MAGYAR KÖZLÖNY

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Budapest,

2007. június 7.,

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TARTALOMJEGYZÉK

II. rész JOGSZABÁLYOK

Törvények

2007. évi XLVI. törvény

a nemzetközi polgári repülésről Chicagóban, az 1944. évi december hó 7. napján aláírt Egyezmény Függelékeinek kihirdetéséről*

(A Függelékek a Magyar Köztársaság vonatkozásában 1969. október 30-án hatályba léptek.)

1. § Az Országgyűlés a nemzetközi polgári repülésről Chicagóban, az 1944. évi december hó 7. napján aláírt Egyezmény Függelékeit e törvénnyel kihirdeti.

2. § A nemzetközi polgári repülésről Chicagóban, az 1944. évi december hó 7. napján aláírt Egyezmény Függelékeinek hiteles angol nyelvű szövegét és hivatalos magyar nyelvű fordítását a törvény *melléklete* tartalmazza.

3. § (1) E törvény a kihirdetését követő 8. napon lép hatályba.

(2) E törvény végrehajtásához szükséges intézkedésekről a közlekedésért felelős miniszter gondoskodik.

Sólyom László s. k.,	*Dr. Szili Katalin* s. k.,
köztársasági elnök	az Országgyűlés elnöke

* A törvényt az Országgyűlés a 2007. május 14-i ülésnapján fogadta el.

Melléklet a 2007. évi XLVI. törvényhez

International Standards
and Recommended Practices

Annex 1
to the Convention on
International Civil Aviation

Personnel Licensing

This edition incorporates all amendments
adopted by the Council prior to 11 March 2006
and supersedes, on 23 November 2006, all previous
editions of Annex 1.

For information regarding the applicability
of the Standards and Recommended Practices,
see Foreword.

Tenth Edition
July 2006

International Civil Aviation Organization

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AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the supplements to the *Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-167	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical Background

Standards and Recommended Practices for Personnel Licensing were first adopted by the Council on 14 April 1948 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 1 to the Convention. They became effective on 15 September 1948.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Application of the PEL Standards

Annex 1 contains Standards and Recommended Practices adopted by the International Civil Aviation Organization as the minimum standards for personnel licensing.

The Annex is applicable to all applicants for and, on renewal, to all holders of the licences and ratings specified herein.

The Council has decided that, in principle, amendments affecting existing licensing specifications are applicable to all applicants for, and holders of, licences but, in considering their application to existing holders of licences, the assessment, if necessary, by re-examination of the knowledge, experience and proficiency of individual licence holders is left to the discretion of Contracting States.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any difference which may subsequently occur, or of the withdrawal of any difference previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Use of the Annex text in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as to facilitate incorporation, without major textual changes, into national legislation.

General Information

The expression "licence" used throughout this Annex has the same meaning as the expressions "certificate of competency and license", "license or certificate" and "license" used in the Convention. Similarly the expression "flight crew member" has the same meaning as the expressions "member of the operating crew of an aircraft" and "operating personnel" used in the Convention while the expression "personnel other than flight crew members" includes the expression "mechanical personnel" used in the Convention.

Status of Annex Components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting

States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

It is to be noted that some Standards in this Annex incorporate, by reference, other specifications having the status of Recommended Practices. In such cases the text of the Recommended Practice becomes part of the Standard.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices (SARPs):*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of Language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own language, and to notify the Organization accordingly.

Editorial Practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

It is to be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb “shall” while Recommended Practices employ the operative verb “should”.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Table A. Amendments to Annex 1

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	Second Session of the PEL Division; January 1947.	Licensing of flight crew members and of key personnel responsible for air navigation services.	14 April 1948 15 September 1948 1 May 1949
1 to 123 (2nd Edition)	Third Session of the PEL Division; March 1948.	Modifications to existing Standards.	22 March 1950 1 September 1950 1 October 1951
124 to 129	Third Session of the PEL Division; March 1948.	Modifications to existing Standards.	27 June 1950 1 November 1950 1 October 1951
130 to 151 (3rd Edition)	Third and Fourth Sessions of the PEL Division; March 1948, February 1952.	Modifications to existing Standards.	25 November 1952 1 April 1953 1 April 1955
152	Special Meeting on Hearing and Visual Requirement for Personnel Licensing; 1955.	Hearing and Visual Requirement for Personnel Licensing.	22 February 1956 1 July 1956 1 December 1956
153	Air Navigation Commission.	New requirement for electrocardiograms.	16 April 1957 1 September 1957 1 December 1957
154 (4th Edition)	Third Air Navigation Conference; 1956.	Amendment of SARPs.	13 June 1957 1 October 1957 1 December 1957
155 (5th Edition)	Recommendation from PEL/MED Meeting; May 1961.	Amendment of SARPs.	27 June 1962 1 November 1962 1 September 1963
156 (6th Edition)	Recommendations from PEL/TRG/MED Divisional Meeting; October–November 1970.	Amendment of SARPs.	11 December 1972 11 April 1973 2 January 1975 26 January 1978
157	Council.	Use of Russian language in personnel licences.	28 June 1976 28 October 1976 21 April 1977
158 (7th Edition)	Correspondence and Secretariat, 21st Assembly and Council.	Modifications to existing Standards for medical examiners. New SARPs for assessment of medical fitness. Replacement of Physical and Mental Requirements by Classes of Medical Assessment.	4 May 1982 4 September 1982 25 November 1982

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
159 (8th Edition)	Second, Third and Fourth Meetings of the Personnel Licensing and Training (PELT) Panel; November 1983, April 1985, May 1986. Air Navigation Commission.	Amendment of SARPs dealing with the licensing of flight crew members. Deletion of the senior commercial pilot licence — aeroplane, the controlled VFR rating, the flight radio operator licence and the flight instructor rating for gliders and free balloons. The dividing line of 5 700 kg maximum take-off mass is replaced by a dividing line based on the crew complement required by certification. All helicopter provisions have the status of Standards. The requirements for the issue of a type rating for aircraft certificated for two-pilot operation are strengthened. The provisions for the issue of each licence and rating have been updated. Flight instruction requirements are established for the private, commercial, glider and free balloon pilot licences and for the instrument and flight instructor ratings.	28 March 1988 31 July 1988 16 November 1989
160	Air Navigation Commission.	Amendment of SARPs for air traffic controllers, aeronautical station operators and flight operations officers.	24 March 1993 26 July 1993 10 November 1994
161	Air Navigation Commission.	Amendment of SARPs for aircraft maintenance technicians/engineers/ mechanics and Specifications for Personnel Licences.	10 March 1997 21 July 1997 5 November 1998
162	First, Second, Third and Fourth Meetings of the Prevention of Substance Abuse in the Workplace Study Group (PSAWSG); December 1993, August 1994, January 1995, May 1995. Air Navigation Commission.	Amendment of SARPs dealing with the use of psychoactive substances by aviation personnel.	25 February 1998 20 July 1998 5 November 1998
163 (9th Edition)	Flight Safety and Human Factors Study Group (FSHFSG); May 1995. Vision and Colour Perception Study Group (VCPSG); June 1997 to May 1998. Air Navigation Commission.	Human Factors knowledge requirements; visual and colour perception requirements; the language used in personnel licences; deletion of the Attachment.	19 February 2001 16 July 2001 1 November 2001
164	32nd Session of the Assembly, MET Divisional Meeting (2002), Air Navigation Commission.	Amendment of definitions; new provisions requiring language proficiency for aeroplane and helicopter pilots, navigators using radiotelephony, air traffic controllers and aeronautical station operators; introduction of a Note on qualification and training for aeronautical meteorology personnel; amendment to the Human Factors knowledge requirements for Aircraft Maintenance Engineer.	5 March 2003 14 July 2003 27 November 2003
165	Air Navigation Commission.	Endorsement of type rating with a limitation of privileges to the cruise phase of the flight.	25 February 2004 12 July 2004 25 November 2004
166	Air Navigation Commission; Medical Provisions Study Group (MPSG); Flight Crew Licensing and Training Panel (FCLTP).	Amendment to the medical provisions; new provisions on approved training organizations.	21 February 2005 11 July 2005 24 November 2005

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
167 (10th Edition)	Air Navigation Commission studies; Second meeting of the Flight Crew Licensing and Training Panel.	Revised and new medical provisions on the upper age limits for flight crew members; new personnel licensing requirements for airships and powered-lifts; introduction of the multi-crew pilot licence; amendments to the details of existing flight crew licensing Standards; amendments to the provisions on the role of flight simulation training devices in acquiring or maintaining the competencies required for the various levels of licences and ratings.	10 March 2006 17 July 2006 23 November 2006

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS AND GENERAL RULES CONCERNING LICENCES

1.1 Definitions

When the following terms are used in the Standards and Recommended Practices for Personnel Licensing, they have the following meanings:

Accredited medical conclusion. The conclusion reached by one or more medical experts acceptable to the Licensing Authority for the purposes of the case concerned, in consultation with flight operations or other experts as necessary.

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft avionics. A term designating any electronic device — including its electrical part — for use in an aircraft, including radio, automatic flight control and instrument systems.

Aircraft — category. Classification of aircraft according to specified basic characteristics, e.g. aeroplane, helicopter, glider, free balloon.

Aircraft certificated for single-pilot operation. A type of aircraft which the State of Registry has determined, during the certification process, can be operated safely with a minimum crew of one pilot.

Aircraft required to be operated with a co-pilot. A type of aircraft that is required to be operated with a co-pilot, as specified in the flight manual or by the air operator certificate.

Aircraft — type of. All aircraft of the same basic design including all modifications thereto except those modifications which result in a change in handling or flight characteristics.

Airmanship. The consistent use of good judgement and well-developed knowledge, skills and attitudes to accomplish flight objectives.

Airship. A power-driven lighter-than-air aircraft.

Approved maintenance organization. An organization approved by a Contracting State, in accordance with the requirements of Annex 6, Part I, Chapter 8 — Aeroplane Maintenance, to perform maintenance of aircraft or parts thereof and operating under supervision approved by that State.

Note.— Nothing in this definition is intended to preclude that the organization and its supervision be approved by more than one State.

Approved training. Training conducted under special curricula and supervision approved by a Contracting State that, in the case of flight crew members, is conducted within an approved training organization.

Approved training organization. An organization approved by a Contracting State in accordance with the requirements of Annex 1, 1.2.8.2 and Appendix 2 to perform flight crew training and operating under the supervision of that State.

Balloon. A non-power-driven lighter-than-air aircraft.

Note.— For the purposes of this Annex, this definition applies to free balloons.

Certify as airworthy (to). To certify that an aircraft or parts thereof comply with current airworthiness requirements after maintenance has been performed on the aircraft or parts thereof.

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Competency. A combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.

Competency element. An action that constitutes a task that has a triggering event and a terminating event that clearly defines its limits, and an observable outcome.

Competency unit. A discrete function consisting of a number of competency elements.

Co-pilot. A licensed pilot serving in any piloting capacity other than as pilot-in-command but excluding a pilot who is on board the aircraft for the sole purpose of receiving flight instruction.

Credit. Recognition of alternative means or prior qualifications.

Cross-country. A flight between a point of departure and a point of arrival following a pre-planned route using standard navigation procedures.

Dual instruction time. Flight time during which a person is receiving flight instruction from a properly authorized pilot on board the aircraft.

Error. An action or inaction by the flight crew that leads to deviations from organizational or flight crew intentions or expectations.

Error management. The process of detecting and responding to errors with countermeasures that reduce or eliminate the consequences of errors and mitigate the probability of further errors or undesired aircraft states.

Note.— See Attachment C to Chapter 3 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868) for a description of undesired aircraft states.*

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight procedures trainer. *See* Flight simulation training device.

Flight simulation training device. Any one of the following three types of apparatus in which flight conditions are simulated on the ground:

A flight simulator, which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;

A flight procedures trainer, which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic, etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;

A basic instrument flight trainer, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.

Flight simulator. *See* Flight simulation training device.

Flight time — aeroplanes. The total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight.

Note. — Flight time as here defined is synonymous with the term "block to block" time or "chock to chock" time in general usage which is measured from the time an aeroplane first moves for the purpose of taking off until it finally stops at the end of the flight.

Flight time — helicopters. The total time from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped.

Glider. A non-power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Glider flight time. The total time occupied in flight, whether being towed or not, from the moment the glider first moves for the purpose of taking off until the moment it comes to rest at the end of the flight.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Instrument flight time. Time during which a pilot is piloting an aircraft solely by reference to instruments and without external reference points.

Instrument ground time. Time during which a pilot is practising, on the ground, simulated instrument flight in a flight simulation training device approved by the Licensing Authority.

Instrument time. Instrument flight time or instrument ground time.

Licensing Authority. The Authority designated by a Contracting State as responsible for the licensing of personnel.

Note.— In the provisions of this Annex, the Licensing Authority is deemed to have been given the following responsibilities by the Contracting State:

a) assessment of an applicant's qualifications to hold a licence or rating;

b) issue and endorsement of licences and ratings;

c) designation and authorization of approved persons;

d) approval of training courses;

e) approval of the use of flight simulation training devices and authorization for their use in gaining the experience or in demonstrating the skill required for the issue of a licence or rating; and

f) validation of licences issued by other Contracting States.

Likely. In the context of the medical provisions in Chapter 6, ***likely*** means with a probability of occurring that is unacceptable to the medical assessor.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Medical Assessment. The evidence issued by a Contracting State that the licence holder meets specific requirements of medical fitness.

Medical assessor. A physician qualified and experienced in the practice of aviation medicine who evaluates medical reports submitted to the Licensing Authority by medical examiners.

Medical examiner. A physician with training in aviation medicine and practical knowledge and experience of the aviation environment, who is designated by the Licensing Authority to conduct medical examinations of fitness of applicants for licences or ratings for which medical requirements are prescribed.

Night. The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise, as may be prescribed by the appropriate authority.

Note.— Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon.

Performance criteria. Simple, evaluative statements on the required outcome of the competency element and a description of the criteria used to judge whether the required level of performance has been achieved.

Pilot (to). To manipulate the flight controls of an aircraft during flight time.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Pilot-in-command under supervision. Co-pilot performing, under the supervision of the pilot-in-command, the duties and functions of a pilot-in-command, in accordance with a method of supervision acceptable to the Licensing Authority.

Powered-lift. A heavier-than-air aircraft capable of vertical take-off, vertical landing, and low-speed flight, which depends principally on engine-driven lift devices or engine thrust for the lift during these flight regimes and on non-rotating aerofoil(s) for lift during horizontal flight.

Problematic use of substances. The use of one or more psychoactive substances by aviation personnel in a way that:

a) constitutes a direct hazard to the user or endangers the lives, health or welfare of others; and/or

b) causes or worsens an occupational, social, mental or physical problem or disorder.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Quality system. Documented organizational procedures and policies; internal audit of those policies and procedures; management review and recommendation for quality improvement.

Rated air traffic controller. An air traffic controller holding a licence and valid ratings appropriate to the privileges to be exercised.

Rating. An authorization entered on or associated with a licence and forming part thereof, stating special conditions, privileges or limitations pertaining to such licence.

Rendering (a licence) valid. The action taken by a Contracting State, as an alternative to issuing its own licence, in accepting a licence issued by any other Contracting State as the equivalent of its own licence.

Sign a maintenance release (to). To certify that maintenance work has been completed satisfactorily in accordance with the applicable Standards of airworthiness, by issuing the maintenance release referred to in Annex 6.

Significant. In the context of the medical provisions in Chapter 6, ***significant*** means to a degree or of a nature that is likely to jeopardize flight safety.

Solo flight time. Flight time during which a student pilot is the sole occupant of an aircraft.

Threat. Events or errors that occur beyond the influence of the flight crew, increase operational complexity and must be managed to maintain the margin of safety.

Threat management. The process of detecting and responding to threats with countermeasures that reduce or eliminate the consequences of threats and mitigate the probability of errors or undesired aircraft states.

Note.— See Attachment C to Chapter 3 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868) for a description of undesired aircraft states.*

1.2 General rules concerning licences

Note 1.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. While Article 83* bis *of the Convention entered into force on 20 June 1997 in respect of Contracting States which have ratified the related Protocol (Doc 9318), the foregoing action will remain particularly relevant for those Contracting States which do not have treaty relations under Article 83* bis. *It was understood that pending entry into force of Article 83* bis *of the Convention, the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Note 2.— International Standards and Recommended Practices are established for licensing the following personnel:

a) Flight crew

- *— private pilot — aeroplane, airship, helicopter or powered-lift;*
- *— commercial pilot — aeroplane, airship, helicopter or powered-lift;*
- *— multi-crew pilot — aeroplane;*
- *— airline transport pilot — aeroplane, helicopter or powered-lift*
- *— glider pilot;*
- *— free balloon pilot;*
- *— flight navigator;*
- *— flight engineer.*

b) Other personnel

- *— aircraft maintenance (technician/engineer/mechanic);*
- *— air traffic controller;*
- *— flight operations officer/flight dispatcher;*
- *— aeronautical station operator.*

1.2.1 Authority to act as a flight crew member

A person shall not act as a flight crew member of an aircraft unless a valid licence is held showing compliance with the specifications of this Annex and appropriate to the duties to be performed by that person. The licence shall have been issued by the State of Registry of that aircraft or by any other Contracting State and rendered valid by the State of Registry of that aircraft.

Note.— Article 29 of the Convention on International Civil Aviation requires that the flight crew members carry their appropriate licences on board every aircraft engaged in international air navigation.

1.2.2 Method of rendering a licence valid

1.2.2.1 When a Contracting State renders valid a licence issued by another Contracting State, as an alternative to the issuance of its own licence, it shall establish validity by suitable authorization to be carried with the former licence accepting it as the equivalent of the latter. When a State limits the authorization to specific privileges, the authorization shall specify the privileges of the licence which are to be accepted as its equivalent. The validity of the authorization shall not extend beyond the period of validity of the licence. The authorization ceases to be valid if the licence upon which it was issued is revoked or suspended.

Note.— This provision is not intended to preclude the State that issued the licence from extending, by a suitable notification, the period of validity of the licence without necessarily requiring either the physical return of the licence or the appearance of the licence holder before the Authorities of that State.

1.2.2.2 When an authorization under 1.2.2.1 is issued for use in commercial air transport operations, the Licensing Authority shall confirm the validity of the other Contracting State's licence before issuing the authorization.

1.2.2.3 **Recommendation.—** *A pilot licence issued by a Contracting State should be rendered valid by other Contracting States for use in private flights.*

Note.— Contracting States which, without formality, render valid a licence issued by another Contracting State for use in private flights are encouraged to notify this facility in their Aeronautical Information Publications.

1.2.3 Privileges of the holder of a licence

A Contracting State shall not permit the holder of a licence to exercise privileges other than those granted by that licence.

1.2.4 Medical fitness

Note 1.— Guidance material is published in the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— To satisfy the licensing requirements of medical fitness for the issue of various types of licences, the applicant must meet certain appropriate medical requirements which are specified as three classes of Medical Assessment. Details are given in 6.2, 6.3, 6.4 and 6.5. To provide the necessary evidence to satisfy the requirements of 1.2.4.1, the Licensing Authority issues the licence holder with the appropriate Medical Assessment, Class 1, Class 2 or Class 3. This can be done in several ways such as a suitably titled separate certificate, a statement on the licence, a national regulation stipulating that the Medical Assessment is an integral part of the licence, etc.

1.2.4.1 An applicant for a licence shall, when applicable, hold a Medical Assessment issued in accordance with the provisions of Chapter 6.

1.2.4.2 The period of validity of a Medical Assessment shall begin on the day the medical examination is performed. The duration of the period of validity shall be in accordance with the provisions of 1.2.5.2.

1.2.4.2.1 The period of validity of a Medical Assessment may be extended, at the discretion of the Licensing Authority, up to 45 days.

Note.— It is advisable to let the calendar day on which the Medical Assessment expires remain constant year after year by allowing the expiry date of the current Medical Assessment to be the beginning of the new validity period under the proviso that the medical examination takes place during the period of validity of the current Medical Assessment but no more than 45 days before it expires.

1.2.4.3 Except as provided in 1.2.5.2.4, flight crew members or air traffic controllers shall not exercise the privileges of their licence unless they hold a current Medical Assessment appropriate to the licence.

1.2.4.4 Contracting States shall designate medical examiners, qualified and licensed in the practice of medicine, to conduct medical examinations of fitness of applicants for the issue or renewal of the licences or ratings specified in Chapters 2 and 3, and of the appropriate licences specified in Chapter 4.

1.2.4.4.1 Medical examiners shall have received training in aviation medicine and shall receive refresher training at regular intervals. Before designation, medical examiners shall demonstrate adequate competency in aviation medicine.

1.2.4.4.2 Medical examiners shall have practical knowledge and experience of the conditions in which the holders of licences and ratings carry out their duties.

Note.— Examples of practical knowledge and experience are flight experience, simulator experience, on-site observation or any other hands-on experience deemed by the Licensing Authority to meet this requirement.

1.2.4.5 Applicants for licences or ratings for which medical fitness is prescribed shall sign and furnish to the medical examiner a declaration stating whether they have previously undergone such an examination and, if so, the date, place and result of the last examination. They shall indicate to the examiner whether a Medical Assessment has previously been refused, revoked or suspended and, if so, the reason for such refusal, revocation or suspension.

1.2.4.5.1 Any false declaration to a medical examiner made by an applicant for a licence or rating shall be reported to the Licensing Authority of the issuing State for such action as may be considered appropriate.

1.2.4.6 Having completed the medical examination of the applicant in accordance with Chapter 6, the medical examiner shall coordinate the results of the examination and submit a signed report, or equivalent, to the Licensing Authority, in accordance with its requirements, detailing the results of the examination and evaluating the findings with regard to medical fitness.

1.2.4.6.1 If the medical report is submitted to the Licensing Authority in electronic format, adequate identification of the examiner shall be established.

1.2.4.6.2 If the medical examination is carried out by two or more medical examiners, Contracting States shall appoint one of these to be responsible for coordinating the results of the examination, evaluating the findings with regard to medical fitness, and signing the report.

1.2.4.7 Contracting States shall use the services of medical assessors to evaluate reports submitted to the Licensing Authorities by medical examiners.

1.2.4.7.1 The medical examiner shall be required to submit sufficient medical information to the Licensing Authority to enable the Authority to audit Medical Assessments.

Note.— The purpose of such auditing is to ensure that medical examiners meet applicable standards for good practice.

1.2.4.8 If the medical Standards prescribed in Chapter 6 for a particular licence are not met, the appropriate Medical Assessment shall not be issued or renewed unless the following conditions are fulfilled:

a) accredited medical conclusion indicates that in special circumstances the applicant's failure to meet any requirement, whether numerical or otherwise, is such that exercise of the privileges of the licence applied for is not likely to jeopardize flight safety;

b) relevant ability, skill and experience of the applicant and operational conditions have been given due consideration; and

c) the licence is endorsed with any special limitation or limitations when the safe performance of the licence holder's duties is dependent on compliance with such limitation or limitations.

1.2.4.9 Medical confidentiality shall be respected at all times.

1.2.4.9.1 All medical reports and records shall be securely held with accessibility restricted to authorized personnel.

1.2.4.9.2 When justified by operational considerations, the medical assessor shall determine to what extent pertinent medical information is presented to relevant officials of the Licensing Authority.

1.2.5 Validity of licences

1.2.5.1 A Contracting State, having issued a licence, shall ensure that the privileges granted by that licence, or by related ratings, are not exercised unless the holder maintains competency and meets the requirements for recent experience established by that State.

1.2.5.1.1 **Recommendation.—** *A Contracting State should establish maintenance of competency and recent experience requirements for pilot licences and ratings based on a systematic approach to accident prevention and should include a risk assessment process and analysis of current operations, including accident and incident data appropriate to that State.*

1.2.5.1.2 A Contracting State, having issued a licence, shall ensure that other Contracting States are enabled to be satisfied as to the validity of the licence.

Note 1.— The maintenance of competency of flight crew members, engaged in commercial air transport operations, may be satisfactorily established by demonstration of skill during proficiency flight checks completed in accordance with Annex 6.

Note 2.— Maintenance of competency may be satisfactorily recorded in the operator's records, or in the flight crew member's personal log book or licence.

Note 3.— Flight crew members may, to the extent deemed feasible by the State of Registry, demonstrate their continuing competency in flight simulation training devices approved by that State.

Note 4.— See the Manual of Criteria for the Qualification of Flight Simulators *(Doc 9625).*

Note 5.— See the Manual of Procedures for Establishment and Management of a State's Personnel Licensing System *(Doc 9379) for guidance material on the development of a risk assessment process.*

1.2.5.2 Except as provided in 1.2.5.2.1, 1.2.5.2.2, 1.2.5.2.3, 1.2.5.2.4, 1.2.5.2.5 and 1.2.5.2.6, a Medical Assessment issued in accordance with 1.2.4.5 and 1.2.4.6 shall be valid from the date of the medical examination for a period not greater than:

60 months for the private pilot licence — aeroplane, airship, helicopter and powered-lift;

12 months for the commercial pilot licence — aeroplane, airship, helicopter and powered-lift;

12 months for the multi-crew pilot licence — aeroplane;

12 months for the airline transport pilot licence — aeroplane, helicopter and powered-lift;

60 months for the glider pilot licence;

60 months for the free balloon pilot licence;

12 months for the flight navigator licence;

12 months for the flight engineer licence;

48 months for the air traffic controller licence.

Note 1.— The periods of validity listed above may be extended by up to 45 days in accordance with 1.2.4.2.1.

Note 2.— When calculated in accordance with 1.2.5.2 and its sub-paragraphs, the period of validity will, for the last month counted, include the day that has the same calendar number as the date of the medical examination or, if that month has no day with that number, the last day of that month.

1.2.5.2.1 The period of validity of a Medical Assessment may be reduced when clinically indicated.

1.2.5.2.2 When the holders of airline transport pilot licences — aeroplane, helicopter and powered-lift, and commercial pilot licences — aeroplane, airship, helicopter and powered-lift, who are engaged in single-crew commercial air transport operations carrying passengers, have passed their 40th birthday, the period of validity specified in 1.2.5.2 shall be reduced to six months.

1.2.5.2.3 When the holders of airline transport pilot licences — aeroplane, helicopter and powered-lift, commercial pilot licences — aeroplane, airship, helicopter and powered-lift, and multi-crew pilot licences — aeroplane, who are engaged in commercial air transport operations, have passed their 60th birthday, the period of validity specified in 1.2.5.2 shall be reduced to six months.

1.2.5.2.4 When the holders of private pilot licences — aeroplane, airship, helicopter and powered-lift, free balloon pilot licences, glider pilot licences and air traffic controller licences have passed their 40th birthday, the period of validity specified in 1.2.5.2 shall be reduced to 24 months.

1.2.5.2.5 **Recommendation.—** *When the holders of private pilot licences — aeroplane, airship, helicopter and powered-lift, free balloon pilot licences, glider pilot licences and air traffic controller licences have passed their 50th birthday, the period of validity specified in 1.2.5.2 should be further reduced to 12 months.*

Note.— The periods of validity listed above are based on the age of the applicant at the time of undergoing the medical examination.

1.2.5.2.6 *Circumstances in which a medical examination may be deferred.* The prescribed re-examination of a licence holder operating in an area distant from designated medical examination facilities may be deferred at the discretion of the Licensing Authority, provided that such deferment shall only be made as an exception and shall not exceed:

a) a single period of six months in the case of a flight crew member of an aircraft engaged in non-commercial operations;

b) two consecutive periods each of three months in the case of a flight crew member of an aircraft engaged in commercial operations provided that in each case a favourable medical report is obtained after examination by a designated medical examiner of the area concerned, or, in cases where such a designated medical examiner is not available, by a physician legally qualified to practise medicine in that area. A report of the medical examination shall be sent to the Licensing Authority where the licence was issued;

c) in the case of a private pilot, a single period not exceeding 24 months where the medical examination is carried out by an examiner designated under 1.2.4.4 by the Contracting State in which the applicant is temporarily located. A report of the medical examination shall be sent to the Licensing Authority where the licence was issued.

1.2.6 Decrease in medical fitness

1.2.6.1 Holders of licences provided for in this Annex shall not exercise the privileges of their licences and related ratings at any time when they are aware of any decrease in their medical fitness which might render them unable to safely and properly exercise these privileges.

1.2.6.1.1 **Recommendation.—** *Licence holders should inform the Licensing Authority of confirmed pregnancy or any decrease in medical fitness of a duration of more than 20 days or which requires continued treatment with prescribed medication or which has required hospital treatment.*

1.2.6.1.2 **Recommendation.—** *Each Contracting State should, as far as practicable, ensure that licence holders do not exercise the privileges of their licences and related ratings during any period in which their medical fitness has, from any cause, decreased to an extent that would have prevented the issue or renewal of their Medical Assessment.*

1.2.7 Use of psychoactive substances

1.2.7.1 Holders of licences provided for in this Annex shall not exercise the privileges of their licences and related ratings while under the influence of any psychoactive substance which might render them unable to safely and properly exercise these privileges.

1.2.7.2 Holders of licences provided for in this Annex shall not engage in any problematic use of substances.

1.2.7.3 **Recommendation.—** *Contracting States should ensure, as far as practicable, that all licence holders who engage in any kind of problematic use of substances are identified and removed from their safety-critical functions. Return to the safety-critical functions may be considered after successful treatment or, in cases where no treatment is necessary, after cessation of the problematic use of substances and upon determination that the person's continued performance of the function is unlikely to jeopardize safety.*

Note.— Guidance on suitable methods of identification (which may include biochemical testing on such occasions as pre-employment, upon reasonable suspicion, after accidents/incidents, at intervals, and at random) and on other prevention topics is contained in the Manual on Prevention of Problematic Use of Substances in the Aviation Workplace *(Doc 9654).*

1.2.8 Approved training and approved training organization

Note.— The qualifications required for the issue of personnel licences can be more readily and speedily acquired by applicants who undergo closely supervised, systematic and continuous courses of training, conforming to a planned syllabus or curriculum. Provision has accordingly been made for some reduction in the experience requirements for the issue of certain licences and ratings prescribed in these Standards and Recommended Practices, in respect of an applicant who has satisfactorily completed a course of approved training.

1.2.8.1 Approved training shall provide a level of competency at least equal to that provided by the minimum experience requirements for personnel not receiving such approved training.

1.2.8.2 The approval of an organization providing training for flight crew by a State shall be dependent upon the applicant demonstrating compliance with the requirements of Appendix 2.

Note.— Guidance on approval of a flight crew training organization can be found in the Manual on the Approval of Flight Crew Training Organizations *(Doc 9841).*

1.2.9 Language proficiency

1.2.9.1 Aeroplane, airship, helicopter and powered-lift pilots and those flight navigators who are required to use the radio telephone aboard an aircraft shall demonstrate the ability to speak and understand the language used for radiotelephony communications.

Note.— Pursuant to Article 42 of the Convention on International Civil Aviation, paragraph 1.2.9.1 does not apply to personnel whose licences are originally issued prior to 5 March 2004 but, in any case, does apply to personnel whose licences remain valid after 5 March 2008.

1.2.9.2 Air traffic controllers and aeronautical station operators shall demonstrate the ability to speak and understand the language used for radiotelephony communications.

1.2.9.3 **Recommendation.—** *Flight engineers, and glider and free balloon pilots should have the ability to speak and understand the language used for radiotelephony communications.*

1.2.9.4 As of 5 March 2008, aeroplane, airship, helicopter and powered-lift pilots, air traffic controllers and aeronautical station operators shall demonstrate the ability to speak and understand the language used for radiotelephony communications to the level specified in the language proficiency requirements in Appendix 1.

1.2.9.5 **Recommendation.—** *Aeroplane, airship, helicopter and powered-lift pilots, flight navigators required to use the radiotelephone aboard an aircraft, air traffic controllers and aeronautical station operators should demonstrate the ability to speak and understand the language used for radiotelephony communications to the level specified in the language proficiency requirements in Appendix 1.*

1.2.9.6 As of 5 March 2008, the language proficiency of aeroplane, airship, helicopter and powered-lift pilots, air traffic controllers and aeronautical station operators who demonstrate proficiency below the Expert Level (Level 6) shall be formally evaluated at intervals in accordance with an individual's demonstrated proficiency level.

1.2.9.7 **Recommendation.—** *The language proficiency of aeroplane, airship, helicopter and powered-lift pilots, flight navigators required to use the radiotelephone aboard an aircraft, air traffic controllers and aeronautical station operators who demonstrate proficiency below the Expert Level (Level 6) should be formally evaluated at intervals in accordance with an individual's demonstrated proficiency level, as follows:*

a) those demonstrating language proficiency at the Operational Level (Level 4) should be evaluated at least once every three years; and

b) those demonstrating language proficiency at the Extended Level (Level 5) should be evaluated at least once every six years.

Note 1.— Formal evaluation is not required for applicants who demonstrate expert language proficiency, e.g. native and very proficient non-native speakers with a dialect or accent intelligible to the international aeronautical community.

Note 2.— The provisions of 1.2.9 refer to Annex 10, Volume II, Chapter 5, whereby the language used for radiotelephony communications may be the language normally used by the station on the ground or English. In practice, therefore, there will be situations whereby flight crew members will only need to speak the language normally used by the station on the ground.

CHAPTER 2. LICENCES AND RATINGS FOR PILOTS

2.1 General rules concerning pilot licences and ratings

2.1.1 General licensing specifications

2.1.1.1 A person shall not act either as pilot-in-command or as co-pilot of an aircraft in any of the following categories unless that person is the holder of a pilot licence issued in accordance with the provisions of this Chapter:

— aeroplane

— airship of a volume of more than 4 600 cubic metres

— free balloon

— glider

— helicopter

— powered-lift.

2.1.1.2 The category of aircraft shall be included in the title of the licence itself, or endorsed as a category rating on the licence.

2.1.1.2.1 When the holder of a pilot licence seeks a licence for an additional category of aircraft, the Licensing Authority shall either:

a) issue the licence holder with an additional pilot licence for that category of aircraft; or

b) endorse the original licence with the new category rating, subject to the conditions of 2.1.2.

Note.— The requirements for category ratings are given in terms of licensing specifications for pilots and at levels appropriate to the privileges to be granted to the licence holder.

2.1.1.3 An applicant shall, before being issued with any pilot licence or rating, meet such requirements in respect of age, knowledge, experience, flight instruction, skill and medical fitness, as are specified for that licence or rating.

2.1.1.3.1 An applicant for any pilot licence or rating shall demonstrate, in a manner determined by the Licensing Authority, such requirements for knowledge and skill as are specified for that licence or rating.

2.1.1.4 *Transitional measures related to the powered-lift category*

Until 10 March 2011, the Licensing Authority may endorse a type rating for aircraft of the powered-lift category on an aeroplane or helicopter pilot licence. The endorsement of the rating on the licence shall indicate that the aircraft is part of the powered-lift category. The training for the type rating in the powered-lift category shall be completed during a course of approved training, shall take into account the previous experience of the applicant in an aeroplane or a helicopter as appropriate and incorporate all relevant aspects of operating an aircraft of the powered-lift category.

2.1.2 Category ratings

2.1.2.1 When established, category ratings shall be for categories of aircraft listed in 2.1.1.1.

2.1.2.2 Category ratings shall not be endorsed on a licence when the category is included in the title of the licence itself.

2.1.2.3 Any additional category rating endorsed on a pilot licence shall indicate the level of licensing privileges at which the category rating is granted.

2.1.2.4 The holder of a pilot licence seeking additional category ratings shall meet the requirements of this Annex appropriate to the privileges for which the category rating is sought.

2.1.3 Class and type ratings

2.1.3.1 Class ratings shall be established for aeroplanes certificated for single-pilot operation and shall comprise:

a) single-engine, land;

b) single-engine, sea;

c) multi-engine, land;

d) multi-engine, sea.

Note.— The provisions of this paragraph do not preclude the establishment of other class ratings within this basic structure.

2.1.3.1.1 **Recommendation.—** *Contracting States should consider establishing a class rating for those helicopters and powered-lifts certificated for single-pilot operations and which have comparable handling, performance and other characteristics.*

2.1.3.2 Type ratings shall be established for:

a) aircraft certificated for operation with a minimum crew of at least two pilots;

b) helicopters and powered-lifts certificated for single-pilot operation except where a class rating has been issued under 2.1.3.1.1; and

c) any aircraft whenever considered necessary by the Licensing Authority.

Note 1.— Where a common type rating is established, it shall be only for aircraft with similar characteristics in terms of operating procedures, systems and handling.

Note 2.— Requirements for class and type ratings for gliders and free balloons have not been determined.

2.1.3.3 When an applicant demonstrates skill and knowledge for the initial issue of a pilot licence, the category and the ratings appropriate to the class or type of aircraft used in the demonstration shall be entered on the licence.

2.1.4 Circumstances in which class and type ratings are required

2.1.4.1 A Contracting State having issued a pilot licence shall not permit the holder of such licence to act either as pilot-in-command or as co-pilot of an aeroplane, an airship, a helicopter or a powered-lift unless the holder has received authorization as follows:

a) the appropriate class rating specified in 2.1.3.1; or

b) a type rating when required in accordance with the provisions of 2.1.3.2.

2.1.4.1.1 When a type rating is issued limiting the privileges to act as co-pilot, or limiting the privileges to act as pilot only during the cruise phase of the flight, such limitation shall be endorsed on the rating.

2.1.4.2 For the purpose of training, testing, or specific special purpose non-revenue, non-passenger carrying flights, special authorization may be provided in writing to the licence holder by the Licensing Authority in place of issuing the class or type rating in accordance with 2.1.4.1. This authorization shall be limited in validity to the time needed to complete the specific flight.

2.1.5 Requirements for the issue of class and type ratings

2.1.5.1 *Class rating*

The applicant shall have demonstrated a degree of skill appropriate to the licence in an aircraft of the class for which the rating is sought.

2.1.5.2 *Type rating as required by 2.1.3.2 a)*

The applicant shall have:

a) gained, under appropriate supervision, experience in the applicable type of aircraft and/or flight simulator in the following:

— normal flight procedures and manoeuvres during all phases of flight;

— abnormal and emergency procedures and manoeuvres in the event of failures and malfunctions of equipment, such as powerplant, systems and airframe;

— where applicable, instrument procedures, including instrument approach, missed approach and landing procedures under normal, abnormal and emergency conditions, including simulated engine failure;

— procedures for crew incapacitation and crew coordination including allocation of pilot tasks; crew cooperation and use of checklists;

Note.— Attention is called to 2.1.8.1 on the qualifications required for pilots giving flight training.

b) demonstrated the skill and knowledge required for the safe operation of the applicable type of aircraft, relevant to the duties of a pilot-in-command or a co-pilot as applicable; and

c) demonstrated, at the airline transport pilot licence level, an extent of knowledge determined by the Licensing Authority on the basis of the requirements specified in 2.6.1.2.

Note.— See the Manual of Procedures for Establishment and Management of a State's Personnel Licensing System *(Doc 9379) for guidance of a general nature on cross-crew qualification and cross-credit.*

2.1.5.3 *Type rating as required by 2.1.3.2 b) and c)*

The applicant shall have demonstrated the skill and knowledge required for the safe operation of the applicable type of aircraft, relevant to the licensing requirements and piloting functions of the applicant.

2.1.6 Use of a flight simulation training device for acquisition of experience and demonstration of skill

The use of a flight simulation training device for acquiring the experience or performing any manoeuvre required during the demonstration of skill for the issue of a licence or rating shall be approved by the Licensing Authority, which shall ensure that the flight simulation training device used is appropriate to the task.

2.1.7 Circumstances in which an instrument rating is required

A Contracting State, having issued a pilot licence, shall not permit the holder thereof to act either as pilot-in-command or as co-pilot of an aircraft under instrument flight rules (IFR) unless such holder has received proper authorization from such Contracting State. Proper authorization shall comprise an instrument rating appropriate to the aircraft category.

Note.— The instrument rating is included in the airline transport pilot licence — aeroplane or powered-lift category, multi-crew pilot licence, and commercial pilot licence — airship category. The provisions of 2.1.7 do not preclude the issue of a licence having the instrument rating as an integral part thereof.

2.1.8 Circumstances in which authorization to conduct instruction is required

2.1.8.1 A Contracting State, having issued a pilot licence, shall not permit the holder thereof to carry out flight instruction required for the issue of a pilot licence or rating, unless such holder has received proper authorization from such Contracting State. Proper authorization shall comprise:

a) a flight instructor rating on the holder's licence; or

b) the authority to act as an agent of an approved organization authorized by the Licensing Authority to carry out flight instruction; or

c) a specific authorization granted by the Contracting State which issued the licence.

2.1.8.2 A Contracting State shall not permit a person to carry out instruction on a flight simulation training device required for the issue of a pilot licence or rating unless such person holds or has held an appropriate licence or has appropriate flight training and flight experience and has received proper authorization from such Contracting State.

2.1.9 Crediting of flight time

2.1.9.1 A student pilot or the holder of a pilot licence shall be entitled to be credited in full with all solo, dual instruction and pilot-in-command flight time towards the total flight time required for the initial issue of a pilot licence or the issue of a higher grade of pilot licence.

2.1.9.2 The holder of a pilot licence, when acting as co-pilot at a pilot station of an aircraft certificated for operation by a single pilot but required by a Contracting State to be operated with a co-pilot, shall be entitled to be credited with not more than 50 per cent of the co-pilot flight time towards the total flight time required for a higher grade of pilot licence. The Contracting State may authorize that flight time be credited in full towards the total flight time required if the aircraft is equipped to be operated by a co-pilot and the aircraft is operated in a multi-crew operation.

2.1.9.3 The holder of a pilot licence, when acting as co-pilot at a pilot station of an aircraft certificated to be operated with a co-pilot, shall be entitled to be credited in full with this flight time towards the total flight time required for a higher grade of pilot licence.

2.1.9.4 The holder of a pilot licence, when acting as pilot-in-command under supervision, shall be entitled to be credited in full with this flight time towards the total flight time required for a higher grade of pilot licence.

2.1.10 Limitation of privileges of pilots who have attained their 60th birthday and curtailment of privileges of pilots who have attained their 65th birthday

2.1.10.1 A Contracting State, having issued pilot licences, shall not permit the holders thereof to act as pilot-in-command of an aircraft engaged in international commercial air transport operations if the licence holders have attained their 60th birthday or, in the case of operations with more than one pilot where the other pilot is younger than 60 years of age, their 65th birthday.

2.1.10.2 **Recommendation.—** *A Contracting State, having issued pilot licences, should not permit the holders thereof to act as co-pilot of an aircraft engaged in international commercial air transport operations if the licence holders have attained their 65th birthday.*

Note.— Attention is drawn to 1.2.5.2.3 on the validity period of Medical Assessments for pilots over the age of 60 who are engaged in commercial air transport operations.

2.2 Student pilot

2.2.1 A student pilot shall meet requirements prescribed by the Contracting State concerned. In prescribing such requirements, Contracting States shall ensure that the privileges granted would not permit student pilots to constitute a hazard to air navigation.

2.2.2 A student pilot shall not fly solo unless under the supervision of, or with the authority of, an authorized flight instructor.

2.2.2.1 A student pilot shall not fly solo in an aircraft on an international flight unless by special or general arrangement between the Contracting States concerned.

2.2.3 Medical fitness

A Contracting State shall not permit a student pilot to fly solo unless that student pilot holds a current Class 2 Medical Assessment.

2.3 Private pilot licence

2.3.1 General requirements for the issue of the licence appropriate to the aeroplane, airship, helicopter and powered-lift categories

2.3.1.1 *Age*

The applicant shall be not less than 17 years of age.

2.3.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a private pilot licence and appropriate to the category of aircraft intended to be included in the licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a private pilot licence; rules of the air; altimeter setting procedures; appropriate air traffic services practices and procedures;

Aircraft general knowledge for aeroplanes, airships, helicopters and powered-lifts

b) principles of operation and functioning of powerplants, systems and instruments;

c) operating limitations of the relevant category of aircraft and powerplants; relevant operational information from the flight manual or other appropriate document;

d) for helicopters and powered-lifts, transmission (power trains) where applicable;

e) for airships, physical properties and practical application of gases;

Flight performance, planning and loading

f) effects of loading and mass distribution on flight characteristics; mass and balance calculations;

g) use and practical application of take-off, landing and other performance data;

h) pre-flight and en-route flight planning appropriate to private operations under VFR; preparation and filing of air traffic services flight plans; appropriate air traffic services procedures; position reporting procedures; altimeter setting procedures; operations in areas of high-density traffic;

Human performance

i) human performance including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

j) application of elementary aeronautical meteorology; use of, and procedures for obtaining, meteorological information; altimetry; hazardous weather conditions;

Navigation

k) practical aspects of air navigation and dead-reckoning techniques; use of aeronautical charts;

Operational procedures

l) application of threat and error management to operational performance;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

m) altimeter setting procedures;

n) use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations;

o) appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather, wake turbulence and other operating hazards;

p) in the case of helicopters, and if applicable, powered-lifts, settling with power; ground resonance; retreating blade stall; dynamic rollover and other operating hazards; safety procedures, associated with flight in VMC;

Principles of flight

q) principles of flight;

Radiotelephony

r) communication procedures and phraseology as applied to VFR operations; action to be taken in case of communication failure.

2.3.1.3 *Skill*

The applicant shall have demonstrated the ability to perform as pilot-in-command of an aircraft within the appropriate category of aircraft, the procedures and manoeuvres described in 2.3.3.2 or 2.3.4.2.1 or 2.3.5.2 or 2.3.6.2 with a degree of competency appropriate to the privileges granted to the holder of a private pilot licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) operate the aircraft within its limitations;

c) complete all manoeuvres with smoothness and accuracy;

d) exercise good judgement and airmanship;

e) apply aeronautical knowledge; and

f) maintain control of the aircraft at all times in a manner such that the successful outcome of a procedure or manoeuvre is assured.

2.3.1.4 *Medical fitness*

The applicant shall hold a current Class 2 Medical Assessment.

Note.— Attention is called to 2.7.1.3 on the medical fitness requirements for private pilot licence holders seeking an instrument rating.

2.3.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.3.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1, 1.2.9 and 2.1, the privileges of the holder of a private pilot licence shall be to act, but not for remuneration, as pilot-in-command or co-pilot of aircraft within the appropriate aircraft category engaged in non-revenue flights.

2.3.2.2 Before exercising the privileges at night, the licence holder shall have received dual instruction in aircraft within the appropriate category of aircraft in night flying, including take-off, landing and navigation.

2.3.3 Specific requirements for the issue of the aeroplane category rating

2.3.3.1 *Experience*

2.3.3.1.1 The applicant shall have completed not less than 40 hours of flight time, or 35 hours if completed during a course of approved training, as a pilot of aeroplanes appropriate to the class rating sought. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 40 hours or 35 hours, as the case may be. Credit for such experience shall be limited to a maximum of 5 hours.

2.3.3.1.1.1 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.3.3.1.1 can be reduced accordingly.

2.3.3.1.2 The applicant shall have completed in aeroplanes not less than 10 hours of solo flight time appropriate to the class rating sought, under the supervision of an authorized flight instructor, including 5 hours of solo cross-country flight time with at least one cross-country flight totalling not less than 270 km (150 NM) in the course of which full-stop landings at two different aerodromes shall be made.

2.3.3.2 *Flight instruction*

The applicant shall have received dual instruction in aeroplanes appropriate to the class rating sought, from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the private pilot:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, aeroplane inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the aeroplane by external visual reference;

e) flight at critically slow airspeeds; recognition of, and recovery from, incipient and full stalls;

f) flight at critically high airspeeds; recognition of, and recovery from, spiral dives;

g) normal and crosswind take-offs and landings;

h) maximum performance (short field and obstacle clearance) take-offs; short-field landings;

i) flight by reference solely to instruments, including the completion of a level 180° turn;

j) cross-country flying using visual reference, dead reckoning and, where available, radio navigation aids;

k) emergency operations, including simulated aeroplane equipment malfunctions;

l) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

m) communication procedures and phraseology.

Note.— The instrument experience specified in 2.3.3.2.1 i) and the night flying dual instruction in 2.3.2.2 do not entitle the holder of a private pilot licence to pilot aeroplanes under IFR.

2.3.4 Specific requirements for the issue of the helicopter category rating

2.3.4.1 *Experience*

2.3.4.1.1 The applicant shall have completed not less than 40 hours of flight time, or 35 hours if completed during a course of approved training, as a pilot of helicopters. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 40 hours or 35 hours, as the case may be. Credit for such experience shall be limited to a maximum of 5 hours.

2.3.4.1.1.1 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.3.4.1.1 can be reduced accordingly.

2.3.4.1.2 The applicant shall have completed in helicopters not less than 10 hours of solo flight time under the supervision of an authorized flight instructor, including 5 hours of solo cross-country flight time with at least one cross-country flight totalling not less than 180 km (100 NM) in the course of which landings at two different points shall be made.

2.3.4.2 *Flight instruction*

2.3.4.2.1 The applicant shall have received not less than 20 hours of dual instruction time in helicopters from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the private pilot:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the helicopter by external visual reference;

e) recovery at the incipient stage from settling with power; recovery techniques from low-rotor rpm within the normal range of engine rpm;

f) ground manoeuvring and run-ups; hovering; take-offs and landings — normal, out of wind and sloping ground;

g) take-offs and landings with minimum necessary power; maximum performance take-off and landing techniques; restricted site operations; quick stops;

h) cross-country flying using visual reference, dead reckoning and, where available, radio navigation aids, including a flight of at least one hour;

i) emergency operations, including simulated helicopter equipment malfunctions; autorotative approach;

j) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

k) communication procedures and phraseology.

2.3.4.2.1.1 **Recommendation.—** *The applicant should have received dual instrument flight instruction from an authorized flight instructor. The instructor should ensure that the applicant has operational experience in flight by reference solely to instruments, including the completion of a level 180° turn, in a suitably instrumented helicopter.*

Note.— The instrument experience specified in 2.3.4.2.1.1 and the night flying dual instruction in 2.3.2.2 do not entitle the holder of a private pilot licence to pilot helicopters under IFR.

2.3.5 Specific requirements for the issue of the powered-lift category rating

2.3.5.1 *Experience*

2.3.5.1.1 **Recommendation.—** *The applicant should have completed not less than 40 hours of flight time as a pilot of powered-lifts. The Licensing Authority should determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 40 hours.*

2.3.5.1.2 **Recommendation.—** *When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority should determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.3.5.1.1 could be reduced accordingly.*

2.3.5.1.3 **Recommendation.—** *The applicant should have completed in powered-lifts not less than 10 hours of solo flight time under the supervision of an authorized flight instructor, including 5 hours of solo cross-country flight time with at least one cross-country flight totalling not less than 270 km (150 NM) in the course of which full-stop landings at two different aerodromes shall be made.*

2.3.5.2 *Flight instruction*

Recommendation.— *The applicant should have received not less than 20 hours of dual instruction time in powered-lifts from an authorized flight instructor. The instructor should ensure that the applicant has operational experience in at least the following areas to the level of performance required for the private pilot:*

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, powered-lift inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the powered-lift by external visual reference;

e) ground manoeuvring and run-ups; hover and rolling take-offs and climb-out; hover and rolling approach and landings — normal, out of wind and sloping ground;

f) take-offs and landings with minimum necessary power; maximum performance take-off and landing techniques; restricted site operations; quick stops;

g) flight by reference solely to instruments, including the completion of a level 180° turn;

h) recovery at the incipient stage from settling with power; recovery techniques from low-rotor rpm within the normal range of engine rpm;

i) cross-country flying using visual reference, dead reckoning and, where available, radio navigation aids, including a flight of at least one hour;

j) emergency operations, including simulated powered-lift equipment malfunctions; power of reconversion to autorotation and autorotative approach, where applicable; transmission and interconnect driveshaft failure, where applicable;

k) operations to from and transiting controlled aerodromes, compliance with air traffic services procedures; and

l) communication procedures and phraseology.

Note.— The instrument experience specified in 2.3.5.2 g) and the night flying dual instruction specified in 2.3.2.2 do not entitle the holder of a private pilot licence to pilot powered-lifts under IFR.

2.3.6 Specific requirements for the issue of the airship category rating

2.3.6.1 *Experience*

The applicant shall have completed not less than 25 hours of flight time as a pilot of airships, including at least:

a) 3 hours of cross-country flight training in an airship with a cross-country flight totalling not less than 45 km (25 NM);

b) 5 take-offs and 5 landings to a full stop at an aerodrome with each landing involving a flight in the traffic pattern at an aerodrome;

c) 3 hours of instrument time; and

d) 5 hours as pilot assuming the duties of the pilot-in-command under the supervision of the pilot-in-command.

2.3.6.2 *Flight instruction*

The applicant shall have received dual instruction in airships from an authorized flight instructor. The instructor shall ensure that the applicant has received instruction in at least the following areas:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, airship inspection and servicing;

c) ground reference manoeuvres;

d) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

e) techniques and procedures for the take-off, including appropriate limitations, emergency procedures and signals used;

f) control of the airship by external visual reference;

g) take-offs, landings and go-arounds;

h) maximum performance (obstacle clearance) take-offs;

i) flight by reference solely to instruments, including the completion of a level 180° turn;

j) navigation, cross-country flying using visual reference, dead reckoning and radio navigation aids;

k) emergency operations (recognition of leaks), including simulated airship equipment malfunctions; and

l) communication procedures and phraseology.

Note.— The instrument experience specified in 2.3.6.2 i) and the night flying dual instruction specified in 2.3.2.2 do not entitle the holder of a private pilot licence to pilot airships under IFR.

2.4 Commercial pilot licence

2.4.1 General requirements for the issue of the licence appropriate to the aeroplane, airship, helicopter and powered-lift categories

2.4.1.1 *Age*

The applicant shall be not less than 18 years of age.

2.4.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a commercial pilot licence and appropriate to the category of aircraft intended to be included in the licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a commercial pilot licence; rules of the air; appropriate air traffic services practices and procedures;

Aircraft general knowledge for aeroplanes, airships, helicopters and powered-lifts

b) principles of operation and functioning of powerplants, systems and instruments;

c) operating limitations of the relevant category of aircraft and powerplants; relevant operational information from the flight manual or other appropriate document;

d) use and serviceability checks of equipment and systems of appropriate aircraft;

e) maintenance procedures for airframes, systems and powerplants of appropriate aircraft;

f) for helicopters and powered-lifts, transmission (power trains) where applicable;

g) for airships, physical properties and practical application of gases;

Flight performance, planning and loading

h) effects of loading and mass distribution on aircraft handling, flight characteristics and performance; mass and balance calculations;

i) use and practical application of take-off, landing and other performance data;

j) pre-flight and en-route flight planning appropriate to commercial operations under VFR; preparation and filing of air traffic services flight plans; appropriate air traffic services procedures; altimeter setting procedures;

k) in the case of airships, helicopters and powered-lifts, effects of external loading on handling;

Human performance

l) human performance including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

m) interpretation and application of aeronautical meteorological reports, charts and forecasts; use of, and procedures for obtaining, meteorological information, pre-flight and in-flight; altimetry;

n) aeronautical meteorology; climatology of relevant areas in respect of the elements having an effect upon aviation; the movement of pressure systems, the structure of fronts, and the origin and characteristics of significant weather phenomena which affect take-off, en-route and landing conditions;

o) causes, recognition and effects of icing; frontal zone penetration procedures; hazardous weather avoidance;

Navigation

p) air navigation, including the use of aeronautical charts, instruments and navigation aids; an understanding of the principles and characteristics of appropriate navigation systems; operation of airborne equipment;

q) in the case of airships:

i) use, limitation and serviceability of avionics and instruments necessary for control and navigation;

ii) use, accuracy and reliability of navigation systems used in departure, en-route, approach and landing phases of flight, identification of radio navigation aids;

iii) principles and characteristics of self-contained and external referenced navigation systems, operation of airborne equipment;

Operational procedures

r) application of threat and error management to operational performance;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

s) use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations;

t) altimeter setting procedures;

u) appropriate precautionary and emergency procedures;

v) operational procedures for carriage of freight; potential hazards associated with dangerous goods;

w) requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from aircraft;

x) in the case of helicopters, and if applicable, powered-lifts, settling with power; ground resonance; retreating blade stall; dynamic rollover and other operating hazards; safety procedures, associated with flight in VMC;

Principles of flight

y) principles of flight;

Radiotelephony

z) communication procedures and phraseology as applied to VFR operations; action to be taken in case of communication failure.

2.4.1.3 *Skill*

The applicant shall have demonstrated the ability to perform as pilot-in-command of an aircraft within the appropriate category of aircraft, the procedures and manoeuvres described in 2.4.3.2 or 2.4.4.2 or 2.4.5.2 or 2.4.6.2 with a degree of competency appropriate to the privileges granted to the holder of a commercial pilot licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) operate the aircraft within its limitations;

c) complete all manoeuvres with smoothness and accuracy;

d) exercise good judgement and airmanship;

e) apply aeronautical knowledge; and

f) maintain control of the aircraft at all times in a manner such that the successful outcome of a procedure or manoeuvre is assured.

2.4.1.4 *Medical fitness*

The applicant shall hold a current Class 1 Medical Assessment.

2.4.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.4.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1, 1.2.9 and 2.1, the privileges of the holder of a commercial pilot licence shall be:

a) to exercise all the privileges of the holder of a private pilot licence in an aircraft within the appropriate aircraft category;

b) to act as pilot-in-command of an aircraft within the appropriate aircraft category engaged in operations other than commercial air transportation;

c) to act as pilot-in-command, in commercial air transportation, of an aircraft within the appropriate aircraft category and certificated for single-pilot operation;

d) to act as co-pilot of an aircraft within the appropriate aircraft category required to be operated with a co-pilot; and

e) for the airship category, to pilot an airship under IFR.

2.4.2.2 Before exercising the privileges at night, the licence holder shall have received dual instruction in aircraft within the appropriate category of aircraft in night flying, including take-off, landing and navigation.

Note.— Certain privileges of the licence are curtailed by 2.1.10 for licence holders when they attain their 60th and 65th birthdays.

2.4.3 Specific requirements for the issue of the aeroplane category rating

2.4.3.1 *Experience*

2.4.3.1.1 The applicant shall have completed not less than 200 hours of flight time, or 150 hours if completed during a course of approved training, as a pilot of aeroplanes. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 200 hours or 150 hours, as the case may be. Credit for such experience shall be limited to a maximum of 10 hours.

2.4.3.1.1.1 The applicant shall have completed in aeroplanes not less than:

a) 100 hours as pilot-in-command or, in the case of a course of approved training, 70 hours as pilot-in-command;

b) 20 hours of cross-country flight time as pilot-in-command including a cross-country flight totalling not less than 540 km (300 NM) in the course of which full-stop landings at two different aerodromes shall be made;

c) 10 hours of instrument instruction time of which not more than 5 hours may be instrument ground time; and

d) if the privileges of the licence are to be exercised at night, 5 hours of night flight time including 5 take-offs and 5 landings as pilot-in-command.

2.4.3.1.2 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.4.3.1.1 can be reduced accordingly.

2.4.3.2 *Flight instruction*

The applicant shall have received dual instruction in aeroplanes appropriate to the class and/or type rating, sought from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the commercial pilot:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, aeroplane inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the aeroplane by external visual reference;

e) flight at critically slow airspeeds; spin avoidance; recognition of, and recovery from, incipient and full stalls;

f) flight with asymmetrical power for multi-engine class or type ratings;

g) flight at critically high airspeeds; recognition of, and recovery from, spiral dives;

h) normal and crosswind take-offs and landings;

i) maximum performance (short field and obstacle clearance) take-offs; short-field landings;

j) basic flight manoeuvres and recovery from unusual attitudes by reference solely to basic flight instruments;

k) cross-country flying using visual reference, dead reckoning and radio navigation aids; diversion procedures;

l) abnormal and emergency procedures and manoeuvres including simulated aeroplane equipment malfunctions;

m) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

n) communication procedures and phraseology.

Note.— The instrument experience specified in 2.4.3.1.1.1 c) and 2.4.3.2 j) and the night flying experience and dual instruction specified in 2.4.3.1.1.1 d) and 2.4.2.2 do not entitle the holder of a commercial pilot licence to pilot aeroplanes under IFR.

2.4.4 Specific requirements for the issue of the helicopter category rating

2.4.4.1 *Experience*

2.4.4.1.1 The applicant shall have completed not less than 150 hours of flight time, or 100 hours if completed during a course of approved training, as a pilot of helicopters. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 150 hours or 100 hours, as the case may be. Credit for such experience shall be limited to a maximum of 10 hours.

2.4.4.1.1.1 The applicant shall have completed in helicopters not less than:

a) 35 hours as pilot-in-command;

b) 10 hours of cross-country flight time as pilot-in-command including a cross-country flight in the course of which landings at two different points shall be made;

c) 10 hours of instrument instruction time of which not more than 5 hours may be instrument ground time; and

d) if the privileges of the licence are to be exercised at night, 5 hours of night flight time including 5 take-offs and 5 landing patterns as pilot-in-command.

2.4.4.1.2 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.4.4.1.1 can be reduced accordingly.

2.4.4.2 *Flight instruction*

The applicant shall have received dual instruction in helicopters from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the commercial pilot:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the helicopter by external visual reference;

e) recovery at the incipient stage from settling with power; recovery techniques from low-rotor rpm within the normal range of engine rpm;

f) ground manoeuvring and run-ups; hovering; take-offs and landings — normal, out of wind and sloping ground; steep approaches;

g) take-offs and landings with minimum necessary power; maximum performance take-off and landing techniques; restricted site operations; quick stops;

h) hovering out of ground effect; operations with external load, if applicable; flight at high altitude;

i) basic flight manoeuvres and recovery from unusual attitudes by reference solely to basic flight instruments;

j) cross-country flying using visual reference, dead reckoning and radio navigation aids; diversion procedures;

k) abnormal and emergency procedures, including simulated helicopter equipment malfunctions, autorotative approach and landing;

l) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

m) communication procedures and phraseology.

Note.— The instrument experience specified in 2.4.4.1.1.1 c) and 2.4.4.2 i) and the night flying experience and dual instruction specified in 2.4.4.1.1.1 d) and 2.4.2.2 do not entitle the holder of a commercial pilot licence to pilot helicopters under IFR.

2.4.5 Specific requirements for the issue of the powered-lift category rating

2.4.5.1 *Experience*

2.4.5.1.1 **Recommendation.—** *The applicant should have completed not less than 200 hours of flight time in a powered-lift, or 150 hours if completed during a course of approved training, as a pilot of aircraft. The Licensing Authority should determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 200 hours or 150 hours, as the case may be.*

2.4.5.1.2 **Recommendation.—** *The applicant should have completed in a powered-lift not less than:*

a) 50 hours as pilot-in-command;

b) 10 hours of cross-country flying as pilot-in-command including a cross-country flight totalling not less than 540 km (300 NM) in the course of which full-stop landings at two different aerodromes should be made;

c) 10 hours of instrument instruction of which not more than 5 hours may be instrument ground time; and

d) if the privileges of the licence are to be exercised at night, 5 hours of night flight time including 5 take-offs and landings as pilot-in-command.

2.4.5.1.3 **Recommendation. —** *When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority should determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.4.5.1.1 could be reduced accordingly.*

2.4.5.2 *Flight instruction*

Recommendation.— *The applicant should have received dual instruction time in a powered-lift from an authorized flight instructor. The instructor should ensure that the applicant has operational experience in at least the following areas to the level of performance required for the commercial pilot:*

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, powered-lift inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) control of the powered-lift by external visual reference;

e) recovery at the incipient stage from settling with power; recovery techniques from low-rotor rpm within the normal range of engine rpm;

f) ground manoeuvring and run-ups; hover and rolling take-offs and climb-out; hover and rolling approach and landings — normal, out of wind and sloping ground; steep approaches;

g) take-offs and landings with minimum necessary power; maximum performance take-off and landing techniques; restricted site operations; quick stops;

h) hovering out of ground effect; operations with external load, if applicable; flight at high altitude;

i) basic flight manoeuvres and recovery from unusual attitudes by reference solely to basic flight instruments;

j) cross-country flying using visual reference, dead reckoning and, where available, radio navigation aids, including a flight of at least one hour;

k) emergency operations, including simulated powered-lift equipment malfunctions; power of reconversion to autorotation and autorotative approach, where applicable; transmission and interconnect driveshaft failure, where applicable;

l) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

m) communication procedures and phraseology.

Note.— The instrument experience specified in 2.4.5.1.2 c) and 2.4.5.2 i) and the night flying experience and dual *instruction specified in 2.4.5.1.2 d) and 2.4.2.2 do not entitle the holder of a commercial pilot licence to pilot powered-lifts under IFR.*

2.4.6 Specific requirements for the issue of the airship category rating

2.4.6.1 *Experience*

2.4.6.1.1 The applicant shall have completed not less than 200 hours of flight time as a pilot.

2.4.6.1.1.1 The applicant shall have completed not less than:

a) 50 hours as a pilot of airships;

b) 30 hours in airships as pilot-in-command or pilot-in-command under supervision, to include not less than:

— 10 hours of cross-country flight time; and

— 10 hours of night flight;

c) 40 hours of instrument time, of which 20 hours shall be in flight and 10 hours in flight in airships; and

d) 20 hours of flight training in airships in the areas of operation listed in 2.4.6.2.

2.4.6.2 *Flight instruction*

The applicant shall have received dual instruction in airships from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the commercial pilot:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) pre-flight operations, including mass and balance determination, airship inspection and servicing;

c) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;

d) techniques and procedures for the take-off, including appropriate limitations, emergency procedures and signals used;

e) control of the airship by external visual reference;

f) recognition of leaks;

g) normal take-offs and landings;

h) maximum performance (short field and obstacle clearance) take-offs; short-field landings;

i) flight under IFR;

j) cross-country flying using visual reference, dead reckoning and, where available, radio navigation aids;

k) emergency operations, including simulated airship equipment malfunctions;

l) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures; and

m) communication procedures and phraseology.

2.5 Multi-crew pilot licence appropriate to the aeroplane category

2.5.1 General requirements for the issue of the licence

2.5.1.1 *Age*

The applicant shall be not less than 18 years of age.

2.5.1.2 *Knowledge*

The applicant shall have met the requirements specified in 2.6.1.2 for the airline transport pilot licence appropriate to the aeroplane category in an approved training course.

2.5.1.3 *Skill*

2.5.1.3.1 The applicant shall have demonstrated the skills required for fulfilling all the competency units specified in Appendix 3 as pilot flying and pilot not flying, to the level required to perform as a co-pilot of turbine-powered aeroplanes certificated for operation with a minimum crew of at least two pilots under VFR and IFR, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG,* *Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) smoothly and accurately, manually control the aeroplane within its limitations at all times, such that the successful outcome of a procedure or manoeuvre is assured;

c) operate the aeroplane in the mode of automation appropriate to the phase of flight and to maintain awareness of the active mode of automation;

d) perform, in an accurate manner, normal, abnormal and emergency procedures in all phases of flight; and

e) communicate effectively with other flight crew members and demonstrate the ability to effectively perform procedures for crew incapacitation, crew coordination, including allocation of pilot tasks, crew cooperation, adherence to standard operating procedures (SOPs) and use of checklists.

2.5.1.3.2 Progress in acquiring the skills specified in 2.5.1.3.1 shall be continuously assessed.

2.5.1.4 *Medical fitness*

The applicant shall hold a current Class 1 medical assessment.

2.5.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.5.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1, 1.2.9 and 2.1, the privileges of the holder of a multi-crew pilot licence shall be:

a) to exercise all the privileges of the holder of a private pilot licence in the aeroplane category provided the requirements of paragraph 2.3.3 have been met;

b) to exercise the privileges of the instrument rating in a multi-crew operation; and

c) to act as co-pilot of an aeroplane required to be operated with a co-pilot.

2.5.2.2 Before exercising the privileges of the instrument rating in a single-pilot operation in aeroplanes, the licence holder shall have demonstrated an ability to act as pilot-in-command in a single-pilot operation exercised by reference solely to instruments and shall have met the skill requirement specified in 2.7.1.2 appropriate to the aeroplane category.

2.5.2.3 Before exercising the privileges of a commercial pilot licence in a single-pilot operation in aeroplanes, the licence holder shall have:

a) completed in aeroplanes 70 hours, either as pilot-in-command, or made up of not less than 10 hours as pilot-in- command and the necessary additional flight time as pilot-in-command under supervision;

b) completed 20 hours of cross-country flight time as pilot-in-command, or made up of not less than 10 hours as pilot-in-command and 10 hours as pilot-in-command under supervision, including a cross-country flight totalling not less than 540 km (300 NM) in the course of which full-stop landings at two different aerodromes shall be made; and

c) met the requirements for the commercial pilot licence specified in 2.4.1.2, 2.4.1.3, 2.4.3.1.1 (with the exception of 2.4.3.1.1.1 a)) and 2.4.3.2 appropriate to the aeroplane category.

Note 1.— When a Contracting State grants single-pilot operation privileges to the holder of a multi-crew pilot licence, it can document the privileges through an endorsement of the multi-crew pilot licence or through the issuance of a commercial pilot licence in the aeroplane category.

Note 2.— Certain privileges of the licence are curtailed by 2.1.10 for licence holders when they attain their 65th birthday.

2.5.3 Experience

2.5.3.1 The applicant shall have completed in an approved training course not less than 240 hours as pilot flying and pilot not flying of actual and simulated flight.

2.5.3.2 Flight experience in actual flight shall include at least the experience requirements at 2.3.3.1, upset recovery training, night flying and flight by reference solely to instruments.

2.5.3.3 In addition to meeting the provisions of 2.5.3.2, the applicant shall have gained, in a turbine-powered aeroplane certificated for operation with a minimum crew of at least two pilots, or in a flight simulation training device approved for that purpose by the Licensing Authority in accordance with Appendix 3, paragraph 4, the experience necessary to achieve the advanced level of competency defined in Appendix 3.

2.5.4 Flight instruction

2.5.4.1 The applicant shall have completed a course of approved training covering the experience requirements specified in 2.5.3.

2.5.4.2 The applicant shall have received dual flight instruction in all the competency units specified in Appendix 3, to the level required for the issue of the multi-crew pilot licence, to include the competency units required to pilot under instrument flight rules.

2.6 Airline transport pilot licence

2.6.1 General requirements for the issue of the licence appropriate to the aeroplane, helicopter and powered-lift categories

2.6.1.1 *Age*

The applicant shall be not less than 21 years of age.

2.6.1.2 *Knowledge*

2.6.1.2.1 The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of an airline transport pilot licence and appropriate to the category of aircraft intended to be included in the licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of an airline transport pilot licence; rules of the air; appropriate air traffic services practices and procedures;

Aircraft general knowledge for aeroplanes, helicopters and powered-lifts

b) general characteristics and limitations of electrical, hydraulic, pressurization and other aircraft systems; flight control systems, including autopilot and stability augmentation;

c) principles of operation, handling procedures and operating limitations of aircraft powerplants; effects of atmospheric conditions on engine performance; relevant operational information from the flight manual or other appropriate document;

d) operating procedures and limitations of the relevant category of aircraft; effects of atmospheric conditions on aircraft performance in accordance with the relevant operational information from the flight manual;

e) use and serviceability checks of equipment and systems of appropriate aircraft;

f) flight instruments; compasses, turning and acceleration errors; gyroscopic instruments, operational limits and precession effects; practices and procedures in the event of malfunctions of various flight instruments and electronic display units;

g) maintenance procedures for airframes, systems and powerplants of appropriate aircraft;

h) for helicopters and powered-lifts, transmission (power trains) where applicable;

Flight performance, planning and loading

i) effects of loading and mass distribution on aircraft handling, flight characteristics and performance; mass and balance calculations;

j) use and practical application of take-off, landing and other performance data, including procedures for cruise control;

k) pre-flight and en-route operational flight planning; preparation and filing of air traffic services flight plans; appropriate air traffic services procedures; altimeter setting procedures;

l) in the case of helicopters and powered-lifts, effects of external loading on handling;

Human performance

m) human performance including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

n) interpretation and application of aeronautical meteorological reports, charts and forecasts; codes and abbreviations; use of, and procedures for obtaining, meteorological information, pre-flight and in-flight; altimetry;

o) aeronautical meteorology; climatology of relevant areas in respect of the elements having an effect upon aviation; the movement of pressure systems; the structure of fronts, and the origin and characteristics of significant weather phenomena which affect take-off, en-route and landing conditions;

p) causes, recognition and effects of icing; frontal zone penetration procedures; hazardous weather avoidance;

q) in the case of aeroplanes and powered-lifts, practical high altitude meteorology, including interpretation and use of weather reports, charts and forecasts; jetstreams;

Navigation

r) air navigation, including the use of aeronautical charts, radio navigation aids and area navigation systems; specific navigation requirements for long-range flights;

s) use, limitation and serviceability of avionics and instruments necessary for the control and navigation of aircraft;

t) use, accuracy and reliability of navigation systems used in departure, en-route, approach and landing phases of flight; identification of radio navigation aids;

u) principles and characteristics of self-contained and external-referenced navigation systems; operation of airborne equipment;

Operational procedures

v) application of threat and error management to operational performance;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

w) interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations;

x) precautionary and emergency procedures; safety practices;

y) operational procedures for carriage of freight and dangerous goods;

z) requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from aircraft;

aa) in the case of helicopters, and if applicable, powered-lifts, settling with power; ground resonance; retreating blade stall; dynamic rollover and other operating hazards; safety procedures, associated with flight in VMC;

Principles of flight

bb) principles of flight;

Radiotelephony

cc) communication procedures and phraseology; action to be taken in case of communication failure.

2.6.1.2.2 In addition to the above subjects, the applicant for an airline transport pilot licence applicable to the aeroplane or powered-lift category shall have met the knowledge requirements for the instrument rating at 2.7.1.1.

2.6.1.3 *Skill*

2.6.1.3.1 The applicant shall have demonstrated the ability to perform, as pilot-in-command of an aircraft within the appropriate category required to be operated with a co-pilot, the following procedures and manoeuvres:

a) pre-flight procedures, including the preparation of the operational flight plan and filing of the air traffic services flight plan;

b) normal flight procedures and manoeuvres during all phases of flight;

c) abnormal and emergency procedures and manoeuvres related to failures and malfunctions of equipment, such as powerplant, systems and airframe;

d) procedures for crew incapacitation and crew coordination, including allocation of pilot tasks, crew cooperation and use of checklists; and

e) in the case of aeroplanes and powered-lifts, procedures and manoeuvres for instrument flight described in 2.7.4.1 a) to d), including simulated engine failure.

2.6.1.3.1.1 In the case of an aeroplane, the applicant shall have demonstrated the ability to perform the procedures and manoeuvres described in 2.6.1.3.1 as pilot-in-command of a multi-engined aeroplane.

2.6.1.3.1.2 The applicant shall have demonstrated the ability to perform the procedures and manoeuvres described in 2.6.1.3 with a degree of competency appropriate to the privileges granted to the holder of an airline transport pilot licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) smoothly and accurately, manually control the aircraft within its limitations at all times, such that the successful outcome of a procedure or manoeuvre is assured;

c) operate the aircraft in the mode of automation appropriate to the phase of flight and to maintain awareness of the active mode of automation;

d) perform, in an accurate manner, normal, abnormal and emergency procedures in all phases of flight;

e) exercise good judgement and airmanship, to include structured decision making and the maintenance of situational awareness; and

f) communicate effectively with other flight crew members and demonstrate the ability to effectively perform procedures for crew incapacitation, crew coordination, including allocation of pilot tasks, crew cooperation, adherence to standard operating procedures (SOPs) and use of checklists.

2.6.1.4 *Medical fitness*

The applicant shall hold a current Class 1 Medical Assessment.

2.6.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.6.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1, 1.2.9 and 2.1, the privileges of the holder of an airline transport pilot licence shall be:

a) to exercise all the privileges of the holder of a private and commercial pilot licence in an aircraft within the appropriate aircraft category and, in the case of a licence for the aeroplane and powered-lift categories, of the instrument rating; and

b) to act as pilot-in-command, in commercial air transportation, of an aircraft within the appropriate category and certificated for operation with more than one pilot.

2.6.2.2 When the holder of an airline transport pilot licence in the aeroplane category has previously held only a multi-crew pilot licence, the privileges of the licence shall be limited to multi-crew operations unless the holder has met the requirements established in 2.5.2.1 a), 2.5.2.2 and 2.5.2.3 as appropriate. Any limitation of privileges shall be endorsed on the licence.

Note.— Certain privileges of the licence are curtailed by 2.1.10 for licence holders when they attain their 60th and 65th birthdays.

2.6.3 Specific requirements for the issue of the aeroplane category rating

2.6.3.1 *Experience*

2.6.3.1.1 The applicant shall have completed not less than 1 500 hours of flight time as a pilot of aeroplanes. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 1 500 hours. Credit for such experience shall be limited to a maximum of 100 hours, of which not more than 25 hours shall have been acquired in a flight procedure trainer or a basic instrument flight trainer.

2.6.3.1.1.1 The applicant shall have completed in aeroplanes not less than:

a) 500 hours as pilot-in-command under supervision or 250 hours, either as pilot-in-command, or made up by not less than 70 hours as pilot-in-command and the necessary additional flight time as pilot-in-command under supervision;

b) 200 hours of cross-country flight time, of which not less than 100 hours shall be as pilot-in-command or as pilot-in-command under supervision;

c) 75 hours of instrument time, of which not more than 30 hours may be instrument ground time; and

d) 100 hours of night flight as pilot-in-command or as co-pilot.

2.6.3.1.2 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.6.3.1.1 can be reduced accordingly.

2.6.3.2 *Flight instruction*

The applicant shall have received the dual flight instruction required at 2.4.3.2 for the issue of the commercial pilot licence and at 2.7.4 for the issue of the instrument rating or at 2.5.4 for the issue of the multi-crew pilot licence.

2.6.4 Specific requirements for the issue of the helicopter category rating

2.6.4.1 *Experience*

2.6.4.1.1 The applicant shall have completed not less than 1 000 hours of flight time as a pilot of helicopters. The Licensing Authority shall determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 1 000 hours. Credit for such experience shall be limited to a maximum of 100 hours, of which not more than 25 hours shall have been acquired in a flight procedure trainer or a basic instrument flight trainer.

2.6.4.1.1.1 The applicant shall have completed in helicopters not less than:

a) 250 hours, either as pilot-in-command, or made up of not less than 70 hours as pilot-in-command and the necessary additional flight time as pilot-in-command under supervision;

b) 200 hours of cross-country flight time, of which not less than 100 hours shall be as pilot-in-command or as pilot-in-command under supervision;

c) 30 hours of instrument time, of which not more than 10 hours may be instrument ground time; and

d) 50 hours of night flight as pilot-in-command or as co-pilot.

2.6.4.1.2 When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.6.4.1.1 can be reduced accordingly.

2.6.4.2 *Flight instruction*

The applicant shall have received the flight instruction required for the issue of the commercial pilot licence (2.4.4.2).

Note.— The instrument time specified in 2.6.4.1.1.1 c) and the night flying time specified in 2.6.4.1.1.1 d) do not entitle the holder of the airline transport pilot licence — helicopter to pilot helicopters under IFR.

2.6.5 Specific requirements for the issue of the powered-lift category rating

2.6.5.1 *Experience*

2.6.5.1.1 **Recommendation.—** *The applicant should have completed not less than 1 500 hours of flight time as a pilot of powered-lifts. The Licensing Authority should determine whether experience as a pilot under instruction in a flight simulation training device is acceptable as part of the total flight time of 1 500 hours.*

2.6.5.1.2 **Recommendation.—** *The applicant should have completed in powered-lifts not less than:*

a) 250 hours, either as pilot-in-command, or made up of not less than 70 hours as pilot-in-command and the necessary additional flight time as pilot-in-command under supervision;

b) 100 hours of cross-country flight time, of which not less than 50 hours should be as pilot-in-command or as pilot-in-command under supervision;

c) 75 hours of instrument time, of which not more than 30 hours may be instrument ground time; and

d) 25 hours of night flight as pilot-in-command or as co-pilot.

2.6.5.1.3 **Recommendation.—** *When the applicant has flight time as a pilot of aircraft in other categories, the Licensing Authority should determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.6.5.1.1 could be reduced accordingly.*

2.6.5.2 *Flight instruction*

Recommendation.— *The applicant should have received the dual flight instruction required at 2.4.5.2 for the issue of the commercial pilot licence and at 2.7.4 for the issue of the instrument rating.*

2.7 Instrument rating

2.7.1 Requirements for the issue of the rating for aeroplane, airship, helicopter and powered-lift categories

2.7.1.1 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of an instrument rating, in at least the following subjects:

Air law

a) rules and regulations relevant to flight under IFR; related air traffic services practices and procedures;

Aircraft general knowledge for the aircraft category being sought

b) use, limitation and serviceability of avionics, electronic devices and instruments necessary for the control and navigation of aircraft under IFR and in instrument meteorological conditions; use and limitations of autopilot;

c) compasses, turning and acceleration errors; gyroscopic instruments, operational limits and precession effects; practices and procedures in the event of malfunctions of various flight instruments;

Flight performance and planning for the aircraft category being sought

d) pre-flight preparations and checks appropriate to flight under IFR;

e) operational flight planning; preparation and filing of air traffic services flight plans under IFR; altimeter setting procedures;

Human performance for the aircraft category being sought

f) human performance relevant to instrument flight in aircraft including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology for the aircraft category being sought

g) application of aeronautical meteorology; interpretation and use of reports, charts and forecasts; codes and abbreviations; use of, and procedures for obtaining, meteorological information; altimetry;

h) causes, recognition and effects of icing; frontal zone penetration procedures; hazardous weather avoidance;

i) in the case of helicopters and powered-lifts, effects of rotor icing;

Navigation for the aircraft category being sought

j) practical air navigation using radio navigation aids;

k) use, accuracy and reliability of navigation systems used in departure, en-route, approach and landing phases of flight; identification of radio navigation aids;

Operational procedures for the aircraft category being sought

l) application of threat and error management to operational performance;

m) interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations, and instrument procedure charts for departure, en-route, descent and approach;

n) precautionary and emergency procedures; safety practices associated with flight under IFR; obstacle clearance criteria;

Note.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in the Procedures for Air Navigation Services *(PANS-OPS, Doc 8168), Volume I —* Flight Procedures. *Procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.*

Radiotelephony

o) communication procedures and phraseology as applied to aircraft operations under IFR; action to be taken in case of communication failure.

2.7.1.2 *Skill*

2.7.1.2.1 The applicant shall have demonstrated in an aircraft of the category for which the instrument rating is being sought the ability to perform the procedures and manoeuvres described in 2.7.4.1 with a degree of competency appropriate to the privileges granted to the holder of an instrument rating, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) operate the aircraft for the category being sought, within its limitations;

c) complete all manoeuvres with smoothness and accuracy;

d) exercise good judgement and airmanship;

e) apply aeronautical knowledge; and

f) maintain control of the aircraft at all times in a manner such that the successful outcome of a procedure or manoeuvre is assured.

2.7.1.2.1.1 The applicant shall have demonstrated the ability to operate multi-engined aircraft within the appropriate category by reference solely to instruments with one engine inoperative, or simulated inoperative, if the privileges of the instrument rating are to be exercised on such aircraft.

Note.— Attention is called to 2.1.6 on the use of flight simulation training devices for demonstrations of skill.

2.7.1.3 *Medical fitness*

2.7.1.3.1 Applicants who hold a private pilot licence shall have established their hearing acuity on the basis of compliance with the hearing requirements for the issue of a Class 1 Medical Assessment.

2.7.1.3.2 **Recommendation.—** *Contracting States should consider requiring the holder of a private pilot licence to comply with the physical and mental, and visual requirements for the issue of a Class 1 Medical Assessment.*

2.7.2 Privileges of the holder of the rating and the conditions to be observed in exercising such privileges

2.7.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6 and 2.1, the privileges of the holder of an instrument rating with a specific aircraft category shall be to pilot that category of aircraft under IFR.

2.7.2.2 Before exercising the privileges on multi-engined aircraft, the holder of the rating shall have complied with the requirements of 2.7.1.2.1.1.

Note.— Pilots may exercise joint category privileges of the instrument rating on more than one category of aircraft if they have completed the requirements in each category.

2.7.3 Experience

2.7.3.1 The applicant shall hold a pilot licence for the aircraft category being sought.

2.7.3.2 The applicant shall have completed not less than:

a) 50 hours of cross-country flight time as pilot-in-command of aircraft in categories acceptable to the Licensing Authority, of which not less than 10 hours shall be in the aircraft category being sought; and

b) 40 hours of instrument time in aircraft of which not more than 20 hours, or 30 hours where a flight simulator is used, may be instrument ground time. The ground time shall be under the supervision of an authorized instructor.

2.7.4 Flight instruction

2.7.4.1 The applicant shall have gained not less than 10 hours of the instrument flight time required in 2.7.3.2 b) while receiving dual instrument flight instruction in the aircraft category being sought, from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in at least the following areas to the level of performance required for the holder of an instrument rating:

a) pre-flight procedures, including the use of the flight manual or equivalent document, and appropriate air traffic services documents in the preparation of an IFR flight plan;

b) pre-flight inspection, use of checklists, taxiing and pre-take-off checks;

c) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

— transition to instrument flight on take-off;

— standard instrument departures and arrivals;

— en-route IFR procedures;

— holding procedures;

— instrument approaches to specified minima;

— missed approach procedures;

— landings from instrument approaches;

d) in-flight manoeuvres and particular flight characteristics.

2.7.4.2 If the privileges of the instrument rating are to be exercised on multi-engined aircraft, the applicant shall have received dual instrument flight instruction in a multi-engined aircraft within the appropriate category from an authorized flight instructor. The instructor shall ensure that the applicant has operational experience in the operation of the aircraft within the appropriate category by reference solely to instruments with one engine inoperative or simulated inoperative.

2.8 Flight instructor rating appropriate to aeroplanes, airships, helicopters and powered-lifts

2.8.1 Requirements for the issue of the rating

2.8.1.1 *Knowledge*

The applicant shall have met the knowledge requirements for the issue of a commercial pilot licence as appropriate to the category of aircraft included in the licence. In addition, the applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a flight instructor rating, in at least the following areas:

a) techniques of applied instruction;

b) assessment of student performance in those subjects in which ground instruction is given;

c) the learning process;

d) elements of effective teaching;

e) student evaluation and testing, training philosophies;

f) training programme development;

g) lesson planning;

h) classroom instructional techniques;

i) use of training aids, including flight simulation training devices as appropriate;

j) analysis and correction of student errors;

k) human performance relevant to flight instruction including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

l) hazards involved in simulating system failures and malfunctions in the aircraft.

2.8.1.2 *Skill*

The applicant shall have demonstrated, in the category and class of aircraft for which flight instructor privileges are sought, the ability to instruct in those areas in which flight instruction is to be given, including pre-flight, post-flight and ground instruction as appropriate.

2.8.1.3 *Experience*

The applicant shall have met the experience requirements for the issue of a commercial pilot licence as specified in 2.4.3.1, 2.4.4.1, 2.4.5.1 and 2.4.6.1 for each aircraft category, as appropriate.

2.8.1.4 *Flight instruction*

The applicant shall, under the supervision of a flight instructor accepted by the Licensing Authority for that purpose:

a) have received instruction in flight instructional techniques including demonstration, student practices, recognition and correction of common student errors; and

b) have practised instructional techniques in those flight manoeuvres and procedures in which it is intended to provide flight instruction.

2.8.2 Privileges of the holder of the rating and the conditions to be observed in exercising such privileges

2.8.2.1 Subject to compliance with the requirements specified in 1.2.5 and 2.1, the privileges of the holder of a flight instructor rating shall be:

a) to supervise solo flights by student pilots; and

b) to carry out flight instruction for the issue of a private pilot licence, a commercial pilot licence, an instrument rating, and a flight instructor rating

provided that the flight instructor:

1) holds at least the licence and rating for which instruction is being given, in the appropriate aircraft category;

2) holds the licence and rating necessary to act as the pilot-in-command of the aircraft on which the instruction is given; and

3) has the flight instructor privileges granted entered on the licence.

2.8.2.2 The applicant, in order to carry out instruction for the multi-crew pilot licence, shall have also met all the instructor qualification requirements.

Note.— Specific provisions for flight instructors carrying out instruction for the multi-crew pilot licence exist in Chapter 4 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

2.9 Glider pilot licence

2.9.1 Requirements for the issue of the licence

2.9.1.1 *Age*

The applicant shall be not less than 16 years of age.

2.9.1.2 *Knowledge*

2.9.1.2.1 The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a glider pilot licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a glider pilot licence; rules of the air; appropriate air traffic services practices and procedures;

Aircraft general knowledge

b) principles of operation of glider systems and instruments;

c) operating limitations of gliders; relevant operational information from the flight manual or other appropriate document;

Flight performance, planning and loading

d) effects of loading and mass distribution on flight characteristics; mass and balance considerations;

e) use and practical application of launching, landing and other performance data;

f) pre-flight and en-route flight planning appropriate to operations under VFR; appropriate air traffic services procedures; altimeter setting procedures; operations in areas of high-density traffic;

Human performance

g) human performance relevant to the glider pilot including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

h) application of elementary aeronautical meteorology; use of, and procedures for obtaining, meteorological information; altimetry;

Navigation

i) practical aspects of air navigation and dead-reckoning techniques; use of aeronautical charts;

Operational procedures

j) use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations;

k) different launch methods and associated procedures;

l) appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather, wake turbulence and other operating hazards;

Principles of flight

m) principles of flight relating to gliders.

2.9.1.2.2 **Recommendation.—** *The applicant should have demonstrated a level of knowledge appropriate to the privileges to be granted to the holder of a glider pilot licence, in communication procedures and phraseology as appropriate to VFR operations and on action to be taken in case of communication failure.*

2.9.1.3 *Experience*

2.9.1.3.1 The applicant shall have completed not less than six hours of flight time as a pilot of gliders including two hours of solo flight time during which not less than 20 launches and landings have been performed.

2.9.1.3.1.1 When the applicant has flight time as a pilot of aeroplanes, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 2.9.1.3.1 can be reduced accordingly.

2.9.1.3.2 The applicant shall have gained, under appropriate supervision, operational experience in gliders in at least the following areas:

a) pre-flight operations, including glider assembly and inspection;

b) techniques and procedures for the launching method used, including appropriate airspeed limitations, emergency procedures and signals used;

c) traffic pattern operations, collision avoidance precautions and procedures;

d) control of the glider by external visual reference;

e) flight throughout the flight envelope;

f) recognition of, and recovery from, incipient and full stalls and spiral dives;

g) normal and crosswind launches, approaches and landings;

h) cross-country flying using visual reference and dead reckoning;

i) emergency procedures.

2.9.1.4 *Skill*

The applicant shall have demonstrated the ability to perform as pilot-in-command of a glider, the procedures and manoeuvres described in 2.9.1.3.2 with a degree of competency appropriate to the privileges granted to the holder of a glider pilot licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) operate the glider within its limitations;

c) complete all manoeuvres with smoothness and accuracy;

d) exercise good judgement and airmanship;

e) apply aeronautical knowledge; and

f) maintain control of the glider at all times in a manner such that the successful outcome of a procedure or manoeuvre is assured.

2.9.1.5 *Medical fitness*

The applicant shall hold a current Class 2 Medical Assessment.

2.9.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.9.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1 and 2.1, the privileges of the holder of a glider pilot licence shall be to act as pilot-in-command of any glider provided the licence holder has operational experience in the launching method used.

2.9.2.2 **Recommendation.—** *If passengers are to be carried, the licence holder should have completed not less than 10 hours of flight time as a pilot of gliders.*

2.10 Free balloon pilot licence

Note.— The provisions of the free balloon pilot licence apply to free balloons using hot air or gas.

2.10.1 Requirements for the issue of the licence

2.10.1.1 *Age*

The applicant shall be not less than 16 years of age.

2.10.1.2 *Knowledge*

2.10.1.2.1 The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a free balloon pilot licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a free balloon pilot licence; rules of the air; appropriate air traffic services practices and procedures;

Aircraft general knowledge

b) principles of operation of free balloon systems and instruments;

c) operating limitations of free balloons; relevant operational information from the flight manual or other appropriate document;

d) physical properties and practical application of gases used in free balloons;

Flight performance, planning and loading

e) effects of loading on flight characteristics; mass calculations;

f) use and practical application of launching, landing and other performance data, including the effect of temperature;

g) pre-flight and en-route flight planning appropriate to operations under VFR; appropriate air traffic services procedures; altimeter setting procedures; operations in areas of high-density traffic;

Human performance

h) human performance relevant to the free balloon pilot including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

i) application of elementary aeronautical meteorology; use of, and procedures for obtaining, meteorological information; altimetry;

Navigation

j) practical aspects of air navigation and dead-reckoning techniques; use of aeronautical charts;

Operational procedures

k) use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations;

l) appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather, wake turbulence and other operating hazards;

Principles of flight

m) principles of flight relating to free balloons.

2.10.1.2.2 **Recommendation.—** *The applicant should have demonstrated a level of knowledge appropriate to the privileges to be granted to the holder of a free balloon pilot licence, in communication procedures and phraseology as appropriate to VFR operations and on action to be taken in case of communication failure.*

2.10.1.3 *Experience*

2.10.1.3.1 The applicant shall have completed not less than 16 hours of flight time as a pilot of free balloons including at least eight launches and ascents of which one must be solo.

2.10.1.3.2 The applicant shall have gained, under appropriate supervision, operational experience in free balloons in at least the following areas:

a) pre-flight operations, including balloon assembly, rigging, inflation, mooring and inspection;

b) techniques and procedures for the launching and ascent, including appropriate limitations, emergency procedures and signals used;

c) collision avoidance precautions;

d) control of the free balloon by external visual reference;

e) recognition of, and recovery from, rapid descents;

f) cross-country flying using visual reference and dead reckoning;

g) approaches and landings, including ground handling;

h) emergency procedures.

2.10.1.3.3 If the privileges of the licence are to be exercised at night, the applicant shall have gained, under appropriate supervision, operational experience in free balloons in night flying.

2.10.1.3.4 **Recommendation.—** *If passengers are to be carried for remuneration or hire, the licence holder should have completed not less than 35 hours of flight time including 20 hours as a pilot of a free balloon.*

2.10.1.4 *Skill*

The applicant shall have demonstrated the ability to perform as pilot-in-command of a free balloon, the procedures and manoeuvres described in 2.10.1.3.2 with a degree of competency appropriate to the privileges granted to the holder of a free balloon pilot licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) operate the free balloon within its limitations;

c) complete all manoeuvres with smoothness and accuracy;

d) exercise good judgement and airmanship;

e) apply aeronautical knowledge; and

f) maintain control of the free balloon at all times in a manner such that the successful outcome of a procedure or manoeuvre is assured.

2.10.1.5 *Medical fitness*

The applicant shall hold a current Class 2 Medical Assessment.

2.10.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

2.10.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1, 2.1 and 2.10.1.3.4, the privileges of the holder of a free balloon pilot licence shall be to act as pilot-in-command of any free balloon provided that the licence holder has operational experience in hot air or gas balloons as appropriate.

2.10.2.2 Before exercising the privileges at night, the licence holder shall have complied with the requirements specified in 2.10.1.3.3.

CHAPTER 3. LICENCES FOR FLIGHT CREW MEMBERS OTHER THAN LICENCES FOR PILOTS

3.1 General rules concerning flight navigator and flight engineer licences

3.1.1 An applicant shall, before being issued with a flight navigator licence or a flight engineer licence, meet such requirements in respect of age, knowledge, experience, skill and medical fitness as are specified for those licences.

3.1.1.1 An applicant for a flight navigator licence or a flight engineer licence shall demonstrate such requirements for knowledge and skill as are specified for those licences, in a manner determined by the Licensing Authority.

3.2 Flight navigator licence

3.2.1 Requirements for the issue of the licence

3.2.1.1 *Age*

The applicant shall be not less than 18 years of age.

3.2.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a flight navigator licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a flight navigator licence; appropriate air traffic services practices and procedures;

Flight performance, planning and loading

b) effects of loading and mass distribution on aircraft performance;

c) use of take-off, landing and other performance data including procedures for cruise control;

d) pre-flight and en-route operational flight planning; preparation and filing of air traffic services flight plans; appropriate air traffic services procedures; altimeter setting procedures;

Human performance

e) human performance relevant to the flight navigator including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

f) interpretation and practical application of aeronautical meteorological reports, charts and forecasts; codes and abbreviations; use of, and procedures for obtaining, meteorological information, pre-flight and in-flight; altimetry;

g) aeronautical meteorology; climatology of relevant areas in respect of the elements having an effect upon aviation; the movement of pressure systems; the structure of fronts, and the origin and characteristics of significant weather phenomena which affect take-off, en-route and landing conditions;

Navigation

h) dead-reckoning, pressure-pattern and celestial navigation procedures; the use of aeronautical charts, radio navigation aids and area navigation systems; specific navigation requirements for long-range flights;

i) use, limitation and serviceability of avionics and instruments necessary for the navigation of the aircraft;

j) use, accuracy and reliability of navigation systems used in departure, en-route and approach phases of flight; identification of radio navigation aids;

k) principles, characteristics and use of self-contained and external-referenced navigation systems; operation of airborne equipment;

l) the celestial sphere including the movement of heavenly bodies and their selection and identification for the purpose of observation and reduction of sights; calibration of sextants; the completion of navigation documentation;

m) definitions, units and formulae used in air navigation;

Operational procedures

n) interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes, abbreviations, and instrument procedure charts for departure, en-route, descent and approach;

Principles of flight

o) principles of flight;

Radiotelephony

p) communication procedures and phraseology.

3.2.1.3 *Experience*

3.2.1.3.1 The applicant shall have completed in the performance of the duties of a flight navigator, not less than 200 hours of flight time acceptable to the Licensing Authority, in aircraft engaged in cross-country flights, including not less than 30 hours by night.

3.2.1.3.1.1 When the applicant has flight time as a pilot, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 3.2.1.3.1 can be reduced accordingly.

3.2.1.3.2 The applicant shall produce evidence of having satisfactorily determined the aircraft's position in flight, and used that information to navigate the aircraft, as follows:

a) by night — not less than 25 times by celestial observations; and

b) by day — not less than 25 times by celestial observations in conjunction with self-contained or external-referenced navigation systems.

3.2.1.4 *Skill*

The applicant shall have demonstrated the ability to perform as flight navigator of an aircraft with a degree of competency appropriate to the privileges granted to the holder of a flight navigator licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) exercise good judgement and airmanship;

c) apply aeronautical knowledge;

d) perform all duties as part of an integrated crew; and

e) communicate effectively with the other flight crew members.

3.2.1.5 *Medical fitness*

The applicant shall hold a current Class 2 Medical Assessment.

3.2.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

Subject to compliance with the requirements specified in 1.2.5, 1.2.6 and 1.2.7.1, the privileges of the holder of a flight navigator licence shall be to act as flight navigator of any aircraft. If the privileges include radiotelephony communication, the licence holder shall comply with the requirements specified in 1.2.9.2.

3.3 Flight engineer licence

3.3.1 Requirements for the issue of the licence

3.3.1.1 *Age*

The applicant shall be not less than 18 years of age.

3.3.1.2 *Knowledge*

3.3.1.2.1 The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a flight engineer licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a flight engineer licence; rules and regulations governing the operation of civil aircraft pertinent to the duties of a flight engineer;

Aircraft general knowledge

b) basic principles of powerplants, gas turbines and/or piston engines; characteristics of fuels, fuel systems including fuel control; lubricants and lubrication systems; afterburners and injection systems, function and operation of engine ignition and starter systems;

c) principles of operation, handling procedures and operating limitations of aircraft powerplants; effects of atmospheric conditions on engine performance;

d) airframes, flight controls, structures, wheel assemblies, brakes and anti-skid units, corrosion and fatigue life; identification of structural damage and defects;

e) ice and rain protection systems;

f) pressurization and air-conditioning systems, oxygen systems;

g) hydraulic and pneumatic systems;

h) basic electrical theory, electric systems (AC and DC), aircraft wiring systems, bonding and screening;

i) principles of operation of instruments, compasses, auto-pilots, radio communication equipment, radio and radar navigation aids, flight management systems, displays and avionics;

j) limitations of appropriate aircraft;

k) fire protection, detection, suppression and extinguishing systems;

l) use and serviceability checks of equipment and systems of appropriate aircraft;

Flight performance, planning and loading

m) effects of loading and mass distribution on aircraft handling, flight characteristics and performance; mass and balance calculations;

n) use and practical application of performance data including procedures for cruise control;

Human performance

o) human performance relevant to the flight engineer including principles of threat and error management;

Note.— Guidance material to design training programmes on human performance, including threat and error management, can be found in the Human Factors Training Manual *(Doc 9683).*

Operational procedures

p) principles of maintenance, procedures for the maintenance of airworthiness, defect reporting, pre-flight inspections, precautionary procedures for fuelling and use of external power; installed equipment and cabin systems;

q) normal, abnormal and emergency procedures;

r) operational procedures for carriage of freight and dangerous goods;

Principles of flight

s) fundamentals of aerodynamics;

Radiotelephony

t) communication procedures and phraseology.

3.3.1.2.2 **Recommendation.—** *The applicant should have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a flight engineer licence in at least the following subjects:*

a) fundamentals of navigation; principles and operation of self-contained systems; and

b) operational aspects of meteorology.

3.3.1.3 *Experience*

3.3.1.3.1 The applicant shall have completed, under the supervision of a person accepted by the Licensing Authority for that purpose, not less than 100 hours of flight time in the performance of the duties of a flight engineer. The Licensing Authority shall determine whether experience as a flight engineer in a flight simulator, which it has approved, is acceptable as part of the total flight time of 100 hours. Credit for such experience shall be limited to a maximum of 50 hours.

3.3.1.3.1.1 When the applicant has flight time as a pilot, the Licensing Authority shall determine whether such experience is acceptable and, if so, the extent to which the flight time requirements of 3.3.1.3.1 can be reduced accordingly.

3.3.1.3.2 The applicant shall have operational experience in the performance of the duties of a flight engineer, under the supervision of a flight engineer accepted by the Licensing Authority for that purpose, in at least the following areas:

a) *Normal procedures*

— pre-flight inspections
— fuelling procedures, fuel management
— inspection of maintenance documents
— normal flight deck procedures during all phases of flight
— crew coordination and procedures in case of crew incapacitation
— defect reporting

b) *Abnormal and alternate (standby) procedures*

— recognition of abnormal functioning of aircraft systems
— use of abnormal and alternate (standby) procedures

c) *Emergency procedures*

— recognition of emergency conditions
— use of appropriate emergency procedures

3.3.1.4 *Skill*

3.3.1.4.1 The applicant shall have demonstrated the ability to perform as flight engineer of an aircraft, the duties and procedures described in 3.3.1.3.2 with a degree of competency appropriate to the privileges granted to the holder of a flight engineer licence, and to:

a) recognize and manage threats and errors;

Note.— Guidance material on the application of threat and error management is found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868), Chapter 3, Attachment C, and in Part II, Chapter 2, of the* Human Factors Training Manual *(Doc 9683).*

b) use aircraft systems within the aircraft's capabilities and limitations;

c) exercise good judgement and airmanship;

d) apply aeronautical knowledge;

e) perform all the duties as part of an integrated crew with the successful outcome assured; and

f) communicate effectively with the other flight crew members.

3.3.1.4.2 The use of a flight simulation training device for performing any of the procedures required during the demonstration of skill described in 3.3.1.4.1 shall be approved by the Licensing Authority, which shall ensure that the flight simulation training device is appropriate to the task.

3.3.1.5 *Medical fitness*

The applicant shall hold a current Class 2 Medical Assessment.

3.3.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

3.3.2.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6 and 1.2.7.1, the privileges of the holder of a flight engineer licence shall be to act as flight engineer of any type of aircraft on which the holder has demonstrated a level of knowledge and skill, as determined by the Licensing Authority on the basis of those requirements specified in 3.3.1.2 and 3.3.1.4 which are applicable to the safe operation of that type of aircraft.

3.3.2.2 The types of aircraft on which the holder of a flight engineer licence is authorized to exercise the privileges of that licence, shall be either entered on the licence or recorded elsewhere in a manner acceptable to the Licensing Authority.

3.4 Flight radiotelephone operator

Note 1.— Where the knowledge and skill of an applicant have been established as satisfactory in respect of the certification requirements for the radiotelephone operator's restricted certificate specified in the general radio regulations annexed to the International Telecommunication Convention and the applicant has met the requirements that are pertinent to the operation of the radiotelephone on board an aircraft, a Contracting State may endorse a licence already held by the applicant (as provided for in 5.1.1.2 XIII) or issue a separate licence as appropriate.

Note 2.— Skill and knowledge requirements on radiotelephony procedures and phraseology have been developed as an integral part of all aeroplane, airship, helicopter and powered-lift pilot licences.

CHAPTER 4. LICENCES AND RATINGS FOR PERSONNEL OTHER THAN FLIGHT CREW MEMBERS

4.1 General rules concerning licences and ratings for personnel other than flight crew members

4.1.1 An applicant shall, before being issued with any licence or rating for personnel other than flight crew members, meet such requirements in respect of age, knowledge, experience and where appropriate, medical fitness and skill, as are specified for that licence or rating.

4.1.2 An applicant, for any licence or rating for personnel other than flight crew members, shall demonstrate, in a manner determined by the Licensing Authority, such requirements in respect of knowledge and skill as are specified for that licence or rating.

4.2 Aircraft maintenance (technician/engineer/mechanic)

Note.— The terms in brackets are given as acceptable additions to the title of the licence. Each Contracting State is expected to use in its own regulations the one it prefers.

4.2.1 Requirements for the issue of the licence

4.2.1.1 *Age*

The applicant shall be not less than 18 years of age.

4.2.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge relevant to the privileges to be granted and appropriate to the responsibilities of an aircraft maintenance licence holder, in at least the following subjects:

Air law and airworthiness requirements

a) rules and regulations relevant to an aircraft maintenance licence holder including applicable airworthiness requirements governing certification and continuing airworthiness of aircraft and approved aircraft maintenance organization and procedures;

Natural science and aircraft general knowledge

b) basic mathematics; units of measurement; fundamental principles and theory of physics and chemistry applicable to aircraft maintenance;

Aircraft engineering

c) characteristics and applications of the materials of aircraft construction including principles of construction and functioning of aircraft structures, fastening techniques; powerplants and their associated systems; mechanical, fluid, electrical and electronic power sources; aircraft instrument and display systems; aircraft control systems; and airborne navigation and communication systems;

Aircraft maintenance

d) tasks required to ensure the continuing airworthiness of an aircraft including methods and procedures for the overhaul, repair, inspection, replacement, modification or defect rectification of aircraft structures, components and systems in accordance with the methods prescribed in the relevant Maintenance Manuals and the applicable Standards of airworthiness; and

Human performance

e) human performance relevant to aircraft maintenance.

Note.— Guidance material to design training programmes on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

4.2.1.3 *Experience*

The applicant shall have had the following experience in the inspection, servicing and maintenance of aircraft or its components:

a) for the issue of a licence with privileges for the aircraft in its entirety, at least:

   1) four years; or

   2) two years if the applicant has satisfactorily completed an approved training course; and

b) for the issue of a licence with privileges restricted in accordance with 4.2.2.2 a) 2) or 3), a period of time that will enable a level of competency equivalent to that required in a) to be attained, provided that this is not less than:

1) two years; or

2) such a period as the State considers necessary to provide an equivalent level of practical experience to applicants who have satisfactorily completed an approved training course.

4.2.1.4 *Training*

Recommendation.— *The applicant should have completed a course of training appropriate to the privileges to be granted.*

Note.— The Training Manual *(Doc 7192), Part D-1, contains guidance material on a training course for applicants for an aircraft maintenance licence.*

4.2.1.5 *Skill*

The applicant shall have demonstrated the ability to perform those functions applicable to the privileges to be granted.

4.2.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

4.2.2.1 Subject to compliance with the requirements specified in 4.2.2.2 and 4.2.2.3, the privileges of the holder of an aircraft maintenance licence shall be to certify the aircraft or parts of the aircraft as airworthy after an authorized repair, modification or installation of a powerplant, accessory, instrument, and/or item of equipment, and to sign a maintenance release following inspection, maintenance operations and/or routine servicing.

4.2.2.2 The privileges of the holder of an aircraft maintenance licence specified in 4.2.2.1 shall be exercised only:

a) in respect of such:

1) aircraft as are entered on the licence in their entirety either specifically or under broad categories; or

2) airframes and powerplants and aircraft systems or components as are entered on the licence either specifically or under broad categories; and/or

3) aircraft avionic systems or components as are entered on the licence either specifically or under broad categories;

b) provided that the licence holder is familiar with all the relevant information relating to the maintenance and airworthiness of the particular aircraft for which the licence holder is signing a Maintenance Release, or such airframe, powerplant, aircraft system or component and aircraft avionic system or component which the licence holder is certifying as being airworthy; and

c) on condition that, within the preceding 24 months, the licence holder has either had experience in the inspection, servicing or maintenance of an aircraft or components in accordance with the privileges granted by the licence held for not less than six months, or has met the provision for the issue of a licence with the appropriate privileges, to the satisfaction of the Licensing Authority.

4.2.2.3 A Contracting State shall prescribe the scope of the privileges of the licence holder in terms of the complexity of the tasks to which the certification relates.

4.2.2.3.1 **Recommendation.—** *Details of the certification privileges should be endorsed on or attached to the licence, either directly or by reference to another document issued by the Contracting State.*

4.2.2.4 When a Contracting State authorizes an approved maintenance organization to appoint non-licensed personnel to exercise the privileges of 4.2.2, the person appointed shall meet the requirements specified in 4.2.1.

4.3 Air traffic controller licence

4.3.1 Requirements for the issue of the licence

Before issuing an air traffic controller licence, a Contracting State shall require the applicant to meet the requirements of 4.3.1 and the requirements of at least one of the ratings set out in 4.4. Unlicensed State employees may operate as air traffic controllers on condition that they meet the same requirements.

4.3.1.1 *Age*

The applicant shall be not less than 21 years of age.

4.3.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the holder of an air traffic controller licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the air traffic controller;

Air traffic control equipment

b) principles, use and limitations of equipment used in air traffic control;

General knowledge

c) principles of flight; principles of operation and functioning of aircraft, powerplants and systems; aircraft performance relevant to air traffic control operations;

Human performance

d) human performance relevant to air traffic control;

Note.— Guidance material to design training programmes on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

e) aeronautical meteorology; use and appreciation of meteorological documentation and information; origin and characteristics of weather phenomena affecting flight operations and safety; altimetry;

Navigation

f) principles of air navigation; principle, limitation and accuracy of navigation systems and visual aids; and

Operational procedures

g) air traffic control, communication, radiotelephony and phraseology procedures (routine, non-routine and emergency); use of the relevant aeronautical documentation; safety practices associated with flight.

4.3.1.3 *Experience*

The applicant shall have completed an approved training course and not less than three months of satisfactory service engaged in the actual control of air traffic under the supervision of an appropriately rated air traffic controller. The experience requirements specified for air traffic controller ratings in 4.4 may be credited as part of the experience specified in this paragraph.

4.3.1.4 *Medical fitness*

The applicant shall hold a current Class 3 Medical Assessment.

4.4 Air traffic controller ratings

4.4.1 Categories of air traffic controller ratings

Air traffic controller ratings shall comprise the following categories:

a) aerodrome control rating;

b) approach control rating;

c) approach radar control rating;

d) approach precision radar control rating;

e) area control rating; and

f) area radar control rating.

Note.— The World Meteorological Organization has specified requirements for personnel making meteorological observations which apply to air traffic controllers providing such a service.

4.4.2 Requirements for air traffic controller ratings

4.4.2.1 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted, in at least the following subjects in so far as they affect the area of responsibility:

a) *aerodrome control rating:*

1) aerodrome layout; physical characteristics and visual aids;

2) airspace structure;

3) applicable rules, procedures and source of information;

4) air navigation facilities;

5) air traffic control equipment and its use;

6) terrain and prominent landmarks;

7) characteristics of air traffic;

8) weather phenomena; and

9) emergency and search and rescue plans;

b) *approach control and area control ratings:*

1) airspace structure;

2) applicable rules, procedures and source of information;

3) air navigation facilities;

4) air traffic control equipment and its use;

5) terrain and prominent landmarks;

6) characteristics of air traffic and traffic flow;

7) weather phenomena; and

8) emergency and search and rescue plans; and

c) *approach radar, approach precision radar and area radar control ratings:* The applicant shall meet the requirements specified in b) in so far as they affect the area of responsibility, and shall have demonstrated a level of knowledge appropriate to the privileges granted, in at least the following additional subjects:

1) principles, use and limitations of radar, other surveillance systems and associated equipment; and

2) procedures for the provision of approach, precision approach or area radar control services, as appropriate, including procedures to ensure appropriate terrain clearance.

4.4.2.2 *Experience*

4.4.2.2.1 The applicant shall have:

a) satisfactorily completed an approved training course;

b) provided, satisfactorily, under the supervision of an appropriately rated air traffic controller:

1) *aerodrome control rating:* an aerodrome control service, for a period of not less than 90 hours or one month, whichever is greater, at the unit for which the rating is sought;

2) *approach, approach radar, area or area radar control rating:* the control service for which the rating is sought, for a period of not less than 180 hours or three months, whichever is greater, at the unit for which the rating is sought; and

3) *approach precision radar control rating:* not less than 200 precision approaches of which not more than 100 shall have been carried out on a radar simulator approved for that purpose by the Licensing Authority. Not less than 50 of those precision approaches shall have been carried out at the unit and on the equipment for which the rating is sought; and

c) if the privileges of the approach radar control rating include surveillance radar approach duties, the experience shall include not less than 25 plan position indicator (PPI) approaches on the surveillance equipment of the type in use at the unit for which the rating is sought and under the supervision of an appropriately rated approach radar controller.

4.4.2.2.2 The experience specified in 4.4.2.2.1 b) shall have been completed within the 6-month period immediately preceding application.

4.4.2.2.3 When the applicant already holds an air traffic controller rating in another category, or the same rating for another unit, the Licensing Authority shall determine whether the experience requirement of 4.4.2.2 can be reduced, and if so, to what extent.

4.4.2.3 *Skill*

The applicant shall have demonstrated, at a level appropriate to the privileges being granted, the skill, judgement and performance required to provide a safe, orderly and expeditious control service.

4.4.2.4 *Concurrent issuance of two air traffic controller ratings*

When two air traffic controller ratings are sought concurrently, the Licensing Authority shall determine the applicable requirements on the basis of the requirements for each rating. These requirements shall not be less than those of the more demanding rating.

4.4.3 Privileges of the holder of the air traffic controller rating(s) and the conditions to be observed in exercising such privileges

4.4.3.1 Subject to compliance with the requirements specified in 1.2.5, 1.2.6, 1.2.7.1 and 1.2.9, the privileges of the holder of an air traffic controller licence endorsed with one or more of the undermentioned ratings shall be:

a) *aerodrome control rating:* to provide or to supervise the provision of aerodrome control service for the aerodrome for which the licence holder is rated;

b) *approach control rating:* to provide or to supervise the provision of approach control service for the aerodrome or aerodromes for which the licence holder is rated, within the airspace or portion thereof, under the jurisdiction of the unit providing approach control service;

c) *approach radar control rating:* to provide and/or supervise the provision of approach control service with the use of radar or other surveillance systems for the aerodrome or aerodromes for which the licence holder is rated, within the airspace or portion thereof, under the jurisdiction of the unit providing approach control service;

   1) subject to compliance with the provisions of 4.4.2.2.1 c), the privileges shall include the provision of surveillance radar approaches;

d) *approach precision radar control rating:* to provide and/or supervise the provision of precision approach radar service at the aerodrome for which the licence holder is rated;

e) *area control rating:* to provide and/or supervise the provision of area control service within the control area or portion thereof, for which the licence holder is rated; and

f) *area radar control rating:* to provide and/or supervise the provision of area control service with the use of radar, within the control area or portion thereof, for which the licence holder is rated.

4.4.3.2 Before exercising the privileges indicated in 4.4.3.1, the licence holder shall be familiar with all pertinent and current information.

4.4.3.3 A Contracting State having issued an air traffic controller licence shall not permit the holder thereof to carry out instruction in an operational environment unless such holder has received proper authorization from such Contracting State.

4.4.3.4 *Validity of ratings*

A rating shall become invalid when an air traffic controller has ceased to exercise the privileges of the rating for a period determined by the Licensing Authority. That period shall not exceed six months. A rating shall remain invalid until the controller's ability to exercise the privileges of the rating has been re-established.

4.5 Flight operations officer/flight dispatcher licence

4.5.1 Requirements for the issue of the licence

4.5.1.1 *Age*

The applicant shall be not less than 21 years of age.

4.5.1.2 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a flight operations officer licence, in at least the following subjects:

Air law

a) rules and regulations relevant to the holder of a flight operations officer licence; appropriate air traffic services practices and procedures;

Aircraft general knowledge

b) principles of operation of aeroplane powerplants, systems and instruments;

c) operating limitations of aeroplanes and powerplants;

d) minimum equipment list;

Flight performance calculation, planning procedures and loading

e) effects of loading and mass distribution on aircraft performance and flight characteristics; mass and balance calculations;

f) operational flight planning; fuel consumption and endurance calculations; alternate aerodrome selection procedures; en-route cruise control; extended range operation;

g) preparation and filing of air traffic services flight plans;

h) basic principles of computer-assisted planning systems;

Human performance

i) human performance relevant to dispatch duties;

Note.— Guidance material to design training programmes on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

Meteorology

j) aeronautical meteorology; the movement of pressure systems; the structure of fronts, and the origin and characteristics of significant weather phenomena which affect take-off, en-route and landing conditions;

k) interpretation and application of aeronautical meteorological reports, charts and forecasts; codes and abbreviations; use of, and procedures for obtaining, meteorological information;

Navigation

l) principles of air navigation with particular reference to instrument flight;

Operational procedures

m) use of aeronautical documentation;

n) operational procedures for the carriage of freight and dangerous goods;

o) procedures relating to aircraft accidents and incidents; emergency flight procedures;

p) procedures relating to unlawful interference and sabotage of aircraft;

Principles of flight

q) principles of flight relating to the appropriate category of aircraft; and

Radio communication

r) procedures for communicating with aircraft and relevant ground stations.

4.5.1.3 *Experience*

4.5.1.3.1 The applicant shall have gained the following experience:

a) a total of two years of service in any one or in any combination of the capacities specified in 1) to 3) inclusive, provided that in any combination of experience the period serviced in any capacity shall be at least one year:

1) a flight crew member in air transportation; or

2) a meteorologist in an organization dispatching aircraft in air transportation; or

3) an air traffic controller; or a technical supervisor of flight operations officers or air transportation flight operations systems;

or

b) at least one year as an assistant in the dispatching of air transport;

or

c) have satisfactorily completed a course of approved training.

4.5.1.3.2 The applicant shall have served under the supervision of a flight operations officer for at least 90 working days within the six months immediately preceding the application.

4.5.1.4 *Skill*

The applicant shall have demonstrated the ability to:

a) make an accurate and operationally acceptable weather analysis from a series of daily weather maps and weather reports; provide an operationally valid briefing on weather conditions prevailing in the general neighbourhood of a specific air route; forecast weather trends pertinent to air transportation with particular reference to destination and alternates;

b) determine the optimum flight path for a given segment, and create accurate manual and/or computer generated flight plans; and

c) provide operating supervision and all other assistance to a flight in actual or simulated adverse weather conditions, as appropriate to the duties of the holder of a flight operations officer licence.

4.5.2 Privileges of the holder of the licence and the conditions to be observed in exercising such privileges

Subject to compliance with the requirements specified in 1.2.5, the privileges of the holder of a flight operations officer licence shall be to serve in that capacity with responsibility for each area for which the applicant meets the requirements specified in Annex 6.

4.6 Aeronautical station operator licence

Note.— This licence is not intended for personnel providing Aerodrome Flight Information Service (AFIS). Guidance on the qualifications to be met by these personnel can be found in Circular 211, Aerodrome Flight Information Service (AFIS).

4.6.1 Requirements for the issue of the licence

4.6.1.1 Before issuing an aeronautical station operator licence, a Contracting State shall require the applicant to meet the requirements of 4.6.1. Unlicensed individuals may operate as aeronautical station operators on the condition that the State from which they operate ensures that they meet the same requirements.

4.6.1.2 *Age*

The applicant shall be not less than 18 years of age.

4.6.1.3 *Knowledge*

The applicant shall have demonstrated a level of knowledge appropriate to the holder of an aeronautical station operator, in at least the following subjects:

General knowledge

a) air traffic services provided within the State;

Operational procedures

b) radiotelephony procedures; phraseology; telecommunication network;

Rules and regulations

c) rules and regulations applicable to the aeronautical station operator; and

Telecommunication equipment

d) principles, use and limitations of telecommunication equipment in an aeronautical station.

4.6.1.4 *Experience*

The applicant shall have:

a) satisfactorily completed an approved training course within the 12-month period immediately preceding application, and have served satisfactorily under a qualified aeronautical station operator for not less than two months; or

b) satisfactorily served under a qualified aeronautical station operator for not less than six months during the 12-month period immediately preceding application.

4.6.1.5 *Skill*

The applicant shall demonstrate, or have demonstrated, competency in:

a) operating the telecommunication equipment in use; and

b) transmitting and receiving radiotelephony messages with efficiency and accuracy.

4.6.2 Privileges of the aeronautical station operator and the conditions to be observed in exercising such privileges

Subject to compliance with the requirements specified in 1.2.5 and 1.2.9, the privileges of the holder of an aeronautical station operator licence shall be to act as an operator in an aeronautical station. Before exercising the privileges of the licence, the holder shall be familiar with all pertinent and current information regarding the types of equipment and operating procedures used at that aeronautical station.

4.7 Aeronautical meteorological personnel

Note.— The requirements for training and qualifications for all aeronautical meteorological personnel are the responsibility of the World Meteorological Organization (WMO) in accordance with the Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization *(Doc 7475). The requirements can be found in WMO Document 258 —* Guidelines for the education and training of personnel in meteorology and operational hydrology — *Volume I:* Meteorology.

CHAPTER 5. SPECIFICATIONS FOR PERSONNEL LICENCES

5.1 Personnel licences issued by a Contracting State in accordance with the relevant provisions of this Annex shall conform to the following specifications:

5.1.1 Detail

5.1.1.1 A Contracting State having issued a licence shall ensure that other States are able to easily determine the licence privileges and validity of ratings.

Note.— Operator records or a flight crew member's personal log book, in which maintenance of competency and recent experience may be satisfactorily recorded, are not normally carried on international flights.

5.1.1.2 The following details shall appear on the licence:

I) Name of State (in bold type);

II) Title of licence (in very bold type);

III) Serial number of the licence, in Arabic numerals, given by the authority issuing the licence;

IV) Name of holder in full (in Roman alphabet also if script of national language is other than Roman);

IVa) Date of birth;

V) Address of holder if desired by the State;

VI) Nationality of holder;

VII) Signature of holder;

VIII) Authority and, where necessary, conditions under which the licence is issued;

IX) Certification concerning validity and authorization for holder to exercise privileges appropriate to licence;

X) Signature of officer issuing the licence and the date of such issue;

XI) Seal or stamp of authority issuing the licence;

XII) Ratings, e.g. category, class, type of aircraft, airframe, aerodrome control, etc.;

XIII) Remarks, i.e. special endorsements relating to limitations and endorsements for privileges, including from 5 March 2008 an endorsement of language proficiency, and other information required in pursuance to Article 39 of the Chicago Convention;

XIV) Any other details desired by the State issuing the licence.

5.1.2 Material

First quality paper or other suitable material, including plastic cards, shall be used and the items mentioned in 5.1.1.2 shown clearly thereon.

5.1.3 Language

When licences are issued in a language other than English, the licence shall include an English translation of at least items I), II), VI), IX), XII), XIII) and XIV). When provided in a language other than English, authorizations issued in accordance with 1.2.2.1 shall include an English translation of the name of the State issuing the authorization, the limit of validity of the authorization and any restriction or limitation that may be established.

5.1.4 Arrangement of items

Item headings on the licence shall be uniformly numbered in roman numerals as indicated in 5.1.1, so that on any licence the number will, under any arrangement, refer to the same item heading.

Note.— Item headings may be arranged in such order as may best suit the convenience of the Contracting State issuing the licence.

CHAPTER 6. MEDICAL PROVISIONS FOR LICENSING

Note 1.— The Standards and Recommended Practices established in this chapter cannot, on their own, be sufficiently detailed to cover all possible individual situations. Of necessity, many decisions relating to the evaluation of medical fitness must be left to the judgement of the individual medical examiner. The evaluation must, therefore, be based on a medical examination conducted throughout in accordance with the highest standards of medical practice.

Note 2.— Predisposing factors for disease, such as obesity and smoking, may be important for determining whether further evaluation or investigation is necessary in an individual case.

Note 3.— In cases where the applicant does not fully meet the medical requirements and in complicated and unusual cases, the evaluation may have to be deferred and the case submitted to the medical assessor of the Licensing Authority for final evaluation. In such cases due regard must be given to the privileges granted by the licence applied for or held by the applicant for the Medical Assessment, and the conditions under which the licence holder is going to exercise those privileges in carrying out assigned duties.

Note 4.— Attention is called to the administrative clause in 1.2.4.8 dealing with accredited medical conclusion.

Note 5.— Guidance material to assist Licensing Authorities and medical examiners is published separately in the Manual of Civil Aviation Medicine *(Doc 8984). This guidance material also contains a discussion of the terms "likely" and "significant" as used in the context of the medical provisions in Chapter 6.*

6.1 Medical Assessments — General

6.1.1 Classes of Medical Assessment

Three classes of Medical Assessment shall be established as follows:

a) Class 1 Medical Assessment;

applies to applicants for, and holders of:

— commercial pilot licences — aeroplane, airship, helicopter and powered-lift
— multi-crew pilot licences — aeroplane
— airline transport pilot licences — aeroplane, helicopter and powered-lift

b) Class 2 Medical Assessment;

applies to applicants for, and holders of:

— flight navigator licences
— flight engineer licences
— private pilot licences — aeroplane, airship, helicopter and powered-lift
— glider pilot licences
— free balloon pilot licences

c) Class 3 Medical Assessment;

applies to applicants for, and holders of:

— air traffic controller licences.

6.1.2 The applicant for a Medical Assessment shall provide the medical examiner with a personally certified statement of medical facts concerning personal, familial and hereditary history. The applicant shall be made aware of the necessity for giving a statement that is as complete and accurate as the applicant's knowledge permits, and any false statement shall be dealt with in accordance with 1.2.4.5.1.

6.1.3 The medical examiner shall report to the Licensing Authority any individual case where, in the examiner's judgement, an applicant's failure to meet any requirement, whether numerical or otherwise, is such that exercise of the privileges of the licence being applied for, or held, is not likely to jeopardize flight safety (1.2.4.8).

6.1.4 The requirements to be met for the renewal of a Medical Assessment are the same as those for the initial assessment except where otherwise specifically stated.

Note.— The intervals between routine medical examinations for the purpose of renewing Medical Assessments are specified in 1.2.5.2.

6.2 Requirements for Medical Assessments

6.2.1 General

An applicant for a Medical Assessment issued in accordance with the terms of 1.2.4.1 shall undergo a medical examination based on the following requirements:

a) physical and mental;

b) visual and colour perception; and

c) hearing.

6.2.2 Physical and mental requirements

An applicant for any class of Medical Assessment shall be required to be free from:

a) any abnormality, congenital or acquired; or

b) any active, latent, acute or chronic disability; or

c) any wound, injury or sequelae from operation; or

d) any effect or side-effect of any prescribed or non-prescribed therapeutic, diagnostic or preventive medication taken;

such as would entail a degree of functional incapacity which is likely to interfere with the safe operation of an aircraft or with the safe performance of duties.

Note.— Use of herbal medication and alternative treatment modalities requires particular attention to possible side-effects.

6.2.3 Visual acuity test requirements

6.2.3.1 The methods in use for the measurement of visual acuity are likely to lead to differing evaluations. To achieve uniformity, therefore, Contracting States shall ensure that equivalence in the methods of evaluation be obtained.

6.2.3.2 **Recommendation.—** *The following should be adopted for tests of visual acuity:*

a) Visual acuity tests should be conducted in an environment with a level of illumination that corresponds to ordinary office illumination (30-60 cd/m^2).

b) Visual acuity should be measured by means of a series of Landolt rings or similar optotypes, placed at a distance from the applicant appropriate to the method of testing adopted.

6.2.4 Colour perception requirements

6.2.4.1 Contracting States shall use such methods of examination as will guarantee reliable testing of colour perception.

6.2.4.2 The applicant shall be required to demonstrate the ability to perceive readily those colours the perception of which is necessary for the safe performance of duties.

6.2.4.3 The applicant shall be tested for the ability to correctly identify a series of pseudoisochromatic plates in daylight or in artificial light of the same colour temperature such as that provided by CIE standard illuminants C or D_{65} as specified by the International Commission on Illumination (CIE).

6.2.4.4 An applicant obtaining a satisfactory result as prescribed by the Licensing Authority shall be assessed as fit. An applicant failing to obtain a satisfactory result in such a test shall be assessed as unfit unless able to readily distinguish the colours used in air navigation and correctly identify aviation coloured lights. Applicants who fail to meet these criteria shall be assessed as unfit except for Class 2 assessment with the following restriction: valid daytime only.

Note.— Guidance on suitable methods of assessing colour vision is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.2.4.4.1 **Recommendation.—** *Sunglasses worn during the exercise of the privileges of the licence or rating held should be non-polarizing and of a neutral grey tint.*

6.2.5 Hearing test requirements

6.2.5.1 Contracting States shall use such methods of examination as will guarantee reliable testing of hearing.

6.2.5.2 Applicants shall be required to demonstrate a hearing performance sufficient for the safe exercise of their licence and rating privileges.

6.2.5.3 Applicants for Class 1 Medical Assessments shall be tested by pure-tone audiometry at first issue of the Assessment, not less than once every five years up to the age of 40 years, and thereafter not less than once every two years.

6.2.5.3.1 Alternatively, other methods providing equivalent results may be used.

6.2.5.4 Applicants for Class 3 Medical Assessments shall be tested by pure-tone audiometry at first issue of the Assessment, not less than once every four years up to the age of 40 years, and thereafter not less than once every two years.

6.2.5.4.1 Alternatively, other methods providing equivalent results may be used.

6.2.5.5 **Recommendation.—** *Applicants for Class 2 Medical Assessment should be tested by pure-tone audiometry at first issue of the Assessment and, after the age of 50 years, not less than once every two years.*

6.2.5.6 At medical examinations, other than those mentioned in 6.2.5.3, 6.2.5.4 and 6.2.5.5, where audiometry is not performed, applicants shall be tested in a quiet room by whispered and spoken voice tests.

Note 1.— The reference zero for calibration of pure-tone audiometers is that of the pertinent Standards of the current edition of the Audiometric Test Methods, published by the International Organization for Standardization (ISO).

Note 2.— For the purpose of testing hearing in accordance with the requirements, a quiet room is a room in which the intensity of the background noise is less than 35 dB(A).

Note 3.— For the purpose of testing hearing in accordance with the requirements, the sound level of an average conversational voice at 1 m from the point of output (lower lip of the speaker) is c. 60 dB(A) and that of a whispered voice c. 45dB(A). At 2 m from the speaker, the sound level is 6 dB(A) lower.

Note 4.— Guidance on assessment of applicants who use hearing aids is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 5.— Attention is called to 2.7.1.3.1 on requirements for the issue of instrument rating to applicants who hold a private pilot licence.

6.3 Class 1 Medical Assessment

6.3.1 Assessment issue and renewal

6.3.1.1 An applicant for a commercial pilot licence — aeroplane, airship, helicopter or powered-lift, a multi-crew pilot licence — aeroplane, or an airline transport pilot licence — aeroplane, helicopter or powered-lift shall undergo an initial medical examination for the issue of a Class 1 Medical Assessment.

6.3.1.2 Except where otherwise stated in this section, holders of commercial pilot licences — aeroplane, airship, helicopter or powered-lift, multi-crew pilot licences — aeroplane, or airline transport pilot licences — aeroplane, helicopter or powered-lift shall have their Class 1 Medical Assessments renewed at intervals not exceeding those specified in 1.2.5.2.

6.3.1.3 When the Licensing Authority is satisfied that the requirements of this section and the general provisions of 6.1 and 6.2 have been met, a Class 1 Medical Assessment shall be issued to the applicant.

6.3.2 Physical and mental requirements

6.3.2.1 The applicant shall not suffer from any disease or disability which could render that applicant likely to become suddenly unable either to operate an aircraft safely or to perform assigned duties safely.

6.3.2.2 The applicant shall have no established medical history or clinical diagnosis of:

a) an organic mental disorder;

b) a mental or behavioural disorder due to use of psychoactive substances; this includes dependence syndrome induced by alcohol or other psychoactive substances;

c) schizophrenia or a schizotypal or delusional disorder;

d) a mood (affective) disorder;

e) a neurotic, stress-related or somatoform disorder;

f) a behavioural syndrome associated with physiological disturbances or physical factors;

g) a disorder of adult personality or behaviour, particularly if manifested by repeated overt acts;

h) mental retardation;

i) a disorder of psychological development;

j) a behavioural or emotional disorder, with onset in childhood or adolescence; or

k) a mental disorder not otherwise specified;

such as might render the applicant unable to safely exercise the privileges of the licence applied for or held.

Note.— Mental and behavioural disorders are defined in accordance with the clinical descriptions and diagnostic guidelines of the World Health Organization as given in the International Statistical Classification of Diseases and Related Health Problems, 10th Edition — Classification of Mental and Behavioural Disorders, *WHO 1992. This document contains detailed descriptions of the diagnostic requirements, which may be useful for their application to medical assessment.*

6.3.2.3 The applicant shall have no established medical history or clinical diagnosis of any of the following:

a) a progressive or non-progressive disease of the nervous system, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges;

b) epilepsy; or

c) any disturbance of consciousness without satisfactory medical explanation of cause.

6.3.2.4 The applicant shall not have suffered any head injury, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.3.2.5 The applicant shall not possess any abnormality of the heart, congenital or acquired, which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.3.2.5.1 An applicant who has undergone coronary bypass grafting or angioplasty (with or without stenting) or other cardiac intervention or who has a history of myocardial infarction or who suffers from any other potentially incapacitating cardiac condition shall be assessed as unfit unless the applicant's cardiac condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.3.2.5.2 An applicant with an abnormal cardiac rhythm shall be assessed as unfit unless the cardiac arrhythmia has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

Note.— Guidance on cardiovascular evaluation is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.6 Electrocardiography shall form part of the heart examination for the first issue of a Medical Assessment.

6.3.2.6.1 Electrocardiography shall be included in re-examinations of applicants over the age of 50 no less frequently than annually.

6.3.2.6.2 **Recommendation.—** *Electrocardiography should be included in re-examinations of applicants between the ages of 30 and 50 no less frequently than every two years.*

Note 1.— The purpose of routine electrocardiography is case finding. It does not provide sufficient evidence to justify disqualification without further thorough cardiovascular investigation.

Note 2.— Guidance on resting and exercise electrocardiography is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.7 The systolic and diastolic blood pressures shall be within normal limits.

6.3.2.7.1 The use of drugs for control of high blood pressure shall be disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on the subject is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.8 There shall be no significant functional nor structural abnormality of the circulatory system.

6.3.2.9 There shall be no acute disability of the lungs nor any active disease of the structures of the lungs, mediastinum or pleurae likely to result in incapacitating symptoms during normal or emergency operations.

6.3.2.9.1 **Recommendation.—** *Chest radiography should form part of the initial examination.*

Note.— Periodic chest radiography is usually not necessary but may be a necessity in situations where asymptomatic pulmonary disease can be expected.

6.3.2.10 Applicants with chronic obstructive pulmonary disease shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.3.2.11 Applicants with asthma causing significant symptoms or likely to cause incapacitating symptoms during normal or emergency operations shall be assessed as unfit.

6.3.2.11.1 The use of drugs for control of asthma shall be disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on hazards of medication and drugs is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.12 Applicants with active pulmonary tuberculosis shall be assessed as unfit.

6.3.2.12.1 Applicants with quiescent or healed lesions which are known to be tuberculous, or are presumably tuberculous in origin, may be assessed as fit.

Note 1.— Guidance on assessment of respiratory diseases is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— Guidance on hazards of medications and drugs is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.13 Applicants with significant impairment of function of the gastrointestinal tract or its adnexa shall be assessed as unfit.

6.3.2.13.1 Applicants shall be completely free from those hernias that might give rise to incapacitating symptoms.

6.3.2.14 Applicants with sequelae of disease of, or surgical intervention on, any part of the digestive tract or its adnexa, likely to cause incapacitation in flight, in particular any obstruction due to stricture or compression, shall be assessed as unfit.

6.3.2.14.1 **Recommendation.—** *An applicant who has undergone a major surgical operation on the biliary passages or the digestive tract or its adnexa with a total or partial excision or a diversion of any of these organs should be assessed as unfit until such time as the medical assessor, having access to the details of the operation concerned, considers that the effects of the operation are not likely to cause incapacitation in flight.*

6.3.2.15 Applicants with metabolic, nutritional or endocrine disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.3.2.16 Applicants with insulin-treated diabetes mellitus shall be assessed as unfit.

6.3.2.16.1 Applicants with non-insulin-treated diabetes mellitus shall be assessed as unfit unless the condition is shown to be satisfactorily controlled by diet alone or by diet combined with oral anti-diabetic medication, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on assessment of diabetic applicants is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.17 Applicants with diseases of the blood and/or the lymphatic system shall be assessed as unfit unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

Note.— Sickle cell trait or other haemoglobinopathic traits are usually compatible with a fit assessment.

6.3.2.18 Applicants with renal or genito-urinary disease shall be assessed as unfit, unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

6.3.2.18.1 Urine examination shall form part of the medical examination and abnormalities shall be adequately investigated.

Note.— Guidance on urine examination and evaluation of abnormalities is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.19 Applicants with sequelae of disease of or surgical procedures on the kidneys or the genito-urinary tract, in particular obstructions due to stricture or compression, shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.3.2.19.1 Applicants who have undergone nephrectomy shall be assessed as unfit unless the condition is well compensated.

6.3.2.20 Applicants with acquired immunodeficiency syndrome (AIDS) shall be assessed as unfit.

6.3.2.20.1 Applicants who are seropositive for human immunodeficiency virus (HIV) shall be assessed as unfit unless full investigation provides no evidence of clinical disease.

Note 1.— Evaluation of applicants who are seropositive for human immunodeficiency virus (HIV) requires particular attention to their mental state, including the psychological effects of the diagnosis.

Note 2.— Guidance on the assessment of applicants who are seropositive for human immunodeficiency virus (HIV) is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.21 Applicants with gynaecological disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.3.2.22 Applicants who are pregnant shall be assessed as unfit unless obstetrical evaluation and continued medical supervision indicate a low-risk uncomplicated pregnancy.

6.3.2.22.1 **Recommendation.—** *For applicants with a low-risk uncomplicated pregnancy, evaluated and supervised in accordance with 6.3.2.22, the fit assessment should be limited to the period from the end of the 12th week until the end of the 26th week of gestation.*

6.3.2.23 Following confinement or termination of pregnancy, the applicant shall not be permitted to exercise the privileges of her licence until she has undergone re-evaluation in accordance with best medical practice and it has been determined that she is able to safely exercise the privileges of her licence and ratings.

6.3.2.24 The applicant shall not possess any abnormality of the bones, joints, muscles, tendons or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

Note.— Any sequelae after lesions affecting the bones, joints, muscles or tendons, and certain anatomical defects will normally require functional assessment to determine fitness.

6.3.2.25 The applicant shall not possess any abnormality or disease of the ear or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.3.2.26 There shall be:

a) no disturbance of vestibular function;

b) no significant dysfunction of the Eustachian tubes; and

c) no unhealed perforation of the tympanic membranes.

6.3.2.26.1 A single dry perforation of the tympanic membrane need not render the applicant unfit.

Note.— Guidance on testing of the vestibular function is contained in Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.2.27 There shall be:

a) no nasal obstruction; and

b) no malformation nor any disease of the buccal cavity or upper respiratory tract

which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.3.2.28 Applicants with stuttering or other speech defects sufficiently severe to cause impairment of speech communication shall be assessed as unfit.

6.3.3 Visual requirements

The medical examination shall be based on the following requirements.

6.3.3.1 The function of the eyes and their adnexa shall be normal. There shall be no active pathological condition, acute or chronic, nor any sequelae of surgery or trauma of the eyes or their adnexa likely to reduce proper visual function to an extent that would interfere with the safe exercise of the applicant's licence and rating privileges.

6.3.3.2 Distant visual acuity with or without correction shall be 6/9 or better in each eye separately, and binocular visual acuity shall be 6/6 or better. No limits apply to uncorrected visual acuity. Where this standard of visual acuity can be obtained only with correcting lenses, the applicant may be assessed as fit provided that:

a) such correcting lenses are worn during the exercise of the privileges of the licence or rating applied for or held; and

b) in addition, a pair of suitable correcting spectacles is kept readily available during the exercise of the privileges of the applicant's licence.

Note 1.— 6.3.3.2 b) is the subject of Standards in Annex 6, Part I.

Note 2.— An applicant accepted as meeting these provisions is deemed to continue to do so unless there is reason to suspect otherwise, in which case an ophthalmic report is required at the discretion of the Licensing Authority. Both uncorrected and corrected visual acuity are normally measured and recorded at each re-examination. Conditions which indicate a need to obtain an ophthalmic report include: a substantial decrease in the uncorrected visual acuity, any decrease in best corrected visual acuity, and the occurrence of eye disease, eye injury or eye surgery.

6.3.3.2.1 Applicants may use contact lenses to meet this requirement provided that:

a) the lenses are monofocal and non-tinted;

b) the lenses are well tolerated; and

c) a pair of suitable correcting spectacles is kept readily available during the exercise of the licence privileges.

Note.— Applicants who use contact lenses may not need to have their uncorrected visual acuity measured at each re-examination provided the history of their contact lens prescription is known.

6.3.3.2.2 Applicants with a large refractive error shall use contact lenses or high-index spectacle lenses.

Note.— If spectacles are used, high-index lenses are needed to minimize peripheral field distortion.

6.3.3.2.3 Applicants whose uncorrected distant visual acuity in either eye is worse than 6/60 shall be required to provide a full ophthalmic report prior to initial Medical Assessment and every five years thereafter.

Note 1.— The purpose of the required ophthalmic examination is (1) to ascertain normal visual performance, and (2) to identify any significant pathology.

Note 2.— Guidance on the assessment of monocular applicants under the provisions of 1.2.4.8 is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.3.3.3 Applicants who have undergone surgery affecting the refractive status of the eye shall be assessed as unfit unless they are free from those sequelae which are likely to interfere with the safe exercise of their licence and rating privileges.

6.3.3.4 The applicant shall have the ability to read, while wearing the correcting lenses, if any, required by 6.3.3.2, the N5 chart or its equivalent at a distance selected by that applicant in the range of 30 to 50 cm and the ability to read the N14 chart or its equivalent at a distance of 100 cm. If this requirement is met only by the use of near correction, the applicant may be assessed as fit provided that this near correction is added to the spectacle correction already prescribed in accordance with 6.3.3.2; if no such correction is prescribed, a pair of spectacles for near use shall be kept readily available during the exercise of the privileges of the licence. When near correction is required, the applicant shall demonstrate that one pair of spectacles is sufficient to meet both distant and near visual requirements.

Note 1.— N5 and N14 refer to the size of typeface used. For further details, see the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— An applicant who needs near correction to meet this requirement will require "look-over", bifocal or perhaps multifocal lenses in order to read the instruments and a chart or manual held in the hand, and also to make use of distant vision, through the windscreen, without removing the lenses. Single-vision near correction (full lenses of one power only, appropriate for reading) significantly reduces distant visual acuity and is therefore not acceptable.

Note 3.— Whenever there is a requirement to obtain or renew correcting lenses, an applicant is expected to advise the refractionist of reading distances for the visual flight deck tasks relevant to the types of aircraft in which the applicant is likely to function.

6.3.3.4.1 When near correction is required in accordance with this paragraph, a second pair of near-correction spectacles shall be kept available for immediate use.

6.3.3.5 The applicant shall be required to have normal fields of vision.

6.3.3.6 The applicant shall be required to have normal binocular function.

6.3.3.6.1 Reduced stereopsis, abnormal convergence not interfering with near vision, and ocular misalignment where the fusional reserves are sufficient to prevent asthenopia and diplopia need not be disqualifying.

6.3.4 Hearing requirements

6.3.4.1 The applicant, when tested on a pure-tone audiometer, shall not have a hearing loss, in either ear separately, of more than 35 dB at any of the frequencies 500, 1 000 or 2 000 Hz, or more than 50 dB at 3 000 Hz.

6.3.4.1.1 An applicant with a hearing loss greater than the above may be declared fit provided that the applicant has normal hearing performance against a background noise that reproduces or simulates the masking properties of flight deck noise upon speech and beacon signals.

Note 1.— It is important that the background noise be representative of the noise in the cockpit of the type of aircraft for which the applicant's licence and ratings are valid.

Note 2.— In the speech material for discrimination testing, both aviation-relevant phrases and phonetically balanced words are normally used.

6.3.4.1.2 Alternatively, a practical hearing test conducted in flight in the cockpit of an aircraft of the type for which the applicant's licence and ratings are valid may be used.

6.4 Class 2 Medical Assessment

6.4.1 Assessment issue and renewal

6.4.1.1 An applicant for a private pilot licence — aeroplane, airship, helicopter or powered-lift, a glider pilot licence, a free balloon pilot licence, a flight engineer licence or a flight navigator licence shall undergo an initial medical examination for the issue of a Class 2 Medical Assessment.

6.4.1.2 Except where otherwise stated in this section, holders of private pilot licences — aeroplane, airship, helicopter or powered-lift, glider pilot licences, free balloon pilot licences, flight engineer licences or flight navigator licences shall have their Class 2 Medical Assessments renewed at intervals not exceeding those specified in 1.2.5.2.

6.4.1.3 When the Licensing Authority is satisfied that the requirements of this section and the general provisions of 6.1 and 6.2 have been met, a Class 2 Medical Assessment shall be issued to the applicant.

6.4.2 Physical and mental requirements

The medical examination shall be based on the following requirements.

6.4.2.1 The applicant shall not suffer from any disease or disability which could render that applicant likely to become suddenly unable either to operate an aircraft safely or to perform assigned duties safely.

6.4.2.2 The applicant shall have no established medical history or clinical diagnosis of:

a) an organic mental disorder;

b) a mental or behavioural disorder due to psychoactive substance use; this includes dependence syndrome induced by alcohol or other psychoactive substances;

c) schizophrenia or a schizotypal or delusional disorder;

d) a mood (affective) disorder;

e) a neurotic, stress-related or somatoform disorder;

f) a behavioural syndrome associated with physiological disturbances or physical factors;

g) a disorder of adult personality or behaviour, particularly if manifested by repeated overt acts;

h) mental retardation;

i) a disorder of psychological development;

j) a behavioural or emotional disorder, with onset in childhood or adolescence; or

k) a mental disorder not otherwise specified;

such as might render the applicant unable to safely exercise the privileges of the licence applied for or held.

Note.— Mental and behavioural disorders are defined in accordance with the clinical descriptions and diagnostic guidelines of the World Health Organization as given in the International Statistical Classification of Diseases and Related Health Problems, 10th Edition — Classification of Mental and Behavioural Disorders, *WHO 1992. This document contains detailed descriptions of the diagnostic requirements, which may be useful for their application to medical assessment.*

6.4.2.3 The applicant shall have no established medical history or clinical diagnosis of any of the following:

a) a progressive or non-progressive disease of the nervous system, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges;

b) epilepsy;

c) any disturbance of consciousness without satisfactory medical explanation of cause.

6.4.2.4 The applicant shall not have suffered any head injury, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.4.2.5 The applicant shall not possess any abnormality of the heart, congenital or acquired, which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.4.2.5.1 An applicant who has undergone coronary by-pass grafting or angioplasty (with or without stenting) or other cardiac intervention or who has a history of myocardial infarction or who suffers from any other potentially incapacitating cardiac condition shall be assessed as unfit unless the applicant's cardiac condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.4.2.5.2 An applicant with an abnormal cardiac rhythm shall be assessed as unfit unless the cardiac arrhythmia has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

Note.— Guidance on cardiovascular evaluation is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.6 Electrocardiography shall form part of the heart examination for the first issue of a Medical Assessment after the age of 40.

6.4.2.6.1 Electrocardiography shall be included in re-examinations of applicants after the age of 50 no less than every two years.

6.4.2.6.2 **Recommendation.—** *Electrocardiography should form part of the heart examination for the first issue of a Medical Assessment.*

Note 1.— The purpose of routine electrocardiography is case finding. It does not provide sufficient evidence to justify disqualification without further thorough cardiovascular investigation.

Note 2.— Guidance on resting and exercise electrocardiography is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.7 The systolic and diastolic blood pressures shall be within normal limits.

6.4.2.7.1 The use of drugs for control of high blood pressure shall be disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on the subject is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.8 There shall be no significant functional nor structural abnormality of the circulatory system.

6.4.2.9 There shall be no disability of the lungs nor any active disease of the structures of the lungs, mediastinum or pleura likely to result in incapacitating symptoms during normal or emergency operations.

6.4.2.9.1 **Recommendation.—** *Chest radiography should form part of the initial and periodic examinations in cases where asymptomatic pulmonary disease can be expected.*

6.4.2.10 Applicants with chronic obstructive pulmonary disease shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.4.2.11 Applicants with asthma causing significant symptoms or likely to cause incapacitating symptoms during normal or emergency operations shall be assessed as unfit.

6.4.2.11.1 The use of drugs for control of asthma shall be disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on hazards of medication and drugs is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.12 Applicants with active pulmonary tuberculosis shall be assessed as unfit.

6.4.2.12.1 Applicants with quiescent or healed lesions, known to be tuberculous or presumably tuberculous in origin, may be assessed as fit.

Note 1.— Guidance on assessment of respiratory diseases is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— Guidance on hazards of medication and drugs is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.13 Applicants shall be completely free from those hernias that might give rise to incapacitating symptoms.

6.4.2.13.1 Applicants with significant impairment of the function of the gastrointestinal tract or its adnexa shall be assessed as unfit.

6.4.2.14 Applicants with sequelae of disease of or surgical intervention on any part of the digestive tract or its adnexa, likely to cause incapacitation in flight, in particular any obstruction due to stricture or compression, shall be assessed as unfit.

6.4.2.14.1 **Recommendation.—** *An applicant who has undergone a major surgical operation on the biliary passages or the digestive tract or its adnexa with a total or partial excision or a diversion of any of these organs should be assessed as unfit until such time as the medical assessor, having access to the details of the operation concerned, considers that the effects of the operation are not likely to cause incapacitation in flight.*

6.4.2.15 Applicants with metabolic, nutritional or endocrine disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.4.2.16 Applicants with insulin-treated diabetes mellitus shall be assessed as unfit.

6.4.2.16.1 Applicants with non-insulin-treated diabetes mellitus shall be assessed as unfit unless the condition is shown to be satisfactorily controlled by diet alone or by diet combined with oral anti-diabetic medication, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on assessment of diabetic applicants is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.17 Applicants with diseases of the blood and/or the lymphatic system shall be assessed as unfit unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

Note.— Sickle cell trait and other haemoglobinopathic traits are usually compatible with fit assessment.

6.4.2.18 Applicants with renal or genito-urinary disease shall be assessed as unfit unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

6.4.2.18.1 Urine examination shall form part of the medical examination and abnormalities shall be adequately investigated.

Note.— Guidance on urine examination and evaluation of abnormalities is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.19 Applicants with sequelae of disease of, or surgical procedures on, the kidneys or the genito-urinary tract, in particular obstructions due to stricture or compression, shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.4.2.19.1 Applicants who have undergone nephrectomy shall be assessed as unfit unless the condition is well compensated.

6.4.2.20 Applicants with acquired immunodeficiency syndrome (AIDS) shall be assessed as unfit.

6.4.2.20.1 Applicants who are seropositive for human immunodeficiency virus (HIV) shall be assessed as unfit unless full investigation provides no evidence of clinical disease.

Note 1.— Evaluation of applicants who are seropositive for human immunodeficiency virus (HIV) requires particular attention to their mental state, including the psychological effects of the diagnosis.

Note 2.— Guidance on the assessment of applicants who are seropositive for human immunodeficiency virus (HIV) is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.21 Applicants with gynaecological disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.4.2.22 Applicants who are pregnant shall be assessed as unfit unless obstetrical evaluation and continued medical supervision indicate a low-risk uncomplicated pregnancy.

6.4.2.22.1 **Recommendation.—** *For applicants with a low-risk uncomplicated pregnancy, evaluated and supervised in accordance with 6.4.2.22, the fit assessment should be limited to the period from the end of the 12th week until the end of the 26th week of gestation.*

6.4.2.23 Following confinement or termination of pregnancy, the applicant shall not be permitted to exercise the privileges of her licence until she has undergone re-evaluation in accordance with best medical practice and it has been determined that she is able to safely exercise the privileges of her licence and ratings.

6.4.2.24 The applicant shall not possess any abnormality of the bones, joints, muscles, tendons or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

Note.— Any sequelae after lesions affecting the bones, joints, muscles or tendons, and certain anatomical defects will normally require functional assessment to determine fitness.

6.4.2.25 The applicant shall not possess any abnormality or disease of the ear or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.4.2.26 There shall be:

a) no disturbance of the vestibular function;

b) no significant dysfunction of the Eustachian tubes; and

c) no unhealed perforation of the tympanic membranes.

6.4.2.26.1 A single dry perforation of the tympanic membrane need not render the applicant unfit.

Note.—Guidance on testing of the vestibular function is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.2.27 There shall be:

a) no nasal obstruction; and

b) no malformation nor any disease of the buccal cavity or upper respiratory tract;

which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.4.2.28 Applicants with stuttering and other speech defects sufficiently severe to cause impairment of speech communication shall be assessed as unfit.

6.4.3 Visual requirements

The medical examination shall be based on the following requirements.

6.4.3.1 The function of the eyes and their adnexa shall be normal. There shall be no active pathological condition, acute or chronic, nor any sequelae of surgery or trauma of the eyes or their adnexa likely to reduce proper visual function to an extent that would interfere with the safe exercise of the applicant's licence and rating privileges.

6.4.3.2 Distant visual acuity with or without correction shall be 6/12 or better in each eye separately, and binocular visual acuity shall be 6/9 or better. No limits apply to uncorrected visual acuity. Where this standard of visual acuity can be obtained only with correcting lenses, the applicant may be assessed as fit provided that:

a) such correcting lenses are worn during the exercise of the privileges of the licence or rating applied for or held; and

b) in addition, a pair of suitable correcting spectacles is kept readily available during the exercise of the privileges of the applicant's licence.

Note.— An applicant accepted as meeting these provisions is deemed to continue to do so unless there is reason to suspect otherwise, in which case an ophthalmic report is required at the discretion of the Licensing Authority. Both uncorrected and corrected visual acuity are normally measured and recorded at each re-examination. Conditions which indicate a need to obtain an ophthalmic report include: a substantial decrease in the uncorrected visual acuity, any decrease in best corrected visual acuity, and the occurrence of eye disease, eye injury or eye surgery.

6.4.3.2.1 Applicants may use contact lenses to meet this requirement provided that:

a) the lenses are monofocal and non-tinted;

b) the lenses are well tolerated; and

c) a pair of suitable correcting spectacles is kept readily available during the exercise of the licence privileges.

Note.— Applicants who use contact lenses may not need to have their uncorrected visual acuity measured at each re-examination provided the history of their contact lens prescription is known.

6.4.3.2.2 Applicants with a large refractive error shall use contact lenses or high-index spectacle lenses.

Note.— If spectacles are used, high-index lenses are needed to minimize peripheral field distortion.

6.4.3.2.3 **Recommendation.—** *Applicants whose uncorrected distant visual acuity in either eye is worse than 6/60 should be required to provide a full ophthalmic report prior to initial Medical Assessment and every five years thereafter.*

Note 1.— The purpose of the required ophthalmic examination is (1) to ascertain normal visual performance, and (2) to identify any significant pathology.

Note 2.— Guidance on the assessment of monocular applicants under the provisions of 1.2.4.8 is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.4.3.3 Applicants who have undergone surgery affecting the refractive status of the eye shall be assessed as unfit unless they are free from those sequelae which are likely to interfere with the safe exercise of their licence and rating privileges.

6.4.3.4 The applicant shall have the ability to read, while wearing the correcting lenses, if any, required by 6.4.3.2, the N5 chart or its equivalent at a distance selected by that applicant in the range of 30 to 50 cm. If this requirement is met only by the use of near correction, the applicant may be assessed as fit provided that this near correction is added to the spectacle correction already prescribed in accordance with 6.4.3.2; if no such correction is prescribed, a pair of spectacles for near use shall be kept readily available during the exercise of the privileges of the licence. When near correction is required, the applicant shall demonstrate that one pair of spectacles is sufficient to meet both distant and near visual requirements.

Note 1.— N5 refers to the size of typeface used. For further details, see the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— An applicant who needs near correction to meet the requirement will require "look-over", bifocal or perhaps multifocal lenses in order to read the instruments and a chart or manual held in the hand, and also to make use of distant vision, through the windscreen, without removing the lenses. Single-vision near correction (full lenses of one power only, appropriate for reading) significantly reduces distant visual acuity and is therefore not acceptable.

Note 3.— Whenever there is a requirement to obtain or renew correcting lenses, an applicant is expected to advise the refractionist of the reading distances for the visual flight deck tasks relevant to the types of aircraft in which the applicant is likely to function.

6.4.3.4.1 When near correction is required in accordance with this paragraph, a second pair of near-correction spectacles shall be kept available for immediate use.

6.4.3.5 The applicant shall be required to have normal fields of vision.

6.4.3.6 The applicant shall be required to have normal binocular function.

6.4.3.6.1 Reduced stereopsis, abnormal convergence not interfering with near vision, and ocular misalignment where the fusional reserves are sufficient to prevent asthenopia and diplopia need not be disqualifying.

6.4.4 Hearing requirements

Note.— Attention is called to 2.7.1.3.1 on requirements for the issue of instrument rating to applicants who hold a private pilot licence.

6.4.4.1 Applicants who are unable to hear an average conversational voice in a quiet room, using both ears, at a distance of 2 m from the examiner and with the back turned to the examiner, shall be assessed as unfit.

6.4.4.2 When tested by pure-tone audiometry, an applicant with a hearing loss, in either ear separately, of more than 35 dB at any of the frequencies 500, 1 000 or 2 000 Hz, or more than 50 dB at 3 000 Hz, shall be assessed as unfit.

6.4.4.3 **Recommendation.—** *An applicant who does not meet the requirements in 6.4.4.1 or 6.4.4.2 should undergo further testing in accordance with 6.3.4.1.1.*

6.5 Class 3 Medical Assessment

6.5.1 Assessment issue and renewal

6.5.1.1 An applicant for an air traffic controller licence shall undergo an initial medical examination for the issue of a Class 3 Medical Assessment.

6.5.1.2 Except where otherwise stated in this section, holders of air traffic controller licences shall have their Class 3 Medical Assessments renewed at intervals not exceeding those specified in 1.2.5.2.

6.5.1.3 When the Licensing Authority is satisfied that the requirements of this section and the general provisions of 6.1 and 6.2 have been met, a Class 3 Medical Assessment shall be issued to the applicant.

6.5.2 Physical and mental requirements

6.5.2.1 The applicant shall not suffer from any disease or disability which could render that applicant likely to become suddenly unable to perform duties safely.

6.5.2.2 The applicant shall have no established medical history or clinical diagnosis of:

a) an organic mental disorder;

b) a mental or behavioural disorder due to psychoactive substance use; this includes dependence syndrome induced by alcohol or other psychoactive substances;

c) schizophrenia or a schizotypal or delusional disorder;

d) a mood (affective) disorder;

e) a neurotic, stress-related or somatoform disorder;

f) a behavioural syndrome associated with physiological disturbances or physical factors;

g) a disorder of adult personality or behaviour, particularly if manifested by repeated overt acts;

h) mental retardation;

i) a disorder of psychological development;

j) a behavioural or emotional disorder, with onset in childhood or adolescence; or

k) a mental disorder not otherwise specified;

such as might render the applicant unable to safely exercise the privileges of the licence applied for or held.

Note.— Mental and behavioural disorders are defined in accordance with the clinical descriptions and diagnostic *guidelines of the World Health Organization as given in the* International Statistical Classification of Diseases and Related Health Problems, 10th Edition — Classification of Mental and Behavioural Disorders, *WHO 1992. This document contains detailed descriptions of the diagnostic requirements which may be useful for their application to medical assessment.*

6.5.2.3 The applicant shall have no established medical history or clinical diagnosis of any of the following:

a) a progressive or non-progressive disease of the nervous system, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges;

b) epilepsy; or

c) any disturbance of consciousness without satisfactory medical explanation of cause.

6.5.2.4 The applicant shall not have suffered any head injury, the effects of which are likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.2.5 The applicant shall not possess any abnormality of the heart, congenital or acquired, which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.2.5.1 An applicant who has undergone coronary bypass grafting or angioplasty (with or without stenting) or other cardiac intervention or who has a history of myocardial infarction or who suffers from any other potentially incapacitating cardiac condition shall be assessed as unfit unless the applicant's cardiac condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.2.5.2 An applicant with an abnormal cardiac rhythm shall be assessed as unfit unless the cardiac arrhythmia has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on cardiovascular evaluation is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.6 Electrocardiography shall form part of the heart examination for the first issue of a Medical Assessment.

6.5.2.6.1 Electrocardiography shall be included in re-examinations of applicants after the age of 50 no less frequently than every two years.

Note 1.— The purpose of routine electrocardiography is case finding. It does not provide sufficient evidence to justify disqualification without further thorough cardiovascular investigation.

Note 2.— Guidance on resting and exercise electrocardiography is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.7 The systolic and diastolic blood pressures shall be within normal limits.

6.5.2.7.1 The use of drugs for control of high blood pressure is disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence privileges.

Note.— Guidance on this subject is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.8 There shall be no significant functional nor structural abnormality of the circulatory system.

6.5.2.9 There shall be no disability of the lungs nor any active disease of the structures of the lungs, mediastinum or pleurae likely to result in incapacitating symptoms.

Note.— Chest radiography is usually not necessary but may be indicated in cases where asymptomatic pulmonary disease can be expected.

6.5.2.10 Applicants with chronic obstructive pulmonary disease shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.5.2.11 Applicants with asthma causing significant symptoms or likely to cause incapacitating symptoms shall be assessed as unfit.

6.5.2.11.1 The use of drugs for control of asthma shall be disqualifying except for those drugs, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on hazards of medications is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.12 Applicants with active pulmonary tuberculosis shall be assessed as unfit.

6.5.2.12.1 Applicants with quiescent or healed lesions, known to be tuberculous or presumably tuberculous in origin, may be assessed as fit.

Note 1.— Guidance on assessment of respiratory diseases is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— Guidance on hazards of medication and drugs is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.13 Applicants with significant impairment of the function of the gastrointestinal tract or its adnexae shall be assessed as unfit.

6.5.2.14 Applicants with sequelae of disease of or surgical intervention on any part of the digestive tract or its adnexa, likely to cause incapacitation, in particular any obstructions due to stricture or compression, shall be assessed as unfit.

6.5.2.14.1 **Recommendation.—** *An applicant who has undergone a major surgical operation on the biliary passages or the digestive tract or its adnexa, with a total or partial excision or a diversion of any of these organs should be assessed as unfit until such time as the medical assessor, having access to the details of the operation concerned, considers that the effects of the operation are not likely to cause incapacitation.*

6.5.2.15 Applicants with metabolic, nutritional or endocrine disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.5.2.16 Applicants with insulin-treated diabetes mellitus shall be assessed as unfit.

6.5.2.16.1 Applicants with non-insulin-treated diabetes shall be assessed as unfit unless the condition is shown to be satisfactorily controlled by diet alone or by diet combined with oral anti-diabetic medication, the use of which is compatible with the safe exercise of the applicant's licence and rating privileges.

Note.— Guidance on assessment of diabetic applicants is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.17 Applicants with diseases of the blood and/or the lymphatic system shall be assessed as unfit, unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

6.5.2.18 Applicants with renal or genito-urinary disease shall be assessed as unfit unless adequately investigated and their condition found unlikely to interfere with the safe exercise of their licence and rating privileges.

6.5.2.18.1 Urine examination shall form part of the medical examination and abnormalities shall be adequately investigated.

Note.— Guidance on urine examination and evaluation of abnormalities is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.19 Applicants with sequelae of disease of, or surgical procedures on the kidneys or the genito-urinary tract, in particular obstructions due to stricture or compression, shall be assessed as unfit unless the applicant's condition has been investigated and evaluated in accordance with best medical practice and is assessed not likely to interfere with the safe exercise of the applicant's licence or rating privileges.

6.5.2.19.1 Applicants who have undergone nephrectomy shall be assessed as unfit unless the condition is well compensated.

6.5.2.20 Applicants with acquired immunodeficiency syndrome (AIDS) shall be assessed as unfit.

6.5.2.20.1 Applicants who are seropositive for human immunodeficiency virus (HIV) shall be assessed as unfit unless full investigation provides no evidence of clinical disease.

Note 1.— Evaluation of applicants who are seropositive for human immunodeficiency virus (HIV) requires particular attention to their mental state, including the psychological effects of the diagnosis.

Note 2.— Guidance on the assessment of applicants who are seropositive for human immunodeficiency virus (HIV) is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.2.21 Applicants with gynaecological disorders that are likely to interfere with the safe exercise of their licence and rating privileges shall be assessed as unfit.

6.5.2.22 Applicants who are pregnant shall be assessed as unfit unless obstetrical evaluation and continued medical supervision indicate a low-risk uncomplicated pregnancy.

6.5.2.22.1 **Recommendation.—** *During the gestational period, precautions should be taken for the timely relief of an air traffic controller in the event of early onset of labour or other complications.*

6.5.2.22.2 **Recommendation.—** *For applicants with a low-risk uncomplicated pregnancy, evaluated and supervised in accordance with 6.5.2.22, the fit assessment should be limited to the period until the end of the 34th week of gestation.*

6.5.2.23 Following confinement or termination of pregnancy the applicant shall not be permitted to exercise the privileges of her licence until she has undergone re-evaluation in accordance with best medical practice and it has been determined that she is able to safely exercise the privileges of her licence and ratings.

6.5.2.24 The applicant shall not possess any abnormality of the bones, joints, muscles, tendons or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

Note.— Any sequelae after lesions affecting the bones, joints, muscles or tendons, and certain anatomical defects will normally require functional assessment to determine fitness.

6.5.2.25 The applicant shall not possess any abnormality or disease of the ear or related structures which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.2.26 There shall be no malformation nor any disease of the nose, buccal cavity or upper respiratory tract which is likely to interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.2.27 Applicants with stuttering or other speech defects sufficiently severe to cause impairment of speech communication shall be assessed as unfit.

6.5.3 Visual requirements

The medical examination shall be based on the following requirements.

6.5.3.1 The function of the eyes and their adnexa shall be normal. There shall be no active pathological condition, acute or chronic, nor any sequelae of surgery or trauma of the eyes or their adnexa likely to reduce proper visual function to an extent that would interfere with the safe exercise of the applicant's licence and rating privileges.

6.5.3.2 Distant visual acuity with or without correction shall be 6/9 or better in each eye separately, and binocular visual acuity shall be 6/6 or better. No limits apply to uncorrected visual acuity. Where this standard of visual acuity can be obtained only with correcting lenses, the applicant may be assessed as fit provided that:

a) such correcting lenses are worn during the exercise of the privileges of the licence or rating applied for or held; and

b) in addition, a pair of suitable correcting spectacles is kept readily available during the exercise of the privileges of the applicant's licence.

Note.— An applicant accepted as meeting these provisions is deemed to continue to do so unless there is reason to suspect otherwise, in which case an ophthalmic report is required at the discretion of the Licensing Authority. Both uncorrected and corrected visual acuity are normally measured and recorded at each re-examination. Conditions which indicate a need to obtain an ophthalmic report include: a substantial decrease in the uncorrected visual acuity, any decrease in best corrected visual acuity, and the occurrence of eye disease, eye injury or eye surgery.

6.5.3.2.1 Applicants may use contact lenses to meet this requirement provided that:

a) the lenses are monofocal and non-tinted;

b) the lenses are well tolerated; and

c) a pair of suitable correcting spectacles is kept readily available during the exercise of the licence privileges.

Note.— Applicants who use contact lenses may not need to have their uncorrected visual acuity measured at each re-examination provided the history of their contact lens prescription is known.

6.5.3.2.2 Applicants with a large refractive error shall use contact lenses or high-index spectacle lenses.

Note.— If spectacles are used, high-index lenses are needed to minimize peripheral field distortion.

6.5.3.2.3 Applicants whose uncorrected distant visual acuity in either eye is worse than 6/60 shall be required to provide a full ophthalmic report prior to initial Medical Assessment and every five years thereafter.

Note 1.— The purpose of the required ophthalmic examination is (1) to ascertain normal vision performance, and (2) to identify any significant pathology.

Note 2.— Guidance on the assessment of monocular applicants under the provisions of 1.2.4.8 is contained in the Manual of Civil Aviation Medicine *(Doc 8984).*

6.5.3.3 Applicants who have undergone surgery affecting the refractive status of the eye shall be assessed as unfit unless they are free from those sequelae which are likely to interfere with the safe exercise of their licence and rating privileges.

6.5.3.4 The applicant shall have the ability to read, while wearing the correcting lenses, if any, required by 6.5.3.2, the N5 chart or its equivalent at a distance selected by that applicant in the range of 30 to 50 cm and the ability to read the N14 chart or its equivalent at a distance of 100 cm. If this requirement is met only by the use of near correction, the applicant may be assessed as fit provided that this near correction is added to the spectacle correction already prescribed in accordance with 6.5.3.2; if no such correction is prescribed, a pair of spectacles for near use shall be kept readily available during the exercise of the privileges of the licence. When near correction is required, the applicant shall demonstrate that one pair of spectacles is sufficient to meet both distant and near visual requirements.

Note 1.— N5 and N14 refer to the size of typeface used. For further details, see the Manual of Civil Aviation Medicine *(Doc 8984).*

Note 2.— An applicant who needs near correction to meet the requirement will require "look-over", bifocal or perhaps multi-focal lenses in order to read radar screens, visual displays and written or printed material and also to make use of distant vision, through the windows, without removing the lenses. Single-vision near correction (full lenses of one power only, appropriate for reading) may be acceptable for certain air traffic control duties. However, it should be realized that single-vision near correction significantly reduces distant visual acuity.

Note 3.— Whenever there is a requirement to obtain or renew correcting lenses, an applicant is expected to advise the refractionist of reading distances for the air traffic control duties the applicant is likely to perform.

6.5.3.4.1 When near correction is required in accordance with this paragraph, a second pair of near-correction spectacles shall be kept available for immediate use.

6.5.3.5 The applicant shall be required to have normal fields of vision.

6.5.3.6 The applicant shall be required to have normal binocular function.

6.5.3.6.1 Reduced stereopsis, abnormal convergence not interfering with near vision, and ocular misalignment where the fusional reserves are sufficient to prevent asthenopia and diplopia need not be disqualifying.

6.5.4 Hearing requirements

6.5.4.1 The applicant, when tested on a pure-tone audiometer shall not have a hearing loss, in either ear separately, of more than 35 dB at any of the frequencies 500, 1 000 or 2 000 Hz, or more than 50 dB at 3 000 Hz.

6.5.4.1.1 An applicant with a hearing loss greater than the above may be declared fit provided that the applicant has normal hearing performance against a background noise that reproduces or simulates that experienced in a typical air traffic control working environment.

Note 1.— The frequency composition of the background noise is defined only to the extent that the frequency range 600 to 4 800 Hz (speech frequency range) is adequately represented.

Note 2.— In the speech material for discrimination testing, both aviation-relevant phrases and phonetically balanced words are normally used.

6.5.4.1.2 Alternatively, a practical hearing test conducted in an air traffic control environment representative of the one for which the applicant's licence and ratings are valid may be used.

APPENDIX 1. REQUIREMENTS FOR PROFICIENCY IN LANGUAGES USED FOR RADIOTELEPHONY COMMUNICATIONS

(Chapter 1, Section 1.2.9, refers)

1. General

Note.— The ICAO language proficiency requirements include the holistic descriptors at Section 2 and the ICAO Operational Level (Level 4) of the ICAO Language Proficiency Rating Scale in Attachment A. The language proficiency requirements are applicable to the use of both phraseologies and plain language.

To meet the language proficiency requirements contained in Chapter 1, Section 1.2.9, an applicant for a licence or a licence holder shall demonstrate, in a manner acceptable to the licensing authority, compliance with the holistic descriptors at Section 2 and with the ICAO Operational Level (Level 4) of the ICAO Language Proficiency Rating Scale in Attachment A.

2. Holistic descriptors

Proficient speakers shall:

a) communicate effectively in voice-only (telephone/radiotelephone) and in face-to-face situations;

b) communicate on common, concrete and work-related topics with accuracy and clarity;

c) use appropriate communicative strategies to exchange messages and to recognize and resolve misunderstandings (e.g. to check, confirm, or clarify information) in a general or work-related context;

d) handle successfully and with relative ease the linguistic challenges presented by a complication or unexpected turn of events that occurs within the context of a routine work situation or communicative task with which they are otherwise familiar; and

e) use a dialect or accent which is intelligible to the aeronautical community.

APPENDIX 2. APPROVED TRAINING ORGANIZATION

(Chapter 1, 1.2.8.2 refers)

1. Issue of approval

1.1 The issuance of an approval for a training organization and the continued validity of the approval shall depend upon the training organization being in compliance with the requirements of this Appendix.

1.2 The approval document shall contain at least the following:

a) organization's name and location;

b) date of issue and period of validity (where appropriate);

c) terms of approval.

2. Training and procedures manual

2.1 The training organization shall provide a training and procedures manual for the use and guidance of personnel concerned. This manual may be issued in separate parts and shall contain at least the following information:

a) a general description of the scope of training authorized under the organization's terms of approval;

b) the content of the training programmes offered including the courseware and equipment to be used;

c) a description of the organization's quality assurance system in accordance with 4;

d) a description of the organization's facilities;

e) the name, duties and qualification of the person designated as responsible for compliance with the requirements of the approval in 6.1;

f) a description of the duties and qualification of the personnel designated as responsible for planning, performing and supervising the training in 6.2;

g) a description of the procedures used to establish and maintain the competence of instructional personnel as required by 6.3;

h) a description of the method used for the completion and retention of the training records required by 7;

i) a description, when applicable, of additional training needed to comply with an operator's procedures and requirements; and

j) when a State has authorized an approved training organization to conduct the testing required for the issuance of a licence or rating in accordance with 9, a description of the selection, role and duties of the authorized personnel, as well as the applicable requirements established by the Licensing Authority.

2.2 The training organization shall ensure that the training and procedures manual is amended as necessary to keep the information contained therein up to date.

2.3 Copies of all amendments to the training and procedures manual shall be furnished promptly to all organizations or persons to whom the manual has been issued.

3. Training programmes

3.1 A Licensing Authority may approve a training programme for a private pilot licence, commercial pilot licence or instrument rating that allows an alternative means of compliance with the experience requirements established by Annex 1, provided that the approved training organization demonstrates to the satisfaction of the Licensing Authority that the training provides a level of competency at least equivalent to that provided by the minimum experience requirements for personnel not receiving such approved training.

3.2 When a Licensing Authority approves a training programme for a multi-crew pilot licence, the approved training organization shall demonstrate to the satisfaction of the Licensing Authority that the training provides a level of competency in multi-crew operations at least equal to that met by holders of a commercial pilot licence, instrument rating and type rating for an aeroplane certificated for operation with a minimum crew of at least two pilots.

Note.— Guidance on the approval of training programmes can be found in the Manual on the Approval of Flight Crew Training Organizations *(Doc 9841).*

4. Quality assurance system

The training organization shall establish a quality assurance system, acceptable to the Licensing Authority granting the approval, which ensures that training and instructional practices comply with all relevant requirements.

5. Facilities

5.1 The facilities and working environment shall be appropriate for the task to be performed and be acceptable to the Licensing Authority.

5.2 The training organization shall have, or have access to, the necessary information, equipment, training devices and material to conduct the courses for which it is approved.

5.3 Synthetic training devices shall be qualified according to requirements established by the State and their use shall be approved by the Licensing Authority to ensure that they are appropriate to the task.

Note.— The Manual of Criteria for the Qualification of Flight Simulators *(Doc 9625) provides guidance on the approval of flight simulators.*

6. Personnel

6.1 The training organization shall nominate a person responsible for ensuring that it is in compliance with the requirements for an approved organization.

6.2 The organization shall employ the necessary personnel to plan, perform and supervise the training to be conducted.

6.3 The competence of instructional personnel shall be in accordance with procedures and to a level acceptable to the Licensing Authority.

6.4 The training organization shall ensure that all instructional personnel receive initial and continuation training appropriate to their assigned tasks and responsibilities. The training programme established by the training organization shall include training in knowledge and skills related to human performance.

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

7. Records

7.1 The training organization shall retain detailed student records to show that all requirements of the training course have been met as agreed by the Licensing Authority.

7.2 The training organization shall maintain a system for recording the qualifications and training of instructional and examining staff, where appropriate.

7.3 The records required by 7.1 shall be kept for a minimum period of two years after completion of the training. The records required by 7.2 shall be retained for a minimum period of two years after the instructor or examiner ceases to perform a function for the training organization.

8. Oversight

Contracting States shall maintain an effective oversight programme of the approved training organization to ensure continuing compliance with the approval requirements.

9. Evaluation and checking

When a State has authorized an approved training organization to conduct the testing required for the issuance of a licence or rating, the testing shall be conducted by personnel authorized by the Licensing Authority or designated by the training organization in accordance with criteria approved by the Licensing Authority.

APPENDIX 3. REQUIREMENTS FOR THE ISSUE OF THE MULTI-CREW PILOT LICENCE — AEROPLANE

(Chapter 2, Section 2.5, refers)

1. Training

1.1 In order to meet the requirements of the multi-crew pilot licence in the aeroplane category, the applicant shall have completed an approved training course. The training shall be competency-based and conducted in a multi-crew operational environment.

1.2 During the training, the applicant shall have acquired the knowledge, skills and attitudes required as the underpinning attributes for performing as a co-pilot of a turbine-powered air transport aeroplane certificated for operation with a minimum crew of at least two pilots.

2. Assessment level

The applicant for the multi-crew pilot licence in the aeroplane category shall have satisfactorily demonstrated performance in all the nine competency units specified in 3, at the advanced level of competency as defined in Attachment B.

Note.— The training scheme for the multi-crew pilot licence in the aeroplane category, including the various levels of competency are contained in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

3. Competency units

The nine competency units that an applicant has to demonstrate in accordance with Chapter 2, 2.5.1.3, are as follows:

1) apply threat and error management (TEM) principles;

2) perform aeroplane ground operations;

3) perform take-off;

4) perform climb;

5) perform cruise;

6) perform descent;

7) perform approach;

8) perform landing; and

9) perform after-landing and aeroplane post-flight operations.

Note 1.— Competency units are broken down into their constituent elements, for which specific performance criteria have been defined. Competency elements and performance criteria are contained in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

Note 2.— The application of threat and error management principles is a specific competency unit that is to be integrated with each of the other competency units for training and testing purposes.

4. Simulated flight

4.1 The flight simulation training devices used to gain the experience specified in Chapter 2, 2.5.3.3, shall have been approved by the Licensing Authority.

4.2 Flight simulation training devices shall be categorized as follows:

a) *Type I.* E-training and part tasking devices approved by the Licensing Authority that have the following characteristics:

— involve accessories beyond those normally associated with desktop computers, such as functional replicas of a throttle quadrant, a sidestick controller, or an FMS keypad; and

— involve psychomotor activity with appropriate application of force and timing of responses.

b) *Type II.* A flight simulation training device that represents a generic turbine-powered aeroplane.

Note.— This requirement can be met by a flight simulation training device equipped with a daylight visual system and otherwise meeting, at a minimum, *the specifications equivalent to FAA FTD Level 5, or JAA FNPT II, MCC.*

c) *Type III.* A flight simulation training device that represents a multi-engined turbine-powered aeroplane certificated for a crew of two pilots with enhanced daylight visual system and equipped with an autopilot.

Note.— This requirement can be met by a flight simulation training device equipped with a daylight visual system and otherwise meeting, at a minimum, the specifications equivalent to a Level B simulator as defined in JAR STD 1A, as amended; and in FAA AC 120-40B, as amended, including Alternate Means of Compliance (AMOC), as permitted in AC 120-40B. (Some previously evaluated Level A full flight simulators that have been approved for training and checking required manoeuvres may be used.)

d) *Type IV.* Fully equivalent to a Level D flight simulator or to a Level C flight simulator with an enhanced daylight visual system.

Note.— This requirement can be met by a flight simulation training device meeting, at a minimum, the specifications equivalent to a Level C and Level D simulator as defined in JAR STD 1A, as amended; and in FAA AC 120-40B, as amended, including Alternate Means of Compliance (AMOC), as permitted in AC 120-40B.

ATTACHMENT A

ICAO LANGUAGE PROFICIENCY RATING SCALE

1.1 Expert, extended and operational levels

LEVEL	*PRONUNCIATION* *Assumes a dialect and/or accent intelligible to the aeronautical community.*	*STRUCTURE* *Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.*	*VOCABULARY*	*FLUENCY*	*COMPREHENSION*	*INTERACTIONS*
Expert 6	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced, and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues and responds to them appropriately.
Extended 5	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation, rarely interfere with ease of understanding.	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	Able to speak at length with relative ease on familiar topics but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect and/or accent) or registers.	Responses are immediate, appropriate, and informative. Manages the speaker/listener relationship effectively.
Operational 4	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.

Levels 1, 2 and 3 are on subsequent page.

1.2 Pre-operational, elementary and pre-elementary levels

LEVEL	*PRONUNCIATION* *Assumes a dialect and/or accent intelligible to the aeronautical community.*	*STRUCTURE* *Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.*	*VOCABULARY*	*FLUENCY*	*COMPREHENSION*	*INTERACTIONS*
Levels 4, 5 and 6 are on preceding page.						
Pre-operational 3	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.	Vocabulary range and accuracy are often sufficient to communicate on common, concrete, or work-related topics, but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.	Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. May fail to understand a linguistic or situational complication or an unexpected turn of events.	Responses are sometimes immediate, appropriate, and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an unexpected turn of events.
Elementary 2	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	Shows only limited control of a few simple memorized grammatical structures and sentence patterns.	Limited vocabulary range consisting only of isolated words and memorized phrases.	Can produce very short, isolated, memorized utterances with frequent pausing and a distracting use of fillers to search for expressions and to articulate less familiar words.	Comprehension is limited to isolated, memorized phrases when they are carefully and slowly articulated.	Response time is slow and often inappropriate. Interaction is limited to simple routine exchanges.
Pre-elementary 1	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.	Performs at a level below the Elementary level.

Note.— The Operational Level (Level 4) is the minimum required proficiency level for radiotelephony communication. Levels 1 through 3 describe Pre-elementary, Elementary, and Pre-operational levels of language proficiency, respectively, all of which describe a level of proficiency below the ICAO language proficiency requirement. Levels 5 and 6 describe Extended and Expert levels, at levels of proficiency more advanced than the minimum required Standard. As a whole, the scale will serve as benchmarks for training and testing, and in assisting candidates to attain the ICAO Operational Level (Level 4).

ATTACHMENT B

MULTI-CREW PILOT LICENCE — AEROPLANE LEVELS OF COMPETENCY

1. Core flying skills

The level of competency at which the applicant shall have complied with the requirements for the private pilot licence specified in Chapter 2, 2.3, including night flight requirements, and, in addition, have completed, smoothly and with accuracy, all procedures and manoeuvres related to upset training and flight with reference solely to instruments. From the outset, all training is conducted in an integrated multi-crew, competency-based and threat and error management (TEM) environment. Initial training and instructional input levels are high as core skills are being embedded in the *ab initio* application. Assessment at this level confirms that control of the aeroplane is maintained at all times in a manner such that the successful outcome of a procedure or a manoeuvre is assured.

2. Level 1 (Basic)

The level of competency at which assessment confirms that control of the aeroplane or situation is maintained at all times and in such a manner that if the successful outcome of a procedure or manoeuvre is in doubt, corrective action is taken. Performance in the generic cockpit environment does not yet consistently meet the Standards of knowledge, operational skills and level of achievement required in the core competencies. Continual training input is required to meet an acceptable initial operating standard. Specific performance improvement/personal development plans will be agreed and the details recorded. Applicants will be continuously assessed as to their suitability to progress to further training and assessment in successive phases.

3. Level 2 (Intermediate)

The level of competency at which assessment confirms that control of the aeroplane or situation is maintained at all times and in such a manner that the successful outcome of a procedure or manoeuvre is assured. The training received at Level 2 shall be conducted under the instrument flight rules, but need not be specific to any one type of aeroplane. On completion of Level 2, the applicant shall demonstrate levels of knowledge and operational skills that are adequate in the environment and achieves the basic standard in the core capability. Training support may be required with a specific development plan to maintain or improve aircraft handling, behavioural performance in leadership or team management. Improvement and development to attain the Standard is the key performance objective. Any core competency assessed as less than satisfactory should include supporting evidence and a remedial plan.

4. Level 3 (Advanced)

The level of competency required to operate and interact as a co-pilot in a turbine-powered aeroplane certificated for operation with a minimum crew of at least two pilots, under visual and instrument conditions. Assessment confirms that control of the aeroplane or situation is maintained at all times in such a manner that the successful outcome of a procedure or manoeuvre is assured. The applicant shall consistently demonstrate the knowledge, skills and attitudes required for the safe operation of an applicable aeroplane type as specified in the performance criteria.

Note.— Material on the development of performance criteria can be found in the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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Rules of the Air

This edition incorporates all amendments adopted by the Council prior to 24 February 2005 and supersedes, on 24 November 2005, all previous editions of Annex 2.

For information regarding the applicability of the Standards, *see* Foreword.

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6/05

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TRANSMITTAL NOTE

NEW EDITIONS OF ANNEXES TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

It has come to our attention that when a new edition of an Annex is published, users have been discarding, along with the previous edition of the Annex, the **Supplement** to the previous edition. Please note that the Supplement to the previous edition should be retained until a new Supplement is issued.

International Standards

Annex 2
to the Convention on
International Civil Aviation

Rules of the Air

This edition incorporates all amendments adopted by the Council prior to 24 February 2005 and supersedes, on 24 November 2005, all previous editions of Annex 2.

For information regarding the applicability of the Standards, *see* Foreword.

Tenth Edition
July 2005

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-38	Incorporated in this edition		
39	23/11/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

In October 1945, the Rules of the Air and Air Traffic Control (RAC) Division at its first session made recommendations for Standards, Practices and Procedures for the Rules of the Air. These were reviewed by the then Air Navigation Committee and approved by the Council on 25 February 1946. They were published as *Recommendations for Standards, Practices and Procedures — Rules of the Air* in the first part of Doc 2010, published in February 1946.

The RAC Division, at its second session in December 1946–January 1947, reviewed Doc 2010 and proposed Standards and Recommended Practices for the Rules of the Air. These were adopted by the Council as Standards and Recommended Practices relating to Rules of the Air on 15 April 1948, pursuant to Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and designated as Annex 2 to the Convention with the title *International Standards and Recommended Practices — Rules of the Air*. They became effective on 15 September 1948.

On 27 November 1951, the Council adopted a complete new text of the Annex, which no longer contained Recommended Practices. The Standards of the amended Annex 2 (Amendment 1) became effective on 1 April 1952 and applicable on 1 September 1952.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The Standards in this document, together with the Standards and Recommended Practices of Annex 11, govern the application of the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and the *Regional Supplementary Procedures* — Rules of the Air and Air Traffic Services, contained in Doc 7030, in which latter document will be found subsidiary procedures of regional application.

Flight over the high seas. It should be noted that the Council resolved, in adopting Annex 2 in April 1948 and Amendment 1 to the said Annex in November 1951, that the Annex constitutes *Rules relating to the flight and manoeuvre of aircraft* within the meaning of Article 12 of the Convention. Over the high seas, therefore, these rules apply without exception.

On 15 November 1972, when adopting Amendment 14 to Annex 2 relating to authority over aircraft operating over the high seas, the Council emphasized that the Amendment was intended solely to improve safety of flight and to ensure adequate provision of air traffic services over the high seas. The Amendment in no way affects the legal jurisdiction of States of Registry over their aircraft or the responsibility of Contracting States under Article 12 of the Convention for enforcing the Rules of the Air.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. Contracting States are also invited to notify the Organization of any differences between their national regulations and practices and the special recommendations contained in Attachment A to this Annex. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the applicability of national rules and procedures, and changes thereto, established according to the Standards specified in this Annex shall be notified in accordance with Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1. — *Material comprising the Annex proper:*

a) Standards and Recommended Practices adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2. — *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*. There are no *Recommended Practices* in Annex 2.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document which is identified by a number includes all subdivisions of the portion.

Table A. Amendments to Annex 2

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
1st Edition (1948)	RAC Division, Second Session (1947)	Standards and Recommended Practices — Rules of the Air.	15 April 1948 15 September 1948 —
1 (2nd Edition)	RAC Division, Fourth Session (1950)	Complete revision and rearrangement of the Annex.	27 November 1951 1 April 1952 1 September 1952
2	RAC Committee of the European- Mediterranean Region Fourth Special Meeting (1952)	Radiocommunication failure procedures; flight plan.	17 November 1953 1 April 1954 1 September 1954
3 (3rd Edition)	Second Air Navigation Conference (1955)	Definitions and terminology; VFR flight outside controlled airspace; distress and urgency signals; signals for aerodrome traffic; marshalling signals.	11 May 1956 15 September 1956 1 December 1956
4	Air Navigation Commission	Guidance material on the application of the definitions of danger area; prohibited area and restricted area.	14 November 1958 — —
5 (4th Edition)	RAC/SAR Divisions Meeting (1958); Air Navigation Commission	Definitions; prohibition of VFR flights at night within controlled airspace; avoidance of collisions; flight plans; visual and instrument flight rules; SELCAL; marshalling signals.	8 December 1959 1 May 1960 1 August 1960
6	RAC/SAR Divisions Meeting (1958); Airworthiness Committee, Fourth Meeting (1960)	VFR flight; table of cruising levels; aircraft navigation lights.	13 December 1961 1 April 1962 1 July 1962
7	Fourth North Atlantic Regional Air Navigation Meeting (1961)	Application of table of cruising levels in polar areas.	27 June 1962 1 November 1962 1 December 1962
8 (5th Edition)	RAC/OPS Divisional Meeting (1963); Air Navigation Commission	Definitions; provisions regarding flight level and altitudes; submission of flight plans; establishment of a single table of VFR criteria; prohibition of VFR flights at night in uncontrolled airspace and above FL 200; communications for IFR flights outside controlled airspace; replacement of quadrantal table of cruising levels by a semi-circular table; vertical separation above FL 290.	29 November 1965 29 March 1966 25 August 1966
9	Air Navigation Commission	Guidance material; excerpts from the International Regulations for Preventing Collisions at Sea.	29 November 1965 — —
10	Air Traffic Control Automation Panel (ATCAP), Fifth Meeting (1966); Air Navigation Commission	Flight plans; deletion of guidance material regarding the International Regulations for Preventing Collisions at Sea and of the associated application Standard.	7 June 1967 5 October 1967 8 February 1968

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
11	Fifth Air Navigation Conference (1967)	Air traffic services reporting office; marshalling signals.	23 January 1969 23 May 1969 18 September 1969
12 (6th Edition)	Sixth Air Navigation Conference (1969)	Definitions; minimum heights/levels; controlled VFR flights; new terminology for designating controlled airspace.	25 May 1970 25 September 1970 4 February 1971
13	Limited European-Mediterranean (RAC/COM) Regional Air Navigation Meeting (1969); Air Navigation Commission	Radiocommunication failure procedures; unserviceability markings on manoeuvring areas.	24 March 1972 24 July 1972 7 December 1972
14	Air Navigation Commission	Authority over aircraft operating over the high seas.	15 November 1972 15 March 1973 16 August 1973
15	Air Traffic Control Automation Panel (ATCAP), Fifth Meeting (1966)	Repetitive flight plans.	13 December 1972 13 April 1973 16 August 1973
16	Seventh Air Navigation Conference (1972)	Note relating to SSR Mode C transmission of pressure-altitude.	23 March 1973 — 23 May 1974
17	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	Practices to be followed in the event that an aircraft is being subjected to unlawful interference.	7 December 1973 7 April 1974 23 May 1974
18	Air Navigation Commission	Radiocommunication failure procedures; Note concerning lease, charter and interchange of aircraft.	8 April 1974 8 August 1974 27 February 1975
19	Technical Panel on Supersonic Transport Operations (SSTP), Fourth Meeting (1973); Air Navigation Commission	Action by an aircraft which is being intercepted; visual signals for use in the event of interception; guidance material to assist States in eliminating or reducing interceptions; provision relating to flight at transonic and supersonic speeds; changes to reflect the concept of cruise climbs.	4 February 1975 4 June 1975 9 October 1975
20	Air Navigation Commission	Time-keeping accuracy in ATS units and on board aircraft; use of SSR code 7500 in the event of unlawful interference.	7 April 1976 7 August 1976 30 December 1976
21	Ninth Air Navigation Conference (1976)	Definitions relating to changeover points and transition altitudes; requirement for aircraft to adhere to the centre line of ATS routes and to comply with changeover points; cruising levels; flight plans and position reports; alignment of the definition of flight level with that in Annex 3 and Annex 10, Volume II.	7 December 1977 7 April 1978 10 August 1978

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
22	Air Navigation Commission	Unmanned free balloons; estimated time of arrival.	2 March 1981 2 July 1981 26 November 1981
23 (7th Edition)	Air Navigation Commission	Interception of civil aircraft.	1 April 1981 1 August 1981 26 November 1981
24	Air Navigation Commission	Aircraft exterior lights.	19 March 1982 19 July 1982 25 November 1982
25	Air Navigation Commission; AGA Divisional Meeting (1981)	Definitions relating to height, instrument approach procedure, manoeuvring and movement area, taxiing, and taxiway; use of the phrase “HIJACK” in the event of interception of civil aircraft; note regarding lease, charter or interchange of aircraft; provisions related to surface movement of aircraft and taxiing; series 2 signals used by helicopters in the event of interception; units of measurement.	21 March 1983 29 July 1983 24 November 1983
26	ATS Data Acquisition, Processing and Transfer Panel, Third Meeting (1981); Air Navigation Commission	Definitions; contents of flight plans; repetitive flight plans; ATS data interchange; pronunciations to be used by intercepting aircraft; alignment of the radiotelephony urgency signal with Annex 10, Volume II; Coordinated Universal Time (UTC).	22 June 1984 22 October 1984 21 November 1985
27 (8th Edition)	Council; Air Navigation Commission	Identification and interception of civil aircraft.	10 March 1986 27 July 1986 20 November 1986
28	Air Navigation Commission	Definition of “apron”; special procedures for use during unlawful interference.	16 March 1987 27 July 1987 19 November 1987
29 (9th Edition)	Visual Flight Rules Operations Panel, Third Meeting (1986); Secretariat; Visual Aids Panel, Eleventh Meeting (1987); Air Navigation Commission; amendments consequential to adoption of amendments to Annex 6	Operation of aircraft in mixed VFR/IFR environments; surface movement of aircraft and surface movement guidance and control; acts of unlawful interference; helicopters as intercepting aircraft.	12 March 1990 30 July 1990 14 November 1991
30	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel, Fourth Meeting (SICASP/4) (1989)	Definitions; airborne collision avoidance system (ACAS).	26 February 1993 26 July 1993 11 November 1993
31	Review of the General Concept of Separation Panel, Seventh Meeting (1990); Air Navigation Commission; Automatic Dependent Surveillance Panel, Second Meeting (1992)	Definitions; air-taxiing; separation between aircraft; formation flights by civil aircraft in controlled airspace; automatic dependent surveillance.	18 March 1994 25 July 1994 10 November 1994

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
32	Air Navigation Commission	Note related to carriage requirements of airborne collision avoidance systems.	19 February 1996 19 February 1996 —
33	Air Navigation Commission	Communication failure procedures.	26 February 1997 21 July 1997 6 November 1997
34	Automatic Dependent Surveillance Panel, Fourth Meeting (1996); Review of the General Concept of Separation Panel, Ninth Meeting (1996); consequential to Amendment 162 to Annex 1	Definitions; automatic dependent surveillance systems and procedures; data interchange between automated ATS systems; ATS applications for air-ground data links; problematic use of psychoactive substances.	19 March 1998 20 July 1998 5 November 1998
35	Air Navigation Commission; Visual Aids Panel, Thirteenth Meeting (1997)	ATS airspace classifications; visual meteorological conditions clearance; runway-holding position.	10 March 1999 19 July 1999 4 November 1999
36	Consequential as a result of Amendment 40 to Annex 11; Amendments 23 and 25 to Annex 6, Part I; Amendments 20 and 7 to Annex 6, Parts II and III, respectively; and Amendment 72 to Annex 3	Revised definitions of “air traffic control unit”, “approach control unit”, “alternate aerodrome” “flight crew member”, “pilot-in-command” and “visibility”; editorial amendments.	12 March 2001 16 July 2001 1 November 2001
37	Separation and Airspace Safety Panel (SASP)	Pilot procedures in the event of unlawful interference; editorial amendments.	28 February 2003 — —
38 (10th Edition)	Secretariat	Definitions; marshalling signals; communication failure procedures; interception manoeuvres; editorial amendments.	23 February 2005 11 July 2005 24 November 2005
39	Secretariat	Restructuring of text to emphasize the responsibility of the pilot-in-command for the avoidance of collisions.	20 February 2006 17 July 2006 23 November 2006

INTERNATIONAL STANDARDS

CHAPTER 1. DEFINITIONS

Note 1.— Throughout the text of this document the term "service" is used as an abstract noun to designate functions, or service rendered; the term "unit" is used to designate a collective body performing a service.

Note 2.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc 9718)).*

When the following terms are used in the International Standards for Rules of the Air, they have the following meanings:

Acrobatic flight. Manoeuvres intentionally performed by an aircraft involving an abrupt change in its attitude, an abnormal attitude, or an abnormal variation in speed.

ADS agreement. An ADS reporting plan which establishes the conditions of ADS data reporting (i.e. data required by the air traffic services unit and frequency of ADS reports which have to be agreed to prior to the provision of the ADS services).

Note.— The terms of the agreement will be exchanged between the ground system and the aircraft by means of a contract, or a series of contracts.

ADS contract. A means by which the terms of an ADS agreement will be exchanged between the ground system and the aircraft, specifying under what conditions ADS reports would be initiated, and what data would be contained in the reports.

Note.— The term "ADS contract" is a generic term meaning variously, ADS event contract, ADS demand contract, ADS periodic contract or an emergency mode. Ground forwarding of ADS reports may be implemented between ground systems.

Advisory airspace. An airspace of defined dimensions, or designated route, within which air traffic advisory service is available.

Advisory route. A designated route along which air traffic advisory service is available.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome control service. Air traffic control service for aerodrome traffic.

Aerodrome control tower. A unit established to provide air traffic control service to aerodrome traffic.

Aerodrome traffic. All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome.

Note.— An aircraft is in the vicinity of an aerodrome when it is in, entering or leaving an aerodrome traffic circuit.

Aerodrome traffic zone. An airspace of defined dimensions established around an aerodrome for the protection of aerodrome traffic.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical station (RR S1.81). A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Air-ground control radio station. An aeronautical telecommunication station having primary responsibility for handling communications pertaining to the operation and control of aircraft in a given area.

Air-taxiing. Movement of a helicopter/VTOL above the surface of an aerodrome, normally in ground effect and at a ground speed normally less than 37 km/h (20 kt).

Note.— The actual height may vary, and some helicopters may require air-taxiing above 8 m (25 ft) AGL to reduce ground effect turbulence or provide clearance for cargo slingloads.

Air traffic. All aircraft in flight or operating on the manoeuvring area of an aerodrome.

Air traffic advisory service. A service provided within advisory airspace to ensure separation, in so far as practical, between aircraft which are operating on IFR flight plans.

Air traffic control clearance. Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.

Note 1.— For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.

Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates.

Air traffic control service. A service provided for the purpose of:

a) preventing collisions:

1) between aircraft, and

2) on the manoeuvring area between aircraft and obstructions, and

b) expediting and maintaining an orderly flow of air traffic.

Air traffic control unit. A generic term meaning variously, area control centre, approach control unit or aerodrome control tower.

Air traffic service. A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services airspaces. Airspaces of defined dimensions, alphabetically designated, within which specific types of flights may operate and for which air traffic services and rules of operation are specified.

Note.— ATS airspaces are classified as Class A to G.

Air traffic services reporting office. A unit established for the purpose of receiving reports concerning air traffic services and flight plans submitted before departure.

Note.— An air traffic services reporting office may be established as a separate unit or combined with an existing unit, such as another air traffic services unit, or a unit of the aeronautical information service.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Airway. A control area or portion thereof established in the form of a corridor.

Alerting service. A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shutdown or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Approach control service. Air traffic control service for arriving or departing controlled flights.

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned.

Appropriate authority.

a) *Regarding flight over the high seas:* The relevant authority of the State of Registry.

b) *Regarding flight other than over the high seas:* The relevant authority of the State having sovereignty over the territory being overflown.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Area control centre. A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Area control service. Air traffic control service for controlled flights in control areas.

ATS route. A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term "ATS route" is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.

Note 2.— An ATS route is defined by route specifications which include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate.

Ceiling. The height above the ground or water of the base of the lowest layer of cloud below 6 000 metres (20 000 feet) covering more than half the sky.

Changeover point. The point at which an aircraft navigating on an ATS route segment defined by reference to very high frequency omnidirectional radio ranges is expected to transfer its primary navigational reference from the facility behind the aircraft to the next facility ahead of the aircraft.

Note.— Changeover points are established to provide the optimum balance in respect of signal strength and quality between facilities at all levels to be used and to ensure a common source of azimuth guidance for all aircraft operating along the same portion of a route segment.

Clearance limit. The point to which an aircraft is granted an air traffic control clearance.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

Controlled aerodrome. An aerodrome at which air traffic control service is provided to aerodrome traffic.

Note.— The term "controlled aerodrome" indicates that air traffic control service is provided to aerodrome traffic but does not necessarily imply that a control zone exists.

Controlled airspace. An airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification.

Note.— Controlled airspace is a generic term which covers ATS airspace Classes A, B, C, D and E as described in Annex 11, 2.6.

Controlled flight. Any flight which is subject to an air traffic control clearance.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Control zone. A controlled airspace extending upwards from the surface of the earth to a specified upper limit.

Cruise climb. An aeroplane cruising technique resulting in a net increase in altitude as the aeroplane mass decreases.

Cruising level. A level maintained during a significant portion of a flight.

Current flight plan. The flight plan, including changes, if any, brought about by subsequent clearances.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Data link communications. A form of communication intended for the exchange of messages via a data link.

Estimated off-block time. The estimated time at which the aircraft will commence movement associated with departure.

Estimated time of arrival. For IFR flights, the time at which it is estimated that the aircraft will arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the aerodrome, the time at which the aircraft will arrive over the aerodrome. For VFR flights, the time at which it is estimated that the aircraft will arrive over the aerodrome.

Expected approach time. The time at which ATC expects that an arriving aircraft, following a delay, will leave the holding fix to complete its approach for a landing.

Note.— The actual time of leaving the holding fix will depend upon the approach clearance.

Filed flight plan. The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight information service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight visibility. The visibility forward from the cockpit of an aircraft in flight.

Ground visibility. The visibility at an aerodrome as reported by an accredited observer or by automatic systems.

Heading. The direction in which the longitudinal axis of an aircraft is pointed, usually expressed in degrees from North (true, magnetic, compass or grid).

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

IFR. The symbol used to designate the instrument flight rules.

IFR flight. A flight conducted in accordance with the instrument flight rules.

IMC. The symbol used to designate instrument meteorological conditions.

Instrument approach procedure. A series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply. Instrument approach procedures are classified as follows:

Non-precision approach (NPA) procedure. An instrument approach procedure which utilizes lateral guidance but does not utilize vertical guidance.

Approach procedure with vertical guidance (APV). An instrument approach procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach (PA) procedure. An instrument approach procedure using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer-generated navigation data.

Instrument meteorological conditions. Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4.

Landing area. That part of a movement area intended for the landing or take-off of aircraft.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.*

Problematic use of substances. The use of one or more psychoactive substances by aviation personnel in a way that:

a) constitutes a direct hazard to the user or endangers the lives, health or welfare of others; and/or

b) causes or worsens an occupational, social, mental or physical problem or disorder.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Radiotelephony. A form of radiocommunication primarily intended for the exchange of information in the form of speech.

Repetitive flight plan (RPL). A flight plan related to a series of frequently recurring, regularly operated individual flights with identical basic features, submitted by an operator for retention and repetitive use by ATS units.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway-holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

Safety-sensitive personnel. Persons who might endanger aviation safety if they perform their duties and functions improperly including, but not limited to, crew members, aircraft maintenance personnel and air traffic controllers.

Signal area. An area on an aerodrome used for the display of ground signals.

Special VFR flight. A VFR flight cleared by air traffic control to operate within a control zone in meteorological conditions below VMC.

Taxiing. Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Taxiway. A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including:

a) *Aircraft stand taxilane.* A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.

b) *Apron taxiway.* A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

c) *Rapid exit taxiway.* A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times.

Terminal control area. A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.

Total estimated elapsed time. For IFR flights, the estimated time required from take-off to arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the destination aerodrome, to arrive over the destination aerodrome. For VFR flights, the estimated time required from take-off to arrive over the destination aerodrome.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Traffic avoidance advice. Advice provided by an air traffic services unit specifying manoeuvres to assist a pilot to avoid a collision.

Traffic information. Information issued by an air traffic services unit to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of flight and to help the pilot avoid a collision.

Transition altitude. The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.

Unmanned free balloon. A non-power-driven, unmanned, lighter-than-air aircraft in free flight.

* As defined in Annex 8.

Note.— Unmanned free balloons are classified as heavy, medium or light in accordance with specifications contained in Appendix 4.

VFR. The symbol used to designate the visual flight rules.

VFR flight. A flight conducted in accordance with the visual flight rules.

Visibility. Visibility for aeronautical purposes is the greater of:

a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;

b) the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note 1.— The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).

Note. 2.— The definition applies to the observations of visibility in local routine and special reports, to the observations of prevailing and minimum visibility reported in METAR and SPECI and to the observations of ground visibility.

Visual meteorological conditions. Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.

Note.— The specified minima are contained in Chapter 4.

VMC. The symbol used to designate visual meteorological conditions.

CHAPTER 2. APPLICABILITY OF THE RULES OF THE AIR

2.1 Territorial application of the rules of the air

2.1.1 The rules of the air shall apply to aircraft bearing the nationality and registration marks of a Contracting State, wherever they may be, to the extent that they do not conflict with the rules published by the State having jurisdiction over the territory overflown.

Note.— The Council of the International Civil Aviation Organization resolved, in adopting Annex 2 in April 1948 and Amendment 1 to the said Annex in November 1951, that the Annex constitutes Rules relating to the flight and manoeuvre of aircraft *within the meaning of Article 12 of the Convention. Over the high seas, therefore, these rules apply without exception.*

2.1.2 If, and so long as, a Contracting State has not notified the International Civil Aviation Organization to the contrary, it shall be deemed, as regards aircraft of its registration, to have agreed as follows:

> For purposes of flight over those parts of the high seas where a Contracting State has accepted, pursuant to a regional air navigation agreement, the responsibility of providing air traffic services, the "appropriate ATS authority" referred to in this Annex is the relevant authority designated by the State responsible for providing those services.

Note.— The phrase "regional air navigation agreement" refers to an agreement approved by the Council of ICAO normally on the advice of a Regional Air Navigation Meeting.

2.2 Compliance with the rules of the air

The operation of an aircraft either in flight or on the movement area of an aerodrome shall be in compliance with the general rules and, in addition, when in flight, either with:

a) the visual flight rules; or

b) the instrument flight rules.

Note 1.— Information relevant to the services provided to aircraft operating in accordance with both visual flight rules and instrument flight rules in the seven ATS airspace classes is contained in 2.6.1 and 2.6.3 of Annex 11.

Note 2.— A pilot may elect to fly in accordance with instrument flight rules in visual meteorological conditions or may be required to do so by the appropriate ATS authority.

2.3 Responsibility for compliance with the rules of the air

2.3.1 Responsibility of pilot-in-command

The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.

2.3.2 Pre-flight action

Before beginning a flight, the pilot-in-command of an aircraft shall become familiar with all available information appropriate to the intended operation. Pre-flight action for flights away from the vicinity of an aerodrome, and for all IFR flights, shall include a careful study of available current weather reports and forecasts, taking into consideration fuel requirements and an alternative course of action if the flight cannot be completed as planned.

2.4 Authority of pilot-in-command of an aircraft

The pilot-in-command of an aircraft shall have final authority as to the disposition of the aircraft while in command.

2.5 Problematic use of psychoactive substances

No person whose function is critical to the safety of aviation (safety-sensitive personnel) shall undertake that function while under the influence of any psychoactive substance, by reason of which human performance is impaired. No such person shall engage in any kind of problematic use of substances.

CHAPTER 3. GENERAL RULES

3.1 Protection of persons and property

3.1.1 Negligent or reckless operation of aircraft

An aircraft shall not be operated in a negligent or reckless manner so as to endanger life or property of others.

3.1.2 Minimum heights

Except when necessary for take-off or landing, or except by permission from the appropriate authority, aircraft shall not be flown over the congested areas of cities, towns or settlements or over an open-air assembly of persons, unless at such a height as will permit, in the event of an emergency arising, a landing to be made without undue hazard to persons or property on the surface.

Note.— See 4.6 for minimum heights for VFR flights and 5.1.2 for minimum levels for IFR flights.

3.1.3 Cruising levels

The cruising levels at which a flight or a portion of a flight is to be conducted shall be in terms of:

a) flight levels, for flights at or above the lowest usable flight level or, where applicable, above the transition altitude;

b) altitudes, for flights below the lowest usable flight level or, where applicable, at or below the transition altitude.

Note.— The system of flight levels is prescribed in the Procedures for Air Navigation Services — Aircraft Operations *(Doc 8168).*

3.1.4 Dropping or spraying

Nothing shall be dropped or sprayed from an aircraft in flight except under conditions prescribed by the appropriate authority and as indicated by relevant information, advice and/or clearance from the appropriate air traffic services unit.

3.1.5 Towing

No aircraft or other object shall be towed by an aircraft, except in accordance with requirements prescribed by the appropriate authority and as indicated by relevant information, advice and/or clearance from the appropriate air traffic services unit.

3.1.6 Parachute descents

Parachute descents, other than emergency descents, shall not be made except under conditions prescribed by the appropriate authority and as indicated by relevant information, advice and/or clearance from the appropriate air traffic services unit.

3.1.7 Acrobatic flight

No aircraft shall be flown acrobatically except under conditions prescribed by the appropriate authority and as indicated by relevant information, advice and/or clearance from the appropriate air traffic services unit.

3.1.8 Formation flights

Aircraft shall not be flown in formation except by prearrangement among the pilots-in-command of the aircraft taking part in the flight and, for formation flight in controlled airspace, in accordance with the conditions prescribed by the appropriate ATS authority(ies). These conditions shall include the following:

a) the formation operates as a single aircraft with regard to navigation and position reporting;

b) separation between aircraft in the flight shall be the responsibility of the flight leader and the pilots-in-command of the other aircraft in the flight and shall include periods of transition when aircraft are manoeuvring to attain their own separation within the formation and during join-up and breakaway; and

c) a distance not exceeding 1 km (0.5 NM) laterally and longitudinally and 30 m (100 ft) vertically from the flight leader shall be maintained by each aircraft.

3.1.9 Unmanned free balloons

An unmanned free balloon shall be operated in such a manner as to minimize hazards to persons, property or other aircraft and in accordance with the conditions specified in Appendix 4.

3.1.10 Prohibited areas and restricted areas

Aircraft shall not be flown in a prohibited area, or in a restricted area, the particulars of which have been duly published, except in accordance with the conditions of the restrictions or by permission of the State over whose territory the areas are established.

3.2 Avoidance of collisions

Nothing in these rules shall relieve the pilot-in-command of an aircraft from the responsibility of taking such action, including collision avoidance manoeuvres based on resolution advisories provided by ACAS equipment, as will best avert collision.

Note 1.— It is important that vigilance for the purpose of detecting potential collisions be exercised on board an aircraft, regardless of the type of flight or the class of airspace in which the aircraft is operating, and while operating on the movement area of an aerodrome.

Note 2.— Operating procedures for use of ACAS detailing the responsibilities of the pilot-in-command are contained in PANS-OPS (Doc 8168), Volume I, Part VIII, Chapter 3.

Note 3.— Carriage requirements for ACAS equipment are addressed in Annex 6, Part I, Chapter 6 and Part II, Chapter 6.

3.2.1 Proximity

An aircraft shall not be operated in such proximity to other aircraft as to create a collision hazard.

3.2.2 Right-of-way

The aircraft that has the right-of-way shall maintain its heading and speed.

3.2.2.1 An aircraft that is obliged by the following rules to keep out of the way of another shall avoid passing over, under or in front of the other, unless it passes well clear and takes into account the effect of aircraft wake turbulence.

3.2.2.2 *Approaching head-on.* When two aircraft are approaching head-on or approximately so and there is danger of collision, each shall alter its heading to the right.

3.2.2.3 *Converging.* When two aircraft are converging at approximately the same level, the aircraft that has the other on its right shall give way, except as follows:

a) power-driven heavier-than-air aircraft shall give way to airships, gliders and balloons;

b) airships shall give way to gliders and balloons;

c) gliders shall give way to balloons;

d) power-driven aircraft shall give way to aircraft which are seen to be towing other aircraft or objects.

3.2.2.4 *Overtaking.* An overtaking aircraft is an aircraft that approaches another from the rear on a line forming an angle of less than 70 degrees with the plane of symmetry of the latter, i.e. is in such a position with reference to the other aircraft that at night it should be unable to see either of the aircraft's left (port) or right (starboard) navigation lights. An aircraft that is being overtaken has the right-of-way and the overtaking aircraft, whether climbing, descending or in horizontal flight, shall keep out of the way of the other aircraft by altering its heading to the right, and no subsequent change in the relative positions of the two aircraft shall absolve the overtaking aircraft from this obligation until it is entirely past and clear.

3.2.2.5 *Landing*

3.2.2.5.1 An aircraft in flight, or operating on the ground or water, shall give way to aircraft landing or in the final stages of an approach to land.

3.2.2.5.2 When two or more heavier-than-air aircraft are approaching an aerodrome for the purpose of landing, aircraft at the higher level shall give way to aircraft at the lower level, but the latter shall not take advantage of this rule to cut in in front of another which is in the final stages of an approach to land, or to overtake that aircraft. Nevertheless, power-driven heavier-than-air aircraft shall give way to gliders.

3.2.2.5.3 *Emergency landing.* An aircraft that is aware that another is compelled to land shall give way to that aircraft.

3.2.2.6 *Taking off.* An aircraft taxiing on the manoeuvring area of an aerodrome shall give way to aircraft taking off or about to take off.

3.2.2.7 *Surface movement of aircraft*

3.2.2.7.1 In case of danger of collision between two aircraft taxiing on the movement area of an aerodrome the following shall apply:

a) when two aircraft are approaching head on, or approximately so, each shall stop or where practicable alter its course to the right so as to keep well clear;

b) when two aircraft are on a converging course, the one which has the other on its right shall give way;

c) an aircraft which is being overtaken by another aircraft shall have the right-of-way and the overtaking aircraft shall keep well clear of the other aircraft.

Note.— For the description of an overtaking aircraft see 3.2.2.4.

3.2.2.7.2 An aircraft taxiing on the manoeuvring area shall stop and hold at all runway-holding positions unless otherwise authorized by the aerodrome control tower.

Note.— For runway-holding position markings and related signs, see Annex 14, Volume I, 5.2.10 and 5.4.2.

3.2.2.7.3 An aircraft taxiing on the manoeuvring area shall stop and hold at all lighted stop bars and may proceed further when the lights are switched off.

3.2.3 Lights to be displayed by aircraft

Note 1.— The characteristics of lights intended to meet the requirements of 3.2.3 for aeroplanes are specified in Annex 8. Specifications for navigation lights for aeroplanes are contained in the Appendices to Parts I and II of Annex 6. Detailed technical specifications for lights for aeroplanes are contained in Volume II, Part A, Chapter 4 of the Airworthiness Manual *(Doc 9760) and for helicopters in Part A, Chapter 5 of that document.*

Note 2.— In the context of 3.2.3.2 c) and 3.2.3.4 a) an aircraft is understood to be operating when it is taxiing or being towed or is stopped temporarily during the course of taxiing or being towed.

Note 3.— For aircraft on the water see 3.2.6.2.

3.2.3.1 Except as provided by 3.2.3.5, from sunset to sunrise or during any other period which may be prescribed by the appropriate authority all aircraft in flight shall display:

a) anti-collision lights intended to attract attention to the aircraft; and

b) navigation lights intended to indicate the relative path of the aircraft to an observer and other lights shall not be displayed if they are likely to be mistaken for these lights.

Note.— Lights fitted for other purposes, such as landing lights and airframe floodlights, may be used in addition to the anti-collision lights specified in the Airworthiness Manual, *Volume II (Doc 9760) to enhance aircraft conspicuity.*

3.2.3.2 Except as provided by 3.2.3.5, from sunset to sunrise or during any other period prescribed by the appropriate authority:

a) all aircraft moving on the movement area of an aerodrome shall display navigation lights intended to indicate the relative path of the aircraft to an observer and other lights shall not be displayed if they are likely to be mistaken for these lights;

b) unless stationary and otherwise adequately illuminated, all aircraft on the movement area of an aerodrome shall display lights intended to indicate the extremities of their structure;

c) all aircraft operating on the movement area of an aerodrome shall display lights intended to attract attention to the aircraft; and

d) all aircraft on the movement area of an aerodrome whose engines are running shall display lights which indicate that fact.

Note.— If suitably located on the aircraft, the navigation lights referred to in 3.2.3.1 b) may also meet the requirements of 3.2.3.2 b). Red anti-collision lights fitted to meet the requirements of 3.2.3.1 a) may also meet the requirements of 3.2.3.2 c) and 3.2.3.2 d) provided they do not subject observers to harmful dazzle.

3.2.3.3 Except as provided by 3.2.3.5, all aircraft in flight and fitted with anti-collision lights to meet the requirement of 3.2.3.1 a) shall display such lights also outside the period specified in 3.2.3.1.

3.2.3.4 Except as provided by 3.2.3.5, all aircraft:

a) operating on the movement area of an aerodrome and fitted with anti-collision lights to meet the requirement of 3.2.3.2 c); or

b) on the movement area of an aerodrome and fitted with lights to meet the requirement of 3.2.3.2 d);

shall display such lights also outside the period specified in 3.2.3.2.

3.2.3.5 A pilot shall be permitted to switch off or reduce the intensity of any flashing lights fitted to meet the requirements of 3.2.3.1, 3.2.3.2, 3.2.3.3 and 3.2.3.4 if they do or are likely to:

a) adversely affect the satisfactory performance of duties; or

b) subject an outside observer to harmful dazzle.

3.2.4 Simulated instrument flights

An aircraft shall not be flown under simulated instrument flight conditions unless:

a) fully functioning dual controls are installed in the aircraft; and

b) a qualified pilot occupies a control seat to act as safety pilot for the person who is flying under simulated instrument conditions. The safety pilot shall have adequate vision forward and to each side of the aircraft, or a competent observer in communication with the safety pilot shall occupy a position in the aircraft from which the observer's field of vision adequately supplements that of the safety pilot.

3.2.5 Operation on and in the vicinity of an aerodrome

An aircraft operated on or in the vicinity of an aerodrome shall, whether or not within an aerodrome traffic zone:

a) observe other aerodrome traffic for the purpose of avoiding collision;

b) conform with or avoid the pattern of traffic formed by other aircraft in operation;

c) make all turns to the left, when approaching for a landing and after taking off, unless otherwise instructed;

d) land and take off into the wind unless safety, the runway configuration, or air traffic considerations determine that a different direction is preferable.

Note 1.— See 3.6.5.1.

Note 2.— Additional rules may apply in aerodrome traffic zones.

3.2.6 Water operations

Note.— In addition to the provisions of 3.2.6.1 of this Annex, rules set forth in the International Regulations for Preventing Collisions at Sea, developed by the International Conference on Revision of the International Regulations for Preventing Collisions at Sea (London, 1972) may be applicable in certain cases.

3.2.6.1 When two aircraft or an aircraft and a vessel are approaching one another and there is a risk of collision, the aircraft shall proceed with careful regard to existing circumstances and conditions including the limitations of the respective craft.

3.2.6.1.1 *Converging.* An aircraft which has another aircraft or a vessel on its right shall give way so as to keep well clear.

3.2.6.1.2 *Approaching head-on.* An aircraft approaching another aircraft or a vessel head-on, or approximately so, shall alter its heading to the right to keep well clear.

3.2.6.1.3 *Overtaking.* The aircraft or vessel which is being overtaken has the right of way, and the one overtaking shall alter its heading to keep well clear.

3.2.6.1.4 *Landing and taking off.* Aircraft landing on or taking off from the water shall, in so far as practicable, keep well clear of all vessels and avoid impeding their navigation.

3.2.6.2 *Lights to be displayed by aircraft on the water.* Between sunset and sunrise or such other period between sunset and sunrise as may be prescribed by the appropriate authority, all aircraft on the water shall display lights as required by the International Regulations for Preventing Collisions at Sea (revised 1972) unless it is impractical for them to do so, in which case they shall display lights as closely similar as possible in characteristics and position to those required by the International Regulations.

Note 1.— Specifications for lights to be shown by aeroplanes on the water are contained in the Appendices to Parts I and II of Annex 6.

Note 2.— The International Regulations for Preventing Collisions at Sea specify that the rules concerning lights shall be complied with from sunset to sunrise. Any lesser period between sunset and sunrise established in accordance with 3.2.6.2 cannot, therefore, be applied in areas where the International Regulations for Preventing Collisions at Sea apply, e.g. on the high seas.

3.3 Flight plans

3.3.1 Submission of a flight plan

3.3.1.1 Information relative to an intended flight or portion of a flight, to be provided to air traffic services units, shall be in the form of a flight plan.

3.3.1.2 A flight plan shall be submitted prior to operating:

a) any flight or portion thereof to be provided with air traffic control service;

b) any IFR flight within advisory airspace;

c) any flight within or into designated areas, or along designated routes, when so required by the appropriate ATS authority to facilitate the provision of flight information, alerting and search and rescue services;

d) any flight within or into designated areas, or along designated routes, when so required by the appropriate ATS authority to facilitate coordination with appropriate military units or with air traffic services units in adjacent States in order to avoid the possible need for interception for the purpose of identification;

e) any flight across international borders.

Note.— The term "flight plan" is used to mean variously, full information on all items comprised in the flight plan description, covering the whole route of a flight, or limited information required when the purpose is to obtain a clearance for a minor portion of a flight such as to cross an airway, to take off from, or to land at a controlled aerodrome.

3.3.1.3 A flight plan shall be submitted, before departure, to an air traffic services reporting office or, during flight, transmitted to the appropriate air traffic services unit or air-ground control radio station, unless arrangements have been made for submission of repetitive flight plans.

3.3.1.4 Unless otherwise prescribed by the appropriate ATS authority, a flight plan for a flight to be provided with air traffic control service or air traffic advisory service shall be submitted at least sixty minutes before departure, or, if submitted during flight, at a time which will ensure its receipt by the appropriate air traffic services unit at least ten minutes before the aircraft is estimated to reach:

a) the intended point of entry into a control area or advisory area; or

b) the point of crossing an airway or advisory route.

3.3.2 Contents of a flight plan

A flight plan shall comprise information regarding such of the following items as are considered relevant by the appropriate ATS authority:

— Aircraft identification

— Flight rules and type of flight

— Number and type(s) of aircraft and wake turbulence category

— Equipment

— Departure aerodrome (see Note 1)

— Estimated off-block time (see Note 2)

— Cruising speed(s)

— Cruising level(s)

— Route to be followed

— Destination aerodrome and total estimated elapsed time

— Alternate aerodrome(s)

— Fuel endurance

— Total number of persons on board

— Emergency and survival equipment

— Other information.

Note 1.— For flight plans submitted during flight, the information provided in respect of this item will be an indication of the location from which supplementary information concerning the flight may be obtained, if required.

Note 2.— For flight plans submitted during flight, the information to be provided in respect of this item will be the time over the first point of the route to which the flight plan relates.

Note 3.— The term "aerodrome" where used in the flight plan is intended to cover also sites other than aerodromes which may be used by certain types of aircraft, e.g. helicopters or balloons.

3.3.3 Completion of a flight plan

3.3.3.1 Whatever the purpose for which it is submitted, a flight plan shall contain information, as applicable, on relevant items up to and including "Alternate aerodrome(s)" regarding the whole route or the portion thereof for which the flight plan is submitted.

3.3.3.2 It shall, in addition, contain information, as applicable, on all other items when so prescribed by the appropriate ATS authority or when otherwise deemed necessary by the person submitting the flight plan.

3.3.4 Changes to a flight plan

Subject to the provisions of 3.6.2.2, all changes to a flight plan submitted for an IFR flight, or a VFR flight operated as a controlled flight, shall be reported as soon as practicable to the appropriate air traffic services unit. For other VFR flights, significant changes to a flight plan shall be reported as soon as practicable to the appropriate air traffic services unit.

Note 1.— Information submitted prior to departure regarding fuel endurance or total number of persons carried on board, if incorrect at time of departure, constitutes a significant change to the flight plan and as such must be reported.

Note 2.— Procedures for submission of changes to repetitive flight plans are contained in the PANS-ATM (Doc 4444).

3.3.5 Closing a flight plan

3.3.5.1 Unless otherwise prescribed by the appropriate ATS authority, a report of arrival shall be made in person, by radiotelephony or via data link at the earliest possible moment after landing, to the appropriate air traffic services unit at the arrival aerodrome, by any flight for which a flight plan has been submitted covering the entire flight or the remaining portion of a flight to the destination aerodrome.

3.3.5.2 When a flight plan has been submitted only in respect of a portion of a flight, other than the remaining portion of a flight to destination, it shall, when required, be closed by an appropriate report to the relevant air traffic services unit.

3.3.5.3 When no air traffic services unit exists at the arrival aerodrome, the arrival report, when required, shall be made as soon as practicable after landing and by the quickest means available to the nearest air traffic services unit.

3.3.5.4 When communication facilities at the arrival aerodrome are known to be inadequate and alternate arrangements for the handling of arrival reports on the ground are not available, the following action shall be taken. Immediately prior to landing the aircraft shall, if practicable, transmit to the appropriate air traffic services unit, a message comparable to an arrival report, where such a report is required. Normally, this transmission shall be made to the aeronautical station serving the air traffic services unit in charge of the flight information region in which the aircraft is operated.

3.3.5.5 Arrival reports made by aircraft shall contain the following elements of information:

a) aircraft identification;

b) departure aerodrome;

c) destination aerodrome (only in the case of a diversionary landing);

d) arrival aerodrome;

e) time of arrival.

Note.— Whenever an arrival report is required, failure to comply with these provisions may cause serious disruption in the air traffic services and incur great expense in carrying out unnecessary search and rescue operations.

3.4 Signals

3.4.1 Upon observing or receiving any of the signals given in Appendix 1, aircraft shall take such action as may be required by the interpretation of the signal given in that Appendix.

3.4.2 The signals of Appendix 1 shall, when used, have the meaning indicated therein. They shall be used only for the purpose indicated and no other signals likely to be confused with them shall be used.

3.4.3 A signalman shall be responsible for providing standard marshalling signals to aircraft in a clear and precise manner using the signals shown in Appendix 1.

3.4.4 No person shall guide an aircraft unless trained, qualified and approved by the appropriate authority to carry out the functions of a signalman.

3.4.5 The signalman shall wear a distinctive fluorescent identification vest to allow the flight crew to identify that he or she is the person responsible for the marshalling operation.

3.4.6 Daylight-fluorescent wands, table-tennis bats or gloves shall be used for all signalling by all participating ground staff during daylight hours. Illuminated wands shall be used at night or in low visibility.

3.5 Time

3.5.1 Coordinated Universal Time (UTC) shall be used and shall be expressed in hours and minutes and, when required, seconds of the 24-hour day beginning at midnight.

3.5.2 A time check shall be obtained prior to operating a controlled flight and at such other times during the flight as may be necessary.

Note.— Such time check is normally obtained from an air traffic services unit unless other arrangements have been made by the operator or by the appropriate ATS authority.

3.5.3 Wherever time is utilized in the application of data link communications, it shall be accurate to within 1 second of UTC.

3.6 Air traffic control service

3.6.1 Air traffic control clearances

3.6.1.1 An air traffic control clearance shall be obtained prior to operating a controlled flight, or a portion of a flight as a controlled flight. Such clearance shall be requested through the submission of a flight plan to an air traffic control unit.

Note 1.— A flight plan may cover only part of a flight, as necessary, to describe that portion of the flight or those manoeuvres which are subject to air traffic control. A clearance may cover only part of a current flight plan, as indicated in a clearance limit or by reference to specific manoeuvres such as taxiing, landing or taking off.

Note 2.— If an air traffic control clearance is not satisfactory to a pilot-in-command of an aircraft, the pilot-in-command may request and, if practicable, will be issued an amended clearance.

3.6.1.2 Whenever an aircraft has requested a clearance involving priority, a report explaining the necessity for such priority shall be submitted, if requested by the appropriate air traffic control unit.

3.6.1.3 *Potential reclearance in flight.* If prior to departure it is anticipated that depending on fuel endurance and subject to reclearance in flight, a decision may be taken to proceed to a revised destination aerodrome, the appropriate air traffic control units shall be so notified by the insertion in the flight plan of information concerning the revised route (where known) and the revised destination.

Note.— The intent of this provision is to facilitate a reclearance to a revised destination, normally beyond the filed destination aerodrome.

3.6.1.4 An aircraft operated on a controlled aerodrome shall not taxi on the manoeuvring area without clearance from the aerodrome control tower and shall comply with any instructions given by that unit.

3.6.2 Adherence to flight plan

3.6.2.1 Except as provided for in 3.6.2.2 and 3.6.2.4, an aircraft shall adhere to the current flight plan or the applicable portion of a current flight plan submitted for a controlled flight unless a request for a change has been made and clearance obtained from the appropriate air traffic control unit, or unless an emergency situation arises which necessitates immediate action by the aircraft, in which event as soon as circumstances permit, after such emergency authority is exercised, the appropriate air traffic services unit shall be notified of the action taken and that this action has been taken under emergency authority.

3.6.2.1.1 Unless otherwise authorized by the appropriate ATS authority, or directed by the appropriate air traffic control unit, controlled flights shall, in so far as practicable:

a) when on an established ATS route, operate along the defined centre line of that route; or

b) when on any other route, operate directly between the navigation facilities and/or points defining that route.

3.6.2.1.2 Subject to the overriding requirement in 3.6.2.1.1, an aircraft operating along an ATS route segment defined by reference to very high frequency omnidirectional radio ranges shall change over for its primary navigation guidance from the facility behind the aircraft to that ahead of it at, or as close as operationally feasible to, the changeover point, where established.

3.6.2.1.3 Deviation from the requirements in 3.6.2.1.1 shall be notified to the appropriate air traffic services unit.

3.6.2.2 *Inadvertent changes.* In the event that a controlled flight inadvertently deviates from its current flight plan, the following action shall be taken:

a) *Deviation from track:* if the aircraft is off track, action shall be taken forthwith to adjust the heading of the aircraft to regain track as soon as practicable.

b) *Variation in true airspeed:* if the average true airspeed at cruising level between reporting points varies or is expected to vary by plus or minus 5 per cent of the true airspeed, from that given in the flight plan, the appropriate air traffic services unit shall be so informed.

c) *Change in time estimate:* if the time estimate for the next applicable reporting point, flight information region boundary or destination aerodrome, whichever comes first, is found to be in error in excess of 3 minutes from that notified to air traffic services, or such other period of time as is prescribed by the appropriate ATS authority or on the basis of air navigation regional agreements, a revised estimated time shall be notified as soon as possible to the appropriate air traffic services unit.

3.6.2.2.1 Additionally, when an ADS agreement is in place, the air traffic services unit (ATSU) shall be informed automatically via data link whenever changes occur beyond the threshold values stipulated by the ADS event contract.

3.6.2.3 *Intended changes.* Requests for flight plan changes shall include information as indicated hereunder:

a) *Change of cruising level:* aircraft identification; requested new cruising level and cruising speed at this level, revised time estimates (when applicable) at subsequent flight information region boundaries.

b) *Change of route:*

1) *Destination unchanged:* aircraft identification; flight rules; description of new route of flight including related flight plan data beginning with the position from which requested change of route is to commence; revised time estimates; any other pertinent information.

2) *Destination changed:* aircraft identification; flight rules; description of revised route of flight to revised destination aerodrome including related flight plan data, beginning with the position from which requested change of route is to commence; revised time estimates; alternate aerodrome(s); any other pertinent information.

3.6.2.4 *Weather deterioration below the VMC.* When it becomes evident that flight in VMC in accordance with its current flight plan will not be practicable, a VFR flight operated as a controlled flight shall:

a) request an amended clearance enabling the aircraft to continue in VMC to destination or to an alternative aerodrome, or to leave the airspace within which an ATC clearance is required; or

b) if no clearance in accordance with a) can be obtained, continue to operate in VMC and notify the appropriate ATC unit of the action being taken either to leave the airspace concerned or to land at the nearest suitable aerodrome; or

c) if operated within a control zone, request authorization to operate as a special VFR flight; or

d) request clearance to operate in accordance with the instrument flight rules.

3.6.3 Position reports

3.6.3.1 Unless exempted by the appropriate ATS authority or by the appropriate air traffic services unit under conditions specified by that authority, a controlled flight shall report to the appropriate air traffic services unit, as soon as possible, the time and level of passing each designated compulsory reporting point, together with any other required information. Position reports shall similarly be made in relation to additional points when requested by the appropriate air traffic services unit. In the absence of designated reporting points, position reports shall be made at intervals prescribed by the appropriate ATS authority or specified by the appropriate air traffic services unit.

3.6.3.1.1 Controlled flights providing position information to the appropriate air traffic services unit via data link communications shall only provide voice position reports when requested.

Note.— The conditions and circumstances in which SSR Mode C transmission of pressure-altitude satisfies the requirement for level information in position reports are indicated in the PANS-ATM (Doc 4444).

3.6.4 Termination of control

A controlled flight shall, except when landing at a controlled aerodrome, advise the appropriate ATC unit as soon as it ceases to be subject to air traffic control service.

3.6.5 Communications

3.6.5.1 An aircraft operated as a controlled flight shall maintain continuous air-ground voice communication watch on the appropriate communication channel of, and establish two-way communication as necessary with, the appropriate air traffic control unit, except as may be prescribed by the appropriate ATS authority in respect of aircraft forming part of aerodrome traffic at a controlled aerodrome.

Note 1.— SELCAL or similar automatic signalling devices satisfy the requirement to maintain an air-ground voice communication watch.

Note 2.— The requirement for an aircraft to maintain an air-ground voice communication watch remains in effect after CPDLC has been established.

3.6.5.2 *Communication failure.* If a communication failure precludes compliance with 3.6.5.1, the aircraft shall comply with the voice communication failure procedures of Annex 10, Volume II, and with such of the following procedures as are appropriate. The aircraft shall attempt to establish communications with the appropriate air traffic control unit using all other available means. In addition, the aircraft, when forming part of the aerodrome traffic at a controlled aerodrome, shall keep a watch for such instructions as may be issued by visual signals.

3.6.5.2.1 If in visual meteorological conditions, the aircraft shall:

a) continue to fly in visual meteorological conditions; land at the nearest suitable aerodrome; and report its arrival by the most expeditious means to the appropriate air traffic control unit;

b) if considered advisable, complete an IFR flight in accordance with 3.6.5.2.2.

3.6.5.2.2 If in instrument meteorological conditions or when the pilot of an IFR flight considers it inadvisable to complete the flight in accordance with 3.6.5.2.1 a), the aircraft shall:

a) unless otherwise prescribed on the basis of regional air navigation agreement, in airspace where radar is not used in the provision of air traffic control, maintain the last assigned speed and level, or minimum flight altitude if higher, for a period of 20 minutes following the aircraft's failure to report its position over a compulsory reporting point and thereafter adjust level and speed in accordance with the filed flight plan;

b) in airspace where radar is used in the provision of air traffic control, maintain the last assigned speed and level, or minimum flight altitude if higher, for a period of 7 minutes following:

   1) the time the last assigned level or minimum flight altitude is reached; or

   2) the time the transponder is set to Code 7600; or

   3) the aircraft's failure to report its position over a compulsory reporting point;

   whichever is later, and thereafter adjust level and speed in accordance with the filed flight plan;

c) when being radar vectored or having been directed by ATC to proceed offset using RNAV without a specified limit, rejoin the current flight plan route no later than the next significant point, taking into consideration the applicable minimum flight altitude;

d) proceed according to the current flight plan route to the appropriate designated navigation aid or fix serving the destination aerodrome and, when required to ensure compliance with e) below, hold over this aid or fix until commencement of descent;

e) commence descent from the navigation aid or fix specified in d) at, or as close as possible to, the expected approach time last received and acknowledged; or, if no expected approach time has been received and acknowledged, at, or as close as possible to, the estimated time of arrival resulting from the current flight plan;

f) complete a normal instrument approach procedure as specified for the designated navigation aid or fix; and

g) land, if possible, within 30 minutes after the estimated time of arrival specified in e) or the last acknowledged expected approach time, whichever is later.

Note 1.— The provision of air traffic control service to other flights operating in the airspace concerned will be based on the premise that an aircraft experiencing communication failure will comply with the rules in 3.6.5.2.2.

Note 2. — See also 5.1.2.

3.7 Unlawful interference

An aircraft which is being subjected to unlawful interference shall endeavour to notify the appropriate ATS unit of this fact, any significant circumstances associated therewith and any deviation from the current flight plan necessitated by the circumstances, in order to enable the ATS unit to give priority to the aircraft and to minimize conflict with other aircraft.

Note 1.— Responsibility of ATS units in situations of unlawful interference is contained in Annex 11.

Note 2.— Guidance material for use when unlawful interference occurs and the aircraft is unable to notify an ATS unit of this fact is contained in Attachment B to this Annex.

Note 3.— Action to be taken by SSR-equipped aircraft which are being subjected to unlawful interference is contained in Annex 11, the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168).

Note 4.— Action to be taken by CPDLC-equipped aircraft which are being subjected to unlawful interference is contained in Annex 11, the PANS-ATM (Doc 4444), and guidance material on the subject is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

3.8 Interception

Note.— The word "interception" in this context does not include intercept and escort service provided, on request, to an aircraft in distress, in accordance with Volumes II and III of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual *(Doc 9731).*

3.8.1 Interception of civil aircraft shall be governed by appropriate regulations and administrative directives issued by Contracting States in compliance with the Convention on International Civil Aviation, and in particular Article 3(d) under which Contracting States undertake, when issuing regulations for their State aircraft, to have due regard for the safety of navigation of civil aircraft. Accordingly, in drafting appropriate regulations and administrative directives due regard shall be had to the provisions of Appendix 1, Section 2 and Appendix 2, Section 1.

Note.— Recognizing that it is essential for the safety of flight that any visual signals employed in the event of an interception which should be undertaken only as a last resort be correctly employed and understood by civil and military aircraft throughout the world, the Council of the International Civil Aviation Organization, when adopting the visual signals in Appendix 1 to this Annex, urged Contracting States to ensure that they be strictly adhered to by their State aircraft. As interceptions of civil aircraft are, in all cases, potentially hazardous, the Council has also formulated special recommendations which Contracting States are urged to apply in a uniform manner. These special recommendations are contained in Attachment A.

3.8.2 The pilot-in-command of a civil aircraft, when intercepted, shall comply with the Standards in Appendix 2, Sections 2 and 3, interpreting and responding to visual signals as specified in Appendix 1, Section 2.

Note.— See also 2.1.1 and 3.4.

3.9 VMC visibility and distance from cloud minima

VMC visibility and distance from cloud minima are contained in Table 3-1.

Table 3-1*
(see 4.1)

Altitude band	Airspace class	Flight visibility	Distance from cloud
At and above 3 050 m (10 000 ft) AMSL	A*** B C D E F G	8 km	1 500 m horizontally 300 m (1 000 ft) vertically
Below 3 050 m (10 000 ft) AMSL and above 900 m (3 000 ft) AMSL, or above 300 m (1 000 ft) above terrain, whichever is the higher	A***B C D E F G	5 km	1 500 m horizontally 300 m (1 000 ft) vertically
At and below 900 m (3 000 ft) AMSL, or 300 m (1 000 ft) above terrain, whichever is the higher	A***B C D E	5 km	1 500 m horizontally 300 m (1 000 ft) vertically
	F G	5 km**	Clear of cloud and with the surface in sight

* When the height of the transition altitude is lower than 3 050 m (10 000 ft) AMSL, FL 100 should be used in lieu of 10 000 ft.

** When so prescribed by the appropriate ATS authority:

a) flight visibilities reduced to not less than 1 500 m may be permitted for flights operating:

1) at speeds that, in the prevailing visibility, will give adequate opportunity to observe other traffic or any obstacles in time to avoid collision; or

2) in circumstances in which the probability of encounters with other traffic would normally be low, e.g. in areas of low volume traffic and for aerial work at low levels.

b) HELICOPTERS may be permitted to operate *in less than 1 500 m* flight visibility, if manoeuvred at a speed that will give adequate opportunity to observe other traffic or any obstacles in time to avoid collision.

***The VMC minima in Class A airspace are included for guidance to pilots and do not imply acceptance of VFR flights in Class A airspace.

CHAPTER 4. VISUAL FLIGHT RULES

4.1 Except when operating as a special VFR flight, VFR flights shall be conducted so that the aircraft is flown in conditions of visibility and distance from clouds equal to or greater than those specified in Table 3-1.

4.2 Except when a clearance is obtained from an air traffic control unit, VFR flights shall not take off or land at an aerodrome within a control zone, or enter the aerodrome traffic zone or traffic pattern:

a) when the ceiling is less than 450 m (1 500 ft); or

b) when the ground visibility is less than 5 km.

4.3 VFR flights between sunset and sunrise, or such other period between sunset and sunrise as may be prescribed by the appropriate ATS authority, shall be operated in accordance with the conditions prescribed by such authority.

4.4 Unless authorized by the appropriate ATS authority, VFR flights shall not be operated:

a) above FL 200;

b) at transonic and supersonic speeds.

4.5 Authorization for VFR flights to operate above FL 290 shall not be granted in areas where a vertical separation minimum of 300 m (1 000 ft) is applied above FL 290.

4.6 Except when necessary for take-off or landing, or except by permission from the appropriate authority, a VFR flight shall not be flown:

a) over the congested areas of cities, towns or settlements or over an open-air assembly of persons at a height less than 300 m (1 000 ft) above the highest obstacle within a radius of 600 m from the aircraft;

b) elsewhere than as specified in 4.6 a), at a height less than 150 m (500 ft) above the ground or water.

Note.— See also 3.1.2.

4.7 Except where otherwise indicated in air traffic control clearances or specified by the appropriate ATS authority, VFR flights in level cruising flight when operated above 900 m (3 000 ft) from the ground or water, or a higher datum as specified by the appropriate ATS authority, shall be conducted at a flight level appropriate to the track as specified in the tables of cruising levels in Appendix 3.

4.8 VFR flights shall comply with the provisions of 3.6:

a) when operated within Classes B, C and D airspace;

b) when forming part of aerodrome traffic at controlled aerodromes; or

c) when operated as special VFR flights.

4.9 A VFR flight operating within or into areas, or along routes, designated by the appropriate ATS authority in accordance with 3.3.1.2 c) or d) shall maintain continuous air-ground voice communication watch on the appropriate communication channel of, and report its position as necessary to, the air traffic services unit providing flight information service.

Note.— See Notes following 3.6.5.1.

4.10 An aircraft operated in accordance with the visual flight rules which wishes to change to compliance with the instrument flight rules shall:

a) if a flight plan was submitted, communicate the necessary changes to be effected to its current flight plan; or

b) when so required by 3.3.1.2, submit a flight plan to the appropriate air traffic services unit and obtain a clearance prior to proceeding IFR when in controlled airspace.

CHAPTER 5. INSTRUMENT FLIGHT RULES

5.1 Rules applicable to all IFR flights

5.1.1 Aircraft equipment

Aircraft shall be equipped with suitable instruments and with navigation equipment appropriate to the route to be flown.

5.1.2 Minimum levels

Except when necessary for take-off or landing, or except when specifically authorized by the appropriate authority, an IFR flight shall be flown at a level which is not below the minimum flight altitude established by the State whose territory is overflown, or, where no such minimum flight altitude has been established:

a) over high terrain or in mountainous areas, at a level which is at least 600 m (2 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft;

b) elsewhere than as specified in a), at a level which is at least 300 m (1 000 ft) above the highest obstacle located within 8 km of the estimated position of the aircraft.

Note 1.— The estimated position of the aircraft will take account of the navigational accuracy which can be achieved on the relevant route segment, having regard to the navigational facilities available on the ground and in the aircraft.

Note 2.— See also 3.1.2.

5.1.3 Change from IFR flight to VFR flight

5.1.3.1 An aircraft electing to change the conduct of its flight from compliance with the instrument flight rules to compliance with the visual flight rules shall, if a flight plan was submitted, notify the appropriate air traffic services unit specifically that the IFR flight is cancelled and communicate thereto the changes to be made to its current flight plan.

5.1.3.2 When an aircraft operating under the instrument flight rules is flown in or encounters visual meteorological conditions it shall not cancel its IFR flight unless it is anticipated, and intended, that the flight will be continued for a reasonable period of time in uninterrupted visual meteorological conditions.

5.2 Rules applicable to IFR flights within controlled airspace

5.2.1 IFR flights shall comply with the provisions of 3.6 when operated in controlled airspace.

5.2.2 An IFR flight operating in cruising flight in controlled airspace shall be flown at a cruising level, or, if authorized to employ cruise climb techniques, between two levels or above a level, selected from:

a) the tables of cruising levels in Appendix 3; or

b) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 for flight above FL 410;

except that the correlation of levels to track prescribed therein shall not apply whenever otherwise indicated in air traffic control clearances or specified by the appropriate ATS authority in Aeronautical Information Publications.

5.3 Rules applicable to IFR flights outside controlled airspace

5.3.1 Cruising levels

An IFR flight operating in level cruising flight outside of controlled airspace shall be flown at a cruising level appropriate to its track as specified in:

a) the tables of cruising levels in Appendix 3, except when otherwise specified by the appropriate ATS authority for flight at or below 900 m (3 000 ft) above mean sea level; or

b) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 for flight above FL 410.

Note.— This provision does not preclude the use of cruise climb techniques by aircraft in supersonic flight.

5.3.2 Communications

An IFR flight operating outside controlled airspace but within or into areas, or along routes, designated by the appropriate ATS authority in accordance with 3.3.1.2 c) or d) shall maintain an air-ground voice communication watch on the appropriate communication channel and establish two-way communication, as necessary, with the air traffic services unit providing flight information service.

Note.— See Notes following 3.6.5.1.

5.3.3 Position reports

An IFR flight operating outside controlled airspace and required by the appropriate ATS authority to:

— submit a flight plan,

— maintain an air-ground voice communication watch on the appropriate communication channel and establish two-way communication, as necessary, with the air traffic services unit providing flight information service,

shall report position as specified in 3.6.3 for controlled flights.

Note.— Aircraft electing to use the air traffic advisory service whilst operating IFR within specified advisory airspace are expected to comply with the provisions of 3.6, except that the flight plan and changes thereto are not subjected to clearances and that two-way communication will be maintained with the unit providing the air traffic advisory service.

APPENDIX 1. SIGNALS

(Note.— See Chapter 3, 3.4 of the Annex)

1. DISTRESS AND URGENCY SIGNALS

Note 1.— None of the provisions in this section shall prevent the use, by an aircraft in distress, of any means at its disposal to attract attention, make known its position and obtain help.

Note 2.— For full details of telecommunication transmission procedures for the distress and urgency signals, see Annex 10, Volume II, Chapter 5.

Note 3.— For details of the search and rescue visual signals, see Annex 12.

1.1 Distress signals

The following signals, used either together or separately, mean that grave and imminent danger threatens, and immediate assistance is requested:

a) a signal made by radiotelegraphy or by any other signalling method consisting of the group SOS (. . . — — — . . . in the Morse Code);

b) a radiotelephony distress signal consisting of the spoken word MAYDAY;

c) a distress message sent via data link which transmits the intent of the word MAYDAY;

d) rockets or shells throwing red lights, fired one at a time at short intervals;

e) a parachute flare showing a red light.

Note.— Article 41 of the ITU Radio Regulations (Nos. 3268, 3270 and 3271 refer) provides information on the alarm signals for actuating radiotelegraph and radiotelephone auto-alarm systems:

3268 The radiotelegraph alarm signal consists of a series of twelve dashes sent in one minute, the duration of each dash being four seconds and the duration of the interval between consecutive dashes one second. It may be transmitted by hand but its transmission by means of an automatic instrument is recommended.

3270 The radiotelephone alarm signal consists of two substantially sinusoidal audio frequency tones transmitted alternately. One tone shall have a frequency of 2 200 Hz and the other a frequency of 1 300 Hz, the duration of each tone being 250 milliseconds.

3271 The radiotelephone alarm signal, when generated by automatic means, shall be sent continuously for a period of at least thirty seconds but not exceeding one minute; when generated by other means, the signal shall be sent as continuously as practicable over a period of approximately one minute.

1.2 Urgency signals

1.2.1 The following signals, used either together or separately, mean that an aircraft wishes to give notice of difficulties which compel it to land without requiring immediate assistance:

a) the repeated switching on and off of the landing lights; or

b) the repeated switching on and off of the navigation lights in such manner as to be distinct from flashing navigation lights.

1.2.2 The following signals, used either together or separately, mean that an aircraft has a very urgent message to transmit concerning the safety of a ship, aircraft or other vehicle, or of some person on board or within sight:

a) a signal made by radiotelegraphy or by any other signalling method consisting of the group XXX;

b) a radiotelephony urgency signal consisting of the spoken words PAN, PAN;

c) an urgency message sent via data link which transmits the intent of the words PAN, PAN.

2. SIGNALS FOR USE IN THE EVENT OF INTERCEPTION

2.1 Signals initiated by intercepting aircraft and responses by intercepted aircraft

Series	*INTERCEPTING Aircraft Signals*	*Meaning*	*INTERCEPTED Aircraft Responds*	*Meaning*
1	DAY or NIGHT — Rocking aircraft and flashing navigational lights at irregular intervals (and landing lights in the case of a helicopter) from a position slightly above and ahead of, and normally to the left of, the intercepted aircraft (or to the right if the intercepted aircraft is a helicopter) and, after acknowledgement, a slow level turn, normally to the left (or to the right in the case of a helicopter) on the desired heading. *Note 1.— Meteorological conditions or terrain may require the intercepting aircraft to reverse the positions and direction of turn given above in Series 1.* *Note 2.— If the intercepted aircraft is not able to keep pace with the intercepting aircraft, the latter is expected to fly a series of race-track patterns and to rock the aircraft each time it passes the intercepted aircraft.*	You have been intercepted. Follow me.	DAY or NIGHT — Rocking aircraft, flashing navigational lights at irregular intervals and following. *Note.— Additional action required to be taken by intercepted aircraft is prescribed in Chapter 3, 3.8.*	Understood, will comply.
2	DAY or NIGHT — An abrupt breakaway manoeuvre from the intercepted aircraft consisting of a climbing turn of 90 degrees or more without crossing the line of flight of the intercepted aircraft.	You may proceed.	DAY or NIGHT — Rocking the aircraft.	Understood, will comply.
3	DAY or NIGHT — Lowering landing gear (if fitted), showing steady landing lights and overflying runway in use or, if the intercepted aircraft is a helicopter, overflying the helicopter landing area. In the case of helicopters, the intercepting helicopter makes a landing approach, coming to hover near to the landing area.	Land at this aerodrome.	DAY or NIGHT — Lowering landing gear, (if fitted), showing steady landing lights and following the intercepting aircraft and, if, after overflying the runway in use or helicopter landing area, landing is considered safe, proceeding to land.	Understood, will comply.

2.2 Signals initiated by intercepted aircraft and responses by intercepting aircraft

Series	*INTERCEPTED Aircraft Signals*	*Meaning*	*INTERCEPTING Aircraft Responds*	*Meaning*
4	DAY or NIGHT — Raising landing gear (if fitted) and flashing landing lights while passing over runway in use or helicopter landing area at a height exceeding 300 m (1 000 ft) but not exceeding 600 m (2 000 ft) (in the case of a helicopter, at a height exceeding 50 m (170 ft) but not exceeding 100 m (330 ft)) above the aerodrome level, and continuing to circle runway in use or helicopter landing area. If unable to flash landing lights, flash any other lights available.	Aerodrome you have designated is inadequate.	DAY or NIGHT — If it is desired that the intercepted aircraft follow the intercepting aircraft to an alternate aerodrome, the intercepting aircraft raises its landing gear (if fitted) and uses the Series 1 signals prescribed for intercepting aircraft. If it is decided to release the intercepted aircraft, the intercepting aircraft uses the Series 2 signals prescribed for intercepting aircraft.	Understood, follow me. Understood, you may proceed.
5	DAY or NIGHT — Regular switching on and off of all available lights but in such a manner as to be distinct from flashing lights.	Cannot comply.	DAY or NIGHT — Use Series 2 signals prescribed for intercepting aircraft.	Understood.
6	DAY or NIGHT — Irregular flashing of all available lights.	In distress.	DAY or NIGHT — Use Series 2 signals prescribed for intercepting aircraft.	Understood.

3. VISUAL SIGNALS USED TO WARN AN UNAUTHORIZED AIRCRAFT FLYING IN, OR ABOUT TO ENTER A RESTRICTED, PROHIBITED OR DANGER AREA

By day and by night, a series of projectiles discharged from the ground at intervals of 10 seconds, each showing, on bursting, red and green lights or stars will indicate to an unauthorized aircraft that it is flying in or about to enter a restricted, prohibited or danger area, and that the aircraft is to take such remedial action as may be necessary.

4. SIGNALS FOR AERODROME TRAFFIC

4.1 Light and pyrotechnic signals

4.1.1 Instructions

Light		*From Aerodrome Control to:*	
		Aircraft in flight	*Aircraft on the ground*
Directed towards aircraft concerned (see Figure A1-1).	Steady green	Cleared to land	Cleared for take-off
	Steady red	Give way to other aircraft and continue circling	Stop
	Series of green flashes	Return for landing*	Cleared to taxi
	Series of red flashes	Aerodrome unsafe, do not land	Taxi clear of landing area in use
	Series of white flashes	Land at this aerodrome and proceed to apron*	Return to starting point on the aerodrome
Red pyrotechnic		Notwithstanding any previous instructions, do not land for the time being	

* *Clearances to land and to taxi will be given in due course.*

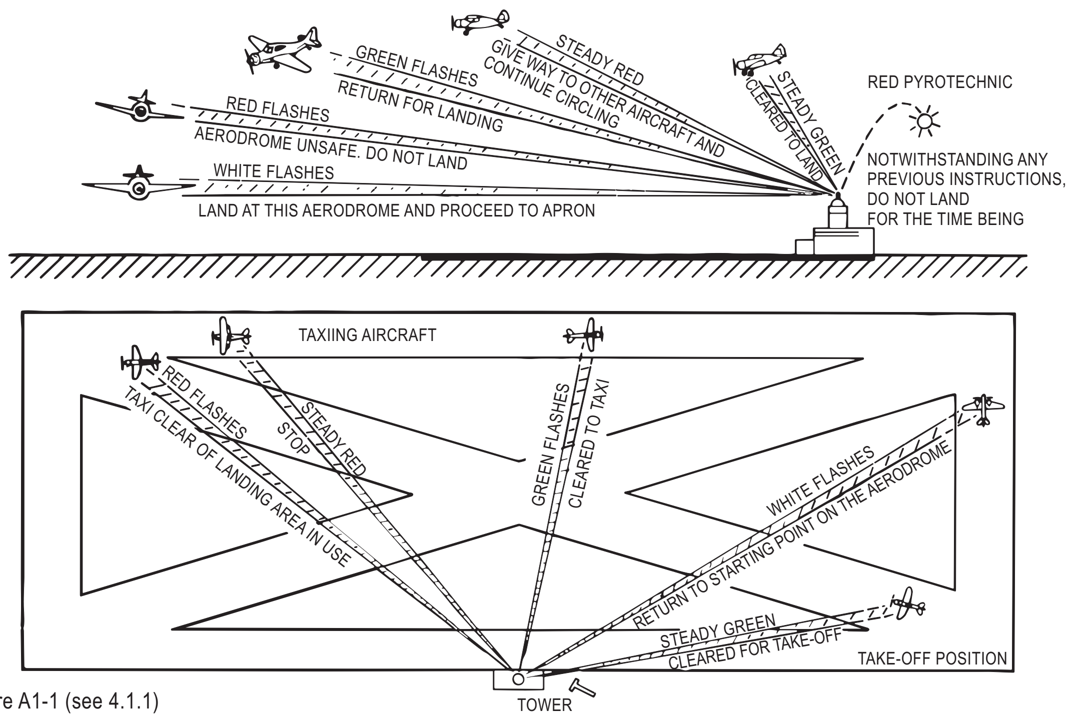


Figure A1-1 (see 4.1.1)

4.1.2 Acknowledgement by an aircraft

a) *When in flight:*

1) during the hours of daylight:

— by rocking the aircraft's wings;

Note.— This signal should not be expected on the base and final legs of the approach.

2) during the hours of darkness:

— by flashing on and off twice the aircraft's landing lights or, if not so equipped, by switching on and off twice its navigation lights.

b) *When on the ground:*

1) during the hours of daylight:

— by moving the aircraft's ailerons or rudder;

2) during the hours of darkness:

— by flashing on and off twice the aircraft's landing lights or, if not so equipped, by switching on and off twice its navigation lights.

4.2 Visual ground signals

Note.— For details of visual ground aids, see Annex 14.

4.2.1 Prohibition of landing

A horizontal red square panel with yellow diagonals (Figure A1-2) when displayed in a signal area indicates that landings are prohibited and that the prohibition is liable to be prolonged.

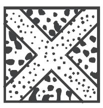


Figure A1-2

4.2.2 Need for special precautions while approaching or landing

A horizontal red square panel with one yellow diagonal (Figure A1-3) when displayed in a signal area indicates that owing to the bad state of the manoeuvring area, or for any other reason, special precautions must be observed in approaching to land or in landing.

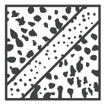


Figure A1-3

4.2.3 Use of runways and taxiways

4.2.3.1 A horizontal white dumb-bell (Figure A1-4) when displayed in a signal area indicates that aircraft are required to land, take off and taxi on runways and taxiways only.

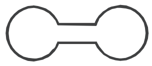


Figure A1-4

4.2.3.2 The same horizontal white dumb-bell as in 4.2.3.1 but with a black bar placed perpendicular to the shaft across each circular portion of the dumb-bell (Figure A1-5) when displayed in a signal area indicates that aircraft are required to land and take off on runways only, but other manoeuvres need not be confined to runways and taxiways.

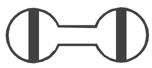


Figure A1-5

4.2.4 Closed runways or taxiways

Crosses of a single contrasting colour, yellow or white (Figure A1-6), displayed horizontally on runways and taxiways or parts thereof indicate an area unfit for movement of aircraft.

Figure A1-6

4.2.5 Directions for landing or take-off

4.2.5.1 A horizontal white or orange landing T (Figure A1-7) indicates the direction to be used by aircraft for landing and take-off, which shall be in a direction parallel to the shaft of the T towards the cross arm.

Note.— When used at night, the landing T is either illuminated or outlined in white lights.

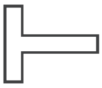


Figure A1-7

4.2.5.2 A set of two digits (Figure A1-8) displayed vertically at or near the aerodrome control tower indicates to aircraft on the manoeuvring area the direction for take-off, expressed in units of 10 degrees to the nearest 10 degrees of the magnetic compass.

Figure A1-8

4.2.6 Right-hand traffic

When displayed in a signal area, or horizontally at the end of the runway or strip in use, a right-hand arrow of conspicuous colour (Figure A1-9) indicates that turns are to be made to the right before landing and after take-off.

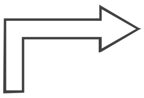


Figure A1-9

4.2.7 Air traffic services reporting office

The letter C displayed vertically in black against a yellow background (Figure A1-10) indicates the location of the air traffic services reporting office.

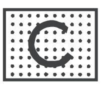


Figure A1-10

4.2.8 Glider flights in operation

A double white cross displayed horizontally (Figure A1-11) in the signal area indicates that the aerodrome is being used by gliders and that glider flights are being performed.

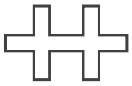


Figure A1-11

5. MARSHALLING SIGNALS

5.1 From a signalman to an aircraft

Note 1.— These signals are designed for use by the signalman, with hands illuminated as necessary to facilitate observation by the pilot, and facing the aircraft in a position:

a) for fixed-wing aircraft, on left side of aircraft, where best seen by the pilot; and

b) for helicopters, where the signalman can best be seen by the pilot.

Note 2.— The meaning of the relevant signals remains the same if bats, illuminated wands or torchlights are held.

Note 3.— The aircraft engines are numbered, for the signalman facing the aircraft, from right to left (i.e. No. 1 engine being the port outer engine).

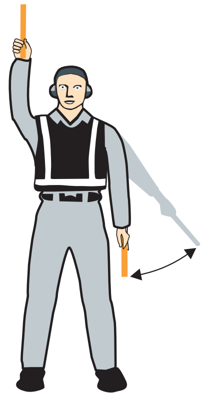
Note 4.— Signals marked with an asterisk (*) are designed for use to hovering helicopters.

Note 5.— References to wands may also be read to refer to daylight-fluorescent table-tennis bats or gloves (daytime only).

Note 6. — References to the signalman may also be read to refer to marshaller.

5.1.1 Prior to using the following signals, the signalman shall ascertain that the area within which an aircraft is to be guided is clear of objects which the aircraft, in complying with 3.4.1, might otherwise strike.

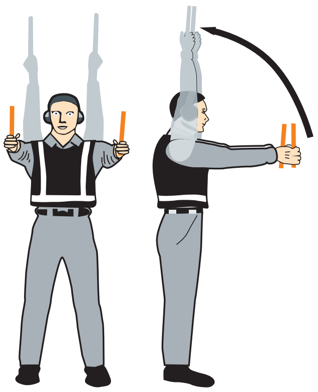
Note.— The design of many aircraft is such that the path of the wing tips, engines and other extremities cannot always be monitored visually from the flight deck while the aircraft is being manoeuvred on the ground.



1. Wingwalker/guide

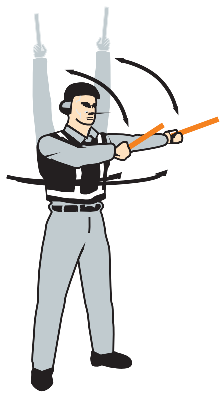
Raise right hand above head level with wand pointing up; move left-hand wand pointing down toward body.

Note.— This signal provides an indication by a person positioned at the aircraft wing tip, to the pilot/ marshaller/ push-back operator, that the aircraft movement on/off a parking position would be unobstructed.



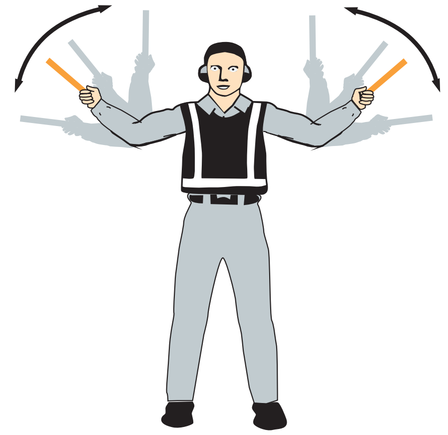
2. Identify gate

Raise fully extended arms straight above head with wands pointing up.



3. Proceed to next signalman or as directed by tower/ground control

Point both arms upward; move and extend arms outward to sides of body and point with wands to direction of next signalman or taxi area.

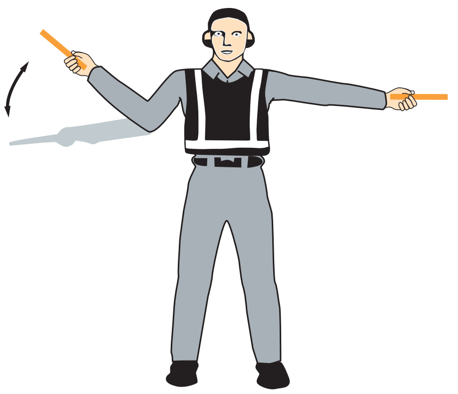


4. Straight ahead

Bend extended arms at elbows and move wands up and down from chest height to head.

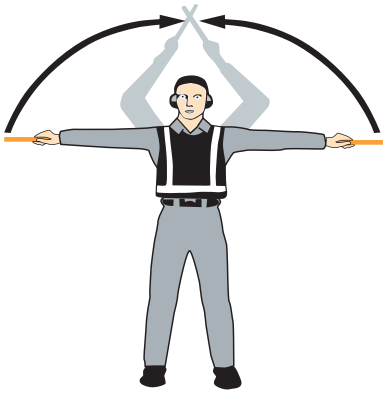
5 a). Turn left
(from pilot's point of view)

With right arm and wand extended at a 90-degree angle to body, make "come ahead" signal with left hand. The rate of signal motion indicates to pilot the rate of aircraft turn.



5 b). Turn right
(from pilot's point of view)

With left arm and wand extended at a 90-degree angle to body, make "come ahead" signal with right hand. The rate of signal motion indicates to pilot the rate of aircraft turn.

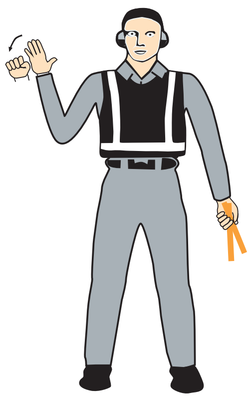


6 a). Normal stop

Fully extend arms and wands at a 90-degree angle to sides and slowly move to above head until wands cross.

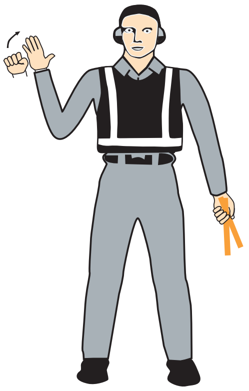
6 b). Emergency stop

Abruptly extend arms and wands to top of head, crossing wands.



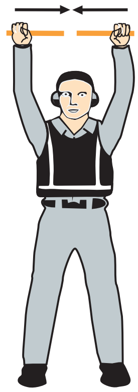
7 a). Set brakes

Raise hand just above shoulder height with open palm. Ensuring eye contact with flight crew, close hand into a fist. **Do not** move until receipt of "thumbs up" acknowledgement from flight crew.



7 b). Release brakes

Raise hand just above shoulder height with hand closed in a fist. Ensuring eye contact with flight crew, open palm. **Do not** move until receipt of “thumbs up” acknowledgement from flight crew.

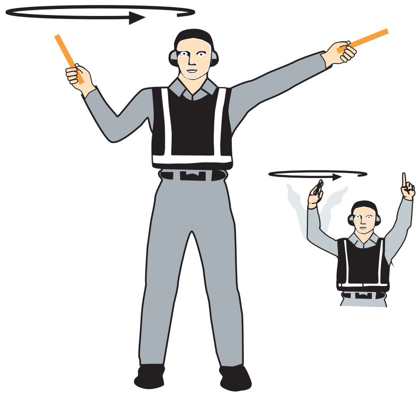


8 a). Chocks inserted

With arms and wands fully extended above head, move wands inward in a “jabbing” motion until wands touch. **Ensure** acknowledgement is received from flight crew.

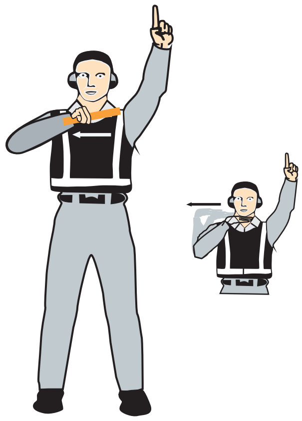
8 b). Chocks removed

With arms and wands fully extended above head, move wands outward in a “jabbing” motion. **Do not** remove chocks until authorized by flight crew.



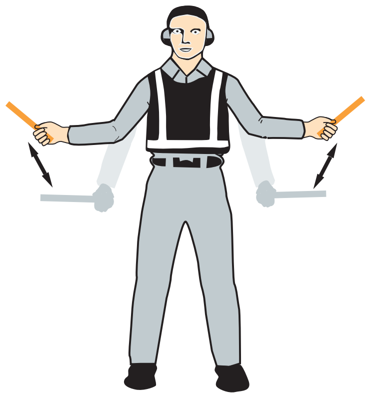
9. Start engine(s)

Raise right arm to head level with wand pointing up and start a circular motion with hand; at the same time, with left arm raised above head level, point to engine to be started.



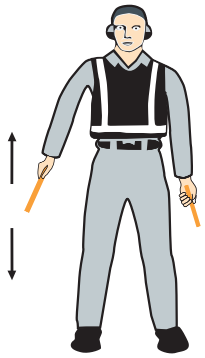
10. Cut engines

Extend arm with wand forward of body at shoulder level; move hand and wand to top of left shoulder and draw wand to top of right shoulder in a slicing motion across throat.



11. Slow down

Move extended arms downwards in a "patting" gesture, moving wands up and down from waist to knees.



12. Slow down engine(s) on indicated side

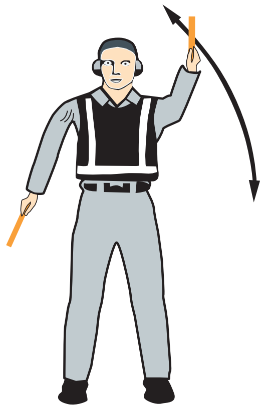
With arms down and wands toward ground, wave either *right* or *left* wand up and down indicating engine(s) on *left* or *right* side respectively should be slowed down.

13. Move back

With arms in front of body at waist height, rotate arms in a forward motion. To stop rearward movement, use signal 6 a) or 6 b).

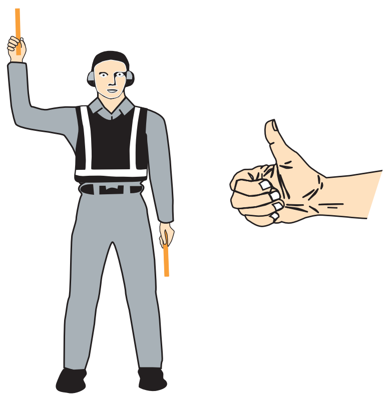
14 a). Turns while backing (for tail to starboard)

Point left arm with wand down and bring right arm from overhead vertical position to horizontal forward position, repeating right-arm movement.



14 b). Turns while backing (for tail to port)

Point right arm with wand down and bring left arm from overhead vertical position to horizontal forward position, repeating left-arm movement.



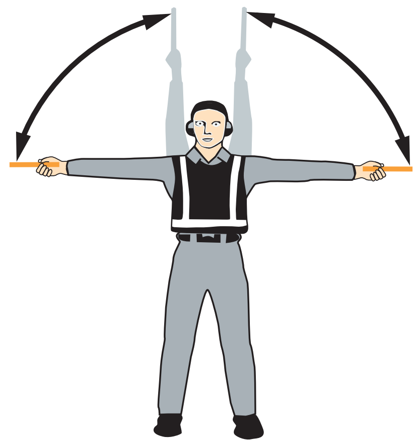
15. Affirmative/all clear

Raise right arm to head level with wand pointing up or display hand with "thumbs up"; left arm remains at side by knee.

Note.— This signal is also used as a technical/ servicing communication signal.

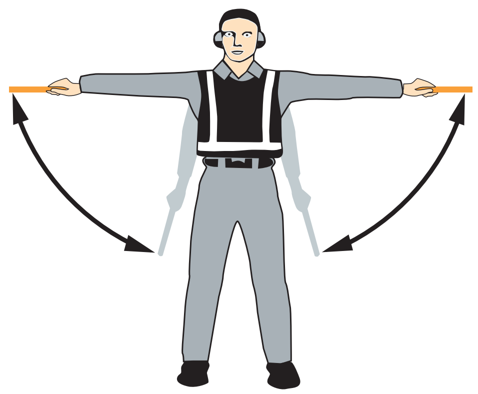
***16. Hover**

Fully extend arms and wands at a 90-degree angle to sides.



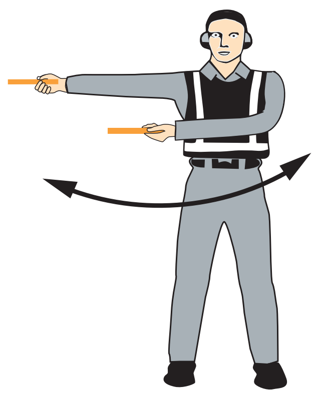
***17. Move upwards**

Fully extend arms and wands at a 90-degree angle to sides and, with palms turned up, move hands upwards. Speed of movement indicates rate of ascent.



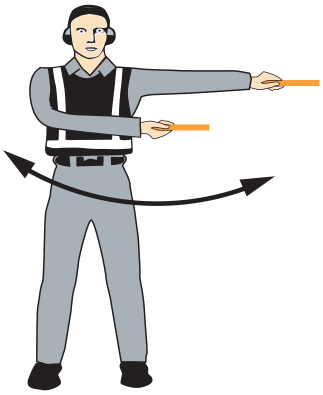
***18. Move downwards**

Fully extend arms and wands at a 90-degree angle to sides and, with palms turned down, move hands downwards. Speed of movement indicates rate of descent.



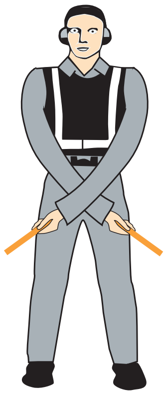
***19 a). Move horizontally left (from pilot's point of view)**

Extend arm horizontally at a 90-degree angle to right side of body. Move other arm in same direction in a sweeping motion.



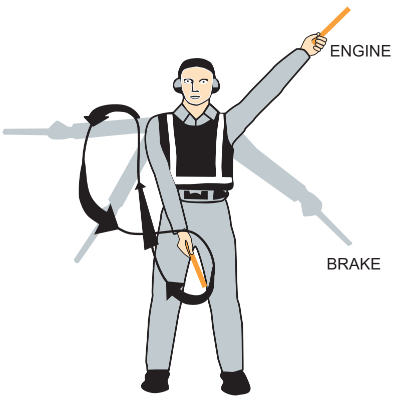
***19 b). Move horizontally right (from pilot's point of view)**

Extend arm horizontally at a 90-degree angle to left side of body. Move other arm in same direction in a sweeping motion.



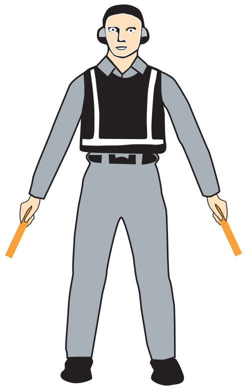
***20. Land**

Cross arms with wands downwards and in front of body.



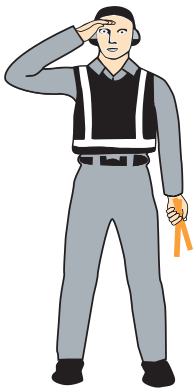
21. Fire

Move right-hand wand in a "fanning" motion from shoulder to knee, while at the same time pointing with left-hand wand to area of fire.



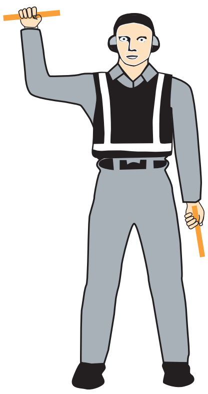
22. Hold position/stand by

Fully extend arms and wands downwards at a 45-degree angle to sides. Hold position until aircraft is clear for next manoeuvre.



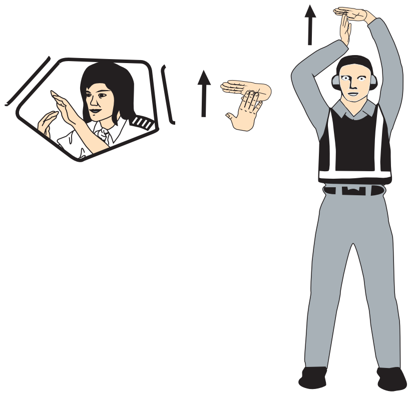
23. Dispatch aircraft

Perform a standard salute with right hand and/or wand to dispatch the aircraft. Maintain eye contact with flight crew until aircraft has begun to taxi.



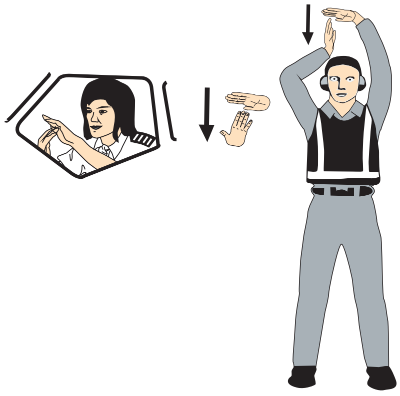
24. Do not touch controls (technical/servicing communication signal)

Extend right arm fully above head and close fist or hold wand in horizontal position; left arm remains at side by knee.



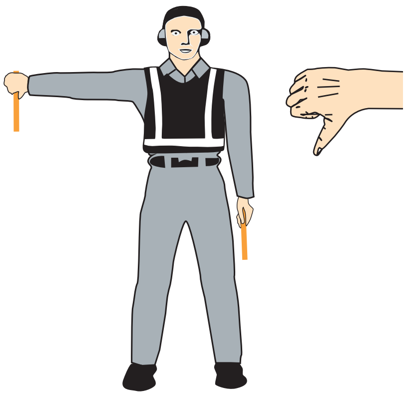
25. Connect ground power (technical/servicing communication signal)

Hold arms fully extended above head; open left hand horizontally and move finger tips of right hand into and touch open palm of left hand (forming a "T"). At night, illuminated wands can also be used to form the "T" above head.



26. Disconnect power (technical/servicing communication signal)

Hold arms fully extended above head with finger tips of right hand touching open horizontal palm of left hand (forming a "T"); then move right hand away from the left. **Do not** disconnect power until authorized by flight crew. At night, illuminated wands can also be used to form the "T" above head.



27. Negative (technical/servicing communication signal)

Hold right arm straight out at 90 degrees from shoulder and point wand down to ground or display hand with "thumbs down"; left hand remains at side by knee.

28. Establish communication via interphone (technical/servicing communication signal)

Extend both arms at 90 degrees from body and move hands to cup both ears.

29. Open/close stairs (technical/servicing communication signal)

With right arm at side and left arm raised above head at a 45-degree angle, move right arm in a sweeping motion towards top of left shoulder.

Note.— This signal is intended mainly for aircraft with the set of integral stairs at the front.

5.2 From the pilot of an aircraft to a signalman

Note 1.— These signals are designed for use by a pilot in the cockpit with hands plainly visible to the signalman, and illuminated as necessary to facilitate observation by the signalman.

Note 2.— The aircraft engines are numbered in relation to the signalman facing the aircraft, from right to left (i.e. No. 1 engine being the port outer engine).

5.2.1 Brakes

Note.— The moment the fist is clenched or the fingers are extended indicates, respectively, the moment of brake engagement or release.

a) *Brakes engaged:* raise arm and hand, with fingers extended, horizontally in front of face, then clench fist.

b) *Brakes released:* raise arm, with fist clenched, horizontally in front of face, then extend fingers.

5.2.2 Chocks

a) *Insert chocks:* arms extended, palms outwards, move hands inwards to cross in front of face.

b) *Remove chocks:* hands crossed in front of face, palms outwards, move arms outwards.

5.2.3 Ready to start engine(s)

Raise the appropriate number of fingers on one hand indicating the number of the engine to be started.

5.3 Technical/servicing communication signals

5.3.1 Manual signals shall only be used when verbal communication is not possible with respect to technical/servicing communication signals.

5.3.2 Signalmen shall ensure that an acknowledgement is received from the flight crew with respect to technical/servicing communication signals.

Note.— The technical/servicing communication signals are included in Appendix 1 to standardize the use of hand signals used to communicate to flight crews during the aircraft movement process that relate to servicing or handling functions.

APPENDIX 2. INTERCEPTION OF CIVIL AIRCRAFT

(Note.— See Chapter 3, 3.8 of the Annex)

1. Principles to be observed by States

1.1 To achieve the uniformity in regulations which is necessary for the safety of navigation of civil aircraft due regard shall be had by Contracting States to the following principles when developing regulations and administrative directives:

a) interception of civil aircraft will be undertaken only as a last resort;

b) if undertaken, an interception will be limited to determining the identity of the aircraft, unless it is necessary to return the aircraft to its planned track, direct it beyond the boundaries of national airspace, guide it away from a prohibited, restricted or danger area or instruct it to effect a landing at a designated aerodrome;

c) practice interception of civil aircraft will not be undertaken;

d) navigational guidance and related information will be given to an intercepted aircraft by radiotelephony, whenever radio contact can be established; and

e) in the case where an intercepted civil aircraft is required to land in the territory overflown, the aerodrome designated for the landing is to be suitable for the safe landing of the aircraft type concerned.

Note.— In the unanimous adoption by the 25th Session (Extraordinary) of the ICAO Assembly on 10 May 1984 of Article 3 bis *to the Convention on International Civil Aviation, Contracting States have recognized that "every State must refrain from resorting to the use of weapons against civil aircraft in flight".*

1.2 Contracting States shall publish a standard method that has been established for the manoeuvring of aircraft intercepting a civil aircraft. Such method shall be designed to avoid any hazard for the intercepted aircraft.

Note.— Special recommendations regarding a method for the manoeuvring are contained in Attachment A, Section 3.

1.3 Contracting States shall ensure that provision is made for the use of secondary surveillance radar, where available, to identify civil aircraft in areas where they may be subject to interception.

2. Action by intercepted aircraft

2.1 An aircraft which is intercepted by another aircraft shall immediately:

a) follow the instructions given by the intercepting aircraft, interpreting and responding to visual signals in accordance with the specifications in Appendix 1;

b) notify, if possible, the appropriate air traffic services unit;

c) attempt to establish radiocommunication with the intercepting aircraft or with the appropriate intercept control unit, by making a general call on the emergency frequency 121.5 MHz, giving the identity of the intercepted aircraft and the nature of the flight; and if no contact has been established and if practicable, repeating this call on the emergency frequency 243 MHz;

d) if equipped with SSR transponder, select Mode A, Code 7700, unless otherwise instructed by the appropriate air traffic services unit.

2.2 If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by visual signals, the intercepted aircraft shall request immediate clarification while continuing to comply with the visual instructions given by the intercepting aircraft.

2.3 If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by radio, the intercepted aircraft shall request immediate clarification while continuing to comply with the radio instructions given by the intercepting aircraft.

3. Radiocommunication during interception

If radio contact is established during interception but communication in a common language is not possible, attempts shall be made to convey instructions, acknowledgement of instructions and essential information by using the phrases and pronunciations in Table A2-1 and transmitting each phrase twice:

Table A2-1

Phrases for use by INTERCEPTING aircraft			*Phrases for use by INTERCEPTED aircraft*		
Phrase	*Pronunciation*[1]	*Meaning*	*Phrase*	*Pronunciation*[1]	*Meaning*
CALL SIGN	KOL SA-IN	What is your call sign?	CALL SIGN (call sign)[2]	KOL SA-IN (call sign)	My call sign is (call sign)
FOLLOW	FOL-LO	Follow me	WILCO Will comply	VILL-KO	Understood
DESCEND	DEE-SEND	Descend for landing	CAN NOT	KANN NOTT	Unable to comply
YOU LAND	YOU LAAND	Land at this aerodrome	REPEAT	REE-PEET	Repeat your instruction
PROCEED	PRO-SEED	You may proceed	AM LOST	AM LOSST	Position unknown
			MAYDAY	MAYDAY	I am in distress
			HIJACK[3]	HI-JACK	I have been hijacked
			LAND (place name)	LAAND (place name)	I request to land at (place name)
			DESCEND	DEE-SEND	I require descent

1. *In the second column, syllables to be emphasized are underlined.*
2. *The call sign required to be given is that used in radiotelephony communications with air traffic services units and corresponding to the aircraft identification in the flight plan.*
3. *Circumstances may not always permit, nor make desirable, the use of the phrase "HIJACK".*

APPENDIX 3. TABLES OF CRUISING LEVELS

The cruising levels to be observed when so required by this Annex are as follows:

a) in areas where, on the basis of regional air navigation agreements and in accordance with conditions specified therein, a vertical separation minimum (VSM) of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive:*

TRACK**											
From 000 degrees to 179 degrees***						From 180 degrees to 359 degrees***					
IFR Flights			VFR Flights			IFR Flights			VFR Flights		
	Altitude			Altitude			Altitude			Altitude	
FL	Metres	Feet	FL	Metres	Feet	FL	Metres	Feet	FL	Metres	Feet
–90			–	–	–	0			–	–	–
10	300	1 000	–	–	–	20	600	2 000	–	–	–
30	900	3 000	35	1 050	3 500	40	1 200	4 000	45	1 350	4 500
50	1 500	5 000	55	1 700	5 500	60	1 850	6 000	65	2 000	6 500
70	2 150	7 000	75	2 300	7 500	80	2 450	8 000	85	2 600	8 500
90	2 750	9 000	95	2 900	9 500	100	3 050	10 000	105	3 200	10 500
110	3 350	11 000	115	3 500	11 500	120	3 650	12 000	125	3 800	12 500
130	3 950	13 000	135	4 100	13 500	140	4 250	14 000	145	4 400	14 500
150	4 550	15 000	155	4 700	15 500	160	4 900	16 000	165	5 050	16 500
170	5 200	17 000	175	5 350	17 500	180	5 500	18 000	185	5 650	18 500
190	5 800	19 000	195	5 950	19 500	200	6 100	20 000	205	6 250	20 500
210	6 400	21 000	215	6 550	21 500	220	6 700	22 000	225	6 850	22 500
230	7 000	23 000	235	7 150	23 500	240	7 300	24 000	245	7 450	24 500
250	7 600	25 000	255	7 750	25 500	260	7 900	26 000	265	8 100	26 500
270	8 250	27 000	275	8 400	27 500	280	8 550	28 000	285	8 700	28 500
290	8 850	29 000				300	9 150	30 000			
310	9 450	31 000				320	9 750	32 000			
330	10 050	33 000				340	10 350	34 000			
350	10 650	35 000				360	10 950	36 000			
370	11 300	37 000				380	11 600	38 000			
390	11 900	39 000				400	12 200	40 000			
410	12 500	41 000				430	13 100	43 000			
450	13 700	45 000				470	14 350	47 000			
490	14 950	49 000				510	15 550	51 000			
etc.	etc.	etc.				etc.	etc.	etc.			

* Except when, on the basis of regional air navigation agreements, a modified table of cruising levels based on a nominal vertical separation minimum of 300 m (1 000 ft) is prescribed for use, under specified conditions, by aircraft operating above FL 410 within designated portions of the airspace.

** Magnetic track, or in polar areas at latitudes higher than 70 degrees and within such extensions to those areas as may be prescribed by the appropriate ATS authorities, grid tracks as determined by a network of lines parallel to the Greenwich Meridian superimposed on a polar stereographic chart in which the direction towards the North Pole is employed as the Grid North.

*** Except where, on the basis of regional air navigation agreements, from 090 to 269 degrees and from 270 to 089 degrees is prescribed to accommodate predominant traffic directions and appropriate transition procedures to be associated therewith are specified.

*Note.— Guidance material relating to vertical separation is contained in th*e Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574)*.

b) in other areas:

TRACK*											
From 000 degrees to 179 degrees**						From 180 degrees to 359 degrees**					
IFR Flights			VFR Flights			IFR Flights			VFR Flights		
	Altitude			Altitude			Altitude			Altitude	
FL	Metres	Feet	FL	Metres	Feet	FL	Metres	Feet	FL	Metres	Feet
–90			–	–	–	0			–	–	–
10	300	1 000	–	–	–	20	600	2 000	–	–	–
30	900	3 000	35	1 050	3 500	40	1 200	4 000	45	1 350	4 500
50	1 500	5 000	55	1 700	5 500	60	1 850	6 000	65	2 000	6 500
70	2 150	7 000	75	2 300	7 500	80	2 450	8 000	85	2 600	8 500
90	2 750	9 000	95	2 900	9 500	100	3 050	10 000	105	3 200	10 500
110	3 350	11 000	115	3 500	11 500	120	3 650	12 000	125	3 800	12 500
130	3 950	13 000	135	4 100	13 500	140	4 250	14 000	145	4 400	14 500
150	4 550	15 000	155	4 700	15 500	160	4 900	16 000	165	5 050	16 500
170	5 200	17 000	175	5 350	17 500	180	5 500	18 000	185	5 650	18 500
190	5 800	19 000	195	5 950	19 500	200	6 100	20 000	205	6 250	20 500
210	6 400	21 000	215	6 550	21 500	220	6 700	22 000	225	6 850	22 500
230	7 000	23 000	235	7 150	23 500	240	7 300	24 000	245	7 450	24 500
250	7 600	25 000	255	7 750	25 500	260	7 900	26 000	265	8 100	26 500
270	8 250	27 000	275	8 400	27 500	280	8 550	28 000	285	8 700	28 500
290	8 850	29 000	300	9 150	30 000	310	9 450	31 000	320	9 750	32 000
330	10 050	33 000	340	10 350	34 000	350	10 650	35 000	360	10 950	36 000
370	11 300	37 000	380	11 600	38 000	390	11 900	39 000	400	12 200	40 000
410	12 500	41 000	420	12 800	42 000	430	13 100	43 000	440	13 400	44 000
450	13 700	45 000	460	14 000	46 000	470	14 350	47 000	480	14 650	48 000
490	14 950	49 000	500	15 250	50 000	510	15 550	51 000	520	15 850	52 000
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.

* Magnetic track, or in polar areas at latitudes higher than 70 degrees and within such extensions to those areas as may be prescribed by the appropriate ATS authorities, grid tracks as determined by a network of lines parallel to the Greenwich Meridian superimposed on a polar stereographic chart in which the direction towards the North Pole is employed as the Grid North.

** Except where, on the basis of regional air navigation agreements, from 090 to 269 degrees and from 270 to 089 degrees is prescribed to accommodate predominant traffic directions and appropriate transition procedures to be associated therewith are specified.

Note.— Guidance material relating to vertical separation is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

APPENDIX 4. UNMANNED FREE BALLOONS

(Note.— See Chapter 3, 3.1.9 of the Annex)

1. Classification of unmanned free balloons

Unmanned free balloons shall be classified as:

a) *light:* an unmanned free balloon which carries a payload of one or more packages with a combined mass of less than 4 kg, unless qualifying as a heavy balloon in accordance with c) 2), 3) or 4) below; or

b) *medium:* an unmanned free balloon which carries a payload of two or more packages with a combined mass of 4 kg or more, but less than 6 kg, unless qualifying as a heavy balloon in accordance with c) 2), 3) or 4) below; or

c) *heavy:* an unmanned free balloon which carries a payload which:

1) has a combined mass of 6 kg or more; or

2) includes a package of 3 kg or more; or

3) includes a package of 2 kg or more with an area density of more than 13 g per square centimetre; or

4) uses a rope or other device for suspension of the payload that requires an impact force of 230 N or more to separate the suspended payload from the balloon.

Note 1.— The area density referred to in c) 3) is determined by dividing the total mass in grams of the payload package by the area in square centimetres of its smallest surface.

Note 2.— See Figure A4-1.

2. General operating rules

2.1 An unmanned free balloon shall not be operated without appropriate authorization from the State from which the launch is made.

2.2 An unmanned free balloon, other than a light balloon used exclusively for meteorological purposes and operated in the manner prescribed by the appropriate authority, shall not be operated across the territory of another State without appropriate authorization from the other State concerned.

2.3 The authorization referred to in 2.2 shall be obtained prior to the launching of the balloon if there is reasonable expectation, when planning the operation, that the balloon may drift into airspace over the territory of another State. Such authorization may be obtained for a series of balloon flights or for a particular type of recurring flight, e.g. atmospheric research balloon flights.

2.4 An unmanned free balloon shall be operated in accordance with conditions specified by the State of Registry and the State(s) expected to be overflown.

2.5 An unmanned free balloon shall not be operated in such a manner that impact of the balloon, or any part thereof, including its payload, with the surface of the earth, creates a hazard to persons or property not associated with the operation.

2.6 A heavy unmanned free balloon shall not be operated over the high seas without prior coordination with the appropriate ATS authority.

3. Operating limitations and equipment requirements

3.1 A heavy unmanned free balloon shall not be operated without authorization from the appropriate ATS authority at or through any level below 18 000 m (60 000 ft) pressure-altitude at which:

a) there are clouds or obscuring phenomena of more than four oktas coverage; or

b) the horizontal visibility is less than 8 km.

3.2 A heavy or medium unmanned free balloon shall not be released in a manner that will cause it to fly lower than 300 m (1 000 ft) over the congested areas of cities, towns or settlements or an open-air assembly of persons not associated with the operation.

3.3 A heavy unmanned free balloon shall not be operated unless:

a) it is equipped with at least two payload flight-termination devices or systems, whether automatic or operated by telecommand, that operate independently of each other;

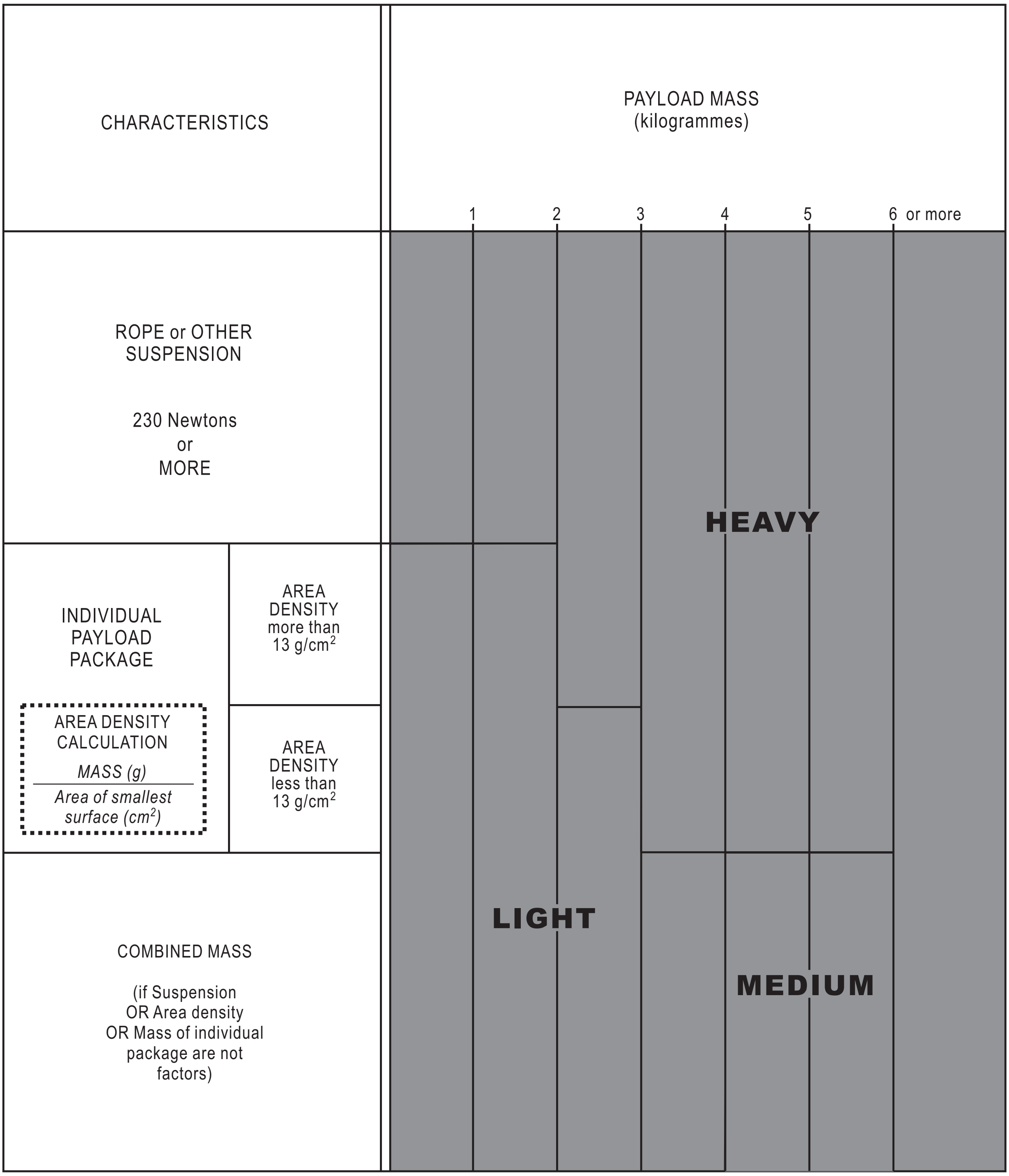


Figure A4-1. Classification of unmanned free balloons

b) for polyethylene zero-pressure balloons, at least two methods, systems, devices, or combinations thereof, that function independently of each other are employed for terminating the flight of the balloon envelope;

Note.— Superpressure balloons do not require these devices as they quickly rise after payload discharge and burst without the need for a device or system designed to puncture the balloon envelope. In this context a superpressure balloon is a simple non-extensible envelope capable of withstanding a differential of pressure, higher inside than out. It is inflated so that the smaller night-time pressure of the gas still fully extends the envelope. Such a superpressure balloon will keep essentially constant level until too much gas diffuses out of it.

c) the balloon envelope is equipped with either a radar reflective device(s) or radar reflective material that will present an echo to surface radar operating in the 200 MHz to 2 700 MHz frequency range, and/or the balloon is equipped with such other devices as will permit continuous tracking by the operator beyond the range of ground-based radar.

3.4 A heavy unmanned free balloon shall not be operated in an area where ground-based SSR equipment is in use, unless it is equipped with a secondary surveillance radar transponder, with altitude reporting capability, which is continuously operating on an assigned code, or which can be turned on when necessary by the tracking station.

3.5 An unmanned free balloon that is equipped with a trailing antenna that requires a force of more than 230 N to break it at any point shall not be operated unless the antenna has coloured pennants or streamers that are attached at not more than 15 m intervals.

3.6 A heavy unmanned free balloon shall not be operated below 18 000 m (60 000 ft) pressure-altitude between sunset and sunrise or such other period between sunset and sunrise (corrected to the altitude of operation) as may be prescribed by the appropriate ATS authority, unless the balloon and its attachments and payload, whether or not they become separated during the operation, are lighted.

3.7 A heavy unmanned free balloon that is equipped with a suspension device (other than a highly conspicuously coloured open parachute) more than 15 m long shall not be operated between sunrise and sunset below 18 000 m (60 000 ft) pressure-altitude unless the suspension device is coloured in alternate bands of high conspicuity colours or has coloured pennants attached.

4. Termination

The operator of a heavy unmanned free balloon shall activate the appropriate termination devices required by 3.3 a) and b) above:

a) when it becomes known that weather conditions are less than those prescribed for the operation;

b) if a malfunction or any other reason makes further operation hazardous to air traffic or to persons or property on the surface; or

c) prior to unauthorized entry into the airspace over another State's territory.

5. Flight notification

5.1 Pre-flight notification

5.1.1 Early notification of the intended flight of an unmanned free balloon in the medium or heavy category shall be made to the appropriate air traffic services unit not less than seven days before the date of the intended flight.

5.1.2 Notification of the intended flight shall include such of the following information as may be required by the appropriate air traffic services unit:

a) balloon flight identification or project code name;

b) balloon classification and description;

c) SSR code or NDB frequency as applicable;

d) operator's name and telephone number;

e) launch site;

f) estimated time of launch (or time of commencement and completion of multiple launches);

g) number of balloons to be launched and the scheduled interval between launches (if multiple launches);

h) expected direction of ascent;

i) cruising level(s) (pressure-altitude);

j) the estimated elapsed time to pass 18 000 m (60 000 ft) pressure-altitude or to reach cruising level if at or below 18 000 m (60 000 ft), together with the estimated location;

Note.— If the operation consists of continuous launchings, the time to be included is the estimated time at which the first and the last in the series will reach the appropriate level (e.g. 122136Z–130330Z).

k) the estimated date and time of termination of the flight and the planned location of the impact/recovery area. In the case of balloons carrying out flights of long duration, as a result of which the date and time of termination of the flight and the location of impact cannot be forecast with accuracy, the term "long duration" shall be used.

Note.— If there is to be more than one location of impact/recovery, each location is to be listed together with the appropriate estimated time of impact. If there is to be a series of continuous impacts, the time to be included is the estimated time of the first and the last in the series (e.g. 070330Z–072300Z).

5.1.3 Any changes in the pre-launch information notified in accordance with 5.1.2 above shall be forwarded to the air traffic services unit concerned not less than 6 hours before the estimated time of launch, or in the case of solar or cosmic disturbance investigations involving a critical time element, not less than 30 minutes before the estimated time of the commencement of the operation.

5.2 Notification of launch

Immediately after a medium or heavy unmanned free balloon is launched the operator shall notify the appropriate air traffic services unit of the following:

a) balloon flight identification;

b) launch site;

c) actual time of launch;

d) estimated time at which 18 000 m (60 000 ft) pressure-altitude will be passed, or the estimated time at which the cruising level will be reached if at or below 18 000 m (60 000 ft), and the estimated location; and

e) any changes to the information previously notified in accordance with 5.1.2 g) and h).

5.3 Notification of cancellation

The operator shall notify the appropriate air traffic services unit immediately it is known that the intended flight of a medium or heavy unmanned free balloon, previously notified in accordance with 5.1, has been cancelled.

6. Position recording and reports

6.1 The operator of a heavy unmanned free balloon operating at or below 18 000 m (60 000 ft) pressure-altitude shall monitor the flight path of the balloon and forward reports of the balloon's position as requested by air traffic services. Unless air traffic services require reports of the balloon's position at more frequent intervals, the operator shall record the position every 2 hours.

6.2 The operator of a heavy unmanned free balloon operating above 18 000 m (60 000 ft) pressure-altitude shall monitor the flight progress of the balloon and forward reports of the balloon's position as requested by air traffic services. Unless air traffic services require reports of the balloon's position at more frequent intervals, the operator shall record the position every 24 hours.

6.3 If a position cannot be recorded in accordance with 6.1 and 6.2, the operator shall immediately notify the appropriate air traffic services unit. This notification shall include the last recorded position. The appropriate air traffic services unit shall be notified immediately when tracking of the balloon is re-established.

6.4 One hour before the beginning of planned descent of a heavy unmanned free balloon, the operator shall forward to the appropriate ATS unit the following information regarding the balloon:

a) the current geographical position;

b) the current level (pressure-altitude);

c) the forecast time of penetration of 18 000 m (60 000 ft) pressure-altitude, if applicable;

d) the forecast time and location of ground impact.

6.5 The operator of a heavy or medium unmanned free balloon shall notify the appropriate air traffic services unit when the operation is ended.

ATTACHMENT A. INTERCEPTION OF CIVIL AIRCRAFT

(Note.— See Chapter 3, 3.8 of the Annex and associated Note)

Note.— In the interest of completeness, the substance of the provisions in Appendix 2 to the Annex is incorporated in this Attachment.

1. In accordance with Article 3 d) of the Convention on International Civil Aviation the Contracting States of ICAO "undertake, when issuing regulations for their state aircraft, that they will have due regard for the safety of navigation of civil aircraft". As interceptions of civil aircraft are, in all cases, potentially hazardous, the Council of ICAO has formulated the following special recommendations which Contracting States are urged to implement through appropriate regulatory and administrative action. The uniform application by all concerned is considered essential in the interest of safety of civil aircraft and their occupants. For this reason the Council of ICAO invites Contracting States to notify ICAO of any differences which may exist between their national regulations or practices and the special recommendations hereunder.

2. General

2.1 Interception of civil aircraft should be avoided and should be undertaken only as a last resort. If undertaken, the interception should be limited to determining the identity of the aircraft, unless it is necessary to return the aircraft to its planned track, direct it beyond the boundaries of national airspace, guide it away from a prohibited, restricted or danger area or instruct it to effect a landing at a designated aerodrome. Practice interception of civil aircraft is not to be undertaken.

2.2 To eliminate or reduce the need for interception of civil aircraft, it is important that:

a) all possible efforts be made by intercept control units to secure identification of any aircraft which may be a civil aircraft, and to issue any necessary instructions or advice to such aircraft, through the appropriate air traffic services units. To this end, it is essential that means of rapid and reliable communications between intercept control units and air traffic services units be established and that agreements be formulated concerning exchanges of information between such units on the movements of civil aircraft, in accordance with the provisions of Annex 11;

b) areas prohibited to all civil flights and areas in which civil flight is not permitted without special authorization by the State be clearly promulgated in Aeronautical Information Publications (AIP) in accordance with the provisions of Annex 15, together with the risk, if any, of interception in the event of penetration of such areas. When delineating such areas in close proximity to promulgated ATS routes, or other frequently used tracks, States should take into account the availability and overall systems accuracy of the navigation systems to be used by civil aircraft and their ability to remain clear of the delineated areas;

c) the establishment of additional navigation aids be considered where necessary to ensure that civil aircraft are able safely to circumnavigate prohibited or, as required, restricted areas.

2.3 To eliminate or reduce the hazards inherent in interceptions undertaken as a last resort, all possible efforts should be made to ensure coordinated actions by the pilots and ground units concerned. To this end, it is essential that Contracting States take steps to ensure that:

a) all pilots of civil aircraft be made fully aware of the actions to be taken by them and the visual signals to be used, as specified in Chapter 3 and Appendix 1 of this Annex;

b) operators or pilots-in-command of civil aircraft implement the provisions in Annex 6, Parts I, II and III, regarding the capability of aircraft to communicate on 121.5 MHz and the availability of interception procedures and visual signals on board aircraft;

c) all air traffic services personnel be made fully aware of the actions to be taken by them in accordance with the provisions of Annex 11, Chapter 2, and the PANS-ATM (Doc 4444);

d) all pilots-in-command of intercepting aircraft be made aware of the general performance limitations of civil aircraft and of the possibility that intercepted civil aircraft may be in a state of emergency due to technical difficulties or unlawful interference;

e) clear and unambiguous instructions be issued to intercept control units and to pilots-in-command of potential intercepting aircraft, covering interception manoeuvres, guidance of intercepted aircraft, action by intercepted aircraft, air-to-air visual signals, radiocommunication with intercepted aircraft, and the need to refrain from resorting to the use of weapons;

Note.— See paragraphs 3 to 8.

f) intercept control units and intercepting aircraft be provided with radiotelephony equipment compatible with the technical specifications of Annex 10, Volume I, so as to enable them to communicate with intercepted aircraft on the emergency frequency 121.5 MHz;

g) secondary surveillance radar facilities be made available to the extent possible to permit intercept control units to identify civil aircraft in areas where they might otherwise be intercepted. Such facilities should permit recognition of discrete four-digit codes in Mode A, including immediate recognition of Mode A, Codes 7500, 7600 and 7700.

3. Interception manoeuvres

3.1 A standard method should be established for the manoeuvring of aircraft intercepting a civil aircraft in order to avoid any hazard for the intercepted aircraft. Such method should take due account of the performance limitations of civil aircraft, the need to avoid flying in such proximity to the intercepted aircraft that a collision hazard may be created and the need to avoid crossing the aircraft's flight path or to perform any other manoeuvre in such a manner that the wake turbulence may be hazardous, particularly if the intercepted aircraft is a light aircraft.

3.2 An aircraft equipped with an airborne collision avoidance system (ACAS), which is being intercepted, may perceive the interceptor as a collision threat and thus initiate an avoidance manoeuvre in response to an ACAS resolution advisory. Such a manoeuvre might be misinterpreted by the interceptor as an indication of unfriendly intentions. It is important, therefore, that pilots of intercepting aircraft equipped with a secondary surveillance radar (SSR) transponder suppress the transmission of pressure-altitude information (in Mode C replies or in the AC field of Mode S replies) within a range of at least 37 km (20 NM) of the aircraft being intercepted. This prevents the ACAS in the intercepted aircraft from using resolution advisories in respect of the interceptor, while the ACAS traffic advisory information will remain available.

3.3 Manoeuvres for visual identification

The following method is recommended for the manoeuvring of intercepting aircraft for the purpose of visually identifying a civil aircraft:

Phase I

The intercepting aircraft should approach the intercepted aircraft from astern. The element leader, or the single intercepting aircraft, should normally take up a position on the left (port) side, slightly above and ahead of the intercepted aircraft, within the field of view of the pilot of the intercepted aircraft, and initially not closer to the aircraft than 300 m. Any other participating aircraft should stay well clear of the intercepted aircraft, preferably above and behind. After speed and position have been established, the aircraft should, if necessary, proceed with Phase II of the procedure.

Phase II

The element leader, or the single intercepting aircraft, should begin closing in gently on the intercepted aircraft, at the same level, until no closer than absolutely necessary to obtain the information needed. The element leader, or the single intercepting aircraft, should use caution to avoid startling the flight crew or the passengers of the intercepted aircraft, keeping constantly in mind the fact that manoeuvres considered normal to an intercepting aircraft may be considered hazardous to passengers and crews of civil aircraft. Any other participating aircraft should continue to stay well clear of the intercepted aircraft. Upon completion of identification, the intercepting aircraft should withdraw from the vicinity of the intercepted aircraft as outlined in Phase III.

Phase III

The element leader, or the single intercepting aircraft, should break gently away from the intercepted aircraft in a shallow dive. Any other participating aircraft should stay well clear of the intercepted aircraft and rejoin their leader.

3.4 Manoeuvres for navigational guidance

3.4.1 If, following the identification manoeuvres in Phase I and Phase II above, it is considered necessary to intervene in the navigation of the intercepted aircraft, the element leader, or the single intercepting aircraft, should normally take up a position on the left (port) side, slightly above and ahead of the intercepted aircraft, to enable the pilot-in-command of the latter aircraft to see the visual signals given.

3.4.2 It is indispensable that the pilot-in-command of the intercepting aircraft be satisfied that the pilot-in-command of the intercepted aircraft is aware of the interception and acknowledges the signals given. If repeated attempts to attract the attention of the pilot-in-command of the intercepted aircraft by use of the Series 1 signal in Appendix 1, Section 2, are unsuccessful, other methods of signalling may be used for this purpose, including as a last resort the visual effect of the reheat/afterburner, provided that no hazard is created for the intercepted aircraft.

3.5 It is recognized that meteorological conditions or terrain may occasionally make it necessary for the element leader, or the single intercepting aircraft, to take up a position on the right (starboard) side, slightly above and ahead of the intercepted aircraft. In such case, the pilot-in-command of the intercepting aircraft must take particular care that the intercepting aircraft is clearly visible at all times to the pilot-in-command of the intercepted aircraft.

4. Guidance of an intercepted aircraft

4.1 Navigational guidance and related information should be given to an intercepted aircraft by radiotelephony, whenever radio contact can be established.

4.2 When navigational guidance is given to an intercepted aircraft, care must be taken that the aircraft is not led into conditions where the visibility may be reduced below that required to maintain flight in visual meteorological conditions and that the manoeuvres demanded of the intercepted aircraft do not add to already existing hazards in the event that the operating efficiency of the aircraft is impaired.

4.3 In the exceptional case where an intercepted civil aircraft is required to land in the territory overflown, care must also be taken that:

a) the designated aerodrome is suitable for the safe landing of the aircraft type concerned, especially if the aerodrome is not normally used for civil air transport operations;

b) the surrounding terrain is suitable for circling, approach and missed approach manoeuvres;

c) the intercepted aircraft has sufficient fuel remaining to reach the aerodrome;

d) if the intercepted aircraft is a civil transport aircraft, the designated aerodrome has a runway with a length equivalent to at least 2 500 m at mean sea level and a bearing strength sufficient to support the aircraft; and

e) whenever possible, the designated aerodrome is one that is described in detail in the relevant Aeronautical Information Publication.

4.4 When requiring a civil aircraft to land at an unfamiliar aerodrome, it is essential that sufficient time be allowed it to prepare for a landing, bearing in mind that only the pilot-in-command of the civil aircraft can judge the safety of the landing operation in relation to runway length and aircraft mass at the time.

4.5 It is particularly important that all information necessary to facilitate a safe approach and landing be given to the intercepted aircraft by radiotelephony.

5. Action by intercepted aircraft

The Standards in Appendix 2, Section 2, specify as follows:

“2.1 An aircraft which is intercepted by another aircraft shall immediately:

a) follow the instructions given by the intercepting aircraft, interpreting and responding to visual signals in accordance with the specifications in Appendix 1;

b) notify, if possible, the appropriate air traffic services unit;

c) attempt to establish radiocommunication with the intercepting aircraft or with the appropriate intercept control unit, by making a general call on the emergency frequency 121.5 MHz, giving the identity of the intercepted aircraft and the nature of the flight; and if no contact has been established and if practicable, repeating this call on the emergency frequency 243 MHz;

d) if equipped with SSR transponder, select Mode A, Code 7700, unless otherwise instructed by the appropriate air traffic services unit.

“2.2 If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by visual signals, the intercepted aircraft shall request immediate clarification while continuing to comply with the visual instructions given by the intercepting aircraft.

“2.3 If any instructions received by radio from any sources conflict with those given by the intercepting aircraft by radio, the intercepted aircraft shall request immediate clarification while continuing to comply with the radio instructions given by the intercepting aircraft.”

6. Air-to-air visual signals

The visual signals to be used by intercepting and intercepted aircraft are those set forth in Appendix 1 to this Annex. It is essential that intercepting and intercepted aircraft adhere strictly to those signals and interpret correctly the signals given by the other aircraft, and that the intercepting aircraft pay particular attention to any signals given by the intercepted aircraft to indicate that it is in a state of distress or urgency.

7. Radiocommunication between the intercept control unit or the intercepting aircraft and the intercepted aircraft

7.1 When an interception is being made, the intercept control unit and the intercepting aircraft should:

a) first attempt to establish two-way communication with the intercepted aircraft in a common language on the emergency frequency 121.5 MHz, using the call signs “INTERCEPT CONTROL”, “INTERCEPTOR (call sign)” and “INTERCEPTED AIRCRAFT” respectively; and

b) failing this, attempt to establish two-way communication with the intercepted aircraft on such other frequency or frequencies as may have been prescribed by the appropriate ATS authority, or to establish contact through the appropriate ATS unit(s).

7.2 If radio contact is established during interception but communication in a common language is not possible, attempts must be made to convey instructions, acknowledgement of instructions and essential information by using the phrases and pronunciations in Table A-1 and transmitting each phrase twice.

8. Refraining from the use of weapons

Note.— In the unanimous adoption by the 25th Session (Extraordinary) of the ICAO Assembly on 10 May 1984 of Article 3 bis *to the Convention on International Civil Aviation, Contracting States have recognized that "every State must refrain from resorting to the use of weapons against civil aircraft in flight".*

The use of tracer bullets to attract attention is hazardous, and it is expected that measures will be taken to avoid their use so that the lives of persons on board and the safety of aircraft will not be endangered.

9. Coordination between intercept control units and air traffic services units

It is essential that close coordination be maintained between an intercept control unit and the appropriate air traffic services unit during all phases of an interception of an aircraft which is, or might be, a civil aircraft, in order that the air traffic services unit is kept fully informed of the developments and of the action required of the intercepted aircraft.

Table A-1

Phrases for use by INTERCEPTING aircraft			*Phrases for use by INTERCEPTED aircraft*		
Phrase	*Pronunciation*[1]	*Meaning*	*Phrase*	*Pronunciation*[1]	*Meaning*
CALL SIGN	KOL SA-IN	What is your call sign?	CALL SIGN (call sign)[2]	KOL SA-IN (call sign)	My call sign is (call sign)
FOLLOW	FOL-LO	Follow me	WILCO	VILL-KO	Understood Will comply
DESCEND	DEE-SEND	Descend for landing	CAN NOT	KANN NOTT	Unable to comply
YOU LAND	YOU LAAND	Land at this aerodrome	REPEAT	REE-PEET	Repeat your instruction
PROCEED	PRO-SEED	You may proceed	AM LOST	AM LOSST	Position unknown
			MAYDAY	MAYDAY	I am in distress
			HIJACK[3]	HI-JACK	I have been hijacked
			LAND (place name)	LAAND (place name)	I request to land at (place name)
			DESCEND	DEE-SEND	I require descent

1. *In the second column, syllables to be emphasized are underlined.*
2. *The call sign required to be given is that used in radiotelephony communications with air traffic services units and corresponding to the aircraft identification in the flight plan.*
3. *Circumstances may not always permit, nor make desirable, the use of the phrase "HIJACK".*

ATTACHMENT B. UNLAWFUL INTERFERENCE

1. General

The following procedures are intended as guidance for use by aircraft when unlawful interference occurs and the aircraft is unable to notify an ATS unit of this fact.

2. Procedures

2.1 Unless considerations aboard the aircraft dictate otherwise, the pilot-in-command should attempt to continue flying on the assigned track and at the assigned cruising level at least until able to notify an ATS unit or within radar coverage.

2.2 When an aircraft subjected to an act of unlawful interference must depart from its assigned track or its assigned cruising level without being able to make radiotelephony contact with ATS, the pilot-in-command should, whenever possible:

a) attempt to broadcast warnings on the VHF emergency frequency and other appropriate frequencies, unless considerations aboard the aircraft dictate otherwise. Other equipment such as on-board transponders and data links should also be used when it is advantageous to do so and circumstances permit; and

b) proceed in accordance with applicable special procedures for in-flight contingencies, where such procedures have been established and promulgated in the *Regional Supplementary Procedures (*Doc 7030); or

c) if no applicable regional procedures have been established, proceed at a level which differs from the cruising levels normally used for IFR flight by:

1) 150 m (500 ft) in an area where a vertical separation minimum of 300 m (1 000 ft) is applied; or

2) 300 m (1 000 ft) in an area where a vertical separation minimum of 600 m (2 000 ft) is applied.

Note.— Action to be taken by an aircraft which is intercepted while being subject to an act of unlawful interference is prescribed in 3.8 of this Annex.

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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International Standards
and Recommended Practices

Annex 3
to the Convention on
International Civil Aviation

Meteorological Service for International Air Navigation

Part I
Core SARPs

Part II
Appendices and Attachments

This edition incorporates all amendments adopted by the Council prior to 26 February 2004 and supersedes, on 25 November 2004, all previous editions of Annex 3.

For information regarding the applicability of Standards and Recommended Practices, *see* Foreword.

Fifteenth Edition
July 2004

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-73	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	15/10/04	15/10/04	ICAO

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ATTACHMENTS

FOREWORD

Historical background

Standards and Recommended Practices relating to meteorology were first adopted by the Council on 16 April 1948, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and designated as Annex 3 to the Convention with the title *Standards and Recommended Practices — Meteorological Codes*. The Standards and Recommended Practices were based on recommendations of the Special Session of the Meteorology Division, held in September 1947.

Table A shows the origin of subsequent amendments, together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted or approved by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notifi-cation of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that are important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in five languages — English, Arabic, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

Any reference to a portion of this document, which is identified by a number, includes all subdivisions of the portion.

Applicability

The Standards and Recommended Practices in this document govern the application of the *Regional Supplementary Procedures* (Doc 7030, Part 3 — Meteorology), in which document will be found statements of regional choices, where such options are permitted by this Annex.

Responsibility

In accordance with a similar provision in the Foreword to Annex 6, Part II, the responsibility which devolves upon an operator, in accordance with the provisions of Annex 3, falls upon the pilot-in-command in the case of international general aviation.

Relation to corresponding WMO publications

The regulatory material contained in Annex 3 is, except for a few minor editorial differences, identical with that appearing in the Technical Regulations (Chapter C.3.1) of the World Meteorological Organization (WMO).

The aeronautical meteorological code forms referred to in Annex 3 are developed by the World Meteorological Organization on the basis of aeronautical requirements contained in this Annex, or stated from time to time by the Council. The aeronautical meteorological code forms are promulgated by WMO in its Publication No. 306 — *Manual on Codes*, Volume I.

Table A. Amendments to Annex 3

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
1st Edition	Second Session of the Meteorology Division	Meteorological codes for the transmission of meteorological information for aeronautical purposes.	16 April 1948 15 September 1948 1 January 1949
1 to 21 (2nd Edition)	Special Session of the Meteorology Division	Updating and improvement of meteorological codes.	17 September 1948 23 December 1948 1 January 1949
22 to 37	Third Session of the Meteorology Division	Use of plain language and a simplified code for flight conditions in air-reports.	28 May 1951 1 October 1951 1 January 1952
38 (3rd Edition)	First Air Navigation Conference	Introduction of the radiotelephony or radiotelegraphy AIREP form of air-report.	15 December 1953 1 August 1954 1 September 1954
39	First Air Navigation Conference	Revised radiotelegraphy form of POMAR Code for air-reports.	18 May 1954 20 August 1954 1 September 1954
40	World Meteorological Organization	New aeronautical meteorological figure codes in an Attachment, replacing those (except the POMAR code) hitherto appearing in the SARPs.	28 September 1954 1 January 1955 1 January 1955
41	Fourth Session of the Meteorology Division	Introduction of Standards and Recommended Practices governing the obligations of Contracting States relating to the establishment of meteorological organization in each State, adequate to satisfy Articles 28 and 37 of the Convention; consequential change of title of Annex 3 to read *International Standards and Recommended Practices — Meteorology*.	1 April 1955 1 August 1955 1 January 1956
42 (4th Edition)	Second Air Navigation Conference	Simplification of the detailed specifications for the method of determining the position in the AIREP and POMAR forms of air-report.	8 May 1956 1 September 1956 1 December 1956
43	Third Air Navigation Conference	Introduction of the term “SIGMET information” to replace the terms “advisory message” and “warning message”; amendment of the table for “State of Sea” in the POMAR code.	13 June 1957 1 October 1957 1 December 1957
44	Rules of the Air and Air Traffic Services/ Search and Rescue Divisions	Changes in the list of elements in Section 1 (Position report) of the AIREP form of air-report — deletion of the element “Flight conditions” and amendment of the last element in the section to read “Next position and time over”.	18 February 1960 1 May 1960 1 August 1960
45	Rules of the Air and Air Traffic Services/ Search and Rescue Divisions	Amendment of model AIREP and POMAR forms of air-report consequential to Amendment 44.	18 February 1960 — 1 August 1960
46	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1960.	8 June 1960 — 8 June 1960

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
47 (5th Edition)	Fifth Session of the Meteorology Division	Amendment to the procedures for aircraft meteorological observations and reports, modifying those for special observations and introducing requirements for additional observations; deletion of the POMAR form of air-report; elimination of flight meteorological watch and the introduction of en-route forecast service to supplement area meteorological watch; amendment to the provisions concerning meteorological conditions along the route to an alternate aerodrome.	2 December 1960 1 April 1961 1 July 1961
48	Fifth Session of the Meteorology Division	Amendment to model AIREP form of air-report to reflect changes in procedures for aircraft meteorological observations and reports, consequential to an amendment to the PANS-RAC.	2 December 1960 — 1 July 1961
49	Fifth Session of the Meteorology Division	Introduction of definition of “D-value”.	8 April 1963 1 August 1963 1 November 1963
50	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1964.	18 March 1964 — 18 March 1964
51 (6th Edition)	Meteorology and Operations Divisional Meeting	Introduction of a requirement for observations to be made at locations where they will be representative of the area for which they are primarily required; extension of the criteria for special air-reports to cover phenomena likely to affect efficiency as well as safety, and deleting the requirement for “additional aircraft observations” according to regionally agreed criteria; deletion from the AIREP form of air-report of D-value, weather and cloud as standard items; introduction of a modified model AIREP form; changes to the provisions relating to forms of meteorological messages and providing for the exchange of information in pictorial form; introduction of definition of “plain language”.	31 May 1965 1 October 1965 10 March 1966
52	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 10 March 1966.	12 December 1966 — 12 December 1966
53	Meteorology and Operations Divisional Meeting	Permitting regional air navigation agreement on the use of a pictorial form of message for the dissemination of forecasts; replacement of the term “symbolic form of message” by a more specific description of the form of message to which this expression was intended to refer.	12 December 1966 12 April 1967 24 August 1967
54	World Meteorological Organization	Updating of aeronautical meteorological figure codes, introduced by WMO, as of 1 January 1968.	13 June 1967 — 1 January 1968
55	France	Permitting changes to be made to air-reports before their ground-to-ground dissemination.	16 December 1968 16 April 1969 18 September 1969
56 (7th Edition)	Sixth Air Navigation Conference	Introduction of: specifications for area forecast centres; simplified specifications for meteorological offices to reflect increasing centralization; extended coverage of aircraft reports to include adverse weather conditions encountered during initial climb and final approach; routine reporting by aircraft of “spot” rather than “mean” winds; improved criteria for in-flight reports of the intensity of turbulence; new definition of “air traffic services reporting office” and changes in the definition of “air traffic services unit”; changes to the aeronautical meteorological codes introduced by WMO, as of 18 September 1969.	15 May 1970 15 September 1970 4 February 1971

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
57	Second Meeting of the Technical Panel on Supersonic Transport Operations	Amendment to the definition of "SIGMET information" to take account of the requirements of SST aircraft operations; introduction of provisions for making and recording special observations whenever moderate turbulence, hail or cumulonimbus clouds are encountered during transonic or supersonic flight.	19 March 1971 6 September 1971 6 January 1972
58	World Meteorological Organization	Updating of aeronautical meteorological codes, introduced by WMO, as of 1 January 1972.	19 March 1971 — 6 January 1972
59	Sixth Air Navigation Conference	Permitting the omission of information on "next position and time over" from Section 1 of air-reports exchanged between meteorological offices; introduction of changes to the formats and data conventions in the model form of air-report to make it suitable for direct input into computers.	24 March 1972 24 July 1972 7 December 1972
60 (8th Edition)	Sixth Air Navigation Conference. Eighth Air Navigation Conference. Meteorology Divisional Meeting (1974)	Complete revision of Annex 3, incorporating the PANS-MET, the specifications of which were regarded as being suitable for inclusion in Annex 3 as Standards and Recommended Practices; the revision took into account recently approved operational requirements and up-to-date methods of meeting them; introduction of new Standards and Recommended Practices, relating to service for operators and flight crew members, meteorological information for air traffic services and for search and rescue services, together with requirements for communications and their use; the title of Annex 3 was, accordingly, amended to read *Meteorological Service for International Air Navigation*.	26 November 1975 26 March 1976 12 August 1976
61	Ninth Air Navigation Conference. Meteorology Divisional Meeting (1974)	New provisions and revision of existing provisions to improve the coordination between meteorological offices/stations and air traffic services units and the supply of meteorological information to the latter; new specifications for observations and reports for take-off and landing; introduction of a note referring to the specifications of Annex 14 for the siting and construction of equipment and installations on operational areas to reduce the hazard to aircraft to a minimum; replacement of the expression "supersonic transport aircraft" by the expression "supersonic aircraft"; updating of Part 2, Appendix 2; revision of definition of "nephanalysis" and deletion of "(29.92 in.)" from definition of "flight level"; deletion of Attachment D — Aeronautical Meteorological Codes.	14 December 1977 14 April 1978 10 August 1978
62	Eighth Air Navigation Conference and ICAO Council	Inclusion in Appendix 1 of model charts and forms developed by WMO on the basis of the operational requirements contained in Annex 3; transfer of the data designators and geographical designators from Appendix 2 to Annex 3 to the *Manual of Aeronautical Meteorological Practice* (Doc 8896).	26 June 1978 26 October 1978 29 November 1979
63	MET Divisional Meeting (1974). ICAO Secretariat. Operational Flight Information Service Panel. Ninth Air Navigation Conference. Doc 9328	Definition for "meteorological bulletin"; correction to shortcomings in ground-to-ground dissemination of air-reports; decrease in SIGMET messages dealing with "active thunderstorm area"; deletion of reference to "reporting lines"; reference to new *Manual of Runway Visual Range Observing and Reporting Practices*.	23 March 1981 23 July 1981 26 November 1981
64	ICAO Secretariat	New provisions and revision of existing provisions to meet operational requirements for observing and reporting of low-level wind shear, including the introduction of wind shear warnings for the climb-out and approach phases of flight.	6 December 1982 6 April 1983 24 November 1983

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
65 (9th Edition)	Communications/ Meteorology Divisional Meeting (1982). Third Meeting of the ADAPT Panel	New provisions and revision of existing provisions related to the introduction of the new world area forecast system; methods of exchange of operational meteorological data; improvement of accuracy of runway visual range assessment, and reporting.	10 June 1983 10 October 1983 22 November 1984
66 (10th Edition)	Communications/ Meteorology Divisional Meeting (1982). Second Asia/ Pacific Regional Air Navigation Meeting. Twenty-second and twenty-third meetings of the European Air Navigation Planning Group. World Meteorological Organization. Recommendations of the ANC relating to the method of reference date/time and units of measurement. ICAO Secretariat	Amendment of the provisions related to the transmission of wind shear information beyond the aerodrome, criteria for the issuance of selected special reports, inclusion of cloud information in aerodrome forecasts, flight documentation to be provided for short-haul flights, format of the SIGMET message and meteorological bulletin headings; introduction of the definition for "SIGMET information"; alignment of Annex 3 with Annex 5 in respect of units of measurement and the referencing of time.	24 March 1986 27 July 1986 20 November 1986
67	Communications/ Meteorology Divisional Meeting (1982). Twenty-second and twenty-fifth meetings of the European Air Navigation Planning Group. ICAO Secretariat. World Meteorological Organization	Amendment of the provisions related to light intensity settings used for RVR assessment; the identification of selected aerodromes and the deletion of the requirement for temperature circles on WAFS charts; the transmission time of forecasts from regional area forecast centres to users; introduction of provisions for the origination and dissemination of volcanic ash warnings; inclusion of wind speed units in examples of the aviation meteorological figure codes; alignment of Annex 3 with the PANS-RAC in respect of the elements of the air-report; editorial amendment of the example of the SIGMET message.	27 March 1987 27 July 1987 19 November 1987
68	Communications/ Meteorology Divisional Meeting (1982). ICAO Secretariat. World Meteorological Organization	Amendment of the provisions relating to identification of RVR reporting positions; the criteria for the issuance of selected special reports for changes in RVR; RVR values for touchdown zone for all runways available for landing to be included in reports disseminated beyond the aerodrome; model charts and forms for flight documentation; issuance and updating of SIGMET messages relating to volcanic ash clouds; explicit provisions regarding the need to provide the aeronautical information services units with MET information; alignment with Annex 10 in respect of definitions for aeronautical fixed telecommunication network and aeronautical mobile service; alignment with PANS-OPS, Volume II, Part III, paragraph 6.3.1 in respect of terminology; editorial amendments to paragraph 3.3.7 to delete the equivalent pressure levels; the example of the SPECI report; the reference in Attachment B, Part 3, paragraph 1.4 b); and the footnote in Attachment C concerning visibility and RVR.	21 March 1989 23 July 1989 16 November 1989

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
69 (11th Edition)	Communications/ Meteorology/ Operations Divisional Meeting (1990). ICAO Secretariat	Amendment of the provisions related to the transition to the final phase of the WAFS; aeronautical meteorological codes, and guidance material on the selected criteria applicable to aerodrome reports; aeronautical climatological information; SIGMET information and related guidance material for the issuance of SIGMETs; automatic weather observing stations; meteorological information for helicopter operations; and alignment with Annex 6, Parts I and II in respect of the definition for alternate aerodrome.	23 March 1992 27 July 1992 12 November 1992; 1 July 1993
70 (12th Edition)	Communications/ Meteorology/ Operations Divisional Meeting (1990). Limited North Atlantic (COM/MET/RAC) Regional Air Navigation Meeting (1992). Third Asia/ Pacific Regional Air Navigation Meeting (1993). Thirty-second meeting of the European Air Navigation Planning Group. ICAO Secretariat	Definitions of AIRMET information, extended range operation, GAMET area forecast, operational control and tropical cyclone; amendment to the provisions concerning horizontal resolution of and the code form in which the upper wind and temperature grid point forecasts are to be prepared by the world area forecast centres; issuance of special reports for changes in temperature at aerodromes; provisions related to the reporting and forecasting of meteorological information at aerodromes on which the new aeronautical meteorological codes are based and a consequential amendment to Models A1, A2, TA1, TA2 and SN to take account of the updated aeronautical meteorological codes; automated air reporting; provision of information on weather phenomenon hazardous to low-level flights; introduction of the minimum threshold value for the maximum surface wind speed for which SIGMETs for tropical cyclones should be issued; observation and reporting of wind shear to take account of new technology in ground-based wind shear observing equipment; interregional exchange of METARs and SPECIs to support extended range operations and long-haul flights conducted under centralized operational control; editorial amendments to replace the term “line squall” by “squall line”; editorial amendments to Models SWL and SN, to align the depiction of freezing level, and editorial corrections to Model A2; inclusion in Model SN of symbols for “volcanic eruptions”, “state of the sea” and “sea surface temperature”; updating operationally desirable accuracy of measurement or observation and the currently attainable accuracy of measurement or observation; introduction of criteria for the inclusion of severe mountain waves in SIGMET information.	17 March 1995 24 July 1995 1 January 1996
71 (13th Edition)	Limited North Atlantic (COM/ MET/RAC) Regional Air Navigation Meeting (1992). Third Asia/ Pacific Regional Air Navigation Meeting (1993). Thirty-eighth meeting of the European Air Navigation Planning Group (EANPG/38). United States. ICAO Secretariat	Definitions of automatic dependent surveillance, Human Factors principles, international airways volcano watch, level, tropical cyclone advisory centre, volcanic ash advisory centre and VOLMET data link service; amendment to the provisions regarding the indication of the designated meteorological authority in States’ AIPs; introduction of the role of the Human Factors principles; inclusion of 6-hour and 36-hour validity WAFS upper wind/ temperature forecasts; introduction of requirements and a new model for volcanic ash advisories in graphical format; specification of the frequency of update of volcanic ash advisories and the specific role of VAACs and TCACs; an editorial amendment to ensure consistency in the order of the words “RVR” and “RWY”; an amendment to the present weather abbreviations; introduction of the requirements regarding “VOLMET” data link service; editorial amendments regarding air reporting; inclusion of “forecast temperature” in aerodrome forecasts; introduction of requirements for the standardization of area forecasts and flight documentation for low-level flights and consequential amendments to the Appendix — Model Charts and Forms; the deletion of the use of national language in connection with SIGMET messages; introduction of requirements for the provision of meteorological information by automated pre-flight information systems; introduction of the provision of meteorological information for centralized flight planning in extended range operations; quantitative definitions of CB clouds and thunderstorms to be used in WAFS SIGWX charts and consequential amendments to guidance material.	11 March 1998 20 July 1998 5 November 1998

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
72 (14th Edition)	Limited Middle East (COM/MET/RAC) RAN Meeting (1996). Ninth meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group. Thirty-sixth, thirty-ninth and fortieth meetings of the European Air Navigation Planning Group. International Air Transport Association. Secretariat	Changes to the definition of flight crew member, grid point data in numerical form, pilot-in-command, regional area forecast centre and world area forecast centre; introduction of definitions for minimum sector altitude, quality assurance, quality control, quality management, quality system and visibility; introduction of requirements regarding global exchange of OPMET information; updated format for volcanic ash and tropical cyclone advisory messages; introduction of requirements on the transmission of information on the accidental release of radioactive materials, inclusion of radiation symbol on WAFS SIGWX charts; updated operational requirements for world area forecast system (WAFS) data regarding the frequency of issuance of WAFS upper wind/temperature data increased to four times per day; inclusion of FL 140 and humidity in the GRIB global data, introduction of the BUFR code, inclusion of “strong surface winds” and “mountain obscuration” symbols on low-level SIGWX charts; operational requirements for aeronautical MET codes regarding the introduction of standardized VOLMET phraseologies, uniform use of date/time groups in METAR and TAF code forms, additional reference level for height of clouds and freezing level in GAMET messages, discrimination between improvements and deterioration of visibility, cloud base and vertical visibility in aerodrome reports and forecasts; introduction of templates for local meteorological report, METAR/SPECI, TAF and SIGMET; the algorithm to report turbulence and provision of a turbulence index, and the operational interpretation of turbulence index; provisions for the MET component for automated pre-flight information systems and harmonized AIS/MET pre-flight briefing; provisions regarding quality assurance and quality control of MET information; SIGMET information in graphical format and quantitative criteria for SIGMET messages; inclusion of forward-scatter meters in RVR provisions; and editorial amendments.	7 March 2001 16 July 2001 1 November 2001
73 (15th Edition)	Meteorology (MET) Divisional Meeting (2002). Secretariat	Restructuring of Annex 3 into two parts; new and amended definitions; upgrading of certain Recommended Practices to Standards; elimination of the need to issue WAFS products in T4 chart form; introduction of the requirement to maintain the integrity of WAFS forecasts; notification of volcanic activity to ACC, MWO and VAAC by selected State volcano observatories; introduction of provisions allowing the issuance of SIGMET messages for volcanic ash and tropical cyclones in graphical format using the WMO BUFR code form; introduction of templates for special air-report (downlink), volcanic ash and tropical cyclone advisory messages and aerodrome and wind shear warnings; introduction of a requirement to issue METARs and SPECIs prior to the aerodrome resuming operations; introduction of enabling provisions to use fully automatic observing systems during non-operational hours; introduction of prevailing visibility; introduction of a requirement to cancel aerodrome forecasts that cannot be kept under continuous review; introduction of a provision for the averaging period for measuring visibility and variation in the mean wind speed; introduction of a provision to use maximum light intensity for assessment of RVR for METAR and SPECI; the deletion of Model TB Example 2; inclusion of new Examples 3 and 4 under Model SWH, deletion of Attachment A; introduction of a new Attachment C describing back-up procedures at WAFCs; and editorial amendments.	25 February 2004 12 July 2004 25 November 2004

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I

CORE SARPs

CHAPTER 1. DEFINITIONS

Note.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies *(Doc 9718)).*

1.1 Definitions

When the following terms are used in the Standards and Recommended Practices for Meteorological Service for International Air Navigation, they have the following meanings:

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome climatological summary. Concise summary of specified meteorological elements at an aerodrome, based on statistical data.

Aerodrome climatological table. Table providing statistical data on the observed occurrence of one or more meteorological elements at an aerodrome.

Aerodrome control tower. A unit established to provide air traffic control service to aerodrome traffic.

Aerodrome elevation. The elevation of the highest point of the landing area.

Aerodrome meteorological office. An office, located at an aerodrome, designated to provide meteorological service for international air navigation.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical fixed telecommunication network (AFTN). A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics.

Aeronautical meteorological station. A station designated to make observations and meteorological reports for use in international air navigation.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical telecommunication station. A station in the aeronautical telecommunication service.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft observation. The evaluation of one or more meteorological elements made from an aircraft in flight.

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/ or meteorological reporting.

Note.— Details of the AIREP form are given in the PANS-ATM (Doc 4444).

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shut-down or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned.

Area control centre. A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate.

Briefing. Oral commentary on existing and/or expected meteorological conditions.

Cloud of operational significance. A cloud with the height of cloud base below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater.

Consultation. Discussion with a meteorologist or another qualified person of existing and/or expected meteorological conditions relating to flight operations; a discussion includes answers to questions.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

Cruising level. A level maintained during a significant portion of a flight.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

Extended range operation. Any flight by an aeroplane with two turbine power-units where the flight time at the one power-unit inoperative cruise speed (in ISA and still air conditions), from a point on the route to an adequate alternate aerodrome, is greater than the threshold time approved by the State of the Operator.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight documentation. Written or printed documents, including charts or forms, containing meteorological information for a flight.

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum; and

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1, indicate altimetric rather than geometric heights and altitudes.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

GAMET area forecast. An area forecast in abbreviated plain language for low-level flights for a flight information region or sub-area thereof, prepared by the meteorological office designated by the meteorological authority concerned and exchanged with meteorological offices in adjacent flight information regions, as agreed between the meteorological authorities concerned.

Grid point data in digital form. Computer processed meteorological data for a set of regularly spaced points on a chart, for transmission from a meteorological computer to another computer in a code form suitable for automated use.

Note.— In most cases such data are transmitted on medium or high speed telecommunications channels.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

International airways volcano watch (IAVW). International arrangements for monitoring and providing warnings to aircraft of volcanic ash in the atmosphere.

Note.— The IAVW is based on the cooperation of aviation and non-aviation operational units using information derived from observing sources and networks that are provided by States. The watch is coordinated by ICAO with the cooperation of other concerned international organizations.

Level. A generic term relating to vertical position of an aircraft in flight and meaning variously height, altitude or flight level.

Meteorological authority. The authority providing or arranging for the provision of meteorological service for international air navigation on behalf of a Contracting State.

Meteorological bulletin. A text comprising meteorological information preceded by an appropriate heading.

Meteorological information. Meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions.

Meteorological office. An office designated to provide meteorological service for international air navigation.

Meteorological report. A statement of observed meteorological conditions related to a specified time and location.

Meteorological satellite. An artificial Earth satellite making meteorological observations and transmitting these observations to Earth.

Minimum sector altitude. The lowest altitude which may be used which will provide a minimum clearance of 300 m (1 000 ft) above all objects located in the area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation.

Observation (meteorological). The evaluation of one or more meteorological elements.

Operational control. The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operational flight plan. The operator's plan for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned.

Operational planning. The planning of flight operations by an operator.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Prevailing visibility. The visibility value, observed in accordance with the definition of "visibility", which is reached or exceeded within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors.

Note.— This value may be assessed by human observation and/or instrumented systems. When instruments are installed, they are used to obtain the best estimate of the prevailing visibility.

Prognostic chart. A forecast of a specified meteorological element(s) for a specified time or period and a specified surface or portion of airspace, depicted graphically on a chart.

Quality assurance. All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality (ISO 9000:2000*).

Quality control. The operational techniques and activities that are used to fulfil requirements for quality (ISO 9000:2000*).

Quality management. All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implementing them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system (ISO 9000:2000*).

* ISO Standard 9000:2000 — *Quality Management Systems — Fundamentals and Vocabulary.*

Quality system. The organizational structure, procedures, processes and resources needed to implement quality management (ISO 9000:2000*).

Regional air navigation agreement. Agreement approved by the Council of ICAO normally on the advice of a regional air navigation meeting.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Rescue coordination centre. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Search and rescue services unit. A generic term meaning, as the case may be, rescue coordination centre, rescue subcentre or alerting post.

Service area (world area forecast system). A geographical area within which a world area forecast centre is responsible for issuing area forecasts to meteorological authorities and other users.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

Standard isobaric surface. An isobaric surface used on a worldwide basis for representing and analysing the conditions in the atmosphere.

Threshold. The beginning of that portion of the runway usable for landing.

Touchdown zone. The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Tropical cyclone. Generic term for a non-frontal synoptic-scale cyclone originating over tropical or sub-tropical waters with organized convection and definite cyclonic surface wind circulation.

* ISO Standard 9000:2000 — *Quality Management Systems — Fundamentals and Vocabulary.*

Tropical cyclone advisory centre (TCAC). A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, world area forecast centres and international OPMET data banks regarding the position, forecast direction and speed of movement, central pressure and maximum surface wind of tropical cyclones.

Upper-air chart. A meteorological chart relating to a specified upper-air surface or layer of the atmosphere.

Visibility. Visibility for aeronautical purposes is the greater of:

a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;

b) the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note.— The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).

Volcanic ash advisory centre (VAAC). A meteorological centre designated by regional air navigation agreement to provide advisory information to meteorological watch offices, area control centres, flight information centres, world area forecast centres and international OPMET data banks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions.

VOLMET. Meteorological information for aircraft in flight.

Data link-VOLMET (D-VOLMET). Provision of current aerodrome routine meteorological reports (METAR) and aerodrome special meteorological reports (SPECI), aerodrome forecasts (TAF), SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET via data link.

VOLMET broadcast. Provision, as appropriate, of current METAR, SPECI, TAF and SIGMET by means of continuous and repetitive voice broadcasts.

World area forecast centre (WAFC). A meteorological centre designated to prepare and issue significant weather forecasts and upper-air forecasts in digital form on a global basis direct to States by appropriate means as part of the aeronautical fixed service.

World area forecast system (WAFS). A worldwide system by which world area forecast centres provide aeronautical meteorological en-route forecasts in uniform standardized formats.

1.2 Terms used with a limited meaning

For the purpose of this Annex, the following terms are used with a limited meaning as indicated below:

a) to avoid confusion in respect of the term "service" between the meteorological service considered as an administrative entity and the service which is provided, "meteorological authority" is used for the former and "service" for the latter;

b) "provide" is used solely in connection with the provision of service;

c) "issue" is used solely in connection with cases where the obligation specifically extends to sending out the information to a user;

d) "make available" is used solely in connection with cases where the obligation ends with making the information accessible to a user; and

e) "supply" is used solely in connection with cases where either c) or d) applies.

CHAPTER 2. GENERAL PROVISIONS

Introductory Note 1.— It is recognized that the provisions of this Annex with respect to meteorological information are subject to the understanding that the obligation of a Contracting State is for the supply, under Article 28 of the Convention, of meteorological information and that the responsibility for the use made of such information is that of the user.

Introductory Note 2.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Introductory Note 3.— In the case of international operations effected jointly with aeroplanes not all of which are registered in the same Contracting State, nothing in this Annex prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of this Annex.

2.1 Objective, determination and provision of meteorological service

2.1.1 The objective of meteorological service for international air navigation shall be to contribute towards the safety, regularity and efficiency of international air navigation.

2.1.2 This objective shall be achieved by supplying the following users: operators, flight crew members, air traffic services units, search and rescue services units, airport managements and others concerned with the conduct or development of international air navigation, with the meteorological information necessary for the performance of their respective functions.

2.1.3 Each Contracting State shall determine the meteorological service which it will provide to meet the needs of international air navigation. This determination shall be made in accordance with the provisions of this Annex and with due regard to regional air navigation agreements; it shall include the determination of the meteorological service to be provided for international air navigation over international waters and other areas which lie outside the territory of the State concerned.

2.1.4 Each Contracting State shall designate the authority, hereinafter referred to as the meteorological authority, to provide or to arrange for the provision of meteorological service for international air navigation on its behalf. Details of the meteorological authority so designated shall be included in the State aeronautical information publication, in accordance with Annex 15, Appendix 1, GEN 1.1.

2.1.5 Each Contracting State shall ensure that the designated meteorological authority complies with the requirements of the World Meteorological Organization in respect of qualifications and training of meteorological personnel providing service for international air navigation.

Note.— Requirements concerning qualifications and training of meteorological personnel in aeronautical meteorology are given in WMO Publication No. 49, Technical Regulations, *Volume I* — General Meteorological Standards and Recommended Practices, *Chapter B.4 — Education and Training*.

2.2 Supply, quality assurance and use of meteorological information

2.2.1 Close liaison shall be maintained between those concerned with the supply and those concerned with the use of meteorological information on matters which affect the provision of meteorological service for international air navigation.

2.2.2 **Recommendation.—** *In order to meet the objective of meteorological service for international air navigation, the*

Contracting State should ensure that the designated meteorological authority referred to in 2.1.4 establishes and implements a properly organized quality system comprising procedures, processes and resources necessary to provide for the quality management of the meteorological information to be supplied to the users listed in 2.1.2.

2.2.3 **Recommendation.—** *The quality system established in accordance with 2.2.2 should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and certified by an approved organization.*

Note.— International Organization for Standardization (ISO) 9000 series of quality assurance standards provide a basic framework for the development of a quality assurance programme. The details of a successful programme are to be formulated by each State and in most cases are unique to the State organization.

2.2.4 **Recommendation.—** *The quality system should provide the users with assurance that the meteorological information supplied complies with the stated requirements in terms of the geographical and spatial coverage, format and content, time and frequency of issuance and period of validity, as well as the accuracy of measurements, observations and forecasts. Where the quality system indicates that meteorological information to be supplied to the users does not comply with the stated requirements, and automatic error correction procedures are not appropriate, such information should not be supplied to the users unless it is validated with the originator.*

Note 1.— Requirements concerning the geographical and spatial coverage, format and content, time and frequency of issuance and period of validity of meteorological information to be supplied to aeronautical users are given in Chapters 3, 4, 6, 7, 8, 9 and 10 and Appendices 2, 3, 5, 6, 7, 8 and 9 of this Annex and the relevant regional air navigation plans. Guidance concerning the accuracy of measurement and observation, and accuracy of forecasts is given in Attachments A and B respectively to this Annex.

Note 2.— Notwithstanding the provisions in 2.2.4, provisional TAF may still be issued, as necessary, in accordance with Appendix 8, 4.4.3.

2.2.5 **Recommendation.—** *In regard to the exchange of meteorological information for operational purposes, the quality system should include verification and validation procedures and resources for monitoring adherence to the prescribed transmission schedules for individual messages and/or bulletins required to be exchanged, and the times of their filing for transmission. The quality system should be capable of detecting excessive transit times of messages and bulletins received.*

Note.— Requirements concerning the exchange of operational meteorological information are given in Chapter 11 and Appendix 10 of this Annex.

2.2.6 **Recommendation.—** *Demonstration of compliance of the quality system applied should be by audit. If non-conformity of the system is identified, action should be initiated to determine and correct the cause. All audit observations should be evidenced and properly documented.*

2.2.7 The meteorological information supplied to the users listed in 2.1.2 shall be consistent with Human Factors principles and shall be in forms which require a minimum of interpretation by these users, as specified in the following chapters.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

2.3 Notifications required from operators

2.3.1 An operator requiring meteorological service or changes in existing meteorological service shall notify, sufficiently in advance, the meteorological authority or the meteorological office(s) concerned. The minimum amount of advance notice required shall be as agreed between the meteorological authority or meteorological office(s) and the operator.

2.3.2 The meteorological authority shall be notified by the operator requiring service when:

a) new routes or new types of operations are planned;

b) changes of a lasting character are to be made in scheduled operations; and

c) other changes, affecting the provision of meteorological service, are planned.

Such information shall contain all details necessary for the planning of appropriate arrangements by the meteorological authority.

2.3.3 The aerodrome meteorological office, or the meteorological office concerned, shall be notified by the operator or a flight crew member:

a) of flight schedules;

b) when non-scheduled flights are to be operated; and

c) when flights are delayed, advanced or cancelled.

2.3.4 **Recommendation.—** *The notification to the aerodrome meteorological office, or the meteorological office concerned, of individual flights should contain the following information except that, in the case of scheduled flights, the requirement for some or all of this information may be waived by agreement between the meteorological office and the operator:*

a) aerodrome of departure and estimated time of departure;

b) destination and estimated time of arrival;

c) route to be flown and estimated times of arrival at, and departure from, any intermediate aerodrome(s);

d) alternate aerodromes needed to complete the operational flight plan and taken from the relevant list contained in the regional air navigation plan;

e) cruising level;

f) for supersonic flights, the alternative subsonic cruising level and the locations of the transonic acceleration and deceleration areas and of the subsonic climb and descent paths;

g) type of flight, whether under the visual or the instrument flight rules;

h) type of meteorological information requested for a flight crew member, whether flight documentation and/or briefing or consultation; and

i) time(s) at which briefing, consultation and/or flight documentation are required.

CHAPTER 3. WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 2.

3.1 Objective of the world area forecast system

The objective of the world area forecast system shall be to supply meteorological authorities and other users with forecasts of global upper wind, upper-air temperature and humidity, direction, speed and height of maximum wind, tropopause height and temperature and forecasts of significant weather phenomena in digital form. This objective shall be achieved through a comprehensive, integrated, worldwide and, as far as practicable, uniform system, and in a cost-effective manner, taking full advantage of evolving technologies.

3.2 World area forecast centres

3.2.1 A Contracting State, having accepted the responsibility for providing a WAFC within the framework of the world area forecast system, shall arrange for that centre:

a) to prepare global forecasts for grid points in digital form for all required levels and in a standard format; the forecasts shall comprise upper winds, upper-air temperatures and humidity, tropopause heights and temperatures and maximum wind speed, direction and height;

b) to prepare global forecasts of significant weather phenomena in digital form;

c) to issue the forecasts referred to in a) and b) in digital form to meteorological authorities and other users in its service area, as approved by the Contracting State on advice from the meteorological authority;

d) to prepare and issue amendments to the forecasts;

e) to receive information concerning the accidental release of radioactive materials into the atmosphere from its associated WMO regional specialized meteorological centre for the provision of transport model products for radiological environmental emergency response, in order to include the information in significant weather forecasts; and

f) to establish and maintain contact with VAACs for the exchange of information on volcanic activity in order to coordinate the inclusion of information on volcanic eruptions in significant weather forecasts.

Note 1.— Specifications for the preparation of significant weather and upper-air prognostic charts are contained in Part II, Appendix 1.

Note 2.— The WAFS service areas are given in the regional air navigation plans.

3.2.2 In case of interruption of the operation of a WAFC, its functions shall be carried out by the other WAFC.

Note.— Back-up procedures to be used in case of interruption of the operation of a WAFC are given in Attachment C. Back-up procedures are expected to be subject to minor revisions by the World Area Forecast System Operations Group (WAFSOPSG) and the latest revision can be found at the WAFSOPSG website at: www.icao.int/anb/wafsopsg.

3.3 Meteorological offices

3.3.1 Each Contracting State shall establish one or more aerodrome and/or other meteorological offices which shall be adequate for the provision of the meteorological service required to satisfy the needs of international air navigation.

3.3.2 An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:

a) prepare and/or obtain forecasts and other relevant information for flights with which it is concerned; the extent of its responsibilities to prepare forecasts shall be related to the local availability and use of en-route and aerodrome forecast material received from other offices;

b) prepare and/or obtain forecasts of local meteorological conditions;

c) maintain a continuous survey of meteorological conditions over the aerodromes for which it is designated to prepare forecasts;

d) provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel;

e) supply other meteorological information to aeronautical users;

f) display the available meteorological information;

g) exchange meteorological information with other meteorological offices; and

h) supply information received on pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud, to its associated air traffic services unit, aeronautical information service unit and meteorological watch office as agreed between the meteorological, aeronautical information service and ATS authorities concerned.

3.3.3 The aerodrome meteorological offices at which flight documentation is required, as well as the areas to be covered, shall be determined by regional air navigation agreement.

3.3.4 The aerodromes for which landing forecasts are required shall be determined by regional air navigation agreement.

3.3.5 For aerodromes without meteorological offices:

a) the meteorological authority concerned shall designate one or more meteorological offices to supply meteorological information as required; and

b) the competent authorities shall establish means by which such information can be supplied to the aerodromes concerned.

3.4 Meteorological watch offices

3.4.1 A Contracting State, having accepted the responsibility for providing air traffic services within a flight information region or a control area, shall establish one or more meteorological watch offices, or arrange for another Contracting State to do so.

3.4.2 A meteorological watch office shall:

a) maintain watch over meteorological conditions affecting flight operations within its area of responsibility;

b) prepare SIGMET and other information relating to its area of responsibility;

c) supply SIGMET information and, as required, other meteorological information to associated air traffic services units;

d) disseminate SIGMET information;

e) when required by regional air navigation agreement, in accordance with 7.2.1:

1) prepare AIRMET information related to its area of responsibility;

2) supply AIRMET information to associated air traffic services units; and

3) disseminate AIRMET information;

f) supply information received on pre-eruption volcanic activity, a volcanic eruption and volcanic ash cloud for which a SIGMET has not already been issued, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to its associated VAAC as determined by regional air navigation agreement; and

g) supply information received concerning the accidental release of radioactive materials into the atmosphere, in the area for which it maintains watch or adjacent areas, to its associated ACC/FIC, as agreed between the meteorological and ATS authorities concerned, and to aeronautical information service units, as agreed between the meteorological and appropriate civil aviation authorities concerned. The information shall comprise location, date and time of the accident, and forecast trajectories of the radioactive materials.

Note.— The information is provided, at the request of the delegated authority in a State, by WMO regional specialized meteorological centres (RSMC) for the provision of transport model products for radiological environmental emergency response. The information is sent by the RSMC to a single contact point of the national meteorological service in each State. This contact point has the responsibility of redistributing the RSMC products within the State concerned.

3.4.3 **Recommendation.—** *The boundaries of the area over which meteorological watch is to be maintained by a meteorological watch office should, in so far as is practicable, be coincident with the boundaries of a flight information region or a control area or a combination of flight information regions and/or control areas.*

3.4.4 **Recommendation.—** *Meteorological watch should be maintained continuously; however, in areas with a low density of traffic the watch may be restricted to the period relevant to expected flight operations.*

3.5 Volcanic ash advisory centres

3.5.1 A Contracting State, having accepted, by regional air navigation agreement, the responsibility for providing a

VAAC within the framework of the international airways volcano watch, shall arrange for that centre to respond to a notification that a volcano has erupted, or is expected to erupt or volcanic ash is reported in its area of responsibility, by arranging for that centre to:

a) monitor relevant geostationary and polar-orbiting satellite data to detect the existence and extent of volcanic ash in the atmosphere in the area concerned;

b) activate the volcanic ash numerical trajectory/dispersion model in order to forecast the movement of any ash "cloud" which has been detected or reported;

Note.— The numerical model may be its own or, by agreement, that of another VAAC.

c) issue advisory information regarding the extent and forecast movement of the volcanic ash "cloud" to:

1) meteorological watch offices, area control centres and flight information centres serving flight information regions in its area of responsibility which may be affected;

2) other VAACs whose areas of responsibility may be affected;

3) world area forecast centres, international OPMET data banks, international NOTAM offices, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems; and

4) airlines requiring the advisory information through the AFTN address provided specifically for this purpose; and

Note.— The AFTN address to be used by the VAACs is given in the Handbook on the International Airways Volcano Watch (IAVW) *(Doc 9766) and at: http://www.icao.int/icao/en/anb/met/index.html.*

d) issue updated advisory information to the meteorological watch offices, area control centres, flight information centres and VAACs referred to in c), as necessary, but at least every six hours until such time as the volcanic ash "cloud" is no longer identifiable from satellite data, no further reports of volcanic ash are received from the area, and no further eruptions of the volcano are reported.

3.5.2 Volcanic ash advisory centres shall maintain a 24-hour watch.

3.6 State volcano observatories

Contracting States that maintain volcano observatories monitoring active volcanoes shall arrange that selected State volcano observatories, as designated by regional air navigation agreement, observing significant pre-eruption volcanic activity, a volcanic eruption and/or volcanic ash in the atmosphere shall send this information as quickly as practicable to its associated ACC, MWO and VAAC.

Note.— Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

3.7 Tropical cyclone advisory centres

A Contracting State having accepted, by regional air navigation agreement, the responsibility for providing a TCAC shall arrange for that centre to:

a) monitor the development of tropical cyclones in its area of responsibility, using geostationary and polar-orbiting satellite data, radar data and other meteorological information;

b) issue advisory information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre; in abbreviated plain language to:

1) meteorological watch offices in its area of responsibility;

2) other TCACs whose areas of responsibility may be affected; and

3) world area forecast centres, international OPMET data banks, and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems; and

c) issue updated advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every six hours.

CHAPTER 4. METEOROLOGICAL OBSERVATIONS AND REPORTS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 3.

4.1 Aeronautical meteorological stations and observations

4.1.1 Each Contracting State shall establish at aerodromes and other points of significance to international air navigation, in its territory, such aeronautical meteorological stations as it determines to be necessary. An aeronautical meteorological station may be a separate station or may be combined with a synoptic station.

4.1.2 **Recommendation.—** *Each Contracting State should establish, or arrange for the establishment of, aeronautical meteorological stations on offshore structures or at other points of significance in support of helicopter operations to offshore structures, if required by regional air navigation agreement.*

4.1.3 Aeronautical meteorological stations shall make routine observations at fixed intervals. At aerodromes, the routine observations shall be supplemented by special observations whenever specified changes occur in respect of surface wind, visibility, runway visual range, present weather, clouds and/or air temperature.

4.1.4 **Recommendation.—** *Each Contracting State should arrange for its aeronautical meteorological stations to be inspected at sufficiently frequent intervals to ensure that a high standard of observations is maintained, that instruments and all their indicators are functioning correctly, and to check whether the exposure of the instruments has changed significantly.*

4.1.5 At aerodromes, with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed to support approach and landing and take-off operations. These devices shall be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems shall observe Human Factors principles and include back-up procedures.

Note 1.— Categories of precision approach and landing operations are defined in Annex 6, Part I.

Note 2.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1.6 **Recommendation.—** *At aerodromes, with runways intended for Category I instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, height of cloud base, air and dew-point temperatures and atmospheric pressure should be installed to support approach and landing and take-off operations. These devices should be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems should observe Human Factors principles and include back-up procedures.*

4.1.7 **Recommendation.—** *Where an integrated automatic system is used for the dissemination/display of meteorological information, it should be capable of accepting the manual insertion of data covering those meteorological elements which cannot be observed by automatic means.*

4.1.8 The observations shall form the basis for the preparation of reports to be disseminated at the aerodrome of origin and for reports to be disseminated beyond the aerodrome of origin.

4.1.9 Owing to the variability of meteorological elements in space and time, to limitations of observing techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a report shall be understood by the recipient to be the best approximation to the actual conditions at the time of observation.

Note.— Guidance on the operationally desirable and currently attainable accuracy of measurement or observation is given in Attachment A.

4.2 Agreement between air traffic services authorities and meteorological authorities

Recommendation.— *An agreement between the meteorological authority and the appropriate ATS authority should be established to cover, amongst other things:*

a) the provision in air traffic services units of displays related to integrated automatic systems;

b) the calibration and maintenance of these displays/instruments;

c) the use to be made of these displays/instruments by air traffic services personnel;

d) as and where necessary, supplementary visual observations (for example, of meteorological phenomena of operational significance in the climb-out and approach areas) if and when made by air traffic services personnel to update or supplement the information supplied by the meteorological station;

e) meteorological information obtained from aircraft taking off or landing (for example, on wind shear); and

f) if available, meteorological information obtained from ground weather radar.

Note.— Guidance on the subject of coordination between ATS and aeronautical meteorological services is contained in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services *(Doc 9377).*

4.3 Routine observations and reports

4.3.1 At aerodromes, routine observations shall be made throughout the 24 hours each day, except as otherwise agreed between the meteorological authority, the appropriate ATS authority and the operator concerned. Such observations shall be made at intervals of one hour or, if so determined by regional air navigation agreement, at intervals of one half-hour. At other aeronautical meteorological stations, such observations shall be made as determined by the meteorological authority taking into account the requirements of air traffic services units and aircraft operations.

4.3.2 Reports of routine observations shall be issued as:

a) local routine reports, only for dissemination at the aerodrome of origin, (intended for arriving and departing aircraft); and

b) METAR for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

Note.— Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local routine report, in accordance with Annex 11, 4.3.6.1 g).

4.3.3 At aerodromes that are not operational throughout 24 hours in accordance with 4.3.1, METAR shall be issued prior to the aerodrome resuming operations in accordance with regional air navigation agreement.

4.4 Special observations and reports

4.4.1 A list of criteria for special observations shall be established by the meteorological authority, in consultation with the appropriate ATS authority, operators and others concerned.

4.4.2 Reports of special observations shall be issued as:

a) local special reports, only for dissemination at the aerodrome of origin, (intended for arriving and departing aircraft); and

b) SPECI for dissemination beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

Note.— Meteorological information used in ATIS (voice-ATIS and D-ATIS) is to be extracted from the local special report, in accordance with Annex 11, 4.3.6.1 g).

4.4.3 At aerodromes that are not operational throughout 24 hours in accordance with 4.3.1, following the resumption of the issuance of METAR, SPECI shall be issued, as necessary.

4.5 Contents of reports

4.5.1 Local routine and special reports and METAR and SPECI shall contain the following elements in the order indicated:

a) identification of the type of report;

b) location indicator;

c) time of the observation;

d) identification of an automated or missing report, when applicable;

e) surface wind direction and speed;

f) visibility;

g) runway visual range, when applicable;

h) present weather;

i) cloud amount, cloud type (only for cumulonimbus and towering cumulus clouds) and height of cloud base or, where measured, vertical visibility;

j) air temperature and dew-point temperature; and

k) QNH and, when applicable, QFE (QFE included only in local routine and special reports).

Note.— The location indicators referred to under b) and their significations are published in Location Indicators *(Doc 7910).*

4.5.2 **Recommendation.—** *In addition to elements listed under 4.5.1 a) to k), local routine and special reports and METAR and SPECI should contain supplementary information to be placed after element k).*

4.5.3 Optional elements included under supplementary information shall be included in METAR and SPECI in accordance with regional air navigation agreement.

4.6 Observing and reporting meteorological elements

4.6.1 Surface wind

4.6.1.1 The mean direction and the mean speed of the surface wind shall be measured, as well as significant variations of the wind direction and speed, and reported in degrees true and kilometres per hour (or knots), respectively.

4.6.1.2 **Recommendation.—** *When local routine and special reports are used for departing aircraft, the surface wind observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the surface wind observations for these reports should be representative of the touchdown zone.*

4.6.1.3 **Recommendation.—** *For METAR and SPECI, the surface wind observations should be representative of conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.*

4.6.2 Visibility

4.6.2.1 The visibility as defined in Chapter 1 shall be measured or observed, and reported in metres or kilometres.

Note.— Guidance on the conversion of instrument readings into visibility is given in Attachment E.

4.6.2.2 **Recommendation.—** *When local routine and special reports are used for departing aircraft, the visibility observations for these reports should be representative of conditions along the runway; when local routine and special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the touchdown zone of the runway.*

4.6.2.3 **Recommendation.—** *For METAR and SPECI, the visibility observations should be representative of the aerodrome.*

4.6.3 Runway visual range

Note.— Guidance on the subject of runway visual range is contained in the Manual of Runway Visual Range Observing and Reporting Practices *(Doc 9328).*

4.6.3.1 Runway visual range as defined in Chapter 1 shall be assessed on all runways intended for Category II and III instrument approach and landing operations.

4.6.3.2 **Recommendation.—** *Runway visual range as defined in Chapter 1 should be assessed on all runways intended for use during periods of reduced visibility, including:*

a) precision approach runways intended for Category I instrument approach and landing operations; and

b) runways used for take-off and having high-intensity edge lights and/or centre line lights.

Note.— Precision approach runways are defined in Annex 14, Volume I, Chapter 1, under "Instrument runway".

4.6.3.3 The runway visual range, assessed in accordance with 4.6.3.1 and 4.6.3.2, shall be reported in metres throughout periods when either the visibility or the runway visual range is less than 1 500 m.

4.6.3.4 Runway visual range assessments shall be representative of:

a) the touchdown zone of the runway intended for non-precision or Category I instrument approach and landing operations;

b) the touchdown zone and the mid-point of the runway intended for Category II instrument approach and landing operations; and

c) the touchdown zone, the mid-point and stop-end of the runway intended for Category III instrument approach and landing operations.

4.6.3.5 The units providing air traffic service and aeronautical information service for an aerodrome shall be kept informed without delay of changes in the serviceability status of the automated equipment used for assessing runway visual range.

4.6.4 Present weather

4.6.4.1 The present weather occurring at the aerodrome and/or its vicinity shall be observed and reported as necessary.

4.6.4.2 **Recommendation.—** *For local routine and special reports, the present weather information should be representative of conditions at the aerodrome.*

4.6.4.3 **Recommendation.—** *For METAR and SPECI, the present weather information should be representative of conditions at the aerodrome and, for certain specified present weather phenomena, in its vicinity.*

4.6.4.4 **Recommendation.—** *Where observations are made using automatic observing systems, provision should be made for manual insertion of those present weather elements which cannot be determined adequately by that equipment.*

4.6.5 Clouds

4.6.5.1 Cloud amount, cloud type and height of cloud base shall be observed, and reported as necessary to describe the clouds of operational significance. When the sky is obscured, vertical visibility shall be observed and reported, where measured, in lieu of cloud amount, cloud type and height of cloud base. The height of cloud base and vertical visibility shall be reported in metres (or feet).

4.6.5.2 **Recommendation.—** *Cloud observations for local routine and special reports should be representative of the approach area.*

4.6.5.3 **Recommendation.—** *Cloud observations for METAR and SPECI should be representative of the aerodrome and its vicinity.*

4.6.5.4 **Recommendation.—** *Where observations of cloud amount and/or the height of cloud base are made using automatic observing systems, provision should be made for manual insertion of cloud amounts and, where appropriate, cloud type, together with the heights of those layers or masses not directly measurable by that equipment.*

4.6.6 Air temperature and dew-point temperature

4.6.6.1 The air temperature and the dew-point temperature shall be measured and reported in degrees Celsius.

4.6.6.2 **Recommendation.—** *Observations of air temperature and dew-point temperature for local routine and special reports and METAR and SPECI should be representative of the whole runway complex.*

4.6.7 Atmospheric pressure

The atmospheric pressure shall be measured, and QNH and QFE values shall be computed and reported in hectopascals.

4.6.8 Supplementary information

4.6.8.1 **Recommendation.—** *Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas. Where practicable, the information should identify the location of the meteorological condition.*

4.6.8.2 **Recommendation.—** *Where observations are made using automatic observing systems, provision should be made for manual insertion of information concerning significant meteorological conditions which cannot be determined adequately by that equipment.*

4.7 Reporting of meteorological information from automatic observing systems

Recommendation.— *METAR and SPECI from automatic observing systems should only be used during non-operational hours of the aerodrome. These METAR and SPECI should be identified with the word "AUTO".*

4.8 Observations and reports of volcanic activity

Recommendation.— *The occurrence of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud should be reported without delay to the associated air traffic services unit, aeronautical information services unit and meteorological watch office. The report should be made in the form of a volcanic activity report comprising the following information in the order indicated:*

a) message type, VOLCANIC ACTIVITY REPORT;

b) station identifier, location indicator or name of station;

c) date/time of message;

d) location of volcano and name if known; and

e) concise description of event including, as appropriate, level of intensity of volcanic activity, occurrence of an eruption and its date and time and the existence of a volcanic ash cloud in the area together with direction of ash cloud movement and height.

Note.— Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

CHAPTER 5. AIRCRAFT OBSERVATIONS AND REPORTS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 4.

5.1 Obligations of States

Each Contracting State shall arrange, according to the provisions of this chapter, for observations to be made by aircraft of its registry operating on international air routes and for the recording and reporting of these observations.

5.2 Types of aircraft observations

The following aircraft observations shall be made:

a) routine aircraft observations during en-route and climb-out phases of the flight; and

b) special and other non-routine aircraft observations during any phase of the flight.

5.3 Routine aircraft observations — designation

5.3.1 **Recommendation.—** *When air-ground data link is used and automatic dependent surveillance (ADS) is being applied, automated routine observations should be made every 15 minutes during the en-route phase and every 30 seconds during the climb-out phase for the first 10 minutes of the flight.*

5.3.2 When voice communications are used, routine observations shall be made during the en-route phase in relation to those air traffic services reporting points or intervals:

a) at which the applicable air traffic services procedures require routine position reports; and

b) which are those separated by distances corresponding most closely to intervals of one hour of flying time.

5.3.3 **Recommendation.—** *For helicopter operations to and from aerodromes on offshore structures, routine observations should be made from helicopters at points and times as agreed between the meteorological authorities and the helicopter operators concerned.*

5.3.4 In the case of air routes with high-density air traffic (e.g. organized tracks), an aircraft from among the aircraft operating at each flight level shall be designated, at approximately hourly intervals, to make routine observations in accordance with 5.3.1 or 5.3.2, as appropriate. The designation procedures shall be subject to regional air navigation agreement.

5.3.5 In the case of the requirement to report during the climb-out phase, an aircraft shall be designated, at approximately hourly intervals, at each aerodrome to make routine observations in accordance with 5.3.1.

5.4 Routine aircraft observations — exemptions

5.4.1 When voice communications are used, an aircraft shall be exempted from making the routine observations specified in 5.3.2 when:

a) the aircraft is not equipped with RNAV equipment; or

b) the flight duration is 2 hours or less; or

c) the aircraft is at a distance equivalent to less than one hour of flying time from the next intended point of landing; or

d) the altitude of the flight path is below 1 500 m (5 000 ft).

5.4.2 **Recommendation.—** *When voice communications are used, additional exemptions may be prescribed by regional air navigation agreement for flights over routes and areas with high-density air traffic and/or with adequate synoptic networks. Such procedures should take the form of exemption or designation procedures and should:*

a) make it possible for the minimum requirements for aircraft observations of all meteorological offices concerned to be met; and

b) be as simple as possible to implement and preferably not involving consideration of individual cases.

5.5 Special aircraft observations

Special observations shall be made by all aircraft whenever the following conditions are encountered or observed:

a) severe turbulence; or

b) severe icing; or

c) severe mountain wave; or

d) thunderstorms, without hail, that are obscured, embedded, widespread or in squall lines; or

e) thunderstorms, with hail, that are obscured, embedded, widespread or in squall lines; or

f) heavy duststorm or heavy sandstorm; or

g) volcanic ash cloud; or

h) pre-eruption volcanic activity or a volcanic eruption.

Note.— Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

In addition, in the case of transonic and supersonic flights:

i) moderate turbulence; or

j) hail; or

k) cumulonimbus clouds.

5.6 Other non-routine aircraft observations

When other meteorological conditions not listed under 5.5, e.g. wind shear, are encountered and which, in the opinion of the pilot-in-command, may affect the safety or markedly affect the efficiency of other aircraft operations, the pilot-in-command shall advise the appropriate air traffic services unit as soon as practicable.

Note.— Icing, turbulence and, to a large extent, wind shear, are elements which, for the time being, cannot be satisfactorily observed from the ground and for which in most cases aircraft observations represent the only available evidence.

5.7 Reporting of aircraft observations during flight

5.7.1 Aircraft observations shall be reported by air-ground data link. Where air-ground data link is not available or appropriate, aircraft observations during flight shall be reported by voice communications.

5.7.2 Aircraft observations shall be reported during flight at the time the observation is made or as soon thereafter as is practicable.

5.7.3 Aircraft observations shall be reported as air-reports.

5.8 Relay of air-reports by ATS units

The meteorological authority concerned shall make arrangements with the appropriate ATS authority to ensure that, on receipt by the ATS units of:

a) routine and special air-reports by voice communications, the ATS units relay them without delay to their associated meteorological watch office;

b) routine air-reports by data link communications, the ATS units relay them without delay to WAFCs; and

c) special air-reports by data link communications, the ATS units relay them without delay to their associated meteorological watch office and WAFCs.

5.9 Recording and post-flight reporting of aircraft observations of volcanic activity

Special aircraft observations of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud shall be recorded on the special air-report of volcanic activity form. A copy of the form shall be included with the flight documentation provided to flights operating on routes which, in the opinion of the meteorological authority concerned, could be affected by volcanic ash clouds.

CHAPTER 6. FORECASTS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 5.

6.1 Interpretation and use of forecasts

6.1.1 Owing to the variability of meteorological elements in space and time, to limitations of forecasting techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast shall be understood by the recipient to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time shall be understood to be the most probable time.

Note.— Guidance on the operationally desirable accuracy of forecasts is given in Attachment B.

6.1.2 The issue of a new forecast by a meteorological office, such as a routine aerodrome forecast, shall be understood to cancel automatically any forecast of the same type previously issued for the same place and for the same period of validity or part thereof.

6.2 Aerodrome forecasts

6.2.1 An aerodrome forecast shall be prepared by the meteorological office designated by the meteorological authority concerned.

6.2.2 An aerodrome forecast shall be issued at a specified time and consist of a concise statement of the expected meteorological conditions at an aerodrome for a specified period.

6.2.3 Aerodrome forecasts and amendments thereto shall be issued as TAF and include the following information in the order indicated:

a) identification of the type of forecast;

b) location indicator;

c) time of issue of forecast;

d) identification of a missing forecast, when applicable;

e) date and period of validity of forecast;

f) identification of a cancelled forecast, when applicable;

g) surface wind;

h) visibility;

i) weather;

j) cloud; and

k) expected significant changes to one or more of these elements during the period of validity.

Optional elements shall be included in TAF in accordance with regional air navigation agreement.

Note.— The visibility included in TAF refers to the forecast prevailing visibility.

6.2.4 Meteorological offices preparing TAF shall keep the forecasts under continuous review and, when necessary, shall issue amendments promptly. The length of the forecast messages and the number of changes indicated in the forecast shall be kept to a minimum.

6.2.5 TAF that cannot be kept under continuous review shall be cancelled.

6.2.6 **Recommendation.—** *The period of validity of a routine TAF should be not less than 9 hours nor more than 24 hours; this period should be determined by regional air navigation agreement. Routine TAF valid for less than 12 hours should be issued every 3 hours and those valid for 12 to 24 hours should be issued every 6 hours.*

6.3 Landing forecasts

6.3.1 A landing forecast shall be prepared by the meteorological office designated by the meteorological authority concerned; such forecasts are intended to meet requirements of local users and of aircraft within about one hour's flying time from the aerodrome.

6.3.2 Landing forecasts shall be prepared in the form of a trend forecast, as determined by regional air navigation agreement.

6.3.3 A trend forecast shall consist of a concise statement of the expected significant changes in the meteorological conditions at that aerodrome to be appended to a local routine or local special report, or a METAR or SPECI. The period of validity of a trend forecast shall be 2 hours from the time of the report which forms part of the landing forecast.

6.4 Forecasts for take-off

6.4.1 A forecast for take-off shall be prepared by the meteorological office designated by the meteorological authority concerned.

6.4.2 **Recommendation.—** *A forecast for take-off should refer to a specified period of time and should contain information on expected conditions over the runway complex in regard to surface wind direction and speed and any variations thereof, temperature, pressure (QNH), and any other elements as agreed locally.*

6.4.3 **Recommendation.—** *A forecast for take-off should be supplied to operators and flight crew members on request within the 3 hours before the expected time of departure.*

6.4.4 **Recommendation.—** *Meteorological offices preparing forecasts for take-off should keep the forecasts under continuous review and, when necessary, should issue amendments promptly.*

6.5 Area and route forecasts, other than forecasts issued within the framework of the world area forecast system

Note.— Provisions concerning forecasts issued within the framework of the world area forecast system are contained in Chapter 3 and Appendix 2 and those concerning area forecasts for low-level flights, under Section 6.6 and Appendix 5.

6.5.1 Area and route forecasts shall contain upper winds, upper-air temperatures, significant en-route weather phenomena and associated clouds. Other elements may be added as required. This information shall cover the flight operations for which they are intended in respect of time, altitude and geographical extent.

6.5.2 Meteorological offices preparing area and route forecasts shall keep the forecasts under continuous review and issue amendments as necessary.

6.6 Area forecasts for low-level flights

6.6.1 When the density of traffic operating below flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) warrants the routine issue and dissemination of area forecasts for such operations, the frequency of issue, the form and the fixed time or period of validity of those forecasts and the criteria of amendments thereto shall be determined by the meteorological authority in consultation with the users.

6.6.2 When the density of traffic operating below flight level 100 warrants the issuance of AIRMET information in accordance with 7.2.1, area forecasts for such operations shall be prepared in a format agreed upon between the meteorological authorities concerned. When abbreviated plain language is used, the forecast shall be prepared as a GAMET area forecast, employing approved ICAO abbreviations and numerical values. The area forecasts shall be issued to cover the layer between the ground and flight level 100 (or up to flight level 150 in mountainous areas, or higher, where necessary) and shall contain information on en-route weather phenomena hazardous to low-level flights, in support of the issuance of AIRMET information, and additional information required by low-level flights.

6.6.3 Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be issued every 6 hours for a period of validity of 6 hours and transmitted to meteorological offices concerned not later than one hour prior to the beginning of their validity period.

CHAPTER 7. SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 6.

7.1 SIGMET information

7.1.1 SIGMET information shall be issued by a meteorological watch office and shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which may affect the safety of aircraft operations, and of the development of those phenomena in time and space.

7.1.2 SIGMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.

7.1.3 The period of validity of a SIGMET message shall be not more than 6 hours, and preferably not more than 4 hours.

7.1.4 **Recommendation.—** *In the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, an outlook should be included giving information for up to 12 hours beyond the period of validity specified in 7.1.3, concerning the trajectory of the volcanic ash cloud and positions of the tropical cyclone centre.*

7.1.5 **Recommendation.—** *SIGMET messages issued in accordance with 7.1.4, concerning volcanic ash cloud and tropical cyclones should be based on advisory information provided by VAACs and TCACs respectively, designated by regional air navigation agreement.*

7.1.6 Close coordination shall be maintained between the meteorological watch office and the associated area control centre/flight information centre to ensure that information on volcanic ash included in SIGMET and NOTAM messages is consistent.

7.1.7 A SIGMET message relating to the expected occurrence of weather phenomena listed in Appendix 6, 1.1.4, with the exception of volcanic ash cloud and tropical cyclones, shall be issued not more than 6 hours, and preferably not more than 4 hours, before the expected time of occurrence of that phenomenon.

7.1.8 **Recommendation.—** *SIGMET messages concerning volcanic ash cloud or tropical cyclones expected to affect a flight information region should be issued up to 12 hours before the commencement of the period of validity or as soon as practicable if such advance warning of the existence of these phenomena is not available. SIGMET messages for volcanic ash and tropical cyclones should be updated at least every 6 hours.*

7.2 AIRMET information

7.2.1 AIRMET information shall be issued by a meteorological watch office in accordance with regional air navigation agreement, taking into account the density of air traffic operating below flight level 100. AIRMET information shall give a concise description in abbreviated plain language concerning the occurrence and/or expected occurrence of specified en-route weather phenomena, which have not been included in Section I of the area forecast for low-level flights issued in accordance with Chapter 6, Section 6.6 and which may affect the safety of low-level flights, and of the development of those phenomena in time and space.

7.2.2 AIRMET information shall be cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area.

7.2.3 The period of validity of an AIRMET message shall be not more than 6 hours, and preferably not more than 4 hours.

7.3 Aerodrome warnings

7.3.1 Aerodrome warnings shall be issued by the meteorological office designated by the meteorological authority concerned and shall give concise information of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.

7.3.2 **Recommendation.—** *Aerodrome warnings should be cancelled when the conditions are no longer occurring and/or no longer expected to occur at the aerodrome.*

7.4 Wind shear warnings

7.4.1 Wind shear warnings shall be prepared by the meteorological office designated by the meteorological authority concerned and shall give concise information of the observed or expected existence of wind shear which could adversely affect aircraft on the approach path or take-off path or during circling approach between runway level and 500 m (1 600 ft) above that level and aircraft on the runway during the landing roll or take-off run. Where local topography has been shown to produce significant wind shears at heights in excess of 500 m (1 600 ft) above runway level, then 500 m (1 600 ft) shall not be considered restrictive.

Note.— Guidance on the subject of wind shear is contained in the Manual on Wind Shear *(Doc 9817, in preparation).*

7.4.2 **Recommendation.—** *Wind shear warnings for arriving aircraft and/or departing aircraft should be cancelled when aircraft reports indicate that wind shear no longer exists, or alternatively, after an agreed elapsed time. The criteria for the cancellation of a wind shear warning should be defined locally for each aerodrome, as agreed between the meteorological authority, the appropriate ATS authority and the operators concerned.*

CHAPTER 8. AERONAUTICAL CLIMATOLOGICAL INFORMATION

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 7.

8.1 General provisions

Note.— In cases where it is impracticable to meet the requirements for aeronautical climatological information on a national basis, the collection, processing and storage of observational data may be effected through computer facilities available for international use, and the responsibility for the preparation of the required aeronautical climatological information may be delegated by agreement between the meteorological authorities concerned.

8.1.1 Aeronautical climatological information required for the planning of flight operations shall be prepared in the form of aerodrome climatological tables and aerodrome climatological summaries. Such information shall be supplied to aeronautical users as agreed between the meteorological authority and those users.

Note.— Climatological data required for aerodrome planning purposes are set out in Annex 14, Volume I, 3.1.3 and in Attachment A.

8.1.2 **Recommendation.—** *Aeronautical climatological information should normally be based on observations made over a period of at least five years and the period should be indicated in the information supplied.*

8.1.3 **Recommendation.—** *Climatological data related to sites for new aerodromes and to additional runways at existing aerodromes should be collected starting as early as possible before the commissioning of those aerodromes or runways.*

8.2 Aerodrome climatological tables

Recommendation.— *Each Contracting State should make arrangements for collecting and retaining the necessary observational data and have the capability:*

a) to prepare aerodrome climatological tables for each regular and alternate international aerodrome within its territory; and

b) to make available such climatological tables to an aeronautical user within a time period as agreed between the meteorological authority and that user.

8.3 Aerodrome climatological summaries

Recommendation.— *Aerodrome climatological summaries should follow the procedures prescribed by the World Meteorological Organization. Where computer facilities are available to store, process and retrieve the information, the summaries should be published, or otherwise made available to aeronautical users on request. Where such computer facilities are not available, the summaries should be prepared using the models specified by the World Meteorological Organization, and should be published and kept up to date as necessary.*

8.4 Copies of meteorological observational data

Each meteorological authority, on request and to the extent practicable, shall make available to any other meteorological authority, to operators and to others concerned with the application of meteorology to international air navigation, meteorological observational data required for research, investigation or operational analysis.

CHAPTER 9. SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 8.

9.1 General provisions

9.1.1 Meteorological information shall be supplied to operators and flight crew members for:

a) pre-flight planning by operators;

b) in-flight re-planning by operators using centralized operational control of flight operations;

c) use by flight crew members before departure; and

d) aircraft in flight.

9.1.2 Meteorological information supplied to operators and flight crew members shall cover the flight in respect of time, altitude and geographical extent. Accordingly, the information shall relate to appropriate fixed times, or periods of time, and shall extend to the aerodrome of intended landing, also covering the meteorological conditions expected between the aerodrome of intended landing and one alternate aerodrome designated by the operator. In addition, if agreed between the meteorological authority and the operator, information up to a further aerodrome shall be supplied.

9.1.3 Meteorological information supplied to operators and flight crew members shall include upper winds and upper-air temperatures, significant en-route weather phenomena, METAR and SPECI (including trend forecasts), TAF, forecasts for take-off, SIGMET information and those special air-reports not covered by a SIGMET, and AIRMET information, which are available at the meteorological office and which are relevant to the planned flight operations.

9.1.4 Where necessary, the meteorological authority of the State providing service for operators and flight crew members shall initiate coordinating action with the meteorological authorities of other States with a view to obtaining from them the reports and/or forecasts required.

9.1.5 Meteorological information shall be supplied to operators and flight crew members at the location to be determined by the meteorological authority, after consultation with the operators and at the time to be agreed upon between the meteorological office and the operator concerned. The service shall normally be confined to flights originating within the territory of the State concerned, unless otherwise agreed between the meteorological authority and the operator concerned. At an aerodrome without a meteorological office, arrangements for the supply of meteorological information shall be as agreed upon between the meteorological authority and the operator concerned.

9.2 Information for operators for pre-flight planning and for in-flight re-planning under centralized operational control

9.2.1 Meteorological information for pre-flight planning and in-flight re-planning by operators shall include any or all of the following information, as established by the meteorological authority in consultation with operators concerned:

a) current and forecast: upper winds, upper-air temperatures and humidity;

b) tropopause height and temperature, and direction, speed and height of maximum wind;

c) existing and expected significant en-route weather phenomena and amendments thereto;

d) a forecast for take-off;

e) METAR and, where available, SPECI (including trend forecasts) for the aerodrome of departure, take-off and en-route alternate aerodromes, the aerodrome of intended landing and destination alternate aerodromes, as determined by regional air navigation agreement;

f) TAF and amendments thereto for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes as determined by regional air navigation agreement;

g) SIGMET information and appropriate special air-reports relevant to the whole of the routes concerned as determined by regional air navigation agreement; and

Note.— Appropriate special air-reports will be those not already used in preparation of SIGMET messages.

h) AIRMET information for low-level flights as determined by regional air navigation agreement.

9.2.2 When upper-air information is supplied in chart form, it shall consist of charts for standard flight levels.

9.2.3 **Recommendation.—** *The upper wind and upper-air temperature information and the significant en-route weather information requested for pre-flight planning and in-flight re-planning by the operator should be supplied as soon as it becomes available, but not later than 3 hours before departure. Other meteorological information requested for pre-flight planning and in-flight re-planning by the operator should be supplied as soon as is practicable.*

9.3 Briefing, consultation and display

Note.— The requirements for the use of automated pre-flight information systems in providing briefing, consultation and display are given in 9.5.

9.3.1 Briefing and/or consultation shall be provided, on request, to flight crew members and/or other flight operations personnel. Its purpose shall be to supply the latest available information on existing and expected meteorological conditions along the route to be flown, at the aerodrome of intended landing, alternate aerodromes and other aerodromes as relevant, either to explain and amplify the information contained in the flight documentation or, if so agreed between the meteorological authority and the operator, in lieu of flight documentation.

9.3.2 Meteorological information used for briefing and consultation shall include any or all of the information listed in 9.2.1.

9.3.3 If the meteorological office expresses an opinion on the development of the meteorological conditions at an aerodrome which differs appreciably from the aerodrome forecast included in the flight documentation, the attention of flight crew members shall be drawn to the divergence. The portion of the briefing dealing with the divergence shall be recorded at the time of briefing and this record shall be made available to the operator.

9.3.4 The required briefing, consultation, display and/or flight documentation shall normally be provided by the meteorological office associated with the aerodrome of departure. At an aerodrome where these services are not available, arrangements to meet the requirements of flight crew members shall be as agreed upon between the meteorological authority and the operator concerned. In exceptional circumstances, such as an undue delay, the meteorological office associated with the aerodrome shall provide or, if that is not practicable, arrange for the provision of a new briefing, consultation and/or flight documentation as necessary.

9.3.5 **Recommendation.—** *The flight crew member or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the meteorological office at the time agreed upon between the meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the meteorological office should provide those services by telephone or other suitable telecommunications facilities.*

9.4 Flight documentation

Note.— The requirements for the use of automated pre-flight information systems in providing flight documentation are given in 9.5.

9.4.1 **Recommendation.—** *Flight documentation should cover the whole route to be flown and comprise information listed under 9.2.1 a), c) and e) to h). However, in accordance with regional air navigation agreement, or in the absence thereof when agreed between the meteorological authority and operator concerned, flight documentation for flights of two hours' duration or less, after a short stop or turnaround should be limited to the information operationally needed, but in all cases the flight documentation should at least comprise information on 9.2.1 e), f), g) and, if appropriate, h).*

9.4.2 **Recommendation.—** *Meteorological offices should provide information received within the framework of the world area forecast system for flight documentation. The flight documentation should be presented in the form of charts, tabular forms, or abbreviated plain-language texts. TAF should be presented in accordance with the template in Appendix 5 or in abbreviated plain-language text using a tabular presentation.*

Note.— Models of charts and forms for use in the preparation of flight documentation are given in Appendix 1. These models and methods for their completion are developed by the World Meteorological Organization on the basis of relevant operational requirements stated by the International Civil Aviation Organization.

9.4.3 Whenever it becomes apparent that the meteoroogical information to be included in the flight documentation will differ materially from that made available for pre-flight planning and in-flight re-planning, the operator shall be advised immediately and, if practicable, be supplied with the revised information as agreed between the operator and the meteorological office concerned.

9.4.4 **Recommendation.—** *Whenever necessary and possible, the flight documentation should be brought up to date, in writing or orally, before it is supplied to flight crew members. In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the meteorological office should, as agreed locally, issue the necessary amendment or updated information to the operator or to the local air traffic services unit, for transmission to the aircraft.*

9.4.5 **Recommendation.—** *The forms and charts included in flight documentation should be printed in English, French, Russian or Spanish; they should, wherever practicable, be completed in the language requested by the operator, preferably using one of those languages. Where appropriate, approved abbreviations should be used. The units employed for each element should be indicated; they should be in accordance with Annex 5.*

9.4.6 The meteorological authority shall retain information supplied to flight crew members, either as printed copies or in computer files, for a period of at least 30 days from the date of issue. This information shall be made available, on request, for inquiries or investigations and, for these purposes, shall be retained until the inquiry or investigation is completed.

9.5 Automated pre-flight information systems for briefing, consultation, flight planning and flight documentation

9.5.1 Where the meteorological authority uses automated pre-flight information systems to supply and display meteorological information to operators and flight crew members for self-briefing, flight planning and flight documentation purposes, the information supplied and displayed shall comply with the relevant provisions in 9.1 to 9.4 inclusive.

9.5.2 **Recommendation.—** *Automated pre-flight information systems providing for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned should be established by an agreement between the meteorological authority and the relevant civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with Annex 15, 3.1.1 c).*

Note.— The meteorological and aeronautical information services information concerned is specified in 9.1 to 9.4 and Appendix 8 and in Annex 15, 8.1 and 8.2, respectively.

9.5.3 Where automated pre-flight information systems are used to provide for a harmonized, common point of access to meteorological information and aeronautical information services information by operators, flight crew members and other aeronautical personnel concerned, the meteorological authority concerned shall remain responsible for the quality control and quality management of meteorological information provided by means of such systems in accordance with Chapter 2, 2.2.2.

Note.— The responsibilities relating to aeronautical information services information and the quality assurance of the information are given in Annex 15, Chapter 3.

9.6 Information for aircraft in flight

9.6.1 Meteorological information for use by aircraft in flight shall be supplied by a meteorological office to its associated air traffic services unit and through D-VOLMET or VOLMET broadcasts. Meteorological information for planning by the operator for aircraft in flight shall be supplied on request, as agreed between the meteorological authority or authorities and the operator concerned.

9.6.2 Meteorological information for use by aircraft in flight shall be supplied to air traffic services units in accordance with the specifications of Chapter 10.

9.6.3 Meteorological information shall be supplied through D-VOLMET or VOLMET broadcasts as determined by regional air navigation agreement, and in accordance with the specifications of Chapter 11.

CHAPTER 10. INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 9.

10.1 Information for air traffic services units

10.1.1 The meteorological authority shall designate a meteorological office to be associated with each air traffic services unit. The associated meteorological office shall, after coordination with the air traffic services unit, supply, or arrange for the supply of up-to-date meteorological information to the unit as necessary for the conduct of its functions.

10.1.2 **Recommendation.—** *The associated meteorological office for an aerodrome control tower or approach control office should be an aerodrome meteorological office.*

10.1.3 The associated meteorological office for a flight information centre or an area control centre shall be a meteorological watch office.

10.1.4 **Recommendation.—** *Where, owing to local circumstances, it is convenient for the duties of an associated meteorological office to be shared between two or more meteorological offices, the division of responsibility should be determined by the meteorological authority in consultation with the appropriate ATS authority.*

10.1.5 Any meteorological information requested by an air traffic services unit in connection with an aircraft emergency shall be supplied as rapidly as possible.

10.2 Information for search and rescue services units

Meteorological offices designated by the meteorological authority in accordance with regional air navigation agreement shall supply search and rescue services units with the meteorological information they require in a form established by mutual agreement. For that purpose, the designated meteorological office shall maintain liaison with the search and rescue services unit throughout a search and rescue operation.

10.3 Information for aeronautical information services units

The meteorological authority, in coordination with the appropriate civil aviation authority, shall arrange for the supply of up-to-date meteorological information to relevant aeronautical information services units, as necessary, for the conduct of their functions.

CHAPTER 11. REQUIREMENTS FOR AND USE OF COMMUNICATIONS

Note 1.— Technical specifications and detailed criteria related to this chapter are given in Appendix 10.

Note 2.— It is recognized that it is for each Contracting State to decide upon its own internal organization and responsibility for implementing the telecommunications facilities referred to in this chapter.

11.1 Requirements for communications

11.1.1 Suitable telecommunications facilities shall be made available to permit aerodrome meteorological offices and, as necessary, aeronautical meteorological stations to supply the required meteorological information to air traffic services units on the aerodromes for which those offices and stations are responsible, and in particular to aerodrome control towers, approach control offices and the aeronautical telecommunications stations serving these aerodromes.

Note.— Circuits of the aeronautical fixed service are used for the collection and regional and inter-regional exchanges of operational meteorological information as well as for access to international operational meteorological data banks. Three aeronautical fixed service satellite distribution systems providing for global coverage are used to support the regional and inter-regional exchanges of operational meteorological information. Provisions relating to the satellite distribution systems are given in Annex 10, Volume III, Part 1, 10.1 and 10.2.

11.1.2 Suitable telecommunications facilities shall be made available to permit meteorological watch offices to supply the required meteorological information to air traffic services and search and rescue services units in respect of the flight information regions, control areas and search and rescue regions for which those offices are responsible, and in particular to flight information centres, area control centres and rescue coordination centres and the associated aeronautical telecommunications stations.

11.1.3 Suitable telecommunications facilities shall be made available to permit world area forecast centres to supply the required world area forecast system products to meteorological offices, meteorological authorities and other users.

11.1.4 Telecommunications facilities between meteorological offices and, as necessary, aeronautical meteorological stations and aerodrome control towers or approach control offices shall permit communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds.

11.1.5 **Recommendation.—** *Telecommunications facilities between meteorological offices and flight information centres, area control centres, rescue coordination centres and aeronautical telecommunications stations should permit:*

a) communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds; and

b) printed communications, when a record is required by the recipients; the message transit time should not exceed 5 minutes.

Note.— In 11.1.4 and 11.1.5 "approximately 15 seconds" refers to telephony communications involving switchboard operation and "5 minutes" refers to printed communications involving retransmission.

11.1.6 **Recommendation.—** *The telecommunications facilities required in accordance with 11.1.4 and 11.1.5 should be supplemented, as and where necessary, by other forms of visual or audio communications, for example, closed-circuit television or separate information processing systems.*

11.1.7 **Recommendation.—** *As agreed between the meteorological authority and operators, provision should be made to enable operators to establish suitable telecommunications facilities for obtaining meteorological information from aerodrome meteorological offices or other appropriate sources.*

11.1.8 Suitable telecommunications facilities shall be made available to permit meteorological offices to exchange operational meteorological information with other meteorological offices.

11.1.9 **Recommendation.—** *The telecommunications facilities used for the exchange of operational meteorological information should be the aeronautical fixed service.*

11.2 Use of aeronautical fixed service communications — meteorological bulletins in alphanumeric format

Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service shall be originated by the appropriate meteorological office or aeronautical meteorological station.

Note.— Meteorological bulletins containing operational meteorological information authorized for transmission via the *aeronautical fixed service are listed in Annex 10, Volume II, Chapter 4, together with the relevant priorities and priority indicators.*

11.3 Use of aeronautical fixed service communications — world area forecast system products

Recommendation.— *World area forecast system products in digital form should be transmitted using binary data communications techniques. The method and channels used for the dissemination of the products should be as determined by regional air navigation agreement.*

11.4 Use of aeronautical mobile service communications

The content and format of meteorological information transmitted to aircraft and by aircraft shall be consistent with the provisions of this Annex.

11.5 Use of aeronautical data link service — contents of D-VOLMET

D-VOLMET shall contain current METAR and SPECI, together with trend forecasts where available, TAF and SIGMET, special air-reports not covered by a SIGMET and, where available, AIRMET.

Note.— The requirement to provide METAR and SPECI may be met by the data link-flight information service (D-FIS) application entitled "Data link-aerodrome routine meteorological report (D-METAR) service"; the requirement to provide TAF may be met by the D-FIS application entitled "Data link-aerodrome forecast (D-TAF) service"; and the requirement to provide SIGMET and AIRMET messages may be met by the D-FIS application entitled "Data link-SIGMET (D-SIGMET) service". The details of these data link services are specified in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

11.6 Use of aeronautical broadcasting service — contents of VOLMET broadcasts

11.6.1 Continuous VOLMET broadcasts, normally on very high frequencies (VHF), shall contain current METAR and SPECI, together with trend forecasts where available.

11.6.2 Scheduled VOLMET broadcasts, normally on high frequencies (HF), shall contain current METAR and SPECI, together with trend forecasts where available and, where so determined by regional air navigation agreement, TAF and SIGMET.

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART II

APPENDICES AND ATTACHMENTS

APPENDIX 1. FLIGHT DOCUMENTATION — MODEL CHARTS AND FORMS

(See Chapter 9 of this Annex.)

MODEL A — Aerodrome forecasts
Example 1 — Tabular form
Example 2 — TAF

MODEL TA — Tabular forecast of en-route conditions
Example 1 — Low level
Example 2 — Medium level

MODEL TB — Tabular forecast of upper winds and upper-air temperatures
Example — Spot locations

MODEL IS — Upper wind and temperature chart for standard isobaric surface
Example 1 — Arrows, feathers and pennants (Mercator projection)
Example 2 — Arrows, feathers and pennants (Polar stereographic projection)

MODEL SWH — Significant weather chart (high level)
Example 1 — Mercator projection
Example 2 — Polar stereographic projection
Example 3 — Polar stereographic projection (showing the jet stream vertical extent and crossing jet stream depictions)

Note.— In accordance with Appendix 8, 4.3.1.1 m) additional information related to volcanic ash should be placed at the side of the charts.

MODEL SWM — Significant weather chart (medium level)

MODEL SWL — Significant weather chart (low level)
Example 1
Example 2

MODEL VAG — Volcanic ash advisory information in graphical format

MODEL SN — Sheet of notations used in flight documentation

Model A. Aerodrome forecasts
Example 1 — Tabular form

ISSUED BY . . . . METEOROLOGICAL OFFICE DATE . . . . TIME . . . . (UTC)

HEIGHTS ABOVE AERODROME ELEVATION

Aerodrome	*Date and time of issue*	*Period of validity (UTC)*	*Type and time of change*	*Surface wind mean direction (degrees true) mean wind speed maximum wind speed*	*Prevailing visibility*	*Weather*	*Cloud*		*Forecast temperature (degrees Celsius)*	*Remarks*
							Lowest layer amount, height of base (feet) and type (if CB)	*Higher layers amount, height of base (feet) and type (if CB)*		
MOMBASA	150350	06–06	TEMPO 09–12	150/15 KT VRB/20 KT MAX 30 KT	10 KM 200 M	HVY SHRA	FEW 1500 SCT 1000 CB	BKN 1500	MAX 30 AT 1200 Z MIN 20 AT 0400 Z	
NAIROBI	142140	03–15	PROB 40 TEMPO 03–05 BECMG 05–06	060/05 KT VRB/03 KT 060/10 KT	2 000 M 500 M 10 KM	FG NSW	OVC 0200 SCT 1500		N/A	EXTRACTED FROM TAF 00–24
KHARTOUM	150400	12–18	PROB 30 TEMPO 12–15	030/05 KT 030/20 KT	10 KM 100 M	MOD BLSA	SCT 2500		MAX 30 AT 1300 Z	EXTRACTED FROM TAF 06–06
CAIRO	150345	06–06		060/10 KT	C A V O K				MAX 25 AT 1400 Z MIN 06 AT 0500 Z	
ROME	151120	12–06	FM 1400 FM 1800	270/10 KT 270/10 KT 330/15 KT	2 000 M 5 000 M 10 KM	HVY DZRA MOD RA NSW	BKN 500 BKN 1200 BKN 2500	OVC 1500 OVC 2000	MAX 06 AT 1500 Z MIN MS 02 AT 0400 Z	TAF 06–06 AMENDED

Model A. Aerodrome forecasts
Example 2 — TAF

ISSUED BY . . . . METEOROLOGICAL OFFICE (DATE, TIME UTC) . . . .

INTENSITY

"–" (light); no indicator (moderate); "+" (heavy, or well-developed in the case of dust/sand whirls (dust devils) and funnel clouds) are used to indicate the forecast intensity of certain phenomena

DESCRIPTORS

MI — shallow	DR — low drifting	SH — shower(s)	FZ — freezing (supercooled)
BC — patches	BL — blowing	TS — thunderstorm	
PR — partial			

FORECAST WEATHER ABBREVIATIONS

DZ — drizzle	BR — mist	PO — dust/sand whirls (dust devils)
RA — rain	FG — fog	SQ — squall
SN — snow	FU — smoke	FC — funnel cloud(s) (tornado or waterspout)
SG — snow grains	VA — volcanic ash	SS — sandstorm
IC — ice crystals (diamond dust)	DU — widespread dust	DS — duststorm
PL — ice pellets	SA — sand	
GR — hail	HZ — haze	
GS — small hail and/or snow pellets		

EXAMPLES

+SHRA	— heavy shower of rain	TSSN	— thunderstorm with moderate snow
FZDZ	— moderate freezing drizzle	SNRA	— moderate snow and rain
+TSSNGR	— thunderstorm with heavy snow and hail		

SELECTED ICAO LOCATION INDICATORS

CYUL Montreal/Pierre Elliot Trudeau Intl	KJFK New York/John F. Kennedy Intl	RJTT Tokyo Intl
EDDF Frankfurt/Main	LFPG Paris/Charles de Gaulle	SBGL Rio de Janeiro/Galeão Intl
EGLL London/Heathrow	NZAA Auckland Intl	YSSY Sydney/Kingsford Smith Intl
HKJK Nairobi/Jomo Kenyatta	OBBI Bahrain Intl	ZBAA Beijing/Capital

RJTT	122130Z	130024 VRB03KT 4000 SCT025 BECMG 0305 9999 T30/12Z T20/06Z =
EGLL	090845Z	091212 27010KT 9999 SCT020 FM2100 30015KT 3000 FZDZ BKN006 FM0000 30015KT 0800 +RASN BKN004 BECMG 0305 33020KT 5000 NSW SCT020 BECMG 0709 9999 =
LFPG	160910Z	161212 10008KT CAVOK FM2000 VRB03KT 8000 SCT012 FM0400 VRB03KT 0800 FG FM0900 10008KT CAVOK =
OBBI	030300Z	030624 03010KT 9999 SCT010 PROB30 TEMPO 0915 03030KT 0500 BLSA FM1800 VRB02KT 8000 SCT020 =
HKJK	280215Z	280624 06010KT 9999 SCT025 TEMPO 1216 3000 SHRA BKN015 PROB40 TEMPO 1416 VRB20G30KT +TSRA SCT010CB BKN015 =

Model TA. Tabular forecast of en-route conditions
Example 1 — Low level

DATE . . . . **HEIGHTS IN FEET ABOVE MSL**

ROUTE FROM . . . . . BIGGIN HILL . . . . **TO** . . . . AMSTERDAM . . . . **VIA** . . . . . AIRWAYS . . . . .

VALID FOR DEPARTURE BETWEEN . . . . 1500 . . . . **UTC AND** . . . . . 1700 . . . . **UTC AND**
FOR ARRIVAL BETWEEN . . . . 1700 . . . . **UTC AND** . . . . . 2100 . . . . **UTC**

SPECIAL FEATURES OF THE METEOROLOGICAL SITUATION:

ACTIVE COLD FRONT FROM HUMBER TO CHANNEL ISLES AT 1000 UTC MOVING EAST AT 20 KNOTS TO LIE NORTH/SOUTH ACROSS TRACK ABOUT 40 NM WEST OF AMSTERDAM BY 1900 UTC.

ZONE	**LONDON** **02° E**	**AMSTERDAM**
UPPER WINDS **(DEGREES TRUE AND KNOTS) 10 000 ft** **TEMPERATURES 5 000 ft** **(DEGREES CELSIUS) 2 000 ft**	280/30 MS 12 290/25 MS 03 290/20 PS 03	250/45 MS 09 240/35 00 230/30 PS 06
CLOUD	SCT CU $\frac{XXX}{1500}$ BKN SC $\frac{5000}{2500}$ BKN AC LYR $\frac{XXX}{8000}$	ISOL EMBD CB $\frac{XXX}{1000}$ BKN ST $\frac{800}{500}$ OVC SC AS LYR $\frac{XXX}{2000}$
SURFACE VISIBILITY	1 500 M IN SHOWERS	4 000 M IN MODERATE RAIN AND 1 000 M IN THUNDERSTORMS
SIGNIFICANT WEATHER	MODERATE OCNL SEVERE ICING $\frac{10000}{3500}$	ISOL THUNDERSTORMS MODERATE OCNL SEVERE ICING $\frac{XXX}{5000}$ MODERATE OCNL SEVERE TURBULENCE IN FRONTAL ZONE $\frac{XXX}{1000}$
HEIGHT OF 0°C ISOTHERM	3500	5000
FORECAST LOWEST QNH (hPa)	1008	1004

Issued by . . . . **at** . . . . **UTC on** . . . . **20** . . . . **by** . . . . **Forecaster.**

Notes: 1. Positive and negative values are indicated by the prefix “PS” (plus) and “MS” (minus), respectively.
2. When a single numerical value of an element is given in a forecast it is to be interpreted as representing the most probable mean of a range of values which the element may assume during the period of the forecast.

Abbreviations: SKC — 0 oktas, FEW — 1 to 2 oktas, SCT — 3 to 4 oktas, BKN — 5 to 7 oktas, OVC — 8 oktas, LYR — Layered, LOC — Locally, ISOL — Isolated, OCNL — Occasional, FRQ — Frequent, EMBD — Embedded.

Model TA. Tabular forecast of en-route conditions
Example 2 — Medium level

DATE . . . . **HEIGHTS IN PRESSURE ALTITUDE IN HUNDREDS OF FEET**		
ROUTE FROM . . . BIGGIN HILL . . . . . . **TO** . . . AMSTERDAM . . . . **VIA** . . . . AIRWAYS . .		
VALID FOR DEPARTURE BETWEEN . . . 1500 . . . . **UTC AND** . . . . . 1700 . . . . **UTC AND** **FOR ARRIVAL BETWEEN** . . . . 1700 . . . . **UTC AND** . . . . . 2100 . . . . **UTC**		
SPECIAL FEATURES OF THE METEOROLOGICAL SITUATION (SURFACE CENTRES AND FRONTS): **ACTIVE COLD FRONT FROM HUMBER TO CHANNEL ISLES AT 1000 UTC MOVING EAST AT 20 KNOTS TO LIE NORTH/SOUTH ACROSS TRACK ABOUT 40 NM WEST OF AMSTERDAM BY 1900 UTC.**		
ZONE	**LONDON** **02° E**	**AMSTERDAM**
UPPER WINDS **(DEGREES TRUE AND KNOTS)** **FL 240** **TEMPERATURES** **FL 180** **(DEGREES CELSIUS)** **FL 100**	260/40 MS 40 270/35 MS 26 280/30 MS 12	240/60 MS 36 240/50 MS 24 250/45 MS 09
SIGNIFICANT WEATHER **AND ASSOCIATED CLOUD**	MODERATE TURBULENCE $\frac{180}{XXX}$	ISOL THUNDERSTORMS MODERATE TO SEVERE ICING AND TURBULENCE $\frac{240}{XXX}$
*** TROPOPAUSE HEIGHT**	————	————
*** JET STREAM**	————	————

* Above planned cruise level if not specified.

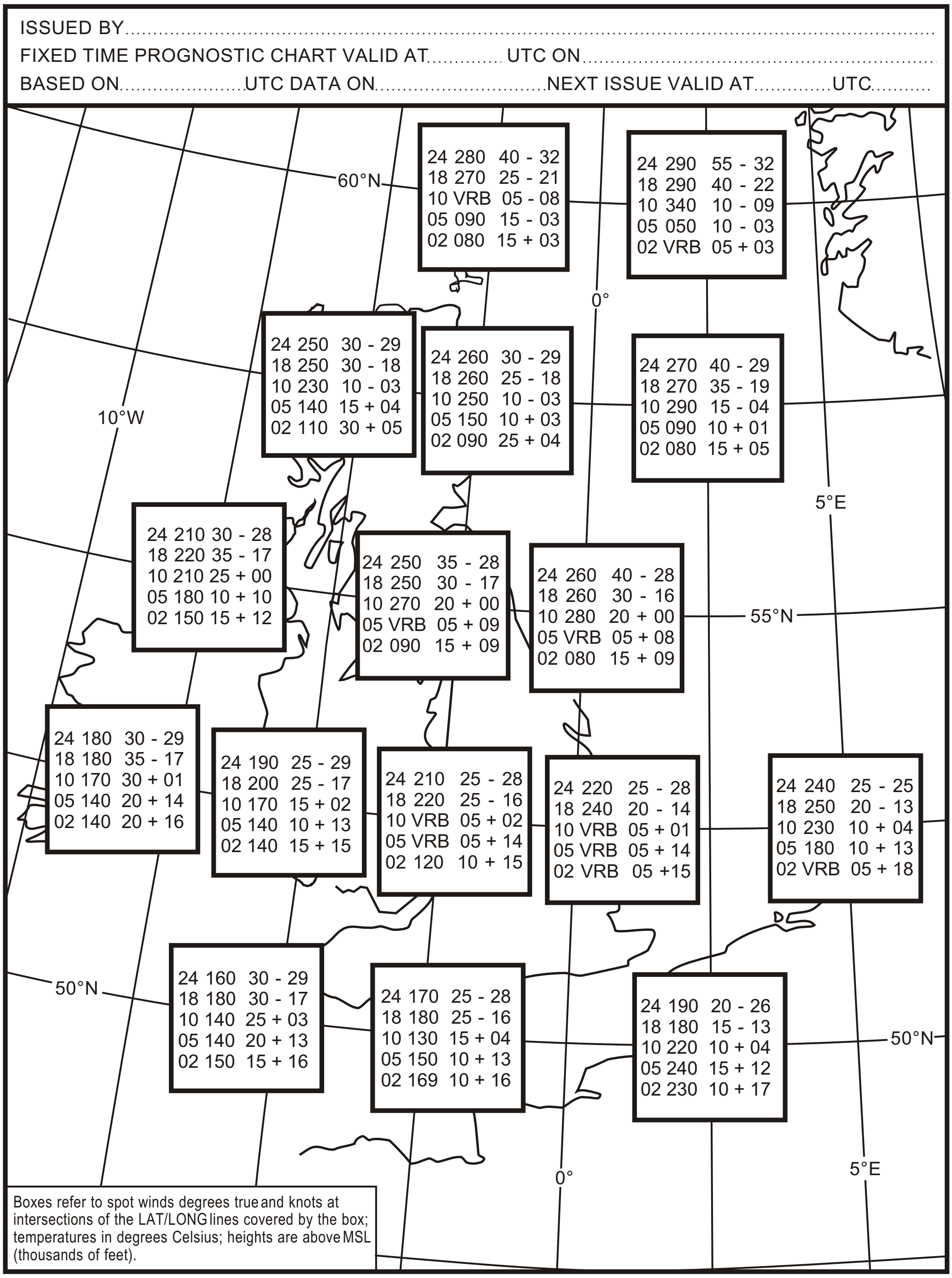
Issued by . . . . **at** . . . . **UTC on** . . . . **20** . . . . **by** . . . . **Forecaster.**

Notes:
1. Pressure altitude is the height in feet of a level in the standard atmosphere above the datum level corresponding to a pressure of 1 013.2 hPa.
2. Positive and negative values are indicated by the prefix "PS" (plus) and "MS" (minus) respectively.
3. Only cloud associated with significant weather is shown. Low stratus and fog, when expected, will be shown for terminal areas in appropriate aerodrome forecasts.
4. When a single numerical value of an element is given in a forecast, it is to be interpreted as representing the most probable mean of a range of values which the element may assume during the period of the forecast.

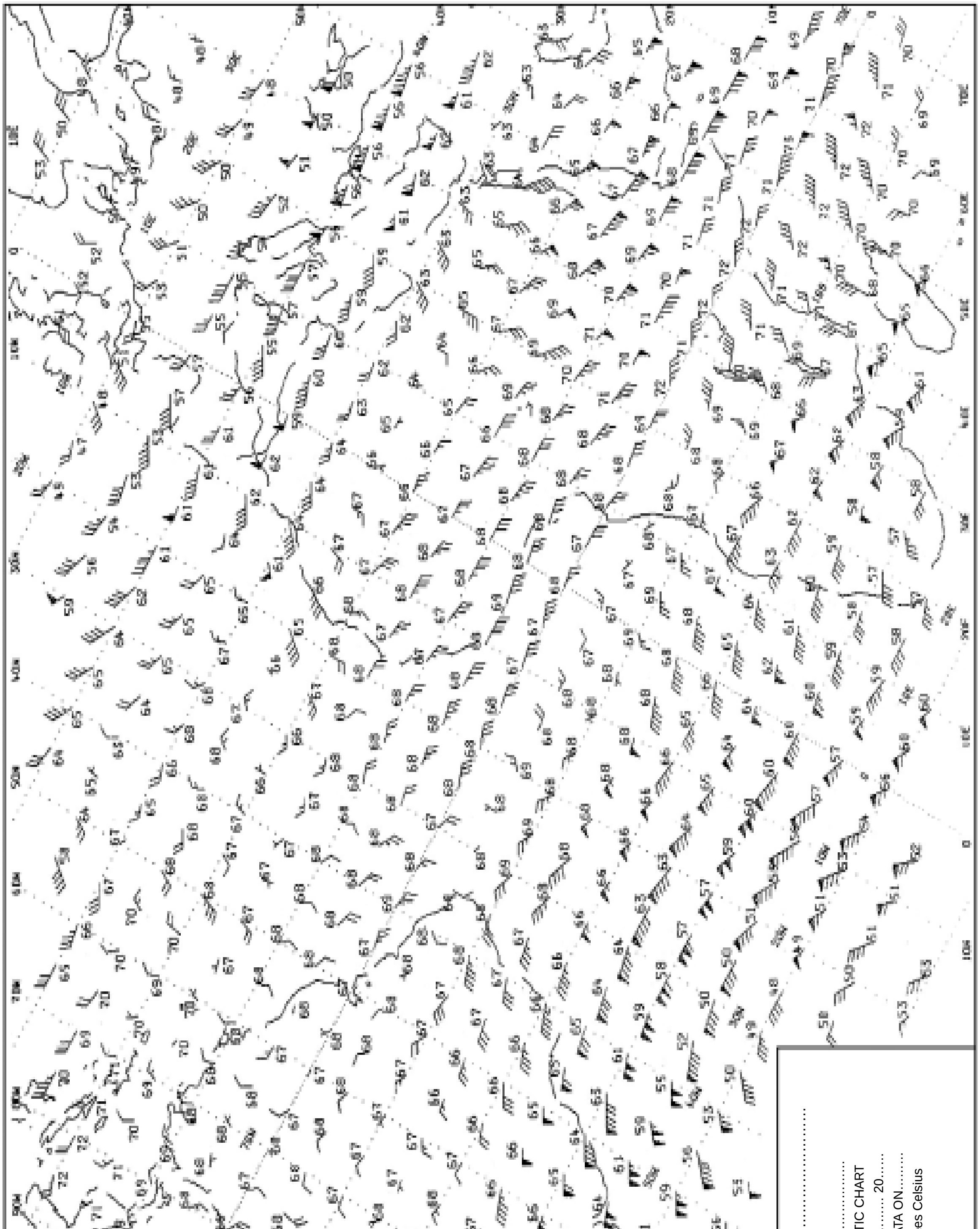
Abbreviations: SKC — 0 oktas, FEW — 1 to 2 oktas, SCT — 3 to 4 oktas, BKN — 5 to 7 oktas, OVC — 8 oktas, LYR — Layered, LOC — Locally, ISOL — Isolated, OCNL — Occasional, FRQ — Frequent, EMBD — Embedded.

Annex 3 — Meteorological Service for International Air Navigation *Appendix 1*

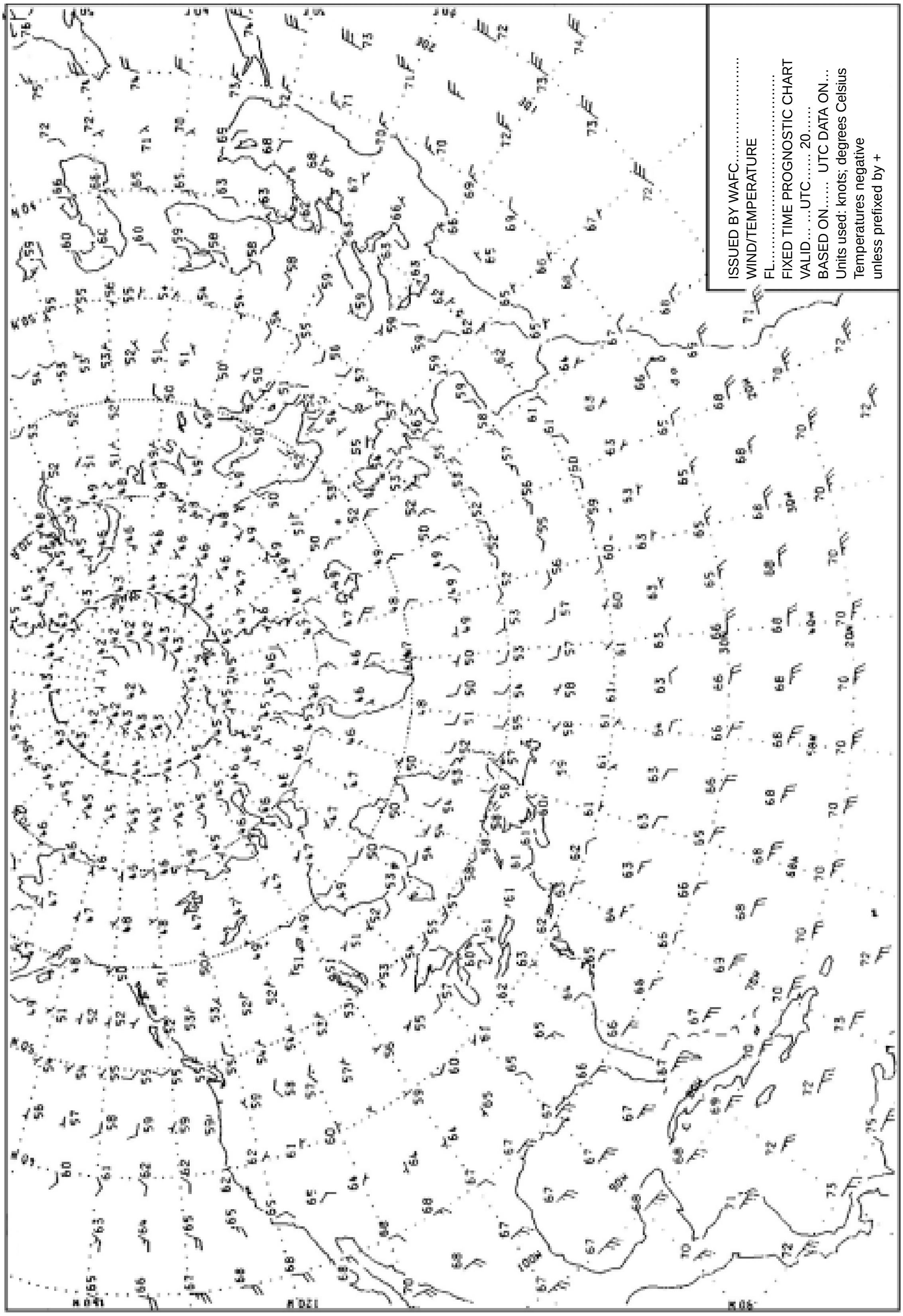
Model TB. Tabular forecast of upper winds and upper-air temperatures
Example — Spot locations



Model IS. Upper wind and temperature chart for standard isobaric surface
Example 1 — Arrows, feathers and pennants (Mercator projection)

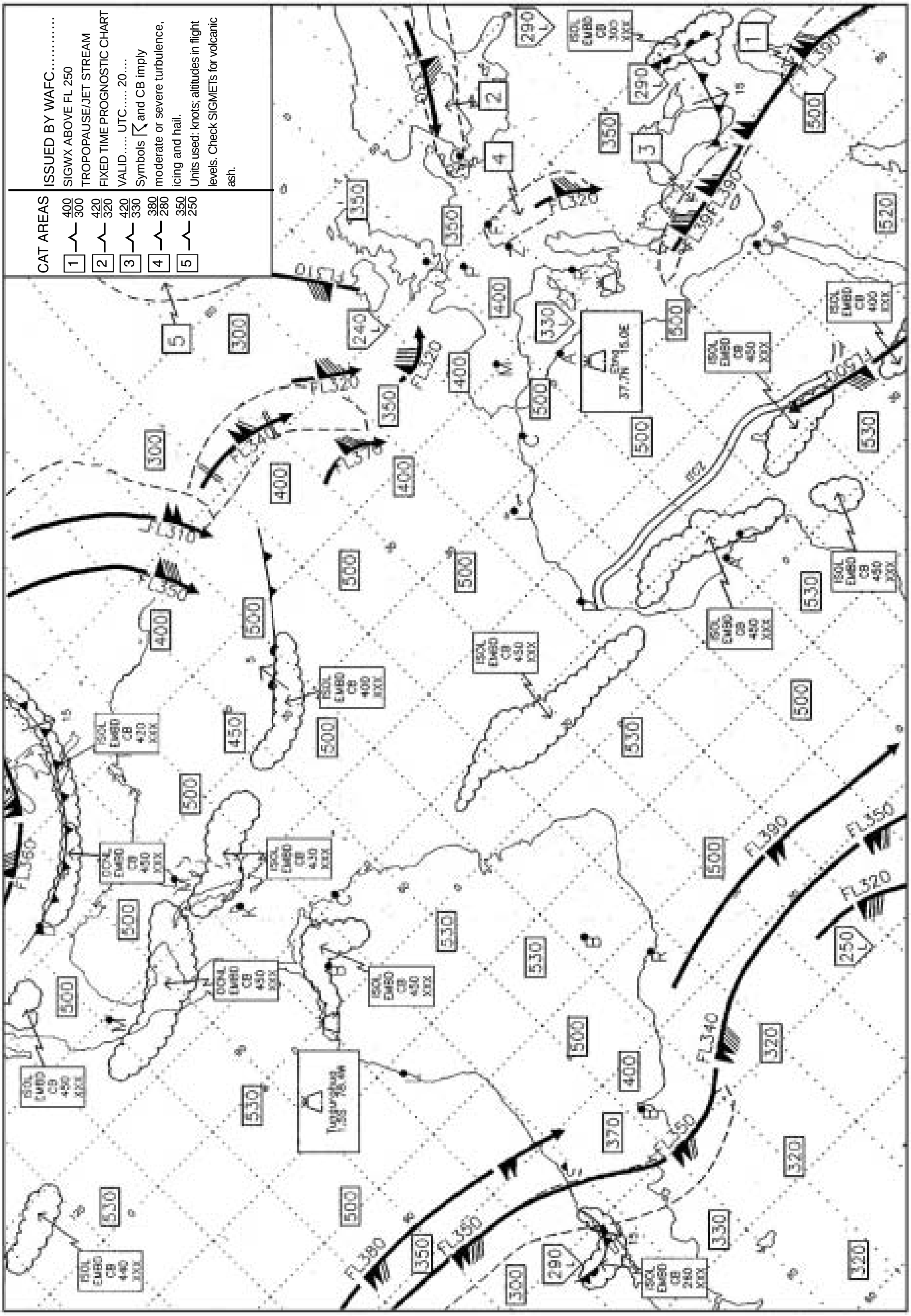


Model IS. Upper wind and temperature chart for standard isobaric surface
Example 2 — Arrows, feathers and pennants (Polar stereographic projection)



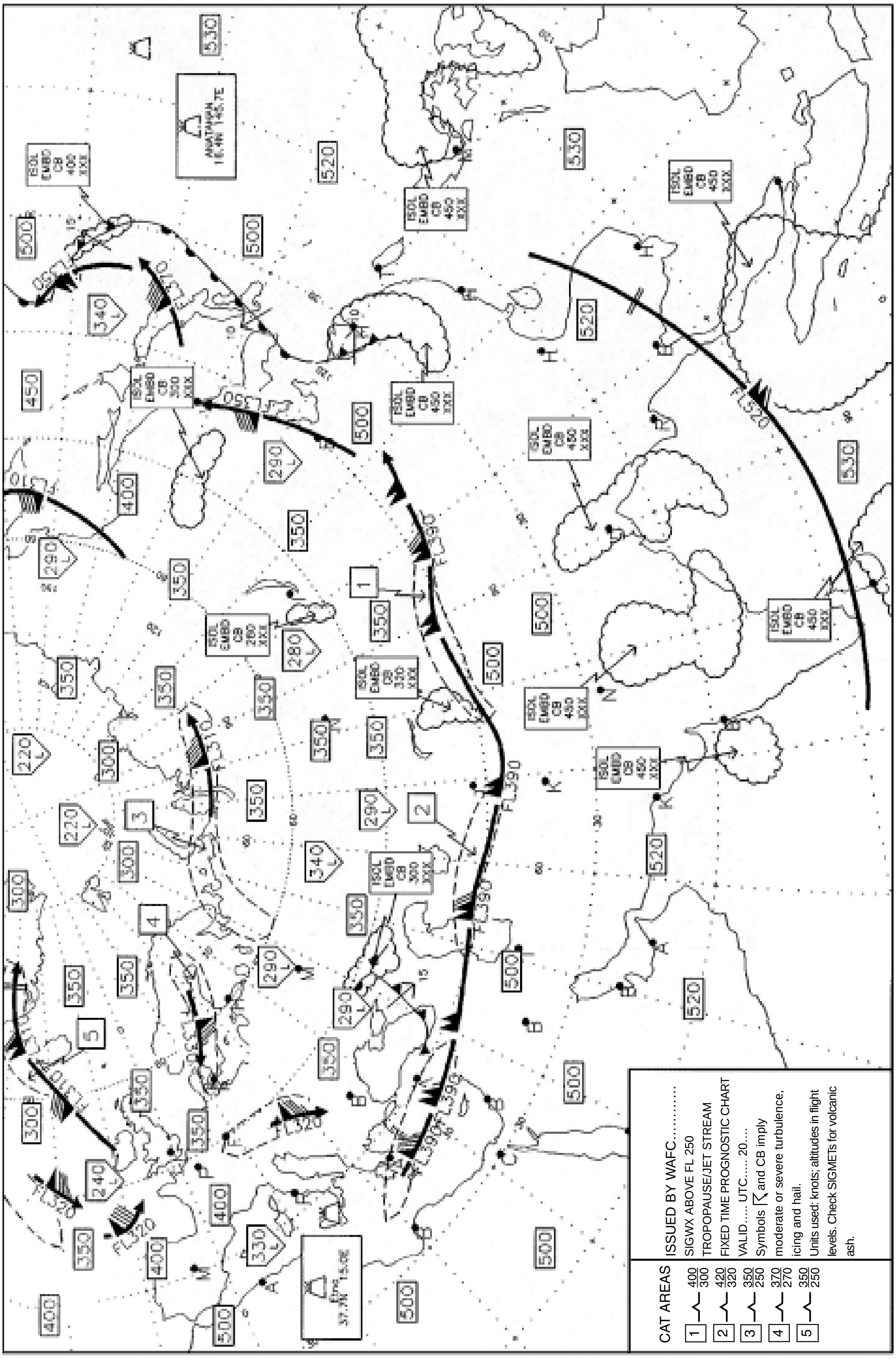
Appendix 1 *Annex 3 — Meteorological Service for International Air Navigation*

Model SWH. Significant weather chart (high level)
Example 1 — Mercator projection



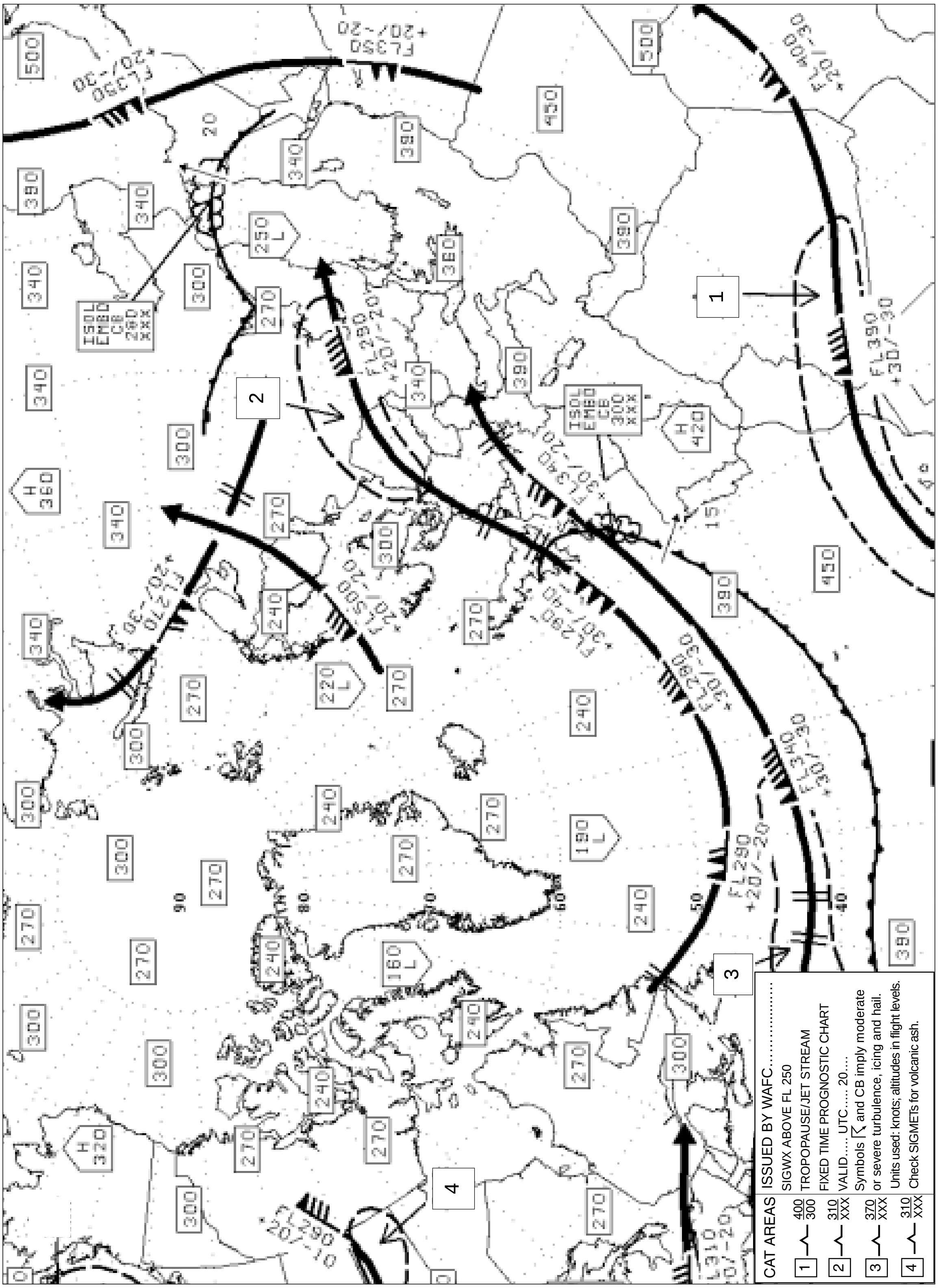
Annex 3 — Meteorological Service for International Air Navigation **Appendix 1**

Model SWH. Significant weather chart (high level)
Example 2 — Polar stereographic projection



Model SWH. Significant weather chart (high level)

Example 3 — Polar stereographic projection (showing the jet stream vertical extent and crossing jet stream depictions)



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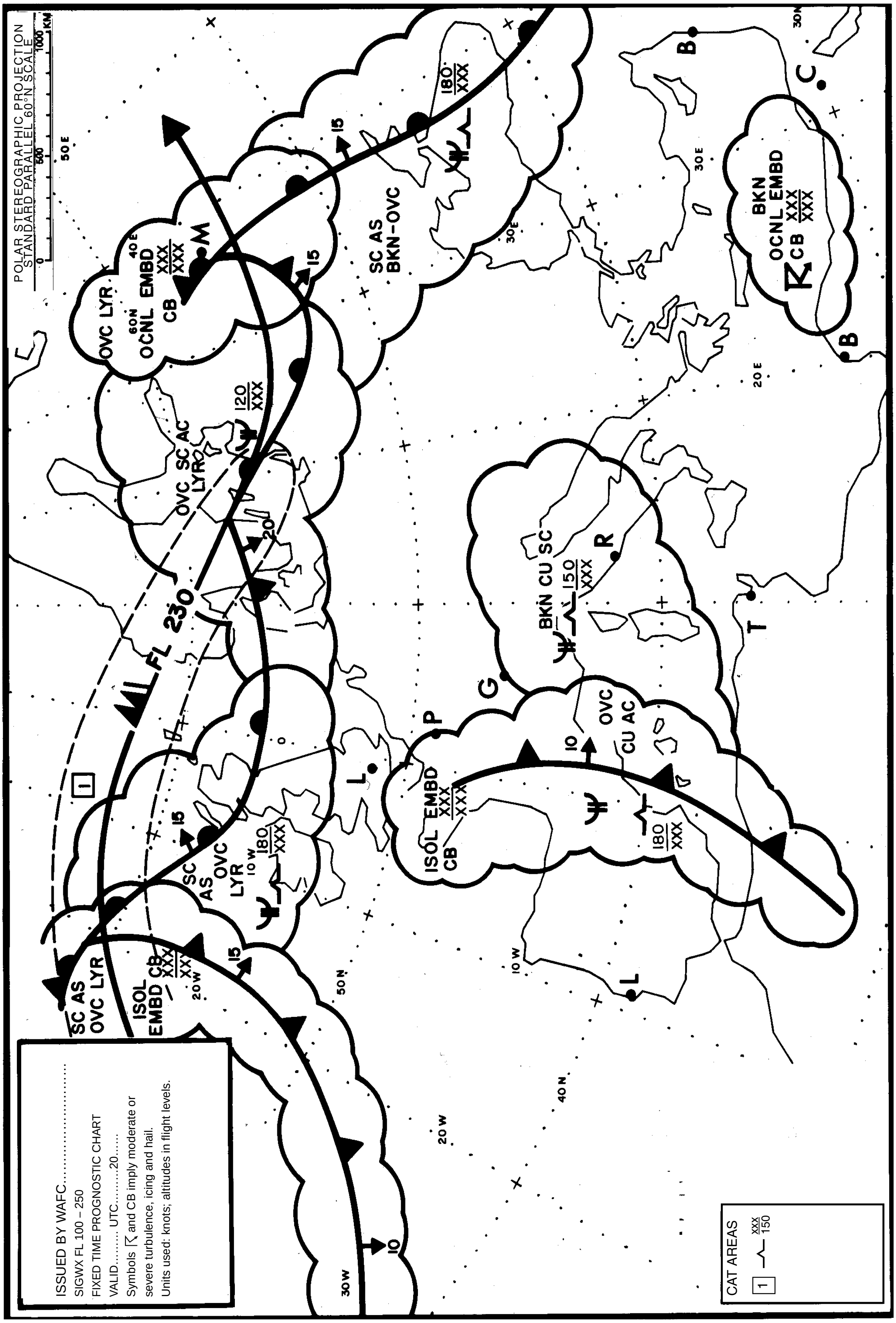
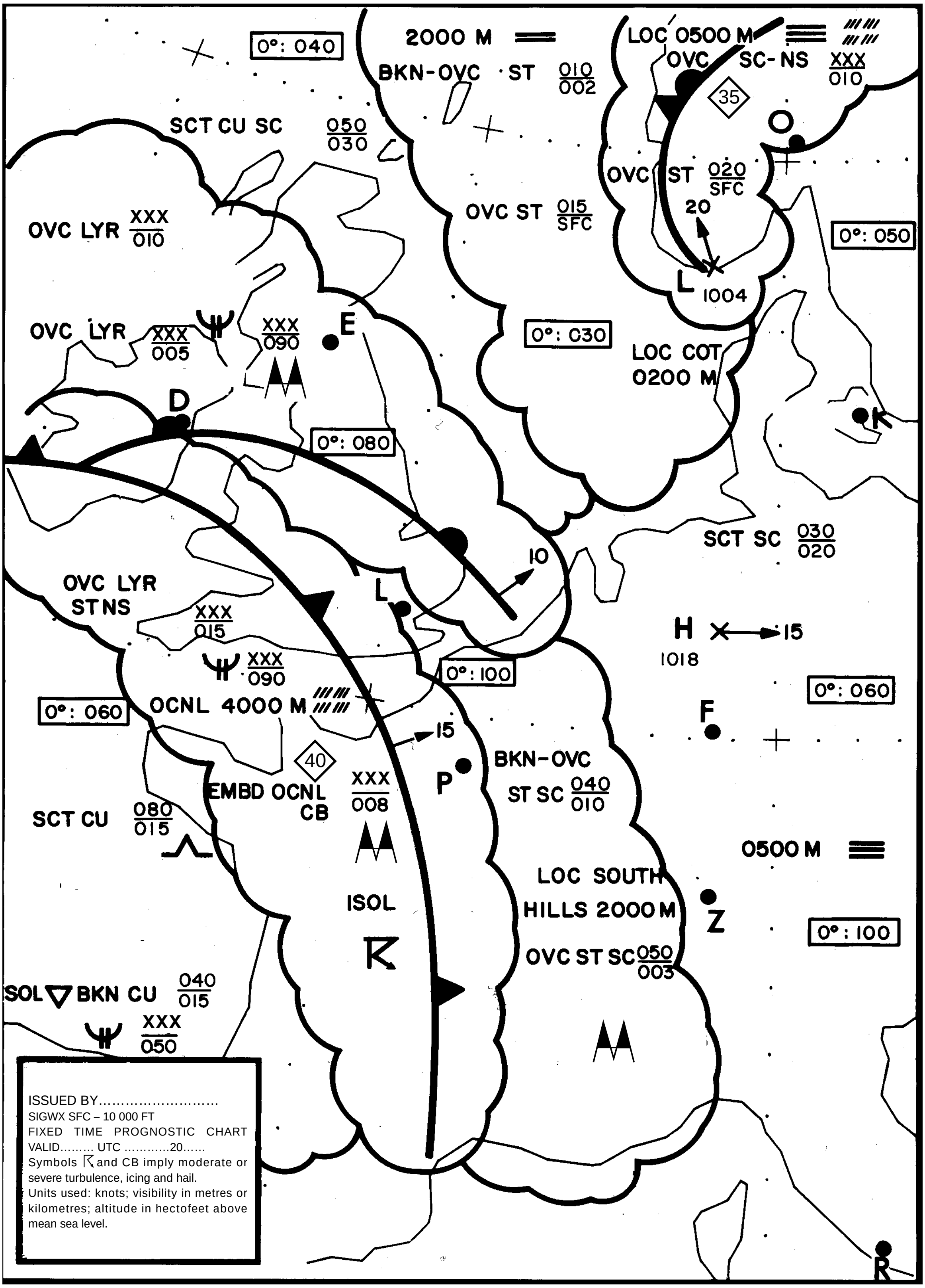


Model SWM. Significant weather chart (medium level)

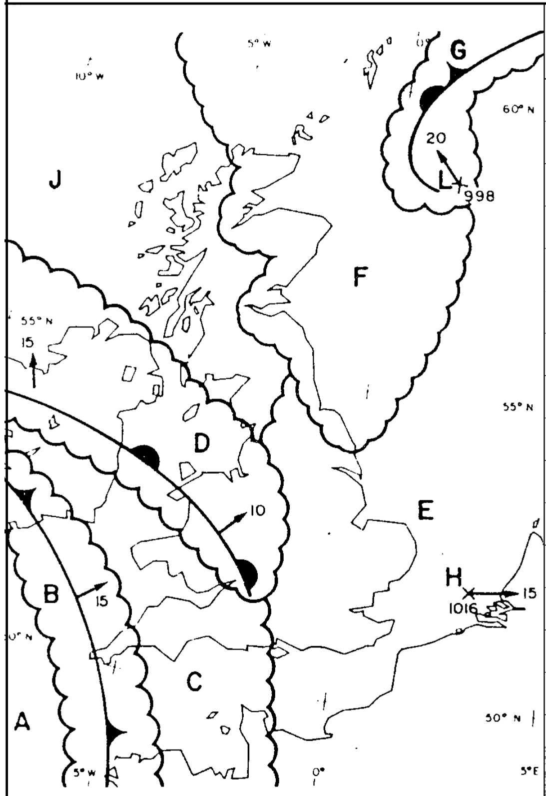
Appendix 1 *Annex 3 — Meteorological Service for International Air Navigation*

Model SWL. Significant weather chart (low level)
Example 1



Model SWL. Significant weather chart (low level)
Example 2

FIXED TIME PROGNOSTIC CHART VALID …………… UTC……………… 20… BASED ON ……… UTC DATA ON…………………



VARIANT	VIS	SIGNIFICANT WEATHER	CLOUD, TURBULENCE, ICING	0°C
AREA A			SCT CU 025/080	50
ISOL			BKN CU 015/XXX 050/XXX	
AREA B			OVC LYR ST NS 015/XXX 050/XXX	50
OCNL	4000	HEAVY RAIN	EMBD CB 008/XXX	
ISOL	1000	THUNDERSTORM		
AREA C			BKN to OVC ST SC 010/040	100
LOC SOUTH COT HILLS	2000	DRIZZLE	OVC ST SC 003/050	
AREA D			OVC LYR SC NS 010/XXX	90
LOC NORTH	4500	RAIN	OVC LYR ST NS 005/XXX 090/XXX	
AREA E			SCT SC 020/030	40
LOC LAND	0500	FOG		
AREA F	2000	MIST	BKN to OVC ST 002/010	30
LOC COT HILLS	0200	FOG	OVC ST SFC/015	
AREA G	4500	RAIN	OVC CU SC NS 010/XXX 030/XXX	30
LOC NORTH	0500	FOG	OVC ST SFC/010	
AREA J			SCT CU SC 030/050	40
LOC HILLS NORTH			BLW 070	

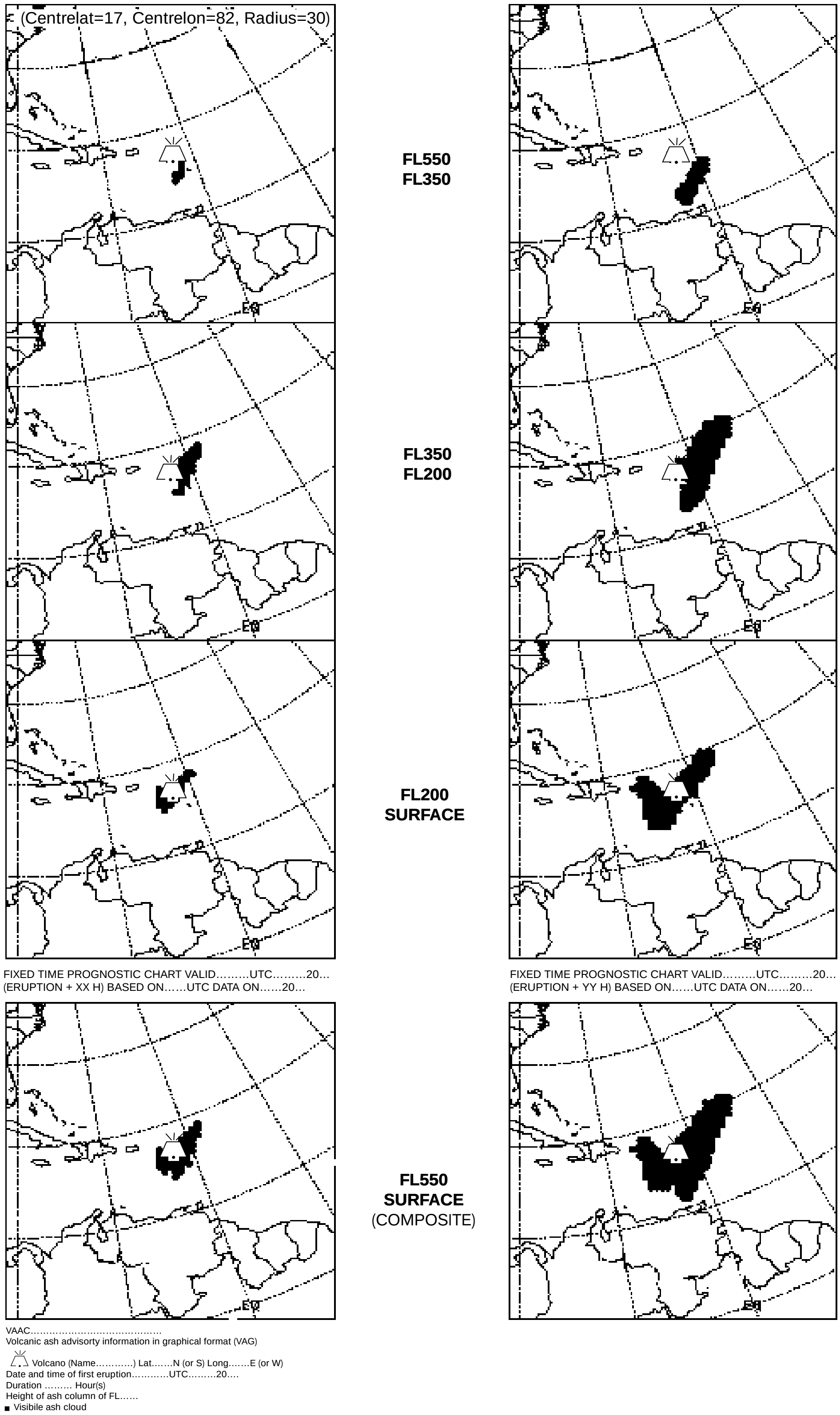
SIGWX SFC – 10 000 FT
ISSUED BY ………………………… AT ……… UTC

Notes:
1. Pressure in hPa and speeds in knots.
2. Vis in m included if less than 5 000 m. implies vis 200 m or less.
3. Altitude in hectofeet above MSL XXX = above 10 000 ft.
4. and CB imply MOD/SEV icing and turbulence.
5. Only significant weather and/or weather phenomena causing visibility reduction below 5 000 m included.

REMARKS:
EAST TO NE GALES SHETLAND TO HEBRIDES - SEVERE MOUNTAIN WAVES NW SCOTLAND -
FOG PATCHES EAST ANGLIA - WDSPR FOG OVER NORTH FRANCE, BELGIUM AND THE NETHERLANDS

Appendix 1 *Annex 3 — Meteorological Service for International Air Navigation*

Model VAG. Volcanic ash advisory information in graphical format



Model SN. Sheet of notations used in flight documentation

1. Symbols for significant weather

	Thunderstorms		Drizzle
	Tropical cyclone		Rain
	Severe squall line*		Snow
	Moderate turbulence		Shower / Hail
	Severe turbulence		Widespread blowing snow
	Mountain waves		Severe sand or dust haze
	Moderate aircraft icing		Widespread sandstorm or dust storm
	Severe aircraft icing		Widespread haze
	Widespread fog		Widespread mist
	Radioactive materials in the atmosphere**		Widespread smoke
	Volcanic eruption***		Freezing precipitation ****
	Mountain obscuration		Visible ash cloud *****

* In flight documentation for flights operating up to Fl 100. This symbol refers to "squall line".

** The following information should be included at the side of the chart: radioactive materials symbol; latitude/longitude of accident site; date and time of accident; check NOTAM for further infomation.

*** The following information should be included at the side of the chart: volcanic eruption symbol; name and international number of volcano (if known); latitude/longitude; date and time of the first eruption (if known);
Check SIGMETs and NOTAM or ASHTAM for volcanic ash.

**** This symbol does not refer to icing due to precipitation coming into contact with an aircraft which is at a very low temperature.

***** Visible ash cloud symbol applies only to model VAG not to SIGWX charts.

NOTE: Height indications between which phenomena are expected, top above base as per chart legend.

2. Fronts and convergence zones and other symbols used

	Cold front at the surface	FL 270	Position, speed and level of max. wind
	Warm front at the surface		Convergence line
	Occluded front at the surface	0°:100	Freezing level
	Quasi-stationary front at the surface		Intertropical convergence zone
H 460	Tropopause High	10	State of the sea
270 L	Tropopause Low	18	Sea-surface temperature
380	Tropopause Level	40	Widespread Strong surface wind *

FL 300 FL 340

Wind arrows indicate the maximum wind in jet and the flight level at which it occurs. Significant changes (speed of 20 knots or more, 3 000 ft (less if practicable) in flight level) are marked by the double bar. In the example, at the double bar the wind speed is 225 km/h (120 kt).

The heavy line delineating the jet axis begins/ends at the points where a wind speed of 150 km/h (80 kt) is forecast.

* This symbol refers to widespread surface wind speeds exceeding 60 km/h (30 kt).

3. Abbreviations used to describe clouds

3.1 Type

CI – Cirrus
CC – Cirrocumulus
CS – Cirrostratus
AC – Altocumulus
AS – Altostratus
NS – Nimbostratus
SC – Stratocumulus
ST – Stratus
CU – Cumulus
CB – Cumulonimbus

3.2 Amount

Clouds except CB
SKC – sky clear (0/8)
FEW – few (1/8 to 2/8)
SCT – scattered (3/8 to 4/8)
BKN – broken (5/8 to 7/8)
OVC – overcast (8/8)

CB only
ISOL – individual CBs (isolated)
OCNL – well-separated CBs (occasional)
FRQ – CBs with little or no separation (frequent)
EMBD – CBs embedded in layers of other clouds or concealed by haze (embedded)

3.3 Heights

Heights are indicated on SWH and SWM charts in flight levels (FL), top over base.
When XXX is used, tops or bases are outside the layer of the atmosphere to which the chart applies.
In SWL charts:
i) Heights are indicated as altitudes above mean sea level;
ii) The abbreviation SFC is used to indicate ground level.

4. Depicting of lines and systems on specific charts

4.1 Models SWH and SWM — Significant weather charts (high and medium)

Scalloped line – demarcation of areas of significant weather
Heavy broken line – delineation of area of CAT
Heavy solid line interrupted by wind arrow and flight level – position of jet stream axis with indication of wind direction, speed in kt or km/h and height in flight levels. The vertical extent of the jet stream is indicated (in flight levels) below the flight level, e.g. FL 270 accompanied by +20/–30 indicates that the height of the jet extends from FL 240 to FL 290.
Figures on arrows – speed in kt or km/h of movements of frontal system
Flight levels inside small rectangles – height in flight levels of tropopause at spot locations, e.g. $\boxed{340}$. Low and high points of the tropopause topography are indicated by the letters L or H, respectively, inside a pentagon with the height in flight levels.

4.2 Model SWL — Significant weather charts (low level)

X – position of pressure centres given in hectopascals
L – centre of low pressure
H – centre of high pressure
Scalloped lines – demarcation of area of significant weather
Dashed lines – altitude of 0°C isotherm in feet (hectofeet) or metres
NOTE: 0°C level may also be indicated by $\boxed{0^\circ : 060}$, i.e. 0°C level is at an altitude of 6 000 ft
Figures on arrows – speed in kt or km/h of movement of frontal systems, depressions or anticyclones
Figure inside the state of the sea symbol – total wave height in feet or metres
Figure inside the sea-surface temperature symbol – sea-surface temperature in °C
Figures inside the strong surface wind symbol – wind in kt or km/h

4.3 Arrows, feathers and pennants

Arrows indicate direction. Number of pennants and/or feathers correspond to speed.
Example:

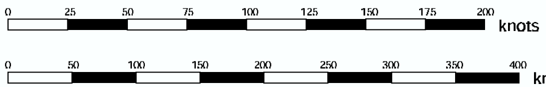
270°/115 kt (equivalent to 213 km/h)
Pennants correspond to 50 kt or 93 km/h
Feathers correspond to 10 kt or 18 km/h
Half-feathers correspond to 5 kt or 9 km/h

Conversion of knots into kilometres per hour

knots	0	1	2	3	4	5	6	7	8	9
	Kilometres per hour									
00	0	1.85	3.70	5.56	7.41	9.26	11.11	12.96	14.82	16.67
10	18.52	20.37	22.22	24.08	25.93	27.78	29.63	31.48	33.34	35.19
20	37.04	38.89	40.74	42.60	44.45	46.30	48.15	50.00	51.86	53.71
30	55.56	57.41	59.26	61.12	62.97	64.82	66.67	68.52	70.38	72.23
40	74.08	75.93	77.78	79.64	81.49	83.34	85.19	87.04	88.90	90.75
50	92.60	94.45	96.30	98.16	100.01	101.86	103.71	105.56	107.42	109.27
60	111.12	112.97	114.82	116.68	118.53	120.38	122.23	124.08	125.94	127.79
70	129.64	131.49	133.34	135.20	137.05	138.90	140.75	142.60	144.46	146.31
80	148.16	150.01	151.86	153.72	155.57	157.42	159.27	161.12	162.98	164.83
90	166.68	168.53	170.38	172.24	174.09	175.94	177.79	179.64	181.50	183.35
100	185.20	187.05	188.90	190.76	192.61	194.46	196.31	198.16	200.02	201.87
110	203.72	205.57	207.42	209.28	211.13	212.98	214.83	216.68	218.54	220.39
120	222.24	224.09	225.94	227.80	229.65	231.50	233.35	235.20	237.06	238.91
130	240.76	242.61	244.46	246.32	248.17	250.02	251.87	253.72	255.58	257.43
140	259.28	261.13	262.98	264.84	266.69	268.54	270.39	272.24	274.10	275.95
150	277.80	279.65	281.50	283.36	285.21	287.06	288.91	290.76	292.62	294.47
160	296.32	298.17	300.02	301.88	303.73	305.58	307.43	309.28	311.14	312.99
170	314.84	316.69	318.54	320.40	322.25	324.10	325.95	327.80	329.66	331.51
180	333.36	335.21	337.06	338.92	340.77	342.62	344.47	346.32	348.18	350.03
190	351.88	353.73	355.58	357.44	359.29	361.14	362.99	364.84	366.70	368.55

kt:	200	210	220	230	240	250	260	270	280	290
km/h:	370.40	388.92	407.44	425.96	444.48	463.00	481.52	500.04	518.56	537.08
kt:	300	310	320	330	340	350	360	370	380	390
km/h:	555.60	574.12	592.64	611.16	629.68	648.20	666.72	685.24	703.76	722.28
kt:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	
km/h:	0.19	0.37	0.56	0.74	0.93	1.11	1.30	1.48	1.67	

1 knot = 1.852 kilometres per hour



APPENDIX 2. TECHNICAL SPECIFICATIONS RELATED TO WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

(See Chapter 3 of this Annex.)

1. WORLD AREA FORECAST SYSTEM

1.1 Formats and codes

WAFCs shall adopt uniform formats and codes for the supply of forecasts and amendments.

1.2 Upper-air wind, temperature and humidity information

1.2.1 The forecasts of upper winds; upper-air temperatures; and humidity; direction, speed and height of maximum winds and tropopause heights and temperatures prepared four times daily by a WAFC shall be valid for 6, 12, 18, 24, 30 and 36 hours after the time (0000, 0600, 1200 and 1800 UTC) of the synoptic data on which the forecasts were based and shall be available for start of transmission in the above order not later than 6 hours after standard time of observation.

1.2.2 **Recommendation.—** *The grid point forecasts prepared by a WAFC should comprise:*

a) wind and temperature data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) and 450 (150 hPa);

b) tropopause height and temperature, and direction, speed and height of maximum wind;

c) humidity data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) and 180 (500 hPa); and

d) wind and temperature data for flight levels 530 (100 hPa) and 600 (70 hPa) when and where required.

1.2.3 The foregoing grid point forecasts shall be issued by a WAFC in binary code form using the GRIB code form prescribed by WMO.

Note 1.— The GRIB code form is contained in WMO Publication No. 306, Manual on Codes, *Volume I.2, Part B — Binary Codes.*

Note 2.— WAFCs continue to issue forecasts of upper-air wind and temperature in chart form in accordance with regional air navigation plans until 1 July 2005.

1.2.4 The foregoing grid point forecasts shall be prepared by a WAFC in a fixed grid with a horizontal resolution of 140 km.

Note.— 140 km represents a distance of about 1.25° of latitude.

1.3 Significant weather information

1.3.1 Forecasts of significant weather phenomena prepared by WAFCs shall be issued four times a day for fixed valid times of 0000, 0600, 1200 and 1800 UTC. The transmission of each forecast shall be completed as soon as technically feasible but at least 12 hours before its validity time.

1.3.2 Forecasts of significant weather phenomena shall be issued in binary code form, using the BUFR code form prescribed by WMO.

Note 1.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, *Volume I.2, Part B — Binary Codes.*

Note 2.— WAFCs continue to issue forecasts of significant weather in chart form in accordance with regional air navigation plans until 1 July 2005.

1.3.3 Forecasts of significant weather phenomena shall include all the items listed in Appendix 8, 4.3.1.1. The forecasts shall be issued for the following flight levels:

a) between flight levels 250 to 630; and

b) between flight levels 100 to 250 for limited geographical areas, as determined by regional air navigation agreement. If the average elevation of the topography of the area could extend a significant topographical effect to flight level 100, a higher level should be specified for the base of the charts, in consultation with the WAFC concerned, and in accordance with regional air navigation agreement.

1.3.4 **Recommendation.—** *Amendments to forecasts of significant weather phenomena should be issued with the minimum possible delay in accordance with the criteria in 1.4 and supplied in the form of amended BUFR files.*

1.4 Criteria for amendments to WAFS products

Recommendation.— *WAFCs should apply the following criteria for the amendment of significant en-route weather forecasts:*

SWH forecasts:
turbulence, and occasional, frequent or embedded cumulonimbus
Newly expected occurrence or non-occurrence

SWM forecasts:
aircraft icing, turbulence, cumulonimbus, and sandstorms/ duststorms
Newly expected occurrence or non-occurrence

Volcanic eruptions or the accidental release of radioactive materials into the atmosphere, of significance to aircraft operations:
Inclusion or removal of volcanic activity symbol, or radiation symbol.

2. METEOROLOGICAL OFFICES

2.1 Use of WAFS products

2.1.1 The extent to which an aerodrome meteorological office prepares forecasts and/or makes use of products from WAFCs and other sources shall be determined by the meteorological authority concerned.

2.1.2 **Recommendation.—** *Aerodrome meteorological offices should use output products of the world area forecast system in the preparation of flight documentation.*

2.1.3 In order to ensure uniformity and standardization of flight documentation, the WAFS GRIB and BUFR data received shall be decoded into standard WAFS charts in accordance with relevant provisions in this Annex, and the content and identification of the originator of the WAFS forecasts shall not be amended.

2.2 Notification of WAFC concerning significant discrepancies

Meteorological offices using WAFS GRIB and/or BUFR data shall notify the WAFC concerned immediately if significant discrepancies in accordance with 1.4 are detected or reported in respect of WAFS data and products. The WAFC receiving the message shall acknowledge its receipt to the originator, together with a brief comment on the report and any action taken, using the same means of communication employed by the originator. If it is considered necessary to issue an amendment, an appropriate ADMIN message shall be transmitted to all users through satellite broadcasts.

Note 1.— There is no requirement for meteorological offices to report incidents of radiological emergencies.

Note 2.— Guidance on reporting significant discrepancies is provided in the Manual of Aeronautical Meteorological Practice *(Doc 8896).*

3. METEOROLOGICAL WATCH OFFICES

3.1 Use of WAFS products

The extent to which a meteorological watch office makes use of products from WAFCs and other sources shall be determined by the meteorological authority concerned.

4. VOLCANIC ASH ADVISORY CENTRES (VAAC)

4.1 Volcanic ash advisory information

4.1.1 **Recommendation.—** *The advisory information on volcanic ash issued in abbreviated plain language, using approved ICAO abbreviations and numerical values of self-explanatory nature, should be in accordance with the template shown in Table A2-1. When no approved ICAO abbreviations are available, English plain language text, to be kept to a minimum, should be used.*

4.1.2 **Recommendation.—** *The volcanic ash advisory information listed in Table A2-1, when issued in graphical format, should be as specified in Appendix 1. When issued in binary format, the BUFR code form should be used.*

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes*, Volume I.2, Part B — Binary Codes.*

5. STATE VOLCANO OBSERVATORIES

5.1 Information from State volcano observatories

Recommendation.— *The information required to be sent by State volcano observatories to their associated ACCs, MWO and VAAC should comprise for:*

a) significant pre-eruption volcanic activity: the date/time (UTC) of report; name and, if known, number of the volcano; location (latitude/longitude); and description of volcanic activity; and

b) volcanic eruption: the date/time (UTC) of report and time of eruption (UTC) if different from time of report; name and, if known, number of the volcano; location (latitude/longitude); and description of the eruption including whether an ash column was ejected and, if so, an estimate of height of ash column and the extent of any visible volcanic ash cloud, during and following an eruption.

Note.— Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

6. TROPICAL CYCLONE ADVISORY CENTRES (TCAC)

6.1 Tropical cyclone advisory information

6.1.1 **Recommendation.—** *The advisory information on tropical cyclones should be in accordance with the template shown in Table A2-2.*

6.1.2 **Recommendation.—** *When the tropical cyclone advisory information is issued in binary format, the BUFR code form should be used.*

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes*, Volume I.2, Part B — Binary Codes.*

Table A2-1. Template for advisory message for volcanic ash

Key: M = inclusion mandatory, part of every message;
O = inclusion optional;
= = a double line indicates that the text following it should be placed on the subsequent line

Note 1.— The ranges and resolutions for the numerical elements included in advisory messages for volcanic ash are shown in Appendix 6, Table A6-4.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Note 3.— Inclusion of a "colon" after each element heading is mandatory.

Note 4.— The numbers 1 to 18 are included only for clarity and they are not part of the advisory message, as shown in the example.

	Element	*Detailed content*	*Template(s)*		*Examples*	
1	Identification of the type of message (M)	Type of message	VOLCANIC ASH ADVISORY		VOLCANIC ASH ADVISORY	
2	Time of origin (M)	Year, month, day, time in UTC *or* day, month, year, time in UTC	ISSUED:	nnnnnnnn/nnnnZ *or* nn*month*[1]nnnn/nnnnZ	ISSUED: ISSUED:	20000402/0700Z 02APR2000/0700Z
3	Name of VAAC (M)	Name of VAAC	VAAC:	nnnnnnnnnnnn	VAAC:	TOKYO
4	Name of volcano (M)	Name and IAVCEI[2] number of volcano	VOLCANO:	nnnnnnnnnnnnnnnnnnnnn [nnnnnn] *or* UNKNOWN *or* UNNAMED	VOLCANO: VOLCANO:	USUZAN 805-03 UNNAMED
5	Location of volcano (M)	Location of volcano in degrees and minutes	LOCATION:	Nnnnn *or* Snnnn Wnnnnn *or* Ennnnn *or* UNKNOWN *or* UNNAMED	LOCATION: LOCATION:	N4230 E14048 UNKNOWN
6	State or region (M)	State, or region if ash is not reported over a State	AREA:	nnnnnnnnnnnnnnnn	AREA:	JAPAN
7	Summit elevation (M)	Summit elevation in m (or ft)	SUMMIT ELEVATION:	nnnnM (*or* nnnnnFT)	SUMMIT ELEVATION:	732M
8	Advisory number (M)	Advisory number: year in full and message number (separate sequence for each volcano)	ADVISORY NUMBER:	nnnn/nnnn	ADVISORY NUMBER:	2000/432
9	Information source (M)	Information source using free text	INFORMATION SOURCE:	*free text up to 32 characters*	INFORMATION SOURCE:	GMS-JMA
10	Colour code (O)	Aviation colour code	AVIATION COLOUR CODE:	RED *or* ORANGE *or* YELLOW *or* GREEN *or* UNKNOWN *or* NOT GIVEN *or* NIL	AVIATION COLOUR CODE:	RED
11	Eruption details (M)	Eruption details (including date/time of eruption(s))	ERUPTION DETAILS:	*free text up to 64 characters* *or* UNKNOWN	ERUPTION DETAILS:	ERUPTED 20000402/ 0641Z ERUPTION OBS ASH TO ABV FL300
12	Time of observation of ash (M)	Day and time (in UTC) of observation of volcanic ash	OBS ASH DATE/TIME:	nn/nnnnZ	OBS ASH DATE/ TIME:	02/0645Z

Appendix 2 *Annex 3 — Meteorological Service for International Air Navigation*

	Element	*Detailed content*	*Template(s)*		*Examples*	
13	Observed ash cloud (M)	Horizontal (in degrees and minutes) and vertical extent of the observed ash cloud or, if the base is unknown, the top of the observed ash cloud; movement of the observed ash cloud	OBS ASH CLOUD:	TOP FLnnn *or* SFC/FLnnn *or* FLnnn/nnn Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn][- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]][3] TOP FLnnn *or* SFC/FLnnn *or* FLnnn/nnn MOV N nnKMH (*or* KT) *or* MOV NE nnKMH (*or* KT) *or* MOV E nnKMH (*or* KT) *or* MOV SE nnKMH (*or* KT) *or* MOV S nnKMH (*or* KT) *or* MOV SW nnKMH (*or* KT) *or* MOV W nnKMH (*or* KT) *or* MOV NW nnKMH (*or* KT)[4] *or*[4] ASH NOT IDENTIFIABLE FROM SATELLITE DATA WINDS FLnnn/nnn nnn/nn[n] KMH (KT)[3]	OBS ASH CLOUD:	FL150/350 N4230 E14048 - N4300 E14130 - N4246 E14230 - N4232 E14150 - N4230 E14048 SFC/FL150 MOV NE 25KT FL150/350 MOV E 30KT TOP FL240 MOV W 40KMH
14	Forecast height and position of the ash clouds (+ 6 HR) (M)	Day and time (in UTC) (6 hours from the “Time of observation of ash” given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST ASH CLOUD+6HR:	nn/nnnnZ SFC *or* FLnnn/[FL]nnn Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn][- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]][3] *or* NO ASH EXP	FCST ASH CLOUD+6HR:	02/1245Z SFC/FL200 N4230 E14048 - N4232 E14150 - N4238 E14300 - N4246 E14230 FL200/350 N4230 E14048 - N4232 E14150 - N4238 E14300 - N4246 E14230 FL350/600 NO ASH EXP
15	Forecast height and position of the ash clouds (+12 HR) (M)	Day and time (in UTC) (12 hours from the “Time of observation of ash” given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST ASH CLOUD+12HR:	nn/nnnnZ SFC *or* FLnnn/[FL]nnn Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn][- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]][3] *or* NO ASH EXP	FCST ASH CLOUD+12HR:	02/1845Z SFC/FL300 N4230 E14048 - N4232 E14150 - N4238 E14300 - N4246 E14230 FL300/600 NO ASH EXP

	Element	*Detailed content*	*Template(s)*		*Examples*	
16	Forecast height and position of the ash clouds (+18 HR) (M)	Day and time (in UTC) (18 hours from the "Time of observation of ash" given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST ASH CLOUD+18HR:	nn/nnnnZ SFC *or* FLnnn/[FL]nnn Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn][- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]- Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]][3] *or* NO ASH EXP	FCST ASH CLOUD+18HR:	03/0045Z SFC/FL600 NO ASH EXP
17	Next advisory (M)	Year, month, day and time in UTC *or* day, month, year and time in UTC of issuance of next advisory	NEXT ADVISORY:	nnnnnnnn/nnnnZ *or* nn*month*[1]nnn/nnnnZ *or* NO LATER THAN nnnnnnnn/nnnnZ *or* nn*month*[1]nnnn/nnnnZ *or* NO FURTHER ADVISORIES *or* WILL BE ISSUED BY nnnnnnnn/nnnnZ *or* nn*month*[1]nnnn/nnnnZ	NEXT ADVISORY:	20000402/1300Z
18	Remarks (M)	Remarks, as necessary	REMARKS:	*Free text up to 256 characters* *or* NIL	REMARKS:	ASH CLD CAN NO LONGER BE DETECTED ON SATELLITE IMAGE

Notes.—

1. Use abbreviations for months of the year from the PANS-ABC (Doc 8400), for example, "JAN".
2. International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).
3. Up to 4 selected layers.
4. If ash reported (e.g. AIREP) but not identifiable from satellite data.

Example A2-1. Advisory message for volcanic ash

VOLCANIC ASH ADVISORY

ISSUED:	20000402/0700Z
VAAC:	TOKYO
VOLCANO:	USUZAN 805-03
LOCATION:	N4230 E14048
AREA:	JAPAN
SUMMIT ELEVATION:	732M
ADVISORY NUMBER:	2000/432
INFORMATION SOURCE:	GMS JMA
AVIATION COLOUR CODE:	RED
ERUPTION DETAILS:	ERUPTED 20000402/0614Z ERUPTION OBS ASH TO ABV FL300
OBS ASH DATE/TIME:	02/0645Z
OBS ASH CLD:	FL150/350 N4230 E14048 – N4300 E14130 – N4246 E14230 – N4232 E14150 – N4230 E14048 SFC/FL150 MOV NE 25KT FL150/350 MOV E 30KT
FCST ASH CLD + 6 HR:	02/1245Z SFC/FL200 N4230 E14048 – N4232 E14150 – N4238 E14300 – N4246 E14230 FL200/350 N4230 E14048 – N4232 E14150 – N4238 E14300 – N4246 E14230 FL350/600 NO ASH EXP
FCST ASH CLD + 12 HR:	02/1845Z SFC/FL300 N4230 E14048 – N4232 E14150 – N4238 E14300 – N4246 E14230 FL300/600 NO ASH EXP
FCST ASH CLD + 18 HR:	03/0045Z SFC/FL600 NO ASH EXP
NEXT ADVISORY:	20000402/1300Z
REMARKS:	ASH CLD CAN NO LONGER BE DETECTED ON SATELLITE IMAGE

Table A2-2. Template for advisory message for tropical cyclones

Key: = = a double line indicates that the text following it should be placed on the subsequent line

Note 1.— The ranges and resolutions for the numerical elements included in advisory messages for tropical cyclones are shown in Appendix 6, Table A6-4.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Note 3.— All the elements are mandatory.

Note 4.— Inclusion of a "colon" after each element heading is mandatory.

Note 5.— The numbers 1 to 16 are included only for clarity and they are not part of the advisory message, as shown in the example.

	Element	*Detailed content*	*Template(s)*		*Examples*	
1	Identification of the type of message	Type of message	TC ADVISORY		TC ADVISORY	
2	Time of origin	Year, month, day and time in UTC of issue	DTG:	nnnnnnnn/nnnnZ	DTG:	20040925/1600Z
3	Name of TCAC	Name of TCAC (location indicator or full name)	TCAC:	nnnn *or* nnnnnnnnnn	TCAC: TCAC:	YUFO[1] MIAMI
4	Name of tropical cyclone	Name of tropical cyclone	TC:	nnnnnnnnnnnn	TC:	GLORIA
5	Advisory number	Advisory number (starting with "01" for each cyclone)	NR:	nn	NR:	01
6	Position of the centre	Position of the centre of the tropical cyclone (in degrees and minutes)	PSN:	Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]	PSN:	N2706 W07306
7	Direction and speed of movement	Direction and speed of movement respectively to at least eight compass points in km/h (or kt), or stationary	MOV:	N nnKMH (*or* KT) *or* NE nnKMH (*or* KT) *or* E nnKMH (*or* KT) *or* SE nnKMH (*or* KT) *or* S nnKMH (*or* KT) *or* SW nnKMH (*or* KT) *or* W nnKMH (*or* KT) *or* NW nnKMH (*or* KT) *or* STNR	MOV:	NW 20KMH
8	Central pressure	Central pressure (in hPa)	C:	nnnHPA	C:	965HPA
9	Maximum surface wind	Maximum surface wind near the centre (mean over 10 minutes, in km/h (or kt))	MAX WIND:	nn[n]KMH (*or* nn[n]KT)	MAX WIND:	90KMH
10	Forecast of centre position (+12 HR)	Day and time (in UTC) (12 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +12 HR:	nn/nnnnZ Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]	FCST PSN +12 HR:	26/0400Z N2830 W07430

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	Element	Detailed content	Template(s)		Examples	
11	Forecast of maximum surface wind (+12 HR)	Forecast of maximum surface wind (12 hours after the "DTG" given in Item 2)	FCST MAX WIND +12 HR:	nn[n]KMH (*or* nn[n]KT)	FCST MAX WIND +12 HR:	90KMH
12	Forecast of centre position (+18 HR)	Day and time (in UTC) (18 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +18 HR:	nn/nnnnZ Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]	FCST PSN +18 HR:	26/1000Z N2852 W07500
13	Forecast of maximum surface wind (+18 HR)	Forecast of maximum surface wind (18 hours after the "DTG" given in Item 2)	FCST MAX WIND +18 HR:	nn[n]KMH (*or* nn[n]KT)	FCST MAX WIND +18 HR:	85KMH
14	Forecast of centre position (+24 HR)	Day and time (in UTC) (24 hours from the "DTG" given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN +24 HR:	nn/nnnnZ Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]	FCST PSN +24 HR:	26/1600Z N2912 W07530
15	Forecast of maximum surface wind (+24 HR)	Forecast of maximum surface wind (24 hours after the "DTG" given in Item 2)	FCST MAX WIND +24 HR:	nn[n]KMH (*or* nn[n]KT)	FCST MAX WIND +24 HR:	80KMH
16	Expected time of issuance of next advisory	Expected year, month, day and time (in UTC) of issuance of next advisory	NXT MSG:	[BFR] nnnnnnnn/nnnnZ *or* NO MSG EXP	NXT MSG:	20040925/2000Z

Note.—

1. Fictitious location.

Example A2-2. Advisory message for tropical cyclones

TC ADVISORY

DTG:	19970925/1600Z
TCAC:	YUFO
TC:	GLORIA
NR:	01
PSN:	N2706 W07306
MOV:	NW 20KMH
C:	965HPA
MAX WIND:	90KMH
FCST PSN + 12 HR:	26/0400Z N2830 W07430
FCST MAX WIND + 12 HR:	90KMH
FCST PSN + 18 HR:	26/1000Z N2852 W07500
FCST MAX WIND + 18 HR:	85KMH
FCST PSN + 24 HR:	26/1600Z N2912 W07530
FCST MAX WIND + 24 HR:	80KMH
NXT MSG:	19970925/2000Z

APPENDIX 3. TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS

(See Chapter 4 of this Annex.)

1. GENERAL PROVISIONS RELATED TO METEOROLOGICAL OBSERVATIONS

1.1 **Recommendation.—** *The meteorological instruments used at an aerodrome should be situated in such a way as to supply data which are representative of the area for which the measurements are required.*

Note.— Specifications concerning the siting and construction of equipment and installations on operational areas, aimed at reducing the hazard to aircraft to a minimum, are contained in Annex 14, Volume I, Chapter 8.

1.2 **Recommendation.—** *Meteorological instruments at aeronautical meteorological stations should be exposed, operated and maintained in accordance with the practices, procedures and specifications promulgated by the World Meteorological Organization.*

1.3 **Recommendation.—** *The observers at an aerodrome should be located, in so far as is practicable, so as to supply data which are representative of the area for which the observations are required.*

1.4 **Recommendation.—** *Where automated equipment forms part of an integrated semi-automatic observing system, displays of data which are made available to the local ATS units should be a subset of and displayed parallel to those available in the local meteorological service unit. In those displays, each meteorological element should be annotated to identify, as appropriate, the locations for which the element is representative.*

2. GENERAL CRITERIA RELATED TO METEOROLOGICAL REPORTS

2.1 Format of meteorological reports

2.1.1 Local routine and special reports shall be issued in abbreviated plain language, in accordance with the template shown in Table A3-1.

2.1.2 METAR and SPECI shall be issued in accordance with the template shown in Table A3-2 and disseminated in the METAR and SPECI code forms prescribed by the World Meteorological Organization.

Note.— The METAR and SPECI code forms are contained in WMO Publication No. 306, Manual on Codes*, Volume I.1, Part A — Alphanumeric Codes.*

2.2 Use of CAVOK

When the following conditions occur simultaneously at the time of observation:

a) visibility, 10 km or more;

Note.— In local routine and special reports, visibility refers to the value(s) to be reported in accordance with 4.2.4.2 and 4.2.4.3; in METAR and SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4.

b) no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus;

c) no weather of significance to aviation as given in 4.4.2.3 and 4.4.2.4;

information on visibility, runway visual range, present weather and cloud amount, cloud type and height of cloud base shall be replaced in all meteorological reports by the term "CAVOK".

2.3 Criteria for issuance of local special reports and SPECI

2.3.1 The list of criteria for the issuance of local special reports shall include the following:

a) those values which most closely correspond with the operating minima of the operators using the aerodrome;

b) those values which satisfy other local requirements of the air traffic services units and of the operators;

c) an increase in air temperature of 2°C or more from that given in the latest report, or an alternative threshold value as agreed between the meteorological authority, the appropriate ATS authority and operators concerned;

d) the available supplementary information concerning the occurrence of significant meteorological conditions in the approach and climb-out areas as given in Table A3-1; and

e) those values which constitute criteria for SPECI.

2.3.2 **Recommendation.—** *SPECI should be issued whenever changes in accordance with the following criteria occur:*

a) when the mean surface wind direction has changed by 60° or more from that given in the latest report, the mean speed before and/or after the change being 20 km/h (10 kt) or more;

b) when the mean surface wind speed has changed by 20 km/h (10 kt) or more from that given in the latest report;

c) when the variation from the mean surface wind speed (gusts) has increased by 20 km/h (10 kt) or more from that given in the latest report, the mean speed before and/or after the change being 30 km/h (15 kt) or more;

d) when the wind changes through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:

1) require a change in runway(s) in use; and

2) indicate that the runway tailwind and crosswind components have changed through values representing the main operating limits for typical aircraft operating at the aerodrome;

e) when the visibility is improving and changes to or passes through one or more of the following values, or when the visibility is deteriorating and passes through one or more of the following values:

1) 800, 1 500 or 3 000 m; and

2) 5 000 m, in cases where significant numbers of flights are operated in accordance with the visual flight rules;

Note.— In local special reports, visibility refers to the value(s) to be reported in accordance with 4.2.4.2 and 4.2.4.3, in SPECI, visibility refers to the value(s) to be reported in accordance with 4.2.4.4.

f) when the runway visual range is improving and changes to or passes through one or more of the following values, or when the runway visual range is deteriorating and passes through one or more of the following values: 150, 350, 600 or 800 m;

g) when the onset, cessation or change in intensity of any of the following weather phenomena or combinations thereof occurs:

— freezing precipitation
— moderate or heavy precipitation (including showers thereof)
— duststorm
— sandstorm;

h) when the onset or cessation of any of the following weather phenomena or combinations thereof occurs:

— ice crystals
— freezing fog
— low drifting dust, sand or snow
— blowing dust, sand or snow
— thunderstorm (with or without precipitation)
— squall
— funnel cloud (tornado or waterspout);

i) when the height of base of the lowest cloud layer of BKN or OVC extent is lifting and changes to or passes through one or more of the following values, or when the height of base of the lowest cloud layer of BKN or OVC extent is lowering and passes through one or more of the following values:

1) 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); and

2) 450 m (1 500 ft), in cases where significant numbers of flights are operated in accordance with the visual flight rules;

j) when the amount of a cloud layer below 450 m (1 500 ft) changes:

1) from SKC, FEW or SCT to BKN or OVC; or

2) from BKN or OVC to SKC, FEW or SCT; and

k) when the sky is obscured and the vertical visibility is improving and changes to or passes through one or more of the following values, or when the vertical visibility is deteriorating and passes through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft).

2.3.3 When a deterioration of one weather element is accompanied by an improvement in another element, a single SPECI shall be issued; it shall then be treated as a deterioration report.

3. DISSEMINATION OF METEOROLOGICAL REPORTS

3.1 METAR and SPECI

3.1.1 METAR and SPECI shall be disseminated to international OPMET data banks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

3.1.2 METAR and SPECI shall be disseminated to other aerodromes in accordance with regional air navigation agreement.

3.1.3 **Recommendation.—** *SPECI representing a deterioration in conditions should be disseminated immediately after the observation. A SPECI representing an improvement in conditions should be disseminated only after the improvement has been maintained for 10 minutes; it should be amended before dissemination, if necessary, to indicate the conditions prevailing at the end of that 10-minute period. A SPECI representing a deterioration of one weather element and an improvement in another element should be disseminated immediately after the observation.*

3.2 Local routine and special reports

3.2.1 Local routine reports shall be transmitted to local air traffic services units and shall be made available to the operators and to other users at the aerodrome.

3.2.2 Local special reports shall be transmitted to local air traffic services units as soon as the specified conditions occur. However, by agreement between the meteorological authority and the appropriate ATS authority, they need not be issued in respect of:

a) any element for which there is in the local air traffic services unit a display corresponding to the one in the meteorological station, and where arrangements are in force for the use of this display to update information included in local routine and special reports; and

b) runway visual range, when all changes of one or more steps on the reporting scale in use are being reported to the local air traffic services unit by an observer on the aerodrome.

Local special reports shall also be made available to the operators and to other users at the aerodrome.

4. OBSERVING AND REPORTING OF METEOROLOGICAL ELEMENTS

Introductory Note.— Selected criteria applicable to meteorological information referred to under 4.1 to 4.8 for inclusion in aerodrome reports are given in tabular form at Attachment D.

4.1 Surface wind

4.1.1 Siting

4.1.1.1 **Recommendation.—** *Surface wind should be observed at a height of approximately 10 m (30 ft) above the runway(s).*

4.1.1.2 **Recommendation.—** *Representative surface wind observations should be obtained by the use of sensors appropriately sited. Sensors for surface wind observations for local routine and special reports should be sited to give the best practicable indication of conditions along the runway and touchdown zones. At aerodromes where topography or prevalent weather conditions cause significant differences in surface wind at various sections of the runway, additional sensors should be provided.*

Note.— Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing are expected to be the best practicable indication of the winds which an aircraft will encounter during take-off and landing.

4.1.2 Displays

4.1.2.1 Surface wind displays relating to each sensor shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required as specified in 4.1.1.2, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

4.1.2.2 **Recommendation.—** *The mean values of, and significant variations in, the surface wind direction and speed for each sensor should be derived and displayed by automated equipment.*

4.1.3 Averaging

4.1.3.1 The averaging period for surface wind observations shall be:

a) 2 minutes for local routine and special reports and for wind displays in air traffic services units; and

b) 10 minutes for METAR and SPECI, except that when the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only data occurring since the discontinuity shall be used for obtaining mean values, hence the time interval in these circumstances should be correspondingly reduced.

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 20 km/h (10 kt) before or after the change, or a change in wind speed of 20 km/h (10 kt) or more, lasting at least 2 minutes.

4.1.3.2 **Recommendation.—** *The averaging period for measuring variations from the mean wind speed (gusts) reported in accordance with 4.1.4.2 c) should be 3 seconds for local routine and special reports and for METAR and SPECI and for wind displays used for depicting variations from the mean wind speed (gusts) in air traffic services units.*

4.1.4 Reporting

4.1.4.1 In local routine and special reports and in METAR and SPECI, the surface wind direction and speed shall be reported in steps of 10 degrees true and 1 kilometre per hour (or 1 knot), respectively. Any observed value which does not fit the reporting scale in use shall be rounded to the nearest step in the scale.

4.1.4.2 In local routine and special reports and in METAR and SPECI:

a) the units of measurement used for the wind speed shall be indicated;

b) variations from the mean wind direction during the past 10 minutes shall be reported as follows, if the total variation is 60° or more:

   1) when the total variation is between 60° and 180° and the wind speed is 6 km/h (3 kt) or more such directional variations shall be reported as the two extreme directions between which the surface wind has varied;

   2) when the total variation is between 60° and 180° and the wind speed is less than 6 km/h (3 kt), the wind direction shall be reported as variable with no mean wind direction; or

   3) when the total variation is 180° or more, the wind direction shall be reported as variable with no mean wind direction;

c) variations from the mean wind speed (gusts) during the past 10 minutes shall be reported when the maximum wind speed exceeds the mean speed by 20 km/h (10 kt) or more;

d) when a wind speed of less than 2 km/h (1 kt) is reported, it shall be indicated as calm;

e) when a wind speed of 200 km/h (100 kt) or more is reported, it shall be indicated to be more than 199 km/h (99 kt); and

f) when the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only variations from the mean wind direction and mean wind speed occurring since the discontinuity shall be reported.

Note.— See note under 4.1.3.1.

4.1.4.3 In local routine and special reports:

a) if the surface wind is observed from more than one location along the runway, the locations for which these values are representative shall be indicated;

b) when there is more than one runway in use and the surface wind related to these runways is observed, the available wind values for each runway shall be given, and the runways to which the values refer shall be reported;

c) when variations from the mean wind direction are reported in accordance with 4.1.4.2 b) 2), the two extreme directions between which the surface wind has varied shall be reported; and

d) when variations from the mean wind speed (gusts) are reported in accordance with 4.1.4.2 c), they shall be reported as the maximum and minimum values of the wind speed attained.

4.1.4.4 In METAR and SPECI, when variations from the mean wind speed (gusts) are reported in accordance with 4.1.4.2 c), the maximum value of the wind speed attained shall be reported.

4.2 Visibility

4.2.1 Siting

Recommendation.— *When instrumented systems are used for the measurement of visibility, representative visibility observations should be obtained by the use of sensors appropriately sited. Sensors for visibility observations for local routine and special reports should be sited to give the best practicable indications of visibility along the runway and touchdown zone. The visibility should be measured at a height of approximately 2.5 m (7.5 ft) above the runway.*

4.2.2 Displays

Recommendation.— *When instrumented systems are used for the measurement of visibility, visibility displays relating to each sensor should be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensors, and where separate sensors are required as specified in 4.2.1,* *the displays should be clearly marked to identify the area, e.g. runway and section of runway, monitored by each sensor.*

4.2.3 Averaging

Recommendation.— *When instrumented systems are used for the measurement of visibility, their output should be updated at least every 60 seconds to permit provision of current representative values. The averaging period should be:*

a) 1 minute for local routine and special reports and for visibility displays in air traffic services units; and

b) 10 minutes for METAR and SPECI, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in the visibility, only those values occurring after the discontinuity should be used for obtaining mean values.

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in visibility, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI reports given in 2.3.

4.2.4 Reporting

4.2.4.1 In local routine and special reports and METAR and SPECI, the visibility shall be reported in steps of 50 m when the visibility is less than 800 m; in steps of 100 m, when it is 800 m or more but less than 5 km; in kilometre steps, when the visibility is 5 km or more but less than 10 km; and it shall be given as 10 km when the visibility is 10 km or more, except when the conditions for the use of CAVOK apply. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

Note.— Specifications concerning the use of CAVOK are given in 2.2.

4.2.4.2 In local routine and special reports, visibility along the runway(s) shall be reported together with the units of measurement.

4.2.4.3 **Recommendation.—** *In local routine and special reports, when instrumented systems are used for the measurement of visibility:*

a) if the visibility is observed from more than one location along the runway as specified in Chapter 4, 4.6.2.2, the values representative of the touchdown zone should be reported first, followed, as necessary, by the values representative of the mid-point and stop-end of the runway, and the locations for which these values are representative should be indicated; and

b) when there is more than one runway in use and the visibility is observed related to these runways, the available visibility values for each runway should be reported, and the runways to which the values refer should be indicated.

4.2.4.4 **Recommendation.—** *In METAR and SPECI, visibility should be reported as prevailing visibility, as defined in Chapter 1. When the visibility is not the same in different directions and*

a) when the lowest visibility is different from the prevailing visibility, and less than 1 500 m or less than 50 per cent of the prevailing visibility, the lowest visibility observed should also be reported and its general direction in relation to the aerodrome indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported; and

b) when the visibility is fluctuating rapidly, and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction.

4.3 Runway visual range

4.3.1 Siting

4.3.1.1 **Recommendation.—** *Runway visual range should be assessed at a height of approximately 2.5 m (7.5 ft) above the runway.*

4.3.1.2 **Recommendation.—** *Runway visual range should be assessed at a lateral distance from the runway centre line of not more than 120 m. The site for observations to be representative of the touchdown zone should be located about 300 m along the runway from the threshold. The sites for observations to be representative of the mid-point and stop-end of the runway should be located at a distance of 1 000 to 1 500 m along the runway from the threshold and at a distance of about 300 m from the other end of the runway. The exact position of these sites and, if necessary, additional sites should be decided after considering aeronautical, meteorological and climatological factors such as long runways, swamps and other fog-prone areas.*

4.3.2 Instrumented systems

Note.— Since accuracy can vary from one instrument design to another, performance characteristics are to be checked before selecting an instrument for assessing RVR. The calibration of a forward-scatter meter has to be traceable and verifiable to a transmissometer standard, the accuracy of which has been verified over the intended operational range.

Guidance on the use of transmissometers and forward-scatter meters in instrumented RVR systems is given in the Manual of Runway Visual Range Observing and Reporting Practices *(Doc 9328).*

4.3.2.1 Instrumented systems based on transmissometers or forward-scatter meters shall be used to assess runway visual range on runways intended for Category II and III instrument approach and landing operations.

4.3.2.2 **Recommendation.—** *Instrumented systems based on transmissometers or forward-scatter meters should be used to assess runway visual range on runways intended for Category I instrument approach and landing operations.*

4.3.3 Display

4.3.3.1 Where runway visual range is determined by instrumented systems, one display or more if required, shall be located in the meteorological station with corresponding displays, in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units shall be related to the same sensors, and where separate sensors are required as specified in 4.3.1.2, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

4.3.3.2 **Recommendation.—** *Where runway visual range is determined by human observers, runway visual range should be reported to the appropriate local air traffic services units, whenever there is a change in the value to be reported in accordance with the reporting scale (except where the provisions of 3.2.2 a) or b) apply). The transmission of such reports should normally be completed within 15 seconds after the termination of the observation.*

4.3.4 Averaging

Where instrumented systems are used for the assessment of runway visual range, their output shall be updated at least every 60 seconds to permit the provision of current, representative values. The averaging period for runway visual range values shall be:

a) 1 minute for local routine and special reports and for runway visual range displays in air traffic services units; and

b) 10 minutes for METAR and SPECI, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the discontinuity shall be used for obtaining mean values.

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI reports given in 2.3.2 f).

4.3.5 Runway light intensity

Recommendation.— *When instrumented systems are used for the assessment of runway visual range, computations should be made separately for each available runway. RVR should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. For local routine and special reports, the light intensity to be used for the computation should be:*

a) for a runway with the lights switched on, the light intensity actually in use on that runway; and

b) for a runway with lights switched off (or at the lowest setting pending the resumption of operations), the optimum light intensity that would be appropriate for operational use in the prevailing conditions.

In METAR and SPECI, the runway visual range should be based on the maximum light intensity available on the runway.

Note.— Guidance on the conversion of instrumented readings into runway visual range is given at Attachment E.

4.3.6 Reporting

4.3.6.1 In local routine and special reports and in METAR and SPECI, the runway visual range shall be reported in steps of 25 m when the runway visual range is less than 400 m; in steps of 50 m when it is between 400 m and 800 m; and in steps of 100 m when the runway visual range is more than 800 m. Any observed value w hich does not fit the reporting scale in use shall be rounded down to the nearest step in the scale.

4.3.6.2 **Recommendation.—** *Fifty metres should be considered the lower limit and 2 000 metres the upper limit for runway visual range. Outside of these limits, local routine and special reports and METAR and SPECI should merely indicate that the runway visual range is less than 50 m or more than 2 000 m.*

4.3.6.3 In local routine and special reports and in METAR and SPECI:

a) when runway visual range is above the maximum value that can be determined by the system in use, it shall be reported using the abbreviation “ABV” in local routine and special reports and the abbreviation “P” in METAR and SPECI, followed by the maximum value that can be determined by the system; and

b) when the runway visual range is below the minimum value that can be determined by the system in use, it shall be reported using the abbreviation “BLW” in local routine and special reports and the abbreviation “M” in METAR and SPECI, followed by the minimum value that can be determined by the system.

4.3.6.4 In local routine and special reports:

a) the units of measurement used shall be included;

b) if runway visual range is observed from only one location along the runway, i.e. the touchdown zone, it shall be included without any indication of location;

c) if the runway visual range is observed from more than one location along the runway, the value representative of the touchdown zone shall be reported first, followed by the values representative of the mid-point and stop-end and the locations for which these values are representative shall be indicated; and

d) when there is more than one runway in use, the available runway visual range values for each runway shall be reported and the runways to which the values refer shall be indicated.

4.3.6.5 **Recommendation.—** *In METAR and SPECI:*

a) only the value representative of the touchdown zone should be reported and no indication of location on the runway should be included; and

b) where there is more than one runway available for landing, touchdown zone runway visual range values should be included for all such runways, up to a maximum of four, and the runways to which the values refer should be indicated.

4.3.6.6 **Recommendation.—** *In METAR and SPECI when instrumented systems are used for the assessment of runway visual range, the variations in runway visual range during the 10-minute period immediately preceding the observation should be included as follows:*

a) if the runway visual range values during the 10-minute period have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period, this should be indicated. When the variation of the runway visual range values shows an upward or downward tendency, this should be indicated by the abbreviation "U" or "D" respectively. In circumstances when actual fluctuations during the 10-minute period show no distinct tendency, this should be indicated using the abbreviation "N". When indications of tendency are not available, no abbreviations should be included; and

b) if the 1-minute runway visual range values during the 10-minute period vary from the mean value by more than 50 m or more than 20 per cent of the mean value, whichever is greater, the 1-minute mean minimum and the 1-minute mean maximum values should be reported instead of the 10-minute mean value. If the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the disconti-nuity should be used to obtain variations.

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI given in 2.3.2 f).

4.4 Present weather

4.4.1 Siting

Recommendation.— *When instrumented systems are used for observing present weather phenomena listed under 4.4.2.3 and 4.4.2.4, representative information should be obtained by the use of sensors appropriately sited.*

4.4.2 Reporting

4.4.2.1 In local routine and special reports, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity, as appropriate.

4.4.2.2 In METAR and SPECI, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity or proximity to the aerodrome, as appropriate.

4.4.2.3 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the following types of present weather phenomena should be reported, using their respective abbreviations and relevant criteria, as appropriate:*

a) Precipitation

Drizzle	*DZ*
Rain	*RA*
Snow	*SN*
Snow grains	*SG*
Ice pellets	*PL*
Ice crystals (very small ice crystals in suspension, also known as diamond dust) *— Reported only when associated visibility is 5 000 m or less.*	*IC*
Hail *— Reported when diameter of largest hailstones is 5 mm or more.*	*GR*
Small hail and/or snow pellets *— Reported when diameter of largest hailstones is less than 5 mm;*	*GS*

b) Obscurations (hydrometeors)

Fog *FG*
— Reported when visibility is less than 1 000 m, except when qualified by "MI", "BC", "PR" or "VC" (see 4.4.2.4 and 4.4.2.5).

Mist *BR*
— Reported when visibility is at least 1 000 m but not more than 5 000 m;

c) Obscurations (lithometeors)
— The following should be used only when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less except "SA" when qualified by "DR" (see 4.4.2.4) and volcanic ash.

Sand *SA*

Dust (widespread) *DU*

Haze *HZ*

Smoke *FU*

Volcanic ash *VA*

d) Other phenomena

Dust/sand whirls (dust devils) *PO*

Squall *SQ*

Funnel cloud (tornado or waterspout) *FC*

Duststorm *DS*

Sandstorm *SS*

4.4.2.4 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the following characteristics of present weather phenomena, as necessary, should be reported, using their respective abbreviations and relevant criteria, as appropriate:*

Thunderstorm *TS*
— Used to report a thunderstorm with rain "TSRA", snow "TSSN", ice pellets "TSPL", hail "TSGR" or small hail and/or snow pellets "TSGS" or combinations thereof, for example, "TSRASN". When thunder is heard or lightning is detected at the aerodrome during the 10-minute period preceding the time of observation but no precipitation is observed at the aerodrome, the abbreviation "TS" should be used without qualification.

Shower *SH*
— Used to report showers of rain "SHRA", snow "SHSN", ice pellets "SHPL", hail "SHGR", small hail and/or snow pellets "SHGS", or combinations thereof, for example "SHRASN". Showers observed in the vicinity of the aerodrome (see 4.4.2.5) should be reported as "VCSH" without qualification regarding type or intensity of precipitation.

Freezing *FZ*
— Supercooled water droplets or precipitation, used only with FG, DZ and RA.

Blowing *BL*
— Used to report DU, SA or SN raised by the wind to a height of 2 m (6 ft) or more above the ground.

Low drifting *DR*
— Used with DU, SA or SN raised by the wind to less than 2 m (6 ft) above ground level.

Shallow *MI*
— Less than 2 m (6 ft) above ground level.

Patches *BC*
— Fog patches randomly covering the aerodrome.

Partial *PR*
— A substantial part of the aerodrome covered by fog while the remainder is clear.

4.4.2.5 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the relevant intensity or, as appropriate, the proximity to the aerodrome of the reported present weather phenomena should be indicated as follows:*

	(local routine and special reports)	*(METAR and SPECI)*
Light	*FBL*	—
Moderate	*MOD*	*(no indication)*
Heavy	*HVY*	+

Used only with DZ, GR, GS, PL, RA, SG and SN (or in combinations involving these present weather types; in these cases, intensity refers to precipitation in accordance with 4.4.2.6); DS and SS (in the cases of DS and SS, only moderate and heavy intensities to be indicated).

Vicinity *VC*
— Not at the aerodrome but not further away than approximately 8 km from the aerodrome perimeter and used only in METAR and SPECI with DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN, TS and VA when not reported under 4.4.2.4.

4.4.2.6 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, one or more up to a maximum of three of the present weather abbreviations given in 4.4.2.3 and 4.4.2.4 should be used, as necessary, together with an indication, where appropriate, of the characteristics and intensity or proximity to the aerodrome, so as to convey a complete description of the present weather of significance to flight operations. In reporting this information, the indication of intensity or proximity as appropriate, should be reported first followed respectively by the characteristics and the type of weather phenomena. Where two different types of weather are observed, they should be reported in two separate groups, where the intensity or proximity indicator refers to the weather phenomenon which follows the indicator. However, different types of precipitation occurring at the time of observation should be reported as one single group with the dominant type of precipitation reported first and preceded by only one intensity qualifier which refers to the intensity of the total precipitation.*

4.5 Clouds

4.5.1 Siting

Recommendation.— *When instrumented systems are used for the measurement of the cloud amount and the height of cloud base, representative observations should be obtained by the use of sensors appropriately sited. For local routine and special reports, in the case of aerodromes with precision approach runways, sensors for cloud amount and height of cloud base should be sited to give the best practicable indications of the height of cloud base and cloud amount at the middle marker site of the instrument landing system or, at aerodromes where a middle marker beacon is not used, at a distance of 900 to 1 200 m (3 000 to 4 000 ft) from the landing threshold at the approach end of the runway.*

Note.— Specifications concerning the middle marker site of an instrument landing system are given in Annex 10, Volume I, Chapter 3 and at Attachment C, Table C-5.

4.5.2 Display

Recommendation.— *When automated equipment is used for the measurement of the height of cloud base, height of cloud base display(s) should be located in the meteorological station with corresponding display(s) in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensor, and where separate sensors are required as specified in 4.5.1, the displays should clearly identify the area monitored by each sensor.*

4.5.3 Reference level

Recommendation.— *The height of cloud base should normally be reported above aerodrome elevation. When a precision approach runway is in use which has a threshold elevation 15 m (50 ft) or more below the aerodrome elevation, local arrangements should be made in order that the height of cloud bases reported to arriving aircraft should refer to the threshold elevation. In the case of reports from off-shore structures, the height of cloud base should be given above mean sea level.*

4.5.4 Reporting

4.5.4.1 **Recommendation.—** *In local routine and special reports and in METAR and SPECI:*

a) cloud amount should be reported using the abbreviations "FEW" (1 to 2 oktas), "SCT" (3 to 4 oktas), "BKN" (5 to 7 oktas) or "OVC" (8 oktas);

b) cumulonimbus clouds and towering cumulus clouds should be indicated as "CB" and "TCU", respectively;

c) the height of cloud base should be reported in steps of 30 m (100 ft) up to 3 000 m (10 000 ft) and in steps of 300 m (1 000 ft) above 3 000 m (10 000 ft);

d) the vertical visibility should be reported in steps of 30 m (100 ft) up to 600 m (2 000 ft);

e) if there are no clouds and no restriction on vertical visibility and the abbreviation "CAVOK" is not appropriate, the abbreviation "SKC" should be used;

f) if there are no clouds of operational significance, no cumulonimbus and no restriction on vertical visibility and the abbreviations "CAVOK" and "SKC" are not appropriate, the abbreviation "NSC" should be used;

g) when several layers or masses of cloud of operational significance are observed, their amount and height of cloud base should be reported in increasing order of the height of cloud base, and in accordance with the following criteria:

1) the lowest layer or mass, regardless of amount to be reported as FEW, SCT, BKN or OVC as appropriate;

2) the next layer or mass, covering more than 2/8 to be reported as SCT, BKN or OVC as appropriate;

3) the next higher layer or mass, covering more than 4/8 to be reported as BKN or OVC as appropriate; and

4) cumulonimbus and/or towering cumulus clouds, whenever observed and not reported in 1) to 3);

h) when the cloud base is diffuse or ragged or fluctuating rapidly, the minimum height of cloud base, or cloud fragments, should be reported; and

i) *when an individual layer (mass) of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only.*

Note.— Towering cumulus indicates cumulus congestus clouds of great vertical extent.

4.5.4.2 In local routine and special reports:

a) the units of measurement used for the height of cloud base and vertical visibility shall be indicated; and

b) when there is more than one runway in use and the heights of cloud bases are observed by instruments for these runways, the available heights of cloud bases for each runway shall be reported and the runways to which the values refer shall be indicated.

4.6 Air temperature and dew-point temperature

4.6.1 Display

Recommendation.— *When automated equipment is used for the measurement of air temperature and dew-point temperature, air temperature and dew-point temperature displays should be located in the meteorological station with corresponding displays in the appropriate air traffic services units. The displays in the meteorological station and in the air traffic services units should relate to the same sensors.*

4.6.2 Reporting

4.6.2.1 In local routine and special reports and in METAR and SPECI, the air temperature and the dew-point temperature shall be reported in steps of whole degrees Celsius. Any observed value which does not fit the reporting scale in use shall be rounded to the nearest whole degree Celsius, with observed values involving 0.5° rounded up to the next higher whole degree Celsius.

4.6.2.2 In local routine and special reports and in METAR and SPECI, a temperature below 0°C shall be identified.

4.7 Atmospheric pressure

4.7.1 Display

When automated equipment is used for the measurement of pressure, QNH and, if required in accordance with 4.7.3.2 b), QFE displays relating to the barometer shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units. When QFE values are displayed for more than one runway, as specified in 4.7.3.2 d), the displays shall be clearly marked to identify the runway to which the QFE value displayed refers.

4.7.2 Reference level

Recommendation.— *The reference level for the computation of QFE should be the aerodrome elevation. For non-precision approach runways, the thresholds of which are 2 m (7 ft) or more below or above the aerodrome elevation, and for precision approach runways, the QFE, if required, should refer to the relevant threshold elevation.*

4.7.3 Reporting

4.7.3.1 For local routine and special reports and in METAR and SPECI, QNH and QFE shall be computed in tenths of hectopascals and reported therein in steps of whole hectopascals, using four digits. Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower whole hectopascal.

4.7.3.2 In local routine and special reports:

a) QNH shall be included;

b) QFE shall be included if required by users or, if so agreed locally between the meteorological and air traffic services authorities and operators concerned, on a regular basis;

c) the units of measurement used for QNH and QFE values shall be included; and

d) if QFE values are required for more than one runway, the required QFE values for each runway shall be reported and the runways to which the values refer shall be indicated.

4.7.3.3 In METAR and SPECI, only QNH values shall be included.

4.8 Supplementary information

4.8.1 Reporting

4.8.1.1 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the following recent weather phenomena, i.e. weather phenomena observed at the aerodrome during the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation, should be reported, up to a maximum of three groups, in the supplementary information:*

— freezing precipitation	*REFZDZ, REFZRA*
— moderate or heavy precipitation (including showers thereof)	*REDZ, RERA, RESN, RESG, REPL, RESHRA, RESHSN, RESHGR, RESHGS*
— blowing snow	*REBLSN*
— duststorm, sandstorm	*REDS, RESS*
— thunderstorm	*RETS*
— funnel cloud (tornado or water spout)	*REFC*
— volcanic ash	*REVA.*

4.8.1.2 **Recommendation.—** *In local routine and special reports, the following significant meteorological conditions, or combinations thereof, should be reported in supplementary information:*

— cumulonimbus clouds	*CB*
— thunderstorm	*TS*
— moderate or severe turbulence	*MOD TURB, SEV TURB*
— wind shear	*WS*
— hail	*GR*
— severe squall line	*SEV SQL*
— moderate or severe icing	*MOD ICE, SEV ICE*
— freezing precipitation	*FZDZ, FZRA*
— severe mountain waves	*SEV MTW*
— duststorm, sandstorm	*DS, SS*
— blowing snow	*BLSN*
— funnel cloud (tornado or water spout)	*FC.*

The location of the condition should be indicated. Where necessary, additional information should be included using abbreviated plain language.

4.8.1.3 **Recommendation.—** *In METAR and SPECI, where local circumstances so warrant, information on wind shear should be added.*

Note.— The local circumstances referred to in 4.8.1.3 include, but are not necessarily limited to, wind shear of a non-transitory nature such as might be associated with low-level temperature inversions or local topography.

4.8.1.4 **Recommendation.—** *In METAR and SPECI, the following information should be included in the supplementary information, in accordance with regional air navigation agreement:*

a) information on sea-surface temperature and the state of the sea from aeronautical meteorological stations established on off-shore structures in support of helicopter operations; and

b) information on the state of the runway provided by the appropriate airport authority.

Note 1.— The state of the sea is specified in WMO Publication No. 306, Manual on Codes, *Volume I.1, Part A — Alphanumeric Codes, Code Table 3700.*

Note 2.— The state of the runway is specified in WMO Publication No. 306, Manual on Codes, *Volume I.1, Part A — Alphanumeric Codes, Code Tables 0366, 0519, 0919 and 1079.*

4.9 Meteorological information from automatic observing systems

4.9.1 Reporting

4.9.1.1 **Recommendation.—** *In automated METAR and SPECI, surface wind, runway visual range, air temperature and dew-point temperature, and atmospheric pressure should be reported in accordance with provisions relevant to METAR and SPECI included in Sections 4.1, 4.3, 4.6 and 4.7, respectively.*

4.9.1.2 **Recommendation.—** *In automated METAR and SPECI, visibility should be reported in accordance with provisions relevant to METAR and SPECI included in Section 4.2. However, when visibility sensors are sited in such a manner that no directional variations can be given, visibility value reported should be followed by the abbreviation "NDV".*

4.9.1.3 **Recommendation.—** *In automated METAR and SPECI, present weather should be reported in accordance with provisions relevant to METAR and SPECI included in Section 4.4. However, in addition to the precipitation types listed under 4.4.2.3 a), the abbreviation UP should be used for unidentified precipitation when the type of precipitation cannot be identified by the automatic observing system.*

4.9.1.4 **Recommendation.—** *In automated METAR and SPECI, clouds and vertical visibility should be reported in accordance with provisions relevant to METAR and SPECI included in Section 4.5. However:*

a) when the cloud type cannot be observed by the automatic observing system, the cloud type in each cloud group should be replaced by "///"; and

b) when no clouds are detected by the automatic observing system, it should be indicated by using the abbreviation "NCD".

4.9.1.5 **Recommendation.—** *In automated METAR and SPECI, supplementary information should be reported in accordance with provisions relevant to METAR and SPECI included in Section 4.8. However, in addition to the recent weather phenomena listed under 4.8.1.2, the abbreviation REUP should be used for recent precipitation when the type of precipitation cannot be identified by the automatic observing system.*

Table A3-1. Template for the local routine (MET REPORT) and local special (SPECIAL) reports

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, dependent on meteorological conditions
O = inclusion optional

Note 1.— The ranges and resolutions for the numerical elements included in the local routine and special reports are shown in Table A3-4 of this appendix.

Note 2.— The explanations for the abbreviations used can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element as specified in Chapter 4	*Detailed content*	*Template(s)*			*Examples*
Identification of the type of report (M)	Type of report	MET REPORT *or* SPECIAL			MET REPORT SPECIAL
Location indicator (M)	ICAO location indicator (M)	nnnn			YUDO[1]
Time of the observation (M)	Day and actual time of the observation in UTC	nnnnnnZ			221630Z
Surface wind (M)	Name of the element (M)	WIND			WIND 240/15KMH (WIND 240/8KT)
	Runway (O)[2]	RWY nn[n]			WIND RWY 18 TDZ 190/22KMH (WIND RWY 18 TDZ 190/11KT)
	Runway section (O)[3]	TDZ			
	Wind direction (M)	nnn/	VRB BTN nnn/ AND nnn/ *or* VRB	CALM	WIND VRB4KMH WIND CALM (WIND VRB2KT) WIND VRB BTN 350/ AND 050/4KMH (WIND VRB BTN 350/ AND 050/2KT)
	Wind speed (M)	[ABV] n[n][n]KMH (*or* [ABV] n[n]KT)			WIND 270/ABV 199KMH (WIND 270/ABV 99KT)
	Significant speed variations (C)[4]	MAX [ABV] nn [n] MNM n [n]			WIND 120/12KMH MAX35 MNM8 (WIND 120/6KT MAX18 MNM4)
	Significant directional variations (C)[5]	VRB BTN nnn/ AND nnn/	—		WIND 020/20KMH VRB BTN 350/ AND 070/ (WIND 020/10KT VRB BTN 350/ AND 070/)
	Runway section (O)[3]	MID			WIND RWY 14R MID 140/22KMH (WIND RWY 14R MID 140/11KT)
	Wind direction (O)[3]	nnn/	VRB BTN nnn/ AND nnn/ *or* VRB	CALM	
	Wind speed (O)[3]	[ABV] n[n][n]KMH (*or* [ABV] n[n]KT)			
	Significant speed variations (C)[4]	MAX [ABV] nn [n] MNM n [n]			
	Significant directional variations (C)[5]	VRB BTN nnn/ AND nnn/	—		

Element as specified in Chapter 4	*Detailed content*	*Template(s)*			*Examples*
	Runway section (O)[3]	END			WIND RWY 27 TDZ 240/32KMH MAX54 MNM20 END 250/28KMH (WIND RWY 27 TDZ 240/16KT MAX27 MNM10 END 250/14KT)
	Wind direction (O)[3]	nnn/	VRB BTN nnn/ AND nnn/ *or* VRB	CALM	
	Wind speed (O)[3]	[ABV] n[n][n]KMH (*or* [ABV] n[n]KT)			
	Significant speed variations (C)[4]	MAX [ABV] nn [n] MNM n [n]			
	Significant directional variations (C)[5]	VRB BTN nnn/ AND nnn/	—		
Visibility (M)	Name of the element (M)	VIS		CAVOK	VIS 350M CAVOK VIS 7KM VIS 10KM
	Runway (O)[2]	RWY nn[n]			VIS RWY 09 TDZ 800M END 1200M
	Runway section (O)[3]	TDZ			
	Visibility (M)	nn[n][n]M *or* n[n]KM			
	Runway section (O)[3]	MID			
	Visibility (O)[3]	nn[n][n]M *or* n[n]KM			
	Runway section (O)[3]	END			VIS RWY 18 TDZ 6KM RWY 27 TDZ 4000M
	Visibility (O)[3]	nn[n][n]M *or* n[n]KM			
RVR (C)[6]	Name of the element (M)	RVR			RVR RWY 32 400M RVR RWY 20 500M
	Runway (C)[7]	RWY nn[n]			
	Runway section (C)[8]	TDZ			
	RVR (M)	[ABV *or* BLW] nn[n][n]M			RVR RWY 10 BLW 50M RVR RWY 14 ABV 2000M RVR RWY 10 BLW 150M RVR RWY 12 ABV 1200M
	Runway section (C)[8]	MID			RVR RWY 12 TDZ 1100M MID ABV 1400M
	RVR (C)[8]	[ABV *or* BLW] nn[n][n]M			
	Runway section (C)[8]	END			RVR RWY 16 TDZ 600M MID 500M END 400M RVR RWY 26 500M RWY 20 800M
	RVR (C)[8]	[ABV *or* BLW] nn[n][n]M			
Present weather (C)[9, 10]	Intensity of present weather (C)[9]	FBL *or* MOD *or* HVY	—		

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Element as specified in Chapter 4	*Detailed content*	*Template(s)*	*Examples*
	Characteristics and type of present weather (C)[9,11]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN | IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG	MOD RA HZ HVY TSRA FG HVY DZ VA FBL SN MIFG HVY TSRASN FBL SNRA FBL DZ FG HVY SHSN BLSN
Cloud (M)[12]	Name of the element (M)	CLD	
	Runway (O)[2]	RWY nn[n]	
	Cloud amount (M) or vertical visibility (O)[9]	FEW *or* SCT or BKN *or* OVC | OBSC | SKC *or* NSC	CLD SCT 300M OVC 600M CLD NSC (CLD SCT 1000FT OVC 2000FT) CLD OBSC VER VIS 150M CLD SKC (CLD OBSC VER VIS 500FT)
	Cloud type (C)[9]	CB *or* TCU | —	CLD BKN TCU 270M (CLD BKN TCU 900FT)
	Height of cloud base or the value of vertical visibility (C)[9]	nn[n][n]M (*or* nnn[n]FT) | [VER VIS nn[n]M (*or* VER VIS nnn[n]FT)]	CLD RWY 08 BKN 60M RWY 26 BKN 90M (CLD RWY 08 BKN 200FT RWY 26 BKN 300FT)
Air temperature (M)	Name of the element (M)	T	T17 TMS08
	Air temperature (M)	[MS]nn	
Dew-point temperature (M)	Name of the element (M)	DP	DP15 DPMS18
	Dew-point temperature (M)	[MS]nn	
Pressure values (M)	Name of the element (M)	QNH	QNH 0995HPA QNH 1009HPA
	QNH (M)	nnnnHPA	
	Name of the element (O)	QFE	QNH 1022HPA QFE 1001HPA QNH 0987HPA QFE RWY 18 0956HPA RWY 24 0955HPA
	QFE (O)	[RWY nn[n]] nnnnHPA [RWY nn[n] nnnnHPA]	
Supplementary information (C)[9]	Significant meteorological phenomena (C)[9]	CB *or* TS *or* MOD TURB *or* SEV TURB *or* WS *or* GR *or* SEV SQL *or* MOD ICE *or* SEV ICE *or* FZDZ *or* FZRA *or* SEV MTW *or* SS *or* DS *or* BLSN *or* FC[13]	FC IN APCH WS IN APCH 60M-WIND: 360/50KMH WS RWY 12
	Location of the phenomenon (C)[9]	IN APCH [nnnM-WIND nnn/nnKMH] *or* IN CLIMB-OUT [nnnM-WIND nnn/nnKMH] (IN APCH [nnnFT-WIND nnn/nnKT] *or* IN CLIMB-OUT [nnnFT-WIND nnn/nnKT]) *or* RWY nn[n]	
	Recent weather (C)[9, 10]	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSPL *or* RETSGR *or* RETSGS *or* REFC *or* REPL *or* REVA	REFZRA CB IN CLIMB-OUT RETSRA

Element as specified in Chapter 4	*Detailed content*	*Template(s)*					*Examples*
Trend forecast (O)[14]	Name of the element (M)	TREND					
	Change indicator (M)[15]	NOSIG	BECMG *or* TEMPO				TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT)
	Period of change (C)[9]		FMnnnn *and/or* TLnnnn *or* ATnnnn				
	Wind (C)[9]		nnn/ [ABV] n[n][n]KMH [MAX[ABV]nn[n]] (*or* nnn/ [ABV] n[n]KT [MAX[ABV]nn])				TREND TEMPO 250/70KMH MAX 100 (TREND TEMPO 250/35KT MAX 50)
	Visibility (C)[9]		VIS nn[n][n]M *or* VIS n[n]KM			CAVOK	TREND BECMG AT1800 VIS 10KM NSW TREND BECMG TL1700 VIS 800M FG TREND BECMG FM1030 TL1130 CAVOK
	Weather phenomenon: intensity (C)[9]		FBL *or* MOD *or* HVY	—	NSW		TREND TEMPO TL1200 VIS 600M BECMG AT1230 VIS 8KM NSW NSC
	Weather phenomenon: characteristics and type (C)[9, 10, 12]		DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN	IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG			TREND TEMPO FM0300 TL0430 MOD FZRA TREND BECMG FM1900 VIS 500M HVY SNRA TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN
	Name of the element (C)[9]		CLD				
	Cloud amount and vertical visibility (C)[9]		FEW *or* SCT *or* BKN *or* OVC	OBSC	SKC *or* NSC		TREND BECMG AT1130 CLD OVC 300M (TREND BECMG AT1130 CLD OVC 1000FT)
	Cloud type (C)[9]		CB *or* TCU	—			TREND TEMPO TL1530 HVY SHRA CLD BKN CB 360M (TREND TEMPO TL1530 HVY SHRA CLD BKN CB 1200FT)
	Height of cloud base or the value of vertical visibility (C)[9]		nn[n][n]M (*or* nnn[n]FT)	[VER VIS nn[n]M (*or* VER VIS nnn[n]FT)]			

Notes.—

1. Fictitious location.
2. Optional values for one or more runways.
3. Optional values for one or more sections of the runway.
4. To be included in accordance with 4.1.4.2 c).
5. To be included in accordance with 4.1.4.2 b) 1).
6. To be included if visibility or RVR < 1 500 m.
7. To be included in accordance with 4.3.6.4 d).
8. To be included in accordance with 4.3.6.4 c).
9. To be included whenever applicable.
10. One or more, up to a maximum of three groups in accordance with 4.4.2.6, 4.8.1.1 and Appendix 5, 2.2.4.1.

11. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.6 and Appendix 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with Appendix 5, 2.2.4.1.
12. Up to four cloud layers in accordance with 4.5.4.1 g).
13. Abbreviated plain language may be used in accordance with 4.8.1.2.
14. To be included in accordance with Chapter 6, 6.3.2.
15. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1, normally not exceeding three groups.

Appendix 3 *Annex 3 — Meteorological Service for International Air Navigation*

Table A3-2. Template for METAR and SPECI

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, dependent on meteorological conditions or method of observation
O = inclusion optional

Note 1.— The ranges and resolutions for the numerical elements included in METAR and SPECI are shown in Table A3-5 of this appendix.

Note 2.— The explanations for the abbreviations used can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element as specified in Chapter 4	*Detailed content*	*Template(s)*		*Examples*
Identification of the type of report (M)	Type of report (M)	METAR, METAR COR, SPECI *or* SPECI COR		METAR METAR COR SPECI
Location indicator (M)	ICAO location indicator (M)	nnnn		YUDO[1]
Time of the observation (M)	Day and actual time of the observation in UTC (M)	nnnnnnZ		221630Z
Identification of an automated or missing report (C)[2]	Automated or missing report identifier (C)	AUTO *or* NIL		AUTO NIL
END OF METAR IF THE REPORT IS MISSING.				
Surface wind (M)	Wind direction (M)	nnn	VRB	24015KMH VRB4KMH (24008KT) (VRB2KT)
	Wind speed (M)	[P]nn[n]		19022KMH (19011KT) 00000KMH (00000KT) 140P199KMH (140P99KT)
	Significant speed variations (C)[3]	G[P]nn[n]		12012G35KMH (12006G18KT) 24032G54KMH (24016G27KT)
	Units of measurement (M)	KMH (*or* KT)		
	Significant directional variations (C)[4]	nnnVnnn	—	02020KMH 350V070 (02010KT 350V070)
Visibility (M)	Prevailing or minimum visibility (M)[5]	nnnn	C A V O K	0350 CAVOK 7000NDV 9999
	Unidirectional visibility (C)[6]	NDV		0800
	Minimum visibility (C)[7]	nnnn		2000 1200NW 6000 2800E
	Direction of the minimum visibility (C)[7]	N *or* NE *or* E *or* SE *or* S *or* SW *or* W *or* NW		
RVR (C)[8]	Name of the element (M)	R		R32/0400
	Runway (M)	nn[n]/		R10/M0050 R14L/P2000
	RVR (M)	[P *or* M]nnnn		R16L/0650 R16C/0500 R16R/0450 R17L/0450

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Element as specified in Chapter 4	*Detailed content*	*Template(s)*			*Examples*
	RVR variations (C)[9]	V[P *or* M]nnnn			R20/0700V1200 R19/0350VP1200
	RVR past tendency (C)[10]	U, D *or* N			R12/1100U R26/0550N R20/0800D R09/0375V0600U R10/M0150V0500D
Present weather (C)[2,11]	Intensity or proximity of present weather (C)[12]	– *or* +	—	VC	
	Characteristics and type of present weather (M)[13]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* FZUP *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN *or* UP[6]	IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG	FG *or* PO *or* FC *or* DS *or* SS *or* TS *or* SH *or* BLSN *or* BLSA *or* BLDU *or* VA	RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS –SN MIFG VCBLSA +TSRASN –SNRA DZ FG +SHSN BLSN UP FZUP
Cloud (M)[14]	Cloud amount and height of cloud base or vertical visibility (M)	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV///	SKC *or* NSC *or* NCD[6]	FEW015 VV005 SKC OVC030 VV/// NSC SCT010 OVC020 BKN025///
	Cloud type (C)[2]	CB *or* TCU *or* ///	—		BKN009TCU NCD SCT008 BKN025CB
Air and dew-point temperature (M)	Air and dew-point temperatures (M)	[M]nn/[M]nn			17/10 02/M08 M01/M10
Pressure values (M)	Name of the element (M)	Q			Q0995 Q1009 Q1022 Q0987
	QNH (M)	nnnn			
Supplementary information (C)	Recent weather (C)[2, 11]	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSPL *or* RETSGR *or* RETSGS *or* REFC *or* REVA *or* REPL *or* REUP			REFZRA RETSRA
	Wind shear (C)[2]	WS RWYnn[n] *or* WS ALL RWY			WS RWY03 WS ALL RWY
	Sea-surface temperature and state of the sea (C)[15]	W[M]nn/Sn			W15/S2

Element as specified in Chapter 4	*Detailed content*		*Template(s)*			*Examples*
	State of the runway (C)[16]	Runway designator (M)	nn		SNOCLO	99421594 SNOCLO 14CLRD//
		Runway deposits (M)	n *or* /	CLRD//		
		Extent of runway contamination (M)	n *or* /			
		Depth of deposit (M)	nn *or* //			
		Friction coefficient or braking action (M)	nn *or* //			
Trend forecast (O)[17]	Change indicator (M)[18]		NOSIG	BECMG *or* TEMPO		NOSIG BECMG FEW020
	Period of change (C)[2]			FMnnnn *and/or* TLnnnn *or* ATnnnn		
	Wind (C)[2]			nnn[P]nn[n][G [P]nn[n]]KMH (*or* nnn[P]nn[G[P] nn]KT*)*		TEMPO 25070G100KMH (TEMPO 25035G50KT)
	Prevailing visibility (C)[2]			nnnn	CAVOK	BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA
	Weather phenomenon: intensity (C)[12]			– *or* + | —	NSW	
	Weather phenomenon: characteristics and type (C)[2,11,13]			DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN | IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG		
	Cloud amount and height of cloud base or vertical visibility (C)[2]			FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn | VVnnn *or* VV///	SKC *or* NSC	TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010
	Cloud type (C)[2]			CB *or* TCU | —		TEMPO TL1530 +SHRA BKN012CB

Notes.—

1. Fictitious location.
2. To be included whenever applicable.
3. To be included in accordance with 4.1.4.2 c).
4. To be included in accordance with 4.1.4.2 b) 1).
5. To be included in accordance with 4.2.4.4 b).
6. For automated reports only, in accordance with Section 4.9.
7. To be included in accordance with 4.2.4.4 a).
8. To be included if visibility or RVR < 1 500 m; for up to a maximum of four runways in accordance with 4.3.6.5 b).
9. To be included in accordance with 4.3.6.6 b).
10. To be included in accordance with 4.3.6.6 a).
11. One or more, up to a maximum of three, groups in accordance with 4.4.2.6, 4.8.1.1 and Appendix 5, 2.2.4.1.
12. To be included whenever applicable; no qualifier for *moderate* intensity in accordance with 4.4.2.5.
13. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.6 and Appendix 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with Appendix 5, 2.2.4.1.
14. Up to four cloud layers in accordance with 4.5.4.1 g).
15. To be included in accordance with 4.8.1.4 a).
16. To be included in accordance with 4.8.1.4 b).
17. To be included in accordance with Chapter 6, 6.3.2.
18. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1; normally not exceeding three groups.

Table A3-3. Use of change indicators in trend forecasts

Change indicator	*Time indicator and period*	*Meaning*	
NOSIG	—	no significant changes are forecast	
BECMG	$FMn_1n_1n_1n_1$ $TLn_2n_2n_2n_2$	the change is forecast to	commence at $n_1n_1n_1n_1$ UTC and be completed by $n_2n_2n_2n_2$ UTC
	TLnnnn		commence at the beginning of the trend forecast period and be completed by nnnn UTC
	FMnnnn		commence at nnnn UTC and be completed by the end of the trend forecast period
	ATnnnn		occur at nnnn UTC (specified time)
	—		a) commence at the beginning of the trend forecast period and be completed by the end of the trend forecast period; *or* b) the time is uncertain
TEMPO	$FMn_1n_1n_1n_1$ $TLn_2n_2n_2n_2$	temporary fluctuations are forecast to	commence at $n_1n_1n_1n_1$ UTC and cease by $n_2n_2n_2n_2$ UTC
	TLnnnn		commence at the beginning of the trend forecast period and cease by nnnn UTC
	FMnnnn		commence at nnnn UTC and cease by the end of the trend forecast period
	—		commence at the beginning of the trend forecast period and cease by the end of the trend forecast period

Table A3-4. Ranges and resolutions for the numerical elements included in local reports

Element as specified in Chapter 4		*Range*	*Resolution*
Runway:		01 – 36	1
Wind direction:	°true	010 – 360	10
Wind speed:	KMH KT	1 – 399* 1 – 199*	1 1
Visibility:	M M KM	0 – 800 800 – 5 000 5 – 10	50 100 1
RVR:	M M M	0 – 400 400 – 800 800 – 2 000	25 50 100
Vertical visibility:	M FT	0 – 600 0 – 2 000	30 100
Clouds: height of cloud base:	M FT	0 – 1 500 0 – 5 000	30 100
Air temperature; Dew-point temperature:	°C	–80 – +60	1
QNH; QFE:	hPa	0500 – 1 100	1

* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.

Table A3-5. Ranges and resolutions for the numerical elements included in METAR and SPECI

Element as specified in Chapter 4		*Range*	*Resolution*
Runway:	(no units)	01 – 36	1
Wind direction:	° true	000 – 360	10
Wind speed:	KMH KT	00 – 399* 00 – 199*	1 1
Visibility:	M M M M	0000 – 0800 0800 – 5 000 5 000 – 9 000 9 000 – 9 999	50 100 1 000 999
RVR:	M M M	0000 – 0400 0400 – 0800 0800 – 2 000	25 50 100
Vertical visibility:	30's M (100's FT)	000 – 020	1
Clouds: height of cloud base:	30's M (100's FT)	000 – 050	1
Air temperature; Dew-point temperature:	°C	–80 – +60	1
QNH:	hPa	0850 – 1 100	1
Sea-surface temperature:	°C	–10 – +40	1
State of the sea:	(no units)	0 – 9	1

Element as specified in Chapter 4			*Range*	*Resolution*
State of the runway	Runway designator:	(no units)	01 – 36; 51 – 86; 88; 99	1
	Runway deposits:	(no units)	0 – 9	1
	Extent of runway contamination:	(no units)	1; 2; 5; 9	—
	Depth of deposit:	(no units)	00 – 90; 92 – 99	1
	Friction coefficient/braking action:	(no units)	00 – 95; 99	1

* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.

Example A3-1. Routine report

a) Local routine report (same location and weather conditions as METAR):

MET REPORT YUDO 221630Z WIND 240/15KMH VIS 600M RVR RWY 12 TDZ 1000M MOD DZ FG CLD SCT 300M OVC 600M T17 DP16 QNH 1018 HPA TREND BECMG TL1700 VIS 800M FG BECMG AT1800 VIS 10KM NSW

b) METAR for YUDO (Donlon/International):*

METAR YUDO 221630Z 24015KMH 0600 R12/1000U DZ FG SCT010 OVC020 17/16 Q1018 BECMG TL1700 0800 FG BECMG AT1800 9999 NSW

Meaning of both reports:

Routine report for Donlon/International* issued on the 22nd of the month at 1630 UTC; surface wind direction 240 degrees; wind speed 15 kilometres per hour; visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) 600 metres; runway visual range representative of the touchdown zone for runway 12 is 1 000 metres and the runway visual range values have shown an upward tendency during previous 10 minutes (RVR tendency to be included in METAR only); and moderate drizzle and fog; scattered cloud at 300 metres; overcast at 600 metres; air temperature 17 degrees Celsius; dew-point temperature 16 degrees Celsius; QNH 1 018 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 800 metres in fog by 1700 UTC; at 1800 UTC visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 10 kilometres or more and nil significant weather.

* Fictitious location

Note.— In this example, the primary units “kilometre per hour” and “metre” were used for wind speed and height of cloud base, respectively. However, in accordance with Annex 5, the corresponding non-SI alternative units “knot” and “foot” may be used instead.

Example A3-2. Special report

a) *Local special report (same location and weather conditions as SPECI):*

SPECIAL YUDO 151115Z WIND 050/25KT MAX37 MNM10 VIS 1200M HVY TSRA CLD BKN CB 500FT T25 DP22 QNH 1008 HPA TREND TEMPO TL1200 VIS 600M BECMG AT1200 VIS 8KM NSW NSC

b) *SPECI for YUDO (Donlon/International)*:*

SPECI YUDO 151115Z 05025G37KT 3000 1200NE+TSRA BKN005CB 25/22 Q1008 TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC

Meaning of both reports:

Special report for Donlon/International* issued on the 15th of the month at 1115 UTC; surface wind direction 050 degrees; wind speed 25 knots gusting between 10 and 37 knots (minimum wind speed not to be included in SPECI) visibility 1 200 metres (along the runway(s) in the local special report); prevailing visibility 3 000 metres (in SPECI) with minimum visibility 1 200 metres to north east (directional variations to be included in SPECI only); thunderstorm with heavy rain; broken cumulonimbus cloud at 500 feet; air temperature 25 degrees Celsius; dew-point temperature 22 degrees Celsius; QNH 1 008 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) temporarily 600 metres from 1115 to 1200, becoming at 1200 UTC visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) 8 kilometres, thunderstorm ceases and nil significant weather and nil significant cloud.

* Fictitious location

Note.— In this example, the non-SI alternative units "knot" and "foot" were used for wind speed and height of cloud base, respectively. However, in accordance with Annex 5, the corresponding primary units "kilometre per hour" and "metre" may be used instead.

Example A3-3. Volcanic activity report

VOLCANIC ACTIVITY REPORT YUSB* 231500 MT TROJEEN* VOLCANO N5605 W12652 ERUPTED 231445 LARGE ASH CLOUD EXTENDING TO APPROX 30000 FEET MOVING SW

Meaning:

Volcanic activity report issued by Siby/Bistock meteorological station at 1500 UTC on the 23rd of the month. Mt. Trojeen volcano 56 degrees 5 minutes north 126 degrees 52 minutes west erupted at 1445 UTC on the 23rd; a large ash cloud was observed extending to approximately 30 000 feet and moving in a south-westerly direction.

* Fictitious location

APPENDIX 4. TECHNICAL SPECIFICATIONS RELATED TO AIRCRAFT OBSERVATIONS AND REPORTS

(See Chapter 5 of this Annex.)

1. CONTENTS OF AIR-REPORTS

1.1 Routine air-reports by air-ground data link

1.1.1 When air-ground data link is used and automatic dependent surveillance (ADS) is being applied, the elements contained in routine air-reports shall be:

Message type designator
Aircraft identification

Data block 1
- Latitude
- Longitude
- Level
- Time

Data block 2
- Wind direction
- Wind speed
- Wind quality flag
- Temperature
- Turbulence (if available)
- Humidity (if available)

Note.— When ADS is being applied, the requirements of routine air-reports may be met by the combination of the basic ADS data block (data block 1) and the meteorological information data block (data block 2), available from ADS reports. The ADS message format is specified in the PANS-ATM (Doc 4444), Part II, Section 14.4 and in Annex 10, Volume III, Part I — Digital Data Communication Systems.

1.1.2 When air-ground data link is used while ADS is not being applied, the elements contained in routine reports shall be in accordance with 1.3.

Note.— When air-ground data link is used while ADS is not being applied, the requirements of routine air-reports may be met by the controller-pilot data link communication (CPDLC) application entitled "Position report". The details of this data link application are specified in the Manual of Air Traffic Services Data Link Applications *(Doc 9694) and in Annex 10, Volume III, Part I.*

1.2 Special air-reports by air-ground data link

When air-ground data link is used, the elements contained in special air-reports shall be:

Message type designator
Aircraft identification

Data block 1
- Latitude
- Longitude
- Level
- Time

Data block 2
- Wind direction
- Wind speed
- Wind quality flag
- Temperature
- Turbulence (if available)
- Humidity (if available)

Data block 3
- Condition prompting the issuance of a special air-report (one condition to be selected from the list presented in Table A4-3).

Note 1.— The requirements of special air-reports may be met by the data link flight information service (D-FIS) application entitled "Special air-report service". The details of this data link application are specified in Doc 9694.

Note 2.— In the case of a special air-report of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud, additional requirements are indicated in 4.2.

1.3 Routine air-reports by voice communications

When voice communications are used, the elements contained in routine air-reports shall be:

Message type designator

Section 1 (Position information)
- Aircraft identification
- Position or latitude and longitude
- Time
- Flight level or altitude
- Next position and time over
- Ensuing significant point

Section 2 (Operational information)
- Estimated time of arrival
- Endurance

Section 3 (Meteorological information)
Air temperature
Wind direction
Wind speed
Turbulence
Aircraft icing
Humidity (if available)

1.4 Special air-reports by voice communications

When voice communications are used, the elements contained in special air-reports shall be:

Message type designator

Section 1 (Position information)
Aircraft identification
Position or latitude and longitude
Time
Flight level or altitude

Section 3 (Meteorological information)
Condition prompting the issuance of a special air-report, to be selected from the list presented in Table A4-3.

Note 1.— Air-reports are considered routine by default. The message type designator for special air-reports is specified in the PANS-ATM (Doc 4444), Appendix 1.

Note 2.— In the case of a special air-report of pre-eruption volcanic activity, volcanic eruption or volcanic ash cloud, additional requirements are indicated in 4.2.

2. CRITERIA FOR REPORTING

2.1 When air-ground data link is used, the wind direction, wind speed, wind quality flag, temperature, turbulence and humidity included in air-reports shall be reported in accordance with the following criteria.

2.2 Wind direction

The wind direction shall be reported in terms of degrees true, rounded to the nearest whole degree.

2.3 Wind speed

The wind speed shall be reported in kilometres per hour or knots, rounded to the nearest 2 km/h (1 knot). The units used shall be indicated.

2.4 Wind quality flag

The wind quality flag shall be reported as 0 when the roll angle is less than 5 degrees and as 1 when the roll angle is 5 degrees or more.

2.5 Temperature

The temperature shall be reported to the nearest tenth of a degree Celsius.

2.6 Turbulence

The turbulence shall be observed in terms of the eddy dissipation rate (EDR).

2.6.1 Routine air-reports

The turbulence shall be reported during the en-route phase of the flight and shall refer to the 15-minute period immediately preceding the observation. Both the average and peak value of turbulence, together with the time of occurrence of the peak value to the nearest minute, shall be observed. The average and peak values shall be reported in terms of a turbulence index comprising seven intensity levels of EDR as indicated in Table A4-1. The time of occurrence of the peak value shall be reported as indicated in Table A4-2.

2.6.2 Interpretation of the turbulence index

Turbulence shall be considered:

a) severe when the turbulence index is between 15 and 27 (i.e. the peak value of the EDR is exceeding 0.5);

b) moderate when the turbulence index is between 6 and 14 (i.e. the peak value of the EDR is exceeding 0.3 while not exceeding 0.5);

c) light when the turbulence index is between 1 and 5 (i.e. the peak value of the EDR is between 0.1 and 0.3); and

d) nil when the turbulence index is 0 (i.e. the peak value of the EDR is less than 0.1).

Note.— The EDR is an aircraft-independent measure of turbulence. However, the relationship between the EDR index and the perception of turbulence is a function of aircraft type, and the mass, altitude, configuration and airspeed of the aircraft.

2.6.3 Special air-reports

Special air-reports on turbulence shall be made during any phase of the flight whenever the peak value exceeds the EDR value of 0.5. The special air-report on turbulence shall be made with reference to the 1-minute period immediately preceding the observation. Both the average and peak value of turbulence shall be observed. The average and peak values shall be reported in terms of a turbulence index as indicated in the shaded part of Table A4-1. Special air-reports shall be issued every minute until such time that the peak values of turbulence fall below the EDR value of 0.5.

2.7 Humidity

The humidity shall be reported as the relative humidity, rounded to the nearest whole per cent.

Note.— The ranges and resolutions for the meteorological elements included in air-reports are shown in Table A4-4.

3. EXCHANGE OF AIR-REPORTS

3.1 Responsibilities of the meteorological watch offices

3.1.1 The meteorological watch offices shall assemble the routine air-reports received by voice communications and shall disseminate them to WAFCs and other meteorological offices in accordance with regional air navigation agreement.

Note.— The exchange of collectives on an hourly basis may be found desirable when reports are numerous.

3.1.2 The meteorological watch office shall transmit without delay the special air-reports received by voice communications to WAFCs.

3.1.3 The meteorological watch office shall transmit without delay special air-reports of pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud received to the associated VAACs.

3.1.4 When a special air-report is received at the meteorological watch office but the forecaster considers that the phenomenon causing the report is not expected to persist and, therefore, does not warrant issuance of a SIGMET, the special air-report shall be disseminated in the same way that SIGMET messages are disseminated in accordance with Appendix 6, 1.2.1, i.e. to meteorological watch offices, WAFCs, and other meteorological offices in accordance with regional air navigation agreement.

3.2 Responsibilities of world area forecast centres

Air-reports received at WAFCs shall be further disseminated as basic meteorological data.

Note.— The dissemination of basic meteorological data is normally carried out on the WMO global telecommunication system.

3.3 Supplementary dissemination of air-reports

Recommendation.— *Where supplementary dissemination of air-reports is required to satisfy special aeronautical or meteorological requirements, such dissemination should be arranged between the meteorological authorities concerned.*

3.4 Format of air-reports

Air-reports shall be exchanged in the format in which they are received, except that when voice communications are used, if the position is given by reference to an ATS reporting point, it shall be converted, by the meteorological watch office, into the corresponding latitude and longitude.

4. SPECIFIC PROVISIONS RELATED TO REPORTING WIND SHEAR AND VOLCANIC ASH

4.1 Reporting of wind shear

4.1.1 **Recommendation.—** *When reporting aircraft observations of wind shear encountered during the climb-out and approach phases of flight, the aircraft type should be included.*

4.1.2 **Recommendation.—** *Where wind shear conditions in the climb-out or approach phases of flight were reported or forecast but not encountered, the pilot-in-command should advise the appropriate air traffic services unit as soon as practicable unless the pilot-in-command is aware that the appropriate air traffic services unit has already been so advised by a preceding aircraft.*

4.2 Post-flight reporting of volcanic activity

Note.— The detailed instructions for recording and reporting volcanic activity observations are given in the PANS-ATM (Doc 4444), Appendix 1.

4.2.1 On arrival of a flight at an aerodrome, the completed report of volcanic activity shall be delivered by the operator or a flight crew member, without delay, to the aerodrome meteorological office, or if such office is not easily accessible to arriving flight crew members, the completed form shall be dealt with in accordance with local arrangements made by the meteorological authority and the operator.

4.2.2 The completed report of volcanic activity received by a meteorological office shall be transmitted without delay to the meteorological watch office responsible for the provision of meteorological watch for the flight information region in which the volcanic activity was observed.

Table A4-1. Turbulence index to be reported as a function of the average and peak value of turbulence (Classes corresponding to severe turbulence are shaded)

	Peak value of turbulence							
Average value of turbulence	*EDR ($m^{2/3}$ s^{-1})*							*Nil report*
EDR ($m^{2/3}$ s^{-1})	< 0. 1	0.1 – 0.2	0.2 – 0.3	0.3 – 0.4	0.4 – 0.5	0.5 – 0.8	> 0.8	
< 0.1	0	1	3	6	10	15	21	
0.1 – 0.2		2	4	7	11	16	22	
0.2 – 0.3			5	8	12	17	23	
0.3 – 0.4				9	13	18	24	
0.4 – 0.5					14	19	25	
0.5 – 0.8						20	26	
> 0.8							27	
Nil report								28

Table A4-2. Time of occurrence of the peak value to be reported

Peak value of turbulence occurring during the one-minute period .... minutes prior to the observation	*Value to be reported*
0 – 1	0
1 – 2	1
2 – 3	2
. . .	. . .
13 – 14	13
14 – 15	14
No timing information available	15

Table A4-3. Template for the special air-report (downlink)

Key: M = mandatory, part of every message
C = inclusion conditional; included whenever available

Note.— Message to be prompted by the pilot-in-command. Currently only the condition "SEV TURB" can be automated (see 2.6.3).

Element as specified in Chapter 5	*Detailed content*	*Template(s)*	*Examples*
Message type designator (M)	Type of the air-report (M)	ARS	ARS
Aircraft identification (M)	Aircraft radiotelephony call sign (M)	nnnnnn	VA812
DATA BLOCK 1			
Latitude (M)	Latitude in degrees and minutes (M)	Nnnnn *or* Snnnn	S4506
Longitude (M)	Longitude in degrees and minutes (M)	Wnnnnn *or* Ennnnn	E01056
Level (M)	Flight level (M)	FLnnn	FL330
Time (M)	Time of occurrence in hours and minutes (M)	OBS AT nnnnZ	OBS AT 1216Z
DATA BLOCK 2			
Wind direction (M)	Wind direction in degrees true (M)	nnn/	262/
Wind speed (M)	Wind speed in kilometres per hour (or knots) (M)	nnnKMH (*or* nnnKT)	158KMH (079KT)
Wind quality flag (M)	Wind quality flag (M)	n	1
Temperature (M)	Air temperature in tenths of degrees C (M)	T[M]nnn	T127 TM455
Turbulence (C)	Turbulence index and the time of occurrence of the peak value (C)[1]	EDRnn/nn	EDR16/08
Humidity (C)	Relative humidity in per cent (C)	RHnnn	RH054
DATA BLOCK 3			
Condition prompting the issuance of a special air-report (M)		SEV TURB [EDRnn][2] *or* SEV ICE *or* SEV MTW *or* TS GR[3] *or* TS[3] *or* HVY SS[4] *or* VA CLD [FL nnn/nnn] *or* VA[5] [MT nnnnnnnnnnnnnnnnnnnn]	SEV TURB EDR16; VA CLD FL050/100

Notes.—

1. The index and the time of occurrence to be reported in accordance with Tables A4-1 and A4-2, respectively.
2. The turbulence index to be reported in accordance with 2.6.3 and Table A4-1.
3. Obscured, embedded or widespread thunderstorms or thunderstorms in squall lines.
4. Duststorm or sandstorm.
5. Pre-eruption volcanic activity or a volcanic eruption.

Table A4-4. Ranges and resolutions for the meteorological elements included in air-reports

Element as specified in Chapter 5		*Range*	*Resolution*
Wind direction:	°true	000 – 360	1
Wind speed:	KMH KT	00 – 500 00 – 250	2 1
Wind quality flag:	(index)*	0 – 1	1
Temperature:	°C	–80 – +60	0.1
Turbulence: routine air-report:	(index)* (time of occurrence)*	0 – 28 0 – 15	1 1
Turbulence: special air-report:	(index)*	15 – 27	1
Humidity:	%	0 – 100	1

* Non-dimensional

APPENDIX 5. TECHNICAL SPECIFICATIONS RELATED TO FORECASTS

(See Chapter 6 of this Annex.)

1. CRITERIA RELATED TO TAF

1.1 TAF format

TAF shall be issued in accordance with the template shown in Table A5-1 and disseminated in the TAF code form prescribed by the World Meteorological Organization.

Note.— The TAF code form is contained in WMO Publication No. 306, Manual on Codes*, Volume I.1, Part A — Alphanumeric Codes.*

1.2 Inclusion of meteorological elements in TAF

Note.— Guidance on operationally desirable accuracy of forecasts is given in Attachment B.

1.2.1 Surface wind

Recommendation.— *In forecasting surface wind, the expected prevailing direction should be given. When it is not possible to forecast a prevailing surface wind direction due to its expected variability, for example, during light wind conditions (less than 6 km/h (3 kt)) or thunderstorms, the forecast wind direction should be indicated as variable using "VRB". When the wind is forecast to be less than 2 km/h (1 kt) the forecast wind speed should be indicated as calm. When the forecast maximum speed (gust) exceeds the forecast mean wind speed by 20 km/h (10 kt) or more, the forecast maximum wind speed should be indicated. When a wind speed of 200 km/h (100 kt) or more is forecast, it should be indicated to be more than 199 km/h (99 kt).*

1.2.2 Visibility

Recommendation.— *When the visibility is forecast to be less than 800 m it should be expressed in steps of 50 m; when it is forecast to be 800 m or more but less than 5 km, in steps of 100 m; 5 km or more but less than 10 km in kilometre steps and when it is forecast to be 10 km, or more it should be expressed as 10 km, except when conditions of CAVOK are forecast to apply. The prevailing visibility should be forecast. When visibility is forecast to vary in different directions and the prevailing visibility cannot be forecast, the lowest forecast visibility should be given.*

1.2.3 Weather phenomena

Recommendation.— *One or more, up to a maximum of three, of the following weather phenomena or combinations thereof, together with their characteristics and, where appropriate, intensity should be forecast if they are expected to occur at the aerodrome:*

- *— freezing precipitation*
- *— freezing fog*
- *— moderate or heavy precipitation (including showers thereof)*
- *— low drifting dust, sand or snow*
- *— blowing dust, sand or snow*
- *— duststorm*
- *— sandstorm*
- *— thunderstorm (with or without precipitation)*
- *— squall*
- *— funnel cloud (tornado or waterspout)*
- *— other weather phenomena given in Appendix 3, 4.4.2.3 only if they are expected to cause a significant change in visibility.*

The expected end of occurrence of those phenomena should be indicated by the abbreviation "NSW".

1.2.4 Cloud

Recommendation.— *Cloud amount should be forecast using the abbreviations "FEW", "SCT", "BKN" or "OVC" as necessary. If no clouds are forecast, and the abbreviation "CAVOK" is not appropriate, the abbreviation "SKC" should be used. When it is expected that the sky will remain or become obscured and clouds cannot be forecast and information on vertical visibility is available at the aerodrome, the vertical visibility should be forecast in the form "VV" followed by the forecast value of the vertical visibility. When several layers or masses of cloud are forecast, their amount and height of base should be included in the following order:*

a) the lowest layer or mass regardless of amount, to be forecast as FEW, SCT, BKN or OVC as appropriate;

b) the next layer or mass covering more than 2/8, to be forecast as SCT, BKN or OVC as appropriate;

c) the next higher layer or mass covering more than 4/8, to be forecast as BKN or OVC as appropriate; and *d) cumulonimbus clouds, whenever forecast and not already included under a) to c).*

Cloud information should be limited to cloud of operational significance, i.e. cloud below 1 500 m (5 000 ft) or the highest minimum sector altitude whichever is greater, and cumulonimbus whenever forecast. In applying this limitation, when no cumulonimbus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude whichever is greater are forecast, and "CAVOK" or "SKC" are not appropriate, the abbreviation "NSC" should be used.

1.2.5 Temperature

Recommendation.— *When forecast temperatures are included in accordance with regional air navigation agreement, the maximum and minimum temperatures expected to occur during the period of validity of the TAF should be given, together with their corresponding times of occurrence.*

1.3 Use of change groups

1.3.1 **Recommendation.—** *The criteria used for the inclusion of change groups in TAF or for the amendment of TAF should be based on the following:*

a) when the surface wind is forecast to change through values of operational significance the threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:

1) require a change in runway(s) in use; and

2) indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome;

b) when the visibility is forecast to improve and change to or pass through one or more of the following values, or when the visibility is forecast to deteriorate and pass through one or more of the following values:

1) 150, 350, 600, 800, 1 500 or 3 000 m; or

2) 5 000 m in cases where significant numbers of flights are operated in accordance with the visual flight rules;

c) when any of the following weather phenomena or combinations thereof are forecast to begin or end or change in intensity:

— freezing precipitation
— moderate or heavy precipitation (including showers thereof)
— duststorm
— sandstorm
— other weather phenomena given in Appendix 3, 4.4.2.3 only if they are expected to cause a significant change in visibility;

d) when the onset or cessation of any of the following weather phenomena or combinations thereof are forecast to begin or end:

— ice crystals
— freezing fog
— low drifting dust, sand or snow
— blowing dust, sand or snow
— thunderstorm (with or without precipitation)
— squall
— funnel cloud (tornado or waterspout);

e) when the height of base of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lift and change to or pass through one or more of the following values, or when the height of the lowest layer or mass of cloud of BKN or OVC extent is forecast to lower and pass through one or more of the following values:

1) 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); or

2) 450 m (1 500 ft), in cases where significant numbers of flights are operated in accordance with the visual flight rules;

f) when the amount of a layer or mass of cloud below 450 m (1 500 ft) is forecast to change:

1) from SKC, FEW or SCT to BKN or OVC; or

2) from BKN or OVC to SKC, FEW or SCT;

g) when cumulonimbus clouds are forecast to develop or dissipate;

h) when the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft); and

i) any other criteria based on local aerodrome operating minima, as agreed between the meteorological authority and the operators.

1.3.2 **Recommendation.—** *When a change in any of the elements given in Chapter 6, 6.2.3 is required to be indicated in accordance with the criteria given in 1.3.1, the change indicators "BECMG" or "TEMPO" should be used followed by the time period during which the change is expected to occur.*

The time period should be indicated as the beginning and end of the period in whole hours UTC. Only those elements for which a significant change is expected should be included following a change indicator. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, should be indicated.

1.3.3 **Recommendation.—** *The change indicator "BECMG" and the associated time group should be used to describe changes where the meteorological conditions are expected to reach or pass through specified threshold values at a regular or irregular rate and at an unspecified time during the time period. The time period should normally not exceed 2 hours but in any case should not exceed 4 hours.*

1.3.4 **Recommendation.—** *The change indicator "TEMPO" and the associated time group should be used to describe expected frequent or infrequent temporary fluctuations in the meteorological conditions which reach or pass specified threshold values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the forecast period during which the fluctuations are expected to occur. If the temporary fluctuation is expected to last one hour or longer, the change group "BECMG" should be used in accordance with 1.3.3 or the validity period should be subdivided in accordance with 1.3.5 .*

1.3.5 **Recommendation.—** *Where one set of prevailing weather conditions is expected to change significantly and more or less completely to a different set of conditions, the period of validity should be subdivided into self-contained periods using the abbreviation "FM" followed immediately by a four-figure time group in whole hours and minutes UTC indicating the time the change is expected to occur. The subdivided period following the abbreviation "FM" should be self-contained and all forecast conditions given before the abbreviation should be superseded by those following the abbreviation.*

1.4 Use of probability groups

Recommendation.— *The probability of occurrence of an alternative value of a forecast element or elements should be indicated, as necessary, by use of the abbreviation "PROB" followed by the probability in tens of per cent and the time period during which the alternative value(s) is (are) expected to apply. The probability information should be placed after the element or elements forecast and be followed by the alternative value of the element or elements. The probability of a forecast of temporary fluctuations in meteorological conditions should be indicated, as necessary, by use of the abbreviation "PROB" followed by the probability in tens of per cent, placed before the change indicator "TEMPO" and associated time group. A probability of an alternative value or change of less than 30 per cent should not be considered sufficiently significant to be indicated. A probability of an alternative value or change of 50 per cent or more, for aviation purposes, should not be considered a probability but instead should be indicated, as necessary, by use of the change indicators "BECMG" or "TEMPO" or by subdivision of the validity period using the abbreviation "FM". The probability group should not be used to qualify the change indicator "BECMG" nor the time indicator "FM".*

1.5 Numbers of change and probability groups

Recommendation.— *The number of change and probability groups should be kept to a minimum and should not normally exceed five groups.*

1.6 Dissemination of TAF

TAF and amendments thereto shall be disseminated to international OPMET data banks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

2. CRITERIA RELATED TO TREND FORECASTS

2.1 Format of trend forecasts

Trend forecasts shall be issued in accordance with the templates shown in Appendix 3, Tables A3-1 and A3-2. The units and scales used in the trend forecast shall be the same as those used in the report to which it is appended.

Note.— Examples of trend forecasts are given in Appendix 3.

2.2 Inclusion of meteorological elements in trend forecasts

2.2.1 General provisions

The trend forecast shall indicate significant changes in respect of one or more of the elements: surface wind, visibility, weather and clouds. Only those elements shall be included for which a significant change is expected. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, shall be indicated. In the case of a significant change in visibility, the phenomenon causing the reduction of visibility shall also be indicated. When no change is expected to occur, this shall be indicated by the term "NOSIG".

2.2.2 Surface wind

The trend forecast shall indicate changes in the surface wind which involve:

a) a change in the mean wind direction of 60° or more, the mean speed before and/or after the change being 20 km/h (10 kt) or more;

b) a change in mean wind speed of 20 km/h (10 kt) or more; and

c) changes in the wind through values of operational significance. The threshold values should be established by the meteorological authority in consultation with the appropriate ATS authority and operators concerned, taking into account changes in the wind which would:

   1) require a change in runway(s) in use; and

   2) indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome.

2.2.3 Visibility

When the visibility is expected to improve and change to or pass through one or more of the following values, or when the visibility is expected to deteriorate and pass through one or more of the following values: 150, 350, 600, 800, 1 500 or 3 000 m, the trend forecast shall indicate the change. When significant numbers of flights are conducted in accordance with the visual flight rules, the forecast shall additionally indicate changes to or passing through 5 000 m.

Note.— In trend forecasts appended to local routine and special reports, visibility refers to the forecast visibility along the runway(s); in trend forecasts appended to METAR and SPECI, visibility refers to the forecast prevailing visibility.

2.2.4 Weather phenomena

2.2.4.1 The trend forecast shall indicate the expected onset, cessation or change in intensity of one or more, up to a maximum of three, of the following weather phenomena or combinations thereof:

— freezing precipitation
— moderate or heavy precipitation (including showers thereof)
— duststorm
— sandstorm
— other weather phenomena given in Appendix 3, 4.4.2.3, only if they are expected to cause a significant change in visibility.

2.2.4.2 The trend forecast shall indicate the expected onset or cessation of one or more, up to a maximum of three, of the following weather phenomena or combinations thereof:

— ice crystals
— freezing fog
— low drifting dust, sand or snow
— blowing dust, sand or snow
— thunderstorm (with or without precipitation)
— squall
— funnel cloud (tornado or waterspout).

2.2.4.3 The expected end of occurrence of the weather phenomena shall be indicated by the abbreviation “NSW”.

2.2.5 Clouds

When the height of the base of a cloud layer of BKN or OVC extent is expected to lift and change to or pass through one or more of the following values, or when the height of the base of a cloud layer of BKN or OVC extent is expected to lower and pass through one or more of the following values: 30, 60, 150, 300 and 450 m (100, 200, 500, 1 000 and 1 500 ft), the trend forecast shall indicate the change. When the height of the base of a cloud layer is below or is expected to fall below or rise above 450 m (1 500 ft), the trend forecast shall also indicate changes in cloud amount from SKC, FEW, or SCT increasing to BKN or OVC, or changes from BKN or OVC decreasing to SKC, FEW or SCT. When no cumulonimbus and no cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, are forecast and “CAVOK” and “SKC” are not appropriate, the abbreviation “NSC” shall be used.

2.2.6 Vertical visibility

When the sky is expected to remain or become obscured and vertical visibility observations are available at the aerodrome, and the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: 30, 60, 150 or 300 m (100, 200, 500 or 1 000 ft), the trend forecast shall indicate the change.

2.2.7 Additional criteria

Criteria for the indication of changes based on local aerodrome operating minima, additional to those specified in 2.2.2 to 2.2.6, shall be used as agreed between the meteorological authority and the operator(s) concerned.

2.3 Use of change indicators

2.3.1 When a change is expected to occur, the trend forecast shall begin with one of the change indicators “BECMG” or “TEMPO”.

2.3.2 The change indicator "BECMG" shall be used to describe forecast changes where the meteorological conditions are expected to reach or pass through specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur shall be indicated, using the abbreviations "FM", "TL", or "AT", as appropriate, each followed by a time group in hours and minutes. When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change shall be indicated by using the abbreviations "FM" and "TL", respectively, with their associated time groups. When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation "FM" and its associated time group shall be omitted and only "TL" and its associated time group shall be used. When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation "TL" and its associated time group shall be omitted and only "FM" and its associated time group shall be used. When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation "AT" followed by its associated time group shall be used. When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period or when the change is forecast to occur within the trend forecast period but the time is uncertain, the abbreviations "FM", "TL" or "AT" and their associated time groups shall be omitted and the change indicator "BECMG" shall be used alone.

2.3.3 The change indicator "TEMPO" shall be used to describe forecast temporary fluctuations in the meteorological conditions which reach or pass specified values and last for a period of less than one hour in each instance and, in the aggregate, cover less than one-half of the period during which the fluctuations are forecast to occur. The period during which the temporary fluctuations are forecast to occur shall be indicated, using the abbreviations "FM" and/or "TL", as appropriate, each followed by a time group in hours and minutes. When the period of temporary fluctuations in the meteorological conditions is forecast to begin and end wholly within the trend forecast period, the beginning and end of the period of temporary fluctuations shall be indicated by using the abbreviations "FM" and "TL", respectively, with their associated time groups. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period but cease before the end of that period, the abbreviation "FM" and its associated time group shall be omitted and only "TL" and its associated time group shall be used. When the period of temporary fluctuations is forecast to begin during the trend forecast period and cease by the end of that period, the abbreviation "TL" and its associated time group shall be omitted and only "FM" and its associated time group shall be used. When the period of temporary fluctuations is forecast to commence at the beginning of the trend forecast period and cease by the end of that period, both abbreviations "FM" and "TL" and their associated time groups shall be omitted and the change indicator "TEMPO" shall be used alone.

2.4 Use of the probability indicator

The indicator "PROB" shall not be used in trend forecasts.

3. CRITERIA RELATED TO FORECASTS FOR TAKE-OFF

3.1 Format of forecasts for take-off

Recommendation.— *The format of the forecast should be as agreed between the meteorological authority and the operator concerned. The order of the elements and the terminology, units and scales used in forecasts for take-off should be the same as those used in reports for the same aerodrome.*

3.2 Amendments to forecasts for take-off

Recommendation.— *The criteria for the issuance of amendments for forecasts for take-off for surface wind direction and speed, temperature and pressure and any other elements agreed locally should be agreed between the meteorological authority and the operators concerned. The criteria should be consistent with the corresponding criteria for special reports established for the aerodrome in accordance with Appendix 3, 2.3.1.*

4. CRITERIA RELATED TO AREA AND ROUTE FORECASTS, OTHER THAN FORECASTS ISSUED WITHIN THE FRAMEWORK OF THE WORLD AREA FORECAST SYSTEM

4.1 Format of area and route forecasts

4.1.1 Area and route forecasts and amendments thereto, disseminated locally, shall be in one of the forms prescribed for the exchange of such information between meteorological offices or in another form as agreed locally.

4.1.2 Route forecasts and amendments thereto which are exchanged between meteorological offices shall be in the ROFOR code form prescribed by the World Meteorological Organization.

Note.— The ROFOR code form is contained in WMO Publication No. 306, Manual on Codes, *Volume I.1, Part A — Alphanumeric Codes.*

4.1.3 **Recommendation.—** *The order of the elements in area and route forecasts (or amendments thereto) in abbreviated plain language should normally follow that of the* *corresponding coded form of message. The terminology and units employed should be consistent with those used in the related aerodrome reports and forecasts. The identifier employed should be "AREA FCST" or "ROUTE FCST", respectively, preceded in the case of amendments by "AMD". The CAVOK procedure applied in TAF should not be used in area and route forecasts.*

4.2 Amendments to area and route forecasts

4.2.1 A list of criteria to be used for amendments to area and route forecasts shall be established by the meteorological authority, in consultation with operators and other users concerned.

4.2.2 Amendments to area and route forecasts shall be issued in accordance with criteria in Appendix 2, 1.4.

5. CRITERIA RELATED TO AREA FORECASTS FOR LOW-LEVEL FLIGHTS

5.1 Format and content of GAMET area forecasts

When prepared in GAMET format, they shall contain two sections: Section I related to information on en-route weather phenomena hazardous to low-level flights, prepared in support of the issuance of AIRMET information, and Section II related to additional information required by low-level flights. The area forecasts shall contain the following information as necessary and, when prepared in GAMET format, in the order indicated. Additional elements in Section II shall be included in accordance with regional air navigation agreement:

a) location indicator of the air traffic services unit serving the flight information region(s) to which the area forecast for low-level flights refers; for example, "YUCC";

b) message identification using the abbreviation "GAMET";

c) date-time groups indicating the period of validity in UTC; for example, "VALID 220600/221200";

d) location indicator of the meteorological office originating the message, followed by a hyphen to separate the preamble from the text; for example, "YUDO-";

e) on the next line, name of the flight information region, or a sub-area thereof, for which the area forecast for low-level flights is issued; for example "AMSWELL FIR/2 BLW FL120";

f) on the next line, indication of the beginning of the first section of the area forecast using the abbreviation "SECN I";

g) widespread mean surface wind speed exceeding 60 km/h (30 kt); for example, "SFC WSPD: 10/12 65 KMH";

h) widespread areas of surface visibility below 5 000 m including the weather phenomena causing the reduction of visibility; for example, "SFC VIS: 06/08 3000 M BR N OF N51";

i) significant weather conditions encompassing thunderstorms and heavy sand- and duststorm (except for phenomena for which a SIGMET message has already been issued); for example, "SIGWX: 11/12 ISOL TS";

j) mountain obscuration; for example, "MT OBSC: MT PASSES S OF N48";

k) widespread areas of broken or overcast cloud with height of base less than 300 m (1 000 ft) above ground level (AGL) or above mean sea level (AMSL) and/or any occurrence of cumulonimbus (CB) or towering cumulus (TCU) clouds, giving height indications of their bases and tops; for example, "SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL";

l) icing (except for that occurring in convective clouds and for severe icing for which a SIGMET message has already been issued); for example, "ICE: MOD FL050/080";

m) turbulence (except for that occurring in convective clouds and for severe turbulence for which a SIGMET message has already been issued); for example, "TURB: MOD ABV FL090";

n) mountain wave (except for severe mountain wave for which a SIGMET message has already been issued); for example, "MTW: MOD ABV FL080 E OF N63";

o) SIGMET messages applicable to the FIR concerned or the sub-area thereof, for which the area forecast is valid; for example, "SIGMET APPLICABLE: 3,5";

p) on the next line, indication of the beginning of the second section of the area forecast using the abbreviation "SECN II";

q) pressure centres and fronts and their expected movements and developments; for example, "PSYS: 06 L 1004 HPA N5130 E01000 MOV NE 25 KT WKN";

r) upper winds and upper-air temperatures for at least the following altitudes: 600, 1 500 and 3 000 m (2 000, 5 000 and 10 000 ft); for example, "WIND/T: 2000 FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11";

s) cloud information not included under k), giving cloud amount, type and height indications of the bases and tops above ground level (AGL) or above mean sea level (AMSL); for example, “CLD: BKN SC 2500/8000 FT AGL”;

t) height indication of 0° C level(s) above ground level (AGL) or above mean sea level (AMSL), if lower than the top of the airspace for which the forecast is supplied; for example, “FZLVL: 3000 FT AGL”;

u) forecast lowest QNH during the period of validity; for example, “MNM QNH: 1004 HPA”;

v) sea-surface temperature and state of the sea if required by regional air navigation agreement; for example, “SEA: T15 HGT 5 M”; and

w) location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, name of volcano and time of first eruption, if known; for example, “VA: MT. HOKKAIDO KOMAGATAKE PSN N4255 E14040 ERUPTED VA CLD TOP 4900 FT MOV SE”.

Each of the items g) to o) and q) to w) shall, when applicable, be included in the GAMET area forecast beginning on a new line and include an indication of the location (referring where possible, to latitude and longitude and/or locations or geographic features well known internationally) and level, where appropriate. Items g) to o) for which no hazardous phenomenon is expected to occur, or which are already covered by a SIGMET message, shall be omitted from the area forecast. When no weather phenomena hazardous to low-level flights occur and no SIGMET information is applicable, the term “HAZARDOUS WX NIL” shall replace all items listed under g) to o).

5.2 Amendments to GAMET area forecasts

When a weather phenomenon hazardous to low-level flights has been included in the GAMET area forecast and the phenomenon forecast does not occur, or is no longer forecast, a GAMET AMD shall be issued, amending only the weather element concerned.

Note.— Specifications regarding the issuance of AIRMET information amending the area forecast in respect of weather phenomena hazardous for low-level flights are given in Appendix 6.

5.3 Exchange of area forecasts for low-level flights

Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be exchanged between meteorological offices responsible for the issuance of flight documentation for low-level flights in the flight information regions concerned.

Table A5-1. Template for TAF

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, dependent on meteorological conditions or method of observation
O = inclusion optional

Note 1.— The ranges and resolutions for the numerical elements included in TAF are shown in Table A5-3 of this appendix.

Note 2.— The explanations for the abbreviations used can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element as specified in Chapter 6	*Detailed content*	*Template(s)*	*Examples*
Identification of the type of forecast (M)	Type of forecast (M)	TAF *or* TAF AMD *or* TAF COR	TAF TAF AMD
Location indicator (M)	ICAO location indicator (M)	nnnn	YUDO[1]
Time of issue of forecast (M)	Day and time of issue of the forecast in UTC (M)	nnnnnnZ	160000Z
Identification of a missing forecast (C)	Missing forecast identifier (C)	NIL	NIL
END OF TAF IF THE FORECAST IS MISSING.			
Day and period of validity of forecast (M)	Day and period of the validity of the forecast in UTC (M)	nnnnnn	160624 080918
Identification of a cancelled forecast (C)	Cancelled forecast identifier (C)	CNL	CNL
END OF TAF IF THE FORECAST IS CANCELLED.			
Surface wind (M)	Wind direction (M)	nnn *or* VRB[2]	24015KMH; VRB04KMH (24008KT); (VRB02KT) 19022KMH (19011KT)
	Wind speed (M)	[P]nn[n]	00000KMH (00000KT) 140P199KMH (140P99KT)
	Significant speed variations (C)[3]	G[P]nn[n]	12012G35KMH (12006G18KT) 24032G54KMH (24016G27KT)
	Units of measurement (M)	KMH (*or* KT)	
Visibility (M)	Prevailing visibility (M)	nnnn CAVOK	0350 7000 9000 9999 CAVOK

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Element as specified in Chapter 6	*Detailed content*	*Template(s)*			*Examples*
Weather (C)[4, 5]	Intensity of weather phenomena (C)[6]	– *or* +		—	
	Characteristics and type of weather phenomena (C)[7]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN		IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG	RA HZ +TSRA FG –FZDZ PRFG +TSRASN SNRA FG
Cloud (M)[8]	Cloud amount and height of base or vertical visibility (M)	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV ///	SKC *or* NSC	FEW010 VV005 SKC OVC020 VV/// NSC SCT005 BKN012
	Cloud type (C)[4]	CB	—		SCT008 BKN025CB
Temperature (O)[9]	Name of the element (M)	TX			TX25/13Z TN09/05Z TX05/12Z TNM02/03Z
	Maximum temperature (M)	[M]nn/			
	Time of occurrence of the maximum temperature (M)	nnZ			
	Name of the element (M)	TN			
	Minimum temperature (M)	[M]nn/			
	Time of occurrence of the minimum temperature (M)	nnZ			
Expected significant changes to one or more of the above elements during the period of validity (C)[4, 10]	Change or probability indicator (M)	PROB30 [TEMPO] *or* PROB40 [TEMPO] *or* BECMG *or* TEMPO *or* FM			
	Period of occurrence or change (M)	nnnn			
	Wind (C)[4]	nnn[P]nn[n][G[P]nn[n]]KMH *or* VRBnnKMH (*or* nnn[P]nn[G[P]nn]KT *or* VRBnnKT)			TEMPO 1518 25070G100KMH (TEMPO 1518 25035G50KT) TEMPO 1214 17025G50KMH 1000 TSRA SCT010CB BKN020 (TEMPO 1214 17012G25KT 1000 TSRA SCT010CB BKN020)

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Element as specified in Chapter 6	*Detailed content*	*Template(s)*				*Examples*
	Prevailing visibility (C)[4]	nnnn			CAVOK	BECMG 1011 00000KMH 2400 OVC010 (BECMG 1011 00000KT 2400 OVC010) PROB30 1214 0800 FG
	Weather phenomenon: intensity (C)[6]	– *or* +	—	NSW		BECMG 1214 RA TEMPO 0304 FZRA TEMPO 1215 BLSN PROB40 TEMPO 0608 0500 FG
	Weather phenomenon: characteristics and type (C)[4, 7]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN	IC *or* FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG			
	Cloud amount and height of base or vertical visibility (C)[4]	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV///	SKC *or* NSC		FM1230 15015KMH 9999 BKN020 (FM1230 15008KT 9999 BKN020) BECMG 1820 8000 NSW NSC
	Cloud type (C)[4]	CB	—			BECMG 0608 SCT015CB BKN020

Notes.—

1. Fictitious location.
2. To be used in accordance with 1.2.1.
3. To be included in accordance with 1.2.1.
4. To be included whenever applicable.
5. One or more, up to a maximum of three, groups in accordance with 1.2.3.
6. To be included whenever applicable in accordance with 1.2.3. No qualifier for *moderate* intensity.
7. Weather phenomena to be included in accordance with 1.2.3.
8. Up to four cloud layers in accordance with 1.2.4.
9. To be included in accordance with 1.2.5.
10. To be included in accordance with 1.3, 1.4 and 1.5.

Table A5-2. Use of change and time indicators in TAF

Change or time indicator		*Time period*	*Meaning*	
FM		$n_h n_h n_m n_m$	used to indicate a significant change in most weather elements occurring at $n_h n_h$ hours and $n_m n_m$ minutes (UTC); all the elements given before "FM" are to be included following "FM" (i.e. they are all superseded by those following the abbreviation)	
BECMG		$n_1 n_1 n_2 n_2$	the change is forecast to commence at $n_1 n_1$ hours (UTC) and be completed by $n_2 n_2$ hours (UTC); only those elements for which a change is forecast are to be given following "BECMG"; the time period $n_1 n_1 n_2 n_2$ should normally be less than 2 hours and in any case should not exceed 4 hours	
TEMPO		$n_1 n_1 n_2 n_2$	temporary fluctuations are forecast to commence at $n_1 n_1$ hours (UTC) and cease by $n_2 n_2$ hours (UTC); only those elements for which fluctuations are forecast are to be given following "TEMPO"; temporary fluctuations should not last more than one hour in each instance, and in the aggregate, cover less than half of the period $n_1 n_1 n_2 n_2$	
PROBnn	—	$n_1 n_1 n_2 n_2$	probability of occurrence (in %) of an alternative value of a forecast element or elements; nn = 30 or nn = 40 only; to be placed after the element(s) concerned	—
	TEMPO	$n_1 n_1 n_2 n_2$		probability of occurrence of temporary fluctuations

Table A5-3. Ranges and resolutions for the numerical elements included in TAF

Element as specified in Chapter 6		*Range*	*Resolution*
Wind direction:	° true	000 – 360	10
Wind speed:	KMH KT	00 – 399* 00 – 199*	1 1
Visibility:	M M M M	0000 – 0800 0800 – 5 000 5 000 – 9 000 9 000 – 9 999	50 100 1 000 999
Vertical visibility:	30's M (100's FT)	000 – 020	1
Cloud: height of base:	30's M (100's FT)	000 – 050	1
Air temperature (maximum and minimum):	°C	–80 – +60	1

* There is no aeronautical requirement to report surface wind speeds of 200 km/h (100 kt) or more; however, provision has been made for reporting wind speeds up to 399 km/h (199 kt) for non-aeronautical purposes, as necessary.

Example A5-1. TAF

TAF for YUDO (Donlon/International):*

TAF YUDO 160000Z 160624 13018KMH 9000 BKN020 BECMG 0608 SCT015CB BKN020 TEMPO 0812 17025G45KMH 1000 TSRA SCT010CB BKN020 FM1230 15015KMH 9999 BKN020

Meaning of the forecast:

TAF for Donlon/International* issued on the 16th of the month at 0000 UTC valid from 0600 UTC to 2400 UTC on the 16th of the month; surface wind direction 130 degrees; wind speed 18 kilometres per hour; visibility 9 kilometres, broken cloud at 600 metres; becoming between 0600 UTC and 0800 UTC, scattered cumulonimbus cloud at 450 metres and broken cloud at 600 metres; temporarily between 0800 UTC and 1200 UTC surface wind direction 170 degrees; wind speed 25 kilometres per hour gusting to 45 kilometres per hour; visibility 1 000 metres in a thunderstorm with moderate rain, scattered cumulonimbus cloud at 300 metres and broken cloud at 600 metres; from 1230 UTC surface wind direction 150 degrees; wind speed 15 kilometres per hour; visibility 10 kilometres or more; and broken cloud at 600 metres.

* Fictitious location

Note.— In this example, the primary units "kilometre per hour" and "metre" were used for wind speed and height of cloud base, respectively. However, in accordance with Annex 5, the corresponding non-SI alternative units "knot" and "foot" may be used instead.

Example A5-2. Cancellation of TAF

Cancellation of TAF for YUDO (Donlon/International):*

TAF AMD YUDO 161500Z 160624 CNL

Meaning of the forecast:

Amended TAF for Donlon/International* issued on the 16th of the month at 1500 UTC cancelling the previously issued TAF valid from 0600 UTC to 2400 UTC on the 16th of the month.

* Fictitious location

Example A5-3. GAMET area forecast

YUCC GAMET VALID 220600/221200 YUDO	
AMSWELL FIR/2 BLW FL100	
SECN I	
SFC WSPD:	10/12 65 KMH
SFC VIS:	06/08 3000 M BR N OF N51
SIGWX:	11/12 ISOL TS
SIG CLD:	06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL
ICE:	MOD FL050/080
TURB:	MOD ABV FL090
SIGMETS APPLICABLE:	3, 5
SECN II	
PSYS:	06 L 1004 HPA N5130 E01000 MOV NE 25 KT WKN
WIND/T:	2000 FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11
CLD:	BKN SC 2500/8000 FT AGL
FZLVL:	3000 FT AGL
MNM QNH:	1004 HPA
SEA:	T15 HGT 5M
VA:	NIL
Meaning:	An area forecast for low-level flights (GAMET) issued for sub-area two of the Amswell* flight information region (identified by YUCC Amswell area control centre) for below flight level 100 by the Donlon/International* meteorological office (YUDO); the message is valid from 0600 UTC to 1200 UTC on the 22nd of the month.
Section I:	
surface wind speeds:	between 1000 UTC and 1200 UTC 65 kilometres per hour;
surface visibility:	between 0600 UTC and 0800 UTC 3 000 metres north of 51 degrees north (due to mist);
significant weather phenomena:	between 1100 UTC and 1200 UTC isolated thunderstorms without hail;
significant clouds:	between 0600 UTC and 0900 UTC overcast base 800, top 1 100 feet above ground level north of 51 degrees north; between 1000 UTC and 1200 UTC isolated towering cumulus base 1 200, top 8 000 feet above ground level;
icing:	moderate between flight level 050 and 080;
turbulence:	moderate above flight level 090 (at least up to flight level 100);
SIGMET messages:	3 and 5 applicable to the validity period and sub-area concerned.
Section II:	
pressure systems:	at 0600 UTC low pressure of 1 004 hectopascals at 51.5 degrees north 10.0 degrees east, expected to move north-eastwards at 25 knots and to weaken;
winds and temperatures:	at 2 000 feet above ground level wind direction 270 degrees; wind speed 70 kilometres per hour, temperature plus 3 degrees Celsius; at 5 000 feet above ground level wind direction 250 degrees; wind speed 80 kilometres per hour, temperature minus 2 degrees Celsius; at 10 000 feet above ground level wind direction 240 degrees; wind speed 85 kilometres per hour, temperature minus 11 degrees Celsius;
clouds:	broken stratocumulus, base 2 500 feet, top 8 000 feet above ground level;
freezing level:	3 000 feet above ground level;
minimum QNH:	1 004 hectopascals;
sea:	surface temperature 15 degrees Celsius; and state of sea 5 metres;
volcanic ash:	nil.

* Fictitious locations

APPENDIX 6. TECHNICAL SPECIFICATIONS RELATED TO SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS

(See Chapter 7 of this Annex.)

Note.— Data type designators to be used in abbreviated headings for SIGMET, AIRMET, tropical cyclone and volcanic ash advisory messages are given in WMO Publication No. 386, Manual on the Global Telecommunication System.

1. SPECIFICATIONS RELATED TO SIGMET INFORMATION

1.1 Format of SIGMET messages

1.1.1 The content and order of elements in a SIGMET message shall be in accordance with the template shown in Table A6-1.

1.1.2 Messages containing SIGMET information for subsonic aircraft shall be identified as "SIGMET", those containing SIGMET information for supersonic aircraft during transonic or supersonic flight shall be identified as "SIGMET SST".

1.1.3 The sequence number referred to in the template in Table A6-1 shall correspond with the number of SIGMET messages issued for the flight information region since 0001 UTC on the day concerned. Separate series of sequence numbers shall be used for "SIGMET" and "SIGMET SST" messages. The meteorological watch offices whose area of responsibility encompasses more than one FIR and/or CTA shall issue separate SIGMET messages for each FIR and/or CTA within its area of responsibility.

1.1.4 In accordance with the template in Table A6-1, only one of the following phenomena shall be included in a SIGMET message, using the abbreviations as indicated below:

a) at a subsonic cruising levels:

thunderstorm	
— obscured	OBSC TS
— embedded	EMBD TS
— frequent	FRQ TS
— squall line	SQL TS
— obscured with hail	OBSC TSGR
— embedded with hail	EMBD TSGR
— frequent, with hail	FRQ TSGR
— squall line with hail	SQL TSGR
tropical cyclone	
— tropical cyclone with 10-minute mean surface wind speed of 63 km/h (34 kt) or more	TC (+ cyclone name)
turbulence	
— severe turbulence	SEV TURB
icing	
— severe icing	SEV ICE
— severe icing due to freezing rain	SEV ICE (FZRA)
mountain wave	
— severe mountain wave	SEV MTW
duststorm	
— heavy duststorm	HVY DS
sandstorm	
— heavy sandstorm	HVY SS
volcanic ash	
— volcanic ash (irrespective of altitude)	VA (+ volcano name, if known)

b) at transonic levels and supersonic cruising levels:

turbulence	
— moderate turbulence	MOD TURB
— severe turbulence	SEV TURB
cumulonimbus	
— isolated cumulonimbus	ISOL CB
— occasional cumulonimbus	OCNL CB
— frequent cumulonimbus	FRQ CB
hail	
— hail	GR
volcanic ash	
— volcanic ash (irrespective of altitude)	VA (+ volcano name, if known)

1.1.5 SIGMET information shall not contain unnecessary descriptive material. In describing the weather phenomena for which the SIGMET is issued, no descriptive material additional to that given in 1.1.4 shall be included. SIGMET information concerning thunderstorms or a tropical cyclone shall not include references to associated turbulence and icing.

1.1.6 **Recommendation.—** *Meteorological watch offices in a position to do so should issue SIGMET information for volcanic ash cloud and tropical cyclones in graphical format using the WMO BUFR code form, in addition to the issuance of this SIGMET information in abbreviated plain language in accordance with 1.1.1.*

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, *Volume I.2, Part B — Binary Codes.*

1.2 Dissemination of SIGMET messages

1.2.1 SIGMET messages shall be disseminated to meteorological watch offices, WAFCs and to other meteorological offices in accordance with regional air navigation agreement. SIGMET messages for volcanic ash shall also be disseminated to VAACs.

1.2.2 SIGMET messages shall be disseminated to international OPMET data banks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.

2. SPECIFICATIONS RELATED TO AIRMET INFORMATION

2.1 Format of AIRMET messages

2.1.1 The content and order of elements in an AIRMET message shall be in accordance with the template shown in Table A6-1.

2.1.2 The sequence number referred to in the template in Table A6-1 shall correspond with the number of AIRMET messages issued for the flight information region since 0001 UTC on the day concerned. The meteorological watch offices whose area of responsibility encompasses more than one FIR and/or CTA shall issue separate AIRMET messages for each FIR and/or CTA within its area of responsibility.

2.1.3 The flight information region shall be divided in sub-areas, as necessary.

2.1.4 In accordance with the template in Table A6-1, only one of the following phenomena shall be included in an AIRMET message, using the abbreviations as indicated below:

at cruising levels below flight level 100 (or below flight level 150 in mountainous areas, or higher, where necessary):

— surface wind speed	
– widespread mean surface wind speed above 60 km/h (30 kt)	SFC WSPD (+ wind speed and units)
— surface visibility	
– widespread areas affected by reduction of visibility to less than 5 000 m, including the weather phenomenon causing the reduction of visibility	SFC VIS (+ visibility) (+ one of the following weather phenomena or combinations thereof: BR, DS, DU, DZ, FC, FG, FU, GR, GS, HZ, IC, PL, PQ, RA, SA, SG, SN, SQ, SS or VA)
— thunderstorms	
– isolated thunderstorms without hail	ISOL TS
– occasional thunderstorms without hail	OCNL TS
– isolated thunderstorms with hail	ISOL TSGR
– occasional thunderstorms with hail	OCNL TSGR
— mountain obscuration	
– mountains obscured	MT OBSC
— cloud	
– widespread areas of broken or overcast cloud with height of base less than 300 m (1 000 ft) above ground level:	
– broken	BKN CLD (+ height of the base and top and units)
– overcast	OVC CLD (+ height of the base and top and units)
– cumulonimbus clouds which are:	
– isolated	ISOL CB
– occasional	OCNL CB
– frequent	FRQ CB
– towering cumulus clouds which are:	
– isolated	ISOL TCU
– occasional	OCNL TCU
– frequent	FRQ TCU
— icing	
– moderate icing (except for icing in convective clouds)	MOD ICE

— turbulence
  – moderate turbulence (except for turbulence in convective clouds) MOD TURB

— mountain wave
  – moderate mountain wave MOD MTW

2.1.5 AIRMET information shall not contain unnecessary descriptive material. In describing the weather phenomena for which the AIRMET is issued, no descriptive material additional to that given in 2.1.4 shall be included. AIRMET information concerning thunderstorms or cumulonimbus clouds shall not include references to associated turbulence and icing.

Note.— The specifications for SIGMET information which is also applicable to low-level flights are given in 1.1.4.

2.2 Dissemination of AIRMET messages

2.2.1 **Recommendation.—** *AIRMET messages should be disseminated to meteorological watch offices in adjacent flight information regions and to other meteorological offices, as agreed by the meteorological authorities concerned.*

2.2.2 **Recommendation.—** *AIRMET messages should be transmitted to international operational meteorological data banks and the centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems, in accordance with regional air navigation agreement.*

3. SPECIFICATIONS RELATED TO SPECIAL AIR-REPORTS

Note.— This appendix deals with the uplink of special air-reports. The general specifications related to special air-reports are in Appendix 4.

3.1 **Recommendation.—** *Special air-reports should be uplinked for 60 minutes after their issuance.*

3.2 **Recommendation.—** *Information on wind and temperature included in automated special air-reports should not be uplinked to other aircraft in flight.*

4. DETAILED CRITERIA RELATED TO SIGMET AND AIRMET MESSAGES AND SPECIAL AIR-REPORTS (UPLINK)

4.1 Identification of the flight information region

Recommendation.— *In cases where the airspace is divided into a flight information region (FIR) and an upper flight information region (UIR), the SIGMET should be identified by the location indicator of the air traffic services unit serving the FIR.*

Note.— The SIGMET message applies to the whole airspace within the lateral limits of the FIR, i.e. to the FIR and to the UIR. The particular areas and/or flight levels affected by the meteorological phenomena causing the issuance of the SIGMET are given in the text of the message.

4.2 Criteria related to phenomena included in SIGMET and AIRMET messages and special air-reports (uplink)

4.2.1 **Recommendation.—** *An area of thunderstorms and cumulonimbus clouds should be considered:*

a) obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness;

b) embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognized;

c) isolated (ISOL) if it consists of individual features which affect, or are forecast to affect, an area with a maximum spatial coverage less than 50 per cent of the area concerned (at a fixed time or during the period of validity); and

d) occasional (OCNL) if it consists of well-separated features which affect, or are forecast to affect, an area with a maximum spatial coverage between 50 and 75 per cent of the area concerned (at a fixed time or during the period of validity).

4.2.2 **Recommendation.—** *An area of thunderstorms should be considered frequent (FRQ) if within that area there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 per cent of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).*

4.2.3 **Recommendation.—** *Squall line (SQL) should indicate a thunderstorm along a line with little or no space between individual clouds.*

4.2.4 **Recommendation.—** *Hail (GR) should be used as a further description of the thunderstorm, as necessary.*

4.2.5 **Recommendation.—** *Severe and moderate turbulence (TURB) should refer only to: low-level turbulence associated with strong surface winds; rotor streaming; or turbulence whether in cloud or not in cloud (CAT). Turbulence should not be used in connection with convective clouds.*

4.2.6 Turbulence shall be considered:

a) severe whenever the turbulence index is between 15 and 27 (i.e. the peak value of the eddy dissipation rate (EDR) exceeds 0.5); and

b) moderate whenever the turbulence index is between 6 and 14 (i.e. the peak value of the eddy dissipation rate (EDR) exceeds 0.3 while not exceeding 0.5).

4.2.7 **Recommendation.—** *Severe and moderate icing (ICE) should refer to icing in other than convective clouds. Freezing rain (FZRA) should refer to severe icing conditions caused by freezing rain.*

4.2.8 **Recommendation.—** *A mountain wave (MTW) should be considered:*

a) severe whenever an accompanying downdraft of 3.0 m/s (600 ft/min) or more and/or severe turbulence is observed or forecast; and

b) moderate whenever an accompanying downdraft of 1.75–3.0 m/s (350–600 ft/min) and/or moderate turbulence is observed or forecast.

4.2.9 **Recommendation.—** *In the outlook of SIGMET messages for volcanic ash, up to four layers or levels should be included.*

5. SPECIFICATIONS RELATED TO AERODROME WARNINGS

5.1 Format and dissemination of aerodrome warnings

5.1.1 The aerodrome warnings shall be issued in accordance with the template in Table A6-2 where required by operators or aerodrome services, and shall be disseminated in accordance with local arrangements to those concerned.

5.1.2 **Recommendation.—** *In accordance with the template in Table A6-2, aerodrome warnings should relate to the occurrence or expected occurrence of one or more of the following phenomena:*

— tropical cyclone (to be included if the 10-minute mean surface wind speed at the aerodrome is expected to be 63 km/h (34 kt) or more)
— thunderstorm
— hail
— snow (including the expected or observed snow accumulation)
— freezing precipitation
— hoar frost or rime
— sandstorm
— duststorm
— rising sand or dust
— strong surface wind and gusts
— squall
— frost
— volcanic ash
— other phenomena as agreed locally.

5.1.3 **Recommendation.—** *The use of text additional to the abbreviations listed in the template in Table A6-2 should be kept to a minimum. The additional text should be prepared in abbreviated plain language using approved ICAO abbreviations and numerical values. If no ICAO approved abbreviations are available, English plain language text should be used.*

5.2 Quantitative criteria for aerodrome warnings

Recommendation.— *When quantitative criteria are necessary for the issue of aerodrome warnings covering, for example, the expected maximum wind speed or the expected total snowfall, the criteria should be established by agreement between the meteorological office and the users of the warnings.*

6. SPECIFICATIONS RELATED TO WIND SHEAR WARNINGS

6.1 Detection of wind shear

Recommendation.— *Evidence of the existence of wind shear should be derived from:*

a) ground-based wind shear remote-sensing equipment, for example, Doppler radar;

b) ground-based wind shear detection equipment, for example, a system of surface wind and/or pressure sensors located in an array monitoring a specific runway or runways and associated approach and departure paths;

c) aircraft observations during the climb-out or approach phases of flight to be made in accordance with Chapter 5; or

d) other meteorological information, for example, from appropriate sensors located on existing masts or towers in the vicinity of the aerodrome or nearby areas of high ground.

Note.— Wind shear conditions are normally associated with the following phenomena:

— thunderstorms, microbursts, funnel cloud (tornado or waterspout), and gust fronts

— *frontal surfaces*
— *strong surface winds coupled with local topography*
— *sea breeze fronts*
— *mountain waves (including low-level rotors in the terminal area)*
— *low-level temperature inversions.*

6.2 Format and dissemination of wind shear warnings

Note.— Information on wind shear is also to be included as supplementary information in local routine and special reports and METAR and SPECI in accordance with the templates in Tables A3-1 and A3-2.

6.2.1 The wind shear warnings shall be prepared in abbreviated plain language in accordance with the template in Table A6-3 and disseminated for aerodromes where wind shear is considered a factor in accordance with local arrangements with the appropriate ATS authority and operators concerned and by the meteorological office designated to provide service for the aerodrome or disseminated directly from automated ground-based wind shear remote-sensing or detection equipment referred to in 6.1 a) and b).

6.2.2 **Recommendation.—** *Where microbursts are observed, reported by pilots or detected by ground-based wind shear detection or remote-sensing equipment, the wind shear warning should include a specific reference to microburst.*

6.2.3 **Recommendation.—** *Where information from ground-based wind shear detection or remote-sensing equipment is used to prepare a wind shear warning, the warning should, if practicable, relate to specific sections of the runway and distances along the approach path or take-off path as agreed between the meteorological authority, the appropriate ATS authority and the operators concerned.*

6.2.4 **Recommendation.—** *When an aircraft report is used to prepare a wind shear warning, or to confirm a warning previously issued, the corresponding aircraft report, including the aircraft type, should be given unchanged in the warning.*

Note 1.— Following reported encounters by both arriving and departing aircraft two different wind shear warnings may exist, one for arriving aircraft and one for departing aircraft.

Note 2.— Specifications for reporting the intensity of wind shear are still undergoing development. It is recognized, however, that pilots, when reporting wind shear, may use the qualifying terms "moderate", "strong" or "severe", based to a large extent on their subjective assessment of the intensity of the wind shear encountered. In accordance with 6.2.4, such reports are to be incorporated unchanged in wind shear warnings.

6.2.5 **Recommendation.—** *The use of text additional to the abbreviations listed in the template in Table A6-3 should be kept to a minimum. The additional text should be prepared in abbreviated plain language using approved ICAO abbreviations and numerical values. If no ICAO approved abbreviations are available, English plain language text should be used.*

Table A6-1. Template for SIGMET and AIRMET messages and special air-reports (uplink)

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, included whenever applicable
= = a double line indicates that the text following it should be placed on the subsequent line

Note.— The ranges and resolutions for the numerical elements included in SIGMET/AIRMET messages and in special air-reports are shown in Table A6-4 of this appendix.

Element as specified in Chapter 5 and Appendix 6	*Detailed content*	*Template(s)*				*Examples*
		SIGMET	*SIGMET SST*[1]	*AIRMET*	*SPECIAL AIR-REPORT*[2]	
Location indicator of FIR/CTA (M)[3]	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET/ AIRMET refers (M)	nnnn			—	YUCC[4] YUDD[4]
Identification (M)	Message identification and sequence number[5] (M)	SIGMET [nn]n	SIGMET SST [nn]n	AIRMET [nn]n	ARS	SIGMET 5 SIGMET A3 SIGMET SST 1 AIRMET 2 ARS
Validity period (M)	Date-time groups indicating the period of validity in UTC (M)	VALID nnnnnn/nnnnnn			—[6]	VALID 221215/221600 VALID 101520/101800 VALID 251600/252200
Location indicator of MWO (M)	Location indicator of MWO originating the message with a separating hyphen (M)	nnnn—				YUDO—[4] YUSO—[4]
Name of the FIR/ CTA *or* aircraft identification (M)	Location indicator and name of the FIR/CTA[7] for which the SIGMET/ AIRMET is issued *or* aircraft radiotelephony call sign (M)	nnnn nnnnnnnnnn FIR[/UIR] *or* nnnn nnnnnnnnnn CTA		nnnn nnnnnnnnnn FIR[/n]	nnnnnn	YUCC AMSWELL FIR[4] YUDD SHANLON FIR/UIR[4] YUCC AMSWELL FIR/2[4] YUDD SHANLON FIR[4] VA812
IF THE SIGMET IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.						

Element as specified in Chapter 5 and Appendix 6	*Detailed content*	*Template(s)*				*Examples*
		SIGMET	*SIGMET SST*[1]	*AIRMET*	*SPECIAL AIR-REPORT*[2]	
Phenomenon (M)[8]	Description of phenomenon causing the issuance of SIGMET/AIRMET (C)	OBSC[9] TS [GR[10]] EMBD[12] TS [GR] FRQ[13] TS [GR] SQL[14] TS [GR] TC nnnnnnnnnn SEV TURB[11] SEV ICE[19] SEV ICE (FZRA)[20] SEV MTW[21] HVY DS HVY SS VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] *or* Snn[nn] Ennn[nn] *or* Wnnn[nn]] VA CLD	MOD TURB[11] SEV TURB ISOL[15] CB[16] OCNL[18] CB FRQ[13] CB GR VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] *or* Snn[nn] Ennn[nn] *or* Wnnn[nn]] VA CLD	SFC WSPD nn[n]KMH (*or* SFC WSPD nn[n]KT) SFC VIS nnnnM (nn)[17] ISOL[15] TS[GR][10] OCNL[18] TS[GR] MT OBSC BKN CLD nnn/[ABV]nnnnM (*or* BKN CLD nnn/[ABV]nnnnFT) OVC CLD nnn/[ABV]nnnnM (*or* OVC CLD nnn/[ABV]nnnnFT) ISOL[15] CB[16] OCNL[18] CB FRQ[13] CB ISOL[15] TCU[16] OCNL[18] TCU1[6] FRQ[13] TCU MOD TURB[11] MOD ICE[19] MOD MTW[21]	TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/nnn] VA [MT nnnnnnnnnn] MOD TURB[11] GR[10] CB[16]	SEV TURB FRQ TS OBSC TSGR EMBD TSGR TC GLORIA VA ERUPTION MT ASHVAL LOC S15 E073 VA CLD MOD TURB MOD MTW ISOL CB BKN CLD 120/900M (BKN CLD 400/3000FT) OVC CLD 270/ABV3000M (OVC CLD 900/ABV10000FT) SEV ICE
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, *or* forecast (M)	OBS [AT nnnnZ] FCST OBS [AT nnnnZ] AND FCST			OBS AT nnnnZ	OBS AT 1210Z OBS OBS AND FCST

Annex 3 — Meteorological Service for International Air Navigation *Appendix 6*

Element as specified in Chapter 5 and Appendix 6	*Detailed content*	*Template(s)*				*Examples*
		SIGMET	*SIGMET SST*[1]	*AIRMET*	*SPECIAL AIR-REPORT*[2]	
Location (C)	Location (referring to latitude and longitude (in degrees and minutes) *or* locations or geographic features well known internationally)	Nnn[nn] Wnnn[nn] *or* Nnn[nn] Ennn[nn] *or* Snn[nn] Wnnn[nn] *or* Snn[nn] Ennn[nn] *or* N OF Nnn[nn] *or* S OF Nnn[nn] *or* N OF Snn[nn] *or* S OF Snn[nn] *or* [AND] W OF Wnnn[nn] *or* E OF Wnnn[nn] *or* W OF Ennn[nn] *or* E OF Ennn[nn] *or* [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] nnnnnnnnnnnn *or* WI Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn] — Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn] — Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn] — [Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn] — Nnn[nn] *or* Snn[nn] Wnnn[nn] *or* Ennn[nn]]			NnnnnWnnnnn *or* NnnnnWnnnnn *or* SnnnnWnnnnn *or* SnnnnEnnnnn	S OF N54 N OF N50 N2020 W07005 YUSB[4] N2706 W07306 N48 E010 N OF N1515 AND W OF E13530 W OF E1554 WI N6030 E02550 - N6055 E02500 - N6050 E02630
Level (C)	Flight level *and* extent[22](C)	FLnnn *or* FLnnn/nnn *or* TOP FLnnn *or* [TOP] ABV FLnnn *or* [TOP] BLW FLnnn *or* BLW nnnnM (*or* BLW nnnnFT) *or*[23] CB TOP [ABV] FLnnn WI nnnKM OF CENTRE (*or* CB TOP [ABV] FLnnn WI nnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnKM OF CENTRE (*or* CB TOP [BLW] FLnnn WI nnnNM OF CENTRE) *or*[24] FLnnn/nnn [APRX nnnKM BY nnnKM] [Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]]] (*or* FLnnn/nnn [APRX nnnNM BY nnnNM] [Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]]])			FLnnn	FL180 FL050/080 TOP FL390 BLW FL200 TOP ABV FL100 FL310/450 CB TOP FL500 WI 270KM OF CENTRE (CB TOP FL500 WI 150NM OF CENTRE) FL310/350 APRX 220KM BY 35KM FL390
Movement or expected movement (C)	Movement or expected movement (direction and speed) with reference to one of the eight points of compass, or stationary (C)	MOV N [nnKMH] *or* MOV NE [nnKMH] *or* MOV E [nnKMH] *or* MOV SE [nnKMH] *or* MOV S [nnKMH] *or* MOV SW [nnKMH] *or* MOV W [nnKMH] *or* MOVNW[nnKMH] (*or* MOV N [nnKT] or MOV NE [nnKT] *or* MOV E [nnKT] *or* MOV SE [nnKT] *or* MOVS[nnKT] *or* MOV SW [nnKT] *or* MOV W [nnKT] *or* MOV NW [nnKT]) *or* STNR			—	MOV E 40KMH (MOV E 20KT) MOV SE STNR
Changes in intensity (C)	Expected changes in intensity (C)	INTSF *or* WKN *or* NC			—	WKN

Element as specified in Chapter 5 and Appendix 6	*Detailed content*	*Template(s)*				*Examples*
		SIGMET	*SIGMET SST*[1]	*AIRMET*	*SPECIAL AIR-REPORT*[2]	
Forecast position (C)[22]	Forecast position of volcanic ash cloud *or* the centre of the TC at the end of the validity period of the SIGMET message (C)	FCST nnnnZ TC CENTRE Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] *or* FCST nnnnZ VA CLD APRX Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]]		—	—	FCST 2200Z TC CENTRE N2740 W07345 FCST 1700Z VA CLD APRX S15 E075 – S15 E081 – S17 E083 – S18 E079 – S15 E075
Outlook[22] (C)	Outlook providing information beyond the period of validity of the trajectory of the volcanic ash cloud and positions of the tropical cyclone centre (C)	OTLK nnnnnn TC CENTRE Nnnnn *or* SnnnnWnnnnn *or* Ennnnn nnnnnn TC CENTRE Nnnnn *or* SnnnnWnnnnn *or* Ennnnn *or* OTLK nnnnn VA CLD APRX [FLnnn/nnn][25] Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] nnnnnn VA CLD APRX Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] – Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]] [– Nnn[nn] *or* Snn[nn]Wnnn[nn] *or* Ennn[nn]]		—		OTLK 260400 TC CENTRE N28030 W07430 261000 TC CENTRE N3100 W07600 OTLK 212300 VA CLD APRX S16 E078 – S17 E084 – S18 E089 – S19 E081 – S16 E078 220300 VA CLD APRX S17 E081 – S18 E086 – S20 E092 – S21 E084 – S17 E081
OR						
Cancellation of SIGMET/ AIRMET[26] (C)	Cancellation of SIGMET/AIRMET referring to its identification	CNL SIGMET [nn]n nnnnnn/nnnnnn *or* CNL SIGMET [nn]n nnnnnn/nnnnnn [VA MOV TO nnnn FIR][24]	CNL SIGMET SST [nn]n nnnnnn/nnnnnn	CNL AIRMET [nn]n nnnnnn/nnnnnn	—	CNL SIGMET 2 101200/101600[26] CNL SIGMET 3 251030/251430 VA MOV TO YUDO FIR[26] CNL SIGMET SST 1 212330/220130[26] CNL AIRMET 151520/151800[26]

Notes.—

1. In accordance with 1.1.2.
2. No wind and temperature to be uplinked to other aircraft in flight in accordance with 3.2.
3. See 4.1.
4. Fictitious location.
5. In accordance with 1.1.3 and 2.1.2.
6. See 3.1.
7. See 2.1.3.
8. In accordance with 1.1.4 and 2.1.4.
9. In accordance with 4.2.1 a).
10. In accordance with 4.2.4.
11. In accordance with 4.2.5 and 4.2.6.
12. In accordance with 4.2.1 b).

13. In accordance with 4.2.2.
14. In accordance with 4.2.3.
15. In accordance with 4.2.1 c).
16. The use of cumulonimbus, CB, is restricted to AIRMETs and SIGMETs related to SST flight during transonic and supersonic cruise; the use of towering cumulus, TCU, is restricted to AIRMETs in accordance with 1.1.4 and 2.1.4.
17. In accordance with 2.1.4.
18. In accordance with 4.2.1 d).
19. In accordance with 4.2.7.
20. In accordance with 4.2.7.
21. In accordance with 4.2.8.
22. Only for SIGMET messages for volcanic ash cloud and tropical cyclones.
23. Only for SIGMET messages for tropical cyclones.
24. Only for SIGMET messages for volcanic ash.
25. Up to four layers (or levels) in accordance with 4.2.9.
26. End of the message (as the SIGMET/AIRMET message is being cancelled).

Note.— In accordance with 1.1.5 and 2.1.5, severe or moderate icing and severe or moderate turbulence (SEV ICE, MOD ICE, SEV TURB, MOD TURB) associated with thunderstorms, cumulonimbus clouds or tropical cyclones should not be included.

Table A6-2. Template for aerodrome warnings

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, included whenever applicable

Note 1.— The ranges and resolutions for the numerical elements included in aerodrome warnings are shown in Table A6-4 of this appendix.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element	*Detailed content*	*Template*	*Example*
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCC[1]
Identification of the type of message (M)	Type of message and sequence number	AD WRNG n	AD WRNG 2
Validity period (M)	Day and time of validity period in UTC	VALID nnnnnn/nnnnnn	VALID 211230/211530
IF THE AERODROME WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.			
Phenomenon (M)[2]	Description of phenomenon causing the issuance of the aerodrome warning	TC[3] nnnnnnnnnn *or* [HVY] TS *or* GR *or* [HVY] SN [nnCM][3] *or* [HVY] FZRA *or* [HVY] FZDZ *or* RIME[4] *or* [HVY] SS *or* [HVY] DS *or* SA *or* DU *or* SFC WSPD nn[n]KMH MAX nn[n] (SFC WSPD nn[n]KT MAX nn[n]) *or* SQ *or* FROST *or* VA *or* *free text up to 32 characters*[5]	TC ANDREW HVY SN 25CM SFC WSPD 80KMH MAX 120 VA
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, *or* forecast	OBS [AT nnnnZ] *or* FCST *or* OBS [AT nnnnZ] AND FCST	OBS AT 1200Z OBS OBS AT 1220Z AND FCST
Changes in intensity (C)	Expected changes in intensity	INTSF *or* WKN *or* NC	WKN
OR			
Cancellation of aerodrome warning[6]	Cancellation of aerodrome warning referring to its identification	CNL AD WRNG n nnnnnn/nnnnnn	CNL AD WRNG 2 211230/211530[6]

Notes.—

1. Fictitious location.
2. One phenomenon or a combination thereof, in accordance with 5.1.2.
3. In accordance with 5.1.2.
4. Hoar frost *or* rime in accordance with 5.1.2.
5. In accordance with 5.1.3.
6. End of the message (as the aerodrome warning is being cancelled).

Table A6-3. Template for wind shear warnings

Key: M = inclusion mandatory, part of every message
C = inclusion conditional, included whenever applicable

Note 1.— The ranges and resolutions for the numerical elements included in wind shear warnings are shown in Table A6-4 of this appendix.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element	*Detailed content*	*Template*	*Example*
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCC[1]
Identification of the type of message (M)	Type of message and sequence number	WS WRNG [nn]	WS WRNG 01
Time of origin and validity period (M)	Day and time of issue and, where applicable, validity period in UTC	nnnnnn [VALID TL nnnnnn] *or* [VALID nnnnnn/nnnnnn]	211230 VALID TL 211330 221200 VALID 221215/221315
IF THE WIND SHEAR WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.			
Phenomenon (M)	Identification of the phenomenon and its location	[MOD] *or* [SEV] WS IN APCH *or* [MOD] *or* [SEV] WS [APCH] RWYnnn *or* [MOD] *or* [SEV] WS IN CLIMB-OUT *or* [MOD] *or* [SEV] WS CLIMB-OUT RWYnnn *or* MBST IN APCH *or* MBST [APCH] RWYnnn *or* MBST IN CLIMB-OUT *or* MBST CLIMB-OUT RWYnnn	WS APCH RWY12 MOD WS RWY34 WS IN CLIMB-OUT MBST APCH RWY26 MBST IN CLIMB-OUT
Observed, reported or forecast phenomenon (M)	Identification whether the phenomenon is observed or reported and expected to continue or forecast	REP AT nnnn nnnnnnnn *or* OBS [AT nnnn] *or* FCST	REP AT 1510 B747 OBS AT 1205 FCST
Details of the phenomenon (C)[2]	Description of phenomenon causing the issuance of the wind shear warning	SFC WIND: nnn/nnKMH (*or* nnn/nnKT) nnnM (nnnFT)-WIND: nnn/nnKMH (*or* nnn/nnKT) *or* nnKMH (*or* nnKT) ASPEEDL nnKM (*or* nnNM) FNA RWYnn *or* nnKMH (*or* nnKT) ASPEEDG nnKM (*or* nnNM) FNA RWYnn	SFC WIND: 320/20KMH 60M-WIND: 360/50KMH (SFC WIND: 320/10KT 200FT-WIND: 360/25KT) 60KMH ASPEEDL 4KM FNA RWY13 (30KT ASPEEDL 2NM FNA RWY13)
OR			
Cancellation of wind shear warning[3]	Cancellation of wind shear warning referring to its identification	CNL WS WRNG n nnnnnn/nnnnnn	CNL WS WRNG 1211230/211330[3]

Notes.—

1. Fictitious location.
2. Additional provisions in 6.2.5.
3. End of the message (as the wind shear warning is being cancelled).

Table A6-4. Ranges and resolutions for the numerical elements included in volcanic ash and tropical cyclone advisory messages, SIGMET/AIRMET messages and aerodrome and wind shear warnings

Element as specified in Appendices 2 and 6		*Range*	*Resolution*
Summit elevation:	M FT	000 – 8 100 000 – 27 000	1 1
Advisory number:	for VA (index)* for TC (index)*	000 – 2 000 00 – 99	1 1
Maximum surface wind:	KMH KT	00 – 399 00 – 199	1 1
Central pressure:	hPa	850 – 1 050	1
Surface wind speed:	KMH KT	60 – 199 30 – 99	1 1
Surface visibility:	M M	0000 – 0800 0800 – 5 000	50 100
Cloud: height of base:	M FT	000 – 300 000 – 1 000	30 100
Cloud: height of top:	M M FT FT	000 – 3 000 3 000 – 20 000 000 – 10 000 10 000 – 60 000	30 300 100 1 000
Latitudes:	° (degrees) ‘ (minutes)	00 – 90 00 – 60	1 1
Longitudes:	° (degrees) ‘ (minutes)	000 – 180 00 – 60	1 1
Flight levels:		000 – 650	10
Movement:	KMH KT	0 – 300 0 – 150	10 5
* Non-dimensional			

Example A6-1. SIGMET and AIRMET message and the corresponding cancellations

SIGMET	Cancellation of SIGMET
YUDD SIGMET 2 VALID 101200/101600 YUSO- YUDD SHANLON FIR/UIR OBSC TS FCST S OF N54 TOP FL390 MOV E WKN	YUDD SIGMET 3 VALID 101345/101600 YUSO- YUDD SHANLON FIR/UIR CNL SIGMET 2 101200/101600
AIRMET	**Cancellation of AIRMET**
YUDD AIRMET 1 VALID 151520/151800 YUSO- YUDD SHANLON FIR ISOL TS OBS N OF S50 TOP ABV FL100 STNR WKN	YUDD AIRMET 2 VALID 151650/151800 YUSO- YUDD SHANLON FIR CNL AIRMET 1 151520/151800

Example A6-2. SIGMET message for tropical cyclone

YUCC SIGMET 3 VALID 251600/252200 YUDO-
YUCC AMSWELL FIR TC GLORIA OBS AT 1600Z N2706 W07306 CB TOP FL500 WI 150NM OF CENTRE MOV NW 10KT NC FCST 2200Z TC CENTRE N2740 W07345
OTLK TC CENTRE 260400 N2830 W07430 261000 N2912 W07530

Meaning:

The third SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1600 UTC to 2200 UTC on the 25th of the month; tropical cyclone Gloria was observed at 1600 UTC at 27 degrees 06 minutes north and 73 degrees 6 minutes west with cumulonimbus top at flight level 500 within 150 nautical miles of the centre; the tropical cyclone is expected to move northwestwards at 10 knots and not to undergo any changes in intensity; the forecast position of the centre of the tropical cyclone at 2200 UTC is expected to be at 27 degrees 40 minutes north and 73 degrees 45 minutes west.

Outlook:

The centre of the tropical cyclone is expected to be on the 26th of the month at 0400 UTC and 1000 UTC located at 28 degrees 30 minutes north and 74 degrees 30 minutes west, and at 29 degrees 12 minutes north and 75 degrees 30 minutes west, respectively.

* Fictitious locations

Example A6-3. SIGMET message for volcanic ash

YUDD SIGMET 2 VALID 211100/211700 YUSO-
YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL LOC S1500 E07348 VA CLD OBS AT 1100Z FL310/450 APRX 220KM BY 35KM S1500 E07348 – S1530 E07642 MOV ESE 65KMH FCST 1700Z VA CLD APRX S1506 E07500 – S1518 E08112 – S1712 E08330 – S1824 E07836
OTLK 212300Z VA CLD APRX S1600 E07806 – S1642 E08412 – S1824 E08900 – S1906 E08100 220500Z VA CLD APRX S1700 E08100 – S1812 E08636 – S2000 E09224 – S2130 E08418

Meaning:

The second SIGMET message issued for the SHANLON* flight information region (identified by YUDD Shanlon area control centre) by the Shanlon/International* meteorological watch office (YUSO) since 0001 UTC; the message is valid from 1100 UTC to 1700 UTC on the 21st of the month; volcanic ash eruption of Mount Ashval* located at 15 degrees south and 73 degrees 48 minutes east; volcanic ash cloud observed at 1100 UTC between flight levels 310 and 450 in an approximate area of 220 km by 35 km between 15 degrees south and 73 degrees 48 minutes east, and 15 degrees 30 minutes south and 76 degrees 42 minutes east; the volcanic ash cloud is expected to move east-southeastwards at 65 kilometres per hour; at 1700 UTC the volcanic ash cloud is forecast to be located approximately in an area bounded by the following points: 15 degrees 6 minutes south and 75 degrees east, 15 degrees 18 minutes south and 81 degrees 12 minutes south, 17 degrees 12 minutes south and 83 degrees 30 minutes east, and 18 degrees 24 minutes south and 78 degrees 36 minutes east.

Outlook:

The volcanic ash cloud at 2300 UTC on the 21st of the month is expected to be located approximately in an area bounded by the following points: 16 degrees south and 78 degrees 6 minutes east, 16 degrees 42 minutes south and 84 degrees 12 minutes east, 18 degrees 24 minutes south and 89 degrees east, and 19 degrees 6 minutes south and 81 degrees east; the volcanic ash cloud at 0500 UTC on the 22nd of the month is expected to be located approximately in an area bounded by the following points: 17 degrees south and 81 degrees east, 18 degrees 12 minutes south and 86 degrees 36 minutes east, 20 degrees south and 92 degrees 24 minutes east, and 21 degrees 30 minutes south and 84 degrees 18 minutes east.

* Fictitious locations

Example A6-4. SIGMET message for severe turbulence

YUCC SIGMET 5 VALID 221215/221600 YUDO-
YUCC AMSWELL FIR SEV TURB OBS AT 1210Z YUSB FL250 MOV E 40KMH WKN

Meaning:

The fifth SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; severe turbulence was observed at 1210 UTC over Siby/Bistock* aerodrome (YUSB) at flight level 250; the turbulence is expected to move eastwards at 40 kilometres per hour and to weaken in intensity.

* Fictitious locations

Example A6-5. AIRMET message for moderate mountain wave

YUCC AIRMET 2 VALID 221215/221600 YUDO-
YUCC AMSWELL FIR MOD MTW OBS AT 1205Z AND FCST N48 E10 FL080 STNR NC

Meaning:

The second AIRMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; moderate mountain wave was observed at 1205 UTC at 48 degrees north and 10 degrees east at flight level 080; the mountain wave is expected to remain stationary and not to undergo any changes in intensity.

* Fictitious locations

APPENDIX 7. TECHNICAL SPECIFICATIONS RELATED TO AERONAUTICAL CLIMATOLOGICAL INFORMATION

(See Chapter 8 of this Annex.)

1. PROCESSING OF AERONAUTICAL CLIMATOLOGICAL INFORMATION

Recommendation.— *Meteorological observations for regular and alternate aerodromes should be collected, processed and stored in a form suitable for the preparation of aerodrome climatological information.*

2. EXCHANGE OF AERONAUTICAL CLIMATOLOGICAL INFORMATION

Recommendation.— *Aeronautical climatological information should be exchanged on request between meteorological authorities. Operators and other aeronautical users desiring such information should normally apply to the meteorological authority responsible for its preparation.*

3. CONTENT OF AERONAUTICAL CLIMATOLOGICAL INFORMATION

3.1 Aerodrome climatological tables

3.1.1 **Recommendation.—** *An aerodrome climatological table should give as applicable:*

a) mean values and variations therefrom, including maximum and minimum values, of meteorological elements (for example, of air temperature); and/or

b) the frequency of occurrence of present weather phenomena affecting flight operations at the aerodrome (for example, of sandstorms); and/or

c) the frequency of occurrence of specified values of one, or of a combination of two or more, elements (for example, of a combination of low visibility and low cloud).

3.1.2 **Recommendation.—** *Aerodrome climatological tables should include information required for the preparation of aerodrome climatological summaries in accordance with 3.2.*

3.2 Aerodrome climatological summaries

Recommendation.— *Aerodrome climatological summaries should cover:*

a) frequencies of the occurrence of runway visual range/visibility and/or height of the base of the lowest cloud layer of BKN or OVC extent below specified values at specified times;

b) frequencies of visibility below specified values at specified times;

c) frequencies of the height of the base of the lowest cloud layer of BKN or OVC extent below specified values at specified times;

d) frequencies of occurrence of concurrent wind direction and speed within specified ranges;

e) frequencies of surface temperature in specified ranges of 5°C at specified times; and

f) mean values and variations therefrom, including maximum and minimum values of meteorological elements required for operational planning purposes, including take-off performance calculations.

Note.— Models of climatological summaries related to a) to e) are given in WMO Publication No. 49, Technical Regulations*, Volume II, C.3.2.*

APPENDIX 8. TECHNICAL SPECIFICATIONS RELATED TO SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

(See Chapter 9 of this Annex.)

Note.— Specifications related to flight documentation (including the model charts and forms) are given in Appendix 1.

1. MEANS OF SUPPLY AND FORMAT OF METEOROLOGICAL INFORMATION

1.1 Meteorological information shall be supplied to operators and flight crew members by one or more of the following, as agreed between the meteorological authority and operator concerned, and with the order shown below not implying priorities:

a) written or printed material, including specified charts and forms;

b) data in digital form;

c) briefing;

d) consultation;

e) display; or

f) in lieu of a) to e), by means of an automated pre-flight information system providing self-briefing and flight documentation facilities while retaining access by operators and aircrew members to consultation, as necessary, with the meteorological office, in accordance with 5.1.

1.2 The meteorological authority, in consultation with the operator, shall determine:

a) the type and format of meteorological information to be supplied; and

b) methods and means of supplying that information.

1.3 **Recommendation.—** *On request by the operator, the meteorological information supplied for flight planning should include data for the determination of the lowest usable flight level.*

2. SPECIFICATIONS RELATED TO INFORMATION FOR PRE-FLIGHT PLANNING AND IN-FLIGHT RE-PLANNING

2.1 Format of upper-air information

Upper-air information supplied by WAFCs for pre-flight and in-flight re-planning shall be in the GRIB code form.

Note.— The GRIB code form is contained in WMO Publication No. 306, Manual on Codes*, Volume I.2, Part B — Binary Codes.*

2.2 Format of information on significant weather

Information on significant weather supplied by WAFCs for pre-flight and in-flight re-planning shall be in the BUFR code form.

Note.— The BUFR code form is contained in WMO Publication No. 306, Manual on Codes, *Volume I.2, Part B — Binary Codes.*

2.3 Specific needs of supersonic aircraft

Recommendation.— *Meteorological information for pre-flight planning and in-flight re-planning by operators for supersonic aircraft should include data covering the levels used for transonic and supersonic flight, together with the levels that may be used for subsonic flight. Particular mention should be made of occurrence and expected occurrence, location and vertical extent of cumulonimbus clouds, turbulence and precipitation.*

2.4 Specific needs of helicopter operations

Recommendation.— *Meteorological information for pre-flight planning and in-flight re-planning by operators of helicopters flying to offshore structures should include data covering the layers from sea level to flight level 100. Particular mention should be made of the expected surface visibility, the amount, type (where available), base and tops of cloud* *below flight level 100, sea state and sea surface temperature, mean sea-level pressure, and the occurrence and expected occurrence of turbulence and icing, as determined by regional air navigation agreement.*

3. SPECIFICATIONS RELATED TO BRIEFING AND CONSULTATION

3.1 Specific needs of supersonic aircraft

Recommendation.— *Briefing and/or consultation for flight crew members of supersonic aircraft should include meteorological information covering the flight levels of transonic and supersonic flight. Particular mention should be made of occurrence and expected occurrence, location and vertical extent of cumulonimbus clouds, turbulence and precipitation.*

3.2 Specific needs of low-level flights

Recommendation.— *Briefing and/or consultation for low-level flights, including those in accordance with the visual flight rules, should include meteorological information covering altitudes up to flight level 100 (or up to flight level 150 in mountainous areas or higher, where necessary). Particular mention should be made of the occurrence or expected occurrence of any phenomena causing widespread reduction of visibility to less than 5 000 m, as well as the occurrence or expected occurrence of clouds which may affect the flight.*

3.3 Information required to be displayed

3.3.1 To assist the flight crew members and others concerned with the preparation of the flight and for use in briefing and consultation, the meteorological office shall display the latest available:

a) METAR and SPECI;

b) TAF and trend forecasts;

c) aerodrome warnings relating to the local aerodrome;

d) forecasts for take-off;

e) SIGMET and AIRMET information and special air-reports not covered by a SIGMET;

f) current and prognostic charts;

g) meteorological satellite images or mosaics and/or nephanalyses; and

h) ground-based weather radar information.

3.3.2 **Recommendation.—** *The material displayed should be readily accessible to the flight crew members or other flight operations personnel concerned. By agreement between the meteorological authority and the user, the display may be used in lieu of briefing and/or consultation.*

4. SPECIFICATIONS RELATED TO FLIGHT DOCUMENTATION

4.1 General

4.1.1 Presentation of flight documentation

4.1.1.1 **Recommendation.—** *Charts included in flight documentation should have a high standard of clarity and legibility and should have the following physical characteristics:*

a) for convenience, the largest size of charts should be about 42 × 30 cm (standard size A3) and the smallest size should be about 21 × 30 cm (standard size A4). The choice between these sizes should depend on the route lengths and the amount of detail that needs to be given in the charts as agreed between meteorological authorities and users;

b) major geographical features, such as coastlines, major rivers and lakes should be depicted in a way that makes them easily recognizable;

c) for charts prepared by computer, meteorological data should take preference over basic chart information, the former cancelling the latter wherever they overlap;

d) major aerodromes should be shown as a dot and identified by the first letter of the name of the city the aerodrome serves as given in Table AOP of the relevant regional air navigation plan;

e) a geographical grid should be shown with meridians and parallels represented by dotted lines at each 10° latitude and longitude; dots should be spaced one degree apart;

f) latitude and longitude values should be indicated at various points throughout the charts (i.e. not only at the edges); and

g) labels on the charts for flight documentation should be clear and simple and should present the name of the world area forecast centre or, for non-WAFS products, the originating centre, the type of chart, date and valid time and, if necessary, the types of units used in an unambiguous way.

4.1.1.2 **Recommendation.—** *Meteorological information included in flight documentation should be represented as follows:*

a) winds on charts should be depicted by arrows with feathers and shaded pennants on a sufficiently dense grid;

b) temperatures should be depicted by figures on a sufficiently dense grid;

c) wind and temperature data selected from the data sets received from a world area forecast centre should be depicted in a sufficiently dense latitude/longitude grid; and

d) wind arrows should take precedence over temperatures and either should take precedence over chart background.

4.1.1.3 **Recommendation.—** *For short-haul flights charts should be prepared covering limited areas at a scale of* $1{:}15 \times 10^6$ *as required and subject to regional air navigation agreement*.

4.1.2 Set of charts to be provided

4.1.2.1 **Recommendation.—** *The minimum number of charts for flights between flight level 250 and flight level 630 should include a high-level significant weather chart (flight level 250 to flight level 630) and a forecast 250 hPa wind and temperature chart. The actual charts provided for pre-flight and in-flight planning and for flight documentation should be as agreed between meteorological authorities and other users within a service area.*

4.1.2.2 **Recommendation.—** *The set of charts to be provided under the world area forecast system for flights below flight level 250 should be as agreed between user States and other users*.

4.1.3 Height indications

Recommendation.— *In flight documentation height indications should be given as follows:*

a) all references to en-route meteorological conditions, such as height indications of upper winds, turbulence or bases and tops of clouds, should preferably be expressed in flight levels; they may also be expressed in pressure, altitude or, for low-level flights, height above ground level; and

b) all references to aerodrome meteorological conditions, such as height indications of the bases of clouds, should be expressed in height above the aerodrome elevation.

4.2 Specifications related to upper wind and upper-air temperature information

4.2.1 In chart form

4.2.1.1 Where upper wind and upper-air temperature information is supplied in chart form to flight crew members before departure, the charts shall be fixed time prognostic charts for standard flight levels. In tropical areas, or for short flights, current charts may be provided in lieu of prognostic charts; in such cases, the levels depicted shall correspond to the standard isobaric levels.

4.2.1.2 Upper wind and upper-air temperature charts for low-level flights shall be supplied for points separated by no more than 500 km (300 NM) and for at least the following altitudes: 600, 1 500 and 3 000 m (2 000, 5 000 and 10 000 ft).

4.2.2 In tabular form

Recommendation.— *Where upper wind and upper-air temperature information is supplied in tabular form, it should include data for the same flight levels as for upper-air charts. This information should be given for spot locations on a regular grid.*

Note.— Examples of the form of presentation of tabular forecasts of upper winds and upper-air temperatures are given in Appendix 1.

4.3 Specifications related to significant weather information

4.3.1 In chart form

4.3.1.1 Where information on significant en-route weather phenomena is supplied in chart form to flight crew members before departure, the charts shall be significant weather charts valid for a specified fixed time. Such charts shall show, as appropriate to the flight:

a) thunderstorms;

b) tropical cyclone;

c) severe squall lines;

d) moderate or severe turbulence (in cloud or clear air);

e) moderate or severe icing;

f) widespread sandstorm/duststorm;

g) for flight level 100 to flight level 250, clouds associated with a) to f);

h) above flight level 250, cumulonimbus cloud associated with a) to f);

i) surface position of well-defined convergence zones;

j) surface positions, speed and direction of movement of frontal systems when associated with significant en-route weather phenomena;

k) tropopause heights;

l) jetstreams;

m) information on the location of volcanic eruptions which are producing ash clouds of significance to aircraft operations, including those producing only steam, comprising: volcanic eruption symbol at the location of the volcano and, at the side of the chart, the volcano eruption symbol, the name of the volcano, its international number, latitude/longitude, the date and time of first eruption, if known, and a reference to SIGMETs and NOTAM or ASHTAM issued for the area concerned; and

n) information on the location of an accidental release of radioactive materials into the atmosphere of significance to aircraft operations, comprising: the radioactivity symbol at the site of the accident and, at the side of the chart, the radioactivity symbol, latitude/longitude of the site of the accident, date and time of the accident and a reminder to users to check NOTAM for the area concerned.

Note 1.— For aircraft operating above flight level 250, items a) to f) are only required if expected to be above that level, and in the case of item a), only those thunderstorms which warrant the issuance of a SIGMET as given in Appendix 6. Guidance on the use of term "FRQ TS" is given in Appendix 6.

Note 2.— The abbreviation "CB" should only be included where it refers to the occurrence or expected occurrence of an area of widespread cumulonimbus clouds or cumulonimbus along a line with little or no space between individual clouds, or to cumulonimbus embedded in cloud layers or concealed by haze. It does not refer to isolated or scattered cumulonimbus not embedded in cloud layers or concealed by haze.

Note 3.— Where a volcanic eruption or the accidental release of radioactive materials into the atmosphere warrants the inclusion of the volcanic activity symbol or the radioactivity symbol on significant weather charts, the symbols are to be included on all such charts (low, medium and high) irrespective of the height to which the ash column or radioactive material is reported or expected to reach.

Note 4.— The international volcano number is allocated by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) and is listed in the Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds *(Doc 9691).*

4.3.1.2 **Recommendation.—** *On significant weather charts, the inclusion of "CB" or the thunderstorm symbol should be understood to include all weather phenomena normally associated with cumulonimbus or thunderstorm, namely, moderate or severe icing, moderate or severe turbulence and hail.*

4.3.1.3 **Recommendation.—** *Significant weather charts for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 (up to flight level 150 in mountainous areas or higher, where necessary) should show, as appropriate to the flight:*

a) the phenomena warranting the issuance of a SIGMET as given in Appendix 6 and which are expected to affect low-level flights; and

b) the elements included in area forecasts for low-level flights as given in Appendix 5 except elements r) and u) concerning upper winds and upper-air temperatures and forecast lowest QNH, respectively.

Note 1.— Examples of the form of presentation of significant weather charts are given in Appendix 1.

Note 2.— Guidance on the use of terms "ISOL", "OCNL" and "FRQ" referring to cumulonimbus clouds and thunderstorms is given in Appendix 6.

4.3.2 In other forms

Recommendation.— *Where flight documentation covering the significant en-route weather conditions is not supplied in chart form, it should be presented in tabular form and/or as an abbreviated plain-language text.*

Note.— Examples of the form of presentation of tabular forecasts are given in Appendix 1.

4.4 Specifications related to TAF

4.4.1 Requirements for TAF

4.4.1.1 The flight documentation shall in all cases include the TAF for the aerodrome of departure, and for the aerodrome of intended landing. In addition, the flight documentation shall include TAF for one or more suitable alternate aerodromes, as needed to complete the operational flight plan and as selected by agreement between the meteorological authority and the operators, and taken from the list of aerodromes contained in the relevant regional air navigation plan.

4.4.1.2 TAF received from other meteorological offices shall be included in flight documentation without change in substance.

4.4.1.3 **Recommendation.—** *By agreement between the meteorological authority and the operator the flight documentation should include TAF for alternate aerodromes en route and of aerodromes where intermediate stops are planned.*

4.4.2 Presentation of TAF

Recommendation.— *TAF should be presented in accordance with the template in Appendix 5; they may also be presented in tabular form or in the form of an abbreviated plain-language text. The location indicators and the abbreviations used should be explained in the flight documentation. If several TAF are included, they should be presented in a manner which permits the ready identification of the beginning and end of each forecast.*

Note.— Examples of the form of presentation of TAF are given in Appendix 1.

4.4.3 Issuance of provisional TAF

Recommendation.— *When a TAF is not received in time, the meteorological office associated with the aerodrome of departure should make all practicable efforts to obtain the forecast but, if unobtainable, the office should, if possible, prepare a provisional forecast. The meteorological office should inform the flight crew member that the forecast is provisional and record its origin in the flight documentation.*

4.5 Specifications related to low-level flights

4.5.1 In chart form

Recommendation.— *Where the forecasts are supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 (or up to flight level 150 in mountainous areas or higher, where necessary), should contain the following as appropriate to the flight:*

a) information from relevant SIGMET and AIRMET messages;

b) upper wind and upper-air temperature charts as given in 4.2.1.2; and

c) significant weather charts as given in 4.3.1.3.

4.5.2 In abbreviated plain language

Recommendation.— *Where the forecasts are not supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 (up to flight level 150 in mountainous areas or higher, where necessary), should contain the following information as appropriate to the flight:*

a) SIGMET and AIRMET information; and

b) information included in the area forecasts for low-level flights as given in Appendix 5 or, where the forecasts are issued in the form of an abbreviated plain-language text, the GAMET area forecasts.

Note.— An example of the GAMET area forecast is given in Appendix 5.

5. SPECIFICATIONS RELATED TO AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS FOR BRIEFING, CONSULTATION, FLIGHT PLANNING AND FLIGHT DOCUMENTATION

5.1 Access to the systems

Automated pre-flight information systems providing self-briefing facilities shall provide for access by operators and flight crew members to consultation, as necessary, with a meteorological office by telephone or other suitable telecommunications means.

5.2 Detailed specifications of the systems

Recommendation.— *Automated pre-flight information systems for the supply of meteorological information for self-briefing, pre-flight planning and flight documentation should*:

a) provide for the continuous and timely updating of the system database and monitoring of the validity and integrity of the meteorological information stored;

b) permit access to the system by operators and flight crew members and also by other aeronautical users concerned through suitable telecommunications means;

c) use access and interrogation procedures based on abbreviated plain language and, as appropriate, ICAO location indicators, and aeronautical meteorological code data-type designators prescribed by the WMO, or based on a menu-driven user interface, or other appropriate mechanisms as agreed between the meteorological authority and operators concerned; and

d) provide for rapid response to a user request for information.

Note.— ICAO abbreviations and codes and location indicators are given respectively in the Procedures for Air

Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400) and* Location Indicators *(Doc 7910). Aeronautical meteorological code data-type designators are given in the WMO Publication No. 386,* Manual on the Global Telecommunication System.

6. SPECIFICATIONS RELATED TO INFORMATION FOR AIRCRAFT IN FLIGHT

6.1 Supply of information requested by an aircraft in flight

Recommendation.— *If an aircraft in flight requests meteorological information, the meteorological office which receives the request should arrange to supply the information with the assistance, if necessary, of another meteorological office.*

6.2 Information for in-flight planning by the operator

Recommendation.— *Meteorological information for planning by the operator for aircraft in flight should be supplied during the period of the flight and should normally consist of any or all of the following:*

a) meteorological reports, TAF and landing forecasts;

b) SIGMET and AIRMET information and special air-reports relevant to the flight, unless the latter have been the subject of a SIGMET message; and

c) upper wind and upper-air temperature information.

6.3 Information for supersonic flights

Recommendation.— *For supersonic aircraft in flight the meteorological office serving the aerodrome of intended landing should, on request by the operator, supply a forecast covering the transonic deceleration and subsonic descent phases. This forecast should be transmitted to the area control centre or flight information centre concerned within the two hours before arrival. The operator should advise the meteorological office, in good time, of the location of the descent path and of the time at which the aircraft is expected to commence the descent.*

APPENDIX 9. TECHNICAL SPECIFICATIONS RELATED TO INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES

(See Chapter 10 of this Annex.)

1. INFORMATION TO BE PROVIDED FOR AIR TRAFFIC SERVICES UNITS

1.1 List of information for the aerodrome control tower

The following meteorological information shall be supplied, as necessary, to an aerodrome control tower by its associated aerodrome meteorological office:

a) local routine and special reports, METAR and SPECI, TAF and trend forecasts and amendments thereto, for the aerodrome concerned;

b) SIGMET and AIRMET information, wind shear warnings and aerodrome warnings;

c) any additional meteorological information agreed upon locally, such as forecasts of surface wind for the determination of possible runway changes; and

d) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned.

1.2 List of information for the approach control office

The following meteorological information shall be supplied, as necessary, to an approach control office by its associated aerodrome meteorological office:

a) local routine and special reports, METAR and SPECI, including current pressure data, TAF and trend forecasts and amendments thereto, for the aerodrome(s) with which the approach control office is concerned;

b) SIGMET and AIRMET information, wind shear warnings and appropriate special air-reports for the airspace with which the approach control office is concerned and aerodrome warnings;

c) any additional meteorological information agreed upon locally; and

d) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned.

1.3 List of information for the flight information centre

The following meteorological information shall be supplied, as necessary, to a flight information centre or an area control centre by its associated meteorological watch office:

a) METAR and SPECI, including current pressure data for aerodromes and other locations, TAF and trend forecasts and amendments thereto, covering the flight information region or the control area and, if required by the flight information centre or area control centre, covering aerodromes in neighbouring flight information regions, as determined by regional air navigation agreement;

b) forecasts of upper winds, upper-air temperatures and significant en-route weather phenomena and amendments thereto, particularly those which are likely to make operation under visual flight rules impracticable, SIGMET and AIRMET information and appropriate special air-reports for the flight information region or control area and, if determined by regional air navigation agreement and required by the flight information centre or area control centre, for neighbouring flight information regions;

c) any other meteorological information required by the flight information centre or area control centre to meet requests from aircraft in flight; if the information requested is not available in the associated meteorological watch office, that office shall request the assistance of another meteorological office in supplying it;

d) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological and ATS authorities concerned; and

e) information received concerning the accidental release of radioactive materials into the atmosphere, as agreed between the meteorological and ATS authorities concerned.

1.4 Specific provisions related to the supply of information on volcanic ash and volcanic eruptions

1.4.1 Volcanic ash advisory information issued by a VAAC shall be supplied to area control centres and flight information centres concerned in its area of responsibility.

1.4.2 Information received on pre-eruption volcanic activity and/or a volcanic eruption shall be supplied, as necessary, to an ATS unit by its corresponding associated meteorological office as agreed between the meteorological and ATS authorities concerned.

1.5 Specific provisions related to the supply of information for supersonic aircraft

Recommendation.— *The information supplied to flight information centres and area control centres for supersonic aircraft should cover the levels used for transonic and supersonic flight and should include forecasts for subsonic descent paths to aerodromes in the flight information region.*

1.6 Supply of information to aeronautical telecommunications stations

Where necessary for flight information purposes, current meteorological reports and forecasts shall be supplied to designated aeronautical telecommunication stations. A copy of such information shall be forwarded, if required, to the flight information centre or the area control centre.

1.7 Format of information

1.7.1 **Recommendation.—** *Local routine and special reports, METAR and SPECI, TAF and trend forecasts, SIGMET and AIRMET information, upper wind and upper-air temperature forecasts and amendments thereto should be supplied to air traffic services units in the form in which they are prepared, disseminated to other meteorological offices or received from other meteorological offices, unless otherwise agreed locally.*

1.7.2 **Recommendation.—** *When computer-processed upper-air data for grid points are made available to air traffic services units in digital form for use by air traffic services computers, the contents, format and transmission arrangements should be as agreed between the meteorological authority and the appropriate ATS authority. The data should normally be supplied as soon as is practicable after the processing of the forecasts has been completed.*

2. INFORMATION TO BE PROVIDED FOR SEARCH AND RESCUE SERVICES UNITS

2.1 List of information

Information to be supplied to rescue coordination centres shall include the meteorological conditions that existed in the last known position of a missing aircraft and along the intended route of that aircraft with particular reference to:

a) significant en-route weather phenomena;

b) cloud amount and type, particularly cumulonimbus; height indications of bases and tops;

c) visibility and phenomena reducing visibility;

d) surface wind and upper wind;

e) state of ground, in particular, any snow cover or flooding;

f) sea-surface temperature, state of the sea, ice cover if any and ocean currents, if relevant to the search area; and

g) sea-level pressure data.

2.2 Information to be provided on request

2.2.1 **Recommendation.—** *On request from the rescue coordination centre, the designated meteorological office should arrange to obtain details of the flight documentation which was supplied to the missing aircraft, together with any amendments to the forecast which were transmitted to the aircraft in flight.*

2.2.2 **Recommendation.—** *To facilitate search and rescue operations the designated meteorological office should, on request, supply:*

a) complete and detailed information on the current and forecast meteorological conditions in the search area; and

b) current and forecast conditions en route, covering flights by search aircraft from and returning to the aerodrome from which the search is being conducted.

2.2.3 **Recommendation.—** *On request from the rescue coordination centre, the designated meteorological office should supply or arrange for the supply of meteorological information required by ships undertaking search and rescue operations.*

3. INFORMATION TO BE PROVIDED FOR AERONAUTICAL INFORMATION SERVICES UNITS

3.1 List of information

The following information shall be supplied, as necessary, to an aeronautical information services unit:

a) information on meteorological service for international air navigation, intended for inclusion in the aeronautical information publication(s) concerned;

Note.— Details of this information are given in Annex 15, Appendix 1, Part 1, 3.5 and Part 3, 2.2, 2.11, 3.2 and 3.11.

b) information necessary for the preparation of NOTAM or ASHTAM including, in particular, information on:

1) the establishment, withdrawal and significant changes in operation of aeronautical meteorological services. This information is required to be provided to the aeronautical information services unit sufficiently in advance of the effective date to permit issuance of NOTAM in compliance with Annex 15, 5.1.1 and 5.1.1.1;

2) the occurrence of volcanic activity; and

Note.— The specific information required is given in Chapter 3, 3.3.2 and Chapter 4, 4.8.

3) accidental release of radioactive materials into the atmosphere, as agreed between the meteorological and appropriate civil aviation authorities concerned; and

Note.— The specific information required is given in Chapter 3, 3.4.2 g).

c) information necessary for the preparation of aeronautical information circulars including, in particular, information on:

1) expected important changes in aeronautical meteorological procedures, services and facilities provided; and

2) effect of certain weather phenomena on aircraft operations.

APPENDIX 10. TECHNICAL SPECIFICATIONS RELATED TO REQUIREMENTS FOR AND USE OF COMMUNICATIONS

(See Chapter 11 of this Annex.)

1. SPECIFIC REQUIREMENTS FOR COMMUNICATIONS

1.1 Required transit times of meteorological information

Recommendation.— *Unless otherwise determined by regional air navigation agreement, AFTN messages and bulletins containing operational meteorological information should achieve transit times of less than the following:*

SIGMET and AIRMET messages, volcanic ash and tropical cyclone advisory information and special air-reports . . . . 5 minutes

Abbreviated plain-language amendments to significant weather and upper air forecasts. . . . . 5 minutes

Amended TAF and corrections to TAF . . . . 5 minutes

METAR, Trend forecasts, TAF, SPECI	*0–900 km (500 NM)*	*5 minutes*
	more than 900 km (500 NM)	*10 minutes*

1.2 Grid point data for ATS and operators

1.2.1 **Recommendation.—** *When upper-air data for grid points in digital form are made available for use by air traffic services computers, the transmission arrangements should be as agreed between the meteorological authority and the appropriate ATS authority.*

1.2.2 **Recommendation.—** *When upper-air data for grid points in digital form are made available to operators for flight planning by computer, the transmission arrangements should be as agreed among the world area forecast centre concerned, the meteorological authority and the operators.*

2. USE OF AERONAUTICAL FIXED SERVICE COMMUNICATIONS

2.1 Meteorological bulletins in alphanumeric format

2.1.1 Composition of bulletins

Recommendation.— *Whenever possible, exchanges of operational meteorological information should be made in consolidated bulletins of the same types of meteorological information.*

2.1.2 Filing times of bulletins

Recommendation.— *Meteorological bulletins required for scheduled transmissions should be filed regularly and at the prescribed scheduled times. METAR should be filed for transmission not later than 5 minutes after the actual time of observation. TAF should be filed for transmission at least one hour before the commencement of their period of validity, unless otherwise determined by regional air navigation agreement.*

2.1.3 Heading of bulletins

Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service facilities shall contain a heading consisting of:

a) an identifier of four letters and two figures;

b) the ICAO four-letter location indicator corresponding to the geographical location of the meteorological office originating or compiling the meteorological bulletin;

c) a date-time group; and

d) if required, a three-letter indicator.

Note 1.— Detailed specifications on format and contents of the heading are given in the WMO Manual on the Global Telecommunication System*, Volume I and are reproduced in the* Manual of Aeronautical Meteorological Practice *(Doc 8896).*

Note 2.— ICAO location indicators are listed in Location Indicators *(Doc 7910).*

2.1.4 Structure of bulletins

Meteorological bulletins containing operational meteorological information to be transmitted via the AFTN shall be encapsulated in the text part of the AFTN message format.

2.2 World area forecast system products

2.2.1 Telecommunications for the supply of WAFS products

Recommendation.— *The telecommunications facilities used for the supply of world area forecast system products should be the aeronautical fixed service.*

2.2.2 Quality requirements for charts

Recommendation.— *Where world area forecast system products are disseminated in chart form, the quality of the charts received should be such as to permit reproduction in a sufficiently legible form for flight planning and documentation. Charts received should be legible over 95 per cent of their area.*

2.2.3 Quality requirements for transmissions

Recommendation.— *Transmissions should be such as to ensure that their interruption should not exceed 10 minutes during any period of 6 hours.*

2.2.4 Heading of bulletins containing WAFS products

Meteorological bulletins containing WAFS products in digital form to be transmitted via aeronautical fixed service facilities shall contain a heading as given in 2.1.3.

3. USE OF AERONAUTICAL MOBILE SERVICE COMMUNICATIONS

3.1 Content and format of meteorological messages

3.1.1 The contents and format of reports, forecasts and SIGMET information transmitted to aircraft shall be consistent with the provisions of Chapters 4, 6 and 7 of this Annex.

3.1.2 The contents and format of air-reports transmitted by aircraft shall be consistent with the provisions of Chapter 5 of this Annex and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), Appendix 1.

3.2 Content and format of meteorological bulletins

The substance of a meteorological bulletin transmitted via the aeronautical mobile service shall remain unchanged from that contained in the bulletin as originated.

4. USE OF AERONAUTICAL DATA LINK SERVICE — D-VOLMET

4.1 Detailed content of meteorological information available for D-VOLMET

4.1.1 **Recommendation.—** *The aerodromes for which METAR, SPECI and TAF are to be available for uplink to aircraft in flight should be determined by regional air navigation agreement.*

4.1.2 **Recommendation.—** *The flight information regions for which SIGMET and AIRMET messages are to be available for uplink to aircraft in flight should be determined by regional air navigation agreement.*

4.2 Criteria related to information to be available for D-VOLMET

4.2.1 **Recommendation.—** *The latest available METAR, SPECI, TAF, SIGMET and AIRMET should be used for uplink to aircraft in flight.*

4.2.2 **Recommendation.—** *TAF included in the D-VOLMET should be amended as necessary to ensure that a forecast, when made available for uplink to aircraft in flight, reflects the latest opinion of the meteorological office concerned.*

4.2.3 **Recommendation.—** *If no SIGMET message is available for a flight information region, an indication of "NIL SIGMET" should be included in the D-VOLMET.*

4.3 Format of information to be available for D-VOLMET

The content and format of reports, forecasts and SIGMET and AIRMET information included in D-VOLMET shall be consistent with the provisions of Chapters 4, 6 and 7 of this Annex.

5. USE OF AERONAUTICAL BROADCASTING SERVICE — VOLMET BROADCASTS

5.1 Detailed content of meteorological information to be included in VOLMET broadcasts

5.1.1 **Recommendation.—** *The aerodromes for which METAR, SPECI and TAF are to be included in VOLMET broadcasts, the sequence in which they are to be transmitted and the broadcast time should be determined by regional air navigation agreement.*

5.1.2 **Recommendation.—** *The flight information regions for which SIGMET messages are to be included in scheduled VOLMET broadcasts should be determined by regional air navigation agreement. Where this is done, the SIGMET message or an indication of "NIL SIGMET" should be transmitted at the beginning of the broadcast or of a five-minute time block.*

5.2 Criteria related to information to be included in VOLMET broadcasts

5.2.1 **Recommendation.—** *When a report has not arrived from an aerodrome in time for a broadcast, the latest available report should be included in the broadcast, together with the time of observation.*

5.2.2 **Recommendation.—** *TAF included in scheduled VOLMET broadcasts should have a period of validity of 9 hours; they should be issued every 3 hours and should, between these routine issues, be amended as necessary to ensure that a forecast, when transmitted, reflects the latest opinion of the meteorological office concerned.*

5.3 Format of information to be included in VOLMET broadcasts

5.3.1 The content and format of reports, forecasts and SIGMET information included in VOLMET broadcasts shall be consistent with the provisions of Chapters 4, 6 and 7 of this Annex.

5.3.2 **Recommendation.—** *VOLMET broadcasts should use standard radiotelephony phraseologies.*

Note.— Guidance on the standard radiotelephony phraseologies to be used in VOLMET broadcasts is given in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services *(Doc 9377), Appendix A.*

ATTACHMENT A. OPERATIONALLY DESIRABLE AND CURRENTLY ATTAINABLE ACCURACY OF MEASUREMENT OR OBSERVATION

Note.— The guidance contained in this table relates to Chapter 4 — Meteorological observations and reports, in particular to 4.1.9.

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Element to be observed	*Operationally desirable accuracy of measurement or observation**	*Attainable accuracy** of measurement or observation (1994)*
Mean surface wind	Direction: ± 10° Speed: ± 2 km/h (1 kt) up to 19 km/h (10 kt) ± 10% above 19 km/h (10 kt)	Direction: ± 5° Speed: ± 2 km/h (1 kt) up to 37 km/h (20 kt) ± 5% above 37 km/h (20 kt)
Variations from the mean surface wind	± 4 km/h (2 kt), in terms of longitudinal and lateral components	as above
Visibility	± 50 m up to 600 m ± 10% between 600 m and 1 500 m ± 20% above 1 500 m	± 50 m up to 500 m ± 10% between 500 m and 2 000 m ± 20% above 2 000 m up to 10 km
Runway visual range	± 10 m up to 400 m ± 25 m between 400 m and 800 m ± 10% above 800 m	± 25 m up to 150 m ± 50 m between 150 m and 500 m ± 10% above 500 m up to 2 000 m
Cloud amount	± 1 okta	In daylight an observer can attain an accuracy of ± 1 okta at the point of observation. In darkness, and when atmospheric phenomena limit the viewing of low cloud, there will be difficulty in attaining that accuracy.
Cloud height	± 10 m (33 ft) up to 100 m (330 ft) ± 10% above 100 m (330 ft)	± 10 m (33 ft) up to 1 000 m (3 300 ft) ± 30 m (100 ft) above 1 000 m (3 300 ft) up to 3 000 m (10 000 ft)
Air temperature and dew-point temperature	± 1°C	± 0.2 °C
Pressure value (QNH, QFE)	± 0.5 hPa	± 0.3 hPa

* The operationally desirable accuracy is not intended as an operational requirement; it is to be understood as a goal that has been expressed by the operators.

** The accuracy stated refers to assessment by instruments (except for cloud amount); it is not normally attainable in observations made without the aid of instruments.

ATTACHMENT B. OPERATIONALLY DESIRABLE ACCURACY OF FORECASTS

Note 1.— The guidance contained in this table relates to Chapter 6 — Forecasts, in particular to 6.1.1.

Note 2.— If the accuracy of the forecasts remains within the operationally desirable range shown in the second column, for the percentage of cases indicated in the third column, the effect of forecast errors is not considered serious in comparison with the effects of navigational errors and of other operational uncertainties.

Element to be forecast	*Operationally desirable accuracy of forecasts*	*Minimum percentage of cases within range*
	TAF	
Wind direction	± 30°	80% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) ± 20% above 46 km/h (25 kt)	80% of cases
Visibility	± 200 m up to 700 m ± 30% between 700 m and 10 km	80% of cases
Precipitation	Occurrence or non-occurrence	80% of cases
Cloud amount	± 2 oktas	70% of cases
Cloud height	± 30 m (100 ft) up to 120 m (400 ft) ± 30% between 120 m (400 ft) and 3 000 m (10 000 ft)	70% of cases
Air temperature	± 1°C	70% of cases
	TREND FORECAST	
Wind direction	± 30°	90% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) ± 20% above 46 km/h (25 kt)	90% of cases
Visibility	± 200 m up to 700 m ± 30% between 700 m and 10 km	90% of cases
Precipitation	Occurrence or non-occurrence	90% of cases
Cloud amount	± 2 oktas	90% of cases
Cloud height	± 30 m (100 ft) up to 120 m (400 ft) ± 30% between 120 m (400 ft) and 3 000 m (10 000 ft)	90% of cases

Element to be forecast	*Operationally desirable accuracy of forecasts*	*Minimum percentage of cases within range*
	FORECAST FOR TAKE-OFF	
Wind direction	± 30°	90% of cases
Wind speed	± 9 km/h (5 kt) up to 46 km/h (25 kt) ± 20% above 46 km/h (25 kt)	90% of cases
Air temperature	± 1°C	90% of cases
Pressure value (QNH)	± 1 hPa	90% of cases
	AREA, FLIGHT AND ROUTE FORECASTS	
Upper-air temperature	± 3°C (Mean for 900 km/500 NM)	90% of cases
Upper wind	± 28 km/h (15 kt) up to flight level 250 ± 37 km/h (20 kt) above flight level 250 (Modulus of vector difference for 900 km/500 NM)	90% of cases
Significant en-route weather phenomena and cloud	Occurrence or non-occurrence	80% of cases
	Location: ± 100 km/60 NM	70% of cases
	Vertical extent: ± 600 m/2 000 ft	70% of cases

ATTACHMENT C. BACK-UP PROCEDURES AT THE WORLD AREA FORECAST CENTRES

(See Chapter 3, 3.2.2 of this Annex.)

1. INTRODUCTION

A WAFC will provide any or all of the WAFS services as needed when the interruption of the operation of the other WAFC occurs. WAFC London and WAFC Washington have studied a number of potential service interruption and outage scenarios, reviewed the current communication links between the two WAFCs, and agreed upon the appropriate responses to each interruption in service.

2. INTERRUPTIONS IN NUMERICAL WEATHER PREDICTION (NWP) OR SIGNIFICANT WEATHER (SIGWX) FORECAST PRODUCTION

2.1 WAFC London interruptions

2.1.1 A global gridpoint NWP model runs in Exeter. The output from this NWP model forms the basis for the wind and temperature forecasts in the Gridded Binary (GRIB) code form. Two, largely identical, supercomputers are housed in separate computer halls, allowing the model to run on either machine. Therefore, routine or non-routine maintenance can be performed on one of the supercomputers without affecting the operational capability of WAFC London. In the rare event that the model cannot be run on either supercomputer, the following course of action would be taken. When the first model run is delayed significantly or is not available, a decision will be made to use the output from the previous model run, incremented by the appropriate number of hours. In the event that the output from a second, consecutive run is unavailable, WAFC London would process the GRIB data routinely received from WAFC Washington to produce the required WAFS forecasts. If the WAFC Washington data cannot be processed, WAFC Washington may be notified to begin the production of the back-up SIGWX forecasts. These forecasts along with other WAFS data are then sent to the WAFC London message-switching centre for normal distribution.

2.1.2 In the event of a failure at the primary operational workstation, the forecaster would use one of the back-up workstations located on the forecast floor, or in the back-up operations centre. If WAFC London is affected by a massive failure, paragraph 5 describes the action under "Total outage of a WAFC".

2.2 WAFC Washington interruptions

2.2.1 A global spectral model runs at the National Centres for Environmental Prediction (NCEP) and produces the WAFC Washington NWP output. This forms the basis for the wind and temperature forecasts in the GRIB code form. NCEP maintains the ability to run the global model on redundant systems in the case of a failure of the primary system. If the NWP is significantly delayed or missing due to the failure of the primary or secondary computer systems, a decision is made to use the NWP data routinely received from WAFC London at the National Weather Service Telecommunications Gateway (NWSTG), incremented by the appropriate number of hours, to produce the WAFS forecasts.

2.2.2 If the primary operational workstation fails, the forecaster would use a back-up workstation located on the forecast floor. If the WAFC Washington SIGWX production centre is out, WAFC London is called on to produce all of the WAFC Washington SIGWX forecasts. These forecasts are then switched back to the NWSTG with the routine WAFC London SIGWX forecasts for dissemination via the International Satellite Communications System (ISCS). If WAFC Washington is affected by a massive failure, paragraph 5 describes the action under "Total outage of a WAFC".

3. INTERRUPTIONS IN MESSAGE SWITCHING

3.1 WAFC London interruptions

Two message switches exist at WAFC London. In the rare event of a failure at the primary switch, the back-up switch would be used to send and receive data. The back-up message switch can be immediately connected to the Washington and Toulouse WMO global telecommunication system (GTS) routes, and is permanently connected to the satellite distribution system for information relating to air navigation (SADIS) in the event of failure of the primary switch. In the extremely unlikely event that WAFC London cannot connect to the GTS, an integrated services digital network (ISDN) circuit between Silver Spring and Exeter will be used to send and receive data. This circuit is a physical back-up to the link that is normally in place, and is used only when a major failure occurs.

3.2 WAFC Washington interruptions

An integrated services digital network (ISDN) circuit is maintained between WAFC London and the ISCS uplink site. In the rare event that the message switch at the NWSTG is out WAFC London would be notified to begin sending WAFS products on the ISDN circuit directly to the ISCS uplink site. The ISCS satellites then broadcast these products normally. A back-up message switch at another site is scheduled for implementation in 2004.

4. INTERRUPTIONS IN SATELLITE UPLINK AND SATELLITE DISTRIBUTION SYSTEMS

The operation of the satellite communications systems used to provide the SADIS and ISCS broadcasts of the WAFS data is outside the control of the two WAFCs. The reliability and availability of these services is guaranteed by the commercial operators, and not by the two WAFCs.

5. TOTAL OUTAGE OF A WAFC

5.1 WAFC London outage

It is considered extremely unlikely that WAFC London would ever be totally out. A new state of the art infrastructure ensures that both computers can operate completely independent of each other. Separate primary and back-up power supplies are furnished for each computer. The back-up procedures carried out will depend on the nature of the outage. In a worst-case scenario when the primary supercomputer becomes inoperable and the WAFC Washington — WAFC London GTS link cannot be regained, the ISDN circuit described in paragraph 4 would be used to send and receive data from Washington. Thus, the failure of the primary supercomputer would not affect the ability of WAFC London to disseminate WAFS products on the SADIS broadcast or send them to Washington for broadcast on the ISCS. In the event of the forecast office at WAFC London becoming unserviceable, WAFC Washington may be contacted to initiate back-up production of all the high-level and medium-level SIGWX forecasts routinely produced by WAFC London. It should be noted that a back-up forecast office is provisioned at WAFC London in a separate wing of the building. Thus, it is considered highly unlikely that WAFC London would be totally unable to produce their WAFS SIGWX forecasts. The SIGWX forecasts would still be available for SADIS uplink from either forecast office in such a scenario assuming that either computer is available.

5.2 WAFC Washington outage

The WAFS product generation facilities are located at multiple sites. Thus, WAFC Washington would never be completely out. The back-up procedures carried out would depend on the facility affected, and have been described above. Two independent data paths exist from the message-switching centre. Thus, a cable cut would not disrupt communications to or from the switch. However, in a scenario where the Washington message switch is completely out, the distribution of products to WAFC London and to the ISCS is also severed. A separate location for a back-up message switch is planned, but will not be implemented until 2004.

6. ROUTINE AND BACK-UP SIGNIFICANT WEATHER FORECASTS

Table C-1 summarizes the ICAO areas to be used by WAFCs Washington and London for both routine and back-up SIGWX forecasts.

Table C-1. Routine and back-up SIGWX areas with WMO headers

SWH area	*Primary WAFC*	*WMO header*
A	Washington	PGEE07 KKCI
B	London	PGSE06 EGRR
B1	Washington	PGIE07 KKCI
C	London	PGRE06 EGRR
D	London	PGZE06 EGRR
E	London	PGGE06 EGRR
F	Washington	PGGE07 KKCI
G	London	PGCE06 EGRR
H	London Washington	PGAE06 EGRR PGAE07 KKCI
I	Washington	PGBE07 KKCI
J	Washington	PGJE07 KKCI
K	London	PGKE06 EGRR
M	Washington	PGDE30 KKCI
NAT	Washington	PGNE40 KKCI
EUR	London	PGDE15 EGRR
MID	London	PGCE15 EGRR
S ASIA	London	PGZE15 EGRR

ATTACHMENT D. SELECTED CRITERIA APPLICABLE TO AERODROME REPORTS

(The guidance in this table relates to Chapter 4 and Appendix 3.)

	Surface wind				*Visibility (VIS)*			*RVR[1]* A B C (OBS TIME) −10 −5 (Time, MIN)			*Present weather*	*Cloud* – *Amount*				*Type[2]*	*Temperature*	*Pressure (QNH, QFE)*		*Supplementary information*
Specifications	Directional variations[3] ≥ 60° and < 180° – Mean speed			Speed variations[3]	Directional variations[4]	Special cases Minimum VIS ≠ prevailing VIS		Past tendency[5] $\lvert \overline{R}_{5(AB)} - \overline{R}_{5(BC)} \rvert$		Variations[5]		Layers reported if coverage								
	< 6 km/h (3 kt)	≥ 6 km/h (3 kt)	≥ 180°	Exceeding the mean speed by ≥ 20 km/h (10 kt)	General rule	Minimum VIS < 1 500 m or < 0.5 × prevailing VIS	VIS fluctuating and prevailing VIS cannot be determined	< 100 m	≥ 100 m	$\lvert \overline{R}_1 - \overline{R}_{10} \rvert$ > MAX [50 m or 20% × $\overline{R}_{10}$]	No general criteria applicable to all the WX phenomena (for specific criteria see 4.8.4 – 4.8.7)	Lowest layer	Next layer >	Next higher layer >	CB[6] or TCU	Identification	No criteria	Parameters reported	Updated if changes > agreed magnitude	Parameter to be included
Local routine and special report	2 min[7] VRB + 2 extreme directions[11]	2 min mean + 2 extreme directions[11]	2 min VRB (no extremes)[11]	2 min Minimum and maximum speed	1 min VIS along the runway(s)	N/A	N/A	1 min N/A[8]				Always	2/8	4/8	Always	CB TCU		QNH QFE[9]	Yes	All[10]
METAR/ SPECI	10 min VRB (no extremes)	10 min mean + 2 extreme directions	10 min VRB (no extremes)	10 min Maximum speed[11]	10 min Prevailing VIS	Prevailing VIS and minimum VIS + direction	Minimum VIS	10 min No tendency observed ("N") / No tendency available, the tendency is to be omitted	Upward ("U") or downward ("D")	1 min Minimum and maximum (instead of 10-minute mean)		Always	2/8	4/8	Always	CB TCU		QNH	No	Recent WX of operational significance and wind shear[12]
Relevant reporting scales for all messages	Direction in three figures rounded off to the nearest 10 degrees (degrees 1 – 4 down, degrees 5 – 9 up)			Speed in 1 km/h or 1 kt Speed < 2 km/h (1 kt) indicated as CALM	*If* VIS < 800 m; 800 m ≤ VIS < 5 000 m; 5 000 m ≤ VIS < 10 km; VIS ≥ 10 km – *Step applicable* : 50 m; : 100 m; : 1 km; : None, given as 10 km or covered under CAVOK			*If* RVR < 400 m; 400 ≤ RVR ≤ 800 m; 800 < RVR < 2 000 m – *Step applicable* : 25 m; : 50 m; : 100 m[13]			N/A	*If* Base ≤ 1 500 m (5 000 ft) – *Step applicable* : 30 m (100 ft) (Reference level: Aerodrome elevation[14] or mean sea level for off-shore structures)					Rounded off to whole degrees: up for decimal 5	In whole hPa[15] *rounding* down for decimals 1 – 9		N/A

Notes.—

1. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. RVR changes or passes 150, 350, 600 or 800 m, lasting ≥ 2 minutes), only data after the discontinuity to be used). A simple diagrammatic convention is used to illustrate those parts of the 10-minute period prior to the observation relevant to RVR criteria, i.e. AB, BC and AC.
2. Layer composed of CB and TCU *with a common base* should be reported as "CB".
3. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. the direction changes ≥ 30° with a speed ≥ 20 km/h *or* the speed changes ≥ 20 km/h lasting ≥ 2 minutes), only data after the discontinuity to be used).
4. If several directions, the most operationally significant direction used.
5. Let $\overline{R}_1$ = any 1-minute mean RVR-value during period AC, $\overline{R}_{10}$ = 10-minute mean RVR-value during period AC, $\overline{R}_{5(AB)}$ = 5-minute mean RVR-value during period AB and $\overline{R}_{5(BC)}$ = 5-minute mean RVR-value during period BC.
6. CB (cumulonimbus) and TCU (towering cumulus = cumulus congestus of great vertical extent) if not already indicated as one of the other layers.
7. Time averaging, if applicable, indicated in the upper left-hand corner.
8. N/A = not applicable.
9. QFE is to be included if required. Reference elevation for QFE should be aerodrome elevation except for precision approach runways, and non-precision approach runways with threshold ≥ 2 m (7 ft) below or above aerodrome elevation, where the reference level should be the relevant threshold elevation.
10. As listed in Appendix 3, 4.8.
11. According to the WMO *Manual on Codes* (WMO-No. 306), Volume I.1, Part A — Alphanumeric Codes, paragraph 15.5.5, "it is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average".
12. Also sea-surface temperature and state of the sea from off-shore structures in accordance with regional air navigation agreement.
13. Report if RVR and/or VIS < 1 500 m, limits for assessments 50 and 2 000 m.
14. For landing at aerodromes with precision approach runways and with the threshold elevation ≥ 15 m below the aerodrome elevation, the *threshold elevation* to be used as a reference.
15. Measured in 0.1 hPa.

ATTACHMENT E. CONVERSION OF INSTRUMENTED READINGS INTO RUNWAY VISUAL RANGE AND VISIBILITY

(See Appendix 3, 4.3.5 of this Annex.)

1. The conversion of instrumented readings into runway visual range and visibility is based on Koschmieder's Law or Allard's Law, depending on whether the pilot can be expected to obtain main visual guidance from the runway and its markings or from the runway lights. In the interest of standardization in runway visual range assessments, this Attachment provides guidance on the use and application of the main conversion factors to be used in these computations.

2. In Koschmieder's Law one of the factors to be taken into account is the pilot contrast threshold. The agreed constant to be used for this is 0.05 (dimensionless).

3. In Allard's Law the corresponding factor is the illumination threshold. This is not a constant, but a continuous function dependent on the background luminance. The agreed relationship to be used in instrumented systems with continuous adjustment of the illumination threshold by a background luminance sensor is shown by the curve in Figure E-1. The use of a continuous function which approximates the step function such as displayed in Figure E-1 is preferred, due to its higher accuracy, to the stepped relationship described in paragraph 4.

4. In instrumented systems without continuous adjustment of the illumination threshold, the use of four equally spaced illumination threshold values with agreed corresponding back-ground luminance ranges is convenient but will reduce accuracy. The four values are shown in Figure E-1 in the form of a step function; they are tabulated in Table E-1 for greater clarity.

Note 1.— Information and guidance material on the runway lights to be used for assessment of runway visual range are contained in the Manual of Runway Visual Range Observing and Reporting Practices *(Doc 9328).*

Note 2.— In accordance with the definition of visibility for aeronautical purposes, the intensity of lights to be used for the assessment of visibility is in the vicinity of 1 000 cd.

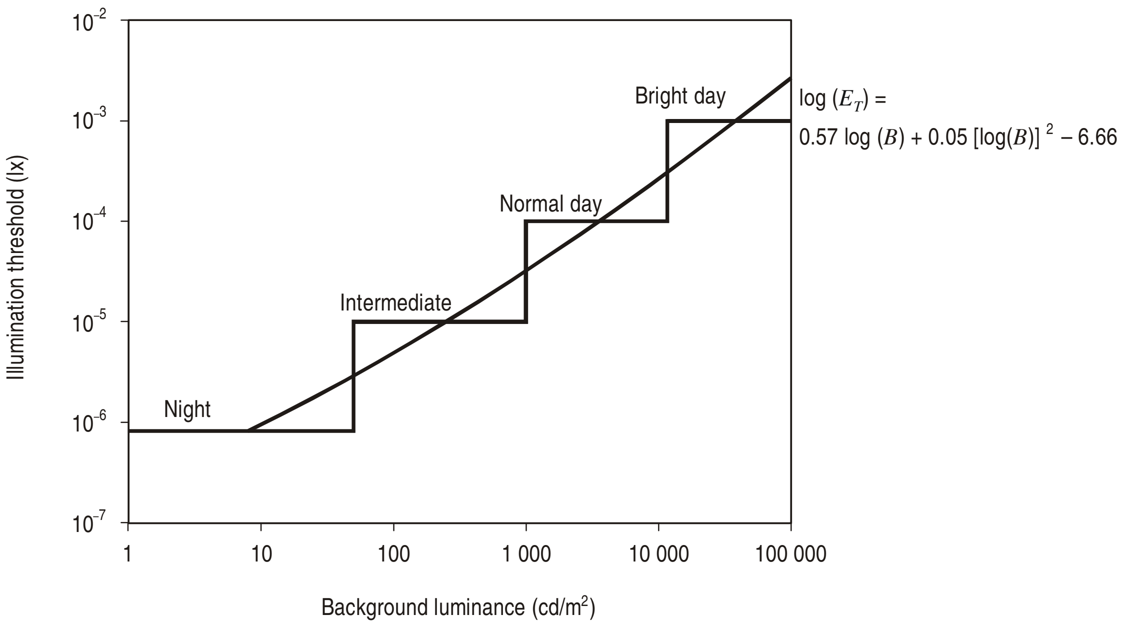

Figure E-1. Relationship between the illumination threshold E_T (lx) and background luminance B (cd/m^2)

Table E-1. Illumination threshold steps

Condition	*Illumination threshold (lx)*	*Background luminance (cd/m²)*
Night	8×10^{-7}	≤ 50
Intermediate	10^{-5}	51 – 999
Normal day	10^{-4}	1 000 – 12 000
Bright day (sunlit fog)	10^{-3}	> 12 000

— END —

International Standards
and Recommended Practices

Annex 4
to the Convention on
International Civil Aviation

Aeronautical Charts

This edition incorporates all amendments adopted by the Council prior to 8 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 4.

For information regarding the applicability of Standards and Recommended Practices, *see* Chapter 1 and the Foreword.

Tenth Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-52	Incorporated in this edition		
53	25/11/04	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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APPENDICES

FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Charts were first adopted by the Council on 16 April 1948, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and were designated as Annex 4 to the Convention. They became applicable on 1 March 1949.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the availability and amendment of aeronautical charts affecting aircraft operations, provided according to the Standards, Recommended Practices and Procedures specified in this Annex, should be notified and take effect in accordance with Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through trans-lation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

It is to be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb "shall" while Recommended Practices employ the operative verb "should".

Throughout this document measurements are given in the metric system followed in parentheses by corresponding measurements in the foot-pound system.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 4

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	Aeronautical Charts Division, First Session (November 1945), Second Session (April 1946), Third Session (January 1947)	World Aeronautical Chart (WAC) — ICAO 1:1 000 000; Instrument Approach and Landing Charts; Aeronautical Charts 1:500 000; Aeronautical Charts 1:250 000; Aeronautical Plotting Charts; Aeronautical Route Charts; Aeronautical Planning Charts.	16 April 1948 1 November 1948 1 March 1949
Amendment No. 1 included in 1st Edition	Aeronautical Charts Division, Fourth Session (March 1948)	Projection of WAC — ICAO 1:1 000 000.	6 December 1948 15 March 1949 15 March 1949
2nd Edition including Amendments 2-22	Aeronautical Charts Division, Fourth Session (March 1948)	Definitions; WAC — ICAO 1:1 000 000; Aeronautical Charts — ICAO 1:500 000; Aeronautical Charts — ICAO 1:250 000; Instrument Approach Charts — ICAO; Instrument Landing Charts — ICAO; Radio Facility Charts.	15 November 1949 1 June 1950 1 September 1950
23-28	Other activities of the Council	Abbreviations; Chart Symbols; Definitions.	25 June 1951 1 November 1951 1 January 1952

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
29	Aeronautical Charts Division, Fifth Session (October 1951)	Definitions; WAC — ICAO 1:1 000 000; Aeronautical Charts — ICAO 1:500 000; Aeronautical Charts — ICAO 1:250 000; Approach Charts — ICAO; Landing Charts — ICAO; Aeronautical Plotting Charts — ICAO; Radio Facility Charts; ICAO Chart Symbols; Aerodrome Obstruction Plans and Profiles — ICAO.	19 June 1952 1 December 1952 1 April 1953
30	Action by Air Navigation Commission in consultation with States	Removal of inconsistencies between Annexes 4 and 15.	22 February 1956 1 July 1956 1 December 1956
31, 32	Third Air Navigation Conference (October 1956); Recommendation of the Air Navigation Commission	Aerodrome Obstruction Charts; editorial amendments; ICAO Chart Symbols.	13 June 1957 1 October 1957 1 December 1957
33	Action by Air Navigation Commission in consultation with States	Application of Definitions of Danger Area, Prohibited Area and Restricted Area (Guidance material).	14 November 1958 — —
34	Aeronautical Information Services Division and Aeronautical Charts Division (AIS/MAP Division) Meeting (April-May 1959)	Definitions; General Specifications; Aerodrome Obstruction Chart — ICAO Types A and B; Plotting Chart — ICAO; Radio Navigation Chart — ICAO; Terminal Area Chart — ICAO; Instrument Approach Chart — ICAO; WAC — ICAO 1:1 000 000; Aeronautical Chart — ICAO 1:500 000; Visual Approach Chart; Landing Chart — ICAO; Aerodrome Chart — ICAO; Aeronautical Navigation Chart 1:2 000 000; Sheet Layout for the WAC — ICAO 1:1 000 000; ICAO Chart Symbols; Colour Guide; Hypsometric Tint Guide; Format for WAC — ICAO 1:1 000 000; Criteria for determination of Minimum Sector Altitudes; Attachments.	20 June 1960 1 October 1960 1 July 1961
35	AIS/MAP Division Meeting (April-May 1959)	Aerodrome Obstruction Chart — ICAO Type A.	8 December 1961 1 April 1962 1 July 1962
36	AIS/MAP Division Meeting (April-May 1959); Informal EUM/MAP Meeting (May 1961)	Minimum Sector Altitudes; Sheet lines WAC — ICAO 1:1 000 000.	14 December 1962 1 April 1963 1 November 1963
37	Canada; Switzerland; United Nations Technical Conference on the International Map of the World	Chart Symbols.	11 December 1963 1 June 1964 1 November 1964
38	AGA Division — 7th Session; PANS-ICAO Abbreviations and Codes (Doc 8400)	Definitions; General Specifications; Sample Aerodrome Obstruction Chart — ICAO Types A and B.	25 March 1964 1 August 1964 1 November 1964
39	RAC/OPS Meeting (1963)	Definitions; Explanatory notes on the Application of the Definitions of Danger Area, Prohibited Area and Restricted Area.	10 December 1965 10 April 1966 25 August 1966

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
40	AIS/MAP Divisional Meeting	Contours and portrayal of relief, hypsometric tints, chart symbols, WAC — ICAO 1:1 000 000, Aeronautical Chart — ICAO Small Scale; reference datum for heights of obstructions, definitions, Attachments.	13 June 1967 8 October 1967 8 February 1968
41	Fifth Air Navigation Conference; Obstacle Clearance Panel (First Meeting); All Weather Operations Panel (Third Meeting)	Definitions; Aerodrome Obstruction Chart — ICAO Type A; Landing Chart — ICAO; Aerodrome Chart — ICAO; ICAO Chart Symbols.	23 January 1969 23 May 1969 18 September 1969
42	Sixth Air Navigation Conference (1969)	Radio Navigation Chart — ICAO; Terminal Area Chart — ICAO.	15 May 1970 15 September 1970 4 February 1971
43	Fifth North Atlantic Regional Air Navigation Meeting (1970) Recommendation 17/5 a)	Aerodrome Chart — ICAO.	29 November 1971 29 March 1972 7 December 1972
44	Third Meeting of the All Weather Operations Panel, Recommendation 8/1	Precision Approach Terrain Chart — ICAO.	27 November 1972 27 March 1973 16 August 1973
45	Air Navigation Commission decisions on RAN Meeting recommendations of worldwide applicability; Sixth EUM RAN Meeting (Rec 16/24); Ninth Air Navigation Conference	Definitions; Aerodrome Obstruction Chart — ICAO Types A and B; Radio Navigation Chart — ICAO; Terminal Area Chart — ICAO; Instrument Approach Chart — ICAO; World Aeronautical Chart — ICAO 1:1 000 000; Aeronautical Chart — ICAO 1:500 000; Visual Approach Chart; Landing Chart — ICAO; Aerodrome Chart — ICAO; Aeronautical Navigation Chart — ICAO Small Scale; Precision Approach Terrain Chart — ICAO; ICAO Chart Symbols.	9 December 1977 9 April 1978 10 August 1978
46	Study on charts to be used in the cockpit; Recommendation 4/2 of the seventh meeting of the Obstacle Clearance Panel and Recommendation 10/1 of the AGA Divisional Meeting (1981)	Definitions; General specifications; Instrument Approach Chart — ICAO.	27 February 1984 30 July 1984 22 November 1984
47	Study on charts to be used in the cockpit; Recommendation 3/1 of the seventh meeting of the Obstacle Clearance Panel and Recommendation 8/2 of the AGA Divisional Meeting (1981)	Definitions; General specifications; Aerodrome Obstacle Chart — ICAO Types A and B; Plotting Chart — ICAO; Enroute Chart — ICAO; Area Chart — ICAO; Instrument Approach Chart — ICAO; World Aeronautical Chart — ICAO 1:1 000 000; Aeronautical Chart — ICAO 1:500 000; Visual Approach Chart — ICAO; Aerodrome Chart — ICAO; Aeronautical Navigation Chart — ICAO Small Scale; Precision Approach Terrain Chart — ICAO; ICAO Chart Symbols; Colour Guide. Introduces Aerodrome Ground Movement Chart — ICAO; Aircraft Parking/Docking Chart — ICAO; Standard Departure Chart — Instrument (SID) — ICAO; Standard Arrival Chart — Instrument (STAR) — ICAO; Aerodrome Obstacle Chart — ICAO Type C.	18 March 1985 29 July 1985 21 November 1985

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
48	Amendment 18 to Annex 6; Amendment 33 to Annex 14; Visual Aids Panel (Eleventh Meeting); Recommendation 2/2 and Secretariat	Aerodrome Obstacle Chart — ICAO Types A, B and C; Precision Approach Terrain Chart — ICAO; Standard Departure Chart — Instrument (SID) — ICAO; Standard Arrival Chart — Instrument (STAR) — ICAO; Instrument Approach Chart — ICAO; Visual Approach Chart — ICAO; Aerodrome Chart — ICAO; Aerodrome Ground Movement Chart — ICAO; Aircraft Parking/Docking Chart — ICAO; World Aeronautical Chart — ICAO 1:1 000 000; Aeronautical Chart — ICAO 1:500 000; Aeronautical Navigation Chart — ICAO Small Scale; Plotting Chart — ICAO; ICAO Chart Symbols.	24 February 1989 31 July 1989 16 November 1989
49	Amendment 33 to Annex 11; Amendment 39 to Annex 14; Adoption of Annex 14, Vol. II; Amendments 5 and 6 to Doc 8168, PANS-OPS, Vols. I and II, respectively	Definitions; General specifications; Enroute Chart — ICAO; Area Chart — ICAO; Instrument Approach Chart — ICAO; Visual Approach Chart — ICAO; Aerodrome Chart — ICAO; World Aeronautical Chart — ICAO 1:1 000 000; Aeronautical Chart — ICAO 1:500 000; ICAO Chart Symbols.	28 February 1992 27 July 1992 12 November 1992
50	Adoption by Council of WGS-84 as the standard geodetic reference system for international aviation; WAFS planning and implementation; PANS-OPS implementation problems; revision of the Manual of All-Weather Operations; integration of helicopter traffic with conventional aeroplane traffic; proposal by RGCSP/8; and the Secretariat	Definitions; introduction of new provisions concerning the promulgation, as of 1 January 1998, of WGS-84 related geographical coordinates; deletion of the requirement for presentation of level acceleration altitude/height; introduction of RNP type; inclusion of the note on close-in obstacles on SID charts; and introduction of new chart symbol for active volcano.	1 March 1995 24 July 1995 9 November 1995; 1 January 1998
51	Tenth and Eleventh Meetings of the Obstacle Clearance Panel and Air Navigation Commission	Definitions; aeronautical data bases; vertical component of the World Geodetic System — 1984 (WGS-84); Human Factors; identification of RNAV procedures; provision of final approach gradient; steep glide path angle approaches; and chart symbols for flyover and fly-by waypoints.	20 March 1998 20 July 1998 5 November 1998
52	Recommendations of the Visual Aids Panel (VAP), the Obstacle Clearance Panel (OCP), the joint ICAO and Industry Controlled Flight Into Terrain (CFIT) Task Force, the Aeronautical Information Services/ Aeronautical Charts (AIS/ MAP) Divisional Meeting (1998), and the Secretariat	Definitions; runway-holding position; air defence identification zone (ADIZ); portrayal of terrain and minimum flight altitudes; runway visual range (RVR) observation sites; airspace classifications, flight procedures and obstacle clearance criteria based on area navigation (RNAV) systems, and chart symbols for runway-holding position, ADIZ, electronic aeronautical charts, airspace classifications; nuclear power station and waypoint and, introduction of new provisions, as of 28 November 2002, concerning the Electronic Aeronautical Chart Display — ICAO.	7 March 2001 16 July 2001 1 November 2001; 28 November 2002

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
53	Twelfth and Thirteenth Meetings of the Obstacle Clearance Panel; the Air Navigation Commission; and the Secretariat	New provisions concerning definitions; vertical and temporal reference systems; terminal arrival altitude; Radar Minimum Altitude Chart — ICAO; and chart symbols for altitudes/flight levels and final approach fix. Updating of existing provisions related to the World Geodetic System — 1984 (WGS-84); obstacles; identification, aerodrome operating minima and supplementary information on the Instrument Approach Chart — ICAO; and aeronautical data quality requirements.	23 February 2004 12 July 2004 25 November 2004

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS, APPLICABILITY AND AVAILABILITY

1.1 Definitions

When the following terms are used in the Standards and Recommended Practices for aeronautical charts, they have the following meanings:

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome elevation. The elevation of the highest point of the landing area.

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation; and

c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and

d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

Aerodrome reference point. The designated geographical location of an aerodrome.

Aeronautical chart. A representation of a portion of the Earth, its culture and relief, specifically designated to meet the requirements of air navigation.

Aircraft stand. A designated area on an apron intended to be used for parking an aircraft.

Air defence identification zone. Special designated airspace of defined dimensions within which aircraft are required to comply with special identification and/or reporting procedures additional to those related to the provision of air traffic services (ATS).

Air taxiway. A defined path on the surface established for the air taxiing of helicopters.

Air traffic service. A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air transit route. A defined path on the surface established for the air transitting of helicopters.

Airway. A control area or portion thereof established in the form of a corridor.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Area minimum altitude (AMA). The lowest altitude to be used under instrument meteorological conditions (IMC) that will provide a minimum vertical clearance of 300 m (1 000 ft) or in designated mountainous terrain 600 m (2 000 ft) above all obstacles located in the area specified, rounded up to the nearest (next higher) 30 m (100 ft).

Arrival routes. Routes identified in an instrument approach procedure by which aircraft may proceed from the en-route phase of flight to an initial approach fix.

ATS route. A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term ATS route is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.

Note 2.— An ATS route is defined by route specifications that include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

Bare Earth. Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Canopy. Bare Earth supplemented by vegetation height.

Change-over point. The point at which an aircraft navigating on an ATS route segment defined by reference to very high frequency omnidirectional radio ranges is expected to transfer its primary navigational reference from the facility behind the aircraft to the next facility ahead of the aircraft.

Note.— Change-over points are established to provide the optimum balance in respect of signal strength and quality between facilities at all levels to be used and to ensure a common source of azimuth guidance for all aircraft operating along the same portion of a route segment.

Clearway. A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height.

Contour line. A line on a map or chart connecting points of equal elevation.

Culture. All man-made features constructed on the surface of the Earth, such as cities, railways and canals.

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Data quality. A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Displaced threshold. A threshold not located at the extremity of a runway.

Electronic aeronautical chart display. An electronic device by which flight crews are enabled to execute, in a convenient and timely manner, route planning, route monitoring and navigation by displaying required information.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Feature. Abstraction of real world phenomena (ISO 19101*).

Final approach. That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or

b) at the point of interception of the last track specified in the approach procedure; and

ends at a point in the vicinity of an aerodrome from which:

1) a landing can be made; or

2) a missed approach procedure is initiated.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Final approach fix or point. That fix or point of an instrument approach procedure where the final approach segment commences.

Final approach segment. That segment of an instrument approach procedure in which alignment and descent for landing are accomplished.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

* All ISO Standards are listed at the end of this chapter.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Geodesic distance. The shortest distance between any two points on a mathematically defined ellipsoidal surface.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Glide path. A descent profile determined for vertical guidance during a final approach.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Helicopter stand. An aircraft stand which provides for parking a helicopter and, where air taxiing operations are contemplated, the helicopter touchdown and lift-off.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Holding procedure. A predetermined manoeuvre which keeps an aircraft within a specified airspace while awaiting further clearance.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Hypsometric tints. A succession of shades or colour gradations used to depict ranges of elevation.

Initial approach segment. That segment of an instrument approach procedure between the initial approach fix and the intermediate approach fix or, where applicable, the final approach fix or point.

Instrument approach procedure. A series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply.

Intermediate approach segment. That segment of an instrument approach procedure between either the intermediate approach fix and the final approach fix or point, or between the end of a reversal, racetrack or dead reckoning track procedure and the final approach fix or point, as appropriate.

Isogonal. A line on a map or chart on which all points have the same magnetic variation for a specified epoch.

Isogriv. A line on a map or chart which joins points of equal angular difference between the North of the navigation grid and Magnetic North.

Landing area. That part of a movement area intended for the landing or take-off of aircraft.

Landing direction indicator. A device to indicate visually the direction currently designated for landing and for take-off.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.

Magnetic variation. The angular difference between True North and Magnetic North.

Note.— The value given indicates whether the angular difference is East or West of True North.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Marking. A symbol or group of symbols displayed on the surface of the movement area in order to convey aeronautical information.

Metadata. Data about data (ISO 19115*).

Note.— Data that describes and documents data.

Minimum sector altitude. The lowest altitude which may be used which will provide a minimum clearance of 300 m

(1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation.

Missed approach point (MAPt). That point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

Missed approach procedure. The procedure to be followed if the approach cannot be continued.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Note.— The term obstacle is used in this Annex solely for the purpose of specifying the charting of objects that are considered a potential hazard to the safe passage of aircraft in the type of operation for which the individual chart series is designed.

Obstacle clearance altitude (OCA) or obstacle clearance height (OCH). The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/height" and abbreviated "OCA/H".

Note 3.— See Procedures for Air Navigation Services — Aircraft Operations *(Doc 8168), Volume I, Part III, 1.5, and Volume II, Part III, 6.4, for specific applications of this definition.*

Obstacle free zone (OFZ). The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.

Orthometric height. Height of a point related to the geoid, generally presented as an MSL elevation.

Point light. A luminous signal appearing without perceptible length.

Position (geographical). Set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of a point on the surface of the Earth.

Precision approach procedure. An instrument approach procedure utilizing azimuth and glide path information provided by ILS or PAR.

Procedure altitude/height. A specified altitude/height flown operationally at or above the minimum altitude/height and established to accommodate a stabilized descent at a prescribed descent gradient/angle in the intermediate/final approach segment.

Procedure turn. A manoeuvre in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1.— Procedure turns are designated "left" or "right" according to the direction of the initial turn.

Note 2.— Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Radar vectoring. Provision of navigational guidance to aircraft in the form of specific headings, based on the use of radar.

Relief. The inequalities in elevation of the surface of the Earth represented on aeronautical charts by contours, hypsometric tints, shading or spot elevations.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Resolution. A number of units or digits to which a measured or calculated value is expressed and used.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Reversal procedure. A procedure designed to enable aircraft to reverse direction during the initial approach segment of an instrument approach procedure. The sequence may include procedure turns or base turns.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway-holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Runway strip. A defined area including the runway and stopway, if provided, intended:

a) to reduce the risk of damage to aircraft running off a runway; and

b) to protect aircraft flying over it during take-off or landing operations.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Shoulder. An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface.

Significant point. A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.

Stopway. A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off.

Taxiing. Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Taxiway. A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including:

a) *Aircraft stand taxilane.* A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.

b) *Apron taxiway.* A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

c) *Rapid exit taxiway.* A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times.

Terminal arrival altitude (TAA). The lowest altitude that will provide a minimum clearance of 300 m (1 000 ft) above all objects located in an arc of a circle defined by a 46-km (25 NM) radius centred on the initial approach fix (IAF), or where there is no IAF on the intermediate approach fix (IF), delimited by straight lines joining the extremity of the arc to the IF. The combined TAAs associated with an approach procedure shall account for an area of 360 degrees around the IF.

Terrain. The surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.

Note.— In practical terms, depending on the method of data collection, terrain represents the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as "first reflective surface".

Threshold. The beginning of that portion of the runway usable for landing.

Touchdown and lift-off area (TLOF). A load bearing area on which a helicopter may touch down or lift off.

Touchdown zone. The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Transition altitude. The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.

Visual approach procedure. A series of predetermined manoeuvres by visual reference, from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, a go-around procedure can be carried-out.

Waypoint. A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. Waypoints are identified as either:

Fly-by waypoint. A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure; or

Flyover waypoint. A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

1.2 Applicability

1.2.1 The specifications in this Annex are applicable on and after 1 November 2001.

Note.— Chapter 20 Electronic Aeronautical Chart Display — ICAO is applicable on and after 28 November 2002.

1.2.2 All charts coming within the scope of this Annex and bearing the aeronautical information date of 1 November 2001 or later shall conform to the Standards relevant to the particular chart.

1.2.2.1 **Recommendation.—** *All such charts should in addition conform to the Recommended Practices relevant to the particular chart.*

1.3 Availability

1.3.1 *Information.* A Contracting State shall on request by another Contracting State provide all information relating to its own territory that is necessary to enable the Standards of this Annex to be met.

1.3.2 *Charts.* Contracting States shall, when so specified, ensure the availability of charts in whichever of the following ways is appropriate for a particular chart or single sheet of a chart series.

1.3.2.1 For any chart or single sheet of a chart series entirely contained within the territory of a Contracting State, the State having jurisdiction over the territory shall either:

1) produce the chart or sheet itself; or

2) arrange for its production by another Contracting State or by an agency; or

3) provide another Contracting State prepared to accept an obligation to produce the chart or sheet with the data necessary for its production.

1.3.2.2 For any chart or single sheet of a chart series which includes the territory of two or more Contracting States, the States having jurisdiction over the territory so included shall determine the manner in which the chart or sheet will be made available. This determination shall be made with due regard being given to regional air navigation agreements and to any programme of allocation established by the Council of ICAO.

Note.— The phrase "regional air navigation agreements" refers to the agreements approved by the Council of ICAO normally on the advice of regional air navigation meetings.

1.3.3 A Contracting State shall take all reasonable measures to ensure that the information it provides and the aeronautical charts made available are adequate and accurate and that they are maintained up to date by an adequate revision service.

1.3.4 **Recommendation.—** *To improve worldwide dissemination of information on new charting techniques and production methods, appropriate charts produced by Contracting States should be made available without charge to other Contracting States on request on a reciprocal basis.*

Note.— Guidance material on the preparation of aeronautical charts, including sample formats, is contained in the Aeronautical Chart Manual *(Doc 8697).*

* ISO Standard
19101, *Geographic information — Reference model*
19104, *Geographic information — Terminology*
19108, *Geographic information — Temporal schema*
19115, *Geographic information — Metadata*

CHAPTER 2. GENERAL SPECIFICATIONS

Note.— The Standards and Recommended Practices contained in this chapter are applicable to all ICAO aeronautical charts unless otherwise stated in the specifications of the chart concerned.

2.1 Operational requirements for charts

Note.— For the purposes of this Annex, the total flight is divided into the following phases:

Phase 1 — Taxi from aircraft stand to take-off point

Phase 2 — Take-off and climb to en-route ATS route structure

Phase 3 — En-route ATS route structure

Phase 4 — Descent to approach

Phase 5 — Approach to land and missed approach

Phase 6 — Landing and taxi to aircraft stand.

2.1.1 Each type of chart shall provide information relevant to the function of the chart and its design shall observe Human Factors principles which facilitate its optimum use.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

2.1.2 Each type of chart shall provide information appropriate to the phase of flight, to ensure the safe and expeditious operation of the aircraft.

2.1.3 The presentation of information shall be accurate, free from distortion and clutter, unambiguous, and be readable under all normal operating conditions.

2.1.4 Colours or tints and type size used shall be such that the chart can be easily read and interpreted by the pilot in varying conditions of natural and artificial light.

2.1.5 The information shall be in a form which enables the pilot to acquire it in a reasonable time consistent with workload and operating conditions.

2.1.6 The presentation of information provided on each type of chart shall permit smooth transition from chart to chart as appropriate to the phase of flight.

2.1.7 **Recommendation.—** *The charts should be True North orientated.*

2.1.8 **Recommendation.—** *The basic sheet size of the charts should be 210 × 148 mm (8.27 × 5.82 in) (A5).*

2.2 Titles

The title of a chart or chart series prepared in accordance with the specifications contained in this Annex and intended to satisfy the function of the chart, shall be that of the relevant chapter heading as modified by application of any Standard contained therein, except that such title shall not include "ICAO" unless the chart conforms with all Standards specified in this Chapter 2 and any specified for the particular chart.

2.3 Miscellaneous information

2.3.1 The marginal note layout shall be as given in Appendix 1, except as otherwise specified for a particular chart.

2.3.2 The following information shall be shown on the face of each chart unless otherwise stated in the specification of the chart concerned:

1) designation or title of the chart series;

   Note.— The title may be abbreviated.

2) name and reference of the sheet;

3) on each margin an indication of the adjoining sheet (when applicable).

2.3.3 A legend to the symbols and abbreviations used shall be provided. The legend shall be on the face or reverse of each chart except that, where it is impracticable for reasons of space, a legend may be published separately.

2.3.4 The name and adequate address of the producing agency shall be shown in the margin of the chart except that, where the chart is published as part of an aeronautical document, this information may be placed in the front of that document.

2.4 Symbols

Symbols used shall conform to those shown in Appendix 2 — ICAO Chart Symbols, except that where it is desired to show on an aeronautical chart special features or items of importance to civil aviation for which no ICAO symbol is at present provided, any appropriate symbol may be chosen for this purpose, provided that it does not cause confusion with any existing ICAO chart symbol or impair the legibility of the chart.

Note.— The size and prominence of symbols and the thickness and spacing of lines may be varied according to the scale and functions of the chart, with due regard to the importance of the information they convey.

2.5 Units of measurement

2.5.1 Distances shall be derived as geodesic distances.

2.5.2 Distances shall be expressed in either kilometres or nautical miles or both, provided the units are clearly differentiated.

2.5.3 Altitudes, elevations and heights shall be expressed in either metres or feet or both, provided the units are clearly differentiated.

2.5.4 Linear dimensions on aerodromes and short distances shall be expressed in metres.

2.5.5 The order of resolution of distances, dimensions, elevations and heights shall be that as specified for a particular chart.

2.5.6 The units of measurement used to express distances, altitudes, elevations and heights shall be conspicuously stated on the face of each chart.

2.5.7 Conversion scales (kilometres/nautical miles, metres/feet) shall be provided on each chart on which distances, elevations or altitudes are shown. The conversion scales shall be placed on the face of each chart.

2.6 Scale and projection

2.6.1 For charts of large areas, the name and basic parameters and scale of the projection shall be indicated.

2.6.2 For charts of small areas, a linear scale only shall be indicated.

2.7 Date of validity of aeronautical information

The date of validity of aeronautical information shall be clearly indicated on the face of each chart.

2.8 Spelling of geographical names

2.8.1 The symbols of the Roman alphabet shall be used for all writing.

2.8.2 The names of places and of geographical features in countries which officially use varieties of the Roman alphabet shall be accepted in their official spelling, including the accents and diacritical marks used in the respective alphabets.

2.8.3 Where a geographical term such as “cape”, “point”, “gulf”, “river”, is abbreviated on any particular chart, that word shall be spelt out in full in the language used by the publishing agency, in respect of the most important example of each type. Punctuation marks shall not be used in abbreviations within the body of a chart.

2.8.4 **Recommendation.—** *In areas where romanized names have not been officially produced or adopted, and outside the territory of Contracting States, names should be transliterated from the non-Roman alphabet form by the system generally used by the producing agency.*

2.9 Abbreviations

2.9.1 Abbreviations shall be used on aeronautical charts whenever they are appropriate.

2.9.2 **Recommendation.—** *Where applicable, abbreviations should be selected from the* Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(Doc 8400).*

2.10 Political boundaries

2.10.1 International boundaries shall be shown, but may be interrupted if data more important to the use of the chart would be obscured.

2.10.2 Where the territory of more than one State appears on a chart, the names identifying the countries shall be indicated.

Note.— In the case of a dependent territory, the name of the sovereign State may be added in brackets.

2.11 Colours

Recommendation.— *Colours used on charts should conform to Appendix 3 — Colour Guide.*

2.12 Relief

2.12.1 Relief, where shown, shall be portrayed in a manner that will satisfy the chart users' need for:

a) orientation and identification;

b) safe terrain clearance;

c) clarity of aeronautical information when shown;

d) planning.

Note.— Relief is usually portrayed by combinations of contours, hypsometric tints, spot elevations and hill shading, the choice of method being affected by the nature and scale of the chart and its intended use.

2.12.2 **Recommendation.—** *Where relief is shown by hypsometric tints, the tints used should be based on those shown in the Hypsometric Tint Guide in Appendix 4.*

2.12.3 Where spot elevations are used they shall be shown for selected critical points.

2.12.3.1 The value of spot elevations of doubtful accuracy shall be followed by the sign ±.

2.13 Prohibited, restricted and danger areas

When prohibited, restricted or danger areas are shown, the reference or other identification shall be included, except that the nationality letters may be omitted.

Note.— Nationality letters are those contained in Doc 7910 — Location Indicators.

2.14 Air traffic services airspaces

2.14.1 When ATS airspace is shown on a chart, the class of airspace, the type, name or call sign, the vertical limits and the radio frequency(ies) to be used shall be indicated and the horizontal limits depicted in accordance with Appendix 2 — ICAO Chart Symbols.

2.14.2 **Recommendation.—** *On charts used for visual flight, those parts of the ATS Airspace Classifications table in Annex 11 applicable to the airspace depicted on the chart should be on the face or reverse of each chart.*

2.15 Magnetic variation

2.15.1 True North and magnetic variation shall be indicated. The order of resolution of magnetic variation shall be that as specified for a particular chart.

2.15.2 **Recommendation.—** *When magnetic variation is shown on a chart, the values shown should be those for the year nearest to the date of publication that is divisible by 5, i.e. 1980, 1985, etc. In exceptional cases where the current value would be more than one degree different, after applying the calculation for annual change, an interim date and value should be quoted.*

Note.— The date and the annual change may be shown.

2.16 Typography

Note.— Samples of type suitable for use on aeronautical charts are included in the Aeronautical Chart Manual *(Doc 8697).*

2.17 Aeronautical data

2.17.1 Each Contracting State shall take all necessary measures to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage as outlined in Annex 15, 3.1.7. The execution of such quality management shall be made demonstrable for each function stage, when required. In addition, States shall ensure that established procedures exist in order that aeronautical data at any moment is traceable to its origin so to allow any data anomalies or errors, detected during the production/ maintenance phases or in the operational use, to be corrected.

Note.— Specifications governing the quality system are given in Annex 15, Chapter 3.

2.17.2 States shall ensure that the order of chart resolution of aeronautical data shall be that as specified for a particular chart and as presented in a tabular form in Appendix 6.

2.17.3 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

a) critical data, integrity level 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data, integrity level 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) routine data, integrity level 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

2.17.4 Aeronautical data quality requirements related to the integrity and data classification shall be as provided in Tables 1 to 5 in Appendix 6.

2.17.5 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the Cyclic Redundancy Check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.17.3, a 32- or 24-bit CRC algorithm shall apply respectively.

2.17.6 **Recommendation.—** *To achieve protection of the integrity level of routine aeronautical data as classified in 2.17.3, a 16-bit CRC algorithm should apply.*

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendix 6 related to chart resolution and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 —* Industry Requirements for Aeronautical Information*.*

2.18 Common reference systems

2.18.1 Horizontal reference system

2.18.1.1 World Geodetic System — 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system. Published aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674).*

2.18.1.2 Geographical coordinates which have been transformed into WGS-84 coordinates but whose accuracy of original field work does not meet the requirements in Annex 11, Chapter 2, and Annex 14, Volumes I and II, Chapter 2, shall be identified by an asterisk.

2.18.1.3 The order of chart resolution of geographical coordinates shall be that specified for a particular chart series and in accordance with Appendix 6, Table 1.

Note.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of WGS-84-related aeronautical coordinates for geographical positions established by air traffic services are given in Annex 11, Chapter 2 and Appendix 5, Table 1; and for aerodrome/heliport-related positions, in Annex 14, Volumes I and II, Chapter 2, and in Table 1 of Appendices 5 and 1, respectively.

2.18.2 Vertical reference system

2.18.2.1 Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

Note 1.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth that coincides with the undisturbed MSL extended continuously through the continents.

Note 2.— Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

2.18.2.2 In addition to the elevations referenced to MSL, for the specific surveyed ground positions, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions shall also be published as specified for a particular chart.

Note.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of elevation and geoid undulation at specific positions at aerodromes/heliports are given in Annex 14, Volumes I and II, Chapter 2, and in Table 2 of Appendices 5 and 1, respectively.

2.18.2.3 The order of chart resolution of elevation and geoid undulation shall be that specified for a particular chart series and in accordance with Appendix 6, Table 2.

2.18.3 Temporal reference system

2.18.3.1 The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.

2.18.3.2 When a different temporal reference system is used for charting, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP).

CHAPTER 3. AERODROME OBSTACLE CHART — ICAO TYPE A (OPERATING LIMITATIONS)

3.1 Function

This chart, in combination with the Aerodrome Obstacle Chart — ICAO Type C or with the relevant information published in the AIP, shall provide the data necessary to enable an operator to comply with the operating limitations of Annex 6, Parts I and II, Chapter 5, and Part III, Chapter 3.

3.2 Availability

3.2.1 Aerodrome Obstacle Charts — ICAO Type A (Operating Limitations) shall be made available in the manner prescribed in 1.3.2 for all aerodromes regularly used by international civil aviation, except for those aerodromes where there are no obstacles in the take-off flight path areas.

3.2.2 Where a chart is not required because no obstacles exist in the take-off flight path area, a notification to this effect shall be published.

3.3 Units of measurement

3.3.1 Elevations shall be shown to the nearest half-metre or to the nearest foot.

3.3.2 Linear dimensions shall be shown to the nearest half-metre.

3.4 Coverage and scale

3.4.1 The extent of each plan shall be sufficient to cover all obstacles.

Note.— Isolated distant obstacles that would unnecessarily increase the sheet size may be indicated by the appropriate symbol and an arrow, provided that the distance and bearing from the end of the runway farthest removed and the elevation are given.

3.4.2 The horizontal scale shall be within the range of 1:10 000 to 1:15 000.

3.4.3 **Recommendation.—** *The horizontal scale should be 1:10 000.*

Note.— When the production of the charts would be expedited thereby, a scale of 1:20 000 may be used.

3.4.4 The vertical scale shall be ten times the horizontal scale.

3.4.5 *Linear scales.* Horizontal and vertical linear scales showing both metres and feet shall be included in the charts.

3.5 Format

3.5.1 The charts shall depict a plan and profile of each runway, any associated stopway or clearway, the take-off flight path area and obstacles.

3.5.2 The profile for each runway, stopway, clearway and the obstacles in the take-off flight path area shall be shown above its corresponding plan. The profile of an alternative take-off flight path area shall comprise a linear projection of the full take-off flight path and shall be disposed above its corresponding plan in the manner most suited to the ready interpretation of the information.

3.5.3 A profile grid shall be ruled over the entire profile area exclusive of the runway. The zero for vertical coordinates shall be mean sea level. The zero for horizontal coordinates shall be the end of the runway furthest from the take-off flight path area concerned. Graduation marks indicating the subdivisions of intervals shall be shown along the base of the grid and along the vertical margins.

3.5.3.1 **Recommendation.—** *The vertical grid should have intervals of 30 m (100 ft) and the horizontal grid should have intervals of 300 m (1 000 ft).*

3.5.4 The chart shall include:

a) a box for recording the operational data specified in 3.8.3;

b) a box for recording amendments and dates thereof.

3.6 Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the designator(s) of the runway(s).

3.7 Magnetic variation

The magnetic variation to the nearest degree and date of information shall be indicated.

3.8 Aeronautical data

3.8.1 Obstacles

3.8.1.1 Objects in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area, shall be regarded as obstacles, except that obstacles lying wholly below the shadow of other obstacles as defined in 3.8.1.2 need not be shown. Mobile objects such as boats, trains and trucks, which may project above the 1.2 per cent plane, shall be considered obstacles but shall not be considered as being capable of creating a shadow.

3.8.1.2 The shadow of an obstacle is considered to be a plane surface originating at a horizontal line passing through the top of the obstacle at right angles to the centre line of the take-off flight path area. The plane covers the complete width of the take-off flight path area and extends to the plane defined in 3.8.1.1 or to the next higher obstacle if it occurs first. For the first 300 m (1 000 ft) of the take-off flight path area, the shadow planes are horizontal and beyond this point such planes have an upward slope of 1.2 per cent.

3.8.1.3 If the obstacle creating a shadow is likely to be removed, objects that would become obstacles by its removal shall be shown.

3.8.2 Take-off flight path area

3.8.2.1 The take-off flight path area consists of a quadrilateral area on the surface of the earth lying directly below, and symmetrically disposed about, the take-off flight path. This area has the following characteristics:

a) it commences at the end of the area declared suitable for take-off (i.e. at the end of the runway or clearway as appropriate);

b) its width at the point of origin is 180 m (600 ft) and this width increases at the rate of 0.25D to a maximum of 1 800 m (6 000 ft), where D is the distance from the point of origin;

c) it extends to the point beyond which no obstacles exist or to a distance of 10.0 km (5.4 NM), whichever is the lesser.

3.8.2.2 For runways serving aircraft having operating limitations which do not preclude the use of a take-off flight path gradient of less than 1.2 per cent, the extent of the take-off flight path area specified in 3.8.2.1 c) shall be increased to not less than 12.0 km (6.5 NM) and the slope of the plane surface specified in 3.8.1.1 and 3.8.1.2 shall be reduced to 1.0 per cent or less.

Note.— When a 1.0 per cent survey plane touches no obstacles, this plane may be lowered until it touches the first obstacle.

3.8.3 Declared distances

3.8.3.1 The following information for each direction of each runway shall be entered in the space provided:

a) take-off run available;

b) accelerate-stop distance available;

c) take-off distance available;

d) landing distance available.

Note.— In Annex 14, Volume I, Attachment A, Section 3, guidance is given on declared distances.

3.8.3.2 **Recommendation.—** *Where a declared distance is not provided because a runway is usable in one direction only, that runway should be identified as "not usable for take-off, landing or both".*

3.8.4 Plan and profile views

3.8.4.1 The plan view shall show:

a) the outline of the runways by a solid line, including the length and width, the magnetic bearing to the nearest degree, and the runway number;

b) the outline of the clearways by a broken line, including the length and identification as such;

c) take-off flight path areas by a dashed line and the centre line by a fine line consisting of short and long dashes;

d) alternative take-off flight path areas. When alternative take-off flight path areas not centred on the extension of the runway centre line are shown, notes shall be provided explaining the significance of such areas;

e) obstacles, including:

1) the exact location of each obstacle together with a symbol indicative of its type;

2) the elevation and identification of each obstacle;

3) the limits of penetration of obstacles of large extent in a distinctive manner identified in the legend.

Note.— This does not exclude the necessity for indicating critical spot elevations within the take-off flight path area.

3.8.4.1.1 **Recommendation.—** *The nature of the runway and stopway surfaces should be indicated.*

3.8.4.1.2 **Recommendation.—** *Stopways should be identified as such and should be shown by a broken line.*

3.8.4.1.3 When stopways are shown, the length of each stopway shall be indicated.

3.8.4.2 The profile view shall show:

a) the profile of the centre line of the runway by a solid line and the profile of the centre line of any associated stopways and clearways by a broken line;

b) the elevation of the runway centre line at each end of the runway, at the stopway and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway;

c) obstacles, including:

   1) each obstacle by a solid vertical line extending from a convenient grid line over at least one other grid line to the elevation of the top of the obstacle;

   2) identification of each obstacle;

   3) the limits of penetration of obstacles of large extent in a distinctive manner identified in the legend.

Note.— An obstacle profile consisting of a line joining the tops of each obstacle and representing the shadow created by successive obstacles may be shown.

3.9 Accuracy

3.9.1 The order of accuracy attained shall be shown on the chart.

3.9.2 **Recommendation.—** *The horizontal dimensions and the elevations of the runway, stopway and clearway to be printed on the chart should be determined to the nearest 0.5 m (1 ft).*

3.9.3 **Recommendation.—** *The order of accuracy of the field work and the precision of chart production should be such that measurements in the take-off flight path areas can be taken from the chart within the following maximum deviations:*

1) horizontal distances: 5 m (15 ft) at a point of origin increasing at a rate of 1 per 500;

2) vertical distances: 0.5 m (1.5 ft) in the first 300 m (1 000 ft) and increasing at a rate of 1 per 1 000.

3.9.4 *Datum.* Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and shall be identified as assumed.

CHAPTER 4. AERODROME OBSTACLE CHART — ICAO TYPE B

4.1 Function

This chart shall provide information to satisfy the following functions:

a) the determination of minimum safe altitudes/heights including those for circling procedures;

b) the determination of procedures for use in the event of an emergency during take-off or landing;

c) the application of obstacle clearing and marking criteria; and

d) the provision of source material for aeronautical charts.

4.2 Availability

4.2.1 **Recommendation.—** *Aerodrome Obstacle Charts — ICAO Type B should be made available, in the manner prescribed in 1.3.2, for all aerodromes regularly used by international civil aviation.*

4.2.2 When a chart combining the specifications of Chapters 3 and 4 is made available, it shall be called the Aerodrome Obstacle Chart — ICAO (Comprehensive).

4.3 Units of measurement

4.3.1 Elevations shall be shown to the nearest half-metre or to the nearest foot.

4.3.2 Linear dimensions shall be shown to the nearest half-metre.

4.4 Coverage and scale

4.4.1 The extent of each plan shall be sufficient to cover all obstacles.

Note.— Isolated distant obstacles that would unnecessarily increase the sheet size may be indicated by the appropriate symbol and an arrow, provided that the distance and bearing from the aerodrome reference point and elevation are given.

4.4.2 The horizontal scale shall be within the range of 1:10 000 to 1:20 000.

4.4.3 A horizontal linear scale showing both metres and feet shall be included in the chart. When necessary, a linear scale for kilometres and a linear scale for nautical miles shall also be shown.

4.5 Format

The charts shall include:

a) any necessary explanation of the projection used;

b) any necessary identification of the grid used;

c) a notation indicating that obstacles are those which penetrate the surfaces specified in Annex 14, Volume I, Chapter 4;

d) a box for recording amendments and dates thereof;

e) outside the neat line, every minute of latitude and longitude marked in degrees and minutes.

Note.— Lines of latitude and longitude may be shown across the face of the chart.

4.6 Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town, or area, which the aerodrome serves and the name of the aerodrome.

4.7 Culture and topography

4.7.1 Drainage and hydrographic details shall be kept to a minimum.

4.7.2 Buildings and other salient features associated with the aerodrome shall be shown. Wherever possible, they shall be shown to scale.

4.7.3 All objects, either cultural or natural, that project above the take-off and approach surfaces specified in 4.9 or the clearing and marking surfaces specified in Annex 14, Volume I, Chapter 4, shall be shown.

4.7.4 Roads and railroads within the take-off and approach area, and less than 600 m (2 000 ft) from the end of the runway or runway extensions, shall be shown.

Note.— Geographical names of features may be shown if of significance.

4.8 Magnetic variation

The chart shall show a compass rose orientated to the True North, or a North point, showing the magnetic variation to the nearest degree with the date of magnetic information and annual change.

4.9 Aeronautical data

4.9.1 The charts shall show:

a) the aerodrome reference point and its geographical coordinates in degrees, minutes and seconds;

b) the outline of the runways by a solid line;

c) the length and width of the runway;

d) the magnetic bearing to the nearest degree of the runway and the runway number;

e) the elevation of the runway centre line at each end of the runway, at the stopway, at the origin of each take-off and approach area, and at each significant change of slope of runway and stopway;

f) taxiways, aprons and parking areas identified as such, and the outlines by a solid line;

g) stopways identified as such and depicted by a broken line;

h) the length of each stopway;

i) clearways identified as such and depicted by a broken line;

j) the length of each clearway;

k) take-off and approach surfaces identified as such and depicted by a broken line;

l) take-off and approach areas;

Note.— The take-off area is described in 3.8.2.1. The approach area consists of an area on the surface of the earth lying directly below the approach surface as specified in Annex 14, Volume I, Chapter 4.

m) obstacles at their exact location, including:

1) a symbol indicative of their type;

2) elevation;

3) identification;

4) limits of penetration of large extent in a distinctive manner identified in the legend;

Note.— This does not exclude the necessity for indicating critical spot elevations within the take-off and approach areas.

n) any additional obstacles, as determined by 3.8.1.1 including the obstacles in the shadow of an obstacle, which would otherwise be exempted.

Note.— The specifications in Annex 14, Volume I, Chapter 4, are minimum requirements. Where the competent authority has established lower surfaces, they may be used in the determination of obstacles.

4.9.1.1 **Recommendation.—** *The nature of the runway and stopway surfaces should be given.*

4.9.1.2 **Recommendation.—** *Wherever practicable, the highest object or obstacle between adjacent approach areas within a radius of 5 000 m (15 000 ft) from the aerodrome reference point should be indicated in a prominent manner.*

4.9.1.3 **Recommendation.—** *The extent of tree areas and relief features, part of which constitute obstacles, should be shown.*

4.10 Accuracy

4.10.1 The order of accuracy attained shall be shown on the chart.

4.10.2 **Recommendation.—** *The horizontal dimensions and the elevations of the movement area, stopways and clearways to be printed on the chart should be determined to the nearest 0.5 m (1 ft).*

4.10.3 **Recommendation.—** *The order or accuracy of the field work and the precision of chart production should be such that the resulting data will be within the maximum deviations indicated herein:*

a) Take-off and approach areas:

1) horizontal distances: 5 m (15 ft) at point of origin increasing at a rate of 1 per 500;

2) vertical distances: 0.5 m (1.5 ft) in the first 300 m (1 000 ft) and increasing at a rate of 1 per 1 000.

b) Other areas:

1) horizontal distances: 5 m (15 ft) within 5 000 m (15 000 ft) of the aerodrome reference point and 12 m (40 ft) beyond that area;

2) vertical distances: 1 m (3 ft) within 1 500 m (5 000 ft) of the aerodrome reference point increasing at a rate of 1 per 1 000.

4.10.4 *Datum.* Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and identified as assumed.

CHAPTER 5. AERODROME OBSTACLE CHART — ICAO TYPE C

5.1 Function

When produced, this chart shall provide the obstacle data necessary to enable an operator to develop procedures to comply with the operating limitations of Annex 6, Parts I and II, Chapter 5, and Part III, Chapter 3, with particular reference to information on obstacles that limit the maximum permissible take-off mass, and also to:

a) determine minimum safe heights including those for circling procedures;

b) determine procedures for use in the event of an emergency during take-off or landing;

c) provide source material for aeronautical charts and aeronautical data bases.

Note.— An explanation of the intended purpose and use of this chart is given in the Aeronautical Chart Manual *(Doc 8697).*

5.2 Availability

This chart is not required where:

a) the obstacle data specified in 5.1 are published in the AIP; or

b) no obstacles exist and notification of this is published in the AIP.

5.3 Coverage and scale

5.3.1 The extent of each chart shall be sufficient:

a) to cover all obstacles, including obstacles in the shadow of an obstacle, in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area. Account shall be taken of mobile obstacles such as boats, trains, trucks, etc., which may project above the 1.2 per cent plane;

b) to cover all obstacles exceeding 120 m (400 ft) above the lowest elevation on the runway(s) which may influence the maximum permissible take-off mass or the choice of the aircraft's flight profile both straight ahead and in all areas where turning departures may occur;

c) to provide topographical information covering a distance of approximately 45 km (24 NM) from the aerodrome reference point.

5.3.2 The horizontal scale shall be within the range of 1:20 000 to 1:100 000.

Note.— A scale of 1:50 000 is preferred.

5.4 Format

The chart shall include:

a) any necessary explanation of the projection used;

b) any necessary identification of the grid used;

c) a box for recording amendments and dates thereof;

d) a box for recording the declared distances specified in 5.8.2;

e) graduation marks at consistent intervals outside the neat line, at least every 10 minutes of latitude and longitude and marked in degrees and minutes.

Note 1.— Lines of latitude and longitude may be shown across the face of the chart.

Note 2.— Aerodrome Obstacle Chart — ICAO Type C may consist of any suitable topographical chart or series of charts available, overprinted with the necessary aeronautical data in a distinctive colour.

5.5 Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town which the aerodrome serves and the name of the aerodrome.

5.6 Magnetic variation

Recommendation.— *The chart should show the magnetic variation to the nearest degree with the date and annual change.*

5.7 Units of measurement

5.7.1 Elevations shall be shown to the nearest metre or foot.

5.7.2 Linear dimensions shall be shown to the nearest metre.

5.8 Aeronautical data

5.8.1 The chart shall show:

a) the aerodrome reference point and its geographical coordinates in degrees, minutes and seconds;

b) the runways and the extended runway centre lines;

c) obstacles as specified in 5.3.1 a) and b); the extent of each plan shall be sufficient to cover all obstacles except that isolated distant obstacles that would unnecessarily increase the sheet size may be indicated by an arrow, provided that the distance and bearing from a reference point and their elevation and geographical coordinates in degrees, minutes, seconds and tenths of seconds are given;

d) the exact position of each obstacle by a symbol and its geographical coordinates in degrees, minutes, seconds and tenths of seconds;

e) the elevation of each obstacle;

f) an indication of the type of each obstacle;

Note.— The obstacle type may be given in textual form or in areas where excessive clutter would ensue, the obstacle may be identified by a number on the chart and the number and type tabulated in the margin or on a separate sheet.

g) the limits of penetration of obstacles of large extent in a distinctive manner identified in the legend;

Note.— This does not exclude the necessity for indicating the positions of critical spot elevations and their geographical coordinates in degrees, minutes, seconds and tenths of seconds within such an area.

h) the positions of all radio navigation aids.

5.8.2 Declared distances

5.8.2.1 The following information for each direction of each runway shall be entered in the space provided:

a) take-off run available;

b) accelerate-stop distance available;

c) take-off distance available;

d) landing distance available.

Note.— In Annex 14, Volume I, Attachment A, guidance is given on declared distances.

5.8.2.2 **Recommendation.—** *Where a declared distance is not provided because a runway direction cannot be used for take-off or landing or both, then this should be indicated and the words "not usable" or the abbreviation "NU" entered.*

5.9 Accuracy

The order of accuracy attained shall be shown on the chart.

CHAPTER 6. PRECISION APPROACH TERRAIN CHART — ICAO

6.1 Function

The chart shall provide detailed terrain profile information within a defined portion of the final approach so as to enable aircraft operating agencies to assess the effect of the terrain on decision height determination by the use of radio altimeters.

6.2 Availability

6.2.1 The Precision Approach Terrain Chart — ICAO shall be made available for all precision approach runways Categories II and III at aerodromes used by international civil aviation.

6.2.2 The Precision Approach Terrain Chart — ICAO shall be revised whenever any significant change occurs.

6.3 Scale

6.3.1 **Recommendation.—** *The horizontal scale should be 1:2 500, and the vertical scale 1:500.*

6.3.2 **Recommendation.—** *When the chart includes a profile of the terrain to a distance greater than 900 m (3 000 ft) from the runway threshold, the horizontal scale should be 1:5 000.*

6.4 Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the designator of the runway.

6.5 Plan and profile information

6.5.1 The chart shall include:

1) a plan showing contours at 1 m (3 ft) intervals in the area 60 m (200 ft) on either side of the extended centre line of the runway, to the same distance as the profile, the contours to be related to the runway threshold;

2) an indication where the terrain or any object thereon, within the plan defined in 1) above, differs by ±3 m (10 ft) in height from the centre line profile and is likely to affect a radio altimeter;

3) a profile of the terrain to a distance of 900 m (3 000 ft) from the threshold along the extended centre line of the runway.

6.5.2 **Recommendation.—** *Where the terrain at a distance greater than 900 m (3 000 ft) from the runway threshold is mountainous or otherwise significant to users of the chart, the profile of the terrain should be shown to a distance not exceeding 2 000 m (6 500 ft) from the runway threshold.*

6.5.3 **Recommendation.—** *The ILS reference datum height should be shown to the nearest half metre or foot.*

CHAPTER 7. ENROUTE CHART — ICAO

7.1 Function

This chart shall provide flight crews with information to facilitate navigation along ATS routes in compliance with air traffic services procedures.

Note.— Simplified versions of these charts are appropriate for inclusion in Aeronautical Information Publications to complement the tabulation of radio communication and navigation facilities.

7.2 Availability

7.2.1 The Enroute Chart — ICAO shall be made available in the manner prescribed in 1.3.2 for all areas where flight information regions have been established.

Note.— Under certain conditions, an Area Chart — ICAO may have to be provided. (See Chapter 8.)

7.2.2 Where different air traffic services routes, position reporting requirements or lateral limits of flight information regions or control areas exist in different layers of airspace and cannot be shown with sufficient clarity on one chart, separate charts shall be provided.

7.3 Coverage and scale

Note 1.— A uniform scale for charts of this type cannot be specified due to the varying degree of congestion of information in certain areas.

Note 2.— A linear scale based on the mean scale of the chart may be shown.

7.3.1 **Recommendation.—** *Layout of sheet lines should be determined by the density and pattern of the ATS route structure.*

7.3.2 Large variations of scale between adjacent charts showing a continuous route structure shall be avoided.

7.3.3 An adequate overlap of charts shall be provided to ensure continuity of navigation.

7.4 Projection

7.4.1 **Recommendation.—** *A conformal projection on which a straight line approximates a great circle should be used.*

7.4.2 Parallels and meridians shall be shown at suitable intervals.

7.4.3 Graduation marks shall be placed at consistent intervals along selected parallels and meridians.

7.5 Identification

Each sheet shall be identified by chart series and number.

7.6 Culture and topography

7.6.1 Generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

7.6.2 Within each quadrilateral formed by the parallels and meridians the area minimum altitude shall be shown, except as provided for in 7.6.3.

7.6.3 **Recommendation.—** *In areas of high latitude where it is determined by the appropriate authority that True North orientation of the chart is impractical, the area minimum altitude should be shown within each quadrilateral formed by reference lines of the graticule (grid) used.*

7.6.4 Where charts are not True North orientated, this fact and the selected orientation used shall be clearly indicated.

7.7 Magnetic variation

Recommendation.— *Isogonals should be indicated and the date of the isogonic information given.*

7.8 Bearings, tracks and radials

7.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 7.8.2.

7.8.2 **Recommendation.—** *In areas of high latitude where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

7.8.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

7.9 Aeronautical data

7.9.1 Aerodromes

All aerodromes used by international civil aviation to which an instrument approach can be made shall be shown.

Note.— Other aerodromes may be shown.

7.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas relevant to the layer of airspace, shall be depicted with their identification and vertical limits.

7.9.3 Air traffic services system

7.9.3.1 Where appropriate, the components of the established air traffic services system shall be shown.

7.9.3.1.1 The components shall include the following:

1) the radio navigation aids associated with the air traffic services system together with their names, identifications, frequencies and geographical coordinates in degrees, minutes and seconds;

2) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

3) an indication of all designated airspace, including lateral and vertical limits and the appropriate class of airspace;

4) all ATS routes for en-route flight including route designators, required navigation performance (RNP) types, the track to the nearest degree in both directions along each segment of the routes and, where applicable, the direction of traffic flow;

5) all significant points which define the ATS routes and are not marked by the position of a radio navigation aid, together with their name-codes and geographical coordinates in degrees, minutes and seconds;

6) in respect of waypoints defining VOR/DME area navigation routes, additionally,

   a) the station identification and radio frequency of the reference VOR/DME;

   b) the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;

7) an indication of all compulsory and “on-request” reporting points and ATS/MET reporting points;

8) the distances to the nearest kilometre or nautical mile between significant points constituting turning points or reporting points;

   Note.— Overall distances between radio navigation aids may also be shown.

9) change-over points on route segments defined by reference to very high frequency omnidirectional radio ranges, indicating the distances to the nearest kilometre or nautical mile to the navigation aids;

   Note.— Change-over points established at the mid-point between two aids, or at the intersection of two radials in the case of a route which changes direction between the aids, need not be shown for each route segment if a general statement regarding their existence is made.

10) minimum flight altitudes on ATS routes to the nearest higher 50 metres or 100 feet (see Annex 11, 2.21);

11) radio communication facilities listed with their frequencies;

12) air defence identification zone (ADIZ) properly identified.

   Note.— ADIZ procedures may be described in the chart legend.

7.9.4 Supplementary information

7.9.4.1 Details of departure and arrival routes and associated holding patterns in terminal areas shall be shown unless they are shown on an Area Chart, a Standard Departure Chart — Instrument (SID) — ICAO or a Standard Arrival Chart — Instrument (STAR) — ICAO.

Note 1.— For specifications of these charts see Chapters 8, 9 and 10.

Note 2.— Departure routes normally originate at the end of a runway; arrival routes normally terminate at the point where an instrument approach is initiated.

7.9.4.2 Where established, altimeter setting regions shall be shown and identified.

CHAPTER 8. AREA CHART — ICAO

8.1 Function

This chart shall provide the flight crew with information to facilitate the following phases of instrument flight:

a) the transition between the en-route phase and approach to an aerodrome;

b) the transition between take-off/missed approach and en-route phase of flight; and

c) flights through areas of complex ATS routes or airspace structure.

Note.— The function described in 8.1 c) may be satisfied by a separate chart or an inset on an Enroute Chart — ICAO.

8.2 Availability

8.2.1 The Area Chart — ICAO shall be made available in the manner prescribed in 1.3.2 where the air traffic services routes or position reporting requirements are complex and cannot be adequately shown on an Enroute Chart — ICAO.

8.2.2 Where air traffic services routes or position reporting requirements are different for arrivals and for departures, and these cannot be shown with sufficient clarity on one chart, separate charts shall be provided.

Note.— Under certain conditions a Standard Departure Chart — Instrument (SID) — ICAO and a Standard Arrival Chart — Instrument (STAR) — ICAO may have to be provided (see Chapters 9 and 10).

8.3 Coverage and scale

8.3.1 The coverage of each chart shall extend to points that effectively show departure and arrival routes.

8.3.2 The chart shall be drawn to scale and a scale-bar shown.

8.4 Projection

8.4.1 **Recommendation.—** *A conformal projection on which a straight line approximates a great circle should be used.*

8.4.2 Parallels and meridians shall be shown at suitable intervals.

8.4.3 Graduation marks shall be placed at consistent intervals along the neat lines, as appropriate.

8.5 Identification

The chart shall be identified by a name associated with the airspace portrayed.

Note.— The name may be that of the air traffic services centre, the name of the largest city or town situated in the area covered by the chart or the name of the city that the aerodrome serves. Where more than one aerodrome serves the city or town, the name of the aerodrome on which the procedures are based should be added.

8.6 Culture and topography

8.6.1 Generalized shorelines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

8.6.2 **Recommendation.—** *To improve situational awareness in areas where significant relief exists, all relief exceeding 300 m (1 000 ft) above the elevation of the primary aerodrome should be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, should be shown printed in black. Obstacles should also be shown.*

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the elevation of the primary aerodrome may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

8.7 Magnetic variation

The average magnetic variation of the area covered by the chart shall be shown to the nearest degree.

8.8 Bearings, tracks and radials

8.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 8.8.2.

8.8.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

8.8.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used, its reference grid meridian shall be identified.

8.9 Aeronautical data

8.9.1 Aerodromes

All aerodromes which affect the terminal routings shall be shown. Where appropriate a runway pattern symbol shall be used.

8.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be depicted with their identification and vertical limits.

8.9.3 Area minimum altitudes

Area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the whole degree of latitude and longitude.

8.9.4 Air traffic services system

8.9.4.1 The components of the established relevant air traffic services system shall be shown.

8.9.4.1.1 The components shall include the following:

1) the radio navigation aids associated with the air traffic services system together with their names, identifications, frequencies and geographical coordinates in degrees, minutes and seconds;

2) in respect of DME, additionally the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

3) terminal radio aids which are required for outbound and inbound traffic and for holding patterns;

4) the lateral and vertical limits of all designated airspace and the appropriate class of airspace;

5) holding patterns and terminal routings, together with the route designators, and the track to the nearest degree along each segment of the prescribed airways and terminal routings;

6) all significant points which define the terminal routings and are not marked by the position of a radio navigation aid, together with their name-codes and geographical coordinates in degrees, minutes and seconds;

7) in respect of waypoints defining VOR/DME area navigation routes, additionally,

   a) the station identification and radio frequency of the reference VOR/DME;

   b) the bearing to the nearest tenth of a degree and the distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference VOR/DME, if the waypoint is not collocated with it;

8) an indication of all compulsory and “on-request” reporting points;

9) the distances to the nearest kilometre or nautical mile between significant points constituting turning points or reporting points;

   Note.— Overall distances between radio navigation aids may also be shown.

10) change-over points on route segments defined by reference to very high frequency omnidirectional radio ranges, indicating the distances to the nearest kilometre or nautical mile to the radio navigation aids;

   Note.— Change-over points established at midpoint between two aids, or at the intersection of two radials in the case of a route which changes direction between the aids, need not be shown for each route segment if a general statement regarding their existence is made.

11) minimum flight altitudes on ATS routes to the nearest higher 50 m or 100 ft (see Annex 11, 2.21);

12) established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

Note 1.— Where radar procedures are used to vector aircraft to or from significant points on a published standard departure or arrival route or to issue clearance for descent below the minimum sector altitude during arrival, the radar procedures may be shown on the Area Chart — ICAO unless excessive chart clutter will result.

Note 2.— Where excessive chart clutter will result, a Radar Minimum Altitude Chart — ICAO may be provided (see Chapter 21), in which case the elements indicated by 8.9.4.1.1, 12), need not be duplicated on the Area Chart — ICAO.

13) area speed and level/altitude restrictions where established;

14) radio communication facilities listed with their frequencies.

CHAPTER 9. STANDARD DEPARTURE CHART — INSTRUMENT (SID) — ICAO

9.1 Function

This chart shall provide the flight crew with information to enable it to comply with the designated standard departure route — instrument from take-off phase to the en-route phase.

Note 1.— Provisions governing the identification of standard departure routes are in Annex 11, Appendix 3; guidance material relating to the establishment of such routes is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

Note 2.— Provisions governing obstacle clearance criteria and details of the minimum information to be published are contained in the Procedures for Air Navigation Services — Aircraft Operations *(PANS-OPS, Doc 8168), Volume II, Part II.*

9.2 Availability

The Standard Departure Chart — Instrument (SID) — ICAO shall be made available wherever a standard departure route — instrument has been established and cannot be shown with sufficient clarity on the Area Chart — ICAO.

9.3 Coverage and scale

9.3.1 The coverage of the chart shall be sufficient to indicate the point where the departure route begins and the specified significant point at which the en-route phase of flight along a designated air traffic services route can be commenced.

Note.— The departure route normally originates at the end of a runway.

9.3.2 **Recommendation.—** *The chart should be drawn to scale.*

9.3.3 If the chart is drawn to scale, a scale-bar shall be shown.

9.3.4 When the chart is not drawn to scale the annotation "NOT TO SCALE" shall be shown and the symbol for scale-break shall be used on tracks and other aspects of the chart which are too large to be drawn to scale.

9.4 Projection

9.4.1 **Recommendation.—** *A conformal projection on which a straight line approximates a great circle should be used.*

9.4.2 **Recommendation.—** *When the chart is drawn to scale, parallels and meridians should be shown at suitable intervals.*

9.4.3 Graduation marks shall be placed at consistent intervals along the neat lines.

9.5 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the identification of the standard departure route(s) — instrument as established in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168), Volume II, Part II, Chapter 5.

Note.— The identification of the standard departure route(s) — instrument is provided by the procedures specialist.

9.6 Culture and topography

9.6.1 Where the chart is drawn to scale, generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

9.6.2 **Recommendation.—** *To improve situational awareness in areas where significant relief exists, the chart should be drawn to scale and all relief exceeding 300 m (1 000 ft) above the aerodrome elevation should be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, should be shown printed in black. Obstacles should also be shown.*

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

9.7 Magnetic variation

Magnetic variation used in determining the magnetic bearings, tracks and radials shall be shown to the nearest degree.

9.8 Bearings, tracks and radials

9.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 9.8.2.

Note.— A note to this effect may be included on the chart.

9.8.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

9.8.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

9.9 Aeronautical data

9.9.1 Aerodromes

9.9.1.1 The aerodrome of departure shall be shown by the runway pattern.

9.9.1.2 All aerodromes which affect the designated standard departure route — instrument shall be shown and identified. Where appropriate the aerodrome runway patterns shall be shown.

9.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits.

9.9.3 Minimum sector altitude

9.9.3.1 The established minimum sector altitude, based on a navigation aid associated with the procedure, shall be shown with a clear indication of the sector to which it applies.

9.9.3.2 Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the half-degree of latitude and longitude.

9.9.4 Air traffic services system

9.9.4.1 The components of the established relevant air traffic services system shall be shown.

9.9.4.1.1 The components shall comprise the following:

1) a graphic portrayal of each standard departure route — instrument, including:

   a) route designator;

   b) significant points defining the route;

   c) track or radial to the nearest degree along each segment of the route;

   d) distances to the nearest kilometre or nautical mile between significant points;

   e) minimum flight altitudes along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft and flight level restrictions where established;

   f) where the chart is drawn to scale and radar vectoring on departure is provided, established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

   Note 1.— Where radar procedures are used to vector aircraft to or from significant points on a published standard departure route, the radar procedures may be shown on the Standard Departure Chart — Instrument (SID) — ICAO unless excessive chart clutter will result.

   Note 2.— Where excessive chart clutter will result, a Radar Minimum Altitude Chart — ICAO may be provided (see Chapter 21), in which case the elements indicated by 9.9.4.1.1, 1) f), need not be duplicated on the Standard Departure Chart — Instrument (SID) — ICAO.

2) the radio navigation aid(s) associated with the route(s) including:

   a) plain language name;

b) identification;

c) frequency;

d) geographical coordinates in degrees, minutes and seconds;

e) for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

3) the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference radio navigation aid;

4) applicable holding patterns;

5) transition altitude/height to the nearest higher 300 m or 1 000 ft;

6) the position and height of close-in obstacles which penetrate the obstacle identification surface (OIS). A note shall be included whenever close-in obstacles penetrating the OIS exist but which were not considered for the published procedure design gradient;

Note.— In accordance with PANS-OPS, Volume II, information on close-in obstacles is provided by the procedures specialist.

7) area speed restrictions, where established;

8) all compulsory and "on-request" reporting points;

9) radio communication procedures, including:

a) call sign(s) of ATS unit(s);

b) frequency;

c) transponder setting, where appropriate.

9.9.4.2 **Recommendation.—** *A textual description of standard departure route(s) — instrument (SID) and communication failure procedures in relation to radar control should be provided and should, whenever feasible, be shown on the chart or on the same page which contains the chart.*

CHAPTER 10. STANDARD ARRIVAL CHART — INSTRUMENT (STAR) — ICAO

10.1 Function

This chart shall provide the flight crew with information to enable it to comply with the designated standard arrival route — instrument from the en-route phase to the approach phase.

Note 1.— Standard arrival routes — instrument are to be interpreted as including "standard descent profiles", "continuous descent approach", and other non-standard descriptions. In the case of a standard descent profile, the depiction of a cross-section is not required.

Note 2.— Provisions governing the identification of standard arrival routes are in Annex 11, Appendix 3; guidance material relating to the establishment of such routes is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

10.2 Availability

The Standard Arrival Chart — Instrument (STAR) — ICAO shall be made available wherever a standard arrival route — instrument has been established and cannot be shown with sufficient clarity on the Area Chart.

10.3 Coverage and scale

10.3.1 The coverage of the chart shall be sufficient to indicate the points where the en-route phase ends and the approach phase begins.

10.3.2 **Recommendation.—** *The chart should be drawn to scale.*

10.3.3 If the chart is drawn to scale, a scale-bar shall be shown.

10.3.4 When the chart is not drawn to scale the annotation "NOT TO SCALE" shall be shown and the symbol for scale break shall be used on tracks and other aspects of the chart which are too large to be drawn to scale.

10.4 Projection

10.4.1 **Recommendation.—** *A conformal projection on which a straight line approximates a great circle should be used.*

10.4.2 **Recommendation.—** *When the chart is drawn to scale, parallels and meridians should be shown at suitable intervals.*

10.4.3 Graduation marks shall be placed at consistent intervals along the neat lines.

10.5 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome, and the identification of the standard arrival route(s) — instrument as established in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168), Volume II, Part III, Chapter 3.

Note.— The identification of the standard arrival route(s) — instrument is provided by the procedures specialist.

10.6 Culture and topography

10.6.1 Where the chart is drawn to scale, generalized shore lines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

10.6.2 **Recommendation.—** *To improve situational awareness in areas where significant relief exists, the chart should be drawn to scale and all relief exceeding 300 m (1 000 ft) above the aerodrome elevation should be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, should be shown printed in black. Obstacles should also be shown.*

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 300 m (1 000 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

10.7 Magnetic variation

Magnetic variation used in determining the magnetic bearings, tracks and radials shall be shown to the nearest degree.

10.8 Bearings, tracks and radials

10.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 10.8.2.

Note.— A note to this effect may be included on the chart.

10.8.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

10.8.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

10.9 Aeronautical data

10.9.1 Aerodromes

10.9.1.1 The aerodrome of landing shall be shown by the runway pattern.

10.9.1.2 All aerodromes which affect the designated standard arrival route — instrument shall be shown and identified. Where appropriate the aerodrome runway patterns shall be shown.

10.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits.

10.9.3 Minimum sector altitude

10.9.3.1 The established minimum sector altitude shall be shown with a clear indication of the sector to which it applies.

10.9.3.2 Where the minimum sector altitude has not been established, the chart shall be drawn to scale and area minimum altitudes shall be shown within quadrilaterals formed by the parallels and meridians. Area minimum altitudes shall also be shown in those parts of the chart not covered by the minimum sector altitude.

Note.— Depending on the selected chart scale, quadrilaterals formed by the parallels and meridians normally correspond to the half-degree of latitude and longitude.

10.9.4 Air traffic services system

10.9.4.1 The components of the established relevant air traffic services system shall be shown.

10.9.4.1.1 The components shall comprise the following:

1) a graphic portrayal of each standard arrival route — instrument, including:

   a) route designator;

   b) significant points defining the route;

   c) track or radial to the nearest degree along each segment of the route;

   d) distances to the nearest kilometre or nautical mile between significant points;

   e) minimum flight altitudes along the route or route segments and altitudes required by the procedure to the nearest higher 50 m or 100 ft and flight level restrictions where established;

   f) where the chart is drawn to scale and radar vectoring on arrival is provided, established radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

   Note 1.— Where radar procedures are used to vector aircraft to or from significant points on a published standard arrival route or to issue clearance for descent below the minimum sector altitude during arrival, the radar procedures may be shown on the Standard Arrival Chart — Instrument (STAR) — ICAO unless excessive chart clutter will result.

   Note 2.— Where excessive chart clutter will result, a Radar Minimum Altitude Chart — ICAO may be provided (see Chapter 21), in which case the elements indicated by 10.9.4.1.1, 1) f), need not be duplicated on the Standard Arrival Chart — Instrument (STAR) — ICAO.

2) the radio navigation aid(s) associated with the route(s) including:

   a) plain language name;

   b) identification;

   c) frequency;

   d) geographical coordinates in degrees, minutes and seconds;

e) for DME, the channel and the elevation of the transmitting antenna of the DME to the nearest 30 m (100 ft);

3) the name-codes of the significant points not marked by the position of a radio navigation aid, their geographical coordinates in degrees, minutes and seconds and the bearing to the nearest tenth of a degree and distance to the nearest two-tenths of a kilometre (tenth of a nautical mile) from the reference radio navigation aid;

4) applicable holding patterns;

5) transition altitude/height to the nearest higher 300 m or 1 000 ft;

6) area speed restrictions, where established;

7) all compulsory and "on-request" reporting points;

8) radio communication procedures, including:

a) call sign(s) of ATS unit(s);

b) frequency;

c) transponder setting, where appropriate.

10.9.4.2 **Recommendation.—** *A textual description of standard arrival route(s) — instrument (STAR) and communication failure procedures in relation to radar control should be provided and should, whenever feasible, be shown on the chart or on the same page which contains the chart.*

CHAPTER 11. INSTRUMENT APPROACH CHART — ICAO

11.1 Function

This chart shall provide flight crews with information which will enable them to perform an approved instrument approach procedure to the runway of intended landing including the missed approach procedure and where applicable, associated holding patterns.

Note.— Detailed criteria for the establishment of instrument approach procedures and the resolutions of associated altitudes/heights are contained in the Procedures for Air Navigation Services — Aircraft Operations *(PANS-OPS, Doc 8168).*

11.2 Availability

11.2.1 Instrument Approach Charts — ICAO shall be made available for all aerodromes used by international civil aviation where instrument approach procedures have been established by the State concerned.

11.2.2 A separate Instrument Approach Chart — ICAO shall normally be provided for each precision approach procedure established by the State.

11.2.3 A separate Instrument Approach Chart — ICAO shall normally be provided for each non-precision approach procedure established by the State.

Note.— A single precision or non-precision approach procedure chart may be provided to portray more than one approach procedure when the procedures for the intermediate approach, final approach and missed approach segments are identical.

11.2.4 When the values for track, time or altitude differ between categories of aircraft on other than the final approach segment of the instrument approach procedures and the listing of these differences on a single chart could cause clutter or confusion, more than one chart shall be provided.

Note.— For categories of aircraft, see Procedures for Air Navigation Services — Aircraft Operations *(PANS-OPS, Doc 8168), Volume II, Part III, Chapter 1.*

11.2.5 Instrument Approach Charts — ICAO shall be revised whenever information essential to safe operation becomes out of date.

11.3 Coverage and scale

11.3.1 The coverage of the chart shall be sufficient to include all segments of the instrument approach procedure and such additional areas as may be necessary for the type of approach intended.

11.3.2 The scale selected shall ensure optimum legibility consistent with:

1) the procedure shown on the chart;

2) sheet size.

11.3.3 A scale indication shall be given.

11.3.3.1 Except where this is not practicable, a distance circle with a radius of 20 km (10 NM) centred on a DME located on or close to the aerodrome, or on the aerodrome reference point where no suitable DME is available, shall be shown; its radius shall be indicated on the circumference.

11.3.3.2 **Recommendation.—** *A distance scale should be shown directly below the profile.*

11.4 Format

Recommendation.— *The sheet size should be 210 × 148 mm (8.27 × 5.82 in).*

11.5 Projection

11.5.1 A conformal projection on which a straight line approximates a great circle shall be used.

11.5.2 **Recommendation.—** *Graduation marks should be placed at consistent intervals along the neat lines.*

11.6 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the identification of the instrument approach procedure as established in accordance with the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168), Volume II, Part III, Chapter 1.

Note.— The identification of the instrument approach procedure is provided by the procedures specialist.

11.7 Culture and topography

11.7.1 Culture and topographic information pertinent to the safe execution of the instrument approach procedure, including the missed approach procedure, associated holding procedures and visual manoeuvring (circling) procedure when established, shall be shown. Topographic information shall be named, only when necessary, to facilitate the understanding of such information, and the minimum shall be a delineation of land masses and significant lakes and rivers.

11.7.2 Relief shall be shown in a manner best suited to the particular elevation characteristics of the area. In areas where relief exceeds 1 200 m (4 000 ft) above the aerodrome elevation within the coverage of the chart or 600 m (2 000 ft) within 11 km (6 NM) of the aerodrome reference point or when final approach or missed approach procedure gradient is steeper than optimal due to terrain, all relief exceeding 150 m (500 ft) above the aerodrome elevation shall be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, shall also be shown printed in black.

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 150 m (500 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations are those provided by the procedures specialist.

11.7.3 **Recommendation.—** *In areas where relief is lower than specified in 11.7.2, all relief exceeding 150 m (500 ft) above the aerodrome elevation should be shown by smoothed contour lines, contour values and layer tints printed in brown. Appropriate spot elevations, including the highest elevation within each top contour line, should also be shown printed in black.*

Note 1.— The next higher suitable contour line appearing on base topographic maps exceeding 150 m (500 ft) above the aerodrome elevation may be selected to start layer tinting.

Note 2.— An appropriate brown colour, on which half-tone layer tinting is to be based, is specified in Appendix 3 — Colour Guide for contours and topographic features.

Note 3.— Appropriate spot elevations are those provided by the procedures specialist.

11.8 Magnetic variation

11.8.1 **Recommendation.—** *The magnetic variation should be shown.*

11.8.2 When shown, the value of the variation, indicated to the nearest degree, shall agree with that used in determining magnetic bearings, tracks and radials.

11.9 Bearings, tracks and radials

11.9.1 Bearings, tracks and radials shall be magnetic except as provided for in 11.9.2.

Note.— A note to this effect may be included on the chart.

11.9.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

11.9.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

11.10 Aeronautical data

11.10.1 Aerodromes

11.10.1.1 All aerodromes which show a distinctive pattern from the air shall be shown by the appropriate symbol. Abandoned aerodromes shall be identified as abandoned.

11.10.1.2 The runway pattern, at a scale sufficiently large to show it clearly, shall be shown for:

1) the aerodrome on which the procedure is based;

2) aerodromes affecting the traffic pattern or so situated as to be likely, under adverse weather conditions, to be mistaken for the aerodrome of intended landing.

11.10.1.3 The aerodrome elevation shall be shown to the nearest metre or foot in a prominent position on the chart.

11.10.1.4 The threshold elevation or, where applicable, the highest elevation of the touchdown zone shall be shown to the nearest metre or foot.

11.10.2 Obstacles

11.10.2.1 Obstacles shall be shown on the plan view of the chart.

Note.— Appropriate obstacles are those provided by the procedures specialist.

11.10.2.2 **Recommendation.—** *If one or more obstacles are the determining factor of an obstacle clearance altitude/ height, those obstacles should be identified.*

11.10.2.3 The elevation of the top of obstacles shall be shown to the nearest (next higher) metre or foot.

11.10.2.4 **Recommendation.—** *The heights of obstacles above a datum other than mean sea level (see 11.10.2.3) should be shown. When shown, they should be given in parentheses on the chart.*

11.10.2.5 When the heights of obstacles above a datum other than mean sea level are shown, the datum shall be the aerodrome elevation except that, at aerodromes having an instrument runway (or runways) with a threshold elevation more than 2 m (7 ft) below the aerodrome elevation, the chart datum shall be the threshold elevation of the runway to which the instrument approach is related.

11.10.2.6 Where a datum other than mean sea level is used, it shall be stated in a prominent position on the chart.

11.10.2.7 Where an obstacle free zone has not been established for a precision approach runway Category I, this shall be indicated.

11.10.3 Prohibited, restricted and danger areas

Prohibited areas, restricted areas, and danger areas which may affect the execution of the procedures shall be shown with their identification and vertical limits.

11.10.4 Radio communication facilities and navigation aids

11.10.4.1 Radio navigation aids required for the procedures together with their frequencies, identifications and track-defining characteristics, if any, shall be shown. In the case of a procedure in which more than one station is located on the final approach track, the facility to be used for track guidance for final approach shall be clearly identified. In addition, consideration shall be given to the elimination from the approach chart of those facilities that are not used by the procedure.

11.10.4.2 The final approach fix (or final approach point for an ILS approach procedure) and other essential fixes or points comprising the procedure shall be shown and identified.

11.10.4.3 **Recommendation.—** *The final approach fix (or final approach point for an ILS approach procedure) should be identified with its geographical coordinates in degrees, minutes and seconds.*

11.10.4.4 Radio navigation aids that might be used in diversionary procedures together with their track-defining characteristics, if any, shall be shown or indicated on the chart.

11.10.4.5 Radio communication frequencies, including call signs, that are required for the execution of the procedures shall be shown.

11.10.4.6 When required by the procedures, the distance to the aerodrome from each radio navigation aid concerned with the final approach shall be shown to the nearest kilometre or nautical mile. When no track-defining aid indicates the bearing of the aerodrome, the bearing shall also be shown to the nearest degree.

11.10.5 Minimum sector altitude or terminal arrival altitude

The minimum sector altitude or terminal arrival altitude established by the competent authority shall be shown, with a clear indication of the sector to which it applies.

11.10.6 Portrayal of procedure tracks

11.10.6.1 The plan view shall show the following information in the manner indicated:

a) the approach procedure track by an arrowed continuous line indicating the direction of flight;

b) the missed approach procedure track by an arrowed broken line;

c) any additional procedure track, other than those specified in a) and b), by an arrowed dotted line;

d) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometre or tenth of a nautical mile or times required for the procedure;

e) where no track-defining aid is available, the magnetic bearing to the nearest degree to the aerodrome from the radio navigation aids concerned with the final approach;

f) the boundaries of any sector in which visual manoeuvring (circling) is prohibited;

g) where specified the holding pattern and minimum holding altitude/height associated with the approach and missed approach;

h) caution notes where required, prominently displayed on the face of the chart.

11.10.6.2 **Recommendation.—** *The plan view should show the distance to the aerodrome from each radio navigation aid concerned with the final approach.*

11.10.6.3 A profile shall be provided normally below the plan view showing the following data:

a) the aerodrome by a solid block at aerodrome elevation;

b) the profile of the approach procedure segments by an arrowed continuous line indicating the direction of flight;

c) the profile of the missed approach procedure segment by an arrowed broken line and a description of the procedure;

d) the profile of any additional procedure segment, other than those specified in b) and c), by an arrowed dotted line;

e) bearings, tracks, radials to the nearest degree and distances to the nearest two-tenths of a kilometre or tenth of a nautical mile or times required for the procedure;

f) altitudes/heights required by the procedures, including transition altitude and procedure altitudes/heights, where established;

g) limiting distance to the nearest kilometre or nautical mile on procedure turn, when specified;

h) the intermediate approach fix or point, on procedures where no course reversal is authorized;

i) a line representing the aerodrome elevation or threshold elevation, as appropriate, extended across the width of the chart including a distance scale with its origin at the runway threshold.

11.10.6.4 **Recommendation.—** *Heights required by procedures should be shown in parentheses, using the height datum selected in accordance with 11.10.2.5.*

11.10.6.5 **Recommendation.—** *The profile view should include a ground profile or a minimum altitude/height portrayal as follows:*

a) a ground profile shown by a solid line depicting the highest elevations of the relief occurring within the primary area of the final approach segment. The highest elevations of the relief occurring in the secondary areas of the final approach segment shown by a dashed line; or

b) minimum altitudes/heights in the intermediate and final approach segments indicated within bounded shaded blocks.

Note 1.— For the ground profile portrayal, actual templates of the primary and secondary areas of the final approach segment are provided to the cartographer by the procedures specialist.

Note 2.— The minimum altitude/height portrayal is intended for use on charts depicting non-precision approaches with a final approach fix.

11.10.7 Aerodrome operating minima

11.10.7.1 Aerodrome operating minima when established by the State shall be shown.

11.10.7.2 The obstacle clearance altitudes/heights for the aircraft categories for which the procedure is designed shall be shown; for precision approach procedures, additional OCA/H for Cat D_L aircraft (wing span between 65 m and 80 m and/or vertical distance between the flight path of the wheels and the glide path antenna between 7 m and 8 m) shall be published, when necessary.

11.10.8 Supplementary information

11.10.8.1 When the missed approach point is defined by:

— a distance from the final approach fix, or

— a facility or a fix and the corresponding distance from the final approach fix,

the distance to the nearest two-tenths of a kilometre or tenth of a nautical mile and a table showing ground speeds and times from the final approach fix to the missed approach point shall be shown.

11.10.8.2 When DME is required for use in the final approach segment, a table showing altitudes/heights for each 2 km or 1 NM, as appropriate, shall be shown. The table shall not include distances which would correspond to altitudes/heights below the OCA/H.

11.10.8.3 **Recommendation.—** *For procedures in which DME is not required for use in the final approach segment but where a suitably located DME is available to provide advisory descent profile information, a table showing the altitudes/heights should be included.*

11.10.8.4 **Recommendation.—** *A rate of descent table should be shown.*

11.10.8.5 Final approach descent gradient and, in parenthesis, descent angle to the nearest one tenth of a degree shall be shown for non-precision procedures with a final approach fix.

11.10.8.6 On charts depicting ILS/MLS and LNAV/VNAV approach procedures, the height of the ILS/MLS and LNAV/VNAV reference datum to the nearest half metre or foot and the glide path/elevation/vertical path angle shall be shown. If the ILS/MLS glide path/elevation angle exceeds 3.5 degrees, a note shall be included referring to appropriate aircraft and flight crew qualification requirements for such a procedure. When a final approach fix is specified at the final approach point for ILS, a clear indication shall be given whether it applies to the ILS, the associated ILS localizer only procedure, or both. In the case of MLS, a clear indication shall be given when an FAF has been specified at the final approach point.

Note.— See Procedures for Air Navigation Services — Aircraft Operations (*PANS-OPS, Doc 8168*), *Volume II, about additional requirements when glide path angles/elevations exceed 3.5 degrees.*

11.10.8.7 Final approach descent angle shall be shown to the nearest one tenth of a degree for instrument procedures with vertical guidance.

11.10.9 Aeronautical data base requirements

The following data shall be published in tabular form on the verso of the chart or as a separate, properly referenced sheet:

a) final approach fixes/points and other essential fixes/points comprising the instrument approach procedure identified with their geographical coordinates in degrees, minutes, seconds and tenths of seconds;

b) instrument approach procedure fix formation bearings to the nearest hundredth of a degree;

c) instrument approach procedure fix formations distance to the nearest hundredth of a nautical mile; and

d) for non-precision approaches, the final approach descent angle to the nearest hundredth of a degree.

CHAPTER 12. VISUAL APPROACH CHART — ICAO

12.1 Function

This chart shall provide flight crews with information which will enable them to transit from the en-route/descent to approach phases of flight to the runway of intended landing by means of visual reference.

12.2 Availability

The Visual Approach Chart — ICAO shall be made available in the manner prescribed in 1.3.2 for all aerodromes used by international civil aviation where:

1) only limited navigation facilities are available; or

2) radio communication facilities are not available; or

3) no adequate aeronautical charts of the aerodrome and its surroundings at 1:500 000 or greater scale are available; or

4) visual approach procedures have been established.

12.3 Scale

12.3.1 The scale shall be sufficiently large to permit depiction of significant features and indication of the aerodrome layout.

12.3.2 **Recommendation.—** *The scale should not be smaller than 1:500 000.*

Note.— A scale of 1:250 000 or 1:200 000 is preferred.

12.3.3 **Recommendation.—** *When an Instrument Approach Chart is available for a given aerodrome, the Visual Approach Chart should be drawn to the same scale.*

12.4 Format

Recommendation.— *The sheet size should be 210 × 148 mm (8.27 × 5.82 in).*

Note.— It would be advantageous to print the charts in several colours, selected to provide maximum legibility in varying degrees and kinds of light.

12.5 Projection

12.5.1 A conformal projection on which a straight line approximates a great circle shall be used.

12.5.2 **Recommendation.—** *Graduation marks should be placed at consistent intervals along the neat lines.*

12.6 Identification

The chart shall be identified by the name of the city or town which the aerodrome serves and the name of the aerodrome.

12.7 Culture and topography

12.7.1 Natural and cultural landmarks shall be shown (e.g. bluffs, cliffs, sand dunes, cities, towns, roads, railroads, isolated lighthouses, etc.).

12.7.1.1 **Recommendation.—** *Geographical place names should be included only when they are required to avoid confusion or ambiguity.*

12.7.2 Shore lines, lakes, rivers and streams shall be shown.

12.7.3 Relief shall be shown in a manner best suited to the particular elevation and obstacle characteristics of the area covered by the chart.

12.7.4 **Recommendation.—** *When shown, spot elevations should be carefully selected.*

Note.— The value of certain spot elevations/heights in relation to both mean sea level and aerodrome elevation may be given.

12.7.5 The figures relating to different reference levels shall be clearly differentiated in their presentation.

12.8 Magnetic variation

The magnetic variation shall be shown.

12.9 Bearings, tracks and radials

12.9.1 Bearings, tracks and radials shall be magnetic except as provided for in 12.9.2.

12.9.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

12.9.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

12.10 Aeronautical data

12.10.1 Aerodromes

12.10.1.1 All aerodromes shall be shown by the runway pattern. Restrictions on the use of any landing direction shall be indicated. Where there is any risk of confusion between two neighbouring aerodromes this shall be indicated. Abandoned aerodromes shall be identified as abandoned.

12.10.1.2 The aerodrome elevation shall be shown in a prominent position on the chart.

12.10.2 Obstacles

12.10.2.1 Obstacles shall be shown and identified.

12.10.2.2 The elevation of the top of obstacles shall be shown to the nearest (next higher) metre or foot.

12.10.2.3 **Recommendation.—** *The heights of obstacles above the aerodrome elevation should be shown.*

12.10.2.3.1 When the heights of obstacles are shown, the height datum shall be stated in a prominent position on the chart and the heights shall be given in parentheses on the chart.

12.10.3 Prohibited, restricted and danger areas

Prohibited areas, restricted areas, and danger areas shall be depicted with their identification and vertical limits.

12.10.4 Designated airspace

Where applicable, control zones and aerodrome traffic zones shall be depicted with their vertical limits and the appropriate class of airspace.

12.10.5 Visual approach information

12.10.5.1 Visual approach procedures shall be shown where applicable.

12.10.5.2 Visual aids for navigation shall be shown as appropriate.

12.10.5.3 Location and type of the visual approach slope indicator systems with their nominal approach slope angle(s), minimum eye height(s) over the threshold of the on-slope signal(s), and where the axis of the system is not parallel to the runway centre line, the angle and direction of displacement, i.e. left or right, shall be shown.

12.10.6 Supplementary information

12.10.6.1 Radio navigation aids together with their frequencies and identifications shall be shown as appropriate.

12.10.6.2 Radio communication facilities with their frequencies shall be shown as appropriate.

CHAPTER 13. AERODROME/HELIPORT CHART — ICAO

13.1 Function

This chart shall provide flight crews with information which will facilitate the ground movement of aircraft:

a) from the aircraft stand to the runway; and

b) from the runway to the aircraft stand;

and helicopter movement:

a) from the helicopter stand to the touchdown and lift-off area and to the final approach and take-off area;

b) from the final approach and take-off area to the touchdown and lift-off area and to the helicopter stand;

c) along helicopter ground and air taxiways; and

d) along air transit routes;

it shall also provide essential operational information at the aerodrome/heliport.

13.2 Availability

13.2.1 The Aerodrome/Heliport Chart — ICAO shall be made available in the manner prescribed in 1.3.2 for all aerodromes/heliports regularly used by international civil aviation.

13.2.2 **Recommendation.—** *The Aerodrome/Heliport Chart — ICAO should be made available also, in the manner prescribed in 1.3.2, for all other aerodromes/heliports available for use by international civil aviation.*

Note.— Under certain conditions an Aerodrome Ground Movement Chart — ICAO and an Aircraft Parking/Docking Chart — ICAO may have to be provided (see Chapters 14 and 15); in which case, the elements portrayed on these supplementary charts need not be duplicated on the Aerodrome/Heliport Chart — ICAO.

13.3 Coverage and scale

13.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 13.6.1.

13.3.2 A linear scale shall be shown.

13.4 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome/heliport serves and the name of the aerodrome/heliport.

13.5 Magnetic variation

True and Magnetic North arrows and magnetic variation to the nearest degree and annual change of the magnetic variation shall be shown.

13.6 Aerodrome/heliport data

13.6.1 This chart shall show:

a) geographical coordinates in degrees, minutes and seconds for the aerodrome/heliport reference point;

b) elevations, to the nearest metre or foot, of the aerodrome/heliport and apron (altimeter checkpoint locations) where applicable; and for non-precision approaches, elevations and geoid undulations of runway thresholds and the geometric centre of the touchdown and lift-off area;

c) elevations and geoid undulations, to the nearest half-metre or foot, of the precision approach runway threshold, the geometric centre of the touchdown and lift-off area, and at the highest elevation of the touchdown zone of a precision approach runway;

d) all runways including those under construction with designation number, length and width to the nearest metre, bearing strength, displaced thresholds, stopways, clearways, runway directions to the nearest degree magnetic, type of surface and runway markings;

Note.— Bearing strengths may be shown in tabular form on the face or verso of the chart.

e) all aprons, with aircraft/helicopter stands, lighting, markings and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems, type of surface for heliports, and bearing strengths or aircraft type restrictions where the bearing strength is less than that of the associated runways;

Note.— Bearing strengths or aircraft type restrictions may be shown in tabular form on the face or verso of the chart.

f) geographical coordinates in degrees, minutes and seconds for thresholds, geometric centre of touchdown and lift-off area and/or thresholds of the final approach and take-off area (where appropriate);

g) all taxiways, helicopter air and ground taxiways with type of surface, helicopter air transit routes, with designations, width, lighting, markings, including runway-holding positions and stop bars, other visual guidance and control aids, and bearing strength or aircraft type restrictions where the bearing strength is less than that of the associated runways;

Note.— Bearing strengths or aircraft type restrictions may be shown in tabular form on the face or verso of the chart.

h) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points and aircraft stands;

i) where established, standard routes for taxiing aircraft with their designators;

j) the boundaries of the air traffic control service;

k) position of runway visual range (RVR) observation sites;

l) approach and runway lighting;

m) location and type of the visual approach slope indicator systems with their nominal approach slope angle(s), minimum eye height(s) over the threshold of the on-slope signal(s), and where the axis of the system is not parallel to the runway centre line, the angle and direction of the displacement, i.e. left or right;

n) radio communication facilities;

o) obstacles to taxiing;

p) aircraft servicing areas and buildings of operational significance;

q) VOR checkpoint and radio frequency of the aid concerned;

r) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

13.6.2 In addition to the items in 13.6.1 relating to heliports, the chart shall show:

a) heliport type;

Note.— Heliport types are identified in Annex 14, Volume II, as surface-level, elevated or helideck.

b) touchdown and lift-off area including dimensions to the nearest metre, slope, type of surface and bearing strength in tonnes;

c) final approach and take-off area including type, true bearing to the nearest degree, designation number (where appropriate), length and width to the nearest metre, slope and type of surface;

d) safety area including length, width and type of surface;

e) helicopter clearway including length and ground profile;

f) obstacles including type and elevation of the top of the obstacles to the nearest (next higher) metre or foot;

g) visual aids for approach procedures, marking and lighting of final approach and take-off area, and of touchdown and lift-off area;

h) declared distances to the nearest metre for heliports, where relevant, including:

1) take-off distance available;

2) rejected take-off distance available;

3) landing distance available.

CHAPTER 14. AERODROME GROUND MOVEMENT CHART — ICAO

14.1 Function

This supplementary chart shall provide flight crews with detailed information to facilitate the ground movement of aircraft to and from the aircraft stands and the parking/docking of aircraft.

14.2 Availability

Recommendation.— *The Aerodrome Ground Movement Chart — ICAO should be made available in the manner prescribed in 1.3.2 where, due to congestion of information, details necessary for the ground movement of aircraft along the taxiways to and from the aircraft stands cannot be shown with sufficient clarity on the Aerodrome/Heliport Chart — ICAO.*

14.3 Coverage and scale

14.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 14.6.

14.3.2 **Recommendation.—** *A linear scale should be shown.*

14.4 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves and the name of the aerodrome.

14.5 Magnetic variation

14.5.1 A True North arrow shall be shown.

14.5.2 **Recommendation.—** *Magnetic variation to the nearest degree and its annual change should be shown.*

Note.— This chart need not be True North orientated.

14.6 Aerodrome data

This chart shall show in a similar manner all the information on the Aerodrome/Heliport Chart — ICAO relevant to the area depicted, including:

a) apron elevation to the nearest metre or foot;

b) aprons with aircraft stands, bearing strengths or aircraft type restrictions, lighting, marking and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems;

c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;

d) taxiways with designations, width to the nearest metre, bearing strength or aircraft type restrictions where applicable, lighting, markings, including runway-holding positions and stop bars and other visual guidance and control aids;

e) where established, standard routes for taxiing aircraft, with their designators;

f) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points;

g) the boundaries of the air traffic control service;

h) relevant radio communication facilities listed with their frequencies;

i) obstacles to taxiing;

j) aircraft servicing areas and buildings of operational significance;

k) VOR checkpoint and radio frequency of the aid concerned;

l) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

CHAPTER 15. AIRCRAFT PARKING/DOCKING CHART — ICAO

15.1 Function

This supplementary chart shall provide flight crews with detailed information to facilitate the ground movement of aircraft between the taxiways and the aircraft stands and the parking/docking of aircraft.

15.2 Availability

Recommendation.— *The Aircraft Parking/ Docking Chart — ICAO should be made available in the manner prescribed in 1.3.2 where, due to the complexity of the terminal facilities, the information cannot be shown with sufficient clarity on the Aerodrome/Heliport Chart — ICAO or on the Aerodrome Ground Movement Chart — ICAO.*

15.3 Coverage and scale

15.3.1 The coverage and scale shall be sufficiently large to show clearly all the elements listed in 15.6.

15.3.2 **Recommendation.—** *A linear scale should be shown.*

15.4 Identification

The chart shall be identified by the name of the city or town, or area, which the aerodrome serves and the name of the aerodrome.

15.5 Magnetic variation

15.5.1 A True North arrow shall be shown.

15.5.2 **Recommendation.—** *Magnetic variation to the nearest degree and its annual change should be shown.*

Note.— This chart need not be True North orientated.

15.6 Aerodrome data

This chart shall show in a similar manner all the information on the Aerodrome/Heliport Chart — ICAO and the Aerodrome Ground Movement Chart — ICAO relevant to the area depicted, including:

a) apron elevation to the nearest metre or foot;

b) aprons with aircraft stands, bearing strengths or aircraft type restrictions, lighting, marking and other visual guidance and control aids, where applicable, including location and type of visual docking guidance systems;

c) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for aircraft stands;

d) taxiway entries with designations, including runway-holding positions and stop bars;

e) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for appropriate taxiway centre line points;

f) the boundaries of the air traffic control service;

g) relevant radio communication facilities listed with their frequencies;

h) obstacles to taxiing;

i) aircraft servicing areas and buildings of operational significance;

j) VOR checkpoint and radio frequency of the aid concerned;

k) any part of the depicted movement area permanently unsuitable for aircraft, clearly identified as such.

CHAPTER 16. WORLD AERONAUTICAL CHART — ICAO 1:1 000 000

16.1 Function

This chart shall provide information to satisfy the requirements of visual air navigation.

Note.— This chart may also serve:

1) as a basic aeronautical chart:

a) when highly specialized charts lacking visual information do not provide essential data;

b) to provide complete world coverage at a constant scale with a uniform presentation of planimetric data;

c) in the production of other charts required by international civil aviation;

2) as a pre-flight planning chart.

16.2 Availability

16.2.1 The World Aeronautical Chart — ICAO 1:1 000 000 shall be made available in the manner prescribed in 1.3.2 for all areas delineated in Appendix 5.

Note.— When operational or chart production considerations indicate that operational requirements can be effectively satisfied by Aeronautical Charts — ICAO 1:500 000 or Aeronautical Navigation Charts — ICAO Small Scale, either of these charts may be made available instead of the basic 1:1 000 000 chart.

16.2.2 **Recommendation.—** *To ensure complete coverage of all land areas and adequate continuity in any one coordinated series, the selection of a scale of other than 1:1 000 000 should be determined by regional agreement.*

16.3 Scales

16.3.1 Linear scales for kilometres and nautical miles arranged in the following order:

— kilometres,

— nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

16.3.1.1 **Recommendation.—** *The length of the linear scales should represent at least 200 km (110 NM).*

16.3.2 A conversion scale (metres/feet) shall be shown in the margin.

16.4 Format

16.4.1 **Recommendation.—** *The title and marginal notes should be in one of the ICAO working languages.*

Note.— The language of the publishing country may be used in addition to the ICAO working language.

16.4.2 The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.

16.4.3 **Recommendation.—** *The method of folding should be as follows:*

Fold the chart on the long axis, near the mid-parallel of latitude, face out; with the bottom half of the chart face upward, fold inwards near the meridian, and fold both halves backward in accordion folds.

16.4.4 **Recommendation.—** *Whenever practicable, the sheet lines should conform with those shown in the index in Appendix 5.*

Note 1.— The area covered by a sheet may vary from the lines shown to satisfy particular requirements.

Note 2.— The value of adopting identical sheet lines for ICAO 1:1 000 000 Charts and the corresponding sheet of the International Map of the World (IMW), provided aeronautical requirements are not compromised, is recognized.

16.4.5 The sheet lines used shall be notified to ICAO for publication in the ICAO *Aeronautical Chart Catalogue* (Doc 7101).

16.4.6 **Recommendation.—** *Overlaps should be provided by extending the chart area on the top and right side beyond the area given on the index. This overlap area should contain all aeronautical, topographical, hydrographical and cultural information. The overlap should extend up to 28 km (15 NM) if possible but in any case from the limiting parallels and meridians of each chart to the neat line.*

16.5 Projection

16.5.1 The projections shall be as follows:

1) between the Equator and 80° latitude: the Lambert conformal conic projection, in separate bands for each tier of charts. The standard parallels for each 4° band shall be 40′ south of the northern parallel and 40′ north of the southern parallel;

2) between 80° and 90° latitude: the Polar stereographic projection with scale matching that of the Lambert conformal conic projection at latitude 80°, except that in the northern hemisphere the Lambert conformal conic projection may be used between 80° and 84° latitude and the Polar stereographic projection between 84° and 90° with the scales matching at 84° North.

16.5.2 Graticules and graduations shall be shown as follows:

1) Parallels:

Latitude	*Distance between parallels*	*Graduations on parallels*
0° to 72°	30′	1′
72° to 84°	30′	5′
84° to 89°	30′	1°
89° to 90°	30′	5° (Only on degree parallels from 72° to 89°)

2) Meridians:

Latitude	*Interval between meridians*	*Graduations on meridians*
0° to 52°	30′	1′
52° to 72°	30′	1′ (Only on even numbered meridians)
72° to 84°	1°	1′
84° to 89°	5°	1′
89° to 90°	15°	1′ (Only on every fourth meridian)

16.5.3 The graduation marks at 1′ and 5′ intervals shall extend away from the Greenwich Meridian and from the Equator. Each 10′ interval shall be shown by a mark on both sides of the graticule line.

16.5.3.1 **Recommendation.—** *The length of the graduation marks should be approximately 1.3 mm (0.05 in) for the 1′ intervals, and 2 mm (0.08 in) for the 5′ intervals and 2 mm (0.08 in) extending on both sides of the graticule line for the 10′ intervals.*

16.5.4 All meridians and parallels shall be numbered in the borders of the charts. In addition, each parallel shall be numbered within the body of the chart in such a manner that the parallel can be readily identified when the chart is folded.

Note.— Meridians may be numbered within the body of the chart.

16.5.5 The name and basic parameters of the projection shall be indicated in the margin.

16.6 Identification

Sheet numbering shall be in conformity with the index in Appendix 5.

Note.— The corresponding International Map of the World (IMW) sheet number may also be shown.

16.7 Culture and topography

16.7.1 Built-up areas

16.7.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

16.7.1.2 **Recommendation.—** *Cities and towns of sufficient size should be indicated by the outline of their built-up areas and not of their established city limits.*

16.7.2 Railroads

16.7.2.1 All railroads having landmark value shall be shown.

Note 1.— In congested areas, some railroads may be omitted in the interest of legibility.

Note 2.— Railroads may be named where space permits.

16.7.2.2 **Recommendation.—** *Important tunnels should be shown.*

Note.— A descriptive note may be added.

16.7.3 Highways and roads

16.7.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

16.7.3.2 **Recommendation.—** *Roads should not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.*

Note.— The numbers or names of important highways may be shown.

16.7.4 Landmarks

Recommendation.— *Natural and cultural landmarks, such as bridges, prominent transmission lines, permanent cable car installations, mine structures, forts, ruins, levees, pipelines, and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, should be shown.*

Note.— Descriptive notes may be added.

16.7.5 Political boundaries

International boundaries shall be shown. Undemarcated and undefined boundaries shall be distinguished by descriptive notes.

16.7.6 Hydrography

16.7.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

16.7.6.2 **Recommendation.—** *The tint covering large open water areas should be kept very light.*

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

16.7.6.3 **Recommendation.—** *Reefs and shoals including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas should be shown by symbols when of significant landmark value.*

Note.— Groups of rocks may be shown by a few representative rock symbols within the area.

16.7.7 Contours

16.7.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

16.7.7.2 The values of the contours used shall be shown.

16.7.8 Hypsometric tints

16.7.8.1 When hypsometric tints are used the range of elevations for the tints shall be shown.

16.7.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

16.7.9 Spot elevations

16.7.9.1 Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of special value to the aviator shall be shown. The position of each selected elevation shall be indicated by a dot.

16.7.9.2 The elevation (in metres or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

16.7.9.3 **Recommendation.—** *The spot elevation of the highest point in any sheet should be cleared of hypsometric tinting.*

16.7.10 Incomplete or unreliable relief

16.7.10.1 Areas that have not been surveyed for contour information shall be labelled “Relief data incomplete”.

16.7.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows:

> “Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution.”

16.7.11 Escarpments

Recommendation.— *Escarpments should be shown when they are prominent landmarks or when cultural detail is very sparse.*

16.7.12 Wooded areas

16.7.12.1 **Recommendation.—** *Wooded areas should be shown.*

Note.— On high latitude charts, the approximate extreme northern or southern limits of tree growth may be shown.

16.7.12.2 Where shown, the approximate extreme northern or southern limits of tree growth shall be indicated by a dashed black line and shall be appropriately labelled.

16.7.13 Date of topographic information

The date of latest information shown on the topographic base shall be indicated in the margin.

16.8 Magnetic variation

16.8.1 Isogonic lines shall be shown.

16.8.2 The date of the isogonic information shall be indicated in the margin.

16.9 Aeronautical data

16.9.1 Aeronautical data shown shall be kept to a minimum consistent with the use of the chart for visual navigation and the revision cycle (see 16.9.6).

16.9.2 Aerodromes

16.9.2.1 Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

16.9.2.2 The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in Appendix 2, provided they do not cause undesirable clutter on the chart, shall be indicated.

16.9.2.3 Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

16.9.3 Obstacles

16.9.3.1 Obstacles shall be shown.

Note.— Objects of a height of 100 m (300 ft) or more above ground are normally regarded as obstacles.

16.9.3.2 When considered of importance to visual flight, prominent transmission lines and permanent cable car installations, which are obstacles, shall be shown.

16.9.4 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be shown.

16.9.5 Air traffic services system

16.9.5.1 Significant elements of the air traffic services system including, where practicable, control zones, aerodrome traffic zones, control areas, flight information regions and other airspaces in which VFR flights operate shall be shown together with the appropriate class of airspace.

16.9.5.2 Where appropriate, the air defence identification zone (ADIZ) shall be shown and properly identified.

Note.— ADIZ procedures may be described in the chart legend.

16.9.6 Radio navigation aids

Radio navigation aids shall be shown by the appropriate symbol and named, but excluding their frequencies, coded designators, times of operation and other characteristics unless any or all of this information which is shown is kept up to date by means of new editions of the chart.

16.9.7 Supplementary information

16.9.7.1 Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.

16.9.7.2 Marine lights on outer prominent coastal or isolated features of not less than 28 km (15 NM) visibility range shall be shown:

1) where they are not less distinguishable than more powerful marine lights in the vicinity;

2) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;

3) where they are the only lights of significance available.

CHAPTER 17. AERONAUTICAL CHART — ICAO 1:500 000

17.1 Function

This chart shall provide information to satisfy the requirements of visual air navigation for low speed, short- or medium-range operations at low and intermediate altitudes.

Note 1.— This chart may be used:

a) to serve as a basic aeronautical chart;

b) to provide a suitable medium for basic pilot and navigation training;

c) to supplement highly specialized charts which do not provide essential visual information;

d) in pre-flight planning.

Note 2.— It is intended that these charts be provided for land areas where charts of this scale are required for civil air operations employing visual air navigation independently or in support of other forms of air navigation.

Note 3.— Where States produce charts of this series covering their national territories, the entire area being portrayed is usually treated on a regional basis.

17.2 Availability

Recommendation.— *The Aeronautical Chart — ICAO 1:500 000 should be made available in the manner prescribed in 1.3.2 for all areas delineated in Appendix 5.*

Note.— The selection of this scale as an alternative to the World Aeronautical Chart — ICAO 1:1 000 000 is covered by 16.2.1 and 16.2.2.

17.3 Scales

17.3.1 Linear scales for kilometres and nautical miles arranged in the following order:

— kilometres,

— nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

17.3.1.1 **Recommendation.—** *The length of the linear scale should be not less than 200 mm (8 in).*

17.3.2 A conversion scale (metres/feet) shall be shown in the margin.

17.4 Format

17.4.1 The title and marginal notes shall be in one of the working languages of ICAO.

Note.— The language of the publishing country or any other language may be used in addition to the ICAO working language.

17.4.2 The information regarding the number of the adjoining sheets and the unit of measurement used to express elevation shall be so located as to be clearly visible when the sheet is folded.

17.4.3 **Recommendation.—** *The method of folding should be as follows:*

Fold the chart on the long axis near the mid-parallel of latitude, face out, with the bottom part of the chart face upward. Fold inwards near the meridian and fold both halves backward in accordion folds.

17.4.4 **Recommendation.—** *Whenever practicable, sheets should be quarter sheets of the World Aeronautical Chart — ICAO 1:1 000 000. An appropriate index to adjacent sheets, showing the relationship between the two chart series should be included on the face of the chart or on the reverse side.*

Note.— Sheet lines may be varied to satisfy particular requirements.

17.4.5 **Recommendation.—** *Overlaps should be provided by extending the chart area on the top and right side beyond the area given on the index. This overlap area should contain all aeronautical, topographical, hydrographical and cultural information. The overlap should extend up to 15 km (8 NM), if possible, but in any case from the limiting parallels and meridians of each chart to the neat line.*

17.5 Projection

17.5.1 A conformal (orthomorphic) projection shall be used.

17.5.2 **Recommendation.—** *The projection of the World Aeronautical Chart — ICAO 1:1 000 000 should be used.*

17.5.3 Parallels shall be shown at intervals of 30′.

17.5.3.1 Meridians shall normally be shown at intervals of 30′.

Note.— At high latitudes this interval may be increased.

17.5.4 Graduation marks shall be shown at 1′ intervals along each whole degree meridian and parallel, extending away from the Greenwich Meridian and from the Equator. Each 10′ interval shall be shown by a mark on both sides of the graticule line.

17.5.4.1 **Recommendation.—** *The length of the graduation marks should be approximately 1.3 mm (0.05 in) for the 1′ intervals, and 2 mm (0.08 in) for the 5′ intervals and 2 mm (0.08 in) extending on both sides of the graticule line for the 10′ intervals.*

17.5.5 All meridians and parallels shown shall be numbered in the borders of the chart.

17.5.5.1 **Recommendation.—** *Each meridian and parallel should be numbered within the body of the chart whenever this data is required operationally.*

17.5.6 The name and basic parameters of the projection shall be indicated in the margin.

17.6 Identification

17.6.1 Each sheet shall be identified by a name which should be that of the principal town or of a main geographical feature appearing on the sheet.

17.6.1.1 **Recommendation.—** *Where applicable, sheets should also be identified by the reference number of the corresponding World Aeronautical Chart — ICAO 1:1 000 000, with the addition of one or more of the following letter suffixes indicating the quadrant or quadrants:*

Letter	Chart quadrant
A	*North-West*
B	*North-East*
C	*South-East*
D	*South-West*

17.7 Culture and topography

17.7.1 Built-up areas

17.7.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

17.7.1.2 **Recommendation.—** *Cities and towns of sufficient size should be shown by the outline of their built-up areas and not of their established city limits.*

17.7.2 Railroads

17.7.2.1 All railroads having landmark value shall be shown.

Note 1.— In congested areas, some railroads may be omitted in the interest of legibility.

Note 2.— Railroads may be named.

Note 3.— Rail stations may be shown.

17.7.2.2 Tunnels shall be shown when they serve as prominent landmarks.

Note.— A descriptive note may be added, if necessary, to accentuate this feature.

17.7.3 Highways and roads

17.7.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

Note.— Roads under construction may be shown.

17.7.3.2 **Recommendation.—** *Roads should not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.*

Note.— The numbers or names of important highways may be shown.

17.7.4 Landmarks

Recommendation.— *Natural and cultural landmarks, such as bridges, mine structures, lookout towers, forts, ruins, levees, pipelines, prominent transmission lines, permanent cable car installations, and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, should be shown.*

Note.— Descriptive notes may be added.

17.7.5 Political boundaries

International boundaries shall be shown. Undemarcated or undefined boundaries shall be distinguished by descriptive notes.

Note.— Other boundaries may be shown.

17.7.6 Hydrography

17.7.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

17.7.6.2 **Recommendation.—** *The tint covering large open water areas should be kept very light.*

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

17.7.6.3 **Recommendation.—** *Reefs and shoals, including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas should be shown by symbols when of significant landmark value.*

Note.— Groups of rocks may be shown by a few representative rock symbols within the area.

17.7.7 Contours

17.7.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

17.7.7.2 The values of the contours used shall be shown.

17.7.8 Hypsometric tints

17.7.8.1 When hypsometric tints are used, the range of elevations for the tints shall be shown.

17.7.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

17.7.9 Spot elevations

17.7.9.1 Spot elevations shall be shown at selected critical points. The elevation selected shall always be the highest in the immediate vicinity and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of navigational value shall be shown. The position of each selected elevation shall be indicated by a dot.

17.7.9.2 The elevation (in metres or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

17.7.9.3 **Recommendation.—** *The spot elevation of the highest point on any sheet should be cleared of hypsometric tinting.*

17.7.10 Incomplete or unreliable relief

17.7.10.1 Areas that have not been surveyed for contour information shall be labelled “Relief data incomplete”.

17.7.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows:

> “Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution.”

17.7.11 Escarpments

Recommendation.— *Escarpments should be shown when they are prominent landmarks or when cultural detail is very sparse.*

17.7.12 Wooded areas

17.7.12.1 **Recommendation.—** *Wooded areas should be shown.*

Note.— On high latitude charts the approximate extreme northern or southern limits of tree growth may be shown.

17.7.12.2 Where shown, the approximate northern or southern limits of tree growth shall be indicated by a dashed black line and shall be appropriately labelled.

17.7.13 Date of topographic information

The date of latest information shown on the topographic base shall be indicated in the margin.

17.8 Magnetic variation

17.8.1 Isogonic lines shall be shown.

17.8.2 The date of the isogonic information shall be indicated in the margin.

17.9 Aeronautical data

17.9.1 Aeronautical information shall be shown consistent with the use of the chart and the revision cycle.

17.9.2 Aerodromes

17.9.2.1 Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

17.9.2.2 The aerodrome elevation, the lighting available, the type of runway surface and the length of the longest runway or channel, shown in abbreviated form for each aerodrome in conformity with the example given in Appendix 2, provided they do not cause undesirable clutter on the chart, shall be indicated.

17.9.2.3 Abandoned aerodromes which are still recognizable as aerodromes from the air shall be shown and identified as abandoned.

17.9.3 Obstacles

17.9.3.1 Obstacles shall be shown.

Note.— Objects of a height of 100 m (300 ft) or more above ground are normally regarded as obstacles.

17.9.3.2 When considered of importance to visual flight, prominent transmission lines and permanent cable car installations, which are obstacles, shall be shown.

17.9.4 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be shown.

17.9.5 Air traffic services system

17.9.5.1 Significant elements of the air traffic services system including, where practicable, control zones, aerodrome traffic zones, control areas, flight information regions and other airspaces in which VFR flights operate shall be shown together with the appropriate class of airspace.

17.9.5.2 Where appropriate, the air defence identification zone (ADIZ) shall be shown and properly identified.

Note.— ADIZ procedures may be described in the chart legend.

17.9.6 Radio navigation aids

Radio navigation aids shall be shown by the appropriate symbol and named, but excluding their frequencies, coded designators, times of operation and other characteristics unless any or all of this information which is shown is kept up to date by means of new editions of the chart.

17.9.7 Supplementary information

17.9.7.1 Aeronautical ground lights together with their characteristics or their identifications or both shall be shown.

17.9.7.2 Marine lights on outer prominent coastal or isolated features of not less than 28 km (15 NM) visibility range shall be shown:

1) where they are not less distinguishable than more powerful marine lights in the vicinity;

2) where they are readily distinguishable from other marine or other types of lights in the vicinity of built-up coastal areas;

3) where they are the only lights of significance available.

CHAPTER 18. AERONAUTICAL NAVIGATION CHART — ICAO SMALL SCALE

18.1 Function

This chart shall:

1) serve as an air navigation aid for flight crews of long range aircraft at high altitudes;

2) provide selective checkpoints over extensive ranges for identification at high altitudes and speeds, which are required for visual confirmation of position;

3) provide for continuous visual reference to the ground during long range flights over areas lacking radio or other electronic navigation aids, or over areas where visual navigation is preferred or becomes necessary;

4) provide a general purpose chart series for long range flight planning and plotting.

18.2 Availability

Recommendation.— *The Aeronautical Navigation Chart — ICAO Small Scale should be made available in the manner prescribed in 1.3.2 for all areas delineated in Appendix 5.*

Note.— The selection of this scale as an alternative to the World Aeronautical Chart — ICAO 1:1 000 000 is covered by 16.2.1 and 16.2.2.

18.3 Coverage and scale

18.3.1 **Recommendation.—** *The Aeronautical Navigation Chart — ICAO Small Scale should provide, as a minimum, complete coverage of the major land masses of the world.*

Note 1.— A sheet layout for this series is contained in the Aeronautical Chart Manual *(Doc 8697).*

Note 2.— The sheet size may represent the maximum press size available to the producing agency.

18.3.2 The scale shall be in the range of 1:2 000 000 to 1:5 000 000.

18.3.3 The scale of the chart shall be substituted in the title for the words “Small Scale”.

18.3.4 Linear scales for kilometres and nautical miles arranged in the following order:

— kilometres,

— nautical miles,

with their zero points in the same vertical line shall be shown in the margin.

18.3.5 **Recommendation.—** *The length of the linear scale should be not less than 200 mm (8 in).*

18.3.6 A conversion scale (metres/feet) shall be shown in the margin.

18.4 Format

18.4.1 The title and marginal notes shall be in one of the working languages of ICAO.

Note.— The language of the publishing country or any other language may be used in addition to the ICAO working language.

18.4.2 The information regarding the number of the adjoining sheets and the unit of measurement to express elevations shall be so located as to be clearly visible when the sheet is folded.

Note.— There is no internationally agreed sheet numbering.

18.5 Projection

18.5.1 A conformal (orthomorphic) projection shall be used.

18.5.1.1 The name and basic parameters of the projection shall be shown in the margin.

18.5.2 Parallels shall be shown at intervals of 1°.

18.5.2.1 Graduations on the parallels shall be shown at sufficiently close intervals compatible with the latitude and the scale of the chart.

18.5.3 Meridians shall be shown at intervals compatible with the latitude and the scale of the chart.

18.5.3.1 Graduations on the meridians shall be shown at intervals not exceeding 5′.

18.5.4 The graduation marks shall extend away from the Greenwich Meridian and from the Equator.

18.5.5 All meridians and parallels shown shall be numbered in the borders of the chart. In addition, when required, meridians and parallels shall be numbered within the body of the chart in such a manner that they can be readily identified when the chart is folded.

18.6 Culture and topography

18.6.1 Built-up areas

18.6.1.1 Cities, towns and villages shall be selected and shown according to their relative importance to visual air navigation.

18.6.1.2 **Recommendation.—** *Cities and towns of sufficient size should be indicated by the outline of their built-up areas and not of their established city limits.*

18.6.2 Railroads

18.6.2.1 All railroads having landmark value shall be shown.

Note.— In congested areas, some railroads may be omitted in the interest of legibility.

18.6.2.2 **Recommendation.—** *Important tunnels should be shown.*

Note.— A descriptive note may be added.

18.6.3 Highways and roads

18.6.3.1 Road systems shall be shown in sufficient detail to indicate significant patterns from the air.

18.6.3.2 **Recommendation.—** *Roads should not be shown in built-up areas unless they can be distinguished from the air as definite landmarks.*

18.6.4 Landmarks

Recommendation.— *Natural and cultural landmarks, such as bridges, prominent transmission lines, permanent cable car installations, mine structures, forts, ruins, levees, pipelines and rocks, bluffs, cliffs, sand dunes, isolated lighthouses, lightships, etc., when considered to be of importance for visual air navigation, should be shown.*

Note.— Descriptive notes may be added.

18.6.5 Political boundaries

International boundaries shall be shown. Undemarcated and undefined boundaries shall be distinguished by descriptive notes.

18.6.6 Hydrography

18.6.6.1 All water features compatible with the scale of the chart comprising shore lines, lakes, rivers and streams (including those non-perennial in nature), salt lakes, glaciers and ice caps shall be shown.

18.6.6.2 **Recommendation.—** *The tint covering large open water areas should be kept very light.*

Note.— A narrow band of darker tone may be used along the shore line to emphasize this feature.

18.6.6.3 **Recommendation.—** *Reefs and shoals including rocky ledges, tidal flats, isolated rocks, sand, gravel, stone and all similar areas should be shown by a symbol when of significant landmark value.*

18.6.7 Contours

18.6.7.1 Contours shall be shown. The selection of intervals shall be governed by the requirement to depict clearly the relief features required in air navigation.

18.6.7.2 The values of the contours used shall be shown.

18.6.8 Hypsometric tints

18.6.8.1 When hypsometric tints are used the range of elevations for the tints shall be shown.

18.6.8.2 The scale of the hypsometric tints used on the chart shall be shown in the margin.

18.6.9 Spot elevations

18.6.9.1 Spot elevations shall be shown at selected critical points. The elevations selected shall always be the highest in the immediate vicinity, and shall generally indicate the top of a peak, ridge, etc. Elevations in valleys and at lake surface levels which are of value to visual air navigation shall be shown. The position of each selected elevation shall be indicated by a dot.

18.6.9.2 The elevation (in metres or feet) of the highest point on the chart and its geographical position to the nearest five minutes shall be indicated in the margin.

18.6.9.3 **Recommendation.—** *The spot elevation of the highest point in any sheet should be cleared of hypsometric tinting.*

18.6.10 Incomplete or unreliable relief

18.6.10.1 Areas that have not been surveyed for contour information shall be labelled "Relief data incomplete".

18.6.10.2 Charts on which spot elevations are generally unreliable shall bear a warning note prominently displayed on the face of the chart in the colour used for aeronautical information, as follows:

"Warning — The reliability of relief information on this chart is doubtful and elevations should be used with caution."

18.6.11 Escarpments

Recommendation.— *Escarpments should be shown when they are prominent landmarks or when cultural detail is very sparse.*

18.6.12 Wooded areas

Recommendation.— *Wooded areas of large extent should be shown.*

18.6.13 Date of topographic information

The date of latest information shown on the topographic base shall be indicated in the margin.

18.6.14 Colours

18.6.14.1 **Recommendation.—** *Subdued colours should be used for the chart background to facilitate plotting.*

18.6.14.2 **Recommendation.—** *Good colour contrast should be ensured to emphasize features important to visual air navigation.*

18.7 Magnetic variation

18.7.1 Isogonic lines shall be shown.

18.7.2 The date of isogonic information shall be indicated in the margin.

18.8 Aeronautical data

18.8.1 Aerodromes

Land and water aerodromes and heliports shall be shown with their names, to the extent that they do not produce undesirable congestion on the chart, priority being given to those of greatest aeronautical significance.

18.8.2 Obstacles

Obstacles shall be shown.

18.8.3 Prohibited, restricted and danger areas

Recommendation.— *Prohibited, restricted and danger areas should be shown when considered to be of importance to air navigation.*

18.8.4 Air traffic services system

18.8.4.1 **Recommendation.—** *Significant elements of the air traffic services system should be shown when considered to be of importance to air navigation.*

18.8.4.2 **Recommendation.—** *Where appropriate, the air defence identification zone (ADIZ) should be shown and properly identified.*

Note.— ADIZ procedures may be described in the chart legend.

18.8.5 Radio navigation aids

Note.— Radio aids to navigation may be shown by the appropriate symbol and named.

CHAPTER 19. PLOTTING CHART — ICAO

19.1 Function

This chart shall provide a means of maintaining a continuous flight record of the aircraft position by various fixing methods and dead reckoning in order to maintain an intended flight path.

19.2 Availability

Recommendation.— *This chart should be made available, in the manner prescribed in 1.3.2, to cover major air routes over oceanic areas and sparsely settled areas used by international civil aviation.*

Note.— In areas where the Enroute Chart — ICAO is provided there may be no requirement for a plotting chart.

19.3 Coverage and scale

19.3.1 **Recommendation.—** *Where practicable, the chart for a particular region should cover major air routes and their terminals on a single sheet.*

19.3.2 **Recommendation.—** *The scale should be governed by the area to be covered.*

Note.— Normally the scale will range from 1:3 000 000 to 1:7 500 000.

19.4 Format

Recommendation.— *The sheet should be of a size that can be adapted for use on a navigator's plotting table.*

19.5 Projection

19.5.1 **Recommendation.—** *A conformal projection on which a straight line approximates a great circle should be used.*

19.5.2 Parallels and meridians shall be shown.

19.5.2.1 **Recommendation.—** *The intervals should be arranged to permit accurate plotting to be carried out with a minimum of time and effort.*

19.5.2.2 Graduation marks shall be shown at consistent intervals along an appropriate number of parallels and meridians. The interval selected shall, regardless of scale, minimize the amount of interpolation required for accurate plotting.

19.5.2.3 **Recommendation.—** *Parallels and meridians should be numbered so that a number appears at least once every 15 cm (6 in) on the face of the chart.*

19.5.2.4 If a navigational grid is shown on charts covering the higher latitudes, it shall comprise lines parallel to the Meridian or anti-Meridian of Greenwich.

19.6 Identification

Each sheet shall be identified by chart series and number.

19.7 Culture and topography

19.7.1 Generalized shore lines of all open water areas, large lakes and rivers shall be shown.

19.7.2 Spot elevations for selected features constituting a hazard to air navigation shall be shown.

19.7.3 **Recommendation.—** *Particularly hazardous or prominent relief features should be emphasized.*

Note.— Large cities and towns may be shown.

19.8 Magnetic variation

19.8.1 Isogonals or, in higher latitudes, isogrivs, or both, shall be shown at consistent intervals throughout the chart. The interval selected shall, regardless of scale, minimize the amount of interpolation required.

19.8.2 The date of the isogonic information shall be shown.

19.9 Aeronautical data

19.9.1 The following aeronautical data shall be shown:

1) aerodromes regularly used by international commercial air transport together with their names;

2) selected radio aids to navigation that will contribute to position-finding together with their names and identifications;

3) lattices of long-range electronic aids to navigation, as required;

4) boundaries of flight information regions, control areas and control zones necessary to the function of the chart;

5) designated reporting points necessary to the function of the chart;

6) ocean station vessels.

Note.— Other aeronautical data may be shown provided that they do not detract from the legibility of essential information.

19.9.2 **Recommendation.—** *Aeronautical ground lights and marine lights useful for air navigation should be shown where other means of navigation are non-existent.*

CHAPTER 20. ELECTRONIC AERONAUTICAL CHART DISPLAY — ICAO

20.1 Function

The Electronic Aeronautical Chart Display — ICAO, with adequate back-up arrangements and in compliance with the requirements of Annex 6 for charts, shall enable flight crews to execute, in a convenient and timely manner, route planning, route monitoring and navigation by displaying required information.

20.2 Information available for display

20.2.1 The Electronic Aeronautical Chart Display — ICAO shall be capable of displaying all aeronautical, cultural and topographic information required by Annex 4, Chapter 5 and Chapters 7 through 19.

20.2.2 **Recommendation.—** *The Electronic Aeronautical Chart Display — ICAO should be capable of displaying all aeronautical, cultural and topographic information recommended by Annex 4, Chapter 5 and Chapters 7 through 19.*

Note.— The Electronic Aeronautical Chart Display — ICAO may display supplementary information, in addition to that required for the equivalent paper chart, which may be considered useful for safe navigation.

20.3 Display requirements

20.3.1 Display categories

20.3.1.1 Information available for display shall be subdivided into the following categories:

a) basic display information, permanently retained on the display and consisting of the minimum information essential for the safe conduct of flight; and

b) other display information, which may be removed from the display or displayed individually on demand, and consisting of information not considered essential for the safe conduct of flight.

20.3.1.2 It shall be a simple function to add or remove other display information but shall not be possible to remove information contained in the basic display.

20.3.2 Display mode and generation of neighbouring area

20.3.2.1 The Electronic Aeronautical Chart Display — ICAO shall be capable of continuously plotting the aircraft's position in a true motion mode where reset and generation of the surrounding area shall take place automatically.

Note.— Other modes, such as static chart displays, may be available.

20.3.2.2 It shall be possible manually to change the chart area and the position of the aircraft relative to the edge of the display.

20.3.3 Scale

It shall be possible to vary the scale at which a chart is displayed.

20.3.4 Symbols

Symbols used shall conform to those specified for electronic charts in Appendix 2 — ICAO Chart Symbols except where it is desired to show items for which no ICAO chart symbol is provided. In these cases electronic chart symbols shall be chosen which:

a) employ a minimum use of lines, arcs and area fills;

b) do not cause confusion with any existing aeronautical chart symbol;

c) do not impair the legibility of the display.

Note.— Additional details for each symbol may be added according to the resolution of the output media, but any enhancements may not change the basic recognizability of the symbol.

20.3.5 Display hardware

20.3.5.1 The effective size of the chart presentation shall be sufficient to display the information required by 20.2 without excessive scrolling.

20.3.5.2 The display shall have the capabilities required to accurately portray required elements of Appendix 2 — ICAO Chart Symbols.

20.3.5.3 The method of presentation shall ensure that the displayed information is clearly visible to the observer in the conditions of natural and artificial light experienced in the cockpit.

20.3.5.4 The display luminance shall be adjustable by the flight crew.

20.4 Provision and updating of data

20.4.1 The provision and updating of data for use by the display shall be in conformance with the aeronautical data quality system requirements.

Note.— For aeronautical data quality system requirements see Chapter 2, 2.17 and Annex 15, Chapter 3, 3.2.

20.4.2 The display shall be capable of automatically accepting authorized updates to existing data. A means of ensuring that authorized data and all relevant updates to that data have been correctly loaded into the display shall be provided.

20.4.3 The display shall be capable of accepting updates to authorized data entered manually with simple means for verification prior to final acceptance of the data. Updates entered manually shall be distinguishable on the display from authorized data and its authorized updates and shall not affect display legibility.

20.4.4 A record shall be kept of all updates, including date and time of application.

20.4.5 The display shall allow the flight crew to display updates so that the flight crew may review the contents of the updates and determine that they have been included in the system.

20.5 Performance tests, malfunction alarms and indications

20.5.1 A means shall be provided for carrying out on-board tests of major functions. In case of a failure, the test shall display information to indicate which part of the system is at fault.

20.5.2 A suitable alarm or indication of system malfunction shall be provided.

20.6 Back-up arrangements

To ensure safe navigation in case of a failure of the Electronic Aeronautical Chart Display — ICAO, the provision of adequate back-up arrangements shall include:

a) facilities enabling a safe takeover of display functions in order to ensure that a failure does not result in a critical situation; and

b) a back-up arrangement facilitating the means for safe navigation of the remaining part of the flight.

Note.— A suitable back-up system may include the carriage of paper charts.

CHAPTER 21. RADAR MINIMUM ALTITUDE CHART — ICAO

21.1 Function

21.1.1 This supplementary chart shall provide information that will enable flight crews to monitor and cross-check altitudes assigned while under radar control.

Note.— The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. Therefore, pilots are at all times responsible to ensure that any clearances issued by air traffic control units are safe in this respect, except when an IFR flight is vectored by radar. See the Procedures for Air Navigation Services — Air Traffic Management *(PANS-ATM, Doc 4444), Chapter 8, 8.6.5.2.*

21.1.2 A note indicating that the chart may only be used for cross-checking of altitudes assigned while under radar control shall be prominently displayed on the face of the chart.

21.2 Availability

Recommendation.— *The Radar Minimum Altitude Chart — ICAO should be made available, in the manner prescribed in 1.3.2, where radar vectoring procedures are established and radar minimum altitudes cannot be shown adequately on the Area Chart — ICAO, Standard Departure Chart — Instrument (SID) — ICAO or Standard Arrival Chart — Instrument (STAR) — ICAO.*

21.3 Coverage and scale

21.3.1 The coverage of the chart shall be sufficient to effectively show the information associated with radar vectoring procedures.

21.3.2 The chart shall be drawn to scale.

21.3.3 **Recommendation.—** *The chart should be drawn to the same scale as the associated Area Chart — ICAO.*

21.4 Projection

21.4.1 **Recommendation.—** *A conformal projection on which a straight line approximates a geodesic line should be used.*

21.4.2 **Recommendation.—** *Graduation marks should be placed at consistent intervals along the neat lines, as appropriate.*

21.5 Identification

The chart shall be identified by the name of the aerodrome for which the radar vectoring procedures are established or, when procedures apply to more than one aerodrome, the name associated with the airspace portrayed.

Note.— The name may be that of the city which the aerodrome serves or, when the procedures apply to more than one aerodrome, that of the air traffic services centre or the largest city or town situated in the area covered by the chart.

21.6 Culture and topography

21.6.1 Generalized shorelines of all open water areas, large lakes and rivers shall be shown except where they conflict with data more applicable to the function of the chart.

21.6.2 Appropriate spot elevations and obstacles shall be shown.

Note.— Appropriate spot elevations and obstacles are those provided by the procedures specialist.

21.7 Magnetic variation

The average magnetic variation of the area covered by the chart shall be shown to the nearest degree.

21.8 Bearings, tracks and radials

21.8.1 Bearings, tracks and radials shall be magnetic, except as provided for in 21.8.2.

21.8.2 **Recommendation.—** *In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, should be used.*

21.8.3 Where bearings, tracks or radials are given with reference to True North or Grid North, this shall be clearly indicated. When Grid North is used its reference grid meridian shall be identified.

21.9 Aeronautical data

21.9.1 Aerodromes

21.9.1.1 All aerodromes that affect the terminal routings shall be shown. Where appropriate a runway pattern symbol shall be used.

21.9.1.2 The elevation of the primary aerodrome to the nearest metre or foot shall be shown.

21.9.2 Prohibited, restricted and danger areas

Prohibited, restricted and danger areas shall be depicted with their identification.

21.9.3 Air traffic services system

21.9.3.1 The chart shall show components of the established air traffic services system including:

1) relevant radio navigation aids together with their identifications;

2) lateral limits of relevant designated airspace;

3) relevant significant points associated with standard instrument departure and arrival procedures;

   Note.— Routes used in the vectoring of aircraft to and from the significant points may be shown.

4) transition altitude, where established;

5) information associated with radar vectoring including:

   a) radar minimum altitudes to the nearest higher 50 m or 100 ft, clearly identified;

   b) lateral limits of radar minimum altitude sectors normally defined by bearings and radials to/from radio navigation aids to the nearest degree or, if not practicable, geographical coordinates in degrees, minutes and seconds and shown by heavy lines so as to clearly differentiate between established radar sectors;

      Note.— In congested areas geographical coordinates may be omitted in the interest of legibility.

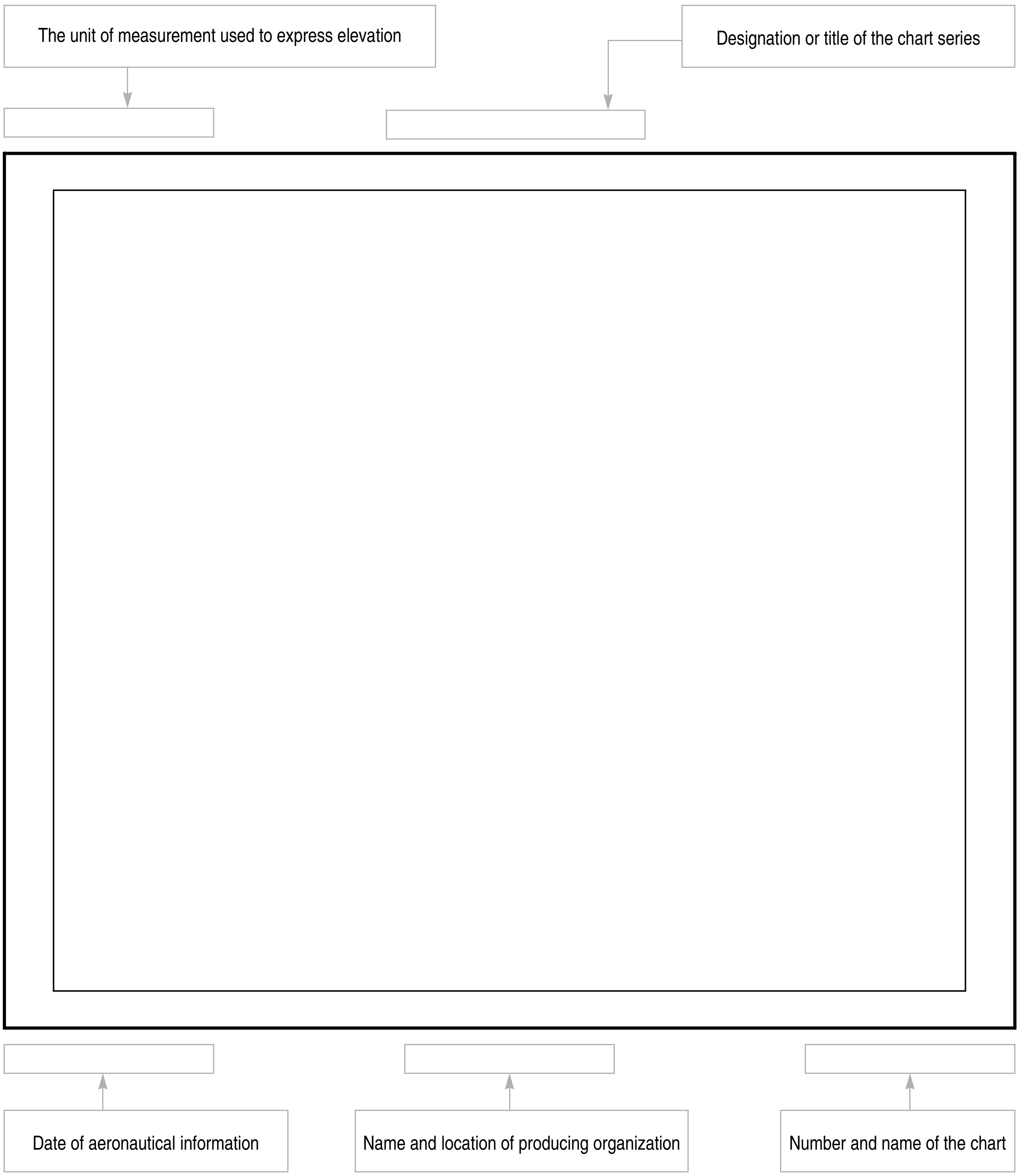
   c) distance circles at 20-km or 10-NM intervals or, when practicable, 10-km or 5-NM intervals shown as fine dashed lines with the radius indicated on the circumference and centred on the identified aerodrome main VOR radio navigation aid or, if not available, on the aerodrome/heliport reference point;

   d) notes concerning correction for low temperature effect, as applicable;

6) radio communications procedures including call sign(s) and frequency(ies) of approach/radar unit(s).

21.9.3.2 **Recommendation.—** *A textual description of communication failure procedures in relation to radar control should be provided and should, whenever feasible, be shown on the chart or on the same page that contains the chart.*

APPENDIX 1. MARGINAL NOTE LAYOUT



APPENDIX 2. ICAO CHART SYMBOLS

Annex 4 — Aeronautical Charts *Appendix 2*

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Appendix 2 *Annex 4 - Aeronautical Charts*

TOPOGRAPHY

1	Contours	5000
2	Approximate contours	5500
3	Relief shown by hachures	
4	Bluff, cliff or escarpment	
5	Lava flow	
6	Sand dunes	
7	Sand area	

8	Gravel		
9	Levee or esker	Alternative	
10	Unusual land features appropriately labelled		Many Small Volcanoes Rock Outcrop
	Active volcano		
11	Mountain pass		5395

12	Highest elevation on chart	Alternative	17456 .17456
13	Spot elevation		.6397 .8975
14	Spot elevation (of doubtful accuracy)		.6370±
15	Coniferous trees		
16	Other trees		
17	Palms		

18	Areas not surveyed for contour information or relief data incomplete	Caution

HYDROGRAPHY

19	Shore line (reliable)		
20	Shore line (unreliable)		
21	Tidal flats		
22	Coral reefs and ledges		
23	Large river (perennial)		
24	Small river (perennial)		
25	Rivers and streams (non-perennial)	Alternative	
26	Rivers and streams (unsurveyed)		
27	Rapids		
28	Falls		
29	Canal		

30	Abandoned canal *Note.— Dry canal having landmark value.*		
31	Lakes (perennial)		
32	Lakes (non-perennial)	Alternative	
33	Salt lake		
34	Salt pans (evaporator)		
35	Swamp		
36	Rice field	Alternative	
37	Spring, well or water hole	perennial	
		intermittent	

38	Reservoir		*Reservoir*
39	Dry lake bed	Alternative	
40	Wash	Alternative	
41	Shoals		
42	Glaciers and ice caps		
43	Danger line (2 m or one fathom line)		
44	Charted isolated rock		+
45	Rock awash		
46	Unusual water features appropriately labelled		*Covered Reef*

Annex 4 - Aeronautical Charts *Appendix 2*

CULTURE

BUILT-UP AREAS

47	City or large town	
48	Town	
49	Village	
50	Buildings	

RAILROADS

51	Railroad (single track)	
52	Railroad (two or more tracks)	
53	Railroad (under construction)	
54	Railroad bridge	
55	Railroad tunnel	
56	Railroad station	

HIGHWAYS AND ROADS

57	Dual highway	
58	Primary road	
59	Secondary road	
60	Trail	
61	Road bridge	
62	Road tunnel	

MISCELLANEOUS

63	Boundaries (international)	
64	Outer boundaries	
65	Fence	
66	Telegraph or telephone line (when a landmark)	—T—T—
67	Dam	
68	Ferry	

MISCELLANEOUS (Cont.)

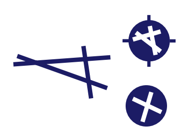
69	Pipeline	Pipeline
70	Oil or gas field	
71	Tank farms	
72	Nuclear power station	
73	Coast guard station	
74	Lookout tower	
75	Mine	
76	Forest ranger station	
77	Race track or stadium	
78	Ruins	
79	Fort	
80	Church	
81	Mosque	
82	Pagoda	
83	Temple	

AERODROMES

84	Civil	Land	
85	Civil	Water	
86	Military	Land	
87	Military	Water	

88	Joint civil and military	Land	
89	Joint civil and military	Water	
90	Emergency aerodrome or aerodrome with no facilities		
91	Abandoned or closed aerodrome		X

92	Sheltered anchorage	
93	Aerodrome for use on charts on which aerodrome classification is not required e.g. Enroute Charts	
94	Heliport *Note.— Aerodrome for the exclusive use of helicopters*	H

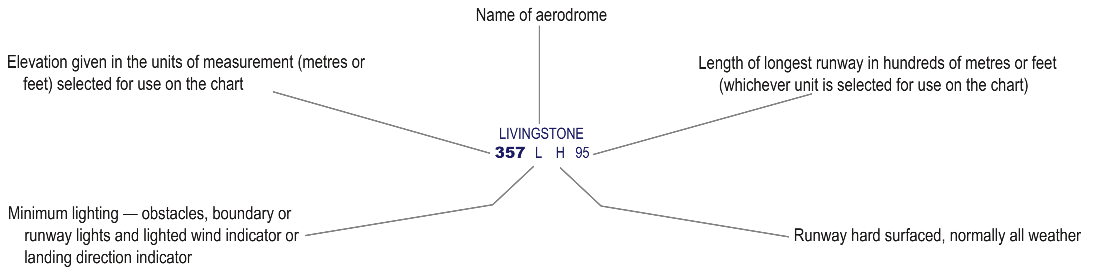
95	*Note.— Where required by the function of the chart, the runway pattern of the aerodrome may be shown in lieu of the aerodrome symbol, for example:*	

AERODROMES *(Cont.)*

AERODROME DATA IN ABBREVIATED FORM WHICH MAY BE IN ASSOCIATION WITH AERODROME SYMBOLS

(Reference: 16.9.2.2 and 17.9.2.2)

96

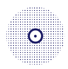
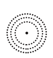
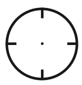
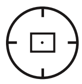


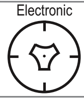
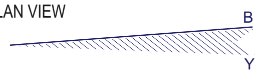
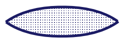
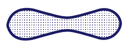
Note.— A dash (—) is to be inserted where L or H do not apply.

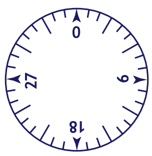
AERODROME SYMBOLS FOR APPROACH CHARTS

97	Aerodromes affecting the traffic pattern on the aerodrome on which the procedure is based		98	The aerodrome on which the procedure is based	

RADIO NAVIGATION AIDS*

99	Basic radio navigation aid symbol *Note.— This symbol may be used with or without a box to enclose the data.*			
				Electronic
100	Non-directional radio beacon	NDB		
101	VHF omnidirectional radio range	VOR		
102	Distance measuring equipment	DME		
103	Collocated VOR and DME radio navigation aids	VOR/DME		
104	DME distance	Distance in kilometres (nautical miles) to DME → Identification of radio navigation aid →	15 km KAV	
105	VOR radial	Radial bearing from, and identification of, VOR	R 090 KAV	
106	UHF tactical air navigation aid	TACAN		

					Electronic
107	Collocated VOR and TACAN radio navigation aids	VORTAC			
108	Instrument landing system	ILS	PLAN VIEW		B Y
			Electronic		FRONT COURSE
					BACK COURSE
			PROFILE		
			Electronic		GLIDE PATH
109	Radio marker beacon		Elliptical		
			Bone Shape		
	Note.— Marker beacon may be shown by outline, or stipple, or both.				

110	Compass rose To be orientated on the chart in accordance with the alignment of the station (normally Magnetic North)		Compass rose to be used as appropriate in combination with the following symbols:	

VOR	
VOR/DME	
TACAN	
VORTAC	

Note.— Additional points of compass may be added as required.

* *Note.— Guidance material on the presentation of radio navigation aid data is given in the* Aeronautical Chart Manual *(Doc 8697).*

Annex 4 - Aeronautical Charts *Appendix 2*

AIR TRAFFIC SERVICES

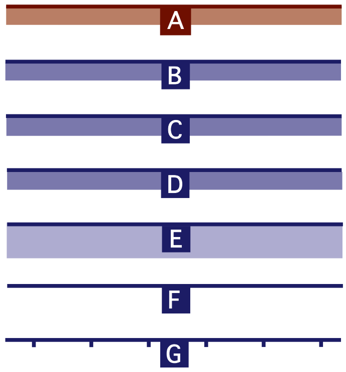
111	Flight information region	FIR		
112	Aerodrome traffic zone	ATZ		
113	Control area Airway Controlled route	CTA AWY	Alternative	
114	Uncontrolled route			
115	Advisory airspace	ADA		
116	Control zone	CTR		
117	Air defence identification zone	ADIZ		ADIZ
118	Advisory route	ADR	Alternative	

119	Visual flight path	compulsory with radio communication requirement		R
		compulsory, without radio communication requirement		R
		recommended		
120	Scale-break (on ATS route)		Alternative	
121	Reporting point	REP	Compulsory	
			On request	
122	Change-over point To be superimposed on the appropriate route symbol at right angles to the route	COP		26 36
123	ATS/MET reporting point	MRP	Compulsory	
			On request	
124	Waypoint WPT	Flyover WPT (also used for start point and end point of a controlled turn)		
		Fly-by WPT		
125	Final approach fix	FAF		

126	Altitudes/flight levels	Altitude/flight level "window"	$\overline{17\ 000}$ $\underline{10\ 000}$	$\overline{\text{FL }220}$ $\underline{10\ 000}$
		"At or above" altitude/flight level	$\underline{7\ 000}$	$\underline{\text{FL }70}$
		"At or below" altitude/flight level	$\overline{5\ 000}$	$\overline{\text{FL }50}$
		"Mandatory" altitude/flight level	$\overline{\underline{3\ 000}}$	$\overline{\underline{\text{FL }30}}$
		"Recommended" procedure altitude/flight level	5 000	FL 50
		"Expected" altitude	Expect 5 000	Expect FL 50
	Note.– For use only on SID and STAR charts. Not intended for depiction of minimum obstacle clearance altitude.			

Appendix 2 *Annex 4 - Aeronautical Charts*

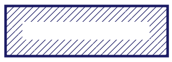
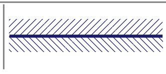
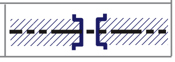
AIRSPACE CLASSIFICATIONS

127	Airspace classifications	

Aeronautical data in abbreviated form to be used in association with airspace classification symbols:

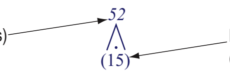
128		TMA DONLON 119.1 C 200m AGL - FL 245 Type / Name or call sign / Radio frequency(ies) / Airspace classification / Vertical limits
	Alternative	C TMA DONLON FL 245 200m AGL 119.1

AIRSPACE RESTRICTIONS

129	Restricted airspace (prohibited, restricted or danger area) *Note.– The angle and density of rulings may be varied according to scale and the size, shape and orientation of the area.*		Common boundary of two areas	
130	International boundary closed to passage of aircraft except through air corridor			

OBSTACLES

131	Obstacle	
132	Lighted obstacle	
133	Group obstacles	
134	Lighted group obstacles	

135	Exceptionally high obstacle (optional symbol)	
136	Exceptionally high obstacle - lighted (optional symbol) *Note.– For obstacles having a height of the order of 300 m (1 000 ft) above terrain.*	
137	Elevation of top (italics) *52* (15) Height above specified datum (upright type in parentheses)	

MISCELLANEOUS

138	Prominent transmission line		139	Isogonic line or isogonal	—— 3° E ——	140	Ocean station vessel (normal position)	

VISUAL AIDS

141	Marine light *Note 2.– Characteristics are to be indicated as follows:*	F ●		*Note 1.– Marine alternating lights are red and white unless otherwise indicated. Marine lights are white unless colours are stated.*
	Alt Alternating B Blue F Fixed	Fl Flashing G Green Gp Group	Occ Occulting R Red SEC Sector	sec Second (U) Unwatched W White
142	Aeronautical ground light		Electronic 	
143	Lightship			

SYMBOLS FOR AERODROME/HELIPORT CHARTS

144	Hard surface runway		
145	Unpaved runway		
146	Stopway	SWY	
147	Taxiways and parking areas		
148	Helicopter alighting area on an aerodrome		H
149	Aerodrome reference point	ARP	
150	VOR check-point		
151	Runway visual range (RVR) observation site		

152	Pierced steel plank or steel mesh runway		
153	Point light		
154	Obstacle light		
155	Landing direction indicator (lighted)		T
156	Landing direction indicator (unlighted)		T
157	Stop bar		•••
158	Runway-holding position	Pattern A	
		Pattern B	

Note.– For application, see Annex 14, Volume I, paragraph 5.2.10.

SYMBOLS FOR AERODROME OBSTACLE CHARTS - TYPE A, B AND C

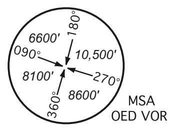
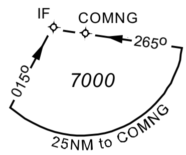
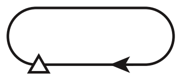
		Plan	Profile
159	Tree or shrub		Identification number 1
160	Pole, tower, spire, antenna, etc.		
161	Building or large structure		
162	Railroad		
163	Transmission line or overhead cable	—T—T—	

			Plan	Profile
164	Terrain penetrating obstacle plane			
165	Escarpment			
166	Stopway	SWY		
167	Clearway	CWY		

Appendix 2 *Annex 4 - Aeronautical Charts*

ADDITIONAL SYMBOLS FOR USE ON PAPER AND ELECTRONIC CHARTS

PLAN VIEW

168	Minimum sector altitude *Note.– This symbol may be modified to reflect particular sector shapes.*	MSA	
169	Terminal arrival altitude *Note.– This symbol may be modified to reflect particular TAA shapes.*	TAA	
170	Holding pattern		
171	Missed approach track		

PROFILE

172	Runway	
173	Radio navigation aid (type of aid and its use in the procedure to be annotated on top of the symbol)	
174	Radio marker beacon (type of beacon to be annotated on top of the symbol)	
175	Collocated radio navigation aid and marker beacon (type of aid to be annotated on top of the symbol)	
176	DME fix (distance from DME and the fix use in the procedure to be annotated on top of the symbol)	
177	Collocated DME fix and marker beacon (distance from DME and the type of beacon to be annotated on top of the symbol)	

APPENDIX 3. COLOUR GUIDE

(Ref. 2.11.1)

CHART SYMBOLS

Culture, except highways and roads; outlines of large cities, grids and graticules; spot elevations; danger lines and off-shore rocks; names and lettering except for aeronautical and hydrographic features		BLACK
Built-up areas of cities		BLACK Stipple
Highways and roads	Optional colours	BLACK Half-tone
		RED
Built-up areas for cities (alternative to black stipple)		YELLOW
Contours and topographic features: Items 1 through 10 of Appendix 2. Hydrographic features: Items 39 through 41 of Appendix 2		BROWN
Shore lines, drainage, rivers, lakes, bathymetric contours and other hydrographic features including their names or description		BLUE
Open water areas		BLUE Half-tone
Salt lakes and salt pans		BLUE Stipple
Large non-perennial rivers and non-perennial lakes		BLUE Stipple
Aeronautical data, except for Enroute and Area Charts - ICAO, where different colours may be required. Both colours may be used on the same sheet but, where only one colour is used, dark blue is preferred	Optional colours	MAGENTA
		DARK BLUE

CHART SYMBOLS *(Cont.)*

Woods		GREEN
Areas which have not been surveyed for contour information or relief data are incomplete	Optional colours	GOLDEN BUFF
		WHITE

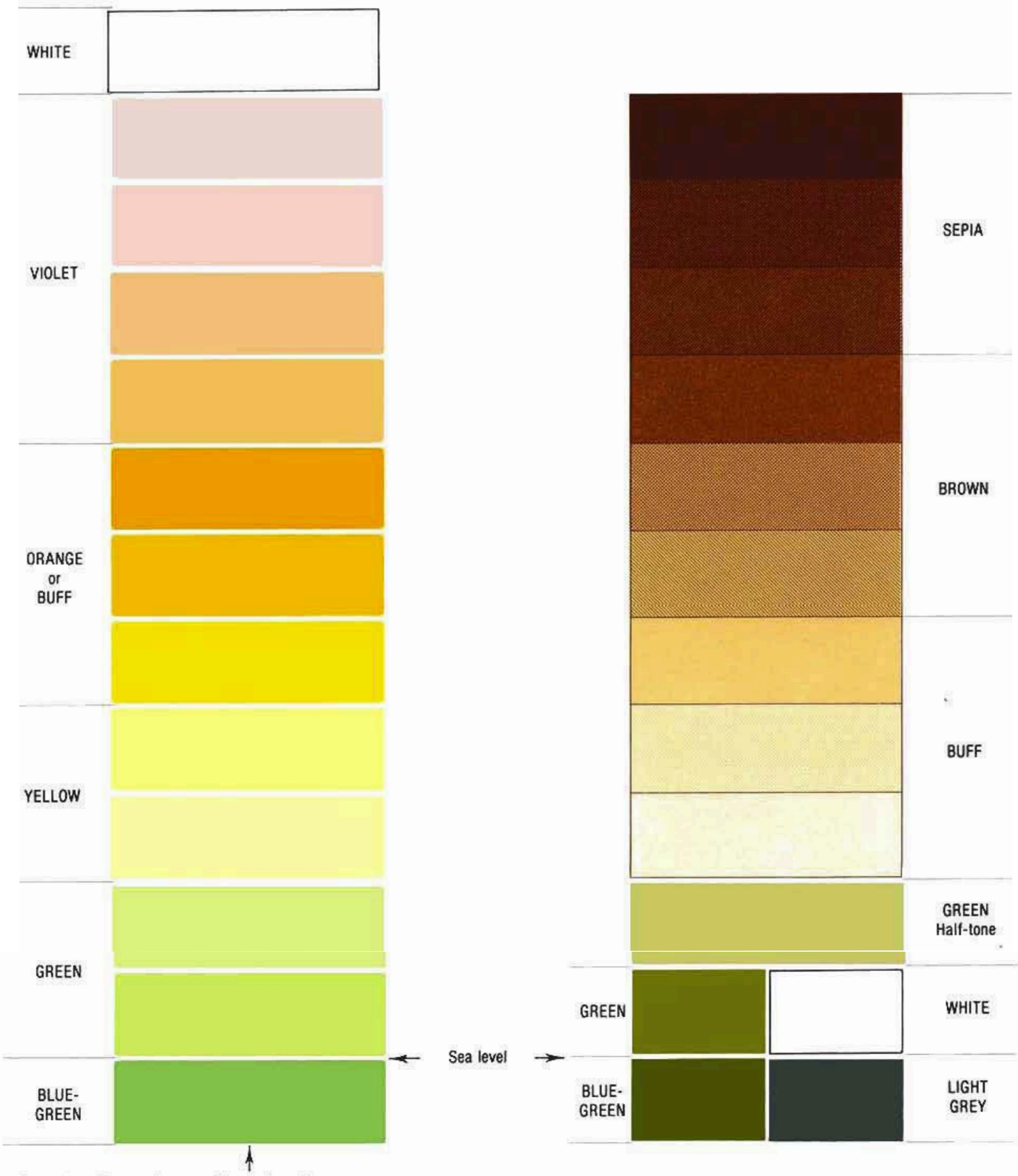
HYPSOMETRIC TINTS

WHITE	Tint for extreme elevation		SEPIA
VIOLET			
ORANGE or BUFF	Tint for higher range elevations		BROWN
YELLOW	Tint for middle range elevations		BUFF
GREEN	Tint for lower range elevations	Optional colours	GREEN
			WHITE
BLUE GREEN	Tint for areas below sea level	Optional colours	BLUE-GREEN
			LIGHT GREY

Note.— Basic tints are identical to those specified for the International Map of the World

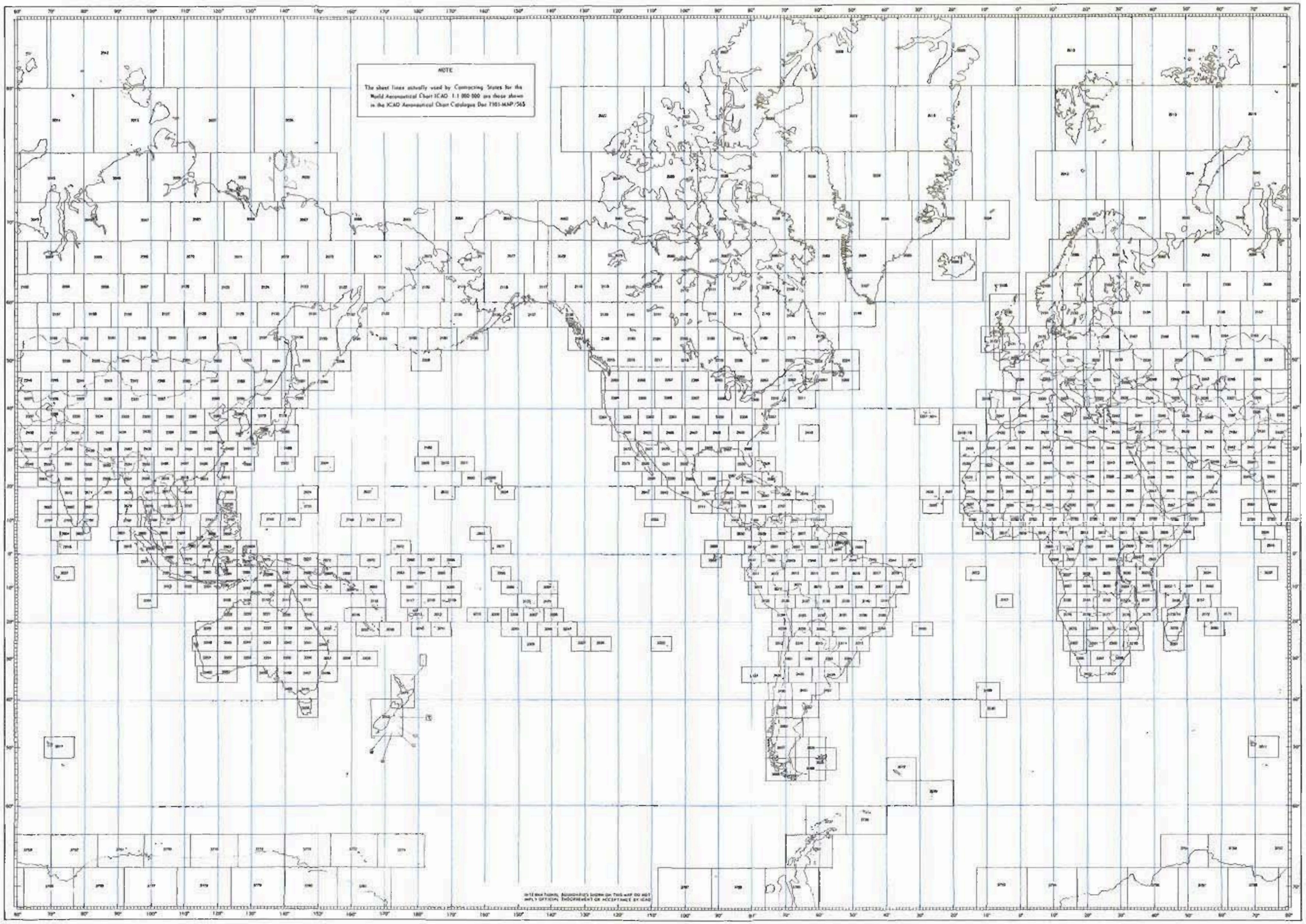
APPENDIX 4. HYPSOMETRIC TINT GUIDE

(Alternative systems, reference 2.12.2)



Note 1.— These tints are identical to those specified for the International Map of the World

Note 2.— Elevations have not been associated with tints of either system in order to allow for flexibility in their selection.


NOTE
The sheet lines actually used by Contracting States for the World Aeronautical Chart ICAO 1:1 000 000 are those shown in the ICAO Aeronautical Chart Catalogue Doc 7101-MAP/565

APPENDIX 6. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Chart resolution	Integrity Classification
Flight information region boundary points	as plotted	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	as plotted	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	as plotted	1×10^{-5} essential
CTA/CTZ boundary points	as plotted	1×10^{-5} essential
En-route navaids and fixes, holding, STAR/SID points	1 sec	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	as plotted	1×10^{-3} routine
Aerodrome/heliport reference point	1 sec	1×10^{-3} routine
Navaids located at the aerodrome/heliport	as plotted	1×10^{-5} essential
Obstacles in Area 3	1/10 sec	1×10^{-5} essential
Obstacles in Area 2	1/10 sec	1×10^{-5} essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	1 sec	1×10^{-5} essential
Runway thresholds	1 sec	1×10^{-8} critical
Taxiway centre line/parking guidance line points	1/100 sec	1×10^{-5} essential
Runway end (flight path alignment point)	1 sec	1×10^{-8} critical
Runway holding position	1 sec	1×10^{-8} critical
Taxiway intersection marking line	1 sec	1×10^{-5} essential
Exit guidance line	1 sec	1×10^{-5} essential
Apron boundaries (polygon)	1 sec	1×10^{-3} routine
De-/anti-icing facility (polygon)	1 sec	1×10^{-3} routine
Aircraft standpoints/INS checkpoints	1/100 sec	1×10^{-3} routine
Geometric centre of TLOF or FATO thresholds, heliports	1 sec	1×10^{-8} critical

Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table 2. Elevation/altitude/height

Elevation/altitude/height	Chart resolution	Integrity Classification
Aerodrome/heliport elevation	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, precision approaches	0.5 m or 1 ft	1×10^{-8} critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches	0.5 m or 1 ft	1×10^{-8} critical
Threshold crossing height, precision approaches	0.5 m or 1 ft	1×10^{-8} critical
Obstacle clearance altitude/height (OCA/H)	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	3 m (10 ft)	1×10^{-3} routine
Obstacles in Area 2	1 m or 1 ft	1×10^{-5} essential
Obstacles in Area 3	1 m or 1 ft	1×10^{-5} essential
Distance measuring equipment (DME)	30 m (100 ft)	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes	50 m or 100 ft	1×10^{-3} routine

Note.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table 3. Magnetic variation

Magnetic variation	Chart resolution	Integrity Classification
Aerodrome/heliport magnetic variation	1 degree	1×10^{-5} essential

Table 4. Bearing

Bearing	Chart resolution	Integrity Classification
Airway segments	1 degree	1×10^{-3} routine
En-route and terminal fix formations	1/10 degree	1×10^{-3} routine
Terminal arrival/departure route segments	1 degree	1×10^{-3} routine
Instrument approach procedure fix formations	1/10 degree	1×10^{-5} essential
ILS localizer alignment	1 degree	1×10^{-5} essential
MLS zero azimuth alignment	1 degree	1×10^{-5} essential
Runway and FATO bearing	1 degree	1×10^{-3} routine

Table 5. Length/distance/dimension

Length/distance/dimension	Chart resolution	Integrity Classification
Airway segment length	1 km or 1 NM	1×10^{-3} routine
En-route fix formation distance	2/10 km (1/10 NM)	1×10^{-3} routine
Terminal arrival/departure route segment length	1 km or 1 NM	1×10^{-5} essential
Terminal and instrument approach procedure fix formation distance	2/10 km (1/10 NM)	1×10^{-5} essential
Runway and FATO length, TLOF dimensions	1 m	1×10^{-8} critical
Runway width	1 m	1×10^{-5} essential
Stopway length and width	1 m	1×10^{-8} critical
Landing distance available	1 m	1×10^{-8} critical
Take-off run available	1 m	1×10^{-8} critical
Take-off distance available	1 m	1×10^{-8} critical
Accelerate-stop distance available	1 m	1×10^{-8} critical
ILS localizer antenna-runway end, distance	as plotted	1×10^{-3} routine
ILS glide slope antenna-threshold, distance along centre line	as plotted	1×10^{-3} routine
ILS marker-threshold distance	2/10 km (1/10 NM)	1×10^{-5} essential
ILS DME antenna-threshold, distance along centre line	as plotted	1×10^{-5} essential
MLS azimuth antenna-runway end, distance	as plotted	1×10^{-3} routine
MLS elevation antenna-threshold, distance along centre line	as plotted	1×10^{-3} routine
MLS DME/P antenna-threshold, distance along centre line	as plotted	1×10^{-5} essential

— END —

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

UNITS OF MEASUREMENT TO BE USED IN AIR AND GROUND OPERATIONS

ANNEX 5

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

FOURTH EDITION — JULY 1979

This edition incorporates all amendments adopted by the Council prior to 24 March 1979 and supersedes on 26 November 1981 all previous editions of Annex 5.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-13	Incorporated in this edition		
14	22/11/84		
15	19/11/87		
16	2/11/00		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

ATTACHMENTS TO ANNEX 5

FOREWORD

Historical background

International Standards and Recommended Practices for Dimensional Units to be used in Air-Ground Communications were first adopted by the Council on 16 April 1948 pursuant to Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and were designated as Annex 5 to the Convention. They became effective on 15 September 1948 and became applicable on 1 January 1949.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.*

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 5

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	**Council action in pursuance of Assembly Resolution A1-35**		**16 April 1948** **15 September 1948** **1 January 1949**
1 to 11 (2nd Edition)	**Air Navigation Commission**	**Reduction of the number of unit tables from five tables to two tables.**	**11 December 1951** **1 May 1952** **1 September 1952**
12 (3rd Edition)	Air Navigation Commission	Provision for identical units in the ICAO Table and the Blue Table except in respect of those units for measurement of altitudes, elevations, heights and vertical speed.	8 December 1961 1 April 1962 1 July 1964
13 (4th Edition)	Council action in pursuance of Assembly Resolution A22-18, Appendix F	Change in the title of the Annex and increase in the scope to cover all aspects of air and ground operations; provision of standardized system of units based on the SI; identification of non-SI units permitted for use in international civil aviation; provision for termination of the use of certain non-SI units.	23 March 1979 23 July 1979 26 November 1981
14	Air Navigation Commission study	Establishment of a firm date for the termination of the unit bar and introduction of guidance material relating to Coordinated Universal Time (UTC) and the method of referencing date and time.	27 February 1984 30 July 1984 22 November 1984
15	Air Navigation Commission	New definition of the metre; introduction of the special name "sievert"; deletion of references to temporary non-SI units no longer to be used.	24 November 1986 19 April 1987 19 November 1987
16	Amendment 162 to Annex 1	New provisions concerning Human Factors.	21 February 2000 17 July 2000 2 November 2000

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices concerning the units of measurement to be used in all aspects of international civil aviation air and ground operations, they have the following meanings:

Ampere (A). The ampere is that constant electric current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 metre apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per metre of length.

Becquerel (Bq). The activity of a radionuclide having one spontaneous nuclear transition per second.

Candela (cd). The luminous intensity, in the perpendicular direction, of a surface of 1/600 000 square metre of black body at the temperature of freezing platinum under a pressure of 101 325 newtons per square metre.

Celsius temperature ($t°_C$). The Celsius temperature is equal to the difference $t°_C = T - T_0$ between two thermodynamic temperatures T and T_0 where T_0 equals 273.15 kelvin.

Coulomb (C). The quantity of electricity transported in 1 second by a current of 1 ampere.

Degree Celsius (°C). The special name for the unit kelvin for use in stating values of Celsius temperature.

Farad (F). The capacitance of a capacitor between the plates of which there appears a difference of potential of 1 volt when it is charged by a quantity of electricity equal to 1 coulomb.

Foot (ft). The length equal to 0.304 8 metre exactly.

Gray (Gy). The energy imparted by ionizing radiation to a mass of matter corresponding to 1 joule per kilogram.

Henry (H). The inductance of a closed circuit in which an electromotive force of 1 volt is produced when the electric current in the circuit varies uniformly at a rate of 1 ampere per second.

Hertz (Hz). The frequency of a periodic phenomenon of which the period is 1 second.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Joule (J). The work done when the point of application of a force of 1 newton is displaced a distance of 1 metre in the direction of the force.

Kelvin (K). A unit of thermodynamic temperature which is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water.

Kilogram (kg). The unit of mass equal to the mass of the international prototype of the kilogram.

Knot (kt). The speed equal to 1 nautical mile per hour.

Litre (L). A unit of volume restricted to the measurement of liquids and gases which is equal to 1 cubic decimetre.

Lumen (lm). The luminous flux emitted in a solid angle of 1 steradian by a point source having a uniform intensity of 1 candela.

Lux (lx). The illuminance produced by a luminous flux of 1 lumen uniformly distributed over a surface of 1 square metre.

Metre (m). The distance travelled by light in a vacuum during 1/299 792 458 of a second.

Mole (mol). The amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon-12.

Note.— When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles or specified groups of such particles.

Nautical mile (NM). The length equal to 1 852 metres exactly.

Newton (N). The force which when applied to a body having a mass of 1 kilogram gives it an acceleration of 1 metre per second squared.

Ohm (Ω). The electric resistance between two points of a conductor when a constant difference of potential of 1 volt, applied between these two points, produces in this conductor a current of 1 ampere, this conductor not being the source of any electromotive force.

Pascal (Pa). The pressure or stress of 1 newton per square metre.

Radian (rad). The plane angle between two radii of a circle which cut off on the circumference an arc equal in length to the radius.

Second (s). The duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom.

Siemens (S). The electric conductance of a conductor in which a current of 1 ampere is produced by an electric potential difference of 1 volt.

Sievert (Sv). The unit of radiation dose equivalent corresponding to 1 joule per kilogram.

Steradian (sr). The solid angle which, having its vertex in the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of the sphere.

Tesla (T). The magnetic flux density given by a magnetic flux of 1 weber per square metre.

Tonne (t). The mass equal to 1 000 kilograms.

Volt (V). The unit of electric potential difference and electromotive force which is the difference of electric potential between two points of a conductor carrying a constant current of 1 ampere, when the power dissipated between these points is equal to 1 watt.

Watt (W). The power which gives rise to the production of energy at the rate of 1 joule per second.

Weber (Wb). The magnetic flux which, linking a circuit of one turn, produces in it an electromotive force of 1 volt as it is reduced to zero at a uniform rate in 1 second.

CHAPTER 2. APPLICABILITY

Introductory Note.— This Annex contains specifications for the use of a standardized system of units of measurement in international civil aviation air and ground operations. This standardized system of units of measurement is based on the International System of Units (SI) and certain non-SI units considered necessary to meet the specialized requirements of international civil aviation. See Attachment A for details concerning the development of the SI.

2.1 Applicability

The Standards and Recommended Practices contained in this Annex shall be applicable to all aspects of international civil aviation air and ground operations.

CHAPTER 3. STANDARD APPLICATION OF UNITS OF MEASUREMENT

3.1 SI Units

3.1.1 The International System of Units developed and maintained by the General Conference of Weights and Measures (CGPM) shall, subject to the provisions of 3.2 and 3.3, be used as the standard system of units of measurement for all aspects of international civil aviation air and ground operations.

3.1.2 Prefixes

The prefixes and symbols listed in Table 3-1 shall be used to form names and symbols of the decimal multiples and sub-multiples of SI units.

Note 1.— As used herein the term SI unit is meant to include base units and derived units as well as their multiples and sub-multiples.

Note 2.— See Attachment B for guidance on the general application of prefixes.

3.2 Non-SI Units

3.2.1 Non-SI units for permanent use with the SI

The non-SI units listed in Table 3-2 shall be used either in lieu of, or in addition to, SI units as primary units of measurement but only as specified in Table 3-4.

3.2.2 Non-SI alternative units permitted for temporary use with the SI

The non-SI units listed in Table 3-3 shall be permitted for temporary use as alternative units of measurement but only for those specific quantities listed in Table 3-4.

Note.— It is intended that the use of the non-SI alternative units listed in Table 3-3 and applied as indicated in Table 3-4 will eventually be discontinued in accordance with individual unit termination dates established by the Council. Termination dates, when established, will be given in Chapter 4.

Table 3-1. SI unit prefixes

Multiplication factor			*Prefix*	*Symbol*
1 000 000 000 000 000 000	=	10^{18}	exa	E
1 000 000 000 000 000	=	10^{15}	peta	P
1 000 000 000 000	=	10^{12}	tera	T
1 000 000 000	=	10^{9}	giga	G
1 000 000	=	10^{6}	mega	M
1 000	=	10^{3}	kilo	k
100	=	10^{2}	hecto	h
10	=	10^{1}	deca	da
0.1	=	10^{-1}	deci	d
0.01	=	10^{-2}	centi	c
0.001	=	10^{-3}	milli	m
0.000 001	=	10^{-6}	micro	µ
0.000 000 001	=	10^{-9}	nano	n
0.000 000 000 001	=	10^{-12}	pico	p
0.000 000 000 000 001	=	10^{-15}	femto	f
0.000 000 000 000 000 001	=	10^{-18}	atto	a

3.3 Application of specific units

3.3.1 The application of units of measurement for certain quantities used in international civil aviation air and ground operations shall be in accordance with Table 3-4.

Note.— Table 3-4 is intended to provide standardization of units (including prefixes) for those quantities commonly used in air and ground operations. Basic Annex provisions apply for units to be used for quantities not listed.

3.3.2 **Recommendation.—** *Means and provisions for design, procedures and training should be established for operations in environments involving the use of standard and non-SI alternatives of specific units of measurement, or the transition between environments using different units, with due consideration to human performance.*

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683) and Circular 238* (Human Factors Digest No. 6 — Ergonomics).

Table 3-2. Non-SI units for use with the SI

Specific quantities in Table 3-4 related to	*Unit*	*Symbol*	*Definition (in terms of SI units)*
mass	tonne	t	$1\ t = 10^3\ kg$
plane angle	degree	°	$1° = (\pi/180)$ rad
	minute	'	$1' = (1/60)° = (\pi/10\ 800)$ rad
	second	"	$1" = (1/60)' = (\pi/648\ 000)$ rad
temperature	degree Celsius	°C	1 unit °C = 1 unit K[a)]
time	minute	min	1 min = 60 s
	hour	h	1 h = 60 min = 3 600 s
	day	d	1 d = 24 h = 86 400 s
	week, month, year	—	
volume	litre	L	$1\ L = 1\ dm^3 = 10^{-3} m^3$

a) See Attachment C, Table C-2 for conversion.

Table 3-3. Non-SI alternative units permitted for temporary use with the SI

Specific quantities in Table 3-4 related to	*Unit*	*Symbol*	*Definition (in terms of SI units)*
distance (long)	nautical mile	NM	1 NM = 1 852 m
distance (vertical)[a)]	foot	ft	1 ft = 0.304 8 m
speed	knot	kt	1 kt = 0.514 444 m/s

a) altitude, elevation, height, vertical speed.

Table 3-4. Standard application of specific units of measurement

Ref. No.	*Quantity*	*Primary unit (symbol)*	*Non-SI alternative unit (symbol)*
1. ***Direction/Space/Time***			
1.1	altitude	m	ft
1.2	area	m^2	
1.3	distance (long)[a)]	km	NM
1.4	distance (short)	m	
1.5	elevation	m	ft
1.6	endurance	h and min	
1.7	height	m	ft
1.8	latitude	° ' "	
1.9	length	m	
1.10	longitude	° ' "	
1.11	plane angle (when required, decimal subdivisions of the degree shall be used)	°	
1.12	runway length	m	
1.13	runway visual range	m	
1.14	tank capacities (aircraft)[b)]	L	
1.15	time	s min h d week month year	
1.16	visibility[c)]	km	
1.17	volume	m^3	
1.18	wind direction (wind directions other than for a landing and take-off shall be expressed in degrees true; for landing and take-off wind directions shall be expressed in degrees magnetic)	°	
2. ***Mass-related***			
2.1	air density	kg/m^3	
2.2	area density	kg/m^2	
2.3	cargo capacity	kg	
2.4	cargo density	kg/m^3	
2.5	density (mass density)	kg/m^3	
2.6	fuel capacity (gravimetric)	kg	
2.7	gas density	kg/m^3	
2.8	gross mass or payload	kg t	
2.9	hoisting provisions	kg	
2.10	linear density	kg/m	
2.11	liquid density	kg/m^3	
2.12	mass	kg	
2.13	moment of inertia	$kg \cdot m^2$	
2.14	moment of momentum	$kg \cdot m^2/s$	
2.15	momentum	$kg \cdot m/s$	

Ref. No.	*Quantity*	*Primary unit (symbol)*	*Non-SI alternative unit (symbol)*
3.	***Force-related***		
3.1	air pressure (general)	kPa	
3.2	altimeter setting	hPa	
3.3	atmospheric pressure	hPa	
3.4	bending moment	kN · m	
3.5	force	N	
3.6	fuel supply pressure	kPa	
3.7	hydraulic pressure	kPa	
3.8	modulus of elasticity	MPa	
3.9	pressure	kPa	
3.10	stress	MPa	
3.11	surface tension	mN/m	
3.12	thrust	kN	
3.13	torque	N · m	
3.14	vacuum	Pa	
4.	***Mechanics***		
4.1	airspeed[d)]	km/h	kt
4.2	angular acceleration	rad/s^2	
4.3	angular velocity	rad/s	
4.4	energy or work	J	
4.5	equivalent shaft power	kW	
4.6	frequency	Hz	
4.7	ground speed	km/h	kt
4.8	impact	J/m^2	
4.9	kinetic energy absorbed by brakes	MJ	
4.10	linear acceleration	m/s^2	
4.11	power	kW	
4.12	rate of trim	°/s	
4.13	shaft power	kW	
4.14	velocity	m/s	
4.15	vertical speed	m/s	ft/min
4.16	wind speed	km/h	kt
5.	***Flow***		
5.1	engine airflow	kg/s	
5.2	engine waterflow	kg/h	
5.3	fuel consumption (specific)		
	piston engines	kg/(kW · h)	
	turbo-shaft engines	kg/(kW · h)	
	jet engines	kg/(kN · h)	
5.4	fuel flow	kg/h	
5.5	fuel tank filling rate (gravimetric)	kg/min	
5.6	gas flow	kg/s	
5.7	liquid flow (gravimetric)	g/s	
5.8	liquid flow (volumetric)	L/s	
5.9	mass flow	kg/s	
5.10	oil consumption		
	gas turbine	kg/h	
	piston engines (specific)	g/(kW · h)	

Annex 5 — Units of Measurement to be used in Air and Ground Operations *Chapter 3*

Ref. No.	Quantity	Primary unit (symbol)	Non-SI alternative unit (symbol)
5.11	oil flow	g/s	
5.12	pump capacity	L/min	
5.13	ventilation airflow	m^3/min	
5.14	viscosity (dynamic)	$Pa \cdot s$	
5.15	viscosity (kinematic)	m^2/s	
6.	***Thermodynamics***		
6.1	coefficient of heat transfer	$W/(m^2 \cdot K)$	
6.2	heat flow per unit area	J/m^2	
6.3	heat flow rate	W	
6.4	humidity (absolute)	g/kg	
6.5	coefficient of linear expansion	$°C^{-1}$	
6.6	quantity of heat	J	
6.7	temperature	°C	
7.	***Electricity and magnetism***		
7.1	capacitance	F	
7.2	conductance	S	
7.3	conductivity	S/m	
7.4	current density	A/m^2	
7.5	electric current	A	
7.6	electric field strength	C/m^2	
7.7	electric potential	V	
7.8	electromotive force	V	
7.9	magnetic field strength	A/m	
7.10	magnetic flux	Wb	
7.11	magnetic flux density	T	
7.12	power	W	
7.13	quantity of electricity	C	
7.14	resistance	Ω	
8.	***Light and related electromagnetic radiations***		
8.1	illuminance	lx	
8.2	luminance	cd/m^2	
8.3	luminous exitance	lm/m^2	
8.4	luminous flux	lm	
8.5	luminous intensity	cd	
8.6	quantity of light	$lm \cdot s$	
8.7	radiant energy	J	
8.8	wavelength	m	
9.	***Acoustics***		
9.1	frequency	Hz	
9.2	mass density	kg/m^3	
9.3	noise level	dB[e)]	
9.4	period, periodic time	s	
9.5	sound intensity	W/m^2	
9.6	sound power	W	
9.7	sound pressure	Pa	
9.8	sound level	dB[e)]	

Ref. No.	*Quantity*	*Primary unit (symbol)*	*Non-SI alternative unit (symbol)*
9.9	static pressure (instantaneous)	Pa	
9.10	velocity of sound	m/s	
9.11	volume velocity (instantaneous)	m^3/s	
9.12	wavelength	m	
10.	***Nuclear physics and ionizing radiation***		
10.1	absorbed dose	Gy	
10.2	absorbed dose rate	Gy/s	
10.3	activity of radionuclides	Bq	
10.4	dose equivalent	Sv	
10.5	radiation exposure	C/kg	
10.6	exposure rate	C/kg · s	

a) As used in navigation, generally in excess of 4 000 m.
b) Such as aircraft fuel, hydraulic fluids, water, oil and high pressure oxygen vessels.
c) Visibility of less than 5 km may be given in m.
d) Airspeed is sometimes reported in flight operations in terms of the ratio MACH number.
e) The decibel (dB) is a ratio which may be used as a unit for expressing sound pressure level and sound power level. When used, the reference level must be specified.

CHAPTER 4. TERMINATION OF USE OF NON-SI ALTERNATIVE UNITS

Introductory Note.— The non-SI units listed in Table 3-3 have been retained temporarily for use as alternative units because of their wide-spread use and to avoid potential safety problems which could result from the lack of international coordination concerning the termination of their use. As termination dates are established by the Council, they will be reflected as Standards contained in this Chapter. It is expected that the establishment of such dates will be well in advance of actual termination. Any special procedures associated with specific unit termination will be circulated to all States separately from this Annex.

4.1 The use in international civil aviation operations of the alternative non-SI units listed in Table 3-3 shall be terminated on the dates listed in Table 4-1.

Table 4-1. Termination dates for non-SI alternative units

Non-SI alternative unit	*Termination date*
Knot Nautical mile	not established[a)]
Foot	not established[b)]

a) No termination date has yet been established for use of nautical mile and knot.
b) No termination date has yet been established for use of the foot.

ATTACHMENTS TO ANNEX 5

ATTACHMENT A. DEVELOPMENT OF THE INTERNATIONAL SYSTEM OF UNITS (SI)

1. Historical background

1.1 The name SI is derived from "Système International d'Unités". The system has evolved from units of length and mass (metre and kilogram) which were created by members of the Paris Academy of Sciences and adopted by the French National Assembly in 1795 as a practical measure to benefit industry and commerce. The original system became known as the metric system. Physicists realized the advantages of the system and it was soon adopted in scientific and technical circles.

1.2 International standardization began with an 1870 meeting of 15 States in Paris that led to the International Metric Convention in 1875 and the establishment of a permanent International Bureau of Weights and Measures. A General Conference on Weights and Measures (CGPM) was also constituted to handle all international matters concerning the metric system. In 1889 the first meeting of the CGPM legalized the old prototype of the metre and the kilogram as the international standard for unit of length and unit of mass respectively. Other units were agreed in subsequent meetings and by its 10th Meeting in 1954, the CGPM had adopted a rationalized and coherent system of units based on the metre-kilogram-second-ampere (MKSA) system which had been developed earlier, plus the addition of the kelvin as the unit of temperature and the candela as the unit of luminous intensity. The 11th CGPM, held in 1960 and in which 36 States participated, adopted the name International System of Units (SI) and laid down rules for the prefixes, the derived and supplementary units and other matters, thus establishing comprehensive specifications for international units of measurement. The 12th CGPM in 1964 made some refinements in the system, and the 13th CGPM in 1967 redefined the second, renamed the unit of temperature as the kelvin (K) and revised the definition of the candela. The 14th CGPM in 1971 added a seventh base unit, the mole (mol) and approved the pascal (Pa) as a special name for the SI unit of pressure or stress, the newton (N) per square metre (m^2) and the siemens (S) as a special name for the unit of electrical conductance. In 1975 the CGPM adopted the becquerel (Bq) as the unit of the activity of radionuclides and the gray (Gy) as the unit for absorbed dose.

2. International Bureau of Weights and Measures

2.1 The Bureau International des Poids et Mesures (BIPM) was set up by the Metre Convention signed in Paris on 20 May 1875 by 17 States during the final session of the Diplomatic Conference of the Metre. This Convention was amended in 1921. BIPM has its headquarters near Paris and its upkeep is financed by the Member States of the Metre Convention. The task of BIPM is to ensure world-wide unification of physical measurements; it is responsible for:

— establishing the fundamental standards and scales for measurement of the principal physical quantities and maintaining the international prototypes;

— carrying out comparisons of national and international standards;

— ensuring the co-ordination of corresponding measuring techniques;

— carrying out and co-ordinating the determinations relating to the fundamental physical constants.

2.2 BIPM operates under the exclusive supervision of the International Committee of Weights and Measures (CIPM), which itself comes under the authority of the General Conference of Weights and Measures (CGPM). The International Committee consists of 18 members each belonging to a different State; it meets at least once every two years. The officers of this Committee issue an Annual Report on the administrative and financial position of BIPM to the Governments of the Member States of the Metre Convention.

2.3 The activities of BIPM, which in the beginning were limited to the measurements of length and mass and to metrological studies in relation to these quantities, have been extended to standards of measurement for electricity (1927), photometry (1937) and ionizing radiations (1960). To this end the original laboratories, built in 1876-78, were enlarged in 1929 and two new buildings were constructed in 1963-64 for the ionizing radiation laboratories. Some 30 physicists or technicians work in the laboratories of BIPM. They do metrological research, and also undertake measurement and certification of material standards of the above-mentioned quantities.

2.4 In view of the extension of the work entrusted to BIPM, CIPM has set up since 1927, under the name of Consultative Committees, bodies designed to provide it with information on matters which it refers to them for study and advice. These Consultative Committees, which may form temporary or permanent working groups to study special subjects, are responsible for co-ordinating the international work carried out in their respective fields and proposing recommendations concerning the amendment to be made to the definitions and values of units. In order to ensure world-wide uniformity in units of measurement, the International Committee accordingly acts directly or submits proposals for sanction by the General Conference.

Annex 5 — Units of Measurement to be used in Air and Ground Operations

Attachment A

2.5 The Consultative Committees have common regulations (*Procès-Verbaux CIPM,* 1963, **31**, 97). Each Consultative Committee, the chairman of which is normally a member of CIPM, is composed of a delegate from each of the large metrology laboratories and specialized institutes, a list of which is drawn up by CIPM, as well as individual members also appointed by CIPM and one representative of BIPM. These Committees hold their meetings at irregular intervals; at present there are seven of them in existence as follows:

1. The Consultative Committee for Electricity (CCE), set up in 1927.
2. The Consultative Committee for Photometry and Radiometry (CCPR), which is the new name given in 1971 to the Consultative Committee for Photometry set up in 1933 (between 1930 and 1933 the preceding committee (CCE) dealt with matters concerning photometry).
3. The Consultative Committee for Thermometry (CCT), set up in 1937.
4. The Consultative Committee for the Definition of the Metre (CCDM), set up in 1952.
5. The Consultative Committee for the Definition of the Second (CCDS), set up in 1956.
6. The Consultative Committee for the Standards of Measurement of Ionizing Radiations (CCEMRI), set up in 1958. Since 1969 this Consultative Committee has consisted of four sections: Section I (measurement of X- and γ-rays); Section II (measurement of radionuclides); Section III (neutron measurements); Section IV (α-energy standards).
7. The Consultative Committee for Units (CCU), set up in 1964.

The proceedings of the General Conference, the International Committee, the Consultative Committees and the International Bureau are published under the auspices of the latter in the following series:

— *Comptes rendus des séances de la Conférence Générale des Poids et Mesures;*

— *Procès-Verbaux des séances du Comité International des Poids et Mesures;*

— *Sessions des Comités Consultatifs;*

— *Recueil de Travaux du Bureau International des Poids et Mesures* (this compilation brings together articles published in scientific and technical journals and books, as well as certain work published in the form of duplicated reports).

2.6 From time to time BIPM publishes a report on the development of the metric system throughout the world, entitled *Les récents progrès du Système Métrique.* The collection of the *Travaux et Mémoires du Bureau International des Poids et Mesures* (22 volumes published between 1881 and 1966) ceased in 1966 by a decision of the CIPM. Since 1965 the international journal *Metrologia,* edited under the auspices of CIPM, has published articles on the more important work on scientific metrology carried out throughout the world, on the improvement in measuring methods and standards, of units, etc, as well as reports concerning the activities, decisions and recommendations of the various bodies created under the Metre Convention.

3. International Organization for Standardization

The International Organization for Standardization (ISO) is a world-wide federation of national standards institutes which, although not a part of the BIPM, provides recommendations for the use of SI and certain other units. ISO Document 1000 and the ISO Recommendation R31 series of documents provide extensive detail on the application of the SI units. ICAO maintains liaison with ISO regarding the standardized application of SI units in aviation.

ATTACHMENT B. GUIDANCE ON THE APPLICATION OF THE SI

1. Introduction

1.1 The International System of Units is a complete, coherent system which includes three classes of units:

a) base units;

b) supplementary units; and

c) derived units.

1.2 The SI is based on seven units which are dimensionally independent and are listed in Table B-1.

Table B-1. SI base units

Quantity	*Unit*	*Symbol*
amount of a substance	mole	mol
electric current	ampere	A
length	metre	m
luminous intensity	candela	cd
mass	kilogram	kg
thermodynamic temperature	kelvin	K
time	second	s

1.3 The supplementary units of the SI are listed in Table B-2 and may be regarded either as base units or as derived units.

Table B-2. SI supplementary units

Quantity	*Unit*	*Symbol*
plane angle	radian	rad
solid angle	steradian	sr

1.4 Derived units of the SI are formed by combining base units, supplementary units and other derived units according to the algebraic relations linking the corresponding quantities. The symbols for derived units are obtained by means of the mathematical signs for multiplication, division and the use of exponents. Those derived SI units which have special names and symbols are listed in Table B-3.

Note.— The specific application of the derived units listed in Table B-3 and other units common to international civil aviation operations is given in Table 3-4.

Table B-3. SI derived units with special names

Quantity	*Unit*	*Symbol*	*Derivation*
absorbed dose (radiation)	gray	Gy	J/kg
activity of radionuclides	becquerel	Bq	l/s
capacitance	farad	F	C/V
conductance	siemens	S	A/V
dose equivalent (radiation)	sievert	Sv	J/kg
electric potential, potential difference, electromotive force	volt	V	W/A
electric resistance	ohm	Ω	V/A
energy, work, quantity of heat	joule	J	N·m
force	newton	N	$kg \cdot m/s^2$
frequency (of a periodic phenomenon)	hertz	Hz	l/s
illuminance	lux	lx	lm/m^2
inductance	henry	H	Wb/A
luminous flux	lumen	lm	cd·sr
magnetic flux	weber	Wb	V·s
magnetic flux density	tesla	T	Wb/m^2
power, radiant flux	watt	W	J/s
pressure, stress	pascal	Pa	N/m^2
quantity of electricity, electric charge	coulomb	C	A·s

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Attachment B

1.5 The SI is a rationalized selection of units from the metric system which individually are not new. The great advantage of SI is that there is only one unit for each physical quantity — the metre for length, kilogram (instead of gram) for mass, second for time, etc. From these elemental or base units, units for all other mechanical quantities are derived. These derived units are defined by simple relationships such as velocity equals rate of change of distance, acceleration equals rate of change of velocity, force is the product of mass and acceleration, work or energy is the product of force and distance, power is work done per unit time, etc. Some of these units have only generic names such as metre per second for velocity; others have special names such as newton (N) for force, joule (J) for work or energy, watt (W) for power. The SI units for force, energy and power are the same regardless of whether the process is mechanical, electrical, chemical or nuclear. A force of 1 newton applied for a distance of 1 mètre can produce 1 joule of heat, which is identical with what 1 watt of electric power can produce in 1 second.

1.6 Corresponding to the advantages of SI, which result from the use of a unique unit for each physical quantity, are the advantages which result from the use of a unique and well-defined set of symbols and abbreviations. Such symbols and abbreviations eliminate the confusion that can arise from current practices in different disciplines such as the use of "b" for both the bar (a unit of pressure) and barn (a unit of area).

1.7 Another advantage of SI is its retention of the decimal relation between multiples and sub-multiples of the base units for each physical quantity. Prefixes are established for designating multiple and sub-multiple units from "exa" (10^{18}) down to "atto" (10^{-18}) for convenience in writing and speaking.

1.8 Another major advantage of SI is its coherence. Units might be chosen arbitrarily, but making an independent choice of a unit for each category of mutually comparable quantities would lead in general to the appearance of several additional numerical factors in the equations between the numerical values. It is possible, however, and in practice more convenient, to choose a system of units in such a way that the equations between numerical values, including the numerical factors, have exactly the same form as the corresponding equations between the quantities. A unit system defined in this way is called coherent with respect to the system of quantities and equations in question. Equations between units of a coherent unit system contain as numerical factors only the number 1. In a coherent system the product or quotient of any two unit quantities is the unit of the resulting quantity. For example, in any coherent system, unit area results when unit length is multiplied by unit length, unit velocity when unit length is divided by unit time, and unit force when unit mass is multiplied by unit acceleration.

Note.— Figure B-1 illustrates the relationship of the units of the SI.

2. Mass, force and weight

2.1 The principal departure of SI from the gravimetric system of metric engineering units is the use of explicitly distinct units from mass and force. In SI, the name kilogram is restricted to the unit of mass, and the kilogram-force (from which the suffix force was in practice often erroneously dropped) is not to be used. In its place the SI unit of force, the newton is used. Likewise, the newton rather than the kilogram-force is used to form derived units which include force, for example, pressure or stress ($N/m^2 = Pa$), energy ($N \cdot m = J$), and power ($N \cdot m/s = W$).

2.2 Considerable confusion exists in the use of the term weight as a quantity to mean either force or mass. In common use, the term weight nearly always means mass; thus, when one speaks of a person's weight, the quantity referred to is mass. In science and technology, the term weight of a body has usually meant the force that, if applied to the body, would give it an acceleration equal to the local acceleration of free fall. The adjective "local" in the phrase "local acceleration of free fall" has usually meant a location on the surface of the earth; in this context the "local acceleration of free fall" has the symbol g (sometimes referred to as "acceleration of gravity") with observed values of g differing by over 0.5 per cent at various points on the earth's surface and decreasing as distance from the earth is increased. Thus, because weight is a force = mass × acceleration due to gravity, a person's weight is conditional on his location, but mass is not. A person with a mass of 70 kg might experience a force (weight) on earth of 686 newtons (≈ 155 lbf) and a force (weight) of only 113 newtons (≈ 22 lbf) on the moon. Because of the dual use of the term weight as a quantity, the term weight should be avoided in technical practice except under circumstances in which its meaning is completely clear. When the term is used, it is important to know whether mass or force is intended and to use SI units properly by using kilograms for mass or newtons for force.

2.3 Gravity is involved in determining mass with a balance or scale. When a standard mass is used to balance the measured mass, the direct effect of gravity on the two masses is cancelled, but the indirect effect through the buoyancy of air or other fluid is generally not cancelled. In using a spring scale, mass is measured indirectly, since the instrument responds to the force of gravity. Such scales may be calibrated in mass units if the variation in acceleration of gravity and buoyancy corrections are not significant in their use.

3. Energy and torque

3.1 The vector product of force and moment arm is widely designated by the unit newton metre. This unit for bending moment or torque results in confusion with the unit for energy, which is also newton metre. If torque is expressed as newton metre per radian, the relationship to energy is clarified, since the product of torque and angular rotation is energy:

$$(N \cdot m/rad) \cdot rad = N \cdot m$$

3.2 If vectors were shown, the distinction between energy and torque would be obvious, since the orientation of force and length is different in the two cases. It is important to recognize this difference in using torque and energy, and the joule should never be used for torque.

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Attachment B

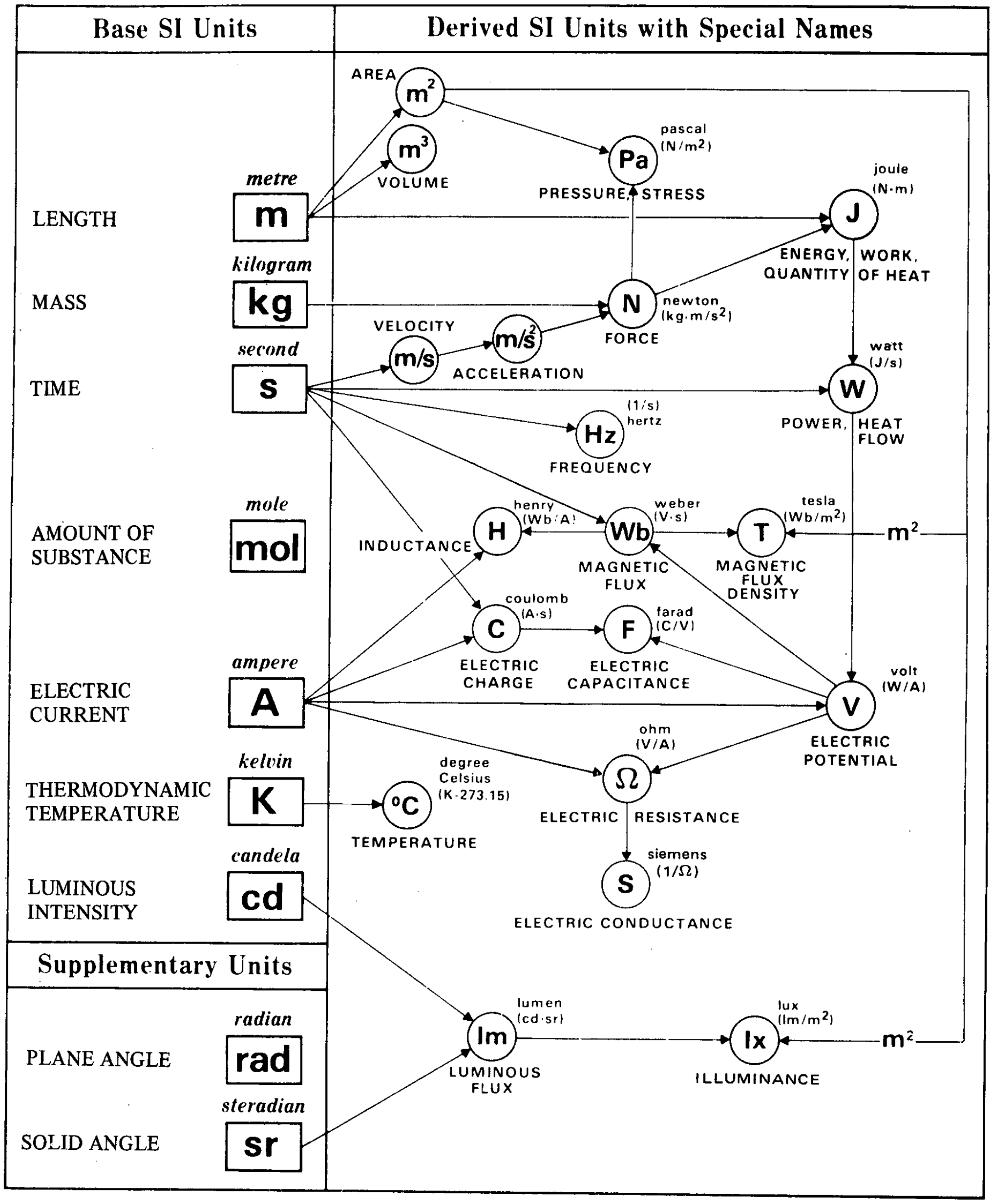

Figure B-1

Annex 5 — Units of Measurement to be used in Air and Ground Operations

Attachment B

4. SI prefixes

4.1 Selection of prefixes

4.1.1 In general the SI prefixes should be used to indicate orders of magnitude, thus eliminating non-significant digits and leading zeros in decimal fractions, and providing a convenient alternative to the powers-of-ten notation preferred in computation. For example:

12 300 mm becomes 12.3 m

12.3×10^3 m becomes 12.3 km

0.00123 μA becomes 1.23 nA

4.1.2 When expressing a quantity by a numerical value and a unit, prefixes should preferably be chosen so that the numerical value lies between 0.1 and 1 000. To minimize variety, it is recommended that prefixes representing powers of 1 000 be used. However, in the following cases, deviation from the above may be indicated:

a) in expressing area and volume, the prefixes hecto, deca, deci and centi may be required: for example, square hectometre, cubic centimetre;

b) in tables of values of the same quantity, or in a discussion of such values within a given context, it is generally preferable to use the same unit multiple throughout; and

c) for certain quantities in particular applications, one particular multiple is customarily used. For example, the hectopascal is used for altimeter settings and the millimetre is used for linear dimensions in mechanical engineering drawings even when the values lie outside the range 0.1 to 1 000.

4.2 Prefixes in compound units[1]

It is recommended that only one prefix be used in forming a multiple of a compound unit. Normally the prefix should be attached to a unit in the numerator. One exception to this occurs when the kilogram is one of the units. For example:

V/m, *not* mV/mm; MJ/kg, *not* kJ/g

4.3 Compound prefixes

Compound prefixes, formed by the juxtaposition of two or more SI prefixes, are not to be used. For example:

1 nm *not* 1mμm; 1 pF *not* 1$\mu\mu$F

If values are required outside the range covered by the prefixes, they should be expressed using powers of ten applied to the base unit.

4.4 Powers of units

An exponent attached to a symbol containing a prefix indicates that the multiple or sub-multiple of the unit (the unit with its prefix) is raised to the power expressed by the exponent. For example:

$1\ \mathrm{cm}^3 = (10^{-2}\ \mathrm{m})^3 = 10^{-6}\ \mathrm{m}^3$

$1\ \mathrm{ns}^{-1} = (10^{-9}\ \mathrm{s})^{-1} = 10^{9}\ \mathrm{s}^{-1}$

$1\ \mathrm{mm}^2/\mathrm{s} = (10^{-3}\ \mathrm{m})^2/\mathrm{s} = 10^{-6}\ \mathrm{m}^2/\mathrm{s}$

5. Style and usage

5.1 Rules for writing unit symbols

5.1.1 Unit symbols should be printed in Roman (upright) type regardless of the type style used in the surrounding text.

5.1.2 Unit symbols are unaltered in the plural.

5.1.3 Unit symbols are not followed by a period except when used at the end of a sentence.

5.1.4 Letter unit symbols are written in lower case (cd) unless the unit name has been derived from a proper name, in which case the first letter of the symbol is capitalized (W, Pa). Prefix and unit symbols retain their prescribed form regardless of the surrounding typography.

5.1.5 In the complete expression for a quantity, a space should be left between the numerical value and the unit symbol. For example, write 35 mm not 35mm, and 2.37 lm, not 2.37lm. When the quantity is used in an adjectival sense, a hyphen is often used, for example, 35-mm film.

Exception: No space is left between the numerical value and the symbols for degree, minute and second of plane angle, and degree Celsius.

5.1.6 No space is used between the prefix and unit symbols.

5.1.7 Symbols, not abbreviations, should be used for units. For example, use "A", not "amp", for ampere.

5.2 Rules for writing unit names

5.2.1 Spelled-out unit names are treated as common nouns in English. Thus, the first letter of a unit name is not capitalized except at the beginning of a sentence or in capitalized material such as a title, even though the unit name may be derived from a proper name and therefore be represented as a symbol by a capital letter (see 5.1.4). For example, normally write "newton" not "Newton" even though the symbol is N.

5.2.2 Plurals are used when required by the rules of grammar and are normally formed regularly, for example, henries for the plural of henry. The following irregular plurals are recommended:

Singular	*Plural*
lux	lux
hertz	hertz
siemens	siemens

1. A compound unit is a derived unit expressed in terms of two or more units, that is, not expressed with a single special name.

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Annex 5 — Units of Measurement to be used in Air and Ground Operations

5.2.3 No space or hyphen is used between the prefix and the unit name.

5.3 Units formed by multiplication and division

5.3.1 *With unit names:*

Product, use a space (preferred) or hyphen:

newton metre *or* newton-metre

in the case of the watt hour the space may be omitted, thus:

watthour.

Quotient, use the word per and not a solidus:

metre per second *not* metre/second.

Powers, use the modifier squared or cubed placed after the unit name:

metre per second squared

In the case of area or volume, a modifier may be placed before the unit name:

square millimetre, cubic metre.

This exception also applies to derived units using area or volume:

watt per square metre.

Note.— To avoid ambiguity in complicated expressions, symbols are preferred to words.

5.3.2 *With unit symbols:*

Product may be indicated in either of the following ways:

Nm *or* N · m for newton metre.

Note.— When using for a prefix a symbol which coincides with the symbol for the unit, special care should be taken to avoid confusion. The unit newton metre for torque should be written, for example, Nm *or* N · m *to avoid confusion with* mN, *the millinewton.*

An exception to this practice is made for computer printouts, automatic typewriter work, etc., where the dot half high is not possible, and a dot on the line may be used.

Quotient, use one of the following forms:

$\mathrm{m/s}$ *or* $\mathrm{m \cdot s^{-1}}$ *or* $\frac{\mathrm{m}}{\mathrm{s}}$

In no case should more than one solidus be used in the same expression unless parentheses are inserted to avoid ambiguity. For example, write:

$\mathrm{J/(mol \cdot K)}$ *or* $\mathrm{J \cdot mol^{-1} \cdot K^{-1}}$ *or* $\mathrm{(J/mol)/K}$

but *not* J/mol/K.

5.3.3 Symbols and unit names should not be mixed in the same expression. Write:

joules per kilogram *or* J/kg *or* $\mathrm{J \cdot kg^{-1}}$

but *not* joules/kilogram *or* joules/kg *or* joules $\cdot\ \mathrm{kg^{-1}}$.

5.4 Numbers

5.4.1 The preferred decimal marker is a point on the line (period); however, the comma is also acceptable. When writing numbers less than one, a zero should be written before the decimal marker.

5.4.2 The comma is not to be used to separate digits. Instead, digits should be separated into groups of three, counting from the decimal point towards the left and the right, and using a small space to separate the groups. For example:

73 655   7 281   2.567 321   0.133 47

The space between groups should be approximately the width of the letter "i" and the width of the space should be constant even if, as is often the case in printing, variable-width spacing is used between the words.

5.4.3 The sign for multiplication of numbers is a cross (×) or a dot half high. However, if the dot half high is used as the multiplication sign, a point on the line must not be used as a decimal marker in the same expression.

5.4.4 Attachment of letters to a unit symbol as a means of giving information about the nature of the quantity under consideration is incorrect. Thus MWe for "megawatts electrical (power)", Vac for "volts ac" and kJt for "kilojoules thermal (energy)" are not acceptable. For this reason, no attempt should be made to construct SI equivalents of the abbreviations "psia" and "psig", so often used to distinguish between absolute and gauge pressure. If the context leaves any doubt as to which is meant, the word pressure must be qualified appropriately. For example:

". . . at a gauge pressure of 13 kPa".

or " . . . at an absolute pressure of 13 kPa".

ATTACHMENT C. CONVERSION FACTORS

1. General

1.1 The list of conversion factors which is contained in this Attachment is provided to express the definitions of miscellaneous units of measure as numerical multiples of SI units.

1.2 The conversion factors are presented for ready adaptation to computer read-out and electronic data transmission. The factors are written as a number greater than 1 and less than 10 with six or less decimal places. This number is followed by the letter E (for exponent), a plus or minus symbol, and two digits which indicate the power of 10 by which the number must be multiplied to obtain the correct value. For example:

3.523 907 E−02 is 3.523 907 × 10^{-2} *or* 0.035 239 07

Similarly,

3.386 389 E+03 is 3.386 389 × 10^{3} *or* 3 386.389

1.3 An asterisk (*) after the sixth decimal place indicates that the conversion factor is exact and that all subsequent digits are zero. Where less than six decimal places are shown, more precision is not warranted.

1.4 Further examples of use of the tables:

To convert from	*to*	*Multiply by*
pound-force per square foot	Pa	4.788 026 E+01
inch	m	2.540 000*E−02

thus:

1 lbf/ft^2 = 47.880 26 Pa

1 inch = 0.025 4 m (exactly)

2. Factors not listed

2.1 Conversion factors for compound units which are not listed herein can easily be developed from numbers given in the list by the substitution of converted units, as follows.

Example: To find conversion factor of lb·ft/s to kg·m/s:

first convert
1 lb to 0.453 592 4 kg
1 ft to 0.304 8 m

then substitute:
(0.453 592 4 kg) × (0.304 8 m)/s
= 0.138 255 kg·m/s
Thus the factor is 1.382 55 E−01.

Table C-1. Conversion factors to SI units
(Symbols of SI units given in parentheses)

To convert from	*to*	*Multiply by*
abampere	ampere (A)	1.000 000*E+01
abcoulomb	coulomb (C)	1.000 000*E+01
abfarad	farad (F)	1.000 000*E+09
abhenry	henry (H)	1.000 000*E−09
abmho	siemens (S)	1.000 000*E+09
abohm	ohm (Ω)	1.000 000*E−09
abvolt	volt (V)	1.000 000*E−08
acre (U.S. survey)	square metre (m^2)	4.046 873 E+03
ampere hour	coulomb (C)	3.600 000*E+03
are	square metre (m^2)	1.000 000*E+02
atmosphere (standard)	pascal (Pa)	1.013 250*E+05
atmosphere (technical = 1 kgf/cm^2)	pascal (Pa)	9.806 650*E+04
bar	pascal (Pa)	1.000 000*E+05
barrel (for petroleum, 42 U.S. liquid gal)	cubic metre (m^3)	1.589 873*E−01

* An asterisk (*) after the sixth decimal place indicates that the conversion factor is exact and that all subsequent digits are zero. Where less than six decimal places are shown, more precision is not warranted.

Attachment C ***Annex 5 — Units of Measurement to be used in Air and Ground Operations***

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
British thermal unit (International Table)	joule (J)	1.055 056 E+03
British thermal unit (mean)	joule (J)	1.055 87 E+03
British thermal unit (thermochemical)	joule (J)	1.054 350 E+03
British thermal unit (39°F)	joule (J)	1.059 67 E+03
British thermal unit (59°F)	joule (J)	1.054 80 E+03
British thermal unit (60°F)	joule (J)	1.054 68 E+03
Btu (International Table)·ft/h·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	1.730 735 E+00
Btu (thermochemical)·ft/h·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	1.729 577 E+00
Btu (International Table)·in/h·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	1.442 279 E−01
Btu (thermochemical)·in/h·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	1.441 314 E−01
Btu (International Table)·in/s·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	5.192 204 E+02
Btu (thermochemical)·in/s·ft²·°F (k, thermal conductivity)	watt per metre kelvin (W/m·K)	5.188 732 E+02
Btu (International Table)/h	watt (W)	2.930 711 E−01
Btu (thermochemical)/h	watt (W)	2.928 751 E−01
Btu (thermochemical)/min	watt (W)	1.757 250 E+01
Btu (thermochemical)/s	watt (W)	1.054 350 E+03
Btu (International Table)/ft²	joule per square metre (J/m²)	1.135 653 E+04
Btu (thermochemical)/ft²	joule per square metre (J/m²)	1.134 893 E+04
Btu (thermochemical)/ft²·h	watt per square metre (W/m²)	3.152 481 E+00
Btu (thermochemical)/ft²·min	watt per square metre (W/m²)	1.891 489 E+02
Btu (thermochemical)/ft²·s	watt per square metre (W/m²)	1.134 893 E+04
Btu (thermochemical)/in²·s	watt per square metre (W/m²)	1.634 246 E+06
Btu (International Table)/h·ft²·°F (C, thermal conductance)	watt per square metre kelvin (W/m²·K)	5.678 263 E+00
Btu (thermochemical)/h·ft²·°F (C, thermal conductance)	watt per square metre kelvin (W/m²·K)	5.674 466 E+00
Btu (International Table)/s·ft²·°F	watt per square metre kelvin (W/m²·K)	2.044 175 E+04
Btu (thermochemical)/s·ft²·°F	watt per square metre kelvin (W/m²·K)	2.042 808 E+04
Btu (International Table)/lb	joule per kilogram (J/kg)	2.326 000*E+03
Btu (thermochemical)/lb	joule per kilogram (J/kg)	2.324 444 E+03
Btu (International Table)/lb·°F (c, heat capacity)	joule per kilogram kelvin (J/kg·K)	4.186 800*E+03
Btu (thermochemical)/lb·°F (c, heat capacity)	joule per kilogram kelvin (J/kg·K)	4.184 000 E+03
calibre (inch)	metre (m)	2.540 000*E−02
calorie (International Table)	joule (J)	4.186 800*E+00
calorie (mean)	joule (J)	4.190 02 E+00
calorie (thermochemical)	joule (J)	4.184 000*E+00
calorie (15°C)	joule (J)	4.185 80 E+00
calorie (20°C)	joule (J)	4.181 90 E+00
calorie (kilogram, International Table)	joule (J)	4.186 800*E+03
calorie (kilogram, mean)	joule (J)	4.190 02 E+03
calorie (kilogram, thermochemical)	joule (J)	4.184 000*E+03
cal (thermochemical)/cm²	joule per square metre (J/m²)	4.184 000*E+04

Annex 5 — Units of Measurement to be used in Air and Ground Operations *Attachment C*

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
cal (International Table)/g	joule per kilogram (J/kg)	4.186 800*E+03
cal (thermochemical)/g	joule per kilogram (J/kg)	4.184 000*E+03
cal (International Table)/g·°C	joule per kilogram kelvin (J/kg·K)	4.186 800*E+03
cal (thermochemical)/g·°C	joule per kilogram kelvin (J/kg·K)	4.184 000*E+03
cal (thermochemical)/min	watt (W)	6.973 333 E−02
cal (thermochemical)/s	watt (W)	4.184 000*E+00
cal (thermochemical)/cm²·min	watt per square metre (W/m²)	6.973 333 E+02
cal (thermochemical)/cm²·s	watt per square metre (W/m²)	4.184 000*E+04
cal (thermochemical)/cm·s·°C	watt per metre kelvin (W/m·K)	4.184 000*E+02
centimetre of mercury (0°C)	pascal (Pa)	1.333 22 E+03
centimetre of water (4°C)	pascal (Pa)	9.806 38 E+01
centipoise	pascal second (Pa·s)	1.000 000*E−03
centistokes	metre squared per second (m²/s)	1.000 000*E−06
circular mil	square metre (m²)	5.067 075 E−10
clo	kelvin metre squared per watt (K·m²/W)	2.003 712 E−01
cup	cubic metre (m³)	2.365 882 E−04
curie	becquerel (Bq)	3.700 000*E+10
day (mean solar)	second (s)	8.640 000 E+04
day (sidereal)	second (s)	8.616 409 E+04
degree (angle)	radian (rad)	1.745 329 E−02
°F·h·ft²/Btu (International Table) (R, thermal resistance)	kelvin metre squared per watt (K·m²/W)	1.761 102 E−01
°F·h·ft²/Btu (thermochemical) (R, thermal resistance)	kelvin metre squared per watt (K·m²/W)	1.762 280 E−01
dyne	newton (N)	1.000 000*E−05
dyne·cm	newton metre (N·m)	1.000 000*E−07
dyne/cm²	pascal (Pa)	1.000 000*E−01
electronvolt	joule (J)	1.602 19 E−19
EMU of capacitance	farad (F)	1.000 000*E+09
EMU of current	ampere (A)	1.000 000*E+01
EMU of electric potential	volt (V)	1.000 000*E−08
EMU of inductance	henry (H)	1.000 000*E−09
EMU of resistance	ohm (Ω)	1.000 000*E−09
erg	joule (J)	1.000 000*E−07
erg/cm²·s	watt per square metre (W/m²)	1.000 000*E−03
erg/s	watt (W)	1.000 000*E−07
ESU of capacitance	farad (F)	1.112 650 E−12
ESU of current	ampere (A)	3.335 6 E−10
ESU of electric potential	volt (V)	2.997 9 E+02
ESU of inductance	henry (H)	8.987 554 E+11
ESU of resistance	ohm (Ω)	8.987 554 E+11
faraday (based on carbon-12)	coulomb (C)	9.648 70 E+04
faraday (chemical)	coulomb (C)	9.649 57 E+04
faraday (physical)	coulomb (C)	9.652 19 E+04
fathom	metre (m)	1.828 8 E+00
fermi (femtometre)	metre (m)	1.000 000*E−15
fluid ounce (U.S.)	cubic metre (m³)	2.957 353 E−05
foot	metre (m)	3.048 000*E−01

Annex 5 — Units of Measurement to be used in Air and Ground Operations

Attachment C

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
foot (U.S. survey)	metre (m)	3.048 006 E−01
foot of water (39.2°F)	pascal (Pa)	2.988 98 E+03
ft^2	square metre (m^2)	9.290 304*E−02
ft^2/h (thermal diffusivity)	metre squared per second (m^2/s)	2.580 640*E−05
ft^2/s	metre squared per second (m^2/s)	9.290 304*E−02
ft^3 (volume; section modulus)	cubic metre (m^3)	2.831 685 E−02
ft^3/min	cubic metre per second (m^3/s)	4.719 474 E−04
ft^3/s	cubic metre per second (m^3/s)	2.831 685 E−02
ft^4 (moment of section)	metre to the fourth power (m^4)	8.630 975 E−03
ft·lbf	joule (J)	1.355 818 E+00
ft·lbf/h	watt (W)	3.766 161 E−04
ft·lbf/min	watt (W)	2.259 697 E−02
ft·lbf/s	watt (W)	1.355 818 E+00
ft·poundal	joule (J)	4.214 011 E−02
free fall, standard (g)	metre per second squared (m/s^2)	9.806 650*E+00
ft/h	metre per second (m/s)	8.466 667 E−05
ft/min	metre per second (m/s)	5.080 000*E−03
ft/s	metre per second (m/s)	3.048 000*E−01
ft/s^2	metre per second squared (m/s^2)	3.048 000*E−01
footcandle	lux (lx)	1.076 391 E+01
footlambert	candela per square metre (cd/m^2)	3.426 259 E+00
gal	metre per second squared (m/s^2)	1.000 000*E−02
gallon (Canadian liquid)	cubic metre (m^3)	4.546 090 E−03
gallon (U.K. liquid)	cubic metre (m^3)	4.546 092 E−03
gallon (U.S. dry)	cubic metre (m^3)	4.404 884 E−03
gallon (U.S. liquid)	cubic metre (m^3)	3.785 412 E−03
gal (U.S. liquid)/day	cubic metre per second (m^3/s)	4.381 264 E−08
gal (U.S. liquid)/min	cubic metre per second (m^3/s)	6.309 020 E−05
gal (U.S. liquid)/hp·h (SFC, specific fuel consumption)	cubic metre per joule (m^3/J)	1.410 089 E−09
gamma	tesla (T)	1.000 000*E−09
gauss	tesla (T)	1.000 000*E−04
gilbert	ampere (A)	7.957 747 E−01
grad	degree (angular)	9.000 000*E−01
grad	radian (rad)	1.570 796 E−02
gram	kilogram (kg)	1.000 000*E−03
g/cm^3	kilogram per cubic metre (kg/m^3)	1.000 000*E+03
$gram\text{-}force/cm^2$	pascal (Pa)	9.806 650*E+01
hectare	square metre (m^2)	1.000 000*E+04
horsepower (550 ft·lbf/s)	watt (W)	7.456 999 E+02
horsepower (electric)	watt (W)	7.460 000*E+02
horsepower (metric)	watt (W)	7.354 99 E+02
horsepower (water)	watt (W)	7.460 43 E+02
horsepower (U.K.)	watt (W)	7.457 0 E+02
hour (mean solar)	second (s)	3.600 000 E+03
hour (sidereal)	second (s)	3.590 170 E+03
hundredweight (long)	kilogram (kg)	5.080 235 E+01
hundredweight (short)	kilogram (kg)	4.535 924 E+01

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Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
inch	metre (m)	2.540 000*E − 02
inch of mercury (32°F)	pascal (Pa)	3.386 38 E + 03
inch of mercury (60°F)	pascal (Pa)	3.376 85 E + 03
inch of water (39.2°F)	pascal (Pa)	2.490 82 E + 02
inch of water (60°F)	pascal (Pa)	2.488 4 E + 02
in^2	square metre (m^2)	6.451 600*E − 04
in^3 (volume; section modulus)	cubic metre (m^3)	1.638 706 E − 05
in^3/min	cubic metre per second (m^3/s)	2.731 177 E − 07
in^4 (moment of section)	metre to the fourth power (m^4)	4.162 314 E − 07
in/s	metre per second (m/s)	2.540 000*E − 02
in/s^2	metre per second squared (m/s^2)	2.540 000*E − 02
kilocalorie (International Table)	joule (J)	4.186 800*E + 03
kilocalorie (mean)	joule (J)	4.190 02 E + 03
kilocalorie (thermochemical)	joule (J)	4.184 000*E + 03
kilocalorie (thermochemical)/min	watt (W)	6.973 333 E + 01
kilocalorie (thermochemical)/s	watt (W)	4.184 000*E + 03
kilogram-force (kgf)	newton (N)	9.806 650*E + 00
kgf·m	newton metre (N·m)	9.806 650*E + 00
$kgf \cdot s^2/m$ (mass)	kilogram (kg)	9.806 650*E + 00
kgf/cm^2	pascal (Pa)	9.806 650*E + 04
kgf/m^2	pascal (Pa)	9.806 650*E + 00
kgf/mm^2	pascal (Pa)	9.806 650*E + 06
km/h	metre per second (m/s)	2.777 778 E − 01
kilopond	newton (N)	9.806 650*E + 00
kW·h	joule (J)	3.600 000*E + 06
kip (1 000 lbf)	newton (N)	4.448 222 E + 03
kip/in^2 (ksi)	pascal (Pa)	6.894 757 E + 06
knot (international)	metre per second (m/s)	5.144 444 E − 01
lambert	candela per square metre (cd/m^2)	$1/\pi$ *E + 04
lambert	candela per square metre (cd/m^2)	3.183 099 E + 03
langley	joule per square metre (J/m^2)	4.184 000*E + 04
$lb \cdot ft^2$ (moment of inertia)	kilogram metre squared ($kg \cdot m^2$)	4.214 011 E − 02
$lb \cdot in^2$ (moment of inertia)	kilogram metre squared ($kg \cdot m^2$)	2.926 397 E − 04
lb/ft·h	pascal second (Pa·s)	4.133 789 E − 04
lb/ft·s	pascal second (Pa·s)	1.488 164 E + 00
lb/ft^2	kilogram per square metre (kg/m^2)	4.882 428 E + 00
lb/ft^3	kilogram per cubic metre (kg/m^3)	1.601 846 E + 01
lb/gal (U.K. liquid)	kilogram per cubic metre (kg/m^3)	9.977 633 E + 01
lb/gal (U.S. liquid)	kilogram per cubic metre (kg/m^3)	1.198 264 E + 02
lb/h	kilogram per second (kg/s)	1.259 979 E − 04
lb/hp·h (SFC, specific fuel consumption)	kilogram per joule (kg/J)	1.689 659 E − 07
lb/in^3	kilogram per cubic metre (kg/m^3)	2.767 990 E + 04
lb/min	kilogram per second (kg/s)	7.559 873 E − 03
lb/s	kilogram per second (kg/s)	4.535 924 E − 01
lb/yd^3	kilogram per cubic metre (kg/m^3)	5.932 764 E − 01
lbf·ft	newton metre (N·m)	1.355 818 E + 00
lbf·ft/in	newton metre per metre (N·m/m)	5.337 866 E + 01

Attachment C

Annex 5 — Units of Measurement to be used in Air and Ground Operations

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
lbf·in	newton metre (N·m)	1.129 848 E−01
lbf·in/in	newton metre per metre (N·m/m)	4.448 222 E+00
lbf·s/ft²	pascal second (Pa·s)	4.788 026 E+01
lbf/ft	newton per metre (N/m)	1.459 390 E+01
lbf/ft²	pascal (Pa)	4.788 026 E+01
lbf/in	newton per metre (N/m)	1.751 268 E+02
lbf/in² (psi)	pascal (Pa)	6.894 757 E+03
lbf/lb (thrust/weight (mass) ratio)	newton per kilogram (N/kg)	9.806 650 E+00
light year	metre (m)	9.460 55 E+15
litre	cubic metre (m³)	1.000 000*E−03
maxwell	weber (Wb)	1.000 000*E−08
mho	siemens (S)	1.000 000*E+00
microinch	metre (m)	2.540 000*E−08
micron	metre (m)	1.000 000*E−06
mil	metre (m)	2.540 000*E−05
mile (international)	metre (m)	1.609 344*E+03
mile (statute)	metre (m)	1.609 3 E+03
mile (U.S. survey)	metre (m)	1.609 347 E+03
mile (international nautical)	metre (m)	1.852 000*E+03
mile (U.K. nautical)	metre (m)	1.853 184*E+03
mile (U.S. nautical)	metre (m)	1.852 000*E+03
mi² (international)	square metre (m²)	2.589 988 E+06
mi² (U.S. survey)	square metre (m²)	2.589 998 E+06
mi/h (international)	metre per second (m/s)	4.470 400*E−01
mi/h (international)	kilometre per hour (km/h)	1.609 344*E+00
mi/min (international)	metre per second (m/s)	2.682 240*E+01
mi/s (international)	metre per second (m/s)	1.609 344*E+03
millibar	pascal (Pa)	1.000 000*E+02
millimetre of mercury (0°C)	pascal (Pa)	1.333 22 E+02
minute (angle)	radian (rad)	2.908 882 E−04
minute (mean solar)	second (s)	6.000 000 E+01
minute (sidereal)	second (s)	5.983 617 E+01
month (mean calendar)	second(s)	2.628 000 E+06
oersted	ampere per metre (A/m)	7.957 747 E+01
ohm centimetre	ohm metre (Ω·m)	1.000 000*E−02
ohm circular-mil per ft	ohm millimetre squared per metre (Ω·mm²/m)	1.662 426 E−03
ounce (avoirdupois)	kilogram (kg)	2.834 952 E−02
ounce (troy or apothecary)	kilogram (kg)	3.110 348 E−02
ounce (U.K. fluid)	cubic metre (m³)	2.841 307 E−05
ounce (U.S. fluid)	cubic metre (m³)	2.957 353 E−05
ounce-force	newton (N)	2.780 139 E−01
ozf·in	newton metre (N·m)	7.061 552 E−03
oz (avoirdupois)/gal (U.K. liquid)	kilogram per cubic metre (kg/m³)	6.236 021 E+00
oz (avoirdupois)/gal (U.S. liquid)	kilogram per cubic metre (kg/m³)	7.489 152 E+00
oz (avoirdupois)/in³	kilogram per cubic metre (kg/m³)	1.729 994 E+03
oz (avoirdupois)/ft²	kilogram per square metre (kg/m²)	3.051 517 E−01
oz (avoirdupois)/yd²	kilogram per square metre (kg/m²)	3.390 575 E−02

Annex 5 — Units of Measurement to be used in Air and Ground Operations *Attachment C*

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
parsec	metre (m)	3.085 678 E+16
pennyweight	kilogram (kg)	1.555 174 E−03
perm (0°C)	kilogram per pascal second metre squared ($kg/Pa \cdot s \cdot m^2$)	5.721 35 E−11
perm (23°C)	kilogram per pascal second metre squared ($kg/Pa \cdot s \cdot m^2$)	5.745 25 E−11
perm·in (0°C)	kilogram per pascal second metre ($kg/Pa \cdot s \cdot m$)	1.453 22 E−12
perm·in (23°C)	kilogram per pascal second metre ($kg/Pa \cdot s \cdot m$)	1.459 29 E−12
phot	lumen per square metre (lm/m^2)	1.000 000*E+04
pint (U.S. dry)	cubic metre (m^3)	5.506 105 E−04
pint (U.S. liquid)	cubic metre (m^3)	4.731 765 E−04
poise (absolute viscosity)	pascal second (Pa·s)	1.000 000*E−01
pound (lb avoirdupois)	kilogram (kg)	4.535 924 E−01
pound (troy or apothecary)	kilogram (kg)	3.732 417 E−01
poundal	newton (N)	1.382 550 E−01
$poundal/ft^2$	pascal (Pa)	1.488 164 E+00
$poundal \cdot s/ft^2$	pascal second (Pa·s)	1.488 164 E+00
pound-force (lbf)	newton (N)	4.448 222 E+00
quart (U.S. dry)	cubic metre (m^3)	1.101 221 E−03
quart (U.S. liquid)	cubic metre (m^3)	9.463 529 E−04
rad (radiation dose absorbed)	gray (Gy)	1.000 000*E−02
rem	sievert (Sv)	1.000 000*E−02
rhe	1 per pascal second (1/Pa·s)	1.000 000*E+01
roentgen	coulomb per kilogram (C/kg)	2.58 E−04
second (angle)	radian (rad)	4.848 137 E−06
second (sidereal)	second (s)	9.972 696 E−01
slug	kilogram (kg)	1.459 390 E+01
slug/ft·s	pascal second (Pa·s)	4.788 026 E+01
$slug/ft^3$	kilogram per cubic metre (kg/m^3)	5.153 788 E+02
statampere	ampere (A)	3.335 640 E−10
statcoulomb	coulomb (C)	3.335 640 E−10
statfarad	farad (F)	1.112 650 E−12
stathenry	henry (H)	8.987 554 E+11
statmho	siemens (S)	1.112 650 E−12
statohm	ohm (Ω)	8.987 554 E+11
statvolt	volt (V)	2.997 925 E+02
stere	cubic metre (m^3)	1.000 000*E+00
stilb	candela per square metre (cd/m^2)	1.000 000*E+04
stokes (kinematic viscosity)	metre squared per second (m^2/s)	1.000 000*E−04
therm	joule (J)	1.055 056 E+08
ton (assay)	kilogram (kg)	2.916 667 E−02
ton (long, 2 240 lb)	kilogram (kg)	1.016 047 E+03
ton (metric)	kilogram (kg)	1.000 000*E+03
ton (nuclear equivalent of TNT)	joule (J)	4.184 E+09
ton (refrigeration)	watt (W)	3.516 800 E+03

Annex 5 — Units of Measurement to be used in Air and Ground Operations

Attachment C

Table C-1 *(cont.)*

To convert from	*to*	*Multiply by*
ton (register)	cubic metre (m^3)	2.831 685 E+00
ton (short, 2 000 lb)	kilogram (kg)	9.071 847 E+02
ton (long)/yd^3	kilogram per cubic metre (kg/m^3)	1.328 939 E+03
ton (short)/h	kilogram per second (kg/s)	2.519 958 E−01
ton-force (2 000 lbf)	newton (N)	8.896 444 E+03
tonne	kilogram (kg)	1.000 000*E+03
torr (mm Hg, 0°C)	pascal (Pa)	1.333 22 E+02
unit pole	weber (Wb)	1.256 637 E−07
W·h	joule (J)	3.600 000*E+03
W·s	joule (J)	1.000 000*E+00
W/cm^2	watt per square metre (W/m^2)	1.000 000*E+04
W/in^2	watt per square metre (W/m^2)	1.550 003 E+03
yard	metre (m)	9.144 000*E−01
yd^2	square metre (m^2)	8.361 274 E−01
yd^3	cubic metre (m^3)	7.645 549 E−01
yd^3/min	cubic metre per second (m^3/s)	1.274 258 E−02
year (calendar)	second (s)	3.153 600 E+07
year (sidereal)	second (s)	3.155 815 E+07
year (tropical)	second (s)	3.155 693 E+07

Table C-2. Temperature conversion formulae

To convert from	*to*	*Use formula*
Celsius temperature ($t_{°C}$)	Kelvin temperature (t_K)	$t_K = t_{°C} + 273.15$
Fahrenheit temperature ($t_{°F}$)	Celsius temperature ($t_{°C}$)	$t_{°C} = (t_{°F} - 32)/1.8$
Fahrenheit temperature ($t_{°F}$)	Kelvin temperature (t_K)	$t_K = (t_{°F} + 459.67)/1.8$
Kelvin temperature (t_K)	Celsius temperature ($t_{°C}$)	$t_{°C} = t_K - 273.15$
Rankine temperature ($t_{°R}$)	Kelvin temperature (t_K)	$t_K = t_{°R}/1.8$

ATTACHMENT D. CO-ORDINATED UNIVERSAL TIME

1. Co-ordinated Universal Time (UTC) has now replaced Greenwich Mean Time (GMT) as the accepted international standard for clock time. It is the basis for civil time in many States and is also the time used in the world-wide time signal broadcasts used in aviation. The use of UTC is recommended by such bodies as the General Conference on Weights and Measures (CGPM), the International Radio Consultative Committee (CCIR) and the World Administration Radio Conference (WARC).

2. The basis for all clock time is the time of apparent rotation of the sun. This is, however, a variable quantity which depends, among other things, on where it is measured on earth. A mean value of this time, based upon measurements in a number of places on the earth, is known as Universal Time. A different time scale, based upon the definition of the second, is known as International Atomic Time (TAI). A combination of these two scales results in Co-ordinated Universal Time. This consists of TAI adjusted as necessary by the use of leap seconds to obtain a close approximation (always within 0.5 seconds) of Universal Time.

ATTACHMENT E. PRESENTATION OF DATE AND TIME IN ALL-NUMERIC FORM

1. Introduction

The International Organization for Standardization (ISO) Standards 2014 and 3307 specify the procedures for writing the date and time in all-numeric form and ICAO will be using these procedures in its documents where appropriate in the future.

2. Presentation of Date

Where dates are presented in all-numeric form, ISO 2014 specifies that the sequence year-month-day should be used. The elements of the date should be:

— four digits to represent the year, except that the century digits may be omitted where no possible confusion could arise from such an omission. There is value in using the century digits during the period of familiarization with the new format to make it clear that the new order of elements is being used;

— two digits to represent the month;

— two digits to represent the day.

Where it is desired to separate the elements for easier visual understanding, only a space or a hyphen should be used as a separator. As an example, 25 August 1983 may be written as:

19830825 or 830825

or 1983-08-25 or 83-08-25

or 1983 08 25 or 83 08 25.

It should be emphasized that the ISO sequence should only be used where it is intended to use an all-numeric presentation. Presentations using a combination of figures and words may still be used if required (e.g. 25 August 1983).

3. Presentation of Time

3.1 Where the time of day is to be written in all-numeric form, ISO 3307 specifies that the sequence hours-minutes-seconds should be used.

3.2 Hours should be represented by two digits from 00 to 23 in the 24-hour timekeeping system and may be followed either by decimal fractions of an hour or by minutes and seconds. Where decimal fractions of an hour are used, the normal decimal separator should be used followed by the number of digits necessary to provide the required accuracy.

3.3 Minutes should likewise be represented by two digits from 00 to 59 followed by either decimal fractions of a minute or by seconds.

3.4 Seconds should also be represented by two digits from 00 to 59 and followed by decimal fractions of a second if required.

3.5 Where it is necessary to facilitate visual understanding a colon should be used to separate hours and minutes and minutes and seconds. For example, 20 minutes and 18 seconds past 3 o'clock in the afternoon may be written as:

152018 or 15:20:18 in hours, minutes and seconds

or 1520.3 or 15:20.3 in hours, minutes and decimal fractions of a minute

or 15.338 in hours and decimal fractions of an hour.

4. Combination Date and Time Groups

This presentation lends itself to a uniform method of writing date and time together where necessary. In such cases, the sequence of elements year-month-day-hour-minute-second should be used. It may be noted that not all the elements need be used in every case — in a typical application, for example, only the elements day-hour-minute might be used.

— END —

International Standards
and Recommended Practices

Annex 6
to the Convention on
International Civil Aviation

Operation of Aircraft

Part I
International Commercial
Air Transport — Aeroplanes

This edition incorporates all amendments adopted by the Council prior to 10 March 2001 and supersedes, on 1 November 2001, all previous editions of Part I of Annex 6.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

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International Civil Aviation Organization

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AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-26	Incorporated in this Edition		
27	28/11/02		ICAO
28	27/11/03		ICAO
29	24/11/05		ICAO
30	23/11/06		ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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ABBREVIATIONS AND SYMBOLS

(used in this Annex)

Abbreviations

AC	Alternating current
ACAS	Airborne collision avoidance system
ADREP	Accident/incident reporting
ADS	Automatic dependent surveillance
AFCS	Automatic flight control system
AGA	Aerodromes, air routes and ground aids
AIG	Accident investigation and prevention
AOC	Aeronautical operational control
AOC	Air operator certificate
APU	Auxiliary power unit
ASDA	Accelerate stop distance available
ASE	Altimetry system error
ASIA/PAC	Asia/Pacific
ATC	Air traffic control
ATM	Air traffic management
ATS	Air traffic services
CAS	Calibrated airspeed
CAT I	Category I
CAT II	Category II
CAT III	Category III
CAT IIIA	Category IIIA
CAT IIIB	Category IIIB
CAT IIIC	Category IIIC
cm	Centimetre
CDL	Configuration deviation list
CFIT	Controlled flight into terrain
CPDLC	Controller-pilot data link communications
CVR	Cockpit voice recorder
DA	Decision altitude
DA/H	Decision altitude/height
DC	Device control
D-FIS	Data link-flight information services
DH	Decision height
DME	Distance measuring equipment
DSTRK	Desired track
ECAM	Electronic centralized aircraft monitor
EFIS	Electronic flight instrument system
EGT	Exhaust gas temperature
EICAS	Engine indication and crew alerting system
ELT	Emergency locator transmitter
ELT(AD)	Automatically deployable ELT
ELT(AF)	Automatic fixed ELT
ELT(AP)	Automatic portable ELT
ELT(S)	Survival ELT
EPR	Engine pressure ratio
ETOPS	Extended range operations by turbine-engined aeroplanes
EUROCAE	European Organization for Civil Aviation Equipment
FDAU	Flight data acquisition unit
FDR	Flight data recorder
FL	Flight level
FM	Frequency modulation
ft	Foot
ft/min	Feet per minute
g	Normal acceleration
GCAS	Ground collision avoidance system
GNSS	Global navigation satellite system
GPWS	Ground proximity warning system
hPa	Hectopascal
IFR	Instrument flight rules
ILS	Instrument landing system

Abbreviations

IMC	Instrument meteorological conditions
INS	Inertial navigation system
ISA	International standard atmosphere
kg	Kilogram
kg/m^2	Kilogram per metre squared
km	Kilometre
km/h	Kilometre per hour
kt	Knot
kt/s	Knots per second
lb	Pound
LDA	Landing distance available
m	Metre
MDA	Minimum descent altitude
MDA/H	Minimum descent altitude/height
MDH	Minimum descent height
MEL	Minimum equipment list
MHz	Megahertz
MLS	Microwave landing system
MMEL	Master minimum equipment list
MNPS	Minimum navigation performance specifications
MOPS	Minimum Operational Performance Specification
m/s	Metres per second
m/s^2	Metres per second squared
N	Newton
N_1	Low pressure compressor speed (two-stage compressor); fan speed (three-stage compressor)
N_2	High pressure compressor speed (two-stage compressor); intermediate pressure compressor speed (three-stage compressor)
N_3	High pressure compressor speed (three stage compressor)
NAV	Navigation
NM	Nautical mile
OCA	Obstacle clearance altitude
OCA/H	Obstacle clearance altitude/height
OCH	Obstacle clearance height
PANS	Procedures for Air Navigation Services
RNP	Required navigation performance
RVR	Runway visual range
RVSM	Reduced vertical separation minima
SICASP	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel
SOP	Standard operating procedures
SST	Supersonic transport
STOL	Short take-off and landing
TAS	True airspeed
TAWS	Terrain awareness warning system
TCAS	Traffic alert and collision avoidance system
TLA	Thrust lever angle
TLS	Target level of safety
TODA	Take-off distance available
TORA	Take-off run available
TVE	Total vertical error
UTC	Coordinated universal time
VFR	Visual flight rules
V_D	Design diving speed
VMC	Visual meteorological conditions
V_{MC}	Minimum control speed with the critical engine inoperative
VOR	VHF omnidirectional radio range

Abbreviations

V_{S_0}	Stalling speed or the minimum steady flight speed in the landing configuration
V_{S_1}	Stalling speed or the minimum steady flight speed in a specified configuration
VTOL	Vertical take-off and landing
WXR	Weather

Symbols

°C	Degrees Celsius
%	Per cent

PUBLICATIONS

(referred to in this Annex)

Convention on International Civil Aviation (Doc 7300)

European Organization for Civil Aviation Equipment (EUROCAE) Documents ED55 and ED56A

International Regulations for Preventing Collisions at Sea

Policy and Guidance Material on the Economic Regulation of International Air Transport (Doc 9587)

Protocol Relating to an Amendment to the Convention on International Civil Aviation (*Article 83* bis) (Doc 9318)

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Part 1 — *Rescue and Fire Fighting*
Part 8 — *Airport Operational Services*

Airworthiness Manual (Doc 9760)

Human Factors Training Manual (Doc 9683)

Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640)

Manual of All-Weather Operations (Doc 9365)

Manual of Criteria for the Qualification of Flight Simulators (Doc 9625)

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Manual of Procedures for the Establishment of a State's Personnel Licensing System (Doc 9379)

Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)

Manual on Required Navigation Performance (RNP) (Doc 9613)

Preparation of an Operations Manual (Doc 9376)

Safety Management Manual (SMM) (Doc 9859)

Safety Oversight Manual (Doc 9734)
Part A — *The Establishment and Management of a State's Safety Oversight System*

Training Manual (Doc 7192)
Part D-3 — *Flight Operations Officers/Flight Dispatchers*

Circulars

Guidance Material on SST Aircraft Operations (Cir 126)

Guidance on the Implementation of Article 83 bis *of the Convention on International Civil Aviation* (Cir 295)

ANNEX 6 — PART I
INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

FOREWORD

Historical background

Standards and Recommended Practices for the Operation of Aircraft — International Commercial Air Transport were first adopted by the Council on 10 December 1948 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and designated as Annex 6 to the Convention. They became effective on 15 July 1949. The Standards and Recommended Practices were based on recommendations of the Operations Division at its first session in April 1946, which were further developed at the second session of the Division in February 1947.

Amendments to the Annex, which included additional Standards and Recommended Practices as well as modifications to existing Standards, and which were based on recommendations of the Operations Division at its third and fourth sessions in February–March 1949 and March–April 1951, were adopted by the Council on 5 December 1950 (Amendments 1–127), 4 December 1951 (Amendments 128–131), 28 November 1952 (Amendments 132 and 133), 2 December 1952 (Amendment 134), 20 October 1953 (Amendment 135), 23 February 1956 (Amendment 136), 8 May 1956 (Amendment 137) and 15 May 1956 (Amendment 138), and became effective on 1 June 1951, 1 May 1952, 1 April 1953, 1 May 1953, 1 March 1954, 1 July 1956, 1 September 1956 and 15 September 1956 respectively.

The Third Air Navigation Conference (Montreal, September–October 1956) made, among other things, a complete review of Chapter 5 of the Annex. As a result of those recommendations, their submission to all Contracting States, and their review by the Air Navigation Commission, a complete new text of Chapter 5 was adopted by the Council as Amendment 139 on 13 June 1957 and became effective on 1 October 1957.

Additionally, the Council adopted Amendment 140 on 13 June 1957, containing amendments to Chapter 6 covering the marking of break-in points on aircraft and the characteristics of navigation lights, to Chapter 8 respecting the qualification of persons to certify aircraft as airworthy, to Chapter 9 respecting the route and aerodrome qualification of pilots and to Chapter 10 respecting requirements for licensing of flight operations officers, which became effective on 1 October 1957. Subsequent to the issuance of the fifth edition, Amendment 141 (4.1.1 and 4.1.2) was adopted by the Council on 12 May 1958 and became applicable on 1 December 1958. On 8 December 1959 the Council adopted Amendment 142 relating to the provisions in Chapter 6 for the carriage of portable emergency radio transmitters. The Amendment became effective on 1 May 1960 and applicable on 1 August 1960. On 2 December 1960 the Council adopted Amendment 143 relating to the provisions in Chapter 4 for co-ordination of operational instructions involving a change in the air traffic control flight plan. The Amendment became effective on 1 April 1961 and applicable on 1 July 1961. On 24 March 1961 the Council adopted Amendment 144 relating to the establishment of limitations upon flight duty periods and provision of rest periods for flight crew members, and the Attachment to the Annex of guidance material on the establishment of flight time and flight duty period limitations and rest periods. The Amendment became effective on 1 August 1961 and applicable on 1 October 1961. The Council on 24 March 1961 approved Amendment 145 containing the Note under 6.2.2 a). On 13 December 1961 the Council adopted Amendments 146 and 147 and approved Amendment 148. These relate respectively to the modernizing of the specifications concerning the provision and use of oxygen supply systems, the installation of high intensity anti-collision lights on aeroplanes and to purely editorial changes respecting references to other documents. The Amendments became effective on 1 April 1962 and applicable on 1 July 1962. On 8 April 1963 the Council adopted Amendment 149. This Amendment related to the specification of the circumstances under which emergency and survival equipment shall be carried on long-range over-water flights. The Amendment became effective on 1 August 1963 and applicable on 1 November 1963.

As a result of the adoption of Amendment 150, a sixth edition of the Annex was published. This was necessitated by the extensive nature of the Amendment which followed recommendations of the Fourth Air Navigation Conference (Montreal, November–December 1965) for extensive revision of the Annex, chiefly with the aim of bringing it up to date to meet the operational needs of high performance turbo-jet aeroplanes. Furthermore, on the recommendation of the Conference, the applicability of the Annex is now limited to ''aeroplanes'' engaged in scheduled and non-scheduled international air transport operations. Previously this limitation applied only to non-scheduled international air transport operations. Amendment 150 was adopted by the Council on 14 December 1966, became effective on 14 April 1967 and applicable on 24 August 1967.

The Council, on 8 November 1967, adopted Amendment 151 which redefined ''Aircraft'' as a result of adoption by Council of Amendment 2 to Annex 7 to the Convention and amended 5.2.7.2.2 to cater for three-engined aeroplanes. The Amendment became effective on 8 March 1968 and applicable on 22 August 1968.

Amendment 152 was adopted by the Council on 23 January 1969. Besides revising certain paragraphs in Chapters 4, 7 and 8 to give them more precision, the Amendment also adds a provision in Chapter 4 which prohibits, when passengers are being carried, the in-flight simulation of emergency situations affecting the flight characteristics of the aeroplane. The opportunity presented by this Amendment was also taken to introduce changes to the Annex as a consequence of the adoption by the Council of a companion document — International Standards and Recommended Practices — *Operation of Aircraft* — Annex 6, Part II — *International General Aviation*. These changes consisted of designating this document, previously known as Annex 6, ''Annex 6, Part I, First Edition''. Amendment 152 became effective on 23 May 1969 and applicable on 18 September 1969.

Consequent to the adoption of Annex 6, Part III, *International Operations — Helicopters*, an amendment to the title was introduced to indicate that Annex 6, Part I was applicable only to aeroplanes.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The present edition of Annex 6, Part I, contains Standards and Recommended Practices adopted by the International Civil Aviation Organization as the minimum Standards applicable to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations. These international commercial air transport operations include scheduled international air services and non-scheduled international air transport operations for remuneration or hire.

In conjunction, these two types of operations include all international air transport operations conducted for remuneration or hire by aeroplanes. The distinction between them lies in the fact that scheduled international air services are especially provided for in the Convention in contradistinction to international air transport operations in general, of which non-scheduled international air transport operations for remuneration or hire were considered most urgently to require the establishment of International Standards and Recommended Practices. It is no longer considered necessary to differentiate in the Standards and Recommended Practices between scheduled international air services and non-scheduled international air transport operations.

The purpose of Annex 6, Part I, is to contribute to the safety of international air navigation by providing criteria of safe operating practice and to contribute to the efficiency and regularity of international air navigation by encouraging States to facilitate the passage over their territories of aeroplanes in international commercial air transport belonging to other States that operate in conformity with such Standards.

Chapter 5

An element of the safety of an operation is the intrinsic safety of the aircraft, that is, its level of airworthiness. The level of airworthiness of an aircraft is, however, not fully defined by the application of the airworthiness Standards of Annex 8, but also requires the application of those Standards in the present Annex that are complementary to them.

As originally adopted and also as amended by Amendments 1 to 138, the Annex contained a chapter ''Aeroplane Operating Limitations'' which included general provisions applicable to the operation of all aeroplanes within the scope of the Annex, a section or sections applicable to aeroplanes certificated in ICAO categories according to the then existent Annex 8, and a section applicable to aeroplanes not so certificated.

At its fourth session, the Operations Division, collaborating with the Airworthiness Division, made, in addition to the proposals that resulted in Amendments 128 to 133, recommendations concerning the use of a performance code as an alternative to the one prescribed for ICAO Category A aeroplanes in which some essential climb values had the status of Recommended Practices. Further, the Airworthiness Division made recommendations concerning certain aspects of the certification in ICAO categories. As a result of those recommendations, the Council, on 2 December 1952, adopted Amendment 134 (which became effective 1 May 1953), and approved the incorporation of the alternative performance code as Attachment A but stated its belief that since agreement had not yet been reached on Standards covering performance, there existed no basis for certification in ICAO Category A. It urged the Contracting States to refrain from such certification pending the becoming effective of Standards on performance or until such time as the Council decides on the basic policy on airworthiness.

The Assembly at its seventh session (June 1953) endorsed the action already taken by the Council and the Air Navigation Commission to initiate a fundamental study of ICAO policy on international airworthiness and directed the Council to complete the study as rapidly as practicable.

In pursuing such study, the Air Navigation Commission was helped by an international body of experts designated as the ''Airworthiness Panel'', which contributed to the preparation of the work of the Third Air Navigation Conference.

As a result of these studies, a revised policy on international airworthiness was developed and it was approved by the Council in 1956. According to this policy the principle of certification in an ICAO Category was abandoned. Instead, Annex 8 included broad Standards which defined, for application by the competent national authorities, the complete minimum international basis for the recognition by States of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories, thereby achieving, among other purposes, protection of other aircraft, third persons and property. It was considered that this met the obligation of the Organization under Article 37 of the Convention to adopt international Standards of airworthiness.

It was recognized that the ICAO Standards of airworthiness would not replace national regulations and that national codes of airworthiness containing the full scope and extent of detail considered necessary by individual States would be necessary as the basis for the certification of individual aircraft. Each State would establish its own comprehensive and detailed code of airworthiness or would select a comprehensive and detailed code established by another Contracting State. The level of airworthiness defined by this code would be indicated by the Standards, supplemented, if necessary, by Acceptable Means of Compliance.

A revised text consistent with the above principles was prepared for Chapter 5 of Annex 6. It included: a) broad Standards that were complementary to the Standards related to aeroplane performance in Annex 8; and b) two Acceptable Means of Compliance which illustrated by examples the level of performance intended by the broad Standards. To adopt a code giving an appreciably lower level of performance than that illustrated by these Acceptable Means of Compliance was considered to be a violation of the Standards in Chapter 5 of this Annex.

Present policy on international airworthiness. There had been some concern about the slow progress that had been made over the years with respect to developing supplementary airworthiness specifications in the form of Acceptable Means of Compliance. It was noted that the majority of the Acceptable Means of Compliance in Annexes 6 and 8 had been developed in 1957 and were therefore applicable to only those aeroplane types operating at that time. No effort had been made to update the specifications in these Acceptable Means of Compliance nor had there been any recommendations from the Airworthiness Committee for upgrading of any of the Provisional Acceptable Means of Compliance, which had been developed as potential material for full-fledged Acceptable Means of Compliance. The Air Navigation Commission therefore requested the Airworthiness Committee to review the progress made by it since its inception with a view to determining whether or not desired results had been achieved and to recommend any changes to improve the development of detailed airworthiness specifications.

The Airworthiness Committee at its Ninth Meeting (Montreal, November/December 1970) made a detailed study of the problems and recommended that the concept of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance be abandoned and a provision be made for an airworthiness technical manual to be prepared and published by ICAO to include guidance material intended to facilitate the development and uniformity of national airworthiness codes by Contracting States.

The Air Navigation Commission reviewed the recommendations of the Airworthiness Committee in the light of the history of the development of the airworthiness policy approved by the Council in 1956. It came to the conclusion that the basic objectives and principles on which the ICAO airworthiness policy had been based were sound and did not require any significant change. It was also concluded that the main reason for the slow progress in the development of airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance was the degree of mandatory status to the former implied by the following statement included in the Forewords of Annexes 6 and 8:

> ''To adopt a code giving an appreciably lower level of airworthiness than that given in an Acceptable Means of Compliance would be a violation of the Standard supplemented by that Acceptable Means of Compliance.''

Several approaches were examined by the Air Navigation Commission to eliminate this difficulty. Finally, it came to the conclusion that the idea of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance should be abandoned and ICAO should declare that the States' obligations, for the purpose of Article 33 of the Convention, shall be met by their compliance with the broad Standards in Annex 8 supplemented, as necessary, by airworthiness technical guidance material, devoid of all mandatory implications or obligations. Also the requirement that each Contracting State should either establish its own comprehensive and detailed code of airworthiness or select a comprehensive and detailed code established by another Contracting State should be retained.

The Council on 15 March 1972 approved the above approach to form the basis for the present policy of ICAO in the field of airworthiness.

It also approved the issuance of the airworthiness guidance material under the title of *Airworthiness Technical Manual*. It was understood that the guidance material would have no formal status and its main purpose would be to provide guidance to Contracting States in developing the detailed national airworthiness code mentioned in 2.2 of Part II of Annex 8.

With respect to Annex 6, Part I, it was agreed that the guidance material in the Acceptable Means of Compliance for Aeroplane Performance Operating Limitations should be edited suitably and retained in the Annex but in the form of an Attachment (green pages).

Performance Standards of Annex 8. Chapter 2, Part IIIA, and Sub-part B, Part IIIB, of Annex 8 contain aeroplane performance Standards that are complementary to the Standards in Chapter 5 of this Annex. Both state broad objectives. The Council has urged Contracting States not to impose on visiting aeroplanes, not exempted by Article 41, operational requirements other than those established by the State of Registry, provided that those requirements assure the level of performance equivalent to that intended by the Standards of Chapter 5 of this Annex and the complementary Standards of Chapter 2, Part IIIA, and Sub-part B, Part IIIB, of Annex 8.

In respect of aircraft exempted by Article 41, Chapter 5 of this Annex contains a Recommended Practice to the effect that the State of Registry should ensure that the level of performance specified in 5.2 applicable to aeroplanes not exempted should be met as far as practicable by those aeroplanes. The Council has urged Contracting States not to impose on visiting aircraft exempted by Article 41 requirements other than those established by the State of Registry provided that in establishing those requirements the State of Registry complied with the Recommended Practice. These recommendations complement one made by the Council in respect of aircraft exempted by Article 41, to the effect that Contracting States apply as far as practicable to aeroplanes over 5 700 kg mass intended for the carriage of passengers or cargo or mail in international air navigation, the Standards of Parts IIIA and IIIB of Annex 8.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Attention of States is also drawn to the provision of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated.

1.—*Material comprising the Annex proper*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

It is to be noted that some Standards in this Annex incorporate, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb ''shall'' is used, and for Recommended Practices the operative verb ''should'' is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 6

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	Derived from Sixth Edition of Annex 6, including Amendment 152		23 January 1969 23 May 1969 18 September 1969
1 (2nd Edition)	Sixth Air Navigation Conference	a) A shift in emphasis of the responsibility for the establishment of minimum en-route flight altitudes from the operator to the State flown over; b) the requirement for additional instruments in aeroplanes operated as controlled VFR flights in the en-route phase; and, of special importance; c) the permitting of aeroplanes, when unable to navigate by visual references to landmarks, to be navigated by equipment other than radio navigation equipment, e.g. solely by self-contained navigation means, provided that certain equipment capabilities are met, thus eliminating any requirement for the carriage of radio navigation equipment.	25 May 1970 25 September 1970 4 February 1971
2	Special Meeting on Aircraft Noise in the Vicinity of Aerodromes (1969) and the Second Meeting of the Supersonic Transport Panel	a) The weight of an aeroplane at the start of take-off or at the expected time of landing not to exceed, except in prescribed circumstances, the relative maximum weights at which compliance has been demonstrated with the applicable Noise Certification Standards; b) the carriage on board an aeroplane of a document attesting noise certification; c) all aeroplanes intended to be operated above 15 000 m (49 000 ft) to carry equipment to measure and indicate continuously the total cosmic radiation being received.	2 April 1971 2 August 1971 6 January 1972
3	Council action in pursuance of Assembly Resolution A17-10	Inclusion in the Annex of a Recommended Practice to the effect that, in all passenger-carrying aeroplanes, the flight crew compartment door should be capable of being locked from within the compartment.	10 December 1971 10 April 1972 7 December 1972
4 (3rd Edition)	Air Navigation Commission Review of the Annex	a) Deletion from Chapter 2 of the provision which allowed, in prescribed circumstances, certain specifications classed as Standards to have the status of Recommended Practices; b) introduction of the term “Aerodrome operating minima” in lieu of “Aerodrome meteorological minima”; c) introduction of the terms “Decision height”, “Instrument meteorological conditions”, “Runway visual range” and “Visual meteorological conditions”; d) Introduction of provisions to require the operator to provide a copy of its Operations Manual to the State of Registry and to incorporate in the Manual certain mandatory material; e) the inclusion of an updated list of the supplies, etc., to be carried aboard aircraft in first-aid kits; f) a change in the equivalent of 5 700 kg from 12 500 lb to 12 566 lb;	27 June 1972 27 October 1972 1 March 1973

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
		g) the introduction of a reference to the need for certain types of aeroplanes to be equipped with a Mach number indicator; h) the introduction of a provision for cabin attendants to be seated and secured during certain prescribed flight phases.	
5	Seventh Air Navigation Conference	Inclusion in the Annex of definitions of "Flight recorder" and "Maximum weight" (of aircraft) and revision of the specifications for the carriage, recording parameters and operation of flight recorders.	29 May 1973 1 October 1973 23 May 1974
6	In pursuance of new policy on international airworthiness and action in pursuance of Assembly Resolution A18-16	Replacement of the Acceptable Means of Compliance on Aeroplane Performance Operating Limitations by guidance material on the subject in the form of an Attachment, and incorporation of provisions for emergency power supply to operate attitude indicating instruments on the total failure of the main electrical generating system. The opportunity presented by this Amendment was also taken to revise the Introductory Note to Chapter 3 of the Annex. The revision points to a practical method for States to discharge their functions in the cases of lease, charter, and interchange of aircraft in international operations.	30 October 1973 28 February 1974 23 May 1974
7	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	Introduced provisions relating to practices to be followed in the event that an aircraft is being subjected to unlawful interference.	7 December 1973 7 April 1974 23 May 1974
8	Pursuant to an Air Navigation Commission study concerning the interception of civil aircraft	Introduced provisions designed to reduce the risk for intercepted aircraft.	4 February 1975 4 June 1975 9 October 1975
9	Accident Investigation and Prevention Divisional Meeting (1974). Fifth Meeting of the Supersonic Transport Panel. Consequent to amendments to Annexes 3 and 14	Introduced requirements for the safeguarding and preservation of flight recorder records of aeroplanes involved in accidents and incidents, provision and use of flight crew restraining devices, procedures to be followed in the event of excessive cosmic radiation exposure during flight, and the maintenance of records for crew members on total cosmic radiation dosages. The Amendment also provided amplification of the specifications for the type of timepiece required for operations in accordance with Instrument Flight Rules and controlled VFR flights and provided a cross-reference to guidance material on SST fuel supplies. The opportunity presented by this Amendment was also taken to introduce changes to the Annex as a result of the adoption by the Council of amendments to companion documents — Annex 3 and Annex 14. These changes consist of the elimination of reference to PANS-MET and the revision of the definitions of Aerodrome, Runway Visual Range, Take-off Run Available and Landing Distance Available.	7 April 1976 7 August 1976 30 December 1976
10	ASIA/PAC Regional Air Navigation Meeting (1973)	The requirement for the carriage of survival radio equipment over those areas in which search and rescue would be especially difficult to be determined by States rather than regional air navigation agreement.	16 June 1976 16 October 1976 6 October 1977
11	Seventh Air Navigation Conference and Air Navigation Commission Study	Required the operator to establish operational procedures designed to ensure that an aeroplane conducting precision approaches crosses the threshold by a safe margin.	23 June 1977 23 October 1977 23 February 1978

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
12	Air Navigation Commission Study	Required the fitting of ground proximity warning systems to certain aeroplanes.	15 December 1977 15 April 1978 10 August 1978
13	Air Navigation Commission Study	Required the fitting of seats with safety harness and their use by cabin attendants assigned emergency evacuation duties.	13 December 1978 13 April 1979 29 November 1979
14	Air Navigation Commission Study	New definition of "operational control" and introduction of requirements for navigation equipment to meet minimum navigational performance specifications (MNPS)	2 April 1980 2 August 1980 27 November 1980
15	Air Navigation Commission Study	Revision of the provisions relating to exterior lights to align with new provisions in Annexes 2 and 8, and requirements to include a checklist of emergency and safety equipment, including instructions for its use, in the Operations Manual.	22 March 1982 22 July 1982 25 November 1982
16 (4th Edition)	Third and Fourth meetings of the Operations Panel, AGA Divisional Meeting (1981), amendments consequent to adoption of Annex 18 and an Air Navigation Study	Introduced provisions related to aircraft operating procedures for noise abatement, development and use of instrument flight procedures, authority and competence to taxi aeroplanes and refuelling with passengers on board. Changes to the Annex were introduced as a result of adoption by the Council of Annex 18 in respect to the carriage of dangerous goods and requirements for crew training programmes in their carriage in commercial aeroplanes. The provisions in respect of aerodromes operating minima were revised to clarify the requirements and to include a requirement for RVR information. Units of measurement were brought in line with the provisions of Annex 5, and the Note in Chapter 3 concerning lease, charter and interchange was updated.	29 March 1983 29 July 1983 24 November 1983
17	Accident Prevention and Investigation Divisional Meeting, AIG (1979)	Revision of the provisions relating to flight recorders. Introduction of related guidance material in an attachment.	6 March 1985 29 July 1985 21 November 1985
18	Seventh meeting of the Obstacle Clearance Panel, Air Navigation Commission studies and a proposal by a State	Provision of climb performance data with all engines operating; extended range operations by aeroplanes with two power-units; the provision of obstacle data; take-off alignment distance accountability.	25 March 1986 27 July 1986 20 November 1986
19 (5th Edition)	Air Navigation Commission review of the Annex, Stage I. Third meeting of the Visual Flight Rules Operations Panel. Air Navigation Commission Study	a) Introduction of new definitions for commercial air transport operations, air operator certificate, master minimum equipment list and minimum equipment list. Introduction of revised definitions of aerial work and general aviation to Annex 6, Part I. Revision of the definition of alternate aerodrome to introduce take-off, en-route and destination alternate aerodromes; b) elimination of the differences between the specifications for scheduled and non-scheduled operations; c) introduction of the concept of the applicability of Annex 6, Part I to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations; d) requirements for the issue of an air operator certificate and the introduction of guidance material; e) requirements for the development of minimum equipment lists and the introduction of guidance material;	19 March 1990 30 July 1990 15 November 1990

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
		f) requirements for the specification of alternate aerodromes;	
		g) requirement for the provision of an aircraft operating manual;	
		h) requirement for the operator to establish an accident prevention and flight safety programme and specifications related to carry-on baggage;	
		i) differentiation in Annex 6, Part I between operational and ATS flight plans;	
		j) requirements for the pilot-in-command to demonstrate knowledge of long-range navigation procedures where appropriate;	
		k) elimination of the term "controlled VFR flight" and recognition that a VFR flight may be a controlled flight;	
		l) amendment to Chapter 13 — Security to make the recommendation on the provision of a lockable flight crew compartment door applicable to all aeroplanes rather than only passenger-carrying aeroplanes, to require guidance material to support the aeroplane search procedure checklist, and to require the operator to establish a training programme for employees in preventative measures and techniques in relation to acts of sabotage or unlawful interference;	
		m) introduction of guidance material concerning flight data recording of important operational information in aeroplanes with electronic displays;	
		n) revision of the requirements for the contents of the operations manual;	
		o) requirements concerning carry-on baggage;	
		p) change of the expression "flight check system" to "checklist";	
20	Fifth meeting of the Operations Panel, Seventh and Eighth meetings of the Review of the General Concept of Separation Panel, Accident Investigation Divisional meeting (AIG/1992), Third meeting of the Continuing Airworthiness Panel, Air Navigation Commission studies	a) Revision of definitions of aerodrome operating minima, decision altitude/height, minimum descent altitude/height and obstacle clearance altitude/height; b) introduction of new definitions for emergency locator transmitters (ELTs), required navigation performance (RNP) and RNP type; c) introduction of the definition for the classification of instrument approach and landing operations; d) introduction of a reference to the *Continuing Airworthiness Manual;* e) revision of the requirements concerning the use of engraving metal foil flight data recorders; f) introduction of carriage requirements for emergency locator transmitters (ELTs) to replace provisions regarding survival radio equipment and emergency location beacon; g) introduction of a requirement that the navigation equipment carried shall enable the aircraft to proceed in accordance with RNP types prescribed for the intended route(s) or areas(s), provisions to permit the uniform implementation of 300 m (1 000 ft) VSM above FL 290 and reference to the requirements relating to operations in RNP airspace in the operations manual; h) revision of the requirements concerning maintenance inspection, modifications and repairs and continuing airworthiness information.	21 March 1994 25 July 1994 10 November 1994

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
21 (6th Edition)	Air Navigation Commission studies, Fourteenth meeting of the Dangerous Goods Panel, editorial amendment, text alignment with Annex 6, Part II and/or Part III, consequential amendment	a) Introduction of new and revised definitions for cabin attendant, flight manual, large aeroplane, operations manual and small aeroplane; b) revision of the provisions concerning operating facilities, flight preparation, flight time, flight duty periods and rest periods for crew members, oxygen supply and extended range operations (ETOPS); c) new requirements for determining the length of the runway available; d) revised and new provisions concerning ground proximity warning systems (GPWS), medical supplies, oxygen equipment for aeroplanes on high altitude flights; e) revision of the provisions concerning aeroplanes operated in accordance with instrument flight rules (IFR); f) inclusion of references to the ICAO *Manual of Criteria for the Qualification of Flight Simulators* (Doc 9625) and new requirements for the flight crew training programme concerning knowledge and skills related to human performance and limitations; g) revision of the denomination of flight operations officer to align with Annex 1; h) revision of the contents of the operations manual and new provisions concerning aerodrome operating minima, oxygen supply, flight and duty time limitations, departure contingency procedures, instructions for mass and balance control and instructions and training requirements for the avoidance of controlled flight into terrain (CFIT) and policy for the use of ground proximity warning systems (GPWS); i) new provisions on flight time, flight duty periods and rest periods for cabin attendants and revision of the provisions concerning training; and j) revised and new requirements related to the incorporation of security into aircraft design.	8 March 1995 24 July 1995 9 November 1995
22	Fourth and Fifth meetings of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/4 and 5)	Requirements concerning pressure-altitude reporting transponders and carriage of airborne collision avoidance systems (ACAS).	19 February 1996 15 July 1996 7 November 1996
23 (7th Edition)	First meeting of the Flight Recorder Panel, Fourth meeting of the Continuing Airworthiness Panel, ICAO and Industry CFIT Task Force, Air Navigation Commission studies, Amendment 162 to Annex 1, Amendment 38 to Annex 11, editorial amendment	a) Introduction of new and revised definitions for aircraft operating manual, configuration deviation list, ETOPS en-route alternate, Human Factors principles, human performance, master minimum equipment list, maintenance, psychoactive substances and required navigation performance; b) revision of the notes concerning lease and interchange; c) new and revised requirements concerning flight recorders; d) introduction of a note concerning the use of psychoactive substances; e) new provisions concerning airborne forward-looking wind shear warning systems;	19 March 1998 20 July 1998 5 November 1998

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
		f) new and revised provisions concerning continuing airworthiness to reflect the use of approved maintenance organizations and to clarify the responsibilities of the operator and the maintenance organization; g) new and revised provisions concerning the content of an operations manual relocated in an appendix and a new Recommended Practice for the carriage of the ground proximity warning system in piston-engined aeroplanes; h) new provisions concerning the responsibility of States with regard to supervision of operations subject to an air operator certificate, acceptance of an operations manual and establishment of a system for certification and continued surveillance of the operator; i) new provisions related to the de/anti-icing of aircraft on the ground, aeroplane performance operating limitations, mass limitation, sensitive pressure altimeters and recent experience of the co-pilot; j) new provisions concerning the carriage of airborne collision avoidance (ACAS) systems and pressure-altitude reporting transponders; and k) new provisions concerning Human Factors.	
24	Second meeting of the Flight Recorder Panel, 32nd Session of the Assembly, Air Navigation Commission studies	a) Change of terminology from "cabin attendant" to "cabin crew"; b) revised definitions; c) new provisions concerning the mandatory carriage of ELTs operating on 406 MHz and 121.5 MHz, the addition of a predictive terrain hazard warning function to the ground proximity warning system (GPWS) and the introduction of an implementation date for the recording of digital communications.	15 March 1999 19 July 1999 4 November 1999
25	Air Navigation Commission studies	a) Revised definitions; and b) introduction of requirements for the provision of RVR and criteria for instrument approach operations, and revision of the duties of the pilot-in-command.	15 March 2000 17 July 2000 2 November 2000
26 (8th Edition)	Second meeting of the Flight Recorder Panel, AIG Divisional Meeting (1999), Third meeting of the Global Navigation Satellite System Panel, Fifth meeting of the Continuing Airworthiness Panel, Air Navigation Commission studies	a) Update the provisions pertaining to flight recorders, including the recording of digital communications; FDR requirements for new aircraft; revised parameter listings; introduction of two-hour duration CVRs; b) new provisions pertaining to flight data analysis programmes; c) amendment of the classification of instrument approach and landing operations; d) new provisions pertaining to approach with vertical guidance (APV) operations; e) new definitions and update of provisions pertaining to maintenance-related requirements; and f) translation into English of documents attesting noise certification.	9 March 2001 16 July 2001 1 November 2001
27	Air Navigation Commission studies	a) Revised requirements for the ground proximity warning system (GPWS) and forward looking terrain avoidance function; and b) new and revised requirements for the incorporation of security into aircraft design.	15 March 2002 15 July 2002 28 November 2002

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
28	Separation and Airspace Safety Panel and Air Navigation Commission studies	a) New provision concerning language proficiency requirements; b) New definition and provision concerning an operator's flight safety documents system; c) New definition and provisions concerning the safety aspects of ground handling arrangements; d) Authorization by the State of the Operator for operations in RNP airspace; and e) New provision concerning the content of an operations manual in regard to the airborne collision avoidance system (ACAS).	13 March 2003 14 July 2003 27 November 2003
29	Sixth meeting of the Operations Panel, and the Separation and Airspace Safety Panel	a) new definitions related to reduced vertical separation minimum (RVSM) operations and cruise relief pilots; b) new Standards 4.9.1 and 4.9.2, concerning single pilot operations under instrument flight rules (IFR) or at night; c) an exception to the operating limitations in 5.1.2 for approved single-engine turbine-powered aeroplanes; d) new Standards 5.4.1 and 5.4.2, specifying requirements for approval of commercial operations by single-engine turbine-powered aeroplanes in instrument meteorological conditions (IMC) or at night; e) new Standard 6.22, specifying aeroplane equipment requirements for single pilot operations under instrument flight rules (IFR) or at night; f) amendments to 7.2.4 regarding flight levels for reduced vertical separation minimum (RVSM) operations, and new Standards 7.2.5, 7.2.6 and 7.2.7, specifying the responsibility of the relevant State authority to take prompt and appropriate action if the monitoring results indicate that the height-keeping performance of a particular aircraft or an aircraft type group exceeds the prescribed limits; g) new Standards 7.4.1 and 7.4.2 concerning operator management of electronic navigation data products; h) amendments to Standards 9.4.1 and 9.4.2 concerning recent experience of the pilot-in-command, co-pilot and cruise relief pilot; i) amendments to Standards 9.4.3.5 and 9.4.3.6, concerning area, route and aerodrome qualifications of the pilot-in-command; j) new Standard 9.4.5.1 requiring States to specify requirements applicable to single pilot operations under the instrument flight rules or at night; k) a new Recommended Practice 9.4.5.2, specifying pilot-in-command experience and training requirements for single pilot operations under the instrument flight rules or at night; l) amendments to Appendix 2, regarding the contents of operations manuals in relation to area, route and aerodrome qualifications of the pilot-in-command, and maximum crosswind and tailwind operating limits; and m) a new Appendix 3 specifying additional requirements for approved operations by single-engine turbine-powered aeroplanes at night and/or in IMC, and a new Appendix 4 regarding the height-keeping performance criteria for operations in RVSM airspace.	9 March 2005 11 July 2005 24 November 2005

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
30	First meeting of the Surveillance and Conflict Resolution Systems Panel, Second meeting of the Flight Crew Licensing and Training Panel, Fourteenth meeting of the Obstacle Clearance Panel, a proposal by the United States, Council request, Assembly Resolution A35-17, 35th Session of the Assembly, and the Eleventh Air Navigation Conference	a) The carriage of altitude encoders with higher resolution; b) pilot recent experience and proficiency check requirements, cross-crew qualification and cross-crediting of experience, evaluation of competency, threat and error management and the biannual pilot proficiency check; c) pilot awareness of operational requirements determined by procedure design; d) qualifications for flight operations officers/flight dispatchers and the critical elements of a State regulatory system; e) the carriage of a copy of the air operator certificate in aircraft; f) legal guidance for the protection of information from safety data collection and processing systems; and g) safety management provisions and references to new guidance material on the concept of acceptable level of safety.	14 March 2006 17 July 2006 23 November 2006

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for operation of aircraft in international commercial air transport, they have the following meanings:

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;

c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and

d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft operating manual. A manual, acceptable to the State of the Operator, containing normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems and other material relevant to the operation of the aircraft.

Note.— The aircraft operating manual is part of the operations manual.

Air operator certificate (AOC). A certificate authorizing an operator to carry out specified commercial air transport operations.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shutdown or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altimetry system error (ASE). The difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

Approach and landing operations using instrument approach procedures. Instrument approach and landing operations are classified as follows:

Non-precision approach and landing operations. An instrument approach and landing which utilizes lateral guidance but does not utilize vertical guidance.

Approach and landing operations with vertical guidance. An instrument approach and landing which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach and landing operations. An instrument approach and landing using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer generated navigation data.

Categories of precision approach and landing operations:

Category I (CAT I) operation. A precision instrument approach and landing with a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II (CAT II) operation. A precision instrument approach and landing with a decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft), and a runway visual range not less than 350 m.

Category IIIA (CAT IIIA) operation. A precision instrument approach and landing with:

a) a decision height lower than 30 m (100 ft) or no decision height; and

b) a runway visual range not less than 200 m.

Category IIIB (CAT IIIB) operation. A precision instrument approach and landing with:

a) a decision height lower than 15 m (50 ft) or no decision height; and

b) a runway visual range less than 200 m but not less than 50 m.

Category IIIC (CAT IIIC) operation. A precision instrument approach and landing with no decision height and no runway visual range limitations.

Note.— Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach and landing operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT IIIA but with an RVR in the range of CAT IIIB would be considered a CAT IIIB operation or an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Cabin crew member. A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Configuration deviation list (CDL). A list established by the organization responsible for the type design with the approval of the State of Design which identifies any external parts of an aircraft type which may be missing at the commencement of a flight, and which contains, where necessary, any information on associated operating limitations and performance correction.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

Cruise relief pilot. A flight crew member who is assigned to perform pilot tasks during cruise flight, to allow the pilot-in-command or a co-pilot to obtain planned rest.

Cruising level. A level maintained during a significant portion of a flight.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Note.— Dangerous goods are classified in Annex 18, Chapter 3.

Decision altitude (DA) or ***decision height (DH).*** A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form "decision altitude/ height" and abbreviated "DA/H".

Emergency locator transmitter (ELT). A generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following:

Automatic fixed ELT (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft.

Automatic portable ELT (ELT(AP)). An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

Automatic deployable ELT (ELT(AD)). An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.

Survival ELT (ELT(S)). An ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight data analysis. A process of analysing recorded flight data in order to improve the safety of flight operations.

Flight duty period. The total time from the moment a flight crew member commences duty, immediately subsequent to a rest period and prior to making a flight or a series of flights, to the moment the flight crew member is relieved of all duties having completed such flight or series of flights.

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft.

Flight operations officer/flight dispatcher. A person designated by the operator to engage in the control and supervision of flight operations, whether licensed or not, suitably qualified in accordance with Annex 1, who supports, briefs and/or assists the pilot-in-command in the safe conduct of the flight.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight recorder. Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Flight safety documents system. A set of interrelated documentation established by the operator, compiling and organizing information necessary for flight and ground operations, and comprising, as a minimum, the operations manual and the operator's maintenance control manual.

Flight simulation training device. Any one of the following three types of apparatus in which flight conditions are simulated on the ground:

A flight simulator, which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;

A flight procedures trainer, which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic, etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;

A basic instrument flight trainer, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.

Flight time — aeroplanes. The total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight.

Note.— Flight time as here defined is synonymous with the term "block to block" time or "chock to chock" time in general usage which is measured from the time an aeroplane first moves for the purpose of taking off until it finally stops at the end of the flight.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Ground handling. Services necessary for an aircraft's arrival at, and departure from, an airport, other than air traffic services.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4 of Annex 2.

Large aeroplane. An aeroplane of a maximum certificated take-off mass of over 5 700 kg.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance organization's procedures manual. A document endorsed by the head of the maintenance organization which details the maintenance organization's structure and management responsibilities, scope of work, description of facilities, maintenance procedures and quality assurance or inspection systems.

Maintenance programme. A document which describes the specific scheduled maintenance tasks and their frequency of completion and related procedures, such as a reliability programme, necessary for the safe operation of those aircraft to which it applies.

Maintenance release. A document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner, either in accordance with the approved data and the procedures described in the maintenance organization's procedures manual or under an equivalent system.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures.

Maximum mass. Maximum certificated take-off mass.

Minimum descent altitude (MDA) or ***minimum descent height (MDH).*** A specified altitude or height in a non-precision approach or circling approach below which descent must not be made without the required visual reference.

Note 1.— Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3.— For convenience when both expressions are used they may be written in the form "minimum descent altitude/height" and abbreviated "MDA/H".

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type.

Night. The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise, as may be prescribed by the appropriate authority.

Note.— Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon.

Obstacle clearance altitude (OCA) or ***obstacle clearance height (OCH).*** The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/height" and abbreviated "OCA/H".

Operational control. The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operational flight plan. The operator's plan for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

* As defined in Annex 2.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Operator's maintenance control manual. A document which describes the operator's procedures necessary to ensure that all scheduled and unscheduled maintenance is performed on the operator's aircraft on time and in a controlled and satisfactory manner.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere*.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Repair. The restoration of an aeronautical product to an airworthy condition to ensure that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the issuance of the type certificate for the respective aircraft type, after it has been damaged or subjected to wear.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Rest period. Any period of time on the ground during which a flight crew member is relieved of all duties by the operator.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Safe forced landing. Unavoidable landing or ditching with a reasonable expectancy of no injuries to persons in the aircraft or on the surface.

Safety management system. A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety programme. An integrated set of regulations and activities aimed at improving safety.

Small aeroplane. An aeroplane of a maximum certificated take-off mass of 5 700 kg or less.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Target level of safety (TLS). A generic term representing the level of risk which is considered acceptable in particular circumstances.

Total vertical error (TVE). The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling**, equal to or better than specified minima.

Note.— The specified minima are contained in Chapter 4 of Annex 2.

* As defined in Annex 8.
** As defined in Annex 2.

CHAPTER 2. APPLICABILITY

The Standards and Recommended Practices contained in Annex 6, Part I, shall be applicable to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations.

Note 1.— Standards and Recommended Practices applicable to international general aviation operations with aeroplanes are to be found in Annex 6, Part II.

Note 2.— Standards and Recommended Practices applicable to international commercial air transport operations or international general aviation operations with helicopters are to be found in Annex 6, Part III.

CHAPTER 3. GENERAL

Note 1.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13 that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Note 2.— In the case of international operations effected jointly with aeroplanes not all of which are registered in the same Contracting State, nothing in this Part prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of the relevant Annexes.

3.1 Compliance with laws, regulations and procedures

3.1.1 An operator shall ensure that all employees when abroad know that they must comply with the laws, regulations and procedures of those States in which operations are conducted.

3.1.2 An operator shall ensure that all pilots are familiar with the laws, regulations and procedures, pertinent to the performance of their duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto. The operator shall ensure that other members of the flight crew are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the aeroplane.

Note.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

3.1.3 An operator or a designated representative shall have responsibility for operational control.

Note.— The rights and obligations of a State in respect to the operation of aeroplanes registered in that State are not affected by this provision.

3.1.4 Responsibility for operational control shall be delegated only to the pilot-in-command and to a flight operations officer/flight dispatcher if an operator's approved method of control and supervision of flight operations requires the use of flight operations officer/flight dispatcher personnel.

Note.— Guidance on the operational control organization and the role of the flight operations officer/flight dispatcher is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335). Detailed guidance on the authorization, duties and responsibilities of the flight operations officer/flight dispatcher is contained in the* Preparation of an Operations Manual *(Doc 9376). The requirements for age, skill, knowledge and experience for licensed flight operations officers/flight dispatchers are contained in Annex 1.*

3.1.5 If an emergency situation which endangers the safety of the aeroplane or persons becomes known first to the flight operations officer/flight dispatcher, action by that person in accordance with 4.6.2 shall include, where necessary, notification to the appropriate authorities of the nature of the situation without delay, and requests for assistance if required.

3.1.6 If an emergency situation which endangers the safety of the aeroplane or persons necessitates the taking of action which involves a violation of local regulations or procedures, the pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the State of the Operator. Such reports shall be submitted as soon as possible and normally within ten days.

3.1.7 Operators shall ensure that pilots-in-command have available on board the aeroplane all the essential information concerning the search and rescue services in the area over which the aeroplane will be flown.

Note.— This information may be made available to the pilot by means of the operations manual or such other means as is considered appropriate.

3.1.8 Operators shall ensure that flight crew members demonstrate the ability to speak and understand the language used for radiotelephony communications as specified in Annex 1.

3.2 Safety management

3.2.1 States shall establish a safety programme in order to achieve an acceptable level of safety in the operation of aircraft.

3.2.2 The acceptable level of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes is contained in the Safety Management Manual (SMM) *(Doc 9859), and the definition of acceptable levels of safety is contained in Attachment E to Annex 11.*

3.2.3 **Recommendation.—** *States should require, as part of their safety programme, that an operator implement a safety management system acceptable to the State of the Operator that, as a minimum:*

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

3.2.4 From 1 January 2009, States shall require, as part of their safety programme, that an operator implement a safety management system acceptable to the State of the Operator that, as a minimum:

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

3.2.5 A safety management system shall clearly define lines of safety accountability throughout the operator's organization, including a direct accountability for safety on the part of senior management.

Note.— Guidance on safety management systems is contained in the Safety Management Manual (SMM) *(Doc 9859).*

3.2.6 **Recommendation.—** *An operator of an aeroplane of a certificated take-off mass in excess of 20 000 kg should establish and maintain a flight data analysis programme as part of its safety management system.*

3.2.7 An operator of an aeroplane of a maximum certificated take-off mass in excess of 27 000 kg shall establish and maintain a flight data analysis programme as part of its safety management system.

Note.— An operator may contract the operation of a flight data analysis programme to another party while retaining overall responsibility for the maintenance of such a programme.

3.2.8 A flight data analysis programme shall be non-punitive and contain adequate safeguards to protect the source(s) of the data.

Note 1.— Guidance on flight data analysis programmes is contained in the Safety Management Manual (SMM) *(Doc 9859).*

Note 2.— Legal guidance for the protection of information from safety data collection and processing systems is contained in Annex 13, Attachment E.

3.2.9 An operator shall establish a flight safety documents system, for the use and guidance of operational personnel, as part of its safety management system.

Note.— Guidance on the development and organization of a flight safety documents system is provided in Attachment H.

3.3 Dangerous goods

Note 1.— Provisions for carriage of dangerous goods are contained in Annex 18.

Note 2.— Article 35 of the Convention refers to certain classes of cargo restrictions.

3.4 Use of psychoactive substances

Note.— Provisions concerning the use of psychoactive substances are contained in Annex 1, 1.2.7 and Annex 2, 2.5.

CHAPTER 4. FLIGHT OPERATIONS

4.1 Operating facilities

4.1.1 An operator shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities available and directly required on such flight, for the safe operation of the aeroplane and the protection of the passengers, are adequate for the type of operation under which the flight is to be conducted and are adequately operated for this purpose.

Note.— "Reasonable means" in this Standard is intended to denote the use, at the point of departure, of information available to the operator either through official information published by the aeronautical information services or readily obtainable from other sources.

4.1.2 An operator shall ensure that any inadequacy of facilities observed in the course of operations is reported to the authority responsible for them, without undue delay.

4.1.3 Subject to their published conditions of use, aerodromes and their facilities shall be kept continuously available for flight operations during their published hours of operations, irrespective of weather conditions.

4.2 Operational certification and supervision

4.2.1 The air operator certificate

4.2.1.1 An operator shall not engage in commercial air transport operations unless in possession of a valid air operator certificate issued by the State of the Operator.

4.2.1.2 The air operator certificate shall authorize the operator to conduct commercial air transport operations in accordance with specified authorizations, conditions and limitations.

Note.— Guidance on the air operator certificate and associated authorizations, conditions and limitations, which may be contained in operations specifications, is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335).*

4.2.1.3 Contracting States shall recognize as valid an air operator certificate issued by another Contracting State, provided that the requirements under which the certificate was issued are at least equal to the applicable Standards specified in this Annex.

4.2.1.4 The issue of an air operator certificate by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, method of control and supervision of flight operations, training programme as well as ground handling and maintenance arrangements consistent with the nature and extent of the operations specified.

Note.— Attachment F contains guidance on the issue of an air operator certificate.

4.2.1.5 The continued validity of an air operator certificate shall depend upon the operator maintaining the requirements of 4.2.1.4 under the supervision of the State of the Operator.

4.2.1.6 The air operator certificate shall contain at least the following:

a) operator's identification (name, location);

b) date of issue and period of validity;

c) description of the types of operations authorized;

d) the type(s) of aircraft authorized for use; and

e) authorized areas of operation or routes.

4.2.1.7 The State of the Operator shall establish a system for both the certification and the continued surveillance of the operator in accordance with Appendix 5 to ensure that the required standards of operations established in 4.2 are maintained.

4.2.2 Operations manual

4.2.2.1 An operator shall provide, for the use and guidance of operations personnel concerned, an operations manual in accordance with Appendix 2. The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use this manual.

4.2.2.2 The State of the Operator shall establish a requirement for the operator to provide a copy of the operations manual together with all amendments and/or revisions, for review and acceptance and, where required, approval. The operator shall incorporate in the operations manual such mandatory material as the State of the Operator may require.

Note 1.— Requirements for the organization and content of an operations manual are provided in Appendix 2.

Note 2.— Specific items in the operations manual require the approval of the State of the Operator in accordance with the Standards in 4.2.7, 6.1.3, 9.3.1, 12.4 and 13.4.1.

4.2.3 Operating instructions — general

4.2.3.1 An operator shall ensure that all operations personnel are properly instructed in their particular duties and responsibilities and the relationship of such duties to the operation as a whole.

4.2.3.2 An aeroplane shall not be taxied on the movement area of an aerodrome unless the person at the controls:

a) has been duly authorized by the operator or a designated agent;

b) is fully competent to taxi the aeroplane;

c) is qualified to use the radiotelephone; and

d) has received instruction from a competent person in respect of aerodrome layout, routes, signs, marking, lights, air traffic control (ATC) signals and instructions, phraseology and procedures, and is able to conform to the operational standards required for safe aeroplane movement at the aerodrome.

4.2.3.3 **Recommendation.—** *The operator should issue operating instructions and provide information on aeroplane climb performance with all engines operating to enable the pilot-in-command to determine the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique. This information should be included in the operations manual.*

4.2.4 In-flight simulation of emergency situations

An operator shall ensure that when passengers or cargo are being carried, no emergency or abnormal situations shall be simulated.

4.2.5 Checklists

The checklists provided in accordance with 6.1.4 shall be used by flight crews prior to, during and after all phases of operations, and in emergency, to ensure compliance with the operating procedures contained in the aircraft operating manual and the aeroplane flight manual or other documents associated with the certificate of airworthiness and otherwise in the operations manual, are followed. The design and utilization of checklists shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.2.6 Minimum flight altitudes

4.2.6.1 An operator shall be permitted to establish minimum flight altitudes for those routes flown for which minimum flight altitudes have been established by the State flown over or the responsible State, provided that they shall not be less than those established by that State.

4.2.6.2 An operator shall specify the method by which it is intended to determine minimum flight altitudes for operations conducted over routes for which minimum flight altitudes have not been established by the State flown over or the responsible State, and shall include this method in the operations manual. The minimum flight altitudes determined in accordance with the above method shall not be lower than specified in Annex 2.

4.2.6.3 **Recommendation.—** *The method for establishing the minimum flight altitudes should be approved by the State of the Operator.*

4.2.6.4 **Recommendation.—** *The State of the Operator should approve such method only after careful consideration of the probable effects of the following factors on the safety of the operation in question:*

a) the accuracy and reliability with which the position of the aeroplane can be determined;

b) the inaccuracies in the indications of the altimeters used;

c) the characteristics of the terrain (e.g. sudden changes in the elevation);

d) the probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

e) possible inaccuracies in aeronautical charts; and

f) airspace restrictions.

4.2.7 Aerodrome operating minima

4.2.7.1 The State of the Operator shall require that the operator establish aerodrome operating minima for each aerodrome to be used in operations, and shall approve the method of determination of such minima. Such minima shall not be lower than any that may be established for such aerodromes by the State in which the aerodrome is located, except when specifically approved by that State.

Note.— This Standard does not require the State in which the aerodrome is located to establish aerodrome operating minima.

4.2.7.2 The State of the Operator shall require that in establishing the aerodrome operating minima which will apply to any particular operation, full account shall be taken of:

a) the type, performance and handling characteristics of the aeroplane;

b) the composition of the flight crew, their competence and experience;

c) the dimensions and characteristics of the runways which may be selected for use;

d) the adequacy and performance of the available visual and non-visual ground aids;

e) the equipment available on the aeroplane for the purpose of navigation and/or control of the flight path during the approach to landing and the missed approach;

f) the obstacles in the approach and missed approach areas and the obstacle clearance altitude/height for the instrument approach procedures;

g) the means used to determine and report meteorological conditions; and

h) the obstacles in the climb-out areas and necessary clearance margins.

Note.— Guidance on the establishment of aerodrome operating minima is contained in the Manual of All-Weather Operations *(Doc 9365).*

4.2.7.3 Category II and Category III instrument approach and landing operations shall not be authorized unless RVR information is provided.

4.2.7.4 **Recommendation.—** *For instrument approach and landing operations, aerodrome operating minima below 800 m visibility should not be authorized unless RVR information is provided.*

4.2.8 Threshold crossing height for precision approaches

An operator shall establish operational procedures designed to ensure that an aeroplane being used to conduct precision approaches crosses the threshold by a safe margin, with the aeroplane in the landing configuration and attitude.

4.2.9 Fuel and oil records

4.2.9.1 An operator shall maintain fuel and oil records to enable the State of the Operator to ascertain that, for each flight, the requirements of 4.3.6 have been complied with.

4.2.9.2 Fuel and oil records shall be retained by the operator for a period of three months.

4.2.10 Crew

4.2.10.1 *Pilot-in-command.* For each flight, the operator shall designate one pilot to act as pilot-in-command.

4.2.10.2 *Flight time, flight duty periods and rest periods.* An operator shall formulate rules to limit flight time and flight duty periods and for the provision of adequate rest periods for all its crew members. These rules shall be in accordance with the regulations established by the State of the Operator, or approved by that State, and included in the operations manual.

4.2.10.3 An operator shall maintain current records of the flight time, flight duty periods and rest periods of all its crew members.

Note.— Guidance on the establishment of limitations is given in Attachment A.

4.2.10.4 For each flight of an aeroplane above 15 000 m (49 000 ft), the operator shall maintain records so that the total cosmic radiation dose received by each crew member over a period of 12 consecutive months can be determined.

Note.— Guidance on the maintenance of cumulative radiation records is given in Circular 126 — Guidance Material on SST Aircraft Operations.

4.2.11 Passengers

4.2.11.1 An operator shall ensure that passengers are made familiar with the location and use of:

a) seat belts;

b) emergency exits;

c) life jackets, if the carriage of life jackets is prescribed;

d) oxygen dispensing equipment, if the provision of oxygen for the use of passengers is prescribed; and

e) other emergency equipment provided for individual use, including passenger emergency briefing cards.

4.2.11.2 The operator shall inform the passengers of the location and general manner of use of the principal emergency equipment carried for collective use.

4.2.11.3 In an emergency during flight, passengers shall be instructed in such emergency action as may be appropriate to the circumstances.

4.2.11.4 The operator shall ensure that, during take-off and landing and whenever considered necessary by reason of turbulence or any emergency occurring during flight, all passengers on board an aeroplane shall be secured in their seats by means of the seat belts or harnesses provided.

4.3 Flight preparation

4.3.1 A flight shall not be commenced until flight preparation forms have been completed certifying that the pilot-in-command is satisfied that:

a) the aeroplane is airworthy;

b) the instruments and equipment prescribed in Chapter 6, for the particular type of operation to be undertaken, are installed and are sufficient for the flight;

c) a maintenance release as prescribed in 8.8 has been issued in respect of the aeroplane;

d) the mass of the aeroplane and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

e) any load carried is properly distributed and safely secured;

f) a check has been completed indicating that the operating limitations of Chapter 5 can be complied with for the flight to be undertaken; and

g) the Standards of 4.3.3 relating to operational flight planning have been complied with.

4.3.2 Completed flight preparation forms shall be kept by an operator for a period of three months.

4.3.3 Operational flight planning

4.3.3.1 An operational flight plan shall be completed for every intended flight. The operational flight plan shall be approved and signed by the pilot-in-command and, where applicable, signed by the flight operations officer/flight dispatcher, and a copy shall be filed with the operator or a designated agent, or, if these procedures are not possible, it shall be left with the aerodrome authority or on record in a suitable place at the point of departure.

Note.— The duties of a flight operations officer/flight dispatcher are contained in 4.6.

4.3.3.2 The operations manual must describe the content and use of the operational flight plan.

4.3.4 Alternate aerodromes

4.3.4.1 *Take-off alternate aerodrome*

4.3.4.1.1 A take-off alternate aerodrome shall be selected and specified in the operational flight plan if the weather conditions at the aerodrome of departure are at or below the applicable aerodrome operating minima or it would not be possible to return to the aerodrome of departure for other reasons.

4.3.4.1.2 The take-off alternate aerodrome shall be located within the following distance from the aerodrome of departure:

a) aeroplanes having two power-units. Not more than a distance equivalent to a flight time of one hour at the single-engine cruise speed; and

b) aeroplanes having three or more power-units. Not more than a distance equivalent to a flight time of two hours at the one-engine inoperative cruise speed.

4.3.4.1.3 For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the aerodrome operating minima for that operation.

4.3.4.2 *En-route alternate aerodromes*

En-route alternate aerodromes, required by 4.7 for extended range operations by aeroplanes with two turbine power-units, shall be selected and specified in the operational and air traffic services (ATS) flight plans.

4.3.4.3 *Destination alternate aerodromes*

For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the operational and ATS flight plans, unless:

a) the duration of the flight and the meteorological conditions prevailing are such that there is reasonable certainty that, at the estimated time of arrival at the aerodrome of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions; or

b) the aerodrome of intended landing is isolated and there is no suitable destination alternate aerodrome.

4.3.5 Weather conditions

4.3.5.1 A flight to be conducted in accordance with the visual flight rules shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under the visual flight rules will, at the appropriate time, be such as to render compliance with these rules possible.

4.3.5.2 A flight to be conducted in accordance with instrument flight rules shall not be commenced unless information is available which indicates that conditions at the aerodrome of intended landing or, where a destination alternate is required, at least one destination alternate aerodrome will, at the estimated time of arrival, be at or above the aerodrome operating minima.

Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as a destination alternate than for the same aerodrome when planned as that of intended landing.

4.3.5.3 A flight to be operated in known or expected icing conditions shall not be commenced unless the aeroplane is certificated and equipped to cope with such conditions.

4.3.5.4 A flight to be planned or expected to operate in suspected or known ground icing conditions shall not take off unless the aeroplane has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other naturally occurring contaminants shall be removed so that the aeroplane is kept in an airworthy condition prior to take-off.

Note.— Guidance material is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations *(Doc 9640).*

4.3.6 Fuel and oil supply

Note.— Fuel and oil reserves for supersonic aeroplanes will require special consideration to account for the particular operating characteristics of this type of aeroplane. Guidance on fuel supplies for supersonic aeroplanes is given in Circular 126 — Guidance Material on SST Aircraft Operations.

4.3.6.1 *All aeroplanes.* A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.

4.3.6.2 *Propeller-driven aeroplanes.* The fuel and oil carried in order to comply with 4.3.6.1 shall, in the case of propeller-driven aeroplanes, be at least the amount sufficient to allow the aeroplane:

4.3.6.2.1 When a destination alternate aerodrome is required, either:

a) to fly to the aerodrome to which the flight is planned thence to the most critical (in terms of fuel consumption) alternate aerodrome specified in the operational and ATS flight plans and thereafter for a period of 45 minutes; or

b) to fly to the alternate aerodrome via any predetermined point and thereafter for 45 minutes, provided that this shall not be less than the amount required to fly to the aerodrome to which the flight is planned and thereafter for:

   1) 45 minutes plus 15 per cent of the flight time planned to be spent at the cruising level(s), or

   2) two hours,

   whichever is less.

4.3.6.2.2 When a destination alternate aerodrome is not required:

a) in terms of 4.3.4.3 a), to fly to the aerodrome to which the flight is planned and thereafter for a period of 45 minutes; or

b) in terms of 4.3.4.3 b), to fly to the aerodrome to which the flight is planned and thereafter for:

   1) 45 minutes plus 15 per cent of the flight time planned to be spent at the cruising level(s), or

   2) two hours,

   whichever is less.

4.3.6.3 *Aeroplanes equipped with turbo-jet engines.* The fuel and oil carried in order to comply with 4.3.6.1 shall, in the case of turbo-jet aeroplanes, be at least the amount sufficient to allow the aeroplane:

4.3.6.3.1 When a destination alternate aerodrome is required, either:

a) to fly to and execute an approach, and a missed approach, at the aerodrome to which the flight is planned, and thereafter:

   1) to fly to the alternate aerodrome specified in the operational and ATS flight plans; and then

   2) to fly for 30 minutes at holding speed at 450 m (1 500 ft) above the alternate aerodrome under standard temperature conditions, and approach and land; and

   3) to have an additional amount of fuel sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator; or

b) to fly to the alternate aerodrome via any predetermined point and thereafter for 30 minutes at 450 m (1 500 ft) above the alternate aerodrome, due provision having been made for an additional amount of fuel sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator; provided that fuel shall not be less than the amount of fuel required to fly to the aerodrome to which the flight is planned and thereafter for two hours at normal cruise consumption.

4.3.6.3.2 When a destination alternate aerodrome is not required:

a) in terms of 4.3.4.3 a), to fly to the aerodrome to which the flight is planned and additionally:

1) to fly 30 minutes at holding speed at 450 m (1 500 ft) above the aerodrome to which the flight is planned under standard temperature conditions; and

2) to have an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator; and

b) in terms of 4.3.4.3 b), to fly to the aerodrome to which the flight is planned and thereafter for a period of two hours at normal cruise consumption.

4.3.6.4 In computing the fuel and oil required in 4.3.6.1 at least the following shall be considered:

a) meteorological conditions forecast;

b) expected air traffic control routings and traffic delays;

c) for IFR flight, one instrument approach at the destination aerodrome, including a missed approach;

d) the procedures prescribed in the operations manual for loss of pressurization, where applicable, or failure of one power-unit while en route; and

e) any other conditions that may delay the landing of the aeroplane or increase fuel and/or oil consumption.

Note.— Nothing in 4.3.6 precludes amendment of a flight plan in flight in order to replan the flight to another aerodrome, provided that the requirements of 4.3.6 can be complied with from the point where the flight has been replanned.

4.3.7 Refuelling with passengers on board

4.3.7.1 An aeroplane shall not be refuelled when passengers are embarking, on board or disembarking unless it is properly attended by qualified personnel ready to initiate and direct an evacuation of the aeroplane by the most practical and expeditious means available.

4.3.7.2 When refuelling with passengers embarking, on board or disembarking, two-way communication shall be maintained by the aeroplane's inter-communication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the aeroplane.

Note 1.— The provisions of 4.3.7.1 do not necessarily require the deployment of integral aeroplane stairs or the opening of emergency exits as a prerequisite to refuelling.

Note 2.— Provisions concerning aircraft refuelling are contained in Annex 14, Volume I, and guidance on safe refuelling practices is contained in the Airport Services Manual, *(Doc 9137), Parts 1 and 8.*

Note 3.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.

4.3.8 Oxygen supply

Note.— Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*
376 hPa	*7 600*	*25 000*

4.3.8.1 A flight to be operated at flight altitudes at which the atmospheric pressure in personnel compartments will be less than 700 hPa shall not be commenced unless sufficient stored breathing oxygen is carried to supply:

a) all crew members and 10 per cent of the passengers for any period in excess of 30 minutes that the pressure in compartments occupied by them will be between 700 hPa and 620 hPa; and

b) the crew and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

4.3.8.2 A flight to be operated with a pressurized aeroplane shall not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all the crew members and passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa. In addition, when an aeroplane is operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa and cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, there shall be no less than a 10-minute supply for the occupants of the passenger compartment.

4.4 In-flight procedures

4.4.1 Aerodrome operating minima

4.4.1.1 A flight shall not be continued towards the aerodrome of intended landing, unless the latest available information indicates that at the expected time of arrival, a landing can be effected at that aerodrome or at least one destination alternate aerodrome, in compliance with the operating minima established in accordance with 4.2.7.1.

4.4.1.2 An instrument approach shall not be continued beyond the outer marker fix in case of precision approach, or below 300 m (1 000 ft) above the aerodrome in case of non-precision approach, unless the reported visibility or controlling RVR is above the specified minimum.

4.4.1.3 If, after passing the outer marker fix in case of precision approach, or after descending below 300 m (1 000 ft) above the aerodrome in case of non-precision approach, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, an aeroplane shall not continue its approach-to-land at any aerodrome beyond a point at which the limits of the operating minima specified for that aerodrome would be infringed.

Note.— Controlling RVR means the reported values of one or more RVR reporting locations (touchdown, mid-point and stop-end) used to determine whether operating minima are or are not met. Where RVR is used, the controlling RVR is the touchdown RVR, unless otherwise specified by State criteria.

4.4.2 Meteorological observations

Note.— The procedures for making meteorological observations on board aircraft in flight and for recording and reporting them are contained in Annex 3, the PANS-ATM (Doc 4444) and the appropriate Regional Supplementary Procedures *(Doc 7030).*

4.4.3 Hazardous flight conditions

Hazardous flight conditions encountered, other than those associated with meteorological conditions, shall be reported to the appropriate aeronautical station as soon as possible. The reports so rendered shall give such details as may be pertinent to the safety of other aircraft.

4.4.4 Flight crew members at duty stations

4.4.4.1 *Take-off and landing.* All flight crew members required to be on flight deck duty shall be at their stations.

4.4.4.2 *En route.* All flight crew members required to be on flight deck duty shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the aeroplane or for physiological needs.

4.4.4.3 *Seat belts.* All flight crew members shall keep their seat belts fastened when at their stations.

4.4.4.4 *Safety harness.* Any flight crew member occupying a pilot's seat shall keep the safety harness fastened during the take-off and landing phases; all other flight crew members shall keep their safety harnesses fastened during the take-off and landing phases unless the shoulder straps interfere with the performance of their duties, in which case the shoulder straps may be unfastened but the seat belt must remain fastened.

Note.— Safety harness includes shoulder straps and a seat belt which may be used independently.

4.4.5 Use of oxygen

4.4.5.1 All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been required in 4.3.8.1 or 4.3.8.2.

4.4.5.2 All flight crew members of pressurized aeroplanes operating above an altitude where the atmospheric pressure is less than 376 hPa shall have available at the flight duty station a quick-donning type of oxygen mask which will readily supply oxygen upon demand.

4.4.6 Safeguarding of cabin crew and passengers in pressurized aeroplanes in the event of loss of pressurization

Recommendation.— *Cabin crew should be safeguarded so as to ensure reasonable probability of their retaining consciousness during any emergency descent which may be necessary in the event of loss of pressurization and, in addition, they should have such means of protection as will enable them to administer first aid to passengers during stabilized flight following the emergency. Passengers should be safeguarded by such devices or operational procedures as will ensure reasonable probability of their surviving the effects of hypoxia in the event of loss of pressurization.*

Note.— It is not envisaged that cabin crew will always be able to provide assistance to passengers during emergency descent procedures which may be required in the event of loss of pressurization.

4.4.7 In-flight operational instructions

Operational instructions involving a change in the ATS flight plan shall, when practicable, be coordinated with the appropriate ATS unit before transmission to the aeroplane.

Note.— When the above coordination has not been possible, operational instructions do not relieve a pilot of the responsibility for obtaining an appropriate clearance from an ATS unit, if applicable, before making a change in flight plan.

4.4.8 Instrument flight procedures

4.4.8.1 One or more instrument approach procedures designed in accordance with the classification of instrument approach and landing operations shall be approved and promulgated by the State in which the aerodrome is located to serve each instrument runway or aerodrome utilized for instrument flight operations.

4.4.8.2 All aeroplanes operated in accordance with instrument flight rules shall comply with the instrument flight procedures approved by the State in which the aerodrome is located.

Note 1.— Definitions for the classification of instrument approach and landing operations are in Chapter 1.

Note 2.— Operational procedures recommended for the guidance of operations personnel involved in instrument flight operations are described in PANS-OPS (Doc 8168), Volume I.

Note 3.— Criteria for the construction of instrument flight procedures for the guidance of procedure specialists are provided in PANS-OPS (Doc 8168), Volume II.

4.4.9 Aeroplane operating procedures for noise abatement

4.4.9.1 **Recommendation.—** *Aeroplane operating procedures for noise abatement should comply with the provisions of PANS-OPS (Doc 8168), Volume I, Part V.*

4.4.9.2 **Recommendation.—** *Noise abatement procedures specified by an operator for any one aeroplane type should be the same for all aerodromes.*

4.5 Duties of pilot-in-command

4.5.1 The pilot-in-command shall be responsible for the safety of all crew members, passengers and cargo on board when the doors are closed. The pilot-in-command shall also be responsible for the operation and safety of the aeroplane from the moment the aeroplane is ready to move for the purpose of taking off until the moment it finally comes to rest at the end of the flight and the engine(s) used as primary propulsion units are shut down.

4.5.2 The pilot-in-command shall ensure that the checklists specified in 4.2.5 are complied with in detail.

4.5.3 The pilot-in-command shall be responsible for notifying the nearest appropriate authority by the quickest available means of any accident involving the aeroplane, resulting in serious injury or death of any person or substantial damage to the aeroplane or property.

Note.— A definition of the term "serious injury" is contained in Annex 13.

4.5.4 The pilot-in-command shall be responsible for reporting all known or suspected defects in the aeroplane, to the operator, at the termination of the flight.

4.5.5 The pilot-in-command shall be responsible for the journey log book or the general declaration containing the information listed in 11.4.1.

Note.— By virtue of Resolution A10-36 of the Tenth Session of the Assembly (Caracas, June–July 1956) "the General Declaration, [described in Annex 9] when prepared so as to contain all the information required by Article 34 [of the Convention on International Civil Aviation] with respect to the journey log book, may be considered by Contracting States to be an acceptable form of journey log book".

4.6 Duties of flight operations officer/ flight dispatcher

4.6.1 A flight operations officer/flight dispatcher in conjunction with a method of control and supervision of flight operations in accordance with 4.2.1.4 shall:

a) assist the pilot-in-command in flight preparation and provide the relevant information;

b) assist the pilot-in-command in preparing the operational and ATS flight plans, sign when applicable and file the ATS flight plan with the appropriate ATS unit; and

c) furnish the pilot-in-command while in flight, by appropriate means, with information which may be necessary for the safe conduct of the flight.

4.6.2 In the event of an emergency, a flight operations officer/flight dispatcher shall:

a) initiate such procedures as outlined in the operations manual while avoiding taking any action that would conflict with ATC procedures; and

b) convey safety-related information to the pilot-in-command that may be necessary for the safe conduct of the flight, including information related to any amendments to the flight plan that become necessary in the course of the flight.

Note.— It is equally important that the pilot-in-command also convey similar information to the flight operations officer/ flight dispatcher during the course of the flight, particularly in the context of emergency situations.

4.7 Additional requirements for extended range operations by aeroplanes with two turbine power-units (ETOPS)

4.7.1 Unless the operation has been specifically approved by the State of the Operator, an aeroplane with two turbine power-units shall not, except as provided in 4.7.4, be operated on a route where the flight time at single-engine cruise speed to an adequate en-route alternate aerodrome exceeds a threshold time established for such operations by that State.

Note 1.— Guidance on the value of the threshold time is contained in Attachment E.

Note 2.— In the context of the approval of operations at which the requirements of 5.2.11 can be met, guidance material on adequate and suitable alternate aerodromes is contained in Attachment E.

4.7.2 In approving the operation, the State of the Operator shall ensure that:

a) the airworthiness certification of the aeroplane type;

b) the reliability of the propulsion system; and

c) the operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes;

provide the overall level of safety intended by the provisions of Annexes 6 and 8. In making this assessment, account shall be taken of the route to be flown, the anticipated operating conditions and the location of adequate en-route alternate aerodromes.

Note 1.— Guidance on compliance with the requirements of this provision is contained in Attachment E.

Note 2.— The Airworthiness Manual *(Doc 9760) contains guidance on the level of performance and reliability of aeroplane systems intended by 4.7.2, as well as guidance on continuing airworthiness aspects of the requirements of 4.7.2.*

4.7.3 A flight to be conducted in accordance with 4.7.1 shall not be commenced unless, during the possible period of arrival, the required en-route alternate aerodrome(s) will be available and the available information indicates that conditions at those aerodromes will be at or above the aerodrome operating minima approved for the operation.

4.7.4 **Recommendation.—** *The State of the Operator of an aeroplane type with two turbine power-units which, prior to 25 March 1986 was authorized and operating on a route where the flight time at single-engine cruise speed to an adequate en-route alternate aerodrome exceeded the threshold time established for such operations in accordance with 4.7.1 should give consideration to permitting such an operation to continue on that route after that date.*

4.8 Carry-on baggage

The operator shall ensure that all baggage carried onto an aeroplane and taken into the passenger cabin is adequately and securely stowed.

4.9 Additional requirements for single pilot operations under the instrument flight rules (IFR) or at night

4.9.1 An aeroplane shall not be operated under the IFR or at night by a single pilot unless approved by the State of the Operator.

4.9.2 An aeroplane shall not be operated under the IFR or at night by a single pilot unless:

a) the flight manual does not require a flight crew of more than one;

b) the aeroplane is propeller-driven;

c) the maximum approved passenger seating configuration is not more than nine;

d) the maximum certificated take-off mass does not exceed 5 700 kg;

e) the aeroplane is equipped as described in 6.22; and

f) the pilot-in-command has satisfied requirements of experience, training, checking and recency described in 9.4.5.

CHAPTER 5. AEROPLANE PERFORMANCE OPERATING LIMITATIONS

5.1 General

5.1.1 Aeroplanes shall be operated in accordance with a comprehensive and detailed code of performance established by the State of Registry in compliance with the applicable Standards of this chapter.

5.1.2 Except as provided in 5.4, single-engine aeroplanes shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure.

5.1.3 **Recommendation.—** *For aeroplanes for which Parts IIIA and IIIB of Annex 8 is not applicable because of the exemption provided for in Article 41 of the Convention, the State of Registry should ensure that the level of performance specified in 5.2 should be met as far as practicable.*

5.2 Applicable to aeroplanes certificated in accordance with Parts IIIA and IIIB of Annex 8

5.2.1 The Standards contained in 5.2.2 to 5.2.11 inclusive are applicable to the aeroplanes to which Parts IIIA and IIIB of Annex 8 are applicable.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 5.1.1, they are to be supplemented by national requirements prepared by Contracting States.

5.2.2 The level of performance defined by the appropriate parts of the comprehensive and detailed national code referred to in 5.1.1 for the aeroplanes designated in 5.2.1 shall be at least substantially equivalent to the overall level embodied in the Standards of this chapter.

Note.— Attachment C contains guidance material which indicates by examples the level of performance intended by the Standards and Recommended Practices of this chapter.

5.2.3 An aeroplane shall be operated in compliance with the terms of its certificate of airworthiness and within the approved operating limitations contained in its flight manual.

5.2.4 The State of Registry shall take such precautions as are reasonably possible to ensure that the general level of safety contemplated by these provisions is maintained under all expected operating conditions, including those not covered specifically by the provisions of this chapter.

5.2.5 A flight shall not be commenced unless the performance information provided in the flight manual indicates that the Standards of 5.2.6 to 5.2.11 can be complied with for the flight to be undertaken.

5.2.6 In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the aerodrome, temperature, wind, runway gradient and condition of runway, i.e. presence of slush, water and/or ice, for landplanes, water surface condition for seaplanes). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated.

5.2.7 Mass limitations

a) The mass of the aeroplane at the start of take-off shall not exceed the mass at which 5.2.8 is complied with, nor the mass at which 5.2.9, 5.2.10 and 5.2.11 are complied with, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is envisaged in applying 5.2.9 and 5.2.10 and, in respect of alternate aerodromes, 5.2.7 c) and 5.2.11.

b) In no case shall the mass at the start of take-off exceed the maximum take-off mass specified in the flight manual for the pressure-altitude appropriate to the elevation of the aerodrome, and, if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition.

c) In no case shall the estimated mass for the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the maximum landing mass specified in the flight manual for the pressure-altitude appropriate to the elevation of those aerodromes, and if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.

d) In no case shall the mass at the start of take-off, or at the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the relevant maximum masses at which compliance has been demonstrated with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized in exceptional circumstances for a certain aerodrome or a runway where there is no noise disturbance problem, by the competent authority of the State in which the aerodrome is situated.

5.2.8 *Take-off.* The aeroplane shall be able, in the event of a critical power-unit failing at any point in the take-off, either to discontinue the take-off and stop within the accelerate-stop distance available, or to continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in a position to comply with 5.2.9.

Note.— "An adequate margin" referred to in this provision is illustrated by the appropriate examples included in Attachment C.

5.2.8.1 In determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

5.2.9 *En route — one power-unit inoperative.* The aeroplane shall be able, in the event of the critical power-unit becoming inoperative at any point along the route or planned diversions therefrom, to continue the flight to an aerodrome at which the Standard of 5.2.11 can be met, without flying below the minimum flight altitude at any point.

5.2.10 *En route — two power-units inoperative.* In the case of aeroplanes having three or more power-units, on any part of a route where the location of en-route alternate aerodromes and the total duration of the flight are such that the probability of a second power-unit becoming inoperative must be allowed for if the general level of safety implied by the Standards of this chapter is to be maintained, the aeroplane shall be able, in the event of any two power-units becoming inoperative, to continue the flight to an en-route alternate aerodrome and land.

5.2.11 *Landing.* The aeroplane shall, at the aerodrome of intended landing and at any alternate aerodrome, after clearing all obstacles in the approach path by a safe margin, be able to land, with assurance that it can come to a stop or, for a seaplane, to a satisfactorily low speed, within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.

5.3 Obstacle data

5.3.1 Obstacle data shall be provided to enable the operator to develop procedures to comply with 5.2.8.

Note.— See Annex 4 and Annex 15 for methods of presentation of certain obstacle data.

5.3.2 The operator shall take account of charting accuracy when assessing compliance with 5.2.8.

5.4 Additional requirements for operations of single-engine turbine-powered aeroplanes at night and/or in Instrument Meteorological Conditions (IMC)

5.4.1 In approving operations by single-engine turbine-powered aeroplanes at night and/or in IMC, the State of the Operator shall ensure that the airworthiness certification of the aeroplane is appropriate and that the overall level of safety intended by the provisions of Annexes 6 and 8 is provided by:

a) the reliability of the turbine engine;

b) the operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes; and

c) equipment and other requirements provided in accordance with Appendix 3.

5.4.2 All single-engine turbine-powered aeroplanes operated at night and/or in IMC shall have an engine trend monitoring system, and those aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2005 shall have an automatic trend monitoring system.

CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

Note.— Specifications for the provision of aeroplane communication and navigation equipment are contained in Chapter 7.

6.1 General

6.1.1 In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in aeroplanes according to the aeroplane used and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the State of Registry.

6.1.2 An aeroplane shall carry a certified true copy of the air operator certificate specified in 4.2.1, and a copy of the authorizations, conditions and limitations relevant to the aeroplane type, issued in conjunction with the certificate. When the certificate and the associated authorizations, conditions and limitations are issued by the State of the Operator in a language other than English, an English translation shall be included.

Note.— Guidance on the air operator certificate and associated authorizations, conditions and limitations, which may be contained in operations specifications, is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335).*

6.1.3 The operator shall include in the operations manual a minimum equipment list (MEL), approved by the State of the Operator which will enable the pilot-in-command to determine whether a flight may be commenced or continued from any intermediate stop should any instrument, equipment or systems become inoperative. Where the State of the Operator is not the State of Registry, the State of the Operator shall ensure that the MEL does not affect the aeroplane's compliance with the airworthiness requirements applicable in the State of Registry.

Note.— Attachment G contains guidance on the minimum equipment list.

6.1.4 The operator shall provide operations staff and flight crew with an aircraft operating manual, for each aircraft type operated, containing the normal, abnormal and emergency procedures relating to the operation of the aircraft. The manual shall include details of the aircraft systems and of the checklists to be used. The design of the manual shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

6.2 All aeroplanes on all flights

6.2.1 An aeroplane shall be equipped with instruments which will enable the flight crew to control the flight path of the aeroplane, carry out any required procedural manoeuvres and observe the operating limitations of the aeroplane in the expected operating conditions.

6.2.2 An aeroplane shall be equipped with:

a) accessible and adequate medical supplies appropriate to the number of passengers the aeroplane is authorized to carry;

Recommendation.— *Medical supplies should comprise:*

1) one or more first-aid kits; and

2) a medical kit, for the use of medical doctors or other qualified persons in treating in-flight medical emergencies for aeroplanes authorized to carry more than 250 passengers.

Note.— Guidance on the types, number, location and contents of the medical supplies is given in Attachment B.

b) portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aeroplane. At least one shall be located in:

1) the pilot's compartment; and

2) each passenger compartment that is separate from the pilot's compartment and that is not readily accessible to the flight crew;

Note.— Any portable fire extinguisher so fitted in accordance with the certificate of airworthiness of the aeroplane may count as one prescribed.

c) 1) a seat or berth for each person over an age to be determined by the State of the Operator;

2) a seat belt for each seat and restraining belts for each berth; and

3) a safety harness for each flight crew seat. The safety harness for each pilot seat shall incorporate a device which will automatically restrain the occupant's torso in the event of rapid deceleration;

Recommendation.— *The safety harness for each pilot seat should incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls.*

Note.— Safety harness includes shoulder straps and a seat belt which may be used independently.

d) means of ensuring that the following information and instructions are conveyed to passengers:

1) when seat belts are to be fastened;

2) when and how oxygen equipment is to be used if the carriage of oxygen is required;

3) restrictions on smoking;

4) location and use of life jackets or equivalent individual flotation devices where their carriage is required; and

5) location and method of opening emergency exits; and

e) spare electrical fuses of appropriate ratings for replacement of those accessible in flight.

6.2.3 An aeroplane shall carry:

a) the operations manual prescribed in 4.2.2, or those parts of it that pertain to flight operations;

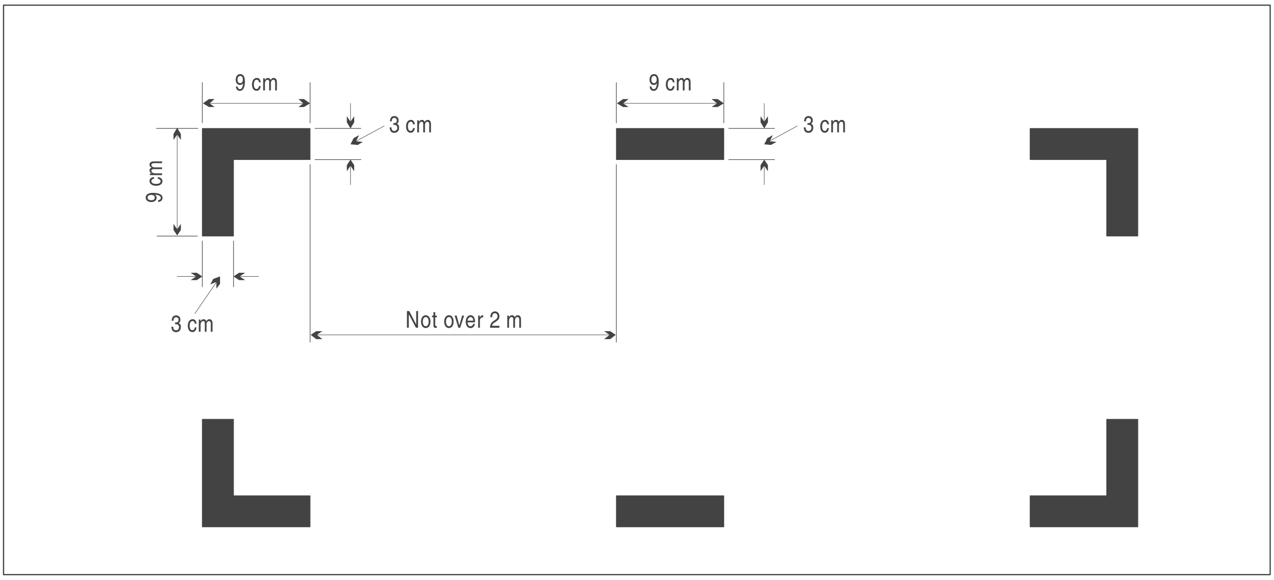
b) the flight manual for the aeroplane, or other documents containing performance data required for the application of Chapter 5 and any other information necessary for the operation of the aeroplane within the terms of its certificate of airworthiness, unless these data are available in the operations manual; and

c) current and suitable charts to cover the route of the proposed flight and any route along which it is reasonable to expect that the flight may be diverted.

6.2.4 Marking of break-in points

6.2.4.1 If areas of the fuselage suitable for break-in by rescue crews in emergency are marked on an aeroplane such areas shall be marked as shown below (see figure following). The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

6.2.4.2 If the corner markings are more than 2 m apart, intermediate lines 9 cm × 3 cm shall be inserted so that there is no more than 2 m between adjacent markings.



MARKING OF BREAK-IN POINTS (see 6.2.4)

Note.— This Standard does not require any aeroplane to have break-in areas.

6.3 Flight recorders

Note 1.— Flight recorders comprise two systems, a flight data recorder (FDR) and a cockpit voice recorder (CVR).

Note 2.— Combination recorders (FDR/CVR) can only be used to meet the flight recorder equipage requirements as specifically indicated in this Annex.

Note 3.— Detailed guidance on flight recorders is contained in Attachment D.

6.3.1 Flight data recorders — types

6.3.1.1 A Type I FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

6.3.1.2 Types II and IIA FDRs shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices.

6.3.1.3 The use of engraving metal foil FDRs shall be discontinued by 1 January 1995.

6.3.1.4 **Recommendation.—** *The use of analogue FDRs using frequency modulation (FM) should be discontinued by 5 November 1998.*

6.3.1.4.1 The use of photographic film FDRs shall be discontinued from 1 January 2003.

6.3.1.5 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

6.3.1.5.1 From 1 January 2007, all aeroplanes which utilize data link communications and are required to carry a CVR shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

6.3.1.5.2 Sufficient information to derive the content of the data link communications message and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance (ADS), controller-pilot data link communications (CPDLC), data link-flight information services (D-FIS) and aeronautical operational control (AOC) messages.

6.3.1.6 **Recommendation.—** *All aeroplanes of a maximum certificated take-off mass over 5 700 kg, required to be equipped with an FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR).*

6.3.1.7 **Recommendation.—** *All multi-engined turbine-powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).*

6.3.1.8 A Type IA FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IA FDR are listed in the paragraphs below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane.

6.3.1.8.1 The following parameters satisfy the requirements for flight path and speed:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Air-ground status and each landing gear air-ground sensor when practicable
- Total or outside air temperature
- Heading (primary flight crew reference)
- Normal acceleration
- Lateral acceleration
- Longitudinal acceleration (body axis)
- Time or relative time count
- Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
- Groundspeed*
- Radio altitude*

6.3.1.8.2 The following parameters satisfy the requirements for attitude:

- Pitch attitude
- Roll attitude
- Yaw or sideslip angle*
- Angle of attack*

6.3.1.8.3 The following parameters satisfy the requirements for engine power:

- Engine thrust/power: propulsive thrust/power on each engine, cockpit thrust/power lever position
- Thrust reverse status*

- Engine thrust command*
- Engine thrust target*
- Engine bleed valve position*
- Additional engine parameters*: EPR, N_1, indicated vibration level, N_2, EGT, TLA, fuel flow, fuel cut-off lever position, N_3

6.3.1.8.4 The following parameters satisfy the requirements for configuration:

- Pitch trim surface position
- Flaps*: trailing edge flap position, cockpit control selection
- Slats*: leading edge flap (slat) position, cockpit control selection
- Landing gear*: landing gear, gear selector position
- Yaw trim surface position*
- Roll trim surface position*
- Cockpit trim control input position pitch*
- Cockpit trim control input position roll*
- Cockpit trim control input position yaw*
- Ground spoiler and speed brake*: Ground spoiler position, ground spoiler selection, speed brake position, speed brake selection
- De-icing and/or anti-icing systems selection*
- Hydraulic pressure (each system)*
- Fuel quantity*
- AC electrical bus status*
- DC electrical bus status*
- APU bleed valve position*
- Computed centre of gravity*

6.3.1.8.5 The following parameters satisfy the requirements for operation:

- Warnings
- Primary flight control surface and primary flight control pilot input: pitch axis, roll axis, yaw axis
- Marker beacon passage
- Each navigation receiver frequency selection
- Manual radio transmission keying and CVR/FDR synchronization reference
- Autopilot/autothrottle/AFCS mode and engagement status*
- Selected barometric setting*: pilot, first officer
- Selected altitude (all pilot selectable modes of operation)*
- Selected speed (all pilot selectable modes of operation)*
- Selected Mach (all pilot selectable modes of operation)*
- Selected vertical speed (all pilot selectable modes of operation)*
- Selected heading (all pilot selectable modes of operation)*
- Selected flight path (all pilot selectable modes of operation)*: course/DSTRK, path angle
- Selected decision height*
- EFIS display format*: pilot, first officer
- Multi-function/engine/alerts display format*
- GPWS/TAWS/GCAS status*: selection of terrain display mode including pop-up display status, terrain alerts, both cautions and warnings, and advisories, on/off switch position
- Low pressure warning*: hydraulic pressure, pneumatic pressure
- Computer failure*
- Loss of cabin pressure*
- TCAS/ACAS (traffic alert and collision avoidance system/airborne collision avoidance system)*
- Ice detection*
- Engine warning each engine vibration*
- Engine warning each engine over temperature*
- Engine warning each engine oil pressure low*
- Engine warning each engine over speed*
- Wind shear warning*
- Operational stall protection, stick shaker and pusher activation*
- All cockpit flight control input forces*: control wheel, control column, rudder pedal cockpit input forces
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Primary navigation system reference*: GNSS, INS, VOR/DME, MLS, Loran C, ILS
- Brakes*: left and right brake pressure, left and right brake pedal position
- Date*
- Event marker*
- Head up display in use*
- Para visual display on*

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, are as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on aeroplane complexity. Parameters without an (*) are to be recorded regardless of aeroplane complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by aeroplane systems and/or flight crew to operate the aeroplane.

6.3.2 Flight data recorders — duration

All FDRs shall be capable of retaining the information recorded during at least the last 25 hours of their operation, except for the Type IIA FDR which shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

6.3.3 Flight data recorders — aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1989

6.3.3.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg shall be equipped with a Type I FDR.

6.3.3.2 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg, up to and including 27 000 kg, shall be equipped with a Type II FDR.

6.3.3.3 **Recommendation.—** *All multi-engined turbine-powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with a Type IIA FDR.*

6.3.4 Flight data recorders — aeroplanes for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989

6.3.4.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg, except those in 6.3.4.3, shall be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.

6.3.4.2 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg, except those in 6.3.4.3, should be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration, heading and such additional parameters as are necessary to determine pitch attitude, roll attitude, radio transmission keying and power on each engine.*

6.3.4.3 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 shall be equipped with a Type II FDR.

6.3.5 Flight data recorders — aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1987

6.3.5.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration and heading.

6.3.5.2 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 should be equipped with an FDR which should record, in addition to time, altitude, airspeed, normal acceleration and heading, such additional parameters as are necessary to meet the objectives of determining:*

a) the attitude of the aeroplane in achieving its flight path; and

b) the basic forces acting upon the aeroplane resulting in the achieved flight path and the origin of such basic forces.

6.3.6 Flight data recorders — aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005

All aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with a Type IA FDR.

6.3.7 Cockpit voice recorders — aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1987

6.3.7.1 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time.

6.3.7.2 **Recommendation.—** *All multi-engined turbine-powered aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time.*

6.3.8 Cockpit voice recorders — aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1987

Note.— CVR performance requirements are as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

6.3.8.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 shall be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time.

6.3.8.2 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg up to and including 27 000 kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 should be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time.*

6.3.9 Cockpit voice recorders — duration

6.3.9.1 A CVR shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

6.3.9.2 **Recommendation.—** *A CVR, installed in aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1990, should be capable of retaining the information recorded during at least the last two hours of its operation.*

6.3.9.3 A CVR, installed in aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued after 1 January 2003, shall be capable of retaining the information recorded during at least the last two hours of its operation.

6.3.10 Flight recorders — construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

Note.— Industry crashworthiness and fire protection specifications can be found in documents such as the European Organization for Civil Aviation Equipment (EUROCAE) documents ED55 and ED56A.

6.3.11 Flight recorders — operation

6.3.11.1 Flight recorders shall not be switched off during flight time.

6.3.11.2 To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with Annex 13.

Note 1.— The need for removal of the flight recorder records from the aircraft will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2.— The operator's responsibilities regarding the retention of flight recorder records are contained in 11.6.

6.3.12 Flight recorders — continued serviceability

Operational checks and evaluations of recordings from the FDR and CVR systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the FDR and CVR systems are given in Attachment D.

6.4 All aeroplanes operated as VFR flights

6.4.1 All aeroplanes when operated as VFR flights shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

d) an airspeed indicator; and

e) such additional instruments or equipment as may be prescribed by the appropriate authority.

6.4.2 VFR flights which are operated as controlled flights shall be equipped in accordance with 6.9.

6.5 All aeroplanes on flights over water

6.5.1 Seaplanes

All seaplanes for all flights shall be equipped with:

a) one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

b) equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable; and

c) one sea anchor (drogue).

Note.— "Seaplanes" includes amphibians operated as seaplanes.

6.5.2 Landplanes

6.5.2.1 Landplanes shall carry the equipment prescribed in 6.5.2.2:

a) when flying over water and at a distance of more than 93 km (50 NM) away from the shore, in the case of landplanes operated in accordance with 5.2.9 or 5.2.10;

b) when flying en route over water beyond gliding distance from the shore, in the case of all other landplanes; and

c) when taking off or landing at an aerodrome where, in the opinion of the State of the Operator, the take-off or approach path is so disposed over water that in the event of a mishap there would be a likelihood of a ditching.

6.5.2.2 The equipment referred to in 6.5.2.1 shall comprise one life jacket or equivalent individual flotation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

Note.— "Landplanes" includes amphibians operated as landplanes.

6.5.3 All aeroplanes on long-range over-water flights

6.5.3.1 In addition to the equipment prescribed in 6.5.1 or 6.5.2 whichever is applicable, the following equipment shall be installed in all aeroplanes when used over routes on which the aeroplane may be over water and at more than a distance corresponding to 120 minutes at cruising speed or 740 km (400 NM), whichever is the lesser, away from land suitable for making an emergency landing in the case of aircraft operated in accordance with 5.2.9 or 5.2.10, and 30 minutes or 185 km (100 NM), whichever is the lesser, for all other aeroplanes:

a) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

b) equipment for making the pyrotechnical distress signals described in Annex 2.

6.5.3.2 Each life jacket and equivalent individual flotation device, when carried in accordance with 6.5.1 a), 6.5.2.1 and 6.5.2.2, shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons, except where the requirement of 6.5.2.1 c) is met by the provision of individual flotation devices other than life jackets.

6.6 All aeroplanes on flights over designated land areas

Aeroplanes, when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

6.7 All aeroplanes on high altitude flights

Note.— Approximate altitude in the Standard Atmosphere corresponding to the value of absolute pressure used in this text is as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*
376 hPa	*7 600*	*25 000*

6.7.1 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa in personnel compartments shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 4.3.8.1.

6.7.2 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa but which is provided with means of maintaining pressures greater than 700 hPa in personnel compartments shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 4.3.8.2.

6.7.3 Pressurized aeroplanes newly introduced into service on or after 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the pilot of any dangerous loss of pressurization.

6.7.4 **Recommendation.—** *Pressurized aeroplanes introduced into service before 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa should be equipped with a device to provide positive warning to the pilot of any dangerous loss of pressurization.*

6.7.5 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa, cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa and for which the individual certificate of airworthiness is first issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment to satisfy the requirements of 4.3.8.2. The total number of oxygen dispensing units shall exceed the number of passenger and cabin crew seats by at least 10 per cent.

6.7.6 **Recommendation.—** *An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, and for which the individual certificate of airworthiness was first issued before 9 November 1998, should be provided with automatically deployable oxygen equipment to satisfy the requirements of 4.3.8.2. The total number of oxygen dispensing units should exceed the number of passenger and cabin crew seats by at least 10 per cent.*

6.8 All aeroplanes in icing conditions

All aeroplanes shall be equipped with suitable de-icing and/or anti-icing devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered.

6.9 All aeroplanes operated in accordance with instrument flight rules

6.9.1 All aeroplanes when operated in accordance with the instrument flight rules, or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation;

Note.— Neither three-pointer nor drum-pointer altimeters satisfy the requirement in 6.9.1 c).

d) an airspeed indicating system with means of preventing malfunctioning due to either condensation or icing;

e) a turn and slip indicator;

f) an attitude indicator (artificial horizon);

g) a heading indicator (directional gyroscope);

Note.— The requirements of 6.9.1 e), f) and g) may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the three separate instruments, are retained.

h) a means of indicating whether the power supply to the gyroscopic instrument is adequate;

i) a means of indicating in the flight crew compartment the outside air temperature;

j) a rate-of-climb and descent indicator; and

k) such additional instruments or equipment as may be prescribed by the appropriate authority.

6.9.2 All aeroplanes over 5 700 kg — Emergency power supply for electrically operated attitude indicating instruments

6.9.2.1 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg newly introduced into service after 1 January 1975 shall be fitted with an emergency power supply, independent of the main electrical generating system, for the purpose of operating and illuminating, for a minimum period of 30 minutes, an attitude indicating instrument (artificial horizon), clearly visible to the pilot-in-command. The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given on the instrument panel that the attitude indicator(s) is being operated by emergency power.

6.9.2.2 Those instruments that are used by any one pilot shall be so arranged as to permit the pilot to see their indications readily from his or her station, with the minimum practicable deviation from the position and line of vision normally assumed when looking forward along the flight path.

6.10 All aeroplanes when operated at night

All aeroplanes, when operated at night shall be equipped with:

a) all equipment specified in 6.9;

b) the lights required by Annex 2 for aircraft in flight or operating on the movement area of an aerodrome;

Note.— Specifications for lights meeting the requirements of Annex 2 for navigation lights are contained in Appendix 1. The general characteristics of lights are specified in Annex 8. Detailed specifications for lights meeting the requirements of Annex 2 for aircraft in flight or operating on the movement area of an aerodrome are contained in the Airworthiness Manual *(Doc 9760).*

c) two landing lights;

Note.— Aeroplanes not certificated in accordance with Annex 8 which are equipped with a single landing light having two separately energized filaments will be considered to have complied with 6.10 c).

d) illumination for all instruments and equipment that are essential for the safe operation of the aeroplane that are used by the flight crew;

e) lights in all passenger compartments; and

f) an electric torch for each crew member station.

6.11 Pressurized aeroplanes when carrying passengers — weather radar

Recommendation.— *Pressurized aeroplanes when carrying passengers should be equipped with operative weather radar* *whenever such aeroplanes are being operated in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne weather radar, may be expected to exist along the route either at night or under instrument meteorological conditions.*

6.12 All aeroplanes operated above 15 000 m (49 000 ft) — radiation indicator

All aeroplanes intended to be operated above 15 000 m (49 000 ft) shall carry equipment to measure and indicate continuously the dose rate of total cosmic radiation being received (i.e. the total of ionizing and neutron radiation of galactic and solar origin) and the cumulative dose on each flight. The display unit of the equipment shall be readily visible to a flight crew member.

Note.— The equipment is calibrated on the basis of assumptions acceptable to the appropriate national authorities.

6.13 All aeroplanes complying with the noise certification Standards in Annex 16, Volume I

An aeroplane shall carry a document attesting noise certification. When the document, or a suitable statement attesting noise certification as contained in another document approved by the State of Registry, is issued in a language other than English, it shall include an English translation.

Note.— The attestation may be contained in any document, carried on board, approved by the State of Registry.

6.14 Mach number indicator

All aeroplanes with speed limitations expressed in terms of Mach number, shall be equipped with a Mach number indicator.

Note.— This does not preclude the use of the airspeed indicator to derive Mach number for ATS purposes.

6.15 Aeroplanes required to be equipped with ground proximity warning systems (GPWS)

6.15.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system.

6.15.2 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

6.15.3 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, for which the individual certificate of airworthiness is first issued on or after 1 January 2004, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

6.15.4 From 1 January 2007, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

6.15.5 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less and authorized to carry more than five but not more than nine passengers should be equipped with a ground proximity warning system which provides the warnings of 6.15.8 a) and c), warning of unsafe terrain clearance and a forward looking terrain avoidance function.*

6.15.6 From 1 January 2007 all piston-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system which provides the warnings in 6.15.8 a) and c), warning of unsafe terrain clearance and a forward looking terrain avoidance function.

6.15.7 A ground proximity warning system shall provide automatically a timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth's surface.

6.15.8 A ground proximity warning system shall provide, unless otherwise specified herein, warnings of the following circumstances:

a) excessive descent rate;

b) excessive terrain closure rate;

c) excessive altitude loss after take-off or go-around;

d) unsafe terrain clearance while not in landing configuration;

1) gear not locked down;

2) flaps not in a landing position; and

e) excessive descent below the instrument glide path.

6.16 Aeroplanes carrying passengers — cabin crew seats

6.16.1 Aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1981

All aeroplanes shall be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 12.1 in respect of emergency evacuation.

6.16.2 Aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1981

Recommendation.— *All aeroplanes should be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 12.1 in respect of emergency evacuation.*

Note.— Safety harness includes shoulder straps and a seat belt which may be used independently.

6.16.3 Cabin crew seats provided in accordance with 6.16.1 and 6.16.2 shall be located near floor level and other emergency exits as required by the State of Registry for emergency evacuation.

6.17 Emergency locator transmitter (ELT)

6.17.1 Except as provided for in 6.17.2, until 1 January 2005 all aeroplanes operated on long-range over-water flights as described in 6.5.3 shall be equipped with at least two ELT(S).

6.17.2 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2002, operated on long-range over-water flights as described in 6.5.3, shall be equipped with at least two ELTs, one of which shall be automatic.

6.17.3 From 1 January 2005, all aeroplanes operated on long-range over-water flights as described in 6.5.3 shall be equipped with at least two ELTs, one of which shall be automatic.

6.17.4 Except as provided for in 6.17.5, until 1 January 2005 aeroplanes on flights over designated land areas as described in 6.6 shall be equipped with at least one ELT(S).

6.17.5 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2002, on flights over designated land areas as described in 6.6, shall be equipped with at least one automatic ELT.

6.17.6 From 1 January 2005, aeroplanes on flights over designated land areas as described in 6.6 shall be equipped with at least one automatic ELT.

6.17.7 **Recommendation.—** *All aeroplanes should carry an automatic ELT.*

6.17.8 ELT equipment carried to satisfy the requirements of 6.17.1, 6.17.2, 6.17.3, 6.17.4, 6.17.5, 6.17.6 and 6.17.7 shall operate in accordance with the relevant provisions of Annex 10, Volume III.

6.18 Aeroplanes required to be equipped with an airborne collision avoidance system (ACAS II)

6.18.1 From 1 January 2003, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers shall be equipped with an airborne collision avoidance system (ACAS II).

6.18.2 From 1 January 2005, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than 19 passengers shall be equipped with an airborne collision avoidance system (ACAS II).

6.18.3 **Recommendation.—** *All aeroplanes should be equipped with an airborne collision avoidance system (ACAS II).*

6.18.4 An airborne collision avoidance system shall operate in accordance with the relevant provisions of Annex 10, Volume IV.

6.19 Aeroplanes required to be equipped with a pressure-altitude reporting transponder

All aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.

Note.— This provision is intended to improve the effectiveness of air traffic services as well as airborne collision avoidance systems.

6.20 Microphones

All flight crew members required to be on flight deck duty shall communicate through boom or throat microphones below the transition level/altitude.

6.21 Turbo-jet aeroplanes — forward-looking wind shear warning system

6.21.1 **Recommendation.—** *All turbo-jet aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers should be equipped with a forward-looking wind shear warning system.*

6.21.2 **Recommendation.—** *A forward-looking wind shear warning system should be capable of providing the pilot with a timely aural and visual warning of wind shear ahead of the aircraft, and the information required to permit the pilot to safely commence and continue a missed approach or go-around or to execute an escape manoeuvre if necessary. The system should also provide an indication to the pilot when the limits specified for the certification of automatic landing equipment are being approached, when such equipment is in use.*

6.22 All aeroplanes operated by a single pilot under the instrument flight rules (IFR) or at night

For approval in accordance with 4.9.1, all aeroplanes operated by a single pilot under the IFR or at night shall be equipped with:

a) a serviceable autopilot that has at least altitude hold and heading select modes;

b) a headset with a boom microphone or equivalent; and

c) means of displaying charts that enables them to be readable in all ambient light conditions.

CHAPTER 7. AEROPLANE COMMUNICATION AND NAVIGATION EQUIPMENT

7.1 Communication equipment

7.1.1 An aeroplane shall be provided with radio communication equipment capable of:

a) conducting two-way communication for aerodrome control purposes;

b) receiving meteorological information at any time during flight; and

c) conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

Note.— The requirements of 7.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

7.1.2 The radio communication equipment required in accordance with 7.1.1 shall provide for communications on the aeronautical emergency frequency 121.5 MHz.

7.2 Navigation equipment

7.2.1 An aeroplane shall be provided with navigation equipment which will enable it to proceed:

a) in accordance with its operational flight plan; and

b) in accordance with the requirements of air traffic services;

except when, if not so precluded by the appropriate authority, navigation for flights under the visual flight rules is accomplished by visual reference to landmarks.

7.2.2 For flights in defined portions of airspace or on routes where an RNP type has been prescribed, an aeroplane shall, in addition to the requirements specified in 7.2.1:

a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed RNP type(s); and

b) be authorized by the State of the Operator for operations in such airspace.

Note.— Information on RNP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613). This document also contains a comprehensive list of references to other documents produced by States and international bodies concerning navigation systems and RNP.*

7.2.3 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, minimum navigation performance specifications (MNPS) are prescribed, an aeroplane shall be provided with navigation equipment which:

a) continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

b) has been authorized by the State of the Operator for MNPS operations concerned.

Note.— The prescribed minimum navigation performance specifications and the procedures governing their application are published in the Regional Supplementary Procedures *(Doc 7030).*

7.2.4 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, an aeroplane:

a) shall be provided with equipment which is capable of:

   1) indicating to the flight crew the flight level being flown;

   2) automatically maintaining a selected flight level;

   3) providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed ± 90 m (300 ft); and

   4) automatically reporting pressure-altitude; and

b) shall be authorized by the State of the Operator for operation in the airspace concerned.

7.2.5 Prior to granting the RVSM approval required in accordance with 7.2.4 b), the State shall be satisfied that:

a) the vertical navigation performance capability of the aeroplane satisfies the requirements specified in Appendix 4;

b) the operator has instituted appropriate procedures in respect of continued airworthiness (maintenance and repair) practices and programmes; and

c) the operator has instituted appropriate flight crew procedures for operations in RVSM airspace.

Note.— An RVSM approval is valid globally on the understanding that any operating procedures specific to a given region will be stated in the operations manual or appropriate crew guidance.

7.2.6 The State of the Operator, in consultation with the State of Registry if appropriate, shall ensure that, in respect of those aeroplanes mentioned in 7.2.4 , adequate provisions exist for:

a) receiving the reports of height-keeping performance issued by the monitoring agencies established in accordance with Annex 11, 3.3.4.1; and

b) taking immediate corrective action for individual aircraft, or aircraft type groups, identified in such reports as not complying with the height-keeping requirements for operation in airspace where RVSM is applied.

7.2.7 All States that are responsible for airspace where RVSM has been implemented, or have issued RVSM approvals to operators within their State, shall establish provisions and procedures which ensure that appropriate action will be taken in respect of aircraft and operators found to be operating in RVSM airspace without a valid RVSM approval.

Note.— These provisions and procedures need to address both the situation where the aircraft in question is operating without approval in the airspace of the State, and the situation where an operator for which the State has regulatory oversight responsibility is found to be operating without the required approval in the airspace of another State.

7.2.8 The aeroplane shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aeroplane to navigate in accordance with 7.2.1 and where applicable 7.2.2, 7.2.3 and 7.2.4.

Note.— Guidance material relating to aircraft equipment necessary for flight in airspace where RVSM is applied is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

7.2.9 On flights in which it is intended to land in instrument meteorological conditions, an aeroplane shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in instrument meteorological conditions and for any designated alternate aerodromes.

7.3 Installation

The equipment installation shall be such that the failure of any single unit required for either communications or navigation purposes or both will not result in the failure of another unit required for communications or navigation purposes.

7.4 Electronic navigation data management

7.4.1 An operator shall not employ electronic navigation data products that have been processed for application in the air and on the ground unless the State of the Operator has approved the operator's procedures for ensuring that the process applied and the products delivered have met acceptable standards of integrity and that the products are compatible with the intended function of the equipment that will use them. The State of the Operator shall ensure that the operator continues to monitor both process and products.

Note.— Guidance relating to the processes that data suppliers may follow is contained in RTCA DO-200A/EUROCAE ED-76 *and* RTCA DO-201A/EUROCAE ED-77.

7.4.2 An operator shall implement procedures that ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

CHAPTER 8. AEROPLANE MAINTENANCE

Note 1.— For the purpose of this chapter, "aeroplane" includes: powerplants, propellers, components, accessories, instruments, equipment and apparatus including emergency equipment.

Note 2.— Reference is made throughout this chapter to the requirements of the State of Registry. When the State of the Operator is not the same as the State of Registry, it may be necessary to consider any additional requirements of the State of the Operator.

Note 3.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual *(Doc 9760).*

8.1 Operator's maintenance responsibilities

8.1.1 Operators shall ensure that, in accordance with procedures acceptable to the State of Registry:

a) each aeroplane they operate is maintained in an airworthy condition;

b) the operational and emergency equipment necessary for an intended flight is serviceable;

c) the Certificate of Airworthiness of each aeroplane they operate remains valid.

8.1.2 An operator shall not operate an aeroplane unless it is maintained and released to service by an organization approved in accordance with 8.7, or under an equivalent system, either of which shall be acceptable to the State of Registry.

8.1.3 When the State of Registry accepts an equivalent system, the person signing the maintenance release shall be licensed in accordance with Annex 1.

8.1.4 An operator shall employ a person or group of persons to ensure that all maintenance is carried out in accordance with the maintenance control manual.

8.1.5 The operator shall ensure that the maintenance of its aeroplanes is performed in accordance with the maintenance programme.

8.2 Operator's maintenance control manual

8.2.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance control manual, acceptable to the State of Registry, in accordance with the requirements of 11.2. The design of the manual shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

8.2.2 The operator shall ensure that the maintenance control manual is amended as necessary to keep the information contained therein up to date.

8.2.3 Copies of all amendments to the operator's maintenance control manual shall be furnished promptly to all organizations or persons to whom the manual has been issued.

8.2.4 The operator shall provide the State of the Operator and the State of Registry with a copy of the operator's maintenance control manual, together with all amendments and/or revisions to it and shall incorporate in it such mandatory material as the State of the Operator or the State of Registry may require.

8.3 Maintenance programme

8.3.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance programme, approved by the State of Registry, containing the information required by 11.3. The design and application of the operator's maintenance programme shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

8.3.2 Copies of all amendments to the maintenance programme shall be furnished promptly to all organizations or persons to whom the maintenance programme has been issued.

8.4 Maintenance records

8.4.1 An operator shall ensure that the following records are kept for the periods mentioned in 8.4.2:

a) the total time in service (hours, calendar time and cycles, as appropriate) of the aeroplane and all life limited components;

b) the current status of compliance with all mandatory continuing airworthiness information;

c) appropriate details of modifications and repairs;

d) the time in service (hours, calendar time and cycles, as appropriate) since the last overhaul of the aeroplane or its components subject to a mandatory overhaul life;

e) the current status of the aeroplane's compliance with the maintenance programme; and

f) the detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

8.4.2 The records in 8.4.1 a) to e) shall be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service, and the records in 8.4.1 f) for a minimum period of one year after the signing of the maintenance release.

8.4.3 In the event of a temporary change of operator, the records shall be made available to the new operator. In the event of any permanent change of operator, the records shall be transferred to the new operator.

Note.— In the context of 8.4.3, a judgement on what should be considered as a temporary change of operator will need to be made by the State of Registry in the light of the need to exercise control over the records, which will depend on access to them and the opportunity to update them.

8.5 Continuing airworthiness information

8.5.1 The operator of an aeroplane over 5 700 kg maximum certificated take-off mass shall monitor and assess maintenance and operational experience with respect to continuing airworthiness and provide the information as prescribed by the State of Registry and report through the system specified in Annex 8, Part II, 4.2.3 f) and 4.2.4.

8.5.2 The operator of an aeroplane over 5 700 kg maximum certificated take-off mass shall obtain and assess continuing airworthiness information and recommendations available from the organization responsible for the type design and shall implement resulting actions considered necessary in accordance with a procedure acceptable to the State of Registry.

Note.— Guidance on the interpretation of "the organization responsible for the type design" is contained in the Airworthiness Manual *(Doc 9760).*

8.6 Modifications and repairs

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry. Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

8.7 Approved maintenance organization

8.7.1 Issue of approval

8.7.1.1 The issue of a maintenance organization approval by a State shall be dependent upon the applicant demonstrating compliance with the requirements of 8.7 for such organizations.

8.7.1.2 The approval document shall contain at least the following:

a) organization's name and location;

b) date of issue and period of validity;

c) terms of approval.

8.7.1.3 The continued validity of the approval shall depend upon the organization remaining in compliance with the requirements of 8.7 for an approved maintenance organization.

8.7.2 Maintenance organization's procedures manual

8.7.2.1 The maintenance organization shall provide for the use and guidance of maintenance personnel concerned a procedures manual which may be issued in separate parts containing the following information:

a) a general description of the scope of work authorized under the organization's terms of approval;

b) a description of the organization's procedures and quality or inspection system in accordance with 8.7.4;

c) a general description of the organization's facilities;

d) names and duties of the person or persons required by 8.7.6.1;

e) a description of the procedures used to establish the competence of maintenance personnel as required by 8.7.6.3;

f) a description of the method used for the completion and retention of the maintenance records required by 8.7.7;

g) a description of the procedures for preparing the maintenance release and the circumstances under which the release is to be signed;

h) the personnel authorized to sign the maintenance release and the scope of their authorization;

i) a description, when applicable, of the additional procedures for complying with an operator's maintenance procedures and requirements;

j) a description of the procedures for complying with the service information reporting requirements of Annex 8, Part II, 4.3.5 and 4.3.8; and

k) a description of the procedure for receiving, assessing, amending and distributing within the maintenance organization all necessary airworthiness data from the type certificate holder or type design organization.

8.7.2.2 The maintenance organization shall ensure that the procedures manual is amended as necessary to keep the information contained therein up to date.

8.7.2.3 Copies of all amendments to the procedures manual shall be furnished promptly to all organizations or persons to whom the manual has been issued.

8.7.3 Safety management

8.7.3.1 States shall establish a safety programme in order to achieve an acceptable level of safety in the maintenance of aircraft.

8.7.3.2 The acceptable level of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes and on defining acceptable levels of safety is contained in Attachment E to Annex 11 and in the Safety Management Manual (SMM) *(Doc 9859).*

8.7.3.3 **Recommendation.—** *States should require, as part of their safety programme, that a maintenance organization implement a safety management system acceptable to the State that, as a minimum:*

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

8.7.3.4 From 1 January 2009, States shall require, as part of their safety programme, that a maintenance organization implement a safety management system acceptable to the State that, as a minimum:

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

8.7.3.5 A safety management system shall clearly define lines of safety accountability throughout a maintenance organization, including a direct accountability for safety on the part of senior management.

Note.— Guidance on safety management systems is contained in the Safety Management Manual (SMM) *(Doc 9859).*

8.7.4 Maintenance procedures and quality assurance system

8.7.4.1 The maintenance organization shall establish procedures, acceptable to the State granting the approval, which ensure good maintenance practices and compliance with all relevant requirements of this chapter.

8.7.4.2 The maintenance organization shall ensure compliance with 8.7.4.1 by either establishing an independent quality assurance system to monitor compliance with and adequacy of the procedures, or by providing a system of inspection to ensure that all maintenance is properly performed.

8.7.5 Facilities

8.7.5.1 The facilities and working environment shall be appropriate for the task to be performed.

8.7.5.2 The maintenance organization shall have the necessary technical data, equipment, tools and material to perform the work for which it is approved.

8.7.5.3 Storage facilities shall be provided for parts, equipment, tools and material. Storage conditions shall be such as to provide security and prevent deterioration of and damage to stored items.

8.7.6 Personnel

8.7.6.1 The maintenance organization shall nominate a person or group of persons whose responsibilities include ensuring that the maintenance organization is in compliance with the requirements of 8.7 for an approved maintenance organization.

8.7.6.2 The maintenance organization shall employ the necessary personnel to plan, perform, supervise, inspect and release the work to be performed.

8.7.6.3 The competence of maintenance personnel shall be established in accordance with a procedure and to a level acceptable to the State granting the approval. The person signing a maintenance release shall be qualified in accordance with Annex 1.

8.7.6.4 The maintenance organization shall ensure that all maintenance personnel receive initial and continuation training appropriate to their assigned tasks and responsibilities. The training programme established by the maintenance organization shall include training in knowledge and skills related to human performance, including coordination with other maintenance personnel and flight crew.

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

8.7.7 Records

8.7.7.1 The maintenance organization shall retain detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

8.7.7.2 The records required by 8.7.7.1 shall be kept for a minimum period of one year after the signing of the maintenance release.

8.8 Maintenance release

8.8.1 A maintenance release shall be completed and signed to certify that the maintenance work performed has been completed satisfactorily and in accordance with approved data and the procedures described in the maintenance organization's procedures manual.

8.8.2 A maintenance release shall contain a certification including:

a) basic details of the maintenance carried out including detailed reference of the approved data used;

b) the date such maintenance was completed;

c) when applicable, the identity of the approved maintenance organization; and

d) the identity of the person or persons signing the release.

CHAPTER 9. AEROPLANE FLIGHT CREW

9.1 Composition of the flight crew

9.1.1 The number and composition of the flight crew shall not be less than that specified in the operations manual. The flight crews shall include flight crew members in addition to the minimum numbers specified in the flight manual or other documents associated with the certificate of airworthiness, when necessitated by considerations related to the type of aeroplane used, the type of operation involved and the duration of flight between points where flight crews are changed.

9.1.2 Radio operator

The flight crew shall include at least one member who holds a valid licence, issued or rendered valid by the State of Registry, authorizing operation of the type of radio transmitting equipment to be used.

9.1.3 Flight engineer

When a separate flight engineer's station is incorporated in the design of an aeroplane, the flight crew shall include at least one flight engineer especially assigned to that station, unless the duties associated with that station can be satisfactorily performed by another flight crew member, holding a flight engineer licence, without interference with regular duties.

9.1.4 Flight navigator

The flight crew shall include at least one member who holds a flight navigator licence in all operations where, as determined by the State of the Operator, navigation necessary for the safe conduct of the flight cannot be adequately accomplished by the pilots from the pilot station.

9.2 Flight crew member emergency duties

An operator shall, for each type of aeroplane, assign to all flight crew members the necessary functions they are to perform in an emergency or in a situation requiring emergency evacuation. Annual training in accomplishing these functions shall be contained in the operator's training programme and shall include instruction in the use of all emergency and life-saving equipment required to be carried, and drills in the emergency evacuation of the aeroplane.

9.3 Flight crew member training programmes

9.3.1 An operator shall establish and maintain a ground and flight training programme, approved by the State of the Operator, which ensures that all flight crew members are adequately trained to perform their assigned duties. The training programme shall:

a) include ground and flight training facilities and properly qualified instructors as determined by the State of the Operator;

b) consist of ground and flight training in the type(s) of aeroplane on which the flight crew member serves;

c) include proper flight crew coordination and training in all types of emergency and abnormal situations or procedures caused by power plant, airframe or systems malfunctions, fire or other abnormalities;

d) include training in knowledge and skills related to visual and instrument flight procedures for the intended area of operation, human performance including threat and error management and in the transport of dangerous goods;

e) ensure that all flight crew members know the functions for which they are responsible and the relation of these functions to the functions of other crew members, particularly in regard to abnormal or emergency procedures; and

f) be given on a recurrent basis, as determined by the State of the Operator and shall include an assessment of competence.

Note 1.— Paragraph 4.2.4 prohibits the in-flight simulation of emergency or abnormal situations when passengers or cargo are being carried.

Note 2.— Flight training may, to the extent deemed appropriate by the State of the Operator, be given in flight simulation training devices approved by the State for that purpose.

Note 3.— The scope of the recurrent training required by 9.2 and 9.3 may be varied and need not be as extensive as the initial training given in a particular type of aeroplane.

Note 4.— The use of correspondence courses and written examinations as well as other means may, to the extent *deemed feasible by the State of the Operator, be utilized in meeting the requirements for periodic ground training.*

Note 5.— Provisions for training in the transport of dangerous goods are contained in Annex 18.

Note 6.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

Note 7.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

Note 8.— Guidance material to design flight crew training programmes can be found in the Preparation of an Operations Manual *(Doc 9376).*

Note 9.— Guidance material on the different means used to assess competence can be found in the Attachment to Chapter 2 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

9.3.2 The requirement for recurrent flight training in a particular type of aeroplane shall be considered fulfilled by:

a) the use, to the extent deemed feasible by the State of the Operator, of flight simulation training devices approved by that State for that purpose; or

b) the completion within the appropriate period of the proficiency check required by 9.4.4 in that type of aeroplane.

9.4 Qualifications

Note.— See the Manual of Procedures for the Establishment of a State's Personnel Licensing System *(Doc 9379) for guidance of a general nature on cross-crew qualification, mixed-fleet flying and cross-credit.*

9.4.1 Recent experience — pilot-in-command and co-pilot

9.4.1.1 An operator shall not assign a pilot-in-command or a co-pilot to operate at the flight controls of a type or variant of a type of aeroplane during take-off and landing unless that pilot has operated the flight controls during at least three take-offs and landings within the preceding 90 days on the same type of aeroplane or in a flight simulator approved for the purpose.

9.4.1.2 When a pilot-in-command or a co-pilot is flying several variants of the same type of aeroplane or different types of aeroplanes with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 9.4.1.1 for each variant or each type of aeroplane can be combined.

9.4.2 Recent experience — cruise relief pilot

9.4.2.1 An operator shall not assign a pilot to act in the capacity of cruise relief pilot in a type or variant of a type of aeroplane unless, within the preceding 90 days that pilot has either:

a) operated as a pilot-in-command, co-pilot or cruise relief pilot on the same type of aeroplane; or

b) carried out flying skill refresher training including normal, abnormal and emergency procedures specific to cruise flight on the same type of aeroplane or in a flight simulator approved for the purpose, and has practised approach and landing procedures, where the approach and landing procedure practice may be performed as the pilot who is not flying the aeroplane.

9.4.2.2 When a cruise relief pilot is flying several variants of the same type of aeroplane or different types of aeroplanes with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 9.4.2.1 for each variant or each type of aeroplane can be combined.

9.4.3 Pilot-in-command area, route and aerodrome qualification

9.4.3.1 An operator shall not utilize a pilot as pilot-in-command of an aeroplane on a route or route segment for which that pilot is not currently qualified until such pilot has complied with 9.4.3.2 and 9.4.3.3.

9.4.3.2 Each such pilot shall demonstrate to the operator an adequate knowledge of:

a) the route to be flown, and the aerodromes which are to be used. This shall include knowledge of:

1) the terrain and minimum safe altitudes;

2) the seasonal meteorological conditions;

3) the meteorological, communication and air traffic facilities, services and procedures;

4) the search and rescue procedures; and

5) the navigational facilities and procedures, including any long-range navigation procedures, associated with the route along which the flight is to take place; and

b) procedures applicable to flight paths over heavily populated areas and areas of high air traffic density, obstructions, physical layout, lighting, approach aids and arrival, departure, holding and instrument approach procedures, and applicable operating minima.

Note.— That portion of the demonstration relating to arrival, departure, holding and instrument approach procedures may be accomplished in an appropriate training device which is adequate for this purpose.

9.4.3.3 A pilot-in-command shall have made an actual approach into each aerodrome of landing on the route, accompanied by a pilot who is qualified for the aerodrome, as a member of the flight crew or as an observer on the flight deck, unless:

a) the approach to the aerodrome is not over difficult terrain and the instrument approach procedures and aids available are similar to those with which the pilot is familiar, and a margin to be approved by the State of the Operator is added to the normal operating minima, or there is reasonable certainty that approach and landing can be made in visual meteorological conditions; or

b) the descent from the initial approach altitude can be made by day in visual meteorological conditions; or

c) the operator qualifies the pilot-in-command to land at the aerodrome concerned by means of an adequate pictorial presentation; or

d) the aerodrome concerned is adjacent to another aerodrome at which the pilot-in-command is currently qualified to land.

9.4.3.4 The operator shall maintain a record, sufficient to satisfy the State of the Operator of the qualification of the pilot and of the manner in which such qualification has been achieved.

9.4.3.5 An operator shall not continue to utilize a pilot as a pilot-in-command on a route or within an area specified by the operator and approved by the State of the Operator unless, within the preceding 12 months, that pilot has made at least one trip as a pilot member of the flight crew, or as a check pilot, or as an observer in the flight crew compartment:

a) within that specified area; and

b) if appropriate, on any route where procedures associated with that route or with any aerodromes intended to be used for take-off or landing require the application of special skills or knowledge.

9.4.3.6 In the event that more than 12 months elapse in which a pilot-in-command has not made such a trip on a route in close proximity and over similar terrain, within such a specified area, route or aerodrome, and has not practised such procedures in a training device which is adequate for this purpose, prior to again serving as a pilot-in-command within that area or on that route, that pilot must requalify in accordance with 9.4.3.2 and 9.4.3.3.

9.4.4 Pilot proficiency checks

9.4.4.1 An operator shall ensure that piloting technique and the ability to execute emergency procedures is checked in such a way as to demonstrate the pilot's competence on each type or variant of a type of aeroplane. Where the operation may be conducted under instrument flight rules, an operator shall ensure that the pilot's competence to comply with such rules is demonstrated to either a check pilot of the operator or to a representative of the State of the Operator. Such checks shall be performed twice within any period of one year. Any two such checks which are similar and which occur within a period of four consecutive months shall not alone satisfy this requirement.

Note 1.— Flight simulation training devices approved by the State of the Operator may be used for those parts of the checks for which they are specifically approved.

Note 2.— See the Manual of Criteria for the Qualification of Flight Simulators *(Doc 9625).*

9.4.4.2 When an operator schedules flight crew on several variants of the same type of aeroplane or different types of aeroplanes with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 9.4.4.1 for each variant or each type of aeroplane can be combined.

9.4.5 Single pilot operations under the instrument flight rules (IFR) or at night

9.4.5.1 The State of the Operator shall prescribe requirements of experience, recency and training applicable to single pilot operations intended to be carried out under the IFR or at night.

9.4.5.2 **Recommendation.—** *The pilot-in-command should:*

a) for operations under the IFR or at night, have accumulated at least 50 hours flight time on the class of aeroplane, of which at least 10 hours shall be as pilot-in-command;

b) for operations under the IFR, have accumulated at least 25 hours flight time under the IFR on the class of aeroplane, which may form part of the 50 hours flight time in sub-paragraph a);

c) for operations at night, have accumulated at least 15 hours flight time at night, which may form part of the 50 hours flight time in sub-paragraph a);

d) for operations under the IFR, have acquired recent experience as a pilot engaged in a single pilot operation under the IFR of:

i) at least five IFR flights, including three instrument approaches carried out during the preceding 90 days on the class of aeroplane in the single pilot role; or

ii) an IFR instrument approach check carried out on such an aeroplane during the preceding 90 days;

e) for operations at night, have made at least three take-offs and landings at night on the class of aeroplane in the single pilot role in the preceding 90 days; and

f) have successfully completed training programmes that include, in addition to the requirements of 9.3, passenger briefing with respect to emergency evacuation, autopilot management, and the use of simplified in-flight documentation.

9.4.5.3 The initial and recurrent flight training and proficiency checks indicated in 9.3.1 and 9.4.4 shall be performed by the pilot-in-command in the single pilot role on the class of aeroplane in an environment representative of the operation.

9.5 Flight crew equipment

A flight crew member assessed as fit to exercise the privileges of a licence, subject to the use of suitable correcting lenses, shall have a spare set of the correcting lenses readily available when exercising those privileges.

9.6 Flight time, flight duty periods and rest periods

The State of the Operator shall establish regulations specifying the limitations applicable to the flight time and flight duty periods for flight crew members. These regulations shall also make provision for adequate rest periods and shall be such as to ensure that fatigue occurring either in a flight or successive flights or accumulated over a period of time due to these and other tasks, does not endanger the safety of a flight.

Note.— Guidance on the establishment of limitations is given in Attachment A.

CHAPTER 10. FLIGHT OPERATIONS OFFICER/FLIGHT DISPATCHER

10.1 When the State of the Operator requires that a flight operations officer/flight dispatcher, employed in conjunction with an approved method of control and supervision of flight operations, be licensed, that flight operations officer/flight dispatcher shall be licensed in accordance with the provisions of Annex 1.

10.2 In accepting proof of qualifications other than the option of holding of a flight operations officer/flight dispatcher licence, the State of the Operator, in accordance with the approved method of control and supervision of flight operations, shall require that, as a minimum, such persons meet the requirements specified in Annex 1 for the flight operations officer/flight dispatcher licence.

10.3 A flight operations officer/flight dispatcher shall not be assigned to duty unless that person has:

a) satisfactorily completed an operator-specific training course that addresses all the specific components of its approved method of control and supervision of flight operations specified in 4.2.1.4;

   Note.— Guidance on the composition of such training syllabi is provided in the Training Manual *(Doc 7192), Part D-3* — Flight Operations Officers/ Flight Dispatchers.

b) made, within the preceding 12 months, at least a one-way qualification flight in the flight crew compartment of an aeroplane over any area for which that individual is authorized to exercise flight supervision. The flight should include landings at as many aerodromes as practicable;

   Note.— For the purpose of the qualification flight, the flight operations officer/flight dispatcher must be able to monitor the flight crew intercommunication system and radio communications, and be able to observe the actions of the flight crew.

c) demonstrated to the operator a knowledge of:

   1) the contents of the operations manual described in Appendix 2;

   2) the radio equipment in the aeroplanes used; and

   3) the navigation equipment in the aeroplanes used;

d) demonstrated to the operator a knowledge of the following details concerning operations for which the officer is responsible and areas in which that individual is authorized to exercise flight supervision:

   1) the seasonal meteorological conditions and the sources of meteorological information;

   2) the effects of meteorological conditions on radio reception in the aeroplanes used;

   3) the peculiarities and limitations of each navigation system which is used by the operation; and

   4) the aeroplane loading instructions;

e) demonstrated to the operator knowledge and skills related to human performance relevant to dispatch duties; and

f) demonstrated to the operator the ability to perform the duties specified in 4.6.

10.4 **Recommendation.—** *A flight operations officer/ flight dispatcher assigned to duty should maintain complete familiarization with all features of the operation which are pertinent to such duties, including knowledge and skills related to human performance.*

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

10.5 **Recommendation.—** *A flight operations officer/flight dispatcher should not be assigned to duty after 12 consecutive months of absence from such duty, unless the provisions of 10.2 are met.*

CHAPTER 11. MANUALS, LOGS AND RECORDS

Note.— The following additional manuals, logs and records are associated with this Annex but are not included in this chapter:

Fuel and oil records — see 4.2.9

Maintenance records — see 8.4

Flight time records — see 4.2.10.3

Flight preparation forms — see 4.3

Operational flight plan — see 4.3.3.1

Pilot-in-command route and airport qualification records — see 9.4.3.4

11.1 Flight manual

Note.— The flight manual contains the information specified in Annex 8.

The flight manual shall be updated by implementing changes made mandatory by the State of Registry.

11.2 Operator's maintenance control manual

The operator's maintenance control manual provided in accordance with 8.2, which may be issued in separate parts, shall contain the following information:

a) a description of the procedures required by 8.1.1 including, when applicable:

   1) a description of the administrative arrangements between the operator and the approved maintenance organization;

   2) a description of the maintenance procedures and the procedures for completing and signing a maintenance release when maintenance is based on a system other than that of an approved maintenance organization.

b) names and duties of the person or persons required by 8.1.4;

c) a reference to the maintenance programme required by 8.3.1;

d) a description of the methods used for the completion and retention of the operator's maintenance records required by 8.4;

e) a description of the procedures for monitoring, assessing and reporting maintenance and operational experience required by 8.5.1;

f) a description of the procedures for complying with the service information reporting requirements of Annex 8, Part II, 4.3.5 and 4.3.8;

g) a description of procedures for assessing continuing airworthiness information and implementing any resulting actions, as required by 8.5.2;

h) a description of the procedures for implementing action resulting from mandatory continuing airworthiness information;

i) a description of establishing and maintaining a system of analysis and continued monitoring of the performance and efficiency of the maintenance programme, in order to correct any deficiency in that programme;

j) a description of aircraft types and models to which the manual applies;

k) a description of procedures for ensuring that unserviceabilities affecting airworthiness are recorded and rectified; and

l) a description of the procedures for advising the State of Registry of significant in-service occurrences.

11.3 Maintenance programme

11.3.1 A maintenance programme for each aeroplane as required by 8.3 shall contain the following information:

a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilization of the aeroplane;

b) when applicable, a continuing structural integrity programme;

c) procedures for changing or deviating from a) and b) above; and

d) when applicable, condition monitoring and reliability programme descriptions for aircraft systems, components and powerplants.

11.3.2 Maintenance tasks and intervals that have been specified as mandatory in approval of the type design shall be identified as such.

11.3.3 **Recommendation.—** *The maintenance programme should be based on maintenance programme information made available by the State of Design or by the organization responsible for the type design, and any additional applicable experience.*

11.4 Journey log book

11.4.1 **Recommendation.—** *The aeroplane journey log book should contain the following items and the corresponding roman numerals:*

I — *Aeroplane nationality and registration.*

II — *Date.*

III — *Names of crew members.*

IV — *Duty assignments of crew members.*

V — *Place of departure.*

VI — *Place of arrival.*

VII — *Time of departure.*

VIII — *Time of arrival.*

IX — *Hours of flight.*

X — *Nature of flight (private, aerial work, scheduled or non-scheduled).*

XI — *Incidents, observations, if any.*

XII — *Signature of person in charge.*

11.4.2 **Recommendation.—** *Entries in the journey log book should be made currently and in ink or indelible pencil.*

11.4.3 **Recommendation.—** *Completed journey log book should be retained to provide a continuous record of the last six months' operations.*

11.5 Records of emergency and survival equipment carried

Operators shall at all times have available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board any of their aeroplanes engaged in international air navigation. The information shall include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment.

11.6 Flight recorder records

An operator shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records and, if necessary, the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with Annex 13.

CHAPTER 12. CABIN CREW

12.1 Assignment of emergency duties

An operator shall establish, to the satisfaction of the State of the Operator, the minimum number of cabin crew required for each type of aeroplane, based on seating capacity or the number of passengers carried, in order to effect a safe and expeditious evacuation of the aeroplane, and the necessary functions to be performed in an emergency or a situation requiring emergency evacuation. The operator shall assign these functions for each type of aeroplane.

12.2 Cabin crew at emergency evacuation stations

Each cabin crew member assigned to emergency evacuation duties shall occupy a seat provided in accordance with 6.16 during take-off and landing and whenever the pilot-in-command so directs.

12.3 Protection of cabin crew during flight

Each cabin crew member shall be seated with seat belt or, when provided, safety harness fastened during take-off and landing and whenever the pilot-in-command so directs.

Note.— The foregoing does not preclude the pilot-in-command from directing the fastening of the seat belt only, at times other than during take-off and landing.

12.4 Training

An operator shall establish and maintain a training programme, approved by the State of the Operator, to be completed by all persons before being assigned as a cabin crew member. Cabin crew shall complete a recurrent training programme annually. These training programmes shall ensure that each person is:

a) competent to execute those safety duties and functions which the cabin crew member is assigned to perform in the event of an emergency or in a situation requiring emergency evacuation;

b) drilled and capable in the use of emergency and life-saving equipment required to be carried, such as life jackets, life rafts, evacuation slides, emergency exits, portable fire extinguishers, oxygen equipment and first-aid kits;

c) when serving on aeroplanes operated above 3 000 m (10 000 ft), knowledgeable as regards the effect of lack of oxygen and, in the case of pressurized aeroplanes, as regards physiological phenomena accompanying a loss of pressurization;

d) aware of other crew members' assignments and functions in the event of an emergency so far as is necessary for the fulfilment of the cabin crew member's own duties;

e) aware of the types of dangerous goods which may, and may not, be carried in a passenger cabin and has completed the dangerous goods training programme required by Annex 18; and

f) knowledgeable about human performance as related to passenger cabin safety duties including flight crew-cabin crew coordination.

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

12.5 Flight time, flight duty periods and rest periods

The State of the Operator shall establish regulations specifying the limits applicable to flight time, flight duty periods and rest periods for cabin crew.

Note.— Guidance on the establishment of limitations is given in Attachment A.

CHAPTER 13. SECURITY*

13.1 Domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this Chapter should be applied by all Contracting States also in case of domestic commercial operations (air services).*

13.2 Security of the flight crew compartment

13.2.1 In all aeroplanes which are equipped with a flight crew compartment door, this door shall be capable of being locked, and means shall be provided by which cabin crew can discreetly notify the flight crew in the event of suspicious activity or security breaches in the cabin.

13.2.2 From 1 November 2003, all passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 shall be equipped with an approved flight crew compartment door that is designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorized persons. This door shall be capable of being locked and unlocked from either pilot's station.

13.2.3 In all aeroplanes which are equipped with a flight crew compartment door in accordance with 13.2.2:

a) this door shall be closed and locked from the time all external doors are closed following embarkation until any such door is opened for disembarkation, except when necessary to permit access and egress by authorized persons; and

b) means shall be provided for monitoring from either pilot's station the entire door area outside the flight crew compartment to identify persons requesting entry and to detect suspicious behaviour or potential threat.

13.2.4 **Recommendation.—** *All passenger-carrying aeroplanes should be equipped with an approved flight crew compartment door, where practicable, that is designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorized persons. This door should be capable of being locked and unlocked from either pilot's station.*

13.2.5 **Recommendation.—** *In all aeroplanes which are equipped with a flight crew compartment door in accordance with 13.2.4:*

a) the door should be closed and locked from the time all external doors are closed following embarkation until any such door is opened for disembarkation, except when necessary to permit access and egress by authorized persons; and

b) means should be provided for monitoring from either pilot's station the entire door area outside the flight crew compartment to identify persons requesting entry and to detect suspicious behaviour or potential threat.

13.3 Aeroplane search procedure checklist

An operator shall ensure that there is on board a checklist of the procedures to be followed in searching for a bomb in case of suspected sabotage and for inspecting aeroplanes for concealed weapons, explosives or other dangerous devices when a well-founded suspicion exists that the aeroplane may be the object of an act of unlawful interference. The checklist shall be supported by guidance on the appropriate course of action to be taken should a bomb or suspicious object be found and information on the least-risk bomb location specific to the aeroplane.

13.4 Training programmes

13.4.1 An operator shall establish and maintain an approved security training programme which ensures crew members act in the most appropriate manner to minimize the consequences of acts of unlawful interference. As a minimum, this programme shall include the following elements:

a) determination of the seriousness of any occurrence;

b) crew communication and coordination;

c) appropriate self-defense responses;

d) use of non-lethal protective devices assigned to crew members whose use is authorized by the State of the Operator;

e) understanding of behaviour of terrorists so as to facilitate the ability of crew members to cope with hijacker behaviour and passenger responses;

f) live situational training exercises regarding various threat conditions;

g) flight deck procedures to protect the aeroplane; and

h) aeroplane search procedures and guidance on least-risk bomb locations where practicable.

13.4.2 An operator shall also establish and maintain a training programme to acquaint appropriate employees with preventive measures and techniques in relation to passengers, baggage, cargo, mail, equipment, stores and supplies intended for carriage on an aeroplane so that they contribute to the prevention of acts of sabotage or other forms of unlawful interference.

13.5 Reporting acts of unlawful interference

Following an act of unlawful interference, the pilot-in-command shall submit, without delay, a report of such an act to the designated local authority.

13.6 Miscellaneous

13.6.1 **Recommendation.—** *Specialized means of attenuating and directing the blast should be provided for use at the least-risk bomb location.*

13.6.2 **Recommendation.—** *Where an operator accepts the carriage of weapons removed from passengers, the aeroplane should have provision for stowing such weapons in a place so that they are inaccessible to any person during flight time.*

* In the context of this Chapter, the word ''security'' is used in the sense of prevention of illicit acts against civil aviation.

APPENDIX 1. LIGHTS TO BE DISPLAYED BY AEROPLANES

(Note.— See Chapter 6, 6.10)

1. Terminology

When the following terms are used in this Appendix, they have the following meanings:

Angles of coverage.

a) Angle of coverage A is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left respectively, looking aft along the longitudinal axis to a vertical plane passing through the longitudinal axis.

b) Angle of coverage F is formed by two intersecting vertical planes making angles of 110 degrees to the right and 110 degrees to the left respectively, looking forward along the longitudinal axis to a vertical plane passing through the longitudinal axis.

c) Angle of coverage L is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the left of the first, when looking forward along the longitudinal axis.

d) Angle of coverage R is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

Horizontal plane. The plane containing the longitudinal axis and perpendicular to the plane of symmetry of the aeroplane.

Longitudinal axis of the aeroplane. A selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the aeroplane.

Making way. An aeroplane on the surface of the water is “making way” when it is under way and has a velocity relative to the water.

Under command. An aeroplane on the surface of the water is “under command” when it is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels.

Under way. An aeroplane on the surface of the water is “under way” when it is not aground or moored to the ground or to any fixed object on the land or in the water.

Vertical planes. Planes perpendicular to the horizontal plane.

Visible. Visible on a dark night with a clear atmosphere.

2. Navigation lights to be displayed in the air

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for navigation lights.

As illustrated in Figure 1, the following unobstructed navigation lights shall be displayed:

a) a red light projected above and below the horizontal plane through angle of coverage L;

b) a green light projected above and below the horizontal plane through angle of coverage R;

c) a white light projected above and below the horizontal plane rearward through angle of coverage A.

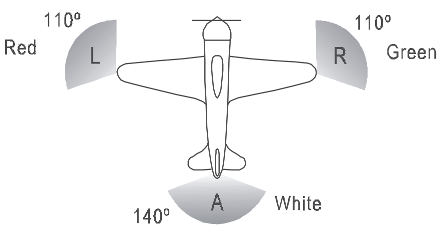


Figure 1

3. Lights to be displayed on the water

3.1 General

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for lights to be displayed by aeroplanes on the water.

The International Regulations for Preventing Collisions at Sea require different lights to be displayed in each of the following circumstances:

a) when under way;

b) when towing another vessel or aeroplane;

c) when being towed;

d) when not under command and not making way;

e) when making way but not under command;

f) when at anchor;

g) when aground.

The lights required by aeroplanes in each case are described below.

3.2 When under way

As illustrated in Figure 2, the following appearing as steady unobstructed lights:

a) a red light projected above and below the horizontal through angle of coverage L;

b) a green light projected above and below the horizontal through angle of coverage R;

c) a white light projected above and below the horizontal through angle of coverage A; and

d) a white light projected through angle of coverage F.

The lights described in 3.2 a), b) and c) should be visible at a distance of at least 3.7 km (2 NM). The light described in 3.2 d) should be visible at a distance of 9.3 km (5 NM) when fitted to an aeroplane of 20 m or more in length or visible at a distance of 5.6 km (3 NM) when fitted to an aeroplane of less than 20 m in length.

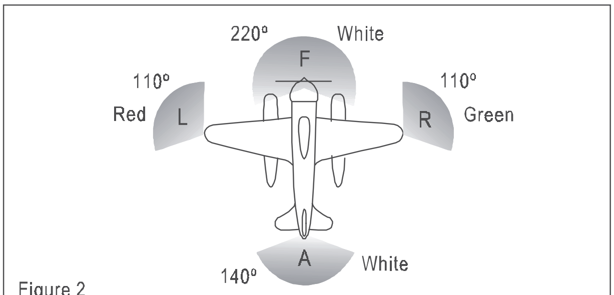


Figure 2

3.3 When towing another vessel or aeroplane

As illustrated in Figure 3, the following appearing as steady, unobstructed lights:

a) the lights described in 3.2;

b) a second light having the same characteristics as the light described in 3.2 d) and mounted in a vertical line at least 2 m above or below it; and

c) a yellow light having otherwise the same characteristics as the light described in 3.2 c) and mounted in a vertical line at least 2 m above it.

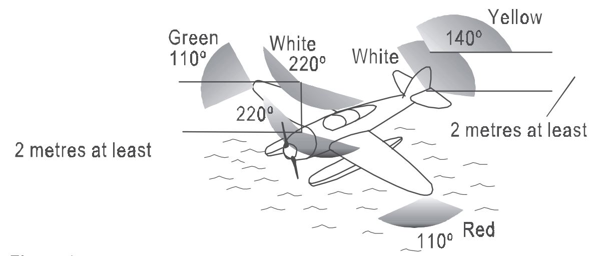


Figure 3

3.4 When being towed

The lights described in 3.2 a), b) and c) appearing as steady, unobstructed lights.

3.5 When not under command and not making way

As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3.7 km (2 NM).

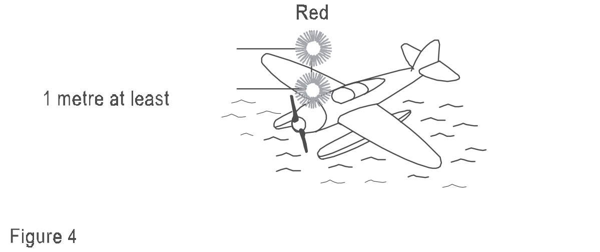


Figure 4

3.6 When making way but not under command

As illustrated in Figure 5, the lights described in 3.5 plus the lights described in 3.2 a), b) and c).

Note.— The display of lights prescribed in 3.5 and 3.6 is to be taken by other aircraft as signals that the aeroplane showing them is not under command and cannot therefore get out of the way. They are not signals of aeroplanes in distress and requiring assistance.

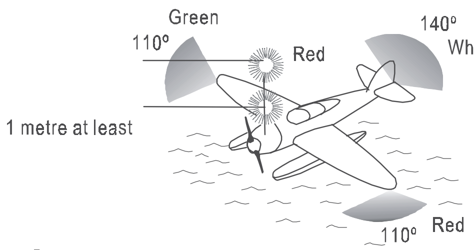


Figure 5

3.7 When at anchor

a) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 NM).

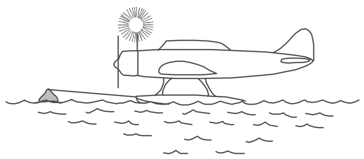


Figure 6

b) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 NM).

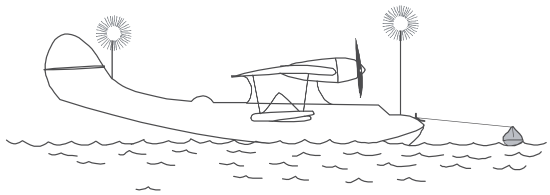
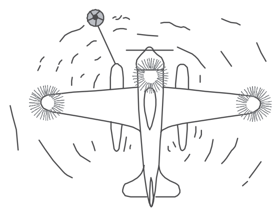


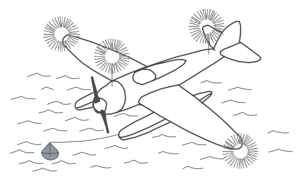
Figure 7

c) If 50 m or more in span a steady white light on each side (Figures 8 and 9) to indicate the maximum span and visible, so far as practicable, all around the horizon at a distance of at least 1.9 km (1 NM).



Less than 50 metres in length; 50 metres or more in span

Figure 8



50 metres or more in length; 50 metres or more in span

Figure 9

3.8 When aground

The lights prescribed in 3.7 and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.

APPENDIX 2. ORGANIZATION AND CONTENTS OF AN OPERATIONS MANUAL

(See Chapter 4, 4.2.2.1)

1. Organization

1.1 **Recommendation.—** *An operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 4, 4.2.2.1 should be organized with the following structure:*

a) General;

b) Aircraft operating information;

c) Areas, routes and aerodromes; and

d) Training.

1.2 From 1 January 2006, an operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 4, 4.2.2.1 shall be organized with the following structure:

a) General;

b) Aircraft operating information;

c) Areas, routes and aerodromes; and

d) Training.

2. Contents

The operations manual referred to in 1.1 and 1.2 shall contain at the least the following:

2.1 General

2.1.1 Instructions outlining the responsibilities of operations personnel pertaining to the conduct of flight operations.

2.1.2 Rules limiting the flight time and flight duty periods and providing for adequate rest periods for flight crew members and cabin crew as required by Chapter 4, 4.2.10.2.

2.1.3 A list of the navigational equipment to be carried including any requirements relating to operations in RNP airspace.

2.1.4 Where relevant to the operations, the long-range navigation procedures, engine failure procedure for ETOPS and the nomination and utilization of diversion aerodromes.

2.1.5 The circumstances in which a radio listening watch is to be maintained.

2.1.6 The method for determining minimum flight altitudes.

2.1.7 The methods for determining aerodrome operating minima.

2.1.8 Safety precautions during refuelling with passengers on board.

2.1.9 Ground handling arrangements and procedures.

2.1.10 Procedures, as prescribed in Annex 12, for pilots-in-command observing an accident.

2.1.11 The flight crew for each type of operation including the designation of the succession of command.

2.1.12 Specific instructions for the computation of the quantities of fuel and oil to be carried, having regard to all circumstances of the operation including the possibility of loss of pressurization and the failure of one or more power-units while en route.

2.1.13 The conditions under which oxygen shall be used and the amount of oxygen determined in accordance with Chapter 4, 4.3.8.2.

2.1.14 Instructions for mass and balance control.

2.1.15 Instructions for the conduct and control of ground de-icing/anti-icing operations.

2.1.16 The specifications for the operational flight plan.

2.1.17 Standard operating procedures (SOP) for each phase of flight.

2.1.18 Instructions on the use of normal checklists and the timing of their use.

2.1.19 Departure contingency procedures.

2.1.20 Instructions on the maintenance of altitude awareness and the use of automated or flight crew altitude call-out.

2.1.21 Instructions on the use of autopilots and auto-throttles in IMC.

2.1.22 Instructions on the clarification and acceptance of ATC clearances, particularly where terrain clearance is involved.

2.1.23 Departure and approach briefings.

2.1.24 Procedures for familiarization with areas, routes and aerodromes.

2.1.25 Stabilized approach procedure.

2.1.26 Limitation on high rates of descent near the surface.

2.1.27 Conditions required to commence or to continue an instrument approach.

2.1.28 Instructions for the conduct of precision and non-precision instrument approach procedures.

2.1.29 Allocation of flight crew duties and procedures for the management of crew workload during night and IMC instrument approach and landing operations.

2.1.30 Instructions and training requirements for the avoidance of controlled flight into terrain and policy for the use of the ground proximity warning system (GPWS).

2.1.31 Policy, instructions, procedures and training requirements for the avoidance of collisions and the use of the airborne collision avoidance system (ACAS).

Note.— Procedures for the operation of ACAS are contained in PANS-OPS (Doc 8168), Volume I, Part VIII, Chapter 3, and in PANS-ATM (Doc 4444), Chapters 12 and 15.

2.1.32 Information and instructions relating to the interception of civil aircraft including:

a) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and

b) visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2.

2.1.33 For aeroplanes intended to be operated above 15 000 m (49 000 ft):

a) information which will enable the pilot to determine the best course of action to take in the event of exposure to solar cosmic radiation; and

b) procedures in the event that a decision to descend is taken, covering:

1) the necessity of giving the appropriate ATS unit prior warning of the situation and of obtaining a provisional descent clearance; and

2) the action to be taken in the event that communication with the ATS unit cannot be established or is interrupted.

Note.— Guidance material on the information to be provided is contained in Circular 126 — Guidance Material on SST Aircraft Operations.

2.1.34 Details of the accident prevention and flight safety programme provided in accordance with Chapter 3, 3.2, including a statement of safety policy and the responsibility of personnel.

2.1.35 Information and instructions on the carriage of dangerous goods, including action to be taken in the event of an emergency.

Note.— Guidance material on the development of policies and procedures for dealing with dangerous goods incidents on board aircraft is contained in Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481).

2.1.36 Security instructions and guidance.

2.1.37 The search procedure checklist provided in accordance with Chapter 13, 13.3.

2.2 Aircraft operating information

2.2.1 Certification limitations and operating limitations.

2.2.2 The normal, abnormal and emergency procedures to be used by the flight crew and the checklists relating thereto as required by Chapter 6, 6.1.3.

2.2.3 Operating instructions and information on climb performance with all engines operating, if provided in accordance with Chapter 4, 4.2.3.3.

2.2.4 Flight planning data for pre-flight and in-flight planning with different thrust/power and speed settings.

2.2.5 The maximum crosswind and tailwind components for each aeroplane type operated and the reductions to be applied to these values having regard to gusts, low visibility, runway surface conditions, crew experience, use of autopilot, abnormal or emergency circumstances, or any other relevant operational factors.

2.2.6 Instructions and data for mass and balance calculations.

2.2.7 Instructions for aircraft loading and securing of load.

2.2.8 Aircraft systems, associated controls and instructions for their use, as required by Chapter 6, 6.1.3.

2.2.9 The minimum equipment list and configuration deviation list for the aeroplane types operated and specific operations authorized, including any requirements relating to operations in RNP airspace.

2.2.10 Checklist of emergency and safety equipment and instructions for its use.

2.2.11 Emergency evacuation procedures, including type-specific procedures, crew coordination, assignment of crew's emergency positions and the emergency duties assigned to each crew member.

2.2.12 The normal, abnormal and emergency procedures to be used by the cabin crew, the checklists relating thereto and aircraft systems information as required, including a statement related to the necessary procedures for the coordination between flight and cabin crew.

2.2.13 Survival and emergency equipment for different routes and the necessary procedures to verify its normal functioning before take-off, including procedures to determine the required amount of oxygen and the quantity available.

2.2.14 The ground-air visual signal code for use by survivors, as contained in Annex 12.

2.3 Routes and aerodromes

2.3.1 A route guide to ensure that the flight crew will have, for each flight, information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures as applicable for the operation, and such other information as the operator may deem necessary for the proper conduct of flight operations.

2.3.2 The minimum flight altitudes for each route to be flown.

2.3.3 Aerodrome operating minima for each of the aerodromes that are likely to be used as aerodromes of intended landing or as alternate aerodromes.

2.3.4 The increase of aerodrome operating minima in case of degradation of approach or aerodrome facilities.

2.3.5 The necessary information for compliance with all flight profiles required by regulations, including but not limited to, the determination of:

a) take-off runway length requirements for dry, wet and contaminated conditions, including those dictated by system failures which affect the take-off distance;

b) take-off climb limitations;

c) en-route climb limitations;

d) approach climb limitations and landing climb limitations;

e) landing runway length requirements for dry, wet and contaminated conditions, including systems failures which affect the landing distance; and

f) supplementary information, such as tire speed limitations.

2.4 Training

2.4.1 Details of the flight crew training programme, as required by Chapter 9, 9.3.

2.4.2 Details of the cabin crew duties training programme as required by Chapter 12, 12.4.

2.4.3 Details of the flight operations officer/flight dispatcher training programme when employed in conjunction with a method of flight supervision in accordance with Chapter 4, 4.2.1.

Note.— Details of the flight operations officer/flight dispatcher training programme are contained in Chapter 10, 10.2.

APPENDIX 3. ADDITIONAL REQUIREMENTS FOR APPROVED OPERATIONS BY SINGLE-ENGINE TURBINE-POWERED AEROPLANES AT NIGHT AND/OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

(*See Chapter 5, 5.4.1*)

Airworthiness and operational requirements provided in accordance with Chapter 5, 5.4.1, shall satisfy the following:

1. Turbine engine reliability

1.1 Turbine engine reliability shall be shown to have a power loss rate of less than 1 per 100 000 engine hours.

Note.— Power loss in this context is defined as any loss of power, the cause of which may be traced to faulty engine or engine component design or installation, including design or installation of the fuel ancillary or engine control systems. (See Attachment I.)

1.2 The operator shall be responsible for engine trend monitoring.

1.3 To minimize the probability of in-flight engine failure, the engine shall be equipped with:

a) an ignition system that activates automatically, or is capable of being operated manually, for take-off and landing, and during flight, in visible moisture;

b) a magnetic particle detection or equivalent system that monitors the engine, accessories gearbox, and reduction gearbox, and which includes a flight deck caution indication; and

c) an emergency engine power control device that permits continuing operation of the engine through a sufficient power range to safely complete the flight in the event of any reasonably probable failure of the fuel control unit.

2. Systems and equipment

Single-engine turbine-powered aeroplanes approved to operate at night and/or in IMC shall be equipped with the following systems and equipment intended to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

a) two separate electrical generating systems, each one capable of supplying all probable combinations of continuous in-flight electrical loads for instruments, equipment and systems required at night and/or in IMC;

b) a radio altimeter;

c) an emergency electrical supply system of sufficient capacity and endurance, following loss of all generated power, to as a minimum:

   1) maintain the operation of all essential flight instruments, communication and navigation systems during a descent from the maximum certificated altitude in a glide configuration to the completion of a landing;

   2) lower the flaps and landing gear, if applicable;

   3) provide power to one pitot heater, which must serve an air speed indicator clearly visible to the pilot;

   4) provide for operation of the landing light specified in 2 j);

   5) provide for one engine restart, if applicable; and

   6) provide for the operation of the radio altimeter;

d) two attitude indicators, powered from independent sources;

e) a means to provide for at least one attempt at engine re-start;

f) airborne weather radar;

g) a certified area navigation system capable of being programmed with the positions of aerodromes and safe forced landing areas, and providing instantly available track and distance information to those locations;

h) for passenger operations, passenger seats and mounts which meet dynamically-tested performance standards and which are fitted with a shoulder harness or a safety belt with a diagonal shoulder strap for each passenger seat;

i) in pressurized aeroplanes, sufficient supplemental oxygen for all occupants for descent following engine failure at the maximum glide performance from the maximum certificated altitude to an altitude at which supplemental oxygen is no longer required;

j) a landing light that is independent of the landing gear and is capable of adequately illuminating the touchdown area in a night forced landing; and

k) an engine fire warning system.

3. Minimum equipment list

The State of the Operator shall require the minimum equipment list of an operator approved in accordance with Chapter 5, 5.4 to specify the operating equipment required for night and/or IMC operations, and for day/VMC operations.

4. Flight manual information

The flight manual shall include limitations, procedures, approval status and other information relevant to operations by single-engine turbine-powered aeroplanes at night and/or in IMC.

5. Event reporting

5.1 An operator approved for operations by single-engine turbine-powered aeroplanes at night and/or in IMC shall report all significant failures, malfunctions or defects to the State of the Operator who in turn will notify the State of Design.

5.2 The State of the Operator shall review the safety data and monitor the reliability information so as to be able to take any actions necessary to ensure that the intended safety level is achieved. The State of the Operator will notify major events or trends of particular concern to the appropriate Type Certificate Holder and the State of Design.

6. Operator planning

6.1 Operator route planning shall take account of all relevant information in the assessment of intended routes or areas of operations, including the following:

a) the nature of the terrain to be overflown, including the potential for carrying out a safe forced landing in the event of an engine failure or major malfunction;

b) weather information, including seasonal and other adverse meteorological influences that may affect the flight; and

c) other criteria and limitations as specified by the State of the Operator.

6.2 An operator shall identify aerodromes or safe forced landing areas available for use in the event of engine failure, and the position of these shall be programmed into the area navigation system.

Note 1.— A 'safe' forced landing in this context means a landing in an area at which it can reasonably be expected that it will not lead to serious injury or loss of life, even though the aeroplane may incur extensive damage.

Note 2.— Operation over routes and in weather conditions that permit a safe forced landing in the event of an engine failure, as specified in Chapter 5, 5.1.2, is not required by Appendix 3, 6.1 and 6.2 for aeroplanes approved in accordance with Chapter 5, 5.4. The availability of forced landing areas at all points along a route is not specified for these aeroplanes because of the very high engine reliability, additional systems and operational equipment, procedures and training requirements specified in this Appendix.

7. Flight crew experience, training and checking

7.1 The State of the Operator shall prescribe the minimum flight crew experience required for night/IMC operations by single-engine turbine-powered aeroplanes.

7.2 An operator's flight crew training and checking shall be appropriate to night and/or IMC operations by single-engine turbine-powered aeroplanes, covering normal, abnormal and emergency procedures and, in particular, engine failure, including descent to a forced landing in night and/or in IMC conditions.

8. Route limitations over water

The State of the Operator shall apply route limitation criteria for single-engine turbine-powered aeroplanes operating at night and/or in IMC on over water operations if beyond gliding distance from an area suitable for a safe forced landing/ditching having regard to the characteristics of the aeroplane, seasonal weather influences, including likely sea state and temperature, and the availability of search and rescue services.

9. Operator certification or validation

The operator shall demonstrate the ability to conduct operations by single-engine turbine-powered aeroplanes at night and/or in IMC through a certification and approval process specified by the State of the Operator.

Note.— Guidance on the airworthiness and operational requirements is contained in Attachment I.

APPENDIX 4. ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS FOR OPERATIONS IN RVSM AIRSPACE

(Note.— See Chapter 7, 7.2.5)

1. In respect of groups of aeroplanes that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of aeroplanes shall have a mean no greater than 25 m (80 ft) in magnitude and shall have a standard deviation no greater than $28 - 0.013z^2$ for $0 \le z \le 25$ when z is the magnitude of the mean TVE in metres, or $92 - 0.004z^2$ for $0 \le z \le 80$ where z is in feet. In addition, the components of TVE shall have the following characteristics:

a) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;

b) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft); and

c) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

2. In respect of aeroplanes for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of aeroplanes encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the aeroplane have the following characteristics:

a) the ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and

b) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

APPENDIX 5. SAFETY OVERSIGHT OF AIR OPERATORS

(Note.— See Chapter 4, 4.2.1.7)

1. Primary aviation legislation

1.1 The State of the Operator shall enact and implement laws that enable the State to regulate civil aviation through a Civil Aviation Authority (CAA) or equivalent organization established for that purpose. The legislation shall empower the Authority to discharge the oversight responsibilities of the State. The legislation shall provide for the making of regulations, the certification and continued supervision of air operators, and the resolution of safety issues identified by the Authority.

Note.— The term Authority as used in this Appendix refers to the Civil Aviation Authority as well as equivalent organizations, including inspectors and staff.

1.2 The State of the Operator shall ensure that the laws of the State require air operators to provide the Authority with access to their personnel, aircraft, operations and facilities and associated records for the purpose of certification and continued surveillance.

Note.— Guidance on the critical elements of a system that enables a State to discharge its responsibility for inspection, certification and continued surveillance of operations is contained in the Safety Oversight Manual *(Doc 9734), Part A —* The Establishment and Management of a State's Safety Oversight System, *the* Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335) and the* Airworthiness Manual *(Doc 9760).*

2. Specific operating regulations

2.1 The State of the Operator shall adopt regulations that provide for the certification and continued surveillance of aircraft operations and the maintenance of aircraft in conformity with the Annexes to the Convention on International Civil Aviation.

2.2 The State of the Operator shall ensure that its regulations are sufficiently comprehensive, detailed, and current with respect to changes in technology and the operating environment to ensure that satisfactory compliance will result in an acceptable level of safety for the operations undertaken.

3. CAA structure and safety oversight functions

3.1 The State of the Operator shall ensure that the Authority is responsible for the safety oversight of air operators and that it has resources appropriate to the size and complexity of civil air operations under the jurisdiction of the State, to effectively discharge the responsibilities of the State.

3.2 The State of the Operator shall ensure that Authority inspectors have adequate support, credentials, and transportation to accomplish, independently, their certification and continued surveillance tasks.

4. Technical guidance

4.1 The State of the Operator shall ensure that Authority inspectors are provided with technical guidance manuals containing the policies, procedures, and standards to be used in the certification and continued surveillance of air operators.

4.2 The State of the Operator shall ensure that Authority inspectors are provided with technical guidance manuals containing the policies, procedures, and standards to be used in the resolution of safety issues, including enforcement.

4.3 The State of the Operator shall ensure that Authority inspectors are provided with technical guidance manuals that address ethics, personal conduct, and the avoidance of actual or perceived conflicts of interest in the performance of official duties.

5. Qualified technical personnel

5.1 The State of the Operator shall use a methodology to determine its inspector staffing requirements according to the size and complexity of civil air operations in that State.

5.2 **Recommendation.—** *The methodology in 5.1 should be documented.*

5.3 The State of the Operator shall establish qualification requirements to ensure that its inspector personnel have operational or technical work experience and training compatible with those activities they are required to certificate or inspect.

Note.— Guidance on experience and training for inspectors is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335), Chapter 9, 9.4.*

5.4 The State of the Operator shall require Authority inspectors to complete initial and recurrent training in relevant technical subjects (including aircraft-specific subjects) and in skills necessary to effectively accomplish their certification and continued surveillance tasks.

5.5 **Recommendation.—** *The State of the Operator should take the necessary measures, such as remuneration and conditions of service, to ensure that qualified inspectors are recruited and retained.*

6. Licensing and certification obligations

6.1 The State of the Operator shall use a documented process for the certification of air operators that includes thorough technical evaluations that lead to approval or acceptance of procedures, documents and operations as specified in Annex 6, Part I.

6.2 The State of the Operator shall require, prior to commencement of new commercial air transport operations, air operators to demonstrate that they can safely conduct the proposed operations.

Note.— Attachment F contains further information in this regard.

7. Continued surveillance obligations

7.1 The State of the Operator shall use a documented process for the continued surveillance of air operators to verify the continued validity of the air operator certificates issued by the Authority.

7.2 The State of the Operator shall use an ongoing surveillance plan to confirm that operators continue to meet the relevant requirements for initial certification and that each air operator is functioning satisfactorily.

8. Resolution of safety issues

8.1 The State of the Operator shall use a documented process to take appropriate corrective actions, up to and including enforcement measures, to resolve identified safety issues.

8.2 The State of the Operator shall ensure that identified safety issues are resolved in a timely manner through a system which monitors and records progress, including actions taken by the air operator, in resolving such issues.

ATTACHMENT A. FLIGHT TIME AND FLIGHT DUTY PERIOD LIMITATIONS

Supplementary to Chapter 4, 4.2.10.3

1. Purpose and scope

1.1 Flight time and flight duty period limitations are established for the sole purpose of reducing the probability that fatigue of flight crew members may adversely affect the safety of flight.

1.2 In order to guard against this, two types of fatigue must be taken into account, namely, transient fatigue and cumulative fatigue. Transient fatigue may be described as fatigue which is normally experienced by a healthy individual following a period of work, exertion or excitement, and it is normally dispelled by a single sufficient period of sleep. On the other hand cumulative fatigue may occur after delayed or incomplete recovery from transient fatigue or as the after-effect of more than a normal amount of work, exertion or excitement without sufficient opportunity for recuperation.

1.3 Limitations based on the provisions of this Part will provide safeguards against both kinds of fatigue because they will recognize:

1.3.1 The necessity to limit flight time in such a way as to guard against both kinds of fatigue.

1.3.2 The necessity to limit time spent on duty on the ground immediately prior to a flight or at intermediate points during a series of flights in such a way as to guard particularly against transient fatigue.

1.3.3 The necessity to provide flight crew members with adequate opportunity to recover from fatigue.

1.3.4 The necessity of taking into account other related tasks the flight crew member may be required to perform in order to guard particularly against cumulative fatigue.

2. Definitions

2.1 Flight time

The definition of flight time is of necessity very general but in the context of limitations it is, of course, intended to apply to flight crew members in accordance with the relevant definition of a flight crew member. Pursuant to that latter definition, licensed crew personnel travelling as passengers cannot be considered flight crew members, although this should be taken into account in arranging rest periods.

2.2 Flight duty periods

2.2.1 The definition of flight duty period is intended to cover a continuous period of duty which always includes a flight or a series of flights. It is meant to include all duties flight crew members may be required to carry out from the moment they report at their place of employment on the day of a flight until they are relieved of duties, having completed the flight or series of flights. It is considered necessary that this period should be subject to limitations because a flight crew member's activities within the limits of such period would eventually induce fatigue — transient or cumulative — which could endanger the safety of a flight. There is on the other hand (from the point of view of flight safety) insufficient reason to establish limitations for any other time during which flight crew members are performing a task assigned to them by the operator. Such a task should, therefore, only be taken into account when making provisions for rest periods as one among many factors which could lead to fatigue.

2.2.2 The definition does not imply the inclusion of such periods as time taken for a flight crew member to travel from home to the place of employment.

2.2.3 An important safeguard may be established if States and operators recognize the right of a crew member to refuse further flight duty when suffering from fatigue of such a nature as to affect adversely the safety of flight.

2.3 Rest periods

The definition of rest period implies an absence of duty and is intended to be for the purpose of recovering from fatigue; the way in which this recovery is achieved is the responsibility of the individual.

3. Types of limitations

3.1 Limitations are broadly divided by time; for example, the majority of States reporting to ICAO prescribe daily, monthly and yearly flight time limitations, and a considerable number also prescribe quarterly flight time limitations. It will probably be sufficient to prescribe flight duty period limitations on a daily basis. It must be understood, however, that these limitations will vary considerably taking into account a variety of situations.

3.2 In formulating regulations or rules governing flight time limitations, the size of the crew complement and the extent to which the various tasks to be performed can be divided among the crew members should be taken into account; and in the case where adequate facilities for relief are provided in the aircraft in such a way that a crew member may have horizontal rest and a degree of privacy, flight duty periods could be extended. Adequate rest facilities on the ground are required at places where relief periods are to be given. Also, States or operators should give due weight to the following factors: traffic density; navigational and communication facilities; rhythm of work/sleep cycle; number of landings and take-offs; aircraft handling and performance characteristics and weather conditions.

ATTACHMENT B. FIRST-AID MEDICAL SUPPLIES

Supplementary to Chapter 6, 6.2.2 a)

TYPES, NUMBER, LOCATION AND CONTENTS OF MEDICAL SUPPLIES

1. Types

Two types of medical supplies should be provided: first-aid kit(s) for carriage in all aeroplanes and a medical kit for carriage where the aeroplane is authorized to carry more than 250 passengers.

2. Number of first-aid kits

The number of first-aid kits should be appropriate to the number of passengers which the aeroplane is authorized to carry:

Passenger	*First-aid kits*
0 – 50	1
51 – 150	2
151 – 250	3
More than 250	4

3. Location

3.1 It is essential that the required first-aid kits be distributed as evenly as practicable throughout the passenger cabin. They should be readily accessible to cabin crew, and, in view of the possible use of medical supplies outside the aeroplane in an emergency situation, they should be located near an exit.

3.2 The medical kit, when carried, should be stored in an appropriate secure location.

4. Contents

4.1 Different factors must be taken into consideration in deciding the contents of first-aid kits and medical kits. The following are typical contents of first-aid and medical kits for carriage aboard an aeroplane.

4.1.1 *First-aid kit:*

— a handbook on first aid
— ''ground-air visual signal code for use by survivors'' as contained in Annex 12
— materials for treating injuries
— ophthalmic ointment
— a decongestant nasal spray
— insect repellant
— emollient eye drops
— sunburn cream
— water-miscible antiseptic/skin cleanser
— materials for treatment of extensive burns
— oral drugs as follows: analgesic, antispasmodic, central nervous system stimulant, circulatory stimulant, coronary vasodilator, antidiarrhoeic and motion sickness medications
— an artificial plastic airway and splints.

4.1.2 *Medical kit:*

Equipment
— one pair of sterile surgical gloves
— sphygmomanometer
— stethoscope
— sterile scissors
— haemostatic forceps
— haemostatic bandages or tourniquet
— sterile equipment for suturing wounds
— disposable syringes and needles
— disposable scalpel handle and blade

Drugs
— coronary vasodilators
— analgesics
— diuretics
— anti-allergics
— steroids
— sedatives
— ergometrine
— where compatible with regulations of the appropriate authority, a narcotic drug in injectable form
— injectable broncho dilator.

Note.— The United Nations Conference for Adoption of a Single Convention on Narcotic Drugs in March 1961 adopted such a Convention, Article 32 of which contains special provisions concerning the carriage of drugs in medical kits of aircraft engaged in international flight.

ATTACHMENT C. AEROPLANE PERFORMANCE OPERATING LIMITATIONS

Example 1

Purpose and scope

The purpose of the following example is to illustrate the level of performance intended by the provisions of Chapter 5 as applicable to the types of aeroplanes described below.

The Standards and Recommended Practices in Annex 6 effective on 14 July 1949 contained specifications similar to those adopted by some Contracting States for inclusion in their national performance codes. A very substantial number of civil transport aeroplanes have been manufactured and are being operated in accordance with these codes. Those aeroplanes are powered with reciprocating engines including turbo-compound design. They embrace twin-engined and four-engined aeroplanes over a mass range from approximately 4 200 kg to 70 000 kg over a stalling speed range,V_{S0} from approximately 100 to 175 km/h (55 to 95 kt) and over a wing loading range from approximately 120 to 360 kg/m^2. Cruising speeds range over 555 km/h (300 kt). Those aeroplanes have been used in a very wide range of altitude, air temperature and humidity conditions. At a later date, the code was applied with respect to the evaluation of certification of the so-called "first generation" of turboprop and turbo-jet aeroplanes.

Although only past experience can warrant the fact that this example illustrates the level of performance intended by the Standards and Recommended Practices of Chapter 5, it is considered to be applicable over a wide range of aeroplane characteristics and atmospheric conditions. Reservation should however be made concerning the application of this example with respect to conditions of high air temperatures. In certain extreme cases, it has been found desirable to apply additional temperature and/or humidity accountability, particularly for the obstacle limited take-off flight path.

This example is not intended for application to aeroplanes having short take-off and landing (STOL) or vertical take-off and landing (VTOL) capabilities.

No detailed study has been made of the applicability of this example to operations in all-weather conditions. The validity of this example has not therefore been established for operations which may involve low decision heights and be associated with low minima operating techniques and procedures.

1. Definitions

CAS (Calibrated airspeed). The calibrated airspeed is equal to the airspeed indicator reading corrected for position and instrument error. (As a result of the sea level adiabatic compressible flow correction to the airspeed instrument dial, CAS is equal to the true airspeed (TAS) in Standard Atmosphere at sea level.)

Declared distances.

a) *Take-off run available (TORA).* The length of runway declared available and suitable for the ground run of an aeroplane taking off.

b) *Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway, if provided.

c) *Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of the stopway, if provided.

d) *Landing distance available (LDA).* The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

Note.— The calculation of declared distances is described in Annex 14, Volume I, Attachment A.

Height. The vertical distance of a level, a point, or an object considered as a point, measured from a specified datum.

Note.— For the purposes of this example, the point referred to above is the lowest part of the aeroplane and the specified datum is the take-off or landing surface, whichever is applicable.

Landing surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft landing in a particular direction.

Take-off surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft taking off in a particular direction.

V_{S0} A stalling speed or minimum steady flight speed in the landing configuration. *(Note.— See 2.4.)*

V_{S1} A stalling speed or minimum steady flight speed. *(Note.— See 2.5.)*

Note.— See Chapter 1 and Annexes 8 and 14, Volume I, for other definitions.

2. Stalling speed — minimum steady flight speed

2.1 For the purpose of this example, the stalling speed is the speed at which an angle of attack greater than that of maximum lift is reached, or, if greater, the speed at which a large amplitude pitching or rolling motion, not immediately controllable, is encountered, when the manoeuvre described in 2.3 is executed.

Note.— It should be noted that an uncontrollable pitching motion of small amplitude associated with pre-stall buffeting does not necessarily indicate that the stalling speed has been reached.

2.2 The minimum steady flight speed is that obtained while maintaining the elevator control in the most rearward possible position when the manoeuvre described in 2.3 is executed. This speed would not apply when the stalling speed defined in 2.1 occurs before the elevator control reaches its stops.

2.3 Determination of stalling speed — Minimum steady flight speed

2.3.1 The aeroplane is trimmed for a speed of approximately $1.4V_{S1}$. From a value sufficiently above the stalling speed to ensure that a steady rate of decrease is obtainable, the speed is reduced in straight flight at a rate not exceeding 0.5 m/s^2 (1 kt/s) until the stalling speed or the minimum steady flight speed, defined in 2.1 and 2.2, is reached.

2.3.2 For the purpose of measuring stalling speed and minimum steady flight speed, the instrumentation is such that the probable error of measurement is known.

2.4 V_{S0}

V_{S0} denotes the stalling speed if obtained in flight tests conducted in accordance with 2.3, or the minimum steady flight speed, CAS, as defined in 2.2, with:

a) engines at not more than sufficient power for zero thrust at a speed not greater than 110 per cent of the stalling speed;

b) propeller pitch controls in the position recommended for normal use during take-off;

c) landing gear extended;

d) wing flaps in the landing position;

e) cowl flaps and radiator shutters closed or nearly closed;

f) centre of gravity in that position within the permissible landing range which gives the maximum value of stalling speed or of minimum steady flight speed;

g) aeroplane mass equal to the mass involved in the specification under consideration.

2.5 V_{S1}

V_{S1} denotes the stalling speed if obtained in flight tests conducted in accordance with 2.3, or the minimum steady flight speed, CAS, as defined in 2.2, with:

a) engines at not more than sufficient power for zero thrust at a speed not greater than 110 per cent of the stalling speed;

b) propeller pitch controls in the position recommended for normal use during take-off;

c) aeroplane in the configuration in all other respects and at the mass prescribed in the specification under consideration.

3. Take-off

3.1 Mass

The mass of the aeroplane at take-off is not to exceed the maximum take-off mass specified in the flight manual for the altitude at which the take-off is to be made.

3.2 Performance

The performance of the aeroplane as determined from the information contained in the flight manual is such that:

a) the accelerate-stop distance required does not exceed the accelerate-stop distance available;

b) the take-off distance required does not exceed the take-off distance available;

c) the take-off path provides a vertical clearance of not less than 15.2 m up to D = 500 m (50 ft up to D = 1 500 ft) and 15.2 + 0.01 [D – 500] m (50 + 0.01 [D – 1 500] ft) thereafter, above all obstacles lying within 60 m plus half the wing span of the aeroplane plus 0.125D on either side of the flight path, except that obstacles lying beyond 1 500 m on either side of the flight path need not be cleared.

The distance D is the horizontal distance that the aeroplane has travelled from the end of the take-off distance available.

Note.— This need not be carried beyond the point at which the aeroplane would be able, without further gaining in height, to commence a landing procedure at the aerodrome of take-off or, alternatively, has attained the minimum safe altitude for commencing flight to another aerodrome.

However, the lateral obstacle clearance is liable to be reduced (below the values stated above) when, and to the extent that, this is warranted by special provisions or conditions which assist the pilot to avoid inadvertent lateral deviations from the intended flight path. For example, particularly in poor weather conditions, a precise radio aid may assist the pilot to maintain the intended flight path. Also, when the take-off is made in sufficiently good visibility conditions, it may, in some cases, be possible to avoid obstacles which are clearly visible but may be within the lateral limits noted in 3.2 c).

Note 1.— The procedures used in defining the accelerate-stop distance required, the take-off distance required and the take-off flight path are described in the Appendix to this example.

Note 2.— In some national codes similar to this example, the specification for "performance" at take-off is such that no credit can be taken for any increase in length of accelerate-stop distance available and take-off distance available beyond the length specified in Section 1 for take-off run available. Those codes specify a vertical clearance of not less than 15.2 m (50 ft) above all obstacles lying within 60 m on either side of the flight path while still within the confines of the aerodrome, and 90 m on either side of the flight path when outside those confines. It is to be observed that those codes are such that they do not provide for an alternative to the method of elements (see the Appendix to this example) in the determination of the take-off path. It is considered that those codes are compatible with the general intent of this example.

3.3 Conditions

For the purpose of 3.1 and 3.2, the performance is that corresponding to:

a) the mass of the aeroplane at the start of take-off;

b) an altitude equal to the elevation of the aerodrome;

and for the purpose of 3.2:

c) the ambient temperature at the time of take-off for 3.2 a) and b) only;

d) the runway slope in the direction of take-off (landplanes);

e) not more than 50 per cent of the reported wind component opposite to the direction of take-off, and not less than 150 per cent of the reported wind component in the direction of take-off. In certain cases of operation of seaplanes, it has been found necessary to take account of the reported wind component normal to the direction of take-off.

3.4 Critical point

In applying 3.2 the critical point chosen for establishing compliance with 3.2 a) is not nearer to the starting point than that used for establishing compliance with 3.2 b) and 3.2 c).

3.5 Turns

In case the flight path includes a turn with bank greater than 15 degrees, the clearances specified in 3.2 c) are increased by an adequate amount during the turn, and the distance D is measured along the intended track.

4. En route

4.1 One power-unit inoperative

4.1.1 At all points along the route or planned diversion therefrom, the aeroplane is capable, at the minimum flight altitudes en route, of a steady rate of climb with one power-unit inoperative, as determined from the flight manual, of at least

1) $K\left(\frac{V_{S_0}}{185.2}\right)^2$ m/s, V_{S_0} being expressed in km/h;

2) $K\left(\frac{V_{S_0}}{100}\right)^2$ m/s, V_{S_0} being expressed in kt;

3) $K\left(\frac{V_{S_0}}{100}\right)^2$ ft/min, V_{S_0} being expressed in kt;

and K having the following value:

$K = 4.04 - \frac{5.40}{N}$ in the case of 1) and 2); and

$K = 797 - \frac{1\,060}{N}$ in the case of 3)

where N is the number of power-units installed.

It should be noted that minimum flight altitudes are usually considered to be not less than 300 m (1 000 ft) above terrain along and adjacent to the flight path.

4.1.2 As an alternative to 4.1.1 the aeroplane is operated at an all power-unit operating altitude such that, in the event of a power-unit failure, it is possible to continue the flight to an aerodrome where a landing can be made in accordance with 5.3, the flight path clearing all terrain and obstructions along the route within 8 km (4.3 NM) on either side of the intended track by at least 600 m (2 000 ft). In addition, if such a procedure is utilized, the following provisions are complied with:

a) the rate of climb, as determined from the flight manual for the appropriate mass and altitude, used in calculating the flight path is diminished by an amount equal to

1) $K\left(\frac{V_{S_0}}{185.2}\right)^2$ m/s, V_{S_0} being expressed in km/h;

2) $K\left(\frac{V_{S_0}}{100}\right)^2$ m/s, V_{S_0} being expressed in kt;

3) $K\left(\frac{V_{S_0}}{100}\right)^2$ ft/min, V_{S_0} being expressed in kt;

and K having the following value:

$K = 4.04 - \frac{5.40}{N}$ in the case of 1) and 2); and

$K = 797 - \frac{1\,060}{N}$ in the case of 3)

where N is the number of power-units installed;

b) the aeroplane complies with 4.1.1 at 300 m (1 000 ft) above the aerodrome used as an alternate in this procedure;

c) after the power-unit failure considered, account is taken of the effect of winds and temperatures on the flight path;

d) it is assumed that the mass of the aeroplane as it proceeds along its intended track is progressively reduced by normal consumption of fuel and oil;

e) it is customary to assume such fuel jettisoning as is consistent with reaching the aerodrome in question.

4.2 Two power-units inoperative
(applicable only to aeroplanes with four power-units)

The possibility of two power-units becoming inoperative when the aeroplane is more than 90 minutes at all power-units operating cruising speed from an en-route alternate aerodrome is catered for. This is done by verifying that at whatever such point such a double failure may occur, the aeroplane in the configuration and with the engine power specified in the flight manual can thereafter reach the alternate aerodrome without coming below the minimum flight altitude. It is customary to assume such fuel jettisoning as is consistent with reaching the aerodrome in question.

5. Landing

5.1 Mass

The calculated mass for the expected time of landing at the aerodrome of intended landing or any destination alternate aerodrome is not to exceed the maximum specified in the flight manual for the elevation of that aerodrome.

5.2 Landing distance

5.2.1 *Aerodrome of intended landing*

The landing distance at the aerodrome of the intended landing, as determined from the flight manual, is not to exceed 60 per cent of the landing distance available on:

a) the most suitable landing surface for a landing in still air; and, if more severe,

b) any other landing surface that may be required for landing because of expected wind conditions at the time of arrival.

5.2.2 *Alternate aerodromes*

The landing distance at any alternate aerodrome, as determined from the flight manual, is not to exceed 70 per cent of the landing distance available on:

a) the most suitable landing surface for a landing in still air; and, if more severe,

b) any other landing surface that may be required for landing because of expected wind conditions at the time of arrival.

Note.— The procedure used in determining the landing distance is described in the Appendix to this example.

5.3 Conditions

For the purpose of 5.2, the landing distances are not to exceed those corresponding to:

a) the calculated mass of the aeroplane for the expected time of landing;

b) an altitude equal to the elevation of the aerodrome;

c) for the purpose of 5.2.1 a) and 5.2.2 a), still air;

d) for the purpose of 5.2.1 b) and 5.2.2 b), not more than 50 per cent of the expected wind component along the landing path and opposite to the direction of landing and not less than 150 per cent of the expected wind component in the direction of landing.

APPENDIX TO EXAMPLE 1 ON AEROPLANE PERFORMANCE OPERATING LIMITATIONS — PROCEDURES USED IN DETERMINING TAKE-OFF AND LANDING PERFORMANCE

1. General

1.1 Unless otherwise specified, Standard Atmosphere and still air conditions are applied.

1.2 Engine powers are based on a water vapour pressure corresponding to 80 per cent relative humidity in standard conditions. When performance is established for temperature above standard, the water vapour pressure for a given altitude is assumed to remain at the value stated above for standard atmospheric conditions.

1.3 Each set of performance data required for a particular flight condition is determined with the powerplant accessories absorbing the normal amount of power appropriate to that flight condition.

1.4 Various wing flap positions are selected. These positions are permitted to be made variable with mass, altitude and temperature in so far as this is considered consistent with acceptable operating practices.

1.5 The position of the centre of gravity is selected within the permissible range so that the performance achieved in the configuration and power indicated in the specification under consideration is a minimum.

1.6 The performance of the aeroplane is determined in such a manner that under all conditions the approved limitations for the powerplant are not exceeded.

1.7 The determined performance is so scheduled that it can serve directly in showing compliance with the aeroplane performance operating limitations.

2. Take-off

2.1 General

2.1.1 The take-off performance data are determined:

a) for the following conditions:

1) sea level;

2) aeroplane mass equal to the maximum take-off mass at sea level;

3) level, smooth, dry and hard take-off surfaces (landplanes);

4) smooth water of declared density (seaplanes);

b) over selected ranges of the following variables:

1) atmospheric conditions, namely: altitude and also pressure-altitude and temperature;

2) aeroplane mass;

3) steady wind velocity parallel to the direction of take-off;

4) steady wind velocity normal to the direction of take-off (seaplanes);

5) uniform take-off surface slope (landplanes);

6) type of take-off surface (landplanes);

7) water surface condition (seaplanes);

8) density of water (seaplanes);

9) strength of current (seaplanes).

2.1.2 The methods of correcting the performance data to obtain data for adverse atmospheric conditions include appropriate allowance for any increased airspeeds and cowl flap or radiator shutter openings necessary under such conditions to maintain engine temperatures within appropriate limits.

2.1.3 For seaplanes appropriate interpretations of the term landing gear, etc., are made to provide for the operation of retractable floats, if employed.

2.2 Take-off safety speed

2.2.1 The take-off safety speed is an airspeed (CAS) so selected that it is not less than:

a) $1.20V_{S1}$, for aeroplanes with two power-units;

b) $1.15V_{S1}$, for aeroplanes having more than two power-units;

c) 1.10 times the minimum control speed, V_{MC} established as prescribed in 2.3;

where V_{S1} is appropriate to the configuration, as described in 2.3.1 b), c) and d).

2.3 Minimum control speed

2.3.1 The minimum control speed, V_{MC}, is determined not to exceed a speed equal to $1.2V_{S1}$, where V_{S1} corresponds with the maximum certificated take-off mass with:

a) maximum take-off power on all power-units;

b) landing gear retracted;

c) wing flaps in take-off position;

d) cowl flaps and radiator shutters in the position recommended for normal use during take-off;

e) aeroplane trimmed for take-off;

f) aeroplane airborne and ground effect negligible.

2.3.2 The minimum control speed is such that, when any one power-unit is made inoperative at that speed, it is possible to recover control of the aeroplane with the one power-unit still inoperative and to maintain the aeroplane in straight flight at that speed either with zero yaw or with a bank not in excess of 5 degrees.

2.3.3 From the time at which the power-unit is made inoperative to the time at which recovery is complete, exceptional skill, alertness, or strength on the part of the pilot is not required to prevent any loss of altitude other than that implicit in the loss of performance or any change of heading in excess of 20 degrees, nor does the aeroplane assume any dangerous attitude.

2.3.4 It is demonstrated that to maintain the aeroplane in steady straight flight at this speed after recovery and before retrimming does not require a rudder control force exceeding 800 N and does not make it necessary for the flight crew to reduce the power of the remaining power-units.

2.4 Critical point

2.4.1 The critical point is a selected point at which, for the purpose of determining the accelerate-stop distance and the take-off path, failure of the critical power-unit is assumed to occur. The pilot is provided with a ready and reliable means of determining when the critical point has been reached.

2.4.2 If the critical point is located so that the airspeed at that point is less than the take-off safety speed, it is demonstrated that, in the event of sudden failure of the critical power-unit at all speeds down to the lowest speed corresponding with the critical point, the aeroplane is controllable satisfactorily and that the take-off can be continued safely, using normal piloting skill, without reducing the thrust of the remaining power-units.

2.5 Accelerate-stop distance required

2.5.1 The accelerate-stop distance required is the distance required to reach the critical point from a standing start and, assuming the critical power-unit to fail suddenly at this point, to stop if a landplane, or to bring the aeroplane to a speed of approximately 6 km/h (3 kt) if a seaplane.

2.5.2 Use of braking means in addition to, or in lieu of, wheel brakes is permitted in determining this distance, provided that they are reliable and that the manner of their employment is such that consistent results can be expected under normal conditions of operation, and provided that exceptional skill is not required to control the aeroplane.

2.5.3 The landing gear remains extended throughout this distance.

2.6 Take-off path

2.6.1 *General*

2.6.1.1 The take-off path is determined either by the method of elements, 2.6.2, or by the continuous method, 2.6.3, or by any acceptable combination of the two.

2.6.1.2 Adjustment of the provisions of 2.6.2.1 c) 1) and 2.6.3.1 c) is permitted when the take-off path would be affected by the use of an automatic pitch changing device, provided that a level of performance safety exemplified by 2.6 is demonstrated.

2.6.2 *Method of elements*

2.6.2.1 In order to define the take-off path, the following elements are determined:

a) The distance required to accelerate the aeroplane from a standing start to the point at which the take-off safety speed is first attained, subject to the following provisions:

   1) the critical power-unit is made inoperative at the critical point;

   2) the aeroplane remains on or close to the ground;

   3) the landing gear remains extended.

b) The horizontal distance traversed and the height attained by the aeroplane operating at the take-off safety speed during the time required to retract the landing gear, retraction being initiated at the end of 2.6.2.1 a) with:

   1) the critical power-unit inoperative, its propeller windmilling, and the propeller pitch control in the position recommended for normal use during take-off, except that, if the completion of the retraction of the landing gear occurs later than the completion of the stopping of the propeller initiated in accordance with 2.6.2.1 c) 1), the propeller may be assumed to be stopped throughout the remainder of the time required to retract the landing gear;

   2) the landing gear extended.

c) When the completion of the retraction of the landing gear occurs earlier than the completion of the stopping of the propeller, the horizontal distance traversed and the height attained by the aeroplane in the time elapsed from the end of 2.6.2.1 b) until the rotation of the inoperative propeller has been stopped, when:

   1) the operation of stopping the propeller is initiated not earlier than the instant the aeroplane has attained a total height of 15.2 m (50 ft) above the take-off surface;

   2) the aeroplane speed is equal to the take-off safety speed;

   3) the landing gear is retracted;

   4) the inoperative propeller is windmilling with the propeller pitch control in the position recommended for normal use during take-off.

d) The horizontal distance traversed and the height attained by the aeroplane in the time elapsed from the end of 2.6.2.1 c) until the time limit on the use of take-off power is reached, while operating at the take-off safety speed, with:

   1) the inoperative propeller stopped;

   2) the landing gear retracted.

The elapsed time from the start of the take-off need not extend beyond a total of 5 minutes.

e) The slope of the flight path with the aeroplane in the configuration prescribed in 2.6.2.1 d) and with the remaining power-unit(s) operating within the maximum continuous power limitations, where the time limit on the use of take-off power is less than 5 minutes.

2.6.2.2 If satisfactory data are available, the variations in drag of the propeller during feathering and of the landing gear throughout the period of retraction are permitted to be taken into account in determining the appropriate portions of the elements.

2.6.2.3 During the take-off and subsequent climb represented by the elements, the wing flap control setting is not changed, except that changes made before the critical point has been reached, and not earlier than 1 minute after the critical point has been passed, are permitted; in this case, it is demonstrated that such changes can be accomplished without undue skill, concentration, or effort on the part of the pilot.

2.6.3 *Continuous method*

2.6.3.1 The take-off path is determined from an actual take-off during which:

a) the critical power-unit is made inoperative at the critical point;

b) the climb-away is not initiated until the take-off safety speed has been reached and the airspeed does not fall below this value in the subsequent climb;

c) retraction of the landing gear is not initiated before the aeroplane reaches the take-off safety speed;

d) the wing flap control setting is not changed, except that changes made before the critical point has been reached, and not earlier than 1 minute after the critical point has been passed, are permitted; in this case, it is demonstrated that such changes can be accomplished without undue skill, concentration, or effort on the part of the pilot;

e) the operation of stopping the propeller is not initiated until the aeroplane has cleared a point 15.2 m (50 ft) above the take-off surface.

2.6.3.2 Suitable methods are provided and employed to take into account, and to correct for, any vertical gradient of wind velocity which may exist during the take-off.

2.7 Take-off distance required

The take-off distance required is the horizontal distance along the take-off flight path from the start of the take-off to a point where the aeroplane attains a height of 15.2 m (50 ft) above the take-off surface.

2.8 Temperature accountability

Operating correction factors for take-off mass and take-off distance are determined to account for temperature above and below those of the Standard Atmosphere. These factors are obtained as follows:

a) For any specific aeroplane type the average full temperature accountability is computed for the range of mass and altitudes above sea level, and for ambient temperatures expected in operation. Account is taken of the temperature effect both on the aerodynamic characteristics of the aeroplane and on the engine power. The full temperature accountability is expressed per degree of temperature in terms of a mass correction, a take-off distance correction and a change, if any, in the position of the critical point.

b) Where 2.6.2 is used to determine the take-off path, the operating correction factors for the aeroplane mass and take-off distance are at least one half of the full accountability values. Where 2.6.3 is used to determine the take-off path, the operating correction factors for the aeroplane mass and take-off distance are equal to the full accountability values. With both methods, the position of the critical point is further corrected by the average amount necessary to assure that the aeroplane can stop within the runway length at the ambient temperature, except that the speed at the critical point is not less than a minimum at which the aeroplane can be controlled with the critical power-unit inoperative.

3. Landing

3.1 General

The landing performance is determined:

a) for the following conditions:

1) sea level;

2) aeroplane mass equal to the maximum landing mass at sea level;

3) level, smooth, dry and hard landing surfaces (landplanes);

4) smooth water of declared density (seaplanes);

b) over selected ranges of the following variables:

1) atmospheric conditions, namely: altitude and also pressure-altitude and temperature;

2) aeroplane mass;

3) steady wind velocity parallel to the direction of landing;

4) uniform landing-surface slope (landplanes);

5) type of landing surface (landplanes);

6) water surface condition (seaplanes);

7) density of water (seaplanes);

8) strength of current (seaplanes).

3.2 Landing distance

3.2.1 The landing distance is the horizontal distance between that point on the landing surface at which the aeroplane is brought to a complete stop or, for seaplanes, to a speed of approximately 6 km/h (3 kt) and that point on the landing surface which the aeroplane cleared by 15.2 m (50 ft).

3.3 Landing technique

3.3.1 In determining the landing distance:

a) immediately before reaching the 15.2 m (50 ft) height, a steady approach is maintained, landing gear fully extended, with an airspeed of not less than $1.3V_{S0}$;

b) the nose of the aeroplane is not depressed in flight nor the forward thrust increased by application of engine power after reaching the 15.2 m (50 ft) height;

c) the wing flap control is set in the landing position, and remains constant during the final approach, flare out and touch down, and on the landing surface at air speeds above $0.9V_{S0}$. When the aeroplane is on the landing surface and the airspeed has fallen to less than $0.9V_{S0}$, change of the wing-flap-control setting is permitted;

d) the landing is made in a manner such that there is no excessive vertical acceleration, no excessive tendency to bounce, and no display of any uncontrollable or otherwise undesirable ground (water) handling characteristics, and such that its repetition does not require either an exceptional degree of skill on the part of the pilot, or exceptionally favourable conditions;

e) wheel brakes are not used in a manner such as to produce excessive wear of brakes or tires, and the operating pressures on the braking system are not in excess of those approved.

3.3.2 In addition to, or in lieu of, wheel brakes, other reliable braking means are permitted to be used in determining the landing distance, provided that the manner of their employment is such that consistent results can be expected under normal conditions of operation and that exceptional skill is not required to control the aeroplane.

3.3.3 The gradient of the steady approach and the details of the technique used in determining the landing distance, together with such variations in the technique as are recommended for landing with the critical power-units inoperative, and any appreciable variation in landing distance resulting therefrom, are entered in the flight manual.

Example 2

Purpose and scope

The purpose of the following example is to illustrate the level of performance intended by the provisions of Chapter 5 as applicable to the types of aeroplanes described below.

This material was contained in substance in Attachment A to the now superseded edition of Annex 6 which became effective on 1 May 1953. It is based on the type of requirements developed by the Standing Committee on Performance* with such detailed changes as are necessary to make it reflect as closely as possible a performance code that has been used nationally.

A substantial number of civil transport aeroplanes have been manufactured and are being operated in accordance with these codes. Those aeroplanes are powered with reciprocating engines, turbo-propellers and turbo-jets. They embrace twin-engined and four-engined aeroplanes over a mass range from approximately 5 500 kg to 70 000 kg over a stalling speed range, V_{S0}, from approximately 110 to 170 km/h (60 to 90 kt) and over a wing loading range from approximately 120 to 350 kg/m^2. Cruising speeds range up to 740 km/h (400 kt). Those aeroplanes have been used in a very wide range of altitude, air temperature and humidity conditions.

Although only past experience can warrant the fact that this example illustrates the level of performance intended by the Standards and Recommended Practices of Chapter 5, it is considered to be applicable, except for some variations in detail as necessary to fit particular cases, over a much wider range of aeroplane characteristics. Reservation should, however, be made concerning one point. The landing distance specification of this example, not being derived from the same method as other specifications, is valid only for the range of conditions stated for Example 1 in this Attachment.

This example is not intended for application to aeroplanes having short take-off and landing (STOL) or vertical take-off and landing (VTOL) capabilities.

No detailed study has been made of the applicability of this example to operations in all-weather conditions. The validity of this example has not therefore been established for operations which may involve low decision heights and be associated with low weather minima operating techniques and procedures.

1. Definitions

Declared distances.

a) *Take-off run available (TORA).* The length of runway declared available and suitable for the ground run of an aeroplane taking off.

b) *Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway, if provided.

* The ICAO Standing Committee on Performance, established as a result of recommendations of the Airworthiness and Operations Divisions at their Fourth Sessions, in 1951, met four times between 1951 and 1953.

c) *Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of the stopway, if provided.

d) *Landing distance available (LDA).* The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

Note.— The calculation of declared distances is described in Annex 14, Volume I, Attachment A.

Declared temperature. A temperature selected in such a way that when used for performance purposes, over a series of operations, the average level of safety is not less than would be obtained by using official forecast temperatures.

Expected. Used in relation to various aspects of performance (e.g. rate or gradient of climb), this term means the standard performance for the type, in the relevant conditions (e.g. mass, altitude and temperature).

Height. The vertical distance of a level, a point, or an object considered as a point, measured from a specified datum.

Note.— For the purposes of this example, the point referred to above is the lowest part of the aeroplane and the specified datum is the take-off or landing surface, whichever is applicable.

Landing surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft landing in a particular direction.

Net gradient. The net gradient of climb throughout these requirements is the expected gradient of climb diminished by the manoeuvre performance (i.e. that gradient of climb necessary to provide power to manoeuvre) and by the margin (i.e. that gradient of climb necessary to provide for those variations in performance which are not expected to be taken explicit account of operationally).

Reference humidity. The relationship between temperature and reference humidity is defined as follows:

— at temperatures at and below ISA, 80 per cent relative humidity,

— at temperatures at and above ISA + 28°C, 34 per cent relative humidity,

— at temperatures between ISA and ISA + 28°C, the relative humidity varies linearly between the humidity specified for those temperatures.

Take-off surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft taking off in a particular direction.

TAS (True airspeed). The speed of the aeroplane relative to undisturbed air.

Note.— See Chapter 1 and Annexes 8 and 14, Volume I, for other definitions.

2. Take-off

2.1 Mass

The mass of the aeroplane at take-off is not to exceed the maximum take-off mass specified in the flight manual for the altitude and temperature at which the take-off is to be made.

2.2 Performance

The performance of the aeroplane, as determined from the information contained in the flight manual, is such that:

a) the accelerate-stop distance required does not exceed the accelerate-stop distance available;

b) the take-off run required does not exceed the take-off run available;

c) the take-off distance required does not exceed the take-off distance available;

d) the net take-off flight path starting at a point 10.7 m (35 ft) above the ground at the end of the take-off distance required provides a vertical clearance of not less than 6 m (20 ft) plus 0.005D above all obstacles lying within 60 m plus half the wing span of the aeroplane plus 0.125D on either side of the intended track until the relevant altitude laid down in the operations manual for an en-route flight has been attained; except that obstacles lying beyond 1 500 m on either side of the flight path need not be cleared.

The distance D is the horizontal distance that the aeroplane has travelled from the end of the take-off distance available.

Note.— This need not be carried beyond the point at which the aeroplane would be able, without further gaining in height, to commence a landing procedure at the aerodrome of take-off or, alternatively, has attained the minimum safe altitude for commencing flight to another aerodrome.

However, the lateral obstacle clearance is liable to be reduced (below the values stated above) when, and to the extent that, this is warranted by special provisions or conditions which assist the pilot to avoid inadvertent lateral deviations from the intended flight path. For example, particularly in poor weather conditions, a precise radio aid may assist the pilot to maintain the intended flight path. Also, when the take-off is made in sufficiently good visibility conditions, it may, in some cases, be possible to avoid obstacles which are clearly visible but may be within the lateral limits noted in 2.2 d).

Note.— The procedures used in determining the accelerate-stop distance required, the take-off run required, the take-off distance required and the net take-off flight path are described in the Appendix to this example.

2.3 Conditions

For the purpose of 2.1 and 2.2, the performance is that corresponding to:

a) the mass of the aeroplane at the start of take-off;

b) an altitude equal to the elevation of the aerodrome;

c) either the ambient temperature at the time of take-off, or a declared temperature giving an equivalent average level of performance;

and for the purpose of 2.2:

d) the surface slope in the direction of take-off (land-planes);

e) not more than 50 per cent of the reported wind component opposite to the direction of take-off, and not less than 150 per cent of the reported wind component in the direction of take-off. In certain cases of operation of seaplanes, it has been found necessary to take account of the reported wind component normal to the direction of take-off.

2.4 Power failure point

In applying 2.2 the power failure point chosen for establishing compliance with 2.2 a) is not nearer to the starting point than that used for establishing compliance with 2.2 b) and 2.2 c).

2.5 Turns

The net take-off flight path may include turns, provided that:

a) the radius of steady turn assumed is not less than that scheduled for this purpose in the flight manual;

b) if the planned change of direction of the take-off flight path exceeds 15 degrees, the clearance of the net take-off flight path above obstacles is at least 30 m (100 ft) during and after the turn, and the appropriate allowance, as prescribed in the flight manual, is made for the reduction in assumed gradient of climb during the turn;

c) the distance D is measured along the intended track.

3. En route

3.1 All power-units operating

At each point along the route and planned diversion therefrom, the all power-units operating performance ceiling appropriate to the aeroplane mass at that point, taking into account the amount of fuel and oil expected to be consumed, is not less than the minimum altitude (see Chapter 4, 4.2.6) or, if greater, the planned altitude which it is intended to maintain with all power-units operating, in order to ensure compliance with 3.2 and 3.3.

3.2 One power-unit inoperative

From each point along the route and planned diversions therefrom, it is possible in the event of one power-unit becoming inoperative to continue the flight to an en-route alternate aerodrome where a landing can be made in accordance with 4.2 and, on arrival at the aerodrome, the net gradient of climb is not less than zero at a height of 450 m (1 500 ft) above the elevation of the aerodrome.

3.3 Two power-units inoperative
(applicable only to aeroplanes with four power-units)

For each point along the route or planned diversions therefrom, at which the aeroplane is more than 90 minutes' flying time at all power-units operating cruising speed from an en-route alternate aerodrome, the two power-units inoperative net flight path is such that a height of at least 300 m (1 000 ft) above terrain can be maintained until arrival at such an aerodrome.

Note.— The net flight path is that attainable from the expected gradient of climb or descent diminished by 0.2 per cent.

3.4 Conditions

The ability to comply with 3.1, 3.2 and 3.3 is assessed:

a) either on the basis of forecast temperatures, or on the basis of declared temperatures giving an equivalent average level of performance;

b) on the forecast data on wind velocity versus altitude and locality assumed for the flight plan as a whole;

c) in the case of 3.2 and 3.3, on the scheduled gradient of climb or gradient of descent after power failure appropriate to the mass and altitude at each point considered;

d) on the basis that, if the aeroplane is expected to gain altitude at some point in the flight after power failure has occurred, a satisfactory positive net gradient of climb is available;

e) in the case of 3.2 on the basis that the minimum altitude (see Chapter 4, 4.2.6), appropriate to each point between the place at which power failure is assumed to occur and the aerodrome at which it is intended to alight, is exceeded;

f) in the case of 3.2, making reasonable allowance for indecision and navigational error in the event of power-unit failure at any point.

4. Landing

4.1 Mass

The calculated mass for the expected time of landing at the aerodrome of intended landing or any destination alternate aerodrome is not to exceed the maximum specified in the flight manual for the altitude and temperature at which the landing is to be made.

4.2 Landing distance required

The landing distance required at the aerodrome of the intended landing or at any alternate aerodrome, as determined from the flight manual, is not to exceed the landing distance available on:

a) the most suitable landing surface for a landing in still air; and, if more severe,

b) any other landing surface that may be required for landing because of expected wind conditions at the time of arrival.

4.3 Conditions

For the purpose of 4.2, the landing distance required is that corresponding to:

a) the calculated mass of the aeroplane for the expected time of landing;

b) an altitude equal to the elevation of the aerodrome;

c) the expected temperature at which landing is to be made or a declared temperature giving an equivalent average level of performance;

d) the surface slope in the direction of landing;

e) for the purpose of 4.2 a), still air;

f) for the purpose of 4.2 b), not more than 50 per cent of the expected wind component along the landing path and opposite to the direction of landing and not less than 150 per cent of the expected wind component in the direction of landing.

APPENDIX TO EXAMPLE 2 ON AEROPLANE PERFORMANCE OPERATING LIMITATIONS — PROCEDURES USED IN DETERMINING TAKE-OFF AND LANDING PERFORMANCE

1. General

1.1 Unless otherwise stated, reference humidity and still air conditions are applied.

1.2 The performance of the aeroplane is determined in such a manner that the approved airworthiness limitations for the aeroplane and its systems are not exceeded.

1.3 The wing flap positions for showing compliance with the performance specifications are selected.

Note.— Alternative wing flap positions are made available, if so desired, in such a manner as to be consistent with acceptably simple operating techniques.

1.4 The position of the centre of gravity is selected within the permissible range so that the performance achieved in the configuration and power indicated in the specification under consideration is a minimum.

1.5 The performance of the aeroplane is determined in such a manner that under all conditions the approved limitations for the powerplant are not exceeded.

1.6 While certain configurations of cooling gills have been specified based upon maximum anticipated temperature, the use of other positions is acceptable provided that an equivalent level of safety is maintained.

1.7 The determined performance is so scheduled that it can serve directly in showing compliance with the aeroplane performance operating limitations.

2. Take-off

2.1 General

2.1.1 The following take-off data are determined for sea level pressure and temperature in the Standard Atmosphere, and reference humidity conditions, with the aeroplane at the corresponding maximum take-off mass for a level, smooth, dry and hard take-off surface (landplanes) and for smooth water of declared density (seaplanes):

a) take-off safety speed and any other relevant speed;

b) power failure point;

c) power failure point criterion, e.g. airspeed indicator reading;

(b) and c) associated with items d), e), f))

d) accelerate-stop distance required;

e) take-off run required;

f) take-off distance required;

g) net take-off flight path;

h) radius of a steady Rate 1 (180 degrees per minute) turn made at the airspeed used in establishing the net take-off flight path, and the corresponding reduction in gradient of climb in accordance with the conditions of 2.9.

2.1.2 The determination is also made over selected ranges of the following variables:

a) aeroplane mass;

b) pressure-altitude at the take-off surface;

c) outside air temperature;

d) steady wind velocity parallel to the direction of take-off;

e) steady wind velocity normal to the direction of take-off (seaplanes);

f) take-off surface slope over the take-off distance required (landplanes);

g) water surface condition (seaplanes);

h) density of water (seaplanes);

i) strength of current (seaplanes);

j) power failure point (subject to provisions of 2.4.3).

2.1.3 For seaplanes appropriate interpretations of the term landing gear, etc., are made to provide for the operation of retractable floats, if employed.

2.2 Take-off safety speed

2.2.1 The take-off safety speed is an airspeed (CAS) so selected that it is not less than:

a) $1.20V_{S_1}$, for aeroplanes with two power-units;

b) $1.15V_{S_1}$, for aeroplanes having more than two power-units;

c) 1.10 times the minimum control speed, V_{MC}, established as prescribed in 2.3;

d) the minimum speed prescribed in 2.9.7.6;

where V_{S_1} is appropriate to the take-off configuration.

Note.— See Example 1 for definition of V_{S_1}.

2.3 Minimum control speed

2.3.1 The minimum control speed is such that, when any one power-unit is made inoperative at that speed, it is possible to recover control of the aeroplane with the one power-unit still inoperative and to maintain the aeroplane in straight flight at that speed either with zero yaw or with a bank not in excess of 5 degrees.

2.3.2 From the time at which the power-unit is made inoperative to the time at which recovery is complete, exceptional skill, alertness, or strength, on the part of the pilot is not required to prevent any loss of altitude other than that implicit in the loss of performance or any change of heading in excess of 20 degrees, nor does the aeroplane assume any dangerous attitude.

2.3.3 It is demonstrated that to maintain the aeroplane in steady straight flight at this speed after recovery and before retrimming does not require a rudder control force exceeding 800 N and does not make it necessary for the flight crew to reduce the power of the remaining power-units.

2.4 Power failure point

2.4.1 The power failure point is the point at which sudden complete loss of power from the power-unit, critical from the performance aspect in the case considered, is assumed to occur. If the airspeed corresponding to this point is less than the take-off safety speed, it is demonstrated that, in the event of sudden failure of the critical power-unit at all speeds down to the lowest speed corresponding with the power failure point, the aeroplane is controllable satisfactorily and that the take-off can be continued safely, using normal piloting skill, without:

a) reducing the thrust of the remaining power-units; and

b) encountering characteristics which would result in unsatisfactory controllability on wet runways.

2.4.2 If the critical power-unit varies with the configuration, and this variation has a substantial effect on performance, either the critical power-unit is considered separately for each element concerned, or it is shown that the established performance provides for each possibility of single power-unit failure.

2.4.3 The power failure point is selected for each take-off distance required and take-off run required, and for each accelerate-stop distance required. The pilot is provided with a ready and reliable means of determining when the applicable power failure point has been reached.

2.5 Accelerate-stop distance required

2.5.1 The accelerate-stop distance required is the distance required to reach the power failure point from a standing start and, assuming the critical power-unit to fail suddenly at this point, to stop if a landplane, or to bring the aeroplane to a speed of approximately 9 km/h (5 kt) if a seaplane.

2.5.2 Use of braking means in addition to, or in lieu of, wheel brakes is permitted in determining this distance, provided that they are reliable and that the manner of their employment is such that consistent results can be expected under normal conditions of operation, and provided that exceptional skill is not required to control the aeroplane.

2.6 Take-off run required

The take-off run required is the greater of the following:

1.15 times the distance required with all power-units operating to accelerate from a standing start to take-off safety speed;

1.0 times the distance required to accelerate from a standing start to take-off safety speed assuming the critical power-unit to fail at the power failure point.

2.7 Take-off distance required

2.7.1 The take-off distance required is the distance required to reach a height of:

10.7 m (35 ft), for aeroplanes with two power-units,

15.2 m (50 ft), for aeroplanes with four power-units,

above the take-off surface, with the critical power-unit failing at the power failure point.

2.7.2 The heights mentioned above are those which can be just cleared by the aeroplane when following the relevant flight path in an unbanked attitude with the landing gear extended.

Note.— Paragraph 2.8 and the corresponding operating requirements, by defining the point at which the net take-off flight path starts as the 10.7 m (35 ft) height point, ensure that the appropriate net clearances are achieved.

2.8 Net take-off flight path

2.8.1 The net take-off flight path is the one-power-unit-inoperative flight path which starts at a height of 10.7 m (35 ft) at the end of the take-off distance required and extends to a height of at least 450 m (1 500 ft) calculated in accordance with the conditions of 2.9, the expected gradient of climb being diminished at each point by a gradient equal to:

0.5 per cent, for aeroplanes with two power-units,

0.8 per cent, for aeroplanes with four power-units.

2.8.2 The expected performance with which the aeroplane is credited in the take-off wing flap, take-off power condition, is available at the selected take-off safety speed and is substantially available at 9 km/h (5 kt) below this speed.

2.8.3 In addition the effect of significant turns is scheduled as follows:

Radius. The radius of a steady Rate 1 (180 degrees per minute) turn in still air at the various true airspeeds corresponding to the take-off safety speeds for each wing-flap setting used in establishing the net take-off flight path below the 450 m (1 500 ft) height point, is scheduled.

Performance change. The approximate reduction in performance due to the above turns is scheduled and corresponds to a change in gradient of

$$\left[0.5\left(\frac{V}{185.2}\right)^2\right]$$ % where V is the true airspeed in km/h; and

$\left[0.5\left(\frac{V}{100}\right)^2\right]$ % where V is the true airspeed in knots.

2.9 Conditions

2.9.1 *Air speed*

2.9.1.1 In determining the take-off distance required, the selected take-off safety speed is attained before the end of the take-off distance required is reached.

2.9.1.2 In determining the net take-off flight path below a height of 120 m (400 ft), the selected take-off safety speed is maintained, i.e. no credit is taken for acceleration before this height is reached.

2.9.1.3 In determining the net take-off flight path above a height of 120 m (400 ft), the airspeed is not less than the selected take-off safety speed. If the aeroplane is accelerated after reaching a height of 120 m (400 ft) and before reaching a height of 450 m (1 500 ft), the acceleration is assumed to take place in level flight and to have a value equal to the true acceleration available diminished by an acceleration equivalent to a climb gradient equal to that specified in 2.8.1.

2.9.1.4 The net take-off flight path includes transition to the initial en-route configuration and airspeed. During all transition stages, the above provisions regarding acceleration are complied with.

2.9.2 *Wing flaps*

The wing flaps are in the same position (take-off position) throughout, except:

a) that the flaps may be moved at heights above 120 m (400 ft), provided that the airspeed specifications of 2.9.1 are met and that the take-off safety speed applicable to subsequent elements is appropriate to the new flap position;

b) the wing flaps may be moved before the earliest power failure point is reached, if this is established as a satisfactory normal procedure.

2.9.3 *Landing gear*

2.9.3.1 In establishing the accelerate-stop distance required and the take-off run required, the landing gear are extended throughout.

2.9.3.2 In establishing the take-off distance required, retraction of the landing gear is not initiated until the selected take-off safety speed has been reached, except that, when the selected take-off safety speed exceeds the minimum value prescribed in 2.2 retraction of the landing gear may be initiated when a speed greater than the minimum value prescribed in 2.2 has been reached.

2.9.3.3 In establishing the net take-off flight path, the retraction of the landing gear is assumed to have been initiated not earlier than the point prescribed in 2.9.3.2.

2.9.4 *Cooling*

For that part of the net take-off flight path before the 120 m (400 ft) height point, plus any transition element which starts at the 120 m (400 ft) height point, the cowl flap position is such that, starting the take-off at the maximum temperatures permitted for the start of take-off, the relevant maximum temperature limitations are not exceeded in the maximum anticipated air temperature conditions. For any subsequent part of the net take-off flight path, the cowl flap position and airspeed are such that the appropriate temperature limitations would not be exceeded in steady flight in the maximum anticipated air temperatures. The cowl flaps of all power-units at the start of the take-off are as above, and the cowl flaps of the inoperative power-unit may be assumed to be closed upon reaching the end of the take-off distance required.

2.9.5 *Power unit conditions*

2.9.5.1 From the starting point to the power failure point, all power-units may operate at maximum take-off power conditions. The operative power-units do not operate at maximum take-off power limitations for a period greater than that for which the use of maximum take-off power is permitted.

2.9.5.2 After the period for which the take-off power may be used, maximum continuous power limitations are not exceeded. The period for which maximum take-off power is used is assumed to begin at the start of the take-off run.

2.9.6 *Propeller conditions*

At the starting point, all propellers are set in the condition recommended for take-off. Propeller feathering or pitch coarsening is not initiated (unless it is by automatic or auto-selective means) before the end of the take-off distance required.

2.9.7 *Technique*

2.9.7.1 In that part of the net take-off flight path prior to the 120 m (400 ft) height point, no changes of configuration or power are made which have the effect of reducing the gradient of climb.

2.9.7.2 The aeroplane is not flown or assumed to be flown in a manner which would make the gradient of any part of the net take-off flight path negative.

2.9.7.3 The technique chosen for those elements of the flight path conducted in steady flight, which are not the subject of numerical climb specifications, are such that the net gradient of climb is not less than 0.5 per cent.

2.9.7.4 All information which it may be necessary to furnish to the pilot, if the aeroplane is to be flown in a manner consistent with the scheduled performance, is obtained and recorded.

2.9.7.5 The aeroplane is held on, or close to the ground until the point at which it is permissible to initiate landing gear retraction has been reached.

2.9.7.6 No attempt is made to leave the ground until a speed has been reached which is at least:

15 per cent above the minimum possible unstick speed with all power-units operating;

7 per cent above the minimum possible unstick speed with the critical power-unit inoperative;

except that these unstick speed margins may be reduced to 10 per cent and 5 per cent, respectively, when the limitation is due to landing gear geometry and not to ground stalling characteristics.

Note.— Compliance with this specification is determined by attempting to leave the ground at progressively lower speeds (by normal use of the controls except that up-elevator is applied earlier and more coarsely than is normal) until it has been shown to be possible to leave the ground at a speed which complies with these specifications, and to complete the take-off. It is recognized that during the test manoeuvre, the usual margin of control associated with normal operating techniques and scheduled performance information will not be available.

2.10 Methods of derivation

2.10.1 *General*

The take-off field lengths required are determined from measurements of actual take-offs and ground runs. The net take-off flight path is determined by calculating each section separately on the basis of performance data obtained in steady flight.

2.10.2 *Net take-off flight path*

Credit is not taken for any change in configuration until that change is complete, unless more accurate data are available to substantiate a less conservative assumption; ground effect is ignored.

2.10.3 *Take-off distance required*

Satisfactory corrections for the vertical gradient of wind velocity are made.

3. Landing

3.1 General

The landing distance required is determined:

a) for the following conditions:

1) sea level;

2) aeroplane mass equal to the maximum landing mass at sea level;

3) level, smooth, dry and hard landing surfaces (landplanes);

4) smooth water of declared density (seaplanes);

b) over selected ranges of the following variables:

1) atmospheric conditions, namely: altitude, or pressure-altitude and temperature;

2) aeroplane mass;

3) steady wind velocity parallel to the direction of landing;

4) uniform landing surface slope (landplanes);

5) nature of landing surface (landplanes);

6) water surface condition (seaplanes);

7) density of water (seaplanes);

8) strength of current (seaplanes).

3.2 Landing distance required

The landing distance required is the measured horizontal distance between that point on the landing surface at which the aeroplane is brought to a complete stop or, for seaplanes, to a speed of approximately 9 km/h (5 kt) and that point on the landing surface which the aeroplane cleared by 15.2 m (50 ft) multiplied by a factor of 1/0.7.

Note.— Some States have found it necessary to use a factor of 1/0.6 instead of 1/0.7.

3.3 Landing technique

3.3.1 In determining the measured landing distance:

a) immediately before reaching the 15.2 m (50 ft) height, a steady approach is maintained, landing gear fully extended, with an airspeed of at least $1.3V_{S0}$;

Note.— See Example 1 for definition of V_{S0}.

b) the nose of the aeroplane is not depressed in flight nor the forward thrust increased by application of engine power after reaching the 15.2 m (50 ft) height;

c) the power is not reduced in such a way that the power used for establishing compliance with the balked landing climb requirement would not be obtained within 5 seconds if selected at any point down to touch down;

d) reverse pitch or reverse thrust are not used when establishing the landing distance using this method and field length factor. Ground fine pitch is used if the effective drag/weight ratio in the airborne part of the landing distance is not less satisfactory than that of conventional piston-engined aeroplane;

Note.— This does not mean that reverse pitch or reverse thrust, or use of ground fine pitch, are to be discouraged.

e) the wing flap control is set in the landing position, and remains constant during the final approach, flare out and touch down, and on the landing surface at airspeeds above $0.9V_{S0}$. When the aeroplane is on the landing surface and the airspeed has fallen to less than $0.9V_{S0}$, change of the wing-flap-control setting is acceptable;

f) the landing is made in a manner such that there is no excessive vertical acceleration, no excessive tendency to bounce, and no display of any other undesirable handling characteristics, and such that its repetition does not require either an exceptional degree of skill on the part of the pilot, or exceptionally favourable conditions;

g) wheel brakes are not used in a manner such as to produce excessive wear of brakes or tires, and the operating pressures on the braking system are not in excess of those approved.

3.3.2 The gradient of the steady approach and the details of the technique used in determining the landing distance, together with such variations in the technique as are recommended for landing with the critical engine inoperative, and any appreciable variation in landing distance resulting therefrom, are entered in the flight manual.

Example 3

Purpose and scope

The purpose of the following example is to illustrate the level of performance intended by the provisions of Chapter 5 as applicable to turbine-powered subsonic transport type aeroplanes over 5 700 kg maximum certificated take-off mass having two or more engines. However, where relevant, it can be applied to all turbine-powered or piston-engined subsonic aeroplanes having two, three or four engines. This example is shown to be compatible with principal national airworthiness codes in effect in 1969.

No study has been made of the applicability of this material to turbine-powered subsonic aeroplanes having characteristics other than those of the transport aeroplanes introduced into service up to 1969.

This example is not intended for application to aeroplanes having short take-off and landing (STOL) or vertical take-off and landing (VTOL) capabilities.

No detailed study has been made of the applicability of this example to operations in all-weather conditions. The validity of this example has not therefore been established for operations which may involve low decision heights and be associated with low minima operating techniques and procedures.

1. General

1.1 The provisions of 1 to 5 are to be complied with, unless deviations therefrom are specifically authorized by the State of Registry on the ground that the special circumstances of a particular case make a literal observance of these provisions unnecessary for safety.

1.2 Compliance with 1 to 5 is to be established using performance data in the flight manual and in accordance with other applicable operating requirements. In no case may the limitations in the flight manual be exceeded. However, additional limitations may be applied when operational conditions not included in the flight manual are encountered.

1.3 The procedures scheduled in the flight manual are to be followed except where operational circumstances require the use of modified procedures in order to maintain the intended level of safety.

Note.— See the Airworthiness Manual *(Doc 9760) for the related airworthiness performance guidance material.*

2. Aeroplane take-off performance limitations

2.1 No aeroplane is taken off at a mass which exceeds the take-off mass specified in the flight manual for the altitude of the aerodrome and for the ambient temperature existing at the time of the take-off.

2.2 No aeroplane is taken off at a mass such that, allowing for normal consumption of fuel and oil in flight to the aerodrome of destination and to the destination alternate aerodromes, the mass on arrival will exceed the landing mass specified in the flight manual for the altitude of each of the aerodromes involved and for the ambient temperatures anticipated at the time of landing.

2.3 No aeroplane is taken off at a mass which exceeds the mass at which, in accordance with the minimum distances for take-off scheduled in the flight manual, compliance with 2.3.1 to 2.3.3 inclusive is shown. These distances correspond with the altitude of the aerodrome, the runway, stopway and clearway to be used, the runway slope, the stopway slope, the clearway plane slope, and the ambient temperature and wind existing at the time of take-off.

2.3.1 The take-off run required does not exceed the length of the runway.

2.3.2 The accelerate-stop distance required does not exceed the length of the runway plus the length of the stopway, where present.

2.3.3 The take-off distance required does not exceed the length of the runway, plus the length of the clearway, where present, except that the sum of the lengths of the runway and the clearway is in no case considered as being greater than 1.5 times the length of the runway.

2.4 Credit is not taken for the length of the stopway or the length of the clearway unless they comply with the relevant specifications in Annex 14, Volume I.

Note.— In determining the length of the runway available, account is taken of the loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

3. Take-off obstacle clearance limitations

3.1 No aeroplane is taken off at a mass in excess of that shown in the flight manual to correspond with a net take-off flight path which clears all obstacles either by at least a height of 10.7 m (35 ft) vertically or at least 90 m plus 0.125D laterally, where D is the horizontal distance the aeroplane has travelled from the end of take-off distance available, except as provided in 3.1.1 to 3.1.3 inclusive. In determining the allowable deviation of the net take-off flight path in order to avoid obstacles by at least the distances specified, it is assumed that the aeroplane is not banked before the clearance of the net take-off flight path above obstacles is at least 15.2 m (50 ft) and that the bank thereafter does not exceed 15 degrees. The net take-off flight path considered is for the altitude of the aerodrome and for the ambient temperature and wind component existing at the time of take-off.

3.1.1 Where the intended track does not include any change of heading greater than 15 degrees,

a) for operations conducted in VMC by day, or

b) for operations conducted with navigation aids such that the pilot can maintain the aeroplane on the intended track with the same precision as for operations specified in 3.1.1 a),

obstacles at a distance greater than 300 m on either side of the intended track need not be cleared.

3.1.2 Where the intended track does not include any change of heading greater than 15 degrees for operations conducted in IMC, or in VMC by night, except as provided in 3.1.1 b); and where the intended track includes changes of heading greater than 15 degrees for operations conducted in VMC by day, obstacles at a distance greater than 600 m on either side of the intended track need not be cleared.

3.1.3 Where the intended track includes changes of heading greater than 15 degrees for operations conducted in IMC, or in VMC by night, obstacles at a distance greater than 900 m on either side of the intended track need not be cleared.

4. En-route limitations

4.1 General

At no point along the intended track, is an aeroplane having three or more engines to be more than 90 minutes at normal cruising speed away from an aerodrome at which the distance specifications for alternate aerodromes (see 5.2) are complied with and where it is expected that a safe landing can be made, unless it complies with 4.3.1.1.

Note.— For the authorization of extended range operations by aeroplanes with two turbine engines, see 4.7 of this Part.

4.2 One engine inoperative

4.2.1 No aeroplane is taken off at a mass in excess of that which, in accordance with the one-engine-inoperative en-route net flight path data shown in the flight manual, permits compliance either with 4.2.1.1 or 4.2.1.2 at all points along the route. The net flight path has a positive slope at 450 m (1 500 ft) above the aerodrome where the landing is assumed to be made after engine failure. The net flight path used is for the ambient temperatures anticipated along the route. In meteorological conditions where icing protection systems are to be operable, the effect of their use on the net flight path data is taken into account.

4.2.1.1 The slope of the net flight path is positive at an altitude of at least 300 m (1 000 ft) above all terrain and obstructions along the route within 9.3 km (5 NM) on either side of the intended track.

4.2.1.2 The net flight path is such as to permit the aeroplane to continue flight from the cruising altitude to an aerodrome where a landing can be made in accordance with 5.2, the net flight path clearing vertically, by at least 600 m (2 000 ft), all terrain and obstructions along the route within 9.3 km (5 NM) on either side of the intended track. The provisions of 4.2.1.2.1 to 4.2.1.2.5 inclusive are applied.

4.2.1.2.1 The engine is assumed to fail at the most critical point along the route, allowance being made for indecision and navigational error.

4.2.1.2.2 Account is taken of the effects of winds on the flight path.

4.2.1.2.3 Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with satisfactory fuel reserves, if a safe procedure is used.

4.2.1.2.4 The aerodrome, where the aeroplane is assumed to land after engine failure, is specified in the operational flight plan and it meets the appropriate aerodrome operating minima.

4.2.1.2.5 The consumption of fuel and oil after the engine becomes inoperative is that which is accounted for in the net flight path data shown in the flight manual.

4.3 Two engines inoperative

4.3.1 Aeroplanes which do not comply with 4.1 comply with 4.3.1.1.

4.3.1.1 No aeroplane is taken off at a mass in excess of that which according to the two-engines-inoperative en-route net flight path data shown in the flight manual, permits the aeroplane to continue flight from the point where two engines are assumed to fail simultaneously, to an aerodrome at which the landing distance specification for alternate aerodromes (see 5.2) is complied with and where it is expected that a safe landing can be made. The net flight path clears vertically, by at least 600 m (2 000 ft) all terrain and obstructions along the route within 9.3 km (5 NM) on either side of the intended track. The net flight path considered is for the ambient temperatures anticipated along the route. In altitudes and meteorological conditions where icing protection systems are to be operable, the effect of their use on the net flight path data is taken into account. The provisions of 4.3.1.1.1 to 4.3.1.1.5 inclusive apply.

4.3.1.1.1 The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is at more than 90 minutes at normal cruising speed away from an aerodrome at which the landing distance specification for alternate aerodromes (see 5.2) is complied with and where it is expected that a safe landing can be made.

4.3.1.1.2 The net flight path has a positive slope at 450 m (1 500 ft) above the aerodrome where the landing is assumed to be made after the failure of two engines.

4.3.1.1.3 Fuel jettisoning is permitted to an extent consistent with 4.3.1.1.4, if a safe procedure is used.

4.3.1.1.4 The aeroplane mass at the point where the two engines are assumed to fail is considered to be not less than that which would include sufficient fuel to proceed to the aerodrome and to arrive there at an altitude of at least 450 m (1 500 ft) directly over the landing area and thereafter to fly for 15 minutes at cruise power and/or thrust.

4.3.1.1.5 The consumption of fuel and oil after the engines become inoperative is that which is accounted for in the net flight path data shown in the flight manual.

5. Landing limitations

5.1 Aerodrome of destination

5.1.1 No aeroplane is taken off at a mass in excess of that which, in accordance with the landing distances required as shown in the flight manual for the altitude of the aerodrome of intended destination, permits the aeroplane to be brought to rest at the aerodrome of intended destination within the effective length of the runway, this length being as declared by the aerodrome authorities with regard to the obstructions in the approach. The mass of the aeroplane is assumed to be reduced by the mass of the fuel and oil expected to be consumed in flight to the aerodrome of intended destination. Compliance is shown with 5.1.1.3 and with either 5.1.1.4 or 5.1.1.5.

5.1.1.1 The runway slope is assumed to be zero, unless the runway is usable in only one direction.

5.1.1.2 A runway condition (wet or dry) not more favourable than that expected is taken into account.

Note.— National authorities will need to develop suitable methods for dealing with accountability for wet and dry runways.

5.1.1.3 It is assumed that the aeroplane is landed on the most favourable runway and in the most favourable direction in still air.

5.1.1.4 It is assumed that the aeroplane is landed on the runway which is the most suitable for the wind conditions anticipated at the aerodrome at the time of landing, taking due account of the probable wind speed and direction, of the ground handling characteristics of the aeroplane, and of other conditions (i.e. landing aids, terrain, etc.).

5.1.1.5 If full compliance with 5.1.1.4 is not shown, the aeroplane may be taken off if a destination alternate aerodrome is designated which permits compliance with 5.2.

5.2 Destination alternate aerodrome

No aerodrome is designated as a destination alternate aerodrome unless the aeroplane, at the mass anticipated at the time of arrival at such aerodrome, can comply with 5.1, in accordance with the landing distance required as shown in the flight manual for the altitude of the alternate aerodrome and in accordance with other applicable operating requirements for the alternate aerodrome.

ATTACHMENT D. FLIGHT RECORDERS

Supplementary to Chapter 6, 6.3

Introduction

The material in this Attachment concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Flight recorders comprise two systems — a flight data recorder and a cockpit voice recorder. Flight data recorders are classified as Type I, Type II and Type IIA depending upon the number of parameters to be recorded and the duration required for retention of the recorded information.

1. Flight data recorder (FDR)

1.1 General requirements

1.1.1 The FDR is to record continuously during flight time.

1.1.2 The FDR container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

1.1.3 The FDR is to be installed so that:

a) the probability of damage to the recording is minimized. To meet this requirement it should be located as far aft as practicable. In the case of pressurized aeroplanes it should be located in the vicinity of the rear pressure bulkhead;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the FDR without jeopardizing service to essential or emergency loads; and

c) there is an aural or visual means for pre-flight checking that the FDR is operating properly.

1.2 Parameters to be recorded

1.2.1 *Type I FDR.* This FDR will be capable of recording, as appropriate to the aeroplane, at least the 32 parameters in Table D-1. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

1.2.2 *Types II and IIA FDRs.* These FDRs will be capable of recording, as appropriate to the aeroplane, at least the first 15 parameters in Table D-1. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

1.3 Additional information

1.3.1 A Type IIA FDR, in addition to a 30-minute recording duration, is to retain sufficient information from the preceding take-off for calibration purposes.

1.3.2 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.

1.3.3 The manufacturer usually provides the national certificating authority with the following information in respect of the FDR:

a) manufacturer's operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

1.3.4 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information should be maintained by the operator. The documentation must be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

2. Cockpit voice recorder (CVR)

2.1 General requirements

2.1.1 The CVR is to be designed so that it will record at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;

b) aural environment on the flight deck;

c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system;

d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker;

e) voice communication of flight crew members using the passenger address system, if installed; and

f) digital communications with ATS, unless recorded by the FDR.

2.1.2 The CVR container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

2.1.3 To aid in voice and sound discrimination, microphones in the cockpit are to be located in the best position for recording voice communications originating at the pilot and co-pilot stations and voice communications of other crew members on the flight deck when directed to those stations. This can best be achieved by wiring suitable boom microphones to record continuously on separate channels.

2.1.4 The CVR is to be installed so that:

a) the probability of damage to the recording is minimized. To meet this requirement it should be located as far aft as practicable. In the case of pressurized aeroplanes it should be located in the vicinity of the rear pressure bulkhead;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the CVR without jeopardizing service to essential or emergency loads;

c) there is an aural or visual means for pre-flight checking of the CVR for proper operation; and

d) if the CVR has a bulk erasure device, the installation should be designed to prevent operation of the device during flight time or crash impact.

2.2 Performance requirements

2.2.1 The CVR will be capable of recording on at least four tracks simultaneously except for the CVR in Chapter 6, 6.3.7.2. To ensure accurate time correlation between tracks, the CVR is to record in an in-line format. If a bi-directional configuration is used, the in-line format and track allocation should be retained in both directions.

2.2.2 The preferred track allocation is as follows:

Track 1 — co-pilot headphones and live boom microphone

Track 2 — pilot headphones and live boom microphone

Track 3 — area microphone

Track 4 — time reference plus the third and fourth crew members' headphone and live microphone, if applicable.

Note 1.— Track 1 is located closest to the base of the recording head.

Note 2.— The preferred track allocation presumes use of current conventional magnetic tape transport mechanisms, and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply.

2.2.3 The CVR, when tested by methods approved by the appropriate certificating authority, will be demonstrated to be suitable for the environmental extremes over which it is designed to operate.

2.2.4 Means will be provided for an accurate time correlation between the FDR and CVR.

Note.— One method of achieving this is by superimposing the FDR time signal on the CVR.

2.3 Additional information

The manufacturer usually provides the national certificating authority with the following information in respect of the CVR:

a) manufacturer's operating instructions, equipment limitations and installation procedures; and

b) manufacturer's test reports.

3. Inspections of FDR and CVR systems

3.1 Prior to the first flight of the day, the built-in test features on the flight deck for the CVR, FDR and Flight Data Acquisition Unit (FDAU), when installed, should be monitored.

3.2 Annual inspections should be carried out as follows:

a) the read-out of the recorded data from the FDR and CVR should ensure that the recorder operates correctly for the nominal duration of the recording;

b) the analysis of the FDR should evaluate the quality of the recorded data to determine if the bit error rate is within acceptable limits and to determine the nature and distribution of the errors;

c) a complete flight from the FDR should be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention should be given to parameters from sensors dedicated to the FDR. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

d) the read-out facility should have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

e) an annual examination of the recorded signal on the CVR should be carried out by re-play of the CVR recording. While installed in the aircraft, the CVR should record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards; and

f) where practicable, during the annual examination, a sample of in-flight recordings of the CVR should be examined for evidence that the intelligibility of the signal is acceptable.

3.3 Flight recorder systems should be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

3.4 A report of the annual inspection should be made available on request to the State's regulatory authority for monitoring purposes.

3.5 Calibration of the FDR system:

a) the FDR system should be re-calibrated at least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters, and to ensure that parameters are being recorded within the calibration tolerances; and

b) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there should be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

Table D-1
Parameters for Flight Data Recorders

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapsed time)	24 hours	4	±0.125% per hour
2	Pressure-altitude	–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)
3	Indicated airspeed	95 km/h (50 kt) to max V_{S_o} *(Note 1)* V_{S_o} to 1.2 V_D *(Note 2)*	1	±5% ±3%
4	Heading	360°	1	±2°
5	Normal acceleration	–3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%
6	Pitch attitude	±75°	1	±2°
7	Roll attitude	±180°	1	±2°
8	Radio transmission keying	On-off (one discrete)	1	
9	Power on each engine *(Note 3)*	Full range	1 (per engine)	±2%
10	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
11	Leading edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
12	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)	
13	Ground spoiler/speed brake selection	Full range or each discrete position	1	±2% unless higher accuracy uniquely required
14	Outside air temperature	Sensor range	2	±2°C
15	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1	

Note.— The preceding 15 parameters satisfy the requirements for a Type II FDR.

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
16	Longitudinal acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
17	Lateral acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
18	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) *(Note 4)*	Full range	1	±2° unless higher accuracy uniquely required

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
19	Pitch trim position	Full range	1	±3% unless higher accuracy uniquely required
20	Radio altitude	–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)
21	Glide path deviation	Signal range	1	±3%
22	Localizer deviation	Signal range	1	±3%
23	Marker beacon passage	Discrete	1	
24	Master warning	Discrete	1	
25	NAV 1 and 2 frequency selection *(Note 5)*	Full range	4	As installed
26	DME 1 and 2 distance *(Notes 5 and 6)*	0 – 370 km	4	As installed
27	Landing gear squat switch status	Discrete	1	
28	GPWS (ground proximity warning system)	Discrete	1	
29	Angle of attack	Full range	0.5	As installed
30	Hydraulics, each system (low pressure)	Discrete	2	
31	Navigation data (latitude/longitude, ground speed and drift angle) *(Note 7)*	As installed	1	As installed
32	Landing gear or gear selector position	Discrete	4	As installed

Note.— The preceding 32 parameters satisfy the requirements for a Type I FDR.

Notes.—

1. V_{S_0} stalling speed or minimum steady flight speed in the landing configuration.
2. V_D design diving speed.
3. Record sufficient inputs to determine power.
4. For aeroplanes with conventional control systems ''or'' applies. For aeroplanes with non-mechanical control systems ''and'' applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.
5. If signal available in digital form.
6. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
7. If signals readily available.

If further recording capacity is available, recording of the following additional information should be considered:

a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

   1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

   2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;

   3) warnings and alerts;

   4) the identity of displayed pages for emergency procedures and checklists;

b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs; and

c) additional engine parameters (EPR, N_1, EGT, fuel flow, etc.).

ATTACHMENT E. EXTENDED RANGE OPERATIONS BY AEROPLANES WITH TWO TURBINE POWER-UNITS

Supplementary to Chapter 4, 4.7

1. Purpose and scope

1.1 Introduction

The purpose of this Attachment is to give guidance on the value of the threshold time which is to be established in compliance with Chapter 4, 4.7.1 and also to give guidance on the means of achieving the required level of safety envisaged by Chapter 4, 4.7.2 where operations beyond the established threshold are approved.

1.2 Threshold time

It should be understood that the threshold time established in accordance with Chapter 4, 4.7.1 is not an operating limit, but is a flight time from an adequate en-route alternate aerodrome beyond which the State of the Operator must give particular consideration to the aeroplane and the operation before granting authorization. Pending the acquisition of additional data for such operations by twin-engined commercial transport aeroplanes and taking into account the level of safety intended by Chapter 4, 4.7.2, it is suggested that the threshold time be 60 minutes.

1.3 Basic concepts

In order to maintain the required level of safety on routes where an aeroplane with two power-units is permitted to operate beyond the threshold time, it is necessary that:

a) the airworthiness certification of the aeroplane type specifically permits operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;

b) the reliability of the propulsion system is such that the risk of double power-unit failure from independent causes is extremely remote;

c) any necessary special maintenance requirements are fulfilled;

d) specific flight dispatch requirements are met;

e) necessary in-flight operational procedures are established; and

f) specific operational authorization is granted by the State of the Operator.

2. Glossary of terms

Where the following terms are used in this Attachment, they have the meaning indicated:

Adequate alternate aerodrome. An adequate alternate aerodrome is one at which the landing performance requirements can be met and which is expected to be available, if required, and which has the necessary facilities and services, such as air traffic control, lighting, communications, meteorological services, navigation aids, rescue and fire-fighting services and one suitable instrument approach procedure.

Aeroplane system. An aeroplane system includes all elements of equipment necessary for the control and performance of a particular major function. It includes both the equipment specifically provided for the function in question and other basic related aeroplane equipment such as that required to supply power for the equipment operation. As used herein the power-unit is not considered to be an aeroplane system.

Extended range operation. Any flight by an aeroplane with two turbine power-units where the flight time at the one power-unit inoperative cruise speed (in ISA and still air conditions), from a point on the route to an adequate alternate aerodrome, is greater than the threshold time approved by the State of the Operator.

Power-unit. A system consisting of an engine and all ancillary parts installed on the engine prior to installation on the aeroplane to provide and control power/thrust and for the extraction of energy for aeroplane systems, but not including independent short-period thrust-producing devices.

Propulsion system. A system consisting of a power-unit and all other equipment utilized to provide those functions necessary to sustain, monitor and control the power/thrust output of any one power-unit following installation on the airframe.

Suitable alternate aerodrome. A suitable alternate aerodrome is an adequate aerodrome where, for the anticipated time of use, weather reports, or forecasts, or any combination thereof, indicate that the weather conditions will be at or above the required aerodrome operating minima, and the runway surface condition reports indicate that a safe landing will be possible.

3. Airworthiness certification requirements for extended range operations

During the airworthiness certification procedure for an aeroplane type intended for extended range operations, special attention should be paid to ensuring that the required level of safety will be maintained under conditions which may be encountered during such operations, e.g. flight for extended periods following failure of an engine and/or essential systems. Information or procedures specifically related to extended range operations should be incorporated into the aeroplane flight manual, maintenance manual or other appropriate document.

Note.— Criteria for aeroplane systems performance and reliability for extended range operations are contained in the Airworthiness Manual *(Doc 9760).*

4. Propulsion system maturity and reliability

4.1 Basic elements to be considered for the authorization of extended range operations are the maturity and reliability of the propulsion system. These should be such that the risk of complete loss of power from independent causes is extremely remote.

4.2 The only way to assess the maturity of the propulsion system and its reliability in service is to exercise engineering judgement, taking account of the worldwide experience with the power-unit.

4.3 For a propulsion system whose reliability has already been assessed, each national authority must evaluate the ability of the operator to maintain that level of reliability, taking into account the operator's record of reliability *vis-à-vis* power-units of closely related types.

5. Airworthiness modifications and maintenance programme requirements

Each operator's maintenance programme should ensure that:

a) the titles and numbers of all airworthiness modifications, additions and changes which were made to qualify aeroplane systems for extended range operations are provided to the State of Registry and, where applicable, to the State of the Operator;

b) any changes to maintenance and training procedures, practices or limitations established in the qualification for extended range operations are submitted to the State of the Operator and, where applicable, to the State of Registry before such changes are adopted;

c) a reliability reporting programme is developed and implemented prior to approval and continued after approval;

d) prompt implementation of required modifications and inspections which could affect propulsion system reliability is undertaken;

e) procedures are established which prevent an aeroplane from being dispatched for an extended range operation after power-unit shutdown or primary system failure on a previous flight until the cause of such failure has been positively identified and the necessary corrective action is completed. Confirmation that such corrective action has been effective may, in some cases, require the successful completion of a subsequent flight prior to dispatch on an extended range operation; and

f) a procedure is established to ensure that the airborne equipment will continue to be maintained at the level of performance and reliability required for extended range operations.

6. Flight dispatch requirements

In applying the general flight dispatch requirements of Chapter 4 particular attention should be paid to the conditions which might prevail during extended range operations, e.g. extended flight with one power-unit inoperative, major systems degradation, reduced flight altitude, etc. In addition to the requirement of Chapter 4, 4.7.3, at least the following aspects should be considered:

a) pre-flight system serviceability;

b) communication and navigation facilities and capabilities;

c) fuel requirements; and

d) availability of relevant performance information.

7. Operational principles

An aeroplane which is engaged in an extended range operation should normally, in the event of:

a) shutdown of a power-unit, fly to and land at the nearest (in terms of the least flying time) aerodrome suitable for landing;

b) a single or multiple primary aeroplane system failure, fly to and land at the nearest suitable aerodrome unless it has been demonstrated, in view of the flight consequences of the failure and the probability and consequences of subsequent failures, that no substantial degradation of safety results from continuation of the planned flight; and

c) changes impacting the status of items on the minimum equipment list, the communications and navigation facilities, fuel and oil supply, en-route alternate aerodromes or aeroplane performance, make appropriate adjustments to the flight plan.

8. Operational authorization

In authorizing the operation of an aeroplane with two power-units on an extended range route in accordance with Chapter 4, 4.7.2, the State of the Operator should, in addition to the requirements previously set forth in this Attachment, ensure that:

a) the operator's past experience and compliance record is satisfactory;

b) the operator has demonstrated that the flight can continue to a safe landing under the anticipated degraded operating conditions which would arise from:

1) total loss of thrust from one power-unit; or

2) total loss of power-unit generated electric power; or

3) any other condition which the State of the Operator considers to be equivalent in airworthiness and performance risk;

c) that the operator's crew training programme is adequate for the proposed operation; and

d) that documentation accompanying the authorization covers all relevant aspects.

ATTACHMENT F. AIR OPERATOR CERTIFICATION AND VALIDATION

Supplementary to Chapter 4, 4.2.1

1. Purpose and scope

1.1 Introduction

The purpose of this Attachment is to provide guidance concerning actions required by States in connection with the operator certification requirements in Chapter 4, 4.2.1, particularly the means of accomplishing and recording those actions.

1.2 Prior certification required

In accordance with Standard 4.2.1.4, the issuance of an air operator certificate (AOC) is "dependent upon the operator demonstrating" to the State that its organization, training policy and programmes, flight operations, ground handling and maintenance arrangements are adequate considering the nature and extent of the operations to be conducted. The certification process involves the State's evaluation of each operator and a determination that the operator is capable of conducting safe operations before initial issuance of an AOC or the addition of any subsequent authorizations to an AOC.

1.3 Standard certification practices

The State of the Operator is required by Standard 4.2.1.7 to establish a certification system to ensure compliance with the required standards for the type of operation to be conducted. Several States have developed policies and procedures to comply with this certification requirement as industry capabilities evolve. While those States did not develop their certification practices in coordination with each other, their practices are remarkably similar and consistent in their requirements. The effectiveness of their practices has been validated over many years, resulting in improved safety records of operators throughout the world. Many of these certification practices have been incorporated by reference in ICAO provisions.

2. Required technical safety evaluations

2.1 Approval and acceptance actions

2.1.1 The certification and continued surveillance of an air operator includes actions taken by a State on matters submitted for its review. The actions can be categorized as approvals or acceptances depending on the nature of the response by the State to the matter submitted for its review.

2.1.2 An approval is an active response by the State to a matter submitted for its review. An approval constitutes a finding or determination of compliance with the applicable standards. An approval will be evidenced by the signature of the approving official, the issuance of a document or certificate, or some other formal action taken by the State.

2.1.3 An acceptance does not necessarily require an active response by the State to a matter submitted for its review. A State may accept a matter submitted to it for review as being in compliance with the applicable standards if the State does not specifically reject all or a portion of the matter under review, usually after some defined period of time after submission.

2.1.4 The phrase "approved by the State" or similar phrases using the word "approval" are frequently used in Annex 6, Part I. Provisions indicating a review and implying approval or at least "acceptance" by the State occur even more frequently in Annex 6, Part I. In addition to these specific phrases, Annex 6, Part I, contains numerous references to requirements which would, as a minimum, create the need for at least a technical review by the State. This Attachment groups and outlines those specific Standards and Recommended Practices for ease of use by States.

2.1.5 The State should make or arrange for a technical safety evaluation before issuing the approval or acceptance. The evaluation should:

a) be accomplished by a person with specific qualifications to make such a technical evaluation;

b) be in accordance with written, standardized methodology; and

c) where necessary to safety, include a practical demonstration of the air operator's actual ability to conduct such an operation.

2.2 Demonstrations before issuance of some approvals

2.2.1 Standard 4.2.1.4 obligates the State of the Operator, prior to certification of an operator, to require sufficient demonstrations by the operator to enable the State to evaluate the adequacy of the operator's organization, method of control and supervision of flight operations, ground handling and maintenance arrangements. These demonstrations should be in addition to the review or inspections of manuals, records, facilities and equipment. Some of the approvals required by

Annex 6, Part I, such as approval for Category III operations, have significant safety implications and should be validated by demonstration before the State approves such operations.

2.2.2 While the specific methodology and extent of the required demonstrations and evaluations vary between States, the certification processes of States whose operators have good safety records are generally consistent. In these States, technically qualified inspectors evaluate a representative sample of the actual training, maintenance and operations prior to the issuance of an AOC or additional authorizations to the AOC.

2.3 Recording of certification actions

2.3.1 It is important that the certification, approval and acceptance actions of the State are adequately documented. The State should issue a written instrument, such as a letter or formal document, as an official record of the action. These written instruments should be retained as long as the operator continues to exercise the authorizations for which the approval or acceptance action was issued. These instruments are unambiguous evidence of the authorizations held by an operator and provide proof in the event that the State and the operator disagree on the operations that the operator is authorized to conduct.

2.3.2 Some States collect certification records such as inspections, demonstrations, approvals and acceptance instruments into a single file which is retained as long as the operator is active. Other States retain these records in files according to the certification action performed, and revise the file as the approvals or acceptance instruments are updated. Regardless of the method used, these certification records are persuasive evidence that a State is complying with its ICAO obligations regarding operator certification.

2.4 Coordination of operations and airworthiness evaluations

Some of the references to approval or acceptance in Annex 6, Part I, will require an operations evaluation and an airworthiness evaluation. Low minima approvals for the conduct of Category II and III ILS approaches, for example, require coordinated prior evaluation by operations and airworthiness specialists. Flight operations specialists should evaluate the operational procedures, training and qualifications. Airworthiness specialists should evaluate the aircraft, equipment reliability and maintenance procedures. These evaluations may be accomplished separately, but should be coordinated to ensure that all aspects necessary for safety have been addressed before any approval is issued.

2.5 State of the Operator and State of Registry responsibilities

2.5.1 Annex 6, Part I, places the responsibility for initial certification, issuance of the AOC, and ongoing surveillance of an air operator on the State of the Operator. Annex 6, Part I, also requires the State of the Operator to consider or act in accordance with various approvals and acceptances by the State of Registry. Under these provisions, the State of the Operator should ensure that its actions are consistent with the approvals and acceptances of the State of Registry and that the air operator is in compliance with State of Registry requirements.

2.5.2 It is essential that the State of the Operator be satisfied with the arrangements by which its air operators use aircraft on the register of another State, particularly for maintenance and crew training. The State of the Operator should review such arrangements in coordination with the State of Registry. Where appropriate, an agreement transferring oversight responsibilities from the State of Registry to the State of the Operator pursuant to Article 83 *bis* to the Convention on International Civil Aviation should be arranged to preclude any misunderstandings regarding which State is responsible for specific oversight responsibilities.

Note.— Guidance concerning the responsibilities of the State of the Operator and the State of Registry in connection with lease, charter and interchange operations is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335). Guidance concerning the transfer of State of Registry responsibilities to the State of the Operator in accordance with Article 83* bis *is contained in* Guidance on the Implementation of Article 83 *bis* of the Convention on International Civil Aviation *(Cir 295).*

3. Approval actions

3.1 Approvals

The term “approval” implies a more formal action on the part of the State with respect to a certification matter than does the term “acceptance”. Some States require the Director of the Civil Aviation Authority (CAA) or a designated lower-level CAA official to issue a formal written instrument for every “approval” action taken. Other States allow a variety of documents to be issued as evidence of an approval. The approval document issued and the matter addressed by the approval will depend on the delegated authority of the official. In such States, authority to sign routine approvals, such as operator minimum equipment lists for specific aircraft, is delegated to technical inspectors. More complex or significant approvals are normally issued by higher-level officials.

3.2 Air operator certificate (AOC)

3.2.1 The AOC required by Annex 6, Part I, 4.2.1, is a formal instrument which, as stated by 4.2.1.6, should include at least the following:

a) operator’s identification (name, location);

b) date of issue and period of validity;

c) description of the types of operations authorized;

d) the type(s) of aircraft authorized for use; and

e) authorized areas of operations or routes.

3.2.2 Some States use the AOC and associated documents, such as Operations Specifications, to document other approvals required by Annex 6, Part I.

3.3 Provisions that require an approval

The following provisions require or encourage approval by specified States. The approval of the State of the Operator is required in all of the certification actions listed below that are not preceded by one or more asterisks. Certification actions listed below that are preceded by one or more asterisks require approval by the State of Registry (single asterisk or "*"), or by the State of Design (double asterisk or "**"). However, the State of the Operator should take the necessary steps to ensure that operators for which it is responsible comply with any applicable approvals issued by the State of Registry and/or State of Design, in addition to its own requirements.

a) **Configuration deviation list (CDL) (Definitions);

b) **Master minimum equipment list (MMEL) (Definitions);

c) The method for establishing minimum flight altitudes (4.2.6.3);

d) The method of determining aerodrome operating minima (4.2.7.1);

e) Additional requirements for single pilot operations under the instrument flight rules (IFR) at night (4.9.1);

f) Flight time, flight duty periods and rest periods (4.2.10.2);

g) Specific extended range operations (4.7.1);

h) Additional requirements for operations of single-engine turbine-powered aeroplanes at night and/or in instrument meteorological conditions (IMC) (5.4.1);

i) Aircraft-specific minimum equipment list (MEL) (6.1.3);

j) RNP operations (7.2.2 b));

k) MNPS operations (7.2.3 b));

l) RVSM operations (7.2.4 b));

m) Procedures for electronic navigation data management (7.4.1);

n) *Aircraft-specific maintenance programme (8.3.1);

o) *Approved maintenance organization (8.7.1.1);

p) *Maintenance quality assurance methodology (8.7.4.1);

q) Flight crew training programmes (9.3.1);

r) Training in the transport of dangerous goods (9.3.1, Note 5);

s) Aerodrome additional safety margin (9.4.3.3 a));

t) Pilot-in-command area, route and aerodrome qualifications (9.4.3.5);

u) Use of flight simulation training devices (9.3.1, Note 2 and 9.4.4, Note 1);

v) Method of control and supervision of flight operations (4.2.1.4 and 10.1);

w) **Mandatory maintenance tasks and intervals (11.3.2);

x) Cabin attendant training programmes (12.4).

3.4 Provisions that require a technical evaluation

Other provisions in Annex 6, Part I, require the State to have made a technical evaluation. These provisions contain the phrases "acceptable to the State", "satisfactory to the State", "determined by the State", "deemed acceptable by the State", and "prescribed by the State". While not necessarily requiring an approval by the State, these Standards do require the State to at least accept the matter at issue after it conducts a specific review or evaluation. These provisions are:

a) details of the aircraft-specific checklists (Definition: aircraft operating manual and 6.1.4);

b) details of the aircraft-specific systems (Definition: aircraft operating manual and 6.1.4);

c) mandatory material for the operations manual (4.2.2.2/Appendix 2);

d) engine trend monitoring systems (5.4.2);

e) equipment for aeroplanes operated by a single pilot under the instrument flight rules or at night (6.22);

f) requirements for approval to operate in RVSM airspace (7.2.5);

g) monitoring of height-keeping performance of aeroplanes approved to operate in RVSM airspace (7.2.6);

h) procedures for distribution and insertion of electronic navigation data in aircraft (7.4.2);

i) *operator's aircraft-specific maintenance responsibilities (8.1.1);

j) *method of maintenance and release (8.1.2);

k) *maintenance control manual (8.2.1);

l) *mandatory material for the maintenance control manual (8.2.4);

m) *reporting of maintenance experience information (8.5.1);

n) *implementing necessary maintenance corrective actions (8.5.2);

o) *modification and repair requirements (8.6);

p) *minimum competence level of maintenance personnel (8.7.6.3);

q) requirement for flight navigator (9.1.4);

r) training facilities (9.3.1);

s) qualifications of instructors (9.3.1);

t) need for recurrent training (9.3.l);

u) use of correspondence courses and written examinations (9.3.1, Note 4);

v) use of flight simulation training devices (9.3.2);

w) flight crew qualification records (9.4.3.4);

x) designated representative of the State of the Operator (9.4.4);

y) pilot experience, recency and training requirements for single pilot operations under the instrument flight rules (IFR) or at night (9.4.5.1 and 9.4.5.2);

z) *flight manual changes (11.1);

aa) minimum number of flight attendants assigned to a specific aircraft (12.1);

bb) altimetry system performance requirements for operations in RVSM airspace (Appendix 4, 1 and 2);

Single-engine operations

cc) turbine engine reliability for approved operations by single-engine turbine-powered aeroplanes at night and/or in instrument meteorological conditions (IMC) (Appendix 3, 1.1);

dd) systems and equipment (Appendix 3, 2);

ee) minimum equipment list (Appendix 3, 3);

ff) flight manual information (Appendix 3, 4);

gg) event reporting (Appendix 3, 5);

hh) operator planning (Appendix 3, 6);

ii) flight crew experience, training and checking (Appendix 3, 7);

jj) route limitations over water (Appendix 3, 8); and

kk) operator certification or validation (Appendix 3, 9).

4. Acceptance actions

4.1 Acceptance

4.1.1 The actual extent of the State's technical evaluation of an operator's readiness to conduct certain flight operations should be much broader than just those Standards which require or imply approval. During certification, the State should ensure that an operator will be in compliance with all requirements of Annex 6, Part I, prior to conducting international commercial air transport operations.

4.1.2 The concept of "acceptance" is used by some States as a formal method of ensuring that all critical aspects of operator certification are reviewed by the State prior to the formal issuance of the AOC. Using this concept, these States exercise their prerogative to have technical inspectors review all operators' policies and procedures impacting operational safety. The actual execution of an instrument to reflect this acceptance (assuming such a document is issued) may be delegated to the technical inspector assigned to the certification.

4.2 Conformance report

Some States use a conformance report to document the acceptances it makes with regard to a particular operator. This is a document submitted by the operator detailing how, with specific references to operations or maintenance manuals, it will comply with all applicable State regulations. This type of document is referenced in Doc 8335, 3.3.2 e) and the *Airworthiness Manual* (Doc 9760), Volume I, 6.2.1 c) 4). Such a conformance report should be actively used during the certification process and revised as necessary to reflect modifications required by the State in the operator's policies and procedures. Then a final conformance report is included in the State's certification records, along with other records of certification. The conformance report is an excellent method of demonstrating that the operator was properly certificated with respect to all applicable regulatory requirements.

4.3 Operations and maintenance manuals

4.3.1 Operations and maintenance manuals, and any subsequent amendments should be submitted to the State (4.2.2.2, 8.1.1, 8.2.4, 8.3.2, and 8.7.2.3). The State also establishes minimum contents for these manuals (11.2, 11.3, 11.4 and Appendix 2). The pertinent portions of an operator's manual for evaluation should be identified in the State's technical guidance, e.g. operations policy manual, operating manual, cabin crew manual, route guide, and training manual. Some States issue a formal instrument accepting each manual and any subsequent amendments.

4.3.2 The State's technical evaluation should, in addition to ensuring that all required contents are addressed, consider if the specific policies and procedures would result in the desired outcome. For example, the specifications for the operational flight plan (Appendix 2, 2.1.16) should provide the step-by-step completion guidance necessary for compliance with 4.3 concerning the content and retention of these plans.

4.3.3 Proven industry practices, such as an example of an actual completed operational flight plan for reference by the flight crew and dispatchers (although not a Standard), may also be required by a State's technical evaluator during certification. This aspect of the technical evaluation should be conducted by inspectors experienced in operator certification. A major consideration with respect to evaluating for proven industry practices that are aircraft-specific, equipment-specific or have limited applications is the employment of evaluators who are currently qualified in the practice to be evaluated.

5. Other approval or acceptance considerations

Some States provide for approval or acceptance of certain critical documents, records or procedures specified in Annex 6, Part I, although the relevant Annex 6 Standards do not require approval or acceptance by the State of the Operator. The following are some examples:

a) safety programme (3.2.1);

b) flight data analysis programme (3.2.7);

c) method for obtaining aeronautical data (4.1.1);

d) adequacy of the fuel and oil records (4.2.9);

e) adequacy of flight time, flight duty and rest period records (4.2.10.3, 9.6, and 12.5);

f) adequacy of the aircraft maintenance log book (4.3.1 a), b), and c));

g) adequacy of the load manifest (4.3.1 d), e) and f));

h) adequacy of the operational plan (4.3.1 g));

i) method for obtaining weather data (4.3.5.1 and 4.3.5.2);

j) method of compliance with carry-on baggage stowage (4.8);

k) aeroplane performance operating limitations (5.2.4);

l) method of obtaining and applying aerodrome obstacle data (5.3);

m) adequacy of passenger information cards (6.2.2 d));

n) procedures for long-range navigation (7.2.1 b));

o) contents of the journey log book (11.4.1); and

p) content of the security training programme (13.4).

6. Validation of the standard of operations

Standard 4.2.1.5 requires that the validity of an AOC shall depend upon the operator maintaining the original certification standards (4.2.1.4) under the supervision of the State of the Operator. This supervision requires that a system of continued surveillance be established to ensure the required standards of operations are maintained (4.2.1.7). A good starting point in the development of such a system is to require annual or semi-annual inspections, observations and tests to validate the required certification approval and acceptance actions.

7. Amendment of air operator certificates

The certification of an operator is an ongoing process. Few operators will be satisfied over time with the initial authorizations issued with their AOC. Evolving market opportunities will cause an operator to change aircraft models and seek approval for new operational areas requiring other additional capabilities. Additional technical evaluations should be required by the State before issuing the formal written instruments approving any changes to the original AOC and other authorizations. Where possible, each request should be "bridged", using the original authorization as the foundation to determine the extent of the State's impending evaluation before issuing the formal instrument.

ATTACHMENT G. MINIMUM EQUIPMENT LIST (MEL)

Supplementary to Chapter 6, 6.1.2

1. If deviations from the requirements of States in the certification of aircraft were not permitted an aircraft could not be flown unless all systems and equipment were operable. Experience has proved that some unserviceability can be accepted in the short term when the remaining operative systems and equipment provide for continued safe operations.

2. The State should indicate through approval of a minimum equipment list those systems and items of equipment that may be inoperative for certain flight conditions with the intent that no flight can be conducted with inoperative systems and equipment other than those specified.

3. A minimum equipment list, approved by the State of the Operator, is therefore necessary for each aircraft, based on the master minimum equipment list established for the aircraft type by the organization responsible for the type design in conjunction with the State of Design.

4. The State of the Operator should require the operator to prepare a minimum equipment list designed to allow the operation of an aircraft with certain systems or equipment inoperative provided an acceptable level of safety is maintained.

5. The minimum equipment list is not intended to provide for operation of the aircraft for an indefinite period with inoperative systems or equipment. The basic purpose of the minimum equipment list is to permit the safe operation of an aircraft with inoperative systems or equipment within the framework of a controlled and sound programme of repairs and parts replacement.

6. Operators are to ensure that no flight is commenced with multiple minimum equipment list items inoperative without determining that any interrelationship between inoperative systems or components will not result in an unacceptable degradation in the level of safety and/or undue increase in the flight crew workload.

7. The exposure to additional failures during continued operation with inoperative systems or equipment must also be considered in determining that an acceptable level of safety is being maintained. The minimum equipment list may not deviate from requirements of the flight manual limitations section, emergency procedures or other airworthiness requirements of the State of Registry or of the State of the Operator unless the appropriate airworthiness authority or the flight manual provides otherwise.

8. Systems or equipment accepted as inoperative for a flight should be placarded where appropriate and all such items should be noted in the aircraft technical log to inform the flight crew and maintenance personnel of the inoperative system or equipment.

9. For a particular system or item of equipment to be accepted as inoperative, it may be necessary to establish a maintenance procedure, for completion prior to flight, to de-activate or isolate the system or equipment. It may similarly be necessary to prepare an appropriate flight crew operating procedure.

10. The responsibilities of the pilot-in-command in accepting an aeroplane for operation with deficiencies in accordance with a minimum equipment list are specified in Chapter 4, 4.3.1.

ATTACHMENT H. FLIGHT SAFETY DOCUMENTS SYSTEM

Supplementary to Chapter 3, 3.3

1. Introduction

1.1 The following material provides guidance on the organization and development of an operator's flight safety documents system. It should be understood that the development of a flight safety documents system is a complete process, and changes to each document comprising the system may affect the entire system. Guidelines applicable to the development of operational documents have been produced by government and industry sources and are available to operators. Nevertheless, it may be difficult for operators to make the best use of these guidelines, since they are distributed across a number of publications.

1.2 Furthermore, guidelines applicable to operational documents development tend to focus on a single aspect of documents design, for example, formatting and typography. Guidelines rarely cover the entire process of operational documents development. It is important for operational documents to be consistent with each other, and consistent with regulations, manufacturer requirements and Human Factors principles. It is also necessary to ensure consistency across departments as well as consistency in application. Hence the emphasis on an integrated approach, based on the notion of the operational documents as a complete system.

1.3 The guidelines in this Attachment address the major aspects of an operator's flight safety documents system development process, with the aim of ensuring compliance with Chapter 3, 3.3. The guidelines are based not only upon scientific research, but also upon current best industry practices, with an emphasis on a high degree of operational relevance.

2. Organization

2.1 A flight safety documents system should be organized according to criteria which ensure easy access to information required for flight and ground operations contained in the various operational documents comprising the system and which facilitate management of the distribution and revision of operational documents.

2.2 Information contained in a flight safety documents system should be grouped according to the importance and use of the information, as follows:

a) time critical information, e.g., information that can jeopardize the safety of the operation if not immediately available;

b) time sensitive information, e.g., information that can affect the level of safety or delay the operation if not available in a short time period;

c) frequently used information;

d) reference information, e.g., information that is required for the operation but does not fall under b) or c) above; and

e) information that can be grouped based on the phase of operation in which it is used.

2.3 Time critical information should be placed early and prominently in the flight safety documents system.

2.4 Time critical information, time sensitive information, and frequently used information should be placed in cards and quick-reference guides.

3. Validation

The flight safety documents system should be validated before deployment, under realistic conditions. Validation should involve the critical aspects of the information use, in order to verify its effectiveness. Interactions among all groups that can occur during operations should also be included in the validation process.

4. Design

4.1 A flight safety documents system should maintain consistency in terminology and in the use of standard terms for common items and actions.

4.2 Operational documents should include a glossary of terms, acronyms and their standard definition, updated on a regular basis to ensure access to the most recent terminology. All significant terms, acronyms and abbreviations included in the flight documents system should be defined.

4.3 A flight safety documents system should ensure standardization across document types, including writing style, terminology, use of graphics and symbols, and formatting across documents. This includes a consistent location of specific types of information, consistent use of units of measurement and consistent use of codes.

4.4 A flight safety documents system should include a master index to locate, in a timely manner, information included in more than one operational document.

Note.— The master index must be placed in the front of each document and consist of no more than three levels of indexing. Pages containing abnormal and emergency information must be tabbed for direct access.

4.5 A flight safety documents system should comply with the requirements of the operator's quality system, if applicable.

5. Deployment

Operators should monitor deployment of the flight safety documents system, to ensure appropriate and realistic use of the documents, based on the characteristics of the operational environment and in a way which is both operationally relevant and beneficial to operational personnel. This monitoring should include a formal feedback system for obtaining input from operational personnel.

6. Amendment

6.1 Operators should develop an information gathering, review, distribution and revision control system to process information and data obtained from all sources relevant to the type of operation conducted, including, but not limited to, the State of the Operator, State of design, State of Registry, manufacturers and equipment vendors.

Note.— Manufacturers provide information for the operation of specific aircraft that emphasizes the aircraft systems and procedures under conditions that may not fully match the requirements of operators. Operators should ensure that such information meets their specific needs and those of the local authority.

6.2 Operators should develop an information gathering, review and distribution system to process information resulting from changes that originate within the operator, including:

a) changes resulting from the installation of new equipment;

b) changes in response to operating experience;

c) changes in an operator's policies and procedures;

d) changes in an operator certificate; and

e) changes for purposes of maintaining cross fleet standardization.

Note.— Operators should ensure that crew coordination philosophy, policies and procedures are specific to their operation.

6.3 A flight safety documents system should be reviewed:

a) on a regular basis (at least once a year);

b) after major events (mergers, acquisitions, rapid growth, downsizing, etc.);

c) after technology changes (introduction of new equipment); and

d) after changes in safety regulations.

6.4 Operators should develop methods of communicating new information. The specific methods should be responsive to the degree of communication urgency.

Note.— As frequent changes diminish the importance of new or modified procedures, it is desirable to minimize changes to the flight safety documents system.

6.5 New information should be reviewed and validated considering its effects on the entire flight safety documents system.

6.6 The method of communicating new information should be complemented by a tracking system to ensure currency by operational personnel. The tracking system should include a procedure to verify that operational personnel have the most recent updates.

ATTACHMENT I. ADDITIONAL GUIDANCE FOR APPROVED OPERATIONS BY SINGLE-ENGINE TURBINE-POWERED AEROPLANES AT NIGHT AND/OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

Supplementary to Chapter 5, 5.4 and Appendix 3

1. Purpose and scope

The purpose of this attachment is to give additional guidance on the airworthiness and operational requirements described in Chapter 5, 5.4 and Appendix 3, which have been designed to meet the overall level of safety intended for approved operations by single-engine turbine-powered aeroplanes at night and/or in IMC.

2. Turbine engine reliability

2.1 The power loss rate required in Chapter 5, 5.4.1 and Appendix 3 should be established as likely to be met based on data from commercial operations supplemented by available data from private operations in similar theatres of operation. A minimum amount of service experience is needed on which to base the judgment, and this should include at least 20 000 hours on the actual aeroplane/engine combination unless additional testing has been carried out or experience on sufficiently similar variants of the engine is available.

2.2 In assessing turbine engine reliability, evidence should be derived from a world fleet database covering as large a sample as possible of operations considered to be representative, compiled by the manufacturers and reviewed with the States of Design and of the Operator. Since flight hour reporting is not mandatory for many types of operators, appropriate statistical estimates may be used to develop the engine reliability data. Data for individual operators approved for these operations including trend monitoring and event reports should also be monitored and reviewed by the State of the Operator to ensure that there is no indication that the operator's experience is unsatisfactory.

2.2.1 Engine trend monitoring should include the following:

a) an oil consumption monitoring programme based on manufacturers' recommendations; and

b) an engine condition monitoring programme describing the parameters to be monitored, the method of data collection and the corrective action process; this should be based on the manufacturer's recommendations. The monitoring is intended to detect turbine engine deterioration at an early stage to allow for corrective action before safe operation is affected.

2.2.2 A reliability programme should be established covering the engine and associated systems. The engine programme should include engine hours flown in the period and the in-flight shutdown rate for all causes and the unscheduled engine removal rate, both on a 12-month moving average basis. The event reporting process should cover all items relevant to the ability to operate safely at night and/or in IMC. The data should be available for use by the operator, the Type Certificate Holder and the State so as to establish that the intended reliability levels are being achieved. Any sustained adverse trend should result in an immediate evaluation by the operator in consultation with the State and manufacturer with a view to determining actions to restore the intended safety level. The operator should develop a parts control programme with support from the manufacturer that ensures that the proper parts and configuration are maintained for single-engine turbine-powered aeroplanes approved to conduct these operations. The programme includes verification that parts placed on an approved single-engine turbine-powered aeroplane during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary configuration of that aeroplane for operations approved in accordance with Chapter 5, 5.4.

2.3 Power loss rate should be determined as a moving average over a specified period (e.g. a 12-month moving average if the sample is large). Power loss rate, rather than in-flight shut-down rate, has been used as it is considered to be more appropriate for a single-engine aeroplane. If a failure occurs on a multi-engine aeroplane that causes a major, but not total, loss of power on one engine, it is likely that the engine will be shut down as positive engine-out performance is still available, whereas on a single-engine aeroplane it may well be decided to make use of the residual power to stretch the glide distance.

2.4 The actual period selected should reflect the global utilization and the relevance of the experience included (e.g. early data may not be relevant due to subsequent mandatory modifications which affected the power loss rate). After the introduction of a new engine variant and whilst global utilization is relatively low, the total available experience may have to be used to try to achieve a statistically meaningful average.

3. Operations manual

The operations manual should include all necessary information relevant to operations by single-engine turbine-powered aeroplanes at night and/or in IMC. This should include all of the additional equipment, procedures and training required for such operations, route and/or area of operation and aerodrome information (including planning and operating minima).

4. Operator certification or validation

The certification or validation process specified by the State of the Operator should ensure the adequacy of the operator's procedures for normal, abnormal and emergency operations, including actions following engine, systems or equipment failures. In addition to the normal requirements for operator certification or validation, the following items should be addressed in relation to operations by single-engine turbine-powered aeroplanes:

a) proof of the achieved engine reliability of the aeroplane engine combination (see Appendix 3, paragraph 1);

b) specific and appropriate training and checking procedures including those to cover engine failure/ malfunction on the ground, after take-off and en-route and descend to a forced landing from the normal cruising altitude;

c) a maintenance programme which is extended to address the equipment and systems referred to in Appendix 3, paragraph 2;

d) an MEL modified to address the equipment and systems necessary for operations at night and/or in IMC;

e) planning and operating minima appropriate to the operations at night and/or in IMC;

f) departure and arrival procedures and any route limitations;

g) pilot qualifications and experience; and

h) the operations manual, including limitations, emergency procedures, approved routes or areas of operation, the MEL and normal procedures related to the equipment referred to in Appendix 3, paragraph 2.

5. Operational and maintenance programme requirements

5.1 Approval to undertake operations by single-engine turbine-powered aeroplanes at night and/or in IMC specified in an air operator certificate or equivalent document should include the particular airframe/engine combinations, including the current type design standard for such operations, the specific aeroplanes approved, and the areas or routes of such operations.

5.2 The operator's maintenance control manual should include a statement of certification of the additional equipment required, and of the maintenance and reliability programme for such equipment, including the engine.

6. Route limitations over water

6.1 Operators of single-engine turbine-powered aeroplanes carrying out operations at night and/or in IMC should make an assessment of route limitations over water. The distance that the aeroplane may be operated from a land mass suitable for a safe forced landing should be determined. This equates to the glide distance from the cruise altitude to the safe forced landing area following engine failure, assuming still air conditions. States may add to this an additional distance taking into account the likely prevailing conditions and type of operation. This should take into account the likely sea conditions, the survival equipment carried, the achieved engine reliability and the search and rescue services available.

6.2 Any additional distance allowed beyond the glide distance should not exceed a distance equivalent to 15 minutes at the aeroplane's normal cruise speed.

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue or the Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART II
INTERNATIONAL GENERAL AVIATION — AEROPLANES

SIXTH EDITION OF PART II — JULY 1998

This edition incorporates all amendments adopted by the Council prior to 21 March 1998 and supersedes, on 5 November 1998, all previous editions of Part II of Annex 6.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the supplements to the *Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-18	Incorporated in this Edition		
19	4/11/99	—	ICAO
20	2/11/00	—	ICAO
21	1/11/01	—	ICAO
22	28/11/02	—	ICAO
23	27/11/03	—	ICAO
24	24/11/05	—	ICAO
25	Approved date 6/3/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	15/1/02	—	ICAO

TABLE OF CONTENTS

ABBREVIATIONS AND SYMBOLS
(used in this Annex)

Abbreviations

ACAS	Airborne collision avoidance system
ADREP	Accident/incident reporting
AFCS	Automatic flight control system
AGA	Aerodromes, air routes and ground aids
AIG	Accident investigation and prevention
ASIA/PAC	Asia/Pacific
ASE	Altrimetry system error
ATC	Air traffic control
ATS	Air traffic services
CAT I	Category I
CAT II	Category II
CAT III	Category III
CAT IIIA	Category IIIA
CAT IIIB	Category IIIB
CAT IIIC	Category IIIC
CFIT	Controlled flight into terrain
cm	Centimetre
CVR	Cockpit voice recorder
DA	Decision altitude
DA/H	Decision altitude/height
DH	Decision height
DME	Distance measuring equipment
ECAM	Electronic centralized aircraft monitor
EFIS	Electronic flight instrument system
EGT	Exhaust gas temperature
EICAS	Engine indication and crew alerting system
ELT	Emergency locator transmitter
ELT(AF)	Automatic fixed ELT
ELT(AP)	Automatic portable ELT
ELT(AD)	Automatically deployable ELT
ELT(S)	Survival ELT
EPR	Engine pressure ratio
EUROCAE	European Organization for Civil Aviation Equipment
FDAU	Flight data acquisition unit
FDR	Flight data recorder
FL	Flight level
FM	Frequency modulation
ft	Foot
g	Normal acceleration
GPWS	Ground proximity warning system
hPa	Hectopascal
IFR	Instrument flight rules
IMC	Instrument meteorological conditions
INS	Inertial navigation systems
kg	Kilogram
km	Kilometre
km/h	Kilometres per hour
kt	Knot
m	Metre
MDA	Minimum descent altitude
MDA/H	Minimum descent altitude/height
MDH	Minimum descent height
MHz	Megahertz
MNPS	Minimum navigation performance specifications
NAV	Navigation
NM	Nautical mile
N1	High pressure turbine speed
OCA	Obstacle clearance altitude
OCA/H	Obstacle clearance altitude/height
OCH	Obstacle clearance height
RNP	Required navigation performance
RVR	Runway visual range
RVSM	Reduced vertical separation minima
SI	International System of Units
SICASP	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel
TLS	Target level of safety
TVE	Total vertical error
UTC	Coordinated universal time
V_D	Design diving speed
VFR	Visual flight rules
VMC	Visual meteorological conditions
V_{S0}	Stalling speed or the minimum steady flight speed in the landing configuration
WXR	Weather

Symbols

°C	Degrees Celsius
%	Per cent

PUBLICATIONS

(referred to in this Annex)

Convention on International Civil Aviation (Doc 7300)

International Regulations for Preventing Collisions at Sea

European Organization for Civil Aviation Equipment (EUROCAE) Documents ED55 and ED56A

Policy and Guidance Material on the Economic Regulation of International Air Transport (Doc 9587)

Annexes to the Convention on International Civil Aviation

Annex 1 — Personnel Licensing

Annex 2 — Rules of the Air

Annex 3 — Meteorological Service for International Air Navigation

Annex 5 — Units of Measurement to be Used in Air and Ground Operations

Annex 6 — Operation of Aircraft
Part I — *International Commercial Air Transport — Aeroplanes*
Part III — *International Operations — Helicopters*

Annex 8 — Airworthiness of Aircraft

Annex 10 — Aeronautical Telecommunications
Volume III (Part I — *Digital Data Communication Systems,* Part II — *Voice Communication Systems*)
Volume IV *(Surveillance Radar and Collision Avoidance Systems)*

Annex 11 — Air Traffic Services

Annex 12 — Search and Rescue

Annex 13 — Aircraft Accident and Incident Investigation

Annex 14 — Aerodromes
Volume I — *Aerodrome Design and Operations*

Annex 15 — Aeronautical Information Services

Annex 16 — Environmental Protection
Volume I — *Aircraft Noise*

Annex 18 — The Safe Transport of Dangerous Goods by Air

Procedures for Air Navigation Services

OPS — Aircraft Operations (Doc 8168)
Volume I — *Flight Procedures*
Volume II — *Construction of Visual and Instrument Flight Procedures*

ATM — Air Traffic Management (Doc 4444)

Protocol Relating to an Amendment to the Convention on International Civil Aviation (*Article 83* bis) (Doc 9318)

Regional Supplementary Procedures (Doc 7030)

Manuals

Accident/Incident Reporting Manual (ADREP Manual) (Doc 9156)

Airport Services Manual (Doc 9137)
Part 1 — *Rescue and Fire Fighting*
Part 8 — *Airport Operational Services*

Airworthiness Manual (Doc 9760)

Manual of Civil Aviation Medicine (Doc 8984)

Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)

Manual on Required Navigation Performance (RNP) (Doc 9613)

ANNEX 6 — PART II
INTERNATIONAL GENERAL AVIATION — AEROPLANES

FOREWORD

Historical background

Standards and Recommended Practices for the Operation of Aircraft — International General Aviation were first adopted by the Council on 2 December 1968 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and designated as Annex 6, Part II, to the Convention. They became effective on 2 April 1969 and applicable on 18 September 1969.

Annex 6, Part II, was developed in the following manner: the Fifteenth Session of the Assembly, Montreal, June-July 1965, adopted Resolution A15-15: "Consideration of the needs of international general aviation in relation to the scope of ICAO technical activities". Subsequently, the Fourth Air Navigation Conference (Montreal, November-December 1965) recommended a series of factors which it considered should be taken into account in extending the scope of Annex 6 to meet the needs of general aviation in accordance with the directives of Assembly Resolution A15-15.

The Fourth Air Navigation Conference recommended that the International Standards and Recommended Practices to be developed for International General Aviation Operations exclude for the present aerial work operations. It was however clearly the view of the conference that the Annex should be framed in such a manner as to facilitate its extension to cover aerial work operations at a later date, should such extension prove desirable.

Based on the above considerations, draft International Standards and Recommended Practices for the Operation of International General Aviation Aircraft were developed by the Air Navigation Commission and, after amendment following the usual consultation with the Member States of the Organization, were adopted by the Council so as to become, together with the Foreword approved by the Council, the text of this Annex. In developing this material the Air Navigation Commission was guided by the following philosophies:

Presentation and conformity with Annex 6, Part I. The Annex should be, as nearly as practicable, equivalent in scope and conform as closely as possible to Annex 6 (now Annex 6, Part I).

Applicability. Although the definition of general aviation originally used in this Annex encompassed aerial work operations, these were specifically excluded from the provisions of this Annex by Chapter 2 — Applicability.

Level of safety. The Annex should ensure an acceptable level of safety to third parties (third parties meaning persons on the ground and persons in the air in other aircraft). Also, as some international general aviation operations will be performed:

a) by crews less experienced and less skilled;

b) by less reliable equipment;

c) to less rigorous standards; and

d) with greater freedom of action than in commercial air transport operations;

it has to be accepted that the passenger in international general aviation aircraft will not necessarily enjoy the same level of safety as the fare-paying passenger in commercial air transport. However, it was recognized that in ensuring an acceptable degree of safety for third parties, an acceptable level of safety for flight crews and passengers would be achieved.

Freedom of Action. The maximum freedom of action consistent with maintaining an acceptable level of safety should be granted to international general aviation.

Responsibility. The responsibility that devolves upon the operator in Annex 6, Part I, should, in Part II of the Annex, fall upon the pilot-in-command. Precedent for this course of action exists in Annex 2.

Consequent to the adoption of Annex 6, Part III, *International Operations — Helicopters*, an amendment to the title was introduced to indicate that Annex 6, Part II was applicable only to aeroplanes.

In 1986 the Air Navigation Commission commenced a review of Annex 6, Part II and concluded that the definition of general aviation should be revised to exclude aerial work thus recognizing that aerial work was a distinct aspect of civil aviation and recognizing the exclusion of aerial work from the applicability of Annex 6, Part II. As with the Fourth Air Navigation Conference in 1965, the Air Navigation

Commission was not aware of any degree of international aerial work operations which would necessitate the development of International Standards and Recommended Practices. The revised definitions for general aviation and aerial work and the revised applicability chapter were submitted to States in the usual manner and approved by the Council in March 1990.

Table A shows the origin of amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The Standards and Recommended Practices of Annex 6, Part II are applicable to international general aviation operations with aeroplanes.

The Standards and Recommended Practices represent minimum provisions and, together with those of Annex 6 — Operation of Aircraft: Part I — International Commercial Air Transport — Aeroplanes, now cover the operation of all aeroplanes in international civil aviation, except in aerial work operations.

It will be noted that the Standards and Recommended Practices contained in Annex 6, Part II, when applied to the operation of large aeroplanes, are less stringent than those in Annex 6, Part I, applicable to the same or similar aeroplanes when used in commercial air transport operations. Nevertheless, it is considered that, in conjunction with existing provisions in Annexes 1 and 8, Annex 6, Part II, ensures an adequate level of safety for the operations envisaged for the large aeroplanes in question. In this connexion attention is drawn to the point that the entire performance standards of Annex 8 are applicable to all aeroplanes of over 5 700 kg mass intended for the carriage of passengers or cargo or mail for international air navigation, of which the prototype was submitted for certification on or after 13 December 1964. Moreover, by virtue of Annex 1 the holder of a private pilot licence, piloting an aircraft in excess of 5 700 kg unless as the sole occupant thereof is required to have a type rating entered on his licence. Since the certificates of airworthiness of the types of aeroplanes in question would preclude solo flight in all normal circumstances, it may be accepted that the private pilot of these aeroplanes must have a type rating entered on his licence.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provision of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.—Material comprising the Annex proper:

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

It is to be noted that some Standards in this Annex incorporate, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 6, Part II

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved* *Effective* *Applicable*
1st Edition	Fifteenth Session of the Assembly (Resolution A15-15) and Fourth Air Navigation Conference		2 December 1968 2 April 1969 18 September 1969
1	Sixth Air Navigation Conference	a) The requirement for additional instruments in aeroplanes operated as controlled VFR flights in the en-route phase; and b) the permitting of aeroplanes, when unable to navigate by visual references to landmarks, to be navigated by equipment other than radio navigation equipment, e.g. solely by self-contained navigation means, provided that certain equipment capabilities are met, thus eliminating any requirement for the carriage of radio navigation equipment.	1 June 1970 1 October 1970 4 February 1971
2 (2nd Edition)	Special Meeting on Aircraft Noise in the Vicinity of Aerodromes	The inclusion of a specification for aeroplanes to be operated within the weight limitations imposed by the applicable Noise Certification Standards, except in prescribed circumstances, and to carry a document attesting noise certification.	2 April 1971 2 August 1971 6 January 1972
3	Seventh Air Navigation Conference	The inclusion of a Recommended Practice covering the design, carriage and installation of Emergency Location Beacons — Aircraft, in such aeroplanes and on such flights as may be determined by the appropriate authority.	29 May 1973 1 October 1973 23 May 1974
4	Revision of Annex 12, the Air Navigation Commission's Study concerning interception of civil aircraft and the Council action in pursuance of Assembly Resolution A18-16	a) Provisions for the marking of break-in points on aircraft; b) provisions for reducing the risk for intercepted aircraft; c) the revision of the Introductory Note to Chapter 3 of the Annex. The revision points to a practical method for States to discharge their functions in the cases of lease, charter and interchange of aircraft in international operations.	4 February 1975 4 June 1975 9 October 1975
5	Studies by the Air Navigation Commission, Amendment 60 to Annex 3 and Amendment 30 to Annex 14	Requirements for the provision and use of flight crew safety harnesses; amplification of specifications for the type of timepiece required for operations in accordance with Instrument Flight Rules and controlled VFR flights; and revision of the definitions of Aerodrome and Meteorological information.	7 April 1976 7 August 1976 30 December 1976
6	ASIA/PAC Regional Air Navigation Meeting	The requirement for the carriage of survival radio equipment over those areas in which search and rescue would be especially difficult to be determined by States rather than regional air navigation agreement.	16 June 1976 16 October 1976 6 October 1977
7	Air Navigation Commission Study	Recommendation for the fitting of ground proximity warning systems to certain aeroplanes.	15 December 1977 15 April 1978 10 August 1978

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved Effective Applicable*
8	Air Navigation Commission Study	Introduction of requirements for navigation equipment to meet minimum navigational performance specifications (MNPS).	2 April 1980 2 August 1980 27 November 1980
9	Air Navigation Commission Study	Revision of the provisions relating to exterior lights to align with new provisions in Annexes 2 and 8.	22 March 1982 22 July 1982 25 November 1982
10 (3rd Edition)	Seventh meeting of the Obstacle Clearance Panel, AGA Divisional Meeting (1981), amendments consequential to adoption of Annexes 5 and 18	Introduced provisions related to development and use of instrument approach procedures, authority and competence to taxi aeroplanes. Changes to the requirements for the carriage of dangerous goods as a result of adoption by the Council of Annex 18. Units of measurement were brought in line with the provisions of Annex 5 and the *Note* in Chapter 3 concerning lease, charter and interchange was updated. The term "aerodrome operating minima" was introduced in lieu of "aerodrome meteorological minima", and definitions of "decision altitude/height" and "minimum descent altitude/height" entered in Chapter 1.	20 May 1983 20 September 1983 24 November 1983
11	Accident Prevention and Investigation Divisional Meeting, AIG (1979)	Introduction of provisions relating to flight recorders. Introduction of related guidance material in an attachment.	8 March 1985 29 July 1985 21 November 1985
12	Air Navigation Commission	Carriage of information on board aircraft; communication equipment on 121.5 MHz.	14 March 1986 27 July 1986 20 November 1986
13	Seventh meeting of the Obstacle Clearance Panel, Air Navigation Commission studies	Supply and use of oxygen and pressurization failure warning; refuelling with passengers on board; provision of climb performance data with all engines operating.	14 March 1986 27 July 1986 20 November 1986
14 (4th Edition)	Air Navigation Commission review of the Annex, Stage I, Third meeting of the Visual Flight Rules Operations Panel, Air Navigation Commission Study	a) Revision of the definitions of aerial work and general aviation. Revision of the definition of alternate aerodrome to introduce take-off, en-route and destination alternate aerodromes. Introduction of a new definition for a commercial air transport operation and the definitions for flight plan and flight recorder; b) deletion of the reference to aerial work from the applicability; c) alignment with Annex 6, Part I, particularly with respect to flight recorder records subsequent to accidents or incidents and the requirement for a Mach number indicator; d) elimination of the term "controlled VFR flight"; e) introduction of guidance material concerning flight data recording of important operational information in aeroplanes with electronic displays.	19 March 1990 30 July 1990 15 November 1990

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved Effective Applicable*
15	Fifth meeting of the Operations Panel, Seventh and Eighth meetings of the Review of the General Concept of Separation Panel, Accident Investigation Divisional Meeting (AIG/1992), Air Navigation Commission studies	a) Revision of definitions of aerodrome operating minima, decision altitude/height, minimum descent altitude/height and introduction of definition of obstacle clearance altitude/height; b) introduction of new definitions for emergency locator transmitters (ELTs) required navigation performance (RNP) and RNP type; c) introduction of the definition for the classification of instrument approach and landing operations; d) revision of the requirements concerning the use of engraving metal foil flight data recorders; e) introduction of carriage requirements for emergency locator transmitters (ELTs) to replace provisions regarding survival radio equipment and emergency location beacon; f) introduction of a requirement that the navigation equipment carried shall enable the aircraft to proceed in accordance with RNP types prescribed for the intended route(s) or area(s) and provisions to permit the uniform implementation of 300 m (1 000 ft) VSM above FL 290.	21 March 1994 25 July 1994 10 November 1994
16 (5th Edition)	Air Navigation Commission studies, Fourteenth meeting of the Dangerous Goods Panel, editorial amendment, text alignment with Annex 6, Part I and/or Part III, consequential amendment	a) Introduction of revised definitions; b) inclusion of references to Article 35 of the Convention; c) revision of the provisions concerning operating facilities, briefing, aeroplane airworthiness and safety precautions, destination alternate aerodromes, limitations imposed by weather conditions, use of oxygen and safety harness; d) new provisions concerning all aeroplanes on all flights, all aeroplanes operated as VFR flights and ground proximity warning systems (GPWS); e) revision of the provisions concerning aeroplanes operated in accordance with instrument flight rules (IFR); f) revision of the provisions concerning the composition of the flight crew; and g) revision of the provisions concerning the carriage and use of oxygen.	10 March 1995 24 July 1995 9 November 1995
17	Fourth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/4)	Requirement for aeroplanes to be equipped with pressure-altitude reporting transponders.	19 February 1996 15 July 1996 7 November 1996

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved Effective Applicable*
18 (6th Edition)	First meeting of the Flight Recorder Panel, ICAO and Industry CFIT Task Force, Air Navigation Commission studies, Amendment 162 to Annex 1, Amendment 38 to Annex 11, editorial amendment	a) Introduction of new and revised definitions for psychoactive substances and required navigation performance; b) revision of the notes concerning lease and interchange; c) introduction of a note concerning use of psychoactive substances; and d) new and revised provisions concerning ground proximity warning systems, pressure-altitude reporting transponders and flight recorders.	20 March 1998 20 July 1998 5 November 1998
19	Second meeting of the Flight Recorder Panel, Air Navigation Commission studies	a) Revised definitions; and b) new provisions concerning the mandatory carriage of ELTs operating on 406 MHz and 121.5 MHz, the addition of a predictive terrain hazard warning function to the ground proximity warning system (GPWS), pressure-altitude reporting transponders and the introduction of an implementation date for the recording of digital communications.	15 March 1999 19 July 1999 4 November 1999
20	Air Navigation Commission studies	a) Revised definitions; and b) revision of the duties of the pilot-in-command and the introduction of criteria for instrument approach operations.	15 March 2000 17 July 2000 2 November 2000
21	Second meeting of the Flight Recorder Panel, Third meeting of the Global Navigation Satellite System Panel, Fifth meeting of the Continuing Airworthiness Panel	a) Update of the provisions pertaining to flight recorders, including the recording of digital communications; FDR requirements for new aircraft; revised parameter listings; introduction of two-hour duration CVRs; b) amendment of the classification of instrument approach and landing operations; c) new provisions pertaining to approach with vertical guidance (APV) operations; and d) new definitions and update of provisions pertaining to maintenance-related requirements.	9 March 2001 16 July 2001 1 November 2001
22	Air Navigation Commission studies	Revised requirements for the ground proximity warning system (GPWS) and forward looking terrain avoidance function.	15 March 2002 15 July 2002 28 November 2002
23	Separation and Airspace Safety Panel	Authorization by the State of Registry for operations in RNP airspace.	13 March 2003 14 July 2003 27 November 2003
24	Separation and Airspace Safety Panel and Air Navigation Commission studies	a) New definitions and provisions regarding height-keeping performance and height-monitoring requirements associated with reduced vertical separation minimum (RVSM) operations; and b) new requirements for the carriage of airborne collision avoidance systems (ACAS II) in general aviation aeroplanes, and associated training requirements for pilots.	28 February 2005 11 July 2005 24 November 2005
25	Fourteenth meeting of the Obstacle Clearance Panel (OCP/14)	Pilot awareness of operational requirements determined by procedure design.	6 March 2006 — —

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards, Recommended Practices and Definitions for the operation of aeroplanes in international general aviation, they have the following meanings:

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;

c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and

d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altimetry system error (ASE). The difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

Approach and landing operations using instrument approach procedures. Instrument approach and landing operations are classified as follows:

Non-precision approach and landing operations. An instrument approach and landing which utilizes lateral guidance but does not utilize vertical guidance.

Approach and landing operations with vertical guidance. An instrument approach and landing which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach and landing operations. An instrument approach and landing using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer generated navigation data.

Categories of precision approach and landing operations:

Category I (CAT I) operation. A precision instrument approach and landing with a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II (CAT II) operation. A precision instrument approach and landing with a decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft), and a runway visual range not less than 350 m.

Category IIIA (CAT IIIA) operation. A precision instrument approach and landing with:

a) a decision height lower than 30 m (100 ft) or no decision height; and

b) a runway visual range not less than 200 m.

Category IIIB (CAT IIIB) operation. A precision instrument approach and landing with:

a) a decision height lower than 15 m (50 ft) or no decision height; and

b) a runway visual range less than 200 m but not less than 50 m.

Category IIIC (CAT IIIC) operation. A precision instrument approach and landing with no decision height and no runway visual range limitations.

Note.— Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach and landing operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT IIIA but with an RVR in the range of CAT IIIB would be considered a CAT IIIB operation or an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Note.— Dangerous goods are classified in Annex 18, Chapter 3.

Decision altitude (DA) or ***decision height (DH)***. A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form "decision altitude/height" and abbreviated "DA/H".

Emergency locator transmitter (ELT). A generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following:

Automatic fixed ELT (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft.

Automatic portable ELT (ELT(AP)). An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

Automatic deployable ELT (ELT(AD)). An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.

Survival ELT (ELT(S)). An ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight recorder. Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Flight time — aeroplanes. The total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight.

Note.— Flight time as here defined is synonymous with the term "block to block" time or "chock to chock" time in general usage which is measured from the time an aeroplane first moves for the purpose of taking off until it finally stops at the end of the flight.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4 of Annex 2.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance programme. A document which describes the specific scheduled maintenance tasks and their frequency of completion and related procedures, such as a reliability programme, necessary for the safe operation of those aircraft to which it applies.

Maintenance release. A document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner, either in accordance with the approved data and the procedures described in the maintenance organization's procedures manual or under an equivalent system.

Meteorological information. Meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions.

Minimum descent altitude (MDA) or ***minimum descent height (MDH).*** A specified altitude or height in a non-precision approach or circling approach below which descent must not be made without the required visual reference.

Note 1.— Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3.— For convenience when both expressions are used they may be written in the form "minimum descent altitude/height" and abbreviated "MDA/H".

Night. The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise, as may be prescribed by the appropriate authority.

Note.— Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon.

Obstacle clearance altitude (OCA) or ***obstacle clearance height (OCH).*** The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/height" and abbreviated "OCA/H".

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Repair. The restoration of an aeronautical product to an airworthy condition to ensure that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the issuance of the type certificate for the respective aircraft type, after it has been damaged or subjected to wear.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

*As defined in Annex 2.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

Target level of safety (TLS). A generic term representing the level of risk which is considered acceptable in particular circumstances.

Total vertical error (TVE). The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, equal to or better than specified minima.

Note.— The specified minima are contained in Chapter 4 of Annex 2.

* As defined in Annex 2.

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CHAPTER 2. APPLICABILITY

The Standards and Recommended Practices contained in Annex 6, Part II shall be applicable to international general aviation operations with aeroplanes.

Note 1.— Standards and Recommended Practices applicable to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations are to be found in Annex 6, Part I.

Note 2.— Standards and Recommended Practices applicable to international commercial air transport operations or international general aviation operations with helicopters are to be found in Annex 6, Part III.

CHAPTER 3. GENERAL

Note 1.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Note 2.— In the case of international operations effected jointly with aeroplanes not all of which are registered in the same Contracting State, nothing in this Part prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of the relevant Annexes.

3.1 The pilot-in-command shall comply with the relevant laws, regulations and procedures of the States in which the aeroplane is operated.

Note 1.— Compliance with more restrictive measures, not in contravention of the provisions of 3.1, may be required by the State of Registry.

Note 2.— Rules covering flight over the high seas are contained in Annex 2.

Note 3.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

3.2 The pilot-in-command shall be responsible for the safety of all crew members, passengers and cargo on board when the doors are closed. The pilot-in-command shall also be responsible for the operation and safety of the aeroplane from the moment the aeroplane is ready to move for the purpose of taking off until the moment it finally comes to rest at the end of the flight and the engine(s) used as primary propulsion units are shut down.

3.3 If an emergency situation which endangers the safety of the aeroplane or persons necessitates the taking of action which involves a violation of local regulations or procedures, the pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the State of Registry. Such reports shall be submitted as soon as possible and normally within ten days.

3.4 The pilot-in-command shall be responsible for notifying the nearest appropriate authority by the quickest available means of any accident involving the aeroplane resulting in serious injury or death of any person or substantial damage to the aeroplane or property.

Note.— A definition of the term "serious injury" is contained in Annex 13, and an explanation of the term "substantial damage" is given in the Accident/Incident Reporting Manual (ADREP Manual) *(Doc 9156).*

3.5 **Recommendation.—** *The pilot-in-command should have available on board the aeroplane essential information concerning the search and rescue services in the areas over which it is intended the aeroplane will be flown.*

3.6 Dangerous goods.

Note 1.— Provisions for carriage of dangerous goods are contained in Annex 18.

Note 2.— Article 35 of the Convention refers to certain classes of cargo restrictions.

3.7 Use of psychoactive substances.

Note.— Provisions concerning the use of psychoactive substances are contained in Annex 1, 1.2.7 and Annex 2, 2.5.

CHAPTER 4. FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES

4.1 Adequacy of operating facilities

The pilot-in-command shall not commence a flight unless it has been ascertained by every reasonable means available that the ground and/or water areas and facilities available and directly required for such flight and for the safe operation of the aeroplane are adequate, including communication facilities and navigation aids.

Note.— "Reasonable means" in this Standard is intended to denote the use, at the point of departure, of information available to the pilot-in-command either through official information published by the aeronautical information services or readily obtainable from other sources.

4.2 Aerodrome operating minima

The pilot-in-command shall not operate to or from an aerodrome using operating minima lower than those which may be established for that aerodrome by the State in which it is located, except with the specific approval of that State.

Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as an alternate, than for the same aerodrome when planned as that of intended landing.

4.3 Briefing

4.3.1 The pilot-in-command shall ensure that crew members and passengers are made familiar, by means of an oral briefing or by other means, with the location and the use of:

a) seat belts; and, as appropriate,

b) emergency exits;

c) life jackets;

d) oxygen dispensing equipment; and

e) other emergency equipment provided for individual use, including passenger emergency briefing cards.

4.3.2 The pilot-in-command shall ensure that all persons on board are aware of the location and general manner of use of the principal emergency equipment carried for collective use.

4.4 Aeroplane airworthiness and safety precautions

4.4.1 A flight shall not be commenced until the pilot-in-command is satisfied that:

a) the aeroplane is airworthy, duly registered and that appropriate certificates with respect thereto are aboard the aeroplane;

b) the instruments and equipment installed in the aeroplane are appropriate, taking into account the expected flight conditions;

c) any necessary maintenance has been performed in accordance with Chapter 8;

d) the mass of the aeroplane and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

e) any load carried is properly distributed and safely secured; and

f) the aeroplane operating limitations, contained in the flight manual, or its equivalent, will not be exceeded.

4.4.2 **Recommendation.—** *The pilot-in-command should have sufficient information on climb performance with all engines operating to enable determination of the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique.*

4.5 Weather reports and forecasts

Before commencing a flight the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under the instrument flight rules, shall include: 1) a study of available current weather reports and forecasts; and 2) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

Note.— The requirements for flight plans are contained in Annex 2 — Rules of the Air *and* Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services *(PANS-ATM, Doc 4444).*

4.6 Limitations imposed by weather conditions

4.6.1 Flight in accordance with the visual flight rules

A flight, except one of purely local character in visual meteorological conditions, to be conducted in accordance with the visual flight rules shall not be commenced unless available current meteorological reports, or a combination of current reports and forecasts, indicate that the meteorological conditions along the route, or that part of the route to be flown under the visual flight rules, will, at the appropriate time, be such as to render compliance with these rules possible.

4.6.2 Flight in accordance with the instrument flight rules

4.6.2.1 *When a destination alternate aerodrome is required.* A flight to be conducted in accordance with the instrument flight rules shall not be commenced unless the available information indicates that conditions, at the aerodrome of intended landing and at least one destination alternate will, at the estimated time of arrival, be at or above the aerodrome operating minima.

4.6.2.2 *When no destination alternate aerodrome is required.* A flight to be conducted in accordance with the instrument flight rules to an aerodrome when no alternate aerodrome is required shall not be commenced unless:

a) a standard instrument approach procedure is prescribed for the aerodrome of intended landing; and

b) available current meteorological information indicates that the following meteorological conditions will exist from two hours before to two hours after the estimated time of arrival:

   1) a cloud base of at least 300 m (1 000 ft) above the minimum associated with the instrument approach procedure; and

   2) visibility of at least 5.5 km or of 4 km more than the minimum associated with the procedure.

4.6.3 Aerodrome operating minima

4.6.3.1 A flight shall not be continued towards the aerodrome of intended landing unless the latest available meteorological information indicates that conditions at that aerodrome, or at least one destination alternate aerodrome, will, at the estimated time of arrival, be at or above the specified aerodrome operating minima.

4.6.3.2 An instrument approach shall not be continued beyond the outer marker fix in case of precision approach, or below 300 m (1 000 ft) above the aerodrome in case of non-precision approach, unless the reported visibility or controlling RVR is above the specified minimum.

4.6.3.3 If, after passing the outer marker fix in case of precision approach, or after descending below 300 m (1 000 ft) above the aerodrome in case of non-precision approach, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, an aeroplane shall not continue its approach-to-land beyond a point at which the limits of the aerodrome operating minima would be infringed.

Note.— Controlling RVR means the reported values of one or more RVR reporting locations (touchdown, mid-point and stop-end) used to determine whether operating minima are or are not met. Where RVR is used, the controlling RVR is the touchdown RVR, unless otherwise specified by State criteria.

4.6.4 Flight in icing conditions

A flight to be operated in known or expected icing conditions shall not be commenced unless the aeroplane is certificated and equipped to cope with such conditions.

4.7 Destination alternate aerodromes

For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the flight plan, unless:

a) the duration of the flight and the meteorological conditions prevailing are such that there is reasonable certainty that, at the estimated time of arrival at the aerodrome of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions; or

b) the aerodrome of intended landing is isolated and there is no suitable destination alternate aerodrome.

4.8 Fuel and oil supply

4.8.1 A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight, and, as applicable, the following special provisions are complied with:

4.8.1.1 *Flight in accordance with the instrument flight rules.* At least sufficient fuel and oil shall be carried to allow the aeroplane:

a) *when, in accordance with the exception contained in 4.6.2.2, a destination alternate aerodrome is not required,* to fly to the aerodrome to which the flight is planned and thereafter for a period of 45 minutes; or

b) *when a destination alternate aerodrome is required,* to fly to the aerodrome to which the flight is planned, thence to an alternate aerodrome, and thereafter for a period of 45 minutes.

Note.— Nothing in 4.8 precludes amendment of a flight plan in flight in order to re-plan the flight to another aerodrome, provided that the requirements of 4.8 can be complied with from the point where the flight is re-planned.

4.9 Oxygen supply

The pilot-in-command shall ensure that breathing oxygen is available to crew members and passengers in sufficient quantities for all flights at such altitudes where a lack of oxygen might result in impairment of the faculties of crew members or harmfully affect passengers.

Note.— Guidance on the carriage and use of oxygen is given in Attachment B.

4.10 Use of oxygen

All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been required in 4.9.

4.11 In-flight emergency instruction

In an emergency during flight, the pilot-in-command shall ensure that all persons on board are instructed in such emergency action as may be appropriate to the circumstances.

4.12 Weather reporting by pilots

Recommendation.— *When weather conditions likely to affect the safety of other aircraft are encountered, they should be reported as soon as possible.*

4.13 Hazardous flight conditions

Recommendation.— *Hazardous flight conditions, other than those associated with meteorological conditions, encountered en route should be reported as soon as possible. The reports so rendered should give such details as may be pertinent to the safety of other aircraft.*

4.14 Fitness of flight crew members

The pilot-in-command shall be responsible for ensuring that a flight:

a) will not be commenced if any flight crew member is incapacitated from performing duties by any cause such as injury, sickness, fatigue, the effects of alcohol or drugs; and

b) will not be continued beyond the nearest suitable aerodrome when flight crew members' capacity to perform functions is significantly reduced by impairment of faculties from causes such as fatigue, sickness, lack of oxygen.

4.15 Flight crew members at duty stations

4.15.1 Take-off and landing

All flight crew members required to be on flight deck duty shall be at their stations.

4.15.2 En route

All flight crew members required to be on flight deck duty shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the aeroplane, or for physiological needs.

4.15.3 Seat belts

All flight crew members shall keep their seat belts fastened when at their stations.

4.15.4 Safety harness

Recommendation.— *When safety harnesses are provided, any flight crew member occupying a pilot's seat should keep the safety harness fastened during the take-off and landing phases; all other flight crew members should keep their safety harnesses fastened during the take-off and landing phases unless the shoulder straps interfere with the performance of their duties, in which case the shoulder straps may be unfastened but the seat belt must remain fastened.*

Note.— Safety harness includes shoulder strap(s) and a seat belt which may be used independently.

4.16 Instrument flight procedures

4.16.1 One or more instrument approach procedures designed in accordance with the classification of instrument approach and landing operations shall be approved and promulgated by the State in which the aerodrome is located to serve each instrument runway or aerodrome utilized for instrument flight operations.

4.16.2 All aeroplanes operated in accordance with instrument flight rules shall comply with the instrument flight procedures approved by the State in which the aerodrome is located.

Note 1.— Definitions for the classification of instrument approach and landing operations are in Chapter 1.

Note 2.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

4.17 Instruction — general

An aeroplane shall not be taxied on the movement area of an aerodrome unless the person at the controls:

a) has been duly authorized by the owner or in the case where it is leased the lessee, or a designated agent;

b) is fully competent to taxi the aeroplane;

c) is qualified to use the radio telephone if radio communications are required; and

d) has received instruction from a competent person in respect of aerodrome layout, and where appropriate, information on routes, signs, marking, lights, ATC signals and instructions, phraseology and procedures, and is able to conform to the operational standards required for safe aeroplane movement at the aerodrome.

4.18 Refuelling with passengers on board

4.18.1 **Recommendation.—** *An aeroplane should not be refuelled when passengers are embarking, on board or disembarking unless it is attended by the pilot-in-command or other qualified personnel ready to initiate and direct an evacuation of the aeroplane by the most practical and expeditious means available.*

4.18.2 **Recommendation.—** *When refuelling with passengers embarking, on board or disembarking, two-way communications should be maintained by aeroplane intercommunications system or other suitable means between the ground crew supervising the refuelling and the pilot-in-command or other qualified personnel required by 4.18.1.*

Note 1.— The provisions of 4.18.1 do not necessarily require the deployment of integral aeroplane stairs or the opening of emergency exits as a prerequisite to refuelling.

Note 2.— Provisions concerning aircraft refuelling are contained in Annex 14, Volume I and guidance on safe refuelling practices is contained in the Airport Services Manual *(Doc 9137), Parts 1 and 8.*

Note 3.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.

CHAPTER 5. AEROPLANE PERFORMANCE OPERATING LIMITATIONS

5.1 An aeroplane shall be operated:

a) in compliance with the terms of its airworthiness certificate or equivalent approved document;

b) within the operating limitations prescribed by the certificating authority of the State of Registry; and

c) within the mass limitations imposed by compliance with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized, in exceptional circumstances for a certain aerodrome or a runway where there is no noise disturbance problem, by the competent authority of the State in which the aerodrome is situated.

5.2 Placards, listings, instrument markings, or combinations thereof, containing those operating limitations prescribed by the certificating authority of the State of Registry for visual presentation, shall be displayed in the aeroplane.

Note.— The Standards of Annex 8 — Airworthiness of Aircraft*, Parts IIIA and IIIB, apply to all aeroplanes of over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.*

CHAPTER 6. AEROPLANE INSTRUMENTS AND EQUIPMENT

Note.— Specifications for the provision of aeroplane communication and navigation equipment are contained in Chapter 7.

6.1 All aeroplanes on all flights

6.1.1 General

In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in aeroplanes according to the aeroplane used and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the State of Registry.

6.1.2 Instruments

An aeroplane shall be equipped with instruments which will enable the flight crew to control the flight path of the aeroplane, carry out any required procedural manoeuvre, and observe the operating limitations of the aeroplane in the expected operating conditions.

6.1.3 Equipment

6.1.3.1 All aeroplanes on all flights.

6.1.3.1.1 All aeroplanes on all flights shall be equipped with:

a) an accessible first-aid kit;

b) portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aeroplane. At least one shall be located in:

1) the pilot's compartment; and

2) each passenger compartment that is separate from the pilot's compartment and not readily accessible to the pilot or co-pilot;

c) 1) a seat or berth for each person over an age to be determined by the State of Registry; and

2) a seat belt for each seat and restraining belts for each berth;

d) the following manuals, charts and information:

1) the flight manual or other documents or information concerning any operating limitations prescribed for the aeroplane by the certificating authority of the State of Registry, required for the application of Chapter 5;

2) current and suitable charts for the route of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

3) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and

4) visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2;

e) spare electrical fuses of appropriate ratings for replacement of those accessible in flight.

6.1.3.1.2 **Recommendation.—** *All aeroplanes on all flights should be equipped with the ground-air signal codes for search and rescue purposes.*

6.1.3.1.3 **Recommendation.—** *All aeroplanes on all flights should be equipped with a safety harness for each flight crew member seat.*

Note.— Safety harness includes shoulder strap(s) and a seat belt which may be used independently.

6.1.4 Marking of break-in points

6.1.4.1 If areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on an aeroplane, such areas shall be marked as shown below (see figure following). The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

6.1.4.2 If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 m between adjacent markings.

Note.— This Standard does not require any aeroplane to have break-in areas.

6.2 All aeroplanes operated as VFR flights

6.2.1 All aeroplanes when operated as VFR flights shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

d) an airspeed indicator; and

e) such additional instruments or equipment as may be prescribed by the appropriate authority.

6.2.2 **Recommendation.—** *VFR flights which are operated as controlled flights should be equipped in accordance with 6.6.*

6.3 All aeroplanes on flights over water

6.3.1 Seaplanes

All seaplanes for all flights shall be equipped with:

a) one life jacket, or equivalent individual floatation device, for each person on board, stowed in a position readily accessible from the seat or berth;

b) equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable;

c) one anchor;

d) one sea anchor (drogue), when necessary to assist in manoeuvring.

Note.— "Seaplanes" includes amphibians operated as seaplanes.

6.3.2 Landplanes

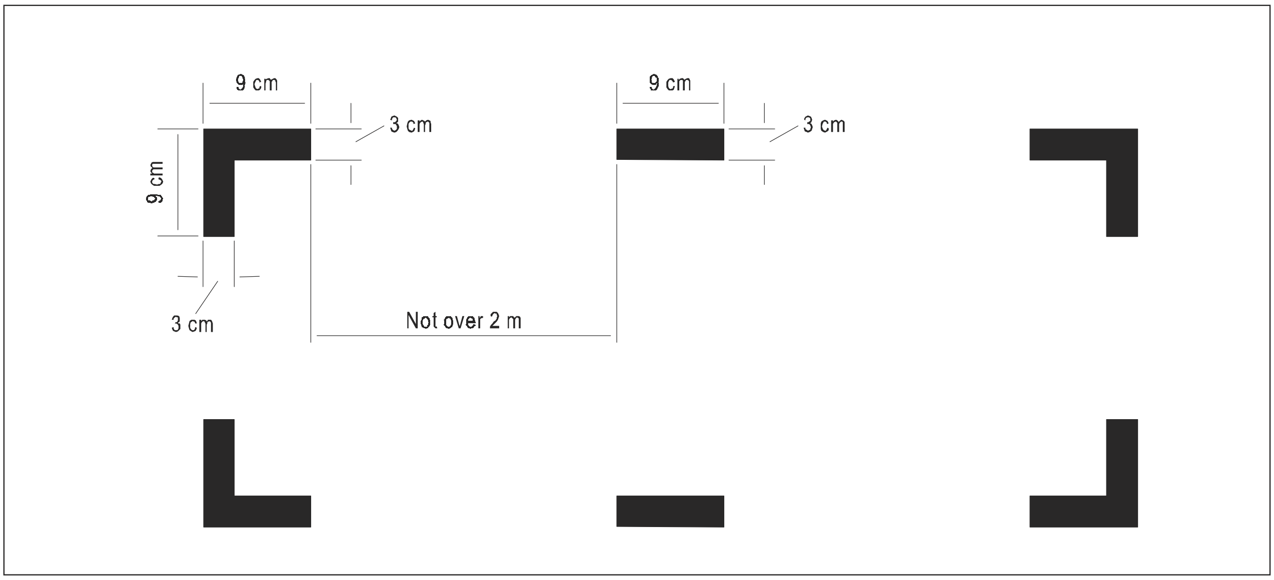
6.3.2.1 Single-engined aeroplanes.

Recommendation.— *All single-engined landplanes when flying en route over water beyond gliding distance from the shore should carry one life jacket or equivalent individual floatation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.*

Note.— "Landplanes" includes amphibians operated as landplanes.

6.3.3 All aeroplanes on extended flights over water

All aeroplanes when operated on extended flights over water shall be equipped with:



MARKING OF BREAK-IN POINTS (see 6.1.4)

a) when the aeroplane may be over water at a distance of more than 93 km (50 NM) away from land suitable for making an emergency landing:

— one life jacket or equivalent individual floatation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

b) when over water away from land suitable for making an emergency landing at a distance of more than 185 km (100 NM), in the case of single-engined aeroplanes, and more than 370 km (200 NM), in the case of multi-engined aeroplanes capable of continuing flight with one engine inoperative:

1) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

2) equipment for making the pyrotechnical distress signals described in Annex 2.

6.4 All aeroplanes on flights over designated land areas

Aeroplanes when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult shall be equipped with such signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

6.5 All aeroplanes on high altitude flights

6.5.1 All aeroplanes intended to be operated at high altitudes shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 4.9.

6.5.2 Aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1990

Pressurized aeroplanes intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

6.5.3 Aeroplanes for which the individual certificate of airworthiness is first issued before 1 January 1990

Recommendation.— *Pressurized aeroplanes intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa should be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.*

6.6 All aeroplanes operated in accordance with the instrument flight rules

All aeroplanes when operated in accordance with the instrument flight rules or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

Note.— Due to the long history of misreadings, the use of drum-pointer altimeters is not recommended.

d) an airspeed indicating system with a means of preventing malfunctioning due to either condensation or icing;

e) a turn and slip indicator;

f) an attitude indicator (artificial horizon);

g) a heading indicator (directional gyroscope);

Note.— The requirements of e), f) and g), may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the three separate instruments, are retained.

h) means of indicating whether the supply of power to the gyroscopic instruments is adequate;

i) a means of indicating in the flight crew compartment the outside air temperature;

j) a rate-of-climb and descent indicator; and

k) such additional instruments or equipment as may be prescribed by the appropriate authority.

6.7 All aeroplanes when operated at night

All aeroplanes, when operated at night, shall be equipped with:

a) all the equipment specified in 6.6;

b) the lights required by Annex 2 for aircraft in flight or operating on the movement area of an aerodrome;

Note.— Specifications for lights meeting the requirements of Annex 2 for navigation lights are contained in the Appendix. The general characteristics of lights are specified in Annex 8. Detailed specifications for lights meeting the requirements of Annex 2 for aircraft in flight or operating on the movement area of an aerodrome are contained in the Airworthiness Manual *(Doc 9760).*

c) a landing light;

d) illumination for all flight instruments and equipment that are essential for the safe operation of the aeroplane;

e) lights in all passenger compartments; and

f) an electric torch for each crew member station.

6.8 All aeroplanes complying with the noise certification Standards in Annex 16, Volume I

An aeroplane shall carry a document attesting noise certification.

Note.— The attestation may be contained in any document, carried on board, approved by the State of Registry.

6.9 Aeroplanes required to be equipped with ground proximity warning systems (GPWS)

6.9.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, for which the individual certificate of airworthiness is first issued on or after 1 January 2004, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

6.9.2 From 1 January 2007, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

6.9.3 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less and authorized to carry more than five but not more than nine passengers should be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.*

6.9.4 **Recommendation.—** *All piston-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers should be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.*

6.9.5 A ground proximity warning system shall provide automatically a timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth's surface.

6.9.6 A ground proximity warning system shall provide, as a minimum, warnings of at least the following circumstances:

a) excessive descent rate;

b) excessive altitude loss after take-off or go-around; and

c) unsafe terrain clearance.

6.9.7 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, should be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.*

6.10 Flight recorders

Note 1.— Flight recorders comprise two systems, a flight data recorder and a cockpit voice recorder.

Note 2.— Combination recorders (FDR/CVR) can only be used to meet the flight recorder equipage requirements as specifically indicated in this Annex.

Note 3.— Detailed guidance on flight recorders is contained in Attachment A.

6.10.1 Flight data recorders — types

6.10.1.1 A Type I flight data recorder shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

6.10.1.2 A Type II flight data recorder shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices.

6.10.1.3 The use of engraving metal foil flight data recorders shall be discontinued by 1 January 1995.

6.10.1.4 **Recommendation.—** *The use of analogue flight data recorders using frequency modulation (FM) should be discontinued by 5 November 1998.*

6.10.1.4.1 The use of photographic film flight data recorders shall be discontinued from 1 January 2003.

6.10.1.5 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a cockpit voice recorder (CVR), shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

6.10.1.5.1 From 1 January 2007, all aeroplanes which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

6.10.1.5.2 Sufficient information to derive the content of the data link communications message, and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance (ADS), controller-pilot data link communications (CPDLC), data link-flight information services (D-FIS) and aeronautical operational control (AOC) messages.

6.10.1.6 **Recommendation.—** *All aeroplanes of a maximum certificated take-off mass over 5 700 kg, required to be equipped with a flight data recorder and a cockpit voice recorder, may alternatively be equipped with two combination recorders (FDR/CVR).*

6.10.1.7 A Type IA flight data recorder shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IA flight data recorder are listed in the paragraphs below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane.

6.10.1.7.1 The following parameters satisfy the requirements for flight path and speed:

– Pressure altitude
– Indicated airspeed or calibrated airspeed
– Air – ground status and each landing gear air-ground sensor when practicable
– Total or outside air temperature
– Heading (primary flight crew reference)
– Normal acceleration
– Lateral acceleration
– Longitudinal acceleration (body axis)
– Time or relative time count
– Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
– Groundspeed*
– Radio altitude*

6.10.1.7.2 The following parameters satisfy the requirements for attitude:

– Pitch attitude
– Roll attitude
– Yaw or sideslip angle*
– Angle of attack*

6.10.1.7.3 The following parameters satisfy the requirements for engine power:

– Engine thrust/power: propulsive thrust/power on each engine, cockpit thrust/power lever position
– Thrust reverse status*
– Engine thrust command*
– Engine thrust target*
– Engine bleed valve position*
– Additional engine parameters*: EPR, N_1, indicated vibration level, N_2, EGT, TLA, fuel flow, fuel cut-off lever position, N_3

6.10.1.7.4 The following parameters satisfy the requirements for configuration:

– Pitch trim surface position
– Flaps*: trailing edge flap position, cockpit control selection
– Slats*: leading edge flap (slat) position, cockpit control selection
– Landing gear*: landing gear, gear selector position
– Yaw trim surface position*
– Roll trim surface position*
– Cockpit trim control input position pitch*
– Cockpit trim control input position roll*
– Cockpit trim control input position yaw*
– Ground spoiler and speed brake*: ground spoiler position, ground spoiler selection, speed brake position, speed brake selection
– De-icing and/or anti-icing systems selection*
– Hydraulic pressure (each system)*
– Fuel quantity*
– AC electrical bus status*
– DC electrical bus status*
– APU bleed valve position*
– Computed centre of gravity*

6.10.1.7.5 The following parameters satisfy the requirements for operation:

– Warnings
– Primary flight control surface and primary flight control pilot input: pitch axis, roll axis, yaw axis
– Marker beacon passage

- Each navigation receiver frequency selection
- Manual radio transmission keying and CVR/FDR synchronization reference
- Autopilot/autothrottle/AFCS mode and engagement status*
- Selected barometric setting*: pilot, first officer
- Selected altitude (all pilot selectable modes of operation)*
- Selected speed (all pilot selectable modes of operation)*
- Selected mach (all pilot selectable modes of operation)*
- Selected vertical speed (all pilot selectable modes of operation)*
- Selected heading (all pilot selectable modes of operation)*
- Selected flight path (all pilot selectable modes of operation)*: course/DSTRK, path angle
- Selected decision height*
- EFIS display format*: pilot, first officer
- Multi-function/engine/alerts display format*
- GPWS/TAWS/GCAS status*: selection of terrain display mode including pop-up display status, terrain alerts, both cautions and warnings, and advisories, on/off switch position
- Low pressure warning*: hydraulic pressure, pneumatic pressure
- Computer failure*
- Loss of cabin pressure*
- TCAS/ACAS (traffic alert and collision avoidance system/airborne collision avoidance system)*
- Ice detection*
- Engine warning each engine vibration*
- Engine warning each engine over temperature*
- Engine warning each engine oil pressure low*
- Engine warning each engine over speed*
- Wind shear warning*
- Operational stall protection, stick shaker and pusher activation*
- All cockpit flight control input forces*: control wheel, control column, rudder pedal cockpit input forces
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Primary navigation system reference*: GNSS, INS, VOR/DME, MLS, Loran C, ILS
- Brakes*: left and right brake pressure, left and right brake pedal position
- Date*
- Event marker*
- Head up display in use*
- Para visual display on*

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on aeroplane complexity. Parameters without an (*) are to be recorded regardless of aeroplane complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by aeroplane systems and/or flight crew to operate the aeroplane.

6.10.2 Flight data recorders — duration

Types I and II flight data recorders shall be capable of retaining the information recorded during at least the last 25 hours of their operation.

6.10.3 Flight data recorders — aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1989

6.10.3.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg shall be equipped with a Type I flight data recorder.

6.10.3.2 **Recommendation.—** *All aeroplanes of a maximum certificated take-off mass of over 5 700 kg up to and including 27 000 kg should be equipped with a Type II flight data recorder.*

6.10.4 Flight data recorders — aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005

All aeroplanes of a maximum certificated take-off mass of over 5 700 kg shall be equipped with a Type IA flight data recorder.

6.10.5 Cockpit voice recorders — aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1987

Note.— Cockpit voice recorder performance requirements are as contained in the Minimum Operational Performance Specifications (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

6.10.5.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg shall be equipped with a cockpit voice recorder, the objective of which is the recording of the aural environment on the flight deck during flight time.

6.10.5.2 **Recommendation.—** *All aeroplanes of a maximum certificated take-off mass of over 5 700 kg up to and including 27 000 kg should be equipped with a cockpit voice recorder, the objective of which is the recording of the aural environment on the flight deck during flight time.*

6.10.6 Cockpit voice recorders — duration

6.10.6.1 A cockpit voice recorder shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

6.10.6.2 **Recommendation.—** *A cockpit voice recorder, installed in aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1990, should be capable of retaining the information recorded during at least the last two hours of its operation.*

6.10.6.3 A cockpit voice recorder, installed in aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued after 1 January 2003, shall be capable of retaining the information recorded during at least the last two hours of its operation.

6.10.7 Flight recorders — construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

Note.— Industry crashworthiness and fire protection specifications can be found in documents such as the European Organization for Civil Aviation Equipment (EUROCAE) documents ED55 and ED56A.

6.10.8 Flight recorders — operation

6.10.8.1 Flight recorders shall not be switched off during flight time.

6.10.8.2 To preserve flight recorder records, flight recorders shall be de-activated upon completion of flight time following an accident or incident. The flight recorders shall not be re-activated before their disposition as determined in accordance with Annex 13.

Note 1.— The need for removal of the flight recorder records from the aircraft will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2.— The pilot-in-command's responsibilities regarding the retention of flight recorder records are contained in 6.10.9.

6.10.9 Flight recorder records

The pilot-in-command shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with Annex 13.

6.10.10 Flight recorders — continued serviceability

Operational checks and evaluations of recordings from the flight data and cockpit voice recorder systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the flight data and cockpit voice recorder systems are given in Attachment A.

6.11 Mach number indicator

All aeroplanes with speed limitations expressed in terms of Mach number shall be equipped with a Mach number indicator.

Note.— This does not preclude the use of the airspeed indicator to derive Mach number for ATS purposes.

6.12 Emergency locator transmitter (ELT)

6.12.1 Except as provided for in 6.12.2, until 1 January 2005 all aeroplanes operated on extended flights over water as described in 6.3.3 b) and when operated on flights over designated land areas as described in 6.4 shall be equipped with one ELT.

6.12.2 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2002, operated on extended flights over water as described in 6.3.3 b) and when operated on flights over designated land areas as described in 6.4 shall be equipped with one automatic ELT.

6.12.3 From 1 January 2005, all aeroplanes operated on extended flights over water as described in 6.3.3 b) and when operated on flights over designated land areas as described in 6.4 shall be equipped with one automatic ELT.

6.12.4 **Recommendation.—** *All aeroplanes should carry an automatic ELT.*

6.12.5 ELT equipment carried to satisfy the requirements of 6.12.1, 6.12.2, 6.12.3 and 6.12.4 shall operate in accordance with the relevant provisions of Annex 10, Volume III.

6.13 Aeroplanes required to be equipped with a pressure-altitude reporting transponder

6.13.1 From 1 January 2003, unless exempted by the appropriate authorities, all aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.

6.13.2 **Recommendation.—** *All aeroplanes should be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.*

Note.— The provisions in 6.13.1 and 6.13.2 are intended to support the effectiveness of ACAS as well as to improve the effectiveness of air traffic services. Effective dates for carriage requirements of ACAS are contained in Annex 6, Part I, 6.18.1 and 6.18.2. The intent is also for aircraft not equipped with pressure-altitude reporting transponders to be operated so as not to share airspace used by aircraft equipped with airborne collision avoidance systems. To this end, exemptions from the carriage requirement for pressure-altitude reporting transponders could be given by designating airspace where such carriage is not required.

6.14 Aeroplanes required to be equipped with an airborne collision avoidance system (ACAS II)

6.14.1 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg, or authorized to carry more than 30 passengers, for which the individual airworthiness certificate is first issued after 24 November 2005, should be equipped with an airborne collision avoidance system (ACAS II).*

6.14.2 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg, or authorized to carry more than 30 passengers, for which the individual airworthiness certificate is first issued after 1 January 2007, shall be equipped with an airborne collision avoidance system (ACAS II).

6.14.3 **Recommendation.—** *All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 15 000 kg, or authorized to carry more than 19 passengers, for which the individual airworthiness certificate is first issued after 1 January 2008, should be equipped with an airborne collision avoidance system (ACAS II).*

6.15 Microphones

Recommendation.— *All flight crew members required to be on flight deck duty should communicate through boom or throat microphones below the transition level/altitude.*

CHAPTER 7. AEROPLANE COMMUNICATION AND NAVIGATION EQUIPMENT

7.1 Communication equipment

7.1.1 An aeroplane to be operated in accordance with the instrument flight rules or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication with those aeronautical stations and on those frequencies prescribed by the appropriate authority.

Note.— The requirements of 7.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

7.1.2 When compliance with 7.1.1 requires that more than one communication equipment unit be provided, each shall be independent of the other or others to the extent that a failure in any one will not result in failure of any other.

7.1.3 An aeroplane to be operated in accordance with the visual flight rules, but as a controlled flight, shall, unless exempted by the appropriate authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

7.1.4 An aeroplane to be operated on a flight to which the provisions of 6.3.3 or 6.4 apply shall, unless exempted by the appropriate authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

7.1.5 The radio communication equipment required in accordance with 7.1.1 to 7.1.4 shall provide for communication on the aeronautical emergency frequency 121.5 MHz.

7.2 Navigation equipment

7.2.1 An aeroplane shall be provided with navigation equipment which will enable it to proceed:

a) in accordance with the flight plan; and

b) in accordance with the requirements of air traffic services;

except when, if not so precluded by the appropriate authority, navigation for flights under the visual flight rules is accomplished by visual reference to landmarks at least every 110 km (60 NM).

7.2.2 For flights in defined portions of airspace or on routes where an RNP type has been prescribed, an aeroplane shall, in addition to the requirements specified in 7.2.1:

a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed RNP type(s); and

b) be authorized by the State of Registry for operations in such airspace.

Note.— Information on RNP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613). This document also contains a comprehensive list of references to other documents produced by States and international bodies concerning navigation systems and RNP.*

7.2.3 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, minimum navigation performance specifications (MNPS) are prescribed, an aeroplane shall be provided with navigation equipment which:

a) continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

b) has been authorized by the State of Registry for MNPS operations concerned.

Note.— The prescribed minimum navigation performance specifications and the procedures governing their application are published in Regional Supplementary Procedures *(Doc 7030).*

7.2.4 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, an aeroplane:

a) shall be provided with equipment which is capable of:

1) indicating to the flight crew the flight level being flown;

2) automatically maintaining a selected flight level;

3) providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed ± 90 m (300 ft); and

4) automatically reporting pressure-altitude; and

b) shall be authorized by the State of Registry for operation in the airspace concerned.

7.2.5 Prior to granting the RVSM approval required in accordance with 7.2.4 b), the State shall be satisfied that:

a) the vertical navigation performance capability of the aeroplane satisfies the requirements specified in Appendix 2;

b) the operator has instituted appropriate procedures in respect of continued airworthiness (maintenance and repair) practices and programmes; and

c) the operator has instituted appropriate flight crew procedures for operations in RVSM airspace.

Note.— An RVSM approval is valid globally on the understanding that any operating procedures specific to a given region will be stated in the operations manual or appropriate crew guidance.

7.2.6 The State of the Operator, in consultation with the State of Registry if appropriate, shall ensure that, in respect of those aeroplanes mentioned in 7.2.4, adequate provisions exist for:

a) receiving the reports of height-keeping performance issued by the monitoring agencies established in accordance with Annex 11, 3.3.4.1; and

b) taking immediate corrective action for individual aircraft, or aircraft type groups, identified in such reports as not complying with the height-keeping requirements for operation in airspace where RVSM is applied.

7.2.7 All States that are responsible for airspace where RVSM has been implemented, or have issued RVSM approvals to operators within their State, shall establish provisions and procedures which ensure that appropriate action will be taken in respect of aircraft and operators found to be operating in RVSM airspace without a valid RVSM approval.

Note 1.— These provisions and procedures need to address both the situation where the aircraft in question was operating without approval in the airspace of the State, and the situation where an operator for which the State has regulatory oversight responsibility is found to be operating without the required approval in the airspace of another State.

Note 2.— Guidance material relating to the approval for operation in RVSM airspace is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

7.2.8 The aeroplane shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aeroplane to navigate in accordance with 7.2.1 and where applicable 7.2.2, 7.2.3 and 7.2.4.

Note 1.— This requirement may be met by means other than the duplication of equipment.

Note 2.— Guidance material relating to aircraft equipment necessary for flight in airspace where RVSM is applied is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

7.2.9 On flights in which it is intended to land in instrument meteorological conditions, an aeroplane shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in instrument meteorological conditions and for any designated alternate aerodromes.

CHAPTER 8. AEROPLANE MAINTENANCE

Note 1.— For the purpose of this chapter "aeroplane" includes: powerplants, propellers, components, accessories, instruments, equipment and apparatus including emergency equipment.

Note 2.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual *(Doc 9760).*

8.1 Responsibilities

8.1.1 The owner of an aeroplane, or in the case where it is leased, the lessee, shall ensure that:

a) the aeroplane is maintained in an airworthy condition;

b) the operational and emergency equipment necessary for the intended flight is serviceable;

c) the Certificate of Airworthiness of the aeroplane remains valid; and

d) the maintenance of the aeroplane is performed in accordance with a maintenance programme acceptable to the State of Registry.

8.1.2 The aeroplane shall not be operated unless it is maintained and released to service under a system acceptable to the State of Registry.

8.1.3 When the maintenance release is not issued by an approved maintenance organization in accordance with Annex 6, Part I, 8.7, the person signing the maintenance release shall be licensed in accordance with Annex 1.

8.2 Maintenance records

8.2.1 The owner shall ensure that the following records are kept for the periods mentioned in 8.2.2:

a) the total time in service (hours, calendar time and cycles, as appropriate) of the aeroplane and all life limited components;

b) the current status of compliance with all mandatory continuing airworthiness information;

c) appropriate details of modifications and repairs;

d) the time in service (hours, calendar time and cycles, as appropriate) since last overhaul of the aeroplane or its components subject to a mandatory overhaul life;

e) the current status of the aeroplane's compliance with the maintenance programme; and

f) the detailed maintenance records to show that all requirements for signing a maintenance release have been met.

8.2.2 The records referred to in 8.2.1 a) to e) shall be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service, and the records in 8.2.1 f) for a minimum period of one year after the signing of the maintenance release.

8.2.3 The lessee of an aeroplane shall comply with the requirements of 8.2.1 and 8.2.2, as applicable, while the aeroplane is leased.

Note.— Maintenance records or related documents, other than a valid certificate of airworthiness, need not be carried in the aeroplane during international flights.

8.3 Continuing airworthiness information

The owner of an aeroplane over 5 700 kg maximum certificated take-off mass, or in the case where it is leased, the lessee, shall, as prescribed by the State of Registry, ensure that the information resulting from maintenance and operational experience with respect to continuing airworthiness, is transmitted as required by Annex 8, Part II, 4.3.5 and 4.3.8.

8.4 Modifications and repairs

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry. Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

8.5 Maintenance release

8.5.1 A maintenance release shall be completed and signed, as prescribed by the State of Registry, to certify that the maintenance work performed has been completed satisfactorily.

8.5.2 A maintenance release shall contain a certification including:

a) basic details of the maintenance carried out;

b) date such maintenance was completed;

c) when applicable, the identity of the approved maintenance organization; and

d) the identity of the person or persons signing the release.

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CHAPTER 9. AEROPLANE FLIGHT CREW

9.1 Qualifications

9.1.1 The pilot-in-command shall ensure that the licences of each flight crew member have been issued or rendered valid by the State of Registry, and are properly rated and of current validity, and shall be satisfied that flight crew members have maintained competence.

Note.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

9.1.2 The pilot-in-command of an aeroplane equipped with an airborne collision avoidance system (ACAS II) shall ensure that each flight crew member has been appropriately trained to competency in the use of ACAS II equipment and the avoidance of collisions.

Note 1.— Procedures for the use of ACAS II equipment are specified in PANS-OPS, *Volume I. ACAS II Training Guidelines for Pilots are provided in PANS-OPS, Volume I, Attachment A to Part VIII.*

Note 2.— Appropriate training, to the satisfaction of the State, to competency in the use of ACAS II equipment and the avoidance of collisions may be evidenced, for example, by:

a) possession of a type rating for an aeroplane equipped with ACAS II, where the operation and use of ACAS II are included in the training syllabus for the type rating; or

b) possession of a document issued by a training organization or person approved by the State to conduct training for pilots in the use of ACAS II, indicating that the holder has been trained in accordance with the guidelines referred to in Note 1; or

c) a comprehensive pre-flight briefing by a pilot who has been trained in the use of ACAS II in accordance with the guidelines referred to in Note 1.

9.2 Composition of the flight crew

The number and composition of the flight crew shall not be less than that specified in the flight manual or other documents associated with the certificate of airworthiness.

APPENDIX 1. LIGHTS TO BE DISPLAYED BY AEROPLANES

(Note.— See Chapter 6)

1. Terminology

When the following terms are used in this Appendix, they have the following meanings:

Angles of coverage.

a) Angle of coverage A is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left respectively, looking aft along the longitudinal axis to a vertical plane passing through the longitudinal axis.

b) Angle of coverage F is formed by two intersecting vertical planes making angles of 110 degrees to the right and 110 degrees to the left respectively, looking forward along the longitudinal axis to a vertical plane passing through the longitudinal axis.

c) Angle of coverage L is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the left of the first, when looking forward along the longitudinal axis.

d) Angle of coverage R is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

Horizontal plane. The plane containing the longitudinal axis and perpendicular to the plane of symmetry of the aeroplane.

Longitudinal axis of the aeroplane. A selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the aeroplane.

Making way. An aeroplane on the surface of the water is ''making way'' when it is under way and has a velocity relative to the water.

Under command. An aeroplane on the surface of the water is ''under command'' when it is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels.

Under way. An aeroplane on the surface of the water is ''under way'' when it is not aground or moored to the ground or to any fixed object on the land or in the water.

Vertical planes. Planes perpendicular to the horizontal plane.

Visible. Visible on a dark night with a clear atmosphere.

2. Navigation lights to be displayed in the air

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for navigation lights.

As illustrated in Figure 1, the following unobstructed navigation lights shall be displayed:

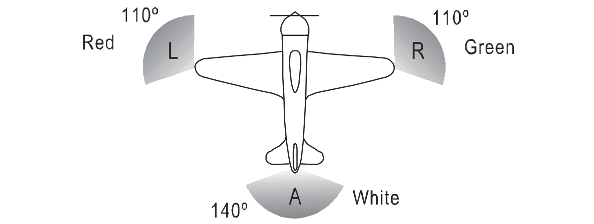


Figure 1

a) a red light projected above and below the horizontal plane through angle of coverage L;

b) a green light projected above and below the horizontal plane through angle of coverage R;

c) a white light projected above and below the horizontal plane rearward through angle of coverage A.

3. Lights to be displayed on the water

3.1 General

Note.— The lights specified herein are intended to meet the requirements of Annex 2 for lights to be displayed by aeroplanes on the water.

The International Regulations for Preventing Collisions at Sea require different lights to be displayed in each of the following circumstances:

a) when under way;

b) when towing another vessel or aeroplane;

c) when being towed;

d) when not under command and not making way;

e) when making way but not under command;

f) when at anchor;

g) when aground.

The lights required by aeroplanes in each case are described below.

3.2 When under way

As illustrated in Figure 2, the following appearing as steady unobstructed lights:

a) a red light projected above and below the horizontal through angle of coverage L;

b) a green light projected above and below the horizontal through angle of coverage R;

c) a white light projected above and below the horizontal through angle of coverage A; and

d) a white light projected through angle of coverage F.

The lights described in a), b) and c) should be visible at a distance of at least 3.7 km (2 NM). The light described in d) should be visible at a distance of 9.3 km (5 NM) when fitted to an aeroplane of 20 m or more in length or visible at a distance of 5.6 km (3 NM) when fitted to an aeroplane of less than 20 m in length.

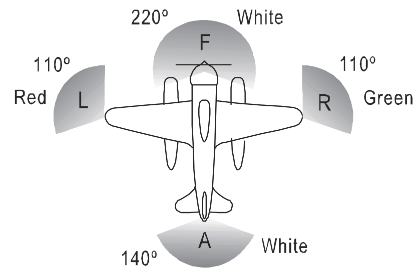


Figure 2

3.3 When towing another vessel or aeroplane

As illustrated in Figure 3, the following appearing as steady, unobstructed lights:

a) the lights described in 3.2;

b) a second light having the same characteristics as the light described in 3.2 d) and mounted in a vertical line at least 2 m above or below it; and

c) a yellow light having otherwise the same characteristics as the light described in 3.2 c) and mounted in a vertical line at least 2 m above it.

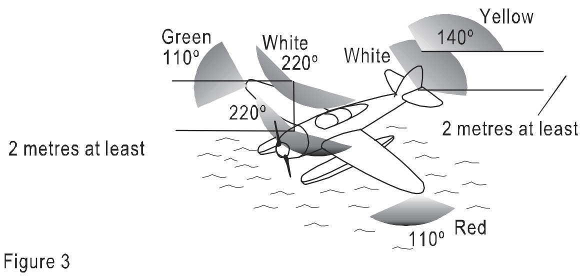


Figure 3

3.4 When being towed

The lights described in 3.2 a), b) and c) appearing as steady, unobstructed lights.

3.5 When not under command and not making way

As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3.7 km (2 NM).

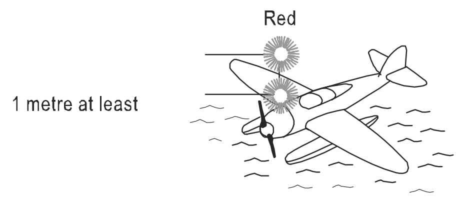


Figure 4

3.6 When making way but not under command

As illustrated in Figure 5, the lights described in 3.5 plus the lights described in 3.2 a), b) and c).

Note.— The display of lights prescribed in 3.5 and 3.6 is to be taken by other aircraft as signals that the aeroplane showing them is not under command and cannot therefore get out of the way. They are not signals of aero-planes in distress and requiring assistance.

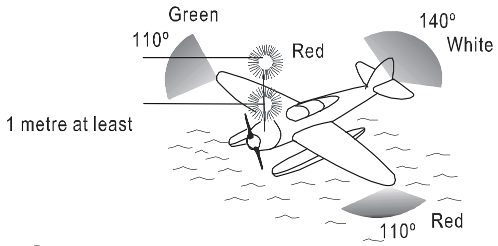


Figure 5

3.7 When at anchor

a) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 NM).

b) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 NM).

c) If 50 m or more in span a steady white light on each side (Figures 8 and 9) to indicate the maximum span and visible, so far as practicable, all around the horizon at a distance of at least 1.9 km (1 NM).

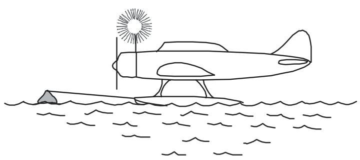


Figure 6

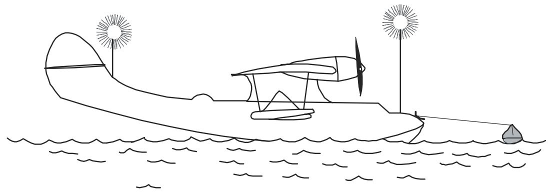
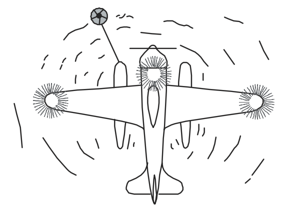
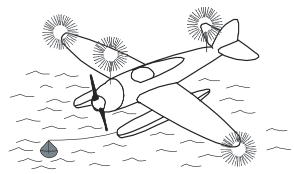


Figure 7



Less than 50 metres in length; 50 metres or more in span

Figure 8



50 metres or more in length; 50 metres or more in span

Figure 9

3.8 When aground

The lights prescribed in 3.7 and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.

APPENDIX 2. ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS FOR OPERATIONS IN RVSM AIRSPACE

(Note.— See Chapter 7, 7.2.5)

1. In respect of groups of aeroplanes that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of aeroplanes shall have a mean no greater than 25 m (80 ft) in magnitude and shall have a standard deviation no greater than $28 - 0.013z^2$ for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in metres, or $92 - 0.004z^2$ for $0 \leq z \leq 80$ where z is in feet. In addition, the components of TVE shall have the following characteristics:

a) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;

b) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft); and

c) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

2. In respect of aeroplanes for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of aeroplanes encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the aeroplane have the following characteristics:

a) the ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and

b) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

ATTACHMENT A. FLIGHT RECORDERS

Supplementary to 6.10

Introduction

The material in this Attachment concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Flight recorders comprise two systems — a flight data recorder and a cockpit voice recorder. Flight data recorders are classified as Type I and Type II depending upon the number of parameters to be recorded.

1. Flight data recorder (FDR)

1.1 General requirements

1.1.1 The recorder is to record continuously during flight time.

1.1.2 The recorder container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

1.1.3 The recorder is to be installed so that:

a) the probability of damage to the recording is minimized. To meet this requirement it should be located as far aft as practicable. In the case of pressurized aeroplanes it should be located in the vicinity of the rear pressure bulkhead;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the recorder without jeopardizing service to essential or emergency loads; and

c) there is an aural or visual means for pre-flight checking that the recorder is operating properly.

1.2 Parameters to be recorded

1.2.1 *Type I flight data recorder*. This recorder will be capable of recording, as appropriate to the aeroplane, at least the 32 parameters in Table A-1. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

1.2.2 *Type II flight data recorder*. This recorder will be capable of recording, as appropriate to the aeroplane, at least the first 15 parameters in Table A-1. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

1.3 Additional information

1.3.1 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.

1.3.2 The manufacturer usually provides the national certificating authority with the following information in respect of the flight data recorder:

a) manufacturer's operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

1.3.3 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information should be maintained by the operator. The documentation must be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

2. Cockpit voice recorder (CVR)

2.1 General requirements

2.1.1 The recorder is to be designed so that it will record at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;

b) aural environment on the flight deck;

c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system;

d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker;

e) voice communication of flight crew members using the passenger address system, if installed; and

f) digital communications with ATS, unless recorded by the flight data recorder.

2.1.2 The recorder container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

2.1.3 To aid in voice and sound discrimination, microphones in the cockpit are to be located in the best position for recording voice communications originating at the pilot and co-pilot stations and voice communications of other crew members on the flight deck when directed to those stations. This can best be achieved by wiring suitable boom microphones to record continuously on separate channels.

2.1.4 The recorder is to be installed so that:

a) the probability of damage to the recording is minimized. To meet this requirement it should be located as far aft as practicable. In the case of pressurized aeroplanes it should be located in the vicinity of the rear pressure bulkhead;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the recorder without jeopardizing service to essential or emergency loads;

c) there is an aural or visual means for pre-flight checking of the recorder for proper operation; and

d) if the recorder has a bulk erasure device, the installation should be designed to prevent operation of the device during flight time or crash impact.

2.2 Performance requirements

2.2.1 The recorder will be capable of recording on at least four tracks simultaneously. To ensure accurate time correlation between tracks, the recorder is to record in an in-line format. If a bi-directional configuration is used, the in-line format and track allocation should be retained in both directions.

2.2.2 The preferred track allocation is as follows:

Track 1 — co-pilot headphones and live boom microphone

Track 2 — pilot headphones and live boom microphone

Track 3 — area microphone

Track 4 — time reference plus the third and fourth crew member's headphone and live microphone, if applicable.

Note 1.— Track 1 is located closest to the base of the recording head.

Note 2.— The preferred track allocation presumes use of current conventional magnetic tape transport mechanisms, and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply.

2.2.3 The recorder, when tested by methods approved by the appropriate certificating authority, will be demonstrated to be suitable for the environmental extremes over which it is designed to operate.

2.2.4 Means will be provided for an accurate time correlation between the flight data recorder and the cockpit voice recorder.

Note.— One method of achieving this is by superimposing the FDR time signal on the CVR.

2.3 Additional information

2.3.1 The manufacturer usually provides the national certificating authority with the following information in respect of the cockpit voice recorder:

a) manufacturer's operating instructions, equipment limitations and installation procedures; and

b) manufacturer's test reports.

3. Inspections of flight data and cockpit voice recorder systems

3.1 Prior to the first flight of the day, the built-in test features on the flight deck for the CVR, FDR and Flight Data Acquisition Unit (FDAU), when installed, should be monitored.

3.2 Annual inspections should be carried out as follows:

a) the readout of the recorded data from the FDR and CVR should ensure that the recorder operates correctly for the nominal duration of the recording;

b) the analysis of the FDR should evaluate the quality of the recorded data to determine if the bit error rate is within acceptable limits and to determine the nature and distribution of the errors;

c) a complete flight from the FDR should be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention should be given to parameters from sensors dedicated to the FDR. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

d) the readout facility should have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

e) an annual examination of the recorded signal on the CVR should be carried out by replay of the CVR recording. While installed in the aircraft the CVR should record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards; and

f) where practicable, during the annual examination, a sample of in-flight recordings of the CVR should be examined for evidence that the intelligibility of the signal is acceptable.

3.3 Flight recorder systems should be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

3.4 A report of the annual inspection should be made available on request to the State's regulatory authority for monitoring purposes.

3.5 Calibration of the FDR system:

a) the FDR system should be re-calibrated at least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters, and to ensure that parameters are being recorded within the calibration tolerances; and

b) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there should be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

Table A-1
Parameters for Flight Data Recorders

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapsed time)	24 hours	4	±0.125% per hour
2	Pressure-altitude	–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)
3	Indicated airspeed	95 km/h (50 kt) to max V_{S0} *(Note 1)* V_{S0} to 1.2 V_D *(Note 2)*	1	±5% ±3%
4	Heading	360°	1	±2°
5	Normal acceleration	–3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%
6	Pitch attitude	±75°	1	±2°
7	Roll attitude	±180°	1	±2°
8	Radio transmission keying	On-off (one discrete)	1	
9	Power on each engine *(Note 3)*	Full range	1 (per engine)	±2%
10	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
11	Leading edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator
12	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)	
13	Ground spoiler/speed brake selection	Full range or each discrete position	1	±2% unless higher accuracy uniquely required
14	Outside air temperature	Sensor range	2	±2°C
15	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1	
Note.— The preceding 15 parameters satisfy the requirements for a Type II FDR.				
16	Longitudinal acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
17	Lateral acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
18	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) *(Note 4)*	Full range	1	±2° unless higher accuracy uniquely required

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
19	Pitch trim position	Full range	1	±3% unless higher accuracy uniquely required
20	Radio altitude	–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)
21	Glide path deviation	Signal range	1	±3%
22	Localizer deviation	Signal range	1	±3%
23	Marker beacon passage	Discrete	1	
24	Master warning	Discrete	1	
25	NAV 1 and 2 frequency selection *(Note 5)*	Full range	4	As installed
26	DME 1 and 2 distance *(Notes 5 and 6)*	0 – 370 km	4	As installed
27	Landing gear squat switch status	Discrete	1	
28	GPWS (ground proximity warning system)	Discrete	1	
29	Angle of attack	Full range	0.5	As installed
30	Hydraulics, each system (low pressure)	Discrete	2	
31	Navigation data (latitude/longitude, ground speed and drift angle) *(Note 7)*	As installed	1	As installed
32	Landing gear or gear selector position	Discrete	4	As installed

Note.— The preceding 32 parameters satisfy the requirements for a Type I FDR.

Notes.—

1. V_{S0} stalling speed or minimum steady flight speed in the landing configuration.
2. V_D design diving speed.
3. Record sufficient inputs to determine power.
4. For aeroplanes with conventional control systems “or” applies. For aeroplanes with non-mechanical control systems “and” applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.
5. If signal available in digital form.
6. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
7. If signals readily available.

If further recording capacity is available, recording of the following additional information should be considered:

a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

   1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

   2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;

   3) warnings and alerts;

   4) the identity of displayed pages for emergency procedures and checklists;

b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs; and

c) additional engine parameters (EPR, N1, EGT, fuel flow, etc.).

ATTACHMENT B. CARRIAGE AND USE OF OXYGEN

Supplementary to 4.9

Introduction

The performance of crew members and the well-being of passengers during flights at such altitudes where a lack of oxygen might result in impairment of faculties are of major concern. Research conducted in altitude chambers or by exposure to mountain elevations indicates that human tolerance could be related to the altitude concerned and the exposure time. The subject is dealt with in detail in the *Manual of Civil Aviation Medicine* (Doc 8984). In the light of the above and to further assist the pilot-in-command in providing the oxygen supply intended by 4.9 of this Annex, the following guidelines, which take into account the requirements already established in Annex 6, Part I, are considered relevant.

1. Oxygen supply

1.1 A flight to be operated at altitudes at which the atmospheric pressure in personnel compartments will be less than 700 hPa should not be commenced unless sufficient stored breathing oxygen is carried to supply:

a) all crew members and at least 10 per cent of the passengers for any period in excess of 30 minutes that the pressure in compartments occupied by them will be between 700 hPa and 620 hPa; and

b) all crew members and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

1.2 A flight to be operated with a pressurized aeroplane should not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all crew members and passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa. In addition, when an aeroplane is operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa and cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, there shall be no less than a 10-minute supply for the occupants of the passenger compartment.

2. Use of oxygen

2.1 All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, should use breathing oxygen continuously whenever the circumstances prevail for which its supply has been indicated to be necessary in 1.1 or 1.2.

2.2 All flight crew members of pressurized aeroplanes operating above an altitude where the atmospheric pressure is less than 376 hPa should have available at the flight duty station a quick donning type of mask which will readily supply oxygen upon demand.

Note.— Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*
376 hPa	*7 600*	*25 000*

— END —

International Standards
and Recommended Practices

Annex 6
to the Convention on
International Civil Aviation

Operation of Aircraft

Part III
International Operations — Helicopters

This edition incorporates all amendments
adopted by the Council prior to 13 March 2001
and supersedes, on 1 November 2001, all previous
editions of Part III of Annex 6.

For information regarding the applicability
of the Standards and Recommended Practices,
see Foreword.

Fifth Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-8	Incorporated in this Edition		
9	27/11/03	—	ICAO
10	24/11/05	—	ICAO
11	23/11/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

ABBREVIATIONS AND SYMBOLS
(used in this Annex)

Abbreviations

ADREP	Accident/incident reporting
ADS	Automatic dependent surveillance
AFCS	Automatic flight control system
AIG	Accident investigation and prevention
AOC	Aeronautical operational control
AOC	Air operator certificate
ATC	Air traffic control
ATM	Air traffic management
ATS	Air traffic services
CAT I	Category I
CAT II	Category II
CAT III	Category III
CAT IIIA	Category IIIA
CAT IIIB	Category IIIB
CAT IIIC	Category IIIC
CDL	Configuration deviation list
CFIT	Controlled flight into terrain
cm	Centimetre
CPDLC	Controller-pilot data link communications
CVR	Cockpit voice recorder
DA	Decision altitude
DA/H	Decision altitude/height
D-FIS	Data link-flight information services
DH	Decision height
DME	Distance measuring equipment
Distance DR	The horizontal distance that the helicopter has travelled from the end of the take-off distance available
ECAM	Electronic centralized aircraft monitor
EFIS	Electronic flight instrument system
EGT	Exhaust gas temperature
EICAS	Engine indication and crew alerting system
ELT	Emergency locator transmitter
ELT(AF)	Automatic fixed ELT
ELT(AP)	Automatic portable ELT
ELT(AD)	Automatically deployable ELT
ELT(S)	Survival ELT
EUROCAE	European Organization for Civil Aviation Equipment
EPR	Engine pressure ratio
FATO	Final approach and take-off area
FDAU	Flight data acquisition unit
FDR	Flight data recorder
FM	Frequency modulation
ft	Foot
g	Normal acceleration
GNSS	Global navigation satellite system
hPa	Hectopascal
HUMS	Health and usage monitor system
IFR	Instrument flight rules
ILS	Instrument landing system
IMC	Instrument meteorological conditions
INS	Inertial navigation system

Abbreviations

kg	Kilogram
km	Kilometre
LDAH	Landing distance available
LDP	Landing decision point
LDRH	Landing distance required
m	Metre
MDA	Minimum descent altitude
MDA/H	Minimum descent altitude/height
MDH	Minimum descent height
MEL	Minimum equipment list
MHz	Megahertz
MLS	Microwave landing system
MMEL	Master minimum equipment list
MOPS	Minimum operational performance specification
NAV	Navigation
N_f	Free power turbine speed
N_g	Engine gas generator speed
NM	Nautical mile
OCA	Obstacle clearance altitude
OCA/H	Obstacle clearance altitude/height
OCH	Obstacle clearance height
PANS	Procedures for Air Navigation Services
PNR	Point of no return
R	Rotor radius
RNP	Required navigation performance
RTODR	Rejected take-off distance required
RVR	Runway visual range
SAR	Search and rescue
SI	International System of Units
SICASP	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel
SOP	Standard operating procedures
T_4	Engine exhaust gas temperature
TDP	Take-off decision point
TIT	Turbine inlet temperature
TLOF	Touchdown and lift-off area
TODAH	Take-off distance available
TODRH	Take-off distance required
UTC	Coordinated universal time
VFR	Visual flight rules
VMC	Visual meteorological conditions
V_{TOSS}	The minimum speed at which climb shall be achieved with the critical power-unit inoperative, the remaining power-units operating within approved operating limits
V_y	Best rate of climb speed
WXR	Weather

Symbols

°C	Degrees Celsius
%	Per cent

PUBLICATIONS

(referred to in this Annex)

Convention on International Civil Aviation (Doc 7300)

European Organization for Civil Aviation Equipment (EUROCAE) Documents ED55 and ED56A

Policy and Guidance Material on the Economic Regulation of International Air Transport (Doc 9587)

Protocol Relating to an Amendment to the Convention on International Civil Aviation (Article 83 bis*)* (Doc 9318)

Annexes to the Convention on International Civil Aviation

Annex 1 — Personnel Licensing

Annex 2 — Rules of the Air

Annex 3 — Meteorological Service for International Air Navigation

Annex 4 — Aeronautical Charts

Annex 5 — Units of Measurement to be Used in Air and Ground Operations

Annex 6 — Operation of Aircraft
Part I — *International Commercial Air Transport — Aeroplanes*
Part II — *International General Aviation — Aeroplanes*

Annex 8 — Airworthiness of Aircraft

Annex 9 — Facilitation

Annex 10 — Aeronautical Telecommunications
Volume III (Part I — *Digital Data Communication Systems;* Part II — *Voice Communication Systems*)
Volume IV *(Surveillance Radar and Collision Avoidance Systems)*

Annex 11 — Air Traffic Services

Annex 12 — Search and Rescue

Annex 13 — Aircraft Accident and Incident Investigation

Annex 14 — Aerodromes
Volume I — *Aerodrome Design and Operations*
Volume II — *Heliports*

Annex 15 — Aeronautical Information Services

Annex 16 — Environmental Protection
Volume I — *Aircraft Noise*

Annex 18 — The Safe Transport of Dangerous Goods by Air

Procedures for Air Navigation Services

OPS — Aircraft Operations (Doc 8168)
Volume I — *Flight Procedures*
Volume II — *Construction of Visual and Instrument Flight Procedures*

ATM — Air Traffic Management (Doc 4444)

TRG — Training (Doc 9868)

Regional Supplementary Procedures (Doc 7030)

Manuals

Accident Prevention Manual (Doc 9422)

Airport Services Manual (Doc 9137)
Part 1 — *Rescue and Fire Fighting*
Part 8 — *Airport Operational Services*

Airworthiness Manual (Doc 9760)

Human Factors Training Manual (Doc 9683)

Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640)

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Manual of Procedures for the Establishment of a State's Personnel Licensing System (Doc 9379)

Manual on Required Navigation Performance (RNP) (Doc 9613)

Preparation of an Operations Manual (Doc 9376)

Safety Management Manual (SMM) (Doc 9859)

Safety Oversight Manual (Doc 9734)
Part A — *The Establishment and Management of a State's Safety Oversight System*

Training Manual (Doc 7192)
Part D-3 — *Flight Operations Officers/Flight Dispatchers*

Circular

Guidance on the Imlementation of Article 83 bis *of the Convention on International Civil Aviation* (Cir 295)

ANNEX 6 — PART III
INTERNATIONAL OPERATIONS — HELICOPTERS

FOREWORD

Historical background

Standards and Recommended Practices for the Operation of Aircraft were first adopted by the Council, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944), on 10 December 1948 for International Air Transport and on 2 December 1968 for International General Aviation. The documents containing these Standards and Recommenced Practices are now designated as Annex 6, Parts I and II, respectively, to the Convention. In general, Parts I and II address aeroplane operations; neither part is specifically applicable to helicopter operations.

Therefore, Part III was introduced as a means of including provisions for helicopter operations. Initially, provisions related to flight data recorders and cockpit voice recorders for helicopters were developed by the Air Navigation Commission following Recommendation 10/1 of the Accident Prevention and Investigation Meeting AIG, (1979) and adopted by the Council on 14 March 1986. They became effective on 27 July 1986 and applicable on 20 November 1986. Subsequently, proposals for comprehensive Standards and Recommended Practices covering other aspects of helicopter operations were developed with the assistance of the Helicopter Operations Panel; these provisions, incorporated in Amendment 1, were adopted by the Council on 21 March 1990. The amendment became effective on 30 July 1990 and applicable on 15 November 1990.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The Standards and Recommended Practices included in Annex 6 — Operation of Aircraft, Parts I and II, cover the operation of all aeroplanes in international civil aviation, except where specifically excluded. Similarly, the Standards and Recommended Practices in Annex 6, Part III, cover the operation of all helicopters in international civil aviation, general aviation as well as commercial air transport operations.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Attention of States is also drawn to the provision of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated.

1. — *Material comprising the Annex proper*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

It is to be noted that some Standards in this Annex may incorporate, by reference, other specifications having the status of Recommended Practices. In such case, the text of the Recommended Practice becomes part of the Standard.

2. — *Material approved by the Council for publication in association with the Standards and Recommended Practices*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.*

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Throughout this Annex, the use of the male gender should be understood to include male and female persons.

Table A. Amendments to Annex 6, Part III

Amendment	*Source*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	Accident Prevention and Investigation Divisional Meeting AIG (1979)	Provisions for flight recorders in helicopters.	14 March 1986 27 July 1986 20 November 1986
1 (2nd Edition)	Fourth Meeting of the Helicopter Operations Panel. Amendments consequential to 1990 amendments to Annex 6, Parts I and II. Air Navigation Commission — directed studies	a) Introduction of provisions pertaining to helicopter operations, similar in scope to those contained in Annex 6, Parts I and II, for aeroplanes. These provisions, together with the flight recorder provisions previously introduced in the First Edition of Annex 6, Part III, complete the initial development of Standards and Recommended Practices for helicopter operations; b) introduction of provisions pertaining to the air operator certificate, minimum equipment lists, the operations manual, and some new definitions. These provisions serve to preserve the parallelism among the three parts of Annex 6; c) introduction of guidance material concerning recording on FDRs of operational flight information for those helicopters equipped with electronic displays.	21 March 1990 30 July 1990 15 November 1990
2	Fifth meeting of the Operations Panel, Eighth meeting of the Review of the General Concept of Separation Panel, Accident Investigation Divisional Meeting (AIG/1992), Air Navigation Commission studies	a) Revision of definitions of heliport operating minima, decision altitude/height, minimum descent altitude/height and introduction of definition of obstacle clearance altitude/height; b) introduction of new definitions for emergency locator transmitters (ELTs), required navigation performance (RNP) and RNP type; c) introduction of a requirement concerning the use of engraving metal foil flight data recorders; d) introduction of carriage requirements for emergency locator transmitters (ELTs) to replace provisions regarding survival radio equipment and emergency location beacon; e) introduction of a requirement that the navigation equipment carried shall enable the aircraft to proceed in accordance with RNP types prescribed for the intended route(s) or areas(s).	21 March 1994 25 July 1994 10 November 1994
3 (3rd Edition)	Air Navigation Commission studies, Fourteenth meeting of the Dangerous Goods Panel, editorial amendment, text alignment with Annex 6, Part I and/or Part II, consequential amendment	a) Introduction of new and revised definitions; b) new provisions concerning accident prevention and flight safety programmes; c) revision of the provisions concerning operating facilities, in-flight simulation of emergency situations, minimum flight altitudes, flight time, flight duty periods and rest periods for crew members, flight preparation, oxygen supply, flight crew members at duty stations, duties of flight operations officers and new provisions for carry-on baggage;	10 March 1995 24 July 1995 9 November 1995

Amendment	*Source*	*Subject(s)*	*Adopted* *Effective* *Applicable*
		d) revision of provisions concerning mass limitations and medical supplies;	
		e) new provisions related to oxygen equipment, revision of the provisions for helicopters operated in accordance with visual flight rules (VFR) and instrument flight rules (IFR);	
		f) new requirements for the flight crew training programme concerning knowledge and skills related to human performance and limitations;	
		g) revision of the denomination of flight operations officers to align with Annex 1;	
		h) revision of the contents of the operations manual; new provisions concerning heliport operating minima, oxygen supply, flight and duty time limitations, procedures and checklists used by flight crew, specifications for the operational flight plan, the flight crew training programme, the cabin attendant duties training programme, security instruction and guidance, accident prevention and flight safety programme, departure contingency procedures and instructions for mass and balance control;	
		i) new provisions on flight time, flight duty periods and rest periods for cabin attendants and revision of the provisions concerning training;	
		j) revision of the provisions concerning first-aid medical supplies; and	
		k) new provisions concerning the minimum equipment list (MEL).	
4	Fourth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/4)	Requirement for helicopters to be equipped with pressure-altitude reporting transponders.	19 February 1996 15 July 1996 7 November 1996
5 (4th Edition)	First meeting of the Flight Recorder Panel, ICAO and Industry CFIT Task Force, Air Navigation Commission studies, Amendment 162 to Annex 1, Amendment 38 to Annex 11, editorial amendment	a) Introduction of new and revised definitions for aircraft operating manual, configuration deviation list, human factors principles, human performance, master minimum equipment list, psychoactive substances and required navigation performance;	20 March 1998 20 July 1998 5 November 1998
		b) revision of the notes concerning lease and interchange;	
		c) introduction of a note concerning the use of psychoactive substances;	
		d) new and revised requirements concerning flight recorders;	
		e) new and revised provisions concerning the content of an operations manual relocated in an appendix;	
		f) new provisions concerning the responsibility of States with regard to supervision of operations subject to an air operator certificate, acceptance of an operations manual and establishment of a system for certification and continued surveillance of the operator;	
		g) new provisions related to the de/anti-icing of aircraft on the ground, aeroplane performance operating limitations, mass limitations, sensitive pressure altimeters and recent experience of the co-pilot;	

Amendment	*Source*	*Subject(s)*	*Adopted* *Effective* *Applicable*
		h) revised provisions concerning pressure-altitude reporting transponders; and i) new provisions concerning Human Factors.	
6	Second meeting of the Flight Recorder Panel, 32nd Session of the Assembly, Air Navigation Commission studies	a) Change of terminology from "cabin attendant" to "cabin crew"; b) revised definitions; and c) new provisions concerning the mandatory carriage of ELTs operating on 406 MHz and 121.5 MHz, pressure-altitude reporting transponders and the introduction of an implementation date for the recording of digital communications.	15 March 1999 19 July 1999 4 November 1999
7	Air Navigation Commission studies	a) Revised definitions and introduction of the definition for instrument approach and landing operations; and b) introduction of requirements for the provision of RVR information and criteria for instrument approach operations, revision of the duties of the pilot-in-command.	15 March 2000 17 July 2000 2 November 2000
8 (5th Edition)	Second meeting of the Flight Recorder Panel, Third meeting of the Global Navigation Satellite System Panel, Fifth meeting of the Continuing Airworthiness Panel, Air Navigation Commission studies	a) Update the provisions concerning flight recorders, including the recording of digital communications; FDR requirements for new aircraft; revised parameter listings; introduction of two-hour-duration CVRs; b) amendment of the classification of instrument approach and landing operations; c) new provisions pertaining to approach with vertical guidance (APV) operations; d) new definitions and update of provisions pertaining to maintenance-related requirements; and e) translation in the English language for documents attesting noise certification.	12 March 2001 16 July 2001 1 November 2001
9	Separation and Airspace Safety Panel and Air Navigation Commission studies	a) New provisions concerning language proficiency requirements; b) new definition and provision concerning an operator's flight safety documents system; c) new definition and provisions concerning the safety aspects of ground handling arrangements; and d) authorization by the State of Operator or State of Registry for en-route operations in RNP airspace.	13 March 2003 14 July 2003 27 November 2003
10	Sixth meeting of the Committee on Aviation Environmental Protection	New provisions concerning references to noise certification.	9 March 2005 11 July 2005 24 November 2005

Amendment	*Source*	*Subject(s)*	*Adopted* *Effective* *Applicable*
11	Second meeting of the Flight Crew Licensing and Training Panel, Fourteenth meeting of the Obstacle Clearance Panel, a proposal by the United States, Council request, 35th Session of the Assembly, and the Eleventh Air Navigation Conference	a) Pilot recent experience and proficiency check requirements, cross-crew qualification and cross-crediting of experience, evaluation of competency, threat and error management, and the biannual pilot proficiency check; b) pilot awareness of operational requirements determined by procedure design; c) qualifications for flight operations officers/flight dispatchers and the critical elements of a State regulatory system; d) the carriage of a copy of the air operator certificate in aircraft; and e) safety management provisions and references to new guidance material on the concept of acceptable level of safety.	14 March 2006 17 July 2006 23 November 2006

ANNEX 6 — PART III

SECTION I

GENERAL

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for international operations with helicopters, they have the following meanings:

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft operating manual. A manual, acceptable to the State of the Operator, containing normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems and other material relevant to the operation of the aircraft.

Note.— The aircraft operating manual is part of the operations manual.

Air operator certificate (AOC). A certificate authorizing an operator to carry out specified commercial air transport operations.

Alternate heliport. A heliport specified in the flight plan to which a flight may proceed when it becomes inadvisable to land at the heliport of intended landing.

Note.— An alternate heliport may be the heliport of departure.

Approach and landing operations using instrument approach procedures. Instrument approach and landing operations are classified as follows:

Non-precision approach and landing operations. An instrument approach and landing which utilizes lateral guidance but does not utilize vertical guidance.

Approach and landing operations with vertical guidance. An instrument approach and landing which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach and landing operations. An instrument approach and landing using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer generated navigation data.

Categories of precision approach and landing operations:

Category I (CAT I) operation. A precision instrument approach and landing with a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II (CAT II) operation. A precision instrument approach and landing with a decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft), and a runway visual range not less than 350 m.

Category IIIA (CAT IIIA) operation. A precision instrument approach and landing with:

a) a decision height lower than 30 m (100 ft) or no decision height; and

b) a runway visual range not less than 200 m.

Category IIIB (CAT IIIB) operation. A precision instrument approach and landing with:

a) a decision height lower than 15 m (50 ft) or no decision height; and

b) a runway visual range less than 200 m but not less than 50 m.

Category IIIC (CAT IIIC) operation. A precision instrument approach and landing with no decision height and no runway visual range limitations.

Note.— Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach and landing operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT IIIA but with an RVR in the range of CAT IIIB would be considered a CAT IIIB operation or an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Approach and landing phase — helicopters. That part of the flight from 300 m (1 000 ft) above the elevation of the FATO, if the flight is planned to exceed this height, or from the commencement of the descent in the other cases, to landing or to the balked landing point.

Cabin crew member. A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Configuration deviation list (CDL). A list established by the organization responsible for the type design with the approval of the State of Design which identifies any external parts of an aircraft type which may be missing at the commencement of a flight, and which contains, where necessary, any information on associated operating limitations and performance correction.

Congested area. In relation to a city, town or settlement, any area which is substantially used for residential, commercial or recreational purposes.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Note.— Dangerous goods are classified in Annex 18, Chapter 3.

Decision altitude (DA) *or* ***decision height (DH)***. A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form "decision altitude/height" and abbreviated "DA/H".

Defined point after take-off. The point, within the take-off and initial climb phase, before which the helicopter's ability to continue the flight safely, with one engine inoperative, is not assured and a forced landing may be required.

Defined point before landing. The point, within the approach and landing phase, after which the helicopter's ability to continue the flight safely, with one engine inoperative, is not assured and a forced landing may be required.

Note.— Defined points apply to performance Class 2 helicopters only.

Elevated heliport. A heliport located on a raised structure on land.

Emergency locator transmitter (ELT). A generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following:

Automatic fixed ELT (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft.

Automatic portable ELT (ELT(AP)). An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

Automatic deployable ELT (ELT(AD)). An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.

Survival ELT (ELT(S)). An ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

En-route phase. That part of the flight from the end of the take-off and initial climb phase to the commencement of the approach and landing phase.

Note.— Where adequate obstacle clearance cannot be guaranteed visually, flights must be planned to ensure that obstacles can be cleared by an appropriate margin. In the *event of failure of the critical power-unit, operators may need to adopt alternative procedures.*

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight duty period. The total time from the moment a flight crew member commences duty, immediately subsequent to a rest period and prior to making a flight or a series of flights, to the moment the flight crew member is relieved of all duties having completed such flight or series of flights.

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft.

Flight operations officer/flight dispatcher. A person designated by the operator to engage in the control and supervision of flight operations, whether licensed or not, suitably qualified in accordance with Annex 1, who supports, briefs and/or assists the pilot-in-command in the safe conduct of the flight.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight recorder. Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Flight safety documents system. A set of interrelated documentation established by the operator, compiling and organizing information necessary for flight and ground operations, and comprising, as a minimum, the operations manual and the operators's maintenance control manual.

Flight simulation training device. Any one of the following three types of apparatus in which flight conditions are simulated on the ground:

A flight simulator, which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;

A flight procedures trainer, which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic, etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;

A basic instrument flight trainer, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.

Flight time — helicopters. The total time from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Ground handling. Services necessary for an aircraft's arrival at, and departure from, an airport, other than air traffic services.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Helideck. A heliport located on a floating or fixed off-shore structure.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Heliport operating minima. The limits of usability of a heliport for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;

c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and

d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4 of Annex 2.

Landing decision point (LDP). The point used in determining landing performance from which, a power-unit failure occurring at this point, the landing may be safely continued or a balked landing initiated.

Note.— LDP applies to performance Class 1 helicopters.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance organization's procedures manual. A document endorsed by the head of the maintenance organization which details the maintenance organization's structure and management responsibilities, scope of work, description of facilities, maintenance procedures and quality assurance or inspection systems.

Maintenance programme. A document which describes the specific scheduled maintenance tasks and their frequency of completion and related procedures, such as a reliability programme, necessary for the safe operation of those aircraft to which it applies.

Maintenance release. A document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner, either in accordance with the approved data and the procedures described in the maintenance organization's procedures manual or under an equivalent system.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures.

Maximum mass. Maximum certificated take-off mass.

Minimum descent altitude (MDA) or ***minimum descent height (MDH).*** A specified altitude or height in a non-precision approach or circling approach below which descent must not be made without the required visual reference.

Note 1.— Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3.— For convenience when both expressions are used they may be written in the form "minimum descent altitude/height" and abbreviated "MDA/H".

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type.

Night. The hours between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise, as may be prescribed by the appropriate authority.

Note.— Civil twilight ends in the evening when the centre of the sun's disc is 6 degrees below the horizon and begins in the morning when the centre of the sun's disc is 6 degrees below the horizon.

Obstacle clearance altitude (OCA) or ***obstacle clearance height (OCH).*** The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/height" and abbreviated "OCA/H".

* As defined in Annex 2.

Operational control. The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operational flight plan. The operator's plan for the safe conduct of the flight based on considerations of helicopter performance, other operating limitations and relevant expected conditions on the route to be followed and at the heliports concerned.

Operations manual. A manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Operator's maintenance control manual. A document which describes the operator's procedures necessary to ensure that all scheduled and unscheduled maintenance is performed on the operator's aircraft on time and in a controlled and satisfactory manner.

Performance Class 1 helicopter. A helicopter with performance such that, in case of critical power-unit failure, it is able to land on the rejected take-off area or safely continue the flight to an appropriate landing area, depending on when the failure occurs.

Performance Class 2 helicopter. A helicopter with performance such that, in case of critical power-unit failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off or after a defined point before landing, in which cases a forced landing may be required.

Performance Class 3 helicopter. A helicopter with performance such that, in case of power-unit failure at any point in the flight profile, a forced landing must be performed.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Psychoactive substances. Alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Repair. The restoration of an aeronautical product to an airworthy condition to ensure that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the issuance of the type certificate for the respective aircraft type, after it has been damaged or subjected to wear.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Rest period. Any period of time on the ground during which a flight crew member is relieved of all duties by the operator.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Safe forced landing. Unavoidable landing or ditching with a reasonable expectancy of no injuries to persons in the aircraft or on the surface.

Safety management system. A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Safety programme. An integrated set of regulations and activities aimed at improving safety.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Take-off and initial climb phase. That part of the flight from the start of take-off to 300 m (1 000 ft) above the elevation of the FATO, if the flight is planned to exceed this height, or to the end of the climb in the other cases.

Take-off decision point (TDP). The point used in determining take-off performance from which, a power-unit failure occurring at this point, either a rejected take-off may be made or a take-off safely continued.

Note.— TDP applies to performance Class 1 helicopters.

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling,* equal to or better than specified minima.

Note.— The specified minima are contained in Chapter 4 of Annex 2.

V_{TOSS}. The minimum speed at which climb shall be achieved with the critical power-unit inoperative, the remaining power-units operating within approved operating limits.

Note.— The speed referred to above may be measured by instrument indications or achieved by a procedure specified in the flight manual.

* As defined in Annex 2.

CHAPTER 2. APPLICABILITY

The Standards and Recommended Practices contained in Annex 6, Part III, shall be applicable to all helicopters engaged in international commercial air transport operations or in international general aviation operations, except that these Standards and Recommended Practices are not applicable to helicopters engaged in aerial work.

Note 1.— Standards and Recommended Practices applicable to the operation of aeroplanes by operators authorized to conduct international commercial air transport operations are to be found in Annex 6, Part I.

Note 2.— Standards and Recommended Practices applicable to international general aviation operations with aeroplanes are to be found in Annex 6, Part II.

ANNEX 6 — PART III

SECTION II

INTERNATIONAL COMMERCIAL AIR TRANSPORT

CHAPTER 1. GENERAL

Note 1.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13 that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Note 2.— In the case of international operations effected jointly with helicopters not all of which are registered in the same Contracting State, nothing in this Part of the Annex prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of the relevant Annexes.

1.1 Compliance with laws, regulations and procedures

1.1.1 Operators shall ensure that their employees when abroad know that they must comply with the laws, regulations and procedures of the States in which their helicopters are operated.

1.1.2 Operators shall ensure that all pilots are familiar with the laws, regulations and procedures, pertinent to the performance of their duties, prescribed for the areas to be traversed, the heliports to be used and the air navigation facilities relating thereto. The operator shall ensure that other members of the flight crew are familiar with such of these regulations and procedures as are pertinent to the performance of their respective duties in the operation of the helicopter.

Note.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

1.1.3 Operators shall ensure that flight crew members demonstrate the ability to speak and understand the language used for radiotelephony communications as specified in Annex 1.

1.1.4 An operator or a designated representative shall have responsibility for operational control.

Note.— The rights and obligations of a State in respect to the operation of helicopters registered in that State are not affected by this provision.

1.1.5 Responsibility for operational control shall be delegated only to the pilot-in-command and to a flight operations officer/flight dispatcher if an operator's approved method of control and supervision of flight operations requires the use of flight operations officer/flight dispatcher personnel.

Note.— Guidance on the operational control organization and the role of the flight operations officer/flight dispatcher is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335). Detailed guidance on the authorization, duties and responsibilities of the flight operations officer/flight dispatcher is contained in the manual* Preparation of an Operations Manual *(Doc 9376). The requirements for age, skill, knowledge and experience for licensed flight operations officers/flight dispatchers are contained in Annex 1.*

1.1.6 If an emergency situation which endangers the safety of the helicopter or persons becomes known first to the flight operations officer/flight dispatcher, action by that person in accordance with 2.6.1 shall include, where necessary, notification to the appropriate authorities of the nature of the situation without delay, and requests for assistance if required.

1.1.7 If an emergency situation which endangers the safety of the helicopter or persons necessitates the taking of action which involves a violation of local regulations or procedures, the pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the State of the Operator. Such reports shall be submitted as soon as possible and normally within ten days.

1.1.8 Operators shall ensure that pilots-in-command have available on board the helicopter all the essential information concerning the search and rescue services in the area over which the helicopter will be flown.

Note.— This information may be made available to the pilot by means of the operations manual or such other means as is considered appropriate.

1.1.9 An operator shall establish and maintain an accident prevention and flight safety programme.

Note.— Guidance on accident prevention is contained in the Accident Prevention Manual *(Doc 9422) and in the manual* Preparation of an Operations Manual *(Doc 9376).*

1.1.10 An operator shall establish a flight safety documents system, for the use and guidance of operational personnel.

Note.— Guidance on the development and organization of a flight safety documents system is provided in Attachment G.

1.2 Safety management

1.2.1 States shall establish a safety programme, in order to achieve an acceptable level of safety in the operation of aircraft.

1.2.2 The acceptable level of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes is contained in the Safety Management Manual (SMM) *(Doc 9859) and the definition of acceptable levels of safety is contained in Attachment E to Annex 11.*

1.2.3 **Recommendation.** *States should require, as part of their safety programme, that an operator implement a safety management system acceptable to the State of the Operator that, as a minimum:*

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

1.2.4 From 1 January 2009, States shall require, as part of their safety programme, that an operator implement a safety management system acceptable to the State of the Operator that, as a minimum:

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

1.2.5 A safety management system shall clearly define lines of safety accountability throughout the operator's organization, including a direct accountability for safety on the part of senior management.

Note.— Guidance on safety management systems is contained in the Safety Management Manual (SMM) *(Doc 9859).*

1.2.6 An operator shall establish a flight safety documents system, for the use and guidance of operational personnel, as part of its safety management system.

Note.— Guidance on the development and organization of a flight safety documents system is provided in Attachment G.

1.3 Dangerous goods

Note 1.— Provisions for carriage of dangerous goods are contained in Annex 18.

Note 2.— Article 35 of the Convention refers to certain classes of cargo restrictions.

1.4 Use of psychoactive substances

Note.— Provisions concerning the use of psychoactive substances are contained in Annex 1, 1.2.7 and Annex 2, 2.5.

CHAPTER 2. FLIGHT OPERATIONS

2.1 Operating facilities

2.1.1 An operator shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities available and directly required on such flight, for the safe operation of the helicopter and the protection of the passengers, are adequate for the type of operation under which the flight is to be conducted and are adequately operated for this purpose.

Note.— "Reasonable means" in this Standard is intended to denote the use, at the point of departure, of information available to the operator either through official information published by the aeronautical information services or readily obtainable from other sources.

2.1.2 An operator shall ensure that any inadequacy of facilities observed in the course of operations is reported to the authority responsible for them, without undue delay.

2.1.3 Subject to their published conditions of use, heliports and their facilities shall be kept continuously available for flight operations during their published hours of operations, irrespective of weather conditions.

2.2 Operational certification and supervision

2.2.1 The air operator certificate

2.2.1.1 An operator shall not engage in commercial air transport operations unless in possession of a valid air operator certificate issued by the State of the Operator.

2.2.1.2 The air operator certificate shall authorize the operator to conduct commercial air transport operations in accordance with specified authorizations, conditions and limitations.

Note.— Guidance on the air operator certificate and associated authorizations, conditions and limitations, which may be contained in operations specifications, is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335).*

2.2.1.3 Contracting States shall recognize as valid an air operator certificate issued by another Contracting State provided that the requirements under which the certificate was issued are at least equal to the applicable Standards specified in this Annex.

2.2.1.4 The issue of an air operator certificate by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, method of control and supervision of flight operations, training programme as well as ground handling and maintenance arrangements consistent with the nature and extent of the operations specified.

Note.— Attachment F to Part I of Annex 6 contains guidance on the issue of an air operator certificate.

2.2.1.5 The continued validity of an air operator certificate shall depend upon the operator maintaining the requirements of 2.2.1.4 under the supervision of the State of the Operator.

2.2.1.6 The air operator certificate shall contain at least the following:

a) operator's identification (name, location);

b) date of issue and period of validity;

c) description of the types of operations authorized;

d) the type(s) of aircraft authorized for use; and

e) authorized areas of operation or routes.

2.2.1.7 The State of the Operator shall establish a system for both the certification and the continued surveillance of the operator in accordance with Appendix 2 to ensure that the required standards of operations established in 2.2 are maintained.

2.2.2 Operations manual

2.2.2.1 An operator shall provide, for the use and guidance of operations personnel concerned, an operations manual in accordance with Appendix 1. The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use this manual.

2.2.2.2 The State of the Operator shall establish a requirement for the operator to provide a copy of the operations manual together with all amendments and/or revisions, for review and acceptance and, where required, approval. The operator shall incorporate in the operations manual such mandatory material as the State of the Operator may require.

Note 1.— Requirements for the organization and contents of an operations manual are provided in Appendix 1.

Note 2.— Specific items in an operations manual require the approval of the State of the Operator in accordance with the Standards in Section II, 2.2.7, 4.1.3, 7.3.1 and 10.3.

2.2.3 Operating instructions — general

2.2.3.1 An operator shall ensure that all operations personnel are properly instructed in their particular duties and responsibilities and the relationship of such duties to the operation as a whole.

2.2.3.2 A helicopter rotor shall not be turned under power without a qualified pilot at the controls.

2.2.3.3 **Recommendation.—** *The operator should issue operating instructions and provide information on helicopter climb performance with all engines operating to enable the pilot-in-command to determine the climb gradient that can be achieved during the take-off and initial climb phase for the existing take-off conditions and intended take-off technique. This information should be included in the operations manual.*

2.2.4 In-flight simulation of emergency situations

An operator shall ensure that when passengers or cargo are being carried, no emergency or abnormal situations shall be simulated.

2.2.5 Checklists

The checklists provided in accordance with 4.1.4 shall be used by flight crews prior to, during and after all phases of operations, and in emergency, to ensure compliance with the operating procedures contained in the aircraft operating manual, the flight manual or other documents associated with the certificate of airworthiness and otherwise in the operations manual. The design and utilization of checklists shall observe human factors principles.

Note.— Guidance material on the application of human factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

2.2.6 Minimum flight altitudes

2.2.6.1 An operator shall be permitted to establish minimum flight altitudes for those routes flown for which minimum flight altitudes have been established by the State flown over or the responsible State, provided that they shall not be less than those established by that State, unless specifically approved.

2.2.6.2 An operator shall specify the method by which it is intended to determine minimum flight altitudes for operations conducted over routes for which minimum flight altitudes have not been established by the State flown over, or the responsible State, and shall include this method in the operations manual. The minimum flight altitudes determined in accordance with the above method shall not be lower than specified in Annex 2.

2.2.6.3 **Recommendation.—** *The method for establishing the minimum flight altitudes should be approved by the State of the Operator.*

2.2.6.4 **Recommendation.—** *The State of the Operator should approve such method only after careful consideration of the probable effects of the following factors on the safety of the operation in question:*

a) the accuracy and reliability with which the position of the helicopter can be determined;

b) the inaccuracies in the indications of the altimeters used;

c) the characteristics of the terrain (e.g. sudden changes in the elevation);

d) the probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

e) possible inaccuracies in aeronautical charts; and

f) airspace restrictions.

2.2.7 Heliport operating minima

2.2.7.1 The State of the Operator shall require that the operator establish heliport operating minima for each heliport to be used in operations and shall approve the method of determination of such minima. Such minima shall not be lower than any that may be established for such heliports by the State in which the heliport is located, except when specifically approved, by that State.

Note.— This Standard does not require the State in which the heliport is located to establish heliport operating minima.

2.2.7.2 The State of the Operator shall require that in establishing the heliport operating minima which will apply to any particular operation, full account shall be taken of:

a) the type, performance and handling characteristics of the helicopter;

b) the composition of the flight crew, their competence and experience;

c) the declared distances;

d) the adequacy and performance of the available visual and non-visual ground aids;

e) the equipment available on the helicopter for the purpose of navigation and/or control of the flight path during the approach to landing and the missed approach;

f) the obstacles in the approach and missed approach areas and the obstacle clearance altitude/height for the instrument approach procedures;

g) the means used to determine and report meteorological conditions; and

h) the obstacles in the climb-out areas and necessary clearance margins.

2.2.7.3 Category II and Category III instrument approach and landing operations shall not be authorized unless RVR information is provided.

2.2.7.4 **Recommendation.—** *For instrument approach and landing operations, heliport operating minima below 800 m visibility should not be authorized unless RVR information or an accurate measurement or observation of visibility is provided.*

Note.— Guidance on the operationally desirable and currently attainable accuracy of measurement or observation is given in Annex 3 — Meteorological Service for International Air Navigation, *Attachment B.*

2.2.8 Fuel and oil records

2.2.8.1 An operator shall maintain fuel and oil records to enable the State of the Operator to ascertain that, for each flight, the requirements of 2.3.6 have been complied with.

2.2.8.2 Fuel and oil records shall be retained by the operator for a period of three months.

2.2.9 Crew

2.2.9.1 *Pilot-in-command.* For each flight, the operator shall designate one pilot to act as pilot-in-command.

2.2.9.2 *Flight time, flight duty periods and rest periods.* An operator shall formulate rules to limit flight time and flight duty periods and for the provision of adequate rest periods for all its crew members. These rules shall be in accordance with the regulations established by the State of the Operator, or approved by that State, and included in the operations manual.

2.2.9.3 An operator shall maintain current records of the flight time, flight duty periods and rest periods of all its crew members.

Note.— Guidance on the establishment of limitations is given in Attachment C.

2.2.10 Passengers

2.2.10.1 An operator shall ensure that passengers are made familiar with the location and use of:

a) seat belts;

b) emergency exits;

c) life jackets, if the carriage of life jackets is prescribed;

d) oxygen dispensing equipment, if the provision of oxygen for the use of passengers is prescribed; and

e) other emergency equipment provided for individual use, including passenger emergency briefing cards.

2.2.10.2 The operator shall inform the passengers of the location and general manner of use of the principal emergency equipment carried for collective use.

2.2.10.3 In an emergency during flight, passengers shall be instructed in such emergency action as may be appropriate to the circumstances.

2.2.10.4 The operator shall ensure that, during take-off and landing and whenever considered necessary by reason of turbulence or any emergency occurring during flight, all passengers on board a helicopter shall be secured in their seats by means of the seat belts or harnesses provided.

2.2.11 Over-water flights

All helicopters on flights over water in accordance with 4.5.1 shall be certificated for ditching. Sea state shall be an integral part of ditching information.

2.3 Flight preparation

2.3.1 A flight shall not be commenced until flight preparation forms have been completed certifying that the pilot-in-command is satisfied that:

a) the helicopter is airworthy;

b) the instruments and equipment prescribed in Chapter 4, for the particular type of operation to be undertaken, are installed and are sufficient for the flight;

c) a maintenance release as prescribed in 6.7 has been issued in respect of the helicopter;

d) the mass of the helicopter and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

e) any load carried is properly distributed and safely secured;

f) a check has been completed indicating that the operating limitations of Chapter 3 can be complied with for the flight to be undertaken; and

g) the Standards of 2.3.3 relating to operational flight planning have been complied with.

2.3.2 Completed flight preparation forms shall be kept by an operator for a period of three months.

2.3.3 Operational flight planning

2.3.3.1 An operational flight plan shall be completed for every intended flight. The operational flight plan shall be approved and signed by the pilot-in-command and, where applicable, signed by the flight operations officer/flight dispatcher, and a copy shall be filed with the operator or a designated agent, or, if these procedures are not possible, it shall be left with the heliport authority or on record in a suitable place at the point of departure.

Note.— The duties of a flight operations officer/flight dispatcher are contained in 2.6.

2.3.3.2 The operations manual must describe the content and use of the operational flight plan.

2.3.4 Alternate heliports

2.3.4.1 For a flight to be conducted in accordance with the instrument flight rules, at least one suitable alternate shall be specified in the operational flight plan and the flight plan, unless:

a) the duration of the flight and the meteorological conditions prevailing are such that there is reasonable certainty that, at the estimated time of arrival at the heliport of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions as prescribed by the State of the Operator; or

b) the heliport of intended landing is isolated and no suitable alternate is available. A point of no return (PNR) shall be determined.

2.3.4.2 Suitable off-shore alternates may be specified subject to the following:

a) the off-shore alternates shall be used only after a point of no return (PNR). Prior to PNR on-shore alternates shall be used;

b) mechanical reliability of critical control systems and critical components shall be considered and taken into account when determining the suitability of the alternates;

c) one engine inoperative performance capability shall be attainable prior to arrival at the alternate;

d) deck availability shall be guaranteed; and

e) weather information must be reliable and accurate.

Note.— The landing technique specified in the flight manual following control system failure may preclude the nomination of certain helidecks as alternate heliports.

2.3.4.3 **Recommendation.—** *Off-shore alternates should not be used when it is possible to carry enough fuel to have an on-shore alternate. Such circumstances should be exceptional and should not include payload enhancement in adverse weather conditions.*

2.3.5 Weather conditions

2.3.5.1 A flight to be conducted in accordance with the visual flight rules shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under the visual flight rules will, at the appropriate time, be such as to render compliance with these rules possible.

2.3.5.2 A flight to be conducted in accordance with instrument flight rules shall not be commenced unless the information is available which indicates that conditions at the heliport of intended landing or, when an alternate is required, at least one alternate heliport will, at the estimated time of arrival, be at or above the heliport operating minima.

Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for a heliport when nominated as an alternate than for the same heliport when planned as that of intended landing.

2.3.5.3 A flight to be operated in known or expected icing conditions shall not be commenced unless the helicopter is certificated and equipped to cope with such conditions.

2.3.5.4 A flight to be planned or expected to operate in suspected or known ground icing conditions shall not be commenced unless the helicopter has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other naturally occurring contaminants shall be removed so that the helicopter is kept in an airworthy condition prior to take-off.

Note.— Guidance material is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations *(Doc 9640).*

2.3.6 Fuel and oil supply

2.3.6.1 *All helicopters.* A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the helicopter carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.

2.3.6.2 *Visual flight rules (VFR) operations.* The fuel and oil carried in order to comply with 2.3.6.1 shall, in the case of VFR operations, be at least the amount sufficient to allow the helicopter:

a) to fly to the heliport to which the flight is planned;

b) to fly thereafter for a period of 20 minutes at best-range speed plus 10 per cent of the planned flight time; and

c) to have an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator.

2.3.6.3 *Instrument flight rules (IFR) operations.* The fuel and oil carried in order to comply with 2.3.6.1 shall, in the case of IFR operations, be at least the amount sufficient to allow the helicopter:

2.3.6.3.1 When an alternate is not required, in terms of 2.3.4.1 a), to fly to the heliport to which the flight is planned, and thereafter:

a) to fly 30 minutes at holding speed at 450 m (1 500 ft) above the destination heliport under standard temperature conditions and approach and land; and

b) to have an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator.

2.3.6.3.2 When an alternate is required, to fly to and execute an approach, and a missed approach, at the heliport to which the flight is planned, and thereafter:

a) to fly to the alternate specified in the flight plan; and then

b) to fly for 30 minutes at holding speed at 450 m (1 500 ft) above the alternate under standard temperature conditions, and approach and land; and

c) to have an additional amount of fuel sufficient to provide for the increased consumption on the occurrence of any of the potential contingencies specified by the operator to the satisfaction of the State of the Operator.

2.3.6.3.3 When no suitable alternate is available, in terms of 2.3.4.1 b), to fly to the heliport to which the flight is planned and thereafter for a period of two hours at holding speed.

2.3.6.4 In computing the fuel and oil required in 2.3.6.1, at least the following shall be considered:

a) meteorological conditions forecast;

b) expected air traffic control routings and traffic delays;

c) for IFR flight, one instrument approach at the destination heliport, including a missed approach;

d) the procedures prescribed in the operations manual for loss of pressurization, where applicable, or failure of one power-unit while en route; and

e) any other conditions that may delay the landing of the helicopter or increase fuel and/or oil consumption.

Note.— Nothing in 2.3.6 precludes amendment of a flight plan in flight in order to re-plan the flight to another heliport, provided that the requirements of 2.3.6 can be complied with from the point where the flight has been replanned.

2.3.7 Refuelling with passengers on board or rotors turning

Recommendation.— *A helicopter should not be refuelled when passengers are embarking, on board, disembarking or when the rotor is turning unless the operator is granted specific authorization by the State of the Operator setting forth the conditions under which such fuelling may be carried out.*

Note 1.— Provisions concerning aircraft refuelling are contained in Annex 14, Volume I, and guidance on safe refuelling practices is contained in the Airport Services Manual *(Doc 9137), Parts 1 and 8.*

Note 2.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when *refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.*

2.3.8 Oxygen supply

Note.— Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*
376 hPa	*7 600*	*25 000*

2.3.8.1 A flight to be operated at flight altitudes at which the atmospheric pressure in personnel compartments will be less than 700 hPa shall not be commenced unless sufficient stored breathing oxygen is carried to supply:

a) all crew members and 10 per cent of the passengers for any period in excess of 30 minutes that the pressure in compartments occupied by them will be between 700 hPa and 620 hPa;

b) the crew and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

2.3.8.2 A flight to be operated with a pressurized helicopter shall not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all the crew members and passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa. In addition, when the helicopter is operated at flight altitudes at which the atmospheric pressure is more than 376 hPa and cannot descend safely to a flight altitude at which the atmospheric pressure is equal to 620 hPa within four minutes, there shall be no less than a 10-minute supply for the occupants of the passenger compartment.

2.4 In-flight procedures

2.4.1 Heliport operating minima

2.4.1.1 A flight shall not be continued towards the heliport of intended landing, unless the latest available information indicates that at the expected time of arrival, a landing can be effected at that heliport, or at least one alternate heliport, in compliance with the operating minima established in accordance with 2.2.7.1.

2.4.1.2 An instrument approach shall not be continued beyond the outer marker fix in case of precision approach, or below 300 m (1 000 ft) above the heliport in case of non-precision approach, unless the reported visibility or controlling RVR is above the specified minimum.

2.4.1.3 If, after passing the outer marker fix in case of precision approach, or after descending below 300 m (1 000 ft) above the heliport in case of non-precision approach, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, a helicopter shall not continue its approach-to-land at any heliport beyond a point at which the limits of the operating minima specified for that heliport would be infringed.

2.4.2 Meteorological observations

Note.— The procedures for making meteorological observations on board aircraft in flight and for recording and reporting them are contained in Annex 3, the PANS-ATM (Doc 4444) and the appropriate Regional Supplementary Procedures *(Doc 7030).*

2.4.3 Hazardous flight conditions

Hazardous flight conditions encountered, other than those associated with meteorological conditions, shall be reported to the appropriate aeronautical station as soon as possible. The reports so rendered shall give such details as may be pertinent to the safety of other aircraft.

2.4.4 Flight crew members at duty stations

2.4.4.1 *Take-off and landing.* All flight crew members required to be on flight deck duty shall be at their stations.

2.4.4.2 *En route.* All flight crew members required to be on flight deck duty shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the helicopter or for physiological needs.

2.4.4.3 *Seat belts.* All flight crew members shall keep their seat belt fastened when at their stations.

2.4.4.4 *Safety harness.* Any flight crew member occupying a pilot's seat shall keep the safety harness fastened during the take-off and landing phases; all other flight crew members shall keep their safety harness fastened during the take-off and landing phases unless the shoulder straps interfere with the performance of their duties, in which case the shoulder straps may be unfastened but the seat belt must remain fastened.

Note.— Safety harness includes shoulder straps and a seat belt which may be used independently.

2.4.5 Use of oxygen

All flight crew members, when engaged in performing duties essential to the safe operation of a helicopter in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been required in 2.3.8.1 or 2.3.8.2.

2.4.6 Safeguarding of cabin crew and passengers in pressurized aircraft in the event of loss of pressurization

Recommendation.— *Cabin crew should be safeguarded so as to ensure reasonable probability of their retaining consciousness during any emergency descent which may be necessary in the event of loss of pressurization and, in addition, they should have such means of protection as will enable them to administer first aid to passengers during stabilized flight following the emergency. Passengers should be safeguarded by such devices or operational procedures as will ensure reasonable probability of their surviving the effects of hypoxia in the event of loss of pressurization.*

Note.— It is not envisaged that cabin crew will always be able to provide assistance to passengers during emergency descent procedures which may be required in the event of loss of pressurization.

2.4.7 In-flight operational instructions

Operational instructions involving a change in the ATS flight plan shall, when applicable, be coordinated with the appropriate ATS unit before transmission to the helicopter.

Note.— When the above coordination has not been possible, operational instructions do not relieve a pilot of the responsibility for obtaining an appropriate clearance from an ATS unit, if applicable, before making a change in flight plan.

2.4.8 Instrument flight procedures

2.4.8.1 One or more instrument approach procedures to serve each final approach and take-off area or heliport utilized for instrument flight operations shall be approved and promulgated by the State in which the heliport is located, or by the State which is responsible for the heliport when located outside the territory of any State.

2.4.8.2 All helicopters operated in accordance with instrument flight rules shall comply with the instrument approach procedures approved by the State in which the heliport is located, or by the State which is responsible for the heliport when located outside the territory of any State.

Note 1.— Operational procedures recommended for the guidance of operations personnel involved in instrument flight operations are described in PANS-OPS (Doc 8168), Volume I.

Note 2.— Criteria for the construction of instrument flight procedures for the guidance of procedure specialists are provided in PANS-OPS (Doc 8168), Volume II.

2.4.9 Helicopter operating procedures for noise abatement

Recommendation.— *Noise abatement procedures specified by an operator for any one helicopter type should be the same for all heliports.*

2.5 Duties of pilot-in-command

2.5.1 The pilot-in-command shall be responsible for the operation and safety of the helicopter and for the safety of all crew members, passengers and cargo on board, from the moment the engine(s) are started until the helicopter finally comes to rest at the end of the flight, with the engine(s) shut down and the rotor blades stopped.

2.5.2 The pilot-in-command shall ensure that the checklists specified in 2.2.5 are complied with in detail.

2.5.3 The pilot-in-command shall be responsible for notifying the nearest appropriate authority by the quickest available means of any accident involving the helicopter, resulting in serious injury or death of any person or substantial damage to the helicopter or property.

Note.— A definition of the term "serious injury" is contained in Annex 13.

2.5.4 The pilot-in-command shall be responsible for reporting all known or suspected defects in the helicopter, to the operator, at the termination of the flight.

2.5.5 The pilot-in-command shall be responsible for the journey log book or the general declaration containing the information listed in 9.4.1.

Note.— By virtue of Resolution A10-36 of the Tenth Session of the Assembly (Caracas, June-July 1956) "the general declaration, [described in Annex 9] when prepared so as to contain all the information required by Article 34 [of the Convention on International Civil Aviation] with respect to the journey log book, may be considered by Contracting States to be an acceptable form of journey log book".

2.6 Duties of flight operations officer/flight dispatcher

2.6.1 A flight operations officer/flight dispatcher in conjunction with a method of control and supervision of flight operations in accordance with 2.2.1.4 shall:

a) assist the pilot-in-command in flight preparation and provide the relevant information;

b) assist the pilot-in-command in preparing the operational and ATS flight plans, sign when applicable and file the ATS flight plan with the appropriate ATS unit; and

c) furnish the pilot-in-command while in flight, by appropriate means, with information which may be necessary for the safe conduct of the flight.

2.6.2 In the event of an emergency, a flight operations officer/flight dispatcher shall:

a) initiate such procedures as outlined in the operations manual while avoiding taking any action that would conflict with ATC procedures; and

b) convey safety-related information to the pilot-in-command that may be necessary for the safe conduct of the flight, including information related to any amendments to the flight plan that become necessary in the course of the flight.

Note.— It is equally important that the pilot-in-command also conveys similar information to the flight operations officer/flight dispatcher during the course of a flight, particularly in the context of emergency situations.

2.7 Carry-on baggage

The operator shall ensure that all baggage carried onto a helicopter and taken into the passenger cabin is adequately and securely stowed.

CHAPTER 3. HELICOPTER PERFORMANCE OPERATING LIMITATIONS

3.1 General

3.1.1 Helicopters shall be operated in accordance with a comprehensive and detailed code of performance established by the State of Registry in compliance with the applicable Standards of this chapter.

3.1.2 Performance Class 3 helicopters shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure. The conditions of this paragraph apply also to performance Class 2 helicopters prior to the defined point after take-off and after the defined point before landing.

3.1.3 **Recommendation.—** *For helicopters for which Part IV of Annex 8 is not applicable because of the exemption provided for in Article 41 of the Convention, the State of Registry should ensure that the level of performance specified in 3.2 should be met as far as practicable.*

3.1.4 Only performance Class 1 helicopters shall be permitted to operate from elevated heliports in congested areas.

3.1.5 **Recommendation.—** *Performance Class 3 helicopters should not be permitted to operate from elevated heliports or helidecks.*

3.2 Applicable to helicopters certificated in accordance with Part IV of Annex 8

3.2.1 The Standards contained in 3.2.2 to 3.2.7 inclusive are applicable to the helicopters to which Part IV of Annex 8 is applicable.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 3.1.1, they are to be supplemented by national requirements prepared by Contracting States.

3.2.2 The level of performance defined by the appropriate parts of the comprehensive and detailed national code referred to in 3.1.1 for the helicopters designated in 3.2.1 shall be at least substantially equivalent to the overall level embodied in the Standards of this chapter.

Note.— Attachment A contains guidance material which indicates, by an example, the level of performance intended by the Standards and Recommended Practices of this chapter.

3.2.3 A helicopter shall be operated in compliance with the terms of its certificate of airworthiness and within the approved operating limitations contained in its flight manual.

3.2.4 The State of Registry shall take such precautions as are reasonably possible to ensure that the general level of safety contemplated by these provisions is maintained under all expected operating conditions, including those not covered specifically by the provisions of this chapter.

3.2.5 A flight shall not be commenced unless the performance information provided in the flight manual indicates that the Standards of 3.2.6 and 3.2.7 can be complied with for the flight to be undertaken.

3.2.6 In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the helicopter (such as: mass, operating procedures, the pressure-altitude appropriate to the elevation of the operating site, temperature, wind and condition of the surface). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the helicopter is being operated.

3.2.7 Mass limitations

a) The mass of the helicopter at the start of take-off shall not exceed the mass at which 3.2.7.1 is complied with, nor the mass at which 3.2.7.2 and 3.2.7.3 are complied with, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is envisaged in applying 3.2.7.2 and in respect of alternates 3.2.7 c) and 3.2.7.3.

b) In no case shall the mass at the start of take-off exceed the maximum take-off mass specified in the flight manual for the pressure-altitude and temperature appropriate to the elevation of the operating site, and, if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition.

c) In no case shall the estimated mass for the expected time of landing at the destination and at any alternate, exceed the maximum landing mass specified in the flight manual for the pressure-altitude and temperature appropriate to the elevation of those operating sites, and, if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.

d) In no case shall the mass at the start of take-off, or at the expected time of landing at the destination and at any alternate, exceed the relevant maximum mass at which compliance has been demonstrated with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized in exceptional circumstances for a certain operating site where there is no noise disturbance problem, by the competent authority of the State in which the operating site is situated.

3.2.7.1 *Take-off and initial climb phase*

3.2.7.1.1 *For performance Class 1 helicopters.* The helicopter shall be able, in the event of the critical power-unit failing at or before the take-off decision point, to discontinue the take-off and stop within the rejected take-off area available, or, in the event of the failure occurring at or past the take-off decision point, to continue the take-off and then climb, clearing all obstacles along the flight path by an adequate margin until the helicopter is in a position to comply with 3.2.7.2.1.

3.2.7.1.2 *For performance Class 2 helicopters.* The helicopter shall be able, with all engines operating, to clear all obstacles along its flight path by an adequate margin until it is in a position to comply with 3.2.7.2.1. The helicopter shall be able, in the event of the critical power-unit becoming inoperative at any time after reaching a defined point after take-off, to continue the take-off and initial climb and clear all obstacles along its flight path by an adequate margin until it is in a position to comply with 3.2.7.2.1. Before the defined point, failure of a critical power-unit may cause the helicopter to force land, therefore the conditions stated in 3.1.2 shall apply before the defined point.

3.2.7.1.3 *For performance Class 3 helicopters.* The helicopter shall be able, with all engines operating, to clear all obstacles along its flight path by an adequate margin until it is in a position to comply with 3.2.7.2.2. At any point of the flight path, failure of a power-unit will cause the helicopter to force land, therefore the conditions stated in 3.1.2 shall apply.

3.2.7.2 *En-route phase*

3.2.7.2.1 *For performance Class 1 and Class 2 helicopters.* The helicopter shall be able, in the event of the critical power-unit becoming inoperative at any point in the en-route phase, to continue the flight to an operating site at which the Standard of 3.2.7.3.1 for Class 1 helicopters, or the Standard of 3.2.7.3.2 for Class 2 helicopters can be met, without flying below the appropriate minimum flight altitude at any point. In the case of helicopters having three or more power-units, on any part of the route where the location of suitable intermediate operating sites and the total duration of the flight are such that the probability of a second power-unit becoming inoperative must be allowed for if the general level of safety implied by the Standard of this chapter is to be maintained, the helicopter shall be able, in the event of any two power-units becoming inoperative, to continue the flight to a suitable operating site and make a landing thereat.

3.2.7.2.2 *For performance Class 3 helicopters.* The helicopter shall be able, with all power-units operating, to continue along its intended route or planned diversions without flying at any point below the appropriate minimum flight altitude. At any point of the flight path, failure of a power-unit will cause the helicopter to force land, therefore the conditions stated in 3.1.2 shall apply.

3.2.7.3 *Approach and landing phase*

3.2.7.3.1 *For performance Class 1 helicopters.* In the event of the critical power-unit becoming inoperative at any point during the approach and landing phase, before the landing decision point, the helicopter shall, at the destination and at any alternate, after clearing all obstacles in the approach path by a safe margin, be able to land and stop within the landing distance available or to perform a balked landing and clear all obstacles in the flight path by an adequate margin equivalent to that specified in 3.2.7.1.1. In case of the failure occurring after the landing decision point, the helicopter shall be able to land and stop within the landing distance available.

3.2.7.3.2 *For performance Class 2 helicopters.* With all engines operating, the helicopter shall, at the destination and at any alternate, after clearing all obstacles in the approach path by a safe margin, be able either to land and stop within the landing distance available or to perform a balked landing and clear all obstacles in the flight path by an adequate margin equivalent to that specified in 3.2.7.1.2. In the event of the critical power-unit becoming inoperative before the defined point before landing, the same specifications are applicable. After the defined point, failure of a power-unit may cause the helicopter to force land, therefore the conditions stated in 3.1.2 shall apply.

3.2.7.3.3 *For performance Class 3 helicopters.* With all engines operating, the helicopter shall, at the destination and at any alternate, after clearing all obstacles in the approach path by a safe margin, be able to land and stop within the landing distance available or to perform a balked landing and clear all obstacles in the flight path by an adequate margin equivalent to that specified in 3.2.7.1.3. At any point of the flight path, failure of a power-unit will cause the helicopter to force land, therefore the conditions stated in 3.1.2 shall apply.

Note.— "An adequate margin" referred to in these provisions, and applicable to all performance classes, is illustrated by the examples included in Attachment A to this Annex.

3.3 Obstacle data

3.3.1 Obstacle data shall be provided to enable the operator to develop procedures to comply with 3.2.7.1 and 3.2.7.3.

Note.— See Annex 4 and Annex 15 for methods of presentation of certain obstacle data.

3.3.2 The operator shall take account of charting accuracy when assessing compliance with 3.2.7.1 and 3.2.7.3.

CHAPTER 4. HELICOPTER INSTRUMENTS, EQUIPMENT, AND FLIGHT DOCUMENTS

Note.— Specifications for the provision of helicopter communication and navigation equipment are contained in Chapter 5.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1 General

4.1.1 In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in helicopters according to the helicopter used and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the State of Registry.

4.1.2 A helicopter shall carry a certified true copy of the air operator certificate specified in 2.2.1, and a copy of the authorizations, conditions and limitations relevant to the helicopter type, issued in conjunction with the certificate. When the certificate and the associated authorizations, conditions and limitations are issued by the State of the Operator in a language other than English, an English translation shall be included.

Note.— Guidance on the air operator certificate and associated authorizations, conditions and limitations, which may be contained in operations specifications, is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335).*

4.1.3 The operator shall include in the operations manual a minimum equipment list (MEL), approved by the State of the Operator which will enable the pilot-in-command to determine whether a flight may be commenced or continued from any intermediate stop should any instrument, equipment or systems become inoperative. Where the State of the Operator is not the State of Registry, the State of the Operator shall ensure that the MEL does not affect the helicopter's compliance with the airworthiness requirements applicable in the State of Registry.

Note.— Attachment E contains guidance on the minimum equipment list.

4.1.4 The operator shall provide operations staff and flight crew with an aircraft operating manual, for each aircraft type operated, containing the normal, abnormal and emergency procedures relating to the operation of the aircraft. The manual shall include details of the aircraft systems and of the checklists to be used. The design of the manual shall observe human factors principles.

4.2 All helicopters on all flights

4.2.1 A helicopter shall be equipped with instruments that will enable the flight crew to control the flight path of the helicopter, carry out any required procedural manoeuvres and observe the operating limitations of the helicopter in the expected operating conditions.

4.2.2 A helicopter shall be equipped with:

a) one or more first-aid kits as appropriate to the number of passengers the helicopter is authorized to carry;

Note.— Guidance on the contents of first-aid kits is given in Attachment D.

b) portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the helicopter. At least one shall be located in:

1) the pilot's compartment; and

2) each passenger compartment that is separate from the pilot's compartment and that is not readily accessible to the flight crew.

Note.— Any portable fire extinguisher so fitted in accordance with the certificate of airworthiness of the helicopter may count as one prescribed.

c) 1) a seat or berth for each person over an age to be determined by the State of the Operator;

2) a seat belt for each seat and restraining belts for each berth; and

3) a safety harness for each flight crew seat. The safety harness for each pilot seat shall incorporate a device which will automatically restrain the occupant's torso in the event of rapid deceleration.

Recommendation.— *The safety harness for each pilot seat should incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls.*

Note.— Safety harness includes shoulder straps and a seat belt which may be used independently.

d) means of ensuring that the following information and instructions are conveyed to passengers:

1) when seat belts are to be fastened;

2) when and how oxygen equipment is to be used if the carriage of oxygen is required;

3) restrictions on smoking;

4) location and use of life jackets or equivalent individual floatation devices where their carriage is required; and

5) location and method of opening emergency exits; and

e) spare electrical fuses of appropriate ratings for replacement of those accessible in flight.

4.2.3 A helicopter shall carry:

a) the operations manual prescribed in 2.2.2; or those parts of it that pertain to flight operations;

b) the helicopter flight manual for the helicopter, or other documents containing performance data required for the application of Chapter 3 and any other information necessary for the operation of the helicopter within the terms of its certificate of airworthiness, unless these data are available in the operations manual; and

c) current and suitable charts to cover the route of the proposed flight and any route along which it is reasonable to expect that the flight may be diverted.

4.2.4 Marking of break-in points

4.2.4.1 If areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on a helicopter, such areas shall be marked as shown below (see figure following). The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

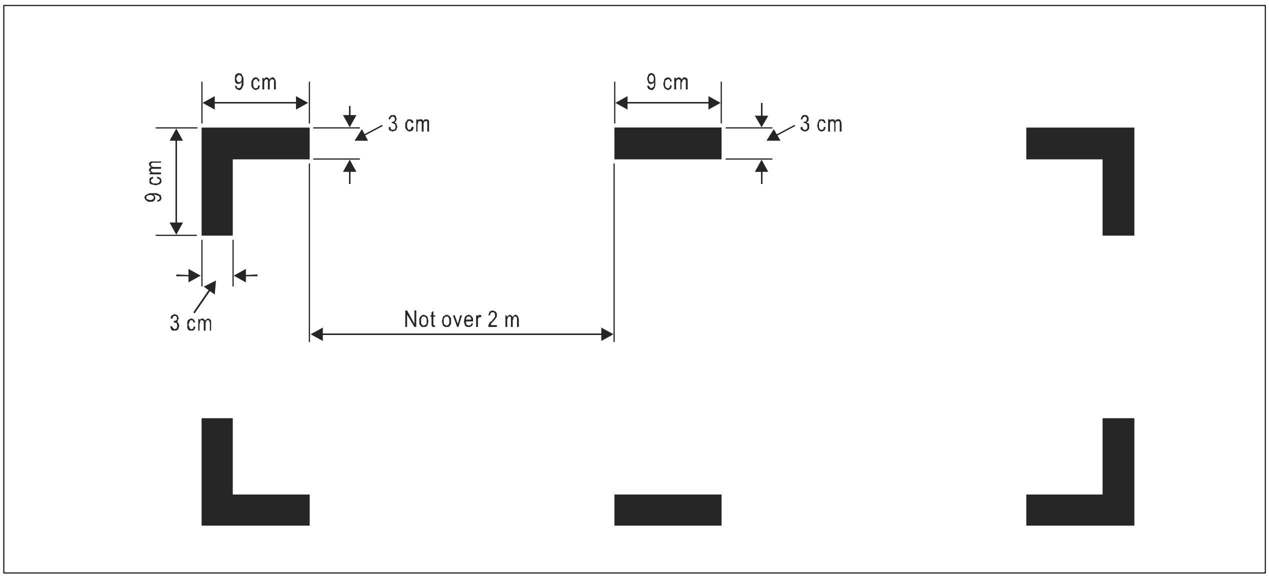
4.2.4.2 If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 m between adjacent markings.

Note.— This Standard does not require any helicopter to have break-in areas.

4.3 Flight recorders

Note 1.— Flight recorders comprise two systems, a flight data recorder (FDR) and a cockpit voice recorder (CVR).

Note 2.— Combination recorders (FDR/CVR) can only be used to meet the flight recorder equipage requirements as specifically indicated in this Annex.



MARKING OF BREAK-IN POINTS (*see* 4.2.4)

Note 3.— Detailed guidance on flight recorders is contained in Attachment B.

4.3.1 Flight data recorders — types

4.3.1.1 A Type IV FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation.

4.3.1.2 A Type V FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power.

4.3.1.3 The use of engraving metal foil FDRs shall be discontinued by 1 January 1995.

4.3.1.4 **Recommendation.—** *The use of analogue FDRs using frequency modulation (FM) should be discontinued by 5 November 1998.*

4.3.1.4.1 The use of photographic film FDRs shall be discontinued from 1 January 2003.

4.3.1.5 All helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005, that utilize data link communications and are required to carry a CVR shall record, on a flight recorder, all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.3.1.5.1 From 1 January 2007, all helicopters that utilize data link communications and are required to carry a CVR shall record, on a flight recorder, all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.3.1.5.2 Sufficient information to derive the content of the data link communications message, and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance (ADS), controller-pilot data link communications (CPDLC), data link-flight information services (D-FIS) and aeronautical operational control (AOC) messages.

4.3.1.6 **Recommendation.—** *All helicopters of a maximum certificated take-off mass over 2 700 kg, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).*

4.3.1.7 A Type IVA FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IVA FDR are listed in the paragraphs below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by helicopter systems or the flight crew to operate the helicopter.

4.3.1.7.1 The following parameters satisfy the requirements for flight path and speed:

– Pressure altitude
– Indicated airspeed
– Outside air temperature
– Heading
– Normal acceleration
– Lateral acceleration
– Longitudinal acceleration (body axis)
– Time or relative time count
– Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
– Radio altitude*

4.3.1.7.2 The following parameters satisfy the requirements for attitude:

– Pitch attitude
– Roll attitude
– Yaw rate

4.3.1.7.3 The following parameters satisfy the requirements for engine power:

– Power on each engine: free power turbine speed (N_f), engine torque, engine gas generator speed (N_g), cockpit power control position
– Rotor: main rotor speed, rotor brake
– Main gearbox oil pressure*
– Gearbox oil temperature*: main gearbox oil temperature, intermediate gearbox oil temperature, tail rotor gearbox oil temperature
– Engine exhaust gas temperature (T_4)*
– Turbine inlet temperature (TIT)*

4.3.1.7.4 The following parameters satisfy the requirements for configuration:

– Landing gear or gear selector position*
– Fuel quantity*
– Ice detector liquid water content*

4.3.1.7.5 The following parameters satisfy the requirements for operation:

– Hydraulics low pressure
– Warnings
– Primary flight controls — pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal, controllable stabilator, hydraulic selection

- Marker beacon passage
- Each navigation receiver frequency selection
- AFCS mode and engagement status*
- Stability augmentation system engagement*
- Indicated sling load force*
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Altitude rate*
- Ice detector liquid water content*
- Helicopter health and usage monitor system (HUMS)*: engine data, chip detectors, track timing, exceedance discretes, broadband average engine vibration

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, are as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on helicopter complexity. Parameters without an (*) are to be recorded regardless of helicopter complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by helicopter systems and/or flight crew to operate the helicopter.

4.3.2 Flight data recorders — duration

Types IV and V FDRs shall be capable of retaining the information recorded during at least the last ten hours of their operation.

4.3.3 Flight data recorders — helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1989

4.3.3.1 All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a Type IV FDR.

4.3.3.2 **Recommendation.—** *All helicopters of a maximum certificated take-off mass of over 2 730 kg up to and including 7 000 kg should be equipped with a Type V FDR.*

4.3.4 Flight data recorders — helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005

4.3.4.1 All helicopters of a maximum certificated take-off mass of over 3 180 kg shall be equipped with a Type IVA FDR with a recording duration of at least 10 hours.

Note.— A single, combination CVR/FDR is acceptable.

4.3.5 Cockpit voice recorders — helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1987

4.3.5.1 All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a CVR the objective of which is the recording of the aural environment on the flight deck during flight time. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on one track of the CVR.

4.3.5.2 All helicopters of a maximum certificated take-off mass of over 3 180 kg up to and including 7 000 kg shall be equipped with a CVR the objective of which is the recording of the aural environment on the flight deck during flight time. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on one track of the CVR.

4.3.6 Cockpit voice recorders — helicopters for which the individual certificate of airworthiness was first issued before 1 January 1987

All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on one track of the CVR.

Note.— CVR performance requirements are as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

4.3.7 Cockpit voice recorders — duration

4.3.7.1 A CVR shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

4.3.7.2 **Recommendation.—** *A CVR, installed in helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1990, should be capable of retaining the information recorded during at least the last two hours of its operation.*

4.3.7.3 A CVR, installed in helicopters for which the individual certificate of airworthiness is first issued after 1 January 2003, shall be capable of retaining the information recorded during at least the last two hours of its operation.

4.3.8 Flight recorders — construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

Note.— Industry crashworthiness and fire protection specifications can be found in documents such as the European Organization for Civil Aviation Equipment (EUROCAE) documents ED55 and ED56A.

4.3.9 Flight recorders — operation

4.3.9.1 Flight recorders shall not be switched off during flight time.

4.3.9.2 To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with Annex 13.

Note 1.— The need for removal of the flight recorder records from the aircraft will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2.— The operator's responsibilities regarding the retention of flight recorder records are contained in 9.6.

4.3.10 Flight recorders — continued serviceability

Operational checks and evaluations of recordings from the FDR and CVR systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the flight data and CVR systems are given in Attachment B.

4.4 All helicopters operated in accordance with visual flight rules

4.4.1 All helicopters when operated in accordance with visual flight rules shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

d) an airspeed indicator; and

e) such additional instruments or equipment as may be prescribed by the appropriate authority.

4.4.2 VFR flights which are operated as controlled flights shall be equipped in accordance with 4.10.

4.5 All helicopters on flights over water

4.5.1 Means of flotation

All helicopters intended to be flown over water shall be fitted with a permanent or rapidly deployable means of flotation so as to ensure a safe ditching of the helicopter when:

a) flying over water at a distance from land corresponding to more than 10 minutes at normal cruise speed in the case of performance Class 1 or 2 helicopters; or

b) flying over water beyond autorotational or safe forced landing distance from land in the case of performance Class 3 helicopters.

4.5.2 Emergency equipment

4.5.2.1 Performance Class 1 and 2 helicopters, operating in accordance with the provisions of 4.5.1, shall be equipped with:

a) one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

b) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

c) equipment for making the pyrotechnical distress signals described in Annex 2.

4.5.2.2 Performance Class 3 helicopters when operating beyond autorotational distance from land but within a distance from land specified by the appropriate authority of the responsible State shall be equipped with one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

Note.— When determining the distance from land referred to in 4.5.2.2, consideration should be given to environmental conditions and the availability of SAR facilities.

4.5.2.3 Performance Class 3 helicopters when operating outside the provisions of 4.5.2.2 shall be equipped as in 4.5.2.1.

4.5.2.4 In the case of performance Class 2 and Class 3 helicopters, when taking off or landing at a heliport where, in the opinion of the State of the Operator, the take-off or approach path is so disposed over water that in the event of a mishap there would be likelihood of a ditching, at least the equipment required in 4.5.2.1 a) shall be carried.

4.5.2.5 Each life jacket and equivalent individual flotation device, when carried in accordance with this 4.5, shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons.

4.5.2.6 **Recommendation.—** *On any helicopter for which the individual certificate of airworthiness is first issued on or after 1 January 1991, at least 50 per cent of the life rafts carried in accordance with the provisions of 4.5.2 should be deployable by remote control.*

4.5.2.7 **Recommendation.—** *Rafts which are not deployable by remote control and which have a mass of more than 40 kg should be equipped with some means of mechanically assisted deployment.*

4.5.2.8 **Recommendation.—** *On any helicopter for which the individual certificate of airworthiness was first issued before 1 January 1991, the provisions of 4.5.2.6 and 4.5.2.7 should be complied with no later than 31 December 1992.*

4.6 All helicopters on flights over designated land areas

Helicopters, when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

4.7 Emergency locator transmitter (ELT)

4.7.1 Except as provided for in 4.7.2, until 1 January 2005 all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.5.1 a) and Performance Class 3 helicopters operating as described in 4.5.1 b) shall be equipped with at least one ELT(S) per raft carried but not more than a total of two ELTs are required.

4.7.2 Performance Class 1 and 2 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating on flights over water as described in 4.5.1 a) and Performance Class 3 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating as described in 4.5.1 b) shall be equipped with at least one automatic ELT and at least one ELT(S) in a raft.

4.7.3 From 1 January 2005, all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.5.1 a) and Performance Class 3 helicopters operating as described in 4.5.1 b) shall be equipped with at least one automatic ELT and at least one ELT(S) in a raft.

4.7.4 Except as provided for in 4.7.5, until 1 January 2005 helicopters on flights over designated land areas as described in 4.6 shall be equipped with at least one ELT.

4.7.5 Helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, on flights over designated land areas as described in 4.6 shall be equipped with at least one automatic ELT.

4.7.6 From 1 January 2005, helicopters on flights over designated land areas as described in 4.6 shall be equipped with at least one automatic ELT.

4.7.7 **Recommendation.—** *All helicopters should carry an automatic ELT.*

4.7.8 ELT equipment carried to satisfy the requirements of 4.7.1, 4.7.2, 4.7.3, 4.7.4, 4.7.5, 4.7.6 and 4.7.7 shall operate in accordance with the relevant provisions of Annex 10, Volume III.

4.8 All helicopters on high altitude flights

Note.— Approximate altitude in the Standard Atmosphere corresponding to the value of absolute pressure used in this text is as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*
376 hPa	*7 600*	*25 000*

4.8.1 A helicopter intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa in personnel compartments shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 2.3.8.1.

4.8.2 A helicopter intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa but which is provided with means of maintaining pressures greater than 700 hPa in personnel compartments shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 2.3.8.2.

4.8.3 A helicopter intended to be operated at flight altitudes at which the atmospheric pressure is more than 376 hPa which cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, and for which the individual certificate of airworthiness was issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment to satisfy the requirements of 2.3.8.2. The total number of oxygen dispensing units shall exceed the number of passenger and cabin crew seats by at least 10 per cent.

4.8.4 **Recommendation.—** *A helicopter intended to be operated at flight altitudes at which the atmospheric pressure is more than 376 hPa which cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa, and for which the individual certificate of airworthiness is issued before 9 November 1998, should be provided with automatically deployable oxygen equipment to satisfy the requirements of 2.3.8.2. The total number of oxygen dispensing units should exceed the number of passenger and cabin crew seats by at least 10 per cent.*

4.9 All helicopters in icing conditions

All helicopters shall be equipped with suitable anti-icing and/ or de-icing devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered.

4.10 All helicopters operated in accordance with instrument flight rules

4.10.1 All helicopters when operated in accordance with the instrument flight rules, or when the helicopter cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation;

Note.— Neither three-pointer nor drum-pointer altimeters satisfy the requirement in 4.10.1 c).

d) an airspeed indicating system with means of preventing malfunctioning due to either condensation or icing;

e) a slip indicator;

f) three attitude indicators (artificial horizon), one of which may be replaced by a turn indicator;

g) a heading indicator (directional gyroscope);

Note.— The requirements of 4.10.1 e), f) and g) may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the separate instruments, are retained.

h) a means of indicating whether the power supply to the gyroscopic instrument is adequate;

i) a means of indicating in the flight crew compartment the outside air temperature;

j) a rate of climb and descent indicator;

k) a stabilization system, unless it has been demonstrated to the satisfaction of the certificating authority that the helicopter possesses, by nature of its design, adequate stability without such a system; and

l) such additional instruments or equipment as may be prescribed by the appropriate authority.

4.10.2 All performance Class 1 and Class 2 helicopters when operated in accordance with the instrument flight rules shall be fitted with an emergency power supply, independent of the main electrical generating system, for the purpose of operating and illuminating, for a minimum period of 30 minutes, an attitude indicating instrument (artificial horizon), clearly visible to the pilot-in-command. The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given on the instrument panel that the attitude indicator(s) is being operated by emergency power.

4.11 All helicopters when operated at night

4.11.1 All helicopters, when operated at night shall be equipped with:

a) all equipment specified in 4.10;

b) the lights required by Annex 2 for aircraft in flight or operating on the movement area of a heliport;

Note.— The general characteristics of lights are specified in Annex 8. Detailed specifications for lights meeting the requirements of Annex 2 for aircraft in flight or operating on the movement area of a heliport are contained in the Airworthiness Manual *(Doc 9760).*

c) two landing lights;

d) illumination for all instruments and equipment that are essential for the safe operation of the helicopter that are used by the flight crew;

e) lights in all passenger compartments; and

f) an electric torch for each crew member station.

4.11.2 **Recommendation.—** *One of the landing lights should be trainable, at least in the vertical plane.*

4.12 Helicopters when carrying passengers — significant-weather detection

Recommendation.— *Helicopters when carrying passengers should be equipped with operative weather radar or other significant-weather detection equipment whenever such helicopters are being operated in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable, may be expected to exist along the route either at night or under instrument meteorological conditions.*

4.13 All helicopters required to comply with the noise certification Standards in Annex 16, Volume I

All helicopters required to comply with the noise certification Standards of Annex 16, Volume I shall carry a document attesting noise certification. When the document, or a suitable statement attesting noise certification as contained in another document approved by the State of Registry, is issued in a language other than English, it shall include an English translation.

Note 1.— The attestation may be contained in any document, carried on board, approved by the State of Registry in accordance with the relevant provisions of Annex 16, Volume I.

Note 2.— The various noise certification Standards of Annex 16, Volume I which are applicable to helicopters are determined according to the date of application for a type certificate, or the date of acceptance of an application under an equivalent prescribed procedure by the certificating authority. Some helicopters are not required to comply with any noise certification Standard. For details see Annex 16, Volume I, Part II, Chapters 8 and 11.

4.14 Helicopters carrying passengers — cabin crew seats

4.14.1 All helicopters shall be equipped with a forward or rearward facing (within 15° of the longitudinal axis of the helicopter) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 10.1 in respect of emergency evacuation.

Note 1.— In accordance with the provisions of 4.2.2 c) 1), a seat and seat belt shall be provided for the use of each additional cabin crew member.

Note 2.— Safety harness includes shoulder straps and a seat belt which may be used independently.

4.14.2 Cabin crew seats shall be located near floor level and other emergency exits as required by the State of Registry for emergency evacuation.

4.15 Helicopters required to be equipped with a pressure-altitude reporting transponder

All helicopters shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the provisions of Annex 10, Volume IV.

Note.— This provision is intended to improve the effectiveness of air traffic services as well as airborne collision avoidance systems.

4.16 Microphones

All flight crew members required to be on flight deck duty shall communicate through boom or throat microphones below the transition level/altitude.

CHAPTER 5. HELICOPTER COMMUNICATION AND NAVIGATION EQUIPMENT

5.1 Communication equipment

5.1.1 A helicopter shall be provided with radio communication equipment capable of:

a) conducting two-way communication for heliport control purposes;

b) receiving meteorological information at any time during flight;

c) conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

Note.— The requirements of 5.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

5.1.2 The radio communication equipment required in accordance with 5.1.1 shall provide for communications on the aeronautical emergency frequency 121.5 MHz.

5.2 Navigation equipment

5.2.1 A helicopter shall be provided with navigation equipment which will enable it to proceed:

a) in accordance with its operational flight plan; and

b) in accordance with the requirements of air traffic services;

except when, if not so precluded by the appropriate authority, navigation for flights under the visual flight rules is accomplished by visual reference to landmarks.

5.2.2 For flights in defined portions of airspace or on routes where an RNP type has been prescribed, a helicopter shall, in addition to the requirements specified in 5.2.1:

a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed RNP type(s); and

b) be authorized by the State of the Operator for operations in such airspace.

Note.— Information on RNP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613). This document also contains a comprehensive list of references to other documents produced by States and international bodies concerning navigation systems and RNP.*

5.2.3 The helicopter shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the helicopter to navigate in accordance with 5.2.1 and, where applicable, 5.2.2.

5.2.4 On flights in which it is intended to land in instrument meteorological conditions a helicopter shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance at each heliport at which it is intended to land in instrument meteorological conditions and at any designated alternate heliports.

5.3 Installation

The equipment installation shall be such that the failure of any single unit required for either communications or navigation purposes or both will not result in the failure of another unit required for communications or navigation purposes.

CHAPTER 6. HELICOPTER MAINTENANCE

Note 1.— For the purpose of this chapter "helicopter" includes: powerplants, power transmissions, rotors, components, accessories, instruments, equipment and apparatus including emergency equipment.

Note 2.— Reference is made throughout this chapter to the requirements of the State of Registry. When the State of the Operator is not the same as the State of Registry, it may be necessary to consider any additional requirements of the State of the Operator.

Note 3.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual *(Doc 9760).*

6.1 Operator's maintenance responsibilities

6.1.1 Operators shall ensure that, in accordance with procedures acceptable to the State of Registry:

a) each helicopter they operate is maintained in an airworthy condition;

b) the operational and emergency equipment necessary for the intended flight is serviceable; and

c) the Certificate of Airworthiness of the helicopter they operate remains valid.

6.1.2 An operator shall not operate a helicopter unless it is maintained and released to service by an organization approved in accordance with Annex 6, Part I, 8.7 or under an equivalent system, either of which shall be acceptable to the State of Registry.

6.1.3 When the State of Registry accepts an equivalent system, the person signing the maintenance release shall be licensed in accordance with Annex 1.

6.1.4 An operator shall employ a person or group of persons to ensure that all maintenance is carried out in accordance with the maintenance control manual.

6.1.5 The operator shall ensure the maintenance of its helicopters is performed in accordance with the maintenance programme approved by the State of Registry.

6.2 Operator's maintenance control manual

6.2.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance control manual, acceptable to the State of Registry, in accordance with the requirements of 9.2. The design of the manual shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

6.2.2 The operator shall ensure that the maintenance control manual is amended as necessary to keep the information contained therein up to date.

6.2.3 Copies of all amendments to the operator's maintenance control manual shall be furnished promptly to all organizations or persons to whom the manual has been issued.

6.2.4 The operator shall provide the State of the Operator and the State of Registry with a copy of the operator's maintenance control manual, together with all amendments and/or revisions to it and shall incorporate in it such mandatory material as the State of the Operator or the State of Registry may require.

6.3 Maintenance programme

6.3.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance programme, approved by the State of Registry, containing the information required by 9.3. The design and application of the operator's maintenance programme shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

6.3.2 Copies of all amendments to the maintenance programme shall be furnished promptly to all organizations or persons to whom the maintenance programme has been issued.

6.4 Maintenance records

6.4.1 An operator shall ensure that the following records are kept for the periods mentioned in 6.4.2:

a) the total time in service (hours, calendar time and cycles, as appropriate) of the helicopter and all life-limited components;

b) the current status of compliance with all mandatory continuing airworthiness information;

c) appropriate details of modifications and repairs to the helicopter and its major components;

d) the time in service (hours, calendar time and cycles, as appropriate) since last overhaul of the helicopter or its components subject to a mandatory overhaul life;

e) the current status of the helicopter's compliance with the maintenance programme; and

f) the detailed maintenance records to show that all requirements for a maintenance release have been met.

6.4.2 The records in 6.4.1 a) to e) shall be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service, and the records in 6.4.1 f) for a minimum period of one year after the signing of the maintenance release.

6.4.3 In the event of a temporary change of operator, the records shall be made available to the new operator. In the event of any permanent change of operator, the records shall be transferred to the new operator.

6.5 Continuing airworthiness information

6.5.1 The operator of a helicopter over 3 180 kg maximum mass shall monitor and assess maintenance and operational experience with respect to continuing airworthiness and provide the information as prescribed by the State of Registry and report through the system specified in Annex 8, Part II, 4.3.5 and 4.3.8.

6.5.2 The operator of a helicopter over 3 180 kg maximum mass shall obtain and assess continuing airworthiness information and recommendations available from the organization responsible for the type design and shall implement resulting actions considered necessary in accordance with a procedure acceptable to the State of Registry.

Note.— Guidance on interpretation of "the organization responsible for the type design" is contained in the Airworthiness Manual *(Doc 9760).*

6.6 Modifications and repairs

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry. Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

6.7 Maintenance release

6.7.1 A maintenance release shall be completed and signed to certify that the maintenance work has been completed satisfactorily and in accordance with approved data and the procedures described in the maintenance organization's procedures manual.

6.7.2 A maintenance release shall contain a certification including:

a) basic details of the maintenance carried out including detailed reference of the approved data used;

b) date such maintenance was completed;

c) when applicable, the identity of the approved maintenance organization; and

d) the identity of the person or persons signing the release.

6.8 Records

6.8.1 An operator shall ensure that the following records are kept:

a) in respect of the entire helicopter: the total time in service;

b) in respect of the major components of the helicopter:

1) the total time in service;

2) the date of the last overhaul;

3) the date of the last inspection;

c) in respect of those instruments and equipment, the serviceability and operating life of which are determined by their time in service;

1) such records of the time in service as are necessary to determine their serviceability or to compute their operating life;

2) the date of the last inspection.

6.8.2 These records shall be kept for a period of 90 days after the end of the operating life of the unit to which they refer.

CHAPTER 7. HELICOPTER FLIGHT CREW

7.1 Composition of the flight crew

7.1.1 The number and composition of the flight crew shall not be less than that specified in the operations manual. The flight crews shall include flight crew members in addition to the minimum numbers specified in the flight manual or other documents associated with the certificate of airworthiness, when necessitated by considerations related to the type of helicopter used, the type of operation involved and the duration of flight between points where flight crews are changed.

7.1.2 The flight crew shall include at least one member who holds a valid licence, issued or rendered valid by the State of Registry, authorizing operation of the type of radio transmitting equipment to be used.

7.2 Flight crew member emergency duties

An operator shall, for each type of helicopter, assign to all flight crew members the necessary functions they are to perform in an emergency or in a situation requiring emergency evacuation. Annual training in accomplishing these functions shall be contained in the operator's training programme and shall include instruction in the use of all emergency and life-saving equipment required to be carried, and drills in the emergency evacuation of the helicopter.

7.3 Flight crew member training programmes

7.3.1 An operator shall establish and maintain a ground and flight training programme, approved by the State of the Operator, which ensures that all flight crew members are adequately trained to perform their assigned duties. The training programme shall:

a) include ground and flight training facilities and properly qualified instructors as determined by the State of the Operator;

b) consist of ground and flight training in the type(s) of helicopter on which the flight crew member serves;

c) include proper flight crew coordination and training for all types of emergency and abnormal situations or procedures caused by powerplant, transmission, rotor, airframe or systems malfunctions, fire or other abnormalities;

d) include training in knowledge and skills related to visual and instrument flight procedures for the intended area of operation, human performance and threat and error management and in the transport of dangerous goods;

e) ensure that all flight crew members know the functions for which they are responsible and the relation of these functions to the functions of other crew members, particularly in regard to abnormal or emergency procedures; and

f) be given on a recurrent basis, as determined by the State of the Operator and shall include an assessment of competence.

Note 1.— Paragraph 2.2.4 prohibits the in-flight simulation of emergency or abnormal situations when passengers or cargo are being carried.

Note 2.— Flight training may, to the extent deemed appropriate by the State of the Operator, be given in flight simulation training devices approved by the State for that purpose.

Note 3.— The scope of the recurrent training required by 7.2 and 7.3 may be varied and need not be as extensive as the initial training given in a particular type of helicopter.

Note 4.— The use of correspondence courses and written examinations as well as other means may, to the extent deemed feasible by the State of the Operator, be utilized in meeting the requirements for periodic ground training.

Note 5.— Provisions for training in the transport of dangerous goods are contained in Annex 18.

Note 6.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

Note 7.— Information for pilots and flight operations personnel on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

Note 8.— Guidance material to design flight crew training programmes can be found in the manual Preparation of an Operations Manual *(Doc 9376).*

Note 9.— Guidance material on the different means used to assess competence can be found in the Attachment to Chapter 2 of the Procedures for Air Navigation Services — Training *(PANS-TRG, Doc 9868).*

7.3.2 The requirement for recurrent flight training in a particular type of helicopter shall be considered fulfilled by:

a) the use, to the extent deemed feasible by the State of the Operator, of flight simulation training devices approved by that State for that purpose; or

b) the completion within the appropriate period of the proficiency check required by 7.4.4 in that type of helicopter.

7.4 Qualifications

Note.— See the Manual of Procedures for the Establishment of a State's Personnel Licensing System *(Doc 9379) for guidance of a general nature on cross-crew qualification, mixed-fleet flying and cross-credit.*

7.4.1 Recent experience — pilot-in-command

7.4.1.1 An operator shall not assign a pilot to act as pilot-in-command of a type or variant of a type of a helicopter unless, on the same type of helicopter within the preceding 90 days, that pilot has made at least three take-offs and landings.

7.4.1.2 When a pilot-in-command is flying several variants of the same type of helicopter or different types of helicopter with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 7.4.1.1 for each variant or each type of helicopter can be combined.

7.4.2 Recent experience — co-pilot

7.4.2.1 An operator shall not assign a co-pilot to operate at the flight controls during take-off and landing of a type or variant of a type of a helicopter unless, on the same type of helicopter within the preceding 90 days, that co-pilot has operated the flight controls, as pilot-in-command or as co-pilot, during three take-offs and landings or has otherwise demonstrated competence to act as co-pilot on a flight simulation training device approved for the purpose.

7.4.2.2 When a co-pilot is flying several variants of the same type of helicopter or different types of helicopter with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 7.4.2.1 for each variant or each type of helicopter can be combined.

7.4.3 Pilot-in-command route and heliport qualification

7.4.3.1 An operator shall not utilize a pilot as pilot-in-command of a helicopter on a route or route segment for which that pilot is not currently qualified until such pilot has complied with 7.4.3.2 and 7.4.3.3.

7.4.3.2 Each such pilot shall demonstrate to the operator an adequate knowledge of:

a) the route to be flown, and the heliports which are to be used. This shall include knowledge of:

   1) the terrain and minimum safe altitudes;

   2) the seasonal meteorological conditions;

   3) the meteorological, communication and air traffic facilities, services and procedures;

   4) the search and rescue procedures; and

   5) the navigational facilities and procedures associated with the route along which the flight is to take place; and

b) procedures applicable to flight paths over heavily populated areas and areas of high air traffic density, obstructions, physical layout, lighting, approach aids and arrival, departure, holding and instrument approach procedures, and applicable operating minima.

Note.— That portion of the demonstration relating to arrival, departure, holding and instrument approach procedures may be accomplished in an appropriate training device which is adequate for this purpose.

7.4.3.3 A pilot-in-command shall have made an actual approach into each heliport of landing on the route, accompanied by a pilot who is qualified for the heliport, as a member of the flight crew or as an observer on the flight deck, unless:

a) the approach to the heliport is not over difficult terrain and the instrument approach procedures and aids available are similar to those with which the pilot is familiar, and a margin to be approved by the State of the Operator is added to the normal operating minima, or there is reasonable certainty that approach and landing can be made in visual meteorological conditions; or

b) the descent from the initial approach altitude can be made by day in visual meteorological conditions; or

c) the operator qualifies the pilot-in-command to land at the heliport concerned by means of an adequate pictorial presentation.

7.4.3.4 The operator shall maintain a record, sufficient to satisfy the State of the Operator of the qualification of the pilot and of the manner in which such qualification has been achieved.

7.4.3.5 An operator shall not continue to utilize a pilot as a pilot-in-command on a route unless, within the preceding 12 months, the pilot has made at least one trip between the terminal points of that route as a pilot member of the flight crew, or as a check pilot, or as an observer on the flight deck. In the event that more than 12 months elapse in which a pilot has not made such a trip on a route in close proximity and over similar terrain, prior to again serving as a pilot-in-command on that route, that pilot must requalify in accordance with 7.4.3.2 and 7.4.3.3.

7.4.4 Pilot proficiency checks

7.4.4.1 An operator shall ensure that piloting technique and the ability to execute emergency procedures is checked in such a way as to demonstrate the pilot's competence on each type or variant of type of helicopter. Where the operation may be conducted under instrument flight rules, an operator shall ensure that the pilot's competence to comply with such rules is demonstrated to either a check pilot of the operator or to a representative of the State of the Operator. Such checks shall be performed twice within any period of one year. Any two such checks which are similar and which occur within a period of four consecutive months shall not alone satisfy this requirement.

Note.— Flight simulation training devices approved by the State of the Operator may be used for those parts of the checks for which they are specifically approved.

7.4.4.2 When an operator schedules flight crew on several variants of the same type of helicopter or different types of helicopter with similar characteristics in terms of operating procedures, systems and handling, the State shall decide under which conditions the requirements of 7.4.4.1 for each variant or each type of helicopter can be combined.

7.5 Flight crew equipment

A flight crew member assessed as fit to exercise the privileges of a licence subject to the use of suitable correcting lenses, shall have a spare set of the correcting lenses readily available when exercising those privileges.

7.6 Flight time, flight duty periods and rest periods

The State of the Operator shall establish regulations specifying the limitations applicable to the flight time and flight duty periods for flight crew members. These regulations shall also make provision for adequate rest periods and shall be such as to ensure that fatigue occurring either in a flight or successive flights or accumulated over a period of time due to these and other tasks, does not endanger the safety of a flight.

Note.— Guidance on the establishment of limitations is given in Attachment A.

CHAPTER 8. FLIGHT OPERATIONS OFFICER/FLIGHT DISPATCHER

8.1 When the State of the Operator requires that a flight operations officer/flight dispatcher, employed in conjunction with an approved method of control and supervision of flight operations be licensed, that flight operations officer/flight dispatcher shall be licensed in accordance with the provisions of Annex 1.

8.2 In accepting proof of qualifications other than the option of holding of a flight operations officer/flight dispatcher licence, the State of the Operator, in accordance with the approved method of control and supervision of flight operations, shall require that, as a minimum, such persons meet the requirements specified in Annex 1 for the flight operations officer/flight dispatcher licence.

8.3 A flight operations officer/flight dispatcher shall not be assigned to duty unless that person has:

a) satisfactorily completed an operator-specific training course that addresses all the specific components of its approved method of control and supervision of flight operations specified in 2.2.1.4;

Note.— Guidance on the composition of such training syllabi is provided in the Training Manual *(Doc 7192), Part D-3* — Flight Operations Officers/ Flight Dispatchers.

b) made within the preceding 12 months, at least a one-way qualification flight in a helicopter over any area for which that person is authorized to exercise flight supervision. The flight shall include landings at as many heliports as practicable;

Note.— For the purpose of the qualification flight, the flight operations officer/flight dispatcher must be able to monitor the flight crew intercommunication system and radio communications, and be able to observe the actions of the flight crew.

c) demonstrated to the operator a knowledge of:

1) the contents of the operations manual described in Appendix 1;

2) the radio equipment in the helicopters used; and

3) the navigation equipment in the helicopters used;

d) demonstrated to the operator a knowledge of the following details concerning operations for which the officer is responsible and areas in which that individual is authorized to exercise flight supervision:

1) the seasonal meteorological conditions and the sources of meteorological information;

2) the effects of meteorological conditions on radio reception in the helicopters used;

3) the peculiarities and limitations of each navigation system which is used by the operation; and

4) the helicopter loading instructions;

e) satisfied the operator as to knowledge and skills related to human performance as they apply to dispatch duties; and

f) demonstrated to the operator the ability to perform the duties specified in 2.6.

8.4 **Recommendation.—** *A flight operations officer/flight dispatcher assigned to duty should maintain complete familiarization with all features of the operations which are pertinent to such duties, including knowledge and skills related to human performance.*

Note.— Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the Human Factors Training Manual *(Doc 9683).*

8.5 **Recommendation.—** *A flight operations officer/flight dispatcher should not be assigned to duty after 12 consecutive months of absence from such duty, unless the provisions of 8.3 are met.*

CHAPTER 9. MANUALS, LOGS AND RECORDS

Note.— The following additional manuals, logs and records are associated with this Annex but are not included in this chapter:

Fuel and oil records — see 2.2.8

Maintenance records — see 6.8

Flight time, flight duty periods and rest periods records — see 2.2.9.3

Flight preparation forms — see 2.3

Operational flight plan — see 2.3.3

Pilot-in-command route and heliport qualification records — see 7.4.3.4

9.1 Flight manual

Note.— The flight manual contains the information specified in Annex 8.

The flight manual shall be updated by implementing changes made mandatory by the State of Registry.

9.2 Operator's maintenance control manual

The operator's maintenance control manual provided in accordance with 6.2, which may be issued in separate parts, shall contain the following information:

a) description of the procedures required by 6.1.1 including, when applicable:

   1) a description of the administrative arrangements between the operator and the approved maintenance organization;

   2) a description of the maintenance procedures and the procedures for completing and signing a maintenance release when maintenance is based on a system other than that of an approved maintenance organization;

b) names and duties of the person or persons required by 6.1.4;

c) a reference to the maintenance programme required by 6.3.1;

d) a description of the methods used for the completion and retention of the operator's maintenance records required by 6.4;

e) a description of the procedures for monitoring, assessing and reporting maintenance and operational experience required by 6.5.1;

f) a description of the procedures for complying with the service information reporting requirements of Annex 8, Part II, 4.3.5 and 4.3.8;

g) a description of procedures for assessing continuing airworthiness information and implementing any resulting actions, as required by 6.5.2;

h) a description of the procedures for implementing action resulting from mandatory continuing airworthiness information;

i) a description of establishing and maintaining a system of analysis and continued monitoring of the performance and efficiency of the maintenance programme, in order to correct any deficiency in that programme;

j) a description of helicopter types and models to which the manual applies;

k) a description of procedures for ensuring that unserviceabilities affecting airworthiness are recorded and rectified;

l) a description of the procedures for advising the State of Registry of significant in-service occurrences;

m) a description of procedures to control the leasing of aircraft and related aeronautical products; and

n) a description of the Maintenance Control Manual amendment procedures.

9.3 Maintenance programme

9.3.1 A maintenance programme for each helicopter as required by 6.3 shall contain the following information:

a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilization of the helicopter;

b) when applicable, a continuing structural integrity programme;

c) procedures for changing or deviating from a) and b) above; and

d) when applicable, condition monitoring and reliability programme descriptions for helicopter systems, components, power transmissions, rotors and powerplants.

9.3.2 Maintenance tasks and intervals that have been specified as mandatory in approval of the type design shall be identified as such.

9.3.3 **Recommendation.—** *The maintenance programme should be based on maintenance programme information made available by the State of Design or by the organization responsible for the type design, and any additional applicable experience*.

9.4 Journey log book

9.4.1 **Recommendation.—** *The helicopter journey log book should contain the following items and the corresponding roman numerals:*

I — Helicopter nationality and registration.

II — Date.

III — Names of crew members.

IV — Duty assignments of crew members.

V — Place of departure.

VI — Place of arrival.

VII — Time of departure.

VIII — Time of arrival.

IX — Hours of flight.

X — Nature of flight (private, scheduled or non-scheduled).

XI — Incidents, observations, if any.

XII — Signature of person in charge.

9.4.2 **Recommendation.—** *Entries in the journey log book should be made currently and in ink or indelible pencil.*

9.4.3 **Recommendation.—** *Completed journey log books should be retained to provide a continuous record of the last six months' operations.*

9.5 Records of emergency and survival equipment carried

Operators shall at all times have available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board any of their helicopters engaged in international air navigation. The information shall include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment.

9.6 Flight recorder records

An operator shall ensure, to the extent possible, in the event the helicopter becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with Annex 13.

CHAPTER 10. CABIN CREW

10.1 Assignment of emergency duties

An operator shall establish, to the satisfaction of the State of the Operator, the minimum number of cabin crew required for each type of helicopter, based on seating capacity or the number of passengers carried, in order to effect a safe and expeditious evacuation of the helicopter, and the necessary functions to be performed in an emergency or a situation requiring emergency evacuation. The operator shall assign these functions for each type of helicopter.

10.2 Protection of cabin crew during flight

Each cabin crew member shall be seated with seat belt or, when provided, safety harness fastened during take-off and landing and whenever the pilot-in-command so directs.

Note.— The foregoing does not preclude the pilot-in-command from directing the fastening of the seat belt only, at times other than during take-off and landing.

10.3 Training

An operator shall establish and maintain a training programme, approved by the State of the Operator, to be completed by all persons being assigned as a cabin crew member. Cabin crew shall complete a recurrent training programme annually. These training programmes shall ensure that each person is:

a) competent to execute those safety duties and functions that the cabin attendant is assigned to perform in the event of an emergency or in a situation requiring emergency evacuation;

b) drilled and capable in the use of emergency and life-saving equipment required to be carried, such as life jackets, life rafts, evacuation slides, emergency exits, portable fire extinguishers, oxygen equipment and first-aid kits;

c) when serving on helicopters operated above 3 000 m (10 000 ft), knowledgeable as regards the effect of lack of oxygen and, in the case of pressurized helicopters, as regards physiological phenomena accompanying a loss of pressurization;

d) aware of other crew members' assignments and functions in the event of an emergency so far as is necessary for the fulfilment of the cabin crew member's own duties;

e) aware of the types of dangerous goods which may, and may not, be carried in a passenger cabin and has completed the dangerous goods training programme required by Annex 18; and

f) knowledgeable about human performance as related to passenger cabin safety duties and including flight crew-cabin crew coordination.

Note.— Guidance material to design training programmes to develop knowledge in human performance and crew co-ordination can be found in the Human Factors Training Manual *(Doc 9683).*

10.4 Flight time, flight duty periods and rest periods

The State of the Operator shall establish regulations specifying the limits applicable to flight time, flight duty periods and rest periods for cabin crew.

Note.— Guidance on the establishment of limitations is given in Attachment A.

CHAPTER 11. SECURITY*

11.1 Helicopter search procedure checklist

An operator shall ensure that there is on board a checklist of the procedures to be followed in searching for a bomb in case of suspected sabotage. The checklist shall be supported by guidance on the course of action to be taken should a bomb or suspicious object be found.

11.2 Training programmes

11.2.1 An operator shall establish and maintain a training programme which enables crew members to act in the most appropriate manner to minimize the consequences of acts of unlawful interference.

11.2.2 An operator shall also establish and maintain a training programme to acquaint appropriate employees with preventive measures and techniques in relation to passengers, baggage, cargo, mail, equipment, stores and supplies intended for carriage on a helicopter so that they contribute to the prevention of acts of sabotage or other forms of unlawful interference.

11.3 Reporting acts of unlawful interference

Following an act of unlawful interference the pilot-in-command shall submit, without delay, a report of such an act to the designated local authority.

* In the context of this Chapter, the word ''security'' is used in the sense of prevention of illicit acts against civil aviation.

ANNEX 6 — PART III

SECTION III

INTERNATIONAL GENERAL AVIATION

CHAPTER 1. GENERAL

Note 1.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13 that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *of the Convention entered into force on 20 June 1997, such transfer agreements will have effect in respect of Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

Note 2.— In the case of international operations effected jointly with helicopters not all of which are registered in the same Contracting State, nothing in this Part of the Annex prevents the States concerned entering into an agreement for the joint exercise of the functions placed upon the State of Registry by the provisions of the relevant Annexes.

1.1 Compliance with laws, regulations and procedures

1.1.1 The pilot-in-command shall comply with the relevant laws, regulations and procedures of the States in which the helicopter is operated.

Note 1.— Compliance with more restrictive measures, not in contravention of the provisions of 1.1.1, may be required by the State of Registry.

Note 2.— Rules covering flight over the high seas are contained in Annex 2.

Note 3.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle Clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

1.1.2 The pilot-in-command shall be responsible for the operation and safety of the helicopter and for the safety of all crew members, passengers and cargo on board, from the moment the engine(s) are started until the helicopter finally comes to rest at the end of the flight, with the engine(s) shut down and the rotor blades stopped.

1.1.3 If an emergency situation which endangers the safety of the helicopter or persons necessitates the taking of action which involves a violation of local regulations or procedures, the pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the State of Registry. Such reports shall be submitted as soon as possible and normally within ten days.

1.1.4 The pilot-in-command shall be responsible for notifying the nearest appropriate authority by the quickest available means of any accident involving the helicopter resulting in serious injury or death of any person or substantial damage to the helicopter or property.

Note.— A definition of the term "serious injury" is contained in Annex 13.

1.1.5 **Recommendation.—** *The pilot-in-command should have available on board the helicopter essential information concerning the search and rescue services in the areas over which it is intended the helicopter will be flown.*

1.2 Dangerous goods

Note 1.— Provisions for carriage of dangerous goods are contained in Annex 18.

Note 2.— Article 35 of the Convention refers to certain classes of cargo restrictions.

1.3 Use of psychoactive substances

Note.— Provisions concerning the use of psychoactive substances are contained in Annex 1, 1.2.7 and Annex 2, 2.5.

CHAPTER 2. FLIGHT OPERATIONS

2.1 Adequacy of operating facilities

The pilot-in-command shall not commence a flight unless it has been ascertained by every reasonable means available that the ground and/or water areas and facilities available and directly required for such flight and for the safe operation of the helicopter are adequate including communication facilities and navigation aids.

Note.— "Reasonable means" in this Standard is intended to denote the use, at the point of departure, of information available to the pilot-in-command either through official information published by the aeronautical information services or readily obtainable from other sources.

2.2 Heliport operating minima

The pilot-in-command shall not operate to or from a heliport using operating minima lower than those which may be established for that heliport by the State in which it is located, except with the specific approval of that State.

Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for a heliport when nominated as an alternate, than for the same heliport when planned as that of intended landing.

2.3 Briefing

2.3.1 The pilot-in-command shall ensure that crew members and passengers are made familiar, by means of an oral briefing or by other means, with the location and the use of:

a) seat belts; and, as appropriate,

b) emergency exits;

c) life jackets;

d) oxygen dispensing equipment; and

e) other emergency equipment provided for individual use, including passenger emergency briefing cards.

2.3.2 The pilot-in-command shall ensure that all persons on board are aware of the location and general manner of use of the principal emergency equipment carried for collective use.

2.4 Helicopter airworthiness and safety precautions

A flight shall not be commenced until the pilot-in-command is satisfied that:

a) the helicopter is airworthy, duly registered and that appropriate certificates with respect thereto are aboard the helicopter;

b) the instruments and equipment installed in the helicopter are appropriate, taking into account the expected flight conditions;

c) any necessary maintenance has been performed in accordance with Chapter 6;

d) the mass of the helicopter and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

e) any load carried is properly distributed and safely secured; and

f) the helicopter operating limitations, contained in the flight manual, or its equivalent, will not be exceeded.

2.5 Weather reports and forecasts

Before commencing a flight the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under the instrument flight rules, shall include: 1) a study of available current weather reports and forecasts; and 2) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

Note.— The requirements for flight plans are contained in Annex 2 — Rules of the Air; *and* Procedures for Air Navigation Services — Air Traffic Management *(PANS-ATM) (Doc 4444).*

2.6 Limitations imposed by weather conditions

2.6.1 Flight in accordance with the visual flight rules

A flight, except one of purely local character in visual meteorological conditions, to be conducted in accordance with the visual flight rules shall not be commenced unless available current meteorological reports, or a combination of current reports and forecasts, indicate that the meteorological conditions along the route, or that part of the route to be flown under the visual flight rules, will, at the appropriate time, be such as to render compliance with these rules possible.

2.6.2 Flight in accordance with the instrument flight rules

2.6.2.1 *When an alternate is required.* A flight to be conducted in accordance with the instrument flight rules shall not be commenced unless the available information indicates that conditions, at the heliport of intended landing and at least one alternate heliport will, at the estimated time of arrival, be at or above the heliport operating minima.

Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for a heliport when nominated as an alternate than for the same heliport when planned as that of intended landing.

2.6.2.2 *When no alternate is required.* A flight to be conducted in accordance with the instrument flight rules to a heliport when no alternate heliport is required shall not be commenced unless available current meteorological information indicates that the following meteorological conditions will exist from two hours before to two hours after the estimated time of arrival: or from the actual time of departure to two hours after the estimated time of arrival, whichever is the shorter period:

a) a cloud base of at least 120 m (400 ft) above the minimum associated with the instrument approach procedure; and

b) visibility of at least 1.5 km more than the minimum associated with the procedure.

Note.— These should be considered as minimum values where a reliable and continuous meteorological watch is maintained. When only an "area" type forecast is available these values should be increased accordingly.

2.6.3 Heliport operating minima

2.6.3.1 A flight shall not be continued towards the heliport of intended landing unless the latest available meteorological information indicates that conditions at that heliport, or at least one alternate heliport, will, at the estimated time of arrival, be at or above the specified heliport operating minima.

2.6.3.2 An instrument approach shall not be continued beyond the outer marker fix in case of precision approach, or below 300 m (1 000 ft) above the heliport in case of non-precision approach, unless the reported visibility or controlling RVR is above the specified minimum.

2.6.3.3 If, after passing the outer marker fix in case of precision approach, or after descending below 300 m (1 000 ft) above the heliport in case of non-precision approach, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, a helicopter shall not continue its approach-to-land beyond a point at which the limits of the heliport operating minima would be infringed.

2.6.4 Flight in icing conditions

A flight to be operated in known or expected icing conditions shall not be commenced unless the helicopter is certificated and equipped to cope with such conditions.

2.7 Alternate heliports

2.7.1 For a flight to be conducted in accordance with the instrument flight rules, at least one suitable alternate shall be specified in the operational flight plan and the flight plan, unless:

a) the weather conditions in 2.6.2.2 prevail, or

b) 1) the heliport of intended landing is isolated and no suitable alternate is available; and

2) an instrument approach procedure is prescribed for the isolated heliport of intended landing; and

3) a point of no return (PNR) is determined in case of an off-shore destination.

2.7.2 Suitable off-shore alternates may be specified subject to the following:

a) the off-shore alternates shall be used only after passing a point of no return (PNR). Prior to PNR on-shore alternates shall be used;

b) mechanical reliability of critical control systems and critical components shall be considered and taken into account when determining the suitability of the alternate;

c) one engine inoperative performance capability shall be attainable prior to arrival at the alternate;

d) deck availability shall be guaranteed; and

e) weather information must be reliable and accurate.

Note.— The landing technique specified in the flight manual following control system failure may preclude the nomination of certain helidecks as alternate heliports.

2.7.3 **Recommendation.—** *Off-shore alternates should not be used when it is possible to carry enough fuel to have an on-shore alternate. Such circumstances should be exceptions and should not include payload enhancement in adverse weather conditions.*

2.8 Fuel and oil supply

2.8.1 *All helicopters.* A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the helicopter carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.

2.8.2 *Visual flight rules (VFR) operations.* The fuel and oil carried in order to comply with 2.8.1 shall, in the case of VFR operations, be at least the amount sufficient to allow the helicopter:

a) to fly to the heliport to which the flight is planned;

b) to fly thereafter for a period of 20 minutes at best-range speed plus 10 per cent of the planned flight time; and

c) to have an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of potential contingencies, as determined by the State and specified in the State regulations governing general aviation.

2.8.3 *Instrument flight rules (IFR) operations.* The fuel and oil carried in order to comply with 2.8.1 shall, in the case of IFR operations, be at least the amount sufficient to allow the helicopter:

2.8.3.1 When no alternate is required, in terms of 2.6.2.2, to fly to the heliport to which the flight is planned, and thereafter:

a) to fly 30 minutes at holding speed at 450 m (1 500 ft) above the destination heliport under standard temperature conditions and approach and land; and

b) to have an additional amount of fuel, sufficient to provide for the increased consumption on the occurrence of potential contingencies.

2.8.3.2 When an alternate is required, in terms of 2.6.2.1, to fly to and execute an approach, and a missed approach, at the heliport to which the flight is planned, and thereafter:

a) to fly to the alternate specified in the flight plan; and then

b) to fly for 30 minutes at holding speed at 450 m (1 500 ft) above the alternate under standard temperature conditions, and approach and land; and

c) to have an additional amount of fuel sufficient to provide for the increased consumption on the occurrence of potential contingencies.

2.8.3.3 When no suitable alternate is available, in terms of 2.7.1 b), to fly to the heliport to which the flight is planned and thereafter for a period of two hours at holding speed.

2.8.4 In computing the fuel and oil required in 2.8.1, at least the following shall be considered:

a) meteorological conditions forecast;

b) expected air traffic control routings and traffic delays;

c) for IFR flight, one instrument approach at the destination heliport, including a missed approach;

d) the procedures for loss of pressurization, where applicable, or failure of one power-unit while en route; and

e) any other conditions that may delay the landing of the helicopter or increase fuel and/or oil consumption.

Note.— Nothing in 2.8 precludes amendment of a flight plan in flight in order to re-plan the flight to another heliport, provided that the requirements of 2.8 can be complied with from the point where the flight has been replanned.

2.9 Oxygen supply

Note.— Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	*3 000*	*10 000*
620 hPa	*4 000*	*13 000*

2.9.1 A flight to be operated at altitudes at which the atmospheric pressure in personnel compartments will be less than 700 hPa shall not be commenced unless sufficient stored breathing oxygen is carried to supply:

a) all crew members and 10 per cent of the passengers for any period in excess of 30 minutes that the pressure in compartments occupied by them will be between 700 hPa and 620 hPa;

b) the crew and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

2.9.2 A flight to be operated with a pressurized helicopter shall not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all the crew members and a proportion of the passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa.

2.10 Use of oxygen

All flight crew members, when engaged in performing duties essential to the safe operation of a helicopter in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been required in 2.9.1 or 2.9.2.

2.11 In-flight emergency instruction

In an emergency during flight, the pilot-in-command shall ensure that all persons on board are instructed in such emergency action as may be appropriate to the circumstances.

2.12 Weather reporting by pilots

Recommendation.— *When weather conditions likely to affect the safety of other aircraft are encountered, they should be reported as soon as possible.*

2.13 Hazardous flight conditions

Recommendation.— *Hazardous flight conditions, other than those associated with meteorological conditions, encountered en route should be reported as soon as possible. The reports so rendered should give such details as may be pertinent to the safety of other aircraft.*

2.14 Fitness of flight crew members

The pilot-in-command shall be responsible for ensuring that a flight:

a) will not be commenced if any flight crew member is incapacitated from performing duties by any cause such as injury, sickness, fatigue, the effects of alcohol or drugs; and

b) will not be continued beyond the nearest suitable heliport when flight crew members' capacity to perform functions is significantly reduced by impairment of faculties from causes such as fatigue, sickness, lack of oxygen.

2.15 Flight crew members at duty stations

2.15.1 Take-off and landing

All flight crew members required to be on flight deck duty shall be at their stations.

2.15.2 En route

All flight crew members required to be on flight deck duty shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the helicopter, or for physiological needs.

2.15.3 Seat belts

All flight crew members shall keep their seat belt fastened when at their stations.

2.15.4 Safety harness

Recommendation.— *When safety harnesses are provided, any flight crew member occupying a pilot's seat should keep the safety harness fastened during the take-off and landing phases; all other flight crew members should keep their safety harness fastened during the take-off and landing phases unless the shoulder straps interfere with the performance of their duties, in which case the shoulder straps may be unfastened but the seat belt must remain fastened.*

Note.— Safety harness includes shoulder strap(s) and a seat belt which may be used independently.

2.16 Instrument flight procedures

2.16.1 One or more instrument approach procedures shall be approved and promulgated by the State in which the heliport is located, or by the State which is responsible for the heliport when located outside the territory of any State, to serve each final approach and take-off area or heliport utilized for instrument flight operations.

2.16.2 All helicopters operated in accordance with instrument flight rules shall comply with the instrument approach procedures approved by the State in which the heliport is located, or by the State which is responsible for the heliport when located outside the territory of any State.

Note 1.— Operational procedures recommended for the guidance of operations personnel involved in instrument flight operations are described in PANS-OPS (Doc 8168), Volume I.

Note 2.— Criteria for the construction of instrument flight procedures for the guidance of procedure specialists are provided in PANS-OPS (Doc 8168), Volume II.

2.17 Instruction — general

A helicopter rotor shall not be turned under power without a qualified pilot at the controls.

2.18 Refuelling with passengers on board or rotors turning

2.18.1 **Recommendation.—** *A helicopter should not be refuelled when passengers are embarking, on board or disembarking or when the rotor is turning unless it is attended by the pilot-in-command or other qualified personnel ready to initiate and direct an evacuation of the helicopter by the most practical and expeditious means available.*

2.18.2 **Recommendation.—** *When refuelling with passengers embarking, on board or disembarking, two-way communications should be maintained by helicopter inter-communications system or other suitable means between the ground crew supervising the refuelling and the pilot-in-command or other qualified personnel required by 2.18.1.*

Note 1.— Provisions concerning aircraft refuelling are contained in Annex 14, Volume I, and guidance on safe refuelling practices is contained in the Airport Services Manual *(Doc 9137), Parts 1 and 8.*

Note 2.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.

2.19 Over-water flights

All helicopters on flights over water in accordance with 4.3.1 shall be certificated for ditching. Sea state shall be an integral part of ditching information.

CHAPTER 3. HELICOPTER PERFORMANCE OPERATING LIMITATIONS

3.1 A helicopter shall be operated:

a) in compliance with the terms of its airworthiness certificate or equivalent approved document;

b) within the operating limitations prescribed by the certificating authority of the State of Registry; and

c) within the mass limitations imposed by compliance with the applicable noise certification Standards in Annex 16, Volume I, unless otherwise authorized, in exceptional circumstances for a certain heliport where there is no noise disturbance problem, by the competent authority of the State in which the heliport is situated.

3.2 Placards, listings, instrument markings, or combinations thereof, containing those operating limitations prescribed by the certificating authority of the State of Registry for visual presentation, shall be displayed in the helicopter.

Note.— The Standards of Annex 8 — Airworthiness of Aircraft, *Part IV, apply to all helicopters intended for the carriage of passengers or cargo or mail in international air navigation.*

3.3 Only performance Class 1 helicopters shall be permitted to operate from elevated heliports in congested areas.

3.4 **Recommendation.—** *Performance Class 3 helicopters should not be permitted to operate from elevated heliports or helidecks.*

CHAPTER 4. HELICOPTER INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

Note.— Specifications for the provision of helicopter communication and navigation equipment are contained in Chapter 5.

4.1 All helicopters on all flights

4.1.1 General

In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in helicopters according to the helicopter used and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the State of Registry.

4.1.2 Instruments

A helicopter shall be equipped with instruments which will enable the flight crew to control the flight path of the helicopter, carry out any required procedural manoeuvre, and observe the operating limitations of the helicopter in the expected operating conditions.

4.1.3 Equipment

4.1.3.1 All helicopters on all flights shall be equipped with:

a) an accessible first-aid kit;

b) portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the helicopter. At least one shall be located in:

1) the pilot's compartment; and

2) each passenger compartment that is separate from the pilot's compartment and not readily accessible to the pilot or co-pilot;

c) 1) a seat or berth for each person over an age to be determined by the State of Registry; and

2) a seat belt for each seat and restraining belts for each berth;

d) the following manuals, charts and information:

1) the flight manual or other documents or information concerning any operating limitations prescribed for the helicopter by the certificating authority of the State of Registry, required for the application of Chapter 3;

2) current and suitable charts for the route of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

3) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and

4) a list of visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2; and

e) spare electrical fuses of appropriate ratings for replacement of those accessible in flight.

4.1.3.2 **Recommendation.—** *All helicopters on all flights should be equipped with the ground-air signal codes for search and rescue purposes.*

4.1.3.3 **Recommendation.—** *All helicopters on all flights should be equipped with a safety harness for each flight crew member seat.*

Note.— Safety harness includes shoulder strap(s) and a seat belt which may be used independently.

4.1.4 Marking of break-in points

4.1.4.1 If areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on a helicopter, such areas shall be marked as shown below (see figure following). The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

4.1.4.2 If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 m between adjacent markings.

Note.— This Standard does not require any helicopter to have break-in areas.

4.2 All helicopters operated as VFR flights

4.2.1 All helicopters when operated as VFR flights shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

d) an airspeed indicator; and

e) such additional instruments or equipment as may be prescribed by the appropriate authority.

4.2.2 **Recommendation.—** *VFR flights which are operated as controlled flights shall be equipped in accordance with 4.6.*

4.3 All helicopters on flights over water

4.3.1 Means of flotation

All helicopters intended to be flown over water shall be fitted with a permanent or rapidly deployable means of flotation so as to ensure a safe ditching of the helicopter when:

a) flying over water at a distance from land corresponding to more than 10 minutes at normal cruise speed in the case of performance Class 1 or 2 helicopters; or

b) flying over water beyond autorotational or safe forced landing distance from land in the case of performance Class 3 helicopters.

4.3.2 Emergency equipment

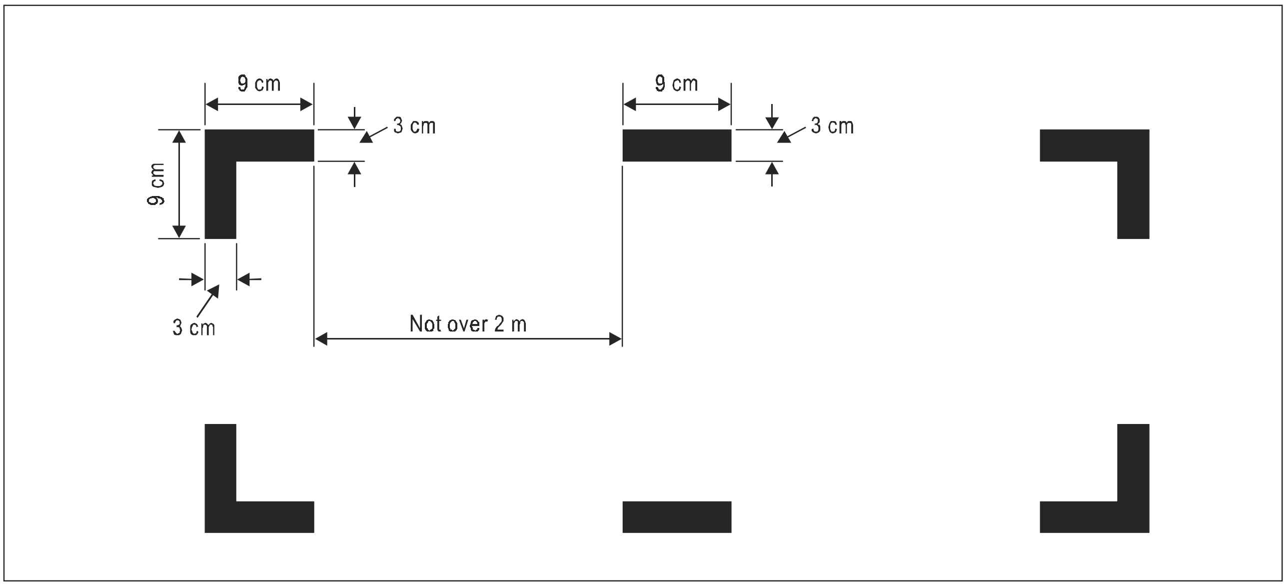
4.3.2.1 Performance Class 1 and 2 helicopters operating in accordance with the provisions of 4.3.1, shall be equipped with:

a) one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

b) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken; and

c) equipment for making the pyrotechnical distress signals described in Annex 2.

4.3.2.2 Performance Class 3 helicopters when operating beyond autorotational distance from land but within a distance from land specified by the appropriate authority of the responsible State shall be equipped with one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.



MARKING OF BREAK-IN POINTS (see 4.1.4)

Note.— When determining the distance from land referred to in 4.3.2.2, consideration should be given to environmental conditions and the availability of SAR facilities.

4.3.2.3 Performance Class 3 helicopters when operating outside the provisions of 4.3.2.2 shall be equipped as in 4.3.2.1.

4.3.2.4 In the case of performance Class 2 and Class 3 helicopters, when taking off or landing at a heliport where the take-off or approach path is so disposed over water that in the event of a mishap there would be likelihood of a ditching, at least the equipment required in 4.3.2.1 a) shall be carried.

4.3.2.5 Each life jacket and equivalent individual floatation device, when carried in accordance with this 4.3, shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons.

4.3.2.6 **Recommendation.—** *On any helicopter for which the individual certificate of airworthiness is first issued on or after 1 January 1991, at least 50 per cent of the life rafts carried in accordance with the provisions of 4.3.2 should be deployable by remote control.*

4.3.2.7 **Recommendation.—** *Rafts which are not deployable by remote control and which have a mass of more than 40 kg should be equipped with some means of mechanically assisted deployment.*

4.3.2.8 **Recommendation.—** *On any helicopter for which the individual certificate of airworthiness was first issued before 1 January 1991, the provisions of 4.3.2.6 and 4.3.2.7 should be complied with no later than 31 December 1992.*

4.4 All helicopters on flights over designated land areas

Helicopters, when operated across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

4.5 All helicopters on high altitude flights

4.5.1 Unpressurized helicopters

Unpressurized helicopters intended to be operated at high altitudes shall carry equipment for storing and dispensing the oxygen supplies required in 2.9.1.

4.5.2 Pressurized helicopters

Recommendation.— *Pressurized helicopters intended to be operated at high altitudes should carry emergency oxygen storage and dispensing equipment capable of storing and dispensing the oxygen supplies required in 2.9.2.*

4.6 All helicopters operated in accordance with the instrument flight rules

All helicopters, when operated in accordance with the instrument flight rules or when the helicopter cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a) a magnetic compass;

b) an accurate timepiece indicating the time in hours, minutes and seconds;

c) a sensitive pressure altimeter;

Note.— Due to the long history of misreadings, the use of drum-pointer altimeters is not recommended.

d) an airspeed indicating system with a means of preventing malfunctioning due to either condensation or icing;

e) a slip indicator;

f) two attitude indicators (artificial horizon), one of which may be replaced by a turn indicator;

g) a heading indicator (directional gyroscope);

Note.— The requirements of 4.6 e), f) and g), may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the separate instruments, are retained.

h) means of indicating whether the supply of power to the gyroscopic instruments is adequate;

i) a means of indicating in the flight crew compartment the outside air temperature;

j) a rate-of-climb and descent indicator; and

k) such additional instruments or equipment as may be prescribed by the appropriate authority.

4.7 All helicopters when operated at night

4.7.1 All helicopters, when operated at night, shall be equipped with:

a) all the equipment specified in 4.6;

b) the lights required by Annex 2 for aircraft in flight or operating on the movement area of a heliport;

Note.— The general characteristics of lights are specified in Annex 8. Detailed specifications for lights meeting the requirements of Annex 2 for aircraft in flight or operating on the movement area of a heliport are contained in the Airworthiness Manual *(Doc 9760).*

c) a landing light;

d) illumination for all flight instruments and equipment that are essential for the safe operation of the helicopter;

e) lights in all passenger compartments; and

f) an electric torch for each crew member station.

4.7.2 **Recommendation.—** *The landing light should be trainable, at least in the vertical plane.*

4.8 All helicopters required to comply with the noise certification Standards in Annex 16, Volume I

All helicopters required to comply with the noise certification Standards of Annex 16, Volume I shall carry a document attesting noise certification. When the document, or a suitable statement attesting noise certification as contained in another document approved by the State of Registry, is issued in a language other than English, it shall include an English translation.

Note 1.— The attestation may be contained in any document, carried on board, approved by the State of Registry in accordance with the relevant provisions of Annex 16, Volume I.

Note 2.— The various noise certification Standards of Annex 16, Volume I which are applicable to helicopters are determined according to the date of application for a type certificate, or the date of acceptance of an application under an equivalent prescribed procedure by the certificating authority. Some helicopters are not required to comply with any noise certification Standard. For details see Annex 16, Volume I, Part II, Chapters 8 and 11.

4.9 Flight recorders

Note 1.— Flight recorders comprise two systems — a flight data recorder (FDR) and a cockpit voice recorder (CVR).

Note 2.— Combination recorders (FDR/CVR) can only be used to meet the flight recorder equipage requirements as specifically indicated in this Annex.

Note 3.— Detailed guidance on flight recorders is contained in Attachment B.

4.9.1 Flight data recorders — types

4.9.1.1 A Type IV FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power and operation.

4.9.1.2 A Type V FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude and engine power.

4.9.1.3 The use of engraving metal foil FDRs shall be discontinued by 1 January 1995.

4.9.1.4 **Recommendation.—** *The use of analogue FDRs using frequency modulation (FM) should be discontinued by 5 November 1998.*

4.9.1.4.1 The use of photographic film FDRs shall be discontinued from 1 January 2003.

4.9.1.5 All helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a CVR, shall record on a flight recorder all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.9.1.5.1 From 1 January 2007, all helicopters which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the helicopter. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.9.1.5.2 Sufficient information to derive the content of the data link communications message, and, whenever practical, the time the message was displayed to or generated by the crew shall be recorded.

Note.— Data link communications include, but are not limited to, automatic dependent surveillance (ADS), controller-pilot data link communications (CPDLC), data link-flight information services (D-FIS) and aeronautical operational control (AOC) messages.

4.9.1.6 **Recommendation.—** *All helicopters of a maximum certificated take-off mass over 2 730 kg, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).*

4.9.1.7 A Type IVA FDR shall record the parameters required to determine accurately the helicopter flight path, speed, attitude, engine power, configuration and operation. The parameters that satisfy the requirements for a Type IVA FDR are listed in the paragraphs below. The parameters without an asterisk (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by helicopter systems or the flight crew to operate the helicopter.

4.9.1.7.1 The following parameters satisfy the requirements for flight path and speed:

– Pressure altitude
– Indicated airspeed
– Outside air temperature
– Heading
– Normal acceleration
– Lateral acceleration
– Longitudinal acceleration (body axis)
– Time or relative time count
– Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
– Radio altitude*

4.9.1.7.2 The following parameters satisfy the requirements for attitude:

– Pitch attitude
– Roll attitude
– Yaw rate

4.9.1.7.3 The following parameters satisfy the requirements for engine power:

– Power on each engine: free power turbine speed (N_f), engine torque, engine gas generator speed (N_g), cockpit power control position
– Rotor: main rotor speed, rotor brake
– Main gearbox oil pressure*
– Gearbox oil temperature*: main gearbox oil temperature, intermediate gearbox oil temperature, tail rotor gearbox oil temperature
– Engine exhaust gas temperature (T_4)*
– Turbine inlet temperature (TIT)*

4.9.1.7.4 The following parameters satisfy the requirements for configuration:

– Landing gear or gear selector position*
– Fuel contents*
– Ice detector liquid water content*

4.9.1.7.5 The following parameters satisfy the requirements for operation:

– Hydraulics low pressure
– Warnings
– Primary Flight Controls — Pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal, controllable stabilator, hydraulic selection
– Marker beacon passage
– Each navigation receiver frequency selection
– AFCS mode and engagement status*
– Stability augmentation system engagement*
– Indicated sling load force*
– Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
– Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
– DME 1 and 2 distances*
– Altitude rate*
– Ice detector liquid water content*
– Helicopter health and usage monitor system (HUMS)*: engine data, chip detectors, track timing, exceedance discretes, broadband average engine vibration

Note 1.— Parameter requirements, including range, sampling, accuracy and resolution, as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

Note 2.— The number of parameters to be recorded will depend on helicopter complexity. Parameters without an (*) are to be recorded regardless of helicopter complexity. Those parameters designated by an (*) are to be recorded if an information source for the parameter is used by helicopter systems and/or flight crew to operate the helicopter.

4.9.2 Flight data recorders — duration

Types IV and V FDRs shall be capable of retaining the information recorded during at least the last ten hours of their operation.

4.9.3 Flight data recorders — helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1989

4.9.3.1 All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a Type IV FDR.

4.9.3.2 **Recommendation.—** *All helicopters of a maximum certificated take-off mass of over 2 730 kg up to and including 7 000 kg should be equipped with a Type V FDR.*

4.9.4 Flight data recorders — helicopters for which the individual certificate of airworthiness is first issued after 1 January 2005

All helicopters of a maximum certificated take-off mass of over 3 180 kg shall be equipped with a Type IVA FDR with a recording duration of at least 10 hours.

Note.— A single, combination CVR/FDR is acceptable.

4.9.5 Cockpit voice recorders — helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1987

Note.— CVR performance requirements are as contained in the Minimum Operational Performance Specification (MOPS) document for Flight Recorder Systems of the European Organization for Civil Aviation Equipment (EUROCAE) or equivalent documents.

4.9.5.1 All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a CVR the objective of which is the recording of the aural environment on the flight deck during flight time. For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on one track of the CVR.

4.9.5.2 **Recommendation.—** *All helicopters of a maximum certificated take-off mass of over 3 180 kg, up to and including 7 000 kg, should be equipped with a CVR, the objective of which is the recording of the aural environment on the flight deck during flight time. For helicopters not equipped with an FDR, at least main rotor speed should be recorded on one track of the CVR.*

4.9.6 Cockpit voice recorders — duration

4.9.6.1 A CVR shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

4.9.6.2 **Recommendation.—** *A CVR, installed in helicopters for which the individual certificate of airworthiness is first issued on or after 1 January 1990, should be capable of retaining the information recorded during at least the last two hours of its operation.*

4.9.6.3 A CVR, installed in helicopters for which the individual certificate of airworthiness is first issued after 1 January 2003, shall be capable of retaining the information recorded during at least the last two hours of its operation.

4.9.7 Flight recorders — construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed.

4.9.8 Flight recorders — operation

4.9.8.1 Flight recorders shall not be switched off during flight time.

4.9.8.2 To preserve flight recorder records, flight recorders shall be de-activated upon completion of flight time following an accident or incident. The flight recorders shall not be re-activated before their disposition as determined in accordance with Annex 13.

Note 1.— The need for removal of the flight recorder records from the aircraft is to be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

Note 2.— The operator's responsibilities regarding the retention of flight recorder records are contained in 9.6.

4.9.9 Flight recorders — continued serviceability

Operational checks and evaluations of recordings from the FDR and CVR systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the flight data and CVR systems are given in Attachment B.

4.10 Emergency locator transmitter (ELT)

4.10.1 Except as provided for in 4.10.2, until 1 January 2005 all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.3.1 a) and Performance Class 3 helicopters operating as described in 4.3.1 b) shall be equipped with at least one ELT(S) per raft carried but not more than a total of two ELTs are required.

4.10.2 Performance Class 1 and 2 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating on flights over water as described in 4.3.1 a) and Performance Class 3 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating as described in 4.3.1 b) shall be equipped with at least one automatic ELT and one ELT(S) in a raft.

4.10.3 From 1 January 2005, all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.3.1 a) and Performance Class 3 helicopters operating as described in 4.3.1 b) shall be equipped with at least one automatic ELT and one ELT(S) in a raft.

4.10.4 Except as provided for in 4.10.5, until 1 January 2005 helicopters on flights over designated land areas as described in 4.4. shall be equipped with at least one ELT.

4.10.5 Helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, on flights over designated land areas as described in 4.4 shall be equipped with at least one automatic ELT.

4.10.6 From 1 January 2005, helicopters on flights over designated land areas as described in 4.4 shall be equipped with at least one automatic ELT.

4.10.7 **Recommendation.—** *All helicopters should carry an automatic ELT.*

4.10.8 ELT equipment carried to satisfy the requirements of 4.10.1, 4.10.2, 4.10.3, 4.10.4, 4.10.5, 4.10.6 and 4.10.7 shall operate in accordance with the relevant provisions of Annex 10, Volume III.

4.11 Helicopters required to be equipped with a pressure-altitude reporting transponder

4.11.1 From 1 January 2003, unless exempted by the appropriate authorities, all helicopters shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.

4.11.2 **Recommendation.—** *All helicopters should be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of Annex 10, Volume IV.*

Note.— The provisions in 4.11.1 and 4.11.2 are intended to support the effectiveness of ACAS as well as to improve effectiveness of air traffic services. Effective dates for carriage requirements of ACAS are contained in Annex 6, Part I, 6.18.1 and 6.18.2. The intent is also for aircraft not equipped with pressure-altitude reporting transponders to be operated so as not to share airspace used by aircraft equipped with airborne collision avoidance systems. To this end, exemptions from the carriage requirement for pressure-altitude reporting transponders could be given by designating airspace where such carriage is not required.

4.12 Microphones

Recommendation.— *All flight crew members required to be on flight deck duty should communicate through boom or throat microphones below the transition level/altitude.*

CHAPTER 5. HELICOPTER COMMUNICATION AND NAVIGATION EQUIPMENT

5.1 Communication equipment

5.1.1 A helicopter to be operated in accordance with the instrument flight rules or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication with those aeronautical stations and on those frequencies prescribed by the appropriate authority.

Note.— The requirements of 5.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

5.1.2 When compliance with 5.1.1 requires that more than one communication equipment unit be provided, each shall be independent of the other or others to the extent that a failure in any one will not result in failure of any other.

5.1.3 A helicopter to be operated in accordance with the visual flight rules, but as a controlled flight, shall, unless exempted by the appropriate authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

5.1.4 A helicopter to be operated on a flight to which the provisions of 4.3 or 4.4 apply shall, unless exempted by the appropriate authority, be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

5.1.5 **Recommendation.—** *The radio communication equipment required in accordance with 5.1.1 to 5.1.4 should provide for communication on the aeronautical emergency frequency 121.5 MHz.*

5.2 Navigation equipment

5.2.1 A helicopter shall be provided with navigation equipment which will enable it to proceed:

a) in accordance with its flight plan; and

b) in accordance with the requirements of air traffic services;

except when, if not so precluded by the appropriate authority, navigation for flights under the visual flight rules is accomplished by visual reference to landmarks. For international general aviation, landmarks shall be located at least every 110 km (60 NM).

5.2.2 For flights in defined portions of airspace or on routes where an RNP type has been prescribed, a helicopter shall, in addition to the requirements specified in 5.2.1:

a) be provided with navigation equipment which will enable it to operate in accordance with the prescribed RNP type(s); and

b) be authorized by the State of Registry for operations in such airspace.

Note.— Information on RNP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613). This document also contains a comprehensive list of references to other documents produced by States and international bodies concerning navigation systems and RNP.*

5.2.3 The helicopter shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the helicopter to navigate in accordance with 5.2.1 and, where applicable, 5.2.2.

Note.— For international general aviation, this requirement may be met by means other than the duplication of equipment.

5.2.4 On flights in which it is intended to land in instrument meteorological conditions a helicopter shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance at each heliport at which it is intended to land in instrument meteorological conditions and at any designated alternate heliports.

CHAPTER 6. HELICOPTER MAINTENANCE

Note 1.— For the purpose of this chapter “helicopter” includes: powerplants, power transmissions, rotors, components, accessories, instruments, equipment and apparatus including emergency equipment.

Note 2.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual *(Doc 9760).*

6.1 Responsibilities

6.1.1 The owner of a helicopter, or in the case where it is leased, the lessee shall ensure that:

a) the helicopter is maintained in an airworthy condition;

b) the operational and emergency equipment necessary for the intended flight is serviceable;

c) the Certificate of Airworthiness of the helicopter remains valid; and

d) the maintenance of the helicopter is performed in accordance with a maintenance programme acceptable to the State of Registry.

6.1.2 The helicopter shall not be operated unless it is maintained and released to service under a system acceptable to the State of Registry.

6.1.3 When the maintenance release is not issued by an organization approved in accordance with Annex 6, Part I, 8.7, the person signing the maintenance release shall be licensed in accordance with Annex 1.

6.2 Maintenance records

6.2.1 The owner shall ensure that the following records are kept for the periods mentioned in 6.2.2:

a) the total time in service hours, calendar time and cycles, as appropriate of the helicopter and all life-limited components;

b) the current status of compliance with all mandatory continuing airworthiness information;

c) appropriate details of modifications and repairs to the helicopter;

d) the time in service (hours, calendar time and cycles, as appropriate) since last overhaul of the helicopter or its components subject to a mandatory overhaul life;

e) the current status of the helicopter’s compliance with the maintenance programme; and

f) the detailed maintenance records to show that all requirements for signing of a maintenance release have been met.

6.2.2 The records in 6.2.1 a) to e) shall be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service, and the records in 6.2.1 f) for a minimum period of one year after the signing of the maintenance release.

6.2.3 The lessee of a helicopter shall comply with the requirements of 6.2.1 and 6.2.2, as applicable, while the helicopter is leased.

6.3 Continuing airworthiness information

The owner of a helicopter over 3 180 kg maximum certificated take-off mass, or in the case where it is leased, the lessee, shall, as required by the State of Registry, ensure that, the information resulting from maintenance and operational experience with respect to continuing airworthiness, is transmitted as required by Annex 8, Part II, paragraphs 4.3.5 and 4.3.8.

6.4 Modifications and repairs

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry. Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

6.5 Maintenance release

6.5.1 A maintenance release shall be completed and signed, as prescribed by the State of Registry, to certify that the maintenance work performed has been completed satisfactorily.

6.5.2 A maintenance release shall contain a certification including:

a) basic details of the maintenance carried out;

b) date such maintenance was completed;

c) when applicable, the identity of the approved maintenance organization; and

d) the identity of the person or persons signing the release.

CHAPTER 7. HELICOPTER FLIGHT CREW

7.1 Qualifications

The pilot-in-command shall ensure that the licences of each flight crew member have been issued or rendered valid by the State of Registry, and are properly rated and of current validity, and shall be satisfied that flight crew members have maintained competence.

Note.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle Clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

7.2 Composition of the flight crew

The number and composition of the flight crew shall not be less than that specified in the flight manual or other documents associated with the certificate of airworthiness.

ANNEX 6 — PART III

APPENDICES

23/11/06

No. 11

APPENDIX 1. ORGANIZATION AND CONTENTS OF AN OPERATIONS MANUAL

(*See Section II, Chapter 2, 2.2.2.1)*

1. Organization

1.1 **Recommendation.—** *An operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 2, 2.2.2.1 should be organized with the following structure:*

a) General;

b) Aircraft operating information;

c) Routes and aerodromes; and

d) Training.

1.2 From 1 January 2006, an operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 2, 2.2.2.1 shall be organized with the following structure:

a) General;

b) Aircraft operating information;

c) Routes and aerodromes; and

d) Training.

2. Contents

The operations manual referred to in 1.1 and 1.2 shall contain at the least the following:

2.1 General

2.1.1 Instructions outlining the responsibilities of operations personnel pertaining to the conduct of flight operations.

2.1.2 Rules limiting the flight time and flight duty periods and providing for adequate rest periods for flight crew members and cabin crew.

2.1.3 A list of the navigational equipment to be carried.

2.1.4 The circumstances in which a radio listening watch is to be maintained.

2.1.5 The method for determining minimum flight altitudes.

2.1.6 The methods for determining heliport operating minima.

2.1.7 Safety precautions during refuelling with passengers on board.

2.1.8 Ground handling arrangements and procedures.

2.1.9 Procedures, as prescribed in Annex 12, for pilots-in-command observing an accident.

2.1.10 The flight crew for each type of operation including the designation of the succession of command.

2.1.11 Specific instructions for the computation of the quantities of fuel and oil to be carried, having regard to all circumstances of the operation including the possibility of loss of pressurization and the failure of one or more power-units while en route.

2.1.12 The conditions under which oxygen shall be used and the amount of oxygen determined in accordance with Section II, Chapter 2, 2.3.8.2.

2.1.13 Instructions for mass and balance control.

2.1.14 Instructions for the conduct and control of ground de-icing/anti-icing operations.

2.1.15 The specifications for the operational flight plan.

2.1.16 Standard operating procedures (SOP) for each phase of flight.

2.1.17 Instructions on the use of normal checklists and the timing of their use.

2.1.18 Departure contingency procedures.

2.1.19 Instructions on the maintenance of altitude awareness.

2.1.20 Instructions on the clarification and acceptance of ATC clearances, particularly where terrain clearance is involved.

2.1.21 Departure and approach briefings.

2.1.22 Route and destination familiarization.

2.1.23 Conditions required to commence or to continue an instrument approach.

2.1.24 Instructions for the conduct of precision and non-precision instrument approach procedures.

2.1.25 Allocation of flight crew duties and procedures for the management of crew workload during night and IMC instrument approach and landing operations.

2.1.26 Information and instructions relating to the interception of civil aircraft including:

a) procedures, as prescribed in Annex 2, for pilots-in-command of intercepted aircraft; and

b) visual signals for use by intercepting and intercepted aircraft, as contained in Annex 2.

2.1.27 Details of the accident prevention and flight safety programme provided in accordance with Section II, Chapter 1, 1.1.7, including a statement of safety policy and the responsibility of personnel.

2.1.28 Information and instructions on the carriage of dangerous goods, including action to be taken in the event of an emergency.

Note.— Guidance material on the development of policies and procedures for dealing with dangerous goods incidents on board aircraft is contained in Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481).

2.1.29 Security instructions and guidance.

2.1.30 The search procedure checklist provided in accordance with Section II, Chapter 11, 11.1.

2.2 Aircraft operating information

2.2.1 Certification limitations and operating limitations.

2.2.2 The normal, abnormal and emergency procedures to be used by the flight crew and the checklists relating thereto as required by Section II, Chapter 4, 4.1.3.

2.2.3 Flight planning data for pre-flight and in-flight planning with different thrust/power and speed settings.

2.2.4 Instructions and data for mass and balance calculations.

2.2.5 Instructions for aircraft loading and securing of load.

2.2.6 Aircraft systems, associated controls and instructions for their use, as required by Section II, Chapter 4, 4.1.3.

2.2.7 The minimum equipment list for the helicopter types operated and specific operations authorized.

2.2.8 Checklist of emergency and safety equipment and instructions for its use.

2.2.9 Emergency evacuation procedures, including type-specific procedures, crew coordination, assignment of crew's emergency positions and the emergency duties assigned to each crew member.

2.2.10 The normal, abnormal and emergency procedures to be used by the cabin crew, the checklists relating thereto and aircraft systems information as required, including a statement related to the necessary procedures for the coordination between flight and cabin crew.

2.2.11 Survival and emergency equipment for different routes and the necessary procedures to verify its normal functioning before take-off, including procedures to determine the required amount of oxygen and the quantity available.

2.2.12 The ground-air visual signal code for use by survivors, as contained in Annex 12.

2.3 Routes and aerodromes

2.3.1 A route guide to ensure that the flight crew will have, for each flight, information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures as applicable for the operation, and such other information as the operator may deem necessary for the proper conduct of flight operations.

2.3.2 The minimum flight altitudes for each route to be flown.

2.3.3 Heliport operating minima for each of the heliports that are likely to be used as heliports of intended landing or as alternate heliports.

2.3.4 The increase of heliport operating minima in case of degradation of approach or heliport facilities.

2.4 Training

2.4.1 Details of the flight crew training programme and requirements, as required by Section II, Chapter 7, 7.3.

2.4.2 Details of the cabin crew duties training programme as required by Section II, Chapter 10, 10.3.

2.4.3 Details of the flight operations officer/flight dispatcher training programme when employed in conjunction with a method of flight supervision in accordance with Section II, Chapter 2, 2.2.

Note.— Details of the flight operations officer/flight dispatcher training programme are contained in Section II, Chapter 8, 8.3.

APPENDIX 2. SAFETY OVERSIGHT OF AIR OPERATORS

(Note. — See Section II, Chapter 2, 2.2.1.7)

1. Primary aviation legislation

1.1 The State of the Operator shall enact and implement laws that enable the State to regulate civil aviation through a Civil Aviation Authority or equivalent organization established for that purpose. The legislation shall empower the Authority to discharge the oversight responsibilities of the State. The legislation shall provide for the making of regulations, the certification and continued supervision of air operators, and the resolution of safety issues identified by the Authority.

Note.— The term Authority as used in this Appendix refers to the Civil Aviation Authority as well as equivalent organizations, including inspectors and staff.

1.2 The State of the Operator shall ensure that the laws of the State require air operators to provide the Authority with access to their personnel records, aircraft, operations and facilities and associated records for the purpose of certification and continued surveillance.

Note.— Guidance on the critical elements of a system that enables a State to discharge its responsibility for inspection, certification and continued surveillance of operations is contained in the Safety Oversight Manual *(Doc 9734)*, Part A — The Establishment and Management of a State's Safety Oversight System, *the* Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335), and the* Airworthiness Manual *(Doc 9760)*.

2. Specific operating regulations

2.1 The State of the Operator shall adopt regulations that provide for the certification and continued surveillance of aircraft operations and the maintenance of aircraft in conformity with the Annexes to the Convention on International Civil Aviation.

2.2 The State of the Operator shall ensure that its regulations are sufficiently comprehensive, detailed, and current with respect to changes in technology and the operating environment to ensure that satisfactory compliance will result in an acceptable level of safety for the operations undertaken.

3. CAA structure and safety oversight functions

3.1 The State of the Operator shall ensure that the Authority is responsible for the safety oversight of air operators and that it has resources appropriate to the size and complexity of civil air operations under the jurisdiction of the State, to effectively discharge the responsibilities of the State.

3.2 The State of the Operator shall ensure that Authority inspectors have adequate support, credentials, and transportation to accomplish, independently, their certification and continued surveillance tasks.

4. Technical guidance

4.1 The State of the Operator shall ensure that Authority inspectors are provided with technical guidance manuals containing the policies, procedures, and standards to be used in the certification and continued surveillance of air operators.

4.2 The State of the Operator shall ensure that Authority inspectors are provided with technical guidance containing the policies, procedures, and standards to be used in the resolution of safety issues, including enforcement.

4.3 The State of the Operator shall ensure that Authority inspectors are provided with guidance that addresses ethics, personal conduct, and the avoidance of actual or perceived conflicts of interest in the performance of official duties.

5. Qualified technical personnel

5.1 The State of the Operator shall use a methodology to determine its inspector staffing requirements according to the size and complexity of civil air operations in that State.

5.2 **Recommendation.** *The methodology in 5.1 should be documented.*

5.3 The State of the Operator shall establish qualification requirements to ensure that its inspector personnel have operational or technical work experience and training compatible with those activities they are required to certificate or inspect.

Note.— Guidance on experience and training for inspectors is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335), Chapter 9, 9.4.*

5.4 The State of the Operator shall require Authority inspectors to complete initial and recurrent training in relevant technical subjects (including aircraft-specific subjects) and in skills necessary to effectively accomplish their certification and continued surveillance tasks.

5.5 **Recommendation.—** *The State of the Operator should take the necessary measures, such as conditions of service, to ensure that qualified inspectors are recruited and retained.*

6. Licensing and certification obligations

6.1 The State of the Operator shall use a documented process for the certification of air operators that includes thorough technical evaluations that lead to approval or acceptance of procedures, documents and operations as specified in Part III, Section II.

6.2 The State of the Operator shall require, prior to commencement of new commercial air transport operations, air operators to demonstrate that they can safely conduct the proposed operations.

7. Continued surveillance obligations

7.1 The State of the Operator shall use a documented process for the continued surveillance of air operators to verify the continued validity of the air operator certificates issued by the Authority.

7.2 The State of the Operator shall use an ongoing surveillance plan to confirm that operators continue to meet the relevant requirements for initial certification and that each air operator is functioning satisfactorily.

8. Resolution of safety issues

8.1 The State of the Operator shall use a documented process to take appropriate corrective actions, up to and including enforcement measures, to resolve identified safety issues.

8.2 The State of the Operator shall ensure that identified safety issues are resolved in a timely manner through a system which monitors and records progress, including actions taken by the air operator, in resolving such issues.

ANNEX 6 — PART III

ATTACHMENTS

1/11/01

ATTACHMENT A. HELICOPTER PERFORMANCE AND OPERATING LIMITATIONS

Purpose and scope

The purpose of the following example is to illustrate the level of performance intended by the provisions of Section II, Chapter 3, and Section III, Chapter 3.

1. Definitions

1.1 Only applicable to performance Class 1 helicopters

Landing distance required (LDRH). The horizontal distance required to land and come to a full stop from a point 10.7 m (35 ft) above the landing surface.

Rejected take-off distance required (RTODR). The horizontal distance required from the start of the take-off to the point where the helicopter comes to a full stop following a power-unit failure and rejection of the take-off at the take-off decision point.

Take-off distance required (TODRH). The horizontal distance required from the start of the take-off to the point at which V_{TOSS}, a height of 10.7 m (35 ft) above the take-off surface, and a positive climb gradient are achieved, following failure of the critical power-unit at TDP, the remaining power-units operating within approved operating limits.

1.2 Applicable to all classes of helicopters

Distance DR. DR is the horizontal distance that the helicopter has travelled from the end of the take-off distance available.

Landing distance available (LDAH). The length of the final approach and take-off area plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

Take-off distance available (TODAH). The length of the final approach and take-off area plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off.

Touchdown and lift-off area (TLOF). A load bearing area on which a helicopter may touch down or lift off.

$\boldsymbol{V_y}$ Best rate of climb speed.

2. General

2.1 Significant factors

To determine the performance of the helicopter, account is taken of at least the following factors:

a) mass of the helicopter;

b) elevation or pressure-altitude and temperature;

c) wind; for take-off and landing, accountability for wind shall be no more than 50 per cent of any reported steady head wind component of 5 knots or more. Where take-off and landing with a tail wind component is permitted in the flight manual, not less than 150 per cent of any reported tail wind component shall be allowed. Where precise wind measuring equipment enables accurate measurement of wind velocity over the point of take-off and landing, these values may be varied; and

d) operating techniques.

2.2 For performance Class 2 or 3 helicopters in any flight phase where a power-unit failure may cause the helicopter to force land:

a) a minimum visibility must be defined by the operator, taking into account the characteristics of the helicopter, but never less than 1 000 m for performance Class 2 helicopters and 1 500 m for performance Class 3 helicopters;

b) the operator is obliged to verify that the surface below the intended flight path permits the pilot to execute a safe forced landing; in addition, in case of a flight over water, the operator must also verify that the helicopter has been certificated for ditching.

In addition, performance Class 3 operations are not to be performed:

c) out of the sight of the surface; or

d) at night; or

e) when the cloud ceiling is less than 180 m (600 ft).

3. Operating area considerations

3.1 Touchdown and lift-off area

On surface level heliports, the length or width of the undercarriage, whichever is the greater, does not exceed 2/3 the diameter of the circle contained in the touchdown and lift-off area. On elevated heliports and on helidecks, it is presumed that the FATO and the touchdown and lift-off area will be coincidental.

3.2 FATO

The over-all length or width of the helicopter, whichever is the greater, does not exceed 2/3 the smallest dimension of the FATO except in case of a water heliport. In this case, it does not exceed 1/2 the width of the FATO. If the FATO includes water surface, the helicopter is to be specifically approved in its flight manual for routine water operations including rejected take-off onto water surfaces. For performance Class 1 helicopters, the dimensions of the FATO are not less than those which are indicated in the flight manual of the helicopter.

3.3 Helicopter clearway

The over-all length or width of the helicopter, whichever is greater, does not exceed 2/3 the width of the helicopter clearway in case of a land heliport or half the width of the helicopter clearway in case of a water heliport.

4. Limitations resulting from performance

4.1 Performance Class 1 helicopters

4.1.1 *Take-off*

4.1.1.1 No helicopter is taken off at a mass that exceeds the maximum take-off mass specified in the flight manual for the altitude of the heliport and for the ambient temperature existing at the time of the take-off.

4.1.1.2 Take-off from a surface-level heliport (Figure A-1)

The take-off mass is such that:

a) the rejected take-off distance required does not exceed the rejected take-off distance available;

b) the take-off distance required does not exceed the take-off distance available; or

As an alternative (Figure A-2), the take-off distance required may be disregarded provided that the helicopter with the critical power-unit failure at the TDP can, when continuing the take-off, clear all obstacles between the end of the take-off distance available and the point at which it becomes established in a climb at V_{TOSS} by a vertical margin of 10.7 m (35 ft) or more. An obstacle is considered to be in the path of the helicopter if its distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the maximum dimension of the helicopter, whichever is greater.

4.1.1.3 Take-off from an elevated heliport or helideck (Figure A-3)

The take-off mass is such that:

a) it is possible to reject the take-off and land on the FATO in case of the critical power-unit failure occurring before the TDP;

b) it is possible to continue the flight if the critical power-unit failure occurs at or after the TDP. In this case, the flight path of the helicopter may descend below the height of the FATO in order to achieve V_{TOSS} if the following conditions are satisfied:

1) A clearance margin is established in relation to the elevated heliport or helideck itself and to all obstacles located on the elevated heliport or helideck. 4.5 m (15 ft) has been found appropriate to a wide range of helicopters.

2) The vertical clearance above all obstacles not located on the elevated heliport or helideck is at least equal to 10.7 m (35 ft). An obstacle is considered if its distance from the flight path does not exceed 30 m or 1.5 times the maximum dimension of the helicopter, whichever is greater.

4.1.2 *Initial climb*

4.1.2.1 The take-off mass is such that the climb path provides a vertical clearance of not less than 10.7 m (35 ft) for VFR operations and 10.7 m (35 ft) + 0.01 DR for IFR operations above all obstacles located in the climb path, the critical power-unit failure occurring at the TDP.

4.1.2.2 An obstacle is considered if its lateral distance from the nearest point on the surface below the intended flight path does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus:

0.10 DR for VFR day operations
0.15 DR for VFR night operations
0.30 DR for IFR operations without electronic guidance
0.15 DR for IFR operations with electronic guidance
0.10 DR for IFR operations with ILS or MLS guidance

except obstacles may be disregarded if they are situated beyond:

a) 7 R* for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

b) 10 R* for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

c) 300 m if navigational accuracy can be achieved by navigation aids; and

d) 900 m in the other cases.

4.1.2.3 Where a change of direction of more than 15° is made, obstacle clearance requirements are to be increased by 5 m (15 ft) from the point at which the turn is initiated. This turn is not to be initiated before reaching a height of 30 m (100 ft) above the take-off surface.

4.1.3 *En route*

The take-off mass is such that it is possible, in case of the critical power-unit failure occurring at any point of the flight path, to continue the flight to an appropriate landing site and achieve the minimum flight altitudes for the route to be flown.

4.1.4 *Approach, landing and balked landing*
(Figures A-7 and A-8)

4.1.4.1 The estimated landing mass at the destination or alternate is such that:

a) it does not exceed the maximum landing mass specified in the flight manual, taking into account the parameters specified in 2.1;

b) the landing distance required does not exceed the landing distance available;

c) in case of the critical power-unit failure occurring at any point after the LDP, it is possible to land and stop within the FATO; and

d) in case of the critical power-unit failure occurring at any point before the LDP, it is possible either to land and stop within the FATO, or to overshoot and clear all obstacles in the flight path by a vertical interval of 10.7 m (35 ft) for VFR plus an additional margin of 0.01 DR for IFR.

An obstacle is considered if its lateral distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus:

0.10 DR for VFR day operations
0.15 DR for VFR night operations
0.30 DR for IFR operations without electronic guidance
0.15 DR for IFR operations with electronic guidance
0.10 DR for IFR operations with ILS or MLS guidance

except obstacles may be disregarded if they are situated beyond:

e) 7 R* for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

f) 10 R* for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

g) 300 m if navigational accuracy can be achieved by navigation aids; and

h) 900 m in the other cases.

4.1.4.2 In case of a landing on an elevated heliport or helideck, the flight path may descend below the height of the landing surface in order to achieve V_{TOSS} if the following conditions are satisfied:

a) A clearance margin is established in relation to the elevated heliport or helideck itself and to all obstacles located on the elevated heliport or helideck. 4.5 m (15 ft) has been found appropriate to a wide range of helicopters.

b) The vertical clearance above all obstacles not located on the elevated heliport or helideck is at least equal to that specified in 4.1.4.1.

4.2 Performance Class 2 helicopters

4.2.1 *Take-off*
(Figures A-4 and A-5)

4.2.1.1 The mass of the helicopter at take-off does not exceed the maximum take-off mass specified in the flight manual taking into account the parameters specified in 2.1.

4.2.1.2 The take-off mass is such that a safe forced landing can be achieved in the event of a power-unit failure prior to reaching the defined point after take-off.

* R is the rotor radius.

4.2.1.3 In case of a take-off from an elevated heliport or helideck and a failure of the critical power-unit occurring before V_y is obtained, the flight path may descend to achieve V_y if the following conditions are satisfied:

a) A clearance margin is established in relation to the elevated heliport or helideck itself and to all obstacles located on the elevated heliport or helideck. 4.5 m (15 ft) has been found appropriate to a wide range of helicopters.

b) The vertical clearance above all obstacles not located on the elevated heliport or helideck is at least equal to 10.7 m (35 ft). An obstacle is considered if its distance from the flight path does not exceed 30 m or 1.5 times the over-all length of the helicopter whichever is greater.

4.2.2 *Initial climb*

4.2.2.1 The take-off mass is such that the climb path provides a vertical clearance of not less than 10.7 m (35 ft) for VFR operations and 10.7 m (35 ft) + 0.01 DR for IFR operations above all obstacles located in the climb path, the critical power-unit failure occurring at the defined point after take-off.

4.2.2.2 An obstacle is considered if its lateral distance from the nearest point on the surface below the intended flight path does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus:

0.10 DR for VFR day operations
0.15 DR for VFR night operations
0.30 DR for IFR operations without electronic guidance
0.15 DR for IFR operations with electronic guidance
0.10 DR for IFR operations with ILS or MLS guidance

except obstacles may be disregarded if they are situated beyond:

a) 7 R* for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

b) 10 R* for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

c) 300 m if navigational accuracy can be achieved by navigation aids; and

d) 900 m in the other cases.

4.2.3 *En route*

The take-off mass is such that it is possible, in case of the critical power-unit failure occurring at any point of the flight path, to continue the flight to an appropriate landing site and achieve the minimum flight altitudes for the route to be flown.

4.2.4 *Approach, landing and balked landing*
(Figures A-9 and A-10)

4.2.4.1 The estimated landing mass at the destination or alternate is such that:

a) it does not exceed the maximum landing mass specified in the flight manual, taking into account the parameters specified in 2.1;

b) a safe forced landing can be achieved in the event of an engine failure after reaching the defined point before landing;

c) it is possible to perform a balked landing, all engines operating, at any point of the flight path and clear all obstacles in the flight path by a vertical clearance of not less than:

10.7 m (35 ft) for VFR operations; and
10.7 m (35 ft) + 0.01 DR for IFR operations; and

d) it is possible, in case of the critical power-unit failure occurring before the defined point before landing, either to land and stop within the FATO, or to overshoot and clear all obstacles in the flight path by a vertical interval of 10.7 m (35 ft).

An obstacle is considered if its lateral distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus:

0.10 DR for VFR day operations
0.15 DR for VFR night operations
0.30 DR for IFR operations without electronic guidance
0.15 DR for IFR operations with electronic guidance
0.10 DR for IFR operations with ILS or MLS guidance

except obstacles may be disregarded if they are situated beyond:

e) 7 R* for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

f) 10 R* for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

g) 300 m if navigational accuracy can be achieved by navigation aids; and

h) 900 m in the other cases.

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* R is the rotor radius.

4.2.4.2 In case of a landing on an elevated heliport or helideck, the flight path may descend below the height of the FATO in order to achieve V_y if the following conditions are satisfied:

a) A clearance margin is established in relation to the elevated heliport or helideck itself and to all obstacles located on the elevated heliport or helideck. 4.5 m (15 ft) has been found appropriate to a wide range of helicopters;

b) The vertical clearance above all obstacles not located on the elevated heliport or helideck is at least equal to that specified in 4.2.4.1.

4.3 Performance Class 3 helicopters

4.3.1 *Take-off*
(Figure A-6)

4.3.1.1 The mass of the helicopter at take-off does not exceed the maximum take-off mass specified in the flight manual taking into account the parameters specified in 2.1.

4.3.1.2 The take-off mass is such that a safe forced landing can be achieved in the event of an engine failure.

4.3.2 *Initial climb*

4.3.2.1 The take-off mass is such that the climb path provides a vertical clearance of not less than 10.7 m (35 ft) above all obstacles located along the climb path, all engines operating.

4.3.2.2 An obstacle is considered if its lateral distance from the nearest point on the surface below the intended flight path does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus 0.10 DR, except obstacles may be disregarded if they are situated beyond 7 R*.

4.3.3 *En route*

The take-off mass is such that it is possible to achieve the minimum flight altitudes for the route to be flown, all engines operating.

4.3.4 *Approach, landing and balked landing*
(Figure A-11)

The estimated landing mass at the destination or alternate is such that:

a) it does not exceed the maximum landing mass specified in the flight manual, taking into account the parameters specified in 2.1;

b) a safe forced landing can be achieved in the event of an engine failure;

c) it is possible to perform a balked landing, all engines operating, at any point of the flight path and clear all obstacles by a vertical interval of 10.7 m (35 ft).

An obstacle is considered if its lateral distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the over-all length of the helicopter, whichever is greater, plus 0.10 DR, except obstacles may be disregarded if they are situated beyond 7 R*.

* R is the rotor radius.

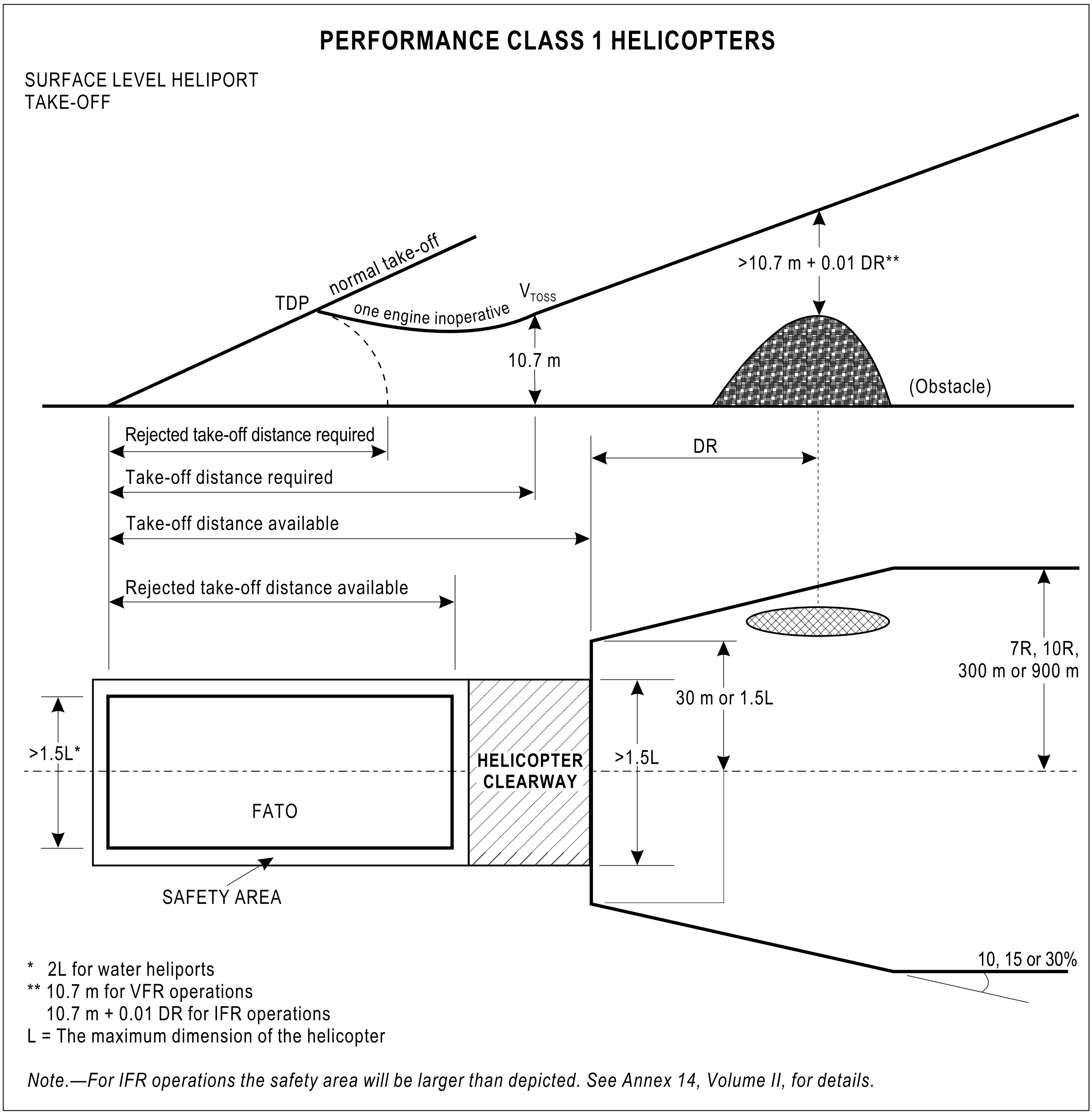
PERFORMANCE CLASS 1 HELICOPTERS
SURFACE LEVEL HELIPORT
TAKE-OFF
normal take-off
TDP
one engine inoperative
V TOSS
>10.7 m + 0.01 DR**
10.7 m
(Obstacle)
Rejected take-off distance required
DR
Take-off distance required
Take-off distance available
Rejected take-off distance available
7R, 10R,
300 m or 900 m
30 m or 1.5L
>1.5L*
HELICOPTER
CLEARWAY
>1.5L
FATO
SAFETY AREA
10, 15 or 30%
* 2L for water heliports
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter
Note.—For IFR operations the safety area will be larger than depicted. See Annex 14, Volume II, for details.

Figure A-1

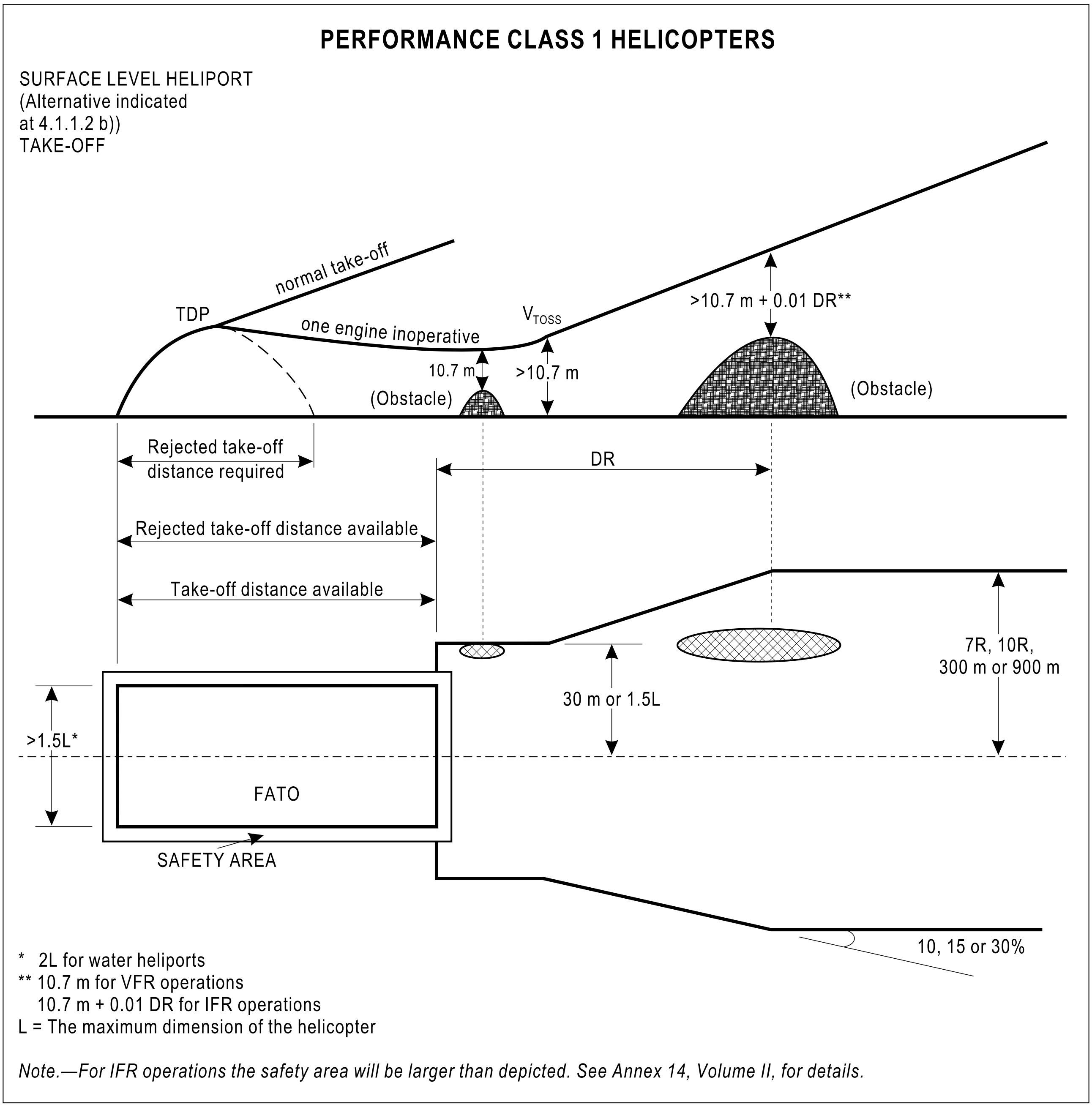
PERFORMANCE CLASS 1 HELICOPTERS
SURFACE LEVEL HELIPORT
(Alternative indicated
at 4.1.1.2 b))
TAKE-OFF
normal take-off
TDP
one engine inoperative
VTOSS
>10.7 m + 0.01 DR**
10.7 m
>10.7 m
(Obstacle)
(Obstacle)
Rejected take-off
distance required
DR
Rejected take-off distance available
Take-off distance available
7R, 10R,
300 m or 900 m
30 m or 1.5L
>1.5L*
FATO
SAFETY AREA
10, 15 or 30%
* 2L for water heliports
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter
Note.—For IFR operations the safety area will be larger than depicted. See Annex 14, Volume II, for details.

Figure A-2

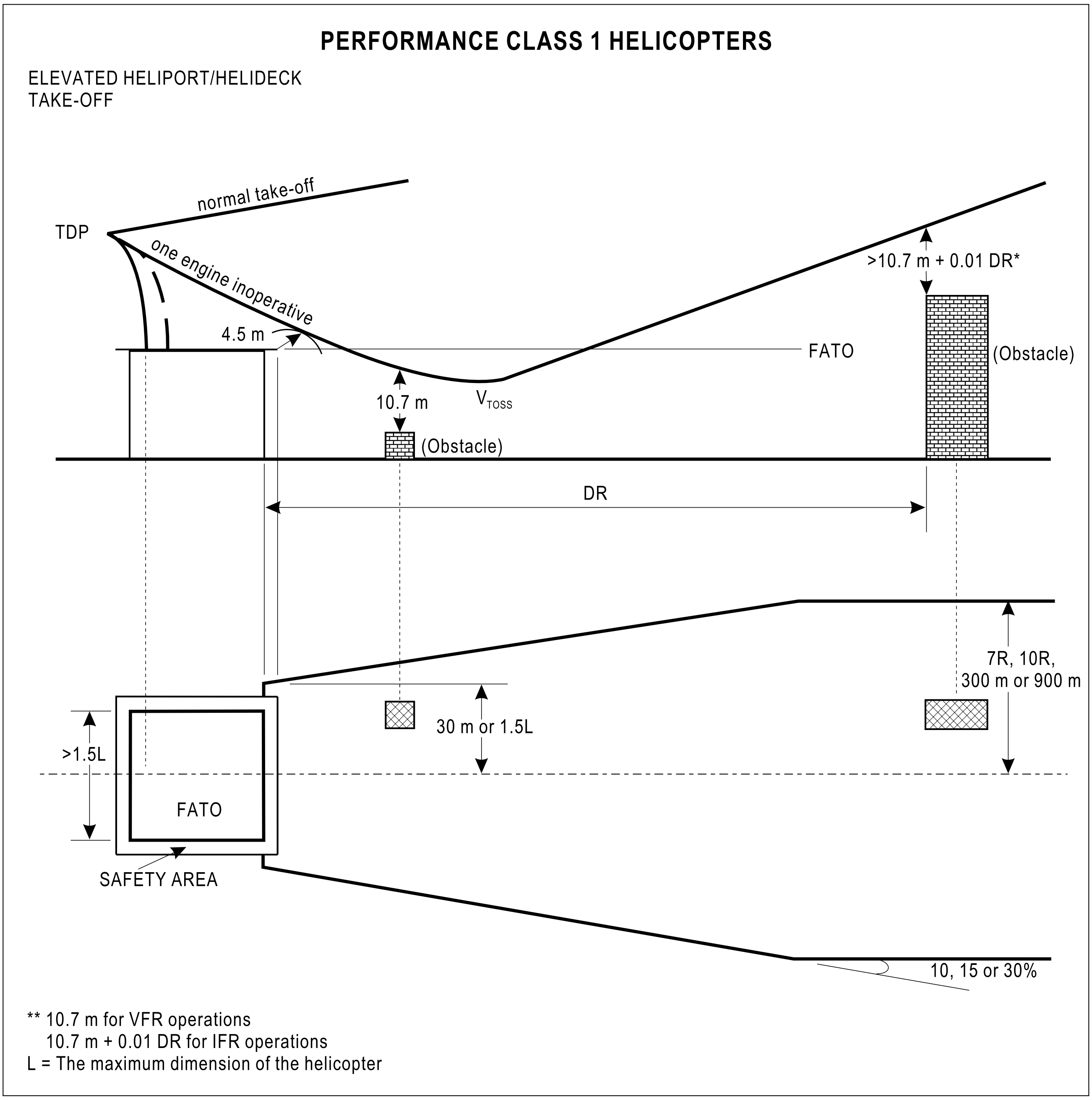
PERFORMANCE CLASS 1 HELICOPTERS
ELEVATED HELIPORT/HELIDECK
TAKE-OFF
normal take-off
TDP
one engine inoperative
4.5 m
>10.7 m + 0.01 DR*
FATO
(Obstacle)
10.7 m
V_{TOSS}
(Obstacle)
DR
7R, 10R,
300 m or 900 m
30 m or 1.5L
>1.5L
FATO
SAFETY AREA
10, 15 or 30%
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter

Figure A-3

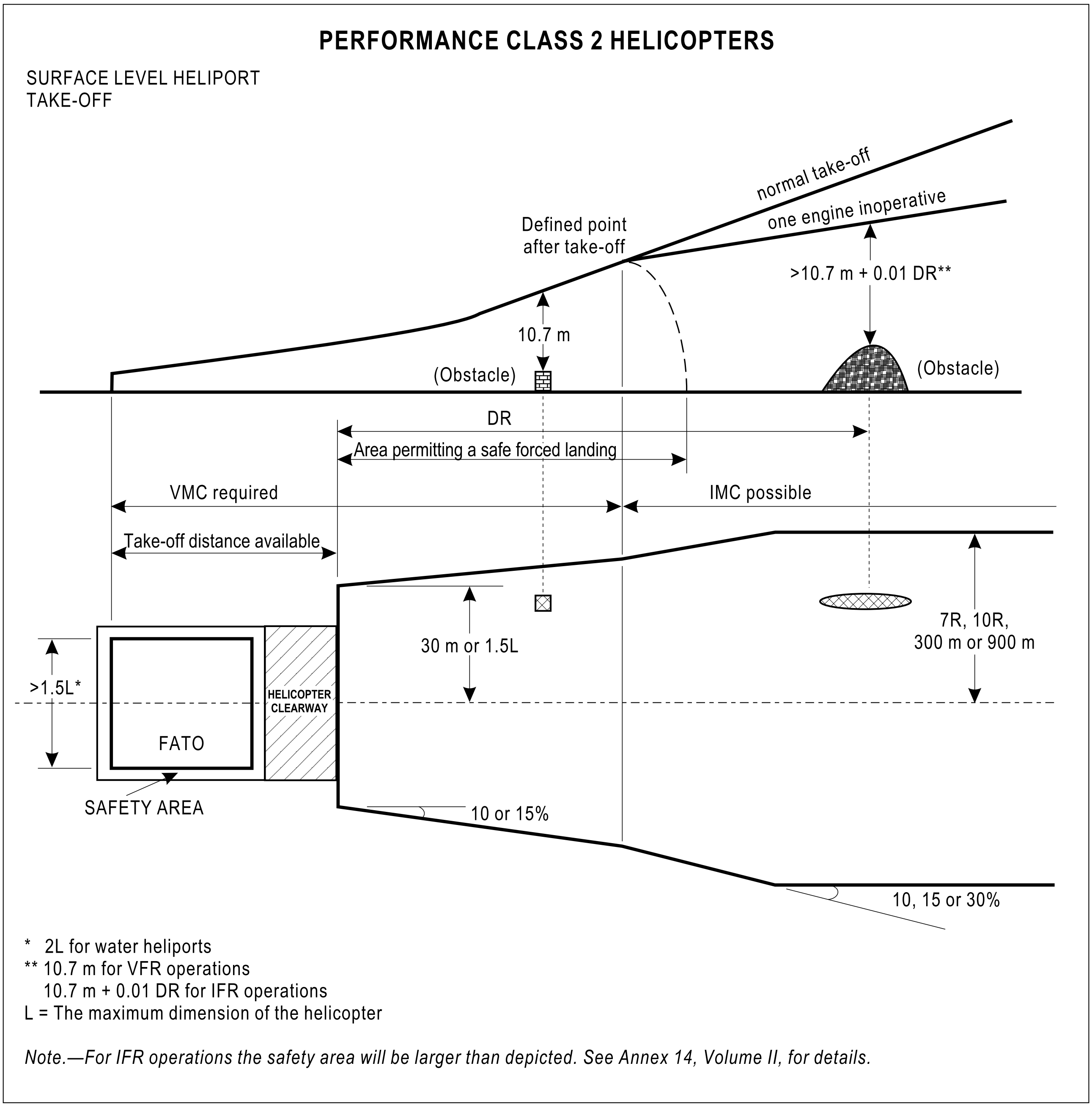
PERFORMANCE CLASS 2 HELICOPTERS
SURFACE LEVEL HELIPORT
TAKE-OFF
normal take-off
one engine inoperative
Defined point
after take-off
>10.7 m + 0.01 DR**
10.7 m
(Obstacle)
(Obstacle)
DR
Area permitting a safe forced landing
VMC required
IMC possible
Take-off distance available
30 m or 1.5L
7R, 10R,
300 m or 900 m
>1.5L*
HELICOPTER
CLEARWAY
FATO
SAFETY AREA
10 or 15%
10, 15 or 30%
* 2L for water heliports
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter
Note.—For IFR operations the safety area will be larger than depicted. See Annex 14, Volume II, for details.

Figure A-4

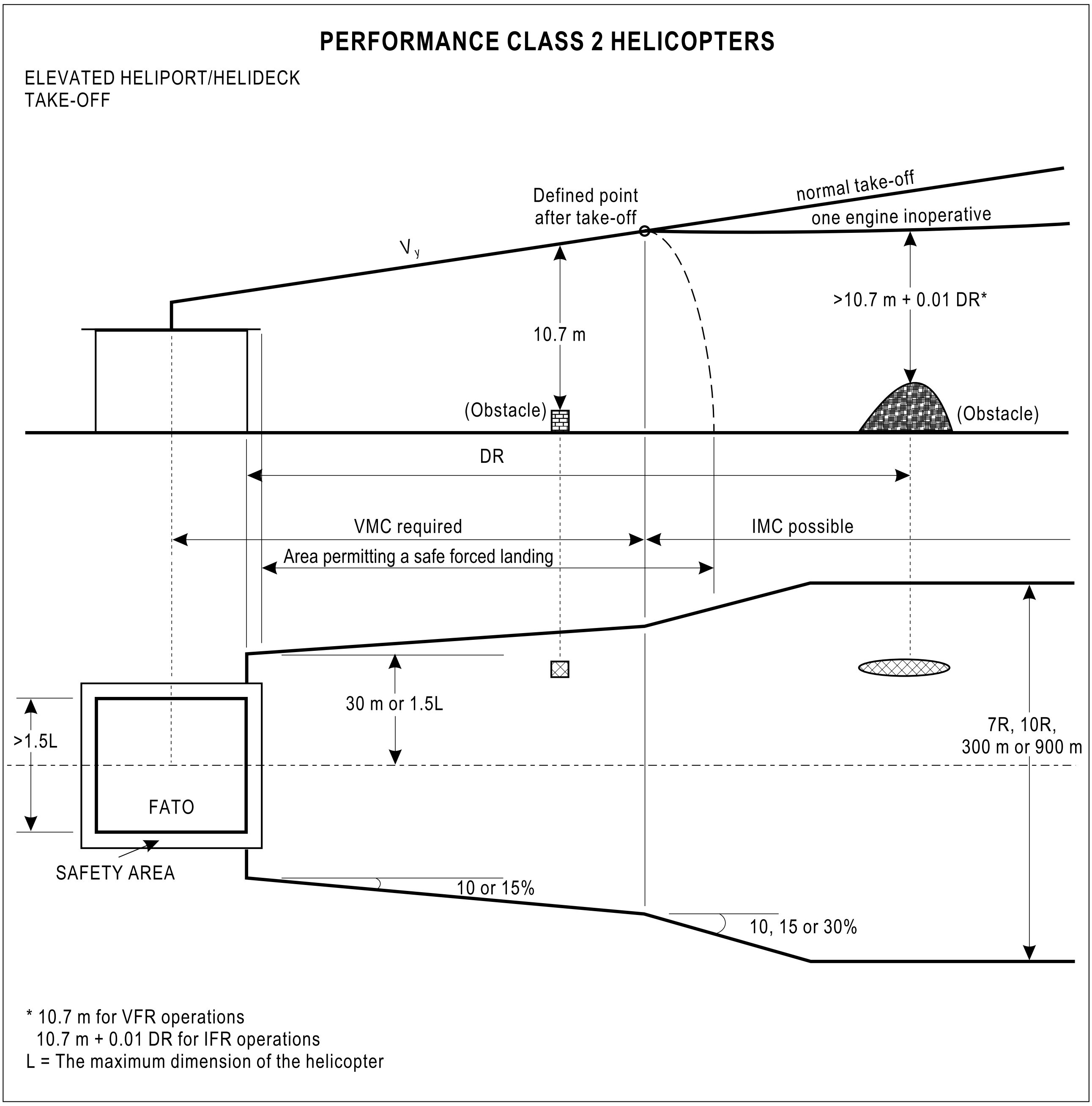
PERFORMANCE CLASS 2 HELICOPTERS
ELEVATED HELIPORT/HELIDECK
TAKE-OFF
Defined point
after take-off
normal take-off
one engine inoperative
V y
>10.7 m + 0.01 DR*
10.7 m
(Obstacle)
(Obstacle)
DR
VMC required
IMC possible
Area permitting a safe forced landing
30 m or 1.5L
>1.5L
7R, 10R,
300 m or 900 m
FATO
SAFETY AREA
10 or 15%
10, 15 or 30%
* 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter

Figure A-5

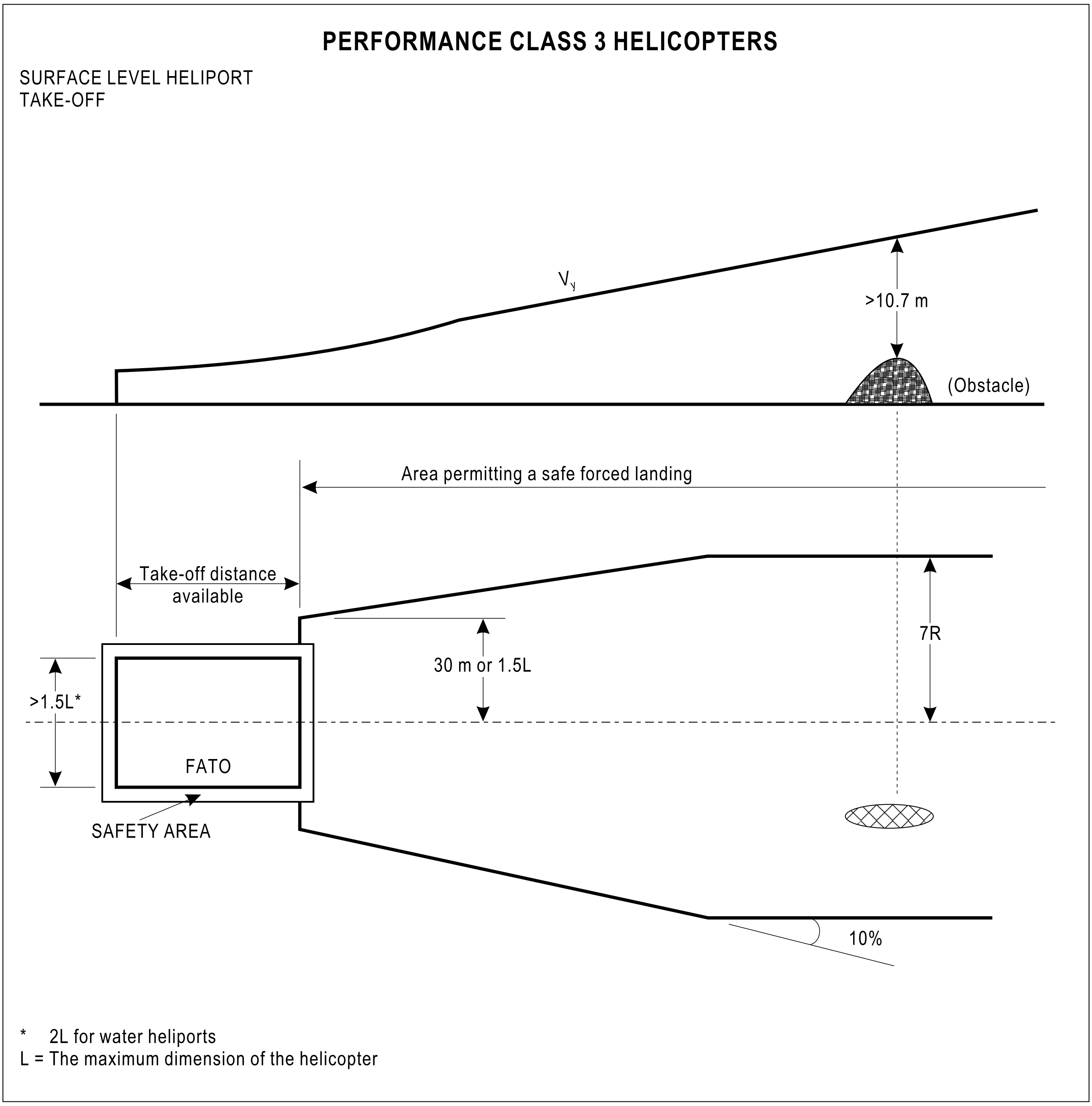
PERFORMANCE CLASS 3 HELICOPTERS
SURFACE LEVEL HELIPORT
TAKE-OFF
V_y
>10.7 m
(Obstacle)
Area permitting a safe forced landing
Take-off distance available
30 m or 1.5L
7R
>1.5L*
FATO
SAFETY AREA
10%
* 2L for water heliports
L = The maximum dimension of the helicopter

Figure A-6

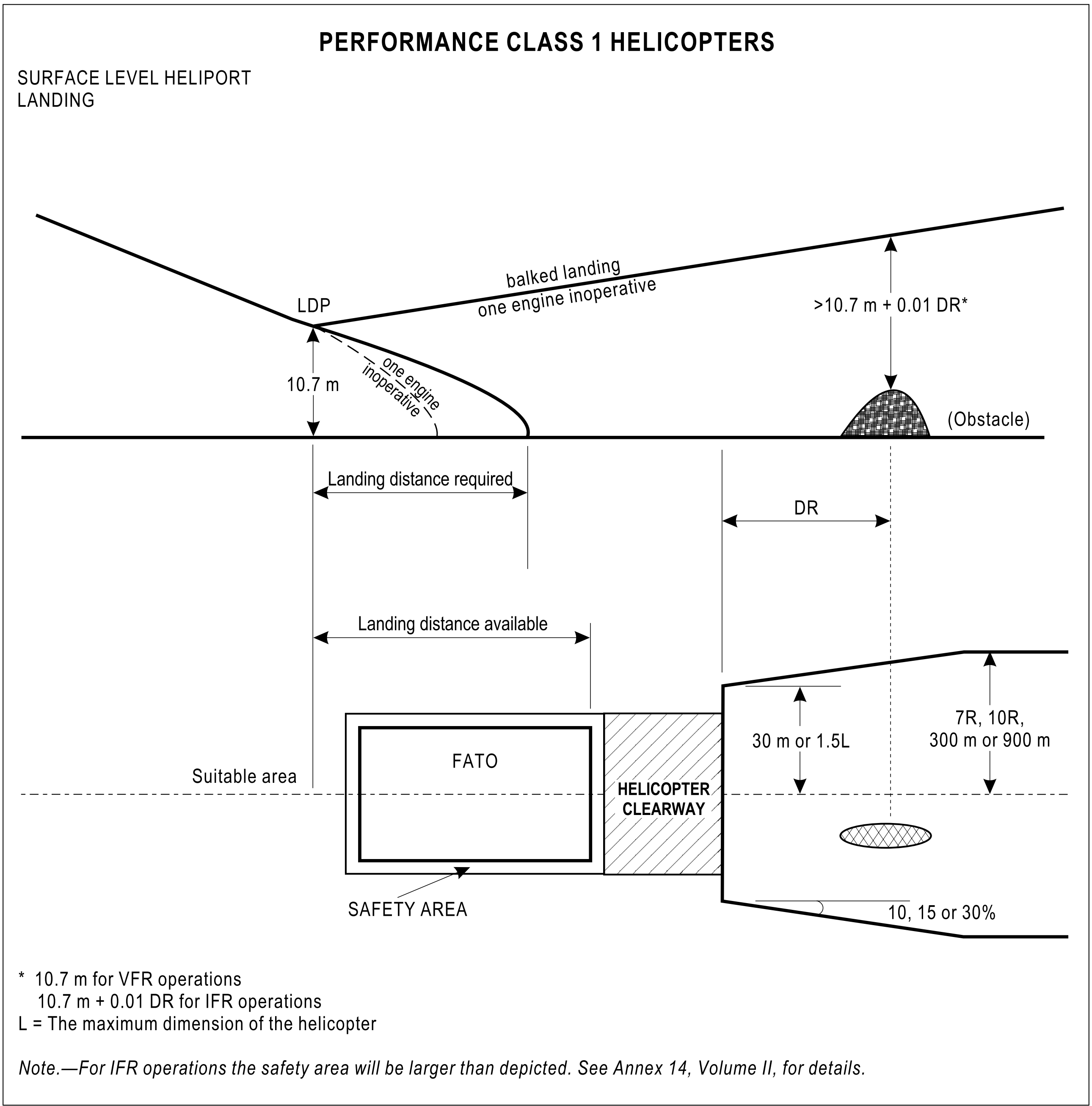
PERFORMANCE CLASS 1 HELICOPTERS
SURFACE LEVEL HELIPORT
LANDING
balked landing
one engine inoperative
LDP
>10.7 m + 0.01 DR*
10.7 m
one engine
inoperative
(Obstacle)
Landing distance required
DR
Landing distance available
FATO
Suitable area
HELICOPTER
CLEARWAY
30 m or 1.5L
7R, 10R,
300 m or 900 m
SAFETY AREA
10, 15 or 30%
* 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter
Note.—For IFR operations the safety area will be larger than depicted. See Annex 14, Volume II, for details.

Figure A-7

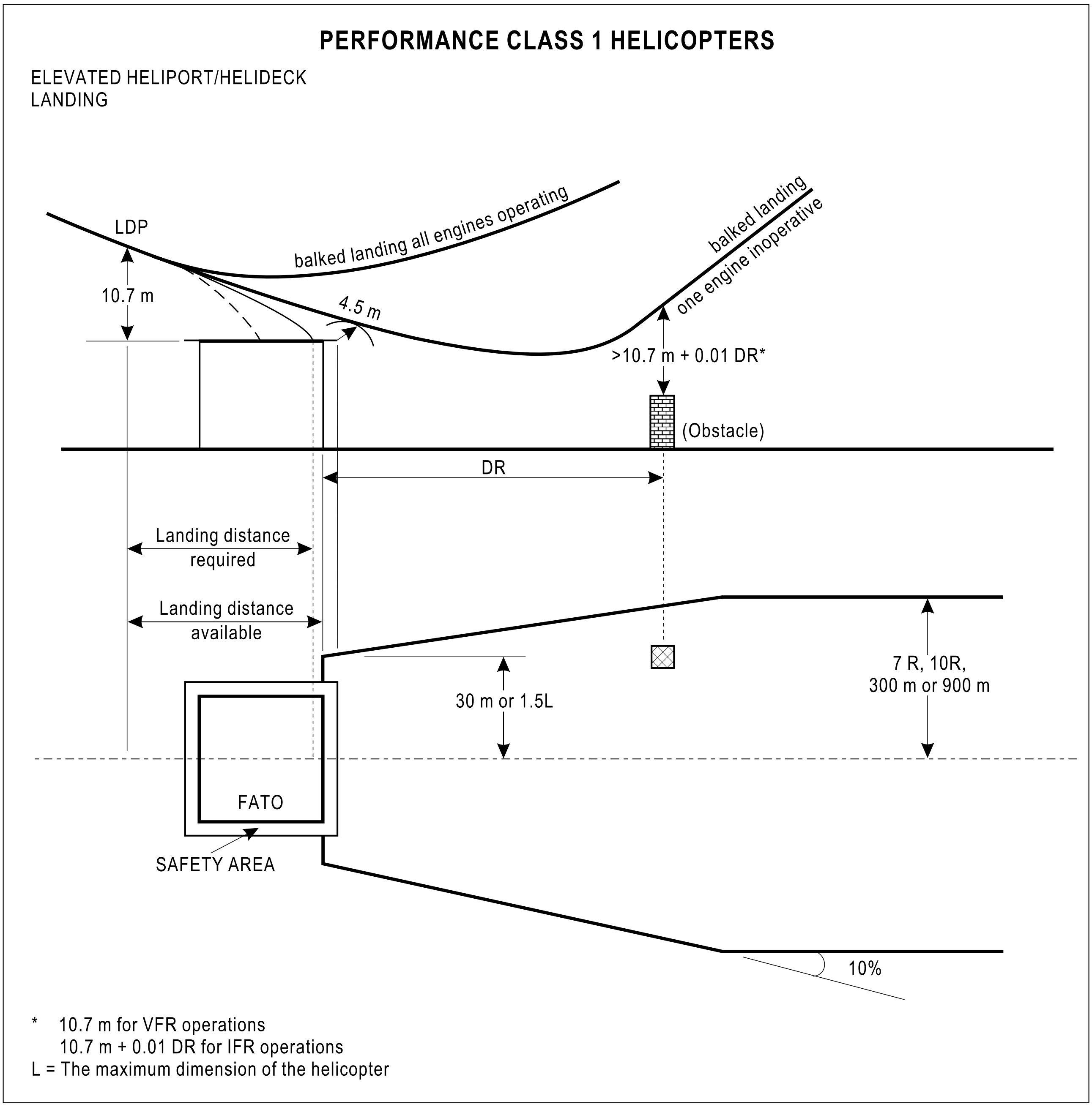
PERFORMANCE CLASS 1 HELICOPTERS
ELEVATED HELIPORT/HELIDECK
LANDING
LDP
balked landing all engines operating
balked landing
one engine inoperative
10.7 m
4.5 m
>10.7 m + 0.01 DR*
(Obstacle)
DR
Landing distance
required
Landing distance
available
7 R, 10R,
300 m or 900 m
30 m or 1.5L
FATO
SAFETY AREA
10%
* 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter

Figure A-8

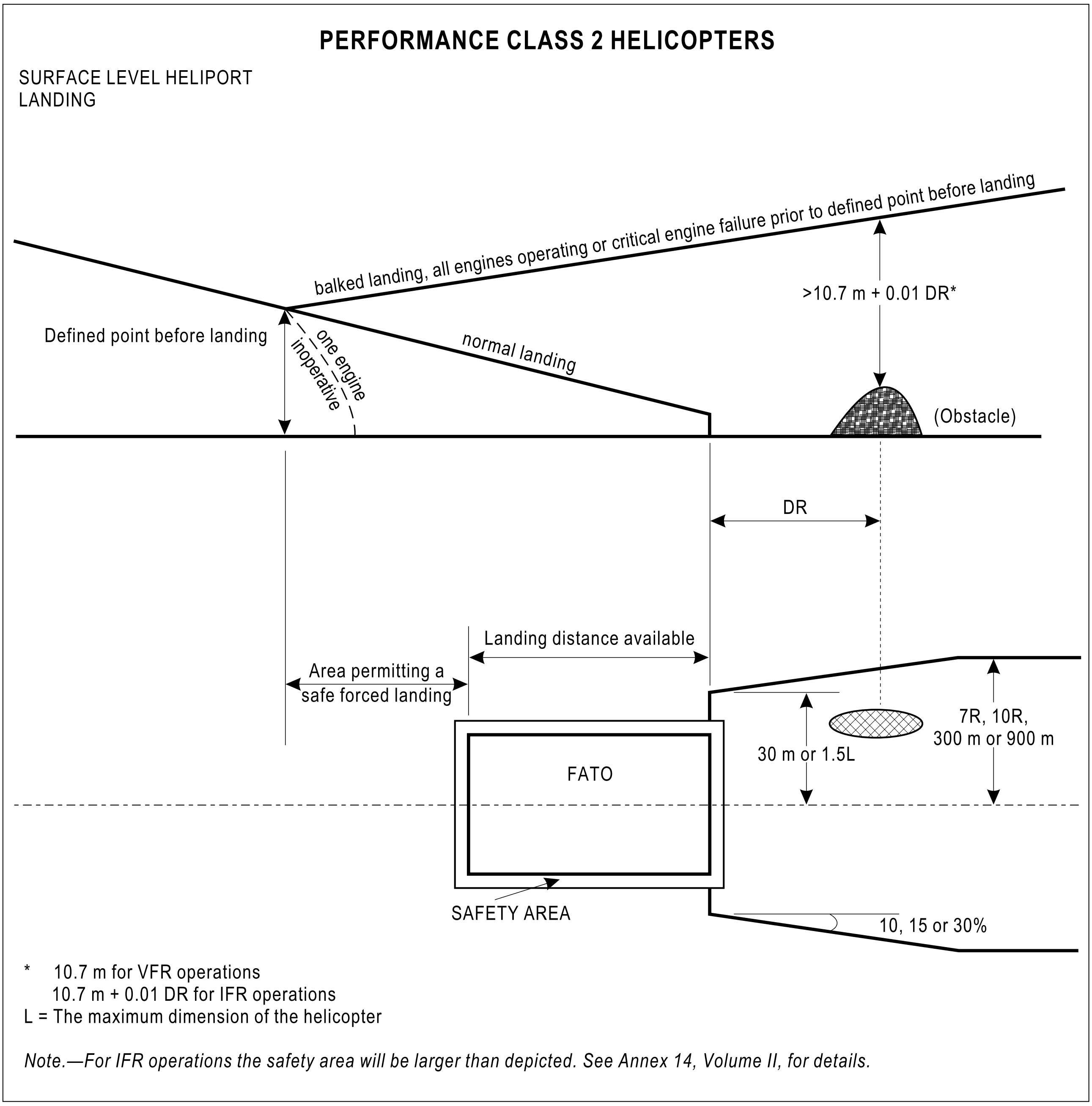
PERFORMANCE CLASS 2 HELICOPTERS
SURFACE LEVEL HELIPORT
LANDING
balked landing, all engines operating or critical engine failure prior to defined point before landing
>10.7 m + 0.01 DR*
Defined point before landing
one engine
inoperative
normal landing
(Obstacle)
DR
Landing distance available
Area permitting a
safe forced landing
FATO
30 m or 1.5L
7R, 10R,
300 m or 900 m
SAFETY AREA
10, 15 or 30%
* 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
L = The maximum dimension of the helicopter
Note.—For IFR operations the safety area will be larger than depicted. See Annex 14, Volume II, for details.

Figure A-9

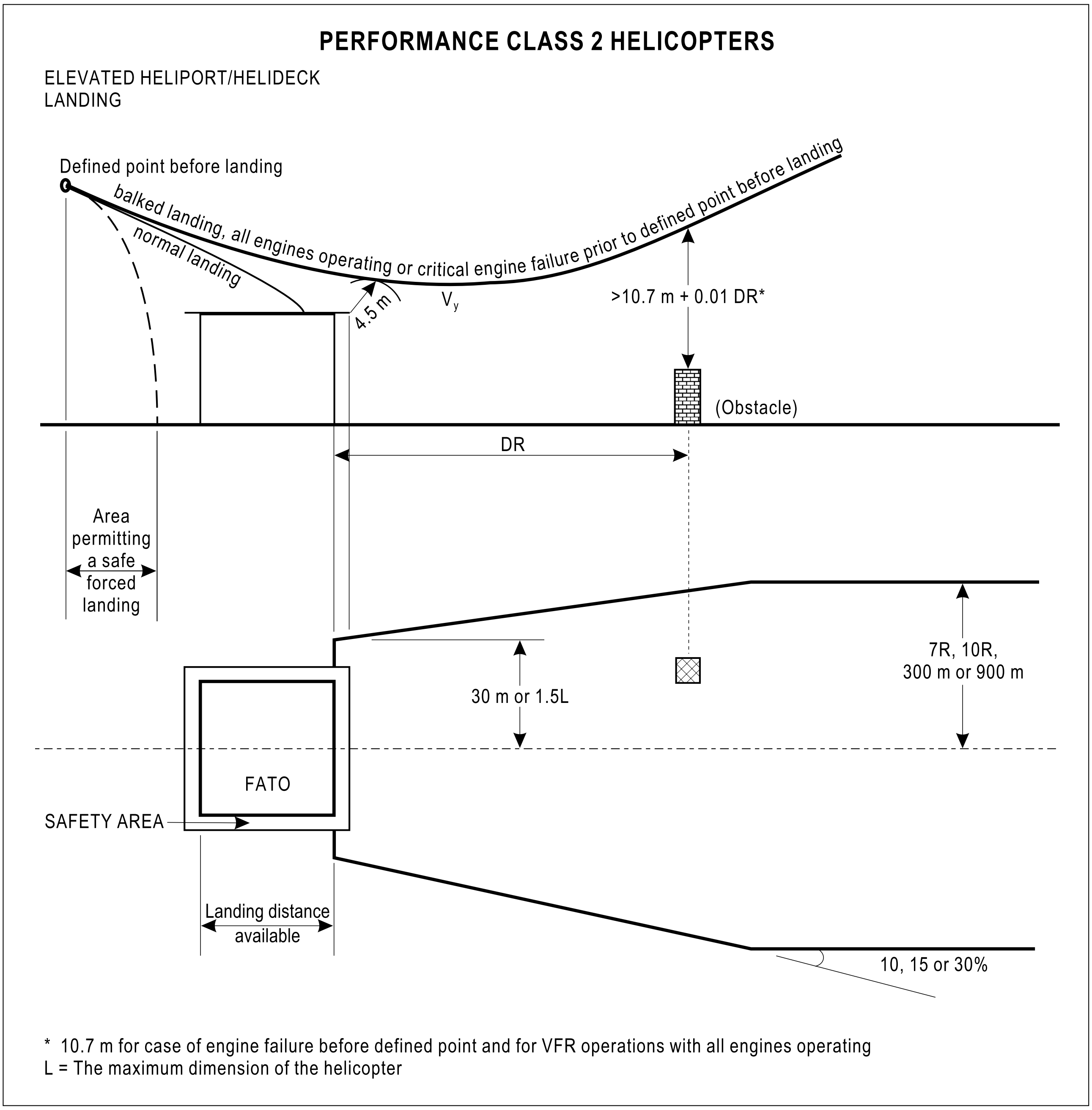
PERFORMANCE CLASS 2 HELICOPTERS
ELEVATED HELIPORT/HELIDECK
LANDING
Defined point before landing
balked landing, all engines operating or critical engine failure prior to defined point before landing
normal landing
4.5 m
Vy
>10.7 m + 0.01 DR*
(Obstacle)
DR
Area permitting a safe forced landing
30 m or 1.5L
7R, 10R, 300 m or 900 m
FATO
SAFETY AREA
Landing distance available
10, 15 or 30%
* 10.7 m for case of engine failure before defined point and for VFR operations with all engines operating
L = The maximum dimension of the helicopter

Figure A-10

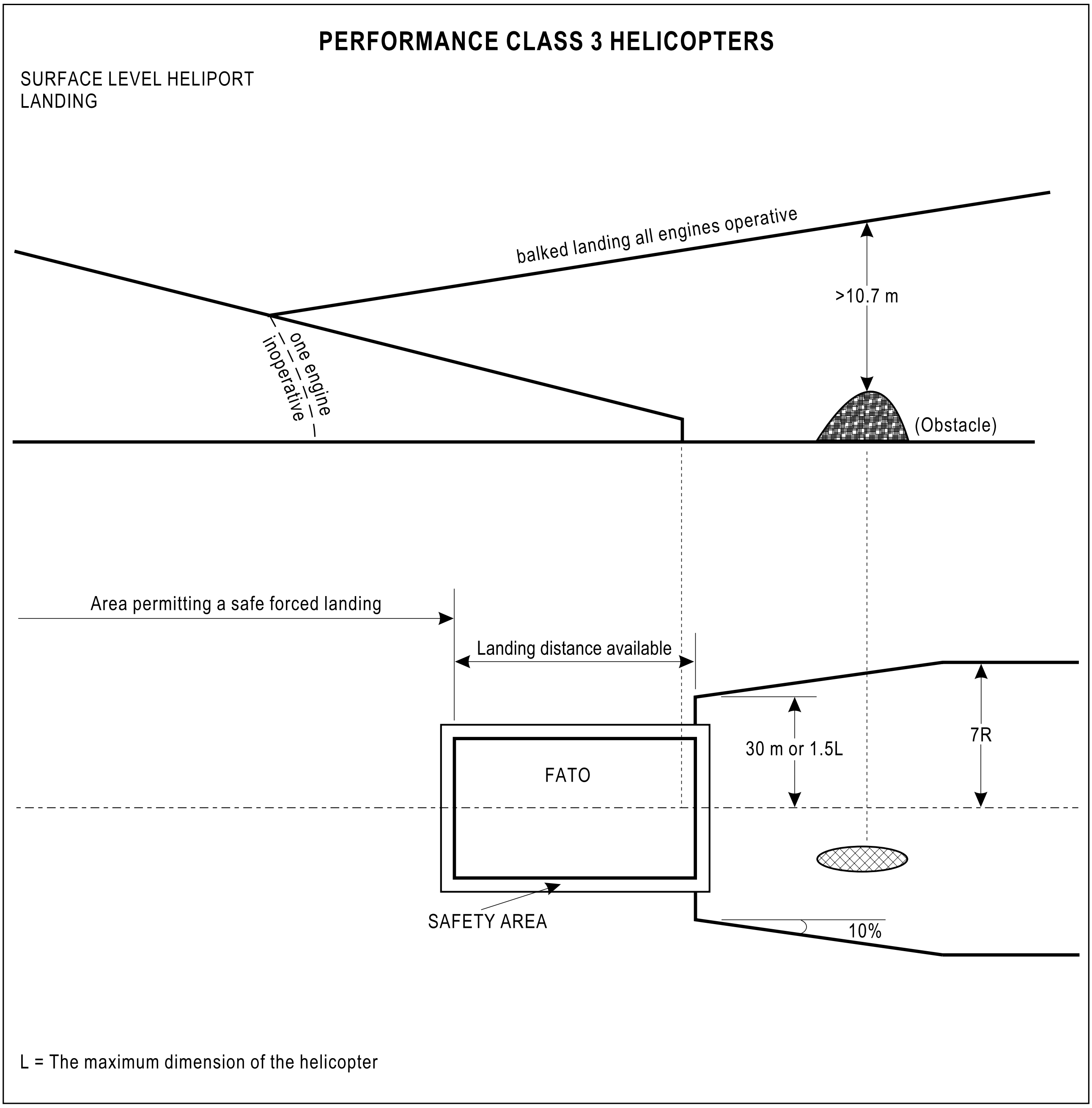
PERFORMANCE CLASS 3 HELICOPTERS
SURFACE LEVEL HELIPORT
LANDING
balked landing all engines operative
>10.7 m
one engine
inoperative
(Obstacle)
Area permitting a safe forced landing
Landing distance available
30 m or 1.5L
7R
FATO
SAFETY AREA
10%
L = The maximum dimension of the helicopter

Figure A-11

ATTACHMENT B. FLIGHT RECORDERS

Supplementary to Section II, Chapter 4, 4.3 and Section III, Chapter 4, 4.9

Introduction

The material in this Attachment concerns flight recorders intended for installation in helicopters engaged in international air navigation. Flight recorders comprise two systems — a flight data recorder and a cockpit voice recorder. Flight data recorders for helicopters are classified as Type IV and Type V depending upon the number of parameters to be recorded.

1. Flight data recorder (FDR)

1.1 General requirements

1.1.1 The FDR is to record continuously during flight time.

1.1.2 The FDR container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

1.1.3 The FDR is to be installed so that:

a) the probability of damage to the recording is minimized;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the FDR without jeopardizing service to essential or emergency loads; and

c) there is an aural or visual means for pre-flight checking that the FDR is operating properly.

1.2 Parameters to be recorded

1.2.1 *Type IV FDR.* This FDR will be capable of recording, as appropriate to the helicopter, at least the thirty parameters in Table B-1. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

1.2.2 *Type V FDR.* This FDR will be capable of recording, as appropriate to the helicopter, at least the first fifteen parameters in Table B-1. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

1.3 Additional information

1.3.1 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.

1.3.2 The manufacturer usually provides the national certificating authority with the following information in respect of the FDR:

a) manufacturer's operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

1.3.3 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information should be maintained by the operator. The documentation must be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

2. Cockpit voice recorder (CVR)

2.1 General requirements

2.1.1 The CVR is to be designed so that it will record at least the following:

a) voice communication transmitted from or received in the aircraft by radio;

b) aural environment on the flight deck;

c) voice communication of flight crew members on the flight deck using the interphone system;

d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker;

e) voice communication of flight crew members using the passenger address system, if installed; and

f) digital communications with ATS, unless recorded by the FDR.

2.1.2 The CVR container is to:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate its location; and

c) have securely attached an automatically activated underwater locating device.

2.1.3 To aid in voice and sound discrimination, microphones in the cockpit are to be located in the best position for recording voice communications originating at the pilot and co-pilot stations and voice communications of other crew members on the flight deck when directed to those stations. This can best be achieved by wiring suitable boom microphones to record continuously on separate channels.

2.1.4 The CVR is to be installed so that:

a) the probability of damage to the recording is minimized;

b) it receives its electrical power from a bus that provides the maximum reliability for operation of the CVR without jeopardizing service to essential or emergency loads;

c) there is an aural or visual means for pre-flight checking of the CVR for proper operation; and

d) if the CVR has a bulk erasure device, the installation should be designed to prevent operation of the device during flight time or crash impact.

2.2 Performance requirements

2.2.1 The CVR will be capable of recording on at least four tracks simultaneously. To ensure accurate time correlation between tracks, the CVR is to record in an in-line format. If a bi-directional configuration is used, the in-line format and track allocation should be retained in both directions.

2.2.2 The preferred track allocation is as follows:

Track 1 — co-pilot headphones and live boom microphone

Track 2 — pilot headphones and live boom microphone

Track 3 — area microphone

Track 4 — time reference, main rotor speed or the flight deck vibration environment, the third and fourth crew member's headphone and live microphone, if applicable.

Note 1.— Track 1 is located closest to the base of the recording head.

Note 2.— The preferred track allocation presumes use of current conventional magnetic tape transport mechanisms, and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply.

2.2.3 The CVR, when tested by methods approved by the appropriate certificating authority, will be demonstrated to be suitable for the environmental extremes over which it is designed to operate.

2.2.4 Means will be provided for an accurate time correlation between the FDR and CVR.

Note.— One method of achieving this is by superimposing the FDR time signal on the CVR.

2.3 Additional information

The manufacturer usually provides the national certificating authority with the following information in respect of the CVR:

a) manufacturer's operating instructions, equipment limitations and installation procedures; and

b) manufacturer's test reports.

3. Inspections of FDR and CVR systems

3.1 Prior to the first flight of the day the built-in test features on the flight deck for the CVR, FDR and Flight Data Acquisition Unit (FDAU), when installed, should be monitored.

3.2 Annual inspections should be carried out as follows:

a) the read-out of the recorded data from the FDR and CVR should ensure that the recorder operates correctly for the nominal duration of the recording;

b) the analysis of the FDR should evaluate the quality of the recorded data to determine if the bit error rate is within acceptable limits and to determine the nature and distribution of the errors;

c) a complete flight from the FDR should be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention should be given to parameters from sensors dedicated to the FDR. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

d) the read-out facility should have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

e) an annual examination of the recorded signal on the CVR should be carried out by re-play of the CVR recording. While installed in the aircraft the CVR should record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards; and

f) where practicable, during the annual examination, a sample of in-flight recordings of the CVR should be examined for evidence that the intelligibility of the signal is acceptable.

3.3 Flight recorder systems should be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

3.4 A report of the annual inspection should be made available on request to the State's regulatory authority for monitoring purposes.

3.5 Calibration of the FDR system:

a) the FDR system should be re-calibrated at least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters, and to ensure that parameters are being recorded within the calibration tolerances; and

b) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there should be a re-calibration performed as recommended by the sensor manufacturer, or at least every two years.

Table B-1
Helicopters — Parameters for Flight Data Recorders

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapsed time)	24 hours	4	±0.125% per hour
2	Pressure-altitude	–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)
3	Indicated airspeed	As the installed measuring system	1	±3%
4	Heading	360°	1	±2°
5	Normal acceleration	–3 g to +6 g	0.125	±1%
6	Pitch attitude	±75°	0.5	±2°
7	Roll attitude	±180°	0.5	±2°
8	Radio transmission keying	On-off (one discrete)	1	
9	Power on each engine *(Note 1)*	Full range	1 (per engine)	±2%
10	Main rotor speed	50-130%	0.5	±2%
11	Pilot input and/or control surface position-primary controls (Collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal) (*Note 2)*	Full range	1	±2% unless higher accuracy uniquely required.
12	Hydraulics, each system (low pressure)	Discrete	2	
13	Outside air temperature	Sensor range	2	±2°C
14	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1	
15	Stability augmentation system engagement	Discrete	1	
Note.— The preceding 15 parameters satisfy the requirements for a Type V FDR.				
16	Main gearbox oil pressure	As installed	1	As installed
17	Main gearbox oil temperature	As installed	2	As installed
18	Yaw acceleration (or yaw rate)	±1 g	0.25	±1.5% max range excluding datum error of ±5%
19	Sling load force	0-200% of certified load	0.5	±3% of max range

Serial number	Parameter	Measurement range	Recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
20	Longitudinal acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
21	Lateral acceleration	±1 g	0.25	±1.5% max range excluding datum error of ±5%
22	Radio altitude	–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)
23	Glide path deviation	Signal range	1	±3%
24	Localizer deviation	Signal range	1	±3%
25	Marker beacon passage	Discrete	1	
26	Master warning	Discrete	1	
27	NAV 1 and 2 frequency selection *(Note 3)*	Full range	4	As installed
28	DME 1 and 2 distance *(Notes 3 and 4)*	0-370 km	4	As installed
29	Navigation data (latitude/longitude, ground speed) *(Note 5)*	As installed	2	As installed
30	Landing gear or gear selector position	Discrete	4	As installed

Note.— The preceding 30 parameters satisfy the requirements for a Type IV FDR.

Notes.—

1. Record sufficient inputs to determine power.
2. For helicopters with conventional control systems ‘‘or’’ applies. For helicopters with non-mechanical control systems ‘‘and’’ applies.
3. If signal available in digital form.
4. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
5. If signals readily available.

If further recording capacity is available, recording of the following additional information should be considered:

a) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS).

   Use the following order of priority:

   1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

   2) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, etc.;

   3) warnings and alerts data; and

   4) the identity of displayed pages for emergency procedures and checklists; and

b) additional engine parameters (EPR, N1, EGT, fuel flow, etc.).

ATTACHMENT C. FLIGHT TIME AND FLIGHT DUTY PERIOD LIMITATIONS

Supplementary to Section II, Chapter 2, 2.2.9.3

1. Purpose and scope

1.1 Flight time and flight duty period limitations are established for the sole purpose of reducing the probability that fatigue of flight crew members may adversely affect the safety of flight.

1.2 In order to guard against this, two types of fatigue must be taken into account, namely, transient fatigue and cumulative fatigue. Transient fatigue may be described as fatigue which is normally experienced by a healthy individual following a period of work, exertion or excitement, and it is normally dispelled by a single sufficient period of sleep. On the other hand cumulative fatigue may occur after delayed or incomplete recovery from transient fatigue or as the after-effect of more than a normal amount of work, exertion or excitement without sufficient opportunity for recuperation.

1.3 Limitations based on the provisions of this Part of the Annex will provide safeguards against both kinds of fatigue because they will recognize:

1.3.1 The necessity to limit flight time in such a way as to guard against both kinds of fatigue.

1.3.2 The necessity to limit time spent on duty on the ground immediately prior to a flight or at intermediate points during a series of flights in such a way as to guard particularly against transient fatigue.

1.3.3 The necessity to provide flight crew members with adequate opportunity to recover from fatigue.

1.3.4 The necessity of taking into account other related tasks the flight crew member may be required to perform in order to guard particularly against cumulative fatigue.

2. General

2.1 The responsibility rests with the pilot, not to exercise the privileges of the licence and related ratings at any time when aware of any decrease in medical fitness which might render the pilot unable to safely exercise these privileges, including any decrease in medical fitness through fatigue.

2.2 The limitations laid down in the following paragraphs are to be considered as minimum requirements and it is the responsibility of the operator to adjust them in certain cases, having regard to the factors mentioned below. Specific factors to be taken into consideration are:

a) the crew composition of the aircraft;

b) the probability of operational delays;

c) the type of aircraft and route complexities such as traffic density, navigation aids, standard of equipment carried, communication difficulties, and high altitude flying in unpressurized aircraft, or flying with high cabin altitudes in pressurized aircraft;

d) the proportion of night flying involved;

e) the extent to which the accommodation at layovers is such as to permit crews to secure real rest;

f) the number of landings and take-offs;

g) the need for an orderly scheduling system, giving a high degree of stability (for this, provision of adequate reserves is an important factor);

h) especially sleep deprivation arising from interruption of the normal sleep/wake cycle; and

i) cockpit environment.

2.3 For reasons of flight safety, the operator has the responsibility to ensure that crew members engaged in duties other than flight duties performed on behalf of the employer are provided with at least the minimum required rest periods before engaging in flight duties.

3. Definitions

Deadheading crew. A crew member positioned by the operator in flight or by surface transport.

Duty period. The time during which a flight crew member carries out any duty at the behest of the flight crew member's employer.

Flight duty period. The total time from the moment a flight crew member commences duty, immediately subsequent to a rest period and prior to making a flight or a series of flights, to the moment the flight crew member is relieved of all duties having completed such flight or series of flights.

Flight sector. A flight or one of a series of flights which commences at a parking place of the aircraft and terminates at a parking place of the aircraft.

It is composed of:

— flight preparation,

— flight time,

— post-flight period after the flight sector or series of flight sectors.

***Flight time* — helicopters.** The total time from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped.

Rest period. Any period of time on the ground during which a flight crew member is relieved of all duties by the operator.

Series of flights. Two or more flight sectors accomplished in between two rest periods.

Standby. A defined period during which a crew member may be called for duty with minimum notice.

Turnaround time. The time spent on the ground during a flight duty period between two flight sectors.

4. Comments about the definitions

4.1 Flight time

The definition of flight time is of necessity very general but in the context of limitations it is, of course, intended to apply to flight crew members in accordance with the relevant definition of a flight crew member. Pursuant to that latter definition, licensed crew personnel travelling as passengers cannot be considered flight crew members, although this should be taken into account in arranging rest periods.

4.2 Flight duty periods

4.2.1 The definition of flight duty period is intended to cover a continuous period of duty which always includes a flight or a series of flights. It is meant to include all duties a flight crew member may be required to carry out from the moment the flight crew member reports at the place of employment on the day of a flight until relieved of duties, having completed the flight or series of flights. It is considered necessary that this period should be subject to limitations because a flight crew member's activities within the limits of such period would eventually induce fatigue — transient or cumulative — which could endanger the safety of a flight. There is on the other hand (from the point of view of flight safety) insufficient reason to establish limitations for any other time during which a flight crew member is performing a task assigned by the operator. Such task should, therefore, only be taken into account when making provisions for rest periods as one among many factors which could lead to fatigue.

4.2.2 The definition does not imply the inclusion of such periods as time taken for a flight crew member to travel from the flight crew member's home to the place of employment.

4.2.3 An important safeguard may be established if States and operators recognize the right of a crew member to refuse further flight duty when suffering from fatigue of such a nature as to affect adversely the safety of flight.

4.3 Rest periods

The definition of rest period implies an absence of duty and is intended to be for the purpose of recovering from fatigue; the way in which this recovery is achieved is the responsibility of the individual.

5. Types of limitations

5.1 Limitations are broadly divided by time; for example, the majority of States reporting to ICAO prescribe daily, monthly and yearly flight time limitations, and a considerable number also prescribe quarterly flight time limitations. It will probably be sufficient to prescribe flight duty period limitations on a daily basis. It must be understood, however, that these limitations will vary considerably taking into account a variety of situations.

5.2 In formulating regulations or rules governing flight time limitations the size of the crew complement and the extent to which the various tasks to be performed can be divided among the crew members should be taken into account; and in the case where adequate facilities for relief are provided in the aircraft in such a way that a crew member may have horizontal rest and a degree of privacy, flight duty periods could be extended. Adequate rest facilities on the ground are required at places where relief periods are to be given. Also States or operators should give due weight to the following factors: traffic density; navigational and communication facilities; rhythm of work/sleep cycle; number of landings and take-offs; aircraft handling and performance characteristics and weather conditions.

6. Pro forma table

For example, the following pro forma table is provided to illustrate one of many forms in which the Standard at Section II, 2.2.9.3, may be implemented.

Crew	*Maximum flight duty period in 24 hours*	*Maximum flight time (hours)*				*Rest periods*	
		Daily 24 hours	*Monthly*	*Quarterly*	*Annually*	*Daily*	*Per week*
Pilot-in-command							
1st Officer							

ATTACHMENT D. MEDICAL SUPPLIES

Supplementary to Section II, Chapter 4, 4.2.2 a)

The following is suggested as being typical contents of a first-aid kit for carriage aboard a helicopter:

- — a handbook on first aid
- — “ground-air visual signal code for use by survivors” as contained in Annex 12
- — materials for treating injuries
- — ophthalmic ointment
- — a decongestant nasal spray
- — insect repellent
- — emollient eye drops
- — sunburn cream
- — water-miscible antiseptic/skin cleanser
- — materials for treatment of extensive burns
- — oral drugs as follows:
  analgesic, antispasmodic, central nervous system stimulant, circulatory stimulant, coronary vasodilator, antidiarrhoeic and motion sickness medications.
- — an artificial plastic airway and splints.

ATTACHMENT E. MINIMUM EQUIPMENT LIST (MEL)

Supplementary to Section II, Chapter 4, 4.1.2

1. If deviations from the requirements of States in the certification of aircraft were not permitted an aircraft could not be flown unless all systems and equipment were operable. Experience has proved that some unserviceability can be accepted in the short term when the remaining operative systems and equipment provide for continued safe operations.

2. The State should indicate through approval of a minimum equipment list those systems and items of equipment that may be inoperative for certain flight conditions with the intent that no flight can be conducted with inoperative systems and equipment other than those specified.

3. A minimum equipment list, approved by the State of the Operator, is therefore necessary for each aircraft, based on the master minimum equipment list established for the aircraft type by the organization responsible for the type design in conjunction with the State of Design.

4. The State of the Operator should require the operator to prepare a minimum equipment list designed to allow the operation of an aircraft with certain systems or equipment inoperative provided an acceptable level of safety is maintained.

5. The minimum equipment list is not intended to provide for operation of the aircraft for an indefinite period with inoperative systems or equipment. The basic purpose of the minimum equipment list is to permit the safe operation of an aircraft with inoperative systems or equipment within the framework of a controlled and sound programme of repairs and parts replacement.

6. Operators are to ensure that no flight is commenced with multiple minimum equipment list items inoperative without determining that any interrelationship between inoperative systems or components will not result in an unacceptable degradation in the level of safety and/or undue increase in the flight crew workload.

7. The exposure to additional failures during continued operation with inoperative systems or equipment must also be considered in determining that an acceptable level of safety is being maintained. The minimum equipment list may not deviate from requirements of the flight manual limitations section, emergency procedures or other airworthiness requirements of the State of Registry or of the State of the Operator unless the appropriate airworthiness authority or the flight manual provides otherwise.

8. Systems or equipment accepted as inoperative for a flight should be placarded where appropriate and all such items should be noted in the aircraft technical log to inform the flight crew and maintenance personnel of the inoperative system or equipment.

9. For a particular system or item of equipment to be accepted as inoperative, it may be necessary to establish a maintenance procedure, for completion prior to flight, to deactivate or isolate the system or equipment. It may similarly be necessary to prepare an appropriate flight crew operating procedure.

10. The responsibilities of the pilot-in-command in accepting a helicopter for operation with deficiencies in accordance with a minimum equipment list are specified in Section II, Chapter 2, 2.3.1.

ATTACHMENT F. AIR OPERATOR CERTIFICATION AND VALIDATION

Supplementary to Section II, Chapter 2, 2.2.1

1. Purpose and scope

1.1 Introduction

The purpose of this Attachment is to provide guidance concerning the actions required by States in connection with the operator certification requirements in Chapter 2, 2.2.1, particularly the means of accomplishing and recording those actions.

1.2 Prior certification required

In accordance with Standard 2.2.1.4, the issuance of an air operator certificate (AOC) is "dependent upon the operator demonstrating" to the State that its organization, training, flight operations and maintenance arrangements are adequate considering the nature and extent of the operations to be conducted. The certification process involves the State's evaluation of each operator and a determination that the operator is capable of conducting safe operations before initial issuance of an AOC or the addition of any subsequent authorizations to an AOC.

1.3 Standard certification practices

The State of the Operator is required by Standard 2.2.1.7 to establish a certification system to ensure compliance with the required standards for the type of operation to be conducted. Several States have developed policies and procedures to comply with this certification requirement as industry capabilities evolve. While those States did not develop their certification practices in coordination with each other, their practices are remarkably similar and consistent in their requirements. The effectiveness of their practices has been validated over many years, resulting in improved safety records of operators throughout the world. Many of these certification practices have been incorporated by reference in ICAO provisions.

2. Required technical safety evaluations

2.1 Approval and acceptance actions

2.1.1 The certification and continued surveillance of an air operator includes actions taken by a State on matters submitted for its review. The actions can be categorized as approvals or acceptances depending on the nature of the response by the State to the matter submitted for its review.

2.1.2 An approval is an active response by the State to a matter submitted for its review. An approval constitutes a finding or determination of compliance with the applicable standards. An approval will be evidenced by the signature of the approving official, the issuance of a document or certificate, or some other formal action taken by the State.

2.1.3 An acceptance does not necessarily require an active response by the State to a matter submitted for its review. A State may accept a matter submitted to it for review as being in compliance with the applicable standards if the State does not specifically reject all or a portion of the matter under review, usually after some defined period of time after submission.

2.1.4 The phrase "approved by the State" or similar phrases using the word "approval" are frequently used in Part III, Section II. Provisions indicating a review and implying approval or at least "acceptance" by the State occur even more frequently in Part III, Section II. In addition to these specific phrases, Part III, Section II contains numerous references to requirements which would, as a minimum, create the need for at least a technical review by the State. This Attachment groups and outlines those specific Standards and Recommended Practices for ease of use by States.

2.1.5 The State should make or arrange for a technical safety evaluation before issuing the approval or acceptance. The evaluation should:

a) be accomplished by a person with specific qualifications to make such a technical evaluation;

b) be in accordance with written, standardized methodology; and

c) where necessary to safety, include a practical demonstration of the air operator's actual ability to conduct such an operation.

2.2 Demonstrations necessary prior to some approvals

2.2.1 Standard 2.2.1.4 obligates the State of the Operator, prior to certification of an operator, to require sufficient demonstrations by the operator to enable the State to evaluate the adequacy of the operator's organization, method of control and supervision of flight operations and maintenance arrangements. These demonstrations should be in addition to the review or inspections of manuals, records, facilities and equipment. Some of the approvals required by this Part, such as approval for Category III operations, have significant safety implications and should be validated by demonstration before the State approves such operations.

2.2.2 While the specific methodology and extent of the required demonstrations and evaluations vary between States, the certification processes of States whose operators have good safety records are generally consistent. In these States, technically qualified inspectors evaluate a representative sample of the actual training, maintenance and operations prior to the issuance of an AOC or additional authorizations to the AOC.

2.3 Recording of certification actions

2.3.1 It is important that the certification, approval and acceptance actions of the State are adequately documented. The State should issue a written instrument, such as a letter or formal document, as an official record of the action. These written instruments should be retained as long as the operator continues to exercise the authorizations for which the approval or acceptance action was issued. These instruments are unambiguous evidence of the authorities held by an operator and provide proof in the event that the State and the operator disagree on the operations that the operator is authorized to conduct.

2.3.2 Some States collect certification records such as inspections, demonstrations, approvals and acceptance instruments into a single file which is retained as long as the operator is active. Other States retain these records in files according to the certification action performed, and revise the file as the approvals or acceptance instruments are updated. Regardless of the method used, these certification records are persuasive evidence that a State is complying with its ICAO obligations regarding operator certification.

2.4 Coordination of operations and airworthiness evaluations

Some of the references to approval or acceptance in Part III, Section II will require an operations evaluation and an airworthiness evaluation. Low minima approvals for the conduct of Category II and III ILS approaches, for example, require coordinated prior evaluation by operations and airworthiness specialists. Flight operations specialists should evaluate the operational procedures, training and qualifications. Airworthiness specialists should evaluate the aircraft, equipment reliability and maintenance procedures. These evaluations may be accomplished separately, but should be coordinated to ensure that all aspects necessary for safety have been addressed before any approval is issued.

2.5 State of the Operator and State of Registry responsibilities

2.5.1 Annex 6, Part III, Section II places the responsibility for initial certification, issuance of the AOC, and ongoing surveillance of an air operator on the State of the Operator. Annex 6, Part III also requires the State of the Operator to consider or act in accordance with various approvals and acceptances by the State of Registry. Under these provisions, the State of the Operator should ensure that its actions are consistent with the approvals and acceptances of the State of Registry and that the air operator is in compliance with State of Registry requirements.

2.5.2 It is essential that the State of the Operator be satisfied with the arrangements by which its air operators use aircraft on the register of another State, particularly for maintenance and crew training. The State of the Operator should review such arrangements in coordination with the State of Registry. Where appropriate, an agreement transferring oversight responsibilities from the State of Registry to the State of the Operator pursuant to Article 83 *bis* to the Convention on International Civil Aviation should be arranged to preclude any misunderstandings regarding which State is responsible for specific oversight responsibilities.

Note.— Guidance concerning the responsibilities of the State of the Operator and the State of Registry in connection with lease, charter and interchange operations is contained in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance *(Doc 8335). Guidance concerning the transfer of State of Registry responsibilities to the State of the Operator in accordance with Article 83* bis *is contained in* Guidance on the Implementation of Article 83 *bis* of the Convention on International Civil Aviation *(Cir 295).*

3. Approval actions

3.1 Approvals

The term “approval” implies a more formal action on the part of the State with respect to a certification matter than does the term “acceptance”. Some States require the Director of the CAA or a designated lower level CAA official to issue a formal written instrument for every “approval” action taken. Other States allow a variety of documents to be issued as evidence of an approval. The approval document issued and the matter addressed by the approval will depend on the delegated authority of the official. In such States, authority to sign routine approvals, such as operator Minimum Equipment Lists for specific aircraft, is delegated to technical inspectors. More complex or significant approvals are normally issued by higher level officials.

3.2 Air operator certificate (AOC)

3.2.1 The AOC required by Annex 6, Part III, 2.2.1 is a formal instrument which, as stated by 2.2.1.6, should include approvals for at least the following:

a) operator's identification (name, location);

b) date of issue and period of validity;

c) description of the types of operations authorized;

d) the type(s) of aircraft authorized for use; and

e) authorized areas of operations or routes.

3.2.2 Some States use the AOC and associated documents, such as Operations Specifications to document the other approvals required by Part III, Section II.

3.3 Provisions that require an approval

The following provisions require or encourage approval by specified States. The approval of the State of the Operator is required in all of the certification actions listed below that are not preceded by one or more asterisks. Certification actions listed below that are preceded by one or more asterisks require approval by the State of Registry (single asterisk or "*"), or by the State of Design (double asterisk or "**"). However, the State of the Operator should take the necessary steps to ensure that operators for which it is responsible comply with any applicable approvals issued by the State of Registry and/or State of Design, in addition to its own requirements.

a) **Configuration deviation list (CDL) (Definitions);

b) **Master minimum equipment list (MMEL) (Definitions);

c) The method for establishing minimum flight altitudes (2.2.6.3);

d) The method of determining heliport operating minima (2.2.7.1);

e) Flight time, flight duty periods and rest periods (2.2.9.2);

f) Helicopter-specific minimum equipment list (MEL) (4.1.3);

g) RNP operations (5.2.2 b));

h) *Approved maintenance organization (6.1.2);

i) *Helicopter-specific maintenance programme (6.3.1);

j) Flight crew training programmes (7.3.1);

k) Training in the transport of dangerous goods (7.3.1, Note 5);

l) Use of flight simulation training devices (7.3.2 a), 7.4.2 and 7.4.4, Note);

m) Heliport additional safety margin (7.4.3.3 a));

n) Method of control and supervision of flight operations (2.2.1.4 and 8.1);

o) **Mandatory maintenance tasks and intervals (9.3.2); and

p) Cabin attendant training programmes (10.3).

3.4 Provisions that require a technical evaluation

Other provisions in this Part require the State to have made a technical evaluation. These provisions contain the phrases "acceptable to the State", "satisfactory to the State", "determined by the State", "deemed acceptable by the State", and "prescribed by the State". While not necessarily requiring an approval by the State, these Standards do require the State to at least accept the matter at issue after it conducts a specific review or evaluation. These provisions are:

a) details of the helicopter-specific checklists (Definition: aircraft operating manual and 4.1.4);

b) details of the aircraft-specific systems (Definition: aircraft operating manual and 4.1.4);

c) mandatory material for the operations manual (2.2.2.2 and Appendix 1);

d) *operator's aircraft-specific maintenance responsibilities (6.1.1);

e) *method of maintenance and release (6.1.2);

f) *maintenance control manual (6.2.1);

g) *mandatory material for the maintenance control manual (6.2.4);

h) *reporting of maintenance experience information (6.5.1);

i) *implementing necessary maintenance corrective actions (6.5.2);

j) *modification and repair requirements (6.6);

k) training facilities (7.3.1);

l) qualifications of instructors (7.3.1);

m) need for recurrent training (7.3.l);

n) use of correspondence courses and written examinations (7.3.1, Note 4);

o) use of flight simulation training devices (7.3.2);

p) flight crew qualification records (7.4.3.4);

q) designated representative of the State of the Operator (7.4.4);

r) *flight manual changes (9.1); and

s) minimum number of flight attendants assigned to a specific aircraft (10.1).

4. Acceptance actions

4.1 Acceptance

4.1.1 The actual extent of the State's technical evaluation of an operator's readiness to conduct certain flight operations should be much broader than just those Standards which require or imply approval. During certification, the State should ensure that an operator will be in compliance with all requirements of Part III, Section II prior to conducting international commercial air transport operations.

4.1.2 The concept of "acceptance" is used by some States as a formal method of ensuring that all critical aspects of operator certification are reviewed by the State prior to the formal issuance of the AOC. Using this concept, these States exercise their prerogative to have technical inspectors review all operators' policies and procedures impacting operational safety. The actual execution of an instrument to reflect this acceptance (assuming such a document is issued) may be delegated to the technical inspector assigned to the certification.

4.1.3 The act of "acceptance" is in addition to the issuance of a specific approval. For example, certain portions of the operations manual may be "accepted" by formal instrument, while other portions such as the aircraft-specific minimum equipment list are "approved" by a separate formal instrument.

4.2 Conformance Report

Some States use a conformance report to document the acceptances it makes with regard to a particular operator. This is a document submitted by the operator detailing how, with specific references to operations or maintenance manuals, it will comply with all applicable State regulations. This type of document is referenced in Doc 8335, 3.3.2 e) and the *Airworthiness Manual* (Doc 9760), Volume I, 6.2.1 c) 4). Such a conformance report should be actively used during the certification process and revised as necessary to reflect modifications required by the State in the operator's policies and procedures. Then a final conformance report is included in the State's certification records, along with other records of certification. The conformance report is an excellent method of demonstrating that the operator was properly certificated with respect to all applicable regulatory requirements.

4.3 Operations and maintenance manuals

4.3.1 Operations and maintenance manuals, and any subsequent amendments should be submitted to the State (2.2.2.2, 6.1.1, 6.2.4, 6.3.2). The State also establishes minimum contents for these manuals (9.2, 9.3, 9.4 and Appendix 1). The pertinent portions of an operator's manual for evaluation should be identified in the State's technical guidance, e.g. operations policy manual, aircraft operating manual, cabin crew manual, route guide, and training manual. Some States issue a formal instrument accepting each manual and any subsequent amendments.

4.3.2 The State's technical evaluation should, in addition to ensuring that all required contents are addressed, consider if the specific policies and procedures would result in the desired outcome. For example, the specifications for the operational flight plan (Appendix 1, 2.1.15) should provide the step-by-step completion guidance necessary for compliance with 2.3 concerning the content and retention of these plans.

4.3.3 Proven industry practices, such as an example of an actual completed operational flight plan for reference by the flight crew and dispatchers (although not a Standard), may also be required by a State's technical evaluator during certification. This aspect of the technical evaluation should be conducted by inspectors experienced in operator certification. A major consideration with respect to evaluating for proven industry practices that are aircraft-specific, equipment-specific or have limited applications is the employment of evaluators who are currently qualified in the practice to be evaluated.

5. Other approval or acceptance considerations

Some States provide for approval or acceptance of certain critical documents, records or procedures specified in this Part although the relevant Annex 6 Standards do not require approval or acceptance by the State of the Operator. The following are some examples:

a) safety programme (1.1.9);

b) method for obtaining aeronautical data (2.1.1);

c) adequacy of the fuel and oil records (2.2.8);

d) adequacy of flight time, flight duty and rest period records (2.2.9.3, 7.6, 10.4);

e) adequacy of the aircraft maintenance logbook (2.3.1 a), b), and c));

f) adequacy of the load manifest (2.3.1 d), e) and f));

g) adequacy of the operational plan (2.3.1 g));

h) method for obtaining weather data (2.3.5.1 and 2.3.5.2);

i) method of compliance with carry-on baggage stowage (2.7);

j) helicopter performance operating limitations (3.2.4);

k) method of obtaining and applying heliport obstacle data (3.3);

l) adequacy of passenger information cards (4.2.2 d));

m) procedures for long-range navigation (5.2.1 b));

n) contents of the journey log book (9.4); and

o) content of the security training programme (11.2).

6. Validation of Standards of Operations

Standard 2.2.1.5 requires that the validity of an AOC shall depend upon the operator maintaining the original certification standards (2.2.1.4) under the supervision of the State of the Operator. This supervision requires that a system of continued surveillance be established to ensure the required standards of operations are maintained (2.2.1.7). A good starting point in the development of such a system is to require annual or semi-annual inspections, observations and tests to validate the required certification approval and acceptance actions.

7. Amendment of Air Operator Certificates

The certification of an operator is an ongoing process. Few operators will be satisfied over time with the initial authorizations issued with their AOC. Evolving market opportunities will cause an operator to change aircraft models and seek approval for new operational areas requiring other additional capabilities. Additional technical evaluations should be required by the State before issuing the formal written instruments approving any changes to the original AOC and other authorizations. Where possible, each request should be "bridged", using the original authorization as the foundation to determine the extent of the State's impending evaluation before issuing the formal instrument.

ATTACHMENT G. FLIGHT SAFETY DOCUMENTS SYSTEM

Supplementary to Section II, Chapter 1, 1.1.8

1. Introduction

1.1 The following material provides guidance on the organization and development of an operator's flight safety documents system. It should be understood that the development of a flight safety documents system is a complete process, and changes to each document comprising the system may affect the entire system. Guidelines applicable to the development of operational documents have been produced by government and industry sources and are available to operators. Nevertheless, it may be difficult for operators to make the best use of these guidelines, since they are distributed across a number of publications.

1.2 Furthermore, guidelines applicable to operational documents development tend to focus on a single aspect of documents design, for example, formatting and typography. Guidelines rarely cover the entire process of operational documents development. It is important for operational documents to be consistent with each other, and consistent with regulations, manufacturer requirements and Human Factors principles. It is also necessary to ensure consistency across departments as well as consistency in application. Hence the emphasis on an integrated approach, based on the notion of the operational documents as a complete system.

1.3 The guidelines in this Attachment address the major aspects of an operator's flight safety documents system development process, with the aim of ensuring compliance with Section II, Chapter 1, 1.1.8. The guidelines are based not only upon scientific research, but also upon current best industry practices, with an emphasis on a high degree of operational relevance.

2. Organization

2.1 A flight safety documents system should be organized according to criteria which ensure easy access to information required for flight and ground operations contained in the various operational documents comprising the system and which facilitate management of the distribution and revision of operational documents.

2.2 Information contained in a flight safety documents system should be grouped according to the importance and use of the information, as follows:

a) time critical information, e.g., information that can jeopardize the safety of the operation if not immediately available;

b) time sensitive information, e.g., information that can affect the level of safety or delay the operation if not available in a short time period;

c) frequently used information;

d) reference information, e.g., information that is required for the operation but does not fall under b) or c) above; and

e) information that can be grouped based on the phase of operation in which it is used.

2.3 Time critical information should be placed early and prominently in the flight safety documents system.

2.4 Time critical information, time sensitive information, and frequently used information should be placed in cards and quick-reference guides.

3. Validation

The flight safety documents system should be validated before deployment, under realistic conditions. Validation should involve the critical aspects of the information use, in order to verify its effectiveness. Interactions among all groups that can occur during operations should also be included in the validation process.

4. Design

4.1 A flight safety documents system should maintain consistency in terminology and in the use of standard terms for common items and actions.

4.2 Operational documents should include a glossary of terms, acronyms and their standard definition, updated on a regular basis to ensure access to the most recent terminology. All significant terms, acronyms and abbreviations included in the flight documents system should be defined.

4.3 A flight safety documents system should ensure standardization across document types, including writing style, terminology, use of graphics and symbols, and formatting across documents. This includes a consistent location of specific types of information, consistent use of units of measurement and consistent use of codes.

4.4 A flight safety documents system should include a master index to locate, in a timely manner, information included in more than one operational document.

Note.— The master index must be placed in the front of each document and consist of no more than three levels of indexing. Pages containing abnormal and emergency information must be tabbed for direct access.

4.5 A flight safety documents system should comply with the requirements of the operator's quality system, if applicable.

5. Deployment

Operators should monitor deployment of the flight safety documents system, to ensure appropriate and realistic use of the documents, based on the characteristics of the operational environment and in a way which is both operationally relevant and beneficial to operational personnel. This monitoring should include a formal feedback system for obtaining input from operational personnel.

6. Amendment

6.1 Operators should develop an information gathering, review, distribution and revision control system to process information and data obtained from all sources relevant to the type of operation conducted, including, but not limited to, the State of the Operator, State of design, State of Registry, manufacturers and equipment vendors.

Note.— Manufacturers provide information for the operation of specific aircraft that emphasizes the aircraft systems and procedures under conditions that may not fully match the requirements of operators. Operators should ensure that such information meets their specific needs and those of the local authority.

6.2 Operators should develop an information gathering, review and distribution system to process information resulting from changes that originate within the operator, including:

a) changes resulting from the installation of new equipment;

b) changes in response to operating experience;

c) changes in an operator's policies and procedures;

d) changes in an operator certificate; and

e) changes for purposes of maintaining cross fleet standardization.

Note.— Operators should ensure that crew coordination philosophy, policies and procedures are specific to their operation.

6.3 A flight safety documents system should be reviewed:

a) on a regular basis (at least once a year);

b) after major events (mergers, acquisitions, rapid growth, downsizing, etc.);

c) after technology changes (introduction of new equipment); and

d) after changes in safety regulations.

6.4 Operators should develop methods of communicating new information. The specific methods should be responsive to the degree of communication urgency.

Note.— As frequent changes diminish the importance of new or modified procedures, it is desirable to minimize changes to the flight safety documents system.

6.5 New information should be reviewed and validated considering its effects on the entire flight safety documents system.

6.6 The method of communicating new information should be complemented by a tracking system to ensure currency by operational personnel. The tracking system should include a procedure to verify that operational personnel have the most recent updates.

— END —

International Standards

Annex 7
to the Convention on
International Civil Aviation

Aircraft Nationality and Registration Marks

This edition incorporates all amendments adopted by the Council prior to 18 February 2003 and supersedes, on 27 November 2003, all previous editions of Annex 7.

For information regarding the applicability of the Standards, *see* Foreword .

Fifth Edition
July 2003

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1–5	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

FOREWORD

Historical background

Annex 7 contains Standards adopted by the International Civil Aviation Organization as the minimum Standards for the display of marks to indicate appropriate nationality and registration which have been determined to comply with Article 20 of the Convention. Standards for Aircraft Nationality and Registration Marks were first adopted by the Council on 8 February 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 7 to the Convention. They became effective on 1 July 1949. The Standards were based on recommendations of the first and second sessions of the Airworthiness Division held respectively in March 1946 and February 1947.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.* There are no *Recommended Practices* in Annex 7.

Any reference to a portion of this document which is identified by a number and/or title includes all subdivisions of that portion.

Table A. Amendments to Annex 7

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	First (1946) and second (1947) sessions of the Airworthiness Division		8 February 1949 1 July 1949 1 November 1949
1 (2nd Edition)	Fifth meeting of the Airworthiness Committee (1962)	Location and size of aircraft nationality and registration marks.	12 November 1963 1 April 1964 1 August 1964
2	Air Navigation Commission study (1967)	Redefining of the term “aircraft” so that all air cushion type vehicles, such as hovercraft and ground effect machines, should not be classified as aircraft.	8 November 1967 8 March 1968 8 July 1968
3 (3rd Edition)	Council study (1969)	The amendment introduces definitions for the expressions “Common mark”, “Common mark registering authority” and “International operating agency” and appropriate provisions to enable aircraft of international operating agencies of the kind contemplated in Article 77 of the Convention to be registered on other than a national basis.	23 January 1969 23 May 1969 18 September 1969
4 (4th Edition)	Air Navigation Commission study (1980), meeting of the Committee on Aircraft Noise (1979)	Unmanned free balloons. Change in the definition of “helicopter”.	30 March 1981 30 July 1981 26 November 1981
5 (5th Edition)	Air Navigation Commission studies	Translation of certificates of registration of aircraft.	17 February 2003 14 July 2003 27 November 2003

INTERNATIONAL STANDARDS

1. DEFINITIONS

When the following terms are used in the Standards for Aircraft Nationality and Registration Marks, they have the following meanings:

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. (See Table 1, Classification of aircraft.)

Airship. A power-driven lighter-than-air aircraft.

Balloon. A non-power-driven lighter-than-air aircraft.

Common mark. A mark assigned by the International Civil Aviation Organization to the common mark registering authority registering aircraft of an international operating agency on other than a national basis.

Note.— All aircraft of an international operating agency which are registered on other than a national basis will bear the same common mark.

Common mark registering authority. The authority maintaining the non-national register or, where appropriate, the part thereof, in which aircraft of an international operating agency are registered.

Fireproof material. A material capable of withstanding heat as well as or better than steel when the dimensions in both cases are appropriate for the specific purpose.

Glider. A non-power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Gyroplane. A heavier-than-air aircraft supported in flight by the reactions of the air on one or more rotors which rotate freely on substantially vertical axes.

Heavier-than-air aircraft. Any aircraft deriving its lift in flight chiefly from aerodynamic forces.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

International operating agency. An agency of the kind contemplated in Article 77 of the Convention.

Lighter-than-air aircraft. Any aircraft supported chiefly by its buoyancy in the air.

Ornithopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on planes to which a flapping motion is imparted.

Rotorcraft. A power-driven heavier-than-air aircraft supported in flight by the reactions of the air on one or more rotors.

State of Registry. The State on whose register the aircraft is entered.

2. NATIONALITY, COMMON AND REGISTRATION MARKS TO BE USED

2.1 The nationality or common mark and registration mark shall consist of a group of characters.

2.2 The nationality or common mark shall precede the registration mark. When the first character of the registration mark is a letter, it shall be preceded by a hyphen.

2.3 The nationality mark shall be selected from the series of nationality symbols included in the radio call signs allocated to the State of Registry by the International Telecommunication Union. The nationality mark shall be notified to the International Civil Aviation Organization.

2.4 The common mark shall be selected from the series of symbols included in the radio call signs allocated to the International Civil Aviation Organization by the International Telecommunication Union.

Note.— Assignment of the common mark to a common mark registering authority will be made by the International Civil Aviation Organization.

2.5 The registration mark shall be letters, numbers, or a combination of letters and numbers, and shall be that assigned by the State of Registry or common mark registering authority.

2.6 When letters are used for the registration mark, combinations shall not be used which might be confused with the five-letter combinations used in the International Code of Signals, Part II, the three-letter combinations beginning with Q used in the Q Code, and with the distress signal SOS, or other similar urgent signals, for example XXX, PAN and TTT.

Note.— For reference to these codes, see the currently effective International Telecommunications Regulations.

3. LOCATION OF NATIONALITY, COMMON AND REGISTRATION MARKS

3.1 General

The nationality or common mark and registration mark shall be painted on the aircraft or shall be affixed by any other means ensuring a similar degree of permanence. The marks shall be kept clean and visible at all times.

3.2 Lighter-than-air aircraft

3.2.1 *Airships.* The marks on an airship shall appear either on the hull or on the stabilizer surfaces. Where the marks appear on the hull, they shall be located lengthwise on each side of the hull and also on its upper surface on the line of symmetry. Where the marks appear on the stabilizer surfaces, they shall appear on the horizontal and on the vertical stabilizers; the marks on the horizontal stabilizer shall be located on the right half of the upper surface and on the left half of the lower surface, with the tops of the letters and numbers toward the leading edge; the marks on the vertical stabilizer shall be located on each side of the bottom half stabilizer, with the letters and numbers placed horizontally.

3.2.2 *Spherical balloons (other than unmanned free balloons).* The marks shall appear in two places diametrically opposite. They shall be located near the maximum horizontal circumference of the balloon.

3.2.3 *Non-spherical balloons (other than unmanned free balloons).* The marks shall appear on each side. They shall be located near the maximum cross-section of the balloon immediately above either the rigging band or the points of attachment of the basket suspension cables.

3.2.4 *Lighter-than-air aircraft (other than unmanned free balloons).* The side marks shall be visible both from the sides and from the ground.

3.2.5 *Unmanned free balloons.* The marks shall appear on the identification plate (see Section 8).

3.3 Heavier-than-air aircraft

3.3.1 *Wings.* On heavier-than-air aircraft, the marks shall appear once on the lower surface of the wing structure. They shall be located on the left half of the lower surface of the wing structure unless they extend across the whole of the lower surface of the wing structure. So far as is possible, the marks shall be located equidistant from the leading and trailing edges of the wings. The tops of the letters and numbers shall be toward the leading edge of the wing.

3.3.2 *Fuselage (or equivalent structure) and vertical tail surfaces.* On heavier-than-air aircraft, the marks shall appear either on each side of the fuselage (or equivalent structure) between the wings and the tail surface or on the upper halves of the vertical tail surfaces. When located on a single vertical tail surface, they shall appear on both sides. When located on multivertical tail surfaces, they shall appear on the outboard sides of the outer surfaces.

3.3.3 *Special cases.* If a heavier-than-air aircraft does not possess parts corresponding to those mentioned in 3.3.1 and 3.3.2, the marks shall appear in a manner such that the aircraft can be identified readily.

4. MEASUREMENTS OF NATIONALITY, COMMON AND REGISTRATION MARKS

The letters and numbers in each separate group of marks shall be of equal height.

4.1 Lighter-than-air aircraft

4.1.1 The height of the marks on lighter-than-air aircraft other than unmanned free balloons shall be at least 50 centimetres.

4.1.2 The measurements of the marks related to unmanned free balloons shall be determined by the State of Registry, taking into account the size of the payload to which the identification plate is affixed.

4.2 Heavier-than-air aircraft

4.2.1 *Wings.* The height of the marks on the wings of heavier-than-air aircraft shall be at least 50 centimetres.

4.2.2 *Fuselage (or equivalent structure) and vertical tail surfaces.* The height of the marks on the fuselage (or equivalent structure) and on the vertical tail surfaces of heavier-than-air aircraft shall be at least 30 centimetres.

4.2.3 *Special cases.* If a heavier-than-air aircraft does not possess parts corresponding to those mentioned in 4.2.1 and 4.2.2, the measurements of the marks shall be such that the aircraft can be identified readily.

5. TYPE OF CHARACTERS FOR NATIONALITY, COMMON AND REGISTRATION MARKS

5.1 The letters shall be capital letters in Roman characters without ornamentation. Numbers shall be Arabic numbers without ornamentation.

5.2 The width of each character (except the letter I and the number 1) and the length of hyphens shall be two-thirds of the height of a character.

5.3 The characters and hyphens shall be formed by solid lines and shall be of a colour contrasting clearly with the background. The thickness of the lines shall be one-sixth of the height of a character.

5.4 Each character shall be separated from that which it immediately precedes or follows, by a space of not less than one-quarter of a character width. A hyphen shall be regarded as a character for this purpose.

6. REGISTER OF NATIONALITY, COMMON AND REGISTRATION MARKS

Each Contracting State or common mark registering authority shall maintain a current register showing for each aircraft registered by that State or common mark registering authority, the information recorded in the certificate of registration (see Section 7). The register of unmanned free balloons shall contain the date, time and location of release, the type of balloon and the name of the operator.

Table 1. Classification of aircraft

AIRCRAFT	Lighter-than-air aircraft	Non-power-driven	Free balloon	Spherical free balloon Non-spherical free balloon	
			Captive balloon	Spherical captive balloon Non-spherical captive balloon[1]	
		Power-driven	Airship	Rigid airship Semi-rigid airship Non-rigid airship	
	Heavier-than-air aircraft	Non-power-driven	Glider Kite[4]	Land glider Sea glider[2]	
		Power-driven	Aeroplane	Landplane[3] Seaplane[2] Amphibian[2]	
			Rotorcraft	Gyroplane	Land gyroplane[3] Sea gyroplane[2] Amphibian gyroplane[2]
				Helicopter	Land helicopter[3] Sea helicopter[2] Amphibian helicopter[2]
			Ornithopter	Land ornithopter[3] Sea ornithopter[2] Amphibian ornithopter[2]	

1. Generally designated "kite-balloon".
2. "Float" or "boat" may be added as appropriate.
3. Includes aircraft equipped with ski-type landing gear (substitute "ski" for "land").
4. For the purpose of completeness only.

7. CERTIFICATE OF REGISTRATION

7.1 The certificate of registration, in wording and arrangement, shall be a replica of the certificate shown in Figure 1.

Note.— The size of the form is at the discretion of the State of Registry or common mark registering authority.

7.2 When certificates of registration are issued in a language other than English, they shall include an English translation.

Note.— Article 29 of the Convention on International Civil Aviation requires that the certificate of registration be carried on board every aircraft engaged in international air navigation.

8. IDENTIFICATION PLATE

An aircraft shall carry an identification plate inscribed with at least its nationality or common mark and registration mark. The plate shall be made of fireproof metal or other fireproof material of suitable physical properties and shall be secured to the aircraft in a prominent position near the main entrance or, in the case of an unmanned free balloon, affixed conspicuously to the exterior of the payload.

9. GENERAL

The provisions of this Annex shall not apply to meteorological pilot balloons used exclusively for meteorological purposes or to unmanned free balloons without a payload.

*	State *or* Common mark registering authority Ministry Department or Service	*
	CERTIFICATE OF REGISTRATION	
1. Nationality or common mark and registration mark	2. Manufacturer and manufacturer's designation of aircraft	3. Aircraft serial no. ....

4. Name of owner ....

5. Address of owner ....

6. It is hereby certified that the above described aircraft has been duly entered on the ....
.... in accordance with the Convention on International Civil
(name of register)
Aviation dated 7 December 1944 and with the (†) ....

(Signature) ....

Date of issue ....

(†) Insert reference to applicable regulations.

*

* For use by the State of Registry or common mark registering authority.

Figure 1. Certificate of Registration

— END —

International Standards
and Recommended Practices

Annex 8
to the Convention on
International Civil Aviation

Airworthiness of Aircraft

This edition incorporates all amendments adopted by the Council prior to 3 March 2001 and supersedes, on 2 March 2004, all previous editions of Annex 8.

For information regarding the applicability of the Standards and Recommended Practices, *see* sections 1.1, 2.1, 3.1 and 4.1 of Part II, 1.1 of Part IIIA, A.1.1 of Part IIIB and the Foreword.

Ninth Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-98	Incorporated in this edition		
99	20/5/06		ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

Standards and Recommended Practices for the Airworthiness of Aircraft were adopted by the Council on 1 March 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 8 to the Convention.

The Annex contained, in Part II, general airworthiness procedures applicable to all aircraft and in Part III, minimum airworthiness characteristics for aeroplanes provided, or to be provided, with certificates of airworthiness classifying them in an established ICAO category. Part I contained definitions.

At its fourth session, the Airworthiness Division collaborating with the Operations Division made recommendations concerning the use of a performance code as an alternative to the one contained in the Annex, in which the climb values had the status of Recommended Practices. Further, the Airworthiness Division made recommendations concerning certain aspects of the certification in ICAO categories. As a result of those recommendations, the Council approved the incorporation of the alternative performance code as Attachment A but stated its belief that since agreement had not yet been reached on Standards covering performance, there existed no basis for certification in ICAO Category A. It urged the Contracting States to refrain from such certification pending the becoming effective of Standards on performance or until such time as the Council decides on the basic policy on airworthiness.

The Assembly at its seventh session (June 1953) endorsed the action already taken by the Council and the Air Navigation Commission to initiate a fundamental study of ICAO policy on international airworthiness and directed the Council to complete the study as rapidly as practicable.

In pursuing such study, the Air Navigation Commission was helped by an international body of experts designated as the "Airworthiness Panel", which contributed to the preparation of the work of the Third Air Navigation Conference.

As a result of these studies, a revised policy on international airworthiness was developed and it was approved by the Council in 1956. According to this policy, the principle of certification in an ICAO Category was abandoned. Instead, Annex 8 included broad Standards which defined, for application by the competent national authorities, the complete minimum international basis for the recognition by States of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories, thereby achieving, among other purposes, protection of other aircraft, third persons and property. It was considered that this met the obligation of the Organization under Article 37 of the Convention to adopt International Standards of airworthiness.

It was recognized that the ICAO Standards of airworthiness would not replace national regulations and that national codes of airworthiness containing the full scope and extent of detail considered necessary by individual States would be necessary as the basis for the certification of individual aircraft. Each State would establish its own comprehensive and detailed code of airworthiness or would select a comprehensive and detailed code established by another Contracting State. The level of airworthiness defined by this code would be indicated by the Standards, supplemented, if necessary, by Acceptable Means of Compliance.

In application of those principles, the Annex was declared as constituting the minimum standards for the purpose of Article 33. It was also recognized that the Annex might, at the time of adoption, not include technical Standards for all classes of aircraft or even for all classes of aeroplanes, if the Council felt that no technical Standards were required at that time to render Article 33 operative. Furthermore, adoption or amendment of the Annex declared to be complete for the purpose of Article 33 did not constitute the end of ICAO's work in the airworthiness field, as there was a need to continue international collaboration in airworthiness matters.

A revised text for Annex 8 consistent with the above principles was prepared on the basis of the recommendations made by the Third Air Navigation Conference (Montreal, September–October 1956). Part III of the Annex was limited to broad Standards stating the objectives rather than the methods of realizing those objectives. However, to indicate by examples the level of airworthiness intended by some of the broad Standards, specifications of a more detailed and quantitative nature were included under the title "Acceptable Means of Compliance". These specifications were intended to assist the Contracting States in the establishment and application of comprehensive and detailed national airworthiness codes.

To adopt a code giving an appreciably lower level of airworthiness than that given in an Acceptable Means of Compliance was considered to be a violation of the Standard supplemented by that Acceptable Means of Compliance.

The revised text for Annex 8 was included in the Fourth Edition of the Annex, which superseded the First, Second and Third Editions.

Another recommendation of the Third Air Navigation Conference led to the establishment by the Council in 1957 of the Airworthiness Committee, consisting of airworthiness experts with broad experience and selected from those Contracting States and International Organizations willing to contribute.

Present policy on international airworthiness. There had been some concern about the slow progress that had been made over the years with respect to developing supplementary airworthiness specifications in the form of Acceptable Means of Compliance. It was noted that the majority of the Acceptable Means of Compliance in Annexes 6 and 8 had been developed in 1957 and were therefore applicable to only those aeroplane types operating at that time. No effort had been made to update the specifications in these Acceptable Means of Compliance nor had there been any recommendations from the Airworthiness Committee for upgrading of any of the Provisional Acceptable Means of Compliance, which had been developed as potential material for full-fledged Acceptable Means of Compliance. The Air Navigation Commission therefore requested the Airworthiness Committee to review the progress made by it since its inception with a view to determining whether or not desired results had been achieved and to recommend any changes to improve the development of detailed airworthiness specifications.

The Airworthiness Committee at its Ninth Meeting (Montreal, November/December 1970) made a detailed study of the problems and recommended that the concept of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance be abandoned and a provision be made for an airworthiness technical manual to be prepared and published by ICAO to include guidance material intended to facilitate the development and uniformity of national airworthiness codes by Contracting States.

The Air Navigation Commission reviewed the recommendations of the Airworthiness Committee in the light of the history of the development of the airworthiness policy approved by the Council in 1956. It came to the conclusion that the basic objectives and principles on which the ICAO airworthiness policy had been based were sound and did not require any significant change. It was also concluded that the main reason for the slow progress in the development of airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance was the degree of mandatory status to the former implied by the following statement included in the Forewords of the Fourth and Fifth Editions of Annex 8:

> "To adopt a code giving an appreciably lower level of airworthiness than that given in an Acceptable Means of Compliance would be a violation of the Standard supplemented by that Acceptable Means of Compliance."

Several approaches were examined by the Air Navigation Commission to eliminate this difficulty. Finally, it came to the conclusion that the idea of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance should be abandoned and ICAO should declare that the States' obligations, for the purpose of Article 33 of the Convention, shall be met by their compliance with the broad Standards in Annex 8 supplemented, as necessary, by airworthiness technical guidance material, devoid of all mandatory implications or obligations. Also the requirement that each Contracting State should either establish its own comprehensive and detailed code of airworthiness or select a comprehensive and detailed code established by another Contracting State should be retained.

The Council on 15 March 1972 approved the above approach to form the basis for the present policy of ICAO in the field of airworthiness. According to this policy:

a) the objective of international airworthiness Standards is to define, for application by the competent national authorities, the minimum level of airworthiness constituting the international basis for the recognition by States, under Article 33 of the Convention, of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories, thereby achieving, among other things, protection of other aircraft, third parties and property;

b) the Standards developed to meet the objective stated in a) are considered by the Council as meeting, in the necessary scope and detail, the obligations of the Organization under Article 37 of the Convention to adopt International Standards of airworthiness;

c) international airworthiness Standards adopted by the Council are recognized as being the complete international code necessary to bring into force and effect the rights and obligations which arise under Article 33 of the Convention;

d) the technical airworthiness Standards in Annex 8 shall be presented as broad specifications stating the objectives rather than the means of realizing these objectives; ICAO recognizes that national codes of airworthiness containing the full scope and extent of detail considered necessary by individual States are required as the basis for the certification by individual States of airworthiness of each aircraft;

e) to assist States in applying the Standards of Annex 8 and in developing their own comprehensive national codes in a uniform manner, detailed guidance material shall be developed and published expeditiously in the working languages of the Organization.

The Council also approved the issuance of the airworthiness guidance material under the title of *Airworthiness Technical Manual*. It was understood that the guidance material will, before issuance, be examined by the Air Navigation Commission. It will however have no formal status and its main purpose would be to provide guidance to Contracting States in developing the detailed national airworthiness codes mentioned in 2.2 of Part II of the Annex.

A text for Annex 8 consistent with the policy on international airworthiness, approved by the Council on 15 March 1972, was developed by the Air Navigation Commission.

Table A shows the origin of amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

On 6 June 2000, the Air Navigation Commission reviewed the recommendation of the Continuing Airworthiness Panel and the Airworthiness Study Group, in light of the introduction of the type certification process, to introduce the Type Certificate concept. It came to the conclusion that this internationally used and known certificate was already introduced in the *Airworthiness Technical Manual* (Doc 9051) and that its introduction complements the type certification process, making the text of Annex 8 consistent with its international airworthiness use.

It was further noted that the State of Registry, which is in charge of the issuance or validation of Certificates of Airworthiness by virtue of Article 31 of the Convention, and the State of Design may be different States, with separate functions and duties, and two independent responsibilities. Accordingly, the requirements governing the issuance of Type Certificates in accordance with applicable provisions of Annex 8 are not part of "the minimum standards" which govern the issuance or validation of Certificates of Airworthiness, and lead to the recognition of their validity pursuant to Article 33 of the Convention.

Applicability

The applicability of the Standards is indicated in 1.1, 2.1, 3.1 and 4.1 of Part II, in 1.1 of Part IIIA and in A.1.1 of Part IIIB. The dates were established so as to take account of the provisions of Article 41 of the Convention. However, the Council has recommended that, as far as practicable, earlier dates be applied.

Related Standards of Annex 6, Part I. Chapter 5 of Annex 6, Part I, dealing with aeroplane performance operating limitations contains Standards that are complementary to the airworthiness Standards of Annex 8. Both state broad objectives. The Standards of Annex 6, Part I, Chapter 5, are supplemented by guidance material in the form of green page attachments which indicate by examples the level of performance intended by the Standards.

The Council has urged Contracting States not to impose on visiting aeroplanes operational requirements other than those established by the State of Registry, provided those requirements are not lower than the Standards of Chapter 5 of Annex 6, Part I, as amended by Amendment 2, 2.2 of Part IIIA and B.2 of Part IIIB of this edition of Annex 8.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards which are of a regulatory character and also of indicating departures from the Standards, including any additional regulations that are important for the safety or regularity of air navigation. Wherever possible, the provisions of Part II of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation. The provisions of Parts IIIA and IIIB of this Annex, on the other hand, are applicable to aeroplanes through the medium of national codes more comprehensive and detailed than the Standards, so that the Council Resolution of 13 April 1948 does not apply to Parts IIIA and IIIB.

Information concerning the national codes establishing compliance with the Annex. States are invited to notify the Organization either of the establishment or of the selection of the comprehensive and detailed national codes mentioned in 3.2.2 of Part II. States that establish such codes are invited to forward a copy of each with its successive amendments, and any appropriate interpretation document concerning them. States that select codes of other Contracting States to comply with 3.2.2 of Part II are invited to indicate the codes that they intend to use.

Use of the guidance material in the Airworthiness Manual (Doc 9760). Contracting States are invited to note that the material in the *Airworthiness Manual* is intended to guide them in the development of their detailed and comprehensive national codes with a view to introducing uniformity in those national codes. The material has no mandatory status and Contracting States are quite free to differ from it either in detail or in methods. States are also not required to notify any differences that may exist between their detailed national regulations and practices and the relevant material in the *Airworthiness Manual*.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated.

1.— *Material comprising the Annex proper*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures*, which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practice

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted, it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 8

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	First and Second Sessions of the Airworthiness Division (1946 and 1947)	—	1 March 1949 1 August 1949 1 September 1949
1 to 63 (2nd Edition)	Third and Fourth Sessions of the Airworthiness Division (1949 and 1951)	—	26 January 1950 1 January 1951 1 February 1951
64 to 83	Third and Fourth Sessions of the Airworthiness Division (1949 and 1951)	—	13 November 1951 15 April 1952 15 May 1952
84 (3rd Edition)	Fourth Session of the Airworthiness Division (1951)	Incorporation of an alternative performance code as an attachment.	2 December 1952 1 May 1953 1 June 1953
85 (4th Edition)	Third Air Navigation Conference (1956)	Revised text consistent with new policy on international airworthiness approved by the Council; Part III of Annex 8 limited to broad Standards stating objectives with more detailed examples of the level of airworthiness intended being included as “Acceptable Means of Compliance”.	13 June 1957 1 October 1957 1 December 1957 or 13 June 1960 depending on date of application for certification for the aeroplane
86 (5th Edition)	Fourth Meeting of the Airworthiness Committee	Amendment of Standards for navigation lights and introduction of requirements for anti-collision lights.	13 December 1961 1 April 1962 13 December 1964
87	Proposal of the United States Committee on the Extension to the Standard Atmosphere	Redefinition of the standard atmosphere.	12 November 1963 1 April 1964 12 November 1966
88	Consequence of Amendment 2 to Annex 7	Revised definition of aircraft; revision of 2.2.3.2 b) of Part III to cater for 3-engined aeroplanes.	8 November 1967 8 March 1968 22 August 1968
89	Consequence of the adoption of Annex 16	Introduction of a reference to noise certification Standards in Annex 16 and Annex 6.	2 April 1971 2 August 1971 6 January 1972
90	Ninth Meeting of the Airworthiness Committee (1970)	Deletion of two Acceptable Means of Compliance for aeroplane performance from the 5th Edition.	10 December 1971 10 April 1972 7 December 1972
91 (6th Edition)	Council action following Ninth Airworthiness Committee	New text consistent with revised policy on airworthiness; deletion of Acceptable Means of Compliance; guidance material henceforth to appear in the *Airworthiness Technical Manual*.	16 March 1973 30 July 1973 23 May 1974
92	Tenth Meeting of the Airworthiness Committee	Introduction of provisions relating to the transmission of continuing airworthiness information; addition of a note concerning lease, charter and interchange of aircraft.	3 April 1974 3 August 1974 27 February 1975
93	Study by the Air Navigation Commission	Revision of the provisions relating to exterior lights to align with new provisions in Annexes 2 and 6.	22 March 1982 22 July 1982 22 March 1985

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
94 (7th Edition)	Fourteenth Meeting of the Airworthiness Committee (1981)	Introduction of a new provision relating to information on faults, malfunctions, defects and other occurrences and to include SI units in conformity with Annex 5 provisions.	6 December 1982 6 April 1983 24 November 1983
95 (8th Edition)	Proposal of States; Studies by the Council and Air Navigation Commission; Third Meeting of the HELIOPS Panel	Extension of the standard atmosphere; strengthened provisions relating to crash survival and fire protection; introduction of airworthiness provisions for helicopters.	22 March 1988 31 July 1988 22 March 1991
96	Third Meeting of the Continuing Airworthiness Panel (CAP/3)	Introduction of responsibilities of State of Design and definition thereof; revision of responsibilities of parties involved in transfer of information relating to continuing airworthiness; addition of new requirements concerning provision of maintenance information.	22 March 1994 25 July 1994 10 November 1994
97	Secretariat study, assisted by ISAD Study Group	Changes to design features; identification of a least-risk bomb location and addition of a new Chapter 11 containing security-related provisions.	12 March 1997 21 July 1997 6 November 1997; 12 March 2000
98 (9th Edition)	Fifth Meeting of the Continuing Airworthiness Panel (CAP/5); Air Navigation Commission studies	a) new definitions of Human Factors principles, human performance, maintenance, repair, Type Certificate; b) restructuring of Part II into four chapters: Type Certificate, Production, Certificate of Airworthiness and Continuing Airworthiness; c) revision of the provisions in Part II to allow the introduction of type certificate concept and production control; d) restructuring of Part III into Part IIIA (same provisions as those contained in the current Part III of Annex 8, Eighth Edition, including Amendment 97, except for applicability clauses and cross-references) and Part IIIB (new); e) revision of provisions (old Part III) in Part IIIB pertaining to performance, stability, control, and cargo compartment fire protection, and new provisions pertaining to cabin environment, electrical bonding, emergency landing, electromagnetic interference, ice protection and systems software; f) the provision of translation into English for Certificates of Airworthiness; and g) new provisions concerning Human Factors.	2 March 2001 16 July 2001 2 March 2004

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
99	Air Navigation Commission studies	a) revision of the title of Part IIIA; b) revision of applicability provisions to reflect the introduction of Recommended Practices in Annex 8 and to change the applicability of Parts IIIA and IIIB to make some provisions applicable only to large aeroplanes of a specific maximum certificated take-off mass and passenger seating capacity; c) revision of design, construction and security provisions in Annex 8, Parts IIIA and IIIB with regard to aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which an application for certification was submitted on or after 12 March 2000 and 2 March 2004, respectively, and introduction of Recommended Practices for aircraft of a maximum certificated take-off mass between 5 700 kg and 45 500 kg. d) introduction of Recommended Practices regarding security provisions for application to aeroplanes engaged in domestic commercial operations; e) introduction of security provisions for all aeroplanes which are required by Annex 6 to have an approved flight crew compartment door providing additional protection to also require additional protection of the bulkheads, floors and ceilings; and f) addition of provisions in Part IIIB for operating information and procedures to require the identification of a least-risk bomb location.	20 May 2003 13 October 2003 20 May 2006

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I. DEFINITIONS

When the following terms are used in the Standards for the Airworthiness of Aircraft, they have the following meanings:

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Anticipated operating conditions. Those conditions which are known from experience or which can be reasonably envisaged to occur during the operational life of the aircraft taking into account the operations for which the aircraft is made eligible, the conditions so considered being relative to the meteorological state of the atmosphere, to the configuration of terrain, to the functioning of the aircraft, to the efficiency of personnel and to all the factors affecting safety in flight. Anticipated operating conditions do not include:

a) those extremes which can be effectively avoided by means of operating procedures; and

b) those extremes which occur so infrequently that to require the Standards to be met in such extremes would give a higher level of airworthiness than experience has shown to be necessary and practical.

Appropriate airworthiness requirements. The comprehensive and detailed airworthiness codes established, adopted or accepted by a Contracting State for the class of aircraft, engine or propeller under consideration (see 3.2.2 of Part II of this Annex).

Approved. Accepted by a Contracting State as suitable for a particular purpose.

Configuration (as applied to the aeroplane). A particular combination of the positions of the moveable elements, such as wing flaps and landing gear, etc., that affect the aerodynamic characteristics of the aeroplane.

Critical power-unit(s). The power-unit(s) failure of which gives the most adverse effect on the aircraft characteristics relative to the case under consideration.

Design landing mass. The maximum mass of the aircraft at which, for structural design purposes, it is assumed that it will be planned to land.

Design take-off mass. The maximum mass at which the aircraft, for structural design purposes, is assumed to be planned to be at the start of the take-off run.

Design taxiing mass. The maximum mass of the aircraft at which structural provision is made for load liable to occur during use of the aircraft on the ground prior to the start of take-off.

Factor of safety. A design factor used to provide for the possibility of loads greater than those assumed, and for uncertainties in design and fabrication.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Landing surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft landing in a particular direction.

Limit loads. The maximum loads assumed to occur in the anticipated operating conditions.

Load factor. The ratio of a specified load to the weight of the aircraft, the former being expressed in terms of aerodynamic forces, inertia forces, or ground reactions.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Performance Class 1 helicopter. A helicopter with performance such that, in case of engine failure, it is able to land on the rejected take-off area or safely continue the flight to an appropriate landing area.

Performance Class 2 helicopter. A helicopter with performance such that, in case of engine failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off or after a defined point before landing, in which cases a forced landing may be required.

Performance Class 3 helicopter. A helicopter with performance such that, in case of engine failure at any point in the flight profile, a forced landing must be performed.

Power-unit. A system of one or more engines and ancillary parts which are together necessary to provide thrust, independently of the continued operation of any other power-unit(s), but not including short period thrust-producing devices.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.

Rendering (a Certificate of Airworthiness) valid. The action taken by a Contracting State, as an alternative to issuing its own Certificate of Airworthiness, in accepting a Certificate of Airworthiness issued by any other Contracting State as the equivalent of its own Certificate of Airworthiness.

Repair. The restoration of an aeronautical product to an airworthy condition to ensure that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the issuance of the Type Certificate for the respective aircraft type, after it has been damaged or subjected to wear.

Standard atmosphere. An atmosphere defined as follows:

a) the air is a perfect dry gas;

b) the physical constants are:

— Sea level mean molar mass:
$M_0 = 28.964420 \times 10^{-3}$ kg mol^{-1}
— Sea level atmospheric pressure:
$P_0 = 1013.250$ hPa
— Sea level temperature:
$t_0 = 15°C$
$T_0 = 288.15$ K
— Sea level atmospheric density:
$\rho_0 = 1.2250$ kg m^{-3}
— Temperature of the ice point:
$T_i = 273.15$ K
— Universal gas constant:
$R^* = 8.31432$ JK^{-1}mol^{-1}

c) the temperature gradients are:

Geopotential altitude (km)		*Temperature gradient (Kelvin per standard geopotential kilometre)*
From	*To*	
–5.0	11.0	–6.5
11.0	20.0	0.0
20.0	32.0	+1.0
32.0	47.0	+2.8
47.0	51.0	0.0
51.0	71.0	–2.8
71.0	80.0	–2.0

Note 1.— The standard geopotential metre has the value 9.80665 m^2 s^{-2}.

Note 2.— See Doc 7488 for the relationship between the variables and for tables giving the corresponding values of temperature, pressure, density and geopotential.

Note 3.— Doc 7488 also gives the specific weight, dynamic viscosity, kinematic viscosity and speed of sound at various altitudes.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

Take-off surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft taking off in a particular direction.

Type Certificate. A document issued by a Contracting State to define the design of an aircraft type and to certify that this design meets the appropriate airworthiness requirements of that State.

Ultimate load. The limit load multiplied by the appropriate factor of safety.

PART II. PROCEDURES FOR CERTIFICATION AND CONTINUING AIRWORTHINESS

Note.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an Operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the abovementioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention, the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *entered into force on 20 June 1997, such transfer agreements will have effect in respect of those Contracting States which have ratified the related Protocol* (Doc 9318) *upon fulfilment of the conditions established in Article 83* bis.

CHAPTER 1. TYPE CERTIFICATION

1.1 Applicability

The Standards of this chapter shall be applicable to all aircraft of types for which the application for certification was submitted to a Contracting State on or after 13 June 1960, except that the provisions of 1.4 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate is submitted to the State of Design on or after 2 March 2004.

Note.— Normally, a request for a type certificate is submitted by the aircraft manufacturer when the aircraft is intended for serial production.

1.2 Design aspects of the appropriate airworthiness requirements

1.2.1 The design aspects of the appropriate airworthiness requirements, used by a Contracting State for type certification in respect of a class of aircraft or for any change to such type certification, shall be such that compliance with them will ensure compliance with the Standards of Part II of this Annex and, where applicable, with the Standards of Parts IIIA, IIIB and IV of this Annex.

1.2.2 The design shall not have any features or characteristics that render it unsafe under the anticipated operating conditions.

1.2.3 Where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts IIIA, IIIB or IV inappropriate, the Contracting State shall apply appropriate requirements that will give at least an equivalent level of safety.

1.2.4 Where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts IIIA, IIIB or IV inadequate, additional technical requirements that are considered by the Contracting State to give at least an equivalent level of safety shall be applied.

Note.— An Airworthiness Manual *(Doc 9760) containing guidance material has been published by ICAO.*

1.3 Proof of compliance with the design aspects of the appropriate airworthiness requirements

1.3.1 There shall be an approved design consisting of such drawings, specifications, reports and documentary evidence as are necessary to define the design of the aircraft and to show compliance with the design aspects of the appropriate airworthiness requirements.

Note.— The approval of the design is facilitated, in some States, by approving the design organization.

1.3.2 The aircraft shall be subjected to such inspections and ground and flight tests as are deemed necessary by the State to show compliance with the design aspects of the appropriate airworthiness requirements.

1.3.3 In addition to determining compliance with the design aspects of the appropriate airworthiness requirements for an aircraft, Contracting States shall take whatever other steps they deem necessary to ensure that the design approval is withheld if the aircraft is known or suspected to have dangerous features not specifically guarded against by those requirements.

1.3.4 A Contracting State issuing an approval for the design of a modification, of a repair or of a replacement part shall do so on the basis of satisfactory evidence that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the type certification of that aircraft type or amended Type Certificate.

Note.— The approval of the design of a modification to an aircraft is signified, in some States, by the issuance of a supplemental Type Certificate or amended Type Certificate.

1.4 Type Certificate

1.4.1 The State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

1.4.2 When a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements.

CHAPTER 2. PRODUCTION

2.1 Applicability

The Standards of this chapter are applicable to all aircraft.

2.2 Production

2.2.1 Aircraft production

The State of Manufacture shall ensure that each aircraft, including parts manufactured by sub-contractors, conforms to the approved design.

2.2.2 Parts production

The Contracting State taking responsibility for the production of parts manufactured under the design approval referred to in 1.3.4 of Part II shall ensure that the parts conform to the approved design.

2.2.3 Production control

When approving production of aircraft or aircraft parts, a Contracting State shall ensure that it is performed in a controlled manner including the use of a quality system so that construction and assembly are satisfactory.

Note.— The oversight of production is facilitated, in some States, by approving the production organization.

2.2.4 Traceability

Records shall be maintained such that the identification of the aircraft and of the parts with their approved design and production can be established.

CHAPTER 3. CERTIFICATE OF AIRWORTHINESS

Note.— The Certificate of Airworthiness as used in these Standards is the Certificate of Airworthiness referred to in Article 31 of the Convention.

3.1 Applicability

The Standards of this chapter are applicable in respect of all aircraft, except 3.3 and 3.4 which are not applicable in respect of all aircraft that are of a type of which the prototype was submitted to appropriate national authorities for certification before 13 June 1960.

3.2 Issuance and renewal of a Certificate of Airworthiness

3.2.1 A Certificate of Airworthiness shall be issued by a Contracting State on the basis of satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements.

3.2.2 A Contracting State shall not issue or render valid a Certificate of Airworthiness for which it intends to claim recognition pursuant to Article 33 of the Convention on International Civil Aviation unless it has satisfactory evidence that the aircraft complies with the applicable Standards of this Annex through compliance with appropriate airworthiness requirements.

3.2.3 A Certificate of Airworthiness shall be renewed or shall remain valid, subject to the laws of the State of Registry, provided that the State of Registry shall require that the continuing airworthiness of the aircraft shall be determined by a periodical inspection at appropriate intervals having regard to lapse of time and type of service or, alternatively, by means of a system of inspection, approved by the State, that will produce at least an equivalent result.

3.2.4 When an aircraft possessing a valid Certificate of Airworthiness issued by a Contracting State is entered on the register of another Contracting State, the new State of Registry, when issuing another Certificate of Airworthiness or rendering the original certificate valid, may consider prior issuance of the Certificate of Airworthiness by a Contracting State as satisfactory evidence, in whole or in part, that the aircraft is airworthy and in compliance with the appropriate airworthiness requirements. The validity of the authorization shall not extend beyond the period of validity of the Certificate of Airworthiness.

Note.— This applies both when the aircraft is registered for the first time and when the aircraft changes its nationality.

3.3 Standard form of Certificate of Airworthiness

3.3.1 The Certificate of Airworthiness shall contain the information shown in Figure 1 and shall be generally similar to it.

3.3.2 When Certificates of Airworthiness are issued in a language other than English, they shall include an English translation.

Note.— Article 29 of the Convention on International Civil Aviation requires that the Certificate of Airworthiness be carried on board every aircraft engaged in international air navigation.

3.4 Aircraft limitations and information

Each aircraft shall be provided with a flight manual, placards, or other documents stating the approved limitations within which the aircraft is considered airworthy as defined by the appropriate airworthiness requirements, and additional instructions and information necessary for the safe operation of the aircraft.

3.5 Temporary loss of airworthiness

Any failure to maintain an aircraft in an airworthy condition as defined by the appropriate airworthiness requirements shall render the aircraft ineligible for operation until the aircraft is restored to an airworthy condition.

3.6 Damage to aircraft

3.6.1 When an aircraft has sustained damage, the State of Registry shall judge whether the damage is of a nature such that the aircraft is no longer airworthy as defined by the appropriate airworthiness requirements.

3.6.2 If the damage is sustained or ascertained when the aircraft is in the territory of another Contracting State, the authorities of the other Contracting State shall be entitled to prevent the aircraft from resuming its flight on the condition that they shall advise the State of Registry immediately, communicating to it all details necessary to formulate the judgement referred to in 3.6.1.

3.6.3 When the State of Registry considers that the damage sustained is of a nature such that the aircraft is no longer airworthy, it shall prohibit the aircraft from resuming flight until it is restored to an airworthy condition; the State of Registry may, however, in exceptional circumstances, prescribe particular limiting conditions to permit the aircraft to fly without fare-paying passengers to an aerodrome at which it will be restored to an airworthy condition, and the Contracting State that had originally, in accordance with 3.6.2, prevented the aircraft from resuming flights shall permit such flight.

3.6.4 When the State of Registry considers that the damage sustained is of a nature such that the aircraft is still airworthy, the aircraft shall be allowed to resume its flight.

*	*State of Registry* *Issuing Authority*	*
CERTIFICATE OF AIRWORTHINESS		
1. Nationality and registration marks	2. Manufacturer and manufacturer’s designation of aircraft**	3. Aircraft serial number . . . .
4. Categories		
5. This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7 December 1944 and †....................................... in respect of the abovementioned aircraft which is considered to be airworthy when maintained and operated in accordance with the foregoing and the pertinent operating limitations. Date of issue . . . . Signature . . . . † Insert reference to appropriate Airworthiness Code.		
6. ***		

* For use of the State of Registry.

** Manufacturer’s designation of aircraft should contain the aircraft type and model.

*** This space shall be used either for periodic endorsement (giving date of expiry) or for a statement that the aircraft is being maintained under a system of continuous inspection.

Figure 1

CHAPTER 4. CONTINUING AIRWORTHINESS OF AIRCRAFT

4.1 Applicability

The Standards of this chapter are applicable to all aircraft.

4.2 Determination of continuing airworthiness

4.2.1 The State of Registry shall develop or adopt requirements to ensure the continued airworthiness of the aircraft during its service life, including requirements to ensure that the aircraft:

a) continues to comply with the appropriate airworthiness requirements after a modification, a repair or the installation of a replacement part; and

b) is maintained in an airworthy condition and in compliance with the maintenance requirements of Annex 6 and, where applicable, Parts IIIA, IIIB and IV of this Annex.

4.2.2 The continuing airworthiness of an aircraft shall be determined by the State of Registry in relation to the appropriate airworthiness requirements in force for that aircraft.

Note.— Guidance on continuing airworthiness requirements is contained in Volume II, Part B, of the Airworthiness Manual *(Doc 9760).*

4.3 Information related to continuing airworthiness of aircraft

4.3.1 When a Contracting State first enters on its register an aircraft of a particular type for which it is not the State of Design and issues or validates a Certificate of Airworthiness in accordance with 3.2.2 of this part, it shall advise the State of Design that it has entered such an aircraft on its register.

4.3.2 The State of Design of an aircraft shall transmit any generally applicable information which it has found necessary for the continuing airworthiness of the aircraft and for the safe operation of the aircraft (hereinafter called mandatory continuing airworthiness information) as follows:

a) to every Contracting State which has in accordance with 4.3.1 advised the State of Design that it has entered the aircraft on its register; and

b) to any other Contracting State upon request.

Note 1.— In 4.3, the term "mandatory continuing airworthiness information" is intended to include mandatory requirements for modification, replacement of parts or inspection of aircraft and amendment of operating limitations and procedures. Among such information is that issued by Contracting States in the form of airworthiness directives.

Note 2.— Circular 95, The Continuing Airworthiness of Aircraft in Service, *provides the necessary information to assist Contracting States in establishing contact with competent authorities of other Contracting States, for the purpose of maintaining continuing airworthiness of aircraft in service.*

4.3.3 The State of Registry shall, upon receipt of mandatory continuing airworthiness information from the State of Design, adopt the mandatory information directly or assess the information received and take appropriate action.

4.3.4 Any Contracting State that has entered on its register an aircraft in respect of which that Contracting State is not the State of Design and for which it has issued or validated a Certificate of Airworthiness in accordance with 3.2 of this part shall ensure the transmission to the State of Design of all mandatory continuing airworthiness information which it, as the State of Registry, originated in respect of that aircraft.

4.3.5 The State of Registry shall ensure that in respect of aeroplanes of over 5 700 kg and helicopters over 3 180 kg maximum certificated take-off mass, there exists a system whereby information on faults, malfunctions, defects and other occurrences that cause or might cause adverse effects on the continuing airworthiness of the aircraft is transmitted to the organization responsible for the type design of that aircraft.

Note.— Guidance on interpretation of "the organization responsible for the type design" is contained in Volume II, Part A, of the Airworthiness Manual (Doc 9760).

4.3.6 The State of Design shall ensure that in respect of aeroplanes over 5 700 kg and helicopters over 3 180 kg maximum certificated take-off mass, there exists a system for:

a) receiving information submitted in accordance with 4.3.5;

b) deciding if and when airworthiness action is needed;

c) developing the necessary airworthiness actions; and

d) promulgating the information on those actions including that required in 4.3.2.

4.3.7 The State of Design shall ensure that in respect of aeroplanes over 5 700 kg maximum certificated take-off mass, there exists a continuing structural integrity programme to ensure the airworthiness of the aeroplane. The programme shall include specific information concerning corrosion prevention and control.

4.3.8 Each Contracting State shall establish, in respect of aeroplanes over 5 700 kg and helicopters over 3 180 kg maximum certificated take-off mass, the type of service information that is to be reported to its airworthiness authority by operators, organizations responsible for type design and maintenance organizations. Procedures for reporting this information shall also be established.

4.3.9 Where the State of Manufacture of an aircraft is other than the State of Design, there shall be an agreement acceptable to both States to ensure that the manufacturing organization cooperates with the organization responsible for the type design in assessing information received on experience with operating the aircraft.

PART III. LARGE AEROPLANES

PART IIIA. AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 JUNE 1960 BUT BEFORE 2 MARCH 2004

Note.— The provisions of Part IIIA are the same as those contained in Part III of Annex 8, Eighth Edition (including Amendment 97), except for modified applicability clauses and cross-references.

CHAPTER 1. GENERAL

1.1 Applicability

1.1.1 The Standards of Part IIIA, except for those specified in 8.4, are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype is submitted to the appropriate national authorities for certification on or after 13 June 1960, but before 2 March 2004.

1.1.2 The Standards specified in 8.4 of Part IIIA are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype is submitted to the appropriate national authorities for certification on or after 22 March 1985, but before 2 March 2004.

1.1.3 Except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of Part IIIA shall apply to aeroplanes of over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 3.2.2 of Part II, they are to be supplemented by national requirements prepared by Contracting States.

1.1.4 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 3.2.2 of Part II for the aeroplanes designated in 1.1.3 shall be at least substantially equivalent to the overall level intended by the broad Standards of Part IIIA.

1.1.5 Unless otherwise stated, the Standards apply to the complete aeroplane including power-units, systems and equipment.

1.2 Number of power-units

The aeroplane shall have not less than two power-units.

1.3 Operating limitations

1.3.1 Limiting conditions shall be established for the aeroplane, its power-units and its equipment (see 9.2). Compliance with the Standards of Part IIIA shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall be sufficiently removed from any condition(s) prejudicial to the safety of the aeroplane to render the likelihood of accidents arising therefrom extremely remote.

1.3.2 Limiting ranges of mass, centre of gravity location, load distribution, speeds, and altitude or pressure-altitude shall be established within which compliance with all the pertinent Standards in Part IIIA is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— The following items, for instance, may be considered as basic aeroplane limitations:

— maximum certificated take-off mass

— maximum certificated taxiing mass

— maximum certificated landing mass

— maximum certificated zero fuel mass

— most forward and rearward centre of gravity positions in various configurations (take-off, en route, landing).

Note 3.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Vol. I, and Annex 6, Parts I and II).

1.4 Unsafe features and characteristics

The aeroplane shall not possess any feature or characteristic that renders it unsafe under the anticipated operating conditions.

1.5 Proof of compliance

1.5.1 Compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, or calculations based on tests, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.5.2 The tests of 1.5.1 shall be such as to provide reasonable assurance that the aeroplane, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 General

2.1.1 Compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Certificate of Airworthiness is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 Performance

2.2.1 General

2.2.1.1 Sufficient data on the performance of the aeroplane shall be determined and scheduled in the aeroplane flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 The performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

2.2.1.3 The scheduled performance of the aeroplane shall be consistent with compliance with 1.3.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.2 Minimum performance

At the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or runway or water run length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the aeroplane flight manual against, for example:

— *aerodrome elevation, or*

— *pressure-altitude at aerodrome level, or*

— *pressure-altitude and atmospheric temperature at aerodrome level,*

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.2.1 *Take-off*

a) The aeroplane shall be capable of taking off assuming the critical power-unit to fail (see 2.2.3), the remaining power-units being operated within their take-off power limitations.

b) After the end of the period during which the take-off power may be used, the aeroplane shall be capable of continuing to climb, with the critical power-unit inoperative and the remaining power-units operated within their maximum continuous power limitations, up to a height that it can maintain and at which it can carry out a circuit of the aerodrome.

c) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 *Landing*

a) Starting from the approach configuration and with the critical power-unit inoperative, the aeroplane shall be

capable, in the event of a missed approach, of continuing the flight to a point from which a fresh approach can be made.

b) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

2.2.3 Scheduling of performance

Performance data shall be determined and scheduled in the aeroplane flight manual so that their application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

2.2.3.1 *Take-off.* The take-off performance data shall include the accelerate-stop distance and the take-off path.

2.2.3.1.1 *Accelerate-stop distance.* The accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical power-unit to fail suddenly at a point not nearer to the start of the take-off than that assumed when determining the take-off path (see 2.2.3.1.2).

2.2.3.1.2 *Take-off path.* The take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical power-unit to fail suddenly during the take-off (see 2.2.3.1.1). The take-off path shall be scheduled up to a height that the aeroplane can maintain and at which it can carry out a circuit of the aerodrome. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with 2.3.1.3.

2.2.3.2 *En route.* The en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

a) the critical power-unit inoperative; and

b) the two critical power-units inoperative in the case of aeroplanes having three or more power-units.

The operating engines shall not exceed maximum continuous power.

2.2.3.3 *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

Note.— If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6, Part I.

2.3 Flying qualities

The aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.1 Controllability

The aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of aeroplane configurations) without requiring exceptional skill, alertness, or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

2.3.1.1 *Controllability on the ground (or water).* The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

2.3.1.3 *Take-off safety speed.* The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical power-unit.

2.3.2 Trim

The aeroplane shall have such trim and other characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more power-units for which performance characteristics are established.

2.3.3 Stability

The aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 Stalling

2.3.4.1 *Stall warning.* When the aeroplane is made to approach a stall both in straight and turning flight with all power-units operating and with one power-unit inoperative, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power, to maintain full control of the aeroplane.

2.3.4.2 *Behaviour following a stall.* In any configuration and power in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane. It shall be acceptable to throttle back the operating power-units during recovery from the stall.

2.3.4.3 *Stalling speeds.* The stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.3.5 Flutter and vibration

It shall be demonstrated by suitable tests that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.3.2). There shall be no buffeting severe enough to interfere with control of the aeroplane, to cause structural damage or to cause excessive fatigue to the flight crew.

Note.— Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

CHAPTER 3. STRUCTURES

3.1 General

The Standards of Chapter 3 apply to the aeroplane structure consisting of all portions of the aeroplane, the failure of which would seriously endanger the aeroplane.

3.1.1 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.3, 3.4 and 3.5 shall be considered as limit loads.

3.1.3 Strength and deformation

In the various loading conditions prescribed in 3.3, 3.4 and 3.5, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.2 Airspeeds

3.2.1 Design airspeeds

Design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.3. In establishing the design airspeeds, consideration shall be given to the following speeds:

a) V_A, the design manoeuvring speed;

b) V_B, the speed at which the maximum vertical gust velocity assumed in accordance with 3.3.2 can be withstood;

c) V_C, a speed not expected to be exceeded in normal cruising flight taking into account possible effects of upsets when flying in turbulent conditions;

d) V_D, maximum dive speed, sufficiently greater than the speed in c), to make it unlikely that such a design speed would be exceeded as a result of inadvertent speed increases in the anticipated operating conditions, taking into account the flying qualities and other characteristics of the aeroplane;

e) V_{E_1} to V_{E_n}, maximum speeds at which flaps and landing gears may be extended or other configuration changes be made.

The speeds V_A, V_B, V_C, and V_E in a), b), c) and e) shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air.

3.2.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.3.1 shall be included in the aeroplane flight manual as part of the operating limitations (see 9.2.2).

3.3 Flight loads

The flight loading conditions of 3.3.1, 3.3.2 and 3.5 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia, and other loads resulting from the specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.3.1 Manoeuvring loads

Manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.3.2 Gust loads

Gust loads shall be computed for vertical and horizontal gust velocities and gradients that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.4 Ground and water loads

The structure shall be able to withstand all the loads due to the reactions of the ground and water surface that are likely to arise during taxiing, take-off and landing.

3.4.1 Landing conditions

The landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the aeroplane at ground or water contact, such velocities of descent and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.5 Miscellaneous loads

In addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, etc.) that are likely to occur in the anticipated operating conditions.

3.6 Flutter, divergence and vibration

The aeroplane structure shall be designed to be free from flutter, structural divergence (i.e. unstable structural distortion due to aerodynamic loading), and loss of control due to structural deformation, at speeds within and sufficiently beyond the operating limitations to comply with 1.3.1. Adequate strength shall be provided to withstand the vibration and buffeting that might occur in the anticipated operating conditions.

3.7 Fatigue strength

The strength and fabrication of the aeroplane shall be such as to ensure that the probability of disastrous fatigue failure of the aeroplane's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 General

Details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall observe Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1.1 Substantiating tests

The functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 Materials

All materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 Fabrication methods

The methods of fabrication and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion, or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.5 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement, or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

4.1.6 Design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

b) *System survivability.*

   1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, aeroplane systems shall be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

   2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, aeroplane systems should be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.*

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimize the possibility of in-flight and ground fires and also to minimize the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused.

g) *Fire suppression*. For aeroplanes for which the application for certification was submitted on or after 12 March 2000, cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

h) *Incapacitation of occupants.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, design precautions should be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.*

i) *Protection of the flight crew compartment from smoke and fumes.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, means shall be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, means should be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.*

4.1.7 Emergency landing provisions

4.1.7.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.1.7.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane.

4.1.7.3 The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

4.1.7.4 On aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

4.1.8 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. ENGINES

5.1 Scope

The Standards of Chapter 5 shall apply to engines of all types that are used on the aeroplane as primary propulsion units.

5.2 Design, construction and functioning

The engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the aeroplane in accordance with Chapter 7 and, if applicable, fitted with a suitable propeller.

5.3 Declared ratings, conditions and limitations

The power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations, which are intended to govern the operation of the engine, shall be declared.

5.4 Tests

An engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration.* Tests shall be conducted to establish the power or thrust characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation.* Tests shall be conducted to ensure that starting, idling, acceleration, vibration, overspeeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge, or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance.* Tests of sufficient duration shall be conducted at such powers, thrust, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6. PROPELLERS

6.1 Scope

The Standards of Chapter 6 shall apply to propellers of all types.

6.2 Design, construction and functioning

The propeller assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the aeroplane in accordance with Chapter 7.

6.3 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations, which are intended to govern the operation of the propeller, shall be declared.

6.4 Tests

A propeller of the type shall complete satisfactorily such tests as are necessary to ensure that it will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength vibration and overspeeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the propeller.

CHAPTER 7. POWERPLANT INSTALLATION

7.1 General

7.1.1 Applicable Standards

The powerplant installation shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

7.1.2 Compliance with engine and propeller limitations

The powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of being used in the anticipated operating conditions. In conditions established in the aeroplane flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with Chapters 5, 6 and 7.

7.1.3 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

7.1.4 Engine restarting

Means shall be provided for restarting an engine at altitudes up to a declared maximum altitude.

7.2 Arrangement and functioning

7.2.1 Independence of power-units

The powerplant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

7.2.2 Propeller vibration

The propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

7.2.3 Cooling

The cooling system shall be capable of maintaining powerplant temperatures within the established limits (see 7.1.2) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum air temperature for which the powerplant has been established as being suitable shall be scheduled in the aeroplane flight manual.

7.2.4 Associated systems

The fuel, oil, air induction, and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

7.2.5 Fire protection

For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e).

a) *Isolation.* Such regions shall be isolated by fire-resisting material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs.

c) *Fire detection.* There shall be provided a sufficient number of fire detectors so located as to ensure rapid detection of any fire that might occur in such regions.

d) *Fire extinguishment.* Such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardize the safety of the aeroplane.

CHAPTER 8. INSTRUMENTS AND EQUIPMENT

8.1 Required instruments and equipment

The aeroplane shall be provided with approved instruments and equipment necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2.— Instruments and equipment design shall observe Human Factors principles.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

8.2 Installation

Instrument and equipment installations shall comply with the Standards of Chapter 4.

8.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

*8.4 Navigation lights and anti-collision lights

8.4.1 The lights required by Annex 2 to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760, Volume II, Part A) for detailed technical specifications for exterior lights for aeroplanes.*

8.4.2 Lights shall be installed in aeroplanes so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject an outside observer to harmful dazzle.

Note.— In order to avoid the effects mentioned in 8.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

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* Please refer to 1.1.2 of this part.

CHAPTER 9. OPERATING LIMITATIONS AND INFORMATION

9.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of an aeroplane flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 Operating limitations

Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions, and floor loadings (see 1.3.2).

9.2.2 Airspeed limitations

The airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

9.2.3 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 7.1.2 and 7.2.3).

9.2.4 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

9.2.5 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.3.1).

9.2.6 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft*, Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

9.2.7 Flying time limitation after system or power-unit failure

The systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine power-units beyond the threshold time established in accordance with 4.7 of Annex 6, Part I.

Note.— The maximum time established in accordance with 4.7 of Annex 6, Part I, for a particular route may be less than that determined in accordance with 9.2.7 because of the operational considerations involved.

9.3 Operating information and procedures

9.3.1 Types of eligible operations

There shall be listed the particular types of operations, as may be defined in Annex 6, Parts I and II, or be generally recognized, for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 Loading information

The loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the

aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

9.3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

9.3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.3.4.3 shall be scheduled.

9.3.5 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimize the effects on the aeroplane in the case of detonation.

9.4 Performance information

The performance of the aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 Aeroplane flight manual

An aeroplane flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The aeroplane flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 Markings and placards

9.6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

CHAPTER 10. CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

10.1 General

Information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 10.2, 10.3 and 10.4.

10.2 Maintenance information

Maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

10.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

10.4 Maintenance information resulting from the type design approval

Maintenance tasks and frequencies that have been specified as mandatory by the State of Design in approval of the type design shall be identified as such.

CHAPTER 11. SECURITY

11.1 Aeroplanes used for domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).*

11.2 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

11.3 Protection of the flight crew compartment

Recommendation.— *In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the type certificate to include a derivative type design is submitted to the appropriate national authority, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.*

Note.— Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in Annex 6, Part I, Chapter 13.

11.4 Interior design

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IIIB. AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 2 MARCH 2004

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 The Standards of Part IIIB are applicable in respect of all aeroplanes designated in A.1.2 for which an application for the issue of a type certificate is submitted to the appropriate national authorities on or after 2 March 2004.

A.1.2 Except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of Part IIIB shall apply to all aeroplanes of over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1.— The aeroplanes described in A.1.2 are known in some States as transport category aeroplanes.

Note 2.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 3.2.2 of Part II, they are to be supplemented by national requirements prepared by Contracting States.

A.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 3.2.2 of Part II for the aeroplanes designated in A.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of Part IIIB.

A.1.4 Unless otherwise stated, the Standards apply to the complete aeroplane including power-units, systems and equipment.

A.2 Operating limitations

A.2.1 Limiting conditions shall be established for the aeroplane, its power-units and its equipment (see G.2). Compliance with the Standards of Part IIIB shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760), Volume II, Part A.*

A.2.2 Limiting ranges of mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude or pressure-altitude shall be established within which compliance with all the pertinent Standards in Part IIIB is shown.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Vol. I, and Annex 6, Parts I and II).

A.3 Unsafe features and characteristics

Under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

A.4 Proof of compliance

Compliance with the appropriate airworthiness requirements shall be based on evidence from tests, calculations or any acceptable combination of tests and calculations, provided that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

SUB-PART B. FLIGHT

B.1 General

B.1.1 Compliance with the Standards prescribed in Sub-part B shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

B.1.2 Compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

B.1.3 Where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

B.2 Performance design parameters

B.2.1 Sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

B.2.2 Achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

B.2.3 The scheduled performance of the aeroplane shall be consistent with compliance with A.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

B.2.4 Minimum performance

At the maximum mass scheduled (see B.2.7) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in B.2.5 and B.2.6, respectively, not considering obstacles, or runway or water run length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the aeroplane flight manual against, for example:

— aerodrome elevation, or

— pressure-altitude at aerodrome level, or

— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

B.2.5 Take-off

a) The aeroplane shall be capable of taking off assuming the critical power-unit to fail (see B.2.7), the remaining power-units being operated within their take-off power or thrust limitations.

b) After the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical power-unit inoperative and the remaining power-units operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

c) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (B.2.7), the departure from the scheduled values is not disproportionate.

B.2.6 Landing

a) Starting from the approach configuration and with the critical power-unit inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which a fresh approach can be made.

b) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

B.2.7 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

a) *Take-off.* The take-off performance data shall include the accelerate-stop distance and the take-off path.

b) *Accelerate-stop distance.* The accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical power-unit to fail suddenly at a point not nearer to the start of the take-off than that assumed when determining the take-off path (see B.2.7 c)). For landplanes, the distance shall be based on operations with worn brakes.

c) *Take-off path.* The take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical power-unit to fail suddenly during the take-off (see B.2.7 b)). The take-off path shall be scheduled up to a height from which the aeroplane can continue safe flight and landing. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with B.3.2.4.

d) *En route.* The en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

1) the critical power-unit inoperative; and

2) the two critical power-units inoperative in the case of aeroplanes having three or more power-units.

The operating engines shall not exceed maximum continuous power or thrust.

e) *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom. For landplanes, this distance shall be based on operations with worn brakes.

Note.— If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6, Part I.

B.3 Flying qualities

B.3.1 The aeroplane shall comply with the Standards of B.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

B.3.2 Controllability

B.3.2.1 The aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness, or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

B.3.2.2 *Controllability on the ground (or water).* The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

B.3.2.3 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

B.3.2.4 *Take-off safety speed.* The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical power-unit.

B.3.3 Trim

The aeroplane shall have such trim and other characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more power-units for which performance characteristics are established.

B.4 Stability and control

B.4.1 Stability

The aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. The stability may be achieved by natural or artificial means, or a combination of both. In those cases where artificial stability is necessary to show compliance with the Standards of this part, it shall be shown that any failure or condition that would result in the need for exceptional pilot skill or strength for recovery of aeroplane stability is extremely improbable.

Note.— Guidance material concerning the expression "extremely improbable" is contained in the Airworthiness Manual *(Doc 9760), Volume II, Part A.*

B.4.2 Stalling

B.4.2.1 *Stall warning.* When the aeroplane is made to approach a stall both in straight and turning flight with all power-units operating and with one power-unit inoperative, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers or thrusts, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

B.4.2.2 *Behaviour following a stall.* In any configuration and power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane. It shall be acceptable to throttle back the operating power-units during recovery from the stall.

B.4.2.3 *Stalling speeds.* The stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

B.4.3 Flutter and vibration

B.4.3.1 It shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see A.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

B.4.3.2 There shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew.

Note.— Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

SUB-PART C. STRUCTURE

C.1 General

The aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

C.2 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

C.3 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in C.6 shall be considered as limit loads.

C.4 Deformation and ultimate strength

In the various loading conditions prescribed in C.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

C.5 Airspeeds

C.5.1 Design airspeeds

Design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedances due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

C.5.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with A.2.1 shall be included in the flight manual as part of the operating limitations (see G.2).

C.6 Strength

C.6.1 All structural elements shall be designed to withstand the expected loads in service without failure, permanent distortion or loss of functionality. In determining the expected loads in service, account shall be taken of:

a) the expected operational life of the aeroplane;

b) the expected vertical and horizontal gust environment, taking into consideration the expected variations in mission profile, operating locations and loading configurations;

c) the likely manoeuvre spectrum, taking into account likely variations in mission profiles, loading configurations, and pilot abilities;

d) asymmetrical as well as symmetrical loading;

e) the likely ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;

f) the likely speed range of the aeroplane, taking into account the aeroplane characteristics, placarded operation limitations, and variations in pilot abilities;

g) vibration and buffeting loads which might be expected to occur;

h) likely corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) any other loads that are likely to occur in service, such as flight control loads, cabin pressurization loads, engine loads, or dynamic loads due to changes to the steady state configuration.

C.6.2 The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

C.7 Survivability

The aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water, or object impact. Consideration shall be given to at least the following:

a) likely impact with birds;

b) energy absorption by the airframe, occupant seats and restraints;

c) the probable behaviour of the aeroplane in ditching; and

d) allowing egress in the shortest practicable time.

C.8 Structural durability

The design and construction of the aeroplane shall, wherever practicable, conform to damage tolerance principles and shall be such as to ensure that the probability of catastrophic failure during the operational life is extremely remote, taking into account:

a) the expected environment;

b) the expected repeated loads applied in service;

c) expected vibrations from aerodynamic interaction or internal sources;

d) thermal cycles;

e) likely corrosion or other degradation;

f) specified maintenance; and

g) likely structural repairs.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760), Volume II, Part A.*

C.9 Lightning protection

The aeroplane shall be protected against catastrophic effects of lightning. Due account shall be taken of the materials used in the construction of the aeroplane.

SUB-PART D. DESIGN AND CONSTRUCTION

D.1 General

D.1.1 Details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also observe Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

D.1.2 Substantiating tests

The functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

D.1.3 Materials

All materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design. The effect of the materials on the occupants of the aeroplane and other persons on the ground, and the environment in general, in normal and emergency situations, shall be taken into account.

D.1.4 Fabrication methods

The methods of fabrication and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

D.1.5 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion, or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

D.1.6 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement, or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

D.2 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operation including prevention of mis-assembly, and unintentional engagement of control surface locking devices.

b) *System survivability.*

   1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, aeroplane systems shall be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

   2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, aeroplane systems should be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.*

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture shall be such as to minimize the possibility of in-flight and ground fires, to minimize the production of smoke and toxic gases in the event of a fire and to delay the occurrence of flashover in the cabin. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused. Lavatories installed in aeroplanes shall be equipped with a smoke detection system and a built-in fire extinguisher system for each receptacle intended for the disposal of towels, paper or waste.

g) *Cargo compartment protection.*

1) each cargo compartment accessible to a crew member in a passenger-carrying aeroplane shall be equipped with a fire suppression system;

2) each cargo compartment not accessible to a crew member shall be equipped with a built-in fire detection system and a built-in fire starvation or suppression system; and

3) cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

h) *Incapacitation of occupants.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, design precautions should be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.*

i) *Protection of the flight crew compartment from smoke and fumes*.

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, means shall be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, means should be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.*

D.3 Aeroelasticity

The aeroplane shall be designed to be free from flutter, structural divergence, and loss of control due to structural deformation, at all speeds within and sufficiently beyond the design envelope to comply with A.2.1. Account shall be taken of the characteristics of the aeroplane and variations in pilot skill and workload. Allowable limits for aerodynamic control surfaces and how those limits are to be monitored shall be specified so as to ensure that the aeroplane remains free from aeroelastic problems during its operational life.

D.4 Occupants accommodation features

D.4.1 Seating and restraints

Adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structure during the operation of the aeroplane.

D.4.2 Cabin environment

Ventilation, heating and, where applicable, pressurization systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

D.5 Electrical bonding

Electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

D.6 Emergency landing provisions

D.6.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

D.6.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

D.6.3 The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

D.6.4 On aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

D.7 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

SUB-PART E. POWERPLANT

E.1 Engines

Each engine type shall be certificated to an appropriate airworthiness requirement.

E.2 Propellers

Each propeller type shall be certificated to an appropriate airworthiness requirement.

E.3 Powerplant installation

E.3.1 Compliance with engine and propeller limitations

The powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of being used in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this sub-part.

E.3.2 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

E.3.3 Turbine engine

For a turbine engine installation:

a) the design shall minimize the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) the power-unit together with the associated engine control devices, systems and instrumentation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

E.3.4 Engine restarting

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

E.3.5 Arrangement and functioning

E.3.5.1 *Independence of power-units*

The powerplant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

E.3.5.2 *Propeller vibration*

The propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

E.3.5.3 *Cooling*

The cooling system shall be capable of maintaining power-plant temperatures within the established limits (see E.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum ambient air temperature for which the powerplant has been established as being suitable shall be scheduled in the flight manual.

E.3.5.4 *Associated systems*

The fuel, oil, air induction, and other systems associated with the power-unit shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmos-pheric conditions, fluid temperatures) within the anticipated operating conditions.

E.3.5.5 *Fire protection*

For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of D.2 e).

a) *Isolation.* Such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be capable of containing the fluid when exposed to fire conditions. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs.

c) *Fire detection.* A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

d) *Fire extinguishment.* Such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardize the safety of the aeroplane.

SUB-PART F. SYSTEMS AND EQUIPMENT

F.1 General

F.1.1 The aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2.— For systems software assessment, see Sub-part H.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

F.1.2 The design of the instruments, equipment and systems required by F.1.1 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) they perform their function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

F.1.3 Means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

F.1.4 The design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations of the aeroplane and essential power loads after failures that affect the electrical generating system and under expected environmental conditions.

F.2 Installation

Instrument and equipment installations shall comply with the Standards of Sub-part D.

F.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

F.4 Navigation lights and anti-collision lights

F.4.1 The lights required by Annex 2 to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See Volume II, Part A, Chapter 4 of the Airworthiness Manual *(Doc 9760) for detailed technical specifications for exterior lights for aeroplanes.*

F.4.2 Lights shall be installed in aeroplanes so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject a person outside the aeroplane to harmful dazzle.

Note.— In order to avoid the effects mentioned in F.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

F.5 Electromagnetic interference protection

Aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

F.6 Ice protection

If certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all expected operating environments.

SUB-PART G. OPERATING LIMITATIONS AND INFORMATION

G.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in this sub-part.

G.2 Operating limitations

G.2.1 Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

G.2.2 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions, and floor loadings (see A.2.2).

G.2.3 Airspeed limitations

The airspeed limitations shall include all speeds (see C.5) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

G.2.4 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see E.3.1 and E.3.5.3).

G.2.5 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

G.2.6 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see A.2.1).

G.2.7 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft*, Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

G.2.8 Flying time limitation after system or power-unit failure

The systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine power-units beyond the threshold time established in accordance with 4.7 of Annex 6, Part I.

Note.— The maximum time established in accordance with 4.7 of Annex 6, Part I, for a particular route may be less than that determined in accordance with G.2.8 because of the operational considerations involved.

G.3 Operating information and procedures

G.3.1 Types of eligible operations

The particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

G.3.2 Loading information

The loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the

aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

G.3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

G.3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by B.4.2.3 shall be scheduled.

G.3.5 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimize the effects on the aeroplane in the case of detonation.

G.4 Performance information

The performance of the aeroplane shall be scheduled in accordance with B.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

G.5 Flight manual

A flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in this sub-part, except those specified in G.7.

G.6 Markings and placards

G.6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

G.6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

G.7 Continuing airworthiness

G.7.1 General

Information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in G.7.2, G.7.3 and G.7.4.

G.7.2 Maintenance information

Maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

G.7.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

G.7.4 Maintenance information resulting from the type design approval

Maintenance tasks and frequencies that have been specified as mandatory by the State of Design in approval of the type design shall be identified as such.

SUB-PART H. SYSTEMS SOFTWARE

All systems software shall be designed and validated such as to ensure that the systems in which they are used perform their intended functions with a level of safety that complies with the requirements of Part IIIB, notably those of F.1.2 a) and F.1.3.

Note.— Some States accept the use of national/international industry standards, such as RTCA/DO-178 or EUROCAE ED12, for the design and testing of systems software.

SUB-PART I. CRASHWORTHINESS AND CABIN SAFETY

I.1 General

Developments in the subject of crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

I.2 Design emergency landing loads

Emergency landing (crash) loads shall be determined for all categories of aeroplanes so that the interiors, furnishings, support structure and safety equipment can be designed to maximize survivability for the occupants. Items to be considered shall include:

a) dynamic effects;

b) restraint criteria for items that could cause a hazard;

c) distortion of the fuselage in the areas of emergency exits;

d) fuel cell integrity and position; and

e) integrity of electrical systems to avoid sources of ignition.

I.3 Cabin fire protection

The cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) flammability of cabin interior materials;

b) fire resistance and the generation of smoke and toxic fumes;

c) provision of safety features to allow for safe evacuation; and

d) fire detection and suppression equipment.

I.4 Evacuation

The aeroplane shall be equipped with sufficient emergency exits to allow maximum opportunity for cabin evacuation within an appropriate time period. Items to be considered shall include:

a) number of seats and seating configuration;

b) number, location and size of exits;

c) marking of exits and provision of instructions for use;

d) likely blockages of exits;

e) operation of exits; and

f) positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

I.5 Lighting and marking

Emergency lighting shall be provided which includes the following characteristics:

a) independence from main electrical supply;

b) automatic activation upon loss of normal power/impact;

c) visual indication of the path to emergency exits in smoke-filled cabin conditions;

d) illumination both inside and outside the aeroplane during evacuation; and

e) no additional hazard in the event of fuel spillage.

I.6 Survival equipment

The aeroplane shall be so equipped as to provide the crew and occupants with the maximum opportunity to survive in the expected external environment for a reasonable time-span. Items to be considered shall include:

a) number of life-rafts/life jackets;

b) survival equipment suited to the likely environment;

c) emergency radios and pyrotechnical distress signalling equipment; and

d) automatic emergency radio beacons.

SUB-PART J. OPERATING ENVIRONMENT AND HUMAN FACTORS

J.1 General

The aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note.— The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.

J.2 Flight crew

J.2.1 The aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

J.2.2 The workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Workload may be considered to be both cognitive and physiological. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

J.3 Ergonomics

During design of the aeroplane, account shall be taken of ergonomic factors including:

a) ease of use and prevention of inadvertent misuse;

b) ease of access;

c) working environment;

d) standardization and commonality; and

e) maintainability.

J.4 Operating environmental factors

The design of the aeroplane shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;

b) effect of physical forces during normal flight;

c) effect of prolonged operation at high altitude; and

d) physical comfort.

SUB-PART K. SECURITY

K.1 Aeroplanes used for domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).*

K.2 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

K.3 Protection of the flight crew compartment

K.3.1 In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for the issue of a type certificate is first submitted to the appropriate national authority on or after 20 May 2006, the flight crew compartment bulkheads, floors and ceilings shall be designed to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.

K.3.2 **Recommendation.—** *In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the type certificate to include a derivative type design is submitted to the appropriate national authority on or after 20 May 2006, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.*

Note.— Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in Annex 6, Part I, Chapter 13.

K.4 Interior design

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IV. HELICOPTERS

CHAPTER 1. GENERAL

1.1 Applicability

1.1.1 The Standards of Part IV are applicable in respect of all helicopters designated in 1.1.2 that are of types of which the prototype is submitted to the appropriate national authorities for certification on or after 22 March 1991.

Note.— The Council recognizes that the Standards relating to fire protection, crash survival and provisions for emergency are very important to safety and urges the implementation of the substance of these Standards as soon as it is feasible and practicable before the applicable date.

1.1.2 The Standards of Part IV shall apply to helicopters intended for the carriage of passengers or cargo or mail in international air navigation.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 3.2.2 of Part II, they are to be supplemented by national requirements prepared by Contracting States.

1.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 3.2.2 of Part II for the helicopters designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of Part IV.

1.1.4 Unless otherwise stated, the Standards apply to the complete helicopter including power-units, systems and equipment.

1.2 Limitations

1.2.1 Limiting conditions shall be established for the helicopter, its power-units and its equipment (see 9.2). Compliance with the Standards of Part IV shall be established assuming that the helicopter is operated within the limitations specified. The limitations shall be sufficiently removed from any conditions prejudicial to the safety of the helicopter to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Limiting ranges of mass, centre of gravity location, load distribution, speeds and ambient conditions shall be established within which compliance with all the pertinent Standards in Part IV is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— The following items, for instance, may be considered as basic helicopter limitations:

— *maximum certificated take-off (including lift-off) mass*

— *maximum certificated ground-taxiing mass*

— *maximum certificated landing mass*

— *most forward, rearward, and lateral centre of gravity positions in various configurations*

— *maximum certificated cargo sling mass.*

Note 3.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Vol. I, and Annex 6, Part III).

1.3 Unsafe features and characteristics

The helicopter shall not possess any feature or characteristic that renders it unsafe under the anticipated operating conditions.

1.4 Proof of compliance

1.4.1 Compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, calculations based on tests, or other methods, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.4.2 The tests of 1.4.1 shall be such as to provide reasonable assurance that the helicopter, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 General

2.1.1 Compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon a helicopter or helicopters of the type for which a Certificate of Airworthiness is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Compliance with each Standard shall be established for all applicable combinations of helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Where necessary, appropriate helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the helicopter's flying qualities.

2.2 Performance

2.2.1 General

2.2.1.1 Sufficient data on the performance of the helicopter shall be determined and scheduled in the helicopter flight manual to provide operators with the necessary information for the purpose of determining the total mass of the helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 The performance scheduled for the helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the pilot.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

2.2.1.3 The scheduled performance of the helicopter shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the helicopter's systems and equipment, the operation of which may affect performance.

2.2.2 Minimum performance

At the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the take-off or landing site elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for water operations, in specified conditions of smooth water, the helicopter shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or final approach and take-off area length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the helicopter flight manual against, for example at the take-off or landing site:

— elevation, or

— pressure-altitude, or

— pressure-altitude and atmospheric temperature,

so as to be readily usable when applying the national code on helicopter performance operating limitations.

2.2.2.1 *Take-off*

a) In the event of critical power-unit failure, at or after the take-off decision point (for performance Class 1) or the defined point after take-off (for performance Class 2), performance Classes 1 and 2 helicopters shall be capable of continuing safe flight, the remaining power-unit(s) being operated within the approved limitations.

b) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 *Landing*

a) Starting from the approach configuration, in the event of critical power-unit failure at or before the landing decision point (performance Class 1) or the defined point before landing (performance Class 2), the helicopter shall be capable of continuing safe flight, the remaining power-unit(s) being operated within the approved limitations.

b) Starting from the landing configuration, the helicopter shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

2.2.3 Scheduling of performance

Performance data shall be determined and scheduled in the helicopter flight manual so that their application by means of the operating rules to which the helicopter is to be operated in accordance with 5.1.2 of Annex 6, Part III, will provide a safe relationship between the performance of the helicopter and the aerodromes, heliports and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, and other ambient conditions and any other operational variables for which the helicopter is to be certificated, and additionally for amphibians, water surface conditions and strength of current.

2.2.3.1 *Take-off.* The take-off performance data shall include the take-off distance required and the take-off path. For performance Class 1 helicopters, it shall also include the rejected take-off distance required.

2.2.3.1.1 *Take-off decision point.* (For performance Class 1 helicopters only) The take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical power-unit inoperative.

2.2.3.1.2 *Take-off distance required.* (For performance Class 1 helicopters only) The take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which V_{TOSS}, a selected height above the take-off surface, and a positive climb gradient are achieved, following failure of the critical power-unit at the take-off decision point, the remaining power-unit(s) operating within approved operating limits.

2.2.3.1.3 *Rejected take-off distance required.* (For performance Class 1 helicopters only) The rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the helicopter comes to a complete stop following a power-unit failure and rejection of the take-off at the take-off decision point.

2.2.3.1.4 *Take-off distance required.* (For performance Class 2 and 3 helicopters only) The take-off distance required shall be the horizontal distance required from the start of take-off to the point where the best rate of climb speed (Vy) or the best angle of climb speed (Vx) or a selected intermediate speed (provided this speed does not involve flight within the avoid areas of the height-velocity diagrams) and a selected height above the take-off surface are achieved, all engines operating at approved take-off power.

2.2.3.2 *En route.* The en-route performance shall be the climb, cruise, or descent performance with:

a) the critical power-unit inoperative;

b) the two critical power-units inoperative in the case of helicopters having three or more power-units; and

c) the operating engine(s) not exceeding the power for which they are certificated.

2.2.3.3 *Landing.* The landing performance data shall include the landing distance required and, for performance Class 1 helicopters, the landing decision point.

2.2.3.3.1 *Landing decision point.* (For performance Class 1 helicopters only) The landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical power-unit inoperative.

2.2.3.3.2 *Landing distance required.* Landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface.

2.3 Flying qualities

The helicopter shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the helicopter is approved.

2.3.1 Controllability

The helicopter shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of helicopter configurations) without requiring exceptional skill, alertness, or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the helicopter shall be established for all stages of flight and helicopter configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

2.3.1.1 *Controllability on the ground (or water).* The helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 *Controllability during take-off.* The helicopter shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the helicopter is handled in the manner associated with the scheduling of the take-off data.

2.3.2 Characteristics of flight controls

The helicopter shall have such trim and handling capabilities as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a malfunction of the systems associated with the flight controls, there must not be any significant deterioration of the handling characteristics.

2.3.3 Stability

The helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. helicopter configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the helicopter shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 Autorotation

2.3.4.1 *Rotor speed control.* The autorotation characteristics of the helicopter shall be such as to enable the pilot to control the rotor speed to within prescribed limits and to maintain full control of the helicopter.

2.3.4.2 *Behaviour following a power loss.* The behaviour of the helicopter following a power loss shall not be so extreme as to make difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the helicopter.

2.3.4.3 *Autorotation airspeeds.* The autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

2.3.5 Flutter and vibration

It shall be demonstrated by suitable tests that all parts of the helicopter are free from flutter and excessive vibration in all helicopter configurations under all speed conditions within the operating limitations of the helicopter (see 1.2.2). There shall be no vibration severe enough to interfere with control of the helicopter, to cause structural damage or to cause excessive fatigue to the flight crew.

CHAPTER 3. STRUCTURES

3.1 General

The Standards of Chapter 3 apply to the helicopter structure consisting of all portions of the helicopter, the failure of which would seriously endanger the helicopter.

3.1.1 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.4, 3.5 and 3.6 shall be considered as limit loads.

3.1.3 Strength and deformation

In the various loading conditions prescribed in 3.4, 3.5 and 3.6, no part of the helicopter structure shall sustain detrimental deformation at any load up to and including the limit load, and the helicopter structure shall be capable of supporting the ultimate load.

3.2 Airspeeds

3.2.1 Design airspeeds

Design airspeeds shall be established for which the helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.4.

3.2.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1 shall be included in the helicopter flight manual as part of the operating limitations (see 9.2.2). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established.

3.3 Main rotor(s) rotational speed limits

A range of main rotor(s) speeds shall be established that:

a) with power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre and is consistent with the kind of governor or synchronizer used; and

b) with power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

3.4 Flight loads

The flight loading conditions of 3.4.1, 3.4.2 and 3.6 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia, and other loads resulting from the specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.4.1 Manoeuvring loads

Manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.4.2 Gust loads

Gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.5 Ground and water loads

The structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that are likely to arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

3.5.1 Landing conditions

The landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the helicopter at ground or water contact, such velocities of descent and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.6 Miscellaneous loads

In addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, loads due to external mass, etc.) that are likely to occur in the anticipated operating conditions.

3.7 Flutter, divergence and vibration

Each part of the helicopter structure shall be free from excessive vibration or oscillation (ground resonance, flutter, etc.) under each appropriate speed and power condition.

3.8 Fatigue strength

The strength and fabrication of the helicopter shall be such as to ensure that the probability of disastrous fatigue failure of the helicopter's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

Note.— This Standard can be complied with by the establishment of "safe lives" or "fail safe" characteristics of the structure, having regard to the reasonable expected load magnitudes and frequencies under the anticipated operating conditions and inspection procedures. For some parts of the structure, it might be necessary to establish "fail safe" characteristics as well as "safe lives".

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 General

Details of design and construction shall be such as to give reasonable assurance that all helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall observe Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1.1 Substantiating tests

The functioning of all moving parts essential to the safe operation of the helicopter shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 Materials

All materials used in parts of the helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 Fabrication methods

The methods of fabrication and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion, or other causes, which could pass unnoticed, taking into account the maintenance the helicopter will receive.

4.1.5 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement, or reconditioning of parts of the helicopter that require such attention, either periodically or after unusually severe operations.

4.1.6 Design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

   i) Each control and control system shall operate with the ease, smoothness and effectiveness appropriate to its function; and

   ii) each element of each flight control system shall be designed to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

c) *Pilot vision.* The arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the helicopter, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

d) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the helicopter. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Part III.

e) *Fire precautions.* The design of the helicopter and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimize the possibility of in-flight and ground fires and also to minimize the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish, wherever possible, all accessible fires as might occur in such a way that no additional danger to the helicopter is caused.

f) *Incapacitation of occupants.* Design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases that could incapacitate the occupants of the helicopter.

4.1.7 Emergency landing provisions

Provisions shall be made in the design of the helicopter to protect the occupants from fire and effects of deceleration in the event of an emergency landing. Facilities shall be provided for the rapid evacuation of the helicopter in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the helicopter. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give maximum practicable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

4.1.8 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. ENGINES

5.1 Scope

The Standards of Chapter 5 shall apply to engines of all types that are used on the helicopter as primary propulsion units.

5.2 Design, construction and functioning

The engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the helicopter in accordance with Chapter 6 and with the suitable rotor and power transmission installed.

5.3 Declared ratings, conditions and limitations

The power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations, which are intended to govern the operation of the engine, shall be declared.

5.4 Tests

An engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration.* Tests shall be conducted to establish the power characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation.* Tests shall be conducted to ensure that starting, idling, acceleration, vibration, overspeeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge, or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6. ROTOR AND POWER TRANSMISSION SYSTEMS AND POWERPLANT INSTALLATION

6.1 General

The powerplant installation, including rotor and power transmission system, shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

6.2 Design, construction and functioning

The rotor and power transmission systems assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the helicopter in accordance with this chapter.

6.3 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations, which are intended to govern the operation of the rotor and power transmission systems, shall be declared.

6.3.1 Maximum and minimum rotor rotational speed limitations

Maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

6.3.2 Rotor underspeed and overspeed warnings

When the helicopter is made to approach a rotor rotational speed limit, with or without power-units inoperative, clear and distinctive warnings shall be apparent to the pilot. The warnings and initial characteristics of the condition shall be such as to enable the pilot to arrest the development of the condition after the warning begins, and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the helicopter.

6.4 Tests

Rotor and power transmission systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength vibration and overspeeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the rotor and power transmission systems.

6.5 Compliance with engine and rotor and power transmission systems limitations

The powerplant installation shall be so designed that the engines and rotor and power transmission systems are capable of being used in the anticipated operating conditions. In conditions established in the helicopter flight manual, the helicopter shall be capable of being operated without exceeding the limitations established for the engines and rotor and power transmission systems in accordance with Chapters 5 and 6.

6.6 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

6.7 Engine restarting

Means shall be provided for restarting an engine at altitudes up to a declared maximum altitude.

6.8 Arrangement and functioning

6.8.1 Independence of power-units

For performance Class 1 and 2 helicopters, the power-plant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

6.8.2 Rotor and power transmission systems vibration

The vibration stresses for the rotor and power transmission systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the helicopter.

6.8.3 Cooling

The cooling system shall be capable of maintaining power-plant and power transmission systems temperatures within the established limits (see 6.5) at ambient air temperatures approved for operation of the helicopter. The maximum and minimum air temperatures for which the powerplant and power transmission systems have been established as being suitable shall be scheduled in the helicopter flight manual.

6.8.4 Associated systems

The fuel, oil, air induction, and other systems associated with each power-unit, each power transmission unit and each rotor shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

6.8.5 Fire protection

For designated fire zones where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e).

a) *Isolation.* Such zones shall be isolated by fire-resisting material from other zones of the helicopter where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such zones shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of hazardous quantities of flammable fluids into such zones if a fire occurs.

c) *Fire protection.* There shall be provided a sufficient number of fire detectors so located as to ensure rapid detection of any fire that might occur in such zones.

d) *Fire extinguishment.* Such zones shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the zone would not jeopardize the safety of the helicopter.

CHAPTER 7. INSTRUMENTS AND EQUIPMENT

7.1 Required instruments and equipment

The helicopter shall be provided with approved instruments and equipment necessary for the safe operation of the helicopter in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the helicopter within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Part III, for particular circumstances or on particular kinds of routes.

Note 2.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems (Doc 9758).

7.2 Installation

Instrument and equipment installations shall comply with the Standards of Chapter 4.

7.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

7.4 Navigation lights and anti-collision lights

7.4.1 The lights required by Annex 2 to be displayed by helicopters in flight or operating on the movement area of an aerodrome or a heliport shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760), Volume II, Part A, for detailed technical specifications for exterior lights for helicopters.*

7.4.2 Lights shall be installed in helicopters so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject an outside observer to harmful dazzle.

Note.— In order to avoid the effects mentioned in 7.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

CHAPTER 8. ELECTRICAL SYSTEMS

The electrical system shall be so designed and installed as to ensure that it will perform its intended function under any foreseeable operating conditions.

CHAPTER 9. OPERATING LIMITATIONS AND INFORMATION

9.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the helicopter, shall be made available by means of a helicopter flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 Operating limitations

Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions, and floor loadings (see 1.2.2).

9.2.2 Airspeed limitations

The airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate helicopter configurations and other pertinent factors.

9.2.3 Powerplant and power transmission limitations

The powerplant limitations shall include all those established for the various powerplant and transmission components as installed in the helicopter (see 6.5 and 6.6 of this part).

9.2.4 Rotor limitations

Limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

9.2.5 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the helicopter.

9.2.6 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the helicopter (see 1.2.1).

9.2.7 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the helicopter, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft*, Part III, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

9.3 Operating information and procedures

9.3.1 Types of eligible operations

There shall be listed the particular types of operations, as may be defined in Annex 6, Part III, or be generally recognized, for which the helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 Loading information

The loading information shall include the empty mass of the helicopter, together with a definition of the condition of the helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

9.3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

9.3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the helicopter characteristics.

9.4 Performance information

The performance of the helicopter shall be scheduled in accordance with 2.2. There shall be included information regarding the various helicopter configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 Helicopter flight manual

A helicopter flight manual shall be made available. It shall identify clearly the specific helicopter or series of helicopters to which it is related. The helicopter flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 Markings and placards

9.6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the helicopter in subsequent flights.

— END —

International Standards
and Recommended Practices

Annex 8
to the Convention on
International Civil Aviation

Airworthiness of Aircraft

This edition incorporates all amendments adopted by the Council prior to 14 December 2004 and supersedes, on 13 December 2007, all previous editions of Annex 8.

For information regarding the applicability of the Standards and Recommended Practices, see sections 1.1, 2.1, 3.1 and 4.1 of Part II, 1.1 of Parts IIIA and IVA, A.1 of Parts IIIB, IVB, V, VI and VII, and the Foreword.

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IMPORTANT NOTE
REGARDING ANNEX 8, NINTH AND TENTH EDITIONS

The *Ninth Edition* of Annex 8 contains International Standards and Recommended Practices that will be applicable on *20 May 2006*. The *Tenth Edition* of Annex 8 contains International Standards and Recommended Practices applicable only on *13 December 2007*.

Users should therefore retain both the Ninth and Tenth Editions of Annex 8.

International Standards
and Recommended Practices

Annex 8
to the Convention on
International Civil Aviation

Airworthiness of Aircraft

This edition incorporates all amendments adopted by the Council prior to 14 December 2004 and supersedes, on 13 December 2007, all previous editions of Annex 8.

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April 2005

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AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-100	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

Standards and Recommended Practices for the Airworthiness of Aircraft were adopted by the Council on 1 March 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 8 to the Convention.

The Annex contained, in Part II, general airworthiness procedures applicable to all aircraft and in Part III, minimum airworthiness characteristics for aeroplanes provided, or to be provided, with certificates of airworthiness classifying them in an established ICAO category. Part I contained definitions.

At its fourth session, the Airworthiness Division collaborating with the Operations Division made recommendations concerning the use of a performance code as an alternative to the one contained in the Annex, in which the climb values had the status of Recommended Practices. Further, the Airworthiness Division made recommendations concerning certain aspects of the certification in ICAO categories. As a result of those recommendations, the Council approved the incorporation of the alternative performance code as Attachment A but stated its belief that since agreement had not yet been reached on Standards covering performance, there existed no basis for certification in ICAO Category A. It urged the Contracting States to refrain from such certification pending the becoming effective of Standards on performance or until such time as the Council decides on the basic policy on airworthiness.

The Assembly at its seventh session (June 1953) endorsed the action already taken by the Council and the Air Navigation Commission to initiate a fundamental study of ICAO policy on international airworthiness and directed the Council to complete the study as rapidly as practicable.

In pursuing such study, the Air Navigation Commission was helped by an international body of experts designated as the "Airworthiness Panel", which contributed to the preparation of the work of the Third Air Navigation Conference.

As a result of these studies, a revised policy on international airworthiness was developed and it was approved by the Council in 1956. According to this policy, the principle of certification in an ICAO Category was abandoned. Instead, Annex 8 included broad Standards which defined, for application by the competent national authorities, the complete minimum international basis for the recognition by States of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories, thereby achieving, among other purposes, protection of other aircraft, third persons and property. It was considered that this met the obligation of the Organization under Article 37 of the Convention to adopt International Standards of airworthiness.

It was recognized that the ICAO Standards of airworthiness would not replace national regulations and that national codes of airworthiness containing the full scope and extent of detail considered necessary by individual States would be necessary as the basis for the certification of individual aircraft. Each State would establish its own comprehensive and detailed code of airworthiness or would select a comprehensive and detailed code established by another Contracting State. The level of airworthiness defined by this code would be indicated by the Standards, supplemented, if necessary, by Acceptable Means of Compliance.

In application of those principles, the Annex was declared as constituting the minimum standards for the purpose of Article 33. It was also recognized that the Annex might, at the time of adoption, not include technical Standards for all classes of aircraft or even for all classes of aeroplanes, if the Council felt that no technical Standards were required at that time to render Article 33 operative. Furthermore, adoption or amendment of the Annex declared to be complete for the purpose of Article 33 did not constitute the end of ICAO's work in the airworthiness field, as there was a need to continue international collaboration in airworthiness matters.

A revised text for Annex 8 consistent with the above principles was prepared on the basis of the recommendations made by the Third Air Navigation Conference (Montréal, September–October 1956). Part III of the Annex was limited to broad Standards stating the objectives rather than the methods of realizing those objectives. However, to indicate by examples the level of airworthiness intended by some of the broad Standards, specifications of a more detailed and quantitative nature were included under the title "Acceptable Means of Compliance". These specifications were intended to assist the Contracting States in the establishment and application of comprehensive and detailed national airworthiness codes.

To adopt a code giving an appreciably lower level of airworthiness than that given in an Acceptable Means of Compliance was considered to be a violation of the Standard supplemented by that Acceptable Means of Compliance.

The revised text for Annex 8 was included in the Fourth Edition of the Annex, which superseded the First, Second and Third Editions.

Another recommendation of the Third Air Navigation Conference led to the establishment by the Council in 1957 of the Airworthiness Committee, consisting of airworthiness experts with broad experience and selected from those Contracting States and International Organizations willing to contribute.

Present policy on international airworthiness. There had been some concern about the slow progress that had been made over the years with respect to developing supplementary airworthiness specifications in the form of Acceptable Means of Compliance. It was noted that the majority of the Acceptable Means of Compliance in Annexes 6 and 8 had been developed in 1957 and were therefore applicable to only those aeroplane types operating at that time. No effort had been made to update the specifications in these Acceptable Means of Compliance nor had there been any recommendations from the Airworthiness Committee for upgrading of any of the Provisional Acceptable Means of Compliance, which had been developed as potential material for full-fledged Acceptable Means of Compliance. The Air Navigation Commission therefore requested the Airworthiness Committee to review the progress made by it since its inception with a view to determining whether or not desired results had been achieved and to recommend any changes to improve the development of detailed airworthiness specifications.

The Airworthiness Committee at its Ninth Meeting (Montréal, November/December 1970) made a detailed study of the problems and recommended that the concept of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance be abandoned and a provision be made for an airworthiness technical manual to be prepared and published by ICAO to include guidance material intended to facilitate the development and uniformity of national airworthiness codes by Contracting States.

The Air Navigation Commission reviewed the recommendations of the Airworthiness Committee in the light of the history of the development of the airworthiness policy approved by the Council in 1956. It came to the conclusion that the basic objectives and principles on which the ICAO airworthiness policy had been based were sound and did not require any significant change. It was also concluded that the main reason for the slow progress in the development of airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance was the degree of mandatory status to the former implied by the following statement included in the Forewords of the Fourth and Fifth Editions of Annex 8:

> "To adopt a code giving an appreciably lower level of airworthiness than that given in an Acceptable Means of Compliance would be a violation of the Standard supplemented by that Acceptable Means of Compliance."

Several approaches were examined by the Air Navigation Commission to eliminate this difficulty. Finally, it came to the conclusion that the idea of developing airworthiness specifications in the form of Acceptable Means of Compliance and Provisional Acceptable Means of Compliance should be abandoned and ICAO should declare that the States' obligations, for the purpose of Article 33 of the Convention, shall be met by their compliance with the broad Standards in Annex 8 supplemented, as necessary, by airworthiness technical guidance material, devoid of all mandatory implications or obligations. Also the requirement that each Contracting State should either establish its own comprehensive and detailed code of airworthiness or select a comprehensive and detailed code established by another Contracting State should be retained.

The Council on 15 March 1972 approved the above approach to form the basis for the present policy of ICAO in the field of airworthiness. According to this policy:

a) the objective of international airworthiness Standards is to define, for application by the competent national authorities, the minimum level of airworthiness constituting the international basis for the recognition by States, under Article 33 of the Convention, of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories, thereby achieving, among other things, protection of other aircraft, third parties and property;

b) the Standards developed to meet the objective stated in a) are considered by the Council as meeting, in the necessary scope and detail, the obligations of the Organization under Article 37 of the Convention to adopt International Standards of airworthiness;

c) international airworthiness Standards adopted by the Council are recognized as being the complete international code necessary to bring into force and effect the rights and obligations which arise under Article 33 of the Convention;

d) the technical airworthiness Standards in Annex 8 shall be presented as broad specifications stating the objectives rather than the means of realizing these objectives; ICAO recognizes that national codes of airworthiness containing the full scope and extent of detail considered necessary by individual States are required as the basis for the certification by individual States of airworthiness of each aircraft;

e) to assist States in applying the Standards of Annex 8 and in developing their own comprehensive national codes in a uniform manner, detailed guidance material shall be developed and published expeditiously in the working languages of the Organization.

The Council also approved the issuance of the airworthiness guidance material under the title of *Airworthiness Technical Manual*. It was understood that the guidance material will, before issuance, be examined by the Air Navigation Commission. It will however have no formal status and its main purpose would be to provide guidance to Contracting States in developing the appropriate airworthiness requirements mentioned in 3.2.2 of Part II of the Annex.

A text for Annex 8 consistent with the policy on international airworthiness, approved by the Council on 15 March 1972, was developed by the Air Navigation Commission.

Table A shows the origin of amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

On 6 June 2000, the Air Navigation Commission reviewed the recommendation of the Continuing Airworthiness Panel and the Airworthiness Study Group, in light of the introduction of the type certification process, to introduce the Type Certificate concept. It came to the conclusion that this internationally used and known certificate was already introduced in the *Airworthiness Technical Manual* (Doc 9051) and that its introduction complements the type certification process, making the text of Annex 8 consistent with its international airworthiness use.

It was further noted that the State of Registry, which is in charge of the issuance or validation of Certificates of Airworthiness by virtue of Article 31 of the Convention, and the State of Design may be different States, with separate functions and duties, and two independent responsibilities. Accordingly, the requirements governing the issuance of Type Certificates in accordance with applicable provisions of Annex 8 are not part of "the minimum standards" which govern the issuance or validation of Certificates of Airworthiness, and lead to the recognition of their validity pursuant to Article 33 of the Convention.

On 7 October 2003, the Air Navigation Commission reviewed the recommendations of the Airworthiness Panel and in light of the observation that small aircraft of a maximum certificated take-off mass greater than 750 kg but not exceeding 5 700 kg are more engaged in international air navigation, it agreed to include in the Annex, for the first time, airworthiness Standards for small aeroplanes, making the text of Annex 8 consistent with its international use.

Applicability

The applicability of the Standards is indicated in 1.1, 2.1, 3.1 and 4.1 of Part II, in 1.1 of Parts IIIA and IVA, and in A.1 of Parts IIIB, IVB, V, VI and VII. The dates were established so as to take account of the provisions of Article 41 of the Convention. However, the Council has recommended that, as far as practicable, earlier dates be applied.

Related Standards of Annex 6, Part I. Chapter 5 of Annex 6, Part I, dealing with aeroplane performance operating limitations contains Standards that are complementary to the airworthiness Standards of Annex 8. Both state broad objectives. The Standards of Annex 6, Part I, Chapter 5, are supplemented by guidance material in the form of green page attachments which indicate by examples the level of performance intended by the Standards.

The Council has urged Contracting States not to impose on visiting aeroplanes operational requirements other than those established by the State of Registry, provided those requirements are not lower than the Standards of Chapter 5 of Annex 6, Part I, as amended by Amendment 2, 2.2 of Part *IIIA* and B.2 of Parts IIIB, IVB and V of this edition of Annex 8.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards which are of a regulatory character and also of indicating departures from the Standards, including any additional regulations that are important for the safety or regularity of air navigation. Wherever possible, the provisions of Part II of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation. The provisions of Parts IIIA and IIIB of this Annex, on the other hand, are applicable to aeroplanes through the medium of national codes more comprehensive and detailed than the Standards, so that the Council Resolution of 13 April 1948 does not apply to Parts IIIA and IIIB.

Information concerning the national codes establishing compliance with the Annex. States are invited to notify the Organization either of the establishment or of the selection of the comprehensive and appropriate airworthiness requirements mentioned in 3.2.2 of Part II. States that establish such codes are invited to forward a copy of each with its successive amendments, and any appropriate interpretation document concerning them. States that select codes of other Contracting States to comply with 3.2.2 of Part II are invited to indicate the codes that they intend to use.

Use of the guidance material in the Airworthiness Manual *(Doc 9760).* Contracting States are invited to note that the material in the *Airworthiness Manual* is intended to guide them in the development of their detailed and comprehensive national codes with a view to introducing uniformity in those national codes. The material has no mandatory status and Contracting States are quite free to differ from it either in detail or in methods. States are also not required to notify any differences that may exist between their detailed national regulations and practices and the relevant material in the *Airworthiness Manual*.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated.

1.— *Material comprising the Annex proper*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures*, which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practice

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted, it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 8

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	First and Second Sessions of the Airworthiness Division (1946 and 1947)	—	1 March 1949 1 August 1949 1 September 1949
1 to 63 (2nd Edition)	Third and Fourth Sessions of the Airworthiness Division (1949 and 1951)	—	26 January 1950 1 January 1951 1 February 1951
64 to 83	Third and Fourth Sessions of the Airworthiness Division (1949 and 1951)	—	13 November 1951 15 April 1952 15 May 1952
84 (3rd Edition)	Fourth Session of the Airworthiness Division (1951)	Incorporation of an alternative performance code as an attachment.	2 December 1952 1 May 1953 1 June 1953
85 (4th Edition)	Third Air Navigation Conference (1956)	Revised text consistent with new policy on international airworthiness approved by the Council; Part III of Annex 8 limited to broad Standards stating objectives with more detailed examples of the level of airworthiness intended being included as "Acceptable Means of Compliance".	13 June 1957 1 October 1957 1 December 1957 or 13 June 1960 depending on date of application for certification for the aeroplane
86 (5th Edition)	Fourth Meeting of the Airworthiness Committee	Amendment of Standards for navigation lights and introduction of requirements for anti-collision lights.	13 December 1961 1 April 1962 13 December 1964
87	Proposal of the United States Committee on the Extension to the Standard Atmosphere	Redefinition of the standard atmosphere.	12 November 1963 1 April 1964 12 November 1966
88	Consequence of Amendment 2 to Annex 7	Revised definition of aircraft; revision of 2.2.3.2 b) of Part III to cater for 3-engined aeroplanes.	8 November 1967 8 March 1968 22 August 1968
89	Consequence of the adoption of Annex 16	Introduction of a reference to noise certification Standards in Annex 16 and Annex 6.	2 April 1971 2 August 1971 6 January 1972
90	Ninth Meeting of the Airworthiness Committee (1970)	Deletion of two Acceptable Means of Compliance for aeroplane performance from the 5th Edition.	10 December 1971 10 April 1972 7 December 1972
91 (6th Edition)	Council action following Ninth Airworthiness Committee	New text consistent with revised policy on airworthiness; deletion of Acceptable Means of Compliance; guidance material henceforth to appear in the *Airworthiness Technical Manual.*	16 March 1973 30 July 1973 23 May 1974
92	Tenth Meeting of the Airworthiness Committee	Introduction of provisions relating to the transmission of continuing airworthiness information; addition of a note concerning lease, charter and interchange of aircraft.	3 April 1974 3 August 1974 27 February 1975
93	Study by the Air Navigation Commission	Revision of the provisions relating to exterior lights to align with new provisions in Annexes 2 and 6.	22 March 1982 22 July 1982 22 March 1985

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
94 (7th Edition)	Fourteenth Meeting of the Airworthiness Committee (1981)	Introduction of a new provision relating to information on faults, malfunctions, defects and other occurrences and to include SI units in conformity with Annex 5 provisions.	6 December 1982 6 April 1983 24 November 1983
95 (8th Edition)	Proposal of States; Studies by the Council and Air Navigation Commission; Third Meeting of the HELIOPS Panel	Extension of the standard atmosphere; strengthened provisions relating to crash survival and fire protection; introduction of airworthiness provisions for helicopters.	22 March 1988 31 July 1988 22 March 1991
96	Third Meeting of the Continuing Airworthiness Panel (CAP/3)	Introduction of responsibilities of State of Design and definition thereof; revision of responsibilities of parties involved in transfer of information relating to continuing airworthiness; addition of new requirements concerning provision of maintenance information.	22 March 1994 25 July 1994 10 November 1994
97	Secretariat study, assisted by ISAD Study Group	Changes to design features; identification of a least-risk bomb location and addition of a new Chapter 11 containing security-related provisions.	12 March 1997 21 July 1997 6 November 1997; 12 March 2000
98 (9th Edition)	Fifth Meeting of the Continuing Airworthiness Panel (CAP/5); Air Navigation Commission studies	a) new definitions of Human Factors principles, human performance, maintenance, repair, Type Certificate; b) restructuring of Part II into four chapters: Type Certificate, Production, Certificate of Airworthiness and Continuing Airworthiness; c) revision of the provisions in Part II to allow the introduction of type certificate concept and production control; d) restructuring of Part III into Part IIIA (same provisions as those contained in the current Part III of Annex 8, Eighth Edition, including Amendment 97, except for applicability clauses and cross-references) and Part IIIB (new); e) revision of provisions (old Part III) in Part IIIB pertaining to performance, stability, control, and cargo compartment fire protection, and new provisions pertaining to cabin environment, electrical bonding, emergency landing, electromagnetic interference, ice protection and systems software; f) the provision of translation into English for Certificates of Airworthiness; and g) new provisions concerning Human Factors.	2 March 2001 16 July 2001 2 March 2004

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
99	Air Navigation Commission studies	a) revision of the title of Part IIIA; b) revision of applicability provisions to reflect the introduction of Recommended Practices in Annex 8 and to change the applicability of Parts IIIA and IIIB to make some provisions applicable only to large aeroplanes of a specific maximum certificated take-off mass and passenger seating capacity; c) revision of design, construction and security provisions in Annex 8, Parts IIIA and IIIB with regard to aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which an application for certification was submitted on or after 12 March 2000 and 2 March 2004, respectively, and introduction of Recommended Practices for aircraft of a maximum certificated take-off mass between 5 700 kg and 45 500 kg; d) introduction of Recommended Practices regarding security provisions for application to aeroplanes engaged in domestic commercial operations; e) introduction of security provisions for all aeroplanes which are required by Annex 6 to have an approved flight crew compartment door providing additional protection to also require additional protection of the bulkheads, floors and ceilings; and f) addition of provisions in Part IIIB for operating information and procedures to require the identification of a least-risk bomb location.	20 May 2003 13 October 2003 20 May 2006
100 (10th Edition)	First meeting of the Airworthiness Panel	a) new definitions of Category A, Category B, discrete source damage, engine, fireproof, fire resistant and satisfactory evidence, new note to critical power-unit; b) amendment to the definition of repair; c) revision of the provisions of Part II to allow the introduction of new parts in the Annex, amend Chapter 3 to clarify provisions relating to the limiting conditions under which a damaged aircraft is permitted to fly uncommercially to an aerodrome where it can be restored to an airworthy condition, and re-organize Chapter 4 to clarify States' responsibilities; d) revision of provisions in Part IIIA pertaining to applicability and operating limitations, proof of compliance; e) revision of provisions in Part IIIB pertaining to applicability, operating limitations, performance, stability, structure, design and construction, powerplant, operating limitations, crashworthiness and cabin safety, operating environment and Human Factors; f) restructuring of Part IV into Part IVA (same provisions as those contained in Part IV of Annex 8, Ninth Edition including Amendment 99, except for applicability clauses and cross-references) and Part IVB (new); g) introduction of new Part V — *Small Aeroplanes*, Part VI — *Engines* and Part VII — *Propellers*.	13 December 2004 13 April 2005 13 December 2007

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I. DEFINITIONS

When the following terms are used in the Standards for the Airworthiness of Aircraft, they have the following meanings:

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Anticipated operating conditions. Those conditions which are known from experience or which can be reasonably envisaged to occur during the operational life of the aircraft taking into account the operations for which the aircraft is made eligible, the conditions so considered being relative to the meteorological state of the atmosphere, to the configuration of terrain, to the functioning of the aircraft, to the efficiency of personnel and to all the factors affecting safety in flight. Anticipated operating conditions do not include:

a) those extremes which can be effectively avoided by means of operating procedures; and

b) those extremes which occur so infrequently that to require the Standards to be met in such extremes would give a higher level of airworthiness than experience has shown to be necessary and practical.

Appropriate airworthiness requirements. The comprehensive and detailed airworthiness codes established, adopted or accepted by a Contracting State for the class of aircraft, engine or propeller under consideration (see 3.2.2 of Part II of this Annex).

Approved. Accepted by a Contracting State as suitable for a particular purpose.

Category A. With respect to helicopters, means a multi-engine helicopter designed with engine and system isolation features specified in Part IVB and capable of operations using take-off and landing data scheduled under a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight or safe rejected take-off.

Category B. With respect to helicopters, means a single-engine or multi-engine helicopter which does not meet Category A standards. Category B helicopters have no guaranteed capability to continue safe flight in the event of an engine failure, and a forced landing is assumed.

Configuration (as applied to the aeroplane). A particular combination of the positions of the moveable elements, such as wing flaps and landing gear, etc., that affect the aerodynamic characteristics of the aeroplane.

Critical power-unit(s). The power-unit(s) failure of which gives the most adverse effect on the aircraft characteristics relative to the case under consideration.

Note.— On some aircraft there may be more than one equally critical power-unit. In this case, the expression "the critical power-unit" means one of those critical power-units.

Design landing mass. The maximum mass of the aircraft at which, for structural design purposes, it is assumed that it will be planned to land.

Design take-off mass. The maximum mass at which the aircraft, for structural design purposes, is assumed to be planned to be at the start of the take-off run.

Design taxiing mass. The maximum mass of the aircraft at which structural provision is made for load liable to occur during use of the aircraft on the ground prior to the start of take-off.

Discrete source damage. Structural damage of the aeroplane that is likely to result from: impact with a bird, uncontained fan blade failure, uncontained engine failure, uncontained high-energy rotating machinery failure or similar causes.

Engine. A unit used or intended to be used for aircraft propulsion. It consists of at least those components and equipment necessary for functioning and control, but excludes the propeller (if applicable).

Factor of safety. A design factor used to provide for the possibility of loads greater than those assumed, and for uncertainties in design and fabrication.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Fireproof. The capability to withstand the application of heat by a flame for a period of 15 minutes.

Note.— The characteristics of an acceptable flame can be found in ISO 2685.

Fire resistant. The capability to withstand the application of heat by a flame for a period of 5 minutes.

Note.— The characteristics of an acceptable flame can be found in ISO 2685.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Landing surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft landing in a particular direction.

Limit loads. The maximum loads assumed to occur in the anticipated operating conditions.

Load factor. The ratio of a specified load to the weight of the aircraft, the former being expressed in terms of aerodynamic forces, inertia forces, or ground reactions.

Maintenance. The performance of tasks required to ensure the continuing airworthiness of an aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Performance Class 1 helicopter. A helicopter with performance such that, in case of engine failure, it is able to land on the rejected take-off area or safely continue the flight to an appropriate landing area.

Performance Class 2 helicopter. A helicopter with performance such that, in case of engine failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off or after a defined point before landing, in which cases a forced landing may be required.

Performance Class 3 helicopter. A helicopter with performance such that, in case of engine failure at any point in the flight profile, a forced landing must be performed.

Power-unit. A system of one or more engines and ancillary parts which are together necessary to provide thrust, independently of the continued operation of any other power-unit(s), but not including short period thrust-producing devices.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.

Rendering (a Certificate of Airworthiness) valid. The action taken by a Contracting State, as an alternative to issuing its own Certificate of Airworthiness, in accepting a Certificate of Airworthiness issued by any other Contracting State as the equivalent of its own Certificate of Airworthiness.

Repair. The restoration of an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements.

Satisfactory evidence. A set of documents or activities that a Contracting State accepts as sufficient to show compliance with an airworthiness requirement.

Standard atmosphere. An atmosphere defined as follows:

a) the air is a perfect dry gas;

b) the physical constants are:

— Sea level mean molar mass:
$M_0 = 28.964420 \times 10^{-3}$ kg mol^{-1}
— Sea level atmospheric pressure:
$P_0 = 1013.250$ hPa
— Sea level temperature:
$t_0 = 15°C$
$T_0 = 288.15$ K
— Sea level atmospheric density:
$\rho_0 = 1.2250$ kg m^{-3}
— Temperature of the ice point:
$T_i = 273.15$ K
— Universal gas constant:
$R^* = 8.31432$ JK^{-1}mol^{-1}

c) the temperature gradients are:

Geopotential altitude (km)		*Temperature gradient (Kelvin per standard geopotential kilometre)*
From	*To*	
–5.0	11.0	–6.5
11.0	20.0	0.0
20.0	32.0	+1.0
32.0	47.0	+2.8
47.0	51.0	0.0
51.0	71.0	–2.8
71.0	80.0	–2.0

Note 1.— The standard geopotential metre has the value 9.80665 $m^2 s^{-2}$.

Note 2.— See Doc 7488 for the relationship between the variables and for tables giving the corresponding values of temperature, pressure, density and geopotential.

Note 3.— Doc 7488 also gives the specific weight, dynamic viscosity, kinematic viscosity and speed of sound at various altitudes.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

Take-off surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft taking off in a particular direction.

Type Certificate. A document issued by a Contracting State to define the design of an aircraft type and to certify that this design meets the appropriate airworthiness requirements of that State.

Ultimate load. The limit load multiplied by the appropriate factor of safety.

PART II. PROCEDURES FOR CERTIFICATION AND CONTINUING AIRWORTHINESS

Note.— Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognized, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an Operator in such instances until such time as Article 83 bis *of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegate to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of Article 83* bis *of the Convention, the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as Article 83* bis *entered into force on 20 June 1997, such transfer agreements will have effect in respect of those Contracting States which have ratified the related Protocol (Doc 9318) upon fulfilment of the conditions established in Article 83* bis.

CHAPTER 1. TYPE CERTIFICATION

1.1 Applicability

The Standards of this chapter shall be applicable to all aircraft of types for which the application for certification was submitted to a Contracting State on or after 13 June 1960, except that the provisions of 1.4 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate is submitted to the State of Design on or after 2 March 2004.

Note.— Normally, a request for a Type Certificate is submitted by the aircraft manufacturer when the aircraft is intended for serial production.

1.2 Design aspects of the appropriate airworthiness requirements

1.2.1 The design aspects of the appropriate airworthiness requirements, used by a Contracting State for type certification in respect of a class of aircraft or for any change to such type certification, shall be such that compliance with them will ensure compliance with the Standards of Part II of this Annex and, where applicable, with the Standards of Parts III, IV, V, VI or VII of this Annex.

1.2.2 The design shall not have any features or characteristics that render it unsafe under the anticipated operating conditions.

1.2.3 Where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts III, IV, V, VI or VII inappropriate, the Contracting State shall apply appropriate requirements that will give at least an equivalent level of safety.

1.2.4 Where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts III, IV, V, VI or VII inadequate, additional requirements that are considered by the Contracting State to give at least an equivalent level of safety shall be applied.

Note.— An Airworthiness Manual *(Doc 9760) containing guidance material has been published by ICAO.*

1.3 Proof of compliance with the appropriate airworthiness requirements

1.3.1 There shall be an approved design consisting of such drawings, specifications, reports and documentary evidence as are necessary to define the design of the aircraft and to show compliance with the design aspects of the appropriate airworthiness requirements.

Note.— The approval of the design is facilitated, in some States, by approving the design organization.

1.3.2 The aircraft shall be subjected to such inspections and ground and flight tests as are deemed necessary by the State to show compliance with the design aspects of the appropriate airworthiness requirements.

1.3.3 In addition to determining compliance with the design aspects of the appropriate airworthiness requirements for an aircraft, Contracting States shall take whatever other steps they deem necessary to ensure that the design approval is withheld if the aircraft is known or suspected to have dangerous features not specifically guarded against by those requirements.

1.3.4 A Contracting State issuing an approval for the design of a modification, of a repair or of a replacement part shall do so on the basis of satisfactory evidence that the aircraft is in compliance with the airworthiness requirements used for the issuance of the Type Certificate, its amendments or later requirements when determined by the State.

Note 1.— While a repair may be completed and shown to be in compliance with the set of requirements that had been selected for the original type certification of the aircraft, some repairs may need to be shown to comply with the latest applicable certification requirements. In such cases, States may issue a repair design approval against the latest set of requirements for that aircraft type.

Note 2.— The approval of the design of a modification to an aircraft is signified, in some States, by the issuance of a supplemental Type Certificate or amended Type Certificate.

1.4 Type Certificate

1.4.1 The State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

Note.— Some Contracting States also issue Type Certificates for engines and propellers.

1.4.2 When a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements.

CHAPTER 2. PRODUCTION

2.1 Applicability

The Standards of this chapter are applicable to all aircraft.

2.2 Production

2.2.1 Aircraft production

The State of Manufacture shall ensure that each aircraft, including parts manufactured by sub-contractors, conforms to the approved design.

2.2.2 Parts production

The Contracting State taking responsibility for the production of parts manufactured under the design approval referred to in 1.3.4 of Part II shall ensure that the parts conform to the approved design.

2.2.3 Production control

When approving production of aircraft or aircraft parts, a Contracting State shall ensure that it is performed in a controlled manner including the use of a quality system so that construction and assembly are satisfactory.

Note.— The oversight of production is facilitated, in some States, by approving the production organization.

2.2.4 Traceability

Records shall be maintained such that the identification of the aircraft and of the parts with their approved design and production can be established.

CHAPTER 3. CERTIFICATE OF AIRWORTHINESS

Note.— The Certificate of Airworthiness as used in these Standards is the Certificate of Airworthiness referred to in Article 31 of the Convention.

3.1 Applicability

The Standards of this chapter are applicable in respect of all aircraft, except 3.3 and 3.4 which are not applicable in respect of all aircraft that are of a type of which the prototype was submitted to appropriate national authorities for certification before 13 June 1960.

3.2 Issuance and continued validity of a Certificate of Airworthiness

3.2.1 A Certificate of Airworthiness shall be issued by a Contracting State on the basis of satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements.

3.2.2 A Contracting State shall not issue or render valid a Certificate of Airworthiness for which it intends to claim recognition pursuant to Article 33 of the Convention on International Civil Aviation unless it has satisfactory evidence that the aircraft complies with the applicable Standards of this Annex through compliance with appropriate airworthiness requirements.

3.2.3 A Certificate of Airworthiness shall be renewed or shall remain valid, subject to the laws of the State of Registry, provided that the State of Registry shall require that the continuing airworthiness of the aircraft shall be determined by a periodical inspection at appropriate intervals having regard to lapse of time and type of service or, alternatively, by means of a system of inspection, approved by the State, that will produce at least an equivalent result.

3.2.4 When an aircraft possessing a valid Certificate of Airworthiness issued by a Contracting State is entered on the register of another Contracting State, the new State of Registry, when issuing its Certificate of Airworthiness may consider the previous Certificate of Airworthiness as satisfactory evidence, in whole or in part, that the aircraft complies with the applicable Standards of this Annex through compliance with the appropriate airworthiness requirements.

Note. — Some Contracting States facilitate the transfer of aircraft onto the register of another State by the issue of an "Export Certificate of Airworthiness" or similarly titled document. While not valid for the purpose of flight, such a document provides confirmation by the exporting State of a recent satisfactory review of the airworthiness status of the aircraft. Guidance on the issue of an "Export Certificate of Airworthiness" is contained in the Airworthiness Manual *(Doc 9760).*

3.2.5 When a State of Registry renders valid a Certificate of Airworthiness issued by another Contracting State, as an alternative to issuance of its own Certificate of Airworthiness, it shall establish validity by suitable authorization to be carried with the former Certificate of Airworthiness accepting it as the equivalent of the latter. The validity of the authorization shall not extend beyond the period of validity of the Certificate of Airworthiness being rendered valid. The State of Registry shall ensure that the continuing airworthiness of the aircraft is determined in accordance with 3.2.3.

3.3 Standard form of Certificate of Airworthiness

3.3.1 The Certificate of Airworthiness shall contain the information shown in Figure 1 and shall be generally similar to it.

3.3.2 When Certificates of Airworthiness are issued in a language other than English, they shall include an English translation.

Note.— Article 29 of the Convention on International Civil Aviation requires that the Certificate of Airworthiness be carried on board every aircraft engaged in international air navigation.

3.4 Aircraft limitations and information

Each aircraft shall be provided with a flight manual, placards or other documents stating the approved limitations within which the aircraft is considered airworthy as defined by the appropriate airworthiness requirements and additional instructions and information necessary for the safe operation of the aircraft.

3.5 Temporary loss of airworthiness

Any failure to maintain an aircraft in an airworthy condition as defined by the appropriate airworthiness requirements shall render the aircraft ineligible for operation until the aircraft is restored to an airworthy condition.

3.6 Damage to aircraft

3.6.1 When an aircraft has sustained damage, the State of Registry shall judge whether the damage is of a nature such that the aircraft is no longer airworthy as defined by the appropriate airworthiness requirements.

3.6.2 If the damage is sustained or ascertained when the aircraft is in the territory of another Contracting State, the authorities of the other Contracting State shall be entitled to prevent the aircraft from resuming its flight on the condition that they shall advise the State of Registry immediately, communicating to it all details necessary to formulate the judgement referred to in 3.6.1.

3.6.3 When the State of Registry considers that the damage sustained is of a nature such that the aircraft is no longer airworthy, it shall prohibit the aircraft from resuming flight until it is restored to an airworthy condition. The State of Registry may, however, in exceptional circumstances, prescribe particular limiting conditions to permit the aircraft to fly a non-commercial air transport operation to an aerodrome at which it will be restored to an airworthy condition. In prescribing particular limiting conditions the State of Registry shall consider all limitations proposed by the Contracting State that had originally, in accordance with 3.6.2, prevented the aircraft from resuming its flight. That Contracting State shall permit such flight or flights within the prescribed limitations.

3.6.4 When the State of Registry considers that the damage sustained is of a nature such that the aircraft is still airworthy, the aircraft shall be allowed to resume its flight.

*	*State of Registry* *Issuing Authority*	*
CERTIFICATE OF AIRWORTHINESS		
1. Nationality and registration marks	2. Manufacturer and manufacturer's designation of aircraft**	3. Aircraft serial number ....
4. Categories and/or operation***..		
5. This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7 December 1944 and †....................................... in respect of the above-mentioned aircraft which is considered to be airworthy when maintained and operated in accordance with the foregoing and the pertinent operating limitations. Date of issue .... Signature.. † Insert reference to appropriate Airworthiness Code.		
6. ****		

* For use of the State of Registry.

** Manufacturer's designation of aircraft should contain the aircraft type and model.

*** This space is normally used to indicate the certification basis, i.e. certification code, with which the particular aircraft complies and/or its permitted operational category, e.g. commercial air transportation, aerial work or private.

**** This space shall be used either for periodic endorsement (giving date of expiry) or for a statement that the aircraft is being maintained under a system of continuous inspection.

Figure 1

CHAPTER 4. CONTINUING AIRWORTHINESS OF AIRCRAFT

4.1 Applicability

The Standards of this chapter are applicable to all aircraft.

4.2 Responsibilities of Contracting States in respect of continuing airworthiness

Note.— Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual *(Doc 9760).*

4.2.1 State of Design

4.2.1.1 The State of Design of an aircraft shall:

a) transmit to every Contracting State which has in accordance with 4.2.3 a) advised the State of Design that it has entered the aircraft on its register, and to any other Contracting State upon request, any generally applicable information which it has found necessary for the continuing airworthiness of the aircraft, including its engines and propellers when applicable, and for the safe operation of the aircraft, (hereinafter called mandatory continuing airworthiness information) and notification of the suspension or revocation of a Type Certificate;

Note 1.— The term "mandatory continuing airworthiness information" is intended to include mandatory requirements for modification, replacement of parts or inspection of aircraft and amendment of operating limitations and procedures. Among such information is that issued by Contracting States in the form of airworthiness directives.

Note 2.— The Continuing Airworthiness of Aircraft in Service (Cir 95) *provides the necessary information to assist Contracting States in establishing contact with competent authorities of other Contracting States for the purpose of maintaining continuing airworthiness of aircraft in service.*

b) ensure that, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg maximum certificated take-off mass, there exists a system for:

i) receiving information submitted in accordance with 4.2.3 f);

ii) deciding if and when airworthiness action is needed;

iii) developing the necessary airworthiness actions; and

iv) promulgating the information on those actions including that required in 4.2.1.1 a);

c) ensure that, in respect of aeroplanes over 5 700 kg maximum certificated take-off mass, there exists a continuing structural integrity programme to ensure the airworthiness of the aeroplane. The programme shall include specific information concerning corrosion prevention and control; and

d) ensure that, where the State of Manufacture of an aircraft is other than the State of Design, there is an agreement acceptable to both States to ensure that the manufacturing organization cooperates with the organization responsible for the type design in assessing information received on experience with operating the aircraft.

4.2.1.2 The State of Design of an engine or a propeller, where it is different from the State of Design of the aircraft, shall transmit any continuing airworthiness information to the State of Design of the aircraft and to any other Contracting State upon request.

4.2.2 State of Manufacture

The State of Manufacture of an aircraft shall ensure that where it is not the State of Design there is an agreement acceptable to both States to ensure that the manufacturing organization cooperates with the organization responsible for the type design in assessing information received on experience with operating the aircraft.

4.2.3 State of Registry

The State of Registry shall:

a) ensure that, when it first enters on its register an aircraft of a particular type for which it is not the State of Design and issues or validates a Certificate of Airworthiness in accordance with 3.2 of this part, it shall advise the State of Design that it has entered such an aircraft on its register;

b) determine the continuing airworthiness of an aircraft in relation to the appropriate airworthiness requirements in force for that aircraft;

c) develop or adopt requirements to ensure the continuing airworthiness of the aircraft during its service life, including requirements to ensure that the aircraft:

   i) continues to comply with the appropriate airworthiness requirements after a modification, a repair or the installation of a replacement part; and

   ii) is maintained in an airworthy condition and in compliance with the maintenance requirements of Annex 6, and where applicable, Parts III, IV and V of this Annex;

d) upon receipt of mandatory continuing airworthiness information from the State of Design, adopt the mandatory information directly or assess the information received and take appropriate action;

e) ensure the transmission to the State of Design of all mandatory continuing airworthiness information which it, as the State of Registry, originated in respect of that aircraft; and

f) ensure that, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg maximum certificated take-off mass, there exists a system whereby information on faults, malfunctions, defects and other occurrences that cause or might cause adverse effects on the continuing airworthiness of the aircraft is transmitted to the organization responsible for the type design of that aircraft.

Note.— Guidance on interpretation of "the organization responsible for the type design" is contained in the Airworthiness Manual *(Doc 9760).*

4.2.4 All Contracting States

Each Contracting State shall establish, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg maximum certificated take-off mass, the type of service information that is to be reported to its airworthiness authority by operators, organizations responsible for type design and maintenance organizations. Procedures for reporting this information shall also be established.

PART III. LARGE AEROPLANES

PART IIIA. AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 JUNE 1960 BUT BEFORE 2 MARCH 2004

Note.— The provisions of Part IIIA are the same as those contained in Part III of Annex 8, Ninth Edition (including Amendment 99), except for modified applicability clauses and cross-references.

CHAPTER 1. GENERAL

1.1 Applicability

1.1.1 The Standards of this part, except for those specified in 8.4, are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype was submitted to the appropriate national authorities for certification on or after 13 June 1960, but before 2 March 2004.

1.1.2 The Standards specified in 8.4 of this part are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype was submitted to the appropriate national authorities for certification on or after 22 March 1985, but before 2 March 2004.

1.1.3 Except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to aeroplanes of over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.4 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in 1.1.3 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.5 Unless otherwise stated, the Standards apply to the complete aeroplane including power-units, systems and equipment.

1.2 Number of power-units

The aeroplane shall have not less than two power-units.

1.3 Operating limitations

1.3.1 Limiting conditions shall be established for the aeroplane, its power-units and its equipment (see 9.2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall be sufficiently removed from any condition(s) prejudicial to the safety of the aeroplane to render the likelihood of accidents arising therefrom extremely remote.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

1.3.2 Limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, and altitude or pressure-altitude, shall be established within which compliance with all the pertinent Standards in this part is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— The following items, for instance, may be considered as basic aeroplane limitations:

— maximum certificated take-off mass;

— maximum certificated taxiing mass;

— maximum certificated landing mass;

— maximum certificated zero fuel mass; and

— *most forward and rearward centre of gravity positions in various configurations (take-off, en route, landing).*

Note 3.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Volume I, and Annex 6, Parts I and II).

1.4 Unsafe features and characteristics

Under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.5 Proof of compliance

1.5.1 Compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, or calculations based on tests, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.5.2 The tests of 1.5.1 shall be such as to provide reasonable assurance that the aeroplane, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 General

2.1.1 Compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Certificate of Airworthiness is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 Performance

2.2.1 General

2.2.1.1 Sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 Achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

2.2.1.3 The scheduled performance of the aeroplane shall be consistent with compliance with 1.3.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.2 Minimum performance

At the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or runway or water run length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the aeroplane flight manual against, for example:

— aerodrome elevation, or

— pressure-altitude at aerodrome level, or

— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.2.1 *Take-off*

a) The aeroplane shall be capable of taking off assuming the critical power-unit to fail (see 2.2.3), the remaining power-units being operated within their take-off power limitations.

b) After the end of the period during which the take-off power may be used, the aeroplane shall be capable of continuing to climb, with the critical power-unit inoperative and the remaining power-units operated within their maximum continuous power limitations, up to a height that it can maintain and at which it can carry out a circuit of the aerodrome.

c) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see 2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 *Landing*

a) Starting from the approach configuration and with the critical power-unit inoperative, the aeroplane shall be

capable, in the event of a missed approach, of continuing the flight to a point from which a fresh approach can be made.

b) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

2.2.3 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

2.2.3.1 *Take-off.* The take-off performance data shall include the accelerate-stop distance and the take-off path.

2.2.3.1.1 *Accelerate-stop distance.* The accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical power-unit to fail suddenly at a point not nearer to the start of the take-off than that assumed when determining the take-off path (see 2.2.3.1.2).

2.2.3.1.2 *Take-off path.* The take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical power-unit to fail suddenly during the take-off (see 2.2.3.1.1). The take-off path shall be scheduled up to a height that the aeroplane can maintain and at which it can carry out a circuit of the aerodrome. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with 2.3.1.3.

2.2.3.2 *En route.* The en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

a) the critical power-unit inoperative; and

b) the two critical power-units inoperative in the case of aeroplanes having three or more power-units.

The operating engines shall not exceed maximum continuous power.

2.2.3.3 *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

Note.— If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6, Part I.

2.3 Flying qualities

The aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.1 Controllability

The aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

2.3.1.1 *Controllability on the ground (or water).* The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

2.3.1.3 *Take-off safety speed.* The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical power-unit.

2.3.2 Trim

The aeroplane shall have such trim and other characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more power-units for which performance characteristics are established.

2.3.3 Stability

The aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 Stalling

2.3.4.1 *Stall warning.* When the aeroplane approaches a stall both in straight and turning flight with all power-units operating and with one power-unit inoperative, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power, to maintain full control of the aeroplane.

2.3.4.2 *Behaviour following a stall.* In any configuration and power in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane. It shall be acceptable to throttle back the operating power-units during recovery from the stall.

2.3.4.3 *Stalling speeds.* The stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.3.5 Flutter and vibration

It shall be demonstrated by suitable tests that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.3.2). There shall be no buffeting severe enough to interfere with control of the aeroplane, to cause structural damage or to cause excessive fatigue to the flight crew.

Note.— Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

CHAPTER 3. STRUCTURES

3.1 General

The Standards of Chapter 3 apply to the aeroplane structure consisting of all portions of the aeroplane, the failure of which would seriously endanger the aeroplane.

3.1.1 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.3, 3.4 and 3.5 shall be considered as limit loads.

3.1.3 Strength and deformation

In the various loading conditions prescribed in 3.3, 3.4 and 3.5, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.2 Airspeeds

3.2.1 Design airspeeds

Design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.3. In establishing the design airspeeds, consideration shall be given to the following speeds:

a) V_A, the design manoeuvring speed;

b) V_B, the speed at which the maximum vertical gust velocity assumed in accordance with 3.3.2 can be withstood;

c) V_C, a speed not expected to be exceeded in normal cruising flight taking into account possible effects of upsets when flying in turbulent conditions;

d) V_D, maximum dive speed, sufficiently greater than the speed in c), to make it unlikely that such a design speed would be exceeded as a result of inadvertent speed increases in the anticipated operating conditions, taking into account the flying qualities and other characteristics of the aeroplane;

e) V_{E_1} to V_{E_n}, maximum speeds at which flaps and landing gears may be extended or other configuration changes be made.

The speeds V_A, V_B, V_C, and V_E in a), b), c) and e) shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air.

3.2.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.3.1, shall be included in the aeroplane flight manual as part of the operating limitations (see 9.2.2).

3.3 Flight loads

The flight loading conditions of 3.3.1, 3.3.2 and 3.5 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.3.1 Manoeuvring loads

Manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.3.2 Gust loads

Gust loads shall be computed for vertical and horizontal gust velocities and gradients that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.4 Ground and water loads

The structure shall be able to withstand all the loads due to the reactions of the ground and water surface that are likely to arise during taxiing, take-off and landing.

3.4.1 Landing conditions

The landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the aeroplane at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.5 Miscellaneous loads

In addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, etc.) that are likely to occur in the anticipated operating conditions.

3.6 Flutter, divergence and vibration

The aeroplane structure shall be designed to be free from flutter, structural divergence (i.e. unstable structural distortion due to aerodynamic loading), and loss of control due to structural deformation, at speeds within and sufficiently beyond the operating limitations to comply with 1.3.1. Adequate strength shall be provided to withstand the vibration and buffeting that might occur in the anticipated operating conditions.

3.7 Fatigue strength

The strength and fabrication of the aeroplane shall be such as to ensure that the probability of disastrous fatigue failure of the aeroplane's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 General

Details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1.1 Substantiating tests

The functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 Materials

All materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 Manufacturing methods

The methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.5 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

4.1.6 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

b) *System survivability.*

   1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, aeroplane systems shall be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

   2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, aeroplane systems should be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.*

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimize the possibility of in-flight and ground fires and also to minimize the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused.

g) *Fire suppression.* For aeroplanes for which the application for certification was submitted on or after 12 March 2000, cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

h) *Incapacitation of occupants.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

2) **Recommendation.**— *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, design precautions should be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.*

i) *Protection of the flight crew compartment from smoke and fumes.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, means shall be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) **Recommendation.**— ***For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, means should be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.***

4.1.7 Emergency landing provisions

4.1.7.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.1.7.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane.

4.1.7.3 The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

4.1.7.4 On aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

4.1.8 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. ENGINES

5.1 Scope

The Standards of Chapter 5 shall apply to engines of all types that are used on the aeroplane as primary propulsion units.

5.2 Design, construction and functioning

The engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the aeroplane in accordance with Chapter 7 and, if applicable, fitted with a suitable propeller.

5.3 Declared ratings, conditions and limitations

The power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

5.4 Tests

An engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration.* Tests shall be conducted to establish the power or thrust characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation.* Tests shall be conducted to ensure that starting, idling, acceleration, vibration, overspeeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance.* Tests of sufficient duration shall be conducted at such powers, thrust, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6. PROPELLERS

6.1 Scope

The Standards of Chapter 6 shall apply to propellers of all types.

6.2 Design, construction and functioning

The propeller assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the aeroplane in accordance with Chapter 7.

6.3 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations which are intended to govern the operation of the propeller shall be declared.

6.4 Tests

A propeller of the type shall complete satisfactorily such tests as are necessary to ensure that it will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength vibration and overspeeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the propeller.

CHAPTER 7. POWERPLANT INSTALLATION

7.1 General

7.1.1 Applicable Standards

The powerplant installation shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

7.1.2 Compliance with engine and propeller limitations

The powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of being used in the anticipated operating conditions. In conditions established in the aeroplane flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with Chapters 5, 6 and 7.

7.1.3 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

7.1.4 Engine restarting

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

7.2 Arrangement and functioning

7.2.1 Independence of power-units

The powerplant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

7.2.2 Propeller vibration

The propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

7.2.3 Cooling

The cooling system shall be capable of maintaining powerplant temperatures within the established limits (see 7.1.2) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum ambient air temperature for which the powerplant has been established as being suitable shall be scheduled in the aeroplane flight manual.

7.2.4 Associated systems

The fuel, oil, air induction, and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

7.2.5 Fire protection

For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e).

a) *Isolation.* Such regions shall be isolated by fire-resisting material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs.

c) *Fire detection.* A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

d) *Fire extinguishment.* Such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardize the safety of the aeroplane.

CHAPTER 8. INSTRUMENTS AND EQUIPMENT

8.1 Required instruments and equipment

The aeroplane shall be provided with approved instruments and equipment necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2.— Instruments and equipment design shall observe Human Factors principles.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

8.2 Installation

Instrument and equipment installations shall comply with the Standards of Chapter 4.

8.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

*8.4 Navigation lights and anti-collision lights

8.4.1 The lights required by Annex 2 — *Rules of the Air* to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760) for detailed technical specifications for exterior lights for aeroplanes.*

8.4.2 Lights shall be installed in aeroplanes so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject an outside observer to harmful dazzle.

Note.— In order to avoid the effects mentioned in 8.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

* Please refer to 1.1.2 of this part.

CHAPTER 9. OPERATING LIMITATIONS AND INFORMATION

9.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of an aeroplane flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 Operating limitations

Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.3.2).

9.2.2 Airspeed limitations

The airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

9.2.3 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 7.1.2 and 7.2.3).

9.2.4 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

9.2.5 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.3.1).

9.2.6 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft, *Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

9.2.7 Flying time limitation after system or power-unit failure

The systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine power-units beyond the threshold time established in accordance with 4.7 of Annex 6, Part I.

Note.— The maximum time established in accordance with 4.7 of Annex 6, Part I, for a particular route may be less than that determined in accordance with 9.2.7 because of the operational considerations involved.

9.3 Operating information and procedures

9.3.1 Types of eligible operations

There shall be listed the particular types of operations, as may be defined in Annex 6, Parts I and II, or be generally recognized, for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 Loading information

The loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the

aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

9.3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

9.3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.3.4.3 shall be scheduled.

9.3.5 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimize the effects on the aeroplane in the case of detonation.

9.4 Performance information

The performance of the aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 Aeroplane flight manual

A flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 Markings and placards

9.6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

CHAPTER 10. CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

10.1 General

Information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 10.2, 10.3 and 10.4.

10.2 Maintenance information

Maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

10.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

10.4 Maintenance information resulting from the type design approval

Maintenance tasks and frequencies that have been specified as mandatory by the State of Design in approval of the type design shall be identified as such.

CHAPTER 11. SECURITY

11.1 Aeroplanes used for domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).*

11.2 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

11.3 Protection of the flight crew compartment

Recommendation.— *In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the Type Certificate to include a derivative type design is submitted to the appropriate national authority, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.*

Note.— Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in Annex 6, Part I, Chapter 13.

11.4 Interior design

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IIIB. AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 2 MARCH 2004

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 The Standards of this part are applicable in respect of all aeroplanes designated in A.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 2 March 2004.

A.1.2 Except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to all aeroplanes over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1.— The aeroplanes described in A.1.2 are known in some States as transport category aeroplanes.

Note 2.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

A.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in A.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

A.1.4 Unless otherwise stated, the Standards apply to the complete aeroplane including power-units, systems and equipment.

A.2 Operating limitations

A.2.1 Limiting conditions shall be established for the aeroplane, its power-units and its equipment (see G2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

A.2.2 Limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude or pressure-altitude, shall be established within which compliance with all the pertinent Standards in this part is shown.

Note.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Volume I, and Annex 6, Parts I and II).

A.3 Unsafe features and characteristics

Under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

A.4 Proof of compliance

The means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

SUB-PART B. FLIGHT

B.1 General

B.1.1 Compliance with the Standards prescribed in this Sub-part shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

B.1.2 Compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

B.1.3 Where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

B.2 Performance design parameters

B.2.1 Sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

B.2.2 Achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

B.2.3 The scheduled performance of the aeroplane shall be consistent with compliance with A.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

B.2.4 Minimum performance

At the maximum mass scheduled (see B.2.7) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in B.2.5 and B.2.6, respectively, not considering obstacles, or runway or water run length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the aeroplane flight manual against, for example:

— aerodrome elevation, or

— pressure-altitude at aerodrome level, or

— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

B.2.5 Take-off

a) The aeroplane shall be capable of taking off assuming the critical power-unit to fail (see B.2.7), the remaining power-units being operated within their take-off power or thrust limitations.

b) After the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical power-unit inoperative and the remaining power-units operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

c) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see B.2.7), the departure from the scheduled values is not disproportionate.

B.2.6 Landing

a) Starting from the approach configuration and with the critical power-unit inoperative, the aeroplane shall be

capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

b) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

B.2.7 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

a) *Take-off.* The take-off performance data shall include the accelerate-stop distance and the take-off path.

b) *Accelerate-stop distance.* The accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical power-unit to fail suddenly at a point not nearer to the start of the take-off than that assumed when determining the take-off path (see B.2.7 c)). For landplanes, the distance shall be based on operations with all the wheel brake assemblies at the fully worn limit of their allowable wear range.

c) *Take-off path.* The take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical power-unit to fail suddenly during the take-off (see B.2.7 b)). The take-off path shall be scheduled up to a height from which the aeroplane can continue safe flight and landing. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with B.3.2.4.

d) *En route.* The en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

   1) the critical power-unit inoperative; and

   2) the two critical power-units inoperative in the case of aeroplanes having three or more power-units.

The operating engines shall not exceed maximum continuous power or thrust.

e) *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom. For landplanes, this distance shall be based on operations with all the wheel brake assemblies at the fully worn limit of their allowable wear range.

Note.— If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6, Part I.

B.3 Flying qualities

B.3.1 The aeroplane shall comply with the Standards of B.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

B.3.2 Controllability

B.3.2.1 The aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

B.3.2.2 *Controllability on the ground (or water).* The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

B.3.2.3 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

B.3.2.4 *Take-off safety speed.* The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical power-unit.

B.3.3 Trim

The aeroplane shall have such trim and other characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more power-units for which performance characteristics are established.

B.4 Stability and control

B.4.1 Stability

The aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. It shall be shown that any combination of failures or conditions that would result in the need for exceptional piloting skills is extremely improbable. The stability may be achieved by natural or artificial means, or a combination of both. If compliance with the flight characteristics requirements is dependent upon a stability augmentation system or upon any other automatic or power-operated system, compliance shall be shown with D.2 of this part.

Note.— Guidance material concerning the expression "extremely improbable" is contained in the Airworthiness Manual *(Doc 9760).*

B.4.2 Stalling

B.4.2.1 *Stall warning.* When the aeroplane approaches a stall both in straight and turning flight with all power-units operating, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers or thrusts, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

B.4.2.2 *Behaviour following a stall.* In any configuration and at any level of power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane.

B.4.2.3 *Stalling speeds.* The stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

B.4.3 Flutter and vibration

B.4.3.1 It shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see A.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

B.4.3.2 There shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew.

Note.— Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

SUB-PART C. STRUCTURE

C.1 General

The aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

C.2 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

C.3 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in C.6 shall be considered as limit loads.

C.4 Deformation and ultimate strength

In the various loading conditions prescribed in C.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

C.5 Airspeeds

C.5.1 Design airspeeds

Design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedances due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

C.5.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with A.2.1, shall be included in the flight manual as part of the operating limitations (see G.2).

C.6 Strength

C.6.1 All structural elements shall be designed to withstand the maximum loads expected in service under all anticipated operating conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) the expected operational life of the aeroplane;

b) the vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) the manoeuvre spectrum, taking into account variations in mission profiles, and loading configurations;

d) asymmetrical as well as symmetrical loading;

e) the ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;

f) the speed range of the aeroplane, taking into account the aeroplane characteristics and operation limitations;

g) vibration and buffeting loads;

h) corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) any other loads, such as flight control loads, cabin pressurization loads, engine loads, or dynamic loads due to changes to the steady state configuration.

C.6.2 The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

C.7 Survivability

The aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water, or object impact. Consideration shall be given to at least the following:

a) likely impact with birds;

b) energy absorption by the airframe, occupant seats and restraints;

c) the probable behaviour of the aeroplane in ditching; and

d) allowing egress in the shortest practicable time.

C.8 Structural durability

The design and construction of the aeroplane shall, wherever practicable, conform to damage tolerance principles and shall be such as to ensure that the probability of catastrophic failure during the operational life is extremely remote, taking into account:

a) the expected environment;

b) the expected repeated loads applied in service;

c) expected vibrations from aerodynamic interaction or internal sources;

d) thermal cycles;

e) accidental and discrete source damage;

f) likely corrosion or other degradation;

g) specified maintenance; and

h) likely structural repairs.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

SUB-PART D. DESIGN AND CONSTRUCTION

D.1 General

D.1.1 Details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

D.1.2 Substantiation of moving parts

The functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

D.1.3 Materials

All materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design. The effect of the materials on the occupants of the aeroplane and other persons on the ground, and the environment in general, in normal and emergency situations, shall be taken into account.

D.1.4 Manufacturing methods

The methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

D.1.5 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

D.1.6 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

D.2 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such that:

   1) each control and control system shall operate with the ease, smoothness and precision appropriate to its function;

   2) continued safe flight and landing of the aeroplane shall not be prevented by:

      i) any single failure not shown to be extremely improbable in the control system; or

      ii) any event that results in a jam of a flight control in any normally encountered position of the flight controls;

   3) the possibility of jamming, inadvertent operations and unintentional engagement of control surface locking devices is minimized; and

   4) each element of each flight control system is designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *System survivability.*

   1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, aeroplane systems shall be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, aeroplane systems should be designed, arranged and physically separated to maximize the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.*

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture shall be such as to minimize the possibility of in-flight and ground fires, to minimize the production of smoke and toxic gases in the event of a fire and to delay the occurrence of flashover in the cabin. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused. Lavatories installed in aeroplanes shall be equipped with a smoke detection system and a built-in fire extinguisher system for each receptacle intended for the disposal of towels, paper or waste.

g) *Cargo compartment protection.*

1) each cargo compartment accessible to a crew member in a passenger-carrying aeroplane shall be equipped with a fire suppression system;

2) each cargo compartment not accessible to a crew member shall be equipped with a built-in fire detection system and a built-in fire starvation or suppression system; and

3) cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

h) *Incapacitation of occupants.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, design precautions should be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.*

i) *Protection of the flight crew compartment from smoke and fumes.*

1) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, means shall be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) **Recommendation.—** *For aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, means should be provided to minimize entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.*

D.3 Aeroelasticity

The aeroplane shall be free from flutter, structural divergence, and loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with A.2.1. Account shall be taken of the characteristics of the aeroplane and variations in pilot skill and workload. Allowable limits for aerodynamic control surfaces and how those limits are to be monitored shall be specified so as to ensure that the aeroplane remains free from aeroelastic problems during its operational life.

D.4 Occupants accommodation features

D.4.1 Seating and restraints

Adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structure during the operation of the aeroplane.

D.4.2 Cabin environment

Ventilation, heating and, where applicable, pressurization systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

D.5 Electrical bonding and protection against lightning and static electricity

D.5.1 Electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

D.5.2 The aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the aeroplane.

D.6 Emergency landing provisions

D.6.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

D.6.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

D.6.3 The interior layout of the cabin and the position and number of emergency exits, including the means of locating and illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

D.6.4 On aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

D.7 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

SUB-PART E. POWERPLANT

E.1 Engines

The Standards of Part VI of this Annex shall apply to each engine that is used on the aeroplane as a primary propulsion unit.

E.2 Propellers

The Standards of Part VII of this Annex shall apply to each propeller that is used on the aeroplane.

E.3 Powerplant installation

E.3.1 Compliance with engine and propeller limitations

The powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this sub-part.

E.3.2 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

E.3.3 Turbine engine

For a turbine engine installation:

a) the design shall minimize the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) the power-unit together with the associated engine control devices, systems and instrumentation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

E.3.4 Engine restarting

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

E.3.5 Arrangement and functioning

E.3.5.1 *Independence of power-units*

The powerplant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

E.3.5.2 *Propeller vibration*

The propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

E.3.5.3 *Cooling*

The cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see E.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum ambient air temperature for which the powerplant has been established as being suitable shall be scheduled in the flight manual.

E.3.5.4 *Associated systems*

The fuel, oil, air induction, and other systems associated with the power-unit shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

E.3.5.5 *Fire protection*

For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of D.2 f).

a) *Isolation.* Such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of the fire.

c) *Fire detection.* A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

d) *Fire extinguishment.* Such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardize the safety of the aeroplane.

SUB-PART F. SYSTEMS AND EQUIPMENT

F.1 General

F.1.1 The aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2.— For systems software assessment, see Sub-part H.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

F.1.2 The design of the instruments, equipment and systems required by F.1.1 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) they perform their function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

F.1.3 Means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

F.1.4 The design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations of the aeroplane and essential power loads after failures that affect the electrical generating system and under expected environmental conditions.

F.2 Installation

Instrument and equipment installations shall comply with the Standards of Sub-part D.

F.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

F.4 Navigation lights and anti-collision lights

F.4.1 The lights required by Annex 2 — *Rules of the Air* to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760) for detailed technical specifications for exterior lights for aeroplanes.*

F.4.2 Lights shall be installed in aeroplanes so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject a person outside the aeroplane to harmful dazzle.

Note.— In order to avoid the effects mentioned in F.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

F.5 Electromagnetic interference protection

Aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

F.6 Ice protection

If certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all expected operating environments.

SUB-PART G. OPERATING LIMITATIONS AND INFORMATION

G.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in this sub-part.

G.2 Operating limitations

G.2.1 Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

G.2.2 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see A.2.2).

G.2.3 Airspeed limitations

The airspeed limitations shall include all speeds (see C.5) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

G.2.4 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see E.3.1 and E.3.5.3).

G.2.5 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

G.2.6 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see A.2.1).

G.2.7 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft, *Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

G.2.8 Flying time limitation after system or power-unit failure

The systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine power-units beyond the threshold time established in accordance with 4.7 of Annex 6, Part I.

Note.— The maximum time established in accordance with 4.7 of Annex 6, Part I, for a particular route may be less than that determined in accordance with G.2.8 because of the operational considerations involved.

G.3 Operating information and procedures

G.3.1 Types of eligible operations

The particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

G.3.2 Loading information

The loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the

aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

G3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

G3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by B.4.2.3 shall be scheduled.

G3.5 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimize the effects on the aeroplane in the case of detonation.

G4 Performance information

The performance of the aeroplane shall be scheduled in accordance with B.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

G5 Flight manual

A flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in G2, G3, G4 and G6.1.

G6 Markings and placards

G6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

G6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

G7 Continuing airworthiness — maintenance information

G7.1 General

Information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in G7.2, G7.3 and G7.4.

G7.2 Maintenance information

Maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

G7.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and recommended intervals at which these tasks are to be performed.

Note.— The development of initial maintenance programme information at the time of aeroplane type certification is some times referred to as the Maintenance Review Board (MRB) process.

G7.4 Mandatory maintenance requirements resulting from the type design approval

Mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of G7.3.

Note.— Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

SUB-PART H. SYSTEMS SOFTWARE

All systems software shall be designed and validated such as to ensure that the systems in which software is used perform their intended functions with a level of safety that complies with the requirements of this Part, notably those of F.1.2 a) and F.1.3.

Note.— Some States accept the use of national/international industry standards, such as RTCA/DO-178 or EUROCAE ED12, for the design and testing of systems software.

SUB-PART I. CRASHWORTHINESS AND CABIN SAFETY

I.1 General

Crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

I.2 Design emergency landing loads

Emergency landing (crash) loads shall be determined for all categories of aeroplanes so that the interiors, furnishings, support structure and safety equipment can be designed to maximize survivability for the occupants. Items to be considered shall include:

a) dynamic effects;

b) restraint criteria for items that could cause a hazard;

c) distortion of the fuselage in the areas of emergency exits;

d) fuel cell integrity and position; and

e) integrity of electrical systems to avoid sources of ignition.

I.3 Cabin fire protection

The cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) flammability of cabin interior materials;

b) fire resistance and the generation of smoke and toxic fumes;

c) provision of safety features to allow for safe evacuation; and

d) fire detection and suppression equipment.

I.4 Evacuation

The aeroplane shall be equipped with sufficient emergency exits to allow maximum opportunity for cabin evacuation within an appropriate time period. Items to be considered shall include:

a) number of seats and seating configuration;

b) number, location and size of exits;

c) marking of exits and provision of instructions for use;

d) likely blockages of exits;

e) operation of exits; and

f) positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

I.5 Lighting and marking

Emergency lighting shall be provided and shall have the following characteristics:

a) independence from main electrical supply;

b) automatic activation upon loss of normal power/impact;

c) visual indication of the path to emergency exits in smoke-filled cabin conditions;

d) illumination both inside and outside the aeroplane during evacuation; and

e) no additional hazard in the event of fuel spillage.

I.6 Survival equipment

The aeroplane shall be so equipped as to provide the crew and occupants with the maximum opportunity to survive in the expected external environment for a reasonable time-span. Items to be considered shall include:

a) number of life rafts/life jackets;

b) survival equipment suited to the likely environment;

c) emergency radios and pyrotechnical distress signalling equipment; and

d) automatic emergency radio beacons.

SUB-PART J. OPERATING ENVIRONMENT AND HUMAN FACTORS

J.1 General

The aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note.— The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.

J.2 Flight crew

J.2.1 The aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

J.2.2 The workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

Note.— Workload can be affected by both cognitive and physiological factors.

J.3 Ergonomics

During design of the aeroplane, account shall be taken of ergonomic factors including:

a) ease of use and prevention of inadvertent misuse;

b) ease of access;

c) working environment;

d) standardization and commonality; and

e) ease of maintenance.

J.4 Operating environmental factors

The design of the aeroplane shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;

b) effect of physical forces during normal flight;

c) effect of prolonged operation at high altitude; and

d) physical comfort.

SUB-PART K. SECURITY

K.1 Aeroplanes used for domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).*

K.2 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

K.3 Protection of the flight crew compartment

K.3.1 In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for the issue of a Type Certificate is first submitted to the appropriate national authority on or after 20 May 2006, the flight crew compartment bulkheads, floors and ceilings shall be designed to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.

K.3.2 **Recommendation.—** *In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the Type Certificate to include a derivative type design is submitted to the appropriate national authority on or after 20 May 2006, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.*

Note.— Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in Annex 6, Part I, Chapter 13.

K.4 Interior design

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IV. HELICOPTERS

PART IVA. HELICOPTERS FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 22 MARCH 1991 BUT BEFORE 13 DECEMBER 2007

Note.— The provisions of Part IVA are the same as those contained in Part IV of Annex 8, Ninth Edition except for modified applicability clauses and cross references.

CHAPTER 1. GENERAL

1.1 Applicability

1.1.1 The Standards of this part are applicable in respect of all helicopters designated in 1.1.2 that are of types of which the prototype was submitted to the appropriate national authorities for certification on or after 22 March 1991 but before 13 December 2007.

1.1.2 The Standards of this part shall apply to helicopters intended for the carriage of passengers or cargo or mail in international air navigation.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the helicopters designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Unless otherwise stated, the Standards apply to the complete helicopter including power-units, systems and equipment.

1.2 Limitations

1.2.1 Limiting conditions shall be established for the helicopter, its power-units and its equipment (see 9.2). Compliance with the Standards of this Part shall be established assuming that the helicopter is operated within the limitations specified. The limitations shall be sufficiently removed from any conditions prejudicial to the safety of the helicopter to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Limiting ranges of mass, centre of gravity location, load distribution, speeds and ambient conditions shall be established within which compliance with all the pertinent Standards in this Part is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— The following items, for instance, may be considered as basic helicopter limitations:

— maximum certificated take-off (including lift-off) mass;

— maximum certificated ground-taxiing mass;

— maximum certificated landing mass;

— most forward, rearward, and lateral centre of gravity positions in various configurations; and

— maximum certificated cargo sling mass.

Note 3.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Volume I, and Annex 6, Part III).

1.3 Unsafe features and characteristics

Under all anticipated operating conditions, the helicopter shall not possess any feature or characteristic that renders it unsafe.

1.4 Proof of compliance

1.4.1 Compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, calculations based on tests, or other methods, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.4.2 The tests of 1.4.1 shall be such as to provide reasonable assurance that the helicopter, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 General

2.1.1 Compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon a helicopter or helicopters of the type for which a Certificate of Airworthiness is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Compliance with each Standard shall be established for all applicable combinations of helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Where necessary, appropriate helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the helicopter's flying qualities.

2.2 Performance

2.2.1 General

2.2.1.1 Sufficient data on the performance of the helicopter shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 Achieving the performance scheduled for the helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the pilot.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

2.2.1.3 The scheduled performance of the helicopter shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the helicopter's systems and equipment, the operation of which may affect performance.

2.2.2 Minimum performance

At the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the take-off or landing site elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for water operations, in specified conditions of smooth water, the helicopter shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or final approach and take-off area length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the helicopter flight manual against, for example at the take-off or landing site:

— elevation, or

— pressure-altitude, or

— pressure-altitude and atmospheric temperature,

so as to be readily usable when applying the national code on helicopter performance operating limitations.

2.2.2.1 *Take-off*

a) In the event of critical power-unit failure, at or after the take-off decision point (for performance Class 1) or the defined point after take-off (for performance Class 2), performance Classes 1 and 2 helicopters shall be capable of continuing safe flight, the remaining power-unit(s) being operated within the approved limitations.

b) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see 2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 *Landing*

a) Starting from the approach configuration, in the event of critical power-unit failure at or before the landing decision point (performance Class 1) or the defined point before landing (performance Class 2), the helicopter shall be capable of continuing safe flight, the remaining power-unit(s) being operated within the approved limitations.

b) Starting from the landing configuration, the helicopter shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

2.2.3 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the helicopter is to be operated in accordance with 5.1.2 of Annex 6, Part III, will provide a safe relationship between the performance of the helicopter and the aerodromes, heliports and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, and other ambient conditions and any other operational variables for which the helicopter is to be certificated, and additionally for amphibians, water surface conditions and strength of current.

2.2.3.1 *Take-off.* The take-off performance data shall include the take-off distance required and the take-off path. For performance Class 1 helicopters, it shall also include the rejected take-off distance required.

2.2.3.1.1 *Take-off decision point.* (For performance Class 1 helicopters only.) The take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical power-unit inoperative.

2.2.3.1.2 *Take-off distance required.* (For performance Class 1 helicopters only.) The take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which the take-off safety speed (V_{TOSS}), a selected height above the take-off surface, and a positive climb gradient are achieved, following failure of the critical power-unit at the take-off decision point, the remaining power-unit(s) operating within approved operating limits.

2.2.3.1.3 *Rejected take-off distance required.* (For performance Class 1 helicopters only.) The rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the helicopter comes to a complete stop following a power-unit failure and rejection of the take-off at the take-off decision point.

2.2.3.1.4 *Take-off distance required.* (For performance Classes 2 and 3 helicopters only.) The take-off distance required shall be the horizontal distance required from the start of take-off to the point where the best rate of climb speed (Vy) or the best angle of climb speed (Vx) or a selected intermediate speed (provided this speed does not involve flight within the avoid areas of the height-velocity diagrams) and a selected height above the take-off surface are achieved, all engines operating at approved take-off power.

2.2.3.2 *En route.* The en-route performance shall be the climb, cruise or descent performance with:

a) the critical power-unit inoperative;

b) the two critical power-units inoperative in the case of helicopters having three or more power-units; and

c) the operating engine(s) not exceeding the power for which they are certificated.

2.2.3.3 *Landing.* The landing performance data shall include the landing distance required and, for performance Class 1 helicopters, the landing decision point.

2.2.3.3.1 *Landing decision point.* (For performance Class 1 helicopters only.) The landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical power-unit inoperative.

2.2.3.3.2 *Landing distance required.* The landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface.

2.3 Flying qualities

The helicopter shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the helicopter is approved.

2.3.1 Controllability

The helicopter shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of helicopter configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the helicopter shall be established for all stages of flight and helicopter configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

2.3.1.1 *Controllability on the ground (or water).* The helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 *Controllability during take-off.* The helicopter shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off, when the helicopter is handled in the manner associated with the scheduling of the take-off data.

2.3.2 Trim

The helicopter shall have such trim and handling capabilities as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a malfunction of the systems associated with the flight controls, there must not be any significant deterioration of the handling characteristics.

2.3.3 Stability

The helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. helicopter configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the helicopter shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 Autorotation

2.3.4.1 *Rotor speed control.* The autorotation characteristics of the helicopter shall be such as to enable the pilot to control the rotor speed to within prescribed limits and to maintain full control of the helicopter.

2.3.4.2 *Behaviour following a power loss.* The behaviour of the helicopter following a power loss shall not be so extreme as to make difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the helicopter.

2.3.4.3 *Autorotation airspeeds.* The autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

2.3.5 Flutter and vibration

It shall be demonstrated by suitable tests that all parts of the helicopter are free from flutter and excessive vibration in all helicopter configurations under all speed conditions within the operating limitations of the helicopter (see 1.2.2). There shall be no vibration severe enough to interfere with control of the helicopter, to cause structural damage or to cause excessive fatigue to the flight crew.

CHAPTER 3. STRUCTURES

3.1 General

The Standards of Chapter 3 apply to the helicopter structure consisting of all portions of the helicopter, the failure of which would seriously endanger the helicopter.

3.1.1 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.4, 3.5 and 3.6 shall be considered as limit loads.

3.1.3 Strength and deformation

In the various loading conditions prescribed in 3.4, 3.5 and 3.6, no part of the helicopter structure shall sustain detrimental deformation at any load up to and including the limit load, and the helicopter structure shall be capable of supporting the ultimate load.

3.2 Airspeeds

3.2.1 Design airspeeds

Design airspeeds shall be established for which the helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.4.

3.2.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the helicopter flight manual as part of the operating limitations (see 9.2.2). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established.

3.3 Main rotor(s) rotational speed limits

A range of main rotor(s) speeds shall be established that:

a) with power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre and is consistent with the kind of governor or synchronizer used; and

b) with power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

3.4 Flight loads

The flight loading conditions of 3.4.1, 3.4.2 and 3.6 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.4.1 Manoeuvring loads

Manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.4.2 Gust loads

Gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.5 Ground and water loads

The structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that are likely to arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

3.5.1 Landing conditions

The landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the helicopter at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.6 Miscellaneous loads

In addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, loads due to external mass, etc.) that are likely to occur in the anticipated operating conditions.

3.7 Flutter, divergence and vibration

Each part of the helicopter structure shall be free from excessive vibration or oscillation (ground resonance, flutter, etc.) under each appropriate speed and power condition.

3.8 Fatigue strength

The strength and fabrication of the helicopter shall be such as to ensure that the probability of disastrous fatigue failure of the helicopter's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

Note 1.— This Standard can be complied with by the establishment of "safe lives" or "fail safe" characteristics of the structure, having regard to the reasonable expected load magnitudes and frequencies under the anticipated operating conditions and inspection procedures. For some parts of the structure, it might be necessary to establish "fail safe" characteristics as well as "safe lives".

Note 2.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 General

Details of design and construction shall be such as to give reasonable assurance that all helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

4.1.1 Substantiating tests

The functioning of all moving parts essential to the safe operation of the helicopter shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 Materials

All materials used in parts of the helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 Manufacturing methods

The methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the helicopter will receive.

4.1.5 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the helicopter that require such attention, either periodically or after unusually severe operations.

4.1.6 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

   i) Each control and control system shall operate with the ease, smoothness and effectiveness appropriate to its function.

   ii) Each element of each flight control system shall be designed to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

c) *Pilot vision.* The arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the helicopter, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

d) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the helicopter. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Part III.

e) *Fire precautions.* The design of the helicopter and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimize the possibility of in-flight and ground fires and also to minimize the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish, wherever possible, all accessible fires as might occur in such a way that no additional danger to the helicopter is caused.

f) *Incapacitation of occupants.* Design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases that could incapacitate the occupants of the helicopter.

4.1.7 Emergency landing provisions

Provisions shall be made in the design of the helicopter to protect the occupants from fire and effects of deceleration in the event of an emergency landing. Facilities shall be provided for the rapid evacuation of the helicopter in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the helicopter. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give maximum practicable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

4.1.8 Ground handling

Adequate provisions shall be made in the design to minimize the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. ENGINES

5.1 Scope

The Standards of Chapter 5 shall apply to engines of all types that are used on the helicopter as primary propulsion units.

5.2 Design, construction and functioning

The engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the helicopter in accordance with Chapter 6 and with the suitable rotor and power transmission installed.

5.3 Declared ratings, conditions and limitations

The power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

5.4 Tests

An engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration.* Tests shall be conducted to establish the power characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation.* Tests shall be conducted to ensure that starting, idling, acceleration, vibration, overspeeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6. ROTOR AND POWER TRANSMISSION SYSTEMS AND POWERPLANT INSTALLATION

6.1 General

The powerplant installation, including rotor and power transmission system, shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

6.2 Design, construction and functioning

The rotor and power transmission systems assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the helicopter in accordance with this chapter.

6.3 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations which are intended to govern the operation of the rotor and power transmission systems shall be declared.

6.3.1 Maximum and minimum rotor rotational speed limitations

Maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

6.3.2 Rotor underspeed and overspeed warnings

When the helicopter is made to approach a rotor rotational speed limit, with or without power-units inoperative, clear and distinctive warnings shall be apparent to the pilot. The warnings and initial characteristics of the condition shall be such as to enable the pilot to arrest the development of the condition after the warning begins and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the helicopter.

6.4 Tests

Rotor and power transmission systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength, vibration and overspeeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the rotor and power transmission systems.

6.5 Compliance with engine and rotor and power transmission systems limitations

The powerplant installation shall be so designed that the engines and rotor and power transmission systems are capable of being used in the anticipated operating conditions. In conditions established in the helicopter flight manual, the helicopter shall be capable of being operated without exceeding the limitations established for the engines and rotor and power transmission systems in accordance with Chapters 5 and 6.

6.6 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

6.7 Engine restarting

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

6.8 Arrangement and functioning

6.8.1 Independence of power-units

For performance Classes 1 and 2 helicopters, the power-plant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical power-unit.

6.8.2 Rotor and power transmission systems vibration

The vibration stresses for the rotor and power transmission systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the helicopter.

6.8.3 Cooling

The cooling system shall be capable of maintaining power-plant and power transmission systems temperatures within the established limits (see 6.5) at ambient air temperatures approved for operation of the helicopter. The maximum and minimum air temperatures for which the powerplant and power transmission systems have been established as being suitable shall be scheduled in the helicopter flight manual.

6.8.4 Associated systems

The fuel, oil, air induction, and other systems associated with each power-unit, each power transmission unit and each rotor shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

6.8.5 Fire protection

For designated fire zones where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e):

a) *Isolation.* Such zones shall be isolated by fire-resisting material from other zones of the helicopter where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such zones shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of hazardous quantities of flammable fluids into such zones if a fire occurs.

c) *Fire detection.* There shall be provided a sufficient number of fire detectors so located as to ensure rapid detection of any fire that might occur in such zones.

d) *Fire extinguishment.* Such zones shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the zone would not jeopardize the safety of the helicopter.

CHAPTER 7. INSTRUMENTS AND EQUIPMENT

7.1 Required instruments and equipment

The helicopter shall be provided with approved instruments and equipment necessary for the safe operation of the helicopter in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the helicopter within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Part III, for particular circumstances or on particular kinds of routes.

Note 2.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

7.2 Installation

Instrument and equipment installations shall comply with the Standards of Chapter 4.

7.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

7.4 Navigation lights and anti-collision lights

7.4.1 The lights required by Annex 2 — *Rules of the Air* to be displayed by helicopters in flight or operating on the movement area of an aerodrome or a heliport shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760) for detailed technical specifications for exterior lights for helicopters.*

7.4.2 Lights shall be installed in helicopters so as to minimize the possibility that they will:

a) adversely affect the satisfactory performance of the flight crews' duties; or

b) subject an outside observer to harmful dazzle.

Note.— In order to avoid the effects mentioned in 7.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

CHAPTER 8. ELECTRICAL SYSTEMS

The electrical system shall be so designed and installed as to ensure that it will perform its intended function under any foreseeable operating conditions.

CHAPTER 9. OPERATING LIMITATIONS AND INFORMATION

9.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the helicopter, shall be made available by means of a helicopter flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 Operating limitations

Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

9.2.2 Airspeed limitations

The airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate helicopter configurations and other pertinent factors.

9.2.3 Powerplant and power transmission limitations

The powerplant limitations shall include all those established for the various powerplant and transmission components as installed in the helicopter (see 6.5 and 6.6).

9.2.4 Rotor limitations

Limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

9.2.5 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the helicopter.

9.2.6 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the helicopter (see 1.2.1).

9.2.7 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the helicopter, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft, *Part III, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

9.3 Operating information and procedures

9.3.1 Types of eligible operations

There shall be listed the particular types of operations, as may be defined in Annex 6, Part III, or be generally recognized, for which the helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 Loading information

The loading information shall include the empty mass of the helicopter, together with a definition of the condition of the helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

9.3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

9.3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the helicopter characteristics.

9.4 Performance information

The performance of the helicopter shall be scheduled in accordance with 2.2. There shall be included information regarding the various helicopter configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 Helicopter flight manual

A flight manual shall be made available. It shall identify clearly the specific helicopter or series of helicopters to which it is related. The flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 Markings and placards

9.6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardize the safety of the helicopter in subsequent flights.

PART IVB. HELICOPTERS FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 DECEMBER 2007

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 The Standards of this part are applicable in respect of all helicopters designated in A.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 13 December 2007.

A.1.2 The Standards of this part shall apply to helicopters over 750 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

A.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the helicopters designated in A.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

A.1.4 Unless otherwise stated, the Standards apply to the complete helicopter including engines, systems and equipment.

A.2 Operating limitations

A.2.1 Limiting conditions shall be established for the helicopter, its engine(s) and its equipment (see G.2). Compliance with the Standards of this part shall be established assuming that the helicopter is operated within the limitations specified. The safety implications of exceeding these operating limits shall be considered.

A.2.2 Limiting ranges of any parameter whose variation may compromise the safe operation of the helicopter, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude, shall be established within which compliance with all the pertinent Standards of this part is shown.

Note 1.— The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each practicably separate operating condition, e.g. take-off, en route, landing.

Note 2.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16, Volume I and Annex 6, Part III).

A.3 Unsafe features and characteristics

Under all anticipated operating conditions, the helicopter shall not possess any feature or characteristic that renders it unsafe.

A.4 Proof of compliance

The means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the helicopter, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

SUB-PART B. FLIGHT

B.1 General

B.1.1 Compliance with the Standards prescribed in this sub-part shall be established by flight or other tests conducted upon a helicopter or helicopters of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

B.1.2 Compliance with each Standard shall be established for all applicable combinations of helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

B.1.3 Where necessary, appropriate helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the helicopter's flying qualities.

B.2 Performance

B.2.1 Sufficient data on the performance of the helicopter shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

B.2.2 Achieving the performance scheduled for the helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

B.2.3 The scheduled performance of the helicopter shall be consistent with compliance with A.2.1 and with the operation in logical combinations of those of the helicopter's systems and equipment, the operation of which may affect performance.

B.2.4 Minimum performance

At the maximum masses scheduled (see B.2.7) for take-off and for landing as functions of the take-off and landing site pressure-altitude and temperature in still air conditions, and, for water operations, in specified conditions of smooth water, the helicopter shall be capable of accomplishing the minimum performances specified in B.2.5 and B.2.6, respectively, not considering obstacles or final approach and take-off area length.

B.2.5 Take-off

a) The performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see B.2.7), the departure from the scheduled values is not disproportionate.

b) For Category A helicopters, in the event of critical engine failure at or after the take-off decision point, the helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

B.2.6 Landing

a) It shall be possible to make a safe landing on a prepared landing surface after complete power failure occurring during normal cruise.

b) For Category A helicopters, starting from the landing configuration in the event of critical engine failure at or before the landing decision point, the helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

B.2.7 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual as follows for the ranges of mass, altitude, temperature and other operational variables for which the helicopter is to be certificated, and additionally for amphibians, water surface conditions and strength of current shall be included.

a) *Hover performance.* The hover performance shall be determined for both in-ground effect and out-of-ground effect with all engines operating.

b) *Climb.* The steady rate of climb with the engine(s) operating at or within approved limits shall be established.

c) *Height-velocity envelope.* If there are any combinations of height and forward velocity (including hover) under which a safe landing cannot be made after failure of the critical engine and with the remaining engines (if applicable) operating within approved limits, a height-velocity envelope shall be established.

d) *Take-off distance – all engines operating.* Where required by the operating rules, the take-off distance — all engines operating shall be the horizontal distance required from the start take-off to the point where a selected speed up to the best rate of climb speed (Vy) and selected height above the take-off surface are achieved, all engines operating at approved take-off power required.

In addition, for Category A helicopters:

e) *Minimum performance.* The minimum climb performance shall be established for both take-off and landing.

f) *Take-off decision point.* The take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical engine inoperative.

g) *Take-off distance required.* The take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which the take-off safety speed (V_{TOSS}), a selected height above the take-off surface, and a positive climb gradient are achieved, following failure of the critical engine at take-off decision point, the remaining engine(s) operating within approved operating limits. If procedures involve rearward flight, the back-up distance shall be included.

h) *Rejected take-off distance required.* The rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the helicopter comes to a complete stop following engine failure and rejection of the take-off at the take-off decision point.

i) *Take-off path – climb gradients.* The take-off path – climb gradient shall be the steady gradient(s) of climb for the appropriate configuration(s) with the critical engine inoperative from the end of the take-off distance required to a defined point above the take-off surface.

j) *Engine inoperative climb.* The engine inoperative climb shall be the steady rate of climb/descent with the critical engine inoperative and the operating engine(s) not exceeding the power for which they are certificated.

k) *Landing decision point.* The landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical engine inoperative.

l) *Landing distance required.* The landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface with the critical engine inoperative.

B.3 Flying qualities

B.3.1 The helicopter shall comply with the Standards of this paragraph at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the helicopter is approved.

B.3.2 Controllability

B.3.2.1 The helicopter shall be controllable and manoeuvrable under all anticipated operating conditions and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of helicopter configuration) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the helicopter shall be established for all stages of flight and helicopter configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

B.3.2.2 *Controllability on the ground (or water).* The helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

B.3.2.3 *Controllability during take-off.* The helicopter shall be controllable in the event of sudden failure of the critical engine at any point in the take-off, when the helicopter is handled in the manner associated with the scheduling of the take-off data.

B.3.3 Trim

The helicopter shall have such trim and handling capabilities as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a malfunction of the systems associated with the flight controls, there shall not be any significant deterioration of the handling characteristics.

B.4 Stability and control

B.4.1 Stability

The helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. helicopter configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the helicopter shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

B.4.2 Autorotation

B.4.2.1 *Rotor speed control.* The autorotation characteristics of the helicopter shall be such as to enable the pilot to control the rotor speed to within prescribed limits and to maintain full control of the helicopter.

B.4.2.2 *Behaviour following a power loss.* The behaviour of the helicopter following a power loss shall not be so extreme as to make difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the helicopter.

B.4.2.3 *Autorotation airspeeds.* For Category A helicopters, airspeeds for autorotative landings shall be established. For other helicopters, the autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

B.4.3 Vibration

There shall be no vibration or buffeting severe enough to interfere with the control of the helicopter.

B.4.4 Ground resonance

The helicopter shall have no dangerous tendency to oscillate on the ground with the rotor turning.

SUB-PART C. STRUCTURE

C.1 General

The helicopter structure shall be designed, manufactured and provided with instructions for its maintenance with the objective of avoiding catastrophic failure throughout its operational life.

Note.— Structure includes the airframe, undercarriage, control system, blades and rotorhead, rotor pylon and auxiliary lifting surfaces.

C.2 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

C.3 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in C.7, C.8 and C.9 shall be considered as limit loads.

C.4 Strength and deformation

In the various loading conditions prescribed in C.7, C.8 and C.9, no part of the helicopter structure shall sustain detrimental deformation at any load up to and including the limit load, and the helicopter structure shall be capable of supporting the ultimate load.

C.5 Airspeeds

C.5.1 Design airspeeds

Design airspeeds shall be established for which the helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with C.7.

C.5.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with A.2.1, shall be included in the flight manual as part of the operating limitations (see G.2.3). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established.

C.6 Main rotor(s) rotational speed limits

A range of main rotor(s) speeds shall be established that:

a) with power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre, and is consistent with the kind of governor or synchronizer used; and

b) with power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

C.7 Loads

C.7.1 The loading conditions of C.7, C.8 and C.9 shall consider the range of mass and mass distributions prescribed in C.2, the main rotor rpm ranges established in C.6, and airspeeds established in accordance with C.5.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

C.7.2 Manoeuvring loads

Manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

C.7.3 Gust loads

Gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

C.8 Ground and water loads

C.8.1 The structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

C.8.2 Landing conditions

The landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the helicopter at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

C.9 Miscellaneous loads

In addition to or in conjunction with, the manoeuvering and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, pilot forces, engine torque, loads due to changes of configuration, external loads, etc.) that are likely to occur in the anticipated operating conditions.

C.10 Fatigue strength

The strength and fabrication technique of the helicopter structure shall be such as to avoid catastrophic fatigue failure under repeated loads and vibratory loads in the anticipated operating conditions. Environmental degradation, accidental damage and other likely failures shall be considered.

C.11 Special factors

Design features (e.g. castings, bearings or fittings), the strength of which are subject to variability in manufacturing processes, deterioration in service or any other cause, shall be accounted for by a suitable factor.

SUB-PART D. DESIGN AND CONSTRUCTION

D.1 General

D.1.1 Details of design and construction shall be such as to give reasonable assurance that all helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

D.1.2 Substantiation of moving parts

The functioning of all moving parts essential to the safe operation of the helicopter shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

D.1.3 Materials

All materials used in parts of the helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

D.1.4 Manufacturing methods

The methods of manufacturing and assembly shall be such as to produce consistently sound structure which shall be reliable with respect to maintenance of strength in service.

D.1.5 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the helicopter will receive.

D.1.6 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the helicopter that require such attention, either periodically or after unusually severe operations.

D.1.7 Critical parts

All critical parts used in the helicopter shall be identified and procedures shall be established to ensure that the required level of integrity for critical parts is controlled during design, manufacture and throughout the service life of those parts.

D.2 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operations and unintentional engagement of control locking devices.

   1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its function.

   2) Each element of each flight control system shall be designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *Crew environment.* The design of the flight crew compartment shall allow operation of the controls by the crew without unreasonable concentration or fatigue.

c) *Crew vision.* The arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the helicopter under all foreseeable operating conditions for which certification is requested.

d) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems which would endanger the helicopter.

e) *Fire precautions.* The helicopter shall have adequate fire protection.

f) *Incapacitation of crew.* Design precautions shall be taken to protect against the presence of toxic gases which under normal operating conditions could incapacitate the flight crew.

D.3 Flutter

Each aerodynamic surface of the helicopter shall be free from flutter under each appropriate speed and power condition.

D.4 Occupant accommodation features

D.4.1 Seating and restraints

Adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structure during the operation of the helicopter.

D.4.2 Cabin environment

Ventilation systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground operating conditions.

D.5 Electrical bonding and protection against lightning and static electricity

D.5.1 Electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the helicopter, its systems, its occupants and those who come in contact with the helicopter on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

D.5.2 The helicopter shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the helicopter.

D.6 Emergency landing provisions

D.6.1 Provisions shall be made in the design of the helicopter to protect the occupants from fire and effects of deceleration in the event of an emergency landing.

D.6.2 Facilities shall be provided for rapid evacuation of the helicopter in conditions likely to occur following an emergency landing, and such facilities shall be related to the passenger and crew capacity of the helicopter. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give reasonable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

D.7 Ground handling

Adequate provisions shall be made in the design to minimize the risk that normal ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

SUB-PART E. ROTORS AND POWERPLANT

E.1 Engines

The Standards of Part VI of this Annex shall apply to engines of all types which are used on the helicopter as primary propulsion units.

E.2 Rotors and powerplant installation

E.2.1 General

The powerplant installation and rotors shall comply with the Standards of Sub-Part D and with the Standards of E.2.

E.2.2 Design, construction and functioning

a) The rotors and rotor drive systems assembly complete with accessories shall be designed and constructed so as to function reliably within their operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the helicopter in accordance with this sub-part.

b) For helicopters of maximum certificated take-off mass greater than 3 175 kg or helicopters which are certificated to Category A Standard, an assessment shall be conducted for the rotors and rotor drive systems to ensure that they function safely throughout the full range of operating conditions. Where this assessment identifies a failure which could prevent continued safe flight or landing of the helicopter, means shall be prescribed to minimize the likelihood of that failure.

E.2.3 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations which are intended to govern the operation of the rotors and rotor drive systems shall be declared.

a) *Maximum and minimum rotor rotational speed limitations.* Maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

b) *Rotor underspeed warnings for single engine helicopters, and for multi-engine helicopters not having an approved device for automatically increasing power when an engine fails.* When the helicopter approaches a rotor rotational speed limit, with or without engines inoperative, clear and distinctive warnings shall be apparent to the pilot. The warnings or initial characteristics of the condition shall be such as to enable the pilot to arrest the development of the condition after the warning begins and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the helicopter.

E.2.4 Tests

Rotors and rotor drive systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength and vibration characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms. Overspeed characteristics shall be demonstrated to be satisfactory for helicopters of maximum certificated take-off mass greater than 3 175 kg; and

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds, and other operating conditions as are necessary to demonstrate reliability and durability of the rotors and rotor drive systems.

E.2.5 Compliance with engine, rotor and rotor drive system limitations

The powerplant installation shall be so designed that the engines, rotors and rotor drive systems are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the helicopter shall be capable of being operated without exceeding the limitations established for the engines, rotors and rotor drive systems in accordance with this sub-part and Part VI.

E.2.6 Control of engine rotation

For helicopters of a maximum certificated take-off mass greater than 3 175 kg and for helicopters which are certificated to Category A Standard, where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the failed engine in flight or to reduce it to a safe level.

E.2.7 Engine restarting

For helicopters of a maximum certificated take-off mass greater than 3 175 kg and for helicopters which are certificated to Category A Standard, a means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

E.2.8 Arrangement and functioning

E.2.8.1 *Independence of engines.* For Category A helicopters, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

E.2.8.2 *Rotors and rotor drive systems vibration.* The vibration stresses for the rotors and rotor drive systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the helicopter.

E.2.8.3 *Cooling.* The cooling system shall be capable of maintaining powerplant temperatures within the established limits (see E.2.5) at all ambient temperatures approved for operation of the helicopter. The maximum and minimum ambient air temperatures for which the powerplant has been established as being suitable shall be scheduled in the flight manual.

E.2.8.4 *Associated systems.* The fuel, oil, air induction, and other systems associated with each engine, rotor drive system and rotor, shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

E.2.8.5 *Fire protection.* For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of D.2 e).

a) *Isolation.* Such regions shall be isolated by fire resistant material from other regions of the helicopter where the presence of fire would jeopardize continued flight and landing (helicopters of a maximum certificated take-off mass greater than 3 175 kg or Category A) or would jeopardize safe landing (other helicopters), taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of fires.

c) *Fire detection.* For turbine engine installations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions, unless the fire can be readily observed in flight by the pilot in the cockpit.

d) *Fire extinguishment.* For turbine engine helicopters of a maximum certificated take-off mass greater than 3 175 kg, such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardize the safety of the helicopter.

SUB-PART F. SYSTEMS AND EQUIPMENT

F.1 General

F.1.1 The helicopter shall be provided with approved instruments, equipment and systems necessary for the safe operation of the helicopter in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the helicopter within its operating limitations. Instruments and equipment design shall consider Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Part III, for particular circumstances or on particular kinds of routes.

Note 2.— For system software certification, see Sub-part H.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

F.1.2 The design of the instruments, equipment and systems required by F.1.1 and their installation shall be such that:

a) for a Category A helicopter, an inverse relationship exists between the probability of a failure condition and the severity of its effect on the helicopter and its occupants, as determined by a system safety assessment process;

b) they perform their function under all anticipated operating conditions; and

c) electrical interference between them does not adversely effect safe operation.

F.1.3 Means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

F.1.4 The design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

F.2 Installation

Instrument and equipment installations shall comply with the Standards of Sub-part D.

F.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

F.4 Navigation lights and anti-collision lights

F.4.1 The lights required by Annex 2 — *Rules of the Air* to be displayed by helicopters in flight or operating on the movement area of an aerodrome or a heliport shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

Note 2.— See the Airworthiness Manual *(Doc 9760) for detailed technical specifications for exterior lights for helicopters.*

F.4.2 Lights shall be installed in helicopters so as to minimize the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

F.5 Electromagnetic interference protection

Aircraft electronic systems, particularly flight-critical and flight-essential systems, shall be protected as appropriate against electromagnetic interference from both internal and external sources.

F.6 Ice protection

If certification for flight in icing conditions is required, the helicopter shall be shown to be able to operate safely in all icing conditions likely to be encountered in all anticipated operating environments.

SUB-PART G. OPERATING LIMITATIONS AND INFORMATION

G.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the helicopter, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

G.2 Operating limitations

G.2.1 Limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

G.2.2 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see A.2.2).

G.2.3 Airspeed limitations

The airspeed limitations shall include all speeds (see C.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate helicopter configurations and other pertinent factors.

G.2.4 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the helicopter (see E.2.5 and E.2.8.3).

G.2.5 Rotor limitations

Limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

G.2.6 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the helicopter.

G.2.7 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the helicopter (see A.2.1).

G.2.8 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the helicopter, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft, *Part III, for the circumstances in which the flight crew includes members in addition to the minimum flight crew defined in this Annex.*

G.3 Operating information and procedures

G.3.1 Types of eligible operations

The particular types of operations for which the helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

G.3.2 Loading information

The loading information shall include the empty mass of the helicopter, together with a definition of the condition of the helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, and the usable fuel supply; it includes the *mass of all fixed ballast, unusable fuel supply and total quantity of oil, engine coolant and hydraulic fluid.*

G3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

G3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the helicopter characteristics.

G4 Performance information

The performance of the helicopter shall be scheduled in accordance with B.2. There shall be included information regarding the various helicopter configurations and powers involved and the relevant speeds, together with information which will assist the flight crew in attaining the performance as scheduled.

G5 Flight manual

A flight manual shall be made available. It shall identify clearly the specific helicopter or series of helicopters to which it is related. The flight manual shall include at least the limitations, information and procedures specified in G2, G3, G4 and G6.1.

G6 Markings and placards

G6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

G6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardize the safety of the helicopter in subsequent flights.

G7 Continuing airworthiness — maintenance information

G7.1 General

Information for use in developing procedures for maintaining the helicopter in an airworthy condition shall be made available. The information shall include that described in G7.2, G7.3 and G7.4.

G7.2 Maintenance information

Maintenance information shall include a description of the helicopter and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

G7.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note.— The development of initial maintenance programme information at the time of helicopter type certification is sometimes referred to as the Maintenance Review Board (MRB) *process or the process of developing instructions for continued airworthiness.*

G7.4 Mandatory maintenance requirements resulting from the type design approval

Mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of G7.3.

Note.— Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

SUB-PART H. SYSTEMS SOFTWARE

All systems software shall be designed and validated such as to ensure that the systems in which software is used perform their intended functions with a level of safety that complies with the requirements of this part.

Note.— Some States accept the use of national/international industry standards, such as RTCA /DO-178 or EUROCAE ED12, for the design and testing of systems software.

SUB-PART I. CRASHWORTHINESS AND CABIN SAFETY

I.1 General

Crashworthiness shall be taken into account in the design of helicopters to improve the probability of occupant survival.

I.2 Design emergency landing conditions

Emergency landing (crash) loads shall be determined so that the interiors, furnishings, support structure and safety equipment can be designed to reasonably protect occupants under emergency landing conditions. Items to be considered shall include:

a) dynamic effects;

b) restraint criteria for items that could cause a hazard;

c) deformation of the fuselage in the areas of emergency exits;

d) fuel cell integrity and position; and

e) integrity of electrical systems to avoid sources of ignition in the area of fuel components.

I.3 Cabin fire protection

The cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) flammability of cabin interior materials;

b) fire resistance and, for helicopters of a maximum certificated take-off mass greater than 3 175 kg, the generation of smoke;

c) provision of safety features to allow for safe evacuation; and

d) fire suppression equipment.

I.4 Evacuation

The helicopter shall be equipped with sufficient emergency exits to allow for cabin evacuation within an appropriate time period. Items to be considered, appropriate to the size and category of the helicopter, shall include:

a) number of seats and seating configuration;

b) number, location and size of exits;

c) marking of exits and provision of instructions for use;

d) likely blockages of exits;

e) operation of exits; and

f) positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

I.5 Lighting and marking

For helicopters with 10 or more passenger seats, emergency lighting shall be provided and shall have the following characteristics:

a) independence from main electrical supply;

b) visual indication of emergency exits; and

c) illumination both inside and outside the helicopter during evacuation.

SUB-PART J. OPERATING ENVIRONMENT AND HUMAN FACTORS

J.1 General

The helicopter shall be designed to allow safe operation within the performance limitations of users, including crew, passengers, ground handling and maintenance staff.

Note.— The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the helicopter is capable of being controlled at all phases of the flight (including a degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.

J.2 Flight crew

J.2.1 The helicopter shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with expected flight crew capabilities. Account shall be taken of the different expected operating conditions of the helicopter in its environment, including operations degraded by failures.

J.2.2 The workload imposed on the flight crew by the design of the helicopter shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the helicopter, such as engine failure.

Note.— Workload can be affected by both cognitive and physiological factors.

J.3 Ergonomics

During design of the helicopter, account shall be taken of ergonomics factors including:

a) ease of use and prevention of inadvertent misuse;

b) ease of access;

c) working environment;

d) standardization and commonality; and

e) ease of maintenance.

J.4 Operating environmental factors

The design of the helicopter shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as noise and vibration; and

b) effect of physical forces during normal flight.

PART V. SMALL AEROPLANES —

AEROPLANES OVER 750 KG BUT NOT EXCEEDING 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 DECEMBER 2007

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 The Standards of this part are applicable in respect of all aeroplanes designated in A.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 13 December 2007.

A.1.2 The Standards of this part shall apply to all aeroplanes having a maximum certificated take-off mass greater than 750 kg but not exceeding 5 700 kg intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1.— The aeroplanes described in A.1.2 are known in some States as normal, utility and aerobatic category aeroplanes.

Note 2.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

A.1.3 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in A.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

A.1.4 Unless otherwise stated, the Standards apply to the complete aeroplane including power-units, systems and equipment.

A.2 Operating limitations

A.2.1 Limiting conditions shall be established for the aeroplane, its power-units and its equipment (see G.2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

A.2.2 Limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude or pressure altitude, shall be established within which compliance with all the pertinent Standards in this part is shown.

A.3 Unsafe features and characteristics

Under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

A.4 Proof of compliance

The means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

SUB-PART B. FLIGHT

B.1 General

B.1.1 Compliance with the Standards prescribed in this Sub-part shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

B.1.2 Compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

B.1.3 Where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

B.1.4 For aeroplanes with one power-unit, or aeroplanes with more than one power-unit that cannot maintain a positive climb gradient following a power-unit failure, the design shall, in the case of engine failure, enable the aeroplane to be operated to a safe forced landing in favourable conditions.

B.2 Performance

B.2.1 Sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

B.2.2 Achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

B.2.3 The scheduled performance of the aeroplane shall be consistent with compliance with A.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

B.2.4 Minimum performance

Minimum performance shall be scheduled for aeroplanes with more than one power-unit that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg as follows:

a) at the maximum mass scheduled (see B.2.7) for take-off and for landing, as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions; and

b) for seaplanes in specified conditions in smooth water,

the aeroplane shall be capable of accomplishing the minimum performances specified in B.2.5 a) and B.2.6 a) respectively, not considering obstacles, or runway or water run length.

Note.— This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the flight manual against, for example:

— aerodrome elevation, or

— pressure-altitude at aerodrome level, or

— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

B.2.5 Take-off

a) For aeroplanes with more than one power-unit that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, after the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical power-unit inoperative and the remaining power-units operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

b) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see B.2.7), the departure from the scheduled values is not disproportionate.

B.2.6 Landing

a) For aeroplanes with more than one power-unit that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, starting from the approach configuration and with the critical power-unit inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

b) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all power-units operating.

B.2.7 Scheduling of performance

Performance data shall be determined and scheduled in the flight manual in order to provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

a) *Take-off.* The take-off performance data shall include the distance required to take-off and climb to a selected height above the take-off surface. It must be determined for each mass, altitude and temperature within the operational limits established for take-off with:

— take-off power on each engine;

— wing flaps in the take-off position(s); and,

— landing gear extended.

b) *En route.* For aeroplanes with more than one power-unit, the en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with the critical power-unit inoperative. The operating power-unit(s) shall not exceed maximum continuous power or thrust.

c) *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

B.3 Flying qualities

B.3.1 The aeroplane shall comply with the Standards of B.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

B.3.2 Controllability

B.3.2.1 The aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any power-unit. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note.— This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.

B.3.2.2 *Controllability on the ground (or water).* The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

B.3.2.3 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical power-unit at any point in the take-off.

B.3.2.4 *Take-off safety speed.* The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical power-unit.

B.3.3 Trim

The aeroplane shall have such trim characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more power-units for which performance characteristics are established.

B.4 Stability and control

B.4.1 Stability

The aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. The stability may be achieved by natural or artificial means, or a combination of both. In those cases where artificial stability is necessary to show compliance with the Standards of this part, it shall be shown that any failure or condition that would result in the need for exceptional pilot skill or strength for recovery of aeroplane stability is extremely improbable.

Note.— Guidance material concerning the expression "extremely improbable" is contained in the Airworthiness Manual *(Doc 9760).*

B.4.2 Stalling

B.4.2.1 *Stall warning.* When the aeroplane approaches a stall both in straight and turning flight, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

B.4.2.2 *Behaviour following a stall.* In any configuration and at any level of power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane.

B.4.2.3 *Stalling speeds.* The stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

B.4.3 Flutter and vibration

B.4.3.1 It shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see A.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

B.4.3.2 There shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew within the operating limitations of the aeroplane.

Note.— Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

B.4.4 Spinning

It shall be demonstrated that the aeroplane during normal operation does not exhibit any tendency to inadvertently enter into a spin. If the design is such that spinning is allowed or for aeroplanes with one power-unit inadvertently possible, it shall be demonstrated that with normal use of the controls and without the use of exceptional piloting skill the aeroplane can be recovered from a spin within appropriate recovery limits.

SUB-PART C. STRUCTURE

C.1 General

The aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

C.2 Mass and mass distribution

Unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

C.3 Limit loads

Except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in C.6 shall be considered as limit loads.

C.4 Deformation and ultimate strength

In the various loading conditions prescribed in C.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

C.5 Airspeeds

C.5.1 Design airspeeds

Design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedences due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

C.5.2 Limiting airspeeds

Limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with A.2.1, shall be included in the flight manual as part of the operating limitations (see G.2).

C.6 Strength

C.6.1 All structural elements shall be designed to withstand the maximum loads expected in service under all anticipated operating conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) the expected operational life of the aeroplane;

b) the vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) the manoeuvre spectrum, taking into account variations in mission profiles, and loading configurations;

d) asymmetrical as well as symmetrical loading;

e) the ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;

f) the speed range of the aeroplane, taking into account the aeroplane characteristics and operation limitations;

g) vibration and buffeting loads;

h) corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) any other loads, such as flight control loads, cabin pressurization loads, engine loads, or dynamic loads due to changes to the steady state configuration.

C.6.2 The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

C.7 Survivability

The aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water or object impact. Consideration shall be given to at least the following:

a) energy absorption by the airframe, occupant seats and restraints; and

b) allowing egress in the shortest practicable time.

C.8 Structural durability

The design and construction of the aeroplane shall conform to damage tolerance, safe-life or failsafe principles and shall be such as to ensure that the probability of catastrophic failure during the operational life is extremely remote, taking into account, where appropriate:

a) the expected environment;

b) the expected repeated loads applied in service;

c) expected vibrations from aerodynamic interaction or internal sources;

d) thermal cycles;

e) accidental and discrete source damage;

f) likely corrosion or other degradation;

g) specified maintenance; and

h) likely structural repairs.

Note.— Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual *(Doc 9760).*

SUB-PART D. DESIGN AND CONSTRUCTION

D.1 General

D.1.1 Details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

D.1.2 Substantiation of moving parts

The functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

D.1.3 Materials

All materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

D.1.4 Manufacturing methods

The methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

D.1.5 Protection

The structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

D.1.6 Inspection provisions

Adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

D.2 Systems design features

Special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operation including prevention of mis-assembly, and unintentional engagement of control surface locking devices.

   1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its functions.

   2) Each element of each flight control system shall be designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *System survivability.* Aeroplane systems shall be designed and arranged to maximize the potential for continued safe flight and landing after events resulting in damage to the aeroplane structure or systems.

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions of moderate rain, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following power-unit or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this Annex and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture shall be such as to minimize the possibility of in-flight and ground fires, to minimize the production of smoke and toxic gases in the event of a fire and to delay the occurrence of flashover in the cabin.

g) *Cargo compartment protection.*

1) Sources of heat within the compartment which are capable of igniting the cargo or baggage shall be shielded or insulated to prevent such ignition; and

2) Each cargo and baggage compartment shall be constructed of materials which are at least flame resistant.

h) *Incapacitation of occupants.* Design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases that could incapacitate the occupants of the aeroplane.

D.3 Aeroelasticity

The aeroplane shall be free from flutter, structural divergence, control reversal, loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with A.2.1. Account shall be taken of the characteristics of the aeroplane.

D.4 Occupant accommodation features

D.4.1 Seating and restraints

Adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structure during the operation of the aeroplane.

D.4.2 Cabin environment

Ventilation, heating and, where applicable, pressurization systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

D.5 Electrical bonding and protection against lightning and static electricity

D.5.1 Electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

D.5.2 The aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the aeroplane.

D.6 Emergency landing provisions

D.6.1 Provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

D.6.2 Facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

D.7 Ground handling

Design provisions and procedures for safe ground-handling (e.g. towing, jacking) shall be defined. The protection that any limitations and instructions for such operations might provide may be taken into account.

SUB-PART E. POWERPLANT

E.1 Engines

The Standards of Part VI of this Annex shall apply to each engine that is used on the aeroplane as a primary propulsion unit.

E.2 Propellers

The Standards of Part VII of this Annex shall apply to each propeller that is used on the aeroplane.

E.3 Powerplant installation

E.3.1 Compliance with engine and propeller limitations

The powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this sub-part.

E.3.2 Control of engine rotation

In those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

Note.— In the case of propeller blade separation it may be impossible to stop engine rotation.

E.3.3 Turbine engine

For a turbine engine installation:

a) the design shall minimize the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) the power-unit together with the associated engine control devices, systems and instrumentation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

E.3.4 Engine restarting

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

E.3.5 Arrangement and functioning

E.3.5.1 *Independence of power-units.* The powerplant shall be arranged and installed so that each power-unit together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

E.3.5.2 *Propeller vibration.* The propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

E.3.5.3 *Cooling.* The cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see E.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane.

E.3.5.4 *Associated systems.* The fuel, oil, air induction, and other systems associated with the power-unit shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

E.3.5.5 *Fire protection.* For regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of D.2 f).

a) *Isolation.* Such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fire proof or shielded from the effects of the fire.

c) *Fire detection.* A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions of the following aeroplane types: aeroplanes with more than one power-unit powered by turbine or turbo-charged engines, or aeroplanes where the engine(s) are not readily visible from the cockpit.

SUB-PART F. SYSTEMS AND EQUIPMENT

F.1 General

F.1.1 The aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall consider Human Factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2.— For systems software assessment, see Sub-part H.

Note 3.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683) and in the* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

F.1.2 The design of the instruments, equipment and systems required by F.1.1 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) they perform their function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

F.1.3 Means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

F.1.4 The design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

F.2 Installation

Instrument and equipment installations shall comply with the Standards of Sub-part D.

F.3 Safety and survival equipment

Prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

F.4 Navigation lights and anti-collision lights

F.4.1 The lights required by Annex 2 — *Rules of the Air* to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note.— It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

F.4.2 Lights shall be installed in aeroplanes so as to minimize the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

Note.— In order to avoid the effects mentioned in F.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.

F.5 Electromagnetic interference protection

Aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

F.6 Ice protection

If certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all expected operating environments.

SUB-PART G. OPERATING LIMITATIONS AND INFORMATION

G.1 General

The operating limitations within which compliance with the Standards of this Annex is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in this sub-part.

G.2 Operating limitations

G.2.1 Limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

G.2.2 Loading limitations

The loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see A.2.2).

G.2.3 Airspeed limitations

The airspeed limitations shall include all speeds (see C.5) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

G.2.4 Powerplant limitations

The powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see E.3.1 and E.3.5.3).

G.2.5 Limitations on equipment and systems

The limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

G.2.6 Miscellaneous limitations

Miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see A.2.1).

G.2.7 Flight crew limitations

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note.— See Annex 6 — Operation of Aircraft, *Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this Annex.*

G.3 Operating information and procedures

G.3.1 Types of eligible operations

The particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

G.3.2 Loading information

The loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note.— Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

G3.3 Operating procedures

A description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more power-units.

G3.4 Handling information

Sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by B.4.2.3 shall be scheduled.

G4 Performance information

The performance of the aeroplane shall be scheduled in accordance with B.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

G5 Flight manual

A flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in G2, G3, G4 and G6.1.

G6 Markings and placards

G6.1 Markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

G6.2 Markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

G7 Continuing airworthiness — maintenance information

G7.1 General

Information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in G7.2, G7.3 and G7.4.

G7.2 Maintenance information

Maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

G7.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note.— The development of initial maintenance programme information at the time of aircraft type certification is sometimes referred to as the Maintenance Review Board (MRB) process or the process of developing instructions for continued airworthiness.

G7.4 Mandatory maintenance requirements resulting from the type design approval

Mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of G7.3.

Note.— Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

SUB-PART H. SYSTEMS SOFTWARE

All systems software shall be designed and validated such as to ensure that the systems in which software is used perform their intended functions with a level of safety that complies with the requirements of this part, notably those of F.1.2 a) and F.1.3.

Note.— Some States accept the use of national/international industry standards, such as RTCA/DO-178 or EUROCAE ED12, for the design and testing of systems software.

SUB-PART I. CRASHWORTHINESS AND CABIN SAFETY

I.1 General

Crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

I.2 Design emergency landing loads

Emergency landing (crash) loads shall be determined for all categories of aeroplanes so that the interiors, furnishings, support structure and safety equipment can be designed to maximize survivability for the occupants. Items to be considered shall include:

a) dynamic effects;

b) restraint criteria for items that could cause a hazard;

c) distortion of the fuselage in the areas of emergency exits;

d) fuel cell integrity and position; and

e) integrity of electrical systems to avoid sources of ignition.

I.3 Cabin fire protection

The cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) flammability of cabin interior materials;

b) fire resistance and the generation of smoke and toxic fumes;

c) provision of safety features to allow for safe evacuation; and

d) fire detection and suppression equipment.

I.4 Evacuation

The aeroplane shall be equipped with sufficient emergency exits to allow for cabin evacuation within an appropriate time period. Items to be considered, appropriate to the size of the aeroplane, shall include:

a) number of seats and seating configuration;

b) number, location and size of exits;

c) marking of exits and provision of instructions for use;

d) likely blockages of exits;

e) operation of exits; and

f) positioning and weight of evacuation equipment at exits, e.g. rafts.

I.5 Lighting and marking

Emergency lighting, if installed, shall have the following characteristics:

a) independence from main electrical supply;

b) automatic activation upon loss of normal power/impact;

c) visual indication of emergency exits;

d) illumination both inside and outside the aeroplane during evacuation; and

e) no additional hazards in the event of fuel spillage, emergency landings and minor crash events.

SUB-PART J. OPERATING ENVIRONMENT AND HUMAN FACTORS

J.1 General

The aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note.— The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.

J.2 Flight crew

J.2.1 The aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

J.2.2 The workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

Note.— Workload can be affected by both cognitive and physiological factors.

J.3 Ergonomics

During design of the aeroplane, account shall be taken of ergonomic factors including:

a) ease of use and prevention of inadvertent misuse;

b) ease of access;

c) working environment;

d) standardization and commonality; and

e) ease of maintenance.

J.4 Operating environmental factors

The design of the aeroplane shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;

b) effect of physical forces during normal flight;

c) effect of prolonged operation at high altitude; and

d) physical comfort.

PART VI. ENGINES

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 Except as noted below, the Standards of this part are applicable to engines of all types, used as primary propulsion units, as required in Parts IIIB, IVB and V.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

A.1.2 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code for the engines designated in A.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

A.2 Engine installation and interfaces

A.2.1 All necessary information for the safe and correct interfaces between the engine and the aircraft shall be made available.

A.2.2 The installation instructions shall specify those assumptions concerning the conditions that may be imposed on the engine when it is eventually installed in an aircraft.

A.3 Declared ratings, conditions and limitations

A.3.1 The thrust or power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

A.3.2 Within the stated limits of A.3.1, the engine shall produce the thrust or power demanded of it at all required flight conditions, taking into account environmental effects and conditions.

A.4 Continuing airworthiness – maintenance information

A.4.1 General

Information for use in developing procedures for maintaining the engine in an airworthy condition shall be made available. The information shall include that described in A.4.2, A.4.3 and A.4.4.

A.4.2 Maintenance information

Maintenance information shall include a description of the engine and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

A.4.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

A.4.4 Mandatory maintenance requirements resulting from the type design approval

Mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of A.4.3.

SUB-PART B. DESIGN AND CONSTRUCTION

B.1 Functioning

The engine shall be designed and constructed so as to function reliably within its operating limitations under its anticipated operating conditions when installed in accordance with Parts IIIB, IVB or V of this Annex and, if applicable, fitted with a propeller approved for the installation.

B.2 Failure analysis

For turbine engines, a safety assessment of the engine shall be conducted to ensure that it functions safely throughout the full range of operating conditions. A summary shall be made of all foreseeable failures and combinations of failures that result in hazardous engine effects. If the primary failure of single elements (for example, disks) is likely to result in hazardous engine effects, reliance shall be placed on meeting prescribed integrity requirements.

B.3 Materials and manufacturing methods

The selection of materials and the manufacturing methods and processes shall account for the operational environment of the engine expected in service. The materials and manufacturing methods and processes used in the construction of the engine shall result in known and reproducible structural behaviour.

B.4 Integrity

The integrity of the engine shall be demonstrated throughout its operating envelope and be maintained for its operational life. The effects of cyclic loading, environmental and operational degradation and likely subsequent part failures shall not reduce the integrity of the engine below acceptable levels. All necessary instructions for ensuring continued airworthiness in this regard shall be promulgated.

SUB-PART C. TESTS

The engine type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration*. Tests shall be conducted to establish the power or thrust characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation*. Tests shall be conducted to ensure that starting, idling, acceleration, vibration, over-speeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge, flutter or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance*. Tests of sufficient duration shall be conducted at such powers, thrust, speeds, temperatures and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

d) *Operating Environment*. Tests shall be conducted to ensure that the engine characteristics are satisfactory with regard to the operating environment.

Note.— Operating environment may include encounter with birds, rain and hail, electromagnetic interference and lightning.

PART VII. PROPELLERS

SUB-PART A. GENERAL

A.1 Applicability

A.1.1 The Standards of this part are applicable to all propellers, as required in Parts IIIB and V.

Note.— The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

A.1.2 The level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code for the propellers designated in A.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

A.2 Declared ratings, conditions and limitations

The power ratings and all operating conditions and limitations which are intended to govern the operation of the propeller shall be declared.

A.3 Continuing airworthiness — maintenance information

A.3.1 General

Information for use in developing procedures for maintaining the propeller in an airworthy condition shall be made available. The information shall include that described in A.3.2, A.3.3 and A.3.4.

A.3.2 Maintenance information

Maintenance information shall include a description of the propeller and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

A.3.3 Maintenance programme information

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

A.3.4 Mandatory maintenance requirements resulting from the type design approval

Mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of A.3.3.

SUB-PART B. DESIGN AND CONSTRUCTION

B.1 Functioning

The propeller assembly shall be designed and constructed so as to function reliably within its operating limitations under its anticipated operating conditions when installed in accordance with Parts IIIB or V of this Annex and shown to be not hazardous.

B.2 Failure analysis

A safety assessment of the propeller shall be conducted to ensure that it functions safely throughout the full range of operating conditions. A summary shall be made of those failures which could result in hazardous propeller effects. If the primary failure of single elements (for example, blades) is likely to result in hazardous propeller effects, reliance must be placed on meeting prescribed integrity requirements.

B.3 Materials and manufacturing methods

The selection of materials and the manufacturing methods and processes shall account for the operational environment of the propeller expected in service. The materials and manufacturing methods and processes used in the construction of the propeller shall result in known and reproducible structural behaviour.

B.4 Pitch control and indication

B.4.1 No loss of normal propeller pitch control shall cause a hazardous overspeeding under anticipated operating conditions.

B.4.2 No single failure or malfunction in the propeller control system during normal or emergency operation shall result in unintended travel of the propeller blades to a position below the in-flight low-pitch position. Failure of structural elements need not be considered if the occurrence of such a failure is shown to be extremely remote.

SUB-PART C. TESTS AND INSPECTIONS

C.1 Blade retention test

Propeller assemblies with detachable blades shall be subjected to a centrifugal load with sufficient margin to ensure that the hub and blade retention system will operate satisfactorily and reliably under the expected loads in service under all anticipated operating conditions.

C.2 Operational and endurance tests

The propeller shall satisfactorily complete such tests as are necessary to ensure that it will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Function.* Tests shall be conducted to demonstrate proper and reliable functioning of the pitch control system.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the propeller.

c) *Operating Environment.* Except for fixed pitch wood propellers, it shall be demonstrated by tests or analysis based on tests or experience on similar designs, that the propeller is capable of withstanding the likely impact of a bird or a lightning strike without causing a hazardous propeller effect.

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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International Standards and
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Annex 9
to the Convention on
International Civil Aviation

Facilitation

This edition incorporates all amendments adopted by the Council prior to 8 March 2005 and supersedes, on 24 November 2005, all previous editions of Annex 9.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Twelfth Edition
July 2005

International Civil Aviation Organization

Published in separate English, Arabic, Chinese, French, Russian and Spanish editions by the International Civil Aviation Organization. All correspondence, except orders and subscriptions, should be addressed to the Secretary General.

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TRANSMITTAL NOTE

NEW EDITIONS OF ANNEXES TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

It has come to our attention that when a new edition of an Annex is published, users have been discarding, along with the previous edition of the Annex, the **Supplement** to the previous edition. Please note that the Supplement to the previous edition should be retained until a new Supplement is issued.

International Standards and Recommended Practices

Annex 9
to the Convention on International Civil Aviation

Facilitation

This edition incorporates all amendments adopted by the Council prior to 8 March 2005 and supersedes, on 24 November 2005, all previous editions of Annex 9.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Twelfth Edition
July 2005

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-19	24/11/05	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

Standards and Recommended Practices on Facilitation were first adopted by the Council on 25 March 1949, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and designated as Annex 9 to the Convention with the title "Standards and Recommended Practices — Facilitation". They became effective on 1 September 1949. The Standards and Recommended Practices were based on recommendations of the First and Second Sessions of the Facilitation Division, held at Montreal in February 1946 and at Geneva in June 1948. They were expanded and amended comprehensively as a result of subsequent Sessions of the Division, i.e., the Third Session, held at Buenos Aires in December 1951, the Fourth Session, held at Manila in October 1955, the Fifth Session, held at Rome in December 1959, the Sixth Session, held at Mexico City in March-April 1963, the Seventh Session, held at Montreal in May 1968, the Eighth Session, held at Dubrovnik in March 1973, the Ninth Session held at Montreal in April-May 1979, the Tenth Session held at Montreal in September 1988 and the Eleventh Session held in Montreal in April 1995, and the Third Meeting of the Facilitation (FAL) Panel held in Montreal in February 2001. As a result of the Division's and FAL Panel's Recommendations for amendment of Annex 9 and Council's action thereon, the Second Edition of Annex 9 became effective on 1 March 1953, the Third Edition on 1 November 1956, the Fourth Edition on 1 November 1960, the Fifth Edition on 1 April 1964, the Sixth Edition on 1 April 1969, the Seventh Edition on 15 April 1974, the Eighth Edition on 15 July 1980, the Ninth Edition on 15 November 1990, the Tenth Edition on 30 April 1997 and the Eleventh Edition on 15 July 2002.

Twelfth Edition.— The present edition incorporates, *inter alia*, provisions arising from the A-type recommendations of the Twelfth Session of the Facilitation Division (FAL/12) (Cairo, Egypt, 22 March to 1 April 2004) on issues including Machine Readable Travel Documents (MRTDs), the deployment of biometric technologies in travel documents, aviation security, travel document fraud and illegal immigration, advance passenger information, international health issues and regulations, and assistance to aircraft accident victims and their families. This again resulted in a comprehensive amendment of Annex 9. This Twelfth Edition of Annex 9 became effective on 11 July 2005 and is to become applicable on 24 November 2005.

The Standards and Recommended Practices on Facilitation are the outcome of Article 37 of the Convention, which provides, *inter alia,* that the "International Civil Aviation Organization shall adopt and amend from time to time, as may be necessary, international standards and recommended practices and procedures dealing with . . . customs and immigration procedures . . . and such other matters concerned with the safety, regularity and efficiency of air navigation as may from time to time appear appropriate". The policy with respect to the implementation by States of the Standards and Recommended Practices on Facilitation is strengthened by Article 22 of the Convention, which expresses the obligation accepted by each Contracting State "to adopt all practicable measures, through the issuance of special regulations or otherwise, to facilitate and expedite navigation by aircraft between the territories of Contracting States, and to prevent unnecessary delays to aircraft, crews, passengers, and cargo, especially in the administration of the laws relating to immigration, quarantine, customs and clearance", and by Article 23 of the Convention, which expresses the undertaking of each Contracting State "so far as it may find practicable, to establish customs and immigration procedures affecting international air navigation in accordance with the practices which may be established or recommended from time to time pursuant to this Convention".*

In addition to the Standards and Recommended Practices of Annex 9, the Organization's FAL Programme is based on the FAL Resolutions of the Assembly and B-type recommendations of FAL Division Sessions which are those recommendations which do not suggest amendments to the Annex provisions.

Applicability

As indicated in Chapter 1, Section B, the Standards and Recommended Practices in this document apply to all

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* A number of other articles of the Convention have special pertinence to the provisions of the FAL Annex and have been taken into account in its preparation. In particular, persons responsible for the implementation of the provisions of this Annex should be familiar with the following articles in addition to Articles 22 and 23:
Article 10, Landing at customs airport;
Article 11, Applicability of air regulations;
Article 13, Entry and clearance regulations;
Article 14, Prevention of spread of disease;
Article 24, Customs duty;
Article 29, Documents carried in aircraft;
Article 35, Cargo restrictions.

categories of aircraft operation except where a particular provision specifically refers to one type of operation without mentioning other types of operations.

The Standards and Recommended Practices on Facilitation inevitably take two forms: first a "negative" form, e.g. that States shall not impose more than certain maximum requirements in the way of paperwork, restrictions of freedom of movement, etc., and second a "positive" form, e.g. that States shall provide certain minimum facilities for passenger convenience, for traffic which is merely passing through, etc. Whenever a question arises under a "negative" provision, it is assumed that States will, wherever possible, relax their requirements below the maximum set forth in the Standards and Recommended Practices. Wherever there is a "positive" provision, it is assumed that States will, wherever possible, furnish more than the minimum set forth in the Standards and Recommended Practices.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Attention of States is also drawn to the provision of Annex 15 related to the publication of significant differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Contracting States should make every effort to publish the FAL information required by Annex 15 (as amplified by the *Aeronautical Information Services Manual* — Doc 8126) and, in particular, ensure that they conform with the new requirements as to presentation and contents of such information prescribed by the Twelfth Edition of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

General information

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined, in the case of this Annex, as follows:

Standard: Any specification, the uniform observance of which has been recognized as practicable and as necessary to facilitate and improve some aspect of international air navigation, which has been adopted by the Council pursuant to Article 54 (*l*) of the Convention, and in respect of which non-compliance must be notified by Contracting States to the Council in accordance with Article 38.

Recommended Practice: Any specification, the observance of which has been recognized as generally practicable and as highly desirable to facilitate and improve some aspect of international air navigation, which has been adopted by the Council pursuant to Article 54 (*l*) of the Convention, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but it is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the words **Recommended Practice**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.*

Any reference to a portion of this document which is identified by a number includes all subdivisions of the portion.

Throughout this Annex, the use of the male gender should be understood to include male and female persons.

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS AND GENERAL PRINCIPLES

A. Definitions

When the following terms are used in the Standards and Recommended Practices on Facilitation, they have the following meanings:

Admission. The permission granted to a person to enter a State by the public authorities of that State in accordance with its national laws.

Aircraft equipment. Articles, including first-aid and survival equipment and commissary supplies, but not spare parts or stores, for use on board an aircraft during flight.

Aircraft operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Aircraft operators' documents. Air waybills/consignment notes, passenger tickets and boarding passes, bank and agent settlement plan documents, excess baggage tickets, miscellaneous charges orders (M.C.O.), damage and irregularity reports, baggage and cargo labels, timetables, and weight and balance documents, for use by aircraft operators.

Airline. As provided in Article 96 of the Convention, any air transport enterprise offering or operating a scheduled international air service.

Authorized agent. A person who represents an aircraft operator and who is authorized by or on behalf of such operator to act on formalities connected with the entry and clearance of the operator's aircraft, crew, passengers, cargo, mail, baggage or stores and includes, where national law permits, a third party authorized to handle cargo on the aircraft.

Baggage. Personal property of passengers or crew carried on an aircraft by agreement with the operator.

Border integrity. The enforcement, by a State, of its laws and/or regulations concerning the movement of goods and/or persons across its borders.

Cargo. Any property carried on an aircraft other than mail, stores and accompanied or mishandled baggage.

Clearance of goods. The accomplishment of the customs formalities necessary to allow goods to enter home use, to be exported or to be placed under another customs procedure.

Commencement of journey. The point at which the person began his journey, without taking into account any airport at which he stopped in direct transit, either on a through-flight or a connecting flight, if he did not leave the direct transit area of the airport in question.

Commissary supplies. Items, either disposable or intended for multiple use, that are used by the aircraft operator for provision of services during flights, in particular for catering, and for the comfort of passengers.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

Declarant. Any person who makes a goods declaration or in whose name such a declaration is made.

Deportation order. A written order, issued by the competent authorities of a State and served upon a deportee, directing him to leave that State.

Deportee. A person who had legally been admitted to a State by its authorities or who had entered a State illegally, and who at some later time is formally ordered by the competent authorities to leave that State.

Direct transit area. A special area established in an international airport, approved by the public authorities concerned and under their direct supervision or control, where passengers can stay during transit or transfer without applying for entry to the State.

Direct transit arrangements. Special arrangements approved by the public authorities concerned by which traffic which is pausing briefly in its passage through the Contracting State may remain under their direct control.

Disembarkation. The leaving of an aircraft after a landing, except by crew or passengers continuing on the next stage of the same through-flight.

Disinsection. The operation in which measures are taken to control or kill insects present in aircraft and in containers.

Embarkation. The boarding of an aircraft for the purpose of commencing a flight, except by such crew or passengers as have embarked on a previous stage of the same through-flight.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Free zone. A part of the territory of a Contracting State where any goods introduced are generally regarded, insofar as import duties and taxes are concerned, as being outside the customs territory.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Ground equipment. Articles of a specialized nature for use in the maintenance, repair and servicing of an aircraft on the ground, including testing equipment and cargo- and passenger-handling equipment.

Immigration control. Measures adopted by States to control the entry into, transit through and departure from their territories of persons travelling by air.

Import duties and taxes. Customs duties and all other duties, taxes or charges, which are collected on or in connection with the importation of goods. Not included are any charges which are limited in amount to the approximate cost of services rendered or collected by the customs on behalf of another national authority.

Improperly documented person. A person who travels, or attempts to travel: (a) with an expired travel document or an invalid visa; (b) with a counterfeit, forged or altered travel document or visa; (c) with someone else's travel document or visa; (d) without a travel document; or (e) without a visa, if required.

Inadmissible person. A person who is or will be refused admission to a State by its authorities.

Infected area. (for human health purposes) Defined as geographical areas where human and/or animal vector-borne diseases are actively transmitted, as reported by local or national public health authorities or by the World Health Organization.

Note.— A list of infected areas notified by health administrations is published in the World Health Organization's Weekly Epidemiological Record.

International airport. Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

Lading. The placing of cargo, mail, baggage or stores on board an aircraft to be carried on a flight.

Mail. Dispatches of correspondence and other items tendered by and intended for delivery to postal services in accordance with the rules of the Universal Postal Union (UPU).

Mishandled baggage. Baggage involuntarily, or inadvertently, separated from passengers or crew.

Narcotics control. Measures to control the illicit movement of narcotics and psychotropic substances by air.

Person with disabilities. Any person whose mobility is reduced due to a physical incapacity (sensory or locomotor), an intellectual deficiency, age, illness or any other cause of disability when using transport and whose situation needs special attention and the adaptation to the person's needs of the services made available to all passengers.

Pilot-in-command. The pilot responsible for the operation and safety of the aircraft during flight time.

Public authorities. The agencies or officials of a Contracting State responsible for the application and enforcement of the particular laws and regulations of that State which relate to any aspect of these Standards and Recommended Practices.

Release of goods. The action by the customs authorities to permit goods undergoing clearance to be placed at the disposal of the persons concerned.

Relief flights. Flights operated for humanitarian purposes which carry relief personnel and relief supplies such as food, clothing, shelter, medical and other items during or after an emergency and/or disaster and/or are used to evacuate persons from a place where their life or health is threatened by such emergency and/or disaster to a safe haven in the same State or another State willing to receive such persons.

Removal of a person. Action by the public authorities of a State, in accordance with its laws, to direct a person to leave that State.

Removal order. A written order served by a State on the operator on whose flight an inadmissible person travelled into that State, directing the operator to remove that person from its territory.

Risk assessment. An assessment by a deporting State of a deportee's suitability for escorted or unescorted removal via commercial air services. The assessment should take into account all pertinent factors, including medical, mental and physical fitness for carriage on a commercial flight, willingness or unwillingness to travel, behavioural patterns and any history of violence.

Risk management. The systematic application of management procedures and practices which provide border inspection agencies with the necessary information to address movements or consignments which represent a risk.

Security equipment. Devices of a specialized nature for use, individually or as part of a system, in the prevention or detection of acts of unlawful interference with civil aviation and its facilities.

Spare parts. Articles, including engines and propellers, of a repair or replacement nature for incorporation in an aircraft.

State of Registry. The State on whose register the aircraft is entered.

Stores (Supplies). a) Stores (supplies) for consumption; and b) Stores (supplies) to be taken away.

Stores (Supplies) for consumption. Goods, whether or not sold, intended for consumption by the passengers and the crew on board aircraft, and goods necessary for the operation and maintenance of aircraft, including fuel and lubricants.

Stores (Supplies) to be taken away. Goods for sale to the passengers and the crew of aircraft with a view to being landed.

Temporary admission. The customs procedure under which certain goods can be brought into a customs territory conditionally relieved totally or partially from payment of import duties and taxes; such goods must be imported for a specific purpose and must be intended for re-exportation within a specified period and without having undergone any change except normal depreciation due to the use made of them.

Through-flight. A particular operation of aircraft, identified by the operator by the use throughout of the same symbol, from point of origin via any intermediate points to point of destination.

Travel document. A passport or other official document of identity issued by a State or organization, which may be used by the rightful holder for international travel.

Unaccompanied baggage. Baggage that is transported as cargo and may or may not be carried on the same aircraft with the person to whom it belongs.

Unclaimed baggage. Baggage that arrives at an airport and is not picked up or claimed by a passenger.

Unidentified baggage. Baggage at an airport, with or without a baggage tag, which is not picked up by or identified with a passenger.

Unlading. The removal of cargo, mail, baggage or stores from an aircraft after a landing.

Visitor. Any person who disembarks and enters the territory of a Contracting State other than that in which that person normally resides; remains there lawfully as prescribed by that Contracting State for legitimate non-immigrant purposes, such as touring, recreation, sports, health, family reasons, religious pilgrimages, or business; and does not take up any gainful occupation during his stay in the territory visited.

B. General Principles

1.1 The Standards and Recommended Practices in this Annex shall apply to all categories of aircraft operation except where a particular provision refers specifically to only one type of operation.

1.2 Contracting States shall take necessary measures to ensure that:

a) the time required for the accomplishment of border controls in respect of persons and aircraft and for the release/clearance of goods is kept to the minimum;

b) minimum inconvenience is caused by the application of administrative and control requirements;

c) exchange of relevant information between Contracting States, operators and airports is fostered and promoted to the greatest extent possible; and

d) optimal levels of security, and compliance with the law, are attained.

1.3 Contracting States shall use risk management in the application of border control procedures for the release/clearance of goods.

1.4 Contracting States shall develop effective information technology to increase the efficiency and effectiveness of their procedures at airports.

1.5 Contracting States shall develop procedures for the pre-arrival lodgement of data so as to enable expeditious release/clearance.

1.6 The provisions of this Annex shall not preclude the application of national legislation with regard to aviation security measures or other necessary controls.

CHAPTER 2. ENTRY AND DEPARTURE OF AIRCRAFT

A. General

2.1 Contracting States shall adopt appropriate measures for the clearance of aircraft arriving from or departing to another Contracting State and shall implement them in such a manner as to prevent unnecessary delays.

2.2 In developing procedures aimed at the efficient clearance of entering or departing aircraft, Contracting States shall take into account the application of aviation security and narcotics control measures, where appropriate.

2.3 **Recommended Practice.—** *The appropriate public authorities of Contracting States should enter into Memoranda of Understanding with the airlines providing international services to that State and with the operators of its international airports, setting out guidelines for their mutual cooperation in countering the threat posed by international trafficking in narcotics and psychotropic substances. Such Memoranda of Understanding should be patterned after the applicable models developed by the World Customs Organization for this purpose. In addition, Contracting States are encouraged to conclude Memoranda of Understanding amongst themselves.*

2.4 **Recommended Practice.—** *In accordance with the International Health Regulations of the World Health Organization, Contracting States should not interrupt air transport services for health reasons. In cases where, in exceptional circumstances, such service suspensions are under consideration, Contracting States should first consult with the World Health Organization and the health authorities of the State of occurrence of the disease before taking any decision as to the suspension of air transport services.*

B. Documents — requirements and use

2.5 Contracting States shall not require any documents, other than those provided for in this Chapter, for the entry and departure of aircraft.

2.6 Contracting States shall not require a visa nor shall any visa or other fee be collected in connection with the use of any documentation required for the entry or departure of aircraft.

2.7 **Recommended Practice.—** *Documents for entry and departure of aircraft should be accepted if furnished in Arabic, English, French, Russian or Spanish. Any Contracting State may require an oral or written translation into its own language.*

2.8 Subject to the technological capabilities of the Contracting State, documents for the entry and departure of aircraft shall be accepted when presented:

a) in electronic form, transmitted to an information system of the public authorities;

b) in paper form, produced or transmitted electronically; or

c) in paper form, completed manually following the formats depicted in this Annex.

2.9 When a particular document is transmitted by or on behalf of the aircraft operator and received by the public authorities in electronic form, the Contracting State shall not require the presentation of the same document in paper form.

2.10 Contracting States shall not normally require the presentation of a General Declaration.

2.10.1 On those occasions when a General Declaration is required, the information requirements shall be limited to the elements indicated in Appendix 1. The information shall be accepted in either electronic or paper form.

2.11 When a Contracting State requires the General Declaration only for the purposes of attestation, it shall adopt measures by which that attestation requirement may be satisfied by a statement added, either manually or by use of a rubber stamp containing the required text, to one page of the Cargo Manifest. Such attestation shall be signed by the authorized agent or the pilot-in-command.

2.12 Contracting States shall not normally require the presentation of a Passenger Manifest. On those occasions when a Passenger Manifest is required, the information requirements shall be limited to the elements indicated in Appendix 2. The information shall be accepted in either electronic or paper form.

2.13 When a Contracting State requires the presentation of the Cargo Manifest in paper form, it shall accept either:

a) the form shown in Appendix 3, completed according to the instructions; or

b) the form shown in Appendix 3, partially completed, with a copy of each air waybill representing the cargo on board the aircraft.

2.14 Contracting States shall not require the presentation of a written declaration of stores remaining on board the aircraft.

2.15 In respect of stores laden on or unladen from the aircraft, the information required in the Stores List shall not exceed:

a) the information indicated in the heading of the format of the Cargo Manifest;

b) the number of units of each commodity; and

c) the nature of each commodity.

2.16 Contracting States shall not require the presentation of a list of accompanied baggage or mishandled baggage laden on or unladen from the aircraft.

2.17 Contracting States shall not require the presentation of a written declaration of the mail other than the form(s) prescribed in the Acts in force of the Universal Postal Union.

2.18 Contracting States shall not require the aircraft operator to deliver to the public authorities more than three copies of any of the above-mentioned documents at the time of entry or departure of the aircraft.

2.19 If the aircraft is not embarking/disembarking passengers or lading/unlading cargo, stores or mail, the relevant document(s) shall not be required, provided an appropriate notation is included in the General Declaration.

C. Correction of documents

2.20 In the event that errors are found in any of the above-mentioned documents, the public authorities concerned shall accord the aircraft operator or authorized agent an opportunity to correct such errors or shall alternatively perform such corrections themselves.

2.21 The aircraft operator or his authorized agent shall not be subjected to penalties if he satisfies the public authorities concerned that any error which was found in such documents was inadvertent and made without fraudulent intent or gross negligence. When considered necessary to discourage a repetition of such errors, a penalty shall be no greater than is necessary for this purpose.

D. Disinsection of aircraft

2.22 Contracting States shall limit any routine requirement for the disinsection of aircraft cabins and flight decks with an aerosol while passengers and crews are on board, to same-aircraft operations originating in, or operating via, territories that they consider to pose a threat to their public health, agriculture or environment.

2.23 Contracting States that require disinsection of aircraft shall periodically review their requirements and modify them, as appropriate, in the light of all available evidence relating to the transmission of insects to their respective territories via aircraft.

2.24 When disinsection is required a Contracting State shall authorize or accept only those methods, whether chemical or non-chemical, and/or insecticides, which are recommended by the World Health Organization and are considered efficacious by the Contracting State.

Note.— This provision does not preclude the trial and testing of other methods for ultimate approval by the World Health Organization.

2.25 Contracting States shall ensure that their procedures for disinsection are not injurious to the health of passengers and crew and cause the minimum of discomfort to them.

2.26 Contracting States shall, upon request, provide to aircraft operators appropriate information, in plain language, for air crew and passengers, explaining the pertinent national regulation, the reasons for the requirement, and the safety of properly performed aircraft disinsection.

2.27 When disinsection has been performed in accordance with procedures recommended by the World Health Organization, the Contracting State concerned shall accept a pertinent certification on the General Declaration as provided for in Appendix 1 or, in the case of residual disinsection, the Certificate of Residual Disinsection set forth in Appendix 4.

2.28 When disinsection has been properly performed pursuant to 2.24 and a certificate as indicated in 2.27 is presented or made available to the public authorities in the country of arrival, the authorities shall normally accept that certificate and permit passengers and crew to disembark immediately from the aircraft.

2.29 Contracting States shall ensure that any insecticide or any other substance used for disinsection does not have a deleterious effect on the structure of the aircraft or its operating equipment. Flammable chemical compounds or solutions likely to damage aircraft structure, such as by corrosion, shall not be employed.

E. Disinfection of aircraft

2.30 Contracting States shall define the types of animals and products of animal origin which, when carried by air, require that the aircraft be disinfected and shall exempt aircraft from disinfection when such animals or animal products are carried in approved containers accompanied by formal certificates from health authorities. When aircraft disinfection is required, the following provisions shall apply:

a) the application shall be limited solely to the container or to the compartment of the aircraft in which the traffic was carried;

b) the disinfection shall be carried out expeditiously; and

c) flammable chemical compounds or solutions likely to damage aircraft structure, such as by corrosion, or chemicals likely to damage the health of passengers, shall not be employed.

Note.— When aircraft disinfection is required for animal health reasons, only those methods and disinfectants recommended by the International Office of Epizootics should be used.

F. Arrangements concerning international general aviation and other non-scheduled flights

I. General

2.31 Contracting States shall publish in their respective Aeronautical Information Publications (AIPs) their requirements concerning advance notices and applications for prior authorization of general aviation and other non-scheduled flights.

2.32 Contracting States requiring advance notice of the intended landing of aircraft in their territory, or applications for prior authorization, shall designate a single agency to receive and coordinate the government's response to such notices or applications.

2.33 Contracting States shall indicate in their respective AIPs the mail address and, where available, the AFTN address, the telex number or cable address, fax number, electronic mail address, web page and telephone number of the agency designated as in 2.32.

2.34 In Contracting States notification to the interested border inspection agencies, e.g. customs, immigration or quarantine, of intended arrivals, departures or transit operations shall be the responsibility of the agency designated as in 2.32.

II. Prior authorization

2.35 Contracting States shall not require that prior authorization or notification be applied for through diplomatic channels unless the flight is diplomatic in nature.

2.36 Contracting States that require aircraft operators to apply for prior authorization shall:

a) establish procedures whereby such application will be dealt with promptly;

b) make such permission effective for a specific length of time or number of flights wherever possible; and

c) impose no fees, dues or charges for the issue of such permission.

2.37 **Recommended Practice.—** *In the case of aircraft engaged in the carriage of passengers, cargo or mail for remuneration or hire, Contracting States should not require more than the following details in applications for prior authorization:*

a) name of operator;

b) type of aircraft and registration marks;

c) date and time of arrival at, and departure from, the airport concerned;

d) place or places of embarkation or disembarkation abroad, as the case may be, of passengers and/or freight;

e) purpose of flight and number of passengers and/or nature and amount of freight; and

f) name, address and business of charterer, if any.

2.37.1 **Recommended Practice.—** *Contracting States should publish in their respective AIPs the minimum amount of time required in advance of the flight for processing the applications for prior authorizations referred to in 2.37.*

2.38 In the case of aircraft either in transit non-stop or stopping for non-traffic purposes, any Contracting State that, for reasons of safety of flight, requires prior authorization shall not require any other information than that contained in a flight plan when application for prior authorization is made.

Note.— Specifications for flight plans are set forth in Annex 2 — Rules of the Air.

2.39 Contracting States that require prior authorization for flights referred to in 2.38 shall not require applications to be filed more than three working days in advance.

III. Advance notification of arrival

2.40 In the case of aircraft either in transit non-stop or stopping for non-traffic purposes, the Contracting State concerned shall not require more advance notice of such operations than is required by the air traffic control services and by interested border inspection agencies.

Note.— This provision is not intended to prevent the application of appropriate narcotics control measures.

2.41 Contracting States shall accept the information contained in a flight plan as adequate advance notification of arrival, provided that such information is received at least two hours in advance of arrival and that the landing occurs at a previously designated international airport.

IV. Clearance and sojourn of aircraft

2.42 **Recommended Practice.**— *At international airports where there are international general aviation operations, Contracting States should arrange for an adequate level of border inspection and clearance services for those operations. Contracting States, in cooperation with aircraft operators and airport operators, should establish as a goal a total time period of 60 minutes in aggregate for the completion of all required departure/arrival formalities inclusive of aviation security measures for an aircraft requiring not more than normal processing, calculated from the time of the crew member's presenting the aircraft at the first processing point at the airport.*

Note.— "Required departure/arrival formalities" to be completed during the 60 minutes should include aviation security measures and, where applicable, the collection of airport charges and other levies, and border control measures.

2.43 **Recommended Practice.—** *At international airports where international general aviation operations are infrequent, Contracting States should authorize one governmental agency to undertake, on behalf of all border inspection agencies, clearance of aircraft and their loads.*

2.44 An aircraft that is not engaged in scheduled international air services and which is making a flight to or through any designated international airport of a Contracting State and is admitted temporarily free of duty in accordance with Article 24 of the Convention shall be allowed to remain within that State, for a period to be established by that State, without security for customs duty on the aircraft being required.

CHAPTER 3. ENTRY AND DEPARTURE OF PERSONS AND THEIR BAGGAGE

A. General

3.1 In order to facilitate and expedite the clearance of persons entering or departing by air, Contracting States shall adopt border control regulations appropriate to the air transport environment and shall apply them in such a manner as to prevent unnecessary delays.

3.2 In developing procedures aimed at the efficient application of border controls on passengers and crew, Contracting States shall take into account the application of aviation security, border integrity, narcotics control and immigration control measures, where appropriate.

3.3 Contracting States that use Integrated Circuit (IC) chips or other optional machine readable technologies for the representation of personal data, including biometric data, in their travel documents shall make provision whereby the encoded data may be revealed to the holder of the document upon request.

3.4 Contracting States shall not extend the validity of their machine readable travel documents.

Note 1.— Specifications for machine readable travel documents (Doc 9303, Series) do not permit alteration of the expiration date and other data in the machine readable zone.

Note 2. — States whose national legislation or regulations currently allow for the extension of the period of validity should undertake to amend the appropriate text in a reasonable period.

B. Documents required for travel

3.5 No documents other than those provided for in this Chapter shall be required by Contracting States for the entry into and departure from their territories of visitors.

3.6 Contracting States shall not require visitors travelling by air, rightfully holding valid passports recognized by the receiving State and holding valid visas, where appropriate, to present any other document of identity.

Note.— It is not the intent of the above provision to discourage Contracting States from accepting other official documents of identity for travel purposes, such as national identity cards, seafarers' identity documents, alien resident cards and provisional alternative travel identity documents.

C. Security of travel documents

3.7 Contracting States shall regularly update security features in new versions of their travel documents, to guard against their misuse and to facilitate detection of cases where such documents have been unlawfully altered, replicated or issued.

3.8 Contracting States shall establish controls on the creation and issuance of travel documents in order to safeguard against the theft of their stocks and the misappropriation of newly issued travel documents.

3.9 **Recommended Practice.**— *Contracting States should incorporate biometric data in their machine readable passports, visas and other official travel documents, using one or more optional data storage technologies to supplement the machine readable zone, as specified in Doc 9303,* Machine Readable Travel Documents. *The required data stored on the integrated circuit chip is the same as that printed on the data page, that is, the data contained in the machine-readable zone plus the digitized photographic image. Fingerprint image(s) and/or iris image(s) are optional biometrics for Contracting States wishing to supplement the facial image with another biometric in the passport. Contracting States incorporating biometric data in their Machine Readable Passports are to store the data in a contactless integrated circuit chip complying with ISO/IEC 14443 and programmed according to the Logical Data Structure as specified by ICAO.*

D. Travel documents

3.10 Contracting States shall begin issuing only Machine Readable Passports in accordance with the specifications of Doc 9303, Part 1, no later than 1 April 2010.

Note.—This provision does not intend to preclude the issuance of non-machine readable passports or temporary travel documents of limited validity in cases of emergency.

3.10.1 For passports issued after 24 November 2005 and which are not machine readable, Contracting States shall ensure the expiration date falls before 24 November 2015.

3.11 **Recommended Practice.—** *When issuing identity documents or visas accepted for travel purposes, Contracting States should issue these in machine readable form, as specified in Doc 9303 (series)*, Machine Readable Travel Documents.

3.12 When issuing passports that are not machine readable, Contracting States shall ensure that the personal identification and document issuance data and the format of the data page conform to the specifications for the "visual zone" set forth in Doc 9303, Part 1, *Machine Readable Passports*. The "machine readable zone" area shall be filled with words such as "this passport is not machine readable" or other data to preclude fraudulent insertion of machine readable characters.

3.13 **Recommended Practice.—** *Contracting States should establish publicly accessible facilities for the receipt of passport applications and/or for the issuance of passports*.

3.14 Contracting States shall establish transparent application procedures for the issuance, renewal or replacement of passports and shall make information describing their requirements available to prospective applicants upon request.

3.14.1 **Recommended Practice.—** *If any fee is charged for the issue or renewal of a passport, the amount of such fee should not exceed the cost of the operation.*

3.15 Contracting States shall issue a separate passport to each person, regardless of age.

3.16 **Recommended Practice.—** *When issuing passports for tourism or business travel, Contracting States should normally provide that such passports be valid for a period of at least five years, for an unlimited number of journeys and for travel to all States and territories.*

Note 1. — In consideration of the limited durability of documents and the changing appearance of the passport holder over time, a validity period of not more than ten years is recommended.

Note 2.— Emergency, diplomatic, official and other special purpose passports could have a shorter validity period.

E. Exit visas

3.17 Contracting States shall not require exit visas from their own nationals wishing to tour abroad nor from visitors at the end of their stay.

3.18 **Recommended Practice.—** *Contracting States should not require exit visas from their resident aliens wishing to tour abroad.*

F. Entry/re-entry visas

3.19 **Recommended Practice.—** *Contracting States should waive or abolish, for a maximum number of States, the requirement for an entry visa for nationals seeking entry as visitors.*

3.20 Contracting States shall not require visas for re-entry from their own nationals.

3.21 **Recommended Practice.—** *Contracting States should not require visas for re-entry from their resident aliens who hold lawful permanent residence permits.*

3.22 Contracting States shall establish simple and transparent application procedures for the issuance of entry visas for prospective visitors and shall ensure that applications for such visas are acted upon as quickly as possible after receipt.

3.23 **Recommended Practice.—** *Visa issuance procedures should not normally require the applicant to make a personal appearance at the issuing office*.

3.24 When issuing entry visas to prospective visitors, Contracting States shall normally provide that such visas be valid for use within a period of at least six months from the date of issue regardless of the number of entries and with the understanding that the duration of each stay may be limited.

3.25 **Recommended Practice.—** *When issuing visas that are not machine readable, Contracting States should ensure that the personal and issuance data in such documents conform to the specifications for the visual zone of the machine readable visa, as set forth in Doc 9303, Part 2 —* Machine Readable Visas.

G. Embarkation/Disembarkation Cards

3.26 **Recommended Practice.—** *Contracting States should not require either from visitors travelling by air, or from aircraft operators on their behalf, identification information in writing supplementary to that presented in their identity documents. Where the collection of identity information is required, Contracting States should develop systems for the electronic capture of this information from machine readable travel documents or other sources.*

3.27 A Contracting State that requires a written record of personal data from visitors arriving or departing by air shall limit its information requirements to those set forth in Appendix 5 — Embarkation/Disembarkation Card.

3.28 Contracting States, when requiring Embarkation/Disembarkation Cards, shall accept their completion by visitors and shall not require them to be completed or checked by the aircraft operator.

3.29 Contracting States that require the presentation of Embarkation/Disembarkation Cards shall provide them to airline operators or their travel agents, without charge, for distribution to departing passengers prior to embarkation or to arriving passengers during the flight.

H. Certificates of vaccination

3.30 In cases where evidence of protection against a quarantinable disease is required, Contracting States shall accept the International Certificate of Vaccination or Revaccination form prescribed by the World Health Organization in the International Health Regulations.

I. Inspection of travel documents

3.31 Contracting States shall assist aircraft operators in the evaluation of travel documents presented by passengers, in order to deter fraud and abuse.

3.32 **Recommended Practice.—** *Contracting States should consider making arrangements with other Contracting States to permit the positioning of liaison officers at airports in order to assist aircraft operators to establish the validity and authenticity of the travel documents of embarking persons.*

3.33 Aircraft operators shall take necessary precautions at the point of embarkation to ensure that passengers are in possession of the documents prescribed by the States of transit and destination for control purposes as described in this chapter.

J. Departure procedures

3.34 Contracting States shall not require income-tax clearance certificates from visitors.

3.35 Contracting States shall not hold the aircraft operator liable in the event of the non-payment of income taxes by any passenger.

3.36 **Recommended Practice.—** *Contracting States, in cooperation with aircraft operators and airport management, should establish as a goal a total time period of 60 minutes in aggregate for the completion of required departure formalities for all passengers requiring not more than normal processing, calculated from the time of the passenger's presenting himself at the first processing point at the airport (i.e. airline check-in, security control point or other required control point depending on arrangements at the individual airport).*

Note.— "Required departure formalities" to be completed during the recommended 60 minutes would include airline check-in, aviation security measures and, where applicable, the collection of airport charges and other levies, and outbound border control measures, e.g. passport, quarantine or customs controls.

3.37 **Recommended Practice.—** *Contracting States that require inspection by the public authorities of the travel documents of departing passengers should, in cooperation with airport management, use applicable technology and adopt a multi-channel inspection system, or other means of streaming passengers, in order to expedite such inspections.*

3.38 Contracting States shall not normally require the presentation, for border control inspection, of baggage of passengers departing from their territory.

K. Entry procedures and responsibilities

3.39 **Recommended Practice.—** *Contracting States, with the cooperation of aircraft operators and airport operators, should establish as a goal the clearance within 45 minutes of disembarkation from the aircraft of all passengers requiring not more than the normal inspection, regardless of aircraft size and scheduled arrival time.*

3.40 In order to expedite inspections, Contracting States, with the cooperation of airport operators, shall use applicable technology and adopt a multi-channel immigration inspection system, or other means of streaming passengers, at international airports where the volume of passenger traffic justifies such measures.

3.41 Except in special circumstances, Contracting States shall not require that travel documents or other identity documents be collected from passengers or crew before they arrive at the passport control points.

3.42 The public authorities concerned shall expeditiously accept passengers and crew for examination as to their admissibility into the State.

Note.—A passenger or crew member is "accepted for examination" when he makes his first appearance at the arrivals control point after disembarkation, to seek entry into the country concerned, at which time the control officer makes a determination whether he should be admitted or not. This does not include the sighting of travel documents, which may be carried out immediately upon disembarkation.

3.43 The aircraft operator shall be responsible for the custody and care of disembarking passengers and crew members from the time they leave the aircraft until they are accepted for examination as provided in 3.42.

3.44 **Recommended Practice.—** *After such acceptance, the public authorities concerned should be responsible for the custody and care of passengers and crew members until they are admitted or found inadmissible.*

3.45 The responsibility of an aircraft operator for custody and care of passengers and crew members shall terminate from the moment such persons have been admitted into that State.

3.46 The public authorities of each Contracting State shall seize fraudulent, falsified or counterfeit travel documents. The public authorities shall also seize the travel documents of a person impersonating the rightful holder of the travel document. Such documents shall be removed from circulation immediately and returned to the appropriate authorities of the State named as issuer or to the resident Diplomatic Mission of that State.

3.47 **Recommended Practice.**— *Where appropriate, Contracting States should introduce a system of advance passenger information which involves the capture of certain passport or visa details prior to departure, the transmission of the details by electronic means to their public authorities, and the analysis of such data for risk management purposes prior to arrival in order to expedite clearance. To minimize handling time during check-in, document reading devices should be used to capture the information in machine readable travel documents.*

3.47.1 When specifying the identifying information on passengers to be transmitted, Contracting States shall require only data elements that are available in machine readable form in travel documents conforming to the specifications contained in Doc 9303 (series), *Machine Readable Travel Documents.* All information required shall conform to specifications for UN/EDIFACT PAXLST messages.

3.47.2 **Recommended Practice.**— *Contracting States should refrain from imposing fines and penalties on aircraft operators for any errors caused by a systems failure which may have resulted in the transmission of no, or corrupted, data to the public authorities in accordance with API systems.*

3.47.3 Contracting States requiring that passenger data be transmitted electronically through an Advance Passenger Information system shall not also require a passenger manifest in paper form.

3.48 **Recommended Practice.**— *Contracting States requiring Passenger Name Record (PNR) access should conform their data requirements and their handling of such data to guidelines developed by ICAO.*

3.49 Except in special circumstances, Contracting States shall make arrangements whereby the identity documents of visitors need to be inspected only once at times of entry and departure.

3.50 Contracting States shall not require a written declaration of baggage from passengers and crew, when no dutiable or restricted goods are being carried.

3.51 Contracting States shall adopt the dual-channel system or other selective process for customs and quarantine inspection based on risk management, as appropriate to the conditions and traffic volumes at the airport concerned.

Note.— See Appendix 6, Recommendation of the Customs Co-operation Council *(now the World Customs Organization) for a simplified customs control based on the dual-channel system.*

3.52 **Recommended Practice.**— *In exceptional circumstances, when a visitor, for reasons of force majeure, does not possess the required entry visa prior to arrival, Contracting States should authorize temporary entry.*

3.53 **Recommended Practice.**— *In cases in which the passport of a visitor has expired prior to the end of the validity period of a visa, the State that has issued the visa should continue to accept the visa until its expiration date when it is presented with the visitor's new passport.*

3.54 Contracting States that issue visas for a limited number of entries shall indicate in an appropriate, clear and non-derogatory way, every instance the visa is used, in order that its holder, any aircraft operator or the public authorities of a State may determine its validity quickly and without the use of any special means.

3.55 After individual presentation by passengers and crew of their passports or other official travel documents, the public officials concerned shall, except in special individual cases, hand back such documents immediately after examination.

3.56 **Recommended Practice.**— *Medical examination of persons arriving by air should normally be limited to those disembarking and coming within the incubation period of the disease concerned, as stated in the International Health Regulations, from an infected area.*

3.57 **Recommended Practice.**— *Contracting States should make arrangements whereby a passenger and his baggage, arriving on an international flight making two or more stops at international airports within the territory of the same State, are not required to be cleared through border control formalities at more than one airport of the State concerned.*

L. Transit procedures and requirements

3.58 Where airport facilities permit, Contracting States shall make provision by means of direct transit areas or other arrangements, whereby crew, passengers and their baggage, arriving from another State and continuing their journey to a third State on the same flight or another flight from the same airport on the same day may remain temporarily within the airport of arrival without undergoing border control formalities to enter the State of transit.

3.59 Contracting States shall keep to a minimum the number of States whose nationals are required to have direct transit visas when arriving on an international flight and continuing their journey to a third State on the same flight or another flight from the same airport on the same day.

3.60 Contracting States shall establish measures whereby in-transit passengers who are unexpectedly delayed overnight due to a flight cancellation or delay may be allowed to leave the airport for the purpose of taking accommodations.

M. Disposition of baggage separated from its owner

3.61 Contracting States shall permit aircraft operators to forward mishandled baggage to the location of its owner and shall not hold aircraft operators liable for penalties, fines, import duties and taxes, on the basis that the baggage was mishandled.

3.62 Contracting States shall permit the direct transfer of mishandled baggage between international flights at the same airport, without examination, except for reasons of aviation security or other necessary controls. In cases when direct transfer cannot be effected, Contracting States shall ensure that arrangements are made for the temporary custody of such baggage under secure supervision at an appropriate location.

3.63 Contracting States shall permit aircraft operators to present unidentified, unclaimed or mishandled baggage for clearance at an appropriate destination on behalf of its owners, and to deliver such baggage to its owners.

3.64 Contracting States shall expedite the clearance of unidentified, unclaimed or mishandled baggage, and its return to the aircraft operator for appropriate disposition. Under the conditions laid down by the public authorities, aircraft operators may be permitted to open such baggage if necessary to ascertain its owner.

3.65 The aircraft operator shall be freed from the obligation to safeguard baggage not yet cleared by the public authorities, and from liability for import duties and taxes chargeable on such baggage, when it is taken into charge by customs and is under their sole control.

N. Identification and entry of crew and other aircraft operators' personnel

3.66 Contracting States shall establish measures, with the cooperation of aircraft operators and airport operators, to expedite the inspection of crew members and their baggage, as required at departure and upon arrival.

3.67 Contracting States shall facilitate and expedite the process under which aircraft operators based in their territories can apply for Crew Member Certificates (CMCs) for their crew members.

Note.— The CMC was developed as a card for use for identification purposes by crew members, leaving the crew licences to serve their primary purpose of attesting to the professional qualifications of the flight crew members.

3.68 **Recommended Practice.—** *Contracting States should issue the certificates referred to in 3.67, in the form of machine readable cards in accordance with the specifications in Doc 9303, Part 3 —* Size 1 and Size 2 Machine Readable Official Travel Documents.

3.68.1 **Recommended Practice.—** *Contracting States should put in place procedures which will enable any crew member issued with a Crew Member Certificate to examine and review the validity of the data held, and to provide for correction if necessary, at no cost to the crew member.*

3.69 **Recommended Practice.—** *To the extent that aircraft operators issue crew identity cards, Contracting States should require the production of such identity documents in the format shown in Appendix 7, i.e. in the same layout as the visual zone of the machine readable crew member certificate and having the capability to support machine assisted identity confirmation and document security verification.*

3.69.1 **Recommended Practice.—** *Contracting States should ensure that a record of each crew member's certificates and other official identity document issued, suspended or withdrawn, is stored in an electronic database, secure from interference and unauthorized access. All information stored in the electronic database and crew member certificate should be restricted to details which are essential for the purpose of verifying a crew member's identity.*

3.70 Adequate controls shall be placed on the issuance of CMCs and other official crew identity documents to prevent fraud, for example, a background check and certification of employment status of an applicant prior to issuance, controls on blank card stock, and accountability requirements for issuing personnel.

3.71 Contracting States shall waive the visa requirement for arriving crew members presenting CMCs, when arriving in a duty status on an international flight and seeking temporary entry for the period allowed by the receiving State in order to join their next assigned flight in a duty status.

3.71.1 **Recommended Practice.—** *Contracting States should waive the visa requirement for arriving crew members presenting CMCs, when arriving on another aircraft operator* *or another mode of transport and seeking temporary entry for the period allowed by the receiving State in order to join their assigned flight in a duty status.*

3.72 Contracting States shall establish measures to provide for the temporary entry without delay into their territories, of technical personnel of foreign aircraft operators operating to or through such territories who are urgently required for the purpose of converting to an airworthy condition any aircraft which is, for technical reasons, unable to continue its journey. Should a State require a guarantee of such persons' subsistence in, and/or return from, such State, this shall be negotiated without delaying their admission.

O. Flight operations and cabin safety inspectors

3.73 **Recommended Practice.—** *Contracting States should provide that flight operations and cabin safety inspectors of another Contracting State, when engaged on inspections duties, be treated in the same manner as crew members when proceeding through departure or arrival formalities.*

3.74 **Recommended Practice.—** *Contracting States should provide their flight operations and cabin safety inspectors with an identity document in the format set forth in Appendix 8.*

3.75 **Recommended Practice.—** *Flight operations inspectors and cabin safety inspectors should carry the identity document specified in 3.74, a copy of the inspector's itinerary issued by the State that employs the inspector, and a valid passport.*

3.76 **Recommended Practice.—** *Contracting States should extend the privileges of temporary admission, as described in 3.72 for crew members, to flight operations and cabin safety inspectors of another Contracting State, provided that they carry the documents listed in 3.75 (e.g. identity document, itinerary and valid passport, and depart after a normal period of rest.*

CHAPTER 4. ENTRY AND DEPARTURE OF CARGO AND OTHER ARTICLES

A. General

4.1 In order to facilitate and expedite the release and clearance of goods carried by air, Contracting States shall adopt regulations and procedures appropriate to air cargo operations and shall apply them in such a manner as to prevent unnecessary delays.

4.2 **Recommended Practice.—** *With respect to cargo moving by both air and surface transport under an air waybill, Contracting States should apply the same regulations and procedures and in the same manner as they are applied to cargo moving solely by air.*

4.3 When introducing or amending regulations and procedures for the release and clearance of goods carried by air, Contracting States shall consult with aircraft operators and other parties concerned, with the aim of accomplishing the actions set forth in 4.1.

4.4 Where the nature of a consignment could attract the attention of different public authorities, e.g. the customs, veterinary or sanitary controllers, Contracting States shall endeavour to delegate authority for release/clearance to customs or one of the other agencies or, where that is not feasible, take all necessary steps to ensure that clearance is coordinated and, if possible, carried out simultaneously and with a minimum of delay.

4.5 Contracting States shall not normally require the physical examination of cargo to be imported or exported and shall use risk management to determine which goods shall be examined and the extent of that examination.

4.6 Where practicable, in order to improve efficiency, modern screening or examination techniques shall be used to facilitate the physical examination of goods to be imported or exported.

4.7 **Recommended Practice.—** *In connection with international airports, Contracting States should establish and either develop and operate themselves, or permit other parties to develop and operate, free zones and/or customs warehouses and should publish detailed regulations as to the types of operations which may or may not be performed therein.*

4.8 In all cases where free-zone facilities and/or customs warehouses are not provided in connection with an international airport but have been provided elsewhere in the same general vicinity, Contracting States shall make arrangements so that air transport can utilize these facilities on the same basis as other means of transport.

B. Information required by the public authorities

4.9 Contracting States shall limit their data requirements to only those particulars which are deemed necessary by the public authorities to release or clear imported goods or goods intended for exportation.

4.10 Contracting States shall provide for the collection of statistical data at such times and under such arrangements so that the release of imported goods or those intended for exportation is not delayed thereby.

4.11 Subject to the technological capabilities of the Contracting State, documents for the importation or exportation of goods, including the Cargo Manifest and/or air waybills, shall be accepted when presented in electronic form transmitted to an information system of the public authorities.

4.12 The production and presentation of the Cargo Manifest and the air waybill(s) shall be the responsibility of the aircraft operator or his authorized agent. The production and presentation of the other documents required for the clearance of the goods shall be the responsibility of the declarant.

4.13 Where a Contracting State has requirements for documents such as commercial invoices, declaration forms, import licences and the like, it shall not make it the obligation of the aircraft operator to ensure that these documentary requirements are met nor shall the operator be held responsible, fined or penalized for inaccuracies or omissions of facts shown on such documents unless he is the declarant himself or is acting on his behalf.

4.14 When documents for the importation or exportation of goods are presented in paper form, the format shall be based on the UN layout key, as regards the goods declaration, and on the format of Appendix 3, as regards the Cargo Manifest. When such documents are submitted in electronic form, the format shall be based on international standards for the exchange of electronic information.

4.15 To facilitate electronic data interchange, Contracting States shall encourage all parties concerned, whether public or private, to implement compatible systems and to use the appropriate internationally accepted standards and protocols.

4.16 **Recommended Practice.—** *Electronic information systems for the release and clearance of goods should cover their transfer between air and other modes of transport.*

4.17 Contracting States that require supporting documents, such as licenses and certificates, for the importation or exportation of certain goods shall publish their requirements and establish convenient procedures for requesting the issue or renewal of such documents.

4.18 **Recommended Practice.—** *Contracting States should, to the greatest extent possible, remove any requirement to manually produce supporting documents and should establish procedures whereby they can be produced by electronic means.*

4.19 Contracting States shall not require consular formalities or consular charges or fees in connection with documents required for the release or clearance of goods.

C. Release and clearance of export cargo

4.20 Contracting States that require documents for export clearance shall normally limit their requirement to a simplified export declaration.

4.21 Contracting States shall provide for export cargo to be released up to the time of departure of an aircraft.

4.22 Contracting States shall allow goods to be exported, to be presented for clearance at any customs office designated for that purpose. Transfer from that office to the airport from which the goods are to be exported shall be carried out under the procedures laid down in the laws and regulations of the Contracting State concerned. Such procedures shall be as simple as possible.

4.23 Contracting States shall not require evidence of the arrival of exported goods as a matter of course.

4.24 **Recommended Practice.—** *When the public authorities of a Contracting State require goods to be examined, but those goods have already been loaded on a departing aircraft, the aircraft operator or, where appropriate, the operator's authorized agent, should normally be permitted to provide security to the customs for the return of the goods rather than delay the departure of the aircraft.*

D. Release and clearance of import cargo

4.25 When scheduling examinations, priority shall be given to the examination of live animals and perishable goods and to other goods which the public authorities accept are urgently required.

4.26 Consignments declared as personal effects and transported as unaccompanied baggage shall be cleared under simplified arrangements.

4.27 Contracting States shall provide for the release or clearance of goods under simplified customs procedures provided that:

a) the goods are valued at less than a maximum value below which no import duties and taxes will be collected; or

b) the goods attract import duties and taxes that fall below the amount that the State has established as the minimum for collection; or

c) the goods are valued at less than specified value limits below which goods may be released or cleared immediately on the basis of a simple declaration and payment of, or the giving of security to the customs for, any applicable import duties and taxes; or

d) the goods are imported by an authorized person and are goods of a specified type.

4.28 **Recommended Practice.—** *For authorized importers who meet specified criteria, including an appropriate record of compliance with official requirements and a satisfactory system for managing their commercial records, Contracting States should establish special procedures, based on the advance supply of information, which provide for the immediate release of goods on arrival.*

4.29 **Recommended Practice.—** *Goods not afforded the simplified or special procedures referred to in provisions 4.25 to 4.28 should be released or cleared promptly on arrival, subject to compliance with customs and other requirements. Contracting States should establish as a goal the release of all goods that do not need any examination, within three hours of their arrival and the submission of the correct documentation. Public authorities, and aircraft operators and importers or their authorized agents, should coordinate their respective functions to ensure that this goal is met.*

4.30 **Recommended Practice.—** *Contracting States should process requests for the release of part consignments when all information has been submitted and other requirements for such part consignments have been met.*

4.31 Contracting States shall allow goods that have been unladen from an aircraft at an international airport to be transferred to any designated customs office in the State concerned for clearance. The customs procedures covering such transfer shall be as simple as possible.

4.32 When, because of error, emergency or inaccessibility upon arrival, goods are not unladen at their intended destination, Contracting States shall not impose penalties, fines or other similar charges provided:

a) the aircraft operator or his authorized agent notifies the customs of this fact, within any time limit laid down;

b) a valid reason, acceptable to the customs authorities, is given for the failure to unload the goods; and

c) the Cargo Manifest is duly amended.

4.33 When, because of error or handling problems, goods are unladen at an international airport without being listed on the Cargo Manifest, Contracting States shall not impose penalties, fines or other similar charges provided:

a) the aircraft operator or his authorized agent notifies the customs of this fact, within any time limit laid down;

b) a valid reason, acceptable to the customs, is given for the non-reporting of the goods;

c) the manifest is duly amended; and

d) the goods are placed under the appropriate customs arrangements.

Where applicable, the Contracting State shall, subject to compliance with its requirements, facilitate the forwarding of the goods to their correct destination.

4.34 If goods are consigned to a destination in a Contracting State, but have not been released for home use in that State and subsequently are required to be returned to the point of origin or to be redirected to another destination, the Contracting State shall allow the goods to be re-forwarded without requiring import, export or transit licences if no contravention of the laws and regulations in force is involved.

4.35 A Contracting State shall absolve the aircraft operator or, where appropriate, his authorized agent, from liability for import duties and taxes when the goods are placed in the custody of the public authorities or, with the latter's agreement, transferred into the possession of a third party who has furnished adequate security to the customs.

E. Spare parts, equipment, stores and other material imported or exported by aircraft operators in connection with international services

4.36 Stores and commissary supplies imported into the territory of a Contracting State for use on board aircraft in international service shall be relieved from import duties and taxes, subject to compliance with the customs regulations of the State.

4.37 **Recommended Practice.—** *Contracting States should not require supporting documentation (such as certificates of origin or consular or specialized invoices) in connection with the importation of stores and commissary supplies.*

4.38 **Recommended Practice.—** *Contracting States should permit, on board aircraft, the sale or use of commissary supplies and stores for consumption without payment of import duties and other taxes in the case where aircraft, engaged in international flights:*

a) stop at two or more international airports within the territory of a Contracting State without intermediate landing in the territory of another State; and

b) do not embark any domestic passengers.

4.39 **Recommended Practice.—** *Subject to compliance with its regulations and requirements, a Contracting State should allow relief from import duties and taxes in respect of ground and security equipment and their component parts, instructional material and training aids imported into its territory, by or on behalf of an aircraft operator of another Contracting State for use by the operator or his authorized agent, within the boundaries of an international airport or at an approved off-airport facility.*

4.40 Contracting States shall grant prompt release or clearance, upon completion of simplified documentary procedures by the aircraft operator or his authorized agent, of aircraft equipment and spare parts that are granted relief from import duties, taxes and other charges under Article 24 of the Chicago Convention.

4.41 Contracting States shall grant prompt release or clearance, upon completion of simplified documentary procedures by the aircraft operator or his authorized agent, of ground and security equipment and their replacement parts, instructional material and training aids imported or exported by an aircraft operator of another Contracting State.

4.42 Contracting States shall allow the loan, between aircraft operators of other Contracting States or their authorized agents, of aircraft equipment, spare parts and ground and security equipment and their replacement parts, which have been imported with conditional relief from import duties and taxes.

4.43 **Recommended Practice.—** *Contracting States should provide for the importation, free of import duties and taxes, of aircraft operators' documents as defined in Chapter 1 of this Annex, to be used in connection with international air services.*

F. Containers and pallets

4.44 Subject to compliance with their regulations and requirements, Contracting States shall grant the aircraft operators of other Contracting States temporary admission of containers and pallets — whether or not owned by the aircraft operator of the aircraft on which they arrive — provided they are to be used on an outbound international service or otherwise re-exported.

4.45 **Recommended Practice.—** *Contracting States should require a temporary admission document for containers and pallets only when they consider it essential for the purposes of customs control.*

4.46 **Recommended Practice.—** *Where proof of the re-exportation of containers and pallets is required, the Contracting State should accept the appropriate usage records of the aircraft operator or his authorized agent as evidence thereof.*

4.47 Contracting States shall make arrangements to allow aircraft operators, under supervision of the public authorities concerned, to unload transit cargo arriving in containers and pallets, so that they may sort and reassemble shipments for onward carriage without having to undergo clearance for home use.

4.48 Containers and pallets imported into a Contracting State under the provisions of 4.44 shall be allowed to leave the boundaries of the international airport for the release or clearance of imported loads, or for export lading, under simplified documentation and control arrangements.

4.49 Where circumstances so require, Contracting States shall allow the storage of temporarily admitted containers and pallets at off-airport locations.

4.50 Contracting States shall allow the loan between aircraft operators of containers and pallets admitted under the provisions of 4.44 without payment of import duties and taxes, provided they are to be used only on an outbound international service or otherwise re-exported.

4.51 Contracting States shall allow temporarily admitted containers and pallets to be re-exported through any designated customs office.

4.52 Contracting States shall allow the temporary admission of replacement parts when they are needed for the repair of containers and pallets imported under the provisions of 4.44.

G. Mail documents and procedures

4.53 Contracting States shall carry out the handling, forwarding and clearance of mail and shall comply with the documentary procedures as prescribed by the Acts in force of the Universal Postal Union.

CHAPTER 5. INADMISSIBLE PERSONS AND DEPORTEES

A. General

5.1 In order to minimize disruptions to the orderly operations of international civil aviation, Contracting States shall cooperate with one another to promptly resolve any differences arising in the course of implementing the provisions of this Chapter.

5.2 Contracting States shall facilitate the transit of persons being removed from another State pursuant to the provisions of this Chapter, and extend necessary cooperation to the aircraft operator(s) and escort(s) carrying out such removal.

5.2.1 During the period when an inadmissible passenger or a person to be deported is under their custody, the state Officers concerned shall preserve the dignity of such persons and take no action likely to infringe such dignity.

Note.— These persons should be treated in accordance with the relevant international provisions, including the UN International Covenant on Civil and Political Rights.

B. Inadmissible persons

5.3 Contracting States shall without delay notify the aircraft operator, confirming this as soon as possible in writing, when a person is found inadmissible, pursuant to 3.44.

Note.— Written notification can be either in paper form or in electronic form, such as e-mail.

5.4 **Recommended Practice.—** *Contracting States, through their public authorities should consult the aircraft operator on the time-frame for removal of the person found inadmissible, in order to allow the aircraft operator a reasonable amount of time during which to effect the person's removal via its own services or to make alternative removal arrangements.*

Note.— Nothing in this provision is to be construed so as to allow the return of a person seeking asylum in the territory of a Contracting State, to a country where his life or freedom would be threatened on account of his race, religion, nationality, membership in a particular social group or political opinion.

5.5 Contracting States shall ensure that a removal order is issued to the aircraft operator in respect of a person found inadmissible. The removal order shall include, if known, the name, age, gender and citizenship of the person in question.

5.6 Contracting States ordering the removal of an inadmissible person who has lost or destroyed his travel documents shall deliver a covering letter in the format set forth in Appendix 9 (1) in order to give information to the authorities of the State(s) of transit and/or the commencement of journey. The covering letter, the removal order and any relevant information shall be handed over to the aircraft operator or, in the case of escorted persons, the escort, who shall be responsible for delivering them to the public authorities at the State of destination.

5.7 Contracting States ordering the removal of an inadmissible person whose travel documents have been seized pursuant to 3.46 shall deliver a covering letter in the format set forth in Appendix 9 (2) in order to give information to the authorities of the State(s) of transit and/or the commencement of journey. The covering letter together with a photocopy of the seized travel documents and the removal order shall be handed over to the aircraft operator or, in the case of escorted persons, the escort, who shall be responsible for delivering them to the public authorities at the State of destination.

5.8 Contracting States that have reason to believe that an inadmissible person might offer resistance to his removal shall inform the aircraft operator concerned as far in advance as possible of scheduled departure so that the aircraft operator can take precautions to ensure the security of the flight.

5.9 The aircraft operator shall be responsible for the cost of custody and care of an improperly documented person from the moment that person is found inadmissible and returned to the aircraft operator for removal from the State.

5.9.1 The State shall be responsible for the cost of custody and care of all other categories of inadmissible persons, including persons not admitted due to document problems beyond the expertise of the aircraft operator or for reasons other than improper documents, from the moment these persons are found inadmissible until they are returned to the aircraft operator for removal from the State.

5.10 When a person is found inadmissible and is returned to the aircraft operator for transport away from the territory of the State, the aircraft operator shall not be precluded from recovering from such person any transportation costs involved in his removal.

5.11 The aircraft operator shall remove the inadmissible person to:

a) the point where he commenced his journey; or

b) to any place where he is admissible.

5.12 A Contracting State shall accept for examination a person removed from a State where he was found inadmissible, if this person commenced his journey from its territory. A Contracting State shall not return such a person to the country where he was earlier found inadmissible.

5.13 Contracting States shall accept the covering letter and other papers delivered pursuant to 5.6 or 5.7 as sufficient documentation to carry out the examination of the person referred to in the letter.

5.14 Contracting States shall not fine aircraft operators in the event that arriving and in-transit persons are found to be improperly documented where aircraft operators can demonstrate that they have taken adequate precautions to ensure that these persons had complied with the documentary requirements for entry into the receiving State.

5.15 **Recommended Practice.—** *When aircraft operators have cooperated with the public authorities to the satisfaction of those authorities, for example pursuant to memoranda of understanding reached between the parties concerned, in measures designed to prevent the transportation of inadmissible persons, Contracting States should mitigate the fines and penalties that might otherwise be applicable should such persons be carried to their territory.*

5.16 Contracting States shall not prevent the departure of an operator's aircraft pending a determination of admissibility of any of its arriving passengers.

Note.— An exception to this provision could be made in the case of infrequent flights or if the Contracting State had reason to believe that there might be an irregularly high number of inadmissible persons on a specific flight.

C. Deportees

5.17 A Contracting State deporting a person from its territory shall serve him a deportation order. Contracting States shall indicate to the deportee the name of the destination State.

5.18 Contracting States removing deportees from their territories shall assume all obligations, responsibilities and costs associated with the removal.

5.19 Contracting States, when making arrangements with an aircraft operator for the removal of a deportee, shall make available the following information as soon as possible, but in any case not later than 24 hours before the scheduled time of departure of the flight:

a) a copy of the deportation order, if legislation of the Contracting State allows for it;

b) a risk assessment by the State and/or any other pertinent information that would help the aircraft operator assess the risk to the security of the flight; and

c) the names and nationalities of any escorts.

Note.— In order to ensure coordination of facilitation and security standards, attention is drawn to the applicable provisions of Annex 17, Chapter 4.

5.20 Contracting States, in making arrangements for the removal of a deportee to a destination State, shall use direct non-stop flights whenever practicable.

5.21 A Contracting State, when presenting a deportee for removal, shall ensure that all official travel documentation required by any transit and/or destination State is provided to the aircraft operator.

5.22 A Contracting State shall admit into its territory its nationals who have been deported from another State.

5.23 A Contracting State shall give special consideration to the admission of a person, deported from another State, who holds evidence of valid and authorized residence within its territory.

5.24 Contracting States, when determining that a deportee must be escorted and the itinerary involves a transit stop in an intermediate State, shall ensure that the escort(s) remain(s) with the deportee to his final destination, unless suitable alternative arrangements are agreed, in advance of arrival, by the authorities and the aircraft operator involved at the transit location.

D. Procurement of a replacement travel document

5.25 When a replacement travel document must be obtained in order to facilitate removal and acceptance of an inadmissible person at his destination, the State ordering the removal shall provide as much assistance as practicable in obtaining that document.

Note.— In order to clarify application of this Standard, attention is drawn to Standard 5.13.

5.26 A Contracting State shall, when requested to provide travel documents to facilitate the return of one of its nationals, respond within a reasonable period of time and not more than 30 days after such a request was made either by issuing a travel document or by satisfying the requesting State that the person concerned is not one of its nationals.

5.27 A Contracting State shall not make the signing by the person concerned of an application for a travel document a prerequisite for the issuance of that document.

5.28 When a Contracting State has determined that a person for whom a travel document has been requested is one of its nationals but cannot issue a passport within 30 days of the request, the State shall issue an emergency travel document that attests to the nationality of the person concerned and that is valid for readmission to that State.

5.29 A Contracting State shall not refuse to issue a travel document to or otherwise thwart the return of one of its nationals by rendering that person stateless.

CHAPTER 6. INTERNATIONAL AIRPORTS — FACILITIES AND SERVICES FOR TRAFFIC

A. General

6.1 Contracting States shall ensure that the provisions of Annex 9 continue to be implemented in the event an airport becomes privatized.

6.1.1 Contracting States shall take all necessary steps to secure the cooperation of aircraft operators and airport operators in ensuring that satisfactory facilities and services are provided for rapid handling and clearance of passengers, crew, baggage, cargo and mail at their international airports. Such facilities and services shall be flexible and capable of expansion to meet anticipated growth in traffic volume, or increased security measures during higher threat situations, while permitting appropriate narcotics control measures.

*Note.— With respect to the application of aviation security measures, attention is drawn to the relevant specification in Annex 17, Chapter 2.**

6.2 Contracting States shall take all necessary steps to encourage consultations between the airport operator on the one hand and aircraft operators, control authorities and appropriate bodies representing other airport users on the other at the earliest stage when planning new or substantially modified terminal buildings or when new procedures require changes in facilities, including changes of layout within existing facilities, at their international airports.

6.3 Contracting States shall take all necessary steps to secure the cooperation of aircraft operators and airport operators in ensuring that the facilities and services at their international airports are designed in such a way as to provide the best possible airport traffic flow arrangements.

6.3.1 **Recommended Practice.—** *Contracting States whose international airports experience traffic peaking problems should, in accordance with appropriate procedures for coordination of schedules at airports, indicate to the appropriate airlines operating scheduled and non-scheduled flights, well in advance of the recognized traffic seasons, any restrictions that may apply in order to match the traffic and the airport capacity.*

* The specification reads as follows:

Recommendation.— *Each Contracting State should whenever possible arrange for the security controls and procedures to cause a minimum of interference with, or delay to the activities of, civil aviation provided the effectiveness of these controls and procedures is not compromised.*

6.4 **Recommended Practice.—** *Where a passenger service charge is levied at an international airport and its collection from passengers gives rise to facilitation problems, this charge should be levied, where practicable, following consultation and advance notice, on the aircraft operators which should in turn recover the charge from passengers in such a way that the necessity for additional queuing at the airport is avoided.*

6.5 **Recommended Practice.—** *Whenever possible, the use of credit cards should be acceptable as a means of payment for services rendered, including duties and taxes, at international airports.*

6.6 **Recommended Practice.—** *It is recommended that aircraft operators, in agreement with, and subject to reasonable limitations which may be imposed by, the airport operators, be offered the choice of providing their own services for ground handling operations, or the option of having such operations performed entirely, or in part, by an organization controlled by another aircraft operator authorized by the airport operator, or by the airport operator, or by a servicing agent approved by the airport operator.*

B. Airport traffic flow arrangements

I. Common provisions

6.7 Contracting States shall ensure that particular attention is given to the need for adequate facilities to be available at all times at international airports and that appropriate measures are adopted to permit embarkation and disembarkation of passengers without delay.

6.7.1 **Recommended Practice.—** *Contracting States should encourage airport operators and aircraft operators to exchange all relevant flight information. Electronic Data Interchange with airlines should be facilitated at busy airports. In such cases, technical solutions complying with industry standards (e.g. UN/EDIFACT) should be encouraged.*

6.8 **Recommended Practice.—** *The arrangements in 6.3 should be by the most direct route with no crossing between passenger and baggage lines nor between different circuits. To the extent that the route is not self-evident, appropriate sign-posting should be used.*

6.9 **Recommended Practice.—** *International signs to facilitate passengers using airports, reproduced in the document* *developed for that purpose entitled* International Signs to Provide Guidance to Persons at Airports and Marine Terminals *(Doc 9636) published jointly by ICAO and the International Maritime Organization, should be introduced at the earliest practicable opportunity.*

6.9.1 **Recommended Practice.—** *Notices and leaflets should be prominently displayed at international airports, warning travellers of the serious consequences of illegal narcotics trafficking and of the penal measures to which persons convicted of narcotics law offences may be liable.*

6.10 **Recommended Practice.—** *Arrangements should be made so that, when necessary, passengers and crew can proceed under shelter between the air terminal buildings and the aircraft, and vice versa.*

6.11 **Recommended Practice.—** *Particular attention should be given to passenger routes involving long distances to be covered on foot and the possibility should be studied of facilitating travel over these routes by mechanical systems.*

6.12 **Recommended Practice.—** *Flight information boards, or displays, supplemented, where necessary, by a clearly audible public address system should be provided so that passengers and the public can be fully informed of arrivals, departures and cancellations of flights, and particularly of any last-minute changes in arrival or departure times or changes in gate numbers.*

6.12.1 **Recommended Practice.—** *In giving effect to 6.12, flight information boards or displays should, as far as possible, be in the standard layout recommended in Doc 9249* — Dynamic Flight-related Public Information Displays. *Contracting States should ensure that the parties concerned in the operation of flights provide on a timely and rapidly updated basis all relevant information on flights, including last-minute changes, to the authorities responsible for the operation of Flight Information Display Systems. Those authorities should be responsible for establishing the list of data elements they need for this operation and the means of communicating them, recognizing existing industry standards.*

6.13 **Recommended Practice.—** *Contracting States should ensure that rapid and reliable city/airport ground transportation is available.*

6.13.1 **Recommended Practice.—** *Contracting States should promote full consultation at the earliest possible stage between airport operators and all agencies and operators involved in surface access to the airport to encourage both increased coordination in the planning of surface access to airports and the provision of relevant information to passengers. Contracting States should also promote both the provision of information to passengers on services available and on the price for such services, and the facilitation of ticketing for ground transportation, including payment methods.*

6.14 **Recommended Practice.—** *International airports should have available appropriate automobile parking facilities for short- and long-term parking.*

II. Parking and servicing arrangements

6.15 **Recommended Practice.—** *Adequate measures should be taken to ensure convenient parking and servicing of aircraft of all types and categories — regular, non-scheduled and general aviation aircraft — in order to expedite clearance and operations on the apron and to reduce aircraft ground stop time. It is desirable in particular:*

a) to make arrangements for optimum allocation of aircraft parking spaces as close as possible to the terminal building for rapid loading and unloading;

b) to provide adequate parking spaces, away from the terminal building, for aircraft when either loading or unloading, so as to avoid obstruction to the flow of traffic on the apron, and make adequate arrangements for their optimum use;

c) to equip the parking spaces with the necessary means for rapid, convenient and safe performance of all aircraft servicing operations, including equipment for secure tie-downs;

d) to give particular importance to measures for assistance to aircraft during embarkation and disembarkation operations;

e) to provide facilities for fuelling of aircraft during hours established by the public authorities;

f) to provide transportation between remote parking positions and the terminal building when distance and safety so require as a result of optimum use of the parking area available; and

g) to provide, when necessary, parking space for international flights where inspection of aircraft, passengers, crew and baggage can be performed.

III. Outbound passengers, crew and baggage

6.16 **Recommended Practice.—** *Easy and speedy access to the terminal should be provided for passengers, crew and their baggage arriving at the airport by surface transport.*

6.17 **Recommended Practice.—** *Contracting States should ensure that, where traffic justifies, aircraft operators, airports and airport handling operators consider the provision of child care rooms of suitable dimensions and with necessary child care facilities, in the departure and transit lounges of* *passenger terminals, to provide special areas for infants/small children accompanied by parent(s) or guardian(s). These rooms should be clearly marked with appropriate signs.*

6.18 **Recommended Practice.—** *Easy and frequent transportation should be available between airport terminal buildings as well as between designated remote parking facilities and airport terminal buildings.*

6.19 **Recommended Practice.—** *Consideration should be given to the provision of baggage check-in facilities as close as possible to arrival points of surface transport.*

6.20 **Recommended Practice.—** *Contracting States should study the possibility of allowing the provision of off-airport check-in facilities, with due regard to the necessary security precautions and control requirements.*

6.21 **Recommended Practice.—** *In order to facilitate aircraft departure, Contracting States, in examining passengers as a security measure, or for purposes of narcotics control as appropriate, should, to the extent feasible, utilize specialized equipment in conducting such examinations so as to reduce materially the number of persons to be searched by other means.*

Note 1.— The use of radiological techniques for screening passengers should be avoided.

Note 2.— Privacy should be assured when a thorough physical search is to be carried out. If special rooms are not available, portable screens may be used for this purpose.

6.22 **Recommended Practice.—** *In order to facilitate aircraft departure, Contracting States, in examining baggage of passengers departing from their territory as a security measure, or for narcotics control purposes as appropriate, should, to the extent feasible, utilize specialized equipment in conducting such examinations so as to reduce materially the amount of baggage to be searched by other means.*

6.23 **Recommended Practice.—** *An individual and continuous "trickle" method of processing and loading of passengers, crew and baggage should be adopted — in lieu of the group ("package") system — whenever this will speed up their clearance.*

6.24 **Recommended Practice.—** *Particular attention should be paid to the use of sorting, conveyance, reconciliation and loading devices for baggage. Provisions should be made as far as possible for:*

a) mechanized systems capable of sorting, transferring and loading large quantities of baggage within a minimum amount of time, consistent with the volume of traffic;

b) the use of the unique baggage identification system, known as the "Licence Plate Concept", for baggage reconciliation, sorting and tracing. The "Licence Plate Concept" developed by ACI/IATA is defined in the IATA Passenger Services Conference Resolutions Manual *(Resolution 740) and in the appropriate Recommended Practices of the same document. The concept includes a coded baggage tag with a unique number that can be read automatically and transmitted electronically between aircraft operators, airports and handling agents. It enables these parties to provide higher-quality baggage sorting and handling. Baggage reconciliation applications (reference Annex 17, 4.4.3) can also use the same data elements;*

c) an area where it would be possible to hold baggage containers and to rearrange their contents; and

d) mechanical means of handling and sorting empty baggage containers, consistent with the volume of traffic.

6.25 **Recommended Practice.—** *The premises that crew members have to visit for operational purposes should be readily accessible and, if possible, next to one another.*

IV. Inbound passengers,
crew and baggage

6.26 Contracting States shall make arrangements for a sufficient number of control channels so that clearance of inbound passengers and crew may be obtained with the least possible delay. Additional channel(s) shall be available if possible to which complicated cases may be directed without delaying the main flow of passengers.

6.27 **Recommended Practice.—** *Particular attention should be given to points where passenger delays are frequently found to occur.*

6.28 To obviate any delay to passengers, the necessary steps shall be taken to ensure that baggage arrives on time in the baggage claim area.

6.28.1 **Recommended Practice.—** *Arrangements should be made for rapid unloading of baggage, including containerized baggage, from the aircraft and its swift movement to the baggage claim area. To this end, mechanical unloading and conveyance systems should be used where the volume of traffic warrants and a sufficient number of handling staff should be available at all times.*

6.29 **Recommended Practice.—** *Adequate space should be provided in the baggage claim area permitting ready identification and speedy withdrawal by each passenger of his checked baggage.*

6.30 **Recommended Practice.—** *Where the volume of baggage so warrants, mechanized baggage dispensing systems* *should be provided in baggage-claim areas so as to move the baggage towards passengers, thus facilitating pick-up of baggage.*

6.30.1 The operators responsible for international airports shall ensure that passengers can obtain assistance in the carriage of baggage to enable them to transfer baggage from baggage claim areas to points as close as possible to areas where surface transportation from the airport or between airport terminals is provided.

V. Transit and transfer of passengers and crew

6.31 **Recommended Practice.—** *Contracting States should, whenever possible, permit passengers to remain on board the aircraft and authorize embarkation and disembarkation during refuelling, subject to the necessary safety measures.*

6.31.1 **Recommended Practice.—** *It is recommended in particular that technical and regulatory provisions should be adopted to ensure that telescopic passageways to and from aircraft can be kept in use during refuelling of aircraft.*

6.32 **Recommended Practice.—** *Contracting States should ensure that physical facilities at airports are provided, where the volume and nature of the traffic so require, whereby crew and passengers in direct transit on the same aircraft, or transferring to other flights, may remain temporarily without being subject to inspection formalities, except for aviation security measures, or in special circumstances.*

Note.— This provision is not intended to prevent the application of appropriate narcotics control measures.

6.33 **Recommended Practice.—** *Provisions should be made for airline handling counters in the transit area for the purpose of processing passengers transferring from one aircraft to another and not going through clearance controls.*

6.34 **Recommended Practice.—** *Arrangements should be made whereby crew members in brief transit can communicate from a point near the aircraft's loading position, located either on the apron or in a locale near the apron, via television or telephone with the various governmental agencies (e.g. air traffic control, MET Office) without the need to report to them in person.*

VI. Miscellaneous facilities and services in passenger terminal buildings

6.35 **Recommended Practice.—** *Facilities provided for the use of transit passengers should contain all necessary arrangements for their convenience.*

6.35.1 **Recommended Practice.—** *Storage facilities should be provided for baggage left by their owners at international airports for later pick-up.*

6.35.2 International airports shall be equipped with functional secure storage facilities where unclaimed, unidentified and mishandled baggage will be kept available for clearance until forwarded, claimed or disposed of in accordance with the governmental regulations and procedures applicable in the territory of the State concerned. Airline personnel shall have access to the baggage at least throughout the hours of airport operation.

6.36 **Recommended Practice.—** *To the extent that the non-travelling public are admitted to terminal buildings, appropriate arrangements should be made so that they do not interfere with the flow of inbound and outbound traffic.*

6.36.1 **Recommended Practice.—** *Provisions should be made to locate facilities for group/tour operators in public or uncontrolled areas in the arrival and/or departure areas in order to minimize congestion in the terminal buildings.*

6.37 **Recommended Practice.—** *When duty-free or other goods are offered for sale in terminal buildings, whether to outbound passengers only or to both outbound and inbound passengers, provisions should be made for convenient locations of the stores which would ensure easy access by a large number of passengers, efficient service and adequate customer space so as to avoid congestion and interference with the main streams of outbound and inbound passenger traffic.*

VII. Cargo and mail handling and clearance facilities

6.38 **Recommended Practice.—** *Contracting States should make arrangements whereby all-cargo aircraft and their loads can be entered and cleared at the cargo terminal area.*

6.39 **Recommended Practice.—** *Easy and speedy access should be provided to airport cargo terminals, taking into account the space requirements of extra-large trucks on access roads and in front of terminals for manoeuvring into position.*

6.40 **Recommended Practice.—** *Each cargo terminal should be provided with delivery/receiving positions adaptable to truck-bed heights.*

6.41 **Recommended Practice.—** *Use should be made, where justified, of mechanized and automated facilities for loading and unloading, conveyance and storage of cargo.*

6.42 **Recommended Practice.—** *Adequate space should be available in cargo terminals for storage and handling of air cargo, including building up and breaking down of pallet and* *container loads, located next to the customs area and easily accessible to authorized persons and vehicles from both the apron and the landside road. Such arrangements should take into account aviation security and appropriate narcotics control measures.*

6.43 **Recommended Practice.—** *Adequate space and facilities should be provided at international airports, or at convenient off-airport locations, for the temporary storage of empty containers.*

6.44 **Recommended Practice.—** *Cargo terminals should be equipped with storage facilities as appropriate for special cargo (e.g. valuable goods, perishable shipments, human remains, radioactive and other dangerous goods, as well as live animals). Those areas of cargo terminals in which general and special cargo and mail are stored prior to shipment by air should be protected against access by unauthorized persons at all times.*

6.45 **Recommended Practice.—** *Parking spaces should be available at cargo terminals for handling equipment when not in use, located so as to avoid interference with the flow of inbound and outbound cargo.*

6.46 **Recommended Practice.—** *Where high-capacity aircraft with mixed passenger and cargo loads are positioned next to the passenger terminal, all necessary facilities should be provided for swift loading/unloading and conveyance between the aircraft and the cargo terminal(s) of large volumes of air cargo. To this end, flow routes should be designed so as to avoid interference with those for passengers and baggage.*

6.47 **Recommended Practice.—** *Facilities should be provided, where necessary, for the direct removal of bulky or heavy consignments by approved transport, from the airport to the premises of the importer, agent or freight forwarder, such removal being subject to customs approval and any conditions attached to that approval.*

6.48 **Recommended Practice.—** *Sufficiently large and convenient areas should be provided at international airports, where, under customs supervision, trans-shipment cargo can be broken down, sorted and reassembled for immediate or later onward transmission. Such arrangements should take into account aviation security and appropriate narcotics control measures.*

6.49 **Recommended Practice.—** *At airports whose cargo handling capacity is insufficient and whose expansion is limited or unfeasible, off-airport bonded warehouses should be allowed, and the procedures for moving cargo between them and the airport should be minimal in order to accelerate clearance and reduce congestion in airport warehouses.*

6.50 **Recommended Practice.—** *Where the volume of airmail so warrants and where it will expedite the onward transmission of the mail, in the opinion of the postal authorities, adequate space and facilities should be provided at international airports for the reworking, sorting and onward transmission of airmail. Such arrangements should take into account aviation security and appropriate narcotics control measures.*

C. Facilities required for implementation of public health, emergency medical relief, and animal and plant quarantine measures

6.51 Contracting States, in cooperation with airport operators, shall ensure the maintenance of public health, including human, animal and plant quarantine at international airports.

6.52 **Recommended Practice.—** *Contracting States should provide, at or near all their major international airports, facilities and services for vaccination or revaccination, and for the delivery of the corresponding certificates.*

6.53 **Recommended Practice.—** *International airports should have available adequate facilities for administration of public health and animal and plant quarantine measures applicable to aircraft, crew, passengers, baggage, cargo, mail and stores.*

6.54 **Recommended Practice.—** *Contracting States should provide arrangements whereby passengers and crew in transit can remain in premises free from any danger of infection and insect vectors of diseases and, when necessary, facilities should be provided for the transfer of passengers and crew to another terminal or airport nearby without exposure to any health hazard. Similar arrangements and facilities should also be made available in respect of animals.*

6.55 Contracting States, in cooperation with airport operators and aircraft operators, shall take all steps to ensure that the procurement, preparation, handling, storage and service of food and water supplies intended for consumption both at airports and on board aircraft are hygienically carried out in accordance with the pertinent regulations, recommendations and standards of the World Health Organization and the per-tinent recommendations of the Food and Agriculture Organization of the United Nations.

6.56 Contracting States, in cooperation with airport operators and aircraft operators, shall ensure that an effective system is instituted for the safe removal and safe disposal of excrement, refuse, waste water, waste, unused and condemned food and other matter dangerous to the health of persons, animals or plants in accordance with the pertinent regulations and recommendations of the World Health Organization and the recommendations of the Food and Agriculture Organization of the United Nations.

6.57 **Recommended Practice.—** *There should be maintained at international airports an organized, immediately responsive staff with facilities for first aid attendance on site and appropriate arrangements should be available for expeditious referral of the occasional more serious case to pre-arranged competent medical attention.*

D. Facilities required for clearance controls and operation of control services

6.58 **Recommended Practice.—** *Space and facilities for the authorities in charge of clearance controls should, as far as possible, be provided at public expense.*

6.59 If the space and facilities referred to in 6.58 are not provided at public expense, Contracting States shall ensure that such space and facilities are provided on terms not less favourable than those which apply to the operators of other means of transportation entering the State and requiring space and facilities on a comparable scale.

6.60 Contracting States shall provide sufficient services of the public authorities concerned, without charge, to operators during working hours established by those authorities.

Note.— Where traffic, volume and available space and facilities warrant, Contracting States may wish to provide clearance controls for passengers and their baggage at more than one location.

6.60.1 Contracting States shall provide sufficient services of the public authorities concerned in such a way as to respond to real needs and thus to the flow of traffic during working hours established by those authorities.

Note 1.— Paragraphs 6.60 and 6.60.1 should be applied in accordance with Article 82 of the International Health Regulations (1969)*, Third Annotated Edition (1983) which provides that no charge shall be made by a health authority for any medical examination provided for in the* International Health Regulations (IHR) *or for any vaccination of a person on arrival and any certificate thereof. The IHR specify that it is not permissible to exact or receive payment for medical examination carried out at any time of the day or night. Article 24 provides that health measures shall be initiated forthwith and completed without delay.*

Note 2.— Under Annex 15 — Aeronautical Information Services*, States are obligated to publish the types and hours of clearance services (customs, immigration, health) at their international airports.*

6.61 Outside of the working hours established to cover any periods of substantial workload at international airports referred to in 6.60 and 6.60.1 Contracting States shall provide services of such authorities on terms not less favourable to operators of aircraft than those which apply to operators of other means of transportation entering the State.

6.62 **Recommended Practice.—** *Contracting States should make arrangements whereby one State will permit another State to station representatives of the public authorities concerned in its territory to examine aircraft, passengers, crew, baggage, cargo and documentation for customs, immigration, public health and animal and plant quarantine purposes, prior to departure for the other State concerned, when such action will facilitate clearance upon arrival in that State. Alternatively, Contracting States may by agreement enter into electronic forms of pre-clearance for any of the functions listed above to facilitate clearance upon arrival in the other State.*

E. Monetary exchange facilities

6.63 Contracting States shall make arrangements to display at their international airports their regulations governing the exchange of funds of other States against national funds.

6.64 Contracting States that maintain exchange controls with respect to funds of other States shall make arrangements:

a) to publish the current legal rates of exchange for such funds;

b) to display or otherwise make available at their international airports such rates as may be of principal interest at the respective airports.

6.65 Contracting States that do not maintain exchange controls with respect to some or all funds of other States shall make arrangements to display information to that effect at their international airports.

6.66 **Recommended Practice.—** *With respect to those funds of other States for which no controlled exchange rates have been established by the Contracting State concerned, it should make such arrangements as may be feasible to make information available at its international airports as to the prevailing open market rates.*

6.67 Contracting States shall provide, at such times as to meet the needs of the travelling public, adequate facilities at international airports for the legal exchange of funds of other States through governmental agencies or shall authorize private agencies to do so. These facilities shall be available to arriving and departing passengers.

Note.— In giving effect to this provision, the use of vending machines at international airports, enabling a departing *passenger to obtain foreign currency, at any time of the day or night, has proved to be of valuable assistance and should be considered as a possibility by Contracting States.*

6.68 **Recommended Practice.—** *Contracting States restricting the import or export of funds of other States should provide for the issuance to travellers of certificates showing the amounts of such funds in their possession upon entering the State and should permit such travellers, upon surrender of such certificates prior to leaving the State, to take such funds with them. Inscription on the passport or other official document for travel may serve the same purpose.*

6.69 **Recommended Practice.—** *Contracting States that prohibit or limit the amount of importation of their own currency should provide reasonable facilities for travellers from abroad, who declare an amount of such currency in excess of that permitted by the current regulations, to deposit such amount at the international airport of entry and, upon departure, to reclaim it at the same point or at any other point designated by the public authorities concerned.*

F. Unruly passengers

6.70 **Recommended Practice.—** *Contracting States should take the necessary steps to increase passenger awareness of the unacceptability and consequences of unruly or disruptive behaviour in aviation facilities and on board aircraft.*

6.71 **Recommended Practice.—** *Contracting States should require that training in noting, anticipating, and handling of irate or unruly passenger behaviour, recognition of potentially escalating situations, crisis containment and related issues should be provided to the relevant staff and crew members who are in contact with passengers.*

CHAPTER 7. LANDING ELSEWHERE THAN AT INTERNATIONAL AIRPORTS

A. General

7.1 Each Contracting State shall take steps to ensure that all possible assistance is rendered by its public authorities to an aircraft which, for reasons beyond the control of the pilot-in-command, has landed elsewhere than at one of its international airports and, to this end, shall keep control formalities and procedures, in such cases, to a minimum.

7.2 The pilot-in-command or the next senior crew member available shall cause the landing to be reported as soon as practicable to the public authorities concerned.

B. Short stopover

7.3 If it is apparent that the aircraft can resume its flight within a relatively short time of arrival, the following procedure shall apply:

7.3.1 Control measures shall be limited to those that ensure that the aircraft departs with the same load that was on board at the time of arrival. In case the load or part thereof cannot, for operational or other reasons, continue on that flight, the public authorities shall expedite clearance formalities and cooperate in speedy onward transportation for that load to its destination.

7.3.2 The public authorities shall designate, if necessary, an adequate area under their general supervision where passengers and crew can move about during their stopover.

7.3.3 The pilot-in-command shall not be required to apply to more than one government agency for take-off permission (other than for any necessary air traffic control clearance).

C. No resumption of flight

7.4 If it is apparent that the aircraft will be substantially delayed or is unable to continue its flight, the following provisions shall apply:

7.4.1 The pilot-in-command, while awaiting the instructions of the public authorities concerned or if he or his crew is unable to get in touch with them, shall be entitled to take such emergency measures as he deems necessary for the health and safety of passengers and crew and for avoiding or minimizing loss or destruction to the aircraft itself and its load.

7.4.2 Passengers and crew shall be permitted to secure suitable accommodation pending completion of the necessary formalities if such formalities cannot be promptly carried out.

7.4.3 Cargo, stores and unaccompanied baggage, if required to be removed from the aircraft for safety reasons, shall be deposited in a nearby area and remain there pending completion of the necessary formalities.

7.4.4 Mail shall be disposed of as is required pursuant to the Acts in force of the Universal Postal Union.

CHAPTER 8. OTHER FACILITATION PROVISIONS

A. Bonds and exemption from requisition or seizure

8.1 **Recommended Practice.—** *If a Contracting State requires bonds of an aircraft operator to cover his liabilities under the customs, immigration, public health, animal and plant quarantine, or similar laws of the State, it should permit the use of a single comprehensive bond whenever possible.*

8.2 **Recommended Practice.—** *The aircraft, ground equipment, security equipment, spare parts and technical supplies of an aircraft operator located in a Contracting State (other than the Contracting State in which such airline is established) for use in the operation of an international air service serving such Contracting State, should be exempt from the laws of such Contracting State authorizing the requisition or seizure of aircraft, equipment, parts or supplies for public use, without prejudice to the right of seizure for breaches of the laws of the Contracting State concerned.*

B. Facilitation of search, rescue, accident investigation and salvage

8.3 Subject to any conditions imposed by Annex 12 — *Search and Rescue* and Annex 13 — *Aircraft Accident and Incident Investigation*, Contracting States shall make arrangements to ensure entry without delay into their territories on a temporary basis of qualified personnel required for search, rescue, accident investigation, repair or salvage in connection with a lost or damaged aircraft.

8.3.1 In arranging for the entry without delay of the personnel referred to in 8.3, when such a document is necessary, States shall not require any other travel document than a passport (cf. 3.4).

8.3.2 **Recommended Practice.—** *In cases where a Contracting State continues to require entrance visas for the personnel referred to in 8.3, it should, when necessary and on an exceptional basis, issue such visas on arrival or otherwise facilitate their admission when such personnel carry an order of mission from the competent authority in their State (cf. 3.38).*

8.3.3 **Recommended Practice.—** *Contracting States should ensure that their authorities are adequately informed of the provisions of Annexes 13 and 9 relating to the facilitation of aircraft accident and incident investigations. In this regard, States should recognize the need for the investigators concerned to be able to arrange transport to the site of the accident or incident without delay and, if necessary, help them to this end.*

8.4 Each Contracting State shall facilitate the temporary entry into its territory of all aircraft, tools, spare parts and equipment required in the search, rescue, accident investigation, repair or salvage of the damaged aircraft of another State. These items shall be temporarily admitted free from customs duties and other taxes or charges and the application of regulations of any nature restricting the importation of goods.

Note.— It is understood that this provision does not preclude the application of public health and animal and plant quarantine measures, if required.

8.5 Each Contracting State shall facilitate the removal from its territory of both the damaged and any assisting aircraft, together with tools, spare parts and equipment that may have been brought in for search, rescue, accident investigation, repair or salvage purposes.

8.6 Damaged aircraft or parts thereof, and any stores or cargo contained therein, together with any aircraft, tools, spare parts or equipment brought in for temporary use in search, rescue, accident investigation, repair or salvage, which are not removed from the territory of the Contracting State within a length of time to be specified by that State, shall be subject to the requirements of the applicable laws of the State concerned.

8.7 If, in connection with an aircraft accident investigation, it becomes necessary to send a part, or parts, of a damaged aircraft to another Contracting State for technical examination or testing, each Contracting State concerned shall ensure that the movement of such part, or parts, is effected without delay. The Contracting States concerned shall likewise facilitate the return of such part, or parts, to the State instituting the accident investigation should the latter State require them in order to complete the investigation.

C. Relief flights following natural and man-made disasters which seriously endanger human health or the environment, and similar emergency situations where United Nations (UN) assistance is required

8.8 Contracting States shall facilitate the entry into, departure from and transit through their territories of aircraft engaged in relief flights performed by or on behalf of international organizations recognized by the UN or by or on behalf of States themselves and shall take all possible measures to ensure their safe operation. Such relief flights are those undertaken in response to natural and man-made disasters which seriously endanger human health or the environment, as well as similar emergency situations where UN assistance is required. Such flights shall be commenced as quickly as possible after obtaining agreement with the recipient State.

Note 1.— According to its Internationally Agreed Glossary of Basic Terms, the United Nations Department of Humanitarian Affairs considers an emergency to be "a sudden and usually unforeseen event that calls for immediate measures to minimize its adverse consequences", and a disaster to be "a serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of the affected society to cope using only its own resources".

Note 2.— With respect to the application of measures to ensure the safe operation of relief flights, attention is drawn to Annex 11 — Air Traffic Services, *the* Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations *(Doc 9554) and the* Manual concerning Interception of Civil Aircraft *(Doc 9433).*

8.9 Contracting States shall ensure that personnel and articles arriving on relief flights referred to in 8.8 are cleared without delay.

D. Marine pollution and safety emergency operations

8.10 In cases of emergency, Contracting States shall facilitate the entry, transit and departure of aircraft engaged in the combatting or prevention of marine pollution, or other operations necessary to ensure maritime safety, safety of the population or protection of the marine environment.

8.11 In cases of emergency, Contracting States shall, to the greatest extent possible, facilitate the entry, transit and departure of persons, cargo, material and equipment required to deal with the marine pollution and safety operations described in 8.10.

E. Implementation of international health regulations and related provisions

8.12 Contracting States shall comply with the pertinent provisions of the current edition of the *International Health Regulations* of the World Health Organization. In accordance with Article 23 of the said Regulations, Contracting States shall apply as a maximum the health measures permitted therein for the entry, departure and transit of passengers and their baggage, cargo and other articles.

8.13 **Recommended Practice.—** *In cases where epidemiological conditions permit and it will result in reducing or eliminating the number of sanitary measures required, Contracting States should, pursuant to Article 85, paragraphs 1 and 1 d) of the* International Health Regulations*, Third Annotated Edition (1983), combine their territories or make agreements for the purpose of sanitary control.*

8.14 Contracting States shall take all possible measures to have vaccinators use the International Certificates of Vaccination or Revaccination form, in order to assure uniform acceptance.

8.15 **Recommended Practice.—** *Each Contracting State should make arrangements to enable all aircraft operators and agencies concerned to make available to passengers, sufficiently in advance of departure, information concerning the vaccination requirements of the countries of destination, as well as vaccination or revaccination certificate forms conforming to the* International Health Regulations (1969).

8.16 Aircraft operator shall ensure compliance with any requirement of a Contracting State whereby illness, other than suspected airsickness, on an aircraft is to be reported promptly by radio to health authorities in the Contracting State for which the aircraft is destined, in order to facilitate provision for the presence of any special medical personnel and equipment necessary for medical assistance and health procedures on arrival.

F. Establishment of national facilitation programmes

8.17 Each Contracting State shall establish a national air transport facilitation programme based on the facilitation requirements of the Convention and of Annex 9 thereto.

8.18 Each Contracting State shall ensure that the objective of its national air transport facilitation programme shall be to adopt all practicable measures to facilitate the movement of aircraft, crews, passengers, cargo, mail and stores, by removing unnecessary obstacles and delays.

8.18.1 **Recommended Practice.—** *In establishing a national air transport facilitation programme, States should use the guidance material outlined in Appendix 12.*

8.19 Each Contracting State shall establish a National Air Transport Facilitation Committee, and Airport Facilitation Committees as required, or similar coordinating bodies, for the purpose of coordinating facilitation activities between departments, agencies, and other organizations of the State concerned with, or responsible for, various aspects of international civil aviation as well as with airport and aircraft operators.

8.20 **Recommended Practice.—** *Contracting States should endeavour to establish close coordination, adapted to* *circumstances, between civil aviation security and facilitation programmes. To this end, certain members of Facilitation Committees should also be members of Security Committees.*

8.21 **Recommended Practice.—** *In establishing and operating National Air Transport and Airport Facilitation Committees, States should use the guidance material outlined in Appendices 11 and 12.*

G. Facilitation of the transport of passengers requiring special assistance

I. General

8.22 **Recommended Practice.—** *When travelling, persons with disabilities should be provided with special assistance in order to ensure that they receive services customarily available to the general public. Such assistance includes the offering of information and directions in media that can be understood by travellers with cognitive or sensory disabilities.*

8.23 **Recommended Practice.—** *Contracting States should cooperate with a view to taking the necessary measures to make accessible to persons with disabilities all the elements of the chain of the person's journey, from beginning to end.*

8.24 **Recommended Practice.—** *Contracting States should take the necessary steps with aircraft operators, airports and ground handling operators to establish minimum uniform standards of accessibility with respect to transportation services for persons with disabilities, from arrival at the airport of departure to leaving the airport of destination.*

8.25 **Recommended Practice.—** *Contracting States should take the necessary steps with aircraft operators, airports, ground handling operators and travel agencies to ensure that persons with disabilities are given the information they need, and should take the necessary steps to ensure that airlines, airports, ground handling operators and travel agencies are in a position to give those passengers the assistance necessary for them, depending on their needs, to help them in their travel.*

8.26 **Recommended Practice.—** *Contracting States should take all necessary steps to secure the cooperation of aircraft operators, airports and ground handling operators in order to establish and coordinate training programmes to ensure that trained personnel are available to assist persons with disabilities.*

II. Access to airports

8.27 Contracting States shall take the necessary steps to ensure that airport facilities and services are adapted to the needs of persons with disabilities.

8.28 **Recommended Practice.—** *Contracting States should ensure that lifting systems or any other appropriate devices are made available in order to facilitate the movement of elderly and disabled passengers between the aircraft and the terminal on both arrival and departure as required where telescopic passageways are not used.*

8.29 **Recommended Practice.—** *Measures should be taken to ensure that the hearing- and vision-impaired are able to obtain flight information.*

8.30 **Recommended Practice.—** *For elderly and disabled persons being set down or picked up at a terminal building, reserved points should be located as close as possible to main entrances. To facilitate movement to the various areas of the airport, access routes should be free of obstacles.*

8.31 **Recommended Practice.—** *Where access to public services is limited, every effort should be made to provide accessible and reasonably priced ground transportation services by adapting current and planned public transit systems or by providing special transport services for people with mobility needs.*

8.32 **Recommended Practice.—** *Adequate parking facilities should be provided for people with mobility needs and appropriate measures taken to facilitate their movement between parking areas and the terminal buildings.*

8.33 **Recommended Practice.—** *Direct transfer from one aircraft to another of passengers, particularly elderly and disabled passengers, should be authorized, where necessary and possible, whenever this is warranted by deadlines in making connecting flights or by other circumstances.*

III. Access to air services

8.34 Contracting States shall take the necessary steps to ensure that persons with disabilities have adequate access to air services.

8.35 **Recommended Practice.—** *Contracting States should introduce provisions by which aircraft coming newly into service or after major refurbishment should conform to minimum uniform standards of accessibility with respect to equipment on board aircraft which would include movable armrests, on-board wheelchairs, lavatories and suitable lighting and signs.*

8.36 **Recommended Practice.—** *Wheelchairs, special apparatus and equipment required by persons with disabilities should be carried free of charge in the cabin where, in the view of the aircraft operator, space and safety requirements permit or should be designated as priority baggage. Service animals accompanying passengers with disabilities should also be carried free of charge in the cabin, subject to the application of any relevant national or aircraft operator regulations.*

8.37 **Recommended Practice.—** *In principle, persons with disabilities should be permitted to determine whether or not they need an escort and to travel without the requirement for a medical clearance. However, advance notice should be mandatory where assistance or lifting is required. Aircraft operators should only be permitted to require passengers with disabilities to obtain a medical clearance in cases of medical condition where it is clear that their safety or well-being or that of other passengers cannot be guaranteed. Furthermore, aircraft operators should only be permitted to require an escort when it is clear that a person with disabilities is not self-reliant and, as such, the safety or well-being of that person or that of another passenger cannot be guaranteed.*

8.38 **Recommended Practice.—** *If the presence of an escort is required, Contracting States should encourage aircraft operators to offer discounts for the carriage of that accompanying person.*

H. Assistance to aircraft accident victims and their families

8.39 The State of Occurrence of an aircraft accident and adjacent States shall make arrangements to facilitate the entry into their territory on a temporary basis of family members of victims of an aircraft accident.

8.40 The State of Occurrence and adjacent States shall also make arrangements to facilitate the entry into their territory, on a temporary basis, of authorized representatives of the operator whose aircraft has met with the accident, or of the operator's alliance partner, in order to enable them to provide assistance to survivors and their family members, the family members of the deceased victims of the accident and the relevant authorities in these States.

Note.— Code-sharing and similar alliance agreements sometimes require alliance partners to act as "first responder" on behalf of an affected operator in case the alliance partner can get to the location of the accident quicker than the affected operator.

8.41 **Recommended Practice.—** *In arranging for the entry of the persons referred to in 8.39, the State of Occurrence and adjacent States should not require any other travel document than a passport, or an emergency travel document issued specifically to such persons, to enable them to travel to these States. In cases where the State of Occurrence of the accident or an adjacent State requires entrance visas for persons referred to in 8.39 and 8.40 above, it should expedite the issuance of such visas.*

8.42 Contracting States shall make arrangements to issue emergency travel documents, if required, to their nationals who have survived the accident.

8.43 Contracting States shall extend all necessary assistance, such as arranging transport and clearing customs, in the repatriation of human remains to their countries of origin, on request by family members of the deceased or the operator whose aircraft met with the accident.

APPENDIX 1. GENERAL DECLARATION

GENERAL DECLARATION

(Outward/Inward)

Operator ....

Marks of Nationality and Registration* .... Flight No. .... Date ....

Departure from.. Arrival at ....
(Place) (Place)

FLIGHT ROUTING

("Place" Column always to list origin, every en-route stop and destination)

PLACE	TOTAL NUMBER OF CREW*	NUMBER OF PASSENGERS ON THIS STAGE**
		Departure Place: Embarking .... Through on same flight .... *Arrival Place:* Disembarking .... Through on same flight ....

Declaration of Health*	For official use only
*Declaration of Health** Persons on board with illnesses other than airsickness or the effects of accidents (including persons with symptoms or signs of illness such as rash, fever, chills, diarrhoea) as well as those cases of illness disembarked during the flight.................... .... Any other conditions on board which may lead to the spread of disease .... Details of each disinsecting or sanitary treatment (place, date, time, method) during the flight. If no disinsecting has been carried out during the flight, give details of most recent disinsecting .... Signed, if required ______________________ Crew member concerned	

I declare that all statements and particulars contained in this General Declaration, and in any supplementary forms required to be presented with this General Declaration, are complete, exact and true to the best of my knowledge and that all through passengers will continue/have continued on the flight.

SIGNATURE ______________________
Authorized Agent or Pilot-in-command

297 mm (or 11 3/4 inches)

Size of document to be 210 mm ∆ 297 mm (or 8 1/4 ∆ 11 3/4 inches).
* To be completed only when required by the State.
** Not to be completed when passenger manifests are presented and to be completed only when required by the State.

210 mm (or 8 1/4 inches)

APPENDIX 2. PASSENGER MANIFEST

PASSENGER MANIFEST

Operator. . . . .

Marks of Nationality and Registration*. . . . . Flight No. . . . . Date . . . .

Point of embarkation . . . . (Place) Point of disembarkation . . . . (Place)

Surname and initials	For use by operator only	For official use only

297 mm (or 11 3/4 inches)

Size of document to be 210 mm Δ 297 mm (or 8 1/4 Δ 11 3/4 inches).
* To be completed only when required by the State.

210 mm (or 8 1/4 inches)

APPENDIX 3. CARGO MANIFEST

297 mm (or 11 3/4 inches)

CARGO MANIFEST

Operator. . . . .

Marks of Nationality and Registration*. . . . . Flight No. . . . . Date . . . .

Point of lading . . . . (Place) Point of unlading . . . . (Place)

Air Waybill Number	Number of packages	Nature of goods*	For use by operator only	For official use only

Size of document to be 210 mm Δ 297 mm (or 8 1/4 Δ 11 3/4 inches).
* To be completed only when required by the State.

210 mm (or 8 1/4 inches)

APPENDIX 4. CERTIFICATE OF RESIDUAL DISINSECTION

GOVERNMENT OF . . . .

CERTIFICATE OF RESIDUAL DISINSECTION

Interior surfaces, including cargo space, of this aircraft . . . . were treated with permethrin on . . . .
(aircraft registration) (date)
in accordance with the World Health Organization recommendations (WHO Weekly Epidemiological Record No. 7, 1985, p. 47; No. 12, 1985, p. 90; No. 45, 1985, pp. 345-346; and No. 44, 1987, pp. 335-336) and any amendments thereto.

The treatment must be renewed if cleaning or other operations remove a significant amount of the permethrin residue, and in any case within 8 weeks of the above date.

Expiry date: . . . .

Signed: . . . .

Designation: . . . .

Date: . . . .

APPENDIX 5. EMBARKATION/DISEMBARKATION CARD

INTERNATIONAL
EMBARKATION/DISEMBARKATION CARD

(Please print in block letters*)

1. Name: . . . .
Primary name *Secondary name(s)*

2. Date of birth: . . . .
Year *Month* *Day*

3. Nationality: . . . .

4. Travel document: . . . .
Issuing State *Document type* *Number*

5. Arriving passengers:
port of embarkation
or . . . .
Departing passengers:
port of disembarkation

6. (Other data, requested at the option of the State)

a) . . . .

b) . . . .

c) . . . .

* Applies to languages using the Latin alphabet.

APPENDIX 6. RECOMMENDATION OF THE CUSTOMS CO-OPERATION COUNCIL*

For a Simplified Customs Control, Based on the Dual-Channel System, of Passengers Arriving by Air (8 June 1971)

“THE CUSTOMS CO-OPERATION COUNCIL,

Having Regard to Recommendation No. B-3 of the Seventh Session of the Facilitation Division of the International Civil Aviation Organization, as adopted by the Council of that Organization in December 1968, relating to the establishment at international airports of dual-channel systems for speedy clearance of inbound baggage;

Having Regard to Recommendation No. 11 adopted by the Second Intermediate Session of the European Civil Aviation Conference in July 1969 on the dual-channel or red/green system;

Desiring to contribute to the efforts to improve the flow of passenger traffic at international airports;

Considering that this aim can be achieved by introducing a simplified procedure, based on the dual-channel system, for the Customs control of passengers and their baggage;

Considering that such a system can be adopted without reducing the effectiveness of the control and that it enables Customs authorities to deal efficiently with an increasing number of passengers without a corresponding increase in the number of Customs staff;

Considering that harmonization of the features of this system, as between the various countries, is essential to its smooth operation;

Recommends that Members introduce, at their major international airports, in close co-operation with the airport operators and other agencies concerned, the dual-channel system outlined below for the clearance inwards of passengers and their baggage:

1) The system shall allow the passengers to choose between two types of channels:

   a) one (green channel) for passengers having with them no goods or only goods which can be admitted free of import duties and taxes and which are not subject to import prohibitions or restrictions; and

   b) the other (red channel) for other passengers.

2) Each channel shall be clearly and distinctively marked so that the choice between them can easily be understood by passengers. The basic distinctive marking shall be:

   a) for the channel referred to under 1) a), green, in the shape of a regular octagon, and the words “NOTHING TO DECLARE” (“RIEN À DÉCLARER”);

   b) for the channel referred to under 1) b), red, in the shape of a square, and the words “GOODS TO DECLARE” (“MARCHANDISES À DÉCLARER”).

   In addition, the channels should be identified by an inscription including the words “CUSTOMS” (“DOUANE”).

3) The texts referred to in paragraph 2) shall be in English and/or French and in any other language or languages deemed useful for the airport concerned.

4) Passengers must be sufficiently well informed to choose between the channels. For this purpose it is important:

   a) that passengers be informed about the functioning of the system and about the descriptions and quantities of goods they may have with them when using the green channel. This may be done by means of posters or panels at the airport or by means of leaflets available to the public at the airport or distributed through tourist agencies, airlines and other interested bodies;

   b) that the route to the channels be clearly signposted.

5) The channels shall be located beyond the baggage delivery area so that passengers have all their baggage with them when choosing their channel. Moreover, the channels shall be so arranged that the passenger flow from that area to the exits from the airport is as direct as possible.

* Now known as the World Customs Organization (WCO).

6) The distance between the baggage delivery area and the entrances to the channels shall be sufficient to allow passengers to decide which channel to choose and to move into that channel without causing congestion.

7) In the green channel passengers shall not be subject to any Customs formalities but the Customs may make spot checks; in the red channel passengers shall accomplish the formalities required by the Customs;

Points out that the dual-channel system is not necessarily incompatible with the application of other controls, for example, exchange control, unless the relevant regulations require full control of the passengers and their baggage;

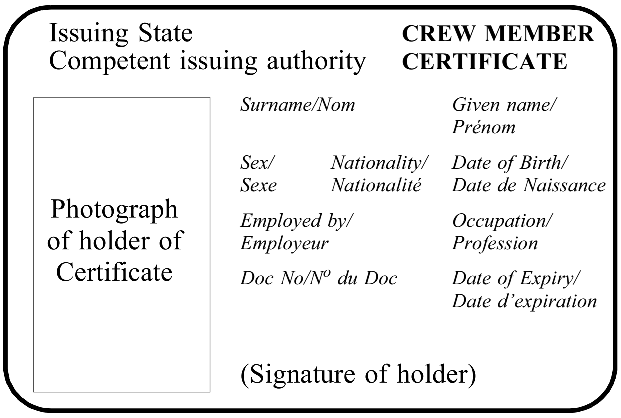
Requests Members who accept this Recommendation to notify to the Secretary General:

a) their acceptance and the date from which they will apply the Recommendation;

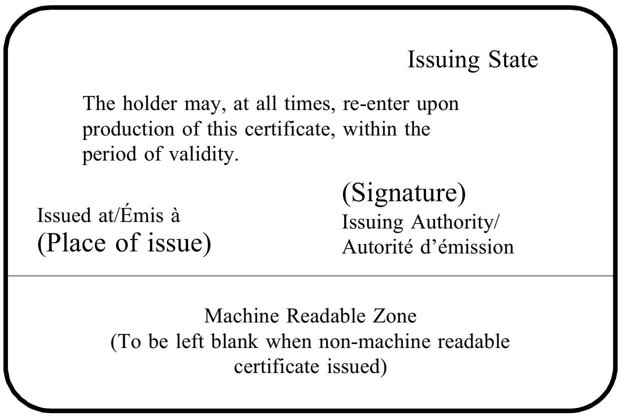
b) the names of the airports where the dual-channel system is applied.

The Secretary General will transmit this information to the Customs Administrations of Members, to the Secretary General of the International Civil Aviation Organization (ICAO) and to the Director General of the International Air Transport Association (IATA).”

APPENDIX 7. CREW MEMBER CERTIFICATE (CMC)



Front of CMC



Back of CMC

Note.— Detailed specifications for a machine readable crew member certificate can be found in Doc 9303, Part 3 — Size 1 and Size 2 Machine Readable Official Travel Documents.

APPENDIX 8. CIVIL AVIATION SAFETY INSPECTOR CERTIFICATE

Issuing State
Competent issuing authority

CIVIL AVIATION SAFETY INSPECTOR CERTIFICATE

Photograph of holder of Certificate

Surname/Nom *Given name/Prénom*

Sex/ Sexe *Nationality/ Nationalité* *Date of Birth/ Date de Naissance*

Employed by/ Employeur *Occupation/ Profession*

CIVIL AVIATION SAFETY INSPECTOR

Doc No/N^{o} du Doc *Date of Expiry/ Date d'expiration*

(Signature of holder)

Front of Certificate

Issuing State

The holder may, at all times, re-enter upon production of this certificate, within the period of validity.

Issued at/Émis à
(Place of issue)

(Signature)
Issuing Authority/
Autorité d'émission

Machine Readable Zone
(To be left blank when non-machine readable certificate issued)

Back of Certificate

Note.— Detailed specifications for a machine readable certificate can be found in Doc 9303, Part 3 — Size 1 and Size 2 Machine Readable Official Travel Documents.

APPENDIX 9. SUGGESTED FORMATS FOR DOCUMENTS RELATING TO THE RETURN OF INADMISSIBLE PERSONS

1. ATTESTING DOCUMENT RELATING TO LOST OR DESTROYED TRAVEL DOCUMENTS (see 5.6)

From: Immigration or other appropriate authority: (Name)
Airport: (Name)
State: (Name)
Telephone:
Telex:
Facsimile:

To: Immigration or other appropriate authority: (Name)
Airport: (Name)
State: (Name)

The person for whom this document is issued arrived on (date) at (name of) Airport on flight (flight number) from (City and State).

This person, who was found to be inadmissible, has lost or destroyed his travel documents and claims to be/is understood to be (strike out whichever is not applicable and add any appropriate supporting information).

Surname:

Given name(s):

Date of birth:

Place of birth:

Nationality:

Residence:

Photograph

if available

The incoming carrier was instructed to remove the passenger from the territory of this State on flight (flight number) departing on (date) at (time) from (name of) airport.

Pursuant to Annex 9 to the Convention on International Civil Aviation, the last State in which a passenger previously stayed and most recently travelled from is invited to accept him for re-examination when he has been refused admission to another State.

Date:

Name of Official:
Title:
Signature:
Name of immigration or other appropriate authority:

(Warning: This is NOT an Identification Document)

2. LETTER RELATING TO FRAUDULENT, FALSIFIED OR COUNTERFEIT TRAVEL DOCUMENTS OR GENUINE DOCUMENTS PRESENTED BY IMPOSTERS (see 5.7)

From: Immigration or appropriate authority: (Name)
Airport: (Name)
State: (Name)
Telephone:
Telex:
Facsimile:

To: Immigration or appropriate authority: (Name)
Airport: (Name)
State: (Name)

Enclosed herewith is a photocopy of a fraudulent/falsified/counterfeit passport/identity card/genuine document presented by an imposter.
Document number:
State in whose name this document was issued:

The above-mentioned document was used by a person claiming to be:

Surname:

Given name(s):

Date of birth:

Place of birth:

Nationality:

Residence:

Photograph

if available

This person arrived on (date) at (name of) Airport on flight (flight number) from (City and State).

The holder was refused entry to (name of State) and the incoming carrier has been instructed to remove the passenger from the territory of this State on flight (flight number) departing at (time) and (date) from (name of airport).

The above-mentioned document will be required as evidence in the holder's prosecution and has been impounded. As this document is the property of the State in whose name it was issued, it will be returned, following prosecution, to the appropriate authorities.

According to Annex 9 to the Convention on International Civil Aviation, the last State in which a passenger previously stayed and most recently travelled from is invited to accept him for re-examination when he has been refused admission to another State.

Date:

Name and signature of Official:
Title:
Name of immigration or appropriate authority:

(Warning: This is NOT an Identification Document)

APPENDIX 10. UNITED NATIONS LAYOUT KEY FOR TRADE DOCUMENTS

Shipper (Exporter)	Date: Reference No. etc.
Consignee	Other address (e.g. buyer, if other than consignee)
Notify or delivery address	Statements as to countries
Statements as to transportation	Terms of delivery and payment

Marks and numbers; number and kind of package; description of goods Statistical No. Net quantity Value

. . . .

Gross weight Measurement

Free disposal

Place and date of issue; signature

297 mm (or 11 3/4 inches)

210 mm (or 8 1/4 inches)

APPENDIX 11. MODEL AIRPORT FACILITATION (FAL) PROGRAMME

1. PURPOSE OF AN AIRPORT FAL PROGRAMME

The purpose of an airport FAL programme is to pursue the objectives of Annex 9 at the operational level, to facilitate the completion of border clearance formalities at the airport with respect to aircraft, crews, passengers and cargo.

2. SCOPE OF AN AIRPORT FAL PROGRAMME

The airport FAL programme encompasses all of the provisions of Annex 9 concerning border clearance processes at the airport, as well as the planning for and management of those processes. A representative list of tasks to be performed and the Standard(s) or Recommended Practice(s) (SARPs) applicable to each one are provided in the table below.

3. ORGANIZATION AND MANAGEMENT

3.1 The recommended vehicle to conduct the facilitation programme at the operational level is the Airport Facilitation Committee. Although such committees should be encouraged by the National FAL Committee and keep it informed of their problems and progress, they are not necessarily supervised by the national body. Their principal concern is day-to-day problem-solving and implementation of Annex 9.

3.2 It is recommended that the airport manager take charge of the committee and convene regular meetings. Membership should consist of the senior officers in charge of their respective inspection agencies at the airport, e.g. customs, immigration, quarantine, etc., as well as the station managers of the aircraft operators with international operations at the airport concerned. The participation of all parties is necessary to make the airport FAL programme a success.

Airport FAL programme task	*Annex 9 (12th Edition) SARPs*
Establish, review and amend, as necessary, procedures for entry and clearance of flights at the airport concerned.	Standard 6.1.1
Review regularly all parties' performance with respect to meeting the 45-minute goal for processing inbound passengers and the 60-minute goal for processing outbound passengers. Use time studies and queue analysis to determine where adjustments should be made.	Recommended Practices 3.36 and 3.39
Establish modern systems for immigration and customs inspection, using applicable technology. Collaborate in setting up automated passenger clearance systems.	Standards 3.40, 3.51 and 6.26
Make necessary changes in traffic flows and checkpoints in the airport to cope with rising traffic volumes.	Standard 6.3
Improve the quality and quantity of signage in the inspection facilities in order to reduce customer confusion.	Recommended Practices 6.9 and 6.12.1
Review staffing of inspection stations – work shifts, overtime, etc. – and seek adjustments to meet traffic demands.	Recommended Practice 6.3.1
Provide input on behalf of resident aircraft operators and inspection agencies to the design of new airports or new inspection facilities.	Standards 6.2 and 6.7
Monitor and improve delivery of baggage to the customs inspection area.	Standard 6.28
Bring to the attention of appropriate authorities any service problems related to currency exchange. Recommend installation of ATMs in the arrivals area.	Standards 6.63, 6.64 and 6.65
Coordinate facilitation, narcotics control, aviation security and dangerous goods handling procedures so that the objectives of all four programmes are met.	Standard 8.19
Do not forget cargo! Coordinate the activities and requirements of the various inspection agencies in order to assure prompt clearance and delivery of air cargo shipments. Provide adequate facilities for loading/unloading and for secure storage of cargo while awaiting customs clearance.	Standard 4.25; Recommended Practices 4.28 and 4.29 and 6.38 to 6.50 incl.
Set up and maintain electronic systems for cargo manifesting, customs clearance, and delivery.	Standards 4.15 and 4.4

Airport FAL programme task	*Annex 9 (12th Edition) SARPs*
Customer service: Review regularly all parties' performance with respect to meeting the 3-hour goal for completion of inspection formalities and make adjustments where necessary and feasible.	Recommended Practices 4.28 and 4.29
Review inspection agency staffing of cargo clearance area – work shifts, overtime, etc. – and seek adjustments to meet customer needs.	Standard 6.60.1

APPENDIX 12. MODEL NATIONAL FAL PROGRAMME

1. PURPOSE OF A NATIONAL FAL PROGRAMME

The purpose of a National FAL Programme is to implement the Chicago Convention mandate that Contracting States provide for and facilitate the border-crossing formalities that must be accomplished with respect to aircraft engaged in international operations and their passengers, crews and cargo.

2. SCOPE OF A NATIONAL FAL PROGRAMME

The applicable articles of the Chicago Convention and the tasks involved in implementing each one are presented in the table below. Activities aimed at accomplishing these and related tasks in a State constitute the National FAL Programme.[1]

3. ORGANIZATION AND MANAGEMENT

3.1 The primary responsibility for the National FAL Programme rests with the Civil Aviation Authority (CAA) and/or the Ministry of Transport. However, success of the programme requires the active participation of other ministries or agencies, such as:

Customs	Passport/visa issuing authorities
Foreign Affairs	Public Health
Agriculture/environment	Identification card issuing authorities
Security and narcotics control	Quarantine
Tourism	
Immigration	

3.2 In addition, the active participation of airport operators (public or private) and resident international aircraft operators or their representative organizations is essential.

1. A group of smaller States with similar needs and goals may decide to establish a sub-regional FAL programme in the interest of achieving economies of scale.

3.3 Other entities which may play an advisory role include the governmental agencies or non-governmental organizations which promote international tourism and trade.

3.4 The recommended vehicle for carrying out the National FAL Programme is the **National FAL Committee**, which is composed of the heads of the government agencies involved and the chief executive officers of the national organizations representing the aircraft operators and airport operators. The chairman should be a top-management official in the CAA or an appropriate authority. In order to sustain a close link between the national FAL committee and the national aviation security committee, appropriate members from the national aviation security committee may also be members of the national FAL committee and vice-versa.

3.5 For the purpose of carrying out the work of the committee, the members may designate one or more middle-management persons in their respective organizations to represent them in meetings at the staff level (working groups). These officials should be given sufficient authority to speak on behalf of their respective organizations and to initiate necessary action in support of the committee's work. The chairman should designate a middle-management official in his department or agency to chair and convene the staff-level meetings.

3.6 The decision to convene meetings of the National FAL Committee or the members' designated representatives, and the frequency and venue of such meetings, are matters of the chairman's discretion. Working arrangements for accomplishment of the various implementing tasks would depend on the nature of the task and the issue at hand.

4. ESTABLISHMENT OF A NATIONAL FAL PROGRAMME

It is advisable that the authority for a National FAL Programme and the membership of the National FAL Committee be established through legislation, regulation, or executive action from an authorized person, in order to ensure the participation of the various agencies and industry groups involved and to make provision for continuity. The Director General of Civil Aviation (DGCA) or appropriate authority should initiate the process to obtain such a mandate through the national political system.

Chicago Convention mandate	*Implementing tasks*
Article 10 – *Landing at customs airport* ... every aircraft which enters the territory of a contracting State shall, if the regulations of that State so require, land at an airport designated by that State for the purpose of customs and other examination. On departure from the territory of a contracting State, such aircraft shall depart from a similarly designated customs airport. ...	— Establish customs airports and open new ones as appropriate. — Develop procedures by which operators of scheduled and non-scheduled services may request permission to land or depart from customs airports. — Arrange for border inspection services at customs airports.
Article 13 – *Entry and clearance regulations* The laws and regulations of a contracting State as to the admission to or departure from its territory of passengers, crew or cargo of aircraft, such as regulations relating to entry, clearance, immigration, passports, customs, and quarantine shall be complied with by or on behalf of such passengers, crew or cargo upon entrance into or departure from, or while within the territory of that State.	— Support the interested border control agencies in the establishment and maintenance of effective inspection systems at airports, and in their efforts to rationalize their respective procedures. — Develop programmes for control of security problems such as document fraud, illegal migration and smuggling. — Coordinate preparations for clearing large numbers of international visitors for special events, e.g. international athletics competitions.
Article 14 – *Prevention of spread of disease* Each contracting State agrees to take effective measures to prevent the spread by means of air navigation of cholera, typhus (epidemic), smallpox, yellow fever, plague, and such other communicable diseases as the contracting States shall from time to time decide to designate, ...	— Establish, review and amend as necessary the national policies regarding prevention of the spread of contagious diseases by air, for example, aircraft disinsection, disinfection, public health-related quarantine programmes, and screening measures to be applied in a health emergency.
Article 22 – *Facilitation of formalities* Each contracting State agrees to adopt all practicable measures, through the issuance of special regulations or otherwise, to facilitate and expedite navigation by aircraft between the territories of contracting States, and to prevent unnecessary delays to aircraft, crews, passengers and cargo, especially in the administration of the laws relating to immigration, quarantine, customs and clearance.	— Establish, review and amend as necessary the national regulations which implement the State's customs, immigration and quarantine laws pertaining to international movements by air.
Article 23 – *Customs and immigration procedures* Each contracting States undertakes, so far as it may find practicable, to establish customs and immigration procedures affecting international air navigation in accordance with the practices which may be established or recommended from time to time, pursuant to this Convention. ...	— Establish and amend as appropriate, customs and immigration procedures carried out at airports, to harmonize them with the standards and recommended practices set forth in Annex 9. — Support and advocate the national issuance of passports and other travel documents in accordance with ICAO specifications in Doc 9303 – *Machine Readable Travel Documents*.
Article 37 – *Adoption of international standards and procedures* Each contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation. ... (j) Customs and immigration procedures ...	— Participate in ICAO development of Annex 9. — Review national procedures periodically in order to ensure harmonization with the provisions of Annex 9.
Article 38 – *Departures from international standards and procedures* Any State which finds it impracticable to comply in all respects with any such international standard or procedure, or to bring its own regulations or practices into full accord with any international standard or procedure after amendment of the latter, or which deems it necessary to adopt regulations or practices differing in any particular respect from those established by an international standard, shall give immediate notification to the International Civil Aviation Organization of the differences between its own practice and that established in the international standard. ...	— Periodically review conformity by all relevant agencies with the provisions of Annex 9 and notify ICAO of differences between national practices and the relevant standards.

— END —

ICAO PUBLICATIONS AND RELATED PRODUCTS IN THE AIR TRANSPORT FIELD

The following summarizes the various publications and related products in the air transport field issued by the International Civil Aviation Organization:

- *International Standards and Recommended Practices (SARPs)* adopted by the Council in accordance with Articles 37, 54 and 90 of the Convention on International Civil Aviation and designated, for convenience, as Annexes to the Convention. Annex 9 — *Facilitation* — contains SARPs dealing with customs, quarantine, immigration and health matters concerned with international air navigation. Annex 17 — *Security* — is composed of SARPs on all matters related to safeguarding civil aviation against acts of unlawful interference. Any differences between the national regulations and practices of a State and what is prescribed by an International Standard must be notified to the Council in accordance with Article 38 of the Convention. The Council has also invited Contracting States to notify differences from the provisions of the Recommended Practices.

- *ICAO's policies* on the regulation of international air transport, charges for airports and air navigation services, and taxation in the field of international air transport.

- *Technical specifications* on machine readable travel documents (MRTDs).

- *Tariffs* for airports and air navigation services, including charges applied towards users in more than 180 States.

- *Manuals* providing information or guidance to Contracting States on such issues as regulation of international air transport, financial management of airports and air navigation services, air traffic forecasting methods, and compliance with Annex 17 provisions.

- *Circulars* providing specialized information of interest to Contracting States. They include studies on medium- and long-term trends in the air transport industry at a global and regional level and specialized studies of a worldwide nature covering issues such as the economic and financial aspects of CNS/ATM systems implementation, regional differences in airline operating economics, economic contribution of civil aviation, privatization of airports and air navigation services, and regulatory implications of slot allocation.

- *Aviation Security Training Packages (ASTPs) and courses* on a range of subjects designed to assist security professionals, managers and staff in developing a more comprehensive understanding of SARPs, as well as to offer specialized practical expertise in the implementation and monitoring of measures and provisions in accordance with local programmes. For further information, please contact avsec@icao.int or visit the training page on the ICAO AVSEC website at www.icao.int/avsec.

- *Publications in electronic form*, in database and interactive forms, such as the world's air services agreements and the ICAO template air services agreements. *Civil aviation statistics* can be accessed by purchasing an annual subscription to one or more of the data series distributed by ICAO through its commercial website at www.icaodata.com. Questions regarding ICAO statistics or special orders for statistical data should be sent to sta@icao.int.

- *Reports of meetings in the air transport field,* including reports on the Facilitation and Statistics divisional-type meetings and those related to conferences on aviation security, regulation of international air transport, and economics of airports and air navigation services.

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International Standards and Recommended Practices

Annex 10
to the Convention on International Civil Aviation

Aeronautical Telecommunications

Volume I
Radio Navigation Aids

This edition incorporates all amendments adopted by the Council prior to 25 February 2006 and supersedes, on 23 November 2006, all previous editions of Annex 10, Volume I.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Sixth Edition
July 2006

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the supplements to the *Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-81	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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ATTACHMENTS

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FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Telecommunications were first adopted by the Council on 30 May 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 10 to the Convention. They became effective on 1 March 1950. The Standards and Recommended Practices were based on recommendations of the Communications Division at its Third Session in January 1949.

Up to and including the Seventh Edition, Annex 10 was published in one volume containing four parts together with associated attachments: Part I — Equipment and Systems, Part II — Radio Frequencies, Part III — Procedures, and Part IV — Codes and Abbreviations.

By Amendment 42, Part IV was deleted from the Annex; the codes and abbreviations contained in that part were transferred to a new document, Doc 8400.

As a result of the adoption of Amendment 44 on 31 May 1965, the Seventh Edition of Annex 10 was replaced by two volumes: Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communication Procedures.

As a result of the adoption of Amendment 70 on 20 March 1995, Annex 10 was restructured to include five volumes: Volume I — Radio Navigation Aids; Volume II — Communication Procedures; Volume III — Communication Systems; Volume IV — Surveillance Radar and Collision Avoidance Systems; and Volume V — Aeronautical Radio Frequency Spectrum Utilization. By Amendment 70, Volumes III and IV were published in 1995 and Volume V was published in 1996 with Amendment 71.

Table A shows the origin of Annex 10, and the origin of subsequent amendments, together with a summary of the principal subjects involved and the dates on which the Annex and the amendments were adopted by Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards, Recommended Practices and Procedures specified in Annex 10, should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been deliberately written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper*:

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*:

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Disclaimer regarding patents

Attention is drawn to the possibility that certain elements of Standards and Recommended Practices in this Annex may be the subject of patents or other intellectual property rights. ICAO shall not be responsible or liable for not identifying any or all such rights. ICAO takes no position regarding the existence, validity, scope or applicability of any claimed patents or other intellectual property rights, and accepts no responsibility or liability therefore or relating thereto.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 10, Volume I

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	Third Session of the COM Division	Introduction of Standards and Recommended Practices for radio navigation aids and communication facilities, together with methods of operation, procedures and codes for worldwide application.	30 May 1949 1 March 1950 1 April 1950
1	Third Session of the COM Division	Amendment to provisions for radio teletypewriter terminal equipment in the band 3-30 MHz.	28 March 1951 1 October 1951 1 January 1952
2*	Third Session of the COM Division	Addition of guidance material concerning radio teletypewriter system engineering.	28 March 1951 1 October 1951 1 January 1952
3	Third Session of the COM Division	Standards and Recommended Practices relating to radio frequencies.	28 March 1951 1 October 1951 1 January 1952
4	Third Session of the COM Division	Standards and Recommended Practices relating to communications procedures.	28 March 1951 1 October 1951 1 April 1952
5	Third Session of the COM Division	Standards and Recommended Practices relating to codes and abbreviations.	28 March 1951 1 October 1951 1 April 1952
6	Third Session of the COM Division	Q Code.	1 April 1952 4 July 1952 1 September 1952
7	Air Navigation Commission	Introduction of definitions for height, altitude and elevation in Annex 10.	17 June 1952 1 December 1952 1 April 1953
8	Fourth Session of the COM Division	Amendments concerning definitions, VHF radiotelegraph for aural reception, DME, SRE, NDB, 75 MHz en-route marker beacons, ILS.	17 June 1952 1 December 1952 1 April 1953
9	Fourth Session of the COM Division	Provisions concerning the utilization of offset frequency simplex.	17 June 1952 1 December 1952 1 April 1953
10	Fourth Session of the COM Division	Definitions and procedures relating to the AFS, AMS and Broadcasts.	17 June 1952 1 December 1952 1 April 1953
11	Secretariat proposal	Editorial amendments consequential to Amendment 7, and editorial improvements to Part IV.	17 June 1952 1 December 1952 1 April 1953
12	Fourth Session of the COM Division	Annulment of 5.1.6.7 of Amendment 10 adopted by Council on 17 June 1952.	28 November 1952 1 March 1953 1 April 1953
13	Proposal by Ireland on Recommendations of the Fourth Session of the COM Division	Procedure governing the relay of traffic between an aeronautical station and an aircraft no longer in radio contact.	5 May 1953 15 August 1953 1 October 1953

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
14	First AN Conference	Specifications for the siting of ILS marker beacons, VHF equisignal localizers and associated monitors.	11 December 1953 1 May 1954 1 June 1954
15	Fifth Session of the COM Division	Amendment of paired frequencies for ILS localizers and glide paths.	2 November 1954 1 March 1955 1 April 1955
16	Fifth Session of the COM Division	Provision of additional assignable frequencies in the VHF bands by extending the allotment table and by making provision for decreasing, under certain conditions, the minimum separation between channels.	2 November 1954 1 March 1955 1 April 1955
17	Fifth Session of the COM Division	Addition of Standards and Recommended Practices on interim long distance radio navigation aids and on communications systems; also updating of the ILS specifications.	10 December 1954 1 April 1955 1 October 1955
18	Fifth Session of the COM Division	Establishment of basic rules for the selection of frequencies for radio navigation aids operating in frequency bands above 30 MHz, including frequencies for secondary radar.	10 December 1954 1 April 1955 1 October 1955
19	Fifth Session of the COM Division	Procedure to facilitate downgrading or cancellation of messages not delivered within time specified by originator and requirement for specification of aircraft heading in distress message.	10 December 1954 1 April 1955 1 October 1955
20	Fifth Session of the COM Division	Amendment of codes and abbreviations.	10 December 1954 1 April 1955 1 October 1955
21	Third North Atlantic RAN Meeting	Alignment of radiotelegraphy messages originating in aircraft with radiotelephony messages.	27 May 1955 1 September 1955 1 October 1955
22	Fifth Session of the COM Division	Pairing of localizer and glide path frequencies for the ILS.	18 November 1955 1 April 1956 1 December 1956
23	Air Navigation Commission	Amendment concerning words to be used in spelling in radiotelephony.	18 November 1955 1 March 1956 1 March 1956
24	Fourth Session of the MET Division	Amendment of Q code signal QBB.	18 November 1955 1 April 1956 1 December 1956
25*	Annex 3	Amendment of the Q code signal QUK (consequential to amendment of Annex 3).	8 November 1955 — 1 January 1956
26	Annex 15	New definition of NOTAM and references to NOTAM (consequential to amendment of Annex 15).	22 February 1956 1 July 1956 1 December 1956
27	Second AN Conference	Siting of the inner and middle markers of the ILS and guidance material on the location of the ILS reference point.	11 May 1956 15 September 1956 1 December 1956

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
28	Procedures of the World Meteorological Organization (WMO) and Annex 3	Amendment of the Q code signals for the reporting of clouds and the introduction of the AIREP reporting procedure.	15 May 1956 15 September 1956 1 December 1956
29	Proposal by Australia	Tape-relay Standards.	4 June 1957 1 October 1957 1 December 1957
30*	Annex 3	Amendment of the Q code signals QUK and QUL (consequential to amendment of Annex 3).	25 November 1957 — 1 December 1957
31	Proposal by France	Amendment of the Q code signals QNH and QNY.	21 March 1958 1 August 1958 1 December 1958
32	Sixth Session of the COM Division	Recommendations of the meeting.	9 June 1958 1 October 1958 1 December 1958
33	ICAO Panel of Teletypewriter Specialists	Communication operational procedures to ensure compatibility between AFTN communication centres employing manual “torn-tape”, semi-automatic and fully automatic operation.	15 December 1958 1 May 1959 1 October 1959
34	RAC/SAR Division	Increased number of radio frequencies that may be selected for use in radio survival equipment.	8 December 1959 1 May 1960 1 August 1960
35	Special COM/OPS/RAC/SAR Division	Implementation requirements for VOR, introduction of new DME specification and extension of protection dates for VOR and DME to 1 January 1975.	8 April 1960 1 August 1960 1 January 1961
36	Air Navigation Commission	Substituted “Radiotelephony Speech for International Aviation” for “International Language for Aviation”.	8 April 1960 1 August 1960 1 January 1961
37	Fifth Session of the MET Division, AIS and Aeronautical Charts Division	Procedures respecting the forwarding of messages; amendment of Q code signals.	2 December 1960 1 April 1961 1 July 1961
38	Ordinary Administrative Radio Conference (OARC-1959)	Alignment of the provisions in Annex 10 with the related provisions of the Radio Regulations of the International Telecommunication Union (ITU).	20 January 1961 1 June 1961 1 July 1961
39	ICAO Panel of Teletypewriter Specialists	Simplification of communication procedures for diversion routing, clarification of the application of ICAO two-letter abbreviations used in the addresses of messages and communication procedures concerning interstation cooperation.	26 June 1961 1 December 1961 1 January 1962
40	Seventh Session of the COM Division	General updating and amendment of equipment and systems; radio frequencies and procedures.	5 April 1963 1 August 1963 1 November 1963
41	PANS-MET	Amendment of the Q code signals QFE, QFF and QNH to permit the transmission of altimeter settings in units of millibars or tenths of a millibar.	4 June 1963 1 October 1963 1 January 1964

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
42	Fourth Meeting of the MOTNE Development/Implementation Panel; Seventh Session of the COM Division; proposals by the Federal Republic of Germany, the United Kingdom and the United States	Non-typing or switching signals on the AFTN; new guidance material on ILS course structures and their evaluation; guidance material on ILS course structure and on the more important communication terms of specialized meaning and their definitions; the deletion of Part IV of the Annex as a consequence of the establishment of a new abbreviations and codes document; departure messages and guidance material on the monitoring of SSR.	25 March 1964 1 August 1964 1 January 1965
43	Seventh Session of the COM Division	Amendments concerning the performance of ILS facilities, Category I and Category II.	23 June 1964 1 November 1964 1 February 1965
44	Seventh Session of the COM Division; Fifth Meeting of the ICAO Panel of Teletypewriter Specialists; RAC/SAR and OPS Division; PANS — Radiotelephony Procedures	Breakdown of Annex 10 into two volumes, Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communications Procedures. Changes in the provisions regarding the action to be taken in the case of communications failure and in the case of transfer of communications watch from one radio frequency to another; provisions relating to teletypewriter procedures; deletion of the radiotelephony procedures in the aeronautical mobile service, except for certain basic provisions of the distress procedures.	31 May 1965 1 October 1965 10 March 1966
45	Fourth AN Conference; Sixth Meeting of the Panel of Teletypewriter Specialists	Specification of the technical characteristics for VHF survival radio equipment and introduction of the concept of the "ILS reference datum" in lieu of the "ILS reference point"; a number of AFTN technical provisions related to the progressive automation of the AFTN.	12 December 1966 12 April 1967 24 August 1967
46	Fifth Meeting of the ATC Automation Panel	Definitions and technical provisions relating to ATS message transmission on direct or omnibus channels.	7 June 1967 5 October 1967 8 February 1968
47	COM/OPS Divisional Meeting	Updating or expansion of practically every major specification. Of special importance are the changes to the ILS and SSR specifications; the introduction of a system specification for Loran-A; the expanded guidance material on the deployment of VHF communications frequencies and specification, for the first time, of the airborne elements of ADF, VHF and HF SSB Communications Systems.	11 December 1967 11 April 1968 22 August 1968
48	COM/OPS Divisional Meeting; Fifth AN Conference	New method of prescribing VOR/DME coverage; provisions regarding the availability of information on the operational status of radio navigation aids, regarding secondary power supplies of radio navigation and communication systems as well as guidance on power supply switch-over times for radio aids used in the vicinity of aerodromes.	23 January 1969 23 May 1969 18 September 1969
49	First Meeting of the Automated Data Interchange Systems Panel; Sixth AN Conference	Introduction of a 7-unit code for data interchange at medium signalling rates, the medium signalling rates to be used and the types of transmission and modulation for each of them; provisions concerning the secondary surveillance radar ground equipment to ensure immediate recognition of Codes 7600 and 7700 and provisions concerning the use of Code 2000 on Mode A.	1 June 1970 1 October 1970 4 February 1971

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
50	Second Meeting of the Automated Data Interchange Systems Panel; ANC study on RAN Meeting recommendations of worldwide applicability; Fourth Meeting of the All Weather Operations Panel	Introduction of the term "Hertz (Hz)" in place of the term "cycles per second (c/s)" as the unit of frequency for electric and radio-technical matters; definition for data signalling rate, the extension of signalling rates to 9 600 bits/second and some explanatory provisions related to the 7-unit coded character set; provisions concerning the pre-flight checking of VOR airborne equipment; definitions for "ILS Point D" and "ILS Point E" and some changes in the provisions relating to the specification for ILS and en-route VHF marker beacons.	24 March 1972 24 July 1972 7 December 1972
51	Third Meeting of the Automated Data Interchange Systems Panel; Third Meeting of the Obstacle Clearance Panel	Technical provisions relating to international ground-ground data interchange; guidance material concerning the lateral placement of the glide path antenna in relation to Annex 14 provisions on obstacle limitation surfaces and objects on strips for runways.	11 December 1972 11 April 1973 16 August 1973
52	Seventh AN Conference	New Standard relating to an emergency locator beacon — aircraft (ELBA); provision for additional localizer and glide path frequency pairs, and the introduction of 25 kHz channel spacing in the VHF band of the International Aeronautical Mobile Service; introduces refinements to the specifications for ILS, SSR and VOR, and extends the protection dates for ILS, DME and VOR from 1975 to 1985.	31 May 1973 1 October 1973 23 May 1974
53	Assembly Resolutions A17-10 and A18-10	Provisions relating to practices to be followed in the event that an aircraft is being subjected to unlawful interference.	7 December 1973 7 April 1974 23 May 1974
54*	Fourth Meeting of the Automated Data Interchange Systems Panel	New Attachment G to Part I of Volume I containing guidance material for ground-ground data interchange over data links at medium and higher signalling rates, and the insertion of cross references in Volume I, Part I, Chapter 4, 4.12.	17 June 1974 — —
55	Fifth Meeting of the All Weather Operations Panel; Second Meeting of the Review of the General Concept of Separation Panel; AN Working Group on Regional Plans; Seventh AN Conference	Technical specifications and guidance material for localizer and glide path components of the ILS; guidance material in respect of mandatory change-over points for VOR-defined ATS routes; alignment of the implementation provisions for ILS with those of other radio navigation aids; required geographic separation between ILS facilities and provisions concerning use of the VHF emergency channel (121.5 MHz) in the event of interception of aircraft.	4 February 1975 4 June 1975 9 October 1975
56	Correspondence	Designation of SSR Code 7500 for use in the event of unlawful interference.	12 December 1975 12 April 1976 12 August 1976
57	ASIA/PAC RAN Meeting	Provision of, and maintenance of guard on the VHF frequency 121.5 MHz.	16 June 1976 16 October 1976 6 October 1977
58	ANC study of threshold wheel clearance; Sixth Meeting of the Automated Data Interchange Systems Panel; proposal by France; proposal by IFALPA	Introduction of tables of code conversion between the International Telegraph Alphabet No. 2 and the 7-unit coded character set; modification of the frame check sequence algorithm used for error checking in automated data interchange; amendment of material related to the ILS reference datum, introduction of new material related to the possibility of interference from spurious radiations in the LF/MF band and amendment to the guidance material in Attachments C and G to Part I.	23 & 27 June 1977 27 October 1977 23 February 1978

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
59*	Ninth AN Conference; ANC study of frangibility requirements emanating from Rec. 3/5 of the Third Meeting of the Obstacle Clearance Panel; COM Divisional Meeting (1976)	Transfer of the SSR Mode B to an unassigned status; cross-reference to the provisions of Annex 14 concerning frangibility criteria for the navigational facilities on operational areas; cross-reference to the provisions of Annex 11 concerning the determination of VOR accuracy and change-over point; introduction of Attachment C to Part II, dealing with Guiding Principles for Long Distance Operational Control Communications.	14 December 1977 14 April 1978 10 August 1978
60	Sixth Meeting of the All Weather Operations Panel	Change of a preferred ILS glide path angle from 2.5 degrees to 3 degrees.	4 December 1978 4 April 1979 29 November 1979
61	Seventh Meeting of the Automated Data Interchange Systems Panel; AWO Divisional Meeting (1978); COM Divisional Meeting (1978)	Introduction of a new series of marginal serial numbers in use by the International Telecommunication Union (ITU) and clarification of the term “Radio Regulations”; change to the definition of the Aeronautical Fixed Telecommunication Network (AFTN); change of the ILS protection date to 1995; addition of information related to the Microwave Landing System (MLS); changes in the radio frequency provisions related to the Final Acts of the ITU World Administrative Radio Conference (WARC) 1978; changes in the provisions related to the introduction of single sideband classes of emission into the high frequency (HF) aeronautical mobile service; clarification of symbols permitted with the 7-unit coded character set; change from single numbered to double numbered code and byte independent data link control procedures; introduction of new material related to character oriented data link control procedures; changes to the definition of operational control communications.	10 December 1979 10 April 1980 27 November 1980
62	Eighth Meeting of the Automated Data Interchange Systems Panel; Eighth Meeting of the All Weather Operations Panel; ANC study related to the interception of civil aircraft; Secretariat recommendation related to the protection date for VOR and DME	Changes to the protection date provisions of VOR and DME; changes and additions to the material related to ILS airborne equipment criteria and criteria on geographic separation of VOR/ILS facilities; addition of material related to the continuous check of channel condition and the use of controlled circuit protocols; changes to the provisions to make the 7-unit coded character set identical to the International Reference Version of International Alphabet No. 5; addition of provisions related to the use of character parity on CIDIN links; addition to the provisions related to character oriented data link control procedures; changes to the provisions related to VHF communication in the event of interception.	14 December 1981 14 April 1982 25 November 1982
63	ANC recommendations relating to the assignment of an air-to-air VHF frequency at the request of IFALPA; Secretariat recommendations related to depletion of the SELCAL codes; AIG Divisional Meeting (1979); COM Divisional Meeting (1981)	Changes and additions to the material related to frequencies above 30 MHz used for particular functions to provide for an air-to-air VHF communications channel; addition of material related to the addition of new RED SELCAL tones; changes and additions to the material related to radar characteristics to provide for the recording and retention of radar data; extensive changes and additions to Chapters 1, 2, 3, 4, 5, 6 and Appendix A with respect to ILS, NDB, DME, MLS, radio-teletype, VHF and HF communications, survival radio equipment and emergency locator beacons.	13 December 1982 13 April 1983 24 November 1983
64	—	No change.	—

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
65	ANC recommendations relating to the protection date of aeronautical mobile VHF communications equipment operating on 25 kHz channel spacing at the request of the Kingdom of the Netherlands; Secretariat recommendations related to harmful interference to aeronautical frequency bands from external sources, and related to switching and signalling over aeronautical voice circuits; ANC recommendations relating to SPI pulse in SSR Mode C at the request of the United Kingdom; Ninth Meeting of the All Weather Operations Panel; 10th Meeting of the Automated Data Interchange Systems Panel	Changes to the material related to the protection date of aeronautical mobile VHF communications equipment operating on 25 kHz channel spacing; changes and additions to the material relating to harmful interference to aeronautical frequency bands from external sources; addition of material relating to switching and signalling over aeronautical voice circuits; changes to material relating to SSR SPI pulse transmission; extensive changes to Chapters 3, 4 and Attachments C, G and H with respect to ILS, DME and CIDIN.	6 December 1984 6 April 1985 21 November 1985
66	Air Navigation Commission	SSR Code 2000; use and provision of 121.5 MHz.	14 March 1986 27 July 1986 20 November 1986
67	COM/OPS Divisional Meeting (1985); 10th and 11th Meetings of the All Weather Operations Panel; Second Meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel; recommendations of the All Weather Operations Panel working group and the Secretariat relating to MLS basic data word parity equations	Refinements of technical specifications for the current secondary surveillance radar (SSR); introduction of technical specifications for SSR Mode S and material on allocation to States and assignment to aircraft of SSR Mode S addresses; extensive changes and additions to the material relating to MLS, DME and ILS; introduction of ILS and MLS protection dates and ICAO ILS/MLS transition plan.	16 March 1987 27 July 1987 22 October 1987
68	11th Meeting of the All Weather Operations Panel; ANC	Refinements of technical specifications for distance measuring equipment (DME); deletion of the requirement for microwave landing system (MLS) Morse Code identification; new provision concerning the installation of 121.5 MHz ground equipment.	29 March 1990 30 July 1990 15 November 1990
69	COM/MET Divisional Meeting (1982); COM/MET/OPS Divisional Meeting (1990); Fourth Meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel; Fifth Meeting of the Operations Panel; 30th Meeting of the European Air Navigation Planning Group; ANC	Changes to AFTN message procedures and addition of material related to the world area forecast system (WAFS) telecommunications requirements; addition of material related to VHF air-ground data link communications and changes to material concerning VHF offset carrier systems; updating of material related to SSR Mode S and the 24-bit aircraft addressing scheme; changes to material related to the operational objectives for the ILS facility performance categories; changes to material related to DME/N total system accuracy; changes and additions to material related to emergency location transmitters (ELTs).	22 March 1993 26 July 1993 11 November 1993

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
70	ANC; Third Meeting of the Aeronautical Fixed Service Systems Planning for Data Interchange Panel; 34th Meeting of the European Air Navigation Planning Group	Restructuring of Annex 10 into five volumes; deletion of obsolete specifications and guidance material on manual Morse code procedures and teletypewriter systems; inclusion of material on common ICAO data interchange network (CIDIN).	20 March 1995 24 July 1995 9 November 1995
71	ANC; Special COM/OPS Divisional Meeting (1995); 12th, 13th and 14th Meetings of the All Weather Operations Panel; Secretariat proposals for deletion of obsolete material	Finalization of SARPs and guidance material for the microwave landing system (MLS), incorporation of a new strategy for introduction and application of non-visual aids to approach and landing in place of the ILS/MLS transition plan; relocation of material to Volumes III, IV and V, as appropriate; deletion of obsolete specifications for Consol and Loran-A systems and guidance material on the utilization of facilities, research, development and evaluation.	12 March 1996 15 July 1996 7 November 1996
72	—	No change.	—
73	Air Navigation Commission	Introduction of Human Factors-related material.	19 March 1998 20 July 1998 5 November 1998
74	Sixteenth Meeting of the All Weather Operations Panel; Air Navigation Commission	Introduction of: a) required navigation performance (RNP) for approach, landing and departure operation; b) updating of specifications for instrument landing system (ILS) and microwave landing system (MLS); and c) associated guidance material.	18 March 1999 19 July 1999 4 November 1999
75	—	No change.	—
76	Third meeting of the Global Navigation Satellite System Panel (GNSSP); proposal by the United Kingdom for continuity of service requirements for ILS and MLS	Global navigation satellite system (GNSS); continuity of service requirements for ILS localizers and MLS azimuth facilities used in support of Category IIIA operations; updating of references to the ITU Radio Regulations.	12 March 2001 16 July 2001 1 November 2001
77	Global Navigation Satellite System Panel (GNSSP)	Incorporation of GLONASS-related technical specifications in the satellite-based augmentation system (SBAS) and ground-based augmentation system (GBAS) sections of GNSS requirements; provision for use of GBAS positioning service in support of terminal area navigation (RNAV) operations; provision for use of new Message Type 28 to enhance performance of SBAS; and incorporation of additional guidance material and clarifications/editorial corrections to SARPs and guidance material.	27 February 2002 15 July 2002 28 November 2002
78	—	No change.	—

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
79	Fourth meeting of the Global Navigation Satellite System Panel	Changes to GNSS SARPs and related guidance material concerning performance specifications for approach with vertical guidance (APV); global positioning system (GPS) selective availability (SA) discontinuation and clarification of signal power level; specifications for modernized GLObal NAvigation Satellite System (GLONASS-M); frequency planning criteria for ground-based augmentation system (GBAS) and a number of other enhancements.	23 February 2004 12 July 2004 25 November 2004
80	Eleventh Air Navigation Conference	Updates to the strategy for introduction and application of non-visual aids to approach and landing.	25 February 2005 11 July 2005 24 November 2005
81	Navigation Systems Panel (NSP)	a) Introduction of ground-based regional augmentation system (GRAS) Standards and Recommended Practices (SARPs); b) amendments to SARPs for instrument landing system (ILS), distance measuring equipment (DME) and microwave landing system (MLS).	24 February 2006 17 July 2006 23 November 2006

* Did not affect any Standards or Recommended Practices.

ER A O A S A DARDS
A D RECO E DED RAC CES

CHA ER 1 DEF O S

Note All references to Radio Regulations are to the Radio Regulations published by the International Telecommunication Union (ITU) Radio Regulations are amended from time to time by the decisions embodied in the Final Acts of orld Radiocommunication Conferences held normally every two to three years Further information on the ITU processes as they relate to aeronautical radio system fre uency use is contained in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc)*

Note Annex olume I includes Standards and Recommended Practices for certain forms of e uipment for air navigation aids hile the Contracting State will determine the necessity for specific installations in accordance with the conditions prescribed in the relevant Standard or Recommended Practice review of the need for specific installation and the formulation of ICA opinion and recommendations to Contracting States concerned is carried out periodically by Council ordinarily on the basis of recommendations of Regional Air Navigation Meetings (Doc Directives to Regional Air Navigation Meetings and Rules of Procedure for their Conduct).

When the following terms are used in this volume, they have the following meanings:

Altitude The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

ective acce tance andwidt The range of frequencies with respect to the assigned frequency for which reception is assured when all receiver tolerances have been taken into account.

ective ad acent c annel re ection The rejection that is obtained at the appropriate adjacent channel frequency when all relevant receiver tolerances have been taken into account.

levation The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

Fan mar er eacon A type of radio beacon, the emissions of which radiate in a vertical fan-shaped pattern.

ei t The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

uman Factors rinci les Principles which apply to design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

ean ower (o a radio transmitter) The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

Note A time of second during which the mean power is greatest will be selected normally

ressure altitude An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.

rotected service volume A part of the facility coverage where the facility provides a particular service in accordance with relevant SARPs and within which the facility is afforded frequency protection.

ouc down The point where the nominal glide path intercepts the runway.

Note Touchdown as defined above is only a datum and is not necessarily the actual point at which the aircraft will touch the runway

mar er eacon A type of radio beacon, the emissions of which radiate in a vertical cone-shaped pattern.

CHA ER 2 E ERA RO S O S FOR RAD O A A O A DS

2 1 Aids to approac landing and departure

2.1.1 The standard non-visual aids to precision approach and landing shall be:

a) the instrument landing system (ILS) conforming to the Standards contained in Chapter 3, 3.1;

b) the microwave landing system (MLS) conforming to the Standards contained in Chapter 3, 3.11; and

c) the global navigation satellite system (GNSS) conforming to the Standards contained in Chapter 3, 3.7.

Note The term non visual aid to precision approach and landing is to be applied when referring to the foregoing systems specified in Chapter

Note It is intended that wherever an I S has been installed conforming to the Standards in Chapter no change in or addition to those Standards will re uire the replacement of such e uipment before anuary

Note It is intended that wherever an M S has been installed conforming to the Standards in Chapter no change in or addition to those Standards will re uire the replacement of such e uipment before December

Note It is intended that wherever a NSS has been installed conforming to the Standards in Chapter no change in or addition to those Standards will re uire the replacement of such e uipment before the dates indicated in

Note The locations at which non visual aids are re uired are normally established on the basis of regional air navigation agreements

Note Since visual reference is essential for the final stages of approach and landing the installation of a non visual aid does not obviate the need for visual aids to approach and landing in conditions of low visibility

Note Non visual aids to approach and landing can also be used to support departure

2.1.1.1 It shall be permissible to replace a non-visual aid with an alternative non-visual aid on the basis of regional air navigation agreement.

2.1.1.2 **Recommendation** *The agreements indicated in should provide at least a five year notice*

Note It is intended that introduction and application of non visual aids will be in accordance with the strategy shown at Attachment

2.1.1.3 When a non-visual aid is to be provided, its performance shall correspond at least to the category of precision approach runway to be served.

Note Categories of precision approach and landing operations are classified in Annex Part I Chapter

Note Information on operational objectives associated with I S facility performance categories is given in Attachment C and

Note Information on operational objectives associated with M S facility performance is given in Attachment Section

2.1.2 Differences in non-visual aids in any respect from the Standards of Chapter 3 shall be published in an Aeronautical Information Publication (AIP).

2.1.2.1 Non-visual aids that do not conform:

a) to the Standards in Chapter 3, 3.1.2.1, 3.1.2.2 and 3.1.7.1 a) shall not be described by the term ILS;

b) to the Standards in Chapter 3, 3.11.3 shall not be described by the term MLS.

2.1.3 Wherever there is installed a non-visual aid that is neither an ILS nor an MLS, but which may be used in whole or in part with aircraft equipment designed for use with the ILS or MLS, full details of parts that may be so used shall be published in an Aeronautical Information Publication (AIP).

Note This provision is to establish a re uirement for promulgation of relevant information rather than to authori e such installations

2.1.4 **Recommendation** *A precision approach radar (PAR) system conforming to the Standards contained in Chapter and e uipment for two way communication with aircraft together with facilities for the efficient coordination of these elements with air traffic control should be installed and operated as a supplement to a non visual aid wherever*

a) air traffic control will be materially assisted by such installation in the landing of aircraft intending to use a non visual aid and

b) the accuracy or expedition of final approaches or the facilitation of approaches by aircraft not e uipped to use a non visual aid will be materially aided by such installation

2.1.4.1 **Recommendation** *nly the precision approach radar (PAR) element of the precision approach radar system conforming to the Standards contained in Chapter together with the e uipment and facilities prescribed in should be installed when it is determined that the surveillance radar element (SRE) associated with the precision approach radar system is not necessary to meet the re uirements of air traffic control for the handling of aircraft intending to use a non visual aid*

Note The SRE is not considered in any circumstances a satisfactory alternative to the precision approach radar system

2.1.4.2 **Recommendation** *Although SRE is not considered a satisfactory alternative to the precision approach radar system an SRE conforming to the Standards contained in Chapter and e uipment for two way communication with aircraft should be installed and operated for*

a) the assistance of air traffic control in handling aircraft intending to use a non visual aid

b) surveillance radar approaches and departures

2.1.5 **Recommendation** *A non visual aid should be supplemented as necessary by a source or sources of guidance information which when used in conjunction with appropriate procedures will provide effective guidance to and efficient coupling (manual or automatic) with the desired reference path*

Note The following sources of guidance have been used for such purposes

a) a suitably located F omnidirectional radio range (R) conforming to the specifications in Chapter or e uivalent

b) a locator or locators conforming with the specifications in Chapter or a suitably located non directional radio beacon (ND)

c) a suitably located U F distance measuring e uipment (DME) conforming to the specifications in Chapter and providing continuous distance information during the approach and missed approach phase of flight

2.1.6 Required navigation performance (RNP)
for approach, landing and departure operations

2.1.6.1 Where used, RNP for approach, landing and departure operations shall be prescribed by States.

2.1.6.2 Where RNP is prescribed for precision approach and landing operations, the RNP shall only be supported by a standard non-visual aid in accordance with 2.1.1.

2 2 S ort distance aids

2.2.1 In localities and along routes where conditions of traffic density and low visibility necessitate a ground-based short-distance radio aid to navigation for the efficient exercise of air traffic control, or where such short-distance aid is required for the safe and efficient conduct of aircraft operations, the standard aid shall be the VHF omnidirectional radio range (VOR) of the continuous wave phase comparison type conforming to the Standards contained in Chapter 3, 3.3.

Note It is not intended that short distance radio aids to navigation provided in accordance with should be re uired primarily to perform the function of a long distance navigation aid

Note It is intended that wherever a R conforming to the Standard in has been installed no change in or addition to that Standard will re uire the replacement of such e uipment before anuary

2.2.1.1 **Recommendation** *Means should be provided for the pre flight chec ing of R airborne e uipment at aerodromes regularly used by international air traffic*

Note uidance material on the pre flight chec ing of R airborne e uipment is contained in Attachment E

2.2.2 At localities where for operational reasons, or because of air traffic control reasons such as air traffic density or proximity of routes, there is a need for a more precise navigation service than that provided by VOR, distance measuring equipment (DME) (conforming to the Standards in Chapter 3, 3.5) shall be installed and maintained in operation as a complement to VOR.

2.2.2.1 DME/N equipment first installed after 1 January 1989 shall also conform to the Standards in Chapter 3, 3.5 denoted by .

Note It is intended that wherever a DME conforming to the Standard in has been installed no change in or addition to that Standard will re uire the replacement of such e uipment before anuary

2 3 Radio beacons

2.3.1 Non-directional radio beacons (NDB)

2.3.1.1 An NDB conforming to the Standards in Chapter 3, 3.4 shall be installed and maintained in operation at a locality where an NDB, in conjunction with direction-finding equipment in the aircraft, fulfils the operational requirement for a radio aid to navigation.

2.3.2 En-route VHF marker beacons (75 MHz)

2.3.2.1 **Recommendation** *here a F mar er beacon is re uired to mar a position on any air route a fan mar er beacon conforming to the Standard contained in Chapter should be installed and maintained in operation*

Note This recommendation does not preclude the use of fan mar er beacons at points other than on an air route as for example an aid to descent under IFR conditions

2.3.2.2 **Recommendation** *here a F mar er beacon is re uired to mar the position of a radio navigation aid giving directional or trac guidance a mar er conforming to the Standard in Chapter should be installed and maintained in operation*

2 lobal na igation satellite system SS

2.4.1 A standard aid to navigation shall be the global navigation satellite system (GNSS) conforming to the Standards contained in Chapter 3, 3.7.

Note It is intended that any change in or addition to Standards in Chapter that will re uire the replacement of NSS e uipment can become applicable on the basis of a six year advance notice

Note NSS is expected to support all phases of flight and aerodrome surface operations however present SARPs provide for en route terminal and approach and landing operations down to Category I precision approach

2.4.2 It shall be permissible to terminate a GNSS satellite service provided by one of its elements (Chapter 3, 3.7.2) on the basis of at least a six-year advance notice by a service provider.

2.4.3 Recording and retention of GNSS data

2.4.3.1 **Recommendation** *A State that approves NSS based operations should ensure that NSS data relevant to those operations are recorded*

Note These recorded data are primarily intended for use in accident and incident investigations They may also support periodic confirmation that accuracy integrity continuity and availability are maintained within the limits re uired for the operations approved

Note uidance material on the recording of NSS parameters is contained in Attachment D

2.4.3.2 **Recommendation** *Recordings should be retained for a period of at least fourteen days hen the recordings are pertinent to accident and incident investigations they should be retained for longer periods until it is evident that they will no longer be re uired*

2 Reser ed

2 6 Distance measuring aids

2.6.1 **Recommendation** *If a distance measuring facility is installed and maintained in operation for any radio navigational purpose additional to that specified in it should conform to the specification in Chapter*

2 round and flig t testing

2.7.1 Radio navigation aids of the types covered by the specifications in Chapter 3 and available for use by aircraft engaged in international air navigation shall be the subject of periodic ground and flight tests.

Note uidance on the ground and flight testing of ICA standard facilities is contained in Attachment C and in the Manual on Testing of Radio Navigation Aids *(Doc)*

2 ro ision of information on t e operational status of radio na igation aids

2.8.1 Aerodrome control towers and units providing approach control service shall be provided without delay with information on the operational status of radio navigation aids essential for approach, landing and take-off at the aerodrome(s) with which they are concerned.

2 Secondary po er supply for radio na igation aids and communication systems

2.9.1 Radio navigation aids and ground elements of communication systems of the types specified in Annex 10 shall be provided with suitable power supplies and means to ensure continuity of service appropriate to the needs of the service provided.

Note uidance material on this subject is contained in Section of Attachment C

2 10 Human Factors considerations

2.10.1 **Recommendation** *uman Factors principles should be observed in the design and certification of radio navigation aids*

Note uidance material on uman Factors principles can be found in the Human Factors Training Manual *(Doc) and Circular* (Human Factors Digest No. 11 — Human Factors in CNS/ATM Systems).

CHA ER 3 S EC F CA O S FOR RAD O A A O A DS

Note Specifications concerning the siting and construction of e uipment and installations on operational areas aimed at reducing the ha ard to aircraft to a minimum are contained in Annex Chapter

3 1 Specification for S

3.1.1 Definitions

An ular dis lacement sensitivit The ratio of measured DDM to the corresponding angular displacement from the appropriate reference line.

ac course sector The course sector which is situated on the opposite side of the localizer from the runway.

Course line The locus of points nearest to the runway centre line in any horizontal plane at which the DDM is zero.

Course sector A sector in a horizontal plane containing the course line and limited by the loci of points nearest to the course line at which the DDM is 0.155.

— i erence in de t o modulation The percentage modulation depth of the larger signal minus the percentage modulation depth of the smaller signal, divided by 100.

is lacement sensitivit (locali er) The ratio of measured DDM to the corresponding lateral displacement from the appropriate reference line.

Facilit er ormance Cate or I — I An ILS which provides guidance information from the coverage limit of the ILS to the point at which the localizer course line intersects the ILS glide path at a height of 60 m (200 ft) or less above the horizontal plane containing the threshold.

Note This definition is not intended to preclude the use of Facility Performance Category I I S below the height of m (ft) with visual reference where the uality of the guidance provided permits and where satisfactory operational procedures have been established

Facilit er ormance Cate or II — I An ILS which provides guidance information from the coverage limit of the ILS to the point at which the localizer course line intersects the ILS glide path at a height of 15 m (50 ft) or less above the horizontal plane containing the threshold.

Facilit er ormance Cate or III — I An ILS which, with the aid of ancillary equipment where necessary, provides guidance information from the coverage limit of the facility to, and along, the surface of the runway.

Front course sector The course sector which is situated on the same side of the localizer as the runway.

al course sector The sector, in a horizontal plane containing the course line and limited by the loci of points nearest to the course line at which the DDM is 0.0775.

al I lide at sector The sector in the vertical plane containing the ILS glide path and limited by the loci of points nearest to the glide path at which the DDM is 0.0875.

I continuit o service That quality which relates to the rarity of radiated signal interruptions. The level of continuity of service of the localizer or the glide path is expressed in terms of the probability of not losing the radiated guidance signals.

I lide at That locus of points in the vertical plane containing the runway centre line at which the DDM is zero, which, of all such loci, is the closest to the horizontal plane.

I lide at an le The angle between a straight line which represents the mean of the ILS glide path and the horizontal.

I lide at sector The sector in the vertical plane containing the ILS glide path and limited by the loci of points nearest to the glide path at which the DDM is 0.175.

Note The I S glide path sector is located in the vertical plane containing the runway centre line and is divided by the radiated glide path in two parts called upper sector and lower sector referring respectively to the sectors above and below the glide path

I inte rit That quality which relates to the trust which can be placed in the correctness of the information supplied by the facility. The level of integrity of the localizer or the glide path is expressed in terms of the probability of not radiating false guidance signals.

I oint A A point on the ILS glide path measured along the extended runway centre line in the approach direction a distance of 7.5 km (4 NM) from the threshold.

I oint A point on the ILS glide path measured along the extended runway centre line in the approach direction a distance of 1 050 m (3 500 ft) from the threshold.

I oint C A point through which the downward extended straight portion of the nominal ILS glide path passes at a height of 30 m (100 ft) above the horizontal plane containing the threshold.

I oint A point 4 m (12 ft) above the runway centre line and 900 m (3 000 ft) from the threshold in the direction of the localizer.

I oint A point 4 m (12 ft) above the runway centre line and 600 m (2 000 ft) from the stop end of the runway in the direction of the threshold.

Note See Attachment C Figure C

I re erence datum (oint) A point at a specified height located above the intersection of the runway centre line and the threshold and through which the downward extended straight portion of the ILS glide path passes.

wo re uenc lide at s stem An ILS glide path in which coverage is achieved by the use of two independent radiation field patterns spaced on separate carrier frequencies within the particular glide path channel.

wo re uenc locali er s stem A localizer system in which coverage is achieved by the use of two independent radiation field patterns spaced on separate carrier frequencies within the particular localizer VHF channel.

3.1.2 Basic requirements

3.1.2.1 The ILS shall comprise the following basic components:

a) VHF localizer equipment, associated monitor system, remote control and indicator equipment;

b) UHF glide path equipment, associated monitor system, remote control and indicator equipment;

c) VHF marker beacons, or distance measuring equipment (DME) in accordance with section 3.5, together with associated monitor system and remote control and indicator equipment.

Note uidance material relative to the use of DME as an alternative to the mar er beacon component of the I S is contained in Attachment C

3.1.2.1.1 Facility Performance Categories I, II and III — ILS shall provide indications at designated remote control points of the operational status of all ILS ground system components.

Note It is intended that the air traffic services unit involved in the control of aircraft on the final approach be one of the designated control points receiving without delay information on the operational status of the I S as derived from the monitors

Note It is intended that the air traffic system is li ely to call for additional provisions which may be found essential for the attainment of full operational Category III capability e g to provide additional lateral and longitudinal guidance during the landing roll out and taxiing and to ensure enhancement of the integrity and reliability of the system

3.1.2.2 The ILS shall be constructed and adjusted so that, at a specified distance from the threshold, similar instrumental indications in the aircraft represent similar displacements from the course line or ILS glide path as appropriate, irrespective of the particular ground installation in use.

3.1.2.3 The localizer and glide path components specified in 3.1.2.1 a) and b) which form part of a Facility Performance Category I — ILS shall comply at least with the Standards in 3.1.3 and 3.1.5 respectively, excepting those in which application to Facility Performance Category II — ILS is prescribed.

3.1.2.4 The localizer and glide path components specified in 3.1.2.1 a) and b) which form part of a Facility Performance Category II — ILS shall comply with the Standards applicable to these components in a Facility Performance Category I — ILS, as supplemented or amended by the Standards in 3.1.3 and 3.1.5 in which application to Facility Performance Category II — ILS is prescribed.

3.1.2.5 The localizer and glide path components and other ancillary equipment specified in 3.1.2.1.1, which form part of a Facility Performance Category III — ILS, shall otherwise comply with the Standards applicable to these components in Facility Performance Categories I and II — ILS, except as supplemented by the Standards in 3.1.3 and 3.1.5 in which application to Facility Performance Category III — ILS is prescribed.

3.1.2.6 To ensure an adequate level of safety, the ILS shall be so designed and maintained that the probability of operation within the performance requirements specified is of a high value, consistent with the category of operational performance concerned.

Note The specifications for Facility Performance Categories II and III I S are intended to achieve the highest degree of system integrity reliability and stability of operation under the most adverse environmental conditions to be encountered uidance material to achieve this objective in Categories II and III operations is given in of Attachment C

3.1.2.7 At those locations where two separate ILS facilities serve opposite ends of a single runway, an interlock shall ensure that only the localizer serving the approach direction in use shall radiate, except where the localizer in operational use is Facility Performance Category I — ILS and no operationally harmful interference results.

3.1.2.7.1 **Recommendation** *At those locations where two separate I S facilities serve opposite ends of a single runway and where a Facility Performance Category I I S is to be used for auto coupled approaches and landings in visual conditions an interloc should ensure that only the locali er serving the approach direction in use radiates providing the other locali er is not re uired for simultaneous operational use*

Note If both locali ers radiate there is a possibility of interference to the locali er signals in the threshold region Additional guidance material is contained in and of Attachment C

3.1.2.7.2 At locations where ILS facilities serving opposite ends of the same runway or different runways at the same airport use the same paired frequencies, an interlock shall ensure that only one facility shall radiate at a time. When switching from one ILS facility to another, radiation from both shall be suppressed for not less than 20 seconds.

Note Additional guidance material on the operation of locali ers on the same fre uency channel is contained in of Attachment C and olume Chapter

3.1.3 VHF localizer and associated monitor

Introduction The specifications in this section cover ILS localizers providing either positive guidance information over 360 degrees of azimuth, or providing such guidance only within a specified portion of the front coverage (see 3.1.3.7.4). Where ILS localizers providing positive guidance information in a limited sector are installed, information from some suitably located navigation aid, together with appropriate procedures, will generally be required to ensure that any misleading guidance information outside the sector is not operationally significant.

3.1.3.1 *eneral*

3.1.3.1.1 The radiation from the localizer antenna system shall produce a composite field pattern which is amplitude modulated by a 90 Hz and a 150 Hz tone. The radiation field pattern shall produce a course sector with one tone predominating on one side of the course and with the other tone predominating on the opposite side.

3.1.3.1.2 When an observer faces the localizer from the approach end of a runway, the depth of modulation of the radio frequency carrier due to the 150 Hz tone shall predominate on the observer s right hand and that due to the 90 Hz tone shall predominate on the observer s left hand.

3.1.3.1.3 All horizontal angles employed in specifying the localizer field patterns shall originate from the centre of the localizer antenna system which provides the signals used in the front course sector.

3.1.3.2 *Radio fre uency*

3.1.3.2.1 The localizer shall operate in the band 108 MHz to 111.975 MHz. Where a single radio frequency carrier is used, the frequency tolerance shall not exceed plus or minus 0.005 per cent. Where two radio frequency carriers are used, the frequency tolerance shall not exceed 0.002 per cent and the nominal band occupied by the carriers shall be symmetrical about the assigned frequency. With all tolerances applied, the frequency separation between the carriers shall not be less than 5 kHz nor more than 14 kHz.

3.1.3.2.2 The emission from the localizer shall be horizontally polarized. The vertically polarized component of the radiation on the course line shall not exceed that which corresponds to a DDM error of 0.016 when an aircraft is positioned on the course line and is in a roll attitude of 20 degrees from the horizontal.

3.1.3.2.2.1 For Facility Performance Category II localizers, the vertically polarized component of the radiation on the course line shall not exceed that which corresponds to a DDM error of 0.008 when an aircraft is positioned on the course line and is in a roll attitude of 20 degrees from the horizontal.

3.1.3.2.2.2 For Facility Performance Category III localizers, the vertically polarized component of the radiation within a sector bounded by 0.02 DDM either side of the course line shall not exceed that which corresponds to a DDM error of 0.005 when an aircraft is in a roll attitude of 20 degrees from the horizontal.

3.1.3.2.3 For Facility Performance Category III localizers, signals emanating from the transmitter shall contain no components which result in an apparent course line fluctuation of more than 0.005 DDM peak to peak in the frequency band 0.01 Hz to 10 Hz.

3.1.3.3 *Coverage*

3.1.3.3.1 The localizer shall provide signals sufficient to allow satisfactory operation of a typical aircraft installation within the localizer and glide path coverage sectors. The localizer coverage sector shall extend from the centre of the localizer antenna system to distances of:

46.3 km (25 NM) within plus or minus 10 degrees from the front course line;

31.5 km (17 NM) between 10 degrees and 35 degrees from the front course line;

18.5 km (10 NM) outside of plus or minus 35 degrees if coverage is provided;

except that, where topographical features dictate or operational requirements permit, the limits may be reduced to 33.3 km (18 NM) within the plus or minus 10-degree sector and 18.5 km (10 NM) within the remainder of the coverage when alternative navigational facilities provide satisfactory coverage within the intermediate approach area. The localizer signals shall be receivable at the distances specified at and above a height of 600 m (2 000 ft) above the elevation of the threshold, or 300 m (1 000 ft) above the elevation of the highest point within the intermediate and final approach areas, whichever is the higher. Such signals shall be receivable, to the distances specified, up to a surface extending outward from the localizer antenna and inclined at 7 degrees above the horizontal.

Note uidance material on locali er coverage is given in of Attachment C

3.1.3.3.2 In all parts of the coverage volume specified in 3.1.3.3.1, other than as specified in 3.1.3.3.2.1, 3.1.3.3.2.2 and 3.1.3.3.2.3, the field strength shall be not less than 40 microvolts per metre (minus 114 dBW/m^2).

Note This minimum field strength is re uired to permit satisfactory operational usage of I S locali er facilities

3.1.3.3.2.1 For Facility Performance Category I localizers, the minimum field strength on the ILS glide path and within the localizer course sector from a distance of 18.5 km (10 NM) to a height of 60 m (200 ft) above the horizontal plane containing the threshold shall be not less than 90 microvolts per metre (minus 107 dBW/m^2).

3.1.3.3.2.2 For Facility Performance Category II localizers, the minimum field strength on the ILS glide path and within the localizer course sector shall be not less than 100 microvolts per metre (minus 106 dBW/m^2) at a distance of 18.5 km (10 NM) increasing to not less than 200 microvolts per metre (minus 100 dBW/m^2) at a height of 15 m (50 ft) above the horizontal plane containing the threshold.

3.1.3.3.2.3 For Facility Performance Category III localizers, the minimum field strength on the ILS glide path and within the localizer course sector shall be not less than 100 microvolts per metre (minus 106 dBW/m^2) at a distance of 18.5 km (10 NM), increasing to not less than 200 microvolts per metre (minus 100 dBW/m^2) at 6 m (20 ft) above the horizontal plane containing the threshold. From this point to a further point 4 m (12 ft) above the runway centre line, and 300 m (1 000 ft) from the threshold in the direction of the localizer, and thereafter at a height of 4 m (12 ft) along the length of the runway in the direction of the localizer, the field strength shall be not less than 100 microvolts per metre (minus 106 BW/m^2).

Note The field strengths given in and are necessary to provide the signal to noise ratio re uired for improved integrity

3.1.3.3.3 **Recommendation** *Above degrees the signals should be reduced to as low a value as practicable*

Note The re uirements in and are based on the assumption that the aircraft is heading directly toward the facility

Note uidance material on significant airborne receiver parameters is given in and of Attachment C

3.1.3.3.4 When coverage is achieved by a localizer using two radio frequency carriers, one carrier providing a radiation field pattern in the front course sector and the other providing a radiation field pattern outside that sector, the ratio of the two carrier signal strengths in space within the front course sector to the coverage limits specified at 3.1.3.3.1 shall not be less than 10 dB.

Note uidance material on locali ers achieving coverage with two radio fre uency carriers is given in the Note to and in of Attachment C

3.1.3.3.5 **Recommendation** *For Facility Performance Category III locali ers the ratio of the two carrier signal strengths in space within the front course sector should not be less than d*

3.1.3.4 *Course structure*

3.1.3.4.1 For Facility Performance Category I localizers, bends in the course line shall not have amplitudes which exceed the following:

one	*Amplitude (DDM)* *(probability)*
Outer limit of coverage to ILS Point "A"	0.031
ILS Point "A" to ILS Point "B"	0.031 at ILS Point "A" decreasing at a linear rate to 0.015 at ILS Point "B"
ILS Point "B" to ILS Point "C"	0.015

3.1.3.4.2 For Facility Performance Categories II and III localizers, bends in the course line shall not have amplitudes which exceed the following:

one	*Amplitude (DDM)* *(probability)*
Outer limit of coverage to ILS Point “A”	0.031
ILS Point “A” to ILS Point “B”	0.031 at ILS Point “A” decreasing at a linear rate to 0.005 at ILS Point “B”
ILS Point “B” to the ILS reference datum	0.005

and, for Category III only:

ILS reference datum to ILS Point “D”	0.005
ILS Point “D” to ILS Point “E”	0.005 at ILS Point “D” increasing at a linear rate to 0.010 at ILS Point “E”

Note The amplitudes referred to in and are the DDMs due to bends as reali ed on the mean course line when correctly adjusted

Note uidance material relevant to the locali er course structure is given in and of Attachment C

3.1.3.5 *Carrier modulation*

3.1.3.5.1 The nominal depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones shall be 20 per cent along the course line.

3.1.3.5.2 The depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones shall be within the limits of 18 and 22 per cent.

3.1.3.5.3 The following tolerances shall be applied to the frequencies of the modulating tones:

a) the modulating tones shall be 90 Hz and 150 Hz within plus or minus 2.5 per cent;

b) the modulating tones shall be 90 Hz and 150 Hz within plus or minus 1.5 per cent for Facility Performance Category II installations;

c) the modulating tones shall be 90 Hz and 150 Hz within plus or minus 1 per cent for Facility Performance Category III installations;

d) the total harmonic content of the 90 Hz tone shall not exceed 10 per cent; additionally, for Facility Performance Category III localizers, the second harmonic of the 90 Hz tone shall not exceed 5 per cent;

e) the total harmonic content of the 150 Hz tone shall not exceed 10 per cent.

3.1.3.5.3.1 **Recommendation** *For Facility Performance Category I I S the modulating tones should be and within plus or minus per cent where practicable*

3.1.3.5.3.2 For Facility Performance Category III localizers, the depth of amplitude modulation of the radio frequency carrier at the power supply frequency or its harmonics, or by other unwanted components, shall not exceed 0.5 per cent. Harmonics of the supply, or other unwanted noise components that may intermodulate with the 90 Hz and 150 Hz navigation tones or their harmonics to produce fluctuations in the course line, shall not exceed 0.05 per cent modulation depth of the radio frequency carrier.

3.1.3.5.3.3 The modulation tones shall be phase-locked so that within the half course sector, the demodulated 90 Hz and 150 Hz wave forms pass through zero in the same direction within:

a) for Facility Performance Categories I and II localizers: 20 degrees; and

b) for Facility Performance Category III localizers: 10 degrees,

of phase relative to the 150 Hz component, every half cycle of the combined 90 Hz and 150 Hz wave form.

Note The definition of phase relationship in this manner is not intended to imply a re uirement to measure the phase within the half course sector

Note uidance material relative to such measurement is given at Figure C of Attachment C

3.1.3.5.3.4 With two-frequency localizer systems, 3.1.3.5.3.3 shall apply to each carrier. In addition, the 90 Hz modulating tone of one carrier shall be phase-locked to the 90 Hz modulating tone of the other carrier so that the demodulated wave forms pass through zero in the same direction within:

a) for Categories I and II localizers: 20 degrees; and

b) for Category III localizers: 10 degrees,

of phase relative to 90 Hz. Similarly, the 150 Hz tones of the two carriers shall be phase-locked so that the demodulated wave forms pass through zero in the same direction within:

1) for Categories I and II localizers: 20 degrees; and

2) for Category III localizers: 10 degrees,

of phase relative to 150 Hz.

3.1.3.5.3.5 Alternative two-frequency localizer systems that employ audio phasing different from the normal in-phase conditions described in 3.1.3.5.3.4 shall be permitted. In this alternative system, the 90 Hz to 90 Hz phasing and the 150 Hz to 150 Hz phasing shall be adjusted to their nominal values to within limits equivalent to those stated in 3.1.3.5.3.4.

Note This is to ensure correct airborne receiver operation in the region away from the course line where the two carrier signal strengths are approximately e ual

3.1.3.5.3.6 **Recommendation** *The sum of the modulation depths of the radio fre uency carrier due to the and tones should not exceed per cent or be less than per cent within the re uired coverage*

3.1.3.5.3.6.1 For equipment first installed after 1 January 2000, the sum of the modulation depths of the radio frequency carrier due to the 90 Hz and 150 Hz tones shall not exceed 60 per cent or be less than 30 per cent within the required coverage.

Note If the sum of the modulation depths is greater than per cent for Facility Performance Category I locali ers the nominal displacement sensitivity may be adjusted as provided for in to achieve the above modulation limit

Note For two fre uency systems the standard for maximum sum of modulation depths does not apply at or near a imuths where the course and clearance carrier signal levels are e ual in amplitude (i e at a imuths where both transmitting systems have a significant contribution to the total modulation depth)

Note The standard for minimum sum of modulation depths is based on the malfunctioning alarm level being set as high as per cent as stated in of Attachment C

3.1.3.5.3.7 When utilizing a localizer for radiotelephone communications, the sum of the modulation depths of the radio frequency carrier due to the 90 Hz and 150 Hz tones shall not exceed 65 per cent within 10 degrees of the course line and shall not exceed 78 per cent at any other point around the localizer.

3.1.3.5.4 **Recommendation** *Undesired fre uency and phase modulation on I S locali er radio fre uency carriers that can affect the displayed DDM values in locali er receivers should be minimi ed to the extent practical*

Note Relevant guidance material is given in of Attachment C

3.1.3.6 *Course alignment accuracy*

3.1.3.6.1 The mean course line shall be adjusted and maintained within limits equivalent to the following displacements from the runway centre line at the ILS reference datum:

a) for Facility Performance Category I localizers: plus or minus 10.5 m (35 ft), or the linear equivalent of 0.015 DDM, whichever is less;

b) for Facility Performance Category II localizers: plus or minus 7.5 m (25 ft);

c) for Facility Performance Category III localizers: plus or minus 3 m (10 ft).

3.1.3.6.2 **Recommendation** *For Facility Performance Category II locali ers the mean course line should be adjusted and maintained within limits e uivalent to plus or minus m (ft) displacement from runway centre line at the I S reference datum*

Note It is intended that Facility Performance Categories II and III installations be adjusted and maintained so that the limits specified in and are reached on very rare occasions It is further intended that design and operation of the total I S ground system be of sufficient integrity to accomplish this aim

Note It is intended that new Category II installations are to meet the re uirements of

Note uidance material on measurement of locali er course alignment is given in of Attachment C

3.1.3.7 *Displacement sensitivity*

3.1.3.7.1 The nominal displacement sensitivity within the half course sector at the ILS reference datum shall be 0.00145 DDM/m (0.00044 DDM/ft) except that for Category I localizers, where the specified nominal displacement sensitivity cannot be met, the displacement sensitivity shall be adjusted as near as possible to that value. For Facility Performance Category I localizers on runway codes 1 and 2, the nominal displacement sensitivity shall be achieved at the ILS Point "B". The maximum course sector angle shall not exceed 6 degrees.

Note Runway codes and are defined in Annex

3.1.3.7.2 The lateral displacement sensitivity shall be adjusted and maintained within the limits of plus or minus:

a) 17 per cent of the nominal value for Facility Performance Categories I and II;

b) 10 per cent of the nominal value for Facility Performance Category III.

3.1.3.7.3 **Recommendation** *For Facility Performance Category II I S displacement sensitivity should be adjusted and maintained within the limits of plus or minus per cent where practicable*

Note The figures given in and are based upon a nominal sector width of m (ft) at the appropriate point i e I S Point on runway codes and and the I S reference datum on other runways

Note uidance material on the alignment and displacement sensitivity of locali ers using two radio fre uency carriers is given in of Attachment C

Note uidance material on measurement of locali er displacement sensitivity is given in of Attachment C

3.1.3.7.4 The increase of DDM shall be substantially linear with respect to angular displacement from the front course line (where DDM is zero) up to an angle on either side of the front course line where the DDM is 0.180. From that angle to plus or minus 10 degrees, the DDM shall not be less than 0.180. From plus or minus 10 degrees to plus or minus 35 degrees, the DDM shall not be less than 0.155. Where coverage is required outside of the plus or minus 35 degrees sector, the DDM in the area of the coverage, except in the back course sector, shall not be less than 0.155.

Note The linearity of change of DDM with respect to angular displacement is particularly important in the neighbourhood of the course line

Note The above DDM in the degree sector is to be considered a minimum re uirement for the use of I S as a landing aid herever practicable a higher DDM e g is advantageous to assist high speed aircraft to execute large angle intercepts at operationally desirable distances provided that limits on modulation percentage given in are met

Note herever practicable the locali er capture level of automatic flight control systems is to be set at or below DDM in order to prevent false locali er captures

3.1.3.8 *oice*

3.1.3.8.1 Facility Performance Categories I and II localizers may provide a ground-to-air radiotelephone communication channel to be operated simultaneously with the navigation and identification signals, provided that such operation shall not interfere in any way with the basic localizer function.

3.1.3.8.2 Category III localizers shall not provide such a channel, except where extreme care has been taken in the design and operation of the facility to ensure that there is no possibility of interference with the navigational guidance.

3.1.3.8.3 If the channel is provided, it shall conform with the following Standards:

3.1.3.8.3.1 The channel shall be on the same radio frequency carrier or carriers as used for the localizer function, and the radiation shall be horizontally polarized. Where two carriers are modulated with speech, the relative phases of the modulations on the two carriers shall be such as to avoid the occurrence of nulls within the coverage of the localizer.

3.1.3.8.3.2 The peak modulation depth of the carrier or carriers due to the radiotelephone communications shall not exceed 50 per cent but shall be adjusted so that:

a) the ratio of peak modulation depth due to the radiotelephone communications to that due to the identification signal is approximately 9:1;

b) the sum of modulation components due to use of the radiotelephone channel, navigation signals and identification signals shall not exceed 95 per cent.

3.1.3.8.3.3 The audio frequency characteristics of the radiotelephone channel shall be flat to within 3 dB relative to the level at 1 000 Hz over the range 300 Hz to 3 000 Hz.

3.1.3.9 *Identification*

3.1.3.9.1 The localizer shall provide for the simultaneous transmission of an identification signal, specific to the runway and approach direction, on the same radio frequency carrier or carriers as used for the localizer function. The transmission of the identification signal shall not interfere in any way with the basic localizer function.

3.1.3.9.2 The identification signal shall be produced by Class A2A modulation of the radio frequency carrier or carriers using a modulation tone of 1 020 Hz within plus or minus 50 Hz. The depth of modulation shall be between the limits of 5 and 15 per cent except that, where a radiotelephone communication channel is provided, the depth of modulation shall be adjusted so that the ratio of peak modulation depth due to radiotelephone communications to that due to the identification signal modulation is approximately 9:1 (see 3.1.3.8.3.2). The emissions carrying the identification signal shall be horizontally polarized. Where two carriers are modulated with identification signals, the relative phase of the modulations shall be such as to avoid the occurrence of nulls within the coverage of the localizer.

3.1.3.9.3 The identification signal shall employ the International Morse Code and consist of two or three letters. It may be preceded by the International Morse Code signal of the letter "I", followed by a short pause where it is necessary to distinguish the ILS facility from other navigational facilities in the immediate area.

3.1.3.9.4 The identification signal shall be transmitted by dots and dashes at a speed corresponding to approximately seven words per minute, and shall be repeated at approximately equal intervals, not less than six times per minute, at all times during which the localizer is available for operational use. When the transmissions of the localizer are not available for operational use, as, for example, after removal of navigation components, or during maintenance or test transmissions, the identification signal shall be suppressed. The dots shall have a duration of 0.1 second to 0.160 second. The dash duration shall be typically three times the duration of a dot. The interval between dots and/or dashes shall be equal to that of one dot plus or minus 10 per cent. The interval between letters shall not be less than the duration of three dots.

3.1.3.10 *Siting*

3.1.3.10.1 The localizer antenna system shall be located on the extension on the centre line of the runway at the stop end, and the equipment shall be adjusted so that the course lines will be in a vertical plane containing the centre line of the runway served. The antenna system shall have the minimum height necessary to satisfy the coverage requirements laid down in 3.1.3.3, and the distance from the stop end of the runway shall be consistent with safe obstruction clearance practices.

3.1.3.11 *Monitoring*

3.1.3.11.1 The automatic monitor system shall provide a warning to the designated control points and cause one of the following to occur, within the period specified in 3.1.3.11.3.1, if any of the conditions stated in 3.1.3.11.2 persist:

a) radiation to cease;

b) removal of the navigation and identification components from the carrier;

c) reversion to a lower category in the case of Facility Performance Categories II and III localizers where the reversion requirement exists.

Note It is intended that the alternative of reversion offered in may be used only if

) the safety of the reversion procedure has been substantiated and

) the means of providing information to the pilot on the change of category has ade uate integrity

3.1.3.11.2 The conditions requiring initiation of monitor action shall be the following:

a) for Facility Performance Category I localizers, a shift of the mean course line from the runway centre line equivalent to more than 10.5 m (35 ft), or the linear equivalent to 0.015 DDM, whichever is less, at the ILS reference datum;

b) for Facility Performance Category II localizers, a shift of the mean course line from the runway centre line equivalent to more than 7.5 m (25 ft) at the ILS reference datum;

c) for Facility Performance Category III localizers, a shift of the mean course line from the runway centre line equivalent to more than 6 m (20 ft) at the ILS reference datum;

d) in the case of localizers in which the basic functions are provided by the use of a single-frequency system, a reduction of power output to less than 50 per cent of normal, provided the localizer continues to meet the requirements of 3.1.3.3, 3.1.3.4 and 3.1.3.5;

e) in the case of localizers in which the basic functions are provided by the use of a two-frequency system, a reduction of power output for either carrier to less than 80 per cent of normal, except that a greater reduction to between 80 per cent and 50 per cent of normal may be permitted, provided the localizer continues to meet the requirements of 3.1.3.3, 3.1.3.4 and 3.1.3.5;

Note It is important to recogni e that a fre uency change resulting in a loss of the fre uency difference specified in may produce a ha ardous condition This problem is of greater operational significance for Categories II and III installations As necessary this problem can be dealt with through special monitoring provisions or highly reliable circuitry

f) change of displacement sensitivity to a value differing by more than 17 per cent from the nominal value for the localizer facility.

Note In selecting the power reduction figure to be employed in monitoring referred to in e particular attention is directed to vertical and hori ontal lobe structure (vertical lobing due to different antenna heights) of the combined radiation systems when two carriers are employed arge changes in the power ratio between carriers may result in low clearance areas and false courses in the off course areas to the limits of the vertical coverage re uirements specified in

3.1.3.11.2.1 **Recommendation** *In the case of locali ers in which the basic functions are provided by the use of a two fre uency system the conditions re uiring initiation of monitor action should include the case when the DDM in the re uired coverage beyond plus or minus degrees from the front course line except in the bac course sector decreases below*

3.1.3.11.3 The total period of radiation, including period(s) of zero radiation, outside the performance limits specified in a), b), c), d), e) and f) of 3.1.3.11.2 shall be as short as practicable, consistent with the need for avoiding interruptions of the navigation service provided by the localizer.

3.1.3.11.3.1 The total period referred to under 3.1.3.11.3 shall not exceed under any circumstances:

10 seconds for Category I localizers;

5 seconds for Category II localizers;

2 seconds for Category III localizers.

Note The total time periods specified are never to be exceeded limits and are intended to protect aircraft in the final stages of approach against prolonged or repeated periods of locali er guidance outside the monitor limits For this reason they include not only the initial period of outside tolerance operation but also the total of any or all periods of outside tolerance radiation including period(s) of ero radiation which might occur during action to restore service for example in the course of consecutive monitor functioning and conse uent changeover(s) to locali er e uipment or elements thereof

Note From an operational point of view the intention is that no guidance outside the monitor limits be radiated after the time periods given and that no further attempts be made to restore service until a period in the order of seconds has elapsed

3.1.3.11.3.2 **Recommendation** *here practicable the total period under should be reduced so as not to exceed two seconds for Category II locali ers and one second for Category III locali ers*

3.1.3.11.4 Design and operation of the monitor system shall be consistent with the requirement that navigation guidance and identification will be removed and a warning provided at the designated remote control points in the event of failure of the monitor system itself.

Note uidance material on the design and operation of monitor systems is given in Attachment C

3.1.3.11.5 Any erroneous navigation signals on the carrier occurring during removal of navigation and identification components in accordance with 3.1.3.11.1 b) shall be suppressed within the total periods allowed in 3.1.3.11.3.1.

Note To prevent ha ardous fluctuations in the radiated signal locali ers employing mechanical modulation e uip ment may re uire suppression of navigation components during modulator rundown

3.1.3.12 *Integrity and continuity of service re uirements*

3.1.3.12.1 The probability of not radiating false guidance signals shall not be less than 1 0.5 10^{9} in any one landing for Facility Performance Categories II and III localizers.

3.1.3.12.2 **Recommendation** *The probability of not radiating false guidance signals should not be less than in any one landing for Facility Performance Category I locali ers*

3.1.3.12.3 The probability of not losing the radiated guidance signal shall be greater than:

a) 1 2 10^{6} in any period of 15 seconds for Facility Performance Category II localizers or localizers intended to be used for Category III A operations (equivalent to 2 000 hours mean time between outages); and

b) 1 2 10^{6} in any period of 30 seconds for Facility Performance Category III localizers intended to be used for the full range of Category III operations (equivalent to 4 000 hours mean time between outages).

3.1.3.12.4 **Recommendation** *The probability of not losing the radiated guidance signal should exceed in any period of seconds for Facility Performance Category I locali ers (e uivalent to hours mean time between outages)*

Note uidance material on integrity and continuity of service is given in Attachment C

3.1.4 Interference immunity performance for ILS localizer receiving systems

3.1.4.1 After 1 January 1998, the ILS localizer receiving system shall provide adequate immunity to interference from two-signal, third-order intermodulation products caused by VHF FM broadcast signals having levels in accordance with the following:

$$2N_1 \quad N_2 \quad 72 \leq 0$$

for VHF FM sound broadcasting signals in the range 107.7 108.0 MHz

and

$$2N_1 + N_2 + 3\left(24 - 20\log\frac{\Delta f}{0.4}\right) \leq 0$$

for VHF FM sound broadcasting signals below 107.7 MHz,

where the frequencies of the two VHF FM sound broadcasting signals produce, within the receiver, a two-signal, third-order intermodulation product on the desired ILS localizer frequency.

N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the ILS localizer receiver input. Neither level shall exceed the desensitization criteria set forth in 3.1.4.2.

Δf 108.1 f_1, where f_1 is the frequency of N_1, the VHF FM sound broadcasting signal closer to 108.1 MHz.

3.1.4.2 After 1 January 1998, the ILS localizer receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with the following table:

Fre uency (M)	*Maximum level of unwanted signal at receiver input (d m)*
88-102	15
104	10
106	5
107.9	10

Note The relationship is linear between adjacent points designated by the above fre uencies

Note uidance material on immunity criteria to be used for the performance uoted in and is contained in Attachment C

3.1.4.3 After 1 January 1995, all new installations of airborne ILS localizer receiving systems shall meet the provisions of 3.1.4.1 and 3.1.4.2.

3.1.4.4 **Recommendation** *Airborne I S locali er receiving systems meeting the immunity performance standards of and should be placed into operation at the earliest possible date*

3.1.5 UHF glide path equipment and associated monitor

Note θ *is used in this paragraph to denote the nominal glide path angle*

3.1.5.1 *eneral*

3.1.5.1.1 The radiation from the UHF glide path antenna system shall produce a composite field pattern which is amplitude modulated by a 90 Hz and a 150 Hz tone. The pattern shall be arranged to provide a straight line descent path in the vertical plane containing the centre line of the runway, with the 150 Hz tone predominating below the path and the 90 Hz tone predominating above the path to at least an angle equal to 1.75 θ.

3.1.5.1.2 **Recommendation** *The U F glide path e uipment should be capable of adjustment to produce a radiated glide path from to degrees with respect to the hori ontal*

3.1.5.1.2.1 **Recommendation** *The I S glide path angle should be degrees I S glide path angles in excess of degrees should not be used except where alternative means of satisfying obstruction clearance re uirements are impracticable*

3.1.5.1.2.2 The glide path angle shall be adjusted and maintained within:

a) 0.075 θ from θ for Facility Performance Categories I and II — ILS glide paths;

b) 0.04 θ from θ for Facility Performance Category III — ILS glide paths.

Note uidance material on adjustment and maintenance of glide path angles is given in of Attachment C

Note uidance material on I S glide path curvature alignment and siting relevant to the selection of the height of the I S reference datum is given in of Attachment C and Figure C

3.1.5.1.3 The downward extended straight portion of the ILS glide path shall pass through the ILS reference datum at a height ensuring safe guidance over obstructions and also safe and efficient use of the runway served.

3.1.5.1.4 The height of the ILS reference datum for Facility Performance Categories II and III — ILS shall be 15 m (50 ft). A tolerance of plus 3 m (10 ft) is permitted.

3.1.5.1.5 **Recommendation** *The height of the I S reference datum for Facility Performance Category I I S should be m (ft) A tolerance of plus m (ft) is permitted*

Note In arriving at the above height values for the I S reference datum a maximum vertical distance of m (ft) between the path of the aircraft glide path antenna and the path of the lowest part of the wheels at the threshold was assumed For aircraft exceeding this criterion appropriate steps may have to be ta en either to maintain ade uate clearance at threshold or to adjust the permitted operating minima

Note Appropriate guidance material is given in of Attachment C

3.1.5.1.6 **Recommendation** *The height of the I S reference datum for Facility Performance Category I I S used on short precision approach runway codes and should be m (ft) A tolerance of plus m (ft) is permitted*

3.1.5.2 *Radio fre uency*

3.1.5.2.1 The glide path equipment shall operate in the band 328.6 MHz to 335.4 MHz. Where a single radio frequency carrier is used, the frequency tolerance shall not exceed 0.005 per cent. Where two carrier glide path systems are used, the frequency tolerance shall not exceed 0.002 per cent and the nominal band occupied by the carriers shall be symmetrical about the assigned frequency. With all tolerances applied, the frequency separation between the carriers shall not be less than 4 kHz nor more than 32 kHz.

3.1.5.2.2 The emission from the glide path equipment shall be horizontally polarized.

3.1.5.2.3 For Facility Performance Category III — ILS glide path equipment, signals emanating from the transmitter shall contain no components which result in apparent glide path fluctuations of more than 0.02 DDM peak to peak in the frequency band 0.01 Hz to 10 Hz.

3.1.5.3 *Coverage*

3.1.5.3.1 The glide path equipment shall provide signals sufficient to allow satisfactory operation of a typical aircraft installation in sectors of 8 degrees in azimuth on each side of the centre line of the ILS glide path, to a distance of at least 18.5 km (10 NM) up to 1.75 θ and down to 0.45 θ above the horizontal or to such lower angle, down to 0.30 θ, as required to safeguard the promulgated glide path intercept procedure.

3.1.5.3.2 In order to provide the coverage for glide path performance specified in 3.1.5.3.1, the minimum field strength within this coverage sector shall be 400 microvolts per metre (minus 95 dBW/m^2). For Facility Performance Category I glide paths, this field strength shall be provided down to a height of 30 m (100 ft) above the horizontal plane containing the threshold. For Facility Performance Categories II and III glide paths, this field strength shall be provided down to a height of 15 m (50 ft) above the horizontal plane containing the threshold.

Note The re uirements in the foregoing paragraphs are based on the assumption that the aircraft is heading directly toward the facility

Note uidance material on significant airborne receiver parameters is given in of Attachment C

Note Material concerning reduction in coverage outside degrees on each side of the centre line of the I S glide path appears in of Attachment C

3.1.5.4 *I S glide path structure*

3.1.5.4.1 For Facility Performance Category I — ILS glide paths, bends in the glide path shall not have amplitudes which exceed the following:

one	*Amplitude (DDM) (probability)*
Outer limit of coverage to ILS Point "C"	0.035

3.1.5.4.2 For Facility Performance Categories II and III — ILS glide paths, bends in the glide path shall not have amplitudes which exceed the following:

one	*Amplitude (DDM) (probability)*
Outer limit of coverage to ILS Point "A"	0.035
ILS Point "A" to ILS Point "B"	0.035 at ILS Point "A" decreasing at a linear rate to 0.023 at ILS Point "B"
ILS Point "B" to the ILS reference datum	0.023

Note The amplitudes referred to in and are the DDMs due to bends as reali ed on the mean I S glide path correctly adjusted

Note In regions of the approach where I S glide path curvature is significant bend amplitudes are calculated from the mean curved path and not the downward extended straight line

Note uidance material relevant to the I S glide path course structure is given in of Attachment C

3.1.5.5 *Carrier modulation*

3.1.5.5.1 The nominal depth of modulation of the radio frequency carrier due to each of the 90 Hz and 150 Hz tones shall be 40 per cent along the ILS glide path. The depth of modulation shall not deviate outside the limits of 37.5 per cent to 42.5 per cent.

3.1.5.5.2 The following tolerances shall be applied to the frequencies of the modulating tones:

a) the modulating tones shall be 90 Hz and 150 Hz within 2.5 per cent for Facility Performance Category I — ILS;

b) the modulating tones shall be 90 Hz and 150 Hz within 1.5 per cent for Facility Performance Category II — ILS;

c) the modulating tones shall be 90 Hz and 150 Hz within 1 per cent for Facility Performance Category III — ILS;

d) the total harmonic content of the 90 Hz tone shall not exceed 10 per cent: additionally, for Facility Performance Category III equipment, the second harmonic of the 90 Hz tone shall not exceed 5 per cent;

e) the total harmonic content of the 150 Hz tone shall not exceed 10 per cent.

3.1.5.5.2.1 **Recommendation** *For Facility Performance Category I I S the modulating tones should be and within plus or minus per cent where practicable*

3.1.5.5.2.2 For Facility Performance Category III glide path equipment, the depth of amplitude modulation of the radio frequency carrier at the power supply frequency or harmonics, or at other noise frequencies, shall not exceed 1 per cent.

3.1.5.5.3 The modulation shall be phase-locked so that within the ILS half glide path sector, the demodulated 90 Hz and 150 Hz wave forms pass through zero in the same direction within:

a) for Facility Performance Categories I and II — ILS glide paths: 20 degrees;

b) for Facility Performance Category III — ILS glide paths: 10 degrees,

of phase relative to the 150 Hz component, every half cycle of the combined 90 Hz and 150 Hz wave form.

Note The definition of phase relationship in this manner is not intended to imply a re uirement for measurement of phase within the I S half glide path sector

Note uidance material relating to such measures is given at Figure C of Attachment C

3.1.5.5.3.1 With two-frequency glide path systems, 3.1.5.5.3 shall apply to each carrier. In addition, the 90 Hz modulating tone of one carrier shall be phase-locked to the 90 Hz modulating tone of the other carrier so that the demodulated wave forms pass through zero in the same direction within:

a) for Categories I and II — ILS glide paths: 20 degrees;

b) for Category III — ILS glide paths: 10 degrees,

of phase relative to 90 Hz. Similarly, the 150 Hz tones of the two carriers shall be phase-locked so that the demodulated wave forms pass through zero in the same direction, within:

1) for Categories I and II — ILS glide paths: 20 degrees;

2) for Category III — ILS glide paths: 10 degrees,

of phase relative to 150 Hz.

3.1.5.5.3.2 Alternative two-frequency glide path systems that employ audio phasing different from the normal in-phase condition described in 3.1.5.5.3.1 shall be permitted. In these alternative systems, the 90 Hz to 90 Hz phasing and the 150 Hz to 150 Hz phasing shall be adjusted to their nominal values to within limits equivalent to those stated in 3.1.5.5.3.1.

Note This is to ensure correct airborne receiver operation within the glide path sector where the two carrier signal strengths are approximately e ual

3.1.5.5.4 **Recommendation** *Undesired fre uency and phase modulation on I S glide path radio fre uency carriers that can affect the displayed DDM values in glide path receivers should be minimi ed to the extent practical*

Note Relevant guidance material is given in of Attachment C

3.1.5.6 *Displacement sensitivity*

3.1.5.6.1 For Facility Performance Category I — ILS glide paths, the nominal angular displacement sensitivity shall correspond to a DDM of 0.0875 at angular displacements above and below the glide path between 0.07 θ and 0.14 θ.

Note The above is not intended to preclude glide path systems which inherently have asymmetrical upper and lower sectors

3.1.5.6.2 **Recommendation** *For Facility Performance Category I I S glide paths the nominal angular displacement sensitivity should correspond to a DDM of at an angular displacement below the glide path of θ with a tolerance of plus or minus θ The upper and lower sectors should be as symmetrical as practicable within the limits specified in*

3.1.5.6.3 For Facility Performance Category II — ILS glide paths, the angular displacement sensitivity shall be as symmetrical as practicable. The nominal angular displacement sensitivity shall correspond to a DDM of 0.0875 at an angular displacement of:

a) 0.12 θ below path with a tolerance of plus or minus 0.02 θ;

b) 0.12 θ above path with a tolerance of plus 0.02 θ and minus 0.05 θ

3.1.5.6.4 For Facility Performance Category III — ILS glide paths, the nominal angular displacement sensitivity shall correspond to a DDM of 0.0875 at angular displacements above and below the glide path of 0.12 θ with a tolerance of plus or minus 0.02 θ.

3.1.5.6.5 The DDM below the ILS glide path shall increase smoothly for decreasing angle until a value of 0.22 DDM is reached. This value shall be achieved at an angle not less than 0.30 θ above the horizontal. However, if it is achieved at an angle above 0.45 θ, the DDM value shall not be less than 0.22 at least down to 0.45 θ or to such lower angle, down to 0.30 θ, as required to safeguard the promulgated glide path intercept procedure.

Note The limits of glide path e uipment adjustment are pictorially represented in Figure C of Attachment C

3.1.5.6.6 For Facility Performance Category I — ILS glide paths, the angular displacement sensitivity shall be adjusted and maintained within plus or minus 25 per cent of the nominal value selected.

3.1.5.6.7 For Facility Performance Category II — ILS glide paths, the angular displacement sensitivity shall be adjusted and maintained within plus or minus 20 per cent of the nominal value selected.

3.1.5.6.8 For Facility Performance Category III — ILS glide paths, the angular displacement sensitivity shall be adjusted and maintained within plus or minus 15 per cent of the nominal value selected.

Note uidance material on I S glide path adjustment and maintenance values is given in Attachment C

3.1.5.7 *Monitoring*

3.1.5.7.1 The automatic monitor system shall provide a warning to the designated control points and cause radiation to cease within the periods specified in 3.1.5.7.3.1 if any of the following conditions persist:

a) shift of the mean ILS glide path angle equivalent to more than minus 0.075 θ to plus 0.10 θ from θ;

b) in the case of ILS glide paths in which the basic functions are provided by the use of a single-frequency system, a reduction of power output to less than 50 per cent of normal, provided the glide path continues to meet the requirements of 3.1.5.3, 3.1.5.4 and 3.1.5.5;

c) in the case of ILS glide paths in which the basic functions are provided by the use of two-frequency systems, a reduction of power output for either carrier to less than 80 per cent of normal, except that a greater reduction to between 80 per cent and 50 per cent of normal may be permitted, provided the glide path continues to meet the requirements of 3.1.5.3, 3.1.5.4 and 3.1.5.5;

   Note It is important to recogni e that a fre uency change resulting in a loss of the fre uency difference specified in may produce a ha ardous condition This problem is of greater operational significance for Categories II and III installations As necessary this problem can be dealt with through special monitoring provisions or highly reliable circuitry

d) for Facility Performance Category I — ILS glide paths, a change of the angle between the glide path and the line below the glide path (150 Hz predominating) at which a DDM of 0.0875 is realized by more than plus or minus 0.0375 θ;

e) for Facility Performance Categories II and III — ILS glide paths, a change of displacement sensitivity to a value differing by more than 25 per cent from the nominal value;

f) lowering of the line beneath the ILS glide path at which a DDM of 0.0875 is realized to less than 0.7475 θ from horizontal;

g) a reduction of DDM to less than 0.175 within the specified coverage below the glide path sector.

Note The value of θ from hori ontal is intended to ensure ade uate obstacle clearance This value was derived from other parameters of the glide path and monitor specification Since the measuring accuracy to four significant figures is not intended the value of θ may be used as a monitor limit for this purpose uidance on obstacle clearance criteria is given in the PANS PS (Doc)

Note Subparagraphs f) and g) are not intended to establish a re uirement for a separate monitor to protect against deviation of the lower limits of the half sector below θ from hori ontal

Note At glide path facilities where the selected nominal angular displacement sensitivity corresponds to an angle below the I S glide path which is close to or at the maximum limits specified in it may be necessary to adjust the monitor operating limits to protect against sector deviations below θ from hori ontal

Note uidance material relating to the condition described in g) appears in Attachment C

3.1.5.7.2 **Recommendation** *Monitoring of the I S glide path characteristics to smaller tolerances should be arranged in those cases where operational penalties would otherwise exist*

3.1.5.7.3 The total period of radiation, including period(s) of zero radiation, outside the performance limits specified in 3.1.5.7.1 a), b), c), d), e) and f) shall be as short as practicable, consistent with the need for avoiding interruptions of the navigation service provided by the ILS glide path.

3.1.5.7.3.1 The total period referred to under 3.1.5.7.3 shall not exceed under any circumstances:

6 seconds for Category I — ILS glide paths;

2 seconds for Categories II and III — ILS glide paths.

Note The total time periods specified are never to be exceeded limits and are intended to protect aircraft in the final stages of approach against prolonged or repeated periods of I S glide path guidance outside the monitor limits For this reason they include not only the initial period of outside tolerance operation but also the total of any or all periods of outside tolerance radiation including periods of ero radiation which might occur during action to restore service for example in the course of consecutive monitor functioning and conse uent changeovers to glide path e uipments or elements thereof

Note From an operational point of view the intention is that no guidance outside the monitor limits be radiated after the time periods given and that no further attempts be made to restore service until a period in the order of seconds has elapsed

3.1.5.7.3.2 **Recommendation** *here practicable the total period specified under for Categories II and III I S glide paths should not exceed second*

3.1.5.7.4 Design and operation of the monitor system shall be consistent with the requirement that radiation shall cease and a warning shall be provided at the designated remote control points in the event of failure of the monitor system itself.

Note uidance material on the design and operation of monitor systems is given in of Attachment C

3.1.5.8 *Integrity and continuity of service re uirements*

3.1.5.8.1 The probability of not radiating false guidance signals shall not be less than 1 0.5 10 ^{9} in any one landing for Facility Performance Categories II and III glide paths.

3.1.5.8.2 **Recommendation** *The probability of not radiating false guidance signals should not be less than in any one landing for Facility Performance Category I glide paths*

3.1.5.8.3 The probability of not losing the radiated guidance signal shall be greater than 1 2 10 ^{6} in any period of 15 seconds for Facility Performance Categories II and III glide paths (equivalent to 2 000 hours mean time between outages).

3.1.5.8.4 **Recommendation** *The probability of not losing the radiated guidance signal should exceed in any period of seconds for Facility Performance Category I glide paths (e uivalent to hours mean time between outages)*

Note uidance material on integrity and continuity of service is given in of Attachment C

3.1.6 Localizer and glide path frequency pairing

3.1.6.1 The pairing of the runway localizer and glide path transmitter frequencies of an instrument landing system shall be taken from the following list in accordance with the provisions of Volume V, Chapter 4, 4.2:

ocali er (M)	*lide path (M)*
108.1	334.7
108.15	334.55
108.3	334.1
108.35	333.95
108.5	329.9
108.55	329.75
108.7	330.5
108.75	330.35
108.9	329.3
108.95	329.15
109.1	331.4
109.15	331.25
109.3	332.0
109.35	331.85
109.5	332.6
109.55	332.45
109.7	333.2
109.75	333.05
109.9	333.8
109.95	333.65
110.1	334.4
110.15	334.25
110.3	335.0
110.35	334.85
110.5	329.6
110.55	329.45
110.7	330.2
110.75	330.05
110.9	330.8
110.95	330.65
111.1	331.7
111.15	331.55
111.3	332.3
111.35	332.15
111.5	332.9
111.55	332.75
111.7	333.5
111.75	333.35
111.9	331.1
111.95	330.95

3.1.6.1.1 In those regions where the requirements for runway localizer and glide path transmitter frequencies of an instrument landing system do not justify more than 20 pairs, they shall be selected sequentially, as required, from the following list:

Se uence number	*ocali er (M)*	*lide path (M)*
1	110.3	335.0
2	109.9	333.8
3	109.5	332.6
4	110.1	334.4
5	109.7	333.2
6	109.3	332.0
7	109.1	331.4
8	110.9	330.8
9	110.7	330.2
10	110.5	329.6
11	108.1	334.7
12	108.3	334.1
13	108.5	329.9
14	108.7	330.5
15	108.9	329.3
16	111.1	331.7
17	111.3	332.3
18	111.5	332.9
19	111.7	333.5
20	111.9	331.1

3.1.6.2 Where existing ILS localizers meeting national requirements are operating on frequencies ending in even tenths of a megahertz, they shall be reassigned frequencies, conforming with 3.1.6.1 or 3.1.6.1.1 as soon as practicable and may continue operating on their present assignments only until this reassignment can be effected.

3.1.6.3 Existing ILS localizers in the international service operating on frequencies ending in odd tenths of a megahertz shall not be assigned new frequencies ending in odd tenths plus one twentieth of a megahertz except where, by regional agreement, general use may be made of any of the channels listed in 3.1.6.1 (see Volume V, Chapter 4, 4.2).

3.1.7 VHF marker beacons

3.1.7.1 *eneral*

a) There shall be two marker beacons in each installation except as provided in 3.1.7.6.6. A third marker beacon may be added whenever, in the opinion of the Competent Authority, an additional beacon is required because of operational procedures at a particular site.

b) The marker beacons shall conform to the requirements prescribed in 3.1.7. When the installation comprises only two marker beacons, the requirements applicable to the middle marker and to the outer marker shall be complied with.

c) The marker beacons shall produce radiation patterns to indicate predetermined distance from the threshold along the ILS glide path.

3.1.7.1.1 When a marker beacon is used in conjunction with the back course of a localizer, it shall conform with the marker beacon characteristics specified in 3.1.7.

3.1.7.1.2 Identification signals of marker beacons used in conjunction with the back course of a localizer shall be clearly distinguishable from the inner, middle and outer marker beacon identifications, as prescribed in 3.1.7.5.1.

3.1.7.2 *Radio fre uency*

3.1.7.2.1 The marker beacons shall operate at 75 MHz with a frequency tolerance of plus or minus 0.005 per cent and shall utilize horizontal polarization.

3.1.7.3 *Coverage*

3.1.7.3.1 The marker beacon system shall be adjusted to provide coverage over the following distances, measured on the ILS glide path and localizer course line:

a) *inner mar er (where installed)* 150 m plus or minus 50 m (500 ft plus or minus 160 ft);

b) *middle mar er* 300 m plus or minus 100 m (1 000 ft plus or minus 325 ft);

c) *outer mar er* 600 m plus or minus 200 m (2 000 ft plus or minus 650 ft).

3.1.7.3.2 The field strength at the limits of coverage specified in 3.1.7.3.1 shall be 1.5 millivolts per metre (minus 82 dBW/m^2). In addition, the field strength within the coverage area shall rise to at least 3.0 millivolts per metre (minus 76 dBW/m^2).

Note In the design of the ground antenna it is advisable to ensure that an ade uate rate of change of field strength is provided at the edges of coverage It is also advisable to ensure that aircraft within the locali er course sector will receive visual indication

Note Satisfactory operation of a typical airborne mar er installation will be obtained if the sensitivity is so adjusted that visual indication will be obtained when the field strength is millivolts per metre (minus d m)

3.1.7.4 *Modulation*

3.1.7.4.1 The modulation frequencies shall be as follows:

a) *inner mar er (when installed)* 3 000 Hz;

b) *middle mar er* 1 300 Hz;

c) *outer mar er* 400 Hz.

The frequency tolerance of the above frequencies shall be plus or minus 2.5 per cent, and the total harmonic content of each of the frequencies shall not exceed 15 per cent.

3.1.7.4.2 The depth of modulation of the markers shall be 95 per cent plus or minus 4 per cent.

3.1.7.5 *Identification*

3.1.7.5.1 The carrier energy shall not be interrupted. The audio frequency modulation shall be keyed as follows:

a) *inner mar er (when installed)* 6 dots per second continuously;

b) *middle mar er* a continuous series of alternate dots and dashes, the dashes keyed at the rate of 2 dashes per second, and the dots at the rate of 6 dots per second;

c) *outer mar er* 2 dashes per second continuously.

These keying rates shall be maintained to within plus or minus 15 per cent.

3.1.7.6 *Siting*

3.1.7.6.1 The inner marker, when installed, shall be located so as to indicate in low visibility conditions the imminence of arrival at the runway threshold.

3.1.7.6.1.1 **Recommendation** *If the radiation pattern is vertical the inner mar er when installed should be located between m (ft) and m (ft) from the threshold and at not more than m (ft) from the extended centre line of the runway*

Note It is intended that the inner mar er pattern should intercept the downward extended straight portion of the nominal I S glide path at the lowest decision height applicable in Category II operations

Note Care must be exercised in siting the inner mar er to avoid interference between the inner and middle mar ers Details regarding the siting of inner mar ers are contained in Attachment C

3.1.7.6.1.2 **Recommendation** *If the radiation pattern is other than vertical the e uipment should be located so as to produce a field within the course sector and I S glide path sector that is substantially similar to that produced by an antenna radiating a vertical pattern and located as prescribed in*

3.1.7.6.2 The middle marker shall be located so as to indicate the imminence, in low visibility conditions, of visual approach guidance.

3.1.7.6.2.1 **Recommendation** *If the radiation pattern is vertical the middle mar er should be located m (ft) plus or minus m (ft) from the landing threshold at the approach end of the runway and at not more than m (ft) from the extended centre line of the runway*

Note See Attachment C regarding the siting of inner and middle mar er beacons

3.1.7.6.2.2 **Recommendation** *If the radiation pattern is other than vertical the e uipment should be located so as to produce a field within the course sector and I S glide path sector that is substantially similar to that produced by an antenna radiating a vertical pattern and located as prescribed in*

3.1.7.6.3 The outer marker shall be located so as to provide height, distance and equipment functioning checks to aircraft on intermediate and final approach.

3.1.7.6.3.1 **Recommendation** *The outer mar er should be located m (NM) from the threshold except that where for topographical or operational reasons this distance is not practicable the outer mar er may be located between and m (and NM) from the threshold*

3.1.7.6.4 **Recommendation** *If the radiation pattern is vertical the outer mar er should be not more than m (ft) from the extended centre line of the runway If the radiation pattern is other than vertical the e uipment should be located so as to produce a field within the course sector and I S glide path sector that is substantially similar to that produced by an antenna radiating a vertical pattern*

3.1.7.6.5 The positions of marker beacons, or where applicable, the equivalent distance(s) indicated by the DME when used as an alternative to part or all of the marker beacon component of the ILS, shall be published in accordance with the provisions of Annex 15.

3.1.7.6.5.1 When so used, the DME shall provide distance information operationally equivalent to that furnished by marker beacon(s).

3.1.7.6.5.2 When used as an alternative for the middle marker, the DME shall be frequency paired with the ILS localizer and sited so as to minimize the error in distance information.

3.1.7.6.5.3 The DME in 3.1.7.6.5 shall conform to the specification in 3.5.

3.1.7.7 *Monitoring*

3.1.7.7.1 Suitable equipment shall provide signals for the operation of an automatic monitor. The monitor shall transmit a warning to a control point if either of the following conditions arise:

a) failure of the modulation or keying;

b) reduction of power output to less than 50 per cent of normal.

3.1.7.7.2 **Recommendation** *For each mar er beacon suitable monitoring e uipment should be provided which will indicate at the appropriate location a decrease of the modulation depth below per cent*

3 2 Specification for precision approac radar system

Note Slant distances are used throughout this specification

3.2.1 The precision approach radar system shall comprise the following elements:

3.2.1.1 The precision approach radar element (PAR).

3.2.1.2 The surveillance radar element (SRE).

3.2.2 When the PAR only is used, the installation shall be identified by the term PAR or precision approach radar and not by the term “precision approach radar system”.

Note Provisions for the recording and retention of radar data are contained in Annex Chapter

3.2.3 The precision approach radar element (PAR)

3.2.3.1 *Coverage*

3.2.3.1.1 The PAR shall be capable of detecting and indicating the position of an aircraft of 15 m^2 echoing area or larger, which is within a space bounded by a 20-degree azimuth sector and a 7-degree elevation sector, to a distance of at least 16.7 km (9 NM) from its respective antenna.

Note For guidance in determining the significance of the echoing areas of aircraft the following table is included

private flyer (single engined) 5 to 10 m^2;

small twin engined aircraft from 15 m^2;

medium twin engined aircraft from 25 m^2;

four engined aircraft from 50 to 100 m^2.

3.2.3.2 *Siting*

3.2.3.2.1 The PAR shall be sited and adjusted so that it gives complete coverage of a sector with its apex at a point 150 m (500 ft) from the touchdown in the direction of the stop end of the runway and extending plus or minus 5 degrees about the runway centre line in azimuth and from minus 1 degree to plus 6 degrees in elevation.

Note Paragraph can be met by siting the e uipment with a set bac from the touchdown in the direction of the stop end of the runway of m (ft) or more for an offset of m (ft) from the runway centre line or of m (ft) or more for an offset of m (ft) when the e uipment is aligned to scan plus or minus degrees about the centre line of the runway Alternatively if the e uipment is aligned to scan degrees to one side and degrees to the other side of the centre line of the runway then the minimum set bac can be reduced to m (ft) and m (ft) for offsets of m (ft) and m (ft) respectively

Note Diagrams illustrating the siting of PAR are given in Attachment C (Figures C to C inclusive)

3.2.3.3 *Accuracy*

3.2.3.3.1 *A imuth accuracy* Azimuth information shall be displayed in such a manner that left-right deviation from the on-course line shall be easily observable. The maximum permissible error with respect to the deviation from the on-course line shall be either 0.6 per cent of the distance from the PAR antenna plus 10 per cent of the deviation from the on-course line or 9 m (30 ft), whichever is greater. The equipment shall be so sited that the error at the touchdown shall not exceed 9 m (30 ft). The equipment shall be so aligned and adjusted that the displayed error at the touchdown shall be a minimum and shall not exceed 0.3 per cent of the distance from the PAR antenna or 4.5 m (15 ft), whichever is greater. It shall be possible to resolve the positions of two aircraft which are at 1.2 degrees in azimuth of one another.

3.2.3.3.2 *Elevation accuracy* Elevation information shall be displayed in such a manner that up-down deviation from the descent path for which the equipment is set shall be easily observable. The maximum permissible error with respect to the deviation from the on-course line shall be 0.4 per cent of the distance from the PAR antenna plus 10 per cent of the actual linear displacement from the chosen descent path or 6 m (20 ft), whichever is greater. The equipment shall be so sited that the error at the touchdown shall not exceed 6 m (20 ft). The equipment shall be so aligned and adjusted that the displayed error at the touchdown shall be a minimum and shall not exceed 0.2 per cent of the distance from the PAR antenna or 3 m (10 ft), whichever is greater. It shall be possible to resolve the positions of two aircraft that are at 0.6 degree in elevation of one another.

3.2.3.3.3 *Distance accuracy* The error in indication of the distance from the touchdown shall not exceed 30 m (100 ft) plus 3 per cent of the distance from the touchdown. It shall be possible to resolve the positions of two aircraft which are at 120 m (400 ft) of one another on the same azimuth.

3.2.3.4 Information shall be made available to permit the position of the controlled aircraft to be established with respect to other aircraft and obstructions. Indications shall also permit appreciation of ground speed and rate of departure from or approach to the desired flight path.

3.2.3.5 Information shall be completely renewed at least once every second.

3.2.4 The surveillance radar element (SRE)

3.2.4.1 A surveillance radar used as the SRE of a precision approach radar system shall satisfy at least the following broad performance requirements.

3.2.4.2 *Coverage*

3.2.4.2.1 The SRE shall be capable of detecting aircraft of 15 m^2 echoing area and larger, which are in line of sight of the antenna within a volume described as follows:

The rotation through 360 degrees about the antenna of a vertical plane surface bounded by a line at an angle of 1.5 degrees above the horizontal plane of the antenna, extending from the antenna to 37 km (20 NM); by a vertical line at 37 km (20 NM) from the intersection with the 1.5-degree line up to 2 400 m (8 000 ft) above the level of the antenna; by a horizontal line at 2 400 m (8 000 ft) from 37 km (20 NM) back towards the antenna to the intersection with a line from the antenna at 20 degrees above the horizontal plane of the antenna, and by a 20-degree line from the intersection with the 2 400 m (8 000 ft) line to the antenna.

3.2.4.2.2 **Recommendation** *Efforts should be made in development to increase the coverage on an aircraft of m echoing area to at least the volume obtained by amending with the following substitutions*

— for *degrees*, read *degree*;

— for *m (NM)*, read *m (NM)*;

— for *m (ft)*, read *m (ft)*;

— for *degrees*, read *degrees*.

Note A diagram illustrating the vertical coverage of SRE is given in Attachment C (Figure C)

3.2.4.3 *Accuracy*

3.2.4.3.1 *A imuth accuracy* The indication of position in azimuth shall be within plus or minus 2 degrees of the true position. It shall be possible to resolve the positions of two aircraft which are at 4 degrees of azimuth of one another.

3.2.4.3.2 *Distance accuracy* The error in distance indication shall not exceed 5 per cent of true distance or 150 m (500 ft), whichever is the greater. It shall be possible to resolve the positions of two aircraft that are separated by a distance of 1 per cent of the true distance from the point of observation or 230 m (750 ft), whichever is the greater.

3.2.4.3.2.1 **Recommendation** *The error in distance indication should not exceed per cent of the true distance or m (ft) whichever is the greater*

3.2.4.4 The equipment shall be capable of completely renewing the information concerning the distance and azimuth of any aircraft within the coverage of the equipment at least once every 4 seconds.

3.2.4.5 **Recommendation** *Efforts should be made to reduce as far as possible the disturbance caused by ground echoes or echoes from clouds and precipitation*

3 3 Specification for HF omnidirectional radio range OR

3.3.1 General

3.3.1.1 The VOR shall be constructed and adjusted so that similar instrumental indications in aircraft represent equal clockwise angular deviations (bearings), degree for degree from magnetic North as measured from the location of the VOR.

3.3.1.2 The VOR shall radiate a radio frequency carrier with which are associated two separate 30 Hz modulations. One of these modulations shall be such that its phase is independent of the azimuth of the point of observation (reference phase). The other modulation (variable phase) shall be such that its phase at the point of observation differs from that of the reference phase by an angle equal to the bearing of the point of observation with respect to the VOR.

3.3.1.3 The reference and variable phase modulations shall be in phase along the reference meridian through the station.

Note The reference and variable phase modulations are in phase when the maximum value of the sum of the radio fre uency carrier and the sideband energy due to the variable phase modulation occurs at the same time as the highest instantaneous fre uency of the reference phase modulation

3.3.2 Radio frequency

3.3.2.1 The VOR shall operate in the band 111.975 MHz to 117.975 MHz except that frequencies in the band 108 MHz to 111.975 MHz may be used when, in accordance with the provisions of Volume V, Chapter 4, 4.2.1 and 4.2.3.1, the use of such frequencies is acceptable. The highest assignable frequency shall be 117.950 MHz. The channel separation shall be in increments of 50 kHz referred to the highest assignable frequency. In areas where 100 kHz or 200 kHz channel spacing is in general use, the frequency tolerance of the radio frequency carrier shall be plus or minus 0.005 per cent.

3.3.2.2 The frequency tolerance of the radio frequency carrier of all new installations implemented after 23 May 1974 in areas where 50 kHz channel spacing is in use shall be plus or minus 0.002 per cent.

3.3.2.3 In areas where new VOR installations are implemented and are assigned frequencies spaced at 50 kHz from existing VORs in the same area, priority shall be given to ensuring that the frequency tolerance of the radio frequency carrier of the existing VORs is reduced to plus or minus 0.002 per cent.

3.3.3 Polarization and pattern accuracy

3.3.3.1 The emission from the VOR shall be horizontally polarized. The vertically polarized component of the radiation shall be as small as possible.

Note It is not possible at present to state uantitatively the maximum permissible magnitude of the vertically polari ed component of the radiation from the R (Information is provided in the Manual on Testing of Radio Navigation Aids *(Doc) as to flight chec s that can be carried out to determine the effects of vertical polari ation on the bearing accuracy)*

3.3.3.2 The accuracy of the bearing information conveyed by the horizontally polarized radiation from the VOR at a distance of approximately four wavelengths for all elevation angles between 0 and 40 degrees, measured from the centre of the VOR antenna system, shall be within plus or minus 2 degrees.

3.3.4 Coverage

3.3.4.1 The VOR shall provide signals such as to permit satisfactory operation of a typical aircraft installation at the levels and distances required for operational reasons, and up to an elevation angle of 40 degrees.

3.3.4.2 **Recommendation** *The field strength or power density in space of R signals re uired to permit satisfactory operation of a typical aircraft installation at the minimum service level at the maximum specified service radius should be microvolts per metre or minus d m*

Note Typical effective radiated powers (ERPs) to achieve specified ranges are contained in of Attachment C

3.3.5 Modulations of navigation signals

3.3.5.1 The radio frequency carrier as observed at any point in space shall be amplitude modulated by two signals as follows:

a) a subcarrier of 9 960 Hz of constant amplitude, frequency modulated at 30 Hz and having a deviation ratio of 16 plus or minus 1 (i.e. 15 to 17):

   1) for the conventional VOR, the 30 Hz component of this FM subcarrier is fixed without respect to azimuth and is termed the “reference phase”;

   2) for the Doppler VOR, the phase of the 30 Hz component varies with azimuth and is termed the “variable phase”;

b) a 30 Hz amplitude modulation component:

   1) for the conventional VOR, this component results from a rotating field pattern, the phase of which varies with azimuth, and is termed the “variable phase”;

   2) for the Doppler VOR, this component, of constant phase with relation to azimuth and constant amplitude, is radiated omnidirectionally and is termed the “reference phase”.

3.3.5.2 The depth of modulation of the radio frequency carrier due to the subcarrier of 9 960 Hz shall be within the limits of 28 per cent and 32 per cent.

3.3.5.3 The depth of modulation of the radio frequency carrier due to the 30 Hz or 9 960 Hz signals, as observed at any angle of elevation up to 5 degrees, shall be within the limits of 28 to 32 per cent.

3.3.5.4 The variable and reference phase modulation frequencies shall be 30 Hz within plus or minus 1 per cent.

3.3.5.5 The subcarrier modulation mid-frequency shall be 9 960 Hz within plus or minus 1 per cent.

3.3.5.6

a) For the conventional VOR, the percentage of amplitude modulation of the 9 960 Hz subcarrier shall not exceed 5 per cent.

b) For the Doppler VOR, the percentage of amplitude modulation of the 9 960 Hz subcarrier shall not exceed 40 per cent when measured at a point at least 300 m (1 000 ft) from the VOR.

3.3.5.7 Where 50 kHz VOR channel spacing is implemented, the sideband level of the harmonics of the 9 960 Hz component in the radiated signal shall not exceed the following levels referred to the level of the 9 960 Hz sideband:

Subcarrier	*evel*
9 960 Hz	0 dB reference
2nd harmonic	30 dB
3rd harmonic	50 dB
4th harmonic and above	60 dB

3.3.6 Voice and identification

3.3.6.1 If the VOR provides a simultaneous communication channel ground-to-air, it shall be on the same radio frequency carrier as used for the navigational function. The radiation on this channel shall be horizontally polarized.

3.3.6.2 The peak modulation depth of the carrier on the communication channel shall not be greater than 30 per cent.

3.3.6.3 The audio frequency characteristics of the speech channel shall be within 3 dB relative to the level at 1 000 Hz over the range 300 Hz to 3 000 Hz.

3.3.6.4 The VOR shall provide for the simultaneous transmission of a signal of identification on the same radio frequency carrier as that used for the navigational function. The identification signal radiation shall be horizontally polarized.

3.3.6.5 The identification signal shall employ the International Morse Code and consist of two or three letters. It shall be sent at a speed corresponding to approximately 7 words per minute. The signal shall be repeated at least once every 30 seconds and the modulation tone shall be 1 020 Hz within plus or minus 50 Hz.

3.3.6.5.1 **Recommendation** *The identification signal should be transmitted at least three times each seconds spaced e ually within that time period ne of these identification signals may ta e the form of a voice identification*

Note here a R and DME are associated in accordance with the identification provisions of influence the R identification

3.3.6.6 The depth to which the radio frequency carrier is modulated by the code identification signal shall be close to, but not in excess of 10 per cent except that, where a communication channel is not provided, it shall be permissible to increase the modulation by the code identification signal to a value not exceeding 20 per cent.

3.3.6.6.1 **Recommendation** *If the R provides a simultaneous communication channel ground to air the modulation depth of the code identification signal should be plus or minus per cent in order to provide a satisfactory voice uality*

3.3.6.7 The transmission of speech shall not interfere in any way with the basic navigational function. When speech is being radiated, the code identification shall not be suppressed.

3.3.6.8 The VOR receiving function shall permit positive identification of the wanted signal under the signal conditions encountered within the specified coverage limits, and with the modulation parameters specified at 3.3.6.5, 3.3.6.6 and 3.3.6.7.

3.3.7 Monitoring

3.3.7.1 Suitable equipment located in the radiation field shall provide signals for the operation of an automatic monitor. The monitor shall transmit a warning to a control point, and either remove the identification and navigation components from the carrier or cause radiation to cease if any one or a combination of the following deviations from established conditions arises:

a) a change in excess of 1 degree at the monitor site of the bearing information transmitted by the VOR;

b) a reduction of 15 per cent in the modulation components of the radio frequency signals voltage level at the monitor of either the subcarrier, or 30 Hz amplitude modulation signals, or both.

3.3.7.2 Failure of the monitor itself shall transmit a warning to a control point and either:

a) remove the identification and navigation components from the carrier; or

b) cause radiation to cease.

Note uidance material on R appears in Section of Attachment C

3.3.8 Interference immunity performance for VOR receiving systems

3.3.8.1 After 1 January 1998, the VOR receiving system shall provide adequate immunity to interference from two signal, third-order intermodulation products caused by VHF FM broadcast signals having levels in accordance with the following:

$$2N_1 \quad N_2 \quad 72 \leq 0$$

for VHF FM sound broadcasting signals in the range 107.7 108.0 MHz

and

$$2N_1 + N_2 + 3\left(24 - 20\log\frac{\Delta f}{0.4}\right) \leq 0$$

for VHF FM sound broadcasting signals below 107.7 MHz,

where the frequencies of the two VHF FM sound broadcasting signals produce, within the receiver, a two-signal, third-order intermodulation product on the desired VOR frequency.

N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the VOR receiver input. Neither level shall exceed the desensitization criteria set forth in 3.3.8.2.

Δf 108.1 f_1, where f_1 is the frequency of N_1, the VHF FM sound broadcasting signal closer to 108.1 MHz.

3.3.8.2 After 1 January 1998, the VOR receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with the following table:

Fre uency (M)	*Maximum level of unwanted signal at receiver input (d m)*
88-102	15
104	10
106	5
107.9	10

Note The relationship is linear between adjacent points designated by the above fre uencies

Note uidance material on immunity criteria to be used for the performance uoted in and is contained in Attachment C

3.3.8.3 After 1 January 1995, all new installations of airborne VOR receiving systems shall meet the provisions of 3.3.8.1 and 3.3.8.2.

3.3.8.4 **Recommendation** *Airborne R receiving systems meeting the immunity performance standards of and should be placed into operation at the earliest possible date*

3 Specification for non directional radio beacon D

3.4.1 Definitions

Note In Attachment C guidance is given on the meaning and application of rated coverage and effective coverage and on coverage of ND s

Avera e radius o rated covera e The radius of a circle having the same area as the rated coverage.

ective covera e The area surrounding an NDB within which bearings can be obtained with an accuracy sufficient for the nature of the operation concerned.

ocator An LF/MF NDB used as an aid to final approach.

Note A locator usually has an average radius of rated coverage of between and m (and NM)

ated covera e The area surrounding an NDB within which the strength of the vertical field of the ground wave exceeds the minimum value specified for the geographical area in which the radio beacon is situated.

Note The above definition is intended to establish a method of rating radio beacons on the normal coverage to be expected in the absence of s y wave transmission and or anomalous propagation from the radio beacon concerned or interference from other F MF facilities but ta ing into account the atmospheric noise in the geographical area concerned

3.4.2 Coverage

3.4.2.1 **Recommendation** *The minimum value of field strength in the rated coverage of an ND should be microvolts per metre*

Note uidance on the field strengths re uired particularly in the latitudes between N and S is given in of Attachment C and the relevant ITU provisions are given in Chapter III Article Section I Part of the Radio Regulations

Note The selection of locations and times at which the field strength is measured is important in order to avoid abnormal results for the locality concerned locations on air routes in the area around the beacon are operationally most significant

3.4.2.2 All notifications or promulgations of NDBs shall be based upon the average radius of the rated coverage.

Note In classifying radio beacons in areas where substantial variations in rated coverage may occur diurnally and seasonally such variations should be ta en into account

Note eacons having an average radius of rated coverage of between and m (and NM) may be designated by the nearest multiple of m (NM) to the average radius of rated coverage and beacons of rated coverage over m (NM) to the nearest multiple of m (NM)

3.4.2.3 **Recommendation** *here the rated coverage of an ND is materially different in various operationally significant sectors its classification should be expressed in terms of the average radius of rated coverage and the angular limits of each sector as follows*

Radius of coverage of sector angular limits of sector expressed as magnetic bearing cloc wise from the beacon

here it is desirable to classify an ND in such a manner the number of sectors should be ept to a minimum and preferably should not exceed two

Note The average radius of a given sector of the rated coverage is e ual to the radius of the corresponding circle sector of the same area Example

3.4.3 Limitations in radiated power

The power radiated from an NDB shall not exceed by more than 2 dB that necessary to achieve its agreed rated coverage, except that this power may be increased if coordinated regionally or if no harmful interference to other facilities will result.

3.4.4 Radio frequencies

3.4.4.1 The radio frequencies assigned to NDBs shall be selected from those available in that portion of the spectrum between 190 kHz and 1 750 kHz.

3.4.4.2 The frequency tolerance applicable to NDBs shall be 0.01 per cent except that, for NDBs of antenna power above 200 W using frequencies of 1 606.5 kHz and above, the tolerance shall be 0.005 per cent.

3.4.4.3 **Recommendation** *here two locators are used as supplements to an I S the fre uency separation between the carriers of the two should be not less than to ensure correct operation of the radio compass and preferably not more than in order to permit a uic tuning shift in cases where an aircraft has only one radio compass*

3.4.4.4 Where locators associated with ILS facilities serving opposite ends of a single runway are assigned a common frequency, provision shall be made to ensure that the facility not in operational use cannot radiate.

Note Additional guidance on the operation of locator beacons on common fre uency channels is contained in olume Chapter

3.4.5 Identification

3.4.5.1 Each NDB shall be individually identified by a two- or three-letter International Morse Code group transmitted at a rate corresponding to approximately 7 words per minute.

3.4.5.2 The complete identification shall be transmitted at least once every 30 seconds, except where the beacon identification is effected by on/off keying of the carrier. In this latter case, the identification shall be at approximately 1-minute intervals, except that a shorter interval may be used at particular NDB stations where this is found to be operationally desirable.

3.4.5.2.1 **Recommendation** *Except for those cases where the beacon identification is effected by on off eying of the carrier the identification signal should be transmitted at least three times each seconds spaced e ually within that time period*

3.4.5.3 For NDBs with an average radius of rated coverage of 92.7 km (50 NM) or less that are primarily approach and holding aids in the vicinity of an aerodrome, the identification shall be transmitted at least three times each 30 seconds, spaced equally within that time period.

3.4.5.4 The frequency of the modulating tone used for identification shall be 1 020 Hz plus or minus 50 Hz or 400 Hz plus or minus 25 Hz.

Note Determination of the figure to be used would be made regionally in the light of the considerations contained in Attachment C

3.4.6 Characteristics of emissions

Note The following specifications are not intended to preclude employment of modulations or types of modulations that may be utili ed in ND s in addition to those specified for identification including simultaneous identification and voice modulation provided that these additional modulations do not materially affect the operational performance of the ND s in conjunction with currently used airborne direction finders and provided their use does not cause harmful interference to other ND services

3.4.6.1 Except as provided in 3.4.6.1.1, all NDBs shall radiate an uninterrupted carrier and be identified by on/off keying of an amplitude modulating tone (NON/A2A).

3.4.6.1.1 NDBs other than those wholly or partly serving as holding, approach and landing aids, or those having an average radius of rated coverage of less than 92.7 km (50 NM), may be identified by on/off keying of the unmodulated carrier (NON/A1A) if they are in areas of high beacon density and/or where the required rated coverage is not practicable of achievement because of:

a) radio interference from radio stations;

b) high atmospheric noise;

c) local conditions.

Note In selecting the types of emission the possibility of confusion arising from an aircraft tuning from a N N A A facility to a N N A A facility without changing the radio compass from MC to C operation will need to be ept in mind

3.4.6.2 For each NDB identified by on/off keying of an audio modulating tone, the depth of modulation shall be maintained as near to 95 per cent as practicable.

3.4.6.3 For each NDB identified by on/off keying of an audio modulating tone, the characteristics of emission during identification shall be such as to ensure satisfactory identification at the limit of its rated coverage.

Note The foregoing re uirement necessitates as high a percentage modulation as practicable together with maintenance of an ade uate radiated carrier power during identification

Note ith a direction finder pass band of plus or minus about the carrier a signal to noise ratio of d at the limit of rated coverage will in general meet the foregoing re uirement

Note Some considerations with respect to modulation depth are contained in Attachment C

3.4.6.4 **Recommendation** *The carrier power of an ND with N N A A emissions should not fall when the identity signal is being radiated except that in the case of an ND having an average radius of rated coverage exceeding m (NM) a fall of not more than d may be accepted*

3.4.6.5 Unwanted audio frequency modulations shall total less than 5 per cent of the amplitude of the carrier.

Note Reliable performance of airborne automatic direction finding e uipment (ADF) may be seriously prejudiced if the beacon emission contains modulation by an audio fre uency e ual or close to the loop switching fre uency or its second harmonic The loop switching fre uencies in currently used e uipment lie between and

3.4.6.6 The bandwidth of emissions and the level of spurious emissions shall be kept at the lowest value that the state of technique and the nature of the service permit.

Note Article S of the ITU Radio Regulations contains the general provisions with respect to technical characteristics of e uipment and emissions The Radio Regulations contain specific provisions relating to necessary bandwidth fre uency tolerance spurious emissions and classification of emissions (see Appendices APS APS and APS)

3.4.7 Siting of locators

3.4.7.1 **Recommendation** *here locators are used as a supplement to the I S they should be located at the sites of the outer and middle mar er beacons here only one locator is used as a supplement to the I S preference should be given to location at the site of the outer mar er beacon here locators are employed as an aid to final approach in the absence of an I S e uivalent locations to those applying when an I S is installed should be selected ta ing into account the relevant obstacle clearance provisions of the* PANS-OPS *(Doc)*

3.4.7.2 **Recommendation** *here locators are installed at both the middle and outer mar er positions they should be located where practicable on the same side of the extended centre line of the runway in order to provide a trac between the locators which will be more nearly parallel to the centre line of the runway*

3.4.8 Monitoring

3.4.8.1 For each NDB, suitable means shall be provided to enable detection of any of the following conditions at an appropriate location:

a) a decrease in radiated carrier power of more than 50 per cent below that required for the rated coverage;

b) failure to transmit the identification signal;

c) malfunctioning or failure of the means of monitoring itself.

3.4.8.2 **Recommendation** *hen an ND is operated from a power source having a fre uency which is close to airborne ADF e uipment switching fre uencies and where the design of the ND is such that the power supply fre uency is li ely to appear as a modulation product on the emission the means of monitoring should be capable of detecting such power supply modulation on the carrier in excess of per cent*

3.4.8.3 During the hours of service of a locator, the means of monitoring shall provide for a continuous check on the functioning of the locator as prescribed in 3.4.8.1 a), b) and c).

3.4.8.4 **Recommendation** *During the hours of service of an ND other than a locator the means of monitoring should provide for a continuous chec on the functioning of the ND as prescribed in a) b) and c)*

Note uidance material on the testing of ND s is contained in of Attachment C

3 Specification for HF
distance measuring e uipment D E

Note In the following section provision is made for two types of DME facility DME N for application as outlined in Chapter and DME P as outlined in

Note In the following paragraphs those denoted by are applicable to e uipment first installed after anuary (Chapter)

3.5.1 Definitions

Control motion noise (C) That portion of the guidance signal error which causes control surface, wheel and column motion and could affect aircraft attitude angle during coupled flight, but does not cause aircraft displacement from the desired course and/or glide path. (See 3.11.)

dead time A period immediately following the decoding of a valid interrogation during which a received interrogation will not cause a reply to be generated.

Note Dead time is intended to prevent the transponder from replying to echoes resulting from multipath effects

Distance measuring equipment, primarily serving operational needs of en-route or TMA navigation, where the “N” stands for narrow spectrum characteristics.

The distance measuring element of the MLS, where the “P” stands for precise distance measurement. The spectrum characteristics are those of DME/N.

uivalent isotro icall radiated ower (e i r) The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).

Final a roac (FA) mode The condition of DME/P operation which supports flight operations in the final approach and runway regions.

Initial a roac (IA) mode The condition of DME/P operation which supports those flight operations outside the final approach region and which is interoperable with DME/N.

e down time The time during which a dot or dash of a Morse character is being transmitted.

a roac re erence datum A point on the minimum glide path at a specified height above the threshold. (See 3.11.)

datum oint The point on the runway centre line closest to the phase centre of the approach elevation antenna. (See 3.11.)

ode A method of coding the DME transmissions by time spacing pulses of a pulse pair, so that each frequency can be used more than once.

artial rise time The time as measured between the 5 and 30 per cent amplitude points on the leading edge of the pulse envelope, i.e. between points h and i on Figures 3-1 and 3-2.

at ollowin error (F) That portion of the guidance signal error which could cause aircraft displacement from the desired course and/or glide path. (See 3.11.)

ulse am litude The maximum voltage of the pulse envelope, i.e. A in Figure 3-1.

ulse deca time The time as measured between the 90 and 10 per cent amplitude points on the trailing edge of the pulse envelope, i.e. between points e and g on Figure 3-1.

ulse code The method of differentiating between W, X, Y and modes and between FA and IA modes.

ulse duration The time interval between the 50 per cent amplitude point on leading and trailing edges of the pulse envelope, i.e. between points b and f on Figure 3-1.

ulse rise time The time as measured between the 10 and 90 per cent amplitude points on the leading edge of the pulse envelope, i.e. between points a and c on Figure 3-1.

e l e icienc The ratio of replies transmitted by the transponder to the total of received valid interrogations.

earc The condition which exists when the DME interrogator is attempting to acquire and lock onto the response to its own interrogations from the selected transponder.

stem e icienc The ratio of valid replies processed by the interrogator to the total of its own interrogations.

rac The condition which exists when the DME interrogator has locked onto replies in response to its own interrogations, and is continuously providing a distance measurement.

ransmission rate The average number of pulse pairs transmitted from the transponder per second.

Virtual ori in The point at which the straight line through the 30 per cent and 5 per cent amplitude points on the pulse leading edge intersects the 0 per cent amplitude axis (see Figure 3-2).

3.5.2 General

3.5.2.1 The DME system shall provide for continuous and accurate indication in the cockpit of the slant range distance of an equipped aircraft from an equipped ground reference point.

3.5.2.2 The system shall comprise two basic components, one fitted in the aircraft, the other installed on the ground. The aircraft component shall be referred to as the interrogator and the ground component as the transponder.

3.5.2.3 In operation, interrogators shall interrogate transponders which shall, in turn, transmit to the interrogator replies synchronized with the interrogations, thus providing means for accurate measurement of distance.

3.5.2.4 DME/P shall have two operating modes, IA and FA.

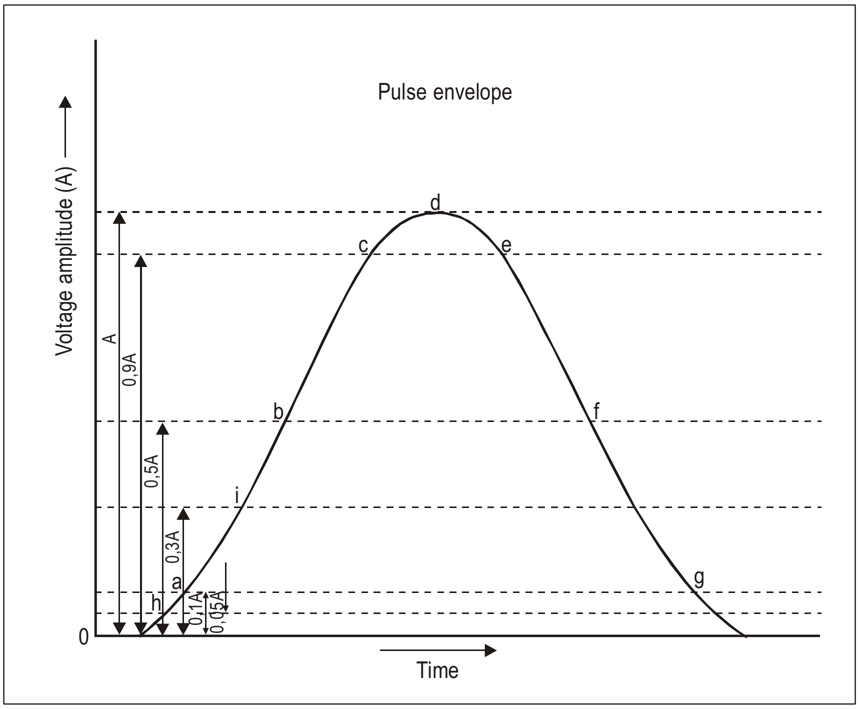

Figure 3 1

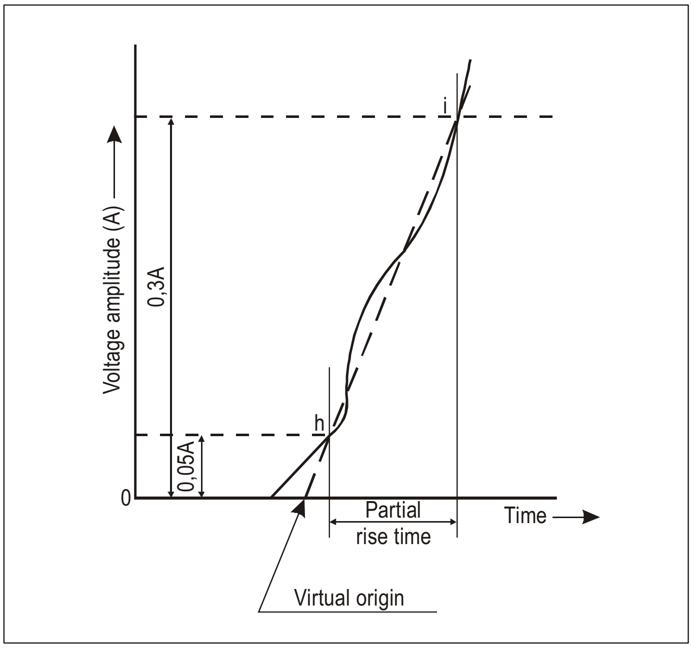

Figure 3 2

3.5.2.5 When a DME function is combined with either an ILS, MLS or VOR for the purpose of constituting a single facility, they shall be considered to be associated in a manner complying with Chapter 2, 2.2.2, only when:

a) operated on a standard frequency pairing in accordance with 3.5.3.3.5;

b) collocated within the limits prescribed for associated facilities in 3.5.2.6; and

c) complying with the identification provisions of 3.5.3.6.4.

Note A single DME facility may be paired with both an I S and M S

3.5.2.6 *Collocation limits for a DME facility associated with an I S M S or R facility*

3.5.2.6.1 Associated VOR and DME facilities shall be collocated in accordance with the following:

a) *coaxial collocation* the VOR and DME antennas are located on the same vertical axis; or

b) *offset collocation*

1) for those facilities used in terminal areas for approach purposes or other procedures where the highest position fixing accuracy of system capability is required, the separation of the VOR and DME antennas does not exceed 30 m (100 ft) except that, at Doppler VOR facilities, where DME service is provided by a separate facility, the antennas may be separated by more than 30 m (100 ft), but not in excess of 80 m (260 ft);

2) for purposes other than those indicated in 1), the separation of the VOR and DME antennas does not exceed 600 m (2 000 ft).

3.5.2.6.2 *Association of DME with I S*

Note Attachment C gives guidance on the association of DME with I S

3.5.2.6.3 *Association of DME with M S*

3.5.2.6.3.1 **Recommendation** *If a DME P is used to provide ranging information it should be sited as close as possible to the M S a imuth facility*

Note Attachment and Attachment C give guidance on siting of DME with M S This guidance sets forth in particular appropriate steps to be ta en to prevent different ero range indication if DME P associated with M S and DME N associated with I S serve the same runway

3.5.3 System characteristics

3.5.3.1 *Performance*

3.5.3.1.1 *Range* The system shall provide a means of measurement of slant range distance from an aircraft to a selected transponder to the limit of coverage prescribed by the operational requirements for the selected transponder.

3.5.3.1.2 *Coverage*

3.5.3.1.2.1 When associated with a VOR, DME/N coverage shall be at least that of the VOR to the extent practicable.

3.5.3.1.2.2 When associated with either an ILS or an MLS, DME/N coverage shall be at least that of the respective ILS or of the MLS azimuth angle guidance coverage sectors.

3.5.3.1.2.3 DME/P coverage shall be at least that provided by the MLS azimuth angle guidance coverage sectors.

Note This is not intended to specify the operational range and coverage to which the system may be used spacing of facilities already installed may limit the range in certain areas

3.5.3.1.3 *Accuracy*

3.5.3.1.3.1 *System accuracy* The accuracy standards specified herein shall be met on a 95 per cent probability basis.

Note The total system limits include errors from all causes such as those from airborne e uipment ground e uipment propagation and random pulse interference effects

3.5.3.1.3.2 *DME N accuracy* **Recommendation** *At distances of from ero to m (NM) from the transponder dependent upon the particular service application the total system error excluding reading error should be not greater than plus or minus m (NM) plus per cent of distance measured*

3.5.3.1.3.3 The total system error shall not exceed plus or minus 370 m (0.2 NM).

Note This system accuracy is predicated upon the achievement of an airborne interrogator error contribution of not more than plus or minus m (NM)

Note In mixed DME N and DME P operations it is intended that the achieved accuracy be at least that in

3.5.3.1.3.4 *DME P accuracy*

Note In the following two accuracy standards and are stated for the DME P to accommodate a variety of applications

Note uidance on accuracy standards is given in Attachment C

3.5.3.1.3.4.1 *Error components* The path following error (PFE) shall be comprised of those frequency components of the DME/P error at the output of the interrogator which lie below 1.5 rad/s. The control motion noise (CMN) shall be comprised of those frequency components of the DME/P error at the output of the interrogator which lie between 0.5 rad/s and 10 rad/s.

Note Specified error limits at a point are to be applied over a flight path that includes that point Information on the interpretation of DME P errors and the measurement of those errors over an interval appropriate for flight inspection is provided in Attachment C

3.5.3.1.3.4.2 Errors on the extended runway centre line shall not exceed the values given in Table B at the end of this chapter.

3.5.3.1.3.4.3 In the approach sector, away from the extended runway centre line, the allowable PFE for both standard 1 and standard 2 shall be permitted to increase linearly with angle up to plus or minus 40 degrees MLS azimuth angle where the permitted error is 1.5 times that on the extended runway centre line at the same distance. The allowable CMN shall not increase with angle. There shall be no degradation of either PFE or CMN with elevation angle.

3.5.3.2 *Radio fre uencies and polari ation* The system shall operate with vertical polarization in the frequency band 960 MHz to 1 215 MHz. The interrogation and reply frequencies shall be assigned with 1MHz spacing between channels.

3.5.3.3 *Channelling*

3.5.3.3.1 DME operating channels shall be formed by pairing interrogation and reply frequencies and by pulse coding on the paired frequencies.

3.5.3.3.2 *Pulse coding* DME/P channels shall have two different interrogation pulse codes as shown in the table in 3.5.4.4.1. One shall be used in the initial approach (IA) mode; the other shall be used in the final approach (FA) mode.

3.5.3.3.3 DME operating channels shall be chosen from Table A (located at the end of this chapter), of 352 channels in which the channel numbers, frequencies, and pulse codes are assigned.

3.5.3.3.4 *Area channel assignment*

3.5.3.3.4.1 In a particular area, the number of DME operating channels to be used shall be decided regionally.

Note Standards and Recommended Practices on the utili ation of the DME fre uency band M are found in olume Chapter

3.5.3.3.4.2 The specific DME operating channels to be assigned in such a particular area shall also be decided regionally, taking into consideration the requirements for co-channel and adjacent channel protection.

3.5.3.3.4.3 **Recommendation** *Coordination of regional DME channel assignments should be effected through ICA*

Note The above paragraphs permit the use of DME airborne interrogators having less than the total number of operating channels where so desired

3.5.3.3.5 *Channel pairing* When a DME transponder is intended to operate in association with a single VHF navigation facility in the 108 MHz to 117.95 MHz frequency band and/or an MLS angle facility in the 5 031.0 MHz to 5 090.7 MHz frequency band, the DME operating channel shall be paired with the VHF channel and/or MLS angle frequency as given in Table A.

Note There may be instances when a DME will be paired with both the I S fre uency and an M S channel (see olume Chapter)

3.5.3.4 *Interrogation pulse repetition fre uency*

Note If the interrogator operates on more than one channel in one second the following specifications apply to the sum of interrogations on all channels

3.5.3.4.1 *DME N* The interrogator average pulse repetition frequency (PRF) shall not exceed 30 pairs of pulses per second, based on the assumption that at least 95 per cent of the time is occupied for tracking.

3.5.3.4.2 *DME N* If it is desired to decrease the time of search, the PRF may be increased during search but shall not exceed 150 pairs of pulses per second.

3.5.3.4.3 *DME N* **Recommendation** *After pairs of pulses have been transmitted without ac uiring indication of distance the PRF should not exceed pairs of pulses per second thereafter until a change in operating channel is made or successful search is completed*

3.5.3.4.4 *DME N* When, after a time period of 30 seconds, tracking has not been established, the pulse pair repetition frequency shall not exceed 30 pulse pairs per second thereafter.

3.5.3.4.5 *DME P* The interrogator pulse repetition frequency shall not exceed the following number of pulse pairs per second:

a)	search	40
b)	aircraft on the ground	5
c)	initial approach mode track	16
d)	final approach mode track	40

Note A pulse repetition fre uency (PRF) of pulse pairs per second for aircraft on the ground may be exceeded if the aircraft re uires accurate range information

Note It is intended that all PRF changes be achieved by automatic means

3.5.3.5 *Aircraft handling capacity of the system*

3.5.3.5.1 The aircraft handling capacity of transponders in an area shall be adequate for the peak traffic of the area or 100 aircraft, whichever is the lesser.

3.5.3.5.2 **Recommendation** *here the pea traffic in an area exceeds aircraft the transponder should be capable of handling that pea traffic*

Note uidance material on aircraft handling capacity will be found in Attachment C

3.5.3.6 *Transponder identification*

3.5.3.6.1 All transponders shall transmit an identification signal in one of the following forms as required by 3.5.3.6.5:

a) an “independent” identification consisting of coded (International Morse Code) identity pulses which can be used with all transponders;

b) an “associated” signal which can be used for transponders specifically associated with a VHF navigation or an MLS angle guidance facility which itself transmits an identification signal.

Note An M S angle guidance facility provides its identification as a digital word transmitted on the data channel into the approach and bac a imuth coverage regions as specified in

3.5.3.6.2 Both systems of identification shall use signals, which shall consist of the transmission for an appropriate period of a series of paired pulses transmitted at a repetition rate of 1 350 pulse pairs per second, and shall temporarily replace all reply pulses that would normally occur at that time except as in 3.5.3.6.2.2. These pulses shall have similar characteristics to the other pulses of the reply signals.

3.5.3.6.2.1 *DME N* Reply pulses shall be transmitted between key down times.

3.5.3.6.2.2 *DME N* **Recommendation** *If it is desired to preserve a constant duty cycle an e uali ing pair of pulses having the same characteristics as the identification pulse pairs should be transmitted microseconds plus or minus microseconds after each identity pair*

3.5.3.6.2.3 *DME P* Reply pulses shall be transmitted between key down times.

3.5.3.6.2.4 For the DME/P transponder, reply pulse pairs to valid FA mode interrogations shall also be transmitted during key down times and have priority over identification pulse pairs.

3.5.3.6.2.5 The DME/P transponder shall not employ the equalizing pair of pulses of 3.5.3.6.2.2.

3.5.3.6.3 The characteristics of the "independent" identification signal shall be as follows:

a) the identity signal shall consist of the transmission of the beacon code in the form of dots and dashes (International Morse Code) of identity pulses at least once every 40 seconds, at a rate of at least 6 words per minute; and

b) the identification code characteristic and letter rate for the DME transponder shall conform to the following to ensure that the maximum total key down time does not exceed 5 seconds per identification code group. The dots shall be a time duration of 0.1 second to 0.160 second. The dashes shall be typically 3 times the duration of the dots. The duration between dots and/or dashes shall be equal to that of one dot plus or minus 10 per cent. The time duration between letters or numerals shall not be less than three dots. The total period for transmission of an identification code group shall not exceed 10 seconds.

Note The tone identification signal is transmitted at a repetition rate of pps This fre uency may be used directly in the airborne e uipment as an aural output for the pilot or other fre uencies may be generated at the option of the interrogator designer (see)

3.5.3.6.4 The characteristics of the "associated" signal shall be as follows:

a) when associated with a VHF or an MLS angle facility, the identification shall be transmitted in the form of dots and dashes (International Morse Code) as in 3.5.3.6.3 and shall be synchronized with the VHF facility identification code;

b) each 40-second interval shall be divided into four or more equal periods, with the transponder identification transmitted during one period only and the associated VHF and MLS angle facility identification, where these are provided, transmitted during the remaining periods;

c) for a DME transponder associated with an MLS, the identification shall be the last three letters of the MLS angle facility identification specified in 3.11.4.6.2.1.

3.5.3.6.5 *Identification implementation*

3.5.3.6.5.1 The "independent" identification code shall be employed wherever a transponder is not specifically associated with a VHF navigational facility or an MLS facility.

3.5.3.6.5.2 Wherever a transponder is specifically associated with a VHF navigational facility or an MLS facility, identification shall be provided by the "associated" code.

3.5.3.6.5.3 When voice communications are being radiated on an associated VHF navigational facility, an "associated" signal from the transponder shall not be suppressed.

3.5.3.7 *DME P mode transition*

3.5.3.7.1 The DME/P interrogator for standard 1 accuracy shall change from IA mode track to FA mode track at 13 km (7 NM) from the transponder when approaching the transponder, or any other situation when within 13 km (7 NM).

3.5.3.7.2 For standard 1 accuracy, the transition from IA mode to FA mode track operation may be initiated within 14.8 m (8 NM) from the transponder. Outside 14.8 km (8 NM), the interrogator shall not interrogate in the FA mode.

Note Paragraph does not apply if the transponder is a DME N or if the DME P transponder FA mode is inoperative

3.5.3.8 *System efficiency* The DME/P system accuracy of 3.5.3.1.3.4 shall be achieved with a system efficiency of 50 per cent or more.

3.5.4 Detailed technical characteristics of transponder and associated monitor

3.5.4.1 *Transmitter*

3.5.4.1.1 *Fre uency of operation* The transponder shall transmit on the reply frequency appropriate to the assigned DME channel (see 3.5.3.3.3).

3.5.4.1.2 *Fre uency stability* The radio frequency of operation shall not vary more than plus or minus 0.002 per cent from the assigned frequency.

3.5.4.1.3 *Pulse shape and spectrum* The following shall apply to all radiated pulses:

a) *Pulse rise time*

1) *DME N* Pulse rise time shall not exceed 3 microseconds.

2) *DME P* Pulse rise time shall not exceed 1.6 microseconds. For the FA mode, the pulse shall have a partial rise time of 0.25 plus or minus 0.05 microsecond. With respect to the FA mode and accuracy standard 1, the slope of the pulse in the partial rise time shall not vary by more than plus or minus 20 per cent. For accuracy standard 2, the slope shall not vary by more than plus or minus 10 per cent.

3) *DME P* **Recommendation** *Pulse rise time should not exceed microseconds*

b) Pulse duration shall be 3.5 microseconds plus or minus 0.5 microsecond.

c) Pulse decay time shall nominally be 2.5 microseconds but shall not exceed 3.5 microseconds.

d) The instantaneous amplitude of the pulse shall not, at any instant between the point of the leading edge which is 95 per cent of maximum amplitude and the point of the trailing edge which is 95 per cent of the maximum amplitude, fall below a value which is 95 per cent of the maximum voltage amplitude of the pulse.

e) For DME/N and DME/P: the spectrum of the pulse modulated signal shall be such that during the pulse the effective radiated power contained in a 0.5 MHz band centred on frequencies 0.8 MHz above and 0.8 MHz below the nominal channel frequency in each case shall not exceed 200 mW, and the effective radiated power contained in a 0.5 MHz band centred on frequencies 2 MHz above and 2 MHz below the nominal channel frequency in each case shall not exceed 2 mW. The effective radiated power contained within any 0.5 MHz band shall decrease monotonically as the band centre frequency moves away from the nominal channel frequency.

Note uidance material relating to the pulse spectrum measurement is provided in Attachment C Section

f) To ensure proper operation of the thresholding techniques, the instantaneous magnitude of any pulse turn-on transients which occur in time prior to the virtual origin shall be less than one per cent of the pulse peak amplitude. Initiation of the turn-on process shall not commence sooner than 1 microsecond prior to the virtual origin.

Note The time during the pulse encompasses the total interval from the beginning of pulse transmission to its end For practical reasons this interval may be measured between the per cent points on the leading and trailing edges of the pulse envelope

Note The power contained in the fre uency bands specified in e) and f) is the average power during the pulse Average power in a given fre uency band is the energy contained in this fre uency band divided by the time of pulse transmission according to Note

3.5.4.1.4 *Pulse spacing*

3.5.4.1.4.1 The spacing of the constituent pulses of transmitted pulse pairs shall be as given in the table in 3.5.4.4.1.

3.5.4.1.4.2 *DME N* The tolerance on the pulse spacing shall be plus or minus 0.25 microsecond.

3.5.4.1.4.3 *DME N* **Recommendation** *The tolerance on the DME N pulse spacing should be plus or minus microsecond*

3.5.4.1.4.4 *DME P* The tolerance on the pulse spacing shall be plus or minus 0.10 microsecond.

3.5.4.1.4.5 The pulse spacings shall be measured between the half voltage points on the leading edges of the pulses.

3.5.4.1.5 *Pea power output*

3.5.4.1.5.1 *DME N* **Recommendation** *The pea effective radiated power should not be less than that re uired to ensure a pea pulse power density of approximately minus d m at the maximum specified service range and level*

3.5.4.1.5.2 *DME N* The peak equivalent isotropically radiated power shall not be less than that required to ensure a peak pulse power density of minus 89 dBW/m^2 under all operational weather conditions at any point within coverage specified in 3.5.3.1.2.

Note Although the Standard in implies an improved interrogator receiver sensitivity it is intended that the power density specified in be available at the maximum specified service range and level

3.5.4.1.5.3 *DME P* The peak equivalent isotropically radiated power shall not be less than that required to ensure the following peak pulse power densities under all operational weather conditions:

a) minus 89 dBW/m^2 at any point within the coverage specified in 3.5.3.1.2 at ranges greater than 13 km (7 NM) from the transponder antenna;

b) minus 75 dBW/m^2 at any point within the coverage specified in 3.5.3.1.2 at ranges less than 13 km (7 NM) from the transponder antenna;

c) minus 70 dBW/m^2 at the MLS approach reference datum;

d) minus 79 dBW/m^2 at 2.5 m (8 ft) above the runway surface, at the MLS datum point, or at the farthest point on the runway centre line which is in line of sight of the DME transponder antenna.

Note uidance material relating to the ERP may be found in Attachment C and

3.5.4.1.5.4 The peak power of the constituent pulses of any pair of pulses shall not differ by more than 1 dB.

3.5.4.1.5.5 **Recommendation** *The reply capability of the transmitter should be such that the transponder should be capable of continuous operation at a transmission rate of plus or minus pulse pairs per second (if aircraft are to be served)*

Note uidance on the relationship between number of aircraft and transmission rate is given in Attachment C

3.5.4.1.5.6 The transmitter shall operate at a transmission rate, including randomly distributed pulse pairs and distance reply pulse pairs, of not less than 700 pulse pairs per second except during identity. The minimum transmission rate shall be as close as practicable to 700 pulse pairs per second. For DME/P, in no case shall it exceed 1 200 pulse pairs per second.

3.5.4.1.6 *Spurious radiation* During intervals between transmission of individual pulses, the spurious power received and measured in a receiver having the same characteristics as a transponder receiver, but tuned to any DME interrogation or reply frequency, shall be more than 50 dB below the peak pulse power received and measured in the same receiver tuned to the reply frequency in use during the transmission of the required pulses. This provision refers to all spurious transmissions, including modulator and electrical interference.

3.5.4.1.6.1 *DME N* The spurious power level specified in 3.5.4.1.6 shall be more than 80 dB below the peak pulse power level.

3.5.4.1.6.2 *DME P* The spurious power level specified in 3.5.4.1.6 shall be more than 80 dB below the peak pulse power level.

3.5.4.1.6.3 *ut of band spurious radiation* At all frequencies from 10 to 1 800 MHz, but excluding the band of frequencies from 960 to 1 215 MHz, the spurious output of the DME transponder transmitter shall not exceed minus 40 dBm in any one kHz of receiver bandwidth.

3.5.4.1.6.4 The equivalent isotropically radiated power of any CW harmonic of the carrier frequency on any DME operating channel shall not exceed minus 10 dBm.

3.5.4.2 *Receiver*

3.5.4.2.1 *Fre uency of operation* The receiver centre frequency shall be the interrogation frequency appropriate to the assigned DME operating channel (see 3.5.3.3.3).

3.5.4.2.2 *Fre uency stability* The centre frequency of the receiver shall not vary more than plus or minus 0.002 per cent from the assigned frequency.

3.5.4.2.3 *Transponder sensitivity*

3.5.4.2.3.1 In the absence of all interrogation pulse pairs, with the exception of those necessary to perform the sensitivity measurement, interrogation pulse pairs with the correct spacing and nominal frequency shall trigger the transponder if the peak power density at the transponder antenna is at least:

a) minus 103 dBW/m^2 for DME/N;

b) minus 86 dBW/m^2 for DME/P IA mode;

c) minus 75 dBW/m^2 for DME/P FA mode.

3.5.4.2.3.2 The minimum power densities specified in 3.5.4.2.3.1 shall cause the transponder to reply with an efficiency of at least:

a) 70 per cent for DME/N;

b) 70 per cent for DME/P IA mode;

c) 80 per cent for DME/P FA mode.

3.5.4.2.3.3 *DME N dynamic range* The performance of the transponder shall be maintained when the power density of the interrogation signal at the transponder antenna has any value between the minimum specified in 3.5.4.2.3.1 up to a maximum of minus 22 dBW/m^2 when installed with ILS or MLS and minus 35 dBW/m^2 when installed for other applications.

3.5.4.2.3.4 *DME P dynamic range* The performance of the transponder shall be maintained when the power density of the interrogation signal at the transponder antenna has any value between the minimum specified in 3.5.4.2.3.1 up to a maximum of minus 22 dBW/m^2.

3.5.4.2.3.5 The transponder sensitivity level shall not vary by more than 1 dB for transponder loadings between 0 and 90 per cent of its maximum transmission rate.

3.5.4.2.3.6 *DME N* When the spacing of an interrogator pulse pair varies from the nominal value by up to plus or minus 1 microsecond, the receiver sensitivity shall not be reduced by more than 1 dB.

3.5.4.2.3.7 *DME P* When the spacing of an interrogator pulse pair varies from the nominal value by up to plus or minus 1 microsecond, the receiver sensitivity shall not be reduced by more than 1 dB.

3.5.4.2.4 *oad limiting*

3.5.4.2.4.1 *DME N* **Recommendation** *hen transponder loading exceeds per cent of the maximum transmission rate the receiver sensitivity should be automatically reduced in order to limit the transponder replies so as to ensure that the maximum permissible transmission rate is not exceeded (The available range of sensitivity reduction should be at least d)*

3.5.4.2.4.2 *DME P* To prevent transponder overloading the transponder shall automatically limit its replies, so as to ensure that the maximum transmission rate is not exceeded. If the receiver sensitivity reduction is implemented to meet this requirement, it shall be applied to the IA mode only and shall not affect the FA mode.

3.5.4.2.5 *Noise* When the receiver is interrogated at the power densities specified in 3.5.4.2.3.1 to produce a transmission rate equal to 90 per cent of the maximum, the noise generated pulse pairs shall not exceed 5 per cent of the maximum transmission rate.

3.5.4.2.6 *andwidth*

3.5.4.2.6.1 The minimum permissible bandwidth of the receiver shall be such that the transponder sensitivity level shall not deteriorate by more than 3 dB when the total receiver drift is added to an incoming interrogation frequency drift of plus or minus 100 kHz.

3.5.4.2.6.2 *DME N* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3 when the input signals are those specified in 3.5.5.1.3.

3.5.4.2.6.3 *DME P IA mode* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3 when the input signals are those specified in 3.5.5.1.3. The 12 dB bandwidth shall not exceed 2 MHz and the 60 dB bandwidth shall not exceed 10 MHz.

3.5.4.2.6.4 *DME P FA mode* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3 when the input signals are those specified in 3.5.5.1.3. The 12 dB bandwidth shall not exceed 6 MHz and the 60 dB bandwidth shall not exceed 20 MHz.

3.5.4.2.6.5 Signals greater than 900 kHz removed from the desired channel nominal frequency and having power densities up to the values specified in 3.5.4.2.3.3 for DME/N and 3.5.4.2.3.4 for DME/P shall not trigger the transponder. Signals arriving at the intermediate frequency shall be suppressed at least 80 dB. All other spurious response or signals within the 960 MHz to 1 215 MHz band and image frequencies shall be suppressed at least 75 dB.

3.5.4.2.7 *Recovery time* Within 8 microseconds of the reception of a signal between 0 dB and 60 dB above minimum sensitivity level, the minimum sensitivity level of the transponder to a desired signal shall be within 3 dB of the value obtained in the absence of signals. This requirement shall be met with echo suppression circuits, if any, rendered inoperative. The 8 microseconds are to be measured between the half voltage points on the leading edges of the two signals, both of which conform in shape, with the specifications in 3.5.5.1.3.

3.5.4.2.8 *Spurious radiations* Radiation from any part of the receiver or allied circuits shall meet the requirements stated in 3.5.4.1.6.

3.5.4.2.9 *C and echo suppression*

Recommendation *C and echo suppression should be ade uate for the sites at which the transponders will be used*

Note In this connection echoes mean undesired signals caused by multipath transmission (reflections etc)

3.5.4.2.10 *Protection against interference*

Recommendation *Protection against interference outside the DME fre uency band should be ade uate for the sites at which the transponders will be used*

3.5.4.3 *Decoding*

3.5.4.3.1 The transponder shall include a decoding circuit such that the transponder can be triggered only by pairs of received pulses having pulse duration and pulse spacings appropriate to interrogator signals as described in 3.5.5.1.3 and 3.5.5.1.4.

3.5.4.3.2 The decoding circuit performance shall not be affected by signals arriving before, between, or after, the constituent pulses of a pair of the correct spacing.

3.5.4.3.3 *DME N Decoder rejection* An interrogation pulse pair with a spacing of plus or minus 2 microseconds, or more, from the nominal value and with any signal level up to the value specified in 3.5.4.2.3.3 shall be rejected such that the transmission rate does not exceed the value obtained when interrogations are absent.

3.5.4.3.4 *DME P Decoder rejection* An interrogation pulse pair with a spacing of plus or minus 2 microseconds, or more, from the nominal value and with any signal level up to the value specified in 3.5.4.2.3.4 shall be rejected such that the transmission rate does not exceed the value obtained when interrogations are absent.

3.5.4.4 *Time delay*

3.5.4.4.1 When a DME is associated only with a VHF facility, the time delay shall be the interval from the half voltage point on the leading edge of the second constituent pulse of the interrogation pair and the half voltage point on the leading edge of the second constituent pulse of the reply transmission. This delay shall be consistent with the following table, when it is desired that aircraft interrogators are to indicate distance from the transponder site.

		Pulse pair spacing (s)		*Time delay (s)*	
Channel suffix	*perating mode*	*Interrogation*	*Reply*	*st pulse timing*	*nd pulse timing*
X	DME/N	12	12	50	50
	DME/P IA M	12	12	50	
	DME/P FA M	18	12	56	
Y	DME/N	36	30	56	50
	DME/P IA M	36	30	56	
	DME/P FA M	42	30	62	
W	DME/N				
	DME/P IA M	24	24	50	
	DME/P FA M	30	24	56	
	DME/N				
	DME/P IA M	21	15	56	
	DME/P FA M	27	15	62	

Note and are multiplexed on the same fre uency

Note and are multiplexed on the same fre uency

3.5.4.4.2 When a DME is associated with an MLS angle facility, the time delay shall be the interval from the half voltage point on the leading edge of the first constituent pulse of the interrogation pair and the half voltage point on the leading edge of the first constituent pulse of the reply transmission. This delay shall be 50 microseconds for mode X channels and 56 microseconds for mode Y channels, when it is desired that aircraft interrogators are to indicate distance from the transponder site.

3.5.4.4.2.1 For DME/P transponders, no time delay adjustment shall be permitted.

3.5.4.4.3 **Recommendation** *For the DME N the transponder time delay should be capable of being set to an appropriate value between the nominal value of the time delay minus microseconds and the nominal value of the time delay to permit aircraft interrogators to indicate ero distance at a specific point remote from the transponder site*

Note Modes not allowing for the full microseconds range of adjustment in transponder time delay may only be adjustable to the limits given by the transponder circuit delay and recovery time

3.5.4.4.3.1 *DME N* The time delay shall be the interval from the half voltage point on the leading edge of the first constituent pulse of the interrogation pair and the half voltage point on the leading edge of the first constituent pulse of the reply transmission.

3.5.4.4.3.2 *DME P IA mode* The time delay shall be the interval from the half voltage point on the leading edge of the first constituent pulse of the interrogation pulse pair to the half voltage point on the leading edge of the first constituent pulse of the reply pulse pair.

3.5.4.4.3.3 *DME P FA mode* The time delay shall be the interval from the virtual origin of the first constituent pulse of the interrogation pulse pair to the virtual origin of the first constituent pulse of the reply pulse pair. The time of arrival measurement points shall be within the partial rise time of the first constituent pulse of the pulse pair in each case.

3.5.4.4.4 *DME N* **Recommendation** *Transponders should be sited as near to the point at which ero indication is re uired as is practicable*

Note It is desirable that the radius of the sphere at the surface of which ero indication is given be ept as small as possible in order to eep the one of ambiguity to a minimum

Note uidance material on siting DME with M S is provided in of Attachment C and of Attachment This guidance material sets forth in particular appropriate steps to be ta en to prevent different ero range indication if DME P associated with M S and DME N associated with I S serve the same runway

3.5.4.5 *Accuracy*

3.5.4.5.1 *DME N* The transponder shall not contribute more than plus or minus 1 microsecond (150 m (500 ft)) to the overall system error.

3.5.4.5.2 *DME N* A transponder associated with a landing aid shall not contribute more than plus or minus 0.5 microsecond (75 m (250 ft)) to the overall system error.

3.5.4.5.3 *DME P FA mode*

3.5.4.5.3.1 *Accuracy standard* The transponder shall not contribute more than plus or minus 10 m (plus or minus 33 ft) PFE and plus or minus 8 m (plus or minus 26 ft) CMN to the overall system error.

3.5.4.5.3.2 *Accuracy standard* The transponder shall not contribute more than plus or minus 5 m (plus or minus 16 ft) PFE and plus or minus 5 m (plus or minus 16 ft) CMN to the overall system error.

3.5.4.5.4 *DME P IA mode* The transponder shall not contribute more than plus or minus 15 m (plus or minus 50 ft) PFE and plus or minus 10 m (plus or minus 33 ft) CMN to the overall system error.

3.5.4.5.5 **Recommendation** *hen a DME is associated with an M S angle facility the above accuracy should include the error introduced by the first pulse detection due to the pulse spacing tolerances*

3.5.4.6 *Efficiency*

3.5.4.6.1 The transponder reply efficiency shall be at least 70 per cent for DME/N and DME/P (IA mode) and 80 per cent for DME/P (FA mode) at all values of transponder loading up to the loading corresponding to 3.5.3.5 and at the minimum sensitivity level specified in 3.5.4.2.3.1 and 3.5.4.2.3.5.

Note hen considering the transponder reply efficiency value account is to be ta en of the DME dead time and of the loading introduced by the monitoring function

3.5.4.6.2 *Transponder dead time* The transponder shall be rendered inoperative for a period normally not to exceed 60 microseconds after a valid interrogation decode has occurred. In extreme cases when the geographical site of the transponder is such as to produce undesirable reflection problems, the dead time may be increased but only by the minimum amount necessary to allow the suppression of echoes for DME/N and DME/P IA mode.

3.5.4.6.2.1 In DME/P the IA mode dead time shall not blank the FA mode channel and vice versa.

3.5.4.7 *Monitoring and control*

3.5.4.7.1 Means shall be provided at each transponder site for the automatic monitoring and control of the transponder in use.

3.5.4.7.2 *DME N monitoring action*

3.5.4.7.2.1 In the event that any of the conditions specified in 3.5.4.7.2.2 occur, the monitor shall cause the following action to take place:

a) a suitable indication shall be given at a control point;

b) the operating transponder shall be automatically switched off; and

c) the standby transponder, if provided, shall be automatically placed in operation.

3.5.4.7.2.2 The monitor shall cause the actions specified in 3.5.4.7.2.1 if:

a) the transponder delay differs from the assigned value by 1 microsecond (150 m (500 ft)) or more;

b) in the case of a DME/N associated with a landing aid, the transponder delay differs from the assigned value by 0.5 microsecond (75 m (250 ft)) or more.

3.5.4.7.2.3 **Recommendation** *The monitor should cause the actions specified in if the spacing between the first and second pulse of the transponder pulse pair differs from the nominal value specified in the table following by microsecond or more*

3.5.4.7.2.4 **Recommendation** *The monitor should also cause a suitable indication to be given at a control point if any of the following conditions arise*

a) a fall of d or more in transponder transmitted power output

b) a fall of d or more in the minimum transponder receiver sensitivity (provided that this is not due to the action of the receiver automatic gain reduction circuits)

c) *the spacing between the first and second pulse of the transponder reply pulse pair differs from the normal value specified in by microsecond or more*

d) *variation of the transponder receiver and transmitter fre uencies beyond the control range of the reference circuits (if the operating fre uencies are not directly crystal controlled)*

3.5.4.7.2.5 Means shall be provided so that any of the conditions and malfunctioning enumerated in 3.5.4.7.2.2, 3.5.4.7.2.3 and 3.5.4.7.2.4 which are monitored can persist for a certain period before the monitor takes action. This period shall be as low as practicable, but shall not exceed 10 seconds, consistent with the need for avoiding interruption, due to transient effects, of the service provided by the transponder.

3.5.4.7.2.6 The transponder shall not be triggered more than 120 times per second for either monitoring or automatic frequency control purposes, or both.

3.5.4.7.3 *DME P monitoring action*

3.5.4.7.3.1 The monitor system shall cause the transponder radiation to cease and provide a warning at a control point if any of the following conditions persist for longer than the period specified:

a) there is a change in transponder PFE that exceeds the limits specified in either 3.5.4.5.3 or 3.5.4.5.4 for more than one second. If the FA mode limit is exceeded, but the IA mode limit is maintained, the IA mode may remain operative;

b) there is a reduction in the effective radiated power to less than that necessary to satisfy the requirements specified in 3.5.4.1.5.3 for a period of more than one second;

c) there is a reduction of 3 dB or more in the transponder sensitivity necessary to satisfy the requirements specified in 3.5.4.2.3 for a period of more than five seconds in FA mode and ten seconds in IA mode (provided that this is not due to the action of the receiver automatic sensitivity reduction circuits);

d) the spacing between the first and second pulse of the transponder reply pulse pair differs from the value specified in the table in 3.5.4.4.1 by 0.25 microsecond or more for a period of more than one second.

3.5.4.7.3.2 **Recommendation** *The monitor should cause a suitable indication to be given at a control point if there is an increase above microseconds or a decrease below microseconds of the reply pulse partial rise time which persists for more than one second*

3.5.4.7.3.3 The period during which erroneous guidance information is radiated shall not exceed the periods specified in 3.5.4.7.3.1. Attempts to clear a fault by resetting the primary ground equipment or by switching to standby ground equipment, if fitted, shall be completed within this time. If the fault is not cleared within the time allowed, the radiation shall cease. After shutdown, no attempt shall be made to restore service until a period of 20 seconds has elapsed.

3.5.4.7.3.4 The transponder shall not be triggered for monitoring purposes more than 120 times per second in the IA mode and 150 times per second in the FA mode.

3.5.4.7.3.5 *DME N and DME P monitor failure* Failure of any part of the monitor itself shall automatically produce the same results as the malfunctioning of the element being monitored.

3.5.5 Technical characteristics of interrogator

Note The following subparagraphs specify only those interrogator parameters which must be defined to ensure that the interrogator

a) *does not jeopardi e the effective operation of the DME system e g by increasing transponder loading abnormally and*

b) *is capable of giving accurate distance readings*

3.5.5.1 *Transmitter*

3.5.5.1.1 *Fre uency of operation* The interrogator shall transmit on the interrogation frequency appropriate to the assigned DME channel (see 3.5.3.3.3).

Note This specification does not preclude the use of airborne interrogators having less than the total number of operating channels

3.5.5.1.2 *Fre uency stability* The radio frequency of operation shall not vary more than plus or minus 100 kHz from the assigned value.

3.5.5.1.3 *Pulse shape and spectrum* The following shall apply to all radiated pulses:

a) *Pulse rise time*

1) *DME N* Pulse rise time shall not exceed 3 microseconds.

2) *DME P* Pulse rise time shall not exceed 1.6 microseconds. For the FA mode, the pulse shall have a partial rise time of 0.25 plus or minus 0.05 microsecond. With respect to the FA mode and accuracy standard 1, the slope of the pulse in the partial rise time shall not vary by more than plus or minus 20 per cent. For accuracy standard 2 the slope shall not vary by more than plus or minus 10 per cent.

3) *DME P* **Recommendation** *Pulse rise time should not exceed microseconds*

b) Pulse duration shall be 3.5 microseconds plus or minus 0.5 microsecond.

c) Pulse decay time shall nominally be 2.5 microseconds, but shall not exceed 3.5 microseconds.

d) The instantaneous amplitude of the pulse shall not, at any instant between the point of the leading edge which is 95 per cent of maximum amplitude and the point of the trailing edge which is 95 per cent of the maximum amplitude, fall below a value which is 95 per cent of the maximum voltage amplitude of the pulse.

e) The spectrum of the pulse modulated signal shall be such that at least 90 per cent of the energy in each pulse shall be within 0.5 MHz in a band centred on the nominal channel frequency.

f) To ensure proper operation of the thresholding techniques, the instantaneous magnitude of any pulse turn-on transients which occur in time prior to the virtual origin shall be less than one per cent of the pulse peak amplitude. Initiation of the turn-on process shall not commence sooner than 1 microsecond prior to the virtual origin.

Note The lower limit of pulse rise time (see a)) and decay time (see c)) are governed by the spectrum re uirements in e)

Note hile e) calls for a practically attainable spectrum it is desirable to strive for the following spectrum control characteristics the spectrum of the pulse modulated signal is such that the power contained in a M band centred on fre uencies M above and M below the nominal channel fre uency is in each case at least d below the power contained in a M band centred on the nominal channel fre uency The power contained in a M band centred on fre uencies M above and M below the nominal channel fre uency is in each case at least d below the power contained in a M band centred on the nominal channel fre uency Any additional lobe of the spectrum is of less amplitude than the adjacent lobe nearer the nominal channel fre uency

3.5.5.1.4 *Pulse spacing*

3.5.5.1.4.1 The spacing of the constituent pulses of transmitted pulse pairs shall be as given in the table in 3.5.4.4.1.

3.5.5.1.4.2 *DME N* The tolerance on the pulse spacing shall be plus or minus 0.5 microsecond.

3.5.5.1.4.3 *DME N* **Recommendation** *The tolerance on the pulse spacing should be plus or minus micro second*

3.5.5.1.4.4 *DME P* The tolerance on the pulse spacing shall be plus or minus 0.25 microsecond.

3.5.5.1.4.5 The pulse spacing shall be measured between the half voltage points on the leading edges of the pulses.

3.5.5.1.5 *Pulse repetition fre uency*

3.5.5.1.5.1 The pulse repetition frequency shall be as specified in 3.5.3.4.

3.5.5.1.5.2 The variation in time between successive pairs of interrogation pulses shall be sufficient to prevent false lock-on.

3.5.5.1.5.3 *DME P* In order to achieve the system accuracy specified in 3.5.3.1.3.4, the variation in time between successive pairs of interrogation pulses shall be sufficiently random to decorrelate high frequency multipath errors.

Note uidance on DME P multipath effects is given in Attachment C

3.5.5.1.6 *Spurious radiation* During intervals between transmission of individual pulses, the spurious pulse power received and measured in a receiver having the same characteristics of a DME transponder receiver, but tuned to any DME interrogation or reply frequency, shall be more than 50 dB below the peak pulse power received and measured in the same receiver tuned to the interrogation frequency in use during the transmission of the required pulses. This provision shall apply to all spurious pulse transmissions. The spurious CW power radiated from the interrogator on any DME interrogation or reply frequency shall not exceed 20 microwatts (minus 47 dBW).

Note Although spurious C radiation between pulses is limited to levels not exceeding minus d States are cautioned that where DME interrogators and secondary surveillance radar transponders are employed in the same aircraft it may be necessary to provide protection to airborne SSR in the band M to M This protection may be provided by limiting conducted and radiated C to a level of the order of minus d here this level cannot be achieved the re uired degree of protection may be provided in planning the relative location of the SSR and DME aircraft antennas It is to be noted that only a few of these fre uencies are utili ed in the F DME pairing plan

3.5.5.1.7 **Recommendation** *The spurious pulse power received and measured under the conditions stated in should be d below the re uired pea pulse power received*

Note Reference and although limitation of spurious C radiation between pulses to levels not exceeding d below the pea pulse power received is recommended States are cautioned that where users employ airborne secondary surveillance radar transponders in the same aircraft it may be necessary to limit direct and radiated C to not more than microwatt in the fre uency band M to M It is to be noted that only a few of these fre uencies are utili ed in the F DME pairing plan

3.5.5.1.8 *DME P* The peak effective radiated power (ERP) shall not be less than that required to ensure the power densities in 3.5.4.2.3.1 under all operational weather conditions.

3.5.5.2 *Time delay*

3.5.5.2.1 The time delay shall be consistent with the table in 3.5.4.4.1.

3.5.5.2.2 *DME N* The time delay shall be the interval between the time of the half voltage point on the leading edge of the second constituent interrogation pulse and the time at which the distance circuits reach the condition corresponding to zero distance indication.

3.5.5.2.3 *DME N* The time delay shall be the interval between the time of the half voltage point on the leading edge of the first constituent interrogation pulse and the time at which the distance circuits reach the condition corresponding to zero distance indication.

3.5.5.2.4 *DME P IA mode* The time delay shall be the interval between the time of the half voltage point on the leading edge of the first constituent interrogation pulse and the time at which the distance circuits reach the condition corresponding to zero distance indication.

3.5.5.2.5 *DME P FA mode* The time delay shall be the interval between the virtual origin of the leading edge of the first constituent interrogation pulse and the time at which the distance circuits reach the condition corresponding to zero distance indication. The time of arrival shall be measured within the partial rise time of the pulse.

3.5.5.3 *Receiver*

3.5.5.3.1 *Fre uency of operation* The receiver centre frequency shall be the transponder frequency appropriate to the assigned DME operating channel (see 3.5.3.3.3).

3.5.5.3.2 *Receiver sensitivity*

3.5.5.3.2.1 *DME N* The airborne equipment sensitivity shall be sufficient to acquire and provide distance information to the accuracy specified in 3.5.5.4 for the signal power density specified in 3.5.4.1.5.2.

Note Although the Standard in is for DME N interrogators the receiver sensitivity is better than that necessary in order to operate with the power density of DME N transponders given in in order to assure interoperability with the IA mode of DME P transponders

3.5.5.3.2.2 *DME P* The airborne equipment sensitivity shall be sufficient to acquire and provide distance information to the accuracy specified in 3.5.5.4.2 and 3.5.5.4.3 for the signal power densities specified in 3.5.4.1.5.3.

3.5.5.3.2.3 *DME N* The performance of the interrogator shall be maintained when the power density of the transponder signal at the interrogator antenna is between the minimum values given in 3.5.4.1.5 and a maximum of minus 18 dBW/m^2.

3.5.5.3.2.4 *DME P* The performance of the interrogator shall be maintained when the power density of the transponder signal at the interrogator antenna is between the minimum values given in 3.5.4.1.5 and a maximum of minus 18 dBW/m^2.

3.5.5.3.3 *andwidth*

3.5.5.3.3.1 *DME N* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3, when the input signals are those specified in 3.5.4.1.3.

3.5.5.3.3.2 *DME P IA mode* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3 when the input signals are those specified in 3.5.4.1.3. The 12-dB bandwidth shall not exceed 2 MHz and the 60-dB bandwidth shall not exceed 10 MHz.

3.5.5.3.3.3 *DME P FA mode* The receiver bandwidth shall be sufficient to allow compliance with 3.5.3.1.3 when the input signals are those specified in 3.5.5.1.3. The 12-dB bandwidth shall not exceed 6 MHz and the 60-dB bandwidth shall not exceed 20 MHz.

3.5.5.3.4 *Interference rejection*

3.5.5.3.4.1 When there is a ratio of desired to undesired co-channel DME signals of at least 8 dB at the input terminals of the airborne receiver, the interrogator shall display distance information and provide unambiguous identification from the stronger signal.

Note Co channel refers to those reply signals that utili e the same fre uency and the same pulse pair spacing

3.5.5.3.4.2 *DME N* DME signals greater than 900 kHz removed from the desired channel nominal frequency and having amplitudes up to 42 dB above the threshold sensitivity shall be rejected.

3.5.5.3.4.3 *DME P* DME signals greater than 900 kHz removed from the desired channel nominal frequency and having amplitudes up to 42 dB above the threshold sensitivity shall be rejected.

3.5.5.3.5 *Decoding*

3.5.5.3.5.1 The interrogator shall include a decoding circuit such that the receiver can be triggered only by pairs of received pulses having pulse duration and pulse spacings appropriate to transponder signals as described in 3.5.4.1.4.

3.5.5.3.5.2 *DME N Decoder rejection* A reply pulse pair with a spacing of plus or minus 2 microseconds, or more, from the nominal value and with any signal level up to 42 dB above the receiver sensitivity shall be rejected.

3.5.5.3.5.3 *DME P Decoder rejection* A reply pulse pair with a spacing of plus or minus 2 microseconds, or more, from the nominal value and with any signal level up to 42 dB above the receiver sensitivity shall be rejected.

3.5.5.4 *Accuracy*

3.5.5.4.1 *DME N* The interrogator shall not contribute more than plus or minus 315 m (plus or minus 0.17 NM) to the overall system error.

3.5.5.4.2 *DME P IA mode* The interrogator shall not contribute more than plus or minus 30 m (plus or minus 100 ft) to the overall system PFE and not more than plus or minus 15 m (plus or minus 50 ft) to the overall system CMN.

3.5.5.4.3 *DME P FA mode*

3.5.5.4.3.1 *Accuracy standard* The interrogator shall not contribute more than plus or minus 15 m (plus or minus 50 ft) to the overall system PFE and not more than plus or minus 10 m (plus or minus 33 ft) to the overall system CMN.

3.5.5.4.3.2 *Accuracy standard* The interrogator shall not contribute more than plus or minus 7 m (plus or minus 23 ft) to the overall system PFE and not more than plus or minus 7 m (plus or minus 23 ft) to the overall system CMN.

Note uidance material on filters to assist in achieving this accuracy is given in Attachment C

3.5.5.4.4 *DME P* The interrogator shall achieve the accuracy specified in 3.5.3.1.3.4 with a system efficiency of 50 per cent or more.

Note uidance material on system efficiency is given in Attachment C

3 6 Specification for en route HF marker beacons H

3.6.1 Equipment

3.6.1.1 *Fre uencies* The emissions of an en-route VHF marker beacon shall have a radio frequency of 75 MHz plus or minus 0.005 per cent.

3.6.1.2 *Characteristics of emissions*

3.6.1.2.1 Radio marker beacons shall radiate an uninterrupted carrier modulated to a depth of not less than 95 per cent or more than 100 per cent. The total harmonic content of the modulation shall not exceed 15 per cent.

3.6.1.2.2 The frequency of the modulating tone shall be 3 000 Hz plus or minus 75 Hz.

3.6.1.2.3 The radiation shall be horizontally polarized.

3.6.1.2.4 *Identification* If a coded identification is required at a radio marker beacon, the modulating tone shall be keyed so as to transmit dots or dashes or both in an appropriate sequence. The mode of keying shall be such as to provide a dot-and-dash duration together with spacing intervals corresponding to transmission at a rate equivalent to approximately six to ten words per minute. The carrier shall not be interrupted during identification.

3.6.1.2.5 *Coverage and radiation pattern*

Note The coverage and radiation pattern of mar er beacons will ordinarily be established by Contracting States on the basis of operational re uirements ta ing into account recommendations of regional meetings

The most desirable radiation pattern would be one that

a) in the case of fan mar er beacons results in lamp operation only when the aircraft is within a rectangular parallelepiped symmetrical about the vertical line through the mar er beacon and with the major and minor axes adjusted in accordance with the flight path served *b) in the case of a mar er beacon results in lamp operation only when the aircraft is within a cylinder the axis of which is the vertical line through the mar er beacons*

In practice the production of such patterns is impracticable and a compromise radiation pattern is necessary In Attachment C antenna systems currently in use and which have proved generally satisfactory are described for guidance Such designs and any new designs providing a closer approximation to the most desirable radiation pattern outlined above will normally meet operational re uirements

3.6.1.2.6 *Determination of coverage* The limits of coverage of marker beacons shall be determined on the basis of the field strength specified in 3.1.7.3.2.

3.6.1.2.7 *Radiation pattern* **Recommendation** *The radiation pattern of a mar er beacon normally should be such that the polar axis is vertical and the field strength in the pattern is symmetrical about the polar axis in the plane or planes containing the flight paths for which the mar er beacon is intended*

Note Difficulty in siting certain mar er beacons may ma e it necessary to accept a polar axis that is not vertical

3.6.1.3 *Monitoring* **Recommendation** *For each mar er beacon suitable monitoring e uipment should be provided which will show at an appropriate location*

a) a decrease in radiated carrier power below per cent of normal

b) a decrease of modulation depth below per cent

c) a failure of eying

3 Re uirements for t e lobal a igation Satellite System SS

3.7.1 Definitions

Aircra t ased au mentation s stem (A A) An augmentation system that augments and/or integrates the information obtained from the other GNSS elements with information available on board the aircraft.

Alert An indication provided to other aircraft systems or annunciation to the pilot to identify that an operating parameter of a navigation system is out of tolerance.

Alert limit For a given parameter measurement, the error tolerance not to be exceeded without issuing an alert.

C annel o standard accurac (C A) The specified level of positioning, velocity and timing accuracy that is available to any GLONASS user on a continuous, worldwide basis.

Core satellite constellation(s) The core satellite constellations are GPS and GLONASS.

lo al navi ation satellite s stem ( ) A worldwide position and time determination system that includes one or more satellite constellations, aircraft receivers and system integrity monitoring, augmented as necessary to support the required navigation performance for the intended operation.

lo al navi ation satellite s stem (A) The satellite navigation system operated by the Russian Federation.

lo al ositionin s stem (The satellite navigation system operated by the United States

osition error The difference between the true position and the position determined by the GNSS receiver.

round ased au mentation s stem (A) An augmentation system in which the user receives augmentation information directly from a ground-based transmitter.

round ased re ional au mentation s stem (A) An augmentation system in which the user receives augmentation information directly from one of a group of ground-based transmitters covering a region.

Inte rit A measure of the trust that can be placed in the correctness of the information supplied by the total system. Integrity includes the ability of a system to provide timely and valid warnings to the user (alerts).

seudo ran e The difference between the time of transmission by a satellite and reception by a GNSS receiver multiplied by the speed of light in a vacuum, including bias due to the difference between a GNSS receiver and satellite time reference.

atellite ased au mentation s stem (A) A wide coverage augmentation system in which the user receives augmentation information from a satellite-based transmitter.

tandard ositionin service ( ) The specified level of positioning, velocity and timing accuracy that is available to any global positioning system (GPS) user on a continuous, worldwide basis.

ime to alert The maximum allowable time elapsed from the onset of the navigation system being out of tolerance until the equipment enunciates the alert.

3.7.2 General

3.7.2.1 *Functions*

3.7.2.1.1 The GNSS shall provide position and time data to the aircraft.

Note These data are derived from pseudo range measurements between an aircraft e uipped with a NSS receiver and various signal sources on satellites or on the ground

3.7.2.2 *NSS elements*

3.7.2.2.1 The GNSS navigation service shall be provided using various combinations of the following elements installed on the ground, on satellites and/or on board the aircraft:

a) Global Positioning System (GPS) that provides the Standard Positioning Service (SPS) as defined in 3.7.3.1;

b) Global Navigation Satellite System (GLONASS) that provides the Channel of Standard Accuracy (CSA) navigation signal as defined in 3.7.3.2;

c) aircraft-based augmentation system (ABAS) as defined in 3.7.3.3;

d) satellite-based augmentation system (SBAS) as defined in 3.7.3.4;

e) ground-based augmentation system (GBAS) as defined in 3.7.3.5;

f) ground-based regional augmentation system (GRAS) as defined in 3.7.3.5; and

g) aircraft GNSS receiver as defined in 3.7.3.6.

3.7.2.3 *Space and time reference*

3.7.2.3.1 *Space reference*. The position information provided by the GNSS to the user shall be expressed in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum.

Note SARPs for S are contained in Annex Chapter Annex Chapter Annex olumes I and II Chapter and Annex Chapter

Note If NSS elements using other than S coordinates are employed appropriate conversion parameters are to be applied

3.7.2.3.2 *Time reference*. The time data provided by the GNSS to the user shall be expressed in a time scale that takes the Universal Time Coordinated (UTC) as reference.

3.7.2.4 *Signal in space performance*

3.7.2.4.1 The combination of GNSS elements and a fault-free GNSS user receiver shall meet the signal-in-space requirements defined in Table 3.7.2.4-1 (located at the end of section 3.7).

Note The concept of a fault free user receiver is applied only as a means of defining the performance of combinations of different NSS elements The fault free receiver is assumed to be a receiver with nominal accuracy and time to alert performance Such a receiver is assumed to have no failures that affect the integrity availability and continuity performance

3.7.3 GNSS elements specifications

3.7.3.1 *PS Standard Positioning Service (SPS) ( )*

3.7.3.1.1 *Space and control segment accuracy*

Note The following accuracy standards do not include atmospheric or receiver errors as described in Attachment D

3.7.3.1.1.1 *Positioning accuracy*. The GPS SPS position errors shall not exceed the following limits:

	Global average 95 of the time	Worst site 95 of the time
Horizontal position error	13 m (43 ft)	36 m (118 ft)
Vertical position error	22 m (72 ft)	77 m (253 ft)

3.7.3.1.1.2 *Time transfer accuracy*. The GPS SPS time transfer errors shall not exceed 40 nanoseconds 95 per cent of the time.

3.7.3.1.1.3 *Range domain accuracy*. The range domain error shall not exceed the following limits:

a) range error of any satellite — the larger of:

— 30 m (100 ft); or
— 4.42 times the broadcast user range accuracy (URA), not to exceed 150 m (490 ft);

b) range rate error of any satellite — 0.02 m (0.07 ft) per second;

c) range acceleration error of any satellite — 0.007 m (0.02 ft) per second-squared; and

d) root-mean-square range error over all satellites — 6 m (20 ft).

3.7.3.1.2 *Availability*. The GPS SPS availability shall be as follows:

≥99 per cent horizontal service availability, average location (36 m 95 per cent threshold)

≥99 per cent vertical service availability, average location (77 m 95 per cent threshold)

≥90 per cent horizontal service availability, worst-case location (36 m 95 per cent threshold)

≥90 per cent vertical service availability, worst-case location (77 m 95 per cent threshold)

3.7.3.1.3 *Reliability*. The GPS SPS reliability shall be within the following limits:

a) frequency of a major service failure — not more than three per year for the constellation (global average);

b) reliability — at least 99.94 per cent (global average); and

c) reliability — at least 99.79 per cent (single point average).

3.7.3.1.4 *Coverage* The GPS SPS shall cover the surface of the earth up to an altitude of 3 000 kilometres.

Note uidance material on PS accuracy availability reliability and coverage is given in Attachment D

3.7.3.1.5 *Radio fre uency (RF) characteristics*

Note Detailed RF characteristics are specified in Appendix

3.7.3.1.5.1 *Carrier fre uency*. Each GPS satellite shall broadcast an SPS signal at the carrier frequency of 1 575.42 MHz (GPS L1) using code division multiple access (CDMA).

Note A new civil fre uency will be added to the PS satellites and will be offered by the United States for critical safety of life applications SARPs for this signal may be developed at a later date

3.7.3.1.5.2 *Signal spectrum*. The GPS SPS signal power shall be contained within a 12 MHz band (1 563.42 1 587.42 MHz) centred on the L1 frequency.

3.7.3.1.5.3 *Polari ation*. The transmitted RF signal shall be right-hand (clockwise) circularly polarized.

3.7.3.1.5.4 *Signal power level*. Each GPS satellite shall broadcast SPS navigation signals with sufficient power such that, at all unobstructed locations near the ground from which the satellite is observed at an elevation angle of 5 degrees or higher, the level of the received RF signal at the output of a 3 dBi linearly-polarized antenna is within the range of 160 dBW to 153 dBW for all antenna orientations orthogonal to the direction of propagation.

3.7.3.1.5.5 *Modulation*. The SPS L1 signal shall be bipolar phase shift key (BPSK) modulated with a pseudo random noise (PRN) 1.023 MHz coarse/acquisition (C/A) code. The C/A code sequence shall be repeated each millisecond. The transmitted PRN code sequence shall be the Modulo-2 addition of a 50 bits per second navigation message and the C/A code.

3.7.3.1.6 *PS time*. GPS time shall be referenced to UTC (as maintained by the U.S. Naval Observatory).

3.7.3.1.7 *Coordinate system*. The GPS coordinate system shall be WGS-84.

3.7.3.1.8 *Navigation information*. The navigation data transmitted by the satellites shall include the necessary information to determine:

a) satellite time of transmission;

b) satellite position;

c) satellite health;

d) satellite clock correction;

e) propagation delay effects;

f) time transfer to UTC; and

g) constellation status.

Note Structure and contents of data are specified in Appendix and respectively

3.7.3.2 *NASS Channel of Standard Accuracy (CSA) ( )*

Note In this section the term NASS refers to all satellites in the constellation Standards relating only to NASS M satellites are ualified accordingly

3.7.3.2.1 *Accuracy*

3.7.3.2.1.1 *Positioning accuracy*. The GLONASS CSA position errors shall not exceed the following limits:

	95 of the time	99.99 of the time
Horizontal position error	28 m (92 ft)	140 m (460 ft)
Vertical position error	60 m (196 ft)	585 m (1 920 ft)

3.7.3.2.1.2 *Time transfer accuracy*. The GLONASS CSA time transfer errors shall not exceed 700 nanoseconds 95 per cent of the time.

3.7.3.2.2 *Availability*. The GLONASS CSA availability shall be at least 99.64 per cent (global average).

3.7.3.2.3 *Reliability*. The GLONASS CSA reliability shall be at least 99.98 per cent (global average).

3.7.3.2.4 *Coverage*. The GLONASS CSA coverage shall be at least 99.9 per cent (global average).

Note uidance material on NASS accuracy availability reliability and coverage is given in Attachment D

3.7.3.2.5 *RF characteristics*

Note Detailed RF characteristics are specified in Appendix

3.7.3.2.5.1 *Carrier fre uency* Each GLONASS satellite shall broadcast CSA navigation signal at its own carrier frequency in the L1 (1.6 GHz) frequency band using frequency division multiple access (FDMA).

Note NASS satellites may have the same carrier fre uency but in this case they are located in antipodal slots of the same orbital plane

Note NASS M satellites will broadcast an additional ranging code at carrier fre uencies in the ( ) fre uency band using FDMA

3.7.3.2.5.2 *Signal spectrum* GLONASS CSA signal power shall be contained within a 5.75 MHz band centred on each GLONASS carrier frequency.

3.7.3.2.5.3 *Polari ation*. The transmitted RF signal shall be right-hand circularly polarized.

3.7.3.2.5.4 *Signal power level*. Each GLONASS satellite shall broadcast CSA navigation signals with sufficient power such that, at all unobstructed locations near the ground from which the satellite is observed at an elevation angle of 5 degrees or higher, the level of the received RF signal at the output of a 3 dBi linearly polarized antenna is within the range of 161 dBW to 155.2 dBW for all antenna orientations orthogonal to the direction of propagation.

Note The power limit of d is based on the predetermined characteristics of a user antenna atmospheric losses of d and an error of an angular position of a satellite that does not exceed one degree (in the direction causing the signal level to increase)

Note NASS M satellites will also broadcast a ranging code on with sufficient power such that at all unobstructed locations near the ground from which the satellite is observed at an elevation angle of degrees or higher the level of the received RF signal at the output of a d i linearly polari ed antenna is not less then d for all antenna orientations orthogonal to the direction of propagation

3.7.3.2.5.5 *Modulation*

3.7.3.2.5.5.1 Each GLONASS satellite shall transmit at its carrier frequency the navigation RF signal using a BPSK-modulated binary train. The phase shift keying of the carrier shall be performed at π-radians with the maximum error 0.2 radian. The pseudo-random code sequence shall be repeated each millisecond.

3.7.3.2.5.5.2 The modulating navigation signal shall be generated by the Modulo-2 addition of the following three binary signals:

a) ranging code transmitted at 511 kbits/s;

b) navigation message transmitted at 50 bits/s; and

c) 100 Hz auxiliary meander sequence.

3.7.3.2.6 *NASS time* GLONASS time shall be referenced to UTC(SU) (as maintained by the National Time Service of Russia).

3.7.3.2.7 *Coordinate system*. The GLONASS coordinate system shall be P -90.

Note Conversion from the P coordinate system used by NASS to the S coordinates is defined in Appendix

3.7.3.2.8 *Navigation information* The navigation data transmitted by the satellite shall include the necessary information to determine:

a) satellite time of transmission;

b) satellite position;

c) satellite health;

d) satellite clock correction;

e) time transfer to UTC; and

f) constellation status.

Note Structure and contents of data are specified in Appendix and respectively

3.7.3.3 *Aircraft based augmentation system (A AS)*

3.7.3.3.1 *Performance*. The ABAS function combined with one or more of the other GNSS elements and both a fault-free GNSS receiver and fault-free aircraft system used for the ABAS function shall meet the requirements for accuracy, integrity, continuity and availability as stated in 3.7.2.4.

3.7.3.4 *Satellite based augmentation system (S AS)*

3.7.3.4.1 *Performance*. SBAS combined with one or more of the other GNSS elements and a fault-free receiver shall meet the requirements for system accuracy, integrity, continuity and availability for the intended operation as stated in 3.7.2.4.

Note S AS complements the core satellite constellation(s) by increasing accuracy integrity continuity and availability of navigation provided within a service area typically including multiple aerodromes

3.7.3.4.2 *Functions* SBAS shall perform one or more of the following functions:

a) ranging: provide an additional pseudo-range signal with an accuracy indicator from an SBAS satellite (3.7.3.4.2.1 and Appendix B, 3.5.7.2);

b) GNSS satellite status: determine and transmit the GNSS satellite health status (Appendix B, 3.5.7.3);

c) basic differential correction: provide GNSS satellite ephemeris and clock corrections (fast and long-term) to be applied to the pseudo-range measurements from satellites (Appendix B, 3.5.7.4); and

d) precise differential correction: determine and transmit the ionospheric corrections (Appendix B, 3.5.7.5).

Note If all the functions are provided S AS in combination with core satellite constellation(s) can support departure en route terminal and approach operations including Category I precision approach The level of performance that can be achieved depends upon the infrastructure incorporated into S AS and the ionospheric conditions in the geographic area of interest

3.7.3.4.2.1 *Ranging*

3.7.3.4.2.1.1 Excluding atmospheric effects, the range error for the ranging signal from SBAS satellites shall not exceed 25 m (82 ft) (95 per cent).

3.7.3.4.2.1.2 The probability that the range error exceeds 150 m (490 ft) in any hour shall not exceed 10 ^{5}.

3.7.3.4.2.1.3 The probability of unscheduled outages of the ranging function from an SBAS satellite in any hour shall not exceed 10 ^{3}.

3.7.3.4.2.1.4 The range rate error shall not exceed 2 m (6.6 ft) per second.

3.7.3.4.2.1.5 The range acceleration error shall not exceed 0.019 m (0.06 ft) per second-squared.

3.7.3.4.3 *Service area*. The SBAS service area shall be a defined area within an SBAS coverage area where SBAS meets the requirements of 3.7.2.4 and supports the corresponding approved operations.

Note The coverage area is that area within which the S AS broadcast can be received (e g the geostationary satellite footprints)

Note S AS coverage and service areas are discussed in Attachment D

3.7.3.4.4 *RF characteristics*

Note Detailed RF characteristics are specified in Appendix

3.7.3.4.4.1 *Carrier fre uency* The carrier frequency shall be 1 575.42 MHz.

Note After when the upper NASS fre uencies are vacated another type of S AS may be introduced using some of these fre uencies

3.7.3.4.4.2 *Signal spectrum*. At least 95 per cent of the broadcast power shall be contained within a 12 MHz band centred on the L1 frequency. The bandwidth of the signal transmitted by an SBAS satellite shall be at least 2.2 MHz.

3.7.3.4.4.3 *Signal power level*. Each SBAS satellite shall broadcast navigation signals with sufficient power such that, at all unobstructed locations near the ground from which the satellite is observed at an elevation angle of 5 degrees or higher, the level of the received RF signal at the output of a 3 dBi linearly polarized antenna is within the range of 161 dBW to 153 dBW for all antenna orientations orthogonal to the direction of propagation.

3.7.3.4.4.4 *Polari ation*. The broadcast signal shall be right-hand circularly polarized.

3.7.3.4.4.5 *Modulation* The transmitted sequence shall be the Modulo-2 addition of the navigation message at a rate of 500 symbols per second and the 1 023 bit pseudo-random noise code. It shall then be BPSK-modulated onto the carrier at a rate of 1.023 megachips per second.

3.7.3.4.5 *S AS networ time (SNT)*. The difference between SNT and GPS time shall not exceed 50 nanoseconds.

3.7.3.4.6 *Navigation information*. The navigation data transmitted by the satellites shall include the necessary information to determine:

a) SBAS satellite time of transmission;

b) SBAS satellite position;

c) corrected satellite time for all satellites;

d) corrected satellite position for all satellites;

e) ionospheric propagation delay effects;

f) user position integrity;

g) time transfer to UTC; and

h) service level status.

Note Structure and contents of data are specified in Appendix and respectively

3.7.3.5 *round based augmentation system (AS) and ground based regional augmentation system (RAS)*

Note Except where specifically annotated AS Standards and Recommended Practices apply to AS and RAS

Note Except where specifically annotated reference to approach with vertical guidance (AP) means AP I and AP II

3.7.3.5.1 *Performance*. GBAS combined with one or more of the other GNSS elements and a fault-free GNSS receiver shall meet the requirements for system accuracy, continuity, availability and integrity for the intended operation as stated in 3.7.2.4.

Note AS is intended to support all types of approach landing departure and surface operations and may support en route and terminal operations RAS is intended to support en route terminal non precision approach departure and approach with vertical guidance The following SARPs are developed to support Category I precision approach approach with vertical guidance and a AS positioning service In order to achieve interoperability and enable efficient spectrum utili ation it is intended that the data broadcast is the same for all operations

3.7.3.5.2 *Functions*. GBAS shall perform the following functions:

a) provide locally relevant pseudo-range corrections;

b) provide GBAS-related data;

c) provide final approach segment data when supporting precision approach;

d) provide predicted ranging source availability data; and

e) provide integrity monitoring for GNSS ranging sources.

Note Additional AS SARPs will be developed to provide ground based ranging function

3.7.3.5.3 *Coverage*

3.7.3.5.3.1 *Category I precision approach and approach with vertical guidance* The GBAS coverage to support each Category I precision approach or approach with vertical guidance shall be as follows, except where topographical features dictate and operational requirements permit:

a) laterally, beginning at 140 m (450 ft) each side of the landing threshold point/fictitious threshold point (LTP/FTP) and projecting out 35 degrees either side of the final approach path to 28 km (15 NM) and 10 degrees either side of the final approach path to 37 km (20 NM); and

b) vertically, within the lateral region, up to the greater of 7 degrees or 1.75 promulgated glide path angle (GPA) above the horizontal with an origin at the glide path interception point (GPIP) and 0.45 GPA above the horizontal or to such lower angle, down to 0.30 GPA, as required, to safeguard the promulgated glide path intercept procedure. This coverage applies between 30 m (100 ft) and 3 000 m (10 000 ft) height above threshold (HAT).

Note TP FTP and PIP are defined in Appendix

3.7.3.5.3.1.1 **Recommendation** *For Category I precision approach the data broadcast as specified in should extend down to m (ft) above the runway surface*

3.7.3.5.3.1.2 **Recommendation** *The data broadcast should be omnidirectional when re uired to support the intended applications*

Note uidance material concerning coverage for Category I precision approach and AP is provided in Attachment D

3.7.3.5.3.2 *AS positioning service* The GBAS positioning service area shall be that area where the data broadcast can be received and the positioning service meets the requirements of 3.7.2.4 and supports the corresponding approved operations.

Note uidance material concerning the positioning service coverage is provided in Attachment D

3.7.3.5.4 *Data broadcast characteristics*

Note RF characteristics are specified in Appendix

3.7.3.5.4.1 *Carrier fre uency*. The data broadcast radio frequencies used shall be selected from the radio frequencies in the band 108 to 117.975 MHz. The lowest assignable frequency shall be 108.025 MHz and the highest assignable frequency shall be 117.950 MHz. The separation between assignable frequencies (channel spacing) shall be 25 kHz.

Note uidance material on R AS fre uency assignments and geographical separation criteria is given in Attachment D

Note I S AS geographical separation criteria and geographical separation criteria for AS and F communication services operating in the M band are under development Until these criteria are defined and included in SARPs it is intended that fre uencies in the band M will be used

3.7.3.5.4.2 *Access techni ue*. A time division multiple access (TDMA) technique shall be used with a fixed frame structure. The data broadcast shall be assigned one to eight slots.

Note Two slots is the nominal assignment Some AS facilities that use multiple F data broadcast (D) transmit antennas to improve D coverage may re uire assignment of more than two time slots uidance on the use of multiple antennas is given in Attachment D some AS broadcast stations in a RAS may use one time slot

3.7.3.5.4.3 *Modulation*. GBAS data shall be transmitted as 3-bit symbols, modulating the data broadcast carrier by D8PSK, at a rate of 10 500 symbols per second.

3.7.3.5.4.4 *Data broadcast RF field strength and polari ation*

Note AS can provide a F data broadcast with either hori ontal (AS) or elliptical (AS E) polari ation that employs both hori ontal polari ation (P) and vertical polari ation (P) components Aircraft using a P component will not be able to conduct operations with AS e uipment Relevant guidance material is provided in Attachment D

3.7.3.5.4.4.1 *AS*

3.7.3.5.4.4.1.1 A horizontally polarized signal shall be broadcast.

3.7.3.5.4.4.1.2 The effective radiated power (ERP) shall provide for a horizontally polarized signal with a minimum field strength of 215 microvolts per metre (99 dBW/m^2) and a maximum field strength of 0.350 volts per metre (35 dBW/m^2) within the GBAS coverage volume. The field strength shall be measured as an average over the period of the synchronization and ambiguity resolution field of the burst. The RF phase offset between the HPOL and any VPOL components shall be such that the minimum signal power defined in Appendix B, 3.6.8.2.2.3 is achieved for HPOL users throughout the coverage volume.

3.7.3.5.4.4.2 *AS E*

3.7.3.5.4.4.2.1 **Recommendation** *An elliptically polari ed signal should be broadcast whenever practical.*

3.7.3.5.4.4.2.2 When an elliptically polarized signal is broadcast, the horizontally polarized component shall meet the requirements in 3.7.3.5.4.4.1.2, and the effective radiated power (ERP) shall provide for a vertically polarized signal with a minimum field strength of 136 microvolts per metre (103 dBW/m^2) and a maximum field strength of 0.221 volts per metre (39 dBW/m^2) within the GBAS coverage volume. The field strength shall be measured as an average over the period of the synchronization and ambiguity resolution field of the burst. The RF phase offset between the HPOL and VPOL components, shall be such that the minimum signal power defined in Appendix B, 3.6.8.2.2.3 is achieved for HPOL and VPOL users throughout the coverage volume.

Note The minimum and maximum field strengths in and are consistent with a minimum receiver sensitivity of d m and minimum distance of m (ft) from the transmitter antenna for a coverage range of m (NM)

3.7.3.5.4.5 *Power transmitted in adjacent channel*s. The amount of power during transmission under all operating conditions when measured over a 25 kHz bandwidth centred on the i^{th} adjacent channel shall not exceed the values shown in Table 3.7.3.5-1 (located at the end of section 3.7).

3.7.3.5.4.6 *Unwanted emissions* Unwanted emissions, including spurious and out-of-band emissions, shall be compliant with the levels shown in Table 3.7.3.5-2 (located at the end of section 3.7). The total power in any VDB harmonic or discrete signal shall not be greater than 53 dBm.

3.7.3.5.5 *Navigation information*. The navigation data transmitted by GBAS shall include the following information:

a) pseudo-range corrections, reference time and integrity data;

b) GBAS-related data;

c) final approach segment data when supporting precision approach; and

d) predicted ranging source availability data.

Note Structure and contents of data are specified in Appendix

3.7.3.6 *Aircraft NSS receiver*

3.7.3.6.1 The aircraft GNSS receiver shall process the signals of those GNSS elements that it intends to use as specified in Appendix B, 3.1 (for GPS), Appendix B, 3.2 (for GLONASS), Appendix B, 3.3 (for combined GPS and GLONASS), Appendix B, 3.5 (for SBAS) and Appendix B, 3.6 (for GBAS and GRAS).

3.7.4 Resistance to interference

3.7.4.1 GNSS shall comply with performance requirements defined in 3.7.2.4 and Appendix B, 3.7 in the presence of the interference environment defined in Appendix B, 3.7.

Note PS and NASS operating in the fre uency band M are classified by the ITU as providing a radio navigation satellite service (RNSS) and aeronautical radio navigation service (ARNS) and are afforded special spectrum protection status for RNSS In order to achieve the performance objectives for precision approach guidance to be supported by the NSS and its augmentations RNSS ARNS is intended to remain the only global allocation in the M band and emissions from systems in this and adjacent fre uency bands are intended to be tightly controlled by national and or international regulation

3.7.5 Database

Note SARPs applicable to aeronautical data are provided in Annex Annex Annex and Annex

3.7.5.1 Aircraft GNSS equipment that uses a database shall provide a means to:

a) update the electronic navigation database; and

b) determine the Aeronautical Information Regulation and Control (AIRAC) effective dates of the aeronautical database.

Note uidance material on the need for a current navigation database in aircraft NSS e uipment is provided in Attachment D

3.7.6 Status monitoring and NOTAM

3.7.6.1 Changes in the current and projected status of GNSS space and ground elements that may have an impact on user performance or operational approvals shall be reported to relevant air traffic service units.

Note Additional information is provided in Attachment D

Note To assess the operational impact of changes in status a service prediction tool may be re uired

able 3 2 1 Signal in space performance re uirements

Typical operation	Accuracy horizontal 95 (Notes 1 and 3)	Accuracy vertical 95 (Notes 1 and 3)	Integrity (Note 2)	Time-to-alert (Note 3)	Continuity (Note 4)	Availability (Note 5)
En-route	3.7 km (2.0 NM) (Note 6)	N/A	1 1 10^{7}/h	5 min	1 1 10^{4}/h to 1 1 10^{8}/h	0.99 to 0.99999
En-route, Terminal	0.74 km (0.4 NM)	N/A	1 1 10^{7}/h	15 s	1 1 10^{4}/h to 1 1 10^{8}/h	0.99 to 0.99999
Initial approach, Intermediate approach, Non-precision approach (NPA), Departure	220 m (720 ft)	N/A	1 1 10^{7}/h	10 s	1 1 10^{4}/h to 1 1 10^{8}/h	0.99 to 0.99999
Approach operations with vertical guidance (APV-I)	16.0 m (52 ft)	20 m (66 ft)	1 2 10^{7} per approach	10 s	1 8 10^{6} in any 15 s	0.99 to 0.99999
Approach operations with vertical guidance (APV-II)	16.0 m (52 ft)	8.0 m (26 ft)	1 2 10^{7} per approach	6 s	1 8 10^{6} in any 15 s	0.99 to 0.99999
Category I precision approach (Note 8)	16.0 m (52 ft)	6.0 m to 4.0 m (20 ft to 13 ft) (Note 7)	1 2 10^{7} per approach	6 s	1 8 10^{6} in any 15 s	0.99 to 0.99999

N TES

1. The 95th percentile values for GNSS position errors are those required for the intended operation at the lowest height above threshold (HAT), if applicable. Detailed requirements are specified in Appendix B and guidance material is given in Attachment D, 3.2.
2. The definition of the integrity requirement includes an alert limit against which the requirement can be assessed. These alert limits are:
   A range of vertical limits for Category I precision approach relates to the range of vertical accuracy requirements.

Typical operation	Horizontal alert limit	Vertical alert limit
En-route (oceanic/continental low density)	7.4 km (4 NM)	N/A
En-route (continental)	3.7 km (2 NM)	N/A
En-route, Terminal	1.85 km (1 NM)	N/A
NPA	556 m (0.3 NM)	N/A
APV-I	40 m (130 ft)	50 m (164 ft)
APV- II	40.0 m (130 ft)	20.0 m (66 ft)
Category I precision approach	40.0 m (130 ft)	15.0 m to 10.0 m (50 ft to 33 ft)

3. The accuracy and time-to-alert requirements include the nominal performance of a fault-free receiver.
4. Ranges of values are given for the continuity requirement for en-route, terminal, initial approach, NPA and departure operations, as this requirement is dependent upon several factors including the intended operation, traffic density, complexity of airspace and availability of alternative navigation aids. The lower value given is the minimum requirement for areas with low traffic density and airspace complexity. The higher value given is appropriate for areas with high traffic density and airspace complexity (see Attachment D, 3.4).
5. A range of values is given for the availability requirements as these requirements are dependent upon the operational need which is based upon several factors including the frequency of operations, weather environments, the size and duration of the outages, availability of alternate navigation aids,

radar coverage, traffic density and reversionary operational procedures. The lower values given are the minimum availabilities for which a system is considered to be practical but are not adequate to replace non-GNSS navigation aids. For en-route navigation, the higher values given are adequate for GNSS to be the only navigation aid provided in an area. For approach and departure, the higher values given are based upon the availability requirements at airports with a large amount of traffic assuming that operations to or from multiple runways are affected but reversionary operational procedures ensure the safety of the operation (see Attachment D, 3.5).

6. This requirement is more stringent than the accuracy needed for the associated RNP types, but it is well within the accuracy performance achievable by GNSS.
7. A range of values is specified for Category I precision approach. The 4.0 m (13 feet) requirement is based upon ILS specifications and represents a conservative derivation from these specifications (see Attachment D, 3.2.7).
8. GNSS performance requirements for Category II and III precision approach operations are under review and will be included at a later date.
9. The terms APV-I and APV-II refer to two levels of GNSS approach and landing operations with vertical guidance (APV) and these terms are not necessarily intended to be used operationally.

able 3 3 1 AS broadcast po er transmitted in ad acent c annels

Channel	Relative power	Maximum power
1st adjacent	40 dBc	12 dBm
2nd adjacent	65 dBc	13 dBm
4th adjacent	74 dBc	22 dBm
8th adjacent	88.5 dBc	36.5 dBm
16th adjacent	101.5 dBc	49.5 dBm
32nd adjacent	105 dBc	53 dBm
64th adjacent	113 dBc	61 dBm
76th adjacent and beyond	115 dBc	63 dBm

N TES

1. The maximum power applies if the authorized transmitter power exceeds 150 W.
2. The relationship is linear between single adjacent points designated by the adjacent channels identified above.

able 3 3 2 AS broadcast un anted emissions

Frequency	Relative unwanted emission level (Note 2)	Maximum unwanted emission level (Note 1)
9 kHz to 150 kHz	93 dBc (Note 3)	55 dBm/1 kHz (Note 3)
150 kHz to 30 MHz	103 dBc (Note 3)	55 dBm/10 kHz (Note 3)
30 MHz to 106.125 MHz	115 dBc	57 dBm/100 kHz
106.425 MHz	113 dBc	55 dBm/100 kHz
107.225 MHz	105 dBc	47 dBm/100 kHz
107.625 MHz	101.5 dBc	53.5 dBm/10 kHz
107.825 MHz	88.5 dBc	40.5 dBm/10 kHz
107.925 MHz	74 dBc	36 dBm/1 kHz
107.9625 MHz	71 dBc	33 dBm/1 kHz
107.975 MHz	65 dBc	27 dBm/1 kHz
118.000 MHz	65 dBc	27 dBm/1 kHz
118.0125 MHz	71 dBc	33 dBm/1 kHz
118.050 MHz	74 dBc	36 dBm/1 kHz
118.150 MHz	88.5 dBc	40.5 dBm/10 kHz
118.350 MHz	101.5 dBc	53.5 dBm/10 kHz
118.750 MHz	105 dBc	47 dBm/100 kHz
119.550 MHz	113 dBc	55 dBm/100 kHz
119.850 MHz to 1 GHz	115 dBc	57 dBm/100 kHz
1 GHz to 1.7 GHz	115 dBc	47 dBm/1 MHz

N TES
1. The maximum unwanted emission level (absolute power) applies if the authorized transmitter power exceeds 150 W.
2. The relative unwanted emission level is to be computed using the same bandwidth for desired and unwanted signals. This may require conversion of the measurement for unwanted signals done using the bandwidth indicated in the maximum unwanted emission level column of this table.
3. This value is driven by measurement limitations. Actual performance is expected to be better.
4. The relationship is linear between single adjacent points designated by the adjacent channels identified above.

3 Reser ed

3 System c aracteristics of airborne ADF recei ing systems

3.9.1 Accuracy of bearing indication

3.9.1.1 The bearing given by the ADF system shall not be in error by more than plus or minus 5 degrees with a radio signal from any direction having a field strength of 70 microvolts per metre or more radiated from an LF/MF NDB or locator operating within the tolerances permitted by this Annex and in the presence also of an unwanted signal from a direction 90 degrees from the wanted signal and:

a) on the same frequency and 15 dB weaker; or

b) plus or minus 2 kHz away and 4 dB weaker; or

c) plus or minus 6 kHz or more away and 55 dB stronger.

Note The above bearing error is exclusive of aircraft magnetic compass error

3 10 Reser ed

3 11 icro a e landing system S c aracteristics

3.11.1 Definitions

Auxiliar data Data, transmitted in addition to basic data, that provide ground equipment siting information for use in refining airborne position calculations and other supplementary information.

asic data Data transmitted by the ground equipment that are associated directly with the operation of the landing guidance system.

eam centre The midpoint between the two minus 3-dB points on the leading and trailing edges of the scanning beam main lobe.

eamwidt The width of the scanning beam main lobe measured at the minus 3-dB points and defined in angular units on the boresight, in the horizontal plane for the azimuth function and in the vertical plane for the elevation function.

Clearance uidance sector The volume of airspace, inside the coverage sector, within which the azimuth guidance information provided is not proportional to the angular displacement of the aircraft, but is a constant left or right indication of which side the aircraft is with respect to the proportional guidance sector.

Control motion noise (C) That portion of the guidance signal error which causes control surface, wheel and column motion and could affect aircraft attitude angle during coupled flight, but does not cause aircraft displacement from the desired course and/or glide path. (See 3.5.)

Coordinate s stem — conical A function is said to use conical coordinates when the decoded guidance angle varies as the minimum angle between the surface of a cone containing the receiver antenna, and a plane perpendicular to the axis of the cone and passing through its apex. The apex of the cone is at the antenna phase centre. For approach azimuth or back azimuth functions, the plane is the vertical plane containing the runway centre line. For elevation functions, the plane is horizontal.

Coordinate s stem — lanar A function is said to use planar coordinates when the decoded guidance angle varies as the angle between the plane containing the receiver antenna and a reference plane. For azimuth functions, the reference plane is the vertical plane containing the runway centre line and the plane containing the receiver antenna is a vertical plane passing through the antenna phase centre.

Covera e sector A volume of airspace within which service is provided by a particular function and in which the signal power density is equal to or greater than the specified minimum.

The distance measuring element of the MLS, where the "P" stands for precise distance measurement. The spectrum characteristics are those of DME/N.

Function A particular service provided by the MLS, e.g. approach azimuth guidance, back azimuth guidance or basic data, etc.

ean course error The mean value of the azimuth error along the runway extended centre line.

ean lide at error The mean value of the elevation error along the glide path of an elevation function.

inimum lide at The lowest angle of descent along the zero degree azimuth that is consistent with published approach procedures and obstacle clearance criteria.

Note This is the lowest elevation angle which has been approved and promulgated for the instrument runway

antenna oresi t The plane passing through the antenna phase centre perpendicular to the horizontal axis contained in the plane of the antenna array.

Note In the a imuth case the boresight of the antenna and the ero degree a imuth are normally aligned owever the preferred designation in a technical context is boresight whereas the preferred designation in an operational context is ero degree a imuth (see definition below)

a imut The locus of points in any horizontal plane where the decoded guidance angle is constant.

a roac re erence datum A point at a specified height above the intersection of the runway centre line and the threshold.

ac a imut re erence datum A point at a specified height above the runway centre line at the runway midpoint.

datum oint The point on the runway centre line closest to the phase centre of the approach elevation antenna.

elevation The locus of points in any vertical plane where the decoded guidance angle is constant.

ero de ree a imut The MLS azimuth where the decoded guidance angle is zero degrees.

ut o covera e indication si nal A signal radiated into areas outside the intended coverage sector where required to specifically prevent invalid removal of an airborne warning indication in the presence of misleading guidance information.

at ollowin error (F) That portion of the guidance signal error which could cause aircraft displacement from the desired course and/or glide path.

at ollowin noise (F) That portion of the guidance signal error which could cause aircraft displacement from the mean course line or mean glide path as appropriate.

ro ortional uidance sector The volume of airspace within which the angular guidance information provided by a function is directly proportional to the angular displacement of the airborne antenna with respect to the zero angle reference.

3.11.2 General

3.11.2.1 MLS is a precision approach and landing guidance system which provides position information and various ground to air data. The position information is provided in a wide coverage sector and is determined by an azimuth angle measurement, an elevation angle measurement and a range (distance) measurement.

Note Unless specifically indicated as the M S airborne e uipment the text in refers to the M S ground e uipment

3.11.3 MLS configurations

3.11.3.1 *asic M S* The basic configuration of the MLS shall be composed of the following:

a) approach azimuth equipment, associated monitor, remote control and indicator equipment;

b) approach elevation equipment, associated monitor, remote control and indicator equipment;

c) a means for the encoding and transmission of essential data words, associated monitor, remote control and indicator equipment;

Note The essential data are those basic and essential auxiliary data words specified in

d) DME/N, associated monitor, remote control and indicator equipment.

3.11.3.2 **Recommendation** *If precise ranging information throughout the a imuth coverage sector is re uired the option of DME P conforming to the Standards of Chapter should be applied*

Note DME is the M S ranging element and is expected to be installed as soon as possible owever mar er beacons installed for I S may be used temporarily with M S while I S service is maintained at the same runway

3.11.3.3 *Expanded M S configurations* It shall be permissible to derive expanded configurations from the basic MLS, by addition of one or more of the following functions or characteristic improvements:

a) back azimuth equipment, associated monitor, remote control and indicator equipment;

b) flare elevation equipment, associated monitor, remote control and indicator equipment;

c) DME/P, associated monitor, remote control and indicator equipment;

d) a means for the encoding and transmission of additional auxiliary data words, associated monitor, remote control and indicator equipment;

e) a wider proportional guidance sector exceeding the minimum specified in 3.11.5.

Note Although the Standard has been developed to provide for flare elevation function this function is not implemented and is not intended for future implementation

Note The M S signal format allows further system growth to include additional functions such as degrees a imuth

3.11.3.4 *Simplified M S configurations*. It shall be permissible to derive simplified configurations from the basic MLS (3.11.3.1), by relaxation of characteristics as follows:

a) an approach azimuth coverage provided in approach region (3.11.5.2.2.1.1) only;

b) an approach azimuth and elevation coverage (3.11.5.2.2 and 3.11.5.3.2) not extending below a height of 30 m (100 ft) above the threshold;

c) accuracy limits for PFE and PFN expanded to be not greater than 1.5 times the values specified in 3.11.4.9.4 for approach azimuth guidance and in 3.11.4.9.6 for elevation guidance;

d) ground equipment contribution to the mean course error and to the mean glide path error expanded to be 1.5 times the values specified in 3.11.5.2.4 and 3.11.5.3.4, respectively;

e) CMN requirements (3.11.4.9.4 and 3.11.4.9.6) waived; and

f) monitor and control action period (3.11.5.2.3 and 3.11.5.3.3) expanded to a six-second period.

Note uidance material on application of the simplified M S configurations is provided in Attachment

3.11.4 Signal-in-space characteristics — angle and data functions

3.11.4.1 *Channelling*

3.11.4.1.1 *Channel arrangement* The MLS angle and data functions shall operate on any one of the 200 channels assigned on the frequencies from 5 031.0 MHz to 5 090.7 MHz as shown in Table A.

3.11.4.1.1.1 Channel assignments in addition to those specified in 3.11.4.1.1 shall be made within the 5 030.4 to 5 150.0 MHz sub-band as necessary to satisfy future air navigation requirements.

3.11.4.1.2 *Channel pairing with DME* The channel pairing of the angle and data channel with the channel of the ranging function shall be in accordance with Table A.

3.11.4.1.3 *Fre uency tolerance* The operating radio frequency of the ground equipment shall not vary more than plus or minus 10 kHz from the assigned frequency. The frequency stability shall be such that there is no more than a plus or minus 50 Hz deviation from the nominal frequency when measured over a one-second interval.

3.11.4.1.4 *Radio fre uency signal spectrum*

3.11.4.1.4.1 The transmitted signal shall be such that, during the transmission time, the mean power density above a height of 600 m (2 000 ft) shall not exceed 94.5 dBW/m^2 for angle guidance or data signals, as measured in a 150 kHz bandwidth centred 840 kHz or more from the nominal frequency.

3.11.4.1.4.2 The transmitted signal shall be such that, during the transmission time, the mean power density beyond a distance of 4 800 m (2.6 NM) from any antennas and for a height below 600 m (2 000 ft) shall not exceed 94.5 dBW/m for angle guidance or data signals, as measured in a 150 kHz bandwidth centred 840 kHz or more from the nominal frequency.

Note Re uirements in are applicable when the operational coverage of another M S ground station has overlap with the radio hori on of the considered ground station

Note uidance material on M S fre uency planning is provided in Attachment

3.11.4.2 *Polari ation* The radio frequency transmissions from all ground equipment shall be nominally vertically polarized. The effect of any horizontally polarized component shall not cause the guidance information to change by more than 40 per cent of the PFE allowed at that location with the airborne antenna rotated 30 degrees from the vertical position or cause the PFE limit to be exceeded.

3.11.4.3 *Time division multiplex (TDM) organi ation*

3.11.4.3.1 Both angle information and data shall be transmitted by TDM on a single radio frequency channel.

3.11.4.3.2 *Synchroni ation* The transmissions from the various angle and data ground equipment serving a particular runway shall be time synchronized to assure interference-free operations on the common radio frequency channel of operation.

3.11.4.3.3 *Function rates* Each function transmitted shall be repeated at the rates shown in the following table:

Function	*Average rate ( ) measured over any second period*
Approach azimuth guidance	13 0.5
High rate approach azimuth guidance	39 1.5
Back azimuth guidance	6.5 0.25
Approach elevation guidance	39 1.5
Flare elevation guidance	39 1.5
Basic data	see Appendix A, Table A-7
Auxiliary data	see Appendix A, Tables A-10 and A-12

3.11.4.3.3.1 **Recommendation** *hen the proportional guidance sector is not greater than plus or minus degrees and a need for flare elevation or other growth functions at that facility is not anticipated the high rate approach a imuth function should be used*

Note Application information is contained in Attachment

3.11.4.3.4 *Function timing* Timing standards for each angle and data function shall be as specified in Appendix A, Tables A-1 through A-6 and A-8. The ground equipment internal timing accuracy of each listed event including jitter shall be the specified nominal value plus or minus 2 microseconds. The timing jitter shall be less than 1 microsecond root mean square (RMS).

Note The timing of each listed event indicates the beginning of the event time slot and the end of the previous event time slot The characteristics and timing of the actual transmissions are as specified in the applicable paragraphs

Note Information on the measurement of the timing accuracy is contained in Attachment

3.11.4.3.5 *Function se uence* The time interval between repetitive transmissions of any one function shall be varied in a manner which provides protection from synchronous interference.

Note Each function transmission is an independent entity which can occur in any position in the TDM se uence (with the exception that bac a imuth must be preceded by basic data word)

Note Some se uences which have demonstrated protection from synchronous interference are illustrated in Attachment

3.11.4.4 *Preamble*

3.11.4.4.1 A preamble signal shall be transmitted throughout the applicable coverage sector to identify the particular function to follow. The preamble shall consist of a radio frequency carrier acquisition period, a receiver reference time code, and a function identification code. The timing of the preamble transmissions shall be as specified in Appendix A, Table A-1.

3.11.4.4.2 *Carrier ac uisition* The preamble transmission shall begin with a period of unmodulated radio frequency carrier as specified in Appendix A, Table A-1.

3.11.4.4.3 *Modulation and coding*

3.11.4.4.3.1 *Differential phase shift eying (DPS)* The preamble codes and the basic and auxiliary data signals specified in 3.11.4.8 shall be transmitted by DPSK of the radio frequency carrier. A “zero” shall be represented by a 0 degrees plus or minus 10 degrees phase shift and a “one” shall be represented by a 180 degrees plus or minus 10 degrees phase shift. The modulation rate shall be 15 625 bauds. The internal timing accuracy of the DPSK transition shall be as specified in 3.11.4.3.4. There shall be no amplitude modulation applied during the phase transition. The transition time shall not exceed 10 microseconds, and the phase shall advance or retard monotonically throughout the transition region.

3.11.4.4.3.2 *Receiver reference time* All preambles shall contain the receiver reference time code, 11101 (bits I_1 to I_5). The time of the last phase transition midpoint in the code shall be the receiver reference time. The receiver reference time code shall be validated by decoding a valid function identification immediately following the receiver reference time code.

3.11.4.4.3.3 *Function identification* A code for function identification shall follow the receiver reference time code. This code shall consist of the five information bits (I_6 to I_{10}) allowing identification of 31 different functions, plus two parity bits (I_{11} and I_{12}) as shown in the following table:

	Code						
Function	*I*	*I*	*I*	*I*	*I*	*I*	*I*
Approach azimuth	0	0	1	1	0	0	1
High rate approach azimuth	0	0	1	0	1	0	0
Approach elevation	1	1	0	0	0	0	1
Flare elevation	0	1	1	0	0	0	1
Back azimuth	1	0	0	1	0	0	1
360 azimuth	0	1	0	0	1	0	1
Basic data 1	0	1	0	1	0	0	0
Basic data 2	0	1	1	1	1	0	0
Basic data 3	1	0	1	0	0	0	0
Basic data 4	1	0	0	0	1	0	0
Basic data 5	1	1	0	1	1	0	0
Basic data 6	0	0	0	1	1	0	1
Auxiliary data A	1	1	1	0	0	1	0
Auxiliary data B	1	0	1	0	1	1	1
Auxiliary data C	1	1	1	1	0	0	0

Note The function identification codes have been chosen so that parity bits I and I satisfy the e uations

$$I_6 \quad I_7 \quad I_8 \quad I_9 \quad I_{10} \quad I_{11} \quad \text{EVEN}$$

$$I_6 \quad I_8 \quad I_{10} \quad I_{12} \quad \text{EVEN}$$

3.11.4.5 *Angle guidance parameters* Angle guidance information shall be encoded by the amount of time separation between the centres of the received TO and FRO scanning beam main lobes. The coding shall be interpreted in the airborne equipment as a linear function of time as follows:

$$\theta \quad (T_0 \quad t)\, V/2$$

where:

θ Azimuth or elevation guidance angle in degrees

t Time separation in microseconds between TO and FRO beam centres

T_0 Time separation in microseconds between TO and FRO beam centres corresponding to zero degrees

V Scan velocity scaling constant in degrees per microsecond.

3.11.4.5.1 The values of the angle guidance parameters shall be as shown in the following table:

Function	*Maximum scan angle (degrees)*	*alue of t for maximum scan angle (s)*	*T_o (s)*	*(degrees s)*
Approach azimuth	62 to 62	13 000	6 800	0.020
High rate approach azimuth	42 to 42	9 000	4 800	0.020
Back azimuth	42 to 42	9 000	4 800	0.020
Approach elevation	1.5 to 29.5	3 500	3 350	0.020
Flare elevation	2 to 10	3 200	2 800	0.010

Note etween the end of the T scan and the beginning of the FR scan there is a pause time of no radiation of appropriate duration Additional information is provided in Attachment

Note The maximum scan angles shown recogni e that the scan angle must exceed the proportional guidance sector limit by at least one half of the width of the detected scanning beam envelope (in e uivalent angle) to allow successful decoding

3.11.4.5.2 The tolerances on the ground equipment scanning beam velocity and the time separation between TO and FRO pulses corresponding to zero degrees shall be sufficient to satisfy the accuracy requirements specified in 3.11.4.9.

3.11.4.5.3 The TO and FRO scan transmissions shall be symmetrically disposed about the mid-scan point listed in each of Tables A-2 through A-5 of Appendix A. The mid-scan point and the centre of the time interval between the TO and FRO scan transmissions shall coincide with a tolerance of plus or minus 10 microseconds.

3.11.4.6 *A imuth guidance functions*

3.11.4.6.1 Each transmission of a guidance angle shall consist of a clockwise TO scan followed by a counterclockwise FRO scan as viewed from above the antenna. For approach azimuth functions, increasing angle values shall be in the direction of the TO scan. For the back azimuth functions, increasing angle values shall be in the direction of the FRO scan.

Note A diagram illustrating the scanning conventions is provided in Attachment

3.11.4.6.2 *Sector signals* The transmission format of any azimuth function shall include time slots for airborne antenna selection, out-of-coverage indication, and test pulses as specified in Appendix A, Tables A-2 and A-3. The internal timing accuracy of the sector signals shall conform to the internal timing accuracy of the DPSK transitions specified in 3.11.4.3.4.

3.11.4.6.2.1 *round e uipment identification* The MLS providing services for a particular runway shall be identified by a four-character alphabetic designator starting with the letter M. This designator less the first letter shall be transmitted as a digital word as listed in Appendix A, Table A-7.

Note It is not re uired that M S ground e uipment will transmit identification outside the angle guidance coverage sectors If M S channel identification is operationally re uired outside angle guidance coverage sectors it may be derived from associated omnidirectional DME (See and Attachment)

3.11.4.6.2.1.1 The signal shall be transmitted on the data channel into the approach and back azimuth coverage regions.

3.11.4.6.2.1.2 The code bit in the time slot previously allocated for the alternate (Morse code) ground equipment identification following the azimuth preamble shall be fixed in the " ERO" state.

3.11.4.6.2.2 *Airborne antenna selection signal* A signal for airborne antenna selection shall be transmitted as a "zero" DPSK signal lasting for a six-bit period. The signal shall be available throughout the coverage sector in which approach or back azimuth guidance is provided.

Note The signal provides an opportunity for the selection of the most appropriate antenna in a multiple antenna airborne installation

3.11.4.6.2.3 *A imuth out of coverage indication pulses* Where out-of-coverage indication pulses are used, they shall be:

a) greater than any guidance signal in the out-of-coverage sector;

b) at least 5 dB less than the fly-left (fly-right) clearance level within the fly-left (fly-right) clearance sector; and

c) at least 5 dB less than the scanning beam level within the proportional coverage region.

The duration of each pulse measured at the half amplitude point shall be at least 100 microseconds, and the rise and fall times shall be less than 10 microseconds.

3.11.4.6.2.3.1 If desired, it shall be permissible to sequentially transmit two pulses in each out-of-coverage indication time slot. Where the pulse pairs are used, the duration of each pulse shall be at least 50 microseconds and the rise and fall times shall be less than 10 microseconds.

3.11.4.6.2.3.2 The transmissions of out-of-coverage indication pulses radiated from antennas with overlapping coverage patterns shall be separated by at least 10 microseconds.

3.11.4.6.2.4 *round radiated test signals*

Note Time has been reserved in the a imuth angle guidance signal formats for the future use of a ground radiated test signal

3.11.4.6.2.5 *Clearance guidance* Where the proportional guidance sector provided is less than the minimum coverage specified in 3.11.5.2.2.1.1 a) and 3.11.5.2.2.2 a), clearance guidance shall be provided to supplement the coverage sector by the transmission of fly-left/fly-right clearance pulses in the formats for the approach azimuth, high rate approach azimuth and back azimuth functions. Alternatively, it shall be permissible to provide clearance guidance by permitting the scanning beam to scan beyond the designated proportional guidance sector to provide fly-left or fly-right clearance information as appropriate when the decoded angle exceeds the designated limits of proportional guidance coverage.

3.11.4.6.2.5.1 Clearance guidance information shall be provided by transmitting pairs of pulses within the angle scan time slots. One pair shall consist of one pulse adjacent to the start time of the scanning beam TO scan and one pulse adjacent to the stop time of the FRO scan. A second pair shall consist of one pulse adjacent to the stop time of the scanning beam TO scan, and one pulse adjacent to the start time of the FRO scan. The fly-right clearance pulses shall represent positive angles and the fly-left clearance pulses shall represent negative angles. The duration of each clearance pulse shall be 50 microseconds with a tolerance of plus or minus 5 microseconds. The transmitter switching time between the clearance pulses and the scanning beam transmissions shall not exceed 10 microseconds. The rise time at the edge of each clearance pulse not adjacent to the scanning beam shall be less than 10 microseconds.

3.11.4.6.2.5.2 The signal-in-space characteristics of the clearance guidance pulses shall be as follows:

a) within the fly-right clearance guidance sector, the fly-right clearance guidance signal shall exceed the scanning beam side lobes and all other guidance and out-of-coverage indication signals by at least 5 dB;

b) within the fly-left clearance guidance sector, the fly-left clearance guidance signal shall exceed the scanning beam side lobes and all other guidance and out-of-coverage indication signals by at least 5 dB;

c) within the proportional guidance sector, the clearance guidance signals shall be at least 5 dB below the scanning beam main lobe.

3.11.4.6.2.5.3 The power density of the clearance signal shall be as required in 3.11.4.10.1.

Note Attachment contains guidance information on the following

a) clearance and scanning beam timing arrangements

b) pulse envelopes in the transition regions between clearance and scanning beam signals

c) clearance (fly right fly left) convention changes

Note The proportional coverage limits are transmitted in basic data as specified in

3.11.4.7 *Elevation guidance functions*

3.11.4.7.1 *Scanning conventions* For the approach elevation function, increasing elevation guidance angles shall be in the upward direction. ero elevation angle shall coincide with a horizontal plane through the respective antenna phase centre. Each guidance angle transmission shall consist of a TO scan followed by a FRO scan. The TO scan shall be in the direction of increasing angle values.

3.11.4.7.2 *Sector signal* Provision for transmission of one out-of-coverage indication pulse shall be made in the format for the approach elevation function. Where an out-of-coverage indication pulse is used, it shall be: (1) greater than any guidance signal in the out-of-coverage indication sector and (2) at least 5 dB less than the guidance signals within the guidance sector. The elevation out-of-coverage indication timing shall be as shown in Appendix A, Table A-4. The duration of each pulse measured at the half amplitude points shall be at least 100 microseconds, and the rise and fall times shall be less than 10 microseconds.

3.11.4.7.2.1 If desired, it shall be permissible to sequentially transmit two pulses in each obstacle clearance indication time slot. Where pulse pairs are used, the duration of each pulse shall be at least 50 microseconds, and the rise and fall times shall be less than 10 microseconds.

3.11.4.8 *Data functions* Provision shall be made in the MLS signal format for the transmission of basic data and auxiliary data.

Note round e uipment data coverage and monitoring re uirements are specified in

3.11.4.8.1 *Data transmission* Data shall be transmitted as specified in 3.11.4.4.3.1.

3.11.4.8.2 *asic data structure and timing* Basic data shall be encoded as 32-bit words consisting of a function preamble (12 bits) specified in 3.11.4.4, and data content as specified in Appendix A, Table A-7. The timing of the basic data words shall be as specified in Appendix A, Table A-6. The content, maximum interval between transmission of the same word and organization of the words shall be as specified in Appendix A, Table A-7. Data containing digital information shall be transmitted with the least significant bit first. The smallest binary number shall represent the lower absolute range limit with increments in binary steps to the upper absolute range limit specified in Appendix A, Table A-7.

3.11.4.8.2.1 *asic data contents* The data items specified in Appendix A, Table A-7 shall be defined as follows:

a) *Approach a imuth antenna to threshold distance* shall represent the minimum distance between the approach azimuth antenna phase centre to the vertical plane perpendicular to the centre line which contains the runway threshold.

b) *Approach a imuth proportional coverage limit* shall represent the limit of the sector in which proportional approach azimuth guidance is transmitted.

c) *Clearance signal type* shall indicate the method of providing the azimuth clearance signal.

d) *Minimum glide path* shall represent the lowest angle of descent along the zero-degree azimuth as defined in 3.11.1.

e) *ac a imuth status* shall represent the operational status of the back azimuth equipment.

f) *DME status* shall represent the operational status of the DME equipment.

g) *Approach a imuth status* shall represent the operational status of the approach azimuth equipment.

h) *Approach elevation status* shall represent the operational status of the approach elevation equipment.

i) *eamwidth* shall represent, for a particular function, the antenna beamwidth as defined in 3.11.1.

j) *DME distance* shall represent the minimum distance between the DME antenna phase centre and the vertical plane perpendicular to the runway centre line which contains the MLS datum point.

k) *Approach a imuth magnetic orientation* shall represent the angle measured in the horizontal plane clockwise from Magnetic North to the zero-degree approach azimuth, originating from the approach azimuth antenna. The vertex of the measured angle shall be the approach azimuth antenna phase centre.

l) *ac a imuth magnetic orientation* shall represent the angle measured in the horizontal plane clockwise from Magnetic North to the zero-degree back azimuth, originating from the back azimuth antenna. The vertex of the measured angle shall be the back azimuth antenna phase centre.

m) *ac a imuth proportional coverage limit* shall represent the limit of the sector in which proportional back azimuth guidance is transmitted.

n) *M S ground e uipment identification* shall represent the last three characters of the system identification specified in 3.11.4.6.2.1. The characters shall be encoded in accordance with International Alphabet No. 5 (IA-5) using bits b_1 through b_6.

Note International Alphabet No (IA) is defined in Annex olume III

Note it b of this code may be reconstructed in the airborne receiver by ta ing the complement of bit b

3.11.4.8.3 *Auxiliary data organi ation and timing* Auxiliary data shall be organized into 76-bit words consisting of the function preamble (12 bits) as specified in 3.11.4.4, the address (8 bits) as specified in Appendix A, Table A9, and data content and parity (56 bits) as specified in Appendix A, Tables A-10, A-11, A-12, A-13 and A-15. Three function identification codes are reserved to indicate transmission of auxiliary data A, auxiliary data B and auxiliary data C. The timing of the auxiliary data function shall be as specified in Appendix A, Table A-8. Two auxiliary data word formats shall be provided, one for digital data and one for alphanumeric character data. Data containing digital information shall be transmitted with the least significant bit first. Alpha characters in data words B1 through B39 shall be encoded in accordance with International Alphabet No. 5 (IA5) using bits b_1 to b_5 with b_1 transmitted first. Alphanumeric data characters in other data words shall be encoded in accordance with IA-5 using seven information bits, plus one even parity bit added to each character. Alphanumeric data shall be transmitted in the order in which they are to be read. The serial transmission of a character shall be with the lower order bit transmitted first and the parity bit transmitted last.

Note International Alphabet No (IA) is defined in Annex olume III

Note Auxiliary data A contents are specified in Auxiliary data contents are specified in Auxiliary data C contents are reserved for national use

3.11.4.8.3.1 *Auxiliary data A content* The data items contained in auxiliary data words A1 through A4 as specified in Appendix A, Table A-10 shall be defined as follows:

a) *Approach a imuth antenna offset* shall represent the minimum distance between the approach azimuth antenna phase centre and a vertical plane containing the runway centre line.

b) *Approach a imuth antenna to M S datum point distance* shall represent the minimum distance between the approach azimuth antenna phase centre and the vertical plane perpendicular to the runway centre line which contains the MLS datum point.

c) *Approach a imuth alignment with runway centre line* shall represent the minimum angle between the zero-degree approach azimuth and the runway centre line.

d) *Approach a imuth antenna coordinate system* shall represent the coordinate system (planar or conical) of the angle data transmitted by the approach azimuth antenna.

Note Although the above Standard has been developed to provide for alternate coordinate systems the planar coordinate system is not implemented and it is not intended for future implementation

e) *Approach a imuth antenna height* shall represent the vertical location of the antenna phase centre with respect to the MLS datum point.

f) *Approach elevation antenna offset* shall represent the minimum distance between the elevation antenna phase centre and a vertical plane containing the runway centre line.

g) *M S datum point to threshold distance* shall represent the distance measured along the runway centre line from the MLS datum point to the runway threshold.

h) *Approach elevation antenna height* shall represent the vertical location of the elevation antenna phase centre with respect to the MLS datum point.

i) *M S datum point elevation* shall represent the datum point elevation relative to mean sea level (msl).

j) *Runway threshold height* shall represent the vertical location of the intersection of the runway threshold and centre line with respect to the MLS datum point.

k) *DME offset* shall represent the minimum distance between the DME antenna phase centre and a vertical plane containing the runway centre line.

l) *DME to M S datum point distance* shall represent the minimum distance between the DME antenna phase centre and the vertical plane perpendicular to the runway centre line which contains the MLS datum point.

m) *DME antenna height* shall represent the vertical location of the antenna phase centre with respect to the MLS datum point.

n) *Runway stop end distance* shall represent the distance along centre line between the runway stop-end and the MLS datum point.

o) *ac a imuth antenna offset* shall represent the minimum distance between the back azimuth antenna phase centre and a vertical plane containing the runway centre line.

p) *ac a imuth to M S datum point distance* shall represent the minimum distance between the back azimuth antenna and the vertical plane perpendicular to the runway centre line which contains the MLS datum point.

q) *ac a imuth alignment with runway centre line* shall represent the minimum angle between the zero-degree back azimuth and the runway centre line.

r) *ac a imuth antenna coordinate system* shall represent the coordinate system (planar or conical) of the angle data transmitted by the back azimuth antenna.

Note Although the above Standard has been developed to provide for alternate coordinate systems the planar coordinate system is not implemented and it is not intended for future implementation

s) *ac a imuth antenna height* shall represent the vertical location of the antenna phase centre with respect to the MLS datum point.

Note It is intended that no additional auxiliary data A words be defined

3.11.4.8.3.2 *Auxiliary data content* Auxiliary data B words shall be defined as specified in Appendix A, Tables A-11 and A-13.

3.11.4.8.3.2.1 *Microwave landing system area navigation (M S RNA) procedure data* Where required, auxiliary data words B1 through B39 shall be used to transmit data to support MLS/RNAV procedures. It shall be permissible to divide this procedure data into two separate databases: one for transmission in the approach azimuth sector, the other for transmission in the back azimuth sector. Data for each procedure shall be transmitted in the database for the coverage sector in which the procedure commences. Missed approach procedure data shall be included in the database containing the associated approach procedure.

3.11.4.8.3.2.2 *Procedure database structure* Where used, each procedure database shall be constructed as follows:

a) a map/CRC word shall identify the size of the database, the number of procedures defined, and the cyclic redundancy check (CRC) code for validation of the database;

b) procedure descriptor words shall identify all named approach and departure procedures within the database; and

c) way-point data words shall define the location and sequence of way-points for the procedures.

Note The structure and coding of auxiliary words through are defined in Appendix A Tables A through A uidance material concerning the coding of M S RNA procedures is given in Attachment

3.11.4.9 *System accuracy* The accuracy standards specified herein shall be met on a 95 per cent probability basis unless otherwise stated.

Note The overall error limits include errors from all causes such as those from airborne e uipment ground e uipment and propagation effects

Note It is intended that the error limits are to be applied over a flight path interval that includes the approach reference datum or bac a imuth reference datum Information on the interpretation of M S errors and the measurement of these errors over an interval appropriate for flight inspection is provided in Attachment

Note To determine the allowable errors for degradation allowances at points other than the appropriate reference datum the accuracy specified at the reference datum should first be converted from its linear value into its e uivalent angular value with an origin at the antenna

3.11.4.9.1 *M S approach reference datum* The height of the MLS approach reference datum shall be 15 m (50 ft). A tolerance of plus 3 m (10 ft) shall be permitted.

Note The operational objective of defining the height of the M S approach reference datum is to ensure safe guidance over obstructions and also safe and efficient use of the runway served The heights noted in assume Code or Code runways as defined by Annex

Note At the same time the reference datum is to provide a convenient point at which the accuracy and other parameters of the function may be specified

Note In arriving at the above height values for the M S approach reference datum a maximum vertical distance of m (ft) between the path of the aircraft M S antenna selected for final approach and the path of the lowest part of the wheels at the threshold was assumed For aircraft exceeding this criterion appropriate steps may have to be ta en either to maintain ade uate clearance at threshold or to adjust the permitted operating minima

3.11.4.9.2 *M S bac a imuth reference datum* The height of the MLS back azimuth reference datum shall be 15 m (50 ft). A tolerance of plus 3 m (10 ft) shall be permitted.

Note The objective of defining the M S bac a imuth reference datum is to provide a convenient point at which the accuracy and other parameters of the function may be specified

3.11.4.9.3 The PFE shall be comprised of those frequency components of the guidance signal error at the output of the airborne receiver which lie below 0.5 rad/s for azimuth guidance information or below 1.5 rad/s for elevation guidance information. The control motion noise shall be comprised of those frequency components of the guidance signal error at the output of the airborne receiver which lie above 0.3 rad/s for azimuth guidance or above 0.5 rad/s for elevation guidance information. The output filter corner frequency of the receiver used for this measurement is 10 rad/s.

3.11.4.9.4 *Approach a imuth guidance functions* At the approach reference datum, the approach azimuth function shall provide performance as follows:

a) the PFE shall not be greater than plus or minus 6 m (20 ft);

b) the PFN shall not be greater than plus or minus 3.5 m (11.5 ft);

c) the CMN shall not be greater than plus or minus 3.2 m (10.5 ft) or 0.1 degree, whichever is less.

3.11.4.9.4.1 **Recommendation** *At the approach reference datum the PFE should not be greater than plus or minus m (ft)*

3.11.4.9.4.2 The linear accuracy specified at the reference datum shall be maintained throughout the runway coverage region specified in 3.11.5.2.2.1.2 except where degradation is allowed as specified in 3.11.4.9.4.3.

3.11.4.9.4.3 *Degradation allowance* The approach azimuth angular PFE, PFN and CMN shall be allowed to degrade linearly to the limits of coverage as follows:

a) *ith distance* The PFE limit and PFN limit, expressed in angular terms at 37 km (20 NM) from the runway threshold along the extended runway centre line, shall be 2 times the value specified at the approach reference datum. The CMN limit shall be 0.1 degree at 37 km (20 NM) from the approach reference datum along the extended runway centre line at the minimum glide path angle.

b) *ith a imuth angle* The PFE limit and PFN limit, expressed in angular terms at plus or minus 40 degrees azimuth angle, shall be 1.5 times the value on the extended runway centre line at the same distance from the approach reference datum. The CMN limit, expressed in angular terms at plus or minus 40 degrees azimuth angle is 1.3 times the value on the extended runway centre line at the same distance from the approach reference datum.

c) *ith elevation angle* The PFE limit and PFN limit shall not degrade up to an elevation angle of 9 degrees. The PFE limit and PFN limit, expressed in angular terms at an elevation angle of 15 degrees from the approach azimuth antenna phase centre, shall be 2 times the value permitted below 9 degrees at the same distance from the approach reference datum and the same azimuth angle. The CMN limit shall not degrade with elevation angle.

d) *Maximum CMN* The CMN limits shall not exceed 0.2 degree in any region of coverage.

3.11.4.9.4.3.1 **Recommendation** *The CMN should not exceed degree in any region of coverage*

3.11.4.9.4.4 *Maximum angular PFE and PFN* In any region within coverage, the angular error limits shall be as follows:

a) the PFE shall not exceed plus or minus 0.25 degree; and

b) the PFN shall not exceed plus or minus 0.15 degree.

3.11.4.9.5 *ac a imuth guidance function* At the back azimuth reference datum, the back azimuth function shall provide performance as follows:

a) the PFE shall not be greater than plus or minus 6 m (20 ft);

b) the PFN component shall not be greater than plus or minus 3.5 m (11.5 ft);

c) the CMN shall not be greater than plus or minus 3.2 m (10.5 ft) or 0.1 degree, whichever is less.

3.11.4.9.5.1 *Degradation allowance* The back azimuth angular PFE, PFN and CMN shall be allowed to degrade linearly to the limits of coverage as follows:

a) *ith distance* The PFE limit and PFN limit, expressed in angular terms at the limit of coverage along the extended runway centre line, shall be 2 times the value specified at the back azimuth reference datum. The CMN limit, expressed in angular terms at 18.5 km (10 NM) from the runway stop end along the extended runway centre line, shall be 1.3 times the value specified at the back azimuth reference datum.

b) *ith a imuth angle* The PFE limit and PFN limit, expressed in angular terms at plus or minus 20 degrees azimuth angle, shall be 1.5 times the value on the extended runway centre line at the same distance from the back azimuth reference datum. The CMN limit, expressed in angular terms at plus or minus 20 degrees azimuth angle, shall be 1.3 times the value on the extended runway centre line at the same distance from the back azimuth reference datum.

c) *ith elevation angle* The PFE limit and PFN limit shall not degrade up to an elevation angle of 9 degrees. The PFE limit and PFN limit, expressed in angular terms at an elevation angle of 15 degrees from the back azimuth antenna phase centre, shall be 2 times the value permitted below 9 degrees at the same distance from the back azimuth reference datum and the same azimuth angle. The CMN limit shall not degrade with elevation angle.

d) *Maximum CMN* The CMN limits shall not exceed 0.2 degree in any region of coverage.

3.11.4.9.5.2 *Maximum angular PFE and PFN* In any region within coverage, the angular error limits shall be as follows:

a) the PFE shall not exceed plus or minus 0.50 degree; and

b) the PFN shall not exceed plus or minus 0.30 degree.

3.11.4.9.6 *Elevation guidance function* For equipment sited to provide a minimum glide path of nominally 3 degrees or lower, the approach elevation function shall provide performance at the approach reference datum as follows:

a) the PFE shall not be greater than plus or minus 0.6 m (2 ft);

b) the PFN shall not be greater than plus or minus 0.4 m (1.3 ft);

c) the CMN shall not be greater than plus or minus 0.3 m (1 ft).

3.11.4.9.6.1 *Degradation allowance* The approach elevation angular PFE, PFN and CMN shall be allowed to degrade linearly to the limits of coverage as follows:

a) *ith distance* The PFE limit and PFN limit, expressed in angular terms at 37 km (20 NM) from the runway threshold on the minimum glide path, shall be 0.2 degree. The CMN limit shall be 0.1 degree at 37 km (20 NM) from the approach reference datum along the extended runway centre line at the minimum glide path angle.

b) *ith a imuth angle* The PFE limit and PFN limit, expressed in angular terms at plus or minus 40 degrees azimuth angle, shall be 1.3 times the value on the extended runway centre line at the same distance from the approach reference datum. The CMN limit, expressed in angular terms at plus or minus 40 degrees azimuth angle, shall be 1.3 times the value on the extended runway centre line at the same distance from the approach reference datum.

c) *ith elevation angle* For elevation angles above the minimum glide path or 3 degrees, whichever is less and up to the maximum of the proportional guidance coverage and at the locus of points directly above the approach reference datum the PFE limit, PFN limit and the CMN limit expressed in angular terms shall be allowed to degrade linearly such that at an elevation angle of 15 degrees the limits are 2 times the value specified at the reference datum. In no case shall the CMN directly above the reference datum exceed plus or minus 0.07 degree. For other regions of coverage within the angular sector from an elevation angle equivalent to the minimum glide path up to the maximum angle of proportional coverage, the degradations with distance and azimuth angle specified in a) and b) shall apply.

d) The PFE, PFN and CMN limits shall not degrade with elevation angle in the region between the minimum glide path and 60 per cent of the minimum glide path. For elevation angles below 60 per cent of the minimum glide path and down to the limit of coverage specified in 3.11.5.3.2.1.2, and at the locus of points directly below the approach reference datum the PFE limit, the PFN limit and the CMN limit expressed in angular terms, shall be allowed to increase linearly to 6 times the value at the approach reference datum. For other regions of coverage within the angular sector from an elevation angle equivalent to 60 per cent of the minimum glide path angle value, and down to the limit of coverage, the degradation with distance and azimuth angle specified in a) and b) shall apply. In no case shall the PFE be allowed to exceed 0.8 degree, or the CMN be allowed to exceed 0.4 degree.

e) *Maximum CMN* For elevation angles above 60 per cent of the minimum glide path, the CMN limits shall not exceed 0.2 degree in any region of coverage.

3.11.4.9.6.2 *Maximum angular PFE and PFN* In any region within coverage, the angular error limits for elevation angles above 60 per cent of the minimum glide path shall be as follows:

a) the PFE shall not exceed plus or minus 0.25 degree; and

b) the PFN shall not exceed plus or minus 0.15 degree.

3.11.4.9.6.3 **Recommendation** *The limit expressed in angular terms on the linear degradation of the PFE limit the PFN limit and the CMN limit at angles below per cent of the minimum glide path and down to the limit of coverage should be times the value permitted at the approach reference datum*

Note For other regions of coverage within the angular sector from an elevation angle e uivalent to per cent of the minimum glide path and down to the limit of coverage the degradation with distance and a imuth angle specified in a) and b) applies

3.11.4.9.6.4 **Recommendation** Maximum CMN. *For elevation angles above per cent of the minimum glide path the CMN limits should not exceed degree in any region of coverage*

3.11.4.9.6.5 **Recommendation** *The PFE should not exceed degree and the CMN should not exceed degree*

3.11.4.9.6.6 Approach elevation equipment sited to provide a minimum glide path higher than 3 degrees shall provide angular accuracies not less than those specified for equipment sited for a 3-degree minimum glide path within the coverage volume.

3.11.4.10 *Power density*

3.11.4.10.1 The power density for DPSK, clearance and angle guidance signals shall be at least the values shown in the following table under all operational weather conditions at any point within coverage except as specified in 3.11.4.10.2.

Function	*DPS signals (d m)*	*Angle signals (d m) (antenna beamwidth)*			*Clearance signals (d m)*
Approach azimuth guidance	89.5	85.7	79.7	76.2	88.0
High rate approach azimuth guidance	89.5	88.0	84.5	81.0	88.0
Back azimuth guidance	89.5	88.0	82.7	79.2	88.0
Approach elevation guidance	89.5	88.0	84.5	N/A	N/A

N/A not applicable

Note The table above specifies the minimum power densities for clearance signals and scanning beam signals The relative values of the two signals are specified in

3.11.4.10.2 The power density of the approach azimuth angle guidance signals shall be greater than that specified in 3.11.4.10.1 by at least:

a) 15 dB at the approach reference datum;

b) 5 dB for one degree or 9 dB for 2 degree or larger beamwidth antennas at 2.5 m (8 ft) above the runway surface, at the MLS datum point, or at the farthest point of the runway centre line which is in line of sight of the azimuth antenna.

Note Near the runway surface the approach a imuth e uipment will normally provide power densities higher than those specified for angle signals in to support auto land operations Attachment provides guidance as regards antenna beamwidth and power budget considerations

Note The specifications for coverage in and ma e provision for difficult ground e uipment siting conditions in which it may not be feasible to provide the power density specified in

3.11.5 Ground equipment characteristics

3.11.5.1 *Synchroni ation and monitoring* The synchronization of the time-division-multiplexed angle guidance and data transmissions which are listed in 3.11.4.3.3 shall be monitored.

Note Specific monitoring re uirements for various M S functions are specified in and

3.11.5.1.1 *Residual radiation of M S functions* The residual radiation of an MLS function at times when another function is radiating shall be at least 70 dB below the level provided when transmitting.

Note The acceptable level of residual radiation for a particular function is that level which has no adverse effect on the reception of any other function and is dependent upon e uipment siting and aircraft position

3.11.5.2 *A imuth guidance e uipment*

3.11.5.2.1 *Scanning beam characteristics* Azimuth ground equipment antennas shall produce a fan-shaped beam which is narrow in the horizontal plane, broad in the vertical plane and which is scanned horizontally between the limits of the proportional guidance sector.

3.11.5.2.1.1 *Coordinate system* Azimuth guidance information shall be radiated in either conical or planar coordinates.

3.11.5.2.1.2 *Antenna beamwidth* The antenna beamwidth shall not exceed 4 degrees.

Note It is intended that the detected scanning beam envelope throughout the coverage should not exceed microseconds (e uivalent to a beamwidth of degrees) in order to ensure proper angle decoding by the airborne e uipment

3.11.5.2.1.3 *Scanning beam shape* The minus 10-dB points on the beam envelope shall be displaced from the beam centre by at least 0.76 beamwidth, but not more than 0.96 beamwidth.

Note The beam shape described applies on boresight in a multipath free environment using a suitable filter Information on beam shape and side lobes is provided in Attachment and

3.11.5.2.2 *Coverage*

Note Diagrams illustrating the coverage re uirements specified herein are contained in Attachment Figures A and

3.11.5.2.2.1 *Approach a imuth* The approach azimuth ground equipment shall provide guidance information in at least the following volumes of space:

3.11.5.2.2.1.1 *Approach region*

a) Laterally, within a sector of 80 degrees (normally plus and minus 40 degrees about the antenna boresight) which originates at the approach azimuth antenna phase centre.

b) Longitudinally, from the approach azimuth antenna to 41.7 km (22.5 NM).

c) Vertically, between:

1) a lower conical surface originating at the approach azimuth antenna phase centre and inclined upward to reach, at the longitudinal coverage limit, a height of 600 m (2 000 ft) above the horizontal plane which contains the antenna phase centre; and

2) an upper conical surface originating at the approach azimuth antenna phase centre inclined at 15 degrees above the horizontal to a height of 6 000 m (20 000 ft).

Note here intervening obstacles penetrate the lower surface it is intended that guidance need not be provided at less than line of sight heights

Note here it is determined that misleading guidance information exists outside the promulgated coverage sector and appropriate operational procedures cannot provide an acceptable solution techni ues to minimi e the effects are available These techni ues include adjustment of the proportional guidance sector or use of out of coverage indication signals uidance material on the use of these techni ues is contained in Attachment

Note here the proportional guidance sector provided is less than the minimum lateral coverage specified in a) clearance guidance signals specified in are re uired

3.11.5.2.2.1.2 *Runway region*

a) Horizontally within a sector 45 m (150 ft) each side of the runway centre line beginning at the stop end and extending parallel with the runway centre line in the direction of the approach to join the minimum operational coverage region as described in 3.11.5.2.2.1.3.

b) Vertically between:

1) a horizontal surface which is 2.5 m (8 ft) above the farthest point of the runway centre line which is in line of sight of the azimuth antenna; and

2) a conical surface originating at the azimuth ground equipment antenna inclined at 20 degrees above the horizontal up to a height of 600 m (2 000 ft).

Note Information on the determination of the point referred to in b)) is given in Attachment

Note It is intended that guidance below the line of sight may be allowed as long as the signal uality can satisfy the accuracy re uirements in

3.11.5.2.2.1.2.1 **Recommendation** *The lower level of the coverage in the runway region should be m (ft) above the runway centre line*

3.11.5.2.2.1.2.2 Where required to support automatic landing, roll-out or take-off, the lower level of coverage in the runway region shall not exceed 2.5 m (8 ft) above the runway centre line.

Note The lower coverage limit of m (ft) is intended to serve all runways Information on the possibility of relaxing the power density re uirements in at m (ft) is provided at Attachment

3.11.5.2.2.1.3 *Minimum operational coverage region*

a) Laterally, within a sector of plus and minus 10 degrees about the runway centre line which originates at the MLS datum point.

b) Longitudinally, from the runway threshold in the direction of the approach to the longitudinal coverage limit specified in 3.11.5.2.2.1.1 b).

c) Vertically, between:

1) a lower plane which contains the line 2.5 m (8 ft) above the runway threshold and is inclined upward to reach the height of the surface specified in 3.11.5.2.2.1.1 c) 1) at the longitudinal coverage limit; and

2) the upper surface specified in 3.11.5.2.2.1.1 c) 2).

3.11.5.2.2.1.4 **Recommendation** *The approach a imuth ground e uipment should provide guidance vertically to degrees above the hori ontal*

3.11.5.2.2.1.5 The minimum proportional guidance sector shall be as follows:

Approach azimuth antenna to threshold distance (AAT)	Minimum proportional coverage
AAT 500 m	8
500 m AAT 3 100 m	6
3 100 m AAT	4

3.11.5.2.2.2 *ac a imuth* The back azimuth ground equipment shall provide information in at least the following volume of space:

a) Horizontally, within a sector plus or minus 20 degrees about the runway centre line originating at the back azimuth ground equipment antenna and extending in the direction of the missed approach at least 18.5 km (10 NM) from the runway stop end.

b) Vertically, in the runway region between:

1) a horizontal surface 2.5 m (8 ft) above the farthest point of runway centre line that is in line-of-sight of the back azimuth antenna; and

2) a conical surface originating at the back azimuth ground equipment antenna inclined at 20 degrees above the horizontal up to a height of 600 m (2 000 ft).

c) Vertically, in the back azimuth region between:

1) a conical surface originating 2.5 m (8 ft) above the runway stop end, inclined at 0.9 degree above the horizontal; and

2) a conical surface originating at the back azimuth ground equipment antenna, inclined at 15 degrees above the horizontal up to a height of 3 000 m (10 000 ft).

Note Information on the determination of the point referred to in b)) is given in Attachment

Note hen physical characteristics of the runway or obstacles prevent the achievement of the Standards in b) and c) it is intended that guidance need not be provided at less than line of sight heights

3.11.5.2.2.2.1 **Recommendation** *The bac a imuth facility should provide guidance information to degrees above the hori ontal*

3.11.5.2.2.2.2 The minimum proportional guidance sector shall be plus or minus 10 degrees about the runway centre line.

Note Application information is provided in Attachment

3.11.5.2.3 *Monitor and control*

3.11.5.2.3.1 The approach azimuth and back azimuth monitor systems shall cause the radiation of their respective functions to cease and a warning shall be provided at the designated control points if any of the following conditions persist for longer than the periods specified:

a) there is a change in the ground equipment contribution to the mean course error such that the PFE at the approach reference datum or in the direction of any azimuth radial exceeds the limits specified in 3.11.4.9.4 and 3.11.4.9.5 and (for simplified MLS configuration) in 3.11.3.4 for a period of more than one second or (for simplified MLS configuration) for a period of more than six seconds;

b) there is a reduction in the radiated power to less than that necessary to satisfy the requirements specified in 3.11.4.10.1 and 3.11.4.6.2.5.2 for a period of more than one second;

c) there is an error in the preamble DPSK transmissions which occurs more than once in any one-second period;

d) there is an error in the TDM synchronization of a particular azimuth function such that the requirement specified in 3.11.4.3.2 is not satisfied, and this condition persists for more than one second.

Note uidance material is provided in Attachment

3.11.5.2.3.2 Design and operation of the monitor system shall cause radiation to cease and a warning shall be provided at the designated control points in the event of failure of the monitor system itself.

3.11.5.2.3.3 The period during which erroneous guidance information is radiated, including period(s) of zero radiation, shall not exceed the periods specified in 3.11.5.2.3.1. Attempts to clear a fault by resetting the primary ground equipment or by switching to standby ground equipment shall be completed within this time. If the fault is not cleared within the time allowed, the radiation shall cease. After shutdown, no attempt shall be made to restore service until a period of 20 seconds has elapsed.

3.11.5.2.4 *Integrity and continuity of service re uirements for M S a imuth*

3.11.5.2.4.1 The probability of not radiating false guidance signals shall not be less than 1 0.5 10 ^{9} in any one landing for an MLS azimuth intended to be used for Categories II and III operations.

3.11.5.2.4.2 **Recommendation** *The probability of not radiating false guidance signals should not be less than in any one landing for an M S a imuth intended to be used for Category I operations*

3.11.5.2.4.3 The probability of not losing the radiated guidance signal shall be greater than:

a) 1 2 10 ^{6} in any period of 15 seconds for an MLS azimuth intended to be used for Category II or Category IIIA operations (equivalent to 2 000 hours mean time between outages); and

b) 1 2 10 ^{6} in any period of 30 seconds for an MLS azimuth intended to be used for the full range of Category III operations (equivalent to 4 000 hours mean time between outages).

3.11.5.2.4.4 **Recommendation** *The probability of not losing the radiated guidance signal should exceed in any period of seconds for an M S a imuth intended to be used for Category I operations (e uivalent to hours mean time between outages)*

Note uidance material on integrity and continuity of service is given in Attachment

3.11.5.2.5 *round e uipment accuracy*

3.11.5.2.5.1 The ground equipment contribution to the mean course error shall not exceed an error equivalent to plus or minus 3 m (10 ft) at the MLS approach reference datum.

3.11.5.2.5.2 **Recommendation** *The ground e uipment contribution to the CMN at the reference datum should not exceed m (ft) or degree whichever is less on a per cent probability basis*

Note This is the e uipment error and does not include any propagation effects

Note uidance on the measurement of this parameter can be found in Attachment

3.11.5.2.6 *Siting*

Note It is not intended to restrict the installation of M S when it is not possible to site the a imuth ground e uipment on the extension of the runway centre line

Note uidance material on critical and sensitive areas for a imuth antennas is provided in Attachment

3.11.5.2.6.1 Normally, the approach azimuth ground equipment antenna shall be located on the extension of the runway centre line beyond the stop end and shall be adjusted so that the vertical plane containing the zero degree course line will contain the MLS approach reference datum. Siting of the antenna shall be consistent with safe obstacle clearance SARPs in Annex 14.

3.11.5.2.6.2 The back azimuth ground equipment antenna shall normally be located on the extension of the runway centre line at the threshold end, and the antenna shall be adjusted so that the vertical plane containing the zero degree course line will contain the back azimuth reference datum.

3.11.5.3 *Elevation guidance e uipment*

3.11.5.3.1 *Scanning beam characteristics* The elevation ground equipment antenna shall produce a fan-shaped beam that is narrow in the vertical plane, broad in the horizontal plane and which is scanned vertically between the limits of the proportional guidance sector.

3.11.5.3.1.1 *Coordinate system* Approach elevation guidance information shall be radiated in conical coordinates.

3.11.5.3.1.2 *Antenna beamwidth* The antenna beamwidth shall not exceed 2.5 degrees.

3.11.5.3.1.3 *Scanning beam shape* The minus 10-dB points on the beam envelope shall be displayed from the centre line by at least 0.76 beamwidth but not more than 0.96 beamwidth.

Note The beam shape described applies on boresight in a multipath free environment using a suitable filter Information on beam shape and side lobes is provided in Attachment and

3.11.5.3.2 *Coverage*

Note Diagrams illustrating the coverage re uirements specified herein are contained in Attachment Figure A

3.11.5.3.2.1 *Approach elevation* The approach elevation ground equipment shall provide proportional guidance information in at least the following volume of space.

3.11.5.3.2.1.1 *Approach region*

a) Laterally, within a sector originating at the elevation antenna phase centre which has an angular extent at least equal to the proportional guidance sector provided by the approach azimuth ground equipment at the longitudinal coverage limit.

b) Longitudinally, from the elevation antenna in the direction of the approach to 37 km (20 NM) from threshold.

c) Vertically, between:

   1) a lower conical surface originating at the elevation antenna phase centre and inclined upward to reach, at the longitudinal coverage limit, a height of 600 m (2 000 ft) above the horizontal plane which contains the antenna phase centre; and

   2) an upper conical surface originating at the elevation antenna phase centre and inclined 7.5 degrees above the horizontal up to a height of 6 000 m (20 000 ft).

Note hen the physical characteristics of the approach region prevent the achievement of the Standards under a) b) and c)) it is intended that guidance need not be provided below the line of sight

3.11.5.3.2.1.1.1 **Recommendation** *The approach elevation ground e uipment should provide proportional guidance to angles greater than degrees above the hori ontal when necessary to meet operational re uirements*

3.11.5.3.2.1.2 *Minimum operational coverage region*

a) Laterally, within a sector originating at the MLS datum point, of plus and minus 10 degrees about the runway centre line;

b) Longitudinally, 75 m (250 ft) from the MLS datum point in the direction of threshold, to the far coverage limit specified in 3.11.5.3.2.1.1 b);

c) Vertically, between the upper surface specified in 3.11.5.3.2.1.1 c) 2), and the higher of:

   1) a surface which is the locus of points 2.5 m (8 ft) above the runway; or

   2) a plane originating at the MLS datum point and inclined upward to reach, at the longitudinal coverage limit, the height of the surface specified in 3.11.5.3.2.1.1 c) 1).

Note Information related to the hori ontal radiation pattern of the approach elevation is provided in Attachment

3.11.5.3.3 *Monitor and control*

3.11.5.3.3.1 The approach elevation monitor system shall cause the radiation of its respective functions to cease and a warning shall be provided at the designated control point if any of the following conditions persist for longer than the periods specified:

a) there is a change in the ground equipment contribution to the mean glide path error component such that the PFE at the approach reference datum or on any glide path consistent with published approach procedures exceeds the limits specified in 3.11.4.9.6 and (for simplified MLS configuration) in 3.11.3.4 for a period of more than one second or (for simplified MLS configuration) for a period of more than six seconds;

b) there is a reduction in the radiated power to less than that necessary to satisfy the requirements specified in 3.11.4.10.1 for a period of more than one second;

c) there is an error in the preamble DPSK transmissions which occurs more than once in any one-second period;

d) there is an error in the TDM synchronization of a particular elevation function such that the requirement specified in 3.11.4.3.2 is not satisfied and this condition persists for more than one second.

Note uidance material is provided in Attachment

3.11.5.3.3.2 Design and operation of the monitor system shall cause radiation to cease and a warning shall be provided at the designated control points in the event of failure of the monitor system itself.

3.11.5.3.3.3 The period during which erroneous guidance information is radiated, including period(s) of zero radiation, shall not exceed the periods specified in 3.11.5.3.3.1. Attempts to clear a fault by resetting the primary ground equipment or by switching to standby ground equipment shall be completed within this time. If the fault is not cleared within the time allowed, radiation shall cease. After shutdown, no attempt shall be made to restore service until a period of 20 seconds has elapsed.

3.11.5.3.4 *Integrity and continuity of service re uirements for M S approach elevation*

3.11.5.3.4.1 The probability of not radiating false guidance signals shall not be less than 1 0.5 10 ^{9} in any one landing for an MLS approach elevation intended to be used for Categories II and III operations.

3.11.5.3.4.2 **Recommendation** *The probability of not radiating false guidance signals should not be less than in any one landing on M S approach elevation intended to be used for Category I operations*

3.11.5.3.4.3 The probability of not losing the radiated guidance signal shall be greater than 1 2 10 ^{6} in any period of 15 seconds for an MLS approach elevation intended to be used for Categories II and III operations (equivalent to 2 000 hours mean time between outages).

3.11.5.3.4.4 **Recommendation** *The probability of not losing the radiated guidance signal should exceed in any period of seconds for an M S approach elevation intended to be used for Category I operations (e uivalent to hours mean time between outages)*

Note uidance material on integrity and continuity of service is given in Attachment

3.11.5.3.5 *round e uipment accuracy*

3.11.5.3.5.1 The ground equipment contribution to the mean glide path error component of the PFE shall not exceed an error equivalent to plus or minus 0.3 m (1 ft) at the approach reference datum.

3.11.5.3.5.2 **Recommendation** *The ground e uipment contribution to the CMN at the reference datum should not exceed m (ft) on a per cent probability basis*

Note This is the e uipment error and does not include any propagation effects

Note uidance on the measurement of this parameter can be found in Attachment

3.11.5.3.6 *Siting*

Note uidance material on critical areas for elevation antennas is provided in Attachment

3.11.5.3.6.1 The approach elevation ground equipment antenna shall be located beside the runway. Siting of the antennas shall be consistent with obstacle clearance Standards and Recommended Practices in Annex 14.

3.11.5.3.6.2 The approach elevation ground equipment antenna shall be sited so that the asymptote of the minimum glide path crosses the threshold at the MLS approach reference datum.

3.11.5.3.6.2.1 **Recommendation** *The minimum glide path angle is normally degrees and should not exceed degrees except where alternative means of satisfying obstacle clearance re uirements are impractical*

Note It is intended that the choice of a minimum glide path angle higher than degrees be determined by operational rather than technical factors

3.11.5.3.6.2.2 **Recommendation** *The approach elevation ground e uipment antenna should be sited so that the height of the point which corresponds to the decoded guidance signal of the minimum glide path above the threshold does not exceed m (ft)*

Note The offset of the elevation antenna from the runway centre line will cause the minimum glide path elevation guidance to be above the approach reference datum

3.11.5.3.6.3 **Recommendation** *hen I S and M S simultaneously serve the same runway the I S reference datum and the M S approach reference datum should coincide within a tolerance of m (ft)*

Note It is intended that this recommendation would apply only if the I S reference datum satisfies the height specifications in and

Note Information related to collocated M S I S siting is provided in Attachment

3.11.5.4 *Data coverage and monitoring*

Note uidance material relating to data applications is provided in Attachment

Note The essential data are basic data and essential auxiliary data transmitted in auxiliary data words A A A and A

3.11.5.4.1 *asic data*

3.11.5.4.1.1 The basic data words 1, 2, 3, 4 and 6 shall be transmitted throughout the approach azimuth coverage sector.

Note The composition of the basic data words is given in Appendix A Table A

3.11.5.4.1.2 Where the back azimuth function is provided, basic data words 4, 5 and 6 shall be transmitted throughout the approach azimuth and back azimuth coverage sectors.

3.11.5.4.2 *Auxiliary data*

3.11.5.4.2.1 Auxiliary data words A1, A2 and A3 shall be transmitted throughout the approach azimuth coverage sector.

3.11.5.4.2.2 Where the back azimuth function is provided, auxiliary data words A3 and A4 shall be transmitted throughout the approach azimuth and back azimuth coverage sectors.

Note Auxiliary data words and are transmitted in place of A and A respectively to support applications which re uire a imuth antenna rotation beyond the alignment range available in A and A

3.11.5.4.2.3 When provided, auxiliary data B words shall be transmitted throughout the approach azimuth sector, except that the words comprising the back azimuth procedure database shall be transmitted throughout the back azimuth sector.

3.11.5.4.2.4 **Recommendation** *If the bac a imuth function is provided the appropriate auxiliary data words should be transmitted*

Note The composition of the auxiliary data words is given in Appendix A Tables A A and A

3.11.5.4.3 *Monitor and control*

3.11.5.4.3.1 The monitor system shall provide a warning to the designated control point if the radiated power is less than that necessary to satisfy the DPSK requirement specified in 3.11.4.10.1.

3.11.5.4.3.2 If a detected error in the basic data radiated into the approach azimuth coverage occurs in at least two consecutive samples, radiation of these data, approach azimuth and elevation functions shall cease.

3.11.5.4.3.3 If a detected error in the basic data radiated into the back azimuth coverage occurs in at least two consecutive samples, radiation of these data and the back azimuth function shall cease.

3.11.5.5 *Distance measuring e uipment*

3.11.5.5.1 DME information shall be provided at least throughout the coverage volume in which approach and back azimuth guidance is available.

3.11.5.5.2 **Recommendation** *DME information should be provided throughout a imuth if operationally re uired*

Note Siting of DME ground e uipment is dependent on runway length runway profile and local terrain uidance on siting of DME ground e uipment is given in Attachment C and Attachment

3.11.6 Airborne equipment characteristics

3.11.6.1 *Angle and data functions*

3.11.6.1.1 *Accuracy*

3.11.6.1.1.1 Where the DPSK and scanning beam signal power densities are the minimum specified in 3.11.4.10.1, the airborne equipment shall be able to acquire the signal and any decoded angle signal shall have a CMN not exceeding 0.1 degree, except that the back azimuth guidance function CMN shall not exceed 0.2 degree.

Note It is intended that basic and auxiliary data words which contain information essential for the desired operation be decoded within a time period and with an integrity which is suitable for the intended application

Note Information related to the ac uisition and validation of angle guidance and data functions is given in Attachment

3.11.6.1.1.2 Where the radiated signal power density is high enough to cause the airborne receiver noise contribution to be insignificant, the airborne equipment shall not degrade the accuracy of any decoded angle guidance signal by greater than plus or minus 0.017 degree (PFE), and plus or minus 0.015 degree (azimuth), and plus or minus 0.01 degree (elevation) CMN.

3.11.6.1.1.3 In order to obtain accurate guidance to 2.5 m (8 ft) above the runway surface, the airborne equipment shall produce less than 0.04 degree CMN with the power densities indicated in 3.11.4.10.2 b).

3.11.6.1.2 *Dynamic range*

3.11.6.1.2.1 The airborne equipment shall be able to acquire the signal and the performance in 3.11.6.1.1.2 shall be met where the power density of any of the radiated signals has any value between the minimum specified in 3.11.4.10.1 up to a maximum of minus 14.5 dBW/m^2.

3.11.6.1.2.2 The receiver performance shall not degrade beyond the specified limits when the maximum differential levels permitted in 3.11.6.1.2.1 exist between signal power densities of individual functions.

3.11.6.1.3 *Receiver angle data output filter characteristics*

3.11.6.1.3.1 For sinusoidal input frequencies, receiver output filters shall not induce amplitude variations or phase lags in the angle data which exceed those obtained with a single pole low-pass filter with a corner frequency of 10 rad/s by more than 20 per cent.

Note Receiver outputs intended only to operate visual displays may benefit from appropriate additional filtering Additional information on output data filtering is given in Attachment

3.11.6.1.4 *Adjacent channel spurious response* The receiver performance specified in 3.11.6 shall be met when the ratio between the desired tracked signals and the noise produced by the adjacent channel signals in a 150 kHz bandwidth centred around the desired frequency is equal to or greater than the signal-to-noise ratio (SNR) values:

a) as specified in Table X1 when the power density received from the desired ground station is equal to or higher than the values as specified in Table Y, or

b) as specified in the Table X2 when the power density received from the desired ground station is between the minimum density power values specified in 3.11.4.10.1 and the values specified in Table Y.

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Function	*eam width (Note)* ^{o}	^{o}	^{o}
Approach azimuth guidance	69.8 dBW/m^2	63.8 dBW/m^2	60.2 dBW/m^2
High rate approach azimuth guidance	74.6 dBW/m^2	69.5 dBW/m^2	65 dBW/m^2
Approach elevation guidance	71 dBW/m^2	65 dBW/m^2	N/A
Back azimuth	N/A (Note 4)	N/A (Note 4)	N/A (Note 4)

able 1

Function	*Data*	*SNR (Note)* *eam width (Note)* ^{o}	^{o}	^{o}
Approach azimuth guidance	5 dB	24.7 dB	30.7 dB	34.3 dB
High rate approach azimuth guidance	5 dB	19.9 dB	26 dB	29.5 dB
Approach elevation guidance	5 dB	23.5 dB	29.5 dB	N/A
Back azimuth (Note 4)	5 dB	5.2 dB	11.2 dB	14.8 dB

able 2

Function	*Data*	*SNR (Note)* *eam width (Note)* ^{o}	^{o}	^{o}
Approach azimuth guidance	5 dB	8.2 dB	14.3 dB	17.8 dB
High rate approach azimuth guidance	5 dB	3.5 dB	9.5 dB	13 dB
Approach elevation guidance	5 dB	3.5 dB	9.5 dB	N/A
Back azimuth (Note 4)	5 dB	5.2 dB	11.2 dB	14.8 dB

Note hen the radiated desired signal power density is high enough to cause the airborne receiver noise contribution to be insignificant the airborne CMN contribution for elevation and approach a imuth guidance (not for bac a imuth) is re uired as stated in to be reduced compared to the CMN contribution when the radiated desired signal power density is at the minimum specified in and the minimum SNR values are therefore higher

Note The relationship is linear between adjacent points designated by the beam widths

Note These SNR values are to be protected through application of fre uency separation criteria as explained in Attachment

Note As there is no change in bac a imuth guidance accuracy when the airborne receiver noise may be considered as insignificant the same SNR values are applied for bac a imuth

able A D E/ S angle D E/ OR and D E/ S/ S c annelling and pairing

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
*1X				1 025	12			962	12
**1Y				1 025	36			1 088	30
*2X				1 026	12			963	12
**2Y				1 026	36			1 089	30
*3X				1 027	12			964	12
**3Y				1 027	36			1 090	30
*4X				1 028	12			965	12
**4Y				1 028	36			1 091	30
*5X				1 029	12			966	12
**5Y				1 029	36			1 092	30
*6X				1 030	12			967	12
**6Y				1 030	36			1 093	30
*7X				1 031	12			968	12
**7Y				1 031	36			1 094	30
*8X				1 032	12			969	12
**8Y				1 032	36			1 095	30
*9X				1 033	12			970	12
**9Y				1 033	36			1 096	30
*10X				1 034	12			971	12
**10Y				1 034	36			1 097	30
*11X				1 035	12			972	12
**11Y				1 035	36			1 098	30
*12X				1 036	12			973	12
**12Y				1 036	36			1 099	30
*13X				1 037	12			974	12
**13Y				1 037	36			1 100	30
*14X				1 038	12			975	12
**14Y				1 038	36			1 101	30
*15X				1 039	12			976	12
**15Y				1 039	36			1 102	30
*16X				1 040	12			977	12
**16Y				1 040	36			1 103	30

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
∇17X	108.00			1 041	12			978	12
17Y	108.05	5 043.0	540	1 041	36	36	42	1 104	30
17		5 043.3	541	1 041		21	27	1 104	15
18X	108.10	5 031.0	500	1 042	12	12	18	979	12
18W		5 031.3	501	1 042		24	30	979	24
18Y	108.15	5 043.6	542	1 042	36	36	42	1 105	30
18		5 043.9	543	1 042		21	27	1 105	15
19X	108.20			1 043	12			980	12
19Y	108.25	5 044.2	544	1 043	36	36	42	1 106	30
19		5 044.5	545	1 043		21	27	1 106	15
20X	108.30	5 031.6	502	1 044	12	12	18	981	12
20W		5 031.9	503	1 044		24	30	981	24
20Y	108.35	5 044.8	546	1 044	36	36	42	1 107	30
20		5 045.1	547	1 044		21	27	1 107	15
21X	108.40			1 045	12			982	12
21Y	108.45	5 045.4	548	1 045	36	36	42	1 108	30
21		5 045.7	549	1 045		21	27	1 108	15
22X	108.50	5 032.2	504	1 046	12	12	18	983	12
22W		5 032.5	505	1 046		24	30	983	24
22Y	108.55	5 046.0	550	1 046	36	36	42	1 109	30
22		5 046.3	551	1 046		21	27	1 109	15
23X	108.60			1 047	12			984	12
23Y	108.65	5 046.6	552	1 047	36	36	42	1 110	30
23		5 046.9	553	1 047		21	27	1 110	15
24X	108.70	5 032.8	506	1 048	12	12	18	985	12
24W		5 033.1	507	1 048		24	30	985	24
24Y	108.75	5 047.2	554	1 048	36	36	42	1 111	30
24		5 047.5	555	1 048		21	27	1 111	15
25X	108.80			1 049	12			986	12
25Y	108.85	5 047.8	556	1 049	36	36	42	1 112	30
25		5 048.1	557	1 049		21	27	1 112	15
26X	108.90	5 033.4	508	1 050	12	12	18	987	12
26W		5 033.7	509	1 050		24	30	987	24
26Y	108.95	5 048.4	558	1 050	36	36	42	1 113	30
26		5 048.7	559	1 050		21	27	1 113	15
27X	109.00			1 051	12			988	12
27Y	109.05	5 049.0	560	1 051	36	36	42	1 114	30
27		5 049.3	561	1 051		21	27	1 114	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
28X	109.10	5 034.0	510	1 052	12	12	18	989	12
28W		5 034.3	511	1 052		24	30	989	24
28Y	109.15	5 049.6	562	1 052	36	36	42	1 115	30
28		5 049.9	563	1 052		21	27	1 115	15
29X	109.20			1 053	12			990	12
29Y	109.25	5 050.2	564	1 053	36	36	42	1 116	30
29		5 050.5	565	1 053		21	27	1 116	15
30X	109.30	5 034.6	512	1 054	12	12	18	991	12
30W		5 034.9	513	1 054		24	30	991	24
30Y	109.35	5 050.8	566	1 054	36	36	42	1 117	30
30		5 051.1	567	1 054		21	27	1 117	15
31X	109.40			1 055	12			992	12
31Y	109.45	5 051.4	568	1 055	36	36	42	1 118	30
31		5 051.7	569	1 055		21	27	1 118	15
32X	109.50	5 035.2	514	1 056	12	12	18	993	12
32W		5 035.5	515	1 056		24	30	993	24
32Y	109.55	5 052.0	570	1 056	36	36	42	1 119	30
32		5 052.3	571	1 056		21	27	1 119	15
33X	109.60			1 057	12			994	12
33Y	109.65	5 052.6	572	1 057	36	36	42	1 120	30
33		5 052.9	573	1 057		21	27	1 120	15
34X	109.70	5 035.8	516	1 058	12	12	18	995	12
34W		5 036.1	517	1 058		24	30	995	24
34Y	109.75	5 053.2	574	1 058	36	36	42	1 121	30
34		5 053.5	575	1 058		21	27	1 121	15
35X	109.80			1 059	12			996	12
35Y	109.85	5 053.8	576	1 059	36	36	42	1 122	30
35		5 054.1	577	1 059		21	27	1 122	15
36X	109.90	5 036.4	518	1 060	12	12	18	997	12
36W		5 036.7	519	1 060		24	30	997	24
36Y	109.95	5 054.4	578	1 060	36	36	42	1 123	30
36		5 054.7	579	1 060		21	27	1 123	15
37X	110.00			1 061	12			998	12
37Y	110.05	5 055.0	580	1 061	36	36	42	1 124	30
37		5 055.3	581	1 061		21	27	1 124	15
38X	110.10	5 037.0	520	1 062	12	12	18	999	12
38W		5 037.3	521	1 062		24	30	999	24
38Y	110.15	5 055.6	582	1 062	36	36	42	1 125	30
38		5 055.9	583	1 062		21	27	1 125	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
39X	110.20			1 063	12			1 000	12
39Y	110.25	5 056.2	584	1 063	36	36	42	1 126	30
39		5 056.5	585	1 063		21	27	1 126	15
40X	110.30	5 037.6	522	1 064	12	12	18	1 001	12
40W		5 037.9	523	1 064		24	30	1 001	24
40Y	110.35	5 056.8	586	1 064	36	36	42	1 127	30
40		5 057.1	587	1 064		21	27	1 127	15
41X	110.40			1 065	12			1 002	12
41Y	110.45	5 057.4	588	1 065	36	36	42	1 128	30
41		5 057.7	589	1 065		21	27	1 128	15
42X	110.50	5 038.2	524	1 066	12	12	18	1 003	12
42W		5 038.5	525	1 066		24	30	1 003	24
42Y	110.55	5 058.0	590	1 066	36	36	42	1 129	30
42		5 058.3	591	1 066		21	27	1 129	15
43X	110.60			1 067	12			1 004	12
43Y	110.65	5 058.6	592	1 067	36	36	42	1 130	30
43		5 058.9	593	1 067		21	27	1 130	15
44X	110.70	5 038.8	526	1 068	12	12	18	1 005	12
44W		5 039.1	527	1 068		24	30	1 005	24
44Y	110.75	5 059.2	594	1 068	36	36	42	1 131	30
44		5 059.5	595	1 068		21	27	1 131	15
45X	110.80			1 069	12			1 006	12
45Y	110.85	5 059.8	596	1 069	36	36	42	1 132	30
45		5 060.1	597	1 069		21	27	1 132	15
46X	110.90	5 039.4	528	1 070	12	12	18	1 007	12
46W		5 039.7	529	1 070		24	30	1 007	24
46Y	110.95	5 060.4	598	1 070	36	36	42	1 133	30
46		5 060.7	599	1 070		21	27	1 133	15
47X	111.00			1 071	12			1 008	12
47Y	111.05	5 061.0	600	1 071	36	36	42	1 134	30
47		5 061.3	601	1 071		21	27	1 134	15
48X	111.10	5 040.0	530	1 072	12	12	18	1 009	12
48W		5 040.3	531	1 072		24	30	1 009	24
48Y	111.15	5 061.6	602	1 072	36	36	42	1 135	30
48		5 061.9	603	1 072		21	27	1 135	15
49X	111.20			1 073	12			1 010	12
49Y	111.25	5 062.2	604	1 073	36	36	42	1 136	30
49		5 062.5	605	1 073		21	27	1 136	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
50X	111.30	5 040.6	532	1 074	12	12	18	1 011	12
50W		5 040.9	533	1 074		24	30	1 011	24
50Y	111.35	5 062.8	606	1 074	36	36	42	1 137	30
50		5 063.1	607	1 074		21	27	1 137	15
51X	111.40			1 075	12			1 012	12
51Y	111.45	5 063.4	608	1 075	36	36	42	1 138	30
51		5 063.7	609	1 075		21	27	1 138	15
52X	111.50	5 041.2	534	1 076	12	12	18	1 013	12
52W		5 041.5	535	1 076		24	30	1 013	24
52Y	111.55	5 064.0	610	1 076	36	36	42	1 139	30
52		5 064.3	611	1 076		21	27	1 139	15
53X	111.60			1 077	12			1 014	12
53Y	111.65	5 064.6	612	1 077	36	36	42	1 140	30
53		5 064.9	613	1 077		21	27	1 140	15
54X	111.70	5 041.8	536	1 078	12	12	18	1 015	12
54W		5 042.1	537	1 078		24	30	1 015	24
54Y	111.75	5 065.2	614	1 078	36	36	42	1 141	30
54		5 065.5	615	1 078		21	27	1 141	15
55X	111.80			1 079	12			1 016	12
55Y	111.85	5 065.8	616	1 079	36	36	42	1 142	30
55		5 066.1	617	1 079		21	27	1 142	15
56X	111.90	5 042.4	538	1 080	12	12	18	1 017	12
56W		5 042.7	539	1 080		24	30	1 017	24
56Y	111.95	5 066.4	618	1 080	36	36	42	1 143	30
56		5 066.7	619	1 080		21	27	1 143	15
57X	112.00			1 081	12			1 018	12
57Y	112.05			1 081	36			1 144	30
58X	112.10			1 082	12			1 019	12
58Y	112.15			1 082	36			1 145	30
59X	112.20			1 083	12			1 020	12
59Y	112.25			1 083	36			1 146	30
**60X				1 084	12			1 021	12
**60Y				1 084	36			1 147	30
**61X				1 085	12			1 022	12
**61Y				1 085	36			1 148	30
**62X				1 086	12			1 023	12
**62Y				1 086	36			1 149	30
**63X				1 087	12			1 024	12
**63Y				1 087	36			1 150	30

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
**64X				1 088	12			1 151	12
**64Y				1 088	36			1 025	30
**65X				1 089	12			1 152	12
**65Y				1 089	36			1 026	30
**66X				1 090	12			1 153	12
**66Y				1 090	36			1 027	30
**67X				1 091	12			1 154	12
**67Y				1 091	36			1 028	30
**68X				1 092	12			1 155	12
**68Y				1 092	36			1 029	30
**69X				1 093	12			1 156	12
**69Y				1 093	36			1 030	30
70X	112.30			1 094	12			1 157	12
**70Y	112.35			1 094	36			1 031	30
71X	112.40			1 095	12			1 158	12
**71Y	112.45			1 095	36			1 032	30
72X	112.50			1 096	12			1 159	12
**72Y	112.55			1 096	36			1 033	30
73X	112.60			1 097	12			1 160	12
**73Y	112.65			1 097	36			1 034	30
74X	112.70			1 098	12			1 161	12
**74Y	112.75			1 098	36			1 035	30
75X	112.80			1 099	12			1 162	12
**75Y	112.85			1 099	36			1 036	30
76X	112.90			1 100	12			1 163	12
**76Y	112.95			1 100	36			1 037	30
77X	113.00			1 101	12			1 164	12
**77Y	113.05			1 101	36			1 038	30
78X	113.10			1 102	12			1 165	12
**78Y	113.15			1 102	36			1 039	30
79X	113.20			1 103	12			1 166	12
**79Y	113.25			1 103	36			1 040	30
80X	113.30			1 104	12			1 167	12
80Y	113.35	5 067.0	620	1 104	36	36	42	1 041	30
80		5 067.3	621	1 104		21	27	1 041	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
81X	113.40			1 105	12			1 168	12
81Y	113.45	5 067.6	622	1 105	36	36	42	1 042	30
81		5 067.9	623	1 105		21	27	1 042	15
82X	113.50			1 106	12			1 169	12
82Y	113.55	5 068.2	624	1 106	36	36	42	1 043	30
82		5 068.5	625	1 106		21	27	1 043	15
83X	113.60			1 107	12			1 170	12
83Y	113.65	5 068.8	626	1 107	36	36	42	1 044	30
83		5 069.1	627	1 107		21	27	1 044	15
84X	113.70			1 108	12			1 171	12
84Y	113.75	5 069.4	628	1 108	36	36	42	1 045	30
84		5 069.7	629	1 108		21	27	1 045	15
85X	113.80			1 109	12			1 172	12
85Y	113.85	5 070.0	630	1 109	36	36	42	1 046	30
85		5 070.3	631	1 109		21	27	1 046	15
86X	113.90			1 110	12			1 173	12
86Y	113.95	5 070.6	632	1 110	36	36	42	1 047	30
86		5 070.9	633	1 110		21	27	1 047	15
87X	114.00			1 111	12			1 174	12
87Y	114.05	5 071.2	634	1 111	36	36	42	1 048	30
87		5 071.5	635	1 111		21	27	1 048	15
88X	114.10			1 112	12			1 175	12
88Y	114.15	5 071.8	636	1 112	36	36	42	1 049	30
88		5 072.1	637	1 112		21	27	1 049	15
89X	114.20			1 113	12			1 176	12
89Y	114.25	5 072.4	638	1 113	36	36	42	1 050	30
89		5 072.7	639	1 113		21	27	1 050	15
90X	114.30			1 114	12			1 177	12
90Y	114.35	5 073.0	640	1 114	36	36	42	1 051	30
90		5 073.3	641	1 114		21	27	1 051	15
91X	114.40			1 115	12			1 178	12
91Y	114.45	5 073.6	642	1 115	36	36	42	1 052	30
91		5 073.9	643	1 115		21	27	1 052	15
92X	114.50			1 116	12			1 179	12
92Y	114.55	5 074.2	644	1 116	36	36	42	1 053	30
92		5 074.5	645	1 116		21	27	1 053	15
93X	114.60			1 117	12			1 180	12
93Y	114.65	5 074.8	646	1 117	36	36	42	1 054	30
93		5 075.1	647	1 117		21	27	1 054	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
94X	114.70			1 118	12			1 181	12
94Y	114.75	5 075.4	648	1 118	36	36	42	1 055	30
94		5 075.7	649	1 118		21	27	1 055	15
95X	114.80			1 119	12			1 182	12
95Y	114.85	5 076.0	650	1 119	36	36	42	1 056	30
95		5 076.3	651	1 119		21	27	1 056	15
96X	114.90			1 120	12			1 183	12
96Y	114.95	5 076.6	652	1 120	36	36	42	1 057	30
96		5 076.9	653	1 120		21	27	1 057	15
97X	115.00			1 121	12			1 184	12
97Y	115.05	5 077.2	654	1 121	36	36	42	1 058	30
97		5 077.5	655	1 121		21	27	1 058	15
98X	115.10			1 122	12			1 185	12
98Y	115.15	5 077.8	656	1 122	36	36	42	1 059	30
98		5 078.1	657	1 122		21	27	1 059	15
99X	115.20			1 123	12			1 186	12
99Y	115.25	5 078.4	658	1 123	36	36	42	1 060	30
99		5 078.7	659	1 123		21	27	1 060	15
100X	115.30			1 124	12			1 187	12
100Y	115.35	5 079.0	660	1 124	36	36	42	1 061	30
100		5 079.3	661	1 124		21	27	1 061	15
101X	115.40			1 125	12			1 188	12
101Y	115.45	5 079.6	662	1 125	36	36	42	1 062	30
101		5 079.9	663	1 125		21	27	1 062	15
102X	115.50			1 126	12			1 189	12
102Y	115.55	5 080.2	664	1 126	36	36	42	1 063	30
102		5 080.5	665	1 126		21	27	1 063	15
103X	115.60			1 127	12			1 190	12
103Y	115.65	5 080.8	666	1 127	36	36	42	1 064	30
103		5 081.1	667	1 127		21	27	1 064	15
104X	115.70			1 128	12			1 191	12
104Y	115.75	5 081.4	668	1 128	36	36	42	1 065	30
104		5 081.7	669	1 128		21	27	1 065	15
105X	115.80			1 129	12			1 192	12
105Y	115.85	5 082.0	670	1 129	36	36	42	1 066	30
105		5 082.3	671	1 129		21	27	1 066	15
106X	115.90			1 130	12			1 193	12
106Y	115.95	5 082.6	672	1 130	36	36	42	1 067	30
106		5 082.9	673	1 130		21	27	1 067	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
107X	116.00			1 131	12			1 194	12
107Y	116.05	5 083.2	674	1 131	36	36	42	1 068	30
107		5 083.5	675	1 131		21	27	1 068	15
108X	116.10			1 132	12			1 195	12
108Y	116.15	5 083.8	676	1 132	36	36	42	1 069	30
108		5 084.1	677	1 132		21	27	1 069	15
109X	116.20			1 133	12			1 196	12
109Y	116.25	5 084.4	678	1 133	36	36	42	1 070	30
109		5 084.7	679	1 133		21	27	1 070	15
110X	116.30			1 134	12			1 197	12
110Y	116.35	5 085.0	680	1 134	36	36	42	1 071	30
110		5 085.3	681	1 134		21	27	1 071	15
111X	116.40			1 135	12			1 198	12
111Y	116.45	5 085.6	682	1 135	36	36	42	1 072	30
111		5 085.9	683	1 135		21	27	1 072	15
112X	116.50			1 136	12			1 199	12
112Y	116.55	5 086.2	684	1 136	36	36	42	1 073	30
112		5 086.5	685	1 136		21	27	1 073	15
113X	116.60			1 137	12			1 200	12
113Y	116.65	5 086.8	686	1 137	36	36	42	1 074	30
113		5 087.1	687	1 137		21	27	1 074	15
114X	116.70			1 138	12			1 201	12
114Y	116.75	5 087.4	688	1 138	36	36	42	1 075	30
114		5 087.7	689	1 138		21	27	1 075	15
115X	116.80			1 139	12			1 202	12
115Y	116.85	5 088.0	690	1 139	36	36	42	1 076	30
115		5 088.3	691	1 139		21	27	1 076	15
116X	116.90			1 140	12			1 203	12
116Y	116.95	5 088.6	692	1 140	36	36	42	1 077	30
116		5 088.9	693	1 140		21	27	1 077	15
117X	117.00			1 141	12			1 204	12
117Y	117.05	5 089.2	694	1 141	36	36	42	1 078	30
117		5 089.5	695	1 141		21	27	1 078	15
118X	117.10			1 142	12			1 205	12
118Y	117.15	5 089.8	696	1 142	36	36	42	1 079	30
118		5 090.1	697	1 142		21	27	1 079	15
119X	117.20			1 143	12			1 206	12
119Y	117.25	5 090.4	698	1 143	36	36	42	1 080	30
119		5 090.7	699	1 143		21	27	1 080	15

Channel pairing				DME parameters					
				Interrogation				Reply	
					Pulse codes				
						DME/P mode			
DME channel number	VHF frequency MHz	MLS angle frequency MHz	MLS channel number	Frequency MHz	DME/N s	Initial approach s	Final approach s	Frequency MHz	Pulse codes s
120X	117.30			1 144	12			1 207	12
120Y	117.35			1 144	36			1 081	30
121X	117.40			1 145	12			1 208	12
121Y	117.45			1 145	36			1 082	30
122X	117.50			1 146	12			1 209	12
122Y	117.55			1 146	36			1 083	30
123X	117.60			1 147	12			1 210	12
123Y	117.65			1 147	36			1 084	30
124X	117.70			1 148	12			1 211	12
**124Y	117.75			1 148	36			1 085	30
125X	117.80			1 149	12			1 212	12
**125Y	117.85			1 149	36			1 086	30
126X	117.90			1 150	12			1 213	12
**126Y	117.95			1 150	36			1 087	30

* These channels are reserved exclusively for national allotments.
** These channels may be used for national allotment on a secondary basis.
The primary reason for reserving these channels is to provide protection for the secondary surveillance radar (SSR) system.
∇ 108.0 MHz is not scheduled for assignment to ILS service. The associated DME operating channel No. 17X may be assigned for emergency use.

able Allo able D E/ errors

Location	Standard	Mode	PFE	CMN
37 km (20 NM) to 9.3 km (5NM) from MLS approach reference datum	1 and 2	1A	250 m (820 ft) reducing linearly to 85 m (279 ft)	68 m (223 ft) reducing linearly to 34 m (111 ft)
9.3 km (5 NM) to MLS approach reference datum	1	FA	85 m (279 ft) reducing linearly to 30 m (100 ft)	18 m (60 ft)
	2	FA	85 m (279 ft) reducing linearly to 12 m (40 ft)	12 m (40 ft)
	see Note	IA	100 m (328 ft)	68 m (223 ft)
At MLS approach reference datum and through runway coverage	1	FA	30 m (100 ft)	18 m (60 ft)
	2	FA	12 m (40 ft)	12 m (40 ft)
Throughout back azimuth coverage volume	1 and 2	FA	100 m (328 ft)	68 m (223 ft)
	see Note	IA	100 m (328 ft)	68 m (223 ft)

Note At distances from m (NM) to the M S approach reference datum and throughout the bac a imuth coverage the IA mode may be used when the FA mode is not operative

A E D A CROWA E A D S S E
S CHARAC ER S CS

able A 1 reamble timing
(see)

Event	Event time slot begins at	
	15.625 kHz Clock pulse (number)	Time (milliseconds)
Carrier acquisition (CW transmission)	0	0
Receiver reference time code		
I_1 1	13	0.832
I_2 1	1	0.896
I_3 1	15	0.960
I_4 0	16	1.024
I_5 1	17	1.088**
Function identification		
I_6	18	1.152
I_7	19	1.216
I_8	20	1.280
I_9 (see 3.11.4.4.3.3)	21	1.344
I_{10}	22	1.408
I_{11}	23	1.472
I_{12}	24	1.536
End preamble	25	1.600

* Applies to all functions transmitted.
** Reference time for receiver synchronization for all function timing.

able A 2 Approac a imut function timing
(see)

Event	Event time slot begins at 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Morse Code (see 3.11.4.6.2.1.2)	25	1.600
Antenna select	26	1.664
Rear OCI	32	2.048
Left OCI	34	2.176
Right OCI	36	2.304
TO test	38	2.432
TO scan*	40	2.560
Pause		8.760
Midscan point		9.060
FRO scan*		9.360
FRO test		15.560
End function (airborne)		15.688
End guard time; end function (ground)		15.900

* The actual commencement and completion of the TO and FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of plus or minus 62.0 degrees. Scan timing shall be compatible with accuracy requirements.

able A 3 Hig rate approac a imut and back a imut function timing
(see)

Event	Event time slot begins at 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Morse Code (see 3.11.4.6.2.1.2)	25	1.600
Antenna select	26	1.664
Rear OCI	32	2.048
Left OCI	34	2.176
Right OCI	36	2.304
TO test	38	2.432
TO scan*	40	2.560
Pause		6.760
Midscan point		7.060
FRO scan*		7.360
FRO test pulse		11.560
End function (airborne)		11.688
End guard time; end function (ground)		11.900

* The actual commencement and completion of the TO and FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of plus or minus 42.0 degrees. Scan timing shall be compatible with accuracy requirements.

able A Approac ele ation function timing
(see)

Event	Event time slot begins at 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Processor pause	25	1.600
OCI	27	1.728
TO scan*	29	1.856
Pause		3.406
Midscan point		3.606
FRO scan*		3.806
End function (airborne)		5.356
End guard time; end function (ground)		5.600

* The actual commencement and completion of the TO and FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of minus 1.5 degrees to plus 29.5 degrees. Scan timing shall be compatible with accuracy requirements.

able A Flare function timing
(see)

Event	Event time slot begins at 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Processor pause	25	1.600
TO scan*	29	1.856
Pause		3.056
Midscan point		3.456
FRO scan*		3.856
End function (airborne)		5.056
End guard time; end function (ground)		5.300

* The actual commencement and completion of the TO and FRO scan transmissions are dependent on the amount of proportional guidance provided. The time slots provided will accommodate a maximum scan of minus 2.0 degrees to plus 10.0 degrees. Scan timing shall be compatible with accuracy requirements.

able A 6 asic data function timing
(see)

Event	Event time slot begins at 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Data transmission (Bits I_{13} - I_{30})	24	1.600
Parity transmission (Bits I_{31} - I_{32})	43	2.752
End function (airborne)	45	2.880
End guard time; end function (ground)		3.100

able A asic data
(see)

Word	Data content	Maximum time between transmissions (seconds)	Bits used	Range of values	Least significant bit	Bit number
1	PREAMBLE	1.0	12	see Note 10		I_1 - I_{12}
	Approach azimuth antenna to threshold distance		6	0 m to 6 300 m	100 m	I_{13} - I_{18}
	Approach azimuth proportional guidance sector negative limit		5	0 to 60 (see Note 11)	2	I_{19} - I_{23}
	Approach azimuth proportional guidance sector positive limit		5	0 to 60 (see Note 11)	2	I_{24} - I_{28}
	Clearance signal type		1	see Note 9		I_{29}
	SPARE		1	see Note 12		I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}
2	PREAMBLE	0.16	12	see Note 10		I_1 - I_{12}
	Minimum glide path		7	2 to 14.7	0.1	I_{13} - I_{19}
	Back azimuth status		1	see Note 2		I_{20}
	DME status		2	see Note 7		I_{21} - I_{22}
	Approach azimuth status		1	see Note 2		I_{23}
	Approach elevation status		1	see Note 2		I_{24}
	SPARE		6	see Notes 6 and 12		I_{25} - I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}

Word	Data content	Maximum time between transmissions (seconds)	Bits used	Range of values	Least significant bit	Bit number
3	PREAMBLE	1.0	12	see Note 10		I_1 - I_{12}
	Approach azimuth beamwidth		3	0.5 to 4 (See Note 8)	0.5	I_{13} - I_{15}
	Approach elevation beamwidth		3	0.5 to 2.5 (See Note 8)	0.5	I_{16} - I_{18}
	DME distance		9	0 m to 6 387.5 m	12.5 m	I_{19} - I_{27}
	SPARE		3	see Note 12		I_{28} - I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}
4	PREAMBLE	1.0	12	see Notes 4 and 10		I_1 - I_{12}
	Approach azimuth magnetic Orientation		9	0 to 359	1	I_{13} - I_{21}
	Back azimuth magnetic orientation		9	0 to 359	1	I_{22} - I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}
5	PREAMBLE	1.0	12	see Notes 5 and 10		I_1 - I_{12}
	Back azimuth proportional guidance sector negative limit		5	0 to 40 (see Note 11)	2	I_{13} - I_{17}
	Back azimuth proportional guidance sector positive limit		5	0 to 40 (see Note 11)	2	I_{18} - I_{22}
	Back azimuth beamwidth		3	0.5 to 4.0 (see Note 8)	0.5	I_{23} - I_{25}
	Back azimuth status		1	see Note 2		I_{26}
	SPARE		4	see Notes 3 and 12		I_{27} - I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}
6	PREAMBLE	1.0	12	see Notes 4 and 10		I_1 - I_{12}
	MLS ground equipment Identification			Letters A to		
	Character 2		6			I_{13} - I_{18}
	Character 3		6			I_{19} - I_{24}
	Character 4		6			I_{25} - I_{30}
	PARITY		2	see Note 1		I_{31} - I_{32}

N TES

1. Parity bits I_{31} and I_{32} are chosen to satisfy the equations:
   I_{13} I_{14} ... I_{29} I_{30} I_{31} ODD
   I_{14} I_{16} I_{18} ... I_{28} I_{30} I_{32} ODD.
2. Coding for status bit:
   0 function not radiated, or radiated in test mode (not reliable for navigation);
   1 function radiated in normal mode (in Basic data word 2 the back azimuth status also indicates that back azimuth transmission is to follow).
3. These bits are reserved for future applications. One possible application is to define the back azimuth deviation scale factor.
4. Basic data words 4 and 6 are transmitted in both approach azimuth and back azimuth coverages if back azimuth guidance is provided, while retaining the maximum specified time between transmissions in each coverage sector.
5. Basic data word 5 is transmitted in both approach azimuth and back azimuth coverages if back azimuth guidance is provided, while retaining the maximum specified time between transmissions in each coverage sector.
6. These bits are reserved for future applications requiring high transmission rates.
7. Coding for I_{21} and I_{22}:
   I_{21} I_{22}
   0 0 DME transponder inoperative or not available
   1 0 Only IA mode or DME/N available
   0 1 FA mode, Standard 1, available
   1 1 FA mode, Standard 2, available
8. The value coded is the actual beamwidth (as defined in Chapter 3, 3.11.1) rounded to the nearest 0.5 degree.
9. Code for I_{29} is:
   0 pulse clearance signal
   1 scanning clearance signal.
10. The 12 data bits of the preamble are preceded by an 0.832 millisecond interval (13 clock pulses) of CW for carrier acquisition (see Table A-1).
11. The scan limits are greater than the proportional guidance sector limits shown in Basic data words 1 and 5 as described in 3.11.4.5.1.
12. All spare bits are set to ERO.

able A Auxiliary data function timing

(see)

Event	Event time slot begins at: 15.625 kHz Clock pulse (number)	Time (milliseconds)
Preamble	0	0
Address transmission (Bits I_{13} - I_{20})	25	1.600
Data transmission (Bits I_{21} - I_{69})	33	2.112
Parity transmission (Bits I_{70} - I_{76})	82	5.248
End function (airborne)	89	5.696
End guard time; end function (ground)		5.900

able A Auxiliary data ords address codes

No.	I_{13}	I_{14}	I_{15}	I_{16}	I_{17}	I_{18}	I_{19}	I_{20}	No.	I_{13}	I_{14}	I_{15}	I_{16}	I_{17}	I_{18}	I_{19}	I_{20}
1	0	0	0	0	0	1	1	1	33	1	0	0	0	0	1	0	1
2	0	0	0	0	1	0	1	0	34	1	0	0	0	1	0	0	0
3	0	0	0	0	1	1	0	1	35	1	0	0	0	1	1	1	1
4	0	0	0	1	0	0	1	1	36	1	0	0	1	0	0	0	1
5	0	0	0	1	0	1	0	0	37	1	0	0	1	0	1	1	0
6	0	0	0	1	1	0	0	1	38	1	0	0	1	1	0	1	1
7	0	0	0	1	1	1	1	0	39	1	0	0	1	1	1	0	0
8	0	0	1	0	0	0	1	0	40	1	0	1	0	0	0	0	0
9	0	0	1	0	0	1	0	1	41	1	0	1	0	0	1	1	1
10	0	0	1	0	1	0	0	0	42	1	0	1	0	1	0	1	0
11	0	0	1	0	1	1	1	1	43	1	0	1	0	1	1	0	1
12	0	0	1	1	0	0	0	1	44	1	0	1	1	0	0	1	1
13	0	0	1	1	0	1	1	0	45	1	0	1	1	0	1	0	0
14	0	0	1	1	1	0	1	1	46	1	0	1	1	1	0	0	1
15	0	0	1	1	1	1	0	0	47	1	0	1	1	1	1	1	0
16	0	1	0	0	0	0	1	1	48	1	1	0	0	0	0	0	1
17	0	1	0	0	0	1	0	0	49	1	1	0	0	0	1	1	0
18	0	1	0	0	1	0	0	1	50	1	1	0	0	1	0	1	1
19	0	1	0	0	1	1	1	0	51	1	1	0	0	1	1	0	0
20	0	1	0	1	0	0	0	0	52	1	1	0	1	0	0	1	0
21	0	1	0	1	0	1	1	1	53	1	1	0	1	0	1	0	1
22	0	1	0	1	1	0	1	0	54	1	1	0	1	1	0	0	0
23	0	1	0	1	1	1	0	1	55	1	1	0	1	1	1	1	1
24	0	1	1	0	0	0	0	1	56	1	1	1	0	0	0	1	1
25	0	1	1	0	0	1	1	0	57	1	1	1	0	0	1	0	0
26	0	1	1	0	1	0	1	1	58	1	1	1	0	1	0	0	1
27	0	1	1	0	1	1	0	0	59	1	1	1	0	1	1	1	0
28	0	1	1	1	0	0	1	0	60	1	1	1	1	0	0	0	0
29	0	1	1	1	0	1	0	1	61	1	1	1	1	0	1	1	1
30	0	1	1	1	1	0	0	0	62	1	1	1	1	1	0	1	0
31	0	1	1	1	1	1	1	1	63	1	1	1	1	1	1	0	1
32	1	0	0	0	0	0	1	0	64	0	0	0	0	0	0	0	0

Note Parity bits I_{19} and I_{20} are chosen to satisfy the equations:

I_{13} I_{14} I_{15} I_{16} I_{17} I_{18} I_{19} EVEN

I_{14} I_{16} I_{18} I_{20} EVEN

able A 10 Auxiliary data
(see)

Word	Data content	Type of data	Maximum time between transmissions (seconds)	Bits used	Range of values	Least significant bit	Bit number
A1	PREAMBLE	digital	1.0	12	see Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	Approach azimuth antenna offset			10	511 m to 511 m (see Note 3)	1 m	1_{21} - I_{30}
	Approach azimuth antenna to MLS datum point distance			13	0 m to 8 191 m	1 m	I_{31} - I_{43}
	Approach azimuth alignment with runway centre line			12	20.47 to 20.47 (see Notes 3 and 7)	0.01	I_{44} - I_{55}
	Approach azimuth antenna coordinate system			1	See Note 2		I_{56}
	Approach azimuth antenna height			7	63 m to 63 m (see Note 3)	1 m	I_{57} - I_{63}
	SPARE			6	See Note 8		I_{64} - I_{69}
	PARITY			7	See Note 1		I_{70} - I_{76}
A2	PREAMBLE	digital	1.0	12	See Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	Approach elevation antenna offset			10	511 m to 511 m (see Note 3)	1 m	I_{21} - I_{30}
	MLS datum point to threshold distance			10	0 m to 1 023 m	1 m	I_{31} - I_{40}
	Approach elevation antenna height			7	6.3 m to 6.3 m (see Note 3)	0.1 m	I_{41} - I_{47}
	MLS datum point elevation			13	4 095 m to 4 095 m (see Note 3)	1 m	I_{48} - I_{60}
	Runway threshold height			7	6.3 m to 6.3 m (see Note 3)	0.1 m	I_{61} - I_{67}
	SPARE			2	See Note 8		I_{68} - I_{69}
	PARITY			7	See Note 1		I_{70} - I_{76}
A3	PREAMBLE (see Note 4)	digital	1.0	12	See Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	DME offset			12	2 047 m to 2 047 m (see Note 3)	1 m	I_{21} - I_{32}
	DME to MLS datum point distance			14	8 191 m to 8 191 m (see Note 3)	1 m	I_{33} - I_{46}

Word	Data content	Type of data	Maximum time between transmissions (seconds)	Bits used	Range of values	Least significant bit	Bit number
	DME antenna height			7	63 m to 63 m (see Note 3)	1 m	I_{47} - I_{53}
	Runway stop-end distance			14	0 m to 16 383 m	1 m	I_{54} - I_{67}
	SPARE			2	See Note 8		I_{68} - I_{69}
	PARITY			7	See Note 1		I_{70} - I_{76}
A4	PREAMBLE (see Note 5)	digital	1.0	12	See Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	Back azimuth antenna offset			10	511 m to 511 m (see Note 3)	1 m	I_{21} - I_{30}
	Back azimuth to MLS datum point distance			11	0 m to 2 047 m	1 m	I_{31} - I_{41}
	Back azimuth alignment with runway centre line			12	20.47 to 20.47 (see Notes 3 and 7)	0.01	I_{42} - I_{53}
	Back azimuth antenna coordinate system			1	See Note 2		I_{54}
	Back azimuth antenna height			7	63 m to 63 m (see Note 3)	1 m	I_{55} - I_{61}
	SPARE			8	See Note 8		I_{62} - I_{69}
	PARITY			7	See Note 1		I_{70} - I_{76}

N TES

1. Parity bits I_{70} to I_{76} are chosen to satisfy the equations which follow.

For bit I_{70}
$$\text{EVEN}\ (I_{13}\ \dots\ I_{18})\ I_{20}\ I_{22}\ I_{24}\ I_{25}\ I_{28}\ I_{29}\ I_{31}\ I_{32}\ I_{33}\ I_{35}\ I_{36}\ I_{38}\ I_{41}\ I_{44}\ I_{45}\ I_{46}\ I_{50}\ (I_{52}\ \dots\ I_{55})\ I_{58}\ I_{60}\ I_{64}\ I_{65}\ I_{70}$$
For bit I_{71}
$$\text{EVEN}\ (I_{14}\ \dots\ I_{19})\ I_{21}\ I_{23}\ I_{25}\ I_{26}\ I_{29}\ I_{30}\ I_{32}\ I_{33}\ I_{34}\ I_{36}\ I_{37}\ I_{39}\ I_{42}\ I_{45}\ I_{46}\ I_{47}\ I_{51}\ (I_{53}\ \dots\ I_{56})\ I_{59}\ I_{61}\ I_{65}\ I_{66}\ I_{71}$$
For bit I_{72}
$$\text{EVEN}\ (I_{15}\ \dots\ I_{20})\ I_{22}\ I_{24}\ I_{26}\ I_{27}\ I_{30}\ I_{31}\ I_{33}\ I_{34}\ I_{35}\ I_{37}\ I_{38}\ I_{40}\ I_{43}\ I_{46}\ I_{47}\ I_{48}\ I_{52}\ (I_{54}\ \dots\ I_{57})\ I_{60}\ I_{62}\ I_{66}\ I_{67}\ I_{72}$$
For bit I_{73}
$$\text{EVEN}\ (I_{16}\ \dots\ I_{21})\ I_{23}\ I_{25}\ I_{27}\ I_{28}\ I_{31}\ I_{32}\ I_{34}\ I_{35}\ I_{36}\ I_{38}\ I_{39}\ I_{41}\ I_{44}\ I_{47}\ I_{48}\ I_{49}\ I_{53}\ (I_{55}\ \dots\ I_{58})\ I_{61}\ I_{63}\ I_{67}\ I_{68}\ I_{73}$$
For bit I_{74}
$$\text{EVEN}\ (I_{17}\ \dots\ I_{22})\ I_{24}\ I_{26}\ I_{28}\ I_{29}\ I_{32}\ I_{33}\ I_{35}\ I_{36}\ I_{37}\ I_{39}\ I_{40}\ I_{42}\ I_{45}\ I_{48}\ I_{49}\ I_{50}\ I_{54}\ (I_{56}\ \dots\ I_{59})\ I_{62}\ I_{64}\ I_{68}\ I_{69}\ I_{74}$$
For bit I_{75}
$$\text{EVEN}\ (I_{13}\ \dots\ I_{17})\ I_{19}\ I_{21}\ I_{23}\ I_{24}\ I_{27}\ I_{28}\ I_{30}\ I_{31}\ I_{32}\ I_{34}\ I_{35}\ I_{37}\ I_{40}\ I_{43}\ I_{44}\ I_{45}\ I_{49}\ (I_{51}\ \dots\ I_{54})\ I_{57}\ I_{59}\ I_{63}\ I_{64}\ I_{69}\ I_{75}$$
For bit I_{76}
$$\text{EVEN}\ I_{13}\ I_{14}\ \dots\ I_{75}\ I_{76}$$

2. Code for antenna coordinate system is 0 conical.

3. The convention for the coding of negative numbers is as follows:
   MSB is the sign bit:
   0 positive
   1 negative
   Other bits represent the absolute value.
   The convention for the antenna location is as follows:
   As viewed from the MLS approach reference datum looking toward the MLS datum point, a positive number represents a location to the right of the runway centre line (lateral offset) or above the runway (vertical offset), or towards the stop end of the runway (longitudinal distance).
   The convention for the alignment is as follows:
   As viewed from above, a positive number represents clockwise rotation from the runway centre line to the respective zero-degree azimuth.
4. Data word A3 is transmitted in both approach azimuth and back azimuth coverages if back azimuth guidance is provided, while retaining the maximum specified time between transmissions in each coverage sector.
5. Data word A4 is transmitted in both approach azimuth and back azimuth coverages if back azimuth guidance is provided, while retaining the maximum specified time between transmissions in each coverage sector.
6. The 12 data bits of the preamble are preceded by an 0.832 millisecond interval (13 clock pulses) of CW for carrier acquisition (see Table A-1).
7. See Table A-12 for data words B42 and B43 which are defined for applications that require azimuth antenna rotation greater than the 20.47 supported by the data items in A1, for azimuth, and A4, for back azimuth. At a facility with the approach azimuth rotation greater than 20.47 , B42 is transmitted in place of A1. At a facility with the back azimuth rotation greater than 20.47 , B43 is transmitted in place of A4.
8. All spare bits are set to ERO.

able A 11 Definitions of auxiliary data items
(see)

Note Definitions of auxiliary data items supporting M S RNA procedures are shown in Table A

a) *atitude of M S datum point* shall be the latitude coordinate of the MLS datum point as defined by the World Geodetic System 1984 (WGS-84) reference ellipsoid, coordinate system and associated datum.

b) *ongitude of the M S datum point* shall be the longitude coordinate of the MLS datum point as defined by the same reference ellipsoid, coordinate system, and datum noted in item a).

c) *ertical coordinate of the M S datum point* shall be the vertical coordinate of the MLS datum point as defined by the same reference ellipsoid, coordinate system, and datum noted in item a).

Note Although S has been approved as the ICA Standard for geographical coordinates indicating latitude and longitude introduction of vertical S coordinates is pending Until this introduction an elevation referenced to mean sea level (msl) can continue to be used

d) *Approach a imuth true north orientation* shall represent the angle measured in the horizontal plane clockwise from True North to the zero-degree approach azimuth, originating from the approach azimuth antenna. The vertex of the measured angle shall be the approach azimuth antenna phase centre.

e) *Runway visual range (R R)* shall represent measurement of instrument RVR at touchdown zone, mid-point and stop end of the runway together with the trend indication, provided in accordance with Annex 3, Chapter 4.

f) *Surface wind* shall represent wind speed and wind direction (magnetic), provided in accordance with Annex 3, Chapter 4.

g) *Approach a imuth antenna offset* shall represent the minimum distance between the approach azimuth antenna phase centre and a vertical plane containing the runway centre line.

h) *Approach a imuth antenna to M S datum point distance* shall represent the minimum distance between the approach azimuth antenna phase centre and the vertical plane perpendicular to the runway centre line and containing the MLS datum point.

i) *Approach a imuth alignment with runway centre line* shall represent the minimum angle between the zero-degree approach azimuth and the runway centre line.

j) *Approach a imuth antenna height* shall represent the vertical location of the antenna phase centre with respect to the MLS datum point.

k) *ac a imuth antenna offset* shall represent the minimum distance between the back azimuth antenna phase centre and a vertical plane containing the runway centre line.

l) *ac a imuth antenna to M S datum point distance* shall represent the minimum distance between the back azimuth antenna and the vertical plane perpendicular to the runway centre line which contains the MLS datum point.

m) *ac a imuth alignment with runway centre line* shall represent the minimum angle between the zero-degree back azimuth and the runway centre line.

n) *ac a imuth antenna height* shall represent the vertical location of the antenna phase centre with respect to the MLS datum point.

o) *Primary runway number* shall represent the primary runway number as defined in Annex 14, Volume I, Chapter 5.

p) *Primary runway letter* shall represent the primary runway letter as defined in Annex 14, Volume I, Chapter 5, where used to differentiate between parallel runways.

q) *Secondary runway number* shall represent the secondary runway number as defined in Annex 14, Volume I, Chapter 5.

r) *Secondary runway letter* shall represent the secondary runway letter as defined in Annex 14, Volume I, Chapter 5, where used to differentiate between parallel runways.

s) *Elevation guidance to secondary runway* shall indicate whether or not elevation guidance may be used to the secondary runway, and if so, whether it is directly usable as a raw angle or requires computed glide path.

t) *Minimum glide path to secondary runway* shall represent the lowest angle of descent along the secondary runway centre line.

u) *Approach a imuth alignment with secondary runway centre line* shall represent the minimum angle between the zero-degree approach azimuth and the secondary runway centre line.

v) *Secondary runway threshold coordinate* shall represent the minimum distance between the secondary runway threshold and the vertical plane perpendicular to the primary runway centre line containing the MLS datum point.

w) *Secondary runway threshold coordinate* shall represent the minimum distance between the secondary runway threshold and the vertical plane containing the primary runway centre line.

x) *Secondary runway threshold coordinate* shall represent the height of the secondary runway threshold above the MLS datum point.

y) *Secondary runway threshold crossing height* shall represent the height above the secondary runway threshold at which the computed glide path crosses the threshold.

z) *irtual a imuth to secondary runway threshold distance* shall represent the distance to the secondary runway threshold from the point to be considered as the origin for lateral guidance to that runway.

Note This distance may be used by the M S receiver in a manner similar to the approach a imuth antenna to threshold distance to establish the lateral deviation scale factor

able A 12 Auxiliary data
(see)

Word	Data content	Type of data	Maximum time between transmissions (seconds)	Bits used	Bits used	Least significant bit	Bit number
Words B1 through B39: Time-invariant (fixed) data items supporting MLS/RNAV procedures (see Table A-15)							
Words B40 through B54: Other fixed data items							
B40	PREAMBLE	digital	2.0	12	see Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	Latitude of MLS datum point			23	324 000.0 arc seconds to 324 000.0 arc seconds (see Note 2)	0.1 arc seconds	I_{21} - I_{43}
	Longitude of MLS datum point			24	648 000.0 arc seconds to 648 000.0 arc seconds (see Note 2)	0.1 arc seconds	I_{44} - I_{67}
	SPARE			2	see Note 9		I_{68} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}
B41	PREAMBLE	digital	2.0	12	see Note 6		I_1 - I_{12}
	Address			8			I_{13} -I_{20}
	Vertical coordinate of MLS datum point			13	4 095 m to 4 095 m (see Note 2)	1 m	I_{21} - I_{33}
	Approach azimuth True North orientation			16	0 to 359.99	0.01	I_{34} - I_{45}
	SPARE			20			I_{50} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}
B42	PREAMBLE (see Note 5)	digital	1.0	12	see Note 6		I_1 - I_{12}
	Address			8			I_{13} - I_{20}
	Approach azimuth antenna offset			10	511 m to 511 m (see Note 2)	1 m	I_{21} - I_{30}
	Approach azimuth antenna to MLS datum point distance			13	0 m to 8 191 m	1 m	I_{31} - I_{43}
	Approach azimuth alignment with runway centre line			14	81.91 to 81.91 (see Note 2)	0.01	I_{44} - I_{67}
	Approach azimuth antenna height			7	63 m to 63 m (see Note 2)	1 m	I_{58} - I_{64}
	SPARE			5	see Note 9		I_{65} - I_{69}

Word	Data content	Type of data	Maximum time between transmissions (seconds)	Bits used	Bits used	Least significant bit	Bit number
	PARITY			7	see Note 1		I_{70} - I_{76}
B43	PREAMBLE (see Notes 4 and 5)	digital	1.0	12	see Note 6		I_{1} - I_{12}
	Address			8			I_{13} - I_{20}
	Back azimuth antenna offset			10	511 m to 511 m (see Note 2)	1 m	I_{21} - I_{30}
	Back azimuth antenna to MLS datum point distance			11	0 m to 2 047 m	1 m	I_{31} - I_{41}
	Back azimuth alignment with runway centre line			14	81.91 to 81.91 (see Note 2)	0.01	I_{42} - I_{55}
	Back azimuth antenna height			7	63 m to 63 m (see Note 2)	1 m	I_{56} - I_{62}
	SPARE			7	see Note 9		I_{63} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}
B44	PREAMBLE	digital	2.0	12	see Note 6		I_{1} - I_{12}
	Address			8			I_{13} - I_{20}
	Primary runway number			6	0 to 36 (see Note 10)		I_{21} - I_{26}
	Primary runway letter			2	see Note 7		I_{27} - I_{28}
	Secondary runway number			6	0 to 36 (see Note 10)		I_{29} - I_{34}
	Secondary runway letter			2	see Note 7		I_{35} - I_{36}
	Elevation guidance to secondary runway			2	see Note 8		I_{37} - I_{38}
	Minimum glide path to secondary runway			7	2 to 14.7	0.1	I_{39} - I_{45}
	Approach azimuth alignment with secondary runway centre line			16	180.00	0.01	I_{46} - I_{61}
	SPARE			8	see Note 9		I_{62} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}
B45	PREAMBLE	digital	2.0	12	see Note 6		I_{1} - I_{12}
	Address			8			I_{13} - I_{20}
	Secondary runway threshold X coordinate			15	16 384 m	1 m	I_{21} - I_{35}
	Secondary runway threshold Y coordinate			15	16 384 m	1 m	I_{36}- I_{50}

Word	Data content	Type of data	Maximum time between transmissions (seconds)	Bits used	Bits used	Least significant bit	Bit number
	Secondary runway threshold coordinate			8	127 m	1 m	I_{51} - I_{58}
	Secondary runway threshold crossing height			5	0 to 31 m	1 m	I_{59} - I_{63}
	Virtual azimuth to secondary runway threshold distance			6	0 to 6 300 m	100 m	I_{64} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}
Words B55 through B64: Time-varying data items. *(Note ord only is defined below)*							
B55	PREAMBLE	digital	10.0	12	see Note 6		I_{1} - I_{12}
	Address			8			I_{13} - I_{20}
	RVR (touchdown zone)			11	0 - 2 555 m (see Note 3)	5 m	I_{21} - I_{31}
	RVR (mid-point)			11	0 - 2 555 m (see Note 3)	5 m	I_{32} - I_{42}
	RVR (stop end)			11	0 - 2 555 m (see Note 3)	5 m	I_{43} - I_{53}
	Surface wind speed			7	0 - 127 kt	1 kt	I_{54} - I_{60}
	Surface wind direction (magnetic)			9	0 - 359	1	I_{61} - I_{69}
	PARITY			7	see Note 1		I_{70} - I_{76}

N TES

1. Parity bits I_{70} to I_{76} are chosen to satisfy the equations which follow.

For bit I_{70}
EVEN (I_{13} ... I_{18}) I_{20} I_{22} I_{24} I_{25} I_{28} I_{29} I_{31} I_{32} I_{33} I_{35} I_{36}
I_{38} I_{41} I_{44} I_{45} I_{46} I_{50} (I_{52} ... I_{55}) I_{58} I_{60} I_{64} I_{65} I_{70}

For bit I_{71}
EVEN (I_{14} ... I_{19}) I_{21} I_{23} I_{25} I_{26} I_{29} I_{30} I_{32} I_{33} I_{34} I_{36} I_{37}
I_{39} I_{42} I_{45} I_{46} I_{47} I_{51} (I_{53} ... I_{56}) I_{59} I_{61} I_{65} I_{66} I_{71}

For bit I_{72}
EVEN (I_{15} ... I_{20}) I_{22} I_{24} I_{26} I_{27} I_{30} I_{31} I_{33} I_{34} I_{35} I_{37} I_{38}
I_{40} I_{43} I_{46} I_{47} I_{48} I_{52} (I_{54} ... I_{57}) I_{60} I_{62} I_{66} I_{67} I_{72}

For bit I_{73}
EVEN (I_{16} ... I_{21}) I_{23} I_{25} I_{27} I_{28} I_{31} I_{32} I_{34} I_{35} I_{36} I_{38} I_{39}
I_{41} I_{44} I_{47} I_{48} I_{49} I_{53} (I_{55} ... I_{58}) I_{61} I_{63} I_{67} I_{68} I_{73}

For bit I_{74}
EVEN (I_{17} ... I_{22}) I_{24} I_{26} I_{28} I_{29} I_{32} I_{33} I_{35} I_{36} I_{37} I_{39} I_{40}
I_{42} I_{45} I_{48} I_{49} I_{50} I_{54} (I_{56} ... I_{59}) I_{62} I_{64} I_{68} I_{69} I_{74}

For bit I_{75}
EVEN (I_{13} ... I_{17}) I_{19} I_{21} I_{23} I_{24} I_{27} I_{28} I_{30} I_{31} I_{32} I_{34} I_{35}
I_{37} I_{40} I_{43} I_{44} I_{45} I_{49} (I_{51} ... I_{54}) I_{57} I_{59} I_{63} I_{64} I_{69} I_{75}

For bit I_{76}
EVEN I_{13} I_{14} ... I_{75} I_{76}

2. The convention for the coding of negative numbers is as follows:
   MSB is the sign bit:
   0 positive
   1 negative

   Other bits represent the absolute value.

   The convention for the antenna location is as follows:
   As viewed from the MLS approach reference datum looking toward the MLS datum point, a positive number represents a location to the right of the runway centre line (lateral offset) or above the runway (vertical offset), or towards the stop end of the runway (longitudinal distance).

   The convention for the alignment is as follows:
   As viewed from above, a positive number represents clockwise rotation from the runway centre line to the respective zero-degree guidance radial.

   The convention for geodetic coordinates is as follows:
   A positive number represents a northern latitude or eastern longitude.
   A negative number represents a southern latitude or western longitude.
3. The tenth and eleventh bits transmitted for each RVR value are used to provide trend information. The convention for coding is as follows:

	Tenth bit	Eleventh bit
Off	0	0
Decreasing	1	0
Equal	0	1
Increasing	1	1

4. When used, data word B43 is transmitted in both approach azimuth and back azimuth coverage sectors if back azimuth guidance is provided, while retaining the specified maximum time between transmissions in each area.
5. Data words B42 and B43 are defined for applications that require azimuth antenna rotation greater than the 20.47 supported by the data items in A1, for azimuth, and A4, for back azimuth. At a facility with approach azimuth rotation greater than 20.47 , B42 is transmitted in place of A1. At a facility with the back azimuth rotation greater than 20.47 , B43 is transmitted in place of A4.
6. The 12 data bits of the preamble are preceded by an 0.832 millisecond interval (13 clock pulses) of CW for carrier acquisition (see Table A-1).
7. The convention for coding is as follows:
   0 no letter
   1 R (right)
   2 C (centre)
   3 L (left)
8. The convention for coding is as follows:
   0 not provided
   1 raw elevation guidance
   2 computed glide path
   3 code not allowed
9. All spare bits are set to ERO.
10. Runway number designation 0 is for heliport operations.

able A 13 Definitions of auxiliary data items concerning S/R A procedure database
(see)

a) *Number of approach a imuth procedure descriptors* shall represent the total number of named approach and departure procedures for which procedure descriptor words are transmitted in the approach azimuth coverage sector.

Note Missed approaches are not counted as they do not use procedure descriptor words Computed centre line procedures to the primary runway are counted if a procedure descriptor is transmitted even though associated waypoint data are not transmitted in auxiliary words to

b) *Number of bac a imuth procedure descriptors* shall represent the total number of named approach and departure procedures for which procedure descriptor words are transmitted in the back azimuth coverage sector.

Note Missed approaches are not counted as they do not use procedure descriptor words

c) *ast approach a imuth database word* shall represent the address code of the last auxiliary data word within the range B1 to B39 which is transmitted in the approach azimuth coverage sector, as defined by bits I_{13} to I_{18} of that word.

d) *First bac a imuth database word* shall represent the address code of the first auxiliary data word within the range B1 to B39 which is transmitted in the back azimuth coverage sector, as defined by bits I_{13} to I_{18} of that word.

e) *Approach a imuth CRC code* shall represent the coefficients of the cyclic redundancy check code for the approach azimuth procedure database.

f) *ac a imuth CRC code* shall represent the coefficients of the cyclic redundancy check code for the back azimuth procedure database.

g) *ord transmitted* shall indicate whether auxiliary data word B42 is transmitted in lieu of word A1.

h) *ord A transmitted* shall indicate whether auxiliary data word A4 is transmitted.

i) *ord transmitted* shall indicate whether auxiliary data word B43 is transmitted.

j) *ac a imuth map CRC indicator* shall indicate whether auxiliary data word B39 is employed as a back azimuth map/CRC word or as an approach azimuth waypoint data word.

k) *asic indicator* shall represent the name of the first flown waypoint in an approach procedure, or the last flown waypoint in a departure procedure. The name shall consist of five alpha characters coded in accordance with bits b_1 to b_5 of International Alphabet No. 5.

l) *alidity indicator* shall represent the revision level of the approach or departure procedure. The validity indicator shall be a number from 1 to 9.

m) *Route indicator* shall represent the route to or from the waypoint named by the basic indicator. The route indicator shall be a single alpha character coded in accordance with bits b_1 to b_5 of International Alphabet No. 5. The letters “I” and “O” shall not be used. Each of the 24 available route indicators shall be assigned not more than once within the combined set of approach azimuth and back azimuth procedure descriptor words.

Note The restriction on the uni ue assignment of route indicators for M S RNA operations is a departure from normal route assignment practice necessary to enhance the integrity of procedure selection and reduce pilot wor load

n) *Runway number* shall represent the runway number as defined in Annex 14, Volume I, Chapter 5.

o) *Runway letter* shall represent the runway letter as defined in Annex 14, Volume I, Chapter 5, where used to differentiate between parallel runways.

p) *Procedure type* shall indicate whether the procedure is an approach procedure or a departure procedure.

q) *First waypoint index* shall represent the sequential position, within the approach azimuth database or back azimuth database, of the waypoint definition data for the first encoded waypoint of the procedure.

r) *coordinate* shall represent the X coordinate of a given waypoint in the coordinate system defined.

s) *coordinate follows* shall indicate whether or not the Y coordinate is transmitted for a given waypoint. If the Y coordinate is not transmitted, the Y coordinate is assumed to be zero.

t) *coordinate* shall represent the Y coordinate of a given waypoint in the coordinate system defined.

u) *coordinate follows* shall indicate whether or not the coordinate is transmitted for a given waypoint.

v) *coordinate* shall represent the coordinate of given waypoint in the coordinate system defined.

w) *Next segment field identifier* shall indicate whether the next segment of a given procedure is straight or curved and indicate which data fields follow the waypoint coordinates.

x) *Threshold waypoint height* shall represent the height of the primary runway threshold waypoint above the runway threshold.

y) *irtual a imuth to waypoint distance* shall represent the distance to the waypoint from the point to be considered as the origin for lateral guidance for an approach procedure not leading to the primary runway threshold.

Note This distance may be used by the M S receiver in a manner similar to the approach a imuth antenna to threshold distance to establish the lateral deviation scale factor for the procedure

z) *Next waypoint index* shall represent the sequential position, within the approach azimuth database or back azimuth database, of the waypoint definition data for the next waypoint in the procedure.

Note The next waypoint index may be used to permit sharing of one or more waypoints which have been explicitly defined as a part of another procedure The shared waypoints are the final ones for approach procedures and the initial ones for missed approach and departure procedures

aa) *Missed approach index* shall represent the sequential position, within the approach azimuth database or back azimuth database, of the waypoint definition data for the first encoded (last flown) waypoint of the associated missed approach procedure.

able A 1 S/R A procedure database structure
(see)

Database	Word	Data content
Approach azimuth	B1	Approach azimuth map/CRC word
	B2	Procedure 1 descriptor word
	. . .	. . .
	. . .	. . .
	B(M 1)	Procedure "M" descriptor word (see Note 1)
	B(M 2) to B(a)	Waypoint data words
	B(a 1) to B(b 1)	Not used.
Back azimuth (see Note 2)	B(b)	Procedure 1 descriptor word
	. . .	. . .
	. . .	. . .
	B(b N 1)	Procedure "N" descriptor word (see Note 1)
	B(b N) to B(38)	Waypoint data words
	B39	Back azimuth map/CRC word

N TES

1. Parameter "M" represents the number of named approach and departure procedures which commence within the approach azimuth coverage sector. Parameter "N" represents the number of named approach and departure procedures which commence within the back azimuth coverage sector.
2. A facility without a back azimuth database may employ all words up to B39 for the approach azimuth database.

able A 1 Auxiliary data ords 1 t roug 3
(see)

Word	Data content	Type of data	Maximum time (seconds)	Bits used	Range of values	Bit numbers
Approac a imut map/CRC ord						
B1	PREAMBLE	digital	2.5	12		I_1 to I_{12}
	Address			8		I_{13} to I_{20}
	Number of approach azimuth procedure descriptors			4	0 to 15	I_{21} to I_{24}
	Last approach azimuth database word			6	see Note 2	I_{25} to I_{30}
	Approach azimuth CRC code			32	see Note 3	I_{31} to I_{62}
	Word B42 transmitted			1	see Note 4	I_{63}
	Word A4 transmitted			1	see Note 4	I_{64}
	Word B43 transmitted			1	see Note 4	I_{65}
	Spare			4	see Note 12	I_{66} to I_{69}
	PARITY			7	see Note 13	I_{70} to I_{76}

Word	Data content	Type of data	Maximum time (seconds)	Bits used	Range of values	Bit numbers
rocedure descriptor ords						
B2 to B(M 1) (approach azimuth database) (see Note 1) B(b) to B(b N 1) (back azimuth database)						
	PREAMBLE	digital	2.5	12		I_1 to I_{12}
	Address			8		I_{13} to I_{20}
	Basic indicator			25	see Note 5	I_{21} to I_{45}
	Validity indicator			4	1 to 9 (see Note 14)	I_{46} to I_{49}
	Route indicator			5	see Note 5	I_{50} to I_{54}
	Runway number			6	0 to 36 (see Note 15)	I_{55} to I_{60}
	Runway letter			2	see Note 6	I_{61} to I_{62}
	Procedure type			1	see Note 7	I_{63}
	First waypoint index			6	0 to 63 (see Notes 8, 9)	I_{64} to I_{69}
	PARITY			7	see Note 13	I_{70} to I_{76}
Waypoint data ords (see Table A-16)						
B(M 2) to B(a) (approach azimuth database) (see Notes 1 and 11) B(b N) to B(38) (back azimuth database)						
	PREAMBLE	digital	2.5	12		I_1 to I_{12}
	Address			8		I_{13} to I_{20}
	Waypoint definition data items			49	see Notes 10, 11	I_{21} to I_{69}
	PARITY			7	see Note 13	I_{70} to I_{76}
ack a imut map/CRC ord (see Notes 1 and 11)						
B39	PREAMBLE	digital	2.5	12		I_1 to I_{12}
	Address			8		I_{13} to I_{20}
	Number of back azimuth procedure descriptors			4	0 to 15	I_{21} to I_{24}
	First back azimuth database word			6	see Note 2	I_{25} to I_{30}
	Back azimuth CRC code			32	see Note 3	I_{31} to I_{62}
	Word B43 transmitted			1	see Note 4	I_{63}
	Spare			5	see Note 12	I_{64} to I_{68}
	Back azimuth map/CRC indicator			1	see Note 11	I_{69}
	PARITY			7	see Note 13	I_{70} to I_{76}

N TES

1. Variables used in word numbers correspond to those used in Table A-14.
2. This field is coded in accordance with Table A-9, using bits I_{13} through I_{18}. In this table, bit I_{25} carries the information of bit I_{13} from Table A-9 and is transmitted first.
3. The CRC code contains the remainder, R(x), of the modulo 2 division of two polynomials:

$$\left[\frac{x^{32}M(x)}{(x)}\right]_{\text{mod } 2} = (x) + \frac{R(x)}{(x)}$$

M(x) is the information field, which consists of the approach azimuth or back azimuth database defined below, excluding the preambles, addresses, parity bits, and CRC code bits. For auxiliary data words these are bits I_{21} to I_{69}, and for basic data words bits I_{13} to I_{30}. The database consists of the following data words in the order listed:

Approach a imuth database	*ac a imuth database*
B1 (bits I_{21} to I_{30}, I_{63} to I_{69})	B(b) to B38
B2 to B(a)	B39 (bits I_{21} to I_{30}, I_{63} to I_{69})
B40, B41	B40, B41, A3
A1 or B42, A2, A3	A4 or B43 (if transmitted)
A4 or B43 (if transmitted)	Basic data word 6
Basic data word 6	

M(x) is multiplied by x^{32}, which appends 32 zero bits to the end of the dividend.
G(x) is the generator polynomial, defined as follows:
G(x) x^{32} x^{31} x^{14} x^{13} x^{9} x^{8} x^{4} x^{3} x 1
Q(x) is the quotient of the division.
The CRC code, R(x), is transmitted with the coefficient of x^{31} as bit I_{31} and the coefficient of x^{0} as bit I_{62}.

4. The convention for coding is as follows:
   0 no
   1 yes
5. Alpha characters are coded as defined in 3.11.4.8.3 for data words B1 through B39.
6. The convention for coding is as follows:
   0 no letter
   1 R (right)
   2 C (centre)
   3 L (left)
7. The convention for coding is as follows:
   0 approach procedure
   1 departure procedure
8. Waypoint index numbers are assigned by sequentially numbering all waypoints in the approach azimuth or back azimuth database. If a waypoint at the primary runway threshold is coded using only a threshold crossing height, it is omitted from the waypoint index sequence.
9. A value of zero in this field indicates that the procedure is a computed centre line procedure based on data contained in auxiliary data words A1 (or B42), A2, A3 and A4 (or B43).
10. Waypoint definitions are of variable length and are coded sequentially without conforming to word boundaries. Spare bits are not permitted between waypoint definitions. Any spare bits at the end of the last waypoint data word are set to zero. Waypoint definitions for an approach procedure are coded in the order that the aircraft flies the procedure. Waypoint definitions for a missed approach or departure are coded in the reverse order. Missed approach or departure waypoints which are not shared with approach waypoints are coded after the last approach waypoint in the database.
11. A facility without a back azimuth data base may employ auxiliary word B39 as a waypoint data word for the approach azimuth database. Bit I_{69} of word B39 is used to indicate the application of this word. The convention for coding is as follows:
    0 word B39 is a waypoint data word
    1 word B39 is the back azimuth map/CRC word
12. All spare bits are set to ERO.
13. Parity bits I_{70} to I_{76} are chosen to satisfy the equations given in Note 1 of Table A-12.
14. The coded value 0000 is not allowed.
15. Runway number designation 0 is for heliport operations.

able A 16 Waypoint definition data items
(see)

Data content	Bits used	Range of values	Least significant bit
X coordinate	15	41 940 m (see Notes 1, 2)	2.56 m
Y coordinate follows	1	See Note 3	
Y coordinate	15	41 940 m (see Notes 1, 2)	2.56 m
coordinate follows	1	See Note 3	
coordinate	13	100 to 8 091 m (see Notes 1, 4)	1 m
Next segment/field identifier	3	See Note 5	
Threshold waypoint height	6	0 to 31.5 m (see Note 5)	0.5 m
Virtual azimuth to waypoint distance	6	0 to 6 300 m (see Note 5)	100 m
Next waypoint index	6	See Notes 5, 6	
Missed approach index	6	See Notes 5, 6	

N TES

1. The origin of the coordinate system is the MLS datum point. The X-axis is horizontal, and lies in the vertical plane containing the runway centre line, with a positive number representing a location toward the approach reference datum. The Y-axis is horizontal and perpendicular to the X-axis, with a positive number representing a location to the left of centre line as viewed from the MLS datum point looking toward the approach reference datum. The -axis is vertical, with a positive number representing a location above the MLS datum point. Earth curvature is not considered when determining waypoint coordinate values.
2. The convention for coding is as follows:
   Most significant bit is the sign bit:
   0 positive
   1 negative
   The other bits represent the absolute value.
3. The convention for coding is as follows:
   0 no
   1 yes
   The “Y coordinate follows” bit is set to ERO (no) to indicate that the Y coordinate for the waypoint is zero. In this case, the Y coordinate field is not used. The “ coordinate follows” bit is set to ERO (no) to indicate either that the waypoint is two-dimensional or that it lies on a constant gradient between two waypoints for which the coordinate is transmitted. In either of these two cases, the coordinate field is not used.
4. This field is coded as an unsigned value with an offset of 100 m. A value of zero in this field would therefore represent a coordinate of 100 m.
5. Data fields which follow the next segment/field identifier are transmitted only for certain cases. The coding of the next segment/field identifier and use of subsequent data fields are defined in Table A-17.
6. Waypoint index numbers are assigned by sequentially numbering all waypoints in the approach azimuth or back azimuth database. If a waypoint at the primary runway threshold is coded using only a threshold crossing height, it is omitted from the waypoint index sequence. The next waypoint index field always refers to an index number lower than that of the current waypoint. The missed approach index field always refers to an index number higher than that of the current waypoint.

able A 1 ext segment/field identifiers
(see)

Application				Next segment/ field identifier	Data field(s) to follow identifier		
Next waypoint location	Next waypoint shared (Note 1)	Linked to missed approach	Segment type		Approach procedure	Missed approach procedure	Departure procedure
Any	No	No	Straight	0	Next waypoint X coordinate		
			Curved	1			
	Yes		Straight	2	1. Next waypoint index 2. Next procedure first waypoint X coordinate		
			Curved	3			
Primary runway threshold	No	No	Straight	4	1. Threshold waypoint height 2. Next procedure first way-point X coordinate	Next procedure first waypoint X coordinate	
		Yes		5	1. Threshold waypoint height 2. Missed approach index 3. Next procedure first way-point X coordinate	Not allowed (see Note 3)	
None		No	None (see Note 2)	6	1. Virtual azimuth to waypoint distance 2. Next procedure first way-point X coordinate	Next procedure first waypoint X coordinate	
		Yes	Straight to first flown missed approach waypoint	7	1.Virtual azimuth to waypoint distance 2. Missed approach index 3. Next procedure first way-point X coordinate	Not allowed (see Note 3)	

N TES

1. A shared waypoint is a waypoint that is identified in the current procedure by waypoint index number only. The waypoint coordinates are explicitly defined as part of another procedure.
2. Beyond this waypoint, guidance information is provided relative to the straight line extended from the current waypoint, tangent to the path entering the waypoint. In the case of a missed approach procedure, this line intersects the last approach waypoint.
3. Next segment/field identifier values 5 and 7 are reserved for use in approach procedures only. Missed approach and departure procedures may share approach waypoints which use these values, ignoring the data fields for threshold waypoint height, virtual azimuth to threshold distance and missed approach index.

A E D ECH CA S EC F CA O S FOR HE O A A A O SA E E S S E SS

1 DEF O S

A A ground-based augmentation system transmitting an elliptically-polarized VHF data broadcast.

A A ground-based augmentation system transmitting a horizontally-polarized VHF data broadcast.

eceiver A subsystem that receives GNSS signals and includes one or more sensors.

eserved (its words ields) Bits/words/fields that are not allocated, but which are reserved for a particular GNSS application.

are (its words ields) Bits/words/fields that are not allocated or reserved, and which are available for future allocation.

Note All spare bits are set to ero

2 E ERA

Note The following technical specifications supplement the provisions of Chapter

3 SS E E E S

3 1 lobal ositioning System S Standard ositioning Ser ice S S 1

3.1.1 NON-AIRCRAFT ELEMENTS

3.1.1.1 *RADI FRE UENC (RF) C ARACTERISTICS*

3.1.1.1.1 *Carrier phase noise*. The carrier phase noise spectral density of the unmodulated carrier shall be such that a phase locked loop of 10 Hz one-sided noise bandwidth is able to track the carrier to an accuracy of 0.1 radian (1 sigma).

3.1.1.1.2 *Spurious emissions* In-band spurious emissions shall be at least 40 dB below the unmodulated L1 carrier over the allocated channel bandwidth.

3.1.1.1.3 *Correlation loss* The loss in the recovered signal power due to imperfections in the signal modulation and waveform distortion shall not exceed 1 dB.

Note The loss in signal power is the difference between the broadcast power in a M bandwidth and the signal power recovered by a noise free loss free receiver with chip correlator spacing and a M bandwidth

3.1.1.1.4 *Coarse ac uisition (C A) code generation and timing* Each C/A code pattern $G_i(t)$ shall be formed by the Modulo-2 sum of two 1 023-bit linear patterns, G1 and $G2_i$. The $G2_i$ sequence shall be formed by effectively delaying the G2 sequence by an integer number of chips to produce one of 36 unique $G_i(t)$ patterns defined in Table B-1. The G1 and G2 sequences shall be generated by 10-stage shift registers having the following polynomials as referred to in the shift register input:

a) G1: X^{10} X^3 1; and

b) G2: X^{10} X^9 X^8 X^6 X^3 X^2 1.

The initialization vector for the G1 and G2 sequences shall be "1111111111". The code phase assignments shall be as shown in Table B-1. The G1 and G2 registers shall be clocked at a 1.023 MHz rate. Timing relationships related to the C/A code shall be as shown in Figure B-1.*

3.1.1.2 *Data structure* The navigation message shall be formatted as shown in Figure B-2. Each page, as shown in Figure B-6, shall utilize a basic format of a 1 500-bit-long frame with up to 5 subframes, each of 300 bits in length. All words shall be transmitted most significant bit (MSB) first.

3.1.1.2.1 *Subframe structure* Each subframe and/or page of a subframe shall start with a telemetry (TLM) word followed by a handover word (HOW). The HOW shall be followed by 8 data words. Each word in each frame shall contain 6 parity bits. The TLM word and HOW formats shall be as shown in Figures B-3 and B-4, respectively.

3.1.1.2.2 *End start of wee* At the end/start of week:

a) the cyclic paging of subframes 1 through 5 shall restart with subframe 1 regardless of which subframe was last transmitted prior to the end/start of week; and

b) the cycling of 25 pages of subframes 4 and 5 shall restart with page 1 of each of the subframes, regardless of which page was transmitted prior to the end/start of week. All upload and page cutovers shall occur on frame boundaries (i.e. Modulo 30 seconds relative to the end/start of week).

Note New data in subframes and may start to be transmitted with any of the pages of these subframes

3.1.1.2.3 *Data parity* Words 1 through 10 of subframes 1 through 5 shall each contain 6 parity bits as their least significant bits (LSBs). In addition, two non-information bearing bits shall be provided as bits 23 and 24 of words 2 and 10 for parity computation purposes.

3.1.1.2.4 *Telemetry (T M) word*. Each TLM word shall be 30 bits long, occur every 6 seconds in the data frame and be the first word in each subframe. The TLM format shall be as shown in Figure B-3. Each TLM word shall begin with a preamble, followed by 16 reserved bits and 6 parity bits.

3.1.1.2.5 *andover word ( )* The HOW shall be 30 bits long and shall be the second word in each subframe/page, immediately following the TLM word. A HOW shall occur every 6 seconds in the data frame. The HOW format and content shall be as shown in Figure B-4. The full time-of-week (TOW) count shall consist of the 19 LSBs of the 29-bit -count (3.1.1.2.6). The HOW shall begin with the 17 MSBs of the TOW count. These 17 bits shall correspond to the TOW count at the 1.5-second epoch that occurs at the start (leading edge) of the next following subframe.

3.1.1.2.5.1 *it* . On satellites designed by configuration code 001, bit 18 shall be an "alert" flag. When this flag is raised (bit 18 is a "1"), it shall indicate to the user that the satellite user range accuracy (URA) may be worse than indicated in subframe 1 and that use of the satellite is at the user s risk.

*All figures are located at the end of the appendix.

able 1 Code p ase assignments

Satellite ID number	GPS PRN signal	G2 delay (chips)	First 10 chips octal*
1	1	5	1440
2	2	6	1620
3	3	7	1710
4	4	8	1744
5	5	17	1133
6	6	18	1455
7	7	139	1131
8	8	140	1454
9	9	141	1626
10	10	251	1504
11	11	252	1642
12	12	254	1750
13	13	255	1764
14	14	256	1772
15	15	257	1775
16	16	258	1776
17	17	469	1156
18	18	470	1467
19	19	471	1633
20	20	472	1715
21	21	473	1746
22	22	474	1763
23	23	509	1063
24	24	512	1706
25	25	513	1743
26	26	514	1761
27	27	515	1770
28	28	516	1774
29	29	859	1127
30	30	860	1453
31	31	861	1625
32	32	862	1712
***	33	863	1745
***	34**	950	1713
***	35	947	1134
***	36	948	1456
***	37**	950	1713

* In the octal notation for the first 10 chips of the C/A code as shown in this column, the first digit represents a “1” for the first chip and the last three digits are the conventional octal representation of the remaining 9 chips (e.g. the first 10 chips of the C/A code for pseudo-random noise (PRN) signal assembly 1 are: 1100100000).

** C/A codes 34 and 37 are common.

*** PRN signal assemblies 33 through 37 are reserved for other uses (e.g. ground transmitters).

3.1.1.2.5.2 *it* Bit 19 shall be reserved.

3.1.1.2.5.3 *its and* . Bits 20, 21 and 22 of the HOW shall provide the identification (ID) of the subframe in which that particular HOW is the second word. The ID code shall be as defined below:

ID	Code
1	001
2	010
3	011
4	100
5	101

3.1.1.2.6 *Satellite count* Each satellite shall internally derive a 1.5-second epoch that shall contain a convenient unit for precisely counting and communicating time. Time stated in this manner shall be referred to as a -count. The -count shall be provided to the user as a 29-bit binary number consisting of two parts as follows.

3.1.1.2.6.1 *Time of wee (T) count* The binary number represented by the 19 LSBs of the -count shall be referred to as the TOW count and is defined as being equal to the number of 1.5-second epochs that have occurred since the transition from the previous week. The count shall be short-cycled such that the range of the TOW count is from 0 to 403 199 1.5-second epochs (equalling one week) and shall be reset to zero at the end of each week. The TOW count s zero state shall be the 1.5-second epoch that is coincident with the start of the present week. A truncated version of the TOW count, consisting of its 17 MSBs, shall be contained in the HOW of the L1 downlink data stream. The relationship between the actual TOW count and its truncated HOW version shall be as indicated in Figure B-5.

Note The above mentioned epoch occurs at (approximately) midnight Saturday night Sunday morning where midnight is defined as hours on the UTC scale which is nominally referenced to the reenwich Meridian

3.1.1.2.6.2 *ee count*. The 10 MSBs of the -count shall be a binary representation of the sequential number assigned to the present GPS week (Modulo 1024). The range of this count shall be from 0 to 1 023. Its zero state shall be that week which starts with the 1.5-second epoch occurring at (approximately) the UTC zero time point (3.1.4). At the expiration of GPS week number 1 023, the GPS week number shall roll over to zero. The previous 1 024 weeks in conversions from GPS time to a calendar date shall be accounted for by the user.

3.1.1.3 *DATA C NTENT*

3.1.1.3.1 *Subframe satellite cloc and health data*. The content of words 3 through 10 of subframe 1 shall contain the clock parameters and other data as indicated in Table B-2. The parameters in a data set shall be valid during the interval of time in which they are transmitted and shall remain valid for an additional period of time after transmission of the next data set has started.

3.1.1.3.1.1 *ee number* The 10 MSBs of word 3 shall contain the 10 MSBs of the 29-bit -count and shall represent the number of the current GPS week at the start of the data set transmission interval with all zeros indicating week “zero.” The GPS week number shall increment at each end/start of week epoch.

3.1.1.3.1.2 *User range accuracy (URA)* Bits 13 through 16 of word 3 shall provide the predicted satellite URA as shown in Table B-3.

Note The URA does not include error estimates due to inaccuracies of the single fre uency ionospheric delay model

Note The URA is a statistical indicator of the contribution of the apparent cloc and ephemeris prediction accuracies to the ranging accuracies obtainable with a specific satellite based on historical data

able 2 Subframe 1 parameters

Parameter	Number of bits**	Scale factor (LSB)	Effective range***	Units
Week number	10	1		weeks
Satellite accuracy	4			
Satellite health	6	1		discretes
T_{GD}	8*	$2^{\ 31}$		seconds
IODC	10			
t_{oc}	16	2^4	604 784	seconds
a_{f2}	8*	$2^{\ 55}$		seconds/second^2
a_{f1}	16*	$2^{\ 43}$		seconds/second
a_{f0}	22*	$2^{\ 31}$		seconds

* Parameters so indicated are two s complement, with the sign bit (or) occupying the MSB.
** See Figure B-6 for complete bit allocation.
*** Unless otherwise indicated in this column, effective range is the maximum range.

able 3 ser range accuracy

URA	Accuracy
0	2 m
1	2.8 m
2	4 m
3	5.7 m
4	8 m
5	11.3 m
6	16 m
7	32 m
8	64 m
9	128 m
10	256 m
11	512 m
12	1 024 m
13	2 048 m
14	4 096 m
15	Do not use

3.1.1.3.1.3 *ealth* The transmitting satellite 6-bit health indication shall be provided by bits 17 through 22 of word 3. The MSB shall indicate a summary of the health of the navigation data, where:

a) 0 all navigation data are valid; and

b) 1 some of the navigation data are not valid.

The 5 LSBs shall indicate the health of the signal components in accordance with 3.1.1.3.3.4. The health indication shall be provided relative to the capabilities of each satellite as designated by the configuration code in 3.1.1.3.3.5. Any satellite that does not have a certain capability shall be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a receiver standpoint and does not require that capability. Additional health data shall be given in subframes 4 and 5.

Note The data given in subframe may differ from that shown in subframes and or of other satellites since the latter may be updated at a different time

3.1.1.3.1.4 *Issue of data cloc (I DC)* Bits 23 and 24 of word 3 in subframe 1 shall be the 2 MSBs of the 10-bit IODC term. Bits 1 through 8 of word 8 in subframe 1 shall contain the 8 LSBs of the IODC. The IODC shall indicate the issue number of data set. The transmitted IODC shall be different from any value transmitted by the satellite during the preceding 7 days.

Note The relationship between the I DC and the Issue of Data Ephemeris (I DE) terms is defined in

3.1.1.3.1.5 *Estimated group delay differential* Bits 17 through 24 of word 7 shall contain the correction term, T_{GD}, to account for the effect of satellite group delay differential.

Note T $_{D}$ does not include any C A to P( ) code relative group delay error

3.1.1.3.1.6 *Satellite cloc correction parameters* Bits 9 through 24 of word 8, bits 1 through 24 of word 9, and bits 1 through 22 of word 10 shall contain the parameters needed by the users for apparent satellite clock correction (t_{oc}, a_{f2}, a_{f1} and a_{f0}).

3.1.1.3.1.7 *Reserved data fields*. Reserved data fields shall be as indicated in Table B-4. All reserved data fields shall support valid parity within their respective words.

3.1.1.3.2 *Subframes and satellite ephemeris data* Subframes 2 and 3 shall contain the ephemeris representation of the transmitting satellite.

3.1.1.3.2.1 *Ephemeris parameters* The ephemeris parameters shall be as indicated in Table B-5. For each parameter in subframe 2 and 3, the number of bits, the scale factor of the LSB, the range, and the units shall be as specified in Table B-6.

3.1.1.3.2.2 *Issue of data ephemeris (I DE)* The IODE shall be an 8-bit number equal to the 8 LSBs of the 10-bit IODC of the same data set. The IODE shall be provided in both subframes 2 and 3 for the purpose of comparison with the 8 LSBs of the IODC term in subframe 1. Whenever these three terms do not match, as a result of a data set cutover, new data shall be collected. The transmitted IODE shall be different from any value transmitted by the satellite during the preceding six hours (Note 1). Any change in the subframe 2 and 3 data shall be accomplished in concert with a change in both IODE words. Change to new data sets shall occur only on hour boundaries except for the first data set of a new upload. Additionally, the t_{oe} value, for at least the first data set transmitted by a satellite after an upload, shall be different from that transmitted prior to the change (Note 2).

able Subframe 1 reser ed data fields

Word	Bit
3	11 12
4	1 24
5	1 24
6	1 24
7	1 16

able Ep emeris data

M_0	Mean anomaly at reference time
Δn	Mean motion difference from computed value
e	Eccentricity
$\sqrt{A}$	Square root of the semi-major axis
$OMEGA_0$	Longitude of ascending node of orbit plane at weekly epoch
i_0	Inclination angle at reference time
ω	Argument of perigee
OMEGADOT	Rate of right ascension
iDOT	Rate of inclination angle
C_{uc}	Amplitude of the cosine harmonic correction term to the argument of latitude
C_{us}	Amplitude of the sine harmonic correction term to the argument of latitude
C_{rc}	Amplitude of the cosine harmonic correction term to the orbit radius
C_{rs}	Amplitude of the sine harmonic correction term to the orbit radius
C_{ic}	Amplitude of the cosine harmonic correction term to the angle of inclination
C_{is}	Amplitude of the sine harmonic correction term to the angle of inclination
t_{oe}	Reference time, ephemeris
IODE	Issue of data, ephemeris

able 6 Ep emeris parameters

Parameter	Number of bits**	Scale factor (LSB)	Effective range***	Units
IODE	8			
C_{rs}	16*	2^{5}		metres
Δn	16*	2^{43}		semi-circles/second
M_0	32*	2^{31}		semi-circles
C_{uc}	16*	2^{29}		radians
e	32	2^{33}	0.03	dimensionless
C_{us}	16*	2^{29}		radians
$\sqrt{A}$	32	2^{19}		$metres^{1/2}$
t_{oe}	16	2^4	604 784	seconds
C_{ic}	16*	2^{29}		radians
$OMEGA_0$	32*	2^{31}		semi-circles
C_{is}	16*	2^{29}		radians
i_0	32*	2^{31}		semi-circles
C_{rc}	16*	2^{5}		metres
ω	32*	2^{31}		semi-circles
OMEGADOT	24*	2^{43}		semi-circles/second
iDOT	14*	2^{43}		semi-circles/second

* Parameters so indicated are two s complement, with the sign bit (or) occupying the MSB.
** See Figure B-6 for complete bit allocation in subframe.
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with the indicated bit allocation and scale factor.

Note The I DE I DC terms provide the receiver with a means for detecting any changes in the ephemeris cloc representation parameters

Note The first data set may change ( ) at any time during the hour and therefore may be transmitted by the satellite for less than hour

3.1.1.3.2.3 *Reserved data fields* Within word 10, subframe 2, bits 17 through 22 shall be reserved. Reserved data fields shall support the valid parity within their respective words.

3.1.1.3.3 *Subframes and support data* Both subframes 4 and 5 shall be subcommutated 25 times each. With the possible exception of "reserved" pages and explicit repeats, each page shall contain different data in words 3 through 10. The pages of subframe 4 shall use 6 different formats, and the pages of subframe 5 shall use two different formats as indicated in Figure B-6.

Pages of subframe 4 shall be as follows:

a) Pages 2, 3, 4, 5, 7, 8, 9 and 10: almanac data for satellites 25 through 32 respectively. If the 6-bit health status word of page 25 is set to 6 "ones" (3.1.1.3.3.4) then the satellite ID of the page shall not have a value in the range of 25 through 32;

Note These pages may be designed for other functions The format and content for each page is defined by the satellite ID of that page

b) Page 17: special messages;

c) Page 18: ionospheric and UTC data;

d) Page 25: satellite configurations for 32 satellites; and

e) Pages 1, 6, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23 and 24: reserved.

Pages of subframe 5 shall be as follows:

a) Pages 1 through 24: almanac data for satellite 1 through 24; and

b) Page 25: satellite health data for satellite 1 through 24, the almanac reference time and the almanac reference week number.

3.1.1.3.3.1 *Data ID* The two MSBs of word 3 in each page shall contain the data ID that defines the applicable GPS navigation data structure. The data ID shall be as indicated in Table B-7 in accordance with the following:

a) for those pages which are assigned to contain the almanac data of one specific satellite, the data ID shall define the data structure utilized by that satellite whose almanac data are contained in that page;

b) for all other pages, the data ID shall denote the data structure of the transmitting satellite; and

c) data ID "1" (denoted by binary state 00) shall not be used.

3.1.1.3.3.2 *Satellite ID* The satellite ID shall be provided by bits 3 through 8 of word 3 in each page. The satellite IDs shall be utilized two ways:

a) for those pages which contain the almanac data of a given satellite, the satellite ID shall be the same number that is assigned the PRN code phase of that satellite in accordance with Table B-1; and

b) for all other pages the satellite ID assigned in accordance with Table B-7 shall serve as the “page ID”. IDs 1 through 32 shall be assigned to those pages which contain the almanac data of specific satellites (pages 1 through 24 of subframe 5 and pages 2 through 5, and 7 through 10 of subframe 4). The “0” ID (binary all zeros) shall be assigned to indicate a dummy satellite, while IDs 51 through 63 shall be utilized for pages containing other than almanac data for a specific satellite (Notes 1 and 2).

Note Specific IDs are reserved for each page of subframes and however the satellite ID of pages and of subframe may change for each page to reflect the alternate contents for that page

Note The remaining IDs (through) are unassigned

able Data Ds and satellite Ds in subframes and

	Subframe 4		Subframe 5	
Page	Data ID	Satellite ID*	Data ID	Satellite ID*
1	***	57	**	1
2****	**	25	**	2
3****	**	26	**	3
4****	**	27	**	4
5****	**	28	**	5
6	***	57	**	6
7****	**	29	**	7
8****	**	30	**	8
9****	**	31	**	9
10****	**	32	**	10
11	***	57	**	11
12	***	62	**	12
13	***	52	**	13
14	***	53	**	14
15	***	54	**	15
16	***	57	**	16
17	***	55	**	17
18	***	56	**	18
19	***	58*****	**	19
20	***	59*****	**	20
21	***	57	**	21
22	***	60*****	**	22
23	***	61*****	**	23
24	***	62	**	24
25	***	63	***	51

* “0” indicates “dummy” satellite. When using “0” to indicate a dummy satellite, the data ID of the transmitting satellite is used.
** Data ID of that satellite whose satellite ID appears in that page.
*** Data ID of transmitting satellite.
**** Pages 2, 3, 4, 5, 7, 8, 9 and 10 of subframe 4 may contain almanac data for satellites 25 through 32, respectively, or data for other functions as identified by a different satellite ID from the value shown.
***** Satellite ID may vary.

3.1.1.3.3.3 *Almanac* Pages 1 through 24 of subframe 5, as well as pages 2 through 5 and 7 through 10 of subframe 4 shall contain the almanac data and a satellite health status word (3.1.1.3.3.4) for up to 32 satellites. The almanac data shall be a reduced-precision subset of the clock and ephemeris parameters. The data shall occupy all bits of words 3 through 10 of each page except the 8 MSBs of word 3 (data ID and satellite ID), bits 17 through 24 of word 5 (satellite health), and the 50 bits devoted to parity. The number of bits, the scale factor (LSB), the range and the units of the almanac parameters shall be as indicated in Table B-8. The almanac message for any dummy satellite shall contain alternating “ones” and “zeros” with a valid parity.

3.1.1.3.3.3.1 *Almanac reference time* The almanac reference time, t_{oa}, shall be a multiple of 2^{12} seconds occurring approximately 70 hours after the first valid transmission time for this almanac data set. The almanac shall be updated often enough to ensure that GPS time, t, will differ from t_{oa} by less than 3.5 days during the transmission period. The almanac parameters shall be updated at least once every 6 days during normal operations.

3.1.1.3.3.3.2 *Almanac time parameters* The almanac time parameters shall consist of an 11-bit constant term (a_{f0}) and an 11-bit first order term (a_{f1}).

3.1.1.3.3.3.3 *Almanac reference wee* Bits 17 through 24 of word 3 in page 25 of subframe 5 shall indicate the number of the week (WN_a) to which the almanac reference time (t_{oa}) is referenced. The WN_a term shall consist of the 8 LSBs of the full week number. Bits 9 through 16 of word 3 in page 25 of subframe 5 shall contain the value of t_{oa} that is referenced to this WN_a.

3.1.1.3.3.4 *ealth summary* Subframes 4 and 5 shall contain two types of satellite health data:

a) each of the 32 pages that contain the clock/ephemeris related almanac data shall provide an 8-bit satellite health status word regarding the satellite whose almanac data they carry; and

b) the 25th pages of subframes 4 and 5 jointly shall contain 6-bit health data for up to 32 satellites.

3.1.1.3.3.4.1 The 8-bit health status words shall occupy bits 17 through 24 of word 5 in those 32 pages that contain the almanac data for individual satellites. The 6-bit health status words shall occupy the 24 MSBs of words 4 through 9 in page 25 of subframe 5, and bits 19 through 24 of word 8, the 24 MSBs of word 9, and the 18 MSBs of word 10 in page 25 of subframe 4.

able Almanac parameters

Parameter	Number of bits**	Scale factor (LSB)	Effective range***	Units
e	16	$2^{\ 21}$		dimensionless
t_{oa}	8	2^{12}	602 112	seconds
δ_i****	16*	$2^{\ 19}$		semi-circles
OMEGADOT	16*	$2^{\ 38}$		semi-circles/second
$\sqrt{A}$	24*	$2^{\ 11}$		metres$^{1/2}$
$OMEGA_0$	24*	$2^{\ 23}$		semi-circles
ω	24*	$2^{\ 23}$		semi-circles
M_0	24*	$2^{\ 23}$		semi-circles
a_{f0}	11*	$2^{\ 20}$		seconds
a_{f1}	11*	$2^{\ 38}$		seconds/second

* Parameters so indicated are two s complement, with the sign bit (or) occupying the MSB.
** See Figure B-6 for complete bit allocation in subframe.
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with the indicated bit allocation and scale factor.
**** Relative to i_0 0.30 semi-circles.

3.1.1.3.3.4.2 The 3 MSBs of the 8-bit health status words shall indicate health of the navigation data in accordance with the code given in Table B-9. The 6-bit words shall provide a 1-bit summary of the navigation data s health status in the MSB position in accordance with 3.1.1.3.1.3. The 5 LSBs of both the 8-bit and the 6-bit health status words shall provide the health status of the satellite s signal components in accordance with the code given in Table B-10.

able a igation data ealt indication

Bit position in page			Indication
137	138	139	
0	0	0	ALL DATA OK
0	0	1	PARITY FAILURE — some or all parity bad
0	1	0	TLM/HOW FORMAT PROBLEM — any departure from standard format (e.g. preamble misplaced and/or incorrect), except for incorrect -count, as reported in HOW
0	1	1	-COUNT in HOW BAD — any problem with -count value not reflecting actual code phase
1	0	0	SUBFRAMES 1, 2, 3 — one or more elements in words 3 through 10 of one or more subframes are bad
1	0	1	SUBFRAMES 4, 5 — one or more elements in words 3 through 10 of one or more subframes are bad
1	1	0	ALL UPLOADED DATA BAD — one or more elements in words 3 through 10 of any one (or more) subframes are bad
1	1	1	ALL DATA BAD — TLM word and/or HOW and one or more elements in any one (or more) subframes are bad

able 10 Codes for ealt of satellite signal components

MSB				LSB	Indication
0	0	0	0	0	ALL SIGNALS OK
1	1	1	0	0	SATELLITE IS TEMPORARILY OUT — do not use this satellite during current pass ___
1	1	1	0	1	SATELLITE WILL BE TEMPORARILY OUT — use with caution ___
1	1	1	1	0	SPARE
1	1	1	1	1	MORE THAN ONE COMBINATION WOULD BE REQUIRED TO DESCRIBE ANOMALIES, EXCEPT THOSE MARKED BY ___
All other combinations					SATELLITE EXPERIENCING CODE MODULATION AND/OR SIGNAL POWER LEVEL TRANSMISSION PROBLEMS. The user may experience intermittent tracking problems if satellite is acquired.

3.1.1.3.3.4.3 A special meaning shall be assigned, to the 6 "ones" combination of the 6-bit health status words in the 25th pages of subframes 4 and 5; it shall indicate that "the satellite which has that ID is not available and there may be no data regarding that satellite in the page of subframe 4 or 5 that is assigned to normally contain the almanac data of that satellite".

Note This special meaning applies to the th pages of subframes and only There may be data regarding another satellite in the almanac page referred to above as defined in

3.1.1.3.3.4.4 The health indication shall be provided relative to the capabilities of each satellite as designated by the configuration code in 3.1.1.3.3.5. Accordingly, any satellite that does not have a certain capability shall be indicated as "healthy" if the lack of this capability is inherent in its design or it has been configured into a mode which is normal from a receiver standpoint and does not require that capability. The predicted health data shall be updated at the time of upload.

Note The transmitted health data may not correspond to the actual health of the transmitting satellite or other satellites in the constellation

Note The data given in subframes and of the other satellites may differ from that shown in subframes and or since the latter may be updated at a different time

3.1.1.3.3.5 *Satellite configuration summary* Page 25 of subframe 4 shall contain a 4-bit-long term for each of up to 32 satellites to indicate the configuration code of each satellite. These 4-bit terms shall occupy bits 9 through 24 of words 3, the 24 MSBs of words 4 through 7, and the 16 MSBs of word 8, all in page 25 of subframe 4. The first MSB of each field shall be reserved. The 3 LSBs shall indicate the configuration of each satellite using the following code:

Code	Satellite configuration
001	Block II satellite

3.1.1.3.3.6 *UTC parameters* Page 18 of subframe 4 shall include:

a) the parameters needed to relate GPS time to UTC time; and

b) notice to the user regarding the scheduled future or past (relative to navigation message upload) value of the delta time due to leap seconds (t_{LSF}), together with the week number (WN_{LSF}) and the day number (DN) at the end of which the leap second becomes effective. "Day one" shall be the first day relative to the end/start of week and the WN_{LSF} value consists of the 8 LSBs of the full week number. The absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

Note The user is expected to account for the truncated nature of this parameter as well as truncation of N N_t and N $_{SF}$ due to rollover of the full wee number ( )

3.1.1.3.3.6.1 The 24 MSBs of words 6 through 9, and the 8 MSBs of word 10 in page 18 of subframe 4 shall contain the parameters related to correlating UTC time with GPS time. The bit length, scale factors, ranges, and units of these parameters shall be as specified in Table B-11.

3.1.1.3.3.7 *Ionospheric parameters*. The ionospheric parameters that allow the GPS SPS user to utilize the ionospheric model for computation of the ionospheric delay shall be contained in page 18 of subframe 4 as specified in Table B-12.

3.1.1.3.3.8 *Special message* Page 17 of subframe 4 shall be reserved for special messages.

able 11 C parameters

Parameter	Number of bits**	Scale factor (LSB)	Effective range***	Units
A_o	32*	2^{30}		seconds
A_1	24*	2^{50}		seconds/second
Δt_{LS}	8*	1		seconds
t_{ot}	8	2^{12}	602 112	seconds
WN_t	8	1		weeks
WN_{LSF}	8	1		weeks
DN	8****	1	7	days
Δt_{LSF}	8*	1		seconds

* Parameters so indicated are two s complement, with the sign bit (or) occupying the MSB.
** See Figure B-6 for complete bit allocation in subframe.
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with the indicated bit allocation and scale factor.
**** Right justified.

able 12 onosp eric parameters

Parameter	Number of bits**	Scale factor (LSB)	Effective range***	Units
α_0	8*	2^{30}		seconds
α_1	8*	2^{27}		seconds/semi-circle
α_2	8*	2^{24}		seconds/semi-circle^2
α_3	8*	2^{24}		seconds/semi-circle^3
β_0	8*	2^{11}		seconds
β_1	8*	2^{14}		seconds/semi-circle
β_2	8*	2^{16}		seconds/semi-circle^2
β_3	8*	2^{16}		seconds/semi-circle^3

* Parameters so indicated are two s complement, with the sign bit (or) occupying the MSB.
** See Figure B-6 for complete bit allocation in subframe.
*** Unless otherwise indicated in this column, effective range is the maximum range attainable with the indicated bit allocation and scale factor.

3.1.1.3.3.9 *Reserved data fields* All bits of words 3 through 10, except the 58 bits used for data ID, satellite (page) ID, parity (six LSBs of each word) and parity computation (bits 23 and 24 of word 10) of pages 1, 6, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23 and 24 of subframe 4, and those almanac pages assigned satellite ID of zero shall be designated as reserved. Other reserved bits in subframes 4 and 5 shall be as shown in Table B-13. Reserved bit positions of each word shall contain a pattern of alternating ones and zeros with a valid word parity.

3.1.2 DEFINITIONS OF PROTOCOLS FOR DATA APPLICATION

Note This section defines the inter relationships of the data broadcast message parameters It provides definitions of parameters that are not transmitted but are used by either or both non aircraft and aircraft elements and that define terms applied to determine the navigation solution and its integrity

able 13 Reser ed bits in subframes and

Subframe	Pages	Words	Reserved bit position in word
4	17	10	17 22
4	18	10	9 22
4	25	8	17 18
4	25	10	19 22
5	25	10	4 22

able 1 arity encoding algorit ms

D_1 $d_1 \oplus D^*_{30}$
D_2 $d_2 \oplus D^*_{30}$
D_3 $d_3 \oplus D^*_{30}$

D_{24} $d_{24} \oplus D^*_{30}$
D_{25} $D^*_{29} \oplus d_1 \oplus d_2 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_{10} \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{17} \oplus d_{18} \oplus d_{20} \oplus d_{23}$
D_{26} $D^*_{30} \oplus d_2 \oplus d_3 \oplus d_4 \oplus d_6 \oplus d_7 \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{18} \oplus d_{19} \oplus d_{21} \oplus d_{24}$
D_{27} $D^*_{29} \oplus d_1 \oplus d_3 \oplus d_4 \oplus d_5 \oplus d_7 \oplus d_8 \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{19} \oplus d_{20} \oplus d_{22}$
D_{28} $D^*_{30} \oplus d_2 \oplus d_4 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{20} \oplus d_{21} \oplus d_{23}$
D_{29} $D^*_{30} \oplus d_1 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_7 \oplus d_9 \oplus d_{10} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{18} \oplus d_{21} \oplus d_{22} \oplus d_{24}$
D_{30} $D^*_{29} \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{10} \oplus d_{11} \oplus d_{13} \oplus d_{15} \oplus d_{19} \oplus d_{22} \oplus d_{23} \oplus d_{24}$

where:

D_1, D_2, D_3, ... D_{29}, D_{30} are the bits transmitted by the satellite;
D_{25}, ... D_{30} are the computed parity bits;
d_1, d_2, ... d_{24} are the source data bits;
$\oplus$ is the Modulo-2 or “Exclusive-Or” operation; and
* is used to identify the last two bits of the previous word of the subframe.

3.1.2.1 *Parity algorithm*. GPS parity algorithms are defined as indicated in Table B-14.

3.1.2.2 *Satellite cloc correction parameters* GPS system time *t* is defined as:

$$t \quad t_{sv} \quad (\Delta t_{sv})_{L1}$$

where

t GPS system time (corrected for beginning and end-of-week crossovers);
t_{sv} satellite time at transmission of the message;
$(\Delta t_{sv})_{L1}$ the satellite PRN code phase offset;
$(\Delta t_{sv})_{L1}$ $a_{f0} \quad a_{f1}(t \quad t_{oc}) \quad a_{f2}(t \quad t_{oc})^2 \quad \Delta t_r \quad T_{GD}$

where

a_{f0}, a_{f1} and a_{f2} and t_{oc}, are contained in subframe 1; and
Δt_r the relativistic correction term (seconds)
Δt_r Fe $\sqrt{A}$ sin E_k

where

e and A are contained in subframes 2 and 3;
E_k is defined in Table B-15; and

$$F \quad \frac{2(\ )}{c^2} \quad 4.442807633(10)^{10} \text{ s/m}$$

where

WGS-84 universal gravitational parameter (3.986005 10^{14} m^3/s^2)
c the speed of light in a vacuum (2.99792458 10^8 m/s)

Note The value of t is intended to account for the beginning or end of wee crossovers That is if the uantity t t_{oc} is greater than seconds subtract seconds from t If the uantity t t_{oc} is less than seconds add seconds to t

3.1.2.3 *Satellite position* The current satellite position (X_k, Y_k, $_k$) is defined as shown in Table B-15.

3.1.2.4 *Ionospheric correction* The ionospheric correction (T_{iono}) is defined as:

$$T_{iono} = \begin{cases} F\times\left[5.0\times10^{-9} + AMP\left(1-\frac{x^2}{2}+\frac{x^4}{24}\right)\right], & |x| < 1.57 \\ F\times(5.0\times10^{-9}) & ,|x| \geq 1.57 \end{cases} \text{(seconds)}$$

where

$$AMP = \begin{cases} \sum_{n=0}^{3} \alpha_n \phi_{m,}^n, & AMP \geq 0 \\ \text{if } AMP \quad 0, & AMP \quad 0 \end{cases} \text{(seconds)}$$

$$x = \frac{2\pi(t-50\ 400)}{PER}, \text{ (radians)}$$

$$PER = \begin{cases} \sum_{n=0}^{3} \beta_n \phi_{m,}^n, & PER \geq 72\ 000 \\ \text{if } PER \quad 72\ 000, & PER \quad 72\ 000 \end{cases} \text{(seconds)}$$

F 1.0 16.0 0.53 E ^{3}

α_n and β_n are the satellite transmitted data words with n 0, 1, 2 and 3

$\phi_m \quad \phi_i \quad 0.064 \cos (\lambda_i \quad 1.617)$ (semi-circles)

$\lambda_i \quad \lambda_u \quad \dfrac{\psi \sin A}{\cos \phi_i}$ (semi-circles)

$\overline{\phi}_i \quad \phi_u \quad \psi \cos A$ (semi-circles)

$$\phi_i = \begin{cases} \phi_i = \overline{\phi}_i \text{ if } \left|\overline{\phi}_i\right| \leq 0.416 \\ \phi_i \quad 0.416 \text{ if } \overline{\phi}_i \quad 0.416, \\ \phi_i \quad -0.416 \text{ if } \overline{\phi}_i \quad -0.416 \end{cases} \text{ (semi-circles)}$$

$$\psi = \frac{0.0137}{E + 0.11} - 0.022 \text{ (semi-circles)}$$

t $\quad 4.32 \quad 10^4 \lambda_i$ GPS time (seconds) where $0 \leq t \quad 86\,400$,
therefore: if $t \geq 86\,400$ seconds, subtract 86 400 seconds; and
if t 0 seconds, add 86 400 seconds

E satellite elevation angle

3.1.2.4.1 The terms used in computation of ionospheric delay are as follows:

a) Satellite transmitted terms

α_n	the coefficients of a cubic equation representing the amplitude of the vertical delay (4 coefficients 8 bits each)
β_n	the coefficients of a cubic equation representing the period of the model (4 coefficients 8 bits each)

b) Receiver generated terms

E	elevation angle between the user and satellite (semi-circles)
A	azimuth angle between the user and satellite, measured clockwise positive from the true North (semi-circles)
ϕ_u	user geodetic latitude (semi-circles) WGS-84
λ_u	user geodetic longitude (semi-circles) WGS-84
GPS time	receiver computed system time

c) Computed terms

x	phase (radians)
F	obliquity factor (dimensionless)
t	local time (seconds)
ϕ_m	geomagnetic latitude of the earth projection of the ionospheric intersection point (mean ionospheric height assumed 350 km) (semi-circles)
λ_i	geomagnetic longitude of the earth projection of the ionospheric intersection point (semi-circles)
ϕ_i	geomagnetic latitude of the earth projection of the ionospheric intersection point (semi-circles)
ψ	earth s central angle between user position and earth projection of ionospheric intersection point (semi-circles)

able 1 Elements of coordinate systems

$A \quad \left(\sqrt{A}\right)^2$	Semi-major axis
$n_0 = \sqrt{\frac{\mu}{A^3}}$	Computed mean motion
$t_k \quad t \quad t_{oe}$	Time from ephemeris reference epoch*
$n \quad n_0 \quad \Delta n$	Corrected mean motion
$M_k \quad M_0 \quad nt_k$	Mean anomaly
$M_k \quad E_k \quad e \sin E_k$	Kepler s equation for eccentric anomaly (may be solved by iteration)
$v_k = \tan^{-1}\left\{\frac{\sin v_k}{\cos v_k}\right\} = \tan^{-1}\left\{\frac{\sqrt{1-e^2}\,\sin E_k/(1-e\cos E_k)}{(\cos E_k - e)/(1-e\cos E_k)}\right\}$ True anomaly	
$E_k = \cos^{-1}\left\{\frac{e \quad \cos v_k}{1 \quad e\cos v_k}\right\}$	Eccentric anomaly
$\phi_k \quad v_k \quad \omega$	Argument of latitude
	Second Harmonic erturbations
$\delta u_k \quad C_{us}\sin 2\phi_k \quad C_{uc}\cos 2\phi_k$	Argument of latitude correction
$\delta r_k \quad C_{rc}\sin 2\phi_k \quad C_{rs}\sin 2\phi_k$	Radius correction
$\delta i_k \quad C_{ic}\cos 2\phi_k \quad C_{is}\sin 2\phi_k$	Inclination correction
$u_k \quad \phi_k \quad \delta u_k$	Corrected argument of latitude
$r_k \quad A(1 \quad e\cos E_k) \quad \delta r_k$	Corrected radius
$i_k \quad i_0 \quad \delta i_k \quad (iDOT)t_k$	Corrected inclination
$\left.\begin{array}{l} x'_k \quad r_k\cos u_k \\ y'_k \quad r_k\sin u_k \end{array}\right\}$	Positions in orbital plane
$\Omega_k = \Omega_0 + (\dot{\Omega} - \Omega_e)t_k - \dot{\Omega}_e t_{oe}$	Corrected longitude of ascending node
$\left.\begin{array}{l} x_k \quad x'_k \cos\Omega_k - y'_k\cos i_k \sin\Omega_k \\ y_k \quad x'_k \sin\Omega_k - y'_k \cos i_k\cos\Omega_k \\ z_k \quad y'_k \sin i_k \end{array}\right\}$	Earth-centred, earth-fixed coordinates

* t is GPS system time at time of transmission, i.e. GPS time corrected for transit time (range/speed of light). Furthermore, t_k is the actual total time difference between the time t and the epoch time t_{oe}, and must account for beginning or end-of-week crossovers. That is, if t_k is greater than 302 400 seconds, subtract 604 800 seconds from t_k. If t_k is less than 302 400 seconds, add 604 800 seconds to t_k.

3.1.3 AIRCRAFT ELEMENTS

3.1.3.1 *NSS (PS) RECEI ER*

3.1.3.1.1 *Satellite exclusion*. The receiver shall exclude any satellite designated unhealthy by the GPS satellite ephemeris health flag.

3.1.3.1.2 *Satellite trac ing*. The receiver shall provide the capability to continuously track a minimum of four satellites and generate a position solution based upon those measurements.

3.1.3.1.3 *Doppler shift*. The receiver shall be able to compensate for dynamic Doppler shift effects on nominal SPS signal carrier phase and C/A code measurements. The receiver shall compensate for the Doppler shift that is unique to the anticipated application.

3.1.3.1.4 *Resistance to interference*. The receiver shall meet the requirements for resistance to interference as specified in Chapter 3, 3.7.

3.1.3.1.5 *Application of cloc and ephemeris data*. The receiver shall ensure that it is using the correct ephemeris and clock data before providing any position solution. The receiver shall monitor the IODC and IODE values, and to update ephemeris and clock databased upon a detected change in one or both of these values. The SPS receiver shall use clock and ephemeris data with corresponding IODC and IODE values for a given satellite.

3.1.4 TIME

GPS time shall be referenced to a UTC (as maintained by the U.S. Naval Observatory) zero time-point defined as midnight on the night of 5 January 1980/morning of 6 January 1980. The largest unit used in stating GPS time shall be 1 week, defined as 604 800 seconds. The GPS time scale shall be maintained to be within 1 microsecond of UTC (Modulo 1 second) after correction for the integer number of leap seconds difference. The navigation data shall contain the requisite data for relating GPS time to UTC.

3 2 lobal na igation satellite system O ASS c annel of standard accuracy CSA 1

Note In this section the term NASS refers to all satellites in the constellation Standards relating only to NASS M satellites are ualified accordingly

3.2.1 NON-AIRCRAFT ELEMENTS

3.2.1.1 *RF C ARACTERISTICS*

3.2.1.1.1 *Carrier fre uencies* The nominal value of L1 and carrier frequencies shall be as defined by the following expressions:

$$f_{k1} \quad f_{01} \quad k\Delta f_1$$

where

k 7, , 0, 1, , 13 are carrier numbers (frequency channels) of the signals transmitted by GLONASS satellites in the L1 sub-band;

f_{01} 1 602 MHz; and

Δf_1 0.5625 MHz.

Carrier frequencies shall be coherently derived from a common on-board time/frequency standard. The nominal value of frequency, as observed on the ground, shall be equal to 5.0 MHz. The carrier frequency of a GLONASS satellite shall be within 2 10 ^{11} relative to its nominal value f_k.

Note The nominal values of carrier fre uencies for carrier numbers are given in Table

Note For NASS M satellites the channel of standard accuracy (CSA) navigation signals will occupy the M M bandwidth as defined by the following expressions

$$f \quad f \quad \Delta f$$

$$f \quad M \quad \Delta f \quad M$$

For any given value of the ratio of carrier fre uencies of and sub bands will be e ual to

$$\frac{f}{f} = -$$

able 16 1 carrier fre uencies

Carrier number	$H^A{}_n$ (see 3.2.1.3.4)	Nominal value of frequency in L1 sub-band (MHz)
13*	13	1 609.3125
12**	12	1 608.7500
11**	11	1 608.1875
10**	10	1 607.6250
09**	9	1 607.0625
08**	8	1 606.5000
07**	7	1 605.9375
06***	6	1 605.3750
05***	5	1 604.8125
4	4	1 604.2500
3	3	1 603.6875
2	2	1 603.1250
1	1	1 602.5625
0	0	1 602.0000
1	31	1 601.4375
2	30	1 600.8750
3	29	1 600.3125
4	28	1 599.7500
5	27	1 599.1875
6	26	1 598.6250
7	25	1 598.0625

* This frequency may be used for technical purposes over the Russian Federation before 2006 and is planned to be vacated after 2005.

** These frequencies are planned to be vacated after 2005.

*** These frequencies may be used for technical purposes over the Russian Federation after 2005.

3.2.1.1.2 *Carrier phase noise*. The phase noise spectral density of the unmodulated carrier shall be such that a phase locked loop of 10 Hz one-sided noise bandwidth provides the accuracy of carrier phase tracking not worse than 0.1 radian (1 sigma).

3.2.1.1.3 *NASS pseudo random code generation*. The pseudo-random ranging code shall be a 511-bit sequence that is sampled at the output of the seventh stage of a 9-stage shift register. The initialisation vector to generate this sequence shall be “111111111”. The generating polynomial that corresponds to the 9-stage shift register shall be:

$$G(x) \quad 1 \quad x^5 \quad x^9.$$

3.2.1.1.4 *Spurious emissions*. The power of the transmitted RF signal beyond the GLONASS allocated bandwidth shall not be more than 40 dB relative to the power of the unmodulated carrier.

Note NASS satellites that are launched during to and beyond will use filters limiting out of band emissions to the harmful interference limit contained in CCIR Recommendation for the M band

Note NASS satellites that are launched beyond will use filters limiting out of band emissions to the harmful interference limit contained in CCIR Recommendation for the M and M bands

3.2.1.1.5 *Correlation loss*. The loss in the recovered signal power due to imperfections in the signal modulation and waveform distortion shall not exceed 0.8 dB.

Note The loss in signal power is the difference between the broadcast power in a M bandwidth and the signal power recovered by a noise free loss free receiver with chip correlator spacing and a M bandwidth

3.2.1.2 DATA STRUCTURE

3.2.1.2.1 *eneral*. The navigation message shall be transmitted as a pattern of digital data which are coded by Hamming code and transformed into relative code. Structurally, the data pattern shall be generated as continuously repeating superframes. The superframe shall consist of the frames and the frames shall consist of the strings. The boundaries of strings, frames and superframes of navigation messages from different GLONASS satellites shall be synchronized within 2 milliseconds.

3.2.1.2.2 *Superframe structure*. The superframe shall have a 2.5-minute duration and shall consist of 5 frames. Within each superframe a total content of non-immediate information (almanac for 24 GLONASS satellites) shall be transmitted.

Note Superframe structure with indication of frame numbers in the superframe and string numbers in the frames is shown in Figure

3.2.1.2.3 *Frame structure* Each frame shall have a 30-second duration and shall consist of 15 strings. Within each frame the total content of immediate information (ephemeris and time parameters) for given satellite and a part of non-immediate information (almanac) shall be transmitted. The frames 1 through 4 shall contain the part of almanac for 20 satellites (5 satellites per frame) and frame 5 shall contain the remainder of almanac for 4 satellites. The almanac for one satellite shall occupy two strings.

Note Frame structures are shown in Figures and

3.2.1.2.4 *String structure*. Each string shall have a 2-second duration and shall contain binary chips of data and time mark. During the last 0.3 second within this 2-second interval (at the end of each string) the time mark shall be transmitted. The time mark (shortened pseudo-random sequence) shall consist of 30 chips with a time duration for each chip of 10 milliseconds and having the following sequence:

1 1 1 1 1 0 0 0 1 1 0 1 1 1 0 1 0 1 0 0 0 0 1 0 0 1 0 1 1 0.

During the first 1.7 seconds within this 2-second interval (in the beginning of each string) 85 bits of data (each data bit of a 20 milliseconds duration) shall be transmitted in bi-binary format. The numbers of bits in the string shall be increased from right to left. Along with information bits (bit positions 9 through 84) the check bits of Hamming code (KX) (bit positions 1 through 8) shall be transmitted. The Hamming code shall have a code length of 4. The data of one string shall be separated from the data of adjacent strings by time mark (MB). The words of the data shall be registered by MSB ahead. In each string bit position, 85 shall be an idle chip ("0") and be transmitted first.

3.2.1.2.4.1 *Strings through* The information contained in strings 1 through 4 of each frame shall correspond to the satellite from which it is transmitted. This information shall not be changed within the superframe.

3.2.1.2.4.2 *Strings through* . Strings 5 through 15 of each frame shall contain GLONASS almanac for 4 or 5 satellites. The information contained in the fifth string shall be repeated in each frame of the superframe.

Note String structure is given in Figure

3.2.1.3 *DATA C NTENT*

3.2.1.3.1 *Ephemeris and time parameters* The ephemeris and time parameters shall be as follows:

m the string number within the frame;

t_k the time referenced to the beginning of the frame within the current day. It is calculated according to the satellite time scale. The integer number of hours elapsed since the beginning of the current day is registered in the 5 MSBs. The integer number of minutes elapsed since the beginning of the current hour is registered in the next 6 bits. The number of 30-second intervals elapsed since the beginning of the current minute is registered in the one LSB. The beginning of the day according to the satellite time scale coincides with the beginning of the recurrent superframe;

t_b the time interval within the current day according to UTC(SU) 03 hours 00 min. The immediate data transmitted within the frame are referred to the middle of t_b. Duration of the time interval and therefore the maximum value of t_b depends on the value of the flag P1;

$\gamma_n(t_b)$ the relative deviation of predicted carrier frequency value of n-satellite from the nominal value at the instant t_b, i.e.

$$\gamma_n(t_b) = \frac{f_n(t_b) - f_{Hn}}{f_{Hn}},$$

where

$f_n(t_b)$ the forecast frequency of n-satellite clocks at an instant t_b;

f_{Hn} the nominal value of frequency of n-satellite clocks;

$\tau_n(t_b)$ the correction to the n-satellite time t_n relative to GLONASS time t_c at an instant t_b, i.e. $\tau_n(t_b)$ $t_c(t_b)$ $t_n(t_b)$;

$x_n(t_b)$, $y_n(t_b)$, $z_n(t_b)$ the coordinates of n-satellite in P -90 coordinate system at an instant t_b;

$\dot{x}_n(t_b)$, $\dot{y}_n(t_b)$, $\dot{z}_n(t_b)$ the velocity vector components of n-satellite in P -90 coordinate system at an instant t_b;

$\ddot{x}_n(t_b)$, $\ddot{y}_n(t_b)$, $\ddot{z}_n(t_b)$ the acceleration components of n-satellite in P -90 coordinate system at an instant t_b, which are caused by effect of sun and moon;

E_n — an indication of the "age" of the immediate information, i.e. a time interval elapsed since the instant of its calculation (uploading) until the instant t_b for n-satellite;

B_n — the health flag. Values greater than 3 indicate the fact of malfunction of given satellite;

P1 — a flag indicating the time interval between the current and previous value of the t_b parameters in minutes as shown:

P1	Time interval between adjacent values of t_b in minutes
0	0
1	30
10	45
11	60

P2 — a flag indicating whether the value of t_b is odd or even. A value of "1" indicates a 30-minute interval of service information transmit (t_b 1, 3, 5), a value of "0" indicates a 60-minute interval of service information transmit (t_b 2, 6, 10);

P3 — a flag indicating the number of satellites for which an almanac is transmitted within a given frame. "1" corresponds to 5 satellites and "0" corresponds to 4 satellites; and

$\Delta\tau_n$ — the time difference between the navigation RF signal transmitted in L2 sub-band and navigation RF signal transmitted in L1 sub-band by given satellite:

$$\Delta\tau_n \quad t_{f2} \quad t_{f1}$$

where t_{f1}, t_{f2} are the equipment delays in L1 and L2 sub-bands respectively, expressed in units of time.

3.2.1.3.2 *Ephemeris and time parameters*. The ephemeris and time parameters shall be as indicated in Table B-17. For the words for which numeric values may be positive or negative, the MSB shall be the sign bit. The chip "0" shall correspond to the " " sign and the chip "1" shall correspond to the " " sign.

3.2.1.3.3 *Arrangement of the ephemeris and time parameters* Arrangements of the ephemeris and time parameters within a frame shall be as indicated in Table B-18.

3.2.1.3.4 *Almanac parameters* The almanac parameters shall be as follows:

A — an index showing relation of this parameter with the almanac;

M^A_n — an index of the modification of n^A-satellite: "00" indicates GLONASS satellite, and "01" indicates GLONASS-M satellite;

τ_c — the GLONASS time scale correction to UTC(SU) time. The correction τ_c is given at the instant of day N^A;

N^A — the calendar day number within the 4-year period beginning since the leap year. The correction τ_c and other almanac data (almanac of orbits and almanac of phases) relate to this day number;

n^A — the slot number occupied by n-satellite;

H^A_n — the channel number of a carrier frequency of n^A-satellite (Table B-16);

λ^A_n — the longitude of the first (within the N^A-day) ascending node of n^A-satellite orbit in P -90 coordinate system;

$t_{\lambda}{}^A{}_n$ — the time of the first ascending node passage of n^A-satellite within N^A-day;

able 1 Ep emeris and time parameters

Parameter	Number of bits	Scale factor (LSB)	Effective range	Units
m	4	1		dimensionless
	5	1	0 to 23	hours
t_k	6	1	0 to 59	minutes
	1	30	0 or 30	seconds
t_b	7	15	15...1 425	minutes
$\gamma_n(t_b)$	11	2^{40}	2^{30}	dimensionless
$\tau_n(t_b)$	22	2^{30}	2^{9}	seconds
$x_n(t_b)$, $y_n(t_b)$, $z_n(t_b)$	27	2^{11}	$2.7 \quad 10^4$	km
$\dot{x}_n(t_b)$, $\dot{y}_n(t_b)$, $\dot{z}_n(t_b)$	24	2^{20}	4.3	km/second
$\ddot{x}_n(t_b)$, $\ddot{y}_n(t_b)$, $\ddot{z}_n(t_b)$	5	2^{30}	$6.2 \quad 10^{9}$	km/second^2
E_n	5	1	0 to 31	days
B_n	3	1	0 to 7	dimensionless
P1	2	———	as detailed in 3.2.1.3.1	———
P2	1	1	0; 1	dimensionless
P3	1	1	0; 1	dimensionless
$\Delta\tau_n$	5	2^{30}	$13.97 \quad 10^{9}$	seconds

able 1 Arrangements of t e ep emeris and time parameters it in t e frame

Parameter	Number of bits	String number within the frame	Bit number within the frame
m	4	1...15	81 84
t_k	12	1	65 76
t_b	7	2	70 76
$\gamma_n(t_b)$	11	3	69 79
$\tau_n(t_b)$	22	4	59 80
$x_n(t_b)$	27	1	9 35
$y_n(t_b)$	27	2	9 35
$z_n(t_b)$	27	3	9 35
$\dot{x}_n(t_b)$	24	1	41 64
$\dot{y}_n(t_b)$	24	2	41 64
$\dot{z}_n(t_b)$	24	3	41 64
$\ddot{x}_n(t_b)$	5	1	36 40
$\ddot{y}_n(t_b)$	5	2	36 40
$\ddot{z}_n(t_b)$	5	3	36 40
E_n	5	4	49 53
B_n	3	2	78 80
P1	2	1	77 78
P2	1	2	77
P3	1	3	80
$\Delta\tau_n$	5	4	54 58

Δi^A_n the correction to the mean value of inclination of n^A-satellite at instant of $t_{\lambda}{}^A{}_n$ (mean value of inclination is equal to 63 degrees);

ΔT^A_n the correction to the mean value of Draconian period of the n^A-satellite at the instant of $t_{\lambda}{}^A{}_n$ (mean value of Draconian period T is equal to 43 200 seconds);

$\Delta \dot{T}^A_n$ the rate of change of Draconian period of n^A-satellite;

ε^A_n the eccentricity of n^A-satellite at instant of $t_{\lambda}{}^A{}_n$;

ω^A_n the argument of perigee of n^A-satellite at the instant of $t_{\lambda}{}^A{}_n$;

τ^A_n the coarse value of n^A-satellite time correction to GLONASS time at instant of $t_{\lambda}{}^A{}_n$;

C^A_n a generalized “unhealthy flag” of n^A-satellite at instant of almanac upload almanac of orbits and phases. When C_n 0, this indicates that n-satellite is non-operational. When C_n 1, this indicates that n-satellite is operational.

3.2.1.3.5 *Partition and coding of almanac parameters*. The GLONASS almanac, transmitted within the superframe, shall be partitioned over the superframe, as indicated in Table B-19. The numeric values of almanac parameters shall be positive or negative. The MSB shall be the sign bit, the chip “0” shall correspond to the “ ” sign, and the chip “1” shall correspond to the “ ” sign. The almanac parameters shall be coded as indicated in Table B-20.

3.2.1.3.6 *Arrangement of the almanac parameters*. Arrangement of the almanac words within the frame shall be as indicated in Table B-21.

3.2.1.4 *C NTENT AND STRUCTURE F ADDITI NA DATA TRANSMITTED NASS M SATE ITES*

3.2.1.4.1 *etter designation of additional data* In addition to the GLONASS data, GLONASS-M satellites shall transmit the following additional data as indicated in Table B-17-A:

n — an index of the satellite transmitting the given navigation signal: it corresponds to a slot number within GLONASS constellation;

l_n — health flag for n-th satellite: “0” indicates the n-th satellite is healthy, “1” indicates the malfunction of the n-th satellite;

B1 — coefficient to determine ΔUT1: it is equal to the difference between UT1 and UTC at the beginning of the day (N^A), expressed in seconds;

B2 — coefficient to determine ΔUT1: it is equal to the daily change of the difference ΔUT1 (expressed in seconds for a mean sun day).

These coefficients shall be used to transform between UTC(SU) and UT1:

$$\Delta UT1 \quad UTC(SU) \quad UT1,$$

where

UT1 — Universal Time referenced to the Mean Greenwich Meridian (taking account of Pole motion),

UTC(SU) — Coordinated Universal Time of the Russian Federation State Standard,

$$\Delta UT1 \quad B1 \quad B2 \quad (N_T \quad N^A),$$

KP — notification of a forthcoming leap second correction of UTC (1 s) as shown:

KP	UTC second correction data
00	No UTC correction at the end of the current quarter
01	UTC correction by plus 1 s at the end of the current quarter
11	UTC correction by minus 1 s at the end of the current quarter

Note NASS system timescale correction is usually performed once a year at midnight hours minutes seconds in accordance with the early notification of the International Time ureau (I IPM) at the end of a uarter

from December to anuary — first uarter
from March to April — second uarter
from une to uly — third uarter
from September to ctober — fourth uarter

N_T — current date, calendar number of the day within the four-year interval starting from 1 January in a leap year;

Note An example of N_T transformation into the common form of current data information (dd mm yy) is presented in Attachment D

N_4 — four-year interval number starting from 1996;

F_T — a parameter that provides the predicted satellite user range accuracy at time t_b. Coding is as indicated in Table B-17-B;

M — type of satellite transmitting the navigation signal. 00 refers to a GLONASS satellite; 01 refers to a GLONASS-M satellite;

P4 — flag to show that updated ephemeris parameters are present. "1" indicates that an updated ephemeris or frequency/time parameters have been uploaded by the control segment;

Note Updated ephemeris or fre uency time information is transmitted in the next interval after the end of the current interval t_b

P — technological parameter of control segment indicating the satellite operation mode in respect of time parameters:

00 — τ_c parameter relayed from control segment, τ_{GPS} parameter relayed from control segment;

01 — τ_c parameter relayed from control segment, τ_{GPS} parameter calculated on-board the GLONASS-M satellite;

10 — τ_c parameter calculated on-board the GLONASS-M satellite; τ_{GPS} parameter relayed from control segment;

11 — τ_c parameter calculated on-board the GLONASS-M satellite; τ_{GPS} parameter calculated on-board the GLONASS-M satellite;

τ_{GPS} — correction to GPS time relative to GLONASS time:

$$T_{GPS} \quad T_{GL} \quad \Delta T \quad \tau_{GPS},$$

where

ΔT is the integer part, and τ_{GPS} is the fractional part of the difference between the system timescales expressed in seconds.

Note The integer part ΔT is determined from the PS navigation message by the user receiver

$M^A{}_n$ — type of satellite n^A: coding "00" indicates a GLONASS satellite, coding "01" indicates a GLONASS-M satellite.

3.2.1.4.2 *Additional data parameters* Additional data parameters are defined in Tables B-17-A to B-18-A.

3.2.1.4.3 *ocation of additional data words within NASS M navigation message* The required location of additional data words within the GLONASS-M navigation message is defined in Table B-18-A.

able 1 A Additional data parameters

Parameter	No. of bits	Scale factor (LSB)	Effective range	Units
n	5	1	0 to 31	Dimensionless
l_n	1	1	0; 1	Dimensionless
B1	11	2^{10}	0.9	seconds
B2	10	2^{16}	(4.5 to 3.5) 10^{3}	s/mean sun day
KP	2	1	0 to 3	Dimensionless
N_T	11	1	0 to 1 461	days
N_4	5	1	1 to 31	four-year interval
F_T	4		See table B-17-B	
M	2	1	0 to 3	Dimensionless
P4	1	1	0; 1	Dimensionless
P	2	1	00,01,10,11	Dimensionless
τ_{GPS}	22	2^{30}	1.9 10^{3}	seconds
$M^A{}_n$	2	1	0 to 3	Dimensionless

able 1 F ord coding

F_T value	Pseudorange accuracy, 1 sigma (m)
0	1
1	2
2	2.5
3	4
4	5
5	7
6	10
7	12
8	14
9	16
10	32
11	64
12	128
13	256
14	512
15	Not used

able 1 A ocation of additional data ords it in t e O ASS na igation message

Word	Number of bits	String number within the superframe	Bit number within the string
n	5	4, 19, 34, 49, 64	11 15
l_n	1	5, 7, 9, 11, 13, 15, 20, 22, 24, 26, 28, 30, 35, 37, 39, 41, 43, 45, 50, 52, 54, 56, 58, 60, 65, 67, 69, 71, 73, 75	9
		3, 18, 33, 48, 63	65
B1	11	74 (within the superframe)	70 80
B2	10	74 (within the superframe)	60 69
KP	2	74 (within the superframe)	58 59
N_T	11	4, 19, 34, 49, 64	16 26
N_4	5	5, 20, 35, 50, 65	32 36
F_T	4	4, 19, 34, 49, 64	30 33
M	2	4, 19, 34, 49, 64	9 10
P4	1	4, 19, 34, 49, 64	34
P	2	3, 18, 33, 48, 63	66 67
ι_{GPS}	22	5, 20, 35, 50, 65	10 31
$M^A{}_n$	2	6, 8, 10, 12, 14	78 79

able 1 Almanac partition it in t e superframe

Frame number within the superframe	Satellite numbers, for which almanac is transmitted within given frame
1	1 to 5
2	6 to 10
3	11 to 15
4	16 to 20
5	21 to 24

able 20 Almanac parameters coding

Parameter	Number of bits	Scale factor (LSB)	Effective range	Units
$M^A{}_n$	2	1	0 to 3	dimensionless
τ_c	28	2^{27}	1	seconds
N^A	11	1	1 to 1 461	days
n^A	5	1	1 to 24	dimensionless
$H^A{}_n$	5	1	0 to 31	dimensionless
$\lambda^A{}_n$	21	2^{20}	1	semi-circles
$t_{\lambda}{}^A{}_n$	21	2^{5}	0 to 44 100	seconds
$\Delta i^A{}_n$	18	2^{20}	0.067	semi-circles
$\Delta T^A{}_n$	22	2^{9}	3.6 10^3	seconds/revolution
$\Delta \dot{T}^A{}_n$	7	2^{14}	2^{8}	seconds/revolution^2
$\varepsilon^A{}_n$	15	2^{20}	0 to 0.03	dimensionless
$\omega^A{}_n$	16	2^{15}	1	semi-circles
$t_{\tau}{}^A{}_n$	10	2^{18}	1.9 10^{3}	seconds
$C^A{}_n$	1	1	0 to 1	dimensionless

able 21 Arrangement of almanac parameters it in t e frame

Parameter	Number of bits	String number within the frame	Bit number within the string
$M^A{}_n$	2	6, 8, 10, 12, 14	78 79
τ_c	28	5	42 69
N^A	11	5	70 80
n^A	5	6, 8, 10, 12, 14	73 77
$H^A{}_n$	5	7, 9, 11, 13, 15	10 14
$\lambda^A{}_n$	21	6, 8, 10, 12, 14	42 62
$t\lambda^A{}_n$	21	7, 9, 11, 13, 15	44 64
$\Delta i^A{}_n$	18	6, 8, 10, 12, 14	24 41
$\Delta T^A{}_n$	22	7, 9, 11, 13, 15	22 43
$\Delta \dot{T}^A{}_n$	7	7, 9, 11, 13, 15	15 21
$\varepsilon^A{}_n$	15	6, 8, 10, 12, 14	9 23
$\omega^A{}_n$	16	7, 9, 11, 13, 15	65 80
$t_{\tau}{}^A{}_n$	10	6, 8, 10, 12, 14	63 72
$C^A{}_n$	1	6, 8, 10, 12, 14	80

Note String numbers of the first four frames within superframe are given There are no almanac parameters in th and th strings of th frame

3.2.2 DEFINITIONS OF PROTOCOLS FOR DATA APPLICATION

Note This section defines the inter relationships of the data broadcast message parameters It provides definitions of parameters that are not transmitted but are used by either or both non aircraft and aircraft elements and that define terms applied to determine the navigation solution and its integrity

able 22 arity c ecking algorit m

b85, b84, , b10, b9 are the data bits (position 9 to 85 in the string);

β1, β2, ..., 8 are the check bits of the Hamming code (positions 1 to 8 in the string);

$c_1, c_2, ..., c_7, c_\Sigma$ are the checksums generated using the following:

$c_1 \quad \beta \oplus \Sigma_i b_i \ _{\text{mod 2}}$

i 9, 10, 12, 13, 15, 17, 19, 20, 22, 24, 26, 28, 30, 32, 34, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84.

$c_2 \quad \beta_2 \oplus \Sigma_j b_j \ _{\text{mod 2}}$

j 9, 11, 12, 14, 15, 18, 19, 21, 22, 25, 26, 29, 30, 33, 34, 36, 37, 40, 41, 44, 45, 48, 49, 52, 53, 56, 57, 60, 61, 64, 65, 67, 68, 71, 72, 75, 76, 79, 80, 83, 84.

$c_3 \quad \beta_3 \oplus \Sigma_k b_k \ _{\text{mod 2}}$

k 10, 11, 12, 16, 17, 18, 19, 23, 24, 25, 26, 31, 32, 33, 34, 38, 39, 40, 41, 46, 47, 48, 49, 54, 55, 56, 57, 62, 63, 64, 65, 69, 70, 71, 72, 77, 78, 79, 80, 85.

$c_4 \quad \beta_4 \oplus \Sigma_l b_l \ _{\text{mod 2}}$

l 13, 14, 15, 16, 17, 18, 19, 27, 28, 29, 30, 31, 32, 33, 34, 42, 43, 44, 45, 46, 47, 48, 49, 58, 59, 60, 61, 62, 63, 64, 65, 73, 74, 75, 76, 77, 78, 79, 80.

$c_5 \quad \beta_5 \oplus \Sigma_m b_m \ _{\text{mod 2}}$

m 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 81, 82, 83, 84, 85.

$c_6 \quad \beta_6 \oplus \Sigma_n b_n \ _{\text{mod 2}}$

n 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65.

$c_7 \quad \beta_7 \oplus \Sigma_p b_p \ _{\text{mod 2}}$

p 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85.

$c_\Sigma \quad \Sigma \beta_q \ _{\text{mod 2}} \oplus \Sigma b_r \ _{\text{mod 2}}$

q 1, 2, 3, 4, 5, 6, 7, 8

r 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85.

3.2.2.1 *Parity chec ing algorithm for data verification* The algorithm shown in Table B-22 and as detailed below is used to detect and correct an error of 1 bit within the string and to detect an error of 2 or more bits within a string.

3.2.2.1.1 Each string includes the 85 data bits where the 77 MSBs are data chips (b_{85}, b_{84}, , b_{10}, b_9), and the 8 LSBs are the check bits of Hamming code length of 4 ($\beta_{8,}$ β_7, , β_2, β_1).

3.2.2.1.2 To correct 1-bit errors within the string the following checksums are generated: (c_1, c_2, , c_7), and to detect 2-bit errors (or more-even-number-of-bits errors) a checksum c_Σ is generated, as shown in Table B-22. The following is used for correcting single errors and detecting multiple errors:

a) A string is considered correct if all checksums (c_1, ..., c_7, and c_Σ) are equal to "0", or if only one of the checksums (c_1, ..., c_7) is equal to "1" and c_Σ is equal to "1".

b) If two or more of the checksums (c_1, ..., c_7) are equal to "1" and c_Σ is equal to "1", then character "b_{icor}" is corrected to the opposite character in the following bit position:

$$\text{“}i_{cor}\text{”} \quad c_7\,c_6\,c_5\,c_4\,c_3\,c_2\,c_1 \quad 8 \quad K, \text{ provided that “}i_{cor}\text{”} \leq 85,$$

where "$c_7\,c_6\,c_5\,c_4\,c_3\,c_2\,c_1$" is a binary number generated from the checksums (c_1, ..., c_7) with c_1 being the LSB and c_7 being the MSB. K is the ordinal number of the most significant checksum not equal to "0".

If i_{cor} 85, then there is an odd number of multiple errors, and the data shall be rejected.

c) If at least one of the checksums (c_1, ..., c_7) is equal to "1" and c_Σ is equal to "0", or if all checksums (c_1, ..., c_7) are equal to "0" but c_Σ is equal to "1", then there are multiple errors and the data shall be rejected.

3.2.2.2 *SATE ITE C C C RRECTI N PARAMETERS*

3.2.2.2.1 GLONASS system time is determined as:

$$t_{GLONASS} \quad t_k \quad \tau_n(t_b) \quad \gamma_n(t_b)\,(t_k \quad t_b)$$

where t_k, $\tau_n(t_b)$, $\gamma_n(t_b)$ are parameters described in 3.2.1.3.1.

3.2.2.2.2 GLONASS time is related to National Time Service of Russia (UTC(SU)) time as indicated below:

$$t_{UTC(SU)} \quad t_{GLONASS} \quad \tau_c \quad \text{03 hours 00 minutes}$$

where

τ_c is a parameter described in 3.2.1.3.4 and
03 hours 00 minutes is continuous time shift caused by difference between Moscow time and Greenwich time.

3.2.2.3 *SATE ITE P SITI N*

3.2.2.3.1 The current satellite position is defined using ephemeris parameters from GLONASS navigation, as indicated and in Table B-17.

3.2.2.3.2 Recalculation of ephemeris from instant t_b to instant t_i within the interval (τ_i t_i t_b $\leq$ 15 minutes) is performed using a technique of numeric integration of differential equations describing the motion of the satellites. In the right-hand parts of these equations the accelerations are determined using the gravitational constant μ and the second zonal harmonic of the geopotential $J^2{}_0$which defines polar flattening of the earth, and accelerations due to luni-solar perturbation are taken into account. The equations are integrated in the P -90 (3.2.5) coordinate system by applying the Runge-Kutta technique of fourth order, as indicated below:

$$\frac{dx}{dt} = Vx$$

$$\frac{dy}{dt} = Vy$$

$$\frac{dz}{dt} = Vz$$

$$\frac{dV_x}{dt} = -\frac{\mu}{r^3}x - \frac{3}{2}J_0^2\frac{\mu a_e^2}{r^5}x\left(1-\frac{5z^2}{r^2}\right)+\omega^2 x + 2\omega V_y + \ddot{x}$$

$$\frac{dV_y}{dt} = -\frac{\mu}{r^3}y - \frac{3}{2}J_0^2\frac{\mu a_e^2}{r^5}y\left(1-\frac{5z^2}{r^2}\right)+\omega^2 y + 2\omega V_x + \ddot{y}$$

$$\frac{dV_z}{dt} = -\frac{\mu}{r^3}z - \frac{3}{2}J_0^2\frac{\mu a_e^2}{r^5}z\left(1-\frac{5z^2}{r^2}\right)+\ddot{z}$$

where

r	$\sqrt{x^2+y^2+z^2}$;
	earth s universal gravitational constant (398 600.44 10^9 m^3/s^2);
a_e	major semi-axis (6 378 136 m);
J^2_0	second zonal harmonic of the geopotential (1 082 625.7 $10^{\ 9}$); and
ω	earth s rotation rate (7.292115 $10^{\ 5}$ radians/s).

Coordinates $x_n(t_b)$, $y_n(t_b)$, $z_n(t_b)$ and velocity vector components $\dot{x}_n(t_b)$ V_x, $\dot{y}_n(t_b)$ V_y, $\dot{z}_n(t_b)$ V_z are initial conditions for the integration. Accelerations due to luni-solar perturbation $\ddot{x}_n(t_b)$, $\ddot{y}_n(t_b)$, $\ddot{z}_n(t_b)$ are constant on the integration interval 15 minutes.

3.2.3 AIRCRAFT ELEMENTS

3.2.3.1 *NSS (NASS) RECEI ER*

3.2.3.1.1 *Satellite exclusion*. The receiver shall exclude any satellite designated unhealthy in the GLONASS navigation message.

3.2.3.1.2 *Satellite trac ing* The receiver shall provide the capability to continuously track a minimum of four satellites and generate a position solution based upon those measurements.

3.2.3.1.3 *Doppler shift* The receiver shall be able to compensate for dynamic Doppler shift effects on nominal GLONASS signal carrier phase and standard code measurements. The receiver shall compensate for the Doppler shift that is unique to the anticipated application.

3.2.3.1.4 *Resistance to interference* The receiver shall meet the requirements for resistance to interference as specified in 3.7.

3.2.3.1.4.1 *Intrasystem interference* When receiving a navigation signal with frequency channel k n, the interference created by a navigation signal with frequency channel number k n 1 or k n 1 shall not be more than 48 dBc with respect to the minimum specified satellite power at the surface of the earth provided that the satellites transmitting these signals are simultaneously located in user s visibility zone.

Note The intrasystem interference is the intercorrelation properties of the ranging pseudo random signal with regard to fre uency division multiple access

3.2.3.1.5 *Application of cloc and ephemeris data* The receiver shall ensure that it is using the correct ephemeris and clock data before providing any position solution.

3.2.3.1.6 *eap second correction* Upon GLONASS time leap second correction (see 3.2.1.3.1, t_b) the GLONASS receiver shall be capable of:

a) generating a smooth and valid series of pseudo-range measurements; and

b) resynchronizing the data string time mark without loss of signal tracking.

3.2.3.1.6.1 After GLONASS time leap second correction the GLONASS receiver shall utilize the UTC time as follows:

a) utilize the old (prior to the correction) UTC time together with the old ephemeris (transmitted before 00 hours 00 minutes 00 seconds UTC); and

b) utilize the updated UTC time together with the new ephemeris (transmitted after 00 hours 00 minutes 00 seconds UTC).

3.2.4 TIME

3.2.4.1 For the GLONASS-M satellites, the navigation message shall contain the data necessary to relate UTC(SU) time to UT1. GLONASS time shall be maintained to be within 1 millisecond of UTC(SU) time after correction for the integer number of hours due to GLONASS control segment specific features:

$$t_{GLONASS} \quad (UTC \quad 03 \text{ hours } 00 \text{ minutes}) \quad 1 \text{ ms}$$

The navigation data shall contain the requisite data to relate GLONASS time to UTC time (as maintained by the National Time Service of Russia, UTC (SU)) within 1 microsecond.

Note The timescales of NASS satellites are periodically compared with central synchroni er time Corrections to the timescales of NASS satellites relative to NASS time and UTC(SU) time are computed at the NASS ground based control complex and uploaded to the satellites twice per day

Note There is no integer second difference between NASS time and UTC time The NASS timescale is periodically corrected to integer number of seconds simultaneously with UTC corrections which are performed according to the ureau International de l eure notification (leap second correction) These corrections are performed at hours minutes seconds UTC time at midnight at the end of a uarter of the year Upon the NASS leap second correction the time mar within navigation message changes its position (in a continuous timescale) to become synchroni ed with second epochs of corrected UTC timescale NASS users are notified in advance on these planned corrections For the NASS M satellites notification of these corrections is provided to users via the navigation message parameter P

3.2.4.2 Accuracy of mutual satellite timescales synchronization shall be 20 nanoseconds (1 sigma) for GLONASS satellites and 8 nanoseconds (1 sigma) for GLONASS-M satellites.

3.2.4.3 The correction to GPS time relative to GLONASS time (or difference between these timescales) broadcast by the GLONASS-M satellites, τ_{GPS}, shall not exceed 30 nanoseconds (1 sigma).

Note The accuracy of τ_{PS} (ns) is determined with reference to the PS SPS coarse ac uisition signal and may be refined upon completion of trials of the NASS system using NASS M satellites

3.2.5 COORDINATE SYSTEM

3.2.5.1 *P (Parameters of common terrestrial ellipsoid and gravitational field of the earth)* The GLONASS broadcast ephemeris shall describe a position of transmitting antenna phase centre of a given satellite in the P -90 earth-centred earth-fixed reference frame.

3.2.5.2 *Conversion between P and S* The following conversion parameters shall be used to obtain position coordinates in WGS-84 from position coordinates in P -90:

$$\begin{bmatrix} X \\ Y \\ \ \end{bmatrix}_{WGS-84} = \begin{bmatrix} -1.1 \\ -0.3 \\ -0.9 \end{bmatrix} + (1 - 0.12 \times 10^{-6}) \begin{bmatrix} 1 & -0.82 \times 10^{-6} & 0 \\ +0.82 \times 10^{-6} & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ \ \end{bmatrix}_{P\ -90}$$

Note and are expressed in metres

3.2.5.2.1 The conversion error shall not exceed 1.5 metres (1 sigma) along each coordinate axis.

3 3 Combined use of S and O ASS

3.3.1 AIRCRAFT ELEMENTS

3.3.1.1 *Combined NSS receiver*. The combined GNSS receiver shall process signals from GPS and GLONASS in accordance with the requirements specified in 3.1.3.1, GPS (GNSS) receiver, and 3.2.3.1, GLONASS (GNSS) receiver.

3.3.1.1.1 *Resistance to interference* The combined GNSS receiver shall meet the individual requirements for GPS and GLONASS as specified in 3.7.

3.3.1.2 *Antenna(e)*. GPS and GLONASS signals shall be received through one or more antennae.

Note Performance characteristics of NSS receiver antennae are defined in

3.3.1.3 *Conversion between coordinate systems*. Position information provided by a combined GPS and GLONASS receiver shall be expressed in WGS-84 earth coordinates. The GLONASS satellite position, obtained in P -90 coordinate frame, shall be converted to account for the differences between WGS-84 and P -90, as defined in 3.2.5.2.

3.3.1.4 *PS NASS time*. When combining measurements from GLONASS and GPS, the difference between GLONASS time and GPS time shall be taken into account.

3 Aircraft based augmentation system A AS

Note uidance on A AS is given in Attachment D section

3 Satellite based augmentation system S AS

3.5.1 GENERAL

Note Parameters in this section are defined in S

3.5.2 RF CHARACTERISTICS

3.5.2.1 *Carrier fre uency stability*. The short-term stability of the carrier frequency (square root of the Allan Variance) at the output of the satellite transmit antenna shall be better than 5 10^{11} over 1 to 10 seconds.

3.5.2.2 *Carrier phase noise*. The phase noise spectral density of the unmodulated carrier shall be such that a phase locked loop of 10 Hz one-sided noise bandwidth is able to track the carrier to an accuracy of 0.1 radian (1 sigma).

3.5.2.3 *Spurious emissions*. Spurious emissions shall be at least 40 dB below the unmodulated carrier power over all frequencies.

3.5.2.4 *Code carrier fre uency coherence*. The short-term (less than 10 seconds) fractional frequency difference between the code phase rate and the carrier frequency shall be less than 5 10^{11} (standard deviation). Over the long term (less than 100 seconds), the difference between the change in the broadcast code phase, converted to carrier cycles by multiplying the number of code chips by 1 540, and the change in the broadcast carrier phase, in cycles, shall be within one carrier cycle (standard deviation).

Note This applies to the output of the satellite transmit antenna and does not include code carrier divergence due to ionospheric refraction in the downlin propagation path

3.5.2.5 *Correlation loss*. The loss in the recovered signal power due to imperfections in the signal modulation and waveform distortion shall not exceed 1 dB.

Note The loss in signal power is the difference between the broadcast power in a M bandwidth and the signal power recovered by a noise free loss free receiver with chip correlator spacing and a M bandwidth

3.5.2.6 *Maximum code phase deviation*. The maximum uncorrected code phase of the broadcast signal shall not deviate from the equivalent SBAS network time (SNT) by more than 2^{20} seconds.

3.5.2.7 *Code data coherence*. Each 2-millisecond symbol shall be synchronous with every other code epoch.

3.5.2.8 *Message synchroni ation*. The leading edge of the first symbol that depends on the first bit of the current message shall be broadcast from the SBAS satellite synchronous with a 1-second epoch of SNT.

3.5.2.9 *Convolutional encoding*. A 250-bit-per-second data stream shall be encoded at a rate of 2 symbols per bit using a convolutional code with a constraint length of 7 to yield 500 symbols per second. The convolutional encoder logic arrangement shall be as illustrated in Figure B-11 with the G3 output selected for the first half of each 4-millisecond data bit period.

3.5.2.10 *Pseudo random noise (PRN) codes*. Each PRN code shall be a 1 023-bit Gold code which is itself the Modulo-2 addition of two 1 023-bit linear patterns, G1 and $G2_i$. The $G2_i$ sequence shall be formed by delaying the G2 sequence by the associated integer number of chips as illustrated in Table B-23. Each of the G1 and G2 sequences shall be defined as the output of stage 10 of a 10-stage shift register, where the input to the shift register is the Modulo-2 addition of the following stages of the shift register:

a) G1: stages 3 and 10; and

b) G2: stages 2, 3, 6, 8, 9 and 10.

The initial state for the G1 and G2 shift registers shall be “1111111111”.

able 23 S AS R codes

PRN code number	G2 delay (chips)	First 10 SBAS chips (Leftmost bit represents first transmitted chip, binary)
120	145	110111001
121	175	101011110
122	52	1101001000
123	21	1101100101
124	237	1110000
125	235	111000001
126	886	1011
127	657	1000110000
128	634	10100101
129	762	101010111
130	355	1100011110
131	1 012	1010010110
132	176	1010101111
133	603	100110
134	130	1000111001
135	359	101110001
136	595	1000011111
137	68	111111000
138	386	1011010111

3.5.3 DATA STRUCTURE

3.5.3.1 *Format summary*. All messages shall consist of a message type identifier, a preamble, a data field and a cyclic redundancy check as illustrated in Figure B-12.

3.5.3.2 *Preamble* The preamble shall consist of the sequence of bits “01010011 10011010 11000110”, distributed over three successive blocks. The start of every other 24-bit preamble shall be synchronous with a 6-second GPS subframe epoch.

3.5.3.3 *Message type identifier* The message type identifier shall be a 6-bit value identifying the message type (Types 0 to 63) as defined in Table B-24. The message type identifier shall be transmitted MSB first.

3.5.3.4 *Data field*. The data field shall be 212 bits as defined in 3.5.6. Each data field parameter shall be transmitted MSB first.

3.5.3.5 *Cyclic redundancy chec (CRC)* The SBAS message CRC code shall be calculated in accordance with 3.9.

3.5.3.5.1 The length of the CRC code shall be k 24 bits.

3.5.3.5.2 The CRC generator polynomial shall be:

$$G(x)\quad x^{24}\quad x^{23}\quad x^{18}\quad x^{17}\quad x^{14}\quad x^{11}\quad x^{10}\quad x^{7}\quad x^{6}\quad x^{5}\quad x^{4}\quad x^{3}\quad x\quad 1$$

able 2 roadcast message types

Message type	Contents
0	"Do Not Use" (SBAS test mode)
1	PRN mask
2 to 5	Fast corrections
6	Integrity information
7	Fast correction degradation factor
8	Spare
9	GEO ranging function parameters
10	Degradation parameters
11	Spare
12	SBAS network time/UTC offset parameters
13 to 16	Spare
17	GEO satellite almanacs
18	Ionospheric grid point masks
19 to 23	Spare
24	Mixed fast/long-term satellite error corrections
25	Long-term satellite error corrections
26	Ionospheric delay corrections
27	SBAS service message
28	Clock-ephemeris covariance matrix
29 to 61	Spare
62	Reserved
63	Null message

3.5.3.5.3 The CRC information field, M(x), shall be:

$$M(x) = \sum_{i=1}^{226} m_i x^{226-i} = m_1 x^{225} + m_2 x^{224} + \ldots + m_{226} x^0$$

3.5.3.5.4 M(x) shall be formed from the 8-bit SBAS message preamble, 6-bit message type identifier, and 212-bit data field. Bits shall be arranged in the order transmitted from the SBAS satellite, such that m_1 corresponds to the first transmitted bit of the preamble, and m_{226} corresponds to bit 212 of the data field.

3.5.3.5.5 The CRC code r-bits shall be ordered such that r_1 is the first bit transmitted and r_{24} is the last bit transmitted.

3.5.4 DATA CONTENT

3.5.4.1 *PRN mas parameters*. PRN mask parameters shall be as follows:

PRN code number a number that uniquely identifies the satellite PRN code and related assignments as shown in Table B-25.

PRN mas 210 PRN mask values that correspond to satellite PRN code numbers. The mask shall set up to 51 of the 210 PRN mask values.

Note The first transmitted bit of the PRN mas corresponds to PRN code number

able 2 R code number assignments

PRN code number	Assignment
1 37	GPS
38 61	GLONASS slot number plus 37
62 119	Spare
120 138	SBAS
139 210	Spare

PRN mas value a bit in the PRN mask indicating whether data are provided for the associated satellite PRN code number (1 to 210).

Coding: 0 data not provided
1 data provided

PRN mas number the sequence number (1 to 51) of the mask values set in the PRN mask.

Note The PRN mas number is for the lowest satellite PRN number for which the PRN mas value is

Issue of data PRN (I DP) an indicator that associates the correction data with a PRN mask.

Note Parameters are broadcast in the following messages

a) PRN mas (consisting of PRN mas values) in Type message

b) PRN mas number in Type and messages

c) PRN code number in Type message and

d) I DP in Type to and messages

3.5.4.2 *eostationary orbit (E) ranging function parameters* GEO ranging function parameters shall be as follows:

t $_E$ the reference time for the GEO ranging function data, expressed as the time after midnight of the current day.

[ ] the position of the GEO at time $t_{0,GEO}$.

[˙ ˙ ˙] the velocity of the GEO at time $t_{0,GEO}$.

[¨ ¨ ¨] the acceleration of the GEO at time $t_{0,GEO}$.

a_f the time offset of the GEO clock with respect to SNT, defined at $t_{0,GEO}$.

a_f the drift rate of the GEO clock with respect to SNT.

User range accuracy (URA) an indicator of the root-mean-square ranging error, excluding atmospheric effects, as described in Table B-26.

Note All parameters are broadcast in Type message

able 26 ser range accuracy

URA	Accuracy (rms)
0	2 m
1	2.8 m
2	4 m
3	5.7 m
4	8 m
5	11.3 m
6	16 m
7	32 m
8	64 m
9	128 m
10	256 m
11	512 m
12	1 024 m
13	2 048 m
14	4 096 m
15	“Do Not Use”

3.5.4.3 *E almanac parameters* GEO almanac parameters shall be as follows:

PRN code number see 3.5.4.1.

ealth and status an indication of the functions provided by the SBAS. The service provider identifiers are shown in Table B-27.

Coding:	Bit 0 (LSB)	Ranging	On (0)	Off (1)
	Bit 1	Precision corrections	On (0)	Off (1)
	Bit 2	Satellite status and basic corrections	On (0)	Off (1)
	Bits 3	Spare		
	Bits 4 to 7	Service provider identifier		

Note A service provider ID of is used for AS and is not applicable to S AS

$\left[\ {}_{A}\quad {}_{A}\quad {}_{A}\right]$ the position of the GEO at time $t_{almanac}$.

$\left[\ \dot{}_{A}\quad \dot{}_{A}\quad \dot{}_{A}\right]$ the velocity of the GEO at time $t_{almanac}$.

$t_{almanac}$ the reference time for the GEO almanac data, expressed as the time after midnight of the current day.

Note All parameters are broadcast in Type message

3.5.4.4 *SATE ITE C RRECTI N R ADCAST PARAMETERS*

3.5.4.4.1 Long-term correction parameters shall be as follows:

Issue of data (I D_i*)* an indicator that associates the long-term corrections for the i^{th} satellite with the ephemeris data broadcast by that satellite.

Note For PS the I D_i matches the I DE and S s of the I DC (and)

Note For NASS the I D_i indicates a period of time that NASS data are to be used with S AS data It consists of two fields as shown in Table

δx_i for satellite i, the ephemeris correction for the x axis.

δy_i for satellite i, the ephemeris correction for the y axis.

$\delta \ _i$ for satellite i, the ephemeris correction for the z axis.

$\delta a_{i\,f}$ for satellite i, the ephemeris time correction.

$\delta \dot{x}_i$ for satellite i, ephemeris velocity correction for x axis.

$\delta \dot{y}_i$ for satellite i, ephemeris velocity correction for y axis.

$\delta \dot{\ }_i$ for satellite i, ephemeris velocity correction for z axis.

$\delta a_{i\,f}$ for satellite i, rate of change of the ephemeris time correction.

$t_{i\ T}$ the time of applicability of the parameters δx_i, δy_i, δz_i, $\delta a_{i,f0}$, $\delta \dot{x}_i$, $\delta \dot{y}_i$, $\delta \dot{z}_i$ and $\delta a_{i,f1}$, expressed in seconds after midnight of the current day.

elocity code an indicator of the message format broadcast (Table B-48 and Table B-49).

Coding: 0 $\delta \dot{x}_i$, $\delta \dot{y}_i$, $\delta \dot{z}_i$ and $\delta a_{i,f1}$ are not broadcast.
1 $\delta \dot{x}_i$, $\delta \dot{y}_i$, $\delta \dot{z}_i$ and $\delta a_{i,f1}$ are broadcast.

Note All parameters are broadcast in Type and messages

able 2 S AS ser ice pro ider identifiers

Identifier	Service provider
0	WAAS
1	EGNOS
2	MSAS
3 to 13	Spare
14, 15	Reserved

able 2 OD_i for O ASS satellites

MSB	LSB
Validity interval (5 bits)	Latency time (3 bits)

3.5.4.4.2 Fast correction parameters shall be as follows:

Fast correction (FC_i) for satellite *i*, the pseudo-range correction for rapidly varying errors, other than tropospheric or ionospheric errors, to be added to the pseudo-range after application of the long-term correction.

Note The user receiver applies separate tropospheric corrections (and)

Fast correction type identifier an indicator (0, 1, 2, 3) of whether the Type 24 message contains the fast correction and integrity data associated with the PRN mask numbers from Type 2, Type 3, Type 4 or Type 5 messages, respectively.

Issue of data fast correction (I DF$_j$) an indicator that associates UDREI$_i$s with fast corrections. The index *j* shall denote the message type (j 2 to 5) to which IODF$_j$ applies (the fast correction type identifier 2).

Note The fast correction type identifier is broadcast in Type messages The FC_i are broadcast in Type to and Type messages The I DF$_j$ are broadcast in Type to and Type messages

3.5.4.5 *Fast and long term correction integrity parameters*. Fast and long-term correction integrity parameters shall be as follows:

UDREI$_i$ an indicator that defines the $\sigma^2_{i,UDRE}$ for satellite *i* as described in Table B-29.

Model variance of residual cloc and ephemeris errors (σ $_{i\ UDRE}$) the variance of a normal distribution associated with the user differential range errors for satellite *i* after application of fast and long-term corrections, excluding atmospheric effects and used in horizontal protection level/vertical protection level computations (3.5.5.6).

Note All parameters are broadcast in Type to and Type messages

3.5.4.6 *Ionospheric correction parameters* Ionospheric correction parameters shall be as follows:

I P mas a set of 11 ionospheric grid point (IGP) band masks defined in Table B-30.

I P band mas a set of IGP mask values which correspond to all IGP locations in one of the 11 IGP bands defined in Table B-30.

able 2 E aluation of DRE $_i$

UDREI$_i$	$\sigma^2_{i,UDRE}$
0	0.0520 m^2
1	0.0924 m^2
2	0.1444 m^2
3	0.2830 m^2
4	0.4678 m^2
5	0.8315 m^2
6	1.2992 m^2
7	1.8709 m^2
8	2.5465 m^2
9	3.3260 m^2
10	5.1968 m^2
11	20.7870 m^2
12	230.9661 m^2
13	2 078.695 m^2
14	“Not Monitored”
15	“Do Not Use”

I P mas value a bit indicating whether data are provided within that IGP band for the associated IGP.

Coding: 0 data are not provided
1 data are provided

Number of I P bands the number of IGP band masks being broadcast.

I P band identifier the number identifying the ionospheric band as defined in Table B-30.

I P bloc identifier the identifier of the IGP block. The IGP blocks are defined by dividing into groups of 15 IGPs the sequence of IGPs within an IGP band mask which have IGP mask values of “1”. The IGP blocks are numbered in an order of IGP mask value transmission, starting with “0”.

alidity interval ( ) the time interval for which the GLONASS ephemeris data are applicable (coded with an offset of 30 s) as described in Table B-31.

atency time ( ) the time interval between the time the last GLONASS ephemeris has been received by the ground segment and the time of transmission of the first bit of the long-term correction message at the GEO(t_{ltc}) as described in Table B-32.

I DI an indication of when the k^{th} IGP band mask changes.

I P vertical delay estimate an estimate of the delay induced for a signal at 1 575.42 MHz if it traversed the ionosphere vertically at the IGP.

Coding: The bit pattern “111111111” indicates “Do Not Use”.

I EI$_i$ an indicator that defines the $\sigma^2_{i,GIVE}$ as described in Table B-33.

Model variance of residual ionospheric errors ($\sigma_{i\ \ I\ E}$) the variance of a normal distribution associated with the residual ionospheric vertical error at the IGP for an L1 signal.

Note All parameters are broadcast in Type and Type messages

able 30 locations and band numbers

IGP location		Transmission order in IGP band mask
Band 0		
180 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N, 85N	1 28
175 W	55S, 50S, 45S, ..., 45N, 50N, 55N	29 51
170 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	52 78
165 W	55S, 50S, 45S, ..., 45N, 50N, 55N	79 101
160 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	102 128
155 W	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
150 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
145 W	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 1		
140 W	85S, 75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 28

IGP location		Transmission order in IGP band mask
135 W	55S, 50S, 45S, ..., 45N, 50N, 55N	29 51
130 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	52 78
125 W	55S, 50S, 45S, ..., 45N, 50N, 55N	79 101
120 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	102 128
115 W	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
110 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
105 W	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 2		
100 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
95 W	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
90 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N, 85N	51 78
85 W	55S, 50S, 45S, ..., 45N, 50N, 55N	79 101
80 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	102 128
75 W	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
70 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
65 W	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 3		
60 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
55 W	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
50 W	85S, 75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 78
45 W	55S, 50S, 45S, ..., 45N, 50N, 55N	79 101
40 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	102 128
35 W	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
30 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
25 W	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 4		
20 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
15 W	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
10 W	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 77
5 W	55S, 50S, 45S, ..., 45N, 50N, 55N	78 100
0	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N, 85N	101 128
5 E	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
10 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
15 E	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 5		
20 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
25 E	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50

IGP location		Transmission order in IGP band mask
30 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 77
35 E	55S, 50S, 45S, ..., 45N, 50N, 55N	78 100
40 E	85S, 75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	101 128
45 E	55S, 50S, 45S, ..., 45N, 50N, 55N	129 151
50 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	152 178
55 E	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 6		
60 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
65 E	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
70 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 77
75 E	55S, 50S, 45S, ..., 45N, 50N, 55N	78 100
80 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	101 127
85 E	55S, 50S, 45S, ..., 45N, 50N, 55N	128 150
90 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N, 85N	151 178
95 E	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 7		
100 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
105 E	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
110 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 77
115 E	55S, 50S, 45S, ..., 45N, 50N, 55N	78 100
120 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	101 127
125 E	55S, 50S, 45S, ..., 45N, 50N, 55N	128 150
130 E	85S, 75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	151 178
135 E	55S, 50S, 45S, ..., 45N, 50N, 55N	179 201
Band 8		
140 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	1 27
145 E	55S, 50S, 45S, ..., 45N, 50N, 55N	28 50
150 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	51 77
155 E	55S, 50S, 45S, ..., 45N, 50N, 55N	78 100
160 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	101 127
165 E	55S, 50S, 45S, ..., 45N, 50N, 55N	128 150
170 E	75S, 65S, 55S, 50S, 45S, ..., 45N, 50N, 55N, 65N, 75N	151 177
175 E	55S, 50S, 45S, ..., 45N, 50N, 55N	178 200
Band 9		
60 N	180W, 175W, 170W, , 165E, 170E, 175E	1 72
65 N	180W, 170W, 160W, , 150E, 160E, 170E	73 108
70 N	180W, 170W, 160W, , 150E, 160E, 170E	109 144

IGP location		Transmission order in IGP band mask
75 N	180W, 170W, 160W, , 150E, 160E, 170E	145 180
85 N	180W, 150W, 120W, , 90E, 120E, 150E	181 192
Band 10		
60 S	180W, 175W, 170W, , 165E, 170E, 175E	1 72
65 S	180W, 170W, 160W, , 150E, 160E, 170E	73 108
70 S	180W, 170W, 160W, , 150E, 160E, 170E	109 144
75 S	180W, 170W, 160W, , 150E, 160E, 170E	145 180
85 S	170W, 140W, 110W, , 100E, 130E, 160E	181 192

able 31 alidity inter al

Data	Bits used	Range of values	Resolution
Validity interval (V)	5	30 s to 960 s	30 s

able 32 atency time

Data	Bits used	Range of values	Resolution
Latency time (L)	3	0 s to 120 s	30 s

able 33 E aluation of E i

$GIVEI_i$	$\sigma^2_{i,GIVE}$
0	0.0084 m^2
1	0.0333 m^2
2	0.0749 m^2
3	0.1331 m^2
4	0.2079 m^2
5	0.2994 m^2
6	0.4075 m^2
7	0.5322 m^2
8	0.6735 m^2
9	0.8315 m^2
10	1.1974 m^2
11	1.8709 m^2
12	3.3260 m^2
13	20.787 m^2
14	187.0826 m^2
15	“Not Monitored”

3.5.4.7 *Degradation parameters* Degradation parameters, whenever used, shall be as follows:

Fast correction degradation factor indicator (ai_i) an indicator of the fast correction degradation factor (a_i) for the i^{th} satellite as described in Table B-34.

Note The ai_i is also used to define the time out interval for fast corrections as described in

System latency time (t_{lat}) the time interval between the origin of the fast correction degradation and the user differential range estimate indicator (UDREI) reference time.

$_{rrc}$ a parameter that bounds the noise and round-off errors when computing the range rate correction degradation as in 3.5.5.6.2.2.

$C_{ltc\ lsb}$ the maximum round-off error due to the resolution of the orbit and clock information.

$C_{ltc\ v}$ the velocity error bound on the maximum range rate difference of missed messages due to clock and orbit rate differences.

$I_{ltc\ v}$ the update interval for long-term corrections if velocity code 1 (3.5.4.4.1).

$C_{ltc\ v}$ a parameter that bounds the difference between two consecutive long-term corrections for satellites with a velocity code 0.

$I_{ltc\ v}$ the minimum update interval for long-term messages if velocity code 0 (3.5.4.4.1).

$C_{E\ \ lsb}$ the maximum round-off error due to the resolution of the orbit and clock information.

$C_{E\ \ v}$ the velocity error bound on the maximum range rate difference of missed messages due to clock and orbit rate differences.

I_{E} the update interval for GEO ranging function messages.

able 3 Fast correction degradation factor

Fast correction degradation factor indicator (ai_i)	Fast correction degradation factor (a_i)
0	0.0 mm/s^2
1	0.05 mm/s^2
2	0.09 mm/s^2
3	0.12 mm/s^2
4	0.15 mm/s^2
5	0.20 mm/s^2
6	0.30 mm/s^2
7	0.45 mm/s^2
8	0.60 mm/s^2
9	0.90 mm/s^2
10	1.50 mm/s^2
11	2.10 mm/s^2
12	2.70 mm/s^2
13	3.30 mm/s^2
14	4.60 mm/s^2
15	5.80 mm/s^2

C_{er} the bound on the residual error associated with using data beyond the precision approach/approach with vertical guidance time-out.

$C_{iono\ step}$ the bound on the difference between successive ionospheric grid delay values.

I_{iono} the minimum update interval for ionospheric correction messages.

$C_{iono\ ramp}$ the rate of change of the ionospheric corrections.

RSS_{UDRE} the root-sum-square flag for fast and long-term correction residuals.

Coding: 0 correction residuals are linearly summed
1 correction residuals are root-sum-squared

RSS_{iono} the root-sum-square flag for ionospheric residuals.

Coding: 0 correction residuals are linearly summed
1 correction residuals are root-sum-squared

$C_{covariance}$ the term which is used to compensate for quantization effects when using the Type 28 message.

Note The parameters a_i and t_{lat} are broadcast in Type message All other parameters are broadcast in Type message

Note If message Type is not broadcast $C_{covariance}$ is not applicable

3.5.4.8 *Time parameters* Time parameters, whenever used, shall be as follows:

UTC standard identifier an indication of the UTC reference source as defined in Table B-35.

PS time of wee count the number of seconds that have passed since the transition from the previous GPS week (similar to the GPS parameter in 3.1.1.2.6.1 but with a 1-second resolution).

able 3 C standard identifier

UTC standard identifier	UTC standard
0	UTC as operated by the Communications Research Laboratory, Tokyo, Japan
1	UTC as operated by the U.S. National Institute of Standards and Technology
2	UTC as operated by the U.S. Naval Observatory
3	UTC as operated by the International Bureau of Weights and Measures
4	Reserved for UTC as operated by a European laboratory
5 to 6	Spare
7	UTC not provided

PS wee number (wee count) see 3.1.1.2.6.2.

NASS indicator a flag indicating if GLONASS time parameters are provided.

Coding: 0 GLONASS time parameters are not provided
1 GLONASS time parameters are provided

NASS time offset (δa_i $_{NASS}$) A parameter that represents the stable part of the offset between the GLONASS time and the SBAS network time.

Note If S AS does not support NASS δa_i $_{NASS}$ is not applicable

UTC parameters A_{1SNT}, A_{0SNT}, t_{0t}, WN_t, Δt_{LS}, WN_{LSF}, DN and Δt_{LSF} are as described in 3.1.1.3.3.6, with the exception that the SBAS parameters relate SNT to UTC time, rather than GPS time.

Note All parameters are broadcast in Type message

3.5.4.9 *Service region parameters* Service region parameters shall be as follows:

Issue of data service (I DS) an indication of a change of the service provided in the region.

Number of service messages the number of different Type 27 SBAS service messages being broadcast. (Value is coded with an offset of 1.)

Service message number a sequential number identifying the message within the currently broadcast set of Type 27 messages (from 1 to number of service messages, coded with an offset of 1).

Number of regions the number of service regions for which coordinates are broadcast in the message.

Priority code an indication of a message precedence if two messages define overlapping regions. The message with a higher value of priority code takes precedence. If priority codes are equal, the message with the lower δUDRE takes precedence.

δUDRE indicator inside an indication of regional UDRE degradation factor (δUDRE) applicable at locations inside any region defined in the message, in accordance with Table B-36.

δUDRE indicator outside an indication of regional UDRE degradation factor (δUDRE) applicable at locations outside all regions defined in all current Type 27 messages, in accordance with Table B-36.

Coordinate latitude the latitude of one corner of a region.

Coordinate longitude the longitude of one corner of a region.

Region shape an indication of whether a region is a triangle or quadrangle.

Coding: 0 triangle
1 quadrangle

Note Coordinate has Coordinate latitude and Coordinate longitude If region is a uadrangle Coordinate has Coordinate latitude and Coordinate longitude Region boundary is formed by joining coordinates in the se uence (triangle) or (uadrangle) oundary segments have either constant latitude constant longitude or constant slope in degrees of latitude per degree of longitude The change in latitude or longitude along any boundary segment between two coordinates is less than degrees

Note All parameters are broadcast in Type message

able 36 δ DRE indicator e aluation

δUDRE indicator	δUDRE
0	1
1	1.1
2	1.25
3	1.5
4	2
5	3
6	4
7	5
8	6
9	8
10	10
11	20
12	30
13	40
14	50
15	100

3.5.4.10 *Cloc ephemeris covariance matrix parameters*. Clock-ephemeris covariance matrix parameters shall be as follows:

PRN mas number see 3.5.4.1.

Scale exponent A term to compute the scale factor used to code the Cholesky factorization elements.

Choles y factori ation elements ($E_{i\,j}$) Elements of an upper triangle matrix which compresses the information in the clock and ephemeris covariance matrix. These elements are used to compute the user differential range estimate (UDRE) degradation factor (δUDRE) as a function of user position.

3.5.5 DEFINITIONS OF PROTOCOLS FOR DATA APPLICATION

Note This section provides definitions of parameters used by the non aircraft or aircraft elements that are not transmitted These parameters necessary to ensure interoperability of S AS are used to determine the navigation solution and its integrity (protection levels)

3.5.5.1 *E P SITI N AND C C*

3.5.5.1.1 *E position estimate*. The estimated position of a GEO at any time *t* is:

$$\begin{bmatrix} X_G \\ Y_G \\ {}_G \end{bmatrix} = \begin{bmatrix} X_G \\ Y_G \\ {}_G \end{bmatrix} + \begin{bmatrix} \dot{X}_G \\ \dot{Y}_G \\ \dot{}_G \end{bmatrix}(t - t_{0,GEO}) + \frac{1}{2}\begin{bmatrix} \ddot{X}_G \\ \ddot{Y}_G \\ \ddot{}_G \end{bmatrix}(t - t_{0,GEO})^2$$

3.5.5.1.2 *E cloc correction*. The clock correction for a SBAS GEO satellite *i* is applied in accordance with the following equation:

$$t \quad t_G \quad \Delta t_G$$

where

t	SBAS network time;
t_G	GEO code phase time at transmission of message; and
Δt_G	GEO code phase offset.

3.5.5.1.2.1 GEO code phase offset (Δt_G) at any time *t* is:

$$\Delta t_G \quad a_{f0} \quad a_{f1}\,(t \quad t_{0,GEO})$$

where ($t \quad t_{0,GEO}$) is corrected for end-of-day crossover.

3.5.5.2 *N TERM C RRECTI NS*

3.5.5.2.1 *PS cloc correction*. The clock correction for a GPS satellite *i* is applied in accordance with the following equation:

$$t \quad t_{SV,i} \quad (\Delta t_{SV,i})_{L1} \quad \delta\Delta t_{SV,i}$$

where

t	SBAS network time;
$t_{SV,i}$	the GPS satellite time at transmission of message;
$(\Delta t_{SV,i})_{L1}$	the satellite PRN code phase offset as defined in 3.1.2.2; and
$\delta\Delta t_{SV,i}$	the code phase offset correction.

3.5.5.2.1.1 The clock time error estimate ($\delta\Delta t_{SV,i}$) for a GPS or SBAS satellite *i* at any time of day *t* is:

$$\delta\Delta t_{SV,i} \quad \delta a_{i,f0} \quad \delta a_{i,f1}\,(t_k \quad t_{i,LT})$$

3.5.5.2.2 *NASS cloc correction*. The clock correction for a GLONASS satellite *i* is applied in accordance with the following equation:

$$t \quad t_{SV,i} \quad \tau_n(t_b) \quad \gamma_n(t_b)(t_{SV,i} \quad t_b) \quad \delta\Delta t_{SV,i}$$

where

t	SBAS network
$t_{SV,i}$	the GLONASS satellite time at transmission of message
$t_{b,}\ \tau_n(t_b),\ \gamma_n(t_b)$	the GLONASS time parameters as defined in 3.2.2.2
$\delta\Delta t_{SV,i}$	the code phase offset correction

The code phase offset correction $\delta\Delta t_{SV,i}$ for a GLONASS satellite *i* is:

$$\delta\Delta t_{SV,i} \quad \delta a_{i,f0} \quad \delta a_{i,f1}(t \quad t_{i,LT}) \quad \delta a_{i,GLONASS}$$

where ($t \quad t_{i,LT}$) is corrected for end-of-day crossover. If the velocity code 0, then $\delta a_{i,f1}$ 0.

3.5.5.2.3 *Satellite position correction*. The SBAS-corrected vector for a core satellite constellation(s) or SBAS satellite *i* at time *t* is:

$$\begin{bmatrix} x_i \\ y_i \\ z_i \end{bmatrix}_{corrected} = \begin{bmatrix} x_i \\ y_i \\ z_i \end{bmatrix} + \begin{bmatrix} \delta x_i \\ \delta y_i \\ \delta z_i \end{bmatrix} + \begin{bmatrix} \delta \dot{x}_i \\ \delta \dot{y}_i \\ \delta \dot{z}_i \end{bmatrix} (t - t_{i,LT})$$

where

$(t \quad t_{i,LT})$ is corrected for end-of-day crossover; and
$x_i \; y_i \; z_i \; ^T$ the core satellite constellation(s) or SBAS satellite position vector as defined in 3.1.2.3, 3.2.2.3 and 3.5.5.1.1.

If the velocity code 0, then $\left[\delta \dot{x}_i \; \delta \dot{y}_i \; \delta \dot{z}_i\right]^T = \left[0 \;\; 0 \;\; 0\right]^T$.

3.5.5.3 *Pseudo range corrections*. The corrected pseudo-range at time *t* for satellite *i* is:

$$PR_{i,corrected} \quad PR_i \quad FC_i \quad RRC_i\,(t \quad t_{i,0f}) \quad IC_i \quad TC_i$$

where

PR_i	the measured pseudo-range after application of the satellite clock correction;
FC_i	the fast correction;
RRC_i	the range rate correction;
IC_i	the ionospheric correction;
TC_i	the tropospheric correction (negative value representing the troposphere delay); and
$t_{i,0f}$	the time of applicability of the most recent fast corrections, which is the start of the epoch of the SNT second that is coincident with the transmission at the SBAS satellite of the first symbol of the message block.

3.5.5.4 *Range rate corrections (RRC)*. The range rate correction for satellite *i* is:

$$RRC_i = \frac{FC_{i,current} - FC_{i,previous}}{t_{i,0f} - t_{i,0f\_previous}}$$

where

$FC_{i,current}$	the most recent fast correction;
$FC_{i,previous}$	a previous fast correction;
$t_{i,0f}$	the time of applicability of $FC_{i,current}$; and
$t_{i,0f\_previous}$	the time of applicability of $FC_{i,previous}$.

3.5.5.5 *R ADCAST I N SP ERIC C RRECTI NS*

3.5.5.5.1 *ocation of ionospheric pierce point (IPP)*. The location of an IPP is defined to be the intersection of the line segment from the receiver to the satellite and an ellipsoid with constant height of 350 km above the WGS-84 ellipsoid. This location is defined in WGS-84 latitude (ϕ_{pp}) and longitude (λ_{pp}).

3.5.5.5.2 *Ionospheric corrections*. The ionospheric correction for satellite *i* is:

$$IC_i \qquad F_{pp}\,\tau_{vpp}$$

where

F_{pp} obliquity factor $\left[1-\left(\frac{R_e \cos\theta_i}{R_e + h_1}\right)^2\right]^{-\frac{1}{2}}$;

τ_{vpp} interpolated vertical ionospheric delay estimate (3.5.5.5.3);
R_e 6 378.1363 km;
θ_i elevation angle of satellite *i*; and
h_I 350 km.

Note For NASS satellites the ionospheric correction (IC_i) is to be multiplied by the s uare of the ratio of the NASS to the PS fre uencies (f_{NASS} f_{PS})

3.5.5.5.3 *Interpolated vertical ionospheric delay estimate* When four points are used for interpolation, the interpolated vertical ionospheric delay estimate at latitude ϕ_{pp} and longitude λ_{pp} is:

$$\tau_{vpp} = \sum_{k=1}^{4} W_k \tau_{vk}$$

where

τ_{vk}: the broadcast grid point vertical delay values at the kth corner of the IGP grid, as shown in Figure B-13.

W_1 x_{pp} $y_{pp;}$
W_2 (1 x_{pp}) $y_{pp;}$
W_3 (1 x_{pp}) (1 y_{pp}); and
W_4 x_{pp} (1 y_{pp}).

3.5.5.5.3.1 For IPPs between N85 and S85 :

$$x_{pp} = \frac{\lambda_{pp} - \lambda_1}{\lambda_2 - \lambda_1}$$

$$y_{pp} = \frac{\phi_{pp} - \phi_1}{\phi_2 - \phi_1}$$

where

λ_1 longitude of IGPs west of IPP;
λ_2 longitude of IGPs east of IPP;
ϕ_1 latitude of IGPs south of IPP; and
ϕ_2 latitude of IGPs north of IPP.

Note If λ and λ cross degrees of longitude the calculation of x_{pp} must account for the discontinuity in longitude values

3.5.5.5.3.2 For IPPs north of N85 or south of S85 :

$$y_{pp} = \frac{|\phi_{pp} - \phi_1|}{10°}$$

$$x_{pp} = \frac{\lambda_{pp} - \lambda_3}{90°} \times (1 - 2\,y_{pp}) + y_{pp}$$

where

λ_1 longitude of the second IGP to the east of the IPP;
λ_2 longitude of the second IGP to the west of the IPP;
λ_3 longitude of the closest IGP to the west of the IPP; and
λ_4 longitude of the closest IGP to the east of the IPP.

When three points are used for interpolation, the interpolated vertical ionospheric delay estimated is:

3.5.5.5.3.3 For points between S75 and N75 :

$$\tau_{vpp} = \sum_{k=1}^{3} W_k \tau_{vk}$$

where

W_1 y_{pp};
W_2 1 x_{pp} y_{pp}; and
W_3 x_{pp}.

3.5.5.5.3.4 x_{pp} and y_{pp} are calculated as for four-point interpolation, except that λ_1 and ϕ_1 are always the longitude and latitude of IGP2, and λ_2 and ϕ_2 are the other longitude and latitude. IGP2 is always the vertex opposite the hypotenuse of the triangle defined by the three points, IGP1 has the same longitude as IGP2, and IGP3 has the same latitude as IGP2 (an example is shown in Figure B-14).

3.5.5.5.3.5 For points north of N75 and south of S75 , three-point interpolation is not supported.

3.5.5.5.4 *Selection of ionospheric grid points (I Ps)* The protocol for the selection of IGPs is:

a) For an IPP between N60 and S60 :

1) if four IGPs that define a 5-degree-by-5-degree cell around the IPP are set to “1” in the IGP mask, they are selected; else,

2) if any three IGPs that define a 5-degree-by-5-degree triangle that circumscribes the IPP are set to “1” in the IGP mask, they are selected; else,

3) if any four IGPs that define a 10-degree-by-10-degree cell around the IPP are set to “1” in the IGP mask, they are selected; else,

4) if any three IGPs that define a 10-degree-by-10-degree triangle that circumscribes the IPP are set to “1” in the IGP mask, they are selected; else,

5) an ionospheric correction is not available.

b) For an IPP between N60 and N75 or between S60 and S75 :

1) if four IGPs that define a 5-degree-latitude-by-10-degree longitude cell around the IPP are set to “1” in the IGP mask, they are selected; else,

2) if any three IGPs that define a 5-degree-latitude-by-10-degree longitude triangle that circumscribes the IPP are set to “1” in the IGP mask, they are selected; else,

3) if any four IGPs that define a 10-degree-by-10-degree cell around the IPP are set to "1" in the IGP mask, they are selected; else,

4) if any three IGPs that define a 10-degree-by-10-degree triangle that circumscribes the IPP are set to "1" in the IGP mask, they are selected; else,

5) an ionospheric correction is not available.

c) For an IPP between N75 and N85 or between S75 and S85 :

1) if the two nearest IGPs at 75 and the two nearest IGPs at 85 (separated by 30 longitude if Band 9 or 10 is used, separated by 90 otherwise) are set to "1" in the IGP mask, a 10-degree-by-10-degree cell is created by linearly interpolating between the IGPs at 85 to obtain virtual IGPs at longitudes equal to the longitudes of the IGPs at 75 ; else,

2) an ionospheric correction is not available.

d) For an IPP north of N85 :

1) if the four IGPs at N85 latitude and longitudes of W180 , W90 , 0 and E90 are set to "1" in the IGP mask, they are selected; else,

2) an ionospheric correction is not available.

e) For an IPP south of S85 :

1) if the four IGPs at S85 latitude and longitudes of W140 , W50 , E40 and E130 are set to "1" in the IGP mask, they are selected; else,

2) an ionospheric correction is not available.

Note This selection is based only on the information provided in the mas without regard to whether the selected I Ps are monitored Not Monitored or Do Not Use If any of the selected I Ps is identified as Do Not Use an ionospheric correction is not available If four I Ps are selected and one of the four is identified as Not Monitored then three point interpolation is used if the IPP is within the triangular region covered by the three corrections that are provided

3.5.5.6 *Protection levels*. The horizontal protection level (HPL) and the vertical protection level (VPL) are:

$$HPL_{SBAS} = \begin{cases} K_{H,NPA} \times d_{major} & \text{for en-route through non-precision approach (NPA) modes} \\ K_{H,PA} \times d_{major} & \text{for precision approach (PA) and approach with vertical guidance (APV) modes} \end{cases}$$

$$VPL_{SBAS} \quad K_{V,PA} \quad d_V$$

where

$d_V^2 = \sum_{i=1}^{N} s_{v,i}^2 \sigma_i^2$ variance of model distribution that overbounds the true error distribution in the vertical axis;

$$d_{major} = \sqrt{\frac{d_x^2 + d_y^2}{2} + \sqrt{\left(\frac{d_x^2 - d_y^2}{2}\right)^2 + d_{xy}^2}};$$

where

$d_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma_i^2$ variance of model distribution that overbounds the true error distribution in the x axis;

$d_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma_i^2$ variance of model distribution that overbounds the true error distribution in the y axis;

$d_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,i} \sigma_i^2$ covariance of model distribution in the x and y axis;

where

$s_{x,i}$ the partial derivative of position error in the x-direction with respect to pseudo-range error on the i^{th} satellite;

$s_{y,i}$ the partial derivative of position error in the y-direction with respect to pseudo-range error on the i^{th} satellite;

$s_{V,i}$ the partial derivative of position error in the vertical direction with respect to pseudo-range error on the i^{th} satellite; and

σ^2_i $\sigma^2_{i,flt}$ $\sigma^2_{i,UIRE}$ $\sigma^2_{i,air}$ $\sigma^2_{i,tropo}$.

The variances ($\sigma^2_{i,flt}$ and $\sigma^2_{i,UIRE}$) are defined in 3.5.5.6.2 and 3.5.5.6.3.1. The parameters ($\sigma^2_{i,air}$ and $\sigma^2_{i,tropo}$) are determined by the aircraft element (3.5.8.4.2 and 3.5.8.4.3).

The x and y axes are defined to be in the local horizontal plane, and the v axis represents local vertical.

For a general least-squares position solution, the projection matrix S is:

$$S \equiv \begin{bmatrix} S_{x,1} & S_{x,2} & \dots & S_{x,N} \\ S_{y,1} & S_{y,2} & \dots & S_{y,N} \\ S_{v,1} & S_{v,2} & \dots & S_{v,N} \\ S_{t,1} & S_{t,2} & \dots & S_{t,N} \end{bmatrix} = (G^T \times W \times G)^{-1} \times G^T \times W$$

where

G_i $\cos El_i \cos Az_i$ $\cos El_i \sin Az_i$ $\sin El_i$ 1 i^{th} row of G;

$$W^{-1} = \begin{bmatrix} w_1 & 0 & \dots & 0 \\ 0 & w_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & & \dots & w_i \end{bmatrix};$$

El_i the elevation angle of the i^{th} ranging source (in degrees);
Az_i the azimuth of the i^{th} ranging source taken counter-clockwise from the x axis in degrees; and
w_i the inverse weight associated with satellite *i*.

Note To improve readability the subscript i *was omitted from the protection matrix s e uation*

Note For an unweighted least s uares solution the weighting matrix is an identity matrix (w_i)

3.5.5.6.1 *Definition of values* The K values are:

$$K_{H,NPA} \quad 6.18;$$

$$K_{H,PA} \quad 6.0; \text{ and}$$

$$K_{V,PA} \quad 5.33.$$

3.5.5.6.2 *Definition of fast and long term correction error model*. If fast corrections and long-term correction/GEO ranging parameters are applied, and degradation parameters are applied:

$$\sigma^2_{i,flt} = \begin{cases} (\sigma_{i,UDRE})\,(\delta_{UDRE}) \quad \varepsilon_{fc} \quad \varepsilon_{rrc} \quad \varepsilon_{ltc} \quad \varepsilon_{er} \;^2, & \text{if } RSS_{UDRE} \quad 0 \text{ (Message Type 10)} \\ (\sigma_{i,UDRE})\,(\delta_{UDRE})\;^2 \quad \varepsilon^2_{fc} \quad \varepsilon^2_{rrc} \quad \varepsilon^2_{ltc} \quad \varepsilon^2_{er}, & \text{if } RSS_{UDRE} \quad 1 \text{ (Message Type 10)} \end{cases}$$

where

if using message Type 27, δ_{UDRE} is a region-specific term as defined in section 3.5.4.9,
if using message Type 28, δ_{UDRE} is a satellite-specific term as defined in section 3.5.5.6.2.5,
if using neither message, δ_{UDRE} 1.

If fast corrections and long-term corrections/GEO ranging parameters are not applied, and degradation parameters are not applied:

$$\sigma^2_{i,flt} \quad (\sigma_{i,UDRE})\,(\delta_{UDRE}) \quad 8m\;^2$$

If fast corrections or long-term corrections/GEO ranging parameters are not applied to a satellite, or if an ephemeris covariance Type 28 message has not been received for the satellite but an active Type 28 message has been received for a different satellite:

$$\sigma^2_{i,flt} \quad (60)^2 m^2$$

3.5.5.6.2.1 *Fast correction degradation* The degradation parameter for fast correction data is:

$$\varepsilon_{fc} = \frac{a(t - t_u + t_{lat})^2}{2}$$

where

t the current time;
t_u ($UDREI_i$ reference time): if $IODF_j \neq 3$, the start time of the SNT 1-second epoch that is coincident with the start of the transmission of the message block that contains the most recent $UDREI_i$ data (Type 2 to 6, or Type 24 messages) that matches the $IODF_j$ of the fast correction being used. If $IODF_j$ 3, the start time of the epoch of the SNT 1-second epoch that is coincident with the start of transmission of the message that contains the fast correction for the i^{th} satellite; and
t_{lat} (as defined in 3.5.4.7).

Note For UDREs broadcast in Type to and Type messages t_u e uals the time of applicability of the fast corrections since they are in the same message For UDREs broadcast in Type message and if the I DF t_u also e uals the time of applicability of the fast corrections ($t_{\,f}$) For UDREs broadcast in Type message and I DF ≠ t_u is defined to be the time of transmission of the first bit of Type message at the E

3.5.5.6.2.2 *Range rate correction degradation*

3.5.5.6.2.2.1 If the RRC 0, then ε_{rrc} 0.

3.5.5.6.2.2.2 If the RRC ≠ 0 and IODF ≠ 3, the degradation parameter for fast correction data is:

$$\varepsilon_{rrc} = \begin{cases} 0, & \text{if } (\mathrm{IODF}_{current} - \mathrm{IODF}_{previous})\mathrm{MOD3} \quad 1 \\ \left(\dfrac{aI_{fc}}{4} + \dfrac{B_{rrc}}{\Delta t}\right)(t - t_{0f}), & \text{if } (\mathrm{IODF}_{current} - \mathrm{IODF}_{previous})\mathrm{MOD3} \neq 1 \end{cases}$$

3.5.5.6.2.2.3 If RRC ≠ 0 and IODF 3, the degradation parameter for range rate data is:

$$\varepsilon_{rrc} = \begin{cases} 0, & \text{if } \left|\Delta t - \dfrac{I_{fc}}{2}\right| = 0 \\ \left(\dfrac{a\left|\Delta t - \dfrac{I_{fc}}{2}\right|}{2} + \dfrac{B_{rrc}}{\Delta t}\right)(t - t_{0f}), & \text{if } \left|\Delta t - \dfrac{I_{fc}}{2}\right| \neq 0 \end{cases}$$

where

t	the current time;
$\mathrm{IODF}_{current}$	IODF associated with most recent fast correction;
$\mathrm{IODF}_{previous}$	IODF associated with previous fast correction;
Δt	$t_{i,0f}$ $t_{i,0f\_previous}$; and
I_{fc}	the user time-out interval for fast corrections.

3.5.5.6.2.3 *ong term correction degradation*

3.5.5.6.2.3.1 *Core satellite constellation(s)*

3.5.5.6.2.3.1.1 For velocity code 1, the degradation parameter for long-term corrections of satellite *i* is:

$$\varepsilon_{ltc} \quad C_{ltc\_lsb} \quad C_{ltc\_v1} \max(0, t_{i,LT} \quad t, t \quad t_{i,LT} \quad I_{ltc\_v1})$$

3.5.5.6.2.3.1.2 For velocity code 0, the degradation parameter for long-term corrections is:

$$\varepsilon_{ltc} = C_{ltc\_v0}\left[\frac{t - t_{ltc}}{I_{lt-v0}}\right]$$

where

t	the current time;
t_{ltc}	the time of transmission of the first bit of the long-term correction message at the GEO; and
x	the greatest integer less than *x*.

3.5.5.6.2.3.2 *E satellites* The degradation parameter for long-term corrections is:

$$\varepsilon_{ltc} \quad C_{geo\_lsb} \quad C_{geo\_v} \max(0, t_{0,GEO} \quad t, t \quad t_{0,GEO} \quad I_{geo})$$

where t the current time.

3.5.5.6.2.4 *Degradation for en route through non precision approach*

$$\varepsilon_{er} = \begin{cases} 0, & \text{if neither fast nor long-term corrections have timed out for precision approach} \\ C_{er,} & \text{if fast or long-term corrections have timed out for precision approach} \end{cases}$$

3.5.5.6.2.5 *UDRE degradation factor calculated with message Type data*. The δUDRE is:

$$\delta_{UDRE} = \sqrt{I^T \cdot C \cdot I} + \varepsilon_c$$

where

I $\begin{bmatrix} i_x \\ i_y \\ i_z \\ 1 \end{bmatrix}$,

$\begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix}$ the unit vector from the user to the satellite in the WGS-84 ECEF coordinate frame

C $R^T \quad R$

ε_C $C_{covariance} \quad SF$

SF $2^{\text{scale exponent} \quad 5}$

R E SF

E $\begin{bmatrix} E_{1,1} & E_{1,2} & E_{1,3} & E_{1,4} \\ 0 & E_{2,2} & E_{2,3} & E_{2,4} \\ 0 & 0 & E_{3,3} & E_{3,4} \\ 0 & 0 & 0 & E_{4,4} \end{bmatrix}$

3.5.5.6.3 *Definition of ionospheric correction error model*

3.5.5.6.3.1 *roadcast ionospheric corrections* If SBAS-based ionospheric corrections are applied, σ^2_{UIRE} is:

$$\sigma^2_{UIRE} \quad F^2_{pp} \quad \sigma^2_{UIVE}$$

where

F_{pp} (as defined in 3.5.5.5.2);

$$\sigma^2_{UIVE} = \sum_{n=1}^{4} W_n \cdot \sigma^2_{n,ionogrid} \text{ or } \sigma^2_{UIVE} = \sum_{n=1}^{3} W_n \cdot \sigma^2_{n,ionogrid}$$

using the same ionospheric pierce point weights (W_n) and grid points selected for the ionospheric correction (3.5.5.5). For each grid point:

$$\sigma^2_{i,ionogrid} = \begin{cases} (\sigma_{GIVE} \quad \varepsilon_{iono})^2, & \text{if } RSS_{iono} \quad 0 \text{ (Type 10 message)} \\ \sigma^2_{GIVE} \quad \varepsilon^2_{iono}, & \text{if } RSS_{iono} \quad 1 \text{ (Type 10 message)} \end{cases}$$

where

$\varepsilon_{iono} \quad C_{iono\_step} \left\lfloor \frac{t - t_{iono}}{I_{iono}} \right\rfloor \quad C_{iono\_ramp}(t \quad t_{iono})$;

t the current time;

t_{iono} the time of transmission of the first bit of the ionospheric correction message at the GEO; and

x the greatest integer less than x.

Note For NASS satellites both σ I E and σI N parameters are to be multiplied by the s uare of the ratio of the NASS to the PS fre uencies (f NASS f PS)

3.5.5.6.3.2 *Ionospheric corrections* If SBAS-based ionospheric corrections are not applied, σ^2_{UIRE} is:

$$\sigma^2_{UIRE} = \text{MAX}\left\{\left(\frac{T_{iono}}{5}\right)^2, (F_{pp} \cdot \tau_{vert})^2\right\}$$

where

T_{iono} the ionospheric delay estimated by the chosen model (GPS correction or other model);

F_{pp} (as defined in 3.5.5.5.2);

$$\tau_{vert} \quad \begin{cases} 9 \text{ m}, & 0 \le |\phi_{pp}| \le 20 \\ 4.5 \text{ m}, & 20 < |\phi_{pp}| \le 55; \text{ and} \\ 6 \text{ m}, & 55 < |\phi_{pp}| \end{cases}$$

ϕ_{pp} latitude of the ionospheric pierce point.

3.5.5.6.3.3 *NASS cloc* The degradation parameter for GLONASS clock correction is:

$$\varepsilon_{GLONASS\ CLOCK} \quad C_{GLONASS\ CLOCK} \quad t - t_{GLONASS\ CLOCK}$$

where

t the current time

$t_{GLONASS\_CLOCK}$ the time of transmission of the first bit of the timing message (MT12) at the GEO

sc the greatest integer less than sc.

Note For non NASS satellites ε NASS C C

Note C NASS C C cm s

3.5.6 MESSAGE TABLES

Each SBAS message shall be coded in accordance with the corresponding message format defined in Tables B-37 through B-53. All signed parameters in these tables shall be represented in two s complement, with the sign bit occupying the MSB.

Note The range for the signed parameters is smaller than indicated as the maximum positive value is constrained to be one value less (the indicated value minus the resolution)

able 3 ype 0 Do ot se message

Data content	Bits used	Range of values	Resolution
Spare	212	—	—

able 3 ype 1 R mask message

Data content	Bits used	Range of values	Resolution
For each of 210 PRN code numbers			
Mask value	1	0 or 1	1
IODP	2	0 to 3	1

Note All parameters are defined in

able 3 ypes 2 to fast correction message

Data content	Bits used	Range of values	Resolution
$IODF_j$	2	0 to 3	1
IODP	2	0 to 3	1
For 13 slots			
Fast correction (FC_i)	12	256.000 m	0.125 m
For 13 slots			
$UDREI_i$	4	(see Table B-29)	(see Table B-29)

Notes
The parameters I DF$_j$ and FC$_i$ are defined in
The parameter I DP is defined in
The parameter UDREI$_i$ is defined in .

able 0 ype 6 integrity message

Data content	Bits used	Range of values	Resolution
$IODF_2$	2	0 to 3	1
$IODF_3$	2	0 to 3	1
$IODF_4$	2	0 to 3	1
$IODF_5$	2	0 to 3	1
For 51 satellites (ordered by PRN mask number)			
$UDREI_i$	4	(see Table B-29)	(see Table B-29)

Notes
The parameters I DF$_j$ are defined in
The parameter UDREI$_i$ is defined in

able 1 ype fast correction degradation factor message

Data content	Bits used	Range of values	Resolution
System latency (t_{lat})	4	0 to 15 s	1 s
IODP	2	0 to 3	1
Spare	2	—	—
For 51 satellites (ordered by PRN mask number)			
Degradation factor indicator (ai_i)	4	(see Table B-34)	(see Table B-34)

Notes
The parameters t_{lat} and ai_i are defined in
The parameter I DP is defined in

able 2 ype ranging function message

Data content	Bits used	Range of values	Resolution
Spare	8	—	—
$t_{0,GEO}$	13	0 to 86 384 s	16 s
URA	4	(see Table B-26)	(see Table B-26)
X_G	30	42 949 673 m	0.08 m
Y_G	30	42 949 673 m	0.08 m
$_G$	25	6 710 886.4 m	0.4 m
$\dot{X}_G$	17	40.96 m/s	0.000625 m/s
$\dot{Y}_G$	17	40.96 m/s	0.000625 m/s
$\dot{}_G$	18	524.288 m/s	0.004 m/s
$\ddot{X}_G$	10	0.0064 m/s^2	0.0000125 m/s^2
$\ddot{Y}_G$	10	0.0064 m/s^2	0.0000125 m/s^2
$\ddot{}_G$	10	0.032 m/s^2	0.0000625 m/s^2
a_{Gf0}	12	0.9537 10 ^{6} s	2 ^{31} s
a_{Gf1}	8	1.1642 10 ^{10} s/s	2 ^{40} s/s

Note All parameters are defined in

able 3 ype 10 degradation parameter message

Data content	Bits used	Range of values	Resolution
B_{rrc}	10	0 to 2.046 m	0.002 m
C_{ltc_lsb}	10	0 to 2.046 m	0.002 m
C_{ltc_v1}	10	0 to 0.05115 m/s	0.00005 m/s
I_{ltc_v1}	9	0 to 511 s	1 s
C_{ltc_v0}	10	0 to 2.046 m	0.002 m
I_{ltc_v0}	9	0 to 511 s	1 s
C_{geo_lsb}	10	0 to 0.5115 m	0.0005 m
C_{geo_v}	10	0 to 0.05115 m/s	0.00005 m/s
I_{geo}	9	0 to 511 s	1 s
C_{er}	6	0 to 31.5 m	0.5 m
C_{iono_step}	10	0 to 1.023 m	0.001 m
I_{iono}	9	0 to 511 s	1 s
$C_{iono\ ramp}$	10	0 to 0.005115 m/s	0.000005 m/s
RSS_{UDRE}	1	0 or 1	1
RSS_{iono}	1	0 or 1	1
$C_{covariance}$	7	0 to 12.7	0.1
Spare	81	—	—

Note All parameters are defined in

able ype 12 S AS net ork time/ C message

Data content	Bits used	Range of values	Resolution
A_{1SNT}	24	$7.45 \quad 10^{9}$ s/s	2^{50} s/s
A_{0SNT}	32	1 s	2^{30} s
t_{0t}	8	0 to 602 112 s	4 096 s
WN_t	8	0 to 255 weeks	1 week
Δt_{LS}	8	128 s	1 s
WN_{LSF}	8	0 to 255 weeks	1 week
DN	8	1 to 7 days	1 day
Δt_{LSF}	8	128 s	1 s
UTC standard identifier	3	(see Table B-35)	(see Table B-35)
GPS time-of-week (TOW)	20	0 to 604 799 s	1 s
GPS week number (WN)	10	0 to 1 023 weeks	1 week
GLONASS indicator	1	0 or 1	1
$\delta a_{i,\ GLONASS}$ (Note 2)	24	$2.0 \cdot 10^{8}$ s	$2.0 \cdot 10^{31}$ s
Spare	50	—	—

Notes
All parameters are defined in
Applies only if S AS sends NASS timing information in message Type (see Timing data).

able ype 1 EO almanac message

Data content	Bits used	Range of values	Resolution
For each of 3 satellites			
Spare	2	—	—
PRN code number	8	0 to 210	1
Health and status	8	—	—
$X_{G,A}$	15	42 598 400 m	2 600 m
$Y_{G,A}$	15	42 598 400 m	2 600 m
$_{G,A}$	9	6 656 000 m	26 000 m
$\dot{X}_{G,A}$	3	40 m/s	10 m/s
$\dot{Y}_{G,A}$	3	40 m/s	10 m/s
$\dot{}_{G,A}$	4	480 m/s	60 m/s
$t_{almanac}$ (applies to all three satellites)	11	0 to 86 336 s	64 s

Note All parameters are defined in

able 6 ype 1 mask message

Data content	Bits used	Range of values	Resolution
Number of IGP bands	4	0 to 11	1
IGP band identifier	4	0 to 10	1
Issue of data — ionosphere ($IODI_k$)	2	0 to 3	1
For 201 IGPs			
IGP mask value	1	0 or 1	1
Spare	1	—	—

Note All parameters are defined in

able ype 2 mixed fast/long term satellite error correction message

Data content	Bits used	Range of values	Resolution
For 6 slots			
Fast correction (FC_i)	12	256.000 m	0.125 m
For 6 slots			
$UDREI_i$	4	(see Table B-31)	(see Table B-31)
IODP	2	0 to 3	1
Fast correction type identifier	2	0 to 3	1
$IODF_j$	2	0 to 3	1
Spare	4	—	—
Type 25 half-message	106	—	—

Notes

The parameters fast correction type identifier I DF$_j$ and FC$_i$ are defined in

The parameter I DP is defined in

The parameter UDREI$_i$ is defined in

The long term satellite error correction message is divided into two half messages The half message for a velocity code is defined in Table The half message for a velocity code is defined in Table

able ype 2 long term satellite error correction alf message
E OC CODE 0

Data content	Bits used	Range of values	Resolution
Velocity Code 0	1	0	1
For 2 Satellites			
PRN mask number	6	0 to 51	1
Issue of data (IOD_i)	8	0 to 255	1
δx_i	9	32 m	0.125 m
δy_i	9	32 m	0.125 m
δz_i	9	32 m	0.125 m
$\delta a_{i,f0}$	10	2^{22} s	2^{31} s
IODP	2	0 to 3	1
Spare	1	—	—

Notes

The parameters PRN mas number and I DP are defined in

All other parameters are defined in

able ype 2 long term satellite error correction alf message
E OC CODE 1

Data content	Bits used	Range of values	Resolution
For 1 Satellite			
Velocity Code 1	1	1	1
PRN mask number	6	0 to 51	1
Issue of data (IOD_i)	8	0 to 255	1
δx_i	11	128 m	0.125 m
δy_i	11	128 m	0.125 m
δz_i	11	128 m	0.125 m
$\delta a_{i,f0}$	11	2^{21} s	2^{31} s
$\delta \dot{x}_i$	8	0.0625 m/s	2^{11} m/s
$\delta \dot{y}_i$	8	0.0625 m/s	2^{11} m/s
$\delta \dot{z}_i$	8	0.0625 m/s	2^{11} m/s
$\delta a_{i,f1}$	8	2^{32} s/s	2^{39} s/s
Time-of-applicability ($t_{i,LT}$)	13	0 to 86 384 s	16 s
IODP	2	0 to 3	1

Notes

The parameters PRN mas number and I DP are defined in

All other parameters are defined in

able 0 ype 26 ionosp eric delay message

Data content	Bits used	Range of values	Resolution
IGP band identifier	4	0 to 10	1
IGP block identifier	4	0 to 13	1
For each of 15 grid points			
IGP vertical delay estimate	9	0 to 63.875 m	0.125 m
Grid ionospheric vertical error indicator ($GIVEI_i$)	4	(see Table B-33)	(see Table B-33)
$IODI_k$	2	0 to 3	1
Spare	7	—	—

Note All parameters are defined in

able 1 ype 2 S AS ser ice message

Data content	Bits used	Range of values	Resolution
Issue of data, service (IODS)	3	0 to 7	1
Number of service messages	3	1 to 8	1
Service message number	3	1 to 8	1
Number of regions	3	0 to 5	1
Priority code	2	0 to 3	1
δUDRE indicator-inside	4	0 to 15	1
δUDRE indicator-outside	4	0 to 15	1
For each of 5 regions			
Coordinate 1 latitude	8	90	1
Coordinate 1 longitude	9	180	1
Coordinate 2 latitude	8	90	1
Coordinate 2 longitude	9	180	1
Region shape	1	—	—
Spare	15	—	—

Note All parameters are defined in

able 2 ype 63 null message

Data content	Bits used	Range of values	Resolution
Spare	212	—	—

able 3 ype 2 clock ep emeris co ariance matrix

Data content	Bits used	Range of values	Resolution
IODP	2	0 to 3	1
For two satellites			
PRN mask number	6	0 to 51	1
Scale exponent	3	0 to 7	1
$E_{1,1}$	9	0 to 511	1
$E_{2,2}$	9	0 to 511	1
$E_{3,3}$	9	0 to 511	1
$E_{4,4}$	9	0 to 511	1
$E_{1,2}$	10	512	1
$E_{1,3}$	10	512	1
$E_{1,4}$	10	512	1
$E_{2,3}$	10	512	1
$E_{2,4}$	10	512	1
$E_{3,4}$	10	512	1

Notes
The parameters PRN mas number and I DP are defined in
All other parameters are defined in

3.5.7 NON-AIRCRAFT ELEMENTS

Note Depending on the level of service offered by a particular S AS different functions can be implemented as described in Chapter

Note The parameters that are referred to in this section are defined in

3.5.7.1 *ENERA*

3.5.7.1.1 *Re uired data and broadcast intervals*. SBAS shall broadcast the data required for the supported functions as shown in Table B-54. If the SBAS broadcasts data that are not required for a particular function, the requirements for that data supporting other functions shall apply. The maximum interval between broadcasts for all data of each data type provided shall be as defined in Table B-54.

3.5.7.1.2 *S AS radio fre uency monitoring* The SBAS shall monitor the SBAS satellite parameters shown in Table B-55 and take the indicated action.

Note S AS may broadcast null messages (Type messages) in each time slot for which no other data are broadcast

3.5.7.1.3 *Do Not Use* SBAS shall broadcast a “Do Not Use” message (Type 0 message) when necessary to inform users not to use the SBAS satellite ranging function and its broadcast data.

3.5.7.1.4 *Almanac data*. SBAS shall broadcast almanac data for SBAS satellites (defined in 3.5.4.3) with error less than 150 km (81 NM) of the true satellite position. Unused almanac slots in Type 17 messages shall be coded with a PRN code number of “0”. The health and status shall indicate satellite status and the service provider as defined in 3.5.4.3.

3.5.7.1.5 **Recommendation** *S AS should broadcast almanac data for all S AS satellites regardless of the service provider*

3.5.7.2 *Ranging function*. If an SBAS provides a ranging function, it shall comply with the requirements contained in this section in addition to the requirements of 3.5.7.1.

3.5.7.2.1 *Performance re uirements*

Note See Chapter

3.5.7.2.2 *Ranging function data*. SBAS shall broadcast ranging function data such that the SBAS satellite position error projected on the line-of-sight to any user in the satellite footprint is less than 256 metres. Each SBAS satellite shall broadcast a URA representing an estimate of the standard deviation of the ranging errors referenced to SNT.

3.5.7.3 *NSS satellite status function*. If an SBAS provides a satellite status function, it shall also comply with the requirements contained in this section.

3.5.7.3.1 *Performance of satellite status functions*. Given any valid combination of active data, the probability of a horizontal error exceeding the HPL_{SBAS} (as defined in 3.5.5.6) for longer than 8 consecutive seconds shall be less than 10^{7} in any hour, assuming a user with zero latency.

Note Active data is defined to be data that have not timed out per This re uirement includes core satellite constellation(s) and S AS failures

3.5.7.3.2 *PRN mas and Issue of data PRN (I DP).* SBAS shall broadcast a PRN mask and IODP (Type 1 message). The PRN mask values shall indicate whether or not data are being provided for each GNSS satellite. The IODP shall change when there is a change in the PRN mask. The change of IODP in Type 1 messages shall occur before the IODP changes in any other message. The IODP in Type 2 to 5, 7, 24 and 25 messages shall equal the IODP broadcast in the PRN mask message (Type 1 message) used to designate the satellites for which data are provided in that message.

able Data broadcast inter als and supported functions

Data type	Maximum broadcast interval	Ranging	GNSS satellite status	Basic differential correction	Precise differential correction	Associated message types
Clock-Ephemeris covariance matrix	120 s					28
SBAS in test mode	6 s					0
PRN mask	120 s		R	R	R	1
UDREI	6 s		R*	R	R	2 to 6, 24
Fast corrections	60 s		R*	R	R	2 to 5, 24
Long-term corrections	120 s		R*	R	R	24, 25
GEO ranging function data	120 s	R				9
Fast correction degradation	120 s		R*	R	R	7
Degradation parameters	120 s				R	10
Ionospheric grid mask	300 s				R	18
Ionospheric corrections, GIVEI	300 s				R	26
Timing data	300 s	R (see Note 3)	R (see Note 3)	R (see Note 3)	R (see Note 3)	12
Almanac data	300 s	R	R	R	R	17
Service level	300 s					27

Notes
R indicates that the data must be broadcast to support the function
R indicates special coding as described in
Type messages are only re uired if data are provided for NASS satellites

able S AS radio fre uency monitoring

Parameter	Reference	Alarm limit	Required action
Signal power level	Chapter 3, 3.7.3.4.4.3	minimum 161 dBW maximum 153 dBW (Note 2)	Minimum: cease ranging function (Note 1). Maximum: cease broadcast.
Modulation	Chapter 3, 3.7.3.4.4.5	monitor for waveform distortion	Cease ranging function (Note 1).
SNT-to-GPS time	Chapter 3, 3.7.3.4.5	N/A (Note 3)	Cease ranging function unless URA reflects error.
Carrier frequency stability	3.5.2.1	N/A (Note 3)	Cease ranging function unless σ^2_{UDRE} and URA reflect error.
Code/frequency coherence	3.5.2.4	N/A (Note 3)	Cease ranging function unless σ^2_{UDRE} and URA reflect error.
Maximum code phase deviation	3.5.2.6	N/A (Notes 2 and 3)	Cease ranging function unless σ^2_{UDRE} and URA reflect error.
Convolutional encoding	3.5.2.9	all transmit messages are erroneous	Cease broadcast.

Notes

Ceasing the ranging function is accomplished by broadcasting a URA and σ_{UDRE} *of Do Not Use for that S AS satellite*

These parameters can be monitored by their impact on the received signal uality (C N impact) since that is the impact on the user

Alarm limits are not specified because the induced error is acceptable provided it is represented in the σ_{UDRE} *and URA parameters If the error cannot be represented the ranging function must cease*

3.5.7.3.2.1 **Recommendation** *hen the PRN mas is changed S AS should repeat the Type message several times before referencing it in other messages to ensure that users receive the new mas*

3.5.7.3.3 *Integrity data*. If SBAS does not provide the basic differential correction function, it shall transmit fast corrections, long-term corrections and fast correction degradation parameters coded to zero for all visible satellites indicated in the PRN mask.

3.5.7.3.3.1 If SBAS does not provide the basic differential correction function, SBAS shall indicate that the satellite is unhealthy (“Do Not Use”) if the pseudo-range error exceeds 150 metres.

3.5.7.3.3.2 If SBAS does not provide the basic differential correction function, SBAS shall indicate that the satellite is “Not Monitored” if the pseudo-range error cannot be determined.

3.5.7.3.3.3 If SBAS does not provide the basic differential correction function, SBAS shall transmit a $UDREI_i$ of 13 if the satellite is not “Do Not Use” or “Not Monitored”.

3.5.7.3.3.4 The $IODF_j$ parameter in Type 2 to 5, 6 or 24 messages shall be equal to 3.

3.5.7.4 *asic differential correction function*. If an SBAS provides a basic differential correction function, it shall comply with the requirements contained in this section in addition to the GNSS satellite status function requirements defined in 3.5.7.3.

3.5.7.4.1 *Performance of basic differential correction function*. Given any valid combination of active data, the probability of a horizontal error exceeding the HPL_{SBAS} (as defined in 3.5.5.6) for longer than 8 consecutive seconds shall be less than 10^{7} in any hour, assuming a user with zero latency.

Note Active data is defined to be data that has not timed out per This re uirement includes core satellite constellation(s) and S AS failures

3.5.7.4.2 *ong term corrections*. Except for SBAS satellites from the same service provider, SBAS shall determine and broadcast long-term corrections for each visible GNSS satellite (see Note) indicated in the PRN mask (PRN mask value equal to "1"). The long-term corrections shall be such that the core satellite constellation(s) satellite position error projected on the line-of-sight to any user in the satellite footprint after application of these long-term corrections is less than 256 metres. For each GLONASS satellite, SBAS shall translate satellite coordinates into WGS-84 as defined in 3.5.5.2 prior to determining the long-term corrections. For each GPS satellite, the broadcast IOD shall match both the GPS IODE and 8 LSBs of IODC associated with the clock and ephemeris data used to compute the corrections (3.1.1.3.1.4 and 3.1.1.3.2.2). Upon transmission of a new ephemeris by a GPS satellite, SBAS shall continue to use the old ephemeris to determine the fast and long-term error corrections for at least 2 minutes and not more than 4 minutes. For each GLONASS satellite, SBAS shall compute and broadcast an IOD that consists of a latency and a validity interval as defined in 3.5.4.4.1.

Note The criteria for satellite visibility include the locations of reference stations and the achieved mas angle at those locations

3.5.7.4.2.1 **Recommendation** *To ensure accurate range rate corrections S AS should minimi e discontinuities in the satellite ephemerides after application of long term corrections*

3.5.7.4.3 *Fast corrections* SBAS shall determine fast corrections for each visible GNSS satellite indicated in the PRN mask (PRN mask value equal to "1"). Unless the IODF 3, each time any fast correction data in Type j (j 2, 3, 4 or 5) message changes, the $IODF_j$ shall sequence "0, 1, 2, 0, ...".

Note If there is an alarm condition the I DF_j *may e ual (see)*

3.5.7.4.4 *Timing data*. If data are provided for GLONASS, SBAS shall broadcast the timing message (Type 12 message) including GLONASS time offset as defined in Table B-44.

3.5.7.4.5 *Integrity data*. For each satellite for which corrections are provided, SBAS shall broadcast integrity data ($UDREI_i$ and, optionally, Type 27 or 28 message data to calculate δUDRE) such that the integrity requirement in 3.5.7.4.1 is met. If the fast corrections or long-term corrections exceed their coding range, SBAS shall indicate that the satellite is unhealthy ("Do Not Use"). If $\sigma^2_{i,UDRE}$ cannot be determined, SBAS shall indicate that the satellite is "Not Monitored".

If Type 6 message is used to broadcast $\sigma^2_{i,UDRE}$, then:

a) the $IODF_j$ shall match the $IODF_j$ for the fast corrections received in Type j message to which the $\sigma^2_{i,UDRE}$ apply; or

b) the $IODF_j$ shall equal 3 if the $\sigma^2_{i,UDRE}$ apply to all valid fast corrections received in Type j message which have not timed out.

3.5.7.4.6 *Degradation data*. SBAS shall broadcast degradation parameters (Type 7 message) to indicate the applicable time out interval for fast corrections and ensure that the integrity requirement in 3.5.7.4.1 is met.

3.5.7.5 *Precise differential correction function*. If SBAS provides a precise differential correction function, it shall comply with the requirements contained in this section in addition to the basic differential correction function requirements in 3.5.7.4.

3.5.7.5.1 *Performance of precise differential correction function*. Given any valid combination of active data, the probability of an out-of-tolerance condition for longer than the relevant time-to-alert shall be less than 2 10 ^{7} during any approach, assuming a user with zero latency. The time-to-alert shall be 5.2 seconds for an SBAS that supports precision approach or APV-II operations, and 8 seconds for an SBAS that supports APV-I operations. An out-of-tolerance condition shall be defined as a horizontal error exceeding the HPL_{SBAS} or a vertical error exceeding the VPL_{SBAS} (as defined in 3.5.5.6). When an out-of-tolerance condition is detected, the resulting alert message (broadcast in a Type 2 to 5 and 6, 24, 26 or 27 messages) shall be repeated three times after the initial notification of the alert condition for a total of four times in 4 seconds.

Note Active data is defined to be data that has not timed out per This re uirement includes core satellite constellation(s) and S AS failures

Note Subse uent messages can be transmitted at the normal update rate

3.5.7.5.2 *Ionospheric grid point (I P) mas* . SBAS shall broadcast an IGP mask and $IODI_k$ (up to 11 Type 18 messages, corresponding to the 11 IGP bands). The IGP mask values shall indicate whether or not data are being provided for each IGP. If IGP Band 9 is used, then the IGP mask values for IGPs north of 55 N in Bands 0 through 8 shall be set to “0”. If IGP Band 10 is used, then the IGP mask values for IGPs south of 55 S in Bands 0 through 8 shall be set to “0”. The $IODI_k$ shall change when there is a change of IGP mask values in the k^{th} band. The new IGP mask shall be broadcast in a Type 18 message before it is referenced in a related Type 26 message. The $IODI_k$ in Type 26 message shall equal the $IODI_k$ broadcast in the IGP mask message (Type 18 message) used to designate the IGPs for which data are provided in that message.

3.5.7.5.2.1 **Recommendation** *hen the I P mas is changed S AS should repeat the Type message several times before referencing it in a Type message to ensure that users receive the new mas The same I DI should be used for all bands*

3.5.7.5.3 *Ionospheric corrections*. SBAS shall broadcast ionospheric corrections for the IGPs designated in the IGP mask (IGP mask values equal to “1”).

3.5.7.5.4 *Ionospheric integrity data*. For each IGP for which corrections are provided, SBAS shall broadcast GIVEI data such that the integrity requirement in 3.5.7.5.1 is met. If the ionospheric correction or $\sigma^2_{i,GIVE}$ exceed their coding range, SBAS shall indicate that the IGP is unhealthy (designated in the correction data). If $\sigma^2_{i,GIVE}$ cannot be determined, SBAS shall indicate that the IGP is “Not Monitored” (designated in the GIVEI coding).

3.5.7.5.5 *Degradation data*. SBAS shall broadcast degradation parameters (Type 10 message) such that the integrity requirement in 3.5.7.5.1 is met.

3.5.7.6 *PTI NA FUNCTI NS*

3.5.7.6.1 *Timing data*. If UTC time parameters are broadcast, they shall be as defined in 3.5.4.8 (Type 12 message).

3.5.7.6.2 *Service indication*. If service indication data are broadcast, they shall be as defined in 3.5.4.9 (Type 27 message) and Type 28 messages shall not be broadcast. The IODS in all Type 27 messages shall increment when there is a change in any Type 27 message data.

3.5.7.6.3 *Cloc ephemeris covariance matrix*. If clock-ephemeris covariance matrix data are broadcast, they shall be broadcast for all monitored satellites as defined in 3.5.4.10 (Type 28 message) and Type 27 messages shall not be broadcast.

3.5.7.7 *M NIT RIN*

3.5.7.7.1 *S AS radio fre uency monitoring* The SBAS shall monitor the SBAS satellite parameters shown in Table B-55 and take the indicated action.

Note In addition to the radio fre uency monitoring re uirements in this section it will be necessary to ma e special provisions to monitor pseudo range acceleration specified in Chapter and carrier phase noise specified in and correlation loss in unless analysis and testing shows that these parameters cannot exceed the stated limits

3.5.7.7.2 *Data monitoring* SBAS shall monitor the satellite signals to detect conditions that will result in improper operation of differential processing for airborne receivers with the tracking performance defined in Attachment D, 8.11.

3.5.7.7.2.1 The ground subsystem shall use the strongest correlation peak in all receivers used to generate the pseudo-range corrections.

3.5.7.7.2.2 The ground subsystem shall also detect conditions that cause more than one zero crossing for airborne receivers that use the Early-Late discriminator function as defined in Attachment D, 8.11.

3.5.7.7.2.3 The monitor action shall be to set UDRE to "Do Not Use" for the satellite.

3.5.7.7.2.4 SBAS shall monitor all active data that can be used by any user within the service area.

3.5.7.7.2.5 SBAS shall raise an alarm within 5.2 seconds if any combination of active data and GNSS signals-in-space results in an out-of-tolerance condition for precision approach or APV II (3.5.7.5.1).

3.5.7.7.2.6 SBAS shall raise an alarm within 8 seconds if any combination of active data and GNSS signals-in-space results in an out-of-tolerance condition for en-route through APV I (3.5.7.4.1).

Note The monitoring applies to all failure conditions including failures in core satellite constellation(s) or S AS satellites This monitoring assumes that the aircraft element complies with the re uirements of RTCA D C except as superseded by and Attachment D

3.5.7.8 *Robustness to core satellite constellation(s) failures*. Upon occurrence of a core satellite constellation(s) satellite anomaly, SBAS shall continue to operate normally using the available healthy satellite signals that can be tracked.

3.5.8 AIRCRAFT ELEMENTS

Note The parameters that are referred to in this section are defined in

Note Some of the re uirements of this section may not apply to e uipment that integrates additional navigation sensors such as e uipment that integrates S AS with inertial navigation sensors

3.5.8.1 *S AS capable NSS receiver*. Except as specifically noted, the SBAS-capable GNSS receiver shall process the signals of the SBAS and meet the requirements specified in 3.1.3.1 (GPS receiver) and/or 3.2.3.1 (GLONASS receiver). Pseudo-range measurements for each satellite shall be smoothed using carrier measurements and a smoothing filter which deviates less than 0.1 metre within 200 seconds after initialization, relative to the steady-state response of the filter defined in 3.6.5.1 in the presence of drift between the code phase and integrated carrier phase of up to 0.01 metre per second.

3.5.8.1.1 *Conditions for use of data*. The receiver shall use data from an SBAS message only if the CRC of this message has been verified. Reception of a Type 0 message from an SBAS satellite shall result in deselection of that satellite and all data from that satellite shall be discarded for at least 1 minute. For GPS satellites, the receiver shall apply long-term corrections only if the IOD matches both the IODE and 8 least significant bits of the IODC. For GLONASS satellites, the receiver shall apply long-term corrections only if the time of reception (t_r) of the GLONASS ephemeris is inside the following IOD validity interval, as defined in 3.5.4.4.1:

$$t_{LT} \quad L \quad V \leq t_r \leq t_{LT} \quad L$$

Note This re uirement does not imply that the receiver has to stop trac ing the S AS satellite

3.5.8.1.1.1 The receiver shall use integrity or correction data only if the IODP associated with that data matches the IODP associated with the PRN mask.

3.5.8.1.1.2 The receiver shall use SBAS-provided ionospheric data (IGP vertical delay estimate and $GIVEI_i$) only if the $IODI_k$ associated with that data in a Type 26 message matches the $IODI_k$ associated with the relevant IGP band mask transmitted in a Type 18 message.

3.5.8.1.1.3 The receiver shall use the most recently received integrity data for which the $IODF_j$ equals 3 or the $IODF_j$ matches the $IODF_j$ associated with the fast correction data being applied (if corrections are provided).

3.5.8.1.1.4 The receiver shall apply any regional degradation to the $\sigma^2_{i,UDRE}$ as defined by a Type 27 service message. If a Type 27 message with a new IODS indicates a higher δUDRE for the user location, the higher δUDRE shall be applied immediately. A lower δUDRE in a new Type 27 message shall not be applied until the complete set of messages with the new IODS has been received.

3.5.8.1.1.5 The receiver shall apply satellite-specific degradation to the $\sigma_{i,UDRE}{}^2$ as defined by a Type 28 clock-ephemeris covariance matrix message. The δ_{UDRE} derived from a Type 28 message shall be applied immediately.

3.5.8.1.1.6 For GPS satellites, the receiver shall apply long-term corrections only if the IOD matches both the IODE and 8 LSBs of the IODC.

Note For S AS satellites there is no mechanism that lin s E ranging function data (Type message) and long term corrections

3.5.8.1.1.7 In the event of a loss of four successive SBAS messages, the receiver shall no longer support SBAS-based precision approach or APV operations.

3.5.8.1.1.8 The receiver shall not use a broadcast data parameter after it has timed out as defined in Table B-56.

able 6 Data time out inter als

Data	Associated message types	En-route, terminal, NPA time-out	Precision approach, APV time-out
Clock-ephemeris covariance matrix	28	360	240
SBAS in test mode	0	N/A	N/A
PRN mask	1	600 s	600 s
UDREI	2 to 6, 24	18 s	12 s
Fast corrections	2 to 5, 24	(see Table B-57)	(see Table B-57)
Long-term corrections	24, 25	360 s	240 s
GEO ranging function data	9	360 s	240 s
Fast correction degradation	7	360 s	240 s
Degradation parameters	10	360 s	240 s
Ionospheric grid mask	18	1 200 s	1 200 s
Ionospheric corrections, GIVEI	26	600 s	600 s
Timing data	12	86 400 s	86 400 s
GLONASS time offset	12	600 s	600 s
Almanac data	17	None	None
Service level	27	86 400 s	86 400 s

Note The time out intervals are defined from the end of the reception of a message

able Fast correction time out inter al e aluation

Fast correction degradation factor indicator (ai_i)	NPA time-out interval for fast corrections (I_{fc})	PA time-out interval for fast corrections (I_{fc})
0	180 s	120 s
1	180 s	120 s
2	153 s	102 s
3	135 s	90 s
4	135 s	90 s
5	117 s	78 s
6	99 s	66 s
7	81 s	54 s
8	63 s	42 s
9	45 s	30 s
10	45 s	30 s
11	27 s	18 s
12	27 s	18 s
13	27 s	18 s
14	18 s	12 s
15	18 s	12 s

3.5.8.1.1.9 The receiver shall not use a fast correction if Δt for the associated RRC exceeds the time-out interval for fast corrections, or if the age of the RRC exceeds 8Δt.

3.5.8.1.1.10 The calculation of the RRC shall be reinitialized if a “Do Not Use” or “Not Monitored” indication is received for that satellite.

3.5.8.1.1.11 For SBAS-based precision approach or APV operations, the receiver shall only use satellites with elevation angles at or above 5 degrees.

3.5.8.1.1.12 The receiver shall no longer support SBAS-based precision approach or APV operation using a particular satellite if the $UDREI_i$ received is greater than or equal to 12.

3.5.8.2 *RAN IN FUNCTI N*

3.5.8.2.1 *Precision approach and AP operations*. The root-mean-square (1 sigma) of the total airborne error contribution to the error in a corrected pseudo-range for an SBAS satellite at the minimum received signal power level (Chapter 3, 3.7.3.4.4.3) under the worst interference environment as defined in 3.7 shall be less than or equal to 1.8 metres, excluding multipath effects, tropospheric and ionospheric residual errors.

Note The aircraft element will bound the errors caused by multipath and troposphere ( ) For the purpose of predicting service the multipath error is assumed to be less than metres (sigma)

3.5.8.2.2 *Departure en route terminal and non precision approach operations*. The root-mean-square (1 sigma) of the total airborne contribution to the error in a corrected pseudo-range for an SBAS satellite at the minimum received signal power level (Chapter 3, 3.7.3.4.4.3) under the worst interference environment as defined in 3.7 shall be less than or equal to 5 metres, excluding multipath, tropospheric and ionospheric errors.

3.5.8.2.3 *S AS satellite position*

3.5.8.2.3.1 *Position computation*. The receiver shall decode Type 9 message and determine the code phase offset and position (X_G, Y_G, $_G$) of the SBAS satellite.

3.5.8.2.3.2 *S AS satellite identification*. The receiver shall discriminate between SBAS satellites.

Note This re uirement applies to false ac uisition of a satellite due to cross correlation

3.5.8.2.4 *Almanac data*

3.5.8.2.4.1 **Recommendation** *The almanac data provided by the S AS should be used for ac uisition*

Note ealth and status information is provided in the E almanac data to support ac uisition but need not be used as a condition for use of that satellite

3.5.8.3 *NSS satellite status function*. The receiver shall exclude satellites from the position solution if they are identified as “Do Not Use” by SBAS. If SBAS-provided integrity is used, the receiver shall not be required to exclude GPS satellites based on the GPS-provided ephemeris health flag as required in 3.1.3.1.1 or to exclude GLONASS satellites based on GLONASS-provided ephemeris health flag as required in 3.2.3.1.1.

Note In the case of a satellite designated unhealthy by the core satellite constellation(s) health flag S AS may be able to broadcast ephemeris and cloc corrections that will allow the user to continue using the satellite

Note If satellites identified as Not Monitored by S AS are used in the position solution integrity is not provided by S AS A AS or AS may be used to provide integrity if available

3.5.8.4 ASIC AND PRECISE DIFFERENTIA FUNCTI NS

3.5.8.4.1 *Core satellite constellation(s) ranging accuracy* The root-mean-square (1 sigma) of the total airborne contribution to the error in a corrected pseudo-range for a GPS satellite at the minimum received signal power level (Chapter 3, 3.7.3.1.5.4) under the worst interference environment as defined in 3.7 shall be less than or equal to 0.4 metres, excluding multipath effects, tropospheric and ionospheric residual errors. The RMS of the total airborne contribution to the error in a corrected pseudo-range for a GLONASS satellite at the minimum received signal power level (Chapter 3, 3.2.5.4) under the worst interference environment as defined in 3.7 shall be less than or equal to 0.8 metres, excluding multipath effects, tropospheric and ionospheric residual errors.

3.5.8.4.2 *Precision approach and AP operations*

3.5.8.4.2.1 The receiver shall compute and apply long-term corrections, fast corrections, range rate corrections and the broadcast ionospheric corrections. For GLONASS satellites, the ionospheric corrections received from the SBAS shall be multiplied by the square of the ratio of GLONASS to GPS frequencies $(f_{GLONASS}/f_{GPS})^2$.

3.5.8.4.2.2 The receiver shall use a general-least-squares position solution.

3.5.8.4.2.3 The receiver shall apply a tropospheric model such that residual pseudo-range errors have a mean value ( ) less than 0.15 metres and a 1 sigma deviation less than 0.07 metres.

Note A model was developed that meets this re uirement uidance is provided in Attachment D

3.5.8.4.2.4 The receiver shall compute and apply horizontal and vertical protection levels defined in 3.5.5.6. In this computation, σ_{tropo} shall be:

$$\frac{1}{\sqrt{0.002+\sin^2(\theta_i)}} \times 0.12 \text{ m}$$

where θ_i is the elevation angle of the i^{th} satellite.

In addition, σ_{air} shall satisfy the condition that a normal distribution with zero mean and a standard deviation equal to σ_{air} bounds the error distribution for residual aircraft pseudo-range errors as follows:

$$\int_y^{\infty} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0 \text{ and}$$

$$\int_{-\infty}^{-y} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0$$

where

$f_n(x)$ probability density function of the residual aircraft pseudo-range error and

$Q(x)$ $\frac{1}{\sqrt{2\pi}}\int_x^{\infty} e^{-\frac{t^2}{2}}dt$

Note The standard allowance for airborne multipath defined in may be used to bound the multipath errors

3.5.8.4.2.5 For precision approach and APV operations, the service provider ID broadcast Type 17 message shall be identical to the service provider ID in the FAS data block, except if ID equals 15 in the FAS data block.

Note For S AS FAS data bloc s are stored in airborne databases The format of the data for validation of a cyclic redundancy chec is shown in Attachment D It differs from the AS FAS data bloc in in that it contains the S AS A and A for the particular approach procedure For approaches conducted using S AS pseudo range corrections the service provider ID in the FAS data bloc is the same as the service provider ID broadcast as part of the health and status information in Type message If the service provider ID in the FAS data bloc e uals then any service provider can be used If the service provider ID in the FAS data bloc e uals then S AS precise differential corrections cannot be used for the approach

3.5.8.4.3 *Departure en route terminal and non precision approach operations*

3.5.8.4.3.1 The receiver shall compute and apply long-term corrections, fast corrections and range rate corrections.

3.5.8.4.3.2 The receiver shall compute and apply ionospheric corrections.

Note Two methods of computing ionospheric corrections are provided in and

3.5.8.4.3.3 The receiver shall apply a tropospheric model such that residual pseudo-range errors have a mean value ( ) less than 0.15 metres and a standard deviation less than 0.07 metres.

Note A model was developed that meets this re uirement uidance is provided in Attachment D

3.5.8.4.3.4 The receiver shall compute and apply horizontal and vertical protection levels as defined in 3.5.5.6. In this computation, s_{tropo} shall be:

$$\frac{1}{\sqrt{0.002+\sin^2(\theta_i)}} \times 0.12 \text{ m}$$

where θ_i is the elevation angle of the i^{th} satellite.

In addition, σ_{air} shall satisfy the condition that a normal distribution with zero mean and standard deviation equal to σ_{air} bounds the error distribution for residual aircraft pseudo-range errors as follows:

$$\int_y^{\infty} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0 \text{ and}$$

$$\int_{-\infty}^{-y} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0$$

where

$f_n(x)$ probability density function of the residual aircraft pseudo-range error and

$Q(x)$ $\frac{1}{\sqrt{2\pi}}\int_x^{\infty} e^{-\frac{t^2}{2}}dt$

Note The standard allowance for airborne multipath defined in may be used to bound the multipath errors

3.5.8.4.4 **Recommendation** *For departure en route terminal and non precision approach operations the receiver should use the broadcast ionospheric corrections when available and a tropospheric model with performance e ual to that specified in*

3.5.9 INTERFACE BETWEEN SBAS

Note uidance material on the interface between different S AS service providers is given in Attachment D

3 6 round based augmentation system AS and ground based regional augmentation system RAS

Note In this section except where specifically annotated reference to approach with vertical guidance (AP) means AP I and AP II

3.6.1 GENERAL

The GBAS shall consist of a ground subsystem and an aircraft subsystem. The GBAS ground subsystem shall provide data and corrections for the GNSS ranging signals over a digital VHF data broadcast to the aircraft subsystem. The GRAS ground subsystem shall consist of one or more GBAS ground subsystems.

Note uidance material is provided in Attachment D

3.6.2 RF CHARACTERISTICS

3.6.2.1 *Carrier fre uency stability*. The carrier frequency of the data broadcast shall be maintained within 0.0002 per cent of the assigned frequency

3.6.2.2 *it to phase change encoding*. GBAS messages shall be assembled into symbols, each consisting of 3 consecutive message bits. The end of the message shall be padded by 1 or 2 fill bits if necessary to form the last 3-bit symbol of the message. Symbols shall be converted to D8PSK carrier phase shifts ($\Delta\phi_k$) in accordance with Table B-58.

Note The carrier phase for the th *symbol* (ϕ) *is given by* ϕ ϕ $\Delta\phi$

3.6.2.3 *Modulation wave form and pulse shaping filters*. The output of differential phase encoder shall be filtered by a pulse shaping filter whose output, s(t), is described as follows:

$$s(t) = \sum_{k=-\infty}^{k=\infty} e^{j\phi_k} h\,(t - kT)$$

where

h the impulse response of the raised cosine filter;
ϕ_k (as defined in 3.6.2.2);
t time; and
T the duration of each symbol 1/10 500 second.

This pulse shaping filter shall have a nominal complex frequency response of a raised-cosine filter with α 0.6. The time response, h(t), and frequency response, H(f), of the base band filters shall be as follows:

$$h(t) = \frac{\sin\left(\frac{\pi t}{T}\right)\cos\left(\frac{\pi\alpha t}{T}\right)}{\frac{\pi t}{T}\left[1 - \left(\frac{2\alpha t}{T}\right)^2\right]}$$

$$H(f) = \begin{cases} 1 & \text{for} \quad 0 \le f < \frac{1-\alpha}{2T} \\ \frac{1 - \sin\left(\frac{\pi}{2\alpha}(2fT - 1)\right)}{2} & \text{for} \quad \frac{1-\alpha}{2T} \le f \le \frac{1+\alpha}{2T} \\ 0 & \text{for} \quad f > \frac{1+\alpha}{2T} \end{cases}$$

The output s(t) of the pulse shaping filter shall modulate the carrier.

3.6.2.4 *Error vector magnitude* The error vector magnitude of the transmitted signal shall be less than 6.5 per cent root-mean-square (1 sigma).

3.6.2.5 *RF data rate*. The symbol rate shall be 10 500 symbols per second 0.005 per cent, resulting in a nominal bit rate of 31 500 bits per second.

able Data encoding

Message bits			Symbol phase shift
I_{3k-2}	I_{3k-1}	I_{3k}	$\Delta\phi_k$
0	0	0	$0\pi/4$
0	0	1	$1\pi/4$
0	1	1	$2\pi/4$
0	1	0	$3\pi/4$
1	1	0	$4\pi/4$
1	1	1	$5\pi/4$
1	0	1	$6\pi/4$
1	0	0	$7\pi/4$

Note Ij is the jth bit of the burst to be transmitted where I is the first bit of the training se uence

3.6.2.6 *Emissions in unassigned time slots*. Under all operating conditions, the maximum power over a 25 kHz channel bandwidth, centred on the assigned frequency, when measured over any unassigned time slot, shall not exceed 105 dBc referenced to the authorized transmitter power.

Note If the authori ed transmitter power is higher than the d c may not protect reception of emissions in a slot assigned to another desired transmitter for receivers within metres from the undesired transmitting antenna

3.6.3 DATA STRUCTURE

3.6.3.1 *TRANSMITTER TIMIN*

3.6.3.1.1 *Data broadcast timing structure*. The time division multiple access (TDMA) timing structure shall be based on frames and time slots. Each frame shall be 500 milliseconds in duration. There shall be 2 such frames contained in each 1-second UTC epoch. The first of these frames shall start at the beginning of the UTC epoch and the second frame shall start 0.5 seconds after the beginning of the UTC epoch. The frame shall be time division multiplexed such that it shall consist of 8 individual time slots (A to H) of 62.5-millisecond duration.

3.6.3.1.2 *ursts*. Each assigned time slot shall contain at most 1 burst. To initiate the use of a time slot, the GBAS shall broadcast a burst in that time slot in each of 5 consecutive frames. For each time slot in use, the ground subsystem shall broadcast a burst in at least 1 frame of every 5 consecutive frames.

Note ursts contain one or more messages and may be of variable length up to the maximum allowed within the slot as re uired by

Note During time slot initiation the airborne receiver may not receive the first bursts

3.6.3.1.3 *Timing budget for bursts*

3.6.3.1.3.1 Each burst shall be contained in a 62.5-millisecond time slot.

3.6.3.1.3.2 The beginning of the burst shall occur 95.2 microseconds after the beginning of the time slot with a tolerance of 95.2 microseconds.

3.6.3.1.3.3 For GBAS/E equipment, the start of the synchronization and ambiguity resolution portion of the burst, transmitted with horizontal polarization (HPOL), shall occur within 10 microseconds of the start of the burst transmitted with vertical polarization (VPOL).

Note Table illustrates the burst timing

3.6.3.1.4 *Ramp up and transmitter power stabili ation*. The transmitter shall ramp up to 90 per cent of the steady-state power level within 190.5 microseconds after the beginning of the burst (2 symbols). The transmitter shall stabilize at the steady-state power within 476.2 microseconds after the beginning of the burst (5 symbols).

Note The transmitter power stabili ation period may be used by the aircraft receiver to settle its automatic gain control

3.6.3.1.5 *Ramp down*. After the final information symbol is transmitted in an assigned time slot, the transmitter output power level shall decrease to at least 30 dB below the steady-state power within 285.7 microseconds (3 symbols).

3.6.3.2 *urst organi ation and coding*. Each burst shall consist of the data elements shown in Table B-60. Encoding of the messages shall follow the sequence: application data formatting, training sequence forward error correction (FEC) generation, application FEC generation and bit scrambling.

3.6.3.2.1 *Synchroni ation and ambiguity resolution*. The synchronization and ambiguity resolution field shall consist of the 48-bit sequence shown below, with the rightmost bit transmitted first:

010 001 111 101 111 110 001 100 011 101 100 000 011 110 010 000

able urst timing

Event	Nominal event duration	Nominal percentage of steady-state power
Ramp-up	190.5 s	0 to 90
Transmitter power stabilization	285.7 s	90 to 100
Synchronization and ambiguity resolution	1 523.8 s	100
Transmission of scrambled data	58 761.9 s	100
Ramp-down	285.7 s (Note 1)	100 to 0

Notes

Event duration indicated for transmission of scrambled data is for maximum application data length of bits fill bits and nominal symbol duration

These timing re uirements provide a propagation guard time of microseconds allowing for a one way propagation range of approximately m (NM)

here bursts from a AS broadcast antenna can be received at a range more than m (NM) greater than the range from another broadcast antenna using the next adjacent slot a longer guard time is re uired to avoid loss of both bursts To provide a longer guard time it is necessary to limit the application data length of the first burst to bits This allows a difference in propagation ranges of up to m (NM) without conflict

able 60 urst data content

Element	Data content	Number of bits
Beginning of burst	all zeros	15
Power stabilization		
Synchronization and ambiguity resolution	3.6.3.2.1	48
Scrambled data:	3.6.3.3	
station slot identifier (SSID)	3.6.3.3.1	3
transmission length	3.6.3.3.2	17
training sequence FEC	3.6.3.3.3	5
application data	3.6.3.3.4	up to 1 776
application FEC	3.6.3.3.5	48
fill bits (Note)	3.6.2.2	0 to 2

Note Data scrambling of the fill bits is optional ( )

3.6.3.3 *SCRAM ED DATA C NTENT*

3.6.3.3.1 *Station slot identifier (SSID)* The SSID shall be a numeric value corresponding to the letter designation A to H of the first time slot assigned to the GBAS ground subsystem, where slot A is represented by 0, B by 1, C by 2, and H by 7. The identifier is transmitted LSB first.

3.6.3.3.2 *Transmission length*. The transmission length shall indicate the total number of bits in both application data and application FEC. The transmission length is transmitted LSB first.

3.6.3.3.3 *Training se uence FEC*. The training sequence FEC shall be computed over the SSID and transmission length fields, using a (25, 20) block code, in accordance with the following equation:

$$P_1, ..., P_5 \quad SSID_1, \quad , SSID_3, TL_1, \quad , TL_{17} \; H^T$$

where

P_n the n^{th} bit of the training sequence FEC (P_1 shall be transmitted first);
$SSID_n$ the n^{th} bit of the station slot identifier ($SSID_1$ LSB);
TL_n the n^{th} bit in the transmission length (TL_1 LSB); and
H^T the transpose of the parity matrix, defined below:

$$H^T \quad \begin{bmatrix} 0&0&0&0&0&0&0&0&1&1&1&1&1&1&1&1&1&1&1&1 \\ 0&0&1&1&1&1&1&1&0&0&0&0&1&1&1&1&1&1&1&1 \\ 1&1&0&0&0&1&1&1&0&0&1&1&0&0&0&0&1&1&1&1 \\ 1&1&0&1&1&0&1&1&0&1&0&1&0&0&1&1&0&0&1&1 \\ 0&1&1&0&1&0&0&1&1&1&1&0&0&1&0&1&0&1&0&1 \end{bmatrix}^T$$

Note This code is capable of correcting all single bit errors and detecting of possible double bit errors

3.6.3.3.4 *Application data*. The application data shall consist of one or more message blocks, as defined in 3.6.3.4. The message blocks shall be mapped directly into the application data with no additional overhead of intervening layers.

3.6.3.3.5 *Application FEC*. The application FEC shall be calculated using the application data by means of a systematic, fixed-length, Reed-Solomon (R-S) (255, 249) code.

3.6.3.3.5.1 The field-defining primitive, p(x), of the R-S code shall be:

$$p(x) \quad x^8 \quad x^7 \quad x^2 \quad x \quad 1$$

3.6.3.3.5.2 The generator polynomial of the R-S code, g(x), shall be:

$$g(x) = \prod_{i=120}^{125} (x - \alpha^i) = x^6 + \alpha^{176}x^5 + \alpha^{186}x^4 + \alpha^{244}x^3 + \alpha^{176}x^2 + \alpha^{156}x + \alpha^{225}$$

where α is a root of p(x) used for construction of the Galois Field of size 2^8, GF(256), and α^i is the i^{th} primitive element in GF(256).

3.6.3.3.5.3 In generating the application FEC, the data to be encoded, m(x), shall be grouped into 8-bit R-S symbols. All data fields in the message blocks that define the application data shall be ordered such as specified in Tables B-61 and B-62, and in the message tables in 3.6.6. However, since the R-S code is a block code, application data blocks shorter than 249 bytes (1 992 bits) shall be extended to 249 bytes by virtual fill bits set to zero and appended to the application data. These virtual fill bits shall not be transferred to the bit scrambler. The data to be encoded, m(x), shall be defined by:

$$m(x) \quad a_{248}x^{248} \quad a_{247}x^{247} \quad .... \quad a_{248\text{-length} \ \ 1}\, x^{248\text{-length} \ \ 1} \quad a_{248\text{-length}}\, x^{248\text{-length}} \quad .... \quad a_1 x \ \ a_0$$

where

length represents the number of 8-bit bytes in the application data block;

a_{248} represents the message block identifier, with the rightmost bit defined as the LSB and the first bit of the application data sent to the bit scrambler;

$a_{248\text{-length} \ \ 1}$ represents the last byte of the message block CRC, with the leftmost bit defined as the MSB and the last bit of the application data sent to the bit scrambler; and

$a_{248\text{-length}}$, ..., a_1, a_0 are the virtual fill bits (if any).

3.6.3.3.5.4 The 6 R-S check symbols (b_i) shall be defined as the coefficients of the remainder resulting from dividing the message polynomial $x^6m(x)$ by the generator polynomial g(x):

$$b(x) \quad \sum_{i=0}^{5} b_i x^i \quad b_5x^5 \quad b_4x^4 \quad b_3x^3 \quad b_2x^2 \quad b_1x \quad b_0 \quad x^6m(x) \ \ \text{mod } g(x)$$

3.6.3.3.5.5 The 8-bit R-S check symbols shall be appended to the application data. Each 8-bit R-S check symbol shall be transmitted MSB first from b_0 to b_5, i.e. the first application FEC bit transferred to the bit scrambler shall be the MSB of b_0 and the last application FEC bit transferred to the bit scrambler shall be the LSB of b_5.

Note This R S code is capable of correcting up to symbol errors

Note The order of the transmitted bit R S chec symbols of the appended application FEC differs from the F data lin (D) Mode Moreover for D Mode each R S chec symbol is transmitted S first

Note Example results of application FEC encoding are given in Attachment D

able 61 Format of a AS message block

Message block	Bits
Message block header	48
Message	up to 1 696
CRC	32

able 62 Format of message block eader

Data field	Bits
Message block identifier	8
GBAS ID	24
Message type identifier	8
Message length	8

3.6.3.3.6 *it scrambling*

3.6.3.3.6.1 The output of a pseudo-noise scrambler with a 15-stage generator register shall be exclusive OR ed with the burst data starting with the SSID and ending with the application FEC. Bit scrambling of the fill bits is optional and the set value of the fill bits is optional.

Note The fill bits are not used by the aircraft receiver and their values have no impact on the system

3.6.3.3.6.2 The polynomial for the register taps of the scrambler shall be 1 x x^{15}. The register content shall be rotated at the rate of one shift per bit. The initial status of the register, prior to the first SSID bit of each burst, shall be “1101 0010 1011 001”, with the leftmost bit in the first stage of the register. The first output bit of the scrambler shall be sampled prior to the first register shift.

Note A diagram of the bit scrambler is given in Attachment D

3.6.3.4 *Message bloc format*. The message blocks shall consist of a message block header, a message and a 32-bit CRC. Table B-61 shows the construction of the message block. All signed parameters shall be two s complement numbers and all unsigned parameters shall be unsigned fixed point numbers. The scaling of the data shall be as shown in the message tables in 3.6.6. All data fields in the message block shall be transmitted in the order specified in the message tables, with the LSB of each field transmitted first.

Note All binary representations reading left to right are MS to S

3.6.3.4.1 *Message bloc header*. The message block header shall consist of a message block identifier, a GBAS identifier (ID), a message type identifier and a message length, as shown in Table B-62.

Message bloc identifier the 8-bit identifier for the operating mode of the GBAS message block.

Coding: 1010 1010 normal GBAS message
1111 1111 test GBAS message
All other values are reserved.

AS ID the four-character GBAS identification to differentiate between GBAS ground subsystems.

Coding: Each character is coded using bits b_1 through b_6 of its International Alphabet No. 5 (IA-5) representation. For each character, bit b_1 is transmitted first and six bits are transmitted for each character. Only upper case letters, numeric digits and IA-5 “space” are used. The rightmost character is transmitted first. For a three-character GBAS ID, the rightmost (first transmitted) character shall be IA-5 “space”.

Note The AS ID is normally identical to the location indicator at the nearest airport Assignment of AS IDs will be coordinated as appropriate to avoid conflicts

Message type identifier the numeric label identifying the content of the message (Table B-63).

Message length the length of the message in 8-bit bytes including the 6-byte message block header, the message and the 4-byte message CRC code.

3.6.3.4.2 *Cyclic redundancy chec (CRC)* The GBAS message CRC shall be calculated in accordance with 3.9.

3.6.3.4.2.1 The length of the CRC code shall be k 32 bits.

3.6.3.4.2.2 The CRC generator polynomial shall be:

$$G(x)\quad x^{32}\quad x^{31}\quad x^{24}\quad x^{22}\quad x^{16}\quad x^{14}\quad x^{8}\quad x^{7}\quad x^{5}\quad x^{3}\quad x\quad 1$$

3.6.3.4.2.3 The CRC information field, M(x), shall be:

$$M(x)\quad \sum_{i=1}^{n} m_i x^{n\ i}\quad m_1 x^{n\ 1}\quad m_2 x^{n\ 2}\quad \ldots\quad m_n x^{0}$$

3.6.3.4.2.4 M(x) shall be formed from the 48-bit GBAS message block header and all bits of the variable-length message, excluding the CRC. Bits shall be arranged in the order transmitted, such that m_1 corresponds to the first transmitted bit of the message block header, and m_n corresponds to the last transmitted bit of the (n-48) message bits.

3.6.3.4.2.5 The CRC shall be ordered such that r_1 is the first bit transmitted and r_{32} is the last bit transmitted.

3.6.4 DATA CONTENT

3.6.4.1 *Message types*. The message types that can be transmitted by GBAS shall be as in Table B-63.

Note Currently only of the available message types have been defined with the intent that future needs can be addressed in the remaining message types

3.6.4.2 *T PE MESSA E PSEUD RAN E C RRECTI NS*

3.6.4.2.1 The Type 1 message shall provide the differential correction data for individual GNSS ranging sources (Table B-70). The message shall contain three sections:

a) message information (time of validity, additional message flag, number of measurements and the measurement type);

b) low-frequency information (ephemeris decorrelation parameter, satellite ephemeris CRC and satellite availability information); and

c) satellite data measurement blocks.

Note Transmission of the low fre uency data for S AS ranging sources is optional

3.6.4.2.2 Each Type 1 message shall include ephemeris decorrelation parameter, ephemeris CRC and source availability duration parameters for one satellite ranging source. The ephemeris decorrelation parameter, ephemeris CRC and source availability duration shall apply to the first ranging source in the message.

3.6.4.2.3 Pseudo-range correction parameters shall be as follows:

Modified count the indication of the time of applicability for all the parameters in the message.

Coding: the modified -count resets on the hour (xx:00), 20 minutes past the hour (xx:20) and 40 minutes past the hour (xx:40) referenced to GPS time.

Additional message flag an identification of whether the set of measurement blocks in a single frame for a particular measurement type is contained in a single Type 1 message or a linked pair of messages.

Coding: 0 All measurement blocks for a particular measurement type are contained in one Type 1 message.
1 This is the first transmitted message of a linked pair of Type 1 messages that together contain the set of all measurement blocks for a particular measurement type.
2 Spare
3 This is the second transmitted message of a linked pair of Type 1 messages that together contain the set of all measurement blocks for a particular measurement type.

Note hen a lin ed pair of Type messages is used for a particular measurement type the number of measurements and low fre uency data are computed separately for each of the two individual messages

Number of measurements the number of measurement blocks in the message.

Measurement type the type of ranging signal from which the corrections have been computed.

able 63 AS HF data broadcast messages

Message type identifier	Message name
0	Spare
1	Pseudo-range corrections
2	GBAS-related data
3	Reserved for ground-based ranging source
4	Final approach segment (FAS) data
5	Predicted ranging source availability
6	Reserved
7	Reserved for national applications
8	Reserved for test applications
9 to 100	Spare
101	GRAS pseudo-range corrections
102 to 255	Spare

Note See for message formats

Coding: 0 C/A or CSA code L1
1 reserved
2 reserved
3 reserved
4 to 7 spare

Ephemeris decorrelation parameter (P): a parameter that characterizes the impact of residual ephemeris errors due to decorrelation for the first measurement block in the message.

For a SBAS geostationary satellite, the ephemeris decorrelation parameter, if transmitted, shall be coded as all zeros.

For GBAS ground subsystems that do not broadcast the additional data block 1 in the Type 2 message, the ephemeris decorrelation parameter shall be coded as all zeros.

Ephemeris CRC the CRC computed with the ephemeris data used to determine corrections for the first measurement block in the message. The ephemeris CRC for core satellite constellation(s) ranging sources shall be calculated in accordance with 3.9. The length of the CRC code shall be k 16 bits. The CRC generator polynomial shall be:

$$G(x) \quad x^{16} \quad x^{12} \quad x^{5} \quad 1$$

The CRC information field, M(x), for a given satellite shall be:

$$M(x) \quad \sum_{i=1}^{n} m_i x^{n\ 1} \quad m_1 x^{n\ 1} \quad m_2 x^{n\ 2} \quad \ldots \quad m_n x^{0}$$

For a GPS satellite, M(x) shall be of length n 576 bits. M(x) for a GPS satellite shall be calculated using the first 24 bits from each of words 3 to S10 of subframes 1, 2 and 3 of the data transmission from that satellite, ANDed with the GPS satellite ephemeris mask of Table B-64. M(x) shall be arranged in the order that bytes are transmitted by the GPS satellite, but with each byte ordered LSB first, such that m_1 corresponds to bit 68 of subframe 1, and m_{576} corresponds to bit 287 of subframe 3.

Note M(x) for a PS satellite does not include word (T M) or word ( ) which start each subframe or the parity bits at the end of each word

For a GLONASS satellite, M(x) shall be of length n 340 bits. M(x) for a GLONASS satellite shall be calculated using strings 1, 2, 3 and 4 of the data transmission from that satellite, ANDed with the GLONASS satellite ephemeris mask of Table B-65. Bits shall be arranged in transmission order such that m_1 corresponds to bit 85 of string 1, and m_{340} corresponds to bit 1 of string 4.

For a SBAS geostationary satellite, the ephemeris CRC, if transmitted shall be coded as all zeros. The CRC shall be ordered such that r_1 is the first bit transmitted and r_{16} is the last bit transmitted.

Source availability duration the predicted duration for which corrections for the ranging source are expected to remain available, relative to the modified -count for the first measurement block.

Coding: 1111 1110 The duration is greater than or equal to 2 540 seconds.
1111 1111 Prediction of source availability duration is not provided by this ground subsystem.

3.6.4.2.4 The measurement block parameters shall be as follows:

Ranging source ID the identity of the ranging source to which subsequent measurement block data are applicable.

able 6 S satellite ep emeris mask

Subframe 1:	Byte 1	Byte 2	Byte 3		Byte 1	Byte 2	Byte 3
Word 3	0000 0000	0000 0000	0000 0011	Word 4	0000 0000	0000 0000	0000 0000
Word 5	0000 0000	0000 0000	0000 0000	Word 6	0000 0000	0000 0000	0000 0000
Word 7	0000 0000	0000 0000	1111 1111	Word 8	1111 1111	1111 1111	1111 1111
Word 9	1111 1111	1111 1111	1111 1111	Word 10	1111 1111	1111 1111	1111 1100
Subframe 2:	**Byte 1**	**Byte 2**	**Byte 3**		**Byte 1**	**Byte 2**	**Byte 3**
Word 3	1111 1111	1111 1111	1111 1111	Word 4	1111 1111	1111 1111	1111 1111
Word 5	1111 1111	1111 1111	1111 1111	Word 6	1111 1111	1111 1111	1111 1111
Word 7	1111 1111	1111 1111	1111 1111	Word 8	1111 1111	1111 1111	1111 1111
Word 9	1111 1111	1111 1111	1111 1111	Word 10	1111 1111	1111 1111	0000 0000
Subframe 3:	**Byte 1**	**Byte 2**	**Byte 3**		**Byte 1**	**Byte 2**	**Byte 3**
Word 3	1111 1111	1111 1111	1111 1111	Word 4	1111 1111	1111 1111	1111 1111
Word 5	1111 1111	1111 1111	1111 1111	Word 6	1111 1111	1111 1111	1111 1111
Word 7	1111 1111	1111 1111	1111 1111	Word 8	1111 1111	1111 1111	1111 1111
Word 9	1111 1111	1111 1111	1111 1111	Word 10	1111 1111	1111 1111	1111 1100

able 6 O ASS satellite ep emeris mask

String 1:
0 0000 0000 0000 0000 0000 1111 1111 1111 1111 1111 1111 1111
1111 1111 1111 1111 1111 1111 1111 0000 0000
String 2:
0 0000 0000 0000 0000 0000 1111 1111 1111 1111 1111 1111 1111
1111 1111 1111 1111 1111 1111 1111 0000 0000
String 3:
0 0000 0111 1111 1111 0000 1111 1111 1111 1111 1111 1111 1111
1111 1111 1111 1111 1111 1111 1111 0000 0000
String 4:
0 0000 1111 1111 1111 1111 1111 1100 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000

Coding:	1 to 36	GPS satellite IDs (PRN)
	37	reserved
	38 to 61	GLONASS satellite IDs (slot number plus 37)
	62 to 119	spare
	120 to 138	SBAS satellite IDs (PRN)
	139 to 255	spare

Issue of data (I D) The issue of data associated with the ephemeris data used to determine pseudo-range and range rate corrections.

Coding: for GPS, IOD GPS IODE parameter (3.1.1.3.2.2)
for GLONASS, IOD GLONASS "t_b" parameter (see 3.2.1.3.1)
for SBAS, IOD 1111 1111

Note For NASS insert in the MS of the I D

Pseudo range correction (PRC) the correction to the ranging source pseudo-range.

Range rate correction (RRC) the rate of change of the pseudo-range correction.

σ_{pr_gnd}: the standard deviation of a normal distribution associated with the signal-in-space contribution of the pseudo-range error at the GBAS reference point (3.6.5.5.1, 3.6.5.5.2 and 3.6.7.2.2.4).

Coding: 1111 1111 Ranging source correction invalid.

through are the integrity parameters associated with the pseudo-range corrections provided in the same measurement block. For the i[th] ranging source these parameters correspond to $B_{i,1}$ through $B_{i,4}$ (3.6.5.5.1.2, 3.6.5.5.2.2 and 3.6.7.2.2.4).

Coding: 1000 0000 Reference receiver was not used to compute the pseudo-range correction.

3.6.4.3 *Type message AS related data* Type 2 message shall identify the location of the GBAS reference point at which the corrections provided by the GBAS apply and shall give other GBAS-related data (Table B-71). GBAS-related data parameters shall be as follows:

Note Additional data bloc s may be included in the Type message Additional data bloc and additional data bloc are defined In the future other additional data bloc s may be defined Data bloc s through are variable length and may be appended to the message after additional data bloc in any order

AS reference receivers the number of GNSS reference receivers installed in this GBAS ground subsystem.

Coding: 0 GBAS installed with 2 reference receivers
1 GBAS installed with 3 reference receivers
2 GBAS installed with 4 reference receivers
3 The number of GNSS reference receivers installed in this GBAS ground subsystem is not applicable

round accuracy designator letter the letter designator indicating the minimum signal-in-space accuracy performance provided by GBAS (3.6.7.1.1).

Coding: 0 accuracy designation A
1 accuracy designation B
2 accuracy designation C
3 spare

AS continuity integrity designator (CID) numeric designator indicating the operational status of the GBAS.

Coding: 0 spare
1 GCID 1
2 GCID 2
3 GCID 3
4 GCID 4
5 spare
6 spare
7 unhealthy

Note The values of CID and are specified in order to ensure compatibility of e uipment with future AS

Note The value of CID indicates that a precision approach or AP cannot be initiated

ocal magnetic variation the published magnetic variation at the GBAS reference point.

Coding: Positive value denotes east variation (clockwise from true north), Negative value denotes west variation (counter-clockwise from true north)
100 0000 0000 Precision approach procedures supported by this GBAS are published based on true bearing.

Note ocal magnetic variation is chosen to be consistent with procedure design and is updated during magnetic epoch years

$\sigma_{vert\ iono\ gradient}$ the standard deviation of a normal distribution associated with the residual ionospheric uncertainty due to spatial decorrelation (3.6.5.4).

Refractivity index (N_r) the nominal tropospheric refractivity index used to calibrate the tropospheric correction associated with the GBAS ground subsystem (3.6.5.3).

Coding: This field is coded as two s complement number with an offset of 400. A value of zero in this field indicates a refractivity index of 400.

Scale height (h_o) a scale factor used to calibrate the tropospheric correction and residual tropospheric uncertainty associated with the GBAS ground subsystem (3.6.5.3).

Refractivity uncertainty (σ_n) the standard deviation of a normal distribution associated with the residual tropospheric uncertainty (3.6.5.3).

atitude the latitude of the GBAS reference point defined in arc seconds.

Coding: Positive value denotes north latitude.
Negative value denotes south latitude.

ongitude the longitude of the GBAS reference point defined in arc seconds.

Coding: Positive value denotes east longitude.
Negative value denotes west longitude.

Reference point height the height of the GBAS reference point above the WGS-84 ellipsoid.

3.6.4.3.1 *Additional data bloc parameters*. Additional data block 1 parameters shall be as follows:

REFERENCE STATI N DATA SE ECT R (RSDS): the numerical identifier that is used to select the GBAS ground subsystem.

Note The RSDS is different from every other RSDS and every reference path data selector (RPDS) broadcast on the same fre uency by every AS ground subsystem within the broadcast region

Coding: 1111 1111 GBAS positioning service is not provided

MA IMUM USE DISTANCE (D_{max}): the maximum distance (slant range) from the GBAS reference point for which the integrity is assured.

Note This parameter does not indicate a distance within which F data broadcast field strength re uirements are met

Coding: 0 No distance limitation

PS EP EMERIS MISSED DETECTI N PARAMETER AS Positioning Service (md e P S PS): the multiplier for computation of the ephemeris error position bound for the GBAS positioning service derived from the probability of missed detection given that there is an ephemeris error in a GPS satellite.

For GBAS ground subsystems that do not broadcast corrections for GPS ranging sources or that do not provide the GBAS positioning service, this parameter shall be coded as all zeros.

PS EP EMERIS MISSED DETECTI N PARAMETER Category I Precision Approach and AP (md e PS): the multiplier for computation of the ephemeris error position bound for Category I precision approach and APV derived from the probability of missed detection given that there is an ephemeris error in a GPS satellite.

For GBAS ground subsystems that do not broadcast corrections for GPS ranging sources, this parameter shall be coded as all zeros.

NASS EP EMERIS MISSED DETECTI N PARAMETER AS Positioning Service (md e P S NASS): the multiplier for computation of the ephemeris error position bound for the GBAS positioning service derived from the probability of missed detection given that there is an ephemeris error in a GLONASS satellite.

For GBAS ground subsystems that do not broadcast corrections for GLONASS ranging sources or that do not provide positioning service, this parameter shall be coded as all zeros.

NASS EP EMERIS MISSED DETECTI N PARAMETER Category I Precision Approach and AP (md e NASS): the multiplier for computation of the ephemeris error position bound for Category I precision approach and APV derived from the probability of missed detection given that there is an ephemeris error in a GLONASS satellite.

For GBAS ground subsystems that do not broadcast corrections for GLONASS ranging sources, this parameter shall be coded as all zeros.

3.6.4.3.2 *Additional data bloc s*. For additional data blocks other than additional data block 1, the parameters for each data block shall be as follows:

ADDITI NA DATA C EN T : the number of bytes in the additional data block, including the additional data block length and additional data block number fields.

ADDITI NA DATA C NUM ER: the numerical identifier of the type of additional data block.

Coding:	0 to 1	reserved
	2	additional data block 2, GRAS broadcast stations
	3 to 255	spare

ADDITI NA DATA PARAMETERS: the set of data defined in accordance with the additional data block number.

3.6.4.3.2.1 *RAS broadcast stations*

Parameters for additional data block 2 shall include data for one or more broadcast stations as follows:

C ANNE NUM ER: the channel number, as defined in 3.6.5.7, associated with a GBAS broadcast station.

Note The channel number in this field refers to a fre uency and an RSDS

Δ *ATITUDE*: the difference of latitude of a GBAS broadcast station, measured from the latitude provided in the latitude parameter of Type 2 message.

Coding: Positive value denotes that the GBAS broadcast station is north of the GBAS reference point.
Negative value denotes that the GBAS broadcast station is south of the GBAS reference point.

Δ *N ITUDE*: the difference of longitude of a GBAS broadcast station, measured from the longitude provided in the longitude parameter of Type 2 message.

Coding: Positive value denotes that the GBAS broadcast station is east of the GBAS reference point.
Negative value denotes that the GBAS broadcast station is west of the GBAS reference point.

Note uidance material concerning additional data bloc is provided in Attachment D

3.6.4.4 *T PE MESSA E*

Note Type message is intended to provide the information re uired to use ground based ranging sources and is reserved for future applications

3.6.4.5 *Type message Final approach segment (FAS)* Type 4 message shall contain one or more sets of FAS data, each defining a single precision approach (Table B-72). Each Type 4 message data set shall include the following:

Data set length the number of bytes in the data set. The data set includes the data set length field and the associated FAS data block, FAS vertical alert limit (FASVAL)/approach status and FAS lateral alert limit (FASLAL)/approach status fields.

FAS data bloc the set of parameters to identify a single precision approach or APV and define its associated approach path.

Coding: See 3.6.4.5.1 and Table B-66.

Note uidance material for FAS path definition is contained in Attachment D

FAS A approach status the value of the parameter FASVAL as used in 3.6.5.6.

Coding: 1111 1111 Do not use vertical deviations.

Note The range and resolution of values for FAS A depend upon the approach performance designator in the associated FAS data bloc

FAS A approach status the value of the parameter FASLAL as used in 3.6.5.6.

Coding: 1111 1111 Do not use approach.

able 6 A RAS broadcast station data

Data content	Bits used	Range of values	Resolution
Channel number	16	20001 to 39999	1
ΔLatitude	8	25.4	0.2
ΔLongitude	8	25.4	0.2

able 66 Final approac segment FAS data block

Data content	Bits used	Range of values	Resolution
Operation type	4	0 to 15	1
SBAS provider ID	4	0 to 15	1
Airport ID	32	—	—
Runway number	6	0 to 36	1
Runway letter	2	—	—
Approach performance designator	3	0 to 7	1
Route indicator	5	—	—
Reference path data selector	8	0 to 48	1
Reference path identifier	32	—	—
LTP/FTP latitude	32	90.0	0.0005 arcsec
LTP/FTP longitude	32	180.0	0.0005 arcsec
LTP/FTP height	16	512.0 to 6 041.5 m	0.1 m
ΔFPAP latitude	24	1.0	0.0005 arcsec
ΔFPAP longitude	24	1.0	0.0005 arcsec
Approach TCH (Note 2)	15	0 to 1 638.35 m or 0 to 3 276.7 ft	0.05 m or 0.1 ft
Approach TCH units selector	1	—	—
GPA	16	0 to 90.0	0.01
Course width (Note 1)	8	80 to 143.75 m	0.25 m
ΔLength offset	8	0 to 2 032 m	8 m
Final approach segment CRC	32	—	—

Note hen the runway number is set to then the course width field is ignored and the course width is metres

Note Information can be provided in either feet or metres as indicated by the approach TC unit selector

3.6.4.5.1 *FAS data bloc* The FAS data block shall contain the parameters that define a single precision approach or APV. The FAS path is a line in space defined by the landing threshold point/fictitious threshold point (LTP/FTP), flight path alignment point (FPAP), threshold crossing height (TCH) and glide path angle (GPA). The local level plane for the approach is a plane perpendicular to the local vertical passing through the LTP/FTP (i.e. tangent to the ellipsoid at the LTP/FTP). Local vertical for the approach is normal to the WGS-84 ellipsoid at the LTP/FTP. The glide path intercept point (GPIP) is where the final approach path intercepts the local level plane. FAS data block parameters shall be as follows:

peration type straight-in approach procedure or other operation types.

Coding: 0 straight-in approach procedure
1 to 15 spare

S AS service provider ID indicates the service provider associated with this FAS data block.

Coding: See Table B-27.
14 FAS data block is to be used with GBAS only.
15 FAS data block can be used with any SBAS service provider.

Note This parameter is not used for approaches conducted using AS or RAS pseudo range corrections

Airport ID the three- or four-letter designator used to designate an airport.

Coding: Each character is coded using the lower 6 bits of its IA-5 representation. For each character, b_i is transmitted first, and 2 zero bits are appended after b_6, so that 8 bits are transmitted for each character. Only upper case letters, numeric digits and IA-5 "space" are used. The rightmost character is transmitted first. For a three-character GBAS ID, the rightmost (first transmitted) character shall be IA-5 "space".

Runway number the approach runway number.

Coding: 0 heliport
1 to 36 runway number

Runway letter the one-letter designator used, as necessary, to differentiate between parallel runways.

Coding: 0 no letter
1 R (right)
2 C (centre)
3 L (left)

Approach performance designator the general information about the approach design.

Coding: 0 APV
1 Category I
2 reserved for Category II
3 reserved for Category III
4 to 7 spare

Route indicator the one-letter identifier used to differentiate between multiple approaches to the same runway end.

Coding: The letter is coded using bits b_1 through b_5 of its IA-5 representation. Bit b_1 is transmitted first. Only upper case letters, excluding "I" and "O", or IA-5 "space" are used.

Reference path data selector (RPDS) the numeric identifier that is used to select the FAS data block (desired approach).

Note The RPDS for a given FAS data bloc is different from every other RPDS and every reference station data selector (RSDS) broadcast on the same fre uency by every AS within the broadcast region

Reference path identifier the three or four alphanumeric characters used to uniquely designate the reference path.

Coding: Each character is coded using bits b_1 through b_6 of its IA-5 representation. For each character, b_1 is transmitted first, and 2 zero bits are appended after b_6 so that 8 bits are transmitted for each character. Only upper case letters, numeric digits and IA-5 "space" are used. The rightmost character is transmitted first. For a three-character reference path identifier, the rightmost (first transmitted) character shall be IA-5 "space".

Note The TP FTP is a point over which the FAS path passes at a relative height specified by the TC TP is normally located at the intersection of the runway centreline and the threshold

TP FTP latitude the latitude of the LTP/FTP point in arc seconds.

Coding: Positive value denotes north latitude.
Negative value denotes south latitude.

TP FTP longitude the longitude of the LTP/FTP point in arc seconds.

Coding: Positive value denotes east longitude.
Negative value denotes west longitude.

TP FTP height the height of the LTP/FTP above the WGS-84 ellipsoid.

Coding: This field is coded as an unsigned fixed-point number with an offset of 512 metres. A value of zero in this field places the LTP/FTP 512 metres below the earth ellipsoid.

Note The FPAP is a point at the same height as the TP FTP that is used to define the alignment of the approach The origin of angular deviations in the lateral direction is defined to be metres (ft) beyond the FPAP along the lateral FAS path For an approach aligned with the runway the FPAP is at or beyond the stop end of the runway

ΔFPAP latitude the difference of latitude of the runway FPAP from the LTP/FTP in arc seconds.

Coding: Positive value denotes the FPAP latitude north of LTP/FTP latitude.
Negative value denotes the FPAP latitude south of the LTP/FTP latitude.

ΔFPAP longitude the difference of longitude of the runway FPAP from the LTP/FTP in arc seconds.

Coding: Positive value indicates the FPAP longitude east of LTP/FTP longitude.
Negative value indicates the FPAP longitude west of LTP/FTP longitude.

Approach TC the height of the FAS path above the LTP/FTP defined in either feet or metres as indicated by the TCH units selector.

Approach TC units selector the units used to describe the TCH.

Coding: 0 feet
1 metres

lide path angle (PA) the angle of the FAS path with respect to the horizontal plane tangent to the WGS-84 ellipsoid at the LTP/FTP.

Course width the lateral displacement from the path defined by the FAS at the LTP/FTP at which full-scale deflection of a course deviation indicator is attained.

Coding: This field is coded as an unsigned fixed-point number with an offset of 80 metres. A value of zero in this field indicates a course width of 80 metres at the LTP/FTP.

Δ ength offset the distance from the stop end of the runway to the FPAP.

Coding: 1111 1111 not provided

Final approach segment CRC the 32-bit CRC appended to the end of each FAS data block in order to ensure approach data integrity. The 32-bit final approach segment CRC shall be calculated in accordance with 3.9. The length of the CRC code shall be k 32 bits.

The CRC generator polynomial shall be:

$$G(x) \quad x^{32} \quad x^{31} \quad x^{24} \quad x^{22} \quad x^{16} \quad x^{14} \quad x^{8} \quad x^{7} \quad x^{5} \quad x^{3} \quad x \quad 1$$

The CRC information field, M(x), shall be:

$$M(x) \quad \sum_{i=1}^{272} m_i x^{272\ i} \quad m_1 x^{271} \quad m_2 x^{270} \quad \ldots \quad m_{272} x^0$$

M(x) shall be formed from all bits of the associated FAS data block, excluding the CRC. Bits shall be arranged in the order transmitted, such that m_1 corresponds to the LSB of the operation type field, and m_{272} corresponds to the MSB of the Δlength offset field. The CRC shall be ordered such that r_1 is the LSB and r_{32} is the MSB.

3.6.4.6 *Type message predicted ranging source availability* When used, the Type 5 message shall contain rising and setting information for the currently visible or soon to be visible ranging sources. Predicted ranging source availability parameters shall be as follows:

Modified count indicates the time of applicability of the parameters in this message.

Coding: Same as modified -count field in Type 1 message (3.6.4.2).

Number of impacted sources the number of sources for which duration information applicable to all approaches is provided.

Coding: 0 Only specified obstructed approaches have limitations.
1 to 31 The number of ranging sources impacted.

Ranging source ID as for Type 1 message (3.6.4.2).

Source availability sense indicates whether the ranging source will become available or cease to be available.

Coding: 0 Differential corrections will soon cease to be provided for the associated ranging source.
1 Differential corrections will soon start to be provided for the associated ranging source.

Source availability duration the predicted minimum ranging source availability duration relative to the modified -count.

Coding: 111 1111 The duration is greater than or equal to 1 270 seconds.

Number of obstructed approaches the number of approaches for which the corrections will be reduced due to approach unique constellation masking.

Reference path data selector an indication of the FAS data block to which the source availability data applies (3.6.4.5.1).

Number of impacted sources for this approach the number of sources for which duration information applicable only to this approach is provided.

3.6.4.7 *T PE MESSA E*

Note Type message is reserved for future use to provide the information re uired for Category II III precision approaches

3.6.4.8 *T PE MESSA E*

Note Type message is reserved for national applications

3.6.4.9 *T PE MESSA E*

Note Type message is reserved for local and regional test applications

3.6.4.10 *T PE MESSA E RAS PSEUD RAN E C RRECTI NS*

3.6.4.10.1 The Type 101 message shall provide the differential correction data for individual GNSS ranging sources (Table B-70A). The message shall contain three sections:

a) message information (time of validity, additional message flag, number of measurements and the measurement type);

b) low-frequency information (ephemeris decorrelation parameter, satellite ephemeris CRC and satellite availability information); and

c) satellite data measurement blocks.

3.6.4.10.2 Each Type 101 message shall include ephemeris decorrelation parameter, ephemeris CRC and source availability duration parameters for one satellite ranging source. The ephemeris decorrelation parameter, ephemeris CRC and source availability duration shall apply to the first ranging source in the message.

3.6.4.10.3 Pseudo-range correction parameters shall be as follows:

Modified count: as defined in 3.6.4.2.3.

Additional message flag: as defined in 3.6.4.2.3 except applicable to Type 101 messages.

Number of measurements: as defined in 3.6.4.2.3.

Measurement type: as defined in 3.6.4.2.3.

Ephemeris decorrelation parameter (P): as defined in 3.6.4.2.3.

Ephemeris CRC: as defined in 3.6.4.2.3.

Source availability duration: as defined in 3.6.4.2.3.

Number of parameters: an indication of whether the B parameters are included in the measurement block for each ranging source.

Coding: 0 B parameters are not included
1 4 B parameters per measurement block

3.6.4.10.4 The measurement block parameters shall be as follows:

Ranging source ID: as defined in 3.6.4.2.4.

Issue of data (I D): as defined in 3.6.4.2.4.

Pseudo range correction (PRC): as defined in 3.6.4.2.4.

Range rate correction (RRC): as defined in 3.6.4.2.4.

$\sigma_{pr\ gnd}$: as defined in 3.6.4.2.4, with the exception of the range of values and resolution.

through : as defined in 3.6.4.2.4.

Note Inclusion of the parameters in the measurement bloc is optional for Type messages

3.6.5 DEFINITIONS OF PROTOCOLS FOR DATA APPLICATION

Note This section defines the inter relationships of the data broadcast message parameters It provides definitions of parameters that are not transmitted but are used by either or both non aircraft and aircraft elements and that define terms applied to determine the navigation solution and its integrity

3.6.5.1 *Measured and carrier smoothed pseudo range* The broadcast correction is applicable to carrier smoothed code pseudo-range measurements that have not had the satellite broadcast troposphere and ionosphere corrections applied to them. The carrier smoothing is defined by the following filter:

$$P_{CSCn} = \alpha P + (1-\alpha)\left(P_{CSC_{n-1}} + \frac{\lambda}{2\pi}(\phi_n - \phi_{n-1})\right)$$

where

P_{CSCn}	the smoothed pseudo-range;
$P_{CSCn\ 1}$	the previous smoothed pseudo-range;
P	the raw pseudo-range measurement where the raw pseudo-range measurements are obtained from a carrier driven code loop, first order or higher and with a one-sided noise bandwidth greater than or equal to 0.125 Hz;
λ	the L1 wavelength;
ϕ_n	the carrier phase;
$\phi_{n\ 1}$	the previous carrier phase; and
α	the filter weighting function equal to the sample interval divided by the time constant of 100 seconds.

3.6.5.2 *Corrected pseudo range* The corrected pseudo-range for a given satellite at time *t* is:

$$PR_{corrected} \quad P_{CSC} \quad PRC \quad RRC \quad (t \quad tz\text{-count}) \quad TC \quad c \quad (\Delta t_{sv})_{L1}$$

where

P_{CSC}	the smoothed pseudo-range (defined in 3.6.5.1);
PRC	the pseudo-range correction (defined in 3.6.4.2);
RRC	the pseudo-range correction rate (defined in 3.6.4.2);
t	the current time;
tz-count	the time of applicability derived from the modified -count (defined in 3.6.4.2);
TC	the tropospheric correction (defined in 3.6.5.3); and
c and $(\Delta t_{sv})_{L1}$	are as defined in 3.1.2.2 for GPS satellites.

3.6.5.3 *TR P SP ERIC DE A*

3.6.5.3.1 The tropospheric correction for a given satellite is:

$$TC = N_r h_0 \frac{10^{-6}}{\sqrt{0.002 + \sin^2(El_i)}}(1 - e^{-\Delta h / h_0})$$

where

N_r	refractivity index from the Type 2 message (3.6.4.3);
Δh	height of the aircraft above the GBAS reference point;

El_i elevation angle of the i[th] satellite; and
h_0 troposphere scale height from the Type 2 message.

3.6.5.3.2 The residual tropospheric uncertainty is:

$$\sigma_{tropo} = \sigma_n h_0 \frac{10^{-6}}{\sqrt{0.002 + \sin^2(El_i)}}(1 - e^{-\Delta h / h_0})$$

where σ_n the refractivity uncertainty from the Type 2 message (3.6.4.3).

3.6.5.4 *Residual ionospheric uncertainty* The residual ionospheric uncertainty for a given satellite is:

$$\sigma_{iono} \quad F_{pp} \quad \sigma_{vert\_iono\_gradient} \quad (x_{air} \quad 2 \quad \tau \quad v_{air})$$

where

F_{pp} the vertical-to-slant obliquity factor for a given satellite (3.5.5.5.2);
$\sigma_{vert\_iono\_gradient}$ (as defined in 3.6.4.3);
x_{air} the distance (slant range) in metres between current aircraft location and the GBAS reference point indicated in the Type 2 message;
τ 100 seconds (time constant used in 3.6.5.1); and
v_{air} the aircraft horizontal approach velocity (metres per second).

3.6.5.5 *PR TECTI N E E S*

3.6.5.5.1 *Category I precision approach and AP* The signal-in-space vertical and lateral protection levels (VPL and LPL) are upper confidence bounds on the error in the position relative to the GBAS reference point defined as:

$$VPL \quad MAX \; VPL_{HO}, VPL_{H1}$$

$$LPL \quad MAX \; LPL_{HO}, LPL_{H1}$$

3.6.5.5.1.1 *Normal measurement conditions*

3.6.5.5.1.1.1 The vertical protection level (VPL_{H0}) and lateral protection level (LPL_{H0}), assuming that normal measurement conditions (i.e. no faults) exist in all reference receivers and on all ranging sources, is calculated as:

$$VPL_{H0} = K_{ffmd}\sqrt{\sum_{i=1}^{N} s\_vert_i^2 \times \sigma_i^2}$$

$$LPL_{H0} = K_{ffmd}\sqrt{\sum_{i=1}^{N} s\_lat_i^2 \times \sigma_i^2}$$

where

K_{ffmd} the multiplier derived from the probability of fault-free missed detection;
s_vert_i $s_{v,i} \quad s_{x,i}$ tan (GPA);
s_lat_i $s_{y,i}$;

$s_{x,i}$ the partial derivative of position error in the x-direction with respect to pseudo-range error on the i^{th} satellite;
$s_{y,i}$ the partial derivative of position error in the y-direction with respect to pseudo-range error on the i^{th} satellite;
$s_{v,i}$ the partial derivative of position error in the vertical direction with respect to pseudo-range error on the i^{th} satellite;
GPA the glidepath angle for the final approach path (3.6.4.5.1);
N the number of ranging sources used in the position solution; and
i the ranging source index for ranging sources used in the position solution.

Note The coordinate reference frame is defined such that x is along trac positive forward y is crosstrac positive left in the local level tangent plane and v is the positive up and orthogonal to x and y

3.6.5.5.1.1.2 For a general-least-squares position solution, the projection matrix S is defined as:

$$S \equiv \begin{bmatrix} S_{x,1} & S_{x,2} & \cdots & S_{x,N} \\ S_{y,1} & S_{y,2} & \cdots & S_{y,N} \\ S_{v,1} & S_{v,2} & \cdots & S_{v,N} \\ S_{t,1} & S_{t,2} & \cdots & S_{t,N} \end{bmatrix} = (G^T \times W \times G)^{-1} \times G^T \times W$$

where

G_i cos El_i cos Az_i cos El_i sin Az_i sin El_i 1 i^{th} row of G; and

$$W = \begin{bmatrix} \sigma_1^2 & 0 & \cdots & 0 \\ 0 & \sigma_2^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_N^2 \end{bmatrix}^{-1};$$

where σ^2_i $\sigma^2_{pr\_gnd,i}$ $\sigma^2_{tropo,i}$ $\sigma^2_{pr\_air,i}$ $\sigma^2_{iono,i}$;

where

$\sigma_{pr\_gnd,i}$ σ_{pr_gnd} for the i^{th} ranging source (3.6.4.2);
$\sigma_{tropo,i}$ the residual tropospheric uncertainty for the i^{th} ranging source (3.6.5.3);
$\sigma_{iono,i}$ the residual ionospheric delay (due to spatial decorrelation) uncertainty for the i^{th} ranging source (3.6.5.4); and
$\sigma_{pr\_air,i}$ $\sqrt{\sigma^2_{receiver}(El_i) + \sigma^2_{multipath}(El_i)}$, the standard deviation of the aircraft contribution to the corrected pseudo-range error for the i^{th} ranging source. The total aircraft contribution includes the receiver contribution (3.6.8.2.1) and a standard allowance for airframe multipath;

where

$\sigma_{multipath}(El_i)$ $0.13 + 0.53e^{-El_i/10\,deg}$, the standard model for the contribution of airframe multipath (in metres);
El_i the elevation angle for the i^{th} ranging source (in degrees); and
Az_i the azimuth for the i^{th} ranging source taken counterclockwise for the x axis (in degrees).

Note To improve readability the subscript i *was omitted from the projection matrix s e uation*

3.6.5.5.1.2 *Faulted measurement conditions* When the Type 101 message is broadcast without B parameter blocks, the values for VPL_{H1} and LPL_{H1} are defined as zero. Otherwise, the vertical protection level (VPL_{H1}) and lateral protection level (LPL_{H1}), assuming that a latent fault exists in one, and only one reference receiver, are:

$$VPL_{H1} \quad \max \; VPL_j$$

$$LPL_{H1} \quad \max \; LPL_j$$

where VPL_j and LPL_j for j 1 to 4 are

$VPL_j \quad B\_vert_j \quad K_{md}\,\sigma_{vert,H1}$ and

$LPL_j \quad B\_lat_j \quad K_{md}\,\sigma_{lat,H1}$

and

$$B\_vert_j \quad \sum_{i=1}^{N} (s\_vert_i \quad B_{i,j});$$

$$B\_lat_j \quad \sum_{i=1}^{N} (s\_lat_i \quad B_{i,j});$$

$B_{i,j}$ the broadcast differences between the broadcast pseudo-range corrections and the corrections obtained excluding the j^{th} reference receiver measurement for the i^{th} ranging source;

K_{md} the multiplier derived from the probability of missed detection given that the ground subsystem is faulted;

$$\sigma^2_{vert,H1} \quad \sum_{i=1}^{N} (s\_vert^2_i \quad \sigma\_H1^2_i);$$

$$\sigma^2_{lat,H1} \quad \sum_{i=1}^{N} (s\_lat^2_i \quad \sigma\_H1^2_i);$$

$$\sigma\_H1^2_i \quad \left(\frac{M_i}{U_i}\right)\sigma^2_{pr\_gnd,i} \quad \sigma^2_{pr\_air,i} \quad \sigma^2_{tropo,i} \quad \sigma^2_{iono,i};$$

M_i the number of reference receivers used to compute the pseudo-range corrections for the i^{th} ranging source (indicated by the B values); and

U_i the number of reference receivers used to compute the pseudo-range corrections for the i^{th} ranging source, excluding the j^{th} reference receiver.

Note A latent fault includes any erroneous measurement(s) that is not immediately detected by the ground subsystem such that the broadcast data are affected and there is an induced position error in the aircraft subsystem

3.6.5.5.1.3 *Definition of multipliers for Category I precision approach and AP* The multipliers are given in Table B-67.

3.6.5.5.2 *AS positioning service* The signal-in-space horizontal protection level is an upper confidence bound on the horizontal error in the position relative to the GBAS reference point defined as:

$$HPL \quad MAX \; HPL_{H0}, HPL_{H1}$$

able 6 multipliers for Category precision approac and A

Multiplier	M_i			
	1(Note)	2	3	4
K_{ffmd}	6.86	5.762	5.81	5.847
K_{md}	Not used	2.935	2.898	2.878

Note For AP I approaches supported by Type messages broadcast without the parameter bloc

3.6.5.5.2.1 *Normal measurements conditions*. The horizontal protection level (HPL_{H0}), assuming that normal measurement conditions (i.e. no faults) exist in all reference receivers and on all ranging sources, is calculated as:

$$HPL_{H0} \quad K_{ffmd,\,POS}{}^{d}{}_{major}$$

where:

$$d_{major} = \sqrt{\frac{d_x^2 + d_y^2}{2} + \sqrt{\left(\frac{d_x^2 - d_y^2}{2}\right)^2 + d_{xy}^2}}$$

$$d_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma_i^2$$

$$d_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma_i^2$$

$$d_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,i} \sigma_i^2$$

$s_{x,i}$ the partial derivative of position error in the x-direction with respect to pseudo-range error on the i^{th} satellite

$s_{y,i}$ the partial derivative of position error in the y-direction with respect to pseudo-range error on the i^{th} satellite

$K_{ffmd,POS}$ the multiplier derived from the probability of fault-free missed detection

N the number of ranging sources used in the position solution

i the ranging source index for ranging sources used in the position solution

σ_i the pseudo-range error term as defined in 3.6.5.5.1.1

Note For the AS positioning service the x and y axes define an arbitrary orthogonal basis in the hori ontal plane

3.6.5.5.2.2 *Faulted measurement conditions* When the Type 101 message is broadcast without B parameter blocks, the value for HPL_{H1} is defined as zero. Otherwise, the horizontal protection level (HPL_{H1}), assuming that a latent fault exists in one and only one reference receiver, is:

$$HPL_{H1} \quad \max \quad HPL_j$$

where HPL_j for j 1 to 4 is:

$$HPL_j \quad B\_horz_j \quad K_{md\_POS}\, d_{major,H1}$$

and

$$B\_horz_j = \sqrt{\left(\sum_{i=1}^{N} S_{x,i} B_{i,j}\right)^2 + \left(\sum_{i=1}^{N} S_{y,i} B_{i,j}\right)^2}$$

$B_{i,j}$ the broadcast differences between the broadcast pseudo-range corrections and the corrections obtained excluding the jth reference receiver measurement for the ith ranging source.

K_{md_POS} the multiplier derived from the probability of missed detection given that the ground subsystem is faulted.

$$d_{major,H1} = \sqrt{\frac{d\_H1_x^2 + d\_H1_y^2}{2} + \sqrt{\left(\frac{d\_H1_x^2 - d\_H1_y^2}{2}\right)^2 + d\_H1_{xy}^2}}$$

$$d\_H1_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma\_H1_i^2$$

$$d\_H1_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma\_H1_i^2$$

$$d\_H1_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,i} \sigma\_H1_i^2$$

Note For the AS positioning service the x and y axes define an arbitrary orthogonal basis in the hori ontal plane

$$\sigma\_H1_i^2 = \left(\frac{M_i}{U_i}\right)\sigma_{pr\_gnd,i}^2 + \sigma_{pr\_air,i}^2 + \sigma_{tropo,i}^2 + \sigma_{iono,i}^2$$

M_i the number of reference receivers used to compute the pseudo-range corrections for the ith ranging source (indicated by the B values).

U_i the number of reference receivers used to compute the pseudo-range corrections for the ith ranging source, excluding the jth reference receiver.

Note A latent fault includes any erroneous measurement(s) that is not immediately detected by the ground subsystem such that the broadcast data are affected and there is an induced position error in the aircraft subsystem

3.6.5.5.2.3 *Definition of multipliers for AS positioning service* The multiplier K_{ffmd_POS} is equal to 10.0 and the multiplier K_{md_POS}, is equal to 5.3.

3.6.5.6 *A ERT IMITS*

Note uidance concerning the calculation of alert limits including approaches associated with channel numbers to is provided in Attachment D

3.6.5.6.1 *Category I precision approach alert limits* The alert limits are defined in Tables B-68 and B-69. For aircraft positions at which the lateral deviation exceeds twice the deviation at which full-scale lateral deflection of a course deviation indicator is achieved, or vertical deviation exceeds twice the deviation at which full-scale fly-down deflection of a course deviation indicator is achieved, both the lateral and vertical alert limits are set to the maximum values given in the tables.

3.6.5.6.2 *AP alert limits*. The alert limits are equal to the FASLAL and FASVAL for approaches with channel numbers in the range of 20 001 to 39 999. For approaches with channel numbers in the range 40 000 to 99 999, the alert limits are stored in the on-board database.

3.6.5.7 *Channel number* Each GBAS approach transmitted from the ground subsystem is associated with a channel number in the range of 20 001 to 39 999. If provided, the GBAS positioning service is associated with a separate channel number in the range of 20 001 to 39 999. The channel number is given by:

Channel number 20 000 40(F 108.0) 411(S)

where

F the data broadcast frequency (MHz)
S RPDS or RSDS

and

RPDS the reference path data selector for the FAS data block (as defined in 3.6.4.5.1)
RSDS the reference station data selector for the GBAS ground subsystem (as defined in 3.6.4.3.1)

For channel numbers transmitted in the additional data block 2 of Type 2 message (as defined in 3.6.4.3.2.1), only RSDS are used.

able 6 Category lateral alert limit

Horizontal distance of aircraft position from the LTP/FTP as translated along the final approach path (metres)	Lateral alert limit (metres)
291 D ≤ 873	FASLAL
873 D ≤ 7 500	0.0044D (m) FASLAL 3.85
D 7 500	FASLAL 29.15

able 6 Category ertical alert limit

Height above LTP/FTP of aircraft position translated onto the final approach path (feet)	Vertical alert limit (metres)
100 H ≤ 200	FASVAL
200 H ≤ 1 340	0.02925H (ft) FASVAL 5.85
H 1 340	FASVAL 33.35

Note hen the FAS is not broadcast for an AP the AS approach is associated with a channel number in the range to

Note uidance material concerning channel number selection is provided in Attachment D

3.6.5.8 *EP EMERIS ERR R P SITI N UND*

Note Ephemeris error position bounds are computed only for core satellite constellation ranging sources used in the position solution (j index) and not for other types of ranging sources (S AS satellites or pseudolites) that are not subject to undetected ephemeris failures owever the calculations of these position bounds use information from all ranging sources used in the position solution (i index)

3.6.5.8.1 *Category I precision approach and AP* The vertical and lateral ephemeris error position bounds are defined as:

$$VEB \quad \underset{j}{MAX} \ VEB_j$$

$$LEB \quad \underset{j}{MAX} \ LEB_j$$

The vertical and lateral ephemeris error position bounds for the j^{th} core satellite constellation ranging source used in the position solution are given by:

$$VEB_j = \left| s\_vert_j \right| x_{air} P_j + K_{md\_e,j} \sqrt{\sum_{i=1}^{N} s\_vert_i^2 \times \sigma_i^2}$$

$$LEB_j = \left| s\_lat_j \right| x_{air} P_j + K_{md\_e,j} \sqrt{\sum_{i=1}^{N} s\_lat_i^2 \times \sigma_i^2}$$

where:

$s\_vert_{i \text{ or } j}$	is defined in 3.6.5.5.1.1
$s\_lat_{i \text{ or } j}$	is defined in 3.6.5.5.1.1
x_{air}	is defined in 3.6.5.4
N	is the number of ranging sources used in the position solution
σ_i	is defined in 3.6.5.5.1.1
P_j	is the broadcast ephemeris decorrelation parameter for the j^{th} ranging source
$K_{md\_e,j}$	is the broadcast ephemeris missed detection multiplier for Category I precision approach and APV associated with the satellite constellation for the j^{th} ranging source ($K_{md\_e,GPS}$ or $K_{md\_e,GLONASS}$)

3.6.5.8.2 *AS positioning service*. The horizontal ephemeris error position bound is defined as:

$$HEB \quad \underset{j}{MAX} \ HEB_j$$

The horizontal ephemeris error position bound for the j^{th} core satellite constellation ranging source used in the position solution is given by:

$$HEB_j = \left| s_{horz,j} \right| x_{air} P_j + K_{md\_e\_POS} \, d_{major}$$

where:

$s_{horz,j}^{2} = s_{xj}^{2} + s_{yj}^{2}$

$s_{x,j}$ is as defined in 3.6.5.5.2.1
$s_{y,j}$ is as defined in 3.6.5.5.2.1
x_{air} is defined in 3.6.5.4
P_j is the broadcast ephemeris decorrelation parameter for the j^{th} ranging source
$K_{md\_e\_POS}$ is the broadcast ephemeris missed detection multiplier for the GBAS positioning service associated with the satellite constellation for the j^{th} ranging source ($K_{md\_e\_POS,GPS}$ or $K_{md\_e\_POS,GLONASS}$)
d_{major} is as defined in 3.6.5.5.2.1

3.6.6 MESSAGE TABLES

Each GBAS message shall be coded in accordance with the corresponding message format defined in Tables B-70 through B-73.

Note Message type structure is defined in

3.6.7 NON-AIRCRAFT ELEMENTS

3.6.7.1 *PERF RMANCE*

3.6.7.1.1 *Accuracy*

3.6.7.1.1.1 The root-mean-square (RMS) (1 sigma) of the ground subsystem contribution to the corrected pseudo-range accuracy for GPS and GLONASS satellites shall be:

$$RMS_{pr\_gnd} \le \sqrt{\frac{(a_0 + a_1 e^{-\theta_n/\theta_0})^2}{M} + (a_2)^2}$$

where

M	the number of GNSS reference receivers, as indicated in the Type 2 message parameter (3.6.4.3), or, when this parameter is coded to indicate “not applicable”, the value of M is defined as 1;
n	n^{th} ranging source;
θ_n	elevation angle for the n^{th} ranging source; and
a_0, a_1, a_2, and θ_0	parameters defined in Tables B-74 and B-75 for each of the defined ground accuracy designators (GADs).

Note The AS ground subsystem accuracy re uirement is determined by the AD letter and the number of installed reference receivers

Note The ground subsystem contribution to the corrected pseudo range error specified by the curves defined in Tables and and the contribution to the S AS satellites do not include aircraft noise and aircraft multipath

able 0 ype 1 pseudo range corrections message

Data content	Bits used	Range of values	Resolution
Modified -count	14	0 to 1 199.9 s	0.1 s
Additional message flag	2	0 to 3	1
Number of measurements (N)	5	0 to 18	1
Measurement type	3	0 to 7	1
Ephemeris decorrelation parameter (P)	8	0 to 1.275 10^{3} m/m	5 10^{6} m/m
Ephemeris CRC	16	—	—
Source availability duration	8	0 to 2 540 s	10 s
For N measurement blocks			
Ranging source ID	8	1 to 255	1
Issue of data (IOD)	8	0 to 255	1
Pseudo-range correction (PRC)	16	327.67 m	0.01 m
Range rate correction (RRC)	16	32.767 m/s	0.001 m/s
σ_{pr_gnd}	8	0 to 5.08 m	0.02 m
B_1	8	6.35 m	0.05 m
B_2	8	6.35 m	0.05 m
B_3	8	6.35 m	0.05 m
B_4	8	6.35 m	0.05 m

able 0A ype 101 RAS pseudo range corrections message

Data content	Bits used	Range of values	Resolution
Modified -count	14	0 to 1 199.9 s	0.1 s
Additional message flag	2	0 to 3	1
Number of measurements (N)	5	0 to 18	1
Measurement type	3	0 to 7	1
Ephemeris decorrelation parameter (P)	8	0 to 1.275 10^{3} m/m	5 10^{6} m/m
Ephemeris CRC	16	—	—
Source availability duration	8	0 to 2540 s	10 s
Number of B parameters	1	0 or 4	—
Spare	7	—	—
For N measurement blocks			
Ranging source ID	8	1 to 255	1
Issue of data (IOD)	8	0 to 255	1
Pseudo-range correction (PRC)	16	327.67 m	0.01 m
Range rate correction (RRC)	16	327.67 m/s	0.001 m/s
σ_{pr_gnd}	8	0 to 50.8 m	0.2 m
B parameter block (if provided)			
B_1	8	25.4 m	0.2 m
B_2	8	25.4 m	0.2 m
B_3	8	25.4 m	0.2 m
B_4	8	25.4 m	0.2 m

able 1 ype 2 AS related data message

Data content	Bits used	Range of values	Resolution
GBAS reference receivers	2	2 to 4	—
Ground accuracy designator letter	2	—	—
Spare	1	—	—
GBAS continuity/integrity designator	3	0 to 7	1
Local magnetic variation	11	180	0.25
Spare	5	—	—
$\sigma_{vert\_iono\_gradient}$	8	0 to 25.5 10 ^{6} m/m	0.1 10 ^{6} m/m
Refractivity index	8	16 to 781	3
Scale height	8	0 to 25 500 m	100 m
Refractivity uncertainty	8	0 to 255	1
Latitude	32	90.0	0.0005 arcsec
Longitude	32	180.0	0.0005 arcsec
GBAS reference point height	24	83 886.07 m	0.01 m
Additional data block 1 (if provided)			
Reference station data selector	8	0 to 48	1
Maximum use distance (D_{max})	8	2 to 510 km	2 km
$K_{md\_e\_POS,GPS}$	8	0 to 12.75	0.05
$K_{md\_e,GPS}$	8	0 to 12.75	0.05
$K_{md\_e\_POS,GLONASS}$	8	0 to 12.75	0.05
$K_{md\_e,GLONASS}$	8	0 to 12.75	0.05
Additional data block 2 (if provided)			
Additional data block length	8	2 to 255	1
Additional data block number	8	2 to 255	1
Additional data parameters	Variable	—	—

able 2 ype FAS data message

Data content	Bits used	Range of values	Resolution
For N data sets			
Data set length	8	2 to 212	1 byte
FAS data block	304	—	—
FAS vertical alert limit/approach status	8		
(1) when associated approach performance designator indicates APV-I (APD coded as 0)		0 to 50.8 m	0.2 m
(2) when associated approach performance designator does not indicate APV-I (APD not coded as 0)		0 to 25.4 m	0.1 m
FAS lateral alert limit/approach status	8	0 to 50.8 m	0.2 m

able 3 ype predicted ranging source a ailability message

Data content	Bits used	Range of values	Resolution
Modified -count	14	0 to 1 199.9 s	0.1 s
Spare	2	—	—
Number of impacted sources (N)	8	0 to 31	1
For N impacted sources			
Ranging source ID	8	1 to 255	1
Source availability sense	1	—	—
Source availability duration	7	0 to 1 270 s	10 s
Number of obstructed approaches (A)	8	0 to 255	1
For A obstructed approaches			
Reference path data selector	8	0 to 48	—
Number of impacted sources for this approach (N_A)	8	1 to 31	1
For N_A impacted ranging sources for this approach			
Ranging source ID	8	1 to 255	1
Source availability sense	1	—	—
Source availability duration	7	0 to 1 270 s	10 s

able AS S accuracy re uirement parameters

Ground accuracy designator letter	θ_n (degrees)	a_0 (metres)	a_1 (metres)	θ_0 (degrees)	a_2 (metres)
A	≥ 5	0.5	1.65	14.3	0.08
B	≥ 5	0.16	1.07	15.5	0.08
C	35	0.15	0.84	15.5	0.04
	5 to 35	0.24	0	—	0.04

able AS O ASS accuracy re uirement parameters

Ground accuracy designator letter	θ_n (degrees)	a_0 (metres)	a_1 (metres)	θ_0 (degrees)	a_2 (metres)
A	≥ 5	1.58	5.18	14.3	0.078
B	≥ 5	0.3	2.12	15.5	0.078
C	35	0.3	1.68	15.5	0.042
	5 to 35	0.48	0	—	0.042

3.6.7.1.1.2 The RMS of the ground subsystem contribution to the corrected pseudo-range accuracy for SBAS satellites shall be:

$$\mathrm{RMS}_{\mathrm{pr\_gnd}} \le \frac{1.8}{\sqrt{\mathrm{M}}}\text{(metres)}$$

where M is as defined in 3.6.7.1.1.1.

Note AD classifications for S AS ranging sources are under development

3.6.7.1.2 *Integrity*

3.6.7.1.2.1 *AS ground subsystem integrity ris*

3.6.7.1.2.1.1 *Category I precision approach and AP* For a GBAS ground subsystem that provides the Category I precision approach or APV, the integrity risk shall be less than 1.5 10 7 per approach.

Note The integrity ris assigned to the AS ground subsystem is a subset of the AS signal in space integrity ris where the protection level integrity ris ( ) has been excluded and the effects of all other AS S AS and core satellite constellations failures are included The AS ground subsystem integrity ris includes the integrity ris of satellite signal monitoring re uired in and the integrity ris associated with the monitoring in

Note AS signal in space integrity ris is defined as the probability that the ground subsystem provides information which when processed by a fault free receiver using any AS data that could be used by the aircraft results in an out of tolerance lateral or vertical relative position error without annunciation for a period longer than the maximum time to alert An out of tolerance lateral or vertical relative position error is defined as an error that exceeds the Category I precision approach or AP protection level and if additional data bloc is broadcast the ephemeris error position bound

3.6.7.1.2.1.1.1 The GBAS ground subsystem maximum time-to-alert shall be less than or equal to 3 seconds when Type 1 messages are broadcast.

Note The time to alert above is the time between the onset of the out of tolerance lateral or vertical relative position error and the transmission of the last bit of the message that contains the integrity data that reflects the condition

3.6.7.1.2.1.1.2 The GBAS ground subsystem maximum time-to-alert shall be less than or equal to 5.5 seconds when Type 101 messages are broadcast.

3.6.7.1.2.1.1.3 For Category I precision approach, the value FASLAL for each FAS block, as defined in the FAS lateral alert limit field of the Type 4 message shall be no greater than 40 metres, and the value FASVAL for each FAS block, as defined in the FAS vertical alert limit field of the Type 4 message, shall be no greater than 10 metres.

3.6.7.1.2.1.1.4 For APV, the value FASLAL and FASVAL shall be no greater than the lateral and vertical alert limits given in Annex 10, Volume I, 3.7.2.4.

3.6.7.1.2.1.2 *AS positioning service*. For GBAS ground subsystem that provides the GBAS positioning service, integrity risk shall be less than 9.9 10 8 per hour.

Note The integrity ris assigned to the AS ground subsystem is a subset of the AS signal in space integrity ris where the protection level integrity ris ( ) has been excluded and the effects of all other AS S AS and core satellite constellations failures are included The AS ground subsystem integrity ris includes the integrity ris of satellite signal monitoring re uired in and the integrity ris associated with the monitoring in

Note AS signal in space integrity ris is defined as the probability that the ground subsystem provides information which when processed by a fault free receiver using any AS data that could be used by the aircraft results in an out of tolerance hori ontal relative position error without annunciation for a period longer than the maximum time to alert An out of tolerance hori ontal relative position error is defined as an error that exceeds both the hori ontal protection level and the hori ontal ephemeris error position bound

3.6.7.1.2.1.2.1 The GBAS ground subsystem maximum time-to-alert shall be less than or equal to 3 seconds when Type 1 messages are broadcast and less than or equal to 5.5 seconds when Type 101 messages are broadcast.

Note The time to alert above is the time between the onset of the out of tolerance hori ontal relative position error and the transmission of the last bit of the message that contains the integrity data that reflects the condition

3.6.7.1.2.2 *Protection level integrity ris*

3.6.7.1.2.2.1 For a GBAS ground subsystem that provides the Category I precision approach or APV, the protection level integrity risk shall be less than 5 10^{8} per approach.

Note The Category I precision approach and AP protection level integrity ris is the integrity ris due to undetected errors in position relative to the AS reference point greater than the associated protection levels under the two following conditions

a) normal measurement conditions defined in and

b) faulted measurement conditions defined in

3.6.7.1.2.2.2 For a GBAS ground subsystem that provides the positioning service, protection level integrity risk shall be less than 10^{9} per hour.

Note The AS positioning service protection level integrity ris is the integrity ris due to undetected errors in the hori ontal position relative to the AS reference point greater than the AS positioning service protection level under the two following conditions

a) normal measurement conditions defined in and

b) faulted measurement conditions defined in

3.6.7.1.3 *Continuity of service*

3.6.7.1.3.1 *Continuity of service for Category I precision approach and AP* The GBAS ground subsystem continuity of service shall be greater than or equal to 1 3.3 10^{6} during any 15 seconds.

Note The AS ground subsystem continuity of service is the probability that during any second period the F data broadcast transmits data in tolerance F data broadcast field strength is within the specified range and the protection levels are lower than the alert limits unless configuration changes occur due to the space segment

3.6.7.1.3.2 *Continuity of service for positioning service*

Note For AS ground subsystems that provide the AS positioning service there may be additional continuity re uirements depending on the intended operations

3.6.7.2 *FUNCTI NA RE UIREMENTS*

3.6.7.2.1 *eneral*

3.6.7.2.1.1 *Data broadcast rates*

3.6.7.2.1.1.1 A GBAS ground subsystem that supports Category I precision approach or APV-II shall broadcast Type 1 messages. A GBAS ground subsystem that does not support Category I precision approach or APV-II shall broadcast either Type 1 or Type 101 messages. A GBAS ground subsystem shall not broadcast both Type 1 and Type 101 messages.

Note uidance material concerning usage of the Type message is provided in Attachment D

3.6.7.2.1.1.2 Each GBAS ground subsystem shall broadcast Type 2 messages.

3.6.7.2.1.1.3 Each GBAS ground subsystem shall broadcast FAS blocks in Type 4 messages for all Category I precision approaches supported by that GBAS ground subsystem. If a GBAS ground subsystem supports APV and does not broadcast FAS blocks for the corresponding approaches, it shall broadcast additional data block 1 in the Type 2 message.

Note FAS bloc s for AP procedures may be held within a database on board the aircraft roadcasting additional data bloc allows the airborne receiver to select the AS ground subsystem that supports the approach procedures in the airborne database FAS bloc s may also be broadcast to support operations by aircraft without an airborne database These procedures use different channel numbers as described in Attachment D

3.6.7.2.1.1.4 When the Type 5 message is used, the ground subsystem shall broadcast the Type 5 message at a rate in accordance with Table B-76.

Note hen the standard degree mas is not ade uate to describe satellite visibility at either the ground subsystem antennas or at an aircraft during a specific approach the Type message may be used to broadcast additional information to the aircraft

3.6.7.2.1.1.5 *Data broadcast rates* For all message types required to be broadcast, messages meeting the field strength requirements of Chapter 3, 3.7.3.5.4.4.1.2 and 3.7.3.5.4.4.2.2 and the minimum rates shown in Table B-76 shall be provided at every point within the coverage. The total message broadcast rates from all antenna systems of the ground subsystem combined shall not exceed the maximum rates shown in Table B-76.

Note uidance material concerning the use of multiple antenna systems is provided in Attachment D

3.6.7.2.1.2 *Message bloc identifier* The MBI shall be set to either normal or test according to the coding given in 3.6.3.4.1.

3.6.7.2.2 *Pseudo range corrections*

3.6.7.2.2.1 *Message latency*. The time between the time indicated by the modified -count and the last bit of the broadcast Type 1 or Type 101 message shall not exceed 0.5 seconds.

able 6 AS HF data broadcast rates

Message type	Minimum broadcast rate	Maximum broadcast rate
1 or 101	For each measurement type: All measurement blocks once per frame (Note)	For each measurement type: All measurement blocks once per slot
2	Once per 20 consecutive frames	Once per frame
4	All FAS blocks once per 20 consecutive frames	All FAS blocks once per frame
5	All impacted sources once per 20 consecutive frames	All impacted sources once per 5 consecutive frames

Note ne Type or Type message or two Type or Type messages that are lin ed using the additional message flag described in

3.6.7.2.2.2 *ow fre uency data*. Except during an ephemeris change, the first ranging source in the message shall sequence so that the ephemeris decorrelation parameter, ephemeris CRC and source availability duration for each core satellite constellation s ranging source are transmitted at least once every 10 seconds. During an ephemeris change, the first ranging source shall sequence so that the ephemeris decorrelation parameter, ephemeris CRC and source availability duration for each core satellite constellation s ranging source are transmitted at least once every 27 seconds. When new ephemeris data are received from a core satellite constellation s ranging source, the ground subsystem shall use the previous ephemeris data from each satellite until the new ephemeris data have been continuously received for at least 2 minutes but shall make a transition to the new ephemeris data before 3 minutes have passed. When this transition is made to using the new ephemeris data for a given ranging source, the ground subsystem shall broadcast the new ephemeris CRC for all occurrences of that ranging source in the low-frequency information of Type 1 or Type 101 message in the next 3 consecutive frames. For a given ranging source, the ground subsystem shall continue to transmit data corresponding to the previous ephemeris data until the new CRC ephemeris is transmitted in the low-frequency data of Type 1 or Type 101 message (see Note). If the ephemeris CRC changes and the IOD does not, the ground subsystem shall consider the ranging source invalid.

Note The delay before the ephemeris transition allow sufficient time for the aircraft subsystem to collect new ephemeris data

3.6.7.2.2.2.1 **Recommendation** *The ephemeris decorrelation parameter and the ephemeris CRC for each core satellite constellation s ranging source should be broadcast as fre uently as possible*

3.6.7.2.2.3 *roadcast pseudo range correction*. Each broadcast pseudo-range correction shall be determined by combining the pseudo-range correction estimates for the relevant ranging source calculated from each of the reference receivers. For each satellite, the measurements used in this combination shall be obtained from the same ephemeris data. The corrections shall be based on smoothed code pseudo-range measurements for each satellite using the carrier measurement from a smoothing filter in accordance with 3.6.5.1.

3.6.7.2.2.4 *roadcast signal in space integrity parameters*. The ground subsystem shall provide σ_{pr_gnd} and B parameters for each pseudo-range correction in Type 1 message such that the protection level integrity risk requirements defined in 3.6.7.1.2.2 are satisfied. The ground subsystem shall provide σ_{pr_gnd} and, if necessary, B parameters for each pseudo-range correction in Type 101 message such that the protection level integrity risk requirements defined in 3.6.7.1.2.2 are satisfied.

Note roadcast of the parameters are optional for Type messages uidance material regarding the parameters in Type messages is contained in Attachment D

3.6.7.2.2.5 **Recommendation** *Reference receiver measurements should be monitored Faulted measurements or failed reference receivers should not be used to compute the pseudo range corrections*

3.6.7.2.2.6 *Repeated transmission of Type or Type messages* For a given measurement type and within a given frame, all broadcasts of Type 1 or Type 101 messages or linked pairs from all GBAS broadcast stations that share a common GBAS identification, shall have identical data content.

3.6.7.2.2.7 *Issue of data* The GBAS ground subsystem shall set the IOD field in each ranging source measurement block to be the IOD value received from the ranging source that corresponds to the ephemeris data used to compute the pseudo-range correction.

3.6.7.2.2.8 *Application of signal error models*. Ionospheric and tropospheric corrections shall not be applied to the pseudo-ranges used to calculate the pseudo-range corrections.

3.6.7.2.2.9 *in ed pair of Type or Type messages* If a linked pair of Type 1 or Type 101 messages is transmitted then,

a) the two messages shall have the same modified -count;

b) the minimum number of pseudo-range corrections in each message shall be one;

c) the measurement block for a given satellite shall not be broadcast more than once in a linked pair of messages; and

d) the two messages shall be broadcast in different time slots.

3.6.7.2.2.10 *Modified count update* The modified -count for Type 1 or Type 101 messages of a given measurement type shall advance every frame.

3.6.7.2.2.11 *Ephemeris decorrelation parameters*

3.6.7.2.2.11.1 *Category I precision approach and AP* . For ground subsystems that broadcast the additional data block 1 in the Type 2 message, the ground subsystem shall broadcast the ephemeris decorrelation parameter for each core satellite constellation ranging source such that the ground subsystem integrity risk of 3.6.7.1.2.1.1 is met.

3.6.7.2.2.11.2 *AS positioning service*. For ground subsystems that provide the GBAS positioning service, the ground subsystem shall broadcast the ephemeris decorrelation parameter for each core satellite constellation s ranging source such that the ground subsystem integrity risk of 3.6.7.1.2.1.2 is met.

3.6.7.2.3 *AS related data*

3.6.7.2.3.1 *Tropospheric delay parameters* The ground subsystem shall broadcast a refractivity index, scale height, and refractivity uncertainty in a Type 2 message such that the protection level integrity risk requirements defined in 3.6.7.1.2.2 are satisfied.

3.6.7.2.3.2 *CID indication*. If the ground subsystem meets the requirements of 3.6.7.1.2.1.1, 3.6.7.1.2.2.1 and 3.6.7.1.3.1 the GCID shall be set to 1 otherwise it shall be set to 7.

3.6.7.2.3.3 *AS reference antenna phase centre position accuracy*. For each GBAS reference receiver, the reference antenna phase centre position error shall be less than 8 cm relative to the GBAS reference point.

3.6.7.2.3.4 **Recommendation** *AS reference point survey accuracy The survey error of the AS reference point relative to S should be less than m vertical and m hori ontal*

Note Relevant guidance material is given in Attachment D

3.6.7.2.3.5 *Ionospheric uncertainty estimate parameter* The ground subsystem shall broadcast an ionospheric delay gradient parameter in the Type 2 message such that the protection level integrity risk requirements defined in 3.6.7.1.2.2 are satisfied.

3.6.7.2.3.6 For ground subsystems that provide the GBAS positioning service, the ground subsystem shall broadcast the ephemeris error position bound parameters using additional data block 1 in the Type 2 message.

3.6.7.2.3.7 **Recommendation** *All ground subsystems should broadcast the ephemeris error position bound parameters using additional data bloc in the Type message*

3.6.7.2.3.8 For ground subsystems that broadcast additional data block 1 in the Type 2 message, the following requirements shall apply:

3.6.7.2.3.8.1 *Maximum use distance*. The ground subsystem shall provide the distance (D_{max}) from the GBAS reference point that defines a volume within which the ground subsystem integrity risk in 3.6.7.1.2.1 and the protection level integrity risk in 3.6.7.1.2.2 are met.

3.6.7.2.3.8.2 *Ephemeris missed detection parameters*. The ground subsystem shall broadcast the ephemeris missed detection parameters for each core satellite constellation such that the ground subsystem integrity risk of 3.6.7.1.2.1 is met.

3.6.7.2.3.8.3 *AS positioning service indication*. If the ground subsystem does not meet the requirements of 3.6.7.1.2.1.2 and 3.6.7.1.2.2.2, the ground subsystem shall indicate using the RSDS parameter that the GBAS positioning service is not provided.

3.6.7.2.3.9 If the VHF data broadcast is transmitted at more than one frequency within the GRAS service area, each GBAS broadcast station within the GRAS ground subsystem shall broadcast additional data blocks 1 and 2.

3.6.7.2.3.9.1 **Recommendation —** *The F data broadcast should include additional data bloc parameters to identify channel numbers and locations of adjacent and nearby AS broadcast stations within the RAS ground subsystem*

Note This facilitates the transition from one AS broadcast station to other AS broadcast stations in the RAS ground subsystem

3.6.7.2.4 *Final approach segment data*

3.6.7.2.4.1 *FAS data points accuracy*. The relative survey error between the FAS data points and the GBAS reference point shall be less than 0.25 metres vertical and 0.40 metres horizontal.

3.6.7.2.4.2 *S AS FAS data points accuracy* For use with SBAS, the survey error of all the FAS data points, relative to WGS-84, shall be less than 0.25 metres vertical and 1 metre horizontal.

3.6.7.2.4.3 **Recommendation** *The final approach segment CRC should be assigned at the time of procedure design and ept as an integral part of the FAS data bloc from that time onward*

3.6.7.2.4.4 **Recommendation** *The AS should allow the capability to set the FAS A and FAS A for any FAS data bloc to to limit the approach to lateral only or to indicate that the approach must not be used respectively*

3.6.7.2.5 *Predicted ranging source availability data*

Note Ranging source availability data are optional for Category I and AP and may be re uired for possible future operations

3.6.7.2.6 *Integrity monitoring for NSS ranging sources*. The ground subsystem shall monitor the satellite signals to detect conditions that will result in improper operation of differential processing for airborne receivers complying with the tracking constraints in Attachment D, 8.11. The ground subsystem shall use the strongest correlation peak in all receivers used to generate the pseudo-range corrections. The monitor time-to-alert shall comply with 3.6.7.1.2. The monitor action shall be to set σ_{pr_gnd} to the bit pattern “1111 1111” for the satellite or to exclude the satellite from the Type 1 or Type 101 message. The ground subsystem shall also detect conditions that cause more than one zero crossing for airborne receivers that use the Early-Late discriminator function as described in Attachment D, 8.11.

3.6.7.3 *M NIT RIN*

3.6.7.3.1 *RF monitoring*

3.6.7.3.1.1 *F data broadcast monitoring* The data broadcast transmissions shall be monitored. The transmission of the data shall cease within 0.5 seconds in case of continuous disagreement during any 3-second period between the transmitted application data and the application data derived or stored by the monitoring system prior to transmission.

3.6.7.3.1.2 *TDMA slot monitoring* The risk that the ground subsystem transmits a signal in an unassigned slot and fails to detect an out-of-slot transmission, which exceeds that allowed in 3.6.2.6, within 1 second, shall be less than 1 10 ^{7} in any 30-second period. If out-of-slot transmissions are detected, the ground subsystem shall terminate all data broadcast transmissions within 0.5 seconds.

3.6.7.3.1.3 *D transmitter power monitor* The probability that the horizontally or elliptically polarized signal s transmitted power increases by more than 3 dB from the nominal power for more than 1 second shall be less than 2.0 10 ^{7} in any 30-second period.

Note The vertical component is only monitored for AS E e uipment

3.6.7.3.2 *Data monitoring*

3.6.7.3.2.1 *roadcast uality monitor*. The ground subsystem monitoring shall comply with the time-to-alert requirements given in 3.6.7.1.2.1. The monitoring action shall be one of the following:

a) to broadcast Type 1 or Type 101 messages with no measurement blocks; or

b) to broadcast Type 1 or Type 101 messages with the $\sigma_{pr\_gnd,i}$ field set to indicate the ranging source is invalid for every ranging source included in the previously transmitted frame; or

c) to terminate the data broadcast.

Note Monitoring actions a) and b) are preferred to c) if the particular failure mode permits such a response because actions a) and b) typically have a reduced signal in space time to alert

3.6.7.4 *R UND ASED RAN IN S URCES*

Note round based ranging systems are expected to use a portion of the M band which will be classified by the ITU as providing RNSS ARNS service and are expected to re uire up to M around their centre fre uency As augmentations to PS and or NASS they will constitute components of NSS and will have associated avionics receivers Their interference protection level must be consistent with the interference environment of NSS receivers

3.6.8 AIRCRAFT ELEMENTS

3.6.8.1 *NSS receiver* The GBAS-capable GNSS receiver shall process signals of GBAS in accordance with the requirements specified in this section as well as with requirements in 3.1.3.1 and/or 3.2.3.1 and/or 3.5.8.1.

Note A AS capable NSS receiver may be implemented without the capability to process the Type message the Type message additional data bloc or data specific to an approach performance designator value of

3.6.8.2 *PERF RMANCE RE UIREMENTS*

3.6.8.2.1 *AS aircraft receiver accuracy*

3.6.8.2.1.1 The RMS of the total aircraft receiver contribution to the error for GPS and GLONASS shall be:

$$RMS_{pr\_air}(\theta_n) \le a_0 \quad a_1 \quad e^{(\theta_n/\theta_0)}$$

where

n — the n[th] ranging source;
θ_n — the elevation angle for the n[th] ranging source; and
a_0, a_1, and θ_0 — as defined in Table B-77 for GPS and Table B-78 for GLONASS.

3.6.8.2.1.2 The RMS of the total aircraft receiver contribution to the error for SBAS satellites shall be as defined in 3.5.8.2.1 for each of the defined aircraft accuracy designators.

Note The aircraft receiver contribution does not include the measurement error induced by airframe multipath

3.6.8.2.2 *F data broadcast receiver performance*

3.6.8.2.2.1 *F data broadcast tuning range* The VHF data broadcast receiver shall be capable of tuning frequencies in the range of 108.000 117.975 MHz in increments of 25 kHz.

3.6.8.2.2.2 *F data broadcast capture range* The VHF data broadcast receiver shall be capable of acquiring and maintaining lock on signals within 418 Hz of the nominal assigned frequency.

Note The fre uency stability of the AS ground subsystem and the worst case doppler shift due to the motion of the aircraft are reflected in the above re uirement The dynamic range of the automatic fre uency control should also consider the fre uency stability error budget of the aircraft F data broadcast receiver

3.6.8.2.2.3 *F data broadcast sensitivity range and message failure rate*. The VHF data broadcast receiver shall achieve a message failure rate less than or equal to one failed message per 1 000 full-length (222 bytes) application data messages, while operating over a range from 87 dBm to 1 dBm, provided that the variation in the average received signal power between successive bursts in a given time slot does not exceed 40 dB. Failed messages include those lost by the VHF data broadcast receiver system or which do not pass the CRC after application of the FEC.

able Aircraft S recei er accuracy re uirement

Aircraft accuracy designator	θ_n (degrees)	a_0 (metres)	a_1 (metres)	θ_0 (degrees)
A	≥5	0.15	0.43	6.9
B	≥5	0.11	0.13	4

able Aircraft O ASS recei er accuracy re uirement

Aircraft accuracy designator	θ_n (degrees)	a_0 (metres)	a_1 (metres)	θ_0 (degrees)
A	≥5	0.39	0.9	5.7
B	≥5	0.105	0.25	5.5

Note Aircraft F data broadcast receiving antenna can be hori ontally or vertically polari ed Due to the difference in the signal strength of hori ontally and vertically polari ed components of the broadcast signal the total aircraft implementation loss is limited to d for hori ontally polari ed receiving antennas and d for vertically polari ed receiving antennas

3.6.8.2.2.4 *F data broadcast time slot decoding*. The VHF data broadcast receiver shall meet the requirements of 3.6.8.2.2.3 for all Type 1, 2 and 4 messages from the selected GBAS ground subsystem. These requirements shall be met in the presence of other GBAS transmissions in any and all time slots respecting the levels as indicated in 3.6.8.2.2.5.1 b).

Note ther AS transmissions may include a) messages other than Type and with the same SSID and b) messages with different SSIDs

3.6.8.2.2.4.1 *Decoding of Type messages*. A VHF data broadcast receiver capable of receiving Type 101 messages, shall meet the requirements of 3.6.8.2.2.3 for all Type 101 messages from the selected GBAS ground subsystem. These requirements shall be met in the presence of other GBAS transmissions in any and all time slots respecting the levels as indicated in 3.6.8.2.2.5.1 b).

3.6.8.2.2.5 *Co channel rejection*

3.6.8.2.2.5.1 *F data broadcast as the undesired signal source*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of an undesired co-channel VHF data broadcast signal that is either:

a) assigned to the same time slot(s) and 26 dB below the desired VHF data broadcast signal power or lower; or

b) assigned different time slot(s) and whose power is up to 15 dBm at the receiver input.

3.6.8.2.2.5.2 *R as the undesired signal*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of an undesired co-channel VOR signal that is 26 dB below the desired VHF data broadcast signal power.

3.6.8.2.2.6 *Adjacent channel rejection*

3.6.8.2.2.6.1 *First adjacent channels ( )* The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of a transmitted undesired signal offset by 25 kHz on either side of the desired channel that is either:

a) 18 dB above the desired signal power when the undesired signal is another VHF data broadcast signal assigned to the same time slot(s); or

b) equal in power when the undesired signal is VOR.

3.6.8.2.2.6.2 *Second adjacent channels ( )*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of a transmitted undesired signal offset by 50 kHz on either side of the desired channel that is either:

a) 43 dB above the desired signal power when the undesired signal is another VHF data broadcast source assigned to the same time slot(s); or

b) 34 dB above the desired signal power when the undesired signal is VOR.

3.6.8.2.2.6.3 *Third and beyond adjacent channels (or more)*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of a transmitted undesired signal offset by 75 kHz or more on either side of the desired channel that is either:

a) 46 dB above the desired signal power when the undesired signal is another VHF data broadcast signal assigned to the same time slot(s); or

b) 46 dB above the desired signal power when the undesired signal is VOR.

3.6.8.2.2.7 *Rejection of off channel signals from sources inside the M band* With no on-channel VHF data broadcast signal present, the VHF data broadcast receiver shall not output data from an undesired VHF data broadcast signal on any other assignable channel.

3.6.8.2.2.8 *Rejection of signals from sources outside the M band*

3.6.8.2.2.8.1 *F data broadcast interference immunity* The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of one or more signals having the frequency and total interference levels specified in Table B-79.

3.6.8.2.2.8.2 *Desensiti ation*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of VHF FM broadcast signals with signal levels shown in Tables B-80 and B-81.

3.6.8.2.2.8.3 *F data broadcast FM intermodulation immunity*. The VHF data broadcast receiver shall meet the requirements specified in 3.6.8.2.2.3 in the presence of interference from two-signal, third-order intermodulation products of two VHF FM broadcast signals having levels in accordance with the following:

$$2N_1 \quad N_2 \quad 72 \leq 0$$

for VHF FM sound broadcasting signals in the range 107.7 108.0 MHz and

$$2N_1 + N_2 + 3\left(24 - 20\log\frac{\Delta f}{0.4}\right) \leq 0$$

for VHF FM sound broadcasting signals below 107.7 MHz

where the frequencies of the two VHF FM sound broadcasting signals produce, within the receiver, a two signal, third-order intermodulation product on the desired VDB frequency.

N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the VHF data broadcast receiver input. Neither level shall exceed the desensitization criteria set forth in 3.6.8.2.2.8.2.

$\Delta f \quad 108.1 \quad f_1$, where f_1 is the frequency of N_1, the VHF FM sound broadcasting signal closer to 108.1 MHz.

Note The FM intermodulation immunity re uirements are not applied to a F data broadcast channel operating below M hence fre uencies below M are not intended for general assignments Additional information is provided in Attachment D

3.6.8.3 *AIRCRAFT FUNCTI NA RE UIREMENTS*

3.6.8.3.1 *Conditions for use of data*

3.6.8.3.1.1 The receiver shall use data from a GBAS message only if the CRC of that message has been verified.

3.6.8.3.1.2 The receiver shall use message data only if the message block identifier is set to the bit pattern “1010 1010”.

3.6.8.3.1.3 The receiver shall use only ranging source measurement blocks with matching modified -counts.

able aximum le els of undesired signals

Frequency	Maximum level of undesired signals at the receiver input (dBm)
50 kHz up to 88 MHz	13
88 MHz 107.900 MHz	(see 3.6.8.2.2.8.2)
108.000 MHz 117.975 MHz	excluded
118.000 MHz	44
118.025 MHz	41
118.050 MHz up to 1 660.5 MHz	13

Notes

The relationship is linear between single adjacent points designated by the above fre uencies

These interference immunity re uirements may not be ade uate to ensure compatibility between F data broadcast receivers and F communication systems particularly for aircraft that use the vertically polari ed component of the F data broadcast ithout coordination between C M and NA fre uencies assignments or respect of a guard band at the top end of the M band the maximum levels uoted at the lowest C M F channels ( ) may be exceeded at the input of the D receivers In that case some means to attenuate the C M signals at the input of the D receivers (e g antenna separation) will have to be implemented The final compatibility will have to be assured when e uipment is installed on the aircraft

able 0 Desensiti ation fre uency and po er re uirements t at apply for D fre uencies from 10 02 to 111 H

Frequency	Maximum level of undesired signals at the receiver input (dBm)
88 MHz ≤ f ≤ 102 MHz	15
104 MHz	10
106 MHz	5
107.9 MHz	10

Notes

The relationship is linear between single adjacent points designated by the above fre uencies

This desensiti ation re uirement is not applied for FM carriers above M and D channels at or M See Attachment D

3.6.8.3.1.4 If D_{max} is broadcast by the ground subsystem, the receiver shall only apply pseudo-range corrections when the distance to the GBAS reference point is less than D_{max}.

3.6.8.3.1.5 The receiver shall only apply pseudo-range corrections from the most recently received set of corrections for a given measurement type. If the number of measurement fields in the most recently received Type 1 or Type 101 message indicates that there are no measurement blocks, then the receiver shall not apply GBAS corrections for that measurement type.

3.6.8.3.1.6 The receiver shall exclude from the differential navigation solution any ranging sources for which σ_{pr_gnd} is set to the bit pattern “1111 1111”.

able 1 Desensiti ation fre uency and po er re uirements t at apply for D fre uencies from 112 000 to 11 H

Frequency	Maximum level of undesired signals at the receiver input (dBm)
88 MHz ≤ f ≤ 104 MHz	15
106 MHz	10
107 MHz	5
107.9 MHz	0

Note The relationship is linear between single adjacent points designated by the above fre uencies

3.6.8.3.1.7 The receiver shall only use a ranging source in the differential navigation solution if the time of applicability indicated by the modified -count in the Type 1 or Type 101 message containing the ephemeris decorrelation parameter for that ranging source is less than 120 seconds old.

3.6.8.3.1.8 *Conditions for use of data to support Category I precision approach and AP*

3.6.8.3.1.8.1 During the final stages of a Category I or APV approach, the receiver shall use only measurement blocks from Type 1 or Type 101 messages that were received within the last 3.5 seconds

3.6.8.3.1.8.2 The receiver shall use message data from a GBAS ground subsystem for Category I precision approach or APV guidance only if the GCID indicates 1, 2, 3 or 4 prior to initiating the final stages of an approach.

3.6.8.3.1.8.3 The receiver shall ignore any changes in GCID during the final stages of an approach.

3.6.8.3.1.8.4 The receiver shall not provide approach vertical guidance based on a particular FAS data block transmitted in a Type 4 message if the FASVAL received prior to initiating the final stages of the approach is set to "1111 1111".

3.6.8.3.1.8.5 The receiver shall not provide approach guidance based on a particular FAS data block transmitted in a Type 4 message if the FASLAL received prior to initiating the final stages of the approach is set to "1111 1111".

3.6.8.3.1.8.6 Changes in the values of FASLAL and FASVAL data transmitted in a Type 4 message during the final stages of an approach shall be ignored by the receiver.

3.6.8.3.1.8.7 The receiver shall use FAS data only if the FAS CRC for that data has been verified.

3.6.8.3.1.8.8 The receiver shall only use messages for which the GBAS ID (in the message block header) matches the GBAS ID in the header of the Type 4 message which contains the selected FAS data or the Type 2 message which contains the selected RSDS.

3.6.8.3.1.8.9 *Use of FAS data*

3.6.8.3.1.8.9.1 The receiver shall use the Type 4 messages to determine the FAS for precision approach.

3.6.8.3.1.8.9.2 The receiver shall use the Type 4 messages to determine the FAS for APV associated with a channel number between 20 001 and 39 999.

3.6.8.3.1.8.9.3 The receiver shall use the FAS held within the on-board database for APV associated with a channel number between 40 000 and 99 999.

3.6.8.3.1.8.10 When the GBAS ground subsystem does not broadcast the Type 4 message and the selected FAS data are available to the receiver from an airborne database, the receiver shall only use messages from the intended GBAS ground subsystem.

3.6.8.3.1.9 *Conditions for use of data to provide the AS positioning service*

3.6.8.3.1.9.1 The receiver shall only use measurement blocks from Type 1 messages that were received within the last 7.5 seconds.

3.6.8.3.1.9.2 The receiver shall only use measurement blocks from Type 101 messages that were received within the last 5 seconds.

3.6.8.3.1.9.3 The receiver shall only use message data if a Type 2 message containing additional data block 1 has been received and the RSDS parameter in this block indicates that the GBAS positioning service is provided.

3.6.8.3.1.9.4 The receiver shall only use messages for which the GBAS ID (in the message block header) matches the GBAS ID in the header of the Type 2 message which contains the selected RSDS.

3.6.8.3.2 *Integrity*

3.6.8.3.2.1 *ounding of aircraft errors* For each satellite used in the navigation solution, the receiver shall compute a $\sigma_{receiver}$ such that a normal distribution with zero mean and a standard deviation equal to $\sigma_{receiver}$ bounds the receiver contribution to the corrected pseudo-range error as follows:

$$\int_{y}^{\infty} f(x)\,dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0 \text{ and}$$

$$\int_{-\infty}^{-y} f(x)\,dx \le Q\left(\frac{y}{\sigma}\right) \text{ for all } \frac{y}{\sigma} \ge 0$$

where

f(x) probability density function of the residual aircraft pseudo-range error and

$$Q(x) = \frac{1}{\sqrt{2\pi}}\int_{x}^{\infty} e^{-\frac{t^2}{2}}\,dt.$$

3.6.8.3.2.2 *Use of AS integrity parameters*. The aircraft element shall compute and apply the vertical, lateral and horizontal protection levels described in 3.6.5.5 using the GBAS broadcast σ_{pr_gnd}, σ_N, h_0, $\sigma_{vert\_iono\_gradient}$, and B parameters as well as the σ_{pr_air} parameter. If a $B_{i,j}$ parameter is set to the bit pattern "1000 0000" indicating that the measurement is not available, the aircraft element shall assume that $B_{i,j}$ has a value of zero. For Category I precision approach and APV, the aircraft element shall verify that the computed vertical and lateral protection levels are smaller than the corresponding vertical and lateral alert limits defined in 3.6.5.6.

3.6.8.3.3 *Use of satellite ephemeris data*

3.6.8.3.3.1 *I D chec* The receiver shall only use satellites for which the IOD broadcast by GBAS in the Type 1 or Type 101 message matches the core satellite constellation IOD for the clock and ephemeris data used by the receiver.

3.6.8.3.3.2 *CRC chec* . The receiver shall compute the ephemeris CRC for each core satellite constellation s ranging source used in the position solution. The computed CRC shall be validated against the ephemeris CRC broadcast in the Type 1 or Type 101 messages within one second of receiving a new broadcast CRC. The receiver shall immediately cease using any satellite for which the computed and broadcast CRC values fail to match.

Note During initial ac uisition of the F data broadcast the receiver may incorporate a satellite into the position solution before receiving the broadcast ephemeris CRC for that satellite

3.6.8.3.3.3 *Ephemeris error position bounds*

3.6.8.3.3.3.1 *Ephemeris error position bounds for Category I precision approach and AP* . If the ground subsystem provides additional data block 1 in the Type 2 messages, the aircraft element shall compute the ephemeris error position bounds defined in 3.6.5.8.1 for each core satellite constellation s ranging source used in the position solution within 1s of receiving the necessary broadcast parameters. The aircraft element shall exclude from the position solution satellites for which the computed vertical or lateral ephemeris error position bounds (VEB_j or LEB_j) are larger than the corresponding vertical and lateral alert limits defined in 3.6.5.6.

Note During initial ac uisition of the F data broadcast the receiver may incorporate a satellite into the position solution before receiving the necessary broadcast parameters for that satellite to compute the ephemeris error position bounds

3.6.8.3.3.3.2 *Ephemeris error position bound for the AS positioning service*. The aircraft element shall compute and apply the horizontal ephemeris error position bound (HEB_j) defined in 3.6.5.8.2 for each core satellite constellation s ranging source used in the position solution.

3.6.8.3.4 *Message loss*

3.6.8.3.4.1 For Category I precision approach, the receiver shall provide an appropriate alert if no Type 1 or Type 101 message was received during the last 3.5 seconds.

3.6.8.3.4.2 For APV, the receiver shall provide an appropriate alert if no Type 1 and no Type 101 message was received during the last 3.5 seconds.

3.6.8.3.4.3 For the GBAS positioning service using Type 1 messages, the receiver shall provide an appropriate alert if no Type 1 message was received during the last 7.5 seconds.

3.6.8.3.4.4 For the GBAS positioning service using Type 101 messages, the receiver shall provide an appropriate alert if no Type 101 message was received during the last 5 seconds.

3.6.8.3.5 *Airborne pseudo range measurements*. Pseudo-range measurement for each satellite shall be smoothed using the carrier measurement and a smoothing filter which deviates less than 0.1 metre within 200 seconds after initialization, relative to the steady-state response of the filter defined in 3.6.5.1 in the presence of drift between the code phase and integrated carrier phase of up to 0.01 metre per second.

3 Resistance to interference

3.7.1 PERFORMANCE OBJECTIVES

Note For unaugmented PS and NASS receivers the resistance to interference is measured with respect to the following performance parameters

	PS	*NASS*
Trac ing error (sigma)	*m*	*m*

Note This trac ing error neither includes contributions due to signal propagation such as multipath tropospheric and ionospheric effects nor ephemeris and PS and NASS satellite cloc errors

Note For S AS receivers the resistance to interference is measured with respect to parameters specified in and

Note For AS receivers the resistance to interference is measured with respect to parameters specified in and

Note The signal levels specified in this section include a minimum standard antenna gain above degree elevation angle of d ic Assumed maximum aircraft antenna gain in the lower hemisphere is d ic For non standard antennas with a different minimum gain above degree elevation angle the signal interference levels can be adjusted accordingly as long as the relative interference to signal level is maintained

Note The performance re uirements are to be met in the interference environments defined below for various phases of flight

3.7.2 CONTINUOUS WAVE (CW) INTERFERENCE

3.7.2.1 *PS AND S AS RECEI ERS*

3.7.2.1.1 GPS and SBAS receivers used for the precision approach phase of flight or used on aircraft with on-board satellite communications shall meet the performance objectives with CW interfering signals present with a power level at the antenna port equal to the interference thresholds specified in Table B-82 and shown in Figure B-15 and with a desired signal level of 164.5 dBW at the antenna port.

3.7.2.1.2 GPS and SBAS receivers used for non-precision approach shall meet the performance objectives with interference thresholds 3 dB less than specified in Table B-82. For terminal area and en-route steady-state navigation operations and for initial acquisition of the GPS and SBAS signals prior to steady-state navigation, the interference thresholds shall be 6 dB less than those specified in Table B-82.

3.7.2.2 *NASS RECEI ERS*

3.7.2.2.1 GLONASS receivers used for the precision approach phase of flight or used on aircraft with on-board satellite communications shall meet the performance objectives with CW interfering signals present with a power level at the antenna port equal to the interference thresholds specified in Table B-83 and shown in Figure B-16 and with a desired signal level of 165.5 dBW at the antenna port.

3.7.2.2.2 GLONASS receivers used for non-precision approach shall meet the performance objectives with interference thresholds 3 dB less than specified in Table B-83. For terminal area and en-route steady-state navigation operations and for initial acquisition of the GLONASS signals prior to steady-state navigation, the interference thresholds shall be 6 dB less than those specified in Table B-83.

able 2 CW interference t res olds for S and S AS recei ers

Frequency range f_i of the interference signal	Interference thresholds for receivers used for precision approach phase of flight
$f_i \leq$ 1 315 MHz	4.5 dBW
1 315 MHz $f_i \leq$ 1 525 MHz	Linearly decreasing from 4.5 dBW to 42 dBW
1 525 MHz $f_i \leq$ 1 565.42 MHz	Linearly decreasing from 42 dBW to 150.5 dBW
1 565.42 MHz $f_i \leq$ 1 585.42 MHz	150.5 dBW
1 585.42 MHz $f_i \leq$ 1 610 MHz	Linearly increasing from 150.5 dBW to 60 dBW
1 610 MHz $f_i \leq$ 1 618 MHz	Linearly increasing from 60 dBW to 42 dBW*
1 618 MHz $f_i \leq$ 2 000 MHz	Linearly increasing from 42 dBW to 8.5 dBW*
1 610 MHz $f_i \leq$ 1 626.5 MHz	Linearly increasing from 60 dBW to 22 dBW**
1 626.5 MHz $f_i \leq$ 2 000 MHz	Linearly increasing from 22 dBW to 8.5 dBW**
f_i 2 000 MHz	8.5 dBW

* Applies to aircraft installations where there are no on-board satellite communications.
** Applies to aircraft installations where there is on-board satellite communications.

able 3 nterference t res old for O ASS recei ers

Frequency range f_i of the interference signal	Interference thresholds for receivers used for precision approach phase of flight
$f_i \leq$ 1 315 MHz	4.5 dBW
1 315 MHz $f_i \leq$ 1 562.15625 MHz	Linearly decreasing from 4.5 dBW to 42 dBW
1 562.15625 MHz $f_i \leq$ 1 583.6525 MHz	Linearly decreasing from 42 dBW to 80 dBW
1 583.65625 MHz $f_i \leq$ 1 592.9525 MHz	Linearly decreasing from 80 dBW to 149 dBW
1 592.9525 MHz $f_i \leq$ 1 609.36 MHz	149 dBW
1 609.36 MHz $f_i \leq$ 1 613.65625 MHz	Linearly increasing from 149 dBW to 80 dBW
1 613.65625 MHz $f_i \leq$ 1 635.15625 MHz	Linearly increasing from 80 dBW to 42 dBW*
1 613.65625 MHz $f_i \leq$ 1 626.15625 MHz	Linearly increasing from 80 dBW to 22 dBW**
1 635.15625 MHz $f_i \leq$ 2 000 MHz	Linearly increasing from 42 dBW to 8.5 dBW*
1 626.15625 MHz $f_i \leq$ 2 000 MHz	Linearly increasing from 22 dBW to 8.5 dBW**
f_i 2 000 MHz	8.5 dBW

* Applies to aircraft installations where there are no on-board satellite communications.
** Applies to aircraft installations where there is on-board satellite communications.

3.7.3 BAND-LIMITED NOISE-LIKE INTERFERENCE

3.7.3.1 *PS AND S AS RECEI ERS*

3.7.3.1.1 After steady-state navigation has been established, GPS and SBAS receivers used for the precision approach phase of flight or used on aircraft with on-board satellite communications shall meet the performance objectives with noise-like interfering signals present in the frequency range of 1 575.42 MHz Bw$_i$/2 and with power levels at the antenna port equal to the interference thresholds specified in Table B-84 and Figure B-17 and with the desired signal level of 164.5 dBW at the antenna port.

Note w$_i$ is the e uivalent noise bandwidth of the interference signal

3.7.3.1.2 GPS and SBAS receivers used for non-precision approach shall meet their performance objectives with interference thresholds for band-limited noise-like signals 3 dB less than specified in Table B-84. For terminal area and en-route steady-state navigation operations and for initial acquisition of the GPS and SBAS signals prior to steady-state navigation, the interference thresholds for band-limited noise-like signals shall be 6 dB less than those specified in Table B-84.

3.7.3.2 *NASS RECEI ERS*

3.7.3.2.1 After steady-state navigation has been established, GLONASS receivers used for the precision approach phase of flight or used on aircraft with on-board satellite communications shall meet the performance objectives while receiving noise-like interfering signals in the frequency band f$_k$ Bw$_i$/2, with power levels at the antenna port equal to the interference thresholds defined in Table B-85 and with a desired signal level of 165.5 dBW at the antenna port.

Note f is the centre fre uency of a NASS channel with f M M and to as defined in Table and w$_i$ is the e uivalent noise bandwidth of the interference signal

3.7.3.2.2 GLONASS receivers used for non-precision approach shall meet their performance objectives with interference thresholds for band-limited noise-like signals 3 dB less than specified in Table B-84. For terminal area and en-route steady-state navigation operations, and for initial acquisition of the GLONASS signals prior to steady-state navigation, the interference thresholds for band-limited noise-like signals shall be 6 dB less than those specified in Table B-85.

Note For the approach phase of flight it is assumed that the receiver operates in trac ing mode and ac uires no new satellites

3.7.3.3 *Pulsed interference*. After steady-state navigation has been established, the receiver shall meet the performance objectives while receiving pulsed interference signals with characteristics according to Table B-86 where the interference threshold is defined at the antenna port.

3.7.3.4 SBAS and GBAS receivers shall not output misleading information in the presence of interference including interference levels above those specified in 3.7.

Note uidance material on this re uirement is given in Attachment D

3 SS aircraft satellite recei er antenna

3.8.1 *Antenna coverage*. The GNSS antenna shall meet the performance requirements for the reception of GNSS satellite signals from 0 to 360 degrees in azimuth and from 0 to 90 degrees in elevation relative to the horizontal plane of an aircraft in level flight.

3.8.2 *Antenna gain* The minimum antenna gain shall not be less than that shown in Table B-87 for the specified elevation angle above the horizon. The maximum antenna gain shall not exceed 7 dBic for elevation angles above 5 degrees.

3.8.3 *Polari ation.* The GNSS antenna polarization shall be right-hand circular (clockwise with respect to the direction of propagation).

3 Cyclic redundancy c eck

Each CRC shall be calculated as the remainder, R(x), of the Modulo-2 division of two binary polynomials as follows:

$$\left\{\frac{x^k M(x)}{G(x)}\right\}_{\text{mod } 2} = Q(x) + \frac{R(x)}{G(x)}$$

where

k the number of bits in the particular CRC;
M(x) the information field, which consists of the data items to be protected by the particular CRC represented as a polynomial;
G(x) the generator polynomial specified for the particular CRC;
Q(x) the quotient of the division; and
R(x) the remainder of the division, contains the CRC:

$$R(x) = \sum_{i=1}^{k} r_i x^{k-i} = r_1 x^{k-1} + r_2 x^{k-2} + \ldots + r_k x^0$$

able nterference t res old for band limited noise like interference to S and S AS recei ers used for precision approac

Interference bandwidth	Interference threshold
0 Hz Bw$_i$ ≤ 700 Hz	150.5 dBW
700 Hz Bw$_i$ ≤ 10 kHz	150.5 6 log$_{10}$(BW/700) dBW
10 kHz Bw$_i$ ≤ 100 kHz	143.5 3 log$_{10}$(BW/10000) dBW
100 kHz Bw$_i$ ≤ 1 MHz	140.5 dBW
1 MHz Bw$_i$ ≤ 20 MHz	Linearly increasing from 140.5 to 127.5 dBW*
20 MHz Bw$_i$ ≤ 30 MHz	Linearly increasing from 127.5 to 121.1 dBW*
30 MHz Bw$_i$ ≤ 40 MHz	Linearly increasing from 121.1 to 119.5 dBW*
40 MHz Bw$_i$	119.5 dBW*

* The interference threshold is not to exceed 140.5 dBW/MHz in the frequency range 1 575.42 10 MHz.

able nterference t res old for band limited noise like interference to O ASS recei ers used for precision approac

Interference bandwidth	Interference threshold
0 Hz Bw$_i$ ≤ 1 kHz	149 dBW
1 kHz Bw$_i$ ≤ 10 kHz	Linearly increasing from 149 to 143 dBW
10 kHz Bw$_i$ ≤ 0.5 MHz	143 dBW
0.5 MHz Bw$_i$ ≤ 10 MHz	Linearly increasing from 143 to 130 dBW
10 MHz Bw$_i$	130 dBW

able 6 nterference t res olds for pulsed interference

	GPS and SBAS	GLONASS
Frequency range	1 575.42 MHz 10 MHz	1 592.9525 MHz to 1 609.36 MHz
Interference threshold (Pulse peak power)	10 dBW	10 dBW
Pulse width	≤125 s, ≤1 ms*	≤1 ms
Pulse duty cycle	≤10	≤10

* Applies to GPS receivers without SBAS.

able inimum antenna gain S/S AS and O ASS

Elevation angle degrees	Minimum gain dBic
0	7.5
5	4.5
10	3
15 to 90	2

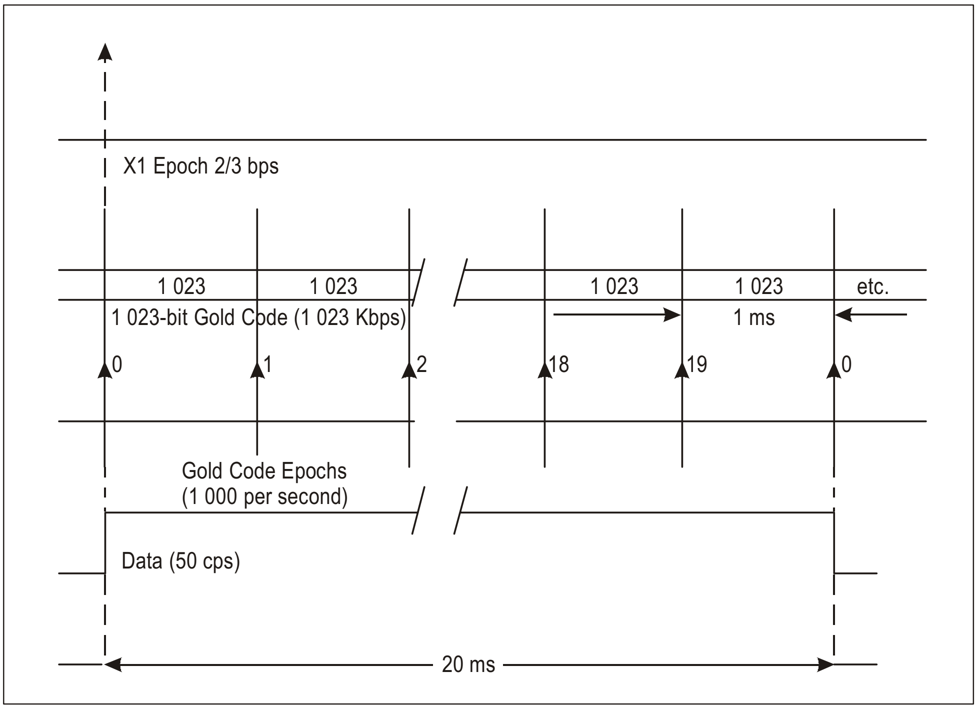


Figure 1 C/A code timing relations ips

SUBFRAME 1	TLM	HOW	GPS week number, SV accuracy and health
SUBFRAME 2	TLM	HOW	Ephemeris parameters
SUBFRAME 3	TLM	HOW	Ephemeris parameters
SUBFRAME 4 (25 pages)	TLM	HOW	Almanac and health for satellites 25–32, special messages, satellite configuration, flags, ionospheric and UTC
SUBFRAME 5 (25 pages)	TLM	HOW	Almanac and health for satellites 1–24 and almanac reference time and GPS week number

Figure 2 Frame structure

Preamble								Reserved																Parity					
1	0	0	0	1	0	1	1	MSB															LSB						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Figure 3 ord format

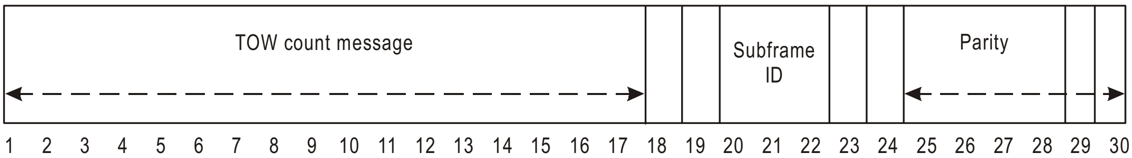
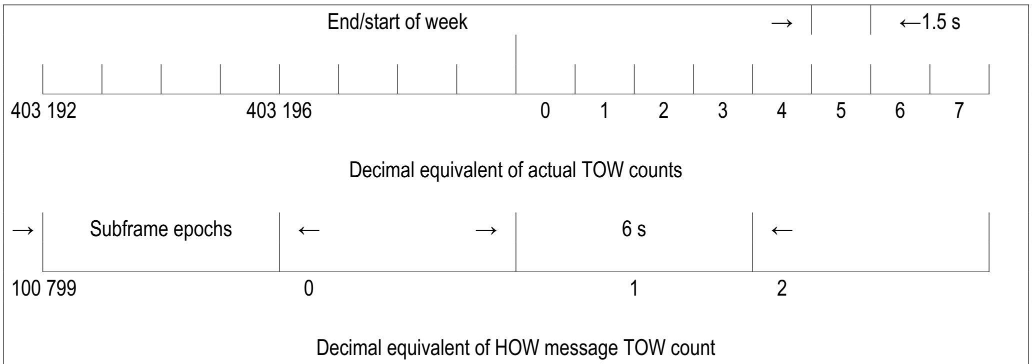
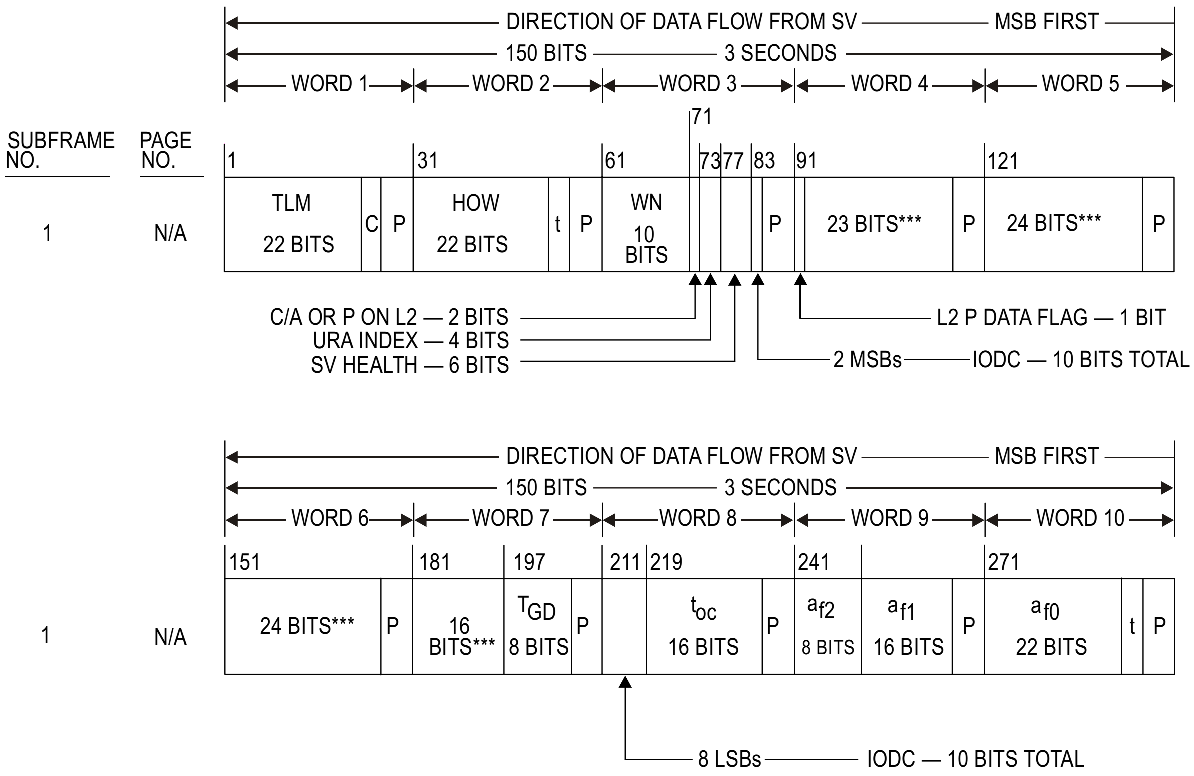


Figure HOW format



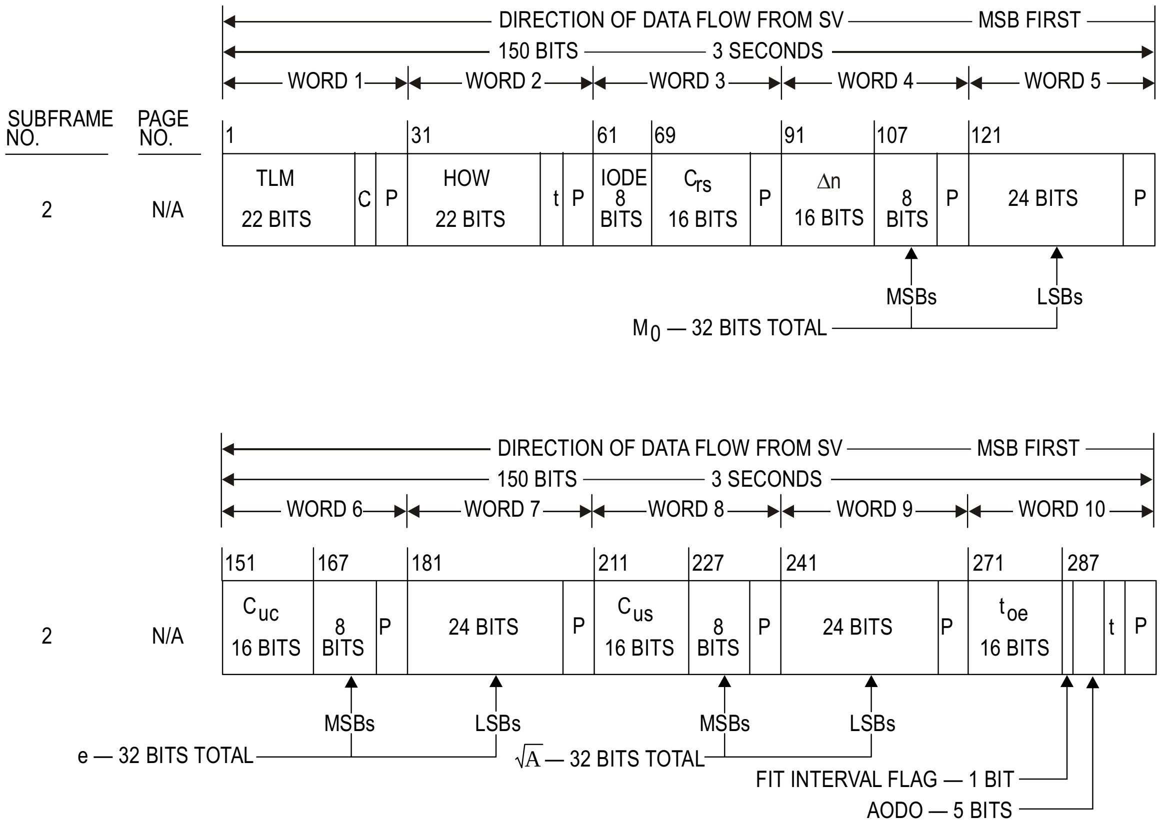
Notes:
1. *To aid in rapid ground lock-on, the HOW of each subframe contains a truncated TOW count.*
2. *The HOW is the second word in each subframe.*
3. *The HOW message TOW count consists of the 17 MSBs of the actual TOW count at the start of the next subframe.*
4. *To convert from the HOW message TOW count to the actual count at the start of the next subframe, multiply by four.*
5. *The first subframe starts synchronously with the end/start of each epoch.*

Figure ime line relations ip of HOW



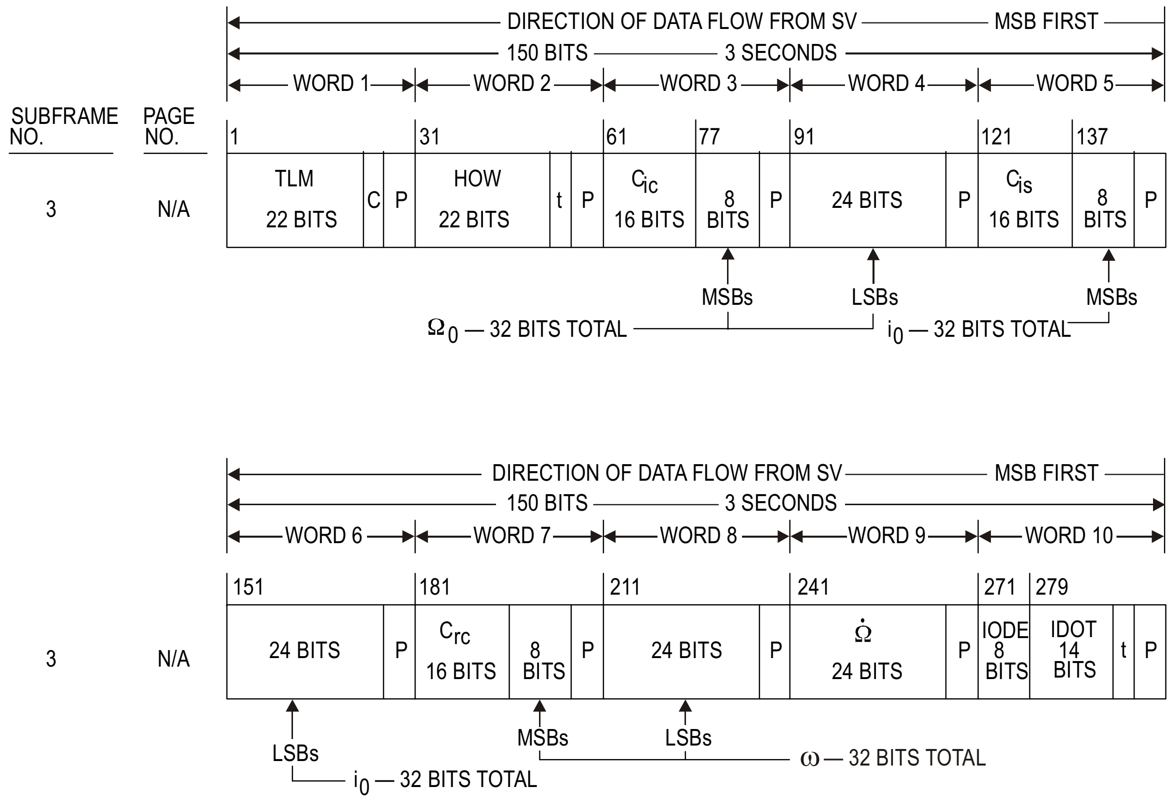
*** RESERVED
P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (1 of 11)



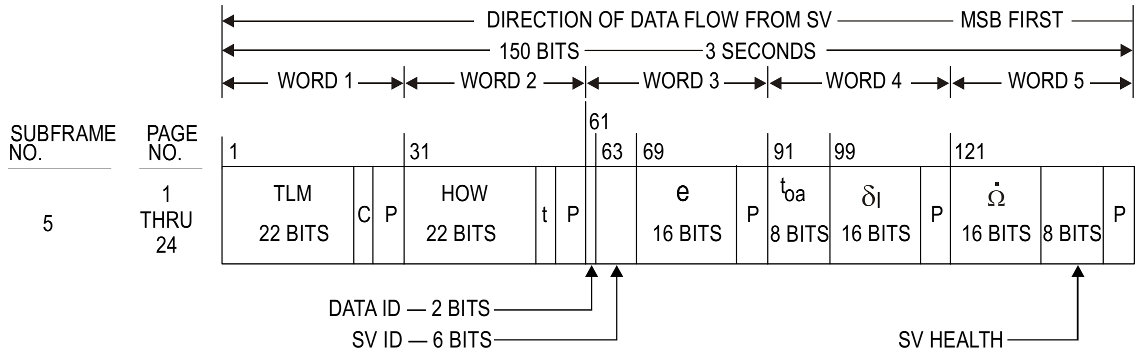
P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

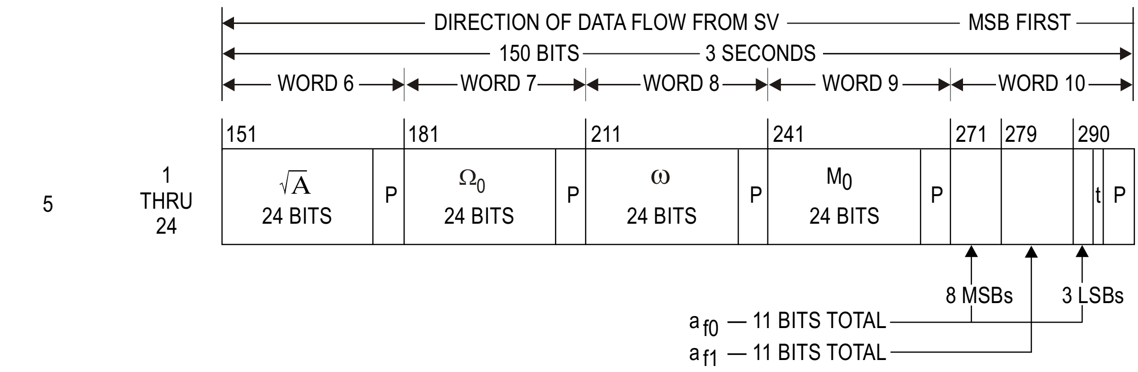
Figure 6 Data format (2 of 11)



P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (3 of 11)





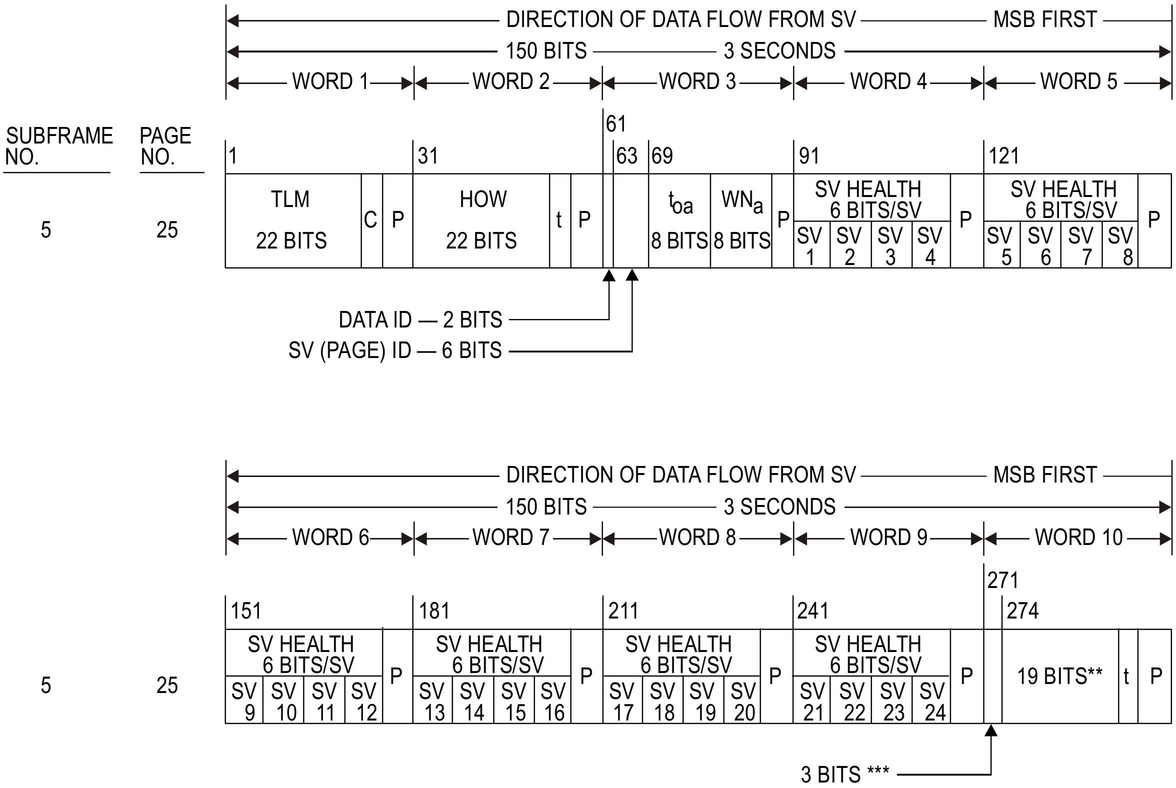
P = 6 PARITY BITS

t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION

C = TLM BITS 23 AND 24 WHICH ARE RESERVED

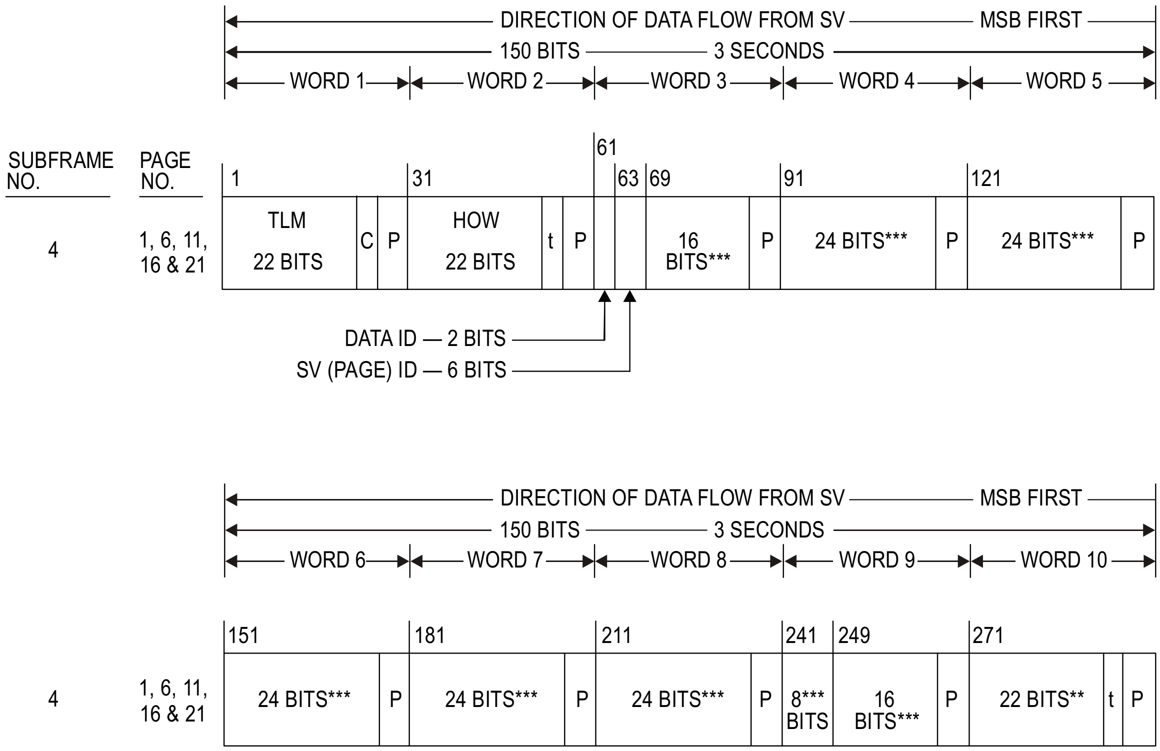
Note.— Pages 2, 3, 4, 5, 7, 8, 9 and 10 of subframe 4 have the same format as pages 1 through 24 of subframe 5.

Figure 6 Data format (4 of 11)



** RESERVED FOR SYSTEM USE
*** RESERVED
P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (5 of 11)



** RESERVED FOR SYSTEM USE
*** RESERVED
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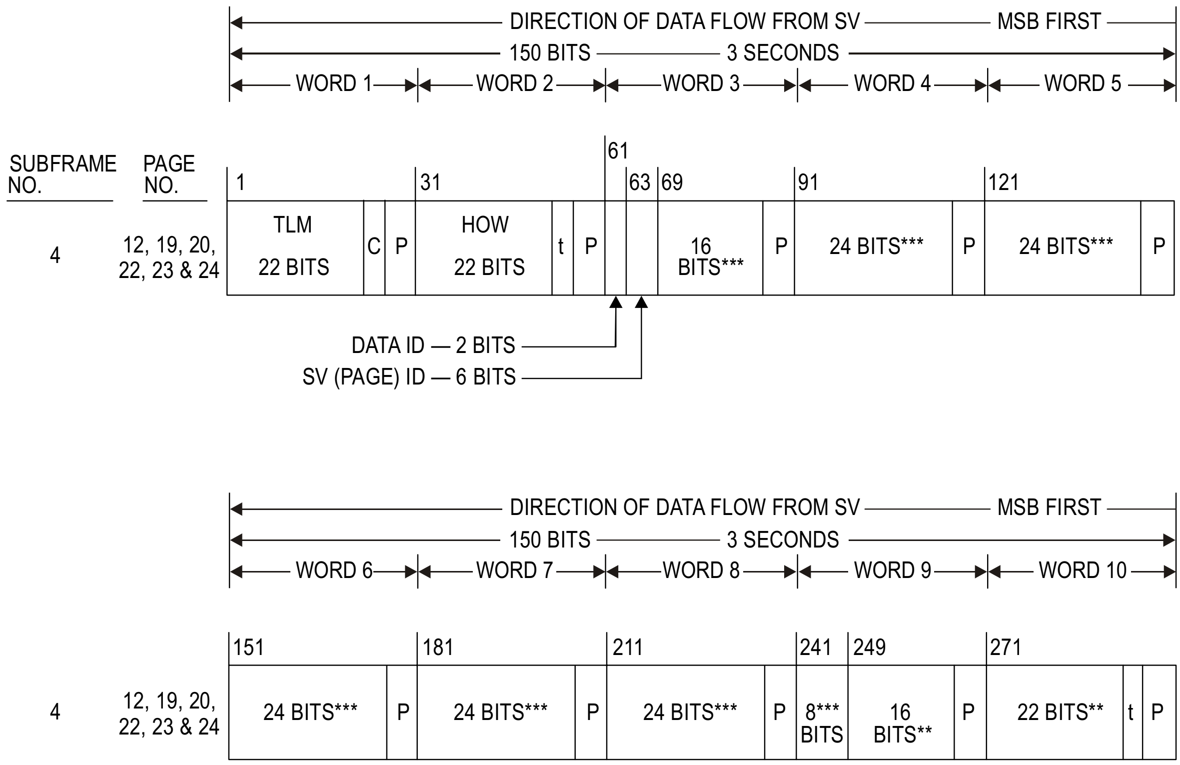
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (6 of 11)



** RESERVED FOR SYSTEM USE
*** RESERVED
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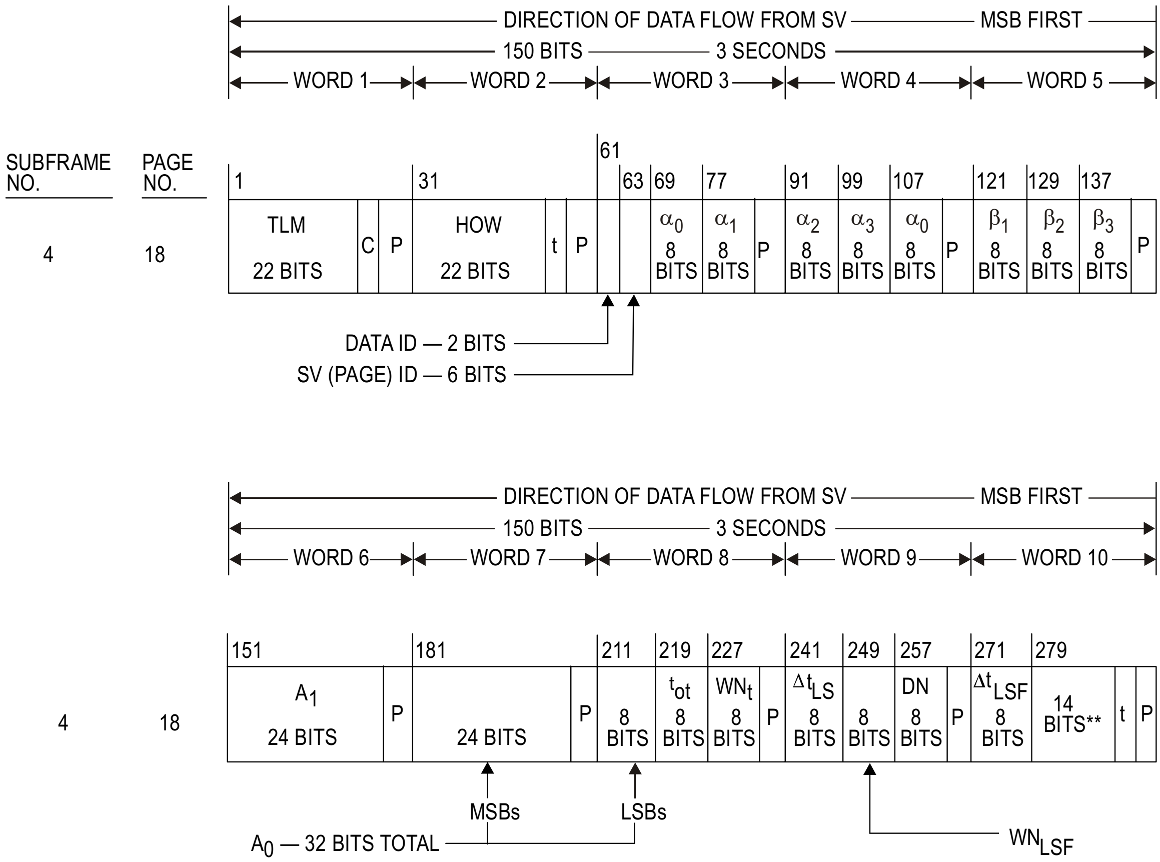
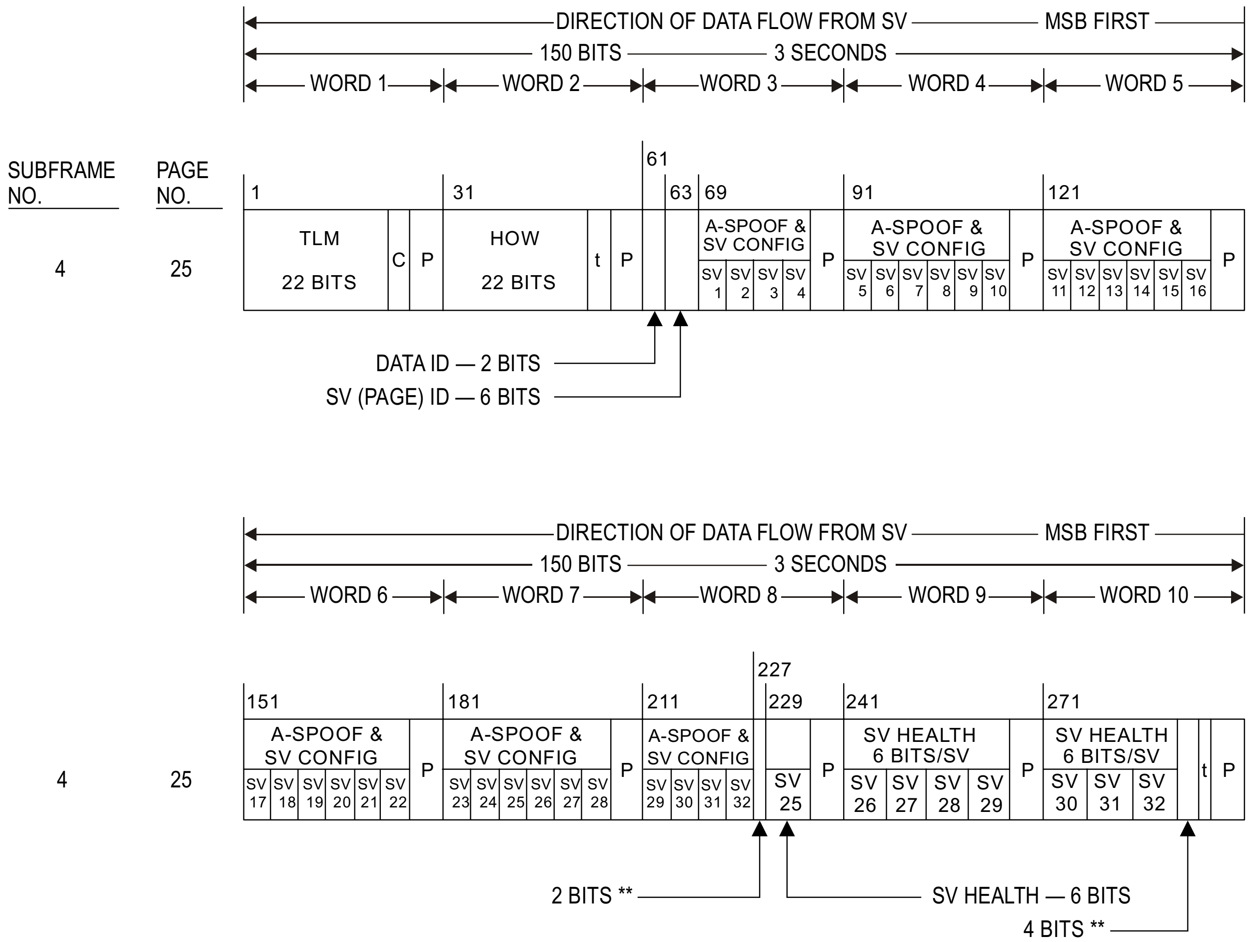
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (7 of 11)



** RESERVED FOR SYSTEM USE
P = 6 PARITY BITS
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (8 of 11)



** RESERVED FOR SYSTEM USE
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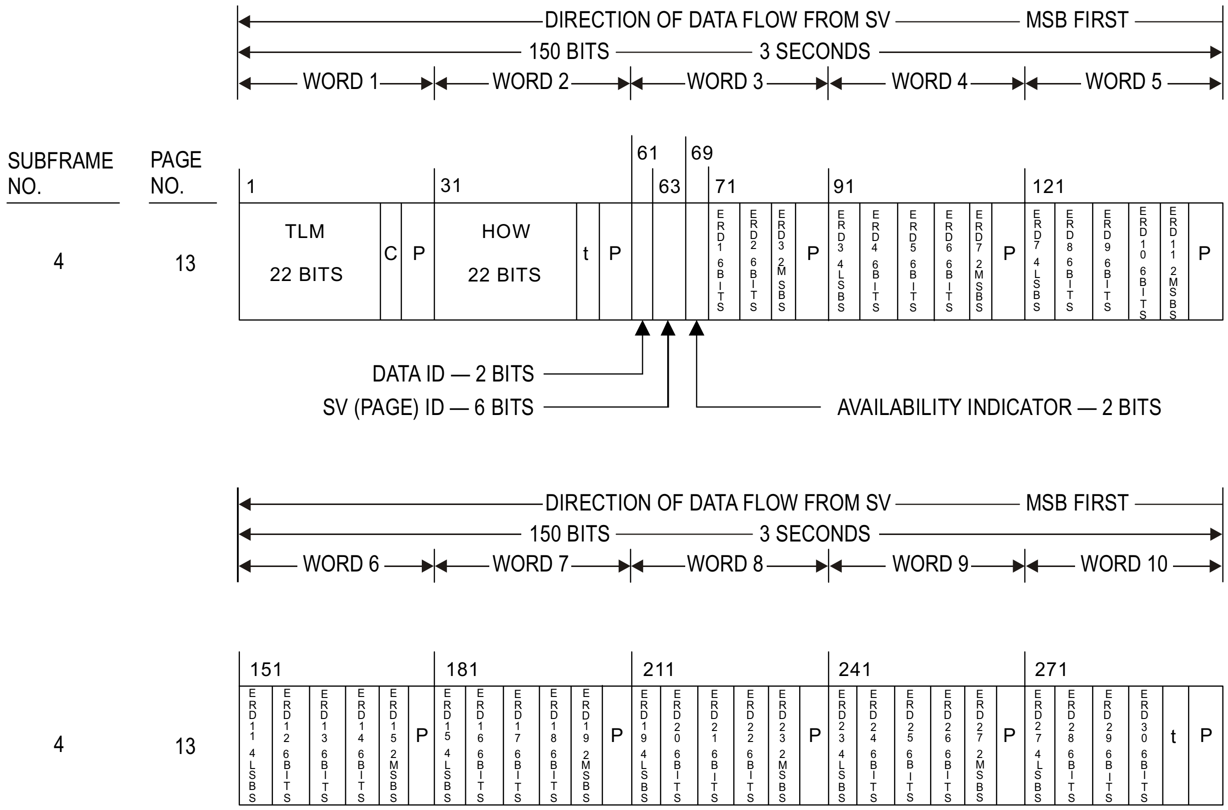
t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION
C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (9 of 11)

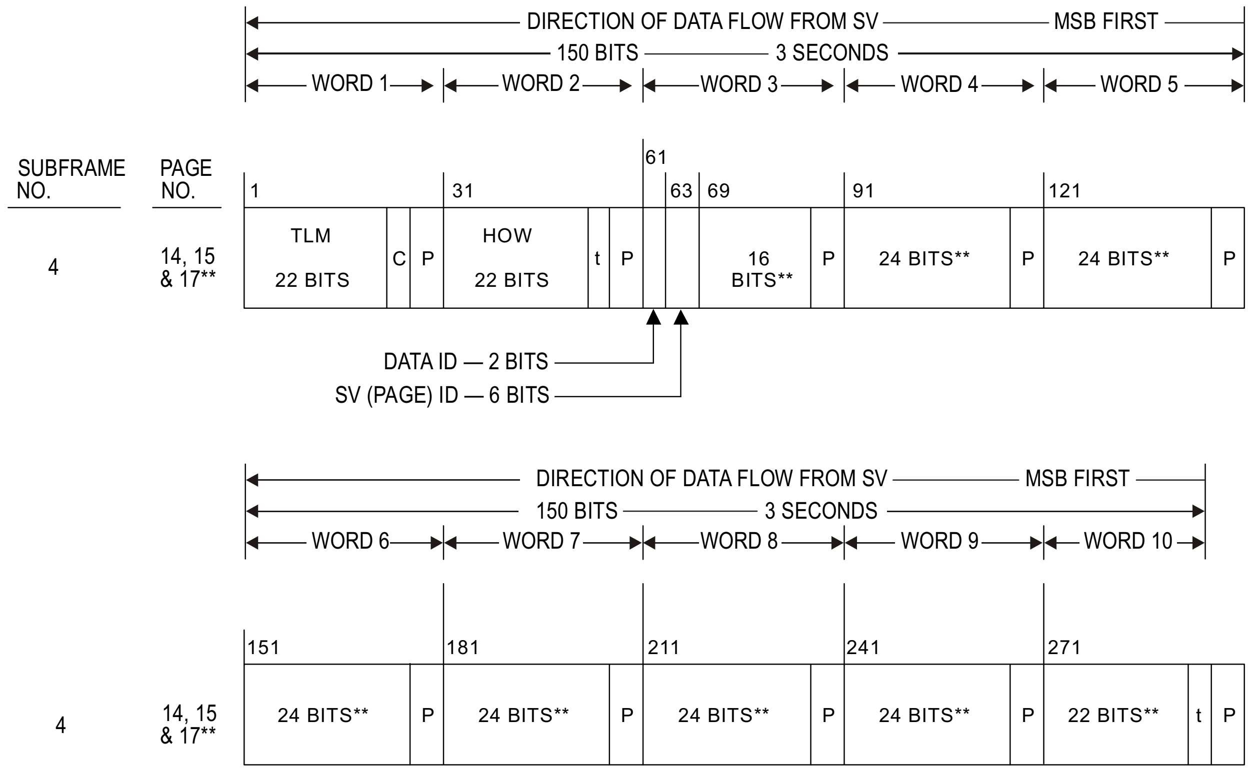


P = 6 PARITY BITS

t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION

C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (10 of 11)



** THE INDICATED PORTIONS OF WORDS 3 THROUGH 10 OF PAGES 14 AND 15 ARE RESERVED FOR SYSTEM USE, WHILE THOSE OF PAGE 17 ARE RESERVED FOR SPECIAL MESSAGES

P = 6 PARITY BITS

t = 2 NON-INFORMATION BEARING BITS USED FOR PARITY COMPUTATION

C = TLM BITS 23 AND 24 WHICH ARE RESERVED

Figure 6 Data format (11 of 11)

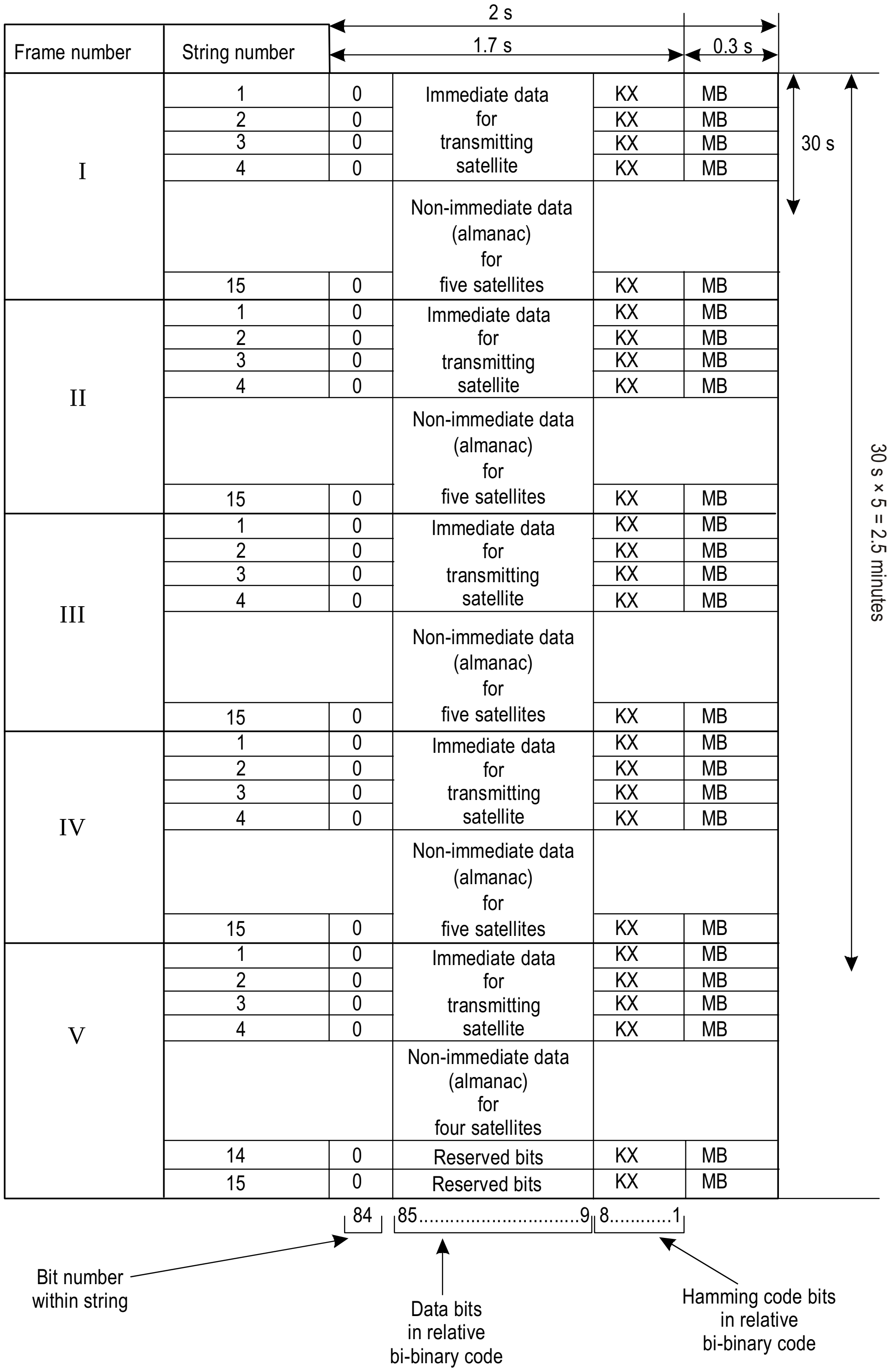
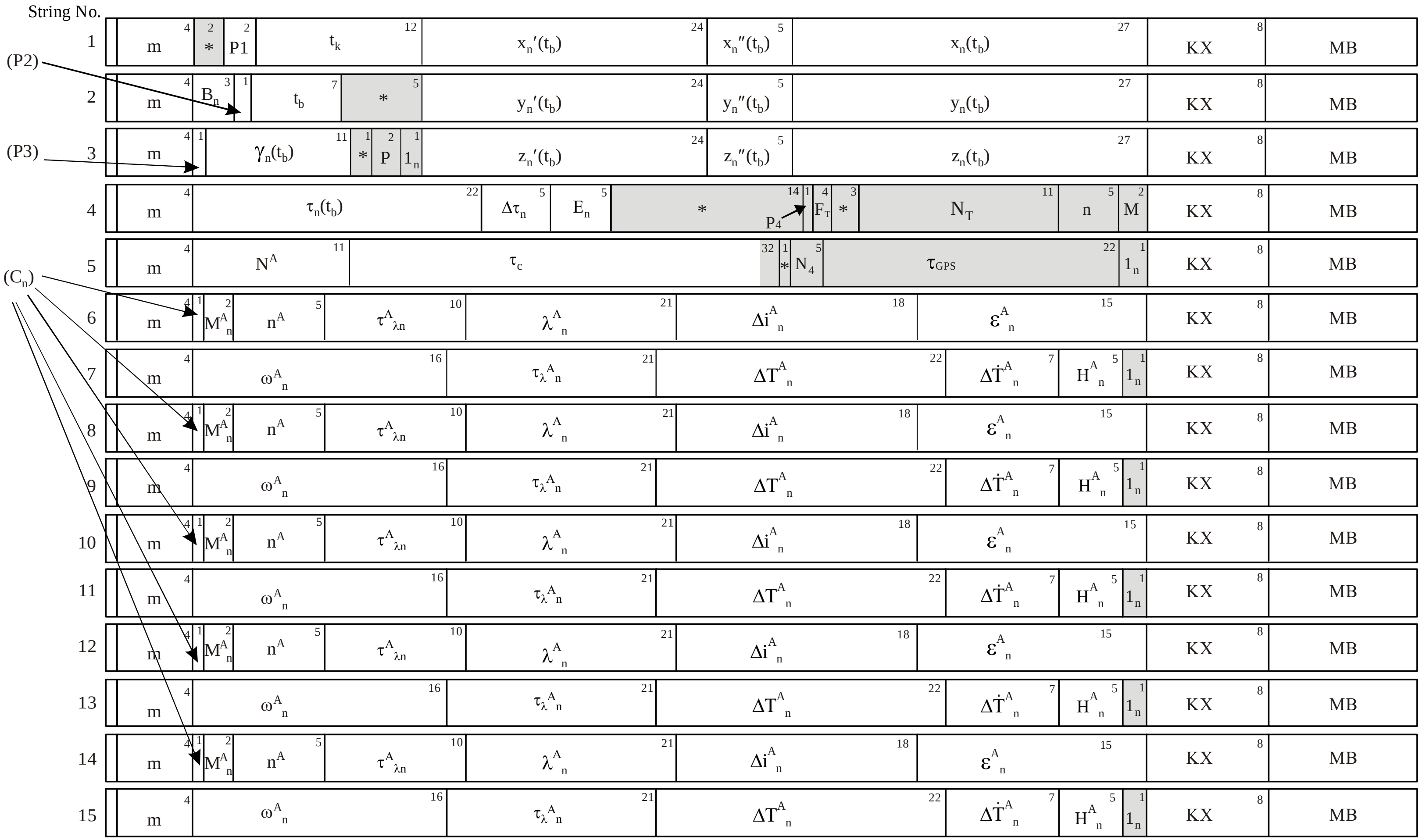


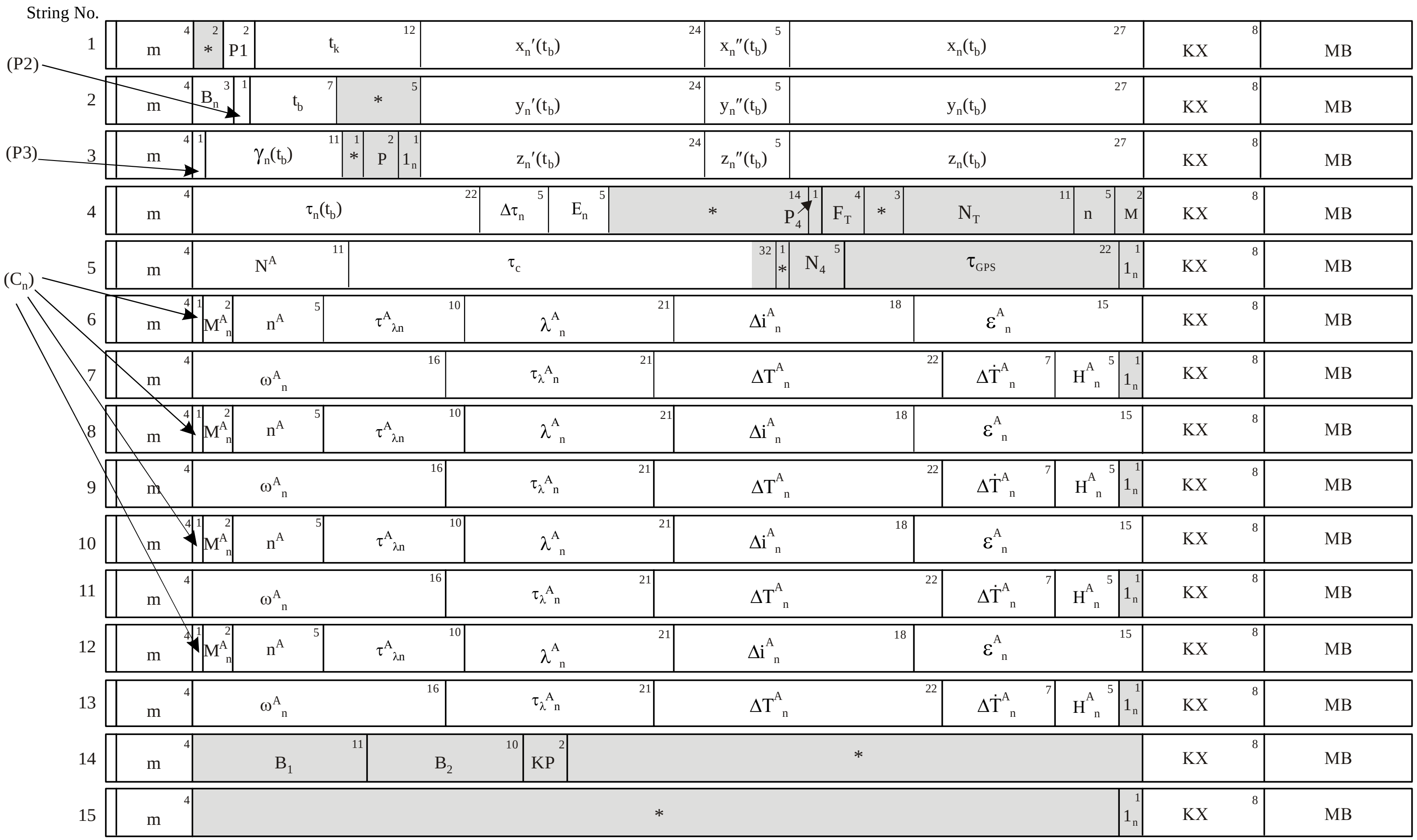
Figure Superframe structure



* Reserved bits within frame

Note Data content definitions and explanations of parameters are given in and Additional data transmitted by NASS M are highlighted in this figure

Figure **Frame structure** (frames 1 to 4)



* Reserved bits within frame

Note.— Data content definitions and explanations of parameters are given in and . Additional data transmitted by NASS M are highlighted in this figure

Figure **Frame structure** (frame 5)

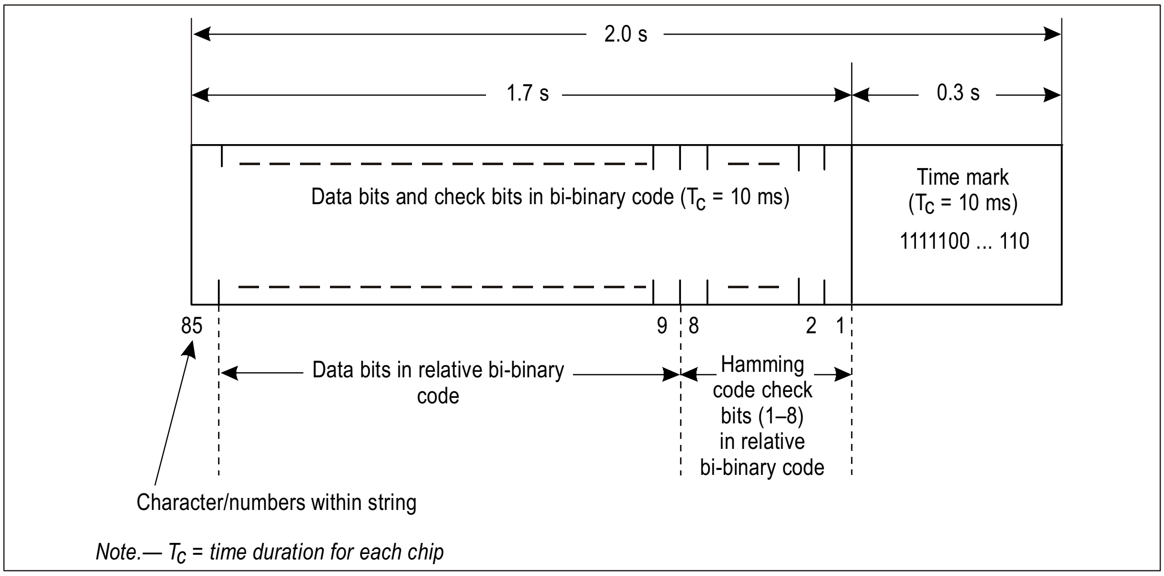


Figure 10 Data string structure

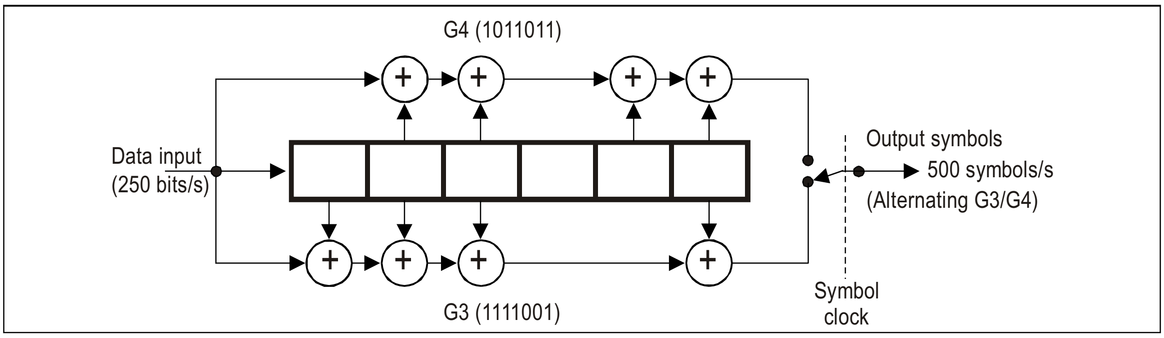


Figure 11 Con olutional encoding

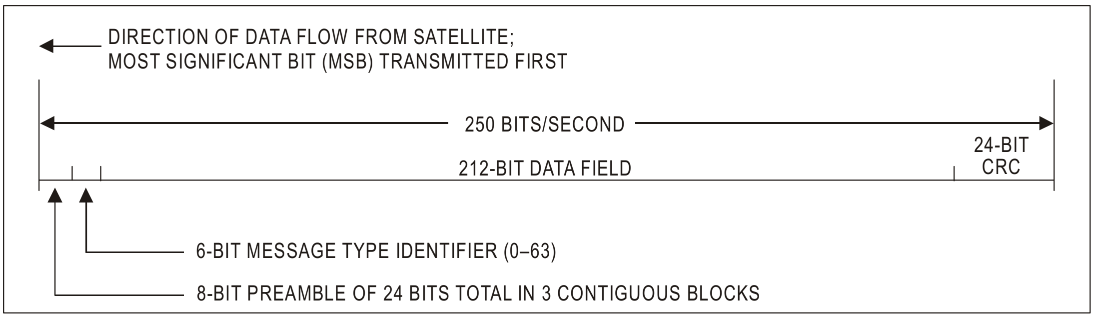


Figure 12 Data block format

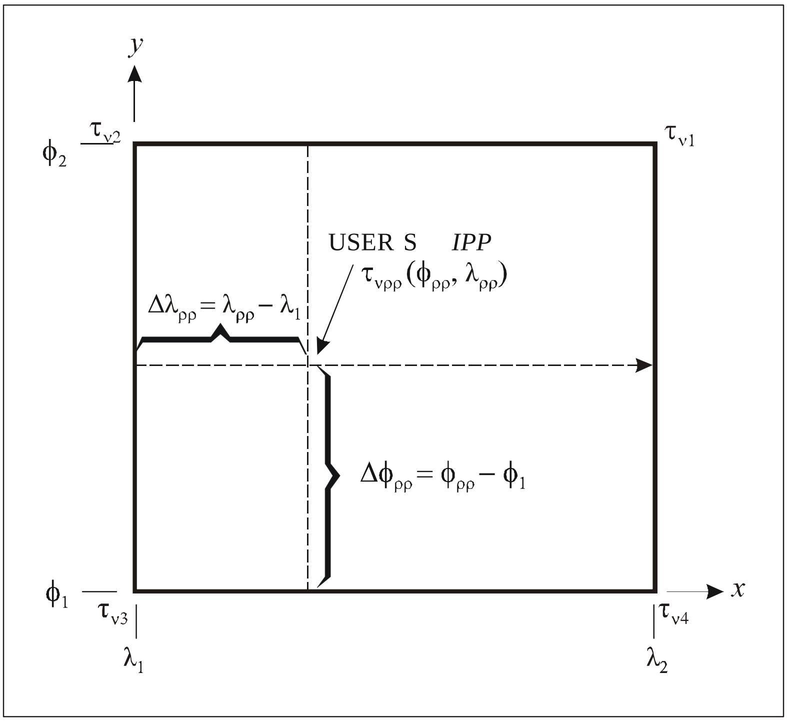


Figure 13 numbering con ention (four IGPs)

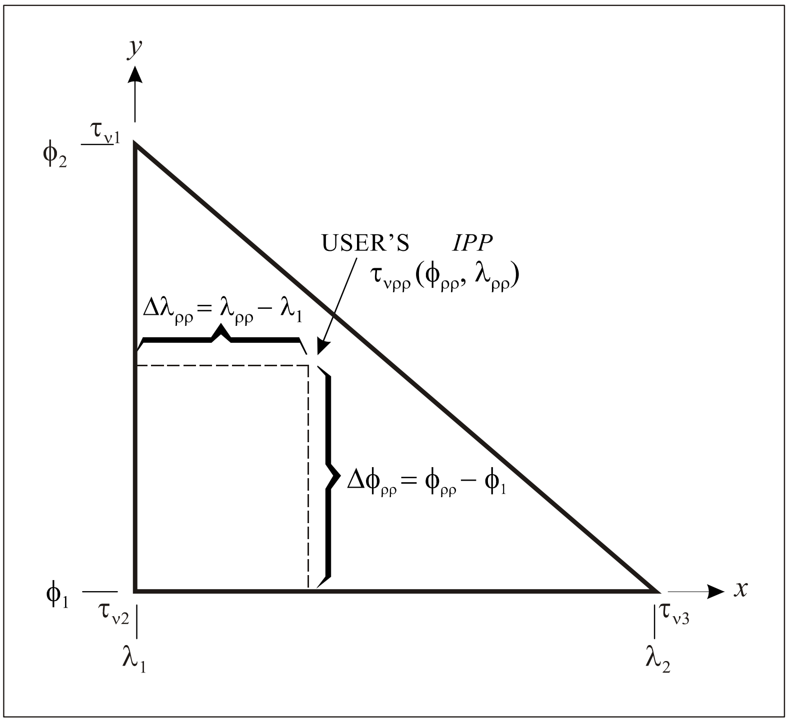


Figure 1 numbering con ention (three IGPs)

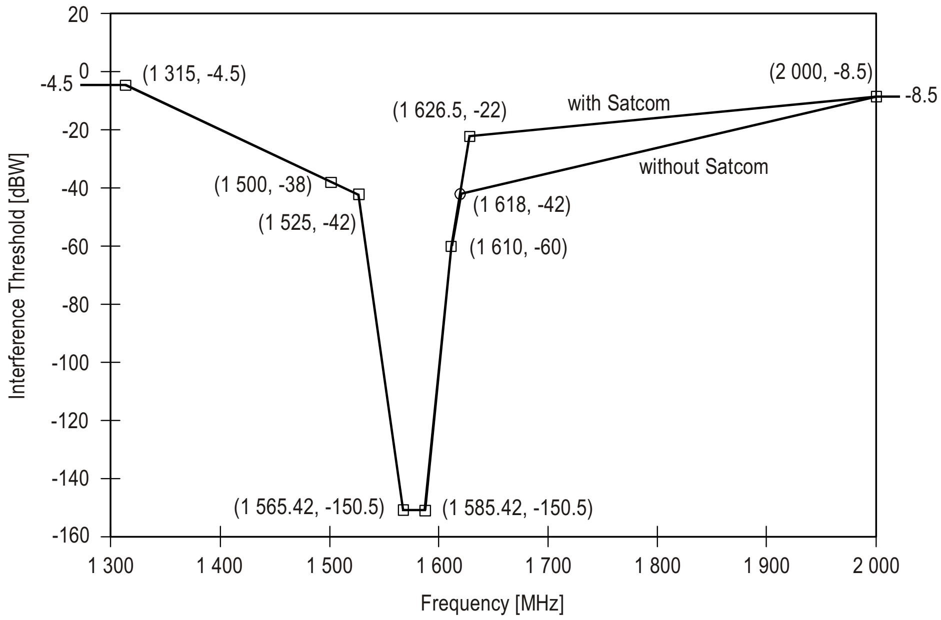


Figure 1 CW interference t res olds for S and S AS recei ers used for precision approac

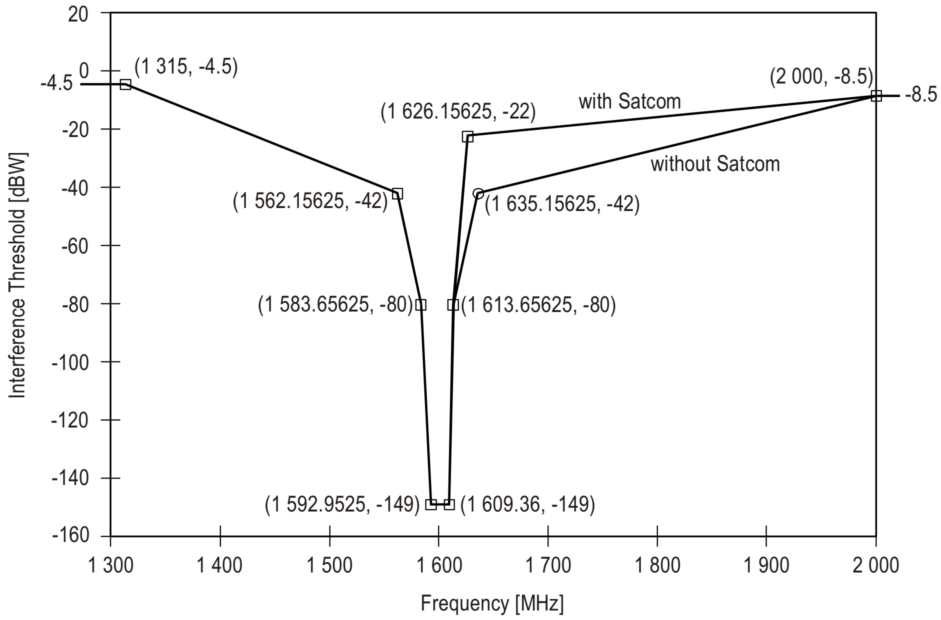


Figure 16 CW interference t res olds for O ASS recei ers used for precision approac

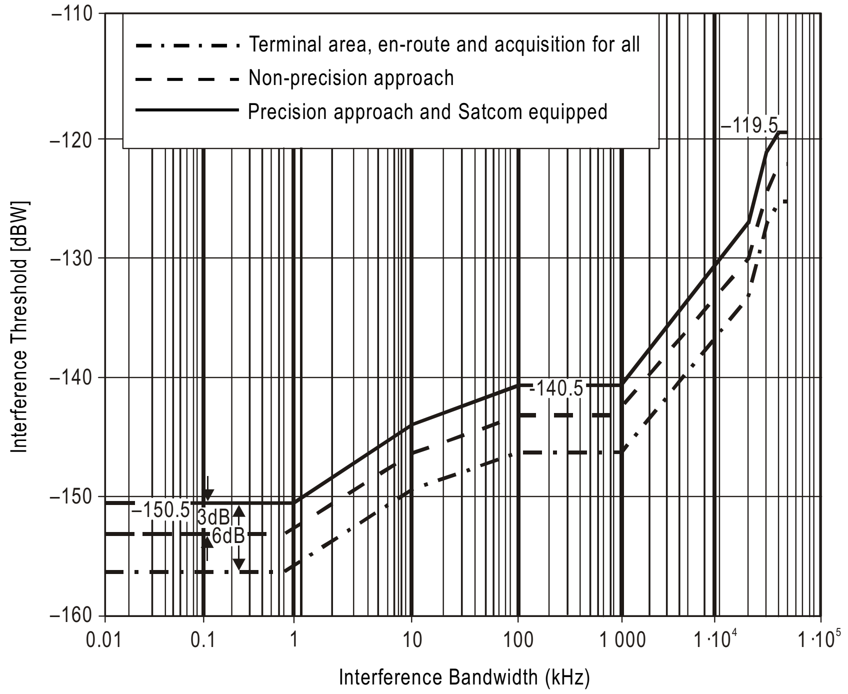


Figure B-17. Interference thresholds versus bandwidth for GPS and SBAS receivers

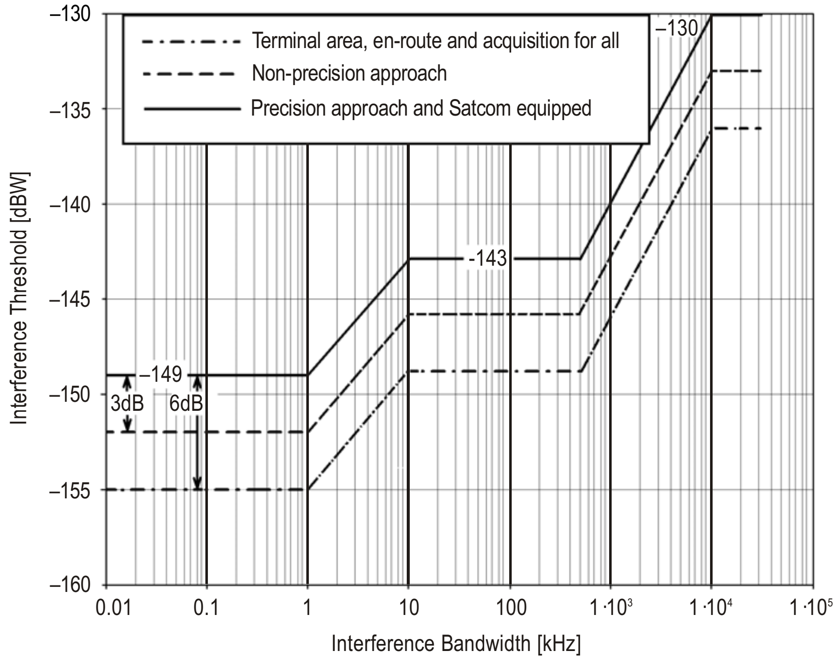
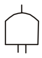


Figure B-18. Interference thresholds versus bandwidth for GLONASS

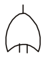
ATTACHMENT A. DETERMINATION OF INTEGRITY AND CONTINUITY OF SERVICE OB ECTIVES USING THE RISK TREE METHOD

1. The risk tree method is a graphical method of expressing the logical relationship between a particular failure condition and the causes or failures leading to this condition. It is an application of fault tree analysis being used in the aerospace industry.

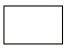
1.1 The method employs a set of logic symbols to show the relationship between the various causes of failure. The following symbols are used in this guidance material.



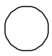
The "AND" gate describes the logical operation whereby the coexistence of all input events is required to produce the output event.



The "OR" gate defines a situation whereby the output event will exist if one or more of the input events exist.



The rectangle identifies an event that results from the combination of fault or failure events through the input logic gate.



The circle describes a primary failure event that requires no further development. Frequency and mode of failure of items so identified are derived from empirical data.

1.2 The method gives a visual representation of sequences and combinations of events leading to the top failure event. The method can also be used to determine the probability of the top event occurring, provided that the probabilities of the individual events are known or can be estimated. In the case of simple fault trees probabilities can be directly calculated, but care must be taken if the primary failure events are not independent, i.e. if failure events are common to more than one path.

1.3 In this guidance material the acceptable probability of the top level event occurring is determined by the risk allocation and the fault tree is used to further partition the risk into integrity and continuity of service risks. Therefore, the term "risk tree" is used rather than "fault tree".

2. A generic risk tree for aircraft landing operations is given in Figure A-1. The top event for this tree is taken to be the loss of the aircraft due to a failure of the non-aircraft guidance system. The causes of this event are either an integrity failure of the primary non-aircraft guidance equipment or a continuity of service (COS) failure of the non-aircraft guidance system (i.e. both the primary system and any secondary system used to support a discontinued approach/missed approach). The primary non-aircraft guidance system is considered to have a number of elements, 1 to N, for example azimuth, elevation and DME/P in the case of MLS. The secondary guidance system may be an alternative non-aircraft system, or in some cases an aircraft navigation system such as an inertial reference system.

2.1 The following probabilities can be defined:

P_a = Probability of aircraft loss due to a failure of the non-aircraft guidance system.

P_b = Probability of aircraft loss due to primary guidance integrity failure.

P_c = Probability of aircraft loss due to COS failure.

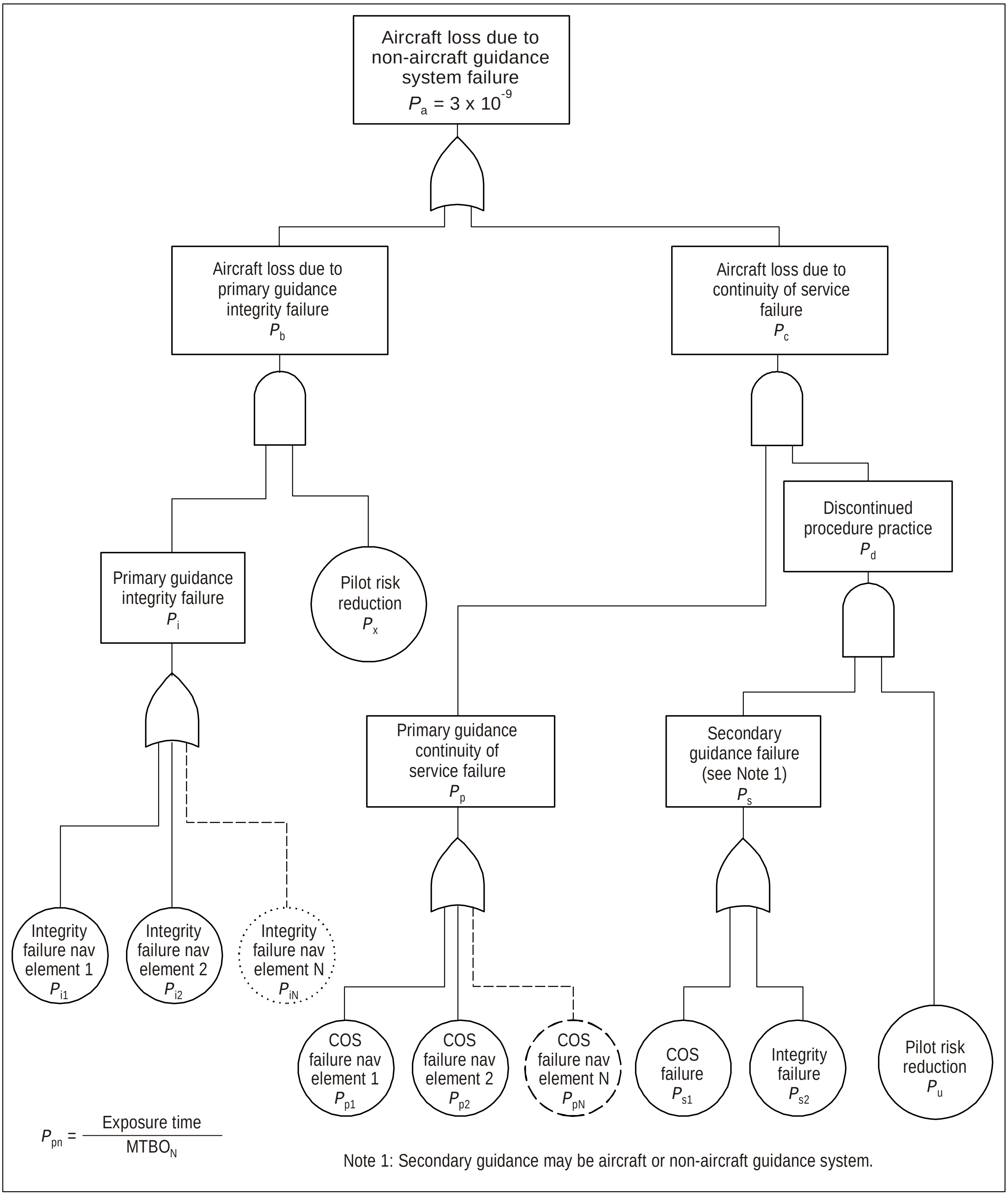


Figure A-1. Generic risk tree

P_x = Probability that the pilot is unable to detect and intervene successfully following a primary guidance integrity failure. This risk reduction factor is only relevant in those cases where an integrity failure of the guidance system may be detected by the pilot, e.g. at decision height in a Category I ILS approach.

P_p = Probability of primary guidance COS failure.

P_d = Probability of aircraft loss during a discontinued approach/missed approach procedure.

P_i = Probability of primary guidance integrity failure.

P_{iN} = Probability of integrity failure in Nav element N.

P_{pN} = Probability of COS failure in Nav element N.

P_s = Probability of aircraft loss during a discontinued approach/missed approach with secondary guidance.

P_{s1} = Probability of secondary guidance COS failure.

P_{s2} = Probability of secondary guidance integrity failure.

P_u = Probability that the pilot is unable to intervene successfully following primary guidance COS failure with no secondary guidance available.

Where:

$P_a = P_b + P_c$

$P_b = P_i \times P_x$

$P_i = P_{i1} + P_{i2} + ... P_{iN}$

$P_c = P_p \times P_d$

$P_p = P_{p1} + P_{p2} + ... P_{pN}$

$P_d = P_s \times P_u$

$P_s = P_{s1} + P_{s2}$

2.2 The acceptable probability of the top event, P_a, can be determined by partitioning the global risk factor for the approach and landing operation to the various classes of accident. Using this method an acceptable value for P_a of 3×10^{-9} has been determined. This is consistent with the smallest probability that can be assigned to each ground navigation element, which is 1×10^{-9} (normally divided equally between integrity and COS failures).

2.3 The risk analysis above assumes no equipment design errors.

3. *Example of the use of the risk tree — MLS Category III basic operations (Figure A-2).*

3.1 In this case there are only two navigation elements involved (e.g. azimuth and elevation). It is assumed that no secondary guidance is available following a COS failure of the primary guidance, the normal procedure being to maintain heading and climb.

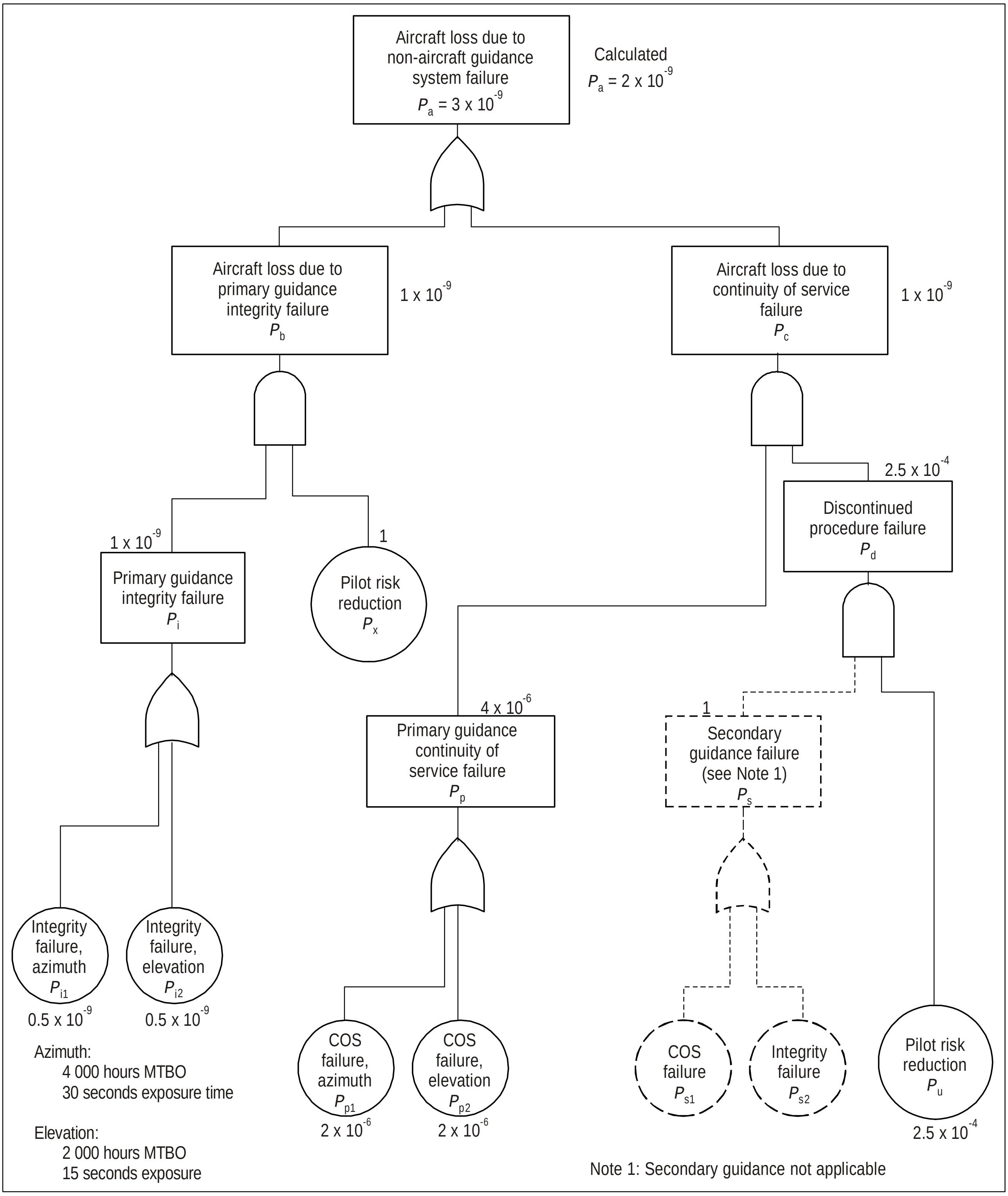


Figure A-2. MLS Category III landing risk tree

$P_{i1} = P_{i2} = 0.5 \times 10^{-9}$

$P_{p1} = P_{p2} = 2 \times 10^{-6}$

Note.— These figures are from Attachment G, Table G-15, Level 4 and assume exposure times of 30 and 15 seconds, and MTBOs of 4 000 and 2 000 hours for the azimuth and elevation elements respectively.

$P_s = 1.0$

Note.— Since there is no guided discontinued approach/missed approach procedure using secondary guidance, the probability of an accident during the procedure is taken to be 1.

$P_x = 1.0$

Note.— It is assumed in this example that in a Category III operation the pilot is unable to intervene in the event of an integrity failure in the ground system. The risk reduction factor is therefore equal to 1.

$P_u = 2.5 \text{ x } 10^{-4}$

Note.— The pilot risk reduction factor is estimated at 1 in 4 000 based on a study of accidents to aircraft conducting approaches to land using ground guidance systems. This is the risk reduction factor assumed due to pilot intervention following a continuity of service failure.

Therefore:

$P_i = 1 \times 10^{-9}$

$P_p = 4 \times 10^{-6}$

$P_d = 2.5 \times 10^{-4}$

$P_c = 4 \times 10^{-6} \times 2.5 \times 10^{-4} = 1 \times 10^{-9}$

$P_b = 1 \times 10^{-9} \times 1$

and:

calculated $P_a = 2 \times 10^{-9}$.

3.2 There is therefore a margin of 1×10^{-9} on the generic requirement.

4. *Application of the risk tree to an MLS/RNAV approach in an obstacle rich environment (Figure A-3).*

4.1 In this case there are three navigation elements (i.e. azimuth, elevation and DME/P) and all are assumed to meet the integrity and COS requirements for Level 4 azimuth equipment; i.e integrity = $1 - 0.5 \times 10^{-9}$ and MTBO = 4 000 hours.

$P_{i1} = P_{i2} = P_{i3} = 0.5 \times 10^{-9}$

$P_x = 1.0$

Note.— It is assumed that the pilot is unable to intervene in the event of an integrity failure in the ground system.

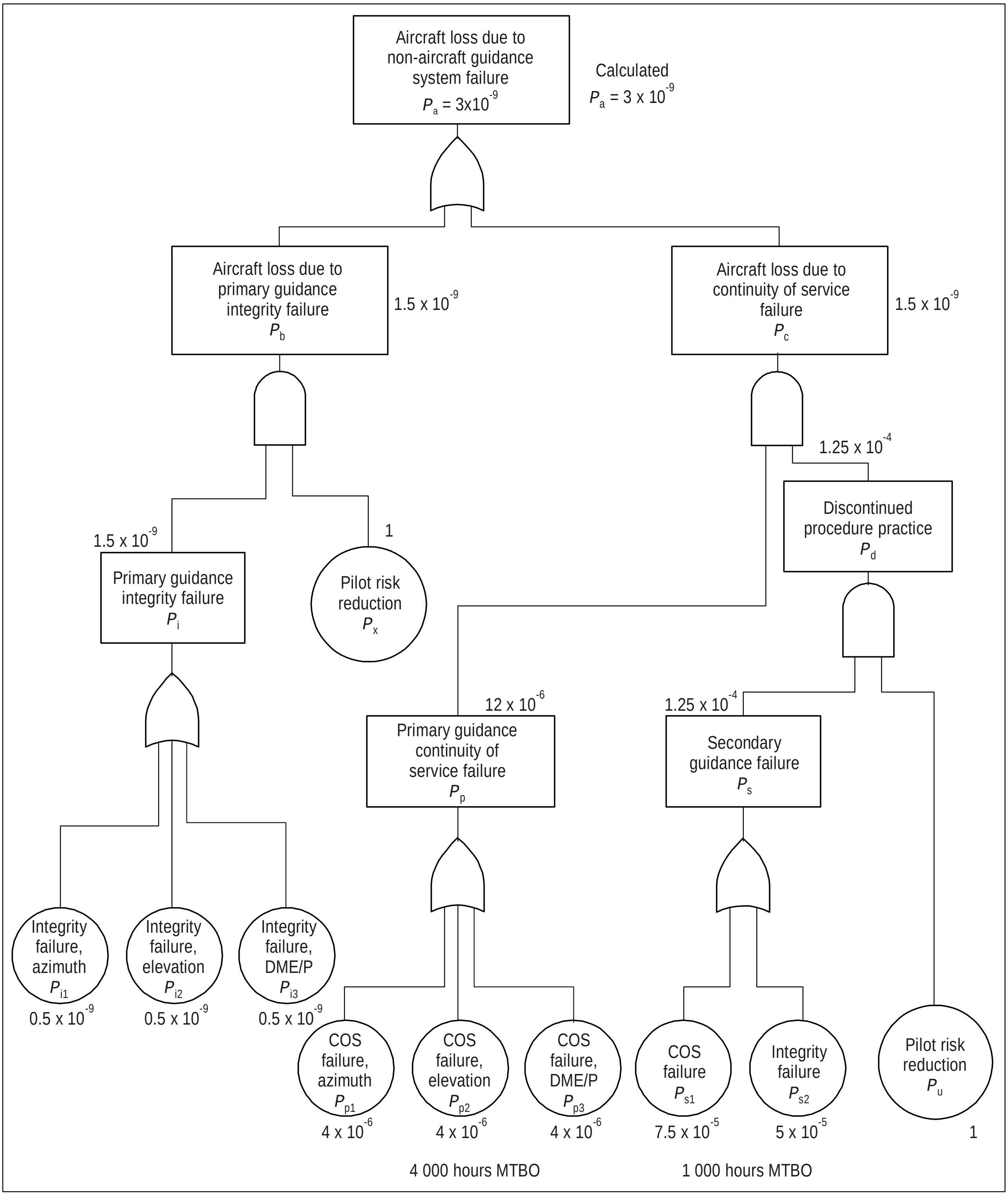


Figure A-3. MLS/RNAV obstacle rich risk tree

$P_{p1} = P_{p2} = P_{p3} = 4 \times 10^{-6}$

Note.— This assumes an obstacle exposure time (OET) of 60 seconds, and an MTBO of 4 000 for all ground elements.

$P_u = 1.0$

Note.— It is assumed that an unguided discontinued approach/missed approach procedure is unacceptable. The probability of an accident during such a procedure is therefore taken to be 1.

4.2 In the case of an MLS/RNAV procedure in an obstacle rich environment, it is assumed that secondary guidance will be essential to execute a safe discontinued approach/missed approach procedure during the period of exposure to the obstacles.

$P_{s1} = 7.5 \times 10^{-5}$

Note.— This is the probability of a COS failure of the secondary guidance ground equipment. It is assumed here that the secondary guidance system has a MTBO of 1 000 hours and that the exposure time is 270 seconds. The exposure time to a failure of the secondary guidance is dependent on the point in the procedure at which the availability of secondary guidance is confirmed. Assuming that this would be prior to the commencement of the MLS/RNAV procedure, and that the pilot would not be required to reconfirm the availability of secondary guidance before commencing the critical obstacle rich part of the procedure, the exposure time could be several minutes.

$P_{s2} = 5 \times 10^{-5}$

Note.— This is the integrity required by the secondary guidance system.

Therefore:

$P_i = 1.5 \times 10^{-9}$

$P_b = 1.5 \times 10^{-9}$

$P_p = 12 \times 10^{-6}$

$P_s = 7.5 \times 10^{-5} + 5 \times 10^{-5} = 1.25 \times 10^{-4}$

$P_d = 1.25 \times 10^{-4}$

$P_c = 12 \times 10^{-6} \times 1.25 \times 10^{-4} = 1.5 \times 10^{-9}$

and:

calculated $P_a = 3 \times 10^{-9}$, as required.

Note.— For obstacle exposure times greater than 60 seconds, it will be necessary to either increase the MTBOs of the primary guidance or to increase the risk reduction factor due to the secondary guidance. For example, if the exposure time is increased to 90 seconds, the MTBOs of the primary guidance must be increased to 6 000 hours or the MTBO of the secondary guidance increased to 2 250 hours. There are clearly trade-offs between the reliability of the primary guidance, the exposure time, and the reliability and integrity of the secondary guidance. The risk tree method can be used to examine individual MLS/RNAV procedures and determine the appropriate reliability and integrity requirements for the primary and secondary guidance.

ATTACHMENT B. STRATEGY FOR INTRODUCTION AND APPLICATION OF NON-VISUAL AIDS TO APPROACH AND LANDING

(see Chapter 2, 2.1)

1. Introduction

1.1 Various elements have an influence on all weather operations in terms of safety, efficiency and flexibility. The evolution of new techniques requires a flexible approach to the concept of all weather operations to obtain full benefits of technical development. To create this flexibility a strategy enables, through identification of its objectives and thoughts behind the strategy, incorporation of new technical developments or ideas into this strategy. The strategy does not assume a rapid transition to a single globally established system or selection of systems to support approach and landing operations.

1.2 The strategy addresses the application of non-visual aids to approach and landing with vertical guidance (APV) and precision approach and landing operations.

2. Ob ectives of strategy

The strategy must:

a) maintain at least the current safety level of all weather operations;

b) retain at least the existing level or planned improved level of service;

c) maintain global interoperability;

d) provide regional flexibility based on coordinated regional planning;

e) be applicable until at least the year 2020; and

f) take account of economic, operational and technical issues.

3. Considerations

3.1 General

The following considerations are based on the assumption that the operational requirement and the required commitment are available and the required effort is applied.

3.2 ILS-related considerations

a) There is a risk that ILS Category II or III operations cannot be safely sustained at specific locations;

b) Annex 10, Volume I, Chapter 3, 3.1.4 contains interference immunity performance standards for ILS receivers;

c) expansion of ILS is limited by channel availability (40 channels);

d) many aging ILS ground installations will need to be replaced; and

e) in most areas of the world, ILS can be maintained in the foreseeable future.

3.3 MLS-related considerations

a) MLS Category I is operational;

b) Category II capable ground equipment is certified. Ground and airborne Category IIIB equipment certification is in progress and is scheduled to be completed in the 2004-2005 time frame; and

c) MLS implementation is planned at specific locations to improve runway utilization in low visibility conditions.

3.4 GNSS-related considerations

a) Standards and Recommended Practices (SARPs) are in place for GNSS with augmentation to support APV and Category I precision approach;

b) SARPs for ground-based regional augmentation system (GRAS) for APV operations are under development;

c) GNSS with satellite-based augmentation system (SBAS) for APV operations is operational in some regions of the world;

d) GNSS with ground-based augmentation system (GBAS) for Category I precision approach operations is expected to be operational by 2006;

e) it is not expected that an internationally accepted GNSS with augmentation as required may be available for Category II and III operations before the 2010-2015 time frame;

f) technical and operational issues associated with GNSS approach, landing and departure operations must be solved in a timely manner; and

g) institutional issues associated with GNSS approach, landing and departure operations must be solved in a timely manner.

3.5 Multi-modal airborne approach and landing capability considerations

To enable this strategy, a multi-modal airborne approach and landing capability is necessary and is expected to be available.

3.6 Other considerations

a) There is an increasing demand for Category II and III operations;

b) GNSS can potentially offer unique operational benefits for low-visibility operations, including new procedures, flexible siting requirements and provision of airport surface guidance;

c) only the three standard systems (ILS, MLS and GNSS with augmentation as required) are considered to play a major role in supporting all weather operations. The use of head-up displays in conjunction with enhanced and/or synthetic vision systems may provide operational benefits;

d) a consequence of the global strategy is that there will not be a rapid transition from ILS to new systems such as GNSS or MLS. It is therefore essential for the implementation of the strategy that the radio frequency spectrum used by all of these systems be adequately protected;

e) to the extent practical, a transition directly from ILS to GNSS is preferable. In some States, however, it may not be possible to make this transition without losing the current level of Category II or III operations;

f) as long as some users of a given runway continue to rely on ILS, the potential operational benefits resulting from the introduction of new landing systems may be limited by the constraints of mixed-system operations;

g) APV operations may be conducted using GNSS with augmentation as required or barometric vertical guidance, and GNSS with ABAS or DME/DME RNAV lateral guidance; and

h) APV operations provide enhanced safety and generally lower operational minima as compared to non-precision approaches.

4. Strategy

Based on the considerations above, the need to consult aircraft operators and international organizations, and to ensure safety, efficiency and cost-effectiveness of the proposed solutions, the global strategy is to:

a) continue ILS operations to the highest level of service as long as operationally acceptable and economically beneficial so as to ensure that airport access is not denied to aircraft solely equipped with ILS;

b) implement MLS where operationally required and economically beneficial;

c) implement GNSS with augmentation (i.e. ABAS, SBAS, GBAS) as required for APV and Category I operations where operationally required and economically beneficial, while ensuring that the issues associated with ionospheric propagation in the equatorial regions are duly addressed and resolved;

d) promote the development and use of a multi-modal airborne approach and landing capability;

e) promote the use of APV operations, particularly those using GNSS vertical guidance, to enhance safety and accessibility;

f) identify and resolve operational and technical feasibility issues for GNSS with ground-based augmentation system (GBAS) to support Category II and III operations. Implement GNSS for Category II and III operations where operationally required and economically beneficial; and

g) enable each region to develop an implementation strategy for these systems in line with the global strategy.

ATTACHMENT C. INFORMATION AND MATERIAL FOR GUIDANCE IN THE APPLICATION OF THE STANDARDS AND RECOMMENDED PRACTICES FOR ILS VOR PAR 75 MHz MARKER BEACONS (EN-ROUTE) NDB AND DME

1. Introduction

The material in this Attachment is intended for guidance and clarification purposes and is not to be considered as part of the specifications or as part of the Standards and Recommended Practices contained in Volume I.

For the clarity of understanding of the text that follows and to facilitate the ready exchange of thoughts on closely associated concepts, the following definitions are included.

Definitions relating to the Instrument Landing System (ILS)

Note.— The terms given here are in most cases capable of use either without prefix or in association with the prefixes nominal and indicated . Such usages are intended to convey the following meanings

The prefix “nominal”: *the design characteristics of an element or concept.*

No prefix: *the achieved characteristics of an element or concept.*

The prefix “indicated”: *the achieved characteristics of an element or concept, as indicated on a receiver (i.e. including the errors of the receiving installation).*

Localizer system	ILS glide path system
Slant course line. The line formed at the intersection of the course surface and the plane of the nominal ILS glide path.	
	alse I S lide pat . Those loci of points in the vertical plane containing the runway centre line at which the DDM is zero, other than that locus of points forming the ILS glide path.
isplacement error. The angular or linear displacement of any point of zero DDM with respect to the nominal course line or the nominal ILS glide path respectively.	
inearit sector. A sector containing the course line or ILS glide path, within a course sector or an ILS glide path sector, respectively, in which the increment of DDM per unit of displacement remains substantially constant.	
ow one. A zone outside a course sector or an ILS glide path sector in which the DDM is less than the minimum value specified for the zone.	
Note.— The minimum values of M related to such zones are specified in Chapter 3, 3.1.3.7 and 3.1.5.6.	
lane of t e nominal I S lide pat . A plane perpendicular to the vertical plane of the runway centre line extended and containing the nominal ILS glide path.	

<table>
<tr><th>Localizer system</th><th>ILS glide path system</th></tr>
<tr><td>Indicated course line. The locus of points in any horizontal plane at which the receiver indicator deflection is zero.</td><td>Indicated I S lide pat . The locus of points in the vertical plane containing the runway centre line at which the receiver indicator deflection is zero.</td></tr>
<tr><td colspan="2">Indicated slant course line. The line formed at the intersection of the indicated course surface and the plane of the nominal ILS glide path.</td></tr>
<tr><td></td><td>Indicated I S lide pat an le. The angle above the horizontal plane of the indicated ILS glide path.</td></tr>
<tr><td>Indicated course sector. A sector in any horizontal plane containing the indicated course line in which the receiver indicator deflection remains within full-scale values.</td><td>Indicated I S lide pat sector. The sector containing the indicated ILS glide path in which the receiver indicator deflection remains within full-scale values.</td></tr>
<tr><td>ocali er course bend. A course bend is an aberration of the localizer course line with respect to its nominal position.</td><td>I S lide pat bend. An ILS glide path bend is an aberration of the ILS glide path with respect to its nominal position.</td></tr>
<tr><td colspan="2">Incremental sensitivit . The increment of receiver indicator current per unit change of receiver antenna displacement from the nominal course line or nominal ILS glide path.</td></tr>
<tr><td colspan="2">lat one. A zone within an indicated course sector or an indicated ILS glide path sector in which the slope of the sector characteristic curve is zero.</td></tr>
<tr><td colspan="2">Reversal one. A zone within an indicated course sector or an indicated ILS glide path sector in which the slope of the sector characteristic curve is negative.</td></tr>
</table>

2. Material concerning ILS installations

2.1 Operational objectives, design and maintenance objectives, and definition of course structure for Facility Performance Categories

2.1.1 The Facility Performance Categories defined in Chapter 3, 3.1.1 have operational objectives as follows:

Category I operation A precision instrument approach and landing with a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II operation A precision instrument approach and landing with a decision height lower than 60 m (200 ft) but not lower than 30 m (100 ft), and a runway visual range not less than 350 m.

Category IIIA operation A precision instrument approach and landing with:

a) a decision height lower than 30 m (100 ft), or no decision height; and

b) a runway visual range not less than 200 m.

Category IIIB operation A precision instrument approach and landing with:

a) a decision height lower than 15 m (50 ft), or no decision height; and

b) a runway visual range less than 200 m but not less than 50 m.

Category IIIC operation A precision instrument approach and landing with no decision height and no runway visual range limitations.

2.1.2 Relevant to these objectives will be the type of aircraft using the ILS and the capabilities of the aircraft flight guidance system(s). Modern aircraft fitted with equipment of appropriate design are assumed in these objectives. In practice, however, operational capabilities may extend beyond the specific objectives given at 2.1.1.

2.1.2.1 The availability of fail-passive and fail-operational flight guidance systems in conjunction with an ILS ground system which provides adequate guidance with an appropriate level of continuity of service and integrity for the particular case can permit the attainment of operational objectives which do not coincide with those described at 2.1.1.

2.1.2.2 For modern aircraft fitted with automatic approach and landing systems the routine use of such systems is being encouraged by aircraft operating agencies in conditions where the progress of the approach can be visually monitored by the flight crew. For example, such operations may be conducted on Facility Performance Category I — ILS where the guidance quality and coverage exceeds basic requirements given at Chapter 3, 3.1.3.4.1 and extends down to the runway.

2.1.2.3 In order to fully exploit the potential benefits of modern aircraft automatic flight control systems there is a related need for a method of describing ground based ILS more completely than can be achieved by reference solely to the Facility Performance Category. This is achieved by the ILS classification system using the three designated characters. It provides a description of those performance aspects which are required to be known from an operations viewpoint in order to decide the operational applications which a specific ILS could support.

2.1.2.4 The ILS classification scheme provides a means to make known the additional capabilities that may be available from a particular ILS ground facility, beyond those associated with the facilities defined in Chapter 3, 3.1.1. These additional capabilities can be exploited in order to permit operational use according to 2.1.2.1 and 2.1.2.2 to be approved down to and below the values stated in the operational objectives described in 2.1.

2.1.2.5 An example of the classification system is presented in 2.14.3.

2.1.3 Guidance material relating to airborne equipment tolerances appropriate to the attainment of the objectives of ILS Operational Performance Categories I and II are given in 2.2.4 and 2.2.5. In the case of Category II operations utilizing appropriate ILS facilities, it may be feasible to allow operations by aircraft with low approach speeds and adequate demonstrable manoeuvrability fitted with airborne equipment having tolerances less stringent than those specified for Category II.

Note.— The following guidance material is intended to assist States when they are evaluating the acceptability of ILS localizer courses and glide paths having bends. Although, by definition, course bends and glide path bends are related to the nominal positions of the localizer course and glide path respectively, the evaluation of high frequency aberrations is based *on the deviations from the mean course or path. The material in 2.1.6 and Figure C-2 regarding the evaluation of bends indicates how the bends relate to the mean position of the course and path. Aircraft recordings will normally be in this form.*

2.1.4 *Course bends.* Localizer course bends should be evaluated in terms of the course structure specified in Chapter 3, 3.1.3.4. With regard to landing and rollout in Category III conditions, this course structure is based on the desire to provide adequate guidance for manual and/or automatic operations along the runway in low visibility conditions. With regard to Category I performance in the approach phase, this course structure is based on the desire to restrict aircraft deviations, due to course bends (95 per cent probability basis) at the 30 m (100 ft) height, to lateral displacement of less than 10 m (30 ft). With regard to Categories II and III performance in the approach phase, this course structure is based on the desire to restrict aircraft deviations due to course bends (95 per cent probability basis) in the region between ILS Point B and the ILS reference datum (Category II facilities) or Point D (Category III facilities), to less than 2 degrees of roll and pitch attitude and to lateral displacement of less than 5 m (15 ft).

Note 1.— Course bends are unacceptable when they preclude an aircraft under normal conditions from reaching the decision height in a stable attitude and at a position, within acceptable limits of displacement from the course line, from which a safe landing can be effected. Automatic and semi-automatic coupling is affected to a greater degree than manual coupling by the presence of bends. Excessive control activity after the aircraft has settled on an approach may preclude it from satisfactorily completing an approach or landing. Additionally, when automatic coupling is used, there may be an operational requirement to continue the approach below the decision height. Aircraft guidance can be satisfied if the specification for course structure in Chapter 3, 3.1.3.4, is met.

Note 2.— Bends or other irregularities that are not acceptable will normally be ascertained by flight tests in stable air conditions requiring precision flight check techniques.

2.1.5 *ILS glide path bends.* Bends should be evaluated in terms of the ILS glide path structure specified in Chapter 3, 3.1.5.4. With regard to Category I performance, this glide path structure is based on the desire to restrict aircraft deviations due to glide path bends (95 per cent probability basis) at the 30 m (100 ft) height, to vertical displacements of less than 3 m (10 ft). With regard to Categories II and III performance, this glide path structure is based on the desire to restrict aircraft deviations due to path bends (95 per cent probability basis) at the 15 m (50 ft) height, to less than 2 degrees of roll and pitch attitude and to vertical displacements of less than 1.2 m (4 ft).

Note 1.— Path bends are unacceptable when they preclude an aircraft under normal conditions from reaching the decision height in a stable attitude and at a position, within acceptable limits of displacement from the ILS glide path, from which a safe landing can be effected. Automatic and semi-automatic coupling is affected to a greater degree than manual coupling by the presence of bends. Additionally, when automatic coupling is used, there may be an operational requirement to continue the approach below the decision height. Aircraft guidance can be satisfied if the specification for ILS glide path structure in Chapter 3, 3.1.4.4, is met.

Note 2.— Bends or other irregularities that are not acceptable will normally be ascertained by precision flight tests, supplemented as necessary by special ground measurements.

2.1.6 *Application of localizer course/glide path bend amplitude Standard.* In applying the specification for localizer course structure (Chapter 3, 3.1.3.4) and ILS glide path structure (Chapter 3, 3.1.5.4), the following criteria should be employed:

— Figure C-1 shows the relationship between the maximum (95 per cent probability) localizer course/glide path bend amplitudes and distances from the runway threshold that have been specified for Categories II and III performance.

— If the bend amplitudes are to be evaluated in any region of the approach, the flight recordings, corrected for aircraft angular position error, should be analysed for a time interval of plus or minus 20 seconds about the midpoint of the region to be evaluated. The foregoing is based on an aircraft ground speed of 195 km/h (105 knots) plus or minus 9 km/h (5 knots).

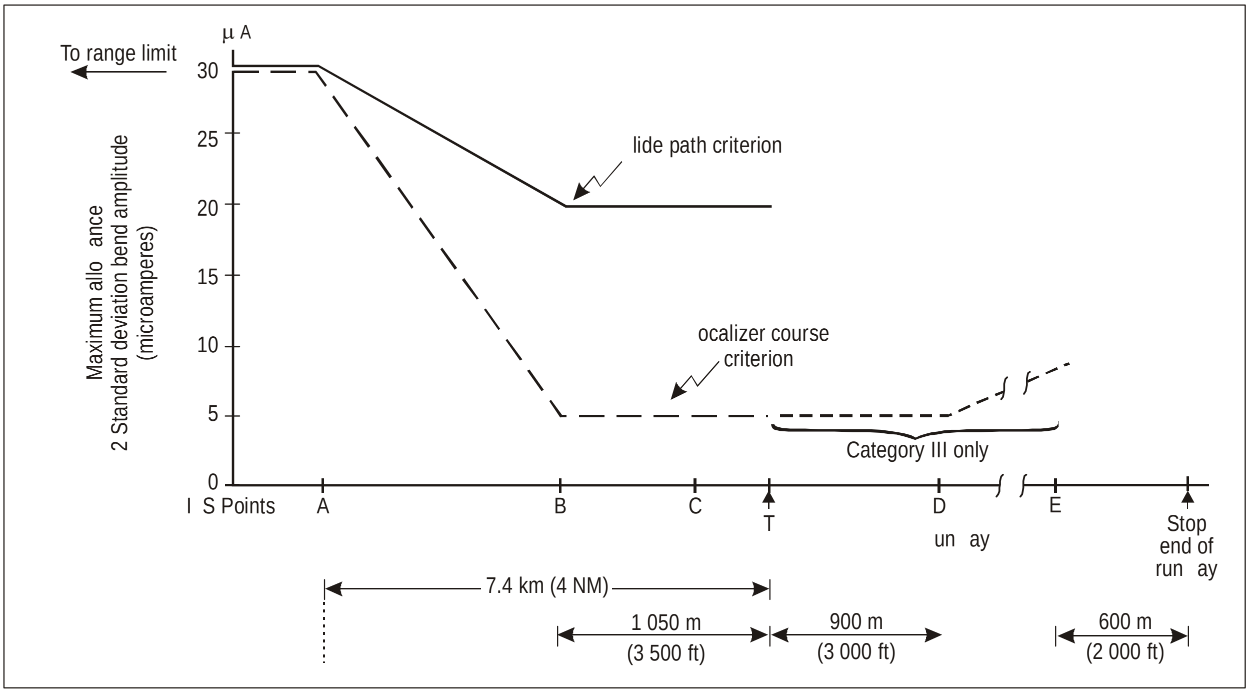


Figure C-1. Categories II and III localizer course and glide path maximum bend amplitude criteria

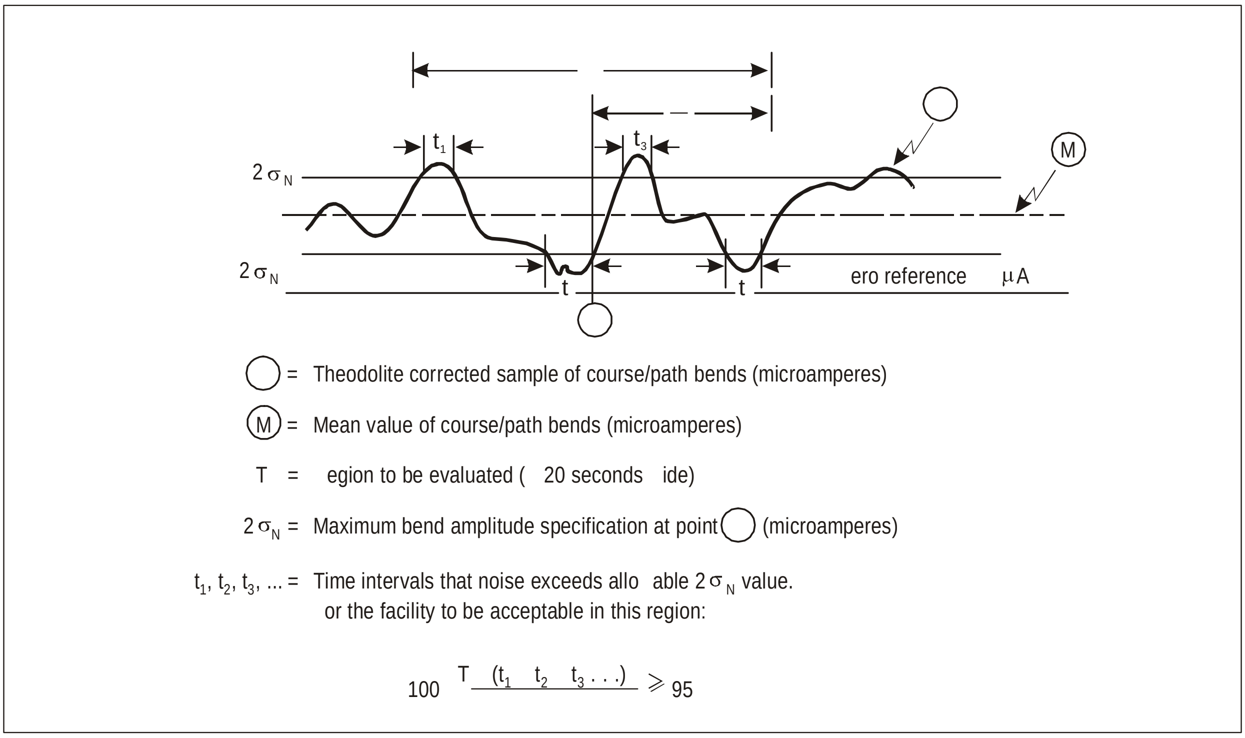


Figure C-2. Evaluation of course/path bend amplitude

The 95 per cent maximum amplitude specification is the allowable percentage of total time interval in which the course/path bend amplitude must be less than the amount specified in Figure C-1 for the region being evaluated. Figure C-2 presents a typical example of the method that can be employed to evaluate the course/path bend amplitude at a particular facility. If the sum of the time intervals t_1, t_2, t_3, where the given specification is exceeded, is equal to or less than 5 per cent of the total time T, the region that is being evaluated is acceptable. Therefore:

$$100 \quad \frac{T - [(t_1 + t_2 + ...)]}{T} \geq 95\%$$

Analysis of ILS glide path bends should be made using as a datum the mean glide path and not the downward extended straight line. The extent of curvature is governed by the offset displacement of the ground equipment glide path antenna system, the distance of this antenna system from the threshold, and the relative heights of the ground along the final approach route and at the glide path site (see 2.4).

2.1.7 Owing to the complex frequency components present in the ILS beam bend structures, measured values of beam bends are dependent on the frequency response of the airborne receiving and recording equipment. It is intended that beam bend measurements be obtained by using a total time constant (in seconds) for the receiver DDM output circuits and associated recording equipment of 92.6/V, where V is the velocity in km/h of the aircraft or ground vehicle as appropriate.

2.1.8 *Monitor systems.* Available evidence indicates that performance stability within the limits defined in Chapter 3, 3.1.3.6, 3.1.3.7 and 3.1.5.6, i.e. well within the monitor limit, can readily be achieved.

The choice of monitor limits is based on judgement, backed by knowledge of the safety requirements for the category of operation. However, the specifications of such monitoring limits do not indicate the magnitude of the normal day-to-day variations in performance which result from setting-up errors and equipment drift. It is necessary to investigate and take corrective action if the day-to-day performance frequently drifts beyond the limits specified in Chapter 3, 3.1.3.6, 3.1.3.7 and 3.1.5.6. The causes of such drifts should be eliminated:

a) to reduce greatly the possibility of critical signal parameters hovering near the specified monitor limits;

b) to ensure a high continuity of ILS service.

Following are some general guidelines for the design, operation and maintenance of monitor systems to meet the requirements in Chapter 3, 3.1.3.11 and 3.1.5.7.

1) Great care should be exercised to ensure that monitor systems respond to all those variations of the ground facility which adversely affect the operation of the airborne system during ILS approach.

2) Monitor systems should not react to local conditions which do not affect the navigational information as seen by airborne systems.

3) Drifts of the monitor system equipment should not appreciably reduce or increase the monitoring limits specified.

4) Special care must be taken in the design and operation of the monitor system with the aim of ensuring that the navigational components will be removed or radiation cease in the event of a failure of the monitor system itself.

5) Some monitors rely on devices which sample the signal in the vicinity of the transmitter antenna system. Experience has shown that such monitor systems require special attention in the following aspects:

a) where large-aperture antenna systems are used, it is often not possible to place the monitor sensors in such a position that the phase relationship observed in the far field on the course exists at the sensing point. Nevertheless, the monitor system should also detect antenna and associated feeder system changes which significantly affect the course in the far field;

b) changes in effective ground level caused by snow, flooding, etc., may affect glide path monitor systems, and the actual course in space differently, particularly when reliance is placed on the ground plane to form the desired glide path pattern;

c) attention should be paid to other causes which may disturb the monitor sensing of the radiated signal, such as icing and birds;

d) in a system where monitoring signals are used in a feedback loop to correct variations of the corresponding equipment, special care should be taken that extraneous influence and changes in the monitor system itself do not cause course or ILS glide path variations outside the specified limits without alarming the monitor.

6) One possible form of monitor is an integral monitor in which the contribution of each transmitting antenna element to the far-field course signal is measured at the antenna system. Experience has shown that such monitoring systems, properly designed, can give a close correlation between the monitor indication and the radiated signal in the far field. This type of monitor, in certain circumstances, overcomes the problem outlined in 5) a), b) and c).

It will be realized that the DDM measured at any one point in space is a function of displacement sensitivity and the position of the course line or ILS glide path. This should be taken into account in the design and operation of monitor systems.

2.1.9 *Radiation by ILS localizers not in operational use.* Severe interference with operational ILS localizer signals has been experienced in aircraft carrying out approaches to low levels at runways equipped with localizer facilities serving the reciprocal direction to the approach. Interference in aircraft overflying this localizer antenna system is caused by cross modulation due to signals radiated from the reciprocal approach localizer. Such interference, in the case of low level operations, could seriously affect approach or landing, and may prejudice safety. Chapter 3, 3.1.2.7, 3.1.2.7.1 and 3.1.2.7.2 specify the conditions under which radiation by localizers not in operational use may be permitted.

2.1.10 *ILS multipath interference due to large reflecting ob ects and movements on the ground*

2.1.10.1 The occurrence of interference to ILS signals is dependent on the total environment around the ILS antennas, and the antenna characteristics. Any large reflecting objects, including vehicles or fixed objects such as structures within the radiated signal coverage, will potentially cause multipath interference to the ILS course and path structure. The location and size of the reflecting fixed objects and structures in conjunction with the directional qualities of the antennas will determine the static course or path structure quality whether Category I, II or III. Movable objects can degrade this structure to the extent that it becomes unacceptable. The areas within which this degradable interference is possible need to be defined and recognized. For the purposes of developing protective zoning criteria, these areas can be divided into two types, i.e. critical areas and sensitive areas:

a) the ILS critical area is an area of defined dimensions about the localizer and glide path antennas where vehicles, including aircraft, are excluded during all ILS operations. The critical area is protected because the presence of vehicles and/or aircraft inside its boundaries will cause unacceptable disturbance to the ILS signal-in-space;

b) the ILS sensitive area is an area extending beyond the critical area where the parking and/or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the ILS signal during ILS operations. The sensitive area is protected against interference caused by large moving objects outside the critical area but still normally within the airfield boundary.

Note 1.— The ob ective of defining critical and sensitive areas is to afford adequate protection to the ILS. The manner in which the terminology is applied may vary between States. In some States, the term critical area is also used to describe the area that is referred to herein as the sensitive area.

Note 2.— It is expected that at sites, where ILS and MLS are to be collocated, the MLS might be located within ILS critical areas in accordance with guidance material in Attachment G, Section 4.1.

2.1.10.2 Typical examples of critical and sensitive areas that need to be protected are shown in Figures C-3A, C-3B, C-4A and C-4B. To protect the critical area, it is necessary to normally prohibit all entry of vehicles and the taxiing or parking of aircraft within this area during all ILS operations. The critical area determined for each localizer and glide path should be clearly designated. Suitable signal devices may need to be provided at taxiways and roadways which penetrate the critical area to restrict the entry of vehicles and aircraft. With respect to sensitive areas, it may be necessary to exclude some or all moving traffic depending on interference potential and category of operation. It would be advisable to have the aerodrome boundaries include all the sensitive areas so that adequate control can be exercised over all moving traffic to prevent unacceptable interference to the ILS signals. If these areas fall outside the aerodrome boundaries, it is essential that the cooperation of appropriate authorities be obtained to ensure adequate control. Operational procedures need to be developed for the protection of sensitive areas.

2.1.10.3 The size of the sensitive area depends on a number of factors including the type of ILS antenna, the topography, and the size and orientation of man-made objects, including large aircraft and vehicles. Modern designs of localizer and glide path antennas can be very effective in reducing the disturbance possibilities and hence the extent of the sensitive areas. Because of the greater potential of the larger types of aircraft for disturbing ILS signals, the sensitive areas for these aircraft extend a considerable distance beyond the critical areas. The problem is aggravated by increased traffic density on the ground.

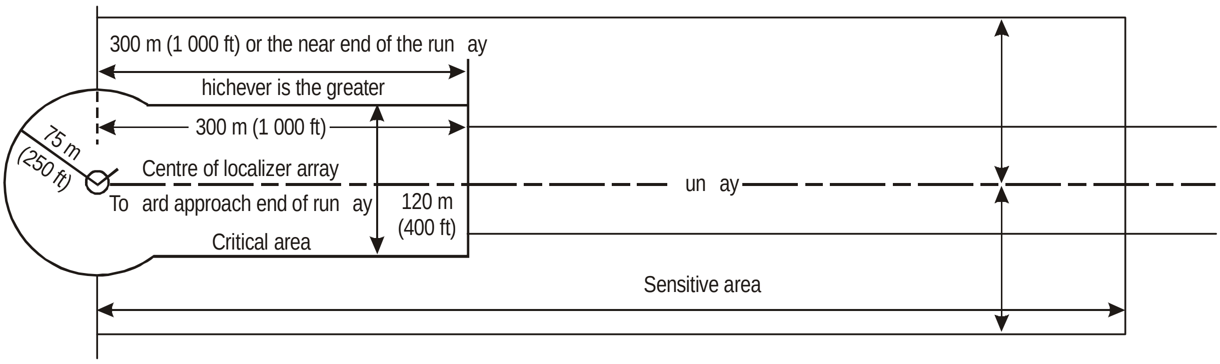
2.1.10.3.1 In the case of the localizer, any large objects illuminated by the main directional radiation of the antenna must be considered as possible sources of unacceptable signal interference. This will include aircraft on the runway and on some taxiways. The dimensions of the sensitive areas required to protect Category I, II and III operations will vary, the largest being required for Category III. Only the least disturbance can be tolerated for Category III, but an out-of-tolerance course along the runway surface would have no effect on Category I or II operations. If the course structure is already marginal due to static multipath effects, less additional interference will cause an unacceptable signal. In such cases a larger-size sensitive area may have to be recognized.

2.1.10.3.2 In the case of the glide path, experience has shown that any object penetrating a surface above the reflection plane of the glide path antenna and within azimuth coverage of the antenna must be considered as a source of signal interference. The angle of the surface above the horizontal plane of the antenna is dependent on the type of glide path antenna array in use at the time. Very large aircraft, when parked or taxiing within several thousand feet of the glide path antenna and directly between it and the approach path, will usually cause serious disturbance to the glide path signal. On the other hand, the effect of small aircraft beyond a few hundred feet of the glide path antenna has been shown to be negligible.

2.1.10.3.3 Experience has shown that the major features affecting the reflection and diffraction of the ILS signal to produce multipath interference are the height and orientation of the vertical surfaces of aircraft and vehicles. The maximum height of vertical surface likely to be encountered must be established, together with the “worst case” orientation. This is because certain orientations can cause out-of-tolerance localizer or glide path deviations at greater distances than parallel or perpendicular orientations.

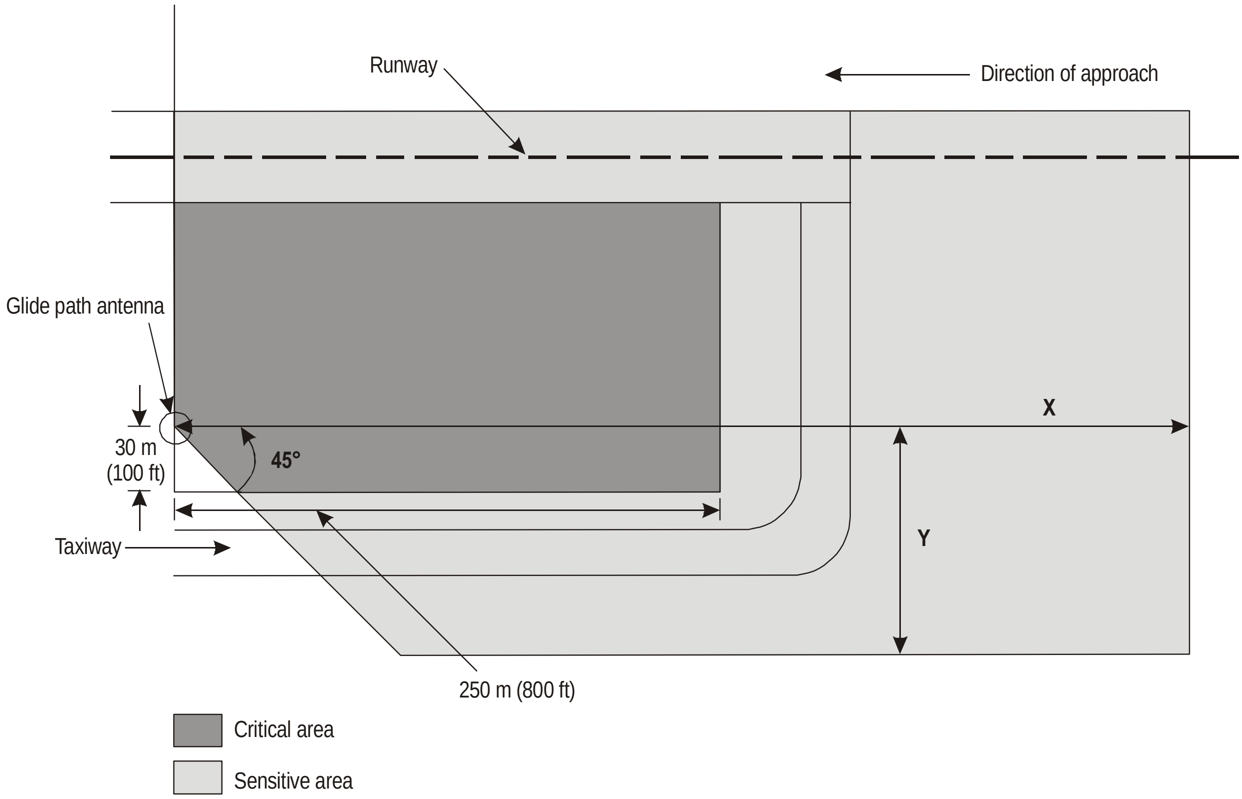
2.1.10.4 Computer or model techniques can be employed to calculate the probable location, magnitude and duration of ILS disturbances caused by objects, whether by structures or by aircraft of various sizes and orientation at different locations. Issues involved with these techniques include the following:

a) computerized mathematical models are in general use and are applied by personnel with a wide variety of experience levels. However, engineering knowledge of and judgement about the appropriate assumptions and limitations are required when applying such models to specific multipath environments. ILS performance information relative to this subject should normally be made available by the ILS equipment manufacturer;



B-747	B-747	B-727
Typically 27 m (90 ft) (Directional dual fre uency, 14 elements)	Typically 16 m (50 ft) (Semi-directional, elements)	Typically 16 m (50 ft) (Semi-directional, elements)
600 m (2 000 ft) 60 m (200 ft)	600 m (2 000 ft) 110 m (350 ft)	300 m (1 000 ft) 60 m (200 ft)
1 220 m (4 000 ft) 90 m (300 ft)	2 750 m (9 000 ft) 210 m (700 ft)	300 m (1 000 ft) 60 m (200 ft)
2 750 m (9 000 ft) 90 m (300 ft)	2 750 m (9 000 ft) 210 m (700 ft)	300 m (1 000 ft) 60 m (200 ft)

Figure C-3A. Typical localizer critical and sensitive areas dimension variations for a 3 000 m (10 000 ft) runway



		Example 1	*Example 2*	*Example 3*
Aircraft type		B-747	B-727	small & medium*
Category I	X	915 m (3 000 ft)	730 m (2 400 ft)	250 m (800 ft)
	Y	60 m (200 ft)	30 m (100 ft)	30 m (100 ft)
Category II/III	X	975 m (3 200 ft)	825 m (2 700 ft)	250 m (800 ft)
	Y	90 m (300 ft)	60 m (200 ft)	30 m (100 ft)

* Small and medium aircraft here are considered as those having both a length less than 18 m (60 ft) and a height less than 6 m (20 ft).

Note.— In some cases the sensitive areas may be extended beyond the opposite side of the runway.

Figure C-3B. Typical glide path critical and sensitive areas dimension variations

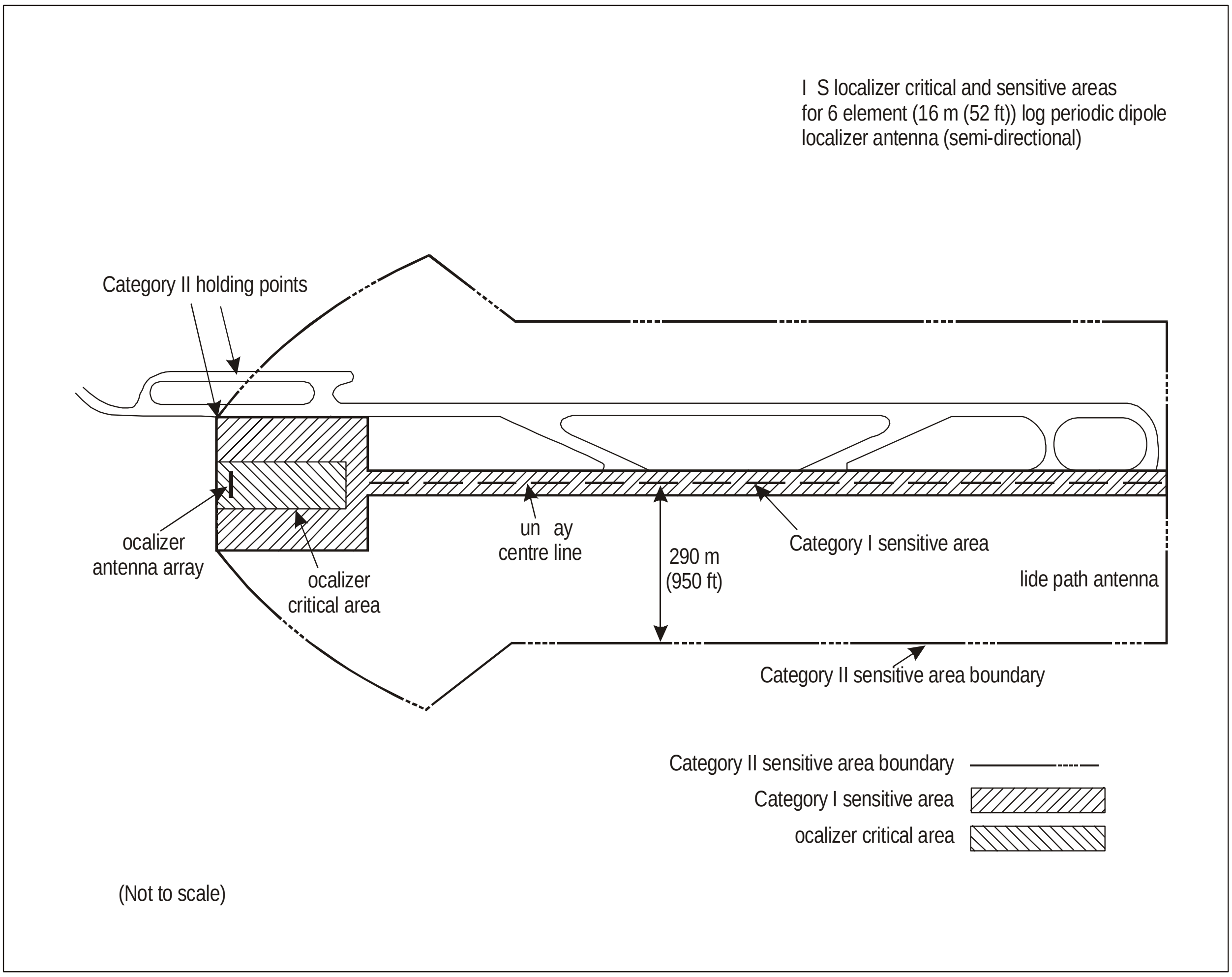


Figure C-4A. Example of critical and sensitive area application at specific sites with B-747 aircraft interference

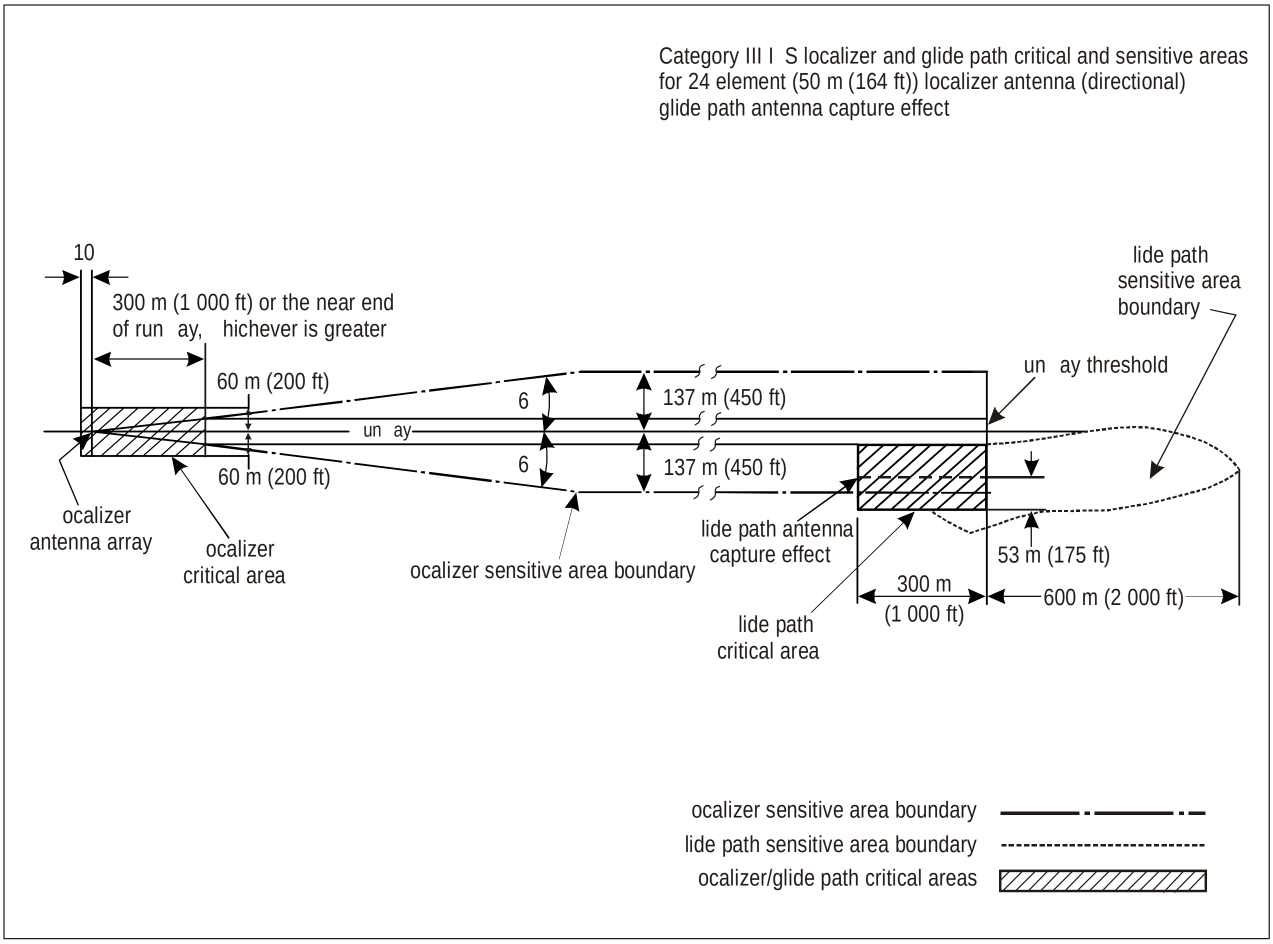


Figure C-4B. Example of critical and sensitive area application at specific sites with B-747 aircraft interference

b) where an ILS has been installed and found satisfactory, computers and simulation techniques can be employed to predict the probable extent of ILS disturbance which may arise as a result of proposed new construction. Wherever possible, the results of such computer-aided simulation should be validated by direct comparison with actual flight measurements of the results of new construction; and

c) taking into account the maximum allowable multipath degradation of the signal due to aircraft on the ground, the corresponding minimum sensitive area limits can be determined. Models have been used to determine the critical and sensitive areas in Figures C-3A, C-3B, C-4A and C-4B, by taking into account the maximum allowable multipath degradation of ILS signals due to aircraft on the ground. The factors that affect the size and shape of the critical and sensitive areas include: aircraft types likely to cause interference, antenna aperture and type (log periodic dipole/dipole, etc.), type of clearance signals (single/dual frequency), category of operations proposed, runway length, and static bends caused by existing structures. Such use of models should involve their validation, which includes spot check comparison of computed results with actual field demonstration data on parked aircraft interference to the ILS signal.

2.1.10.5 Control of critical areas and the designation of sensitive areas on the airport proper may still not be sufficient to protect an ILS from multipath effects caused by large, fixed ground structures. This is particularly significant when considering the size of new buildings being erected for larger new aircraft and other purposes. Structures outside the boundaries of the airport may also cause difficulty to the ILS course quality, even though they meet restrictions with regard to obstruction heights.

2.1.10.5.1 Should the environment of an airport in terms of large fixed objects such as tall buildings cause the structure of the localizer and/or glide path to be near the tolerance limits for the category of operation, much larger sensitive areas may need to be established. This is because the effect of moving objects, which the sensitive areas are designed to protect the ILS against, has to be added to the static beam bends caused by fixed objects. However, direct addition of the maximum bend amplitudes is not considered appropriate and a root sum square combination is felt to be more realistic. Examples are as follows:

a) localizer course bends due to static objects equals plus or minus 1½µ*A*. Limit plus or minus 5µ*A*. Therefore allowance for moving objects to define localizer sensitive area is

$$\sqrt{5^2 - 1.5^2} = 4.77\mu A$$

b) localizer course bends due to static objects equals plus or minus 4µ*A*. Limit plus or minus 5µ*A*. Therefore allowance for moving objects to define localizer sensitive area is

$$\sqrt{5^2 - 4^2} = 3\mu A$$

In case b) the sensitive area would be larger, thus keeping interfering objects further away from the runway so that they produce 3µ*A* or less distortion of the localizer beam. The same principle is applied to the glide path sensitive area.

2.1.11 *Guidance on operational aspects of improving the performance of the ILS localizer in respect to bends*

2.1.11.1 *Introduction.* Owing to site effects at certain locations, it is not always possible to produce with simple standard ILS installations localizer courses that are sufficiently free from troublesome bends or irregularities. At such installations, it will often be possible to reduce bends and irregularities in the localizer course to a satisfactory extent by various methods, most of which require acceptance of some deviation from the specification for ILS set forth in this Annex, together with possible penalties from an operational aspect.

2.1.11.2 *Methods of effecting improvement.* In general, improvements in localizer courses from the aspect of bends or irregularities may be effected by restriction of radiation in particular directions so as to avoid or minimize reflection from objects that give rise to the bends. In the majority of instances where special treatment is required, this may be achieved by screens placed and designed to reduce the radiation in the direction of the object. Where reflecting objects are numerous or of large dimensions, however, it may be necessary to restrict almost all the radiation from the localizer to a narrow sector centred on the course line. Each method introduces certain disadvantages which should be weighed for the individual installation in the light of the specific operational application to be made of the installation and the following considerations.

2.1.11.3 *isadvantages of methods of effecting improvements mentioned above*

2.1.11.3.1 The use of screens limiting radiation in selected directions will, in general, give rise to a reduction of the clearance between the two modulation signals of the ILS in some other direction, with the consequence that the ILS indicator needle may move towards the centre when the aircraft is passing through areas in that direction. It is considered however that, in general, such deviations are not operationally significant or may be overcome by suitable procedures. In certain applications including the use of screens or reflectors to reinforce signals in the course sector, the use of screens or reflectors will modify the range and characteristics of the back course of the localizer. Here again, it is considered that the effects are unlikely to be operationally significant unless operational use is being made of the back course. In this latter case, it may be necessary to provide an additional facility to supplement or replace the back course.

2.1.11.3.2 Where it is necessary to limit radiation from the localizer over a wide sector and confine most of it to a sector centred on the front course of the localizer in order to reduce bends sufficiently, the disadvantages will, in general, be as follows:

a) Orientation information from the localizer in the sector in which radiation is limited will no longer be available or will be unreliable.

b) It will not be practicable to carry out a preliminary check of the performance of the aircraft receiver through the flag system until the aircraft is within the sector centred on the course line.

c) In the area outside the sector centred on the course line, sufficient radiation may occur in particular directions to operate the ILS indicator in the aircraft in an erratic manner, giving rise to false indications.

d) The loss of the back course.

2.1.11.3.3 In respect to a), it is considered that orientation information is necessary but that practice has shown that such information is preferably obtained in any event from an auxiliary aid such as a locator. Such an auxiliary aid would be necessary if radiation from the localizer is confined to a narrow sector centred on the course line. In respect to b), it is considered that the loss of a receiver check prior to entry into the sector centred on the course line could be operationally accepted.

2.1.11.3.4 The disadvantage indicated in c) may, in some instances, be a serious drawback. In general, it is considered that acceptance of this disadvantage will depend on the extent to which false indications will occur at a particular site and on the procedures established or specified for the use of the ILS installation. In practice, it is possible to establish procedures so that no use is made of the localizer signals until the aircraft is able to check that it is in the usable sector. Experience has shown at one installation in operational use that, procedurally, no difficulty has arisen through the existence of erratic indications in the off-course sector. It is considered that the question of whether or not the off-course signal characteristics due to reduction of radiation in a narrow sector may be accepted operationally is a matter for individual assessment at each location concerned.

2.1.11.3.5 The loss of the back course indicated in d) may have several disadvantages. At some locations, the back course serves a useful function through intersection with other aids for facilitating procedures in the area concerned. Also, the back course often provides a useful aid in missed approach procedures and can often be used to simplify approach for landing when conditions require that the landing direction be opposite to the direction for which the ILS is primarily installed. Loss of the back course will, in general, require the provision of a substitute aid or aids, and the principal disadvantage in suppressing the back course may be considered in terms of the additional expense of a substitute aid or aids.

2.1.11.4 *Extent to which sector centred on course line may be narrowed.* It is considered that a radiation sector 10 degrees each side of the localizer course line would be the minimum sector that could be accepted operationally. It is desirable that the characteristics of the signal from the localizer be identical with those specified in Chapter 3 within the region in the immediate vicinity (region from DDMs 0.155 to zero) of the course line and approximate closely to them out to 10 degrees, so that the indications of the ILS indicator and the signals fed to a coupling device, if used, will correspond to the standard ILS throughout any manoeuvres necessary in the transition from the approach to the localizer to establishment on course line.

It should be realized, however, that for an increased runway length, the localizer course sector wherein proportional guidance is provided will be narrower as a result of adjusting the localizer to the sensitivity specified in Chapter 3, 3.1.3.7.1. Although a proportional guidance signal is provided on each side of the course line up to a level of 0.180 DDM, the level above 0.150 DDM may not be usable by the automatic airborne system during the intercept manoeuvre unless that system is armed within the sector in which a minimum of 0.180 DDM is provided (e.g. plus or minus 10 degrees). It is advantageous to permit the localizer capture mode of the automatic airborne system to be armed at off-course angles greater than 10 degrees; consequently it is desirable to maintain a minimum DDM of 0.180 through a wider sector than plus or minus 10 degrees wherever practical.

2.1.11.5 *Further possibilities.* If the disadvantages arising from the use of the restricted coverage and modified signal characteristics discussed in 2.1.11.3 are unacceptable, possibilities exist through the use of two radio frequency carriers to provide the coverage and signal characteristics that would maintain the essential information provided by a standard ILS in the suppressed sector while, at the same time, maintaining in the regions about the course sector the objective of the restricted coverage system. It may be necessary to employ this more elaborate system at aerodromes with high multipath environments. Additional guidance on two radio frequency carrier coverage is provided in 2.7.

2.2 ILS airborne receiving equipment

Note.— The specified tolerances are those considered necessary to achieve the operational ob ective and include allowances, where appropriate, for

a) variation of relevant ground system parameters within the limits defined in Chapter 3, 3.1

b) variation of aircraft environment

c) measurement error and

d) deterioration in service between maintenance periods.

The words receiving equipment , as used in this section, include the receiver itself, the antenna(s) and the necessary interconnections in the aircraft.

2.2.1 *General*

2.2.1.1 In order to ensure consistent and reliable operation, the output characteristics of the receiver in respect of course line (centring) and course width (deflection) should be maintained to a degree of accuracy appropriate to the operational objective. Attention is directed towards the need to take into account the variable conditions that may affect such accuracy.

2.2.1.2 Furthermore, in order to ensure that a constant course width is realized by all users of the ILS system, it is necessary to standardize the overall gain of the localizer receiver. Similar considerations apply in the case of the glide path receiver.

2.2.2 *Localizer receiver audio gain ad ustment*

2.2.2.1 The audio gain of the receiver should be such that, with a radio frequency input of 1 000 microvolts modulated 20 per cent by a 90 Hz tone and 20 per cent by a 150 Hz tone, a zero indication is achieved and that, upon a simultaneous increase in one component of 4.65 per cent (i.e. to 24.65 per cent) and a decrease in the other component of 4.65 per cent (i.e. to 15.35 per cent), there is a proportional deflection of 3/5 of the full course width indication but not less than 9.5 mm along its scale. This gain adjustment is to be made with the normal power supply voltage encountered under airborne operating conditions.

2.2.3 *Localizer receiving equipment centring tolerance*

2.2.3.1 To obtain the operational objectives associated with ILS Performance Categories I, II and III and to ensure the safe operation of aircraft within the obstacle clearance surfaces, the centring error of the receiving equipment, operating within all the likely aircraft environmental conditions and receiving a zero signal (DDM) within the limits of the ground equipment radio frequency modulation characteristics and identification tolerances, as specified in Chapter 3, 3.1.3, and with an RF field strength of 90 microvolts per metre (minus 107 dBW/m^2), should not exceed the following limits with a 68 per cent probability:

Category I: 4.66 per cent of the full course width indication (0.0072 DDM)

Category II: 2.33 per cent of the full course width indication (0.0036 DDM)

Category III: 1.66 per cent of the full course width indication (0.00258 DDM)

Note.— These operational requirements are also to be met at larger field strengths up to the maximum field strength likely to be encountered in operational service.

2.2.4 *Localizer course displacement sensitivity (deflection) tolerance*

2.2.4.1 When the receiver audio gain has been adjusted in accordance with 2.2.2, and with an increase in one modulation tone of the audio frequency input signal of 4.65 per cent with respect to the nominal value (i.e. 24.65 per cent) and a simultaneous decrease of the other component by 4.65 per cent with respect to the nominal value (i.e. 15.35 per cent), the indicated deflection signal should not vary more than plus or minus 0.019 DDM from the nominal value at a signal strength of 90 microvolts per metre (minus 107 dBW/m^2) up to the maximum field strength likely to be encountered in operational service.

Note.— See 2.2.5 in respect to signal levels.

2.2.5 *Localizer receiving system minimum signal level sensitivity*

2.2.5.1 The sensitivity of the localizer receiving equipment should be such that in a high percentage of cases, the receiver indicates a usable signal and a substantially steady indication in the presence of the minimum field strength specified in Chapter 3, 3.1.3.3.2 (40 microvolts per metre or minus 114 dBW/m^2).

Note 1.— The maximum signal level likely to be encountered under 2.2.3 and 2.2.4 is 500 microvolts. Signal levels on the order of 5 000 microvolts may be encountered in the near vicinity of the transmitter (e.g. when flying over the localizer during a missed approach, or when the localizer is used for rollout or take-off guidance).

Note 2.— The two levels of sensitivity addressed in 2.2.4 and 2.2.5 ensure *a) a high quality output such as is necessary for approach purposes and*

b) an output of lesser quality adequate for operational usage of the facility in other parts of the coverage volume.

Note 3.— The proper operation of the localizer receiving system in the presence of the specified minimum field strength is to occur independently of the orientation of the aircraft longitudinal axis in the horizontal plane when the aircraft is exposed to roll angles of 20 degrees and pitch angles of 10 degrees.

2.2.6 *Localizer course displacement linearity*

2.2.6.1 The receiver output course displacement signal should be a substantially linear function of the DDM of the receiver input signal. For any input over the range of plus or minus 0.155 DDM, and for any RF signal level likely to be encountered in operational service, the displacement sensitivity should not depart from the nominal DDM/deflection ratio defined in 2.2.2 by more than plus or minus 20 per cent. Also for an input signal of plus or minus 0.165 DDM or greater, the output must be greater than full course displacement.

Note.— See 2.2.5 in respect to signal levels.

2.2.7 *Localizer receiver bandwidth*

2.2.7.1 The receiver bandwidth should be such as to provide for the reception of channels having the characteristics defined in Chapter 3, 3.1.3.2.1 after taking suitable account of appropriate receiver tolerances.

2.2.8 *Localizer receiver susceptibility to VOR and localizer signals*

2.2.8.1 The receiver design should provide correct operation in the following environment:

a) the desired signal exceeds an undesired co-channel by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 34 dB. (During bench testing of the receiver, in this first adjacent channel case, the undesired signal is varied over the frequency range of the combined ground station (plus or minus 9 kHz) and receiver frequency tolerance.);

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

Note 1.— It is recognized that not all receivers currently meet requirement b) however, all future equipment shall be designed to meet this requirement.

Note 2.— In some States, a smaller ground station tolerance is used.

2.2.9 *Immunity performance of ILS localizer receiving systems to interference from V F FM broadcast signals*

2.2.9.1 With reference to Note 2 of 3.1.4.2, Chapter 3, the immunity performance defined there must be measured against an agreed measure of degradation of the receiving system's normal performance, and in the presence of, and under standard conditions for the input wanted signal. This is necessary to ensure that the testing of receiving equipment on the bench can be performed to a repeatable set of conditions and results and to facilitate their subsequent approval. Tests have shown that FM interference signals may affect both course guidance and flag current, and their effects vary depending on the

DDM of the wanted signal which is applied. Additional information can be found in ITU Recommendation ITU-R IS.1140, *Test procedures for measuring receiver characteristics used for determining compatibility between the sound-broadcasting service in the band of about 7 10 M z and the aeronautical services in the band 10 11 M z.*

2.2.9.2 Commonly agreed methodology and formulae should be used to assess potential incompatibilities to receivers meeting the general interference immunity criteria specified in Chapter 3, 3.1.4. The formulae provide clarification of immunity interference performance of spurious emission (type A1) interference, out-of-band channel (type A2) interference, two-signal and three-signal third order (type B1) interference, and overload/desensitization (type B2) interference. Additional information can be found in ITU Recommendation ITU-R IS.1009-1, *Compatibility between the sound-broadcasting service in the band of about 7 10 M z and the aeronautical services in the band 10 137 M z.*

2.2.9.3 The frequency planning criteria given in Recommendation ITU-R IS.1009-1 does not take account of the potential for two-signal and three-signal fifth order (type B1) intermodulation products. Measurements have determined that fifth order intermodulation products created in receiver by FM stations might degrade the performance of ILS receivers conforming to specifications in Chapter 3, 3.1.4. Fifth order intermodulation products can occur without a third order intermodulation product occurring on the same ILS frequency. In the planning of frequencies, and in the assessment of protection from FM broadcast interference, consideration needs to be given to two-signal and three-signal fifth order intermodulation products generated within ILS receivers by FM broadcast stations.

2.2.10 *Glide path receiver audio gain ad ustment*

2.2.10.1 The audio gain of the receiver should be such that, with a radio frequency input of 600 microvolts modulated 40 per cent by a 90 Hz tone and 40 per cent by a 150 Hz tone, a zero indication is achieved and that, upon a simultaneous increase in one component of 5.25 per cent (i.e. to 45.25 per cent) and a decrease in the other component of 5.25 per cent (i.e. to 34.75 per cent), there is a proportional deflection of 3/5 of full course width indication but not less than 9.5 mm along its scale. This gain adjustment is to be made with the normal power supply voltage encountered under airborne operational conditions.

2.2.11 *Glide path receiving equipment centring tolerance*

2.2.11.1 To obtain the operational objectives associated with ILS Performance Categories I, II and III and to ensure the safe operation of aircraft within the obstacle clearance surfaces, the centring error of the receiving equipment, operating within all likely aircraft environmental conditions and receiving a zero signal (DDM) within the limits of the ground equipment radio frequency modulation characteristics and identification tolerances, as specified in Chapter 3, 3.1.5, and with an RF field strength of 400 microvolts per metre (minus 95 dBW/m^2), should not exceed the following limits with a 68 per cent probability:

Category I: 5.33 per cent of the full course width indication (0.0093 DDM)

Category II: 3.33 per cent of the full course width indication (0.0058 DDM)

Category III: 3.33 per cent of the full course width indication (0.0058 DDM)

Note.— These operational requirements are also to be met at larger field strengths up to the maximum field strength likely to be encountered in operational service.

2.2.12 *Glide path course displacement sensitivity (deflection) tolerance*

2.2.12.1 When the receiver audio gain has been adjusted in accordance with 2.2.10, and with an increase in one modulation tone of the radio frequency input signal of 5.25 per cent (i.e. to 45.25 per cent) and a simultaneous decrease of the other component of 5.25 per cent (i.e. to 34.75 per cent), the displacement signal should not vary more than plus or minus 0.016 DDM from the nominal value at a signal strength of 400 microvolts per metre (minus 95 dBW/m^2) up to the maximum field strength likely to be encountered in operational service.

Note.— See 2.2.13 in respect to signal levels.

2.2.13 *Glide path receiving system minimum signal level sensitivity*

2.2.13.1 The sensitivity of the glide path receiving system should be such that, in a high percentage of cases, the receiver should indicate a usable signal and a substantially steady indication in the presence of the minimum field strength specified in Chapter 3, 3.1.5.3.2 (400 microvolts per metre or minus 95 dBW/m^2).

Note 1.— The maximum signal level likely to be encountered under 2.2.11 and 2.2.12 is 2 500 microvolts. This signal level occurs when the aircraft is at the runway threshold.

Note 2.— The two levels of sensitivity addressed in 2.2.12 and 2.2.13 ensure

a) a high quality output such as is necessary for approach purposes and

b) an output of lesser quality adequate for operational usage of the facility in other parts of the coverage volume.

Note 3.— The proper operation of the glide path receiving system in the presence of the specified minimum field strength should occur also if the aircraft longitudinal axis is varied plus or minus 10 degrees in the horizontal plane together with 20 degrees roll about the localizer course line and also plus or minus 10 degrees pitch in the vertical plane about the horizontal plane.

2.2.14 *Glide path displacement linearity*

2.2.14.1 The receiver output glide path displacement signal should be a substantially linear function of the DDM of the receiver input signal. For any input over the range plus or minus 0.175 DDM, and for any RF signal strength likely to be encountered in operational service, the displacement sensitivity should not depart from the nominal DDM/deflection ratio defined in 2.2.10 by more than plus or minus 20 per cent. For an input signal of 0.185 DDM or greater, the output must be greater than full course displacement.

Note.— See 2.2.13 with respect to signal levels.

2.2.15 *Glide path receiver bandwidth*

2.2.15.1 The receiver bandwidth should be such as to provide for the reception of channels having the characteristics defined in Chapter 3, 3.1.5.2.1 after taking suitable account of appropriate receiver tolerances.

2.2.16 *Glide path receiver susceptibility to glide path signal*

2.2.16.1 The receiver design should provide correct operation in the following environment:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired glide path signal, 150 kHz removed from the desired signal, exceeds the desired signal by up to 20 dB. (During bench testing of the receiver, in this first adjacent channel case, the undesired signal is varied over the frequency range of the combined ground station (plus or minus 17 kHz) and receiver frequency tolerance.);

c) an undesired glide path signal, 300 kHz or further removed from the desired signal, exceeds the desired signal by up to 40 dB.

Note 1.— It is recognized that not all receivers currently meet requirement b) however, all future equipment shall be designed to meet this requirement.

Note 2.— In some States, a smaller ground station tolerance is used.

2.2.17 *Localizer and glide path receiver effect from vertical polarization*

2.2.17.1 Over the localizer and glide path frequency bands, respectively, the reception of vertically polarized signals from the forward direction with respect to the localizer and glide path antenna should be at least 10 dB below the reception of horizontally polarized signals from the same direction.

2.2.18 *Localizer and glide path receiver spurious response*

2.2.18.1 The response (indicator deflection) of the localizer receiver to a 150 Hz 30 per cent modulated RF signal at 110 MHz should be greater than the response to a similarly modulated but 60 dB greater amplitude RF signal varied over 90 kHz to 107.8 MHz and 112.2 MHz to 1 500 MHz. The response of the glide path receiver to a 150 Hz 30 per cent modulated RF signal at 332.0 MHz should be greater than the response to a similarly modulated but 60 dB greater amplitude RF signal varied over 90 kHz to 329.0 MHz and 335.3 MHz to 1 500 MHz.

2.3 Malfunctioning alarm in ILS airborne equipment

2.3.1 Ideally, a receiver alarm system such as a visual mechanical flag should warn a pilot of any unacceptable malfunctioning conditions which might arise within either the ground or airborne equipments. The extent to which such an ideal may be satisfied is specified below.

2.3.2 The alarm system is actuated by the sum of two modulation depths and, therefore, the removal of the ILS course modulation components from the radiated carrier should result in the actuation of the alarm.

2.3.3 The alarm system should indicate to the pilot and to any other airborne system which may be utilizing the localizer and glide path data, the existence of any of the following conditions:

a) the absence of any RF signal as well as the absence of simultaneous 90 Hz and 150 Hz modulation;

b) the percentage modulation of either the 90 Hz or 150 Hz signal reduction to zero with the other maintained at its normal 20 per cent and 40 per cent modulation respectively for the localizer and glide path;

Note.— It is expected that the localizer alarm occur when either the 90 z or 150 z modulation is reduced to 10 per cent with the other maintained at its normal 20 per cent. It is expected that the glide path alarm occur when either the 90 z or 150 z modulation is reduced to 20 per cent with the other maintained at its normal 40 per cent.

c) the receiver off-course indication 50 per cent or less of that specified when setting the receiver audio gain adjustment (see 2.2.2 and 2.2.10).

2.3.3.1 The alarm indication should be easily discernible and visible under all normal flight deck conditions. If a flag is used, it should be as large as practicable commensurate with the display.

2.4 Guidance for the siting, elevation, adjustment and coverage of glide path equipment

2.4.1 The ILS reference datum and the ILS glide path angle setting are the primary factors influencing the longitudinal location of the ILS glide path equipment with respect to the threshold.

2.4.2 The lateral placement of the glide path antenna system with respect to the runway centre line is normally not less than 120 m (400 ft). In deciding the lateral placement of the glide path antenna, account should be taken of the appropriate provisions of Annex 14 with regard to obstacle clearance surfaces and objects on strips for runways.

2.4.3 In selecting the ILS glide path antenna location and glide path angle, the aim should be to place the ILS reference datum as close as possible to the appropriate nominal value. The actual selection of the ILS glide path antenna location and glide path angle are governed by a number of factors, including:

a) acceptable rates of descent and/or approach speeds for the type of operations envisaged at the particular aerodrome;

b) the position of obstacles in the final approach area, the aerodrome sector and the missed approach area, and the resulting obstacle clearance limits;

c) technical siting problems.

2.4.4 The selection of the antenna location and the angle, and the resulting ILS reference datum height, will also be affected by:

a) the runway length available;

b) the operating limits envisaged.

Where the application of the foregoing criteria permits, the preferred angle of the ILS glide path would be 3 degrees.

2.4.5 An ILS reference datum and glide path should then be selected, having regard to the foregoing criteria, and the ability of the site to provide the clearance required by the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168) should be determined by calculation and confirmed, where possible, by flight test.

2.4.6 Where the selected ILS reference datum, the ILS glide path angle and the other relevant equipment characteristics do not provide the required clearances, the following alternative course of action should be investigated:

a) removal of the offending obstacle;

b) selection of an alternative height for the ILS reference datum, taking into account the criteria indicated in 2.4.3 and 2.4.5;

c) selection of an alternative acceptable ILS glide path angle;

d) variation of the obstacle clearance limit to cater for the offending obstacle.

2.4.7 To enable more effective use of land adjacent to Category III — ILS glide path sites and to reduce siting requirements and sensitive areas at these sites, it is desirable that the signals forming the horizontal radiation pattern from the Category III — ILS glide path antenna system be reduced to as low a value as practicable outside the azimuth coverage limits specified in Chapter 3, 3.1.5.3. Another acceptable method is to rotate in azimuth the glide path antennas away from multipath sources thus reducing the amount of radiated signals at specific angles while still maintaining the azimuth coverage limits.

2.4.8 *ILS glide path curvature.* In many cases the ILS glide path is formed as a conic surface originating at the glide path aerial system. Owing to the lateral placement of the origin of this conic surface from the runway centre line, the locus of the glide path in the vertical plane along the runway centre line is a hyperbola. Curvature of the glide path occurs in the threshold region and progressively increases until touchdown.

2.4.9 Relationship between siting of glide path antenna and glide path threshold crossing height. The longitudinal position of the glide path antenna should be selected so as to meet the recommendation made in Chapter 3, 3.1.5.1.4, in respect to the height of the ILS reference datum above the runway threshold. The height of the ILS reference datum above the runway threshold is then a function of the longitudinal position of the glide path antenna, of the longitudinal slope of the glide path reflection plane and of the position of the runway threshold in respect to the glide path reflection plane. This situation is described pictorially in Figure C-5. The longitudinal position of the glide path antenna is then calculated as follows:

$$\frac{\quad + \quad}{\tan(\theta + \alpha)}$$

where

= the horizontal distance between O and P;

= the nominal threshold crossing height;

= the vertical height of the runway threshold above P ;

θ = the nominal ILS glide path angle;

α = the longitudinal downslope of the glide path reflection plane.

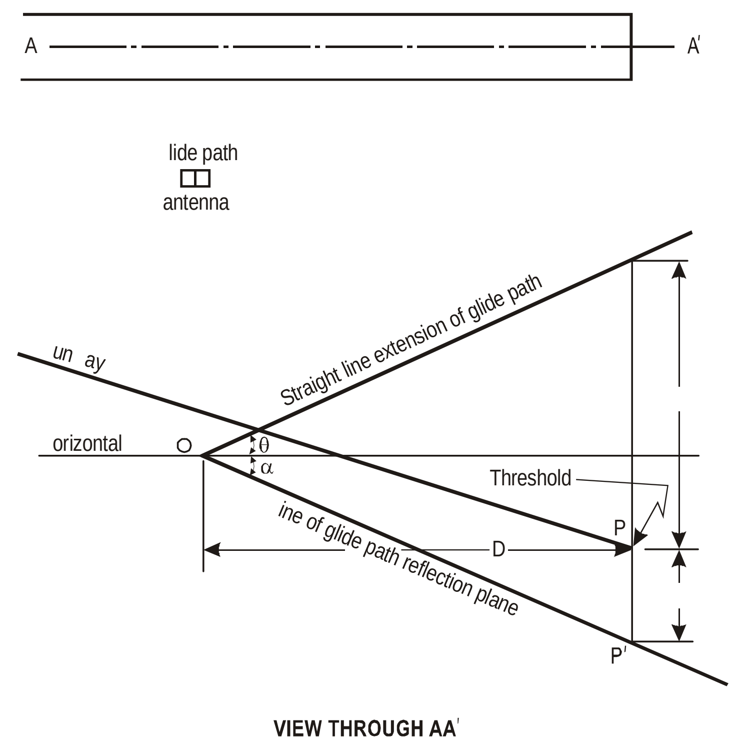
Note.— In the above formula α *is to be taken as positive in the case of a downslope from the antenna towards the threshold.* Y *is taken as positive if the threshold is above the reflection plane intersection line.*

2.4.10 The foregoing guidance material in respect of the longitudinal placement to the glide path antenna in relation to the runway threshold, which takes into account the fact that the runway may not be in the glide path reflection plane, and that the glide path reflection plane may be sloped, is based on geometrical abstractions. The material implicitly assumes that the glide path locus in the vertical plane, containing the runway centre line, is a perfect hyperbola; consequently, the glide path extension is implicitly assumed as the asymptote to this hyperbola.

2.4.11 In fact, however, the glide path is often quite irregular. The mean ILS glide path angle can be ascertained only by flight tests; the mean observed position of that part of the glide path between ILS Points A and B being represented as a straight line, and the ILS glide path angle being the angle measured between that straight line and its vertical projection on the horizontal plane.

2.4.12 It is important to recognize that the effect of glide path irregularities if averaged within the region between the middle marker and the threshold will likely tend to project a reference datum which is actually different from the ILS reference datum. This reference datum, defined here as the achieved ILS reference datum, is considered to be of important operational significance. The achieved ILS reference datum can only be ascertained by flight check, i.e. the mean observed position of that portion of the glide path typically between points 1 830 m (6 000 ft) and 300 m (1 000 ft) from the threshold being represented as a straight line and extended to touchdown. The point at which this extended straight line meets the line drawn vertically through the threshold at the runway centre line is the achieved ILS reference datum.

Note.— Further guidance on the measurement of the glide path angle and the achieved ILS reference datum is given in oc 071.



Note.— The line OP′ represents the intersection of the glide path reflection plane and the vertical plane through AA′.

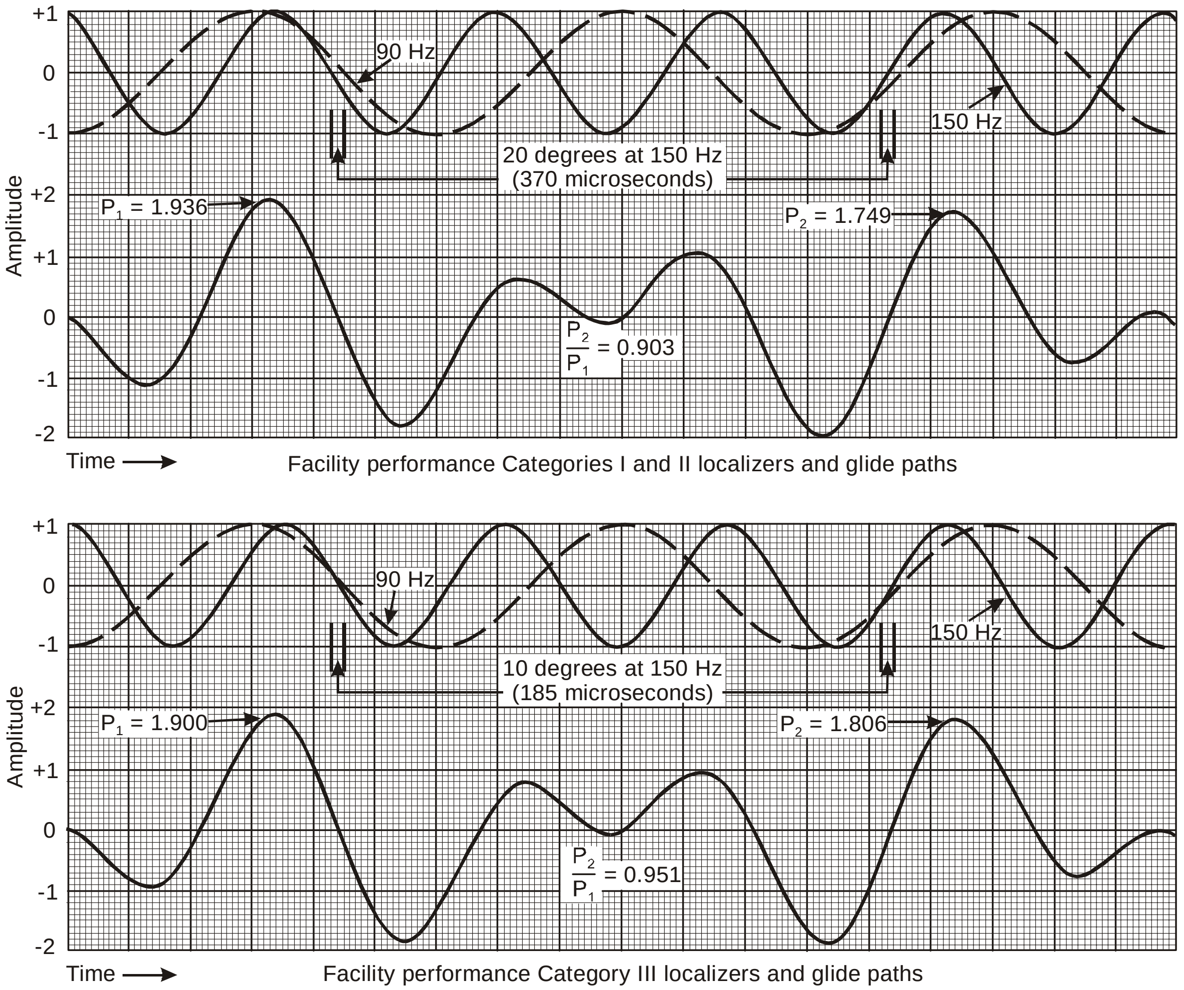
Figure C-5. Glide path siting for sloping runway

2.4.13 Chapter 3, 3.1.5.3.1 indicates the glide path coverage to be provided to allow satisfactory operation of a typical aircraft installation. The operational procedures promulgated for a facility must be compatible with the lower limit of this coverage. It is usual for descents to be made to the intercept altitude and for the approach to continue at this altitude until a fly-down signal is received. In certain circumstances a cross-check of position may not be available at this point. Automatic flight control systems will normally start the descent whenever a fly-up signal has decreased to less than about 10 microamperes.

2.4.14 The objective is, therefore, to provide a fly-up signal prior to intercepting the glide path. Although under normal conditions, approach procedures will be accomplished in such a way that glide path signals will not be used below 0.45 θ, or beyond 18.5 km (10 NM) from the runway, it is desirable that misleading guidance information should not be radiated in this area. Where procedures are such that the glide path guidance may be used below 0.45 θ, adequate precautions must be taken to guard against the radiation of misleading guidance information below 0.45 θ, under both normal conditions and during a malfunction, thus preventing the final descent being initiated at an incorrect point on the approach. Some precautions which can be employed to guard against the radiation of misleading guidance include the radiation of a supplementary clearance signal such as provided for in Chapter 3, 3.1.5.2.1, the provision of a separate clearance monitor and appropriate ground inspection and setting-up procedures.

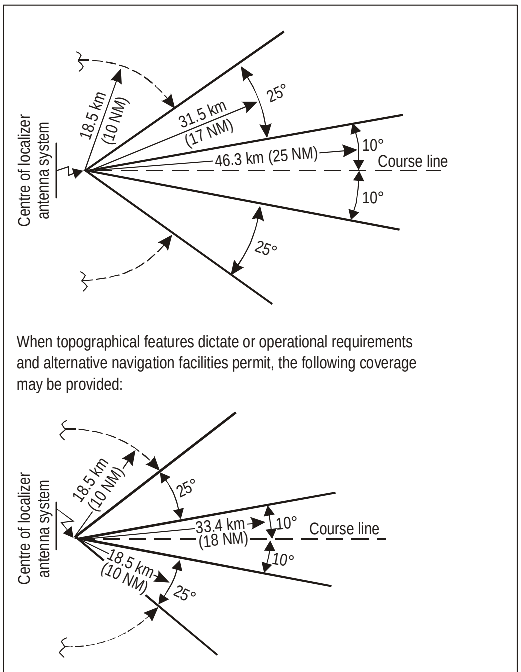
2.4.15 To achieve satisfactory monitor protection against below-path out-of-tolerance DDM, depending on the antenna system used, the displacement sensitivity monitor as required in Chapter 3, 3.1.5.7.1 e) may not be adequate to serve also as a clearance monitor. In some systems, e.g. those using multi-element arrays without supplementary clearance, a slight deterioration of certain antenna signals can cause serious degradation of the clearance with no change or only insignificant changes within the glide path sector as seen by the deviation sensitivity monitor. It is important to ensure that monitor alarm is achieved for any or all possible deteriorated antenna and radiated signal conditions, which may lead to a reduction of clearance to 0.175 DDM or less in the below-path clearance coverage.

2.5 Diagrams (Figures C-6 to C-12 illustrate certain of the Standards contained in Chapter 3)



The accompanying graphs illustrate a method that can be used to measure the relative phase relationship between the 90 Hz and 150 Hz tones. The upper portion of each graph shows the individual waveforms and their relationship at the limit of phase differences allowed by Chapter 3, 3.1.3.5.3.3 and 3.1.5.5.3. The lower portion shows the combined waveforms as would be seen on an oscilloscope. By taking the ratio of P_1 and P_2, which gives a value equal to or less than unity, it is possible to determine if the phasing is within tolerance. For Categories I and II ILS the ratio should be greater than 0.903 and for Category III the ratio should be greater than 0.951.

Figure C-6. ILS wave forms illustrating relative audio phasing of the 90 Hz and 150 Hz tones



Note.— If coverage as prescribed in Chapter 3, 3.1.3.3.1 is required outside the plus or minus 35-degree sector, this is provided to 18.5 km (10 NM), as indicated by the broken arc above.

Figure C-7. Localizer coverage with respect to azimuth

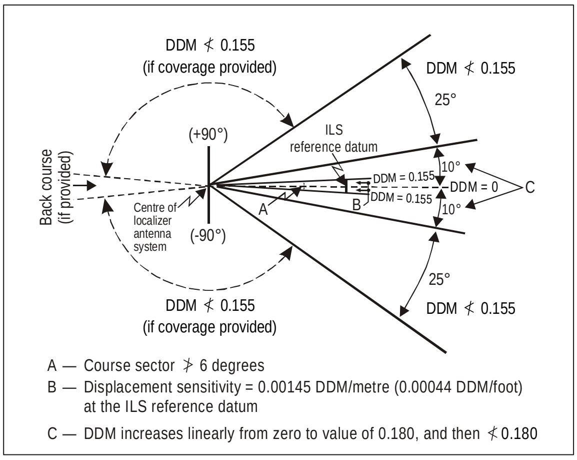
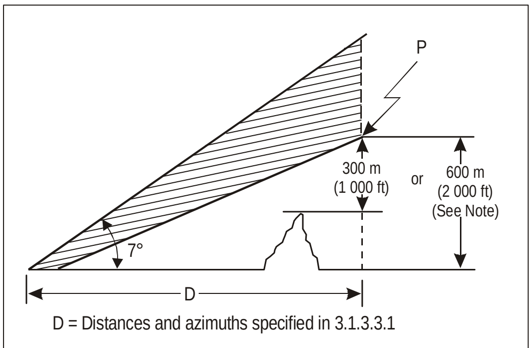


Figure C-9. Difference in depth of modulation and displacement sensitivity



Note.— The point P is either 600 metres (2 000 ft) above the elevation of the threshold, or 300 metres (1 000 ft) above the elevation of the highest point within the intermediate and final approach areas, whichever is the higher.

Figure C-8. Localizer coverage with respect to elevation

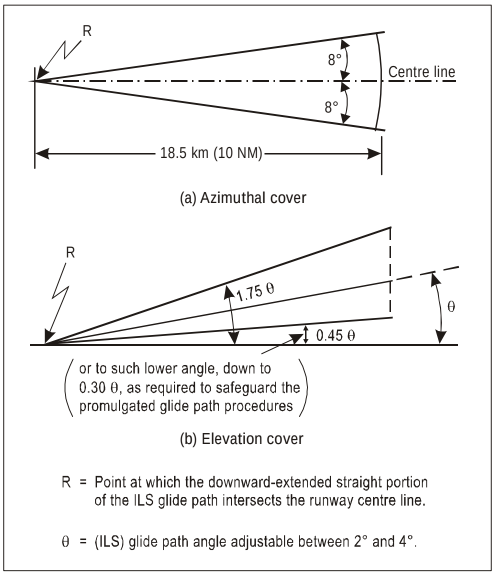


Figure C-10. Glide path coverage

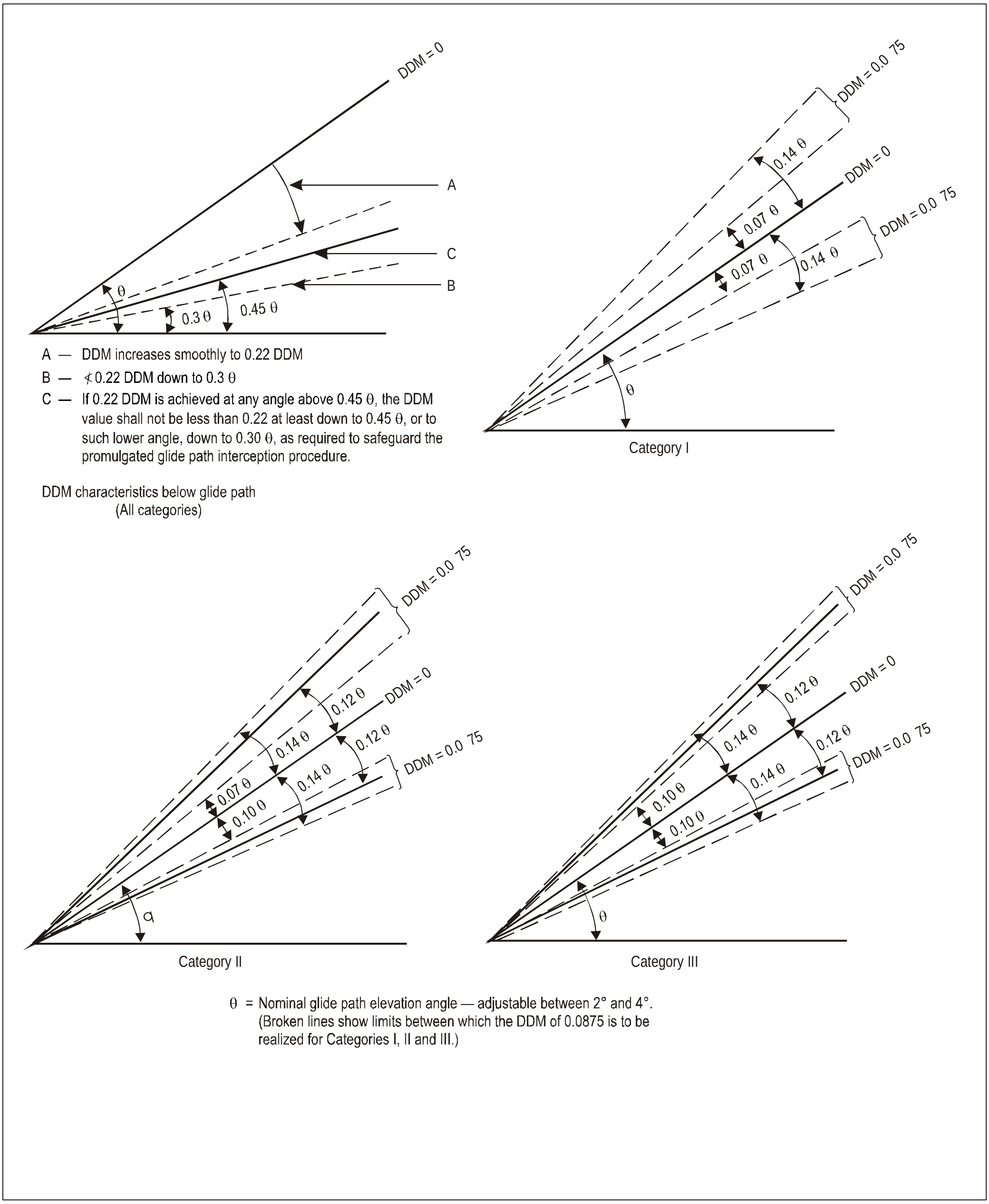


Figure C-11. Glide path — difference in depth of modulation

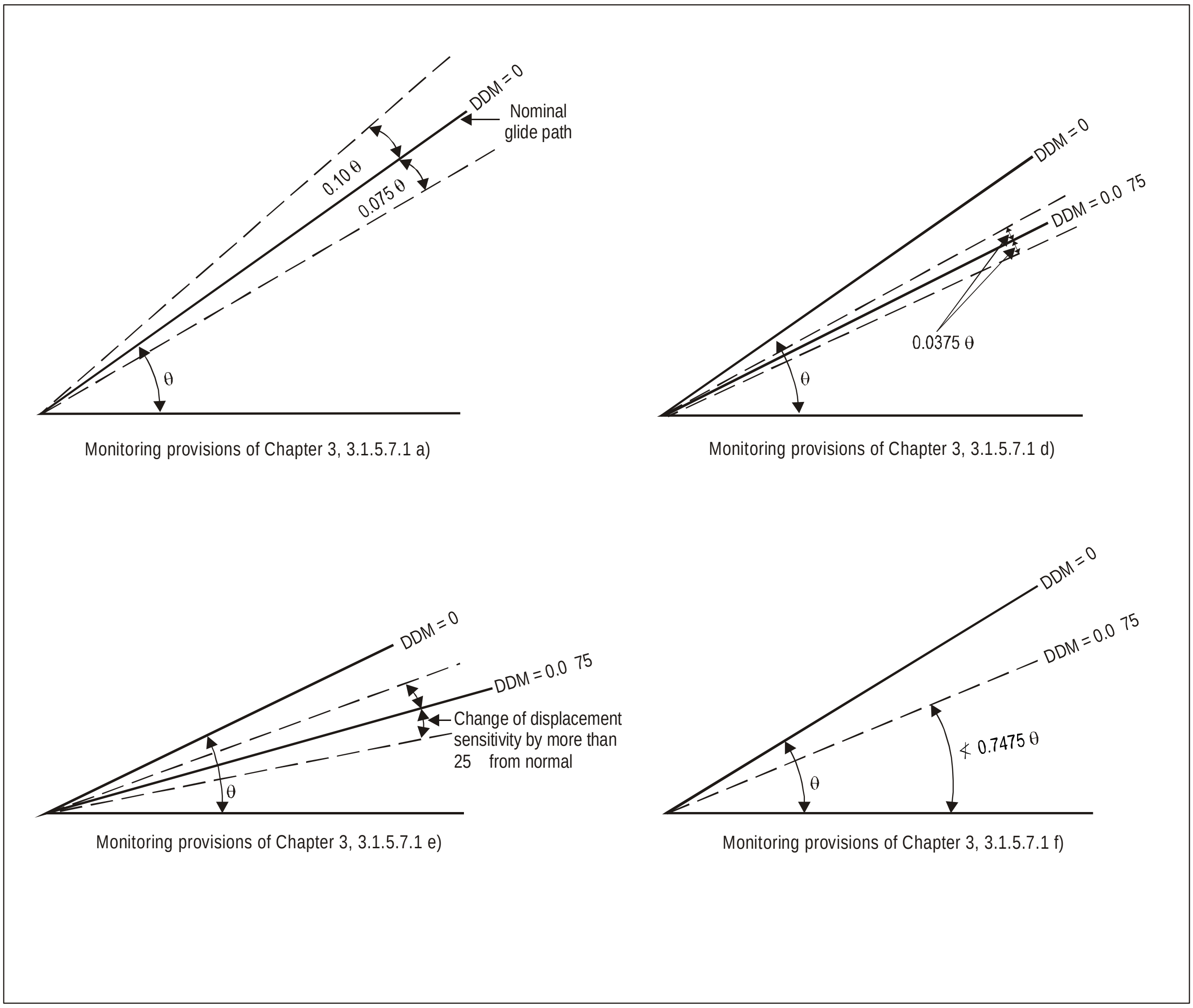


Figure C-12. Glide path monitoring provisions

2.6 Deployment of ILS frequencies

2.6.1 In using the figures listed in Table C-1, it must be noted that these are related to ensuring freedom from interference to a point at the protection height and at the limit of service distance of the ILS in the direction of the front beam. If there is an operational requirement for back beam use, the criteria would also be applied to a similar point in the back beam direction. Frequency planning will therefore need to take into account the localizer azimuthal alignment. It is to be noted that the criteria must be applied in respect of each localizer installation, in the sense that while of two localizers, the first may not cause interference to the use of the second, nevertheless the second may cause interference to the use of the first.

2.6.2 The figures listed in Table C-1 are based on providing an environment within which the airborne receivers can operate correctly.

Table C-1. Required distance separations

	Frequency separation	Minimum separation between second facility and the protection point of the first facility km (NM)		
		List A	List B	List C
Localizer	Co-channel	148 (80)	148 (80)	148 (80)
	50 kHz	—	37 (20)	9 (5)
	100 kHz	65 (35)	9 (5)	0
	150 kHz	—	0	0
	200 kHz	11 (6)	0	0
Glide path	Co-channel	93 (50)	93 (50)	93 (50)
	150 kHz	—	20 (11)	2 (1)
	300 kHz	46 (25)	2 (1)	0
	450 kHz	—	0	0
	600 kHz	9 (5)	0	0

List A refers to the use of localizer receivers designed for 200 kHz channel spacing coupled with glide path receivers designed for 600 kHz channel spacing and applicable only in regions where the density of facilities is low.

List B refers to the use of localizer receivers designed for 100 kHz channel spacing coupled with glide path receivers designed for 300 kHz channel spacing.

List C refers to the use of localizer receivers designed for 50 kHz channel spacing coupled with glide path receivers designed for 150 kHz channel spacing.

Note 1.— The above figures are based on the assumption of protection points for the localizer at 46 km (25 NM) distance and 1 900 m (6 250 ft) height and for the ILS glide path at 1 .5 km (10 NM) distance and 760 m (2 500 ft) height.

Note 2.— States, in applying the separations shown in the table, have to recognize the necessity to site the ILS and VOR facilities in a manner which will preclude the possibility of airborne receiver error due to overloading by high unwanted signal levels when the aircraft is in the initial and final approach phases.

Note 3.— States, in applying the separations shown in the table, have to recognize the necessity to site the ILS glide path facilities in a manner which will preclude the possibility of erroneous glide path indications due to reception of ad acent channel signals when the desired signal ceases to radiate for any reason while the aircraft is in the final approach phase.

2.6.2.1 *ILS localizer receivers*

2.6.2.1.1 In order to protect receivers designed for 50 kHz channel spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 34 dB;

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

2.6.2.1.2 In order to protect receivers designed for 100 kHz channel spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 7 dB;

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

2.6.2.2 *ILS glide path receivers*

2.6.2.2.1 In order to protect receivers designed for 150 kHz spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) a desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired glide path signal, 150 kHz removed from the desired signal, exceeds the desired signal by up to 20 dB;

c) an undesired glide path signal, 300 kHz or further removed from the desired signal, exceeds the desired signal by up to 40 dB.

2.6.2.2.2 In order to protect receivers designed for 300 kHz spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) a desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired glide path signal, 150 kHz removed from the desired signal, does not exceed the desired signal (0 dB signal ratio);

c) an undesired glide path signal, 300 kHz removed from the desired signal, exceeds the desired signal by up to 20 dB;

d) an undesired glide path signal, 450 kHz or further removed from the desired signal, exceeds the desired signal by up to 40 dB.

2.6.3 The calculations are based on the assumption that the protection afforded to the wanted signal against interference from the unwanted signal is 20 dB. This corresponds to a disturbance of not more than 15 microamperes at the limit of the service distance of ILS.

2.6.4 In so far as the wanted and unwanted carriers may produce a heterodyne note, the protection ratio ensures that the instrumentation is not affected. However, in cases where a voice facility is used, the heterodyne note may interfere with this facility.

2.6.5 In general, when international use of ILS systems is confined to the pairings listed in Chapter 3, 3.1.6.1.1, the criteria are such that, provided they are met for the localizer element, the glide path element is automatically covered. At certain congested locations, where it is necessary to make assignments in both the first ten and the second ten sequence pairings, it may be necessary to select certain pairings out of sequence in order to meet the minimum geographical separation in 2.6.6.

Example Referring to Chapter 3, 3.1.6.1.1, it will be noted that ILS Sequence Number 2 pairs the localizer frequency of 109.9 MHz with glide path frequency 333.8 MHz. Sequence Numbers 12 and 19, however, although providing wide frequency separation from Sequence Number 2 in the case of the localizers, assign frequencies of 334.1 MHz and 333.5 MHz, respectively, for the glide paths, both being first adjacent channels (300 kHz spacing) to the Sequence Number 2 glide path channel. If selection of ILS channels is confined to either the first ten or the second ten pairings, then the minimum glide path frequency separation will be 600 kHz.

2.6.6 *Table of required distance separations* [See Table C-1.]

2.6.7 The application of the figures given in Table C-1 will only be correct within the limitations set by the assumptions which include that facilities are essentially non-directional in character, that they have similar radiated powers, that the field strength is approximately proportional to the angle of elevation for angles up to 10 degrees, and that the aircraft antenna is essentially omnidirectional in character. If more precise determination of separation distances is required in areas of frequency congestion, this may be determined for each facility from appropriate propagation curves, taking into account the particular directivity factors, radiated power characteristics and the operational requirements as to coverage. Where reduced separation distances are determined by taking into account directivity, etc., flight measurements at the ILS protection point and at all points on the approach path should be made wherever possible to ensure that a protection ratio of at least 20 dB is achieved in practice.

2.7 Localizers and glide paths achieving coverage with two radio frequency carriers

2.7.1 Localizer coverage may be achieved by using two composite radiation field patterns on different carrier frequencies spaced within the localizer frequency channel. One field pattern gives accurate course and displacement indications within the front course sector; the other field pattern provides ILS indications outside the front course sector to meet the coverage requirements in Chapter 3, 3.1.3.3 and 3.1.3.7. Discrimination between signals is obtained in airborne receivers by the stronger signal capturing the receiver. Effectiveness of capture depends on the type of detector used but, in general, if the ratio of the two signals is of the order of 10 dB or more, the smaller signal does not cause significantly large errors in demodulated output. For optimum performance within the front course sector, the following guidance material should be applied in the operation of two carrier frequency localizer systems.

2.7.2 The localizer should be designed and maintained so that the ratio of the two radiated signals-in-space within the front course sector does not fall below 10 dB. Particular attention should be directed to the vertical lobe structure produced by the two antenna systems which may be different in height and separated in distance, thus resulting in changes in ratio of signal strengths during approach.

2.7.3 Due to the 6 dB allowance for the receiver pass-band filter ripple, localizer receiver response variations can occur as the clearance frequency is displaced from the course frequency. To minimize this effect, particularly for Category III operations, the course-to-clearance signal ratio needs to be increased from 10 dB to 16 dB.

2.7.4 To minimize further the risk of errors if the ratio of the two radiated signals falls below 10 dB within the front course sector, the difference in alignment of the radiation field patterns of the two signals should be kept as minimal as practicable.

2.7.5 Glide paths which employ two carriers are used to form a composite radiation field pattern on the same radio frequency channel. Special configurations of antennas and the distribution of antenna currents and phasing may permit siting of glide path facilities at locations with particular terrain conditions which may otherwise cause difficulty to a single-frequency system. At such sites, an improvement is obtained by reducing the low angle radiation. The second carrier is employed to provide coverage in the region below the glide path.

2.8 Integrity and continuity of service — ILS ground equipment

2.8.1 *Introduction*

2.8.1.1 This material is intended to provide clarification of the integrity and continuity of service objectives of ILS localizer and glide path ground equipment and to provide guidance on engineering design and system characteristics of this equipment. The integrity and continuity of service must of necessity be known from an operational viewpoint in order to decide the operational application which an ILS could support.

2.8.1.2 It is generally accepted, irrespective of the operational objective, that the average rate of a fatal accident during landing, due to failures or shortcomings in the whole system, comprising the ground equipment, the aircraft and the pilot, should not exceed 1×10^{-7}. This criterion is frequently referred to as the global risk factor.

2.8.1.3 In the case of Category I operations, responsibility for assuring that the above objective is not exceeded is vested more or less completely in the pilot. In Category III operations, the same objective is required but must now be inherent in the whole system. In this context it is of the utmost importance to endeavour to achieve the highest level of integrity and continuity of service of the ground equipment. Integrity is needed to ensure that an aircraft on approach will have a low probability of receiving false guidance; continuity of service is needed to ensure that an aircraft in the final stages of approach will have a low probability of being deprived of a guidance signal.

2.8.1.4 It is seen that various operational requirements correspond to varied objectives of integrity and continuity of service. Paragraph 2.14 identifies and describes four levels of integrity and continuity of service.

2.8.2 *Guidance material concerning the achievement and retention of integrity and continuity of service levels*

2.8.2.1 An integrity failure can occur if radiation of a signal which is outside specified tolerances is either unrecognized by the monitoring equipment or the control circuits fail to remove the faulty signal. Such a failure might constitute a hazard if it results in a gross error.

2.8.2.2 Clearly not all integrity failures are hazardous in all phases of the approach. For example, during the critical stages of the approach, undetected failures producing gross errors in course width or course line shifts are of special significance whereas an undetected change of modulation depth, or loss of localizer and glide slope clearance and localizer identification would not necessarily produce a hazardous situation. The criterion in assessing which failure modes are relevant must however include all those deleterious fault conditions which are not unquestionably obvious to the automatic flight system or pilot.

2.8.2.3 It is especially important that monitors be designed to provide fail-safe operation through compliance with the Standards of Chapter 3, 3.1.3.11.4 and 3.1.5.7.4. This often requires a rigorous design analysis. Monitor failures otherwise may permit the radiation of erroneous signals. Some of the possible conditions which might constitute a hazard in Operational Performance Categories II and III are:

a) an undetected shift of course line significantly outside the monitor limits for localizer and glide path;

b) an undetected fault that significantly changes the course width and glide path sensitivity;

c) an undetected fault causing slow cyclic movements of the course, producing apparent course bends as seen by the approaching aircraft significantly exceeding in amplitude the figures specified in Chapter 3, 3.1.3.4.2 for the localizer and Chapter 3, 3.1.5.4.2 for the glide path between ILS points "B" and "T".

2.8.2.4 The highest order of protection is required against the risk of undetected failures in the monitoring and associated control system. This would be achieved by careful design to reduce the probability of such occurrences to a low level and by carrying out maintenance checks on the monitor system performance at intervals which are determined by the design analysis. Such an analysis can be used to calculate the level of integrity of the system in any one landing. The following formula applies to certain types of ILS and provides an example of the determination of system integrity, *I*, from a calculation of the probability of transmission of undetected erroneous radiation, *P*.

(1) $I = 1 - P$

$$P = \frac{T_1 T_2}{\alpha_1 \alpha_2 M_1 M_2} \text{ when } T_1 < T_2$$

where

I = integrity

P = the probability of a concurrent failure in transmitter and monitor systems resulting in erroneous undetected radiation

M_1 = transmitter MTBF

M_2 = MTBF of the monitoring and associated control system

$\frac{1}{\alpha_1}$ = ratio of the rate of failure in the transmitter resulting in the radiation of an erroneous signal to the rate of all transmitter failures

$\frac{1}{\alpha_2}$ = ratio of the rate of failure in the monitoring and associated control system resulting in inability to detect an erroneous signal to the rate of all monitoring and associated control system failures

T_1 = period of time (in hours) between transmitter checks

T_2 = period of time (in hours) between checks on the monitoring and associated control system

When $T_1 \geq T_2$ the monitor system check may also be considered a transmitter check. In this case, therefore $T_1 = T_2$ and the formula would be:

(2) $$P = \frac{T_2^2}{\alpha_1 \alpha_2 M_1 M_2}$$

2.8.2.5 With regard to integrity, since the probability of occurrence of an unsafe failure within the monitoring or control equipment is extremely remote, to establish the required integrity level with a high degree of confidence would necessitate an evaluation period many times that needed to establish the equipment MTBF. Such a protracted period is unacceptable and therefore the required integrity level can only be predicted by rigorous design analysis of the equipment.

2.8.2.6 The MTBF and continuity of service of equipment is governed by basic construction and operating environment. Equipment design should employ the most suitable engineering techniques, materials and components, and rigorous inspection should be applied during manufacture. It is essential to ensure that equipment is operated within the environmental conditions specified by the manufacturer. The manufacturer is required to provide the details of the design to enable the MTBF and continuity of service to be calculated. It is expected that the equipment MTBF is confirmed by evaluation in an operational environment to take account of the impact of operational factors, i.e. airport environment, inclement weather conditions, power availability, quality and frequency of maintenance. For integrity and continuity of service Levels 2, 3 or 4 the evaluation period should be sufficient to determine achievement of the required level with a high degree of confidence. The following considerations apply:

a) the minimum acceptable confidence level is 60 per cent. Depending on the service level of the ILS, this may result in different evaluation periods. To assess the influence of the airport environment, a minimal evaluation period of one year is typically required for a new type of installation at that particular airport. It may be possible to reduce this period in cases where the operating environment is well controlled and similar to other proven installations. Subsequent installation of the same type of equipment under similar operational and environmental conditions may follow different evaluation periods. Typically, these minimal periods for subsequent installations are for Level 2, 1 600 hours, for Level 3, 3 200 hours and for Level 4, at least 6 400 hours. Where several identical systems are being operated under similar conditions, it may be possible to base the assessment on the cumulative operating hours of all the systems. This will result in a reduced evaluation period; and

b) during the evaluation period, it should be decided for each outage if it is caused by a design failure or if it is caused by a failure of a component due to its normal failure rate. Design failures are, for instance, operating components beyond their specification (overheating, overcurrent, overvoltage, etc. conditions). These design failures should be dealt with such that the operating condition is brought back to the normal operating condition of the component or that the component is replaced with a part suitable for the operating conditions. If the design failure is treated in this way, the evaluation may continue and this outage is not counted, assuming that there is a high probability that this design failure will not occur again. The same applies to outages due to any causes which can be mitigated by permanent changes to the operating conditions.

2.8.2.7 Continuity of service performance may also be demonstrated by means of MTBO (mean time between outages) where an outage is defined as any unanticipated cessation of signal-in-space. It is calculated by dividing the total facility up-time by the number of operational failures. MTBF and MTBO are not always equivalent, as not all equipment failures will necessarily result in an outage, e.g. an event such as a failure of a transmitter resulting in the immediate transfer to a standby transmitter. The minimum MTBO values expected for the continuity of service in 2.14 have been derived from several years of operational experience of many systems. To determine whether the performance record of an individual ILS system justifies its assignment to Levels 2, 3 or 4 requires a judicious consideration of such factors as:

a) the performance record and experience of system use established over a suitable period of time (see 2.8.2.6);

b) the average achieved MTBO established for this type of ILS; and

c) the trend of the failure rates.

An assigned designation should not be subject to frequent change. A suitable method to assess the behaviour of a particular installation is to keep the records and calculate the average MTBO over the last five to eight failures of the equipment. A typical record of this method is given in Figures C-12A and C-12B.

2.8.2.8 During the equipment evaluation, and subsequent to its introduction into operational service, records should be maintained of all equipment failures or outages to confirm retention of the desired continuity of service.

2.8.2.9 The following configuration is an example of a redundant equipment arrangement that is likely to meet the objectives for integrity and continuity of service Levels 3 or 4. The localizer facility consists of two continuously operating transmitters, one connected to the antenna and the standby connected to a dummy load. With these transmitters is associated a monitor system performing the following functions:

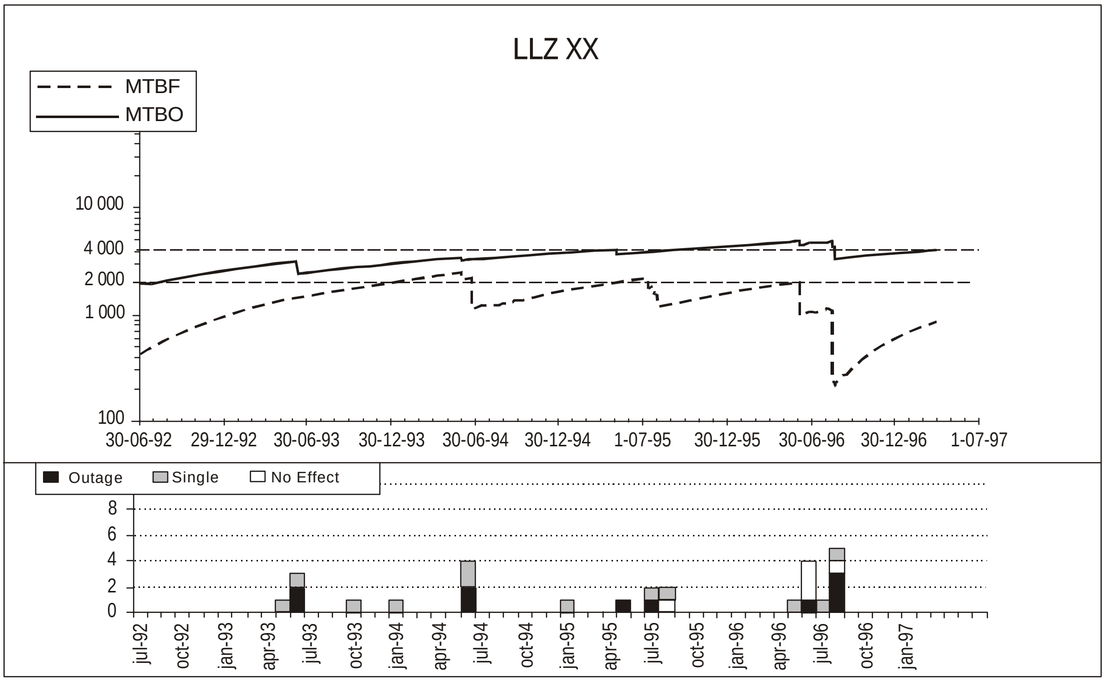


Figure C-12A. Example of a localizer outage record

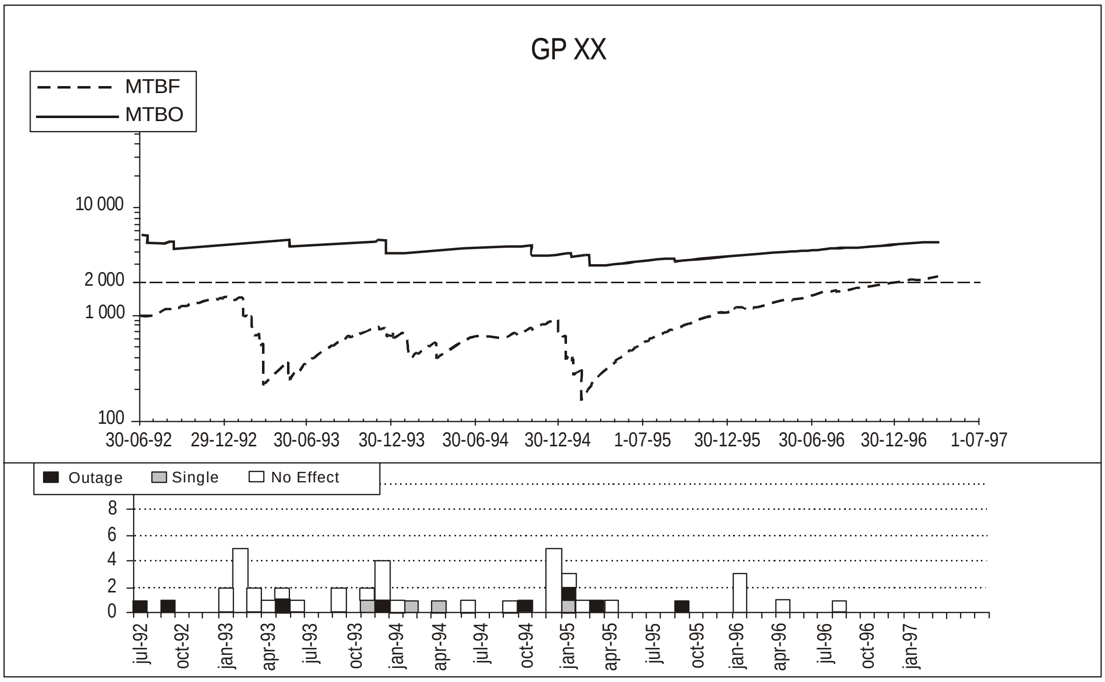


Figure C-12B. Example of a glide path outage record

a) monitoring of operation within the specified limits of the main transmitter and antenna system by means of majority voting among redundant monitors;

b) monitoring the standby equipment.

2.8.2.9.1 Whenever the monitor system rejects one of the equipments the facility continuity of service level will be reduced because the probability of cessation of signal consequent on failure of other equipment will be increased. This change of performance must be automatically indicated at remote locations.

2.8.2.9.2 An identical monitoring arrangement to the localizer is used for the glide path facility.

2.8.2.9.3 To reduce mutual interference between the main and standby transmitters any stray radiation from the latter is at least 50 dB below the carrier level of the main transmitter measured at the antenna system.

2.8.2.9.4 In the above example, the equipment would include provision to facilitate monitoring system checks at intervals specified by the manufacturer, consequent to the design analysis, to ensure attainment of the required integrity level. Such checks, which can be manual or automatic, provide the means to verify correct operation of the monitoring system including the control circuitry and changeover switching system. The advantage of adopting an automatic monitor integrity test is that no interruption to the operational service provided by the localizer or glide path is necessary. It is important when using this technique to ensure that the total duration of the check cycle is short enough not to exceed the total period specified in Chapter 3, 3.1.3.11.3 or 3.1.5.7.3.

2.8.2.9.5 Interruption of facility operation due to primary power failures is avoided by the provision of suitable standby supplies, such as batteries or “no-break” generators. Under these conditions, the facility should be capable of continuing in operation over the period when an aircraft may be in the critical stages of the approach. Therefore the standby supply should have adequate capacity to sustain service for at least two minutes.

2.8.2.9.6 Warnings of failures of critical parts of the system, such as the failure of the primary power supply, must be given at the designated control points.

2.8.2.10 In order to reduce failure of equipment that may be operating near its monitor tolerance limits, it is useful for the monitor system to include provision to generate a pre-alarm warning signal to the designated control point when the monitored parameters reach a limit equal to a value in the order of 75 per cent of the monitor alarm limit.

2.8.2.11 Protection of the integrity of the signal-in-space against degradation which can arise from extraneous radio interference falling within the ILS frequency band or from re-radiation of ILS signals must also be considered. Measures to prevent the latter by critical and sensitive area protection are given in general terms at 2.1.10. With regard to radio interference it may be necessary to confirm periodically that the level of interference does not constitute a hazard.

2.8.2.12 A far field monitor can provide additional protection by providing a warning against the extremely remote probability of the radiation of false information from a localizer facility, as indicated in 2.8.5.

2.8.2.13 In general, monitoring equipment design is based on the principle of continuously monitoring the radiated signals-in-space at specific points within the coverage volume to ensure their compliance with the Standards specified at Chapter 3, 3.1.3.11 and 3.1.5.7. Although such monitoring provides to some extent an indication that the signal-in-space at all other points in the coverage volume is similarly within tolerance, this is largely inferred. It is essential therefore to carry out rigorous flight and ground inspections at periodic intervals to ensure the integrity of the signal-in-space throughout the coverage volume.

2.8.2.14 An equipment arrangement similar to that at 2.8.2.9, but with no transmitter redundancy, and the application of the provisions outlined in 2.8.2.11, 2.8.2.12 and 2.8.2.13, would normally be expected to achieve the objectives for integrity and continuity of service Level 2.

2.8.2.15 An analysis of the factors involved in different types of operations allows the determination of desired values for the integrity, expressed in terms of the probability in any one landing, to be determined from the allowable global risk factor criterion. See 2.14.2 c).

2.8.3 The stringent requirement for integrity and high continuity of service essential for Category III operations requires the use of ILS Facility Performance Category III equipment having adequate assurance against failures. A failure is taken to be performance outside the monitor system tolerances specified in Chapter 3, 3.1.3.11 for Category III localizers and 3.1.5.7 for Category III glide paths. Reliability of ground equipment operation must be very high, so as to ensure that safety during the critical phase of approach and landing is not impaired by a ground equipment failure when the aircraft is at such a height or attitude that it is unable to take safe corrective action. A high probability of performance within the specified limits has to be ensured. Facility reliability in terms of mean time between failures (MTBF) clearly has to be related on a system basis to the probability of failure which may affect any characteristic of the total signal-in-space. The system must ensure the highest degree of protection against failure of the monitors to detect a failure in performance of the ground equipment. It is suggested that States endeavour to achieve reliability with as large a margin as is technically and economically reasonable.

2.8.3.1 The following configuration is an example of a redundant arrangement suitable for Category III operations. The localizer facility consists of two continuously operating transmitters, one connected to an antenna load. With these transmitters is associated a monitor system performing the following functions:

a) monitoring of operation within the specified limits of the main transmitter and antenna system by means of a majority voting among redundant monitors;

b) monitoring of the standby equipment.

2.8.3.1.1 Whenever the monitor system rejects one of the equipments the facility will no longer have Category III status because the probability of cessation of signal consequent on failure of other equipment will be too high. This reversion to a lower category is automatically indicated at remote locations.

2.8.3.1.2 An identical monitoring arrangement is used for the glide path facility.

2.8.3.1.3 To reduce mutual interference between the main and standby transmitters, any stray radiation from the latter should be at least 50 dB below the carrier level of the main transmitter measured at the antenna system.

2.8.3.2 The highest order of protection is required against the consequence of undetected monitor system failures. This should be achieved by careful design to reduce the probability of such occurrences to a low level and by carrying out maintenance checks on the monitor system performance at intervals which are determined by the design analysis.

2.8.4 Additional guidance material applicable to Categories II and III — ILS localizer and glide path ground equipment is given below.

2.8.4.1 Reliability of equipment is governed by basic construction and operating environment. Equipment design should employ the most suitable engineering techniques, materials and components, and rigorous inspection should be applied in manufacture. Equipment should be operated in environmental conditions appropriate to the manufacturers' design criteria. It is expected that the equipment reliability be established by evaluation before introduction into Categories II and III service. Design analysis should verify the predicted performance of the equipment.

2.8.5 Guidance relating to localizer far field monitors is given below.

2.8.5.1 Far field monitors are provided to monitor course alignment but may also be used to monitor course sensitivity. A far field monitor operates independently from integral and near field monitors. Its primary purpose is to protect against the risk of erroneous setting-up of the localizer, or faults in the near field or integral monitors. In addition, the far field monitor system will enhance the ability of the combined monitor system to respond to the effects of physical modification of the radiating elements or variations in the ground reflection characteristics. Moreover, multipath effects and runway area disturbances not seen by near field and integral monitors, and some occurrences of radio interferences may be substantially monitored by using a far field monitoring system built around a suitable receiver(s), installed under the approach path.

2.8.5.2 A far field monitor is generally considered essential for Category III operations, while for Category II it is generally considered to be desirable. Also for Category I installations, a far field monitor has proved to be a valuable tool to supplement the conventional monitor system.

2.8.5.3 The signal received by the far field monitor will suffer short-term interference effects caused by aircraft movements on or in the vicinity of the runway and experience has shown that it is not practical to use the far field monitor as an executive monitor. When used as a passive monitor, means must be adopted to minimize such temporary interference effects and to reduce the occurrence of nuisance downgrade indications; some methods of achieving this are covered in 2.8.5.4. The response of the far field monitor to interference effects offers the possibility of indicating to the air traffic control point when temporary disturbance of the localizer signal is present. However, experience has shown that disturbances due to aircraft movements may be present along the runway, including the touchdown zone, and not always be observed at the far field monitor. It must not be assumed, therefore, that a far field monitor can provide comprehensive surveillance of aircraft movements on the runway.

2.8.5.3.1 Additional possible applications of the far field monitor are as follows:

a) it can be a useful maintenance aid to verify course and/or course deviation sensitivity in lieu of a portable far field monitor;

b) it may be used to provide a continuous recording of far field signal performance showing the quality of the far field signal and the extent of signal disturbance.

2.8.5.4 Possible methods of reducing the occurrence of nuisance downgrade indications include:

a) incorporation of a time delay within the system adjustable from 30 to 240 seconds;

b) the use of a validation technique to ensure that only indications not affected by transitory disturbances are transmitted to the control system;

c) use of low pass filtering.

2.8.5.5 A typical far field monitor consists of an antenna, VHF receiver and associated monitoring units which provide indications of DDM, modulation sum, and RF signal level. The receiving antenna is usually of a directional type to minimize unwanted interference and should be at the greatest height compatible with obstacle clearance limits. For course line monitoring, the antenna is usually positioned along the extended runway centre line. Where it is desired to also monitor displacement sensitivity, an additional receiver and monitor are installed with antenna suitably positioned to one side of the extended runway centre line. Some systems utilize a number of spatially separated antennas.

2.9 Localizer and glide path displacement sensitivities

2.9.1 Although certain localizer and glide path alignment and displacement sensitivities are specified in relation to the ILS reference datum, it is not intended to imply that measurement of these parameters must be made at this datum.

2.9.2 Localizer monitor system limits and adjustment and maintenance limits given in Chapter 3, 3.1.3.7 and 3.1.3.11 are stated as percentage changes of displacement sensitivity. This concept, which replaces specifications of angular width in earlier editions, has been introduced because the response of aircraft guidance systems is directly related to displacement sensitivity. It will be noted that angular width is inversely proportional to displacement sensitivity.

2.10 Siting of ILS markers

2.10.1 Considerations of interference between inner and middle markers, and the minimum operationally acceptable time interval between inner and middle marker light indications, will limit the maximum height marked by the inner marker to a height on the ILS glide path of the order of 37 m (120 ft) above threshold for markers sited within present tolerances in Annex 10. A study of the individual site will determine the maximum height which can be marked, noting that with a typical airborne marker receiver a separation period of the order of 3 seconds at an aircraft speed of 140 kt between middle and inner marker light indications is the minimum operationally acceptable time interval.

2.10.2 In the case of ILS installations serving closely spaced parallel runways, e.g. 500 m (1 650 ft) apart, special measures are needed to ensure satisfactory operation of the marker beacons. Some States have found it practical to employ a common outer marker for both ILS installations. However, special provisions, e.g. modified field patterns, are needed in the case of the middle markers if mutual interference is to be avoided, and especially in cases where the thresholds are displaced longitudinally from one another.

2.11 Use of DME as an alternative to ILS marker beacons

2.11.1 When DME is used as an alternative to ILS marker beacons, the DME should be located on the airport so that the zero range indication will be a point near the runway. If the DME associated with ILS uses a zero range offset, this facility has to be excluded from RNAV solutions.

2.11.2 In order to reduce the triangulation error, the DME should be sited to ensure a small angle (e.g. less than 20 degrees) between the approach path and the direction to the DME at the points where the distance information is required.

2.11.3 The use of DME as an alternative to the middle marker beacon assumes a DME system accuracy of 0.37 km (0.2 NM) or better and a resolution of the airborne indication such as to allow this accuracy to be attained.

2.11.4 While it is not specifically required that DME be frequency paired with the localizer when it is used as an alternative for the outer marker, frequency pairing is preferred wherever DME is used with ILS to simplify pilot operation and to enable aircraft with two ILS receivers to use both receivers on the ILS channel.

2.11.5 When the DME is frequency paired with the localizer, the DME transponder identification should be obtained by the “associated” signal from the frequency-paired localizer.

2.12 The use of supplementary sources of orientation guidance in association with ILS

2.12.1 Aircraft beginning an ILS approach may be assisted by guidance information provided by other ground referenced facilities such as VORs, surveillance radar or, where these facilities cannot be provided, by a locator beacon.

2.12.2 When not provided by existing terminal or en-route facilities, a VOR, suitably sited, will provide efficient transition to the ILS. To achieve this purpose the VOR may be sited on the localizer course or at a position some distance from the localizer course provided that a radial will intersect the localizer course at an angle which will allow smooth transitions in the case of auto coupling. The distance between the VOR site and the desired point of interception must be recognized when determining the accuracy of the interception and the airspace available to provide for tracking errors.

2.12.3 Where it is impracticable to provide a suitably sited VOR, a compass locator or an NDB can assist transition to the ILS. The facility should be sited on the localizer course at a suitable distance from the threshold to provide for optimum transition.

2.13 The use of Facility Performance
Category I — ILS for automatic approaches and landings in visibility conditions
permitting visual monitoring of the operation by the pilot

2.13.1 Facility Performance Category I — ILS installations of suitable quality can be used, in combination with aircraft flight control systems of types not relying solely on the guidance information derived from the ILS sensors, for automatic approaches and automatic landings in visibility conditions permitting visual monitoring of the operation by the pilot.

2.13.2 To assist aircraft operating agencies with the initial appraisal of the suitability of individual ILS installations for such operations, provider States are encouraged to promulgate:

a) the differences in any respect from Chapter 3, 3.1;

b) the extent of compliance with the provisions in Chapter 3, 3.1.3.4 and 3.1.5.4, regarding localizer and glide path beam structure; and

c) the height of the ILS reference datum above the threshold.

2.13.3 To avoid interference which might prevent the completion of an automatic approach and landing, it is necessary that local arrangements be made to protect, to the extent practicable, the ILS critical and sensitive areas.

2.13.4 Where two separate ILS facilities serve opposite ends of a single runway, an interlock should ensure that only the localizer serving the approach direction in use should radiate.

2.14 ILS classification — supplementary ILS description method with objective
to facilitate operational utilization

2.14.1 The classification system given below, in conjunction with the current facility performance categories, is intended to provide a more comprehensive method of describing an ILS.

2.14.2 The ILS classification is defined by using three characters as follows:

a) I, II or III: this character indicates conformance to Facility Performance Category in Chapter 3, 3.1.3 and 3.1.5.

b) A, B, C, T, D or E: this character defines the ILS points to which the localizer structure conforms to the course structure given at Chapter 3, 3.1.3.4.2, except the letter T, which designates the runway threshold. The points are defined in Chapter 3, 3.1.1.

c) 1, 2, 3 or 4: this number indicates the level of integrity and continuity of service given in Table C-2.

Note.— In relation to specific ILS operations it is intended that the level of integrity and continuity of service would typically be associated as follows

1) Level 2 is the performance ob ective for ILS equipment used to support low visibility operations when ILS guidance for position information in the landing phase is supplemented by visual cues. This level is a recommended ob ective for equipment supporting Category I operations

2) Level 3 is the performance ob ective for ILS equipment used to support operations which place a high degree of reliance on ILS guidance for positioning through touchdown. This level is a required ob ective for equipment supporting Category II and IIIA operations and

Table C-2. Integrity and continuity of service ob ectives

Level	Localizer or glide path		
	Integrity	Continuity of service	MTBO (hours)
1		Not demonstrated, or less than required for Level 2	
2	$1 - 10^{-7}$ in any one landing	$1 - 4 \times 10^{-6}$ in any period of 15 seconds	1 000
3	$1 - 0.5 \times 10^{-9}$ in any one landing	$1 - 2 \times 10^{-6}$ in any period of 15 seconds	2 000
4	$1 - 0.5 \times 10^{-9}$ in any one landing	$1 - 2 \times 10^{-6}$ in any period of 30 seconds (localizer) 15 seconds (glide path)	4 000 (localizer) 2 000 (glide path)

Note.— For currently installed systems, in the event that the Level 2 integrity value is not available or cannot be readily calculated, it is necessary to at least perform a detailed analysis of the integrity to assure proper monitor fail-safe operation.

3) Level 4 is the performance ob ective for ILS equipment used to support operations which place a high degree of reliance on ILS guidance throughout touchdown and rollout. This level basically relates to the needs of the full range of Category III operations.

2.14.3 As an example, a Facility Performance Category II — ILS which meets the localizer course structure criteria appropriate to a Facility Performance Category III — ILS down to ILS point “D” and conforms to the integrity and continuity of service objectives of Level 3 would be described as class II/D/3.

2.14.4 ILS classes are appropriate only to the ground ILS element. Consideration of operational categories must also include additional factors such as operator capability, critical and sensitive area protection, procedural criteria and ancillary aids, such as transmissometers and lights.

2.15 ILS carrier frequency and phase modulation

2.15.1 In addition to the desired 90 Hz and 150 Hz AM modulation of the ILS RF carriers, undesired frequency modulation (FM) and/or phase modulation (PM) may exist. This undesired modulation can cause centring errors in ILS receivers due to slope detection by ripple in the intermediate frequency (IF) filter pass-band.

2.15.2 For this to occur, the translated RF carrier frequency must fall on an IF frequency where the pass-band has a high slope. The slope converts the undesired 90 Hz and 150 Hz frequency changes to AM of the same frequencies. Similarly, any difference in FM deviation between the undesired 90 Hz and 150 Hz components is converted to DDM, which in turn produces an offset in the receiver. The mechanism is identical for PM as for FM, since PM causes a change in frequency equal to the change in phase (radians) multiplied by the modulating frequency.

2.15.3 The effect of the undesired FM and/or PM is summed by vector addition to the desired AM. The detected FM is either in phase or anti-phase with the AM according to whether the pass-band slope at the carrier’s IF is positive or negative. The detected PM is in quadrature with the AM, and may also be positive or negative according to the pass-band slope.

2.15.4 Undesired FM and/or PM from frequencies other than 90 Hz and 150 Hz, but which pass through the 90 Hz and 150 Hz tone filters of the receiver, can also cause changes to the desired 90 Hz and 150 Hz AM modulation of the ILS RF carrier, resulting in a DDM offset error in the receiver. Thus, it is essential that when measuring undesired FM and PM levels, audio band-pass filters with a pass-band at least as wide as that of the tone filters of ILS receivers be used. These filters are typically inserted in commercial modulation meter test equipment between the demodulation and metering circuits, to ensure that only spectral components of interest to ILS applications are measured. To standardize such measurements, the filter characteristics are recommended as shown below:

Frequency (z)	*90 z band-pass filter attenuation, dB*	*150 z band-pass filter attenuation, dB*
≤45	–10	–16
85	–0.5	(no specification)
90	0	–14
95	–0.5	(no specification)
142	(no specification)	–0.5
150	–14	0
158	(no specification)	–0.5
≥300	–16	–10

2.15.5 The preferred maximum limits, as shown below, are derived from ILS receiver centring error limits specified in EUROCAE documents ED-46B and ED-47B, based on the worst-case-to-date observed correlation between undesired modulation levels and centring errors:

Facility type	*90 z peak deviation, FM z/PM radians (Note 1)*	*150 z peak deviation, FM z/PM radians (Note 2)*	*eviation difference, z (Note 3)*
Localizer, Cat I	135/1.5	135/0.9	45
Localizer, Cat II	60/0.66	60/0.4	20
Localizer, Cat III	45/0.5	45/0.3	15
Glide path, Cat I	150/1.66	150/1.0	50
Glide path, Cat II or III	90/1.0	90/0.6	30

Note 1.— This column applies to the peak frequency or phase deviation as measured with the 90 z tone filter specified in 2.15.4.

Note 2.— This column applies to the peak frequency or phase deviation as measured with the 150 z tone filter specified in 2.15.4.

Note 3.— This column applies to the difference in peak frequency deviation between the separate measurements of the undesired 90 z FM (or equivalent PM) and the 150 z FM (or equivalent PM) obtained with the filters specified in the table in 2.15.4. The equivalent deviation for 90 z and 150 z measured PM values is calculated by multiplying each peak PM measurement in radians by its corresponding modulating frequency in z.

3. Material concerning VOR

3.1 Guidance relating to VOR effective radiated power (ERP) and coverage

3.1.1 The field strength specified at Chapter 3, 3.3.4.2, is based on the following consideration:

Airborne receiver sensitivity	–117 dBW
Transmission line loss, mismatch loss, antenna polar pattern variation with respect to an isotropic antenna	+7 dBW
Power required at antenna	–110 dBW

The power required of minus 100 dBW is obtained at 118 MHz with a power density of minus 107 dBW/m^2; minus 107 dBW/m^2 is equivalent to 90 microvolts per metre, i.e. plus 39 dB referenced to 1 microvolt per metre.

Note.— The power density for the case of an isotropic antenna may be computed in the following manner

$$P_d = P_a - 10 \log \frac{\lambda^2}{4\pi}$$

where

P_d *power density in dB /m^2*

P_a *power at receiving point in dB*

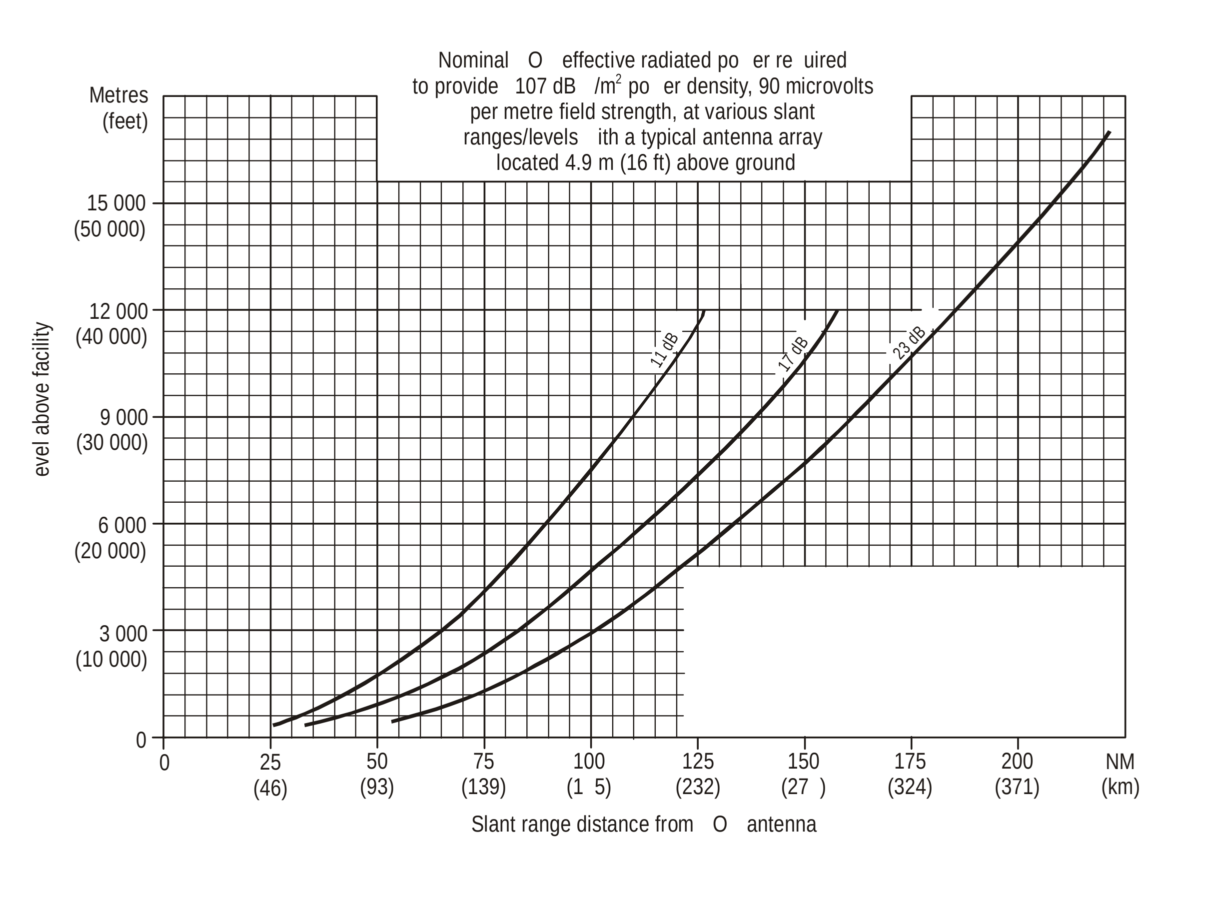
λ *wavelength in metres.*

3.1.2 Nominal values of the necessary ERP to achieve a field strength of 90 microvolts per metre (minus 107 dBW/m^2) are given at Figure C-13. For coverage under difficult terrain and siting conditions, it may be necessary to make appropriate increases in the effective radiated power. Conversely, practical experience has shown that under favourable siting conditions, and under the less pessimistic conditions often found in actual service, satisfactory system operation is achieved with a lower ERP.

Note.— The nominal effective radiated powers, expressed as a function of level and range, are based upon consideration of basic theoretical data from various sources (such as IT -R and NBS) modified empirically to reflect typical operational experience.

3.1.3 The use of Figure C-13 is illustrated by the following examples. In order to achieve the necessary field strength at 342 km (185 NM)/12 000 m (40 000 ft), 300 km (162 NM)/12 000 m (40 000 ft), and 166.5 km (90 NM)/6 000 m (20 000 ft), nominal effective radiated powers of plus 23 dBW, plus 17 dBW and plus 11 dBW respectively are required.

3.1.4 In order to facilitate frequency and equipment planning, wherever practicable, ERP categories corresponding to plus 23 dBW, plus 17 dBW and plus 11 dBW should be employed. These ERP values should be indicated during regional planning activities.



Nominal O effective radiated po er re uired
to provide 107 dB /m² po er density, 90 microvolts
per metre field strength, at various slant
ranges/levels ith a typical antenna array
located 4.9 m (16 ft) above ground
Metres
(feet)
15 000
(50 000)
12 000
(40 000)
9 000
(30 000)
6 000
(20 000)
3 000
(10 000)
0
evel above facility
11 dB
17 dB
23 dB
0
25
(46)
50
(93)
75
(139)
100
(1 5)
125
(232)
150
(27)
175
(324)
200
(371)
NM
(km)
Slant range distance from O antenna

Figure C-13

3.1.5 A VOR having an ERP of plus 23 dBW approximates to a VOR previously referred to in Annex 10 as Category A (transmitter power 200 W). Possible relationships between ERP and transmitter output powers are illustrated by the following examples:

	Example I	*Example II*
Transmitter power	+23 dBW	+18 dBW
Ground transmission line loss	–2 dB	–1 dB
Antenna gain relative to an isotropic antenna	+2 dB	+6 dB
ERP	+23 dBW	+23 dBW

Similarly, a VOR having an ERP of plus 17 dBW approximates to a VOR previously referred to in Annex 10 as Category B (transmitter power 50 W). Possible relationships between ERP and transmitter output powers are illustrated by the following examples:

	Example I	*Example II*
Transmitter power	+17 dBW	+10 dBW
Ground transmission line loss	–2 dB	–1 dB
Antenna gain relative to an isotropic antenna	+2 dB	+8 dB
ERP	+17 dBW	+17 dBW

3.1.6 It is recognized that the above ERP categories may achieve a greater coverage than is necessary for some operational requirements. A suitable lesser coverage might be achieved by a VOR facility having an ERP of approximately plus 11 dBW as follows:

	Example I	*Example II*
Transmitter power	+11 dBW	+7 dBW
Ground transmission line loss	–2 dB	–1 dB
Antenna gain relative to an isotropic antenna	+2 dB	+5 dB
ERP	+11 dBW	+11 dBW

3.2 Guidance in respect of siting of VOR

3.2.1 The site should be on the highest ground in the vicinity to obtain the greatest line-of-sight coverage and should be level or should slope away from the station (at a downgrade not exceeding 4 per cent) to a distance of at least 300 m (1 000 ft) and preferably to 600 m (2 000 ft) from the station. The site contours should be circular with respect to the antenna array to a radius of at least 300 m (1 000 ft). The site should be as far removed from wire lines and fences as possible. The height of wire lines and fences should not subtend a vertical angle of more than 1.5 degrees or extend more than 0.5 degree above the horizontal as measured from the antenna array. These limits may be increased by 50 per cent for fences or lines which are essentially radial to the antenna array or which subtend a horizontal angle of no more than 10 degrees. Single trees of moderate size, up to 9 m (30 ft) in height, may be tolerated beyond 150 m (500 ft). No groups of trees should subtend a vertical angle greater than 2 degrees or be situated within 300 m (1 000 ft) of the station. Provisions should be made for clearing trees to 600 m (2 000 ft) if it should prove necessary. No structures should subtend a vertical angle greater than 1.2 degrees or be situated within 150 m (500 ft) of the station. Wooden structures with negligible metallic content and with little prospect of future metallic additions may subtend vertical angles up to 2.5 degrees.

3.2.2 In mountainous terrain, a mountain-top site will often be preferable. The site should be on the highest accessible hilltop or mountain, the top of which should be graded flat to a radius of at least 45 m (150 ft). On such sites, the antenna system should be installed approximately a half wavelength above ground level in the centre of the graded area and the transmitter building should be beyond the graded area, far enough down the slope to be below optical line of sight from the antenna array. No ground, trees, power lines, buildings, etc. between 45 m (150 ft) and 360 m (1 200 ft) should be within optical line of sight of the antenna array.

3.3 Determination of the effect of "polarization error" on VOR accuracy

3.3.1 As it is not possible to specify as yet the maximum permissible value of the vertically polarized component of the radiation from the VOR, certain flight tests are necessary to determine the effect on the bearing indication accuracy due to the presence of the "polarization errors".

3.3.2 Three methods are available to determine the effects of "polarization errors":

a) 30-degree wing rock;

b) flying 8 tracks over a ground checkpoint;

c) flying a circle at 30-degree bank.

The first of these methods is designed to measure the polarization errors which occur when an aircraft rolls while flying a given VOR radial. The second method measures the polarization error for eight different aircraft headings when the aircraft is not banked. The third method measures the polarization errors, for all aircraft headings, with the aircraft banked at 30 degrees. The flight tests are as follows:

3.3.3 *30-degree wing rock.* The aircraft is flown on a constant heading towards the VOR station and is banked slowly from plus 30 degrees to minus 30 degrees. The course deviation indicator current is recorded and converted into degrees of course displacement.

3.3.4 *Eight tracks over a ground checkpoint.* The aircraft is flown over a specific ground checkpoint on eight different headings displaced by 45 degrees. The course deviation indicator current is recorded and the recording is marked when the aircraft is over the checkpoint. The indicated bearing on each heading is compared with the indicated bearing when the aircraft is heading towards the VOR station and is over the checkpoint.

3.3.5 *Circular flight with 30-degree bank.* The aircraft is first headed towards the VOR station over a ground checkpoint. From this point, it is flown in a circle at constant 30-degree bank. The course deviation indicator current is recorded while the aircraft is flying this circle and converted into degrees of error from the bearing indicated at the beginning of the procedure when the aircraft is over the checkpoint. The change of bearing of the aircraft with respect to the VOR station must be subtracted from the course deviation error. The resultant, after receiver error has been eliminated, is assumed to be polarization error.

3.3.6 The polarization tests may conveniently be conducted at an altitude of 300 m (1 000 ft). Flight tests in 3.3.4 and 3.3.5 may be employed with respect to a checkpoint which is approximately 33.4 km (18 NM) from the VOR.

3.4 Criteria for geographical separation of VOR type facilities

3.4.1 In using the figures listed in Table C-3, it must be noted that these are derived from the agreed formulae in respect of specific altitudes. In application of the figures, regional meetings would only afford protection to the extent of the operationally required altitude and distance and, by use of the formulae, criteria can be calculated for any distance or altitude.

3.4.2 The figures listed are calculated on the assumption that the effective adjacent channel rejection of the airborne receiver is better than 60 dB down at the next assignable channel.

3.4.3 The calculations are based on the assumption that the protection against interference afforded to the wanted signal from the unwanted signal is 20 dB, corresponding to a bearing error of less than 1 degree due to the unwanted signal.

3.4.4 It is recognized that, in the case of adjacent channel operation, there is a small region in the vicinity of a VOR facility, in which interference may be caused to an aircraft using another VOR facility. However, the width of this region is so small that the duration of the interference would be negligible and, in any case, it is probable that the aircraft would change its usage from one facility to the other.

Table C-3. Values of geographical separation distances for co-channel operation

		VOR facilities of equal effective radiated power		VOR facilities which differ in effective radiated power by 6 dB				VOR facilities which differ in effective radiated power by 12 dB			
		Minimum geographical separation between facilities is $2D_1 + \frac{20}{S}$ *if* $D_1 > D_2$ or $2D_2 + \frac{20}{S}$ *if* $D_2 > D_1$		Minimum geographical separation between facilities is $2D_1 + \frac{20-K}{S}$ *if* $D_1 > D_2 + \frac{K}{S}$ or $2D_2 + \frac{20+K}{S}$ *if* $D_1 < D_2 + \frac{K}{S}$				Minimum geographical separation between facilities is $2D_1 + \frac{20-K}{S}$ *if* $D_1 > D_2 + \frac{K}{S}$ or $2D_2 + \frac{20+K}{S}$ *if* $D_1 < D_2 + \frac{K}{S}$			
Altitude m (ft)	S dB/km (NM)	K dB	$\frac{20}{S}$ km (NM)	K dB	$\frac{K}{S}$ km (NM)	$\frac{20-K}{S}$ km (NM)	$\frac{20+K}{S}$ km (NM)	K dB	$\frac{K}{S}$ km (NM)	$\frac{20-K}{S}$ km (NM)	$\frac{20+K}{S}$ km (NM)
1	2	3	4	5	6	7	8	9	10	11	12
1 200 (4 000)	0.32 (0.60)	0	61 (33)	6	19 (10)	43 (23)	80 (43)	12	37 (20)	24 (13)	98 (53)
3 000 (10 000)	0.23 (0.43)	0	87 (47)	6	26 (14)	61 (33)	113 (61)	12	52 (28)	35 (19)	137 (74)
4 500 (15 000)	0.18 (0.34)	0	109 (59)	6	33 (18)	76 (41)	143 (77)	12	67 (36)	44 (24)	174 (94)
6 000 (20 000)	0.15 (0.29)	0	128 (69)	6	39 (21)	89 (48)	167 (90)	12	78 (42)	52 (28)	206 (110)
7 500 (25 000)	0.13 (0.25)	0	148 (80)	6	44 (24)	104 (56)	193 (104)	12	89 (48)	59 (32)	237 (128)
9 000 (30 000)	0.12 (0.23)	0	161 (87)	6	48 (26)	113 (61)	209 (113)	12	96 (52)	65 (35)	258 (139)
12 000 (40 000)	0.10 (0.19)	0	195 (105)	6	59 (32)	135 (73)	254 (137)	12	119 (64)	78 (42)	311 (168)
18 000 (60 000)	0.09 (0.17)	0	219 (118)	6	65 (35)	154 (83)	284 (153)	12	130 (70)	87 (47)	348 (188)

Note.— S, and the sign of are defined in 3.4.5.

3.4.5 The agreed formulae for calculating the geographical separations are as follows (nautical miles may be substituted for kilometres):

A — *minimum geographical separation (co-channel)*

either $2\ {}_{1} + \frac{20 -}{S}$ km

where ${}_{1} > \ {}_{2} + \frac{}{S}$

or $2\ {}_{2} + \frac{20 +}{S}$ km

where ${}_{1} < \ {}_{2} + \frac{}{S}$

B — *geographical separation (ad acent channel)*

collocation case

$< \frac{40 -}{S}$

non-collocated case

$> 2\ {}_{1} - \frac{40 +}{S}\ km$

where ${}_{1} > \ {}_{2} + \frac{}{S}$

or $2\ {}_{2} - \frac{40 -}{S}\ km$

where ${}_{1} < \ {}_{2} + \frac{}{S}$

C — *geographical separation (ad acent channel)*
(receivers designed for 100 k z channel spacing in a 50 k z channel spacing environment)

If receivers having an effective adjacent channel rejection of no better than 26 dB are used (e.g. a 100 kHz receiver used in a 50 kHz environment), a figure of 6 should be substituted for the figure of 40 in the above adjacent channel formulae. In this instance, the geographical collocation formula should not be used as the protection afforded may be marginal.

This leads to the following formula:

$> 2\ {}_{1} + \frac{6 +}{S}\ km$

where $_1 > \; _2 + \frac{}{S}$

or $2 \; _2 - \frac{6 -}{S}$ *km*

where $_1 < \; _2 + \frac{}{S}$

In the above formulae:

$_1, \; _2$ = service distances required of the two facilities (km).

= the ratio (dB) by which the effective radiated power of the facility providing D_1 coverage exceeds that of the facility providing D_2 coverage.

Note.— If the facility providing $_2$ is of higher effective radiated power, then will have a negative value.

S = slope of the curve showing field strength against distance for constant altitude (dB/km).

3.4.6 The figures listed in Table C-3 are based on providing an environment within which the airborne receivers can operate correctly.

3.4.6.1 In order to protect VOR receivers designed for 50 kHz channel spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 34 dB;

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

3.4.6.2 In order to protect VOR receivers designed for 100 kHz channel spacing, minimum separations are chosen in order to provide the following minimum signal ratios within the service volume:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 7 dB;

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

3.4.7 Use of the figures given in 3.4.6 or other figures appropriate to other service distances and altitudes implies recognition of the basic assumptions made in this substitution of an approximate method of calculating separation, and the application of the figures will only be correct within the limitations set by those assumptions. The assumptions include that the change of field strength with distance (Factor "S") at various altitudes of reception is only valid for angles of elevation at the VOR of up to about 5 degrees, but above the radio line of sight. If more precise determination of separation distances is required in areas of frequency congestion, this may be determined for each facility from appropriate propagation curves.

3.4.8 The deployment of 50 kHz channel spacing requires conformity with Chapter 3, 3.3.2.2 and 3.3.5.7 and Annex 10, Volume V, Chapter 4, 4.2.4. Where, due to special circumstances it is essential during the initial conversion period from 100 kHz channel spacing to 50 kHz channel spacing to take account of nearby VOR facilities that do not conform with Chapter 3, 3.3.2.2 and 3.3.5.7 and Annex 10, Volume V, Chapter 4, 4.2.4, greater geographical separation between these and the new facilities utilizing 50 kHz channel spacing will be required to ensure a bearing error of less than one degree due to the unwanted signal. On the assumption that the sideband levels of the 9 960 Hz harmonic of the radiated signal of such facilities do not exceed the following levels:

9 960 Hz	0 dB reference
2nd harmonic	–20 dB
3rd harmonic	–30 dB
4th harmonic and above	–40 dB

the separation formulae at 3.4.5 should be applied as follows:

a) where only receivers designed for 50 kHz channel spacing need to be protected, the value of 40 should be replaced by 20 in the formula at B — non-collocated case;

b) where it is necessary to protect receivers designed for 100 kHz channel spacing, the co-channel formula at A — co-channel case, should be applied for the range of altitudes for which protection is required.

3.4.9 When DME/N facilities and VOR facilities are intended to operate in association with each other, as outlined in Chapter 3, 3.5.3.3.5, and have a common service volume, both the co-channel and adjacent channel geographical separation distances required by the DME are satisfied by the separation distances of the VOR as computed in this section, provided the distance between VOR and DME does not exceed 600 m (2 000 ft). However, if DME/W facilities are employed, the first adjacent channel minimum separation for the DME/W facilities should be equal to the co-channel separation specified for the VOR. The second adjacent channel minimum separation for DME/W facilities should equal the first adjacent channel separation specified for VOR. A potential interference situation may also occur with the implementation of DME “Y” channels since interference between two DME ground stations spaced 63 MHz apart could occur when transmitting and receiving on the same frequency (e.g. transmissions from channel 17 Y could interfere with reception on channels 80 X and 80 Y). To obviate any ground receiver desensitization due to this interference, a minimum ground separation distance of 18.5 km (10 NM) between facilities is necessary.

3.5 Criteria for geographical separation of VOR/ILS facilities

3.5.1 In using the figures of 3.5.3.1 and 3.5.3.2, it is to be borne in mind that the following assumptions have been made:

a) that the localizer receiver characteristic is as shown in 2.6.2, and the VOR receiver characteristic as shown in 3.4.2;

b) that the protection ratio for the ILS system and the VOR system is 20 dB as in 2.6.3 and 3.4.3, respectively;

c) that the protection point for ILS is at a service distance of 46.25 km (25 NM) measured along the line of use, and at an altitude of 1 900 m (6 250 ft).

Note.— ith the advent of highly directional ILS localizer antenna arrays, the most critical protection point will not be along the extended runway centre line. irective antennas result in critical protection points at maximum distance, either plus or minus 10 degrees or plus or minus 35 degrees off the runway centre line. Protection of these points should be examined during the frequency assignment process.

3.5.2 Although international VOR and ILS facilities will not appear on the same frequency, it may occur that an international VOR facility may share temporarily the same frequency as, and on a comparable basis with, a national ILS facility. For this reason, guidance is given as to the geographical separation required not only for a VOR and an ILS facility separated by 50 kHz or 100 kHz, but also for co-channel usage.

3.5.3 Because of the differing characteristics of use of the two equipments, the criteria for minimum geographical separation of VOR/ILS to avoid harmful interference are stated separately for each facility where relevant.

3.5.3.1 *Co-channel case*

a) Protection of the ILS system requires that a VOR having an ERP of 17 dBW (50 W) be at least 148 km (80 NM) from the ILS protection point.

b) On the assumption that a VOR having an ERP of 17 dBW (50 W) is to be protected to a service distance of 46.25 km (25 NM) and an altitude of 3 000 m (10 000 ft), protection of the VOR system requires that the ILS be at least 148 km (80 NM) from the VOR.

c) If protection of the VOR is required to, say, 92.5 km (50 NM) and 6 000 m (20 000 ft), the ILS is to be at least 250 km (135 NM) from the VOR.

3.5.3.2 *Ad acent channel case.* Protection of the VOR system is effectively obtained without geographical separation of the facilities. However, in the case of:

a) a localizer receiver designed for 100 kHz channel spacing and used in an area where navaid assignments are spaced at 100 kHz, the protection of the ILS system requires that a VOR having an ERP of 17 dBW (50 W) be at least 9.3 km (5 NM) from the ILS protection point;

b) a localizer receiver designed for 100 kHz channel spacing and used in an area where assignments are spaced at 50 kHz, the protection of the ILS system requires that a VOR having an ERP of 17 dBW (50 W) be at least 79.6 km (43 NM) from the ILS protection point.

3.5.4 Use of the figures given in 3.5.3 or other figures appropriate to other service distances and altitudes implies recognition of the basic assumptions made in this substitution of an approximate method of calculating separation, and the application of the figures will only be correct within the limitations set by those assumptions. If more precise determination of separation distances is required in areas of frequency congestion, this may be determined for each facility from appropriate propagation curves.

3.5.5 Protection of the ILS system from VOR interference is necessary where a VOR facility is located near an ILS approach path. In such circumstances, to avoid disturbance of the ILS receiver output due to possible cross modulation effects, suitable frequency separation between the ILS and VOR channel frequencies should be used. The frequency separation will be dependent upon the ratio of the VOR and ILS field densities, and the characteristics of the airborne installation.

3.6 Receiving function

3.6.1 *Sensitivity.* After due allowance has been made for aircraft feeder mismatch, attenuation loss and antenna polar diagram variation, the sensitivity of the receiving function should be such as to provide on a high percentage of occasions the accuracy of output specified in 3.6.2, with a signal having a field strength of 90 microvolts per metre or minus 107 dBW/m^2.

3.6.2 *Accuracy.* The error contribution of the airborne installation should not exceed plus or minus 3 degrees with a 95 per cent probability.

Note 1.— The assessment of the error contribution of the receiver will need to take account of

1) the tolerance of the modulation components of the ground VOR facility as defined in Chapter 3, 3.3.5

2) variation in signal level and carrier frequency of the ground VOR facility

3) the effects of unwanted VOR and ILS signals.

Note 2.— The airborne VOR installation is not considered to include any special elements which may be provided for the processing of VOR information in the aircraft and which may introduce errors of their own (e.g. radio magnetic indicator (RMI).).

3.6.3 *Flag alarm operation.* Ideally, the flag alarm should warn a pilot of any unacceptable malfunctioning conditions which might arise within either the ground or airborne equipments. The extent to which such an ideal might be satisfied is specified below.

3.6.3.1 The flag alarm movement is actuated by the sum of two currents which are derived from the 30 Hz and 9 960 Hz elements of the VOR bearing component signal and, therefore, the removal of these elements from the radiated carrier results in the appearance of the flags. Since the VOR ground monitor interrupts the bearing components when any unacceptable condition prevails on the ground, there will be an immediate indication within an aircraft when the system is unusable.

3.6.3.2 The flag alarm movement current is also dependent upon the AGC characteristics of the airborne equipment and any subsequent gain following the receiver's second detector. Thus, if with a correctly adjusted airborne receiver the flag is just out of view when receiving a VOR signal conforming to the modulation characteristics specified in Chapter 3, 3.3.5, the flags will again become visible in the event of a decrease in the receiver's overall gain characteristics.

Note.— Certain types of receivers employ warning indications other than mechanical flags to perform the functions described here.

3.6.4 *VOR receiver susceptibility to VOR and localizer signals*

3.6.4.1 The receiver design should provide correct operation in the following environment:

a) the desired signal exceeds an undesired co-channel signal by 20 dB or more;

b) an undesired signal, 50 kHz removed from the desired signal, exceeds the desired signal by up to 34 dB (during bench testing of the receiver, in this first adjacent channel case, the undesired signal is varied over the frequency range of the combined ground station (plus or minus 9 kHz) and receiver frequency tolerance);

c) an undesired signal, 100 kHz removed from the desired signal, exceeds the desired signal by up to 46 dB;

d) an undesired signal, 150 kHz or further removed from the desired signal, exceeds the desired signal by up to 50 dB.

Note 1.— It is recognized that not all receivers currently meet requirement b) however, all future equipments are designed to meet this requirement.

Note 2.— In some States, a smaller ground station tolerance is used.

3.6.5 *Immunity performance of VOR receiving systems to interference from V F FM broadcast signals*

3.6.5.1 With reference to the Note of 3.3.8, Chapter 3, the immunity performance defined there must be measured against an agreed measure of degradation of the receiving system's normal performance, and in the presence of, and under standard conditions for the input wanted signal. This is necessary to ensure that the testing of receiving equipment on the bench can be performed to a repeatable set of conditions and results and to facilitate their subsequent approval. Tests have shown that FM interference signals may affect both course guidance and flag current, and their effects vary depending on the DDM of the wanted signal which is applied. Additional information can be found in ITU Recommendation ITU-R IS.1140, *Text procedures for measuring receiver characteristics used for determining compatibility between the sound-broadcasting service in the band of about 7 10 M z and the aeronautical services in the band 10 11 M z.*

3.6.5.2 Commonly agreed formulae should be used to assess potential incompatibilities to receivers meeting the general interference immunity criteria specified in Chapter 3, 3.3.8. The formulae provide clarification of immunity interference performance of spurious emission (type A1) interference, out-of-band channel (type A2) interference, two-signal and three-signal third order (type B1) interference, and overload/desensitization (type B2) interference. Additional information can be found in ITU Recommendation ITU-R IS.1009-1, *Compatibility between the sound-broadcasting service in the band of about 7 10 M z and the aeronautical services in the band 10 137 M z.*

3.6.5.3 The frequency planning criteria given in Recommendation ITU-R IS.1009-1 do not take account of the potential for two-signal and three-signal fifth order intermodulation products. Measurements have determined that fifth order intermodulation products created in the receiver by FM stations might degrade the performance of VOR receivers conforming to specifications in Chapter 3, 3.3.8. Fifth order intermodulation products can occur without a third order intermodulation product occurring on the same VOR frequency. In the planning of frequencies, and in the assessment of protection from FM broadcast interference, consideration needs to be given to two-signal and three-signal fifth order intermodulation products generated within VOR receivers by FM broadcast stations.

3.7 VOR system accuracy

Note.— Guidance material on the determination of VOR system performance values is also contained in Annex 11, Attachment A.

3.7.1 *Purpose.* The following guidance material is intended to assist in the use of VOR systems. It is not intended to represent lateral separation standards or minimum obstacle clearances, although it may of course provide a starting point in their determination. The setting of separation standards or minimum obstacle clearances will necessarily take account of many factors not covered by the following material.

3.7.1.1 There is, however, a need to indicate a system use accuracy figure for the guidance of States planning VOR systems.

3.7.2 *Explanation of terms.* The following terms are used with the meanings indicated:

a) *VOR radial signal error.* The difference between the nominal magnetic bearing to a point of measurement from the VOR ground station and the bearing indicated by the VOR signal at that same point. The VOR radial signal error is made up of certain stable elements, such as course displacement error and most site and terrain effect errors, and certain random variable errors. The VOR radial signal error is associated with the ground station only and excludes other error factors, such as airborne equipment errors and pilotage element.

b) *VOR radial variability error.* That part of the VOR radial signal error which can be expected to vary about the essentially constant remainder. The radial variability error is the sum of the variable errors.

c) *VOR radial displacement error.* That part of the VOR radial signal error which is stable and may be considered as fixed for long periods of time.

d) *VOR airborne equipment error.* That error attributable to the inability of the equipment in the aircraft to translate correctly the bearing information contained in the radial signal. This error includes the contributions of the airborne receiver and the instrumentation used to present the information to the pilot.

e) *VOR aggregate error.* The difference between the magnetic bearing to a point of measurement from the VOR ground station and the bearing indicated by airborne VOR equipment of stated accuracy. More simply put, this is the error in the information presented to the pilot, taking into account not only the ground station and propagation path errors, but also the error contributed by the airborne VOR receiver and its instrumentation. The entire VOR radial signal error, both fixed and variable, is used.

f) *VOR pilotage element.* The error in the use of VOR navigation attributable to the fact that the pilot cannot or does not keep the aircraft precisely at the centre of the VOR radial or bearing indicated by the equipment.

g) *VOR system use error.* The square root of the sum of the squares (RSS) of VOR aggregate error and the pilotage element. This combination may be used to determine the probability of an aircraft remaining within specified limits when using VOR.

3.7.3 *Calculation of VOR system use accuracy*

3.7.3.1 The VOR system use accuracy is derived by considering the following error elements:

a) *VOR radial signal error* (Eg). This element consists of the radial displacement error and the radial variability error. It is determined by considering such factors as fixed radial displacement, monitoring, polarization effects, terrain effects and environment changes.

b) *VOR airborne equipment error* (Ea). This element embraces all factors in the airborne VOR system which introduces errors (errors resulting from the use of compass information in some VOR displays are not included).

c) *VOR pilotage element* (Ep). The value taken for this element is that used in PANS-OPS (Doc 8168) for pilot tolerance.

Note.— A measurement error also exists, but in a generalized discussion of errors may be considered to be absorbed in the other error values.

3.7.3.2 Since the errors in a), b), and c), when considered on a system basis (not any one radial) are independent variables, they may be combined on a root-sum-square method (RSS) when the same probability level is given to each element. For the purpose of this material, each element is considered to have a 95 per cent probability.

Therefore, the following formulae are derived:

$$\text{VOR aggregate error} = \sqrt{\mathrm{Eg}^2 + \mathrm{Ea}^2}$$

$$\text{VOR system use error} = \sqrt{\mathrm{Eg}^2 + \mathrm{Ea}^2 + \mathrm{Ep}^2}$$

3.7.3.3 The following examples will derive only the VOR system use error but calculations can also be made to determine VOR aggregate error, if desired. By use of these formulae, the impact on the system of improvement or degradation of one of more error elements can be assessed.

Note.— All figures for VOR radial signal error are related to radials for which no restrictions are published.

3.7.3.4 Subject to the qualifications indicated in 3.7.1, it is considered that a VOR system use accuracy of plus or minus 5 degrees on a 95 per cent probability basis is a suitable figure for use by States planning the application of the VOR system (see, however, 3.7.3.5). This figure corresponds to the following component errors:

VOR radial signal error

plus or minus 3° (95 per cent probability), a value readily achieved in practice.

VOR airborne equipment error

plus or minus 3° (95 per cent probability), system characteristics value (see 3.6.2).

VOR pilotage element

plus or minus 2.5° (95 per cent probability), in accordance with PANS-OPS (see also 3.7.3.8).

3.7.3.5 While the figure of plus or minus 5 degrees on a 95 per cent probability basis is a useful figure based on broad practical experience and used by many States, it must be noted that this figure may be achieved only if the error elements which make it up remain within certain tolerances. It is clear that, if the errors attributable to the VOR system elements are larger than the amounts noted, the resulting VOR system use error will also be larger. Conversely, where any or all of the VOR system error elements are smaller than those used in the above computation, the resulting VOR system use error will also be smaller.

3.7.3.6 The following examples, also derived from practical experience, provide additional planning guidance for States:

A.— *VOR radial signal error*

plus or minus 3.5° (95 per cent probability), used by some States as the total ground system error.

VOR airborne equipment error

plus or minus 4.2° (95 per cent probability), recognized in some States as the minimum performance figure for some classes of operations.

VOR pilotage element

plus or minus 2.5° (95 per cent probability), in accordance with PANS-OPS (see also 3.7.3.8).

Calculated VOR system use accuracy

plus or minus 6° (95 per cent probability).

B. — *VOR radial signal error*

plus or minus 1.7° (95 per cent probability), based on extensive flight measurements conducted in one State on a large number of VORs.

VOR airborne equipment error

plus or minus 2.7° (95 per cent probability), achieved in many airline operations.

VOR pilotage element

plus or minus 2.5° (95 per cent probability), in accordance with PANS-OPS (see also 3.7.3.8).

Calculated VOR system use accuracy

plus or minus 4° (95 per cent probability).

3.7.3.7 More realistic application of the VOR system may be achieved by assessing the errors as they actually exist in particular circumstances, rather than by using all-embracing generalizations which may give unduly optimistic or pessimistic results. In individual applications, it may be possible to utilize a system use accuracy value less than plus or minus 5 degrees if one or more of the error elements are smaller than the values used to compute the plus or minus 5 degrees. Conversely, a system use accuracy value greater than plus or minus 5 degrees will be necessary where it is known that radials are of poor quality or significant site errors exist, or for other reasons. However, in addition to this advice a warning is also essential regarding the use of lower values of individual elements in the system (for example, the radial signal error) on the assumption that an overall improvement in system accuracy will occur. There is considerable evidence that this may not be the case in some circumstances and that lower system accuracy values should not be applied without other confirmation (e.g. by radar observation) that an actual improvement in overall performance is being achieved.

3.7.3.8 It is to be noted that in angular systems such as the VOR, the pilotage element error, expressed in angular terms, will be greater as the aircraft nears the point source. Thus, while ground system and airborne error contributions, expressed in angular terms, are for all practical purposes constant at all ranges, it is necessary when considering the overall system use accuracy figures to take into account the larger pilotage element error occurring when the aircraft is near the VOR. However, these larger pilotage element errors do not result in large lateral deviations from course when near the facility.

3.8 Changeover points for VORs

Guidance on the establishment of changeover points on ATS routes defined by VORs is contained in Annex 11, Attachment A.

4. Precision approach radar system

Figures C-14 to C-18 illustrate certain of the Standards contained in Chapter 3, 3.2.

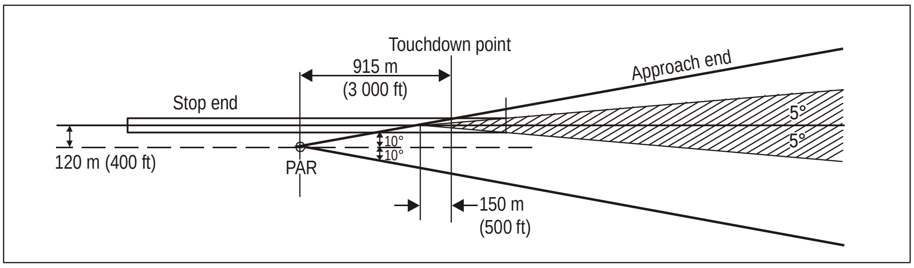


Figure C-14. Minimum set-back of PAR with respect to touchdown for offset of 120 m (400 ft) when aligned to scan plus or minus 10 degrees on DR of runway

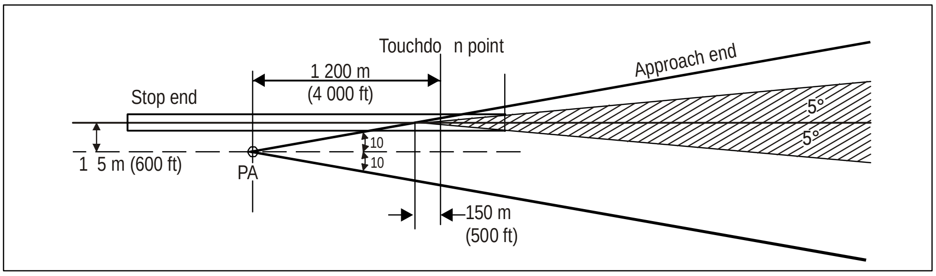


Figure C-15. Minimum set-back of PAR with respect to touchdown for offset of 185 m (600 ft) when aligned to scan plus or minus 10 degrees on DR of runway

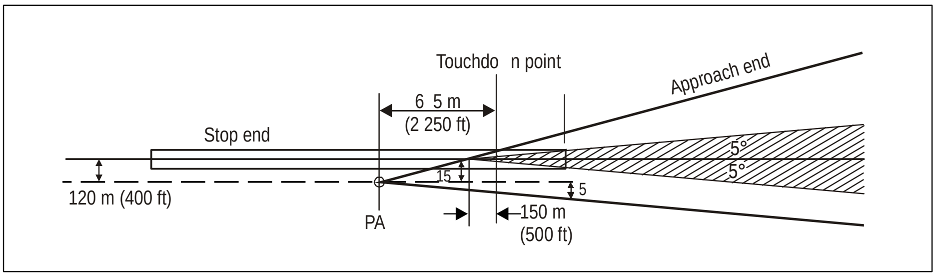


Figure C-16. Minimum set-back of PAR with respect to touchdown for offset of 120 m (400 ft) when aligned to scan 5 degrees and 15 degrees on DR of runway

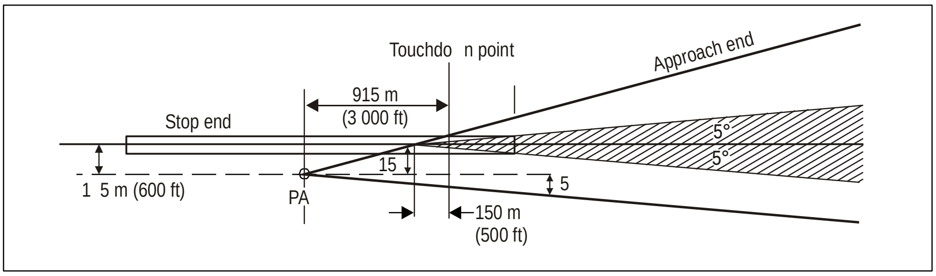


Figure C-17. Minimum set-back of PAR with respect to touchdown for offset of 185 m (600 ft) when aligned to scan 5 degrees and 15 degrees on DR of runway

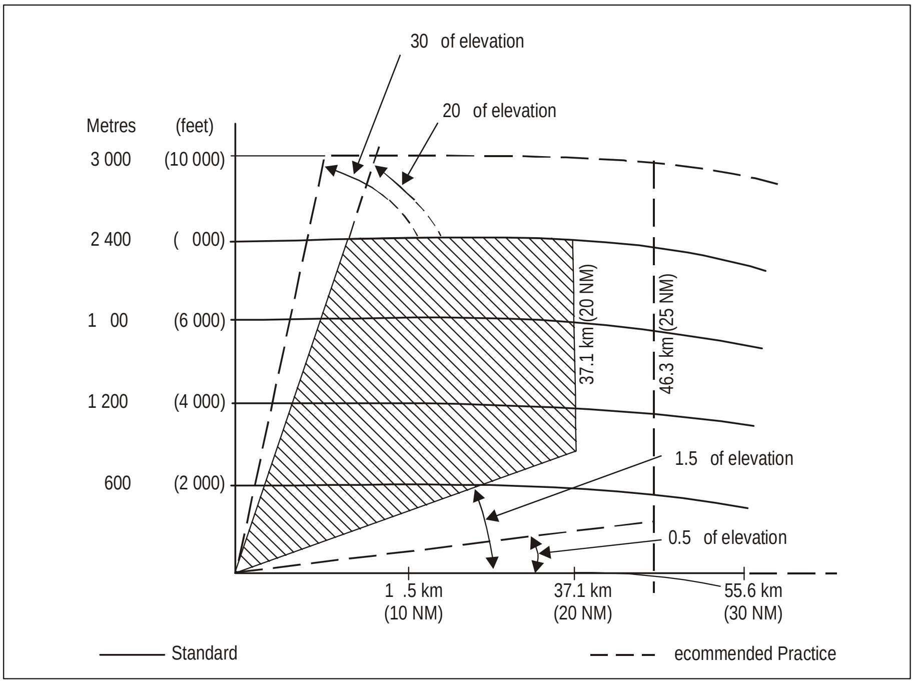


Figure C-18. SRE of precision approach radar system — vertical coverage on a 15 m² echoing area aircraft

5. Specification for 75 MHz marker beacons (en-route)

5.1 Marker beacon antenna arrays

5.1.1 *General.* The following describes types of marker antenna arrays that are frequently used in current practice. These types are the simplest forms meeting normal requirements; in special cases, arrays having a better performance (see Note to 5.1.4) may be required.

5.1.2 *marker beacons*

a) *Radiating system.* A radiating system consisting of two horizontal dipole arrays crossed at right angles, each comprising two co-linear half-wave radiating elements with centres spaced approximately a half wavelength apart and mounted one-quarter wavelength above the counterpoise. The currents in the dipoles and their respective elements are adjusted so that:

1) the current in one set of dipole arrays relative to that in the other set is equal but differs in time phase by 90 degrees;

2) the currents in the radiating elements of a particular dipole array are equal and in time phase.

b) *Counterpoise.* A square counterpoise with minimum dimensions of 9 m × 9 m, usually elevated about 1.8 m (6 ft) above the ground and, if fabricated from wire mesh, with the dimension of the mesh not exceeding 7.5 cm × 7.5 cm.

5.1.3 *Fan marker beacons for use only at low altitudes (low power fan marker beacons).* A radiating system capable of providing the field strengths indicated in Chapter 3, 3.1.7.3.2.

5.1.4 *Fan marker beacons for general use (high power fan marker beacons)*

a) *Radiating system.* A radiating system consisting of four horizontal co-linear half-wave (approximate) radiating elements mounted approximately one-quarter wavelength above the counterpoise. The current in each of the antenna elements should be in phase and should have a current ratio of 1:3:3:1.

Note.— The current distribution between elements and their height above the counterpoise may be altered to provide patterns for specific operational requirements. Improved vertical patterns for certain operational needs may be achieved by ad usting the height of the dipole arrays above the counterpoise to a value of one-quarter wavelength or greater, but less than a half wavelength.

b) *Counterpoise.* A rectangular counterpoise with minimum dimensions of 6 m × 12 m, usually elevated about 1.8 m (6 ft) above the ground and, if fabricated from wire mesh, with the dimension of the mesh not exceeding 7.5 cm × 7.5 cm.

5.2 Identification coding for fan marker beacons associated with a four-course radio range

5.2.1 Fan marker beacons located on the legs of a four-course radio range do not normally require an identification signal relating to a particular geographic location, but only a signal that will indicate the leg with which they are associated.

5.2.2 In the case of a four-course radio range having not more than one marker on any leg, it is current practice to identify a marker by a single dash if on the leg bearing true north or nearest to north in a clockwise direction (east), and to identify a marker on other legs by two, three or four dashes according to whether the leg with which it is associated is the second, third or fourth leg from north in a clockwise direction. Where more than one fan marker beacon is associated with one leg of a four-course radio range, the marker nearest to the station is identified by dashes only, the next nearest by two dots preceding the dashes, and the third by three dots preceding the dashes, and so on.

Note.— In certain special circumstances, the above coding system may lead to ambiguities due to two markers associated with the legs of different but overlapping radio ranges being geographically close together. In such cases, it is desirable to use a distinctive identification coding with one of the marker beacons.

6. Material concerning NDB

6.1 Guidance material on NDB field strength requirements in latitudes between 30°N and 30°S

6.1.1 In order to obtain a satisfactory service within the rated coverage of an NDB located in latitudes between 30°N and 30°S, a minimum value of field strength of 120 microvolts per metre would be required, except where practical experience in the operation of NDBs over several years has revealed that a minimum field strength of 70 microvolts per metre would be adequate to meet all the operational needs. In some specific areas, field strength values considerably in excess of 120 microvolts per metre would be required. Such areas are:

a) Indonesia and Papua New Guinea, Myanmar, Malay Peninsula, Thailand, Lao People's Democratic Republic, Democratic Kampuchea, Viet Nam and Northern Australia;

b) Caribbean and northern parts of South America;

c) Central and South Central Africa.

6.1.2 The field strength of 120 microvolts per metre is based upon practical experience to date and is a compromise between what is technically desirable and what it is economically possible to provide.

6.2 Guidance material on meaning and application of rated and effective coverage

6.2.1 *Rated coverage*

6.2.1.1 The rated coverage as defined in Chapter 3, 3.4.1, is a means of designating actual NDB performance, in a measurable way, which is dependent on the frequency, the radiated power, and the conductivity of the path between the NDB and a point on the boundary where the minimum value of field strength is specified.

6.2.1.2 The rated coverage has been found to be a useful means of facilitating regional planning and, in some instances, may be related to effective coverage.

6.2.1.3 The application of rated coverage to frequency planning is governed by the following criteria:

6.2.1.3.1 Frequencies should be deployed having regard to the rated coverage of the NDBs concerned, so that the ratio of the signal strength of any NDB at the boundary of its rated coverage to the total field strength due to co-channel stations and adjacent channel stations (with an appropriate allowance for the selectivity characteristics of a typical airborne receiver) is not less than 15 dB by day.

6.2.1.3.2 The figures set forth in Attachment B to Volume V of Annex 10 should be applied, as appropriate, in determining the allowance to be made for the attenuation of adjacent channel signals.

6.2.1.4 It follows from the application of rated coverage to frequency deployment planning that, unless otherwise specified, protection against harmful interference can only be ensured within the rated coverage of an NDB and, then, only if the radiated power of the NDBs is adjusted to provide within reasonably close limits the field strength required at the limit of the rated coverage. In areas where the density of NDBs is high, any NDB providing a signal at the limit of its rated coverage materially in excess of that agreed in the region concerned will give rise, in general, to harmful interference within the rated coverages of cochannel or adjacent channel NDBs in the area concerned, and will limit the number of NDBs which can be installed in the region within the available spectrum. It is important, therefore, that increases in radiated power beyond that necessary to provide the rated coverage, particularly at night when sky wave propagation may give rise to interference over long distances, should not be made without coordination with the authorities of the other stations likely to be affected (see Chapter 3, 3.4.3).

6.2.1.5 Frequency planning is considerably facilitated if a common value of minimum field strength within the desired coverage is used.

6.2.1.6 Extensive experience has shown that in relatively low noise level areas, such as Europe, the figure of 70 microvolts per metre is satisfactory.

6.2.1.6.1 Experience has also shown that the figure of 120 microvolts per metre is generally satisfactory for higher noise level areas but will be inadequate in areas of very high noise. In such areas, the information given in 6.3 may be used for general guidance.

6.2.2 *Relationship to effective coverage*

6.2.2.1 Rated coverage may have a close correlation to effective coverage under the following conditions:

a) when the minimum field strength within the rated coverage is such that, for most of the time, it exceeds the field strength due to atmospheric and other noise sufficiently to ensure that the latter will not distort the information presented in the aircraft to the extent that it is unusable;

b) when the ratio of the strength of the wanted signal to that of interfering signals exceeds the minimum required value at all points within the coverage, in order to ensure that interfering signals will also not distort the information presented in the aircraft to the extent that it is unusable.

6.2.2.2 Since, normally, the lowest signal within the coverage will occur at its boundary, these conditions imply that at the boundary the field strength should be such that its ratio to atmospheric noise levels would ensure usable indications in the aircraft for most of the time and that, in respect of the boundary value, overall planning should ensure that the ratio of its value to that of interfering signals exceeds the required value for most of the time.

6.2.2.3 Although the value of 70 microvolts per metre used for frequency deployment has been found successful in Europe (i.e. north of 30° latitude) in giving coverage values which closely approximate to effective coverage most of the time, experience is too limited to prove the suitability of the 120 microvolts per metre value for general application in areas of high noise. It is to be expected that rated coverages in high noise based on a boundary value of 120 microvolts per metre will, on many occasions, be substantially greater than the effective coverage achieved. In such areas, in order to secure a better correlation between rated coverage and an average of the achieved effective coverage, it may be advisable to choose a boundary value based more closely on the proportionality of noise in that area to the noise in areas where a boundary value has been satisfactorily established (e.g. Europe), or to determine an appropriate value from a statistical examination of achieved effective coverages in respect of an NDB in the area of known performance.

6.2.2.4 It is important to appreciate, however, that minimum values of field strength based on a simple comparison of noise levels in different areas may be insufficient, because factors such as the frequency of occurrence of noise, its character and effect on the airborne receiver and the nature of the air operation involved may all modify ratios determined in this way.

6.2.2.5 Values of diurnal and seasonal noise in various parts of the world have been published in Report 322 of the former CCIR of the ITU.

6.2.2.5.1 Correlation of these values to actual local conditions and the derivation of required signal-to-noise ratios for effective operational use of ADF equipment is not yet fully established.

6.2.3 *Effective coverage*

6.2.3.1 Effective coverage as defined in Chapter 3, 3.4.1, is the area surrounding an NDB, within which useful information to the operator concerned can be obtained at a particular time. It is, therefore, a measure of NDB performance under prevailing conditions.

6.2.3.2 The effective coverage is limited by the ratio of the strength of the steady (non-fading) signal received from the NDB to the total noise intercepted by the ADF receiver. When this ratio falls below a limiting value, useful bearings cannot be obtained. It should also be noted that the effective coverage of an NDB may in some cases be limited to the range of the usable identification signal.

6.2.3.3 The strength of signal received from the NDB is governed by:

a) the power supplied to the antenna of the NDB;

b) the radiation efficiency of the antenna, which varies according to the height of the antenna and other characteristics of the radiating system;

c) the conductivity of the path between the NDB and the receiver, which may vary considerably as between one site and another, and is always less over land than over seawater;

d) the operating radio frequency.

6.2.3.4 The noise admitted by the receiver depends on:

a) the bandwidth of the receiver;

b) the level of atmospheric noise, which varies according to the geographical area concerned, with the time of day and the season of the year, and which may reach very high levels during local thunderstorms;

c) the level of the interference produced by other radio emissions on the same or on adjacent frequencies, which is governed to a large extent by the NDB density in the area concerned and the effectiveness of regional planning;

d) the level of noise due to electrical noise in the aircraft or to industrial noise (generated by electric motors, etc.), when the coverage of the NDB extends over industrial areas.

6.2.3.4.1 It has to be noted that the effect of noise depends on characteristics of the ADF receiver and the associated equipment, and also on the nature of the noise (e.g. steady noise, impulsive noise).

6.2.3.5 A further factor which limits the effective coverage of an NDB is present at night when interaction occurs between components of the signal which are propagated respectively in the horizontal plane (ground wave propagation) and by reflection from the ionosphere (sky wave propagation). When there is interaction between these components, which arrive at the ADF receiver with a difference of phase, bearing errors are introduced (night effect).

6.2.3.6 It will thus be seen that the effective coverage of an NDB depends on so many factors, some of which are variable, that it is impossible to specify the effective coverage of an NDB in any simple manner. The effective coverage of any NDB, in fact, varies according to the time of day and the season of the year.

6.2.3.6.1 Hence any attempt to specify an effective coverage, which would be obtainable at any time throughout the day or throughout the year, would result either in a figure for coverage which would be so small (since this would be the coverage obtained under the worst conditions of atmospheric noise, etc.) as to give quite a misleading picture of the effectiveness of the NDB, or would involve such high power and costly antenna systems (to provide the required coverage under the worst conditions), that the installation of such an NDB would usually be precluded by considerations of initial and operating costs. No specific formula can be given in determining what rated coverage would be equivalent to a desired effective coverage and the relation must be assessed regionally.

6.2.3.7 Those concerned with the operational aspects of NDB coverage will normally consider requirements in terms of a desired operational coverage and, in regional planning, it will usually be necessary to interpret such requirements in terms of a rated coverage from which may be derived the essential characteristics of the NDB required and which will also define the area to be protected against harmful interference. No specific formula can be given in determining what rated coverage would be equivalent to a desired operational coverage and the relation must be assessed regionally.

6.2.3.8 Some States have recorded data on NDBs and their effective coverage; and collection of similar information would be a practical way of obtaining an assessment of effective coverage in terms of rated coverage of facilities in a given area. This information would also be useful for future regional planning. In order to reduce the number of factors involved in assessing effective coverage, it would be desirable to establish criteria for determining the limit of useful coverage in terms of the reaction of the bearing indicator. The data referred to previously, together with measurements of actual field strength within the coverage of the NDB, would also permit determination of the effectiveness of existing installations and provide a guide to improvements that may be necessary to achieve a desired effective coverage.

6.3 Coverage of NDBs

6.3.1 *Introduction*

6.3.1.1 The following studies have been based on the latest propagation and noise data available to the ITU. They are included in this Attachment as general guidance in respect of NDB planning. Attention is called particularly to the assumptions made.

6.3.1.2 When applying the material, the validity of the assumptions in respect of the particular conditions under consideration should be carefully examined and, in particular, it should be noted that the assumed signal-to-noise ratios require considerable further study before they can be accepted as representative of the ratios limiting useful reception.

6.3.2 *Assumptions*

1. Operating frequency — 300 kHz.
   Reference is made, however, where appropriate, to frequencies of 200 kHz and 400 kHz.

2. a) Average soil conductivity:
      ($\sigma = 10^{-13}$ e.m.u.)

   b) Average seawater conductivity:
      ($\sigma = 4.10^{-11}$ e.m.u.)

3. The level of atmospheric noise (RMS) which is likely to prevail: 1) by day, 2) by night, over land masses, within the belts of latitude mentioned. [The values of expected noise have been derived from Recommendation ITU-R P.372-6 and have been taken as the average noise by day and by night during equinox periods, i.e. the values which are likely to be exceeded 20–25 per cent of the year.]

4. Input powers to the antenna of the NDB of:

   a) 5 kW
   b) 1 kW
   c) 500 W
   d) 100 W
   e) 50 W
   f) 10 W

5. The following average values of radiation efficiencies of antennas, i.e. the ratio of:

$$\left[\frac{\text{Radiated power}}{\text{Input power to antenna}}\right]$$

	Input power to antenna	*Radiation efficiency of antenna*
a)	5 kW	20% (–7 dB)
b)	5 kW	10% (–10 dB)
c)	1 kW	8% (–11 dB)
d)	500 W	5% (–13 dB)
e)	100 W	3% (–15 dB)
f)	50 W	2% (–17 dB)
g)	10 W	1% (–20 dB)
h)	10 W	0.3% (–25 dB)

i) The figure for a) is included because it is possible to realize this efficiency by the use of a more elaborate antenna system than is usually employed.

ii) The figure for h) is included because many low power NDBs use very inefficient antennas.

6. An admittance band of the ADF receiver of 6 kHz.

7. Required ratios of signal-(median) to-noise (RMS) of:

a) 15 dB by day;

b) 15 dB by night.

6.3.3 *Results of studies*

A.— *Minimum field strengths required at the boundary of the rated coverage*

Latitude	*By day for 15 dB S/N ratio*	*By night for 15 dB S/N ratio*
5°N – 5°S	320 µV/m (+50 dB)	900 µV/m (+59 dB)
5° – 15°N S	85 µV/m (+39 dB)	700 µV/m (+57 dB)
15° – 25°N S	40 µV/m (+32 dB)	320 µV/m (+50 dB)
25° – 35°N S	18★µV/m (+25 dB)	120 µV/m (+42 dB)
>35°N S	18★µV/m (+25 dB)	50 µV/m (+35 dB)

A star shown against a figure indicates that a higher value of field strength — probably 2 or 3 times the values shown (plus 6 to plus 10 dB) — may be necessary in the presence of high aircraft noise and/or industrial noise.

B.— *Coverage of N Bs (expressed in terms of the radius of a circle, in kilometres, with the N B at the centre) which may be expected under the assumptions made*

1) By *day*, over *land*, and for *15 dB S/N ratio* at the boundary of the coverage:

	Input power to antenna			
	(a)	*(b)*	*(c)*	*(d)*
Latitude	*5 k*	*5 k*	*1 k*	*500*
5°N – 5°S	320	300	170	120
5° – 15°N S	510	470	320	250
15° – 25°N S	>600	600	450	350
25° – 35°N S	>600★	>600★	600★	500★
>35°N S	>600★	>600★	>600★	500★

	Input power to antenna			
	(e)	*(f)*	*(g)*	*(h)*
Latitude	*100*	*50*	*10*	*10*
5°N – 5°S	50	30	10	<10
5° – 15°N S	150	90	40	10
15° – 25°N S	220	160	70	45
25° – 35°N S	330★	250★	130★	80★
>35°N S	330★	250★	130★	100★

2) By *night*, over *land*, and for *15 dB S/N ratio* at the boundary of the coverage:

	Input power to antenna			
	(a)	*(b)*	*(c)*	*(d)*
Latitude	*5 k*	*5 k*	*1 k*	*500*
5°N – 5°S	190	150	85	50
5° – 15°N S	210	180	110	70
15° – 25°N S	320	300	170	120
25° – 35°N S	390	390	280	200
>35°N S	390	390	390	310

	Input power to antenna			
	(e)	*(f)*	*(g)*	*(h)*
Latitude	*100*	*50*	*10*	*10*
5°N – 5°S	20	<10	<10	<10
5° – 15°N S	25	15	<10	<10
15° – 25°N S	50	30	10	<10
25° – 35°N S	100	70	25	15
>35°N S	180	120	50	30

6.3.3.1 In all of the above tables, it has to be noted that:

a) the distances are given in kilometres, in accordance with ITU practice;

b) the figures in the final columns, with the heading 10 W, are calculated on the assumption that the low power NDB uses a very inefficient antenna (see 6.3.2, assumption 5 h));

c) a star shown against a figure indicates that the coverage may be limited by aircraft and industrial noises.

6.3.3.2 It has also to be noted that:

a) if a frequency of 200 kHz were used in place of 300 kHz, this would not appreciably affect the coverage of low power short range NDBs, but the coverage of the higher power, longer range beacons (for example, those with a range of 150 km or more) would be increased, as compared with those shown in the tables, by about 20 per cent;

b) if a frequency of 400 kHz were used in place of 300 kHz this would not appreciably affect the coverage of low power short range NDBs, but the coverage of the higher power, longer range beacons (for example, those with a range of 150 km or more) would be decreased, as compared with those shown in the tables, by about 25 per cent;

c) use of an ADF receiver with a narrower band would, other things being equal, provide wider coverage for the same radiated power of the NDB or, for the same coverage, an improved effective signal-to-noise ratio.

For example, if an admittance band of 1 kHz instead of 6 kHz were used, the coverage might be increased by as much as 30 per cent for the same radiated power or, alternatively, the effective signal-to-noise ratio might be increased by as much as 8 dB;

d) if a sector of the coverage of an NDB is over seawater, a greater coverage may be expected within that sector due to:

1) better ground wave propagation over seawater than over land;

2) the noise level, which is highest over land, often drops fairly steeply with increasing distance from the land. It might be assumed, therefore, that the distances shown in the tables could be increased by about 30 per cent by day, and by about 20 per cent by night, when the path is over seawater;

e) if, however, the beacon is sited on an island remote from land masses (for example, in mid-Pacific or mid-Atlantic, but not in the Caribbean), the coverage of the beacon is likely to be much greater, particularly in tropical latitudes, than is indicated in the tables; and in such cases figures for coverage similar to those shown for latitudes more than 35°N and S may be assumed for all latitudes, due to the much lower level of atmospheric noise which prevails in mid-ocean as compared with that experienced over, or in proximity to, land masses.

6.3.4 Limitation of coverage of a beacon at night due to “night effect”.

a) The distances, at night, at which the ground wave and sky wave components of the received field are likely to be equal are as follows:

Frequency	*Over land*	*Over sea*
200 kHz	500 km	550 km
300 kHz	390 km	520 km
400 kHz	310 km	500 km

b) The distances, at night, at which the ground wave component of the received field is likely to exceed the sky wave component by 10 dB are as follows:

Frequency	*Over land*	*Over sea*
200 kHz	300 km	320 km
300 kHz	230 km	300 km
400 kHz	200 km	280 km

c) It is, therefore, unlikely that reliable bearings can be obtained, at night, due to interaction of the two components of the received field, at much greater distances than those shown in 6.3.4 b). *These distances are independent of the power of the N B.*

d) It has to be noted, moreover, that, while with overland paths of good conductivity, night effect will only be serious at somewhat greater distances than those indicated over paths of poor conductivity, night effect may become pronounced at much shorter ranges. This will also depend to some extent upon the characteristics of the radiation system.

6.4 Considerations affecting operations of NDBs

6.4.1 *epth of modulation*

6.4.1.1 In specifying that the depth of modulation should be maintained as near to 95 per cent as is practicable, it must be noted that, at the frequencies used for NDBs, the small antennas generally in use can affect the effective modulation depth of the NDB system due to attenuation of the sidebands.

6.4.1.2 At this order of frequency, the antennas are normally only a small fraction of a wavelength long; they are therefore highly reactive and tend to have a high Q.

6.4.1.3 The effect is illustrated in Figure C-19, which was compiled from measurements made by one State. The modulating frequency in these measurements was 1 020 Hz. If a lower modulating frequency were used, the effect would be less.

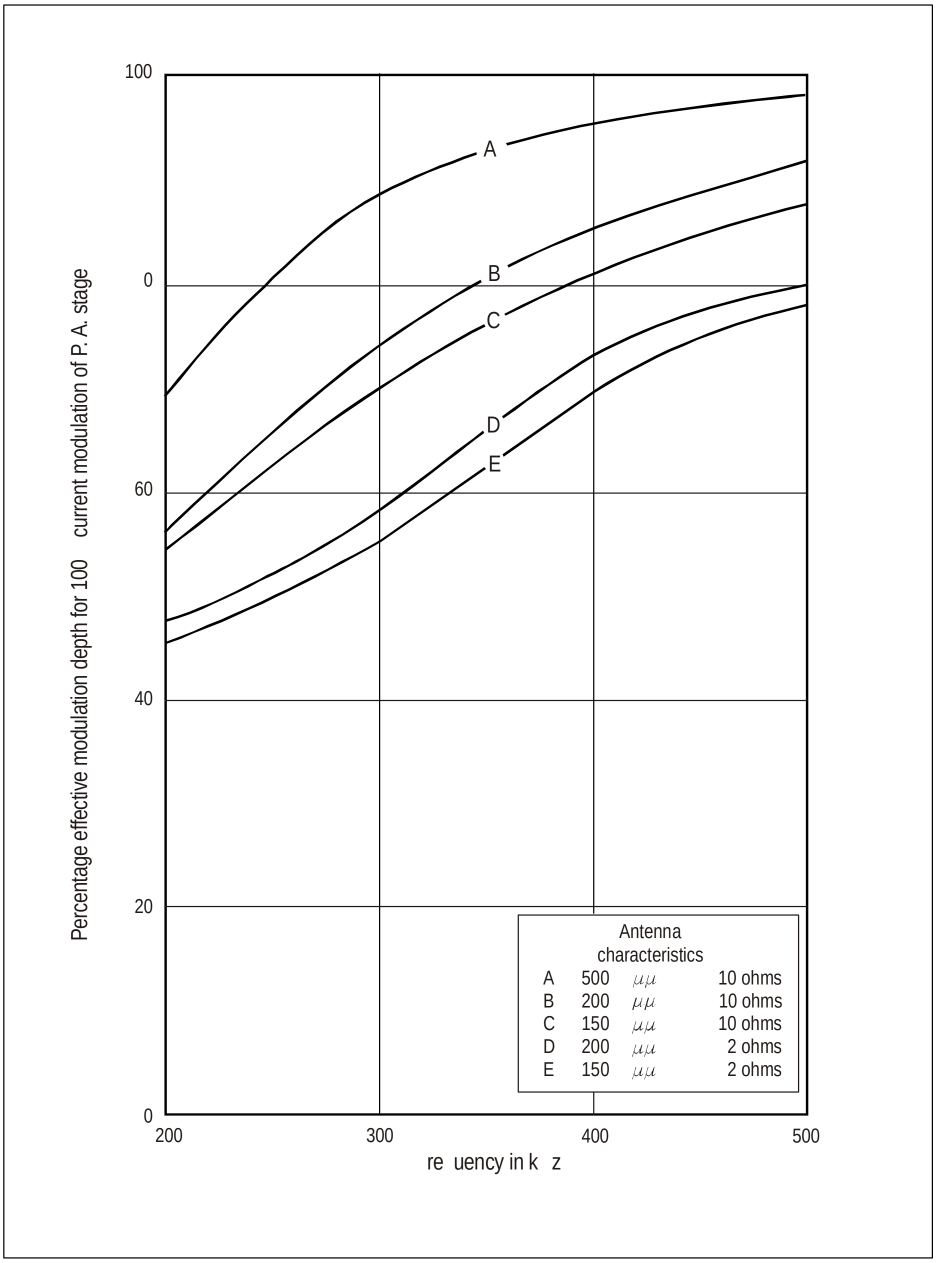


Figure C-19. The effect of antenna on the depth of modulation of the radiated signal

6.4.1.4 In order to reduce the attenuation, attempts should be made to reduce the Q of the antenna. This can be done in two ways, by increasing either its capacity or resistance.

6.4.1.5 Inserting additional resistance in an antenna wastes power, whereas increasing the capacity does not. Additionally, the effect of increasing the capacity is to reduce the voltage across the system and hence to reduce the insulation problems.

6.4.1.6 For these reasons, it is considered desirable to increase antenna capacity by the use of a top load as, for example, in the so-called umbrella top capacity.

6.4.2 *Earth systems*

Frequency planning is done on the assumption that the field strength will be maintained at the correct value. If the earth resistance is high (i.e. an insufficient earth system), not only will the radiation efficiency be low but the power radiated will be sensitive to changes in climatic conditions and other factors affecting the earth loss. In all cases, the earth system needs to be the best possible, taking into account all local circumstances.

6.5 Considerations affecting the choice of the modulating frequency for NON/A2A NDBs

Recognition of the fact that modern narrow band ADF receivers have improved selectivity characteristics requires consideration of the fact that, in so far as attenuation of the audio sidebands by these receivers results in a reduction of the effective depth of modulation of the signal, the distance at which satisfactory identification is obtained is consequently reduced. In such circumstances, it is considered that 400 Hz would provide a better identification service than 1 020 Hz. There is some evidence, however, that under conditions of high atmospheric noise, the higher frequency of 1 020 Hz may provide a more easily readable signal.

6.6 Guidance material on the testing of NDBs

6.6.1 In the following paragraphs an indication is given of the desirable periodicity for various tests. These figures are intended as only general guidance, it being recognized that many local circumstances will influence a State in establishing its test programmes.

6.6.1.1 *Carrier frequency*

6.6.1.1.1 The carrier frequency should periodically be tested against an accurate standard to ensure that the tolerance specified in Chapter 3, 3.4.4.2, is maintained. A standard such as a crystal controlled frequency meter having an accuracy of 0.001 per cent of the operating frequency is recommended for this purpose.

6.6.1.1.2 This test of carrier frequency stability should be carried out:

a) at least semi-annually for crystal controlled transmitters;

b) at least once a month for non-crystal controlled transmitters.

6.6.1.1.3 If practicable, tests at shorter intervals should be made.

6.6.1.2 *Frequency of the modulating tone*

6.6.1.2.1 The identification frequency requirements are specified in Chapter 3, 3.4.5.4. An audio signal generator calibrated to an accuracy of 0.5 per cent or better at the specified frequency is recommended as a calibration standard.

6.6.1.2.2 This test should be made at least once a month.

6.6.1.3 *Ground wave field strength*

6.6.1.3.1 It is recommended that remote field strength measurements be made using a field strength indicator set capable of checking that the power radiated from an NDB is in accordance with Chapter 3, 3.4.3.

6.6.1.3.2 This test should be carried out at least once a month.

6.6.1.4 *Modulation depth*

6.6.1.4.1 Chapter 3, 3.4.6.2, requires that the depth of modulation of the carrier frequency should be maintained as near to 95 per cent as practicable. Use of an oscilloscope capable of operation at the transmitting frequency of the NDB is recommended for this purpose.

6.6.1.4.2 This test, using an oscilloscope, should be made at least every three months. Additionally, rough checks of modulation depth may be made frequently by using a calibrated diodevoltmeter, but these are not a satisfactory substitute for the test using the oscilloscope.

6.6.1.4.3 Unwanted audio frequency modulation should be measured at least every three months to ensure that it does not exceed the limits of Chapter 3, 3.4.6.5. An oscilloscope is also recommended for this test.

6.6.1.5 *Fall of carrier power with modulation*

6.6.1.5.1 When modulation is applied, the carrier power should not decrease by more than the amount specified in Chapter 3, 3.4.6.4. A recommended method of ensuring this is to use, at a suitable remote site, a calibrated communication receiver having a continuous wave IF crystal filter as an indicator of transmitter field strength and having sufficient selectivity to reject the audio sidebands.

6.6.1.5.2 An alternative but probably less accurate method of determining the fall of carrier power would be a comparison of the current fed into the antenna when the transmitter is modulated with that when it is not modulated.

6.6.1.5.3 This test should be done at least once a month.

7. Material concerning DME

7.1 Guidance material concerning both DME/N and DME/P

7.1.1 *System efficiency*

7.1.1.1 System efficiency is the combined effect of down-link garble, ground transponder dead time, up-link garble, and interrogator signal processor efficiency. Since each of these efficiency components are statistically independent, they can be computed individually and then combined to yield the system efficiency. The effect of a single component is defined as the percentage ratio of valid replies processed by the interrogator in response to its own interrogations assuming all other components are not present. The system efficiency is then the product of the individual components.

7.1.1.2 In computing system efficiency, the number of missing replies as well as the accuracy of the range measurement made with the received replies should be considered. Missing replies may result from signal interference due to garble or from interrogations being received at the transponder during a dead time period. Replies which contain significant errors large enough to be rejected by the interrogator signal processing also should be treated as missing replies when computing the efficiency component.

7.1.1.3 The interference rate due to garble is dependent upon the channel assignment plan, traffic loading, and the ground transponder and interrogator receiver bandwidths. Because the FA mode has a wider receiver bandwidth than the IA mode, it is more susceptible to interference. These factors were accommodated in the DME/P system definition and normally do not require special consideration by the operating authority.

7.1.2 *own-link garble*

Down-link garble occurs when valid interrogations at the ground transponder are interfered with by coincident interrogations from other aircraft and results in loss of signal or errors in time-of-arrival measurement. This undesired air-to-ground loading is a function of the number of interrogating aircraft in the vicinity of the serving transponder and the corresponding distribution of interrogation frequencies and signal amplitudes received at the transponder.

Note.— Transponder to transponder garbling is controlled by the channel assignment authorities.

7.1.3 *p-link garble*

Up-link garble occurs when valid replies at the interrogator are interfered with by other transponders and results in loss of signal or errors in pulse time-of-arrival measurement. The garble can be interference from any transponder whose frequency is within the bandwidth of the interrogator, including those on the same frequency, but with different pulse coding. This undesired ground-to-air loading is a function of the number of transponders in the vicinity of the interrogator and the corresponding distribution of reply frequencies and signal amplitudes received at the interrogator.

7.1.4 *Interrogator processor efficiency*

The interrogator signal processor efficiency is the ratio of the number of replies processed by the interrogator to the number of interrogations in the absence of garble and transponder dead time effects. This efficiency depends on the reply pulse threshold level and the receiver noise level.

7.1.5 *Relationship between aircraft served and transmission rate*

7.1.5.1 Specification of the maximum transponder transmission rate establishes the maximum average transmitter power level. Chapter 3, 3.5.4.1.5.5 recommends that the transponder have a transmission rate capability of 2 700 pulse pairs per second if 100 aircraft are to be served. This represents typical transponder loading arising from 100 aircraft. To determine the actual transmission rate capability that should be accommodated at a given facility during peak traffic conditions requires that the maximum number of interrogators be estimated. To compute the interrogation loading on the transponder, the following should be considered:

a) the number of aircraft that constitutes the peak traffic load;

b) the number of interrogators in use on each aircraft;

c) the distribution of operating modes of the interrogators in use (e.g. search, initial approach, final approach, ground test);

d) the appropriate pulse repetition frequency as given in Chapter 3, 3.5.3.4.

7.1.5.2 Given the interrogation loading which results from the peak traffic as well as the reply efficiency of the transponder in the presence of this load, the resulting reply rate can be computed, thereby establishing the required transmitter capability. This reply rate is the level that, when exceeded, results in a reduction in receiver sensitivity (as specified in Chapter 3, 3.5.4.2.4) in order to maintain the reply rate at or below this maximum level.

7.1.6 *Siting of ME associated with ILS or MLS*

7.1.6.1 The DME should, where possible, provide to the pilot an indicated zero range at touchdown in order to satisfy current operational requirements.

7.1.6.2 The optimum site for a DME transponder is dependent upon a number of technical and operational factors. DME/N may be installed with ILS or MLS where operational requirements permit. DME/P, which provides higher accuracy and coverage throughout the entire runway region, is required to support the more flexible and advanced operations that are available with MLS.

7.1.6.3 In the case of DME/N, the provision of zero range indication may be achieved by siting the transponder as close as possible to the point at which zero range indication is required. Alternatively, the transponder time delay can be adjusted to permit aircraft interrogators to indicate zero range at a specified distance from the DME antenna. When the indicated DME zero range has a reference other than the DME antenna, consideration should be given to publishing this information.

7.1.6.4 In the case of DME/P, in order to meet accuracy and coverage requirements, particularly in the runway region, it is recommended that the DME/P be sited as closely as possible to the MLS azimuth facility, consistent with obstacle clearance criteria. For aircraft equipped with a full MLS capability, the desired zero range indication can then be obtained by utilizing MLS basic data. Note that the DME/P transponder time delay must not be adjusted for this purpose.

7.1.6.5 It is desirable that all users obtain indicated zero range at touchdown irrespective of the airborne equipment fitted. This would necessitate location of the DME/P abeam the runway at the touchdown point. In this case accuracy requirements for DME/P would not be met on the runway. It must be noted that MLS Basic Data Word 3 only permits the coding of DME/P coordinates within certain limits.

7.1.6.6 If an MLS/DME/P and an ILS/DME/N serve the same runway, an aircraft equipped with a minimum MLS capability can have a zero range indication at the MLS approach azimuth site when operating on MLS and a zero range indication at the touchdown point when operating on ILS. As this is considered to be operationally unacceptable, specifically from an ATC point of view, and if ILS/MLS/DME frequency tripling to prevent the relocation of the DME/N is not possible, the implementation of DME/P is to be postponed until the DME/N is withdrawn.

7.1.6.7 The nominal location of the zero range indication provided by a DME/N interrogator needs to be published.

7.1.6.8 In considering DME sites, it is also necessary to take into account technical factors such as runway length, profile, local terrain and transponder antenna height to assure adequate signal levels in the vicinity of threshold and along the runway. Care is also to be taken that where distance information is required in the runway region, the selected site is not likely to cause the interrogator to lose track due to excessive rate of change of velocity.

7.1.7 *Geographical separation criteria*

In order to allow consideration of actual antenna designs, equipment characteristics, and service volumes, the signal ratios needed to assure interference-free operation of the various facilities operating on DME channels are provided in 7.1.8, 7.1.9 and 7.1.10. Given these ratios, the geographical separations of facilities may be readily evaluated by accounting for power losses over the propagation paths.

7.1.8 *esired to undesired (/) signal ratios at the airborne receiver*

7.1.8.1 Table C-4 indicates the necessary D/U signal ratios needed to protect the desired transponder reply signal at an airborne receiver from the various co-frequency/adjacent frequency, same code/different code, undesired transponder reply signal combinations that may exist. For initial assignments, the D/U ratios necessary to protect airborne equipment with 6-microsecond decoder rejection should be used. In making an assignment, each facility must be treated as the desired source with the other acting as the undesired. If both satisfy their unique D/U requirement, then the channel assignment may be made.

Table C-4. Protection ratio D/U (dB)

Type of assignment	A	B
Co-frequency:		
Same pulse code	8	8
Different pulse code	8	–42
First adjacent frequency:		
Same pulse code	$-(P_u - 1)$	–42
Different pulse code	$-(P_u + 7)$	–75
Second adjacent frequency:		
Same pulse code	$-(P_u + 19)$	–75
Different pulse code	$-(P_u + 27)$	–75

Note 1.— The / ratios in column A protect those ME/N interrogators operating on or channels. Column A applies to decoder re ection of 6 microseconds.

Note 2.— The / ratios in column B protect those ME/N or ME/P interrogators utilizing discrimination in conformance with 3.5.5.3.4.2 and 3.5.5.3.4.3 of Chapter 3 and providing a decoder re ection conforming to 3.5.5.3.5 of Chapter 3.

Note 3.— P_u is the peak effective radiated power of the undesired signal in dB .

Note 4.— The frequency protection requirement is dependent upon the antenna patterns of the desired and undesired facility and the ERP of the undesired facility.

Note 5.— In assessing ad acent channel protection, the magnitude of / ratio in column A should not exceed the magnitude of the value in column B.

7.1.8.2 Accordingly, DME channel assignments depend upon the following:

a) *For co-channel assignments* This condition occurs when both the desired and undesired signals operate on a channel (W, X, Y or Z) that is co-frequency, same code. The D/U signal ratio should be at least 8 dB throughout the service volume.

b) *For co-frequency, different code assignments* This condition occurs when one facility operates on an X channel with the other on a W channel. A similar Y channel and a Z channel combination also applies.

c) *For first ad acent frequency, same code assignments* This condition occurs when both the desired and undesired facilities are of W, X, Y or Z type.

d) *For first ad acent frequency, different code assignments* This condition occurs when one facility operates on an X channel with the other on a W channel, but with a frequency offset of 1 MHz between transponder reply frequencies. A similar Y channel and a Z channel combination also applies.

e) *For second ad acent frequency, same or different code assignments* The second adjacent frequency combinations generally need not be frequency protected. However, special attention should be given to Note 4 of Table C-4, especially if the undesired facility is a DME/P transponder.

7.1.9 *Special considerations for ME and channel assignments*

Assignment of a Y or Z channel whose reply frequency is 63 MHz removed from the reply frequency of another channel (either a W, X, Y or Z channel) or vice versa requires a distance separation of at least 28 km (15 NM) between facilities.

7.1.10 *Special considerations for ME or channel assignments*

Assignment of a W or Z channel whose reply frequency is 63 MHz removed from the reply frequency of a Y channel or vice versa requires a distance separation of at least equal to the service volume range of the Y channel facility plus 28 km (15 NM).

7.1.11 *Special considerations for making pulse spectrum measurements*

The effective radiated power contained in the 0.5 MHz measurement frequency band specified in 3.5.4.1.3 e) can be calculated by integrating the power spectral density in the frequency domain or equivalently by integrating the instantaneous power per unit time in the time domain using the appropriate analogue or digital signal processing techniques. If the integration is performed in the frequency domain then the resolution bandwidth of the spectrum analyser must be commensurate with the 5 per cent duration interval of the DME pulse. If the integration is performed in the time domain at the output of a 0.5 MHz five pole (or more) filter then the time sample rate must be commensurate with the pulse spectrum width.

7.1.12 *Special considerations for ME/P associated with ILS*

7.1.12.1 For those runways where it is intended to install DME associated with ILS and where early MLS/RNAV operations are planned, installation of DME/P is preferred.

7.1.12.2 When it is intended to use the DME/P ranging information throughout the terminal area, interrogation pulse pairs with the correct spacing and nominal frequency must trigger the transponder if the peak power density at the transponder antenna is at least minus 93 dBW/m^2. This sensitivity level is based on the values contained in Chapter 3, 3.5.4.2.3.1 and it is applied to DME/P IA mode, where at this level DME/P IA mode is intended to comply with DME/N reply efficiency and at least DME/N accuracy.

7.2 Guidance material concerning DME/N only

7.2.1 *Effective radiated power (ERP) of ME/N facilities*

7.2.1.1 The power density figure prescribed in 3.5.4.1.5.1 of Chapter 3 is on the following assumptions:

Airborne receiver sensitivity	–112 dBW
Airborne transmission line loss	+3 dB
Airborne polar pattern loss relative to an isotopic antenna	+4 dB
Necessary power at antenna	–105 dBW

Minus 105 dBW at the antenna corresponds to minus 83 dBW/m^2 at the mid-band frequency.

Note.— The power density for the case of an isotropic antenna may be computed in the following manner

$$P_d = P_a - 10 \log \frac{\lambda^2}{4\pi}$$

where P_d = *power density in dB /m*^{2}

P_a = *power at receiving point in dB*

λ = *wavelength in metres.*

7.2.1.2 Nominal values of the necessary ERP to achieve a power density of minus 83 dBW/m^2 are given in Figure C-20. For coverage under difficult terrain and siting conditions it may be necessary to make appropriate increases in the ERP. Conversely, under favourable siting conditions, the stated power density may be achieved with a lower ERP.

7.2.1.3 The use of Figure C-20 is illustrated by the following examples. In order to achieve the necessary nominal power density at slant range/levels of 342 km (185 NM)/12 000 m (40 000 ft), 263 km (142 NM)/12 000 m (40 000 ft) and 135 km (73 NM)/6 000 m (20 000 ft), ERPs of the order of plus 42 dBW, plus 36 dBW and plus 30 dBW respectively would be required.

7.3 Guidance material concerning DME/P only

7.3.1 *ME/P system description*

7.3.1.1 The DME/P is an integral element of the microwave landing system described in Chapter 3, 3.11. The DME/P signal format defines two operating modes, initial approach (IA) and final approach (FA). The IA mode is compatible and interoperable with DME/N and is designed to provide improved accuracies for the initial stages of approach and landing. The FA mode provides substantially improved accuracy in the final approach area. Both modes are combined into a single DME/P ground facility and the system characteristics are such that DME/N and DME/P functions can be combined in a single interrogator. The IA and FA modes are identified by pulse codes which are specified in Chapter 3, 3.5.4.4. In the MLS approach sector, the DME/P coverage is at least 41 km (22 NM) from the ground transponder. It is intended that the interrogator does not operate in the FA mode at ranges greater than 13 km (7 NM) from the transponder site, although the transition from the IA mode may begin at 15 km (8 NM) from the transponder. These figures were selected on the assumption that the transponder is installed beyond the stop end of the runway at a distance of approximately 3 600 m (2 NM) from the threshold.

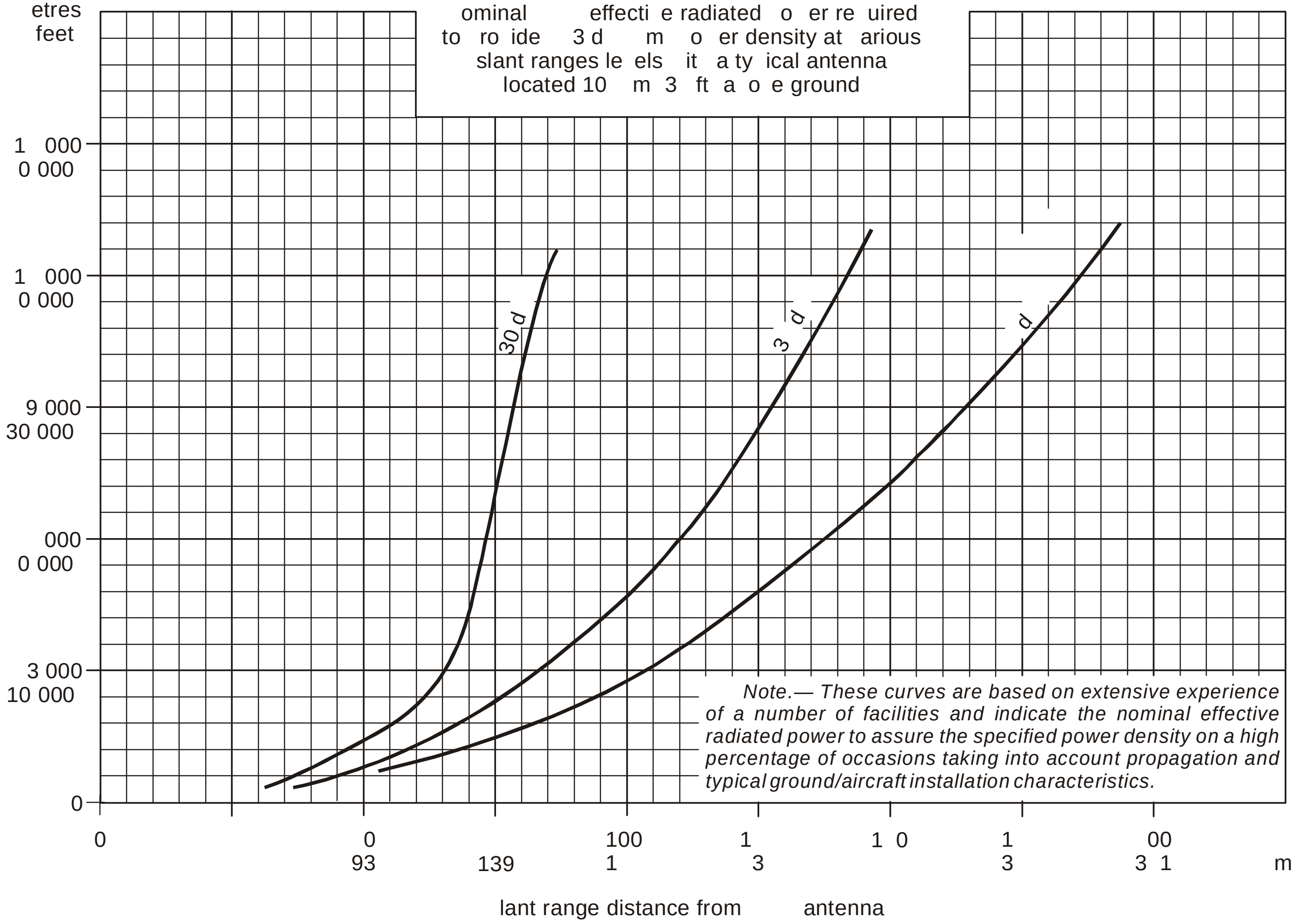

etres
feet
ominal effecti e radiated o er re uired
to ro ide 3 d m o er density at arious
slant ranges le els it a ty ical antenna
located 10 m 3 ft a o e ground
e el a o e facility
30 d
3 d
d
lant range distance from antenna
m
Note.— These curves are based on extensive experience of a number of facilities and indicate the nominal effective radiated power to assure the specified power density on a high percentage of occasions taking into account propagation and typical ground/aircraft installation characteristics.

Figure C-20

7.3.1.2 A major potential cause of accuracy degradation encountered in the final phases of the approach and landing operation is multipath (signal reflection) interference. DME/P FA mode minimizes these effects by using wideband signal processing of pulses having fast rise time leading edges, and by measuring the time of arrival at a low point on the received pulse where it has not been significantly corrupted by multipath. This is in contrast to the slower rise time pulses and higher thresholding at the 50 per cent level used in DME/N.

7.3.1.3 Because the FA mode is used at ranges less than 13 km (7 NM), the transmitter can provide an adequate signal level to meet the required accuracy without the fast rise time pulse violating the transponder pulse spectrum requirements. Use of the 50 per cent threshold and a narrow receiver bandwidth in the IA mode permits an adequate but less demanding performance to the coverage limits. The transponder determines the interrogation mode in use by the interrogation code in order to time the reply delay from the proper measurement reference. The IA mode is interoperable with DME/N permitting a DME/N interrogator to be used with a DME/P transponder to obtain at least the accuracy with a DME/N transponder. Similarly, a DME/P interrogator may be used with a DME/N transponder.

7.3.2 *ME/P system accuracy requirements*

7.3.2.1 *ME/P accuracy requirements*

7.3.2.1.1 When considering the DME/P accuracy requirement, the operations that can be performed in the service volume of the final approach mode tend to fall into one of two groups. This has led to two accuracy standards being defined for the final approach mode:

a) *accuracy standard 1* this is the least demanding and is designed to cater for most CTOL operations;

b) *accuracy standard 2* this gives improved accuracy that may be necessary for VTOL and STOL operations, CTOL flare manoeuvres using MLS flare elevation guidance and CTOL high-speed turnoffs.

7.3.2.1.2 Table C-5 shows applications of DME and typical accuracy requirements. This will assist in selecting the appropriate accuracy standard to meet the operational requirement. The calculations are based on a distance of 1 768 m (5 800 ft) between the DME antenna and the runway threshold. The following paragraphs refer to Table C-5.

7.3.2.1.3 It is intended that the DME/P accuracy approximately corresponds to the azimuth function PFE at a distance of 37 km (20 NM) from the MLS reference datum both along the extended runway centre line and at an azimuth angle of 40 degrees. Also the DME/N error at the limits of MLS coverage is consistent with the 0.37 km (0.2 NM) system accuracy in Chapter 3, 3.5.3.1.3.3. The CMN is the linear equivalent of the plus or minus 0.1 degree CMN specified for the azimuth angle function.

7.3.2.1.4 PFE corresponds to azimuth angular error; CMN is approximately the linear equivalent of the plus or minus 0.1 degree CMN specified for the azimuth angle system.

7.3.2.1.5 The plus or minus 30 m PFE corresponds to a plus or minus 1.5 m vertical error for a 3-degree elevation angle.

7.3.2.1.6 Flare initiation begins in the vicinity of the MLS approach reference datum; MLS elevation and DME/P provide vertical guidance for automatic landing when the terrain in front of the runway threshold is uneven.

7.3.2.1.7 Sensitivity modification or autopilot gain scheduling requirements are not strongly dependent on accuracy.

Table C-5.

Function	Typical distance from the threshold	PFE (95% probability)	CMN (95% probability)
Approach (7.3.2.1.3)			
— extended runway centre line	37 km (20 NM)	±250 m (±820 ft)	±68 m (±223 ft)
— at 40° azimuth	37 km (20 NM)	±375 m (±1 230 ft)	±68 m (±223 ft)
Approach (7.3.2.1.4)			
— extended runway centre line	9 km (5 NM)	±85 m (±279 ft)	±34 m (±111 ft)
— at 40° azimuth	9 km (5 NM)	±127 m (±417 ft)	±34 m (±111 ft)
Marker replacement			
— outer marker	9 km (5 NM)	±800 m (±2 625 ft)	not applicable
— middle marker	1 060 m (0.57 NM)	±400 m (±1 312 ft)	not applicable
30 m decision height determination (100 ft) (7.3.2.1.5)			
— 3° glide path (CTOL)	556 m (0.3 NM)	±30 m (±100 ft)	not applicable
— 6° glide path (STOL)	556 m (0.3 NM)	±15 m (±50 ft)	not applicable
Flare initiation over uneven terrain (7.3.2.1.6)			
— 3° glide path (CTOL)	0	±30 m (±100 ft)	±18 m (±60 ft)
— 6° glide path (STOL)	0	±12 m (±40 ft)	±12 m (±40 ft)
Sensitivity modifications (7.3.2.1.7) (autopilot gain scheduling)	37 km (20 NM) to 0	±250 m (±820 ft)	not applicable
Flare manoeuvre with MLS flare elevation (7.3.2.1.8)			
— CTOL	0	±30 m (±100 ft)	±12 m (±40 ft)
— STOL	0	±12 m (±40 ft)	±12 m (±40 ft)
Long flare alert (7.3.2.1.9)	Runway region	±30 m (±100 ft)	not applicable
CTOL high speed roll-out/turnoffs (7.3.2.1.10)	Runway region	±12 m (±40 ft)	±30 m (±100 ft)
Departure climb and missed approach	0 to 9 km (5 NM)	±100 m (±328 ft)	±68 m (±223 ft)
VTOL approaches (7.3.2.1.11)	925 m (0.5 NM) to 0	±12 m (±40 ft)	±12 m (±40 ft)
Coordinate translations (7.3.2.1.12)	—	±12 m to ±30 m (±40 ft to ±100 ft)	±12 m (±40 ft)

7.3.2.1.8 It is intended that this specification applies when vertical guidance and sink rate for automatic landing are derived from the MLS flare elevation and the DME/P.

Note.— Although the standard has been developed to provide for MLS flare elevation function, this function is not implemented and is not intended for future implementation.

7.3.2.1.9 It indicates to the pilot if the aircraft is landing beyond the touchdown region.

7.3.2.1.10 The roll-out accuracy requirement reflects system growth potential. In this application the roll-out PFE would be dictated by the possible need to optimize roll-out deceleration and turnoff so as to decrease runway utilization time.

7.3.2.1.11 It is intended to assure the pilot that the aircraft is over the landing pad before descending.

7.3.2.1.12 It may be desirable to translate the MLS coordinates from one origin to another when the antennas are not installed in accordance with Chapter 3, 3.11.5.2.6 or 3.11.5.3.5. The figures in the table are typical of a VTOL application; actual values will depend on the geometry of the installation.

7.3.3 *ME/P error budgets*

Example error budgets for DME/P accuracy standards 1 and 2 are shown in Table C-6. If the specified error components are not individually exceeded in practice, it can be expected that the overall system performance, as specified in 3.5.3.1.3.4, will be achieved. A garbling contribution to the system error is computed by taking the root sum square (RSS) of the errors obtained in the specified down-link environment with those obtained in the specified up-link environment and removing, on an RSS basis, the error obtained in a non-garbling environment.

Table C-6. Example of DME/P error budget

		FA mode Standard 1		FA mode Standard 2		IA mode	
Error source	Error component	PFE m (ft)	CMN m (ft)	PFE m (ft)	CMN m (ft)	PFE m (ft)	CMN m (ft)
Instrumentation	Transponder	±10 (±33)	±8 (±26)	±5 (±16)	±5 (±16)	±15 (±50)	±10 (±33)
	Interrogator	±15 (±50)	±10 (±33)	±7 (±23)	±7 (±23)	±30 (±100)	±15 (±50)
Site related	Down-link specular multipath	±10 (±33)	±8 (±26)	±3 (±10)	±3 (±10)	±37 (±121)	±20 (±66)
	Up-link specular multipath	±10 (±33)	±8 (±26)	±3 (±10)	±3 (±10)	±37 (±121)	±20 (±66)
	Non-specular (diffuse) multipath	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)
	Garble	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)

Note 1.— The figures for non-specular multipath and for garble are the totals of the up-link and down-link components.

Note 2.— PFE contains both bias and time varying components. In the above table the time varying components and most site related errors are assumed to be essentially statistically independent. The bias components may not conform to any particular statistical distribution.

In considering these error budgets, caution is to be exercised when combining the individual components in any particular mathematical manner.

Note 3.— The transmitter wave form is assumed to have a 1 200 nanosecond rise time.

7.3.4 *System implementation*

7.3.4.1 While the DME/P may be implemented in various ways, the instrumental and propagation errors assumed are typical of those obtainable with equipment designs which provide internal time delay drift compensation and which establish timing reference points by thresholding on the leading edge of the first pulse of a pulse pair using the following techniques:

a) *IA mode.* A conventional technique which thresholds at the 50 per cent amplitude point;

b) *FA mode.* A delay-attenuate-and-compare (DAC) technique which thresholds between the 5 per cent and 30 per cent amplitude points.

7.3.4.2 Accuracy standard 1 can be achieved using a delay of 100 nanoseconds and an attenuation of 5 to 6 dB. It is also required that the threshold amplitude point of both the delayed pulse and the attenuated pulse lie within the partial rise time region.

7.3.4.3 The example above does not preclude time of arrival measurement techniques other than the DAC from being used, but it is necessary in any case that threshold measurements take place during the pulse partial rise time.

7.3.5 *ME/P interrogator signal processing*

7.3.5.1 *uring acquisition*

a) The interrogator acquires and validates the signal within 2 seconds before transitioning to track mode even in the presence of squitter and random pulse pairs from adjacent channels, which result in a 50 per cent system efficiency.

b) After loss of the acquired signal in either the IA or FA mode, the interrogator provides a warning output within 1 second, during which time the guidance information continues to be displayed. After loss of signal, the interrogator returns to the search condition in the IA mode in order to re-establish track.

7.3.5.2 *uring track*

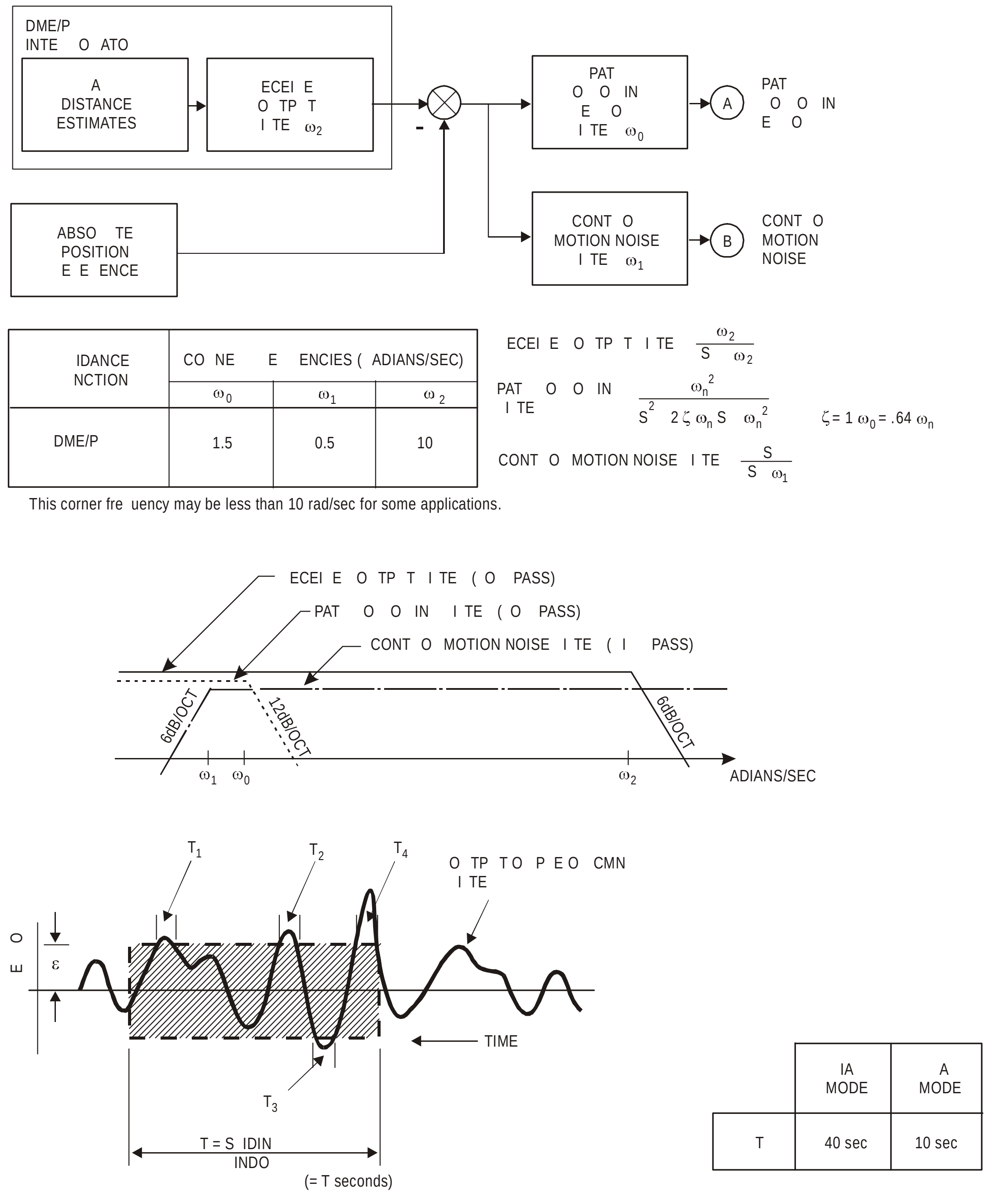
When track is established, the receiver output consists of valid guidance information before removing the warning. The validation process continues to operate as long as the interrogator is in track. The interrogator remains in track as long as the system efficiency is 50 per cent or greater. While in track, the receiver provides protection against short duration, large amplitude erroneous signals.

7.3.5.3 *Range date filter*

The accuracy specifications in Chapter 3, 3.5.3.1.3.4, as well as the error budgets discussed in 7.3.3, assume that the higher frequency noise contributions are limited by a low pass filter with a corner frequency of qw as specified in Figure C-21. Depending upon the user's application, additional filtering for noise reduction can be used provided that the induced phase delay and amplitude variation do not adversely affect the aircraft flight control system's dynamic response. The following sections recommend additional features which should be incorporated into the data filter.

7.3.5.4 *Velocity memory*

The data filter may require a velocity memory in order to achieve the specified accuracies in Chapter 3, 3.5.3.1.3.4 with a system efficiency of 50 per cent. It should be noted that low system efficiencies can occur in the IA mode during identification transmissions.



IDANCE NCTION	CO NE E ENCIES (ADIANS/SEC)		
	ω_0	ω_1	ω_2
DME/P	1.5	0.5	10

This corner fre uency may be less than 10 rad/sec for some applications.

	IA MODE	A MODE
T	40 sec	10 sec

DME/P measurement methodology: ε is the error specification T region to be evaluated T_1, T_2, T_3 ... time intervals that error exceeds specifications. or the e uipment to be acceptable in this region, the follo ing ine uality should be true:

$(T_1 \quad T_2 \quad T_3 \quad ...) / T \leq 0.05.$

Figure C-21

7.3.5.5 *Outlier re ection*

Range estimates which are significantly different from previous filtered range estimates, because they cannot be the result of aircraft motion, should be assumed to be in error. Such data should be rejected at the input to the data filter.

7.3.6 *ME/P error measurement methods*

7.3.6.1 *System errors*

7.3.6.1.1 The DME/P system accuracies are specified in Chapter 3, 3.5.4.1.3.4 in terms of path following error (PFE) and control motion noise (CMN). These parameters describe the interaction of the DME/P guidance signal with the aircraft in terms directly related to aircraft position errors and flight control system design.

7.3.6.1.2 For the purposes of determining compliance with the accuracy standard, the PFE and CMN components are evaluated over any T second interval (where T = 40 seconds in the IA mode and 10 seconds in the FA mode) of the flight error record taken within the DME/P coverage limits. The 95 per cent probability requirement is interpreted to be satisfied if the PFE and CMN components do not exceed the specified error limits for a total period that is more than 5 per cent of the evaluation time interval. This is illustrated in Figure C-21. To evaluate the PFE and CMN components of the DME/P guidance data, the true aircraft position, as determined by a suitable position reference, is subtracted from the guidance data to form an error signal. This error signal is then filtered by the PFE and CMN filters, where the outputs provide suitable estimates of the PFE and CMN components, respectively. These filters are defined in Figure C-21.

7.3.6.1.3 These filters can be utilized to determine the transponder instrumentation error components specified in Chapter 3, 3.5.4.5.3 and 3.5.4.5.4. Similarly, the interrogator instrumentation error components, specified in Chapter 3, 3.5.5.4, can be determined.

7.3.7 *Multipath effects*

7.3.7.1 Under the multipath conditions likely to exist, the accuracy specifications of the DME/P assume that the performance is not degraded beyond a certain limit and that this degradation is equally applied to both interrogator and transponder receiver.

7.3.7.2 To ensure that the equipment is working according to the specifications, the following should apply to FA mode operation of the system:

a) if a signal of sufficient power to make thermal noise contributions insignificant is applied to the receivers, a second signal delayed between 0 and 350 nanoseconds with respect to the first, with an amplitude 3 dB or more below the first and with a scalloping frequency between 0.05 and 200 Hz should not produce errors in the receiver output of more than plus or minus 100 nanoseconds (15 m);

b) for delays more than 350 nanoseconds the error contribution will be reduced considerably. A typical value will be plus or minus 7 nanoseconds (1 m).

7.3.7.3 The airborne DME antenna should be located so as to preclude antenna gain reductions in the forward direction with the aircraft in the landing configuration. Any such antenna gain reductions could enhance the multipath error component when the aircraft is on approach and landing phases when highest DME accuracies are required.

7.3.8 *ME/P power budget*

7.3.8.1 Tables C-7 and C-8 are an example of CTOL air-to-ground and ground-to-air power budgets. The permitted peak ERP value is based on a pulse shape which meets the spectral constraints in Chapter 3, 3.5.4.1.3 e).

Table C-7. CTOL ground-to-air power budget

Power budget items	41 km (22 NM)	13 km (7 NM)	Ref. datum	Roll-out
Peak effective radiated power, dBm	55	55	55	55
Ground multipath loss, dB	–5	–3	–4	–17
Antenna pattern loss, dB	–4	–2	–5	–5
Path loss, dB	–125	–115	–107	–103
Monitor loss, dB	–1	–1	–1	–1
Polarization and rain loss, dB	–1	–1	0	0
Received signal at aircraft, dBm	–81	–67	–62	–71
Power density at aircraft, dBW/m^2	–89	–75	–70	–79
Aircraft antenna gain, dB	0	0	0	0
Aircraft cable loss, dB	–4	–4	–4	–4
Received signal at interrogator, dBm	–85	–71	–66	–75
Receiver noise video, dBm				
(Noise factor (NF) = 9 dB)				
IF BW: 3.5 MHz		–103	–103	–103
IF BW: 0.8 MHz	–109			
Signal-to-noise ratio (video), dB	24	32	37	28

Table C-8. CTOL air-to-ground power budget

Power budget items	41 km (22 NM)	13 km (7 NM)	Ref. datum	Roll-out
Interrogator transmitter power, dBm	57	57	57	57
Aircraft antenna gain, dB	0	0	0	0
Aircraft cable loss, dB	–4	–4	–4	–4
Peak effective radiated power, dBm	53	53	53	53
Ground multipath loss, dB	–5	–3	–4	–17
Path loss, dB	–125	–115	–107	–103
Polarization and rain loss, dB	–1	–1	0	0
Received signal at transponder antenna, dBm	–78	–66	–58	–67
Ground antenna gain, dB	8	8	8	8
Pattern loss, dB	–4	–2	–5	–5
Cable loss, dB	–3	–3	–3	–3
Received signal at transponder, dBm	–77	–63	–58	–67
Receiver noise video, dBm				
(Noise factor (NF) = 9 dB)				
IF BW: 3.5 MHz		–106	–106	–106
IF BW: 0.8 MHz	–112			
Signal-to-noise ratio (video), dB	35	43	48	39

7.3.8.2 In the power budget calculations, it is assumed that the aircraft antenna is not shielded by the aircraft structure including the landing gear when extended.

7.3.8.3 The video power signal-to-noise ratio is related to the IF power signal-to-noise ratio in the following manner:

$$S/N\ (\text{video}) = S/N\ (\text{IF}) + 10 \log \frac{\text{IF noise bandwidth}}{\text{video noise bandwidth}}$$

Note 1.— The distances are measured from the transponder antenna.

Note 2.— Frequency dependent parameters were calculated for 1 0 M z.

7.3.9 *ME/P monitor time delay measurement*

The required time delay measurement can be accomplished by measuring the output of a PFE filter and making a control decision within 1 second. However, since the transponder PFE is a slowly varying error component, an equivalent measurement is to average the unfiltered time delay samples for 1 second.

8. Material concerning power supply switch-over times

8.1 Power supply switch-over times for ground-based radio aids used in the vicinity of aerodromes

The power supply switch-over times for radio navigation aids and ground elements of communications systems are dependent on the type of runway and aircraft operations to be supported. Table C-9 indicates representative switch-over times which may be met by power supply systems currently available.

Table C-9. Power supply switch-over times for ground-based radio aids used at aerodromes

Type of runway	Aids requiring power	Maximum switch-over times (seconds)
Instrument approach	SRE	15
	VOR	15
	NDB	15
	D/F facility	15
Precision approach, Category I	ILS localizer	10
	ILS glide path	10
	ILS middle marker	10
	ILS outer marker	10
	PAR	10
Precision approach, Category II	ILS localizer	0
	ILS glide path	0
	ILS inner marker	1
	ILS middle marker	1
	ILS outer marker	10
Precision approach, Category III	(same as Category II)	

ATTACHMENT D. INFORMATION AND MATERIAL FOR GUIDANCE IN THE APPLICATION OF THE GNSS STANDARDS AND RECOMMENDED PRACTICES

1. Definitions

Bi binar . Bi-binary is known as “Manchester Encoding”. It is sometimes referred to as “Differential Manchester Encoding”. Using this system, it is the transition of the edge that determines the bit.

C ip. A single digital bit of the output of a pseudo-random bit sequence.

Gold code. A class of unique codes used by GPS, which exhibit bounded cross-correlation and off-peak auto-correlation values.

Selective availabilit (SA). A set of techniques for denying the full accuracy and selecting the level of positioning, velocity and time accuracy of GPS available to users of the standard positioning service signal.

Note.— GPS SA was discontinued at midnight on 1 May 2000.

2. General

Standards and Recommended Practices for GNSS contain provisions for the elements identified in Chapter 3, 3.7.2.2.

Note.— Except where specifically annotated, GBAS guidance material applies to GRAS.

3. Navigation system performance requirements

3.1 Introduction

3.1.1 Navigation system performance requirements are defined in the *Manual on Required Navigation Performance (RNP)* (Doc 9613) for a single aircraft and for the total system which includes the signal-in-space, the airborne equipment and the ability of the aircraft to fly the desired trajectory. These total system requirements were used as a starting point to derive GNSS signal-in-space performance requirements. In the case of GNSS, degraded configurations which may affect multiple aircraft are to be considered. Therefore, certain signal-in-space performance requirements are more stringent to take into account multiple aircraft use of the system.

3.1.2 Two types of approach and landing operations with vertical guidance (APV), APV-I and APV-II, use vertical guidance relative to a glide path, but the facility or navigation system may not satisfy all of the requirements associated with precision approach. These operations combine the lateral performance equal to that of an ILS Category I localizer with different levels of vertical guidance. Both APV-I and APV-II provide access benefits relative to a non-precision approach, and the service that is provided depends on the operational requirements and the SBAS infrastructure. APV-I and APV-II exceed the requirements (lateral and vertical) for current RNAV approaches using barometric altimetry, and the relevant on-board equipment will therefore be suitable for the conduct of barometric VNAV APV and RNAV non-precision approaches.

3.2 Accuracy

3.2.1 GNSS position error is the difference between the estimated position and the actual position. For an estimated position at a specific location, the probability should be at least 95 per cent that the position error is within the accuracy requirement.

3.2.2 Stationary, ground-based systems such as VOR and ILS have relatively repeatable error characteristics, so that performance can be measured for a short period of time (e.g. during flight inspection) and it is assumed that the system accuracy does not change after the test. However, GNSS errors change over time. The orbiting of satellites and the error characteristics of GNSS result in position errors that can change over a period of hours. In addition, the accuracy itself (the error bound with 95 per cent probability) changes due to different satellite geometries. Since it is not possible to continually measure system accuracy, the implementation of GNSS demands increased reliance on analysis and characterization of errors. Assessment based on measurements within a sliding time window is not suitable for GNSS.

3.2.3 The error for many GNSS architectures changes slowly over time, due to filtering in the augmentation systems and in the user receiver. This results in a small number of independent samples in periods of several minutes. This issue is very important for precision approach applications, because it implies that there is a 5 per cent probability that the position error can exceed the required accuracy for an entire approach. However, due to the changing accuracy described in 3.2.2, this probability is usually much lower.

3.2.4 The 95 per cent accuracy requirement is defined to ensure pilot acceptance, since it represents the errors that will typically be experienced. The GNSS accuracy requirement is to be met for the worst-case geometry under which the system is declared to be available. Statistical or probabilistic credit is not taken for the underlying probability of particular ranging signal geometry.

3.2.5 Therefore, GNSS accuracy is specified as a probability for each and every sample, rather than as a percentage of samples in a particular measurement interval. For a large set of independent samples, at least 95 per cent of the samples should be within the accuracy requirements in Chapter 3, Table 3.7.2.4-1. Data is scaled to the worst-case geometry in order to eliminate the variability in system accuracy that is caused by the geometry of the orbiting satellites.

3.2.6 An example of how this concept can be applied is the use of GPS to support performance required for non-precision approach operations. Assume that the system is intended to support non-precision approaches when the horizontal dilution of precision (HDOP) is less than or equal to 6. To demonstrate this performance, samples should be taken over a long period of time (e.g. 24 hours). The measured position error g for each sample i is denoted g_i. This error is scaled to the worst-case geometry as $6 \times g_i$/HDOP. Ninety-five per cent of the scaled errors must be less than 220 m for the system to comply with the non-precision accuracy requirement under worst-case geometry conditions. The total number of samples collected must be sufficient for the result to be statistically representative, taking into account the decorrelation time of the errors.

3.2.7 A range of vertical accuracy values is specified for Category I precision approach operations which bounds the different values that may support an equivalent operation to ILS. A number of values have been derived by different groups, using different interpretations of the ILS standards. The lowest value from these derivations was adopted as a conservative value for GNSS; this is the minimum value given for the range. Because this value is conservative, and because GNSS error characteristics are different from ILS, it may be possible to achieve Category I operations using larger values of accuracy and alert limits within the range. The larger values would result in increased availability for the operation. The maximum value in the range has been proposed as a suitable value, subject to validation.

3.2.8 Specific alert limits have been defined for each augmentation system. For GBAS, technical provision has been made to broadcast the alert limit to aircraft. GBAS standards require the alert limit of 10 m. For SBAS, technical provisions have been made to standardize the alert limit through an updateable database (see *Minimum Operational Performance Standards for Global Positioning System/ ide Area Augmentation System (GPS/ AAS) Airborne Equipment* (RTCA/DO-229C)).

3.2.9 The GPS SPS position error (Chapter 3, 3.7.3.1.1.1) accounts for the contribution of the space and control segment to position errors (satellite clock and ephemeris errors) only; it does not include the contributions of ionospheric and tropospheric delay model errors, errors due to multipath effects, and receiver measurement noise errors (Attachment D, 4.1.2). These errors are addressed in the receiver standards. The user positioning error at the output of ABAS-capable equipment is mainly driven by the GNSS receiver used.

3.2.9.1 For Basic GNSS receivers, the receiver qualification standards require demonstration of user positioning accuracy in the presence of interference and a model of selective availability (SA) to be less than 100 m (95 per cent of time) horizontally and 156 m (95 per cent of time) vertically. The receiver standards do not require that a Basic GNSS receiver applies the ionospheric correction described in Appendix B, 3.1.2.4.

Note.— The term Basic GNSS receiver designates the GNSS avionics that at least meet the requirements for a GPS receiver as outlined in Annex 10, Volume I and the specifications of RTCA/ O-20 as amended by nited States Federal Aviation Administration (FAA) TSO-C129A, or E ROCAE E -72A (or equivalent).

3.2.9.2 Since the discontinuation of SA, the representative user positioning accuracy of GPS has been conservatively estimated to be as shown in Table D-0. The numbers provided assume that the worst two satellites of a nominal 24 GPS satellite constellation are out of service. In addition, a 7 m (1 σ) ionospheric delay model error, a 0.25 m (1 σ) residual tropospheric delay error, and a 0.80 m (1 σ) receiver noise error are assumed. After discontinuation of SA (Attachment D, 1.), the dominant pseudo-range error for users of the GPS Standard Positioning Service is the ionospheric error that remains after application of the ionospheric corrections. This error is also highly variable and depends on conditions such as user geomagnetic latitude, level of solar activity (i.e. point of the solar cycle that applies), level of ionospheric activity (i.e. whether there is a magnetic storm, or not), elevation angle of the pseudo-range measurement, season of the year, and time of day. The ionospheric delay model error assumption reflected in Table D-0 is generally conservative; however, conditions can be found under which the assumed 7 m (1 σ) error during solar maximum would be inadequate.

Table D-0. GPS user positioning accuracy

	GPS user positioning accuracy 95% of time, global average
Horizontal position error	33 m (108 ft)
Vertical position error	73 m (240 ft)

3.2.10 SBAS and GBAS receivers will be more accurate, and their accuracy will be characterized in real time by the receiver using standard error models, as described in Chapter 3, 3.5, for SBAS and Chapter 3, 3.6, for GBAS.

Note 1.— The term SBAS receiver designates the GNSS avionics that at least meet the requirements for an SBAS receiver as outlined in Annex 10, Volume I and the specifications of RTCA/ O-229C, as amended by nited States FAA TSO-C145A/TSO-C146A (or equivalent).

Note 2.— The term GBAS receiver designates the GNSS avionics that at least meet the requirements for a GBAS receiver as outlined in Annex 10, Volume I and the specifications of RTCA/ O-253A, as amended by nited States FAA TSO-C161 and TSO-C162 (or equivalent).

3.3 Integrity and time-to-alert

3.3.1 Integrity is a measure of the trust that can be placed in the correctness of the information supplied by the total system. Integrity includes the ability of a system to provide timely and valid warnings to the user (alerts) when the system must not be used for the intended operation (or phase of flight).

3.3.2 To ensure that the position error is acceptable, an alert limit is defined that represents the largest position error allowable for a safe operation. The position error cannot exceed this alert limit without annunciation. This is analogous to ILS in that the system can degrade so that the error is larger than the 95th percentile but within the monitor limit.

3.3.3 The integrity requirement of the navigation system for a single aircraft to support en-route, terminal, initial approach, non-precision approach and departure is assumed to be $1 - 1 \times 10^{-5}$ per hour.

3.3.4 For satellite-based navigation systems, the signal-in-space in the en-route environment simultaneously serves a large number of aircraft over a large area, and the impact of a system integrity failure on the air traffic management system will be greater than with traditional navigation aids. The performance requirements in Chapter 3, Table 3.7.2.4-1, are therefore more demanding.

3.3.5 For precision approach operations, integrity requirements for GNSS signal-in-space requirements of Chapter 3, Table 3.7.2.4-1, were selected to be consistent with ILS requirements.

3.4 Continuity of service

3.4.1 Continuity of service of a system is the capability of the system to perform its function without unscheduled interruptions during the intended operation.

3.4.2 *En-route*

3.4.2.1 For en-route operations, continuity of service relates to the capability of the navigation system to provide a navigation output with the specified accuracy and integrity throughout the intended operation, assuming that it was available at the start of the operation. The occurrence of navigation system alerts, either due to rare fault-free performance or to failures, constitute continuity failures. Since the durations of these operations are variable, the continuity requirement is specified as a probability on a per-hour basis.

3.4.2.2 The navigation system continuity requirement for a single aircraft is $1 - 1 \times 10^{-4}$ per hour. However, for satellite-based systems, the signal-in-space may serve a large number of aircraft over a large area. The continuity requirements in Chapter 3, Table 3.7.2.4-1, represent reliability requirements for the GNSS signal-in-space, i.e. they derive mean time between outage (MTBO) requirements for the GNSS elements.

3.4.2.3 A range of values is given in Chapter 3, Table 3.7.2.4-1, for the signal-in-space continuity requirement for en-route operations. The lower value is the minimum continuity for which a system is considered to be practical. It is appropriate for areas with low traffic density and airspace complexity. In such areas, the impact of a navigation system failure is limited to a small number of aircraft, and there is, therefore, no need to increase the continuity requirement significantly beyond the single aircraft requirement ($1 - 1 \times 10^{-4}$ per hour). The highest value given (i.e. $1 - 1 \times 10^{-8}$ per hour) is suitable for areas with high traffic density and airspace complexity, where a failure will affect a large number of aircraft. This value is appropriate for navigation systems where there is a high degree of reliance on the system for navigation and possibly for dependent surveillance. The value is sufficiently high for the scenario based on a low probability of a system failure during the life of the system. Intermediate values of continuity (e.g. $1 - 1 \times 10^{-6}$ per hour) are considered to be appropriate for areas of high traffic density and complexity where there is a high degree of reliance on the navigation system but in which mitigation for navigation system failures is possible. Such mitigation may be through the use of alternative navigation means or the use of ATC surveillance and intervention to maintain separation standards. The values of continuity performance are determined by airspace needs to support navigation where GNSS has either replaced the existing navigation aid infrastructure or where no infrastructure previously existed.

3.4.3 *Approach and landing*

3.4.3.1 For approach and landing operations, continuity of service relates to the capability of the navigation system to provide a navigation output with the specified accuracy and integrity during the approach, assuming that it was available at the start of the operation. The occurrence of navigation system alerts, either due to rare fault-free performance or to failures, constitute continuity failures. In this case, the continuity requirement is stated as a probability for a short exposure time.

3.4.3.2 The continuity requirements for approach and landing operations represent only the allocation of the requirement between the aircraft receiver and the non-aircraft elements of the system. In this case, no increase in the requirement is considered necessary to deal with multiple aircraft use of the system. The continuity value is normally related only to the risk associated with a missed approach and each aircraft can be considered to be independent. However, in some cases, it may be necessary to increase the continuity values since a system failure has to be correlated between both runways (e.g. the use of a common system for approaches to closely-spaced parallel runways).

3.5 Availability

3.5.1 The availability of GNSS is characterized by the portion of time the system is to be used for navigation during which reliable navigation information is presented to the crew, autopilot, or other system managing the flight of the aircraft.

3.5.2 When establishing the availability requirements for GNSS, the desired level of service to be supported should be considered. If the satellite navigation service is intended to replace an existing en-route navigation aid infrastructure, the availability of the GNSS should be commensurate with the availability provided by the existing infrastructure. An assessment of the operational impact of a degradation in service should be conducted.

3.5.3 Where GNSS availability is low, it is still possible to use the satellite navigation service by restricting the navigation operating times to those periods when it is predicted to be available. This is possible in the case of GNSS since unavailability due to insufficient satellite geometry is repeatable. Under such restrictions, there remains only a continuity risk associated with the failure of necessary system components between the time the prediction is made and the time the operation is conducted.

3.5.4 *En-route*

3.5.4.1 Specific availability requirements for an area or operation should be based upon:

a) traffic density and complexity;

b) alternate navigation aids;

c) primary/secondary surveillance coverage;

d) air traffic and pilot procedures; and

e) duration of outages.

3.5.4.2 For this reason, the GNSS SARPs specify a range of values for availability requirements. The requirements support GNSS sole-means operations in airspace with various levels of traffic and complexity. The lower end of the range is only sufficient for providing sole means of navigation in a low traffic density and complexity airspace.

3.5.4.3 While augmentations can reduce the dependency of the GNSS on a particular core element, they do not provide usable service without the core elements. The requirement for the availability of a particular augmentation in an area should account for potential degradation in the GNSS core elements (i.e. the minimum constellation of core elements (number and diversity of satellites) that is expected). Operational procedures should be developed in case such a degraded configuration occurs.

3.5.5 *Approach*

3.5.5.1 Specific requirements for an area should be based upon:

a) traffic density and complexity;

b) procedures for filing and conducting an approach to an alternate airport;

c) navigation system to be used for an alternate airport;

d) air traffic and pilot procedures;

e) duration of outages; and

f) geographic extent of outages.

3.5.5.2 When developing operating procedures for GNSS approach systems, the duration of an outage and its impact on the alternate airport should be considered. Although GNSS outages can occur which affect many approaches, the approach service can be restored without any maintenance because of the orbiting of the satellites.

3.5.6 *etermining GNSS availability*

The availability of GNSS is complicated by the movement of satellites relative to a coverage area under consideration and the potentially long time needed to restore a satellite in the event of a failure. Accurately measuring the availability would require many years to allow for a measurement period longer than the MTBF and repair times. The availability of GNSS should be determined through design, analysis and modelling, rather than measurement. The availability model should account for the ionospheric, tropospheric and receiver error models used by the receiver to verify integrity (e.g. HPL, LPL and VPL calculations). The availability specified in Chapter 3, 3.7.2.4, applies to the design availability.

Note.— Additional guidance material pertaining to reliability and availability of radio communications and navigation aids is contained in Attachment F.

4. GNSS core elements

4.1 GPS

Note.— Additional information concerning GPS can be found in the Global Positioning System Standard Positioning Service — Performance Standard, *October 2001, and Interface Control ocument (IC)-GPS-200C.*

4.1.1 The performance standard is based upon the assumption that a representative standard positioning service (SPS) receiver is used. A representative receiver has the following characteristics: designed in accordance with ICD-GPS-200C; uses a 5-degree masking angle; accomplishes satellite position and geometric range computations in the most current realization of the World Geodetic System 1984 (WGS-84) Earth-Centred, Earth-Fixed (ECEF) coordinate system; generates a position and time solution from data broadcast by all satellites in view; compensates for dynamic Doppler shift effects on nominal SPS ranging signal carrier phase and C/A code measurements; excludes GPS unhealthy satellites from the position solution; uses up-to-date and internally consistent ephemeris and clock data for all satellites it is using in its position solution; and loses track in the event that a GPS satellite stops transmitting C/A code. The time transfer accuracy applies to a stationary receiver operating at a surveyed location. A 12-channel receiver will meet performance requirements specified in Chapter 3, 3.7.3.1.1.1 and 3.7.3.1.2. A receiver that is able to track four satellites only (Appendix B, 3.1.3.1.2) will not get the full accuracy and availability performance.

4.1.2 *Accuracy*. The accuracy is measured with a representative receiver and a measurement interval of 24 hours for any point within the coverage area. The positioning and timing accuracy are for the signal-in-space (SIS) only and do not include such error sources as: ionosphere, troposphere, interference, receiver noise or multipath. The accuracy is derived based on the worst two of 24 satellites being removed from the constellation and a 6-metre constellation RMS SIS user range error (URE).

4.1.3 *Range domain accuracy*. Range domain accuracy is conditioned by the satellite indicating a healthy status and transmitting C/A code and does not account for satellite failures outside of the normal operating characteristics. Range domain accuracy limits can be exceeded during satellite failures or anomalies while uploading data to the satellite. Exceedance of the range error limit constitutes a major service failure as described in 4.1.6. The range rate error limit is the maximum for any satellite measured over any 3-second interval for any point within the coverage area. The range acceleration error limit is the maximum for any satellite measured over any 3-second interval for any point within the coverage area. The root-mean-square range error accuracy is the average of the RMS URE of all satellites over any 24-hour interval for any point within the coverage area. Under nominal conditions, all satellites are maintained to the same standards, so it is appropriate for availability modelling purposes to assume that all satellites have a 6-metre RMS SIS URE. The standards are restricted to range domain errors allocated to space and control segments.

4.1.4 *Availability*. Availability is the percentage of time over any 24-hour interval that the predicted 95 per cent positioning error (due to space and control segment errors) is less than its threshold, for any point within the coverage area. It is based on a 36-metre horizontal 95 per cent threshold; a 77-metre vertical 95 per cent threshold; using a representative receiver; and operating within the coverage area over any 24-hour interval. The service availability assumes the worst combination of two satellites out of service.

4.1.4.1 *Relationship to augmentation availability*. The availability of ABAS, GBAS and SBAS does not directly relate to the GPS availability defined in Chapter 3, 3.7.3.1.2. States and operators must evaluate the availability of the augmented system by comparing the augmented performance to the requirements. Availability analysis is based on an assumed satellite constellation and the probability of having a given number of satellites. Twenty-four operational satellites are available on orbit with 0.95 probability (averaged over any day), where a satellite is defined to be operational if it is capable of, but is not necessarily transmitting, a usable ranging signal. At least 21 satellites in the 24 nominal plane/slot positions must be set healthy and must be transmitting a navigation signal with 0.98 probability (yearly averaged).

4.1.5 *Reliability*. Reliability is the percentage of time over a specified time interval that the instantaneous SPS SIS URE is maintained within the range error limit, at any given point within the coverage area, for all healthy GPS satellites. The reliability standard is based on a measurement interval of one year and the average of daily values within the coverage area. The single point average reliability assumes that the total service failure time of 18 hours will be over that particular point (3 failures each lasting 6 hours).

4.1.6 *Ma or service failure*. A major service failure is defined to be a condition over a time interval during which a healthy GPS satellite's ranging signal error (excluding atmospheric and receiver errors) exceeds the range error limit. As defined in Chapter 3, 3.7.3.1.1.3 a), the range error limit is the larger of:

a) 30 m; or

b) 4.42 times the URA, not to exceed 150 m.

4.1.7 *Coverage*. The SPS supports the terrestrial coverage area, which is from the surface of the earth up to an altitude of 3 000 km.

4.2 GLONASS

Note.— Additional information concerning GLONASS can be found in the GLONASS Interface Control Document *published by Scientific Coordination Information Center, Russian Federation Ministry of efence, Moscow.*

4.2.1 *Satellite selection*. The performance standard definitions are based upon the assumption that the channel of standard accuracy (CSA) receiver will select satellites based on the minimum PDOP every 5 minutes, or whenever a satellite used in the position solution sets below the mask angle.

4.2.2 *Accuracy*. Accuracy is conditioned by coverage, availability and reliability standards, and a measurement interval of 24 hours for any point on the earth.

4.2.3 *Time transfer accuracy*. Time transfer accuracy is conditioned by coverage, availability and reliability standards and a measurement interval of 24 hours for any point on the earth. It is based upon the GLONASS CSA receiver time as computed using the output of the position solution. Time transfer accuracy is defined with respect to Universal Coordinated Time as maintained by the National Time Service of Russia (UTC(SU)).

4.2.4 *Availability*. Availability is conditioned by coverage and a typical 24-hour interval (defined using an averaging period of 60 days) averaged over the earth.

4.2.5 *Reliability*. Reliability is conditioned by coverage, service availability, 200 m not to exceed predictable horizontal reliability threshold, a maximum of 18 hours of major service failure behaviour over the sample interval, and a measurement interval of one year, average of daily values over the earth.

4.2.5.1 *Ma or service failure*. A major service failure is defined as a departure from the normal ranging signal characteristics in a manner that can cause a reliability or availability service failure. Specifically, a major service failure is defined as a departure from the normal ranging signal characteristics in one of the following ways:

a) a statistical departure from nominal system ranging accuracy that causes the CSA instantaneous ranging error to exceed 70 m; or

b) a fault in a CSA ranging signal, navigation message structure or navigation message content that impacts the CSA receiver's minimum ranging signal reception or processing capabilities.

4.2.6 *Coverage*. Coverage is conditioned by the probability of four or more satellites in view over any 24-hour interval averaged over the earth, a PDOP of 6 or less from four satellites, a 5-degree mask angle, and a constellation of twenty-four operational satellites as defined in the almanac.

4.2.7 *GLONASS time*. GLONASS time is generated based on GLONASS Central Synchronizer time. Daily instability of the Central Synchronizer hydrogen clock is not worse than 5×10^{-14}. The difference between GLONASS time and UTC(SU) is within 1 millisecond. The navigation message contains the requisite data to relate GLONASS time to UTC(SU) within 0.7 microsecond.

4.2.7.1 *Transformation of GLONASS-M current data information into common form*. A satellite navigation message contains current data information in N_T parameter. It could be transformed into the common form by the following algorithm:

a) Current year number J in the four-year interval is calculated:

If $1 \leq N_T \leq 366$; J = 1;
If $367 \leq N_T \leq 731$; J = 2;
If $732 \leq N_T \leq 1096$; J = 3;
If $1097 \leq N_T \leq 1461$; J = 4.

b) Current year in common form is calculated by the following formula:

$Y = 1996 + 4 (N_4 – 1) + (J – 1)$.

c) Current day and month (dd/mm) are extracted from the reference table stored in user equipment ROM. The table interrelates N_T parameter and common form dates.

4.2.8 *GLONASS coordinate system*. The GLONASS coordinate system is PZ-90 as described in *Parameters of Earth, 1990 (P -90)*, published by the Topographic Service, Russian Federation Ministry of Defence, Moscow.

4.2.8.1 PZ-90 parameters include fundamental geodetic constants, dimensions of the common terrestrial ellipsoid, the characteristics of the gravitational field of the earth, and the elements of the Krasovsky ellipsoid (coordinate system 1942) orientation relative to the common terrestrial ellipsoid.

4.2.8.2 By definition, the coordinate system PZ-90 is a geocentric Cartesian space system whose origin is located at the centre of the earth’s body. The Z-axis is directed to the Conventional Terrestrial Pole as recommended by the International Earth Rotation Service. The X-axis is directed to the point of intersection of the earth’s equatorial plane and zero meridian established by the Bureau International de l’Heure. The Y-axis completes the right-handed coordinate system.

4.3 Dilution of precision

Dilution of precision (DOP) factors express how ranging accuracy is scaled by a geometry effect to yield position accuracy. The optimal geometry (i.e. the lowest DOP values) for four satellites is achieved when three satellites are equally spaced on the horizon, at minimum elevation angle, and one satellite is directly overhead. The geometry can be said to “dilute” the range domain accuracy by the DOP factor.

4.4 GNSS receiver

4.4.1 The failures caused by the receiver can have two consequences on navigation system performance which are the interruption of the information provided to the user or the output of misleading information. Neither of these events are accounted for in the signal-in-space requirement.

4.4.2 The nominal error of the GNSS aircraft element is determined by receiver noise, interference, and multipath and tropospheric model residual errors. Specific receiver noise requirements for both the SBAS airborne receiver and the GBAS airborne receiver include the effect of any interference below the protection mask specified in Appendix B, 3.7. The required performance has been demonstrated by receivers that apply narrow correlator spacing or code smoothing techniques.

5. Aircraft-based augmentation system (ABAS)

5.1 ABAS augments and/or integrates the information obtained from GNSS elements with information available on board the aircraft in order to ensure operation according to the values specified in Chapter 3, 3.7.2.4.

5.2 ABAS includes processing schemes that provide:

a) integrity monitoring for the position solution using redundant information (e.g. multiple range measurements). The monitoring scheme generally consists of two functions: fault detection and fault exclusion. The goal of fault detection is to detect the presence of a positioning failure. Upon detection, proper fault exclusion determines and excludes the source of the failure (without necessarily identifying the individual source causing the problem), thereby allowing GNSS navigation to continue without interruption. There are two general classes of integrity monitoring: receiver autonomous integrity monitoring (RAIM), which uses GNSS information exclusively, and aircraft autonomous integrity monitoring (AAIM), which uses information from additional on-board sensors (e.g. barometric altimeter, clock and inertial navigation system (INS));

b) continuity aiding for the position solution using information of alternative sources, such as INS, barometric altimetry and external clocks;

c) availability aiding for the position solution (analogous to the continuity aiding); and

d) accuracy aiding through estimation of remaining errors in determined ranges.

5.3 Non-GNSS information can be integrated with GNSS information in two ways:

a) integrated within the GNSS solution algorithm (an example is the modelling of altimetry data as an additional satellite measurement); and

b) external to the basic GNSS position calculation (an example is a comparison of the altimetry data for consistency with the vertical GNSS solution with a flag raised whenever the comparison fails).

5.4 Each scheme has specific advantages and disadvantages, and it is not possible to present a description of all potential integration options with specific numerical values of the achieved performance. The same applies to the situation when several GNSS elements are combined (e.g. GPS and GLONASS).

6. Satellite-based augmentation system (SBAS)

6.1 An SBAS is made up of three distinct elements:

a) the ground infrastructure;

b) the SBAS satellites; and

c) the SBAS airborne receiver.

6.1.1 The ground infrastructure includes the monitoring and processing stations that receive the data from the navigation satellites and compute integrity, corrections and ranging data which form the SBAS signal-in-space. The SBAS satellites relay the data relayed from the ground infrastructure to the SBAS airborne receivers that determine position and time information using core satellite constellation(s) and SBAS satellites. The SBAS airborne receivers acquire the ranging and correction data and apply these data to determine the integrity and improve the accuracy of the derived position.

6.1.2 The SBAS ground network measures the pseudo-range between the ranging source and an SBAS receiver at the known locations and provides separate corrections for ranging source ephemeris errors, clock errors and ionospheric errors. The user applies a tropospheric delay model.

6.1.3 The ranging source ephemeris error and slow moving clock error are the primary bases for the long-term correction. The ranging source clock error is adjusted for the long-term correction and tropospheric error and is the primary basis for the fast correction. The ionospheric errors among many ranging sources are combined into vertical ionospheric errors at predetermined ionospheric grid points. These errors are the primary bases for ionospheric corrections.

6.2 SBAS coverage area and service areas

6.2.1 It is important to distinguish between the coverage area and service areas for an SBAS. A coverage area comprises one or more service areas, each capable of supporting operations based on some or all of the SBAS functions defined in Chapter 3, 3.7.3.4.2. These functions can be related to the operations that are supported as follows:

a) *Ranging*: SBAS provides a ranging source for use with other augmentation(s) (ABAS, GBAS or other SBAS);

b) *Satellite status and basic differential corrections*: SBAS provides en-route, terminal, and non-precision approach service. Different operations (e.g. RNP types) may be supported in different service areas;

c) *Precise differential corrections*: SBAS provides APV and precision approach service (i.e. APV-I, APV-II and precision approach may be supported in different service areas).

6.2.2 Figure D-1* shows the initial coverage areas and approximated initial service areas for three SBASs: the Wide Area Augmentation System (WAAS), the European Geo-stationary Navigation Overlay Service (EGNOS) and the Multifunction Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS).

6.2.3 An SBAS may provide accurate and reliable service outside the defined service area(s). The ranging, satellite status and basic differential corrections functions are usable throughout the entire coverage area. The performance of these functions may be technically adequate to support en-route, terminal and non-precision approach operations by providing monitoring and integrity data for core satellite constellations and/or SBAS satellites. The only potential for integrity to be compromised is if there is a satellite ephemeris error that cannot be observed by the SBAS ground network while it creates an unacceptable error outside the service area. For alert limits of 0.3 NM specified for non-precision approach and greater, this is very unlikely.

6.2.4 Each State is responsible for defining SBAS service areas and approving SBAS-based operations within its airspace. In some cases, States will field SBAS ground infrastructure linked to an existing SBAS. This would be required to achieve APV or precision approach performance. In other cases, States may simply approve service areas and SBAS-based operations using available SBAS signals. In either case, each State is responsible for ensuring that SBAS meets the requirements of Chapter 3, 3.7.2.4, within its airspace, and that appropriate operational status reporting and NOTAMs are provided for its airspace.

6.2.5 Before approving SBAS-based operations, a State must determine that the proposed operations are adequately supported by one or more SBASs. This determination should focus on the practicality of using SBAS signals, taking into account the relative location of the SBAS ground network. This could involve working with the State(s) or organization(s) responsible for operating the SBASs. For an airspace located relatively far from an SBAS ground network, the number of visible satellites for which that SBAS provides status and basic corrections would be reduced. Since SBAS receivers are able to use data from two SBASs simultaneously, and to use autonomous fault detection and exclusion when necessary, availability may still be sufficient for approval of operations.

6.2.6 Before publishing procedures based on SBAS signals, a State is expected to provide a status monitoring and NOTAM system. To determine the effect of a system element failure on service, a mathematical service volume model is to be used. The State can either obtain the model from the SBAS operator or develop its own model. Using the current and forecast status data of the basic system elements, and the locations where the State has approved operations, the model would identify airspace and airports where service outages are expected, and it could be used to originate NOTAMs. The system element status data (current and forecast) required for the model could be obtained via a bilateral arrangement with the SBAS service provider, or via connection to a real time "broadcast" of the data if the SBAS service provider chooses to provide data in this way.

* All figures are located at the end of the attachment.

6.2.7 Participating States or regions will coordinate through ICAO to ensure that SBAS provides seamless global coverage, taking into account that aircraft equipped to use the signal could suffer operational restrictions in the event that a State or region does not approve the use of one or more of the SBAS signals in its airspace. In such an event, the pilot may have to deselect GNSS altogether since the aircraft equipment may not allow deselection of all SBAS or a particular SBAS.

6.2.8 As the SBAS geostationary orbit satellite coverages (footprints) overlap, there will be interface issues among the SBASs. As a minimum, the SBAS airborne receivers must be able to operate within the coverage of any SBAS. It is possible for an SBAS provider to monitor and send integrity and correction data for a geostationary orbit satellite that belongs to another SBAS service provider. This improves availability by adding ranging sources. This improvement does not require any interconnection between SBAS systems and should be accomplished by all SBAS service providers.

6.2.9 Other levels of integration can be implemented using a unique connection between the SBAS networks (e.g. separate satellite communication). In this case, SBASs can exchange either raw satellite measurements from one or more reference stations or processed data (corrections or integrity data) from their master stations. This information can be used to improve system robustness and accuracy through data averaging, or integrity through a cross check mechanism. Availability will also be improved within the service areas, and the technical performance will meet the GNSS SARPs throughout the entire coverage (i.e. monitoring of satellites ephemeris would be improved). Finally, SBAS control and status data could be exchanged to improve system maintenance.

6.3 Integrity

6.3.1 The provisions for integrity are complex, as some attributes are determined within the SBAS ground network and transmitted in the signal-in-space, while other attributes are determined within the SBAS equipment on the aircraft. For the satellite status and basic corrections functions, an error uncertainty for the ephemeris and clock corrections is determined by the SBAS ground network. This uncertainty is modelled by the variance of a zero-mean, normal distribution that describes the user differential range error (UDRE) for each ranging source after application of fast and long-term corrections and excluding atmospheric effects and receiver errors.

6.3.2 For the precise differential function, an error uncertainty for the ionospheric correction is determined. This uncertainty is modelled by the variance of a zero-mean, normal distribution that describes the L1 residual user ionospheric range error (UIRE) for each ranging source after application of ionospheric corrections. This variance is determined from an ionospheric model using the broadcast grid ionospheric vertical error (GIVE).

6.3.3 There is a finite probability that an SBAS receiver would not receive an SBAS message. In order to continue navigation in that case, the SBAS broadcasts degradation parameters in the signal-in-space. These parameters are used in a number of mathematical models that characterize the additional residual error from both basic and precise differential corrections induced by using old but active data. These models are used to modify the UDRE variance and the UIRE variance as appropriate.

6.3.4 The individual error uncertainties described above are used by the receiver to compute an error model of the navigation solution. This is done by projecting the pseudo-range error models to the position domain. The horizontal protection level (HPL) provides a bound on the horizontal position error with a probability derived from the integrity requirement. Similarly, the vertical protection level (VPL) provides a bound on the vertical position. If the computed HPL exceeds the horizontal alert limit (HAL) for a particular operation, SBAS integrity is not adequate to support that operation. The same is true for precision approach and APV operations, if the VPL exceeds the vertical alert limit (VAL).

6.3.5 One of the most challenging tasks for an SBAS provider is to determine UDRE and GIVE variances so that the protection level integrity requirements are met without having an impact on availability. The performance of an individual SBAS depends on the network configuration, geographical extent and density, the type and quality of measurements used and the algorithms used to process the data. General methods for determining the model variance are described in Section 14.

6.3.6 *Residual clock and ephemeris error (σ_{RE}).* The residual clock error is well characterized by a zero-mean, normal distribution since there are many receivers that contribute to this error. The residual ephemeris error depends upon the user location. For the precise differential function, the SBAS provider will ensure that the residual error for all users within a defined service area is reflected in the σ_{UDRE}. For the basic differential function, the residual ephemeris error should be evaluated and may be determined to be negligible.

6.3.7 *Vertical ionospheric error (σ_{GIVE}).* The residual ionospheric error is well represented by a zero-mean, normal distribution since there are many receivers that contribute to the ionospheric estimate. Errors come from the measurement noise, the ionospheric model and the spatial decorrelation of the ionosphere. The position error caused by ionospheric error is mitigated by the positive correlation of the ionosphere itself. In addition, the residual ionospheric error distribution has truncated tails, i.e. the ionosphere cannot create a negative delay, and has a maximum delay.

6.3.8 *Aircraft element errors*. The combined multipath and receiver contribution is bounded as described in Section 14. This error can be divided into multipath and receiver contribution as defined in Appendix B, 3.6.5.5.1, and the standard model for multipath may be used. The receiver contribution can be taken from the accuracy requirement (Appendix B, 3.5.8.2 and 3.5.8.4.1) and extrapolated to typical signal conditions. Specifically, the aircraft can be assumed to have $\sigma^2_{air} = \sigma^2_{receiver} + \sigma^2_{multipath}$, where it is assumed that $\sigma_{receiver}$ is defined by the RMS_{pr_air} specified for GBAS Airborne Accuracy Designator A equipment, and $\sigma_{multipath}$ is defined in Appendix B, 3.6.5.5.1. The aircraft contribution to multipath includes the effects of reflections from the aircraft itself. Multipath errors resulting from reflections from other objects are not included. If experience indicates that these errors are not negligible, they must be accounted for operationally.

6.3.9 *Tropospheric error*. The receiver must use a model to correct for tropospheric effects. The residual error of the model is constrained by the maximum bias and variance defined in Appendix B, 3.5.8.4.2 and 3.5.8.4.3. The effects of this mean must be accounted for by the ground subsystem. The airborne user applies a specified model for the residual tropospheric error (σ_{tropo}).

6.4 RF characteristics

6.4.1 *SBAS pseudo-random noise (PRN) codes*. RTCA/DO-229C, Appendix A, provides two methods for SBAS PRN code generation.

6.4.2 *SBAS network time.* SBAS network time is a time reference maintained by SBAS for the purpose of defining corrections. When using corrections, the user's solution for time is relative to the SBAS network time rather than core satellite constellation system time. If corrections are not applied, the position solution will be relative to a composite core satellite constellation/SBAS network time depending on the satellites used and the resulting accuracy will be affected by the difference among them.

6.4.3 *SBAS convolutional encoding.* Information on the convolutional coding and decoding of SBAS messages can be found in RTCA/DO-229C, Appendix A.

6.4.4 *Message timing.* The users' convolutional decoders will introduce a fixed delay that depends on their respective algorithms (usually 5 constraint lengths, or 35 bits), for which they must compensate to determine SBAS network time (SNT) from the received signal.

6.5 SBAS data characteristics

6.5.1 *SBAS messages.* Due to the limited bandwidth, SBAS data is encoded in messages that are designed to minimize the required data throughput. RTCA/DO-229C, Appendix A, provides detailed specifications for SBAS messages.

6.5.2 *ata broadcast intervals.* The maximum broadcast intervals between SBAS messages are specified in Appendix B, Table B-54. These intervals are such that a user entering the SBAS service broadcast area is able to output a corrected position along with SBAS-provided integrity information in a reasonable time. For en-route, terminal and NPA operations, all needed data will be received within 2 minutes, whereas for precision approach operations, it will take a maximum of 5 minutes. The maximum intervals between broadcasts do not warrant a particular level of accuracy performance as defined in Chapter 3, Table 3.7.2.4-1. In order to ensure a given accuracy performance, each service provider will adopt a set of broadcast intervals taking into account different parameters such as the type of constellations (e.g. GPS with SA, GPS without SA) or the ionospheric activity.

6.5.2.1 For fast corrections, Table B-54 allows the maximum broadcast interval to be 60 seconds. Table B-56 gives data time-out intervals for the various data messages with reference to Table B-57 which shows the fast corrections time-out intervals as a function of the fast correction degradation factor indicator (ai_i). However, if the service provider chose 60 seconds for the fast corrections broadcast interval and the ai_i was 15, the user, due to data time-out prior to the next broadcast, would not have current fast corrections for 42 seconds of every minute for NPA and APV-I and for 48 seconds of every minute for APV-II and PA. In order to ensure that the aircraft element processes valid fast corrections without such interruptions, the maximum broadcast interval for fast corrections has to be set at a value that is one third of the NPA and APV-I time-out interval for fast corrections and one-half of the APV-II and PA time-out interval for fast corrections as determined by ai_i.

Note.— Maximum fast corrections broadcast intervals for each ai_i can be found in RTCA/ O-229C, Table A- .

6.5.3 *Time-to-alert.* Figure D-2 provides explanatory material for the allocation of the total time-to-alert defined in Chapter 3, Table 3.7.2.4-1. The time-to-alert requirements in Appendix B, 3.5.7.3.1, 3.5.7.4.1 and 3.5.7.5.1 (corresponding to the GNSS satellite status, basic differential correction and precise differential correction functions, respectively) include both the ground and space allocations shown in Figure D-2.

6.5.4 *Tropospheric function.* Because tropospheric refraction is a local phenomenon, users will compute their own tropospheric delay corrections. A tropospheric delay estimate for precision approach is described in RTCA/DO-229C, although other models can be used.

6.5.5 *Multipath considerations.* Multipath is one of the largest contributors to positioning errors for SBAS affecting both ground and airborne elements. For SBAS ground elements, emphasis should be placed on reducing or mitigating the effects of multipath as much as possible so that the signal-in-space uncertainties will be small. Many mitigation techniques have been studied from both theoretical and experimental perspectives. The best approach for implementing SBAS reference stations with minimal multipath errors is to:

a) ensure that an antenna with multipath reduction features is chosen;

b) consider the use of ground plane techniques;

c) ensure that the antenna is placed in a location with low multipath effects; and

d) use multipath-reducing receiver hardware and processing techniques.

6.5.6 *GLONASS issue of data.* Since the existing GLONASS design does not provide a uniquely defined identifier for sets of ephemeris and clock data, SBAS will use a specific mechanism to avoid any ambiguity in the application of the broadcast corrections. This mechanism is explained in Figure D-3. The definitions of the latency time and validity interval along with the associated coding requirements can be found in Appendix B, section 3.5.4. The user can apply the long-term corrections received only if the set of GLONASS ephemeris and clock data used on board have been received within the validity interval.

6.6 SBAS final approach segment (FAS) data block

6.6.1 The SBAS final approach segment (FAS) data block for a particular approach procedure is as shown in Table D-1. It is the same as the GBAS FAS data block defined in Appendix B, section 3.6.4.5, with the exception that the SBAS FAS data block also contains the HAL and VAL to be used for the approach procedure as described in 6.3.4.

6.6.2 FAS data blocks for SBAS and some GBAS approaches are held within a common on-board database supporting both SBAS and GBAS. Within this database, channel assignments must be unique for each approach and coordinated with civil authorities. States are responsible for providing the FAS data for incorporation into the database. The FAS block for a particular approach procedure is described in Appendix B, 3.6.4.5.1 and Table B-66.

Table D-1. SBAS FAS data block

Data content	Bits used	Range of values	Resolution
Operation type	4	0 to 15	1
SBAS provider ID	4	0 to 15	1
Airport ID	32	–	–
Runway number (Note 1)	6	0 to 36	1
Runway letter	2	–	–
Approach performance designator	3	0 to 7	1
Route indicator	5	–	–
Reference path data selector	8	0 to 48	1
Reference path identifier	32	–	–
LTP/FTP latitude	32	± 90.0°	0.0005 arcsec
LTP/FTP longitude	32	± 180.0°	0.0005 arcsec
LTP/FTP height	16	–512.0 to 6 041.5 m	0.1 m
ΔFPAP latitude	24	± 1.0°	0.0005 arcsec
ΔFPAP longitude	24	± 1.0°	0.0005 arcsec
Approach threshold crossing height (TCH) (Note 2)	15	0 to 1 638.35 m (0 to 3 276.7 ft)	0.05 m (0.1 ft)
Approach TCH units selector	1	–	–
Glide path angle (GPA)	16	0 to 90.0°	0.01°
Course width at threshold (Note 1)	8	80.0 to 143.75 m	0.25 m
ΔLength offset	8	0 to 2 032 m	8 m
Horizontal alert limit (HAL)	8	0 to 50.8 m	0.2 m
Vertical alert limit (VAL) (Note 3)	8	0 to 50.8 m	0.2 m
Final approach segment CRC	32	–	–

Note 1.— hen the runway number is set to 00, then the course width field is ignored and the course width is 3 m.

Note 2.— Information can be provided in either feet or metres as indicated by the approach TC unit sector.

Note 3.— VAL of 0 indicates that the vertical deviations are not to be used (i.e. a lateral guidance only approach).

7. Ground-based augmentation system (GBAS) and ground-based regional augmentation system (GRAS)

Note.— In this section, except where specifically annotated, reference to approach with vertical guidance (APV) means APV-I and APV-II.

7.1 System description

7.1.1 GBAS consists of ground and aircraft elements. A GBAS ground subsystem typically includes a single active VDB transmitter and broadcast antenna, referred to as a broadcast station, and multiple reference receivers. A GBAS ground subsystem may include multiple VDB transmitters and antennas that share a single common GBAS identification (GBAS ID) and frequency as well as broadcast identical data. The GBAS ground subsystem can support all the aircraft subsystems within its coverage providing the aircraft with approach data, corrections and integrity information for GNSS satellites in view. All international aircraft supporting APV should maintain approach data within a database on board the aircraft. The Type 4 message must be broadcast when the ground subsystem supports Category I precision approaches. The Type 4 message must also be broadcast when the ground subsystem supports APV approaches if the approach data is not required by the State to be maintained in the on-board database.

Note.— Allocation of performance requirements between the GBAS subsystems and allocation methodology can be found in RTCA/ O-245, Minimum Aviation System Performance Standards for the Global Positioning System/Local Area Augmentation System (GPS/LAAS). Minimum Operational Performance Standards for GRAS airborne equipment are under development by RTCA.

7.1.2 GBAS ground subsystems provide two services: the approach service and the GBAS positioning service. The approach service provides deviation guidance for FASs in Category I precision approach, APV, and NPA within the operational coverage area. The GBAS positioning service provides horizontal position information to support RNAV operations within the service area. The two services are also distinguished by different performance requirements associated with the particular operations supported (see Table 3.7.2.4-1) including different integrity requirements as discussed in 7.5.1.

7.1.3 A primary distinguishing feature for GBAS ground subsystem configurations is whether additional ephemeris error position bound parameters are broadcast. This feature is required for the positioning service, but is optional for approach services. If the additional ephemeris error position bound parameters are not broadcast, the ground subsystem is responsible for assuring the integrity of ranging source ephemeris data without reliance on the aircraft calculating and applying the ephemeris bound as discussed in 7.5.9.

7.1.4 *GBAS*. There are multiple configurations possible of GBAS ground subsystems conforming to the GNSS Standards, such as:

a) configuration that supports Category I precision approach only;

b) a configuration that supports Category I precision approach and APV, and also broadcasts the additional ephemeris error position bound parameters;

c) a configuration that supports Category I precision approach, APV, and the GBAS positioning service, while also broadcasting the ephemeris error position bound parameters referred to in b); and

d) a configuration that supports APV and the GBAS positioning service, and is used within a GRAS.

7.1.5 From a user perspective, a GRAS ground subsystem consists of one or more GBAS ground subsystems (as described in 7.1.1 through 7.1.4), each with a unique GBAS identification, providing the positioning service and APV where required. By using multiple GBAS broadcast stations, and by broadcasting the Type 101 message, GRAS is able to support en-route operations via the GBAS positioning service, while also supporting terminal, departure, and APV operations over a larger coverage region than that typically supported by GBAS. In some GRAS applications, the corrections broadcast in the Type 101 message may be computed using data obtained from a network of reference receivers distributed in the coverage region. This permits detection and mitigation of measurement errors and receiver faults.

7.1.6 All broadcast stations of a GBAS ground subsystem broadcast identical data with the same GBAS identification on a common frequency. The airborne receiver need not and cannot distinguish between messages received from different broadcast stations of the same GBAS ground subsystem. When within coverage of two such broadcast stations, the receiver will receive and process duplicate copies of messages in different time division multiple access (TDMA) time slots.

7.1.7 Interoperability of the GBAS ground and aircraft elements compatible with RTCA/DO-253A is addressed in Appendix B, 3.6.8.1. GBAS receivers compliant with RTCA/DO-253A will not be compatible with GRAS ground subsystems broadcasting Type 101 messages. However, GRAS and GBAS receivers compliant with RTCA GRAS MOPS, will be compatible with GBAS ground subsystems. SARPs-compliant GBAS receivers may not be able to decode the FAS data correctly for APV transmitted from GBAS ground subsystems. These receivers will apply the FASLAL and FASVAL as if conducting a Category I precision approach. Relevant operational restrictions have to apply to ensure the safety of the operation.

7.1.8 The GBAS VDB transmits with either horizontal or elliptical polarization (GBAS/H or GBAS/E). This allows service providers to tailor the broadcast to their operational requirements and user community.

7.1.9 The majority of aircraft will be equipped with a horizontally-polarized VDB receiving antenna, which can be used to receive the VDB from both GBAS/H and GBAS/E equipment. A subset of aircraft will be equipped with a vertically-polarized antenna due to installation limitations or economic considerations. These aircraft are not compatible with GBAS/H equipment and are, therefore, limited to GBAS-based operations supported by GBAS/E.

7.1.10 GBAS service providers must publish the signal polarization (GBAS/H or GBAS/E), for each GBAS facility in the aeronautical information publication (AIP). Aircraft operators that use vertically polarized receiving antenna will have to take this information into account when managing flight operations, including flight planning and contingency procedures.

7.2 RF characteristics

7.2.1 *Frequency and time slot planning*

7.2.1.1 *Performance factors*

7.2.1.1.1 The geographical separation between a candidate GBAS station and existing VOR or GBAS installations must consider the following factors:

a) the coverage volume, minimum field strength and effective radiated power (ERP) of the candidate GBAS including the GBAS positioning service, if provided. The minimum requirements for coverage and field strength are found in Chapter 3, 3.7.3.5.3 and 3.7.3.5.4.4, respectively. The ERP is determined from these requirements;

b) the coverage volume, minimum field strength and ERP of the surrounding VOR and GBAS stations including the GBAS positioning service, if provided. Specifications for coverage and field strength for VOR are found in Chapter 3, 3.3, and respective guidance material is provided in Attachment C;

c) the performance of VDB receivers, including co-channel and adjacent channel rejection, and immunity to desensitization and intermodulation products from FM broadcast signals. These requirements are found in Appendix B, 3.6.8.2.2;

d) the performance of VOR receivers, including co-channel and adjacent channel rejection of VDB signals. Since existing VOR receivers were not specifically designed to reject VDB transmissions, desired-to-undesired (D/U) signal ratios for co-channel and adjacent channel rejection of the VDB were determined empirically. Table D-2 summarizes the assumed signal ratios based upon empirical performance of numerous VOR receivers designed for 50 kHz channel spacing;

e) for areas/regions of frequency congestion, a precise determination of separation may be required using the appropriate criteria.

7.2.1.1.2 The nominal link budget for VDB is shown in Table D-3. The figures in the table assume a receiver height of 3 000 m (10 000 ft) MSL and a transmit antenna designed to suppress ground illumination in order to limit the fading losses to a maximum of 10 dB at coverage edge. In the case of GBAS/E equipment, the 10 dB also includes any effects of signal loss due to interference between the horizontal and vertical components.

7.2.1.2 *FM immunity*

7.2.1.2.1 Once a candidate frequency is identified for which the GBAS and VOR separation criteria are satisfied, compatibility with FM transmissions must be determined. This is to be accomplished using the methodology applied when determining FM compatibility with VOR. If FM broadcast violates this criterion, an alternative candidate frequency has to be considered.

Table D-2. Assumed D/U $_{required}$ signal ratios to protect VOR from GBAS VDB

Frequency offset	$[D/U]_{required}$ ratio to protect VOR receivers (dB)
Co-channel	26
$\lvert f_{VOR} – f_{VDB} \rvert$ = 25 kHz	0
$\lvert f_{VOR} – f_{VDB} \rvert$ = 50 kHz	–34
$\lvert f_{VOR} – f_{VDB} \rvert$ = 75 kHz	–46
$\lvert f_{VOR} – f_{VDB} \rvert$ = 100 kHz	–65

Table D-3. Nominal VDB link budget

VDB link elements	Vertical component link budget at coverage edge	Horizontal component link budget at coverage edge
Required receiver sensitivity (dBm)	–87	–87
Maximum aircraft implementation loss (dB)	11	15
Power level after aircraft antenna (dBm)	–76	–72
Operating margin (dB)	3	3
Fade margin (dB)	10	10
Free space path loss (dB) at 43 km (23 NM)	106	106
Nominal effective radiated power (dBm)	43	47

7.2.1.2.2 The desensitization is not applied for FM carriers above 107.7 MHz and VDB channels at 108.050 MHz because the off-channel component of such high-level emissions from FM stations above 107.7 MHz will interfere with GBAS VDB operations on 108.025 and 108.050 MHz, hence those assignments will be precluded except for special assignments in geographic areas where the number of FM broadcast stations in operation is small and would unlikely generate interference in the VDB receiver.

7.2.1.2.3 The FM intermodulation immunity requirements are not applied to a VDB channel operating below 108.1 MHz, hence assignments below 108.1 MHz will be precluded except for special assignments in geographic areas where the number of FM broadcast stations in operation is small and would unlikely generate intermodulation products in the VDB receiver.

7.2.1.3 *Geographic separation methodologies*

7.2.1.3.1 The methodologies below may be used to determine the required GBAS-to-GBAS and GBAS-to-VOR geographical separation. They rely on preserving the minimum desired-to-undesired signal ratio. $[D/U]_{required}$ is defined as the signal ratio intended to protect the desired signal from co-channel or adjacent channel interference from an undesired transmission. $[D/U]_{required}$ values required for protection of a GBAS receiver from undesired GBAS or VOR signals are defined in Appendix B, 3.6.8.2.2.5 and 3.6.8.2.2.6. $[D/U]_{required}$ values intended for protection of a VOR receiver from GBAS VDB transmissions as shown in Table D-2 are not defined in SARPs and represent the assumed values based on test results.

7.2.1.3.2 Geographic separation is constrained by preserving $[D/U]_{required}$ at the edge of the desired signal coverage where the desired signal power is derived from the minimum field strength requirements in Chapter 3. This desired signal level, converted to dBm, is denoted $P_{D,min}$. The allowed signal power of the undesired signal ($P_{U,allowed}$) is:

$$P_{Uallowed}(\text{dBm}) = (P_{D,min}\ (\text{dBm}) - [D/U]_{required}\ (\text{dB}))$$

The undesired signal power P_U converted to dBm is:

$$P_U(\text{dBm}) = (Tx_U\ (\text{dBm}) - L\ (\text{dB}))$$

where

Tx_U is the effective radiated power of the undesired transmitter; and

L is the transmission loss of the undesired transmitter, including free-space path loss, atmospheric and ground effects. This loss depends upon the distance between the undesired transmitter and the edge of the desired signal coverage.

To ensure $D/U_{required}$ is satisfied, $P_u \leq D_{Uallowed}$. The constraint for assigning a channel is therefore:

$$L(\text{dB}) \geq ([D/U]_{required}\ (\text{dB}) + Tx_U(\text{dBm}) - P_{D,min}\ (\text{dBm}))$$

7.2.1.3.3 The transmission loss can be obtained from standard propagation models published in ITU-R Recommendation P.528-2 or from free-space attenuation until the radio horizon and then a constant 0.5 dB/NM attenuation factor. These two methodologies result in slightly different geographical separation for co-channel and first adjacent channels, and identical separation as soon as the second adjacent channel is considered. The free-space propagation approximation is applied in this guidance material.

7.2.1.4 *Example of GBAS/GBAS geographical separation criteria*

7.2.1.4.1 For GBAS VDB co-channel transmissions assigned to the same time slot, the parameters for horizontal polarization are:

D/U = 26 dB (Appendix B, 3.6.8.2.2.5.1);

$P_{D,min}$ = –72 dBm (equivalent to 215 microvolts per metre, Chapter 3, 3.7.3.5.4.4); and

Tx_U = 47 dBm (example link budget, Table D-3);

so

$$L \geq (47 + 26 - (-72)) = 145 \text{ dB}.$$

7.2.1.4.2 The geographic separation for co-channel, co-slot GBAS VDB assignments is obtained by determining the distance at which the transmission loss equals 145 dB for receiver altitude of 3 000 m (10 000 ft) above that of the GBAS VDB transmitter antenna. This distance is 318 km (172 NM) using the free-space attenuation approximation and assuming a negligible transmitter antenna height. The minimum required geographical separation can then be determined by adding this distance to the nominal distance between the edge of coverage and the GBAS transmitter 43 km (23 NM). This results in a co-channel, co-slot reuse distance of 361 km (195 NM).

7.2.1.5 *Guidelines on GBAS/GBAS geographical separation criteria*. Using the methodology described above, typical geographic separation criteria can be defined for GBAS to GBAS and GBAS to VOR. The resulting GBAS/GBAS minimum required geographical separation criteria are summarized in Table D-4.

Note.— Geographical separation criteria between the GBAS transmitters providing the GBAS positioning service are under development. A conservative value corresponding to the radiohorizon may be used as an interim value for separation between co-frequency, ad acent time slot transmitters to ensure time slots do not overlap.

7.2.1.6 *Guidelines on GBAS/VOR geographical separation criteria.* The GBAS/VOR minimum geographical separation criteria are summarized in Table D-5 based upon the same methodology and the nominal VOR coverage volumes in Attachment C.

Note 1.— hen determining the geographical separation between VOR and GBAS, VOR as the desired signal is generally the constraining case due to the greater protected altitude of the VOR coverage region.

Note 2.— Reduced geographical separation requirements can be obtained using standard propagation models defined in IT -R Recommendation P.52 -2.

Table D-4. Typical GBAS/GBAS frequency assignment criteria

Channel of undesired VDB in the same time slots	Path loss (dB)	Minimum required geographical separation for Tx_U = 47 dBm and $P_{D,min}$ = –72 dBm in km (NM)
Cochannel	145	361 (195)
1st adjacent channel (±25 kHz)	101	67 (36)
2nd adjacent channel (±50 kHz)	76	44 (24)
3rd adjacent channel (±75 kHz)	73	No restriction
4th adjacent channel (±100 kHz)	73	No restriction

Note.— No geographic transmitter restrictions are expected between co-frequency, ad acent time slots provided the undesired V B transmitting antenna is located at least 200 m from areas where the desired signal is at minimum field strength.

Table D-5. Minimum required geographical separation for a VOR coverage (12 000 m (40 000 ft) level)

Channel of undesired GBAS VDB	Path loss (dB)	VOR coverage radius		
		342 km (185 NM)	300 km (162 NM)	167 km (90 NM)
Co-channel	152	892 km (481 NM)	850 km (458 NM)	717 km (386 NM)
$\lvert f_{Desired} - f_{Undesired} \rvert = 25$ kHz	126	774 km (418 NM)	732 km (395 NM)	599 km (323 NM)
$\lvert f_{Desired} - f_{Undesired} \rvert = 50$ kHz	92	351 km (189 NM)	309 km (166 NM)	176 km (94 NM)
$\lvert f_{Desired} - f_{Undesired} \rvert = 75$ kHz	80	344 km (186 NM)	302 km (163 NM)	169 km (91 NM)
$\lvert f_{Desired} - f_{Undesired} \rvert = 100$ kHz	61	No restriction	No restriction	No restriction

Note.— Calculations are based on reference frequency of 112 M z and assume GBAS Tx 47 dBm and VOR P $_{,min}$ 79 dBm.

7.2.2 The geographical separation criteria for GBAS/ILS and GBAS/VHF communications are under development.

7.2.3 *Compatibility with ILS*. Until compatibility criteria are developed for GBAS VDB and ILS, VDB cannot be assigned to channels below 112.025 MHz. If there is an ILS with a high assigned frequency at the same airport as a VDB with a frequency near 112 MHz, it is necessary to consider ILS and VDB compatibility. Considerations for assignment of VDB channels include the frequency separation between the ILS and the VDB, the distance separation between the ILS coverage area and the VDB, the VDB and ILS field strengths, and the VDB and ILS sensitivity. For GBAS equipment with transmitter power of up to 150 W (GBAS/E, 100 W for horizontal component and 50 W for vertical component) or 100 W (GBAS/H), the 16th channel (and beyond) will be below –106 dBm at a distance of 200 m from the VDB transmitter, including allowing for a +5 dB positive reflection. This –106 dBm figure assumes a –86 dBm localizer signal at the ILS receiver input and a minimum 20 dB signal-to-noise ratio.

7.2.4 *Compatibility with V F communications*. For GBAS VDB assignments above 116.400 MHz, it is necessary to consider VHF communications and GBAS VDB compatibility. Considerations for assignment of these VDB channels include the frequency separation between the VHF communication and the VDB, the distance separation between the transmitters and coverage areas, the field strengths, the polarization of the VDB signal, and the VDB and VHF sensitivity. Both aircraft and ground VHF communication equipment are to be considered. For GBAS/E equipment with a transmitter maximum power of up to 150 W (100 W for horizontal component and 50 W for vertical component), the 64th channel (and beyond) will be below –120 dBm at a distance of 200 m from the VDB transmitter including allowing for a +5 dB positive reflection. For GBAS/H equipment with a transmitter maximum power of 100 W, the 32nd channel (and beyond) will be below –120 dBm at a distance of 200 m from the VDB transmitter including allowing for a +5 dB positive reflection, and a 10 dB polarization isolation. It must be noted that due to differences in the VDB and VDL transmitter masks, separate analysis must be performed to ensure VDL does not interfere with the VDB.

7.2.5 For a GBAS ground subsystem that only transmits a horizontally-polarized signal, the requirement to achieve the power associated with the minimum sensitivity is directly satisfied through the field strength requirement. For a GBAS ground subsystem that transmits an elliptically-polarized component, the ideal phase offset between HPOL and VPOL components is 90 degrees. In order to ensure that an appropriate received power is maintained throughout the GBAS coverage volume during normal aircraft manoeuvres, transmitting equipment should be designed to radiate HPOL and VPOL signal components with an RF phase offset of 90 degrees. This phase offset should be consistent over time and environmental conditions. Deviations from the nominal 90 degrees must be accounted for in the system design and link budget, so that any fading due to polarization loss does not jeopardize the minimum receiver sensitivity. System qualification and flight inspection procedures will take into account an allowable variation in phase offset consistent with maintaining the appropriate signal level throughout the GBAS coverage volume. One method of ensuring both horizontal and vertical field strength is to use a single VDB antenna that transmits an elliptically-polarized signal, and flight inspect the effective field strength of the vertical and horizontal signals in the coverage volume.

7.3 Coverage

7.3.1 The GBAS coverage to support approach services is depicted in Figure D-4. When the additional ephemeris error position bound parameters are broadcast, differential corrections may only be used within the Maximum Use Distance (D_{max}) defined in the Type 2 message. Where practical, it is operationally advantageous to provide valid guidance along the visual segment of an approach.

7.3.2 The coverage required to support the GBAS positioning service is dependent upon the specific operations intended. The optimal coverage for this service is intended to be omnidirectional in order to support operations using the GBAS positioning service that are performed outside of the precision approach coverage volume. Each State is responsible for defining a service area for the GBAS positioning service and ensuring that the requirements of Chapter 3, 3.7.2.4 are satisfied. When making this determination, the characteristics of the fault-free GNSS receiver should be considered, including the reversion to ABAS-based integrity in the event of loss of GBAS positioning service.

7.3.3 The limit on the use of the GBAS positioning service information is given by the Maximum Use Distance (D_{max}), which defines the range within which the required integrity is assured and differential corrections can be used for either the positioning service or precision approach. D_{max} however does not delineate the coverage area where field strength requirements specified in Chapter 3, 3.7.3.5.4.4 are met nor matches this area. Accordingly, operations based on the GBAS positioning service can be predicated only in the coverage area(s) (where the field strength requirements are satisfied) within the D_{max} range.

7.3.4 As the desired coverage area of a GBAS positioning service may be greater than that which can be provided by a single GBAS broadcast station, a network of GBAS broadcast stations can be used to provide the coverage. These stations can broadcast on a single frequency and use different time slots (8 available) in neighbouring stations to avoid interference or they can broadcast on different frequencies. Figure D-4A details how the use of different time slots will allow a single frequency to be used without interference subject to guard time considerations noted under Table B-59. For a network based on different VHF frequencies, guidance material in 7.17 should be considered.

7.4 Data structure

A bit scrambler/descrambler is shown in Figure D-5.

Note.— Additional information on the data structure of the V F data broadcast is given in RTCA/ O-246B, GNSS Based Precision Approach Local Area Augmentation System (LAAS)—Signal-in-Space Interface Control Document (ICD).

7.5 Integrity

7.5.1 Different levels of integrity are specified for precision approach operations and operations based on the GBAS positioning service. The signal-in-space integrity risk for Category I is 2×10^{-7} per approach. GBAS ground subsystems that are also intended to support other operations through the use of the GBAS positioning service have to also meet the signal-in-space integrity risk requirement specified for terminal area operations, which is 1×10^{-7}/hour (Chapter 3, Table 3.7.2.4-1). Therefore additional measures are necessary to support these more stringent requirements for positioning service. The signal-in-space integrity risk is allocated between the ground subsystem integrity risk and the protection level integrity risk. The ground subsystem integrity risk allocation covers failures in the ground subsystem as well as core constellation and SBAS failures such as signal quality failures and ephemeris failures. The protection level integrity risk allocation covers rare fault-free performance risks and the case of failures in one of the reference receiver measurements. In both cases the protection level equations ensure that the effects of the satellite geometry used by the aircraft receiver are taken into account. This is described in more detail in the following paragraphs.

7.5.2 The GBAS ground subsystem defines a corrected pseudo-range error uncertainty for the error relative to the GBAS reference point (σ_{pr_gnd}) and the errors resulting from vertical (σ_{tropo}) and horizontal (σ_{iono}) spatial decorrelation. These uncertainties are modelled by the variances of zero-mean, normal distributions which describe these errors for each ranging source.

7.5.3 The individual error uncertainties described above are used by the receiver to compute an error model of the navigation solution. This is done by projecting the pseudo-range error models to the position domain. General methods for determining that the model variance is adequate to guarantee the protection level integrity risk are described in Section 14. The lateral protection level (LPL) provides a bound on the lateral position error with a probability derived from the integrity requirement. Similarly, the vertical protection level (VPL) provides a bound on the vertical position. For Category I precision approach and APV, if the computed LPL exceeds the lateral alert limit (LAL) or the VPL exceeds the vertical alert limit (VAL), integrity is not adequate to support the operation. For the positioning service the alert limits are not defined in the standards, with only the horizontal protection level and ephemeris error position bounds required to be computed and applied. The alert limits will be determined based on the operation being conducted. The aircraft will apply the computed protection level and ephemeris bounds by verifying they are smaller than the alert limits. Two protection levels are defined, one to address the condition when all reference receivers are fault-free (H_0 – Normal Measurement Conditions), and one to address the condition when one of the reference receivers contains failed measurements (H_1 – Faulted Measurement Conditions). Additionally an ephemeris error position bound provides a bound on the position error due to failures in ranging source ephemeris. For Category I precision approach and APV, a lateral error bound (LEB) and a vertical error bound (VEB) are defined. For the positioning service a horizontal ephemeris error bound (HEB) is defined.

7.5.4 *Ground system contribution to corrected pseudo-range error ($\sigma_{pr\ gnd}$).* Error sources that contribute to this error include receiver noise, multipath, and errors in the calibration of the antenna phase centre. Receiver noise has a zero-mean, normally distributed error, while the multipath and antenna phase centre calibration can result in a small mean error.

7.5.5 *Residual tropospheric errors*. Tropospheric parameters are broadcast in Type 2 messages to model the effects of the troposphere, when the aircraft is at a different height than the GBAS reference point. This error can be well-characterized by a zero-mean, normal distribution.

7.5.6 *Residual ionospheric errors*. An ionospheric parameter is broadcast in Type 2 messages to model the effects of the ionosphere between the GBAS reference point and the aircraft. This error can be well-characterized by a zero-mean, normal distribution.

7.5.7 *Aircraft receiver contribution to corrected pseudo-range error*. The receiver contribution is bounded as described in Section 14. The maximum contribution, used for analysis by the GBAS provider, can be taken from the accuracy requirement, where it is assumed that $\sigma_{receiver}$ equals RMS_{pr_air} for GBAS Airborne Accuracy Designator A equipment.

7.5.8 *Airframe multipath error*. The error contribution from airframe multipath is defined in Appendix B, 3.6.5.5.1. Multipath errors resulting from reflections from other objects are not included. If experience indicates that these errors are not negligible, they must be accounted for operationally or through inflation of the parameters broadcast by the ground (e.g. σ_{pr_gnd}).

7.5.9 *Ephemeris error uncertainty*. Pseudo-range errors resulting from ephemeris errors (defined as a discrepancy between the true satellite position and the satellite position determined from the broadcast data) are spatially decorrelated and will therefore be different for receivers in different locations. When users are relatively close to the GBAS reference point, the residual differential error due to ephemeris errors will be small and both the corrections and uncertainty parameters σ_{pr_gnd} sent by the ground subsystem will be valid to correct the raw measurements and compute the protection levels. For users further away from the GBAS reference point, protection against ephemeris failures can be ensured in two different ways:

a) the ground subsystem does not transmit the additional ephemeris error position bound parameters. In this case, the ground subsystem is responsible for assuring integrity in case of satellite ephemeris failures without reliance on the aircraft calculating and applying the ephemeris bound. This may impose a restriction on the distance between the GBAS reference point and the decision altitude/height depending upon the ground subsystem means of detecting ranging source ephemeris failures. One means of detection is to use satellite integrity information broadcast by SBAS; and

b) the ground subsystem transmits the additional ephemeris error position bound parameters which enable the airborne receiver to compute an ephemeris error bound. These parameters are: coefficients used in the ephemeris error position bound equations ($K_{md\_e\_()}$, where the subscript () means either “GPS”, “GLONASS”, “POS, GPS” or “POS, GLONASS”), the maximum use distance for the differential corrections (D_{max}), and the ephemeris decorrelation parameters (P). The ephemeris decorrelation parameter (P) in the Type 1 or Type 101 message characterizes the residual error as a function of distance between the GBAS reference point and the aircraft. The value of P is expressed in m/m. The values of P are determined by the ground subsystem for each satellite. One of the main factors influencing the values of P is the ground subsystem monitor design. The quality of the ground monitor will be characterized by the smallest ephemeris error (or minimum detectable error (MDE)) that it can detect. The relationship between the P parameter and the MDE for a particular satellite can be approximated by $P_i = MDE_i/R_i$ where R_i is the smallest of the predicted ranges from the ground subsystem reference receiver antenna(s) for the period of validity of P_i. Being dependent on satellite geometry, the P parameters values are slowly varying. However, it is not a requirement for the ground subsystem to dynamically vary P. Static P parameters could be sent if they properly ensure integrity. In this latter case, the availability would be slightly degraded. Generally, as MDE becomes smaller, overall GBAS availability improves.

7.5.10 *Ephemeris error/failure monitoring*. There are several types of monitoring approaches for detecting ephemeris errors/failures. They include:

a) *Long baseline*. This requires the ground subsystem to use receivers separated by large distances to detect ephemeris errors that are not observable by a single receiver. Longer baselines translate to better performance in MDE;

b) *SBAS*. Since SBAS augmentation provides monitoring of satellite performance, including ephemeris data, integrity information broadcast by SBAS can be used as an indication of ephemeris validity. SBAS uses ground subsystem receivers installed over very long baselines, therefore this provides optimum performance for ephemeris monitoring and thus achieves small MDEs; and

c) *Ephemeris data monitoring*. This approach involves comparing the broadcast ephemeris over consecutive satellite orbits. There is an assumption that the only threat of failure is due to a failure in ephemeris upload from the constellation ground control network. Failures due to uncommanded satellite manoeuvres must be sufficiently improbable to ensure that this approach provides the required integrity.

7.5.10.1 The monitor design (for example, its achieved MDE) is to be based upon the integrity risk requirements and the failure model the monitor is intended to protect against. A bound on the GPS ephemeris failure rate can be determined from the reliability requirements defined in Chapter 3, 3.7.3.1.3, since such an ephemeris error would constitute a major service failure.

7.5.10.2 The GLONASS control segment monitors the ephemeris and time parameters, and in case of any abnormal situation it starts to input the new and correct navigation message. The ephemeris and time parameter failures do not exceed 70 m of range errors. The failure rate of GLONASS satellite including the ephemeris and time parameter failures does not exceed 4×10^{-5} per satellite per hour.

7.5.11 A typical GBAS ground subsystem processes measurements from 2 to 4 reference receivers installed in the immediate vicinity of the reference point. The aircraft receiver is protected against a large error or fault condition in a single reference receiver by computing and applying the B parameters from the Type 1 or Type 101 message to compare data from the various reference receivers. Alternative system architectures with sufficiently high redundancy in reference receiver measurements may employ processing algorithms capable of identifying a large error or fault in one of the receivers. This may apply for a GRAS network with receivers distributed over a wide area and with sufficient density of ionospheric pierce points to separate receiver errors from ionospheric effects. The integrity can then be achieved using only the protection levels for normal measurement conditions (VPL_{H0} and LPL_{H0}), with appropriate values for K_{ffmd} and σ_{pr_gnd}. This can be achieved using the Type 101 message with the B parameters excluded.

7.6 Continuity of service

7.6.1 *Ground continuity and integrity designator*. The ground continuity and integrity designator (GCID) provides a classification of GBAS ground subsystems. The ground subsystem meets the requirements of Category I precision approach or APV when GCID is set to 1. GCID 2, 3 and 4 are intended to support future operations with requirements that are more stringent than Category I operations. The GCID is intended to be an indication of ground subsystem status to be used when an aircraft selects an approach. It is not intended to replace or supplement an instantaneous integrity indication communicated in a Type 1 or Type 101 message. GCID does not provide any indication of the ground subsystem capability to support the GBAS positioning service.

7.6.2 *Ground subsystem continuity of service*. GBAS ground subsystems are required to meet the continuity specified in Appendix B to Chapter 3, 3.6.7.1.3 in order to support Category I precision approach and APV. GBAS ground subsystems that are also intended to support other operations through the use of the GBAS positioning service should support the minimum continuity required for terminal area operations, which is $1–10^{-4}$/hour (Chapter 3, Table 3.7.2.4-1). When the Category I precision approach or APV required continuity ($1\text{-}3.3 \times 10^{-6}$/15 seconds) is converted to a per hour value it does not meet the $1–10^{-4}$/hour minimum continuity requirement. Therefore, additional measures are necessary to meet the continuity required for other operations. One method of showing compliance with this requirement is to assume that airborne implementation uses both GBAS and ABAS to provide redundancy and that ABAS provides sufficient accuracy for the intended operation.

7.7 GBAS channel selection

7.7.1 Channel numbers are used in GBAS to facilitate an interface between aircraft equipment and the signal-in-space that is consistent with interfaces for ILS and MLS. The cockpit integration and crew interface for GBAS may be based on entry of the 5-digit channel number. An interface based on approach selection through a flight management function similar to current practice with ILS is also possible. The GBAS channel number may be stored in an on-board navigation database as part of a named approach. The approach may be selected by name and the channel number can automatically be provided to the equipment that must select the appropriate GBAS approach data from the broadcast data. Similarly, the use of the GBAS positioning service may be based on the selection of a 5-digit channel number. This facilitates conducting operations other than the approaches defined by the FAS data. To facilitate frequency tuning, the GBAS channel numbers for neighbouring GBAS ground subsystems supporting positioning service may be provided in the Type 2 message additional data block 2.

7.7.2 A channel number in the range from 20 001 to 39 999 is assigned when the FAS data are broadcast in the Type 4 message. A channel number in the range from 40 000 to 99 999 is assigned when the FAS data associated with an APV are obtained from the on-board database.

7.8 Reference path data selector and reference station data selector

A mapping scheme provides a unique assignment of a channel number to each GBAS approach. The channel number consists of five numeric characters in the range 20 001 to 39 999. The channel number enables the GBAS airborne subsystem to tune to the correct frequency and select the final approach segment (FAS) data block that defines the desired approach. The correct FAS data block is selected by the reference path data selector (RPDS), which is included as part of the FAS definition data in a Type 4 message. Table D-6 shows examples of the relationship between the channel number, frequency and RPDS. The same mapping scheme applies to selection of the positioning service through the reference station data selector (RSDS). The RSDS is broadcast in the Type 2 message and allows the selection of a unique GBAS ground subsystem that provides the positioning service. For GBAS ground subsystems that do not provide the positioning service and broadcast the additional ephemeris data, the RSDS is coded with a value of 255. All RPDS and RSDS broadcast by a ground subsystem must be unique on the broadcast frequency within radio range of the signal. The RSDS value must not be the same as any of the broadcast RPDS values.

Table D-6. Channel assignment examples

Channel number (N)	Frequency in MHz (F)	Reference path data selector (RPDS) or Reference station data selector (RSDS)
20 001	108.025	0
20 002	108.05	0
20 003	108.075	0
….	….	….
20 397	117.925	0
20 398	117.95	0
20 412 (Note)	108.025	1
20 413	108.05	1
….	….	….

Note.— Channels between 20 39 and 20 412 are not assignable because the channel algorithm maps them to frequencies outside the range of 10 .025 M z and 117.950 M z. A similar gap in the channel assignments occurs at each RP S transition.

7.9 Assignment of RPDS and RSDS by service provider

RPDS and RSDS assignments are to be controlled to avoid duplicate use of channel numbers within the protection region for the data broadcast frequency. Therefore, the GBAS service provider has to ensure that an RPDS and RSDS are assigned only once on a given frequency within radio range of a particular GBAS ground subsystem. Assignments of RPDS and RSDS are to be managed along with assignments of frequency and time slots for the VHF data broadcast.

7.10 GBAS identification

The GBAS identification (ID) is used to uniquely identify a GBAS ground subsystem broadcasting on a given frequency within the coverage region of the GBAS. The aircraft will navigate using data broadcast from one or more GBAS broadcast stations of a single GBAS ground subsystem (as identified by a common GBAS identification).

7.11 Final approach segment (FAS) path

7.11.1 FAS path is a line in space defined by the landing threshold point/fictitious threshold point (LTP/FTP), flight path alignment point (FPAP), threshold crossing height (TCH) and glide path angle (GPA). These parameters are determined from data provided in a FAS data block within a Type 4 message or in the on-board database. The relationship between these parameters and the FAS path is illustrated in Figure D-6.

7.11.1.1 FAS data blocks for SBAS and some GBAS approaches are held within a common onboard database supporting both SBAS and GBAS. States are responsible for providing the FAS data to support APV procedures when the Type 4 message is not broadcast. These data comprise the parameters contained within the FAS block, the RSDS, and associated broadcast frequency. The FAS block for a particular approach procedure is described in Appendix B, 3.6.4.5.1 and Table B-66.

7.11.2 *FAS path definition*

7.11.2.1 *Lateral orientation*. The LTP/FTP is typically at or near the runway threshold. However, to satisfy operational needs or physical constraints, the LTP/FTP may not be at the threshold. The FPAP is used in conjunction with the LTP/FTP to define the lateral reference plane for the approach. For a straight-in approach aligned with the runway, the FPAP will be at or beyond the stop end of the runway. The FPAP is not placed before the stop end of the runway.

7.11.2.2 *ΔLength offset*. The Δlength offset defines the distance from the end of the runway to the FPAP. This parameter is provided to enable the aircraft equipment to compute the distance to the end of the runway. If the Δlength offset is not set to appropriately indicate the end of the runway relative to the FPAP, the service provider should ensure the parameter is coded as "not provided".

7.11.2.3 *Vertical orientation*. Local vertical for the approach is defined as normal to the WGS-84 ellipsoid at the LTP/FTP and may differ significantly from the local gravity vector. The local level plane for the approach is defined as a plane perpendicular to the local vertical passing through the LTP/FTP (i.e. tangent to the ellipsoid at the LTP/FTP). The datum crossing point (DCP) is a point at a height defined by TCH above the LTP/FTP. The FAS path is defined as a line with an angle (defined by the GPA) relative to the local level plane passing through the DCP. The GPIP is the point where the final approach path intercepts the local level plane. The GPIP may actually be above or below the runway surface depending on the curvature of the runway.

7.11.3 *ILS look-alike deviation computations*. For compatibility with existing aircraft designs, it is desirable for aircraft equipment to output guidance information in the form of deviations relative to a desired flight path defined by the FAS path. The Type 4 message includes parameters that support the computation of deviations that are consistent with ILS requirements.

7.11.3.1 *Lateral deviation definition*. Figure D-6 illustrates the relationship between the FPAP and the origin of the lateral angular deviations. The course width parameter and FPAP are used to define the origin and sensitivity of the lateral deviations. By adjusting the location of the FPAP and the value of the course width, the course width and sensitivity of a GBAS can be set to the desired values. They may be set to match the course width and sensitivity of an existing ILS. This may be necessary, for example, for compatibility with existing visual landing aids.

7.11.3.1.1 *Lateral deviation reference*. The lateral deviation reference plane is the plane that includes the LTP/FTP, FPAP and a vector normal to the WGS-84 ellipsoid at the LTP/FTP. The rectilinear lateral deviation is the distance of the computed aircraft position from the lateral deviation reference plane. The angular lateral deviation is a corresponding angular displacement referenced to the GBAS azimuth reference point (GARP). The GARP is defined to be beyond the FPAP along the procedure centre line by a fixed offset value of 305 m (1 000 ft).

7.11.3.1.2 *Lateral displacement sensitivity*. The lateral displacement sensitivity is determined by the aircraft equipment from the course width provided in the FAS data block. The service provider is responsible for setting the course width parameter to a value that results in the appropriate angle for full scale deflection (i.e. 0.155 DDM or 150 µA) taking into account any operational constraints.

7.11.3.2 *Vertical deviations*. Vertical deviations are computed by the aircraft equipment with respect to a GBAS elevation reference point (GERP). The GERP may be at the GPIP or laterally offset from the GPIP by a fixed GERP offset value of 150 m. Use of the offset GERP allows the glide path deviations to produce the same hyperbolic effects that are normal characteristics of ILS and MLS (below 200 ft). The decision to offset the GERP or not is made by the aircraft equipment in accordance with requirements driven by compatibility with existing aircraft systems. Service providers should be aware that users may compute vertical deviations using a GERP which is placed at either location. Sensitivity of vertical deviations is set automatically in the aircraft equipment as a function of the GPA. The relationship between GPA and the vertical deviation sensitivity is equivalent to the glide path displacement sensitivity provided by ILS.

7.11.4 *Approaches not aligned with the runway*. Some operations may require the definition of a FAS path that is not aligned with the runway centre line as illustrated in Figure D-7. For approaches not aligned with the runway, the LTP/FTP may or may not lie on the extended runway centre line. For this type of approach Δlength offset is not meaningful and should be set to “not provided”.

7.11.5 *SBAS service provider.* A common format is used for FAS data blocks to be used by both GBAS and SBAS. The SBAS service provider ID field identifies which SBAS system(s) may be used by an aircraft that is using the FAS data during an approach. The GBAS service provider may inhibit use of the FAS data in conjunction with any SBAS service. For precision approaches based on GBAS this field is not used, and it can be ignored by aircraft GBAS equipment.

7.11.6 *Approach identifier*. The service provider is responsible for assigning the approach identifier for each approach. The approach identification should be unique within a large geographical area. Approach identifications for multiple runways at a given airport should be chosen to reduce the potential for confusion and misidentification. The approach identification should appear on the published charts that describe the approach.

7.12 Airport siting considerations

7.12.1 The installation of a GBAS ground subsystem involves special considerations in choosing prospective sites for the reference receiver antennas and the VDB antenna(s). In planning antenna siting, Annex 14 obstacle limitation requirements must be met.

7.12.2 *Locating reference receiver antennas*. The site should be selected in an area free of obstructions, so as to permit the reception of satellite signals at elevation angles as low as possible. In general, anything masking GNSS satellites at elevation angles higher than 5 degrees will degrade system availability.

7.12.2.1 The antennas for the reference receivers should be designed and sited to limit multipath signals that interfere with the desired signal. Mounting antennas close to a ground plane reduces long-delay multipath resulting from reflections below the antenna. Mounting height should be sufficient to prevent the antenna being covered by snow, or being interfered with by maintenance personnel or ground traffic. The antenna should be sited so that any metal structures, such as air vents, pipes and other antennas are outside the near-field effects of the antenna.

7.12.2.2 Besides the magnitude of the multipath error at each reference receiver antenna location, the degree of correlation must also be considered. Reference receiver antennas should be located in places that provide independent multipath environments.

7.12.2.3 The installation of each antenna should include a mounting that will not flex in winds or under ice loads. Reference receiver antennas should be located in an area where access is controlled. Traffic may contribute to error due to multipath or obstruct view of satellites from the antennas.

7.12.3 *Locating the V B antenna*. The VDB antenna should be located so that an unobstructed line-of-sight exists from the antenna to any point within the coverage volume for each supported FAS. Consideration should also be given to ensuring the minimum transmitter-to-receiver separation so that the maximum field strength is not exceeded. In order to provide the required coverage for multiple FASs at a given airport, and in order to allow flexibility in VBD antenna siting, the actual coverage volume around the transmitter antenna may need to be considerably larger than that required for a single FAS. The ability to provide this coverage is dependent on the VDB antenna location with respect to the runway and the height of the VDB antenna. Generally speaking, increased antenna height may be needed to provide adequate signal strength to users at low altitudes, but may also result in unacceptable multipath nulls within the desired coverage volume. A suitable antenna height trade-off must be made based on analysis, to ensure the signal strength requirements are met within the entire volume. Consideration should also be given to the effect of terrain features and buildings on the multipath environment.

7.12.4 *se of multiple transmit antennas to improve V B coverage.* For some GBAS installations, constraints on antenna location, local terrain or obstacles may result in ground multipath and/or signal blockage that make it difficult to provide the specified field strength at all points within the coverage area. Some GBAS ground facilities may make use of one or more additional antenna systems, sited to provide signal path diversity such that collectively they meet the coverage requirements.

7.12.4.1 Whenever multiple antenna systems are used, the antenna sequence and message scheduling must be arranged to provide broadcasts at all points within the coverage area that adhere to the specified minimum and maximum data broadcast rates and field strengths, without exceeding the receiver's ability to adapt to transmission-to-transmission variations in signal strength in a given slot. To avoid receiver processing issues concerning lost or duplicated messages, all transmissions of the Type 1 or Type 101 message, or linked pair of Type 1 or Type 101 messages for a given measurement type within a single frame need to provide identical data content.

7.12.4.2 One example of the use of multiple antennas is a facility with two antennas installed at the same location but at different heights above the ground plane. The heights of the antennas are chosen so that the pattern from one antenna fills the nulls in the pattern of the other antenna that result from reflections from the ground plane. The GBAS ground subsystem alternates broadcasts between the two antennas, using one or two assigned slots of each frame for each antenna. Type 1 or Type 101 messages are broadcast once per frame, per antenna. This allows for reception of one or two Type 1 or Type 101 messages per frame, depending on whether the user is located within the null of one of the antenna patterns. Type 2 and 4 messages are broadcast from the first antenna in one frame, then from the second antenna in the next frame. This allows for reception of one each of the Type 2 and 4 messages per one or two frames, depending on the user location.

7.13 Definition of lateral and vertical alert limits

7.13.1 The lateral and vertical alert limits for Category I precision approach are computed as defined in Appendix B, Tables B-68 and B-69. In these computations the parameters D and H have the meaning shown in Figure D-8.

7.13.2 The vertical alert limit for Category I precision approach is scaled from a height of 60 m (200 ft) above the LTP/FTP. For a procedure designed with a decision height of more than 60 m (200 ft), the VAL at that decision height will be larger than the broadcast FASVAL.

7.13.3 The lateral and vertical alert limits for APV procedures associated with channel numbers 40 001 to 99 999 are computed in the same manner as for APV procedures using SBAS as given in Attachment D, 3.2.8.

7.14 Monitoring and maintenance actions

7.14.1 Specific monitoring requirements or built-in tests may be necessary and should be determined by individual States. Since the VDB signal is critical to the operation of the GBAS broadcast station, any failure of the VDB to successfully transmit a usable signal within the assigned slots and over the entire coverage area is to be corrected as soon as possible. Therefore, it is recommended that the following conditions be used as a guide for implementing a VDB monitor:

a) *Power.* A significant drop in power is to be detected within 3 seconds.

b) *Loss of message type.* The failure to transmit any scheduled message type(s). This could be based on the failure to transmit a unique message type in succession, or a combination of different message types.

c) *Loss of all message types.* The failure to transmit any message type for a period equal to or greater than 3 seconds will be detected.

7.14.2 Upon detection of a failure, and in the absence of a backup transmitter, termination of the VDB service should be considered if the signal cannot be used reliably within the coverage area to the extent that aircraft operations could be significantly impacted. Appropriate actions in operational procedures are to be considered to mitigate the event of the signal being removed from service. These would include dispatching maintenance specialists to service the GBAS VDB or special ATC procedures. Additionally, maintenance actions should be taken when possible for all built-in test failures to prevent loss of GBAS service.

7.15 Examples of VDB messages

7.15.1 Examples of the coding of VDB messages are provided in Tables D-7 through D-10. The examples illustrate the coding of the various application parameters, including the cyclic redundancy check (CRC) and forward error correction (FEC) parameters, and the results of bit scrambling and D8PSK symbol coding. The engineering values for the message parameters in these tables illustrate the message coding process, but are not necessarily representative of realistic values.

7.15.2 Table D-7 provides an example of a Type 1 VDB message. The additional message flag field is coded to indicate that this is the first of two Type 1 messages to be broadcast within the same frame. This is done for illustration purposes; a second Type 1 message is not typically required, except to allow broadcast of more ranging source corrections than can be accommodated in a single message.

7.15.3 Table D-7A provides an example of a Type 101 VDB message. The additional message flag field is coded to indicate that this is the first of two Type 101 messages to be broadcast within the same frame. This is done for illustration purposes; a second Type 101 message is not typically required, except to allow broadcast of more ranging source corrections than can be accommodated in a single message.

7.15.4 Table D-8 provides examples of a Type 1 VDB message and a Type 2 VDB message coded within a single burst (i.e. two messages to be broadcast within a single transmission slot). The additional message flag field of the Type 1 message is coded to indicate that it is the second of two Type 1 messages to be broadcast within the same frame. The Type 2 message includes additional data block 1. Table D-8A provides an example of Type 1 and Type 2 messages with additional data blocks 1 and 2.

7.15.5 Table D-9 provides an example of a Type 4 message containing two FAS data blocks.

7.15.6 Table D-10 provides an example of a Type 5 message. In this example, source availability durations common to all approaches are provided for two ranging sources. Additionally, source availability durations for two individual approaches are provided: the first approach has two impacted ranging sources and the second approach has one impacted ranging source. The Type 2 message includes additional data block 1.

7.16 GBAS survey accuracy

The standards for the survey accuracy for NAVAIDs are contained in Annex 14 — *Aerodromes*. In addition, the *Manual of the orld Geodetic System 19 4 (GS- 4)* (Doc 9674) provides guidance on the establishment of a network of survey control stations at each aerodrome and how to use the network to establish WGS-84 coordinates. Until specific requirements are developed for GBAS, the Annex 14 survey accuracy requirements for NAVAIDs located at the aerodrome apply to GBAS. The recommendation contained in Appendix B to Chapter 3, 3.6.7.2.3.4, for the survey accuracy of the GBAS reference point is intended to further reduce the error in the WGS-84 position calculated by an airborne user of the GBAS positioning service to a value smaller than that established by the requirements of Appendix B to Chapter 3, 3.6.7.2.4.1 and 3.6.7.2.4.2, in the GBAS standards and to enhance survey accuracy compared to that specified in Annex 14. The integrity of all aeronautical data used for GBAS is to be consistent with the integrity requirements in Chapter 3, Table 3.7.2.4-1.

7.17 Type 2 message additional data block 2

Type 2 message additional data block 2 data may be used in GRAS to enable the GRAS airborne subsystem to switch between GBAS broadcast stations, particularly if the GBAS broadcast stations utilize different frequencies. Additional data block 2 identifies the channel numbers and locations of the GBAS broadcast station currently being received and other adjacent or nearby GBAS broadcast stations.

Table D-7. Example of a Type 1 VDB message

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
A LE A A					
Station slot identifier (SSID)	3	—	—	E	100
Transmission length (bits)	17	0 to 1 824 bits	1 bit	536	000 0000 1000 0110 00
Training sequence FEC	5	—	—	—	0000 1
APPL A A A E AGE L					
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8	—	—	Normal	1010 1010
GBAS ID	24	—	—	BELL	0000 1000 0101 0011 0000 1100
Message type identifier	8	1 to 8	1	1	0000 0001
Message length	8	10 to 222 bytes	1 byte	61	0011 1101
e a e (e e am le)					
Modified Z-count	14	0 to 1 199.9 s	0.1 s	100 s	00 0011 1110 1000
Additional message flag	2	0 to 3	1	1st of pair	01
Number of measurements	5	0 to 18	1	4	0 0100
Measurement type	3	0 to 7	1	C/A L1	000
Ephemeris Decorrelation Parameter (P)	8	0 to 1.275 × 10^{-3}m/m	5 × 10^{-6}m/m	1 × 10^{-4}	0001 0100
Ephemeris CRC	16	—	—	—	0000 0000 0000 0000
Source availability duration	8	0 to 2 540 s	10 s	Not provided	1111 1111
ea urement loc					
Ranging source ID	8	1 to 255	1	2	0000 0010
Issue of data (IOD)	8	0 to 255	1	255	1111 1111
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	+1.0 m	0000 0000 0110 0100
Range rate correction (RRC)	16	±32.767 m	0.001 m/s	–0.2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0 to 5.08 m	0.02 m	0.98 m	0011 0001
B_1	8	±6.35 m	0.05 m	+0.10 m	0000 0010
B_2	8	±6.35 m	0.05 m	+0.15 m	0000 0011
B_3	8	±6.35 m	0.05 m	–0.25 m	1111 1011
B_4	8	±6.35 m	0.05 m	Not used	1000 0000
ea urement loc					
Ranging source ID	8	1 to 255	1	4	0000 0100
Issue of data (IOD)	8	0 to 255	1	126	0111 1110
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	–1.0 m	1111 1111 1001 1100
Range rate correction (RRC)	16	±32.767 m	0.001 m/s	+0.2 m/s	0000 0000 1100 1000
σ_{pr_gnd}	8	0 to 5.08 m	0.02 m	0.34 m	0001 0001
B_1	8	±6.35 m	0.05 m	+0.20 m	0000 0100
B_2	8	±6.35 m	0.05 m	+0.30 m	0000 0110
B_3	8	±6.35 m	0.05 m	–0.50 m	1111 0110
B_4	8	±6.35 m	0.05 m	Not used	1000 0000

DATA CONTENT DESC IPTION	BITS SED	AN E O A ES	ESO TION	A ES	BINA EP ESENTATION (NOTE 1)
Measurement Block 3					
anging source ID		1 to 255	1	12	0000 1100
Issue of data (IOD)		0 to 255	1	222	1101 1110
Pseudo-range correction (P C)	16	327.67 m	0.01 m	1.11 m	0000 0000 0110 1111
ange rate correction (C)	16	32.767 m	0.001 m/s	0.2 m/s	1111 1111 0011 1000
$\sigma_{pr\ gnd}$		0 to 5.0 m	0.02 m	1.02 m	0011 0011
B_1		6.35 m	0.05 m	0.10 m	0000 0010
B_2		6.35 m	0.05 m	0.25 m	0000 0101
B_3		6.35 m	0.05 m	0.25 m	1111 1011
B_4		6.35 m	0.05 m	Not used	1000 0000
Measurement Block 4					
anging source ID		1 to 255	1	23	0001 0111
Issue of data (IOD)		0 to 255	1	0	0101 0000
Pseudo-range correction (P C)	16	327.67 m	0.01 m	2.41 m	1111 1111 0000 1111
ange rate correction (C)	16	32.767 m	0.001 m/s	0.96 m/s	1111 1100 0100 0000
$\sigma_{pr\ gnd}$		0 to 5.0 m	0.02 m	0.16 m	0000 1000
B_1		6.35 m	0.05 m	0.20 m	0000 0100
B_2		6.35 m	0.05 m	0.30 m	0000 0110
B_3		6.35 m	0.05 m	0.50 m	1111 0110
B_4		6.35 m	0.05 m	Not used	1000 0000
Message Block CRC	32				1100 0010 1111 0011 0000 1011 1100 1010
APPLICATION FEC	4				0110 0011 1110 1001 1110 0000 1110 1101 0010 1001 0111 0101
Input to the bit scrambling (Note 2)	0 46 10 10 55 30 CA 10 0 BC 17 C2 20 2 00 00 40 26 00 1C C 40 C0 D 01 20 7E 39 13 00 20 60 6 01 30 7B 6 00 1C CC 40 A0 D 01 E 0A 0 02 3 10 20 60 6 01 53 D0 C 43 AE 94 B7 07 97 C6				
Output from the bit scrambling (Note 3)	0 60 27 9 1 2 D2 3B 5 26 C2 1B 12 4 46 D0 09 1 B6 25 1C 1 D0 7C 2A 7 B9 55 A B0 27 17 3A 60 EB 5 1B 3B A5 E 0A E1 43 D7 A D7 B3 7A 65 D 4E D7 79 D2 E1 AD 95 E6 6D 67 12 B3 EA 4 1A 51 B6 1C 1 2 31				
ill bits	0 to 2			0	
Po er ramp-do n	9				000 000 000
D8PSK Symbols (Note 4)	00000035 11204546 31650100 12707716 71645524 74035772 26234621 45311123 22460075 52232477 16617052 04750422 07724363 40733535 05120746 45741125 22545252 73171513 51047466 13171745 10622642 17157064 67345046 36541025 07135576 55745512 222				
π π .					

Table D-7A. Example of a Type 101 VDB message

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
SCRAMBLED DATA					
Station slot identifier (SSID)	3			E	100
Transmission length (bits)	17	0 to 1824 bits	1 bit	416	00000000110100000
Training sequence FEC	5				11011
APPL A A A E AGE L					
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8			Normal	1010 1010
GBAS ID	24			ERWN	00010101 00100101 11001110
Message type identifier	8	1 to 8,101	1	101	0110 0101
Message length	8	10 to 222 bytes	1 byte	46	0010 1110
e a e (e e am le)					
Modified Z-count	14	0 to 1199.9 s	0.1 s	100 s	00 0011 1110 1000
Additional message flag	2	0 to 3	1	1st of pair	01
Number of measurements	5	0 to 18	1	4	0 0100
Measurement type	3	0 to 7	1	C/A L1	000
Ephemeris Decorrelation Parameter (P)	8	0 to 1.275 × 10^{-3}m/m	5 × 10^{-6}m/m	0.115 × 10^{-3}m/m	0001 0111
Ephemeris CRC	16			0	0000 0000 0000 0000
Source availability duration	8	0 to 2540 s	10 s	Not provided	1111 1111
Number of B parameters	1	0 to 1	1	0	0
Spare	7			0	000 0000
ea urement loc					
Ranging source ID	8	1 to 255	1	2	0000 0010
Issue of data (IOD)	8	0 to 255	1	255	1111 1111
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	+3.56 m	0000 0001 0110 0100
Range rate correction (RRC)	16	±32.767 m/s	0.001 m/s	-0.011 m/s	1111 1111 1111 0101
σ_{pr_gnd}	8	0 to 50.8 m	0.2 m	9.8 m	0011 0001
ea urement loc					
Ranging source ID	8	1 to 255	1	4	0000 0100
Issue of data (IOD)	8	0 to 255	1	126	0111 1110
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	-1.0 m	1111 1111 1001 1100
Range rate correction (RRC)	16	±32.767 m/s	0.001 m/s	+0.002 m/s	0000 0000 0000 0010
σ_{pr_gnd}	8	0 to 50.8 m	0.2 m	3.4 m	0001 0001
ea urement loc					
Ranging source ID	8	1 to 255	1	12	0000 1100
Issue of data (IOD)	8	0 to 255	1	222	1101 1110
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	+4.11 m	0000 0001 1001 1011
Range rate correction (RRC)	16	±32.767 m/s	0.001 m/s	-0.029 m/s	1111 1111 1110 0011
σ_{pr_gnd}	8	0 to 50.8 m	0.2 m	10.2 m	0011 0011

DATA CONTENT DESC IPTION	BITS SED	AN E O A ES	ESO TION	A ES	BINA EP ESENTATION (NOTE 1)
Measurement Block 4					
anging source ID		1 to 255	1	23	0001 0111
Issue of data (IOD)		0 to 255	1	0	0101 0000
Pseudo-range correction (P C)	16	327.67 m	0.01 m	-2.41 m	1111 1111 0000 1111
ange rate correction (C)	16	32.767 m/s	0.001 m/s	-0.096 m/s	1111 1111 1010 0000
σ_{pr_gnd}		0 to 50. m	0.2 m	1.6 m	0000 1000
Message Block CRC	32				1000 1000 1001 1111 0111 1000 0000 0100
APPLICATION FEC	4				1100 1100 1110 0110 1111 0110 1100 1110 1101 0110 0110 0010
Input to the bit scrambling (Note 2)	0 41 60 1B 55 73 A4 A A6 74 17 C2 20 E 00 00 00 40 26 0 A C 20 7E 39 40 00 30 7B D9 0 C7 CC E 0A 0 05 10 20 1E 9 11 46 6B 73 6 67 33				
Output from the bit scrambling (Note 3)	0 67 57 93 1 6C BC 3 79 EE C2 1B 12 34 46 D0 09 C1 09 C 3A 4 0 0 E6 9 1 6D 77 E 1E 60 19 1B BA BC AB 6 26 7B E7 BC CE A 0B D3 C4 43 C E0 B6 A 42 4 A1				
ill bits	0 to 2			0	
Po er ramp-do n	9				000 000 000
D8PSK Symbols (Note 4)	00000035 11204546 31650105 06345463 57026113 51374661 15123376 12066670 44776307 04225000 02735027 73373152 13230100 04706272 74137202 47724524 12715704 15442724 01101677 44571303 66447212 222				
π π					

Table D-8. Example of Type 1 and Type 2 VDB messages in a single burst

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
A LE A A					
Station slot identifier (SSID)	3	—	—	E	10 0
Transmission length (bits)	17	0 to 1 824 bits	1 bit	544	000 0000 1000 1000 00
Training sequence FEC	5	—	—	—	0000 0
APPL A A A					
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8	—	—	Normal	1010 1010
GBAS ID	24	—	—	BELL	0000 1000 0101 0011 0000 1100
Message type identifier	8	1 to 8	1	1	0000 0001
Message length	8	10 to 222 bytes	1 byte	28	0001 1100
e a e(e e am le)					
Modified Z-count	14	0 to 1 199.9 s	0.1 s	100 s	00 0011 1110 1000
Additional message flag	2	0 to 3	1	2nd of pair	11
Number of measurements	5	0 to 18	1	1	0 0001
Measurement type	3	0 to 7	1	C/A L1	000
Ephemeris Decorrelation Parameter (P)	8	0 to 1.275 × 10^{-3} m/m	5 × 10^{-6} m/m	0 (SBAS)	0000 0000
Ephemeris CRC	16	—	—	0	0000 0000 0000 0000
Source availability duration	8	0 to 2 540 s	10 s	Not provided	1111 1111
ea urement loc					
Ranging source ID	8	1 to 255	1	122	0111 1010
Issue of data (IOD)	8	0 to 255	1	2	0000 0010
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	+1.0 m	0000 0000 0110 0100
Range rate correction (RRC)	16	±32.767 m	0.001 m/s	–0.2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0 to 5.08 m	0.02 m	1.96 m	0110 0010
B_1	8	±6.35 m	0.05 m	+0.10 m	0000 0010
B_2	8	±6.35 m	0.05 m	+0.15 m	0000 0011
B_3	8	±6.35 m	0.05 m	–0.25 m	1111 1011
B_4	8	±6.35 m	0.05 m	Not used	1000 0000
e a e loc	32	—	—	—	1011 0101 1101 0000 1011 1100 0101 0010
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8	—	—	Normal	1010 1010
GBAS ID	24	—	—	BELL	0000 1000 0101 0011 0000 1100
Message type identifier	8	1 to 8	1	2	0000 0010
Message length	8	10 to 222 bytes	1 byte	34	0010 0010
e a e(e e am le)					
GBAS reference receivers	2	2 to 4	1	3	01
Ground accuracy designator letter	2	—	—	B	01
Spare	1	—	—	0	0

DATA CONTENT DESC IPTION	BITS SED	AN E O A ES	ESO TION	A ES	BINA EP ESENTATION (NOTE 1)
BAS continuity/integrity designator	3	0 to 7	1	1	001
ocal magnetic variation	11	1 0	0.25	5 E	000 1110 1000
Spare	5			0	0000 0
$\sigma_{vert\ iono\ gradient}$		0 to 25.5 10 6 m/m	0.1 10 6 m/m	0	0000 0000
efractivity index		16 to 7 1	3	379	1111 1001
Scale height		0 to 25 500 m	100 m	100 m	0000 0001
efractivity uncertainty		0 to 255	1	20	0001 0100
atitude	32	90.0	0.0005 arcsec	45 40 32 N	0001 0011 1001 1010 0001 0001 0000 0000
ongitude	32	1 0.0	0.0005 arcsec	93 25 13	1101 0111 1110 1000 1000 1010 1011 0000
Ellipsoid height	24	3 6.07 m	0.01 m	92.55 m	0000 0001 0101 1100 1010 0111
Additional Data Block 1					
eference Station Data Selector		0 to 4	1	5	0000 0101
Maximum se Distance (D_{max})		2 to 510 km	2 km	50 km	0001 1001
md e POS, PS		0 to 12.75	0.05	6	0111 1000
md e, PS		0 to 12.75	0.05	5	0110 0100
md e POS, ONASS		0 to 12.75	0.05	0	0000 0000
md e, ONASS		0 to 12.75	0.05	0	0000 0000
Message Block 2 CRC	32				0101 1101 0111 0110 0010 0011 0001 1110
Application FEC	4				1110 1000 0100 0101 0011 1011 0011 1011 0100 0001 0101 0010
Input to the bit scrambling (Note 2)	0 41 10 00 55 30 CA 10 0 3 17 C3 0 00 00 00 5E 40 26 00 1C 46 40 C0 D 01 4A 3D 0B AD 55 30 CA 10 40 44 A4 17 00 00 9 0 2 00 59 C 0D 51 17 EB E5 3A 0 A0 9 1E 26 00 00 7 C4 6E BA 4A 2 DC DC A2 17				
Output from the bit scrambling (Note 3)	0 67 27 1 2 D2 3B 5 A2 C2 1A B2 DC 46 D0 09 9 09 25 1C 1 D0 B6 2A 7 B9 55 C2 3 15 45 7C 50 A9 6 3B 10 00 D9 71 17 DC 4B 2D 1B 7B 3 72 D4 7 CA 62 C D9 12 25 5E 13 2E 13 E0 42 44 37 45 6 29 5A B9 55 65				
ill bits	0 to 2			1	0
Po er ramp-do n	9				000 000 000
D8PSK Symbols (Note 4)	00000035 11204546 31650105 67443352 35201160 30501336 62023576 12066670 74007653 30010255 31031274 26172772 76236442 41177201 35131033 33421734 42751235 60342057 66270254 17431214 03421036 70316613 46567433 66547730 34732201 40607506 014444				

π π

Table D-8A. Example of Type 1 and Type 2 VDB messages with additional data blocks 1 and 2

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
A LE A A					
Station slot identifier (SSID)	3			E	100
Transmission length (bits)	17	0 to 1824 bits	1 bit	592	00000001001010000
Training sequence FEC	5				10110
APPL A A A					
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8			Normal	1010 1010
GBAS ID	24			ERWN	00010101 00100101 11001110
Message type identifier	8	1 to 8	1	1	0000 0001
Message length	8	10 to 222 bytes	1 byte	28	0001 1100
e a e(e e am le)					
Modified Z-count	14	0 to 1199.9 s	0.1 s	100 s	00 0011 1110 1000
Additional message flag	2	0 to 3	1	2nd of pair	11
Number of measurements	5	0 to 18	1	1	0 0001
Measurement type	3	0 to 7	1	C/A L1	000
Ephemeris Decorrelation Parameter (P)	8	0 to 1.275×10^{-3} m/m	5×10^{-6} m/m	0 (SBAS)	0000 0000
Ephemeris CRC	16			0	0000 0000 0000 0000
Source availability duration	8	0 to 2540 s	10 s	Not provided	1111 1111
ea urement loc					
Ranging source ID	8	1 to 255	1	122	0111 1010
Issue of data (IOD)	8	0 to 255	1	2	0000 0010
Pseudo-range correction (PRC)	16	±327.67 m	0.01 m	+2.09 m	0000 0000 1101 0001
Range rate correction (RRC)	16	±32.767 m/s	0.001 m/s	-0.2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0 to 5.08 m	0.02 m	1.96 m	0110 0010
B1	8	±6.35 m	0.05 m	+0.10 m	0000 0010
B2	8	±6.35 m	0.05 m	+0.15 m	0000 0011
B3	8	±6.35 m	0.05 m	–0.25 m	1111 1011
B4	8	±6.35 m	0.05 m	Not used	1000 0000
e a e loc	32				00110010 10100100 11001011 00110000
e a e loc (e me a e)					
e a e loc ea er					
Message block identifier	8			Normal	1010 1010
GBAS ID	24			ERWN	00010101 00100101 11001110
Message type identifier	8	1 to 8	1	2	0000 0010
Message length	8	10 to 222 bytes	1 byte	40	0010 1000
e a e(e e am le)					
GBAS reference receivers	2	2 to 4	1	3	01
Ground accuracy designator letter	2			B	01
Spare	1			0	0

DATA CONTENT DESC IPTION	BITS SED	AN E O A ES	ESO TION	A ES	BINA EP ESENTATION (NOTE 1)
BAS continuity/integrity designator	3	0 to 7	1	1	001
ocal magnetic variation	11	1 0	0.25	5 E	000 1110 1000
Spare	5			0	0000 0
$\sigma_{vert\ iono\ gradient}$		0 to 25.5 10^{-6}m/m	0.1 10^{-6}m/m	0	0000 0000
efractivity index		16 to 7 1	3	379	1111 1001
Scale height		0 to 25 500 m	100 m	100 m	0000 0001
efractivity uncertainty		0 to 255	1	20	0001 0100
atitude	32	90.0	0.0005 arcsec	45 40 32 N	0001 0011 1001 1010 0001 0001 0000 0000
ongitude	32	1 0.0	0.0005 arcsec	93 25 13	1101 0111 1110 1000 1000 1010 1011 0000
Ellipsoid height	24	3 6.07 m	0.01 m	92.55 m	0000 0001 0101 1100 1010 0111
Additional Data Block 1					
eference Station Data Selector		0 to 4	1	5	0000 0101
Maximum se Distance (Dmax)		2 to 510 km	2 km	50 km	0001 1001
md e POS, PS		0 to 12.75	0.05	6	0111 1000
md e, PS		0 to 12.75	0.05	5	0110 0100
md e POS, ONASS		0 to 12.75	0.05	0	0000 0000
md e, ONASS		0 to 12.75	0.05	0	0000 0000
Additional Data Blocks					
Additional Data Block ength		2 to 255	1	6	0000 0110
Additional Data Block Number		2 to 255	1	2	0000 0010
Additional Data Block 2					
Channel Number	16	20001 to 39999	1	25001	0110 0001 1010 1001
Δ atitude		25.4	0.2	5.2	0001 1010
Δ ongitude		25.4	0.2	3.4	1110 1111
Message Block 2 CRC	32				11100000 01110010 00011101 00100100
Application FEC	4				1110 0010 0101 1100 0000 1111 1010 1011 0011 0100 0100 0000
Input to the bit scrambling (Note 2)		0 42 90 0D 55 73 A4 A 0 3 17 C3 0 00 00 00 5E 40 B 00 1C 46 40 C0 D 01 0C D3 25 4C 55 73 A4 A 40 14 A4 17 00 00 9 0 2 00 59 C 0D 51 17 EB E5 3A 0 A0 9 1E 26 00 00 60 40 95 6 5 7 24 B 4E 07 02 2C D5 0 3A 47			
Output from the bit scrambling (Note 3)		0 64 A7 5 1 6C BC 3 5 A2 C2 1A B2 DC 46 D0 09 9 09 1C 1 D0 B6 2A 7 B9 55 4 1D 3B A4 7C 13 C7 D7 3B 40 00 D9 71 17 DC 4B 2D 1B 7B 3 72 D4 7 CA 62 C D9 12 25 5E 13 2E 13 E0 5A C0 CC 79 7A 5C A2 DD B9 75 B6 95 64 52 7 3			
ill bits	0 to 2			1	0
Po er ramp-do n	9				000 000 000
D8PSK Symbols (Note 4)		00000035 11204546 31650107 56336574 60137224 74145772 26467132 56422234 30443700 05565722 06506741 73647332 27242654 63345227 31575333 33421734 42751235 60342057 66270254 17431214 03421036 70316613 46567433 62077121 37275607 55315167 17135031 34423411 274444			

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Table D-9. Example of a Type 4 message

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				010 0011 1110 1111 1100 0110 0011 1011 0000 0011 1100 1000 0
A LE A A					
Station slot identifier (SSID)	3	—	—	D	01 1
Transmission length (bits)	17	0 to 1 824 bits	1 bit	784	000 0000 1100 0100 00
Training sequence FEC	5	—	—	—	0000 0
APPL A A A E AGE L					
e a e loc (e 4 me a e)					
e a e loc ea er					
Message block identifier	8	—	—	Normal	1010 1010
GBAS ID	24	—	—	CMJ	0000 1100 1101 0010 1010 0000
Message type identifier	8	1 to 8	1	4	0000 0100
Message length	8	10 to 222 bytes	1 byte	92	0101 1100
e a e (e 4 e am le)					
A ata et					
Data set length	8	2 to 212	1 byte	41	0010 1001
A ata loc					
Operation type	4	0 to 15	1	0	0000
SBAS service provider	4	0 to 15	1	15	1111
Airport ID	32	—	—	LFBO	0000 1100 0000 0110 0000 0010 0000 1111
Runway number	6	0 to 36	1	15	00 1111
Runway letter	2	—	—	R	01
Approach performance designator	3	0 to 7	1	CAT 1	001
Route indicator	5	—	—	C	0001 1
Reference path data selector (RPDS)	8	0 to 48	1	3	0000 0011
Reference path identifier	32	—	—	GTBS	0000 0111 0001 0100 0000 0010 0001 0011
LTP/FTP latitude	32	±90.0°	0.0005 arcsec	43.6441075°N	0001 0010 1011 1010 1110 0010 1000 0110
LTP/FTP longitude	32	±180.0°	0.0005 arcsec	1.345940°E	0000 0000 1001 0011 1101 1110 1001 0000
LTP/FTP height	16	–512.0 to 6 041.5 m	0.1 m	197.3	0001 1011 1011 0101
ΔFPAP latitude	24	±1°	0.0005 arcsec	–0.025145°	1111 1101 0011 1100 1100 1100
ΔFPAP longitude	24	±1°	0.0005 arcsec	0.026175°	0000 0010 1110 0000 0010 1100
Approach threshold crossing height (TCH)	15	0 to 1 638.35 m (0 to 3 276.7 ft)	0.05 m (0.1 ft)	17.05 m	000 0001 0101 0101
Approach TCH units selector	1	0 = ft; 1 = m	—	metres	1
Glide path angle (GPA)	16	0 to 90°	0.01°	3°	0000 0001 0010 1100
Course width	8	80.0 to 143.75 m	0.25 m	105	0110 0100
ΔLength offset	8	0 to 2 032 m	8 m	0	0000 0000
FAS Data Block 1 CRC	32	—	—	—	1010 0010 1010 0101 1010 1000 0100 1101
A AL A roach tatu	8	0 to 25.4	0.1 m	10	0110 0100
A LAL A roach tatu	8	0 to 50.8	0.2 m	40	1100 1000
A ata et					
Data set length	8	2 to 212	1 byte	41	0010 1001

FAS Data Block 2					
Operation type	4	0 to 15	1	0	0000
SBAS service provider	4	0 to 15	1	01	0001
Airport ID	32			BO	0000 1100 0000 0110 0000 0010 0000 1111
un ay number	6	0 to 36	1	33	10 0001
un ay letter	2				01
Approach performance designator	3	0 to 7	1	CAT 1	001
oute indicator	5			A	0000 1
eference path data selector (PDS)		0 to 4	1	21	0001 0101
eference path identifier	32			TN	0000 0111 0001 0100 0000 1110 0010 0000
TP/ TP latitude	32	90.0	0.0005 arcsec	43.6156350 N	0001 0010 1011 0111 1100 0001 1011 1100
TP/ TP longitude	32	1 0.0	0.0005 arcsec	1.3 02350 E	0000 0000 1001 0111 1010 0011 0001 1100
TP/ TP height	16	512.0 to 6 041.5 m	0.1 m	200.2 m	0001 1011 1101 0010
Δ PAP latitude	24	1	0.0005 arcsec	0.02172375	0000 0010 0110 0010 1111 1011
Δ PAP longitude	24	1	0.0005 arcsec	0.0226050	1111 1101 1000 0100 0011 1100
Approach threshold crossing height (TC)	15	0 to 1 63 .35 m (0 to 3 276.7 ft)	0.05 m (0.1 ft)	15.25 m	000 0001 0011 0001
Approach TC units selector	1	0 = ft 1 = m		metres	1
lide path angle (PA)	16	0 to 90	0.01	3.01	0000 0001 0010 1101
Course idth		0.0 to 143.75 m	0.25 m	105	0110 0100
Δ ength offset		0 to 2 032 m	m	0	0000 0000
AS data block 2 C C	32				1010 1111 0100 1101 1010 0000 1101 0111
FASVAL/Approach status		0 to 25.4	0.1 m	10	0110 0100
FASLAL /Approach status		0 to 50.	0.2 m	40	1100 1000
Message Block CRC	32				0101 0111 0000 0011 1111 1110 1001 1011
APPLICATION FEC	4				0001 1011 1001 0001 0010 1010 1011 1100 0010 0101 1000 0101
Input to the bit scrambling (Note 2)	1 2 30 00 55 05 4B 30 20 3A 94 0 0 40 60 30 2 9 C0 C 40 2 E0 61 47 5D 4 09 7B C9 00 AD D 33 3C B 34 07 40 AA 1 34 0 26 00 B2 15 A5 45 26 13 94 0 0 40 60 30 6 90 A 04 70 2 E0 3D 3 ED 4 3 C5 E9 00 4B D D 46 40 3C 21 B C 1 B4 0 26 00 EB 05 B2 5 26 13 D9 7 C0 EA A1 A4 3D 54 9 D				
Output from the bit scrambling (Note 3)	1 A4 07 1 1A 53 1B A0 41 D6 C2 9C 26 E0 04 59 9 CB 5C 2C C 91 2D E2 2E 5D 3 07 1E 45 1 53 5 C0 4 53 E4 64 0 23 C3 ED 05 A9 E6 7 B5 49 1 DD A3 2 B5 40 9D A0 17 90 12 60 64 7C C E3 BE A0 1E 72 61 6E E4 02 44 D9 1E D2 D 63 D1 12 C3 5A 00 0E 9 E 4C 12 0C 7 4 9D 55 0 16 6				
ill bits	0 to 2			1	0
Po er ramp do n	9				000 000 000
D8PSK Symbols (Note 4)	000000351120454631650432230077166217071305255667317672434537777615776346166157054361521457640513340167752142313044430613011502667743417556032762416305275365400152470514203225753334625554377076056527606314446243163101353722250120760407526435103457714077770415665273600122324007402031443362754444				
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Table D-10. Example of a Type 5 message

DATA CONTENT DESCRIPTION	BITS USED	RANGE OF VALUES	RESOLUTION	VALUES	BINARY REPRESENTATION (NOTE 1)
A A E					
Power ramp-up and settling	15				000 0000 0000 0000
Synchronization and ambiguity resolution	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
A LE A A					
Station slot identifier (SSID)	3	—	—	D	01 1
Transmission length (bits)	17	0 to 1 824 bits	1 bit	272	000 0000 0100 0100 00
Training sequence FEC	5	—	—	—	0001 1
APPL A A A E AGE L					
e a e loc (e 5 me a e)					
e a e loc ea er					
Message block identifier	8	—	—	Normal	1010 1010
GBAS ID	24	—	—	CMJ	0000 1100 1101 0010 1010 0000
Message type identifier	8	1 to 8	1	5	0000 0101
Message length	8	10 to 222 bytes	1 byte	28	0001 1100
e a e (e 5 e am le)					
Modified Z-count	14	0 to 1 199.9 s	0.1 s	100 s	00 0011 1110 1000
Spare	2	—	—	—	00
Number of impacted sources (N)	8	0 to 31	1	2	0000 0010
ir t im acte ource					
Ranging source ID	8	1 to 255	1	4	0000 0100
Source availability sense	1	—	—	Will cease	0
Source availability duration	7	0 to 1 270 s	10 s	50 s	0000 101
econ im acte ource					
Ranging source ID	8	1 to 255	1	3	0000 0011
Source availability sense	1	—	—	Will start	1
Source availability duration	7	0 to 1 270 s	10 s	200 s	0010 100
Number of obstructed approaches (A)	8	0 to 255	1	2	0000 0010
ir t ob tructe a roach					
Reference path data selector (RPDS)	8	0 to 48	1	21	0001 0101
Number of impacted sources for first obstructed approach (N_A)	8	1 to 31	1	2	0000 0010
ir t im acte ran in ource o ir t ob tructe a roach					
Ranging source ID	8	1 to 255	1	12	0000 1100
Source availability sense	1	—	—	Will cease	0
Source availability duration	7	0 to 1 270 s	10 s	250 s	0011 001
econ im acte ran in ource o ir t ob tructe a roach					
Ranging source ID	8	1 to 255	1	14	0000 1110
Source availability sense	1	—	—	Will cease	0
Source availability duration	7	0 to 1 270 s	10 s	1 000 s	1100 100
econ ob tructe a roach					
Reference path data selector (RPDS)	8	0 to 48	1	14	0000 1110
Number of impacted sources for second obstructed approach (N_A)	8	1 to 31	1	1	0000 0001

DATA CONTENT DESC IPTION	BITS SED	AN E O A ES	ESO TION	A ES	BINA EP ESENTATION (NOTE 1)
First impacted ranging source of second obstructed approach					
anging source ID		1 to 255	1	12	0000 1100
Source availability sense	1			ill cease	0
Source availability duration	7	0 to 1 270 s	10 s	220 s	0010 110
Message Block CRC	32				1101 1011 0010 1111 0001 0010 0000 1001
APPLICATION FEC	4				0011 1110 1011 1010 0001 1110 0101 0110 1100 1011 0101 1011
Input to the bit scrambling (Note 2)	1 2 20 1 55 05 4B 30 A0 3 17 C0 40 20 50 C0 94 40 A 40 30 4C 70 13 70 0 30 34 90 4 4 DB DA D3 6A 7 5D 7C				
Output from the bit scrambling	1 A4 17 90 1 1A 53 1B 7 A2 C2 19 72 C 16 10 62 1 E1 43 2C 4 5 E3 1A 3 56 60 1 6 EA 33 3 B3 09 07 26 2				
ill bits	0 to 2			0	
Po er ramp-do n	9				000 000 000
D8PSK Symbols (Note 3)	0000003511204546316504322056660551067602416124477363463220700103224006601332124166231163643777110173115 74302323445146644444				

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7.18 Type 101 message

Type 101 message is an alternative to Type 1 message developed to fit the specific needs of GRAS systems. The primary difference in the contents and application of these two message types is two-fold: (a) Type 101 message has a larger available range for σpr_gnd values and (b) ground subsystem time-to-alert is larger for a system broadcasting Type 101 messages. The first condition would typically occur in a system where a broadcast station covers a large area, such that decorrelation errors increase the upper limit of the pseudo-range correction errors. The second condition may be typical for systems where a central master station processes data from multiple receivers dispersed over a large area.

8. Signal quality monitor (S M) design

8.1 The objective of the signal quality monitor (SQM) is to detect satellite signal anomalies in order to prevent aircraft receivers from using misleading information (MI). MI is an undetected aircraft pseudo-range differential error greater than the maximum error (MERR) that can be tolerated. These large pseudo-range errors are due to C/A code correlation peak distortion caused by satellite payload failures. If the reference receiver used to create the differential corrections and the aircraft receiver have different measurement mechanizations (i.e. receiver bandwidth and tracking loop correlator spacing), the signal distortion affects them differently. The SQM must protect the aircraft receiver in cases when mechanizations are not similar. SQM performance is further defined by the probability of detecting a satellite failure and the probability of incorrectly annunciating a satellite failure.

8.2 The signal effects that might cause a GBAS or SBAS to output MI can be categorized into three different effects on the correlation function as follows:

a) *ead zones* If the correlation function loses its peak, the receiver’s discriminator function will include a flat spot or dead zone. If the reference receiver and aircraft receiver settle in different portions of this dead zone, MI can result.

b) *False peaks* If the reference receiver and aircraft receiver lock to different peaks, MI could exist.

c) *istortions* If the correlation peak is misshapen, an aircraft that uses a correlator spacing other than the one used by the reference receivers may experience MI.

8.3 The threat model proposed for use in assessment of SQM has three parts that can create the three correlation peak pathologies listed above.

8.4 Threat Model A consists of the normal C/A code signal except that all the positive chips have a falling edge that leads or lags relative to the correct end-time for that chip. This threat model is associated with a failure in the navigation data unit (NDU), the digital partition of a GPS or GLONASS satellite.

8.4.1 Threat Model A for GPS has a single parameter Δ, which is the lead ($\Delta < 0$) or lag ($\Delta > 0$) expressed in fractions of a chip. The range for this parameter is $-0.12 \leq \Delta \leq 0.12$. Threat Model A for GLONASS has a single parameter Δ, which is the lead ($\Delta < 0$) or lag ($\Delta > 0$) expressed in fractions of a chip. The range for this parameter is $-0.11 \leq \Delta \leq 0.11$.

8.4.2 Within this range, threat Model A generates the dead zones described above. (Waveforms with lead need not be tested, because their correlation functions are simply advances of the correlation functions for lag; hence, the MI threat is identical.)

8.5 Threat Model B introduces amplitude modulation and models degradations in the analog section of the GPS or GLONASS satellite. More specifically, it consists of the output from a second order system when the nominal C/A code baseband signal is the input. Threat Model B assumes that the degraded satellite subsystem can be described as a linear system dominated by a pair of complex conjugate poles. These poles are located at $\sigma \pm j2\pi f_d$, where σ is the damping factor in nepers/second and f_d is the resonant frequency with units of cycles/second.

8.5.1 The unit step response of a second order system is given by:

$$e(t) = \begin{cases} 0 & t \le 0 \\ 1 - \exp(-\sigma t)\left[\cos\omega_d t + \dfrac{\sigma}{\omega_d}\sin\omega_d t\right] & t \ge 0 \end{cases}$$

where $\omega_d = 2\pi f_d$.

8.5.2 Threat Model B for GPS corresponding to second order anomalies uses the following ranges for the parameters Δ, f_d and σ:

$$\Delta = 0;\ 4 \le f_d \le 17;\ \text{and } 0.8 \le \sigma \le 8.8.$$

Threat Model B for GLONASS corresponding to second order anomalies uses the following ranges for the parameters defined above:

$$\Delta = 0;\ 10 \le f_d \le 20;\ \text{and } 2 \le \sigma \le 8.$$

8.5.3 Within these parameter ranges, threat Model B generates distortions of the correlation peak as well as false peaks.

8.6 Threat Model C introduces both lead/lag and amplitude modulation. Specifically, it consists of outputs from a second order system when the C/A code signal at the input suffers from lead or lag. This waveform is a combination of the two effects described above.

8.6.1 Threat Model C for GPS includes parameters Δ, f_d and σ with the following ranges:

$$-0.12 \le \Delta \le 0.12;\ 7.3 \le f_d \le 13;\ \text{and } 0.8 \le \sigma \le 8.8.$$

Threat Model C for GLONASS includes parameters Δ, f_d and σ with the following ranges:

$$-0.11 \le \Delta \le 0.11;\ 10 \le f_d \le 20;\ \text{and } 2 \le \sigma \le 8.$$

8.6.2 Within these parameter ranges, threat Model C generates dead zones, distortions of the correlation peak and false peaks.

8.7 Unlike GPS and GLONASS, the SBAS signal is commissioned and controlled by the service provider. Moreover, the service provider also monitors the quality of the signal from the SBAS. To this end, the threat model will be specified and published by the service provider for each SBAS satellite. The SBAS SQM will be designed to protect all avionics that comply with Table D-12. Publication of the threat model is required for those cases where a service provider chooses to allow the SBAS ranging signal from a neighbouring service provider to be used for precision approach by SBAS or GBAS. In these cases, the service provider will monitor the SBAS ranging signal from the neighbouring satellite.

8.8 In order to analyse the performance of a particular monitor design, the monitor limit must be defined and set to protect individual satellite pseudo-range error relative to the protection level, with an allocation of the ground subsystem integrity risk. The maximum tolerable error (denoted as MERR) for each ranging source *i* can be defined in GBAS as:

$$\text{MERR} = K_{ffmd}\sigma_{pr\_gnd,i} \text{ and}$$

$$\text{MERR}=K_{V,PA}\sqrt{\sigma^2_{i,UDRE} + \min\left\{\sigma^2_{i,UIRE}\right\}}$$

for SBAS APV and precision approach where min $\left\{\sigma^2_{i,UIRE}\right\}$ is the minimum possible value for any user. MERR is evaluated at the output of a fault-free user receiver and varies with satellite elevation angle and ground subsystem performance.

8.9 The SQM is designed to limit the UDRE to values below the MERR in the case of a satellite anomaly. Typically, the SQM measures various correlation peak values and generates spacing and ratio metrics that characterize correlation peak distortion. Figure D-9 illustrates typical points at the top of a fault-free, unfiltered correlation peak.

8.9.1 A correlator pair is used for tracking. All other correlator values are measured with respect to this tracking pair.

8.9.2 Two types of test metrics are formed: early-minus-late metrics (D) that are indicative of tracking errors caused by peak distortion, and amplitude ratio metrics (R) that measure slope and are indicative of peak flatness or close-in, multiple peaks.

8.9.3 It is necessary that the SQM has a precorrelation bandwidth that is sufficiently wide to measure the narrow spacing metrics, so as not to cause significant peak distortion itself and not to mask the anomalies caused by the satellite failure. Typically, the SQM receiver must have a precorrelation bandwidth of at least 16 MHz for GPS and at least 15 MHz for GLONASS.

8.9.4 The test metrics are smoothed using low-pass digital filters. The time constant of these filters are to be shorter than those used jointly (and standardized at 100 seconds) by the reference receivers for deriving differential corrections and by the aircraft receiver for smoothing pseudo-range measurements (using carrier smoothing). The smooth metrics are then compared to thresholds. If any one of the thresholds is exceeded, an alarm is generated for that satellite.

8.9.5 The thresholds used to derive performance are defined as minimum detectable errors (MDEs) and minimum detectable ratios (MDRs). Fault-free false detection probability and missed detection probability are used to derive MDEs and MDRs. The noise in metrics (D) and (R), as denoted $\sigma_{D,test}$ and $\sigma_{R,test}$ below, is dominated by multipath errors. Note that the metric test can also have a mean value (μ_{test}) caused by SQM receiver filter distortion. Threshold tests must also account for the mean values.

8.9.6 The MDE and MDR values used in the SQM performance simulations are calculated based on the following equations:

$$MDE = (K_{ffd} + K_{md})\ \sigma_{D,test} \text{ and}$$
$$MDR = (K_{ffd} + K_{md})\ \sigma_{R,test}$$

where

$K_{ffd} = 5.26$ is a typical fault-free detection multiplier representing a false detection probability of 1.5×10^{-7} per test;

$K_{md} = 3.09$ is a typical missed detection multiplier representing a missed detection probability of 10^{-3} per test;

$\sigma_{D,test}$ is the standard deviation of measured values of difference test metric D; and

$\sigma_{R,test}$ is the standard deviation of measured values of ratio test metric R.

8.9.7 If multiple independent SQM receivers are used to detect the failures, the sigma values can be reduced by the square root of the number of independent monitors.

8.9.8 A failure is declared if

$$| D,test - \mu_{D,test} | \geq MDE \text{ or}$$
$$| R,test - \mu_{R,test} | \geq MDR$$

for any of the tests performed, where $\mu_{X,test}$ is the mean value of the test X that accounts for fault-free SQM receiver filter distortion, as well as correlation peak distortion peculiar to the specific C/A code PRN. (Not all C/A code correlation peaks have the same slope. In a simulation environment, however, this PRN distortion can be ignored, and a perfect correlation peak can be used, except for simulated filter distortion.)

8.10 The standard deviations of the test statistics, $\sigma_{D,test}$ and $\sigma_{R,test}$ can be determined via data collection on a multicorrelator receiver in the expected operating environment. The data collection receiver utilizes a single tracking pair of correlators and additional correlation function measurement points which are slaved to this tracking pair, as illustrated in Figure D-9. Data is collected and smoothed for all available measurement points in order to compute the metrics. The standard deviation of these metrics define $\sigma_{D,test}$. It is also possible to compute these one sigma test statistics if a multipath model of the installation environment is available.

8.10.1 The resulting $\sigma_{D,test}$ is highly dependent on the multipath environment in which the data are collected. The deviation due to multipath can be an order of magnitude greater than that which would result from noise even at minimum carrier-to-noise level. This aspect illustrates the importance of the antenna design and siting criteria which are the primary factors in determining the level of multipath that will enter the receiver. Reducing multipath will significantly decrease the resulting MDEs and thus improve the SQM capabilities.

8.10.2 Mean values $\mu_{D,test}$ and $\mu_{R,test}$, on the other hand, are determined in a relatively error-free environment, such as through the use of GPS and GLONASS signal simulator as input. These mean values model the nominal SQM receiver's filter distortion of the autocorrelation peak, including the effects of distortion due to adjacent minor autocorrelation peaks. The mean values can differ for the various PRNs based on these properties.

8.11 In order for the ground monitor to protect users against the different threat models described above, it is necessary to assume that aircraft receivers have specific characteristics. If no such constraints were assumed, the complexity of the ground monitor would be unnecessarily high. Evolution in the technology may lead to improved detection capability in the aircraft receiver and may alleviate the current constraints.

8.11.1 For double-delta correlators, the aircraft receiver tracks the strongest correlation peak over the full code sequence for every ranging source used in the navigation solution.

8.11.2 For double-delta correlators, the precorrelation filter rolls off by at least 30 dB per octave in the transition band.

8.11.3 The following parameters are used to describe the tracking performance specific to each type of satellite:

a) the instantaneous correlator spacing is defined as the spacing between a particular set of early and late samples of the correlation function;

b) the average correlator spacing is defined as a one-second average of the instantaneous correlator spacing. The average applies over any one-second time frame;

c) the discriminator Δ is based upon an average of early-minus-late samples with spacings inside the specified range, or is of the type $\Delta = 2\Delta_{d1} - \Delta_{2d1}$, with both d_1 and $2d_1$ in the specified range. Either a coherent or non-coherent discriminator is used;

d) the differential group delay applies to the entire aircraft system prior to the correlator, including the antenna. The differential group delay is defined as:

$$\left|\frac{d\phi}{d\omega}(f_c) - \frac{d\phi}{d\omega}(f)\right|$$

where

f_c is the precorrelation band pass filter centre frequency;

f is any frequency within the 3dB bandwidth of the precorrelation filter;

ϕ is the combined phase response of precorrelation band pass filter and antenna; and

ω is equal to $2\pi f$.

8.11.4 For aircraft receivers using early-late correlators and tracking GPS satellites, the precorrelation bandwidth of the installation, the correlator spacing and the differential group delay are within the ranges defined in Table D-11.

8.11.5 For aircraft receivers using early-late correlators and tracking GLONASS satellites, the precorrelation bandwidth of the installation, the correlator spacing, and the differential group delay are within the ranges as defined in Table D-12.

8.11.6 For aircraft receivers using double-delta correlators and tracking GPS satellites, the precorrelation bandwidth of the installation, the correlator spacing and the differential group delay are within the ranges defined in Table D-13.

8.11.7 For aircraft receivers using the early-late or double-delta correlators and tracking SBAS satellites, the precorrelation bandwidth of the installation, the correlator spacing and the differential group delay are within the ranges defined in Table D-14.

9. Status monitoring and NOTAM

9.1 System status

9.1.1 Degradation of GBAS usually has local effects and affects mainly approach operations. System degradation of GBAS is to be distributed as approach-related information.

9.1.2 Degradation of core satellite constellation(s) or SBAS usually has not only local effects, but additional consequences for a wider area, and may directly affect en-route operations. System degradation of these elements is to be distributed as area-related information. An example is a satellite failure.

9.1.3 Degradation of GRAS may have local effects and/or wide area effects. Therefore, if the degradation has only local effects, GRAS system degradation information is to be distributed in accordance with 9.1.1. If the degradation has wide area effects, GRAS system degradation information is to be distributed in accordance with 9.1.2.

9.1.4 Information is to be distributed to indicate the inability of GNSS to support a defined operation. For example, GPS/SBAS may not support a precision approach operation on a particular approach. This information can be generated automatically or manually based upon models of system performance.

Table D-11. GPS tracking constraints for early-late correlators

Region	3 dB precorrelation bandwidth, BW	Average correlator spacing (chips)	Instantaneous correlator spacing (chips)	Differential group delay
1	2 < BW ≤ 7 MHz	0.045 – 1.1	0.04 – 1.2	≤ 600 ns
2	7 < BW ≤ 16 MHz	0.045 – 0.21	0.04 – 0.235	≤ 150 ns
3	16 < BW ≤ 20 MHz	0.045 – 0.12	0.04 – 0.15	≤ 150 ns
4	20 < BW ≤ 24 MHz	0.08 – 0.12	0.07 – 0.13	≤ 150 ns

Table D-12. GLONASS tracking constraints for early-late correlators

Region	3 dB precorrelation bandwidth, BW	Average correlator spacing range (chips)	Instantaneous correlator spacing range (chips)	Differential group delay
1	7 < BW ≤ 9 MHz	0.05 – 1.0	0.045 – 1.1	≤100 ns
2	9 < BW ≤ 15 MHz	0.05 – 0.2	0.045 – 0.22	≤ 100 ns
3	15 < BW ≤ 18 MHz	0.05 – 0.1	0.045 – 0.11	≤ 100 ns

Table D-13. GPS tracking constraints for double-delta correlators

Region	3 dB precorrelation bandwidth, BW	Average correlator spacing range (chips)	Instantaneous correlator spacing range (chips)	Differential group delay
1	2 < BW ≤ 7 MHz	0.045 – 0.6	0.04 – 0.65	≤ 600 ns
2	7 < BW ≤ 14 MHz	0.045 – 0.24	0.04 – 0.26	≤ 150 ns
3	14 < BW ≤ 16 MHz	0.07 – 0.24	0.04 – 0.26	≤ 150 ns

Table D-14. SBAS ranging function tracking constraints

Region	3 dB precorrelation bandwidth, BW	Average correlator spacing (chips)	Instantaneous correlator spacing (chips)	Differential group delay
1	2 < BW ≤ 7 MHz	0.045 – 1.1	0.04 – 1.2	≤ 600 ns
2	7 < BW ≤ 20 MHz	0.045 – 1.1	0.04 – 1.2	≤ 150 ns

9.2 Information on type of degradation

The following information is to be distributed:

a) non-availability of service;

b) downgrade of service, if applicable; and

c) time and expected duration of degradation.

9.3 Timing of notification

For scheduled events, notification should be given to the NOTAM authority at least 72 hours prior to the event. For unscheduled events, notification to the NOTAM authority should be given within 15 minutes. Notification should be given for events of 15-minute, or longer, duration.

10. Interference

10.1 Potential for interference

Satellite radio navigation systems such as GPS and GLONASS feature relatively weak received signal power, meaning that an interference signal could cause loss of service. In order to maintain service, it will be necessary to ensure that the maximum interference levels specified in the SARPs are not exceeded.

10.2 Specification of the interference threshold at the antenna port

The indications of the interference threshold levels are referenced to the antenna port. In this context, the term “antenna port” means the interface between the antenna and the GNSS receiver where the satellite signal power corresponds to the nominal minimum received signal power of –164.5 dBW for GPS and –165.5 dBW for GLONASS. Due to the reduced distance from potential interference sources, GNSS receivers that are used for the approach phase of flight must have a higher interference threshold than receivers that are only used for en-route navigation.

10.3 In-band interference sources

A potential source of in-band harmful interference is Fixed Service operation in certain States. There is a primary allocation to the fixed service for point-to-point microwave links in certain States in the frequency band used by GPS and GLONASS.

10.4 Out-of-band interference sources

Potential sources of out-of-band interference include harmonics and spurious emissions of aeronautical VHF and UHF transmitters. Out-of-band noise, discrete spurious products and intermodulation products from radio and TV broadcasts can also cause interference problems.

10.5 Aircraft generated sources

10.5.1 The potential for harmful interference to GPS and GLONASS on an aircraft depends on the type of aircraft, its size and the transmitting equipment installed. The GNSS antenna location should take into account the possibility of on-board interference (mainly SATCOM).

10.5.2 GNSS receivers that are used on board aircraft with SATCOM equipment must have a higher interference threshold in the frequency range between 1 610 MHz and 1 626.5 MHz than receivers on board aircraft without SATCOM equipment. Therefore, specifications for the interference threshold discriminate between both cases.

Note.— Limits for radiated SATCOM aircraft earth stations are given in Annex 10, Volume III, Part I, Chapter 4, 4.2.3.5.

10.5.3 The principal mitigation techniques for on-board interference include shielding, filtering, receiver design techniques, and, especially on larger aircraft, physical separation of antennas, transmitters and cabling. Receiver design techniques include the use of adaptive filters and interference cancellation techniques that mitigate against narrow in-band interference. Antenna design techniques include adaptive null steering antennas that reduce the antenna gain in the direction of interference sources without reducing the signal power from satellites.

10.6 Integrity in the presence of interference

The requirement that SBAS and GBAS receivers do not output misleading information in the presence of interference is intended to prevent the output of misleading information under unintentional interference scenarios that could arise. It is not intended to specifically address intentional interference. While it is impossible to completely verify this requirement through testing, an acceptable means of compliance can be found in the appropriate receiver Minimum Operational Performance Standards published by RTCA and EUROCAE.

11. Recording of GNSS parameters

11.1 In order to be able to conduct post-incident/accident investigations (Chapter 2, 2.4.3), it is necessary to record GNSS information both for the augmentation system and for the appropriate GNSS core system constellation used for the operation. The parameters to be recorded are dependent on the type of operation, augmentation system and core elements used. All parameters available to users within a given service area should be recorded at representative locations in the service area.

11.2 The objective is not to provide independent assurance that the GNSS is functioning correctly, nor is it to provide another level of system monitoring for anomalous performance or input data for a NOTAM process. The recording system need not be independent of the GNSS service and may be delegated to other States or entities. In order to enable future reconstruction of position, velocity and time indications provided by specific GNSS configurations, it is recommended to log data continuously, generally at a 1 Hz rate.

11.3 For GNSS core systems the following monitored items should be recorded for all satellites in view:

a) observed satellite carrier-to-noise density (C/N_0);

b) observed satellite raw pseudo-range code and carrier phase measurements;

c) broadcast satellite navigation messages, for all satellites in view; and

d) relevant recording receiver status information.

11.4 For SBAS the following monitored items should be recorded for all geostationary satellites in view in addition to the GNSS core system monitored items listed above:

a) observed geostationary satellite carrier-to-noise density (C/N_0);

b) observed geostationary satellite raw pseudo-range code and carrier phase measurements;

c) broadcast SBAS data messages; and

d) relevant receiver status information.

11.5 For GBAS the following monitored items should be recorded in addition to the GNSS core system and SBAS monitored items listed above (where appropriate):

a) VDB power level;

b) VDB status information; and

c) broadcast GBAS data messages.

12. GNSS performance assessment

The data described in Section 11 may also support periodic confirmation of GNSS performance in the service area.

13. GNSS and database

Note.— Provisions relating to aeronautical data are contained in Annex 11, Chapter 2, and Annex 15, Chapter 3.

13.1 The database is to be current with respect to the effective AIRAC cycle, which generally means that a current database be loaded into the system approximately every 28 days. Operating with out-of-date navigation databases has to be avoided.

13.2 In certain situations, operations using an expired database can be conducted safely by implementing a process and/or using procedures to ensure that the required data is correct. These processes and/or procedures need prior approval by the State.

13.2.1 These procedures should be based on one of the following methods:

a) require the crew to check, prior to the operation, critical database information against current published information. (This method increases workload and would not be practical for all applications.); or

b) waive the requirement for a current database and frequent checks by the crew of the database information. This waiver can only be applied to very specific cases where aircraft are operated in a strictly limited geographical area and where that area is controlled by a single regulatory agency or multiple agencies that coordinate this process; or

c) use another approved method that ensures an equivalent level of safety.

14. Modelling of residual errors

14.1 Application of the integrity requirements for SBAS and GBAS requires that a model distribution be used to characterize the error characteristics in the pseudo-range. The HPL/LPL and VPL models (see 7.5.3) are constructed based on models of the individual error components (in the pseudo-range domain) that are independent, zero-mean, normal distributions. The relationship between this model and the true error distribution must be defined.

14.2 One method of ensuring that the protection level risk requirements are met is to define the model variance (σ^2), such that the cumulative error distribution satisfies the conditions:

$$\int_{y}^{\infty} f(x)dx \leq Q\left(\frac{y}{\sigma}\right) \text{ for all } \left(\frac{y}{\sigma}\right) \geq 0 \text{ and}$$

$$\int_{-\infty}^{-y} f(x)dx \leq Q\left(\frac{y}{\sigma}\right) \text{ for all } \left(\frac{y}{\sigma}\right) \geq 0 \text{ and}$$

where

$f(x) =$ probability density function of the residual aircraft pseudo-range error; and

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_{x}^{\infty} e^{-\frac{t^2}{2}} dt.$$

14.3 This method can be directly applied when the error components have zero-mean, symmetrical and unimodal probability density functions. This is the case for the receiver contribution to corrected pseudo-range error, since the aircraft element is not subjected to low-frequency residual multipath errors.

14.4 This method can be extended to address non-zero-mean, residual errors by inflating the model variance to compensate for the possible effect of the mean in the position domain.

14.5 Verification of the pseudo-range error models must consider a number of factors including:

a) the nature of the error components;

b) the sample size required for confidence in the data collection and estimation of each distribution;

c) the correlation time of the errors; and

d) the sensitivity of each distribution to geographic location and time.

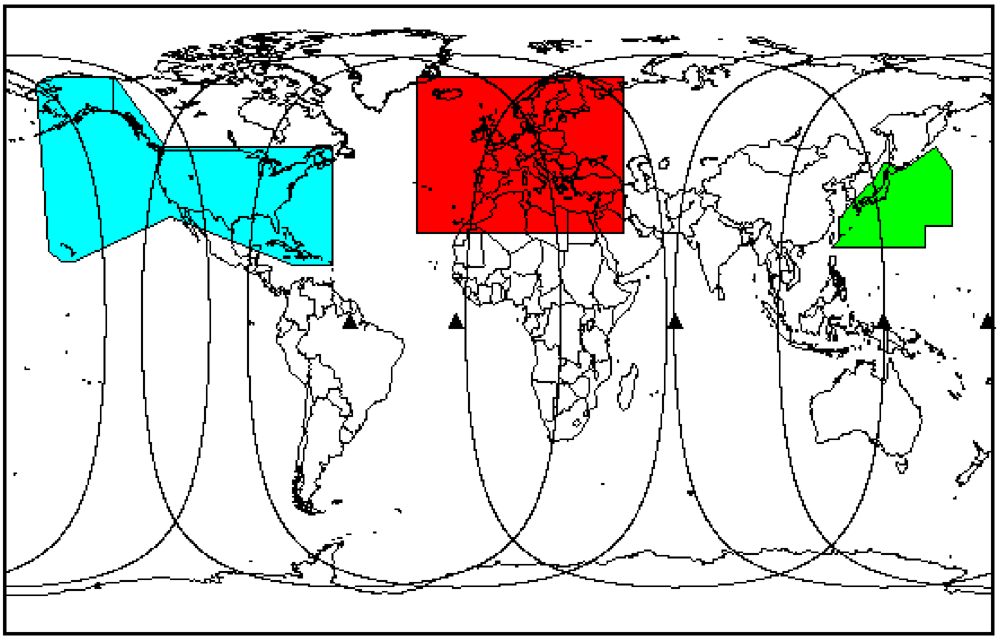

Figure D-1. Initial SBAS coverage areas and service areas

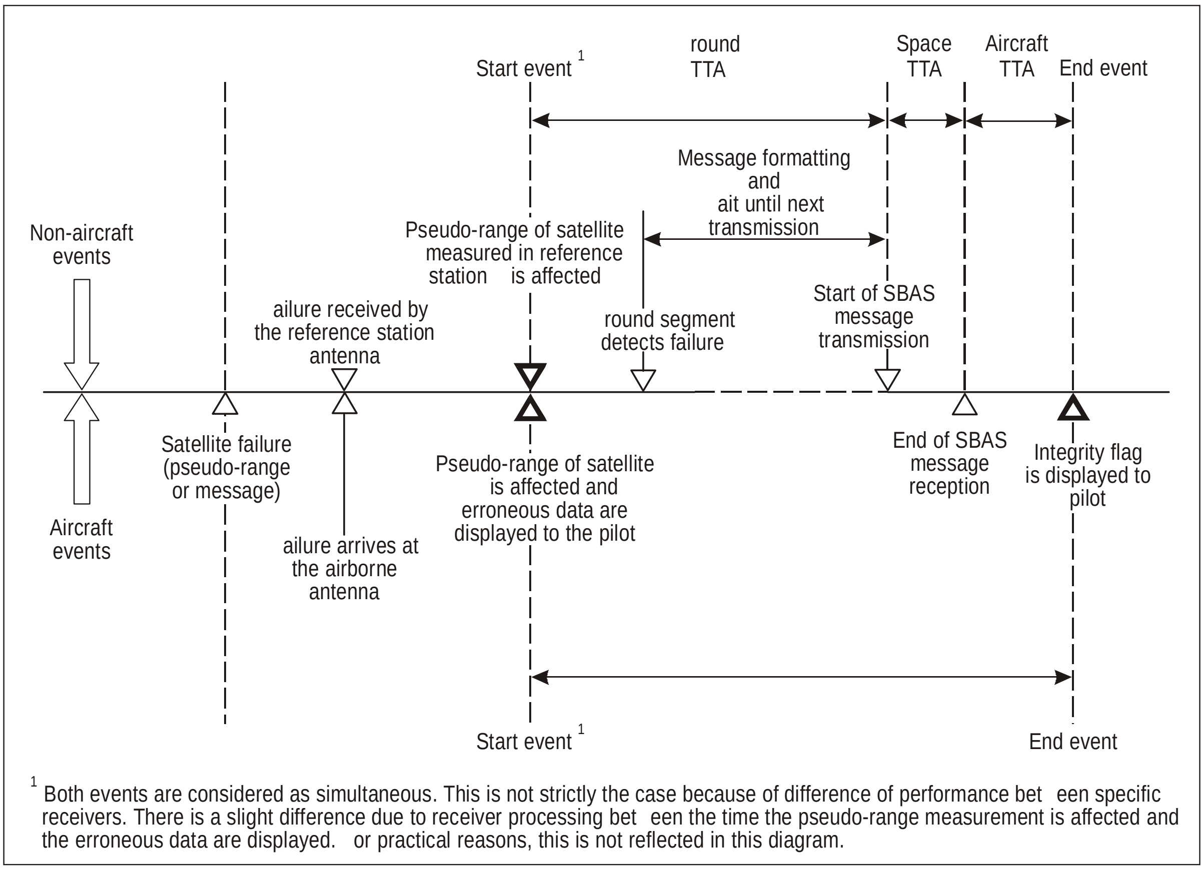

Figure D-2. SBAS time-to-alert

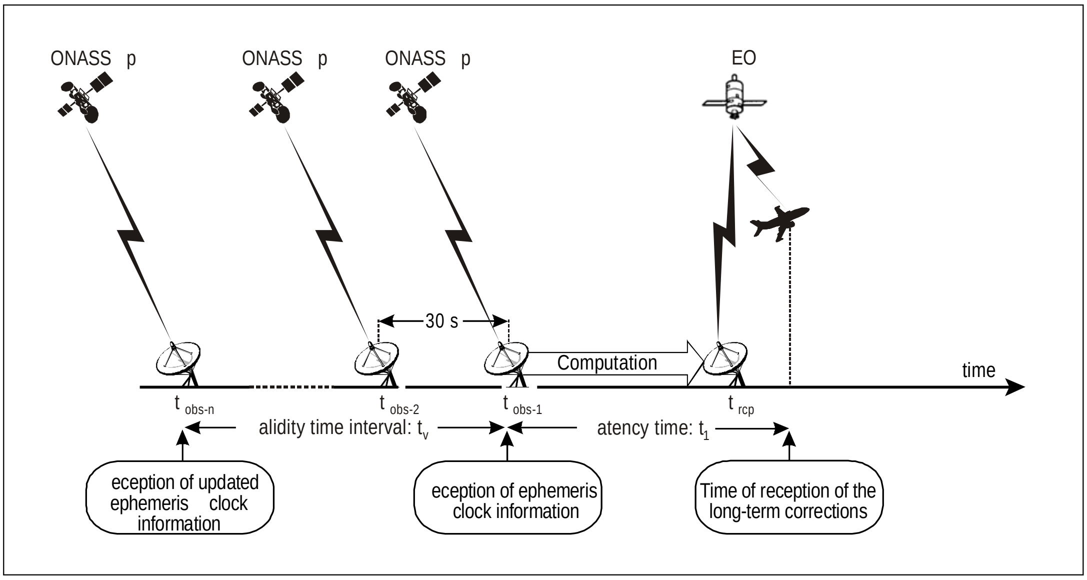

Figure D-3. GLONASS time

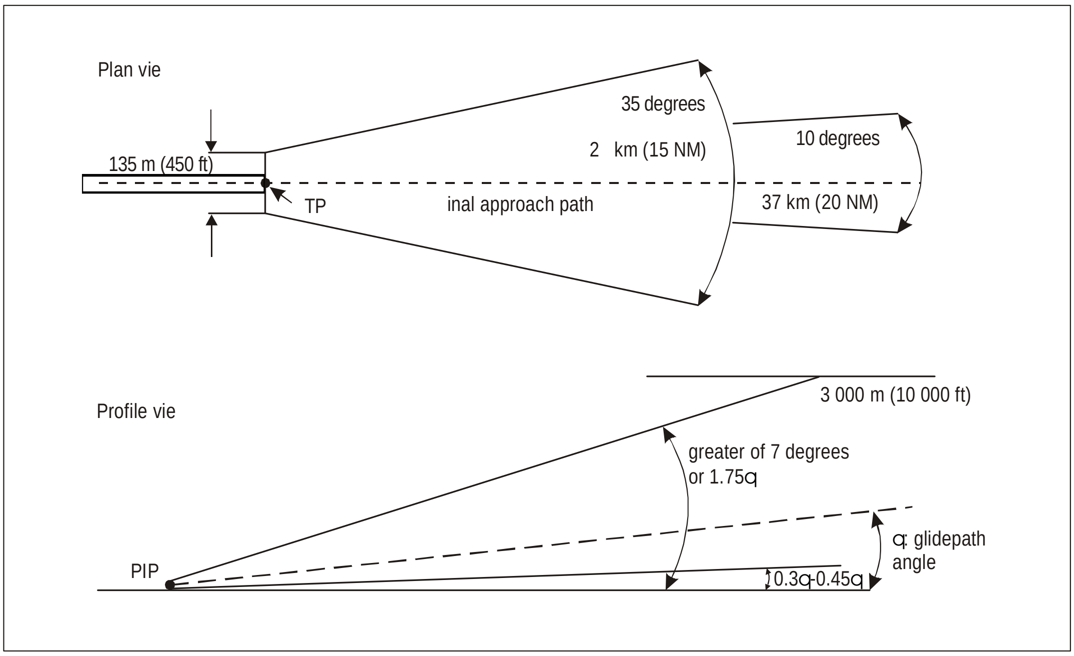

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Figure D-4. Minimum GBAS coverage

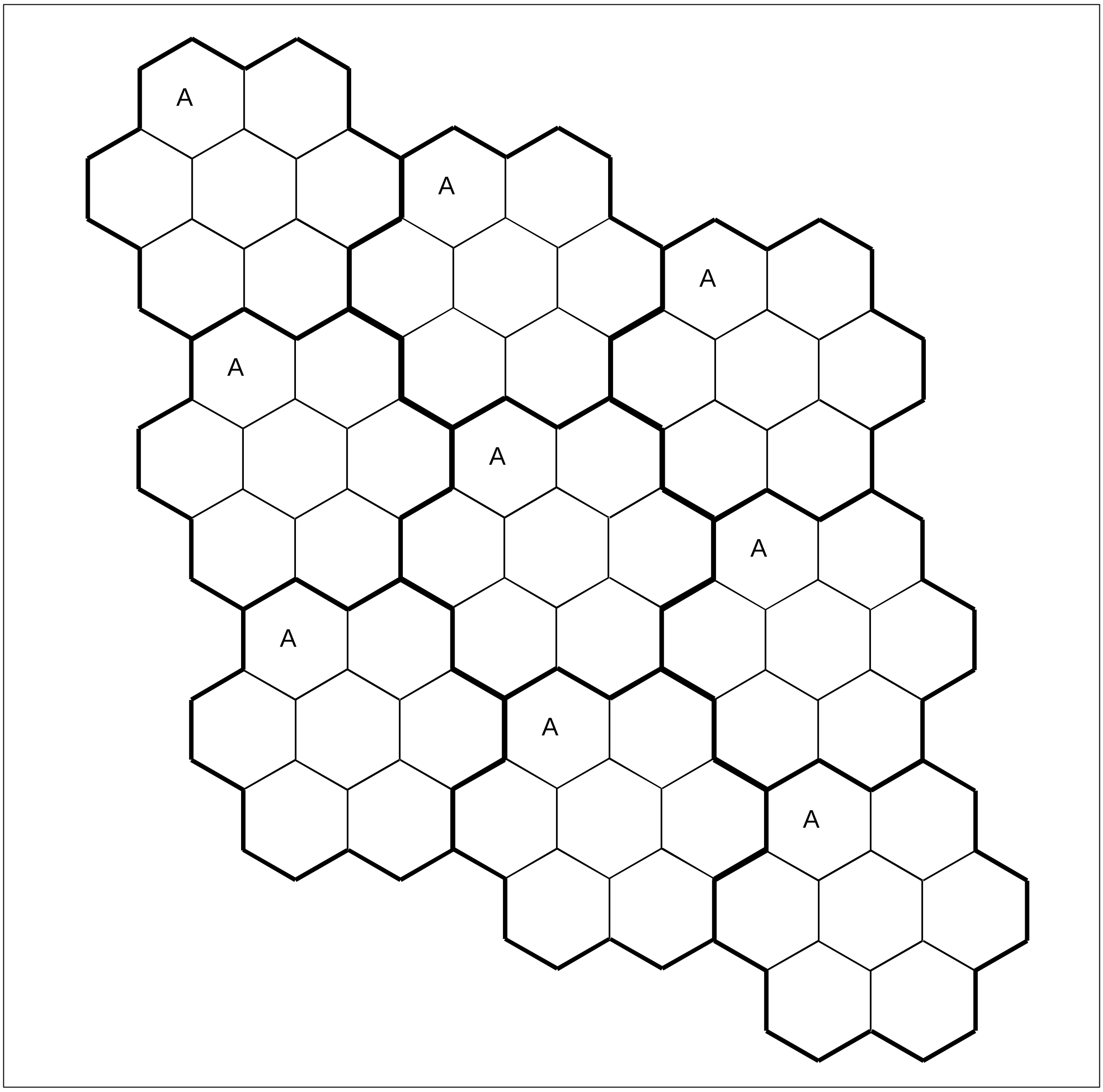

Figure D-4A. Single frequency GRAS VHF networking using multiple time slots

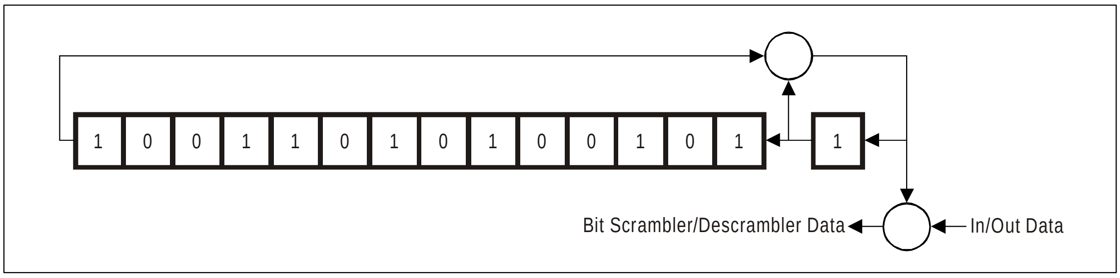

Figure D-5. Bit scrambler/descrambler

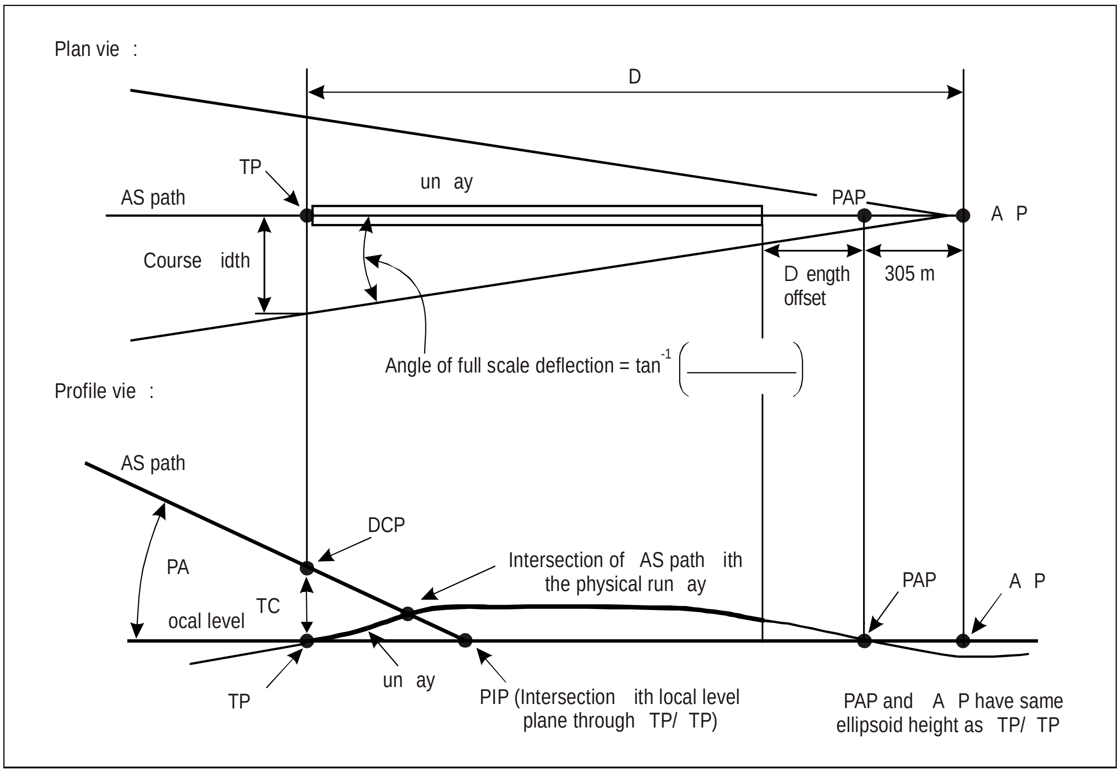

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Figure D-6. FAS path definition

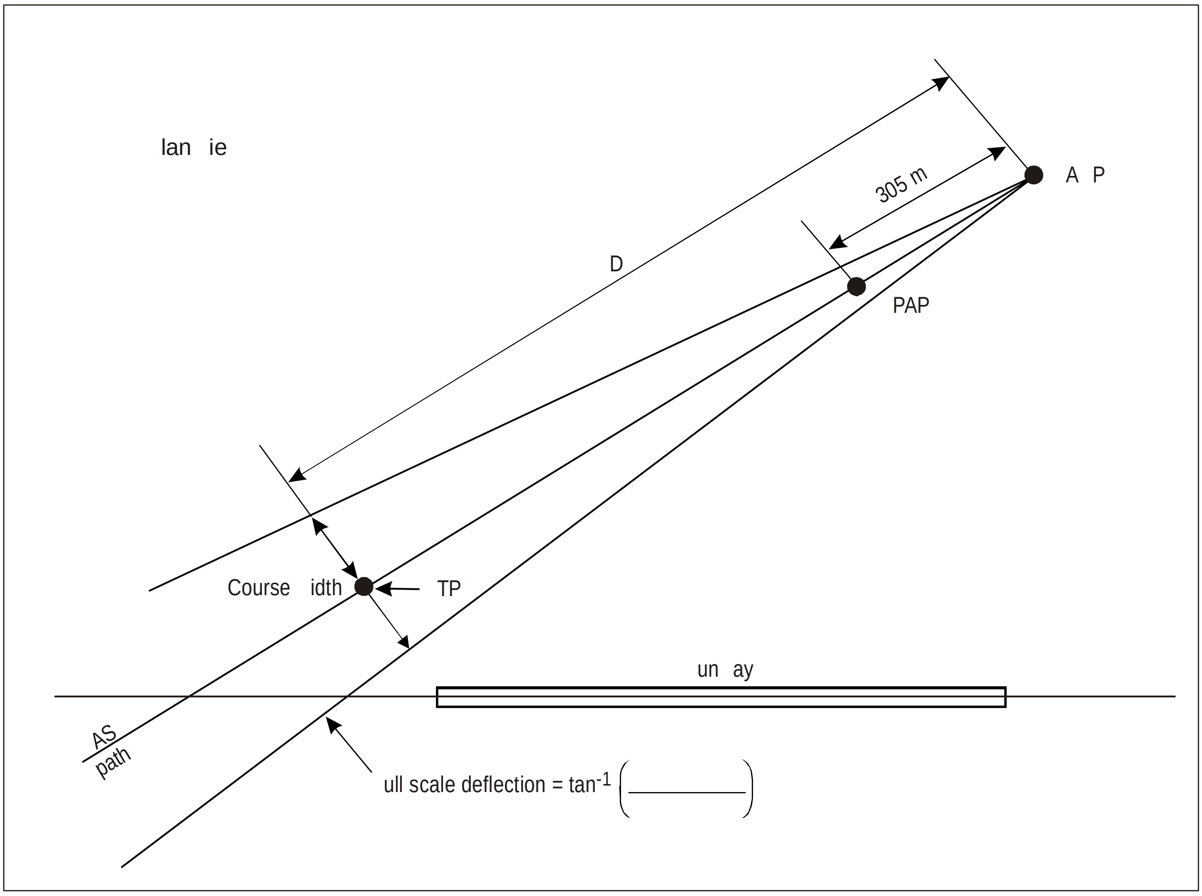

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Figure D-7. FAS path definition for approaches not aligned with the runway

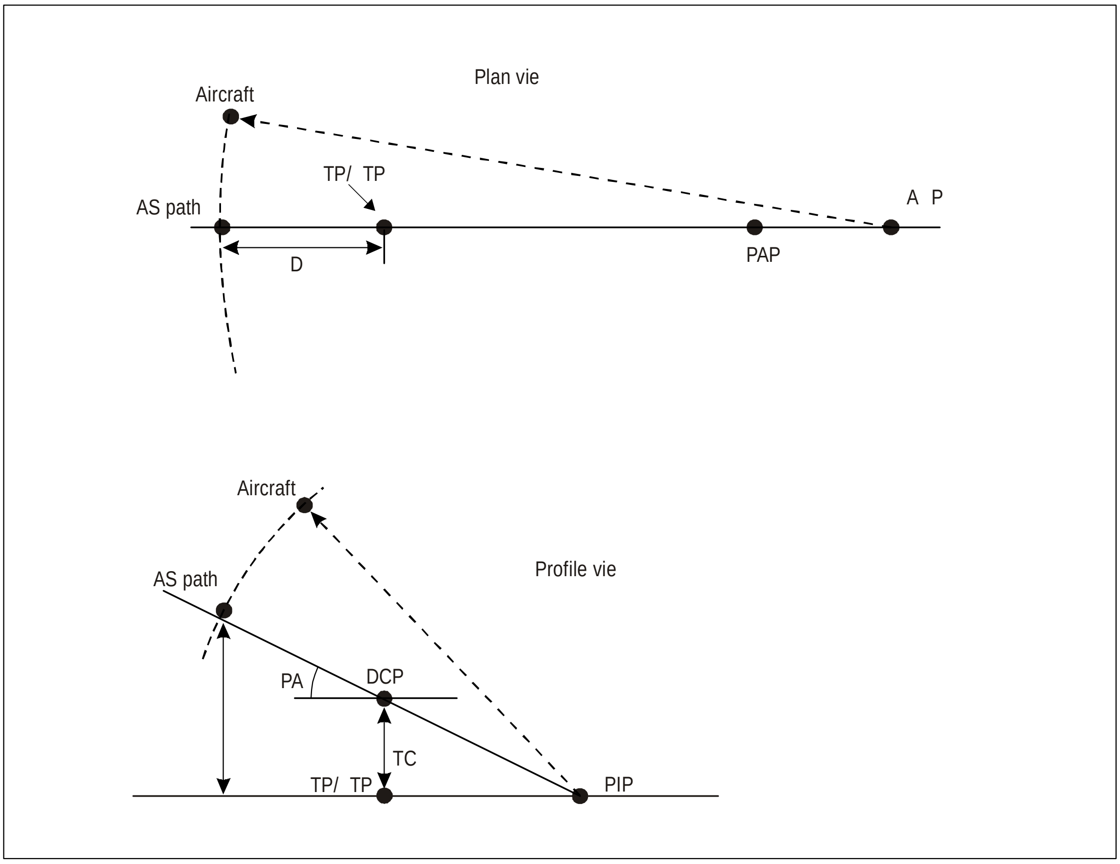

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Figure D-8. Definition of D and H parameters in alert limit computations

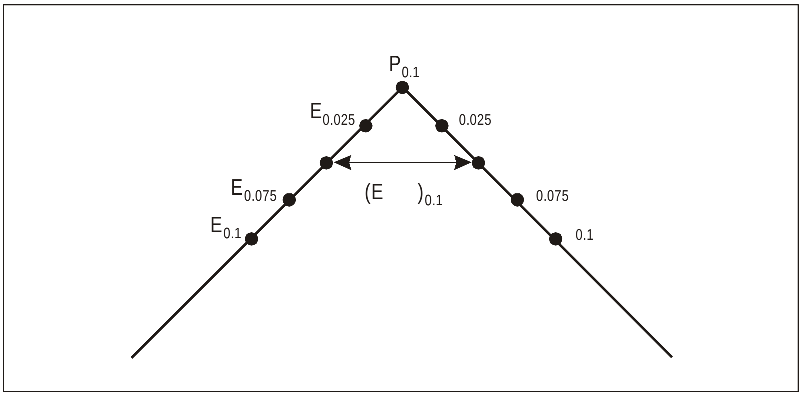


Figure D-9. "Close-in" correlation peak and measured correlator values

ATTACHMENT E. GUIDANCE MATERIAL ON THE PRE-FLIGHT CHECKING OF VOR AIRBORNE E UIPMENT

1. Specification for a VOR airborne equipment test facility (VOT)

1.1 Introduction

For the guidance of States wishing to provide a test signal for the pre-flight checking of VOR airborne equipment, suggested characteristics for a VOR airborne equipment test facility (VOT) are given hereafter.

1.2 General

1.2.1 The VOT must be designed to provide signals that will permit satisfactory operation of a typical VOR aircraft installation in those areas of the aerodrome where pre-flight checking is convenient and desirable.

1.2.2 The VOT must be constructed and adjusted so that the VOR bearing indicator in the aircraft will indicate zero degrees “FROM” when the receiver has not departed from calibration. This indication remains constant irrespective of the aircraft s angular position with respect to the VOT within the intended coverage.

1.2.3 In view of the manner in which use is made of a VOT, there is no fundamental need for its duplication at any one site.

1.2.4 The VOT is required to radiate a radio frequency carrier with which are associated two separate 30 Hz modulations. The characteristics of these modulations should be identical with the reference phase and variable phase signals associated with VOR. The phases of these modulations should be independent of azimuth and should be coincident with each other at all times.

1.3 Radio frequency

The VOT should operate in the band 108 to 117.975 MHz on an appropriate VOR channel selected so as not to interfere with any VHF navigation or communication services. The highest assignable frequency is 117.95 MHz. The frequency tolerance of the radio frequency carrier should be plus or minus 0.005 per cent, except as specified in Chapter 3, 3.3.2.2 and 3.3.2.3.

1.4 Polarization and accuracy

1.4.1 The emission from the VOT should be horizontally polarized.

1.4.2 The accuracy of the “bearing” information conveyed by the radiation from the VOT should be plus or minus 1 degree.

Note.— Since the two modulations on the radio frequency carrier are in phase coincidence at all times, the vestigial vertically polarized energy will have no effect on the accuracy of the facility.

1.5 Coverage

1.5.1 Coverage requirements, and hence the power which must be radiated, will necessarily depend to a considerable extent on local circumstances. For some installations, a small fraction of 1 W will suffice while in other cases, particularly if two or more closely adjacent aerodromes are to be served by a single test facility, several watts of radio frequency energy may need to be emitted.

1.5.2 Where there is a need to protect co-channel VORs, VOTs and ILS localizers from VOT interference, the radio emission must be limited to that required to provide satisfactory operation and to ensure that interference with other co-channel assignments does not occur.

1.6 Modulation

1.6.1 The radio frequency carrier as observed at any point in space should be amplitude modulated by two signals as follows:

a) a subcarrier of 9 960 Hz of constant amplitude, frequency modulated at 30 Hz and having a deviation ratio of 16 plus or minus 1 (i.e. 15 to 17);

b) 30 Hz.

1.6.2 The depth of modulation due to the 9 960 Hz and the 30 Hz signals should be within the limits of 28 per cent for each component.

1.6.3 The signal which frequency modulates the 9 960 Hz subcarrier and the signal which amplitude modulates the radio frequency carrier should both be maintained at 30 Hz within plus or minus 1 per cent.

1.6.4 The frequency of the 9 960 Hz subcarrier should be maintained within plus or minus 1 per cent.

1.6.5 The percentage of amplitude modulation on the 9 960 Hz subcarrier present at the output of the transmitter should not be greater than 5 per cent.

1.7 Identification

1.7.1 The VOT should transmit a 1 020 Hz identification signal. The identification code for a VOT installation should be selected by the competent authority so as to be unmistakably distinctive as to the test function and, if necessary, as to the location.

Note.— In one State, when the VOT coverage is confined to a single aerodrome, the identification consists of a continuous series of dots.

1.7.2 The depth to which the radio frequency carrier is modulated by the identification signal should be approximately 10 per cent.

1.8 Monitoring

1.8.1 Basically, there is no need for continuous automatic monitoring of VOT provided the relative phase of the AM and FM 30 Hz components are mechanically locked and facilities exist for periodic inspection and remote supervision of the state of the VOT.

1.8.2 Provision of automatic monitoring can double the cost of a VOT installation and, consequently, many competent authorities are likely to employ only remote supervision at a control point. However, where, in the light of the operational use to be made of a VOT, a State decides to provide automatic monitoring, the monitor should transmit a warning to a control point and cause a cessation of transmission if either of the following deviations from established conditions arises:

a) a change in excess of 1 degree at the monitor site of the “bearing” information transmitted by the VOT;

b) a reduction of 50 per cent in the signal level of the 9 960 Hz or 30 Hz signals at the monitor.

Failure of the monitor should automatically cause a cessation of transmission.

2. Selection and use of VOR aerodrome check-points

2.1 General

2.1.1 When a VOR is suitably located in relationship to an aerodrome, the pre-flight checking of an aircraft VOR installation can be facilitated by the provision of suitably calibrated and marked check-points at convenient parts of the aerodrome.

2.1.2 In view of the wide variation in circumstances encountered, it is not practicable to establish any standard requirements or practices for the selection of VOR aerodrome check-points. However, States wishing to provide this facility should be guided by the following considerations in selecting the points to be used.

2.2 Siting requirements for check-points

2.2.1 The signal strength of the nearby VOR has to be sufficient to ensure satisfactory operation of a typical aircraft VOR installation. In particular, full flag action (no flag showing) must be ensured.

2.2.2 The check-points should, within the limits of operating convenience, be located away from buildings or other reflecting objects (fixed or moving) which are likely to degrade the accuracy or stability of the VOR signal.

2.2.3 The observed VOR bearing at any selected point should ideally be within plus or minus 1.5 degrees of the bearing accurately determined by survey or chart plotting.

Note.— The figure of plus or minus 1.5 degrees has no direct operational significance in that the observed bearing becomes the published bearing however, where a larger difference is observed, there is some possibility of poor stability.

2.2.4 The VOR information at a selected point should be used operationally only if found to be consistently within plus or minus 2 degrees of the published bearing. The stability of the VOR information at a selected point should be checked periodically with a calibrated receiver to ensure that the plus or minus 2-degree tolerance is satisfied, irrespective of the orientation of the VOR receiving antenna.

Note.— The tolerance of plus or minus 2 degrees relates to the consistency of the information at the selected point and includes a small tolerance for the accuracy of the calibrated VOR receiver used in checking the point. The 2-degree figure does not relate to any figure for acceptance or re ection of an aircraft VOR installation, this being a matter for determination by Administrations and users in the light of the operation to be performed.

2.2.5 Check-points which can satisfy the foregoing requirements should be selected in consultation with the operators concerned. Provision of check-points in holding bays, at runway ends and in maintenance and loading areas, is usually desirable.

2.3 Marking of VOR check-points

Each VOR check-point must be distinctively marked. This marking must include the VOR bearing which a pilot would observe on the aircraft instrument if the VOR installation were operating correctly.

2.4 Use of VOR check-points

The accuracy with which a pilot must position the aircraft with respect to a check-point will depend on the distance from the VOR station. In cases where the VOR is relatively close to a check-point, particular care must be taken to place the aircraft's VOR receiving antenna directly over the check-point.

ATTACHMENT F. GUIDANCE MATERIAL CONCERNING RELIABILITY AND AVAILABILITY OF RADIOCOMMUNICATIONS AND NAVIGATION AIDS

1. Introduction and fundamental concepts

This Attachment is intended to provide guidance material which Member States may find helpful in providing the degree of facility reliability and availability consistent with their operational requirement.

The material in this Attachment is intended for guidance and clarification purposes, and is not to be considered as part of the Standards and Recommended Practices contained in this Annex.

1.1 Definitions

acilit availabilit . The ratio of actual operating time to specified operating time.

acilit failure. Any unanticipated occurrence which gives rise to an operationally significant period during which a facility does not provide service within the specified tolerances.

acilit reliabilit . The probability that the ground installation operates within the specified tolerances.

Note.— This definition refers to the probability that the facility will operate for a specified period of time.

ean time between failures (B). The actual operating time of a facility divided by the total number of failures of the facility during that period of time.

Note.— The operating time is in general chosen so as to include at least five, and preferably more, facility failures in order to give a reasonable measure of confidence in the figure derived.

Si nal reliabilit . The probability that a signal-in-space of specified characteristics is available to the aircraft.

Note.— This definition refers to the probability that the signal is present for a specified period of time.

1.2 Facility reliability

1.2.1 Reliability is achieved by a combination of factors. These factors are variable and may be individually adjusted for an integrated approach that is optimum for, and consistent with, the needs and conditions of a particular environment. For example, one may compensate to some extent for low reliability by providing increased maintenance staffing and/or equipment redundancy. Similarly, low levels of skill among maintenance personnel may be offset by providing equipment of high reliability.

1.2.2 The following formula expresses facility reliability as a percentage:

$$R = 100\ e^{\ t/m}$$

where:

R = reliability (probability that the facility will be operative within the specified tolerances for a time t, also referred to as probability of survival, P_s);

e = base of natural logarithms;

t = time period of interest;

m = mean time between facility failures.

It may be seen that reliability increases as mean time between failures (MTBF) increases. For a high degree of reliability, and for operationally significant values of t, we must have a large MTBF; thus, MTBF is another more convenient way of expressing reliability.

1.2.3 Experimental evidence indicates that the above formula is true for the majority of electronic equipments where the failures follow a Poisson distribution. It will not be applicable during the early life of an equipment when there is a relatively large number of premature failures of individual components; neither will it be true when the equipment is nearing the end of its useful life.

1.2.4 At many facility types utilizing conventional equipment, MTBF values of 1 000 hours or more have been consistently achieved. To indicate the significance of a 1 000-hour MTBF, the corresponding 24-hour reliability is approximately 97.5 per cent (i.e. the likelihood of facility failure during a 24-hour period is about 2.5 per cent).

1.2.5 Figure F-1 shows the probability of facility survival, P_s, after a time period, t, for various values of MTBF.

Note.— It is significant that the probability of surviving a period of time equal to the MTBF is only 0.37 (37 per cent) thus, it is not assumed that the MTBF is a failure-free period.

1.2.6 It may be seen that adjustment of MTBF will produce the desired degree of reliability. Factors which affect MTBF and hence facility reliability are:

a) inherent equipment reliability;

b) degree and type of redundancy;

c) reliability of the serving utilities such as power and telephone or control lines;

d) degree and quality of maintenance;

e) environmental factors such as temperature and humidity.

1.3 Facility availability

1.3.1 Availability, as a percentage, may be expressed in terms of the ratio of actual operating time divided by specified operating time taken over a long period. Symbolically,

$$A = \frac{\text{Actual time operating (100)}}{\text{Specified operating time}}$$

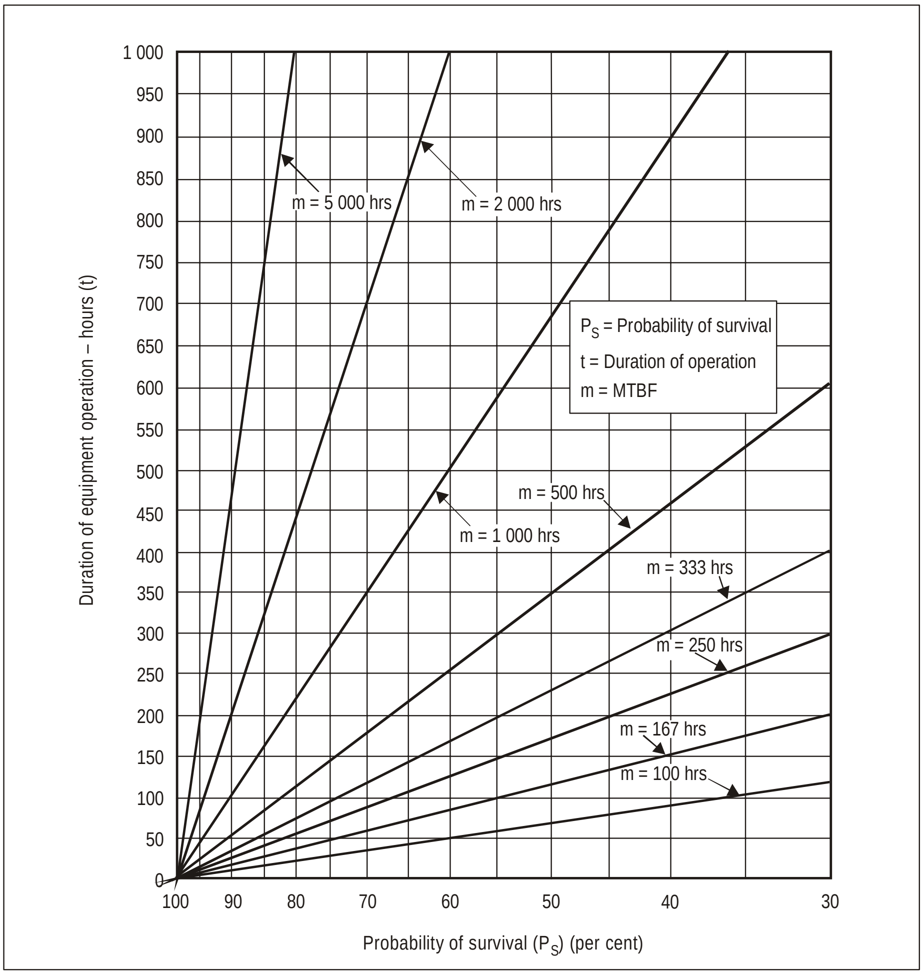


Figure F-1. Plot of $_s$ = 100 *e* $^{t/m}$

For example, if a facility was operating normally for a total of 700 hours during a 720-hour month, the availability for that month would be 97.2 per cent.

1.3.2 Factors important in providing a high degree of facility availability are:

a) facility reliability;

b) quick response of maintenance personnel to failures;

c) adequate training of maintenance personnel;

d) equipment designs providing good component accessibility and maintainability;

e) efficient logistic support;

f) provision of adequate test equipment;

g) standby equipment and/or utilities.

2. Practical aspects of reliability and availability

2.1 Measurement of reliability and availability

2.1.1 *Reliability.* The value that is obtained for MTBF in practice must of necessity be an estimate since the measurement will have to be made over a finite period of time. Measurement of MTBF over finite periods of time will enable Administrations to determine variations in the reliability of their facilities.

2.1.2 *Availability.* This is also important in that it provides an indication of the degree to which a facility (or group of facilities) is available to the users. Availability is directly related to the efficiency achieved in restoring facilities to normal service.

2.1.3 The basic quantities and manner of their measurement are indicated in Figure F-2. This figure is not intended to represent a typical situation which would normally involve a larger number of inoperative periods during the specified operating time. It should also be recognized that to obtain the most meaningful values for reliability and availability the specified operating time over which measurements are made should be as long as practicable.

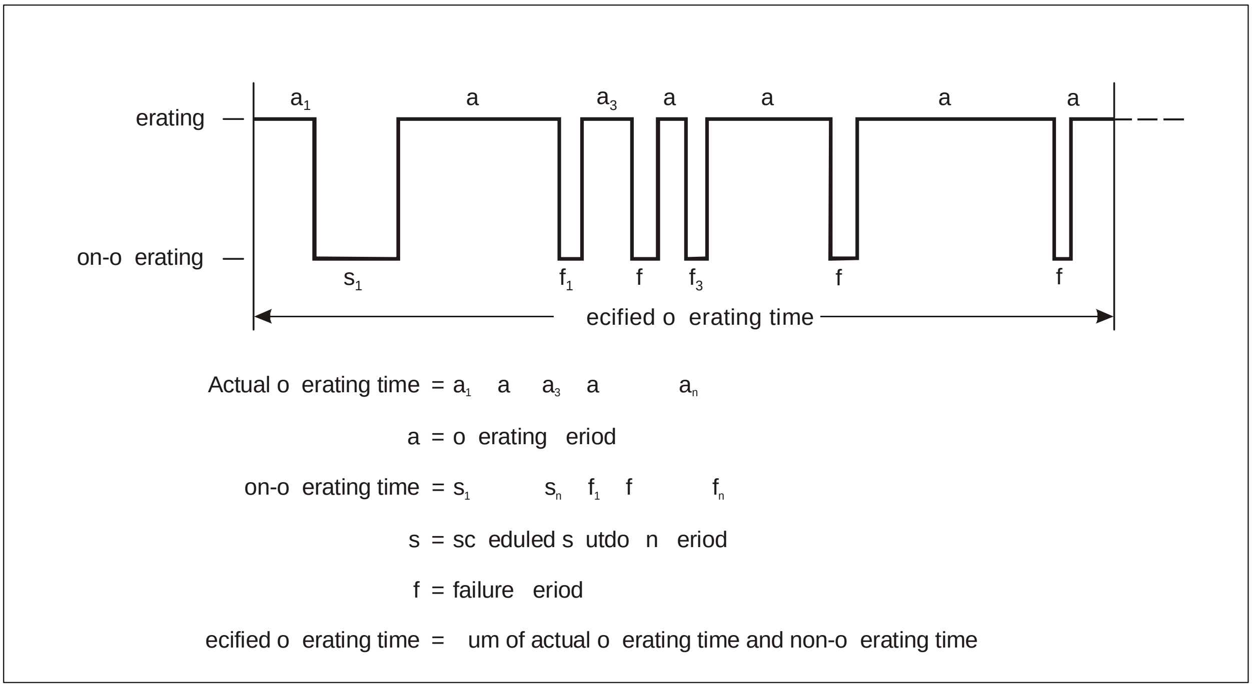


Figure F-2. Evaluation of facility availability and reliability

2.1.4 Using the quantities illustrated in Figure F-2, which includes one scheduled shutdown period and five failure periods, one may calculate mean time between failures (MTBF) and availability (A) as follows:

Let:

$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7$	=	5 540	hours
s_1	=	20	hours
f_1	=	2½	hours
f_2	=	6	hours
f_3	=	3	hours
f_4	=	5	hours
f_5	=	2½	hours
Specified operating time	=	5 580	hours

$$\text{MTBF} = \frac{\text{Actual operating time}}{\text{Number of failures}}$$

$$= \frac{\sum_{i=1}^{7} a_1}{5}$$

$$= \frac{5\,540}{5} = 1\,108 \text{ hours}$$

$$A = \frac{\text{Actual operating time} \times 100}{\text{Specified operating time}}$$

$$= \frac{\sum_{i=1}^{7} a_i \times 100}{\sum_{i=1}^{7} a_i + s_1 + \sum_{i=1}^{5} f_i}$$

$$= \frac{5\,540}{5\,580} \times 100 = 99.3 \text{ per cent}$$

ATTACHMENT G. INFORMATION AND MATERIAL FOR GUIDANCE IN THE APPLICATION OF THE MLS STANDARDS AND RECOMMENDED PRACTICES

1. Definitions
(see also Chapter 3, 3.11.1)

namic side lobe level. The level that is exceeded 3 per cent of the time by the scanning antenna far field radiation pattern exclusive of the main beam as measured at the function scan rate using a 26 kHz beam envelope video filter. The 3 per cent level is determined by the ratio of the side-lobe duration which exceeds the specified level to the total scan duration.

Effective side lobe level. That level of scanning beam side lobe which in a specified multipath environment results in a particular guidance angle error.

S point . A point 2.5 m (8 ft) above the runway centre line and 900 m (3 000 ft) from the threshold in the direction of the azimuth antenna.

S point E. A point 2.5 m (8 ft) above the runway centre line and 600 m (2 000 ft) from the stop end of the runway in the direction of the threshold.

Standard receiver. The airborne receiver model assumed in partitioning the MLS error budgets. The salient characteristics are: (1) signal processing based on the measurement of beam centres; (2) negligible centring error; (3) control motion noise (CMN) less than or equal to the values contained in Chapter 3, 3.11.6.1.1.2; (4) a 26 kHz bandwidth 2-pole low pass beam envelope filter; and (5) angle data output filtering by a single pole, low pass filter with a corner frequency of 10 radians per second.

2. Signal-in-space characteristics — angle and data functions

2.1 Signal format organization

2.1.1 The signal format is based on time-division multiplexing wherein each angle guidance function is transmitted in sequence and all are transmitted on the same radio frequency. The angle information is derived by measuring the time difference between the successive passes of highly directive, unmodulated fan beams. Functions may be transmitted in any order. Recommended time slots are provided for the approach azimuth, approach elevation, flare, and back azimuth angle functions. Preceding each scanning beam and data transmission is a preamble which is radiated throughout the coverage volume by a sector antenna. The preamble identifies the next scan function and also synchronizes the airborne receiver signal processing circuits and logic.

2.1.2 In addition to the angle scan function, there are basic and auxiliary data functions, each with its own preamble, which are also transmitted from the sector antennas. The preamble permits each function to be recognized and processed independently. Consequently, functions can be added to or deleted from the ground configurations without affecting the operation of the receiver. The codes used in the preamble and data functions are modulated by differential phase shift keying (DPSK).

2.1.2.1 *PS data signal characteristics.* The DPSK data are transmitted by differential phase modulation of the radio frequency carrier with relative phase states of 0 or 180 degrees. The DPSK data signal has the following characteristics:

data rate — 15.625 kHz
bit length — 64 microseconds
logic “0” — no phase transition
logic “1” — phase transition

2.1.3 Examples of the angle function organization and timing are shown in Figures G-1 and G-2.* Details and definitions of the data items shown in Figure G-1 are given in Chapter 3, 3.11.4.8.

2.1.4 The sequences of angle guidance and data transmissions shown in Figures G-3A, G-3B and G-3C have been demonstrated to provide sufficient freedom from synchronous interference.

2.1.4.1 The structure of these sequences is intended to provide sufficient randomization to preclude synchronous interference such as may be caused by propeller rotation effects.

2.1.4.2 The sequence pair shown in Figure G-3A accommodates the transmission of all functions. Any function not required may be deleted so long as the remaining functions are transmitted in the designated time positions.

2.1.4.3 The sequence pair shown in Figure G-3B accommodates the high rate approach azimuth function. Any function not required may be deleted so long as the remaining functions are transmitted in the designated time positions.

2.1.4.4 Figure G-3C shows the complete time multiplex transmission cycle which may be composed of the sequence pairs from Figure G-3A or from Figure G-3B. The open time periods between sequences can be used for the transmission of auxiliary data words as indicated. Basic data words also may be transmitted in any open time period.

2.1.4.5 Sufficient time is available in the cycle shown for the transmission of the basic data and the auxiliary data defined in words A1-A4, B1-B39, B40-B45 and B55, provided that data are also transmitted during unused time slots or slots devoted for data words within the sequences.

2.1.4.6 More efficient sequences may be designed by adjusting the timing within the sequences and the inter-sequence gaps to allow the transmission of additional auxiliary data words. Such sequences must be designed to provide equivalent freedom from synchronous interference as the sequences shown in Figures G-3A, G-3B and G-3C. Frequency domain analysis techniques may be utilized to demonstrate that alternative sequences are sufficiently randomized.

2.2 Angle guidance parameters

2.2.1 The angle guidance parameters that define the MLS angle measurement process are specified in Chapter 3, 3.11.4.5. Two additional parameters that are useful in visualizing the operation of the system are the midscan time (T_m) and the pause time. They may be derived from the Chapter 3 specifications and are shown for reference in the following table.

* All figures are located at the end of the Attachment.

Signal format midscan and pause times
(see Figure G-2)

Function	*Midscan[1] time, T_m (s)*	*Pause time (s)*
Approach azimuth	7 972	600
High rate approach azimuth	5 972	600
Back azimuth	5 972	600
Approach elevation	2 518	400
Flare elevation	2 368	800

1 Measured from the receiver reference time (see Appendix A, Table A-1).

2.2.2 *Function timing accuracy.* Because of the inaccuracy in the determination of the reference time of the Barker code, and because the transmitter circuits smooth the phase or amplitude during phase transitions of the DPSK modulation, it is not possible to determine the timing of the signal with an accuracy better than 2 microseconds from the signal-in-space. It is therefore necessary to measure the timing accuracy specified in Chapter 3, 3.11.4.3.4 on the ground equipment. Suitable test points should be provided in the ground equipment.

2.3 Azimuth guidance functions

2.3.1 *Scanning conventions.* Figure G-4 shows the approach azimuth and back azimuth scanning conventions.

2.3.2 *Coverage requirements.* Figures G-5 and G-6 illustrate the azimuth coverage requirements specified in Chapter 3, 3.11.5.2.2.

2.3.2.1 When the approach or back azimuth antenna sites are necessarily offset from the runway centre line, the following factors should be considered:

a) coverage requirements throughout the runway region;

b) accuracy requirements at the applicable reference datum;

c) approach azimuth to back azimuth transition; and

d) potential disturbances due to moving vehicles, aircraft or airport structures.

2.3.2.2 An offset azimuth antenna is normally adjusted such that the zero-degree azimuth is either parallel to the runway centre line or intersects the centre line extended at an operationally preferred point for the intended application. The alignment of the zero-degree azimuth with respect to the runway centre line is transmitted on the auxiliary data.

2.3.3 *igh rate approach azimuth.* Where the approach proportional guidance sector is plus or minus 40 degrees or less, it is possible to use a higher scanning rate for the azimuth function. The high rate approach azimuth function is available to offset the increase in CMN caused by large beamwidth antennas (e.g. 3 degrees). Reducing the CMN provides two benefits: 1) angle guidance signal-in-space power density requirements can be reduced; and 2) dynamic side-lobe level requirements can be relaxed.

2.3.3.1 In general, this function will reduce the CMN caused by wide bandwidth, uncorrelated sources such as diffuse multipath or receiver thermal noise by a factor of $\sqrt{1/3}$ relative to the basic 13 Hz function rate. However, the full reduction of power density by $\sqrt{1/3}$ cannot be realized for all ground antenna beamwidths because of the requirement to provide sufficient power density for signal acquisition on a single scan basis. The power required for DPSK transmissions may be such that no economies are realized in the ground equipment transmitters by using the higher data rate (see Table G-1).*

2.3.3.2 However, with respect to the CMN performance, the full benefit of the increased data rate can be realized. For example, at the minimum signal levels shown in Table G-2, the azimuth CMN can be reduced from 0.10 degree to 0.06 degree for the 1-degree and the 2-degree beamwidth antennas.

2.3.4 *Clearance*

2.3.4.1 Where used, clearance pulses are transmitted adjacent to the scanning beam signals at the edges of proportional guidance sector as shown in the timing diagram in Figure G-7. The proportional guidance sector boundary is established at one beamwidth inside the scan start/stop angles, such that the transition between scanning beam and clearance signals occurs outside the proportional guidance sector. Examples of composite waveforms which may occur during transition are shown in Figure G-8.

2.3.4.2 When clearance guidance is provided in conjunction with a narrow beamwidth (e.g. one degree) scanning antenna, the scanning beam antenna is to radiate for 15 microseconds while stationary at the scan start/stop angles.

2.3.4.3 At some locations it may be difficult to satisfy the amplitude criteria of Chapter 3, 3.11.6.2.5.2, because of clearance signal reflections. At these locations the scan sector may be extended.

2.3.4.4 Care is to be taken with respect to the fly-right/fly-left clearance convention change when approaching azimuth stations in an opposite direction (e.g. approach towards the back azimuth antenna).

2.3.5 *Approach azimuth monitoring.* The intention of monitoring is to guarantee the guidance integrity appropriate for the promulgated approach procedure. It is not intended that all azimuth angles be monitored independently, but that at least one approach azimuth, normally aligned with the extended runway centre line, be monitored and that adequate means be provided to ensure that the performance and integrity of the other azimuth angles are maintained.

2.3.6 *Lower coverage limit determination.* When the threshold is not in line of sight of the approach azimuth antenna, the height of the lower limit of the approach azimuth coverage in the runway region is determined by simulation and/or field measurements. The lower limit of the azimuth coverage to be published is the height above the runway surface that satisfies the accuracy requirements in Chapter 3, 3.11.4.9.4 as determined by field measurements.

2.3.6.1 If operations require coverage below the coverage limits obtainable from 2.3.6, the azimuth antenna can be offset from the runway centre line and moved toward the runway threshold to cover the touchdown region. The airborne installation must use the azimuth guidance, precision distance and siting coordinates of the ground equipment to compute the centre line approach.

2.3.6.2 The landing minima obtainable from a computed centre line approach are, among other things, a function of the combined reliability and integrity of the MLS approach azimuth, DME/P transponder and airborne equipment.

2.4 Elevation guidance functions

2.4.1 *Scanning conventions.* Figure G-9 shows the approach elevation scanning conventions.

* All tables are located at the end of the Attachment.

2.4.2 *Coverage requirements.* Figures G-10A and G-10B illustrate the elevation requirements specified in Chapter 3, 3.11.5.3.2.

2.4.3 *Elevation monitoring.* The intention of monitoring is to guarantee the guidance integrity appropriate for the promulgated approach procedure. It is not intended that all elevation angles be monitored independently, but that at least one, normally the minimum glide path, be monitored, and that adequate means be provided to ensure that the performance and integrity of the other elevation angles are maintained.

2.5 Accuracy

2.5.1 *General*

2.5.1.1 System accuracy is specified in Chapter 3, in terms of the path following error (PFE), path following noise (PFN), and control motion noise (CMN). These parameters are intended to describe the interaction of the angle guidance signal with the aircraft in terms which can be directly related to aircraft guidance errors and the flight control system design.

2.5.1.2 The system PFE is the difference between the airborne receiver angle measurement and the true position angle of the aircraft. The guidance signal is distorted by ground and airborne equipment errors and errors due to propagation effects. To assess the suitability of the signal-in-space for aircraft guidance, these errors are viewed in the pertinent frequency region. The PFE includes the mean course error and the PFN.

2.5.2 *MLS measurement methodology*

2.5.2.1 The PFE, PFN and CMN are evaluated by using the filters defined in Figure G-11. The filter characteristics are based on a wide range of existing aircraft response properties and are considered adequate for foreseeable aircraft designs as well.

2.5.2.2 While the term "PFE" suggests the difference between a desired flight path and the actual flight path taken by an aircraft following the guidance signal, in practice, this error is evaluated by instructing the flight inspection pilot to fly a desired MLS azimuth and recording the difference between the airborne equipment output guidance indication from the PFE filter and the corresponding aircraft position measurement as determined by a suitable position reference. A similar technique using the appropriate filter determines the CMN.

2.5.2.3 *Error evaluation.* The PFE estimates are obtained at the output of the PFE filter (test point A in Figure G-11). The CMN estimates are obtained at the output of the CMN filter (test point B in Figure G-11). Filter corner frequencies are shown in Figure G-11.

2.5.2.3.1 The PFE and CMN for approach azimuth or for back azimuth are evaluated over any 40-second interval of the flight error record taken within the coverage limits (i.e. T = 40 in Figure G-12). The PFE and CMN for approach elevation are evaluated over any 10-second interval of the flight error record taken within the coverage limits (i.e. T = 10 in Figure G-12).

2.5.2.3.2 The 95 per cent probability requirement is interpreted to be met if the PFE or CMN does not exceed the specified error limits for more than 5 per cent of the evaluation interval (see Figure G-12).

2.5.2.3.3 An alternative flight inspection procedure can be used which does not rely on an absolute reference. In this procedure, only the fluctuating components of the flight record produced at the output of the PFE filter are measured and compared with the PFN standard. The average value of the PFE is assumed to not exceed the mean course alignment specified during the flight inspection period. Therefore, the mean course alignment is added to the PFN measurement for comparison with the specified system PFE. The CMN may be similarly evaluated without accounting for the mean course alignment.

2.5.2.4 *Ground and airborne instrumentation errors.* The instrumentation error induced by the ground and airborne equipment may be determined by measurements taken in an environment which is free from reflected signals or other propagation anomalies which can cause beam envelope perturbations.

2.5.2.4.1 First, the instrumentation errors associated with the standard airborne receiver are determined using a bench test instrument, and the centring error is adjusted to zero. Airborne equipment errors can be measured by recording 40 seconds of data using a standard bench test set. The data can then be divided into four 10-second intervals. The average of each interval is considered to be the PFE while twice the square root of its associated variance is the CMN.

Note.— The receiver output may be evaluated using the PFE and CMN filters, if desired.

2.5.2.4.2 Second, this standard receiver is used to measure the total system instrumentation error by operating the ground equipment on an antenna range or in some other reflection-free environment. Since the receiver centring error has been made negligible, the measured PFE can be attributed to the ground equipment. The ground equipment CMN is obtained by subtracting the known standard receiver CMN variance from the CMN variance of the measurement. The average error over a 10-second measurement interval is considered to be the PFE, while twice the square root of the differential variances is considered to be the instrumental CMN.

2.6 Power density

2.6.1 *General*

2.6.1.1 Three criteria establish the angle power budgets:

a) angle single-scan acquisition requires a 14-dB signal-to-noise ratio (SNR) as measured at the beam envelope filter (i.e. the video SNR);

b) the angle CMN must be maintained within specified limits;

c) the DPSK transmissions must have a detection probability at the extremes of coverage of at least 72 per cent.

2.6.1.2 The source of CMN at 37 km (20 NM) is primarily internal receiver thermal noise. The noise induced error ($d\theta$) can be estimated by:

$$d\theta = \frac{\theta_{BW}}{2\left(\sqrt{SNR}\sqrt{g}\right)}$$

$$g = \frac{\text{Function sample rate}}{2\ (\text{Filter noise bandwidth right})}$$

where θ_{BW} is the antenna beamwidth in degrees and g is the ratio of the function sample rate to the noise bandwidth of the receiver output filter. For a single pole filter, the noise bandwidth is $\pi/2$ times the 3 dB bandwidth. This expression reflects the CMN dependence upon ground antenna beamwidth and sample rate.

2.6.2 *System power budget*

2.6.2.1 The system power budget is presented in Table G-1. The power density specified in Chapter 3, 3.11.4.10.1, is related to the signal power specified in Table G-1 at the aircraft antenna by the relation:

Power into isotropic antenna (dBm) =
Power density (dBW/m^2) – 5.5

2.6.2.2 The angle function measurement assumes a 26-kHz beam envelope filter bandwidth. The video (SNR) given in 2.6.1 is related to the intermediate frequency (IF) SNR by:

$$\text{SNR (Video)} = \text{SNR (IF)} +$$

$$+10\log\left[\frac{\text{IF noise bandwidth}}{\text{Video noise bandwidth}}\right]$$

2.6.2.3 The DPSK preamble function analysis assumes: 1) a carrier reconstruction phase lock loop airborne receiver implementation; and 2) that the receiver preamble decoder rejects all preambles which do not satisfy the Barker code or fail the preamble parity check.

2.6.2.4 Items a) through e) in Table G-1 are functions of the aircraft position or weather, and thus have been assumed to be random events. That is, they will simultaneously reach their worst-case values only on rare occasions. Therefore, these losses are viewed as random variables and are root-sum-squared to obtain the loss component.

2.6.2.5 To support autoland operations, power densities higher than those specified for the approach azimuth angle signals in Chapter 3, 3.11.4.10.1 are required at the lower coverage limit above the runway surface to limit the CMN to 0.04 degree. Normally, this additional power density will exist as a natural consequence of using the same transmitter to provide the scanning beam and DPSK signals and considering other power margins such as the available aircraft antenna gain, propagation losses, coverage losses at wide angles and rain losses which can be, at least partially, discounted in the runway region (see Table G-1).

2.6.3 *Airborne power budget*

2.6.3.1 Table G-2 provides an example of an airborne power budget used in developing the power density standards.

2.7 Data applications

2.7.1 *Basic data.* The basic data defined in Chapter 3, 3.11.4.8.2.1 are provided to enable airborne receivers to process scanning beam information for various ground equipment configurations and to adjust outputs so they are meaningful to the pilot or airborne system. Data functions are also used to provide additional information (e.g. station identification and equipment status) to the pilot or airborne system.

2.7.2 *Auxiliary data*

2.7.2.1 The auxiliary data defined in Chapter 3, 3.11.4.8.3.1 and 3.11.4.8.3.2 are provided to digitally uplink the following types of information:

a) *ata describing ground equipment siting geometry.* These are transmitted in words A1-A4 and in some of the words B40-B54.

b) *ata to support MLS/RNAV operations.* These are transmitted in words B1-B39.

c) *Operational information data.* These are transmitted in words B55-B64.

2.7.2.2 The rates of transmission of auxiliary data words are based on the following criteria:

a) Data that are required to be decoded within six seconds upon entering the MLS coverage volume should be transmitted with a maximum time between transmissions of 1 second (see 7.3.3.1.1).

b) Data that are required for an intended operation but are not required to be decoded within six seconds should be transmitted with a maximum time between transmissions of 2 seconds. This rate will allow the generation of a warning upon loss of data within 6 seconds.

c) Operational information data should be transmitted with a maximum time between transmissions of 10 seconds. This will allow the generation of a warning upon loss of data within 30 seconds.

2.7.3 *Application of MLS/RNAV data words B1 through B39*

2.7.3.1 The data contained in auxiliary data words B1-B39 are designed to allow MLS/RNAV operations to be supported utilizing only the data contained within the MLS data words. In order to support computed centre line approaches to both the primary and secondary runways, curved approaches and departures, and missed approaches, these data include information on procedure type (approach or departure), procedure name, runway and way-points.

2.7.3.2 The data transmitted by approach azimuth and back azimuth are segregated. This means, for example, that each will have a separate cyclic redundancy check (CRC) and be decoded independently by the airborne equipment. Data for a given MLS/RNAV procedure are transmitted in the coverage where the procedure begins. Normally this means that approach and missed approach data would be transmitted by approach azimuth and departure data would be transmitted by back azimuth equipment. However, way-points belonging to approaches, missed approaches or departures could be transmitted in either the azimuth or the back azimuth coverage. For example, a departure may be initiated in approach azimuth coverage, therefore that data would be transmitted by approach azimuth. If the procedure begins in a common coverage region the associated data can be transmitted in only one region, except where otherwise dictated by operational requirements.

2.7.3.3 The procedures are defined by a series of way-points. The way-points are specified in a cartesian coordinate system with X, Y and Z coordinates whose origin is at the MLS datum point. The coordinate system is illustrated in Figure G-13.

2.7.3.4 The segments between way-points are either straight or curved. Curved segments are defined as the arc joining two way-points, as illustrated in Figure G-14. The arc of the circle is always tangent to the preceding and following segments, straight or circular. Final approach segments and segments pointing to the initial way-point of an approach procedure or extending from the last flown way-point of a departure or missed approach procedure are always straight. They are extensions to straight segments or tangents to circular segments. These straight segments would not necessarily require a way-point at the edge of the coverage, thus way-points could be saved.

2.7.3.5 For any procedure type the coding starts with the way-point farthest from the threshold and ends with the way-point nearest to the runway. All way-points for approach procedures must be coded before any missed approach way-points or departure way-points. This rule simplifies the decoding by segregating the way-points belonging to the approaches from the others. Several procedures can share one or more way-points. When this is the case it is feasible to transmit this information only once. The shared way-points must be the final ones for approach procedures and the initial ones for missed approach and departure procedures. Approaches, missed approaches and departures can share data provided the data are transmitted in the same coverage sector. When way-points are shared with a procedure previously defined in the database this is indicated by a way-point index following a way-point. The way-point index gives the location in the database of the first shared way-point.

2.7.3.6 The way-point index is the value representing the sequential order in which the way-points are listed in the database. It is used in the coding to indicate where the way-points for a procedure are located. A way-point index of zero in the procedure descriptor indicates that this is a computed centre line application where no way-points are provided.

2.7.3.7 Although way-points are defined by X, Y and Z coordinates, in a variety of cases not all coordinates have to be transmitted. Way-points located on the primary runway centre line have a Y coordinate equal to zero. The corresponding field defining this value can be omitted by setting the "Y coordinate follows" bit to ZERO.

2.7.3.8 Whenever the Z coordinate is not necessary for path construction, data can be saved by not transmitting this value. This is indicated by setting the "Z coordinate follows" bit to ZERO. This may apply to initial way-points preceding the final approach fix where guidance is based on altimetry and not on a computed MLS vertical position. It may also apply to way-points located on a constant gradient between way-points for which the Z value is defined. In this case, the airborne equipment would compute the Z coordinate assuming a constant gradient. Missed approach and departure way-points located in back azimuth coverage are also candidates for deleting the Z coordinate, since vertical guidance is not available. For the back azimuth application, the Z coordinate may be transmitted for use by the airborne equipment to resolve the horizontal position of the aircraft. This allows for a reduction of the lateral errors introduced in the conversion from the slant range and conical back azimuth angle to X-Y coordinates.

2.7.3.9 The 3-bit field following the way-point coordinates contains the next segment/field identifier. This data item indicates whether the next segment of the procedure is straight or curved, whether the current way-point is the last one defined for the procedure, and whether to link the procedure to a missed approach or a shared portion of another procedure identified by a missed approach index or next way-point index. It also indicates whether a data field for threshold crossing height or virtual azimuth to way-point distance is appended to the way-point definition.

2.7.3.9.1 Some typical applications of the identifiers in Appendix A, Table A-17 are listed below. This list is not all inclusive:

a) identifiers 0 and 1 are used when the next way-point in the procedure is not a shared way-point, or is a shared way-point coded for the first time;

b) identifiers 2 and 3 are used to refer to the next way-points in the procedure that are already coded and shared with another procedure. The coding of these way-points is not repeated but the index allows the connection of the procedure to the shared way-points of the other procedure;

c) identifiers 4 and 5 are used in the next-to-last way-point for procedures ending or beginning on the primary runway. The last way-point is the threshold. For this way-point only, the threshold crossing height is specified since the exact location of the threshold with respect to the MLS datum is given in the auxiliary A words. Identifier 4 is used when the MLS/RNAV missed approach guidance is not required, and identifier 5 is used when a "missed approach index" follows;

d) identifiers 6 and 7 are used for the final way-point of any procedure except as noted in c) above. For the primary runway these identifiers are used if there is a need to fully specify the X, Y and Z coordinates of the last way-point. These identifiers are also used for secondary runways and helipads. Identifier 6 is used when no missed approach is following and identifier 7 when a missed approach follows; and

e) identifiers 5 and 7 do not apply to missed approaches and departures.

2.7.3.10 Following the convention for other MLS basic and auxiliary data, all digital data encoded in the database are transmitted with the least significant bit first and the sign bit is transmitted as the most significant bit, with a ONE indicating a negative value. It is noted that the auxiliary data word addresses used to indicate the last approach azimuth database word and the first back azimuth database word are transmitted with the most significant bit first.

2.7.4 *Example application of MLS/RNAV data words*

2.7.4.1 The following paragraphs provide an example of the data assignment process for MLS/RNAV data words contained in auxiliary data words B1-B39. A sample set of approach and departure procedures is provided and the process by which the various way-points and associated procedure characteristics are interpreted and formatted for transmission is described.

2.7.4.2 Table G-3 depicts a set of sample approach, missed approach, and departure procedures for two hypothetical runways. Table G-4 contains way-point data for the sample procedures indicated in Table G-3 and illustrated in Figure G-15.

2.7.4.3 Prior to inserting the procedures data into the structure of B1-B39, the characteristics of the MLS/RNAV data must be understood in order to optimally use the available number of data words. In the data set of Tables G-3 and G-4, the following specific characteristics can be noted: procedures KASEL and NELSO share the same way-points No. 1 (WP 1) and No. 2 (WP 2); procedures KASEL and NELSO link to a missed approach procedure; procedure SEMOR is a secondary runway approach; procedure LAWSO is a departure procedure and will be transmitted in back azimuth coverage; all way-points outside of the precision final approach fix (PFAF) will not require the Z coordinate to be transmitted; the Y coordinate will not have to be transmitted for several way-points that are located on the extended primary runway centre line.

2.7.4.4 Data word B1 specified in Appendix A, Table A-15, defines the structure of the MLS/RNAV data to be transmitted in the approach azimuth coverage sector. This word also contains the approach azimuth CRC code. The number of procedures to be transmitted in the approach azimuth sector is 3. This can be determined from Table G-3. The data word address with the last approach azimuth MLS/RNAV data word is determined after the complete set is inserted into the format. In this case, the address of the last word is B11. The CRC code is calculated as described in Note 3 to Table A-15. Words B42 and B43 are not transmitted so that the relevant bits are set to ZERO. Word A4 is transmitted so that the relevant bit is set to ONE. The coding for data word B1 is shown in Table G-5.

2.7.4.5 Data word B39 specified in Appendix A, Table A-15 defines the structure of the MLS/RNAV data to be transmitted in the back azimuth coverage sector. This word also contains the back azimuth CRC code. The number of procedures to be transmitted in the back azimuth sector is 1. The data word address with the first back azimuth MLS/RNAV data word is determined after the complete set is inserted into the format. In this case the address of the first word is B36. The CRC code is calculated as described in Note 3 to Table A-15. Word B43 is not transmitted so that bit is set to ZERO. The back azimuth map/CRC indicator bit is set to ONE to indicate that this is a map/CRC word. The coding for data word B39 is shown in Table G-5.

2.7.4.6 Procedure descriptor words specified in Appendix A, Table A-15 are defined for all approach and departure procedures. Missed approach procedures are linked to approach procedures in the data format and hence do not require a procedure descriptor. Procedure descriptor words for the sample data set are shown in Table G-6. It is noted that the procedure descriptor data words cannot be fully defined until the completion of the actual assignment of the way-point data due to the need for a "first way-point index" associated with each procedure. This item is the first way-point for the procedure sequence. The index is generated as indicated in 2.7.3.6. It is noted that the "validity indicator" of a procedure name (see Table G-4) is the version number of the procedure and is a value from 1 to 9.

2.7.4.7 The way-point data assignment process is in accordance with Appendix A, Tables A-15, 16 and 17. Table G-7 represents the assignment of the sample data set. The preambles, addresses and parity bits have been left out of the table. Starting with the data word immediately after the approach procedure descriptor words, the first way-point of the first procedure is assigned. For the sample data set, it means that data word B5 is the first word with way-point data. The next step is to insert the data into the appropriate format. The procedures data always commence with the X coordinate of the initial way-point. The structure of the database allows for individual data items to overlap between auxiliary data words. For example, the first 14 bits of the X coordinate of WP 3 of procedure KASEL are transmitted in word B5. The final bit is transmitted in word B6.

2.7.4.7.1 Because of the bit weight of the way-point coordinate least significant bit, the coded way-point coordinate must be rounded. It is desirable to achieve a result as close as possible to the actual way-point coordinate value. Such rounding is normally performed by adding to the actual value half the weight of the LSB then performing integer division on the result. For example, the X coordinate of WP 2 of procedure KASEL is 6 556 m (actual). The coded binary value should be 2 561 since,

$$Integer\left[\frac{\left(|\,6\,556\,| + \dfrac{2.56}{2}\right)}{2.56}\right] = 2\,561$$

For negative numbers the sign bit should be carried through the calculation.

2.7.4.8 After the X coordinate is the "Y coordinate follows" bit. This bit would be set to zero, and the Y coordinate would not be transmitted as shown in Table G-7 for KASEL WP 2 and WP 1. As shown in KASEL WP 3, the Y coordinate is needed and is transmitted after the "Y coordinate follows" bit.

2.7.4.9 Depending on the coding of the "Y coordinate follows" bit, the "Z coordinate follows" bit is coded after the Y coordinate information. For procedure KASEL, WP 4 does not require the Z coordinate since it is prior to the PFAF. The Z coordinate is also not required for WP 2 because there is a constant glide path between WP 3 and WP 1. As shown in KASEL WP 3, the Z coordinate is needed and is transmitted after the "Z coordinate follows" bit.

2.7.4.10 The next segment/field identifier is assigned in accordance with Appendix A, Table A-17. For the identifier following WP 2 in procedure KASEL, the value 5 indicates that the threshold way-point height is transmitted next, followed by the way-point index of the missed approach procedure. For procedure NELSO, since the last two way-points are shared with procedure KASEL the identifier following WP 3 has the value 3, indicating that the index for the next way-point is transmitted next. In this case the index is 3, pointing to WP 2 of procedure KASEL. For the missed approach procedure the identifier is set to 6, indicating that this is the last way-point in the procedure. For secondary runway procedure SEMOR the identifier is also set to 6. In this case, however, it indicates that the virtual azimuth to way-point distance follows.

2.7.4.11 Table G-8 shows the assignment of the departure procedure way-points. The departure data start with word B36, the procedure descriptor. The way-points data begin with word B37. Departure data are assigned using the same method as for the approach data.

2.7.4.12 After the database is completely assigned, the CRC values may be calculated using B1-B39 and the other required data items. Table G-9 shows the results of this calculation for the sample data set including the auxiliary A words, basic word B6, and auxiliary words B40-B41.

2.8 Adjacent channel interference considerations

2.8.1 The standard has been structured such that there is at least a 5-dB margin to account for variations in the effective radiated power above the minimum power density specification. The interference specification is based upon worst-case antenna beamwidth combinations, data rate, and undesired interference synchronization.

3. Ground equipment

3.1 Scanning beam shape

3.1.1 The azimuth scanning beam envelope on the antenna boresight and the elevation scanning beam envelope at the preferred elevation angle, as detected by a standard receiver, has to conform to the limits specified in Figure G-16 under conditions of high SNR and negligible multipath (e.g. during a trial on an antenna range). The –10 dB symmetry relative to accuracy performance is not necessarily expected in the equipment design.

3.2 Scanning beam side lobes

3.2.1 *Performance specification.* The antenna side-lobe design has to satisfy two conditions: 1) the dynamic side-lobe level does not prevent the airborne receiver from acquiring and tracking the main beam. Satisfactory performance cannot be assured if dynamic side lobes persist at levels above –10 dB; 2) the effective side-lobe level is compatible with the system error budget.

3.2.2 The effective side-lobe level (P_{ESL}) is related to the dynamic side-lobe level (P_{DYN}) by:

$$P_{ESL} = \quad \times P_{DYN}$$

where   is a reduction factor which depends upon the antenna implementation. The reduction factor may be dependent upon:

a) a directive antenna element pattern which reduces the multipath signal level relative to the coverage volume;

b) the degree of randomness in the dynamic side lobes.

Note.— The dynamic side lobes are of least concern, if the measured dynamic side-lobe levels are less than the specified effective side-lobe levels.

3.2.3 Lateral multipath reflections from the azimuth antenna side lobes and ground multipath reflections from elevation antenna side lobes can perturb the main beam and induce angular errors. To ensure that the error dv generated by the antenna side lobes is within the propagation error budgets, the required effective side-lobe level ESL can be estimated using:

$$P_{ESL} = \frac{\mathrm{d}\theta}{\theta_{BW} P_R P_{MA}}$$

where P_R is the multipath obstacle reflection coefficient, θ_{BW} is the ground antenna beamwidth and P_{MA} is the motion averaging factor.

3.2.4 The motion averaging factor depends on the specific multipath geometry, the aircraft velocity, the function data rate and the output filter bandwidth. For combinations of multipath geometry and aircraft velocity such that the multipath scalloping frequency is greater than 1.6 Hz, the motion factor is:

$$P_{MA} = \sqrt{\frac{2\ (\text{output filter noise bandwidth})}{\text{Function data rate}}}$$

3.2.5 This factor can be further reduced at higher multipath scalloping frequencies where the multipath-induced beam distortions are uncorrelated within the time interval between the TO and FRO scans.

3.3 Approach elevation antenna pattern

3.3.1 If required to limit multipath effects, the horizontal radiation pattern of the approach elevation antenna gradually de-emphasizes the signal away from the antenna boresight. Typically the horizontal pattern of the approach elevation antenna is to be reduced by 3 dB at 20 degrees off the boresight and by 6 dB at 40 degrees. Depending on the actual multipath conditions, the horizontal radiation pattern may require more or less de-emphasis.

3.4 Approach/back azimuth channels

3.4.1 When a runway has MLS installed for both approach directions, the equipment not in use for the approach may be operated as a back azimuth. If it is desired to assign different channels to each runway direction, necessarily the azimuth units will be operated on different frequencies depending on the mode of operation — approach or back azimuth. Care must be taken in the channel assignments so that the two frequencies are close enough to avoid any mechanical adjustment of the azimuth antenna vertical pattern when the approach direction is reversed.

3.4.2 The frequency separation should be limited such that the loss in pattern gain for back azimuth (from the optimum approach value) can be accommodated by the transmitter power margins shown in Table G-1 for the back azimuth function.

4. Siting considerations

4.1 MLS/ILS collocation

4.1.1 *MLS elevation antenna*

4.1.1.1 *Introduction*

4.1.1.1.1 When collocating an MLS elevation antenna with an ILS glide path, a series of decisions will have to be made to determine an elevation antenna location. Siting criteria have been developed based on minimizing the effects of MLS elevation equipment on the ILS glide path signal. This criteria along with signal-in-space, operational, critical areas, and obstacle clearance considerations will influence the final location of the elevation antenna.

4.1.1.1.2 The purpose is to start with a general region for siting the elevation antenna and then to reduce this region to an optimum location for a particular facility. This goal is achieved by stepping through a series of factors and considerations. This decision-making process is shown as a logic flow diagram in Figure G-17. These guidelines are not intended to be an all-inclusive MLS siting manual, but only to provide additional guidance when MLS collocation with ILS is required.

4.1.1.1.3 Referring to Figure G-17, the section number corresponds to one of the three siting geometries, that is 4.1.1.2 for “siting the elevation antenna between the glide path and runway”, etc. The numbers in each block reference the specific paragraph in the supporting text for Figure G-17. This paragraph provides a more detailed description of the factor(s) to be considered for that step.

4.1.1.1.4 The two general regions for siting the elevation antenna are shown in Figure G-18. Depending on the location of the glide path, either one region or the other may not exist. In addition, these regions must already satisfy signal-in-space criteria prior to their consideration.

4.1.1.2 *Siting the elevation antenna between the glide path and the runway*

4.1.1.2.1 The setback for the elevation antenna is dependent upon the MLS approach reference datum (ARD) height. The MLS ARD must satisfy the criteria stated in Chapter 3, 3.11.4.9.1. The elevation antenna setback can be determined by the equation (see Figure G-19):

$$SB = \frac{AR \quad - RPC}{\tan\theta} \geq \frac{15 - RPC}{\tan\theta}$$

Where:

all distances are in metres;

SB is the setback distance of the elevation antenna phase centre from the runway threshold, parallel to the runway centre line;

RPCH is the relative phase centre height of the elevation antenna compared to the runway surface at threshold. (This includes the elevation antenna phase centre height and the difference in terrain elevation between the threshold and the elevation antenna site.);

ARDH is the desired MLS approach reference datum height; and

θ is the minimum glide path.

4.1.1.2.2 The conical coordinate system of the elevation antenna and its offset from centre line will cause the minimum glide path elevation guidance to be above the approach reference datum. Considering the recommendation of Chapter 3, 3.11.5.3.5.2.2 this offset should be limited by the following equation:

$$(OS)^2 + (SB)^2 \le \left[\frac{(18 - RPC\quad)}{\tan\theta}\right]^2$$

Where:

all distances are in metres; and

OS is the offset distance between the elevation antenna phase centre and the vertical plane containing the runway centre line (see Figure G-19).

4.1.1.2.3 Furthermore, the MLS ARD should be coincident with the ILS reference datum within one metre as stated in Chapter 3, 3.11.5.3.5.3. This is given in the following equation:

$$\frac{R\qquad -1 - RPC}{\tan\theta} \le SB \le \frac{R\qquad +1 - RPC}{\tan\theta}$$

Where:

all distances are in metres; and

RDH is the height of the ILS reference datum.

4.1.1.2.4 To determine the diagonal boundary for Region 1 of Figure G-18 two factors need to be considered. The first factor is that the elevation antenna must not penetrate the region through which the Fresnel zone for the ILS glide path migrates during an approach. In general, this requirement can be achieved by siting the elevation antenna to the runway side of the diagonal line between the glide path antenna mast and the runway centre line at threshold. The value for φ in Figure G-18 is dependent on the location of the glide path antenna mast relative to centre line at threshold. The second factor is to minimize lateral penetration of the glide path antenna pattern (see 4.1.1.3.2). However, for this elevation antenna region satisfying the second factor is preferable but not essential.

4.1.1.2.5 After determining the acceptable range of elevation antenna locations based on the above criteria, the minimum elevation antenna offset is determined by the obstacle limitation requirements in Annex 14, Chapter 4.

4.1.1.2.6 When possible the elevation antenna location is to be adjusted to minimize the effects of the elevation antenna critical area on flight operations. Furthermore, it may be desirable to choose the elevation antenna location in a way which maximizes the union of the MLS elevation critical area and the ILS glide path critical area. This union will minimize any enlargement of the combined critical areas. Due to the necessity to site the elevation antenna in front of the glide path, the elevation antenna will normally have to be sited in the glide path critical area. For elevation antenna critical areas see Section 4.3. For a description of the glide path critical area see Attachment C, Section 2.1.10.

4.1.1.2.7 Once the site for the elevation antenna has been identified, a location for the elevation antenna monitor must be found. The elevation signal is to be monitored as stated in 2.4.3. The height of the elevation field monitor is dependent on the use of integral monitoring of the minimum glide path and obstacle clearance criteria. The following considerations may be helpful in determining a monitor location:

a) It is desirable to have the field monitor as close to the far field as practical to minimize near field effects on the monitor. However, this distance is to be limited to avoid false alarms due to vehicle and aircraft traffic between the field monitor and the antenna.

b) It is desirable to minimize blockage and distortion of the elevation signal by the monitor in the final approach region. This may be achieved if the monitor location is offset up to 30 degrees from the elevation antenna boresight and at distances from 40 m (130 ft) to 80 m (260 ft) depending on particular equipment designs.

c) The field monitor offset from the antenna boresight is to be limited to maintain the appropriate monitor sensitivity to mechanical stability. It is not intended that the field monitor offset will exceed 30 degrees from the elevation antenna boresight.

d) The elevation field monitor is to be sited to avoid affecting, or being affected by, the ILS glide path field monitor.

4.1.1.3 *Siting the elevation antenna at a greater offset than the glide path*

4.1.1.3.1 When siting the elevation antenna at offsets of 130 m (430 ft) to 180 m (590 ft) from runway centre line, the conical effect on the achieved approach reference datum height becomes more prominent. Depending on the facility, the elevation antenna setback may have to be adjusted to satisfy the criteria discussed in 4.1.1.2.1, 4.1.1.2.2 and 4.1.1.2.3.

4.1.1.3.2 When siting the elevation antenna at an offset from runway centre line greater than that of the resident glide path, the elevation antenna should not penetrate the lateral pattern of the glide path. The value of Φ in Figure G-18 is dependent on the type of glide path antenna present and the physical characteristics of the elevation equipment. In general, "Φ" denotes the –10 dB point in the glide path antenna lateral pattern. The –10 dB value may be relaxed to –4 dB, particularly for capture-effect glide path antennas, subject to verification of glide path signal quality.

4.1.1.3.3 After determining the acceptable range of elevation antenna locations based on the above criteria, this location may have to be bounded further to satisfy obstacle limitation requirements in Annex 14, particularly taxiway-to-obstacle separation criteria.

4.1.1.4 *Alternatives*

4.1.1.4.1 If collocation of the elevation antenna with the glide path cannot readily be achieved, an alternative is to site the elevation antenna on the opposite side of the runway.

4.1.2 *MLS azimuth antenna*

4.1.2.1 *Introduction*

4.1.2.1.1 When collocating the MLS azimuth antenna with the ILS localizer, one will have to make a series of decisions which will determine the azimuth antenna location. Siting criteria have been developed based on minimizing the effects of the MLS azimuth antenna equipment on the ILS localizer signal and vice versa. The criteria developed along with signal-in-space, operation, critical areas, and obstacle clearance considerations will influence the final location of the azimuth antenna. Since the presence of a humped runway or approach lighting system may require an increase in the azimuth antenna phase centre height (PCH), these factors must be considered when applying any of the following criteria.

4.1.2.1.2 The purpose is to start with a general region for siting the azimuth antenna and then reduce this region to an optimum location for a particular facility. This goal is achieved by stepping through a list of considerations shown as a logic flow diagram in Figure G-20.

4.1.2.1.3 Referring to Figure G-20, the section numbers refer to one of the four siting geometries (i.e. 4.1.2.2 corresponds to “azimuth antenna sited ahead of the localizer antenna”, etc.). The numbers in each box reference a specific paragraph in the supporting text for Figure G-20. This paragraph provides a more detailed description of the factors to be considered for that step.

4.1.2.1.4 The general regions for siting the azimuth antenna are shown in Figure G-21.

4.1.2.2 *Azimuth antenna sited ahead of localizer antenna*

4.1.2.2.1 The azimuth antenna is to be symmetrically sited on the localizer course line at least 30 m (100 ft) ahead of the localizer antenna array. The limit for the maximum distance (variable “X” in Figure G-21) is determined by the requirement to satisfy the obstacle limitation requirements set forth in Annex 14 for both the azimuth antenna structure and azimuth monitor. This is the preferred location for the azimuth antenna. However, factors such as the presence of a localizer near field monitor may require the location of the azimuth antenna to be modified. The azimuth antenna cannot be sited such that it blocks line-of-sight between the localizer antenna and the localizer field monitor. Due to line-of-sight blockage of the ILS ground check point by the azimuth station, the ILS ground check points may have to be reassessed.

4.1.2.2.2 It is desirable to collocate the DME/P antenna with azimuth antenna whenever possible. However, if the DME/P antenna cannot be collocated with the azimuth antenna due to violation of obstacle limitation requirements, one may consider an offset DME/P site or selecting an alternate collocation configuration (see Attachment C, Section 7.1.6 and Section 5 below).

4.1.2.2.3 When possible, the azimuth antenna location can be adjusted to minimize the effect of the azimuth antenna critical area on flight operations. In addition, it may be desirable to maximize the union of azimuth and localizer critical areas. Due to the necessity to collocate the azimuth antenna in close proximity to the localizer antenna, normally one of the antennas will have to be sited in the critical area of the other antenna. For the azimuth antenna critical area, see 4.3. For the localizer critical areas see Attachment C, Section 2.1.10.

4.1.2.2.4 After a suitable site for the azimuth antenna has been determined, a location for the azimuth antenna field monitor must be found. The azimuth antenna should be monitored as stated in 2.3.5. The preferred location for the field monitor is on the extended runway centre line. However, the monitor pole can be a source of azimuth signal degradation. Therefore, if this monitor location causes unacceptable signal degradation or unsatisfactory monitoring capabilities due to the presence of light lane structures, ILS localizer, etc., an alternate field monitor location may be desirable. This second procedure is only recommended if integral monitoring of the approach radial is available. The following considerations may be helpful in determining a monitor location:

a) It is desirable to have the field monitor as close to the far field as practical to minimize near field effects on the monitor. However, this distance should be limited to avoid false alarms due to vehicle and aircraft traffic between the monitor and azimuth antenna.

b) It is desirable to minimize blockage and distortion of the azimuth signal by the field monitor in the final approach region. The field monitor should be sited as far below the azimuth antenna phase centre as practical.

c) The field monitor offset from the antenna boresight should be limited to maintain the appropriate monitor sensitivity to mechanical stability.

d) The azimuth antenna field monitor should be sited to avoid affecting, or being affected by, the localizer monitor.

4.1.2.3 *Azimuth antenna sited behind ILS localizer*

4.1.2.3.1 The distance between the localizer and the MLS azimuth antenna will depend on obstacle limitation requirements, availability of real estate, presence of a localizer back course, and the desirability of collocating the DME/P antenna with the azimuth antenna. If a localizer back course is being utilized, a distance of at least 30 m (100 ft) between the azimuth and localizer antennas is preferred, and the azimuth antenna must be symmetrically sited on the localizer course centre line. For localizer antennas with a high front-to-back power ratio, it may be possible to reduce the 30 m (100 ft) separation. Once the distance between the azimuth and localizer antennas is known, Figure G-22 can be used to determine the height of the azimuth antenna phase centre relative to the localizer antenna array. To ensure that the azimuth guidance errors due to signal scattering by the ILS localizer remain insignificant (≤0.03 degree) throughout the azimuth coverage volume, point "W" (Figure G-22) is typically selected to determine the value for variable "X" of Figure G-22. If selection of that point results in an azimuth antenna siting which violates obstacle clearance requirements or a tower-mounted installation that is not feasible, the following actions may be considered:

a) knowing the specific localizer and azimuth equipment involved, an analysis may be performed to determine the height of the azimuth antenna phase centre. Generally, it is recommended that the azimuth antenna phase centre height be selected so that the errors due to signal scattering from the localizer are limited to 0.03 degree. However, that allocation may be increased after considering the contribution from other error sources such as ground and airborne equipment errors, side lobe reflections from buildings, ground reflections, and errors due to interfering aircraft (see Table G-10); and

b) a point on the line $W – W_N$ (Figure G-22) may be selected to determine the value for variable "X". It is preferred that the point selected be as close to point "W" as practical and it must be operationally acceptable for the procedure concerned. Since the error allocation used in the development of this criteria represents a small portion of the total propagation error budget, the azimuth signal might meet the accuracy requirement even below the plane which contains the point selected and the azimuth antenna phase centre. The point to which acceptable azimuth signal exists along the minimum glide path angle may be determined by flight measurements.

4.1.2.3.2 If a localizer near field monitor is present on the extended runway centre line, adjustment of the azimuth antenna phase centre height (PCH) or the localizer monitor height may be required to minimize the effects of the localizer monitor pole on the azimuth signal. However, it is expected that as long as the monitor pole is at or lower than the localizer antenna element height no further adjustment due to the presence of the monitor pole will be required.

4.1.2.4 *Integrated azimuth and localizer configuration*

4.1.2.4.1 *Azimuth antenna integrated under the localizer array*

4.1.2.4.1.1 The first consideration for this configuration is to determine the height of the obstacle clearance surface at the localizer array. The vertical distance between the ground and the obstacle clearance surface at this point should be at least equal to the azimuth antenna height, including the pedestal, plus the required vertical spacing between the top of the azimuth antenna and the localizer antenna element. If this condition is not observed an alternate collocation configuration has to be considered.

4.1.2.4.1.2 Experimental results, from a 24-element log-period localizer, indicate that the vertical spacing between the top of the azimuth antenna and the bottom of the localizer antenna elements has to be at least 0.5 m (1.6 ft) with a spacing of greater than 0.7 m (2.3 ft) being preferred. For localizers with elements having relatively higher coupling, increased vertical spacing is preferred.

4.1.2.4.2 *Azimuth antenna integrated within the localizer array*

4.1.2.4.2.1 For this configuration it may not be necessary to consider the height of the obstacle clearance surface since the azimuth antenna is usually lower than the existing localizer antenna. When integrating the azimuth antenna, some modifications at the localizer antenna are required which may influence the localizer signal-in-space. However, effects depend very much on the type of localizer.

4.1.2.4.2.2 Experimental results, from a two-frequency localizer using dipole antennas, indicate that it is possible to compensate these effects by minor on-site modifications at the localizer antenna. The feasibility of this integrated configuration has to be confirmed for each type of localizer.

4.1.2.4.3 If an ILS near field monitor is present, it is necessary to determine the increase in azimuth antenna phase centre height or decrease in the localizer monitor height required to minimize the effects of the monitor pole on the azimuth signal. In general, satisfactory results may be obtained by siting the azimuth antenna phase centre approximately 0.3 m (1 ft) above the monitor pole. This value is dependent on the localizer monitor design and location.

4.1.2.5 *Offset azimuth*

4.1.2.5.1 At some sites where ILS and MLS are to be collocated, it may be found impossible because of physical restrictions to locate the MLS azimuth antenna in front of or back of the ILS localizer antenna or to integrate it with the ILS localizer antenna. At those sites an advantageous solution could be to offset the MLS and DME/P antennas. The siting information contained in auxiliary data would enable computation in the aircraft of an MLS centre line approach.

4.1.2.5.2 For this collocation configuration, the preferred siting is with the azimuth antenna radome in the localizer array plane (Area 1 of Figure G-21). A minimum distance of 3 m (10 ft) between the azimuth equipment and the localizer array (end element) is preferable.

4.1.2.5.3 If siting the azimuth antenna abeam the localizer is not practical, the azimuth antenna may be sited behind the localizer array plane (Area 2 of Figure G-21). The azimuth antenna offset has to provide at least a 3 m (10 ft) distance and prohibit penetration of the azimuth proportional guidance region by the localizer array.

4.1.2.5.4 If siting the azimuth antenna ahead of the localizer array plane is required, degradation of the localizer signal may result. The region where the least effect of the azimuth equipment on the localizer signal is expected is shown in Area 3 of Figure G-21. The azimuth antenna location can be verified using an azimuth equipment mock-up.

4.2 MLS siting within an approach lighting system

4.2.1 The presence of an approach lighting system serving the opposite end approach will affect the siting of an MLS azimuth antenna. Factors to be considered in proper siting are coverage requirements (see 2.3.2), the need to avoid visual blockage of lights, obstacle limitation requirements, and azimuth signal multipath from the light structures.

4.2.2 These criteria are applicable for typical installations where the approach lights are mounted at essentially a constant height or rise with increasing distance from the runway.

4.2.3 The following guidance is based on MLS siting within existing lighting system structures. It may be more practical to use light structures which do not affect the signal-in-space if these are available.

4.2.4 If the location of an MLS azimuth antenna on extended runway centre line 60 m (200 ft) beyond the far end of the approach lighting system is not possible or practical, it may be sited within the light plane boundaries given the following criteria:

a) in the horizontal plane, the antenna is to be sited on extended runway centre line not closer than 300 m to the runway stop end and as far as possible from the nearest light position toward runway stop end. (This places the back of the azimuth equipment against a light position.)

b) the siting of the azimuth station is to be such that the shadowing of the lights of the approach lighting system is minimized, particularly within decision height boundaries. The azimuth station should not shadow any light(s) other than that located in a centre part of a cross bar or a centre line barrette (see Annex 14, Volume I, Attachment A, Section 11.3 for further guidance).

4.2.4.1 If the spacing between adjacent light stations is 30 m (100 ft) or more, the phase centre should be at least 0.3 m (1 ft) above light centre line of the closest light station toward runway stop end. This could be relaxed to 0.15 m (0.5 ft), if necessary, if the site is otherwise free of significant multipath problems. This may require the use of an elevated azimuth station.

4.2.4.2 If the spacing between adjacent light stations is less than 30 m (100 ft), the phase centre should be at least 0.6 m (2 ft) above light centre line of the closest light station toward runway stop end.

4.3 Critical and sensitive areas

4.3.1 The occurrence of interference to MLS signals is dependent on the reflection and shadowing environment around the MLS antennas and the antenna beamwidths. Vehicles and fixed objects within 1.7 beamwidths of the receiver location are considered “in-beam” and will cause main lobe multipath interference to the MLS guidance signals. Typically, the ground equipment beamwidths are chosen such that no azimuth in-beam reflections exist along the final approach course and no elevation in-beam multipath exists along the commissioned glide paths. However, movable objects may enter the in-beam multipath regions and cause interfering reflections to or shadowing of the guidance signals to the extent that the quality becomes unacceptable. The areas within which vehicles can cause degraded performance need to be defined and recognized. For the purpose of developing protective zoning criteria, these areas can be divided into two types, i.e. critical areas and sensitive areas:

a) The MLS critical area is an area of defined dimensions about the azimuth and elevation antennas where vehicles, including aircraft, are excluded during all MLS operations. The critical area is protected because the presence of vehicles and/or aircraft inside its boundaries will cause unacceptable disturbance to the guidance signals.

b) The MLS sensitive area is an area extending beyond the critical area where the parking and/or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the MLS signals during MLS operations. The sensitive area provides protection against interference caused by large objects outside the critical area but still normally within the airfield boundary.

Note 1.— here disturbance to the guidance signal can occur only at some height above the ground the terms critical volume or sensitive volume are used.

Note 2.— The ob ective of defining critical and sensitive areas is to afford adequate protection of the MLS guidance signals. The manner in which the terminology is applied may vary between States. In some States, the term critical area is also used to describe the area that is referred to herein as the sensitive area.

4.3.2 Typical examples of critical and sensitive areas that need to be protected are shown in Figure G-23 and Figure G-24. The tabled values associated with Figure G-23 and Figure G-24 apply to approach procedures with elevation angles of three degrees or higher. To assure the signal quality, it is necessary normally to prohibit all entry of vehicles and the taxiing or parking of aircraft within this area during all MLS operations. The critical area determined for each azimuth and elevation antenna should be clearly designated. Suitable signal devices may need to be provided at taxiways and roadways which penetrate the critical area in order to restrict the entry of vehicles and aircraft.

4.3.3 Computer modelling techniques can be employed to calculate the magnitude and duration of signal disturbances caused by structures or by aircraft of various sizes and orientation at differing locations. Typically, the parameters required to operate such a model are the antenna beamwidths and the size, location and orientation of reflecting and shadowing objects. Taking into account the maximum allowable multipath degradation of the signal due to aircraft on the ground, the corresponding critical and sensitive areas can be determined. Such a method has been used in developing Figures G-23 and G-24, after validation of computer models which included comparisons at selected points of computed results with actual field and flight data on parked aircraft interference to the MLS guidance signals.

4.3.4 Control of critical areas and the designation of sensitive areas on the airport proper generally will be sufficient to protect MLS signals from multipath effects caused by large, fixed ground structures. This is particularly significant when considering the size of new buildings. Structures outside the boundaries of the airport generally will not cause difficulty to the MLS signal quality as long as the structures meet obstacle limitation criteria.

4.3.5 The boundary of the protected zone (i.e. the combined critical and sensitive areas) is defined such that interference caused by aircraft and vehicles outside that boundary will not cause errors in excess of typical allowances for propagation effects. The derivation of error allowances to protect centre line approach profiles, as shown in Tables G-10 and G-11 for a “clean” and “complex” propagation environment, proceed as follows. Allowances for equipment errors are subtracted (on a root sum square basis (RSS)) from the system error limits at the approach reference datum (ARD) and the resulting balance of the error budget is available for propagation anomalies. The ground reflection is accommodated at both clean and complex sites, while in complex environments, a margin is reserved to accommodate additional error sources such as support structure vibration, diffracted signals from, for example, approach lighting system (ALS) lights and supports or more intense lateral reflections. Finally, 70 per cent of the remaining error balance is allocated to define the protected zone boundary. Thus, error balances are available to define protected zone boundaries for the extreme cases of a very clean propagation environment with only ground reflections and for a very complex environment with several significant sources of propagation errors.

4.3.6 The MLS critical areas are smaller than the ILS critical areas. Where MLS antennas are located in close proximity to the ILS antennas, the ILS critical areas in most cases will protect the MLS for similar approach paths.

Note.— A reduction of the MLS critical and sensitive areas may be obtained by measurements or analysis which consider the specific environment. It is recommended that samples be taken at least every 15 m (50 ft).

4.3.7 *Azimuth.* For an azimuth antenna supporting an aligned approach along the zero degree azimuth, the region between the azimuth antenna and runway stop end is to be designated as a critical area. The sensitive area of Figure G-23 provides additional signal protection when low visibility landing operations are in progress. In general, the azimuth sensitive area will fall within the runway boundaries such that adequate control can be exercised over all moving traffic to prevent unacceptable interference to the MLS signals. In developing the sensitive area lengths of Table G-12A it was assumed that the landed B-727 (or B-747) type aircraft has cleared the runway before the landing aircraft reaches a height of 90 m (300 ft) (or 180 m (600 ft) for B-747)). That assumption resulted from consideration of the following factors:

a) 5.6 km (3 NM) separation behind B-747 size aircraft;

b) 3.7 km (2 NM) separation behind B-727 size aircraft;

c) runway occupancy time for the landing aircraft is 30 seconds; and

d) approaching aircraft speed is approximately 220 km/hr (2 NM/min).

4.3.7.1 For an azimuth antenna supporting an offset approach the critical and sensitive areas will depend on the azimuth antenna location and the approach track orientation relative to the zero degree azimuth. The critical area extends for at least 300 m (1 000 ft) in front of the azimuth antenna. To avoid shadowing while landing operations are in progress, additional protection is to be provided in the form of a sensitive area. Table G-12B gives sensitive area length for use with an offset azimuth installation. When a procedure is along an azimuth other than the zero degree azimuth, the plan view definition has to take into account beam spreading. Figure G-25 shows typical examples.

Note.— This guidance material also applies to an azimuth antenna providing the back azimuth function.

4.3.7.2 *Critical and sensitive areas for the computed centre line approach.* Figure G-26 provides a general illustration of the areas to be protected from uncontrolled movement of ground traffic. The exact shape of that area will depend on the azimuth antenna location, azimuth to threshold distance, decision height, type of aircraft operating at the facility, and the multipath environment.

4.3.7.2.1 In determining the area to be protected, the following steps are appropriate:

a) determine the direction of line AG (Figure G-26) from the azimuth antenna (point A) to the nearest point to the runway centre line where guidance is required (point G);

b) locate point C on line AG at a distance from the azimuth antenna found by entering Table G-12C or G-12D with azimuth to threshold distance, size of the largest aircraft on ground and height of point G on the minimum glide path;

c) line AB has the same length as line AC and lines AC and AB are angularly separated by an amount for in-beam multipath (1.7 beamwidth) and a value for flight path deviation allowance to account for deviations of the approaching aircraft about the nominal approach track;

d) determine the direction of line AF from the azimuth antenna to point F at a height of 300 m (1 000 ft) on the minimum glide path;

e) determine the direction of line AD which is angularly separated by 1.7 BW from line AF;

f) the length of line AD is taken from Table G-12C or G-12D with information on the height of point F; and

g) the area to be protected is bounded by the polygon ABCD.

4.3.7.2.2 Typically the areas of polygon ABCD in Figure G-26 within at least the first 300 m (1 000 ft) or 600 m (2 000 ft) of the azimuth antenna are to be designated, respectively, as a critical area where B-727 or B-747 size aircraft are operating. The balance of the region is designated as a sensitive area. Where possible, the azimuth antenna is to be offset to the runway side away from that of active taxiways. At facilities where the azimuth antenna is set back less than 300 m (1 000 ft) or located ahead of the runway stop end, a detailed analysis and consideration of the airport layout may support reductions of the area to be protected.

4.3.7.3 *Critical and sensitive areas for MLS/RNAV procedures.* For MLS/RNAV approach procedures, the critical and sensitive areas will require expansion to protect against in-beam multipath in the sectors used. These expanded areas protect approach procedures which are not possible with ILS. The length of the area to be protected depends on the operational minimum height surface selected from Table G-13. Information for determining the area to be protected is given in Figure G-27. For a wide range of profiles, simulation indicated that, where B-727 size aircraft are operating, adequate protection would be afforded if the first 300 m (1 000 ft) of the protected area is designated as a critical area and the remainder as a sensitive area. For B-747 size aircraft, the corresponding length is 600 m (2 000 ft). For higher approach profiles, the length derived from Table G-13 or an equation therein may be less than these values; in this case the entire expanded area is to be designated as a critical area. Increased flexibility may be obtained by performing an analysis considering the specific approach profile and airport environment.

4.3.8 *Elevation.* The elevation critical area to be protected results from the critical volume shown in Figure G-24. Normally no sensitive area is defined for the elevation antenna. As the lower surface of the critical volume normally is well above ground level, aircraft may hold near the elevation antenna as long as the lower boundary of the critical volume is not penetrated.

4.3.8.1 For normal siting of a 1.0 degree beamwidth elevation antenna and flat ground, the fuselage of most aircraft types will fit under the profile lower surface of the critical volume of Figure G-24.

4.3.8.2 For a 1.5 degree beamwidth elevation antenna, limited penetration of the profile lower surface of the critical volume of Figure G-24 by an aircraft fuselage may be tolerated by defining the lower part of the critical volume between 1.5 degrees and 1.7 beamwidth below the minimum glide path as sensitive volume. At sites performing well within tolerance, aircraft may hold in front of the antenna provided:

a) the separation angle between the glide path and the top of the aircraft fuselage is at least 1.5 degrees;

b) the aircraft tail fin does not penetrate the lower surface of the critical volume; and

c) the fuselage is at right angle to the centre line.

4.3.8.3 For MLS/RNAV approach procedures, the plan view of the elevation critical area will require expansion to ensure the elevation signal quality along the nominal approach track (Figure G-28). These expanded areas protect approach procedures which are not possible with ILS. The characteristics of the profile view (Figure G-24) remain unchanged, noting that the lower boundary is referenced to the nominal approach track. This guidance material covers a wide range of profiles. Increased flexibility may be obtained by performing an analysis considering the specific approach profile and airport environment.

5. Operational considerations on siting of DME ground equipment

5.1 The DME equipment should, whenever possible, provide indicated zero range to the pilot at the touchdown point in order to satisfy current operational requirements.

5.1.1 When DME/P is installed with the MLS, indicated zero range referenced to the MLS datum point may be obtained by airborne equipment utilizing coordinate information from the MLS data. DME zero range should be referenced to the DME/P site.

6. Interrelationship of ground equipment monitor and control actions

6.1 The interrelationship of monitor and control actions is considered necessary to ensure that aircraft do not receive incomplete guidance which could jeopardize safety, but at the same time continue to receive valid guidance which may safely be utilized in the event of certain functions ceasing to radiate.

Note.— The interrelationship of ground equipment monitor and control actions is presented in Table G-14.

7. Airborne equipment

7.1 General

7.1.1 The airborne equipment parameters and tolerances included in this section are intended to enable an interpretation of the Standards contained in Chapter 3, 3.11 and include allowances, where appropriate, for:

a) variation of the ground equipment parameters within the limits defined in Chapter 3, 3.11;

b) aircraft manoeuvres, speeds and attitudes normally encountered within the coverage volume.

Note 1.— The airborne equipment includes the aircraft antenna(s), the airborne receiver, the pilot interface equipment and the necessary interconnections.

Note 2.— etailed Minimum Performance Specifications for MLS avionics have been compiled and coordinated by the European Organization for Civil Aviation Electronics (E ROCAE) and RTCA Inc. ICAO periodically provides to Contracting States current lists of the publications of these organizations in accordance with Recommendations 3/1 (a) and 6/7(a) of the Seventh Air Navigation Conference.

7.1.2 *Function decoding*

7.1.2.1 The airborne equipment is to be capable of decoding and processing the approach azimuth, high rate approach azimuth, back azimuth, and approach elevation functions, and data required for the intended operation.

7.1.2.2 In addition, the receiver utilizes techniques to prevent function processing resulting from the presence of function preambles embedded within the data fields of basic and auxiliary data words and scanning beam side lobe radiation. One technique to accomplish this is to decode all function preambles. Following the decode of a preamble, the detection and decoding of all function preambles is then disabled for a period of time corresponding to the length of the function.

7.1.2.3 Range information is decoded independently.

7.1.3 The receiver decodes the full range of angles permitted by the signal format for each function. The guidance angle is determined by measuring the time interval between the received envelopes of the TO and FRO scans. The decoded angle is related to this time interval by the equation given in Chapter 3, 3.11.4.5.

7.1.4 The receiver is capable of normal processing of each radiated function without regard to the position of the function in the transmitted sequences.

7.1.5 If the MLS approach azimuth and back azimuth information is presented on the selector and/or flight instruments, it is to be displayed in magnetic degrees. Receivers in the automatic mode display the relevant information transmitted by the ground station as part of the basic data word 4.

7.1.6 The receiver has the capability for both manual and automatic selection of approach track, elevation angle and back azimuth radial when provided. When in automatic mode, the selection is made as follows.

7.1.6.1 *Approach azimuth* — select the angular reciprocal of the approach azimuth magnetic orientation in basic data word 4.

7.1.6.2 *Elevation angle* — select the minimum glide path in basic data word 2.

7.1.6.3 *Back azimuth* — select the angle of the back azimuth magnetic orientation in basic data word 4.

Note.— The receiver indicates when deviation is referenced to the back azimuth signal.

7.1.7 The MLS airborne receiver system must have an integrity compatible with the overall integrity of MLS which is at least $1 - 1 \times 10^{-7}$ in any one landing.

7.1.8 For airborne equipment used in MLS/RNAV operations the capability is to be provided to unambiguously display the procedure selected.

7.2 Radio frequency response

7.2.1 *Acceptance bandwidth*

7.2.1.1 The receiver should meet acquisition and performance requirements when the received signal frequency is offset by up to plus or minus 12 kHz from the normal channel centre frequency. This figure considers possible ground transmitter offsets of plus or minus 10 kHz and Doppler shifts of plus or minus 2 kHz. The receiver should decode all functions independently of the different frequency offsets of one function relative to another.

7.2.2 *Selectivity*

7.2.2.1 When the receiver is tuned to an inoperative channel and an unwanted MLS signal of a level 33 dB above that specified in Chapter 3, 3.11.4.10.1 for the approach azimuth DPSK is transmitted on any one of the remaining channels, the receiver should not acquire the signal.

7.2.3 *In-channel spurious response*

7.2.3.1 The receiver performance specified in Chapter 3, 3.11.6, should be met when, in addition, interference on the same channel is received at a level not exceeding that specified in Chapter 3, 3.11.4.1.4.

7.2.4 *Interference from out-of-band transmissions*

7.2.4.1 The receiver performance in Chapter 3, 3.11.6 is to be met when, in addition, interference from undesired signals is received at a level not exceeding –124.5 dBW/m^2 at the MLS receiver antenna.

7.3 Signal processing

7.3.1 *Acquisition*

7.3.1.1 The receiver should, in the presence of an input guidance signal which conforms to the requirements of Chapter 3, 3.11.4, acquire and validate the guidance signal before transitioning to the track mode within two seconds along the critical portion of the approach and within six seconds at the limits of coverage.

7.3.2 *Tracking*

7.3.2.1 While tracking, the receiver should provide protection against short duration large amplitude spurious signals. When track is established, the receiver should output valid guidance information before removing the warning. During track mode, the validation process should continue to operate.

7.3.2.2 After loss of the tracked signal for more than one second, the receiver should provide a warning signal. Within the one-second interval, the guidance information should remain at the last output value.

Note 1.— A validated guidance signal is one that satisfies the following criteria

a) the correct function identification is decoded

b) the preamble timing signal is decoded *c) the TO and FRO scanning beams or left/right clearance signals are present and symmetrically located with respect to the midpoint time and*

d) the detected beamwidth is from 25 to 250 microseconds.

Note 2.— Guidance signal validation also requires that the receiver repeatedly confirm that the signal being acquired or tracked is the largest and most persistent signal within the coverage.

7.3.3 *ata functions*

7.3.3.1 *ata acquisition.* Performance in the airborne acquisition of data provided on either the basic or auxiliary data function is broken into two items: the time allowed to acquire the data and the probability of an undetected error in the acquired data.

7.3.3.1.1 At the minimum signal power density, the time to acquire basic data word 2 which is transmitted at a rate of 6.25 Hz does not exceed two seconds on a 95 per cent probability basis. The time to acquire data that are transmitted at a rate of 1 Hz does not exceed 6 seconds on a 95 per cent probability basis.

7.3.3.1.2 In the acquisition process, the receiver decodes the appropriate data words and applies certain tests to ensure that the probability of undetected errors does not exceed 1×10^{-6} at the minimum signal power density for those data requiring this level of integrity. The recommended performance specifications for undetected errors may require additional airborne processing of the data beyond simple decoding. For example, these may be achieved by processing multiple samples of the same data words.

7.3.3.1.3 If the receiver does not acquire data required for the intended operation, a suitable warning is to be provided.

7.3.3.1.4 At the minimum signal power density the time to acquire all data words required to support MLS/ RNAV operations (auxiliary data words B1-B41, A1/B42, A2, A3, A4/B43 and basic data word 6) must not exceed 20 seconds on a 95 per cent probability basis. The MLS/RNAV equipment has to ensure that the probability of undetected errors for this block of data does not exceed 0.5×10^{-9}. This performance assumes a 2 dB improvement in signal to noise. This may be achieved through reduced cable loss, margin or improved receiver sensitivity (see the airborne power budget given in Table G-2). Additionally, with signal levels above this, the acquisition time is intended to be less than 20 seconds.

7.3.3.2 *ata validation.* After acquisition of data, the receiver repeatedly confirms that the data being received are the same as the acquired data. The receiver decodes several consecutive and identical data different from that previously acquired before taking action to accept the new decoded data.

7.3.3.2.1 For data required to support MLS/RNAV operations, the airborne equipment applies the cyclic redundancy check (CRC) to the data to ensure sufficient integrity has been achieved. Data that continue to be received continue to be validated. The MLS/RNAV equipment does not accept a new block of data to be used until it is validated with the CRC.

7.3.3.3 *ata loss.* Within 6 seconds after the loss of basic data or auxiliary data that is transmitted with a maximum interval of 2 seconds or less, the receiver provides a suitable warning and removes the existing data. Within 30 seconds after the loss of auxiliary data other than that referred to above, the receiver provides a suitable warning.

7.3.3.3.1 For data required to support MLS/RNAV operations, the airborne equipment does not remove existing data following validation except under the conditions described in 7.3.3.2.1. An MLS/RNAV data block that has been validated by the CRC is not removed until a new data block has been received with a different ground equipment identification in basic data word 6, a new MLS channel is selected, or power is removed. Additionally the data block is not removed when transitioning to back azimuth coverage.

7.3.4 *Multipath performance*

7.3.4.1 Where the radiated signal power density is high enough to cause the airborne equipment thermal noise contribution to be insignificant, the following specifications should apply for scalloping frequencies between 0.05 Hz and 999 Hz.

7.3.4.1.1 *In-beam multipath.* Multipath signals coded less than two beamwidths from the direct signal and with amplitudes of 3 dB or more below the direct signal should not degrade the angle guidance accuracy output by more than plus or minus 0.5 beamwidth (peak error).

7.3.4.1.2 *Out-of-beam multipath.* Multipath signals coded 2 beamwidths or more from the direct signal and with amplitudes of 3 dB or more below the direct signal should not degrade the angle guidance accuracy by more than plus or minus 0.02 beamwidth.

7.3.5 *Clearance*

7.3.5.1 The airborne equipment should provide clearance guidance information whenever the antenna is in the presence of a valid clearance guidance signal.

7.3.5.2 When the decoded angle indication is outside the proportional guidance sector defined in Chapter 3, Table A-7, the MLS guidance signal should be interpreted as clearance guidance.

7.3.5.3 When clearance pulses are transmitted, the receiver shall be able to process the range of pulse envelope shapes that may appear in the transition between clearance and scanning beam signals. A particular pulse envelope is dependent on the receiver position, scanning antenna beamwidth, and the relative phase and amplitude ratios of the clearance and scanning beam signals as shown in Figure G-8. The receiver is also required to process rapid changes of indicated angle of the order of 1.5 degrees (peak amplitude) when outside the proportional guidance limits.

7.3.5.4 In receivers with the capability to select or display azimuth angle guidance information greater than plus or minus 10 degrees, the proportional coverage limits in basic data must be decoded and used to preclude use of erroneous guidance.

7.4 Control and output

7.4.1 *Approach azimuth and approach elevation deviation scale factor*

7.4.1.1 *Approach azimuth.* When the approach azimuth deviation information is intended to have the same sensitivity characteristics as ILS, it is a function of the "approach azimuth antenna to threshold distance", as supplied by the basic data, in accordance with the following table:

Approach azimuth antenna to threshold distance (ATT)	Nominal course width
0 – 400 m	± 3.6 degrees
500 – 1 900 m	± 3.0 degrees
2 000 – 4 100 m	$\pm \arctan\left(\frac{105}{\text{ATT}}\right)$ degrees
4 200 – 6 300 m	± 1.5 degrees

7.4.1.2 *Approach elevation.* The deviation information is a continuous function of the manually or automatically selected elevation angle (Θ) in accordance with the formula Θ/4 = half a nominal glide path width, so that glide path widths are nominally in accordance with the following examples:

Selected elevation angle (degrees)	Nominal glide path width (degrees)
3	± 0.75
7.5	± 1.875

Note.— These sensitivity characteristics are applicable to elevation angles up to 7.5 degrees.

7.4.2 *Angle data output filter characteristics*

7.4.2.1 *Phase lags.* To assure proper autopilot interface, the receiver output filter, for sinusoidal input frequencies, does not include phase lags which exceed:

a) 4 degrees from 0.0 to 0.5 rad/s for the azimuth function; and

b) 6.5 degrees from 0.0 to 1.0 rad/s and 10 degrees at 1.5 rad/s for the elevation function.

7.4.3 *Minimum glide path.* When there is capability of selecting the approach elevation angle, a suitable warning is to be issued if the selected angle is lower than the minimum glide path as provided in basic data word 2.

7.4.4 *Status bits.* A suitable warning is to be provided when the function status bits in acquired basic data indicate that the respective function is not being radiated or is being radiated in test mode.

7.5 Use of back azimuth guidance for missed approaches and departures

7.5.1 *sable back azimuth angles*

7.5.1.1 Flight test results indicated that back azimuth angles of up to ±30 degrees from the runway centre line can be used for navigation guidance for missed approaches and departures. With appropriate interception techniques, larger angle offsets might be acceptable up to the flyable limits of back azimuth coverage. Departure guidance can utilize the back azimuth signal for centre line guidance throughout the take-off roll and initial departure. It is intended that a turn to intercept the back azimuth is initiated at an operationally acceptable altitude, and the prescribed procedure is protected according to appropriate obstacle clearance criteria.

7.5.2 *Back azimuth deviation scale*

7.5.2.1 The scaling of back azimuth deviations must be sufficient to support back azimuth departures and missed approaches not aligned with the approach azimuth, as well as missed approach and departure tracks aligned with the approach azimuth. Deviation scaling effects are most pronounced when manoeuvring to intercept a back azimuth. Very sensitive scaling will cause lateral overshoots and limit flyability of the signal, whereas very insensitive scaling will result in the large consumption of airspace. A nominal course width sensitivity of ±6 degrees provides for an acceptable interception of back azimuth during missed approach and departure.

7.5.3 *Approach azimuth to back azimuth switching*

7.5.3.1 Following initiation of a missed approach using back azimuth guidance, the guidance must switch from approach azimuth to back azimuth. The switching, either automatically or manually, from approach azimuth to back azimuth guidance is intended to provide continuous flyable guidance throughout the missed approach sequence. Switching is not expected to occur until the aircraft receives a validated back azimuth signal, but it is intended to occur before the approach azimuth guidance becomes too sensitive to fly. Switching based on loss of approach azimuth may not occur until the aircraft is very close to the approach azimuth antenna resulting in unflyable guidance. Switching based only on loss of elevation guidance may occur prior to the aircraft receiving a valid back azimuth signal. However, switching might be based on loss of elevation guidance once the back azimuth signal has been validated. Automatic switching at or near the mid-point between azimuth antennas will provide a method which results in continuous guidance during the transition. The mid-point switching methodology may require the use of DME information by the MLS receiver. Precautions are to be taken so that approach to back azimuth switching does not automatically occur unless a missed approach has been initiated.

8. Operations at the limits of and outside the promulgated MLS coverage sectors

8.1 The limits of the azimuth proportional guidance sectors are transmitted in basic data words 1 and 5. These limits do not indicate the maximum flyable MLS approach and back azimuth angles which will normally be at some angle inside these limits. For example, for an approach azimuth providing a proportional guidance sector of ±40 degrees, flyable MLS approach azimuth angles with a full course width of ±3 degrees will exist to approximately ±37 degrees. For a back azimuth, flyable back azimuth angles with full course width will exist to within 6 degrees of the proportional guidance sector limits.

8.2 The basic MLS antenna designs should preclude the generation of unwanted signals outside coverage. Under some unusual siting conditions, MLS signals might be reflected into regions outside the promulgated coverage with sufficient strength to cause erroneous guidance information to be presented by the receiver. As in current procedure the implementing authority would specify operational procedures based on the use of other navaids to bring the aircraft into landing system coverage without transiting the area of concern or may publish advisories which alert pilots to the condition. In addition, the MLS signal format permits the use of two techniques to further reduce the probability of encountering erratic flag activity.

8.2.1 If the undesired MLS signals are reflections and if operational conditions permit, the coverage sector can be adjusted (increased or decreased) such that, at the receiver, either the direct signal is greater than any reflection or the reflector is not illuminated. This technique is referred to as coverage control.

8.2.2 Out-of-coverage indication signals can be transmitted into the out-of-coverage sectors for use in the receiver to ensure a flag whenever an undesired angle guidance signal is present. This is accomplished by transmitting an out-of-coverage indication signal into the region which is greater in magnitude than the undesired guidance signal.

8.3 If it is operationally required to confirm the selected MLS channel outside the promulgated coverage sectors of the MLS, it is intended that this confirmation be derived from the identification of the associated DME. MLS status information is not available outside the promulgated MLS coverage sectors.

9. Separation criteria in terms of signal ratios and propagation losses

9.1 Geographical separation

9.1.1 The separation criteria are provided in 9.2 and 9.3 as desired signal-to-noise ratios and when combined with appropriate propagation losses allow evaluation of MLS C-Band frequency assignments as regards on-channel and adjacent channel interference. When selecting frequencies for MLS facilities, a similar criteria for the DME/P element or an associated DME/N as provided in Attachment C to this Part need to be considered.

9.2 Co-frequency requirements

9.2.1 Co-frequency MLS channel assignments should be made to preclude the acquisition of DPSK preambles of an undesired co-channel facility. The required level of the undesired signal is less than minus 120 dBm, which is 2 dB below a sensitive MLS airborne system, as shown below:

— receiver sensitivity	=	–112	dBm
— margin for aircraft antenna gain above minimum	=	–6	dBm
		–118	dBm

Considering the system power budget in Table G-1, which shows the minimum signal level at the aircraft is required to be at least minus 95 dBm, the minus 120 dBm requirement is achieved by placing the undesired co-channel at a geographic separation which exceeds the radio horizon distance at any point in the promulgated coverage sector of the desired facility.

Note.— The PS signal requires more protection than the scanning beam so that by limiting the undesired co-channel signal to minus 120 dBm, interference from the scanning beam is negligible.

9.3 Adjacent frequency requirements

9.3.1 Considering the absence of requirements on transmitter spectrum characteristics for the first and second adjacent channels, the ground stations operating at these frequencies should be placed at a geographical separation that exceeds the radio horizon distance at any point in the promulgated coverage sector of the desired facility.

Note.— here for specific reasons (for example, ILS/MLS/ ME pairing channels) the first or second ad acent channels need to be assigned, a less conservative method to assure receiver protection is to guarantee that the minimum SNR values as quoted in 3.11.6.1.4 are available at any point in the promulgated coverage sector of the desired facility while the undesired facility is transmitting.

9.3.2 For the third and subsequent adjacent channels, the ground stations operating at these frequencies should be placed at a geographical separation which guarantees that the minimum SNR values as quoted in Chapter 3, 3.11.6.1.4 are available at any point in the promulgated coverage sector of the desired facility while undesired facilities are transmitting.

9.3.2.1 If there is no undesired MLS transmission situated at less than 4 800 m from any point of the promulgated coverage, the –94.5 dBW/m maximum power of Chapter 3, 3.11.4.1.4.2 compared to the minimum power density of Chapter 3, 3.11.4.10.1 assures that the SNR minimum values will be met. No constraints are anticipated.

9.3.2.2 If there is an undesired MLS transmission situated at less than 4 800 m from a point of the promulgated coverage, the maximum power produced by this transmission and measured, during transmission time for angle and data signals, in a 150 kHz band centred on the desired nominal frequency has to be assessed taking into account the frequency separation, spectrum performances and antenna pattern of the transmitter and the appropriate propagation losses. This maximum power has then to be compared to the desired angle and data level to check that the minimum SNR values defined in 3.11.6.1.4 are met. If not, another channel offering a larger frequency separation has to be assigned in order to reduce this maximum undesired power taking benefit of the spectrum characteristic of the transmitter.

9.4 Development of frequency planning criteria

9.4.1 The controlling factor when developing adjacent channel frequency planning criteria is the radiated spectrum from the MLS ground station. When developing frequency planning criteria for the third adjacent channel and above, ideally, the radiated spectrum output of individual MLS ground stations should be considered. However it may be possible in a geographic region to use a generic MLS transmitter mark which meets the requirements of that region.

10. Material concerning MLS installations at special locations

10.1 MLS facility performance throughout the coverage volume

10.1.1 It is recognized that at some locations the requirements for MLS specified in Chapter 3, 3.11 cannot be met throughout the whole volume of coverage due to environmental effects on the signal. It is expected that at such locations the requirements of Chapter 3, 3.11 are to be met at least in the guidance sector for all published instrument procedures to a defined point beyond which the MLS guidance is not used for intended operations. To assist appropriate authorities with the initial appraisal of the suitability of such individual MLS installations for the intended operations, relevant coverage restrictions need to be promulgated.

11. Integrity and continuity of service — MLS ground equipment

11.1 Introduction

11.1.1 This material is intended to provide description of the integrity and continuity of service objectives of MLS ground equipment and to provide guidance on engineering design and system characteristics of this equipment. The integrity and continuity of service must of necessity be known from an operational viewpoint in order to decide the operational application which an MLS could support.

11.1.2 It is generally accepted, irrespective of the operational objective, that the average rate of a fatal accident during landing, due to failures or shortcomings in the whole system, comprising the ground equipment, the aircraft and the pilot, should not exceed 1×10^{-7}. This criterion is frequently referred to as the global risk factor.

11.1.3 In the case of Category I operations, while minimum standards of accuracy and integrity are required during the early stages of landing, most of the responsibility for assuring that the above objective is not exceeded is vested in the pilot. In Category III operations, the same objective is required but must now be inherent in the whole system. In this context it is of the utmost importance to endeavour to achieve the highest level of integrity and continuity of service of the ground equipment. Integrity is needed to ensure that an aircraft on approach will have a low probability of receiving false guidance; continuity of service is needed to ensure that an aircraft in the final stages of approach will have a low probability of being deprived of a guidance signal.

11.1.4 It is seen that various operational requirements correspond to varied objectives of integrity and continuity of service. Table G-15 identifies and describes four levels of integrity and continuity of service that are applicable for basic procedures where DME is not a critical element.

11.2 Achievement and retention of integrity and continuity of service levels

11.2.1 An integrity failure can occur if radiation of a signal which is outside specified tolerances or which is incorrect (in the case of digital data) is either unrecognized by the monitoring equipment or the control circuits fail to remove the faulty signal. Such a failure might constitute a hazard if it results in a gross error.

11.2.2 Clearly not all integrity failures are hazardous in all phases of the approach. For example, during the critical stages of the approach, undetected failures producing significant path following error (PFE) are of special significance whereas an undetected loss of clearance or identification signals would not necessarily produce a hazardous situation. The criterion in assessing which failure modes are relevant must however include all those deleterious fault conditions which are not unquestionably obvious to the automatic flight system or pilot.

11.2.3 It is especially important that monitors be designed to provide fail-safe operation through compliance with the Standards of Chapter 3, 3.11.5.2.3 and 3.11.5.3.3. This often requires a rigorous design analysis. Monitor failures otherwise may permit the radiation of erroneous signals. Some of the possible conditions which might constitute a hazard in operational performance Categories II and III are:

a) an undetected fault causing a significant increase in PFE as seen by an approaching aircraft;

b) an undetected error in the minimum glide path, transmitted in basic data word 2;

c) an undetected error in the TDM synchronization resulting in overlap; and

d) loss of power that increases CMN to unacceptable limits.

11.2.4 The highest order of protection is required against the risk of undetected failures in the monitoring and associated control system. This would be achieved by careful design to reduce the probability of such occurrences to a low level and by carrying out periodic checks on the monitor system performance at intervals which are determined by the design analysis. Such an analysis can be used to calculate the level of integrity of the system in any one landing. The following formula can be applied to certain types of MLS and provides an example of the determination of system integrity, I, from a calculation of the probability of transmission of undetected erroneous radiation, P.

$$I = 1 - P$$

$$P = \frac{T^2}{\alpha_1 \alpha_2 M_1 M_2}$$

Where:

I = integrity;

P = the probability of a concurrent failure in transmitter and monitor systems resulting in undetected erroneous radiation;

M_1 = transmitter mean time between failure (MTBF)

M_2 = MTBF of the monitoring and associated control system;

$\frac{1}{\alpha_1}$ = ratio of the rate of failure in the transmitter resulting in the radiation of an erroneous signal to the rate of all transmitter failures;

$\frac{1}{\alpha_2}$ = ratio of the rate of failure in the monitoring and associated control system resulting in inability to detect an erroneous signal to the rate of all monitoring and associated control system failures; and

T = period of time (in hours) between checks on the monitoring and associated control system.

This example formula would be applicable to a non-redundant monitor design in which a single value of *T* applies to all elements of the monitoring and associated control system.

11.2.5 With regard to integrity, since the probability of occurrence of an unsafe failure within the monitoring or control equipment is extremely remote, to establish the required integrity level with a high degree of confidence would necessitate an evaluation period many times that needed to establish the equipment MTBF. Such a protracted period is unacceptable and therefore the required integrity level can only be predicted by rigorous design analysis of the equipment. However, a degree of confidence in the analysis can be achieved by demonstration of independence between the transmitter and monitor functions. The predicted performances of the transmitter and monitor can then be evaluated independently, resulting in more feasible evaluation periods.

11.2.6 The MTBF and continuity of service of equipment is governed by basic construction characteristics and by the operating environment. The basic construction characteristics include the failure rate of the components of the equipment and the physical relationship of the components. Failure rate (1/MTBF) and continuity of service are not always directly related because not all equipment failures will necessarily result in an outage, e.g. an event such as a failure of a transmitter resulting in the immediate transfer to a standby transmitter. The manufacturer is expected to provide the details of the design to allow the MTBF and the continuity of service to be calculated. Equipment design has to employ the most suitable engineering techniques, materials, and components, and rigorous inspection should be applied during manufacture. It is essential to ensure that equipment is operated within the environmental conditions specified by the manufacturer.

11.2.7 The design continuity of service is expected to exceed that given in 12.4 by as large a margin as is feasible. The reasons for that are as follows:

a) the MTBF experienced in an operational environment is often worse than that determined by the design calculations due to the impact of operational factors;

b) the continuity of service objectives given in 12.4 are minimum values to be achieved in an operational environment. Any improvement in performance above these values enhances the overall safety of the landing operation;

c) a margin between the continuity of service objective and that achieved is required in order to reduce the chance of falsely rejecting the suitability of an equipment for a particular level of service due to statistical uncertainty.

Note.— The Level 3 and 4 continuity of service values include a factor that accounts for the pilot s capability to avoid a fatal accident in the event of a loss of guidance. It is particularly desirable to reduce this factor to the maximum extent practical by achieving the best possible continuity of service for Level 3 and 4 equipment.

11.2.8 Experience has shown that there is often a difference between the calculated continuity of service and that experienced in an operational environment both because the performance of the equipment may be different from the calculated value and because of the impact of operational factors, i.e. airport environment, inclement weather conditions, power availability, quality and frequency of maintenance, etc. For these reasons, it is recommended that the equipment MTBF and continuity of service be confirmed by evaluation in an operational environment. Continuity of service may be evaluated by means of mean time between outages, where an outage is defined as any unanticipated cessation of signal-in-space. It is calculated by dividing total facility up-time by the number of operational failures. For integrity and continuity of service Levels 2, 3 or 4, the evaluation period is to be sufficient to determine achievement of the required level with a high degree of confidence. To determine whether the performance record of an individual equipment justifies its assignment to Levels 2, 3 or 4 requires judicious consideration of such factors as:

a) the performance record and experience of system use established over a suitable period of time;

b) the average achieved MTBO established for this type of equipment; and

c) the trend of the failure rates.

11.2.9 The minimum acceptable confidence level for acceptance/rejection is 60 per cent. Depending on the service level of the MLS, this may result in different evaluation periods. To assess the influence of the airport environment, a minimal evaluation period of one year is typically required for a new type of installation at that particular airport. It may be possible to reduce this period in cases where the operating environment is well controlled and similar to other proven installations. Subsequent installation of the same type of equipment under similar operational and environmental conditions may follow different evaluation periods. Typically, these minimal periods for subsequent installations are for Level 2, 1 600 hours, for Level 3, 3 200 hours and for Level 4, at least 6 400 hours. Where several identical systems are being operated under similar conditions, it may be possible to base the assessment on the cumulative operating hours of all the systems. This will result in a reduced evaluation period.

11.2.10 During the evaluation period it should be decided for each outage if it is caused by a design failure or if it is caused by a failure of a component due to its normal failure rate. Design failures are, for instance, operating components beyond their specification (overheating, overcurrent, overvoltage, etc., conditions). These design failures should be dealt with such that the operating condition is brought back to the normal operating condition of the component or that the component is replaced with a part suitable for the operating conditions. If the design failure is treated in this way, the evaluation may continue and this outage is not counted, assuming that there is a high probability that this design failure will not occur again. The same applies to outages due to any causes which can be mitigated by permanent changes to the operating conditions.

11.2.11 A suitable method to assess the behaviour of a particular installation is to keep the records and calculate the average MTBO over the last five to eight failures of the equipment. A typical record of this method is given in Figures G-35A and G-35B.

11.2.12 During the equipment evaluation, and subsequent to its introduction into operational service, records have to be maintained of all equipment failures or outages to confirm retention of the desired continuity of service.

Note.— If an equipment requires redundant or standby units to achieve the required continuity of service, an arrangement such as that described in 11.3.4 is required to assure that the standby equipment is available when needed.

11.3 Additional considerations concerning continuity of service and integrity

11.3.1 The stringent requirement for integrity and continuity of service essential for Category III operations requires equipment having adequate assurance against failures. Reliability of the ground equipment must be very high, so as to ensure that safety during the critical phase of approach and landing is not impaired by a ground equipment failure when the aircraft is at such a height or attitude that it is unable to take safe corrective action. A high probability of performance within the specified limits has to be ensured. Facility reliability in terms of MTBF clearly has to be related on a system basis to the probability of failure which may affect any characteristic of the total signal-in-space.

11.3.2 The following configuration is an example of a redundant equipment arrangement that is likely to meet the objectives for integrity and continuity of service Levels 3 and 4. The azimuth facility consists of two transmitters and an associated monitor system performing the following functions:

a) monitoring of operation within the specified limits of the main transmitter and antenna system by means of majority voting among redundant monitors; and

b) monitoring the standby equipment.

11.3.2.1 Whenever the monitor system rejects one of the equipments the facility continuity of service level will be reduced because the probability of cessation of signal consequent on failure of other equipment will be increased. The change of performance must be automatically indicated at remote locations.

11.3.2.2 An identical monitoring arrangement to the azimuth is used for the elevation facility.

11.3.3 In the above example, the equipment would include provision to facilitate monitoring system checks at intervals specified by the manufacturer, consequent to his design analysis, to ensure attainment of the required integrity level. Such checks, which can be manual or automatic, provide the means to verify correct operation of the monitoring system including the control circuitry and changeover switching system. It is desirable to perform these checks in such a way that there is no interruption to operational service. The advantage of implementing an automatic monitor integrity test is that it can be accomplished more frequently, thereby achieving a higher level of integrity.

11.3.4 Interruption of facility operation due to primary power failures is avoided by the provision of suitable standby supplies, such as batteries or "no-break" generators. Under these conditions, the facility should be capable of continuing in operation over the period when an aircraft may be in the critical stages of the approach. Therefore the standby supply should have adequate capacity to sustain service for at least two minutes.

11.3.5 Warnings of failures of critical parts of the system, such as the failure of the primary power supply, must be given at the designated control points if the failure affects operational use.

11.3.6 In order to reduce failure of equipment that may be operating near its monitor tolerance limits, it is useful for the monitor system to include provision to generate a pre-alarm warning signal to the designated control point when the monitored parameters reach a limit equal to a value on the order of 75 per cent of the monitor alarm limit.

11.3.7 Protection of the integrity of the signal-in-space against degradation, which can arise from extraneous electromagnetic interference falling within the MLS frequency band or from reradiation of MLS signals, must be considered.

11.3.8 A field monitor can provide additional protection by providing a warning against exceeding path following error limits due to physical movement of the MLS antenna or by protecting against faults in the integral monitor.

11.3.9 In general, monitoring equipment design is based on the principle of continuously monitoring the radiated signals-in-space at specific points within the coverage volume to ensure their compliance with the Standards specified at Chapter 3, 3.11.5.2.3 and 3.11.5.3.3. Although such monitoring provides to some extent an indication that the signal-in-space at all other points in the coverage volume is similarly within tolerance, this is largely inferred. It is essential therefore to carry out rigorous inspections at periodic intervals to ensure the integrity of the signal-in-space throughout the coverage volume.

11.3.10 An equipment arrangement similar to that at 11.3.2, but with no transmitter redundancy, and the application of the guidance outlined in 11.3.5, 11.3.6, 11.3.7, 11.3.8, and 11.3.9, would normally be expected to achieve the objectives for integrity and continuity of service for level 2.

12. Classification of MLS approach azimuth elevation and DME ground facilities

12.1 The classification system as described in the following paragraphs, is intended to identify in a concise way essential information to be used by instrument procedure designers, operators and air traffic services regarding the performance of a particular MLS installation. The information is to be published in the aeronautical information publication (AIP).

12.2 The information concerning MLS facility performance should comprise:

a) the limits of the azimuth proportional guidance sector;

b) the vertical guidance limit;

c) the availability of the guidance signal along the runway; and

d) the reliability of the guidance signal (azimuth, elevation and DME).

12.3 The classification system, containing information of a particular MLS facility, is defined using the following formats:

a) *Azimuth proportional guidance sector limits.* This field identifies for a particular MLS the azimuth proportional guidance sector limits as defined in basic data word 1. Two values separated by a colon (XX:YY) indicate the sector limits as seen from the approach direction; the first value being the sector limit left of the zero degree azimuth and the second value being the sector limit right of the zero degree azimuth.

b) *Vertical guidance limit.* This field, located directly after the azimuth limit (format: XX:YY/ZZ m (or XX:YY/ ZZ ft)), represents the minimum height (in metres or feet) above threshold on the final approach segment along the minimum glide path (MGP) to which the system conforms to the signal characteristics specified in Chapter 3, 3.11.

c) *Runway guidance.* The character D or E (as defined in Section 1 of Attachment G) represents the point to which the azimuth guidance along the runway conforms to the signal characteristics specified in Chapter 3, 3.11 (format: XX:YY/ZZ/E). If the guidance signal along the runway does not conform to the above-mentioned characteristics, then a dash (—) is used in the format.

d) *Reliability of the guidance signal.* The character 1, 2, 3 or 4 indicates the level of integrity and continuity of service of the guidance signal (Table G-15). The character A, which is placed after the Level 3 or 4 designation, indicates that the elevation and DME/P objectives are equivalent to the azimuth objectives in accordance with Note 6 of Table G-15 (format: XX:YY/ZZ/E/4).

Note 1.— here ME is not required for the intended MLS operations, there is no need to include ME/P reliability in MLS classification.

Note 2.— here an improved elevation and/or ME/P reliability is required according to Note 6 of Table G-15 for the intended MLS/RNAV operations, the improved elevation and/or ME/P reliability is to be included in the MLS classification.

12.3.1 Any degradation of the signal below Annex 10 Standards, or below previously published performance, should be promulgated by the appropriate authority (Chapter 2, 2.1.2 and Section 10 above).

12.4 Table G-15 gives continuity of service and integrity objectives for MLS basic and MLS/RNAV operations.

Note.— In relation to specific MLS operations it is intended that the level of integrity and continuity of service would typically be associated as follows

1) Level 2 is the performance ob ective for MLS equipment used to support low visibility operations when guidance for position information in the landing phase is supplemented by visual cues. This level is a recommended ob ective for equipment supporting Category I operations

2) Level 3 is the performance ob ective for MLS equipment used to support operations which place a high degree of reliance on MLS guidance for positioning through touchdown. This level is a required ob ective for equipment supporting Category II and IIIA operations and

3) Level 4 is the performance ob ective for MLS equipment used to support operations which place a high degree of reliance on MLS guidance throughout touchdown and rollout. This level basically relates to the needs of the full range of Category III operations.

12.5 The following example of MLS facility classification:

40:30/50 ft/E/4A

denotes a system with:

a) a proportional guidance sector of 40 degrees left and 30 degrees right of the zero-degree azimuth;

b) vertical guidance down to 50 ft above threshold;

c) roll-out guidance to MLS point E; and

d) integrity and continuity of service Level 4 with elevation and DME/P objectives equivalent to azimuth.

13. Computed centre line approaches

13.1 General

13.1.1 Computed centre line approaches considered below are based on a computed path along a runway centre line where the azimuth antenna is not sited on the extended runway centre line. The simplest form of a computed centre line approach is one in which the nominal track is parallel to the zero-degree azimuth. In order to conduct MLS/RNAV operation, a greater capability than that available in the basic MLS receiver is required.

13.1.2 Computed centre line approaches to the MLS primary runway are conducted to the runway whose relationship to the MLS ground equipment is identified in the auxiliary data words.

13.1.3 When the final segment is contained in the MLS coverage volume, computed centre line approaches can be conducted along a straight final segment on a descent gradient down to the decision height (DH). Computed centre line approaches may result in decision heights that are above decision heights achievable with aligned MLS approaches.

13.2 Computed centre line approach error budget

13.2.1 RTCA (RTCA/DO-198) has described a total system error budget for MLS area navigation (RNAV) equipment. This error budget includes contributions due to:

a) ground system performance;

b) airborne sensor performance;

c) ground system geometry effects;

d) MLS/RNAV computer computational error; and

e) flight technical error (FTE).

13.2.2 The composite of the above errors with the exclusion of FTE is referred to as total position error. Within 3.7 km (2 NM) of the MLS approach reference datum the permissible total lateral position error for MLS/RNAV equipment at a position 60 m (200 ft) above the MLS datum point on a 3-degree elevation angle and a runway length of 3 000 m (10 000 ft), is 15 m (50 ft) (see the note below). Similarly, the permissible total vertical position error is 3.7 m (12 ft) at the same position. A portion of the total position error budget has been reserved for the MLS/RNAV computer performance (computational error). Within 3.7 km (2 NM) of the MLS approach reference datum, the portion of the error budget reserved for computational error is ±0.6 m (2 ft) both laterally and vertically. The results presented in 13.5 are dependent on meeting this computational accuracy requirement.

13.2.3 Using root sum square methodology the permissible total lateral position error, exclusive of MLS/RNAV computer performance, is slightly less than ±15 m (50 ft). Similarly, the permissible total vertical position error, exclusive of computational error is slightly less than ±3.7 m (12 ft). Hence, the combined error due to ground system performance, airborne sensor performance and ground system geometry effects is not expected to exceed ±15 m (50 ft) laterally and 3.7 m (12 ft) vertically at the described location. Using this information and assumptions about ground and airborne sensor performance, the maximum permissible azimuth and elevation antenna offsets (geometry effects) from the runway centre line can be obtained.

13.2.4 The CMN does not exceed ±7.3 m (24 ft) laterally and ±1.9 m (6.3 ft) vertically, or the linear equivalent of ± 0.1 degree, whichever is less. The linear values are based on nominal antenna sitings (azimuth antenna to threshold distance of 3 300 m (11 000 ft) and datum point to threshold distance of 230 m (760 ft)), with a 3-degree elevation angle. Within 3.7 km (2 NM) of the MLS approach reference datum, the portion of the CMN budget reserved for computational error is 1.1 m (3.5 ft) laterally and 0.6 m (2.0 ft) vertically.

Note.— All errors represent 95 percentile errors.

13.3 Siting and accuracy considerations

13.3.1 Theoretical and operational analysis has shown that several factors will impact the amount of azimuth antenna lateral offset that can be permitted and still obtain lateral and vertical position accuracy identified in 13.2.

13.3.2 *istance between azimuth and elevation antennas*

13.3.2.1 For a given azimuth antenna offset, a short azimuth to elevation distance results in relatively large azimuth angles at positions near the approach reference datum. As a result, the error contribution from the DME is large, and the lateral accuracy may degrade unacceptably. At a runway where a large azimuth antenna offset and a short azimuth to elevation distance exist, use of DME/P rather than DME/N may be required to achieve the required lateral accuracy.

13.3.3 *Azimuth accuracy*

13.3.3.1 The azimuth antenna offset limits presented in 13.5 are based on the ±6 m (20 ft) azimuth path following error accuracy specification (see Chapter 3, 3.11.4.9.4). The recommended ±4 m (13.5 ft) azimuth accuracy specification would permit larger azimuth antenna offsets and still obtain required computed position accuracy at DH. Azimuth angle accuracy is assumed to degrade in accordance with Chapter 3, 3.11.4.9.

13.3.4 *ME accuracy*

13.3.4.1 Smaller errors in position determination result when DME/P equipment is used and the final approach segment is contained within 9.3 km (5 NM) of the MLS approach reference datum. There are two DME/P final approach mode accuracy standards in this region. Resulting azimuth antenna offset values when using DME/P as presented in 13.5, are based on final approach mode Standard 1 accuracy. Larger azimuth antenna offset values may be permissible if DME/P equipment meeting final approach mode Standard 2 accuracy is used. DME/P final approach mode Standard 1 ranging accuracy is assumed to degrade in accordance with Chapter 3, 3.5.3.1.3.4 and Table B. DME/N is assumed to degrade in accordance with Chapter 3, 3.5.3.1.3.2.

13.3.5 *se of elevation information in the lateral position computation*

13.3.5.1 Generally, lateral position computation that excludes elevation information will be sufficient for computed centre line approaches to the primary runway. If elevation information is not used in lateral computation, the lateral error increases. This error increases with azimuth angle, height and decreasing range. Permissible azimuth antenna offsets presented in 13.5 are reduced if elevation information is not used in the lateral computation. Elevation angle accuracy is assumed to degrade in accordance with Chapter 3, 3.11.4.9.

13.4 Equipment considerations

13.4.1 Performance of airborne sensors, MLS ground equipment and MLS/RNAV avionics implementation influence the range of application of computed centre line approaches. Information presented in 13.5 is based on the following equipment considerations.

13.4.2 *Airborne sensors*

13.4.2.1 It is assumed the receiver will decode all auxiliary data words required for MLS computed centre line approaches unless the information contained in the data words is available from other avionics sources with the same accuracy and integrity as required for auxiliary data. Digital MLS angle data and range data are needed for computing lateral and vertical position. Angle data quantization is 0.01 degrees. Range quantization is 2.0 m (0.001 NM).

13.4.3 *RNAV computations*

13.4.3.1 No assumption is made about where the RNAV position computations are made. A portion of the computed centre line approach error budget has been reserved for computation error. This permits flexible algorithm implementation.

13.4.4 *Permissible azimuth antenna offset calculation techniques*

13.4.4.1 RTCA (RTCA/DO-198, Appendix D) has identified several different position determination algorithms. Different algorithms can handle different ground equipment configurations. The algorithm designed to handle any ground equipment geometry is the RTCA case 12 algorithm. Permissible antenna offset values were obtained using Monte Carlo simulation techniques. The results were also obtained using a direct analytical method. The analytical method uses geometric transformations of the maximum MLS angle and range errors to determine system performance. The Monte Carlo technique through the emulation of an MLS/RNAV system is a statistical method used to determine system performance.

13.4.4.2 *Possible restriction in position determination.* Depending on ground equipment geometry a region of possible multiple solutions to the position determination algorithm may exist. This region of multiple solutions is dependent on the locations of the elevation antenna and DME transponder relative to the runway and computed approach path. The most pronounced effect occurs when the DME transponder lies in the region between the approach path DH point and the elevation antenna. The position ambiguities can be resolved when the DME transponder is located behind the elevation antenna when viewed from the approach direction. When the DME transponder is located in front of the elevation antenna it may not be possible to resolve the position ambiguity.

13.4.5 *Ground equipment geometry*

13.4.5.1 The nominal ground equipment geometry in terms of the relative position of the ground components is depicted in Figure G-29. The DME/P transponder is assumed to be collocated with the approach azimuth antenna. When DME/P ground equipment is not available, the DME/N transponder is assumed to be located between the MLS approach azimuth and elevation antennas.

13.4.5.2 Because of the relatively large error induced by the DME/N, the location of the DME/N transponder has no significant influence on the calculated permissible azimuth antenna offset. This permits DME/N siting over a large area between the azimuth and elevation antennas. Similarly, the offset of the elevation antenna will have little effect.

13.5 Permissible approach azimuth antenna offset positions for computed centre line approaches to the primary runway

13.5.1 *ME results*

13.5.1.1 The maximum azimuth offset represents, for a given set of conditions, the largest offset that does not exceed the computed centre line approach error budget identified in 13.2. DME/P results are presented as a function of the azimuth to elevation distance. The permissible azimuth antenna offsets with DME/P are presented in Figure G-30.

13.5.1.2 For a given azimuth to elevation distance, the azimuth antenna can be sited any place in the shaded area and the resulting computed centre line approach meet requirements of 13.2.

13.5.1.3 Results were obtained when DME/N ranging accuracies are used. These results are presented in Figure G-31.

13.6 Low visibility approaches

13.6.1 *Possible applications*

13.6.1.1 The possibility of low visibility computed centre line applications may be limited to operations on the primary instrument runway because of the geometry considerations involved in achieving adequate accuracy. Primary instrument runway applications where computed centre line capability would be useful are those where the azimuth is offset from the runway centre line due to a severe siting restriction. There may be such azimuth offset applications where low visibility operations would be considered beneficial.

13.6.1.2 The expected airborne implementation for such low visibility computed centre line approaches would use non-computed elevation guidance (assuming the elevation ground antenna is sited normally) and lateral guidance derived from a combination of azimuth (including MLS siting data contained in the basic and auxiliary data functions) and range from the DME/P transponder.

13.6.2 *Airborne system performance*

13.6.2.1 Safety-critical software associated with the guidance function for non-computed low visibility approaches mainly involves the MLS receiver. For computed centre line approaches, the DME interrogator and the navigation computations must also be considered. The safety-critical software for these functions will have to be designed, developed, documented and evaluated.

13.6.2.2 The necessary algorithms are relatively simple and do not pose any certification difficulty. However, experience with flight management system (FMS) computers indicates that it would be difficult to certify a safety-critical function implemented within an existing FMS. Current FMS architectures are not partitioned to allow separate certification of different functions to different levels of criticality and the size and complexity of an FMS precludes safety-critical certification of the entire FMS computer. Consequently, alternatives to FMS implementation can be considered for computed centre line capability intended for low visibility applications (e.g. incorporation within the autopilot or within the MLS receiver). These alternatives would provide output guidance with the same output characteristics as a normal straight-in approach.

13.6.3 *Ground system performance*

13.6.3.1 Based on the implementation assumed in 13.3.5, elevation guidance would be used in exactly the same manner as for basic MLS approaches. Consequently, the elevation ground equipment integrity and continuity of service objectives would remain unchanged from those already given in Table G-15. For lateral guidance, the integrity and continuity of service objectives given in Table G-15 for azimuth would apply to the azimuth and DME combined, resulting in objectives for both that are more stringent than those needed for basic MLS operations. However, a low visibility computed centre line operation to a 30 m (100 ft) DH may be achieved by the use of ground equipment meeting the level 4 objectives contained in Table G-15.

13.6.4 *Accuracy*

13.6.4.1 MLS/RNAV will support computed paths to Category I decision heights for the primary runway given siting limitations as identified in Figure G-30. In addition, under certain conditions MLS/RNAV may provide sufficient accuracy to support Category II and III approaches. In order to accomplish this, the airborne implementation is as stated in 13.6.1.2.

13.6.4.2 The error budgets for Category II and III procedures are the following. For Category III, the lateral accuracy requirements are the same as the MLS approach azimuth accuracies specified at the approach reference datum. These requirements are ± 6 m (20 ft) for PFE and ± 3.2 m (10.5 ft) for CMN (Chapter 3, 3.11.4.9.4). For Category II the lateral requirements are obtained by splaying the allowed Category III values from the approach reference datum out to the Category II decision height of 30 m (100 ft). The equations used to compute these values (in metres) are:

$$PFE = 6 \times \frac{\left(\;_{\text{AZ-ARD}} + R \right)}{_{\text{AZ-ARD}}}$$

$$CMN = 3.2 \times \frac{\left(\;_{\text{AZ-ARD}} + R \right)}{_{\text{AZ-ARD}}}$$

$$R = \frac{\;_{\text{CatII}} - \;_{\text{CatIII}}}{\tan \theta}$$

Where:

$_{\text{AZ-ARD}}$	=	distance between approach azimuth antenna and approach reference datum (threshold)
R	=	distance between $DH_{\text{Cat II}}$ and $DH_{\text{Cat III}}$
θ	=	elevation angle

As an example, for a 3 000 m runway and a 3-degree elevation with an approach azimuth setback of 300 m, a Category III decision height of 15 m (50 ft) and a Category II decision height of 30 m (100 ft), the following values are obtained:

$_{\text{AZ-ARD}}$	=	3 300 m
R	=	286 m
$PFE_{\text{DH Cat II}}$	=	6.5 m (21.3 ft)
$CMN_{\text{DH Cat II}}$	=	3.5 m (11.5 ft)

13.6.4.3 The computed centre line capability down to Category II decision height will not necessarily support autoland operations as the guidance may not be provided down to the runway and in the runway region. Also, the more stringent error tolerances for Category II/III will result in more constraints in antenna siting than for Category I. Primarily this will constrain the lateral offset of the approach azimuth from runway centre line.

13.7 Computed centre line approaches to parallel secondary runways

13.7.1 A secondary runway as defined here is a runway that has a different geometric relationship than the one contained in the auxiliary data A words. Computed centre line approaches to a parallel secondary runway are approaches along a computed path on the extended runway centre line which is not aligned with an MLS azimuth radial and/or elevation angle but is parallel to the primary runway centre line.

13.7.2 The material in this section provides guidance on permissible runway geometries for computed centre line approaches to a parallel secondary runway to decision heights of 60 m (200 ft). The material in this section is based on the theoretical application of MLS and DME/P (Standard 1) SARPs. The error budget used is the conservative error budget identified in 13.2, and relaxations of this error budget are described in 13.7.6.1.

13.7.3 *Runway geometry considerations*

13.7.3.1 Figure G-32 presents the runway and equipment geometry. The secondary runway location is established laterally with the use of runway spacing in metres. Negative values represent secondary runway locations left of the primary runway. The longitudinal position of the secondary runway threshold is referred to as threshold stagger relative to the primary runway. Negative values represent threshold stagger forward of the primary runway threshold.

13.7.4 *Large runway spacing considerations*

13.7.4.1 Additional considerations are necessary for computed centre line approaches to widely spaced parallel runways. These considerations include:

a) adequate signal coverage to DH for some parallel runway geometries may require the use of an elevation antenna with more than ±40 degrees of horizontal coverage;

b) the critical areas around the MLS antennas may have to be increased for these operations; and

c) these operations require the use of elevation guidance below the primary runway minimum glide path.

13.7.5 *Runway geometry*

13.7.5.1 Figure G-33 shows permitted runway spacings and threshold staggers for the secondary runway. It represents results for a 3 000 m (10 000 ft) primary runway. The geometrics change marginally with primary runway length. The shaded area represents results obtained using existing MLS and DME/P (Standard 1) SARPs and the error budget identified in 13.2. To use Figure G-33, enter the values for secondary runway spacing and threshold stagger. If the resulting point lies within the shaded area a computed centre line approach to a 60 m (200 ft) DH on a 3-degree elevation is possible.

Note.— The circular region near the 1 200 m runway threshold stagger is due to the upper limit of elevation guidance used. This region is not expected to present any practical operational limitations.

13.7.6 *Extensions to the runway geometries*

13.7.6.1 Flight and ground tests have shown that the shaded area can be expanded with the following additional considerations:

a) an angular expansion is possible by utilizing existing elevation guidance outside the minimum specified azimuth proportional guidance sector. Elevation guidance for this angular expansion must be verified; and

b) a radial expansion is possible with a slight relaxation of the vertical error budget to 4.9 m (16 ft). This relaxation is still very conservative and equates to 66 per cent of the equivalent ILS error budget [7 m (24.1 ft)].

13.7.6.2 An example of the use of Figure G-33 is presented by point A. Using the foregoing expansions, a computed centre line approach to a secondary runway is possible for a –1 400 m runway spacing and +200 m threshold stagger.

14. Application of Table G-15 service level ob ectives for MLS/RNAV operations

14.1 MLS/RNAV procedures discussed below can be conducted with ground equipment meeting integrity and continuity of service objectives identified in Table G-15. Many of these operations may be accomplished with MLS ground equipment meeting Level 2 objectives only. Further a majority of the procedures may not require positive guidance during the discontinued approach/missed approach procedure. Where procedural means cannot provide the required obstacle clearance along an unguided discontinued approach/missed approach, some form of secondary guidance will be required. The accuracy requirements of the secondary guidance system will be determined by the nature of the obstacle-rich environment.

14.1.1 In those rare cases where an MLS/RNAV procedure is in an obstacle-rich environment, the calculated obstacle exposure time (OET) may require a higher level of equipment type than that required for landing.

14.1.2 *etermination of critical segments*

14.1.2.1 The following terms are used to determine the length of the critical segments of an MLS/RNAV procedure.

Obstacle-rich environment. An environment where it is not possible to construct an unguided discontinued approach/missed approach using procedural means. Secondary guidance will be required to achieve a climb to minimum sector altitude.

Critical segment. A segment where an unguided discontinued approach/missed approach would expose the aircraft to an obstacle.

Obstacle exposure time (OET). The time interval required to fly the critical segment of an MLS/RNAV procedure. This time is used to establish the required level of service of the non-aircraft guidance equipment.

14.1.2.2 In order to determine OET the following procedure can be followed (see Figure G-34):

a) determine if there is an obstacle-rich environment by aligning the unguided discontinued approach/missed approach surface with any potential heading that may be used during an unguided discontinued approach/missed approach from the MLS/RNAV procedure;

b) determine whether there is a procedural means for avoiding the obstacle without the need for secondary guidance; and

c) determine the OET as the period of time during which the obstacle is within the unguided discontinued approach/ missed approach surface, while there is no procedural means for avoiding the obstacle.

14.2 Computed centre line operations

14.2.1 When conducted to the primary runway, these operations require the airborne system to compute lateral guidance only. Vertical guidance is provided by the elevation function directly. The airborne equipment providing the lateral guidance must have the same integrity as the MLS receiver is required to have for basic MLS operations being conducted to an equivalent decision height. Computed centre line operations conducted to a decision height below a Category I decision height require that the DME have an accuracy, integrity and continuity of service level applicable to the type of operation.

14.2.2 When conducted to a parallel secondary runway these operations require the airborne system to compute both lateral and vertical guidance. Decision heights may be limited by the MLS signal coverage and computed guidance accuracy achievable.

14.2.3 MLS ground equipment meeting Level 2 service objectives may be sufficient for computed centre line operations when:

a) the operation is conducted to Category I decision heights or higher; and

b) reference path construction and computed lateral and vertical guidance by the airborne equipment meets the same level of integrity as the MLS receiver for a basic MLS operation.

14.2.4 When computed centre line operations are conducted below Category I decision heights, the service level of the MLS ground equipment must be commensurate with the decision height used. Identically the airborne equipment providing computed guidance must have the same integrity as the basic receiver would have to conduct MLS basic operations to an equivalent decision height.

14.3 MLS curved path procedures

14.3.1 These procedures must be examined carefully to determine the level of service needed for the ground equipment. With MLS curved path operations the most stringent requirement for integrity and continuity of service may be based on a portion of the flight path prior to decision height. In these situations, the integrity and continuity of service objectives of the MLS ground equipment cannot be predicated solely on the category of the landing. For operations where the obstacle clearance requirements place a high degree of reliance on guidance accuracy, the ground equipment integrity and continuity of service objectives can be determined using the risk tree method described in Attachment A. The following requirements must also be considered:

a) airborne equipment must have the capability of reference path construction and computed vertical and lateral guidance with positive control in the turns; and

b) airborne integrity and continuity of service must be consistent with the degree of reliance on the guidance accuracy necessary to safely execute the procedure.

15. Application of simplified MLS configurations

15.1 While SARPs for basic and expanded MLS configurations state a single signal-in-space standard, a simplified MLS configuration is defined in Chapter 3, 3.11.3.4 to permit the use of MLS in support of RNP-based approach and departure operations (Chapter 2, 2.1.6).

15.2 Relaxed coverage, accuracy, and monitor limits do not exceed those specified in Chapter 3, 3.1 for a Facility Performance Category I ILS. Such a simplified MLS configuration is capable of supporting Category I operations with significant reductions in size of azimuth and elevation antennas. Further reductions in equipment complexity can be achieved as the CMN requirement is waived for applications in support of approach and landing operations which do not require autopilot coupling.

15.3 The simplified MLS is compatible with the basic and expanded MLS configurations.

Table G-1. System power budget

(±40° azimuth coverage; 0–20° vertical coverage; 37 km (20 NM) range)

Power budget items (Note 1)	Approach azimuth function					Elevation function			Back azimuth function			
			Angle BW				Angle BW			Angle BW		
	DPSK	Clearance	1°	2°	3° (Note 2)	DPSK	1°	2°	DPSK	1°	2°	3°
Signal required at aircraft (dBm)	–95.0	–93.5	–91.2	–85.2	–81.7	–95.0	–93.5	–90.0	–95.0	–93.5	–88.2	–84.7
Propagation loss (dB) (Notes 3, 4)	139.0	139.0	139.0	139.0	139.0	138.1	138.1	138.1	133.9	133.9	133.9	133.9
Probabilistic losses (dB):												
a) Polarization	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b) Rain	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.3	1.3	1.3	1.3
c) Atmospheric	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
d) Horizontal multipath	3.0	3.0	0.5	0.5	0.5	3.0	–	–	3.0	0.5	0.5	0.5
e) Vertical multipath	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0
Root – sum – square (RSS) total a) through e) (dB)	4.3	4.3	3.1	3.1	3.1	4.3	2.5	2.5	3.9	2.5	2.5	2.5
Horizontal and vertical pattern loss (dB)	–	1.0	2.0	2.0	2.0	–	6.0	6.0	–	2.0	2.0	2.0
Monitor margin (dB)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Antenna gain (dB) (Note 5)	–	–13.3	–23.0	–20.0	–18.0	–	–20.8	–17.8	–	–23.0	–20.0	–18.0
Net power gain at coverage extremes (dB)	–7.3	–	–	–	–	–7.3	–	–	–7.3	–	–	–
Required transmitter power (dBm)	42.5	39.0	31.4	40.4	41.1	41.6	33.8	40.3	37.1	23.4	31.7	37.2
Example 20 watt transmitter (dBm)	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
Transmitter power margin (dB)	0.5	4.0	11.6	2.6	1.9	1.4	9.2	2.7	5.9	19.6	11.3	5.8

NOTES.—

1. Losses and antenna gains are representative values.
2. High data rate for 3° azimuth beamwidth will reduce required transmitter power by 4.8 dB.
3. Distance to azimuth antenna taken as 41.7 km (22.5 NM).
4. Distance to back azimuth antenna taken as 23.1 km (12.5 nautical miles).
5. The required transmitter power can be reduced by using higher efficiency antennas.

Table G-2. Airborne power budget

Power budget items	DPSK	Clearance	Approach azimuth function				Elevation function		Back azimuth function		
			Angle BW				Angle BW		Angle BW		
			1°	2°	3°	3° (Note 1)	1°	2°	1°	2°	3°
IF SNR (dB) required for:											
a) 72% decode rate	5.0	—	—	—	—	—	—	—	—	—	—
b) 0.1° CMN (Note 2)	—	—	8.8	14.8	18.3	13.5	—	10.0	—	11.8	15.3
c) Acquisition	—	6.5	—	—	—	—	6.5	—	6.5	—	—
Noise power in 150 kHz IF bandwidth (dBm)	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0	–122.0
Signal power required at IF (dBm)	–117.0	–115.5	–113.2	–107.2	–103.7	–108.5	–115.5	–112.0	–115.5	–110.2	–106.7
Noise figure (dB)	11	11	11	11	11	11	11	11	11	11	11
Cable loss (Note 3) (dB)	5	5	5	5	5	5	5	5	5	5	5
Airborne antenna gain (dBi)	0	0	0	0	0	0	0	0	0	0	0
Margin (dB)	6	6	6	6	6	6	6	6	6	6	6
Signal required at aircraft (dBm)	–95.0	–93.5	–91.2	–85.2	–81.7	–86.5	–93.5	–90.0	–93.5	–88.2	–84.7

NOTES.—

1. High rate approach azimuth function.
2. 0.2° CMN for the back azimuth function.
3. Provides for either front or rear antenna cable losses in typical installations. Additional losses (up to 11 dB) may be accommodated by air carrier class avionics.

Table G-3. Sample RNAV procedures for MLS installation on Runway 23R
(see Figure G-15)

Procedure name	Procedure type	Runway	Missed approach	Number of way-points	AAZ or BAZ
KASEL-1-A	Approach	23R	Yes	4	AAZ
NELSO-1-B	Approach	23R	Yes	3	AAZ
N/A	Missed approach	23R	N/A	2	AAZ
SEMOR-1-C	Approach	26 (Note)	No	2	AAZ
LAWSO-6-D	Departure	23R	N/A	3	BAZ

Note.— Runway 26 is a secondary runway. The virtual azimuth to way-point distance is 3 000 m.

Table G-4. Sample way-point information for MLS/RNAV procedures

Basic indicator	Validity indicator	Route indicator	Way-point number	X (metres)	Y (metres)	Z (metres)	Notes
KASEL	1	A	4	8 200	–9 094	N/A	No Z
			3	9 954	–5 336	789	PFAF
			2	6 556	0	344	No Z, No Y
			1	259	0	16.8 (Note)	Threshold
NELSO	1	B	3	9 742	6 499	819	PFAF
			2	6 556	0	344	Shared with KASEL
			1	259	0	16.8 (Note)	Shared with KASEL
N/A (missed approach)	N/A	N/A	2	–7 408	0	N/A	No Z, No Y
			1	0	0	N/A	No Z, No Y
SEMOR	1	C	2	5 567	–5 276	346	PFAF
			1	159	–2 401	16	Threshold
LAWSO	6	D	3	–8 018	3 057	N/A	No Z
			2	–4 964	0	N/A	No Z, No Y
			1	0	0	N/A	No Z, No Y

Note.— This value is the threshold crossing height, referenced to ground level at threshold. The height of the threshold with respect to the MLS datum point is given in auxiliary word A2.

Table G-5. Example of B1 and B39 data word assignments

Data word title	Data word	Bit numbers	Data item	Value	Coding
Approach azimuth map/CRC	B1	I_{21-24}	Number of procedure descriptors	3	1100
		I_{25-30}	Last approach azimuth database word	11	001011 (Note 2)
		I_{31-62}	CRC code	See Table G-9	
		I_{63}	Word B42 transmitted	No	0
		I_{64}	Word A4 transmitted	Yes	1
		I_{65}	Word B43 transmitted	No	0
		I_{66-69}	Spare	zeros	0000
Back azimuth map/CRC (Note 3)	B39	I_{21-24}	Number of procedure descriptors	1	1000
		I_{25-30}	First back azimuth database word	36	100100 (Note 2)
		I_{31-62}	CRC code	See Table G-9	
		I_{63}	Word B43 transmitted	No	0
		I_{64-68}	Spare	zeros	00000
		I_{69}	Back azimuth map/CRC indicator	map/CRC	1

NOTES.—

1. Bit coding is indicated with the lower bit number on the left.
2. Data word addresses are as defined in Table A-9, Appendix A with the most significant bit first.
3. Facility without back azimuth database may employ all words up to B39 for the approach azimuth database.

Table G-6. Example of procedure descriptor word assignments

Data item	Bit numbers	Procedure descriptor data words							
		KASEL		NELSO		SEMOR		LAWSO	
		B2		B3		B4		B36	
		Value	Coded	Value	Coded	Value	Coded	Value	Coded
Basic indicator (first character)	I_{21}-I_{25}	K	11010	N	01110	S	11001	L	00110
Second character	I_{26}-I_{30}	A	10000	E	10100	E	10100	A	10000
Third character	I_{31}-I_{35}	S	11001	L	00110	M	10110	W	11101
Fourth character	I_{36}-I_{40}	E	10100	S	11001	O	11110	S	11001
Fifth character	I_{41}-I_{45}	L	00110	O	11110	R	01001	O	11110
Validity indicator	I_{46}-I_{49}	1	1000	1	1000	1	1000	6	0110
Route indicator	I_{50}-I_{54}	A	10000	B	01000	C	11000	D	00100
Runway number	I_{55}-I_{60}	23	111010	23	111010	26	010110	23	111010
Runway letter	I_{61}-I_{62}	R	10	R	10	–	00	R	10
Procedure type	I_{63}	APP	0	APP	0	APP	0	DEP	1
First way-point index	I_{64}-I_{69}	1	100000	4	001000	5	101000	1	100000

Note.— Bit coding is indicated with the lower bit number on the left.

Table G-7. Example of way-point assignments for MLS/RNAV approach procedures

Procedure name	Data word	Bit numbers	Data item	Value	Value	WP Index
KASEL	B5	I_{21-35}	WP 4 – X coordinate	8 200 m	110000010011000	1
		I_{36}	Y coordinate follows	Yes	1	
		I_{37-51}	WP 4 – Y coordinate	–9 094 m	000001111011001	
		I_{52}	Z coordinate follows	No	0	
		I_{53-55}	Next segment/field identifier	straight = 0	000	
		I_{56-69}	WP 3 – X coordinate (first 14 bits)	9 954 m	00001100111100	2
	B6	I_{21}	WP 3 – X coordinate (last bit)		0	
		I_{22}	Y coordinate follows	Yes	1	
		I_{23-37}	WP 3 – Y coordinate	–5 336 m	001001000001001	
		I_{38}	Z coordinate follows	Yes	1	
		I_{39-51}	WP 3 – Z coordinate	789 m	1001111011000	
		I_{52-54}	Next segment field/identifier	curved = 1	100	
		I_{55-69}	WP 2 – X coordinate	6 556 m	100000000101000	3
	B7	I_{21}	Y coordinate follows	No	0	
		I_{22}	Z coordinate follows	Yes	1	
		I_{23-35}	WP 2 – Z coordinate	344 m	0011110110000	
		I_{36-38}	Next segment/field identifier	5	101	
		I_{39-44}	Threshold way-point height	16.8 m	010001	
		I_{45-50}	Missed approach index	7	111000	
NELSO		I_{51-65}	WP 3 – X coordinate	9 742 m	101110110111000	4
		I_{66}	Y coordinate follows	Yes	1	
		I_{67-69}	WP 3 – Y coordinate (first 3 bits)	6 499 m	110	
	B8	I_{21-32}	WP 3 – Y coordinate (last 12 bits)		101111001000	
		I_{33}	Z coordinate follows	Yes	1	
		I_{34-46}	WP 3 – Z coordinate	819 m	1110100111000	
		I_{47-49}	Next segment/field identifier	shared = 3	110	
		I_{50-55}	Next way-point index	3	110000	
SEMOR		I_{56-69}	WP 2 – X coordinate (first 14 bits)	5 567 m	11111110000100	5
	B9	I_{21}	WP 2 – X coordinate (last bit)		0	
		I_{22}	Y coordinate follows	Yes	1	
		I_{23-37}	WP 2 – Y coordinate	–5 276 m	101100000001001	
		I_{38}	Z coordinate follows	Yes	1	
		I_{39-51}	WP 2 – Z coordinate	346 m	0111110110000	
		I_{52-54}	Next segment/field identifier	straight = 0	000	
		I_{55-69}	WP 1 – X coordinate	159 m	011111000000000	6
	B10	I_{21}	Y coordinate follows	Yes	1	
		I_{22-36}	WP 1 – Y coordinate	–2 401 m	010101011100001	
		I_{37}	Z coordinate follows	Yes	1	

Procedure name	Data word	Bit numbers	Data item	Value	Value	WP Index
		$I_{38\text{-}50}$	WP 1 – Z coordinate	16 m	0010111000000	
		$I_{51\text{-}53}$	Next segment/field identifier	6	011	
		$I_{54\text{-}59}$	Virtual azimuth distance	3 000 m	011110	
Missed Approach		$I_{60\text{-}69}$	WP 2 – X coordinate (first 10 bits)	–7 408 m	0111001011	7
	B11	$I_{21\text{-}25}$	WP 2 – X coordinate (last 5 bits)		01001	
		I_{26}	Y coordinate follows	No	0	
		I_{27}	Z coordinate follows	No	0	
		$I_{28\text{-}30}$	Next segment/field identifier	straight = 0	000	
		$I_{31\text{-}45}$	WP 1 – X coordinate	0	000000000000000	8
		I_{46}	Y coordinate follows	No	0	
		I_{47}	Z coordinate follows	No	0	
		$I_{48\text{-}50}$	Next segment/field identifier	6	011	
		$I_{51\text{-}69}$	Spare	zeros	000...000	

Note.— Bit coding is indicated with the lower bit number on the left.

Table G-8. Example MLS/RNAV departure way-point assignments

Procedure name	Data word	Bit numbers	Data item	Value	Coding	WP Index
LAWSO	B37	I_{21-35}	WP 3 – X coordinate	–8 018 m	001111000011001	1
		I_{36}	Y coordinate follows	Yes	1	
		I_{37-51}	WP 3 – Y coordinate	3 057 m	010101010010000	
		I_{52}	Z coordinate follows	No	0	
		I_{53-55}	Next segment/field identifier	curved = 1	100	
		I_{56-69}	WP 2 – X coordinate (first 14 bits)	–4 964 m	11001001111000	2
	B38	I_{21}	WP 2 – X coordinate (last bit)		1	
		I_{22}	Y coordinate follows	No	0	
		I_{23}	Z coordinate follows	No	0	
		I_{24-26}	Next segment/field identifier	straight = 0	000	
		I_{27-41}	WP 1 – X coordinate	0	000000000000000	3
		I_{42}	Y coordinate follows	No	0	
		I_{43}	Z coordinate follows	No	0	
		I_{44-46}	Next segment/field identifier	Last WP = 6	011	
		I_{47-69}	Spare	zeros	000...000	

Note.— Bit coding is indicated with the lower bit number on the left.

Table G-9. Example of complete MLS/RNAV database

	Bit position															
	1	2			3		4			5		6			7	
Word	3456	7890	1234	5678	9012	3456	7890	1234	5678	9012	3456	7890	1234	5678	9012	3456
A1	0000	0111	0011	0010	0101	1101	1001	1000	0010	0110	0010	0100	0000	0000	0000	0100
A2	0000	1010	0011	0010	0111	0000	0010	0111	1001	1000	0000	0000	0110	0000	0001	1010
A3	0000	1101	0011	0010	0001	0111	0110	0110	0011	0000	0100	0110	0111	0000	0111	1101
A4	0001	0011	0011	0010	0111	0000	0010	0000	0000	0000	0001	0000	0000	0000	0110	1000
B1	0000	0111	1100	0010	1100	0111	0100	0011	1111	0000	0001	1001	0001	0000	0010	0111
B2	0000	1010	1101	0100	0011	0011	0100	0011	0100	0100	0011	1010	1001	0000	0111	1001
B3	0000	1101	0111	0101	0000	1101	1001	1111	0100	0010	0011	1010	1000	0100	0000	1101
B4	0001	0011	1100	1101	0010	1101	1110	0100	1100	0110	0001	0110	0001	0100	0011	1110
B5	0001	0100	1100	0001	0011	0001	0000	0111	1011	0010	0000	0001	1001	1110	0000	0001
B6	0001	1001	0100	1001	0000	0100	1110	0111	1011	0001	0010	0000	0001	0100	0011	0000
B7	0001	1110	0100	1111	0110	0001	0101	0001	1110	0010	1110	1101	1100	0111	0110	1001
B8	0010	0010	1011	1100	1000	1111	0100	1110	0011	0110	0001	1111	1100	0010	0000	0011
B9	0010	0101	0110	1100	0000	0100	1101	1111	0110	0000	0001	1111	0000	0000	0101	0110
B10	0010	1000	1010	1010	1110	0001	1001	0111	0000	0001	1011	1100	1110	0101	1110	0100
B11	0010	1111	0100	1000	0000	0000	0000	0000	0000	1100	0000	0000	0000	0000	0110	0100
B36	1001	0001	0011	0100	0011	1011	1001	1111	0011	0001	0011	1010	1011	0000	0010	0101
B37	1001	0110	0011	1100	0011	0011	0101	0101	0010	0000	1001	1001	0011	1100	0100	0000
B38	1001	1011	1000	0000	0000	0000	0000	0000	1100	0000	0000	0000	0000	0000	0001	1101
B39	1001	1100	1000	1001	0010	1011	0010	0001	1000	1011	1111	0010	0000	0000	1010	1001
B40	1010	0000	0111	0011	0110	0110	0110	1000	0101	0110	0101	0010	0010	1010	0110	1001
B41	1010	0111	1100	0000	0000	0110	1101	1001	0111	0000	0000	0000	0000	0000	0001	1111
B44	1011	0011	1110	1010	0101	1000	0100	1010	0000	1110	1110	1000	1000	0000	0001	1011
B45	1011	0100	1111	1001	0000	0000	0000	1101	0010	0100	0000	0000	0010	1111	0000	0011
BDW6	0011	0011	1000	1000	0011											

Note.— Preamble bits I_1 to I_{12} are not shown.

Table G-10. Error allocations for MLS azimuth critical and sensitive area development

(distances are in metres (feet); error values are in degrees)

		Azimuth to threshold distance metres (feet)							
		1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 360 (11 000)	3 660 (12 000)	3 960 (13 000)
	Antenna beamwidth	2°	2°	2°	2°	2°	1°	1°	1°
a)	System budget for PFN = 3.5 m (11.5 ft)	0.1098	0.0941	0.0824	0.0732	0.0659	0.0599	0.0549	0.0507
b)	Ground equipment error allowance	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120
c)	Ground reflection allowance	0.0400	0.0400	0.0400	0.0400	0.0400	0.0200	0.0200	0.0200
d)	Clean site error allocation $\left[d = \sqrt{a^2 - b^2 - c^2}\right]$	0.1016	0.0844	0.0710	0.0601	0.0510	0.0552	0.0497	0.0450
e)	ALS/monitor pole allowance	0.0300	0.0300	0.0300	0.0300	0.0300	0.0150	0.0150	0.0150
f)	Complex site error allocation $\left[f = \sqrt{d^2 - e^2}\right]$	0.0970	0.0788	0.0643	0.0521	0.0412	0.0531	0.0474	0.0424
g)	70 per cent complex site error allocation	0.0679	0.0552	0.0450	0.0365	0.0288	0.0372	0.0332	0.0297
a)	System budget for CMN = 3.2 m (10.5 ft)	0.1003	0.0859	0.0752	0.0668	0.0602	0.0547	0.0501	0.0463
b)	Ground equipment error allowance	0.0315	0.0270	0.0236	0.0210	0.0189	0.0172	0.0158	0.0145
c)	Airborne equipment error allowance	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150
d)	Allowance for structure vibration	0.0320	0.0320	0.0320	0.0320	0.0320	0.0320	0.0320	0.0320
e)	Clean/complex site error allocation $\left[e = \sqrt{a^2 - b^2 - c^2 - d^2}\right]$	0.0884	0.0735	0.0620	0.0527	0.0449	0.0380	0.0319	0.0261
f)	70 per cent complex site error allocation	0.0619	0.0515	0.0434	0.0369	0.0314	0.0266	0.0223	0.0183

Table G-11. Error allocations for MLS elevation critical area development
(all allocation values are in degrees)

Antenna beamwidth		1.5°	1.0°
a)	System budget for PFN = 0.4 m (1.3 ft)	0.083	0.083
b)	Ground equipment error allowance	0.010	0.010
c)	Sidelobe reflections allowance	0.055	0.037
d)	Clean site error allocation $\left[d = \sqrt{a^2 - b^2 - c^2}\right]$	0.061	0.073
e)	Vertical diffractions (field monitors)	0.030	0.030
f)	Lateral reflections allowance	0.031	0.043
g)	Complex site error allocation $\left[g = \sqrt{d^2 - e^2 - f^2}\right]$	0.043	0.051
h)	70% complex site error allocation	0.030	0.036
a)	System budget for CMN = 0.3 m (1.0 ft)	0.064	0.064
b)	Ground equipment error allowance	0.032	0.032
c)	Airborne equipment error allowance	0.010	0.010
d)	Sidelobe reflections allowance	0.015	0.010
e)	Allowance for structure vibration	0.010	0.010
f)	Clean/complex site error allocation $\left[f = \sqrt{a^2 - b^2 - c^2 - d^2 - e^2}\right]$	0.052	0.053
g)	70% complex site error allocation	0.036	0.037

Table G-12A. Typical azimuth sensitive area lengths
(aligned approach along zero degree azimuth see 4.3.7)
(distances are in metres (feet); values in both units have been rounded)

Azimuth to threshold distance	2.0° beamwidth					1.0° beamwidth		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-747, clean site	490 (1 600)	520 (1 700)	580 (1 900)	610 (2 000)	640 (2 100)	670 (2 200)	700 (2 300)	700 (2 300)
B-727, clean site	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	460 (1 500)	490 (1 600)
B-747, complex site	490 (1 600)	550 (1 800)	580 (1 900)	640 (2 100)	700 (2 300)	730 (2 400)	760 (2 500)	820 (2 700)
B-727, complex site	300 (1 000)	300 (1 000)	300 (1 000)	460 (1 500)	550 (1 800)	460 (1 500)	490 (1 600)	550 (1 800)

Table G-12B. Typical azimuth sensitive area lengths
(offset approach see 4.3.7.1)
(distances are in metres (feet); values in both units have been rounded)

Azimuth to threshold distance	2.0° beamwidth					1.0° beamwidth		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-747, clean site	640 (2 100)	730 (2 400)	790 (2 600)	880 (2 900)	880 (2 900)	920 (3 000)	940 (3 100)	1 010 (3 300)
B-727, clean site	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	490 (1 600)	550 (1 800)
B-747, complex site	670 (2 200)	760 (2 500)	820 (2 700)	880 (2 900)	1 010 (3 300)	980 (3 200)	1 070 (3 500)	1 130 (3 700)
B-727, complex site	300 (1 000)	300 (1 000)	330 (1 100)	460 (1 500)	550 (1 800)	490 (1 600)	520 (1 700)	550 (1 800)

Table G-12C. Typical azimuth sensitive area lengths
(computed centre line approach see 4.3.7.2 clean sites)
(distances are in metres (feet); values in both units have been rounded)

Azimuth to threshold distance	2.0° beamwidth					1.0° beamwidth		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-727, clean site								
Height: 300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)
75 (250)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	490 (1 600)	550 (1 800)
60 (200)	300 (1 000)	300 (1 000)	300 (1 000)	460 (1 500)	490 (1 600)	610 (2 000)	610 (2 000)	670 (2 200)
45 (150)	300 (1 000)	300 (1 000)	490 (1 600)	550 (1 800)	610 (2 000)	670 (2 200)	760 (2 500)	820 (2 700)
30 (100)	300 (1 000)	520 (1 700)	610 (2 000)	700 (2 300)	820 (2 700)	920 (3 000)	980 (3 200)	1 100 (3 600)
15 (50)	610 (2 000)	730 (2 400)	880 (2 900)	1 010 (3 300)	1 070 (3 500)	1 100 (3 600)	1 040 (3 400)	1 190 (3 900)
B-747, clean site								
300 (1 000)	430 (1 400)	460 (1 500)	490 (1 600)	520 (1 700)	520 (1 700)	550 (1 800)	580 (1 900)	610 (2 000)
75 (250)	640 (2 100)	730 (2 400)	790 (2 600)	850 (2 800)	880 (2 900)	920 (3 000)	940 (3 100)	1 010 (3 300)
60 (200)	700 (2 300)	790 (2 600)	820 (2 700)	920 (3 000)	940 (3 100)	940 (3 100)	1 010 (3 300)	1 010 (3 300)
45 (150)	760 (2 500)	820 (2 700)	920 (3 000)	1 010 (3 300)	1 070 (3 500)	1 070 (3 500)	1 190 (3 900)	1 400 (4 600)
30 (100)	850 (2 800)	960 (3 100)	1 100 (3 600)	1 250 (4 100)	1 400 (4 600)	1 550 (5 100)	1 710 (5 600)	1 890 (6 200)
15 (50)	1 070 (3 500)	1 340 (4 400)	1 580 (5 200)	1 830 (6 000)	1 980 (6 500)	2 040 (6 700)	2 070 (6 800)	2 070 (6 800)

Table G-12D. Typical azimuth sensitive area lengths
(computed centre line approach see 4.3.7.2 complex sites)
(distances are in metres (feet); values in both units have been rounded)

Azimuth to threshold distance	2.0° beamwidth					1.0° beamwidth		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-727, complex site								
Height: 300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)
300 (1 000)	300 (1 000)	300 (1 000)	330 (1 100)	460 (1 500)	550 (1 800)	490 (1 600)	520 (1 700)	550 (1 800)
300 (1 000)	300 (1 000)	330 (1 100)	330 (1 100)	490 (1 600)	550 (1 800)	580 (1 900)	610 (2 000)	730 (2 400)
330 (1 100)	330 (1 100)	330 (1 100)	490 (1 600)	550 (1 800)	670 (2 200)	700 (2 300)	790 (2 600)	880 (2 900)
330 (1 100)	330 (1 100)	550 (1 800)	640 (2 100)	730 (2 400)	1 010 (3 300)	940 (3 100)	1 040 (3 400)	1 160 (3 800)
640 (2 100)	640 (2 100)	790 (2 600)	940 (3 100)	1 070 (3 500)	1 250 (4 100)	1 250 (4 100)	1 280 (4 200)	1 430 (4 700)
B-747, clean site								
300 (1 000)	430 (1 400)	460 (1 500)	490 (1 600)	520 (1 700)	670 (2 200)	550 (1 800)	580 (1 900)	610 (2 000)
75 (250)	670 (2 200)	760 (2 500)	820 (2 700)	880 (2 900)	1 010 (3 300)	980 (3 200)	1 070 (3 500)	1 130 (3 700)
60 (200)	730 (2 400)	820 (2 700)	920 (3 000)	1 010 (3 300)	1 130 (3 700)	1 040 (3 400)	1 070 (3 500)	1 220 (4 000)
45 (150)	820 (2 700)	880 (2 900)	980 (3 200)	1 100 (3 600)	1 220 (4 000)	1 100 (3 600)	1 190 (3 900)	1 430 (4 700)
30 (100)	920 (3 000)	1 010 (3 300)	1 130 (3 700)	1 280 (4 200)	1 430 (4 700)	1 580 (5 200)	1 770 (5 800)	1 950 (6 400)
15 (50)	1 100 (3 600)	1 370 (4 500)	1 620 (5 300)	1 830 (6 000)	2 130 (7 000)	2 230 (7 300)	2 350 (7 700)	2 380 (7 800)

Table G-13. Minimum height surface angle and related protected coverage volume lengths for MLS/RNAV approach procedures

Protected coverage volume length L[m(ft)] PCH = 2.0 m	Minimum height surface angle (degrees), θ B-727	B-747
300 (1 000)	1.81	3.49
450 (1 500)	1.23	2.36
600 (2 000)	0.95	1.79
750 (2 500)	0.77	1.44
900 (3 000)	N/A	1.21

The following equation can be used to determine the minimum height surface angle (Θ) in respect to an azimuth antenna phase centre for arbitrary protected coverage volume length "L".

$$\theta = \tan^{-1}\left[\frac{\mathrm{TFH} + \frac{\sqrt{\lambda(\mathrm{L})}}{4} - \mathrm{PCH}}{\mathrm{L}}\right]$$

where:

TFH = tail fin height;
PCH = phase centre height of MLS antenna;
λ = MLS wave length.

Note.— TF equals 10.4 m for B-727 and 19.3 m for B-747, and λ is 0.06 m. PC and L must be in metres if TF and λ are in metres.

Table G-14. Interrelationship of ground equipment monitor and control action

	Resultant action						
Sub-system failure	Approach azimuth	Approach elevation	Back azimuth	Basic data radiated into approach azimuth coverage	Basic data radiated into back azimuth coverage	Auxiliary data	DME/N or DME/P
Approach azimuth	*	*		+		+	
Approach elevation		*					
Back azimuth			*		+		
Basic data radiated into approach azimuth coverage	*	*		*		+	
Basic data radiated into back azimuth coverage			*		*		
Auxiliary data	+	+		+		*	
DME/N or DME/P							*

* Indicates radiation should cease.
\+ Indicates radiation may continue when operationally required.

Table G-15. Continuity of service and integrity ob ectives for MLS basic and MLS/RNAV operations

Level	Azimuth or elevation			DME/P (Note 6)		
	Integrity in any one landing	Continuity of service	MTBO (hours)	Integrity in any one landing (Note 4)	Continuity of service	MTBO (hours)
1	Not demonstrated, but designed to meet the Level 2 requirements (Note 3)					
2	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000
3	$1 - 0.5 \times 10^{-9}$	$1 - 2 \times 10^{-6}$ (15 s)	2 000	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000
4 (Note 5)	$1 - 0.5 \times 10^{-9}$	$1 - 2 \times 10^{-6}$ (30 s Az) (15 s El) (Note 6)	4 000 Az 2 000 El (Note 6)	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000

NOTES.—

1. Data word continuity of service and integrity are included in the specified values of the angle function for each level of service.
2. Back azimuth is not required for basic operations.
3. It is intended that all equipments meet at least Level 2 requirements.
4. If DME/N is used with MLS the figures may be reduced to $1 - 1 \times 10^{-5}$.
5. The Level 4 exposure times are based on experience with ILS and are consistent with existing operational capabilities. As experience is gained with MLS, and enhanced operational capabilities are proposed, it may be necessary to adjust these values.
6. MLS/RNAV procedures may require the Level 3 and 4 integrity, continuity of service and MTBO objectives of the elevation, DME/P and, if used, back azimuth to be equivalent to the approach azimuth equipment.

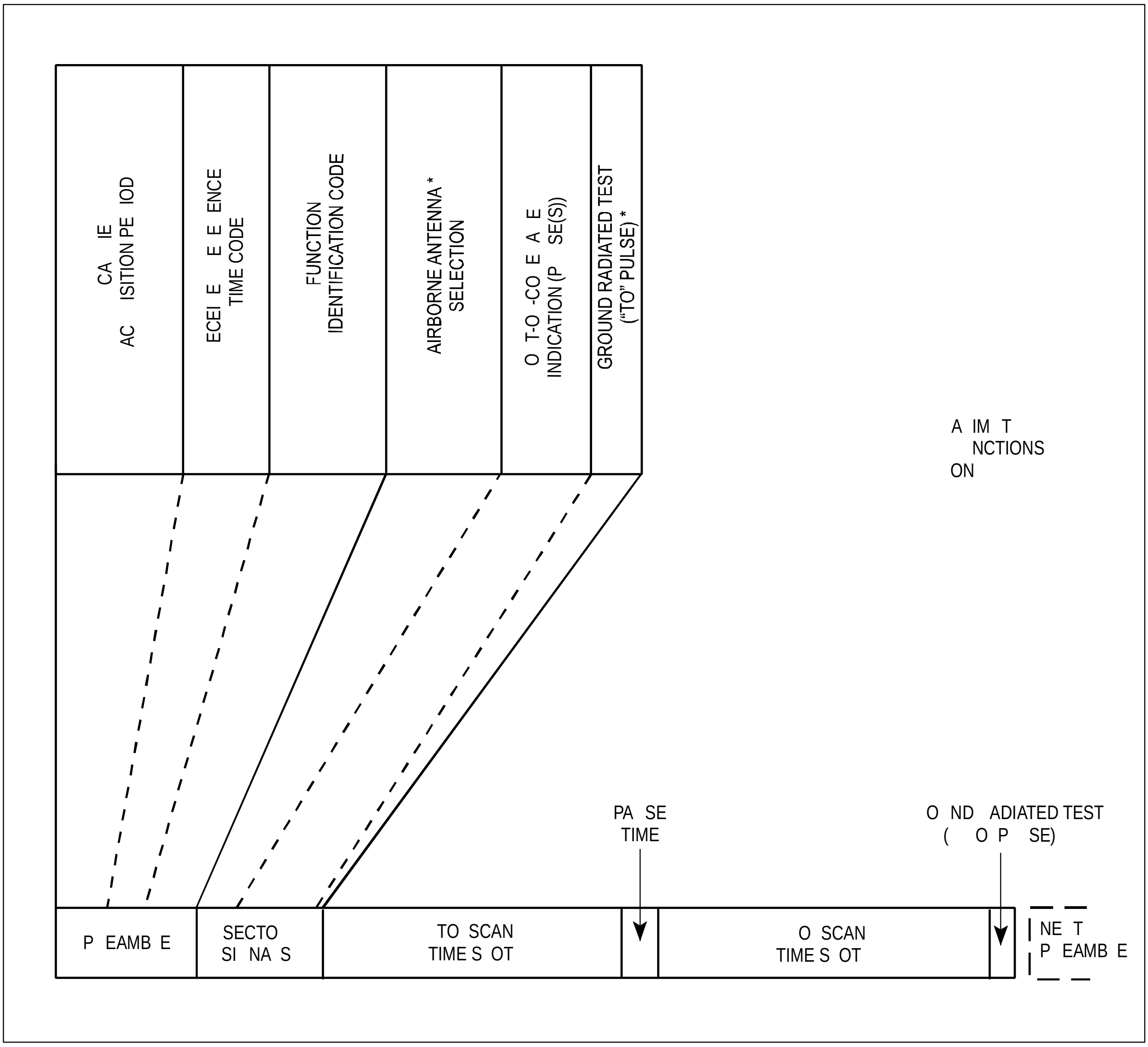


Figure G-1. Angle function organization

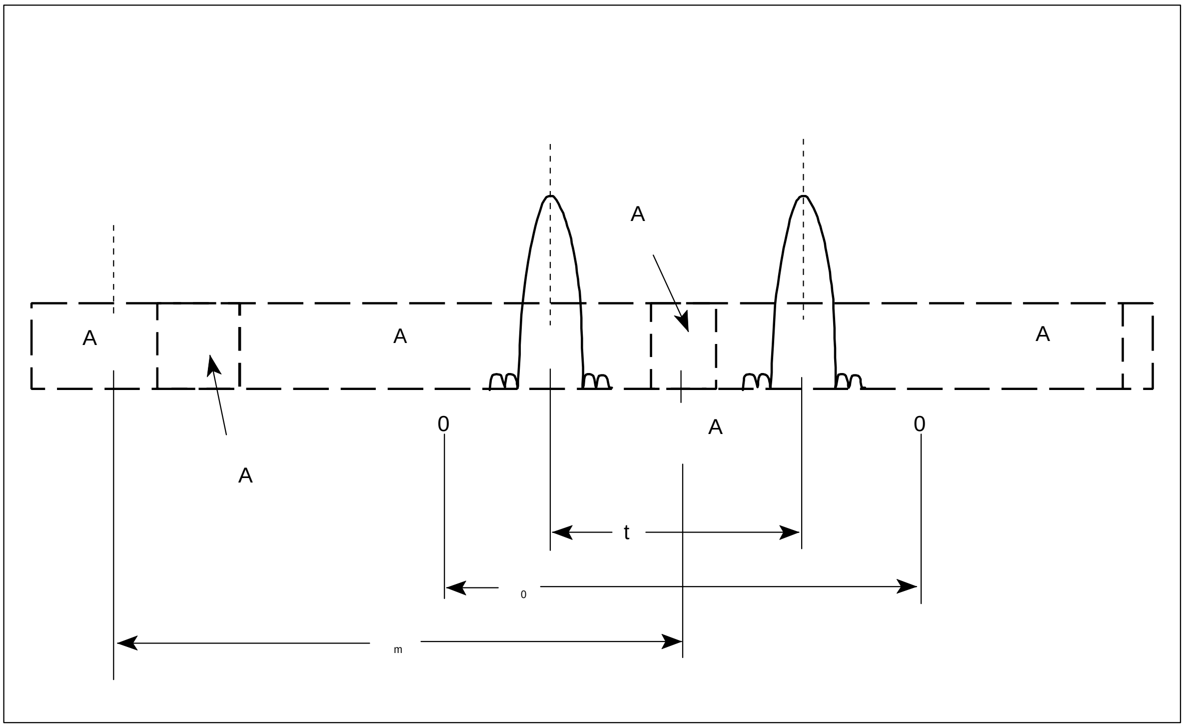
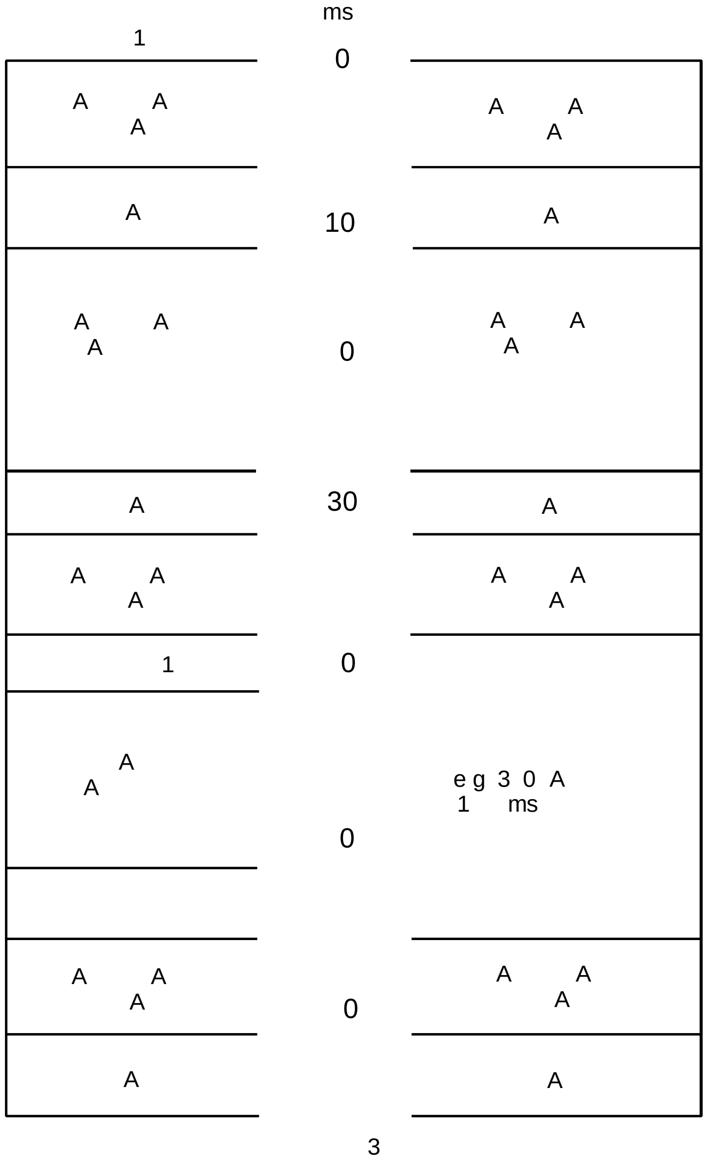


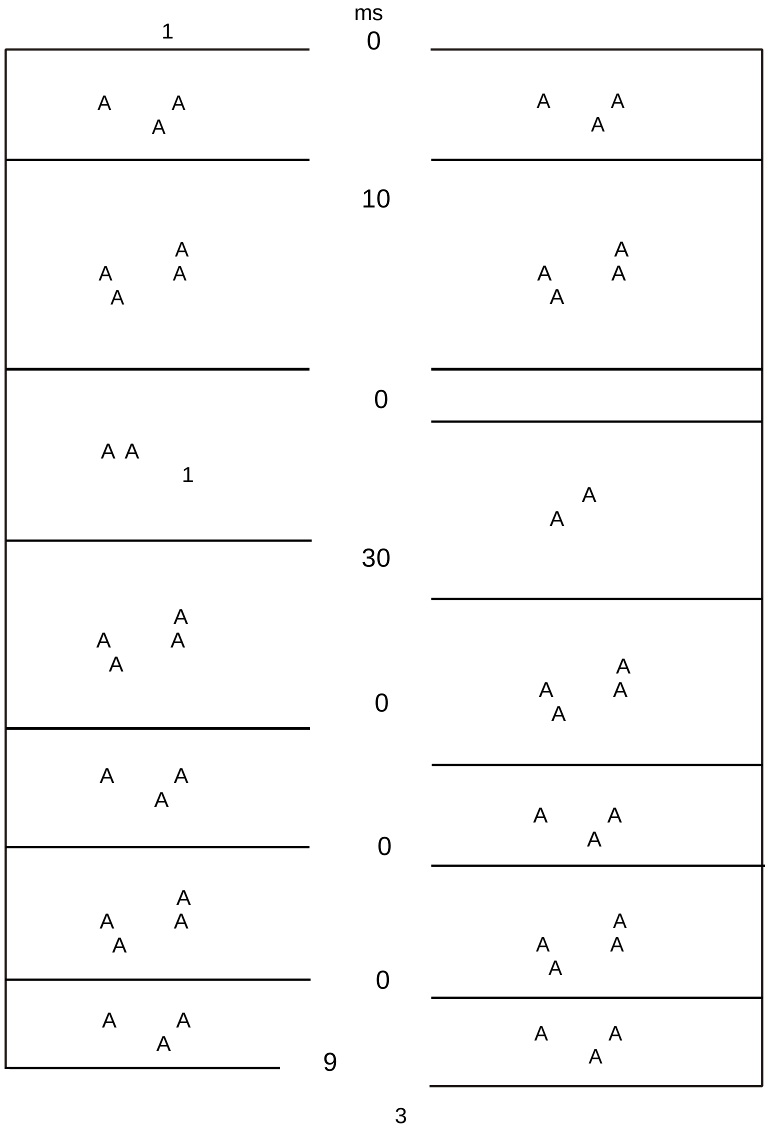
Figure G-2. Angle scan timing parameters



otes

1 en ac a imut is ro ided asic data ord must e transmitted only in t is osition
ata ords may e transmitted in any o en time eriods
3 e total time duration of se uence 1 lus se uence must not exceed 13 ms

Figure G-3A. Transmission sequence pair which provides for all MLS angle guidance functions



otes

1 ata ords may e transmitted in any o en time eriods
en ac a imut is ro ided asic data ord must e transmitted only in t is osition
3 e total time duration of se uence 1 lus se uence must not exceed 13 ms

Figure G-3B. Transmission sequence pair which provides for the MLS high rate approach azimuth angle guidance function

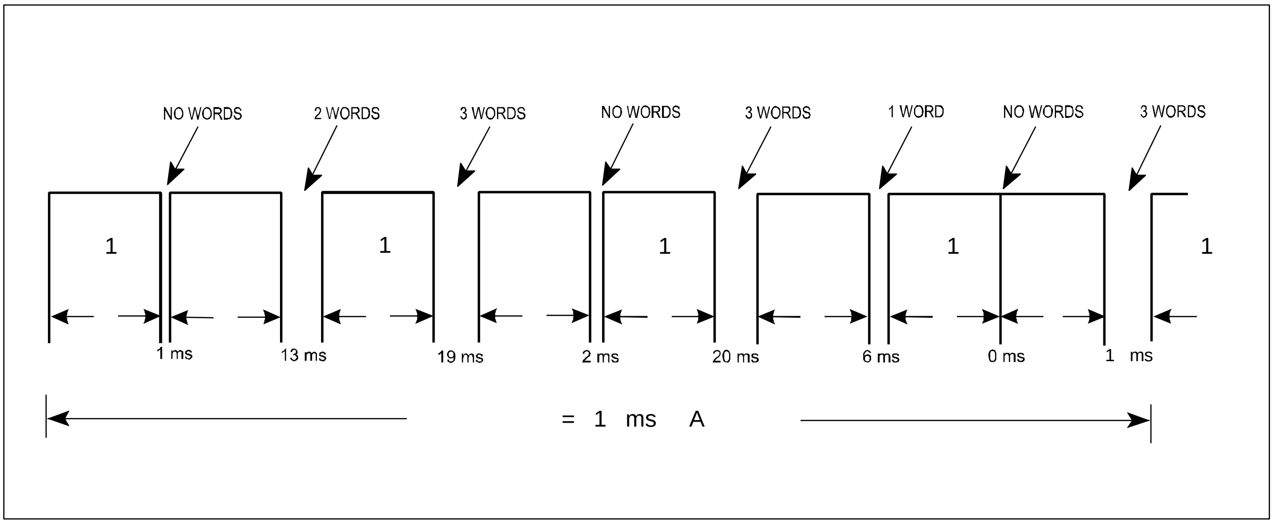


Figure G-3C. Complete multiplex transmission cycle showing open time periods available for data words

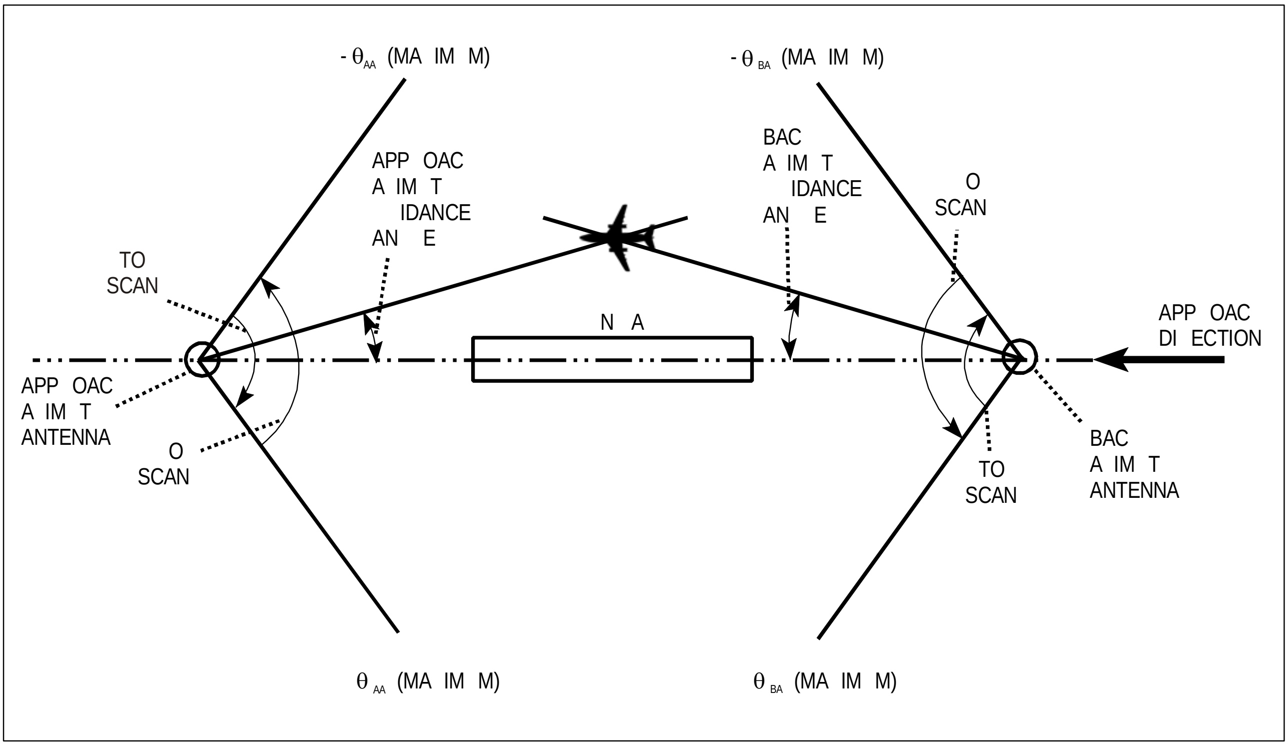
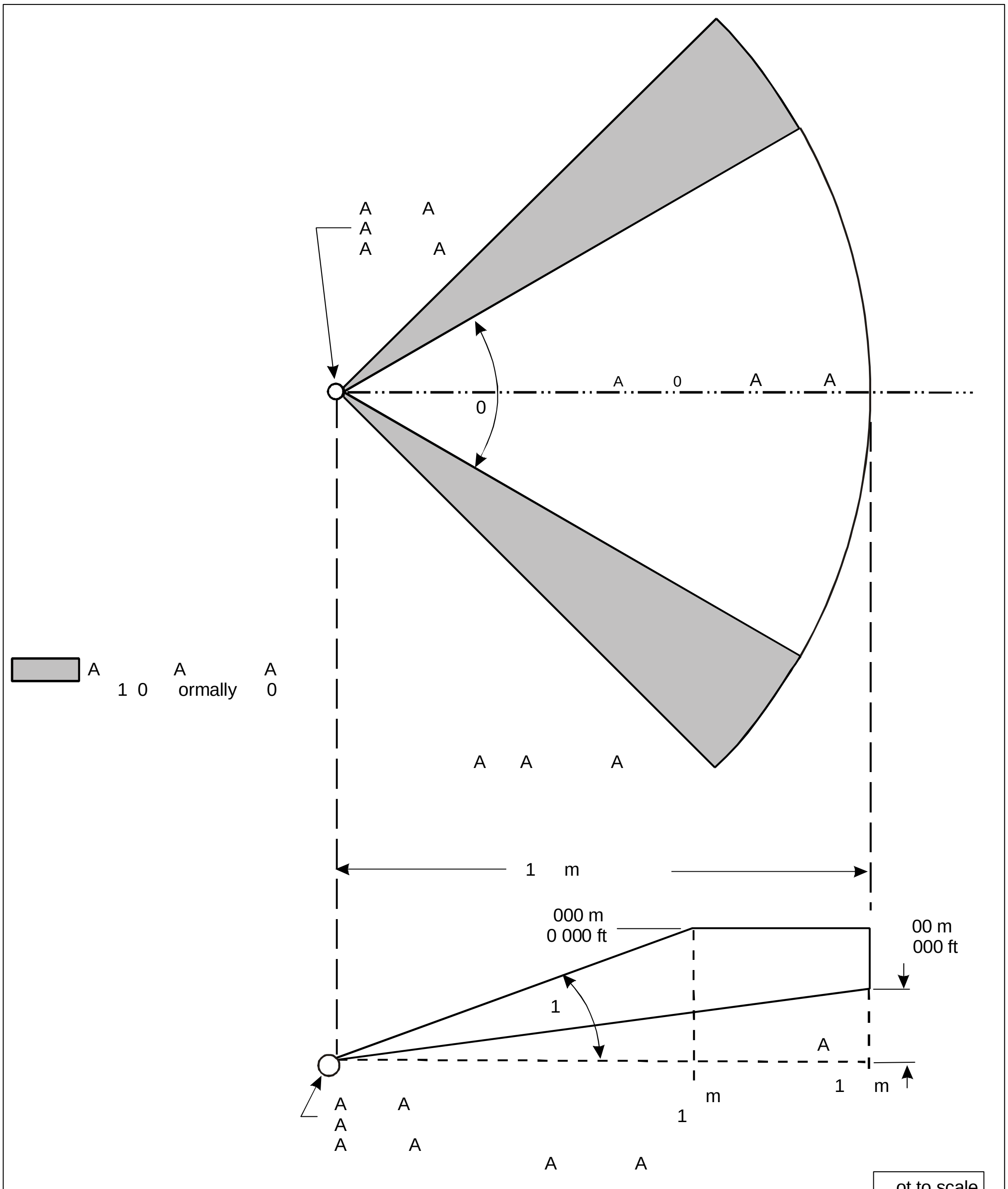
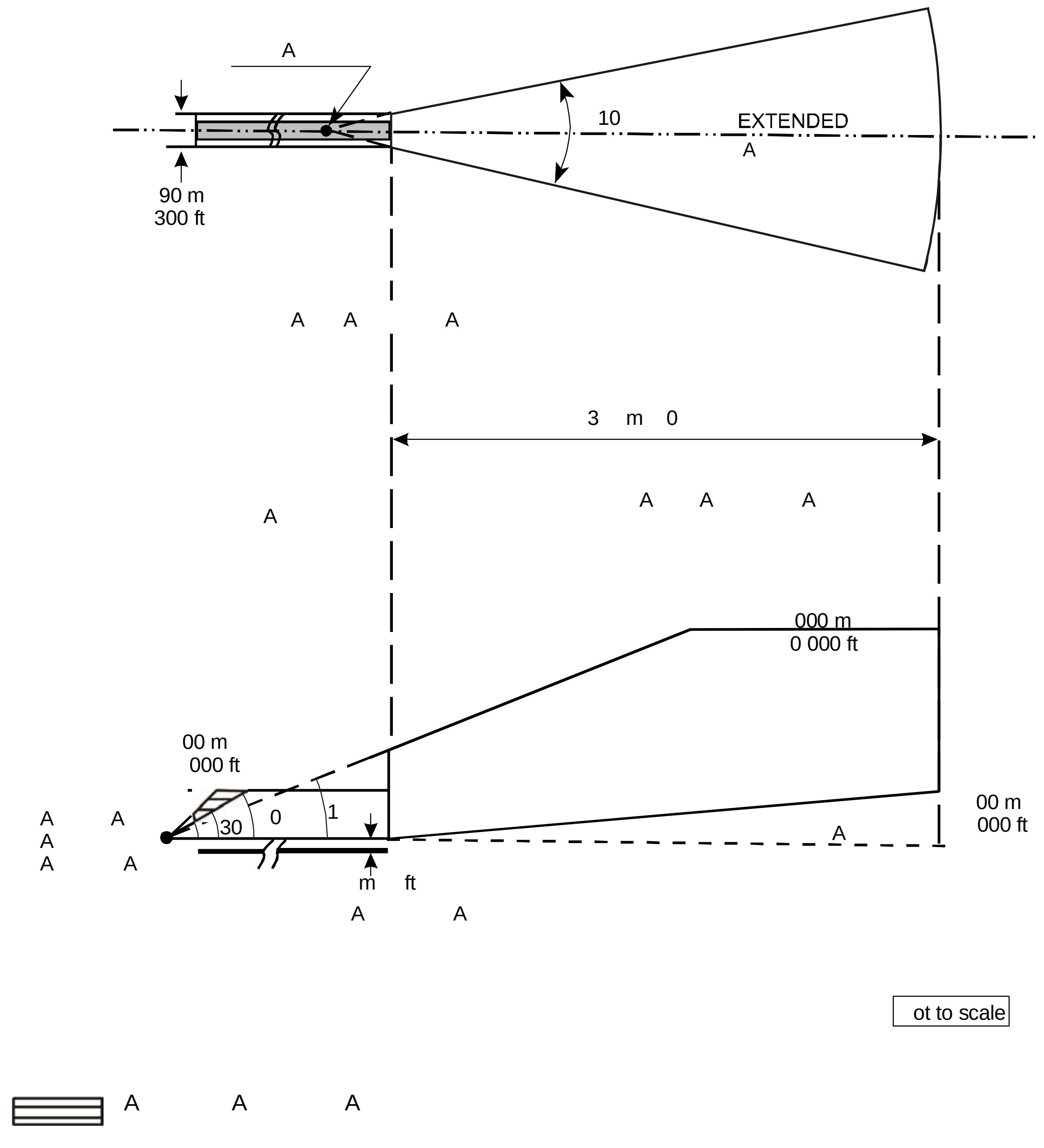


Figure G-4. Scanning conventions for azimuth guidance functions



Note. The above represents the coverage sector originating at the phase centre of the installed antenna.

Figure G-5A. Approach azimuth region coverage



Note. The above represents the minimum proportional guidance sector re uired, irrespective of e uipment location or orientation.

Figure G-5B. Azimuth runway region coverage and minimum operational coverage region

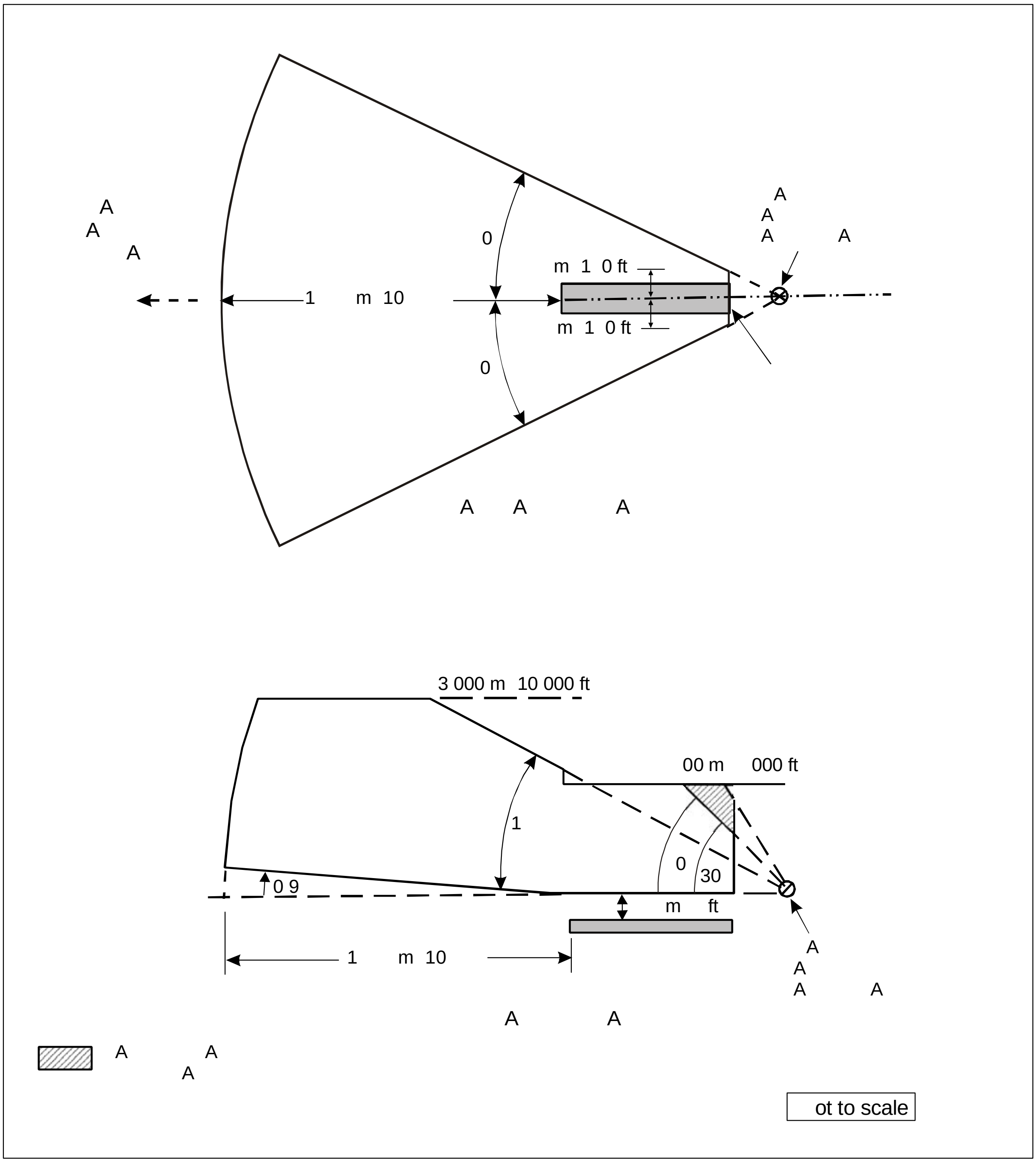


Figure G-6. Back azimuth region coverage

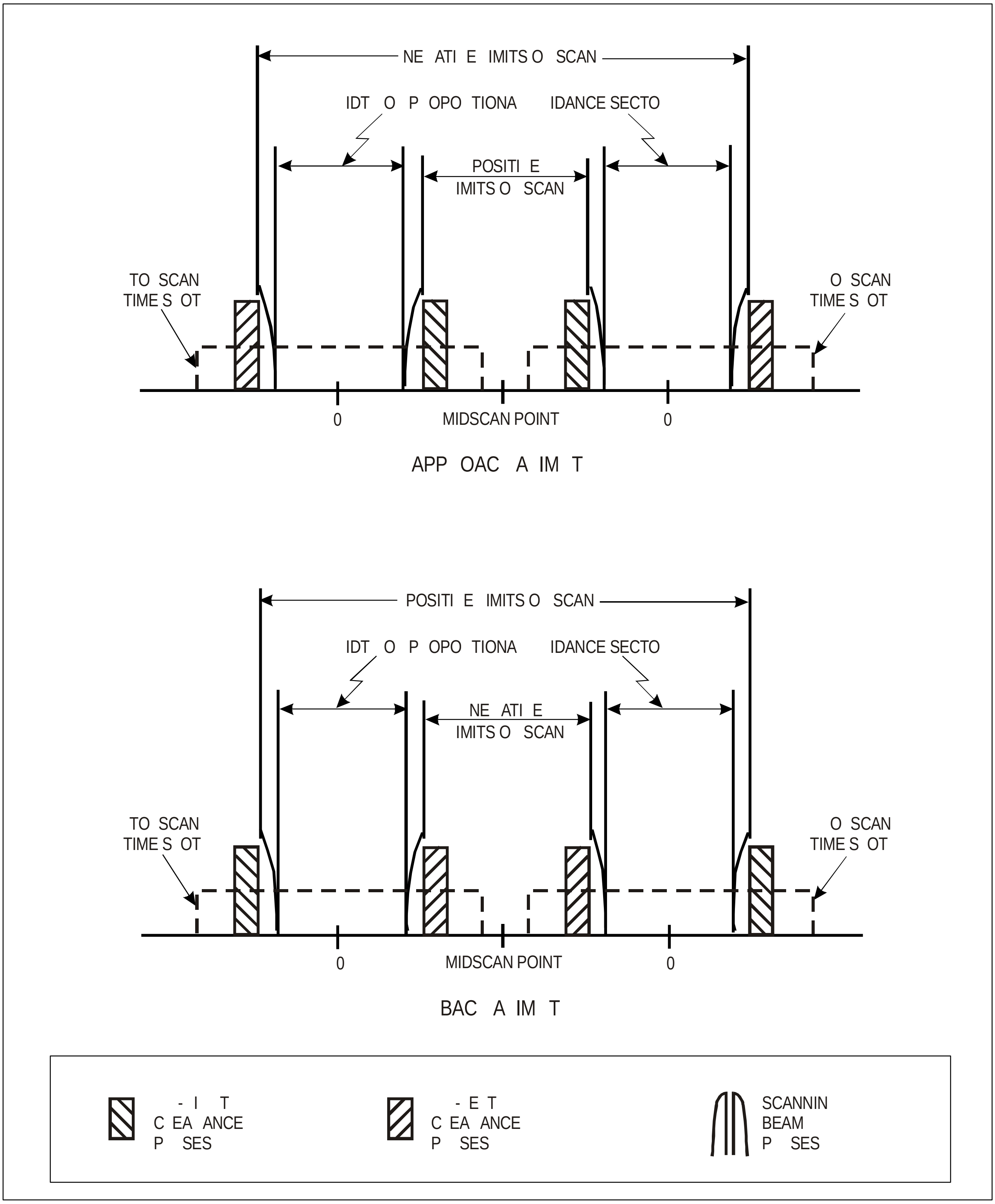


Figure G-7. Clearance pulse conventions for azimuth functions

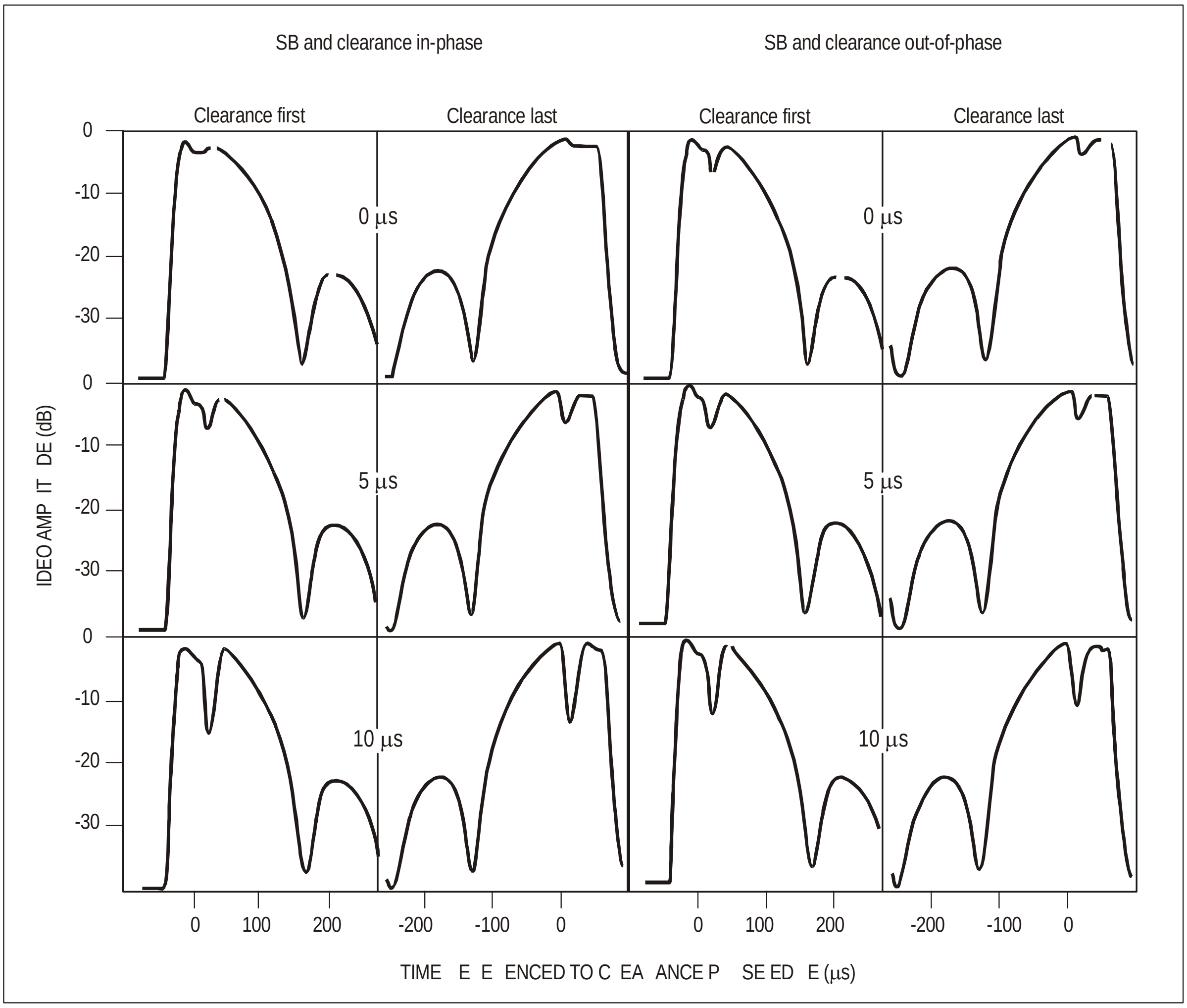


Figure G-8. Examples of received video waveforms in SB/clearance transition region for switching times of 0 5 and 10 microseconds

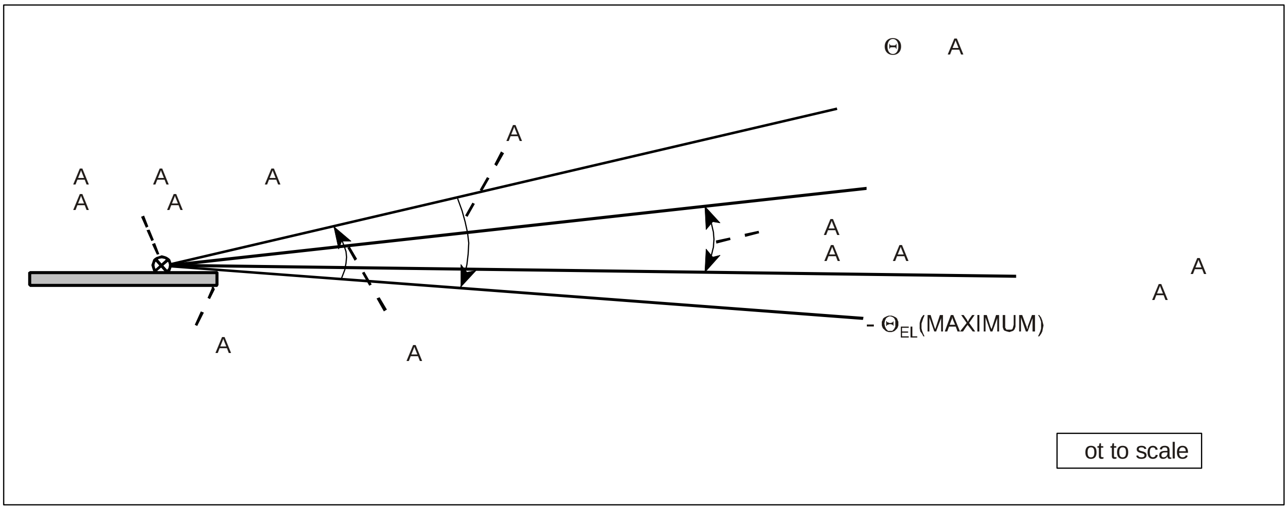
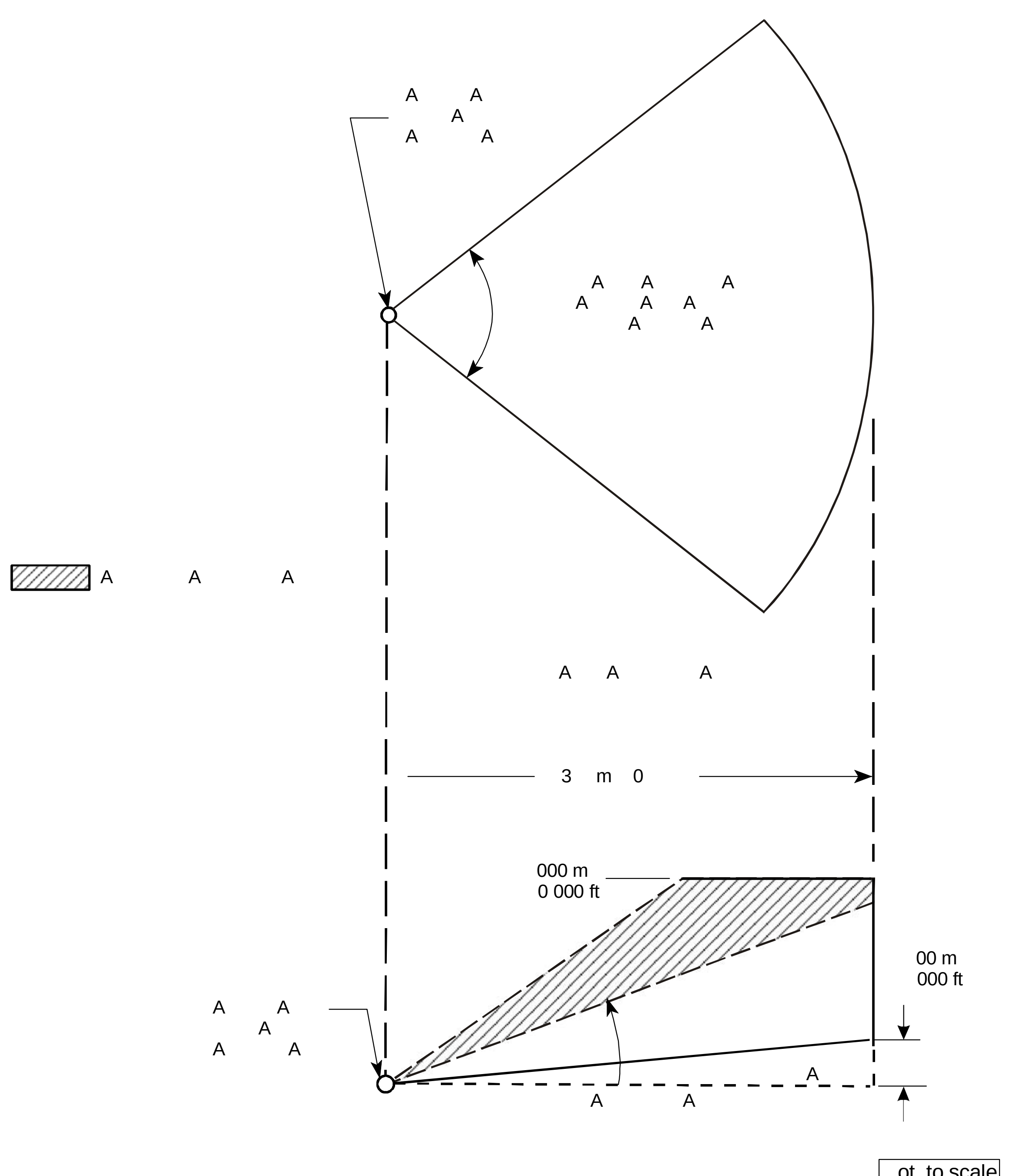
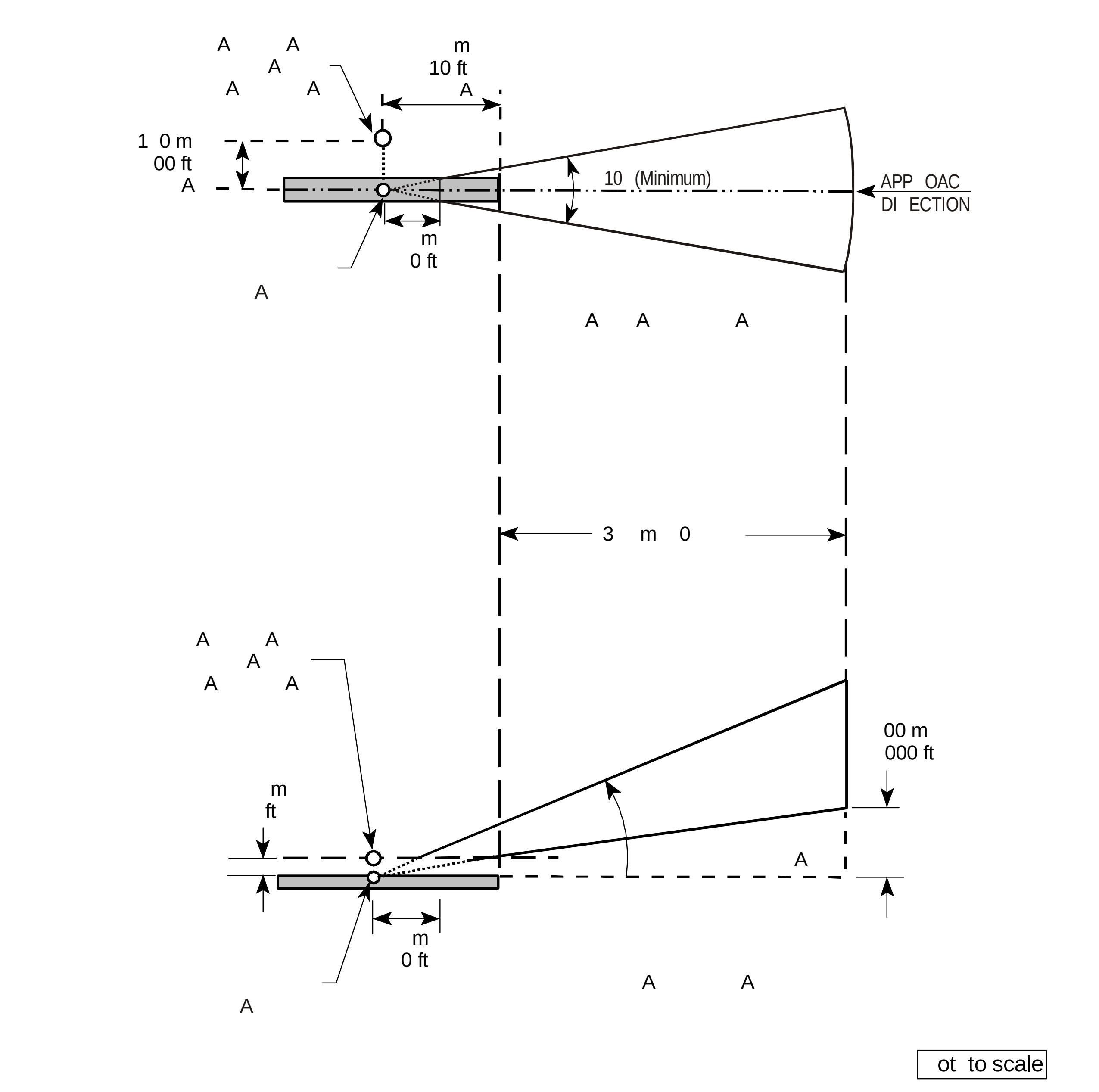


Figure G-9. Scanning conventions for approach elevation function



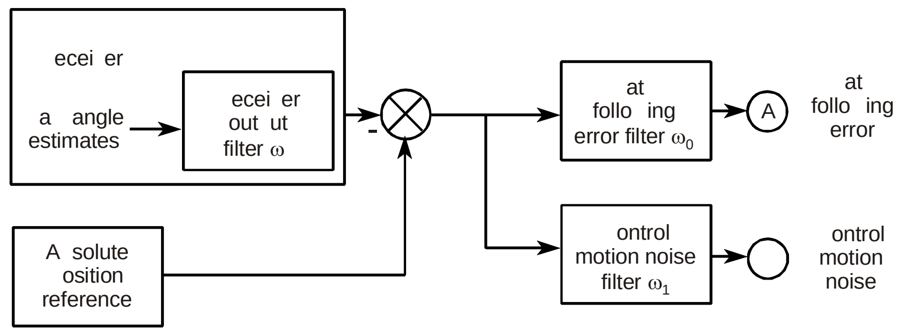
Note. The above represents the coverage sector originating at the phase centre of the installed antenna.

Figure G-10A. Elevation approach region coverage



Note. The above represents the minimum proportional guidance sector re uired, irrespective of e uipment location or orientation.

Figure G-10B. Elevation minimum operational coverage



uidance function	orner fre uencies adians sec		
	ω_0	ω_1	ω
A roac a imut	0	0 3	10
A roac ele ation	1	0	10
	1	0	10

ecei er out ut filter: $\frac{\omega}{\omega}$

at follo ing filter: $\frac{\omega_n}{\zeta\omega_n \quad \omega_n}$ $\zeta = 1$, $\omega_0 = 0 \quad \omega_n$

ontrol motion noise filter: $\frac{}{\omega_1}$ $= \omega$

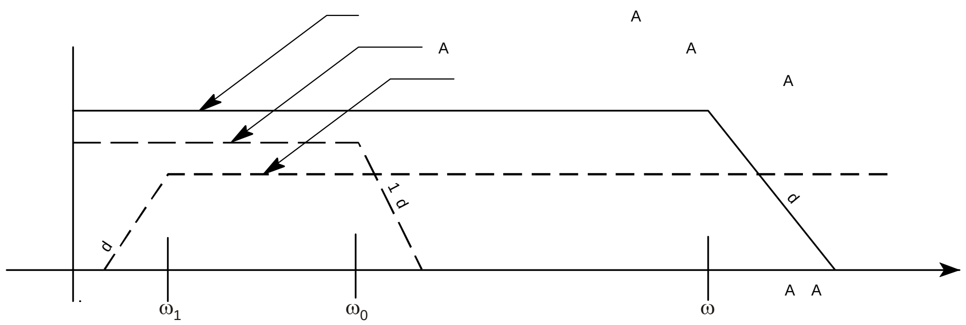
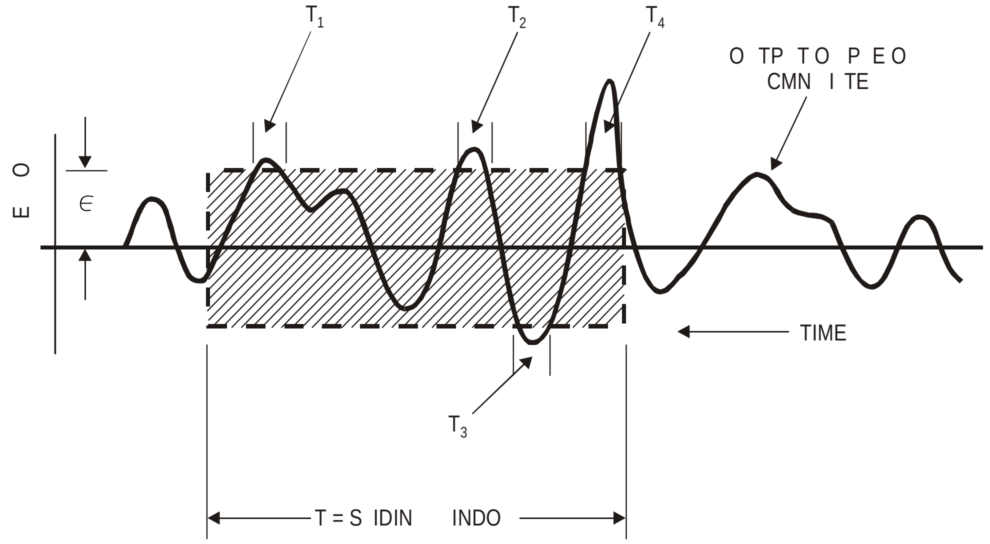


Figure G-11. Filter configurations and corner frequencies



Notes:

∈ = Error specification
T = egion to be evaluated
T_1 T_2 T_3 ⋯ = Time intervals that error exceeds specifications.
or the ground e uipment to be acceptable in this region,
the follo ing ine uality should be true:

$$\frac{(T_1 \quad T_2 \quad T_3 \quad \ldots)}{T} \leq 0.05$$

Figure G-12. MLS measurement methodology

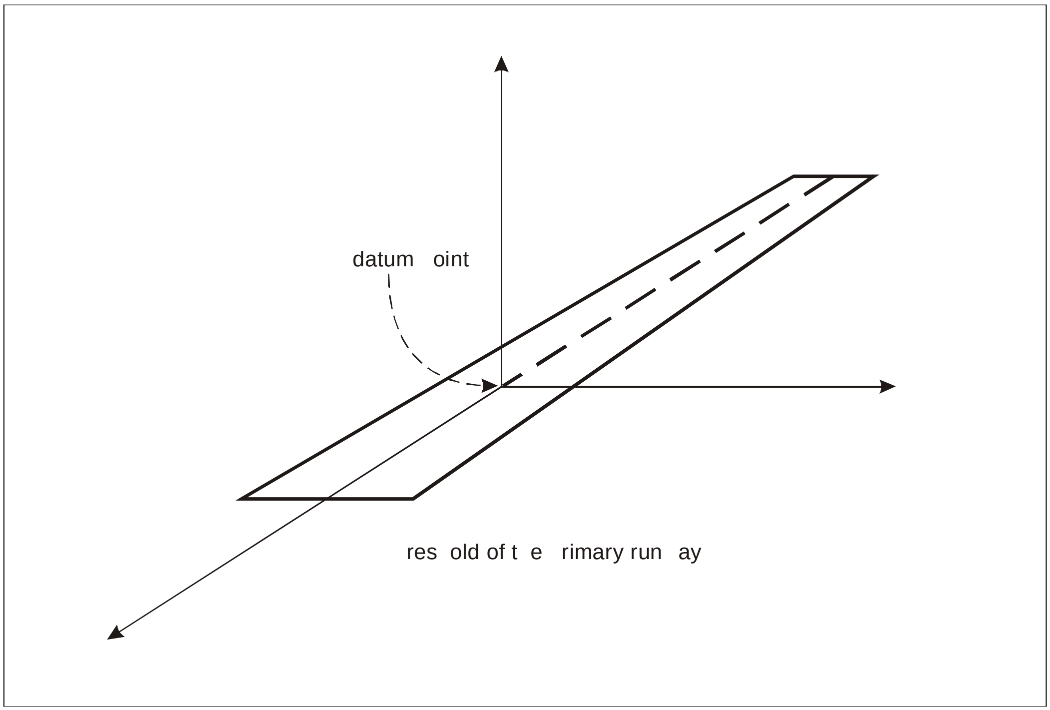


Figure G-13. MLS/RNAV way-point coordinate system

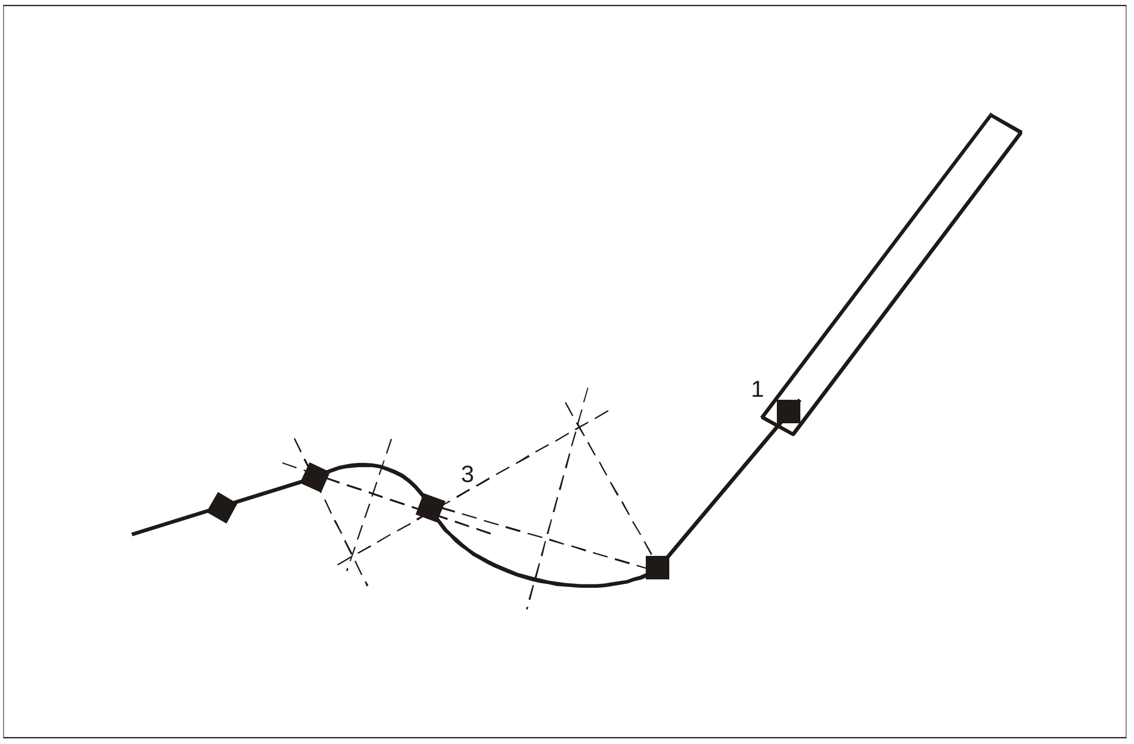


Figure G-14. Definition of curved segments

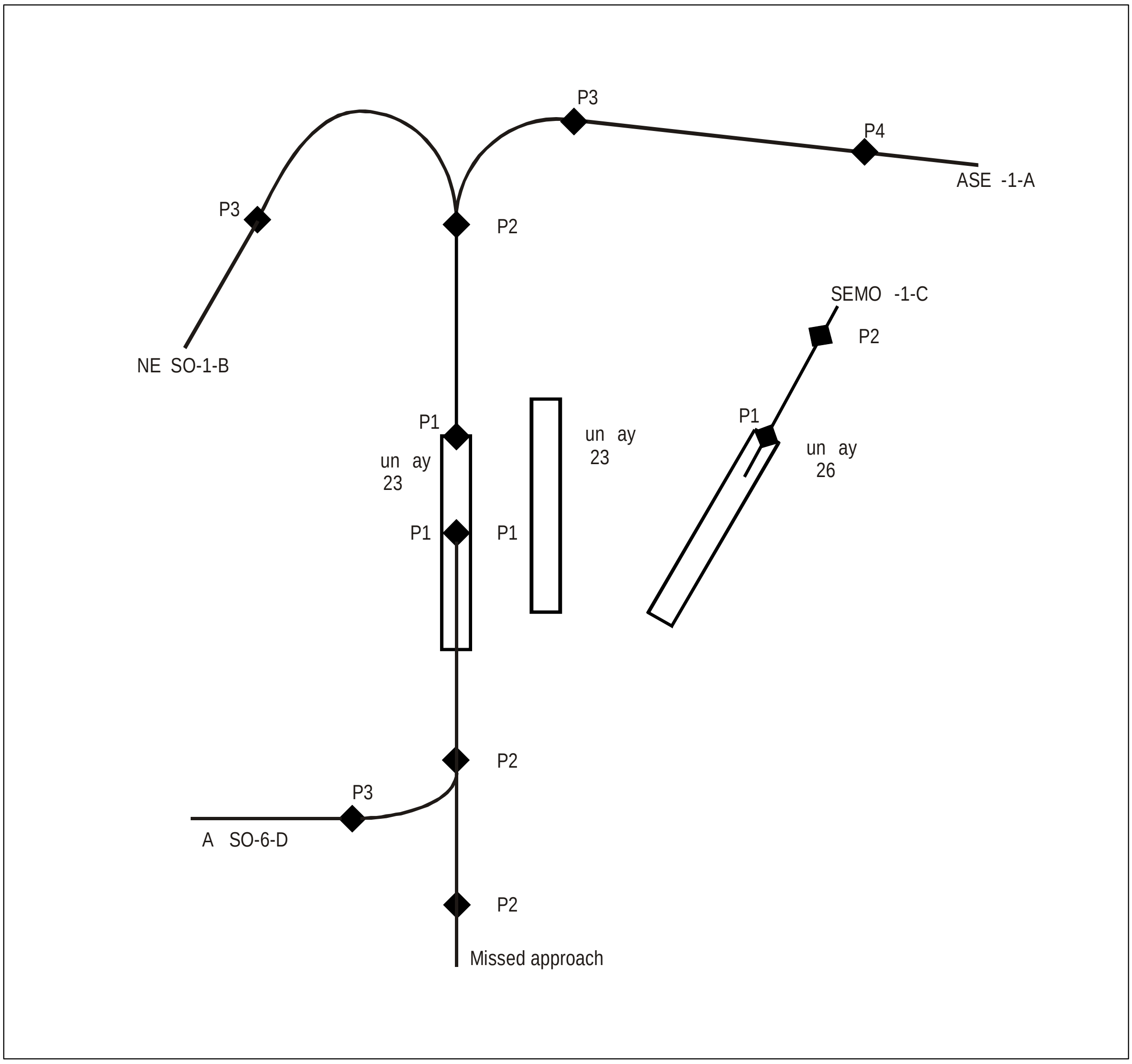


Figure G-15. Diagram of sample MLS/RNAV procedures

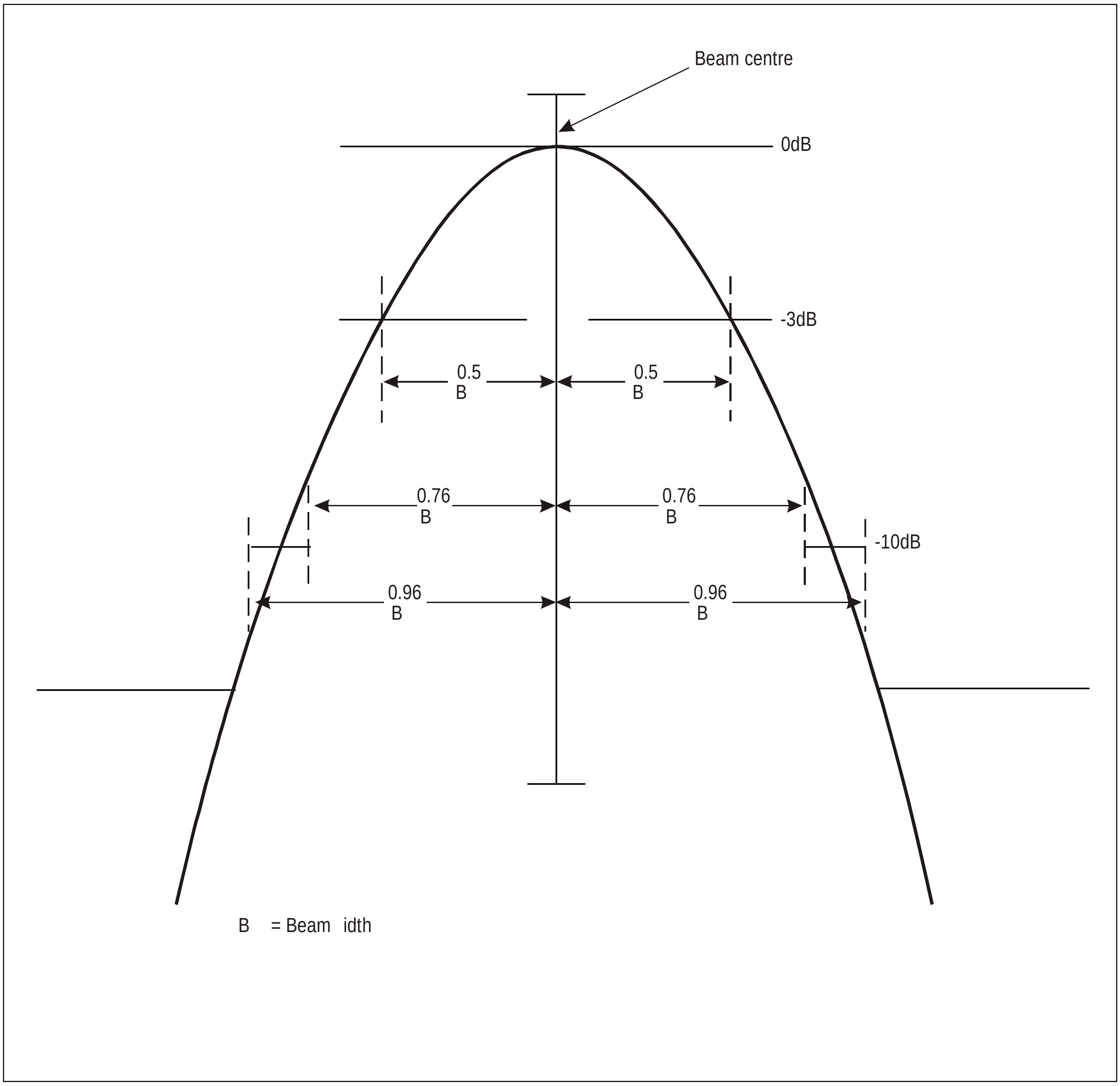


Figure G-16. Far field dynamic signal-in-space

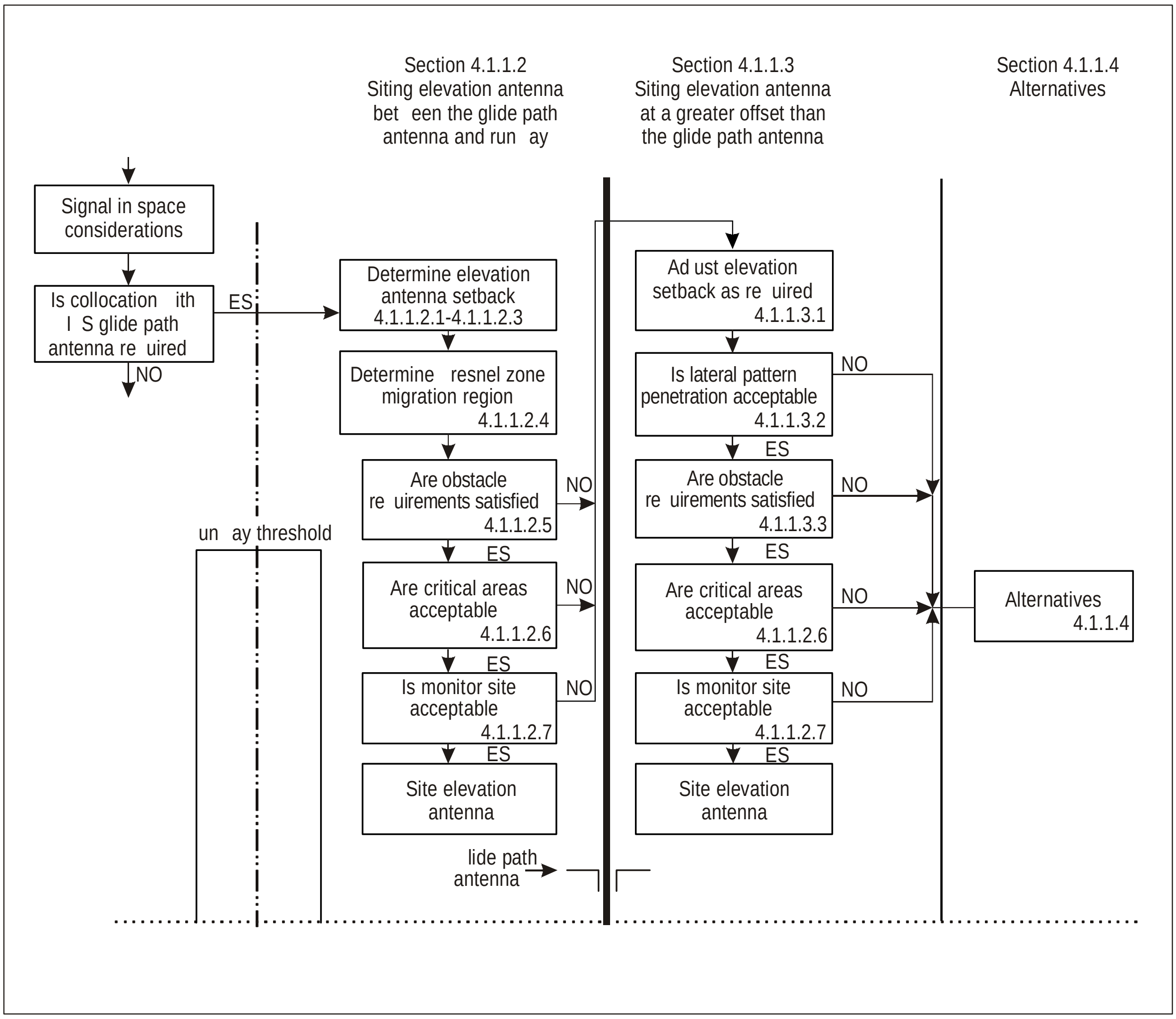
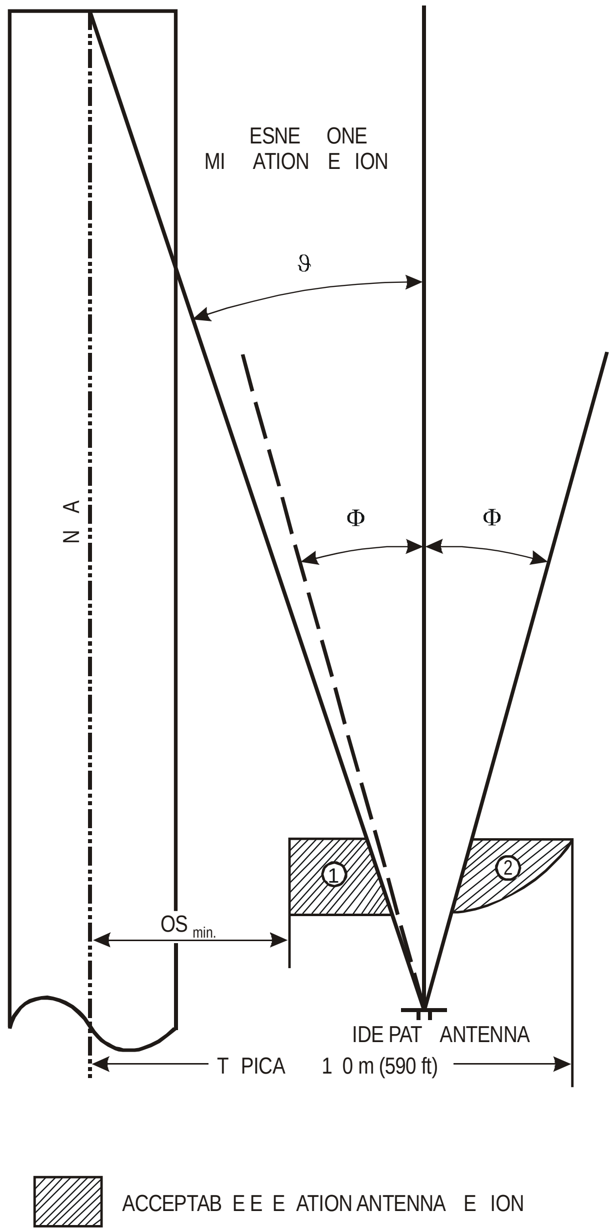


Figure G-17. Elevation/glide path logic flow diagram



Note.— If | ϑ | < | Φ | lateral pattern penetration factor will prevail over Fresnel zone factor in region 1.

Figure G-18. Elevation antenna regions for collocation with ILS (3 minimum glide path)

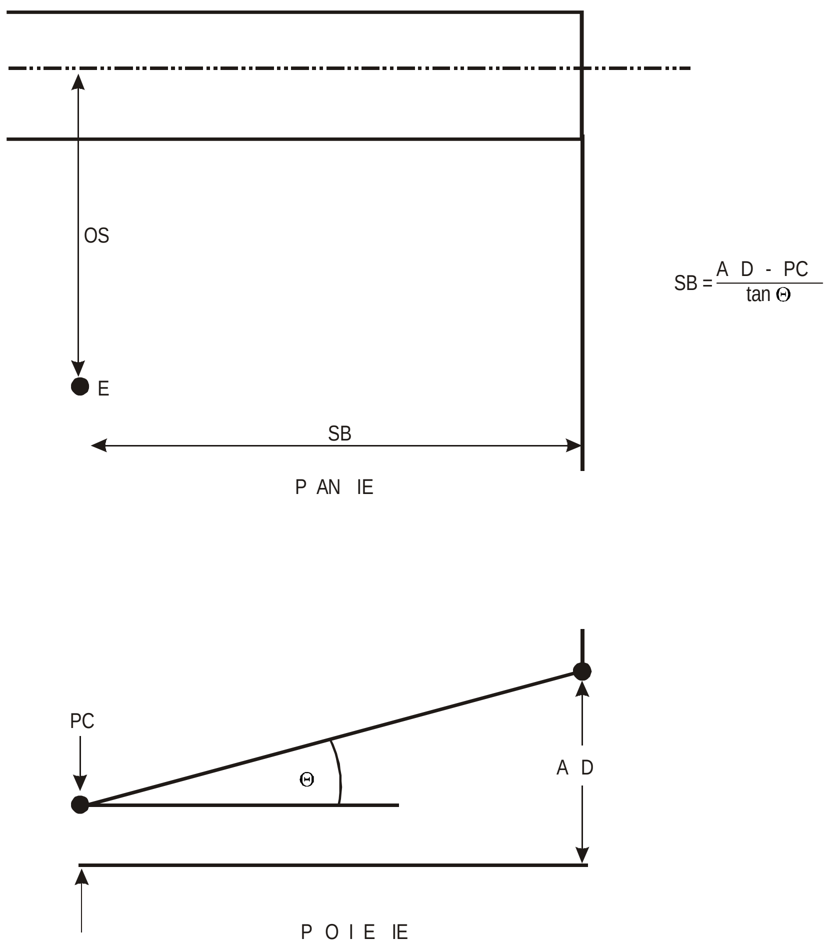


Figure G-19. Elevation siting parameters

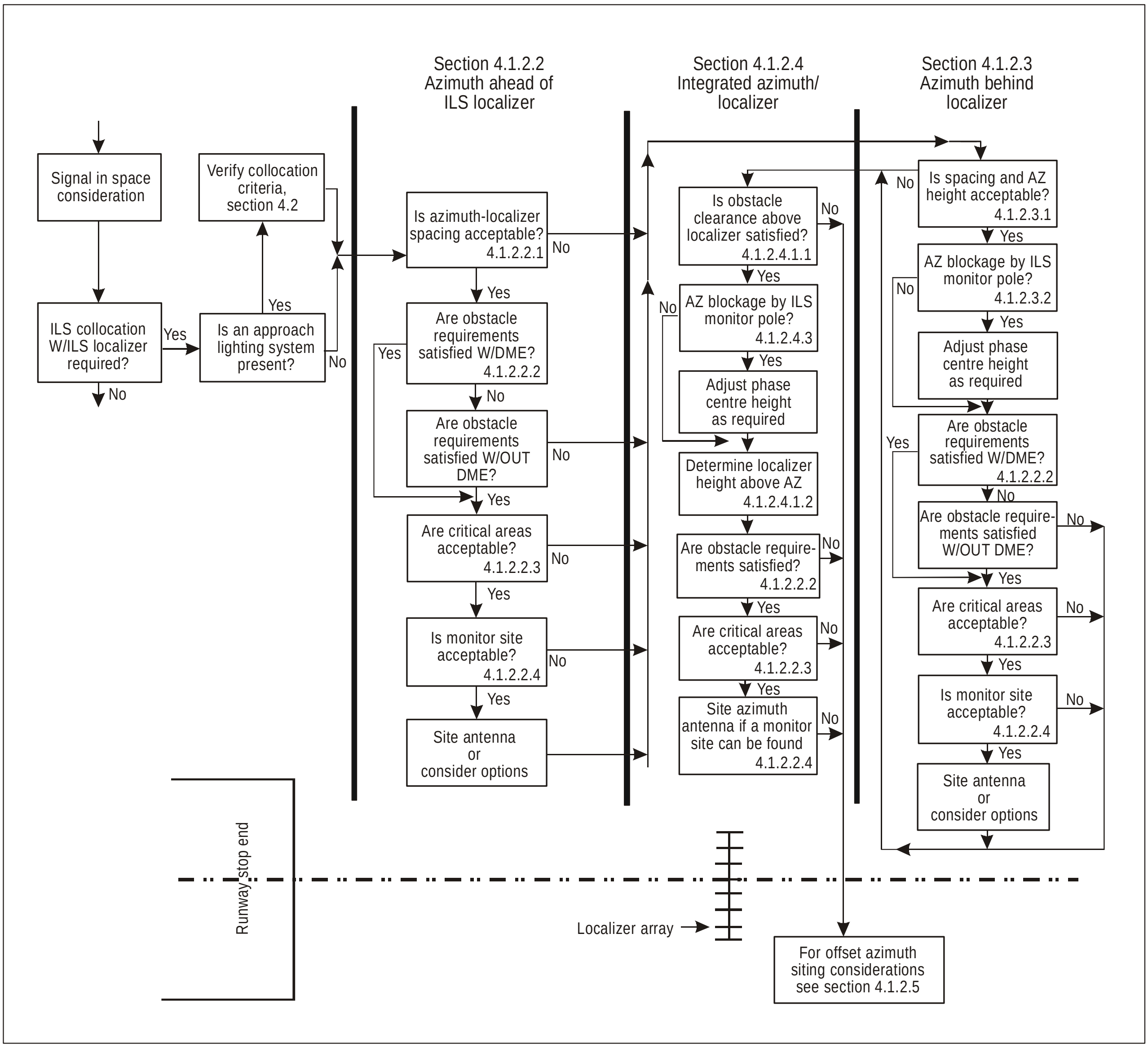


Figure G-20. Azimuth/localizer logic flow diagram

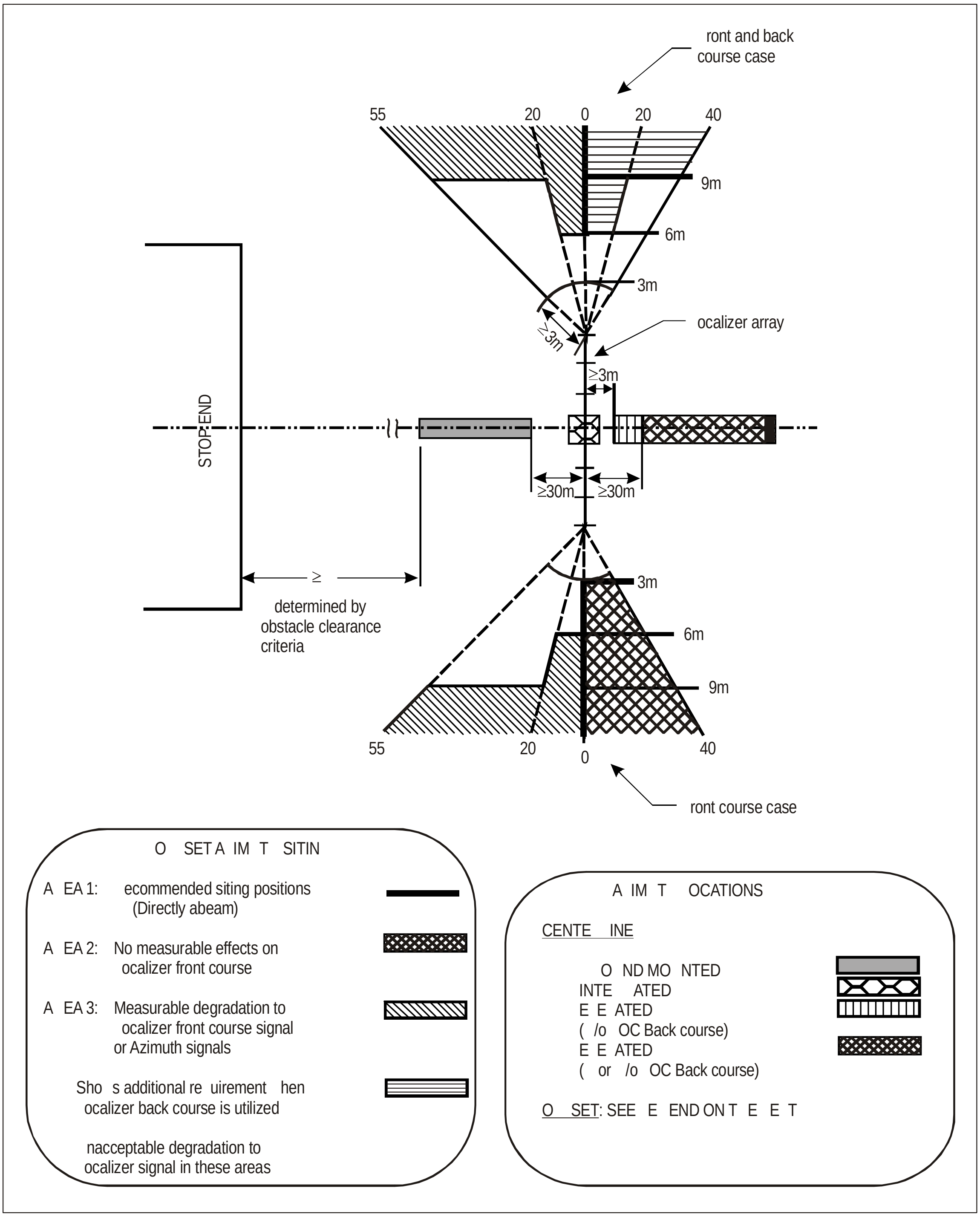


Figure G-21. Azimuth antenna regions for collocation with ILS

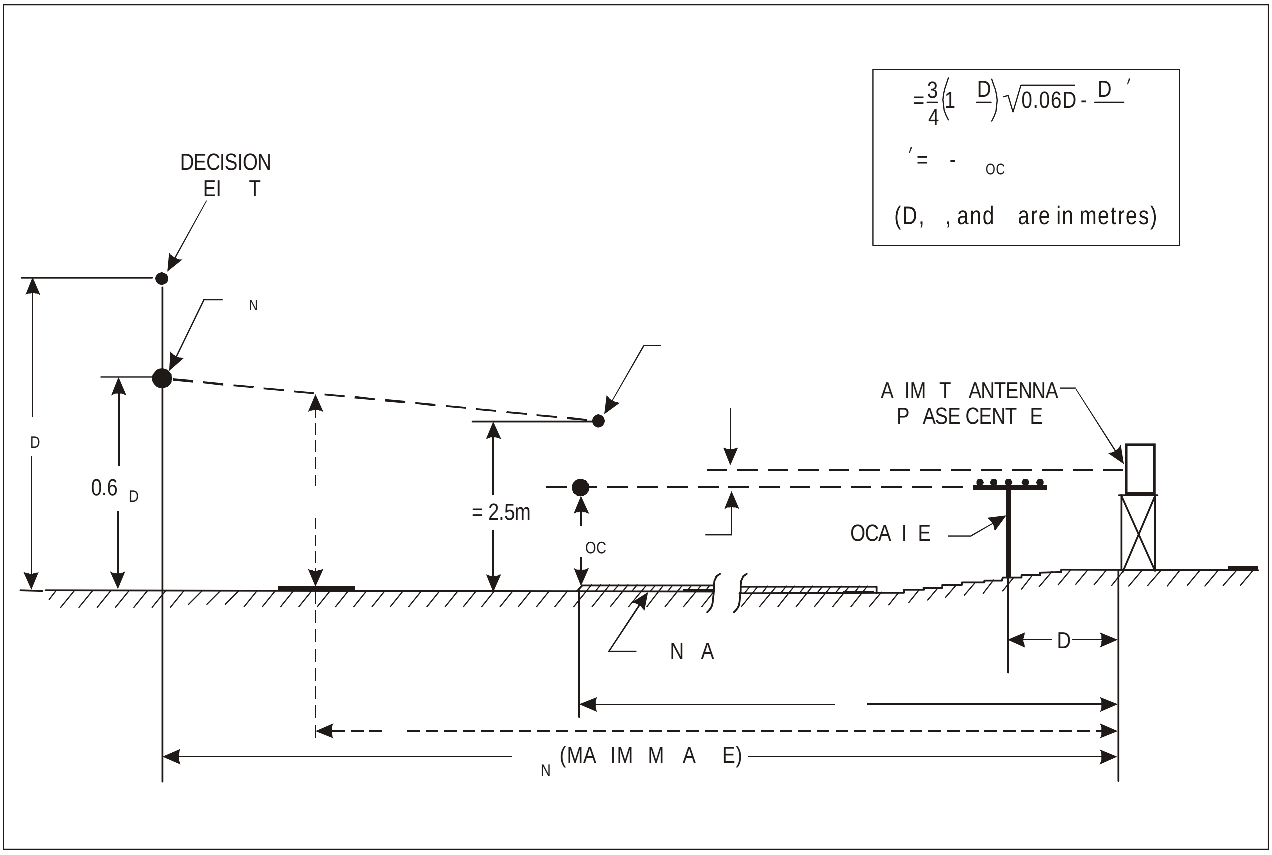
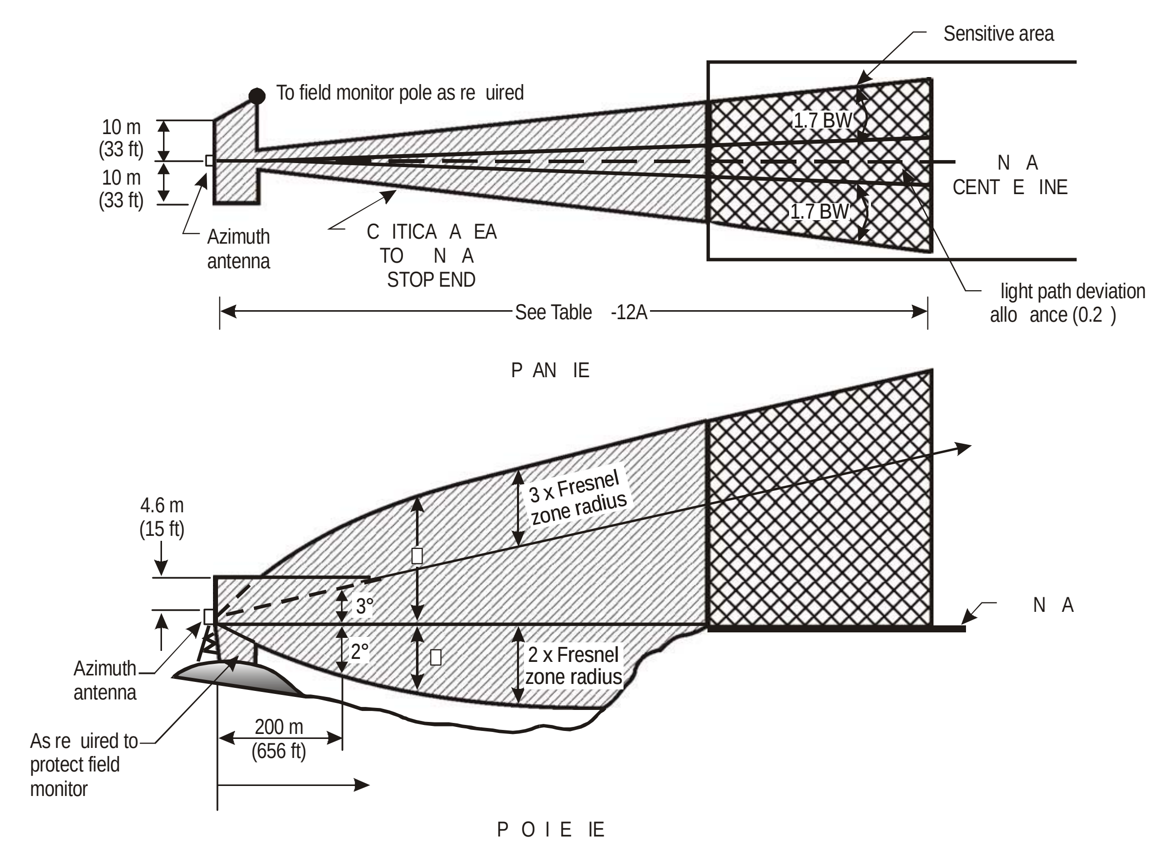


Figure G-22. Azimuth phase centre height requirement when siting an azimuth antenna behind an ILS localizer



A E O α and b

m (ft)	α m (ft)	β m (ft)
30 (100)	1.1 (3.5)	5.7 (1 .6)
75 (250)	2.7 (.7)	10.5 (34.3)
150 (500)	5.3 (17.5)	17.1 (56.2)
225 (750)	7.5 (24.5)	23.2 (76.0)
300 (1 000)	.6 (2 .3)	2 .9 (94.)

here:
α = 0.035 200m

$\alpha = 2\ \sqrt{0.06}$ 200m

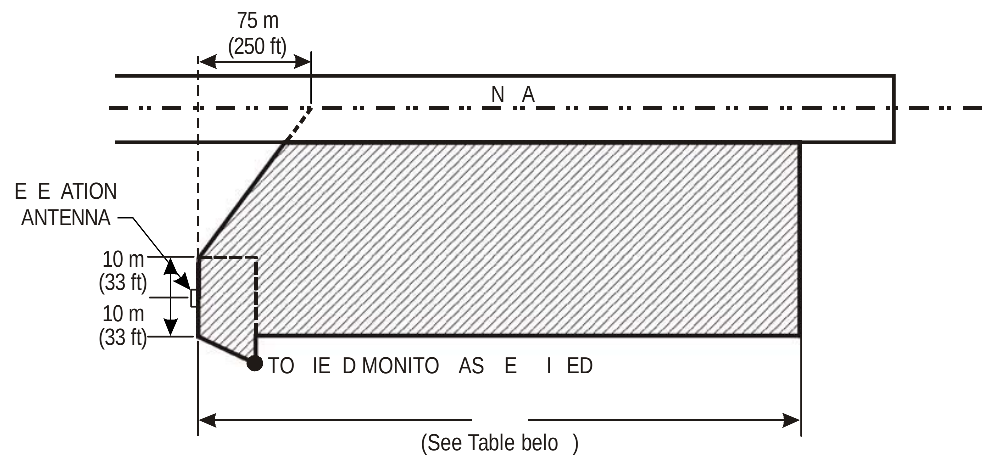
$\beta =$ tan 3 $3\sqrt{0.06}$

MEAS ED O I ONTA OM
A IM T ANTENNA

MEAS ED E TICA OM BOTTOM
O A IM T ANTENNA APE T E

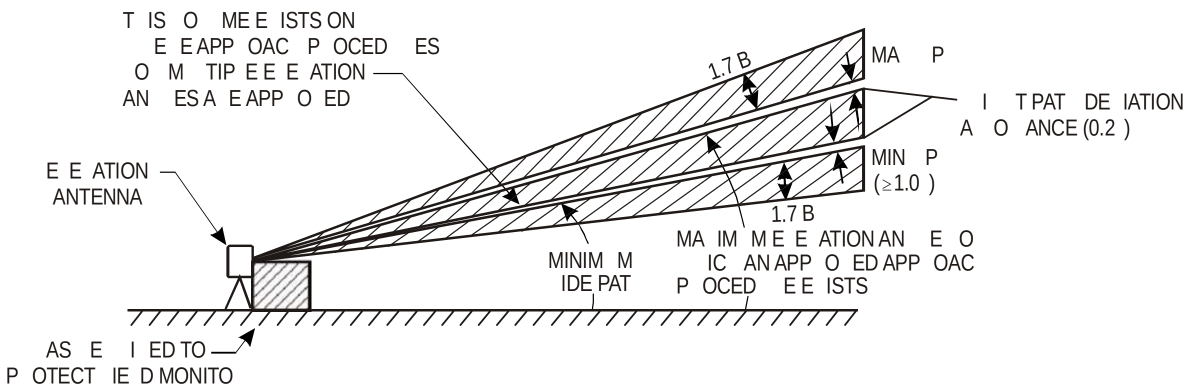
B = BEAM IDT

Figure G-23. Typical azimuth critical and sensitive areas



BEAM IDT	C EAN SITE		COMP E SITE	
	B-747	B-727	B-747	B-727
1.0	320 m (1 050 ft)	170 m (560 ft)	3 5 m (1 260 ft)	1 0 m (600 ft)
1.5	400 m (1 310 ft)	250 m (20 ft)	565 m (1 60 ft)	300 m (990 ft)

P AN IE



P O I E IE

Figure G-24. Typical elevation critical and sensitive areas/volume

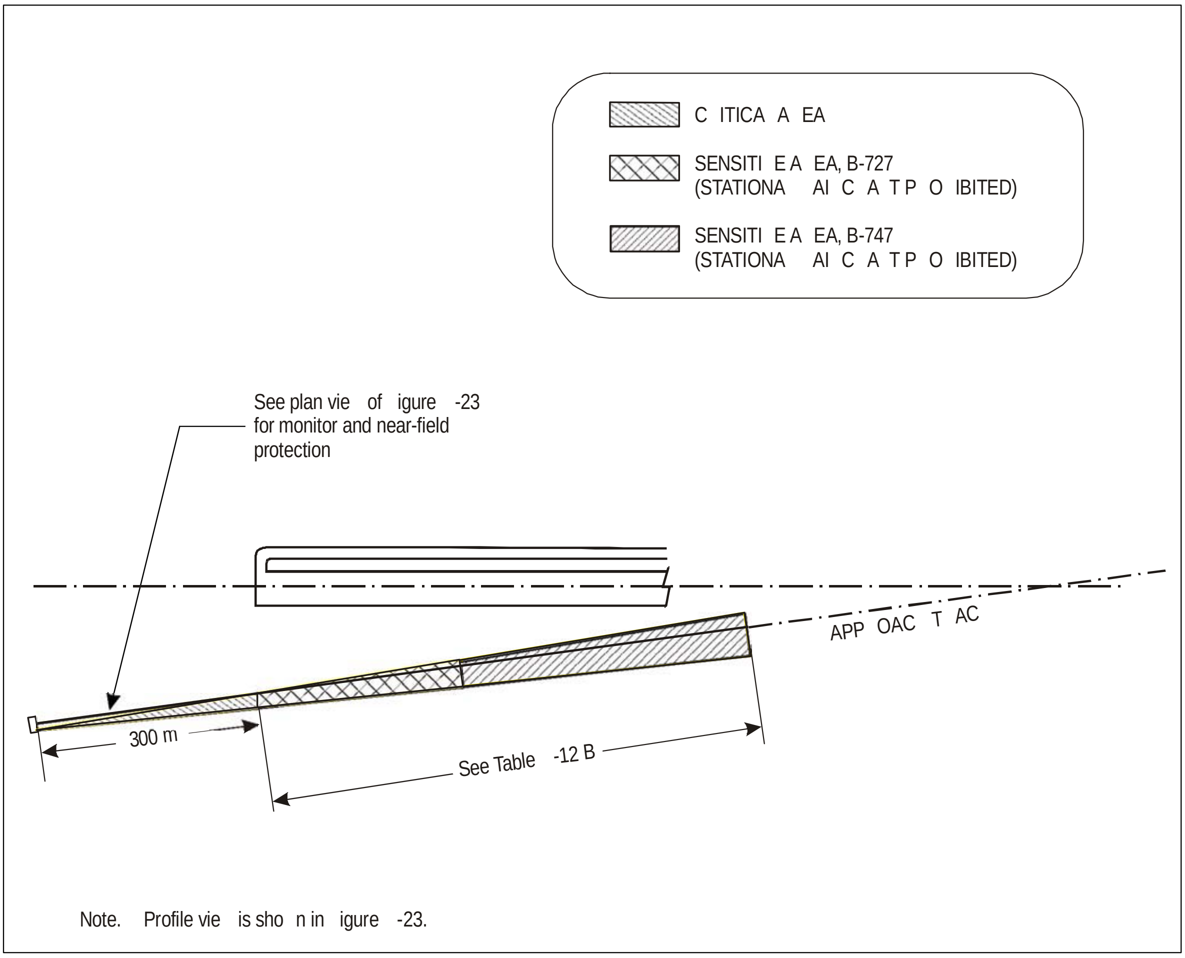


Figure G-25. Typical azimuth critical and sensitive areas for offset azimuth installation

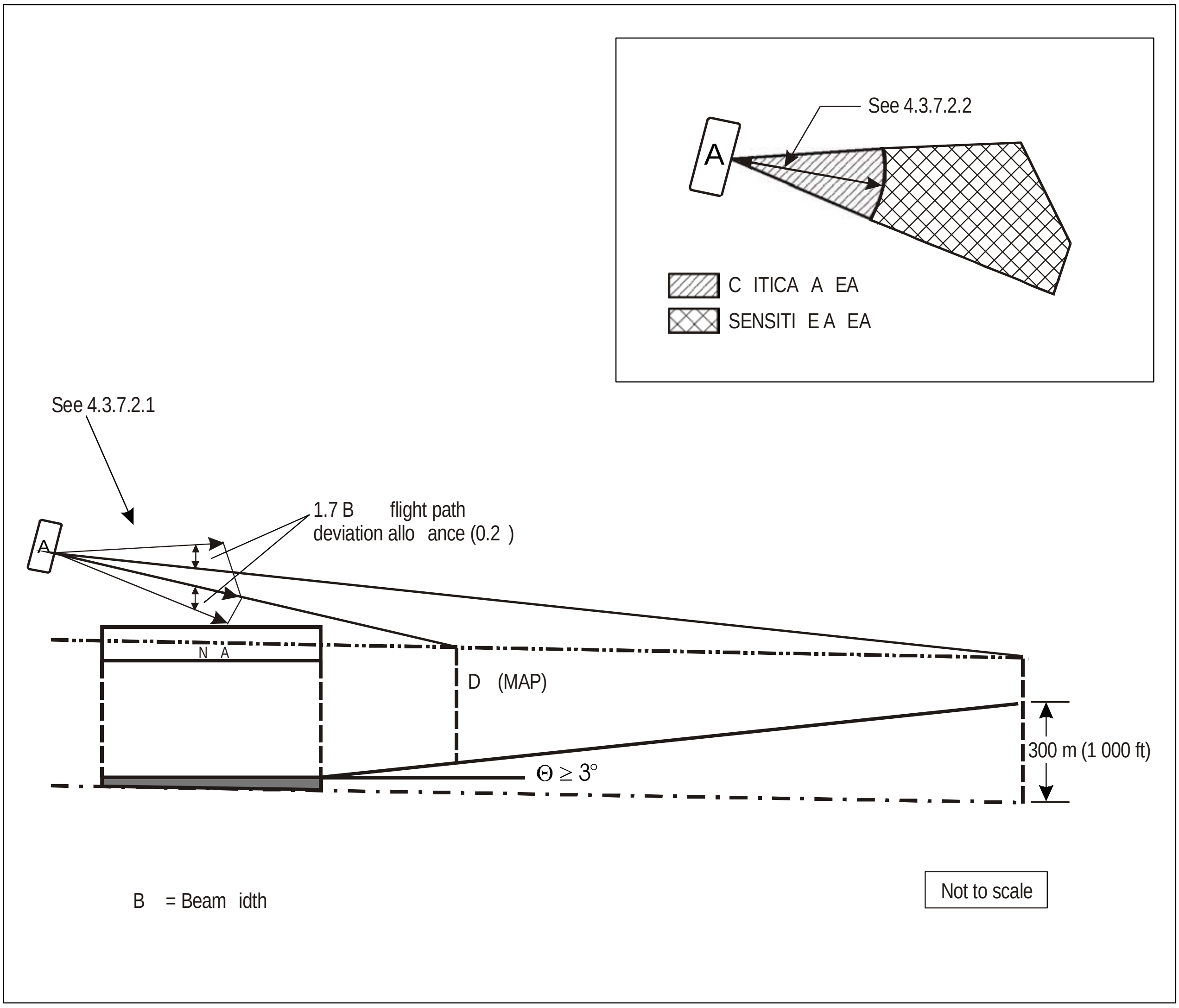


Figure G-26. Typical azimuth critical and sensitive areas/volume for the computed centre line procedure

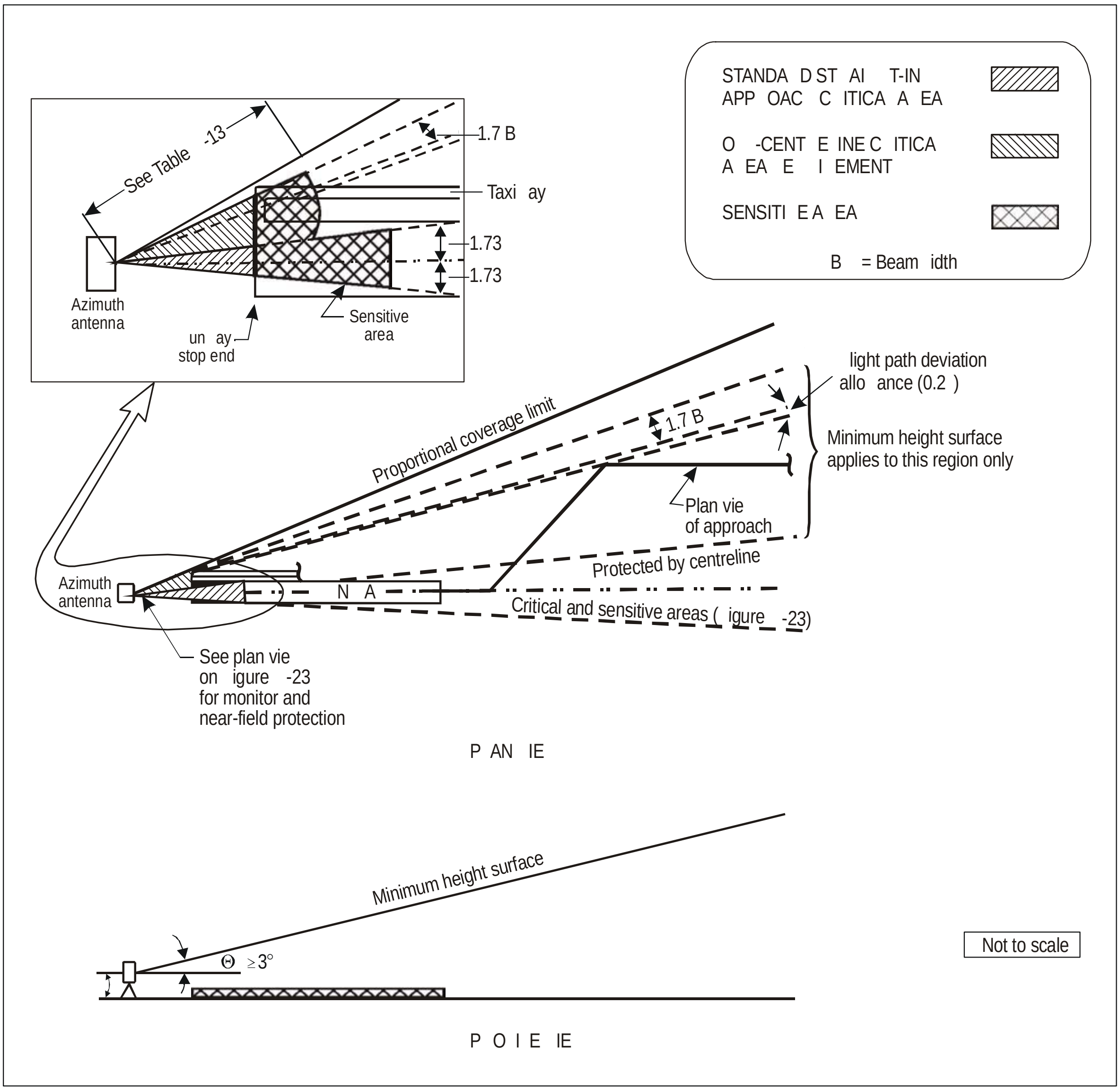


Figure G-27. Typical extension of azimuth critical and sensitive areas for segmented and curved approaches

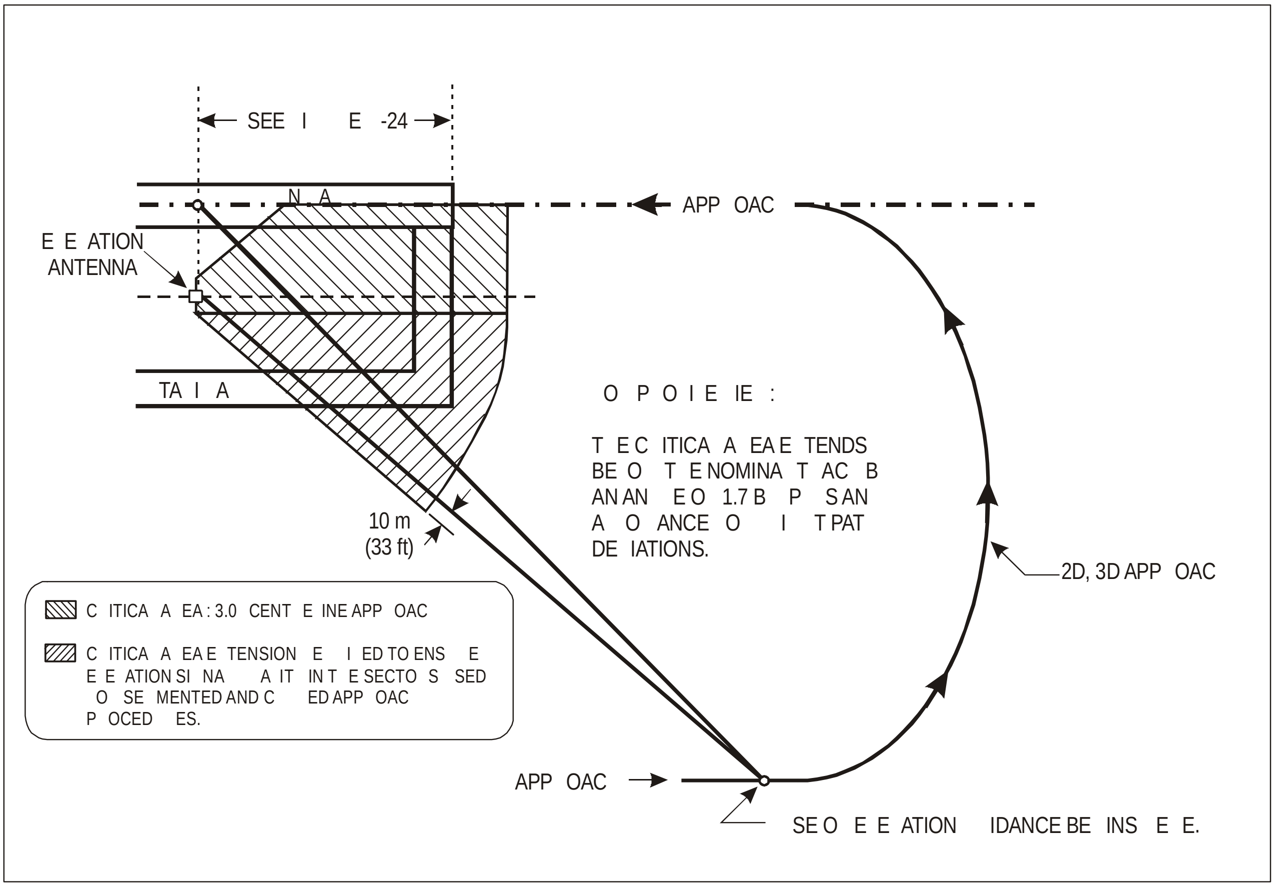


Figure G-28. Typical extension of the elevation critical area for segmented and curved approach procedures

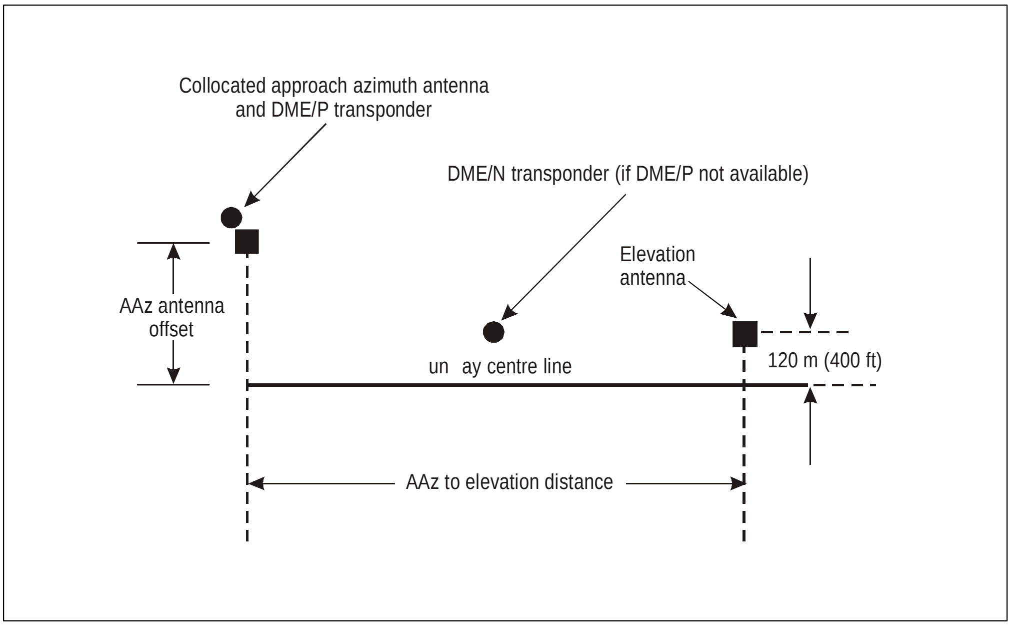


Figure G-29. Ground equipment geometry for computed centre line approaches

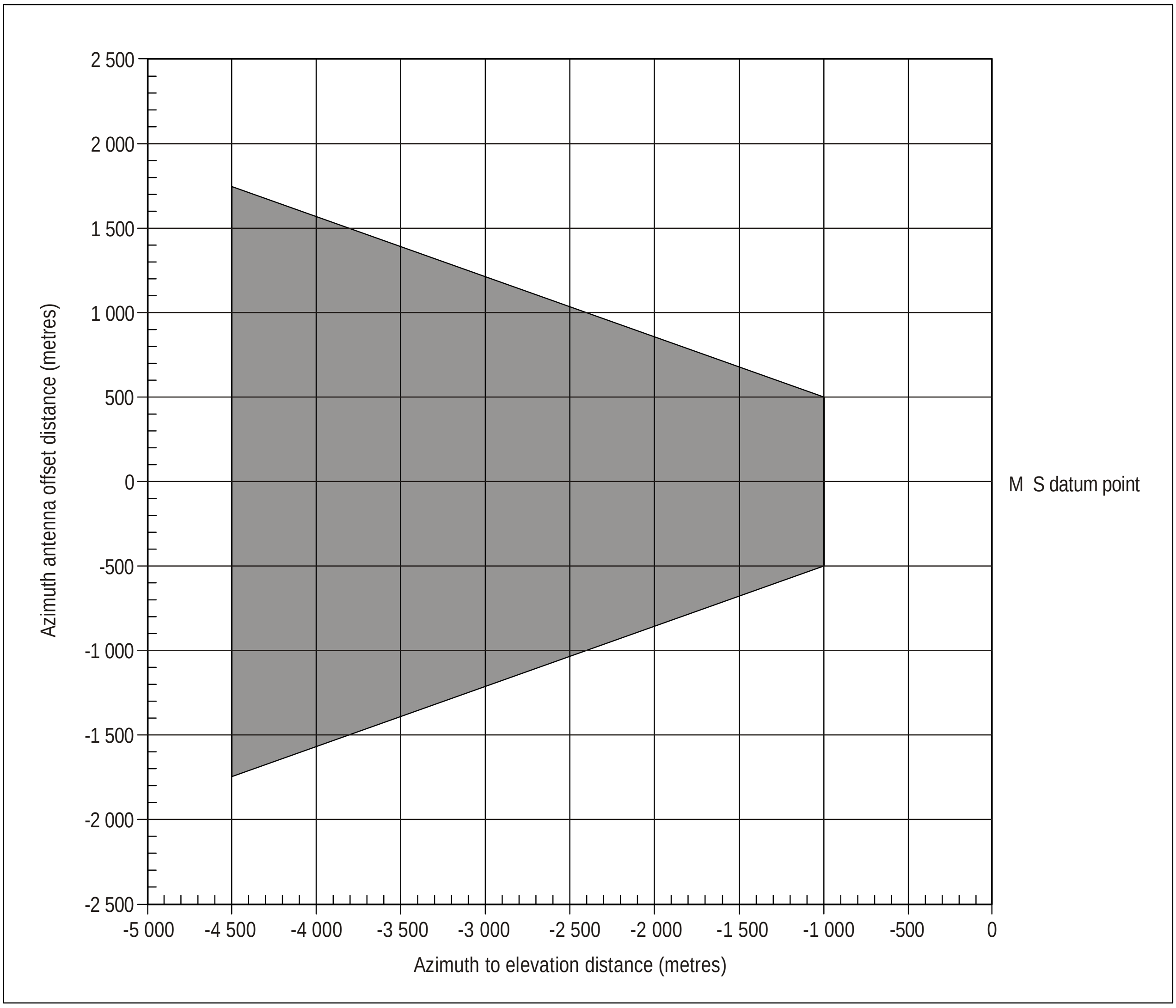


Figure G-30. Permissible azimuth antenna offsets for computed centre line approaches with DME/P (Standard 1) ranging

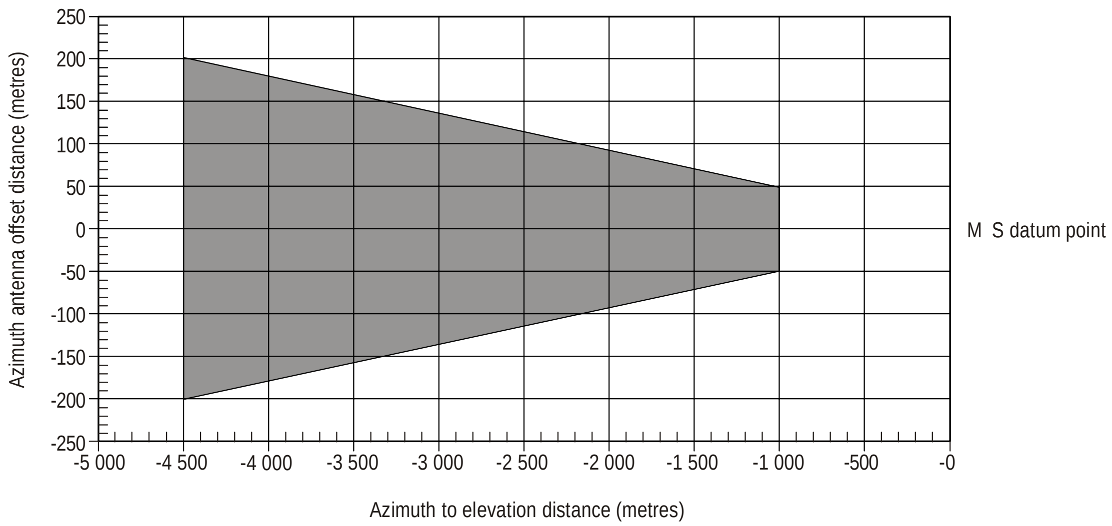
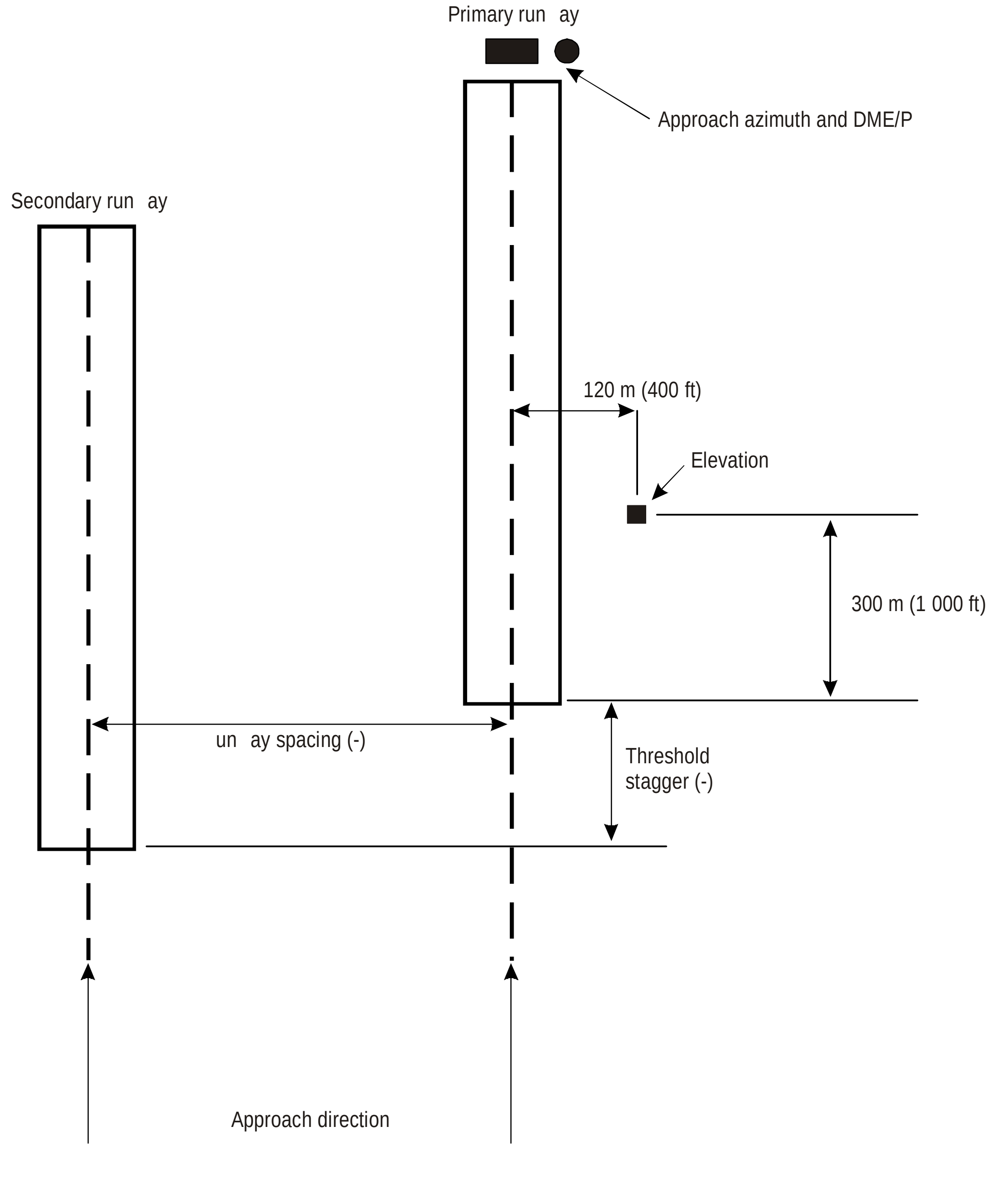
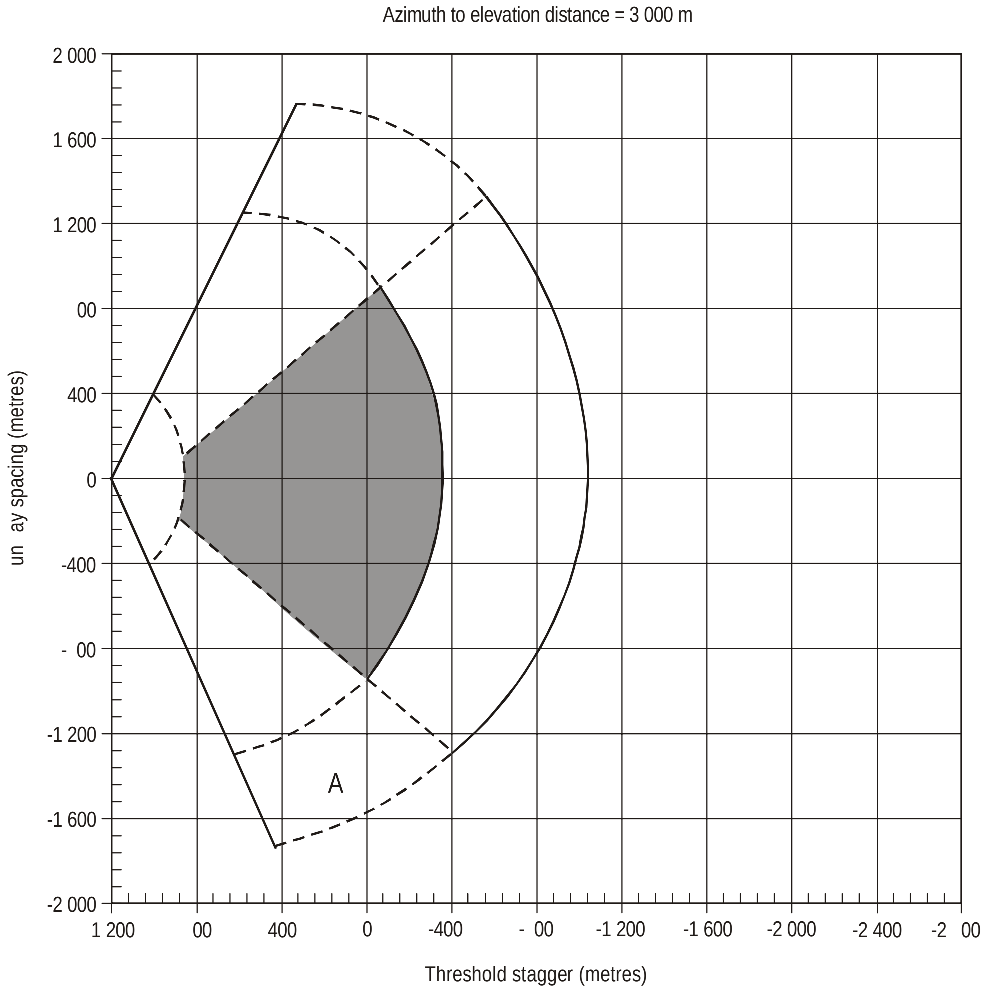


Figure G-31. Permissible azimuth antenna offsets for computed centre line approaches with DME/N ranging



Note. The position sho n for the elevation antenna is defined by typical values that are used to compute the data sho n in igure -33.

Figure G-32. Runway and equipment geometry for computed centre line approaches to parallel secondary runways



Notes:

1. The radial boundary is dependent on elevation antenna performance.
2. Point A represents the example described in 13.7.6.

Figure G-33. Permissible runway geometries for computed centre line approaches to parallel secondary runways

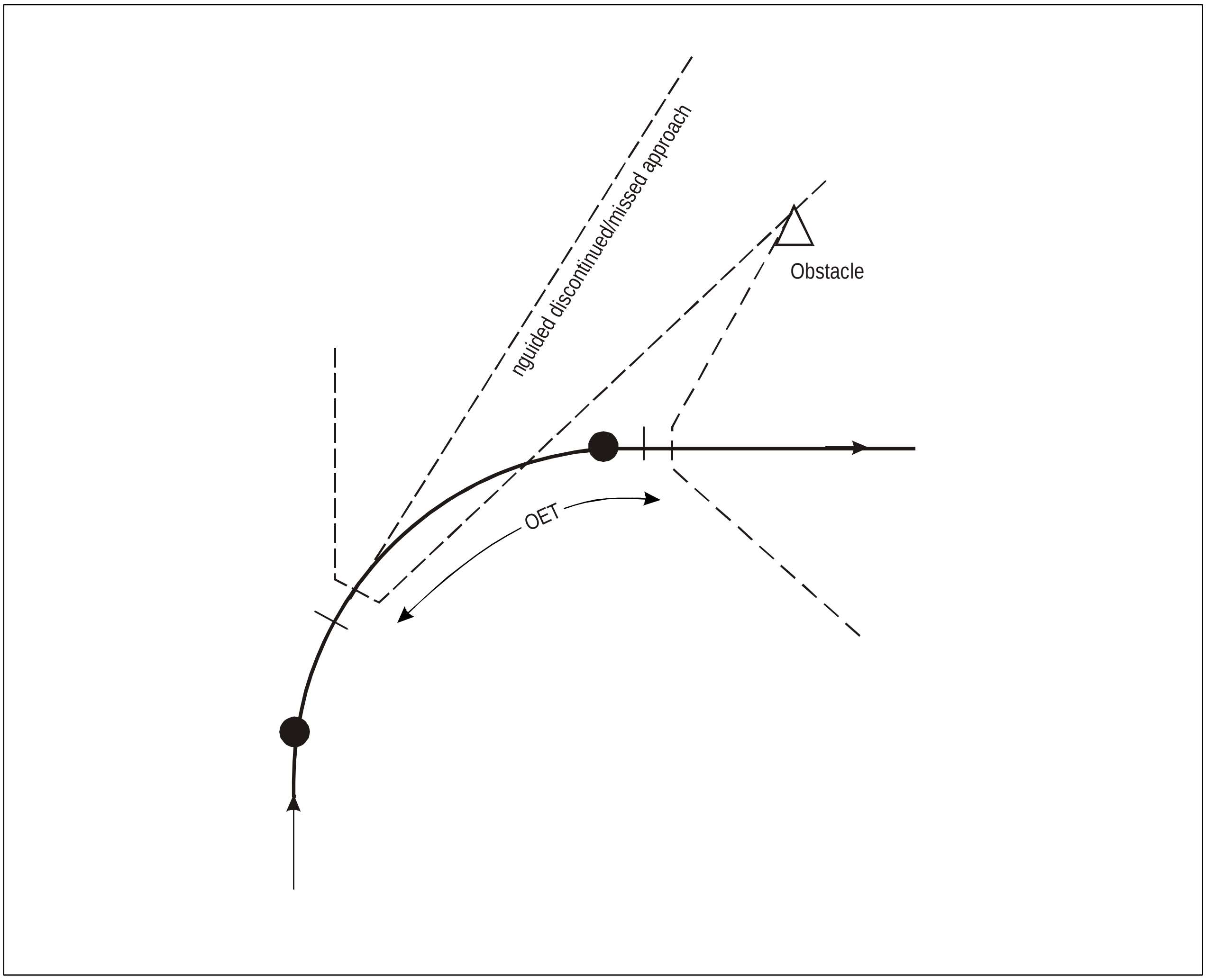


Figure G-34. Determination of obstacle exposure time (OET)

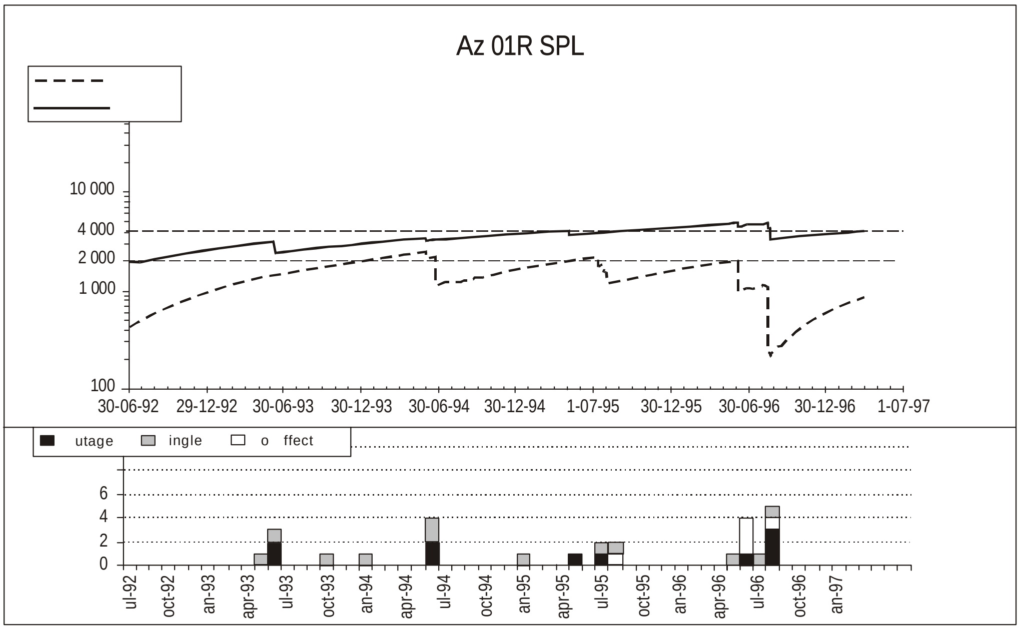


Figure G-35A. Example outage record for MLS azimuth facility

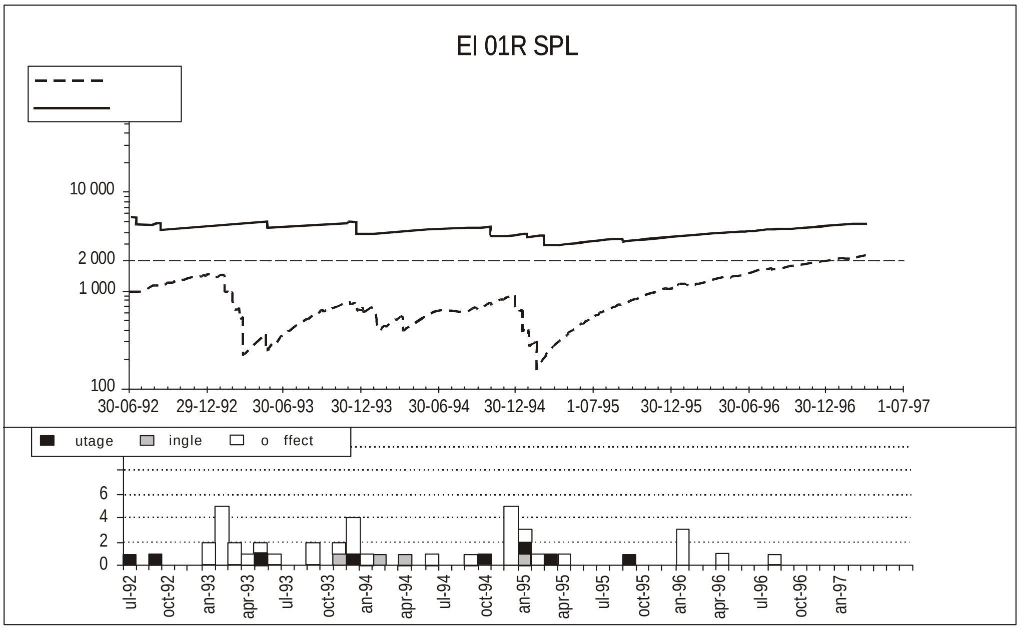


Figure G-35B. Example outage record for MLS elevation facility

— END —

International Standards
and Recommended Practices and
Procedures for Air Navigation Services

Annex 10
to the Convention on
International Civil Aviation

Aeronautical Telecommunications

Volume II
Communication Procedures
including those with PANS status

This edition incorporates all amendments adopted by the Council prior to 13 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 10, Volume II.

For information regarding the applicability of the Standards and Recommended Practices and the Procedures for Air Navigation Services, *see* Foreword.

Sixth Edition
October 2001

International Civil Aviation Organization

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Sixth Edition
October 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
44-76	Incorporated in this edition		
77	Did not affect this volume		
78	27/11/03	—	ICAO
79	Did not affect this volume		
80	24/11/05	—	ICAO
81	Did not affect this volume		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Telecommunications were first adopted by the Council on 30 May 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 10 to the Convention. They became effective on 1 March 1950. The Standards and Recommended Practices were based on recommendations of the Communications Division at its Third Session in January 1949.

Up to and including the Seventh Edition, Annex 10 was published in one volume containing four Parts together with associated attachments: Part I — Equipment and Systems, Part II — Radio Frequencies, Part III — Procedures, and Part IV — Codes and Abbreviations.

By Amendment 42, Part IV was deleted from the Annex; the codes and abbreviations contained in that Part were transferred to a new document, Doc 8400.

As a result of the adoption of Amendment 44 on 31 May 1965, the Seventh Edition of Annex 10 was replaced by two volumes: Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communication Procedures.

As a result of the adoption of Amendment 70 on 20 March 1995, Annex 10 was restructured to include five volumes: Volume I — Radio Navigation Aids; Volume II — Communication Procedures; Volume III — Communication Systems; Volume IV — Surveillance Radar and Collision Avoidance Systems; and Volume V — Aeronautical Radio Frequency Spectrum Utilization. By Amendment 70, Volumes III and IV were published in 1995 and Volume V was planned for publication with Amendment 71.

Volume II contains material that has the status of Procedures for Air Navigation Services (PANS). This latter material was included, prior to the publication of the First Edition of Volume II, in *PANS — Radiotelephony Procedures* (Doc 7181), which document is now superseded.

Table A shows the origin of amendments to Annex 10 subsequent to Amendment 43, together with a list of the principal subjects involved, where appropriate, and the dates on which the Annex and the amendments were adopted by Council, when they became effective, and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards, Recommended Practices and Procedures specified in Annex 10 should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been deliberately written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

The Procedures for Air Navigation Services (PANS) contained in Volume II of Annex 10 do not carry the status afforded to Standards adopted by the Council as Annexes to the Convention and, therefore, do not come within the obligation imposed by Article 38 of the Convention to notify differences in the event of non-implementation. However, attention of States is drawn to the provisions of Annex 15 related to the publication in their Aeronautical Information Publications of lists of significant differences between their procedures and the related ICAO Procedures.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Disclaimer regarding patents

Attention is drawn to the possibility that certain elements of Standards and Recommended Practices in this Annex may be the subject of patents or other intellectual property rights. ICAO shall not be responsible or liable for not identifying any or all such rights. ICAO takes no position regarding the existence, validity, scope or applicability of any claimed patents or other intellectual property rights, and accepts no responsibility or liability therefore or relating thereto.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units.

Where two sets of units are quoted, it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

With respect to the typesetting of the material in Volume II of Annex 10, *Procedures for Air Navigation Services* have been printed in light face italics, the status being indicated by the prefix **PANS**.

Table A. Amendments to Annex 10, Volume II

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
44	Seventh Session of the COM Division	With the creation of Volume II and the inclusion of appropriate provisions which up to that time were included in Doc 7181 — *PANS — Radiotelephony Procedures*, a general rearrangement of the provisions relating to communications procedures was necessary and was effected in the new Volume II.	31 May 1965 1 October 1965 10 March 1966
45	Sixth Meeting of the Panel of Teletypewriter Specialists; Fourth AN Conference	A number of detailed changes in the AFTN procedures; amendment to Chapters 5 and 6, to indicate more precisely the procedures to be used when communications take place directly between a pilot and an air traffic controller; and a rewording of 3.7 — Use of Abbreviations and Codes, to correct an unintentional change in meaning introduced in Amendment 42.	12 December 1966 12 April 1967 24 August 1967
46	Fifth Meeting of the ATC Automation Panel	Provisions for the transmission of ATS messages intended for use in an ATC computer.	7 June 1967 5 October 1967 8 February 1968
47	COM/OPS Divisional Meeting	Introduction of new simplified Aeronautical Mobile Distress Procedures which are better suited to the special requirements of international civil aviation.	11 December 1967 11 April 1968 22 August 1968
48	Seventh Meeting of the Panel of Teletypewriter Specialists	Introduction of changes to message classification and teletypewriter procedures in the light of experience gained in automated operation of the AFTN.	23 January 1969 23 May 1969 18 September 1969
49	First Meeting of the Automated Data Interchange Systems Panel; Sixth AN Conference	Provision concerning the use of the 7-unit code for data interchange at medium signalling rates; introduction of provisions relating to the categories of aeronautical mobile service messages. On the basis of the study of consolidation and presentation of the Regional Supplementary Procedures, it introduces provisions relating to: appropriate diversion routing lists at AFTN communication centres; early transmission of AFTN messages bearing Priority Indicators GG or higher; guarding of 121.5 MHz during long over-water flights; action by aeronautical stations receiving an air-report or a message containing meteorological information transmitted by an aircraft; and the action taken by a station receiving a distress message or an emergency message; and when it is aware that the distress condition is ended.	1 June 1970 1 October 1970 4 February 1971

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
50	Fifth NAT RAN Meeting; Second Meeting of the Automated Data Interchange Systems Panel; Air Navigation Study on RAN Meeting recommendations of worldwide applicability; Sixth AN Conference	Introduction of the term "Hertz (Hz)" in place of the term "cycles per second (c/ s)" as the unit of frequency for electric and radio-technical matters; changes in the provisions relating to short-term and long-term retention of AFTN traffic records and the period of thirty days for the retention of communications logs; expansion of the Introduction to Volume II with material relating to the 7-unit coded character set; introduction of the definitions for "ATS direct speech circuit", "Meteorological operational channel" and "Meteorological operational telecommunication network"; reorganization of the provisions at Chapters 3 and 4 by grouping under Chapter 3 the general provisions for the four parts of the international aeronautical telecommunication service and under Chapter 4 the provisions relating to the aeronautical fixed service, including the aeronautical fixed telecommunication network; provisions concerning the recording of air-reports in AIREP form.	24 March 1972 24 July 1972 7 December 1972
51	Sixth EUM RAN Meeting	Introduction of provisions concerning the use of a predetermined distribution system for AFTN messages.	11 December 1972 11 April 1973 16 August 1973
52	—	No change.	—
53	—	No change.	—
54[1]	Fourth Meeting of the Automated Data Interchange Systems Panel	Insertion of cross-references in Volume I, Part I, Chapter 4, 4.12 and in the Introduction to Volume II, concerning data exchange rates.	17 June 1974 — —
55	—	No change.	—
56	—	No change.	—
57	ASIA/PAC RAN Meeting	Amendments concerning the maintenance of guard on the VHF emergency frequency 121.5 MHz by the crews of aircraft crossing designated areas, and the elimination of ocean station vessels from those aeronautical stations with which radio contact should be attempted in case of air-ground communications failure.	16 June 1976 16 October 1976 6 October 1977
58	Sixth Meeting of the Automated Data Interchange Systems Panel	Amendment concerning the material permitted in AFS messages and the procedures for requesting repetition of mutilated messages in the AFTN; also the introduction of a message format for the 7-unit coded character set.	27 June 1977 27 October 1977 23 February 1978
59	COM Divisional Meeting (1976)	Amendment concerning address part of the AFTN messages.	14 December 1977 14 April 1978 10 August 1978
60	Eighth Meeting of the EUR Air Navigation Planning Group; Third Meeting of the EUR/NAM/NAT Regional Planning Group	Designation of VHF 25 kHz channels; short-term retention of AFTN messages.	4 December 1978 4 April 1979 29 November 1979
61	Seventh Meeting of the Automated Data Interchange Systems Panel; COM Divisional Meeting (1978)	Introduction of a new series of marginal serial numbers in use by the International Telecommunication Union (ITU) and clarification of the term "Radio Regulations"; changes to the definition of the Aeronautical Fixed Telecommunication Network (AFTN); introduction of the definition of "operational control communications"; new provisions regarding stripped address procedure; changes in the provisions regarding maximum message length; changes in the provisions regarding flight regularity messages.	10 December 1979 10 April 1980 27 November 1980

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
62	Eighth Meeting of the Automated Data Interchange Systems Panel	Changes and additions to the provisions related to service messages, multiple lines of address and stripped address procedure; changes and additions to the provisions related to channel-check transmissions and the use of controlled circuit protocols; changes and additions to the provisions related to the detection of mutilated messages; addition of provisions related to the transfer of AFTN messages over code and byte independent circuits and networks.	14 December 1981 14 April 1982 25 November 1982
63	Ninth Meeting of the Automated Data Interchange Systems Panel	Changes to the provisions related to message priority and priority indicators.	13 December 1982 13 April 1983 24 November 1983
64	Air Navigation Commission	Introduction of new and revised radiotelephony procedures for use in the Aeronautical Mobile Service.	30 March 1983 29 July 1983 7 June 1984
65	Recommendations of the ANC relating to the method of referencing date/time; COM/MET Divisional Meeting (1982); Third Meeting of the ATS Data Acquisition, Processing and Transfer Panel; 10th Meeting of the Automated Data Interchange Systems Panel	Coordinated universal time (UTC); changes to AFTN message text length, and priorities for movement and control messages; test procedures on AFTN channels; new material on AFTN address stripping in Attachment C.	6 December 1984 6 April 1985 21 November 1985
66	—	No change.	—
67	Eighth Meeting, 104th Session of Council; COM/MET Divisional Meeting (1982); Air Navigation Commission	Changes and editorial rearrangement of AFTN procedures resulting from the new ICAO three-letter designator; changes related to predetermined distribution system for the AFTN; introduction of new procedures concerning transmission of whole hundreds in radiotelephony; introduction of new procedures for use on VHF air-to-air communications channel; editorial rearrangement to present English language radiotelephony phraseology in all language versions of Annex 10, Volume II.	16 March 1987 27 July 1987 22 October 1987
68	Air Navigation Commission	New procedures for the formulation of aircraft radiotelephony call signs; changes to safeguard aircraft against acts of unlawful interference; new procedures related to the maintenance of guard on 121.5 MHz.	29 March 1990 30 July 1990 15 November 1990
69	COM/MET Divisional Meeting (1982); COM/MET/OPS Divisional Meeting (1990)	Changes to AFTN message procedures and addition of material related to the world area forecast system (WAFS) telecommunications requirements; addition of material related to VHF air-ground data link communications and changes to material concerning VHF off-set carrier systems.	22 March 1993 26 July 1993 11 November 1993
70 (5th Edition)	Air Navigation Commission	New phraseology for the transmission of numbers in radiotelephony. A number of changes in the AFTN procedures related to the acceptance and transmission of messages, categories of messages and removal of obsolete material related to radiotelephony.	20 March 1995 24 July 1995 9 November 1995
71	Air Navigation Commission; first meeting of the Aeronautical Telecommunication Network Panel (ATNP)	Changes to aeronautical fixed telecommunications network procedures.	12 March 1996 15 July 1996 7 November 1996
72	Air Navigation Commission; fourth meeting of the Aeronautical Mobile Communications Panel (AMCP)	Modification of R/T procedures concerning the introduction of 8.33 kHz channel spacing; deletion of definition for VDL.	12 March 1997 21 July 1997 6 November 1997

Annex 10 — Aeronautical Telecommunications *Volume II*

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
73	Air Navigation Commission; second meeting of the Aeronautical Telecommunication Network Panel (ATNP)	Changes to the composition of meteorological messages sent via the AFTN; introduction of Human Factors related material.	19 March 1998 20 July 1998 5 November 1998
74	Air Navigation Commission	Introduction of interpilot air-to-air channel.	18 March 1999 19 July 1999 4 November 1999
75	—	No change.	—
76 (6th Edition)	Third meeting of the Aeronautical Telecommunication Network Panel (ATNP); the Secretariat on the basis of proposals by the Multi-Agency Air Traffic Services Procedures Coordination Group (MAPCOG); fifth meeting of the Automatic Dependent Surveillance Panel (ADSP); seventh meeting of the Aeronautical Mobile Communication Panel (AMCP); Secretariat	Aeronautical fixed service (AFS) procedural provisions for voice and data communications elements; consequential changes resulting from the introduction of a single interpilot air-to-air frequency; deletion of references to obsolete radiotelegraphy techniques; radiotelephony speech and standard phraseology; technology in relation to a number of data link applications; update of references to the ITU Radio Regulations.	12 March 2001 16 July 2001 1 November 2001
77	—	No change.	—
78	Air Navigation Commission	Language proficiency requirements.	5 March 2003 14 July 2003 27 November 2003
79	—	No change.	—
80	European Air Navigation Planning Group (EANPG); Aeronautical Communications Panel (ACP)	Changes to the procedures for indication of the transmitting channels in VHF radiotelephony communications.	25 February 2005 11 July 2005 24 November 2005
81	—	No change.	—

[1] Did not affect any Standards or Recommended Practices.

ANNEX 10 — VOLUME II
COMMUNICATION PROCEDURES

Introduction

The object of the international aeronautical telecommunication service is to ensure the telecommunications and radio aids to air navigation necessary for the safety, regularity and efficiency of international air navigation.

Procedures for the International Aeronautical Telecommunication Service are herein set forth for worldwide use. It is recognized that Supplementary Procedures may be required in certain cases in order to meet particular requirements of the ICAO Regions. Any Supplementary Procedure recommended for this purpose must be a requirement peculiar to the region and must not be contained in, nor conflict with, any worldwide Procedure of ICAO.

Where appropriate, specific ITU Radio Regulations have been paraphrased in this document. Users of these Procedures should note that the Radio Regulations Annex of the International Telecommunications Convention is all-embracing in character and, therefore, should be applied in all pertinent cases.

All references to "Radio Regulations" are to the Radio Regulations published by the International Telecommunication Union.

The Communication Procedures are to be used in conjunction with the Abbreviations and Codes of Doc 8400 and with such other codes and abbreviations as may be approved by ICAO for use in communications.

Volume II contains a number of provisions relating to the exchange of information which were developed primarily for low modulation rates utilizing the coded character sets of International Alphabets Nos. 2 and 3. Provisions for International Alphabet No. 5 (IA-5) for use at medium and higher signalling rates are contained in Annex 10, Volume III.

CHAPTER 1. DEFINITIONS

When the following terms are used in this publication, they have the meaning prescribed in this chapter:

Note 1.— A list of additional specialized communication terms and their definitions is contained in Attachment A.

Note 2.— All references to "Radio Regulations" are to the Radio Regulations published by the International Telecommunication Union (ITU). Radio Regulations are amended from time to time by the decisions embodied in the Final Acts of World Radiocommunication Conferences held normally every two to three years. Further information on the ITU processes as they relate to aeronautical radio system frequency use is contained in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc 9718).*

1.1 Services

Aeronautical broadcasting service. A broadcasting service intended for the transmission of information relating to air navigation.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical fixed telecommunication network (AFTN). A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radiobeacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical mobile (R)* service (RR S1.33). An aeronautical mobile service reserved for communications relating to

* route

safety and regularity of flight, primarily along national or international civil air routes.

Aeronautical mobile-satellite service (RR S1.35). A mobile-satellite service in which mobile earth stations are located on board aircraft; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service.

Aeronautical mobile-satellite (R)* service (RR S1.36). An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flights, primarily along national or international civil air routes.

Aeronautical radio navigation service (RR S1.46). A radio navigation service intended for the benefit and for the safe operation of aircraft.

Note.— The following Radio Regulations are quoted for purposes of reference and/or clarity in understanding of the above definition of the aeronautical radio navigation service:

RR S1.10 Radio navigation: *Radiodetermination used for the purpose of navigation, including obstruction warning.*

RR S1.9 Radiodetermination: *The determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.*

Aeronautical telecommunication service. A telecommunication service provided for any aeronautical purpose.

International telecommunication service. A telecommunication service between offices or stations of different States, or between mobile stations which are not in the same State, or are subject to different States.

1.2 Stations

Aerodrome control radio station. A station providing radiocommunication between an aerodrome control tower and aircraft or mobile aeronautical stations.

Aeronautical fixed station. A station in the aeronautical fixed service.

Aeronautical station (RR S1.81). A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.

Aeronautical telecommunication station. A station in the aeronautical telecommunication service.

AFTN communication centre. An AFTN station whose primary function is the relay or retransmission of AFTN traffic from (or to) a number of other AFTN stations connected to it.

AFTN destination station. An AFTN station to which messages and/or digital data are addressed for processing for delivery to the addressee.

AFTN origin station. An AFTN station where messages and/or digital data are accepted for transmission over the AFTN.

AFTN station. A station forming part of the aeronautical fixed telecommunication network (AFTN) and operating as such under the authority or control of a State.

Air-ground control radio station. An aeronautical telecommunication station having primary responsibility for handling communications pertaining to the operation and control of aircraft in a given area.

Aircraft station (RR S1.83). A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft.

Communication centre. An aeronautical fixed station which relays or retransmits telecommunication traffic from (or to) a number of other aeronautical fixed stations directly connected to it.

Mobile surface station. A station in the aeronautical telecommunication service, other than an aircraft station, intended to be used while in motion or during halts at unspecified points.

Network station. An aeronautical station forming part of a radiotelephony network.

Radio direction finding (RR S1.12). Radiodetermination using the reception of radio waves for the purpose of determining the direction of a station or object.

Radio direction-finding station (RR S1.91). A radiodetermination station using radio direction finding.

Note.— The aeronautical application of radio direction finding is in the aeronautical radio navigation service.

Regular station. A station selected from those forming an en-route air-ground radiotelephony network to communicate with or to intercept communications from aircraft in normal conditions.

Tributary station. An aeronautical fixed station that may receive or transmit messages and/or digital data but which

* route

does not relay except for the purpose of serving similar stations connected through it to a communication centre.

1.3 Communication methods

Air-ground communication. Two-way communication between aircraft and stations or locations on the surface of the earth.

Air-to-ground communication. One-way communication from aircraft to stations or locations on the surface of the earth.

Blind transmission. A transmission from one station to another station in circumstances where two-way communication cannot be established but where it is believed that the called station is able to receive the transmission.

Broadcast. A transmission of information relating to air navigation that is not addressed to a specific station or stations.

Duplex. A method in which telecommunication between two stations can take place in both directions simultaneously.

Ground-to-air communication. One-way communication from stations or locations on the surface of the earth to aircraft.

Interpilot air-to-air communication. Two-way communication on the designated air-to-air channel to enable aircraft engaged in flights over remote and oceanic areas out of range of VHF ground stations to exchange necessary operational information and to facilitate the resolution of operational problems.

Non-network communications. Radiotelephony communications conducted by a station of the aeronautical mobile service, other than those conducted as part of a radiotelephony network.

Radiotelephony network. A group of radiotelephony aeronautical stations which operate on and guard frequencies from the same family and which support each other in a defined manner to ensure maximum dependability of air-ground communications and dissemination of air-ground traffic.

Readback. A procedure whereby the receiving station repeats a received message or an appropriate part thereof back to the transmitting station so as to obtain confirmation of correct reception.

Simplex. A method in which telecommunication between two stations takes place in one direction at a time.

Telecommunication (RR S1.3). Any transmission, emission, or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.

1.4 Direction finding

Homing. The procedure of using the direction-finding equipment of one radio station with the emission of another radio station, where at least one of the stations is mobile, and whereby the mobile station proceeds continuously towards the other station.

Radio bearing. The angle between the apparent direction of a definite source of emission of electro-magnetic waves and a reference direction, as determined at a radio direction-finding station. A *true* radio bearing is one for which the reference direction is that of true North. A *magnetic* radio bearing is one for which the reference direction is that of magnetic North.

1.5 Teletypewriter systems

Automatic relay installation. A teletypewriter installation where automatic equipment is used to transfer messages from incoming to outgoing circuits.

Note.— This term covers both fully automatic and semi-automatic installations.

Fully automatic relay installation. A teletypewriter installation where interpretation of the relaying responsibility in respect of an incoming message and the resultant setting-up of the connections required to effect the appropriate retransmissions is carried out automatically, as well as all other normal operations of relay, thus obviating the need for operator intervention, except for supervisory purposes.

Message field. An assigned area of a message containing specified elements of data.

Semi-automatic relay installation. A teletypewriter installation where interpretation of the relaying responsibility in respect of an incoming message and the resultant setting-up of the connections required to effect the appropriate retransmissions require the intervention of an operator but where all other normal operations of relay are carried out automatically.

Teletypewriter tape. A tape on which signals are recorded in the 5-unit Start-Stop code by completely severed perforations (Chad Type) or by partially severed perforations (Chadless Type) for transmission over teletypewriter circuits.

"Torn-tape" relay installation. A teletypewriter installation where messages are received and relayed in teletypewriter tape form and where all operations of relay are performed as the result of operator intervention.

1.6 Agencies

Aeronautical telecommunication agency. An agency responsible for operating a station or stations in the aeronautical telecommunication service.

Aircraft operating agency. The person, organization or enterprise engaged in, or offering to engage in, an aircraft operation.

1.7 Frequencies

Primary frequency. The radiotelephony frequency assigned to an aircraft as a first choice for air-ground communication in a radiotelephony network.

Secondary frequency. The radiotelephony frequency assigned to an aircraft as a second choice for air-ground communication in a radiotelephony network.

1.8 Data link communications

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Current data authority. The designated ground system through which a CPDLC dialogue between a pilot and a controller currently responsible for the flight is permitted to take place.

Downstream data authority. A designated ground system, different from the current data authority, through which the pilot can contact an appropriate ATC unit for the purposes of receiving a downstream clearance.

Next data authority. The ground system so designated by the current data authority through which an onward transfer of communications and control can take place.

1.9 Miscellaneous

Aeronautical fixed circuit. A circuit forming part of the aeronautical fixed service (AFS).

Aeronautical fixed telecommunication network circuit. A circuit forming part of the aeronautical fixed telecommunication network (AFTN).

Aeronautical telecommunication log. A record of the activities of an aeronautical telecommunication station.

Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.

Note.— Details of the AIREP form are given in PANS-ATM (Doc 4444).

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

ATS direct speech circuit. An aeronautical fixed service (AFS) telephone circuit, for direct exchange of information between air traffic services (ATS) units.

Automatic telecommunication log. A record of the activities of an aeronautical telecommunication station recorded by electrical or mechanical means.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the standard atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Frequency channel. A continuous portion of the frequency spectrum appropriate for a transmission utilizing a specified class of emission.

Note.— The classification of emissions and information relevant to the portion of the frequency spectrum appropriate for a given type of transmission (bandwidths) is specified in the ITU Radio Regulations, Article S2 and Appendix S1.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Location indicator. A four-letter code group formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.

Meteorological operational channel. A channel of the aeronautical fixed service (AFS), for the exchange of aeronautical meteorological information.

Meteorological operational telecommunication network. An integrated system of meteorological operational channels, as part of the aeronautical fixed service (AFS), for the exchange of aeronautical meteorological information between the aeronautical fixed stations within the network.

Note.— "Integrated" is to be interpreted as a mode of operation necessary to ensure that the information can be transmitted and received by the stations within the network in accordance with pre-established schedules.

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Operational control communications. Communications required for the exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of a flight.

Note.— Such communications are normally required for the exchange of messages between aircraft and aircraft operating agencies.

Route segment. A route or portion of route usually flown without an intermediate stop.

Routing Directory. A list in a communication centre indicating for each addressee the outgoing circuit to be used.

SNOWTAM. A special series NOTAM notifying the presence or removal of hazardous conditions due to snow, ice, slush or standing water associated with snow, slush and ice on the movement area, by means of a specific format.

CHAPTER 2. ADMINISTRATIVE PROVISIONS RELATING TO THE INTERNATIONAL AERONAUTICAL TELECOMMUNICATION SERVICE

2.1 Division of service

The international aeronautical telecommunication service shall be divided into four parts:

1) aeronautical fixed service;

2) aeronautical mobile service;

3) aeronautical radio navigation service;

4) aeronautical broadcasting service.

2.2 Telecommunication — Access

All aeronautical telecommunication stations, including end systems and intermediate systems of the aeronautical telecommunication network (ATN), shall be protected from unauthorized direct or remote access.

2.3 Hours of service

2.3.1 The Competent Authority shall give notification of the normal hours of service of stations and offices of the international aeronautical telecommunication service under its control to the aeronautical telecommunication agencies designated to receive this information by other Administrations concerned.

2.3.2 Whenever necessary and practicable, the Competent Authority shall give notification of any change in the normal hours of service, before such a change is effected, to the aeronautical telecommunication agencies designated to receive this information by other Administrations concerned. Such changes shall also, whenever necessary, be promulgated in NOTAM.

2.3.3 If a station of the international aeronautical telecommunication service, or an aircraft operating agency, requests a change in the hours of service of another station, such change shall be requested as soon as possible after the need for change is known. The station or aircraft operating agency requesting the change shall be informed of the result of its request as soon as possible.

2.4 Supervision

2.4.1 Each State shall designate the authority responsible for ensuring that the international aeronautical telecommunication service is conducted in accordance with the Procedures in this Annex.

2.4.2 **Recommendation.—** *Occasional infringements of the Procedures contained herein, when not serious, should be dealt with by direct communication between the parties immediately interested either by correspondence or by personal contact.*

2.4.3 When a station commits serious or repeated infringements, representations relating to them shall be made to the authority designated in 2.4.1 of the State to which the station belongs by the authority which detects them.

2.4.4 **Recommendation.—** *The authorities designated in 2.4.1 should exchange information regarding the performance of systems of communication, radio navigation, operation and maintenance, unusual transmission phenomena, etc.*

2.5 Superfluous transmissions

Each State shall ensure that there is no wilful transmission of unnecessary or anonymous signals, messages or data by any station within that State.

2.6 Interference

Before authorizing tests and experiments in any station, each Administration, in order to avoid harmful interference, shall prescribe the taking of all possible precautions, such as the choice of frequency and of time, and the reduction or, if possible, the suppression of radiation. Any harmful interference resulting from tests and experiments shall be eliminated as soon as possible.

CHAPTER 3. GENERAL PROCEDURES FOR THE INTERNATIONAL AERONAUTICAL TELECOMMUNICATION SERVICE

3.1 General

The procedures outlined in this chapter are general in character and shall be applied where appropriate to the other chapters contained in this Volume.

Note.— Detailed procedures, with special application to the service concerned, are contained in Chapters 4, 5, 6, 7 and 8.

3.2 Extensions of service and closing down of stations

3.2.1 Stations of the international aeronautical telecommunication service shall extend their normal hours of service as required to provide for traffic necessary for flight operation.

3.2.2 Before closing down, a station shall notify its intention to all other stations with which it is in direct communication, confirm that an extension of service is not required and advise the time of re-opening if other than its normal hours of service.

3.2.3 When it is working regularly in a network on a common circuit, a station shall notify its intention of closing down either to the control station, if any, or to all stations in the network. It shall continue watch for two minutes and may then close down if it has received no call during this period.

3.2.4 Stations with other than continuous hours of operation, engaged in, or expected to become engaged in distress, urgency, unlawful interference, or interception traffic, shall extend their normal hours of service to provide the required support to those communications.

3.3 Acceptance, transmission and delivery of messages

3.3.1 Only those messages coming within the categories specified in 4.4.1.1 shall be accepted for transmission by the aeronautical telecommunication service.

3.3.1.1 The responsibility for determining the acceptability of a message shall rest with the station where the message is filed for transmission.

3.3.1.2 Once a message is deemed acceptable, it shall be transmitted, relayed and (or) delivered in accordance with the priority classification and without discrimination or undue delay.

3.3.1.3 **Recommendation.—** *The authority in control of any station through which a message is relayed, should make representations at a later date to the authority in control of the accepting station regarding any message which is considered unacceptable.*

3.3.2 Only messages for stations forming part of the aeronautical telecommunication service shall be accepted for transmission, except where special arrangements have been made with the telecommunication authority concerned.

3.3.2.1 Acceptance as a single message of a message intended for two or more addresses, whether at the same station or at different stations, shall be permitted subject, however, to the provisions prescribed in 4.4.3.1.2.3.

3.3.3 Messages handled for aircraft operating agencies shall be accepted only when handed in to the telecommunication station in the form prescribed herein and by an authorized representative of that agency, or when received from that agency over an authorized circuit.

3.3.4 For each station of the aeronautical telecommunication service from which messages are delivered to one or more aircraft operating agencies, a single office for each aircraft operating agency shall be designated by agreement between the aeronautical telecommunication agency and the aircraft operating agency concerned.

3.3.5 Stations of the international aeronautical telecommunication service shall be responsible for delivery of messages to addressee(s) located within the boundaries of the aerodrome(s) served by that station and beyond those boundaries only to such addressee(s) as may be agreed by special arrangements with the Administrations concerned.

3.3.6 Messages shall be delivered in the form of a written record, or other permanent means as prescribed by authorities.

3.3.6.1 **Recommendation.—** *In cases where telephone or loudspeaker systems are used without recording facilities for the delivery of messages, a written copy should be provided, as confirmation of delivery, as soon as possible.*

3.3.7 Messages originated in the aeronautical mobile service by an aircraft in flight and which require transmission over the aeronautical fixed telecommunication network to effect delivery, shall be reprocessed by the aeronautical telecommunication station into the message format prescribed in 4.4.2 prior to transmission on the AFTN.

3.3.7.1 Messages originated in the aeronautical mobile service by an aircraft in flight and which require transmission over the aeronautical fixed service, other than on AFTN circuits, shall also be reprocessed by the aeronautical telecommunication station into the format prescribed in 4.4.2 except where, subject to the provisions of 3.3.5, prior and other arrangements have been made between the aeronautical telecommunication agency and the aircraft operating agency concerned for predetermined distribution of messages from aircraft.

3.3.7.2 Messages (including air-reports) without specific address containing meteorological information received from an aircraft in flight shall be forwarded without delay to the meteorological office associated with the point of reception.

3.3.7.3 Messages (including air-reports) without specific address containing air traffic services information from aircraft in flight shall be forwarded without delay to the air traffic services unit associated with the communication station receiving the message.

3.3.7.4 **PANS.—** *When recording the text of air-reports in AIREP form, the data conventions approved by ICAO for this purpose shall be used wherever possible.*

Note.— Provisions relating to the composition, including data conventions, of air-reports and to the order and form in which the elements of such reports are transmitted by the aircraft stations and recorded and retransmitted by the aeronautical stations, are contained in the PANS-ATM (Doc 4444).

3.3.7.5 **PANS.—** *When air-reports in AIREP form are to be retransmitted by telegraphy (including teletypewriting), the text transmitted shall be as recorded in compliance with 3.3.7.4.*

3.4 Time system

3.4.1 Universal Co-ordinated Time (UTC) shall be used by all stations in the aeronautical telecommunication service. Midnight shall be designated as 2400 for the end of the day and 0000 for the beginning of the day.

3.4.2 A date-time group shall consist of six figures, the first two figures representing the date of the month and the last four figures the hours and minutes in UTC.

3.5 Record of communications

3.5.1 General

3.5.1.1 A telecommunication log, written or automatic, shall be maintained in each station of the aeronautical telecommunication service except that an aircraft station, when using radiotelephony in direct communication with an aeronautical station, need not maintain a telecommunication log.

Note.— The telecommunication log will serve as a protection, should the operator's watch activities be investigated. It may be required as legal evidence.

3.5.1.1.1 **Recommendation.—** *Aeronautical stations should record messages at the time of their receipt, except that, if during an emergency the continued manual recording would result in delays in communication, the recording of messages may be temporarily interrupted and completed at the earliest opportunity.*

Note.— In the case of radiotelephony operation it would be desirable if voice recording were provided for use during interruption in manual recording.

3.5.1.1.2 **Recommendation.—** *When a record is maintained in an aircraft station, either in a radiotelephone log or elsewhere, concerning distress communications, harmful interference, or interruption to communications, such a record should be associated with information concerning the time and the position, and altitude of the aircraft.*

3.5.1.2 In written logs, entries shall be made only by operators on duty except that other persons having knowledge of facts pertinent to the entries may certify in the log the accuracy of operators' entries.

3.5.1.3 All entries shall be complete, clear, correct and intelligible. Superfluous marks or notations shall not be made in the log.

3.5.1.4 In written logs, any necessary correction in the log shall be made only by the person making the initial entry. The correction shall be accomplished by drawing or typing a single line through the incorrect entry, initialling same, recording the time and date of correction. The correct entry shall be made on the next line after the last entry.

3.5.1.5 Telecommunication logs, written or automatic, shall be retained for a period of at least thirty days. When logs are pertinent to inquiries or investigations they shall be retained for longer periods until it is evident that they will be no longer required.

3.5.1.6 The following information shall be entered in written logs:

a) the name of the agency operating the station;

b) the identification of the station;

c) the date;

d) the time of opening and closing the station;

e) the signature of each operator, with the time the operator assumes and relinquishes a watch;

f) the frequencies being guarded and type of watch (continuous or scheduled) being maintained on each frequency;

g) except at intermediate mechanical relay stations where the provisions of this paragraph need not be complied with, a record of each communication, test transmission, or attempted communication showing text of communication, time communication completed, station(s) communicated with, and frequency used. The text of the communication may be omitted from the log when copies of the messages handled are available and form part of the log;

h) all distress communications and action thereon;

i) a brief description of communication conditions and difficulties, including harmful interference. Such entries should include, whenever practicable, the time at which interference was experienced, the character, radio frequency and identification of the interfering signal;

j) a brief description of interruption to communications due to equipment failure or other troubles, giving the duration of the interruption and action taken;

k) such additional information as may be considered by the operator to be of value as a part of the record of the station's operations.

3.6 Establishment of radiocommunication

3.6.1 All stations shall answer calls directed to them by other stations in the aeronautical telecommunication service and shall exchange communications on request.

3.6.2 All stations shall radiate the minimum power necessary to ensure a satisfactory service.

3.7 Use of abbreviations and codes

3.7.1 Abbreviations and codes shall be used in the international aeronautical telecommunication service whenever they are appropriate and their use will shorten or otherwise facilitate communication.

3.7.1.1 Where abbreviations and codes other than those approved by ICAO are contained in the text of messages, the originator shall, if so required by the aeronautical telecommunication station accepting the message for transmission, make available to that station a decode for the abbreviations and codes used.

Note.— The use of ICAO approved abbreviations and codes wherever appropriate — for example, those contained in PANS-ABC (Doc 8400) — obviates the need for application of the provisions of 3.7.1.1.

3.8 Cancellation of messages

Messages shall be cancelled by a telecommunication station only when cancellation is authorized by the message originator.

CHAPTER 4. AERONAUTICAL FIXED SERVICE (AFS)

4.1 General

4.1.1 The aeronautical fixed service shall comprise the following systems and applications that are used for ground-ground (i.e. point-to-point and/or point-to-multipoint) communications in the international aeronautical telecommunication service:

a) ATS direct speech circuits and networks;

b) meteorological operational circuits, networks and broadcast systems;

c) the aeronautical fixed telecommunications network (AFTN);

d) the common ICAO data interchange network (CIDIN);

e) the air traffic services (ATS) message handling services; and

f) the inter-centre communications (ICC).

Note 1.— Provisions relating to ATS direct speech communications are contained in 4.2.

Note 2.— Provisions relating to meteorological operational channels and meteorological operational telecommunication networks are contained in 4.3.

Note 3.— The AFTN provides a store-and-forward messaging service for the conveyance of text messages in ITA-2 or IA-5 format, using character-oriented procedures. Provisions relating to the AFTN are contained in 4.4.

Note 4.— The CIDIN provides a common transport service for the conveyance of binary or text application messages, in support of the AFTN and OPMET applications. Procedural provisions relating to the CIDIN are contained in 4.5.

Note 5.— The ATS (air traffic services) message handling services (ATSMHS) application allows ATS messages to be exchanged between service users over the aeronautical telecommunication network (ATN) internet communication service (ICS). Procedural provisions relating to ATS message handling services are contained in 4.6.

Note 6.— The inter-centre communications applications enable the exchange of information between air traffic service units over the aeronautical telecommunication network (ATN) internet communication service (ICS), in support of notification, coordination, transfer of control, flight planning, airspace management and air traffic flow management. Procedural provisions relating to inter-centre communications are contained in 4.7.

Note 7.— The aeronautical telecommunication network through its ATSMHS and ICC applications enable the transition of existing AFTN and CIDIN users and systems into the ATN architecture.

4.1.2 Material permitted in AFS messages

Note.— The provisions contained in 4.1.2 do not apply to ATS voice communications.

4.1.2.1 The following characters are allowed in text messages:

Letters: ABCDEFGHIJKLMNOPQRSTUVWXYZ

Figures: 1 2 3 4 5 6 7 8 9 0

Other signs:	-	(hyphen)
	?	(question mark)
	:	(colon)
	(	(open bracket)
	)	(close bracket)
	.	(full stop, period, or decimal point)
	,	(comma)
	'	(apostrophe)
	=	(double hyphen or equal sign)
	/	(oblique)
	+	(plus sign)

Characters other than those listed above shall not be used in messages unless absolutely necessary for understanding of the text. When used, they shall be spelled out in full.

4.1.2.2 For the exchange of messages over the teletypewriter circuits, the following signals of the International Telegraph Alphabet No. 2 (ITA-2) shall be permitted:

signals nos. 1 to 3	—	in letter and in figure case;
signal no. 4	—	in letter case only;
signal no. 5	—	in letter and in figure case;
signals nos. 6 to 8	—	in letter case only;
signal no. 9	—	in letter and in figure case;
signal no. 10	—	in letter case only; and
signals nos. 11 to 31	—	in letter and figure case.

Note 1.— "Letter case" and "figure case" are to be understood as the shift condition in which the equipment associated with the channel was positioned prior to the reception of the signal.

Note 2.— When using any of the above signals, account is to be taken of, amongst others, the provisions of 4.4.5.3.

Note 3.— The foregoing provisions of 4.1.2.2 are not intended to prevent the use of:

a) figure case of signals nos. 6, 7 and 8 after bilateral agreements between States having telecommunication stations directly connected to each other;

*b) figure case of signal no. 10 as the priority alarm (*see *4.4.4.3); and*

c) figure case of signal no. 4 for operational purposes only and not as part of a message.

4.1.2.3 For the exchange of messages over the teletypewriter circuits, the following characters of International Alphabet No. 5 (IA-5) shall be permitted:

— characters 0/1 to 0/3, 0/7 — in the priority alarm (*see* 4.4.15.2.2.5), 0/10, 0/11 — in the ending sequence (*see* 4.4.15.3.12.1), 0/13;
— characters 2/0, 2/7 to 2/9, 2/11 to 2/15;
— characters 3/0 to 3/10, 3/13, 3/15;
— characters 4/1 to 4/15;
— characters 5/0 to 5/10; and
— character 7/15.

Note.— The foregoing provisions of 4.1.2.3 are not intended to prevent the use of the full IA-5 after agreement between the Administrations concerned.

4.1.2.4 Roman numerals shall not be employed. If the originator of a message wishes the addressee to be informed that roman figures are intended, the arabic figure or figures shall be written and preceded by the word ROMAN.

4.1.2.5 Messages using the ITA-2 code shall not contain:

1) any uninterrupted sequence of signals nos. 26, 3, 26 and 3 (letter case and figure case) in this order, other than the one in the heading as prescribed in 4.4.2.1.1; and

2) any uninterrupted sequence of four times signal no. 14 (letter case and figure case) other than the one in the ending as prescribed in 4.4.6.1.

4.1.2.6 Messages using IA-5 shall not contain:

1) character 0/1 (SOH) other than the one in the heading as prescribed in 4.4.15.1.1 a);

2) character 0/2 (STX) other than the one in the origin line as prescribed in 4.4.15.2.2.7;

3) character 0/3 (ETX) other than the one in the ending as prescribed in 4.4.15.3.12.1;

4) any uninterrupted sequence of characters 5/10, 4/3, 5/10, 4/3 in this order (ZCZC);

5) any uninterrupted sequence of characters 2/11, 3/10, 2/11, 3/10 in this order (+:+:);

6) any uninterrupted sequence of four times character 4/14 (NNNN); and

7) any uninterrupted sequence of four times character 2/12 (,,,,).

4.1.2.7 The text of messages shall be drafted in plain language or in abbreviations and codes, as prescribed in 3.7. The originator shall avoid the use of plain language when reduction in the length of the text by appropriate abbreviations and codes is practicable. Words and phrases which are not essential, such as expressions of politeness, shall not be used.

4.1.2.8 If the originator of a message wishes alignment functions [<≡] to be transmitted at specific places in the text part of such message (*see* 4.4.5.3 and 4.4.15.3.6), the sequence [<≡] shall be written on each of those places.

4.2 ATS direct speech circuits

Note.— Provisions relating to ATS direct speech communications are contained in Chapter 6 of Annex 11.

4.3 Meteorological operational channels and meteorological operational telecommunication networks

Meteorological operational channel procedures and meteorological operational communication network procedures shall be compatible with aeronautical fixed telecommunications network (AFTN) procedures.

Note.— "Compatible" is to be interpreted as a mode of operation ensuring that the information exchanged over the meteorological operational channels also can be exchanged over the aeronautical fixed telecommunication network without harmful effect on the operation of the aeronautical fixed telecommunication network and vice versa.

4.4 Aeronautical fixed telecommunication network (AFTN)

4.4.1 General

4.4.1.1 *Categories of messages.* Subject to the provisions of 3.3, the following categories of message shall be handled by the aeronautical fixed telecommunication network:

a) distress messages;

b) urgency messages;

c) flight safety messages;

d) meteorological messages;

e) flight regularity messages;

f) aeronautical information services (AIS) messages;

g) aeronautical administrative messages;

h) service messages.

4.4.1.1.1 *Distress messages (priority indicator SS).* This message category shall comprise those messages sent by mobile stations reporting that they are threatened by grave and imminent danger and all other messages relative to the immediate assistance required by the mobile station in distress.

4.4.1.1.2 *Urgency messages (priority indicator DD).* This category shall comprise messages concerning the safety of a ship, aircraft or other vehicles, or of some person on board or within sight.

4.4.1.1.3 Flight safety messages (priority indicator FF) shall comprise:

a) movement and control messages as defined in PANS-ATM (Doc 4444), Chapter 10;

b) messages originated by an aircraft operating agency of immediate concern to aircraft in flight or preparing to depart;

c) meteorological messages restricted to SIGMET information, special air-reports, AIRMET messages, volcanic ash and tropical cyclone advisory information and amended forecasts.

4.4.1.1.4 Meteorological messages (priority indicator GG) shall comprise:

a) messages concerning forecasts, e.g. terminal aerodrome forecasts (TAFs), area and route forecasts;

b) messages concerning observations and reports, e.g. METAR, SPECI.

4.4.1.1.5 Flight regularity messages (priority indicator GG) shall comprise:

a) aircraft load messages required for weight and balance computation;

b) messages concerning changes in aircraft operating schedules;

c) messages concerning aircraft servicing;

d) messages concerning changes in collective requirements for passengers, crew and cargo covered by deviation from normal operating schedules;

e) messages concerning non-routine landings;

f) messages concerning pre-flight arrangements for air navigation services and operational servicing for non-scheduled aircraft operations, e.g. overflight clearance requests;

g) messages originated by aircraft operating agencies reporting an aircraft arrival or departure;

h) messages concerning parts and materials urgently required for the operation of aircraft.

4.4.1.1.6 Aeronautical information services (AIS) messages (priority indicator GG) shall comprise:

a) messages concerning NOTAMs;

b) messages concerning SNOWTAMs.

4.4.1.1.7 Aeronautical administrative messages (priority indicator KK) shall comprise:

a) messages regarding the operation or maintenance of facilities provided for the safety or regularity of aircraft operations;

b) messages concerning the functioning of aeronautical telecommunication services;

c) messages exchanged between civil aviation authorities relating to aeronautical services.

4.4.1.1.8 Messages requesting information shall take the same priority indicator as the category of message being requested except where a higher priority is warranted for flight safety.

4.4.1.1.9 *Service messages (priority indicator as appropriate).* This category shall comprise messages originated by aeronautical fixed stations to obtain information or verification concerning other messages which appear to have been transmitted incorrectly by the aeronautical fixed service, confirming channel-sequence numbers, etc.

4.4.1.1.9.1 Service messages shall be prepared in the format prescribed in 4.4.2 or 4.4.15. In applying the provisions of 4.4.3.1.2 or 4.4.15.2.1.3 to service messages addressed to an aeronautical fixed station identified only by a location indicator, this indicator shall be immediately followed by the ICAO three-letter designator YFY, followed by an appropriate 8th letter.

4.4.1.1.9.2 Service messages shall be assigned the appropriate priority indicator.

4.4.1.1.9.2.1 **Recommendation.—** *When service messages refer to messages previously transmitted, the priority indicator assigned should be that used for the message(s) to which they refer.*

4.4.1.1.9.3 Service messages correcting errors in transmission shall be addressed to all the addressees that will have received the incorrect transmission.

4.4.1.1.9.4 A reply to a service message shall be addressed to the station which originated the initial service message.

4.4.1.1.9.5 **Recommendation.—** *The text of all service messages should be as concise as possible.*

4.4.1.1.9.6 A service message, other than one acknowledging receipt of SS messages, shall be further identified by the use of the abbreviation SVC as the first item in the text.

4.4.1.1.9.7 When a service message refers to a message previously handled, reference to the previous message shall be made by use of the appropriate transmission identification (*see* 4.4.2.1.1 b) and 4.4.15.1.1 b)) or the filing time and originator indicator groups (*see* 4.4.4 and 4.4.15.2.2) identifying the reference message.

4.4.1.2 *Order of priority*

4.4.1.2.1 The order of priority for the transmission of messages in the aeronautical fixed telecommunication network shall be as follows:

Transmission priority	*Priority indicator*
1	SS
2	DD FF
3	GG KK

4.4.1.2.2 **Recommendation.—** *Messages having the same priority indicator should be transmitted in the order in which they are received for transmission.*

4.4.1.3 *Routing of messages*

4.4.1.3.1 All communications shall be routed by the most expeditious route available to effect delivery to the addressee.

4.4.1.3.2 Predetermined diversion routing arrangements shall be made, when necessary, to expedite the movement of communication traffic. Each communication centre shall have the appropriate diversion routing lists, agreed to by the Administration(s) operating the communication centres affected and shall use them when necessary.

4.4.1.3.2.1 **Recommendation.—** *Diversion routing should be initiated:*

1) *in a fully automatic communication centre:*

   a) *immediately after detection of the circuit outage, when the traffic is to be diverted via a fully automatic communication centre;*

   b) *within a 10-minute period after detection of the circuit outage, when the traffic is to be diverted via a non-fully automatic communication centre;*

2) *in a non-fully automatic communication centre within a 10-minute period after detection of the circuit outage.*

Service message notification of the diversion requirement should be provided where no bilateral or multilateral prearranged agreements exist.

4.4.1.3.3 As soon as it is apparent that it will be impossible to dispose of traffic over the aeronautical fixed service within a reasonable period, and when the traffic is held at the station where it was filed, the originator shall be consulted regarding further action to be taken, unless:

a) otherwise agreed between the station concerned and the originator; or

b) arrangements exist whereby delayed traffic is automatically diverted to commercial telecommunication services without reference to the originator.

Note.— The expression "reasonable period" means a period of time such that it seems probable that the traffic will not be delivered to the addressee within any fixed transit period applicable to the category of traffic concerned, or, alternatively, any predetermined period agreed between originators and the telecommunication station concerned.

4.4.1.4 *Supervision of message traffic*

4.4.1.4.1 *Continuity of message traffic.* The receiving station shall check the transmission identification of incoming transmissions to ensure the correct sequence of channel-sequence numbers of all messages received over that channel.

4.4.1.4.1.1 When the receiving station detects that one or more channel-sequence numbers are missing, it shall send a complete service message (*see* 4.4.1.1.9) to the previous station rejecting receipt of any message that may have been transmitted with such missing number(s). The text of this service message shall comprise the signal QTA, the procedure signal MIS followed by one or more missing transmission identification (*see* 4.4.2.1.1.3 and 4.4.15.1.1.4) and the end-of-text signal (*see* 4.4.5.6 and 4.4.15.3.12).

Note.— The following examples illustrate application of the above-mentioned procedure. In example 2) the hyphen (-) separator is understood to mean "through" in plain language.

1) when one channel-sequence number is missing:

SVC→QTA→MIS→ABC↑123↓<≡

2) when several channel-sequence numbers are missing:

SVC→QTA→MIS→ABC↑123-126↓<≡

4.4.1.4.1.1.1 When the provisions of 4.4.1.4.1.1 are applied, the station notified of the missing message(s) condition by the service message shall reassume its responsibility for transmission of the message (or messages) that it had previously transmitted with the transmission identification concerned, and shall retransmit that message (or those messages) with a new (correct in sequence) transmission identification. The receiving station shall synchronize such that the next expected channel-sequence number is the last received channel-sequence number plus one.

4.4.1.4.1.2 **Recommendation.—** *When the receiving station detects that a message has a channel sequence number less than that expected, it should advise the previous station using a service message with a text comprising:*

1) the abbreviation SVC;

2) the procedure signal LR followed by the transmission identification of the received message;

3) the procedure signal EXP followed by the transmission identification expected;

4) the end-of-text signal.

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→LR→ABC↑123→↓EXP→ABC↑135↓<≡

4.4.1.4.1.2.1 **Recommendation.—** *When the provisions of 4.4.1.4.1.2 are applied, the station receiving the out-of-sequence message should synchronize such that the next expected channel-sequence number is the last received channel-sequence number plus one. The previous station should check its outgoing channel-sequence numbers and, if necessary, correct the sequence.*

4.4.1.4.2 *Misrouted messages*

Note.— A message is considered to have been misrouted when it contains no relaying instructions, expressed or implied, on which the receiving station can take action.

4.4.1.4.2.1 When the receiving station detects that a message has been misrouted to it, it shall either:

1) send a service message (*see* 4.4.1.1.9) to the previous station rejecting receipt of the misrouted message; or

2) itself assume responsibility for transmission of the message to all addressee indicators.

Note.— The procedure of 1) is preferable at stations using "torn-tape" relay methods or a semi-automatic relay technique with continuous tape. The procedure of 2) may be preferred at stations using fully automatic relay methods or a semi-automatic relay technique without continuous tape.

4.4.1.4.2.2 When the provisions of 4.4.1.4.2.1, 1) are applied, the text of the service message shall comprise the abbreviation SVC, the signal QTA, the procedure signal MSR followed by the transmission identification (*see* 4.4.2.1.1.3 and 4.4.15.1.1.4) of the misrouted message and the end-of-text signal (*see* 4.4.5.6 and 4.4.15.3.12).

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→QTA→MSR→ABC↑123↓<≡

4.4.1.4.2.3 When, as a result of the provisions of 4.4.1.4.2.2, a sending station is notified of the misrouted message condition by service message, it shall reassume its responsibility for the message and shall retransmit as necessary on the correct outgoing channel or channels.

4.4.1.4.3 When a circuit becomes interrupted and alternative facilities exist, the last channel-sequence numbers sent and received shall be exchanged between the stations concerned. Such exchanges shall take the form of complete service messages (*see* 4.4.1.1.9) with the text comprising the abbreviation SVC, the procedure signals LR and LS followed by the transmission identifications of the relevant messages and the end-of-text signal (*see* 4.4.5.6 and 4.4.15.3.12).

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→LR→ABC↑123↓→LS→BAC↑321↓<≡

4.4.1.5 *Failure of communications*

4.4.1.5.1 Should communication on any fixed service circuit fail, the station concerned shall attempt to re-establish contact as soon as possible.

4.4.1.5.2 **Recommendation.—** *If contact cannot be re-established within a reasonable period on the normal fixed service circuit, an appropriate alternative circuit should be used. If possible, attempts should be made to establish communication on any authorized fixed service circuit available.*

4.4.1.5.2.1 If these attempts fail, use of any available air-ground frequency shall be permitted only as an exceptional and temporary measure when no interference to aircraft in flight is ensured.

4.4.1.5.2.2 Where a radio circuit fails due to signal fade-out or adverse propagation conditions, a receiving watch shall be maintained on the regular fixed service frequency normally in use. In order to re-establish contact on this frequency as soon as possible there shall be transmitted:

a) the procedure signal DE;

b) the identification of the transmitting station transmitted three times;

c) the alignment function [<≡];

d) the letters RY repeated without separation for three lines of page copy;

e) the alignment function [<≡];

f) end-of-message signal (NNNN).

The foregoing sequence shall be repeated as required.

4.4.1.5.2.3 A station experiencing a circuit or equipment failure shall promptly notify other stations with which it is in direct communication if the failure will affect traffic routing by those stations. Restoration to normal shall also be notified to the same stations.

4.4.1.5.3 Where diverted traffic will not be accepted automatically or where a predetermined diversion routing has not been agreed, a temporary diversion routing shall be established by the exchange of service messages. The text of such service messages shall comprise:

1) the abbreviation SVC;

2) the procedure signal QSP;

3) if required, the procedure signal RQ, NO or CNL to request, refuse or cancel a diversion;

4) identification of the routing areas, States, territories, locations, or stations for which the diversion applies;

5) the end-of-text signal.

Note.— The following examples illustrate application of the above-mentioned procedures:

a) to request a diversion:

SVC→QSP→RQ→C→K→BG→BI↓<≡

b) to accept a diversion:

SVC→QSP→C→K→BG→BI↓<≡

c) to refuse a diversion:

SVC→QSP→NO→C→K→BG→BI↓<≡

d) to cancel a diversion:

SVC→QSP→CNL→C→K→BG→BI↓<≡

4.4.1.6 *Long-term retention of AFTN traffic records*

4.4.1.6.1 Copies of all messages, in their entirety, transmitted by an AFTN origin station shall be retained for a period of at least 30 days.

Note.— The AFTN origin station, although responsible for ensuring that AFTN traffic is recorded, is not necessarily the unit where the records are made and retained. By local agreement the State concerned may permit the originators to perform those functions.

4.4.1.6.2 AFTN destination stations shall retain, for a period of at least 30 days, a record containing the information necessary to identify all messages received and the action taken thereon.

Note.— The provision for identification of messages mentioned in 4.4.1.6.2 may be obtained by recording the heading, address and origin parts of messages.

4.4.1.6.3 **Recommendation.—** *AFTN communication centres should retain, for a period of at least 30 days, a record containing the information necessary to identify all messages relayed or retransmitted and the action taken thereon.*

Note 1.— The provision for identification of messages mentioned in 4.4.1.6.3 may be obtained by recording the heading, address and origin parts of messages.

Note 2.— Provisions relating to short-term retention of AFTN traffic records in AFTN communication centres are contained in 4.4.1.7.

4.4.1.7 *Short-term retention of AFTN traffic records*

4.4.1.7.1 Except as provided in 4.4.1.7.2, AFTN communication centres shall retain, for a period of at least one hour, a copy of all messages, in their entirety, retransmitted or relayed by that communication centre.

4.4.1.7.2 In cases where acknowledgement is made between AFTN communication centres, a relay centre shall be considered as having no further responsibility for retransmission or repetition of a message for which it has received positive acknowledgement, and it may be deleted from its records.

Note.— Provisions relating to long-term retention of AFTN traffic records in AFTN communication centres are contained in 4.4.1.6.

4.4.1.8 *Test procedures on AFTN channels*

4.4.1.8.1 **Recommendation.—** *Test messages transmitted on AFTN channels for the purpose of testing and repairing lines should consist of the following:*

1) the start-of-message signal;

2) the procedure signal QJH;

3) the originator indicator;

*4) three page-copy lines of the sequence of characters RY in ITA-2 or U(5/5) *(2/10) in IA-5; and*

5) the end-of-message signal.

4.4.2 Message format — International Telegraph Alphabet No. 2 (ITA-2)

All messages, other than those prescribed in 4.4.1.8 and 4.4.9.3, shall comprise the components specified in 4.4.2.1 to 4.4.6.1 inclusive.

Note 1.— An illustration of the ITA-2 message format is given in Figure 4-1.

Note 2.— In the subsequent Standards relative to message format the following symbols have been used in making reference to the functions assigned to certain signals in the International Telegraph Alphabet No. 2 (see Volume III, Part I, 8.2.1 and Table 8-1):

Symbol	*Signification*
<	CARRIAGE RETURN *(signal no. 27)*
≡	LINE FEED *(signal no. 28)*
↓	LETTER SHIFT *(signal no. 29)*
↑	FIGURE SHIFT *(signal no. 30)*
→	SPACE *(signal no. 31)*

4.4.2.1 *Heading*

4.4.2.1.1 The heading shall comprise:

a) start-of-message signal, the characters ZCZC;

b) transmission identification comprising:

1) circuit identification;

2) channel-sequence number.

c) additional service information (if necessary) comprising:

1) one SPACE;

2) no more than ten characters.

d) spacing signal.

4.4.2.1.1.1 The circuit identification shall consist of three letters selected and assigned by the transmitting station; the first letter identifying the transmitting, the second letter the receiving end of the circuit and the third letter to identify the channel; where there is only one channel between the transmitting and receiving stations, channel letter A shall be assigned; where more than one channel between stations is provided, the channels shall be identified as A, B, C, etc. in respective order.

4.4.2.1.1.2 Three-digit channel-sequence numbers from 001 to 000 (representing 1 000) shall be assigned sequentially by telecommunication stations to all messages transmitted directly from one station to another. A separate series of these numbers shall be assigned for each channel and a new series shall be started daily at 0000 hours.

4.4.2.1.1.2.1 **Recommendation.—** *The use of the 4-digit channel-sequence number, to preclude duplication of the same numbers during the 24-hour period, is permitted subject to agreement between the authorities responsible for the operation of the circuit.*

4.4.2.1.1.3 The transmission identification shall be sent over the circuit in the following sequence:

a) SPACE [→];

b) transmitting-terminal letter;

c) receiving-terminal letter;

d) channel-identification letter;

e) FIGURE SHIFT [↑];

f) channel-sequence number (3 digits).

Message part		*Component of the message part*	*Element of the component*	*Teletypewriter signal*
HEADING (*see* 4.4.2.1)		Start-of-Message Signal	—	**ZCZC**
		Transmission Identification	a) One SPACE b) Transmitting-terminal letter c) Receiving-terminal letter d) Channel-Identification letter e) One FIGURE SHIFT f) Channel-sequence number (3 digits) (*Example:* NRA062)	→…↑…
		(If necessary) Additional Service Indication	a) One SPACE b) No more than 10 characters (*Example:* 270930)	
		Spacing Signal	Five SPACES One LETTER SHIFT	→→→→→↓
ADDRESS (*see* 4.4.3)	THE PERMANENT PART OF A MESSAGE	Alignment Function	One CARRIAGE RETURN, one LINE FEED	<≡
		Priority Indicator	The relevant 2-letter group	..
		Addressee Indicator(s)	One SPACE / An 8-letter group — given in sequence for each addressee (*Example:* → **EGLLZRZX**→**EDLLYKYX**→**EGLLACAM**)	
		Alignment Function(s)	One CARRIAGE RETURN, one LINE FEED	<≡
ORIGIN (*see* 4.4.4)		Filing Time	One FIGURE SHIFT The 6-digit date-time group specifying when the message was filed for transmission One LETTER SHIFT	↑ …… ↓
		Originator Indicator	One SPACE The 8-letter group identifying the message originator	→ ……
		Priority Alarm *(used only in teletypewriter operation for Distress Messages)*	One FIGURE SHIFT Five Signal No. 10 of Telegraph Alphabet No. 2 One LETTER SHIFT	↑ Attention ↓ Signal(s)
		Alignment Function	One CARRIAGE RETURN, one LINE FEED	<≡
TEXT (*see* 4.4.5)		Beginning of the Text	Specific identification of Addressee(s) *(if necessary) with* each followed by one CARRIAGE RETURN, one LINE FEED *(if necessary)* The English word FROM *(if necessary)* (*see* 4.4.5.2.3) Specific identification of Originator *(if necessary)* The English word STOP followed by one CARRIAGE RETURN, one LINE FEED *(if necessary)* (*see* 4.4.5.2.3); *and/or* Originator's reference *(if used)*	
		Message Text	Message Text with one CARRIAGE RETURN, one LINE FEED at the end of each printed line of the Text except for the last one (*see* 4.4.5.3)	
		Confirmation *(if necessary)*	a) One CARRIAGE RETURN, one LINE FEED b) The abbreviation CFM followed by the portion of the Text being confirmed	
		Correction *(if necessary)*	a) One CARRIAGE RETURN, one LINE FEED b) The abbreviation COR followed by the correction of an error made in the preceding Text	
		End-of-Text Signal	a) One LETTER SHIFT b) One CARRIAGE RETURN, one LINE FEED	↓<≡
ENDING (*see* 4.4.6)		Page-Feed Sequence	Seven LINE FEEDS	≡≡≡≡≡≡≡
		End-of-Message Signal	Four of the letter case of N (Signal No. 14)	NNNN
		Message-Separation Signal *(used only on message traffic transmitted to a "torn-tape" station)*	Twelve LETTER SHIFTS	↓↓↓↓↓↓↓↓↓↓↓↓
		Tape Feed (*see* 4.4.7)	Additional LETTER SHIFTS will appear at this point in instances where prior arrangements have been made for tape-feed transmissions to be employed on an incoming circuit (*see* 4.4.7).	

Legend: ↑ FIGURE SHIFT *(Signal No. 30)* ≡ LINE FEED *(Signal No. 28)* ↓ LETTER SHIFT *(Signal No. 29)*
→ SPACE *(Signal No. 31)* < CARRIAGE RETURN *(Signal No. 27)*

Figure 4-1. Message format ITA-2

(the above illustrates the teletypewriter message format prescribed in 4.4.2 to 4.4.9.1 inclusive)

4.4.2.1.2 In teletypewriter operation, the spacing signal, consisting of 5 SPACES [→→→→→] followed by 1 LETTER SHIFT [↓], shall be transmitted immediately following the transmission identification prescribed in 4.4.2.1.1.3.

*Note.— The examples appearing below illustrate the application of the transmission identification Standard (*see *4.4.2.1.1 b) and 4.4.2.1.1.3):*

Tape	*Page-copy*
→GLB↑039→→→→→↓	GLB039

(This indicates the 39th message of the day transmitted on Channel B of the circuit from Station G to Station L.)

4.4.2.1.3 Optional service information shall be permitted to be inserted following the transmission identification subject to agreement between the authorities responsible for the operation of the circuit. Such additional service information shall be preceded by a SPACE followed by not more than ten characters and shall not contain any alignment functions.

4.4.2.1.4 **Recommendation.—** *To avoid any misinterpretation of the diversion indicator especially when considering the possibility of a partly mutilated heading, the sequence of two consecutive signals no. 22 (in the letter case or in the figure case) should not appear in any other component of the heading.*

4.4.3 Address

4.4.3.1 The address shall comprise:

a) alignment function [<≡];

b) priority indicator;

c) addressee indicator(s);

d) alignment function [<≡].

4.4.3.1.1 The priority indicator shall consist of the appropriate two-letter group assigned by the originator in accordance with the following:

Message category	*Priority indicator*
distress messages (*see* 4.4.1.1.1)	SS
urgency messages (*see* 4.4.1.1.2)	DD
flight safety messages (*see* 4.4.1.1.3).	FF
meteorological messages (*see* 4.4.1.1.4)	GG
flight regularity messages (*see* 4.4.1.1.5)	GG
aeronautical information services messages (*see* 4.4.1.1.6)	GG
aeronautical administrative messages (*see* 4.4.1.1.7).	KK
service messages (*see* 4.4.1.1.9)	*(as appropriate)*

4.4.3.1.2 An addressee indicator, which shall be immediately preceded by a SPACE, except when it is the first address indicator of the second or third line of address shall comprise:

a) the four-letter location indicator of the place of destination;

b) the three-letter designator identifying the organization/ function (aeronautical authority, service or aircraft operating agency) addressed;

c) an additional letter, which shall represent a department, division or process within the organization/function addressed. The letter X shall be used to complete the address when explicit identification is not required.

Note 1.— The four-letter location indicators are listed in Doc 7910 — Location Indicators.

Note 2.— The three-letter designators are listed in Doc 8585 — Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services.

4.4.3.1.2.1 Where a message is to be addressed to an organization that has not been allocated an ICAO three-letter designator of the type prescribed in 4.4.3.1.2, the location indicator of the place of destination shall be followed by the ICAO three-letter designator YYY (or the ICAO three-letter designator YXY in the case of a military service or organization). The name of the addressee organization shall then be included in the first item of the text of the message. The eighth position letter following the ICAO three-letter designator YYY or YXY shall be the filler letter X.

4.4.3.1.2.2 Where a message is to be addressed to an aircraft in flight and, therefore, requires handling over the AFTN for part of its routing before retransmission over the aeronautical mobile service, the location indicator of the aeronautical station which is to relay the message to the aircraft shall be followed by the ICAO three-letter designator ZZZ. The identification of the aircraft shall then be included in the first item of the text of the message. The eighth position letter following the ICAO three-letter designator ZZZ shall be the filler letter X.

Note.— The following examples illustrate application of the Standards in 4.4.3.1.2.1 and 4.4.3.1.2.2:

1) addressee indicators (possible types):

LGATZTZX	*aerodrome control tower (ZTZ) at LGAT*
LGATYMYF	*section (F) of the Meteorological Office (YMY) at LGAT*
LGATKLMN	*department (N) of the aircraft operating agency KLM (KLM) at LGAT*
LGATYYYX	*the aircraft operating agency whose name appears in the beginning of the message text and whose office location is served by LGAT*
LGATZZZX	*the aeronautical station (LGAT) is required to relay this message in the aeronautical mobile service to the aircraft whose identification appears in the beginning of the message text.*

2) YYY ICAO three-letter designator:

Example of a message addressed to (say) "Penguin Airlines" at NCRG by the PHNL office of the same aircraft operating agency. The Heading and Ending of the message are not shown in this example of teletypewriter page-copy form.

(Address)	*GG NCRGYYYX*
(Origin)	*311521 PHNLYYYX*
(Text)	*AIR PENGUIN FLIGHT 801*
	CANCELLED

3) ZZZ ICAO three-letter designator:

Example of a message addressed to aircraft GABCD via aeronautical station NZAA from Area Control Centre at NZZC. The Heading and Ending of the message are not shown in this example of teletypewriter page-copy form.

(Address)	*FF NZAAZZZX*
(Origin)	*031451 NZZCZQZX*
(Text)	*GABCD CLR DES 5000FT HK NDB*

4.4.3.1.2.3 The complete address shall be restricted to three lines of page-printing copy and, except as provided in 4.4.14, a separate addressee indicator shall be used for each addressee whether at the same or at different locations.

4.4.3.1.2.3.1 Where messages are offered in page-copy form for transmission and contain more addressee indicators than can be accommodated on three lines of a page-copy, such message shall be converted, before transmission, into two or more messages, each of which shall conform with the provisions of 4.4.3.1.2.3. During such conversion, the addressee indicators shall, in so far as practicable, be positioned in the sequence which will ensure that the minimum number of retransmissions will be required at subsequent communication centres.

4.4.3.1.2.3.2 On teletypewriter circuits, the completion of each line of addressee indicator groups in the address of a message shall be immediately followed by the alignment function [<≡].

4.4.4 Origin

The origin shall comprise:

a) filing time;

b) originator indicator;

c) priority alarm (when necessary);

d) optional heading field;

e) alignment function [<≡].

4.4.4.1 The filing time shall comprise the 6-digit date-time group indicating the date and time of filing the message for transmission (*see* 3.4.2); in teletypewriter operation, the filing time shall be followed by one LETTER SHIFT [↓].

4.4.4.2 An originator indicator, which shall be immediately preceded by a SPACE, shall comprise:

a) the four-letter location indicator of the place at which the message is originated;

b) the three-letter designator identifying the organization/function (aeronautical authority, service or aircraft operating agency) which originated the message;

c) an additional letter which shall represent a department, division or process within the organization/function of the originator. The letter X shall be used to complete the address when explicit identification is not required.

4.4.4.2.1 Where a message is originated by an organization that has not been allocated an ICAO three-letter designator of the type prescribed in 4.4.4.2 b), the location indicator of the place at which the message is originated shall be followed immediately by the ICAO three-letter designator YYY followed by the filler letter X (or the ICAO three-letter designator YXY followed by the filler letter X in the case of a military service or organization). The name of the organization (or military service) shall then be included in the first item in the text of the message.

4.4.4.2.2 Where a message originated by an aircraft in flight requires handling on the AFTN for part of its routing before delivery, the originator indicator shall comprise the location indicator of the aeronautical station responsible for transferring the message to the AFTN, followed immediately by the ICAO three-letter designator ZZZ followed by the filler letter X. The identification of the aircraft shall then be included in the first item in the text of the message.

4.4.4.2.3 Messages relayed over the AFTN that have been originated in other networks shall use a valid AFTN originator indicator that has been agreed for use by the relay or gateway function linking the AFTN with the external network.

Note.— The following illustrates the application of 4.4.4.2.2 procedure as it would appear with a message from aircraft KLM153 addressed to the Area Control Centre at CZEG, the message being handled via aeronautical station CYCB. The heading and ending of the message are not shown in this example of teletypewriter page-copy form:

(Address)	*FF CZEGZRZX*
(Origin)	*031821 CYCBZZZX*
(Text)	*KLM153 [remainder of text as received from aircraft]*

4.4.4.3 The priority alarm shall be used only for distress messages. When used, it shall consist of the following, in the order stated:

a) FIGURE SHIFT [↑];

b) FIVE transmissions of signal no. 10 (figure case);

c) LETTER SHIFT [↓].

Note 1.— The figure case of signal no. 10 of the International Telegraph Alphabet No. 2 generally corresponds to the figure case of J of teletypewriter equipment in use on aeronautical fixed service circuits.

Note 2.— Use of the priority alarm will actuate a bell (attention) signal at the receiving teletypewriter station, other than at those fully automatic stations which may provide a similar alarm on receipt of priority indicator SS, thereby alerting supervisory personnel at relay centres and operators at tributary stations, so that immediate attention may be given to the message.

4.4.4.4 The inclusion of optional data in the origin line shall be permitted provided a total of 69 characters is not exceeded and subject to agreement between the authorities concerned.

4.4.4.4.1 **Recommendation.—** *The presence of the optional data field should be indicated by one occurrence of the space character and terminated by the alignment function.*

4.4.4.4.2 **Recommendation.—** *When additional addressing information in a message needs to be exchanged between source and destination addresses, it should be conveyed in the optional data field (ODF), using the following specific format:*

a) characters one and full stop (1.) to indicate the parameter code for the additional address function;

b) three modifier characters, followed by an equal sign [=] and the assigned 8-character ICAO address; and

c) the character hyphen (-) to terminate the additional address parameter field.

4.4.4.4.2.1 **Recommendation.—** *When a separate address for service messages or inquiries is different from the originator indicator, the modifier SVC should be used.*

4.4.4.5 The origin line shall be concluded by an alignment function [<≡].

4.4.5 Text

4.4.5.1 The text of messages shall be drafted in accordance with 4.1.2.

4.4.5.2 When an originator's reference is used, it shall appear at the beginning of the text, except as provided in 4.4.5.2.1 and 4.4.5.2.2.

4.4.5.2.1 When the ICAO three-letter designators YXY, YYY or ZZZ comprise the second element of the addressee indicator (*see* 4.4.3.1.2.1 and 4.4.3.1.2.2) and it, therefore, becomes necessary to identify in the text the specific addressee of the message, such identification group will precede the originator's reference (if used) and become the first item of the text.

4.4.5.2.2 When the ICAO three-letter designators YXY, YYY or ZZZ comprise the second element of the originator indicator (*see* 4.4.4.2.1 and 4.4.4.2.2) and it thus becomes necessary to identify in the text the name of the organization (or military service), or the aircraft, which originated the message, such identification shall be inserted in the first item of the text of the message.

4.4.5.2.3 When applying the provisions of 4.4.5.2.1 and 4.4.5.2.2 to messages where the ICAO three-letter designator(s) YXY, YYY or ZZZ is (are) used to refer to two or more different organizations (or military services), the sequence of further identification in the text shall correspond to the complete sequence used in the address and origin of the message. In such instance, each addressee identification shall be followed immediately by an alignment function. The name of the (YXY, YYY or ZZZ) organization originating the message shall then be preceded with "FROM". "STOP" followed by an alignment function shall then be included in the text at the end of these identifications to precede the remainder of the text wording.

4.4.5.3 An alignment function [<≡] shall be transmitted at the end of each printed line of the text except for the last (*see* 4.4.5.6).

4.4.5.4 When it is desired to confirm a portion of the text of a message in teletypewriter operation, such confirmation shall be separated from the last text group by an alignment function [<≡], and shall be indicated by the abbreviation CFM followed by the portion being confirmed.

4.4.5.5 When it is discovered that an error has been made in the text, the correction shall be separated from the last text group or confirmation, if any, by an alignment function [<≡] in the case of teletypewriter circuits. This shall be followed by the abbreviation COR and the correction.

4.4.5.5.1 Stations shall make all indicated corrections on the page-copy prior to local delivery.

4.4.5.6 At the end of the text the following end-of-text signal shall be transmitted:

1 LETTER SHIFT [↓], alignment function [<≡].

4.4.5.7 The text of the messages entered by the AFTN origin station shall not exceed 1 800 characters in length.

Note 1.— Where it is desired that a communication with a text exceeding 1 800 characters be transmitted over the aeronautical fixed telecommunication network, 4.4.5.7 requires that such a communication be entered by the AFTN origin station in the form of separate messages, each text of which does not exceed 1 800 characters. Guidance material for forming separate messages from a single long message is given in Attachment B to Volume II.

Note 2.— The character count includes all printing and non-printing characters in the message from, but not including, the alignment function preceding the beginning of the text to, but not including, the end-of-text signal.

4.4.6 Ending

4.4.6.1 The ending shall comprise:

a) the page-feed sequence consisting of 7 LINE FEEDS [≡≡≡≡≡≡≡];

   Note.— This, together with the 1 LINE FEED of the preceding alignment function, will provide sufficient separation between messages when appearing in page-copy form.

b) the end-of-message signal, consisting of the letter N (letter case of signal no. 14), appearing FOUR times in undivided sequence.

   Note.— This component, transmitted intact from the moment of the first transmission of the message until ultimate delivery, is required so that connections set up for cross-office transmission, at a semi-automatic or fully automatic relay installation, can be cleared for following message traffic.

And in addition, on message traffic transmitted to “torn-tape” relay stations only:

c) the message-separation signal, consisting of a LETTER SHIFT [↓] transmitted 12 times in uninterrupted sequence.

Note 1.— Nothing but letter shifts are to be transmitted in message traffic between the end-of-message signal of one message and the start-of-message signal of the next.

Note 2.— The following illustrates the procedures specified in 4.4.2 to 4.4.6.1 inclusive for a message in page-copy form:

(Heading)	**ZCZC LPA183*
(Address)	*GG LGGGZRZX LGATKLMW*
(Origin)	*201838 EGLLKLMW*
(Text)	*As required*
(Ending)	*(Page feed)*
	*NNNN***

**Note 2A.— If this message had been one of a series and there had been no manual paper-feed action between messages by the operator attending the receiving page teletypewriter, the “NNNN” of the preceding message would have appeared here.*

***Note 2B.— In the circumstances described in Note 2A, the heading of the next message received would be printed on page-copy at this position.*

Note 2C.— In actual station practice, messages would be separated on page-copy by tearing through the page-feed sequence. The end-of-message signal would then appear to have become a component part of the next message. This apparent misplacement is, however, unlikely to give rise to any misunderstanding on the part of communicators or addressees since, in practice, the end-of-message signal has no significance on page-copy.

4.4.6.2 AFTN messages entered by the AFTN origin station shall not exceed 2 100 characters in length.

Note.— The character count includes all printing and non-printing characters in the message from and including the start-of-message signal (ZCZC) to and including the end-of-message signal (NNNN).

4.4.7 Tape feed

4.4.7.1 **Recommendation.—** *In “torn-tape” installations, and in “semi-automatic” installations using continuous tape technique, when signals additional to those prescribed in 4.4.6.1 are required to ensure that the tape is* *adequately advanced from the reperforator at the receiving stations, when the ending of one message is not followed immediately by the start-of-message signal of another message, local arrangements should be made at the receiving station to avoid the need for transmission of these signals by the transmitting station.*

Note.— In "torn-tape" stations, a facility is normally necessary whereby the tape can be fed from the receiving reperforator to an extent that permits the receiving operator to tear through the message-separation signal at the correct point, on occasions when the operator is ready to tear the tape but there has been no following message to cause this tape-feed to take place. In semi-automatic stations using continuous-tape techniques, a similar process may be necessary in similar circumstances to advance the tape to an extent that permits the end-of-message signal to reach the transmitter.

4.4.7.1.1 When the provisions of 4.4.7.1 cannot be applied, arrangements shall be made with the transmitting station for the latter to send, at the end of a single message, or following the last message of a series, an agreed number of LETTER SHIFTS [↓] in addition to the components prescribed in 4.4.6.

4.4.8 Stripped address

When applying the provisions of 4.4.3 or 4.4.15.2.1, an AFTN communication centre shall omit from the address all the addressee indicators not required for:

a) onward transmission by the AFTN communication centre to which the message is transmitted;

b) local delivery to the addressee(s) by the AFTN destination station;

c) onward transmission or local delivery by the aggregate of stations on a multi-point circuit.

4.4.9 Teletypewriter operating procedure — general

4.4.9.1 *End-of-line functions*

4.4.9.1.1 A single line of page-copy shall not contain more than a total of 69 characters and/or spaces.

4.4.9.1.2 One CARRIAGE RETURN [<] and one LINE FEED IMPULSES [≡] shall be transmitted between each printed page-line of the text of a message.

4.4.9.2 *Duration of transmissions.* For simplex circuits, the transmission of a series of messages in a single transmission shall not continue for longer than approximately five minutes. Action shall be taken to deliver or relay each message correctly received without waiting for the end of the series.

4.4.9.3 *Channel-check transmissions.* Except as provided in 4.4.9.3.3 and 4.4.9.3.5 the following periodic transmissions shall be sent on teletypewriter circuits:

1) heading (*see* 4.4.2.1.1);

2) alignment function [<≡];

3) the procedure signal CH;

4) alignment function [<≡];

5) end-of-message signal [NNNN];

6) message-separation signal [↓↓↓↓↓↓↓↓↓↓↓↓] (if required).

The receiving station shall then check the transmission identification of this incoming transmission to ensure its correct sequence in respect of all messages received over that incoming channel.

Note.— Application of this procedure provides some measure of assurance that channel continuity is maintained.

4.4.9.3.1 **Recommendation.—** *Where a circuit is unoccupied, the transmission specified in 4.4.9.3 should be sent at H + 00, H + 20, H + 40.*

4.4.9.3.2 If a periodic channel check transmission is not received within a tolerance agreed for that channel, a station shall send a service message to the station from which the transmission was expected. The text of this service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal MIS;

3) the procedure signal CH;

4) (optionally) the time at which the transmission was expected;

5) the procedure signal LR;

6) the transmission identification of the last message received;

7) the end-of-text signal.

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→MIS→CH→[↑1220↓→]LR→ABC↑123↓<≡

4.4.9.3.3 When a teletypewriter channel is equipped with a system of controlled circuit protocol, and following agreement between the Administrations responsible, the transmission specified in 4.4.9.3 shall not be made.

4.4.9.3.4 *Channel-check transmissions and station radio identifications.* In order to satisfy the requirements of ITU regarding periodic transmission of the station radio identification, those AFTN stations using radioteletypewriter channels may combine the station radio identification transmission with the channel-check transmission specified in 4.4.9.3. In this case the combined transmission shall be sent as follows:

1) heading (*see* 4.4.2.1.1);

2) alignment function [<≡];

3) the procedure signal CH;

4) alignment function [<≡];

5) the procedure signal DE followed by one SPACE [→] and the assigned ITU radio call sign;

6) alignment function [<≡];

7) end-of-message signal [NNNN];

8) message-separation signal [↓↓↓↓↓↓↓↓↓↓↓↓] (if required).

Note.— Application of this format will permit this special transmission to be handled by fully automatic switching centres without the intervention of supervisory personnel.

4.4.9.3.4.1 **Recommendation.—** *When multichannel radioteletypewriter circuits are used (e.g. MET and AFTN) the station radio call sign transmission should be sent on only one channel of the circuit. The channel chosen should be the one which is the most convenient for this purpose with the identification transmission being sent in conformance with the format used on that channel. When an AFTN channel is chosen the identification transmission should be combined with the channel-check transmission.*

4.4.9.3.5 When a teletypewriter circuit is associated with Automatic Error Correction (ARQ) equipment, and following agreement between the Administrations responsible, the transmissions specified in 4.4.9.3 need not be made: however stations employing radioteletypewriter channels on the AFTN for which the station radio identification is required, shall comply with the provisions of 4.4.9.3.4.

Note.— The foregoing is not to be interpreted as implying any ICAO requirement necessitating the installation of Automatic Error Correction (ARQ) equipment on international aeronautical fixed circuits.

4.4.10 Normal teletypewriter transmission procedures

4.4.10.1 Messages shall be transmitted in accordance with predetermined responsibility for onward relay as agreed between the Administrations responsible for the operation of directly connected stations (*see also* 4.4.1.3 and 4.4.1.5.2.3).

4.4.10.1.1 Arising from the responsibility agreements established under the provisions of 4.4.10.1, each station of the AFTN shall employ and, subject to the provisions of 4.4.10.1.1.1, adhere to a Routing Directory which consists of the Routing List.

4.4.10.1.1.1 When an incoming message contains only identical location indicators in the lines-following-the-heading the receiving station shall accept responsibility for further relay. If possible such relay shall be effected on the normal outgoing circuit to the place of destination of the message; if it is not possible to use the normal circuit, an appropriate alternative outgoing circuit shall be used. When neither of these facilities is in operation, the message shall not be retransmitted over the circuit from which it was received, without prior service message (*see* 4.4.1.1.9) notification of this action being given to the station that had made the previous transmission.

4.4.10.1.1.2 **Recommendation.—** *An AFTN message originator not capable of handling service messages should agree with the AFTN centre it is connected to on a method of exchanging service messages.*

Note.— A method of specifying service address in the optional data field is shown in 4.4.4.4.2 and 4.4.4.4.2.1.

4.4.10.1.2 *Form of transmission — teletypewriter operation.* All transmissions shall comprise in the following order (*see* Figure 4-2).

4.4.10.1.2.1 *Starting pulse.* When the receiving station uses equipment fitted with a time-switch to stop the teletypewriter machine motor when the channel is idle, a 20-30 millisecond SPACING IMPULSE shall be transmitted when the channel has been at rest for 30 seconds or more and at least 1.5 seconds shall be permitted to elapse before the transmission of the heading.

Note 1.— This is equivalent to the transmission of a LETTER SHIFT [↓], *followed by a pause (i.e. a continuous MARKING IMPULSE) of at least 1.37 seconds.*

Note 2.— Application of this procedure will allow the receiving equipment to reach synchronization before transmission of the heading is commenced.

4.4.10.1.3 *Message format.* All messages shall be prepared in accordance with the provisions of 4.4.2 (ITA-2 format) or 4.4.15 (IA-5 format).

STARTING PULSE *(if necessary)*		HEADING	ADDRESS	ORIGIN	TEXT	ENDING

Figure 4-2. Form of transmission — teletypewriter operation (*see* 4.4.10.1.2)

4.4.10.1.3.1 **Recommendation.—** *The Heading Line, with the exception of the SOH character, should be omitted on circuits employing one of the data link control procedures contained in 8.6.3 and 8.6.4 of Annex 10, Volume III.*

4.4.10.1.4 *Reprocessing procedures*

4.4.10.1.4.1 A message requiring retransmission shall have its previous heading deleted by the station which received such message for relay. The retransmission shall commence with the new heading using the transmission identification for the outgoing channel.

4.4.10.1.4.1.1 When applying the provisions of 4.4.10.1.4.1, transmission of the address part of the message shall commence at some point during the 5 SPACES, 1 LETTER SHIFT [→→→→→↓] immediately preceding the first alignment function [<≡].

4.4.10.1.4.1.2 At tributary and "torn-tape" relay stations not equipped with automatic numbering machine devices and hence where it is necessary for a small number of additional teletypewriter characters to be perforated on a tape before the start-of-message signal to preclude risk of mutilation of the latter signal during retransmission, such additional characters, as required, shall consist of LETTER SHIFTS [↓]. Subsequent transmission on the outgoing channel shall then commence at a point as close as practicable to the start-of-message signal.

4.4.10.1.4.1.3 At stations where the heading of a message is originated by automatic equipment at the point of and time of transmission on the outgoing channel, but where preparation of the other parts of a message is by the perforation of a tape and where, therefore, it is necessary for a small number of additional teletypewriter characters to be perforated before the alignment function [<≡] at the commencement of the address so as to preclude risk of mutilation of this alignment function, such additional characters, as required, shall consist of LETTER SHIFTS [↓] or SPACES [→]. Subsequent transmission on the outgoing channel shall then commence at a point as close as practicable to the first alignment function [<≡] of the message.

4.4.10.1.4.2 At a "torn-tape" station the incoming tapes shall be torn at a position in the message-separation signal component (*see* 4.4.6.1 and 4.4.7.1) so that the preceding end-of-message signal remains intact.

4.4.10.1.4.2.1 Following application of the provisions of 4.4.10.1.4.2 the shortened (i.e. less than 12 LETTER SHIFTS [↓]) message-separation signal remaining on the message tape shall be deleted, if necessary by electronic methods, before retransmission to an automatic relay installation. If the retransmission is to another "torn-tape" station then:

1) the shortened message-separation signal shall be reformed to a complete [↓↓↓↓↓↓↓↓↓↓↓↓] signal by transmission of the necessary number of additional LETTER SHIFTS [↓]; or

2) the shortened message-separation signal remaining on the tape shall be removed and a new and complete message-separation signal shall be added to the message in the process of retransmission in accordance with the provisions of 4.4.6.1 c).

4.4.10.1.5 When possible in "torn-tape" or semi-automatic installations, a correct tape shall be obtained prior to onward relay; when tape is illegible or mutilated the station shall not relay the message unless good judgement indicates that this is not likely to result in malfunctioning of equipment at subsequent relay stations.

4.4.10.1.6 *Acknowledgement of receipt of messages.* In teletypewriter operation and except as provided in 4.4.10.1.6.1, a receiving station shall not transmit acknowledgement of receipt of incoming messages. In lieu thereof the provisions of 4.4.1.4.1 shall be applied.

4.4.10.1.6.1 The receipt of distress messages (priority SS — *see* 4.4.1.1.1) shall be individually acknowledged by the AFTN destination station sending a service message (*see* 4.4.1.1.9) to the AFTN origin station. Such acknowledgement of receipt shall take the format of a complete message addressed to the AFTN origin station, shall be assigned priority indicator SS and the associated priority alarm (*see* 4.4.4.3) and shall have a text comprising:

1) the procedure signal R;

2) the origin (*see* 4.4.4), without priority alarm, or optional heading information of the message being acknowledged;

3) the end-of-text signal [↓<≡].

Note.— The following example illustrates the application of 4.4.10.1.6.1 procedure:

Heading (see *4.4.2.1.1)*
<≡SS→LECBZRZX<≡
↑121322↓→ EGLLYFYX (Priority Alarm) <≡
R→↑121319↓→LECBZRZX↓<≡
Ending (see *4.4.6)*

4.4.10.1.7 In cases where an addressee of a multi-address message requests a repetition of the message from the origin station, the origin station shall address the repeat of the message only to the addressee requesting the repeat. Under these conditions the procedure signal DUPE shall not be included.

4.4.11 Action on mutilated or improperly formatted messages detected in teletypewriter relay stations

4.4.11.1 If, before retransmission is commenced, a relay station detects that a message has been mutilated or improperly formatted at some point ahead of the end-of-message signal, and it has reason to believe that this mutilation had occurred before the message had been received by the previous station, it shall send a service message (*see* 4.4.1.1.9) to the originator as identified by the originator indicator in the origin of the mutilated or improperly formatted message, requesting repetition of the incorrectly received message.

Note 1.— The following example illustrates a typical text of a service message in which the foregoing procedure has been applied in respect of a mutilated message having as its origin "141335 CYULACAX":

SVC→QTA→RPT→↑141335↓→CYULACAX↓<≡

Note 2.— This circumstance of detection of a mutilation may only be possible at "torn-tape" relay stations.

4.4.11.2 When the provisions of 4.4.11.1 are applied, the originator as identified by the originator indicator in the origin of the mutilated message shall reassume responsibility for the mutilated message, and shall comply with the provisions of 4.4.11.3.

4.4.11.3 Following application of the provisions of 4.4.11.2, the following reprocessing shall be accomplished before the unmutilated version of the message is transmitted for the second time towards the same addressee or addressees:

1) *insert* a new heading;

2) *remove* the ending of the message (*see* 4.4.6.1);

3) *insert* in lieu thereof the procedure signal DUPE, preceded by at least 1 LETTER SHIFT [↓] and followed by 1 CARRIAGE RETURN, 8 LINE FEEDS, end-of-message signal and, if necessary (*see* 4.4.6 and 4.4.7), the LETTER SHIFTS [↓] of the message-separation signal and tape feed.

Note.— The example appearing in Figure 4-3 illustrates the application of this procedure.

4.4.11.4 If, before retransmission is commenced, a relay station detects that one or more messages have been mutilated at some point ahead of the end-of-message signal, and it has reason to believe that this mutilation had occurred during or subsequent to its transmission from the previous station, it shall send a service message (*see* 4.4.1.1.9) to the previous station rejecting the mutilated transmission and requesting a repetition of the incorrectly received message (or messages).

Note 1.— The following examples illustrate application of the above-mentioned procedure. In example 2) the hyphen (-) separator is understood to mean "through" in plain language.

1) *in respect of a single mutilated message:*

SVC→QTA→RPT→ABC↑123↓<≡

2) *in respect of several mutilated messages:*

SVC→QTA→RPT→ABC↑123-126↓<≡

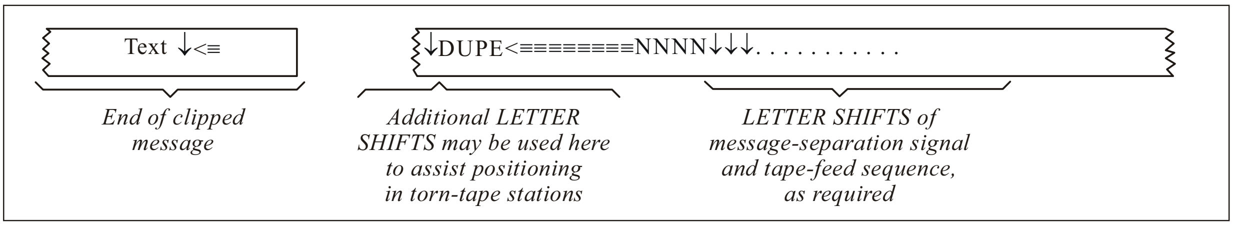

Figure 4-3. Example of application of 4.4.11.3 procedure

Note 2.— This circumstance of detection of a mutilation may only be possible at “torn-tape” relay stations.

4.4.11.5 When the provisions of 4.4.11.4 are applied, the station receiving the service message shall reassume responsibility for the referenced message. It shall then retransmit the unmutilated copy of the referenced message with a new (i.e. correct in sequence) transmission identification (*see* 4.4.2.1.1 b)). If that station is not in possession of an unmutilated copy of the original message, it shall take the action prescribed in 4.4.11.1.

4.4.11.6 If, before retransmission is commenced, a relay station detects that a received message has a recognizable but mutilated end-of-message signal, it shall, where necessary, repair this mutilation before retransmission.

Note.— This circumstance of detection of a mutilation may only be possible at “torn-tape” relay stations and the action prescribed will be essential where messages are being transmitted to a semi-automatic or fully automatic station.

4.4.11.7 If, during retransmission of a message, a relay station detects that the message has been mutilated at some point ahead of the end-of-message signal and is able to take action before a correct end-of-message signal has been transmitted, it shall:

1) cancel the transmission by inserting into the channel the sequence ↓<≡QTA→QTA↓<≡ followed by a complete ending (*see* 4.4.6);

2) reassume responsibility for the message;

3) comply with the provisions of 4.4.11.1 or 4.4.11.4 as appropriate.

Note.— This circumstance of detection of a mutilation may only be possible at “torn-tape” relay stations or at semi-automatic stations using continuous-tape.

4.4.11.8 If, after a message has been transmitted *in toto*, a station detects that the text or the origin of the message was mutilated or incomplete, it shall transmit to all addressees concerned a service message with the following text, if an unmutilated copy of the message is available in the station:

SVC CORRECTION *(the origin of the incorrect message) STOP (followed by the correct text).*

Note.— This circumstance of detection of a mutilation or incomplete message may only be possible at “torn-tape” relay stations or at semi-automatic stations using continuous-tape.

4.4.11.9 If, after transmission of the text of a message, a relay station detects that the message has an obviously mutilated end-of-message signal, it shall insert a proper end-of-message signal into the channel.

Note.— This circumstance of detection of a mutilation may only be possible at “torn-tape” relay stations or at semi-automatic stations using continuous-tape.

4.4.11.10 If, after transmission of the text material of a message, a relay station can detect that there is no complete end-of-message signal, but has no practicable means of discovering whether the irregularity has affected only the end-of-message signal or whether it may have also caused part of the original text to have been lost, it shall insert into the channel the following:

1) ↓<≡CHECK≡TEXT≡
NEW→ENDING→ADDED→

2) its own station identification;

3) ↓<≡

4) a proper ending as prescribed in 4.4.6.1.

Note 1.— On tape copy, this insertion will appear as follows:

↓<≡CHECK≡TEXT≡
NEW→ENDING→ADDED→LOWWYFYX↓<≡
≡≡≡≡≡≡≡NNNN↓↓↓ . . .

Note 2.— On page copy, this insertion will appear as follows:

CHECK
        TEXT
                NEW ENDING ADDED LOWWYFYX
NNNN

Note 3.— The staggered presentation on copy is prescribed to ensure that the attention of the addressee is drawn immediately to the insertion.

Note 4.— The FIGURE SHIFT [↑] *is included to ensure proper functioning where First Line Monitoring Equipment is used, where the presence of the FIGURE SHIFT in the origin is used to cause disconnection of this equipment and where the missing part of the message includes this FIGURE SHIFT.*

Note 5.— This circumstance of detection of a mutilation may only be relevant to fully automatic stations or stations using semi-automatic methods without continuous-tape.

4.4.11.11 **Recommendation.—** *Relay stations applying the procedural provisions of 4.4.11.9 or 4.4.11.10 should, if practicable, ensure that the appropriate material therein prescribed is inserted prior to the transmission of a complete start-of-message signal associated with any following message.*

4.4.11.12 If a relay station detects that a message was received with a completely mutilated address line, it shall send a service message to the previous station rejecting the mutilated transmission.

4.4.11.12.1 The text of this service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal QTA;

3) the procedure signal ADS;

4) the transmission identification of the message rejected;

5) the indication CORRUPT;

6) the end-of-text signal.

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→QTA→ADS→ABC↑123↓→CORRUPT↓<≡

4.4.11.12.2 The station receiving such a service message shall reassume responsibility for the referenced message, and shall retransmit the message with a corrected address line, and a new transmission identification.

4.4.11.13 If a relay station detects a received message with an invalid (i.e. length other than 8 letters) or unknown addressee indicator, it shall relay the message to those valid addresses for which it has relay responsibility using the stripped address procedure (*see* 4.4.8).

4.4.11.13.1 In addition, except as in 4.4.11.13.3, the station shall send a service message to the previous station requesting correction of the error. The text of this service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal ADS;

3) the transmission identification of the message in error;

4) an alignment function;

5) the first address line of the message as received;

6) an alignment function;

7) either:

   a) for an invalid addressee indicator: the indication CHECK;

   b) for an unknown addressee indicator: the indication UNKNOWN;

8) the invalid or unknown addressee indicator(s);

9) the end-of-text signal.

Note.— The following examples illustrate the application of the procedure of 4.4.11.13.1:

a) for an invalid addressee indicator:

SVC→ADS→ABC↑123↓<≡
GG→EGLLACAX→EGPKYTYX→CYAAYFYX→
CYQXAFX<≡CHECK→CYQXAFX↓<≡

b) for an unknown addressee indicator:

SVC→ADS→ABC↑123↓<≡
GG→EGLLACAX→EGEHYTYX→CYAAYFYX→
CYQXACAX<≡UNKNOWN→EGEHYTYX↓<≡

4.4.11.13.2 A station receiving a service message as prescribed in 4.4.11.13.1 shall, if a correct addressee indicator is available, repeat the message to that addressee only using the stripped address procedure (*see* 4.4.8) or, if a correct addressee indicator is not available, act as prescribed in 4.4.11.13.1.

4.4.11.13.3 Where the procedure of 4.4.11.13 is applied in the case of an unknown addressee indicator, and if the origin of the message is without fault, the station shall send a service message to the originator. The text of this service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal ADS;

3) the origin of the message in error;

4) an alignment function;

5) the first address line of the message as received;

6) an alignment function;

7) the indication UNKNOWN;

8) the unknown addressee indicator(s);

9) the end-of-text signal.

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→ADS→↑141335↓→CYULACAX<≡
GG→EGLLACAX→EGEHYTYX→CYAAYFYX→
CYQXACAX<≡UNKNOWN→EGEHYTYX↓<≡

4.4.11.13.4 A station receiving such a service message shall obtain a correct addressee indicator and shall repeat the message to the addressee using the stripped address procedure (*see* 4.4.8).

4.4.11.14 When the first relay station detects that a message was received with a mutilated origin line or without any origin, it shall:

a) stop processing the message;

b) send a service message to the station from which the message was received.

4.4.11.14.1 The text of this service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal QTA;

3) the procedure signal OGN;

4) the transmission identification of the message rejected;

5) the indication CORRUPT;

6) the end-of-text signal.

Note.— The following example illustrates application of the above-mentioned procedure:

SVC→QTA→OGN→ABC↑123↓→CORRUPT↓<≡

4.4.11.14.2 The station receiving a service message as prescribed in 4.4.11.14.1 shall reassume responsibility for the referenced message and shall retransmit the message with a correct origin line and a new transmission identification.

Note.— When applying the provisions of 4.4.11.14, the minimum requirements for processing the origin of AFTN messages are:

1) the date-time group consisting of six numeric characters;

2) the originator indicator consisting of eight alpha characters.

4.4.11.15 When the first relay station detects that a message was received with an incorrect originator indicator, it shall:

a) stop processing the message; and

b) send a service message to the station from which the message was received.

4.4.11.15.1 The text of the service message shall comprise:

1) the abbreviation SVC;

2) the procedure signal QTA;

3) the procedure signal OGN;

4) the transmission identification of the message rejected;

5) the indicator INCORRECT; and

6) the end-of-text signal.

Note.— The following ITA-2 example illustrates application of the above-mentioned procedure:

SVC→QTA→OGN→ABC↑123↓→INCORRECT↓<≡

4.4.11.15.2 The station receiving a service message as prescribed in 4.4.11.15.1 shall resume responsibility for the referenced message and shall retransmit the message with a correct originator indicator and, if applicable, a new transmission identification.

Note.— When applying the provisions of 4.4.11.15 the relay centre requirement is as a minimum the first character of the originator indicator verified as the first character of the location indicator of the place at which the message is originated.

4.4.12 Correction of errors during tape preparation

4.4.12.1 Messages for which tapes are prepared at the origin station shall not be allowed to flow into the AFTN with known uncorrected errors.

4.4.12.2 Errors made ahead of the text of a message shall be corrected by discarding the incorrect tape and preparing a new one.

4.4.12.3 Where possible, errors made in the text of a message shall be corrected by back-spacing the tape and eliminating the error by operation of the LETTERS [↓] key over the undesired portion.

4.4.12.4 Where the action of 4.4.12.3 is not possible, correction to the text shall be made immediately after the error by making the error sign (→E→E→E→), transmitting the last correct word or group and then continuing with the tape preparation.

4.4.12.5 Where neither the action of 4.4.12.3 nor the action of 4.4.12.4 is possible because the error in the text is not noticed until later in the preparation process (but before the end-of-message signal has been added) the station shall comply with the provisions of 4.4.5.5.

4.4.12.6 The ending must be typed without error.

4.4.13 Correction of errors during message origination in cases where the message is flowing into the AFTN during preparation

4.4.13.1 Messages flowing into the AFTN during preparation shall not be terminated with an end-of-message signal if they contain known uncorrected errors.

4.4.13.2 Where an error is made, in this circumstance, in any part of the message which precedes the text, the unfinished message shall be cancelled by sending the sequence ↓<≡QTA→QTA↓<≡ followed by a complete ending (*see* 4.4.6).

4.4.13.3 Errors made in the text and noticed immediately shall be corrected by making the error sign (→E→E→E→), transmitting the last correct word or group and then continuing with the message.

4.4.13.4 In cases where errors are made in the text and not noticed until later in the origination process, the station shall comply with the provisions of 4.4.5.5.

4.4.13.5 In cases where it becomes obvious, during the origination of the text, that the message should be cancelled, the station shall take the action described in 4.4.13.2.

4.4.14 Predetermined distribution system for AFTN messages

4.4.14.1 When it has been agreed between the Administrations concerned to make use of a predetermined distribution system for AFTN messages, the system described below shall be used.

4.4.14.2 The Predetermined Distribution Addressee Indicator (PDAI) shall be constructed as follows:

a) The first and second letters:

The first two letters of the Location Indicator of the communications centre of the State which has agreed to implement the system and which receives messages over a circuit for which it has a predetermined routing responsibility;

b) The third and fourth letters:

The letters ZZ, indicating a requirement for special distribution;

c) The fifth, sixth and seventh letters:

1) The fifth, sixth and seventh letters taken from the series A to Z and denoting the national and/or international distribution list(s) to be used by the receiving AFTN centre;

2) "N" and "S", as the fifth letter, are reserved for NOTAM and SNOWTAM respectively (*see* Appendix 5 to Annex 15);

d) The eighth letter:

Either the filler letter "X" or a letter taken from the series A to Z to further define the national and/or international distribution list(s) to be used by the receiving AFTN centre.

Note 1.— To avoid conflict with the AFTN start-of-message signal, combinations with ZC or CZ will not be used.

Note 2.— To avoid conflict with the AFTN end-of-message signal, combinations with NN will not be used.

4.4.14.3 **PANS.—** *Predetermined Distribution Addressee Indicators (PDAIs) should be used whenever possible on AFTN messages between States which have agreed to make use of the predetermined distribution system.*

4.4.14.4 AFTN messages carrying Predetermined Distribution Addressee Indicators allocated by the State receiving the message shall be routed to the addressees listed on the associated list of Addressee Indicators described in 4.4.14.5.

4.4.14.5 States shall send their list of selected Predetermined Distribution Addressee Indicators together with the associated lists of Addressee Indicators to:

a) the States from which they will receive AFTN messages for predetermined distribution, to assure correct routing; and

b) the States which will originate AFTN messages for predetermined distribution to facilitate the treatment of requests for retransmission and to assist originators in using the Predetermined Distribution Addressee Indicators correctly.

4.4.14.5.1 The list of Addressee Indicators associated with a Predetermined Distribution Addressee Indicator shall include either:

a) Addressee Indicators for national distribution; or

b) Addressee Indicators for international distribution; or

c) Predetermined Distribution Addressee Indicators for international distribution; or

d) any combination of a), b) and c).

4.4.15 Message format — International Alphabet No. 5 (IA-5)

When it has been agreed between the Administrations concerned to use International Alphabet No. 5 (IA-5) the format described in 4.4.15 through 4.4.15.3 shall be used. It shall be the responsibility of Administrations using IA-5 to accommodate adjacent AFTN stations employing ITA-2 code in the format described in 4.4.2.

All messages, other than those prescribed in 4.4.1.8 and 4.4.9.3 shall comprise the components specified in 4.4.15.1 to 4.4.15.6 inclusive.

Note 1.— An illustration of the IA-5 message format is given in Figure 4-4.

*Note 2.— In the subsequent standards relative to message format the following symbols have been used in making reference to the functions assigned to certain signals in IA-5. (*See *Volume III, Part I, 8.6.1 and Tables 8-2 and 8-3.)*

Symbol	*Signification*
<	CARRIAGE RETURN (character position 0/13)
≡	LINE FEED (character position 0/10)
→	SPACE (character position 2/0).

4.4.15.1 *Heading*

4.4.15.1.1 The heading shall comprise:

a) start-of-heading (SOH) character 0/1;

b) transmission identification comprising:

1) circuit or link identification;

2) channel-sequence number;

c) additional service information (if necessary) comprising:

1) one SPACE;

2) no more than 10 characters.

4.4.15.1.1.1 On point-to-point circuits or links, the identification shall consist of three letters selected and assigned by the transmitting station; the first letter identifying the transmitting, the second letter the receiving end of the circuit, and the third letter the channel. Where only one channel exists, the letter A shall be assigned. Where more than one channel between stations is provided, the channels shall be identified as A, B, C, etc., in respective order. On multipoint channels, the identification shall consist of three letters selected and assigned by the circuit control or master station.

4.4.15.1.1.2 Except as provided in 4.4.15.1.1.3 three-digit channel-sequence numbers from 001 to 000 (representing 1 000) shall be assigned sequentially by telecommunication stations to all messages transmitted directly from one station to another. A separate series of these numbers shall be assigned for each channel and a new series shall be started daily at 0000 hours.

4.4.15.1.1.3 **Recommendation.—** *The expansion of the channel-sequence number to preclude duplication of the same numbers during the 24-hour period should be permitted subject to agreement between the Authorities responsible for the operation of the circuit.*

4.4.15.1.1.4 The transmission identification shall be sent over the circuit in the following sequence:

a) transmitting-terminal letter;

b) receiving-terminal letter;

c) channel-identification letter;

d) channel-sequence number.

4.4.15.1.1.5 Additional service information shall be permitted to be inserted following the transmission identification subject to agreement between the Authorities responsible for the operation of the circuit. Such additional service information shall be preceded by a SPACE (→) followed by not more than 10 characters inserted into the heading of message immediately following the last digit of the channel-sequence number and shall not contain any alignment functions. When no such additional service information is added the information in 4.4.15.1.1.4 shall be followed immediately by that of 4.4.15.2.

4.4.15.2 *Address*

4.4.15.2.1 The address shall comprise:

a) alignment function [<≡];

b) priority indicator;

c) addressee indicator(s);

d) alignment function [<≡].

4.4.15.2.1.1 The priority indicator shall consist of the appropriate two-letter group assigned by the originator in accordance with the following:

Message part		*Component of the message part*	*Elements of the component*	*Teletypewriter character*
THE HEADING	HEADING LINE (*see* 4.4.15.1.1)	Start-of-Heading Character	One Character (0/1)	SOH
		Transmission Identification	a) Transmitting-terminal letter b) Receiving-terminal letter c) Channel-identification letter d) Channel-sequence number (*Example:* NRA062)	......
		(If necessary) Additional Service Indication	a) One SPACE b) No more than the remainder of the line (*Example:* 270930)	→
	ADDRESS (*see* 4.4.15.2.1)	Alignment Function	One CARRIAGE RETURN, one LINE FEED	<≡
		Priority Indicator	The relevant 2-letter group	··
		Addressee Indicator(s)	One SPACE / An 8-letter group — given in sequence for each addressee (*Example:*→**EGLLZRZX**→**EGLLYKYX**→**EGLLACAD**)	
		Alignment Function(s)	One CARRIAGE RETURN, one LINE FEED	<≡
	ORIGIN (*see* 4.4.15.2.2)	Filing Time	6-digit date-time group specifying when the message was filed for transmission	......
		Originator Indicator	a) One SPACE b) 8-letter group identifying the message originator	→......
		Priority Alarm (used only in teletypewriter operation for Distress Messages)	Five characters (0/7)(BEL)	
		Optional Heading Information	Additional data not to exceed the remainder of the line. *See* 4.4.15.2.2.6.	
		Alignment Function	One CARRIAGE RETURN, one LINE FEED	<≡
		Start-of-Text Character	One character (0/2)	STX
TEXT (*see* 4.4.15.3)		Beginning of the Text	Specific identification of Addressee(s) *(if necessary)* *with* each followed by one CARRIAGE RETURN, one LINE FEED *(if necessary)* The English word FROM *(if necessary)* (*see* 4.4.15.3.5) Specific identification of Originator *(if necessary)* The English word STOP followed by one CARRIAGE RETURN, one LINE FEED *(if necessary)* (*see* 4.4.15.3.5) *and/or* Originator's reference *(if used)*	
		Message Text	Message Text with one CARRIAGE RETURN, one LINE FEED at the end of each printed line of the Text except for the last one (*see* 4.4.15.3.6)	
		Confirmation *(if necessary)*	a) One CARRIAGE RETURN, one LINE FEED b) The abbreviation CFM followed by the portion of the Text being confirmed	
		Correction *(if necessary)*	a) One CARRIAGE RETURN, one LINE FEED b) The abbreviation COR followed by the correction of an error made in the preceding Text	
ENDING (*see* 4.4.15.3.12.1)		Alignment Function	One CARRIAGE RETURN, one LINE FEED	<≡
		Page-feed Sequence	One character (0/11)	VT
		End-of-Text character	One character (0/3)	ETX

Figure 4-4. Message format International Alphabet No. 5 (IA-5)
(the above illustrates the teletypewriter message format described in 4.4.15)

Priority indicator	*Message category*
SS	distress messages
DD	urgency messages (*see* 4.4.1.1.2)
FF	flight safety messages (*see* 4.4.1.1.3)
GG	meteorological messages (*see* 4.4.1.1.4)
GG	flight regularity messages (*see* 4.4.1.1.5)
GG	aeronautical information services messages (*see* 4.4.1.1.6)
KK	aeronautical administrative messages (*see* 4.4.1.1.7)
as appropriate	service messages (*see* 4.4.1.1.9)

4.4.15.2.1.2 The order of priority shall be the same as specified in 4.4.1.2.

4.4.15.2.1.3 An addressee indicator, which shall be immediately preceded by a SPACE, except when it is the first address indicator of the second or third line of addresses, shall comprise:

a) the four-letter location indicator of the place of destination;

b) the three-letter designator identifying the organization/function (aeronautical authority, service or aircraft operating agency) addressed;

c) an additional letter, which shall represent a department, division or process within the organization/function addressed. The letter X shall be used to complete the address when explicit identification is not required.

4.4.15.2.1.3.1 Where a message is to be addressed to an organization that has not been allocated an ICAO three-letter designator of the type prescribed in 4.4.15.2.1.3 the location indicator of the place of destination shall be followed by the ICAO three-letter designator YYY (or the ICAO three-letter designator YXY in the case of a military service or organization). The name of the addressee organization shall then be included in the first item in the text of the message. The eighth position letter following the ICAO three-letter designator YYY or YXY shall be the filler letter X.

4.4.15.2.1.3.2 Where a message is to be addressed to an aircraft in flight and, therefore, requires handling over the AFTN for part of its routing before retransmission over the Aeronautical Mobile Service, the location indicator of the aeronautical station which is to relay the message to the aircraft shall be followed by the ICAO three-letter designator ZZZ. The identification of the aircraft shall then be included in the first item of the text of the message. The eighth position letter following the ICAO three-letter designator ZZZ shall be the filler letter X.

4.4.15.2.1.4 The complete address shall be restricted to three lines of page-printing copy, and, except as provided in 4.4.16, a separate addressee indicator shall be used for each addressee whether at the same or different locations.

4.4.15.2.1.5 The completion of the addressee indicator group(s) in the address of a message shall be immediately followed by the alignment function.

4.4.15.2.1.6 Where messages are offered in page-copy form for transmission and contain more addressee indicators than can be accommodated on three lines of a page copy, such messages shall be converted, before transmission, into two or more messages, each of which shall conform with the provisions of 4.4.15.2.1.5. During such conversion, the addressee indicators shall, in so far as practicable, be positioned in the sequence which will ensure that the minimum number of retransmissions will be required at subsequent communication centres.

4.4.15.2.2 *Origin*

The origin shall comprise:

a) filing time;

b) originator indicator;

c) priority alarm (when necessary);

d) optional heading information;

e) alignment function [<≡];

f) start-of-text character, character 0/2 (STX).

4.4.15.2.2.1 The filing time shall comprise the 6-digit date-time group indicating the date and time of filing the message for transmission (*see* 3.4.2).

4.4.15.2.2.2 The originator indicator, which shall be immediately preceded by a SPACE, shall comprise:

a) the four-letter location indicator of the place at which the message is originated;

b) the three-letter designator identifying the organization/function (aeronautical authority, service or aircraft operating agency) which originated the message;

c) an additional letter which shall represent a department, division or process within the organization/function of the originator. The letter X shall be used to complete the address when explicit identification is not required.

4.4.15.2.2.3 Where a message is originated by an organization that has not been allocated an ICAO three-letter designator of the type prescribed in 4.4.15.2.2.2, the location indicator of the place at which the message is originated shall be followed immediately by the ICAO three-letter designator YYY followed by the filler letter X (or the ICAO three-letter designator YXY followed by the filler letter X in the case of a military service or organization). The name of the organization (or military service) shall then be included in the first item in the text of the message.

4.4.15.2.2.3.1 Messages relayed over the AFTN that have been originated in other networks shall use a valid AFTN originator indicator that has been agreed for use by the relay or gateway function linking the AFTN with the external network.

4.4.15.2.2.4 Where a message originated by an aircraft in flight requires handling on the AFTN for part of its routing before delivery, the originator indicator shall comprise the location indicator of the aeronautical station responsible for transferring the message to the AFTN, followed immediately by the ICAO three-letter designator ZZZ followed by the filler letter X. The identification of the aircraft shall then be included in the first item in the text of the message.

4.4.15.2.2.5 The priority alarm shall be used only for distress messages. When used it shall consist of five successive BEL (0/7) characters.

Note.— Use of the priority alarm will actuate a bell (attention) signal at the receiving teletypewriter station, other than at those fully automatic stations which may provide a similar alarm on receipt of priority indicator SS, thereby alerting supervisory personnel at relay centres and operators at tributary stations, so that immediate attention may be given to the message.

4.4.15.2.2.6 The inclusion of optional data in the origin line shall be permitted provided a total of 69 characters is not exceeded and subject to agreement between the Administrations concerned.

4.4.15.2.2.6.1 **Recommendation.—** *The presence of the optional data field should be indicated by one occurrence of the space character and terminated by the alignment function.*

4.4.15.2.2.6.2 **Recommendation.—** *When additional addressing information in a message needs to be exchanged between source and destination addresses, it should be conveyed in the optional data field (ODF), using the following specific format:*

a) characters one and full stop (1.) to indicate the parameter code for the additional address function;

b) three modifier characters, followed by an equal sign (=) and the assigned 8-character ICAO address; and

c) the character hyphen (-) to terminate the additional address parameter field.

4.4.15.2.2.6.2.1 **Recommendation.—** *When a separate address for service messages or inquiries is different from the originator indicator, the modifier SVC should be used.*

4.4.15.2.2.7 The origin line shall be concluded by an alignment function [<≡] and the start-of-text (STX) (0/2) character.

4.4.15.3 *Text*

4.4.15.3.1 The text of messages shall be drafted in accordance with 4.1.2 and shall consist of all data between STX and ETX.

Note.— When message texts do not require conversion to the ITA-2 code and format and do not conflict with ICAO message types or formats in PANS-ATM (Doc 4444), Administrations may make full use of the characters available in International Alphabet No. 5 (IA-5).

4.4.15.3.2 When an originator’s reference is used, it shall appear at the beginning of the text, except as provided in 4.4.15.3.3 and 4.4.15.3.4.

4.4.15.3.3 When the ICAO three-letter designators YXY, YYY or ZZZ comprise the second element of the addressee indicator (*see* 4.4.15.2.1.3.1 and 4.4.15.2.1.3.2) and it, therefore, becomes necessary to identify in the text the specific addressee of the message, such identification group shall precede the originator’s reference (if used) and become the first item of the text.

4.4.15.3.4 When the ICAO three-letter designators YXY, YYY or ZZZ comprise the second element of the originator indicator (*see* 4.4.15.2.2.3 and 4.4.15.2.2.4) and it thus becomes necessary to identify in the text the name of the organization (or military service) or the aircraft which originated the message, such identification shall be inserted in the first item of the text of the message.

4.4.15.3.5 When applying the provisions of 4.4.15.3.3 and 4.4.15.3.4 to messages where the ICAO three-letter designator(s) YXY, YYY, ZZZ refer to two or more different organizations (or military services), the sequence of further identification in the text shall correspond to the complete sequence used in the address and originator indicator of the message. In such instance, each addressee identification shall be followed immediately by an alignment function. The name of the (YXY, YYY or ZZZ) organization originating the message shall then be preceded with “FROM”. “STOP” followed by an alignment function shall then be included in the text at the end of this identification and preceding the remainder of text.

4.4.15.3.6 An alignment function shall be transmitted at the end of each printed line of the text. When it is desired to confirm a portion of the text of a message in teletypewriter operation, such confirmation shall be separated from the last text group by an alignment function [<≡], and shall be indicated by the abbreviation CFM followed by the portion being confirmed.

4.4.15.3.7 Where messages are prepared off-line, e.g. by preparation of a paper tape, errors in the text shall be corrected by backspacing and replacing the character in error by character DEL (7/15).

4.4.15.3.8 Corrections to textual errors made in on-line operations shall be corrected by inserting →E→E→E→ following the error, then retyping the last correct word (or group).

4.4.15.3.9 When it is not discovered until later in the origination process that an error has been made in the text, the correction shall be separated from the last text group, or confirmation, if any, by an alignment function [<≡]. This shall be followed by the abbreviation COR and the correction.

4.4.15.3.10 Stations shall make all indicated corrections on the page-copy prior to local delivery or a transfer to a manually operated circuit.

4.4.15.3.11 The text of messages entered by the AFTN origin station shall not exceed 1 800 characters in length. AFTN messages exceeding 1 800 characters shall be entered by the AFTN origin station in the form of separate messages. Guidance material for forming separate messages from a single long message is given in Attachment B to Volume II. When messages or data are transmitted only on medium or high speed circuits the text may be increased to a length that exceeds 1 800 characters as long as performance characteristics of the network or link are not diminished and subject to agreement between the Administrations concerned.

Note.— The character count includes all printing and non-printing characters in the text from, but not including, the start-of-text signal to, but not including, the first alignment function of the ending.

4.4.15.3.12 *Ending*

4.4.15.3.12.1 The ending of a message shall comprise the following in the order stated:

a) an alignment [<≡] function following the last line of text;

b) page-feed character, character 0/11 (VT);

c) end-of-text character 0/3 (ETX).

4.4.15.3.12.1.1 **Recommendation.—** *Station terminal equipment (page printers) on the International Alphabet Number 5 (IA-5) shall be provided with a capability to generate sufficient line feed functions for local station use upon the reception of a VERTICAL TAB character (0/11).*

4.4.15.3.12.1.2 **Recommendation.—** *When the message does not transit ITA-2 portions of the AFTN, or where Administrations have made provisions to add automatically the second carriage return before transmission to an ITA-2 circuit, one carriage return in the alignment function and end-of-line function should be permitted subject to agreement between the Administrations concerned.*

4.4.15.3.12.1.3 Messages entered by the AFTN origin station shall not exceed 2 100 characters in length.

Note.— The character count includes all printing and non-printing characters in the message from and including the start-of-heading character (SOH) to and including the end-of-text character.

4.4.15.4 Except as provided in 4.4.15.5 to 4.4.15.6 and 4.4.16, the procedures of 4.4.8 and 4.4.9 to 4.4.13 shall be used for messages using IA-5 code.

4.4.15.5 *Channel-check transmissions.* In the case where continuous control of channel condition is not provided the following periodic transmissions shall be sent on teletypewriter circuits:

1) heading line (*see* 4.4.15.1.1);

2) alignment function STX;

3) the procedure signal CH;

4) alignment function ETX.

The receiving station shall then check the transmission identification of this incoming transmission to ensure its correct sequence in respect of all messages received over that incoming channel.

Note.— Application of this procedure provides some measure of assurance that channel continuity is maintained; however, a continuously controlled channel is much more preferable in that data integrity can also be improved.

4.4.15.5.1 **Recommendation.—** *Where a circuit is unoccupied and uncontrolled, the transmission identified in 4.4.15.5 should be sent at H + 00, H + 20, H + 40.*

4.4.15.6 The receipt of distress messages (priority indicator SS, *see* 4.4.1.1.1) shall be individually acknowledged by the AFTN destination station by sending a service message (*see* 4.4.1.1.9) to the AFTN origin station. Such acknowledgement of receipt shall take the format of a complete message addressed to the AFTN origin station, shall be assigned priority indicator SS and the associated priority alarm (*see* 4.4.15.2.2.5), and shall have a text comprising:

1) the procedure signal R;

2) the origin line (*see* 4.4.15.2.2) without priority alarm, or optional heading information of the message being acknowledged;

3) the ending (*see* 4.4.15.3.12.1).

Note.— The following example illustrates the application of the 4.4.15.6 procedures:

Heading (*see* 4.4.15.1.1)

<≡ SS → LECBZRZX <≡

121322 → EGLLYFYX (Priority Alarm) <≡

S
TR → 121319 → LECBZRZX <≡
X

Ending (*see* 4.4.15.3.12.1).

4.4.16 Action taken on mutilated messages in IA-5 detected in computerized AFTN relay stations

4.4.16.1 On channels employing continuous control the mutilation detection and subsequent recovery shall be a function of the link control procedures and shall not require the subsequent sending of service or CHECK TEXT NEW ENDING ADDED messages.

4.4.16.2 On channels not employing continuous control the relay station shall employ the following procedures:

4.4.16.2.1 If, during the reception of a message a relay station detects that the message has been mutilated at some point ahead of the end-of-text character, it shall:

1) cancel the onward routing responsibility for the message;

2) send a service message to the transmitting station requesting a retransmission.

Note.— The following example illustrates a typical text of a service message in which the foregoing procedure has been applied in respect of a mutilated message:

SVC→QTA→RPT→ABC 123 (ending — *see* 4.4.15.3.12.1)

4.4.16.2.2 When the provisions of 4.4.16.2.1 are applied, the station receiving the service message shall reassume responsibility for the referenced message with a new (i.e. correct in sequence) transmission identification (*see* 4.4.15.2.1). If that station is not in possession of an unmutilated copy of the original message, it shall send a message to the originator as identified by the originator indicator in the origin of the mutilated message, requesting repetition of the incorrectly received message.

Note.— The following example illustrates a typical text of a service message in which the foregoing procedure has been applied in respect of a mutilated message having as its origin "141335 CYULACAX":

SVC→QTA→RPT→141335→CYULACAX
(ending — *see* 4.4.15.3.12.1)

4.4.16.3 If, after transmission of the text material of a message, a relay station can detect that there is no complete end-of-text character, but has no practical means of discovering whether the irregularity has affected only the end-of-text character, or whether it has also caused part of the original text to have been lost, it shall insert into the channel the following:

1) <≡CHECK≡TEXT≡
NEW→ENDING→ADDED

2) its own station identification;

3) (ending — *see* 4.4.15.3.12.1).

4.4.17 Transfer of AFTN messages over code and byte independent circuits and networks

When AFTN messages are transferred across code and byte independent circuits and networks of the AFS, the following shall apply.

4.4.17.1 Except as provided in 4.4.17.3 the heading line of the message shall be omitted. The message shall start with an alignment function followed by the address.

4.4.17.2 The message shall end with a complete ending.

4.4.17.3 **Recommendation.—** *For the purposes of technical supervision, entry centres should be permitted to insert additional data preceding the first alignment function and/or following the ending of the message. Such data may be disregarded by the receiving station.*

4.4.17.3.1 When the provisions of 4.4.17.3 are applied, the data added shall not include either carriage return or line feed characters or any of the combinations listed in 4.1.2.4.

4.5 Common ICAO Data Interchange Network (CIDIN)

Note 1.— The common ICAO data interchange network (CIDIN), which comprises application entities and communication services for ground-ground message exchange, makes use of protocols based on the International Telegraph and Telephone Consultative Committee (CCITT) X.25 Recommendation to provide code and byte-independent communication facilities.

Note 2.— The principal goals of the CIDIN are to improve the AFTN and to support large message transmission and more demanding applications, such as operational meteorological information (OPMET), between two or multiple ground systems.

Note 3.— Details of CIDIN communication procedures, as implemented in Europe, are shown in the EUR CIDIN Manual.

4.6 ATS Message Handling Services (ATSMHS)

The ATS message service of the ATS (air traffic services) message handling service (ATSMHS) application shall be used to exchange ATS messages between users over the aeronautical telecommunication network (ATN) internet.

Note 1.— The ATS message service comprised in the ATS message handling service application aims at providing generic message services over the ATN internet communication service (ICS). It may, in turn, be used as a communication system by user-applications communicating over the ATN. This may be achieved, for example, by means of application programme interfaces to the ATS message service.

Note 2.— The detailed specification of the ATS message handling service application is included in the Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) *(Doc 9705), Sub-volume III.*

Note 3.— The ATS message service is provided by the implementation over the ATN internet communication service of the message handling systems specified in ISO/IEC (International Organization for Standardization/International Electrotechnical Commission) 10021 and ITU-T (International Telecommunication Union — Telecommunication Standardization Sector) X.400 and complemented by the additional requirements specified in the Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) *(Doc 9705). The two sets of documents, the ISO/IEC MOTIS (Message-Oriented Text Interchange System) International Standards and the ITU-T X.400 Series of Recommendations (1988 or later) are, in principle, aligned with each other. However, there are a small number of differences. In the above-mentioned document, reference is made to the relevant ISO International Standards and International Standardized Profiles (ISP), where applicable. Where necessary, e.g. for reasons of interworking or to point out differences, reference is also made to the relevant X.400 Recommendations.*

Note 4.— The following types of ATN end systems performing ATS message handling services are defined in the Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) *(Doc 9705), Sub-volume III:*

1) an ATS message server;

2) an ATS message user agent;

3) an AFTN/AMHS gateway (aeronautical fixed telecommunication network/ATS message handling system); and

4) a CIDIN/AMHS gateway (common ICAO data interchange network/ATS message handling system).

Connections may be established over the internet communications service between any pair constituted of these ATN end systems (see Table 4-1).

Table 4-1. Communications between ATN end systems implementing ATS message handling services

ATN End System 1	ATN End System 2
ATS Message Server	ATS Message Server
ATS Message Server	AFTN/AMHS Gateway
ATS Message Server	CIDIN/AMHS Gateway
ATS Message Server	ATS Message User Agent
AFTN/AMHS Gateway	AFTN/AMHS Gateway
CIDIN/AMHS Gateway	CIDIN/AMHS Gateway
CIDIN/AMHS Gateway	AFTN/AMHS Gateway

4.7 Inter-Centre Communications (ICC)

The inter-centre communications (ICC) applications set shall be used to exchange ATS messages between air traffic service users over the ATN internet.

Note 1.— The ICC applications set enables the exchange of information in support of the following operational services:

a) flight notification;

b) flight coordination;

c) transfer of control and communications;

d) flight planning;

e) airspace management; and

f) air traffic flow management.

Note 2.— The first of the applications developed for the ICC set is the ATS interfacility data communication (AIDC).

Note 3.— The AIDC application exchanges information between ATS units (ATSUs) for support of critical air traffic control (ATC) functions, such as notification of flights approaching a flight information region (FIR) boundary, coordination of boundary conditions and transfer of control and communications authority.

Note 4.— The detailed specification of the AIDC application is included in the Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) *(Doc 9705), Sub-volume III.*

Note 5.— The AIDC application is strictly an ATC application for exchanging tactical control information between ATS units. It does not support the exchange of information with other offices or facilities.

Note 6.— The AIDC application supports the following operational services:

a) flight notification;

b) flight coordination;

c) transfer of executive control;

d) transfer of communications; and

e) transfer of general information (flight-related data or free text messages, i.e. unstructured).

CHAPTER 5. AERONAUTICAL MOBILE SERVICE — VOICE COMMUNICATIONS

5.1 General

Note.— For the purposes of these provisions, the communication procedures applicable to the aeronautical mobile service, as appropriate, also apply to the aeronautical mobile satellite service.

5.1.1 In all communications the highest standard of discipline shall be observed at all times.

5.1.1.1 ICAO standardized phraseology shall be used in all situations for which it has been specified. Only when standardized phraseology cannot serve an intended transmission, plain language shall be used.

Note.— Detailed language proficiency requirements appear in the Appendix to Annex 1.

5.1.1.2 The transmission of messages, other than those specified in 5.1.8, on aeronautical mobile frequencies when the aeronautical fixed services are able to serve the intended purpose, shall be avoided.

5.1.1.3 **Recommendation.—** *In all communications, the consequences of human performance which could affect the accurate reception and comprehension of messages should be taken into consideration.*

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

5.1.2 Where it is necessary for an aircraft station to send signals for testing or adjustment which are liable to interfere with the working of a neighbouring aeronautical station, the consent of the station shall be obtained before such signals are sent. Such transmissions shall be kept to a minimum.

5.1.3 When it is necessary for a station in the aeronautical mobile service to make test signals, either for the adjustment of a transmitter before making a call or for the adjustment of a receiver, such signals shall not continue for more than 10 seconds and shall be composed of spoken numerals (ONE, TWO, THREE, etc.) in radiotelephony, followed by the radio call sign of the station transmitting the test signals. Such transmissions shall be kept to a minimum.

5.1.4 Except as otherwise provided, the responsibility of establishing communication shall rest with the station having traffic to transmit.

Note.— In certain cases when SELCAL is used the procedures respecting the establishment of communications are contained in 5.2.4.

5.1.5 **Recommendation.—** *After a call has been made to the aeronautical station, a period of at least 10 seconds should elapse before a second call is made. This should eliminate unnecessary transmissions while the aeronautical station is getting ready to reply to the initial call.*

5.1.6 When an aeronautical station is called simultaneously by several aircraft stations, the aeronautical station shall decide the order in which aircraft shall communicate.

5.1.7 In communications between aircraft stations, the duration of communication shall be controlled by the aircraft station which is receiving, subject to the intervention of an aeronautical station. If such communications take place on an ATS frequency, prior permission of the aeronautical station shall be obtained. Such requests for permission are not required for brief exchanges.

5.1.8 Categories of messages

The categories of messages handled by the aeronautical mobile service and the order of priority in the establishment of communications and the transmission of messages shall be in accordance with the following table.

Message category and order of priority	*Radiotelephony signal*
a) Distress calls, distress messages and distress traffic	MAYDAY
b) Urgency messages, including messages preceded by the medical transports signal	PAN, PAN *or* PAN, PAN MEDICAL
c) Communications relating to direction finding	—
d) Flight safety messages	—
e) Meteorological messages	—
f) Flight regularity messages	—

Note 1.— Messages concerning acts of unlawful interference constitute a case of exceptional circumstances which may preclude the use of recognized communication procedures used to determine message category and priority.

Note 2.— A NOTAM may qualify for any of the categories or priorities c) to f) inclusive. The decision as to which priority will depend on the contents of the NOTAM and its importance to the aircraft concerned.

5.1.8.1 *Distress messages and distress traffic* shall be handled in accordance with the provisions of 5.3.

5.1.8.2 *Urgency messages and urgency traffic,* including messages preceded by the medical transports signal, shall be handled in accordance with the provisions of 5.3.

Note.— The term "medical transports" is defined in the 1949 Geneva Conventions and Additional Protocols (see also RR S33 Section III) and refers to "any means of transportation by land, water, or air, whether military or civilian, permanent or temporary, assigned exclusively to medical transportation and under the control of a competent authority of a Party to the conflict".

5.1.8.3 *Communications relating to direction finding* shall be handled in accordance with Chapter 6.

5.1.8.4 *Flight safety messages* shall comprise the following:

1) movement and control messages [*see* PANS-ATM (Doc 4444)];

2) messages originated by an aircraft operating agency or by an aircraft, of immediate concern to an aircraft in flight;

3) meteorological advice of immediate concern to an aircraft in flight or about to depart (individually communicated or for broadcast);

4) other messages concerning aircraft in flight or about to depart.

5.1.8.5 *Meteorological messages* shall comprise meteorological information to or from aircraft, other than those in 5.1.8.4, 3).

5.1.8.6 *Flight regularity messages* shall comprise the following:

1) messages regarding the operation or maintenance of facilities essential for the safety or regularity of aircraft operation;

2) messages concerning the servicing of aircraft;

3) instructions to aircraft operating agency representatives concerning changes in requirements for passengers and crew caused by unavoidable deviations from normal operating schedules. Individual requirements of passengers or crew shall not be admissible in this type of message;

4) messages concerning non-routine landings to be made by the aircraft;

5) messages concerning aircraft parts and materials urgently required;

6) messages concerning changes in aircraft operating schedules.

5.1.8.6.1 Air traffic services units using direct pilot-controller communication channels shall only be required to handle flight regularity messages provided this can be achieved without interference with their primary role and no other channels are available for the handling of such messages.

Note.— The messages at 5.1.8.4, 2) and 5.1.8.6, 1) to 6) typify some of the operational control communications defined in Chapter 1.

5.1.8.7 **Recommendation.—** *Messages having the same priority should, in general, be transmitted in the order in which they are received for transmission.*

5.1.8.8 Interpilot air-to-air communication shall comprise messages related to any matter affecting safety and regularity of flight. The category and priority of these messages shall be determined on the basis of their content in accordance with 5.1.8.

5.1.9 Cancellation of messages

5.1.9.1 *Incomplete transmissions.* If a message has not been completely transmitted when instructions to cancel are received, the station transmitting the message shall instruct the receiving station to disregard the incomplete transmission. This shall be effected in radiotelephony by use of an appropriate phrase.

5.1.9.2 *Complete transmissions*

Recommendation.— *When a completed message transmission is being held pending correction and the receiving station is to be informed to take no forwarding action, or when delivery or onward relay cannot be accomplished, transmission should be cancelled. This should be effected in radiotelephony by the use of an appropriate phrase.*

5.1.9.3 The station cancelling a transmission shall be responsible for any further action required.

5.2 Radiotelephony procedures

Note.— When Selective Calling (SELCAL) equipment is used certain of the following procedures are superseded by those contained in 5.2.4.

5.2.1 General

5.2.1.1 **PANS.—** *When a controller or pilot communicates via voice, the response should be via voice. Except as provided by 8.2.12.1, when a controller or pilot communicates via CPDLC, the response should be via CPDLC.*

5.2.1.2 *Language to be used*

5.2.1.2.1 The air-ground radiotelephony communications shall be conducted in the language normally used by the station on the ground or in the English language.

Note 1.— The language normally used by the station on the ground may not necessarily be the language of the State in which it is located. A common language may be agreed upon regionally as a requirement for stations on the ground in that region.

Note 2.— The level of language proficiency required for aeronautical radiotelephony communications is specified in the Appendix to Annex 1.

5.2.1.2.2 The English language shall be available, on request from any aircraft station, at all stations on the ground serving designated airports and routes used by international air services.

5.2.1.2.3 The languages available at a given station on the ground shall form part of the Aeronautical Information Publications and other published aeronautical information concerning such facilities.

5.2.1.3 *Word spelling in radiotelephony.* When proper names, service abbreviations and words of which the spelling is doubtful are spelled out in radiotelephony the alphabet in Figure 5-1 shall be used.

Note 1.— The pronunciation of the words in the alphabet as well as numbers may vary according to the language habits of the speakers. In order to eliminate wide variations in pronunciation, posters illustrating the desired pronunciation are available from ICAO.

Note 2.— The Spelling Alphabet specified in 5.2.1.3 is also prescribed for use in the Maritime Mobile Service (ITU Radio Regulations, Appendix S14).

5.2.1.4 *Transmission of numbers in radiotelephony*

5.2.1.4.1 *Transmission of numbers*

5.2.1.4.1.1 All numbers, except as prescribed in 5.2.1.4.1.2, shall be transmitted by pronouncing each digit separately.

*Note.— The following examples illustrate the application of this procedure (*see *5.2.1.4.3.1 for pronunciation).*

aircraft call signs	*transmitted as*
CCA 238	Air China **two three eight**
OAL 242	Olympic **two four two**
flight levels	*transmitted as*
FL 180	flight level **one eight zero**
FL 200	flight level **two zero zero**
headings	*transmitted as*
100 degrees	heading **one zero zero**
080 degrees	heading **zero eight zero**
wind direction and speed	*transmitted as*
200 degrees 70 knots	wind **two zero zero** degrees **seven zero** knots
160 degrees 18 knots gusting 30 knots	wind **one six zero** degrees **one eight** knots gusting **three zero knots**
transponder codes	*transmitted as*
2 400	squawk **two four zero zero**
4 203	squawk **four two zero three**
runway	*transmitted as*
27	runway **two seven**
30	runway **three zero**
altimeter setting	*transmitted as*
1 010	QNH **one zero one zero**
1 000	QNH **one zero zero zero**

5.2.1.4.1.2 All numbers used in the transmission of altitude, cloud height, visibility and runway visual range (RVR) information, which contain whole hundreds and whole thousands, shall be transmitted by pronouncing each digit in the number of hundreds or thousands followed by the word HUNDRED or THOUSAND as appropriate. Combinations of thousands and whole hundreds shall be transmitted by pronouncing each digit in the number of thousands followed by the word THOUSAND followed by the number of hundreds followed by the word HUNDRED.

*Note.— The following examples illustrate the application of this procedure (*see *5.2.1.4.3.1 for pronunciation).*

Letter	*Word*	*Approximate pronunciation*	
		International Phonetic Convention	*Latin alphabet representation*
A	**Alfa**	'ælfa	AL FAH
B	**Bravo**	'bra:'vo	BRAH VOH
C	**Charlie**	'tʃɑ:li *or* 'ʃɑ:li	CHAR LEE *or* SHAR LEE
D	**Delta**	'deltɑ	DELL TAH
E	**Echo**	'eko	ECK OH
F	**Foxtrot**	'fɔkstrɔt	FOKS TROT
G	**Golf**	gʌlf	GOLF
H	**Hotel**	ho:'tel	HO TELL
I	**India**	'indi·ɑ	IN DEE AH
J	**Juliett**	'dʒu:li·'et	JEW LEE ETT
K	**Kilo**	'ki:lo	KEY LOH
L	**Lima**	'li:mɑ	LEE MAH
M	**Mike**	mɑik	MIKE
N	**November**	no'vembə	NO VEM BER
O	**Oscar**	'ɔskɑ	OSS CAH
P	**Papa**	pə'pɑ	PAH PAH
Q	**Quebec**	ke'bek	KEH BECK
R	**Romeo**	'ro:mi·o	ROW ME OH
S	**Sierra**	si'erɑ	SEE AIR RAH
T	**Tango**	'tængo	TANG GO
U	**Uniform**	'ju:nifɔ:m *or* 'u:nifɔrm	YOU NEE FORM *or* OO NEE FORM
V	**Victor**	'viktɑ	VIK TAH
W	**Whiskey**	'wiski	WISS KEY
X	**X-ray**	'eks'rei	ECKS RAY
Y	**Yankee**	'jænki	YANG KEY
Z	**Zulu**	'zu:lu:	ZOO LOO

Note.— In the approximate representation using the Latin alphabet, syllables to be emphasized are underlined.

Note 1.— The pronunciation of the words in the alphabet may vary according to the language habits of the speakers. In order to eliminate wide variations in pronunciation, posters illustrating the desired pronunciation are available from ICAO.

Note 2.— The Spelling Alphabet specified in 5.2.1.3 is also prescribed for use in the Maritime Mobile Service (ITU Radio Regulations, Appendix S14).

Figure 5-1. The Radiotelephony Spelling Alphabet (*see* 5.2.1.3)

altitude	*transmitted as*
800	**eight hundred**
3 400	**three thousand four hundred**
12 000	**one two thousand**
cloud height	*transmitted as*
2 200	**two thousand two hundred**
4 300	**four thousand three hundred**
visibility	*transmitted as*
1 000	visibility **one thousand**
700	visibility **seven hundred**
runway visual range	*transmitted as*
600	RVR **six hundred**
1 700	RVR **one thousand seven hundred**

5.2.1.4.1.3 Numbers containing a decimal point shall be transmitted as prescribed in 5.2.1.4.1.1 with the decimal point in appropriate sequence being indicated by the word DECIMAL.

Note 1.— The following examples illustrate the application of this procedure:

Number	*Transmitted as*
100.3	ONE ZERO ZERO DECIMAL THREE
38 143.9	THREE EIGHT ONE FOUR THREE DECIMAL NINE

Note 2.— For identification of VHF frequencies the number of digits used after the decimal point are determined on the basis of the channel spacing (5.2.1.7.3.4.3 refers to frequencies separated by 25 kHz, 5.2.1.7.3.4.4 refers to frequencies separated by 8.33 kHz).

Note 3.— The channelling/frequency pairing relationship for 8.33 kHz and 25 kHz is found in Table 4-1 (bis), Volume V.

5.2.1.4.1.4 **PANS.—** *When transmitting time, only the minutes of the hour should normally be required. Each digit should be pronounced separately. However, the hour should be included when any possibility of confusion is likely to result.*

Note.— The following example illustrates the application of this procedure when applying the provisions of 5.2.1.2.2:

Time	*Statement*
0920 *(9:20 A.M.)*	TOO ZE-RO
	or ZE-RO NIN-er TOO ZE-RO
1643 *(4:43 P.M.)*	FOW-er TREE
	or WUN SIX FOW-er TREE

5.2.1.4.2 *Verification of numbers*

5.2.1.4.2.1 When it is desired to verify the accurate reception of numbers the person transmitting the message shall request the person receiving the message to read back the numbers.

5.2.1.4.3 *Pronunciation of numbers*

5.2.1.4.3.1 When the language used for communication is English, numbers shall be transmitted using the following pronunciation:

Numeral or numeral element	*Pronunciation*
0	ZE-RO
1	WUN
2	TOO
3	TREE
4	FOW-er
5	FIFE
6	SIX
7	SEV-en
8	AIT
9	NIN-er
Decimal	DAY-SEE-MAL
Hundred	HUN-dred
Thousand	TOU-SAND

Note.— The syllables printed in capital letters in the above list are to be stressed; for example, the two syllables in ZE-RO are given equal emphasis, whereas the first syllable of FOW-er is given primary emphasis.

5.2.1.5 *Transmitting technique*

5.2.1.5.1 **PANS.—** *Each written message should be read prior to commencement of transmission in order to eliminate unnecessary delays in communications.*

5.2.1.5.2 Transmissions shall be conducted concisely in a normal conversational tone.

Note.—See the language proficiency requirements in the Appendix to Annex 1.

5.2.1.5.3 **PANS.—** *Speech transmitting technique should be such that the highest possible intelligibility is incorporated in each transmission. Fulfilment of this aim requires that air crew and ground personnel should:*

a) *enunciate each word clearly and distinctly;*

b) *maintain an even rate of speech not exceeding 100 words per minute. When a message is transmitted to an aircraft and its contents need to be recorded the speaking rate should be at a slower rate to allow for the writing process. A slight pause preceding and following numerals makes them easier to understand;*

c) *maintain the speaking volume at a constant level;*

d) *be familiar with the microphone operating techniques particularly in relation to the maintenance of a constant distance from the microphone if a modulator with a constant level is not used;*

e) *suspend speech temporarily if it becomes necessary to turn the head away from the microphone.*

5.2.1.5.4 **Recommendation.—** *Speech transmitting technique should be adapted to the prevailing communications conditions.*

5.2.1.5.5 **PANS.—** *Messages accepted for transmission should be transmitted in plain language or ICAO phraseologies without altering the sense of the message in any way. Approved ICAO abbreviations contained in the text of the message to be transmitted to aircraft should normally be converted into the unabbreviated words or phrases which these abbreviations represent in the language used, except for those which, owing to frequent and common practice, are generally understood by aeronautical personnel.*

Note.— The abbreviations which constitute the exceptions mentioned in 5.2.1.5.5 are specifically identified in the abbreviation encode sections of the PANS-ABC (Doc 8400).

5.2.1.5.6 **PANS.—** *To expedite communication, the use of phonetic spelling should be dispensed with, if there is no risk of this affecting correct reception and intelligibility of the message.*

5.2.1.5.7 **PANS.—** *The transmission of long messages should be interrupted momentarily from time to time to permit the transmitting operator to confirm that the frequency in use is clear and, if necessary, to permit the receiving operator to request repetition of parts not received.*

5.2.1.5.8 The following words and phrases shall be used in radiotelephony communications as appropriate and shall have the meaning ascribed hereunder:

Phrase	*Meaning*
ACKNOWLEDGE	"Let me know that you have received and understood this message."
AFFIRM	"Yes."
APPROVED	"Permission for proposed action granted."
BREAK	"I hereby indicate the separation between portions of the message." *(To be used where there is no clear distinction between the text and other portions of the message.)*
BREAK BREAK	"I hereby indicate the separation between messages transmitted to different aircraft in a very busy environment."
CANCEL	"Annul the previously transmitted clearance."
CHECK	"Examine a system or procedure." *(Not to be used in any other context. No answer is normally expected.)*
CLEARED	"Authorized to proceed under the conditions specified."
CONFIRM	"I request verification of: (*clearance, instruction, action, information*)."
CONTACT	"Establish communications with..."
CORRECT	"True" or "Accurate".
CORRECTION	"An error has been made in this transmission (*or* message indicated). The correct version is..."
DISREGARD	"Ignore."
GO AHEAD	"Proceed with your message." *Note.— Not used whenever the possibility exists of misconstruing "GO AHEAD" as an authorization for an aircraft to proceed. The phrase "GO AHEAD" may be omitted and, in its place, a response made by using the calling aeronautical station's call sign followed by the answering aeronautical station's call sign.*
HOW DO YOU READ	"What is the readability of my transmission?" (*see* 5.2.1.8.4.)
I SAY AGAIN	"I repeat for clarity or emphasis."
MAINTAIN	"Continue in accordance with the condition(s) specified" or in its literal sense, e.g. "Maintain VFR".
MONITOR	"Listen out on (frequency)."

NEGATIVE	"No" *or* "Permission not granted" *or* "That is not correct" *or* "Not capable".
OVER	"My transmission is ended, and I expect a response from you." *Note.— Not normally used in VHF communications.*
OUT	"This exchange of transmissions is ended and no response is expected." *Note.— Not normally used in VHF communications.*
READ BACK	"Repeat all, or the specified part, of this message back to me exactly as received."
RECLEARED	"A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof."
REPORT	"Pass me the following information..."
REQUEST	"I should like to know..." *or* "I wish to obtain..."
ROGER	"I have received all of your last transmission." *Note.— Under no circumstances to be used in reply to a question requiring "READ BACK" or a direct answer in the affirmative (AFFIRM) or negative (NEGATIVE).*
SAY AGAIN	"Repeat all, or the following part, of your last transmission."
SPEAK SLOWER	"Reduce your rate of speech." *Note.— For normal rate of speech,* see *5.2.1.5.3 b).*
STANDBY	"Wait and I will call you." *Note.— The caller would normally re-establish contact if the delay is lengthy. STANDBY is not an approval or denial.*
UNABLE	"I cannot comply with your request, instruction, or clearance." *Note.— UNABLE is normally followed by a reason.*
WILCO	*(Abbreviation for "will comply".)* "I understand your message and will comply with it."
WORDS TWICE	a) *As a request:* "Communication is difficult. Please send every word, or group of words, twice." b) *As information:* "Since communication is difficult, every word, or group of words, in this message will be sent twice."

5.2.1.6 *Composition of messages*

5.2.1.6.1 Messages handled entirely by the aeronautical mobile service shall comprise the following parts in the order stated:

a) call indicating the addressee and the originator (*see* 5.2.1.7.3);

b) text (*see* 5.2.1.6.2.1.1).

Note.— The following examples illustrate the application of this procedure:

(call)	NEW YORK RADIO SWISSAIR ONE ONE ZERO
(text)	REQUEST SELCAL CHECK
	or
(call)	SWISSAIR ONE ONE ZERO NEW YORK RADIO
(text)	CONTACT SAN JUAN ON FIVE SIX

5.2.1.6.2 Messages requiring handling by the AFTN for part of their routing and similarly messages which are not handled in accordance with predetermined distribution arrangements (*see* 3.3.7.1) shall be composed as follows:

5.2.1.6.2.1 *When originated in an aircraft:*

1) call (*see* 5.2.1.7.3);

2) the word FOR;

3) the name of the organization addressed;

4) the name of the station of destination;

5) the text.

5.2.1.6.2.1.1 The text shall be as short as practicable to convey the necessary information; full use shall be made of ICAO phraseologies.

Note.— The following example illustrates the application of this procedure:

(call)	BOSTON RADIO SWISSAIR ONE TWO EIGHT
(address)	FOR SWISSAIR BOSTON
(text)	NUMBER ONE ENGINE CHANGE REQUIRED

5.2.1.6.2.2 *When addressed to an aircraft.* When a message, prepared in accordance with 4.4.2, is retransmitted by an aeronautical station to an aircraft in flight, the heading and address of the AFTN message format shall be omitted during the retransmission on the aeronautical mobile service.

5.2.1.6.2.2.1 When the provisions of 5.2.1.6.2.2 are applied, the aeronautical mobile service message transmission shall comprise:

a) the text [incorporating any corrections (COR) contained in the AFTN message];

b) the word FROM;

c) the name of the originating organization and its location (taken from the origin section of the AFTN message).

5.2.1.6.2.2.2 **PANS.—** *When the text of a message to be transmitted by an aeronautical station to an aircraft in flight contains approved ICAO abbreviations, these abbreviations should normally be converted during the transmission of the message into the unabbreviated words or phrases which the abbreviations represent in the language used, except for those which, owing to frequent or common practice, are generally understood by aeronautical personnel.*

Note.— The abbreviations which constitute the exceptions mentioned in 5.2.1.6.2.2.2 are specifically identified in the abbreviations encode sections of the PANS-ABC (Doc 8400).

5.2.1.7 *Calling*

5.2.1.7.1 *Radiotelephony call signs for aeronautical stations*

Note.— The formation of call signs as specified in ITU Radio Regulations S19 Section III and Section VII.

5.2.1.7.1.1 Aeronautical stations in the aeronautical mobile service shall be identified by:

a) the name of the location; and

b) the unit or service available.

5.2.1.7.1.2 The unit or service shall be identified in accordance with the table below except that the name of the location or the unit/service may be omitted provided satisfactory communication has been established.

Unit/service available	*Call sign suffix*
area control centre	CONTROL
approach control	APPROACH
approach control radar arrivals	ARRIVAL
approach control radar departures	DEPARTURE
aerodrome control	TOWER
surface movement control	GROUND
radar (in general)	RADAR
precision approach radar	PRECISION
direction-finding station	HOMER
flight information service	INFORMATION
clearance delivery	DELIVERY
apron control	APRON
company dispatch	DISPATCH
aeronautical station	RADIO

5.2.1.7.2 *Radiotelephony call signs for aircraft*

5.2.1.7.2.1 *Full call signs*

5.2.1.7.2.1.1 An aircraft radiotelephony call sign shall be one of the following types:

Type a) — the characters corresponding to the registration marking of the aircraft; or

Type b) — the telephony designator of the aircraft operating agency, followed by the last four characters of the registration marking of the aircraft;

Type c) — the telephony designator of the aircraft operating agency, followed by the flight identification.

*Note 1.— The name of the aircraft manufacturer or of the aircraft model may be used as a radiotelephony prefix to the Type a) call sign (*see *Table 5-1).*

Note 2.— The telephony designators referred to in Types b) and c) are contained in Doc 8585 — Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services.

Note 3.— Any of the foregoing call signs may be inserted in field 7 of the ICAO flight plan as the aircraft identification. Instructions on the completion of the flight plan form are contained in PANS-ATM, Doc 4444.

5.2.1.7.2.2 *Abbreviated call signs*

5.2.1.7.2.2.1 The aircraft radiotelephony call signs shown in 5.2.1.7.2.1.1, with the exception of Type c), may be abbreviated in the circumstances prescribed in 5.2.1.7.3.3.1. Abbreviated call signs shall be in the following form:

Type a) — the first character of the registration and at least the last two characters of the call sign;

Type b) — the telephony designator of the aircraft operating agency, followed by at least the last two characters of the call sign;

Table 5-1. Examples of full call signs and abbreviated call signs
(*see* 5.2.1.7.2.1 and 5.2.1.7.2.2)

		Type a)		*Type b)*	*Type c)*
Full call sign	N 57826	*CESSNA FABCD	*CITATION FABCD	VARIG PVMA	SCANDINAVIAN 937
Abbreviated call sign	N26 or N826	CESSNA CD or CESSNA BCD	CITATION CD or CITATION BCD	VARIG MA or VARIG VMA	(no abbreviated form)

* Examples illustrate the application of Note 1 to 5.2.1.7.2.1.1.

Type c) — no abbreviated form.

Note.— Either the name of the aircraft manufacturer or of the aircraft model may be used in place of the first character in Type a).

5.2.1.7.3 *Radiotelephony procedures*

5.2.1.7.3.1 An aircraft shall not change the type of its radiotelephony call sign during flight, except temporarily on the instruction of an air traffic control unit in the interests of safety.

5.2.1.7.3.1.1 Except for reasons of safety no transmission shall be directed to an aircraft during take-off, during the last part of the final approach or during the landing roll.

5.2.1.7.3.2 *Establishment of radiotelephony communications*

5.2.1.7.3.2.1 Full radiotelephony call signs shall always be used when establishing communication. The calling procedure of an aircraft establishing communication shall be in accordance with Table 5-2.

5.2.1.7.3.2.2 **PANS.—** *Stations having a requirement to transmit information to all stations likely to intercept should preface such transmission by the general call ALL STATIONS, followed by the identification of the calling station.*

Note.— No reply is expected to such general calls unless individual stations are subsequently called to acknowledge receipt.

5.2.1.7.3.2.3 The reply to the above calls shall be in accordance with Table 5-3.

5.2.1.7.3.2.4 **PANS.—** *When a station is called but is uncertain of the identification of the calling station, it should reply by transmitting the following:*

STATION CALLING . . . (station called) SAY AGAIN YOUR CALL SIGN

Note.— The following example illustrates the application of this procedure:

(CAIRO station replying)

STATION CALLING CAIRO *(pause)* SAY AGAIN YOUR CALL SIGN

5.2.1.7.3.2.5 Communications shall commence with a call and a reply when it is desired to establish contact, except that, when it is certain that the station called will receive the call, the calling station may transmit the message, without waiting for a reply from the station called.

5.2.1.7.3.2.6 Interpilot air-to-air communication shall be established on the air-to-air channel 123.45 MHz by either a directed call to a specific aircraft station or a general call, taking into account conditions pertaining to use of this channel.

Note.— For conditions on use of air-to-air channels see *Annex 10, Volume V, 4.1.3.2.1, also Volume II, 5.2.2.1.1.4.*

5.2.1.7.3.2.6.1 **PANS.—** *As the aircraft may be guarding more than one frequency, the initial call should include the distinctive channel identification "INTERPILOT".*

Note.— The following examples illustrate the application of this calling procedure.

CLIPPER 123 — SABENA 901 — INTERPILOT — DO YOU READ

or

ANY AIRCRAFT VICINITY OF 30 NORTH 160 EAST — JAPANAIR 401 — INTERPILOT — OVER

Table 5-2. Radiotelephony calling procedure* (*see* 5.2.1.7.3.2.1)

	Type a)	*Type b)*	*Type c)*
Designation of the station called	NEW YORK RADIO	NEW YORK RADIO	NEW YORK RADIO
Designation of the station calling	GABCD**	SPEEDBIRD ABCD**	AEROFLOT 321**

* *In certain cases where the call is initiated by the aeronautical station, the call may be effected by transmission of coded tone signals.*

** *With the exception of the telephony designators and the type of aircraft, each character in the call sign shall be spoken separately. When individual letters are spelled out, the radiotelephony spelling alphabet prescribed in 5.2.1.3 shall be used. Numbers are to be spoken in accordance with 5.2.1.4.*

Table 5-3. Radiotelephony reply procedure (*see* 5.2.1.7.3.2.3)

	Type a)	*Type b)*	*Type c)*
Designation of the station called	GABCD*	SPEEDBIRD ABCD*	AEROFLOT 321*
Designation of the answering station	NEW YORK RADIO	NEW YORK RADIO	NEW YORK RADIO
Invitation to proceed with transmission	GO AHEAD	GO AHEAD	GO AHEAD

* *With the exception of the telephony designators and the type of aircraft, each character in the call sign shall be spoken separately. When individual letters are spelled out, the radiotelephony spelling alphabet prescribed in 5.2.1.3 shall be used. Numbers are to be spoken in accordance with 5.2.1.4.*

5.2.1.7.3.3 *Subsequent radiotelephony communications*

5.2.1.7.3.3.1 Abbreviated radiotelephony call signs, as prescribed in 5.2.1.7.2.2, shall be used only after satisfactory communication has been established and provided that no confusion is likely to arise. An aircraft station shall use its abbreviated call sign only after it has been addressed in this manner by the aeronautical station.

5.2.1.7.3.3.2 After contact has been established, continuous two-way communication shall be permitted without further identification or call until termination of the contact.

5.2.1.7.3.3.3 In order to avoid any possible confusion, when issuing ATC clearances and reading back such clearances, controllers and pilots shall always add the call sign of the aircraft to which the clearance applies.

5.2.1.7.3.4 *Indication of transmitting channel*

5.2.1.7.3.4.1 **PANS.—** *As the aeronautical station operator generally guards more than one frequency, the call should be followed by an indication of the frequency used, unless other suitable means of identifying the frequency are known to exist.*

5.2.1.7.3.4.2 **PANS.—** *When no confusion is likely to arise, only the first two digits of the High Frequency (in kHz) need be used to identify the transmitting channel.*

Note.— The following example illustrates the application of this procedure:

(PAA 325 calling Kingston on 8 871 kHz)

KINGSTON CLIPPER THREE TWO FIVE — ON EIGHT EIGHT

5.2.1.7.3.4.3 **PANS.—** *Except as specified in 5.2.1.7.3.4.4 all six digits of the numerical designator should be used to identify the transmitting channel in VHF radiotelephony communications, except in the case of both the fifth and sixth digits being zeros, in which case only the first four digits should be used.*

Note 1.— The following examples illustrate the application of the procedure in 5.2.1.7.3.4.3:

Channel	*Transmitted as*
118.000	*ONE ONE EIGHT DECIMAL ZERO*
118.005	*ONE ONE EIGHT DECIMAL ZERO ZERO FIVE*

118.010	*ONE ONE EIGHT DECIMAL ZERO ONE ZERO*
118.025	*ONE ONE EIGHT DECIMAL ZERO TWO FIVE*
118.050	*ONE ONE EIGHT DECIMAL ZERO FIVE ZERO*
118.100	*ONE ONE EIGHT DECIMAL ONE*

Note 2.— Caution must be exercised with respect to the indication of transmitting channels in VHF radiotelephony communications when all six digits of the numerical designator are used in airspace where communication channels are separated by 25 kHz, because on aircraft installations with a channel separation capability of 25 kHz or more, it is only possible to select the first five digits of the numerical designator on the radio management panel.

*Note 3.— The numerical designator corresponds to the channel identification in Annex 10, Volume V, Table 4-1 (*bis*).*

5.2.1.7.3.4.4 **PANS.—** *In airspace where all VHF voice communications channels are separated by 25 kHz or more and the use of six digits as in 5.2.1.7.3.4.3 is not substantiated by the operational requirement determined by the appropriate authorities, the first five digits of the numerical designator should be used, except in the case of both the fifth and sixth digits being zeros, in which case only the first four digits should be used.*

Note 1.— The following examples illustrate the application of the procedure in 5.2.1.7.3.4.4 and the associated settings of the aircraft radio management panel for communication equipment with channel separation capabilities of 25 kHz and 8.33/25 kHz:

Channel	*Transmitted as*	*Radio management panel setting for communication equipment with*	
		25 kHz (5 digits)	*8.33/ 25 kHz (6 digits)*
118.000	*ONE ONE EIGHT DECIMAL ZERO*	*118.00*	*118.000*
118.025	*ONE ONE EIGHT DECIMAL ZERO TWO*	*118.02*	*118.025*
118.050	*ONE ONE EIGHT DECIMAL ZERO FIVE*	*118.05*	*118.050*
118.075	*ONE ONE EIGHT DECIMAL ZERO SEVEN*	*118.07*	*118.075*
118.100	*ONE ONE EIGHT DECIMAL ONE*	*118.10*	*118.100*

Note 2.— Caution must be exercised with respect to the indication of transmitting channels in VHF radiotelephony communications when five digits of the numerical designator are used in airspace where aircraft are also operated with channel separation capabilities of 8.33/25 kHz. On aircraft installations with a channel separation capability of 8.33 kHz and more, it is possible to select six digits on the radio management panel. It should therefore be ensured that the fifth and sixth digits are set to 25 kHz channels (see Note 1).

Note 3.—The numerical designator corresponds to the channel identification in Annex 10, Volume V, Table 4-1 (bis).

5.2.1.8 *Test procedures*

5.2.1.8.1 **PANS.—** *The form of test transmissions should be as follows:*

a) the identification of the station being called;

b) the aircraft identification;

c) the words "RADIO CHECK";

d) the frequency being used.

5.2.1.8.2 **PANS.—** *The reply to a test transmission should be as follows:*

a) the identification of the aircraft;

b) the identification of the aeronautical station replying;

c) information regarding the readability of the aircraft transmission.

5.2.1.8.3 **PANS.—** *The test transmission and reply thereto should be recorded at the aeronautical station.*

5.2.1.8.4 **PANS.—** *When the tests are made, the following readability scale should be used:*

Readability Scale

1 Unreadable
2 Readable now and then
3 Readable but with difficulty
4 Readable
5 Perfectly readable

5.2.1.9 *Exchange of communications*

5.2.1.9.1 Communications shall be concise and unambiguous, using standard phraseology whenever available.

5.2.1.9.1.1 **Recommendation.—** *Abbreviated procedures should only be used after initial contact has been established and where no confusion is likely to arise.*

5.2.1.9.2 *Acknowledgement of receipt.* The receiving operator shall make certain that the message has been received correctly before acknowledging receipt.

Note.— Acknowledgement of receipt is not to be confused with acknowledgement of intercept in radiotelephony network operations.

5.2.1.9.2.1 When transmitted by an aircraft station, the acknowledgement of receipt of a message shall comprise the call sign of that aircraft.

5.2.1.9.2.2 **PANS.—** *An aircraft station should acknowledge receipt of important air traffic control messages or parts thereof by reading them back and terminating the readback by its radio call sign.*

Note 1.— Air traffic control clearances, instructions and information requiring readback are specified in PANS-ATM (Doc 4444).

Note 2.— The following example illustrates the application of this procedure:

(ATC clearance by network station to an aircraft)

Station:
TWA NINE SIX THREE MADRID

Aircraft:
MADRID TWA NINE SIX THREE — GO AHEAD

Station:
TWA NINE SIX THREE MADRID — ATC CLEARS TWA NINE SIX THREE TO DESCEND TO NINE THOUSAND FEET

Aircraft (acknowledging):
CLEARED TO DESCEND TO NINE THOUSAND FEET — TWA NINE SIX THREE

Station (denoting accuracy of readback):
MADRID

5.2.1.9.2.3 When acknowledgement of receipt is transmitted by an aeronautical station:

1) *to an aircraft station:* it shall comprise the call sign of the aircraft, followed if considered necessary by the call sign of the aeronautical station;

2) *to another aeronautical station:* it shall comprise the call sign of the aeronautical station that is acknowledging receipt.

5.2.1.9.2.3.1 **PANS.—** *An aeronautical station should acknowledge position reports and other flight progress reports by reading back the report and terminating the readback by its call sign, except that the readback procedure may be suspended temporarily whenever it will alleviate congestion on the communication channel.*

5.2.1.9.2.4 **PANS.—** *It is permissible for verification for the receiving station to read back the message as an additional acknowledgement of receipt. In such instances, the station to which the information is read back should acknowledge the correctness of readback by transmitting its call sign.*

5.2.1.9.2.5 **PANS.—** *If both position report and other information — such as weather reports — are received in the same message, the information should be acknowledged with the words such as "WEATHER RECEIVED" after the position report has been read back, except when intercept of the information is required by other network stations. Other messages should be acknowledged, the aeronautical station transmitting its call sign only.*

5.2.1.9.3 *End of conversation.* A radiotelephone conversation shall be terminated by the receiving station using its own call sign.

5.2.1.9.4 *Corrections and repetitions*

5.2.1.9.4.1 When an error has been made in transmission, the word "CORRECTION" shall be spoken, the last correct group or phrase repeated, and then the correct version transmitted.

5.2.1.9.4.2 If a correction can best be made by repeating the entire message, the operator shall use the phrase "CORRECTION, I SAY AGAIN" before transmitting the message a second time.

5.2.1.9.4.3 **Recommendation.—** *When an operator transmitting a message considers that reception is likely to be difficult, he should transmit the important elements of the message twice.*

5.2.1.9.4.4 If the receiving operator is in doubt as to the correctness of the message received, he shall request repetition either in full or in part.

5.2.1.9.4.5 If repetition of an entire message is required, the words "SAY AGAIN" shall be spoken. If repetition of a portion of a message is required, the operator shall state: "SAY AGAIN ALL BEFORE...(first word satisfactorily received)"; or "SAY AGAIN...(word before missing portion) TO...(word after missing portion)"; or "SAY AGAIN ALL AFTER...(last word satisfactorily received)".

5.2.1.9.4.6 **Recommendation.—** *Specific items should be requested, as appropriate, such as "SAY AGAIN ALTIMETER", "SAY AGAIN WIND".*

5.2.1.9.4.7 If, in checking the correctness of a readback, an operator notices incorrect items, he shall transmit the words "NEGATIVE I SAY AGAIN" at the conclusion of the readback followed by the correct version of the items concerned.

5.2.1.9.5 *"Operations normal" reports*

PANS.— *When "operations normal" reports are transmitted by aircraft, they should consist of the prescribed call followed by the words "OPERATIONS NORMAL".*

5.2.2 Establishment and assurance of communications

5.2.2.1 *Communications watch/ Hours of service*

5.2.2.1.1 During flight, aircraft stations shall maintain watch as required by the appropriate Authority and shall not cease watch, except for reasons of safety, without informing the aeronautical station(s) concerned.

5.2.2.1.1.1 Aircraft on long over-water flights, or on flights over designated areas over which the carriage of an emergency locator transmitter (ELT) is required, shall continuously guard the VHF emergency frequency 121.5 MHz, except for those periods when aircraft are carrying out communications on other VHF channels or when airborne equipment limitations or cockpit duties do not permit simultaneous guarding of two channels.

5.2.2.1.1.2 Aircraft shall continuously guard the VHF emergency frequency 121.5 MHz in areas or over routes where the possibility of interception of aircraft or other hazardous situations exist, and a requirement has been established by the appropriate authority.

5.2.2.1.1.3 **Recommendation.—** *Aircraft on flights other than those specified in 5.2.2.1.1.1 and 5.2.2.1.1.2 should guard the emergency frequency 121.5 MHz to the extent possible.*

5.2.2.1.1.4 The user of the air-to-air VHF communications channel shall ensure that adequate watch is maintained on designated ATS frequencies, the frequency of the aeronautical emergency channel, and any other mandatory watch frequencies.

5.2.2.1.2 Aeronautical stations shall maintain watch as required by the appropriate Authority.

5.2.2.1.3 Aeronautical stations shall maintain a continuous listening watch on VHF emergency channel 121.5 MHz during the hours of service of the units at which it is installed.

Note.— See *Annex 10, Volume V, 4.1.3.1.1 for provisions related to the utilization of 121.5 MHz at aeronautical stations.*

5.2.2.1.4 When it is necessary for an aircraft station or aeronautical station to suspend operation for any reason, it shall, if possible, so inform other stations concerned, giving the time at which it is expected that operation will be resumed. When operation is resumed, other stations concerned shall be so informed.

5.2.2.1.4.1 When it is necessary to suspend operation beyond the time specified in the original notice, a revised time of resumption of operation shall, if possible, be transmitted at or near the time first specified.

5.2.2.1.5 **Recommendation.—** *When two or more ATS frequencies are being used by a controller, consideration should be given to providing facilities to allow ATS and aircraft transmissions on any of the frequencies to be simultaneously retransmitted on the other frequencies in use thus permitting aircraft stations within range to hear all transmissions to and from the controller.*

5.2.2.2 *Principles of network operation (HF communications)*

5.2.2.2.1 **PANS.—** *The aeronautical stations of a radiotelephony network should assist each other in accordance with the following network principles, in order to provide the air-ground communication service required of the network by aircraft flying on the air routes for which the network is responsible.*

5.2.2.2.2 **PANS.—** *When the network comprises a large number of stations, network communications for flights on any individual route segment should be provided by selected stations, termed "regular stations" for that segment.*

Note 1.— The selection of stations to act as regular stations for a particular route segment will, where necessary, be undertaken by regional or local agreement, after consultation, if necessary, between the States responsible for the network.

Note 2.— In principle, the regular stations will be those serving the locations immediately concerned with flights on that route segment, i.e. points of take-off and landing, appropriate flight information centres or area control centres and, in some cases, additional suitably located stations required to complete the communication coverage or for intercept purposes.

Note 3.— In selecting the regular stations, account will be taken of the propagation characteristics of the frequencies used.

5.2.2.2.3 **PANS.—** *In areas or on routes where radio conditions, length of flights or distance between aeronautical stations require additional measures to ensure continuity of air-ground communication throughout the route segment, the regular stations should share between them a responsibility of* *primary guard whereby each station will provide the primary guard for that portion of the flight during which the messages from the aircraft can be handled most effectively by that station.*

5.2.2.2.4 **PANS.—** *During its tenure of primary guard, each regular station should, among other things:*

a) be responsible for designating suitable primary and secondary frequencies for its communications with the aircraft;

b) receive all position reports and handle other messages from and to the aircraft essential to the safe conduct of the flight;

*c) be responsible for the action required in case of failure of communications (*see *5.2.2.7.2).*

5.2.2.2.5 **PANS.—** *The transfer of primary guard from one station to the next will normally take place at the time of the traversing of flight information region or control area boundaries, this guard being provided at any time, as far as possible, by the station serving the flight information centre or area control centre in whose area the aircraft is flying. However, where communication conditions so demand, a station may be required to retain primary guard beyond such geographical boundaries or release its guard before the aircraft reaches the boundary, if appreciable improvement in air-ground communication can be effected thereby.*

5.2.2.3 *Frequencies to be used*

5.2.2.3.1 Aircraft stations shall operate on the appropriate radio frequencies.

5.2.2.3.1.1 The air-ground control radio station shall designate the frequency(ies) to be used under normal conditions by aircraft stations operating under its control.

5.2.2.3.1.2 **PANS.—** *In network operation, the initial designation of primary and secondary frequencies should be made by the network station with which the aircraft makes pre-flight check or its initial contact after take-off. This station should also ensure that other network stations are advised, as required, of the frequency(ies) designated.*

5.2.2.3.2 **Recommendation.—** *An aeronautical station, when designating frequencies in accordance with 5.2.2.3.1.1 or 5.2.2.3.1.2, should take into account the appropriate propagation data and distance over which communications are required.*

5.2.2.3.3 **Recommendation.—** *If a frequency designated by an aeronautical station proves to be unsuitable, the aircraft station should suggest an alternative frequency.*

5.2.2.3.4 **PANS.—** *When, notwithstanding the provisions of 5.1.1, air-ground frequencies are used for the exchange between network stations of messages essential for coordination and cooperation between the stations, such communication should, so far as possible, be effected over network frequencies not being used at that time for the bulk of the air-ground traffic. In all cases, the communication with aircraft stations should take priority over the inter-ground station communications.*

5.2.2.4 *Establishment of communications*

5.2.2.4.1 Aircraft stations shall, if possible, communicate directly with the air-ground control radio station appropriate to the area in which the aircraft are flying. If unable to do so, aircraft stations shall use any relay means available and appropriate to transmit messages to the air-ground control radio station.

5.2.2.4.2 When normal communications from an aeronautical station to an aircraft station cannot be established, the aeronautical station shall use any relay means available and appropriate to transmit messages to the aircraft station. If these efforts fail, the originator shall be advised in accordance with procedures prescribed by the appropriate Authority.

5.2.2.4.3 **PANS.—** *When, in network operation, communication between an aircraft station and a regular station has not been established after calls on the primary and secondary frequencies, aid should be rendered by one of the other regular stations for that flight, either by calling the attention of the station first called or, in the case of a call made by an aircraft station, by answering the call and taking the traffic.*

5.2.2.4.3.1 **PANS.—** *Other stations of the network should render assistance by taking similar action only if attempts to establish communications by the regular stations have proved unsuccessful.*

5.2.2.4.4 **PANS.—** *The provisions of 5.2.2.4.3 and 5.2.2.4.3.1 should also be applied:*

a) on request of the air traffic services unit concerned;

b) when an expected communication from an aircraft has not been received within a time period such that the occurrence of a communication failure is suspected.

Note.— A specific time period may be prescribed by the appropriate ATS Authority.

5.2.2.5 *Transfer of HF communications*

5.2.2.5.1 **PANS.—** *An aircraft station should be advised by the appropriate aeronautical station to transfer from one radio frequency or network to another. In the absence of such advice, the aircraft station should notify the appropriate aeronautical station before such transfer takes place.*

5.2.2.5.2 **PANS.—** *In the case of transfer from one network to another, the transfer should preferably take place while the aircraft is in communication with a station operating in both networks to ensure continuity of communications. If, however, the change of network must take place concurrently with the transfer of communication to another network station, the transfer should be coordinated by the two network stations prior to advising or authorizing the frequency change. The aircraft should also be advised of the primary and secondary frequencies to be used after the transfer.*

5.2.2.5.3 An aircraft station which has transferred communications watch from one radio frequency to another shall, when so required by the appropriate ATS Authority, inform the aeronautical station concerned that communications watch has been established on the new frequency.

5.2.2.5.4 **PANS.—** *When entering a network after take-off, an aircraft station should transmit its take-off time or time over the last check-point, to the appropriate regular station.*

5.2.2.5.5 **PANS.—** *When entering a new network, an aircraft station should transmit the time over the last checkpoint, or of its last reported position, to the appropriate regular station.*

5.2.2.5.6 **PANS.—** *Before leaving the network, an aircraft station should in all cases advise the appropriate regular station of its intention to do so by transmitting one of the following phrases, as appropriate:*

a) *when transferring to a pilot-to-controller channel:*
   Aircraft: CHANGING TO . . . *(air traffic services unit concerned)*

b) *after landing:*
   Aircraft: LANDED . . . *(location)* . . . *(time)*

5.2.2.6 *Transfer of VHF communications*

5.2.2.6.1 An aircraft shall be advised by the appropriate aeronautical station to transfer from one radio frequency to another in accordance with agreed procedures. In the absence of such advice, the aircraft station shall notify the appropriate aeronautical station before such a transfer takes place.

5.2.2.6.2 When establishing initial contact on, or when leaving, a VHF frequency, an aircraft station shall transmit such information as may be prescribed by the appropriate Authority.

5.2.2.7 *Communications failure*

5.2.2.7.1 *Air-ground*

5.2.2.7.1.1 When an aircraft station fails to establish contact with the aeronautical station on the designated frequency, it shall attempt to establish contact on another frequency appropriate to the route. If this attempt fails, the aircraft station shall attempt to establish communication with other aircraft or other aeronautical stations on frequencies appropriate to the route. In addition, an aircraft operating within a network shall monitor the appropriate VHF frequency for calls from nearby aircraft.

5.2.2.7.1.2 If the attempts specified under 5.2.2.7.1.1 fail, the aircraft station shall transmit its message twice on the designated frequency(ies), preceded by the phrase “TRANSMITTING BLIND” and, if necessary, include the addressee(s) for which the message is intended.

5.2.2.7.1.2.1 **PANS.—** *In network operation, a message which is transmitted blind should be transmitted twice on both primary and secondary frequencies. Before changing frequency, the aircraft station should announce the frequency to which it is changing.*

5.2.2.7.1.3 *Receiver failure*

5.2.2.7.1.3.1 When an aircraft station is unable to establish communication due to receiver failure, it shall transmit reports at the scheduled times, or positions, on the frequency in use, preceded by the phrase “TRANSMITTING BLIND DUE TO RECEIVER FAILURE”. The aircraft station shall transmit the intended message, following this by a complete repetition. During this procedure, the aircraft shall also advise the time of its next intended transmission.

5.2.2.7.1.3.2 An aircraft which is provided with air traffic control or advisory service shall, in addition to complying with 5.2.2.7.1.3.1, transmit information regarding the intention of the pilot-in-command with respect to the continuation of the flight of the aircraft.

5.2.2.7.1.3.3 When an aircraft is unable to establish communication due to airborne equipment failure it shall, when so equipped, select the appropriate SSR code to indicate radio failure.

Note.— General rules which are applicable in the event of communications failure are contained in Annex 2 to the Convention.

5.2.2.7.2 *Ground-to-air*

5.2.2.7.2.1 When an aeronautical station has been unable to establish contact with an aircraft station after calls on the frequencies on which the aircraft is believed to be listening, it shall:

a) request other aeronautical stations to render assistance by calling the aircraft and relaying traffic, if necessary;

b) request aircraft on the route to attempt to establish communication with the aircraft and relay traffic, if necessary.

5.2.2.7.2.2 The provisions of 5.2.2.7.2.1 shall also be applied:

a) on request of the air traffic services unit concerned;

b) when an expected communication from an aircraft has not been received within a time period such that the occurrence of a communication failure is suspected.

Note.— A specific time period may be prescribed by the appropriate ATS Authority.

5.2.2.7.2.3 **Recommendation.—** *If the attempts specified in 5.2.2.7.2.1 fail, the aeronautical station should transmit messages addressed to the aircraft, other than messages containing air traffic control clearances, by blind transmission on the frequency(ies) on which the aircraft is believed to be listening.*

5.2.2.7.2.4 Blind transmission of air traffic control clearances shall not be made to aircraft, except at the specific request of the originator.

5.2.2.7.3 *Notification of communications failure.* The air-ground control radio station shall notify the appropriate air traffic services unit and the aircraft operating agency, as soon as possible, of any failure in air-ground communication.

5.2.3 HF message handling

5.2.3.1 *General*

5.2.3.1.1 **PANS.—** *When operating within a network, an aircraft station should, in principle, whenever communications conditions so permit, transmit its messages to the stations of the network from which they can be most readily delivered to their ultimate destinations. In particular, aircraft reports required by air traffic services should be transmitted to the network station serving the flight information centre or area control centre in whose area the aircraft is flying. Conversely, messages to aircraft in flight should, whenever possible, be transmitted directly to the aircraft by the network station serving the location of the originator.*

Note.— Exceptionally, an aircraft may need to communicate with an aeronautical station outside the network appropriate to its particular route segment. This is permissible, provided it can be done without interrupting the continuous watch with the communication network appropriate to the route segment, when such watch is required by the appropriate ATS Authority, and provided it does not cause undue interference with the operation of other aeronautical stations.

5.2.3.1.2 **PANS.—** *Messages passed from an aircraft to a network station should, whenever possible, be intercepted and acknowledged by other stations of the network, which serve locations where the information is also required.*

Note 1.— Determination of the arrangements for dissemination of air-ground messages without address will be a matter for multilateral or local agreement.

Note 2.— In principle, the number of stations required to intercept are to be kept to a minimum consistent with the operational requirement.

5.2.3.1.2.1 **PANS.—** *Acknowledgement of intercept should be made immediately after the acknowledgement of receipt by the station to which the message was passed.*

5.2.3.1.2.2 **PANS.—** *Acknowledgement of an intercept message should be made by transmitting the radio call sign of the station having intercepted the message, followed by the word ROGER, if desired, and the call sign of the station having transmitted the message.*

5.2.3.1.2.3 **PANS.—** *In the absence of acknowledgement of intercept within one minute, the station accepting the message from the aircraft should forward it, normally over the aeronautical fixed service, to the station(s) which have failed to acknowledge intercept.*

5.2.3.1.2.3.1 **PANS.—** *If, in abnormal circumstances, forwarding is necessary using the air-ground channels, the provisions of 5.2.2.3.4 should be observed.*

5.2.3.1.2.4 **PANS.—** *When such forwarding is done over the aeronautical fixed telecommunication network, the messages should be addressed to the network station(s) concerned.*

5.2.3.1.2.5 **PANS.—** *The station(s) to which the messages have been forwarded should carry out local distribution of them in the same way as if they had been received directly from the aircraft over the air-ground channel.*

5.2.3.1.2.6 The aeronautical station receiving an air-report or a message containing meteorological information transmitted by an aircraft in flight shall forward the message without delay:

1) to the air traffic services unit and meteorological offices associated with the station;

2) to the aircraft operating agency concerned or its representative when that agency has made a specific request to receive such messages.

5.2.3.1.3 **PANS.—** *The provisions of 5.2.3.1.2 should also be applied, if practicable, in non-network operation.*

5.2.3.1.4 **Recommendation.—** *When a message addressed to an aircraft in flight is received by the aeronautical station included in the address, and when that station is not able to establish communication with the aircraft to which the message is addressed, the message should be forwarded to those aeronautical stations on the route which may be able to establish communication with the aircraft.*

Note.— This does not preclude the transmission by the forwarding aeronautical station, of the original message to the aircraft addressed, if the forwarding station is later able to communicate with that aircraft.

5.2.3.1.4.1 **Recommendation.—** *If the aeronautical station to which the message is addressed is unable to dispose of the message in accordance with 5.2.3.1.4, the station of origin should be advised.*

5.2.3.1.4.2 The aeronautical station forwarding the message shall amend the address thereof, by substituting for its own location indicator the location indicator of the aeronautical station to which the message is being forwarded.

5.2.3.2 *Transmission of ATS messages to aircraft*

5.2.3.2.1 **PANS.—** *If it is not possible to deliver an ATS message to the aircraft within the time specified by ATS, the aeronautical station should notify the originator. Thereafter, it should take no further action with respect to this message unless specifically instructed by ATS.*

5.2.3.2.2 **PANS.—** *If delivery of an ATS message is uncertain because of inability to secure an acknowledgement, the aeronautical station should assume that the message has not been received by the aircraft and should advise the originator immediately that, although the message has been transmitted, it has not been acknowledged.*

5.2.3.2.3 **PANS.—** *The aeronautical station, having received the message from ATS, should not delegate to another station the responsibility for delivery of the message to the aircraft. However, in case of communication difficulties, other stations should assist, when requested, in relaying the message to the aircraft. In this case, the station having received the message from ATS should obtain without delay definite assurance that the aircraft has correctly acknowledged the message.*

5.2.3.3 *Recording of air-ground communications on teletypewriter*

5.2.3.3.1 **PANS.—** *When recording on teletypewriter, the following procedure should be used:*

a) each line should begin at the left margin;

b) a new line should be used for each transmission;

c) each communication should contain some or all of the following items in the order shown:

1) call sign of the calling station;

2) text of the message;

3) call sign of the station called or the receiving station, followed by the appropriate abbreviation to indicate "Received", "Readback", or "No reply heard";

4) call sign of station(s) acknowledging intercept followed by appropriate abbreviation to indicate "Received";

5) designation of frequency used;

6) time in UTC of the communication;

d) missing parts of the message text should be indicated by typing the three periods (space . space . space . space) or three letters M (space M space M space M space);

e) correction of typing errors should be made by keyboard manipulation (space E space E space E space), followed by the correct information. Errors detected after the completion of the entry should be corrected after the last entry, using the abbreviation COR, followed by the correct information.

5.2.4 SELCAL procedures

Note.— The procedures contained in 5.2.4 are applicable when SELCAL is used and replace certain of the procedures related to calling contained in 5.2.1.

5.2.4.1 *General*

5.2.4.1.1 **PANS.—** *With the selective calling system known as SELCAL, the voice calling is replaced by the transmission of coded tones to the aircraft over the radiotelephony channels. A single selective call consists of a combination of four pre-selected audio tones whose transmission requires approximately 2 seconds. The tones are generated in the aeronautical station coder and are received by a decoder connected to the audio output of the airborne receiver. Receipt of the assigned tone code (SELCAL code) activates a cockpit call system in the form of light and/or chime signals.*

Note.— Due to the limited number of SELCAL codes, similar code assignments to multiple aircraft may be expected.

Therefore, the use of correct radiotelephony (RTF) procedures contained in this chapter is emphasized when establishing communications via SELCAL.

5.2.4.1.2 **PANS.—** *SELCAL should be utilized by suitably equipped stations for ground-to-air selective calling on the en-route HF and VHF radio channels.*

5.2.4.1.3 **PANS.—** *On aircraft equipped with SELCAL, the pilot is still able to keep a conventional listening watch if required.*

5.2.4.2 *Notification to aeronautical stations of aircraft SELCAL codes*

5.2.4.2.1 **PANS.—** *It is the responsibility of the aircraft operating agency and the aircraft to ensure that all aeronautical stations, with which the aircraft would normally communicate during a particular flight, know the SELCAL code associated with its radiotelephony call sign.*

5.2.4.2.2 **PANS.—** *When practicable, the aircraft operating agency should disseminate to all aeronautical stations concerned, at regular intervals, a list of SELCAL codes assigned to its aircraft or flights.*

5.2.4.2.3 **PANS.—** *The aircraft should:*

a) include the SELCAL code in the flight plan submitted to the appropriate air traffic services unit; and

b) ensure that the HF aeronautical station has the correct SELCAL code information by establishing communications temporarily with the HF aeronautical station while still within VHF coverage.

Note.— Provisions regarding completion of the flight plan are set forth in the PANS-ATM (Doc 4444).

5.2.4.3 *Pre-flight check*

5.2.4.3.1 **PANS.—** *The aircraft station should contact the appropriate aeronautical station and request a pre-flight SELCAL check and, if necessary, give its SELCAL code.*

5.2.4.3.2 **PANS.—** *When primary and secondary frequencies are assigned, a SELCAL check should normally be made first on the secondary frequency and then on the primary frequency. The aircraft station would then be ready for continued communication on the primary frequency.*

5.2.4.3.3 **PANS.—** *Should the pre-flight check reveal that either the ground or airborne SELCAL installation is inoperative, the aircraft should maintain a continuous listening watch on its subsequent flight until SELCAL again becomes available.*

5.2.4.4 *Establishment of communications*

5.2.4.4.1 **PANS.—** *When an aeronautical station initiates a call by SELCAL, the aircraft replies with its radio call sign, followed by the phrase "GO AHEAD".*

5.2.4.5 *En-route procedures*

5.2.4.5.1 **PANS.—** *Aircraft stations should ensure that the appropriate aeronautical station(s) are aware that SELCAL watch is being established or maintained.*

5.2.4.5.2 **PANS.—** *When so prescribed on the basis of regional air navigation agreements, calls for scheduled reports from aircraft may be initiated by an aeronautical station by means of SELCAL.*

5.2.4.5.3 **PANS.—** *Once SELCAL watch has been established by a particular aircraft station, aeronautical stations should employ SELCAL whenever they require to call aircraft.*

5.2.4.5.4 **PANS.—** *In the event the SELCAL signal remains unanswered after two calls on the primary frequency and two calls on the secondary frequency, the aeronautical station should revert to voice calling.*

5.2.4.5.5 **PANS.—** *Stations in a network should keep each other immediately advised when malfunctioning occurs in a SELCAL installation on the ground or in the air. Likewise, the aircraft should ensure that the aeronautical stations concerned with its flight are immediately made aware of any malfunctioning of its SELCAL installation, and that voice calling is necessary.*

5.2.4.5.6 **PANS.—** *All stations should be advised when the SELCAL installation is again functioning normally.*

5.2.4.6 *SELCAL code assignment to aircraft*

5.2.4.6.1 **PANS.—** *In principle, the SELCAL code in the aircraft should be associated with the radiotelephony call sign, i.e. where the flight number (service number) is employed in the radio call sign, the SELCAL code in the aircraft should be listed against the flight number. In all other cases, the SELCAL code in the aircraft should be listed against the aircraft registration.*

Note.— The use of aircraft radio call signs, consisting of the airline abbreviation followed by the flight service number, is increasing among aircraft operators throughout the world. The SELCAL equipment in aircraft should, therefore, be of a type which permits a particular code being associated with a particular flight number, i.e. equipment which is capable of adjustment in code combinations. At this stage, however, many aircraft still carry SELCAL equipment of the single code type, *and it will not be possible for aircraft with such equipment to satisfy the principle set out above. This should not militate against use of the flight number type of radio call sign by an aircraft so equipped if it wishes to apply this type of call sign, but it is essential when a single code airborne equipment is used in conjunction with a flight number type radio call sign that the ground stations be advised in connection with each flight of the SELCAL code available in the aircraft.*

5.3 Distress and urgency radiotelephony communication procedures

5.3.1 General

Note.— The distress and urgency procedures contained in 5.3 relate to the use of radiotelephony. The provisions of Article S30 and Appendix S13 of the ITU Radio Regulations are generally applicable, except that S30.9 permits other procedures to be employed where special arrangements between governments exist, and are also applicable to radiotelephony communications between aircraft stations and stations in the maritime mobile service.

5.3.1.1 Distress and urgency traffic shall comprise all radiotelephony messages relative to the distress and urgency conditions respectively. Distress and urgency conditions are defined as:

a) *Distress:* a condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.

b) *Urgency:* a condition concerning the safety of an aircraft or other vehicle, or of some person on board or within sight, but which does not require immediate assistance.

5.3.1.2 The radiotelephony distress signal MAYDAY and the radiotelephony urgency signal PAN PAN shall be used at the commencement of the first distress and urgency communication respectively.

5.3.1.2.1 At the commencement of any subsequent communication in distress and urgency traffic, it shall be permissible to use the radiotelephony distress and urgency signals.

5.3.1.3 The originator of messages addressed to an aircraft in distress or urgency condition shall restrict to the minimum the number and volume and content of such messages as required by the condition.

5.3.1.4 If no acknowledgement of the distress or urgency message is made by the station addressed by the aircraft, other stations shall render assistance, as prescribed in 5.3.2.2 and 5.3.3.2 respectively.

Note.— "Other stations" is intended to refer to any other station which has received the distress or urgency message and has become aware that it has not been acknowledged by the station addressed.

5.3.1.5 Distress and urgency traffic shall normally be maintained on the frequency on which such traffic was initiated until it is considered that better assistance can be provided by transferring that traffic to another frequency.

Note.— 121.5 MHz or alternative available VHF or HF frequencies may be used as appropriate.

5.3.1.6 In cases of distress and urgency communications, in general, the transmissions by radiotelephony shall be made slowly and distinctly, each word being clearly pronounced to facilitate transcription.

5.3.2 Radiotelephony distress communications

5.3.2.1 *Action by the aircraft in distress*

5.3.2.1.1 In addition to being preceded by the radiotelephony distress signal MAYDAY (*see* 5.3.1.2), preferably spoken three times, the distress message to be sent by an aircraft in distress shall:

a) be on the air-ground frequency in use at the time;

b) consist of as many as possible of the following elements spoken distinctly and, if possible, in the following order:

   1) name of the station addressed (time and circumstances permitting);

   2) the identification of the aircraft;

   3) the nature of the distress condition;

   4) intention of the person in command;

   5) present position, level (i.e. flight level, altitude, etc., as appropriate) and heading.

Note 1.— The foregoing provisions may be supplemented by the following measures:

a) the distress message of an aircraft in distress being made on the emergency frequency 121.5 MHz or another aeronautical mobile frequency, if considered necessary or desirable. Not all aeronautical stations maintain a continuous guard on the emergency frequency;

b) the distress message of an aircraft in distress being broadcast, if time and circumstances make this course preferable;

c) the aircraft transmitting on the maritime mobile service radiotelephony calling frequencies;

d) the aircraft using any means at its disposal to attract attention and make known its conditions (including the activation of the appropriate SSR mode and code);

e) any station taking any means at its disposal to assist an aircraft in distress;

f) any variation on the elements listed under 5.3.2.1.1 b), when the transmitting station is not itself in distress, provided that such circumstance is clearly stated in the distress message.

Note 2.— The station addressed will normally be that station communicating with the aircraft or in whose area of responsibility the aircraft is operating.

5.3.2.2 *Action by the station addressed or first station acknowledging the distress message*

5.3.2.2.1 The station addressed by aircraft in distress, or first station acknowledging the distress message, shall:

a) immediately acknowledge the distress message;

b) take control of the communications or specifically and clearly transfer that responsibility, advising the aircraft if a transfer is made;

c) take immediate action to ensure that all necessary information is made available, as soon as possible, to:

1) the ATS unit concerned;

2) the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements;

Note.— The requirement to inform the aircraft operating agency concerned does not have priority over any other action which involves the safety of the flight in distress, or of any other flight in the area, or which might affect the progress of expected flights in the area.

d) warn other stations, as appropriate, in order to prevent the transfer of traffic to the frequency of the distress communication.

5.3.2.3 *Imposition of silence*

5.3.2.3.1 The station in distress, or the station in control of distress traffic, shall be permitted to impose silence, either on all stations of the mobile service in the area or on any station which interferes with the distress traffic. It shall address these instructions "to all stations", or to one station only, according to circumstances. In either case, it shall use:

— STOP TRANSMITTING;

— the radiotelephony distress signal MAYDAY.

5.3.2.3.2 The use of the signals specified in 5.3.2.3.1 shall be reserved for the aircraft station in distress and for the station controlling the distress traffic.

5.3.2.4 *Action by all other stations*

5.3.2.4.1 The distress communications have absolute priority over all other communications, and a station aware of them shall not transmit on the frequency concerned, unless:

a) the distress is cancelled or the distress traffic is terminated;

b) all distress traffic has been transferred to other frequencies;

c) the station controlling communications gives permission;

d) it has itself to render assistance.

5.3.2.4.2 Any station which has knowledge of distress traffic, and which cannot itself assist the station in distress, shall nevertheless continue listening to such traffic until it is evident that assistance is being provided.

5.3.2.5 *Termination of distress communications and of silence*

5.3.2.5.1 When an aircraft is no longer in distress, it shall transmit a message cancelling the distress condition.

5.3.2.5.2 When the station which has controlled the distress communication traffic becomes aware that the distress condition is ended, it shall take immediate action to ensure that this information is made available, as soon as possible, to:

1) the ATS unit concerned;

2) the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements.

5.3.2.5.3 The distress communication and silence conditions shall be terminated by transmitting a message, including the words "DISTRESS TRAFFIC ENDED", on the frequency or frequencies being used for the distress traffic. This message shall be originated only by the station controlling the communications when, after the reception of the message prescribed in 5.3.2.5.1, it is authorized to do so by the appropriate authority.

5.3.3 Radiotelephony urgency communications

5.3.3.1 *Action by the aircraft reporting an urgency condition except as indicated in 5.3.3.4*

5.3.3.1.1 In addition to being preceded by the radiotelephony urgency signal PAN PAN (*see* 5.3.1.2), preferably spoken three times and each word of the group pronounced as the French word "panne", the urgency message to be sent by an aircraft reporting an urgency condition shall:

a) be on the air-ground frequency in use at the time;

b) consist of as many as required of the following elements spoken distinctly and, if possible, in the following order:

1) the name of the station addressed;

2) the identification of the aircraft;

3) the nature of the urgency condition;

4) the intention of the person in command;

5) present position, level (i.e. flight level, altitude, etc., as appropriate) and heading;

6) any other useful information.

Note 1.— The foregoing provisions of 5.3.3.1.1 are not intended to prevent an aircraft broadcasting an urgency message, if time and circumstances make this course preferable.

Note 2.— The station addressed will normally be that station communicating with the aircraft or in whose area of responsibility the aircraft is operating.

5.3.3.2 *Action by the station addressed or first station acknowledging the urgency message*

5.3.3.2.1 The station addressed by an aircraft reporting an urgency condition, or first station acknowledging the urgency message, shall:

a) acknowledge the urgency message;

b) take immediate action to ensure that all necessary information is made available, as soon as possible, to:

1) the ATS unit concerned;

2) the aircraft operating agency concerned, or its representative, in accordance with pre-established arrangements;

Note.— The requirement to inform the aircraft operating agency concerned does not have priority over any other action which involves the safety of the flight in distress, or of any other flight in the area, or which might affect the progress of expected flights in the area.

c) if necessary, exercise control of communications.

5.3.3.3 *Action by all other stations*

5.3.3.3.1 The urgency communications have priority over all other communications, except distress, and all stations shall take care not to interfere with the transmission of urgency traffic.

5.3.3.4 *Action by an aircraft used for medical transports*

5.3.3.4.1 The use of the signal described in 5.3.3.4.2 shall indicate that the message which follows concerns a protected medical transport pursuant to the 1949 Geneva Conventions and Additional Protocols.

5.3.3.4.2 For the purpose of announcing and identifying aircraft used for medical transports, a transmission of the radiotelephony urgency signal PAN PAN, preferably spoken three times, and each word of the group pronounced as the French word "panne", shall be followed by the radiotelephony signal for medical transports MAY-DEE-CAL, pronounced as in the French "médical". The use of the signals described above indicates that the message which follows concerns a protected medical transport. The message shall convey the following data:

a) the call sign or other recognized means of identification of the medical transports;

b) position of the medical transports;

c) number and type of medical transports;

d) intended route;

e) estimated time en route and of departure and arrival, as appropriate; and

f) any other information such as flight altitude, radio frequencies guarded, languages used, and secondary surveillance radar modes and codes.

5.3.3.5 *Action by the station addressed or by other stations receiving a medical transports message*

5.3.3.5.1 The provisions of 5.3.3.2 and 5.3.3.3 shall apply as appropriate to stations receiving a medical transports message.

5.4 Communications related to acts of unlawful interference

The station addressed by an aircraft being subjected to an act of unlawful interference, or first station acknowledging a call from such aircraft, shall render all possible assistance, including notification of appropriate ATS units as well as any other station, agency or person in a position to facilitate the flight.

CHAPTER 6. AERONAUTICAL RADIO NAVIGATION SERVICE

6.1 General

6.1.1 The aeronautical radio navigation service shall comprise all types and systems of radio navigation aids in the international aeronautical service.

6.1.2 An aeronautical radio navigation aid which is not in continuous operation shall, if practicable, be put into operation on receipt of a request from an aircraft, any controlling authority on the ground, or an authorized representative of an aircraft operating agency.

6.1.2.1 **Recommendation.—** *Requests from aircraft should be made to the aeronautical station concerned on the air-ground frequency normally in use.*

6.1.3 Arrangements shall be made for the local aeronautical information service unit to receive without delay essential information about changes in the operational status of non-visual aids as required for pre-flight briefing and dissemination in accordance with the provisions of Annex 15.

6.2 Direction finding

Introductory Notes

1) Direction-finding stations work either singly or in groups of two or more stations under the direction of a main direction-finding station.

2) A direction-finding station working alone can only determine the direction of an aircraft in relation to itself.

6.2.1 **Recommendation.—** *A direction-finding station working alone should give the following, as requested:*

1) true bearing of the aircraft, using the appropriate phrase;

2) true heading to be steered by the aircraft, with no wind, to head for the direction-finding station using the appropriate phrase;

3) magnetic bearing of the aircraft, using the appropriate phrase;

4) magnetic heading to be steered by the aircraft with no wind to make for the station, using the appropriate phrase.

6.2.2 **Recommendation.—** *When direction-finding stations work as a network to determine the position of an aircraft, the bearings taken by each station should be sent immediately to the station controlling the direction-finding network to enable the position of the aircraft to be determined.*

6.2.2.1 **Recommendation.—** *The station controlling the network should, on request, give the aircraft its position in one of the following ways:*

1) position in relation to a point of reference or in latitude and longitude, using the appropriate phrase;

2) true bearing of the aircraft in relation to the direction-finding station or other specified point, using the appropriate phrase, and its distance from the direction-finding station or point, using the appropriate phrase;

3) magnetic heading to steer with no wind, to make for the direction-finding station or other specified point using the appropriate phrase, and its distance from the direction-finding station or point, using the appropriate phrase.

6.2.3 Aircraft stations shall normally make requests for bearings, courses or positions, to the aeronautical station responsible, or to the station controlling the direction-finding network.

6.2.4 To request a bearing, heading or position, the aircraft station shall call the aeronautical station or the direction-finding control station on the listening frequency. The aircraft shall then specify the type of service that is desired by the use of the appropriate phrase.

6.2.5 As soon as the direction-finding station or group of stations is ready, the station originally called by the aircraft station shall where necessary request transmission for direction-finding service and, if necessary, indicate the frequency to be used by the aircraft station, the number of times the transmission should be repeated, the duration of the transmission required or any special transmission requirement.

6.2.5.1 In radiotelephony, an aircraft station which requests a bearing shall end the transmission by repeating its call sign. If the transmission has been too short for the direction-finding station to obtain a bearing, the aircraft shall give a longer transmission for two periods of approximately ten seconds, or alternatively provide such other signals as may be requested by the direction-finding station.

Note.— Certain types of VHF/DF stations require the provision of a modulated signal (voice transmission) in order to take a bearing.

6.2.6 When a direction-finding station is not satisfied with its observation, it shall request the aircraft station to repeat the transmission.

6.2.7 When a heading or bearing has been requested, the direction-finding station shall advise the aircraft station in the following form:

1) the appropriate phrase;

2) bearing or heading in degrees in relation to the direction-finding station, sent as three figures;

3) class of bearing;

4) time of observation, if necessary.

6.2.8 When a position has been requested, the direction-finding control station, after plotting all simultaneous observations, shall determine the observed position of the aircraft and shall advise the aircraft station in the following form:

1) the appropriate phrase;

2) the position;

3) class of position;

4) time of observation.

6.2.9 As soon as the aircraft station has received the bearing, heading or position, it shall repeat back the message for confirmation or correction.

6.2.10 When positions are given by bearing or heading and distance from a known point other than the station making the report, the reference point shall be an aerodrome, prominent town or geographic feature. An aerodrome shall be given in preference to other places. When a large city or town is used as a reference place, the bearing or heading, and the distance given shall be measured from its centre.

6.2.11 When the position is expressed in latitude and longitude, groups of figures for degrees and minutes shall be used followed by the letter N or S for latitude and the letter E or W for longitude, respectively. In radiotelephony the words NORTH, SOUTH, EAST or WEST shall be used.

6.2.12 According to the estimate by the direction-finding station of the accuracy of the observations, bearings and positions shall be classified as follows:

Bearings:

Class A — accurate within plus or minus 2 degrees;

Class B — accurate within plus or minus 5 degrees;

Class C — accurate within plus or minus 10 degrees;

Class D — accuracy less than Class C.

Positions:

Class A — accurate within 9.3 km (5 NM);

Class B — accurate within 37 km (20 NM);

Class C — accurate within 92 km (50 NM);

Class D — accuracy less than Class C.

6.2.13 Direction-finding stations shall have authority to refuse to give bearings, heading or positions when conditions are unsatisfactory or when bearings do not fall within the calibrated limits of the station, stating the reason at the time of refusal.

CHAPTER 7. AERONAUTICAL BROADCASTING SERVICE

7.1 General

7.1.1 Broadcast material

The text of broadcast material shall be prepared by the originator in the form desired for transmission.

7.1.2 Frequencies and schedules

7.1.2.1 Broadcasts shall be made on specified frequencies and at specified times.

7.1.2.2 Schedules and frequencies of all broadcasts shall be publicized in appropriate documents. Any change in frequencies or times shall be publicized by NOTAM at least two weeks in advance of the change.* Additionally, any such change shall, if practicable, be announced on all regular broadcasts for 48 hours preceding the change and shall be transmitted once at the beginning and once at the end of each broadcast.

*****_Note.— This does not prevent an emergency change of frequency when required in circumstances which do not permit the promulgation of a NOTAM at least two weeks in advance of the change._

7.1.2.3 Scheduled broadcasts (other than sequential collective type broadcasts), shall be started at the scheduled time by the general call. If a broadcast must be delayed, a short notice shall be transmitted at the scheduled time advising recipients to "stand by" and stating the approximate number of minutes of delay.

7.1.2.3.1 After definite advice has been given to stand by for a certain period, the broadcast shall not be started until the end of the standby period.

7.1.2.4 Where broadcasts are conducted on a time-allotment basis, transmission shall be terminated by each station promptly at the end of the allotted time period whether or not transmission of all material has been completed.

7.1.2.4.1 In sequential collective type broadcasts each station shall be ready to commence its broadcasts at the designated time. If for any reason a station does not commence its broadcast at the designated time, the station immediately following in sequence shall wait and then commence its broadcast at its own designated time.

7.1.3 Interruption of service

In the event of interruption of service at the station responsible for a broadcast, the broadcast shall, if possible, be made by another station until normal service is resumed. If this is not possible, and the broadcast is of the type intended for interception by fixed stations, the stations which are required to copy the broadcasts shall continue to listen on the specified frequencies until normal service is resumed.

7.2 Radiotelephone broadcast procedures

7.2.1 Broadcast technique

7.2.1.1 Transmissions by radiotelephone shall be as natural, short and concise as practicable consistent with clarity.

7.2.1.2 Rate of speech on radiotelephone broadcasts shall not exceed 100 words per minute.

7.2.2 Preamble of the general call

The preamble of each radiotelephone broadcast shall consist of the general call, station name, and optionally the time of broadcast (UTC).

Note.— The following example illustrates the application of this procedure:

(general call)	*ALL STATIONS*
(the words THIS IS)	*THIS IS*
(station name)	*NEW YORK RADIO*
(time of broadcast)	*TIME, ZERO ZERO FOUR FIVE*

CHAPTER 8. AERONAUTICAL MOBILE SERVICE — DATA LINK COMMUNICATIONS

8.1 General

Note 1.— While the provisions of Chapter 8 are based primarily on the use of controller-pilot data link communications (CPDLC), the provisions of 8.1 would apply to other data link applications, where applicable, including Data link—flight information services (e.g. D-ATIS, D-VOLMET, etc.).

Note 2.— For the purposes of these provisions, the communication procedures applicable to the aeronautical mobile service, as appropriate, also apply to the aeronautical mobile satellite service.

8.1.1 Composition of data link messages

8.1.1.1 The text of messages shall be composed in standard message format (e.g. CPDLC message set), in plain language or in abbreviations and codes, as prescribed in 3.7. Plain language shall be avoided when the length of the text can be reduced by using appropriate abbreviations and codes. Non-essential words and phrases, such as expressions of politeness, shall not be used.

8.1.1.2 The following characters are allowed in the composition of messages:

Letters: ABCDEFGHIJKLMNOPQRSTUVWXYZ (upper case only)

Figures: 1 2 3 4 5 6 7 8 9 0

Other signs:	-	(hyphen)
	?	(question mark)
	:	(colon)
	(	(open bracket)
	)	(close bracket)
	.	(full stop, period, or decimal point)
	,	(comma)
	’	(apostrophe)
	=	(double hyphen or equal sign)
	/	(oblique)
	+	(plus sign)

and the space character.

Characters other than those listed above shall not be used in messages.

8.1.1.3 Roman numerals shall not be employed. If the originator of a message wishes the addressee to be informed that Roman figures are intended, the Arabic figure or figures shall be written and preceded by the word ROMAN.

8.1.2 Display of data link messages

8.1.2.1 Ground and airborne systems shall allow for messages to be appropriately displayed, printed when required, and stored in a manner that permits timely and convenient retrieval should such action be necessary.

8.1.2.2 Whenever textual presentation is required, the English language shall be displayed as a minimum.

8.2 CPDLC procedures

Note.— The CPDLC message set referred to in this section can be found in the PANS-ATM, Appendix 5.

8.2.1 In all communications the highest standard of discipline shall be observed at all times.

8.2.1.1 **Recommendation.—** *Consequences of human performance, which could affect the accurate reception and comprehension of messages, should be taken into consideration when composing a message.*

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683) and* Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

8.2.2 Ground and airborne systems shall provide controllers and pilots with the capability to review and validate any operational messages they send.

8.2.3 Ground and airborne systems shall provide controllers and pilots with the capability to review, validate and when applicable, acknowledge any operational messages they receive.

8.2.4 The controller shall be provided with the capability to respond to messages, including emergencies, to issue clearances, instructions and advisories, and to request and provide information, as appropriate.

8.2.5 The pilot shall be provided with the capability to respond to messages, to request clearances and information, to report information, and to declare or cancel an emergency.

8.2.6 The pilot and the controller shall be provided with the capability to exchange messages which do not conform to defined formats (i.e. free text messages).

8.2.7 Unless specified by the appropriate ATS authority, voice read-back of CPDLC messages shall not be required.

8.2.8 Establishment of CPDLC

8.2.8.1 The controller and the pilot shall be informed when CPDLC has been successfully established.

8.2.8.2 **PANS.—** *CPDLC shall be established in sufficient time to ensure that the aircraft is communicating with the appropriate ATC unit.*

8.2.8.3 The controller and pilot shall be informed when CPDLC is available for operational use, at initial establishment, as well as on resumption of CPDLC after a failure.

8.2.8.4 The pilot shall be able to identify the air traffic control unit providing the air traffic control service at any time while the service is being provided.

8.2.8.5 When the airborne system detects that CPDLC is available for operational use, it shall send the CPDLC downlink message element CURRENT DATA AUTHORITY.

8.2.8.6 *Airborne-initiated CPDLC*

8.2.8.6.1 **PANS.—** *When an ATC unit receives an unexpected request for CPDLC from an aircraft, the circumstances leading to the request shall be obtained from the aircraft to determine further action.*

8.2.8.6.2 **PANS.—** *When the ATC unit rejects a request for CPDLC, it shall provide the pilot with the reason for the rejection using an appropriate CPDLC message.*

8.2.8.7 *ATC unit-initiated CPDLC*

8.2.8.7.1 An ATC unit shall only establish CPDLC with an aircraft if the aircraft has no CPDLC link established, or when authorized by the ATC unit currently having CPDLC established with the aircraft.

8.2.8.7.2 When a request for CPDLC is rejected by an aircraft, the reason for the rejection shall be provided using CPDLC downlink message element NOT CURRENT DATA AUTHORITY or message element NOT AUTHORIZED NEXT DATA AUTHORITY, as appropriate. Local procedures shall dictate whether the reason for rejection is presented to the controller. No other reasons for airborne rejectionof ATC unit-initiation of CPDLC shall be permitted.

8.2.9 Exchange of operational CPDLC messages

8.2.9.1 Controllers and pilots shall construct CPDLC messages using the defined message set, a free text message or a combination of both.

8.2.9.1.1 **PANS.—** *When CPDLC is being used, and the intent of the message is included in the CPDLC message set contained in the PANS-ATM, Appendix 5, the associated message shall be used.*

8.2.9.1.2 **PANS.—** *Except as provided by 8.2.12.1, when a controller or pilot communicates via CPDLC, the response should be via CPDLC. When a controller or pilot communicates via voice, the response should be via voice.*

8.2.9.1.3 **PANS.—** *If a CPDLC message that requires an operational response is subsequently negotiated via voice, an appropriate CPDLC message closure response shall be sent, to ensure proper synchronization of the CPDLC dialogue.*

8.2.9.2 The composition of a CPDLC message shall not exceed five message elements, only two of which may contain the route clearance variable.

8.2.9.2.1 **PANS.—** *The use of long messages or messages with multiple clearance elements or messages with a combination of clearances and information should be avoided where possible.*

Note.— Guidance material on the development of local operating procedures and CPDLC good operating technique can be found in the Human Factors Guidelines for Air Traffic Management (ATM) Systems *(Doc 9758).*

8.2.9.3 CPDLC ground systems and airborne systems shall be capable of using the CPDLC message urgency and alert attributes to alter presentations in order to draw attention to higher priority messages.

Note.— Message attributes dictate certain message handling requirements for the CPDLC user receiving a message. Each CPDLC message has three attributes: urgency, alert and response attributes. When a message contains multiple message elements, the highest precedence message element attribute type becomes the attribute type for the entire message.

8.2.9.3.1 The urgency attribute shall delineate the queuing requirements for received messages that are displayed to the end-user. Urgency types are presented in Table 8-1.

8.2.9.3.2 The alert attribute shall delineate the type of alerting required upon message receipt. Alert types are presented in Table 8-2.

8.2.9.3.3 The response attribute shall delineate valid responses for a given message element. Response types are presented in Table 8-3 for uplink messages and Table 8-4 for downlink messages.

8.2.9.3.3.1 **PANS.—** *When a multi-element message requires a response, and the response is in the form of a single message element, the response shall apply to all message elements.*

Note.— For example, a multi-element message containing CLIMB TO FL310 MAINTAIN MACH.84*, a* WILCO *response applies to, and indicates compliance with, both elements of the message.*

8.2.9.3.3.2 **PANS.—** *When a single message element clearance or any part of a multi-element clearance message cannot be complied with, the pilot shall send an UNABLE response for the whole message.*

8.2.9.3.3.3 **PANS.—** *The controller shall respond with an UNABLE message that applies to all elements of the request when no element(s) of a single or multi-element clearance request can be approved. The current clearance(s) shall not be restated.*

8.2.9.3.3.4 **PANS.—** *When all elements of a single or multi-element clearance request can be accommodated, the controller shall respond with clearances corresponding to each element of the request. This response should be a single uplink message.*

8.2.9.3.3.5 **PANS.—** *When a controller can only partially accommodate multi-element clearance requests, the requests shall be responded to with clearances corresponding to the parts that can be accommodated, and for the parts that cannot be accommodated, the current clearance shall be restated or an alternative clearance shall be given.*

Note.— For example, a multi-element downlink message containing the indicated message elements:

MAINTAINING FL310
REQUEST CLEARANCE YQM YYG YYT YQX TRACK X EINN FPL EDDF
REQUEST CLIMB FL350
WE CAN ACCEPT FL390 AT 1139Z
REQUEST MACH .84

could be responded to with

CLEARED YQM YYG YYT YQX TRACK X EINN FPL EDDF
CLIMB TO FL350
REPORT REACHING
CROSS 52N 30W AT OR AFTER 1150Z
NO SPEED RESTRICTION.

8.2.9.3.3.6 **PANS.—** *When a CPDLC message contains more than one message element and the response attribute for the message is Y, when utilized, the single response message shall contain the corresponding number of replies in the same order.*

Note.— For example, a multi-element uplink message containing

CONFIRM SQUAWK
WHEN CAN YOU ACCEPT FL410

could be responded to with

SQUAWKING 5525
WE CAN ACCEPT FL410 AT 1636Z

Table 8-1. Urgency Attribute (Uplink and Downlink)

Type	*Description*	*Precedence*
D	Distress	1
U	Urgent	2
N	Normal	3
L	Low	4

Table 8-2. Alert Attribute (Uplink and Downlink)

Type	*Description*	*Precedence*
H	High	1
M	Medium	2
L	Low	3
N	No alerting required	4

Table 8-3. Response Attribute (Uplink)

Type	*Response required*	*Valid responses*	*Precedence*
W/U	Yes	WILCO, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR	1
A/N	Yes	AFFIRM, NEGATIVE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR	2
R	Yes	ROGER, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (only if required), ERROR	3
Y	Yes	Any CPDLC downlink message, LOGICAL ACKNOWLEDGEMENT (only if required)	4
N	No, unless logical acknowledgement required	LOGICAL ACKNOWLEDGEMENT (only if required), NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, ERROR	5

Table 8-4. Response Attribute (Downlink)

Type	*Response required*	*Valid responses*	*Precedence*
Y	Yes	Any CPDLC uplink message, LOGICAL ACKNOWLEDGEMENT (only if required)	1
N	No, unless logical acknowledgement required	LOGICAL ACKNOWLEDGEMENT (only if required), SERVICE UNAVAILABLE, FLIGHT PLAN NOT HELD, ERROR	2

8.2.9.4 When a ground or airborne system generates the CPDLC message ERROR, the reason for the error shall be included in the message.

8.2.9.5 The appropriate ATS authority shall select those message elements contained in PANS-ATM, Appendix 5 that support operations in their airspace. Should an ATS authority choose to select a subset of the message elements, and a received message does not belong to this subset, the ATC unit shall respond by uplinking the message element SERVICE UNAVAILABLE.

Note.— Further processing of the received message is not required.

8.2.9.5.1 **Recommendation.—** *Only the uplink messages appropriate to a particular control sector's operations should be provided to the controller.*

Note.— The CPDLC message set contained in PANS-ATM, Appendix 5 was developed to encompass different air traffic management environments.

8.2.9.5.2 When considered necessary by the appropriate ATS authority, additional pre-formatted free text messages shall be made available to the controller for those occasions where the CPDLC message set contained in the PANS-ATM does not provide for specific requirements. In such cases, a list of pre-formatted free text messages shall be established by the appropriate ATS authority, in consultation with operators and other ATS authorities that may be concerned.

8.2.9.5.3 Information concerning CPDLC message element subsets utilized and, if applicable, any additional pre-formatted free text messages, shall be published in aeronautical information publications.

8.2.9.6 *Transfer of CPDLC*

Note.— Details on CPDLC transfer can be found in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

8.2.9.6.1 **PANS.—** *When CPDLC is transferred, the transfer of voice communications and CPDLC shall commence concurrently.*

8.2.9.6.2 **PANS.—** *When an aircraft is transferred from an ATC unit where CPDLC is available to an ATC unit where CPDLC is not available, CPDLC termination shall commence concurrent with the transfer of voice communications.*

8.2.9.6.3 When a transfer of CPDLC results in a change of data authority, and there are still messages for which the closure response has not been received (i.e. messages outstanding), the controller transferring the CPDLC shall be informed.

8.2.9.6.3.1 If the controller needs to transfer the aircraft without replying to any downlink message(s) outstanding, the system shall have the capability to automatically send the appropriate closure response message(s). In such cases, the contents of any automatically sent closure response message(s) shall be promulgated in local instructions.

8.2.9.6.3.2 When the controller decides to transfer the aircraft without receiving pilot responses to any uplink message(s) outstanding, the ground system shall have the capability to automatically end the dialogue for each message prior to the transfer.

8.2.9.6.3.2.1 **PANS.—** *The controller should revert to voice communications to clarify any ambiguity associated with the message(s) outstanding.*

8.2.9.6.4 When a transfer of CPDLC does not result in a change of data authority, and there are still messages outstanding, these messages shall either be forwarded to the appropriate controller or shall be closed in accordance with local instructions and, if necessary, letters of agreement.

8.2.10 Display of CPDLC messages

Recommendation.— *ATC units utilizing a CPDLC message contained in the PANS-ATM should display the associated text pertaining to that message as presented in the PANS-ATM, Appendix 5.*

8.2.11 Free text messages

PANS.— *The use of free text messages by controllers or pilots, other than pre-formatted free text messages referred to in paragraph 8.2.9.5.2, should be avoided.*

Note.— Whilst it is recognized that non-routine and emergency situations may necessitate the use of free text, particularly when voice communication has failed, the avoidance of utilizing free text messages is intended to reduce the possibility of misinterpretation and ambiguity.

8.2.12 Emergencies, hazards and equipment failure procedures

8.2.12.1 **PANS.—** *When a CPDLC emergency message is received, the controller shall acknowledge receipt of the message by the most efficient means available.*

8.2.12.2 **PANS.—** *When responding via CPDLC to a report indicating unlawful interference, uplink message* ROGER 7500 *shall be used.*

8.2.12.3 **PANS.—** *When responding via CPDLC to all other emergency or urgency messages, uplink message* ROGER *shall be used.*

8.2.12.4 When a CPDLC message requires a logical acknowledgement and/or an operational response, and such a response is not received, the pilot or controller, as appropriate, shall be alerted.

8.2.12.5 *Failure of CPDLC*

8.2.12.5.1 **Recommendation.—** *A CPDLC failure should be detected in a timely manner.*

8.2.12.5.2 The controller and pilot shall be alerted to a failure of CPDLC as soon as a failure has been detected.

8.2.12.5.3 **PANS.—** *When a controller or pilot is alerted that CPDLC has failed, and the controller or pilot needs to communicate prior to CPDLC being restored, the controller or pilot should revert to voice, if possible, and preface the information with the phrase:*

CPDLC FAILURE.

8.2.12.5.4 **PANS.—** *Controllers having a requirement to transmit information concerning a complete CPDLC ground system failure to all stations likely to intercept should preface such a transmission by the general call ALL STATIONS CPDLC FAILURE, followed by the identification of the calling station.*

Note.— No reply is expected to such general calls unless individual stations are subsequently called to acknowledge receipt.

8.2.12.5.5 **PANS.—** *When CPDLC fails and communications revert to voice, all CPDLC messages outstanding should be considered not delivered and the entire dialogue involving the messages outstanding should be recommenced by voice.*

8.2.12.5.6 **PANS.—** *When CPDLC fails but is restored prior to a need to revert to voice communications, all messages outstanding should be considered not delivered and the entire dialogue involving the messages outstanding should be recommenced via CPDLC.*

8.2.12.6 *Intentional shutdown of CPDLC*

8.2.12.6.1 When a system shutdown of the communications network or the CPDLC ground system is planned, a NOTAM shall be published to inform all affected parties of the shutdown period and if necessary, the details of the voice communication frequencies to be used.

8.2.12.6.2 Aircraft currently in communication with the ATC unit shall be informed by voice or CPDLC of any imminent loss of CPDLC service.

8.2.12.6.3 The controller and pilot shall be provided with the capability to abort CPDLC.

8.2.13 Where the testing of CPDLC with an aircraft could affect the air traffic services being provided to the aircraft, coordination shall be effected prior to such testing.

8.2.14 Downstream clearance delivery service

8.2.14.1 The appropriate ATS authority shall determine whether an ATC unit supports downstream clearance delivery service.

8.2.14.2 *Establishment of downstream clearance delivery service*

8.2.14.2.1 Downstream clearance delivery service shall only be initiated by the airborne system. The initiation shall indicate that this communication is only to receive a downstream clearance.

8.2.14.2.2 When an ATC unit rejects a request for downstream clearance delivery service, it shall provide the pilot with the reason for the rejection using the CPDLC message SERVICE UNAVAILABLE.

8.2.14.3 *Operation of downstream clearance delivery service*

8.2.14.3.1 The controller and pilot shall be informed when downstream clearance delivery service is available for operational communication.

8.2.14.3.2 The controller and pilot shall be informed of the failure of downstream clearance delivery service.

8.2.14.3.3 The CPDLC message elements that are permitted for downstream clearance delivery service shall be established by regional air navigation agreement.

8.2.14.3.4 A clearance request issued as a downstream clearance request shall be clearly identifiable as such to the controller.

8.2.14.3.5 A clearance issued as a downstream clearance shall be clearly identifiable as such to the pilot.

8.2.14.4 *Termination of downstream clearance delivery service*

8.2.14.4.1 Termination of downstream clearance delivery service shall only be initiated by the airborne system.

8.2.14.4.2 Downstream clearance delivery service with an ATC unit shall be terminated whenever the downstream data authority becomes the current data authority.

ATTACHMENTS TO ANNEX 10 — VOLUME II

Attachment A to Volume II —

LIST OF SPECIALIZED COM TERMS AND THEIR DEFINITIONS RELATED TO AERONAUTICAL TELECOMMUNICATIONS PLANNING

On 25 March 1964 the Council at the 11th Meeting of its Fifty-first Session approved the following list of specialized communication terms and their definitions for general use within ICAO. The Council further requested States to use the terms in the approved manner in particular in correspondence with ICAO, in working papers presented by them to ICAO meetings and in any other appropriate texts.

Those terms which are marked with an asterisk are already used and defined in the main body of Annex 10 while the remaining terms were selected as terms in general use by aeronautical telecommunications people but having caused difficulty at some ICAO meetings or having resulted in the development of conflicting definitions by different meetings.

1. For general use

*__*Aeronautical telecommunication agency.*__* An agency responsible for operating a station or stations in the aeronautical telecommunication service.

*__*Aeronautical telecommunication service.*__* A telecommunication service provided for any aeronautical purpose.

*__*Aeronautical telecommunication station.*__* A station in the aeronautical telecommunication service.

*__*Aircraft operating agency.*__* The person, organization or enterprise engaged in, or offering to engage in, an aircraft operation.

*__*Double channel simplex.*__* Simplex using two frequency channels one in each direction.

Note.— This method was sometimes referred to as cross band.

*__*Duplex.*__* A method in which telecommunication between two stations can take place in both directions simultaneously.

*__*Frequency channel.*__* A continuous portion of the frequency spectrum appropriate for a transmission utilizing a specified class of emission.

Note.— The classification of emissions and information relevant to the portion of the frequency spectrum appropriate for a given type of transmission (bandwidths) are specified in the ITU Radio Regulations, Article S2 and Appendix S1.

*__*International telecommunication service.*__* A telecommunication service between offices or stations of different States, or between mobile stations which are not in the same State, or are subject to different States.

*__*Offset frequency simplex.*__* A variation of single channel simplex wherein telecommunication between two stations is effected by using in each direction frequencies that are intentionally slightly different but contained within a portion of the spectrum allotted for the operation.

*__*Simplex.*__* A method in which telecommunication between two stations takes place in one direction at a time.

Note.— In application to the aeronautical mobile service this method may be subdivided as follows:

a) single channel simplex;

b) double channel simplex;

c) offset frequency simplex.

*__*Single channel simplex.*__* Simplex using the same frequency channel in each direction.

2. For use in aeronautical fixed service planning

*__*Aeronautical fixed service (AFS).*__* A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

*__*Aeronautical fixed telecommunication network (AFTN).*__* A worldwide system of aeronautical fixed circuits provided,

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*__*Aeronautical fixed service (AFS).*__* A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

*__*Aeronautical fixed telecommunication network (AFTN).*__* A worldwide system of aeronautical fixed circuits provided,

****Aeronautical station.*** A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be placed on board a ship or an earth satellite.

****Aircraft station.*** A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft.

****Air-ground communication.*** Two-way communication between aircraft and stations or locations on the surface of the earth.

****Air-ground control radio station.*** An aeronautical telecommunication station having primary responsibility for handling communications pertaining to the operation and control of aircraft in a given area.

****Air-to-ground communication.*** One-way communication from aircraft to stations or locations on the surface of the earth.

****Alternative means of communication.*** A means of communication provided with equal status, and in addition to the primary means.

General purpose system (GP). Air-ground radiotelephony facilities providing for all categories of traffic listed in 5.1.8.

Note.— In this system communication is normally indirect, i.e. exchanged through the intermediary of a third person.

****Ground-to-air communication.*** One-way communication from stations or locations on the surface of the earth to aircraft.

****Non-network communications.*** Radiotelephony communications conducted by a station of the aeronautical mobile service, other than those conducted as part of a radiotelephony network.

****Operational control communications.*** Communications required for the exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of a flight.

Note.— Such communications are normally required for the exchange of messages between aircraft and aircraft operating agencies.

"Pilot-controller" system. Air-ground radiotelephony facilities implemented primarily to provide a means of direct communication between pilots and controllers.

****Primary means of communication.*** The means of communication to be adopted normally by aircraft and ground stations as a first choice where alternative means of communication exists.

****Radiotelephony network.*** A group of radiotelephony aeronautical stations which operate on and guard frequencies from the same family and which support each other in a defined manner to ensure maximum dependability of air-ground communications and dissemination of air-ground traffic.

****Regular station.*** A station selected from those forming an en-route air-ground radiotelephony network to communicate with or to intercept communications from aircraft in normal conditions.

Attachment B to Volume II —

GUIDANCE MATERIAL FOR THE TRANSMISSION OF LONG MESSAGES ON THE AFTN

1. Introduction

The requirement for the transmission of separate messages over the AFTN when a text exceeding 1 800 characters is encountered is detailed in 4.4.5.7 and 4.4.15.3.11. When messages have to be divided into two or more parts, the following procedure should be applied.

2. Procedure

Each message part should carry the same address and origin with the sequence of each part indicated on the last line of text as follows:

(End of first message)	/ / END PART 01 / /
(End of second message)	/ / END PART 02 / /
... etc. ...	
(End of last message)	/ / END PART XX/XX / /

Note.— The following example illustrates the application of the above procedure, for a three-part message. The message part sequence information is included in the text character count.

a) *First message:*

(Address)	GG EGLLYMYX
(Origin)	102030 KWBCYMYX
(Text)	text
	/ / END PART 01 / /
(Ending)	NNNN

b) *Second message:*

(Address)	GG EGLLYMYX
(Origin)	102030 KWBCYMYX
(Text)	text continued
	/ / END PART 02 / /
(Ending)	NNNN

c) *Third and last message:*

(Address)	GG EGLLYMYX
(Origin)	102030 KWBCYMYX
(Text)	remainder of text
	/ / END PART 03/03 / /
(Ending)	NNNN

— **END** —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

AERONAUTICAL TELECOMMUNICATIONS

ANNEX 10

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME III — COMMUNICATION SYSTEMS

**(PART I — DIGITAL DATA COMMUNICATION SYSTEMS;
PART II — VOICE COMMUNICATION SYSTEMS)**

FIRST EDITION — JULY 1995

The first edition of Annex 10, Volume III was adopted by the Council on 20 March 1995 and becomes applicable on 9 November 1995.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
71	7/11/96	—	ICAO
72	6/11/97	—	ICAO
73	5/11/98	—	ICAO
74	4/11/99	—	ICAO
75	2/11/00	—	ICAO
76	1/11/01	—	ICAO
77	28/11/02	—	ICAO
78	27/11/03	—	ICAO
79	25/11/04	—	ICAO
80	24/11/05	—	ICAO
81	23/11/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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PART II — VOICE COMMUNICATION SYSTEMS

ATTACHMENTS

FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Telecommunications were first adopted by the Council on 30 May 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 10 to the Convention. They became effective on 1 March 1950. The Standards and Recommended Practices were based on recommendations of the Communications Division at its Third Session in January 1949.

Up to and including the Seventh Edition, Annex 10 was published in one volume containing four Parts together with associated attachments: Part I — Equipment and Systems, Part II — Radio Frequencies, Part III — Procedures, and Part IV — Codes and Abbreviations.

By Amendment 42, Part IV was deleted from the Annex; the codes and abbreviations contained in that Part were transferred to a new document, Doc 8400.

As a result of the adoption of Amendment 44 on 31 May 1965, the Seventh Edition of Annex 10 was replaced by two volumes: Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communication Procedures.

As a result of the adoption of Amendment 70 on 20 March 1995, Annex 10 was restructured to include five volumes: Volume I — Radio Navigation Aids; Volume II — Communication Procedures; Volume III — Communication Systems; Volume IV — Surveillance Radar and Collision Avoidance Systems; and Volume V — Aeronautical Radio Frequency Spectrum Utilization. By Amendment 70, Volumes III and IV were published in 1995 and Volume V was planned for publication with Amendment 71.

Table A shows the origin of Annex 10, Volume III subsequent to Amendment 70, together with a summary of the principal subjects involved and the dates on which the Annex and the amendments were adopted by Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards, Recommended Practices and Procedures specified in Annex 10 should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been deliberately written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper*:

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*:

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Disclaimer regarding patents

Attention is drawn to the possibility that certain elements of Standards and Recommended Practices in this Annex may be the subject of patents or other intellectual property rights. ICAO shall not be responsible or liable for not identifying any or all such rights. ICAO takes no position regarding the existence, validity, scope or applicability of any claimed patents or other intellectual property rights, and accepts no responsibility or liability therefore or relating thereto.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 10, Volume III

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
70	Air Navigation Commission, Third Meeting of the Aeronautical Mobile Communications Panel (AMCP)	Introduction of new Volume III and SARPs related to the Aeronautical Mobile-Satellite Service (AMSS)	20 March 1995 24 July 1995 9 November 1995
71	Air Navigation Commission; SP COM/OPS/95 Divisional Meeting (1995); fifth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP); third meeting of the Aeronautical Mobile Communications Panel (AMCP)	Addition of specifications for the Mode S subnetwork of ATN; addition of material relating to the introduction of 8.33 kHz channel spacing; changes to material related to the protection of air-ground communications in the VHF band; addition of technical specifications relating to the RF characteristics for the VHF digital link (VDL).	12 March 1996 15 July 1996 7 November 1996
72	Air Navigation Commission; fourth meeting of the Aeronautical Mobile Communications Panel (AMCP)	Introduction of SARPs and guidance material for VHF digital link (VDL); definition for VDL and deletion of obsolete material on air/ground data interchange.	12 March 1997 21 July 1997 6 November 1997
73	Air Navigation Commission; second meeting of the Aeronautical Telecommunication Network Panel (ATNP); sixth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP)	Introduction of material relating to the ATN; changes to specifications of the Mode S subnetwork.	19 March 1998 20 July 1998 5 November 1998
74	Fifth meeting of the Aeronautical Mobile Communications Panel (AMCP); Air Navigation Commission	Introduction of: a) specifications for HF data link; and b) changes to the specifications for emergency locator transmitters.	18 March 1999 19 July 1999 4 November 1999
75	Sixth meeting of the Aeronautical Mobile Communications Panel (AMCP); Air Navigation Commission	Changes to the AMSS SARPs introducing a new antenna type, a new voice channel type and enhanced provisions for interoperability among AMSS systems; changes to the VDL SARPs to reduce potential interference to current VHF voice communication systems caused by VDL transmitters; changes to the VHF voice communication SARPs to enhance immunity to interference from VDL transmitters on board the same aircraft.	13 March 2000 17 July 2000 2 November 2000
76	Third meeting of the Aeronautical Telecommunication Network Panel (ATNP); seventh meeting of the Aeronautical Mobile Communications Panel (AMCP); the Secretariat assisted by the ATS Voice Switching and Signalling Study Group (AVSSSG)	Aeronautical telecommunication network (ATN) system management, security and directory services; removal of detailed material relating to CIDIN; integrated voice and data link system (VDL Mode 3); data link satisfying surveillance applications (VDL Mode 4); deletion of all the provisions for VDL Mode 1; removal of the detailed technical specifications for VDL Mode 2; aeronautical speech circuits; update of references to the ITU Radio Regulations.	12 March 2001 16 July 2001 1 November 2001

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
77	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP)	Mode S subnetwork (Part I), aircraft addressing system (Part I).	27 February 2002 15 July 2002 28 November 2002
78	Air Navigation Commission	Changes to technical specifications relating to radio frequency channels; introduction of registration requirement for ELTs; incorporation of VDL Modes 3 and 4 in the table of ATN subnetwork priorities (Table 3-3); editorial amendments.	5 March 2003 14 July 2003 27 November 2003
79	Eighth meeting of the Aeronautical Mobile Communications Panel (AMCP)	Changes to technical specifications relating to high frequency data link (HFDL) to align them with relevant provisions of ITU RR; introduction of FM immunity characteristics for VDL Mode 4; deletion of the note indicating that VDL Mode 4 SARPs apply to surveillance applications.	23 February 2004 12 July 2004 25 November 2004
80	Air Navigation Commission	Provisions for the location protocols for use in emergency locator transmitters (ELTs) operating on the 406 MHz frequency.	25 February 2005 11 July 2005 24 November 2005
81	—	No change.	—

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I — DIGITAL DATA COMMUNICATION SYSTEMS

CHAPTER 1. DEFINITIONS

Note 1.— All references to "Radio Regulations" are to the Radio Regulations published by the International Telecommunication Union (ITU). Radio Regulations are amended from time to time by the decisions embodied in the Final Acts of World Radiocommunication Conferences held normally every two to three years. Further information on the ITU processes as they relate to aeronautical radio system frequency use is contained in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc 9718).*

Note 2.— This Part of Annex 10 includes Standards and Recommended Practices for certain forms of equipment for communication systems. While the Contracting State will determine the necessity for specific installations in accordance with the conditions prescribed in the relevant Standard or Recommended Practice, review of the need for specific installation and the formulation of ICAO opinion and recommendations to Contracting States concerned, is carried out periodically by Council, ordinarily on the basis of recommendations of Regional Air Navigation Meetings (Doc 8144, Directives to Regional Air Navigation Meetings and Rules of Procedure for their Conduct*).*

Note 3.— This chapter contains general definitions relevant to communication systems. Definitions specific to each of the systems included in this volume are contained in the relevant chapters.

Note 4.— Material on secondary power supply and guidance material concerning reliability and availability for communication systems is contained in Annex 10, Volume I, 2.9 and Volume I, Attachment F, respectively.

Aeronautical telecommunication network (ATN). An internetwork architecture that allows ground, air-ground and avionic data subnetworks to interoperate by adopting common interface services and protocols based on the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) reference model.

Aircraft address. A unique combination of twenty-four bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance.

Aircraft earth station (AES). A mobile earth station in the aeronautical mobile-satellite service located on board an aircraft (see also "GES").

Bit error rate (BER). The number of bit errors in a sample divided by the total number of bits in the sample, generally averaged over many such samples.

Carrier-to-multipath ratio (C/M). The ratio of the carrier power received directly, i.e. without reflection, to the multipath power, i.e. carrier power received via reflection.

Carrier-to-noise density ratio (C/N_0). The ratio of the total carrier power to the average noise power in a 1 Hz bandwidth, usually expressed in dBHz.

Channel rate. The rate at which bits are transmitted over the RF channel. These bits include those bits used for framing and error correction, as well as the information bits. For burst transmission, the channel rate refers to the instantaneous burst rate over the period of the burst.

Channel rate accuracy. This is relative accuracy of the clock to which the transmitted channel bits are synchronized. For example, at a channel rate of 1.2 kbits/s, maximum error of one part in 10^6 implies the maximum allowed error in the clock is $\pm 1.2 \times 10^{-3}$ Hz.

Circuit mode. A configuration of the communications network which gives the appearance to the application of a dedicated transmission path.

Doppler shift. The frequency shift observed at a receiver due to any relative motion between transmitter and receiver.

End-to-end. Pertaining or relating to an entire communication path, typically from (1) the interface between the information source and the communication system at the transmitting end to (2) the interface between the communication system and the information user or processor or application at the receiving end.

End-user. An ultimate source and/or consumer of information.

Energy per symbol to noise density ratio (E_s/N_o). The ratio of the average energy transmitted per channel symbol to the average noise power in a 1 Hz bandwidth, usually expressed in dB. For A-BPSK and A-QPSK, one channel symbol refers to one channel bit.

Equivalent isotropically radiated power (e.i.r.p). The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna *(absolute or isotropic gain).*

Forward error correction (FEC). The process of adding redundant information to the transmitted signal in a manner which allows correction, at the receiver, of errors incurred in the transmission.

Gain-to-noise temperature ratio. The ratio, usually expressed in dB/K, of the antenna gain to the noise at the receiver output of the antenna subsystem. The noise is expressed as the temperature that a 1 ohm resistor must be raised to produce the same noise power density.

Ground earth station (GES). An earth station in the fixed satellite service, or, in some cases, in the aeronautical mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the aeronautical mobile-satellite service.

Note.— This definition is used in the ITU's Radio Regulations under the term "aeronautical earth station." The definition herein as "GES" for use in the SARPs is to clearly distinguish it from an aircraft earth station (AES), which is a mobile station on an aircraft.

Mode S subnetwork. A means of performing an interchange of digital data through the use of secondary surveillance radar (SSR) Mode S interrogators and transponders in accordance with defined protocols.

Packet. The basic unit of data transfer among communications devices within the network layer.

Packet layer protocol (PLP). A protocol to establish and maintain a connection between peer level entities at the network layer, and to transfer data packets between them. In the context of this standard, the term refers to the protocol defined by the ISO 8208 standard used in this document.

Point-to-point. Pertaining or relating to the interconnection of two devices, particularly end-user instruments. A communication path of service intended to connect two discrete end-users; as distinguished from broadcast or multipoint service.

Slotted aloha. A random access strategy whereby multiple users access the same communications channel independently, but each communication must be confined to a fixed time slot. The same timing slot structure is known to all users, but there is no other co-ordination between the users.

Switched virtual circuit (SVC). The primary circuit management technique provided within the ISO 8208 protocol. The network resources are dynamically allocated when needed and released when no longer required.

Time division multiplex (TDM). A channel sharing strategy in which packets of information from the same source but with different destinations are sequenced in time on the same channel.

Time division multiple access (TDMA). A multiple access scheme based on time-shared use of an RF channel employing: (1) discrete contiguous time slots as the fundamental shared resource; and (2) a set of operating protocols that allows users to interact with a master control station to mediate access to the channel.

Transit delay. In packet data systems, the elapsed time between a request to transmit an assembled data packet and an indication at the receiving end that the corresponding packet has been received and is ready to be used or forwarded.

VHF digital link (VDL). A constituent mobile subnetwork of the aeronautical telecommunication network (ATN), operating in the aeronautical mobile VHF frequency band. In addition, the VDL may provide non-ATN functions such as, for instance, digitized voice.

CHAPTER 2. GENERAL

[to be developed]

CHAPTER 3. AERONAUTICAL TELECOMMUNICATION NETWORK

3.1 DEFINITIONS

Note 1.— The following definitions were taken from ISO/IEC 7498-1, Information technology — Open Systems Interconnection — Basic Reference Model *(Reference: ITU-T Rec. X.200 (1994)) and from ICAO Doc 9705 —* Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN).

Note 2.— ICAO Doc 9705 has evolved through multiple editions. Each sub-volume of that document indicates the evolution of the provisions between successive editions.

Note 3.— Sub-volume I of ICAO Doc 9705 provides a cross-reference chart between versions (i.e. embedded software capabilities) and editions (i.e. technical provisions).

Accounting management. An ATN systems management facility to monitor users for use of network resources and to limit the use of those resources.

ADS application. An ATN application that provides ADS data from the aircraft to the ATS unit(s) for surveillance purposes.

Aeronautical administrative communication (AAC). Communication used by aeronautical operating agencies related to the business aspects of operating their flights and transport services. This communication is used for a variety of purposes, such as flight and ground transportation, bookings, deployment of crew and aircraft or any other logistical purposes that maintain or enhance the efficiency of over-all flight operation.

Aeronautical operational control (AOC). Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons.

Aeronautical passenger communication (APC). Communication relating to the non-safety voice and data services to passengers and crew members for personal communication.

AIDC application. An ATN application dedicated to exchanges between ATS units (ATSUs) of air traffic control (ATC) information in support of flight notification, flight coordination, transfer of control, transfer of communication, transfer of surveillance data and transfer of general data.

Air traffic service. A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Application. The ultimate use of an information system, as distinguished from the system itself.

Application entity (AE). Part of an application process that is concerned with communication within the OSI environment. The aspects of an application process that need to be taken into account for the purposes of OSI are represented by one or more AEs.

Application information. Refers to the application names (e.g. AE qualifiers such as ADS and CPC), version numbers, and addresses (the long or short TSAP, as required) of each application.

ATIS application. A FIS application that supports the D-ATIS.

ATN directory services (DIR). A service which provides the capability for an application entity or user in the ATN community to query a distributed directory data base and retrieve addressing, security and technical capabilities information relating to other users or entities within the ATN community.

ATN security services. A set of information security provisions allowing the receiving end system or intermediate system to unambiguously identify (i.e. authenticate) the source of the received information and to verify the integrity of that information.

ATN systems management (SM). A collection of facilities to control, coordinate and monitor the resources which allow communications to take place in the ATN environment. These facilities include fault management, accounting management, configuration management, performance management and security management.

ATSC class. The ATSC class parameter enables the ATSC user to specify the quality of service expected for the offered data. The ATSC class value is specified in terms of ATN end-to-end transit delay at 95 per cent probability.

ATS communications (ATSC). Communication related to air traffic services including air traffic control, aeronautical and meteorological information, position reporting and services related to safety and regularity of flight. This communication involves one or more air traffic service administrations. This term is used for purposes of address administration.

ATS interfacility data communication (AIDC). Automated data exchange between air traffic services units, particularly in regard to co-ordination and transfer of flights.

ATS message handling services (ATSMHS). Procedures used to exchange ATS messages over the ATN such that the conveyance of an ATS message is in general not correlated with the conveyance of another ATS message by the service provider.

ATS unit (ATSU). A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Authentication. A process used to ensure the identity of a person/user/network entity.

Authorized path. A communication path that the administrator(s) of the routing domain(s) has pre-defined as suitable for a given traffic type and category.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position, and additional data as appropriate.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof.

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Configuration management. An ATN systems management facility for managers to change the configuration of remote elements.

Context management (CM) application. An ATN application that provides a log-on service allowing initial aircraft introduction into the ATN and a directory of all other data link applications on the aircraft. It also includes functionality to forward addresses between ATS units.

Note.— Context management is a recognized OSI presentation layer term. The OSI use and the ATN use have nothing in common.

Context management (CM) server. An ATS facility that is capable of providing application information relating to other ATSUs to requesting aircraft or ATSUs.

Controller pilot data link communication (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

CPDLC application. An ATN application that provides a means of ATC data communication between controlling, receiving or downstream ATS units and the aircraft, using air-ground and ground-ground subnetworks, and which is consistent with the ICAO phraseology for the current ATC voice communication.

Data integrity. The probability that data has not been altered or destroyed.

D-METAR. The symbol used to designate data link aviation weather report service.

End system (ES). A system that contains the OSI seven layers and contains one or more end user application processes.

End-to-end. Pertaining or relating to an entire communication path, typically from (1) the interface between the information source and the communication system at the transmitting end to (2) the interface between the communication system and the information user or processor or application at the receiving end.

Entity. An active element in any layer which can be either a software entity (such as a process) or a hardware entity (such as an intelligent I/O chip).

Fault management. An ATN systems management facility to detect, isolate and correct problems.

FIS application. An ATN application that provides to aircraft information and advice useful for the safe and efficient conduct of flights.

Flight information service (FIS). A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

Inter-centre communications (ICC). ICC is data communication between ATS units to support ATS, such as notification, coordination, transfer of control, flight planning, airspace management and air traffic flow management.

Intermediate system (IS). A system which performs relaying and routing functions and comprises the lowest three layers of the OSI reference model.

Internet communications service. The internet communications service is an internetwork architecture which allows ground, air-to-ground and avionics data subnetworks to interoperate by adopting common interface services and protocols based on the ISO/OSI reference model.

METAR application. A FIS application that supports the D-METAR.

Open systems interconnection (OSI) reference model. A model providing a standard approach to network design introducing modularity by dividing the complex set of functions into seven more manageable, self-contained, functional layers. By convention these are usually depicted as a vertical stack.

Note.— The OSI reference model is defined by ISO/IEC 7498-1.

Performance management. An ATN systems management facility to monitor and evaluate the performance of the systems.

Security management. An ATN systems management facility for access control, authentication and data integrity.

Subnetwork. An actual implementation of a data network that employs a homogeneous protocol and addressing plan and is under control of a single authority.

System level requirement. The system level requirement is a high-level technical requirement that has been derived from operational requirements, technological constraints and regulatory constraints (administrative and institutional). The system level requirements are the basis for the functional requirements and lower-level requirements.

Transit delay. In packet data systems, the elapsed time between a request to transmit an assembled data packet and an indication at the receiving end that the corresponding packet has been received and is ready to be used or forwarded.

Upper layers (UL) communications service. A term pertaining to the session, presentation and application layers of the OSI reference model.

3.2 INTRODUCTION

3.2.1 The aeronautical telecommunication network (ATN) comprises application entities and communication services which allow ground, air-to-ground and avionics data subnetworks to interoperate by adopting common interface services and protocols based on the International Organization for Standardization (ISO) open systems interconnection (OSI) reference model. The conceptual model of the ATN is shown in Figure 3-1.*

* All figures are located at the end of this chapter.

3.2.2 The ATN and the associated application processes have been designed in support of the communications, navigation, surveillance and air traffic management (CNS/ATM) systems. The ATN:

a) is specifically and exclusively intended to provide data communications services to air traffic service provider organizations and aircraft operating agencies supporting the following types of communications traffic:

   1) air traffic services communication (ATSC);

   2) aeronautical operational control (AOC);

   3) aeronautical administrative communication (AAC); and

   4) aeronautical passenger communication (APC);

b) provides, in a manner transparent to the user, a reliable end-to-end communications service essential to support the provision of safe and efficient air traffic services, between:

   1) airborne systems and ground systems; and

   2) multiple ground systems;

c) provides a data communication service which is capable of meeting the security and safety requirements of the users;

d) is based on internationally recognized data communications standards which will facilitate the development of compliant systems and encourage the competitive provision of network services;

e) accommodates differing types/categories/classes of service (including preferred/selected air-ground subnetwork) required by the various applications;

f) defines an architecture that enables the integration of public and private subnetworks, both air-ground and ground-ground. This allows the use of existing/planned infrastructure and network technologies, as well as giving implementors the freedom to scale the network to meet the increasing needs of the users; and

g) efficiently uses the bandwidth limited air-ground subnetworks and consequently reduces the associated costs.

3.2.3 The ATN applications presently defined have been developed to provide aeronautical communication, surveillance, and information services. These applications are intended to support the following air traffic management services:

a) air traffic services (ATS);

1) air traffic control service;

2) flight information service (FIS); and

3) alerting service.

b) air traffic flow management (ATFM); and

c) airspace management.

3.2.4 This chapter contains broad and general provisions for the ATN. The detailed technical provisions are found in Doc 9705. The remainder of this chapter is organized to address the following requirements and functions:

a) general;

b) system level requirements;

c) ATN applications requirements;

d) ATN communications service requirements;

e) ATN naming and addressing;

f) ATN systems management requirements; and

g) ATN security requirements.

3.3 GENERAL

3.3.1 The aeronautical telecommunication network (ATN) shall provide data communication services and application entities in support of:

a) the delivery of air traffic services (ATS) to aircraft;

b) the exchange of ATS information between ATS units; and

c) other applications such as aeronautical operational control (AOC) and aeronautical administrative communication (AAC).

Note 1.— Provisions have been made to accommodate the exchange of information such as weather, flight plans, notices to airmen and dynamic real time air traffic flow management between aircraft operating agencies' ground-based systems and ATS units.

Note 2.— Provisions have also been made to accommodate aeronautical passenger communication (APC).

3.3.2 When the ATN is used in support of air traffic services, it shall conform with the provisions of this chapter.

3.3.3 Requirements for use of the ATN shall be made on the basis of regional air navigation agreements.

3.3.4 **Recommendation.—** *Civil aviation authorities should co-ordinate, with national authorities and aeronautical industry, those implementation aspects of the ATN which will permit its world-wide safety, interoperability and efficient use, as appropriate.*

3.4 SYSTEM LEVEL REQUIREMENTS

Note.— The system level requirements are high-level technical requirements that have been derived from operational requirements, technological constraints and regulatory constraints (administrative and institutional). These system level requirements are the basis for the functional requirements and lower-level requirements.

3.4.1 The ATN shall use International Organization for Standardization (ISO) communication standards for open systems interconnection (OSI).

3.4.2 The ATN shall provide a means to facilitate migration to future versions of application entities and/or the communication services.

Note.— It is an objective that the evolution towards future versions facilitates the backward compatibility with previous versions.

3.4.3 The ATN shall enable the transition of existing AFTN/CIDIN users and systems into the ATN architecture.

Note.— The transition from the AFTN or from the CIDIN to the ATN is handled by AFTN/AMHS and CIDIN/AMHS gateways respectively, which are defined in Doc 9705, Sub-volume III.

3.4.4 The ATN shall make provisions whereby only the controlling ATS unit may provide ATC instructions to aircraft operating in its airspace.

Note.— This is achieved through the current and next data authority aspects of the controller-pilot data link communications (CPDLC) application entity.

3.4.5 The ATN shall accommodate routing based on a pre-defined routing policy.

3.4.6 The ATN shall provide means to define data communications that can be carried only over authorized paths for the traffic type and category specified by the user.

3.4.7 The ATN shall offer ATSC classes in accordance with the criteria in Table 3-1.*

* All tables are located at the end of this chapter.

Note 1.— When an ATSC class is specified by an ATN application, packets will be forwarded in the ATN internet communications service on a best effort basis. Best effort basis means that when a route is available of the requested ATSC class, the packet is forwarded on that route. When no such route is available, the packet will be forwarded on the first known route of the ATSC class higher than that requested, or if there is no such route, first known route of the ATSC class lower than that requested.

Note 2.— The ATN communications service will not inform application entities if the requested ATSC class was not achieved. It is the responsibility of the application entity to determine the actual transit delay achieved by local means such as time stamping.

3.4.8 The ATN shall operate in accordance with the communication priorities defined in Table 3-2 and Table 3-3.

3.4.9 The ATN shall enable exchange of application information when one or more authorized paths exist.

3.4.10 The ATN shall notify the appropriate application processes when no authorized path exists.

3.4.11 The ATN shall provide means to unambiguously address all ATN end and intermediate systems.

3.4.12 The ATN shall enable the recipient of a message to identify the originator of that message.

3.4.13 The ATN addressing and naming plans shall allow States and organizations to assign addresses and names within their own administrative domains.

3.4.14 The ATN shall support data communications to fixed and mobile systems.

3.4.15 The ATN shall accommodate ATN mobile subnetworks as defined in this Annex.

3.4.16 The ATN shall make provisions for the efficient use of limited bandwidth subnetworks.

3.4.17 The ATN shall enable an aircraft intermediate system to be connected to a ground intermediate system via concurrent mobile subnetworks.

3.4.18 The ATN shall enable an aircraft intermediate system to be connected to multiple ground intermediate systems.

3.4.19 The ATN shall enable the exchange of address information between application entities.

3.4.20 The ATN shall support the context management (CM) application when any of the other air-ground applications are supported.

3.4.21 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the context management (CM) application.

3.4.22 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the automatic dependent surveillance (ADS) application.

3.4.23 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the controller-pilot data link communications (CPDLC) application.

3.4.24 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the automatic terminal information service (ATIS) application.

3.4.25 The ATN shall be capable of establishing, maintaining, releasing and aborting application associations for the ATS message handling services (ATSMHS) application.

3.4.26 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the ATS interfacility data communication (AIDC) application.

3.4.27 Where the absolute time of day is used within the ATN, it shall be accurate to within 1 second of coordinated universal time (UTC).

Note.— A time accuracy value may result in synchronization errors of up to two times the stated accuracy value.

3.4.28 The end system shall make provisions to ensure that the probability of not detecting a 255-octet message being mis-delivered, non-delivered or corrupted by the internet communication service is less than or equal to 10^{-8} per message.

Note.— It is assumed that ATN subnetworks will ensure data integrity consistent with this system level requirement.

3.4.29 ATN end systems supporting ATN security services shall be capable of authenticating the identity of peer end systems, authenticating the source of application messages and ensuring the data integrity of the application messages.

Note.— Application messages in this context include messages related to ATS, systems management and directory services.

3.4.30 ATN ground and air-ground boundary intermediate systems supporting ATN security services shall be capable of authenticating the identity of peer boundary intermediate systems, authenticating the source of routing information and ensuring the data integrity of routing information.

3.4.31 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the exchange of directory information.

3.4.32 ATN systems supporting ATN systems management shall facilitate enhanced continuity of ATN operations, including the monitoring and maintenance of the quality of the communications service.

3.4.33 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the systems management (SM) application.

3.4.34 The ATN shall be capable of establishing, maintaining, releasing and aborting peer-to-peer application associations for the aviation routine weather report service (METAR) application.

3.5 ATN APPLICATIONS REQUIREMENTS

Note 1.— Implementation of ATN application(s) within a State or region does not imply implementation of all of the ATN applications defined below.

Note 2.— The implementation of pre-defined subsets of the ATN application technical provisions are allowed as detailed in Doc 9705.

3.5.1 System applications

Note.— System applications provide services that are necessary for operation of the ATN air-ground applications, ground-ground applications and/or ATN communication services.

3.5.1.1 CONTEXT MANAGEMENT (CM) APPLICATION

Note.— The CM application provides the capability for an aircraft to log on with an ATS ground system; in some instances the ground system will request the aircraft to contact a specific ground system. Once an appropriate connection is established, CM provides for the exchange of information on each supported ATN application including the network address of each, as appropriate. For ATN systems supporting security services, CM also obtains and exchanges key and key usage information. CM also provides the capability to update log-on information and the capability for an ATS ground system to forward log-on information to another ATS ground system. The registration function of the CM allows the sharing of information with other applications on the ground or on the aircraft.

3.5.1.1.1 The ATN shall be capable of supporting the following CM application functions:

a) log-on;

b) contact;

c) update;

d) CM server query;

e) CM server update;

f) ground forwarding; and

g) registration.

Note.— The technical provisions for the CM application are defined in Doc 9705, Sub-volume II.

3.5.1.2 ATN DIRECTORY SERVICES (DIR)

3.5.1.2.1 The ATN shall be capable of supporting the following DIR application functions:

a) directory bind;

b) directory information retrieval; and

c) directory information change.

Note 1.— The ATN Directory Service provides a capability for an application or user to query a distributed directory data base and to retrieve addressing, security and technical capabilities information. Directory Service provides a capability to special, authorized users to add, delete and modify parts of the directory data base for which they are responsible. The Directory Service is offered over the ATN to all applications and users complying with the technical provisions of Doc 9705, Sub-volume VII .

Note 2.— Directory bind is the function of establishing an association between two directory components that support other directory functions. Directory bind sets up the application contexts and underlying communications connections for use in other directory functions.

3.5.1.3 OTHER SYSTEM APPLICATIONS

(to be developed)

3.5.2 Air-ground applications

Note.— The ground components of air-ground applications include functionality to support the forwarding of the contents of air-to-ground messages along ground-ground communications paths.

3.5.2.1 AUTOMATIC DEPENDENT SURVEILLANCE (ADS) APPLICATION

Note.— The ADS application comprises an airborne and ground component. The airborne ADS application component is capable of automatically providing, via the ATN communications service, to the ground component data derived from on-board navigation systems (e.g. aircraft identification, four-dimensional position, intent, and additional data as appropriate). The ADS application provides service based on contracts established between its air and ground components (i.e. demand contract, periodic contract, event contract and emergency contract) and between two ADS ground components (i.e. forward contract).

3.5.2.1.1 The ATN shall be capable of supporting the following ADS application functions:

a) demand contracts;

b) periodic contracts;

c) event contracts;

d) emergency contracts; and

e) forward contracts.

Note.— The technical provisions for the ADS application are defined in Doc 9705, Sub-volume II.

3.5.2.2 CONTROLLER-PILOT DATA LINK COMMUNICATIONS (CPDLC) APPLICATION

Note.— The CPDLC application, comprising an airborne and ground component, provides capability for data link communications between ATS units and aircraft under their control and/or aircraft about to come under their control. The CPDLC application has the capability to establish, manage, and terminate CPDLC dialogues for controller-pilot message exchange and for ground message forwarding.

3.5.2.2.1 The ATN shall be capable of supporting the following CPDLC application functions:

a) controller-pilot message exchange;

b) transfer of data authority;

c) downstream clearance; and

d) ground forward.

Note.— The technical provisions for the CPDLC application are defined in Doc 9705, Sub-volume II.

3.5.2.3 FLIGHT INFORMATION SERVICE (FIS) APPLICATIONS

Note.— FIS applications provide flight information services to airspace users from ground FIS systems.

3.5.2.3.1 *AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS) APPLICATION*

3.5.2.3.1.1 The ATN shall be capable of supporting the following ATIS application functions:

a) aircraft-initiated FIS demand contracts;

b) aircraft-initiated FIS update contracts; and

c) both an aircraft- and ground-initiated FIS cancellation of contracts.

Note.— The technical provisions for the ATIS application are defined in Doc 9705, Sub-volume II.

3.5.2.3.2 *AVIATION ROUTINE WEATHER REPORT SERVICE (METAR) APPLICATION*

3.5.2.3.2.1 The ATN shall be capable of supporting the METAR application function for aircraft-initiated FIS demand contracts.

Note.— The technical provisions for the METAR application are defined in Doc 9705, Sub-volume II.

3.5.2.3.3 *OTHER FIS APPLICATIONS*

(to be developed)

3.5.2.4 OTHER AIR-GROUND APPLICATIONS

(to be developed)

3.5.3 Ground-ground applications

Note.— Ground-ground applications are defined as those ATN applications resident in ground-based systems which solely exchange information with peer applications also resident in ground-based systems.

3.5.3.1 INTER-CENTRE COMMUNICATIONS (ICC)

Note.— The inter-centre communications applications set enables the exchange of information between air traffic service units.

3.5.3.1.1 *ATS Interfacility Data Communication (AIDC)*

Note.— AIDC is an ATN application that is used by two air traffic service units to enable the exchange of ATS information for active flights related to flight notification, flight coordination, transfer of control, surveillance data and free (i.e. unstructured) text data.

3.5.3.1.1.1 The ATN shall be capable of supporting the following AIDC application functions:

a) flight notification;

b) flight coordination;

c) transfer of control;

d) transfer of communications;

e) transfer of surveillance data; and

f) transfer of general data.

Note.— The technical provisions for the AIDC application are defined in Doc 9705, Sub-volume III.

3.5.3.2 ATS Message Handling Services (ATSMHS) application

Note.— The ATS message handling services (ATSMHS) application comprises a main function named the ATS message service function. The ATS message service function enables ATS messages to be exchanged between service users through the provision of generic message services. The ATSMHS application includes the definition of AFTN/ATN and CIDIN/ATN gateways.

3.5.3.2.1 The ATN shall be capable of supporting the ATS message service of the ATS message handling services application (ATSMHS).

Note.— The technical provisions for the ATSMHS application are defined in Doc 9705, Sub-volume III.

3.5.3.3 Other ground-ground applications

(to be developed)

3.6 ATN COMMUNICATION SERVICE REQUIREMENTS

Note.— The ATN communication service requirements define the requirements for layers 3 through 6, as well as part of layer 7, of the OSI reference model. These services take information produced by one of the individual ATN applications and perform the end-to-end communication service using standard protocols. These communication service requirements are divided into two parts. The upper layer communications service defines the standards for layers 5 through 7. The Internet communications service defines standards for layers 3 and 4. The requirements for layers 1 and 2 are outside the scope of ATN SARPs.

3.6.1 Upper layer communications service

3.6.1.1 The upper layer communications service shall include the:

a) session layer;

b) presentation layer;

c) application entity structure;

d) association control service element (ACSE);

e) security application service object (ASO), for ATN systems supporting security services; and

f) control function (CF).

Note 1.— The technical provisions for the upper layer communications service for all ATN applications, except the ATS message service function of the ATSMHS application, are defined in Doc 9705, Sub-volume IV.

Note 2.— The technical provisions for the upper layer communications service for the ATS message service function of the ATSMHS application are defined in Doc 9705, Sub-volume III.

3.6.2 ATN Internet communications service

Note.— The ATN Internet communications service requirements are applicable to the end system and intermediate system functional entities which together provide the ATN Internet communications service. The ATN Internet communications service is provided to its user (i.e. the upper layers) via the transport layer service interface.

3.6.2.1 An ATN end system (ES) shall be capable of supporting the ATN Internet including the:

a) transport layer; and

b) network layer.

3.6.2.2 An ATN intermediate system (IS) shall support the ATN network layer provisions as appropriate to the class of ATN IS under consideration.

Note.— A number of different classes of ATN intermediate systems for which network layer profiles are defined are contained in Doc 9705, Sub-volume V.

3.7 ATN NAMING AND ADDRESSING REQUIREMENTS

Note.— The ATN naming and addressing scheme supports the principles of unambiguous identification of information objects and global address standardization.

3.7.1 The ATN shall provide provisions for application entity naming.

3.7.2 The ATN shall provide provisions for network and transport addressing.

Note.— The technical provisions for ATN application entity naming are defined in Doc 9705, Sub-volume IV, the provisions for network and transport addressing are defined in Sub-volume V, and the provisions for registration services are defined in Sub-volume IX of the same document.

3.8 ATN SYSTEMS MANAGEMENT REQUIREMENTS

Note 1.— The ATN systems management (SM) application provides the capability for an SM manager to exchange information with an SM agent and/or another SM manager.

Note 2.— Support for the ATN SM services technical provisions may be required on a State or regional basis.

3.8.1 The ATN shall be capable of supporting the following systems management application functions:

a) fault management;

b) configuration management;

c) accounting management;

d) performance management; and

e) security management.

Note.— The technical provisions for ATN Systems Management are defined in Doc 9705, Sub-volume VI.

3.8.1.1 ATN end systems and intermediate systems that support the ATN systems management application and SM managers shall support access to managed objects.

Note.— The SM application managed object definitions and access provisions are defined in Doc 9705, Sub-volume VI.

3.9 ATN SECURITY REQUIREMENTS

3.9.1 The security of the ATN shall be achieved based on a combination of technical provisions, local physical security measures, and procedural security measures.

Note 1.— The technical provisions for ATN security are defined in Doc 9705, and the physical and procedural security measures are defined in Annex 17 and the Security Manual.

Note 2.— Support for the ATN security services technical provisions may be required on a State or regional basis.

3.9.1.1 **Recommendation.—** *The following physical and procedural techniques should be used to provide security for ATN end systems, intermediate systems, network managers, directory servers and subnetworks:*

a) restricted physical access to ATN end systems, intermediate systems, SM workstations, directory servers and subnetwork switches, network managers, and other essential network sub-systems;

b) restricted user access to ATN end systems, intermediate systems, directory servers and SM workstations to only authorized personnel; and

c) non-use, or restricted use, of remote access to ATN ground end system, intermediate systems and SM workstations.

3.9.2 ATN security policy

Note.— Communication monitoring and third party traffic analysis do not constitute safety hazards and are not considered security threats for the ATSC. However, some ATS and/or non-ATS users and applications may have local, or organizational, policies wherein communication monitoring and third party traffic analysis would be considered security threats based on other concerns, such as economic considerations.

3.9.2.1 ATS messages shall be protected from masquerade, modification and replay.

Note 1. — This means that for data messages exchanged among ATN entities there will be a high level of assurance that a message comes from where it claims, has not been tampered with, and is not a repeat of an obsolete message.

Note 2. — The level of protection may vary by the type of security threat and by the level of ATN security service selected by the user or application process.

3.9.2.2 A request for protection of ATS messages shall be honoured.

Note.— A request for non-use of protection may be honoured. This means that the use of security is the default and negotiation to non-use is based on local policy.

3.9.2.3 The ATN services that support messages to and from the aircraft shall be protected against denial of service attacks to a level of probability consistent with the required application service availability as determined by local policies.

Note 1.— The term "denial of service" describes a condition where legitimate access to information or other ATN resources is deliberately impeded.

Note 2.— This may mean having alternative communications paths available in case one path is subject to denial of service.

TABLES FOR CHAPTER 3

Table 3-1. Transit delays for ATSC Classes

Maximum one-way ATN end-to-end transit delay at 95% probability (seconds)	*ATSC Class*
Reserved	A
4.5	B
7.2	C
13.5	D
18	E
27	F
50	G
100	H
No value specified	no preference

Note 1.— The value for the ATN end-to-end transit delay represents approximately 90% of the value for the total end-to-end transit delay between the ultimate users of the system.

Note 2.— The 95% probability is based on the availability of a route conforming to the requested ATSC class.

Table 3-2. Mapping of ATN communication priorities

Message categories	*ATN application*	*Corresponding protocol priority*	
		Transport layer priority	*Network layer priority*
Network/systems management	SM	0	14
Distress communications		1	13
Urgent communications		2	12
High-priority flight safety messages	CPDLC, ADS	3	11
Normal-priority flight safety messages	AIDC, ATIS	4	10
Meteorological communications	METAR	5	9
Flight regularity communications	CM, ATSMHS	6	8
Aeronautical information service messages		7	7
Network/systems administration	SM, DIR	8	6
Aeronautical administrative messages		9	5
<unassigned>		10	4
Urgent-priority administrative and U.N. Charter communications		11	3
High-priority administrative and State/Government communications		12	2
Normal-priority administrative communications		13	1
Low-priority administrative communications and aeronautical passenger communications		14	0

Note.— The network layer priorities shown in the table apply only to connectionless network priority and do not apply to subnetwork priority.

Table 3-3. Mapping of ATN network priority to mobile subnetwork priority

Message categories	*ATN network layer priority*	*Corresponding mobile subnetwork priority (see Note 4)*					
		AMSS	*VDL Mode 2*	*VDL Mode 3*	*VDL Mode 4 (see Note 5)*	*SSR Mode S*	*HFDL*
Network/systems management	14	14	see Note 1	3	high	high	14
Distress communications	13	14	see Note 1	2	high	high	14
Urgent communications	12	14	see Note 1	2	high	high	14
High-priority flight safety messages	11	11	see Note 1	2	high	high	11
Normal-priority flight safety messages	10	11	see Note 1	2	high	high	11
Meteorological communications	9	8	see Note 1	1	medium	low	8
Flight regularity communications	8	7	see Note 1	1	medium	low	7
Aeronautical information service messages	7	6	see Note 1	0	medium	low	6
Network/systems administration	6	5	see Note 1	0	medium	low	5
Aeronautical administrative messages	5	5	not allowed	not allowed	not allowed	not allowed	not allowed
<unassigned>	4	unassigned	unassigned	unassigned	unassigned	unassigned	unassigned
Urgent-priority administrative and U.N. Charter communications	3	3	not allowed	not allowed	not allowed	not allowed	not allowed
High-priority administrative and State/Government communications	2	2	not allowed	not allowed	not allowed	not allowed	not allowed
Normal-priority administrative communications	1	1	not allowed	not allowed	not allowed	not allowed	not allowed
Low-priority administrative communications and aeronautical passenger communications	0	0	not allowed	not allowed	not allowed	not allowed	not allowed

Note 1.— VDL Mode 2 has no specific subnetwork priority mechanisms.

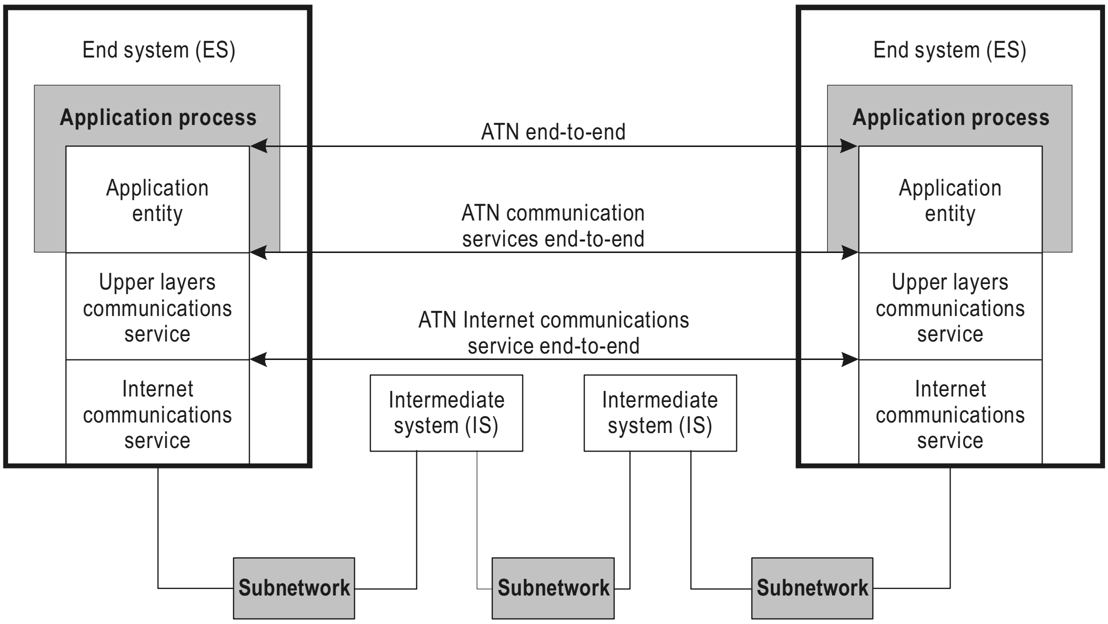
Note 2.— The AMSS SARPs specify mapping of message categories to subnetwork priority without explicitly referencing ATN network layer priority.

Note 3.—The term "not allowed" means that only communications related to safety and regularity of flight are authorized to pass over this subnetwork as defined in the subnetwork SARPs.

Note 4.— Only those mobile subnetworks are listed for which subnetwork SARPs exist and for which explicit support is provided by the ATN boundary intermediate system (BIS) technical provisions.

Note 5.— The VDL Mode 4 subnetwork provides support for surveillance applications (e.g. ADS).

FIGURE FOR CHAPTER 3



Note 1.— Shading indicates elements outside the scope of these SARPs. User requirements define the interface between the application entity and the user and ensure the functionality and interoperability of the ATN.

Note 2.— The figure represents a simplified model of the ATN and does not depict all of its capabilities (e.g. the store and forward capability which is provided for ATS message handling service).

Note 3.— Various end-to-end points have been defined within the ATN to specify certain end-to-end performance requirements. It may be necessary, however, to define different end-to-end points to facilitate the qualification of implementations to those performance requirements. In such cases, the end-to-end points should be clearly defined and correlated with the end-to-end points shown in the figure.

Note 4.— An IS is a conceptual representation of functionality and does not correspond precisely to a router. A router which implements the system management application requires the protocols of an end system and when using the system management application is also acting as an end system.

Figure 3-1. Conceptual model of the ATN

CHAPTER 4. AERONAUTICAL MOBILE-SATELLITE SERVICE

4.1 DEFINITIONS AND DESCRIPTIONS OF CHANNEL TYPES; GENERAL; SYSTEM CAPABILITIES

4.1.1 Definitions and descriptions of channel types

4.1.1.1 DEFINITIONS

Application. The ultimate use of an information system, as distinguished from the system itself.

Aviation-BPSK (A-BPSK). The particular form of binary phase shift keyed modulation which is used in AMSS for channel rates of 2.4, 1.2 and 0.6 kbits/s. A-BPSK is a modulation technique which maps a "0" to a phase shift of –90° and "1" to a phase shift of +90°. The phase-encoded A-BPSK data stream is then filtered with a filter which satisfies the amplitude and phase versus frequency limits defined by Tables A1-1 and A1-2 in Appendix 1 to Chapter 4.

Aviation-QPSK (A-QPSK). The particular form of offset quaternary phase shift keyed modulation which is used in AMSS for channel rates greater than 2 400 bits/s. A-QPSK is a modulation technique which maps a "0" into a 0 degrees and "1" into a 180 degrees, or "0" into 90 degrees and "1" into 270 degrees, alternating between the two options on successive bits. The encoded A-QPSK data stream is then filtered such that the modulated spectrum meets the amplitude mask of Table A1-3 and the phase mask defined in Table A1-2 in Appendix 1 to Chapter 4.

Burst. A time-defined, contiguous set of one or more related signal units which may convey user information and protocols, signalling, and any necessary preamble.

Cyclic redundancy check. The last two bytes of each signal unit form a cyclic redundancy check of the whole signal unit as follows. The check bits for error detection are calculated from the first 10 octets of a standard length signal unit, or from the first 17 octets of an extended length signal unit or from the first 4 octets of the burst identifier, using the following generator polynomial:

$$x^{16} + x^{12} + x^{5} + 1$$

Note.— See CCITT (Red Book) Recommendation X.25, Section 2.2.7 for the method of calculation and the bit order.

Direct link service (DLS). A data communications service which makes no attempt to automatically correct errors, detected or undetected, at the link layer of the air-ground communications path. (Error control may be effected by end-user systems.)

Epoch. A span of time related to the beginning and end, or lifetime, of an event or a sequence of associated events.

Frame. A structured, repeating time-segment of a communication link architecture that provides for time-predictable communication activities between its beginning and end.

Global beam. Satellite antenna directivity whose main lobe encompasses the entire earth's surface that is within line-of-sight view of the satellite.

Initial signal unit (ISU). The first of the series of signal units followed by SSUs.

Link interface control information (LICI). The control information exchanged between the link layer and any of its service users as part of the link interface data unit (LIDU).

Link interface data unit (LIDU). The total information transferred in a single interaction across the interface between the link layer and a link service user. Each LIDU contains link interface control information (LICI) and may also contain a single link service data unit (LSDU).

Link service data unit (LSDU). A part of the link interface data unit (LIDU) and is the same as the subnetwork protocol data unit (SNPDU).

Lone signal unit (LSU). A single signal unit comprising the total message.

Near-geostationary orbits. Satellites operating in near-geostationary orbits have an orbit period of 24 hours with an inclination of up to five degrees from the equatorial plane.

Network co-ordination station (NCS). The entity of the over-all AMS(R)S system that has functional responsibilities to: co-ordinate communications traffic and satellite connectivity within its satellite region; and provide inter-system co-ordination with adjacent satellite regions served by other satellites.

P channel synchronization. The state of the P channel demodulator when the P channel unique word is reliably detected.

P channel degradation/loss. A declaration that is made when the P channel bit error rate rises above 10^{-4} over an averaging period of 3 minutes, or more than 10 short-term interruptions (loss of P channel synchronization for less than 10 seconds) are experienced in any 3-minute period; or when the P channel synchronization is lost for more than 10 seconds.

Q number, Q level, Q precedence. A definition of the transmission precedence of a message or signalling sequence, using numbers from 0 to 15 (with 15 transmitted first).

Reliable link service (RLS). A data communications service provided by the subnetwork which automatically provides for error control over its link through error detection and requested retransmission of signal units found to be in error.

Satellite region. A geographically defined sub-area within the view of a satellite within which services can be provided by that satellite.

Satellite service area. A geographically defined sub-area within the view of a satellite within which services are provided by that satellite. Note that a satellite service area might be sub-divided in terms of operational characteristics, conditions, or limitations for a variety of reasons.

Signal unit (SU). A time-ordered, contiguous set of data octets used for signalling and control, and for user packet data transmissions. Standard-length SUs are 96 bits (12 octets) used in P, T and C channels. R channel SUs are 152 bits (19 octets), and the T channel uses a header SU of 48 bits (6 octets).

Spot beam. Satellite antenna directivity whose main lobe encompasses significantly less than the earth's surface that is within line-of-sight view of the satellite. May be designed so as to improve system resource efficiency with respect to geographical distribution of user earth stations.

Subsequent signal unit (SSU). In a series of SUs, the signal unit(s) following the initial signal unit.

Superframe. A recurring, time-structured set of data transmission frames, which also includes a superframe marker (see also the definition of "frame").

4.1.1.2 DESCRIPTION OF CHANNEL TYPES

4.1.1.2.1 *P channel.* Packet mode time division multiplex(TDM) channel transmitted continuously from the aeronautical ground earth station (GES) in the to-aircraft direction to carry signalling and user data. A P channel being used for system management functions is designated P_{smc}, while a P channel being used for other functions is designated by P_d. The functional designations P_{smc} and P_d do not necessarily apply to separate physical channels.

4.1.1.2.2 *R channel.* Random access (slotted Aloha) channel, used in the from-aircraft direction to carry signalling and user data. An R channel being used for system management functions is designated R_{smc}, while an R channel being used for other functions is designated R_d. The functional designations R_{smc} and R_d do not necessarily apply to separate physical channels.

4.1.1.2.3 *T channel.* Reservation time division multiple access (TDMA) channel, used in the from-aircraft direction only. The receiving GES reserves time slots for transmissions requested by aircraft earth stations (AESs) according to message length. The sending AES transmits the message in the reserved time slots according to priority.

4.1.1.2.4 *C channel.* Circuit-mode single channel per carrier (SCPC) channel, used in both to-aircraft and from-aircraft directions. This channel is time division multiplexed to provide a primary channel for voice or data traffic and a sub-band channel for signalling, supervision and data messages. The use of the channel is controlled by assignment and release signalling at the start and end of each transaction.

4.1.2 General

4.1.2.1 When aeronautical mobile-satellite service (AMSS), using near-geostationary orbiting satellites, is installed and maintained in operation as an aid to air traffic services, it shall conform with the provisions of 4.1 to 4.10.

4.1.2.2 Requirements for mandatory carriage of AMSS equipment including the level of system capability shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation time-scales for the carriage of equipment.

4.1.2.3 The agreements indicated in 4.1.2.2 shall provide at least two years' notice of mandatory carriage of airborne systems.

4.1.2.4 **Recommendation.—** *Civil aviation authorities should co-ordinate, with national authorities and service providers, those implementation aspects of AMSS which will permit its world-wide interoperability and optimum use, as appropriate.*

Note.— Provisions on the allocation and assignment of 24-bit aircraft addresses for use by the AMSS are contained in Chapter 9.

4.1.3 System capabilities

Note.— A system providing aeronautical mobile-satellite service (AMSS) comprises the AES, the satellite and the GES. A Level 1 (2, 3 or 4) system consists of an AES with Level 1 (2, 3 or 4) capability with one or more satellites and one or more GESs having the capabilities to operate compatibly with all capabilities of the AES. Multiple service providers of such systems may coexist. A basic level of interoperability among different systems is provided.

4.1.3.1 *Scope.* A level of system capability shall include the performance of the AES, the satellite and the GES. All AESs, as a minimum, shall have a Level 1 capability and shall continuously monitor the P channel after log-on to the GES. Each GES shall provide at all times when operating AMS(R)S, a Level 1 capability as a minimum.

4.1.3.1.1 There shall be a P channel and an R channel P_{smc} and R_{smc} capability which perform system management functions for each satellite service area.

4.1.3.1.2 For the case where there is one transmit channel unit shared between the R and T channels, R channel transmissions shall be delayed, whenever necessary, to avoid interrupting a T channel transmission.

4.1.3.2 *Level 1.* An AES with Level 1 capability shall have the capabilities for:

a) receiving and processing data on one P channel at channel rates of 0.6 and 1.2 kbits/s; and

b) processing and transmitting data on one R channel and on one T channel at channel rates of 0.6 and 1.2 kbits/s.

Simultaneous transmission on the R channel and the T channel shall not be required.

4.1.3.2.1 An AES with Level 1 capability shall receive and process continuously the assigned P channel once logged on with the GES to enable receipt of AES-addressed messages and respond to GES commands.

4.1.3.2.2 **Recommendation.—** *An AES with Level 1 capability should have the capabilities described in 4.1.3.2 for the additional channel rate of 2.4 kbits/s.*

Note.— An AES with Level 1 capability provides basic packet mode data communications based on the open system interconnection model to support aviation safety communications. An AES with Level 1 capability requires one receive channel and one transmit channel.

4.1.3.3 *Level 2.* An AES with Level 2 capability shall have the capabilities for:

a) receiving and processing data on one P channel at channel rates of 0.6 and 10.5 kbits/s; and

b) processing and transmitting data on one R channel and on one T channel at channel rates of 0.6 and 10.5 kbits/s.

Simultaneous transmission on the R channel and the T channel shall not be required. Simultaneous reception on more than one P channel shall not be required.

4.1.3.3.1 **Recommendation.—** *An AES with Level 2 capability should have the capabilities described in 4.1.3.3 a) for the additional channel rate of 4.8 kbits/s.*

4.1.3.4 *Level 3.* An AES with Level 3 capability shall provide the capabilities for:

a) an AES with Level 2 capability; and

b) receiving, processing and transmitting digital information on one C channel at a channel rate of 8.4 or 21.0 kbits/s.

Simultaneous operation of the C channel with either the R channel or the T channel shall not be required.

4.1.3.4.1 **Recommendation.—** *Level 3 channel capability should be provided at channel rates of 5.25, 6.0 and 10.5 kbits/s.*

Note.— An AES with Level 3 capability provides digitized voice capability on a C channel in addition to the Level 2 packet mode data capability. Pre-emption requirements are described in Sections 4.8 and 4.9. Two receive channels and one transmit channel are required.

4.1.3.5 *Level 4.* An AES with Level 4 capability shall provide the capabilities for:

a) an AES with Level 3 capability;

b) simultaneous operation of a C channel with the R channel; and

c) simultaneous operation of the C channel with the T channel.

Simultaneous operation of the three channels (C, R and T) shall not be required.

4.1.3.5.1 **Recommendation.—** *Level 4 channel capability should be provided at channel rates of 5.25, 6.0 and 10.5 kbits/s.*

Note.— An AES with Level 4 capability provides digitized voice capability on a C channel simultaneously with packet mode data capability on the R channel or the T channel. Two receive channels and two transmit channels are required.

4.1.3.5.2 **Recommendation.—** *A Level 4 AES should be capable of simultaneous R and T channel transmissions whenever the C channel is not in use.*

4.2 BROADBAND RF CHARACTERISTICS

4.2.1 Frequency bands

4.2.1.1 USE OF AMS(R)S BANDS

Note.— Categories of messages, and their relative priorities within the aeronautical mobile (R) service, are given in Annex 10, Volume II, 5.1.8. These categories and priorities are equally valid for the aeronautical mobile-satellite (R) service (see ITU Radio Regulations Article S44).

4.2.1.1.1 Every aircraft earth station and ground earth station shall be designed to ensure that messages defined in Annex 10, Volume II, 5.1.8 are not delayed by the transmission and/or reception of other types of messages employing frequencies within the bands stated in 4.2.1.2 and 4.2.1.3 or other frequencies to which the station can tune. Message types not defined in Annex 10, Volume II, 5.1.8 shall be terminated if necessary, and without warning, to allow Annex 10, Volume II, 5.1.8 type messages to be transmitted and received.

Note.— See ITU Radio Regulations No. S5.357A.

4.2.1.2 TO-AIRCRAFT

4.2.1.2.1 The aircraft earth station shall be capable of receiving in the frequency band 1 544 to 1 555 MHz.

Note.— Use of the band 1 544 to 1 545 MHz by mobile satellite services is limited to distress and safety operations.

4.2.1.2.2 **Recommendation.—** *The aircraft earth station should be capable of receiving in the frequency band 1 555 to 1 559 MHz.*

Note.— The band 1 555 to 1 559 MHz may be protected and utilized by some States for national and international AMS(R)S purposes.

4.2.1.2.3 **Recommendation.—** *The aircraft earth station should also be capable of receiving in the frequency band 1 525 to 1 544 MHz.*

Note.— The band 1 525 to 1 544 MHz may be used to communicate for purposes of distress and public correspondence with stations of the maritime mobile-satellite service in accordance with ITU Radio Regulations Article S41.

4.2.1.3 FROM-AIRCRAFT

4.2.1.3.1 The aircraft earth station shall be capable of transmitting in the frequency band 1 645.5 to 1 656.5 MHz.

Note.— Use of the band 1 645.5 to 1 646.5 MHz by mobile-satellite services is limited to distress and safety operations.

4.2.1.3.2 **Recommendation.—** *The aircraft earth station should be capable of transmitting in the frequency band 1 656.5 to 1 660.5 MHz.*

Note.— The band 1 656.5 to 1 660.5 MHz may be protected and utilized by some States for national and international AMS(R)S purposes.

4.2.1.3.3 **Recommendation.—** *The aircraft earth station should also be capable of transmitting in the frequency band 1 626.5 to 1 645.5 MHz.*

Note.— The band 1 626.5 to 1 645.5 MHz may be used to communicate for purposes of distress and public correspondence with stations of the maritime mobile-satellite service in accordance with ITU Radio Regulations Article S41.

4.2.1.4 TUNING INCREMENTS

4.2.1.4.1 Channels shall be allocated throughout the bands in increments of 2.5 kHz, for the to- and from-aircraft transmission path.

4.2.1.4.2 Channel assignment and tuning of the aircraft earth station shall be achieved under control from the GES.

4.2.1.5 CHANNEL NUMBERING

4.2.1.5.1 The channel number (Ct) shall be defined with respect to the centre frequency on the to-aircraft transmission path by the formula:

$$Ct = \frac{\text{frequency of transmission (MHz)} - 1\ 510.0}{0.0025}$$

4.2.1.5.2 The channel number (Cf) shall be defined with respect to the centre frequency on the from-aircraft transmission path by the formula:

$$Cf = \frac{\text{frequency of transmission (MHz)} - 1\ 611.5}{0.0025}$$

4.2.2 Frequency accuracy

The frequency of transmission from the aircraft earth station, as would be received at the satellite, shall not vary from the nominal channel frequency by more than ±383 Hz due to all causes.

Note.— The frequency of transmissions received by a subsonic aircraft should not vary from the nominal channel frequency by more than ±2.18 kHz due to all causes.

4.2.3 Aircraft earth stations RF characteristics

Note.— The following requirements apply over the entire transmit and receive frequency bands.

4.2.3.1 GENERAL ANTENNA CHARACTERISTICS

4.2.3.1.1 *Reference coverage volume.* Antenna systems shall be installed to meet performance requirements for transmitting and receiving over a coverage volume of 360 degrees of azimuth and from 5 to 90 degrees in elevation from a horizontal plane for aircraft in straight and level flight.

4.2.3.1.1.1 **Recommendation.—** *To the maximum extent possible, antenna systems should be installed to meet performance requirements for transmitting and receiving over a coverage volume of 360 degrees in azimuth and from 5 to 90 degrees in elevation from a horizontal plane for aircraft attitudes of +20/–5 degrees of pitch and ±25 degrees of roll.*

4.2.3.1.2 *Polarization.* The polarization shall be right-hand circular for both receiving and transmitting, in accordance with the definition of ITU Radio Regulations No. S1.154.

4.2.3.1.3 *Antenna switching.* Aircraft earth stations that require more than one antenna shall be capable of switching from one antenna to another in the same antenna sub-system so as to introduce a signal interruption of not more than 40 ms.

Note.— 4.2.3.2, 4.2.3.2 bis *and 4.2.3.3 outline the requirements for high gain, intermediate gain and low gain antennas only. This does not preclude the future introduction of other gain antennas; however, some of the considerations which must be made before such an introduction are described in the guidance material contained in Attachment A to Part I of Annex 10, Volume III.*

4.2.3.2 LOW GAIN ANTENNA SUB-SYSTEMS

4.2.3.2.1 *Gain-to-noise temperature ratio.* Receiving subsystems employing low gain antennas shall achieve a gain-to-noise temperature ratio (G/T) of not less than –26 dB/K over not less than 85 per cent of the reference coverage volume defined in 4.2.3.1.1; and not less than –31 dB/K over the remaining 15 per cent of the reference coverage volume. The only exception to this is the region greater than 70 degrees in elevation from the horizontal plane where the G/T shall be not less than –28 dB/K.

4.2.3.2.2 *Axial ratio.* The axial ratio shall be less than 6 dB for elevation angles of 45 to 90 degrees and less than 20 dB for elevation angles of 5 to 45 degrees or the AES antenna shall have sufficient gain to compensate for additional polarization loss in excess of that caused by the axial ratios. The condition for including the compensation shall assume the satellite axial ratio to be 2.5 dB, with major axes of the polarization ellipses orthogonal.

4.2.3.2.3 **Recommendation.—** *To the maximum extent possible, the G/T should be not less than –26 dB/K and the axial ratio should be less than 6 dB over 100 per cent of the reference coverage volume.*

4.2.3.2 *bis* INTERMEDIATE GAIN ANTENNA SUB-SYSTEMS

See paragraph 4.2.3.6.

4.2.3.3 HIGH GAIN ANTENNA SUB-SYSTEMS

4.2.3.3.1 *Gain-to-noise temperature ratio.* Receiving subsystems employing high gain antennas shall achieve a gain-to-noise temperature ratio (G/T) of not less than –13 dB/K over not less than 75 per cent of the reference coverage volume and shall be not less than –25 dB/K over the remaining 25 per cent of the reference coverage volume defined in 4.2.3.1.1.

4.2.3.3.2 *Axial ratio.* The axial ratio shall be less than 6 dB over the 75 per cent of the reference coverage volume referred to in 4.2.3.3.1 where the G/T must exceed –13 dB/K or the AES antenna shall have sufficient gain to compensate for additional polarization loss in excess of that caused by this axial ratio. The condition for including the compensation shall assume the satellite axial ratio to be 2.5 dB, with the major axes of the polarization ellipses orthogonal.

4.2.3.3.3 **Recommendation.—** *To the maximum extent possible, the G/T should be not less than –13 dB/K and the axial ratio should be less than 6 dB over 100 per cent of the reference coverage volume.*

4.2.3.3.4 *Discrimination.* The antenna gain pattern for both transmit and receive functions shall discriminate by not less than 13 dB between the directions of wanted and unwanted satellites spaced 45 degrees or greater in longitude over not less than 75 per cent of the reference coverage volume defined in 4.2.3.1.1.

4.2.3.3.4.1 **Recommendation.—** *The antenna gain pattern for both transmit and receive functions should discriminate by not less than 13 dB between the directions of wanted and unwanted satellites spaced 45 degrees or greater in longitude over 100 per cent of the reference coverage volume defined in 4.2.3.1.1.*

4.2.3.3.5 *Phase discontinuity.* Beam steering transitions between adjacent beam positions of a switched beam antenna shall not cause RF phase transitions greater than 12 degrees in the transmitted signal for 99 per cent of all possible adjacent beam combinations.

4.2.3.3.5.1 **Recommendation.—** *Beam steering transitions between adjacent beam positions of a switched beam antenna should not cause RF phase transitions greater than 12 degrees in the transmitted signal for 100 per cent of all possible adjacent beam combinations.*

Note.— This requirement only applies to individual array performance in the case of multiple array antennas.

4.2.3.4 RECEIVER REQUIREMENTS

4.2.3.4.1 *Receiver spurious and linearity performance.* The required performance defined in 4.4.2.3 and 4.4.5.4 shall be achieved when the receiving antenna is illuminated in the direction of maximum gain by a power flux density of –100 dBW/m^2 distributed across the 1 525 to 1 559 MHz band.

4.2.3.4.2 *Receiver out-of-band performance.* The required performance defined in 4.4.2.3 and 4.4.5.4 shall be achieved in the presence of out-of-band interference at levels typical of normal operating conditions.

4.2.3.4.3 *Received phase noise.* The design of the receiver and the demodulators shall be such as to ensure full compliance with the performance requirements whenever the received signal phase noise characteristic does not exceed the mask defined in Table 4-1.*

4.2.3.4.4 *Capture range.* The receiver shall be capable of acquiring and maintaining lock to signals with a frequency offset from nominal of up to ±2.180 kHz at carrier-to-noise levels as shown in Table 4-2.

4.2.3.4.5 *Receiver Doppler rate.* The receiver shall be capable of acquiring and maintaining performance per 4.3.3 with a rate of change of frequency of 30 Hz per second.

4.2.3.5 TRANSMITTER REQUIREMENTS

4.2.3.5.1 *EIRP LIMITS*

4.2.3.5.1.1 For low gain antenna operation, the minimum value of EIRP per carrier in the direction of the satellite, when commanded to the maximum setting, shall be 13.5 dBW. The EIRP radiated in any direction shall not exceed 22.8 dBW.

4.2.3.5.1.1 *bis* For intermediate gain antenna operation, the minimum value of EIRP per carrier in the direction of the satellite, when commanded to the maximum setting, shall be 12.5 dBW. The EIRP radiated in any direction shall not exceed 34.8 dBW at the maximum setting.

4.2.3.5.1.2 For high gain antenna operation, the minimum value of EIRP per carrier in the direction of the satellite, when commanded to the maximum setting, shall be 25.5 dBW. The EIRP radiated in any direction shall not exceed 34.8 dBW at the maximum setting.

4.2.3.5.1.3 At settings less than the maximum setting, the EIRP per carrier radiated in any direction shall not exceed the EIRP radiated toward the wanted satellite by more than 5 dB.

4.2.3.5.1.4 For multicarrier operation, the maximum allowable operating EIRP shall be the level at which:

a) the total intermodulation product contribution from active sources is the maximum permitted in 4.2.3.5.7 (in-band intermodulation products), or

b) the gain-to-noise temperature ratio is the minimum permitted in 4.2.3.2.1 or 4.2.3.3.1, as applicable.

4.2.3.5.2 *EIRP control.* The EIRP per carrier in the direction of the wanted satellite shall be adjustable over a range of 15 dB in steps of 1 dB by command from the GES.

4.2.3.5.3 **Recommendation.—** *The minimum EIRP of the power control range should be a function of the channel rate and the satellite beam characteristics to minimize the interference potential.*

4.2.3.5.4 *Carrier-off level.* The EIRP in any direction, summed across the 1 626.5 to 1 660.5 MHz band, when all carriers are commanded off shall be –24.5 dBW or less.

4.2.3.5.5 *Log-on EIRP.* When logging on to a GES, the EIRP of the AES shall be at least 12.5 dBW.

4.2.3.5.6 *In-band spurious EIRP.* When transmitting a modulated carrier at any level up to the maximum allowable operating EIRP, the composite radiated in-band spurious and noise EIRP (excluding intermodulation products) referenced to a 4 kHz band shall not exceed –55 dBc. This requirement shall not apply to the frequency band on either side of the carrier centre frequency which is described in 4.3.2.1.

4.2.3.5.7 *INTERMODULATION PRODUCTS*

4.2.3.5.7.1 For multicarrier AES, the radiated intermodulation products shall not cause harmful interference to satellite navigation receiver operation where such receiver is operated on the same aircraft when transmitting two equal carriers with a total power equal to the maximum allowable operating EIRP of the AES.

* All tables are located at the end of this chapter.

4.2.3.5.7.2 The AES transceiver shall not transmit on a newly assigned frequency that would produce a fifth-order intermodulation product at a frequency below 1 610.0 MHz.

4.2.3.5.7.3 Frequency management techniques shall be used to preclude 5th and lower order intermodulation products below 1 610 MHz being radiated by the AES.

4.2.3.5.8 *Out-of-band EIRP density levels.* When transmitting a carrier at any level up to the maximum power level as described in 4.2.3.5.1, the out-of-band EIRP including spurious, harmonics and noise generated by the AES in any direction shall not exceed the levels shown in Table 4-3.

4.2.3.5.8.1 **Recommendation.**— *The EIRP density should not exceed –140 dBc/1 MHz from 1 605 to 1 610 MHz.*

4.2.3.5.9 *Phase noise.* The phase noise induced on a modulated carrier shall have a power spectral density not exceeding the envelope defined in Table 4-4.

4.2.3.5.10 *Transmitter Doppler rate.* The maximum rate of change of the frequency of the transmitted signal when compensated for aircraft acceleration in the direction of the satellite shall not exceed 15 Hz per second. The Doppler adjustment resolution shall not exceed 10 Hz and the associated frequency changes shall be made without introducing phase discontinuity into the transmitted signal.

4.2.3.5.11 AMSS transmissions shall not cause harmful interference to satellite navigation receiver operation where such receiver is operated on the same aircraft as the AES.

4.2.3.6 INTERMEDIATE GAIN ANTENNA SUB-SYSTEMS

4.2.3.6.1 *Gain-to-noise temperature ratio.* Receiving sub-systems employing intermediate gain antennas shall achieve a gain-to-noise temperature ratio (G/T) of not less than –19 dB/K over not less than 85 per cent of the reference coverage volume defined in 4.2.3.1.1. The only exception to this is the region greater than 70 degrees in elevation from the horizontal plane where the G/T shall be not less than –21 dB/K.

4.2.3.6.2 *Axial ratio.* The axial ratio shall be less than 6 dB over 85 per cent of the reference coverage volume referred to in 4.2.3.1.1 where the G/T must exceed –19 dB/K or the AES antenna shall have sufficient gain to compensate for the additional polarization loss in excess of that caused by this axial ratio. The condition for including the compensation shall assume the satellite axial ratio to be 2.5 dB, with the major axes of the polarization ellipses orthogonal.

4.2.3.6.3 **Recommendation.**— *The G/T should be not less than –19 dB/K and the axial ratio should be less than 6 dB over 100 per cent of the reference coverage volume.*

4.2.3.6.4 *Discrimination.* The antenna gain pattern for both transmit and receive functions shall discriminate by not less than 7 dB between the directions of wanted and unwanted satellites spaced 80 degrees or greater in longitude over not less than 85 per cent of the reference coverage volume defined in 4.2.3.1.1.

4.2.3.6.5 **Recommendation.**— *The antenna gain pattern for both transmit and receive functions should discriminate by not less than 7 dB between the directions of wanted and unwanted satellites spaced 80 degrees or greater in longitude over 100 per cent of the reference coverage volume defined in 4.2.3.1.1.*

4.2.3.6.6 *Phase discontinuity.* Beam steering transitions between adjacent beam positions of a switched beam antenna shall not cause RF phase transitions greater than 30 degrees in the phase of the receive and transmit signal for 99 per cent of all possible adjacent beam combinations.

4.2.3.6.7 **Recommendation.**— *Beam steering transitions between adjacent beam positions of a switched beam antenna should not cause RF phase transitions greater than 30 degrees in the received and transmitted signal for 100 per cent of all possible adjacent beam combinations.*

4.3 RF CHANNEL CHARACTERISTICS

4.3.1 Modulation

4.3.1.1 *Modulation for channel rates 2.4 kbits/s and below.* For channel rates of 2.4, 1.2 and 0.6 kbits/s, the modulation shall be aviation binary phase shift keying (A-BPSK).

4.3.1.2 *Modulation for channel rates above 2.4 kbits/s.* For channel rates above 2.4 kbits/s the modulation shall be aviation quadrature phase shift keying (A-QPSK).

4.3.2 *Radiated power spectral density.* The following bounds on radiated power spectral density shall apply in any direction normalized to the peak spectral density in that direction. The bounds shall apply to a single carrier and shall be centred at the carrier frequency. The lower bound shall not apply when the AES is transmitting the unmodulated preamble at the beginning of a burst.

4.3.2.1 *From-aircraft.* The power spectrum radiated by the AES shall fall within the mask defined by Table 4-5.

4.3.2.2 *To-aircraft.* The power spectrum received by the AES shall be within the mask defined by Table 4-6 for A-BPSK and, Table 4-7 and Table 4-7A for A-QPSK.

4.3.3 *Demodulator performance.* Where the channel rates are implemented as defined in 4.1, the bit error rate (BER) performance of the channel demodulators after descrambling shall be equal to or better than that shown in Table 4-8. This performance shall be attained under the following conditions:

a) in the presence of two adjacent interfering carriers on either side of the wanted carrier at a level of 5 dB higher than the wanted carrier with a frequency uncertainty from the nominal carrier spacing as specified and for the AES demodulator, with the AES operating up to its maximum allowable operating EIRP;

b) while receiving a signal transmitted with the maximum phase noise characteristics described in 4.2.3.5.9;

c) during 12° RF phase discontinuities occurring at the rate of one per second; and

d) under Rician channel conditions for fading bandwidths of 20, 60 and 100 Hz with a carrier to multipath ratio of 7 dB for systems using a low gain antenna or low and high gain antennas; or 10 dB for systems using only a high gain antenna.

Note.— Bit error performance objectives for AMS(R)S radio link are contained in ITU-R Recommendation M.1037.

4.3.4 Acquisition performance

4.3.4.1 *Time to acquire superframe synchronization.* The period from the command to the antenna to acquire the satellite to superframe synchronization shall not exceed 16 seconds.

Note.— This assumes the AES is within the satellite service area of that P channel.

4.3.4.2 **Recommendation.—** *The period from the command to the antenna to acquire the satellite to superframe synchronization should be as small as possible.*

4.3.4.3 C CHANNEL AES DEMODULATOR ACQUISITION

4.3.4.3.1 *CHANNEL RATE OF 21.0 KBITS/S*

4.3.4.3.1.1 *Frame lock.* The probability of failing to achieve frame lock on the first unique word following the burst preamble shall be less than one in 10^4 at an E_s/N_0 of 1.2 dB in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.3.1.2 *False frame lock.* The probability of false frame lock shall be less than one in 10^5 for an E_s/N_0 of 0 dB in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.3.1.3 *Reacquisition of frame lock.* Upon the loss of frame lock, it shall be acquired within 3.0 seconds for 99 per cent of the time, at an E_s/N_0 of 0 dB in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.3.2 *CHANNEL RATE OF 8.4 KBITS/S*

4.3.4.3.2.1 *Frame lock.* The probability of failing to achieve frame lock on the first unique word shall be less than one in 10^3 at an E_s/N_0 of 4.1 dB in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.3.2.2 *False frame lock.* The probability of false frame lock shall be less than one in 10^4 for an E_s/N_0 of 4.1 dB in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.3.2.3 *Reacquisition of frame lock.* Upon the loss of frame lock, it shall be acquired within 0.5 seconds at an E_s/N_0 of 4.1 dB, in 90 per cent of all cases, in a Gaussian channel, including conditions of 4.3.3 a) and b), and with a maximum burst-to-burst frequency uncertainty of ±30 Hz and maximum channel rate accuracy deviation of 4.4.5.1.

4.3.4.4 C CHANNEL GES DEMODULATOR ACQUISITION

4.3.4.4.1 *Channel rate of 21.0 kbits/s.* In a Gaussian channel, and under the conditions of 4.3.3 a) and b), with a frequency offset of ±600 Hz, and a clock frequency offset of ±0.5 Hz, the probability of failing to achieve frame lock on the first unique word shall be less than 1 in 10^3 at an E_s/N_0 of 1.7 dB. The probability of false frame lock shall be less than 1 in 10^5 at an E_s/N_0 of 1.7 dB. Should frame lock be lost, it shall be reacquired within 3.0 seconds, for 99 per cent of the time, at an E_s/N_0 of 1.7 dB.

4.3.4.4.1 *bis* *Channel rate of 8.4 kbits/s.* In a Gaussian channel, and under the conditions of 4.3.3 a) and b), with a frequency offset of ±600 Hz, and a clock frequency offset of ±0.5 Hz, the probability of failing to achieve frame lock on the first unique word shall be less than 1 in 10^3 at an E_s/N_0 of 4.4 dB. The probability of false frame lock shall be less than 1 in 10^4 at an E_s/N_0 of 4.4 dB. Should frame lock be lost, it shall be reacquired within 0.5 seconds, 90 per cent of the time, at an E_s/N_0 of 4.4 dB.

4.3.4.4.2 *Other C channel rates.* The probability of the GES demodulator failing to achieve frame lock within 0.75 seconds of the start of C channel transmission shall be less than one in 10^2.

4.3.4.4.3 **Recommendation.—** *The GES demodulator should achieve C channel frame lock as soon as possible after the start of C channel transmission.*

4.4 CHANNEL FORMAT TYPES AND RATES

4.4.1 General

4.4.1.1 *Aircraft system-timing reference point.* The reference timing point for signals generated and received by the AES shall be at the antenna.

4.4.1.2 *Channel rates.* The channel rates as applicable to the system capability levels defined in 4.1.3 shall be as shown in Table 4-9.

4.4.1.3 *Signal units (SUs).* All information to be transmitted over the P, R, T and sub-band C channels shall be in the format of signal units. For the P, T and sub-band C channel each signal unit shall consist of 96 bits. For the R channel each signal unit shall consist of 152 bits. The signal unit formats shall be as specified in Appendix 2.

4.4.1.3.1 *Cyclic redundancy check (CRC).* The last two bytes of each SU shall form a CRC of the SU. Any received SU which fails the CRC shall be discarded.

4.4.1.3.2 *Signal quality estimation.* The AES shall make information such as P channel degradation/loss and C channel bit error rate available to the AES management functions and GES management functions as appropriate.

4.4.2 P channel

4.4.2.1 *Channel rate accuracy.* The channel rate error shall not exceed one part in 10^6.

4.4.2.2 FRAME FORMAT

4.4.2.2.1 *General characteristics.* All P channel frames shall be either 500 ms, or a multiple of 500 ms to provide simple derivation of an 8-second superframe which shall be used for R channel and T channel slot allocation. Each P channel frame shall consist of five fields identified as: format identifier, superframe boundary marker, dummy field (for data rates greater than 2.4 kbits/s), information field and unique word, as shown in Figure 4-1* for channel rates of 2.4 kbits/s and less, and in Figure 4-2 for channel rates greater than 2.4 kbits/s.

4.4.2.2.2 *Format identifier.* This field shall consist of the 4 bits: 0001. Other values for this field are reserved for future use.

4.4.2.2.3 *Superframe boundary marker.* This field shall consist of 12 bits.

— 4 bits to indicate the start of a new superframe
 1111 for frame 0 in a superframe of 8 seconds
 0000 for all remaining frames in the superframe
— 4 bits to indicate frame of superframe
 0000,0001,0010,0011 at 0.6 kbits/s
 0000,0001,.....,0111 at 1.2 kbits/s
 0000,0001,.....,1111 at 2.4 kbits/s and above
— 4 bits which repeat the previous 4 bits.

4.4.2.2.4 *Dummy field.* For channel rates above 2.4 kbits/s this field shall be:

16 bits for 4.8 kbits/s
178 bits for 10.5 kbits/s

The dummy field shall consist of the sequence 0001 repeated until the required number of bits is obtained.

Note.— The dummy field is included to make each frame 0.5 seconds long. There is no dummy field required for data rates of 2.4 kbits/s and below.

4.4.2.2.5 *Information field.* The information field shall contain multiple signal units which are scrambled, coded and interleaved, in that order. The number of bits in the information field shall be as indicated in Table 4-10.

Note.— The number of bits in the information field is dependent on the data rate and the number of interleaver blocks in the field.

4.4.2.2.5.1 *Scrambling.* A scrambler with a 15-stage generator register shall be used for data scrambling before FEC coding. The polynomial for the generator register of the scrambler and the descrambler shall be $1 + X + X^{15}$. The scrambler and descrambler shall be clocked at the information rate with the first scrambled bit output before the first shift. In the absence of programming commands, the shift register shall be initialized to 1101 0010 1011 001 (leftmost bit in shift register stage 1) at the beginning of the information field of each frame. The scrambler and descrambler functions shall be as illustrated in Figure 4-3. The scrambler shall be re-initialized at the beginning of the information field of each frame.

Note.— The concept of a scrambler is explained in ITU-R Recommendation S.446-4, Annex I, Section 4.3.1 Method 1.

4.4.2.2.5.2 *Forward error correction (FEC).* The Standard in 4.4.5.3.3.5.2 shall apply.

Note.— There are no flush bits on the P channel.

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* All figures are located at the end of this chapter.

4.4.2.2.5.3 *Interleaving.* All P channels shall employ block interleaving. The column depth (number of rows) of the interleaver shall be 64 transmission bits, while the number of columns shall depend on the transmission rate as shown in Table 4-11. At the transmitter, the output of the convolutional encoder shall be written into the 64-bit columns until the prescribed number of columns are full. The rows shall then be permuted using the algorithm $Row_j = (Row_i * 27)$ modulo 64. The content of the interleaver shall then be transmitted row by row as shown in Figure 4-4. At the receiver, the soft decision data from the demodulator shall be written into the interleaver row by row, and when it is full the interleaver rows shall be permuted using the converse algorithm $Row_j = (Row_i * 19)$ modulo 64. The soft decision data shall then be read column by column into the FEC decoder.

4.4.2.2.6 *Unique word.* With A-BPSK each P channel frame shall end with the 32-bit unique word 1110 0001 0101 1010 1110 1000 1001 0011, with the leftmost bit transmitted first. With A-QPSK, the unique word shall be the A-BPSK unique word repeated in each of the in-phase and quadrature channels.

4.4.2.3 *Performance.* The over-all physical layer shall be configured and operated such that the average bit error rate is 10^{-5} or less after descrambling.

4.4.3 R channel

4.4.3.1 *Channel rate accuracy.* The channel rate error shall not exceed one part in 2R, where R is the channel rate, and one part in 10^4.

4.4.3.2 *Burst timing.* The beginning of each R channel burst shall occur within ±300 μs of the beginning of an R channel slot defined by the received P channel superframe. As shown in Figure 4-5, each P channel superframe shall define 8, 16, 32 and 64 random access slots for R channel data rates of 0.6, 1.2, 2.4 and 10.5 kbits/s, respectively.

4.4.3.3 BURST FORMAT

4.4.3.3.1 *General characteristics.* Each R channel burst shall consist of three fields: the preamble, the unique word and the information field as shown in Figure 4-6.

4.4.3.3.2 *Preamble.* The preamble for the R channel shall consist of an unmodulated carrier portion followed by a modulated portion. The length of these depend on the data rate as shown in Table 4-12. The unmodulated portion of the A-BPSK preamble shall be a signal of constant phase and the modulated portion shall consist of alternating "0" and "1" input to a standard A-BPSK modulator. The first bit of the modulated portion shall be a "0" and shall give a –90 degree phase change relative to the phase of the unmodulated signal. The unmodulated portion of the A-QPSK preamble shall be a signal of constant phase corresponding to the output of an ideal A-QPSK modulator with all "0"s at its input. The modulated portion shall consist of alternating "0" and "1" (commencing with a "0" in the first bit) on the I channel and continuous "0"s on the Q channel.

Note.— It is intended that the unmodulated portion of the preamble be used for carrier acquisition and the modulated portion for clock acquisition.

4.4.3.3.3 *Unique word.* The Standard in 4.4.2.2.6 shall apply.

4.4.3.3.4 *Information field.* The information field of each R channel burst shall consist of 160 bits and shall contain an extended signal unit plus 8 flush bits prior to convolutional encoding, where an extended SU shall have 152 bits and a Flush field shall be 0000 0000. The information field shall be scrambled, coded and interleaved, in that order.

4.4.3.3.4.1 *Scrambling.* The Standard in 4.4.2.2.5.1 shall apply, except that the flush bits are not scrambled.

4.4.3.3.4.2 *Forward error correction (FEC) coding.* The Standard in 4.4.5.3.3.5.2 shall apply, except that the encoder is re-initialized to the all 0s state at the beginning of the information field of each burst.

4.4.3.3.4.3 *Interleaving.* All R channels shall employ block interleaving. The number of rows in the interleaver shall be 64 transmission bits, while the number of columns shall be 5. Row interchanging in the interleaver shall be performed in accordance with 4.4.2.2.5.3.

4.4.3.4 *Performance.* The Standard in 4.4.2.3 shall apply.

4.4.4 T channel

4.4.4.1 *Channel rate accuracy.* The channel rate error shall not exceed one part in 2R, where R is the channel rate, and one part in 10^4.

4.4.4.2 *Timing relative to P channel.* The beginning of each T channel burst shall occur within ±300μs of the beginning of the assigned T channel slot defined by the received P channel superframe. As shown in Figure 4-7, each P channel superframe shall be divided into 16 nominal frames with 64 T channel slots in each frame. The shortest guard time between the T channel bursts of two different aircraft is under control of the GES and shall be 5 slots.

4.4.4.3 BURST STRUCTURE

4.4.4.3.1 *General characteristics.* Each T channel burst shall consist of three fields: the preamble, the unique word and the information field as shown in Figure 4-8.

4.4.4.3.2 *Preamble.* The Standard in 4.4.3.3.2 shall apply.

4.4.4.3.3 *Unique word.* The Standard in 4.4.2.2.6 shall apply.

4.4.4.3.4 *Information field.* The information field of each T channel burst shall consist of a burst identifier, n SUs and 16 flush bits prior to convolutional encoding, as follows.

Burst identifier — this field has 48 bits which shall identify the originating aircraft and the destination GES,

n SUs — from 2 to 31 standard length signal units of 96 bits each, and

Flush — a field of 16 bits (all 0s) to flush out the convolutional encoder.

The information field shall be scrambled, coded and interleaved, in that order.

4.4.4.3.4.1 *Scrambling.* The Standard in 4.4.2.2.5.1 shall apply, except that the scrambler shall be re-initialized at the beginning of the information field of each burst.

4.4.4.3.4.2 *Forward error correction (FEC) coding.* The Standard in 4.4.5.3.3.5.2 shall apply, except that the convolutional encoder shall be initialized to the all 0s state at the beginning of the information field of each burst.

4.4.4.3.4.3 *Interleaving.* All T channels shall employ block interleaving. The number of rows in the interleaver shall be 64 transmission bits, while the number of columns shall depend on the data rate as shown in Table 4-13. At the transmitter the output of the convolutional encoder shall be written into the 64-bit columns, until the specified number of columns are full. The interleaver row interchange algorithm shall be in accordance with 4.4.2.2.5.3.

4.4.4.4 *Performance.* The Standard in 4.4.2.3 shall apply.

4.4.5 C channel

4.4.5.1 *Channel rate accuracy.* The channel rate error shall not exceed one part in 2R, where R is the channel rate, and one part in 10^4.

4.4.5.2 TRANSMISSION FORMATS

4.4.5.2.1 *Preamble.* The burst preamble for all the C channel rates, except the 8.4 kbits/s channel, shall consist of an unmodulated carrier portion followed by a modulated portion. The length of these shall depend on the channel rate as shown in Table 4-14 as applicable to the system capability levels defined in 4.1.3. The preamble shall be as described in the text of 4.4.3.3.2 and in Table 4-14. The 8.4 kbits/s C channel shall not have a preamble.

4.4.5.2.2 *POSTAMBLE*

4.4.5.2.2.1 *8.4 kbits/s C channel.* The postamble of the C channel shall consist of alternating "1"s and "0"s (commencing with "1") on the I channel and the Q channel. The length of the 8.4 kbits/s C channel postamble shall be equivalent to 104 bits.

4.4.5.2.2.2 *All other C channels.* The postamble of all other C channels shall consist of continuous "0"s on the I channel, and alternating "0" and "1" (commencing with "0") on the Q channel. The length of the postamble shall be equivalent to a single interleaver block for channels with interleaving, and 96 bits for channels without interleaving.

4.4.5.2.3 *TO-AIRCRAFT*

4.4.5.2.3.1 *8.4 kbits/s C channel.* The C channel shall operate in burst mode in the to-aircraft direction. In this mode, the C channel shall consist of a series of contiguous frames followed by a postamble. Each frame shall consist of two fields: the unique word and the information field as in Figure 4-9 *bis.* Each frame shall be 500 ms long.

4.4.5.2.3.2 *All other C channels.* All other C channels shall operate in burst mode in the to-aircraft direction. In this mode, the C channel burst shall consist of a preamble followed by a series of contiguous frames followed by a postamble. Each frame shall consist of three fields: the unique word, a dummy field and the information field, as in Figures 4-9 and 4-10. Each frame shall be 500 ms long.

4.4.5.2.4 *FROM-AIRCRAFT*

4.4.5.2.4.1 *8.4 kbits/s C channel.* The C channel shall operate in continuous mode in the from-aircraft direction. In this mode, the C channel shall consist of two fields: the unique word and the information field as in Figure 4-9 *bis.* Each frame shall be 500 ms long.

4.4.5.2.4.2 *All other C channels.* All other C channels shall operate in continuous mode in the from-aircraft direction. Each transmission shall begin with the preamble described in 4.4.5.2.1. In this mode, the C channel frame shall consist of three fields: the unique word, a dummy field and the information field as in Figures 4-9 and 4-10. Each frame shall be 500 ms long.

Note.— In the P, R and T channels the information field refers to the information bits after forward error correction coding. With the C channel the information field may or may not include coding depending upon the particular C channel type.

4.4.5.3 FRAME FORMAT

4.4.5.3.1 *UNIQUE WORD*

4.4.5.3.1.1 *8.4 kbits/s C channel.* The unique word shall consist of two 52-bit sequences on the I and Q channels of the A-QPSK signal:

I 1010 1011 0011 0111 0110 1001 0011 1000 1011 1100 1010 0011 0000
Q 0000 1100 0101 0011 1101 0001 1100 1001 0110 1110 1100 1101 0101

with the leftmost bit transmitted first.

4.4.5.3.1.2 *All other C channels.* The unique word shall consist of two identical 44-bit sequences on the I and Q channels of the A-QPSK signal; 0100 0010 1101 1010 1111 0011 0100 1011 1011 0001 0001, with the leftmost bit transmitted first.

4.4.5.3.2 *Dummy field.* Where the channel rates are implemented as defined in Table 4-9, and as illustrated in Figures 4-9, 4-9 *bis* and 4.10, the number of bits in the dummy field shall be:

— 62 at 10.5 kbits/s;
— 44 at 21.0 kbits/s;
— 37 at 5.25 kbits/s;
— 32 at 6.0 kbits/s; and
— 0 at 8.4 kbits/s.

The dummy bits for the 5.25, 6.0, 10.5 and 21.0 kbits/s channels shall consist of the sequence 0101 1010 0011 1100 repeated until the required number of bits is obtained. For the 8.4 kbits/s C channel there is a single dummy bit d3 added after FEC encoding. The value of bit d3 is set to 1, as shown in Figure 4-9 *bis.*

4.4.5.3.3 *INFORMATION FIELD FOR CODED CHANNELS*

4.4.5.3.3.1 At the channel rate of 8.4 kbits/s this field shall contain 4 096 bits which shall be subdivided into 16 interleaver blocks of 256 bits each. At the channel rate of 21.0 kbits/s this field shall contain 10 368 bits which shall be subdivided into 27 interleaver blocks of 384 bits each.

4.4.5.3.3.2 **Recommendation.**— *At the recommended channel rate of 6.0 kbits/s this field should contain 2 880 bits which are subdivided into 15 interleaver blocks of 192 bits each.*

4.4.5.3.3.3 *Information field structure including sub-band data.* Prior to scrambling, FEC encoding and interleaving, the information field shall consist of a fill-in field followed by 25 alternating sub-band data and transparent data (voice) subfields as shown in Figure 4-9 or 4-9 *bis*, as appropriate.

4.4.5.3.3.3.1 At a channel rate of 21.0 kbits/s the fill-in field shall consist of 84 zeros, each subfield shall contain 12 sub-band data bits and 192 primary bits, and the last 12 bits of the 25th sub-band data subfield shall be filled with zeros.

4.4.5.3.3.3.2 **Recommendation.**— *At the recommended channel rate of 6.0 kbits/s the fill-in field should consist of 40 zeros, each subfield should contain 8 sub-band data bits and 48 primary bits, and the last 8 bits of the 25th sub-band data subfield should be filled with zeros.*

4.4.5.3.3.3.3 At a channel rate of 8.4 kbits/s the fill-in field shall consist of a single reference bit with a value set to 1, and each subfield shall contain 12 sub-band data bits and 96 primary bits.

4.4.5.3.3.4 *Scrambling.* The Standard in 4.4.2.2.5.1 shall apply.

4.4.5.3.3.5 *Forward error correction (FEC) coding*

4.4.5.3.3.5.1 *8.4 kbits/s C channel.* The FEC consists of a punctured rate 2/3 convolutional coding of constraint length $k = 7$ and a soft decision Viterbi decoder. The generator polynomials for this code shall be:

$$G1: 1 + X^2 + X^3 + X^5 + X^6$$
$$G2: 1 + X + X^2 + X^3 + X^6$$

The input/output relationship of the encoder is three output bits for every two input bits; the fourth bit of every four transmitted bits is dropped. The sequence is:

Input bit	1	2
Output sequence	G1 G2	G1

4.4.5.3.3.5.2 *Other C channel rates.* The information field shall use rate ½ forward error correction coding. The FEC coding shall be implemented with a constraint length 7 rate ½ convolutional encoder. The output sequence of the encoded symbols shall be G1, G2 (as defined in 4.4.5.3.3.5.1 and as shown in Figure 4-3). The convolutional encoder shall not be initialized between frames.

4.4.5.3.3.6 *Interleaving*

4.4.5.3.3.6.1 The number of rows in the interleaver shall be 64 transmission bits. At the channel rate of 8.4 kbits/s the number of columns shall be 4. At the channel rate of 21.0 kbits/s the number of columns shall be 6.

4.4.5.3.3.6.2 **Recommendation.**— *At the recommended channel rate of 6.0 kbits/s the number of rows in the interleaver should be 64 transmission bits and the interleaver columns should be 3.*

4.4.5.3.3.6.3 At the transmitter the output of the convolutional encoder shall be written into the 64-bit columns, until the specified number of columns are full. The rows shall then be permuted using the algorithm described in 4.4.2.2.5.3.

4.4.5.3.4 *Information field for uncoded channels.* Where the channel rates are implemented as defined in 4.1, at the channel rate of 10.5 kbits/s this field shall contain 5 100 bits and at the recommended channel rate of 5.25 kbits/s this field shall contain 2 500 bits.

4.4.5.3.4.1 *Information field structure including sub-band data.* Prior to scrambling this field shall be divided into 25 alternating sub-band data and primary fields as shown in Figure 4-10. Where the channel rates are implemented as defined in 4.1.3, at the channel rate of 10.5 kbits/s each subfield shall contain 12 sub-band data bits and 192 primary bits; the last 12 bits of the 25th sub-band data subfield shall be filled with zeros. Where the channel rates are implemented as defined in 4.1.3, at the channel rate of 5.25 kbits/s each subfield shall contain 4 sub-band data bits and 96 primary bits; the last 4 bits of the 25th sub-band data subfield shall be filled with zeros.

Note.— Interleaving is not applicable at the channel rates of 10.5 and 5.25 kbits/s because the data is not forward error correction coded at these rates.

4.4.5.4 *Performance.* The C channel physical layer shall be configured and operated such that the average bit error rate is 10^{-3} or less after descrambling.

Note.— GES measurements of received BER permit GES commands to the AES for adjustment of the AES transmitted power. The GES also receives performance data measurement results made by the AES to enable GES output power adjustments.

4.5 LINK LAYER P CHANNEL AND R CHANNEL PROTOCOLS

4.5.1 General

Note.— The AMSS protocols are defined in terms of the OSI layered reference model. Section 4.5 defines the functional requirements of the link layer for P and R channels to transfer user data and signalling between the AES and the GES.

4.5.1.1 For each AES and GES, the link layer shall interface to the following:

a) the subnetwork layer;

b) the AES/GES management;

c) the circuit-mode services;

d) the physical layer.

4.5.1.2 The term link service user when used with respect to the link layer in 4.5 shall include items a), b) and c) in the list above.

4.5.2 Link interface data unit (LIDU)

4.5.2.1 The link interface data unit (LIDU) shall be the total information unit transferred across the interface between the link service user and the link layer in a single interaction. Each LIDU shall comprise link interface control information (LICI) and, if required, one LSDU.

4.5.2.2 The LIDU exchanged between the link layer and the subnetwork layer shall contain an LSDU and LICI, except that the transmission status indication LIDU (Table 4-25) passed by the link layer to the subnetwork layer at the transmitting end shall contain only LICI. The LIDU exchanged between the link layer and the AES/GES management and between the link layer and the circuit-mode services shall contain only LICI.

4.5.2.3 LINK INTERFACE CONTROL INFORMATION (LICI)

4.5.2.3.1 The LICI parameters exchanged between the link layer and the subnetwork layer shall be as defined in Table 4-11.

4.5.2.3.2 The LICI parameters exchanged between the link layer and the circuit-mode services shall be as defined in Table 4-38.

4.5.2.3.3 The LICI parameters exchanged between the link layer and the AES and GES management functions shall be as defined in 4.9.2.1.2 and Table 4-45, respectively.

4.5.2.4 LINK SERVICE DATA UNIT (LSDU)

Note.— The link service data unit (LSDU) is a part of an LIDU whose identity is preserved between the two link service users communicating with each other.

4.5.2.4.1 The link service data unit (LSDU) shall contain link service user data and shall be extracted from the LIDU received from the subnetwork layer.

4.5.2.4.2 *LINK SERVICE DATA UNIT FORMAT*

The LSDU format shall be the same as the format of satellite subnetwork protocol data units (SNPDUs) in the SSND sub-layer described in 4.7.

4.5.3 Link protocol data unit (LPDU)

4.5.3.1 The link protocol data units (LPDUs) shall be the signal units (SUs) described in 4.5.3.2.

4.5.3.2 SIGNAL UNIT (SU)

4.5.3.2.1 There shall be two lengths of SUs for the P and R channels:

a) 96 bits (12 octets): standard length SUs for P channel;

b) 152 bits (19 octets): extended length SUs for R channel.

4.5.3.2.2 Each SU shall contain control information, and may include user data depending upon the SU type.

4.5.3.2.3 *LIDU-TO-SU SET MAPPING*

4.5.3.2.3.1 Each LIDU received by the link layer, before being transmitted to the peer link layer, shall be mapped into an SU set. Each SU set shall comprise either a single signal unit called a "lone signal unit" (LSU) or more than one signal unit of which the first shall be an "initial signal unit" (ISU) and those that follow shall be "subsequent signal units" (SSUs).

4.5.3.2.3.2 *For LIDU comprised of LSDU and LICI*

4.5.3.2.3.2.1 For the P channel, an LSDU of length 2, 3 or 4 octets shall be mapped into standard length LSUs of Figures A2-37, A2-39 and A2-40 in Appendix 2 to Chapter 4, respectively. An LSDU of length greater than 4 octets, shall result in an ISU followed by a maximum of 63 SSUs. For an LSDU of length greater than 4 octets, the first two octets of the LSDU shall be mapped into the 2-octet user data field of an ISU (Appendix 2 to Chapter 4, Figure A2-37). The remaining octets shall be mapped into the 8-octet user data fields of subsequent SSUs (Appendix 2 to Chapter 4, Figure A2-38) ordered by sequence numbers (Appendix 3 to Chapter 4, Item 59). The number of SSUs shall depend upon the number of octets in the LSDU. The control information in each SU of the SU set shall be mapped from the information contained in the LICI and the information generated by the internal link layer protocol processes.

Note.— Each ISU contains information indicating the number of octets in the user data field of the last SSU of the SU set.

4.5.3.2.3.2.2 For the R channel, an LSDU shall map into a maximum of 3 extended length SUs, with the ISU of the SU set containing the first 11-octets (Appendix 2 to Chapter 4, Figure A2-44) of the LSDU in its user data field. The remaining octets shall be mapped into the 11-octet user data field of SSUs ordered by sequence indicator (Appendix 3 to Chapter 4, Item 58). The control information in each SU of the SU set shall be mapped from the information contained in the LICI and the information generated by the internal link layer protocol processes.

4.5.3.2.3.3 *For LIDU comprised of LICI only*

For an LIDU containing LICI only, the SU set shall be generated by mapping the information contained in the LICI and generated by the internal link layer protocol processes into the fields of the control information of the appropriate SU.

4.5.3.2.4 *SU SET-TO-LIDU MAPPING*

4.5.3.2.4.1 At the receiving end, an SU set shall be reassembled into an LIDU before being passed to the link service user.

4.5.3.2.4.2 For an SU set with SU(s) containing user data, the resulting LIDU shall contain LSDU and LICI. The LSDU shall be reassembled by combining the user data field of each SU of the received complete SU set. The LICI shall be generated from the control information in the SUs.

4.5.3.2.4.3 For an SU set with SU(s) containing no user data, the resulting LIDU shall contain only LICI. The LICI shall be generated from the control information in the received SUs.

4.5.3.3 SIGNAL UNIT FORMAT

4.5.3.3.1 The formats of all SUs transmitted on the P and the R channels shall be as shown in Appendix 2 to Chapter 4. The signal unit field mapping and the transmission order of the bits shall be as shown in Figure A2-1. The signal unit field coding and definitions shall be as described in Appendix 3 to Chapter 4.

4.5.3.3.2 SUs not recognized by the receiving link layer shall be ignored.

Note.— SUs not specified in Appendix 2 to Chapter 4 may be in use under mutual agreement between an AMSS service provider and an AMSS user for non-safety services.

4.5.4 LIDU routing

The receiving link layer (in either the GES or the AES) shall use the message type parameter in the LICI to route the LIDU to the appropriate link service user. The transmitting link layer (in the GES and the AES) shall use the routing parameter in the LICI received from the circuit-mode services (Table 4-38) to route the SU set corresponding to an LIDU, for transmission on the sub-band C channel or the R/P channels.

4.5.5 Precedence (Q number)

Each SU of the SU set generated from an LIDU shall be assigned a precedence (Q number) by the link layer according to the precedence parameter passed to it in the LICI by the link service user. Each link layer signalling SU shall be assigned a Q number according to its message type. A Q number shall be in the range from 0 (lowest precedence) to 15 (highest precedence).

4.5.6 DLS and RLS services

4.5.6.1 The link layer shall provide two distinct types of services, designated as direct link service (DLS) and reliable link service (RLS).

4.5.6.2 DLS shall be a link-layer service in which the SUs shall be transmitted to the peer link layer without making any provision for identification and retransmission of any lost SUs.

Note.— DLS is only available to AES/GES management functions and circuit-mode services.

4.5.6.3 RLS shall be a link-layer service that provides for the identification and retransmission of any lost SUs.

4.5.7 P channel protocol

Note.— In this subsection, the use of the terms "AES" and "GES" refer to the link layer functions for the P channel protocol within the AES and the GES.

4.5.7.1 General

The link layer functions for the P channel shall be as defined in 4.5.7.2 and 4.5.7.3.

4.5.7.2 Ground earth station (GES)

4.5.7.2.1 Upon receipt of an LIDU, the GES shall assign an available (not currently assigned to an LIDU with the same Q number) reference number to it whenever this can be done in accordance with 4.5.7.2.2; however, the GES shall not assign a reference number to LIDUs received from the circuit-mode services and to system table broadcast LIDUs received from the GES management. If a reference number cannot be assigned to an LIDU, the LIDU shall be stored until one is assigned to it.

Note.— The circuit-mode LIDUs are assigned application reference numbers by the circuit-mode services.

4.5.7.2.2 At any Q precedence level, each assignment of a reference number to an LIDU destined to a particular AES shall be to the oldest LIDU among all the LIDUs without a reference number at that Q level destined to this AES. The GES shall not assign a reference number to an RLS LIDU if there is a reference number currently assigned to another LIDU with the same Q number and addressed to the same AES. Two consecutive reference number assignments for LIDUs of the same Q number shall not be made with the same reference number except for two DLS LIDUs which are mapped into LSUs. In the case of RLS, the reference number assigned by the GES shall not be equal to the last assigned reference number to an RLS LIDU with the same Q number and addressed to the same AES.

4.5.7.2.3 For DLS, the reference number shall be released immediately after it is assigned. For RLS, the reference number shall be released after the GES sends a transmission status indication LIDU (Table 4-25) to the link service user in the GES. The GES shall not reassign a released reference number until all the reference numbers that were available before its release have been assigned, in accordance with 4.5.7.2.2, the only exception to that shall be for a reference number that was assigned to a DLS LIDU mapping into an LSU, which may be immediately reassigned to another DLS LIDU mapping into an LSU.

4.5.7.2.4 After the assignment of a reference number to the LIDU or upon receipt of circuit-mode LIDU, an SU set shall be generated according to 4.5.3.2.3. Among all the SUs awaiting transmission, the oldest of the SUs with the highest Q number shall always be transmitted first. The ISU or the RTX SU of an SU set shall be transmitted before the SSUs, and the SSUs shall be transmitted in the descending order of their sequence numbers (Appendix 3 to Chapter 4, Item 59). After the transmission of the complete SU set, the GES shall do the following:

4.5.7.2.4.1 For RLS:

a) If a P channel acknowledgement (PACK) SU (Appendix 2 to Chapter 4, Figure A2-49) indicating no error in the SU set is received from the AES, the GES shall send a transmission status indication LIDU indicating success (Table 4-25) to the link service user in the GES.

b) If a PACK SU (Appendix 2 to Chapter 4, Figure A2-49) indicating missing SUs in the SU set is received from the AES and if another PACK SU of the PACK SU set is not received within tG2 seconds (Appendix 4 to Chapter 4) from the time the last PACK SU of the PACK SU set was received, or if no more PACK SUs identifying missing SUs are expected, the GES shall transmit a retransmission SU set. The retransmission SU set shall comprise a retransmission header (RTX) SU (Appendix 2 to Chapter 4, Figure A2-41) followed by the missing SUs identified in the received PACK SUs of the PACK SU set. The GES shall then proceed as in 4.5.7.2.4.1; however, if a PACK SU indicating missing

SUs in the SU set is received from the AES before the complete retransmission SU set has been transmitted, the GES shall discard the received PACK SU.

c) If a PACK SU (Appendix 2 to Chapter 4, Figure A2-49) requesting a complete retransmission of the SU set is received from the AES, the GES shall retransmit the entire SU set as a sequence of an ISU and SSUs. The GES shall then proceed as in 4.5.7.2.4.1

d) If no PACK SU associated with the SU set is received from the AES within tG1 seconds (Appendix 4 to Chapter 4) from the time the last SSU of the SU set (original or retransmitted) was transmitted, the GES shall transmit a request for acknowledgement (RQA) SU (Appendix 2 to Chapter 4, Figure A2-27) to the AES. The GES shall transmit the RQA SU every tG1 seconds from the time the last RQA SU was sent, until a response is received from the AES, or until the number of times the RQA SU was sent equals five. If tG1 seconds elapse after the fifth retransmission of the RQA SU without receiving any corresponding PACK SU from the AES, the GES shall send a transmission status indication LIDU indicating failure (Table 4-25) to the link service user in the GES and shall cease processing that SU set; otherwise, the GES shall proceed as in 4.5.7.2.4.1.

4.5.7.2.4.2 If a PACK SU identifying an SU set which is not present in the GES is received from an AES, the GES shall discard the received PACK SU.

4.5.7.2.5 If there are no SUs (data or signalling) to be transmitted, the GES shall transmit an AES system table broadcast SU (Appendix 2 to Chapter 4, Figures A2-30 to A2-34), if one has been generated from an LIDU received from the GES management; otherwise, the GES shall transmit a fill-in SU (Appendix 2 to Chapter 4, Figure A2-42).

4.5.7.3 AIRCRAFT EARTH STATION (AES)

4.5.7.3.1 Upon receipt of an SU set comprised of an LSU, the AES shall form an LIDU according to 4.5.3.2.4 and pass it to the appropriate link service user in the AES. For an LSU using RLS, the AES shall then send a PACK SU indicating no error to the GES. The AES shall command the selection of an R channel frequency and then shall resend that PACK SU if an RQA SU identifying this SU set is received before another SU set for this AES with the same Q number.

4.5.7.3.2 Upon receipt of SUs comprising an SU set, the AES shall reassociate the received SUs into an SU set according to their reference numbers, Q numbers and sequence numbers (Appendix 3 to Chapter 4, Items 43, 46 and 59, respectively). For such an SU set, if an SSU is received without its corresponding ISU or RTX SU having been received, the AES shall discard the SSU.

4.5.7.3.3 For an SU set comprised of multiple SUs, following receipt of an ISU the AES shall determine whether or not any more SSUs corresponding to the SU set headed by the ISU are expected from the GES in accordance with the following criterion:

No more SSUs corresponding to the SU set are expected if either the last SSU in the SU set, or an SU of lower Q number than the one awaiting completion, or an SU with the same Q number as the one awaiting completion but with a different reference number, or an AES system table broadcast SU, or a fill-in SU, is received.

Note.— To apply this criterion, the AES considers all received SUs independently of their AES ID.

4.5.7.3.3.1 When an SU set with the same Q number and AES ID as an SU set awaiting completion but with a different reference number is received from the GES, the AES shall discard the incomplete SU set awaiting completion.

4.5.7.3.3.2 The AES shall discard the received SU set if the received SU set (complete or incomplete) has the same Q number, and reference number as the last SU set that has been completed and reassembled into an LIDU at that Q number.

4.5.7.3.4 If no more SUs corresponding to the SU set are expected, the AES shall determine whether or not there are any missing SUs in the received SU set. The AES shall then do the following:

4.5.7.3.4.1 For DLS:

a) If there are no missing SUs, the AES shall reassemble the SUs into an LIDU according to 4.5.3.2.4 and pass the LIDU to the appropriate link service user in the AES.

b) If there are any missing SUs, the AES shall discard the incomplete SU set.

4.5.7.3.4.2 For RLS:

a) If there are no missing SUs in the SU set, the AES shall reassemble the SU set into an LIDU according to subsection 4.5.3.2.4 and forward it to the appropriate link service user. The AES shall then send a PACK SU indicating no errors to the GES. If subsequently an RQA SU requesting acknowledgement for that same SU set is received, the AES shall command the selection of an R channel frequency and then shall retransmit that PACK SU.

b) If the number of missing SUs is less than 43, the AES shall send to the GES one or more PACK SUs comprising the PACK SU set, identifying the missing SUs and requesting their retransmission.

Note.— A PACK SU indicating errors can identify as many as three missing SUs.

c) If more than 42 SUs in an SU set are missing, the AES shall send to the GES a PACK SU set comprised of one PACK SU requesting retransmission of the entire SU set.

4.5.7.3.4.2.1 After sending a PACK SU set requesting partial or complete retransmission to the GES, the AES shall then do the following:

a) If an RQA SU is received from the GES within tA1 seconds (Appendix 4 to Chapter 4) from the time the PACK SU set was transmitted to the GES, the AES shall command the selection of an R channel frequency and then shall retransmit the last PACK SU set to the GES and shall proceed as in 4.5.7.3.4.2.1. If an RQA SU is received from the GES before the complete PACK SU set has been transmitted, the AES shall discard the RQA SU.

b) Upon receipt of SUs headed by an RTX SU or an ISU from the GES, the AES shall determine whether or not any more SUs corresponding to the retransmitted SU set are expected in accordance with the criterion described in 4.5.7.3.3. The AES shall then determine whether or not the incomplete SU set identified in the RTX SU is present in the AES. If the incomplete SU set is not present in the AES, the AES shall discard the received SU set headed by RTX SU; otherwise, the AES shall insert the received SUs headed by RTX SU into the incomplete SU set. After inserting the received retransmitted SUs into the incomplete SU set and discarding any duplicated SUs (as required), the AES shall determine whether or not the resultant SU set is complete. The AES then shall do the following:

1) If the SU set is complete, the AES shall send a PACK SU indicating no error to the GES. Then the AES shall reassemble the complete SU set into an LIDU according to 4.5.3.2.4 and shall pass it to the appropriate link service user in the AES. If subsequently, an RQA SU requesting acknowledgement for that same SU set is received before another SU set for this AES with the same Q number, the AES shall command the selection of an R channel frequency and then shall retransmit that PACK SU.

2) If the SU set is not complete, the AES shall send to the GES one or more PACK SUs comprising a PACK SU set, in accordance with 4.5.7.3.4.2 b) and c). The AES shall then proceed as in 4.5.7.3.4.2.1.

c) If no response is received from the GES within tA1 seconds (Appendix 4 to Chapter 4) from the time the complete PACK SU set requesting retransmissions was sent, the AES shall command the selection of an R channel frequency and then shall send the PACK SU set again to the GES identifying the missing SUs. The AES shall retransmit the PACK SU set every tA1 seconds (Appendix 4 to Chapter 4), from the time the last PACK SU set was sent, until a corresponding retransmitted SU set is received from the GES, or until the number of times the PACK SU set, identifying the same missing SUs, was sent equals five. If tA1 seconds elapse after the fifth retransmission of the PACK SU set without receiving any retransmitted SUs from the GES, the AES shall discard the incomplete SU set.

4.5.7.3.5 The AES shall respond to a request for acknowledgement (RQA) SU received from the GES by sending a PACK SU requesting the retransmission of the entire SU set if the RQA SU identifies an SU set not received at the AES.

4.5.7.3.6 The AES link layer shall pass the revision number of the system table broadcast to the AES management upon receipt of the first SU of a system table broadcast sequence received on the satellite/beam-identifying P_{smc} channel. The broadcast LIDU corresponding to a series of a complete or partial broadcast sequence (see 4.10.4.5.2.2) shall be assembled and passed to the AES management after all the expected SUs of the series have been received, or after an SU of another series with a revision number equal to or greater than the series awaiting completion is received.

4.5.8 R channel protocol

Note.— In 4.5.8, the use of the terms "AES" and "GES" refers to the link layer functions for the R channel protocol within the AES and the GES.

4.5.8.1 GENERAL

4.5.8.1.1 The link layer functions associated with the R channel protocol shall be as defined in 4.5.8.2 and 4.5.8.3.

4.5.8.2 AIRCRAFT EARTH STATION (AES)

4.5.8.2.1 Upon receipt of an LIDU for RLS, the AES shall assign a reference number (Appendix 3 to Chapter 4, Item 46) to it if there is no reference number currently assigned to an LIDU for RLS with the same Q number as the received LIDU. Upon receipt of an LIDU for DLS, the AES shall assign an available (not currently assigned to an LIDU with the same Q number) reference number to it; however, the AES shall not assign a reference number to LIDUs received from the circuit-mode services. If a reference number is not assigned to an LIDU, the LIDU shall be stored until one is assigned to it. Each assignment of a reference number shall be to the oldest received LIDU without a reference number. Two consecutive reference number assignments for LIDUs of the same Q number shall not be made with the same reference number, except for two LIDUs which are mapped into DLS LSU.

Note.— Circuit-mode services LIDUs are assigned application reference numbers by the circuit-mode services.

4.5.8.2.2 For DLS, the reference number shall be released immediately after it is assigned. For RLS, the reference number shall be released after the AES sends a transmission status indication LIDU (Table 4-25) to the link service user in the AES. The AES shall not reassign a released reference number until all the reference numbers that were available before its release have been assigned; the only exception to that is for a reference number that was assigned to a DLS LIDU mapping into an LSU, which may be immediately reassigned to another DLS LIDU mapping into an LSU.

4.5.8.2.3 After the assignment of a reference number to an LIDU or upon the receipt of a circuit-mode services LIDU, an SU set shall be generated according to 4.5.3.2.3. Among all the SUs awaiting transmission, the oldest SU of the SUs with the highest Q number shall always be transmitted first. The SUs of an SU set shall be transmitted in the ascending order of their sequence indicators (Appendix 3 to Chapter 4, Item 58).

4.5.8.2.4 *For RLS.* For each transmitted SU set, the AES shall do the following:

a) Respond to the R channel acknowledgement (RACK) SUs received from the destination GES as follows:

1) If the RACK SU (Appendix 2 to Chapter 4, Figure A2-28) indicates that the SU set has been completely received at the GES, the AES shall send a transmission status indication LIDU indicating success (Table 4-25) to the link service user in the AES.

2) If the RACK SU (Appendix 2 to Chapter 4, Figure A2-29) identifies one or more SUs that have not been received, the AES shall command the selection of an R channel frequency and retransmit the missing SUs in the ascending order of their sequence indicators. If any other RACK SU identifying missing SUs is received, the AES shall discard it if the transmission of all missing SUs identified in the previously received RACK SU is not yet completed. However, if either:

i) in addition to the first RACK SU, five more RACK SUs identifying missing SUs are received before the AES has completely transmitted any of the identified missing SUs in the first RACK SU,

or

ii) the first RACK SU identified two missing SUs, and one SU has been transmitted, and subsequent to the transmission five more RACK SUs identifying missing SUs have been received without transmitting another SU,

then, the AES shall send a transmission status indication LIDU indicating failure (Table 4-25) to the link service user in the AES and shall cease processing that SU set.

Note.— A RACK SU received at the AES would identify at most two missing SUs from an SU set.

b) If a RACK SU from the destination GES does not arrive within tA3 seconds (Appendix 4 to Chapter 4) from the time the last SU in a set (the original SU set or a retransmitted set of SUs corresponding to the original SU set) was transmitted, the AES shall command the selection of an R channel frequency from the available group of R channel frequencies and shall retransmit the set of SUs. The AES shall repeat this process until an acknowledgement from the GES is received, except that the number of times the same set of SUs was retransmitted shall not exceed 5. If a RACK SU does not arrive within tA3 seconds after the fifth repetition, the AES shall send a transmission status indication LIDU indicating failure (Table 4-25) to the link service user in the AES and shall cease processing that SU set.

4.5.8.3 GROUND EARTH STATION (GES)

4.5.8.3.1 The GES shall associate the SUs received from logged-on AESs into sets according to their AES IDs, Q numbers, reference numbers and sequence indicators (Appendix 3 to Chapter 4, Item 58).

4.5.8.3.2 *FOR RLS*

4.5.8.3.2.1 After an SU of an SU set has been received by the GES without completing the set, the GES shall send a RACK SU identifying the remaining missing SUs to the AES if any of the following is true:

a) if the received SU is either the last SU of the SU set or the last SU of the missing SUs of the SU set;

b) if a period of tG4 seconds (Appendix 4 to Chapter 4) elapses without another SU (DLS or RLS) from the same AES having been received; or

c) if the GES subsequently receives from the same AES an SU with a lower Q number or an SU, indicating DLS, of the same Q number but different reference number.

If after sending a RACK SU, identifying the missing SUs, the GES receives no SU in response within tG3 seconds, it shall retransmit the RACK SU to the AES, except that, instead of sending the RACK SU, the GES shall discard the SU set if a total of 6 identical RACK SUs have been sent and no missing SU was received within tG3 seconds since the last RACK SU was transmitted. The GES shall also discard an incomplete

SU set if an SU indicating RLS and having the same Q number but different reference number than the SUs of the set, is received from the same AES.

4.5.8.3.2.2 Whenever a complete SU set has been received, the GES shall reassemble an LIDU according to 4.5.3.2.4, shall pass it to the appropriate link service user, and shall send a RACK SU indicating no error to the AES.

4.5.8.3.2.3 After an LIDU has been formed the GES shall discard all SU sets with the same Q number and reference number subsequently received from the same AES until at least one SU with the same Q number and a different reference number has been received from the same AES, and shall retransmit, for each discarded SU set, a RACK SU indicating no error to the AES.

4.5.8.3.2.4 Whenever two or more SUs of the same Q number and reference number and sequence indicator have been received from the same AES before the corresponding LIDU has been formed, all but one shall be discarded.

4.5.8.3.3 *FOR DLS*

After an SU of an SU set has been received by the GES without completing the set, if any of the following is true, the GES shall discard the received SUs:

a) if the received SU is the last SU in the set;

b) if a period of tG4 seconds (Appendix 4 to Chapter 4) elapses without another SU (DLS or RLS) from the same AES having been received; or

c) if the GES subsequently receives from the same AES an SU with a lower Q number or an SU of the same Q number but different reference number.

If and when the SU set becomes complete, the GES shall reassemble the set into an LIDU according to 4.5.3.2.4 and shall pass it to the appropriate link service user. However, if the SUs of the complete SU set specify a different GES ID and the SU set corresponds to a circuit-mode services LIDU, the GES shall send the SU set to the GES whose ID is specified.

4.6 LINK LAYER T CHANNEL AND SUB-BAND C CHANNEL PROTOCOLS

4.6.1 General

4.6.1.1 The link layer functions for T and sub-band C channels to transfer user data and signalling shall be as defined in this section.

4.6.1.2 The P and R channels, described in 4.5, shall be used to set up T and sub-band C channels as described in 4.6.5 and 4.6.6, respectively.

4.6.2 Link interface data unit (LIDU)

4.6.2.1 The LIDU exchanged between the link layer and the subnetwork layer for transmission on the T channel shall contain link interface control information (LICI) and link service data unit (LSDU), except that the transmission status indication LIDU (Table 4-25) passed by the link layer to the subnetwork layer at the transmitting end shall contain only LICI.

4.6.2.2 The LIDU exchanged between the link layer and circuit-mode services and between the link layer and AES/GES management functions for transmission on the sub-band C channel shall contain LICI only.

4.6.2.3 LINK INTERFACE CONTROL INFORMATION (LICI)

4.6.2.3.1 The LICI parameters exchanged between the link layer and the subnetwork layer shall be as defined in Table 4-25.

4.6.2.3.2 The LICI parameters exchanged between the link layer and circuit-mode services shall be as defined in Table 4-38. The LICI parameters exchanged between the link layer and subnetwork management functions shall be as defined in Tables 4-44 and 4-45.

4.6.2.4 LINK SERVICE DATA UNIT (LSDU)

The link service data unit (LSDU) shall contain link service user data and shall be extracted from the LIDU received from the subnetwork layer.

4.6.3 Signal unit (SU)

4.6.3.1 There shall be two lengths of SUs for the T channel and one length for the sub-band C channel:

a) 48 bits (6 octets): burst identifier lone signal unit (LSU) (Appendix 2 to Chapter 4, Figure A2-43) for T channel.

b) 96 bits (12 octets): standard length SUs for T and sub-band C channels.

4.6.3.2 Each SU of the SU set corresponding to an LIDU received from the satellite subnetwork layer shall contain control information and user data. The SUs of the SU set corresponding to an LIDU received from the circuit-mode services and AES/GES management shall contain only control information.

4.6.3.3 LIDU-TO-SU SET MAPPING

4.6.3.3.1 *FOR LIDU COMPRISED OF LSDU AND LICI*

An LIDU shall be mapped into an SU set. Each SU set shall comprise an "initial signal unit" (ISU) followed by a maximum of 63 "subsequent signal units" (SSUs). The first two octets of the LSDU shall be mapped into the 2-octet user data field of the ISU (Appendix 2 to Chapter 4, Figure A2-37). The remaining octets shall be mapped into the 8-octets user data fields of the SSUs ordered by sequence numbers (Appendix 3 to Chapter 4, Item 59). The number of SSUs shall depend upon the number of octets in the LSDU. The control information in each SU of the SU set shall be mapped from the information contained in the LICI and the information generated by the internal link layer protocol processes.

4.6.3.3.2 *FOR LIDU COMPRISED OF LICI*

For an LIDU containing LICI only, the SU set shall be generated by mapping the information contained in the LICI and generated by the internal link layer processes into the fields of the control information of the appropriate SU.

4.6.3.4 SU SET-TO-LIDU MAPPING

4.6.3.4.1 An SU set shall be mapped into an LIDU before being passed to the link service user.

4.6.3.4.2 For an SU set with SU(s) containing user data, the resulting LIDU shall contain LSDU and LICI. The LSDU of the resulting LIDU shall be reassembled by combining the user data field of each SU of the received complete SU set. The associated LICI shall be generated from the control information in the SUs.

4.6.3.4.3 For an SU set with SU(s) containing no user data, the resulting LIDU shall contain only LICI. The LICI shall be generated from the control information in the received SUs.

4.6.3.5 SIGNAL UNIT FORMAT

4.6.3.5.1 The formats for all SUs transmitted on the T and sub-band C channels shall be as shown in Appendix 2 to Chapter 4. The signal unit field mapping and the transmission order of the bits shall be as shown in Figure A2-1. The signal unit field coding and definitions shall be as described in Appendix 3 to Chapter 4.

4.6.3.5.2 SUs not recognized by the receiving link layer shall be ignored.

Note.— SUs not specified in Appendix 2 to Chapter 4 may be in use under mutual agreement between an AMSS service provider and an AMSS user for non-safety services.

4.6.4 T channel transmission protocol

Note.— In 4.6.4, the use of the terms "AES" and "GES" refer to the link layer functions for the T channel transmission protocol within the AES and the GES.

4.6.4.1 GENERAL

The link layer functions for the T channel transmission protocol shall be as defined in 4.6.4.2 and 4.6.4.3.

4.6.4.2 AIRCRAFT EARTH STATION (AES)

4.6.4.2.1 Upon receiving an LIDU, the AES shall generate an SU set according to 4.6.3.3.1.

Note.— LIDUs are assigned reference numbers by the T channel reservation protocol.

4.6.4.2.2 *SU transmission.* SUs shall be transmitted on the T channel in burst reservations. Among all the SUs awaiting transmission, the oldest SU of the SUs with the highest Q number shall always be transmitted first. The ISU or the RTX SU of an SU set shall always be transmitted before the SSUs, and the SSUs shall be transmitted in the descending order of their sequence numbers (Appendix 3 to Chapter 4, Item 59). A burst identifier SU (Appendix 2 to Chapter 4, Figure A2-43) shall be transmitted at the beginning of each burst (as specified in 4.4.4.3.4). Whenever, during a burst transmission, there is no SU available for transmission, a fill-in SU (Appendix 2 to Chapter 4, Figure A2-42) shall be transmitted. However, if no SUs are available at the start of a burst reservation, the AES shall inhibit the transmission of the corresponding burst.

4.6.4.2.3 *For RLS.* For each transmitted SU set the AES shall do the following:

a) respond to each T channel acknowledgement (TACK) SU sent by the destination GES via the P channel in response to the SU set as follows:

   1) when the TACK SU (Appendix 2 to Chapter 4, Figure A2-29) indicates that the SU set has been completely received at the GES, the AES shall send a transmission status indication LIDU indicating success (Table 4-25) to the link service user;

   2) when the TACK SU (Appendix 2 to Chapter 4, Figure A2-29) indicates that the entire SU set has been lost, the AES shall retransmit the entire original SU set;

   3) when the TACK SU (Appendix 2 to Chapter 4, Figure A2-29) indicates missing SUs at the GES, if no more TACK SUs indicating more missing SUs of the same SU set are expected, or if one or more

TACK SUs are expected but none is received within tA5 seconds (Appendix 4 to Chapter 4) from the time the previous TACK SU was received, the AES shall retransmit the missing SUs as indicated in the received TACK SUs. A retransmission header (RTX) SU (Appendix 2 to Chapter 4, Figure A2-41) shall be transmitted before any retransmitted SU. Then, if any further TACK SU indicating missing SUs associated with the same SU set is received before the entire retransmission SU set has been retransmitted, the AES shall discard the received TACK SU.

However, the AES shall not transmit the same set, either the original SU set or a retransmission SU set, more than three times. If, after the third transmission, the AES receives a TACK SU that would result in a fourth transmission of the same SU set, the AES shall send a transmission status indication LIDU indicating the failure to the link service user and shall cease processing that SU set.

b) If an acknowledgement, associated with the SU set, is not received from the destination GES within tA4A seconds (Appendix 4 to Chapter 4) from the time the last SU in the set (either the original SU set or a retransmission set of SUs corresponding to the original SU set) was transmitted or, as specified in 4.6.5.2.6 b), discarded, the AES shall transmit a request for acknowledgement (RQA) SU (Appendix 2 to Chapter 4, Figure A2-48). Thereafter, the AES shall command the selection of an R channel frequency and then shall retransmit the RQA SU every tA4B seconds (Appendix 4 to Chapter 4) from the time the previous RQA SU was transmitted, until a corresponding TACK SU is received. However, if a corresponding TACK SU is not received within tA4B seconds from the time the fifth RQA SU was transmitted, the AES shall send a transmission status indication LIDU indicating failure (Table 4-25) to the link service user in the AES and shall cease processing that SU set.

4.6.4.3 GROUND EARTH STATION (GES)

4.6.4.3.1 The GES shall reassociate and reorder the SUs received from a logged-on AES according to their AES IDs, Q numbers, reference numbers and sequence numbers, defined in Appendix 3 to Chapter 4. A received SSU shall be discarded if the corresponding ISU or RTX SU has not been received.

Note.— The AES ID associated with a T channel burst could be determined either from the burst ID SU, if received, or any other SU, within the same burst, that contains an AES ID field.

4.6.4.3.2 Following the receipt of an ISU, the GES shall determine whether or not any more SSUs corresponding to the SU set headed by the received ISU are expected from the AES according to the following criterion:

No more SSUs corresponding to the SU set are expected if either the last SSU of the set, or an SU from the same AES but with a lower Q number, or an SU from the same AES with the same Q number but with a different reference number, or a fill-in SU with the same AES ID, is received.

4.6.4.3.3 When no more SUs corresponding to an SU set are expected, the GES shall determine whether or not there are any missing SUs in the received SU set. The GES then shall do the following:

a) if the SU set is complete, send a T channel acknowledgement (TACK) SU (Appendix 2 to Chapter 4, Figure A2-29) indicating that no SUs are missing, assemble an LIDU from the SU set according to 4.6.3.4, and pass it to the appropriate link service user;

b) if the SU set is incomplete, transmit one or more TACK SUs identifying the missing SUs to the AES, according to the following:

   1) if more than 42 or less than 4 SUs of the SU set are missing, only one TACK SU (Appendix 2 to Chapter 4, Figure A2-29) shall be sent. In the first case the TACK SU shall indicate a request for the retransmission of the entire SU set, while in the second case it shall indicate a request for retransmission of all missing SUs;

   2) otherwise, a maximum of 14 TACK SUs (Appendix 2 to Chapter 4, Figure A2-29) indicating all missing SUs shall be sent to the AES.

4.6.4.3.3.1 If the received SU set is a retransmission of an SU set awaiting completion at the GES, the GES shall use these sets to form a new SU set that is as complete as possible prior to sending an acknowledgement as given in 4.6.4.3.3 a) and b).

4.6.4.3.3.2 For each completed SU set, the GES shall discard all subsequent SU sets (complete or incomplete) with the same Q number, AES ID and reference number, until an SU set with the same Q number, AES ID and the paired reference number (according to the pairing scheme given in 4.6.5.2.2) is received.

4.6.4.3.4 Following the reception of an RTX SU (Appendix 2 to Chapter 4, Figure A2-41), the GES shall determine, according to the criterion described in 4.6.4.3.2, whether or not any more SUs corresponding to the retransmission set, headed by the received RTX SU, are expected from the AES. When no more SUs are still expected, the GES shall insert the retransmitted SUs into the appropriate (incomplete) SU set and shall acknowledge as specified in 4.6.4.3.3.

4.6.4.3.5 The GES shall respond to a request for acknowledgement (RQA) SU received from the AES by retransmitting the latest previously sent set of TACK SUs corresponding to the SU set indicated in the RQA SU. If the RQA SU identifies an SU set awaiting completion at the GES and for which no TACK SU has been transmitted, the GES shall send a TACK SU requesting the retransmissions of the missing SUs. If the RQA SU identifies an SU set not received at the GES, the GES shall send a TACK SU requesting the retransmission of the entire SU set.

4.6.4.3.6 If the GES receives an ISU with the same AES ID and Q number as those of an SU set awaiting completion and with a reference number equal to the reference number paired with the reference number of the SU set according to the pairing scheme given in 4.6.5.2.2, the GES shall discard the awaiting SU set.

4.6.5 T channel reservation protocol

Note.— In 4.6.5, the use of the terms "AES" and "GES" refer to the link layer functions for the T channel reservation protocol within the AES and the GES.

4.6.5.1 General

The link layer functions for the T channel reservation protocol shall be as defined in 4.6.5.2 and 4.6.5.3.

4.6.5.2 Aircraft earth station (AES)

4.6.5.2.1 Upon receipt of an LIDU containing an LSDU exceeding 33 octets, the AES shall route the LIDU to the T channel protocol.

Note.— An LIDU containing an LSDU of 33 octets or less may be routed to R channel protocol or T channel protocol.

4.6.5.2.2 Before passing the LIDU to the T channel transmission protocol, the AES shall assign an available (not currently assigned) reference number (Appendix 3 to Chapter 4, Item 46) to it. If a reference number is not assigned to an LIDU, the LIDU shall be stored until one is assigned to it. Each assignment of a reference number shall be to the oldest received LIDU without a reference number. The reference numbers for assignment to T channel LIDUs shall be defined in pairs as (0,1); (2,3); (4,5); (6,7); (8,9); (10,11); (12,13); (14,15). Once released, a reference number from a pair shall not be reassigned until the other number from the pair has been assigned and released. The AES shall not assign a reference number from a pair whose other number has just been released until a reference number from each pair that was available for assignment before the release has been assigned. The assigned reference number shall be used by both the T channel transmission protocol and the T channel reservation protocol.

4.6.5.2.3 To request a reservation for the transmission of an SU set, the AES shall send a reservation request (REQ) SU to the GES indicating the reference number, Q number and the length of the SU set to be transmitted.

4.6.5.2.4 The AES shall transmit a REQ SU on the R channel (Appendix 2 to Chapter 4, Figure A2-47) or on the T channel (Appendix 2 to Chapter 4, Figure A2-7) to the GES in accordance with the following criterion:

The T channel shall be used if the AES is currently transmitting a T channel burst and there is enough room to accommodate the REQ SU or if there is a T channel burst due to start in the next 8-second time window; otherwise, the R channel shall be used.

4.6.5.2.5 When the T channel is used for transmitting a REQ SU to the GES, the requested length shall be increased by one SU.

4.6.5.2.6 After sending a REQ SU to the GES, the AES shall do the following:

a) If the T channel was used for a REQ SU transmission, and neither a corresponding reservation (RES) SU (Appendix 2 to Chapter 4, Figure A2-23) nor a corresponding reservation forthcoming (RFC) SU (Appendix 2 to Chapter 4, Figure A2-24) is received from the GES within tA6 seconds (Appendix 4 to Chapter 4) from the time the REQ SU was sent on the T channel, the AES shall send the REQ SU again on the T or R channel, in accordance with 4.6.5.2.4, with the requested transmission length equal to the length last requested or incremented by one if T channel is used. The AES shall then proceed as in 4.6.5.2.6.

b) If the R channel was used for the REQ SU transmission, and neither a corresponding RES SU nor a corresponding RFC SU is received from the GES within tA7 seconds (Appendix 4 to Chapter 4) from the time the REQ SU was sent on the R channel, the AES shall command the selection of an R channel frequency and send the REQ SU again on the T or R channel, in accordance with 4.6.5.2.4, with the requested transmission length equal to the length last requested or incremented by one if the T channel is used. The AES shall then proceed as in 4.6.5.2.6. However, if tA7 seconds elapse after the fifth consecutive transmission of a REQ SU on the R channel without receiving any corresponding RES SU or RFC SU from the GES, the AES shall abort the reservation procedure for the corresponding LIDU and shall discard the number of SUs specified in the last transmitted REQ SU. If an ISU is amongst the SUs discarded, the AES shall then discard the complete SU set headed by the discarded ISU even if this shall result in discarding more SUs than the number of SUs specified in the REQ SU. The AES shall then send a transmission status indication LIDU (Table 4-25) indicating failure to the appropriate link service user in the AES corresponding to that completely discarded SU set. If an RTX SU is amongst the SUs discarded, the AES shall discard the complete SU set headed by the RTX SU. If a REQ SU is amongst the SUs discarded, the AES shall retransmit the REQ SU again on the R channel or the T channel in accordance with 4.6.5.2.4.

c) If a RES SU corresponding to a REQ SU is received from the GES, the AES shall pass the reservation information in the RES SU to the T channel transmission protocol. The starting frame number in the T channel burst reservation shall refer to either the current frame number or one of the 15 frames following the current frame number.

d) If an RFC SU corresponding to a REQ SU is received from the GES, the AES shall compute tA8 (Appendix 4 to Chapter 4), according to the delay specified in the RFC SU for the expected RES SU to arrive. The AES then shall do the following:

1) If no RES SU or RFC SU corresponding to that RFC SU set is received from the GES within tA8 seconds from the time the RFC SU was received, the AES shall send a REQ SU to the GES on the T or R channel in accordance with 4.6.5.2.4 with the requested length equal to the length associated with the corresponding RFC SU or incremented by one if the T channel is used and the AES shall then proceed as in 4.6.5.2.6.

2) If an RFC SU associated with the previously received RFC SU is received from the GES, the AES shall update the corresponding tA8 according to the new delay specified in the RFC SU.

3) If a RES SU corresponding to that RFC SU is received from the GES within tA8 seconds from the time the RFC SU was received, the AES shall pass the reservation information in the RES SU to the T channel transmission protocol in the AES.

4.6.5.2.7 After the T channel transmission protocol in the AES receives a TACK SU set requesting the retransmission of missing SUs, the AES shall compute tA8, according to the delay specified in the TACK SU for the expected RES SU to arrive. The AES then shall do the following:

a) If no RES SU or RFC SU corresponding to that TACK SU set is received from the GES within tA8 seconds from the time the complete SU set was received, the AES shall send a REQ SU to the GES on the T or R channel in accordance with 4.6.5.2.4 with the requested length equal to the number of missing SUs identified in the TACK SU set plus on if the R channel is used or incremented by one more if the T channel is used and the AES shall then proceed as in 4.6.5.2.6.

b) If an RFC SU associated with the previously received TACK SU set is received from the GES, the AES shall update the corresponding tA8 according to the new delay specified in the RFC SU.

c) If a RES SU is received from the GES within tA8 seconds from the time the complete TACK SU set was received, the AES shall pass the reservation information in the RES SU to the T channel transmission protocol in the AES.

Note.— The RFC flag field (Appendix 3 to Chapter 4, Item 50) in the RES or RFC SU to distinguish between the RES or RFC SUs associated with REQ SUs and those associated with TACK SUs or RFC SUs.

4.6.5.2.8 If a RES SU is received from the GES which does not correspond to any REQ SU sent by the AES or to RFC SU or TACK SU received by the AES, the AES shall pass the reservation information in the RES SU to the T channel transmission protocol.

4.6.5.2.9 If the AES is not able to transmit a T channel burst in the assigned T channel burst reservation, the AES shall send a REQ SU to the GES requesting a reservation for the not transmitted burst.

4.6.5.2.10 When an AES terminates communications with a GES as the result of a handover procedure (4.9), both the AES and the GES shall release all link layer resources which were allocated for data communication between them.

4.6.5.2.11 The reference number assigned to an LIDU shall be released when either all the expected reservations associated with the SU set corresponding to the LIDU have been received at the AES or the reservation procedure corresponding to that LIDU has been aborted, and after a transmission status indication LIDU (Table 4-25) indicating success or failure has been sent to the link service user in the AES.

4.6.5.3 GROUND EARTH STATION (GES)

4.6.5.3.1 Upon receipt of a REQ SU from the AES, the GES shall assign one or more burst reservations to the AES for the SU set identified in the REQ SU. When the GES transmits a TACK SU set indicating error to the AES, the GES shall assign one or more burst reservations for retransmission of the partial SU set comprised of an RTX SU followed by the missing SUs or retransmission of the complete SU set.

Note.— A TACK SU indicating error contains a field defining the preset delay to the forthcoming RES SU.

4.6.5.3.2 The GES shall send a RES SU to the AES at a time such that there is a subsequent maximum delay of 8 seconds before the intended SU set transmission time. If the start of the assigned reservation is outside the 8-second time window from the time the reservation was made, the GES shall send an RFC SU to the AES indicating the delay and then shall send the RES SU once the actual time is within 8 seconds of the scheduled reservation time. If a reservation associated with a TACK SU set indicating errors or RFC SU previously transmitted cannot be made within the delay specified in the TACK SU set or the RFC SU, the GES shall send an RFC SU to the AES before the delay period has elapsed. The RFC SU shall indicate a new delay to reservation. The GES shall send a RES SU to the AES early enough so that it arrives in time for the AES to begin sending an SU set at the start of burst reservation.

4.6.5.3.3 The GES shall not assign overlapping reservations on the same T channel. The interval between the end of one reservation and the beginning of the next reservation shall be sufficient to assure that the T channel bursts reserved by the GES do not overlap. A long SU set shall be assigned multiple bursts separated by intervals. The interval between the multiple burst reservations or between individual reservations for different SU sets shall be such as to allow for the transmission of at least one R channel burst every 8 seconds. The T channel burst length shall be chosen to allow the R channel and T channel transmissions to meet the performance requirements in 4.7. The length of each burst reservation shall be sufficient to accommodate the burst identifier SU which heads each T channel burst and the total reservation length shall be at least one SU longer than the requested one. The GES shall make reservations such that any given AES shall not be required to transmit at any time on more than one T channel belonging to the group of T channels assigned to the AES.

4.6.6 Sub-band C channel to-aircraft protocol

Note.— In this subsection, the use of the terms "AES" and "GES" refers to the link layer functions for the sub-band C channel to-aircraft protocol within the GES and the AES.

4.6.6.1 GENERAL

The link layer functions for an individual sub-band C channel in the to-aircraft direction shall be as specified in 4.6.6.2 and 4.6.6.3.

4.6.6.2 GROUND EARTH STATION (GES)

4.6.6.2.1 Upon receipt of an LIDU from the circuit-mode link service user (Table 4-38) or the GES management (Table 4-45), the GES shall generate an SU set from the LIDU. Each SU set shall comprise either a single signal unit called a "lone signal unit (LSU)" or more than one signal unit of which the first shall be an "initial signal unit (ISU)" and those that follow shall be "subsequent signal units (SSUs)". The SU set shall be generated by mapping the information contained in the LICI and generated by the internal link layer protocol processes into the fields of the control information of the appropriate SU.

4.6.6.2.2 Among all the SUs awaiting transmission, the oldest of the SUs with the highest Q number shall always be transmitted first. The SUs of an SU set comprised of multiple SUs shall be transmitted in the descending order of their sequence numbers (Appendix 3 to Chapter 4, Item 59).

Note.— The sub-band C channel link layer in the GES does not assign a reference number to the LIDU received from the circuit-mode link service user. Instead an application reference number is assigned by the circuit-mode services and is passed to the link layer in the LICI.

4.6.6.2.3 If there are no SUs to be transmitted, the GES shall transmit fill-in SUs (Appendix 2 to Chapter 4, Figure A2-42).

4.6.6.3 AIRCRAFT EARTH STATION (AES)

4.6.6.3.1 For an SU set comprised of an LSU, the AES shall form an LIDU containing only LICI and pass the LIDU to the appropriate link service user in the AES. The LICI shall be generated from the control information in the received LSU.

4.6.6.3.2 For an SU set comprised of multiple SUs, the AES shall reassociate and reorder the received SUs into an SU set according to their application reference number (Appendix 3 to Chapter 4, Item 4), sequence numbers (Appendix 3 to Chapter 4, Item 59) and Q numbers (Appendix 3 to Chapter 4, Item 43). Following receipt of an ISU, the AES shall determine whether or not any more SSUs corresponding to the SU set headed by the ISU are expected from the GES in accordance with the following criterion:

> No more SSUs corresponding to the SU set are expected if either the last SSU in the SU set or a fill-in SU is received, or if the channel is released.

If an ISU or an LSU with a Q number equal to the Q number of the SU set awaiting completion is received, the AES shall discard the incomplete SU set awaiting completion.

4.6.6.3.2.1 If no more SUs corresponding to a transmission of an SU set are expected, the AES shall determine whether or not there are any missing SUs. The AES shall then do the following:

a) if there are no missing SUs, the AES shall reassemble the SUs into an LIDU according to 4.6.3.4.3 and pass the LIDU to the appropriate link service user in the AES;

b) if there are any missing SUs, the AES shall not generate an LIDU from the received incomplete SU set; instead, the AES shall store the received SUs until the other missing SUs are received in a retransmission of the SU set, or until the channel is released.

4.6.6.3.3 *C channel crosstalk detection.* If a received SU or SU set contains an AES ID or application reference number which differs from that which prevailed when the C channel was established, the AES shall command the AES management to inhibit transmission on the C channel frequency and command the AES circuit-mode services to terminate the call.

4.6.7 Sub-band C channel from-aircraft protocol

Note.— In 4.6.7, the use of the terms "AES" and "GES" refers to the link layer functions for the sub-band C channel from-aircraft protocol within the AES and the GES.

4.6.7.1 GENERAL

The link layer functions for an individual sub-band C channel in the from-aircraft direction shall be as defined in 4.6.7.2 and 4.6.7.3.

4.6.7.2 AIRCRAFT EARTH STATION (AES)

4.6.7.2.1 Upon receipt of an LIDU from the circuit-mode link service user (Table 4-38) or the AES management (Table 4-44), the AES link layer shall generate the corresponding SU set according to 4.6.6.2.1.

4.6.7.2.2 Among all the SUs awaiting transmission, the oldest of the SUs with highest Q number shall always be transmitted first. The SUs of an SU set comprised of multiple SUs shall be transmitted in the descending order of their sequence numbers (Appendix 3 to Chapter 4, Item 59).

Note.— The sub-band C channel link layer in the AES does not assign a reference number to the LIDU received from the circuit-mode link service user. Instead an application reference number is assigned by the circuit-mode services and is passed to the link layer in the LICI.

4.6.7.2.3 If there are no SUs to be transmitted, the AES shall transmit fill-in SUs (Appendix 2 to Chapter 4, Figure A2-42).

4.6.7.3 GROUND EARTH STATION (GES)

4.6.7.3.1 For an SU set comprised of an LSU, the GES shall form an LIDU according to 4.6.6.3.1 and pass the LIDU to the appropriate link services user in the GES.

4.6.7.3.2 For an SU set comprised of multiple SUs, the GES shall reassociate and reorder the received SUs into an SU set according to their application reference number (Appendix 3 to Chapter 4, Item 4), sequence numbers (Appendix 3 to Chapter 4, Item 59) and Q numbers (Appendix 3 to Chapter 4, Item 43). Following receipt of an ISU, the GES shall determine whether or not any more SSUs corresponding to the SU set headed by the ISU are expected from the AES in accordance with the following criterion:

No more SSUs corresponding to the SU set are expected if either the last SSU in the SU set or a fill-in SU is received, or if the channel is released.

If an ISU or an LSU with a Q number equal to the Q number of the SU set awaiting completion is received, the GES shall discard the incomplete SU set awaiting completion.

4.6.7.3.2.1 If no more SUs corresponding to a transmission of an SU set are expected, the GES shall determine whether or not there are any missing SUs. The GES shall then do the following:

a) if there are no missing SUs, the GES shall reassemble the SUs into an LIDU according to 4.6.3.4.3 and pass the LIDU to the appropriate link service user in the GES;

b) if there are any missing SUs, the GES shall not generate an LIDU from the received incomplete SU set; instead, the GES shall store the received SUs until the other missing SUs are received in a retransmission of the SU set, or until the channel is released.

4.7 SATELLITE SUBNETWORK LAYER

4.7.1 General provisions

4.7.1.1 ARCHITECTURE

4.7.1.1.1 The satellite subnetwork layer (SSNL) in the AES and GES shall provide connection-oriented packet data service by establishing subnetwork connections (SNCs) between subnetwork service (SNS) users. Both of the SSNL in the AES and GES shall contain the following three functions:

a) satellite subnetwork dependent (SSND) function;

b) subnetwork access (SNAc) function; and

c) interworking (IW) function.

The SSND function shall perform the SSND protocol (SSNDP) between each pair of AES and GES by exchanging subnetwork protocol data units (SNPDUs). It shall perform the SSNDP aircraft (SSNDPA) function in the AES and the SSNDP ground (SSNDPG) function in the GES. At a minimum, the SNAc function shall perform the ISO 8208 protocol between the AES or GES and the attached routers by exchanging ISO 8208 packets. It shall perform the ISO 8208 DCE function in the AES and the GES. The IW function (IWF) shall provide the necessary harmonization functions between the SSND and the SNAc functions. Figure 4-11 shows the SSND, IW and SNAc functions and the ATN satellite subnetwork protocol architecture.

4.7.1.1.2 The term DCE when used shall mean ISO 8208 DCE.

4.7.1.1.3 The SSNL shall interface with the link layer and the AES/GES management.

4.7.1.2 SERVICES

The SSNL shall provide the following services:

a) transparency of transferred information — provide for the transparent transfer of octet aligned SSNL user data and/ or control information; and

b) quality of service selection — make available to SNS users a means to request and to agree to the quality of service for the transfer of SSNL user data.

4.7.2 Packet data performance

4.7.2.1 DEFINITIONS

4.7.2.1.1 The terms used with respect to packet data performance are based on the definitions in ISO 8348 (first edition). In applying these definitions to the AMSS subnetwork layer, the word "network" and its abbreviation "N" in ISO 8348 are replaced by the word "subnetwork" and its abbreviation "SN", respectively, wherever they appear. Additional definitions are provided as follows.

4.7.2.1.2 *Data transfer delay (95 percentile).* The 95th percentile of the statistical distribution of delays for which transit delay is the average.

4.7.2.1.2 *bis Data transit delay.* In accordance with ISO 8348, the average value of the statistical distribution of data delays.

4.7.2.1.3 *Subnetwork service data unit (SNSDU).* An amount of subnetwork user data, the identity of which is preserved from one end of a subnetwork connection to the other.

Note.— Subnetwork performance depends on a number of factors, including the level of communication traffic. The performance values given here apply during peak busy hours.

4.7.2.2 SPEED-OF-SERVICE

4.7.2.2.1 *CONNECTION ESTABLISHMENT DELAY*

Note.— Connection establishment delay, as defined in ISO 8348, includes a component, attributable to the called subnetwork service user, which is the time between the SN-CONNECT indication and the SN-CONNECT response. This user component is due to actions outside the boundaries of the satellite subnetwork and is therefore excluded from the AMSS specifications.

4.7.2.2.1.1 Connection establishment delay shall not exceed the following maximum values:

Minimum channel rate in use by AES (bits/s)	Maximum connection established delay (95 percentile) (seconds)
600	70
1 200	45
2 400	25
4 800	25
10 500	25

4.7.2.2.2 *DATA TRANSIT DELAY*

Note.— In accordance with ISO 8348, data transit delay values are based on a fixed SNSDU length of 128 octets. Data transit delays are defined as average values. (4.7.2.1.2 and 4.7.2.1.2 bis *refer)*

4.7.2.2.2.1 Data transit delay shall not exceed the following maximum values:

Minimum channel rate in use by AES (bits/s)	Maximum data transit delay (seconds)		
	To-aircraft		From-aircraft
	Highest priority service	Lowest priority service	Highest priority service
600	12	40	40
1 200	8	25	30
2 400	5	12	15
4 800	4	7	13
10 500	4	5	13

Note.— In any particular AES, lower priority from-aircraft traffic may be subject to additional delay, depending on the amount and rate of from-aircraft traffic loading.

4.7.2.2.3 *DATA TRANSFER DELAY (95 PERCENTILE)*

Note.— In accordance with ISO 8348, 95 per cent data transfer delay values are based on a fixed SNSDU length of 128 octets. 95 per cent data transfer delay is defined in 4.7.2.1.2.

Data transfer delay (95 percentile) shall not exceed the following maximum values:

Minimum channel rate in use by AES (bits/s)	Maximum data transfer delay (95 percentile) (seconds)		
	To-aircraft		From-aircraft
	Highest priority service	Lowest priority service	Highest priority service
600	15	110	80
1 200	9	60	65
2 400	6	30	35
4 800	5	20	30
10 500	4	10	30

Note.— In any particular AES, lower priority from-aircraft traffic may be subject to additional delay, depending on the amount and rate of from-aircraft traffic loading.

4.7.2.2.4 *CONNECTION RELEASE DELAY*

The connection release delay (95 percentile) shall not exceed 30 seconds.

4.7.2.3 RELIABILITY OF SERVICE

4.7.2.3.1 *RESIDUAL ERROR RATE*

The residual error rate in the from-aircraft direction shall not exceed 10^{-4} per SNSDU. The residual error rate in the to-aircraft direction shall not exceed 10^{-6} per SNSDU.

Note.— Residual error rate includes the probability of undetected error, the probability of losing an SNSDU, and the probability of duplicating an SNSDU.

4.7.2.3.2 *CONNECTION RESILIENCE*

4.7.2.3.2.1 The probability of an SNC provider-invoked SNC release shall not exceed 10^{-4} over any one-hour interval.

Note.— Connection release resulting from either GES-to-GES handover or AES log-off or VC pre-emption are excluded from this specification.

4.7.2.3.2.2 The probability of an SNC provider-invoked reset shall not exceed 10^{-1} over any one-hour interval.

4.7.3 Satellite subnetwork-dependent protocol services and operations

4.7.3.1 GENERAL PROVISIONS

Since the functional differences between the SSNDPA and SSNDPG are minimal, their operations shall be described in terms of SSNDPX where X shall stand for either A or G. Where differences do occur, the SSNDPA and SSNDPG functions shall be described individually.

4.7.3.2 SATELLITE SUBNETWORK-DEPENDENT PROTOCOL ENTITIES

Note.— At least one pair of SSNDPA and SSNDPG entities exists between each pair of AES and GES. Figure 4-12 shows two pairs of SSNDPA and SSNDPG entities between two AESs and a GES.

4.7.3.2.1 The SSNDPX defined in this section shall pertain to each SSNDPX entity.

4.7.3.3 LOGICAL CHANNELS

Note.— The connections between SSNDPAs and SSNDPGs are established through logical channels. Up to 255 logical channels may be established between each pair of SSNDPX entities. Each logical channel is identified by its own logical channel number (LCN) ranging from 1 through 255. LCN 0 is reserved.

4.7.3.3.1 For a new ground-to-air connection establishment, the SSNDPG shall allocate a logical channel number in the range 1 to 127, by choosing the lowest numbered logical channel in the ready state in that range. For a new air-to-ground connection setup, the SSNDPA shall allocate a logical channel number in the range 128 to 255, by choosing the highest numbered logical channel in the ready state in that range.

4.7.3.4 OPERATIONS

The SSNDPX virtual call (VC) service shall proceed through three distinct phases:

a) connection establishment;

b) data transfer; and

c) connection release.

Note.— The SSNDPX is specified in terms of locally originated, or remotely originated operations. Locally originated specifies the procedure at the SSNDPX for handling operations originating from a local SNS user, while remotely originated specifies the procedure at the SSNDPX for handling operations originating from a remote SNS user.

4.7.3.5 CONNECTION ESTABLISHMENT

Note.— Up to 128 octets of user data may be transferred during connection establishment.

4.7.3.5.1 The connection establishment procedure shall apply independently to each establishment request.

4.7.3.5.2 User data shall be transparently forwarded in both directions.

4.7.3.5.3 *LOCALLY ORIGINATED*

4.7.3.5.3.1 *Normal operation*

4.7.3.5.3.1.1 When the SSNDPX receives a call request packet from the IWF, it shall allocate a logical channel which is in the ready state, forward the call request packet to the remote SSNDPX by means of a connection request SNPDU and place the logical channel into the IWF call request state.

4.7.3.5.3.1.2 If the call is accepted at the remote SSNDPX, a connection confirm SNPDU is received. The SSNDPX shall then place the logical channel in the data transfer/flow control state (flow control ready/no remote or local interrupt pending) and forward a call connected packet to the IWF. The call connected packet shall use default values (if any) for the facilities which are not transmitted over the satellite subnetwork, according to the SNPDU to packet mapping rules defined in 4.7.3.16.

4.7.3.5.3.1.3 If the SSNDPX does not receive either a connection confirm or connection released SNPDU from the remote SSNDPX before the timer (see tN1, Table 4-18) expires, it shall initiate a connection release procedure.

4.7.3.5.3.2 *Other operation*

If resources are not available, or a requested facility value is not allowed, then the originating SSNDPX shall send a clear indication packet to the IWF.

4.7.3.5.4 *REMOTELY ORIGINATED*

4.7.3.5.4.1 *Normal operation*

4.7.3.5.4.1.1 When the SSNDPX receives a connection request SNPDU from the remote SSNDPX, it shall place the logical channel selected in the incoming call state. The SSNDPX shall forward an incoming call packet to the IWF using default values for any facilities which are not transmitted over the satellite subnetwork (see 4.7.3.16).

4.7.3.5.4.1.2 When the SSNDPX receives a call accepted packet from the IWF, it shall forward a connection confirm SNPDU to the remote SSNDPX and place the logical channel in the data transfer/flow control state (flow control ready/no remote or local interrupt pending) when it receives from the interfacing link layer the information that the connection confirm SNPDU has been processed (receipt of fail/success LIDU).

4.7.3.5.4.2 *Other operation*

4.7.3.5.4.2.1 If the receiving SSNDPX cannot support the request, then it shall transmit a connection released SNPDU to the originating SSNDPX.

4.7.3.5.4.2.2 If a selected facility value is not allowed, then the receiving SSNDPX shall initiate a connection release procedure.

4.7.3.6 CONNECTION RELEASE

Note.— A subnetwork connection may be released at any time by any party once the logical channel is in the data transfer, IWF call request, or incoming call states. The connection released SNPDU may contain user data (128 octets maximum) provided by the IWF.

4.7.3.6.1 User data shall be transparently forwarded in both directions.

4.7.3.6.2 The SSNDPX shall guarantee in-sequence transmission between data/ interrupt SNPDUs already forwarded to the link layer and a subsequently transmitted connection released or connection release complete SNPDU.

4.7.3.6.3 *LOCALLY ORIGINATED*

4.7.3.6.3.1 When the SSNDPX receives a clear request packet from the IWF, it shall place the logical channel in the local clear request state, generate a connection released SNPDU, and forward it to the remote SSNDPX. The only SNPDUs it shall then accept, are a connection released SNPDU or a connection release complete SNPDU. It shall discard all other SNPDUs. The SSNDPX shall also consider the receipt of any packet other than a clear request packet as an error, and shall discard it.

4.7.3.6.3.2 When the SSNDPX receives a connection release complete after the connection released has been successfully sent, it shall return the logical channel to the ready state. If the SSNDPX receives a connection released SNPDU from the remote SSNDPX, it shall not expect to receive a connection release complete SNPDU.

4.7.3.6.3.3 If the SSNDPX does not receive a response from the remote SSNDPX before the associated timer (see tN6, Table 4-18) expires, it shall return the logical channel to the ready state.

4.7.3.6.4 *REMOTELY ORIGINATED*

When the SSNDPX receives a connection released SNPDU, it shall enter the remote clear request state, and forward a clear indication packet to the IWF. It shall also construct a connection release complete SNPDU, send it to the remote SSNDPX, and return the logical channel to the ready state.

4.7.3.6.5 *SSNDPX ORIGINATED*

If the SSNDPX entity needs to disconnect a connection, it shall place the logical channel in the local clear request state, send a clear indication packet to the IWF and transmit a connection released SNPDU to the remote SSNDPX. It expects to receive as a response from the remote SSNDPX a connection release complete SNPDU or connection released SNPDU, and shall return the logical channel to the ready state when the expected response is received or timing supervision expires (see tN6, Table 4-20).

4.7.3.7 DATA TRANSFER

4.7.3.7.1 The data transfer procedure shall apply independently to each logical channel which is in the data transfer/flow control state.

4.7.3.7.2 *DATA TRANSFER PROCEDURE*

4.7.3.7.2.1 Data shall be forwarded transparently and in sequence between the SNS users.

4.7.3.7.2.2 An M-bit SNPDU sequence shall consist of a sequence of one or more data SNPDUs. Each data SNPDU except the last one, shall contain the maximum 503 octets of user data and its M-bit shall be set to 1. The user data field of the last SNPDU which belongs to the sequence may have less than the maximum length and shall have its M-bit set to 0.

4.7.3.7.2.3 *Locally originated*

4.7.3.7.2.3.1 An M-bit packet sequence received from the IWF shall be forwarded as an M-bit SNPDU sequence to the remote SSNDPX.

4.7.3.7.2.3.2 Upon receipt from the IWF of one or more data packets belonging to one M-bit packet sequence, the SSNDPX shall generate one or more data SNPDUs, using the M-bit to indicate a following data SNPDU of the same sequence of data SNPDUs and shall forward them to the remote SSNDPX.

Note.— The number of data SNPDUs needed in the sequence depends on the amount of user data in the data packets which belong to the M-bit packet sequence.

4.7.3.7.2.3.3 The SSNDPX shall also assign an SNPDU number to each data SNPDU. SNPDU numbers shall be consecutive over a given connection. The sequence numbering of data SNPDUs shall be performed modulo 256 and the SNPDU numbers shall cycle through the entire range from 0 through 255. The first data SNPDU to be transmitted over the satellite link, when the logical channel has just entered the flow control ready state, shall have an SNPDU number equal to 0.

4.7.3.7.2.4 *Remotely originated*

4.7.3.7.2.4.1 An M-bit SNPDU sequence received from the remote SSNDPX shall be forwarded as an M-bit packet sequence to the IWF.

4.7.3.7.2.4.2 Upon receipt of an M-bit SNPDU sequence, the SSNDPX shall generate an M-bit packet sequence, using the M-bit to indicate a following packet of the same sequence as required and forward it to the IWF.

Note.— The number of data packets needed in the M-bit packet sequence depends on the amount of user data in the M-bit SNPDU sequence and the packet size.

4.7.3.7.2.4.3 If a data SNPDU is received which contains less than the maximum size and with M-bit = 1 and D-bit = 0, then the SSNDPX shall initiate a reset procedure (see 4.7.3.8.2.1).

4.7.3.7.3 *FLOW CONTROL*

4.7.3.7.3.1 Flow control shall be provided within the SSNDPX to prevent the overflow of data buffers.

4.7.3.7.3.2 To interrupt the flow of data, the receiving SSNDPX shall generate a flow control SNPDU with its flow control reason field set to suspend and transmit it to the remote SSNDPX. The SNPDU number in the flow control (suspend) SNPDU shall be set to the SNPDU number of the last received and accepted data SNPDU. If there are any out-of-sequence data SNPDUs in the SSNDPG, the SNPDU number in the flow control SNPDU with its reason field set to suspend shall be set to the SNPDU number of the SNPDU received and accepted before the out-of-sequence SNPDU. When subsequently the receiving SNDPX is able to resume the data transfer, it shall transmit a flow control SNPDU with its flow control reason field set to resume.

4.7.3.7.3.3 When the SSNDPX receives a flow control SNPDU with its flow control field set to suspend, it shall stop transmitting data SNPDUs on the indicated logical channel. If the SNPDU number in the flow control (suspend) SNPDU is other than that of the last data SNPDU transmitted and the data

SNPDU with SNPDU number equal to the SNPDU number in the flow control (suspend) SNPDU plus one modulo 256 is no longer in the data buffer, the SSNDPX shall initiate a reset of the logical channel. When the SSNDPX receives a flow control SNPDU with its control field set to resume, it shall restart transmitting data SNPDUs on the indicated logical channel. The first (re)transmitted data SNPDU shall have its SNPDU number equal to the SNPDU number of the previously received flow control SNPDU (suspend) plus one modulo 256, unless a reset procedure has been invoked.

4.7.3.7.3.4 If the receiving SSNDPX is not able to resume data transfer before the associated timer (see tN7 in Table 4-18 and Table 4-20) expires, it shall initiate a reset of the logical channel.

4.7.3.7.4 *EXPEDITED DATA TRANSFER*

Note.— The expedited data transfer allows an SSNDPX to transmit user data contained in an interrupt packet to the remote SSNDPX, bypassing any flow control that may have been applied by subnetwork layer entities.

4.7.3.7.4.1 The expedited data transfer procedure shall apply independently to each logical channel which is in the data transfer state and shall not be initiated when a release or reset procedure is in process.

4.7.3.7.4.2 Only one interrupt SNPDU at a time, with a maximum user data length of 32 octets, shall be permitted in each direction.

4.7.3.7.4.3 *Locally originated*

4.7.3.7.4.3.1 When the originating SSNDPX receives an interrupt packet from the IWF and provided there is no pre-existing interrupt SNPDU awaiting interrupt confirm SNPDU, the SSNDPX shall then generate an interrupt SNPDU and forward it to the remote SSNDPX, and await an interrupt confirm SNPDU; otherwise, the SSNDPX shall discard the interrupt packet.

4.7.3.7.4.3.2 Upon receipt of an interrupt confirm SNPDU, the SSNDPX shall generate an interrupt confirmation packet and forward it to the IWF.

4.7.3.7.4.3.3 If the SSNDPX does not receive the interrupt confirm SNPDU before the associated timer (see tN4 in Table 4-18 and Table 4-20) expires, it shall initiate a reset of the logical channel.

4.7.3.7.4.4 *Remotely originated*

4.7.3.7.4.4.1 When the SSNDPX receives an interrupt SNPDU, it shall forward an interrupt packet to the IWF.

4.7.3.7.4.4.2 When the SSNDPX receives an interrupt confirmation packet from the IWF, it shall construct an interrupt confirm SNPDU, and send it to the remote SSNPDX.

4.7.3.8 CONNECTION RESET

4.7.3.8.1 When the SSNDPX detects an error in the SSNDPX operation for which its action is to reset the virtual circuit (see Table 4-24), then it shall place the logical channel into the local reset state, carry out the reset procedure and transmit a reset SNPDU to the remote SSNDPX.

Note.— The cause and diagnostic codes indicate whether the reset should be carried out within the satellite subnetwork alone or should be extended to the IWF.

4.7.3.8.2 *RESET ACTION*

During the reset process, the following actions shall be taken by the SSNDPX with respect to its data transfer operation:

a) the SNPDUs which have not yet been passed to the link layer shall be discarded;

b) the SNPDUs that have been received prior to receiving/transmitting a reset SNPDU but which do not constitute an M-bit SNPDU sequence shall be flushed from the reassembly area;

c) the expected (data) SNPDU number shall be reset to 0 and subsequently transmitted data SNPDUs shall be numbered starting from 0; and

d) any outstanding interrupt SNPDU to or from the remote SSNDPX remains unconfirmed and tN4 is stopped.

4.7.3.8.3 *RESET PROCEDURES*

4.7.3.8.3.1 The reset procedures shall apply only to logical channels that are in the data transfer state.

4.7.3.8.3.2 The SSNDPX shall guarantee in sequence transmission between data/interrupt SNPDUs already forwarded to the link layer and a subsequently transmitted reset or reset confirm SNPDU.

4.7.3.8.3.3 *Locally/SSNDPX originated*

4.7.3.8.3.3.1 When the originating SSNDPX receives a reset request packet from the IWF or when it has detected an error for which its action is to reset the SVC, it shall place the logical channel into the local reset state, execute the reset action, transmit a reset SNPDU to the remote SSNDPX, and start a timer tN3 (see Table 4-18). If required by the error procedures in 4.7.3.9, the SSNDPX shall forward a reset indication packet to the IWF.

4.7.3.8.3.3.2 Upon receipt of the reset confirm SNPDU from the remote SSNDPX, it shall return the logical channel to the data transfer/flow control state.

4.7.3.8.3.3.3 If the SSNDPX does not receive a response from the SSNDPX before the associated timer (see tN3 in Table 4-18) expires, it shall initiate a connection release procedure.

4.7.3.8.3.4 *Remotely originated*

4.7.3.8.3.4.1 When the SSNDPX receives a reset SNPDU, it shall place the logical channel into the remote reset state, execute the reset action and transmit a reset indication packet to the IWF as required (see Table 4-24).

4.7.3.8.3.4.2 The SSNDPX shall transmit a reset confirm SNPDU to its remote SSNDPX and shall return the logical channel to the data transfer state when it has received from the link layer the information that the reset confirm SNPDU has been successfully transmitted.

4.7.3.8.3.5 *Simultaneous reset*

If the SSNDPX sends a reset SNPDU and subsequently receives a reset SNPDU it shall:

a) not send a reset confirm SNPDU; and

b) not expect to receive a reset confirm SNPDU.

4.7.3.9 ERROR PROCEDURES

Note.— Errors which are recognized by the SSNDPX may be the result of the following events:

— channel degradation or loss of synchronization
— AES log-off
— a GES-to-GES handover
— link congestion
— an uncorrected transmission error
— a remote SSNDPX protocol error
— a protocol error in the IWF/SSNDPX interface procedure

4.7.3.9.1 When an error as noted in Tables 4-22 to 4-24 is detected, the SSNDPX shall initiate either reset or release of the relevant connection.

4.7.3.9.2 Errors shall be notified to the IWF by means of cause and diagnostic parameters within the relevant packet. Errors shall be notified to the remote SSNDPX by using the corresponding fields of the SNPDUs, i.e. reset or release cause and diagnostic code.

4.7.3.9.3 The coding of the cause fields which are generated by the SSNDPX and passed to the remote SSNDPX shall be as defined in Table 4-16.

4.7.3.9.4 The coding of the corresponding SSNDPX generated diagnostic code field shall be as defined in Table 4-17.

4.7.3.9.5 LOG-ON/LOG-OFF

Note.— The procedures for log-on and log-off are covered in 4.7.6.

4.7.3.9.6 ORIGINATING SSNDPX ERROR RECOVERY

4.7.3.9.6.1 Transmission error resulting from the loss or delay of SNPDUs shall be detected either by time-out when a response is expected or by the fail LIDU reported by the link layer.

4.7.3.9.6.2 The actions the SSNDPX follows upon time-out shall be as summarized in Table 4-18.

4.7.3.9.6.3 The actions the SSNDPX shall follow when it is informed by the link layer that the transmission of an SNPDU has failed shall be as summarized in Table 4-19. Receipt of a fail (data/interrupt) LIDU while the relevant LCN is either in local/remote reset state or local/remote clear request state, shall not cause the SSND sub-layer entity to generate a (further) connection reset.

4.7.3.9.7 PROTOCOL ERROR

Note.— Two types of protocol error may occur at the SSNDPX. These are:

a) a syntactical error which occurs when a received SNPDU does not conform to the format specifications over the satellite subnetwork; and

b) a logical error which occurs when the SSNDPX receives from its peer entity an SNPDU that is not an acceptable input to the current state of the logical channel.

4.7.3.9.7.1 When the SSNDPX detects a protocol error, it shall respond as indicated in Tables 4-21 to 4-24. These tables are depicted for each logical channel state.

4.7.3.9.8 OUT-OF-SEQUENCE DATA SNPDU PROCEDURE

4.7.3.9.8.1 The SSNDPX shall process received data SNPDUs in proper sequence, according to SNPDU number to construct data packets to be forwarded to the IWF. The SSNDPX shall discard duplicate SNPDUs.

Note.— The receiving link layer at the GES may deliver SNPDUs to the SSNDPG in altered sequence. The SSNDPG assembles data SNPDUs in proper sequence before forwarding them to the IWF.

4.7.3.9.8.2 *SSNDPG actions for out-of-sequence data SNPDUs*

A data SNPDU shall be defined as out of sequence if and only if its SNPDU number does not immediately follow the SNPDU number of the last received data SNPDU that has been used in creating the last data packet.

Note.— SNPDU numbers are incremented modulo 256. Thus, SNPDU number 0 follows SNPDU number 255.

4.7.3.9.8.2.1 If an out-of-sequence data SNPDU is not a duplicate, the SSNDPG shall store the out-of-sequence data SNPDU. If no more storage is available, the SSNDPG shall place the logical channel in the reset state and extend the reset to the IWF.

4.7.3.9.8.2.2 Stored data SNPDUs shall be processed to create data packets whenever this can be done without creating an out-of-sequence condition. Data packets shall be forwarded to the IWF as soon as possible.

4.7.3.9.8.3 *SSNDPA actions for out-of-sequence SNPDUs*

If a data SNPDU is received which is not a duplicate but has an SNPDU number not immediately following the SNPDU number of the data SNPDU last received, the SSNDPA shall initiate a reset of the connection.

4.7.3.10 SNPDU FORMATS

4.7.3.10.1 *GENERAL SNPDU FORMAT*

4.7.3.10.1.1 An SNPDU shall consist of at least two octets. Octet 1 shall contain the D- and M-bits and the SNPDU type identifier field. Octet 2 shall contain the logical channel number field; depending on the particular SNPDU type, additional octets may be required. The general SNPDU format shall be as defined in Figure 4-13.

4.7.3.10.1.2 The D- and M-bits shall be bits 7 and 8, respectively, in octet 1.

4.7.3.10.1.3 The M-bit shall be used in an M-bit SNPDU sequence consisting of a sequence of data SNPDUs; it shall be set to 0 in all other SNPDUs.

Note.— The D-bit may be used for end-to-end acknowledgement (receipt confirmation).

4.7.3.10.1.4 The SNPDU type identifier field shall be bits 1-6 in octet 1. The coding of the SNPDU type identifier field shall be as defined in Table 4-15.

4.7.3.10.1.5 Octet 2 shall contain the logical channel number field.

Note.— In the following sections, fields are defined in the order they may appear in the relevant SNPDU.

4.7.3.10.2 *CONNECTION REQUEST SNPDU*

4.7.3.10.2.1 The format of connection request SNPDU shall be as defined in Figure 4-14.

4.7.3.10.2.2 *SNPDU type identifier field*

4.7.3.10.2.2.1 Bits 1, 2, 3 and 6 shall be the following indicator bits:

a) bit 1, facilities field present;

b) bit 2, called NSAP address present;

c) bit 3, calling NSAP address present; and

d) bit 6, fast select with restriction on response.

4.7.3.10.2.2.2 Bits 1, 2 and 3 shall be set to 1 if the corresponding fields are present in the connection request SNPDU; otherwise, they shall be set to 0. Bit 6 shall be set to 1 if fast select with restriction on response applies; otherwise, it shall be set to 0.

4.7.3.10.2.3 *DTE address length field*

Octet 3 shall consist of the calling- and called-DTE address length fields. Bits 8 to 5 shall specify the length of the calling-DTE address in semi-octets. Bits 4 to 1 shall specify the length of the called-DTE address in semi-octets. Each address-length field shall be binary-coded, where bit 5 or 1 shall be the low-order bit of the indicator.

4.7.3.10.2.4 *Calling- and called-DTE fields*

4.7.3.10.2.4.1 When indicated by the DTE addresses length field, the octets following the DTE addresses length field shall contain the called-DTE address followed by the calling-DTE address.

4.7.3.10.2.4.2 Each digit of an address shall be coded in a semi-octet in binary-coded decimal, where bit 5 or bit 1 shall be the low-order bit of the digit.

4.7.3.10.2.4.3 Starting from the high-order digit, a DTE address shall be coded in consecutive octets, with two digits per octet. In each octet, the higher-order digit shall be coded in bits 8 to 5. When the total number of digits in the called-plus calling-DTE fields is odd, the combined fields shall be rounded up to an integral number of octets by inserting zeros in bits 4 to 1 of the last octet of the combined fields.

4.7.3.10.2.5 *Called- and calling-NSAP address fields*

When indicated by the called- and calling-NSAP address present indicator bits, the octets following the calling- and called-DTE fields shall contain the called-NSAP address field, then the calling-NSAP address field.

4.7.3.10.2.6 *Facility field length field*

When indicated by the facilities field present indicator bit, the next octet shall contain the length of the facilities field in octets. The facility field length field shall be binary-coded, where bit 1 shall be the low-order bit of the field.

4.7.3.10.2.7 *Facilities field*

When indicated by the facilities field present indicator bit, the octets following the facility field length field shall contain the codes and parameters for the facilities.

4.7.3.10.2.8 *Call user data field*

The next octets shall be used to carry the call user data, if any. If fast select facility is not used, not more than 16 octets of data shall be present. If fast select facility is used, not more than 128 octets of data shall be present.

4.7.3.10.3 *CONNECTION CONFIRM SNPDU*

4.7.3.10.3.1 The format of the connection confirm SNPDU shall be as specified in Figure 4-15.

4.7.3.10.3.2 *SNPDU type identifier field*

4.7.3.10.3.2.1 Bits 1 and 2 shall be the following indicator bits:

a) bit 1: facilities field present; and

b) bit 2: NSAP address present.

4.7.3.10.3.2.2 These bits shall be set to 1 if the corresponding fields are present; otherwise, they shall be set to 0.

4.7.3.10.3.3 *Called-NSAP address field*

When indicated by the NSAP address present indicator bit, the octets following the logical channel number field shall consist of the called-NSAP address.

4.7.3.10.3.4 *Facility length field*

When indicated by the facilities field present indicator bit, the next octet shall contain the length of the facilities field in octets. The facility length indicator shall be binary-coded, where bit 1 shall be the low-order bit of the field.

4.7.3.10.3.5 *Facilities field*

When indicated by the facilities field present indicator bit, the octets following the facilities field shall contain the codes and parameters for the facilities.

4.7.3.10.3.6 *Called user data field*

The next octets shall be used to carry the called user data, if any. If fast select facility is used, not more than 128 octets of data shall be present.

4.7.3.10.4 *CONNECTION RELEASED SNPDU*

4.7.3.10.4.1 The connection released SNPDU format shall be as defined in Figure 4-16.

4.7.3.10.4.2 *SNPDU type identifier field*

4.7.3.10.4.2.1 Bit 2 shall be the NSAP address present indicator bit.

4.7.3.10.4.2.2 This bit shall be set to 1 if the called-NSAP address field is present; otherwise, it shall be set to 0.

4.7.3.10.4.3 *Called-NSAP address field*

This field shall have the same coding as 4.7.3.10.3.3.

4.7.3.10.4.4 *Clearing cause field*

4.7.3.10.4.4.1 The next octet shall be the clearing cause field. It shall contain the clearing cause for the release of the connection.

4.7.3.10.4.4.2 The coding of the clearing cause which may be generated by the SSNDPX shall be as given in Table 4-16.

4.7.3.10.4.5 *Diagnostic code field*

The octet following the clearing cause field shall be the diagnostic code field. It shall contain additional information on the reason for the release of the connection. The coding of the diagnostic code field shall be dependent on the clearing cause as in Table 4-16. The diagnostic code field codings when connection release has been initiated by the SSNDPX shall be as defined in Table 4-17.

4.7.3.10.4.6 *Clear user data field*

The field following the diagnostic code field shall be the user data field. If present, this field shall contain not more than 128 octets of user data.

4.7.3.10.5 *CONNECTION RELEASE COMPLETE SNPDU*

The connection release complete SNPDU format shall be as defined in Figure 4-17.

4.7.3.10.6 *DATA SNPDU*

4.7.3.10.6.1 The data SNPDU format shall be as defined in Figure 4-18.

4.7.3.10.6.2 *M-bit*

The M-bit shall be set to 1 if the SNPDU is not the last in an M-bit sequence of data SNPDUs; otherwise, it shall be set to 0.

4.7.3.10.6.3 *SNPDU number field*

Octet 3 shall contain the 8-bit SNPDU number.

4.7.3.10.6.4 *User data field*

The field following the SNPDU number field shall contain the user data. This field shall contain up to a maximum of 503 octets.

4.7.3.10.7 *INTERRUPT DATA SNPDU*

4.7.3.10.7.1 The interrupt data SNPDU format shall be as defined in Figure 4-19.

4.7.3.10.7.2 *Interrupt user data field*

The field following the logical channel number field shall be the interrupt user data field. This field shall contain up to a maximum of 32 octets.

4.7.3.10.8 *INTERRUPT CONFIRM SNPDU*

The interrupt confirm SNPDU format shall be as defined in Figure 4-20.

4.7.3.10.9 *RESET SNPDU*

4.7.3.10.9.1 The reset SNPDU format shall be as defined in Figure 4-21.

4.7.3.10.9.2 *Resetting cause*

Octet 3 shall be the resetting cause field and shall contain the reason for the reset. When the reset has been initiated by the SSNDPX, the coding of the resetting cause field in a reset SNPDU shall be as given in Table 4-16.

4.7.3.10.9.3 *Diagnostic code*

4.7.3.10.9.3.1 Octet 4 shall be the diagnostic code field and shall contain additional information on the reason for the reset. The coding of the diagnostic code field shall be dependent on the resetting cause as given in Table 4-16. The diagnostic code field codings when the reset has been initiated by the SSNDPX shall be as defined in Table 4-17.

4.7.3.10.9.3.2 If the resetting cause field indicates "IWF originated", the diagnostic code field shall have been passed unchanged from the IWF as a result of its having initiated a resetting procedure.

4.7.3.10.10 *RESET CONFIRM SNPDU*

The reset confirm SNPDU format shall be as defined in Figure 4-22.

4.7.3.10.11 *FLOW CONTROL (SUSPEND) SNPDU*

4.7.3.10.11.1 The flow control (suspend) SNPDU format shall be as defined in Figure 4-23.

4.7.3.10.11.2 *Flow control reason field*

Octet 3 shall contain the flow control reason field. This field shall be set to 11001001 (suspend).

4.7.3.10.11.3 *SNPDU number field*

Octet 4 shall contain the 8-bit SNPDU number of the last in-sequence received and accepted data SNPDU.

4.7.3.10.12 *FLOW CONTROL (RESUME) SNPDU*

4.7.3.10.12.1 The flow control (resume) SNPDU format shall be as defined in Figure 4-24.

4.7.3.10.12.2 *Flow control field*

Octet 3 shall contain the flow control reason field. This field shall be set to 11001011 (resume) to resume transmission from the peer.

4.7.3.10.13 *CONNECTION REQUEST/CONFIRM SNPDU FACILITIES FIELD*

4.7.3.10.13.1 The facilities field shall be present only when the facility field present indicator bit is set to one in the connection request, and connection confirm SNPDUs.

4.7.3.10.13.2 The facilities field shall contain one facility element for each facility or group of facilities requested. The first octet of each facility element shall be the facility code field, which shall indicate the code for the facility or facilities requested. The remaining octets of a facility element shall contain the facility parameter field.

4.7.3.10.13.3 *Recommended facilities*

Recommendation.— *The following facilities should be supported by the SSNDPX:*

a) throughput class negotiation;

b) transit delay selection and indication; and

c) fast select.

4.7.3.10.13.4 *Throughput class negotiation (TCN) facility format*

The format of the throughput class negotiation (TCN) facility field shall be as defined in Figure 4-25.

4.7.3.10.13.5 *Transit delay selection and indication (TDSAI) facility format*

The format of the transit delay selection and indication facility field shall be as defined in Figure 4-26.

4.7.3.10.13.6 *Fast select facility format*

The fast select facility format shall be as defined in Figure 4-27.

4.7.3.10.13.7 *Expedited data negotiation*

The expedited data negotiation facility format shall be as defined in Figure 4-28.

4.7.3.10.14 *DIAGNOSTIC CODES*

When connection release/reset is initiated by the SSNDPX, the coding of the diagnostic code field in the connection released and reset SNPDUs shall be as defined in Table 4-17.

4.7.3.11 TIMER VALUES

The timer values shall be as defined in Table 4-20.

4.7.3.12 STATE DIAGRAMS

State diagrams for the following states shall be given below:

a) The state diagram for connection establishment/release of a logical channel shall be as defined in Figure 4-29.

b) The state diagram for reset and flow control states within the data transfer state shall be as defined in Figure 4-30.

4.7.3.13 STATE TABLES

4.7.3.13.1 Action taken in any state of the SSNDPX shall be given by Tables 4-21 to 4-24.

4.7.3.13.2 The following conventions shall be used in the state tables:

a) action taken, which could be:

— normal, as defined in 4.7.3.5 to 4.7.3.8;

— discard the received SNPDU and take no subsequent action as a result of receiving that SNPDU;

— error, as defined in the table;

b) D = the diagnostic code contained in the diagnostic code field of the appropriate SNPDU (connection released, or reset) issued upon the detection of the indicated error.

4.7.3.14 SATELLITE SUBNETWORK DEPENDENT TO LINK LAYER INTERFACE FUNCTIONS

4.7.3.14.1 The interface functions to the link layer shall include the following:

a) generation and reception of link interface data units (LIDUs);

b) routing of received SNPDUs according to connection;

c) selection of further SNPDUs for transmission according to a cyclic order of selecting among the logical channels at a given Q number and giving precedence to interrupt SNPDUs over data SNPDUs of the same Q number; and

d) routing of local acknowledgement (success/fail) for RLS transmission status indication LIDUs.

4.7.3.14.2 The LIDUs passed between the SSNDPX and the link layer shall include the LIDUs defined in Table 4-25.

4.7.3.15 PACKET TO SNPDU MAPPING RULES

4.7.3.15.1 The rules for mapping the ISO 8208 packet fields into the corresponding fields in SNPDU shall be as specified in this section.

4.7.3.15.2 *DTE ADDRESSES*

4.7.3.15.2.1 The called-DTE address and the calling-DTE address fields in the ISO 8208 call request packet shall be directly mapped into the called-DTE address and the calling-DTE address fields in the connection request SNPDU.

4.7.3.15.2.2 The calling- and called-DTE addresses in the ISO 8208 call accepted packet shall not be transmitted across the satellite link.

4.7.3.15.3 *NSAP ADDRESS*

4.7.3.15.3.1 The called address extension and the calling address extension parameter fields in the ISO 8208 call request packet shall be directly mapped into the called NSAP address and the calling NSAP address fields in the connection request SNPDU.

4.7.3.15.3.2 If the called address extension parameter in either the ISO 8208 call accepted packet or clear request packet is equal to the called NSAP address of the corresponding connection request SNPDU, then the called address extension shall not be transmitted across the satellite link; otherwise, it shall be directly mapped into the relevant SNPDU.

4.7.3.15.4 *SUBNETWORK CONNECTION PRIORITY*

4.7.3.15.4.1 The target value for the priority of data on a connection in the ISO 8208 call request packet shall be mapped to the LIDU Q number passed to the link layer as defined in Table 4-26. This value shall be used as long as the connection setup procedure has not been completed.

4.7.3.15.4.2 The selected value for the priority of data on a connection in the ISO 8208 call accepted packet shall be mapped to the LIDU Q number passed to the link layer as defined in Table 4-26. This value shall be used for the remainder of the SNC.

4.7.3.15.4.3 If an invalid priority value is provided in the call request or call accepted packet, the SSNDPX shall reject the call. The diagnostic code in the clear indication packet shall be set to "connection rejection — requested quality of service not available — (permanent condition)".

4.7.3.15.4.4 If priority of data on a connection is not indicated in the call request packet, a default value (SNC priority = 0) shall be used.

4.7.3.15.5 *THROUGHPUT CLASS NEGOTIATION*

4.7.3.15.5.1 The throughput class negotiation shall apply independently for each direction of transfer.

4.7.3.15.5.2 *Throughput*

The throughput subparameter shall be defined as one of the values (unspecified, 75, 150, 300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 48 000, 64 000 bits/s).

4.7.3.15.6 *TRANSIT DELAY*

4.7.3.15.6.1 The negotiated transit delay shall apply to both directions of transfer.

4.7.3.15.6.2 *Aircraft-originated connection establishment*

4.7.3.15.6.2.1 The SSNDPA shall map directly the transit delay selection and indication (TDSAI) facility in the call request packet to the same facility in the connection request SNPDU.

4.7.3.15.6.2.2 If the SSNDPG receives a call accepted packet from the IWF in response to an incoming call packet with TDSAI facility, it shall forward the same facility in the connection confirm SNPDU to the SSNDPA.

4.7.3.15.6.3 *Ground-originated connection establishment*

If the SSNDPG receives a call request packet with the TDSAI facility from the IWF, the SSNDPG shall forward to the SSNDPA a mean value for the satellite subnetwork transit delay of a data SNPDU of 131 octets in the connection request SNPDU.

4.7.3.15.7 *FAST SELECT*

The fast select facility shall be treated as follows:

a) a call request packet without the fast select facility shall be mapped to a connection request with no restriction on response SNPDU with the fast select (use not permitted) facility;

b) a call request packet with the fast select facility indicating fast select requested with no restriction on response shall be mapped to a connection request with no restriction on response SNPDU without the fast select (use not permitted) facility; and

c) a call request packet with the fast select facility indicating fast select request with restriction on response shall be mapped to a connection request with restriction on response SNPDU without the fast select (use not permitted) facility.

4.7.3.15.8 *EXPEDITED DATA NEGOTIATION*

The expedited data negotiation facility in the call request or call accepted packet shall not be mapped to the corresponding connection request or connection confirm SNPDU unless the facility parameter is set to "no use of expedited data".

4.7.3.15.9 *CAUSE AND DIAGNOSTIC CODES*

4.7.3.15.9.1 Clearing cause, resetting cause and diagnostic code fields shall be transferred without modification from the packets to the corresponding SNPDUs.

4.7.3.15.9.2 If the SSNDPX has initiated the clear or reset procedure, then the clearing cause, the resetting cause and the diagnostic code fields shall be set as defined in Tables 4-16 and 4-17.

4.7.3.15.10 *DATA*

4.7.3.15.10.1 If the user data field in the data packets of an M-bit packet sequence is less than the default data SNPDU maximum user data field length, then these fields shall be concatenated to form an M-bit SNPDU sequence.

4.7.3.15.10.2 If the user data field in the data packets of an M-bit packet sequence is greater than the default data SNPDU maximum user data field length, then these fields shall be segmented to form an M-bit SNPDU sequence.

4.7.3.16 SNPDU TO PACKET MAPPING RULES

4.7.3.16.1 This section shall specify the rules for mapping the SNPDU fields into the corresponding fields in ISO 8208 packet.

4.7.3.16.2 *DTE ADDRESS*

4.7.3.16.2.1 The called DTE address and the calling DTE address fields in the connection request SNPDU shall be directly mapped into the called DTE address and the calling DTE address fields in the incoming call packet.

4.7.3.16.2.2 Both the calling and called DTE address fields shall be regenerated when forwarding a call connected packet, if they were present in the corresponding call request packet.

4.7.3.16.3 *NSAP ADDRESS*

4.7.3.16.3.1 The called NSAP address and the calling NSAP address fields in the connection request SNPDU shall be directly mapped into the called address extension and calling address extension parameter fields in the incoming call packet.

4.7.3.16.3.2 The called NSAP address field in the connection confirm or connection released SNPDU shall be mapped into the called address extension field in the call connected or clear indication packet.

4.7.3.16.4 *PRIORITY*

The Q number associated with the connection request and connection confirm SNPDUs shall be mapped into the target and selected values of the priority of data on a connection field in the priority facility in the ISO 8208 incoming call and call connected packets.

4.7.3.16.5 *THROUGHPUT CLASS NEGOTIATION*

4.7.3.16.5.1 The throughput class negotiation shall apply independently for each direction of transfer.

4.7.3.16.5.2 *Throughput*

The throughput sub-parameter shall be defined as one of the values (unspecified, 75, 150, 300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 48 000, 64 000 bits/s).

4.7.3.16.6 *TRANSIT DELAY*

4.7.3.16.6.1 The negotiated transit delay shall apply to both directions of transfer.

4.7.3.16.6.2 *Aircraft-originated connection establishment*

4.7.3.16.6.2.1 If the SSNDPG receives a connection request SNPDU from an SSNDPA with TDSAI facility, the SSNDPG shall forward to the IWF a mean value for satellite subnetwork transit delay of a data SNPDU of 131 octets in the incoming call packet.

4.7.3.16.6.2.2 The SSNDPA shall map directly the TDSAI facility in the connection confirm SNPDU to the same facility in the call connected packet.

4.7.3.16.6.3 *Ground-originated connection establishment*

4.7.3.16.6.3.1 The SSNDPA shall map directly the TDSAI facility in the connection request SNPDU to the same facility in the incoming call packet.

4.7.3.16.6.3.2 If the SSNDPG receives a connection confirm SNPDU from the SSNDPA in response to a connection request SNPDU with TDSAI facility, it shall forward the same facility in the call connected packet to the IWF.

4.7.3.16.7 *FAST SELECT*

The fast select facility shall be treated as follows:

a) a connection request with no restriction on response SNPDU with the fast select (use not permitted) facility shall be mapped into an incoming call packet without the fast select facility;

b) a connection request with no restriction on response SNPDU without the fast select (use not permitted) facility shall be mapped into an incoming call packet with the fast select facility with the "no restriction on response" parameter;

c) a connection request with restriction on response SNPDU without the fast select (use not permitted) facility shall be mapped into an incoming call packet with the fast select facility with the "restriction on response" parameter.

4.7.3.16.8 *EXPEDITED DATA NEGOTIATION*

If the expedited data negotiation facility is not present in the connection request or connection confirm SNPDU, this facility with its parameter set to "use of expedited data" shall be added to the corresponding incoming call or call connected packet; otherwise, this facility shall be mapped to the corresponding packet.

4.7.3.16.9 *CAUSE AND DIAGNOSTIC CODES*

Clearing cause, resetting cause and diagnostic code fields shall be transferred without modification from the SNPDUs to the corresponding packets.

4.7.3.16.10 *DATA*

4.7.3.16.10.1 If the user data field in the data SNPDUs of an M-bit SNPDU sequence is less than the default data packet maximum user data field length, then these fields shall be concatenated to form an M-bit packet sequence.

4.7.3.16.10.2 If the user data field in the data SNPDUs of an M-bit SNPDU sequence is greater than the default data packet maximum user data field length, then these fields shall be segmented to form an M-bit packet sequence.

4.7.3.17 CAPACITY

The SSNDPA shall support at least eight simultaneous, independent logical channels.

4.7.4 ISO 8208 DCE protocol operations

4.7.4.1 GENERAL PROVISIONS

4.7.4.1.1 The protocol between the ISO 8208 DCE and the ISO 8208 DTE shall comply with the ISO 8208 second edition.

4.7.4.1.2 *PACKET LAYER ENTITY*

Note.— Within the ISO 8208 DCE there may be more than one DCE/DTE interface, e.g. a GES may be connected to more than one ground ATN router. One such entity exists in the DCE for each DCE/DTE interface. Deciding which entity to use to reach a particular destination is a function performed external to the protocol described here. The protocol defined in 4.7.4 pertains to each packet layer entity in the DCE.

4.7.4.2 CONFORMANCE REQUIREMENTS

4.7.4.2.1 *SUPPORTED SERVICES AND CAPABILITIES*

The following services and capabilities shall be supported:

a) virtual call service;

b) a user data field of up to 128 octets in data packets; and

c) expedited data delivery, i.e. the use of interrupt packets with a user data field of up to 32 octets.

4.7.4.2.2 *SUPPORTED FACILITIES*

The following facilities shall be supported:

a) calling address extension and called address extension; and

b) priority.

Note.— The target and lowest acceptable values for the priority to gain a connection and keep a connection, and the lowest acceptable value for data on a connection, need not be supported.

4.7.4.2.3 *RECOMMENDED FACILITIES*

Recommendation.— *The following facilities should be supported:*

a) throughput class negotiation;

b) transit delay selection and indication;

c) fast select;

d) fast select acceptance.

4.7.4.3 OPERATIONS

4.7.4.3.1 *EXTERNAL INTERACTIONS*

Note.— The initiation of certain DCE procedures is directed by elements outside the ISO 8208 DCE. Likewise, the *occurrence of certain ISO 8208 DCE events are to be reported appropriately. These external interactions include:*

a) requesting of the link layer, transmission of outgoing packets;

b) receiving, from the link layer, incoming packets;

c) accepting requests from the IWF to initiate certain ISO 8208 protocol procedures including:

1) originate a virtual call,

2) accept a virtual call,

3) terminate a virtual call,

4) transfer data and interrupt information, and

5) re-initialize a logical channel.

d) reporting to the IWF the occurrence of certain ISO 8208 protocol events including:

1) receipt of an incoming request to set up a virtual call,

2) receipt of the acceptance of a virtual call setup,

3) termination of a virtual call,

4) receipt of data and interrupt information, and

5) re-initialization of a logical channel.

4.7.4.3.1.1 The ISO 8208 DCE shall accept all ISO 8208 packets from the ISO 8208 DTE without failure.

4.7.4.3.2 LOGICAL CHANNELS

Note.— Each virtual call and permanent virtual circuit is assigned a logical channel identifier which is a number in the range from 1 through 4 095. For each virtual call, a logical channel identifier is assigned during the call setup phase from a range of previously agreed-upon logical channel identifiers. For each permanent virtual circuit, a logical channel identifier is assigned in agreement with the DTE. A DCE's use of logical channels is agreed upon for a period of time with the DTE.

4.7.4.3.3 STATE TRANSITIONS

4.7.4.3.3.1 The specifications and definitions in ISO 8208 shall apply for format definitions, diagnostic and cause codes, facility registration protocols (if used), and flow control on the ISO 8208 interface.

Note 1.— The ISO 8208 DCE is defined as a state machine. An ISO 8208 packet received from the DTE can cause state transitions, as can a packet received from IWF. The next state transition (if any) that occurs when the DCE receives a packet from the DTE is specified by Tables 4-29 to 4-34. These tables are organized according to the hierarchy in Figure 4-31.

Note 2.— Upon receiving a packet, the action is classified as normal or erroneous under the entry "A =". The resulting state is shown under the entry, "S =".

4.7.4.3.3.2 If a state transition is specified, the action taken shall be as specified in Tables 4-29 to 4-34.

4.7.4.3.4 DISPOSITION OF PACKETS

When a packet is received from the DTE, the expressions in parentheses in Tables 4-29 to 4-34 specify whether the packet shall be forwarded or not forwarded to the IWF. If no remark in parentheses is listed or listed as not forwarded, then the packet shall be discarded. The ISO 8208 DCE shall either forward or not forward a packet from the IWF to the DTE in a manner that is compatible with ISO 8208.

4.7.4.3.5 DIAGNOSTIC AND CAUSE CODES

For certain conditions, Tables 4-29 to 4-34 indicate a diagnostic code that shall be included in the packet generated when entering the state indicated. The term, "D =", shall define the diagnostic code. When "A = DIAG", the action taken shall be to generate an ISO 8208 diagnostic packet and transfer it to the DTE; the diagnostic code indicated shall define the entry in the diagnostic field of the packet. In the cause field of any packet type, bit 8 of the cause field shall always be set to 0, indicating that the condition was recognized by the ISO 8208 interface.

Note.— The state Tables 4-29 to 4-34 are defined so that the SSNDPX and ISO 8208 DCE functions can operate simultaneously. While asynchronous operation is a suitable implementation strategy, it is not a requirement for the SSNDPX and ISO 8208 DCE operations.

4.7.4.3.6 DCE TIMER

Note.— Under certain circumstances, the DTE must respond to a packet issued from the DCE within a given time.

4.7.4.3.6.1 Table 4-35 covers these circumstances and the action that the DCE shall initiate upon the expiration of that time.

4.7.4.4 CAPACITY

The AES DCE shall support at least eight simultaneous, independent logical channels.

4.7.4.5 VC PRE-EMPTION

A logical channel of the lowest priority and the associated virtual call shall be cleared as necessary to accept a request for higher priority service.

Note.— Logical channels and virtual calls have a priority level of 0 unless the ISO 8208 priority facility was invoked during call set up.

4.7.5 Interworking function

4.7.5.1 SSNDPX/IWF INTERFACE

4.7.5.1.1 The ISO 8208 packets exchanged between the IWF and the SSNDPX shall be as defined in Table 4-36.

4.7.5.1.2 *INCOMING CALL PACKET HANDLING*

The IWF shall forward the incoming call packet with the expedited data negotiation facility and "use of expedited data" parameter to the appropriate ISO 8208 DCE entity.

Note.— If the facility parameter is "no use of expedited data", the IWF forwards the incoming call packet with or without this facility.

4.7.5.1.3 *CALL CONNECTED PACKET HANDLING*

If the parameter of the expedited data negotiation facility is set to "use of expedited data" in the call connected packet, the IWF shall forward this facility and its parameter with the packet to the appropriate ISO 8208 DCE entity. For each virtual call, the IWF shall associate the SSNDPX logical channel with the corresponding ISO 8208 DCE logical channel.

Note.— If the expedited data negotiation facility parameter is set to "no use of expedited data", the IWF forwards the call connected packet with or without this facility.

4.7.5.1.4 *CLEAR INDICATION PACKET HANDLING*

4.7.5.1.4.1 The IWF shall disassociate the SSNDPX logical channel with the corresponding ISO 8208 DCE logical channel and forward the packet to the ISO 8208 DCE entity.

4.7.5.1.5 *DATA, INTERRUPT, INTERRUPT CONFIRMATION AND RESET INDICATION PACKET HANDLING*

4.7.5.1.5.1 Data, interrupt, interrupt confirmation and reset indication packets shall be forwarded to the appropriate ISO 8208 DCE entity based on the logical channel association established after the completion of a connection establishment.

4.7.5.2 ISO 8208 DCE/IWF INTERFACE

4.7.5.2.1 The ISO 8208 packets exchanged between the IWF and the ISO 8208 DCE shall be as defined in Table 4-37.

4.7.5.2.2 *CALL REQUEST PACKET HANDLING*

If the call request packet does not contain the expedited data negotiation facility, the IWF shall add this facility with its parameter set to "no use of expedited data" to the packet and shall forward it to the appropriate SSNDPX entity; otherwise, the IWF shall forward the call request packet with this facility and parameter. If the optional called DTE address is invalid, then the IWF shall return a clear indication packet to the ISO 8208 DCE entity.

4.7.5.2.3 *CALL ACCEPTED PACKET HANDLING*

If the call accepted packet does not contain the expedited data negotiation facility, the IWF shall add this facility with its parameter set to "no use of expedited data" to the packet and shall forward it to the appropriate SSNDPX entity; otherwise, the IWF shall forward the call accepted packet with this facility and parameter. For each virtual call, the IWF shall associate the ISO 8208 DCE logical channel with the corresponding SSNDPX logical channel.

4.7.5.2.4 *CLEAR REQUEST PACKET HANDLING*

The IWF shall disassociate the ISO 8208 DCE logical channel with the corresponding SSNDPX logical channel and forward the packet to the SSNDPX entity.

4.7.5.2.5 *DATA, INTERRUPT, INTERRUPT CONFIRMATION AND RESET REQUEST PACKET HANDLING*

Data, interrupt, interrupt confirmation and reset request packets shall be forwarded to the appropriate SSNDPX entity based on the logical channel association established after the completion of a connection establishment.

4.7.5.3 (Reserved)

4.7.5.4 ISO 8208 LOGICAL CHANNEL AND SSNDPX LOGICAL CHANNEL ASSOCIATION

Note.— ISO 8208 DCE logical channel identifier and the SSNDPX logical channel number of an SNC need not be identical.

4.7.5.5 DATA TRANSFER PROCEDURES

4.7.5.5.1 *FLOW CONTROL*

Flow control shall be applied between the SSNDPX and the ISO 8208 DCE to prevent storage overflow.

4.7.5.6 CAUSE AND DIAGNOSTIC CODE

4.7.5.6.1 The IWF shall replace the cause "local procedure error" in ISO 8208 packets received from the DCE, by the cause "remote procedure error" before forwarding them to the SSNDPX. The IWF shall replace the cause "local link error" in an SNPDU received from the SSNDPX by the cause "network congestion" before forwarding them to the DCE. All other causes shall be transferred without modification.

4.7.5.6.2 Diagnostic codes shall be transferred without modification.

4.7.6 Management interface

4.7.6.1 AES MANAGEMENT INTERFACE

4.7.6.1.1 The changes in log-on status conveyed from the AES management to the SSNL shall be as defined in 4.9.2.1.1.

4.7.6.1.2 When the AES either logs-off or otherwise terminates communication with a GES, the AES SSNL shall clear all connections with this GES.

4.7.6.1.3 *CONNECTIVITY NOTIFICATION EVENT*

4.7.6.1.3.1 The CN function shall be performed by the CN entity.

4.7.6.1.3.1 *bis Join and leave events*

The AES shall provide join and leave event messages to the aircraft routing function to indicate that the air-ground data link is either available or not available, respectively. The join and leave messages shall include sufficient information for the routing function to determine the address(es) of the DTE(s) attached to the log-on GES.

Note.— This may be accomplished, for example, by passing the GES/satellite ID from the AES to the routing function containing a lookup table for translation to DTE address(es), or by passing the DTE address(es) directly from the AES to the routing function.

4.7.6.1.3.2 (Reserved)

4.7.6.1.3.3 (Reserved)

4.7.6.2 GES MANAGEMENT INTERFACE

4.7.6.2.1 The changes in log-on status conveyed from the GES management to the SSNL shall be as defined in 4.10.3.2.

4.7.6.2.2 When the AES logs off from the GES, the SSNL shall clear all connections associated with the AES, and shall release all resources associated with these SNCs. In addition, the GES shall provide to the attached ATN ground routers a leave event indication referencing the 24-bit ICAO aircraft identifier.

4.8 CIRCUIT-MODE SERVICES

4.8.1 AMS(R)S circuit-mode general requirements

Note.— The AMS(R)S circuit-mode service is a communications service between aircraft and ground facilities using satellite links as one of the connecting media. The AMS(R)S circuit-mode service provides a means to establish and maintain a non-shared switched circuit between aircraft and ground users on demand. The primary purpose of the circuit-mode service is to provide for safety voice communications. A switched circuit is held for the duration of the call unless automatically pre-empted in order to reassign resources for a higher priority call attempt. AMS(R)S switched circuits may be interconnected with one or more terrestrial communications facilities in tandem with the AMS(R)S subnetwork. These facilities may include safety circuit-switched networks or dedicated circuits.

4.8.1.1 *AMS(R)S circuit-mode services.* Circuit-mode AMS(R)S communications services shall be provided to Level 3 and 4 AESs and shall consist of distress, urgency, flight safety and other messages related to meteorology and flight regularity.

Note.— Non-AMS(R)S circuit switched voice and data service for non-safety communications may be supported by AMS(R)S on a not-to-interfere basis provided that the provisions of 4.8.3.2 are complied with.

4.8.1.2 *Order of importance.* AMS(R)S services for ATS communications shall have precedence over non-AMS(R)S communications.

4.8.1.3 *Non-AMS(R)S communications.* Non-AMS(R)S communications shall not interfere with AMS(R)S communications.

4.8.2 Circuit-mode system architecture

4.8.2.1 AES circuit-mode services shall be able to specify a particular GES to be used in air-origination calls and shall not be restricted to its log-on GES. Conversely, a ground originated call arriving from the terrestrial network of any GES which has current log-on information of the AES shall be completed by that GES rather than the GES to which the AES is logged on.

4.8.2.2 *Circuit-mode link layer signalling interface.* The AES and GES circuit-mode service procedures shall use the AMS(R)S link layer to exchange signalling information. This information shall be conveyed in circuit-mode — link interface data units (CM-LIDU). As a link service user, the AMS(R)S circuit-mode procedures shall use the services of the link layer interface defined in 4.5 and 4.6. Each CM-LIDU shall be comprised of specific link interface control information (LICI) parameters required by the link layer service. The CM-LIDUs and their relevant LICI parameters are defined in Table 4-38.

4.8.2.3 CIRCUIT-MODE TELEPHONY INTERWORKING INTERFACE

Note.— Guidance material on the circuit-mode telephony interworking interface is contained in Attachment A to Part I.

4.8.2.3.1 The AES and GES circuit-mode service procedures shall interwork with external telephony networks through an interworking interface comprising a standardized set of interworking telephony events which conform to ITU CCITT Recommendations Q.601 to Q.608. The set of interworking telephony events used by the circuit-mode procedures, and the requirements for mapping parameters between the events and corresponding CM-LIDUs, shall be as defined in Tables 4-39 to 4-42.

Note.— Details of ITU CCITT Recommendations Q.601 to Q.608 are contained in CCITT Blue Book, Volume VI — Fascicle VI.6.

4.8.2.4 OTHER AES CIRCUIT-MODE SYSTEM INTERFACES

4.8.2.4.1 *AES management interface.* The specific information exchanged between AES circuit-mode services and AES management shall be as defined in 4.9.

4.8.2.4.2 *AES voice codec external interface.* The AES external voice interface shall convey bi-directional voice information in a form compatible with aircraft-specific audio systems.

4.8.2.5 OTHER GES CIRCUIT-MODE SYSTEM INTERFACES

4.8.2.5.1 *GES management interface.* The specific information exchanged between GES circuit-mode services and GES management shall be as defined in 4.10.

4.8.2.5.2 *Voice codec external interface.* The GES external voice interface shall convey bi-directional voice information in a form compatible with terrestrial network audio channels.

4.8.3 AMS(R)S service requirements

4.8.3.1 *Connectivity.* The AMS(R)S service shall support the on-demand establishment of switched circuits between any aircraft within the service area of a GES and the terrestrial networks serving the GES. The AMS(R)S service shall allow a circuit switched transaction to be established between an aircraft and a terrestrial network via a GES other than the GES to which the aircraft is logged on.

4.8.3.2 *Priority and pre-emption.* AMS(R)S calls shall have priority over all non-AMS(R)S calls and shall be capable of pre-empting non-AMS(R)S calls if required to gain immediate access to the circuit-mode service. AMS(R)S calls shall be established and maintained in accordance with the priority levels defined in Table 4-43. An AMS(R)S call with a higher service priority than an AMS(R)S call in progress shall be able to preempt the lower service priority call if necessary to gain immediate access to circuit-mode service. All AMS(R)S call attempts crossing the interface between a GES and a terrestrial network shall be identified as to the associated priority category.

4.8.3.3 *Grade-of-service.* The GES shall have available sufficient C channel resources such that an air or ground-originated call attempt received at the GES shall experience a probability of blockage within the GES of no more than 0.01. Available GES C channel resources shall include all pre-emptable resources (e.g. those in use by non-safety users).

4.8.4 AMS(R)S performance requirements

4.8.4.1 CALL PROCESSING DELAYS

Note 1.— Guidance material on access delay performance requirements for the AMS(R)S subnetwork and how they impact planning of ATS terrestrial networks is contained in Attachment A to Part I.

Note 2.— Figure A5-1a) shows the "access request" CM-LIDU which is associated with one of the two different access request SUs shown in Figures A2-45 and A2-46. The first is the baseline standard, with the second providing slightly less connection establishment delay.

4.8.4.1.1 AIR-ORIGINATIONS

4.8.4.1.1.1 *GES signalling transit delay.* The maximum time delay for a GES to present a call origination event (FITE 18, *see* Table 4-42) to the terrestrial network interworking interface after the first arrival of all AES call information at the GES link layer shall be 1.0 second (95th percentile).

Note.— AES call information is contained within the "access request" CM-LIDU received via the R channel and in the CM-LIDU received via the C channel. Figures A2-45 and A2-46 show two access request SUs.

4.8.4.1.1.2 *GES C channel assignment delay.* The maximum time delay for a GES to enqueue a "C channel assignment" CM-LIDU for service by the P channel link layer after an "access request" CM-LIDU has arrived at the GES link layer shall be 1.5 seconds (95th percentile).

4.8.4.1.1.3 *AES C channel assignment response delay.* The maximum time delay for an AES to begin transmitting a C channel carrier after a "C channel assignment" CM-LIDU has arrived at the AES link layer shall be 1.0 second (95th percentile).

4.8.4.1.2 GROUND-ORIGINATIONS

4.8.4.1.2.1 *GES C channel assignment delay.* The maximum time delay for a GES to enqueue a "C channel assignment" CM-LIDU for service by the P channel link layer after a call origination event (FITE 18, see Table 4-41) has arrived at the terrestrial network interworking interface shall be 1.5 seconds (95th percentile).

4.8.4.1.2.2 *AES C channel assignment response delay.* The maximum time delay for an AES to begin transmitting a C channel carrier after both a "call announcement" CM-LIDU and a "C channel assignment" CM-LIDU have arrived at the AES link layer shall be 1.0 second (95th percentile).

Note.— The AES procedures for ground-originated calls require an AES to await the successful receipt of both CM-LIDUs before C channel transmission can begin. These procedures include error-recovery logic to handle their potential receipt out of normal order.

4.8.4.2 TRANSFER DELAY

4.8.4.2.1 The total allowable transfer delay within the AMS(R)S subnetwork on a C channel operating at 21.0 kbits/s shall be no more than 0.485 second.

4.8.4.2.2 The maximum transfer delay component that can be attributed to the AES or GES shall be 0.080 second for each.

Note 1.— Fixed transfer delay components of 0.285 second and 0.040 second are allotted to RF propagation delay (worst case path geometry) and vocoder frame emission delay respectively. Allocating 0.040 second for vocoder frame emission delay provides for worst case synchronization where the first 0.020 second vocoder speech frame is delayed by an additional C channel interleaver block.

Note 2.— Total transfer delay for the AMS(R)S subnetwork is defined as the elapsed time commencing at the instant that speech is presented to the AES or GES and concluding at the instant that the speech enters the interconnecting network of the counterpart GES or AES. This delay includes vocoder processing time, physical layer delay, RF propagation delay and any other delays within the AMS(R)S subnetwork.

4.8.4.3 MISROUTING

The probability of misrouting caused by internal processing or signalling errors within the GES shall not exceed 1 in 10^6.

Note.— Misrouting can occur if the GES misinterprets (1) the network-ID or ground address digits contained in an "access request — telephone" CM-LIDU (for air-originations) or (2) the AES-ID or terminal-ID contained in a FITE 18 received from the interworking interface with the terrestrial network (for ground-originations).

4.8.5 Circuit-mode voice encoding/decoding

4.8.5.1 *Circuit-mode voice.* For circuit-mode voice, the appropriate voice encoding/decoding algorithm for the AES and GES shall be used for each C channel as indicated below.

4.8.5.1.1 *21.0 kbits/s C channel.* A 9.6 kbits/s encoding/decoding algorithm (see Appendix 7 to Chapter 4) shall be used with a 21 kbits/s C channel (see 4.4.5).

Note.— The voice encoding algorithm is subject to BT (formerly British Telecom) patent rights and copyrights. BT has agreed to grant royalty-free non-exclusive licences under such patent rights and copyrights to all manufacturers of AES and GES implementations for civil aeronautical mobile satellite communications only (which include AMSS and AMS(R)S communications, as provided in Chapter 4). These manufacturers should enter into a royalty-free licence agreement with BT Laboratories prior to incorporating the algorithm in equipments for civil aeronautical mobile satellite communications.

4.8.5.1.2 *8.4 kbits/s C channel.* A 4.8 kbits/s encoding/decoding algorithm shall be used with an 8.4 kbits/s C channel (see 4.4.5).

Note.— Information on technical characteristics of the industry standard 4.8 kbits/s encoding/decoding algorithm is contained in the document "Low Level Description", version number 1.5, dated 3 May 1996, and developed by Digital Voice Systems Inc. (DVSI), United States.

The 4.8 kbits/s encoding/decoding technology described in the document is subject to DVSI patent rights and copyrights. Manufacturers must enter into a licence agreement with DVSI prior to obtaining a detailed description of the algorithm before incorporation in equipment operating in the AMSS service. By letter to ICAO dated 10 November 1998, DVSI confirmed its commitment to license the technology for the manufacture and sale of aeronautical equipment under reasonable terms and conditions, negotiated on a non-discriminatory basis.

4.8.6 AMS(R)S circuit-mode procedures

The AMS(R)S circuit-mode procedures comprise the following four functional areas:

a) For the AES circuit-mode services:

   i) AES outgoing logic procedure (for air-originations); and

   ii) AES incoming logic procedure (for ground-originations).

b) For the GES circuit-mode services:

   i) GES outgoing logic procedure (for ground-originations); and

   ii) GES incoming logic procedure (for air-originations).

4.8.6.1 AMS(R)S CIRCUIT-MODE PROCEDURES

Note 1.— It is assumed that an AMS(R)S circuit-mode service procedure will encode or interpret the relevant parameters of any CM-LIDU being transmitted or received without specifically stating the exact code values in the procedures contained herein. Specific requirements for parameter encoding can be found in the interworking telephony events mapping requirements defined in Appendix 5 to Chapter 4.

Note 2.— The term "C channel resources" includes all required C channel hardware and sufficient transmitter power to maintain a C channel.

4.8.6.1.1 *AES CIRCUIT-MODE LOGIC*

Note.— The requirements for mapping between interworking telephony events and CM-LIDUs by the AES outgoing and incoming procedures are defined in Appendix 5 to Chapter 4, Figures A5-1 to A5-11 and A5-12 to A5-18, respectively. Circuit-mode configuration parameters (e.g. those used in 4.8.6.1.1.1) are defined in Appendix 6 to Chapter 4.

4.8.6.1.1.1 *AES outgoing circuit-mode procedure.* Receipt of an "AMS(R)S call origination" event (FITE 18) at the interworking interface shall cause AES circuit-mode services to assign a unique application reference number to the call. AES circuit-mode services shall then do the following:

a) if sufficient AES C channel resources are not available and the blockage is attributable to calls operating at a C channel priority equal to or greater than the current call attempt, AES circuit-mode services shall return a "call unsuccessful — network congestion" event (BITE 12) to the interworking interface and terminate all activities for the call; or

b) if sufficient C channel resources are available or if at least one of the calls causing the blockage is operating at a C channel priority less than the current call attempt, AES circuit-mode services shall do the following and then await a C channel assignment from GES circuit-mode services:

   1) if the call priority is distress/urgency, AES circuit-mode services shall forward to the link layer nA21 "access request — telephone" CM-LIDUs; or

   2) if the call priority is flight safety, AES circuit-mode services shall forward to the link layer nA22 "access request — telephone" CM-LIDUs; or

   3) if the call priority is regularity/meteorological, the AES circuit-mode services shall forward to the link layer nA23 "access request — telephone" CM-LIDUs.

4.8.6.1.1.1.1 AES circuit-mode services shall do the following while awaiting a response from GES circuit-mode services:

a) if a response is not received from GES circuit-mode services within tA50 seconds after the transmission of the latest "access request — telephony" CM-LIDU, the AES shall command the selection of an R channel frequency and then shall transmit the original quantity of CM-LIDUs; provided that the total number of retransmissions of the CM-LIDU series does not exceed four. If, tA50 seconds after the fourth retransmission of the CM-LIDU series, no response has been received, AES circuit-mode services shall return a "call unsuccessful — line out of service" event (BITE 17) to the interworking interface and terminate all activities for the call; or

b) if a "clear forward" event (FITE 22) is received at the interworking interface, AES circuit-mode services shall forward to the link layer a "call progress — channel release" CM-LIDU via the R channel and terminate all activities for the call; or

c) if the call attempt is to be pre-empted by a higher priority call, AES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface, forward to the link layer a "call progress — channel release" CM-LIDU via the R channel, and then terminate all activities for the call; or

d) if any of the following responses are received, AES circuit-mode services shall do the following:

1) if either a "call progress — call attempt result" CM-LIDU or a "call progress — channel release" CM-LIDU are received, AES circuit-mode services shall forward a "clear back" event (BITE 25) or an appropriate "call unsuccessful" event (BITE 14, 15, 16, 17, or 20) to the interworking interface as determined by the cause location, cause class, and cause value parameters received in the CM-LIDU. AES circuit-mode services shall then terminate all activities for the call; or

2) if a "C channel assignment" CM-LIDU is received, AES circuit-mode services shall request AES management to allocate C channel resources and activate a C channel unit on the assigned frequency at the C channel Q number value as per Table 4-43.

Note.— This is to say that the Q number of the C channel is inferred from the Q number used in the initial circuit-mode call signalling at the link layer.

AES circuit-mode services shall then forward to the link layer a "call information — service address" CM-LIDU every tA29 seconds indefinitely and interconnect the C channel audio interface with that of the calling terminal.

Note.— The call information conveyed by the "call information — service address" CM-LIDU is redundant with that conveyed by the "access request" CM-LIDU, when the access request procedure used is not the "general access request" procedure. In this case, this information is used to maintain compatibility with the circuit continuity test procedure in use by those GESs which are providing AMSS services to non-AMS(R)S users; and it will not be submitted to digit analysis by a GES.

4.8.6.1.1.1.2 If no response is received from GES circuit-mode services within tA28 seconds after C channel unit activation, AES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, return a "call unsuccessful — line out of service" event (BITE 17) to the interworking interface, and terminate all activities for the call; otherwise, AES circuit-mode services shall do the following:

a) if one or more "call progress — test" CM-LIDUs are received, AES circuit-mode services shall ignore them; or

b) if one or more "call progress — channel release" CM-LIDUs are received, or if a "clear forward" event (FITE 22) is received at the interworking interface, then AES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, return an appropriate telephony event (BITE 14, 15, 16, 17, 20, or 25) to the interworking interface, and terminate all activities for the call; or

c) if a "call progress — connect" CM-LIDU is received, or if the CM-LIDU arrives preceded by either a "call progress — test" CM-LIDU or a "call progress — call attempt result" CM-LIDU which was previously received within tA28 seconds after C channel unit activation, AES circuit-mode services shall do the following:

1) ensure that the repetitive transmission of the "call information — service address" CM-LIDU has ceased; and

2) forward an "answer" event (BITE 22) to the interworking interface and forward to the link layer a positive "telephony acknowledge" CM-LIDU via the C channel sub-band. If any additional "call progress — connect" CM-LIDUs are received subsequent to the initial "call progress — connect" CM-LIDU, AES circuit-mode services shall respond to each by forwarding to the link layer a positive "telephony acknowledge" CM-LIDU to GES circuit-mode services; or

Note.— At this point the end-to-end call is established.

d) if a "call progress — call attempt result" CM-LIDU (encoded to indicate an "address complete" event) is received, or if it arrives preceded by a "call progress — test" CM-LIDU which was previously received within tA28 seconds after C channel unit activation, AES circuit-mode services shall do the following:

1) ensure that the repetitive transmission of the "call information — service address" CM-LIDU has ceased; and

2) forward an "address complete" event (BITE 5) to the interworking interface and forward to the link layer a positive "telephony acknowledge" CM-LIDU via the

C channel sub-band. If any additional "call progress — call attempt result" CM-LIDUs are received subsequent to the initial "call progress — call attempt result" CM-LIDU, AES circuit-mode services shall respond to each by forwarding to the link layer a positive "telephony acknowledge" CM-LIDU to GES circuit-mode services; or

e) if C channel resources are pre-empted for a higher priority call, AES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, return a "clear back" event (BITE 25) to the interworking interface, and terminate all activities for the call; or

f) if the C channel sub-band link layer commands the call be terminated, AES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface and terminate all activities for the call.

4.8.6.1.1.2 *AES incoming circuit-mode procedure.* This procedure shall be defined by the following interrelated procedures:

a) AES incoming circuit-mode call initiation — 4.8.6.1.1.2.1;

b) AES incoming C channel continuity check — 4.8.6.1.1.2.2;

c) AES incoming aircraft completion — 4.8.6.1.1.2.3; and

d) AES incoming C channel maintenance — 4.8.6.1.1.2.4.

4.8.6.1.1.2.1 *AES incoming circuit-mode call initiation.* Upon receipt of either a "call announcement" or "C channel assignment" CM-LIDU with a unique application reference number, AES circuit-mode services shall do the following:

a) if a "C channel assignment" was received, AES circuit-mode services shall forward to the link layer a negative "telephony acknowledge" CM-LIDU (encoded to indicate that the "call announcement" CM-LIDU is missing) via the R channel and do the following:

1) if neither a related "call announcement" CM-LIDU or a "call progress — channel release" CM-LIDU are received within tA27 seconds of the transmission of the latest negative "telephony acknowledge" CM-LIDU, AES circuit-mode services shall forward to the link layer the negative "telephony acknowledge" CM-LIDU via the R channel and await their arrival for an additional tA27 seconds; provided that the total number of repetitions of the "telephony acknowledge" CM-LIDU does not exceed four. If neither of the aforementioned CM-LIDUs are received within tA27 seconds after the fourth repetition of the "telephony acknowledge" CM-LIDU, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

2) if a "call progress — channel release" CM-LIDU is received within tA27 seconds after the latest transmission of the "telephony acknowledge" CM-LIDU, AES circuit-mode services shall terminate all activities for the call; or

3) if the call attempt is to be preempted for a higher priority call, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

4) if the related "call announcement" CM-LIDU is received within tA27 seconds after the latest transmission of the "telephony acknowledge" CM-LIDU, AES circuit-mode services shall do the following:

i) if the called terminal is occupied with a call at a priority higher than or equal to the current call attempt, or if C channel resources are not available, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

ii) if the called terminal and C channel resources are both available, AES circuit-mode services shall request AES management to allocate C channel resources and activate a C channel unit on the assigned frequency at the C channel Q number value as per Table 4-43.

Note.— This is to say that the Q number of the C channel shall be inferred from the Q number used in the initial circuit-mode call signalling at the link layer.

AES circuit-mode services shall then forward to the link layer a "call progress — test" CM-LIDU and perform the AES incoming C channel continuity check procedure in 4.8.6.1.1.2.2; or

b) if a "call announcement" CM-LIDU was received, AES circuit-mode services shall do the following:

1) if a "call progress — channel release" CM-LIDU is received within tA25 seconds after receipt of the "call announcement" CM-LIDU, AES circuit-mode services shall terminate all activities for the call; or

2) if neither a "C channel assignment" CM-LIDU or a "call progress — channel release" CM-LIDU are received within tA25 seconds after receipt of the "call announcement" CM-LIDU, AES circuit-mode

services shall forward to the link layer a negative "telephony acknowledge" CM-LIDU (encoded to indicate that the "C channel assignment" CM-LIDU is missing) via the R channel and await their arrival for an additional tA27 seconds. If neither of the CM-LIDUs arrive after tA27 seconds, AES circuit-mode services shall again forward to the link layer the negative "telephony acknowledge" CM-LIDU and await an additional tA27 seconds; provided that the total number of repetitions of the negative "telephony acknowledge" CM-LIDU does not exceed four. If neither of the CM-LIDUs are received within tA27 seconds after the fourth repetition of the negative "telephony acknowledge" CM-LIDU, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

3) if the call attempt is to be pre-empted for a higher priority call, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

4) if a "C channel assignment" CM-LIDU is received within either tA25 seconds after receipt of the "call announcement" CM-LIDU or tA27 seconds after receipt of the transmission of the latest negative "telephony acknowledge" CM-LIDU, AES circuit-mode services shall do the following:

   i) if the called terminal is occupied with a call at a priority higher than or equal to the current call attempt, or if C channel resources are not available, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

   ii) if the called terminal and C channel resources are both available, AES circuit-mode services shall request AES management to allocate the resources at a C channel Q number value as per Table 4-43 and activate a C channel unit on the assigned frequency. AES circuit-mode services shall then forward to the link layer a "call progress — test" CM-LIDU and perform the AES incoming C channel continuity check procedure in 4.8.6.1.1.2.2.

4.8.6.1.1.2.2 *AES incoming C channel continuity check.* Where required elsewhere in 4.8, AES circuit-mode services shall perform a C channel continuity check by doing the following:

a) if neither a "call progress — test" CM-LIDU or a "call progress — channel release" CM-LIDU are received within tA26 seconds after the most recent "call progress — test" CM-LIDU has been forwarded, AES circuit-mode services shall forward to the link layer another "call progress — test" CM-LIDU until any of the following occur:

   1) if neither a "call progress — test" CM-LIDU or a "call progress — channel release" CM-LIDU are received within tA41 seconds after activation of the C channel unit, AES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs, shall then forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

   2) if a "call progress — channel release" CM-LIDU is received within tA41 seconds after activation of the C channel unit, AES circuit-mode services shall terminate all activities for the call; or

   3) if the C channel is to be pre-empted for a higher priority call, AES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the R channel and terminate all activities for the call; or

   4) if a "call progress — test" CM-LIDU is received within tA41 seconds after C channel unit activation, AES circuit-mode services shall enable the circuit path between the C channel unit and the forward circuit of the aircraft network. AES circuit-mode services shall then forward to the link layer a positive "telephony acknowledge" CM-LIDU via the C channel sub-band, forward an "AMS(R)S call origination" event (FITE 18) to the interworking interface and await completion of the call to the called terminal as per the AES incoming aircraft completion procedure defined in 4.8.6.1.1.2.3.

4.8.6.1.1.2.3 *AES incoming aircraft completion.* Where required elsewhere in 4.8, AES circuit-mode services shall do the following in order to complete a call across the aircraft network to the called terminal:

a) if one or more "call progress — test" CM-LIDUs are received, AES circuit-mode services shall forward to the link layer a positive "telephony acknowledge" CM-LIDU via the C channel sub-band; or

b) if an "answer" event (BITE 22) is not received from the interworking interface within tA42 seconds after forwarding the "AMS(R)S call origination" event (FITE 18), AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

c) if a "call progress — channel release" CM-LIDU is received within tA42 seconds after forwarding the "AMS(R)S call origination" event (FITE 18), or if the C channel is to be pre-empted for a higher priority call, then AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

d) if an "answer" event (BITE 22) is received from the interworking interface within tA42 seconds after forwarding the "AMS(R)S call origination" event (FITE 18), AES circuit-mode services shall forward to the link layer a "call progress — connect" CM-LIDU and perform the AES incoming C channel maintenance procedure defined in 4.8.6.1.1.2.4.

4.8.6.1.1.2.4 *AES incoming C channel maintenance.* Where required elsewhere in 4.8, AES circuit-mode services shall allow the end-to-end connection to continue while doing the following to maintain a C channel:

a) if, within tA26 seconds after transmission of the latest "call progress — connect" CM-LIDU, neither a positive "telephony acknowledge" CM-LIDU is received or a "clear back" event (BITE 25) is received from the interworking interface, AES circuit-mode services shall again forward to the link layer the "call progress — connect" CM-LIDU via the C channel sub-band; or

b) if, within tA30 seconds after transmission of the first "call progress — connect" CM-LIDU, neither a positive "telephony acknowledge" CM-LIDU is received or a "clear back" event (BITE 25) is received from the interworking interface, AES circuit-mode services shall stop forwarding the "call progress — connect" CM-LIDU, forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

c) if, within tA30 seconds after transmission of the first "call progress — connect" CM-LIDU, a "call progress — channel release" CM-LIDU is received, AES circuit-mode services shall stop forwarding the "call progress — connect" CM-LIDU, forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

d) if the C channel is to be pre-empted for a higher priority call, AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, and terminate all activities for the call; or

e) if one or more positive "telephony acknowledge" CM-LIDUs are received, AES circuit-mode services shall stop forwarding the "call progress — connect" CM-LIDU and do the following while allowing the C channel to function:

Note.— This is the location in the logic procedure at which the end-to-end voice channel is ready for use and the air and ground users can begin conversation.

1) if a "clear back" event (BITE 25) is received from the interworking interface, AES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

2) if a "call progress — channel release" CM-LIDU is received, AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

3) if the C channel is to be pre-empted for a higher priority call, AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and terminate all activities for the call; or

Note.— The above logic transitions monitor for call clearing via either a normal call clearing action or an AES-initiated C channel pre-emption.

f) if the C channel sub-band link layer commands the call be terminated, AES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface and terminate all activities for the call.

4.8.6.1.2 *GES CIRCUIT-MODE LOGIC*

Note.— The requirements for mapping between interworking telephony events and CM-LIDUs by the GES outgoing and incoming procedures are defined in Appendix 5 to Chapter 4, Figures A5-19 to A5-27 and A5-28 to A5-40, respectively.

4.8.6.1.2.1 *GES outgoing circuit-mode procedure.* This procedure shall be defined by the following interrelated procedures:

a) GES outgoing circuit-mode call initiation — 4.8.6.1.2.1.1;

b) GES outgoing C channel establishment — 4.8.6.1.2.1.2;

c) GES outgoing C channel continuity check — 4.8.6.1.2.1.3;

d) GES outgoing C channel maintenance — 4.8.6.1.2.1.4; and

e) GES outgoing C channel release guard — 4.8.6.1.2.1.5.

4.8.6.1.2.1.1 *GES outgoing circuit-mode call initiation.* Receipt of an "AMS(R)S call origination" event (FITE 18) at the interworking interface shall cause GES circuit-mode services to assign a unique application reference number to the call. If the AES is not logged on, GES circuit-mode services shall forward a "call unsuccessful — send error indication" event (BITE 20) to the interworking interface and terminate all activities for the call; otherwise, GES circuit-mode services shall request GES management to assign C channel resources to the call at the C channel Q number value as per Table 4-43.

Note.— This is to say that the Q number of the C channel shall be inferred from the Q number used in the initial circuit-mode call signalling at the link layer.

GES circuit-mode services shall then do the following:

a) if a "clear forward" event (FITE 22) is received at the interworking interface, GES circuit-mode services shall terminate all activities for the call; or

b) if C channel resources are not available, GES circuit-mode services shall forward a "call unsuccessful — network congestion" event (BITE 12) to the interworking interface and terminate all activities for the call; or

c) if C channel resources are available, GES circuit-mode services shall forward to the link layer a "call announcement" CM-LIDU followed immediately by a "C channel assignment" CM-LIDU. GES circuit-mode services shall then request GES management to activate the previously assigned C channel unit on the assigned frequency and then establish the C channel as per 4.8.6.1.2.1.2.

4.8.6.1.2.1.2 *GES outgoing C channel establishment.* Where required elsewhere in 4.8, GES circuit-mode services shall do the following to establish a C channel for use in a ground-origination:

a) if, within tG16 seconds after the latest transmission of either the "call announcement" or "C channel assignment" CM-LIDUs, a negative "telephony acknowledge" CM-LIDU is received, GES circuit-mode services shall again forward to the link layer the missing CM-LIDU indicated in the received CM-LIDU and await an additional tG16 seconds; or

b) if nothing is received from AES circuit-mode services within tG16 seconds after the latest transmission of either the "call announcement" or "C channel assignment" CM-LIDU, GES circuit-mode services shall again forward to the link layer both of the CM-LIDUs and await an additional tG16 seconds. If, after the additional tG16 second period, nothing is received, GES circuit-mode services shall forward a "call unsuccessful — line out of service" event (BITE 17) to the interworking interface and forward to the link layer a "call progress — channel release" CM-LIDU via the P channel. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier does not terminate within tG23 seconds after the first "call progress — channel release" CM-LIDU was forwarded, GES circuit-mode services shall again forward the CM-LIDU. If the from-aircraft carrier terminates during either tG23 second period, GES circuit-mode services shall terminate all activities for the call. If the from-aircraft carrier does not terminate by the expiry of the second tG23 second period, GES circuit-mode services shall terminate all activities for the call; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

c) if a "call progress — call attempt result" CM-LIDU is received, GES circuit-mode services shall forward an appropriate "call unsuccessful" event (BITES 12, 16, or 17) to the interworking interface. Also, GES circuit-mode services shall wait tG23 seconds for the C channel from-aircraft carrier to terminate. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the from-aircraft carrier terminates by the end of the period, GES circuit-mode services shall terminate all activities for the call. If the from-aircraft carrier does not terminate within the same period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

d) if a "clear forward" event (FITE 22) is received at the interworking interface, GES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band followed by a "call progress — channel release" CM-LIDU via the P channel. GES circuit-mode services shall then perform the GES outgoing C channel release guard procedure defined in 4.8.6.1.2.1.5; or

e) if a "call progress — test" CM-LIDU is received, GES circuit-mode services shall forward to the link layer a "call progress — test" CM-LIDU and then perform the GES outgoing C channel continuity check procedure defined in 4.8.6.1.2.1.3.

4.8.6.1.2.1.3 *GES outgoing C channel continuity check.* When checking the circuit continuity of a C channel which is to be used for a ground-origination, GES circuit-mode services shall do the following:

a) if tG34 seconds have elapsed from the time that the first "call progress — test" CM-LIDU was sent to AES circuit-mode services, GES circuit-mode services shall forward a "call unsuccessful — line out of service" event (BITE 17) to the interworking interface and forward to the link layer a "call progress — channel release" CM-LIDU via the P channel. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier does not terminate within tG23 seconds after the first transmission of the "call progress — channel release" CM-LIDU, GES circuit-mode services shall again forward the CM-LIDU via the P channel and await an additional tG23 seconds. If the from-aircraft carrier terminates during either period, GES circuit-mode services shall terminate all activities for the call. If the from-aircraft carrier does not terminate by expiry of the second period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

b) if tG34 seconds have not elapsed since the time that the first "call progress — test" CM-LIDU was sent to AES circuit-mode services, GES circuit-mode services shall do the following while simultaneously forwarding to the link layer a "call progress — test" CM-LIDU to AES circuit-mode services every tG35 seconds:

1) if a "call progress — call attempt result" CM-LIDU is received, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs to AES circuit-mode services. GES circuit-mode services shall then forward an appropriate "call unsuccessful" event (BITE 12, 16 or 17) to the interworking interface and await tG23 seconds for the C channel from-aircraft carrier to terminate. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the from-aircraft carrier terminates by the end of the period, GES circuit-mode services shall terminate all activities for the call. If the from-aircraft carrier does not terminate by the expiry of this period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

2) if a "clear forward" event (FITE 22) is received at the interworking interface, GES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, stop forwarding "call progress — test" CM-LIDUs and then perform the GES outgoing C channel release guard procedure defined in 4.8.6.1.2.1.5; or

3) if a "call progress — channel release" CM-LIDU is received from AES circuit-mode services, GES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface and stop forwarding "call progress — test" CM-LIDUs. GES circuit-mode services shall then wait tG23 seconds for the C channel from-aircraft carrier to terminate. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the from-aircraft carrier terminates during the period, GES circuit-mode services shall terminate all activities for the call. If the from-aircraft carrier does not terminate within this period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

4) if a positive "telephony acknowledge" CM-LIDU is received, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. GES circuit-mode services shall then forward an "address complete" event (BITE 5) to the interworking interface and perform the GES outgoing C channel maintenance procedure defined in 4.8.6.1.2.1.4; or

5) if a "call progress — connect" CM-CIDU is received, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. GES circuit-mode services shall then forward an "address complete" event (BITE 5) and an "answer" event (BITE 22) to the interworking interface, forward to the link layer a positive "telephony acknowledge" CM-LIDU via the C channel sub-band, and perform the GES outgoing C channel maintenance procedure defined in 4.8.6.1.2.1.4.

4.8.6.1.2.1.4 *GES outgoing C channel maintenance.* Where required elsewhere in 4.8, GES circuit-mode services shall enable the circuit path between the forward circuit of the terrestrial network and the C channel unit, and then do the following to maintain the C channel:

a) if a "call progress — connect" CM-LIDU is received, GES circuit-mode services shall forward to the link layer a positive "telephony acknowledge" CM-LIDU via the C channel sub-band. If an identical CM-LIDU was not received previously during the GES outgoing C channel establishment procedure defined in 4.8.6.1.2.1.2, GES circuit-mode services shall also forward an "answer" event (BITE 22) to the interworking interface; or

b) if a "clear forward" event is received at the interworking interface, GES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band. GES circuit-mode services shall then perform the GES outgoing C channel release guard procedure defined in 4.8.6.1.2.1.5; or

c) if the C channel from-aircraft carrier drops for more than tG19 seconds, GES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface. GES circuit-mode services shall then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and perform the GES outgoing C channel release guard procedure defined in 4.8.6.1.2.1.5; or

d) if the C channel is to be pre-empted for a higher priority call, GES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface. GES circuit-mode services shall then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and perform the GES outgoing C channel release guard procedure defined in 4.8.6.1.2.1.5; or

e) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall forward a "clear back" event (BITE 25) to the interworking interface and terminate all activities for the call.

4.8.6.1.2.1.5 *GES outgoing C channel release guard.* When releasing a C channel which is in use for a ground-origination, GES circuit-mode services shall do the following when required elsewhere in 4.8:

a) if the C channel from-aircraft carrier terminates within tG17 seconds after the last of the six "call progress — channel release" CM-LIDUs has been forwarded, GES circuit-mode services shall terminate all activities for the call; or

b) if the C channel from-aircraft carrier does not terminate within tG17 seconds after the last of the six "call progress — channel release" CM-LIDUs has been forwarded, GES circuit-mode services shall forward to the link layer twelve "call progress — channel release" CM-LIDUs via the C channel sub-band and one "call progress — channel release" CM-LIDU via the P channel. If the from-aircraft carrier is not present, terminate all activities for the call. Otherwise, if the C channel from-aircraft carrier terminates within tG18 seconds after the transmission of the "call progress — channel release" CM-LIDU via the P channel, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within the same tG18 second period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

c) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall await the termination of the C channel from-aircraft carrier. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier terminates within tG18 seconds after receipt of the "call progress — channel release" CM-LIDU, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within this same period, GES circuit-mode services shall terminate all activities for the call at the end of the period.

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

4.8.6.1.2.2 *GES incoming circuit-mode procedure.* This procedure shall be defined by the following interrelated procedures:

a) GES incoming circuit-mode call initiation — 4.8.6.1.2.2.1;

b) GES incoming bi-directional setup — 4.8.6.1.2.2.2;

c) GES incoming C channel establishment — 4.8.6.1.2.2.3;

d) GES incoming terrestrial completion — 4.8.6.1.2.2.4;

e) GES incoming C channel maintenance — 4.8.6.1.2.2.5; and

f) GES incoming C channel release guard — 4.8.6.1.2.2.6.

4.8.6.1.2.2.1 *GES incoming circuit-mode call initiation.* Upon receipt from an AES of an "access request — telephone" CM-LIDU with a unique application reference number, GES circuit-mode services shall request GES management to assign C channel resources at the C channel Q number value as per Table 4-43.

Note.— This is to say that the Q number of the C channel shall be inferred from the Q number used in the initial circuit-mode call signalling at the link layer.

GES circuit-mode services shall then do the following:

a) if a "call progress — channel release" CM-LIDU is received prior to GES management assigning C channel resources, GES circuit-mode services shall terminate all activities for the call; or

b) if C channel resources are not available, then GES circuit-mode services shall forward to the link layer a "call progress — call attempt result" CM-LIDU via the P channel. GES circuit-mode services shall then await tG9 seconds for the potential receipt of a repetition of the original "access request — telephone" CM-LIDU at the current application reference number. If such an additional CM-LIDU is received from AES circuit-mode services, GES circuit-mode services shall again forward the "call progress — call attempt result" CM-LIDU; otherwise, GES circuit-mode services shall terminate all activities for the call after expiry of the initial tG9 second period.

Otherwise, GES circuit-mode services shall forward to the link layer a "C channel assignment" CM-LIDU. Simultaneously, GES circuit-mode services shall request GES management to activate the previously assigned C channel unit. Any redundant "access request — telephone" CM-LIDUs (with an identical application reference number) received prior to C channel unit activation shall be ignored. GES circuit-mode services shall then perform the GES incoming bi-directional setup procedure defined in 4.8.6.1.2.2.2.

Note.— Redundant "access request — telephone" CM-LIDUs might be received, prior to C channel unit activation, as a result of the series transmission of several such CM-LIDUs by the AES. The redundant CM-LIDUs can be ignored without effect.

4.8.6.1.2.2.2 *GES incoming bi-directional setup.* Where required elsewhere in 4.8, GES circuit-mode services shall perform routing analysis of the network-ID specified in the "access request — telephone" CM-LIDU while simultaneously performing the following:

Note 1.— Routing analysis is considered to be a GES-specific procedure wherein the network-ID parameter is used to identify the specific group of voice circuits which inter-connect the GES with the desired terrestrial circuit-switched voice network.

Note 2.— The logic in this subsection initiates terrestrial call completion while simultaneously initiating the establishment of the C channel.

a) if an additional "access request — telephone" CM-LIDU at the current application reference number is received from AES circuit-mode services within tG11 seconds after the latest "C channel assignment" CM-LIDU has been forwarded to the link layer, GES circuit-mode services shall again forward the "C channel assignment" CM-LIDU to AES circuit-mode services; or

b) if a "call information — service address" CM-LIDU is not received within tG11 seconds after the latest "C channel assignment" CM-LIDU has been forwarded to the link layer, GES circuit-mode services shall perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

c) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall await the termination of the C channel from-aircraft carrier. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier terminates within tG24 seconds after receipt of the "call progress — channel release" CM-LIDU, GES circuit-mode services shall terminate all activities for the call. If the carrier does not terminate within the same tG24 second period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

d) if a "call information — service address" CM-LIDU is received within tG11 seconds after C channel unit activation, GES circuit-mode services shall send "call progress — test" CM-LIDUs every tG10 seconds indefinitely; or

e) if routing analysis indicates that completion of the call is blocked due to congestion in either the GES switching equipment or the forward circuit group leading to the terrestrial network, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs and then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band. GES circuit-mode services shall then perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

f) if routing analysis is successful in obtaining a forward circuit to the terrestrial network, GES circuit-mode services shall forward an "AMS(R)S call origination" event (FITE 18) to the interworking interface with the terrestrial network. If a "call information — service address" CM-LIDU has already been received, GES circuit-mode services shall then perform the GES incoming terrestrial completion procedure defined in 4.8.6.1.2.2.4; otherwise GES circuit-mode services shall await establishment of the C channel by performing the GES incoming C channel establishment procedure defined in 4.8.6.1.2.2.3.

4.8.6.1.2.2.3 *GES incoming C channel establishment.* Where required elsewhere in 4.8, GES circuit-mode services shall do the following while awaiting the establishment of the C channel:

Note.— Within this subsection, it is possible that signalling events might be received from the terrestrial network. Therefore, if any telephony interworking events are received at the interworking interface with the terrestrial network, they should be held in queue for interpretation by logic specified in subsequent subsections.

a) if an additional "access request — telephone" CM-LIDU at the current application reference number is received from AES circuit-mode services within tG11 seconds after the latest "C channel assignment" CM-LIDU has been forwarded to the link layer, GES circuit-mode services shall again forward the "C channel assignment" CM-LIDU to AES circuit-mode services; or

b) if a "call progress — channel release" CM-LIDU is received within tG11 seconds of C channel unit activation, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs and forward a "clear forward" event (FITE 22) to the interworking interface. (If additional "call progress — channel release" CM-LIDUs are received, GES circuit-mode services shall ignore them.) GES circuit-mode services shall then wait tG24 seconds after receipt of the "call progress — channel release" CM-LIDU for the C channel from-aircraft carrier to terminate. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier terminates within the tG24 second period, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within the same period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of the unterminated from-aircraft carrier should be posted to a monitoring function.

c) if a "call information — service address" CM-LIDU is not received within tG11 seconds after the latest "C channel assignment" CM-LIDU has been forwarded to the link layer, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface and perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

d) if a "call information — service address" CM-LIDU is received within tG11 seconds after C channel unit activation, GES circuit-mode services shall send "call progress — test" CM-LIDUs every tG10 seconds indefinitely and perform the GES incoming terrestrial completion procedure defined in 4.8.6.1.2.2.4.

4.8.6.1.2.2.4 *GES incoming terrestrial completion.* While GES circuit-mode services is awaiting completion of the call across the terrestrial network it shall enable the circuit path between the C channel unit and the forward circuit of the terrestrial network while simultaneously forwarding to the link layer a "call progress — test" CM-LIDU every tG10 seconds indefinitely. It shall also do the following:

Note.— At this point, circuit continuity is established through the GES between the C channel and the terrestrial network circuit. Call completion across the terrestrial network is still under way and call progress tones from that network may be audible to the on-aircraft party. If the called party answers the call attempt, this will be indicated by receipt from the terrestrial network of an "answer" event (BITE 22) at the interworking interface.

a) if the C channel from-aircraft carrier terminates for more than tG13 seconds, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface. After the FITE 22 event has been forwarded, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. GES circuit-mode services shall then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band. GES circuit-mode services shall then perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

b) if either a "release incoming side" event (BITE 29) or a "call unsuccessful" event (BITE 12, 14, 15, 16, 17 or 20) were received from the interworking interface, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. GES circuit-mode services shall then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band. GES circuit-mode services shall then perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

c) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs and shall forward a "clear forward" event (FITE 22) to the interworking interface. (If additional "call progress — channel release" CM-LIDUs are received, GES circuit-mode services shall ignore them.) If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier terminates within tG14 seconds, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within the same period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

d) if an "address complete" event (BITE 5) or "sending finished" event (BITE 27) are received at the interworking interface, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. It shall then forward to the link layer a "call progress — call attempt result" CM-LIDU every tG10 seconds until a positive "telephony acknowledge" CM-LIDU is received. If a positive "telephony acknowledge" CM-LIDU is not received within tG11 seconds of the transmission of the first "call progress — call attempt result" CM-LIDU, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, and perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; otherwise, GES circuit-mode services shall perform the GES incoming C channel maintenance procedure defined in 4.8.6.1.2.2.5; or

e) if an "answer" event (BITE 22) is received at the interworking interface, GES circuit-mode services shall stop forwarding "call progress — test" CM-LIDUs. It shall then forward to the link layer a "call progress — connect" CM-LIDU every tG10 seconds until a positive "telephony acknowledge" CM-LIDU is received. If a positive "telephony acknowledge" CM-LIDU is not received within tG11 seconds after the first "call progress — connect" CM-LIDU was forwarded, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, and perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; otherwise, GES circuit-mode services shall perform the GES incoming C channel maintenance procedure defined in 4.8.6.1.2.2.5.

4.8.6.1.2.2.5 *GES incoming C channel maintenance.* GES circuit-mode services shall then allow the end-to-end circuit-mode connection to continue until any of the following occur:

a) if an "answer" event (BITE 22) is received at the interworking interface, GES circuit-mode services shall forward to the link layer a "call progress — connect" CM-LIDU every tG10 seconds until a positive "telephony acknowledge" CM-LIDU is received. If a positive "telephony acknowledge" CM-LIDU is not received within tG11 seconds after the first "call progress — connect" CM-LIDU was forwarded, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface, forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band, and perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6. Otherwise, GES circuit-mode services shall allow the end-to-end circuit-mode connection to continue; or

b) if a "clear back" event (BITE 25) is received at the interworking interface, GES circuit-mode services shall forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band. GES circuit-mode services shall then perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

c) if the C channel from-aircraft carrier terminates for more than tG13 seconds, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface. GES circuit-mode services shall then forward to the link layer six "call progress — channel release" CM-LIDUs via the C channel sub-band and then perform the GES incoming release guard procedure defined in 4.8.6.1.2.2.6; or

d) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall forward a "clear forward" event (FITE 22) to the interworking interface. (If additional "call progress — channel release" CM-LIDUs are received, GES circuit-mode services shall ignore them.) If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier does not terminate within tG14 seconds after the receipt of the "call progress — channel release" CM-LIDU, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier terminates within the same tG14 second period, GES circuit-mode services shall terminate all activities for the call at the end of the period.

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

4.8.6.1.2.2.6 *GES incoming release guard.* When releasing a C channel which is in use for an air-origination, GES circuit-mode services shall do the following when required elsewhere in 4.8:

a) if the C channel from-aircraft carrier terminates within tG12 seconds after the last of the six "call progress — channel release" CM-LIDUs was forwarded, GES circuit-mode services shall terminate all activities for the call; or

b) if the C channel from-aircraft carrier does not terminate within tG12 seconds after the last of the six "call progress — channel release" CM-LIDUs was forwarded, GES circuit-mode services shall forward to the link layer twelve "call progress — channel release" CM-LIDUs via the C channel sub-band followed by one "call progress — channel release" CM-LIDU via the P channel. If the from-aircraft carrier is not present, terminate all activities for the call. Otherwise, if the C channel from-aircraft carrier terminates within tG14 seconds after the transmission of the "call progress — channel release" CM-LIDU sent via the P channel, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within the same tG14 second period, GES circuit-mode services shall terminate all activities for the call at the end of the period; or

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

c) if a "call progress — channel release" CM-LIDU is received, GES circuit-mode services shall await the termination of the C channel from-aircraft carrier. If the from-aircraft carrier is not present, terminate all activities for the call; otherwise, if the C channel from-aircraft carrier terminates within tG14 seconds after receipt of the "call progress — channel release" CM-LIDU, GES circuit-mode services shall terminate all activities for the call. If the C channel from-aircraft carrier does not terminate within the same tG14 second period, GES circuit-mode services shall terminate all activities for the call at the end of the period.

Note.— The status of an unterminated from-aircraft carrier should be posted to a monitoring function.

4.8.7 ATS-specific terrestrial network standards

Note.— Guidance material on aeronautical speech circuit switching and signalling is contained in ICAO Circular 183 — ATS Speech Circuits — Guidance Material on Switched Network Planning *and in Attachment A to Part I.*

4.8.7.1 *Closed user group.* The AMS(R)S voice service inclusive of interconnecting aircraft and terrestrial networks shall be considered a closed user group to the extent that it is a non-public safety service to be accessible only by ATS and AOC users and used strictly for the conveyance of safety information.

Note.— The definition of a closed user group implies that a private numbering plan is also in effect. A telephony numbering plan for the safety service need not conform to that of the international public switched telephone network (PSTN) as defined in CCITT Recommendation E.163.

4.8.7.2 *Safety terrestrial private networks.* The GES shall interwork in tandem with private ground networks that may be implemented by ATS administrations and aircraft operators. These networks shall provide connectivity between the GES facilities and the relevant ATS or aircraft operator facilities and shall interwork with the GES circuit-mode procedures defined herein.

4.8.7.2.1 The application of aeronautical speech circuit switching and signalling interfaces between the GES and an administration or aircraft operator shall be made on the basis of individual agreements.

4.8.7.2.1.1 **Recommendation.—** *Terrestrial networks should provide:*

a) priority access to the ground party without adversely impacting any existing communications by the ground party;

b) automatic call-back in those instances where a call is blocked by an engaged condition at a ground party;

c) the capability of alternate routing, when necessary and feasible;

d) identification of originator of incoming air-originated calls, when feasible; and

e) call forwarding, when necessary and feasible.

Note.— Call forwarding ensures that calls to operating positions which are temporarily not manned will be rerouted automatically to an appropriate operating position.

4.8.7.2.2 The characteristics of the ringing tone, the busy tone and the congestion tone used by the terrestrial network shall conform to ITU CCITT Recommendation E.180.

Note.— Details of ITU CCITT Recommendation E.180 are contained in CCITT Blue Book, Volume II — Fascicle II-2.

4.8.7.3 *Registration of air-originated attempts to a busy ground party.* All call attempts offered to a terrestrial network or a ground destination shall be afforded the priority and pre-emption services defined in 4.8.3.2.

4.8.7.3.1 **Recommendation.—** *If an air-originated call attempt is blocked due to an engaged condition at the ground party, a record of the call attempt should be maintained by the ground user or terrestrial network for a subsequent ground-originated return call to the original aircraft. A GES should not be required to provide specific functions that allow a blocked call attempt to be held in a GES-managed internal queue for later service.*

4.8.8 Telephony numbering plan

4.8.8.1 *General.* A universal telephony numbering plan for AMS(R)S circuit-mode services shall be established so as to facilitate universal interoperability with terrestrial networks.

4.8.8.2 AIRCRAFT NUMBERING

4.8.8.2.1 *Specific requirements.* A fixed address length of 10 address digits shall be allotted to the aircraft numbering plan. All assigned addresses shall be of the same length.

4.8.8.2.2 *Address analysis.* Numbering of individual aircraft destinations shall consist of the AES ID of the aircraft expressed as eight octal digits to which is appended the two-digit decimal ID of the calling or called terminal on the aircraft numbered from 00 to 99 decimal. The first 10 terminal addresses (00-09) shall be reserved for ATS application.

4.8.8.2.2.1 AES circuit-mode services shall maintain a private, 100 entry terminal ID address space specific to all AMS(R)S safety terminals on an aircraft. Use of this address space, as opposed to the parallel address space for non-safety services, shall be inferred by AES circuit-mode services by the associated priority of the call attempt.

4.8.8.2.2.2 **Recommendation.—** *Subsequent mutual agreement by aircraft manufacturers and ATS administrations should provide for the assignment of aircraft terminal ID "00" as the default destination for all ground-originated safety voice calls to an aircraft. Flight deck audio management systems should associate any incoming call directed to this terminal ID with an appropriate available audio channel on the flight deck (e.g. "SATCOM 1" or "SATCOM 2" on a flight deck audio panel). Terminal IDs "05" to "09" should be reserved for the future application of facsimile devices or other types of digital terminals.*

4.8.8.3 TERRESTRIAL NUMBERING

4.8.8.3.1 *Ground destination address.* When there exists a private network specifically intended to support safety circuit mode services, all terrestrial addresses shall be 10 digits in length. In the other cases, the terrestrial addresses for safety calls are of variable length and shall be in accordance with the numbering plan of the network to which the call is directed.

4.8.8.3.1.1 *Address analysis.* When there exists a private network specifically intended to support safety circuit mode services, numbering of individual ground destinations shall consist of the following digit sequence:

a) a digit "8";

b) a three-digit country code signifying the destination State;

c) a three-digit facility code signifying the destination facility within the destination State. The code values to be assigned to individual facilities within a State shall be determined and published by the administration of the destination State; and

d) a three-digit agent code signifying the destination agent within the destination facility. The code values to be assigned to individual agents within a facility shall be determined and published by the organizational entity controlling the facility.

Note 1.— A GES is not required to convert any ground address received during an air-originated AMS(R)S call. The terrestrial network may convert any such address, if necessary, to that which is required for that particular network.

Note 2.— GES operators may convert a ground address to that which is required by a particular terrestrial network upon mutual agreement with that network operator.

Note 3.— Country codes are based on the International Telecommunication Union (ITU) country code shown in Table 1 of Appendix 43 of the ITU Radio Regulations. However, only one code per country should be used in the AMS(R)S service for safety and regulatory communications.

4.8.8.3.2 *Network ID.* Network ID "10" shall be used in all air-originated safety calls which are to be routed to a private network specifically intended to support safety circuit mode services.

Note.— Additional network IDs may be used for safety communications upon prior arrangement between GES operators and the affected ATS administrations and aircraft operators.

4.9 AIRCRAFT EARTH STATION (AES) MANAGEMENT

4.9.1 General

AES management functions shall include the functions performed in the AES to initiate and carry out a log-on process, to maintain a logged-on status, to initiate and carry out a log-off process, and to manage the data and voice communications with a GES.

4.9.2 AES management interfaces

4.9.2.1 The AES management shall provide for interfaces to the following AES entities:

a) subnetwork layer;

b) link layer;

c) physical layer;

d) circuit-mode services.

4.9.2.1.1 *SUBNETWORK LAYER*

The information exchanged between the AES management and the subnetwork layer shall include the following to the subnetwork layer:

1) log-on status: logged on initial or renewal/logged off;

2) log-on GES ID (if logged on);

3) AES ID.

4.9.2.1.2 *LINK LAYER*

The information exchanged between the AES management and the link layer shall be in the form of the link interface data units (LIDUs) described in 4.5.2. All LIDUs exchanged across this interface shall be as specified in Table 4-44 except that the information sent to the AES management shall also include interface control information commanding the AES management to randomly select an R channel frequency.

Note.— The link layer assembles SUs in accordance with the information in the received LIDUs. LIDU formats are not prescribed. SU formats are given in Appendix 2 to Chapter 4.

4.9.2.1.3 *PHYSICAL LAYER*

The information exchanged between the AES management and the physical layer shall include the following:

a) to the physical layer:

1) frequencies for the transmit and receive channel units;

2) channel unit mode selection (R, T or C channel);

3) channel rates;

4) transmitter power settings;

5) channel unit number;

b) from the physical layer:

1) P channel loss/degradation indication;

2) P channel synchronization indication;

3) estimated bit error rate on each channel unit receiving a C channel.

4.9.2.1.4 *CIRCUIT-MODE SERVICES*

The information exchanged between the AES management and the circuit-mode services shall include the following:

a) to circuit-mode services:

1) log-on status, (i.e. logged on/logged off);

2) log-on GES ID;

3) channel unit number in response to each request for a channel unit assignment;

b) from circuit-mode services:

1) request for assignment of a transmit channel unit and associated Q number, application reference number, frequency, channel rate and initial EIRP;

2) request for assignment of a receive channel unit and associated Q number, application reference number, frequency and channel rate;

3) command to randomly select an R channel frequency.

4.9.3 AES management functions

4.9.3.1 AES management shall carry out the following functions:

a) AES table management;

b) AES log-status management;

c) AES channel management.

4.9.3.2 AES TABLE MANAGEMENT

4.9.3.2.1 AES management shall maintain the following two tables:

a) system table;

b) log-on confirm table.

4.9.3.2.2 *SYSTEM TABLE*

The content of this table for each beam in a satellite service area shall be as provided by the GES (see 4.10.4.2.2).

4.9.3.2.3 *AES SYSTEM TABLE UPDATE*

For updating the contents of the system tables, the AES management shall use the following procedures:

a) *Prior to log-on.* Once the AES management receives a broadcast sequence on a satellite/beam-identifying P_{smc} channel frequency, it shall determine whether the received sequence is a partial sequence or a complete sequence (see 4.10.4.5.2) and then do the following:

1) if it is a partial sequence, the AES management shall compare the revision number specified in the received partial sequence with the revision number of the corresponding current data segment in the system table. If the received revision number is one higher

than the current number, the AES shall update its system table according to the received sequence. If the received revision number differs from the current number by more than one, the AES management shall wait for the following complete sequence and update its system table accordingly.

2) if the received sequence is a complete sequence, the AES shall update its system table accordingly.

b) *After log-on.* When the AES management receives a partial sequence from the log-on GES, it shall update its system table accordingly.

4.9.3.2.4 *LOG-ON CONFIRM TABLE*

This table shall include the following:

a) satellite ID;

b) beam ID;

c) log-on GES ID;

d) initial EIRP for R channels;

e) P_d channel frequency and channel rate;

f) R_d channel frequencies and channel rate;

g) T channel frequencies and channel rate;

h) number of C channels supportable by the AES simultaneously (including a C channel that utilizes a transmitter that is shared by the C, R and T channels for Level 3 AES).

4.9.3.2.5 *LOG-ON CONFIRM TABLE UPDATE*

The content of the log-on confirm table, except for item h), shall be updated whenever the AES management logs on, renews its log-on or completes a data channel reassignment procedure with the GES (4.9.3.3.4.2 f)).

4.9.3.3 AES LOG-STATUS MANAGEMENT

4.9.3.3.1 Before an AES begins providing user communication services, the AES management shall successfully complete the log-on procedure, given in 4.9.3.3.4, with a selected GES. Prior to initiating the log-on procedure, the AES management shall select a suitable satellite, beam and GES combination as specified in 4.9.3.3.2.

4.9.3.3.2 *SATELLITE, BEAM AND GES SELECTIONS*

The satellite, beam and GES selections shall be made such that the AES is capable of receiving an adequate signal level on a P_{smc} channel of the selected GES. The adequacy of the signal level shall be based on receiving a P channel synchronization indication (4.9.2.1.3 b)) from the physical layer. The information used to make these selections shall be as specified in the most current version of the system table. The currency of the system table shall be determined by comparing the revision number (Appendix 3 to Chapter 4, Item 49) of the system table currently held at the AES with the revision number of the system table broadcast received on the satellite/beam-identifying P_{smc} channel. If necessary, the system table shall be updated in accordance with 4.9.3.2.3.

4.9.3.3.3 *LOG-ON PROCEDURE*

4.9.3.3.3.1 Initiation of a log-on procedure with the selected GES shall be either automatic or in response to a received command. The AES management shall initiate the log-on procedure immediately following the selection of a log-on GES. When the AES is able to receive a satellite-identifying P_{smc} channel, and does not have an equipment fault, it shall always be logged on to a selected GES during those periods when AMS(R)S operation is intended.

4.9.3.3.3.2 To log on to the selected GES, the AES management shall transmit a log-on request LIDU to the GES on an R_{smc} channel frequency randomly selected from the GES R_{smc} channel frequencies given in the system table. The AES management shall then do the following:

a) If tA11 seconds (Appendix 4 to Chapter 4) elapses without receiving a response from the GES as specified in b) to e) below, the AES management shall command the selection of an R_{smc} channel frequency and then retransmit the log-on request LIDU to the selected GES. The AES management shall command the selection of an R_{smc} channel frequency and then retransmit the log-on request LIDU every tA11 seconds until a response is received, except that the number of transmissions of the log-on request LIDU shall not exceed 5. If, after the fifth transmission, a response is not received within tA11 seconds, the AES management shall abort the log-on procedure to the current selected GES, select a GES according to 4.9.3.3.2 and then shall log-on to the selected GES in accordance with 4.9.3.3.3.

b) If within tA11 seconds the AES management receives a log-on confirm LIDU, and the channel control LIDUs (P/ R and T channel control LIDUs) indicated in the log-on confirm LIDU, the AES management shall command the selection of an R_d channel frequency and then shall transmit a log-on acknowledgement LIDU indicating the correct receipt of all expected LIDUs to the GES. If, after tA12 seconds from sending a log-on acknowledgement LIDU, the AES management does not receive a log-on acknowledgement LIDU from the GES on the assigned P_d channel, it shall command the selection of an R_d channel frequency and then shall retransmit the log-on acknowledgement LIDU. The AES management shall command the selection of an R_d channel frequency and then shall retransmit the same LIDU every tA12 seconds until a log-on acknowledgement LIDU is received from the GES, except that the total number of transmissions of the log-on acknowledgement LIDU shall not exceed four. If, after tA12 seconds from the fourth transmission, a log-on acknowledgement LIDU is not yet received from the GES, the AES management shall abort the log-on procedure to the current selected GES, select a GES according to 4.9.3.3.2 and then shall log-on to the selected GES in accordance with 4.9.3.3.3; otherwise, when a log-on acknowledgement LIDU is received, the AES shall be considered logged on. The AES management shall then relay this information on the various interfaces, where applicable, and update its log-on confirm table.

c) If some, but not all, of the expected LIDUs are received within tA11 seconds, the AES management shall transmit a log-on acknowledgement LIDU to the GES indicating the missing LIDUs. If, after tA11 seconds from the time the AES log-on acknowledgement LIDU was transmitted, the AES management still has not received all expected LIDUs, it shall command the selection of an R_{smc} channel frequency and then retransmit another log-on acknowledgement LIDU indicating all missing LIDUs to the same GES. The AES management shall command the selection of an R_{smc} channel frequency and then shall repeat the transmission of a log-on acknowledgement LIDU, indicating all missing LIDUs, every tA11 seconds until all expected LIDUs are received, except that the total number of transmitted log-on request LIDUs (in a) above) and log-on acknowledgement LIDUs shall not exceed five. If, after tA11 seconds from the fifth transmission, all expected LIDUs have not been received, the AES management shall abort the log-on procedure to the current selected GES, select a GES according to 4.9.3.3.2 and then shall log-on to the selected GES in accordance with 4.9.3.3.3. If, and when, within the required time the AES management receives all the expected LIDUs, it shall transmit a log-on acknowledgement LIDU indicating no errors to the GES and shall then proceed as given in b).

d) If a log-on reject LIDU is received, the AES management shall respond according to the rejection reason (Appendix 3 to Chapter 4, item 44) indicated in the LIDU.

e) If a log-off request LIDU is received from the GES, the AES management shall consider the AES logged off and immediately inhibit its transmissions on the R and T channels to the GES. The GES shall be considered as "temporarily unavailable" (see Appendix 3 to Chapter 4, Item 44).

f) If a selective release broadcast LIDU is received from the GES, the AES shall immediately inhibit any transmission on the frequency specified in the LIDU.

4.9.3.3.3.2.1 If during the log-on procedure the AES management receives a P channel loss/degradation indication (defined in Appendix 1 to Chapter 4), it shall abort the log-on procedure to the current selected GES, select a GES according to 4.9.3.3.2 and log on to the selected GES in accordance with 4.9.3.3.3.

4.9.3.3.4 *PROCEDURES AFTER LOG-ON*

4.9.3.3.4.1 The AES management shall attempt to log-off before terminating communication with the log-on GES.

Note.— Loss or degradation of the P channel precludes any log-off attempt (4.9.3.3.4.4 refers).

4.9.3.3.4.2 The AES management shall respond to the LIDUs received from its log-on GES as follows:

a) *partial sequence of system table broadcast LIDUs:* the AES management shall update its system table as indicated in 4.9.3.2.3;

b) *log-on prompt LIDU:* the AES management shall initiate the log-on procedure (4.9.3.3.3) with the selected GES being the one specified in the log-on prompt LIDU;

c) *log-on interrogation LIDU:* if the AES management has indicated the capability of responding to a log-on interrogation LIDU (by setting LOV = 0 in the log-on request LIDU, Table 4-44), it shall respond by sending a log-on acknowledgement LIDU to the GES;

d) *selective release broadcast LIDU:* the AES management shall immediately inhibit any transmission on the frequency specified in the LIDU.

Note.— A selective release broadcast LIDU may be sent by a GES to its logged-on AESs at any time.

e) *GES channel status report LIDU:* the AES management shall respond by sending an AES channel report LIDU corresponding to the C channel indicated in the received LIDU. Any transmit channel EIRP adjustment indicated in the received LIDU shall be made in accordance with 4.9.3.4.1.3.2.

f) *log control/data channel reassignment LIDU:* the AES management shall respond with a log control/ready for reassignment LIDU, then shall do the following:

1) if within tA11 seconds (Appendix 4 to Chapter 4) the AES management does not receive all of the expected LIDUs (a log-on confirm LIDU and, either a P/R channel control LIDU or a T channel control LIDU or both), the AES management shall send a log control/reassignment reject LIDU to the GES;

2) if all the expected LIDUs are received, the AES management shall command the selection of an R_d channel frequency and then shall send a log-on acknowledgement LIDU to the GES. If the AES management does not receive a return log-on acknowledgement LIDU from the GES within tA12 (Appendix 4 to Chapter 4) seconds from the time the log-on acknowledgement LIDU was sent to the GES, it shall command the selection of an R_d channel frequency and then shall retransmit the same LIDU. The AES management shall command the selection of an R_d channel frequency and then shall repeat the retransmission of the same LIDU every tA12 seconds until a log-on acknowledgement is received from the GES, except that the number of transmissions of the log-on acknowledgement LIDU shall not exceed four. If, after the fourth transmission, a log-on acknowledgement LIDU is not received from the GES within tA12 seconds, the AES management shall initiate the log-on procedure (4.9.3.3.3) with the current log-on GES if an adequate signal level is received on the log-on GES P_{smc} channel; otherwise, with a different GES selected according to the GES selection procedure (4.9.3.3.2). If a log-on acknowledgement LIDU is received from the GES, the AES management shall update its log-on confirm table.

g) *log-off request LIDU:* the AES management shall consider the AES logged-off and immediately inhibit its transmissions on the R and T channels to the GES. The GES shall be considered as "temporarily unavailable" (see Appendix 3 to Chapter 4, Item 44).

4.9.3.3.4.2.1 **Recommendation.—** *Upon receipt of a universal time broadcast LIDU from the GES, the AES management should make the time information in the LIDU available to the appropriate application processes within the aircraft. The time information in the LIDU should be considered correct at the instant of reception of the first bit of the next P channel superframe (4.4.2).*

4.9.3.3.4.3 The AES management shall respond to received commands as follows:

a) *log-off command:* the AES management shall transmit a log-off request LIDU to the GES, relay the log-off status on the AES management interfaces as specified in 4.9.2, and then do the following:

1) if a log-off acknowledgement LIDU from the GES is not received within tA10 seconds (Appendix 4 to Chapter 4) from the time the log-off request LIDU was transmitted, the AES management shall retransmit another log-off request LIDU. The AES management shall retransmit the same LIDU every tA10 seconds until a log-off acknowledgement LIDU from the GES is received, except that the number of transmissions of the log-off request LIDU shall not exceed five. If, within tA10 seconds from the time of the fifth transmission, a log-off acknowledgement LIDU is not received, the AES management shall consider the AES logged off;

2) when a log-off acknowledgement LIDU is received from the log-on GES, the AES management shall consider the AES logged off;

b) *GES-to-GES handover command:* the AES management shall log on to the specified GES within the same satellite service area as the current log-on GES using the procedure in 4.9.3.3.3. However, for a Level-3 AES, if the AES transmit channel unit is being used for a circuit-mode call, the AES management shall initiate the log-on procedure after the circuit-mode call is terminated;

c) *satellite-to-satellite handover command:* the AES management shall first maintain all previously established circuit-mode calls for three minutes or until all calls are cleared, whichever comes first. After three minutes, the AES management shall clear any remaining circuit-mode calls. After all calls are cleared, the AES management shall select a suitable beam in the service area of the specified satellite. If a suitable beam cannot be found, the AES management shall select a different satellite and a beam within its service area according to 4.9.3.3.2. The AES management shall then select, according to 4.9.3.3.2, a GES that supports the selected beam and shall automatically log on to the selected GES using the procedure in 4.9.3.3.3.

4.9.3.3.4.4 The AES management shall respond to the indications relayed to it via the AES physical layer interface as follows:

P_d channel loss/degradation indication: the AES management shall either attempt to (1) reacquire an adequate signal level on the same P_d channel and resume normal operation, or (2) renew its log-on to the same GES by re-initiating the log-on procedure to the same GES, or (3) re-initiate the satellite, beam and GES selection and the log-on process as specified in 4.9.3.3.2 and 4.9.3.3.3 respectively. All R and T channel transmissions shall be inhibited if there is a loss or degradation of the P_d channel. C channel transmissions for an existing circuit-mode call shall be allowed to continue provided the bit error rate of received C channel transmissions does not exceed its nominal value for any subsequent period of more than 40 seconds.

4.9.3.4 AES CHANNEL MANAGEMENT

4.9.3.4.1 *CHANNEL UNIT CONTROL*

4.9.3.4.1.1 The AES management shall control all of the AES transmit and receive channel units via the interface with the AES physical layer.

4.9.3.4.1.2 *Channel unit frequency and channel rate control.* The AES management shall control the frequencies and channel rate settings of all the AES receive and transmit channel units. The frequencies and the channel rates for the P_{smc} and R_{smc} channels shall be as provided in the system table. The frequencies and channel rates for the P_d, R_d and T channels shall be as instructed by the GES in the log-on confirm LIDU and the P/R channel control and the T channel control LIDUs. When the AES management receives from the circuit-mode services a request for assignment of transmit and receive channel units with certain settings of frequencies and channel rates, it shall accomplish these assignments and settings by communication with the physical layer and shall relay these assignments and settings back to the circuit-mode services. However, the AES management shall ensure that no assigned frequencies are used for transmission that could generate intermodulation products that produce harmful interference to on-aircraft satellite navigation receiver operation and shall pre-empt a lower priority call if necessary.

4.9.3.4.1.2.1 The AES management shall carry out the randomized selection of R channel frequencies in response to commands generated by protocols in the link layer, circuit-mode services and the AES management itself. Every selection shall persist until another such random selection is made.

4.9.3.4.1.3 *Channel unit power control.* The AES management shall control the EIRP settings of each of the AES transmit channels via the AES management-physical layer interface.

4.9.3.4.1.3.1 The AES management shall use the EIRP setting in 4.2.3.5.5 for transmission of the log-on request LIDU on the R_{smc} channel. Thereafter, the AES management shall set the EIRP on the R_d channel to the initial EIRP setting value communicated to it by the GES, either via the log-on confirm LIDU, or via the data EIRP broadcast LIDUs. If the initial EIRP is obtained from the log-on confirm LIDU, the T channel initial EIRP setting shall be computed according to the ratio of R_d channel and T channel channel rates and the assigned R_d channel initial EIRP.

Note.— The log-on GES is responsible for determining the amount of the adjustments of the values of the EIRP settings for the R_d and T channels.

4.9.3.4.1.3.2 For a C channel, the AES management shall relay from the circuit-mode services to the physical layer the initial EIRP setting of the transmit channel unit. Subsequent adjustments to the EIRP setting shall be made according to the EIRP adjustment values received from the GES in the GES channel status report LIDUs.

Note.— All decisions about the power control and the adjustments required for a C channel are made at the GES through which the call is established and relayed to the AES circuit-mode services on the C channel sub-band.

4.9.3.4.1.4 *Level-3 AES channel unit switching.* In the case of a level-3 AES, the single transmit channel unit shall be shared between the R/T channel mode and the C channel mode of transmission.

4.9.3.4.1.4.1 The transmit channel unit shall be switched to the R/T channel mode whenever not doing so would inhibit the transmission of:

a) any packet-mode data SU with precedence higher than the precedence of the circuit-mode call-in-progress; or

b) any link layer signalling SU associated with packet-mode data SUs of a precedence higher than the precedence of the circuit-mode call-in-progress; or

c) any call setup signalling SU associated with a circuit-mode call of a precedence higher than the precedence of the circuit-mode call-in-progress.

4.9.3.4.1.4.2 The transmit channel unit shall be switched to the C channel mode whenever not doing so would inhibit the establishment or the continuation of a circuit-mode call having a precedence higher than the precedences of all packet-mode data SUs in the link layer and the precedences of the packet-mode data SUs associated with all signalling SUs in the link layer.

4.10 GROUND EARTH STATION (GES) MANAGEMENT

4.10.1 General

Note.— This section defines the management functions required at the GES to initiate and execute the log-on process and to manage the data and voice communications between the AES and the GES.

4.10.1.1 The GES shall perform the set of functions described in this section in order to establish and maintain communications channels with its logged-on AESs and shall share the information about the status of each of its logged-on AESs with all the other GESs supporting AMS(R)S services through the same satellite.

4.10.2 GES management architecture

4.10.2.1 GROUND-TO-AIR

Anywhere within a satellite service area, an AES shall have at least one unique P_{smc} channel available at 600 bits/s for identification of the satellite and the beam supporting the P_{smc} channel.

4.10.2.2 GROUND-TO-GROUND

There shall be communication between the GESs in the same satellite service area to exchange information as required for carrying out the GES management functions specified in 4.10.4.

4.10.3 GES management interfaces

4.10.3.1 The GES management shall interface with the subnetwork layer, circuit-mode services, link layer and physical layer in order to exchange control information required for GES table management, log status management and channel management.

4.10.3.2 SUBNETWORK LAYER

The following control information shall be exchanged between the GES management and the subnetwork layer in the GES:

a) to subnetwork layer:

1) log status information:

i) logged-on/logged-off;

ii) AES ID;

iii) GES ID;

2) minimum channel rate of T channel;

3) channel rate of P_d and R_d channels.

4.10.3.3 CIRCUIT-MODE SERVICES

The following control information shall be exchanged between the GES management and the circuit-mode services in the GES:

a) to circuit-mode services:

1) log status information:

i) logged-on/logged-off;

ii) AES ID;

iii) GES ID;

2) EIRP value;

3) frequency assigned (Q number, application reference number);

4) voice channel characteristics;

5) channel unit assigned (Q number, application reference number);

6) channel unit pre-empted (Q number, application reference number);

b) from circuit-mode services:

1) voice channel characteristics;

2) request for frequency (Q number, application reference number);

3) request for channel unit (Q number, application reference number).

4.10.3.4 LINK LAYER

4.10.3.4.1 The control information exchanged between the GES management and the link layer in the GES shall be as in Table 4-45.

4.10.3.4.2 The information shall be exchanged in the form of link interface data units (LIDUs). The LIDU shall contain link interface control information (LICI) only.

Note.— Each LIDU received from the GES management is mapped into a corresponding SU set in the link layer according to 4.5.3.2.3.

4.10.3.5 PHYSICAL LAYER

The following control information shall be exchanged between the GES management and the physical layer in the GES:

a) to physical layer (for each channel):

1) frequency;

2) channel rate setting (if selectable);

3) power setting;

4) mode (T, or R, or C, if selectable);

5) channel unit number;

b) from physical layer (for each channel):

1) estimated C channel bit error rate;

2) channel unit number;

3) mode.

4.10.4 GES management functions

4.10.4.1 The GES management shall carry out the following functions:

a) GES table management;

b) GES log status management;

c) GES channel management;

d) GES system broadcast.

4.10.4.2 GES TABLE MANAGEMENT

4.10.4.2.1 The GES management shall maintain the following tables:

a) AES system table;

b) AES log-on status table.

4.10.4.2.2 *AES SYSTEM TABLE*

4.10.4.2.2.1 The AES system table for a satellite service area shall include initial search data (search frequencies for satellite and beam identification) and regional data (information about each GES in the satellite service area).

4.10.4.2.2.2 Each GES in a satellite service area shall broadcast both the initial search data and regional data. The initial search data shall consist of the information specified in 4.10.4.2.2.3 for each satellite service area of all the satellite systems providing AMS(R)S services in accordance with SARPs for near geosynchronous satellites. The regional data shall consist of the information specified in 4.10.4.2.2.4 for that satellite service area. The initial search data shall be exchanged in a timely manner among all AMS(R)S providers and shall be broadcast as common initial search data.

4.10.4.2.2.3 The initial search data for a satellite service area shall include the following satellite/beam identifying information for each beam that supports a satellite/beam-identifying P_{smc} channel in the satellite service area:

a) primary satellite/beam-identifying P_{smc} channel frequency at 600 bits/s;

b) secondary satellite/beam-identifying P_{smc} channel frequency at 600 bits/s;

c) satellite ID;

d) satellite location, orbit inclination and right ascension epoch;

e) beam ID (for spot-beam-only satellites).

4.10.4.2.2.4 The regional data for a satellite service area shall include the following information:

a) system table revision number;

b) satellite ID;

c) for a satellite with a global beam, for each GES supporting the global beam:

1) GES ID;

2) P_{smc} channel and R_{smc} channel frequencies; and

3) P_{smc} channel and R_{smc} channel rates;

d) for a satellite with spot beams only:

1) beam ID (same as in e) of initial search);

2) GES spot beam support table indicating in which spot beam the GES radiates; and

3) for each GES supporting a spot beam:

i) GES ID;

ii) P_{smc} channel and R_{smc} channel frequencies; and

iii) P_{smc} channel and R_{smc} channel rates.

4.10.4.2.3 *AES LOG-ON STATUS TABLE*

4.10.4.2.3.1 Each GES shall maintain an AES log-on status table, which shall include the information specified in 4.10.4.2.3.2 and 4.10.4.2.3.3.

4.10.4.2.3.2 The GES shall include in its AES log-on status table, for every AES logged-on to it or to any other GES in the same satellite service area, the following information:

a) AES ID;

b) satellite ID;

c) beam ID;

d) log-on GES ID.

4.10.4.2.3.3 For each AES logged-on to the GES, the AES log-on status table at the GES shall contain the following information in addition to the information specified in 4.10.4.2.3.2:

a) P channel frequency assigned to the AES;

b) R channel frequencies assigned to the AES;

c) T channel frequencies assigned to the AES;

d) channel rate capabilities of P, R, T and C channels;

e) AES activity indicator (active or inactive).

4.10.4.2.3.4 *AES log-on status table update*

The GES shall update the AES log-on status table when an AES logs on (initial or renewal) or logs off from this GES or when the GES receives log-on or log-off information corresponding to an AES from another GES.

4.10.4.3 GES LOG STATUS MANAGEMENT

4.10.4.3.1 The GES log status management function shall manage the AES log-on/log-off, verify the activity of each of its log-on AESs, renew the log-on (when required), and reassign data channels to the AESs (when required).

4.10.4.3.2 *LOG-ON*

Note.— The AES initiates a log-on by sending a log-on request LIDU to the GES (4.9.3.3.3) after the AES has selected a satellite, a beam and a GES.

4.10.4.3.2.1 To reject the log-on request of an AES, the GES management shall reply to the log-on request LIDU by sending a log-on reject LIDU to the AES indicating the reason for rejection.

4.10.4.3.2.1 *bis* The "Reason" code "AES not authorized" (see Appendix 3 to Chapter 4, Item 44) shall be sent (in response to a log-on request LIDU) only to an AES which has not been authorized to use the satellite system.

Note.— The "Q number of the application" parameter in the log-on request LIDU will indicate whether the aircraft is in distress or not. The "Q number of application" parameter will be set to 15 for an aircraft in distress.

4.10.4.3.2.2 To accept the log-on request of an AES, the GES management shall reply to the log-on request LIDU by sending a log-on confirm LIDU followed by a P/R channel control LIDU and a T channel control LIDU to the AES, as required to assign new P_d, R_d and T channels to the AES.

4.10.4.3.2.3 After transmitting the log-on confirm LIDU followed by the channel control LIDUs (P/R and T channel control LIDUs) as indicated in the log-on confirm LIDU to the AES or after transmitting the missing LIDUs identified in the log-on acknowledgement LIDU received from the AES, the GES management shall do the following:

a) If no response is received from the AES within tG26 seconds (Appendix 4 to Chapter 4) from the time the log-on confirm LIDU followed by channel control LIDUs were sent or the missing LIDUs indicated in the log-on acknowledgement LIDU received from the AES were retransmitted, the GES management shall send another log-on confirm LIDU followed by the required channel control LIDUs to the AES. The GES management shall send the log-on confirm LIDU followed by channel control LIDUs to the AES every tG26 seconds until a response is received or the number of times the log-on confirm LIDU followed by channel control LIDUs have been sent equals four. If no response is received within tG26 seconds from the time the fourth log-on confirm LIDU followed by the channel control LIDUs were sent, the GES management shall delete the requesting AES from its AES log-on status table and then transmit log-off information to other GESs in the same satellite service area if the AES is identified as logged on to this GES in the AES log-on status table.

b) If a log-on acknowledgement LIDU indicating no error is received from the AES, the GES management shall send a log-on acknowledgement LIDU to the AES on the newly assigned P_d channel. Thereafter, the GES management shall, each time another log-on acknowledgement LIDU is received from the AES within tG27 seconds (Appendix 4 to Chapter 4) from the time the last log-on acknowledgement LIDU was sent to the AES, send another log-on acknowledgement LIDU to the AES. The GES management shall repeat the above procedure until one of the following occurs:

   1) no log-on acknowledgement LIDU is received from the AES within tG27 seconds from the time the last log-on acknowledgement LIDU was sent to the AES; or

   2) an R channel SU that is not a log-on request LIDU or a log-on acknowledgement LIDU is received from the AES, after which, the GES management shall update its AES log-on status table as specified in 4.10.4.2.3, and send log-on information to the other GESs in the same satellite service area.

c) If a log-on acknowledgement LIDU identifying the missing LIDUs is received from the AES, the GES management shall retransmit the missing LIDUs to the AES and shall proceed as in 4.10.4.3.2.3.

4.10.4.3.2.4 If another log-on request LIDU is received from the AES before the GES management has finished responding to the previously received log-on request LIDU, the GES management shall discard the last received log-on request LIDU.

4.10.4.3.3 *LOG-OFF*

Note.— An AES log-off may be initiated by the AES by sending a log-off request LIDU to the GES or by the GES by sending a log-off request LIDU to the AES. The GES initiated log-off is intended to provide the GES with the capability to shut down undesired AES transmissions.

4.10.4.3.3.1 Upon receipt of a log-off request LIDU from an AES, the GES management shall do the following:

a) if the AES is identified as logged on to this GES in the AES log-on status table, delete the AES from its AES log-on status table, transmit log-off information to other GESs in the same satellite service area and then transmit log-off acknowledgement LIDU to the AES; or

b) if the AES is not identified as logged-on to this GES in the AES log-on status table but is in the process of logging on, transmit log-off acknowledgement LIDU to the AES.

4.10.4.3.3.2 After sending a log-off request LIDU to an AES, the GES management shall consider the AES as logged off.

4.10.4.3.4 *LOG-ON VERIFICATION*

Note.— The AES log-on status table in the GES management contains an activity indicator for each AES logged on to the GES. The activity indicator for the AES is set to "active" whenever any data/signalling is received from the AES. The activity indicator is set to "inactive" if no data or signalling is received from the AES within tG6 seconds (Appendix 4 to Chapter 4) from the time the activity indicator was last set to "active".

4.10.4.3.4.1 The GES management shall verify the AES activity status by either of the following two methods:

a) direct verification; or

b) indirect verification.

Note.— The log-on verification of the AES is the responsibility of its log-on GES only.

4.10.4.3.4.2 *Direct verification*

If no data/signalling is received at the log-on GES or at another GES in the same satellite service area as the log-on GES from an AES capable of responding to log-on interrogation LIDU within tG6 seconds (Appendix 4 to Chapter 4) from the time the activity indicator for the AES was last set to inactive, the GES management shall send a log-on interrogation LIDU to the AES. The GES management shall then do the following:

a) If no log-on acknowledgement LIDU is received from the AES within tG8 seconds (Appendix 4 to Chapter 4) from the time the log-on interrogation LIDU was sent, the GES management shall send another log-on interrogation LIDU to the AES. The GES management shall retransmit the log-on interrogation LIDU to the AES every tG8 seconds until a log-on acknowledgement LIDU is received or the total number of times the log-on interrogation LIDU has been sent equals five. When tG8 seconds has elapsed after the transmission of the fifth log-on interrogation LIDU without receiving a log-on acknowledgement LIDU from the AES, the GES management shall delete the AES from its AES log-on status table and shall send log-off information to the other GESs in the same satellite service area.

b) If a log-on acknowledgement LIDU is received from the AES, the GES management shall set the activity indicator for the AES in the AES log-on status table to "active".

4.10.4.3.4.3 *Indirect verification*

The AES shall remain inactive for twelve hours before the GES management considers it logged off.

4.10.4.3.5 *LOG-ON PROMPT*

Upon receipt of an R channel SU (ISU or a C channel access request SU) by the GES link layer from an AES which is not in its AES log-on status table, the GES management shall send a log-on prompt LIDU to the AES.

4.10.4.3.6 *CHANNEL REASSIGNMENT*

4.10.4.3.6.1 The GES management shall have the capability to reassign the data channels to a logged-on AES.

4.10.4.3.6.2 Upon receipt of a data channel reassignment request, the GES management shall forward a log control/data channel reassignment LIDU to the AES. The GES management shall then do the following:

a) If no response is received from the AES within tG31 seconds (Appendix 4 to Chapter 4) from the time the log control/data channel reassignment LIDU was sent to the AES, the GES management shall send another log control/data channel reassignment LIDU to the AES. If no response is received again within the tG31 seconds, the GES management shall abort the data channel reassignment procedure.

b) If data channel reassignment reject LIDU is received from the AES, the GES management shall abort the data channel reassignment procedure.

c) If a log control/ready for assignment LIDU is received from the AES, the GES management shall transmit a log-on confirm LIDU followed by a P/R channel control LIDU and a T channel control LIDU, as required, containing the reassigned channel information to the AES. The GES management shall then do the following:

1) If no response is received from the AES within tG32 seconds (Appendix 4 to Chapter 4) from the time the log-on confirm LIDU followed by the channel control LIDUs were sent, the GES management shall send another log-on confirm LIDU on the previous P_d channel followed by a P/R channel control and T channel control LIDUs as appropriate. If no response is received again within tG32 seconds, the GES management shall abort the data channel reassignment procedure.

2) If a log-on acknowledgement LIDU indicating no error is received from the AES on the newly assigned R_d channel, the GES management shall send a log-on acknowledgement LIDU to the AES on the newly assigned P_d channel. The GES management shall, if another log-on acknowledgement LIDU is received within tG33 seconds (Appendix 4 to Chapter 4) from the time the last log-on acknowledgement LIDU was sent, send another log-on acknowledgement LIDU to the AES on the new P_d channel. The GES management shall repeat the above procedure until no response has been received from the AES within tG33 seconds from the time the last log-on acknowledgement was sent by the GES, after which the GES management shall update the AES log-on status table with the new channel frequencies assigned to the AES.

3) If a data channel reassignment reject LIDU is received from the AES, the GES management shall abort the data channel reassignment procedure.

4.10.4.4 GES CHANNEL MANAGEMENT

4.10.4.4.1 The GES channel management shall control the AES/GES channel configuration, channel power and channel frequency.

4.10.4.4.2 *CHANNEL CONFIGURATION MANAGEMENT*

4.10.4.4.2.1 *GES channel configuration for management communication*

For each GES, the following channels shall be provided for system management communications:

a) at least one transmit P_{smc} channel, and

b) at least four receive R_{smc} channels.

4.10.4.4.2.2 *AES channel configuration assignment and adjustment*

4.10.4.4.2.2.1 During log-on, the GES management shall assign a P_d channel to an AES in a manner which ensures that the performance requirements in 4.7 and 4.8 are met.

4.10.4.4.2.2.2 During log-on, the GES management shall assign a group of R channels and one or more T channels to an AES, in a manner which ensures that the performance requirements in 4.7 and 4.8 are met.

4.10.4.4.2.2.3 For the C channel(s), the GES management shall assign C channel(s) on a per-call basis.

4.10.4.4.2.2.4 After log-on, the GES management shall adjust an AES channel configuration, if required, by initiating channel reassignment as described in 4.10.4.3.6.

4.10.4.4.2.2.5 The GES or its system management shall ensure that no frequencies are assigned to an AES that could generate intermodulation products that produce harmful interference to on-aircraft satellite navigation receiver operations.

4.10.4.4.3 *CHANNEL POWER MANAGEMENT*

4.10.4.4.3.1 *AES power setting*

Note.— Prior to log-on, the AES will use its default power setting to transmit the log-on request LIDU to the GES management.

4.10.4.4.3.1.1 For the R and T channels, during the log-on process the GES management shall assign an initial power setting to the AES as the "initial EIRP" value in the log-on confirm LIDU sent to the AES. The initial EIRP value shall be determined so that the estimated bit error rate at the GES shall not exceed 10^{-5}.

4.10.4.4.3.1.1 *bis.* **Recommendation.—** *For increased power management efficiency, the R and T channel EIRPs should be determined from the data EIRP broadcast LIDUs (Figure A2-61) for both global and spot beam channels. For a global beam channel, the most significant bit of the channel frequency shall be set to "0" (zero). For a spot beam channel, the most significant bit of the channel frequency shall be set to "1" (one).*

Note.— The AES will adjust its channel unit power levels according to the EIRP value received in either the log-on confirm LIDU or the data EIRP broadcast LIDUs.

4.10.4.4.3.1.2 For the C channel, the initial EIRP value shall be assigned by the GES management on a per-call basis and shall be sent to the AES via the circuit-mode services in the C channel assignment LIDU.

4.10.4.4.3.2 *C channel power adjustment*

4.10.4.4.3.2.1 For the to-aircraft C channel, the GES management shall adjust the GES EIRP according to the BER value received from the AES management in the channel status report LIDU. The adjustment EIRP shall be required to maintain a BER of no more than 10^{-3}.

4.10.4.4.3.2.2 For the from-aircraft C channel, the GES management shall determine the AES EIRP adjustment required to maintain a BER of no more than 10^{-3} based on the BER value measured at the GES. The adjustment shall be sent to the AES management in the channel status report LIDU.

4.10.4.4.4 *CHANNEL FREQUENCY MANAGEMENT*

4.10.4.4.4.1 *AES frequency setting*

Note.— Prior to log-on, the AES will use the R_{smc} channel frequency from the system table to send the log-on request LIDU to the GES management.

4.10.4.4.4.1.1 For the P, R and T channels, the GES management shall assign the initial P, R and T channel frequencies to the AES (if the P_d/R_d frequency is different from the P_{smc}/R_{smc} frequencies) by sending P/R channel control LIDU and T channel control LIDU to the AES after the log-on confirm LIDU in response to the received log-on request LIDU.

4.10.4.4.4.1.2 For a C channel, the GES management shall assign the AES C channel transmit/receive frequency by passing the assigned frequencies to the AES in the C channel assignment LIDU transmitted by the circuit-mode services in the GES.

4.10.4.4.4.2 *AES channel frequency reassignment*

4.10.4.4.4.2.1 For the P and R channels, the GES management shall adjust the P/R channel frequencies previously assigned to the AES by initiating channel reassignment procedure as described in 4.10.4.3.6 and sending the newly assigned frequencies in the P/ R channel control LIDUs following the log-on confirm LIDU.

4.10.4.4.4.2.2 For the T channel, the GES management shall adjust the T channel frequencies by initiating channel reassignment procedure and transmitting the T channel control LIDU, following the log-on confirm LIDU, to the AES.

4.10.4.4.5 *CHANNEL INTERFERENCE MANAGEMENT*

The GES management shall maintain one or more reserve frequencies for each GES in each beam it supports to be used as P_{smc} channel and as R_{smc} channel frequencies, in the event of interference to the previously assigned P_{smc} channel and R_{smc} channel frequencies. In the event that changeover is required, the GES management shall update the system table accordingly.

4.10.4.4.6 *PRE-EMPTION MANAGEMENT*

4.10.4.4.6.1 *Voice versus voice pre-emption*

After the circuit-mode services in the GES transmits a C channel assignment LIDU to the AES, the GES management shall immediately make available a channel unit serving the lowest precedence call for the new call, when no channel units are available, and indicate the availability of the channel unit to the circuit-mode services in the GES.

4.10.4.4.6.2 *Data versus voice pre-emption*

The GES shall have the capability to reassign spectrum and power resources from circuit-mode services to packet-mode services in order to meet packet data service requirements.

4.10.4.5 GES SYSTEM BROADCAST

4.10.4.5.1 The GES management shall transmit the system table and time data to the AES in order to maintain the currency of the data and time in the AES.

4.10.4.5.2 *SYSTEM TABLE BROADCAST*

4.10.4.5.2.1 The GES management shall transmit the system table data to the AES by means of one or more of the following broadcast LIDUs:

a) broadcast index;

b) GES P/R channel advice;

c) satellite identification advice;

d) GES beam support advice;

e) data EIRP table broadcast.

4.10.4.5.2.2 The system table data shall be transmitted in the following two forms:

a) partial sequence containing the most recent updates; and

b) complete sequence containing the full initial search and regional data update.

4.10.4.5.2.3 A partial sequence shall comprise one or more broadcast LIDUs described in 4.10.4.5.2.1.

4.10.4.5.2.4 The complete sequence shall include all the broadcast LIDUs in 4.10.4.5.2.1. There shall be a complete sequence for each beam in the satellite service area supporting a satellite/beam-identifying P_{smc} channel.

4.10.4.5.2.5 The partial and complete sequence shall each include one broadcast index LIDU.

Note 1.— The broadcast index LIDU provides an existence flag for each LIDU in the complete sequence.

Note 2.— The GES P_{smc} and R_{smc} channel series of the complete sequence can contain up to 64 LIDUs because of the size of the "initial sequence number" field in the broadcast index LIDU. In case more LIDUs are included in the series, the second series of the GES P_{smc} and R_{smc} channel series is used.

4.10.4.5.2.6 The GES shall transmit the partial sequence on all the P channels it supports. In addition, the GES shall transmit the complete sequence on each satellite/beam-identifying P_{smc} channel it supports. Each GES in a satellite service area shall transmit to each of its logged-on AESs all partial sequences due to any update made by any GES in the satellite service area.

4.10.4.5.2.7 The partial sequence shall be transmitted twice as often as the complete sequence.

4.10.4.5.3 *SELECTIVE RELEASE BROADCAST*

Note.— The selective release broadcast LIDU is used to command all logged-on AESs to cease transmission on specified L-band frequency(ies).

4.10.4.5.3.1 The GES management shall send one or more selective release broadcast LIDUs to the AES upon occurrence of either of the following events:

a) request to release certain channels;

b) for circuit-mode calls, if the in-band channel clearing facilities (such as the channel release signalling facility on the sub-band C channel) are ineffective.

4.10.4.5.4 **Recommendation.—** *The GES management should broadcast the system time to the AES following an AES log-on by transmitting the system time broadcast LIDU on all P channels. The time in the system time broadcast LIDU should be the predicted time of reception at an AES of the first bit of the next superframe of the relevant P channel.*

4.10.5 Satellite system management

At least one satellite/beam-identifying P_{smc} channel shall be active at all times for each beam that supports a satellite/beam-identifying P_{smc} channel.

TABLES FOR CHAPTER 4

Table 4-1. Received phase noise mask

Offset from carrier (Hz)	Phase noise (dBc)
10	–34
100	–65
1 000	–73
3 000	–77
10 000	–79
35 000	–79

1. Phase noise is measured single sideband relative to carrier.
2. The mask shall be defined by drawing straight lines through the above points on a graph which is logarithmic in frequency.

Note.— This mask is illustrated in the guidance material contained in Attachment A to Part I of Annex 10, Volume III.

Table 4-2. P channel acquisition carrier-to-noise levels

Channel rates (bits/s)	C/No (dB-Hz)	Nominal channel spacing (kHz)
600	31.9	5
1 200	35.0	5
2 400	38.0	5
4 800	39.5	5
10 500	42.9	10
10 500	43.3	7.5

Table 4-3. Maximum harmonic, discrete spurious and noise density levels

Frequency (MHz)	EIRP (density)
below 1 525	–135 dBc/4 kHz
1 525 to 1 559	–203 dBc/4 kHz
1 559 to 1 585	–155 dBc/MHz
1 585 to 1 605	–143 dBc/MHz
1 605 to 1 610	–117 dBc/MHz
1 610 to 1 614	–95 dBc/MHz
1 614 to 1 660	–55 dBc/4 kHz[1]
1 660 to 1 670	–55 dBc/20 kHz[1]
1 670 to 1 735	–55 dBc/4 kHz
1 735 to 12 000	–105 dBc/4 kHz
12 000 to 18 000	–70 dBc/4 kHz

1. Within the transmit band, excluding the frequency band within ±35 kHz of the carrier.

Table 4-4. Transmitted phase noise mask

Offset from carrier (Hz)	Phase noise (dBc)
10	–40
100	–67
500	–72
1 100	–80
X	–80

1. Phase noise is measured single sideband relative to carrier.
2. The mask shall be defined by drawing straight lines through the above points on a graph which is logarithmic in frequency.
3. X is equal to 35 kHz or four times the symbol rate, whichever is less.
4. Where discrete spectral components exist, the sum of the discrete phase noise components and continuous spectral component averaged over a bandwidth of ±10 Hz on either side of the discrete component shall not exceed the phase noise mask.

Note.— This mask is illustrated in the guidance material contained in Attachment A to Part I.

Table 4-5. Required spectral limits for AES transmissions

Frequency offset	Attenuation (dB) (relative to maximum envelope level)
±0.75 SR	0
±1.40 SR	20
±2.95 SR	40
35 kHz	40

1. The mask shall be defined by drawing straight lines through the above points.
2. The symbol rate, SR, is equal to the channel rate for A-BPSK and is half the channel rate for A-QPSK.

Table 4-6. Required spectral limits for A-BPSK received by AES

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
–X	–40	—	—
–0.75	–40	—	—
–0.66	–12	—	—
–0.56	–3.5	—	—
–0.4	0.25	–0.1	–3
0.4	0.25	0.1	–3
0.56	–3.5	—	—
0.66	–12	—	—
0.75	–40	—	—
X	–40	—	—

1. The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate, and the amplitude is normalized to 0 dB at a frequency of 0.
2. X is equal to 35 kHz. For larger frequency offsets the spurious requirements of 4.2.3.5.6 apply.

Note.— This mask is illustrated in the guidance material contained in Attachment A to Part I.

Table 4-7. Required spectral limits for A-QPSK received by AES for 100 per cent roll-off

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
–X	–40	—	—
–0.625	–40	—	—
–0.5	–20	—	—
–0.425	–10	—	—
–0.375	–6	—	—
–0.275	–3	—	—
–0.175	–1	—	—
–0.075	0.25	–0.05	–3
0.075	0.25	0.05	–3
0.175	–1	—	—
0.275	–3	—	—
0.375	–6	—	—
0.425	–10	—	—
0.5	–20	—	—
0.625	–40	—	—
X	–40	—	—

1. The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate, and the amplitude is normalized to 0 dB at a frequency of 0.
2. X is 35 kHz. For larger frequency offsets the spurious requirements of 4.2.3.5.6 apply.

Note.— This mask is illustrated in the guidance material contained in Attachment A to Part I.

Table 4-7A. Required spectral limits for A-QPSK received by AES for 60 per cent roll-off

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
–X	–40	–X	—
–0.839	–40	–0.839	—
–0.43	–35	–0.43	—
–0.41	–22	–0.41	—
–0.375	–13	–0.375	–25
–0.357	—	–0.357	–15
–0.34	–8	–0.34	–11
–0.286	–4.4	–0.286	–6.4
–0.232	–1.6	–0.232	–2.6
–0.16	0	–0.16	–1
–0.125	0.25	–0.125	—
–0.107	—	–0.107	–0.25
0.107	—	0.107	–0.25
0.125	0.25	0.125	—
0.16	0	0.16	–1
0.232	–1.6	0.232	–2.6
0.286	–4.4	0.286	–6.4
0.34	–8	0.34	–11
0.357	—	0.357	–15
0.375	–13	0.375	–25
0.41	–22	0.41	—
0.43	–35	0.43	—
0.839	–40	0.839	—
X	–40	X	—

1. The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate, and the amplitude is normalized to 0 dB at a frequency of 0.
2. X is 35 kHz. For larger frequency offsets, the spurious requirements of 4.2.3.5.6 apply.

Note.— This mask is illustrated in the guidance material contained in Attachment A to Part I.

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Table 4-8. Demodulator performance

Channel type	Required BER	E_s/N_0[1] (dB)
P: 0.6, 1.2 and 2.4 kbits/s	10^{-5}	7.3
R,T: 0.6, 1.2 and 2.4 kbits/s	10^{-5}	7.5
P: 4.8 and 10.5 kbits/s	10^{-5}	5.4
R,T: 4.8 and 10.5 kbits/s	10^{-5}	5.7
C: 5.25 kbits/s	10^{-3}	10.8
C: 6.0 kbits/s	10^{-3}	3.9
C: 8.4 kbits/s, 7.5 kHz[2,3]	10^{-3}	7.0
C: 10.5 kbits/s, 10 kHz[2]	10^{-3}	10.8
C: 10.5 kbits/s, 7.5 kHz[2]	10^{-3}	12.7
C: 21.0 kbits/s	10^{-3}	5.4

1. E_s/N_0 is the ratio of the average energy transmitted per channel bit period to the noise power spectral density.
2. Channel spacing.
3. Demodulator performance shall be tested with the local frequency offset of adjacent channels of 1.5 kHz towards the carrier frequency.

Table 4-9. Channel rates

Channel rates (kbits/s)	Applicable channels	
	AES receive	AES transmit
0.6	P	R,T
1.2	P	R,T
2.4	P	R,T
4.8	P	R,T
5.25	C	C
6.0	C	C
8.4	C	C
10.5	P,C	R,T,C
21.0	C	C

Table 4-10. P channel information field components

	Channel rate (kbits/s)				
	0.6	1.2	2.4	4.8	10.5
Number of bits	1152	1152	1152	2304	4992
Number of interleaver blocks	3	2	1	1	1
Number of SUs/interleaver block	2	3	6	12	26

Table 4-11. P channel interleaver structure

	Channel rate (kbits/s) 0.6	1.2	2.4	4.8	10.5
Interleaver columns	6	9	18	36	78

Table 4-12. R and T channel preamble structure

	Channel rate (kbits/s) 0.6	1.2	2.4	10.5
Unmodulated carrier (equivalent bit periods)	150	126	78	248
Modulated bits	74	74	74	256
Total	224	200	152	504

Table 4-13. T channel interleaver structure

	Channel rate (kbits/s) 0.6	1.2	2.4	10.5
Interleaver columns:				
first block	5	5	5	8-95[1]
subsequent blocks	3	3	3	NA

1. The number of interleaver columns is variable from 8 to 95 in steps of 3 and is chosen to match the amount of data.

Table 4-14. C channel preamble structure

	Channel rate (kbits/s) 5.25	6.0	8.4	10.5	21.0
Unmodulated carrier (equivalent bit periods)	80	96	not required	160	336
Modulated bits	128	144	0	256	504
Total	208	240	0	416	840

Table 4-15. SNPDU type identifier encoding

Code	SNPDU TYPE
Bits 654321	(refer to Figures 4-13 through 4-24 SNPDU format)
000000	CONNECTION REQUEST, NO CALLING NSAP ADD., NO CALLED NSAP ADD., NO FACILITY FIELD, NO RESTRICTION ON RESPONSE
000001	CONNECTION REQUEST, NO CALLING NSAP ADD., NO CALLED NSAP ADD., WITH FACILITY FIELD, NO RESTRICTION ON RESPONSE
000010	CONNECTION REQUEST, NO CALLING NSAP ADD., WITH CALLED NSAP ADD., NO FACILITY FIELD, NO RESTRICTION ON RESPONSE
000011	CONNECTION REQUEST, NO CALLING NSAP ADD., WITH CALLED NSAP ADD., WITH FACILITY FIELD, NO RESTRICTION ON RESPONSE
000100	CONNECTION REQUEST, WITH CALLING NSAP ADD., NO CALLED NSAP ADD., NO FACILITY FIELD, NO RESTRICTION ON RESPONSE
000101	CONNECTION REQUEST, WITH CALLING NSAP ADD., NO CALLED NSAP ADD., WITH FACILITY FIELD, NO RESTRICTION ON RESPONSE
000110	CONNECTION REQUEST, WITH CALLING NSAP ADD., WITH CALLED NSAP ADD., NO FACILITY FIELD, NO RESTRICTION ON RESPONSE
000111	CONNECTION REQUEST, WITH CALLING NSAP ADD., WITH CALLED NSAP ADD., WITH FACILITY FIELD, NO RESTRICTION ON RESPONSE
001000	CONNECTION CONFIRM, NO CALLED NSAP ADD., NO FACILITY FIELD
001001	CONNECTION CONFIRM, NO CALLED NSAP ADD., WITH FACILITY FIELD
001010	CONNECTION CONFIRM, WITH CALLED NSAP ADD., NO FACILITY FIELD
001011	CONNECTION CONFIRM, WITH CALLED NSAP ADD., WITH FACILITY FIELD
0011XX	SPARES
010000	CONNECTION RELEASED, NO CALLED NSAP ADD., NO FACILITY FIELD
010010	CONNECTION RELEASED, WITH CALLED NSAP ADD., NO FACILITY FIELD
0100X1	SPARES
0101XX	SPARES
011000	CONNECTION RELEASE COMPLETE
011010	SPARE
0111X0	SPARES
011XX1	SPARES
100000	CONNECTION REQUEST, NO CALLING NSAP ADD., NO CALLED NSAP ADD., NO FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100001	CONNECTION REQUEST, NO CALLING NSAP ADD., NO CALLED NSAP ADD., WITH FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100010	CONNECTION REQUEST, NO CALLING NSAP ADD., WITH CALLED NSAP ADD., NO FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100011	CONNECTION REQUEST, NO CALLING NSAP ADD., WITH CALLED NSAP ADD., WITH FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100100	CONNECTION REQUEST, WITH CALLING NSAP ADD., NO CALLED NSAP ADD., NO FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100101	CONNECTION REQUEST, WITH CALLING NSAP ADD., NO CALLED NSAP ADD., WITH FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100110	CONNECTION REQUEST, WITH CALLING NSAP ADD., WITH CALLED NSAP ADD., NO FACILITY FIELD, WITH RESTRICTION ON RESPONSE
100111	CONNECTION REQUEST, WITH CALLING NSAP ADD., WITH CALLED NSAP ADD., WITH FACILITY FIELD, WITH RESTRICTION ON RESPONSE
101XXX	SPARES
110000	DATA
110001	SPARE
110010	INTERRUPT
110011	RESET
110100	RESERVED
110101	SPARE
11011X	SPARES
111000	RESERVED
111001	FLOW CONTROL
111010	INTERRUPT CONFIRM
111011	RESET CONFIRM
11110X	SPARES
111110	SPARE
111111	RESERVED

Table 4-16. SSNDPX generated cause field coding

Generating condition	Release/reset cause field coding Bits 8765	Bits 4321
SSNDPX originated release (local link error)	1001	0011
SSNDPX originated release (invalid facility request)	1000	0011
SSNDPX originated release (network congestion)	1000	0101
SSNDPX originated reset (local link error)	1000	0101
SSNDPX originated reset (network congestion)	1000	0111

Table 4-17. Diagnostic code field codings (for those originated by the SSND sub-layer)

Generating condition	Diagnostic field coding (decimal)	Applicable SNPDUs
SSNDP operation:		
Disconnection (temporary, e.g. handover)	1110 0001 (225)	Released
Disconnection (permanent, e.g. log off)	1110 0010 (226)	Released
Unable to establish call (temporary)	1110 0011 (227)	Released
Unable to establish call (permanent)	1110 0100 (228)	Released
Connection rejection — requested quality of service not available (transient condition)	1110 0101 (229)	Released
Connection rejection — requested quality of service not available (permanent condition)	1110 0110 (230)	Released
Protocol error (SNPDU type invalid while in):		
Ready state	0001 0100 (20)	Released
IWF call request state	0001 0101 (21)	Released
Incoming call state	0001 0110 (22)	Released
Data transfer state	0001 0111 (23)	Released
Remote clear request state	0001 1010 (26)	Released
Flow control state	0001 1011 (27)	Reset
Remote reset request state	0001 1101 (29)	Reset
Protocol error (SNPDU not allowed):		
Unidentifiable SNPDU	0010 0001 (33)	Released, reset
Invalid LCN (see 4.7.3.3)	0010 0010 (34)	Released
SNPDU too short	0010 0110 (38)	Released, reset
SNPDU too long	0010 0111 (39)	Released, reset
SNPDU type not compatible with facility	0010 1010 (42)	Released
Unauthorized interrupt confirm SNPDU	0010 1011 (43)	Reset
Unauthorized interrupt SNPDU	0010 1100 (44)	Reset
Invalid called DTE address	0100 0011 (67)	Released

(continued)

Generating condition	Diagnostic field coding (decimal)	Applicable SNPDUs
Invalid calling DTE address	0100 0100 (68)	Released
Invalid facility length	0100 0101 (69)	Released
D-bit procedure not supported	1010 0110 (166)	Reset
Transmission error:		
No additional information	0000 0000 (0)	Released, reset
Invalid SNPDU number	0000 0001 (1)	Reset
Retransmission count surpassed	1001 0000 (144)	Released, reset
Timer expired:		
tN1 (for connection confirm SNPDU)	0011 0001 (49)	Released
tN3 (for reset confirm SNPDU)	0011 0011 (51)	Released
tN4 (for interrupt confirm SNPDU)	0011 1001 (57)	Reset
tN7 (for flow control (suspend) supervision)	0011 1011 (59)	Reset

Table 4-18. SSNDPX time supervision

Timer design	Start event	Normally terminated by	Action when timer expires
tN1	Transmission of connection request SNPDU	Reception of connection confirm or connection released SNPDU	The SSNDPX shall initiate a release of the connection
tN3	Transmission of reset SNPDU	Reception of reset confirm or reset SNPDU	The SSNDPX shall initiate a release of the connection
tN4	Transmission of interrupt SNPDU	Reception of interrupt confirm SNPDU	SSNDPX shall initiate a reset of connection
tN6	Transmission of connection released SNPDU	Reception of connection release complete or connection released SNPDU	Return logical channel to ready state
tN7	Transmission of flow control (suspend) SNPDU	Transmission of flow control (resume) SNPDU	SSNDPX shall initiate a reset of connection

NOTES:

1. The timers tN2, tN5 and tN8 are reserved.
2. Timers are started when the SSNDPX receives success status in the transmission status indication LIDU from the link layer, unless the response SNPDU from the remote SSNDPX has been received prior to the status indication.

Table 4-19. SSNDPX supervision of transmission errors — receiving a "Fail" LIDU

SNPDU type reported through fail	SSNDPX action
CONNECTION REQUEST	Send clear indication packet to IWF and return the logical channel to the ready state
CONNECTION CONFIRM, CONNECTION RELEASE COMPLETE, INTERRUPT CONFIRM	No action
RESET CONFIRM	Retry once. If retry fails then return the logical channel to the data transfer state
CONNECTION RELEASED	Retry once. If retry fails then return the logical channel to the ready state
DATA, INTERRUPT	SSNDPX initiates a reset of the connection (reset cause = "network congestion")
FLOW CONTROL	SSNDPX initiates a release of the connection (release cause = "network congestion")
RESET	Retry once. If retry fails then initiate a release of the connection (release cause = "network congestion")

Note.— For SNPDUs which are confirmed by the remote SSND sub-layer entity, processing of the corresponding fail LIDU only applies if it is received prior to the reception of the expected response from the other end.

Table 4-20. SSNDPX timers

Timer	Value (seconds)
tN1	180
tN3	120
tN4	120
tN6	120
tN7	60

Table 4-21. SSNDPX actions — any state

SNPDU received from remote SSNDPX	Any state
Any SNPDU with an invalid SNPDU type	Discard
Any SNPDU less than 2 octets in length	Discard

Note.— The SNPDU type is invalid if it is identified as "spare" or "reserved" in Table 4-15.

Table 4-22. SSNDPX actions — connection establishment states

SNPDU received from remote SSNDPX	Call setup states (Notes 1, 3) Ready state	 IWF call request	 Incoming call
CONNECTION REQUEST	Action: Normal (forward to IWF)	Not applicable	Action: Error send CONNECTION RELEASED D = 0001 0110 (extend clear to IWF)
CONNECTION CONFIRM	Action: Error * send CONNECTION RELEASED D = 0001 0100	Action: Normal (forward to IWF) or Action: Error (Note 2), send CONNECTION RELEASED (extend clear to IWF) D = 0010 1010	Action: Error send CONNECTION RELEASED D = 0001 0110 (extend clear to IWF)
CONNECTION RELEASED	Action: Normal (do not forward)	Action: Normal (forward to IWF)	Action: Normal (forward to IWF)
CONNECTION RELEASE COMPLETE	Action: Error * send CONNECTION RELEASED D = 0001 0100	Action: Error send CONNECTION RELEASED D = 0001 0101 (extend clear to IWF)	Action: Error send CONNECTION RELEASED D = 0001 0110 (extend clear to IWF)
DATA, INTERRUPT, INTERRUPT CONFIRM, RESET, RESET CONFIRM, FLOW CONTROL	Action: Error * send CONNECTION RELEASED D = 0001 0100	Action: Error send CONNECTION RELEASED D = 0001 0101 (extend clear to IWF)	Action: Error send CONNECTION RELEASED D = 0001 0110 (extend clear to IWF)

*SSNDPX internal connection release request (i.e. IWF not informed)

NOTES:

1. In cases where the SNPDU is not acceptable to the state of the logical channel (i.e., Action = Error), the clearing cause field is equal to 147, i.e. SSND local link error.
2. The error may occur if fast select with restriction on response has been requested.
3. If the SNPDU is acceptable to the state of the logical channel (i.e. action = normal) but contains a format error or is otherwise unacceptable then the SSND initiates a connection release procedure (diagnostic codes that may apply include 34, 38, 39, 67, 68, 69, 225-230).

Table 4-23. SSNDPX actions — data transfer and connection release states

SNPDU received from remote SSNDPX	Data transfer and call clearing states		
	Data transfer	Local clear request*	Remote clear request
CONNECTION REQUEST	Action: Error send CONNECTION RELEASED D = 0001 0111 (see Note 1) (extend clear to IWF)	Action: Discard	Action: Error send CONNECTION RELEASED D = 0001 1010
CONNECTION CONFIRM	Action: Error send CONNECTION RELEASED D = 0001 0111 (see Note 1) (extend clear to IWF)	Action: Discard	Action: Error send CONNECTION RELEASED D = 0001 1010
CONNECTION RELEASE COMPLETE	Action: Error send CONNECTION RELEASED D = 0001 0111 (extend clear to IWF) (see Note 1)	Action: Normal	Action: Error send CONNECTION RELEASED D = 0001 1010
CONNECTION RELEASED	Action: Normal (forward to IWF)	Action: Normal (do not forward to IWF)	Action: Discard
DATA, INTERRUPT, INTERRUPT CONFIRM, RESET, RESET CONFIRM, FLOW CONTROL	See Table 4-24	Action: Discard	Action: Error send CONNECTION RELEASED D = 0001 1010

* Internal clear (at connection establishment) or clear requested by the IWF

NOTES:

1. The clearing cause field is equal to 147, i.e. SSND local link error.
2. If the SNPDU is acceptable to the state of the logical channel (i.e. Action = Normal) but contains a format error, then the SSND initiates a connection release procedure (diagnostic codes that may apply include 38, 39).

Table 4-24. SSNDPX actions — data transfer states

SNPDU received from remote SSNDPX	Data transfer states			
	Flow control		Local reset request	Remote reset request
RESET	Action: Normal		Action: Normal (do not forward)	Action: Discard
RESET CONFIRM	Action: Error send RESET SNPDU D = 0001 1011 (extend reset to IWF)		Action: Normal (do not forward)	Action: Error send RESET SNPDU D = 0001 1101
INTERRUPT	*No remote interrupt pending:* Action: Normal	*Remote interrupt ongoing:* Action: Error send RESET SNPDU D = 0010 1100 (extend reset to IWF)	Action: Discard	Action: Error, send RESET SNPDU D = 0001 1101
INTERRUPT CONFIRM	*No local interrupt pending:* Action: Error send RESET SNPDU D = 0010 1011 (extend reset to IWF)	*Local interrupt ongoing:* Action: Normal	Action: Discard	Action: Error, send RESET SNPDU D = 0001 1101
DATA with valid SNPDU No.	Action: Normal (if flow control ready) or Action: Discard (if flow control not ready)		Action: Discard	Action: Error send RESET SNPDU D = 0001 1101
DATA with invalid SNPDU No. (unrecoverable)	Action: Error send RESET SNPDU D = 0000 0001 (extend reset to IWF) or Action: Discard (if flow control not ready)		Action: Discard	Action: Error send RESET SNPDU D = 0001 1101
FLOW CONTROL (suspend) with valid SNPDU No. or flow control (resume)	Action: Normal		Action: Discard	Action: Error send RESET SNPDU D = 0001 1101
FLOW CONTROL (suspend) with invalid SNPDU No.	Action: Error send RESET SNPDU D = 0000 0001 (extend reset to IWF)		Action: Discard	Action: Error send RESET SNPDU D = 0001 1101

NOTES:

1. In cases where the SNPDU is not acceptable to the state of the logical channel (i.e. Action = Error), the resetting cause field is equal to 133, i.e. SSND local link error.
2. If the SNDPU is acceptable to the state of the logical channel (i.e. Action = Normal) but contains a format error, then the SSND initiates a connection reset procedure (diagnostic codes that may apply include 1, 38, 39).

Table 4-25. Summary of link interface data units and parameters

Direction	LIDU name	Parameters
From the subnetwork layer to the link layer	Data	GES ID (in AES) or AES ID (in GES) RLS Q number LSDU
From the link layer to the subnetwork layer	Data	GES ID (in AES) or AES ID (in GES) RLS Q number LSDU
	Transmission status indication	RLS Success/Fail First two octets of LSDU

Table 4-26. Subnetwork connection priority mapping

Categories of messages	Priority/Q number mapping: SNC priority in CALL REQUEST/CALL ACCEPTED packet	Q number	SNC priority in INCOMING CALL/CALL CONNECTED packet
Unspecified	255	0	None
Reserved	254-15	Invalid/reject call	Not applicable
Distress communications, urgent communications, network/systems management	14	14	14
Reserved	13	Invalid/reject call	Not applicable
Reserved	12	Invalid/reject call	Not applicable
Communications relating to direction finding, flight safety messages	11	11	11
Reserved	10	Invalid/reject call	Not applicable
Reserved	9	Invalid/reject call	Not applicable
Meteorological communications	8	8	8
Flight regularity communications	7	7	7
Aeronautical information services messages	6	6	6
Aeronautical administrative messages, network/systems administration	5	5	5
Reserved	4	Invalid/reject call	Not applicable
Urgent priority administrative and UN Charter communications	3	3	3
High priority administrative and State/Government communications	2	2	2
Normal priority/administrative	1	1	1
Low priority administrative	0	0	None

Note 1.— SNC priority value 255 (unspecified) in call request/call accepted packet should be mapped to Q number = 0, and none in incoming call/call connected packet.

Note 2.— Network/system management and administration are not categories of end-user messages, but are used by the ATN or other network management/administration.

Table 4-27. DCE actions at restart, call setup, and call clearing states

DCE state	State definition	Action when entering state
r1	PACKET LAYER READY	All VCs are returned to the p1 state (see p1 state READY explanation) and all PVCs are returned to d1, (flow control ready) state.
r2	DTE RESTART REQUEST	The DCE returns each VC to the p1 state (see p1 state explanation) and issues a restart confirmation packet to the DTE.
r3	DCE RESTART INDICATION	The DCE returns each VC to the p1 state (see p1 state explanation) and issues a restart indication packet to the DTE.
p1	READY	Release all resources assigned to VC channel.
p2	DTE CALL REQUEST	Determine if sufficient resources exist to support request; if so, allocate resources and forward ISO 8208 call request packet to IWF; if not, enter DCE clear indication to DTE state (p7). Determination of resources and allocation is as defined in ISO 8208.
p3	DCE INCOMING CALL	Determine if sufficient resources exist to support request; if so, allocate resources and forward ISO 8208 incoming call packet to DTE; if not, send a clear request packet to the IWF. Determination of resources and allocation is as defined in ISO 8208.
p4	DATA TRANSFER	No action.
p5	CALL COLLISION	Send a clear request packet to the IWF, corresponding to the incoming call packet (the DTE in its call collision state ignores the incoming call), and proceed with the DTE call request packet.
p6	DTE CLEAR REQUEST	Release all resources assigned to VC channel. Send an ISO 8208 clear confirmation packet to the DTE, a clear request packet to the IWF, and enter p1 state.
p7	DCE CLEAR INDICATION TO DTE	Forward ISO 8208 clear indication packet to DTE.

Note.— State nomenclature in this table may differ from that used in ISO 8208.

Table 4-28. DCE actions at reset, interrupt, and flow control states

DCE state	State definition	Action when entering state
d1	FLOW CONTROL READY	No action.
d2	RESET REQUEST BY DTE	Remove data packets transmitted to DTE from window; discard any data packets that represent partially transmitted M-bit sequences and discard interrupt and interrupt confirmation packets awaiting transfer to the DTE; reset all window counters to zero. Send reset confirmation packet to DTE. Return channel to d1 state.
d3	RESET INDICATION BY DCE TO DTE	Remove data packets transmitted to DTE from window; discard any data packets that represent partially transmitted M-bit sequences and discard interrupt and interrupt confirmation packets awaiting transfer to the DTE; reset all window counters to zero. Send reset indication packet to DTE.
i1	DTE INTERRUPT READY	No action.
i2	DTE INTERRUPT SENT	Forward interrupt packet received from DTE to IWF.
j1	DCE INTERRUPT READY	No action.
j2	DCE INTERRUPT SENT	Forward interrupt packet received from IWF to DTE.
f1	DCE RECEIVE READY	No action.
f2	DCE RECEIVE NOT READY	No action.
g1	DTE RECEIVE READY	No action.
g2	DTE RECEIVE NOT READY	No action.

Note.— State nomenclature in this table may differ from that used in ISO 8208.

Table 4-29. DCE state table — any state

Received from DTE	DCE special cases Any state
Any packet less than 2 octets in length	A = DIAG D = 38
Any packet with an invalid general format identifier	A = DIAG D = 40
Any packet with unassigned logical channel identifier	A = DIAG D = 36
Any packet with a valid general format identifier and an assigned logical channel identifier (includes a logical channel identifier of 0)	See Table 4-30

Table 4-30. DTE effect on DCE restart states

Packet received from DTE	DCE restart states (see Notes 6 and 7) Packet layer READY (see Note 1) r1	DTE RESTART REQUEST (see Note 4) r2	DCE RESTART INDICATION (see Note 5) r3
Packets having a packet type identifier shorter than 1 octet with assigned logical channel identifier <> 0	see Table 4-31	A = ERROR S = r3 D = 38 (see Note 3)	A = DISCARD
Packet supported by DCE other than restart with a logical channel identifier of 0	A = DIAG D = 36	A = DIAG D = 36	A = DIAG D = 36
Packet with a packet type identifier which is undefined or not supported by DCE and with assigned logical channel identifer <> 0	see Table 4-31	A = ERROR S = r3 D = 33 (see Note 3)	A = DISCARD
Restart request, or restart confirmation packet with a logical channel identifier <> 0	see Table 4-31	A = ERROR S = r3 D = 41 (see Note 3)	A = DISCARD
Restart request	A = NORMAL (see Note 1) S = r2	A = DISCARD	A = NORMAL (4.2) S = p1 or d1 (see Note 2)
Restart confirmation	A = ERROR S = r3 D = 17 (see Note 8)	A = ERROR S = r3 D = 18 (see Note 3)	A = NORMAL (4.4) S = p1 or d1 (see Note 2)
Restart request or restart confirmation packet with format error	A = DIAG D = 38, 39, 81, or 82	A = DISCARD	A = ERROR D = 38, 39, 81, or 82
Call setup, call clearing, data, interrupt, flow control, or reset packet	see Table 4-31	A = ERROR S = r3 D = 18	A = DISCARD
Packets having a packet type identifier shorter than 1 byte and a logical channel identifier equal to 0	A = DIAG D = 38	A = ERROR S = r3 D = 38	A = DISCARD
Packet with a packet type identifier which is undefined or not supported by DCE and a logical channel identifier equal to 0	A = DIAG D = 33	A = ERROR S = r3 D = 33 (see Note 4)	A = DISCARD

NOTES:

1. Receipt of a restart request packet causes the DCE to issue a clear request packet to the IWF for each VC associated with the DCE entity.
2. The VC channels are returned to state p1, the PVC channels are returned to state d1.
3. No action is taken by the DCE.
4. The restart request packet is not forwarded to the IWF.
5. The DCE upon entering the r3 state checks for the completion of r2 processing and issues an ISO 8208 restart indication packet to the DTE, when the r3 state is entered via the r2 state. If the r3 state is not entered via the r2 state, the DCE performs all of the actions normally performed when entering r2 and issues an ISO 8208 restart indication packet to the DTE, and send a clear request packet to the IWF for each VC associated with the DCE entity.
6. Table entries are defined as follows: A = action to be taken, S = state to be entered, D = diagnostic code to be used in packets generated as a result of this action, and discard indicates that the received packet is to be cleared from the buffers.
7. The number in the parentheses below an "A = normal" table entry is the paragraph number in ISO 8208, second edition. The DCE shall take the same action as the one taken by the DTE, acting as a DCE, to perform nominal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
8. The error procedure consists of entering the r3 state and sending a restart indication packet to the DTE.

Table 4-31. DTE effect on DCE call setup and clearing states

Packet received from DTE	READY p1	DTE CALL REQUEST p2	DCE INCOMING CALL p3	DATA TRANSFER p4	CALL COLLISION p5; see Notes 1 and 4	DTE CLEAR REQUEST p6	DCE CLEAR INDICATION TO DTE p7
	DCE call setup and clearing states (see Notes 5 and 6)						
Packet having a packet type identifier shorter than 1 octet	A = ERROR S = p7 D = 38	A = ERROR S = p7 D = 38 see Note 2	A = ERROR S = p7 D = 38 see Note 2	see Table 4-32	A = ERROR S = p7 D = 38 see Note 2	A = ERROR S = P7 D = 38 see Note 2	A = DISCARD
Packet having a packet type identifier which is undefined or not supported by DCE	A = ERROR S = p7 D = 33	A = ERROR S = p7 D = 33 see Note 2	A = ERROR S = p7 D = 33 see Note 2	see Table 4-32	A = ERROR S = p7 D = 33 see Note 2	A = ERROR S = p7 D = 33 see Note 2	A = DISCARD
RESTART REQUEST, or RESTART CONFIRMATION packet with logical channel identifier not = 0	A = ERROR S = p7 D = 41	A = ERROR S = p7 D = 41 see Note 2	A = ERROR S = p7 D = 41 see Note 2	see Table 4-32	A = ERROR S = p7 D = 41 see Note 2	A = ERROR S = p7 D = 41 see Note 2	A = DISCARD
CALL REQUEST	A = NORMAL (5.2.2) S = p2 (forward)	A = ERROR S = p7 D = 21 see Note 2	A = NORMAL (5.2.5) S = p5	A = ERROR S = p7 D = 23 see Note 2	A = ERROR S = p7 D = 24 see Note 2	A = ERROR S = p7 D = 25 see Note 2	A = DISCARD
CALL ACCEPTED	A = ERROR S = p7 D = 20	A = ERROR S = p7 D = 21 see Note 2	A = NORMAL (5.2.4) S = p4(Frd)/ A = ERROR S = p7 D = 42; see Notes 2 and 3	A = ERROR S = p7 D = 23 see Note 2	A = ERROR S = p7 D = 24; see Notes 2 and 4	A = ERROR S = p7 D = 25 see Note 2	A = DISCARD
CLEAR REQUEST	A = NORMAL (4.5.5.2) S = p6	A = NORMAL (4.5.5.2) S = p6 (forward)	A = NORMAL (4.5.5.2) S = p6 (forward)	A = NORMAL (4.5.5.2) S = p6 (forward)	A = NORMAL (4.5.5.2) S = p6 (forward)	A = DISCARD	A = NORMAL (4.5.5.4) S = p1 (do not forward)
CLEAR CONFIRMATION	A = ERROR S = p7 D = 20	A = ERROR S = p7 D = 21 see Note 2	A = ERROR S = p7 D = 22 see Note 2	A = ERROR S = p7 D = 23 see Note 2	A = ERROR S = p7 D = 24 see Note 2	A = ERROR S = p7 D =25 see Note 2	A = NORMAL (5.5.4) S = p1 (do not forward)
Data, interrupt, flow control or reset packets	A = ERROR S = p7 D = 20	A = ERROR S = p7 D = 21 see Note 2	A = ERROR S = p7 D = 22 see Note 2	see Table 4-32	A = ERROR S = p7 D = 24 see Note 2	A = ERROR S = p7 D = 25 see Note 2	A = DISCARD

NOTES:

1. On entering the p5 state, the DCE sends a clear request packet to the IWF, corresponding to the incoming call (the DTE in its call collision state ignores the incoming call), and proceed with the DTE call request.
2. The error procedure consists of performing the actions specified when entering the p7 state (including sending a clear indication packet to the DTE) and additionally sending a clear request packet to the IWF.
3. The use of fast select facility with restriction on response prohibits the DTE from sending a call accepted packet.
4. The DTE in the event of a call collision must discard the call request packet received from the DCE.
5. Table entries are defined as follows: A = action to be taken, S = the state to be entered, D = diagnostic code to be used in packets generated as a result of this action, and discard indicates that the received packet is to be cleaned from the buffers.
6. The number in parentheses below an "A = normal" table entry is the paragraph number in ISO 8208, second edition. The DCE shall take the same actions as the one taken by the DTE, acting as a DCE, to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
7. If the packet is acceptable to the state of the logical channel (i.e. action = normal) but contains a format error or is otherwise unacceptable, then the DCE shall initiate a connection release procedure (diagnostic codes that may apply include 34, 38, 39, 65, 66, 67, 68, 69, 73, 77, 82). If such an error is detected in state p1 or state p7, the DCE does not send a clear request packet to the IWF.

Table 4-32. DTE effect on DCE reset states

Packet received from DTE	DCE reset states (see Notes 2 and 3) FLOW CONTROL READY d1	RESET REQUEST by DTE d2	RESET INDICATION BY DCE to DTE d3
Packet with a packet type identifier shorter than 1 octet	A = ERROR S = d3 D = 38 (see Note 1)	A = ERROR S = d3 D = 38 (see Note 1)	A = DISCARD
Packet with a packet type identifier which is undefined or not supported by DCE	A = ERROR S = d3 D = 33 (see Note 1)	A = ERROR S = d3 D = 33 (see Note 1)	A = DISCARD
RESTART REQUEST, or RESTART CONFIRMATION packet with logical channel identifier <> 0	A = ERROR S = d3 D = 41 (see Note 1)	A = ERROR S = d3 D = 41 (see Note 1)	A = DISCARD
RESET REQUEST	A = NORMAL (8.2) S = d2 (forward)	A = DISCARD	A = NORMAL (8.3) S = d1 (do not forward)
RESET CONFIRMATION	A = ERROR S = d3 D = 27 (see Note 1)	A = ERROR S = d3 D = 28 (see Note 1)	A = NORMAL (8.4) S = d1 (do not forward)
INTERRUPT packet	see Table 4-33	A = ERROR S = d3 D = 28 (see Note 1)	A = DISCARD
INTERRUPT CONFIRMATION packet	see Table 4-33	A = ERROR S = d3 D = 28 (see Note 1)	A = DISCARD
DATA or flow control packet	see Table 4-34	A = ERROR S = d3 D = 28 (see Note 1)	A = DISCARD

NOTES:

1. The error procedure consists of performing the specified actions when entering the d3 state (which includes forwarding a reset indication packet to the DTE) and sending a reset request packet to the IWF.
2. Table entries are defined as follows: A = action to be taken, S = the state to be entered, D = the diagnostic code to be used in packets generated as a result of this action, and discard indicates that the received packet is to be cleared from the AES buffers.
3. The number in parentheses below an "A = normal" table entry is the paragraph number in ISO 8208, second edition. The DCE shall take the same actions as those taken by the DTE to perform normal processing on the received packet. If no paragraph is referenced, the normal processing is defined in the table entry.
4. If the packet is acceptable to the state of the logical channel (i.e. action = normal) but contains a format error, then the DCE shall initiate a connection reset procedure (diagnostic codes that may apply include 38, 39, 81, 82).

Table 4-33. DTE effect on DCE interrupt transfer states

Packet received from DTE	DTE/DCE INTERRUPT TRANSFER STATES (see Notes 2 and 3) DTE INTERRUPT READY i1	DTE INTERRUPT SENT i2
INTERRUPT (see Note 1)	A = NORMAL (6.8.2) S = i2 (forward)	A = ERROR S = d3 D = 44 (see Note 4)

Packet received from DTE	DTE/DCE INTERRUPT TRANSFER STATES (see Notes 2 and 3) DCE INTERRUPT READY j1	DCE INTERRUPT SENT j2
INTERRUPT CONFIRMATION (see Note 1)	A = ERROR S = d3 D = 43 (see Note 4)	A = NORMAL (6.8.3) S = j1 (forward)

NOTES:

1. If the packet is acceptable to the state of the logical channel (i.e. action = normal) but contains a format error, then the error procedure applies (see Note 4).
2. Table entries are defined as follows: A = action to be taken, S = the state to be entered, and D = the diagnostic code to be used in packets generated as a result of this action.
3. The number in parentheses below an "A = normal" table entry is the paragraph number in ISO 8208, second edition. The DCE shall take the same action as those taken by the DTE to perform normal processing on the received packet. If no paragraph is referenced, the normal processing is defined in the table entry.
4. The error procedure consists of performing the specified actions when entering the d3 state (which includes forwarding a reset indication packet to the DTE) and sending a reset request packet to the IWF.

Table 4-34. DTE effect on DCE flow control transfer states

Packet received from DTE	DCE flow control transfer states (see Note 2) DCE RECEIVE READY f1	 DCE RECEIVE NOT READY f2
DATA packet with invalid PR	A = ERROR S = d3 D = 2 (see Note 4)	A = ERROR S = d3 D = 2 (see Note 4)
DATA packet with valid PR but invalid PS or user data field with improper format	A = ERROR S = d3 D = (see Note 5) (see Note 4)	A = DISCARD (process PR data)
DATA packet with valid PR with M-bit set to 1 when the user data field is partially full, or the D-bit set to 1 (when not supported)	A = ERROR S = d3 D = 165 or 166 (see Note 4)	A = DISCARD (process PR data)
DATA packet with valid PR, PS and user data field with proper format	A = NORMAL (forward)	A = DISCARD (process PR data) (see Note 7)

Packet received from DTE	DCE flow control transfer states (see Notes 2 and 3) DTE RECEIVE READY g1	 DTE RECEIVE NOT READY g2
RR, or RNR packet with an invalid PR	A = ERROR S = d3 D = 2 (see Note 4)	A = ERROR S = d3 D = 2 (see Note 4)
RR packet with a valid PR (see Note 6)	A = NORMAL (4.7.1.5)	A = NORMAL (4.7.1.5) S = g1
RNR packet with a valid PR (see Note 6)	A = NORMAL (4.7.1.6) S = g2	A = NORMAL (4.7.1.6)

NOTES:

1. The RR and RNR procedures are a local DTE/DCE matter and the corresponding packets are not forwarded to the IWF.
2. Table entries are defined as follows: A = action to be taken, S = the state to be entered, D = the diagnostic code to be used in packets generated as a result of this action, and discard indicates that the received packet is to be cleared from the buffers.
3. The number in parentheses below an "A = normal" table entry is the paragraph number in ISO 8208, second edition. The DCE shall take the same action as those taken by the DTE to perform normal processing on the received packet. If no paragraph is referenced, the normal processing is defined in the table entry.
4. The error procedure consists of performing the specified actions when entering the d3 state (which includes forwarding a reset indication packet to the DTE) and sending a reset request packet to the IWF.
5. The diagnostic codes are as follows: D = 1 for invalid PS; D = 39 for a user data field greater than 128 octets; D = 82 for a user data field not octet aligned.
6. For RR, RNR, or REJECT packets, the presence of one or more octets beyond the third octet is considered an error. Although a valid P(R) may be accepted to update the status of outstanding data packets, the DCE shall invoke the error procedure as defined in Note 4 (with D = 39).
7. If possible, the DCE should process these packets normally. On the other hand, the DCE may define an internal mechanism to indicate that valid data packets have been discarded during a receive-not-ready condition. In this case, when the receive-not-ready condition clears, the DCE should reset the logical channel, forwarding both a reset indication packet to the DTE (D=0, no additional information) and a reset request packet to the IWF.

Table 4-35. DCE timer

Timer design	Default time-limit value	Start event	Normally terminated by	Action when timer expires
tN10	60 s	DCE issues a RESTART INDICATION packet	Reception of RESTART CONFIRMATION or RESTART REQUEST packet	DCE enters the r1 state and may issue a DIAGNOSTIC packet (D = 52)
tN11	180 s	DCE issues an INCOMING CALL packet	Reception of CALL ACCEPTED or CLEAR REQUEST or CALL REQUEST packet	DCE enters the p7 state signalling a CLEAR INDICATION packet (D = 49) (see Note)
tN12	60 s	DCE issues a RESET INDICATION packet	Receipt of RESET CONFIRMATION or RESET REQUEST packet	DCE enters the p7 state signalling a CLEAR INDICATION packet (D = 51) (see Note)
tN13	60 s	DCE issues a CLEAR INDICATION packet	Reception of a CLEAR CONFIRMATION or CLEAR REQUEST packet	DCE enters the p1 state and may issue a DIAGNOSTIC packet (D = 50)

Note.— The clear is extended to the IWF, i.e. the DCE shall issue a clear request packet to the IWF.

Table 4-36. SSNDPX/IWF interface

Packets received from SSNDPX	Action
INCOMING CALL	See 4.7.5.1.2
CALL CONNECTED	See 4.7.5.1.3
CLEAR INDICATION	See 4.7.5.1.4
DATA	See 4.7.5.1.5
INTERRUPT	See 4.7.5.1.5
INTERRUPT CONFIRMATION	See 4.7.5.1.5
RESET INDICATION	See 4.7.5.1.5

Packets sent to SSNDPX
CALL REQUEST
CALL ACCEPTED
CLEAR REQUEST
DATA
INTERRUPT
INTERRUPT CONFIRMATION
RESET REQUEST

Table 4-37. ISO 8208 DCE/IWF interface

Packets received from ISO 8208 DCE	Action
CALL REQUEST	See 4.7.5.2.2
CALL ACCEPTED	See 4.7.5.2.3
CLEAR REQUEST	See 4.7.5.2.4
DATA	See 4.7.5.2.5
INTERRUPT	See 4.7.5.2.5
INTERRUPT CONFIRMATION	See 4.7.5.2.5
RESET REQUEST	See 4.7.5.2.5

Packets sent to ISO 8208 DCE
INCOMING CALL
CALL CONNECTED
CLEAR INDICATION
DATA
INTERRUPT
INTERRUPT CONFIRMATION
RESET INDICATION
RESTART INDICATION

Table 4-38. Circuit-mode — link interface data units

LIDU
1. Access request — telephone
2. Call announcement
3. C channel assignment
4. Call information — service address
5. Call progress — call attempt result
6. Call progress — channel release
7. Call progress — data mode
8. Call progress — test
9. Call progress — connect
10. Telephony acknowledge

LICI parameters
Message type (all)
AES ID (all)
GES ID (all)
Q number (all)
Application reference number (all)
Source (1,2)
Service direction (1,2)
Service ID (1,2)
Network ID (1)
Circuit data rate (1,2)
Voice channel characteristics (1,2)
Called terminal (2)
Calling terminal (1,4)
Initial EIRP (3)
Receive channel frequency (3)
Transmit channel frequency (3)
Report type (5,6,7,8,9)
S (5,6)
Location (5,6)
Cause class (5,6)
Cause value (5,6)
Digit 0,1 (1)
Digit 2-9 (1,4)
Ack/nack (10)
Routing (5,6,10)
Message type of missing CM-LIDU (10)

Table 4-39. AES outgoing procedure — interworking telephony events

Event type	Event name	Parameter mapping requirements (Figure*)	To/from interworking interface with aircraft network
FITE 18	Calling party category indicator — AMS(R)S call origination	A5-1 a), b)	From
FITE 22	Clear forward	A5-2	From
BITE 5	Address complete	A5-3	To
BITE 12	Call unsuccessful — network congestion	A5-4	To
BITE 14	Call unsuccessful — address incomplete	A5-5	To
BITE 15	Call unsuccessful — unallocated number	A5-6	To
BITE 16	Call unsuccessful — called party busy	A5-7	To
BITE 17	Call unsuccessful — line out of service	A5-8	To
BITE 20	Call unsuccessful — send error indication	A5-9	To
BITE 22	Answer	A5-10	To
BITE 25	Clear back	A5-11	To

* Figures are located in Appendix 5 to Chapter 4.

Table 4-40. AES incoming procedure — interworking telephony events

Event type	Event name	Parameter mapping requirements (Figure*)	To/from interworking interface with aircraft network
FITE 18	Calling party category indicator — AMS(R)S call origination	A5-12	To
FITE 22	Clear forward	A5-13	To
BITE 12	Call unsuccessful — network congestion	A5-14	From
BITE 16	Call unsuccessful — called party busy	A5-15	From
BITE 17	Call unsuccessful — line out of service	A5-16	From
BITE 22	Answer	A5-17	From
BITE 25	Clear back	A5-18	From

* Figures are located in Appendix 5 to Chapter 4.

Table 4-41. GES outgoing procedure — interworking telephony events

Event type	Event name	Parameter mapping requirements (Figure*)	To/from interworking interface with terrestrial network
FITE 18	Calling party category indicator — AMS(R)S call origination	A5-19	From
FITE 22	Clear forward	A5-20	From
BITE 5	Address complete	A5-21	To
BITE 12	Call unsuccessful — network congestion	A5-22	To
BITE 16	Call unsuccessful — called party busy	A5-23	To
BITE 17	Call unsuccessful — line out of service	A5-24	To
BITE 20	Call unsuccessful — send error indication	A5-25	To
BITE 22	Answer	A5-26	To
BITE 25	Clear back	A5-27	To

* Figures are located in Appendix 5 to Chapter 4.

Table 4-42. GES incoming procedure — interworking telephony events

Event type	Event name	Parameter mapping requirements (Figure*)	To/from interworking interface with terrestrial network
FITE 18	Calling party category indicator — AMS(R)S call origination	A5-28	To
FITE 22	Clear forward	A5-29	To
BITE 5	Address complete	A5-30	From
BITE 12	Call unsuccessful — network congestion	A5-31	From
BITE 14	Call unsuccessful — address incomplete	A5-32	From
BITE 15	Call unsuccessful — unallocated number	A5-33	From
BITE 16	Call unsuccessful — subscriber busy	A5-34	From
BITE 17	Call unsuccessful — line out of service	A5-35	From
BITE 20	Call unsuccessful — send error indication	A5-36	From
BITE 22	Answer	A5-37	From
BITE 25	Clear back	A5-38	From
BITE 27	Sending finished — Set up speech condition	A5-39	From
BITE 29	Release incoming side	A5-40	From

* Figures are located in Appendix 5 to Chapter 4.

Table 4-43. Circuit-mode priority

Priority	Service	Link layer Q No.	C channel Q No.	Description
1	AMS(R)S	15	15	Distress and urgency
2	AMS(R)S	12	12	Flight safety
3	AMS(R)S	10	10	Regularity and meteorological
4	AMSS	9	4	Public correspondence

Table 4-44. AES management — link layer interface data units

LIDU name	LIDU parameters[1]
From link layer 1. Log-on confirm 2. Log-on acknowledgement 3. Log-off acknowledgement 4. Log-on reject 5. Log-on interrogation 6. Log-on prompt 7. P/R channel control 8. T channel control 9. AES system table broadcast a) index b) GES P/R channel advice c) satellite ID channel advice d) beam ID channel advice e) GES beam support advice f) data EIRP table broadcast 10. System time broadcast 11. Selective release broadcast 12. Log control data channel reassignment 13. Channel status report 13a. Log-off request *To link layer* 14. Log-on request 15. Log-off request 16. Log-on acknowledgement 17. Log control ready for reassignment 18. Log control reassignment reject 19. Channel status report	Q number of application (14) Message type (all) AES ID (all) GES ID (all) Q number (all) Satellite ID (1, 9c, 9d, 14) Initial EIRP (1) TDMA message (1) Received bit error rate (19) EIRP adjust (13) P/R message (1) Voice channel characteristics (1, 14) Channel rate(s) (7, 8, 9d) Reason (4) P, R channel frequencies (7, 9b, d) T channel frequencies (8) Number of frequencies (7, 8) Beam IDs (1, 9d, 14) Revision number (9a, b, c, d, e) Application reference no. (13, 19) Satellite inclination (9c) Satellite right ascension (9c) Satellite longitude (9c) Satellite/beam identification frequencies (9c) Century, year, month, day, hour, second (10) Data bit rate capability (14) ACK/NAK messages 1-3 (2, 3, 16) Class of AES (1, 14) Number of C channels (14) Initial/renewal (14) Primary/secondary (14) Existence (9a) NOT (number of transmitters) (14) Report type (13, 19) LOV (log-on verification) (14) Channel frequency (11) AAS (9e) Antenna gain (14) Data EIRP (Global or Spot) (9f) Data EIRP table sequence number (9f) DETC/DETP (9a) ISU/SSU (9f) SIN/DOU (9f)

1. Definitions of LIDU parameters shall be as given in Appendix 3 to Chapter 4. The number(s) associated with each LIDU parameter shall indicate the LIDU(s) containing the parameter.

Table 4-45. GES management — link interface data units (LIDUs)

LIDU name	LIDU parameters[1]
To link layer 1. Log-on confirm 2. Log-on acknowledgement 3. Log-off acknowledgement 4. Log-on reject 5. Log-on interrogation 6. Log-on prompt 7. P/R channel control 8. T channel control 9. AES system table broadcast a) index b) GES P/R channel advice c) satellite ID channel advice d) beam ID channel advice e) GES beam support advice f) data EIRP table broadcast 10. System time broadcast 11. Selective release broadcast 12. Log control-data channel reassignment 12a. Channel status report 12b. Log-off request *From link layer* 13. Log-on request 14. Log-off request 15. Log-on acknowledgement 16. Log control-ready for reassignment 17. Log control-reassignment reject 18. Channel status report	Message type (all) AES ID (all) GES ID (all) Q Number of application (13) Satellite ID (1, 9c, 9d, 13) Initial EIRP (1) BER (18) TDMA message (1) P/R message (1) Voice channel characteristics (1, 13) Bit rate (7, 8, 9d) Reason (4) P, R channel freqencies (7, 9b) T channel frequency (8) Number of frequencies (7, 8) Beam IDs (1, 9c, 9d, 13) Revision number (9a, b, c, d, e) Satellite inclination (9c) EIRP adjustment (12a) Satellite right ascension (9c) Satellite longitude (9c) Satellite/beam-ID. frequency (9c) Century, year, month, day, hour, minute, second (10) ACK/NAK MSG1, MSG2, MSG3 (2, 3, 15) Number of C channels (13) Initial/renew (13) Primary/secondary (13) NOT (13) Beam-ID P channel frequency (9c) Beam support table (9e) Report type (12a, 18) Application reference number (12a, 18) Class of AES (13) LOV (13) Transmit channel frequency (11) Existence (9a) AAS (9e) Antenna gain (13) Data EIRP (Global or Spot) (9) Data EIRP table sequence number (9f) DETC/DETP (9a) ISU/SSU (9f) SIN/DOU (9f)

1. The order of the LIDU PARAMETER list does not correspond to the order of the LIDU NAME list. The number in parentheses after each LIDU parameter indicates the LIDU name to which the parameter applies.

FIGURES FOR CHAPTER 4

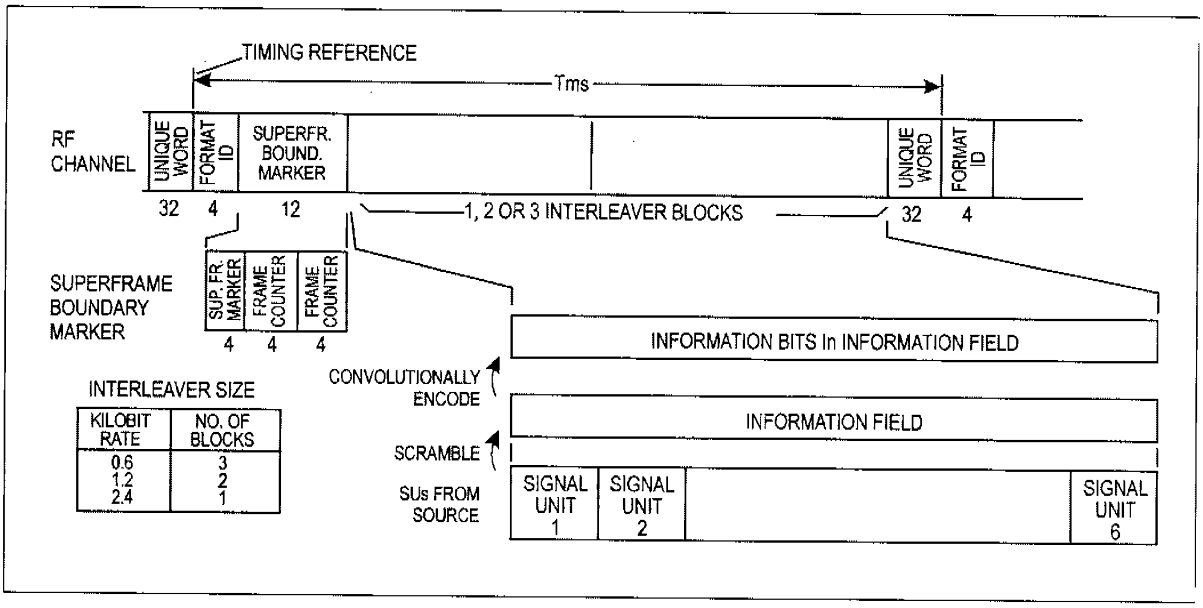

Figure 4-1. P channel format (0.6, 1.2 and 2.4 kbits/s)

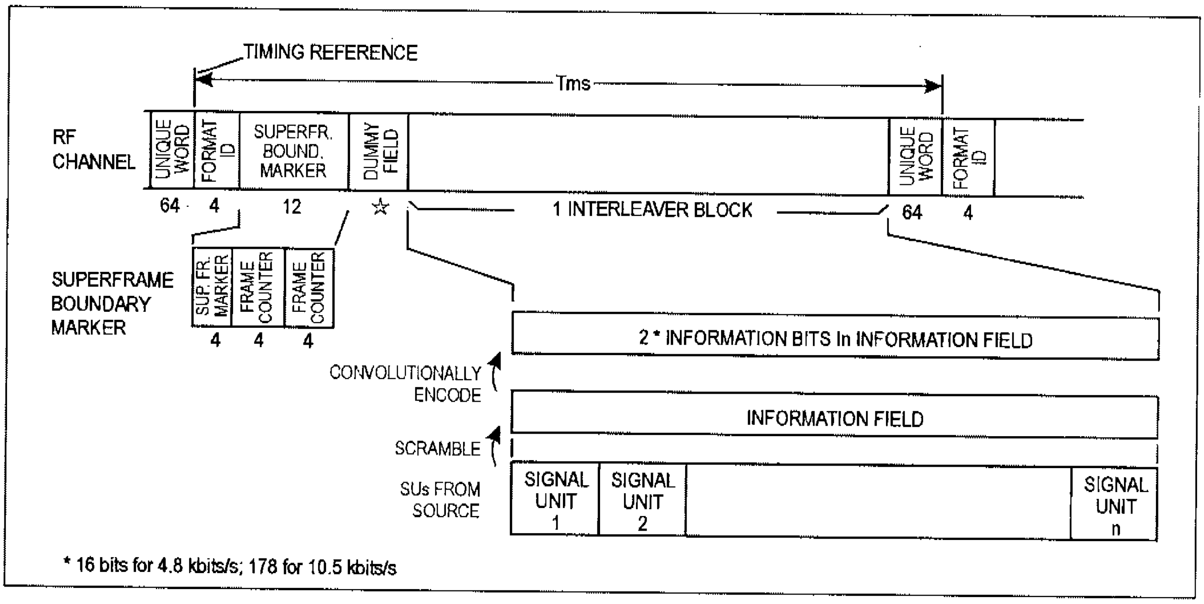

Figure 4-2. P channel format (4.8 and 10.5 kbits/s)

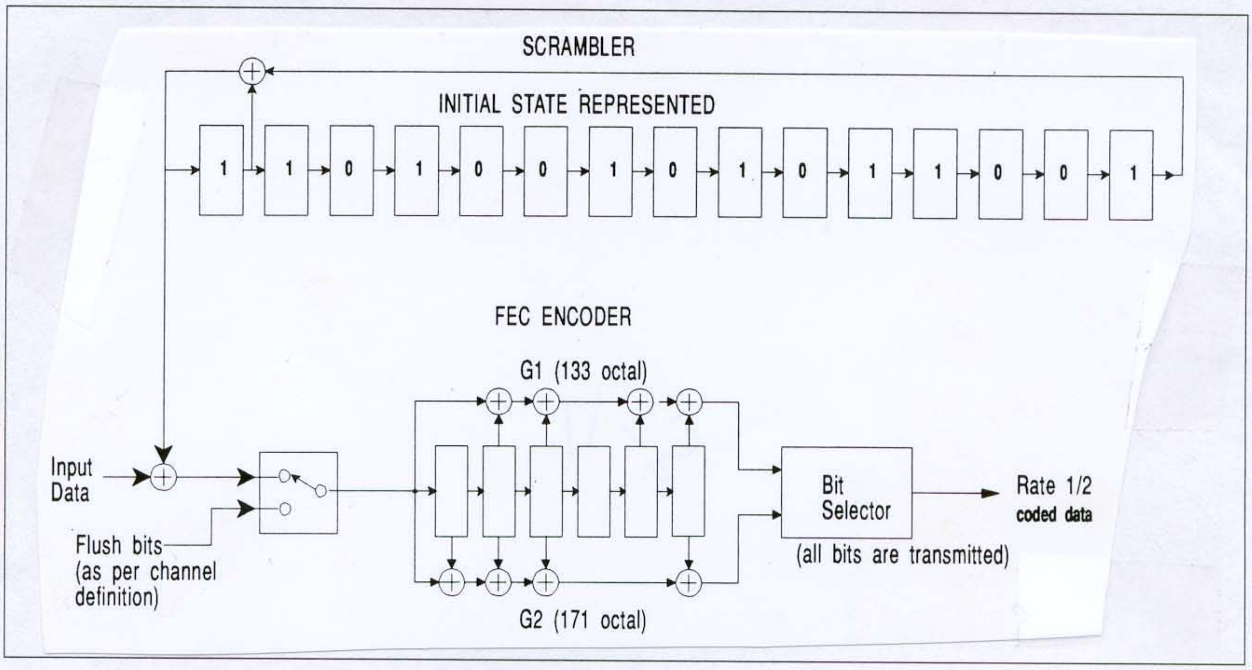

Figure 4-3. Scrambler and convolutional encoder functions

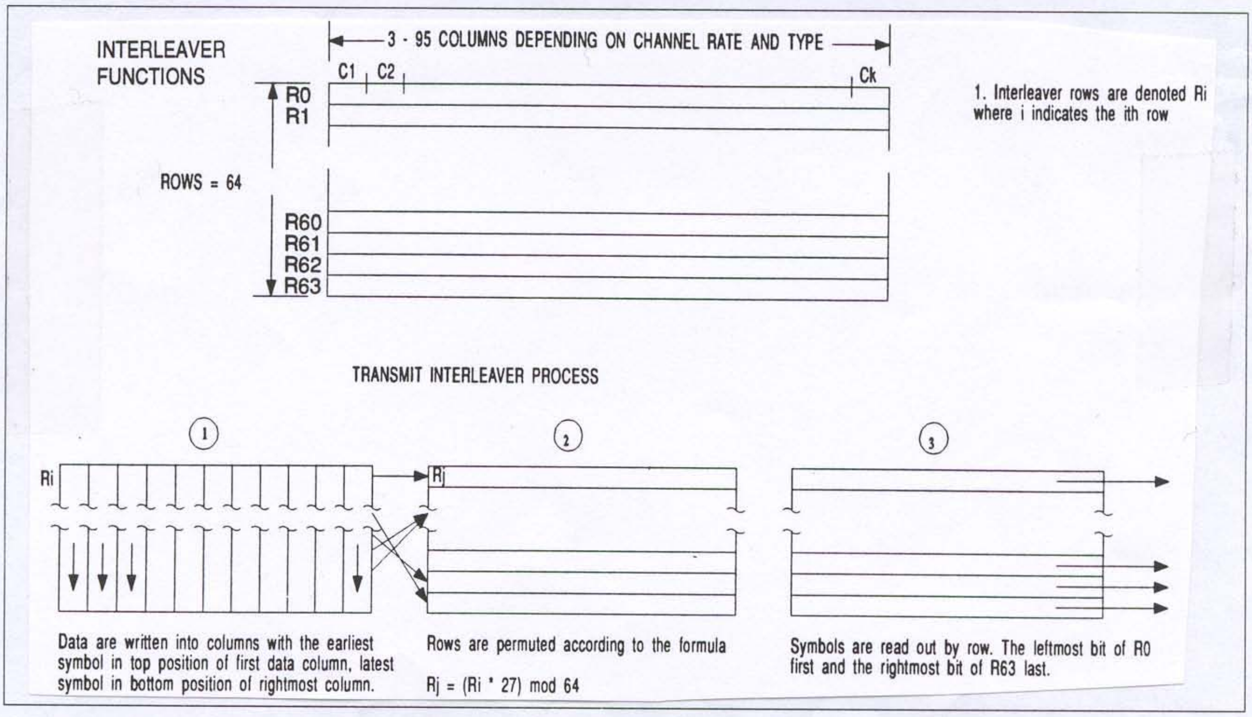

Figure 4-4. Interleaver functions

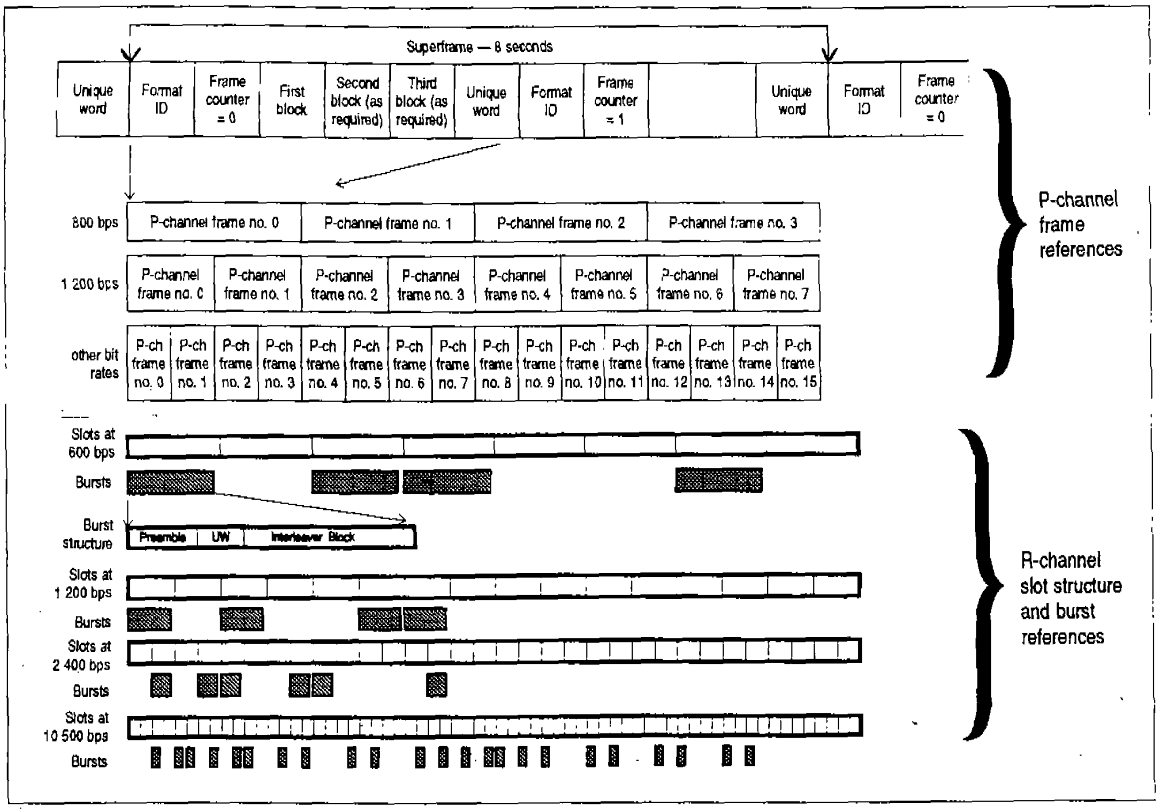

Figure 4-5. Timing references between P and R channels

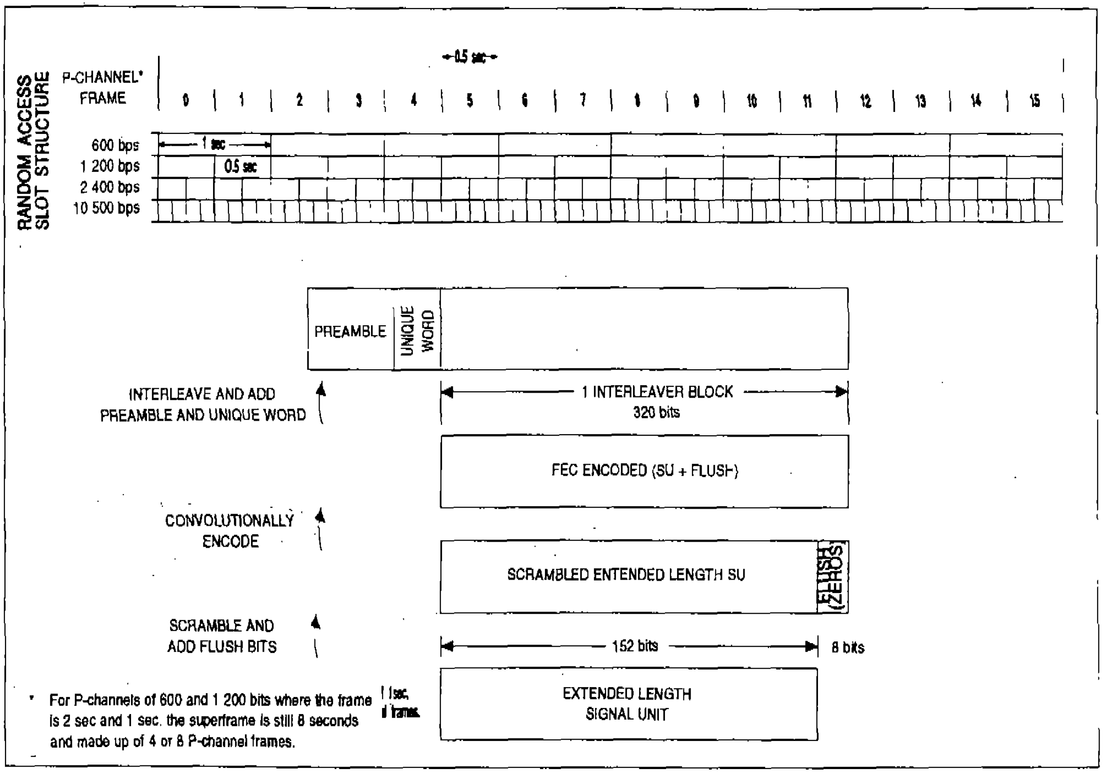

Figure 4-6. R channel burst format

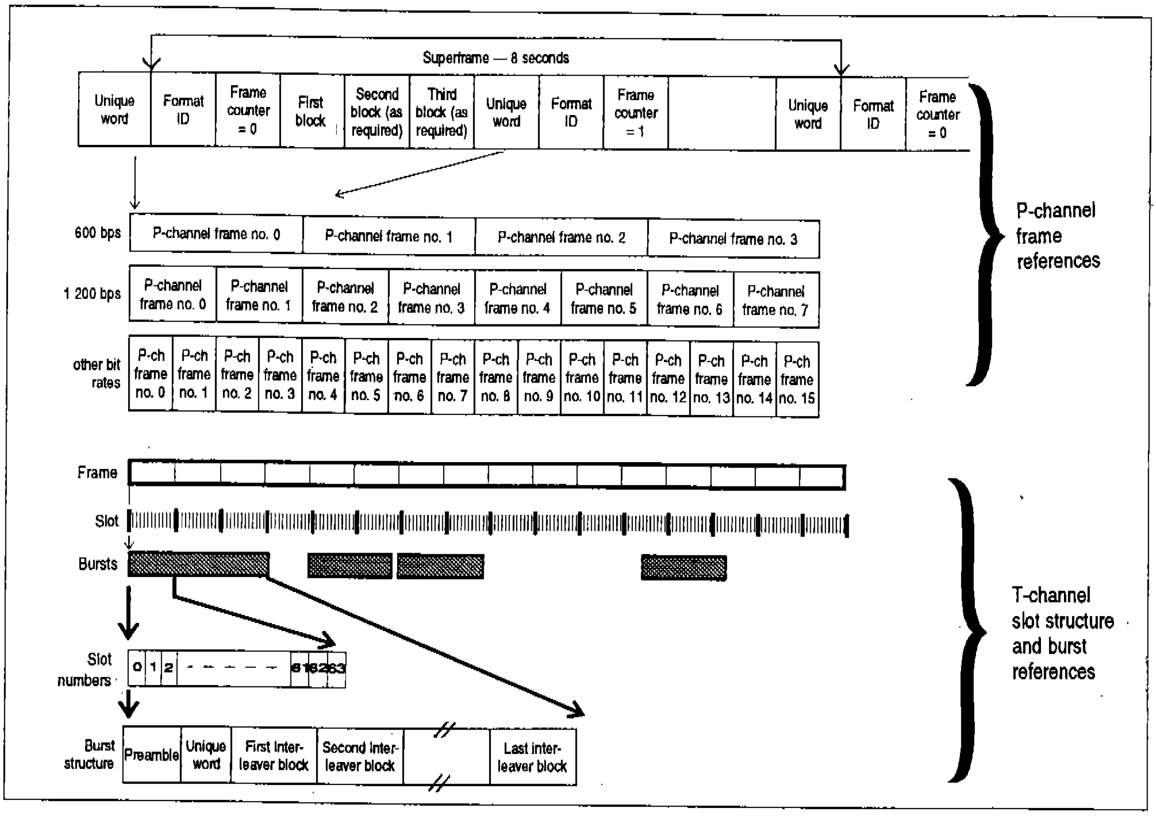

Figure 4-7. Timing references between P and T channels

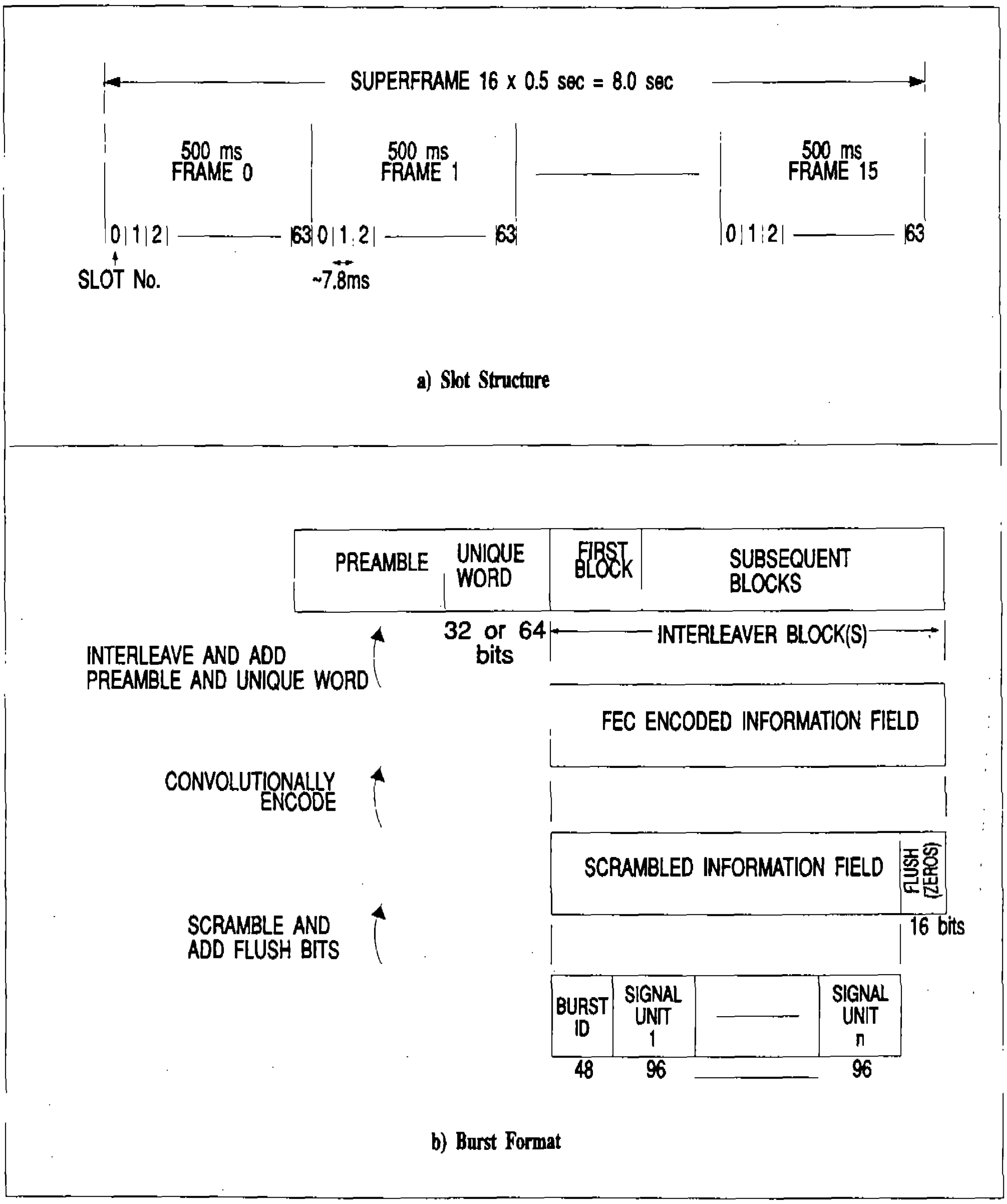

Figure 4-8. T channel format

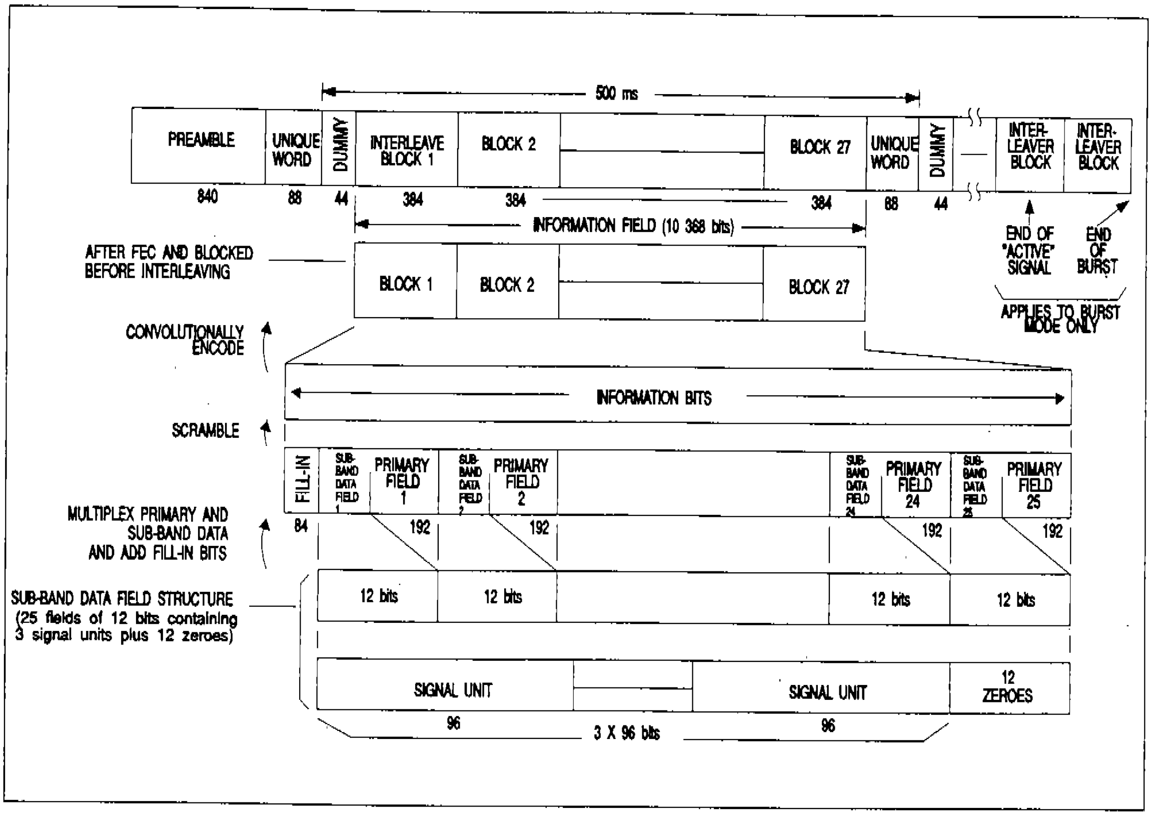

Figure 4-9. C channel format at 21.0 kbits/s channel rate

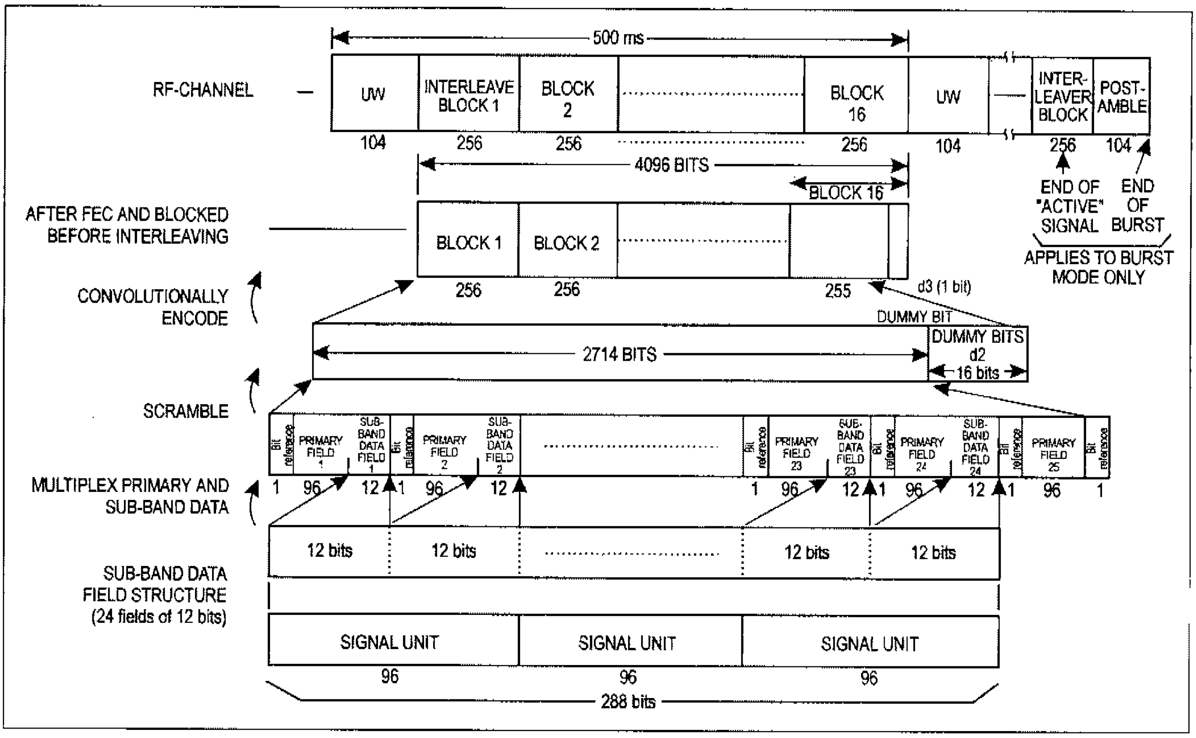

Figure 4-9 *bis*. C channel format at 8.4 kbits/s channel rate

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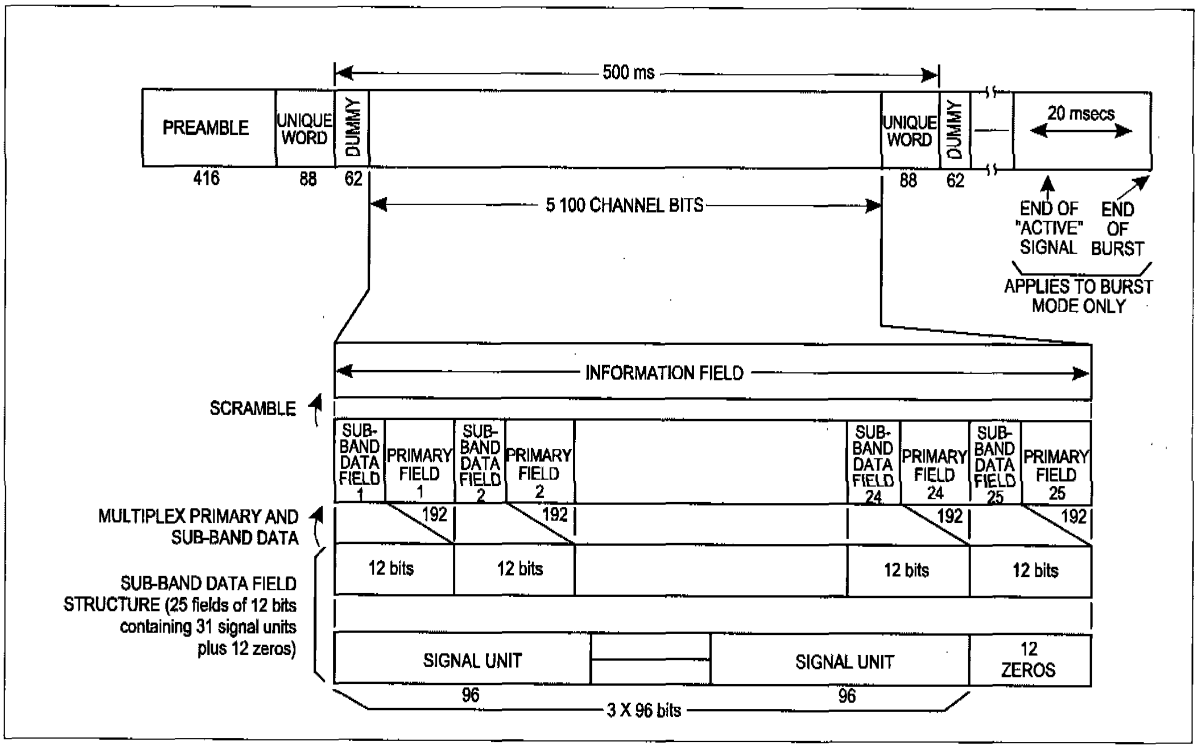

Figure 4-10. C channel format at 10.5 kbits/s channel rate

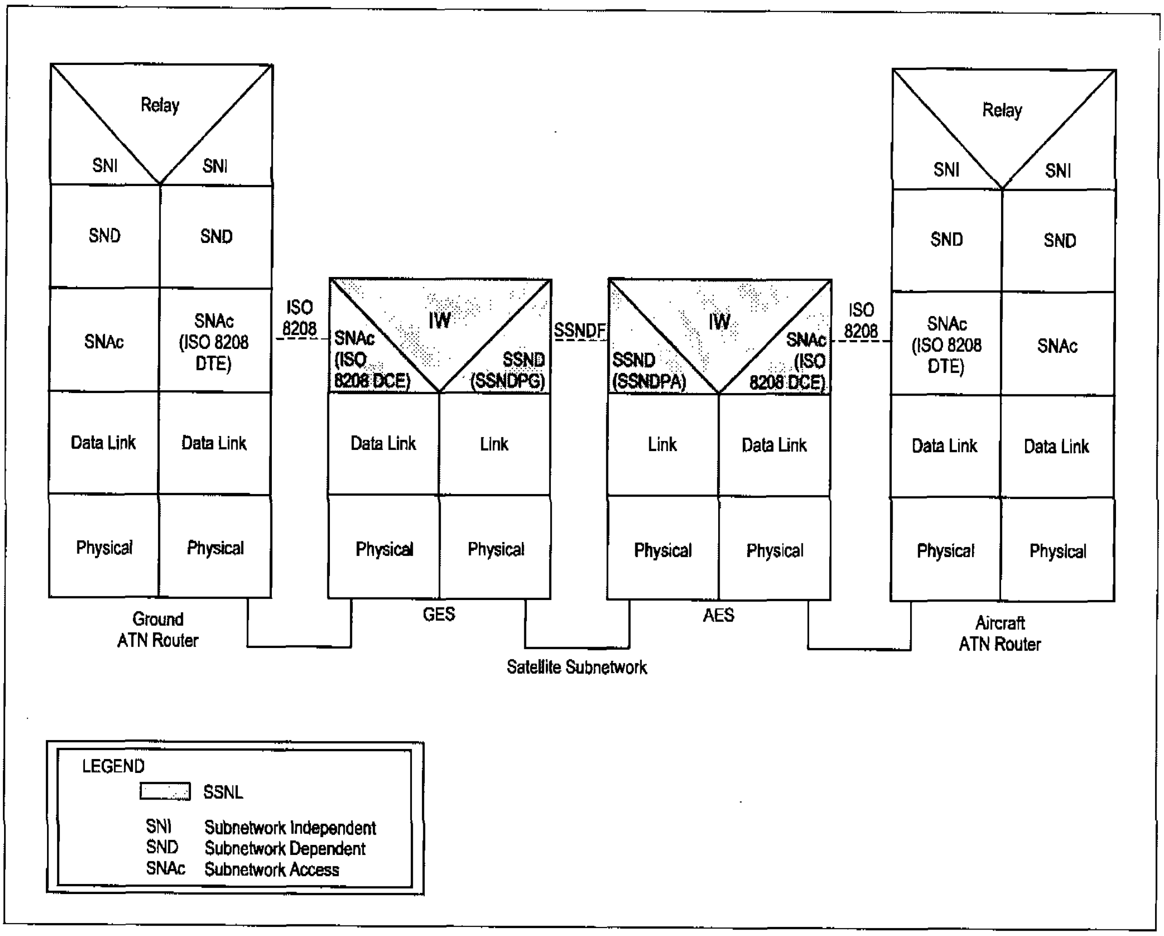

Figure 4-11. The SSNL functions and the ATN satellite subnetwork

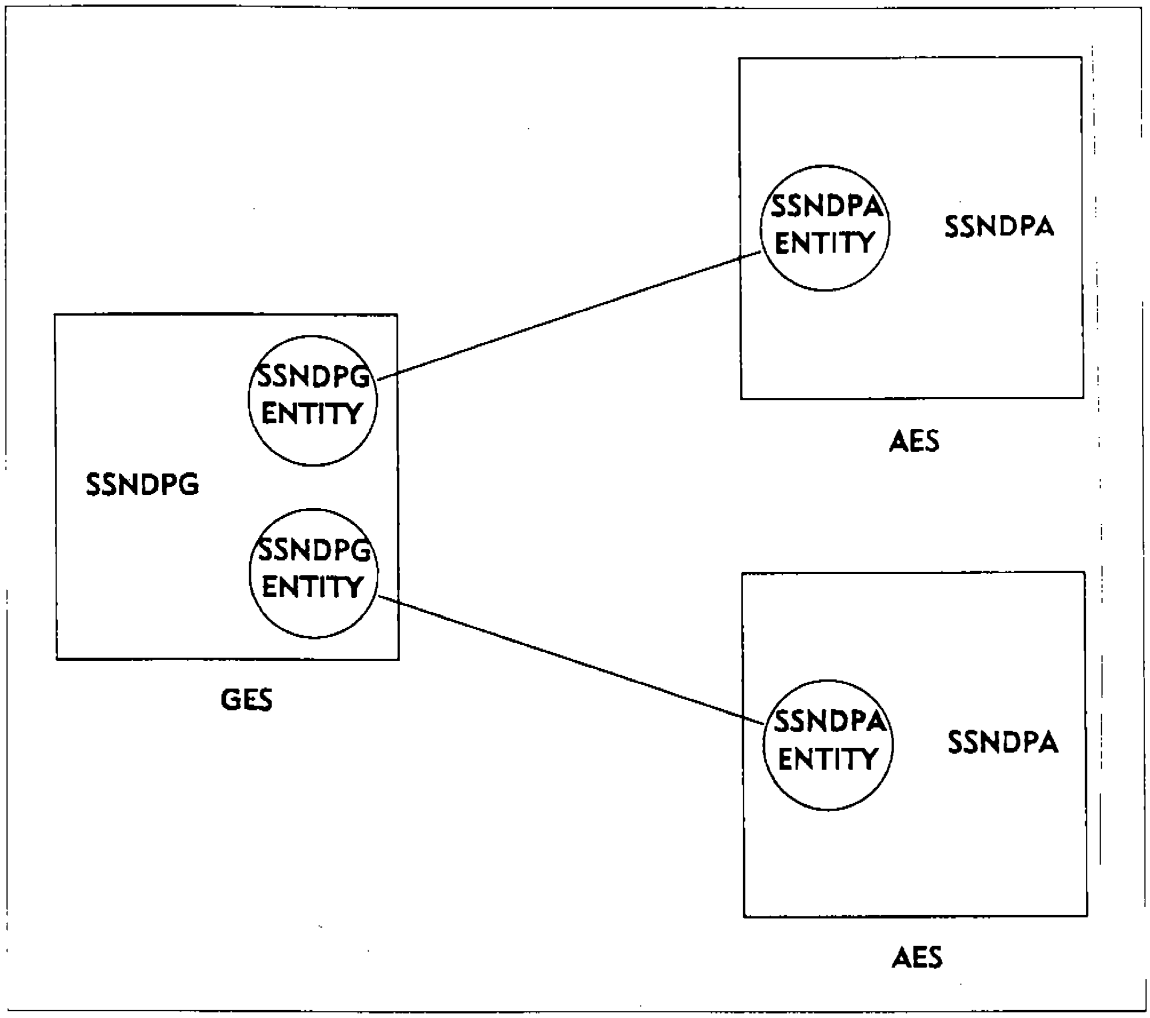

Figure 4-12. SSNDPX entities

Bits

Octets	8	7	6	5	4	3	2	1
1	M	D	SNPDU type identifier					
2	Logical channel number							
	Additional fields depending on SNPDU type							

Figure 4-13. General format of a SNPDU

Bits

Octets	8	7	6	5	4	3	2	1
1	0	X	X	0	0	X	X	X
2	Logical channel number							
3	DTE address length							
	Called DTE **							
	Calling DTE **							
	Called NSAP *							
	Calling NSAP *							
	Facility field length *							
	Facilities *							
	Call user data *							

* if present
** if length not equal to 0

Figure 4-14. Connection request SNPDU format

<table>
<tr><td></td><td></td><td colspan="8">Bits</td></tr>
<tr><td></td><td></td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td rowspan="6">Octets</td><td>1</td><td>0</td><td>X</td><td>0</td><td>0</td><td>1</td><td>0</td><td>X</td><td>X</td></tr>
<tr><td>2</td><td colspan="8">Logical channel number</td></tr>
<tr><td></td><td colspan="8">Called NSAP address *</td></tr>
<tr><td></td><td colspan="8">Facility field length *</td></tr>
<tr><td></td><td colspan="8">Facilities *</td></tr>
<tr><td></td><td colspan="8">Call user data *</td></tr>
</table>

* if present

Figure 4-15. Connection confirm SNPDU format

<table>
<tr><td></td><td></td><td colspan="8">Bits</td></tr>
<tr><td></td><td></td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td rowspan="6">Octets</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>X</td><td>0</td></tr>
<tr><td>2</td><td colspan="8">Logical channel number</td></tr>
<tr><td></td><td colspan="8">Called NSAP address *</td></tr>
<tr><td></td><td colspan="8">Clearing cause</td></tr>
<tr><td></td><td colspan="8">Diagnostic code</td></tr>
<tr><td></td><td colspan="8">Clear user data *</td></tr>
</table>

* if present

Figure 4-16. Connection released SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	0	1	1	0	0	0
2	Logical channel number							

Figure 4-17. Connection release complete SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	M	D	1	1	0	0	0	0
2	Logical channel number							
3	SNPDU number							
	User data							

Figure 4-18. Data SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	0	0	1	0
2	Logical channel number							
	Interrupt user data							

Figure 4-19. Interrupt data SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	1	0
2	Logical channel number							

Figure 4-20. Interrupt confirm SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	0	0	1	1
2	Logical channel number							
3	Resetting cause							
4	Diagnostic code							

Figure 4-21. Reset SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	1	1
2	Logical channel number							

Figure 4-22. Reset confirm SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	0	1
2	Logical channel number							
3	Flow control reason							
4	SNPDU number							

Figure 4-23. Flow control (suspend) SNPDU format

Bits

Octets	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	0	1
2	Logical channel number							
3	Flow control reason							

Figure 4-24. Flow control (resume) SNPDU format

Bits

	8	7	6	5	4	3	2	1
Code:	0	0	0	0	0	0	1	0

	8 7 6 5	4 3 2 1
Parameter field:	from the called DTE *	from the calling DTE *

* The four bits indicating each throughput class are binary coded and correspond to throughput classes as indicated on the right

Bits: 8765 or Bits: 4321	Throughput class (bits/s) as defined in ISO-8208
0000	Reserved
0001	Reserved
0010	Reserved
0011	75
0100	150
0101	300
0110	600
0111	1200
1000	2400
1001	4800
1010	9600
1011	19200
1100	48000
1101	64000
1110	Reserved
1111	Reserved

Figure 4-25. Throughput class negotiation (TCN) facility field

Bits

	8	7	6	5	4	3	2	1
Code:	0	1	0	0	1	0	0	1

	8 7 6 5 4 3 2 1
Parameter field: Octet 1	Transit delay expressed in millisecond (higher order bits)
Octet 2	Transit delay expressed in millisecond (lower order bits)

Figure 4.26. Transit delay selection and indication facility format

Bits

	8	7	6	5	4	3	2	1
Code:	0	0	0	0	0	0	0	1

	8	7	6	5	4	3	2	1
Parameter field:	0	0	0	0	0	0	0	0

Figure 4-27. Fast select (use not permitted) facility format

Bits

	8	7	6	5	4	3	2	1
Code:	0	0	0	0	1	0	1	1

	8	7	6	5	4	3	2	1
Parameter field:	0	0	0	0	0	0	0	0

Figure 4-28. Expedited data negotiation ("no use of expedited data") facility format

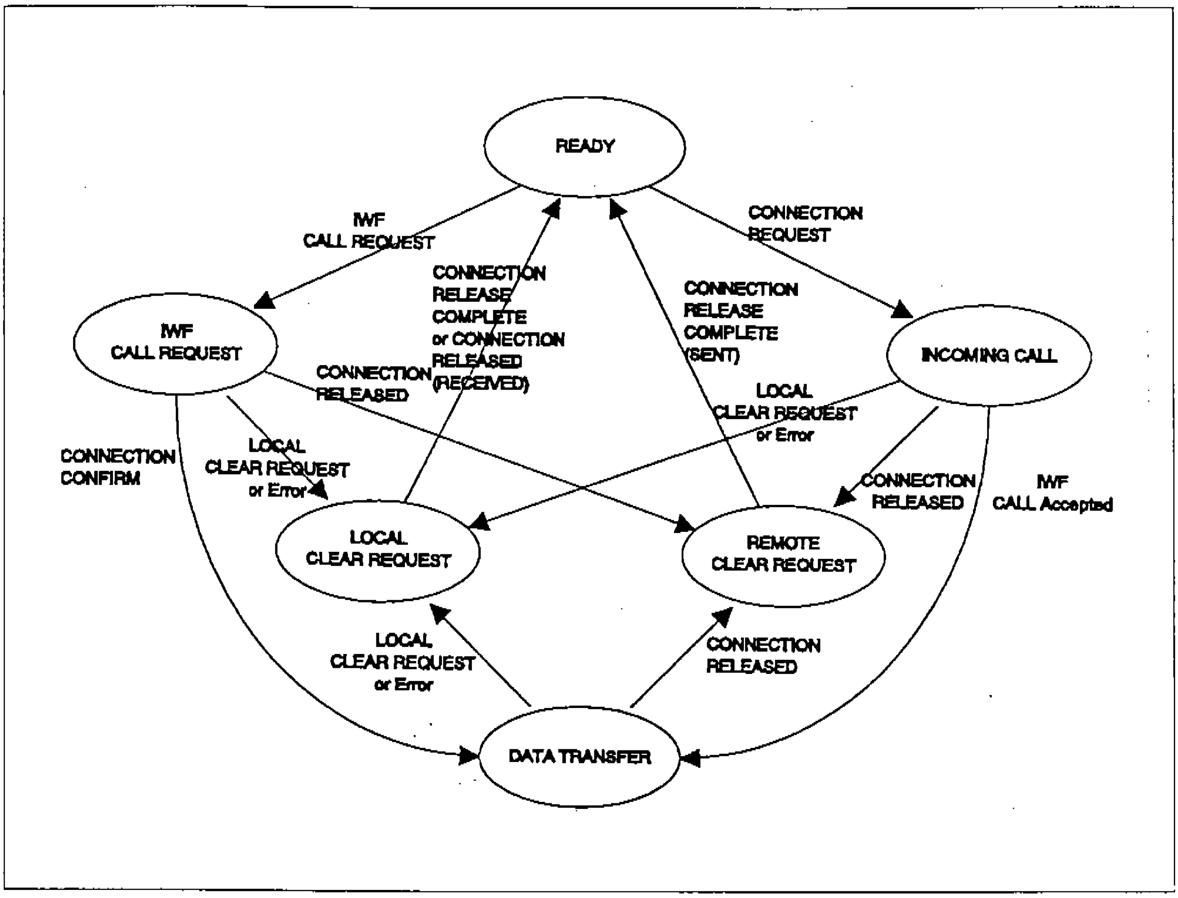

Figure 4-29. Connection establishment and release state diagram

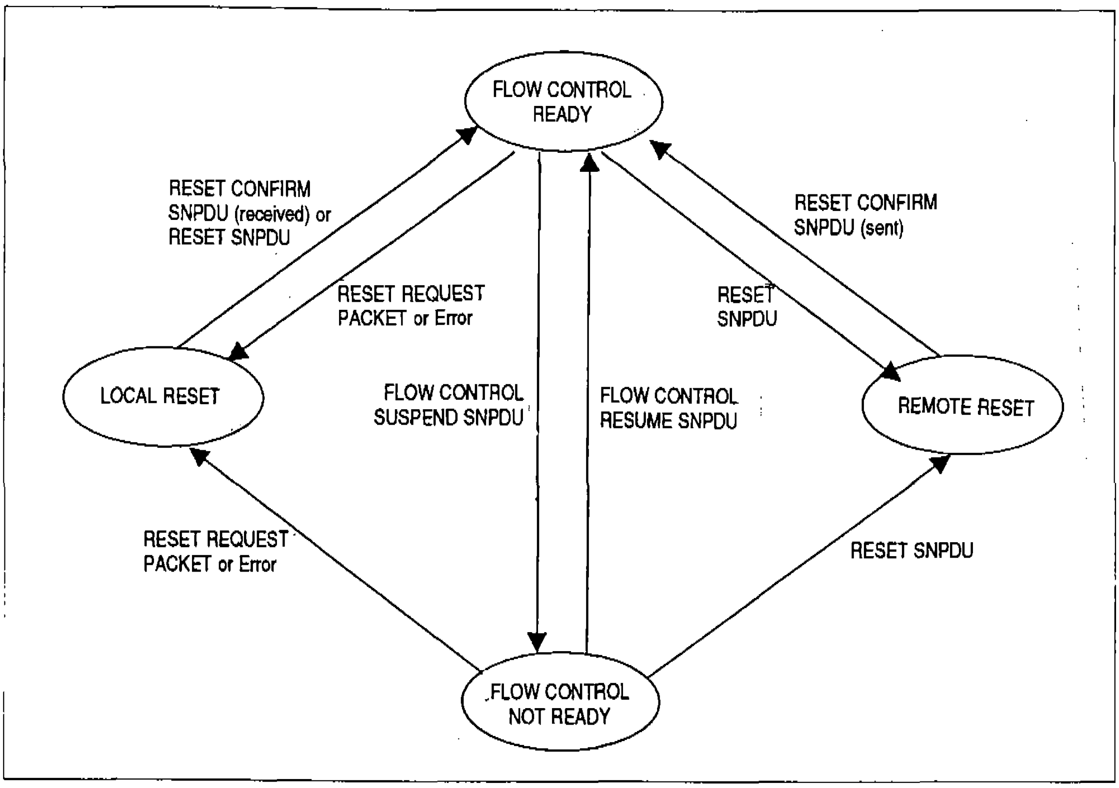

Figure 4-30. Reset and flow control state diagrams within the data transfer state

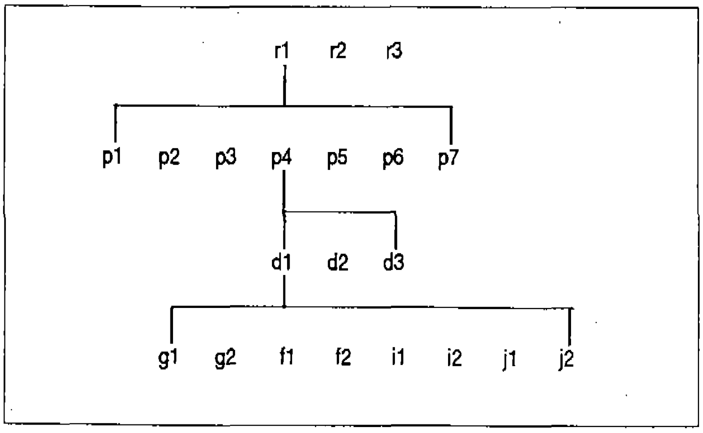

Figure 4-31. ISO-8208 DCE sub-state hierarchy

Appendix 1 to Chapter 4

RESPONSE MASKS OF A-BPSK AND A-QPSK FILTERS

Table A1-1. Required filter amplitude versus frequency response limits for A-BPSK

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
0	0.25	0	–0.25
0.8	0.25	0.6	–0.25
1.133	–3.5	0.9	–2.5
1.333	–12	1.05	–5.5
1.533	–40	1.22	–12
—	—	1.333	–28
—	—	1.333	–45

The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate divided by 2, and the amplitude is normalized to 0 dB at a frequency of 0. This mask is illustrated in the guidance material.

Table A1-2. Required filter phase versus frequency response limits for A-BPSK and A-QPSK for 100 per cent roll-off

Upper bound		Lower bound	
Normalized frequency	Phase response (deg)	Normalized frequency	Phase response (deg)
0	1.8	0	–1.8
1.0	1.8	1.0	–1.8
1.0	2.8	1.0	–2.8
1.25	≥2.8	1.25	≤–2.8

The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate divided by 2, and the amplitude is normalized to 0 dB at a frequency of 0. This mask is illustrated in the guidance material.

Table A1-2 *bis*. Required filter phase versus frequency response limits for A-QPSK for 60 per cent roll off

Upper bound		Lower bound	
Normalized frequency	Phase response (deg)	Normalized frequency	Phase response (deg)
0	1.8	0	–1.8
0.25	1.8	0.25	–1.8
0.25	2.8	0.25	–2.8
0.31	≥2.8	0.31	≤–2.8

The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate divided by 2, and the amplitude is normalized to 0 dB at a frequency of 0. This mask is illustrated in the guidance material.

Table A1-3. Required filter amplitude versus frequency response limits for A-QPSK for 100 per cent roll-off

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
0	0.25	0	–0.25
0.3	0.25	0.2	–0.25
0.7	–1	0.5	–1
1.1	–3	0.9	–3
1.5	–6	1.2	–6
1.7	–10	1.5	–10
2.0	–20	1.7	–16
2.5	–40	1.733	–27
3.0	–40	1.733	–40

The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate divided by 4, and the amplitude is normalized to 0 dB at a frequency of 0. This mask is illustrated in the guidance material.

Table A1-3 *bis*. Required filter amplitude versus frequency response limits for A-QPSK for 60 per cent roll-off

Upper bound		Lower bound	
Normalized frequency	Amplitude response (dB)	Normalized frequency	Amplitude response (dB)
0	0.25	0	–0.25
0.5	0.25	0.43	–0.25
0.64	0	0.64	–1
0.93	–1.6	0.93	–2.6
1.14	–4.4	1.14	–6.4
1.36	–8	1.36	–11
1.5	–13	1.43	–15
1.64	–22	1.5	–25
1.71	–35		
3.36	–40		
16.67	–40		

The mask shall be defined by drawing straight lines through the above points where frequencies are normalized to the channel rate divided by 4, and the amplitude is normalized to 0 dB at a frequency of 0. This mask is illustrated in the guidance material.

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Appendix 2 to Chapter 4
SIGNAL UNIT FORMATS

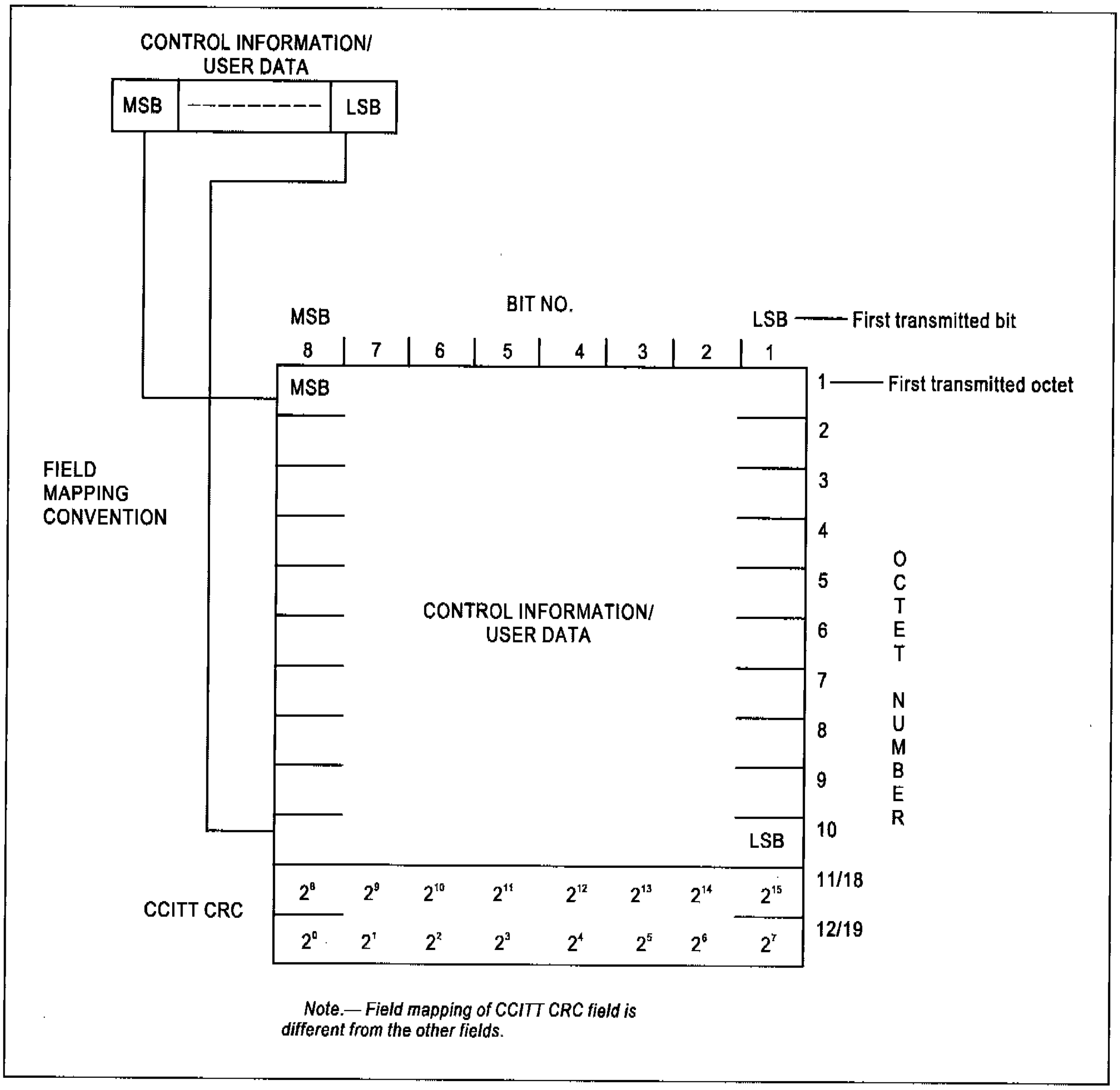

Figure A2-1. Signal unit field mapping and bit transmission order

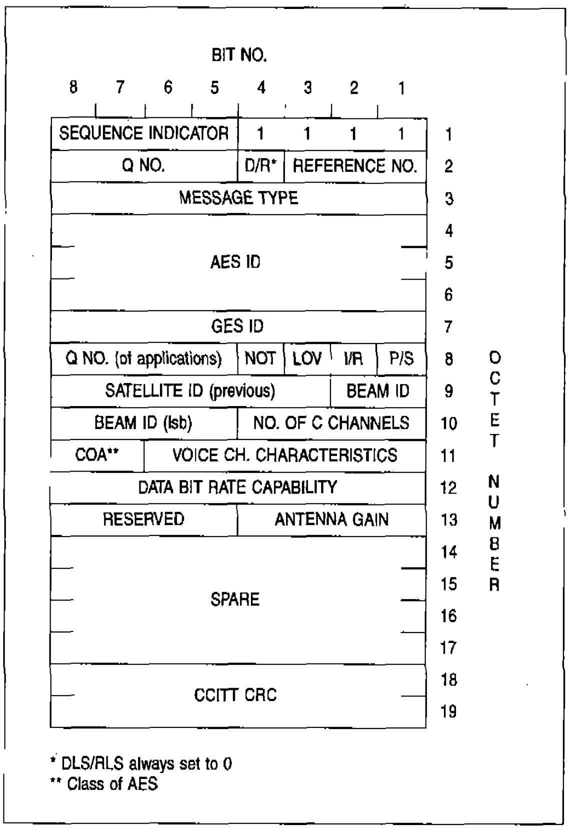

Figure A2-2. Log-on request — R channel

BIT NO. 8 7 6 5 4 3 2 1					OCTET NUMBER
MESSAGE TYPE					1
AES ID					2–4
GES ID					5
Q NO.	TDMA	P/R	RES*	RES*	6
SATELLITE ID (previous)			BEAM ID		7
BEAM ID (lsb)	INIT. EIRP (R/T CH)				8
CLASS OF AES	VOICE CH. CHARACTERISTICS				9
REFERENCE NO.					10
CCITT CRC					11–12

* Reserved

Figure A2-3. Log-on confirm — P channel

BIT NO. 8 7 6 5 4 3 2 1		OCTET NUMBER
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	REFERENCE NO.	6
SPARE		7–10
CCITT CRC		11–12

Figure A2-4. Log control — P channel
Log-on interrogation/log-on prompt/
log-off acknowledgement/data channel reassignment

BIT NO. 8 7 6 5 4 3 2 1		OCTET NUMBER
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	REFERENCE NO.	6
REASON		7
SPARE		7–10
CCITT CRC		11–12

Figure A2-5. Log control — P channel
Log-on reject

BIT NO. 8 7 6 5 4 3 2 1		OCTET NUMBER
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	REFERENCE NO.	6
SPARE		7–10
CCITT CRC		11–12

Figure A2-6. Log control — P channel
Log-off request

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–1			Octet number
MESSAGE TYPE			1
AES ID			2–4
GES ID			5
Q NO.		RESERVED	6
SOURCE	SERVICE DIRECTION	SERVICE ID	7
Q NO. (of message)		REF. NO. (of message)	8
SPARE	MESSAGE LENGTH		9
SPARE			10
CCITT CRC			11–12

Figure A2-7. Access request data — T channel
Request for reservation (REQ)

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–1			Octet number
MESSAGE TYPE			1
AES ID			2–4
GES ID			5
Q NO.		APPLICATION REF. NO.	6
SOURCE	SERVICE DIRECTION	SERVICE ID	7
CIRCUIT DATA RATE		RESERVED	8
SPARE	VOICE CH. CHARACTERISTICS		9
CALLED TERMINAL ID (units digit)		CALLED TERMINAL ID (tens digit)	10
CCITT CRC			11–12

Figure A2-8. Call announcement telephone — P channel

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–1		Octet number
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	APPLICATION REF. NO.	6
RESERVED	SEQUENCE NO.	7
CALLING TERMINAL ID (units digit)	CALLING TERMINAL ID (tens digit)	8
DIGIT 3	DIGIT 2	9
DIGIT 5	DIGIT 4	10
CCITT CRC		11–12

Figure A2-9. Call information telephone — from-aircraft sub-band C channel
Service address (ISU)

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–1				Octet number
1	1	SEQUENCE NO.		1
Q NO.			APPLICATION REF. NO.	2
DIGIT 7			DIGIT 6	3
DIGIT 9			DIGIT 8	4
RESERVED			RESERVED	5
RESERVED			RESERVED	6
RESERVED			RESERVED	7
RESERVED			RESERVED	8
SPARE			SPARE	9
SPARE			SPARE	10
CCITT CRC				11–12

Figure A2-10. Call information telephone — from-aircraft sub-band C channel
Service address (SSU)

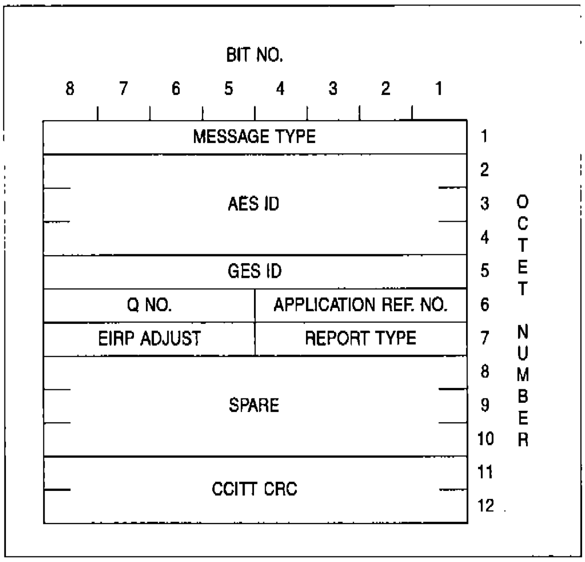

Figure A2-11. Call progress — to-aircraft sub-band C channel
Channel status report

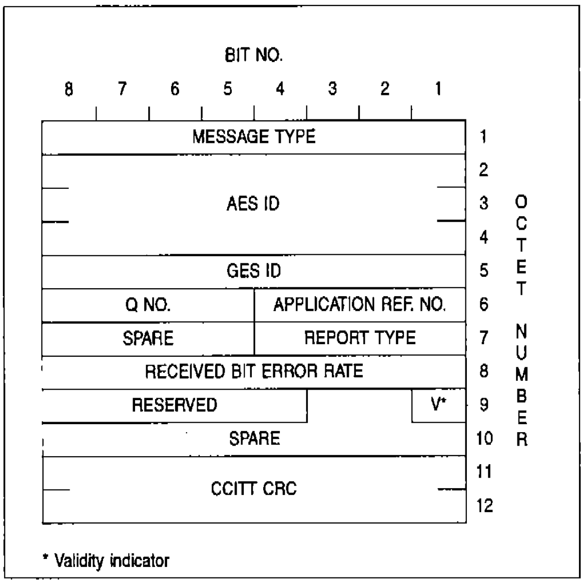

Figure A2-12. Call progress — from-aircraft sub-band C channel
Channel status report

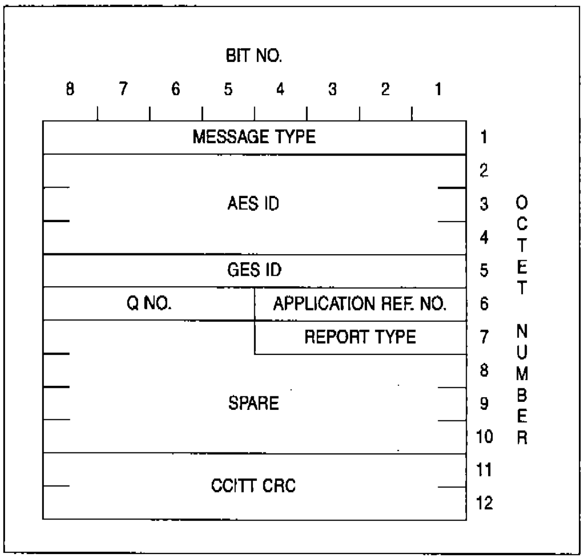

Figure A2-13. Call progress — To-/from-aircraft sub-band C channel
Connect

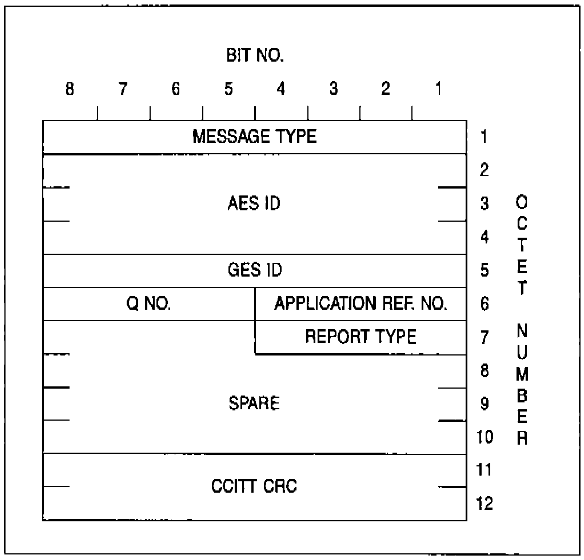

Figure A2-14. Call progress — To-/from-aircraft sub-band C channel
Test

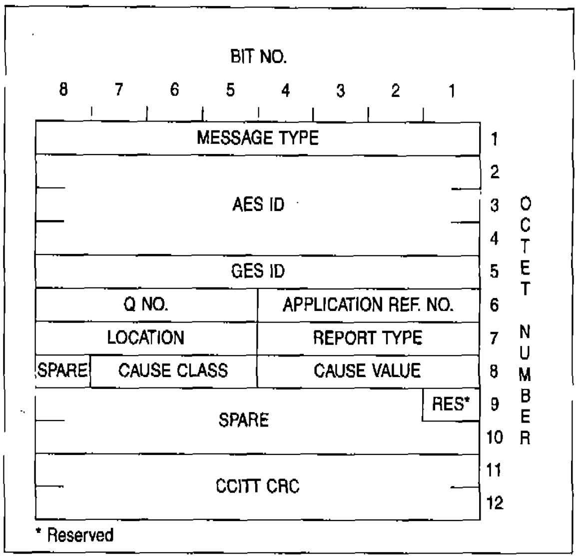

Figure A2-15. Call progress — P or to-/from-aircraft sub-band C channel
Call attempt result

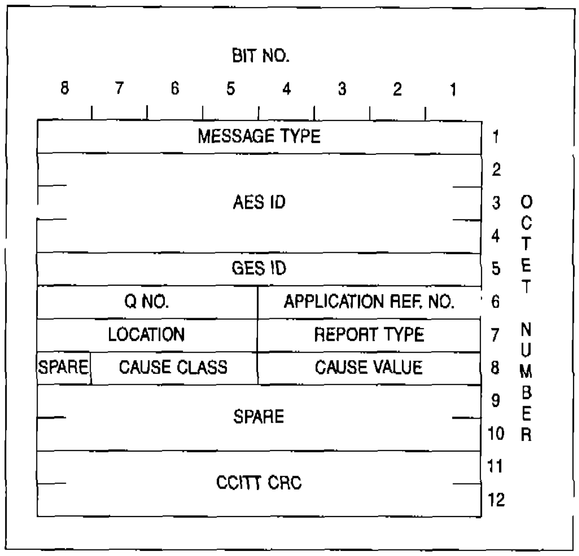

Figure A2-16. Call progress — P or to-/from-aircraft sub-band C channel
Channel release

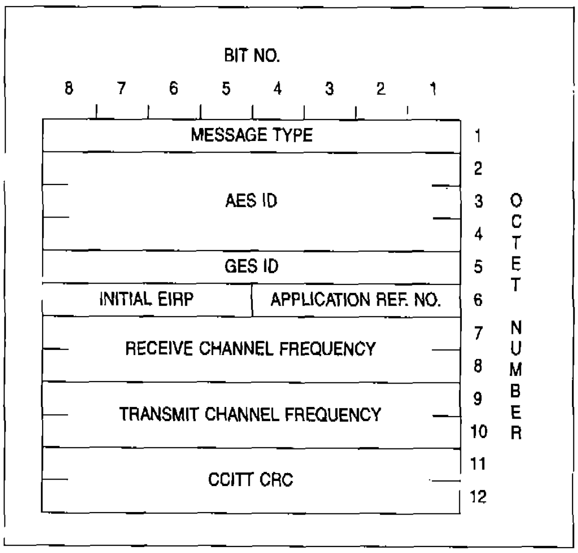

Figure A2-17. C channel assignment — P channel

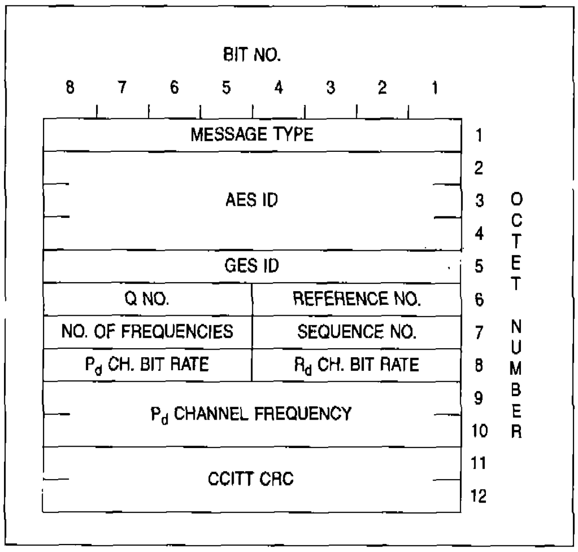

Figure A2-18. P/R channel control — P channel
(ISU)

BIT NO. 8 7	BIT NO. 6 5 4 3 2 1	OCTET NUMBER
1 1	SEQUENCE NO.	1
Q NO.	REFERENCE NO.	2
R_d CHANNEL NO. 0(4) FREQUENCY		3–4
R_d CHANNEL NO. 1(5) FREQUENCY		5–6
R_d CHANNEL NO. 2(6) FREQUENCY		7–8
R_d CHANNEL NO. 3(7) FREQUENCY		9–10
CCITT CRC		11–12

Figure A2-19. P/R channel control — P channel
(SSU)

BIT NO. 8 7 6 5	BIT NO. 4 3 2 1	OCTET NUMBER
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	REFERENCE NO.	6
NO. OF FREQUENCIES	SEQUENCE NO.	7
SPARE	CH. NO. 0 BIT RATE	8
TDMA CHANNEL NO. 0 FREQUENCY		9–10
CCITT CRC		11–12

Figure A2-20. T channel control — P channel
(ISU)

BIT NO. 8 7 6 5	BIT NO. 4 3 2 1	OCTET NUMBER
1 1	SEQUENCE NO.	1
Q NO.	REFERENCE NO.	2
TDMA CHANNEL NO. 1 FREQUENCY		3–4
TDMA CHANNEL NO. 2 FREQUENCY		5–6
TDMA CHANNEL NO. 3 FREQUENCY		7–8
CH. NO. 2 BIT RATE	CH. NO. 1 BIT RATE	9
SPARE	CH. NO. 3 BIT RATE	10
CCITT CRC		11–12

Figure A2-21. T channel control — P channel
(SSU)

BIT NO. 8 7 6 5	BIT NO. 4 3 2 1	OCTET NUMBER
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO.	SPARE	6
SPARE		7
NO. OF BURSTS RESERVED	BURST LENGTH	8
STARTING SLOT NUMBER	T_X CH. NO.	9
BURST INTERVAL	STARTING FRAME NO.	10
CCITT CRC		11–12

Figure A2-22. Unsolicited reservation — P channel

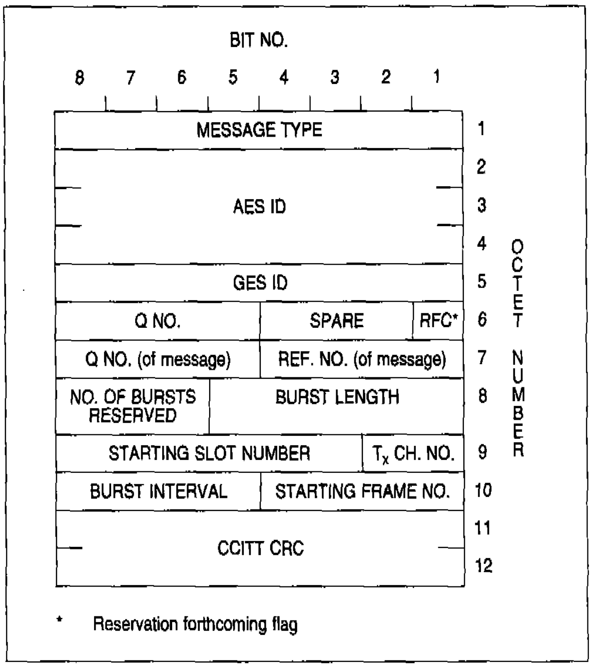

Figure A2-23. T channel assignment — P channel
RES SU

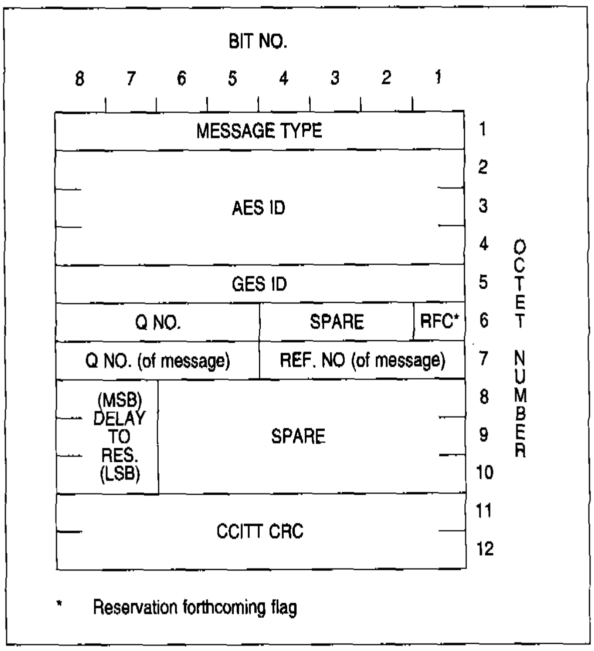

Figure A2-24. Reservation forthcoming — P channel
RFC LSU

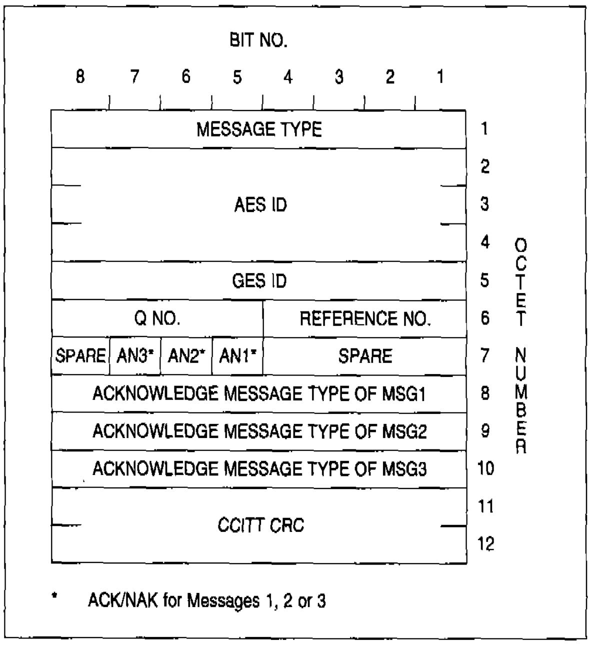

Figure A2-25. Log-on acknowledgement — P channel

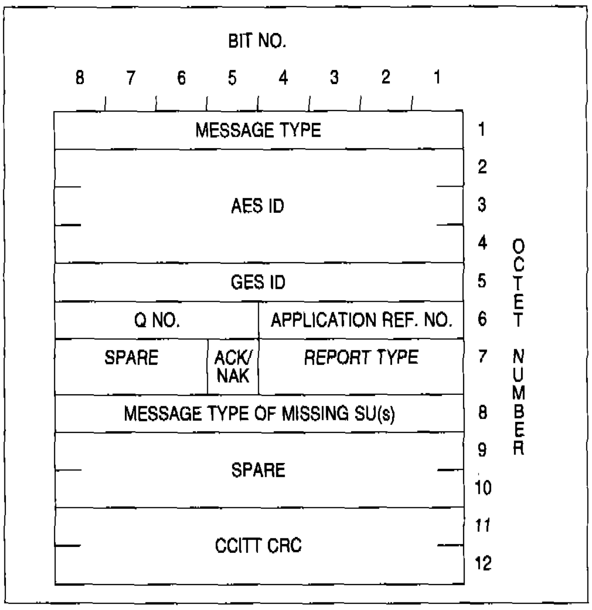

Figure A2-26. Telephony acknowledgement — P/sub-band C channel

BIT NO. 8 7 6 5 4 3 2 1

Field		Octet number
MESSAGE TYPE		1
AES ID		2–4
GES ID		5
Q NO. (of message)	REF. NO. (of message)	6
SPARE	MESSAGE LENGTH	7
SPARE		8–10
CCITT CRC		11–12

Figure A2-27. Request for acknowledgement — P channel

BIT NO. 8 7 6 5 4 3 2 1

Field			Octet number
MESSAGE TYPE			1
AES ID			2–4
GES ID			5
Q NO. (of message)		REF. NO. (of message)	6
CH. TYPE	NO. OF SSU NK*	ACKNOWLEDGE CONTROL	7
SPARE		SSU SEQUENCE IND.+	8
SPARE		SSU SEQUENCE IND**	9
SPARE		RESERVED	10
CCITT CRC			11–12

* Number of SSUs in acknowledgement indicating error
** Spare in RACK identifying one missing SU and in RACK indicating no error
\+ Spare in RACK indicating no error

Figure A2-28. Acknowledgement — P channel
R channel acknowledgement (RACK)

BIT NO. 8 7 6 5 4 3 2 1

Field			Octet number
MESSAGE TYPE			1
AES ID			2–4
GES ID			5
Q NO. (of message)		REF. NO. (of message)	6
CH. TYPE	NO. OF SSU NK*	ACKNOWLEDGE CONTROL	7
(MSB) DELAY TO RES. (LSB)	SSU SEQUENCE NO.**		8
	SSU SEQUENCE NO.**		9
	SSU SEQUENCE NO.**		10
CCITT CRC			11–12

* Number of SSUs in acknowledgement indicating error
** Spare in TACK requesting complete retransmissions and in TACK indicating no error
\+ Spare in TACK indicating no error

Figure A2-29. Acknowledgement — P channel
T channel acknowledgement (TACK)

BIT NO. 8 7 6 5 4 3 2 1

Field			Octet number
MESSAGE TYPE			1
REVISION NO.			2
INITIAL SEQ. NO. OF A2-31 (PARTIAL)	DETC**	EXS*	3
INITIAL SEQ. NO. OF A2-32 & 33 (PARTIAL)	DETP++	EXS*	4
INITIAL SEQ. NO. OF A2-34 (PARTIAL)	SPARE	EXS*	5
INITIAL SEQ. NO. OF A2-31 (COMP)	SPARE	EXS*	6
INITIAL SEQ. NO. OF A2-32 & 33 (COMP)	SPARE	EXS*	7
INITIAL SEQ. NO. OF A2-34 (COMP)	SPARE	EXS*	8
INITIAL SEQ. NO. OF 2nd 2-31 (COMP)	SPARE	EXS*	9
SPARE		SBS+	10
CCITT CRC			11–12

* Existence
\+ Spot beam series
** Data EIRP Table — Complete
++ Data EIRP Table — Partial

Figure A2-30. AES system table broadcast — P channel
Global beam series index

BIT NO. 8 7 6 5 4 3 2 1	OCTET NUMBER
MESSAGE TYPE	1
REVISION NO.	2
SEQUENCE NO. / LSU NO.	3
GES ID	4
CHANNEL FREQUENCY	5–6
CHANNEL FREQUENCY	7–8
CHANNEL FREQUENCY	9–10
CCITT CRC	11–12

Figure A2-31. AES system table broadcast — P channel
GES P/R channel advice

BIT NO. 8 7 6 5 4 3 2 1	OCTET NUMBER
MESSAGE TYPE	1
REVISION NO.	2
SEQUENCE NO. / SATELLITE ID	3
SATELLITE ID (lsb) / SATELLITE INCLINATION / SF*	4
SATELLITE RIGHT ASCENSION	5
SATELLITE LONGITUDE	6
SATELLITE/BEAM-IDENTIFYING P_{smc} CHANNEL FREQUENCY #1	7–8
SATELLITE/BEAM-IDENTIFYING P_{smc} CHANNEL FREQUENCY #2	9–10
CCITT CRC	11–12

* Satellite flag

Figure A2-32. AES system table broadcast — P channel
Satellite/beam ID channel advice

BIT NO. 8 7 6 5 4 3 2 1	OCTET NUMBER
MESSAGE TYPE	1
REVISION NO.	2
SEQUENCE NO. / SATELLITE ID	3
SATELLITE ID (lsb) / BEAM ID 1 (msb)	4
BEAM ID 1 / BEAM ID 2	5
BEAM-IDENTIFYING P CHANNEL FREQUENCY FOR BEAM 1	6–7
BEAM-IDENTIFYING P CHANNEL FREQUENCY FOR BEAM 2	8–9
CH. BIT RATE BEAM 2 / CH. BIT RATE BEAM 1	10
CCITT CRC	11–12

Figure A2-33. AES system table broadcast — P channel
Beam ID channel advice

BIT NO. 8 7 6 5 4 3 2 1	OCTET NUMBER
MESSAGE TYPE	1
REVISION NO.	2
SEQUENCE NO. / SPARE	3
GES ID	4
GES BEAM SUPPORT TABLE	5–9
RESERVED	9
SPARE	10
CCITT CRC	11–12

Figure A2-34. AES system table broadcast — P channel
GES beam support advice

Part I

Annex 10 — Aeronautical Telecommunications

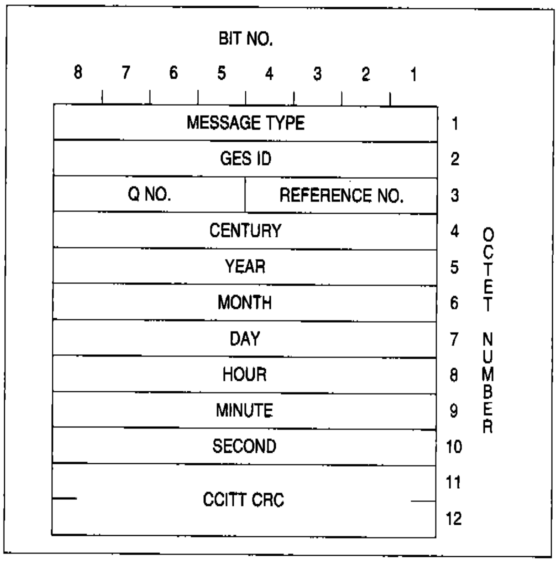

Figure A2-35. System broadcast — P channel
Universal Time

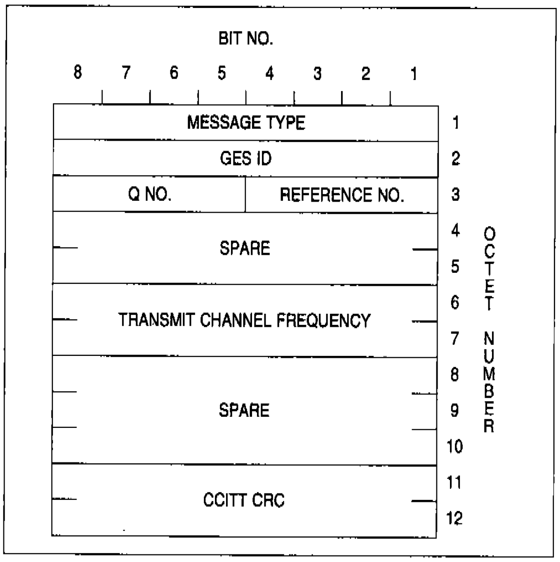

Figure A2-36. System broadcast — P channel
Selective release

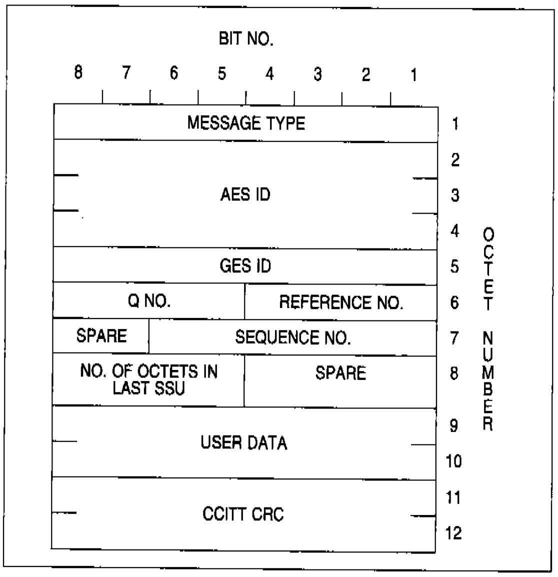

Figure A2-37. User data — P/T channel
ISU

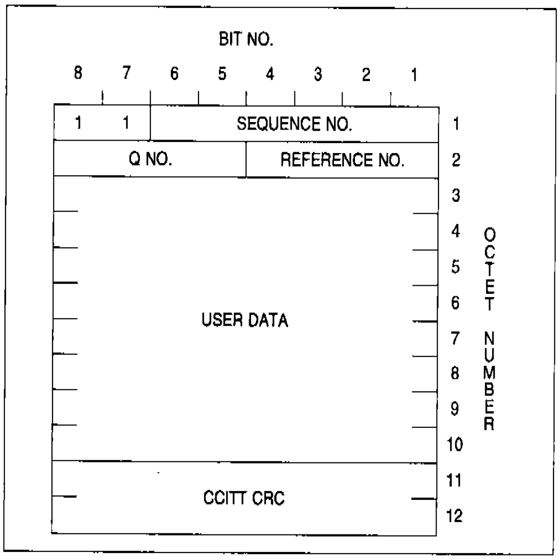

Figure A2-38. User data — P/T channel
SSU

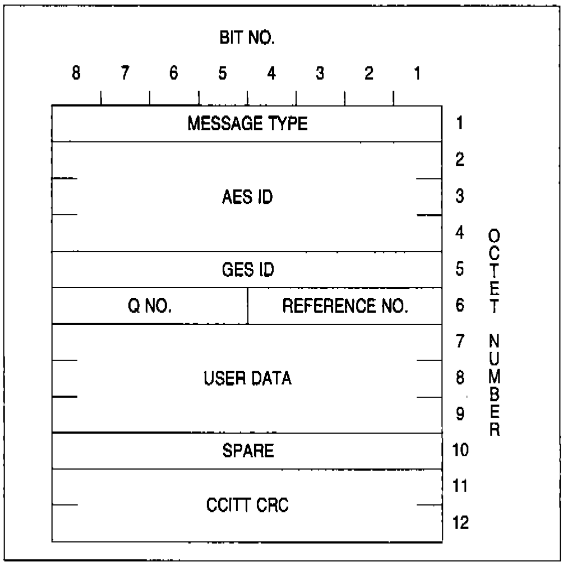

Figure A2-39. User data — P channel
3 octet LSU

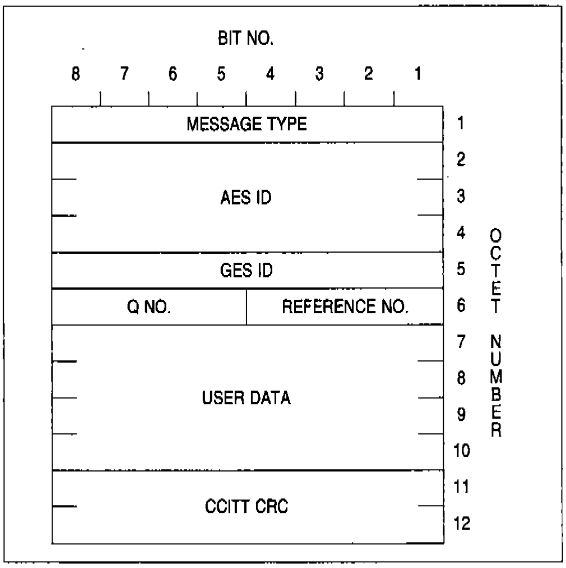

Figure A2-40. User data — P channel
4 octet LSU

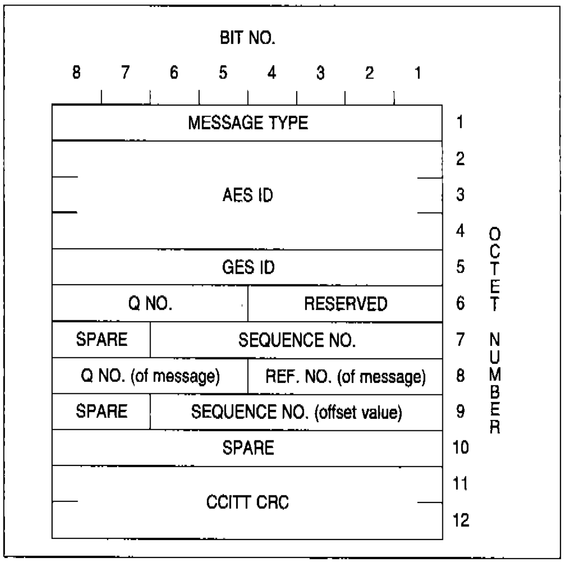

Figure A2-41. Retransmission header — P/T channel
RTX SU

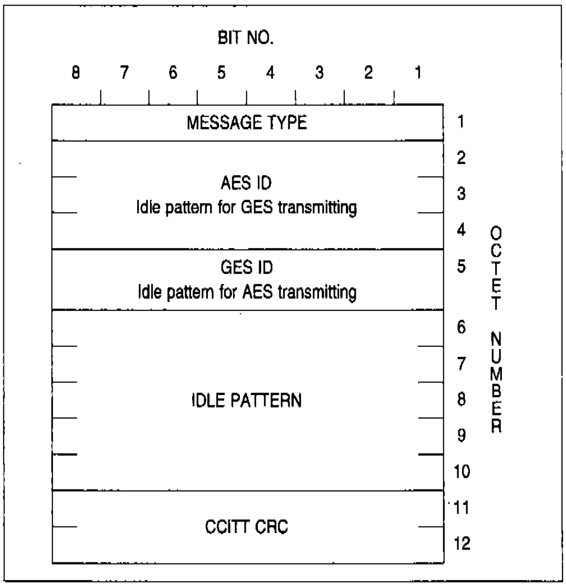

Figure A2-42. Fill-in — P, T and to-/from-aircraft sub-band C channel
FISU

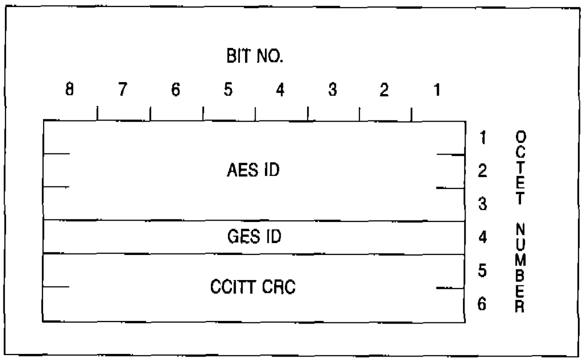

Figure A2-43. Burst identifier — T channel

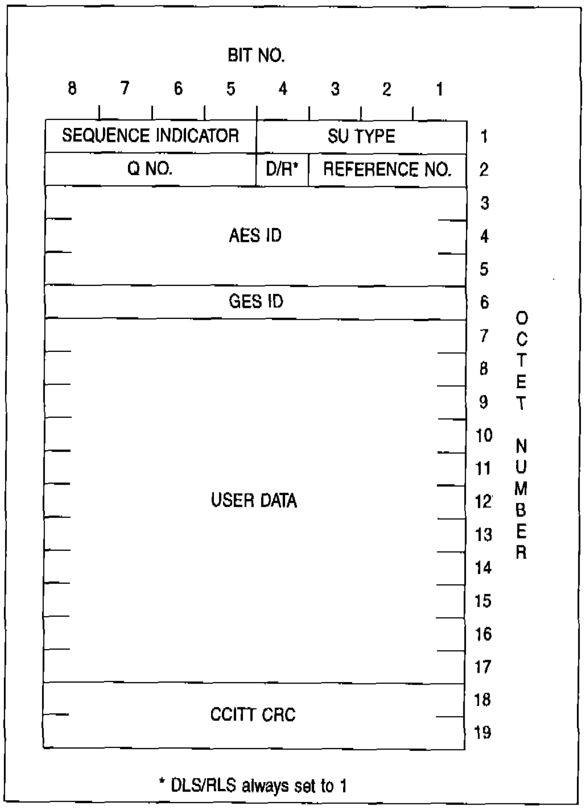

Figure A2-44. User data — R channel
ISU/SSU

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–5		Bits 4–1		Octet number
SEQUENCE INDICATOR		1 1 1 1		1
Q NO.		D/R*	RESERVED	2
MESSAGE TYPE				3
AES ID				4–6
GES ID				7
RESERVED		APPLICATION REF. NO.		8
SOURCE	SERVICE DIRECTION	SERVICE ID		9
RESERVED		NETWORK ID		10
RESERVED	VOICE CH. CHARACTERISTICS			11
DIGIT 1		DIGIT 0		12
SPARE				13–17
CCITT CRC				18–19

* DLS/RLS always set to 0

Figure A2-45. General access request telephone — R channel

BIT NO. 8 7 6 5 4 3 2 1

Bits 8–5		Bits 4–1		Octet number
SEQUENCE INDICATOR		1 1 1 1		1
Q NO.		D/R*	RESERVED	2
MESSAGE TYPE				3
AES ID				4–6
GES ID				7
RESERVED		APPLICATION REF. NO.		8
SOURCE	SERVICE DIRECTION	SERVICE ID		9
RESERVED		NETWORK ID		10
RESERVED	VOICE CH. CHARACTERISTICS			11
DIGIT 1		DIGIT 0		12
DIGIT 3		DIGIT 2		13
DIGIT 5		DIGIT 4		14
DIGIT 7		DIGIT 6		15
DIGIT 9		DIGIT 8		16
CALLING TERMINAL ID (units digit)		CALLING TERMINAL ID (tens digit)		17
CCITT CRC				18–19

* DLS/RLS always set to 0

Figure A2-46. Abbreviated access request telephone — R channel

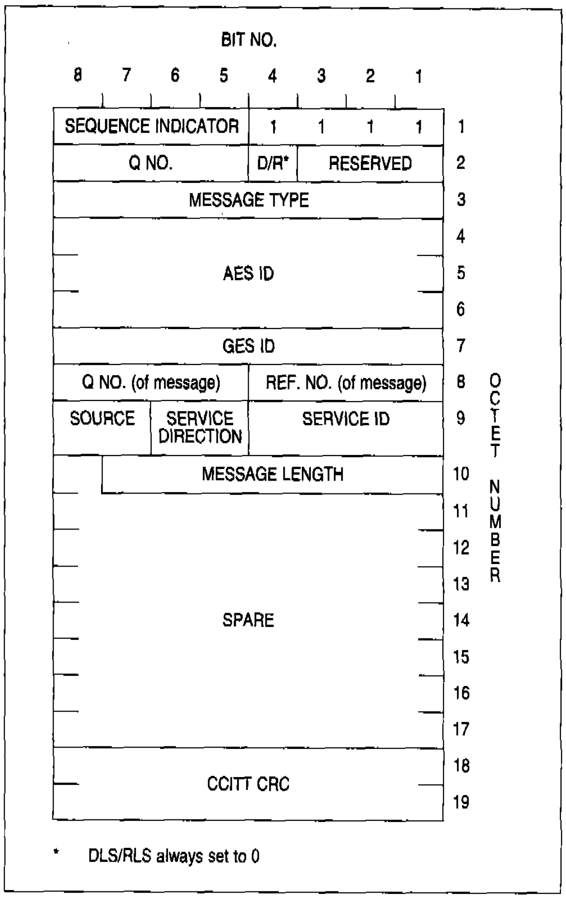

Figure A2-47. Access request data — R channel
Request for reservation (REQ)

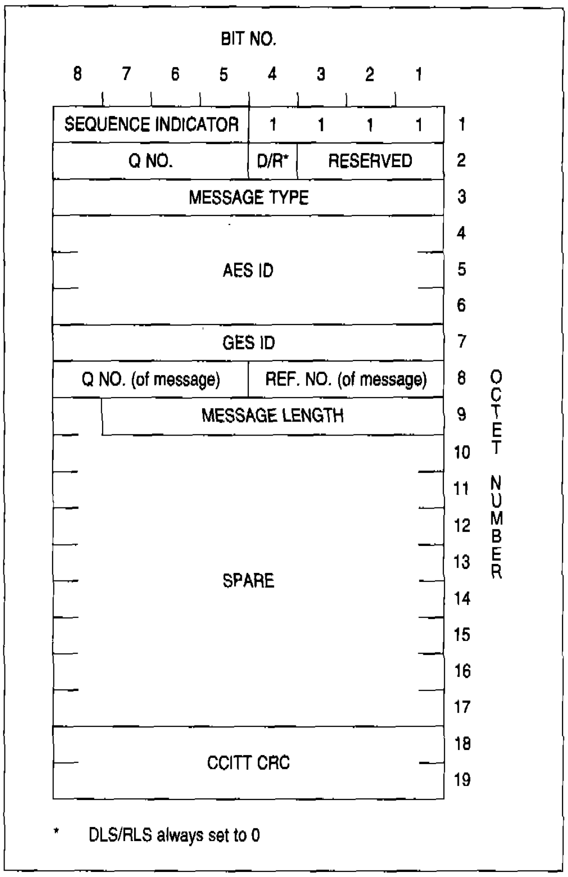

Figure A2-48. Request for acknowledgement — R channel
RQA SU

BIT NO.

8	7	6	5	4	3	2	1	OCTET NUMBER
SEQUENCE INDICATOR				1	1	1	1	1
Q NO.				D/R*	RESERVED			2
MESSAGE TYPE								3
AES ID								4–6
GES ID								7
Q NO. (of message)				REF. NO. (of message)				8
CH. TYPE		NO. OF SSU NK**		ACKNOWLEDGE CONTROL				9
SPARE		SSU SEQUENCE NO.+						10
SPARE		SSU SEQUENCE NO.+						11
SPARE		SSU SEQUENCE NO.+						12
SPARE								13–17
CCITT CRC								18–19

* DLS/RLS always set to 0
** Number of SSUs in acknowledgement indicating error
\+ spare in PACK requesting complete retransmission and in PACK indicating no error

Figure A2-49. Acknowledgement — R channel
P channel acknowledgement (PACK)

BIT NO.

8	7	6	5	4	3	2	1	OCTET NUMBER
SEQUENCE INDICATOR				1	1	1	1	1
Q NO.				D/R*	REFERENCE NO.			2
MESSAGE TYPE								3
AES ID								4–6
GES ID								7
RESERVED				SPARE				8
SPARE								9–17
CCITT CRC								18–19

* DLS/RLS always set to 0

Figure A2-50. Log control — R channel
Log-off request/ready for reassignment/ reassignment reject

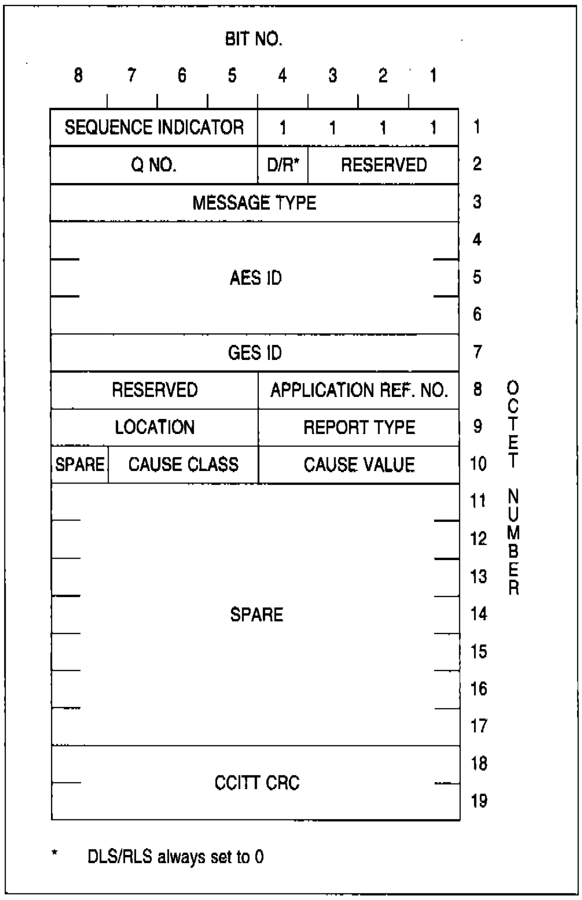

Figure A2-51. Call progress — R channel
Channel release

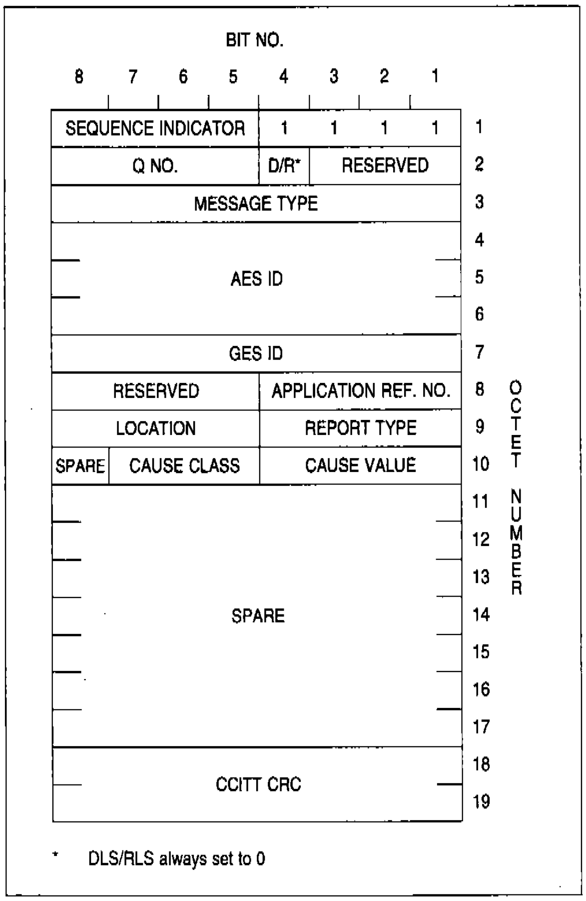

Figure A2-52. Call progress — R channel
Call attempt result

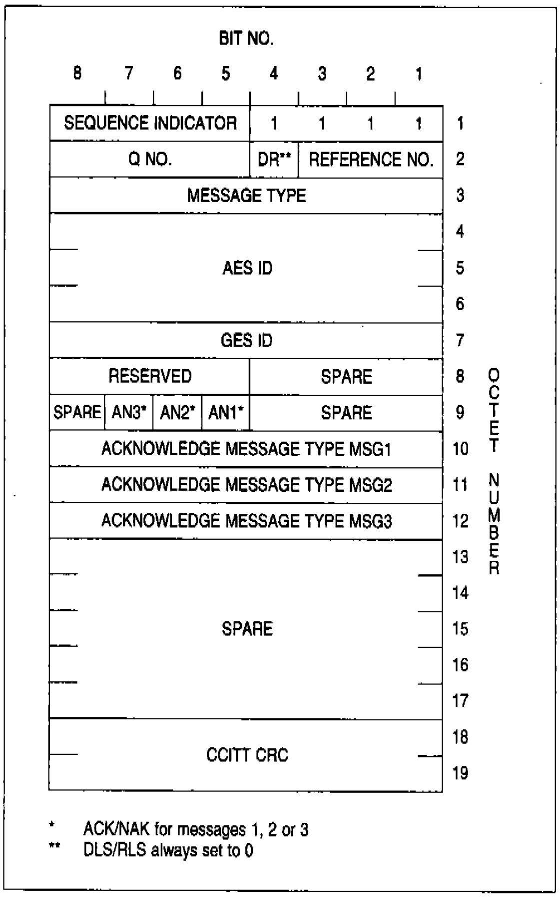

Figure A2-53. Log-on acknowledgement — R channel

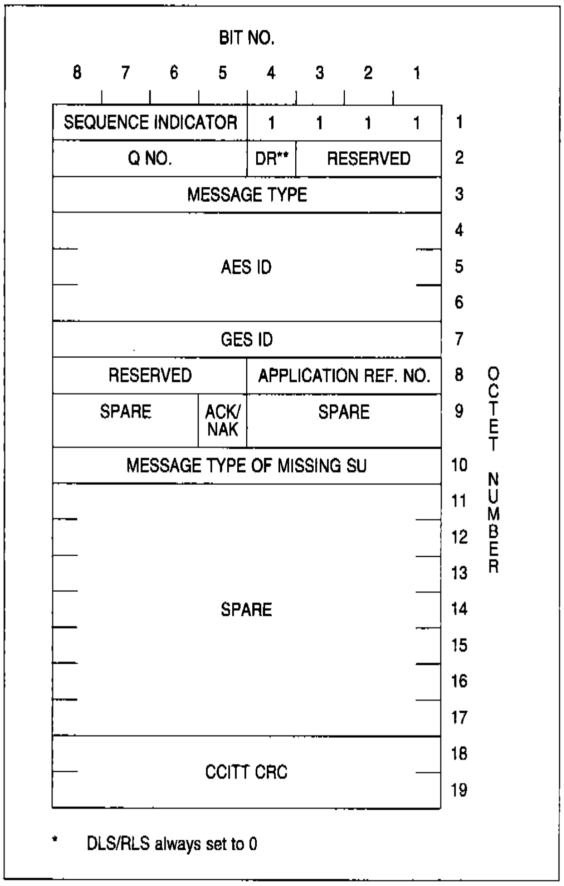

Figure A2-54. Telephony acknowledge — R channel

BIT NO. 8 7 6 5 4 3 2 1

Field			OCTET NUMBER
MESSAGE TYPE			1
REVISION NO.			2
INITIAL SEQ. NO. OF A2-56 (PARTIAL)	SPARE	EXS*	3
INITIAL SEQ. NO. OF A2-58 (PARTIAL)	SPARE	EXS*	4
INITIAL SEQ. NO. OF A2-60 (PARTIAL)	SPARE	EXS*	5
INITIAL SEQ. NO. OF A2-56 (COMP)	SPARE	EXS*	6
INITIAL SEQ. NO. OF A2-58 (COMP)	SPARE	EXS*	7
INITIAL SEQ. NO. OF A2-60 (COMP)	SPARE	EXS*	8
INITIAL SEQ. NO. OF 2nd A2-56 (COMP)	SPARE	EXS*	9
SPARE		GBS+	10
CCITT CRC			11–12

* Existence + Global beam series

Figure A2-55. AES system table broadcast — P channel
Spot beam series index

BIT NO. 8 7 6 5 4 3 2 1

Field		OCTET NUMBER
MESSAGE TYPE		1
REVISION NO.		2
SEQUENCE NO.	LSU NO.	3
GES ID		4
CHANNEL FREQUENCY		5–6
CHANNEL FREQUENCY		7–8
CHANNEL FREQUENCY		9–10
CCITT CRC		11–12

Figure A2-56. AES system table broadcast — P channel
Spot beam series GES P/R channel advice SU

BIT NO. 8 7 6 5 4 3 2 1

Field		OCTET NUMBER
MESSAGE TYPE		1
REVISION NO.		2
SEQUENCE NO.	SPARE	3
GES ID		4
BEAM ID	SPARE	5
SPARE		6–10
CCITT CRC		11–12

Figure A2-57. AES system table broadcast — P channel
Spot beam series GES P/R channel advice last SSU

BIT NO. 8 7 6 5 4 3 2 1

Field			OCTET NUMBER
MESSAGE TYPE			1
REVISION NO.			2
SEQUENCE NO.	SAT. ID		3
SAT. ID (lsb)	SAT. INCLINATION	SF*	4
SATELLITE RIGHT ASCENSION			5
SATELLITE LONGITUDE			6
SATELLITE/BEAM-IDENTIFYING P_{smc} CHANNEL FREQUENCY NO. 1			7–8
SATELLITE/BEAM-IDENTIFYING P_{smc} CHANNEL FREQUENCY NO. 2			9–10
CCITT CRC			11–12

* Satellite flag

Figure A2-58. AES system table broadcast — P channel
Spot beam series satellite/beam
ID channel advice ISU

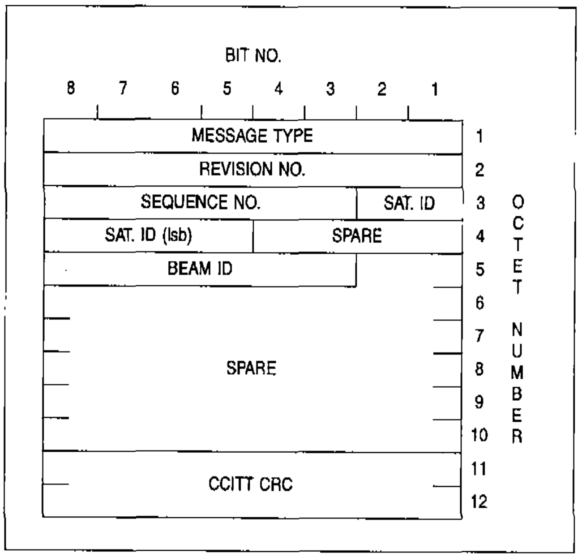

Figure A2-59. AES system table broadcast — P channel
Spot beam series satellite/beam ID channel advice SSU

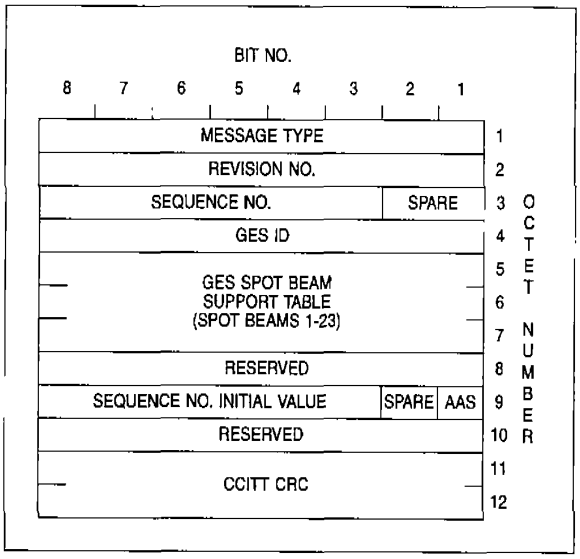

Figure A2-60. AES system table broadcast — P channel
Spot beam series GES beam support advice
(beams 1 – 23)

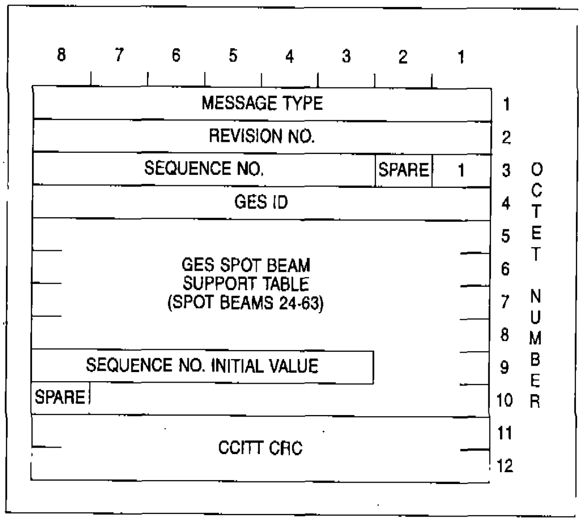

Figure A2-61. AES system table broadcast — P channel
Spot beam series GES beam support advice
(beams 24 – 63)

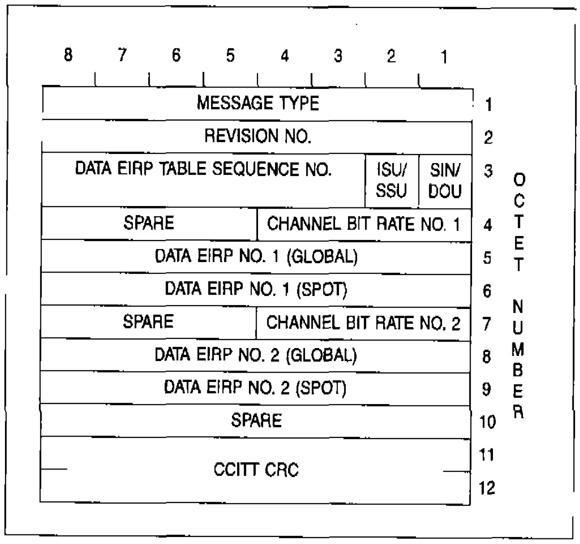

Figure A2-62. Data EIRP table broadcast

Appendix 3 to Chapter 4

SIGNAL UNIT FIELD CODING AND DESIGNATION

1. ACK/NAK
1a. AAS
2. Acknowledge control
3. AES ID
3a. Antenna gain
4. Application reference number
5. Beam ID
6. Burst interval
7. Burst length
8. Called/calling terminal
9. Cause class
10. Cause value
11. Channel bit rate
12. Channel frequency
13. Channel type
14. Circuit data rate
15. Circuit data requirement
16. Class of AES
17. CCITT CRC
18. Data bit rate capability
18a. Data EIRP (global or spot)
18b. Data EIRP table sequence number
19. Delay to RES
19a. DETC/DETP (data EIRP table complete/data EIRP table partial)
20. Digit
21. DLS/RLS
22. EIRP adjustment
23. Existence
24. GES ID
25. GES beam support table
26. Idle pattern
27. Initial EIRP
27a. ISU/SSU (initial signal unit/subsequent signal unit)
28. I/R (initial/renewal)
29. Length
29a. Global beam series (GBS)
30. Location
31. LSU number
31a. LOV
32. Message length
33. Message type
34. Network ID
35. NOT (number of transmitters)
36. Number of bursts reserved
37. Number of C channels
38. Number of frequencies
39. Number of octets in the last SSU
40. Number of SSUs (in Ack)
41. P/R MSG
42. P/S (primary/secondary)
43. Q number (precedence)
44. Reason
45. Received bit error rate
46. Reference number
47. Report type
48. Reserved
49. Revision number
50. RFC flag
51. S (coding standard)
52. Satellite flag
53. Satellite ID
54. Satellite inclination
55. Satellite longitude
56. Satellite right ascension
58. Sequence indicator
59. Sequence number
60. Sequence number (off-set value)
61. Service direction
62. Service identity
62a. SIN/DOU (single/double)
63. Source
64. Spare
64a. Spot beam series (SPS)
65. Starting frame number
66. Starting slot number
67. SU type
68. TDMA MSG
69. T_X channel number
70. Universal time
71. Voice channel characteristics

SIGNAL UNIT FIELD CODING AND DESIGNATIONS

Note.— Codes are listed as their decimal values unless indicated as hexadecimal by the letters HEX. Codes marked RESERVED are reserved for use in particular AMSS system implementations.

1. ACK/NAK (1 bit)

Code	Function
0	NAK, retransmit indicated message
1	ACK, do not retransmit indicated message

1a. AAS (1 bit)

This field shall indicate that the GES supports the "Abbreviated Call Establishment" procedure.

Code	Function
0	The GES does not support the "Abbreviated Call Establishment" procedure.
1	The GES does support the "Abbreviated Call Establishment" procedure.

2. Acknowledge control (4 bits)

Code	Function
0	This ACK includes all retransmission requests
1-13	Number of retransmission request ACK messages remaining (applicable for PACK and TACK SUs only)
14	No errors in entire message
15	Retransmit entire message (applicable for PACK and TACK SUs only)

3. AES ID (3 octets)

This field shall be the 24-bit aircraft address of the AES (see Chapter 9).

3a. Antenna gain (4 bits)

This field shall indicate the antenna gain for an AES of Class 3-4 (see 16). This field shall be "spare" for class 1 AES.

Code	Function
0	High gain
1	Intermediate gain
2-15	Spare

4. Application reference number (4 bits)

This field shall contain the direct binary number of the reference number assigned by the circuit-mode services to the circuit-mode call.

The application reference number shall uniquely identify a call between an AES/GES pair. Application reference numbers shall be assigned cyclically by the AES on air-to-ground calls from the range 0-7 and by the GES on ground-to-air calls to a given AES from the range 8-15.

5. Beam ID (6 bits)

Code	Function
0	Global beam
1-63	Spot beams

6. Burst interval (4 bits)

In a multi-burst reservation, this field shall indicate that there is one burst reservation per 2^{BI} frames, where BI=burst interval.

7. Burst length (5 bits)

This field shall indicate the length of the burst in terms of the number of signal units.

8. Called/calling terminal (8 bits)

Binary coded decimal (BCD) encoding, with the most significant digits appearing in least significant half octet, and vice versa.

9. Cause class (3 bits)

The assignment and interpretation of this field shall be dictated by the value assigned to the S (coding standard) field (Item 51). Cause class shall be used in association with cause value (Item 10) to identify the actual cause meaning.

CCITT Q.931 standard coding:

Code	Function
0	Normal event
1	Normal event
2	Resource unavailable
3	Service or option not available
4	Service or option not implemented
5	Invalid message (e.g. parameter out of range)
6	Protocol error (e.g. unknown message)
7	Interworking

Satellite network specific coding:

Code	Function
0	PSTN/ISDN call progress events
1	Call pre-emption
2	Resource unavailable
3	Invalid parameter
4	Out of service
5	Network failure
6	Service/option not supported
7	Normal event

10. Cause value (4 bits)

The assignment and interpretation of this field shall be dictated by the value of the S (coding standard) field (Item 51). Cause value shall be used in association with cause class (Item 9) to identify the actual cause meaning. The values given below are those required for interworking with the PSTN signalling systems R2, CCITT No. 5 and CCITT No. 7 TUP.

CCITT Q.931 standard coding:

Cause class	Cause value	Function
0	1	Unallocated number
0	3	No route to destination
1	0	Normal clearing
1	1	User busy
1	2	No user responding
1	3	Called user busy (user alerted)
1	5	Call rejected
1	11	Destination out of service
1	12	Invalid (incomplete) number format
1	15	Normal, unspecified
2	2	No circuit/channel available
2	6	Network out of order
2	10	Switching equipment congestion
4	2	Channel type not implemented

Satellite network specific coding:

Cause class	Cause value	Function
0	1	Address complete
1	1	Call pre-empted
2	1	No channel available
2	2	No channel unit available
2	3	Analog data equipment not available
2	4	Digital data equipment not available
3	1	Reserved
3	2	Invalid/incomplete address
4	1	Destination out of service
4	2	AES not authorized
4	3	Incoming calls barred
5	1	Continuity failure or no response
6	1	Reserved
6	2	Required analog data rate not supported
6	3	Required digital data rate not supported
6	4	Voice channel type not supported
6	5	Service type not supported
7	1	User busy
7	2	Unallocated number
7	3	AES absent
7	4	Spot beam handover
7	15	Undefined cause

11. Channel bit rate (receive or transmit) (4 bits)

Code	Function
0	600 bits/s
1	1 200 bits/s
2	2 400 bits/s
3	4 800 bits/s
4	6 000 bits/s
5	5 250 bits/s
6	10 500 bits/s
7	8 400 bits/s
8	Unassigned
9	21 000 bits/s
10-15	Unassigned

12. Channel frequency (2 octets)

Most significant bit: 1=spot beam, 0=global beam
Least significant 15 bits: 0000 to 7FFF (HEX)
Frequency expressed as binary number N, where:

frequency (MHz) = Base (MHz) + N * 0.0025 MHz;
base = 1 510.0000 MHz for receive channels;
base = 1 611.5000 MHz for transmit channels.

The all ZEROs code shall be used to denote the null value.

13. Channel type (2 bits)

This field shall identify the channel which was used for the message being acknowledged.

Code	Function
0	R channel
1	P channel
2	T channel
3	Unassigned

14. Circuit data rate (4 bits)

This field shall be used by the AES to indicate the requested circuit-mode data rate (modem type, if applicable). It shall also be used by the GES to inform the AES of the actual data rate achieved, which may be different from the requested data rate if a multi-rate modem is used or if modem synchronization is not achieved.

The coding shall be dependent on the type of circuit-mode data service, as indicated by the service identity field (Item 62).

Analog-interconnect data service:

Code	Function
0	Data mode not required/achieved
1	1 200 bits/s: CCITT V.22
2	1 200 bits/s: CCITT V.22 *bis*
3	2 400 bits/s: CCITT V.22 *bis*
4	4 800 bits/s: CCITT V.32
5	9 600 bits/s: CCITT V.32
6	1 200 bits/s: CCITT V.23
7-14	Unassigned
15	Facsimile (Group 3) service: CCITT T.30

Digital interconnect data service:

Code	Function
0	Data mode not required/achieved
1	1 200 bits/s
2	2 400 bits/s
3	4 800 bits/s
4	9 600 bits/s
5-15	Unassigned

15. Circuit data requirement (2 bits)

This field shall be used by the AES to indicate whether all ground-to-air circuit-mode calls should be allocated circuit-mode data service-capable channel equipment by the GES, and if so, which type of interconnect capability shall be required.

Code	Function
00	Circuit-mode data service not required
01	Analog interconnect service required
10	Digital interconnect service required
11	Unassigned

16. Class of AES (2 bits)

The AESs shall be classified according to their equipment configuration and capabilities, as follows:

Class 1: Low gain antenna only, packet-mode services only;
Class 2: Reserved;
Class 3: High gain or intermediate gain antenna, circuit-mode and packet-mode (simultaneous and non-simultaneous) services;
Class 4: High gain or intermediate gain antenna, packet-mode services only.

Code	Function
0	Class 1
1	Reserved
2	Class 3
3	Class 4

17. CCITT CRC (16 bits)

Each signal unit shall contain 16 check bits (the last two octets) for error detection. These check bits shall be calculated from the first 10 octets of standard length SU, from the first 17 octets of an extended length signal unit or from the first 4 octets of the burst identifier SU (Appendix 2 to Chapter 4, Figure A2-47), using the following generator polynomial:

$$x^{16} + x^{12} + x^{5} + 1$$

(see CCITT Red Book, Recommendation X.25, Section 2.2.7)

At the receiving end, the check bits for each received signal unit shall be calculated and if there is a mismatch with the received check bits, the signal unit shall be discarded.

18. Data bit rate capability (1 octet)

Each bit in this field shall indicate the availability ("1") or unavailability ("0") of the corresponding channel/bit rate combination at the AES as follows:

Bit	Combination	
1	P-Ch	1 200 bits/s
2	P-Ch	2 400 bits/s
3	P-Ch	4 800 bits/s
4	P-Ch	10 500 bits/s
5	R-/T-Ch	2 400 bits/s
6	R-/T-Ch	10 500 bits/s
7	R-/T-Ch	4 800 bits/s
8	Unassigned	

Note.— 0.6 and 1.2 kbit/s P, R and T channels are mandatory for all AESs.

18a. Data EIRP (global or spot) (8 bits)

Data EIRP level for global beam or spot beam operation expressed as a binary number N, where:

Data EIRP = N*0.1 dBW

The EIRP range shall be from 0.1 to 25.5 dB. The EIRP values are valid for all types of antenna. The all zeros code shall be used to denote a NULL value.

18b. Data EIRP table sequence number (6 bits)

Sequence number of Data EIRP table SUs. The field shall be set in the ISU to equal the total number of SSUs in the sequence corresponding to that ISU (i.e. in the complete sequence if the ISU is for the complete sequence, in the partial sequence otherwise). The value shall be decremented by one in each following SSU, until the last SSU of the sequence has a value of zero.

19. Delay to RES (6 bits)

This field shall indicate the delay before the reservation will be sent to the AES by the GES. The delay shall be given as a direct binary number of superframes.

19a. DETC/DETP (1 bit)

This field shall indicate whether the complete (DETC) or partial (DETP) data EIRP tables are transmitted.

Code	Function
0	The data EIRP table is not transmitted
1	The data EIRP table is transmitted

20. Digit

This field shall be a binary coded decimal digit. The end-of-digits code shall be combination F (HEX).

21. DLS/RLS (1 bit)

Code	Function
0	Direct link service (DLS)
1	Reliable link service (RLS)

22. EIRP adjustment (4 bits)

This field shall be used to indicate the EIRP adjustment value relative to the current transmit level as follows:

Code	Function
0	No adjustment
1	+1 dB
2	+2 dB
3	+3 dB
4-12	Unassigned
13	–3 dB
14	–2 dB
15	–1 dB

23. Existence (1 bit)

Code	Function
0	This series of broadcasts is not being transmitted
1	This series of broadcasts is being transmitted

24. GES ID (1 octet)

This field shall be the 8-bit identifier given to the GES.

25. GES beam support table

This field shall start from octet 5, bit 1 and shall end at octet 7, bit 8 of the AES System Table Broadcast P-channel, spot beam series GES beam support advice signal unit (Figure A2-60). Each bit shall correspond to a satellite beam, starting from global beam in the first bit then spot beam 1, 2, 3, etc. up to spot beam 23, respectively.

This field shall start from octet 5, bit 1 and shall end at octet 10, bit 7 of the AES System Table Broadcast P-channel, spot beam series GES beam support advice signal unit (Figure A2-61). Each bit shall correspond to a satellite beam, starting from global beam in the first bit then spot beam 24, 25, 26, etc. up to spot beam 63, respectively.

Each bit shall be encoded as:

Code	Function
0	The GES does not support the beam
1	The GES does support that beam

26. Idle pattern

All zeros.

27. Initial EIRP (4 bits)

The EIRP value shall be equal to:

(–1.5 + N) dBW for a Class 1 AES (as defined in section 16);

(–0.5 + N) dBW for Class 3/4 AES with intermediate gain antenna;

(10.5 + N) dBW for Class 3/4 AES with high gain antenna;

where N is the value of this field (range 0 to 15).

27a. ISU/SSU (1 bit)

This bit shall be 0 for the initial signal unit of a series of SUs in a set. This bit shall be 1 for each subsequent signal unit in the series.

28. I/R (initial/renewal) (1 bit)

This field shall indicate whether the log-on request is initial or for log-on renewal.

Code	Function
0	Initial log-on
1	Log-on renewal

29. Length (8 bits)

This field shall be the direct binary representation of the number of octets to follow.

29a. Global beam series (GBS) (1 bit)

This field shall indicate, in the spot beam series broadcast index SU, whether or not a global beam series is present. This field shall be set to one if the global beam series is present; otherwise, the field shall be set to zero.

30. Location (of cause) (4 bits)

This information element shall indicate the location relevant to the cause value and cause class information elements. Its interpretation shall be dictated by the value assigned to the S (coding standard) information element, which specifies whether the CCITT Q.931 standard coding or the satellite network specific coding rules apply.

CCITT Q.931 standard coding:

Code	Function
0	User
1	Private network serving the local user
2	Public network serving the local user
3	Transit network
4	Public network serving the remote user
5	Private network serving the remote user
7	International network
10	Network beyond interworking point

All other values are reserved.

Satellite network specific coding:

Code	Function
1	AES — user network side
2	AES — satellite network side
3	GES — satellite network side
4	GES — fixed network side
5	Reserved
6	Interworking with the terrestrial network

All other values are unassigned.

31. LSU number (2 bits)

Code	Function
0	Indicating the initial LSU and the LSU contains P_{smc}, $R_{smc}0$, $R_{smc}1$ frequencies in this order
1	LSU contains P_{smc}, $R_{smc}0$, $R_{smc}1$ frequencies in this order (as for code 0, but this can appear anywhere in the sequence)
2	LSU contains $R_{smc}2$, $R_{smc}3$, $R_{smc}4$ frequencies in this order
3	LSU contains $R_{smc}5$, $R_{smc}6$, $R_{smc}7$ frequencies in this order

31a. LOV (1 bit)

This field shall indicate the capability of the AES to respond to the log-on interrogation from the GES.

Code	Function
0	AES capable of responding
1	AES not capable of responding

32. Message length (7 bits)

This field shall indicate, in direct binary number, the number of SUs in an SU set (2 user octets in the initial signal unit, and 8 octets per subsequent signal unit). When used for requesting T channel capacity, this number shall be increased by one each time a request (initial or repeated) is transmitted via the T channel. The maximum length of an initial SU set shall be limited to 64 (SUs).

33. Message type (1 octet)

This field shall identify the type of the message. The complete set of message types shall be as listed in the table "Message type list" which is included at the end of this appendix.

34. Network ID (4 bits)

Code	Function
0	Unassigned
1	E164/E163
2	X.121
3	F.69
4	Private network — no address following
5	Private network — address following
6-14	To be coded for applicable public and private networks (SITA, ARINC, etc.)
15	Distress call

35. NOT (1 bit)

This field shall indicate the transmitter capability of the AES.

Code	Function
0	Indicating the AES has one transmitter
1	Indicating the AES has multiple transmitters

36. Number of bursts reserved (3 bits)

This field shall identify the number of bursts reserved as a binary number.

Code	Function
0	Unassigned
1-7	1-7 bursts reserved

37. Number of C channels (5 bits)

This field shall indicate, as a direct binary number, the number of voice channels which the AES is equipped for. This field shall be 1 for Level 3 AES.

38. Number of frequencies (4 bits)

This field shall indicate, as a direct binary number (e.g. 1 = 1 frequency), the number of frequencies assigned.

39. Number of octets in the last SSU (4 bits)

This field shall indicate, as a direct binary number (e.g. 1 = 1 octet), the number of octets of user data in the user data field of the last SSU of the SU set.

40. Number of SSUs (in ACK/NAK) (2 bits)

Code	Function
0	No SSU, only used when ACKCTL field equals 14 or 15
1	One SSU
2	Two SSUs
3	Three SSUs

41. P/R MSG (1 bit)

This field shall indicate whether the log-on confirm SU has an associated P/R channel control SU.

Code	Function
0	No associated P/R channel control SU
1	Associated P/R channel control SU exists

42. P/S (primary/secondary) (1 bit)

This field shall indicate whether the log-on is primary or secondary.

Code	Function
0	Primary log-on
1	Secondary log-on

43 . Q number (precedence) (4 bits)

The following table shall indicate the scheme for the assignment of Q numbers to the various categories of messages for transmission on the P, R, T and sub-band C channels. The actual Q numbers assigned to the individual signal unit message types shall be as specified in the message type list at the end of this appendix.

Code	Function
15	Distress/urgency C channel request/assignment signalling; distress/urgency T channel request signalling; all T channel assignment signalling (including reservation forthcoming signalling); link layer protocol signalling for distress data traffic (Q = 14)
14	Distress/urgency packet-mode data
13	Link layer protocol signalling for flight safety, other safety and non-safety data traffic (Q = 0-3, 5-8, 11); AES/GES management SUs; flight safety and other "safety" T channel request signalling (Q = 11, 5-8); C channel signalling other than request/assignment
12	Flight safety C channel request/assignment signalling
11	Flight safety packet-mode data
10	Other "safety" C channel request/assignment signalling
9	"Non-safety" C channel request/assignment signalling; "non-safety" T channel request signalling (Q = 0-3)
5-8	Other "safety" packet-mode data (See Table 4-12)
4	Reserved for "non-safety" C channel precedence
0-3	"Non-safety" packet-mode data (See Table 4-12)
NA	System table broadcast SUs and fill-in SU

44. Reason (4 bits)

Code	Function	Rejection category
0	Log-on table full	Temporary unavailable
1	Requested voice channel characteristic not available	Permanent unavailable
2	Requested beam not served	Invalid parameters
3	Fixed network failure	Temporary unavailable
4	Unassigned	
5	Invalid satellite ID	Invalid parameters
6	Invalid GES ID	Invalid parameters
7	P/R/T channels not available	Temporary unavailable
8	Packet-mode data services not available	Permanent unavailable
9	Reserved	
10	Requested VCC and data services not available	Permanent unavailable
11-13	Unassigned	
14	Other unspecified reason	Temporary unavailable
15	AES not authorized	Permanent unavailable

45. Received bit error rate (8 bits)

This field shall indicate the error rate before FEC decoding. The code value = V, where V = average number of errors per 2 560 channel bits.

46. Reference number (3 bits for R channel or 4 or 8 bits for P and T channels)

The value for this field shall be assigned by the AES for air-to-ground data transfer and by the GES for ground-to-air data transfer. The scope of the reference number shall be within its Q number (precedence level). The reference number, in association with the Q number, shall be used for message segmentation/assembly and ARQ error control at the link level.

Each user data message shall be given a reference number at the time of initial transmission and this is used in subsequent acknowledge, retransmission, and request for acknowledge messages to guard against confusion/duplication of messages. The allocation of the reference numbers shall be performed independently for messages sent via the R, T and P channels.

47. Report type (4 bits)

This field shall identify the specific type of call progress signal unit.

Code	Function
0	Unassigned
1	Channel status report
2	Connect
3	Test
4	Call attempt result
5	Channel release
6-8	Reserved
9-15	Unassigned

48. Reserved (variable number of bits)

Fields marked RESERVED are reserved for use in particular AMSS system implementations.

49. Revision number (8 bits)

This field shall indicate the revision number of the AES system table. It shall be incremented by one for each successive revision.

50. RFC flag (1 bit)

This field shall be used to identify whether or not a reservation (RES) SU or a reservation forthcoming (RFC) SU has been preceded by either an RFC LSU or TACK LSU indicating errors.

Code	Function
0	Not preceded by either RFC LSU or TACK SU set indicating errors
1	Has been preceded by either an RFC LSU or TACK SU set indicating errors

51. S (coding standard) (1 bit)

The field shall identify the rules (coding standard) according to which the location, cause class and cause value information elements are coded.

Code	Function
0	CCITT Q.931 standard coding
1	Satellite network specific coding

52. Satellite flag (1 bit)

Code	Function
0	Indicating the SU contains information for the satellite via which it is broadcast
1	Indicating the SU contains information for the satellite in another region

53. Satellite ID (6 bits)

This field shall be the 6-bit identifier given to the satellite.

54. Satellite inclination (3 bits)

Code	Function
0	0 to 5/8 degree
1	more than 5/8 up to 10/8 degrees
2	more than 10/8 up to 15/8 degrees
3	more than 15/8 up to 20/8 degrees
4	more than 20/8 up to 25/8 degrees
5	more than 25/8 up to 30/8 degrees
6	more than 30/8 up to 35/8 degrees
7	more than 35/8 up to 40/8 degrees

55. Satellite longitude (8 bits)

This field shall be a binary code representation of the longitudinal location of the satellite, as east longitude relative to the Greenwich meridian in units of 1.5 degrees.

56. Satellite right ascension (8 bits)

This field shall indicate the closest time point expressed in minutes from 00:00 UTC with 10 minutes increment to the time when the satellite crosses the equatorial plane from south to north on the New Year's day. The time of satellite ascension on day "n" of the year shall be "4 x n" minutes earlier than on the New Year's day.

58. Sequence indicator (4 bits)

This field shall be used only in extended length (i.e. 19 octet) SUs on the R channel. It shall indicate the position of the SU within the sequence of SUs that comprise an SU set. It also specifies the total number of SUs in the SU set.

Code	SU position	Number of SUs in the SU set
0	Unassigned	Unassigned
1	1	1
2	1 (first)	2
3	2 (last)	2
4	1 (first)	3
5	2 (intermediate)	3
6	3 (last)	3
7-15	Unassigned	Unassigned

59. Sequence number (4 bits or 6 bits)

This field shall be used in standard length (i.e. 12 octet) signal units on all channels. The field shall be set in an ISU of an SU set to the total number of subsequent signal units (SSUs) in the SU set and shall be decremented by one in each following SSU, until the last SSU of the SU set has a value of 0. The field in a broadcast index SU of the AES system table broadcast shall be set to the largest sequence number (one less than the number of LSUs included) in each series of broadcast LSUs. The sequence number in the first LSU in a series shall be set to the same number as in the index SU and shall be decremented by one in each following LSU, until the last LSU of the series has a value of 0. The field in an RTX SU heading of a retransmission SU set shall be set equal to the total number of SSUs in the retransmission SU set. In each retransmitted SSU, this field shall be offset by subtracting the value in the sequence number (offset value) field of the RTX SU from the original SSU sequence number.

60. Sequence number (offset value) (6 bits)

This field shall be used in standard length (i.e. 12 octet) signal units on all channels. It shall indicate the last (lowest) SSU sequence number in error.

61. Service direction (2 bits)

Code	Function
0	Unassigned
1	Air-to-ground
2	Ground-to-air
3	Bi-directional

62. Service identity (4 bits)

Code	Function
0	Unassigned
1	Telephone
2	Circuit-mode data, analog-interconnect
3	Circuit-mode data, digital-interconnect
4-9	Unassigned
10	Direct link service message
11	Reliable link service message
12-15	Unassigned

62a. SIN/DOU (1 bit)

This bit shall be set to 0 if one channel bit rate and EIRP is defined in the signal unit. This bit shall be set to 1 if two channel bit rates and EIRPs are defined in the signal unit.

63. Source (2 bits)

This field shall identify the location at which the signal unit was generated.

Code	Function
0	Unassigned
1	AES
2	GES
3	Reserved

64. Spare (variable number of bits)

Fields marked SPARE shall be filled entirely with zeros.

64a. Spot beam series (SBS) (1 bit)

This field shall indicate, in the global beam series broadcast index SU, whether or not a spot beam series is present. This field shall be set to one if the spot beam series is present; otherwise, the field shall be set to zero.

65. Starting frame number (4 bits)

This field shall indicate, as a direct number, the starting frame number of the allocated reservation.

66. Starting slot number (6 bits)

This field shall indicate, as a direct binary number, the starting slot number of the allocated reservation within the starting frame number.

67. SU type (4 bits)

This field shall indicate whether the extended length SU is carrying signalling application information or user data. In the latter case, its value shall represent the number of octets of user data in the user data field of the extended length (i.e. 19 octet) SU.

Code	Function
0	Unassigned
1-11	1 to 11 octets of user data SU
12-14	Unassigned
15	Signalling information SU

68. TDMA MSG (1 bit)

This field shall indicate whether the log-on confirm SU has an associated T channel control message.

Code	Function
0	No associated T channel control message
1	Associated T channel control message exists

69. TX channel number (2 bits)

Code	Function
0	Channel No. 0
1	Channel No. 1
2	Channel No. 2
3	Channel No. 3

70. Universal time (7 octets)

The time information shall be synchronized to the UTC time standard.

Format:	Each of the following is a single octet field coded in the binary coded decimal (BCD) format. The code FF_H can be used in any field to represent a NULL entry.
Century:	Century AD (Anno Domini), CC (2 digit): 00 to 99
Year:	Year within the century, YY (2 digit): 00 to 99
Month:	Month within the year, MM (2 digit): 01 to 12
Day:	Day within the month, DD (2 digit): 01 to 31
Hour:	Hour within the day, hh (2 digit): 00 to 24
Minute:	Minute within the hour, mm (2 digit): 00 to 59
Second:	Second in the minute, ss (2 digit): 00 to 59

71. Voice channel characteristics (6 bits)

Code	Voice rate to AES	Voice rate from AES	Channel bit rate	FEC rate
0	Unassigned			
1	Reserved			
2	9 600 LPC[1]	9 600 LPC[1]	21 000	1/2
3	4 800 AMBE[2]	4 800 AMBE[2]	8 400	2/3
4	9 600 LPC[1] and 4 800 AMBE[2]	9 600 LPC[1] 4 800 AMBE[2]	21 000 8 400	1/2 2/3
5	Reserved			
6	Unassigned			
7	Reserved			
8-63	Unassigned			

1. LPC corresponds to the multi-pulse excited linear predictive coding algorithm as defined in Section 4.8.

2. AMBE corresponds to the advanced multi-band excitation algorithm as identified in Section 4.8.

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MESSAGE TYPE LIST (see paragraph 33)

Code (HEX)	Function	Message format figure (refer to Appendix 2 to Chapter 4)	Q number (precedence)
BROADCAST			
00	Reserved		
01	Fill-in signal unit	A2-42	NA
02	AES system table broadcast (GES P_{smc} and R_{smc} channels PARTIAL)	A2-31	NA
03	AES system table broadcast (beam identification PARTIAL)	A2-33	NA
04	AES system table broadcast (GES beam support PARTIAL)	A2-34/A2-61	NA
05	AES system table broadcast (GES P_{smc} and R_{smc} channels COMPLETE)	A2-31	NA
06	AES system table broadcast (beam identification COMPLETE)	A2-33	NA
07	AES system table broadcast (GES beam support COMPLETE)	A2-34/A2-61	NA
08	System broadcast — selective release	A2-36	13
09	System broadcast — universal time	A2-35	13
0A	AES system table broadcast (index)	A2-30	NA
0B	AES system table broadcast (satellite identification PARTIAL)	A2-32	NA
0C	AES system table broadcast (satellite identification COMPLETE)	A2-32	NA
0D	AES system table broadcast (2nd series of GES P_{smc} and R_{smc} channels COMPLETE)	A2-31	NA
0E	Reserved		
SYSTEM LOG-ON/LOG-OFF			
10	Log-on request	A2-2	13
11	Log-on confirm	A2-3	13
12	Log control (R channel)-log-off request	A2-50	13
12	Log control (P channel)-log-off request	A2-6	13
13	Log control (P channel)-log-on reject	A2-5	13
13	Log control (R channel)-reassignment reject	A2-50	13
14	Log control (P channel)-log-on interrogation	A2-4	13
15	Log-on/log-off acknowledge (P channel)	A2-25	13
15	Log-on/log-off acknowledge (R channel)	A2-53	13
16	Log control (P channel)-log-on prompt	A2-4	13
17	Log control (P channel)-data channel reassignment	A2-4	13
17	Log control (R channel)-ready for reassignment	A2-50	13
18	Reserved		
19	Reserved		

Code (HEX)	Function	Message format figure (refer to Appendix 2 to Chapter 4)	Q number (precedence)
CALL INITIATION			
20	General access request telephone (non-safety)	A2-45	9
20	General access request telephone (other safety)	A2-45	10
20	General access request telephone (flight safety)	A2-45	12
20	General access request telephone (distress)	A2-45	15
20	Call announcement (non-safety)	A2-8	9
20	Call announcement (other safety)	A2-8	10
20	Call announcement (flight safety)	A2-8	12
20	Call announcement (distress)	A2-8	15
21	Call information service address (ISU)	A2-9	13
22	Access request data (R/T channel) (non-safety)	A2-47/A2-7	9
22	Access request data (R/T channel) (flight safety and other safety)	A2-47/A2-7	13
22	Access request data (R/T channel) (distress)	A2-47/A2-7	15
23	Abbreviated access request telephone (other safety)	A2-46	10
23	Abbreviated access request telephone (flight safety)	A2-46	12
23	Abbreviated access request telephone (distress)	A2-46	15
24	Reserved		
25	Reserved		
26	Reserved		
27	Reserved		
28	Data EIRP table broadcast — complete sequence	A2-62	NA
29	Data EIRP table broadcast — partial sequence	A2-62	NA
CALL PROGRESS			
30	Call progress (P/C channel)	A2-11/A2-12/A2-13/ A2-14/A2-15/A2-16	13
30	Call progress (R channel)	A2-51/A2-52	13
31	C channel assignment (distress)	A2-17	15
32	C channel assignment (flight safety)	A2-17	12
33	C channel assignment (other safety)	A2-17	10
34	C channel assignment (non-safety)	A2-17	9
35	Reserved		
36	Reserved		
37	Reserved		
38	Reserved		
39	Reserved		

Code (HEX)	Function	Message format figure (refer to Appendix 2 to Chapter 4)	Q number (precedence)
CHANNEL INFORMATION			
40	P/R channel control (ISU)	A2-18	13
41	T channel control (ISU)	A2-20	13
TDMA RESERVATION			
50	Unsolicited reservation	A2-22	15
51	T channel assignment	A2-23	15
52	Reserved		
53	Reservation forthcoming (RFC)	A2-24	15
ACKNOWLEDGEMENT			
60	Telephony acknowledge (P/C channel)	A2-26	13
60	Telephony acknowledge (R channel)	A2-54	13
61	Request for acknowledgement (RQA) (P channel) — distress data	A2-27	15
61	Request for acknowledgement (RQA) (P channel) — all other data	A2-27	13
61	Request for acknowledgement (RQA) (P channel) — distress data	A2-48	15
61	Request for acknowledgement (RQA) (P channel) — all other data	A2-48	13
62	Acknowledge (RACK, TACK) (P channel) — distress data	A2-29/A2-28	15
62	Acknowledge (RACK, TACK) (P channel) — all other data	A2-29/A2-28	13
62	Acknowledge (PACK) (R channel) — distress data	A2-49	15
62	Acknowledge (PACK) (R channel) — all other data	A2-49	13
63	Reserved		
64	Reserved		
65	Reserved		
USER DATA			
70	Reserved		
71	User data (ISU) — RLS (P/T channel)	A2-37	V(0-3,5-8,11,14)
72	Retransmission header (RTX) (P/T channel)	A2-41	V(0-3,5-8,11,14)
73	Reserved		
74	User data (3 octet LSDU) — RLS (P channel)	A2-39	V(0-3,5-8,11,14)
75	Reserved		
76	User data (4 octet LSDU) — RLS (P channel)	A2-40	V(0-3,5-8,11,14)
N/A	User data (ISU/SSU) (R channel)	A2-44	V(0-3,5-8,11,14)

Code (HEX)	Function	Message format figure (refer to Appendix 2 to Chapter 4)	Q number (precedence)
80	Broadcast reserved		
81	AES system table broadcast-spot beam series GES P/R channel (partial)	A2-56/A2-57	NA
82	AES system table broadcast-spot beam series GES beam support (partial)	A2-60	NA
83	AES system table broadcast-spot beam series GES P/R channel (complete)	A2-56/A2-57	NA
84	AES system table broadcast-spot beam series GES beam support (complete)	A2-60	NA
85	AES system table broadcast-spot beam series index	A2-55	NA
86	AES system table broadcast-spot beam series satellite/beam ID (partial)	A2-58/A2-59	NA
87	AES system table broadcast-spot beam series satellite/beam ID (complete)	A2-58/A2-59	NA
88	AES system table broadcast-spot beam series 2nd series of GES P/R channel (complete)	A2-56/A2-57	NA
89	Reserved		
SUBSEQUENT SIGNAL UNITS: bits 8-7 = 1 1			
	Call information service address (SSU)	A2-10	13
	P/R channel control (SSU)	A2-19	13
	T channel control (SSU)	A2-21	13
	User data (SSU) — (P/T channel)	A2-38	V(0-3,5-8,11,14)

All other codes are unassigned.

In the Q number column, message types with a variable Q number are indicated by V followed in brackets by the value or range of values normally used.

Appendix 4 to Chapter 4

TIME-OUT VALUES

Time	Value (seconds)
tG1	9.3
tG2	5
tG3	18
tG3A	Reserved
tG3B	Reserved
tG4	2.5
tG5	Reserved
tG6	At the discretion of the GES operator
tG7	Unassigned
tG8	10
tG9	20 to 30
tG10	Tch (Note 3)
tG11	12
tG12	10
tG13	10
tG14	7
tG15	Unassigned
tG16	10
tG17	10
tG18	7
tG19	10
tG20	120 to 240
tG21	120 to 240
tG22	60 to 120
tG23	10
tG24	10
tG25	2
tG26	25
tG27	12
tG28-tG29	Unassigned
tG30	2
tG31	5 + 5* (P-Ch frame duration)
tG32	10
tG33	10
tG34	4
tG35	Tch (Note 3)
tG36	2
tA1	20 + (No. of SUs)*Ts (Note 2)
tA2	Unassigned
tA3	7.9 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA4	Unassigned
tA4A	8
tA4B	7.9 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA5	4
tA6	8
tA7	7.9 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA8(i) (Note 1)	(Delay to res)*8 + 2
tA9	Unassigned
tA10	5 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA11	12 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA12	10
tA13	10
tA14	10
tA15-tA17	Unassigned
tA18	20 to 30
tA19	10
tA20	15 + RND $(0,Z_k - 1)$*Ts (Notes 2, 4)
tA21	Unassigned
tA22	Tch (Note 3)
tA23-tA24	Unassigned
tA25	5
tA26	Tch (Note 3)
tA27	10
tA28	10
tA29	K *Tch, K = 2 (Note 3)
tA30	10
tA31	20
tA32	10
tA33	Tch (Note 3)
tA34	20
tA35	10
tA36	Tch (Note 3)
tA37	5
tA38	(No. of SUs)*Tch (Note 3)
tA39	5
tA40	(No. of SUs)*Tch (Note 3)
tA41	15
tA42	120 to 240
tA43-tA49	Unassigned
tA50	4 + 2* (P-Ch frame duration)

NOTES

1. Multiple timers as required, indicated by suffix (i).
2. $Z_k = Zo * 2^k$, Zo = 4 normally; Ts = R channel slot duration and k is the number of retries; k = 0 for initial transmission.
3. Tch = time required to transmit 1 SU on sub-band C channel, e.g. 0.167 seconds for 21 000 bits/s channel.
4. RND(x,y) = function that randomly selects an integer value from the interval [x,y]; all integers in the interval are equally probable.

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Appendix 5 to Chapter 4

INTERWORKING TELEPHONY EVENT MAPPING

FITE 18	Event Name: **AMS(R)S Call Origination (Calling Party Category Indicator, Subscriber, Call with Priority)**	
MAPS INTO:	AMS(R)S CM-LIDU: **Access Request — Telephone and Call Information — Service Address**	Procedure Usage: **AES Outgoing**

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING	
CPCI (Calling Party Category Indicator)	Q Number	
Distress/Urgency	►	15
Flight Safety	►	12
Regularity	►	10
Called Party Number Ground Address (10-digit fixed length)	Address Digit 0-9 (10-digit fixed length) ►	(Variable)
Calling Party Subaddress Aircraft Audio System Channel	Calling Terminal ►	(Variable)
	Network ID	10 (AMS(R)S Terrestrial Voice Network)
	Service ID	1
	Circuit Data Rate	0
	Voice Channel Characteristics	2 or 3
	Source	1
	Service Direction	3
	Application Reference Number	(Variable)
	Message Type	20/23 (hex)
	Routing	R channel

Comments:

This parameter mapping is applicable to the "Access Request — Telephone" CM-LIDU only.

Message type 23 (hex) corresponds to the "Abbreviated Access Request — Telephone" SU.
Message type 20 (hex) corresponds to the "General Access Request — Telephone" SU; and in this case, only the first two digits of the ground address are transmitted with this CM-LIDU.
Network ID = 10 is applicable if there is a private AMS(R)S terrestrial voice network.

Figure A5-1 a)

FITE 18 CONTINUED	Event Name: **AMS(R)S Call Origination (Calling Party Category Indicator, Subscriber, Call with Priority)**	
MAPS INTO:	AMS(R)S CM-LIDU: **Access Request — Telephone and Call Information — Service Address**	Procedure Usage: **AES Outgoing**

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Called Party Number Ground Address	Address Digit 2-9 → (Variable)
Calling Party Sub-address Aircraft Audio System Channel	Calling Terminal → (Variable)
	Message Type 21 (hex)
	Routing C channel sub-band

Comments:

This parameter mapping is applicable to the "Call Information — Service Address" CM-LIDU only.

Figure A5-1 b)

FITE 22	Event Name: Clear Forward	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Outgoing

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing R-Channel or C-Channel subband

Comments: (1) The preemption event is generated internal to the AES Outgoing procedure in response to the arrival of the higher priority AMS(R)S call. It does not arrive via the interworking interface.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
(1) Preemption by higher priority AMS(R)S call at the AES	1	1	1	1
Normal forward clearing by the calling subscriber	0	0	1	0

Figure A5-2

BITE 5	Event Name: Address Complete	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Address complete signal received from the terrestrial network	1	6	0	1

Figure A5-3

BITE 12	Event Name: Call Unsuccessful - Network Congestion	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release or Call Progress - Call Attempt Result	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below)	S (Coding Standard) [Values as per table below]
Cause Location (See below)	Location (of Cause) [Values as per table below]
Cause Class (See below)	Cause Class [Values as per table below]
Cause Value (See below)	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5 (Channel release) 4 (Call attempt result)

Comments:

① This event is generated internal to the AES Outgoing procedure. It does not arrive via the Link Layer.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
C-Channel frequency unavailable at GES	1	3	2	1
C-Channel unit unavailable at GES	1	3	2	2
GES equipment congestion	0	2	2	10
Terrestrial network congestion	0	4	2	10
① C-Channel unit unavailable at AES	1	2	2	2

Figure A5-4

BITE 14	Event Name: Call Unsuccessful - Address Incomplete	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Incomplete called number format detected by terrestrial network	0	4	1	12
Incomplete called number format detected by GES	1	4	3	2

Figure A5-5

BITE 15	Event Name: Call Unsuccessful - Unallocated Number	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Unallocated called number detected by terrestrial network	0	4	0	1

Figure A5-6

BITE 16	Event Name: Call Unsuccessful - Called Party Busy	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Called user busy	0	5	1	1
Called user busy (Called user alerted)	0	5	1	3

Figure A5-7

BITE 17	Event Name: Call Unsuccessful - Line out of Service	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

(1) The "No response from GES" event trigger is generated internally by the AES Outgoing procedure and is not mapped from a received CM-LIDU.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
C-Channel continuity test failure at the GES or carrier interruption	1	3	5	1
Destination out of service	0	5	1	11
(1) No response from GES	1	2	5	1

Figure A5-8

BITE 20	Event Name: **Call Unsuccessful - Send Error Indication**	
MAPS FROM:	AMS(R)S CM-LIDU: **Call Progress - Channel Release**	Procedure Usage: **AES Outgoing**

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Reqd voice characteristics not supported by GES	1	3	6	4
Undefined cause	1	3	7	15
Calling AES not authorized for service	1	3	4	2
Expiry of answer timer at GES	0	4	1	2

Figure A5-9

BITE 22	Event Name: Answer	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Connect	Procedure Usage: AES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
	Message Type 30 (hex)
	Report Type 2
Comments:	

Figure A5-10

BITE 25	Event Name: **Clear Back**	
MAPS FROM:	AMS(R)S CM-LIDU: **Call Progress - Channel Release**	Procedure Usage: **AES Outgoing**

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

(1) The preemption event is generated internal to the AES Outgoing procedure in response to the arrival of a higher priority AMS(R)S call.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Normal backward clearing	0	0	1	0
(1) Preemption by higher priority AMS(R)S call at the AES	1	2	1	1

Figure A5-11

FITE 18	Event Name: AMS(R)S Call Origination (Calling-Party-Category Indicator, Subscriber, Call with Priority)	
MAPS FROM:	AMS(R)S CM-LIDU: Call Announcement and C-Channel Assignment	Procedure Usage: AES Incoming

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
CPCI (Calling Party Category Indicator)	Q Number
Distress/Urgency	15
Flight Safety	12
Regularity	10
Called Party Subaddress: Aircraft Audio System Channel	Called Terminal (Variable)
Network-Specific Facilities: Voice Call	Service ID: 1
User Data Rate: Data Mode Not Required	Circuit Data Rate: 0
	Voice Channel Characteristics: 2
	Source: 2
	Service Direction: 3
	Message Type: 20 (hex)
Comments: This parameter mapping is applicable to the "Call Announcement" CM-LIDU only.	

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
	Initial EIRP (Variable)
	Receive Channel Frequency (variable)
	Transmit Channel Frequency (variable)
	Message Type: 31 (hex)
Comments: This parameter mapping is applicable to the "C-Channel Assignment" CM-LIDU only.	

Figure A5-12

FITE 22	Event Name: Clear Forward	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Incoming

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

(1) The preemption event is generated internal to the AES Incoming procedure in response to the arrival of a higher priority AMS(R)S call. It does not arrive via the CM-LIDU.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Normal forward clearing	0	0	1	0
(1) Preemption by higher priority AMS(R)S call at the AES	1	1	1	1
Undefined cause	1	4	7	15
C-channel continuity test failure at the GES/AES not responding or interruption in received AES carrier.	1	3	5	1
Expiry of answer timer (internally generated by the AES)	0	1	1	2
Connection acknowledgement not received by AES (internally generated by the AES)	1	2	5	1
Call preempted at the GES	1	3	1	1

Figure A5-13

BITE 12	Event Name: Call Unsuccessful - Network Congestion	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: AES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard	S (Coding Standard) [Value as per table below]
Cause Location	Location (of Cause) [Value as per table below]
Cause Class	Cause Class [Value as per table below]
Cause Value	Cause Value [Value as per table below]
	Message Type 30 (hex)
	Report Type 4
	Routing R-Channel

Comments:

These events are generated internal to the AES incoming procedure and do not arrive via the interworking interface.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
C-channel unit unavailable at the AES	1	2	2	2
Preempted by higher priority AMS(R)S call at the AES	1	1	1	1

Figure A5-14

BITE 16	Event Name: **Call Unsuccessful - Called Party Busy**	
MAPS INTO:	AMS(R)S CM-LIDU: **Call Progress - Call Attempt Result**	Procedure Usage: **AES Incoming**

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4
	Routing R-Channel
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Called Terminal Busy	1	1	7	1

Figure A5-15

BITE 17	Event Name: Call Unsuccessful - Line out of Service	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: AES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below)	S (Coding Standard) [Values as per table below]
Cause Location (See below)	Location (of Cause) [Values as per table below]
Cause Class (See below)	Cause Class [Values as per table below]
Cause Value (See below)	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4
	Routing R-channel

Comments:
(1) These events are generated internally by the AES Incoming procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
(1) Continuity test failure at the AES	1	2	5	1
Called terminal out of service	1	1	4	1
(1) Call announcement or C-channel assignment CM-LIDU not received from GES	1	2	3	2

Figure A5-16

BITE 22	Event Name: Answer	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Connect	Procedure Usage: AES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
	Message Type 30 (hex)
	Report Type 2
	Routing C-channel subband
Comments:	

Figure A5-17

BITE 25	Event Name: Clear Back	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: AES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below)	S (Coding Standard) [Values as per table below]
Cause Location (See below)	Location (of Cause) [Values as per table below]
Cause Class (See below)	Cause Class [Values as per table below]
Cause Value (See below)	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing C-Channel subband

Comments:

(1) These events are generated internal to the AES Incoming procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
(1) Preemption by AMS(R)S call at the AES	1	1	1	1
Normal backward clearing	0	0	1	0
(1) Answer timer expiry at the AES	0	1	1	2
(1) *Connection-acknowledgement timer expiry at the AES*	1	2	5	1
Undefined cause	1	2	7	15

Figure A5-18

FITE 18	Event Name: AMS(R)S Call Origination (Calling-Party Category Indicator,Subscriber, Call with Priority)	
MAPS INTO:	AMS(R)S CM-LIDU: Call Announcement and C-Channel Assignment	Procedure Usage: GES Outgoing

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
CPCI (Calling Party Category Indicator) Distress/Urgency Flight Safety Regularity	Q Number → 15 → 12 → 10
First 8 digits of 10-digit address (Variable)	AES ID → (Variable)
Last 2 digits of 10-digit address (Variable)	Called Terminal → (Variable)
	Service ID 1
	Circuit Data Rate 0
	Voice Channel Characteristics 2
	Source 2
	Service Direction 3
	Message Type 20 (hex)
	Routing P-Channel
Comments:	This parameter mapping is applicable to the "Call Announcement" CM-LIDU only.

	Initial EIRP (Variable)
	Receive Channel Frequency (variable)
	Transmit Channel Frequency (variable)
	Message Type 31 (hex)
	Routing P-Channel
Comments:	This parameter mapping is applicable to the "C-Channel Assignment" CM-LIDU only.

Figure A5-19

FITE 22	Event Name: Clear Forward	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Outgoing

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-Channel or C-Channel subband

Comments:

(1) These events are generated internal to the GES outgoing procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Normal forward clearing by the calling subscriber	0	0	1	0
(1) C-channel continuity test failure at the GES/AES not responding	1	3	5	1
(1) Interruption in received AES carrier	1	3	5	1
(1) Call preempted by higher priority AMS(R)S call	1	3	1	1
Undefined cause	1	4	7	15

Figure A5-20

BITE 5	Event Name: Address Complete	
MAPS FROM:	AMS(R)S CM-LIDU: Telephony Acknowledge (When received by the GES at the completion of the C-Channel continuity check)	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
	Message Type 60 (hex)
	Ack/Nack Ack

Comments:

No parameters are mapped for this event. However, the Telephony Acknowledge CM-LIDU received during the C-Channel continuity check must have its Ack/Nack parameter set to ACK.

Figure A5-21

BITE 12	Event Name: Call Unsuccessful - Network Congestion	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: GES Outgoing

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below)	S (Coding Standard) [Values as per table below]
Cause Location (See below)	Location (of Cause) [Values as per table below]
Cause Class (See below)	Cause Class [Values as per table below]
Cause Value (See below)	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4

Comments:

(1) These events are generated internal to the GES outgoing procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
(1) C-Channel frequency unavailable at GES	1	3	2	1
(1) C-Channel unit unavailable at GES	1	3	2	2
(1) GES equipment congestion	0	4	2	10
Call preempted by higher priority AMS(R)S call at the AES	1	1	1	1

Figure A5-22

BITE 16	Event Name: Call Unsuccessful - Called Party Busy	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4

Comments:

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Called party busy	1	1	7	1
C-channel unit unavailable at AES	1	2	2	2

Figure A5-23

BITE 17	Event Name: Call Unsuccessful - Line out of Service	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 4

Comments:

① This event trigger is generated internally by the GES Outgoing procedure upon the failure of the C-Channel continuity test within the GES. It does not arrive via the CM-LIDU.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
C-channel continuity test failure at the AES	1	2	5	1
① C-channel continuity test failure at the GES/AES not responding	1	3	5	1
Called terminal out of service	1	1	4	1
Call announcement or C-channel assignment CM-LIDU not received from GES	1	2	3	2

Figure A5-24

BITE 20	Event Name: Call Unsuccessful - Send Error Indication	
MAPS FROM:	AMS(R)S CM-LIDU: (None. See below.)	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Comments: This event is generated internal to the GES Outgoing procedure when a call is attempted to an AES which is not logged-on.	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
AES not logged on	1	3	7	3

Figure A5-25

BITE 22	Event Name: Answer	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Connect	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
	Message Type 30 (hex)
	Report Type 2
Comments:	

Figure A5-26

BITE 25	Event Name: Clear Back	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Outgoing

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

(1) These events are generated internal to the AES incoming procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Normal backward clearing	0	0	1	0
Preempted by higher priority AMS(R)S call at the AES	1	1	1	1
Answer timer expiry at the AES	0	1	1	2
Connection-acknowledgement timer expiry at the AES	1	2	5	1
(1) Interruption in received AES carrier	1	3	5	1
(1) Call preempted for higher priority AMS(R)S call	1	3	1	1
Undefined cause	1	2	7	15

Figure A5-27

FITE 18	Event Name: AMS(R)S Call Origination (Calling-Party Category Indicator,Subscriber, Call with Priority)	
MAPS FROM:	AMS(R)S CM-LIDU: Abbreviated Access Request - Telephone	Procedure Usage: GES Incoming

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING	
CPCI (Calling Party Category Indicator)	Q Number	
Distress/Urgency		15
Flight Safety		12
Regularity		10
Called Party Number	Address Digit 0-9 (10 digit fixed length)	
Ground Address (10 digit fixed length)		(Variable)
Calling Party Number	AES ID	
Aircraft Address (first 8 of 10 digits)		(Variable)
Aircraft Address (last 2 of 10 digits)	Calling Terminal	(Variable)
Closed User Group Info	Network ID	
AMS(R)S Terrestrial Voice Network		10
Network-Specific Facilities	Service ID	
Voice Call		1
User Data Rate	Circuit Data Rate	
Data Mode Not Required		0
	Voice Channel Characteristics	2
	Source	1
	Service Direction	3
	Application Reference Number	(Variable)
	Message Type	23 (hex)

Comments:

Figure A5-28

FITE 22	Event Name: Clear Forward	
MAPS FROM:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) ←	S (Coding Standard) [Values as per table below]
Cause Location (See below) ←	Location (of Cause) [Values as per table below]
Cause Class (See below) ←	Cause Class [Values as per table below]
Cause Value (See below) ←	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5

Comments:

1 This event is generated internal to the GES incoming procedure.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Preemption by higher priority AMS(R)S call at the AES	1	1	1	1
Normal forward clearing by the calling party	0	0	1	0
1 Interruption in received AES carrier or continuity failure	1	3	5	1

Figure A5-29

BITE 5	Event Name: **Address Complete**	
MAPS INTO:	AMS(R)S CM-LIDU: **Call Progress - Call Attempt Result**	Procedure Usage: **GES Incoming**

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) → [Values as per table below]
Cause Location (See below) →	Location (of Cause) → [Values as per table below]
Cause Class (See below) →	Cause Class → [Values as per table below]
Cause Value (See below) →	Cause Value → [Values as per table below]
	Message Type 30 (hex)
	Report Type 4
	Routing C-Channel subband
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Address complete signal received from the terrestrial network	1	6	0	1

Figure A5-30

BITE 12	Event Name: Call Unsuccessful - Network Congestion	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release or Call Progress - Call Attempt Result	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5 (channel release) 4 (call attempt result)
	Routing P-channel or C-channel subband

Comments:

① This event trigger is generated internal to the GES Incoming procedure and does not arrive via the interworking interface with the terrestrial network.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
① C-Channel frequency unavailable at GES	1	3	2	1
① C-Channel unit unavailable at GES	1	3	2	2
① GES equipment congestion	0	2	2	10
Terrestrial network congestion or no route to destination	0	4	2	10

Figure A5-31

BITE 14	Event Name: Call Unsuccessful - Address Incomplete	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-channel or C-channel subband

Comments:

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Incomplete called number format detected by the terrestrial network	0	4	1	12
Invalid called number format detected by the terrestrial network	1	4	3	2

Figure A5-32

BITE 15	Event Name: Call Unsuccessful - Unallocated Number	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

FITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) → [Values as per table below]
Cause Location (See below) →	Location (of Cause) → [Values as per table below]
Cause Class (See below) →	Cause Class → [Values as per table below]
Cause Value (See below) →	Cause Value → [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-channel or C-channel subband
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Unallocated called number detected by terrestrial network	0	4	0	1

Figure A5-33

BITE 16	Event Name: **Call Unsuccessful - Called Party Busy**	
MAPS INTO:	AMS(R)S CM-LIDU: **Call Progress - Channel Release**	Procedure Usage: **GES Incoming**

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-channel or C-channel subband

Comments:

① The "called party busy (called party alerted)" event trigger is supported only by a GES which is equipped to receive that event from the terrestrial network.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Called party busy	0	5	1	1
① Called party busy (Called party alerted)	0	5	1	3

Figure A5-34

BITE 17	Event Name: Call Unsuccessful - Line out of Service	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-channel or C-channel subband
Comments: (1) This event is generated internal to the GES Incoming procedure. It does not arrive via the Interworking Interface.	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
(1) C-Channel continuity test failure at the GES or carrier interruption	1	3	5	1
Destination out of service	0	5	1	11

Figure A5-35

BITE 20	Event Name: Call Unsuccessful - Send Error Indication	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress -- Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-channel or C-channel subband

Comments:

All event triggers for this BITE are generated internal to the GES Incoming procedure. They do not arrive via the Interworking interface.

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Reqd voice characteristics not supported by GES	1	3	6	4
Undefined cause	1	3	7	15
Calling AES not authorized for service	1	3	4	2
Expiry of answer timer at GES	0	4	1	2

Figure A5-36

BITE 22	Event Name: Answer	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Connect	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
	Message Type 30 (hex)
	Report Type 2
	Routing C-channel subband
Comments:	

Figure A5-37

BITE 25	Event Name: Clear Back	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-Channel or C-channel subband
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Normal backward clearing	0	0	1	0

Figure A5-38

BITE 27	Event Name: Sending Finished - Set Up Speech Condition	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Call Attempt Result	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) → [Values as per table below]
Cause Location (See below) →	Location (of Cause) → [Values as per table below]
Cause Class (See below) →	Cause Class → [Values as per table below]
Cause Value (See below) →	Cause Value → [Values as per table below]
	Message Type 30 (hex)
	Report Type 4
	Routing C-channel subband
Comments:	

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Address complete signal received from the terrestrial network	1	6	0	1

Figure A5-39

BITE 29	Event Name: Release Incoming Side	
MAPS INTO:	AMS(R)S CM-LIDU: Call Progress - Channel Release	Procedure Usage: GES Incoming

Parameter Mapping:

BITE PARAMETER	LICI PARAMETER CODING
Coding Standard (See below) →	S (Coding Standard) [Values as per table below]
Cause Location (See below) →	Location (of Cause) [Values as per table below]
Cause Class (See below) →	Cause Class [Values as per table below]
Cause Value (See below) →	Cause Value [Values as per table below]
	Message Type 30 (hex)
	Report Type 5
	Routing P-Channel or C-channel subband

Comments:

SPECIFIC CM-LIDU PARAMETER CODING INDICATIVE OF THIS EVENT				
Event Trigger	Coding Std.	Location	Cause Class	Cause Value
Release Incoming Side event received from terrestrial network (Normal backward clearing)	0	0	1	0

Figure A5-40

Appendix 6 to Chapter 4

AMS(R)S CONFIGURATION PARAMETERS

Table A6-1. Circuit-mode configuration parameters

Parameter	Description	Value
nA21	Length of CM-LIDU series for distress/urgency air-originations	4
nA22	Length of CM-LIDU series for flight safety air-originations	3
nA23	Length of CM-LIDU series for regularity/meteorological air-originations	2

Appendix 7 to Chapter 4

VOICE ENCODING ALGORITHM DEFINITION

1. INTRODUCTION

Interoperability of equipments utilizing the 9.6 kbits/s LPC codec operating in the AMS(R)S service can only be ensured if all provisions of this algorithm definition are fully complied with.

Note 1.— Refer to Figure A7-1 for a schematic representation of the algorithm.*

Note 2.— The flow and processing of information within the algorithm is defined with the use of the Pascal language. Individual implementations of this algorithm need not use this language.

Note 3.— All scalar variable names are depicted with a simple name. All vector variable names are depicted with a simple name followed by paired brackets ([]).

2. REQUIREMENTS FOR NUMERIC CALCULATIONS

Except where explicitly noted, and except for obvious integer variables such as vector indices and loop counters, all variables shall be maintained as floating-point values with a minimum mantissa precision of 24 bits inclusive of a sign bit. The range of the associated exponent shall be such that the magnitude of a positive or negative non-zero variable can vary over a minimum range of $5.87747*10^{-39}$ to $3.40282*10^{38}$.

Note.— Compliance with this minimum numeric range is essential if interoperability between different vocoder implementations is to be ensured.

3. AUDIO INPUT CHARACTERISTICS

3.1 Audio input spectral characteristics

Prior to sampling and quantization, speech audio which is presented to the encoding algorithm shall exhibit the following minimum spectral characteristics. These characteristics may be met by any combination of specific anti-aliasing filters and/or the natural spectral roll-off characteristics of transducers and audio channels:

Note.— All specifications are referenced to 1 020 Hz.

a) over a passband of 300 to 3 400 Hz, a gain variation of no more than ±2 dB;

b) over a transition band of 4 000 Hz to 4 600 Hz, a gain of –45 dB or lower; and

c) at 4 600 Hz and above, a gain of –75 dB or lower.

Note 1.— In addition to the listed spectral characteristics, additional filtering appropriate to the particular equipment installation should be provided in the low-end response characteristics of the vocoder so as to mitigate the effects of power supply noise pickup (e.g. 400 Hz for AES installations and 50/60 Hz for GES installations).

Note 2.— The input to the encoding algorithm is defined in 3.2 to be quantized audio samples with at least 12 bits of resolution. Consequently, all required spectral characteristics at the point of sampling are defined with this in mind. The use of u-law or A-law companded audio in conjunction with both reduced resolution (e.g. 8 bits) and appropriately relaxed transition-band and stop-band gain characteristics is permitted provided that the quantized samples are decompanded (linearized) prior to their presentation to the algorithm.

* All figures are located at the end of this chapter.

3.2 Sampling, quantization and scaling

Audio which exhibits the spectral characteristics defined in 3.1 shall be sampled at a continuous 8 kHz rate, and the resultant series of samples shall be quantized to an equivalent time-ordered series of linear (i.e. non-companded) binary values. Each quantization operation shall be performed with a precision of at least 12 bits and a linearity of at least 10 bits. The maximum dynamic range of this series shall be scaled up or down in magnitude as appropriate so that it is tightly bounded by the floating-point range of 4 095.0 to –4 096.0 without exceeding it. The resultant time-ordered series of scaled values shall be presented to the segmentation and windowing logic defined in 4.1.

Note.— The above bounding range of scaled values is indicative of a fixed-point signed value of 13 bits in length. Scaling of the time-ordered series of binary values to the indicated numeric range is required in order to take maximum advantage of the internal numeric range of the algorithm.

4. ENCODING PROCESS DEFINITION

4.1 Segmentation and windowing

The time-ordered stream of input samples shall be subdivided into time-ordered segments termed *segspch[]*, each comprising 256 time-ordered input samples (32 ms). Each *segspch[]* shall be so constructed that the first and last 96 samples (12 ms) contained within it overlap with the immediately previous and subsequent *segspch[]*. Each *segspch[]* shall be windowed with a Hamming window vector *hamwindow[]* defined by:

```
FOR n:=0 TO 255 DO hamwindow[n]:=
0.54–0.46*COS(2*3.1415927*n/255);
```

and a windowing operation defined by:

```
FOR n:=0 TO 255 DO windspch[n]:=
segspch[n]*hamwindow[n];.
```

An additional time-ordered vector *spch[]* corresponding to the central 160 samples of each *segspch[]* vector shall be generated by the operation defined by:

```
FOR n:=0 TO 159 DO spch[]:=segspch[n+48];.
```

4.2 Autocorrelation

For each *windspch[]*, an eleven element autocorrelation vector *corr[]* shall be generated by the operation defined by:

```
FOR i:=0 TO 10 DO
BEGIN
dot:=0;
   FOR n:=0 TO 255-i DO dot:=dot+windspch[n]
   *windspch[n+i];
corr[i]:=dot
END;
```

4.3 Durbin's recursion

For each *corr[]*, a partial correlation coefficient vector *parcor[]* shall be generated by the operation defined by:

```
IF corr[0]=0 THEN FOR i:=1 TO 10 DO parcor[i]:=0;
ELSE
BEGIN
parcor[1]:=corr[1]/corr[0];
taps[1]:=parcor[1];
error:=(1-sqr(parcor[1]))*corr[0];
FOR i:=2 TO 10 DO
   BEGIN
   FOR j:=1 TO pred(i) DO alpha[j]:=taps[j];
   parcor[i]:=corr[i];
   FOR j:=1 TO pred(i) DO parcor[i]:=parcor[i]-
      alpha[j]*corr[i-j];
   parcor[i]:=parcor[i]/error;
   taps[i]:=parcor[i];
   FOR j:=1 TO pred(i) DO taps[j]:=alpha[j]-
      parcor[i]*alpha[i-j];
   error:=(1-sqr(parcor[i]))*error
   END
END;
```

4.4 Quantization of the partial correlation coefficients

For each *parcor[]*, the ten partial correlation coefficients contained within shall be quantized and stored in vector *qparcor[]* which is generated by the operation defined by:

```
{Quantizer initialization procedure}

{No. of quantizer levels for each coefficient}

plevel[1]:=64;
plevel[2]:=64;
plevel[3]:=32;
plevel[4]:=32;
plevel[5]:=16;
plevel[6]:=16;
plevel[7]:=8;
plevel[8]:=8;
plevel[9]:=4;
plevel[10]:=4;
```

```
FOR i:=1 TO 10 DO
FOR j:=0 TO pred(plevel[i]) DO
    parql[i,j]:=pardl[i,pred(j)]+pardl[i,j]/2;

{Partial correlation coefficient quantizer}

FOR i:=1 TO 10 DO
BEGIN
j:=0;
        WHILE (parcor[i]>pardl[i,j] and
        (j<pred(plevel[i])) DO j:=succ(j);
    qparcor[i]:=parql[i,j]
END;
```

Note.— Vector pardl[] *contains the fixed decision levels for each partial correlation coefficient and its contents are defined in Table A7-1.**

4.5 Line codes for the partial correlation coefficients

A line code corresponding to each quantized partial correlation coefficient contained in *qparcor[]* shall be inserted into the transmission frame. Each line code shall be generated by the table look-up operation defined by:

a) for *qparcor[1]* use Table A7-2;

b) for *qparcor[2]* use Table A7-3;

c) for *qparcor[3]* use Table A7-4;

d) for *qparcor[4]* use Table A7-5;

e) for *qparcor[5]* use Table A7-6;

f) for *qparcor[6]* use Table A7-7;

g) for *qparcor[7]* use Table A7-8;

h) for *qparcor[8]* use Table A7-9;

i) for *qparcor[9]* use Table A7-10; and

j) for *qparcor[10]* use Table A7-11.

4.6 LPC filter tap step up

For each *qparcor[]*, the vector *qtaps[]* shall be generated by the operation defined by:

```
qtaps:=qparcor; {all 10 elements of vector qtaps set equal
to corresponding elements in qparcor}

FOR i:=2 TO 10 DO
BEGIN
    FOR j:=1 TO pred(i) DO alpha[j]:=qtaps[j];
        FOR j:=1 TO pred(i) DO qtaps[j]:=alpha[j]-
            qtaps[i]*alpha[i-j]
END;
```

4.7 Long-term correlation analysis

4.7.1 LPC INVERSE FILTERING

For each *spch[]*, the vector *residue[]* shall be generated by the operation defined by:

```
FOR n:=0 TO 159 DO
BEGIN
sum:=spch[n];
FOR i:=1 TO 10 DO sum:=sum-qtaps[i]*spch[n-i];
residue[n]:=sum
END;
```

Note.— The values near the start of each spch[], *for which the index of* spch[] *is less than zero, refers to speech samples at the end of the previous* spch[]. *For the first* spch[] *processed by the encoder, these values shall be considered to be zero.*

4.7.2 LONG-TERM CORRELATION

For each *residue[]*, the scalars *gain* and *delay* shall be generated by the operation defined by:

```
max:=0
FOR lag:=33 TO 96 DO
    BEGIN
    sum:=0;
    FOR n:=0 TO 159 DO sum:-
        sum+residue[n]*residue[n-lag];
        IF sum>max THEN
        BEGIN
        max:=sum;
        delay:=lag
        END
    END;
sum:=0;
FOR n:=0 TO 159 DO sum:=sum+sqr(residue[n-delay]);
IF sum=0 THEN gain:=0 ELSE gain:=max/sum;
END;
```

* All tables are located at the end of this chapter.

Note 1.— The scalar delay is a 16-bit signed integer.

Note 2.— Negative values of the indices n-lag and n-delay point to entries in the residue[] *that were calculated for the previous* spch[]. *For the first* spch[] *processed, the referenced entries in* residue[] *shall be considered to be zero.*

4.7.3 Quantization and line encoding of the scalar gain

For each *gain*, its contents shall be quantized and stored in scalar *qgain* by the operation defined by:

```
IF gain>0.75 THEN qgain:=0.9 ELSE
    IF gain>0.45 THEN qgain:=0.60 ELSE
        IF gain>0.2 THEN qgain:=0.325 ELSE qgain:=0.1
```

A 2-bit line code corresponding to *qgain* shall be inserted into the transmission frame. The line code shall be generated by the table look-up operation defined by Table A7-12.

4.7.4 Line encoding of the scalar delay

A line code corresponding to *delay* shall be generated by the table look-up operation defined by Table A7-13.

4.8 Excitation analysis

Note 1.— The transmission frame generated by this encoding algorithm contains five excitation frames. Each group of five excitation frames is associated with the same speech frame (spch[]) *from which the partial correlation coefficients of the current transmission frame were calculated.*

Note 2.— Any operation that generates an output variable that is a component of an excitation frame must be performed at the generation rate of the excitation frames (i.e. five executions for each spch[]*).*

4.8.1 Error signal derivation

For each *delay, qgain, qtaps[], synthspch[],* and *s2[]*, the vector *error[]* shall be generated by the operation defined by:

```
local_synthspch:=synthspch; {create a local copy
    of the short term predictor filter memory}
local_s2:=s2; {create a local copy of the
    long term predictor filter memory}
FOR n:=b TO b+31 DO
    BEGIN
    sum:=0;
        FOR i:=1 TO 10 DO sum:=sum+qtaps[i]*
        local_synthspch[n-i];
    local_synthspch[n]:=qgain*local_s2[n-delay]+sum;
    error[n]:=spch[n]-local_synthspch[n]
    END;
```

Note.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.8.2 Impulse response calculation

For each *qtaps[]*, the vectors *iresp[]* and *ipwr[]* shall be generated by the operation defined by the following:

```
iresp[0]:=1;
ipwr[31]:=1;
FOR n:=1 TO 31 DO
    BEGIN
    sum:=0;
    FOR j:=1 TO 10 DO IF n>=j THEN
        sum:=sum+qtaps[j]*iresp[n-j];
    iresp[n]:=sum;
    ipwr[32-succ(n)]:=ipwr[32-n]+sqr(sum)
    END;
```

Note.— Since the minimum possible value for the delay parameter is 32, the long-term predictor has no influence on the first 32 samples of the impulse response.

4.8.3 Cross-correlation calculation

For each *error[]* and *iresp[]*, the vector *xcorr[]* shall be generated by the operation defined by:

```
FOR n:=0 TO 31 DO
    BEGIN
    dot:=0;
        FOR j:=n TO 31 DO dot:=dot+error[b+j]*
            iresp[j-n];
    xcorr[n]:=dot
    END;
```

Note 1.— The scalar b is the sample number corresponding to the start of the current excitation frame within the current speech frame. For the first, second, third, fourth and fifth excitation frames of each speech frame, the value of b equals 0, 32, 64, 96, and 128 respectively.

Note 2.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.8.4 Pulse selection

For each *xcorr[], ipwr[],* and *iresp[]*, the vectors *posns[]* and *qamp[]* shall be generated by the operation defined by:

```
FOR pulse:=1 TO 3 DO
BEGIN
max:=0;
FOR n:=0 TO 31 DO
    IF (sqr(xcorr[n])>=max*ipwr[n]) and not
        (n in posn_set) THEN BEGIN
    max:=sqr(xcorr[n])/ipwr[n];
    pos:=n
END;
posn_set:=posn_set+[pos];
posns[pulse]:=pos;
amp:= xcorr[pos]/ipwr[pos];
qamp[pulse]:=quantamp(amp,pulse);

{Account for the effect of the quantized pulse
    just calculated on the error to be minimized}
    WHILE pulse<npulse DO
    BEGIN
        FOR n:=0 TO pred(pos) DO
        BEGIN
        dot:=0;
            FOR j:=0 TO 31-pos DO dot:=dot+iresp[j]*
                iresp[j+(pos-n)];
        xcorr[n]:=xcorr[n-qamp*dot
        END;

        FOR n:= pos TO 31 DO
        BEGIN
        dot:=0;
            FOR j:=0 TO 31-n DO dot:=dot+iresp[j]*
                iresp[j+(n-pos)];
        xcorr[n]:=xcorr[n]-qamp*dot
        END
    END
END;
```

Note 1.— The second and third pulses selected in each excitation frame are not allowed to occupy a position already occupied by a previously selected pulse in that excitation frame.

Note 2.— The function quantamp(amp,pulse) *is defined in 4.8.4.1.*

Note 3.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.8.4.1 PULSE AMPLITUDE QUANTIZATION

Where invoked elsewhere, the function *quantamp(amp,pulse)* shall be used to generate values in the vector *qamp[]* by the operation defined by:

```
{Pulse amplitude quantizer initialization}

gfact_leak:=1; maxadapt:=false;
adjust[1]:=1; adjust[2]:=1.0/0.625; adjust[3]:=1.0/0.375;

{3 bit quantizer initialization}

adapt[3,0]:=0.875; adapt[3,1]:=0.875;
    adapt[3,2]:=1.0; adapt[3,3]:=1.5;
quant[3,0]:=0.5006; quant[3,1]:=1.050;
    quant[3,2]:=1.748;
inv_quant[3,0]:=0.2451; inv_quant[3,1]:=0.7560;
    inv_quant[3,2]:=1.344;
inv_quant[3,3]:=2.152;

{4 bit quantizer initialization}

adapt[4,0]:=0.75; adapt[4,1]:=0.875;
    adapt[4,2]:=0.875; adapt[4,3]:=0.875;
adapt[4,4]:=1.0;
adapt[4,5]:=1.25; adapt[4,6]:=1.5; adapt[4,7]:=2.0;
quant[4,0]:=0.2582; quant[4,1]:=0.5224;
    quant[4,2]:=0.7996;
quant[4,3]:=1.099; quant[4,4]:=1.437;
    quant[4,5]:=1.844; quant[4,6]:=2.401;
inv_quant[4,0]:=0.1284; inv_quant[4,1]:=0.3881;
    inv_quant[4,2]:=0.6568;
inv_quant[4,3]:=0.9424; inv_quant[4,4]:=1.256;
    inv_quant[4,5]:=1.618; inv_quant[4,6]:=2.069;
inv_quant[4,7]:=2.733;

FUNCTION quantamp(lev:real, pulse:integer):real;

VAR    i,qbits       : integer
sgn     : -1..1;
BEGIN
lev:=lev*adjust[pulse]
IF pulse<3 THEN BEGIN qbits:=4; qlevels:=7 END
    ELSE BEGIN qbits:=3; qlevels:=3 END;
IF lev>0 THEN sgn:=1 ELSE sgn:=-1;
i:=0;
WHILE (abs(lev)>quant[qbits,i]*gfact_leak) and
    (i<qlevels) DO i:=succ(i);
quantamp:=inv_quant[qbits,i]*gfact_leak*
    sgn/adjust[pulse];
gfact_leak:=EXP(0.98*LN(gfact_leak));

IF i=qlevels THEN
    BEGIN
    IF maxadapt THEN gfact_leak:=gfact_leak*
        adapt[qbits,qlevels]; maxadapt:=true
    END ELSE maxadapt:=false;
gfact_leak:=gfact_leak*adapt[qbits,i];
IF gfact_leak>512.0 THEN gfact_leak:=512.0 ELSE
    IF gfact_leak<0.5 THEN gfact_leak:=0.5
END { of quantamp. };
```

Note 1.— This operation is performed for each of the five excitation frames contained within a transmission frame.

Note 2.— The final, post-leakage pulse amplitudes developed within the function quantamp() *are each quantized to a* *fixed value based on internal quantization thresholds; and then converted to corresponding line codes. The quantization and line code generation aspects of the function are, in effect, a table lookup operation which can be visualized by referring to Tables A7-14 and A7-15.*

4.8.5 Pulse position line code generation

A line code corresponding to the contents of *posns[]* for each excitation frame shall be generated by the table look-up operation defined by Table A7-16.

Note.— Each pulse position shall be encoded with reference to the beginning of the excitation frame within which it falls. There are 32 possible positions per excitation frame. Positions within each excitation frame are numbered from 0 to 31, with 0 corresponding to the first sample position within each frame and 31 corresponding to the last sample position.

4.9 Local decoder

Note.— The local decoder logic is used to generate a locally derived version of the encoded speech for feedback to the excitation analysis logic defined in 4.8. The local decoder logic is also used in the definition of the decoding process in Section 5.

4.9.1 Excitation generator

For each *posns[]* and *qamp[]*, the vector *s1[]* shall be generated by the operation defined by:

```
FOR n:=b TO b+31 DO s1[n]:=0;
FOR pulse:=1 TO 3 DO s1[posns[pulse]+b]:=
    qamp[pulse];
```

Note 1.— The scalar b is the sample number in the current spch[] *frame corresponding to the start of the current excitation frame and* posns[] *is the vector of pulse positions belonging to the current excitation frame. For the first, second, third, fourth and fifth excitation frames of each speech frame, the value of b equals 0, 32, 64, 96, and 128 respectively.*

Note 2.— The vector s1[] *contains pulses of amplitude* qamp[] *located at positions* posns[], *and having the corresponding quantized amplitudes,* qamp[].

Note 3.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.9.2 Long-term predictor

For each *qgain* and *delay*, and for each of the five *s1[]* associated with a transmission frame, the vector *s2[]* shall be generated by the operation defined by:

```
FOR n:=b TO b+31 DO s2[n]:=qgain*s2[n-delay]+s1[n];
```

Note 1.— Values of the index, n-delay, *are always less than b (the beginning of the current excitation frame) and the index thus points to values in the long term predictor filter memory. For the first* spch[] *frame processed, the contents of* s2[] *shall be set to zero.*

Note 2.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.9.3 Short-term predictor

For each *qtaps[]*, and for each of the five *s2[]* associated with a transmission frame, the vector *synthspch[]* shall be generated by the operation defined by:

```
FOR n:=b TO b+31 DO
BEGIN
sum:=0;
   FOR i:=1 TO 10 DO sum:=sum+qtaps[i]*
      synthspch[n-i];synthspch[n]:
      =s2[n]+sum
END;
```

Note 1.— The index, n-i, *points to values in the short-term predictor memory. For the first* spch[] *frame processed, the contents of* synthspch[] *shall be set to zero.*

Note 2.— This operation is performed for each of the five excitation frames contained within a transmission frame.

4.10 Transmission frame generation

A transmission frame comprising the structure defined in 4.10.1 shall be generated by the voice encoder process every 20 milliseconds.

4.10.1 Transmission frame structure

The 192-bit transmission frame structure shall be as defined in Table A7-17.

4.10.2 TRANSMISSION ORDERING AND ALIGNMENT

Commencing with Partial Correlation Coefficient No. 1, the transmission frame shall be rendered as a sequence of 192 bits by aligning each succeeding line code in Table A7-17 in bit serial order. Alignment shall be such that the least significant bit of each line code is followed immediately by the most significant bit of the following line code. Each 192-bit transmission frame shall be aligned with and contained within a 192-bit C channel primary data field as defined in Section 4.

4.10.3 ERROR PROTECTION

The 26 bits designated by underscoring in Table A7-18 shall be protected by the error correction/detection logic defined in 4.10.3.1 and 4.10.3.2.

4.10.3.1 *SINGLE BIT ERROR CORRECTION AND DOUBLE BIT ERROR DETECTION*

The protected bits defined in 4.10.3 shall be used to generate a 5-bit Hamming code word by the operation defined by:

```
TYPE hamrng = 1..26;
hamword = array [hamrng] of boolean;

FUNCTION hamming (word:hamword):integer;
VAR n,count,ham :integer;
i   :hamrng;
BEGIN
n:=4; count:=3; ham:=0;
FOR i:=1 TO 26 DO
   BEGIN
   IF word[i] THEN ham:=EXOR(ham,count);
   count:=succ(count);
   IF count=n THEN BEGIN n:=n*2;
      count:=succ(count)END
   END

hamming:=ham
END{of hamming.};
```

A sixth bit representing an odd-parity bit of the code word shall be generated and appended to the code word as the most significant bit. The resultant 6-bit value shall be inserted in the transmission frame and submitted to the burst error detection logic defined in 4.10.3.2.

4.10.3.2 *BURST ERROR DETECTION*

The 26 protected bits defined in Table A7-18 and the 6-bit value resulting from the Hamming code word defined in 4.10.3.1 shall be arranged in the order defined by the matrix in Table A7-19 at the locations denoted by 'p' and 'e' respectively.

Each bit 'b' shall be set to make even parity for its respective column. The 8 'b' bits shall then be exclusive-ORed with the binary mask '10101010' and the resulting 8 bits inserted in the transmission frame.

5. DECODING PROCESS DEFINITION

Each transmission frame shall be decoded as per 5.1. The line codes shall be used to generate quantized speech samples as per 5.2.

5.1 Transmission frame decoding

5.1.1 PARTIAL CORRELATION COEFFICIENT DECODING

5.1.1.1 *BURST ERROR DETECTION/ CORRECTION*

The 26 protected bits (Table A7-18), the 6-bit Hamming code word, and the 8 burst error detection bits shall be extracted from the transmission frame and arranged in a burst error detection calculation matrix as per Table A7-19. The burst error detection bits shall then be exclusive-ORed in place with the binary mask '10101010'. Each column of the resulting matrix shall then be examined for a potential lack of even parity. The matrix and the associated column parity error information shall then be submitted to the error detection and correction process defined in Figure A7-2. If that process indicates that the corrected error level of the received coefficient line codes is adequate, the coefficients shall be decoded from the line codes as per 5.1.1.2. However, if the corrected error level is inadequate, the line codes shall be discarded and the output of the decoder shall be muted by the logic defined in 5.1.3.2 and 5.1.3.2.1.

Note.— The purpose of the 8 burst error detection bits is to guard against a pathological case where an extremely long burst error series might render '0' bits in all 40 positions of the calculation matrix. In that case, the exclusive-OR operation on the 'b' bits of the matrix would cause odd parity to be made in four of the columns, thereby forcing the error detection and correction process to discard the transmission frame.

5.1.1.2 *COEFFICIENT DECODING*

If the corrected error level of the line codes corresponding to the 10 coefficients is shown to be adequate (5.1.1.1), the 10 coefficients shall be decoded as per Tables A7-2 through A7-11 and the resulting values inserted into the vector *qparcor[]*. Vector *qparcor[]* shall then be used to generate vector *qtaps[]* by the operation defined in 4.6.

5.1.2 LONG-TERM PREDICTOR PARAMETER DECODING

The long-term predictor parameters *qgain* and *delay* shall be decoded from the received line codes by the table look-up operation defined by Tables A7-12 and A7-13 respectively.

5.1.3 EXCITATION PARAMETER DECODING

5.1.3.1 *PULSE POSITION DECODING*

For each excitation frame, the vector *posns[]* shall be generated from the contents of the three pulse position values. The contents shall be decoded from the received line codes by the table look-up operation defined by Table A7-16.

5.1.3.2 *PULSE AMPLITUDE DECODING*

For each excitation frame, the vector *qamp[]* shall be generated from the contents of the three pulse amplitude values contained in the excitation frame. The contents shall be decoded from the received line codes by the table look-up operation defined by Tables A7-14 and A7-15.

5.1.3.2.1 If muting of the decoder output is indicated (5.1.1), the line codes corresponding to *qamp[1]* and *qamp[2]* shall be forced to '0100' prior to decoding. Similarly, the line code corresponding to *qamp[3]* shall be forced to '010' prior to decoding.

Note.— The contents of qamp[1], qamp[2] *and* qamp[3] *represent the amplitudes of the first through third pulses of the excitation frame respectively.*

5.1.3.3 Beginning with excitation frame no. 1 and continuing in sequence for each of the remaining excitation frames, the contents of the vector *qamp[]* corresponding to each of the five excitation frames shall be modified by the operation defined by:

Note.— This operation compensates for the amplitude normalization and gain adjustment processes performed during encoder pulse quantization (4.8.4.1).

```
{Initialization}

gfact_leak:=1; maxadapt:=false;
adjust[1]:=1; adjust[2]:=1.0/0.625; adjust[3]:=1.0/0.375;

{3 bit initialization}

adapt[3,0]:=0.875; adapt[3,1]:=0.875;
    adapt[3,2]:=1.0; adapt[3,3]:=1.5;
inv_quant[3,0]:=0.2451; inv_quant[3,1]:=0.7560;
    inv_quant[3,2]:=1.344; inv_quant[3,3]:=2.152;

{4 bit initialization}

adapt[4,0]:=0.75; adapt[4,1]:=0.875; adapt[4,2]:=0.875;
    adapt[4,3]:=0.875; adapt[4,4]:=1.0;
adapt[4,5]:=1.25; adapt[4,6]:=1.5; adapt[4,7]:=2.0;
inv_quant[4,0]:=0.1284; inv_quant[4,1]:=0.3881;
    inv_quant[4,2]:=0.6568;
inv_quant[4,3]:=0.9424; inv_quant[4,4]:=1.256;
    inv_quant[4,5]:=1.618; inv_quant[4,6]:=2.069;
inv_quant[4,7]:=2.733;

VAR   i,qbits: integer
sgn   : -1..1;

FOR pulse:= 1 TO 3 DO
BEGIN
IF pulse<3 THEN BEGIN qbits:=4; qlevels:=7 END
    ELSE BEGIN qbits:=3; qlevels:=3 END;
i:=0;
WHILE (abs(qamp[pulse])>inv_quant[qbits,i]) and
    (i<qlevels) DO i:=succ(i);
qamp[pulse]:=qamp[pulse]*gfact_leak/adjust[pulse];
gfact_leak:=EXP(0.98*LN(gfact_leak));

IF i=qlevels THEN
    BEGIN
    IF maxadapt THEN gfact_leak:=gfact_leak*
        adapt[qbits,qlevels]; maxadapt:=true
    END ELSE maxadapt:=false;
gfact_leak:=gfact_leak*adapt[qbits,i];
IF gfact_leak>512.0 THEN gfact_leak:=512.0 ELSE
    IF gfact_leak<0.5 THEN gfact_leak:=0.5
END;
```

5.1.3.3.1 If muting of the decoder output is indicated (5.1.1), the contents of *qamp[]* shall be set to zero **after** the completion of the above operation.

5.2 Generation of the decoded speech output

For each decoded transmission frame, time-ordered speech samples shall be generated by the following operations in sequence:

a) for each of the five vectors *posns[]* and *qamp[]* associated with the current transmission frame, a vector *s1[]* shall be generated by the operation defined in 4.9.1;

b) for each of the five vectors *s1[]* associated with the current transmission frame, and for the scalars *qgain* and *delay* associated with the current transmission frame, a vector *s2[]* shall be generated by the operation defined in 4.9.2; and then

c) for each of the five vectors *s2[]* associated with the current transmission frame, and for the vector *qtaps[]* associated with the current transmission frame, a vector *synthspch[]* shall be generated by the operation defined in 4.9.3.

Note.— The rate at which the vector synthspch[] *is generated by the decoder (5 vectors/frame at 50 frames/second) and the rate of speech samples from each* synthspch[] *(32 samples/vector) will yield an over-all speech sample rate of 8.0 kHz.*

5.3 Speech output transcoding

Each speech sample derived from the vector *synthspch[]* will exhibit the internal floating point numeric range as defined in Section 2. The numeric range of the speech sample stream should be appropriately scaled prior to any subsequent digital transcoding or analog speech reconstruction.

Table A7-1. ***pardl[]*** **(decision levels for the partial correlation coefficient quantizer)**

pardl[1,-1], pardl[1,0], pardl[1,1], pardl[1,2]	-0.7512804,	-0.7269750,	-0.7017226,	-0.6755562
pardl[1,3], pardl[1,4], pardl[1,5], pardl[1,6]	-0.6485097,	-0.6206185,	-0.5919189,	-0.5624482
. . . .	-0.5322449,	-0.5013483,	-0.4697985,	-0.4376369
. . . .	-0.4049051,	-0.3716459,	-0.3379026,	-0.3037192
. . . .	-0.2691401,	-0.2342104,	-0.1989756,	-0.1634817
. . . .	-0.1277748,	-0.0919014,	-0.0559084,	-0.0198425
. . . .	0.0162492,	0.0523198,	0.0883222,	0.1241096
. . . .	0.1599351,	0.1954524,	0.2307150,	0.2656771
. . . .	0.3002931,	0.3345180,	0.3683071,	0.4016164
. . . .	0.4344026,	0.4666229,	0.4982354,	0.5291989
. . . .	0.5594731,	0.5890184,	0.6177965,	0.6457698
. . . .	0.6729020,	0.6991577,	0.7245026,	0.7489037
. . . .	0.7723293,	0.7947488,	0.8161331,	0.8364543
. . . .	0.8556859,	0.8738029,	0.8907816,	0.9066001
. . . .	0.9212375,	0.9346749,	0.9468949,	0.9578813
pardl[1,59], pardl[1,60], pardl[1,61], pardl[1,62]	0.9676200,	0.9760983,	0.9833051,	0.9892311
pardl[1,63], pardl[2,-1], pardl[2,0], pardl[2,1]	0.9938684,	-0.9687151,	-0.9600082,	-0.9502578
pardl[2,2], pardl[2,3], pardl[2,4], pardl[2,5]	-0.9394747,	-0.9276705,	-0.9148581,	-0.9010514
. . . .	-0.8862653,	-0.8705161,	-0.8538207,	-0.8361974
. . . .	-0.8176653,	-0.7982445,	-0.7779561,	-0.7568223
. . . .	-0.7348658,	-0.7121107,	-0.6885817,	-0.6643043
. . . .	-0.6393048,	-0.6136106,	-0.5872494,	-0.5602500
. . . .	-0.5326418,	-0.5044546,	-0.4757191,	-0.4464666
. . . .	-0.4167289,	-0.3865382,	-0.3559275,	-0.3249299
. . . .	-0.2935792,	-0.2619094,	-0.2299549,	-0.1977505
. . . .	-0.1653312,	-0.1327322,	-0.0999890,	-0.0671371
. . . .	-0.0342122,	-0.0012501,	0.0317133,	0.0646423
. . . .	0.0975010,	0.1302537,	0.1628649,	0.1952991
. . . .	0.2275210,	0.2594956,	0.2911882,	0.3225643
. . . .	0.3535898,	0.3842311,	0.4144548,	0.4442280
. . . .	0.4735184,	0.5022941,	0.5305240,	0.5581772
. . . .	0.5852238,	0.6116344,	0.6373802,	0.6624333
pardl[2,62], pardl[2,63], pardl[3,-1], pardl[3,0]	0.6867664,	0.7103531,	-0.6209860,	-0.5817980
pardl[3,1], pardl[3,2], [pardl[3,3], pardl[3,4]	-0.5412097,	-0.4993190,	-0.4562265,	-0.4120361
. . . .	-0.3668540,	-0.3207891,	-0.2739522,	-0.2264559
. . . .	-0.1784146,	-0.1299440,	-0.0811606,	-0.0321819
. . . .	0.0168742,	0.0658897,	0.1147467,	0.1633275
. . . .	0.2115152,	0.2591939,	0.3062488,	0.3525667
. . . .	0.3980361,	0.4425475,	0.4859939,	0.5282706
. . . .	0.5692760,	0.6089114,	0.6470813,	0.6836939
pardl[3,29], pardl[3,30], pardl[3,31], pardl[4,-1]	0.7186612,	0.7518988,	0.7833269,	-0.8819578
pardl[4,0], pardl[4,1], pardl[4,2], pardl[4,3]	-0.8576206,	-0.8311930,	-0.8027395,	-0.7723294
. . . .	-0.7400368,	-0.7059404,	-0.6701235,	-0.6326731
. . . .	-0.5936806,	-0.5532411,	-0.5114532,	-0.4684186
. . . .	-0.4242423,	-0.3790320,	-0.3328978,	-0.2859522
. . . .	-0.2383097,	-0.1900863,	-0.1413995,	-0.0923682
. . . .	-0.0431116,	0.0062499,	0.0555963,	0.1048072
. . . .	0.1537625,	0.2023432,	0.2504306,	0.2979076
pardl[4,28], pardl[4,29], pardl[4,30], pardl[4,31]	0.3446585,	0.3905694,	0.4355282,	0.4794255
pardl[5,-1], pardl[5,0], pardl[5,1], pardl[5,2]	-0.5728675,	-0.5044545,	-0.4327131,	-0.3581167
. . . .	-0.2811575,	-0.2023432,	-0.1221939,	-0.0412383
. . . .	0.0399893,	0.1209531,	0.2011188,	0.2799576
. . . .	0.3569492,	0.4315858,	0.5033747,	0.5718424
pardl[5,15], pardl[6,-1], pardl[6,0], pardl[6,1]	0.6365371,	-0.7032794,	-0.6508853,	-0.5951883
. . . .	-0.5364712,	-0.4750316,	-0.4111817,	-0.3452452
. . . .	-0.2775567,	-0.2084599,	-0.1383052,	-0.0674487
. . . .	0.0037500,	0.0749297,	0.1457292,	0.2157892
pardl[6,14], pardl[6,15], pardl[7,-1], pardl[7,0]	0.2847542,	0.3522742,	-0.4617792,	-0.3299494
pardl[7,1], pardl[7,2], pardl[7,3],pardl[7,4]	-0.1913133,	-0.0487307,	0.0948572,	0.2364883
pardl[7,5], pardl[7,6], pardl[7,7], pardl[8,-1]	0.3732410,	0.5022942,	0.6209860,	-0.6287930
pardl[8,0], pardl[8,1], pardl[8,2], pardl[8,3]	-0.5098411,	-0.3801884,	-0.2425563,	-0.0998334
pardl[8,4], pardl[8,5], pardl[8,6], pardl[8,7]	0.0449848,	0.1888589,	0.3287691,	0.4617791
pardl[9,-1], pardl[9,0], pardl[9,1], pardl[9,2]	-0.4259395,	-0.1271548,	0.1839465,	0.4772301
pardl[9,3], pardl[10,-1], pardl[10,0], pardl[10,1]	0.7242872,	-0.4968801,	-0.2763557,	-0.0399893
pardl[10,2], pardl[10,3]	0.1986693,	0.4259395		

Table A7-2. Line codes for partial correlation coefficient No. 1

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
–0.7391278	000000	0.3174056	100000
–0.7143489	000001	0.3514125	100001
–0.6886395	000010	0.3849618	100010
–0.6620330	000011	0.4180095	100011
–0.6345642	000100	0.4505128	100100
–0.6062688	000101	0.4824292	100101
–0.5771836	000110	0.5137172	100110
–0.5473465	000111	0.5443360	100111
–0.5167966	001000	0.5742458	101000
–0.4855734	001001	0.6034074	101001
–0.4537177	001010	0.6317832	101010
–0.4212710	001011	0.6593359	101011
–0.3882755	001100	0.6860299	101100
–0.3547743	001101	0.7118301	101101
–0.3208109	001110	0.7367031	101110
–0.2864296	001111	0.7606165	101111
–0.2516752	010000	0.7835391	110000
–0.2165930	010001	0.8054410	110001
–0.1812287	010010	0.8262937	110010
–0.1456282	010011	0.8460701	110011
–0.1098381	010100	0.8647444	110100
–0.0739049	010101	0.8822923	110101
–0.0378754	010110	0.8986909	110110
–0.0017966	010111	0.9139188	110111
0.0342845	011000	0.9279562	111000
0.0703210	011001	0.9407849	111001
0.1062659	011010	0.9523881	111010
0.1420724	011011	0.9627507	111011
0.1776938	011100	0.9718592	111100
0.2130837	011101	0.9797017	111101
0.2481961	011110	0.9862680	111110
0.2829851	011111	0.9915497	111111

Table A7-3. Line codes for partial correlation coefficient No. 2

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.9643617	000000	−0.2459321	100000
−0.9551330	000001	−0.2138527	100001
−0.9448663	000010	−0.1815409	100010
−0.9335726	000011	−0.1490317	100011
−0.9212644	000100	−0.1163606	100100
−0.9079548	000101	−0.0835630	100101
−0.8936584	000110	−0.0506746	100110
−0.8783907	000111	−0.0177312	100111
−0.8621684	001000	0.0152316	101000
−0.8450091	001001	0.0481778	101001
−0.8269314	001010	0.0810716	101010
−0.8079550	001011	0.1138773	101011
−0.7881004	001100	0.1465593	101100
−0.7673892	001101	0.1790820	101101
−0.7458441	001110	0.2114100	101110
−0.7234883	001111	0.2435083	101111
−0.7003462	010000	0.2753419	110000
−0.6764430	010001	0.3068762	110001
−0.6518046	010010	0.3380771	110010
−0.6264577	010011	0.3689105	110011
−0.6004300	010100	0.3993429	110100
−0.5737497	010101	0.4293413	110101
−0.5464459	010110	0.4588732	110110
−0.5185482	010111	0.4879062	110111
−0.4900868	011000	0.5164090	111000
−0.4610929	011001	0.5443506	111001
−0.4315977	011010	0.5717005	111010
−0.4016336	011011	0.5984291	111011
−0.3712329	011100	0.6245073	111100
−0.3404287	011101	0.6499068	111101
−0.3092546	011110	0.6745999	111110
−0.2777443	011111	0.6985598	111111

Table A7-4. Line codes for partial correlation coefficient No. 3

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.6013920	00000	0.1390371	10000
−0.5615038	00001	0.1874214	10001
−0.5202643	00010	0.2353546	10010
−0.4777727	00011	0.2827214	10011
−0.4341313	00100	0.3294078	10100
−0.3894451	00101	0.3753014	10101
−0.3438216	00110	0.4202918	10110
−0.2973706	00111	0.4642707	10111
−0.2502041	01000	0.5071322	11000
−0.2024353	01001	0.5487733	11001
−0.1541793	01010	0.5890937	11010
−0.1055523	01011	0.6279963	11011
−0.0566713	01100	0.6653876	11100
−0.0076539	01101	0.7011775	11101
0.0413820	01110	0.7352800	11110
0.0903182	01111	0.7676129	11111

Table A7-5. Line codes for partial correlation coefficient No. 4

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.8697892	00000	−0.2621310	10000
−0.8444068	00001	−0.2141980	10001
−0.8169663	00010	−0.1657429	10010
−0.7875345	00011	−0.1168839	10011
−0.7561831	00100	−0.0677399	10100
−0.7229886	00101	−0.0184309	10101
−0.6880320	00110	0.0309231	10110
−0.6513983	00111	0.0802017	10111
−0.6131769	01000	0.1292848	11000
−0.5734609	01001	0.1780529	11001
−0.5323472	01010	0.2263869	11010
−0.4899359	01011	0.2741691	11011
−0.4463305	01100	0.3212830	11100
−0.4016372	01101	0.3676139	11101
−0.3559649	01110	0.4130488	11110
−0.3094251	01111	0.4574769	11111

Table A7-6. Line codes for partial correlation coefficient No. 5

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.5386610	0000	0.0804712	1000
−0.4685838	0001	0.1610360	1001
−0.3954149	0010	0.2405382	1010
−0.3196371	0011	0.3184534	1011
−0.2417503	0100	0.3942675	1100
−0.1622685	0101	0.4674802	1101
−0.0817161	0110	0.5376085	1110
−0.0006245	0111	0.6041898	1111

Table A7–7. Line codes for partial correlation coefficient No. 6

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.6770824	0000	−0.1733826	1000
−0.6230369	0001	−0.1028770	1001
−0.5658298	0010	−0.0318494	1010
−0.5057514	0011	0.0393399	1011
−0.4431067	0100	0.1103295	1100
−0.3782134	0101	0.1807592	1101
−0.3114009	0110	0.2502717	1110
−0.2430083	0111	0.3185142	1111

Table A7–8. Line codes for partial correlation coefficient No. 7

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
−0.3958643	000	0.1656727	100
−0.2606314	001	0.3048646	101
−0.1200220	010	0.4377676	110
0.0230632	011	0.5616401	111

Table A7–9. Line codes for partial correlation coefficient No. 8

QUANTIZER LEVEL	LINE CODE
−0.5693170	000
−0.4450148	001
−0.3113724	010
−0.1711949	011

QUANTIZER LEVEL	LINE CODE
−0.0274243	100
0.1169218	101
0.2588140	110
0.3952741	111

Table A7–10. Line codes for partial correlation coefficient No. 9

QUANTIZER LEVEL	LINE CODE
−0.2765472	00
0.0283959	01

QUANTIZER LEVEL	LINE CODE
0.3305883	10
0.6007586	11

Table A7–11. Line codes for partial correlation coefficient No. 10

QUANTIZER LEVEL	LINE CODE
−0.3866179	00
−0.1581725	01

QUANTIZER LEVEL	LINE CODE
0.0793400	10
0.3123044	11

Table A7-12. Line encoding for quantized long-term predictor *qgain*

qgain	LINE CODE
0.100	00
0.325	01
0.600	10
0.900	11

Table A7-13. Line encoding for the long term predictor *delay*

delay	LINE CODE
32	000000
33	000001
34	000010
35	000011
...	...
63	011111
64	100000
65	100001
66	100010
...	...
92	111100
93	111101
94	111110
95	111111

Table A7-14. Line codes for the first and second pulse amplitudes of each excitation frame

DECISION THRESHOLD	CONTENTS OF *QAMP[1]* AND *[2]*	LINE CODE
−2.4010	−2.7330	1111
−1.8440	−2.0690	1110
−1.4370	−1.6180	1101
−1.0990	−1.2560	1100
−0.7996	−0.9424	1011
−0.5224	−0.6568	1010
−0.2582	−0.3881	1001
−0.0000	−0.1284	1000
0.0000	0.1284	0000
0.2582	0.3881	0001
0.5224	0.6568	0010
0.7996	0.9424	0011
1.0990	1.2560	0100
1.4370	1.6180	0101
1.8440	2.0690	0110
2.4010	2.7330	0111

Table A7-15. Line codes for the third pulse amplitude of each excitation frame

DECISION THRESHOLD	CONTENTS OF *QAMP[3]*	LINE CODE
−1.7480	−2.1520	111
−1.0500	−1.3440	110
−0.5006	−0.7560	101
−0.0000	−0.2451	100
0.0000	0.2451	000
0.5006	0.7560	001
1.0500	1.3440	010
1.7480	2.1520	011

Table A7-16. Line codes for the three pulse positions within each excitation frame

PULSE POSITION	LINE CODE
0	00000
1	00001
2	00010
3	00011
4	00100
...	...
15	01111
16	10000
...	...
29	11101
30	11110
31	11111

Table A7-17. Transmission frame structure

FRAME COMPONENT (line code)	REFERENCE	LENGTH (bits)
Partial correlation coefficient No. 1	Table A7-2	6
Partial correlation coefficient No. 2	Table A7-3	6
Partial correlation coefficient No. 3	Table A7-4	5
Partial correlation coefficient No. 4	Table A7-5	5
Partial correlation coefficient No. 5	Table A7-6	4
Partial correlation coefficient No. 6	Table A7-7	4
Partial correlation coefficient No. 7	Table A7-8	3
Partial correlation coefficient No. 8	Table A7-9	3
Partial correlation coefficient No. 9	Table A7-10	2
Partial correlation coefficient No. 10	Table A7-11	2
Hamming code word (5 bits plus odd parity)	4.10.3.1	6
Burst error detection	4.10.3.2	8
Long term correlation gain	Table A7-12	2
Long term correlation delay	Table A7-13	6
Excitation frame No. 1 (pulse no. 1 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 1 amplitude)	Table A7-14	4
Excitation frame No. 1 (pulse no. 2 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 2 amplitude)	Table A7-14	4
Excitation frame No. 1 (pulse no. 3 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 3 amplitude)	Table A7-15	3
Excitation Frame No. 2 (identical to No. 1)	-	26
Excitation frame No. 3 (identical to No. 1)	-	26
Excitation frame No. 4 (identical to No. 1)	-	26
Excitation frame No. 5 (identical to No. 1)	-	26

Table A7-18. Protected partial correlation coefficient line code bits

	Parcor coefficient									
	1	2	3	4	5	6	7	8	9	10
Protected bits ( )	$\underline{5\ 4\ 3\ 2\ 1\ 0}$	$\underline{5\ 4\ 3\ 2\ 1}\ 0$	$\underline{4\ 3\ 2}\ 1\ 0$	$\underline{4\ 3\ 2}\ 1\ 0$	$\underline{3\ 2}\ 1\ 0$	$\underline{3\ 2}\ 1\ 0$	$\underline{2\ 1}\ 0$	$\underline{2\ 1}\ 0$	$\underline{1}\ 0$	1 0

Table A7-19. Burst error detection calculation matrix

pppppppp
pppppppp
pppppppp
ppeeeeee
bbbbbbbb

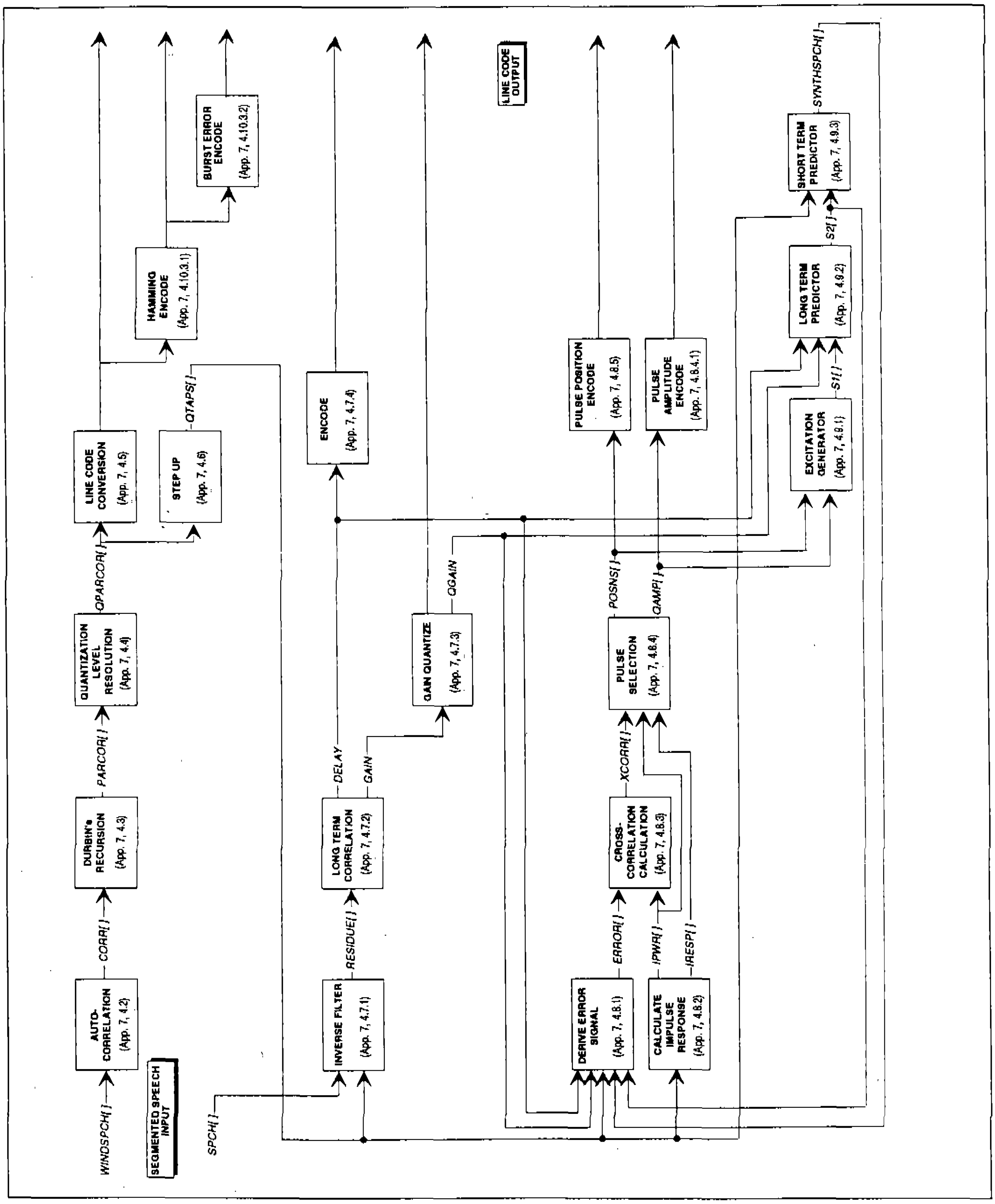

Figure A7-1. AMSS voice encoding algorithm

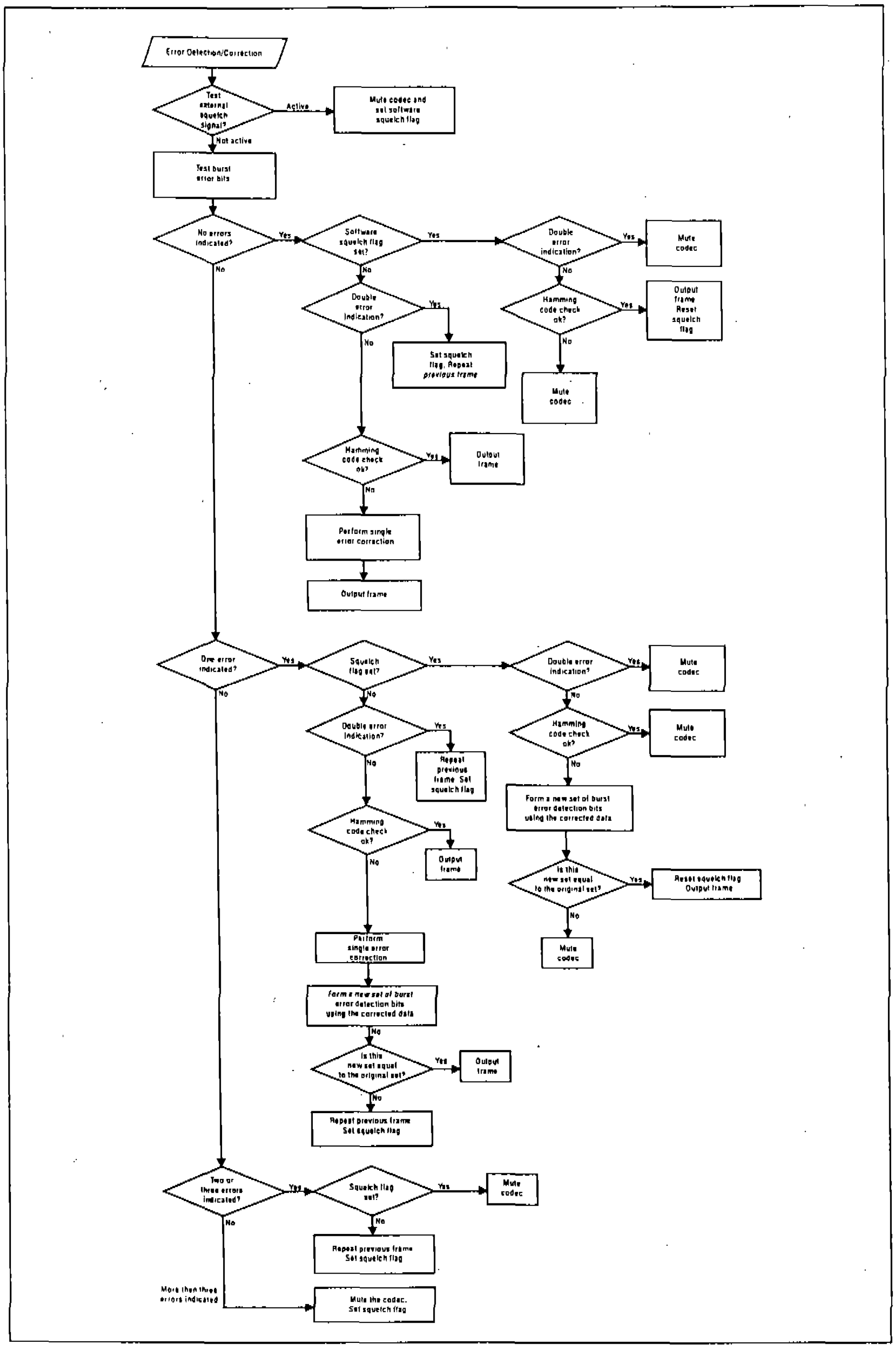

Figure A7-2. Error detection/correction process

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CHAPTER 5. SSR MODE S AIR-GROUND DATA LINK

Note.— The SSR Mode S air-ground data link is also referred to as the Mode S subnetwork in the context of the aeronautical telecommunication network (ATN).

5.1 DEFINITIONS RELATING TO THE MODE S SUBNETWORK

Air-initiated protocol. A procedure initiated by a Mode S aircraft installation for delivering a standard length or extended length downlink message to the ground.

Aircraft. The term aircraft may be used to refer to Mode S emitters (e.g. aircraft/vehicles), where appropriate.

Aircraft data circuit-terminating equipment (ADCE). An aircraft specific data circuit-terminating equipment that is associated with an airborne data link processor (ADLP). It operates a protocol unique to Mode S data link for data transfer between air and ground.

Aircraft data link processor (ADLP). An aircraft-resident processor that is specific to a particular air-ground data link (e.g. Mode S) and which provides channel management, and segments and/or reassembles messages for transfer. It is connected to one side of aircraft elements common to all data link systems and on the other side to the air-ground link itself.

Aircraft address. A unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance.

Aircraft/vehicle. May be used to describe either a machine or device capable of atmospheric flight, or a vehicle on the airport surface movement area (i.e. runways and taxiways).

BDS Comm-B Data Selector. The 8-bit BDS code determines the register whose contents are to be transferred in the MB field of a Comm-B reply. It is expressed in two groups of 4 bits each, BDS1 (most significant 4 bits) and BDS2 (least significant 4 bits).

Broadcast. The protocol within the Mode S system that permits uplink messages to be sent to all aircraft in coverage area, and downlink messages to be made available to all interrogators that have the aircraft wishing to send the message under surveillance.

Capability report. Information identifying whether the transponder has a data link capability as reported in the capability (CA) field of an all-call reply or squitter transmission (see “data link capability report”).

Close-out. A command from a Mode S interrogator that terminates a Mode S link layer communication transaction.

Cluster of interrogators. Two or more interrogators with the same interrogator identifier (II) code, operating cooperatively to ensure that there is no interference to the required surveillance and data link performance of each of the interrogators, in areas of common coverage.

Comm-A. A 112-bit interrogation containing the 56-bit MA message field. This field is used by the uplink standard length message (SLM) and broadcast protocols.

Comm-B. A 112-bit reply containing the 56-bit MB message field. This field is used by the downlink SLM, ground-initiated and broadcast protocols.

Comm-C. A 112-bit interrogation containing the 80-bit MC message field. This field is used by the uplink extended length message (ELM) protocol.

Comm-D. A 112-bit reply containing the 80-bit MD message field. This field is used by the downlink ELM protocol.

Connection. A logical association between peer-level entities in a communication system.

Data link capability report. Information in a Comm-B reply identifying the complete Mode S communications capabilities of the aircraft installation.

Downlink. A term referring to the transmission of data from an aircraft to the ground. Mode S air-to-ground signals are transmitted on the 1 090 MHz reply frequency channel.

Extended length message (ELM). A series of Comm-C interrogations (uplink ELM) transmitted without the requirement for intervening replies, or a series of Comm-D replies (downlink ELM) transmitted without intervening interrogations.

Uplink ELM (UELM). A term referring to extended length uplink communication by means of 112-bit Mode S Comm-C interrogations, each containing the 80-bit Comm-C message field (MC).

Downlink ELM (DELM). A term referring to extended length downlink communication by means of 112-bit Mode S Comm-D replies, each containing the 80-bit Comm-D message field (MD).

Frame. The basic unit of transfer at the link level. In the context of Mode S subnetwork, a frame can include from one to four Comm-A or Comm-B segments, from two to sixteen Comm-C segments, or from one to sixteen Comm-D segments.

General formatter/manager (GFM). The aircraft function responsible for formatting messages to be inserted in the transponder registers. It is also responsible for detecting and handling error conditions such as the loss of input data.

Ground data circuit-terminating equipment (GDCE). A ground specific data circuit-terminating equipment associated with a ground data link processor (GDLP). It operates a protocol unique to Mode S data link for data transfer between air and ground.

Ground data link processor (GDLP). A ground-resident processor that is specific to a particular air-ground data link (e.g. Mode S), and which provides channel management, and segments and/or reassembles messages for transfer. It is connected on one side (by means of its DCE) to ground elements common to all data link systems, and on the other side to the air-ground link itself.

Ground-initiated Comm-B (GICB). The ground-initiated Comm-B protocol allows the interrogator to extract Comm-B replies containing data from a defined source in the MB field.

Ground-initiated protocol. A procedure initiated by a Mode S interrogator for delivering standard length or extended length messages to a Mode S aircraft installation.

Mode S air-initiated Comm-B (AICB) protocol. A procedure initiated by a Mode S transponder for transmitting a single Comm-B segment from the aircraft installation.

Mode S broadcast protocols. Procedures allowing standard length uplink or downlink messages to be received by more than one transponder or ground interrogator respectively.

Mode S ground-initiated Comm-B (GICB) protocol. A procedure initiated by a Mode S interrogator for eliciting a single Comm-B segment from a Mode S aircraft installation, incorporating the contents of one of 255 Comm-B registers within the Mode S transponder.

Mode S multisite-directed protocol. A procedure to ensure that extraction and close-out of a downlink standard length or extended length message is affected only by the particular Mode S interrogator selected by the aircraft.

Mode S packet. A packet conforming to the Mode S subnetwork standard, designed to minimize the bandwidth required from the air-ground link. ISO 8208 packets may be transformed into Mode S packets and vice-versa.

Mode S specific protocol (MSP). A protocol that provides restricted datagram service within the Mode S subnetwork.

Mode S specific services. A set of communication services provided by the Mode S system which are not available from other air-ground subnetworks, and therefore not interoperable.

Mode S specific services entity (SSE). An entity resident within an XDLP to provide access to the Mode S specific services.

Packet. The basic unit of data transfer among communication devices within the network layer, (e.g. an ISO 8208 packet or a Mode S packet).

Required navigation performance (RNP). A statement of the navigation performance accuracy necessary for operation within a defined airspace.

Segment. A portion of a message that can be accommodated within a single MA/MB field in the case of a standard length message, or MC/MD field in the case of an extended length message. This term is also applied to the Mode S transmissions containing these fields.

Standard length message (SLM). An exchange of digital data using selectively addressed Comm-A interrogations and/or Comm-B replies (see “Comm-A” and “Comm-B”).

Subnetwork. An actual implementation of a data network that employs a homogeneous protocol and addressing plan, and is under the control of a single authority.

Subnetwork management entity (SNME). An entity resident within a GDLP that performs subnetwork management and communicates with peer entities in intermediate or end-systems.

Timeout. The cancellation of a transaction after one of the participating entities has failed to provide a required response within a pre-defined period of time.

Uplink. A term referring to the transmission of data from the ground to an aircraft. Mode S ground-to-air signals are transmitted on the 1 030 MHz interrogation frequency channel.

XDCE. A general term referring to both the ADCE and the GDCE.

XDLP. A general term referring to both the ADLP and the GDLP.

5.2 MODE S SUBNETWORK CHARACTERISTICS

5.2.1 General provisions

Note 1.— Reference ISO document. When the term "ISO 8208" is referred to in this standard, it means the ISO Standard "Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment, Reference Number ISO/IEC 8208: 1990(E)".

Note 2.— The overall architecture of the Mode S subnetwork is presented in the diagram on the following page.

Note 3.— The processing splits into three different paths. The first consists of the processing of switched virtual circuits (SVCs), the second consists of the processing of Mode S specific services, and the third consists of the processing of subnetwork management information. SVCs utilize the reformatting process and the ADCE or GDCE function. Mode S specific services utilize the Mode S specific services entity (SSE) function.

5.2.1.1 *Message categories.* The Mode S subnetwork shall only carry aeronautical communications classified under categories of flight safety and flight regularity as specified in Annex 10, Volume II, Chapter 5, 5.1.8.4 and 5.1.8.6.

5.2.1.2 *Signals in space.* The signal-in-space characteristics of the Mode S subnetwork shall conform to the provisions contained in Annex 10, Volume IV, Chapter 3, 3.1.2.

5.2.1.3 *Code and byte independency.* The Mode S subnetwork shall be capable of code and byte independent transmission of digital data.

5.2.1.4 *Data transfer.* Data shall be conveyed over the Mode S data link in segments using either standard length message (SLM) protocols or extended length message (ELM) protocols as defined in 3.1.2.6.11 and 3.1.2.7 of Annex 10, Volume IV.

Note 1.— An SLM segment is the contents of one 56-bit MA or MB field. An ELM segment is the contents of one 80-bit MC or MD field.

Note 2.— An SLM frame is the contents of up to four linked MA or MB fields. An ELM frame is the contents of 2 to 16 MC or 1 to 16 MD fields.

5.2.1.5 *Bit numbering.* In the description of the data exchange fields, the bits shall be numbered in the order of their transmission, beginning with bit 1. Bit numbers shall continue through the second and higher segments of multi-segment frames. Unless otherwise stated, numerical values encoded by groups (fields) of bits shall be encoded using positive binary notation and the first bit transmitted shall be the most significant bit (MSB) (3.1.2.3.1.3 of Annex 10, Volume IV).

5.2.1.6 *Unassigned bits.* When the length of the data is not sufficient to occupy all bit positions within a message field or subfield, the unassigned bit positions shall be set to 0.

5.2.2 Frames

5.2.2.1 UPLINK FRAMES

5.2.2.1.1 *SLM frame.* An uplink SLM frame shall be composed of up to four selectively addressed Comm-A segments.

Note.— Each Comm-A segment (MA field) received by the ADLP is accompanied by the first 32 bits of the interrogation that delivered the segment (3.1.2.10.5.2.1.1 of Annex 10, Volume IV). Within these 32 bits is the 16-bit special designator (SD) field (3.1.2.6.1.4 of Annex 10, Volume IV).

5.2.2.1.1.1 *SD field.* When the designator identification (DI) field (bits 14-16) has a code value of 1 or 7, the special designator (SD) field (bits 17-32) of each Comm-A interrogation shall be used to obtain the interrogator identifier subfield (IIS, bits 17-20) and the linked Comm-A subfield (*LAS*, bits 30-32). The action to be taken shall depend on the value of *LAS*. The contents of *LAS* and IIS shall be retained and shall be associated with the Comm-A message segment for use in assembling the frame as indicated below. All fields other than the *LAS* field shall be as defined in 3.1.2 of Annex 10, Volume IV.

Note.— The SD field structure is shown in Figure 5-1.*

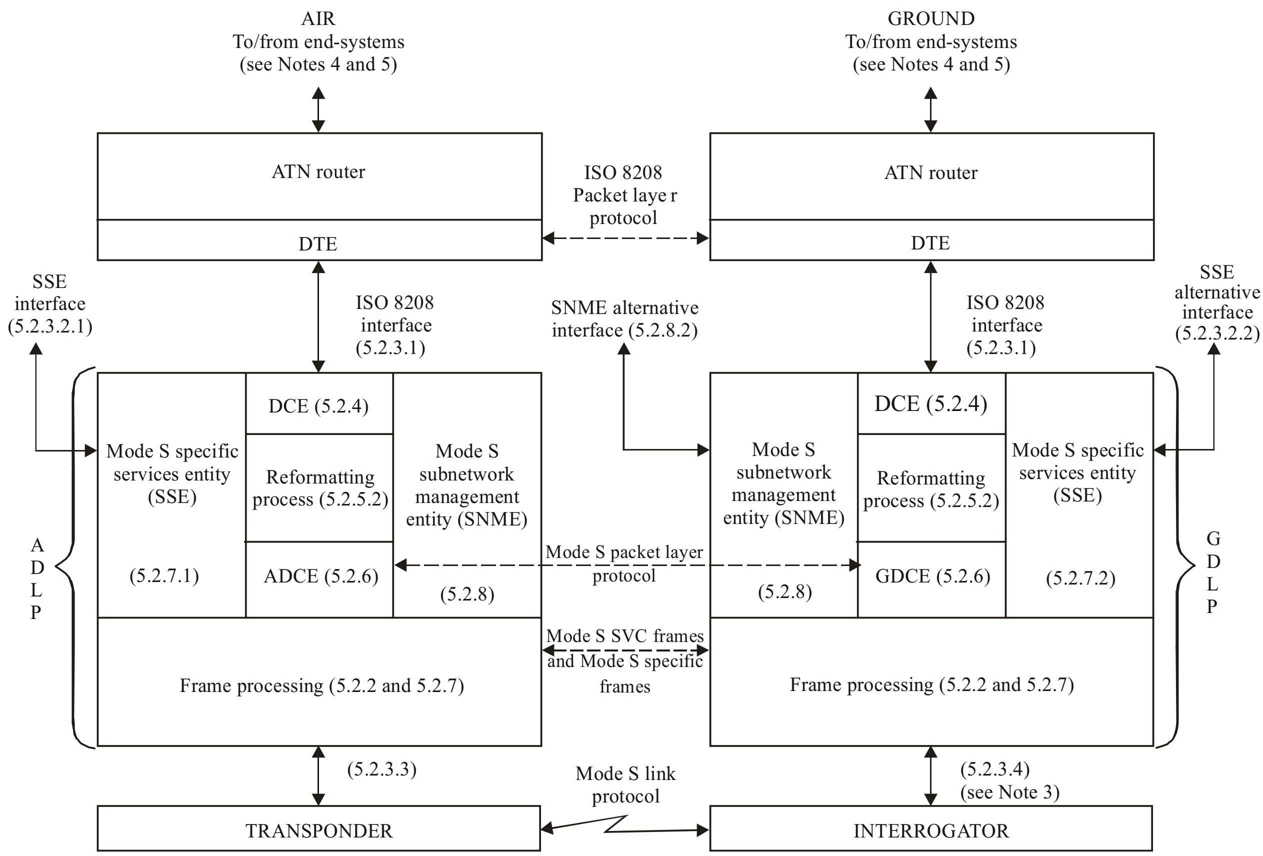
5.2.2.1.1.2 *LAS coding.* The 3-bit *LAS* subfield shall be coded as follows:

LAS	*MEANING*
0	single segment
1	linked, 1st segment
2	linked, 2nd but not final segment
3	linked, 3rd but not final segment
4	linked, 4th and final segment
5	linked, 2nd and final segment
6	linked, 3rd and final segment
7	unassigned

5.2.2.1.1.3 *Single segment SLM frame.* If *LAS* = 0, the data in the MA field shall be considered a complete frame and shall be made available for further processing.

* All tables and figures are located at the end of this chapter.

Functional elements of the Mode S subnetwork



Key

: physical (RF) connection

: peer level association

: interfaces

Notes:

1. Relevant Mode S subnetwork SARPs paragraph numbers are given in parenthesis.
2. The ADLP/transponder interface is also specified in Annex 10, Volume IV, 3.1.
3. A GDLP may be interfaced to more than one Mode S interrogator.
4. DTEs may be directly associated with end-systems.
5. ATN router access to end-systems may be made via other intermediate systems.

5.2.2.1.1.4 *Multiple segment SLM frame.* The ADLP shall accept and assemble linked 56-bit Comm-A segments associated with all sixteen possible interrogator identifier (II) codes. Correct linking of Comm-A segments shall be achieved by requiring that all Comm-A segments have the same value of IIS. If *LAS* = 1 through 6, the frame shall consist of two to four Comm-A segments as specified in the following paragraphs.

5.2.2.1.1.4.1 *Initial segment.* If *LAS* = 1, the MA field shall be assembled as the initial segment of an SLM frame. The initial segment shall be stored until all segments of the frame have been received or the frame is cancelled.

5.2.2.1.1.4.2 *Intermediate segment.* If *LAS* = 2 or 3, the MA field shall be assembled in numerical order as an intermediate segment of the SLM frame. It shall be associated with previous segments containing the same value of IIS.

5.2.2.1.1.4.3 *Final segment.* If *LAS* = 4, 5 or 6, the MA field shall be assembled as the final segment of the SLM frame. It shall be associated with previous segments containing the same value of IIS.

5.2.2.1.1.4.4 *Frame completion.* The frame shall be considered complete and shall be made available for further processing as soon as all segments of the frame have been received.

5.2.2.1.1.4.5 *Frame cancellation.* An incomplete SLM frame shall be cancelled if one or more of the following conditions apply:

a) a new initial segment (*LAS* = 1) is received with the same value of IIS. In this case, the new initial segment shall be retained as the initial segment of a new SLM frame;

b) the sequence of received *LAS* codes (after the elimination of duplicates) is not contained in the following list:

   1) *LAS* = 0
   2) *LAS* = 1,5
   3) *LAS* = 1,2,6
   4) *LAS* = 1,6,2
   5) *LAS* = 1,2,3,4
   6) *LAS* = 1,3,2,4
   7) *LAS* = 1,2,4,3
   8) *LAS* = 1,3,4,2
   9) *LAS* = 1,4,2,3
   10) *LAS* = 1,4,3,2

c) *Tc* seconds have elapsed since the last Comm-A segment with the same value of IIS was received (Table 5-1).

5.2.2.1.1.4.6 *Segment cancellation.* A received segment for an SLM frame shall be discarded if it is an intermediate or final segment and no initial segment has been received with the same value of IIS.

5.2.2.1.1.4.7 *Segment duplication.* If a received segment duplicates a currently received segment number with the same value of IIS, the new segment shall replace the currently received segment.

Note.— The action of the Mode S subnetwork protocols may result in the duplicate delivery of Comm-A segments.

5.2.2.1.2 *ELM frame.* An uplink ELM frame shall consist of from 20 to 160 bytes and shall be transferred from the interrogator to the transponder using the protocol defined in 3.1.2.7 of Annex 10, Volume IV. The first 4 bits of each uplink ELM segment (MC field) shall contain the interrogator identifier (II) code of the Mode S interrogator transmitting the ELM. The ADLP shall check the II code of each segment of a completed uplink ELM. If all of the segments contain the same II code, the II code in each segment shall be deleted and the remaining message bits retained as user data for further processing. If all of the segments do not contain the same II code, the entire uplink ELM shall be discarded.

Note.— An uplink ELM frame consists of two to sixteen associated Comm-C segments, each of which contains the 4-bit II code. Therefore, the capacity for packet transfer is 19 to 152 bytes per uplink ELM frame.

5.2.2.2 DOWNLINK FRAMES

5.2.2.2.1 *SLM frame.* A downlink SLM frame shall be composed of up to 4 Comm-B segments. The MB field of the first Comm-B segment of the frame shall contain a 2-bit linked Comm-B subfield (LBS, bits 1 and 2 of the MB field). This subfield shall be used to control linking of up to four Comm-B segments.

Note.— The LBS uses the first 2-bit positions in the first segment of a multi or single segment downlink SLM frame. Hence, 54 bits are available for Mode S packet data in the first segment of a downlink SLM frame. The remaining segments of the downlink SLM frame, if any, have 56 bits available.

5.2.2.2.1.1 *LBS coding.* Linking shall be indicated by the coding of the LBS subfield of the MB field of the initial Comm-B segment of the SLM frame.

The coding of LBS shall be as follows:

LBS	*MEANING*
0	single segment
1	initial segment of a two-segment SLM frame
2	initial segment of a three-segment SLM frame
3	initial segment of a four-segment SLM frame

5.2.2.2.1.2 *Linking protocol*

5.2.2.2.1.2.1 In the Comm-B protocol, the initial segment shall be transmitted using the air-initiated or multisite-directed protocols. The LBS field of the initial segment shall indicate to the ground the number of additional segments to be transferred (if any). Before the transmission of the initial segment to the transponder, the remaining segments of the SLM frame (if any) shall be transferred to the transponder for transmission to the interrogator using the ground-initiated Comm-B protocol. These segments shall be accompanied by control codes that cause the segments to be inserted in ground-initiated Comm-B registers 2, 3 or 4, associated respectively with the second, third, or fourth segment of the frame.

5.2.2.2.1.2.2 Close-out of the air-initiated segment that initiated the protocol shall not be performed until all segments have been successfully transferred.

Note.— The linking procedure including the use of the ground-initiated Comm-B protocol is performed by the ADLP.

5.2.2.2.1.3 *Directing SLM frames.* If the SLM frame is to be multisite-directed, the ADLP shall determine the II code of the Mode S interrogator or cluster of interrogators (5.2.8.1.3) that shall receive the SLM frame.

5.2.2.2.2 *ELM FRAME*

Note.— A downlink ELM consists of one to sixteen associated Comm-D segments.

5.2.2.2.2.1 *Procedure*. Downlink ELM frames shall be used to deliver messages greater than or equal to 28 bytes and shall be formed using the protocol defined in 3.1.2.7 of Annex 10, Volume IV.

5.2.2.2.2.2 *Directing ELM frames.* If the ELM frame is to be multisite-directed, the ADLP shall determine the II code of the Mode S interrogator or cluster of interrogators (5.2.8.1.3) that shall receive the ELM frame.

5.2.2.3 *XDLP frame processing.* Frame processing shall be performed on all Mode S packets (except for the MSP packet) as specified in 5.2.2.3 to 5.2.2.5. Frame processing for Mode S specific services shall be performed as specified in 5.2.7.

5.2.2.3.1 *Packet length.* All packets (including a group of packets multiplexed into a single frame) shall be transferred in a frame consisting of the smallest number of segments needed to accommodate the packet. The user data field shall be an integral multiple of bytes in length. A 4-bit parameter (LV) shall be provided in the Mode S DATA, CALL REQUEST, CALL ACCEPT, CLEAR REQUEST and INTERRUPT packet headers so that during unpacking no additional bytes are added to the user data field. The LV field shall define the number of full bytes used in the last segment of a frame. During LV calculations, the 4-bit II code in the last segment of an uplink ELM message shall be (1) ignored for uplink ELM frames with an odd number of Comm-C segments and (2) counted for uplink ELM frames with an even number of Comm-C segments. The value contained in the LV field shall be ignored if the packet is multiplexed.

Note.— A specific length field is used to define the length of each element of a multiplexed packet. Therefore the LV field value is not used. LV field error handling is described in Tables 5-16 and 5-19.

5.2.2.3.2 *Multiplexing.* When multiplexing multiple Mode S packets into single SLM on ELM frame, the following procedures shall be used. Multiplexing of the packets within the ADLP shall not be applied to packets associated with SVCs of different priorities.

Note.— Multiplexing is not performed on MSP packets.

5.2.2.3.2.1 *Multiplexing optimization*

Recommendation.— *When multiple packets are awaiting transfer to the same XDLP, they should be multiplexed into a single frame in order to optimize throughput, provided that packets associated with SVCs of different priorities are not multiplexed together.*

5.2.2.3.2.2 *Structure.* The structure of the multiplexed packets shall be as follows:

HEADER:6 or 8	LENGTH:8	1ST PACKET:v	LENGTH:8	2ND PACKET:v

Note.— A number in the field signifies the field length in bits; "v" signifies that the field is of variable length.

5.2.2.3.2.2.1 *Multiplexing header.* The header for the multiplexed packets shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2

Where,

Data packet type (DP) = 0

MSP packet type (MP) = 1

Supervisory packet (SP) = 3

Supervisory type (ST) = 2

Note.— See Figure 5-23 for a definition for the field structure used in the multiplexing header.

5.2.2.3.2.2.2 *Length.* This field shall contain the length of the following packet in bytes. Any error detected in a multiplexed DATA packet, such as inconsistency between length as indicated in the LENGTH field and the length of the frame hosting that packet, shall result in the discarding of the packet unless the error can be determined to be limited to the LENGTH field, in which case a REJECT packet with the expected PS value can be sent.

Recommendation.— *For multiplex packets it is recommended that, if the entire packet cannot be de-multiplexed, then the first constituent packet be treated as a format error, and the remainder be discarded.*

5.2.2.3.2.3 *Termination.* The end of a frame containing a sequence of multiplexed packets shall be determined by one of the following events:

a) a length field of all zeros; or

b) less than eight bits left in the frame.

5.2.2.3.3 *MODE S CHANNEL SEQUENCE PRESERVATION*

5.2.2.3.3.1 *Application.* In the event that multiple Mode S frames from the same SVC are awaiting transfer to the same XDLP, the following procedure shall be used.

5.2.2.3.3.2 *Procedure*

Note 1.— SLM and ELM transactions can occur independently.

Note 2.— Uplink and downlink transactions can occur independently.

5.2.2.3.3.2.1 *SLM frames.* SLM frames awaiting transfer shall be transmitted in the order received.

5.2.2.3.3.2.2 *ELM frames.* ELM frames awaiting transfer shall be transmitted in the order received.

5.2.2.4 GDLP FRAME PROCESSING

5.2.2.4.1 *GENERAL PROVISIONS*

5.2.2.4.1.1 The GDLP shall determine the data link capability of the ADLP/transponder installation from the data link capability report (5.2.9) before performing any data link activity with that ADLP.

5.2.2.4.1.2 GDLP frame processing shall provide to the interrogator all data for the uplink transmission that are not provided directly by the interrogator.

5.2.2.4.2 *Delivery status.* GDLP frame processing shall accept an indication from the interrogator function that a specified uplink frame that was previously transferred to the interrogator has been successfully delivered over the ground-to-air link.

5.2.2.4.3 *Aircraft address.* GDLP frame processing shall receive from the interrogator along with the data in each downlink SLM or ELM frame, the 24-bit address of the aircraft that transmitted the frame. GDLP frame processing shall be capable of transferring to the interrogator the 24-bit address of the aircraft that is to receive an uplink SLM or ELM frame.

5.2.2.4.4 *Mode S protocol type identification.* GDLP frame processing shall indicate to the interrogator the protocol to be used to transfer the frame: standard length message protocol, extended length message protocol or broadcast protocol.

5.2.2.4.5 *Frame determination.* A Mode S packet (including multiplexed packets but excluding MSP packets) intended for uplink and less than or equal to 28 bytes shall be sent as an SLM frame. A Mode S packet greater than 28 bytes shall be sent as an uplink ELM frame for transponders with ELM capability, using M-bit processing as necessary (5.2.5.1.4.1). If the transponder does not have ELM capability, packets greater than 28 bytes shall be sent using the M-bit or S-bit (5.2.5.1.4.2) assembly procedures as necessary and multiple SLM frames.

Note.— The Mode S DATA, CALL REQUEST, CALL ACCEPT, CLEAR REQUEST and INTERRUPT packets are the only Mode S packets that use M-bit or S-bit sequencing.

5.2.2.5 ADLP FRAME PROCESSING

5.2.2.5.1 *General provisions.* With the possible exception of the last 24 bits (address/parity), ADLP frame processing shall accept from the transponder the entire content of both 56-bit and 112-bit received uplink transmissions, excluding all-call and ACAS interrogations. ADLP frame processing shall provide to the transponder all data for the downlink transmission that is not provided directly by the transponder (5.2.3.3).

5.2.2.5.2 *Delivery status.* ADLP frame processing shall accept an indication from the transponder that a specified downlink frame that was previously transferred to the transponder has been closed out.

5.2.2.5.3 *Interrogator identifier.* ADLP frame processing shall accept from the transponder, along with the data in each uplink SLM and ELM, the interrogator identifier (II) code of the interrogator that transmitted the frame. ADLP frame processing shall transfer to the transponder the II code of the interrogator or cluster of interrogators that shall receive a multisite-directed frame.

5.2.2.5.4 *Mode S protocol type identification.* ADLP frame processing shall indicate to the transponder the protocol to be used to transfer the frame: ground-initiated, air-initiated, broadcast, multisite-directed, standard length or extended length.

5.2.2.5.5 *Frame cancellation.* ADLP frame processing shall be capable of cancelling downlink frames previously transferred to the transponder for transmission but for which a close-out has not been indicated. If more than one frame is stored within the transponder, the cancellation procedure shall be capable of cancelling the stored frames selectively.

5.2.2.5.6 *Frame determination.* A Mode S packet (including multiplexed packets but excluding MSP packets) intended for downlink and less than or equal to 222 bits shall be sent as an SLM frame. A Mode S packet greater than 222 bits shall be sent as a downlink ELM frame for transponders with ELM capability using M-bit processing as necessary (5.2.5.1.4.1). When M-bit processing is used, all ELM frames containing M = 1 shall contain the maximum number of ELM segments that the transponder is capable of transmitting in response to one requesting interrogation (UF = 24) (5.2.9.1). If the transponder does not have ELM capability, packets greater than 222 bits shall be sent using the M-bit or S-bit (5.2.5.1.4.2) assembly procedures and multiple SLM frames.

Note.— The maximum length of a downlink SLM frame is 222 bits. This is equal to 28 bytes (7 bytes for 4 Comm-B segments) minus the 2-bit linked Comm-B subfield (5.2.2.2.1.1).

5.2.2.6 PRIORITY MANAGEMENT

5.2.2.6.1 *ADLP priority management.* Frames shall be transferred from the ADLP to the transponder in the following order of priority (highest first):

a) Mode S specific services;

b) search requests (5.2.8.1);

c) frames containing only high priority SVC packets; and

d) frames containing only low priority SVC packets.

5.2.2.6.2 *GDLP PRIORITY MANAGEMENT*

Recommendation.— *Uplink frames should be transferred in the following order of priority (highest first):*

a) Mode S specific services;

b) frames containing at least one Mode S ROUTE packet (5.2.8.1);

c) frames containing at least one high priority SVC packet; and

d) frames containing only low priority SVC packets.

5.2.3 Data exchange interfaces

5.2.3.1 THE DTE ISO 8208 INTERFACE

5.2.3.1.1 *General provisions.* The interface between the XDLP and the DTE(s) shall conform to ISO 8208 packet layer protocol (PLP). The XDLP shall support the procedures of the DTE as specified in ISO 8208. As such, the XDLP shall contain a DCE (5.2.4).

5.2.3.1.2 *Physical and link layer requirements for the DTE/DCE interface.* The requirements are:

a) the interface shall be code and byte independent and shall not impose restrictions on the sequence, order, or pattern of the bits transferred within a packet; and

b) the interface shall support the transfer of variable length network layer packets.

5.2.3.1.3 *DTE ADDRESS*

5.2.3.1.3.1 *Ground DTE address.* The ground DTE address shall have a total length of 3 binary coded decimal (BCD) digits, as follows:

$X_0X_1X_2$

X_0 shall be the most significant digit. Ground DTE addresses shall be decimal numbers in the range of 0 through 255 coded in BCD. Assignment of the DTE address shall be a local issue. All DTEs connected to GDLPs having overlapping coverage shall have unique addresses. GDLPs which have a flying time less than T_r (Table 5-1) between their coverage areas shall be regarded as having overlapping coverage.

5.2.3.1.3.2 *Mobile DTE address.* The mobile DTE address shall have a total length of 10 BCD digits, as follows:

$X_0X_1X_2X_3X_4X_5X_6X_7X_8X_9$

X_0 shall be the most significant digit. The digits X_0 to X_7 shall contain the octal representation of the aircraft address coded in BCD. The digits X_8X_9 shall identify a sub-address for specific DTEs on board an aircraft. This sub-address shall be a decimal number in the range of 0 and 15 coded in BCD. The following sub-address assignments shall be used:

00 ATN router

01 to 15 Unassigned

5.2.3.1.3.3 *Illegal DTE addresses.* DTE addresses outside of the defined ranges or not conforming to the formats for the ground and mobile DTE addresses specified in 5.2.3.1.3.1 and 5.2.3.1.3.2 shall be defined to be illegal DTE addresses. The detection of an illegal DTE address in a CALL REQUEST packet shall lead to a rejection of the call as specified in 5.2.5.1.5.

5.2.3.1.4 PACKET LAYER PROTOCOL REQUIREMENTS OF THE DTE/DCE INTERFACE

5.2.3.1.4.1 *Capabilities.* The interface between the DTE and the DCE shall conform to ISO 8208 with the following capabilities:

a) expedited data delivery, i.e. the use of INTERRUPT packets with a user data field of up to 32 bytes;

b) priority facility (with two levels, 5.2.5.2.1.1.6);

c) fast select (5.2.5.2.1.1.13, 5.2.5.2.1.1.16); and

d) called/calling address extension facility, if required by local conditions (i.e. the XDLP is connected to the DTE via a network protocol that is unable to contain the Mode S address as defined).

Other ISO 8208 facilities and the D-bit and the Q-bit shall not be invoked for transfer over the Mode S packet layer protocol.

5.2.3.1.4.2 *Parameter values.* The timer and counter parameters for the DTE/DCE interface shall conform to the default ISO 8208 values.

5.2.3.2 MODE S SPECIFIC SERVICES INTERFACE

Note.— Mode S specific services consist of the broadcast Comm-A and Comm-B, GICB and MSP.

5.2.3.2.1 *ADLP*

5.2.3.2.1.1 *General provisions.* The ADLP shall support the accessing of Mode S specific services through the provision of one or more separate ADLP interfaces for this purpose.

5.2.3.2.1.2 *Functional capability.* Message and control coding via this interface shall support all of the capabilities specified in 5.2.7.1.

5.2.3.2.2 *GDLP*

5.2.3.2.2.1 *General provisions.* The GDLP shall support the accessing of Mode S specific services through the provision of a separate GDLP interface for this purpose and/or by providing access to these services through the DTE/DCE interface.

5.2.3.2.2.2 *Functional capability.* Message and control coding via this interface shall support all of the capabilities specified in 5.2.7.2.

5.2.3.3 ADLP/TRANSPONDER INTERFACE

5.2.3.3.1 *TRANSPONDER TO ADLP*

5.2.3.3.1.1 The ADLP shall accept an indication of protocol type from the transponder in connection with data transferred from the transponder to the ADLP. This shall include the following types of protocols:

a) surveillance interrogation;

b) Comm-A interrogation;

c) Comm-A broadcast interrogation; and

d) uplink ELM.

The ADLP shall also accept the II code of the interrogator used to transmit the surveillance, Comm-A or uplink ELM.

Note.— Transponders will not output all-call and ACAS information on this interface.

5.2.3.3.1.2 The ADLP shall accept control information from the transponder indicating the status of downlink transfers. This shall include:

a) Comm-B close-out;

b) Comm-B broadcast timeout; and

c) downlink ELM close-out.

5.2.3.3.1.3 The ADLP shall have access to current information defining the communication capability of the Mode S transponder with which it is operating. This information shall be used to generate the data link capability report (5.2.9).

5.2.3.3.2 *ADLP TO TRANSPONDER*

5.2.3.3.2.1 The ADLP shall provide an indication of protocol type to the transponder in connection with data transferred from the ADLP to the transponder. This shall include the following types of protocols:

a) ground-initiated Comm-B;

b) air-initiated Comm-B;

c) multisite-directed Comm-B;

d) Comm-B broadcast;

e) downlink ELM; and

f) multisite-directed downlink ELM.

The ADLP shall also provide the II code for transfer of a multisite-directed Comm-B or downlink ELM and the Comm-B data selector (BDS) code (3.1.2.6.11.2 of Annex 10, Volume IV) for a ground-initiated Comm-B.

5.2.3.3.2.2 The ADLP shall be able to perform frame cancellation as specified in 5.2.2.5.5.

5.2.3.4 GDLP/MODE S INTERROGATOR INTERFACE

5.2.3.4.1 *INTERROGATOR TO GDLP*

5.2.3.4.1.1 The GDLP shall accept an indication of protocol type from the interrogator in connection with data transferred from the interrogator to the GDLP. This shall include the following types of protocols:

a) ground-initiated Comm-B;

b) air-initiated Comm-B;

c) air-initiated Comm-B broadcast; and

d) downlink ELM.

The GDLP shall also accept the BDS code used to identify the ground-initiated Comm-B segment.

5.2.3.4.1.2 The GDLP shall accept control information from the interrogator indicating the status of uplink transfers and the status of the addressed Mode S aircraft.

5.2.3.4.2 *GDLP to interrogator.* The GDLP shall provide an indication of protocol type to the interrogator in connection with data transferred from the GDLP to the interrogator. This shall include the following types of protocols:

a) Comm-A interrogation;

b) Comm-A broadcast interrogation;

c) uplink ELM; and

d) ground-initiated Comm-B request.

The GDLP shall also provide the BDS code for the ground-initiated Comm-B protocol.

5.2.4 DCE operation

Note.— The DCE process within the XDLP acts as a peer process to the DTE. The DCE supports the operations of the DTE with the capability specified in 5.2.3.1.4. The following requirements do not specify format definitions and flow control on the DTE/DCE interface. The specifications and definitions in ISO 8208 apply for these cases.

5.2.4.1 *State transitions.* The DCE shall operate as a state machine. Upon entering a state, the DCE shall perform the actions specified in Table 5-2. State transitions and additional action(s) shall be as specified in Table 5-3 through Table 5-12.

Note.— The next state transition (if any) that occurs when the DCE receives a packet from the DTE is specified by Table 5-3 through Table 5-8. These tables are organized according to the hierarchy illustrated in Figure 5-2. The same transitions are defined in Table 5-9 through Table 5-12 when the DCE receives a packet from the XDCE (via the reformatting process).

5.2.4.2 DISPOSITION OF PACKETS

5.2.4.2.1 Upon receipt of a packet from the DTE, the packet shall be forwarded or not forwarded to the XDCE (via the reformatting process) according to the parenthetical instructions contained in Tables 5-3 to 5-8. If no parenthetical instruction is listed or if the parenthetical instruction indicates "do not forward", the packet shall be discarded.

5.2.4.2.2 Upon receipt of a packet from the XDCE (via the reformatting process), the packet shall be forwarded or not forwarded to the DTE according to the parenthetical instructions contained in Tables 5-9 to 5-12. If no parenthetical instruction is listed or if the parenthetical instruction indicates "do not forward", the packet shall be discarded.

5.2.5 Mode S packet layer processing

5.2.5.1 GENERAL REQUIREMENTS

5.2.5.1.1 *BUFFER REQUIREMENTS*

5.2.5.1.1.1 *ADLP buffer requirements*

5.2.5.1.1.1.1 The following requirements apply to the entire ADLP and shall be interpreted as necessary for each of the main processes (DCE, reformatting, ADCE, frame processing and SSE).

5.2.5.1.1.1.2 The ADLP shall be capable of maintaining sufficient buffer space for fifteen SVCs:

a) maintain sufficient buffer space to hold fifteen Mode S subnetwork packets of 152 bytes each in the uplink direction per SVC for a transponder with uplink ELM capability or 28 bytes otherwise;

b) maintain sufficient buffer space to hold fifteen Mode S subnetwork packets of 160 bytes each in the downlink direction per SVC for a transponder with downlink ELM capability or 28 bytes otherwise;

c) maintain sufficient buffer space for two Mode S subnetwork INTERRUPT packets of 35 bytes each, (user data field plus control information), one in each direction, for each SVC;

d) maintain sufficient resequencing buffer space for storing thirty-one Mode S subnetwork packets of 152 bytes each in the uplink direction per SVC for a transponder with uplink ELM capability or 28 bytes otherwise; and

e) maintain sufficient buffer space for the temporary storage of at least one Mode S packet of 160 bytes undergoing M-bit or S-bit processing in each direction per SVC.

5.2.5.1.1.1.3 The ADLP shall be capable of maintaining a buffer of 1 600 bytes in each direction to be shared among all MSPs.

5.2.5.1.1.2 *GDLP buffer requirements*

5.2.5.1.1.2.1 **Recommendation.—** *The GDLP should be capable of maintaining sufficient buffer space for an average of 4 SVCs for each Mode S aircraft in the coverage area of the interrogators connected to it, assuming all aircraft have ELM capability.*

Note.— Additional buffer space may be required if DTEs associated with end-systems are supported.

5.2.5.1.2 CHANNEL NUMBER POOLS

5.2.5.1.2.1 The XDLP shall maintain several SVC channel number pools; the DTE/DCE (ISO 8208) interface uses one set. Its organization, structure and use shall be as defined in the ISO 8208 standard. The other channel pools shall be used on the ADCE/GDCE interface.

5.2.5.1.2.2 The GDLP shall manage a pool of temporary channel numbers in the range of 1 to 3, for each ground DTE/ADLP pair. Mode S CALL REQUEST packets generated by the GDLP shall contain the ground DTE address and a temporary channel number allocated from the pool of that ground DTE. The GDLP shall not reuse a temporary channel number allocated to an SVC that is still in the CALL REQUEST state.

Note 1.— The use of temporary channel numbers allows the GDLP to have up to three call requests in process at the same time for a particular ground DTE and ADLP combination. It also allows the GDLP or ADLP to clear a channel before the permanent channel number is assigned.

Note 2.— The ADLP may be in contact with multiple ground DTEs at any one time. All the ground DTEs use temporary channel numbers ranging from 1 to 3.

5.2.5.1.2.3 The ADLP shall use the ground DTE address to distinguish the temporary channel numbers used by the various ground DTEs. The ADLP shall assign a permanent channel number (in the range of 1 to 15) to all SVCs and shall inform the GDLP of the assigned number by including it in the Mode S CALL REQUEST by ADLP or Mode S CALL ACCEPT by ADLP packets. The temporary channel number shall be included in the Mode S CALL ACCEPT by ADLP together with the permanent channel number in order to define the association of these channel numbers. The ADLP shall continue to associate the temporary channel number with the permanent channel number of an SVC until the SVC is returned to the READY (*p*1) state, or else, while in the DATA TRANSFER (*p*4) state, a Mode S CALL REQUEST by GDLP packet is received bearing the same temporary channel number. A non-zero permanent channel number in the Mode S CLEAR REQUEST by ADLP, CLEAR REQUEST by GDLP, CLEAR CONFIRMATION by ADLP or CLEAR CONFIRMATION by GDLP packet shall indicate that the permanent channel number shall be used and the temporary channel number shall be ignored. In the event that an XDLP is required to send one of these packets in the absence of a permanent channel number, the permanent channel number shall be set to zero, which shall indicate to the peer XDLP that the temporary channel number is to be used.

Note.— The use of a zero permanent channel number allows the ADLP to clear an SVC when no permanent channel number is available, and allows the GDLP to do likewise before it has been informed of the permanent channel number.

5.2.5.1.2.4 The channel number used by the DTE/DCE interface and that used by the ADCE/GDCE interface shall be assigned independently. The reformatting process shall maintain an association table between the DTE/DCE and the ADCE/GDCE channel numbers.

5.2.5.1.3 *Receive ready and receive not ready conditions.* The ISO 8208 interface and the ADCE/GDCE interface management procedures shall be independent operations since each system must be able to respond to separate receive ready and receive not ready indications.

5.2.5.1.4 PROCESSING OF *M*-BIT AND *S*-BIT SEQUENCES

Note.— M-bit processing applies to the sequencing of the DATA packet. S-bit processing applies to the sequencing of Mode S CALL REQUEST, CALL ACCEPT, CLEAR REQUEST and INTERRUPT packets.

5.2.5.1.4.1 *M-bit processing*

Note.— The packet size used on the DTE/DCE interface can be different from that used on the ADCE/GDCE interface.

5.2.5.1.4.1.1 M-bit processing shall be used when DATA packets are reformatted (5.2.5.2). M-bit processing shall utilize the specifications contained in the ISO 8208 standard. The M-bit sequence processing shall apply on a per channel basis. The M-bit set to 1 shall indicate that a user data field continues in the subsequent DATA packet. Subsequent packets in an M-bit sequence shall use the same header format (i.e. the packet format excluding the user data field).

5.2.5.1.4.1.2 If the packet size for the XDCE (5.2.6.4.2) interface is larger than that used on the DTE/DCE interface, packets shall be combined to the extent possible as dictated by the M-bit, when transmitting a Mode S DATA packet. If the packet size is smaller on the XDCE interface than that defined on the DTE/DCE interface, packets shall be fragmented to fit into the smaller Mode S packet using M-bit assembly.

5.2.5.1.4.1.3 A packet shall be combined with subsequent packets if the packet is filled and more packets exist in the M-bit sequence (M-bit = 1). A packet smaller than the maximum packet size defined for this SVC (partial packet) shall only be allowed when the M-bit indicates the end of an M-bit sequence. A received packet smaller than the maximum packet size with M-bit equal to 1 shall cause a reset to be generated as specified in ISO 8208 and the remainder of the sequence should be discarded.

5.2.5.1.4.1.4 **Recommendation.—** *In order to decrease delivery delay, reformatting should be performed on the partial receipt of an M-bit sequence, rather than delay reformatting until the complete M-bit sequence is received.*

5.2.5.1.4.2 *S-bit processing.* S-bit processing shall apply only to Mode S CALL REQUEST, CALL ACCEPT, CLEAR REQUEST and INTERRUPT packets. This processing shall be performed as specified for M-bit processing (5.2.5.1.4.1) except that the packets associated with any S-bit sequence whose reassembly is not completed in *Tq* seconds (Tables 5-1 and 5-13) shall be discarded (5.2.6.3.6, 5.2.6.4.5.2 and 5.2.6.9), and receipt of a packet shorter than the maximum packet size with S = 1 shall cause the entire S-bit sequence to be treated as a format error in accordance with Table 5-16.

5.2.5.1.5 *MODE S SUBNETWORK ERROR PROCESSING FOR ISO 8208 PACKETS*

5.2.5.1.5.1 *D-bit.* If the XDLP receives a DATA packet with the D-bit set to 1, the XDLP shall send a RESET REQUEST packet to the originating DTE containing a cause code *(CC)* = 133 and a diagnostic code *(DC)* = 166. If the D-bit is set to 1 in a CALL REQUEST packet, the D-bit shall be ignored by the XDLP. The D-bit of the corresponding CALL ACCEPT packet shall always be set to 0. The use of CC is optional.

5.2.5.1.5.2 *Q-bit.* If the XDLP receives a DATA packet with the Q-bit set to 1, the XDLP shall send a RESET REQUEST packet to the originating DTE containing *CC* = 133 and *DC* = 83. The use of CC is optional.

5.2.5.1.5.3 *Invalid priority.* If the XDLP receives a call request with a connection priority value equal to 2 through 254, the XDLP shall clear the virtual circuit using *DC* = 66 and *CC* = 131. The use of CC is optional.

5.2.5.1.5.4 *Unsupported facility.* If the XDLP receives a call request with a request for a facility that it cannot support, the XDLP shall clear the virtual circuit using *DC* = 65 and *CC* = 131. The use of CC is optional.

5.2.5.1.5.5 *Illegal calling DTE address.* If the XDLP receives a call request with an illegal calling DTE address (5.2.3.1.3.3), the XDLP shall clear the virtual circuit using *DC* = 68 and *CC* = 141. The use of CC is optional.

5.2.5.1.5.6 *Illegal called DTE address.* If the XDLP receives a call request with an illegal called DTE address (5.2.3.1.3.3), the XDLP shall clear the virtual circuit using *DC* = 67 and *CC* = 141. The use of CC is optional.

5.2.5.2 REFORMATTING PROCESS

Note.— The reformatting process is divided into two subprocesses: uplink formatting and downlink formatting. For the ADLP, the uplink process reformats Mode S packets into ISO 8208 packets and the downlink process reformats ISO 8208 packets into Mode S packets. For the GDLP, the uplink process reformats ISO 8208 packets into Mode S packets and the downlink process reformats Mode S packets into ISO 8208 packets.

5.2.5.2.1 *CALL REQUEST BY ADLP*

5.2.5.2.1.1 *Translation into Mode S packets*

5.2.5.2.1.1.1 *Translated packet format.* Reception by the ADLP reformatting process of an ISO 8208 CALL REQUEST packet from the local DCE shall result in the generation of corresponding Mode S CALL REQUEST by ADLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	P:1	FILL:1	SN:6	

	CH:4	AM:4	AG:8	S:1	FS:2	F:1	LV:4	UD:v

5.2.5.2.1.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.1.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.1.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.1.1.5 *Supervisory type (ST).* This field shall be set to 0.

5.2.5.2.1.1.6 *Priority (P).* This field shall be set to 0 for a low priority SVC and to 1 for a high priority SVC. The value for this field shall be obtained from the data transfer field of the priority facility of the ISO 8208 packet, and shall be set to 0 if the ISO 8208 packet does not contain the priority facility or if a priority of 255 is specified. The other fields of the priority facility shall be ignored.

5.2.5.2.1.1.7 *Sequence number (SN).* For a particular SVC, each packet shall be numbered (5.2.6.9.4).

5.2.5.2.1.1.8 *Channel number (CH).* The channel number shall be chosen from the pool of SVC channel numbers available to the ADLP. The pool shall consist of 15 values from 1 through 15. The highest available channel number shall be chosen from the pool. An available channel shall be defined as one in state *p*1. The correspondence between the channel number used by the Mode S subnetwork and the number used by the DTE/DCE interface shall be maintained while the channel is active.

Note.— Also refer to 5.2.5.1.2 on channel pool management.

5.2.5.2.1.1.9 *Address, mobile (AM).* This address shall be the mobile DTE sub-address (5.2.3.1.3.2) in the range of 0 to 15. The address shall be extracted from the two least significant digits of the calling DTE address contained in the ISO 8208 packet and converted to binary representation.

Note.— The 24-bit aircraft address is transferred within the Mode S link layer.

5.2.5.2.1.1.10 *Address, ground (AG).* This address shall be the ground DTE address (5.2.3.1.3.1) in the range of 0 to 255. The address shall be extracted from the called DTE address contained in the ISO 8208 packet and converted to binary representation.

5.2.5.2.1.1.11 *Fill field.* The fill field shall be used to align subsequent data fields on byte boundaries. When indicated as “FILL:n”, the fill field shall be set to a length of “n” bits. When indicated as “FILL1: 0 or 6”, the fill field shall be set to a length of 6 bits for a non-multiplexed packet in a downlink SLM frame and 0 bit for all other cases. When indicated as “FILL2: 0 or 2”, the fill field shall be set to a length of 0 bit for a non-multiplexed packet in a downlink SLM frame or for a multiplexing header and 2 bits for all other cases.

5.2.5.2.1.1.12 *S field (S).* A value of 1 shall indicate that the packet is part of an S-bit sequence with more packets in the sequence to follow. A value of 0 shall indicate that the sequence ends with this packet. This field shall be set as specified in 5.2.5.1.4.2.

5.2.5.2.1.1.13 *FS field (FS).* A value of 0 shall indicate that the packet does not contain fast select data. A value of 2 or 3 shall indicate that the packet contains fast select data. A value of 2 shall indicate normal fast select operation. A value of 3 shall indicate fast select with restricted response. An FS value of 1 shall be undefined.

5.2.5.2.1.1.14 *First packet flag (F).* This field shall be set to 0 in the first packet of an S-bit sequence and in a packet that is not part of an S-bit sequence. Otherwise it shall be set to 1.

5.2.5.2.1.1.15 *User data length (LV).* This field shall indicate the number of full bytes used in the last SLM or ELM segment as defined in 5.2.2.3.1.

5.2.5.2.1.1.16 *User data field (UD).* This field shall only be present if optional CALL REQUEST user data (maximum 16 bytes) or fast select user data (maximum 128 bytes) is contained in the ISO 8208 packet. The user data field shall be transferred from ISO 8208 packet unchanged using S-bit processing as specified in 5.2.5.1.4.2.

5.2.5.2.1.2 *Translation into ISO 8208 packets*

5.2.5.2.1.2.1 *Translation.* Reception by the GDLP reformat-ting process of a Mode S CALL REQUEST by ADLP packet (or an S-bit sequence of packets) from the GDCE shall result in the generation of a corresponding ISO 8208 CALL REQUEST packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.1.1 with the exceptions as specified in the following paragraph.

5.2.5.2.1.2.2 *Called DTE, calling DTE address and length fields.* The calling DTE address shall be composed of the aircraft address and the value contained in the AM field of the Mode S packet, converted to BCD (5.2.3.1.3.2). The called DTE address shall be the ground DTE address contained in the AG field of the Mode S packet, converted to BCD. The length field shall be as defined in ISO 8208.

5.2.5.2.2 *CALL REQUEST BY GDLP*

5.2.5.2.2.1 *Translation into Mode S packets*

5.2.5.2.2.1.1 *General.* Reception by the GDLP reformat-ting process of an ISO 8208 CALL REQUEST packet from the local DCE shall result in the generation of corresponding Mode S CALL REQUEST by GDLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL:2	P:1	FILL:1	SN:6

FILL:2	TC:2	AM:4	AG:8	S:1	FS:2	F:1	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.2.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.2.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.2.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.2.1.5 *Supervisory type (ST).* This field shall be set to 0.

5.2.5.2.2.1.6 *Temporary channel number field (TC).* This field shall be used to distinguish multiple call requests from a GDLP. The ADLP reformatting process, upon receipt of a temporary channel number, shall assign a channel number from those presently in the READY state, *p*1.

5.2.5.2.2.1.7 *Address, ground (AG).* This address shall be the ground DTE address (5.2.3.1.3.1) in the range of 0 to 255. The address shall be extracted from the calling DTE address contained in the ISO 8208 packet and converted to binary representation.

5.2.5.2.2.1.8 *Address, mobile (AM).* This address shall be the mobile DTE sub-address (5.2.3.1.3.2) in the range of 0 to 15. The address shall be extracted from the two least significant digits of the called DTE address contained in the ISO 8208 packet and converted to binary representation.

5.2.5.2.2.2 *Translation into ISO 8208 packets*

5.2.5.2.2.2.1 *Translation.* Reception by the ADLP reformatting process of a Mode S CALL REQUEST by GDLP packet (or an S-bit sequence of packets) from the ADCE shall result in the generation of a corresponding ISO 8208 CALL REQUEST packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.2.1 with the exceptions as specified in the following paragraph.

5.2.5.2.2.2.2 *Called DTE, calling DTE address and length fields.* The called DTE address shall be composed of the aircraft address and the value contained in the AM field of the Mode S packet, converted to BCD (5.2.3.1.3.2). The calling DTE address shall be the ground DTE address contained in the AG field of the Mode S packet, converted to BCD. The length field shall be as defined in ISO 8208.

5.2.5.2.3 *CALL ACCEPT BY ADLP*

5.2.5.2.3.1 *Translation into Mode S packets*

5.2.5.2.3.1.1 *Translated packet format.* Reception by the ADLP reformatting process of an ISO 8208 CALL ACCEPT packet from the local DCE shall result in the generation of corresponding Mode S CALL ACCEPT by ADLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	TC:2	SN:6	

	CH:4	AM:4	AG:8	S:1	FILL:2	F:1	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.3.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.3.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.3.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.3.1.5 *Supervisory type (ST).* This field shall be set to 1.

5.2.5.2.3.1.6 *Temporary channel number (TC).* The TC value in the originating Mode S CALL REQUEST by GDLP packet shall be returned to the GDLP along with the channel number (CH) assigned by the ADLP.

5.2.5.2.3.1.7 *Channel number (CH).* The field shall be set equal to the channel number assigned by the ADLP as determined during the CALL REQUEST procedures for the Mode S connection.

5.2.5.2.3.1.8 *Address, mobile and address, ground.* The AM and AG values in the originating Mode S CALL REQUEST by GDLP packet shall be returned in these fields. When present, DTE addresses in the ISO 8208 CALL ACCEPT packet shall be ignored.

5.2.5.2.3.2 *Translation into ISO 8208 packets*

5.2.5.2.3.2.1 *Translation.* Reception by the GDLP reformatting process of a Mode S CALL ACCEPT by ADLP packet (or an S-bit sequence of packets) from the GDCE shall result in the generation of a corresponding ISO 8208 CALL ACCEPT packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.3.1 with the exceptions as specified in the following paragraph.

5.2.5.2.3.2.2 *Called DTE, calling DTE address and length fields.* Where present, the called DTE address shall be composed of the aircraft address and the value contained in the AM field of the Mode S packet, converted to BCD (5.2.3.1.3.2). Where present, the calling DTE address shall be the ground DTE address contained in the AG field of the Mode S packet, converted to BCD. The length field shall be as defined in ISO 8208.

Note.— The called and calling DTE addresses are optional in the corresponding ISO 8208 packet and are not required for correct operation of the Mode S subnetwork.

5.2.5.2.4 *CALL ACCEPT BY GDLP*

5.2.5.2.4.1 *Translation into Mode S packets*

5.2.5.2.4.1.1 *Translated packet format.* Reception by the GDLP reformatting process of an ISO 8208 CALL ACCEPT packet from the local DCE shall result in the generation of corresponding Mode S CALL ACCEPT by GDLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL:2	FILL:2	SN:6	CH:4

AM:4	AG:8	S:1	FILL:2	F:1	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.4.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.4.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.4.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.4.1.5 *Supervisory type (ST).* This field shall be set to 1.

5.2.5.2.4.1.6 *Address, mobile and address, ground.* The AM and AG values in the originating Mode S CALL REQUEST by ADLP packet shall be returned in these fields. When present, DTE addresses in the ISO 8208 CALL ACCEPT packet shall be ignored.

5.2.5.2.4.2 *Translation into ISO 8208 packets*

5.2.5.2.4.2.1 *Translation.* Reception by the ADLP reformatting process of a Mode S CALL ACCEPT by GDLP packet (or an S-bit sequence of packets) from the ADCE shall result in the generation of a corresponding ISO 8208 CALL ACCEPT packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.4.1 with the exceptions as specified in the following paragraph.

5.2.5.2.4.2.2 *Called DTE, calling DTE address and length fields.* Where present, the calling DTE address shall be composed of the aircraft address and the value contained in the AM field of the Mode S packet, converted to BCD (5.2.3.1.3.2). Where present, the called DTE address shall be the ground DTE address contained in the AG field of the Mode S packet, converted to BCD. The length field shall be as defined in ISO 8208.

Note.— The called and calling DTE addresses are optional in the corresponding ISO 8208 packet and are not required for correct operation of the Mode S subnetwork.

5.2.5.2.5 *CLEAR REQUEST BY ADLP*

5.2.5.2.5.1 *Translation into Mode S packets*

5.2.5.2.5.1.1 *Translated packet format.* Reception by the ADLP reformatting process of an ISO 8208 CLEAR REQUEST packet from the local DCE shall result in the generation of a corresponding Mode S CLEAR REQUEST by ADLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	TC:2	SN:6	CH:4	AM:4

AG:8	CC:8	DC:8	S:1	FILL:2	F:1	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1 and 5.2.5.2.2.

5.2.5.2.5.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.5.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.5.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.5.1.5 *Channel number (CH)*: If a channel number has been allocated during the call acceptance phase, then CH shall be set to that value, otherwise it shall be set to zero.

5.2.5.2.5.1.6 *Temporary channel (TC)*: If a channel number has been allocated during the call acceptance phase, then TC shall be set to zero, otherwise it shall be set to the value used in the CALL REQUEST by GDLP.

5.2.5.2.5.1.7 *Supervisory type (ST).* This field shall be set to 2.

5.2.5.2.5.1.8 *Address, ground or address, mobile.* The AG and AM values in the originating Mode S CALL REQUEST by ADLP or CALL REQUEST by GDLP packets shall be returned in these fields. When present, DTE addresses in the ISO 8208 CLEAR REQUEST packet shall be ignored.

5.2.5.2.5.1.9 *Clearing cause (CC) and diagnostic code (DC) fields.* These fields shall be transferred without modification from the ISO 8208 packet to the Mode S packet when the

DTE has initiated the clear procedure. If the XDLP has initiated the clear procedure, the clearing cause field and diagnostic field shall be as defined in the state tables for the DCE and XDCE (see also 5.2.6.3.3). The coding and definition of these fields shall be as specified in ISO 8208.

5.2.5.2.5.2 *Translation into ISO 8208 packets*

5.2.5.2.5.2.1 *Translation.* Reception by the GDLP reformatting process of a Mode S CLEAR REQUEST by ADLP packet (or an S-bit sequence of packets) from the local GDCE shall result in the generation of a corresponding ISO 8208 CLEAR REQUEST packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.5.1 with the exceptions specified in the following paragraphs.

5.2.5.2.5.2.2 *Called DTE, calling DTE and length fields.* These fields shall be omitted in the ISO 8208 CLEAR REQUEST packet.

5.2.5.2.5.2.3 *Clearing Cause Field.* This field shall be set taking account of 5.2.6.3.3.

5.2.5.2.6 *CLEAR REQUEST BY GDLP*

5.2.5.2.6.1 *Translation into Mode S packets*

5.2.5.2.6.1.1 *Translated packet format.* Reception by the GDLP reformatting process of an ISO 8208 CLEAR REQUEST packet from the local DCE shall result in the generation of corresponding Mode S CLEAR REQUEST by GDLP packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL:2	TC:2	SN:6	CH:4	AM:4

AG:8	CC:8	DC:8	S:1	FILL:2	F:1	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1, 5.2.5.2.2 and 5.2.5.2.5.

5.2.5.2.6.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.6.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.6.1.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.2.6.1.5 *Channel number (CH)*: If a channel number has been allocated during the call acceptance phase, then CH shall be set to that value, otherwise it shall be set to zero.

5.2.5.2.6.1.6 *Temporary channel (TC)*: If a channel number has been allocated during the call acceptance phase, then TC shall be set to zero, otherwise it shall be set to the value used in the CALL REQUEST by GDLP.

5.2.5.2.6.1.7 *Supervisory type (ST).* This field shall be set to 2.

5.2.5.2.6.2 *Translation into ISO 8208 packets*

5.2.5.2.6.2.1 *Translation.* Reception by the ADLP reformatting process of a Mode S CLEAR REQUEST by GDLP packet (or an S-bit sequence of packets) from the local ADCE shall result in the generation of a corresponding ISO 8208 CLEAR REQUEST packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.6.1.

5.2.5.2.6.2.2 *Called DTE, calling DTE and length fields.* These fields shall be omitted in the ISO 8208 CLEAR REQUEST packet.

5.2.5.2.7 *DATA*

5.2.5.2.7.1 *Translation into Mode S packets*

5.2.5.2.7.1.1 *Translated packet format.* Reception by the XDLP reformatting process of ISO 8208 DATA packet(s) from the local DCE shall result in the generation of corresponding Mode S DATA packet(s) as determined by M-bit processing (5.2.5.1.4.1), as follows:

DP:1	M:1	SN:6	FILL1:0 or 6	PS:4

PR:4	CH:4	LV:4	UD:v

5.2.5.2.7.1.2 *Data packet type (DP).* This field shall be set to 1.

5.2.5.2.7.1.3 *M field (M).* A value of 1 shall indicate that the packet is part of an M-bit sequence with more packets in the sequence to follow. A value of 0 shall indicate that the sequence ends with this packet. The appropriate value shall be placed in the M-bit field of the Mode S packet.

Note.— See 5.2.5.1.4 and ISO 8208 for a complete explanation.

5.2.5.2.7.1.4 *Sequence number (SN).* The sequence number field shall be set as specified in 5.2.5.2.1.1.7.

5.2.5.2.7.1.5 *Packet send sequence number (PS).* The packet send sequence number field shall be set as specified in 5.2.6.4.4.

5.2.5.2.7.1.6 *Packet receive sequence number (PR).* The packet receive sequence number field shall be set as specified in 5.2.6.4.4.

5.2.5.2.7.1.7 *Channel number (CH).* The channel number field shall contain the Mode S channel number that corresponds to the incoming ISO 8208 DATA packet channel number.

5.2.5.2.7.1.8 *User data length (LV).* This field shall indicate the number of full bytes used in the last SLM or ELM segment as defined in 5.2.2.3.1.

5.2.5.2.7.1.9 *Fill (FILL1).* This field shall be set as specified in 5.2.5.2.1.1.11.

5.2.5.2.7.1.10 *User data (UD).* The user data shall be transferred from the ISO 8208 packet to the Mode S packet utilizing the M-bit packet assembly processing as required.

5.2.5.2.7.2 *Translation into ISO 8208 packets.* Reception by the XDLP reformatting process of Mode S DATA packet(s) from the local XDCE shall result in the generation of corresponding ISO 8208 DATA packet(s) to the local DCE. The translation from Mode S packet(s) to the ISO 8208 packet(s) shall be the inverse of the processing defined in 5.2.5.2.7.1.

5.2.5.2.8 *INTERRUPT*

5.2.5.2.8.1 *Translation into Mode S packets*

5.2.5.2.8.1.1 *Translated packet format.* Reception by the XDLP reformatting process of an ISO 8208 INTERRUPT packet from the local DCE shall result in the generation of corresponding Mode S INTERRUPT packet(s) (as determined by S-bit processing (5.2.5.1.4.2)) as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	S:1	

	F:1	SN:6	CH:4	LV:4	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.8.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.8.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.8.1.4 *Supervisory packet (SP).* This field shall be set to 3.

5.2.5.2.8.1.5 *Supervisory type (ST).* This field shall be set to 1.

5.2.5.2.8.1.6 *User data length (LV).* This field shall be set as specified in 5.2.2.3.1.

5.2.5.2.8.1.7 *User data (UD).* The user data shall be transferred from the ISO 8208 packet to the Mode S packet using the S-bit packet reassembly processing as required. The maximum size of the user data field for an INTERRUPT packet shall be 32 bytes.

5.2.5.2.8.2 *Translation into ISO 8208 packets.* Reception by the XDLP reformatting process of Mode S INTERRUPT packet(s) from the local XDCE shall result in the generation of a corresponding ISO 8208 INTERRUPT packet to the local DCE. The translation from the Mode S packet(s) to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.8.1.

5.2.5.2.9 *INTERRUPT CONFIRMATION*

5.2.5.2.9.1 *Translation into Mode S packets*

5.2.5.2.9.1.1 *Translated packet format.* Reception by the XDLP reformatting process of an ISO 8208 INTERRUPT CONFIRMATION packet from the local DCE shall result in the generation of a corresponding Mode S INTERRUPT CONFIRMATION packet as follows:

DP:1	MP:1	SP:2	ST:2	SS:2	

	FILL2:0 or 2	SN:6	CH:4	FILL:4

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.9.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.9.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.9.1.4 *Supervisory packet (SP).* This field shall be set to 3.

5.2.5.2.9.1.5 *Supervisory type (ST).* This field shall be set to 3.

5.2.5.2.9.1.6 *Supervisory subset (SS).* This field shall be set to 0.

5.2.5.2.9.2 *Translation into ISO 8208 packets.* Reception by the XDLP reformatting process of a Mode S INTERRUPT CONFIRMATION packet from the local XDCE shall result in the generation of a corresponding ISO 8208 INTERRUPT CONFIRMATION packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.9.1.

5.2.5.2.10 *RESET REQUEST*

5.2.5.2.10.1 *Translation into Mode S packets*

5.2.5.2.10.1.1 *Translated packet format.* Reception by the XDLP reformatting process of an ISO 8208 RESET REQUEST packet from the local DCE shall result in the generation of a corresponding Mode S RESET REQUEST packet as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	FILL:2

SN:6	CH:4	FILL:4	RC:8	DC:8

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1.

5.2.5.2.10.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.2.10.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.2.10.1.4 *Supervisory packet (SP).* This field shall be set to 2.

5.2.5.2.10.1.5 *Supervisory type (ST).* This field shall be set to 2.

5.2.5.2.10.1.6 *Reset cause code (RC) and diagnostic code (DC).* The reset cause and diagnostic codes used in the Mode S RESET REQUEST packet shall be as specified in the ISO 8208 packet when the reset procedure is initiated by the DTE. If the reset procedure originates with the DCE, the DCE state tables shall specify the diagnostic fields coding. In this case, bit 8 of the reset cause field shall be set to 0.

5.2.5.2.10.2 *Translation into ISO 8208 packets.* Reception by the XDLP reformatting process of a Mode S RESET packet from the local XDCE shall result in the generation of a corresponding ISO 8208 RESET packet to the local DCE. The translation from the Mode S packet to the ISO 8208 packet shall be the inverse of the processing defined in 5.2.5.2.10.1.

5.2.5.2.11 *ISO 8208 RESTART REQUEST to Mode S CLEAR REQUEST.* The receipt of an ISO 8208 RESTART REQUEST from the local DCE shall result in the reformatting process generating a Mode S CLEAR REQUEST by ADLP or Mode S CLEAR REQUEST by GDLP for all SVCs associated with the requesting DTE. The fields of the Mode S CLEAR REQUEST packets shall be set as specified in 5.2.5.2.5 and 5.2.5.2.6.

Note.— There are no restart states in the Mode S packet layer protocol.

5.2.5.3 PACKETS LOCAL TO THE MODE S SUBNETWORK

Note.— Packets defined in this section do not result in the generation of an ISO 8208 packet.

5.2.5.3.1 *MODE S RECEIVE READY*

5.2.5.3.1.1 *Packet format.* The Mode S RECEIVE READY packet arriving from an XDLP is not related to the control of the DTE/DCE interface and shall not cause the generation of an ISO 8208 packet. The format of the packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2

FILL:2	SN:6	CH:4	PR:4

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1. The packet shall be processed as specified in 5.2.6.5.

5.2.5.3.1.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.1.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.1.4 *Supervisory packet (SP).* This field shall be set to 2.

5.2.5.3.1.5 *Supervisory type (ST).* This field shall be set to 0.

5.2.5.3.1.6 *Packet receive sequence number (PR).* This field shall be set as specified in 5.2.6.4.4.

5.2.5.3.2 *MODE S RECEIVE NOT READY*

5.2.5.3.2.1 *Packet format.* The Mode S RECEIVE NOT READY packet arriving from an XDLP is not related to the control of the DTE/DCE interface and shall not cause the generation of an ISO 8208 packet. The format of the packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2

FILL:2	SN:6	CH:4	PR:4

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1. The packet shall be processed as specified in 5.2.6.6.

5.2.5.3.2.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.2.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.2.4 *Supervisory packet (SP).* This field shall be set to 2.

5.2.5.3.2.5 *Supervisory type (ST).* This field shall be set to 1.

5.2.5.3.2.6 *Packet receive sequence number (PR).* This field shall be set as specified in 5.2.6.4.4.

5.2.5.3.3 *MODE S ROUTE*

5.2.5.3.3.1 *Packet format.* The format for the packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	OF:1	IN:1	

	RTL:8	RT:v	ODL:0 or 8	OD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1. The packet shall only be generated by the GDLP. It shall be processed by the ADLP as specified in 5.2.8.1.2 and shall have a maximum size as specified in 5.2.6.4.2.1.

5.2.5.3.3.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.3.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.3.4 *Supervisory packet (SP).* This field shall be set to 3.

5.2.5.3.3.5 *Supervisory type (ST).* This field shall be set to 0.

5.2.5.3.3.6 *Option flag (OF).* This field shall indicate the presence of the optional data length (ODL) and optional data (OD) fields. OF shall be set to 1 if ODL and OD are present. Otherwise it shall be set to 0.

5.2.5.3.3.7 *Initialization bit (IN).* This field shall indicate the requirement for subnetwork initialization. It shall be set by the GDLP as specified in 5.2.8.1.2 d).

Note.— Initialization causes the clearing of any open SVCs associated with the DTE addresses contained in the ROUTE packet. This is needed to assure that all channels are closed at acquisition and for initialization following recovery after a GDLP failure.

5.2.5.3.3.8 *Route table length (RTL).* This field shall indicate the size of the route table, expressed in bytes.

5.2.5.3.3.9 *Route table (RT)*

5.2.5.3.3.9.1 *Contents.* This table shall consist of a variable number of entries each containing information specifying the addition or deletion of entries in the II code-DTE cross-reference table (5.2.8.1.1).

5.2.5.3.3.9.2 *Entries.* Each entry in the route table shall consist of the II code, a list of up to 8 ground DTE addresses, and a flag indicating whether the resulting II code-DTE pairs shall be added or deleted from the II code-DTE cross-reference table. A route table entry shall be coded as follows:

II:4	AD:1	ND:3	DAL:v

5.2.5.3.3.9.3 *Interrogator identifier (II).* This field shall contain the 4-bit II code.

5.2.5.3.3.9.4 *Add/delete flag (AD).* This field shall indicate whether the II code-DTE pairs shall be added ($AD = 1$) or deleted ($AD = 0$) from the II code-DTE cross-reference table.

5.2.5.3.3.9.5 *Number of DTE addresses (ND).* This field shall be expressed in binary in the range from 0 to 7 and shall indicate the number of DTE addresses present in DAL minus 1 (in order to allow from 1 to 8 DTE addresses).

5.2.5.3.3.9.6 *DTE address list (DAL).* This list shall consist of up to 8 DTE addresses, expressed in 8-bit binary representation.

5.2.5.3.3.10 *Optional data length (ODL).* This field shall contain the length in bytes of the following OD field.

5.2.5.3.3.11 *Optional data (OD).* This variable length field shall contain optional data.

5.2.5.3.4 *MODE S CLEAR CONFIRMATION BY ADLP*

5.2.5.3.4.1 *Packet format.* The format for this packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	

	TC:2	SN:6	CH:4	AM:4	AG:8

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1 and 5.2.5.2.5. This packet shall be processed as specified in 5.2.6.3.

5.2.5.3.4.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.4.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.4.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.3.4.5 *Channel number (CH)*: If a channel number has been allocated during the call acceptance phase, then CH shall be set to that value, otherwise it shall be set to zero.

5.2.5.3.4.6 *Temporary channel (TC)*: If a channel number has been allocated during the call acceptance phase, then TC shall be set to zero, otherwise it shall be set to the value used in the CALL REQUEST by GDLP.

5.2.5.3.4.7 *Supervisory type (ST).* This field shall be set to 3.

5.2.5.3.5 *MODE S CLEAR CONFIRMATION BY GDLP*

5.2.5.3.5.1 *Packet format.* The format for this packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL:2	

	TC:2	SN:6	CH:4	AM:4	AG:8

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1 and 5.2.5.2.6. This packet shall be processed as specified in 5.2.6.3.

5.2.5.3.5.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.5.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.5.4 *Supervisory packet (SP).* This field shall be set to 1.

5.2.5.3.5.5 *Channel number (CH)*: If a channel number has been allocated during the call acceptance phase, then CH shall be set to that value, otherwise it shall be set to zero.

5.2.5.3.5.6 *Temporary channel (TC)*: If a channel number has been allocated during the call acceptance phase, then TC shall be set to zero, otherwise it shall be set to the value used in the CALL REQUEST by GDLP.

5.2.5.3.5.7 *Supervisory type (ST).* This field shall be set to 3.

5.2.5.3.6 *MODE S RESET CONFIRMATION*

5.2.5.3.6.1 *Packet format.* The format for this packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	FILL2:0 or 2	

	FILL:2	SN:6	CH:4	FILL:4

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1. This packet shall be processed as specified in Table 5-14.

5.2.5.3.6.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.6.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.6.4 *Supervisory packet (SP).* This field shall be set to 2.

5.2.5.3.6.5 *Supervisory type (ST).* This field shall be set to 3.

5.2.5.3.7 *MODE S REJECT*

5.2.5.3.7.1 *Packet format.* The format for this packet shall be as follows:

DP:1	MP:1	SP:2	ST:2	SS:2	

	FILL2:0 or 2	SN:6	CH:4	PR:4

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1. This packet shall be processed as specified in 5.2.6.8.

5.2.5.3.7.2 *Data packet type (DP).* This field shall be set to 0.

5.2.5.3.7.3 *MSP packet type (MP).* This field shall be set to 1.

5.2.5.3.7.4 *Supervisory packet (SP).* This field shall be set to 3.

5.2.5.3.7.5 *Supervisory type (ST).* This field shall be set to 3.

5.2.5.3.7.6 *Supervisory subset (SS).* This field shall be set to 1.

5.2.5.3.7.7 *Packet receive sequence number (PR).* This field shall be set as specified in 5.2.6.4.4.

5.2.6 XDCE operation

Note.— The ADCE process within the ADLP acts as a peer process to the GDCE process in the GDLP.

5.2.6.1 *State transitions.* The XDCE shall operate as a state machine. Upon entering a state, the XDCE shall perform the actions specified in Table 5-14. State transition and additional action(s) shall be as specified in Table 5-15 through Table 5-22.

Note 1.— The next state transition (if any) that occurs when the XDCE receives a packet from the peer XDCE is specified by Table 5-15 through Table 5-19. The same transitions are defined in Table 5-20 through Table 5-22 when the XDCE receives a packet from the DCE (via the reformatting process).

Note 2.— The XDCE state hierarchy is the same as for the DCE as presented in Figure 5-2, except that states r2, r3 and p5 are omitted.

5.2.6.2 DISPOSITION OF PACKETS

5.2.6.2.1 Upon receipt of a packet from the peer XDCE, the packet shall be forwarded or not forwarded to the DCE (via the reformatting process) according to the parenthetical instructions contained in Tables 5-15 to 5-19. If no parenthetical instruction is listed or if the parenthetical instruction indicates "do not forward" the packet shall be discarded.

5.2.6.2.2 Upon receipt of a packet from the DCE (via the reformatting process), the packet shall be forwarded or not forwarded to the peer XDCE according to the parenthetical instructions contained in Tables 5-20 to 5-22. If no parenthetical instruction is listed or if the parenthetical instruction indicates "do not forward" the packet shall be discarded.

5.2.6.3 SVC CALL SETUP AND CLEAR PROCEDURE

5.2.6.3.1 *Setup procedures.* Upon receipt of a CALL REQUEST from the DCE or peer XDCE, the XDLP shall determine if sufficient resources exist to operate the SVC. This shall include: sufficient buffer space (refer to 5.2.5.1.1 for buffer requirements) and an available *p*1 state SVC. Upon acceptance of the CALL REQUEST from the DCE (via the reformatting process), the Mode S CALL REQUEST packet shall be forwarded to frame processing. Upon acceptance of a Mode S CALL REQUEST from the peer XDCE (via frame processing), the Mode S CALL REQUEST shall be sent to the reformatting process.

5.2.6.3.2 *Aborting a call request.* If the DTE and/or the peer XDCE abort a call before they have received a CALL ACCEPT packet, they shall indicate this condition by issuing a CLEAR REQUEST packet. Procedures for handling these cases shall be as specified in Table 5-16 and Table 5-20.

5.2.6.3.3 VIRTUAL CALL CLEARING

5.2.6.3.3.1 If the XDCE receives a Mode S CALL REQUEST from the reformatting process that it cannot support, it shall initiate a Mode S CLEAR REQUEST packet that is sent to the DCE (via the reformatting process) for transfer to the DTE (the DCE thus enters the DCE CLEAR REQUEST to DTE state, *p*7).

5.2.6.3.3.2 If the XDCE receives a Mode S CALL REQUEST packet from the peer XDCE (via frame processing) which it cannot support, it shall enter the state *p*7.

5.2.6.3.3.3 A means shall be provided to advise the DTE whether an SVC has been cleared due to the action of the peer DTE or due to a problem within the subnetwork itself.

5.2.6.3.3.4 **Recommendation.—** *The requirement of 5.2.6.3.3.3 should be satisfied by setting bit 8 of the cause field to 1 to indicate that the problem originated in the Mode S subnetwork and not in the DTE. The diagnostic and cause codes should be set as follows:*

a) no channel number available, DC = 71, CC = 133;

b) buffer space not available, DC = 71, CC = 133;

c) DTE not operational, DC = 162, CC = 141; and

d) link failure, DC = 225, CC = 137.

5.2.6.3.3.5 If the ADLP receives a Mode S ROUTE packet with the IN bit set to ONE, the ADLP shall perform local initialization by clearing Mode S SVCs associated with the DTE addresses contained in the ROUTE packet. If the GDLP receives a search request (Table 5-23) from an ADLP, the GDLP shall perform local initialization by clearing Mode S SVCs associated with that ADLP. Local initialization shall be accomplished by:

a) releasing all allocated resources associated with these SVCs (including the resequencing buffers);

b) returning these SVCs to the ADCE ready state (*p*1); and

c) sending Mode S CLEAR REQUEST packets for these SVCs to the DCE (via the reformatting process) for transfer to the DTE.

Note.— This action will allow all ISO 8208 SVCs attached to the Mode S SVCs to be cleared and return to their ready states (p1).

5.2.6.3.4 *Clear confirmation.* When the XDCE receives a Mode S CLEAR CONFIRMATION packet, the remaining allocated resources to manage the SVC shall be released (including the resequencing buffers) and the SVC shall be returned to the *p*1 state. Mode S CLEAR CONFIRMATION packets shall not be transferred to the reformatting process.

5.2.6.3.5 *Clear collision.* A clear collision occurs at the XDCE when it receives a Mode S CLEAR REQUEST packet from the DCE (via the reformatting process) and then receives a Mode S CLEAR REQUEST packet from the peer XDCE (or vice versa). In this event, the XDCE does not expect to receive a Mode S CLEAR CONFIRMATION packet for this SVC and shall consider the clearing complete.

5.2.6.3.6 *Packet processing.* The XDCE shall treat an S-bit sequence of Mode S CALL REQUEST, CALL ACCEPT and CLEAR REQUEST packets as a single entity.

5.2.6.4 DATA TRANSFER AND INTERRUPT PROCEDURES

5.2.6.4.1 *GENERAL PROVISIONS*

5.2.6.4.1.1 Data transfer and interrupt procedures shall apply independently to each SVC. The contents of the user data field shall be passed transparently to the DCE or to the peer XDCE. Data shall be transferred in the order dictated by the sequence numbers assigned to the data packets.

5.2.6.4.1.2 To transfer DATA packets, the SVC shall be in a FLOW CONTROL READY state (*d*1).

5.2.6.4.2 *MODE S PACKET SIZE*

5.2.6.4.2.1 The maximum size of Mode S packets shall be 152 bytes in the uplink direction and 160 bytes in the downlink direction for installations that have full uplink and downlink ELM capability. The maximum downlink packet size for level four transponders with less than 16 segment downlink ELM capability shall be 10 bytes times the maximum number of downlink ELM segments that the transponder specifies in its data link capability report. If there is no ELM capability, the maximum Mode S packet size shall be 28 bytes.

5.2.6.4.2.2 The Mode S subnetwork shall allow packets of less than the maximum size to be transferred.

5.2.6.4.3 *FLOW CONTROL WINDOW SIZE*

5.2.6.4.3.1 The flow control window size of the Mode S subnetwork shall be independent of that used on the DTE/DCE interface. The Mode S subnetwork window size shall be 15 packets in the uplink and downlink directions.

5.2.6.4.4 *SVC FLOW CONTROL*

5.2.6.4.4.1 Flow control shall be managed by means of a sequence number for received packets (PR) and one for packets that have been sent (PS). A sequence number (PS) shall be assigned for each Mode S DATA packet generated by the XDLP for each SVC. The first Mode S DATA packet transferred by the XDCE to frame processing when the SVC has just entered the flow control ready state shall be numbered zero. The first Mode S packet received from the peer XDCE after an SVC has just entered the flow control ready state shall be numbered zero. Subsequent packets shall be numbered consecutively.

5.2.6.4.4.2 A source of Mode S DATA packets (the ADCE or GDCE) shall not send (without permission from the receiver) more Mode S DATA packets than would fill the flow control window. The receiver shall give explicit permission to send more packets.

5.2.6.4.4.3 The permission information shall be in the form of the next expected packet sequence number, and shall be denoted PR. If a receiver wishes to update the window and it has data to transmit to the sender, a Mode S DATA packet shall be used for information transfer. If the window must be updated and no data are to be sent, a Mode S RECEIVE READY (RR) or Mode S RECEIVE NOT READY (RNR) packet shall be sent. At this point, the "sliding window" shall be moved to begin at the new PR value. The XDCE shall now be authorized to transfer more packets without acknowledgement up to the window limit.

5.2.6.4.4.4 When the sequence number (PS) of the next Mode S DATA packet to be sent is in the range $PR \leq PS \leq PR + 14$ (modulo 16), the sequence number shall be defined to be "in the window" and the XDCE shall be authorized to transmit the packet. Otherwise, the sequence number (PS) of the packet shall be defined to be "outside the window" and the XDCE shall not transmit the packet to the peer XDCE.

5.2.6.4.4.5 When the sequence number (PS) of the packet received is next in sequence and within the window, the XDCE shall accept this packet. Receipt of a packet with a PS:

a) outside the window; or

b) out of sequence; or

c) not equal to 0 for the first data packet after entering FLOW CONTROL READY state (*d*1);

shall be considered an error (5.2.6.8).

5.2.6.4.4.6 The receipt of a Mode S DATA packet with a valid PS number (i.e. the next PS in sequence) shall cause the lower window PR to be changed to that PS value plus 1. The packet receive sequence number (PR) shall be conveyed to the originating XDLP by a Mode S DATA, RECEIVE READY, RECEIVE NOT READY, or REJECT packet. A valid PR value shall be transmitted by the XDCE to the peer XDCE after the receipt of 8 packets provided that sufficient buffer space exists to store 15 packets. Incrementing the PR and PS fields shall be performed using modulo 16 arithmetic.

Note.— The loss of a packet which contains the PR value may cause the ADLP/GDLP operations for that SVC to cease.

5.2.6.4.4.7 A copy of a packet shall be retained until the user data has been successfully transferred. Following successful transfer, the PS value shall be updated.

5.2.6.4.4.8 The PR value for user data shall be updated as soon as the required buffer space for the window (as determined by flow control management) is available within the DCE.

5.2.6.4.4.9 Flow control management shall be provided between the DCE and XDCE.

5.2.6.4.5 *INTERRUPT PROCEDURES FOR SWITCHED VIRTUAL CIRCUITS*

5.2.6.4.5.1 If user data is to be sent via the Mode S subnetwork without following the flow control procedures, the interrupt procedures shall be used. The interrupt procedure shall have no effect on the normal data packet and flow control procedures. An interrupt packet shall be delivered to the DTE (or the transponder or interrogator interface) at or before the point in the stream of data at which the interrupt was generated. The processing of a Mode S INTERRUPT packet shall occur as soon as it is received by the XDCE.

Note.— The use of clear, reset, and restart procedures can cause interrupt data to be lost.

5.2.6.4.5.2 The XDCE shall treat an S-bit sequence of Mode S INTERRUPT packets as a single entity.

5.2.6.4.5.3 Interrupt processing shall have precedence over any other processing for the SVC occurring at the time of the interrupt.

5.2.6.4.5.4 The reception of a Mode S INTERRUPT packet before the previous interrupt of the SVC has been confirmed (by the receipt of a Mode S INTERRUPT CONFIRMATION packet) shall be defined as an error. The error results in a reset (see Table 5-18).

5.2.6.5 RECEIVE READY PROCEDURE

5.2.6.5.1 The Mode S RECEIVE READY packet shall be sent if no Mode S DATA packets (that normally contain the updated PR value) are available for transmittal and it is necessary to transfer the latest PR value. It also shall be sent to terminate a receiver not ready condition.

5.2.6.5.2 Receipt of the Mode S RECEIVE READY packet by the XDCE shall cause the XDCE to update its value of PR for the outgoing SVC. It shall not be taken as a demand for retransmission of packets that have already been transmitted and are still in the window.

5.2.6.5.3 Upon receipt of the Mode S RECEIVE READY packet, the XDCE shall go into the ADLP(GDLP) RECEIVE READY state ($g1$).

5.2.6.6 RECEIVE NOT READY PROCEDURE

5.2.6.6.1 The Mode S RECEIVE NOT READY packet shall be used to indicate a temporary inability to accept additional DATA packets for the given SVC. The Mode S RNR condition shall be cleared by the receipt of a Mode S RR packet or a Mode S REJECT packet.

5.2.6.6.2 When the XDCE receives a Mode S RECEIVE NOT READY packet from the peer XDCE, it shall update its value of PR for the SVC and stop transmitting Mode S DATA packets on the SVC to the XDLP. The XDCE shall go into the ADLP(GDLP) RECEIVE NOT READY state ($g2$).

5.2.6.6.3 The XDCE shall transmit a Mode S RECEIVE NOT READY packet to the peer XDCE if it is unable to receive from the peer XDCE any more Mode S DATA packets on the indicated SVC. Under these conditions, the XDCE shall go into the ADCE(GDCE) RECEIVE NOT READY state ($f2$).

5.2.6.7 RESET PROCEDURE

5.2.6.7.1 When the XDCE receives a Mode S RESET REQUEST packet from either the peer XDCE or the DCE (via the reformatting process) or due to an error condition performs its own reset, the following actions shall be taken:

a) those Mode S DATA packets that have been transmitted to the peer XDCE shall be removed from the window;

b) those Mode S DATA packets that are not transmitted to the peer XDCE but are contained in an M-bit sequence for which some packets have been transmitted shall be deleted from the queue of DATA packets awaiting transmission;

c) those Mode S DATA packets received from the peer XDCE that are part of an incomplete M-bit sequence shall be discarded;

d) the lower window edge shall be set to 0 and the next packet sent shall have a sequence number (PS) of 0;

e) any outstanding Mode S INTERRUPT packets to or from the peer XDCE shall be left unconfirmed; and

f) any Mode S INTERRUPT packet awaiting transfer shall be discarded;

g) data packets awaiting transfer shall not be discarded (unless they are part of a partially transferred M-bit sequence); and

h) the transition to $d1$ shall also include a transition to $i1$, $j1$, $f1$ and $g1$.

5.2.6.7.2 The reset procedure shall apply to the DATA TRANSFER state (*p*4). The error procedure in Table 5-16 shall be followed. In any other state the reset procedure shall be abandoned.

5.2.6.8 REJECT PROCEDURE

5.2.6.8.1 When the XDCE receives a Mode S DATA packet from the peer XDCE with incorrect format or whose packet sequence number (PS) is not within the defined window (Table 5-19) or is out of sequence, it shall discard the received packet and send a Mode S REJECT packet to the peer XDCE via frame processing. The Mode S REJECT packet shall indicate a value of PR for which retransmission of the Mode S DATA packets is to begin. The XDCE shall discard subsequent out-of-sequence Mode S DATA packets whose receipt occurs while the Mode S REJECT packet response is still outstanding.

5.2.6.8.2 When the XDCE receives a Mode S REJECT packet from the peer XDCE, it shall update its lower window value with the new value of PR and begin to (re)transmit packets with a sequence number of PR.

5.2.6.8.3 Reject indications shall not be transferred to the DCE. If the ISO 8208 interface supports the reject procedures, the reject indications occurring on the ISO 8208 interface shall not be transferred between the DCE and the XDCE.

5.2.6.9 PACKET RESEQUENCING AND DUPLICATE SUPPRESSION

Note 1.— If the frames for an SVC include both types (SLM and ELM), the sequence of packets may be lost due to the different delivery times. The order may also be lost if multiple interrogators are used to deliver frames for the same SVC to a given XDLP. The following procedure will correct for a limited amount of desequencing.

Note 2.— This process serves as an interface between frame processing and the XDCE function.

5.2.6.9.1 *Resequencing.* Resequencing shall be performed independently for the uplink and downlink transfers of each Mode S SVC. The following variables and parameters shall be used:

SNR A 6-bit variable indicating the sequence number of a received packet on a specific SVC. It is contained in the SN field of the packet (5.2.5.2.1.1.7).

NESN The next expected sequence number following a series of consecutive sequence numbers.

HSNR The highest value of SNR in the resequencing window.

Tq Resequencing timers (see Tables 5-1 and 5-13) associated with a specific SVC.

All operations involving the sequence number (SN) shall be performed modulo 64.

5.2.6.9.2 *Duplication window.* The range of *SNR* values between *NESN* – 32 and *NESN* – 1 inclusive shall be denoted the duplication window.

5.2.6.9.3 *Resequencing window.* The range of *SNR* values between *NESN* + 1 and *NESN* + 31 inclusive shall be denoted the resequencing window. Received packets with a sequence number value in this range shall be stored in the resequencing window in sequence number order.

5.2.6.9.4 *TRANSMISSION FUNCTIONS*

5.2.6.9.4.1 For each SVC, the first packet sent to establish a connection (the first Mode S CALL REQUEST or first Mode S CALL ACCEPT packet) shall cause the value of the *SN* field to be initialized to zero. The value of the *SN* field shall be incremented after the transmission (or retransmission) of each packet.

5.2.6.9.4.2 The maximum number of unacknowledged sequence numbers shall be 32 consecutive *SN* numbers. Should this condition be reached, then it shall be treated as an error and the channel cleared.

Note.— A limit on the number of unacknowledged packets is required since the SN field is six bits long and therefore has a maximum of 64 different values before the values repeat.

5.2.6.9.5 *RECEIVE FUNCTIONS*

5.2.6.9.5.1 *Resequencing.* The resequencing algorithm shall maintain the variables *HSNR* and *NESN* for each SVC. *NESN* shall be initialized to 0 for all SVCs and shall be reset to 0 when the SVC re-enters the channel number pool (5.2.5.1.2).

5.2.6.9.5.2 *Processing of packets within the duplication window.* If a packet is received with a sequence number value within the duplication window, the packet shall be discarded.

5.2.6.9.5.3 *Processing of packets within the resequencing window.* If a packet is received with a sequence number within the resequencing window, it shall be discarded as a duplicate if a packet with the same sequence number has already been received and stored in the resequencing window. Otherwise, the packet shall be stored in the resequencing window. Then, if no *Tq* timers are running, *HSNR* shall be set to the value of *SNR* for this packet and a *Tq* timer shall be started with its initial value (Tables 5-1 and 5-13). If at least one *Tq* timer is running, and *SNR* is not in the window between *NESN* and *HSNR* + 1 inclusive, a new *Tq* timer shall be started and the value of *HSNR* shall be updated. If at least one *Tq* timer is running, and *SNR* for this packet is equal to *HSNR* + 1, the value of *HSNR* shall be updated.

5.2.6.9.5.4 *Release of packets to the XDCE.* If a packet is received with a sequence number equal to *NESN*, the following procedure shall be applied:

a) the packet and any packets already stored in the resequencing window up to the next missing sequence number shall be passed to the XDCE;

b) *NESN* shall be set to 1 + the value of the sequence number of the last packet passed to the XDCE; and

c) the *Tq* timer associated with any of the released packets shall be stopped.

5.2.6.9.6 *Tq timer expiration.* If a *Tq* timer expires, the following procedure shall be applied:

a) *NESN* shall be incremented until the next missing sequence number is detected after that of the packet associated with the *Tq* timer that has expired;

b) any stored packets with sequence numbers that are no longer in the resequencing window shall be forwarded to the XDCE except that an incomplete S-bit sequence shall be discarded; and

c) the *Tq* timer associated with any released packets shall be stopped.

5.2.7 Mode S specific services processing

The data formats and protocols for messages transferred via Mode S specific services shall be as specified in the Appendix to this chapter. Mode S specific services shall be processed by an entity in the XDLP termed the Mode S specific services entity (SSE).

Note 1.— This section describes the processing of control and message data received from the Mode S specific services interface.

Note 2.— Control data consists of information permitting the determination of, for example, message length, BDS code used to access the data format for a particular register, and aircraft address.

5.2.7.1 ADLP PROCESSING

5.2.7.1.1 *DOWNLINK PROCESSING*

5.2.7.1.1.1 *Specific services capability.* The ADLP shall be capable of receiving control and message data from the Mode S specific services interface(s) and sending delivery notices to this interface. The control data shall be processed to determine the protocol type and the length of the message data. When the message or control data provided at this interface are erroneous (i.e. incomplete, invalid or inconsistent), the ADLP shall discard the message and deliver an error report at the interface.

Note.— The diagnostic content and error reporting mechanism are a local issue.

5.2.7.1.1.2 *Broadcast processing.* The control and message data shall be used to format the Comm-B broadcast message as specified in 5.2.7.5 and transferred to the transponder.

5.2.7.1.1.3 *GICB processing.* The 8-bit BDS code shall be determined from the control data. The 7-byte register content shall be extracted from the received message data. The register content shall be transferred to the transponder, along with an indication of the specified register number. A request to address one of the air-initiated Comm-B registers or the airborne collision avoidance system (ACAS) active resolution advisories register shall be discarded. The assignment of registers shall be as specified in Table 5-24.

5.2.7.1.1.4 *MSP processing*

5.2.7.1.1.4.1 The MSP message length, channel number (M/CH) (5.2.7.3.1.3) and optionally the interrogator identifier (II) code shall be determined from the control data. The MSP message content shall be extracted from the received message data. If the message length is 26 bytes or less, the SSE shall format an air-initiated Comm-B message (5.2.7.1.1.4.2) for transfer to the transponder using the short form MSP packet (5.2.7.3.1). If the message length is 27 to 159 bytes and the transponder has adequate downlink ELM capability, the SSE shall format an ELM message for transfer using the short form MSP packet. If the message length is 27 to 159 bytes and the transponder has a limited downlink ELM capability, the SSE shall format multiple long form MSP packets (5.2.7.3.2) using ELM messages, as required utilizing the L-bit and M/SN fields for association of the packets. If the message length is 27 to 159 bytes and the transponder does not have downlink ELM capability, the SSE shall format multiple long form MSP packets (5.2.7.3.2) using air initiated Comm-B messages, as required utilizing the L-bit and M/SN fields for association of the packets. Different frame types shall never be used in the delivery of an MSP message. Messages longer than 159 bytes shall be discarded. The assignment of downlink MSP channel numbers shall be as specified in Table 5-25.

5.2.7.1.1.4.2 For an MSP, a request to send a packet shall cause the packet to be multisite-directed to the interrogator which II code is specified in control data. If no II code is specified, the packet shall be downlinked using the air-initiated protocol. A message delivery notice for this packet shall be provided to the Mode S specific interface when the corresponding close-out(s) have been received from the transponder. If a close-out has not been received from the transponder in *Tz* seconds, as specified in Table 5-1, the MSP packet shall be discarded. This shall include the cancellation in the transponder of any frames associated with this packet. A delivery failure notice for this message shall be provided to the Mode S specific services interface.

5.2.7.1.2 *UPLINK PROCESSING*

Note.— This section describes the processing of Mode S specific services messages received from the transponder.

5.2.7.1.2.1 *Specific services capability.* The ADLP shall be capable of receiving Mode S specific services messages from the transponder via frame processing. The ADLP shall be capable of delivering the messages and the associated control data at the specific services interface. When the resources allocated at this interface are insufficient to accommodate the output data, the ADLP shall discard the message and deliver an error report at this interface.

Note.— The diagnostic content and the error reporting mechanism are a local issue.

5.2.7.1.2.2 *Broadcast processing.* If the received message is a broadcast Comm-A, as indicated by control data received over the transponder/ADLP interface, the broadcast ID and user data (5.2.7.5) shall be forwarded to the Mode S specific services interface (5.2.3.2.1) along with the control data that identifies this as a broadcast message. The assignment of uplink broadcast identifier numbers shall be as specified in Table 5-23.

5.2.7.1.2.3 *MSP processing.* If the received message is an MSP, as indicated by the packet format header (5.2.7.3), the user data field of the received MSP packet shall be forwarded to the Mode S specific services interface (5.2.3.2.1) together with the MSP channel number (M/CH), the IIS subfield (5.2.2.1.1.1) together with control data that identifies this as an MSP message. L-bit processing shall be performed as specified in 5.2.7.4. The assignment of uplink MSP channel numbers shall be as specified in Table 5-25.

5.2.7.2 GDLP PROCESSING

5.2.7.2.1 *UPLINK PROCESSING*

5.2.7.2.1.1 *Specific services capability.* The GDLP shall be capable of receiving control and message data from the Mode S specific services interface(s) (5.2.3.2.2) and sending delivery notices to the interface(s). The control data shall be processed to determine the protocol type and the length of the message data.

5.2.7.2.1.2 *Broadcast processing.* The GDLP shall determine the interrogator(s), broadcast azimuths and scan times from the control data and format the broadcast message for transfer to the interrogator(s) as specified in 5.2.7.5.

5.2.7.2.1.3 *GICB processing.* The GDLP shall determine the register number and the aircraft address from the control data. The aircraft address and BDS code shall be passed to the interrogator as a request for a ground-initiated Comm-B.

5.2.7.2.1.4 *MSP processing.* The GDLP shall extract from the control data the message length, the MSP channel number (M/CH) and the aircraft address, and obtain the message content from the message data. If the message length is 27 bytes or less, the SSE shall format a Comm-A message for transfer to the interrogator using the short form MSP packet (5.2.7.3.1). If the message length is 28 to 151 bytes and the transponder has uplink ELM capability, the SSE shall format an ELM message for transfer to the interrogator using the short form MSP packet. If the message length is 28 to 151 bytes and the transponder does not have uplink ELM capability, the SSE shall format multiple long form MSP packets (5.2.7.3.2) utilizing the L-bit and the M/SN fields for association of the packets. Messages longer than 151 bytes shall be discarded. The interrogator shall provide a delivery notice to the Mode S specific services interface(s) indicating successful or unsuccessful delivery, for each uplinked packet.

5.2.7.2.2 *DOWNLINK PROCESSING*

5.2.7.2.2.1 *Specific services capability.* The GDLP shall be capable of receiving Mode S specific services messages from the interrogator via frame processing.

5.2.7.2.2.2 *Broadcast processing.* If the received message is a broadcast Comm-B, as indicated by the interrogator/GDLP interface, the GDLP shall:

a) generate control data indicating the presence of a broadcast message and the 24-bit address of the aircraft from which the message was received;

b) append the 7-byte MB field of the broadcast Comm-B; and

c) forward this data to the Mode S specific services interface(s) (5.2.3.2.2).

5.2.7.2.2.3 *GICB processing.* If the received message is a GICB, as indicated by the interrogator/GDLP interface, the GDLP shall:

a) generate control data indicating the presence of a GICB message, the register number and the 24-bit address of the aircraft from which the message was received;

b) append the 7-byte MB field of the GICB; and

c) forward this data to the Mode S specific services interface(s) (5.2.3.2.2).

5.2.7.2.2.4 *MSP processing.* If the received message is an MSP as indicated by the packet format header (5.2.7.3), the GDLP shall:

a) generate control data indicating the transfer of an MSP, the length of the message, the MSP channel number (M/CH) and the 24-bit address of the aircraft from which the message was received;

b) append the user data field of the received MSP packet; and

c) forward this data to the Mode S specific services interface(s) (5.2.3.2.2).

L-bit processing shall be performed as specified in 5.2.7.4.

5.2.7.3 MSP PACKET FORMATS

5.2.7.3.1 *Short form MSP packet.* The format for this packet shall be as follows:

DP:1	MP:1	M/CH:6	FILL1:0 or 6	UD:v

5.2.7.3.1.1 *Data packet type (DP).* This field shall be set to 0.

5.2.7.3.1.2 *MSP packet type (MP).* This field shall be set to 0.

5.2.7.3.1.3 *MSP channel number (M/CH).* The field shall be set to the channel number derived from the SSE control data.

5.2.7.3.1.4 *Fill field (FILL1:0 or 6).* The fill length shall be 6 bits for a downlink SLM frame. Otherwise the fill length shall be 0.

5.2.7.3.1.5 *User data (UD).* The user data field shall contain message data received from the Mode S specific services interface (5.2.3.2.2).

5.2.7.3.2 *Long form MSP packet.* The format for this packet shall be as follows:

DP:1	MP:1	SP:2	L:1	M/SN:3	FILL2:0 or 2	M/CH:6	UD:v

Fields shown in the packet format and not specified in the following paragraphs shall be set as specified in 5.2.5.2.1 and 5.2.7.3.1.

5.2.7.3.3 *Data packet type (DP).* This field shall be set to 0.

5.2.7.3.3.1 *MSP packet type (MP).* This field shall be set to 1.

5.2.7.3.3.2 *Supervisory packet (SP).* This field shall be set to 0.

5.2.7.3.3.3 *L field (L).* A value of 1 shall indicate that the packet is part of an L-bit sequence with more packets in the sequence to follow. A value of 0 shall indicate that the sequence ends with this packet.

5.2.7.3.3.4 *MSP sequence number field (M/SN).* This field shall be used to detect duplication in the delivery of L-bit sequences. The first packet in an L-bit sequence shall be assigned a sequence number of 0. Subsequent packets shall be numbered sequentially. A packet received with the same sequence number as the previously received packet shall be discarded.

5.2.7.4 *L-bit processing.* L-bit processing shall be performed only on the long form MSP packet and shall be performed as specified for M-bit processing (5.2.5.1.4.1) except as specified in the following paragraphs.

5.2.7.4.1 Upon receipt of a long form MSP packet, the XDLP shall construct the user data field by:

a) verifying that the packet order is correct using the M/SN field (5.2.7.3.2);

b) assuming that the user data field in the MSP packet is the largest number of integral bytes that is contained within the frame;

c) associating each user data field in an MSP packet received with a previous user data field in an MSP packet that has an L-bit value of 1; and

Note.— Truncation of the user data field is not permitted as this is treated as an error condition.

d) if an error is detected in the processing of an MSP packet, the packet shall be discarded.

5.2.7.4.2 In the processing of an L-bit sequence, the XDLP shall discard any MSP packets that have duplicate M/SN values. The XDLP shall discard the entire L-bit sequence if a long form MSP packet is determined to be missing by use of the M/SN field.

5.2.7.4.3 The packets associated with any L-bit sequence whose reassembly is not completed in *Tm* seconds (Tables 5-1 and 5-13) shall be discarded.

5.2.7.5 *BROADCAST FORMAT*

5.2.7.5.1 *Uplink Broadcast*. The format of the broadcast Comm-A shall be as follows: The 83-bit uplink broadcast shall be inserted in an uplink Comm-A frame. The MA field of the Comm-A frame shall contain the broadcast identifier specified in Table 5-23 in the first 8 bits, followed by the first 48 user data bits of the broadcast message. The last 27 user data bits of the broadcast message shall be placed in the 27 bits immediately following the UF field of the Comm-A frame.

5.2.7.5.2 *Downlink Broadcast.* The format of broadcast Comm-B shall be as follows: The 56-bit downlink broadcast message shall be inserted in the MB field of the broadcast Comm-B. The MB field shall contain the broadcast identifier specified in Table 5-23 in the first 8 bits, followed by the 48 user data bits.

5.2.8 Mode S subnetwork management

5.2.8.1 INTERROGATOR LINK DETERMINATION FUNCTION

Note.— The ADLP interrogator link determination function selects the II code of the Mode S interrogator through which a Mode S subnetwork packet may be routed to the desired destination ground DTE.

5.2.8.1.1 *II code-DTE address correlation.* The ADLP shall construct and manage a Mode S interrogator-data terminal equipment (DTE) cross-reference table whose entries are Mode S interrogator identifier (II) codes and ground DTE addresses associated with the ground ATN routers or other ground DTEs. Each entry of the II code-DTE cross-reference table shall consist of the 4-bit Mode S II code and the 8-bit binary representation of the ground DTE.

Note 1.— Due to the requirement for non-ambiguous addresses, a DTE address also uniquely identifies a GDLP.

Note 2.— An ATN router may have more than one ground DTE address.

5.2.8.1.2 *Protocol.* The following procedures shall be used:

a) when the GDLP initially detects the presence of an aircraft, or detects contact with a currently acquired aircraft through an interrogator with a new II code, the appropriate fields of the DATA LINK CAPABILITY report shall be examined to determine if, and to what level, the aircraft has the capability to participate in a data exchange. After positive determination of data link capability, the GDLP shall uplink one or more Mode S ROUTE packets as specified in 5.2.5.3.3. This information shall relate the Mode S II code with the ground DTE addresses accessible through that interrogator. The ADLP shall update the II code-DTE cross-reference table and then discard the Mode S ROUTE packet(s);

b) a II code-DTE cross-reference table entry shall be deleted when commanded by a Mode S ROUTE packet or when the ADLP recognizes that the transponder has not been selectively interrogated by a Mode S interrogator with a given II code for *Ts* seconds by monitoring the IIS subfield in Mode S surveillance or Comm-A interrogations (Table 5-1);

c) when the GDLP determines that modification is required to the Mode S interrogator assignment, it shall transfer one or more Mode S ROUTE packets to the ADLP. The update information contained in the Mode S ROUTE packet shall be used by the ADLP to modify its cross-reference table. Additions shall be processed before deletions;

d) when the GDLP sends the initial ROUTE packet after acquisition of a Mode S data link-equipped aircraft, the IN bit shall be set to ONE. This value shall cause the ADLP to perform the procedures as specified in 5.2.6.3.3.3. Otherwise, the IN bit shall be set to ZERO;

e) when the ADLP is initialized (e.g. after a power-up procedure), the ADLP shall issue a search request by sending a broadcast Comm-B message with broadcast identifier equal to 255 (FF_{16}, as specified in Table 5-23) and the remaining 6 bytes unused. On receipt of a search request, a GDLP shall respond with one or more Mode S ROUTE packets, clear all SVCs associated with the ADLP, as specified in 5.2.6.3.3, and discard the search request. This shall cause the ADLP to initialize the II code-DTE cross-reference table; and

f) on receipt of an update request (Table 5-23), a GDLP shall respond with one or more Mode S ROUTE packets and discard the update request. This shall cause the ADLP to update the II code-DTE cross-reference table.

Note.— The update request may be used by the ADLP under exceptional circumstances (e.g. changeover to standby unit) to verify the contents of its II code-DTE cross-reference table.

5.2.8.1.3 *PROCEDURES FOR DOWNLINKING MODE S PACKETS*

5.2.8.1.3.1 When the ADLP has a packet to downlink, the following procedures shall apply:

a) *CALL REQUEST packet.* If the packet to be transferred is a Mode S CALL REQUEST, the ground DTE address field shall be examined and shall be associated with a connected Mode S interrogator using the II code-DTE cross-reference table. The packet shall be downlinked using the multisite-directed protocol. A request to transfer a packet to a DTE address not in the cross-reference table shall result in the action specified in 5.2.6.3.3.1.

b) *Other SVC packets.* For an SVC, a request to send a packet to a ground DTE shall cause the packet to be multisite-directed to the last Mode S interrogator used to successfully transfer (uplink or downlink) a packet to that DTE, provided that this Mode S interrogator is currently in the II code-DTE cross-reference table. Otherwise, an SVC packet shall be downlinked using the multisite-directed protocol to any other Mode S interrogator associated with the specified ground DTE address.

Level 5 transponders shall be permitted to use additional interrogators for downlink transfer as indicated in the II code-DTE cross-reference table.

5.2.8.1.3.2 A downlink frame transfer shall be defined to be successful if its Comm-B or ELM close-out is received from the transponder within *Tz* seconds as specified in Table 5-1. If the attempt is not successful and an SVC packet is to be sent, the II code-DTE cross-reference table shall be examined for another entry with the same called ground DTE address and a different Mode S II code. The procedure shall be retried using the multisite-directed protocol with the new Mode S interrogator. If there are no entries for the required called DTE, or all entries result in a failed attempt, a link failure shall be declared (5.2.8.3.1).

5.2.8.2 SUPPORT FOR THE DTE(S)

5.2.8.2.1 *GDLP connectivity reporting.* The GDLP shall notify the ground DTE(s) of the availability of a Mode S data link-equipped aircraft ("join event"). The GDLP shall also inform the ground DTEs when such an aircraft is no longer in contact via that GDLP ("leave event"). The GDLP shall provide for notification (on request) of all Mode S data link-equipped aircraft currently in contact with that GDLP. The notifications shall provide the ground ATN router with the subnetwork point of attachment (SNPA) address of the mobile ATN router, with the position of the aircraft and quality of service as optional parameters. The SNPA of the mobile ATN router shall be the DTE address formed by the aircraft address and a sub-address of 0 (5.2.3.1.3.2).

5.2.8.2.2 *ADLP connectivity reporting.* The ADLP shall notify all aircraft DTEs whenever the last remaining entry for a ground DTE is deleted from the II code-DTE cross-reference table (5.2.8.1.1). This notification shall include the address of this DTE.

5.2.8.2.3 *Communications requirements.* The mechanism for communication of changes in subnetwork connectivity shall be a confirmed service, such as the join/leave events that allow notification of the connectivity status.

5.2.8.3 ERROR PROCEDURES

5.2.8.3.1 *Link failure.* The failure to deliver a packet to the referenced XDLP after an attempt has been made to deliver this packet via all available interrogators shall be declared to be a link level failure. For an SVC, the XDCE shall enter the state *p*1, and release all resources associated with that channel. This shall include the cancellation in the transponder of any frames associated with this SVC. A Mode S CLEAR REQUEST packet shall be sent to the DCE via the reformatting process and shall be forwarded by the DCE as an ISO 8208 packet to the local DTE as described in 5.2.6.3.3. On the aircraft side, the channel shall not be returned to the ADCE channel pool, i.e. does not return to the state *p*1, until *Tr* seconds after the link failure has been declared (Table 5-1).

5.2.8.3.2 *ACTIVE CHANNEL DETERMINATION*

5.2.8.3.2.1 *Procedure for d1 state.* The XDLP shall monitor the activity of all SVCs, not in a READY state (*p*1). If an SVC is in the (XDCE) FLOW CONTROL READY state (*d*1) for more than *Tx* seconds (the active channel timer, Tables 5-1 and 5-13) without sending a Mode S RR, RNR, DATA, or REJECT packet, then:

a) if the last packet sent was a Mode S REJECT packet to which a response has not been received, then the XDLP shall resend that packet;

b) otherwise, the XDLP shall send a Mode S RR or RNR packet as appropriate to the peer XDLP.

5.2.8.3.2.2 *Procedure for other states.* If an XDCE SVC is in the *p*2, *p*3, *p*6, *p*7, *d*2 or *d*3 state for more than *Tx* seconds, the link failure procedure of 5.2.8.3.1 shall be performed.

5.2.8.3.2.3 Link failure shall be declared if either a failure to deliver, or a failure to receive, keep-alive packets has occurred. In which case the channel shall be cleared.

5.2.9 The data link capability report format

5.2.9.1 This report shall be transferred using the ground-initiated Comm-B protocol, as specified in 3.1.2.6.10.2 of Annex 10, Volume IV.

5.2.9.2 *Format.* The format of the MB field shall be as follows:

Bit	*Content*
1-8	BDS = 10_{16}
9	Continuation flag 0 = No continuation 1 = Continues in the next register

10-15 Unassigned

16 Reserved for ACAS

17-23 Mode S Subnetwork Version No.
- 0 = Mode S subnetwork not available
- 1 = Version No. 1 (1996)
- 2 = Version No. 2 (1998)
- 3 = Version No. 3 (2002)
- 4-127 = Unassigned

24 Transponder level (2.1.5 of Annex 10, Volume IV)
- 0 = Level 2-4
- 1 = Level 5

25 Mode S specific services capability
- 0 = Not available
- 1 = Available

26-28 Uplink ELM Average Throughput Capability
- 0 = No UELM Capability
- 1 = 16 UELM segments in 1 second
- 2 = 16 UELM segments in 500 ms
- 3 = 16 UELM segments in 250 ms
- 4 = 16 UELM segments in 125 ms
- 5 = 16 UELM segments in 60 ms
- 6 = 16 UELM segments in 30 ms
- 7 = Unassigned

29-32 Downlink ELM: Throughput Capability of downlink ELM containing the maximum number of ELM segments that the transponder can deliver in response to a single requesting interrogation (UF = 24).
- 0 = No DELM capability
- 1 = One 4-segment DELM every second
- 2 = One 8-segment DELM every second
- 3 = One 16-segment DELM every second
- 4 = One 16-segment DELM every 500 ms
- 5 = One 16-segment DELM every 250 ms
- 6 = One 16-segment DELM every 125 ms
- 7-15 = Unassigned

33 Aircraft Identification Capability (Table 5-24)
- 0 = No aircraft identification capability
- 1 = Aircraft identification capability

34 Squitter capability subfield

35 Surveillance identifier capability

36 Common usage GICB capability report

37-40 Reserved for ACAS

41-56 Bit array indicating the support status of DTE sub-address 0 to 15
- Bit value 0 = DTE not supported
- Bit value 1 = DTE supported

Note.— The Mode S transponder may update bits 1-8, 16 and 37-40 independent of the ADLP. Bits 1-8 are provided by the transponder when the data link capability report is broadcast as a result of a transponder-detected change in capability reported by the ADLP (3.1.2 of Annex 10, Volume IV).

5.2.9.3 *Protocol.* In all cases, the first bit shall be the high order bit and shall be the first bit transmitted. ADLP frame processing shall generate the data link capability report at least once per second and transfer it to the transponder at least once every second.

5.2.10 System timers

5.2.10.1 The values for timers shall conform to the values given in Tables 5-1 and 5-13.

5.2.10.2 Tolerance for all timers shall be plus or minus one percent.

5.2.10.3 Resolution for all timers shall be one second.

5.2.11 System requirements

5.2.11.1 *Data integrity.* The maximum bit error rates for data presented at the ADLP/transponder interface or the GDLP/interrogator interface measured at the local DTE/XDLP interface (and vice versa) shall not exceed 10^{-9} for undetected errors and 10^{-7} for detected errors.

Note.— The maximum error rate includes all errors resulting from data transfers across the interfaces and from XDLP internal operation.

5.2.11.2 TIMING

5.2.11.2.1 *ADLP timing.* ADLP operations shall not take longer than 0.25 seconds for regular traffic and 0.125 seconds for interrupt traffic. This interval shall be defined as follows:

a) *Transponders with downlink ELM capability.* The time that the final bit of a 128-byte data packet is presented to the DCE for downlink transfer to the time that the final bit of the first encapsulating frame is available for delivery to the transponder.

b) *Transponders with Comm-B capability.* The time that the final bit of a user data field of 24 bytes is presented to the DCE for downlink transfer to the time that the final bit of the last of the four Comm-B segments that forms the frame encapsulating the user data is available for delivery to the transponder.

c) *Transponders with uplink ELM capability.* The time that the final bit of the last segment of an ELM of 14 Comm-C segments that contains a user data field of 128 bytes is received by the ADLP to the time that the final bit of the corresponding packet is available for delivery to the DTE.

d) *Transponders with Comm-A capability.* The time that the final bit of the last segment of four linked Comm-A segments that contains a user data field of 25 bytes is received by the ADLP to the time that the final bit of the corresponding packet is available for delivery to the DTE.

5.2.11.2.2 *GDLP TIMING*

Recommendation.— *The total time delay across the GDLP, exclusive of transmission delay, should not be greater than 0.125 seconds.*

5.2.11.3 *Interface rate.* The physical interface between the ADLP and the transponder shall have a minimum bit rate of 100 kilobits per second.

5.3 DCE AND XDCE STATE TABLES

5.3.1 *State table requirements.* The DCE and XDCE shall function as specified in state Tables 5-3 to 5-22. State Tables 5-15 through 5-22 shall be applied to:

a) ADLP state transitions when the XDCE or XDLP terms in parenthesis are omitted; and

b) GDLP state transitions when the terms in parenthesis are used and the XDCE or XDLP preceding them are omitted.

5.3.2 *Diagnostic and cause codes.* The table entries for certain conditions indicate a diagnostic code that shall be included in the packet generated when entering the state indicated. The term, "*D =* ," shall define the diagnostic code. When "*A = DIAG,*" the action taken shall be to generate an ISO 8208 DIAGNOSTIC packet and transfer it to the DTE; the diagnostic code indicated shall define the entry in the diagnostic field of the packet. The cause field shall be set as specified in 5.2.6.3.3. The reset cause field shall be set as specified in ISO 8208.

Note 1.— The tables provided below specify state requirements in the following order:

5-3 DCE special cases

5-4 DTE effect on DCE restart states

5-5 DTE effect on DCE call setup and clearing states

5-6 DTE effect on DCE reset states

5-7 DTE effect on DCE interrupt transfer states

5-8 DTE effect on DCE flow control transfer states

5-9 XDCE effect on DCE restart states

5-10 XDCE effect on DCE call setup and clearing states

5-11 XDCE effect on DCE reset states

5-12 XDCE effect on DCE interrupt transfer states

5-15 GDLP (ADLP) effect on ADCE (GDCE) packet layer ready states

5-16 GDLP (ADLP) effect on ADCE (GDCE) call setup and clearing states

5-17 GDLP (ADLP) effect on ADCE (GDCE) reset states

5-18 GDLP (ADLP) effect on ADCE (GDCE) interrupt transfer states

5-19 GDLP (ADLP) effect on ADCE (GDCE) flow control transfer states

5-20 DCE effect on ADCE (GDCE) call setup and clearing states

5-21 DCE effect on ADCE (GDCE) reset states

5-22 DCE effect on ADCE (GDCE) interrupt transfer states

Note 2.— All tables specify both ADLP and GDLP actions.

Note 3.— Within the Mode S subnetwork, states p6 *and* d2 *are transient states.*

Note 4.— References to "notes" in the state tables refer to table-specific notes that follow each state table.

Note 5.— All diagnostic and cause codes are interpreted as decimal numbers.

Note 6.— An SVC between an ADCE and a GDCE may be identified by a temporary and/or permanent channel number, as defined in 5.2.5.1.2.

5.4 MODE S PACKET FORMATS

5.4.1 *Formats.* The Mode S packet formats shall be as specified in Figures 5-3 to 5-22.

5.4.2 *Significance of control fields.* The structure of the format control fields used in Mode S packets shall be as specified in Figure 5-23. The significance of all control fields used in these packet formats shall be as follows:

Field symbol	*Definition*
AG	Address, Ground; the 8-bit binary representation of the ground DTE address (5.2.3.1.3.1)
AM	Address, Mobile; the 4-bit binary representation of the last two BCD digits of the mobile DTE address (5.2.3.1.3.2)
CC	Clearing cause as defined in ISO 8208
CH	Channel number (1 to 15)
DC	Diagnostic code as defined in ISO 8208
DP	Data packet type (Figure 5-23)
F	S-bit sequence, first packet flag
FILL	Fill field
FILL1	Has a length of 6 bits for a non-multiplexed packet in a downlink SLM frame; otherwise it is 0 bit
FILL2	Has a length of 0 bit for a non-multiplexed packet in a downlink SLM frame and for a multiplexing header; otherwise it is 2 bits
FIRST PACKET	The contents of the first of the multiplexed packets
FS	Fast select present
IN	Initialization bit
L	“More bit” for long-form MSP packets as specified in 5.2.7.4
LAST PACKET	The contents of the last of the multiplexed packets
LENGTH	The length of a multiplexed packet in bytes expressed as an unsigned binary number
LV	User data field length; number of user bytes as specified in 5.2.2.3.1
M	“More bit” for SVC DATA packets as specified in 5.2.5.1.4.1
M/CH	MSP channel number
MP	MSP packet type (Figure 5-23)
M/SN	Sequence number; the sequence number for the long form MSP packet
OD	Optional data
ODL	Optional data length
OF	Option flag
P	Priority field
PR	Packet receive sequence number
PS	Packet send sequence number
RC	Resetting cause code as defined in ISO 8208
RT	Route table as defined in 5.2.5.3.3.8
RTL	Route table length expressed in bytes
S	“More bit” for CALL REQUEST, CALL ACCEPT, CLEAR REQUEST and INTERRUPT packets as specified in 5.2.5.1.4.2
SN	Sequence number; the sequence number for this packet type
SP	Supervisory packet (Figure 5-23)
SS	Supervisory subset number (Figure 5-23)
ST	Supervisory type (Figure 5-23)
TC	Temporary channel number (1 to 3)
UD	User data field

TABLES FOR CHAPTER 5

Table 5-1. ADLP Mode S subnetwork timers

Timer name	*Timer label*	*Nominal value*	*Reference*
Channel retirement	*Tr*	600 s	5.2.8.3.1
Active channel-ADLP	*Tx*	420 s	5.2.8.3.2
Interrogator interrogation	*Ts*	60 s	5.2.8.1.2
Interrogator link	*Tz*	30 s	5.2.7.1.1.4.2, 5.2.8.1.3.2
Link frame cancellation	*Tc*	60 s	5.2.2.1.1.4.5
L-bit delivery-ADLP	*Tm*	120 s	5.2.7.4.3
Packet resequencing and S-bit delivery	*Tq*	60 s	5.2.6.9

Table 5-2. DCE actions at state transition

DCE state	*State definition*	*Action that shall be taken when entering the state*
*r*1	PACKET LEVEL READY	Return all SVCs to the *p*1 state (see *p*1 state explanation).
*r*2	DTE RESTART REQUEST	Return each SVC to the *p*1 state (see *p*1 state explanation). Issue a RESTART CONFIRMATION to the DTE.
*r*3	DCE RESTART REQUEST	Issue a RESTART REQUEST to the DTE. Unless entered via the *r*2 state, send a RESTART REQUEST to the reformatting process.
*p*1	READY	Release all resources assigned to SVC. Break the correspondence between the DTE/DCE SVC and the ADCE/GDCE SVC (the ADCE/GDCE SVC may not yet be in the *p*1 state).
*p*2	DTE CALL REQUEST	Determine if sufficient resources exist to support request; if so, allocate resources and forward CALL REQUEST packet to reformatting process; if not, enter DCE CLEAR REQUEST to DTE state (*p*7). Determination of resources and allocation is as defined in ISO 8208.
*p*3	DCE CALL REQUEST	Determine if sufficient resources exist to support request; if so allocate resources and forward CALL REQUEST packet to DTE; if not, send a CLEAR REQUEST packet to the reformatting process. Determination of resources and allocation is as defined in ISO 8208.
*p*4	DATA TRANSFER	No action.
*p*5	CALL COLLISION	Reassign outgoing call to another SVC (the DTE in its call collision state ignores the incoming call) and enter the DCE CALL REQUEST state (*p*3) for that new SVC. Enter the *p*2 state to process the CALL REQUEST from the DTE.
*p*6	DTE CLEAR REQUEST	Release all resources assigned to SVC, send a CLEAR CONFIRMATION packet to the DTE and enter *p*1 state.
*p*7	DCE CLEAR REQUEST to DTE	Forward CLEAR REQUEST packet to DTE.
*d*1	FLOW CONTROL READY	No action.
*d*2	DTE RESET REQUEST	Remove DATA packets transmitted to DTE from window; discard any DATA packets that represent partially transmitted M-bit sequences and discard any INTERRUPT packet awaiting transfer to the DTE; reset all window counters to 0; set any timers and retransmission parameters relating to DATA and INTERRUPT transfer to their initial value. Send RESET CONFIRMATION packet to DTE. Return SVC to *d*1 state.

DCE state	*State definition*	*Action that shall be taken when entering the state*
*d*3	DCE RESET REQUEST to DTE	Remove DATA packets transmitted to DTE from window; discard any DATA packets that represent partially transmitted M-bit sequences and discard any INTERRUPT packet awaiting transfer to the DTE; reset all window counters to 0; set any timers and retransmission parameters relating to DATA and INTERRUPT transfer to their initial value. Forward RESET REQUEST packet to DTE.
*i*1	DTE INTERRUPT READY	No action.
*i*2	DTE INTERRUPT SENT	Forward INTERRUPT packet received from DTE to reformatting process.
*j*1	DCE INTERRUPT READY	No action.
*j*2	DCE INTERRUPT SENT	Forward INTERRUPT packet received from reformatting process to DTE.
*f*1	DCE RECEIVE READY	No action.
*f*2	DCE RECEIVE NOT READY	No action.
*g*1	DTE RECEIVE READY	No action.
*g*2	DTE RECEIVE NOT READY	No action.

Table 5-3. DCE special cases

Received from DTE	*DCE special cases* *Any state*
Any packet less than 2 bytes in length (including a valid data link level frame containing no packet)	A=DIAG *D*=38
Any packet with an invalid general format identifier	A=DIAG *D*=40
Any packet with a valid general format identifier and an assigned logical channel identifier (includes a logical channel identifier of 0)	See Table 5-4

Table 5-4. DTE effect on DCE restart states

Packet received from DTE	DCE restart states (see Note 5) PACKET LEVEL READY (see Note 1) *r*1	DTE RESTART REQUEST *r*2	DCE RESTART REQUEST *r*3
Packets having a packet type identifier shorter than 1 byte and logical channel identifier not equal to 0	See Table 5-5	*A=ERROR* *S=r*3 *D*=38 (see Note 4)	*A=DISCARD*
Any packet, except RESTART, REGISTRATION (if supported) with a logical channel identifier of 0	*A=DIAG* *D*=36	*A=DIAG* *D*=36	*A=DIAG* *D*=36
Packet with a packet type identifier which is undefined or not supported by DCE	See Table 5-5	*A=ERROR* *S=r*3 *D*=33 (see Note 4)	*A=DISCARD*
RESTART REQUEST, RESTART CONFIRMATION, or REGISTRATION (if supported) packet with a logical channel identifier unequal to 0	See Table 5-5	*A=ERROR* *S=r*3 *D*=41 (see Note 4)	*A=DISCARD*
RESTART REQUEST	*A=NORMAL* (forward) *S=r*2	*A=DISCARD*	*A=NORMAL* *S=p*1 or *d*1 (see Note 2)
RESTART CONFIRMATION	*A=ERROR* *S=r*3 *D*=17 (see Note 6)	*A=ERROR* *S=r*3 *D*=18 (see Note 4)	*A=NORMAL* *S=p*1 or *d*1 (see Note 2)
RESTART REQUEST OR RESTART CONFIRMATION packet with a format error	*A=DIAG* *D*=38, 39, 81 or 82	*A=DISCARD*	*A=ERROR* *D*=38, 39, 81 or 82
REGISTRATION REQUEST or REGISTRATION CONFIRMATION packets (see Note 3)	*A=NORMAL*	*A=NORMAL*	*A=NORMAL*
REGISTRATION REQUEST or REGISTRATION CONFIRMATION packet with a format error (see Note 3)	*A=DIAG* *D*=38, 39, 81 or 82	*A=ERROR* *S=r*3 *D*=38, 39, 81 or 82 (see Note 4)	*A=ERROR* *D*=38, 39, 81 or 82
Call setup, call clearing, DATA, interrupt, flow control, or reset packet	See Table 5-5	*A=ERROR* *S*=r3 *D*=18	*A=DISCARD*

NOTES:

1. The Mode S subnetwork has no restart states. Receipt of a RESTART REQUEST causes the DCE to respond with a RESTART CONFIRMATION. The RESTART REQUEST packet is forwarded to the reformatting process, which issues clear requests for all SVCs associated with the DTE. The DCE enters the *r*3 state only as a result of an error detected on the DTE/DCE interface.
2. The SVC channels are returned to state *p*1, the permanent virtual circuits (PVC) channels are returned to state *d*1.
3. The use of the registration facility is optional on the DTE/DCE interface.
4. No action is taken within the Mode S subnetwork.
5. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared for the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
6. The error procedure consists of entering the *r*3 state, and sending a RESTART REQUEST to the reformatting process.

Table 5-5. DTE effect on DCE call setup and clearing states

Packet received from DTE	READY $p1$	DTE CALL REQUEST $p2$	DCE CALL REQUEST $p3$	DATA TRANSFER $p4$	CALL COLLISION $p5$ (see Notes 1 and 4)	DTE CLEAR REQUEST $p6$	DCE CLEAR REQUEST to DTE $p7$
	DCE call setup and clearing states (see Note 5)						
Packets having a packet type identifier shorter than 1 byte	*A=ERROR* *S=p*7 *D*=38	*A=ERROR* *S=p*7 *D*=38 (see Note 2)	*A=ERROR* *S=p*7 *D*=38 (see Note 2)	See Table 5-6	*A=ERROR* *S=p*7 *D*=38 (see Note 2)	*A=ERROR* *S=p*7 *D*=38 (see Note 2)	*A=DISCARD*
Packets having a packet type identifier which is undefined or not supported by DCE	*A=ERROR* *S=p*7 *D*=33	*A=ERROR* *S=p*7 *D*=33 (see Note 2)	*A=ERROR* *S=p*7 *D*=33 (see Note 2)	See Table 5-6	*A=ERROR* *S=p*7 *D*=33 (see Note 2)	*A=ERROR* *S=p*7 *D*=33 (see Note 2)	*A=DISCARD*
RESTART REQUEST, RESTART CONFIRMATION or REGISTRATION packet with logical channel identifier unequal to 0	*A=ERROR* *S=p*7 *D*=41	*A=ERROR* *S=p*7 *D*=41 (see Note 2)	*A=ERROR* *S=p*7 *D*=41 (see Note 2)	See Table 5-6	*A=ERROR* *S=p*7 *D*=41 (see Note 2)	*A=ERROR* *S=p*7 *D*=41 (see Note 2)	*A=DISCARD*
CALL REQUEST	*A=NORMAL* *S=p*2 (forward)	*A=ERROR* *S=p*7 *D*=21 (see Note 2)	*A=NORMAL* *S=p*5	*A=ERROR* *S=p*7 *D*=23 (see Note 2)	*A=ERROR* *S=p*7 *D*=24 (see Note 2)	*A=ERROR* *S=p*7 *D*=25 (see Note 2)	*A=DISCARD*
CALL ACCEPT	*A=ERROR* *S=p*7 *D*=20	*A=ERROR* *S=p*7 *D*=21 (see Note 2)	*A=NORMAL* *S=p*4 (Forward) or *A=ERROR* *S=p*7 *D*=42 (see Notes 2 and 3)	*A=ERROR* *S=p*7 *D*=23 (see Note 2)	*A=ERROR* *S=p*7 *D*=24 (see Notes 2 and 4)	*A=ERROR* *S=p*7 *D*=25 (see Note 2)	*A=DISCARD*
CLEAR REQUEST	*A=NORMAL* *S=p*6	*A=NORMAL* *S=p*6 (forward)	*A=NORMAL* *S=p*6 (forward)	*A=NORMAL* *S=p*6 (forward)	*A=NORMAL* *S=p*6 (forward)	*A=DISCARD*	*A=NORMAL* *S=p*1 (do not forward)
CLEAR CONFIRMATION	*A=ERROR* *S=p*7 *D*=20	*A=ERROR* *S=p*7 *D*=21 (see Note 2)	*A=ERROR* *S=p*7 *D*=22 (see Note 2)	*A=ERROR* *S=p*7 *D*=23 (see Note 2)	*A=ERROR* *S=p*7 *D*=24 (see Note 2)	*A=ERROR* *S=p*7 *D*=25 (see Note 2)	*A=NORMAL* *S=p*1 (do not forward)
DATA, interrupt, flow control or reset packets	*A=ERROR* *S=p*7 *D*=20	*A=ERROR* *S=p*7 *D*=21 (see Note 2)	*A=ERROR* *S=p*7 *D*=22 (see Note 2)	See Table 5-6	*A=ERROR* *S=p*7 *D*=24 (see Note 2)	*A=ERROR* *S=p*7 *D*=25 (see Note 2)	*A=DISCARD*

NOTES:

1. On entering the *p*5 state, the DCE reassigns the outgoing call to the DTE to another channel (no CLEAR REQUEST is issued) and responds to incoming DTE call as appropriate with a CLEAR REQUEST or CALL ACCEPT packet.
2. The error procedure consists of performing the actions specified when entering the *p*7 state (including sending a CLEAR REQUEST packet to the DTE) and additionally sending a CLEAR REQUEST packet to the XDCE (via the reformatting process).
3. The use of the fast select facility with a restriction on the response prohibits the DTE from sending a CALL ACCEPT packet.
4. The DTE in the event of a call collision must discard the CALL REQUEST packet received from the DCE.
5. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.

Table 5-6. DTE effect on DCE reset states

	DCE reset states (see Note 2)		
Packet received from DTE	FLOW CONTROL READY *d*1	RESET REQUEST by DTE *d*2	DCE RESET REQUEST to DTE *d*3
Packet with a packet type identifier shorter than 1 byte	*A=ERROR* *S=d*3 *D*=38 (see Note 1)	*A=ERROR* *S=d*3 *D*=38 (see Note 1)	*A=DISCARD*
Packet with a packet type identifier which is undefined or not supported by DCE	*A=ERROR* *S=d*3 *D*=33 (see Note 1)	*A=ERROR* *S=d*3 *D*=33 (see Note 1)	*A=DISCARD*
RESTART REQUEST, RESTART CONFIRMATION, or REGISTRATION (if supported) packet with logical channel identifier unequal to 0	*A=ERROR* *S=d*3 *D*=41 (see Note 1)	*A=ERROR* *S=d*3 *D*=41 (see Note 1)	*A=DISCARD*
RESET REQUEST	*A=NORMAL* *S=d*2 (forward)	*A=DISCARD*	*A=NORMAL* *S=d*1 (do not forward)
RESET CONFIRMATION	*A=ERROR* *S=d*3 *D*=27 (see Note 1)	*A=ERROR* *S=d*3 *D*=28 (see Note 1)	*A=NORMAL* *S=d*1 (do not forward)
INTERRUPT packet	See Table 5-7	*A=ERROR* *S=d*3 *D*=28 (see Note 1)	*A=DISCARD*
INTERRUPT CONFIRMATION packet	See Table 5-7	*A=ERROR* *S=d*3 *D*=28 (see Note 1)	*A=DISCARD*
DATA or flow control packet	See Table 5-8	*A=ERROR* *S=d*3 *D*=28 (see Note 1)	*A=DISCARD*
REJECT supported but not subscribed to	*A=ERROR* *S=d*3 *D*=37 (see Note 1)	*A=ERROR* *S=d*3 *D*=37 (see Note 1)	*A=DISCARD*

NOTES:

1. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the DTE) and sending a RESET REQUEST packet to the XDCE (via the formatting function).
2. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared for the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.

Table 5-7. DTE effect on DCE interrupt transfer states

Packet received from DTE	DTE/DCE interrupt transfer states (see Note 2) DTE INTERRUPT READY *i*1	DTE/DCE interrupt transfer states (see Note 2) DTE INTERRUPT SENT *i*2
INTERRUPT (see Note 1)	*A=NORMAL* *S=i*2 (forward)	*A=ERROR* *S=d*3 *D*=44 (see Note 3)
Packet received from DTE	**DCE INTERRUPT READY *j*1**	**DCE INTERRUPT SENT *j*2**
INTERRUPT CONFIRMATION (see Note 1)	*A=ERROR* *S=d*3 *D*=43 (see Note 3)	*A=NORMAL* *S=j*1 (forward)

NOTES:

1. If the packet has a format error, then the error procedure applies (see Note 3). Interrupt packets with user data greater than 32 bytes should be treated as a format error.
2. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
3. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the DTE) and sending a RESET REQUEST packet to the XDCE (via the reformatting process).

Table 5-8. DTE effect on DCE flow control transfer states

Packet received from DTE	DCE flow control transfer states (see Notes 2 and 3) DCE RECEIVE READY *f*1	DCE flow control transfer states (see Notes 2 and 3) DCE RECEIVE NOT READY *f*2
DATA packet with less than 4 bytes when using modulo 128 numbering	*A=ERROR* *S=d*3 *D*=38 (see Note 4)	*A=DISCARD*
DATA packet with invalid PR	*A=ERROR* *S=d*3 *D*=2 (see Note 4)	*A=ERROR* *S=d*3 *D*=2 (see Note 4)
DATA packet with valid PR but invalid PS or user data field with improper format	*A=ERROR* *S=d*3 *D*=1 (invalid PS) *D*=39 (UD > max negotiated length) *D*=82 (UD unaligned) (see Note 4)	*A=DISCARD* (process PR data)
DATA packet with valid PR with M-bit set to 1 when the user data field is partially full	*A=ERROR* *S=d*3 *D*=165 (see Note 4)	*A=DISCARD* (process PR data)
DATA packet with valid PR, PS and user data field format	*A=NORMAL* (forward)	*A=DISCARD* (process PR data)
Packet received from DTE	**DCE flow control transfer states (see Notes 2 and 3) DTE RECEIVE READY *g*1**	**DCE flow control transfer states (see Notes 2 and 3) DTE RECEIVE NOT READY *g*2**
RR, RNR, or REJECT packet with less than 3 bytes when using modulo 128 numbering (see Note 1)	*A=DISCARD*	*A=DISCARD*
RR, RNR, or REJECT packet with an invalid PR	*A=ERROR* *S=d*3 *D*=2 (see Note 4)	*A=ERROR* *S=d*3 *D*=2 (see Note 4)
RR packet with a valid PR	*A=NORMAL*	*A=NORMAL* *S=g*1
RNR packet with a valid PR	*A=NORMAL* *S=g*2	*A=NORMAL*
REJECT packet with a valid PR	*A=NORMAL*	*A=NORMAL* *S=g*1

NOTES:

1. The reject procedures are not required.
2. The RR, RNR and REJECT procedures are a local DTE/DCE matter and the corresponding packets are not forwarded to the XDCE.
3. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
4. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the DTE) and sending a RESET REQUEST packet to the XDCE (via the reformatting process).

Table 5-9. XDCE effect on DCE restart states

Packet received from XDCE	DCE restart states (see Note) PACKET LEVEL READY *r*1	DTE RESTART REQUEST *r*2	DCE RESTART REQUEST *r*3
CALL REQUEST	See Table 5-10	Send CLEAR REQUEST to reformatting process with *D*=244	Send CLEAR REQUEST to reformatting process with *D*=244
CALL ACCEPT, CLEAR REQUEST, DATA, INTERRUPT, INTERRUPT CONFIRMATION, RESET REQUEST	See Table 5-10	*A=DISCARD*	*A=DISCARD*

Note.— Table entries are defined as follows: A = *action to be taken,* S = *the state to be entered,* D = *the diagnostic code to be used in packets generated as a result of this action,* DISCARD *indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.*

Table 5-10. XDCE effect on DCE call setup and clearing states

Packet received from XDCE	DCE call setup and clearing states (see Note) READY *p*1	DTE CALL REQUEST *p*2	DCE CALL REQUEST *p*3	DATA TRANSFER *p*4	CALL COLLISION *p*5	DTE CLEAR REQUEST *p*6	DCE CLEAR REQUEST to DTE *p*7
CALL REQUEST	*A=NORMAL* *S=p*3 (forward)	INVALID	INVALID	INVALID	INVALID	INVALID	INVALID
CALL ACCEPT	*A=DISCARD*	*A=NORMAL* *S=p*4 (forward)	INVALID	INVALID	INVALID	*A=DISCARD*	*A=DISCARD*
CLEAR REQUEST	*A=DISCARD*	*A=NORMAL* *S=p*7 (forward)	*A=NORMAL* *S=p*7 (forward)	*A=NORMAL* *S=p*7 (forward)	INVALID	*A=DISCARD*	*A=DISCARD*
DATA, INTERRUPT, INTERRUPT CONFIRMATION, or RESET REQUEST	*A=DISCARD*	INVALID	INVALID	See Table 5-11	INVALID	*A=DISCARD*	*A=DISCARD*

Note.— Table entries are defined as follows: A = *action to be taken,* S = *the state to be entered,* D = *the diagnostic code to be used in packets generated as a result of this action,* DISCARD *indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.*

Table 5-11. XDCE effect on DCE reset states

Packet received from XDCE	DCE reset states (see Note) FLOW CONTROL READY *d*1	DTE RESET REQUEST *d*2	DCE RESET REQUEST to DTE *d*3
RESET REQUEST	*A=NORMAL* *S=d*3 (forward)	*A=NORMAL* *S=d*1 (forward)	*A=DISCARD*
INTERRUPT	See Table 5-12	*A=DISCARD*	*A=DISCARD*
INTERRUPT CONFIRMATION	See Table 5-12	*A=DISCARD*	INVALID
DATA	*A=NORMAL* (forward)	*A=DISCARD*	*A=DISCARD*

Note.— Table entries are defined as follows: A = *action to be taken,* S = *the state to be entered,* D = *the diagnostic code to be used in packets generated as a result of this action,* DISCARD *indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.*

Table 5-12. XDCE effect on DCE interrupt transfer states

Packet received from XDCE	DCE interrupt transfer states (see Note) DTE INTERRUPT READY *i*1	 DTE INTERRUPT SENT *i*2
INTERRUPT CONFIRMATION	INVALID	*A=NORMAL* *S=i*1 (forward)
Packet received from XDCE	**DCE interrupt transfer states (see Note) DCE INTERRUPT READY *j*1**	** DCE INTERRUPT SENT *j*2**
INTERRUPT	*A=NORMAL* *S=j*2 (forward)	INVALID

Note.— Table entries are defined as follows: A = *action to be taken,* S = *the state to be entered,* D = *the diagnostic code to be used in packets generated as a result of this action,* DISCARD *indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.*

Table 5-13. GDLP Mode S subnetwork timers

Timer name	*Timer label*	*Nominal value*	*Reference*
Active channel-GDLP	*Tx*	300 s	5.2.8.3.2
L-bit delivery-GDLP	*Tm*	120 s	5.2.7.4.3
Packet resequencing and S-bit delivery	*Tq*	60 s	5.2.6.9

Table 5-14. XDCE actions at state transition

XDCE state	*State definition*	*Action that shall be taken when entering the state*
*r*1	PACKET LEVEL READY	Return all SVCs to the *p*1 state.
*p*1	READY	Release all resources assigned to the SVC. Break the correspondence between the ADCE/GDCE SVC and the DTE/DCE SVC (the DTE/DCE SVC may not yet be in a *p*1 state).
*p*2	GDLP(ADLP) CALL REQUEST	Determine if sufficient resources exist to support request; if so allocate resources and forward Mode S CALL REQUEST packet to reformatting process; if not, enter ADCE(GDCE) CLEAR REQUEST to GDLP(ADLP) state (*p*7).
*p*3	ADCE(GDCE) CALL REQUEST	Determine if sufficient resources exist to support request; if so, allocate resources and forward Mode S CALL REQUEST packet to frame processing; if not, send Mode S CLEAR REQUEST to reformatting process and go to state *p*1. Do not forward the Mode S CALL REQUEST to the peer XDCE.
*p*4	DATA TRANSFER	No action.
*p*6	GDLP(ADLP) CLEAR REQUEST	Release all resources, send a Mode S CLEAR CONFIRMATION packet to the peer XDCE and enter the *p*1 state.
*p*7	ADCE(GDCE) CLEAR REQUEST to GDLP(ADLP)	Forward Mode S CLEAR REQUEST packet to the peer XDCE via frame processing.
*d*1	FLOW CONTROL READY	No action.
*d*2	GDLP(ADLP) RESET REQUEST	Remove Mode S DATA packets transmitted to peer XDCE from window; discard any DATA packets that represent partially transmitted M-bit sequences and discard any Mode S INTERRUPT packets awaiting transfer to the peer XDCE; reset all flow control window counters to 0 (5.2.6.7.1). Send Mode S RESET CONFIRMATION packet to the peer XDCE. Return SVC to *d*1 state. Forward Mode S RESET REQUEST packet to reformatting process.
*d*3	ADCE(GDCE) RESET REQUEST to GDLP(ADLP)	Remove Mode S DATA packets transmitted to peer XDCE from window; discard any DATA packets that represent partially transmitted M-bit sequences and discard any Mode S INTERRUPT packets awaiting transfer to the peer XDCE; reset all flow control window counters to 0 (5.2.6.7.1). Forward Mode S RESET REQUEST packet to peer XDCE via frame processing.
*i*1	GDLP(ADLP) INTERRUPT READY	No action.
*i*2	GDLP(ADLP) INTERRUPT SENT	Forward Mode S INTERRUPT packet received from peer XDCE to the reformatting process.
*j*1	ADCE(GDCE) INTERRUPT READY	No action.
*j*2	ADCE(GDCE) INTERRUPT SENT	Forward Mode S INTERRUPT packet received from the reformatting process.
*f*1	ADCE(GDCE) RECEIVE READY	No action.
*f*2	ADCE(GDCE) RECEIVE NOT READY	No action.
*g*1	GDLP(ADLP) RECEIVE READY	No action.
*g*2	GDLP(ADLP) RECEIVE NOT READY	No action.

Table 5-15. GDLP (ADLP) effect on ADCE (GDCE) packet layer ready states

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) states (see Notes 1 and 3) PACKET LEVEL READY *r*1
CH=0 with no TC present (see Note 4) or CH=0 in a CALL ACCEPT by ADLP packet	*A=DISCARD*
Unassigned packet header	*A=DISCARD*
Call setup, call clearing, DATA, interrupt, flow control, or reset	See Table 5-16

NOTES:

1. The XDCE state is not necessarily the same state as the DTE/DCE interface.
2. All packets from the peer XDLP have been checked for duplication before evaluation as represented by this table.
3. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
4. Where CH=0 and a valid TC is present in a CLEAR REQUEST by ADLP or GDLP packet or a CLEAR CONFIRMATION by ADLP or GDLP packet, it is handled as described in 5.2.5.1.2.3 and Table 5-16.

Table 5-16. GDLP (ADLP) effect on ADCE (GDCE) call setup and clearing states

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) call setup and clearing States (See Notes 1, 7 and 8) READY *p*1	GDLP (ADLP) CALL REQUEST *p*2	ADCE (GDCE) CALL REQUEST *p*3	DATA TRANSFER *p*4	GDLP (ADLP) CLEAR REQUEST *p*6	ADCE (GDCE) CLEAR REQUEST to GDLP (ADLP) *p*7
Format error (see Note 3)	*A=ERROR* (see Note 10) *S=p*7 *D*=33 (see Note 9)	*A=ERROR* *S=p*7 *D*=33 (see Note 6)	*A=ERROR* *S=p*7 *D*=33 (see Notes 6 & 9)	See Table 5-17	*A=ERROR* *S=p*7 *D*=25 (see Note 6)	*A=DISCARD*
CALL REQUEST	*A=NORMAL* (5.2.6.3.1) *S=p*2 (forward request to DCE)	*A=ERROR* *S=p*7 *D*=21 (see Note 6)	Not applicable (see Note 4)	Not applicable (see Note 4)	*A=ERROR* *S=p*7 *D*=25 (see Note 6)	*A=DISCARD*
CALL ACCEPT	*A=ERROR* *S=p*7 *D*=20 (see Note 10)	*A=ERROR* *S=p*7 *D*=21 (see Note 6)	*A=NORMAL* (5.2.6.3.1) *S=p*4 (forward to DCE), or *A=ERROR* *S=p*7 *D*=42 (see Note 6)	*A=ERROR* *S=p*7 *D*=23 (see Note 6)	*A=ERROR* *S=p*7 *D*=25 (see Note 6)	*A=DISCARD*
CLEAR REQUEST	*A=NORMAL* (5.2.6.3.3) *S=p*6 (do not forward)	*A=NORMAL* (5.2.6.3.3) *S=p*6 (forward to DCE)	*A=NORMAL* (5.2.6.3.3) *S=p*6 (forward to DCE)	*A=NORMAL* (5.2.6.3.3) *S=p*6 (forward to DCE)	*A=DISCARD*	*A=NORMAL* (5.2.6.3.3) *S=p*1 (do not forward)
CLEAR CONFIRMATION	*A=ERROR* *S=p*7 *D*=20 (see Note 10)	*A=ERROR* *S=p*7 *D*=21 (see Note 6)	*A=ERROR* *S=p*7 *D*=22 (see Note 6)	*A=ERROR* *S=p*7 *D*=23 (see Note 6)	*A=ERROR* *S=p*7 *D*=25 (see Note 6)	*A=NORMAL* (5.2.6.3.3) *S=p*1 (do not forward)
DATA, interrupt, flow control or reset packets	*A=ERROR* *S=p*7 *D*=20 (see Note 10)	*A=ERROR* *S=p*7 *D*=21 (see Notes 6 & 9)	*A=ERROR* *S=p*7 *D*=22 (see Notes 5 & 6)	See Table 5-17	*A=ERROR* *S=p*7 *D*=25 (see Note 6)	*A=DISCARD*

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. All packets from the peer XDLP have been checked for duplication before evaluation as represented by this table.
3. A format error may result from an S-bit sequence having a first or intermediate packet shorter than the maximum length, or else from an invalid LV field in a CALL REQUEST, CALL ACCEPT, CLEAR REQUEST or INTERRUPT packet. There are no other detectable Mode S format errors.
4. The ADCE assigns all channel numbers used between the ADLP and GDLP, hence call collisions are not possible. When a CALL REQUEST by GDLP packet is received bearing a temporary channel number associated with an SVC in the *p*4 state, the association of the temporary to permanent channel number is broken (5.2.5.1.2.3).
5. Not applicable to the GDLP.
6. The error procedure consists of performing the actions specified when entering the *p*7 state (including sending a CLEAR REQUEST packet to the peer XDLP) and additionally sending a CLEAR REQUEST packet to the DCE (via the reformatting process).
7. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
8. The number in parentheses below an *"A = NORMAL"* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
9. An error condition is declared and transfer to the *p*7 state is possible only if the ground DTE address is known unambiguously. Otherwise the action is to discard the packet.
10. The error procedure consists of performing the action when entering the *p*7 state (including sending a CLEAR REQUEST packet to the XDLP) but without sending a CLEAR REQUEST packet to the local DCE.

Table 5-17. GDLP (ADLP) effect on ADCE (GDCE) reset states

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) reset states (see Notes 1, 4 and 5) FLOW CONTROL READY *d*1	GDLP (ADLP) RESET REQUEST *d*2	ADCE (GDCE) RESET REQUEST to GDLP (ADLP) *d*3
RESET REQUEST	*A=NORMAL* (5.2.6.7) *S=d*2 (forward to DCE)	*A=DISCARD*	*A=NORMAL* (5.2.6.7) *S=d*1 (do not forward)
RESET CONFIRMATION	*A=ERROR* *S=d*3 *D*=27 (see Note 3)	*A=ERROR* *S=d*3 *D*=28 (see Note 3)	*A=NORMAL* (5.2.6.7) *S=d*1 (do not forward)
INTERRUPT	See Table 5-18	*A=ERROR* *S=d*3 *D*=28 (see Note 3)	*A=DISCARD*
INTERRUPT CONFIRMATION	See Table 5-18	*A=ERROR* *S=d*3 *D*=28 (see Note 3)	*A=DISCARD*
DATA or flow control packet	See Table 5-19	*A=ERROR* *S=d*3 *D*=28 (see Note 3)	*A=DISCARD*
Format error (see Note 6)	*A=ERROR* *S=d*3 *D*=33 (see Note 3)	*A=ERROR* *S=d*3 *D*=33 (see Note 3)	*A=DISCARD*

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. All packets from the peer XDLP have been checked for duplication before evaluation as represented by this table.
3. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the peer XDLP) and sending a RESET REQUEST packet to the DCE (via the formatting function).
4. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared for the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
5. The number in parentheses below an *"A = NORMAL"* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
6. A format error may result from an S-bit sequence having a first or intermediate packet shorter than the maximum length, or else from an invalid LV field in a CALL REQUEST, CALL ACCEPT, CLEAR REQUEST, or INTERRUPT packet. There are no other detectable Mode S format errors.

Table 5-18. GDLP (ADLP) effect on ADCE (GDCE) interrupt transfer states

Packet received from GDLP (ADLP) (see Note 2)	ADCE/GDCE interrupt transfer states (see Notes 1, 3 & 4) GDLP (ADLP) INTERRUPT READY *i*1	GDLP (ADLP) INTERRUPT SENT *i*2
INTERRUPT (see Note 6)	*A=NORMAL* (5.2.6.4.5) *S=i*2 (forward to DCE)	*A=ERROR* *S=d*3 *D*=44 (see Note 5)

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) interrupt transfer states (see Notes 1, 3 & 4) ADCE (GDCE) INTERRUPT READY *j*1	ADCE (GDCE) INTERRUPT SENT *j*2
INTERRUPT CONFIRMATION	*A=ERROR* *S=d*3 *D*=43 (see Note 5)	*A=NORMAL* (5.2.6.4.5) *S=j*1 (forward confirmation to DCE)

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. All packets from the peer XDLP have been checked for duplication before evaluation as represented by this table.
3. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared for the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
4. The number in parentheses below an *"A = NORMAL"* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
5. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the peer XDLP) and sending a RESET REQUEST packet to the DCE (via the reformatting process).
6. User data length for INTERRUPT packets greater than 32 bytes, or an out of sequence INTERRUPT packet, are considered as errors.

Table 5-19. GDLP (ADLP) effect on ADCE (GDCE) flow control transfer states

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) flow control transfer states (see Notes 1, 6 and 7) ADCE (GDCE) RECEIVE READY *f*1	ADCE (GDCE) RECEIVE NOT READY *f*2
DATA packet with invalid PR (see Note 3)	*A=ERROR* *S=d*3 *D*=2 (see Note 8)	*A=ERROR* *S=d*3 *D*=2 (see Note 8)
DATA packet with valid PR, invalid PS or LV subfield (see Notes 4 & 5)	*A=DISCARD,* but process the PR value and send REJECT packet containing the expected PS value (see Note 5)	*A=DISCARD*, but process the PR value and send REJECT packet containing the expected PS value when busy condition ends
DATA packet with valid PR, PS and LV subfield	*A=NORMAL* (5.2.6.4.4) (forward)	*A=PROCESS*, if possible; or *A=DISCARD*, but process the PR value and send REJECT containing the expected PS value when busy condition ends

Packet received from GDLP (ADLP) (see Note 2)	ADCE (GDCE) flow control transfer states (see Notes 1, 6 and 7) GDLP (ADLP) RECEIVE READY *g*1	GDLP (ADLP) RECEIVE NOT READY *g*2
RR, RNR, REJECT packet with invalid PR (see Note 3)	*A=ERROR* *S=d*3 *D*=2 (see Note 8)	*A=ERROR* *S=d*3 *D*=2 (see Note 8)
RR with valid PR field (see Note 9)	*A=NORMAL* (5.2.6.5)	*A=NORMAL* (5.2.6.6) *S=g*1
RNR with valid PR value (see Note 9)	*A=NORMAL* (5.2.6.5) *S=g*2	*A=NORMAL* (5.2.6.6)
REJECT with valid PR (see Note 9)	*A=NORMAL* (5.2.6.5)	*A=NORMAL* (5.2.6.6) *S=g*1

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. All packets from the peer XDLP have been checked for duplication before evaluation as represented by this table.
3. An invalid PR value is one which is less than the PR value (modulo 16) of the last packet sent by the peer XDLP, or greater than the PS value of the next data packet to be transmitted by the XDLP.
4. An invalid PS value is one which is different from the next expected value for PS.
5. An invalid LV subfield is one which represents a value that is too large for the size of the segment received. In the event of an LV field error which gives rise to a loss of confidence in the correctness of the other fields in the packet, the packet is discarded without any further action.
6. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.

7. The number in parentheses below an *"A = NORMAL"* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.
8. The error procedure consists of performing the specified actions when entering the *d*3 state (which includes forwarding a RESET REQUEST packet to the peer XDLP) and sending a RESET REQUEST packet to the DCE (via the reformatting process).
9. RR, RNR, and REJECT packets have no end-to-end significance and are not forwarded to the DCE.
10. The receipt of a packet smaller than the maximum packet size with M-bit = 1 shall cause a reset to be generated and the remainder of the sequence shall be discarded.

Table 5-20. DCE effect on ADCE (GDCE) call setup and clearing states

	ADCE (GDCE) call setup and clearing states (see Notes 1, 7 and 8)					
Packet received from DCE (see Notes 2 & 4)	READY *p*1	GDLP (ADLP) CALL REQUEST *p*2	ADCE (GDCE) CALL REQUEST *p*3	DATA TRANSFER *p*4	GDLP (ADLP) CLEAR REQUEST *p*6	ADCE (GDCE) to GDLP (ADLP) CLEAR REQUEST *p*7
CALL REQUEST (see Note 6)	*A=NORMAL* (5.2.6.3.1) *S=p*3 (forward)	INVALID (see Note 5)	INVALID (see Note 3)	INVALID (see Note 3)	INVALID (see Note 3)	INVALID (see Note 3)
CALL ACCEPT (see Note 4)	*A=DISCARD*	*A=NORMAL* *S=P*4 (forward)	INVALID (see Note 3)	INVALID (see Note 3)	*A=DISCARD*	*A=DISCARD*
CLEAR REQUEST (see Note 4)	*A=DISCARD*	*A=NORMAL* (5.2.6.3.3) *S=p*7 (forward)	*A=NORMAL* (5.2.6.3.3) *S=p*7 (forward)	*A=NORMAL* (5.2.6.3.3) *S=p*7 (forward)	*A=DISCARD*	*A=DISCARD*
DATA, INTERRUPT or RESET packets (see Note 4)	*A=DISCARD*	INVALID (see Note 3)	INVALID (see Note 3)	See Table 5-21	*A=DISCARD*	*A=DISCARD*

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. This is the DTE packet received via the DCE after all DTE/DCE processing has occurred. Procedures local to the DTE/DCE interface (such as RR, RNR, and REJECT if in effect), do not affect the XDCE directly. All error procedures as documented in ISO 8208 have been performed. Hence certain packets are rejected by the interface and are not represented in this table.
3. The DCE in its protocol operation with the DTE will detect this error condition, hence the erroneous packet can be said never to "reach" the XDCE; see also Note 2.
4. The channel number for the DTE/DCE need not be the same channel number used for the ADCE/GDCE; a packet from the DTE which contains a channel number is associated with an air/ground channel by means of a previously established cross-reference table. If none exists then the DTE/DCE channel by definition references an air/ground channel in the *p*1 state.
5. The ADCE assigns all channel numbers used between the ADLP and GDLP; hence call collisions (denoted *p*5 ISO 8208) are not possible; see also Note 4.
6. A CALL REQUEST from the DTE can never be associated with an XDCE channel number which is not in the *p*1 state.
7. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
8. The number in parentheses below an *"A = NORMAL"* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.

Table 5-21. DCE effect on ADCE (GDCE) reset states

Packet received from DCE	ADCE (GDCE) reset states (see Notes 1, 4 and 5) FLOW CONTROL READY *d*1	GDLP (ADLP) RESET REQUEST *d*2	ADCE (GDCE) RESET REQUEST to GDLP (ADLP) *d*3
RESET REQUEST	*A=NORMAL* (5.2.6.7) *S=d*3 (forward)	*A=NORMAL* (5.2.6.7) *S=d*1 (forward)	*A=DISCARD*
RESET CONFIRMATION	INVALID (see Note 3)	INVALID (see Note 3)	INVALID (see Note 3)
INTERRUPT	See Table 5-22	*A=DISCARD*	Hold interrupt until Mode S reset complete
INTERRUPT CONFIRMATION	See Table 5-22	*A=DISCARD*	INVALID (see Note 3)
DATA (see Note 2)	*A=NORMAL* (5.2.6.4) (forward)	*A=DISCARD*	Hold data until Mode S reset complete

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. This is the DTE packet received via the DCE after all DTE/DCE processing has occurred. Procedures local to the DTE/DCE interface (such as RR, RNR, and REJECT if in effect), do not affect the XDCE directly. All error procedures as documented in ISO 8208 have been performed. Hence certain packets are rejected by the interface and are not represented in this table.
3. The DCE in its protocol operation with the DTE will detect this error condition, hence the erroneous packet can be said never to “reach” the XDCE; see also Note 2.
4. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
5. The number in parentheses below an *“A = NORMAL”* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.

Table 5-22. DCE effect on ADCE (GDCE) interrupt transfer states

Packet received from DCE (see Note 2)	ADCE (GDCE) interrupt transfer state (see Notes 1, 4 and 5) GDLP (ADLP) INTERRUPT READY *i*1	GDLP (ADLP) INTERRUPT SENT *i*2
INTERRUPT CONFIRMATION	INVALID (See Note 3)	*A=NORMAL* (5.2.6.4.5) *S=i*1 (forward)
Packet received from DCE (see Note 2)	**ADCE (GDCE) interrupt transfer states (see Notes 1, 4 and 5) ADCE (GDCE) INTERRUPT READY *j*1**	**ADCE (GDCE) INTERRUPT SENT *j*2**
INTERRUPT	*A=NORMAL* (5.2.6.4.5) *S=j*2 (forward)	INVALID (see Note 3)

NOTES:

1. The XDCE is not necessarily in the same state as the DTE/DCE interface.
2. This is the DTE packet received via the DCE after all DTE/DCE processing has occurred. Procedures local to the DTE/DCE interface (such as RR, RNR, and REJECT if in effect), do not affect the XDCE directly. All error procedures as documented in ISO 8208 have been performed. Hence certain packets are rejected by the interface and are not represented in this state.
3. The DCE in its protocol operation with the DTE will detect this error condition, hence the erroneous packet can be said never to “reach” the XDCE; see also Note 2.
4. Table entries are defined as follows: *A* = action to be taken, *S* = the state to be entered, *D* = the diagnostic code to be used in packets generated as a result of this action, *DISCARD* indicates that the received packet is to be cleared from the XDLP buffers, and INVALID indicates that the packet/state combination cannot occur.
5. The number in parentheses below an *“A = NORMAL”* table entry is the paragraph number in this document that defines the actions to be taken to perform normal processing on the received packet. If no paragraph number is referenced, the normal processing is defined in the table entry.

Table 5-23. Broadcast identifier number assignments

Uplink broadcast identifier	*Assignment*
00_{16}	Not valid
01_{16}	Reserved (differential GNSS correction)
30_{16}	Not valid
31_{16}	Reserved for ACAS (RA broadcast)
32_{16}	Reserved for ACAS (ACAS broadcast)
Others	Unassigned
Downlink broadcast identifier	*Assignment*
00_{16}	Not valid
02_{16}	Reserved (traffic information service)
10_{16}	Data link capability report
20_{16}	Aircraft identification
FE_{16}	Update request
FF_{16}	Search request
Others	Unassigned

Table 5-24. Register number assignments

Register Number	*Assignment*
00_{16}	Not valid
01_{16}	Unassigned
02_{16}	Linked Comm-B, segment 2
03_{16}	Linked Comm-B, segment 3
04_{16}	Linked Comm-B, segment 4
05_{16}	Extended squitter airborne position
06_{16}	Extended squitter surface position
07_{16}	Extended squitter status
08_{16}	Extended squitter identification and type
09_{16}	Extended squitter airborne velocity
$0A_{16}$	Extended squitter event-driven information
$0B_{16}$	Air/air information 1 (aircraft state)
$0C_{16}$	Air/air information 2 (aircraft intent)
$0D_{16}$-$0E_{16}$	Reserved (other air-air information)
$0F_{16}$	Reserved (ACAS)
10_{16}	Data link capability report
11_{16}-16_{16}	Extension to data link capability report
17_{16}	Common usage GICB capability report
18_{16}-$1F_{16}$	Mode S specific services capability reports
20_{16}	Aircraft identification
21_{16}	Aircraft registration number
22_{16}	Antenna positions
23_{16}	Reserved (antenna position)
24_{16}	Reserved (static aircraft parameter)
25_{16}	Aircraft type
26_{16}-$2F_{16}$	Unassigned
30_{16}	ACAS active resolution advisory (RA)
31_{16}-$3F_{16}$	Unassigned
40_{16}	Aircraft intention
41_{16}	Next waypoint identifier
42_{16}	Next waypoint position
43_{16}	Next waypoint information
44_{16}	Meteorological routine air report
45_{16}	Meteorological hazard report
46_{16}	Flight management system Mode 1
47_{16}	Flight management system Mode 2
48_{16}	VHF channel report
49_{16}-$4F_{16}$	Unassigned
50_{16}	Track and turn report
51_{16}	Position report coarse

Register Number	*Assignment*
52_{16}	Position report fine
53_{16}	Air referenced state vector
54_{16}	Waypoint 1
55_{16}	Waypoint 2
56_{16}	Waypoint 3
57_{16}-$5E_{16}$	Unassigned
$5F_{16}$	Quasi-static parameter monitoring
60_{16}	Heading and speed report
61_{16}	Extended squitter emergency/priority status
62_{16}	Current trajectory change point
63_{16}	Next trajectory change point
64_{16}	Aircraft operational coordination message
65_{16}	Aircraft operational status
66_{16}-$6F_{16}$	Reserved for extended squitter
70_{16}-75_{16}	Reserved for future downlink parameters
76_{16}-$E0_{16}$	Unassigned
$E1_{16}$-$E2_{16}$	Reserved for Mode S byte
$E3_{16}$-$F0_{16}$	Unassigned
$F1_{16}$-$F2_{16}$	Military applications
$F3_{16}$-FF_{16}	Unassigned

Table 5-25. MSP channel number assignments

Uplink channel number	*Assignment*
0	Not valid
1	Reserved (specific services management)
2	Reserved (traffic information service)
3	Reserved (ground-to-air alert)
4	Reserved (ground derived position)
5	ACAS sensitivity level control
6	Reserved (ground-to-air service request)
7	Reserved (air-to-ground service response)
8-63	Unassigned
Downlink channel number	*Assignment*
0	Not valid
1	Reserved (specific services management)
2	Unassigned
3	Reserved (data flash)
4	Reserved (position request)
5	Unassigned
6	Reserved (ground-to-air service response)
7	Reserved (air-to-ground service request)
8-63	Unassigned

FIGURES FOR CHAPTER 5

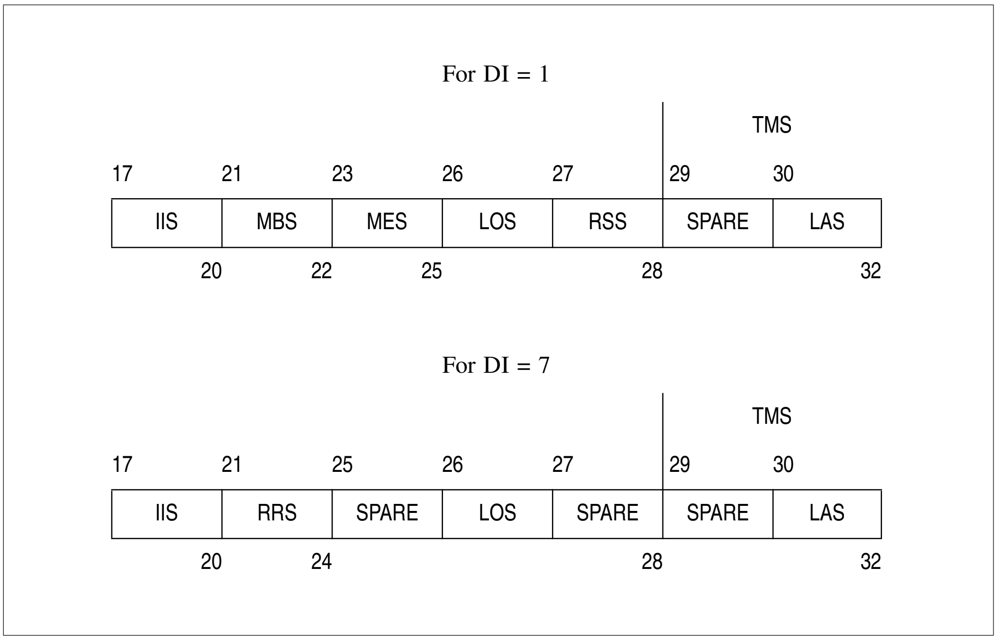


Figure 5-1. The SD field structure

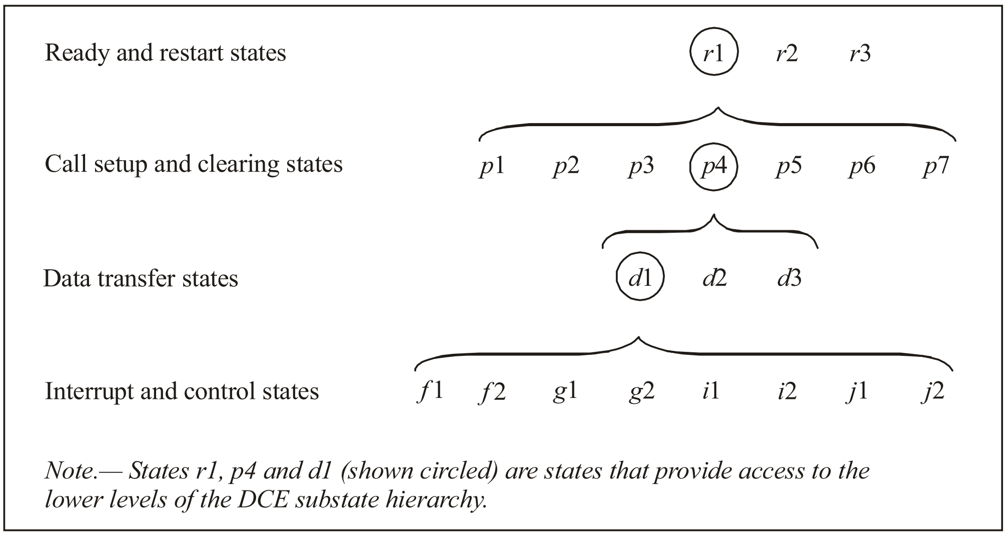


Figure 5-2. DCE substate hierarchy

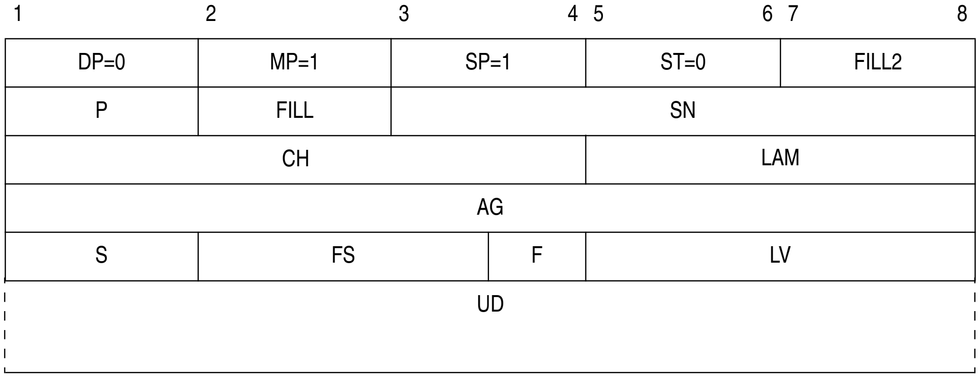


Figure 5-3. CALL REQUEST by ADLP packet

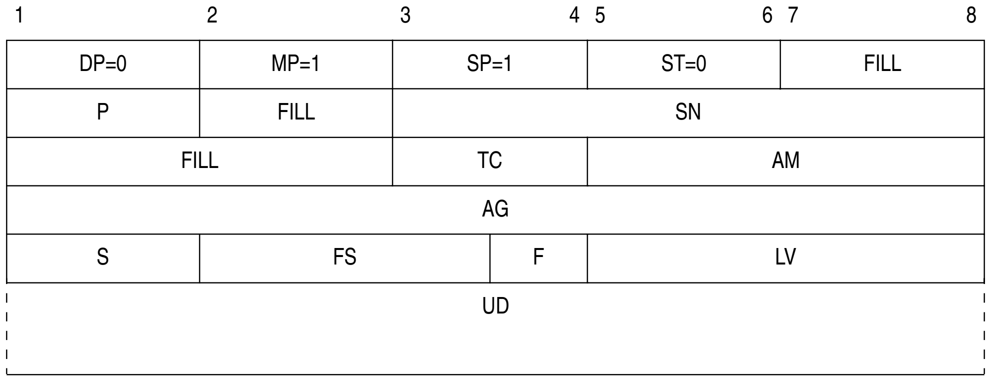


Figure 5-4. CALL REQUEST by GDLP packet

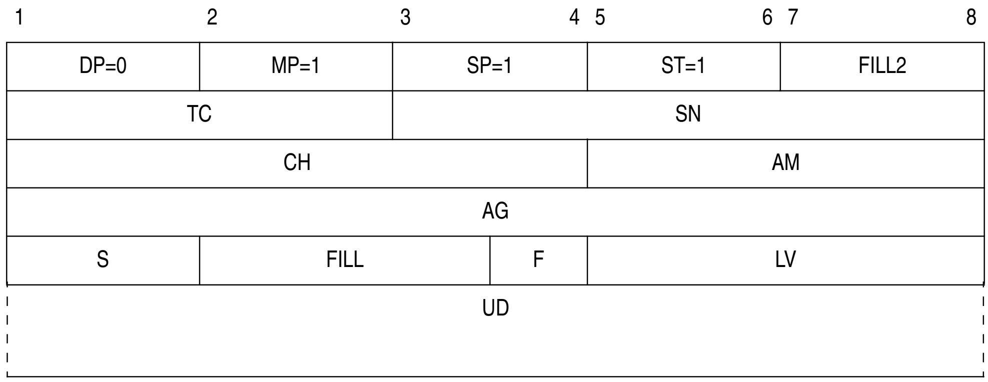


Figure 5-5. CALL ACCEPT by ADLP packet

<table>
<tr><td>1</td><td>2</td><td>3</td><td>4 5</td><td>6 7</td><td>8</td></tr>
<tr><td>DP=0</td><td>MP=1</td><td colspan="2">SP=1</td><td>ST=1</td><td>FILL</td></tr>
<tr><td colspan="2">FILL</td><td colspan="4">SN</td></tr>
<tr><td colspan="4">CH</td><td colspan="2">AM</td></tr>
<tr><td colspan="6">AG</td></tr>
<tr><td>S</td><td colspan="2">FILL</td><td>F</td><td colspan="2">LV</td></tr>
<tr><td colspan="6">UD</td></tr>
</table>

Figure 5-6. CALL ACCEPT by GDLP packet

<table>
<tr><td>1</td><td>2</td><td>3</td><td>4 5</td><td>6 7</td><td>8</td></tr>
<tr><td>DP=0</td><td>MP=1</td><td colspan="2">SP=1</td><td>ST=2</td><td>FILL2</td></tr>
<tr><td colspan="2">TC</td><td colspan="4">SN</td></tr>
<tr><td colspan="4">CH</td><td colspan="2">AM</td></tr>
<tr><td colspan="6">AG</td></tr>
<tr><td colspan="6">CC</td></tr>
<tr><td colspan="6">DC</td></tr>
<tr><td>S</td><td colspan="2">FILL</td><td>F</td><td colspan="2">LV</td></tr>
<tr><td colspan="6">UD</td></tr>
</table>

Figure 5-7. CLEAR REQUEST by ADLP packet

<table>
<tr><td>1</td><td>2</td><td>3</td><td>4 5</td><td>6 7</td><td>8</td></tr>
<tr><td>DP=0</td><td>MP=1</td><td colspan="2">SP=1</td><td>ST=2</td><td>FILL</td></tr>
<tr><td colspan="2">TC</td><td colspan="4">SN</td></tr>
<tr><td colspan="4">CH</td><td colspan="2">AM</td></tr>
<tr><td colspan="6">AG</td></tr>
<tr><td colspan="6">CC</td></tr>
<tr><td colspan="6">DC</td></tr>
<tr><td>S</td><td colspan="2">FILL</td><td>F</td><td colspan="2">LV</td></tr>
<tr><td colspan="6">UD</td></tr>
</table>

Figure 5-8. CLEAR REQUEST by GDLP packet

1 2 3 4 5 6 7 8

<table>
<tr><td>DP=0</td><td>MP=1</td><td>SP=1</td><td>ST=3</td><td>FILL2</td></tr>
<tr><td colspan="2">TC</td><td colspan="3">SN</td></tr>
<tr><td colspan="3">CH</td><td colspan="2">AM</td></tr>
<tr><td colspan="5">AG</td></tr>
</table>

Figure 5-9. CLEAR CONFIRMATION by ADLP packet

1 2 3 4 5 6 7 8

<table>
<tr><td>DP=0</td><td>MP=1</td><td>SP=1</td><td>ST=3</td><td>FILL</td></tr>
<tr><td colspan="2">TC</td><td colspan="3">SN</td></tr>
<tr><td colspan="3">CH</td><td colspan="2">AM</td></tr>
<tr><td colspan="5">AG</td></tr>
</table>

Figure 5-10. CLEAR CONFIRMATION by GDLP packet

1 2 3 4 5 6 7 8

<table>
<tr><td>DP=1</td><td>M</td><td colspan="3">SN</td></tr>
<tr><td colspan="4">FILL1</td><td></td></tr>
<tr><td colspan="3">PS</td><td colspan="2">PR</td></tr>
<tr><td colspan="3">CH</td><td colspan="2">LV</td></tr>
<tr><td colspan="5">UD</td></tr>
</table>

Figure 5-11. DATA packet

1 2 3 4 5 6 7 8

<table>
<tr><td>DP=0</td><td>MP=1</td><td>SP=3</td><td>ST=1</td><td>FILL2</td></tr>
<tr><td>S</td><td>F</td><td colspan="3">SN</td></tr>
<tr><td colspan="3">CH</td><td colspan="2">LV</td></tr>
<tr><td colspan="5">UD</td></tr>
</table>

Figure 5-12. INTERRUPT packet

1 2 3 4 5 6 7 8

DP=0	MP=1	SP=3	ST=3	SS=0
FILL2		SN		
CH			FILL	

Figure 5-13. INTERRUPT CONFIRMATION packet

1 2 3 4 5 6 7 8

DP=0	MP=1	SP=3	ST=3	SS=1
FILL2		SN		
CH			PR	

Figure 5-14. REJECT packet

1 2 3 4 5 6 7 8

DP=0	MP=1	SP=2	ST=0	FILL2
FILL		SN		
CH			PR	

Figure 5-15. RECEIVE READY packet

1 2 3 4 5 6 7 8

DP=0	MP=1	SP=2	ST=1	FILL2
FILL		SN		
CH			PR	

Figure 5-16. RECEIVE NOT READY packet

1 2 3 4 5 6 7 8

DP=0	MP=1	SP=2	ST=2	FILL2
FILL		SN		
CH			FILL	
RC				
DC				

Figure 5-17. RESET REQUEST packet

1 2	3	4 5	6 7	8
DP=0	MP=1	SP=2	ST=3	FILL2
FILL		SN		
CH			FILL	

Figure 5-18. RESET CONFIRMATION packet

1 2	3	4 5	6 7	8	
DP=0	MP=1	SP=3	ST=0	OF	IN
RTL					
RT					
ODL					
OD					

Figure 5-19. ROUTE packet

1 2	3	4 5	6 7	8
DP=0	MP=1	SP=3	ST=2	FILL2
LENGTH				
FIRST PACKET				
LENGTH				
LAST PACKET				
LENGTH = 0				

Figure 5-20. MULTIPLEX packet

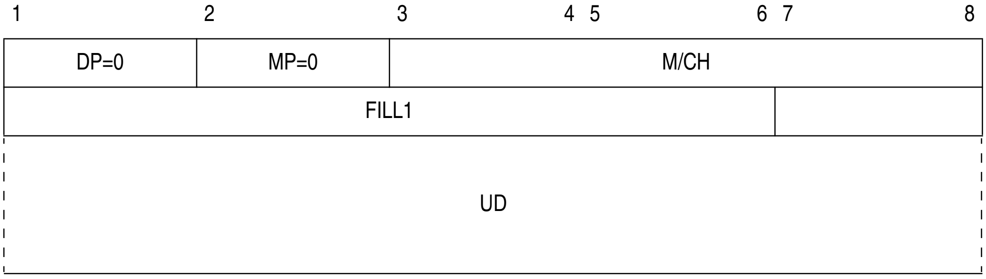


Figure 5-21. SHORT FORM MSP packet

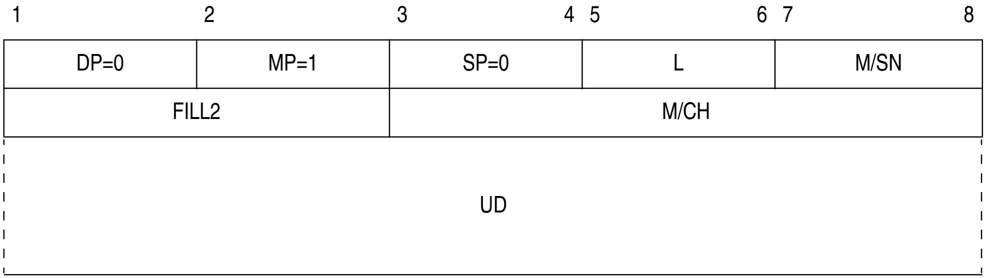
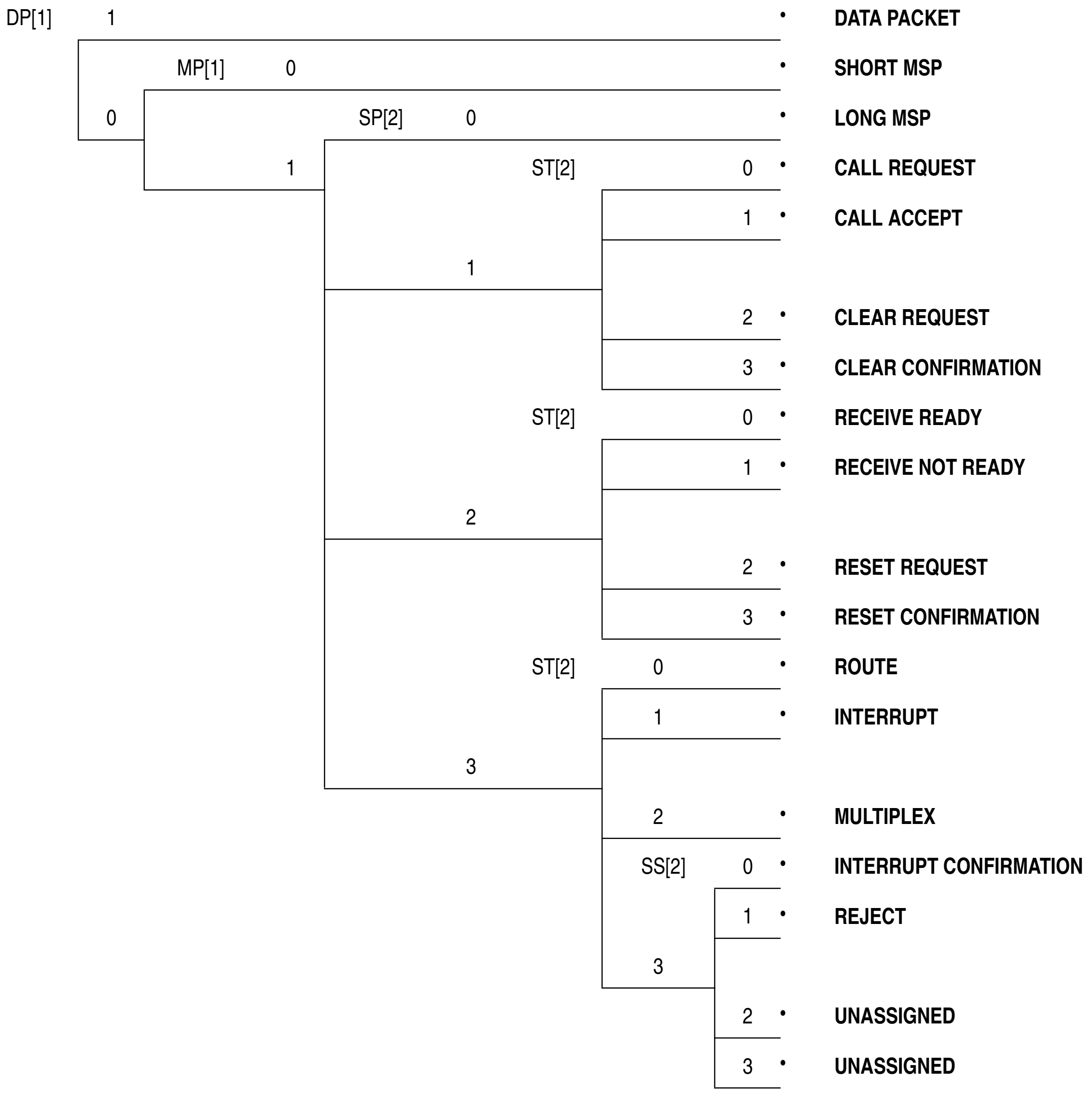


Figure 5-22. LONG FORM MSP packet



LEGEND:

DP = DATA packet type

MP = MSP packet type

SP = SUPERVISORY packet

ST = SUPERVISORY type

SS = SUPERVISORY subset

Figure 5-23. Control fields used in MODE S packets

APPENDIX TO CHAPTER 5. DATA FORMATS AND CONTROL PARAMETERS FOR COMMUNICATIONS VIA MODE S SPECIFIC SERVICES

TECHNICAL SUPPORT FOR SSR MODE S AIR-GROUND DATA LINK

This appendix defines data formats and control parameters that shall be used for communications using Mode S specific services.

Appendix 1 is arranged in the following manner:

Section 1 List of acronyms

Section 2 Data formats for transponder registers

Section 3 Formats for Mode S specific protocols (MSP)

Section 4 Mode S broadcast protocols

Note.— Guidance material on possible data sources, the use of control parameters, and the protocols involved is given in the Manual on Mode S Specific Services *(Doc 9688).*

1. LIST OF ACRONYMS

ACAS	Airborne collision avoidance system
ADLP	Airborne data link processor
ADS-B	Automatic dependent surveillance-broadcast
ATN	Aeronautical telecommunication network
ATS	Air traffic service
A/V	Aircraft/vehicle
BDS	Comm-B data selector
CPR	Compact position reporting
ELM	Extended length message
GDLP	Ground data link processor
GICB	Ground-initiated Comm-B
GFM	General formatter/manager
GNSS	Global navigation satellite system
II	Interrogator identifier
MA	Message, Comm-A
MB	Message, Comm-B
MC	Message, Comm-C
MD	Message, Comm-D
MSP	Mode S specific protocol
NUC_P	Navigational uncertainty category — position
NUC_R	Navigational uncertainty category — rate
RNP	Required navigation performance
SI	Surveillance identifier
SLM	Standard length message
SPI	Special position identification
SSR	Secondary surveillance radar
TIS	Traffic information service
UTC	Coordinated universal time

2. DATA FORMATS FOR TRANSPONDER REGISTERS

2.1 REGISTER ALLOCATION

Applications shall use the allocated register numbers as shown in the table below:

Register No.	*Assignment*	*Minimum update rate*
00_{16}	Not valid	N/A
01_{16}	Unassigned	N/A
02_{16}	Linked Comm-B, segment 2	N/A
03_{16}	Linked Comm-B, segment 3	N/A
04_{16}	Linked Comm-B, segment 4	N/A
05_{16}	Extended squitter airborne position	0.2 s
06_{16}	Extended squitter surface position	0.2 s
07_{16}	Extended squitter status	1.0 s
08_{16}	Extended squitter identification and type	15.0 s
09_{16}	Extended squitter airborne velocity	0.2 s
$0A_{16}$	Extended squitter event-driven information	variable
$0B_{16}$	Air/air information 1 (aircraft state)	1.0 s
$0C_{16}$	Air/air information 2 (aircraft intent)	1.0 s
$0D_{16}$-$0E_{16}$	Reserved for air/air state information	To be determined
$0F_{16}$	Reserved for ACAS	To be determined
10_{16}	Data link capability report	≤4.0 s (see 2.1.3)
11_{16}-16_{16}	Reserved for extension to data link capability reports	5.0 s
17_{16}	Common usage GICB capability report	5.0 s
18_{16}-$1F_{16}$	Mode S specific services capability reports	5.0 s
20_{16}	Aircraft identification	5.0 s
21_{16}	Aircraft and airline registration markings	15.0 s
22_{16}	Antenna positions	15.0 s
23_{16}	Reserved for antenna position	15.0 s
24_{16}	Reserved for aircraft parameters	15.0 s
25_{16}	Aircraft type	15.0 s
26_{16}-$2F_{16}$	Unassigned	N/A
30_{16}	ACAS active resolution advisory	see ACAS SARPs (4.3.8.4.2.2)
31_{16}-$3F_{16}$	Unassigned	N/A
40_{16}	Aircraft intention	1.0 s
41_{16}	Next waypoint identifier	1.0 s
42_{16}	Next waypoint position	1.0 s

Register No.	*Assignment*	*Minimum update rate*
43_{16}	Next waypoint information	0.5 s
44_{16}	Meteorological routine air report	1.0 s
45_{16}	Meteorological hazard report	1.0 s
46_{16}	Reserved for flight management system Mode 1	To be determined
47_{16}	Reserved for flight management system Mode 2	To be determined
48_{16}	VHF channel report	5.0 s
49_{16}-$4F_{16}$	Unassigned	N/A
50_{16}	Track and turn report	1.0 s
51_{16}	Position report coarse	0.5 s
52_{16}	Position report fine	0.5 s
53_{16}	Air-referenced state vector	0.5 s
54_{16}	Waypoint 1	5.0 s
55_{16}	Waypoint 2	5.0 s
56_{16}	Waypoint 3	5.0 s
57_{16}-$5E_{16}$	Unassigned	N/A
$5F_{16}$	Quasi-static parameter monitoring	0.5 s
60_{16}	Heading and speed report	1.0 s
61_{16}	Extended squitter emergency/priority status	1.0 s
62_{16}	Current trajectory change point	1.7 s
63_{16}	Next trajectory change point	1.7 s
64_{16}	Aircraft operational coordination message	2.0 s or 5.0 s (2.3.10.1)
65_{16}	Aircraft operational status	1.7 s
66_{16}-$6F_{16}$	Reserved for extended squitter	N/A
70_{16}-75_{16}	Reserved for future aircraft downlink parameters	N/A
76_{16}-$E0_{16}$	Unassigned	N/A
$E1_{16}$-$E2_{16}$	Reserved for Mode S byte	N/A
$E3_{16}$-$F0_{16}$	Unassigned	N/A
$F1_{16}$-$F2_{16}$	Military applications	15 s
$F3_{16}$-FF_{16}	Unassigned	N/A

2.1.1 The details of the data to be entered into the assigned registers shall be as defined in the following pages of this section. The above table specifies the minimum update rates at which the appropriate transponder register(s) shall be reloaded with valid data. If the defined update rate is not maintained, the status bit (if provided) shall indicate that the data in that field are invalid.

2.1.2 The time between the availability of the data at the SSE and the time that the data are processed and appear in the relevant transponder register shall be less than the minimum update rate specified in the table above.

2.1.3 **Recommendation**.—*The time between the availability of data at the SSE and the time that the data are processed and appears in the relevant transponder register should be as short as possible.*

2.1.4 The register number shall be equivalent to the Comm-B data selector (BDS) value used to address that register, (see 3.1.2.6.11.2.1 of Annex 10, Volume IV). Register $0A_{16}$ shall not be used for GICB or ACAS cross-link read-out. The data link capability report (register number 10_{16}) shall be updated within one second of the data changing and at least every four seconds thereafter.

2.2 GENERAL CONVENTIONS ON DATA FORMATS

2.2.1 Validity of data

The bit patterns contained in the 56-bit transponder registers shall be considered as valid application data only if:

1) the data link capability report is contained in register number 10_{16}. This is indicated by bit 25 of the data link capability report contained in register number 10_{16} being set to "ONE".

2) the GICB service corresponding to the application is shown as "supported" by the corresponding bit in the GICB capability report register numbers 17_{16} to $1C_{16}$ being set to "ONE".

Note 1.— The intent of the capability bits in register number 17_{16} is to indicate that useful data are contained in the corresponding transponder register. For this reason, each bit for a register is cleared if data becomes unavailable (2.5.4.1) and set again when data insertion into the register resumes.

Note 2.— A bit set in register numbers 18_{16} to $1C_{16}$ indicates that the application using this register has been installed on the aircraft. These bits are not cleared to reflect the real-time loss of an application, as is done for register number 17_{16} (2.5.4.2).

3) the data value is valid at the time of extraction. This is indicated by a data field status bit (if provided). When this status bit is set to "ONE", the data field(s) which follow, up to the next status bit, are valid. When this status bit is set to "ZERO", the data field(s) are invalid.

2.2.2 Representation of numerical data

Numerical data shall be represented as follows:

1) Numerical data shall be represented as binary numerals. When the value is signed, 2's complement representation shall be used, and the bit following the status bit shall be the sign bit.

2) Unless otherwise specified, whenever more bits of resolution are available from the data source than in the data field into which that data are to be loaded, the data shall be rounded to the nearest value that can be encoded in that data field.

3) In all cases where a status bit is used it shall be set to "ONE" to indicate VALID and to "ZERO" to indicate INVALID.

Note.— This facilitates partial loading of the registers.

4) When present, a switch bit shall indicate which of two alternative data types is being used to update the parameter in the transponder register.

5) Bit numbering in the MB field shall be as specified in Annex 10, Volume IV (3.1.2.3.1.3).

6) Registers containing data intended for broadcast Comm-B shall have the broadcast identifier located in the eight most significant bits of the MB field.

Note.— Tables are numbered Table 2-X where "X" is the decimal equivalent of the BDS code to which the format applies.

2.2.3 Reserved fields

Unless specified in this Annex, these bit fields shall be reserved for future allocation by ICAO.

2.3 EXTENDED SQUITTER FORMATS

This section defines the formats and coding that shall be used for extended squitter ADS-B messages. When the extended squitter capability is implemented as an extended squitter/non-transponder device (ES/NT, Annex 10, Volume IV, 3.1.2.8.7), the convention for register numbering shall not apply. The data content and the transmit times shall be the same as specified for the transponder case.

2.3.1 FORMAT TYPE CODES

The format type code shall differentiate the Mode S extended squitter messages into several classes as specified in the following table:

"TYPE" Subfield Code Definitions (DF = 17 or 18)					
Type code	*Format*	*Horizontal protection limit, (HPL)*	*95% Containment radius, μ and v, on horizontal and vertical position error*	*Altitude type (2.3.2.4)*	*NUC_P*
0	No position information			Baro altitude or no altitude information	0
1	Identification (Category Set D)			*Not applicable*	
2	Identification (Category Set C)			*Not applicable*	
3	Identification (Category Set B)			*Not applicable*	
4	Identification (Category Set A)			*Not applicable*	
5	Surface position	HPL < 7.5 m	μ < 3 m	No altitude information	9
6	Surface position	HPL < 25 m	3 m ≤ μ < 10 m	No altitude information	8
7	Surface position	HPL < 185.2 m (0.1 NM)	10 m ≤ μ < 92.6 m (0.05 NM)	No altitude information	7
8	Surface position	HPL > 185.2 m (0.1 NM)	(0.05 NM) 92.6 m ≤ μ	No altitude information	6
9	Airborne position	HPL < 7.5 m	μ < 3 m	Baro altitude	9
10	Airborne position	7.5 m ≤ HPL < 25 m	3 m ≤ μ < 10 m	Baro altitude	8
11	Airborne position	25 m ≤ HPL < 185.2 m (0.1 NM)	10 m ≤ μ < 92.6 m (0.05 NM)	Baro altitude	7
12	Airborne position	185.2 m (0.1 NM) ≤ HPL < 370.4 m (0.2 NM)	92.6 m (0.05 NM) ≤ μ < 185.2 m (0.1 NM)	Baro altitude	6
13	Airborne position	380.4 m (0.2 NM) ≤ HPL < 92.6 m (0.5 NM)	185.2 m (0.1 NM) ≤ μ < 463 m (0.25 NM)	Baro altitude	5
14	Airborne position	26 m (0.5 NM) ≤ HPL < 185.2 m (1.0 NM)	463 m (0.25 NM) ≤ μ < 92.6 m (0.5 NM)	Baro altitude	4
15	Airborne position	185.2 m (1.0 NM) ≤ HPL < 370.4 m (2.0 NM)	92.6 m (0.5 NM) ≤ μ < 185.2 km (1.0 NM)	Baro altitude	3
16	Airborne position	7.704 km (2.0 NM) ≤ HPL < 18.52 km (10 NM)	1.852 km (1.0 NM) ≤ μ < 9.26 km (5.0 NM)	Baro altitude	2
17	Airborne position	18.52 km (10 NM) ≤ HPL < 37.04 km (20 NM)	9.26 km (5.0 NM) ≤ μ < 18.52 km (10.0 NM)	Baro altitude	1
18	Airborne position	HPL ≥ 37.04 km (20 NM)	8.52 km (10.0 NM) ≤ μ	Baro altitude	0
19	Airborne velocity	*Not applicable*	*Not applicable*	*Difference between "Baro altitude" and "GNSS height (HAE) or GNSS altitude (MSL)" (2.3.5.7)*	*N/A*
20	Airborne position	HPL < 7.5 m	μ < 3 m and *v* < 4 m	GNSS height (HAE)	9
21	Airborne position	HPL < 25 m	μ < 10 m and *v* < 15 m	GNSS height (HAE)	8

"TYPE" Subfield Code Definitions (DF = 17 or 18)					
Type code	*Format*	*Horizontal protection limit, (HPL)*	*95% Containment radius, μ and v, on horizontal and vertical position error*	*Altitude type (2.3.2.4)*	*NUC_P*
22	Airborne position	HPL ≥ 25 m	μ ≥ 10 m or v ≥ 15 m	GNSS height (HAE)	Reserved
23	Reserved for test purposes				
24	Reserved for surface system status				
25 - 27	Reserved				
28	Extended squitter aircraft status				
29	Current/next trajectory change point				
30	Aircraft operational coordination				
31	Aircraft operational status				

The 95 per cent containment limit, μ, on horizontal position error shall be derived from, HFOM (horizontal figure of merit). Likewise, the 95 per cent containment limit, v, on vertical position error shall be derived from, VFOM (vertical figure of merit). The horizontal protection level (HPL) shall be derived from AHIL (autonomous horizontal integrity limit).

Note.— The term "broadcast" when applied to extended squitter, refers to a spontaneous transmission by the transponder. This is distinct from the Comm-B broadcast protocol.

2.3.2 AIRBORNE POSITION FORMAT

The airborne position squitter format shall be formatted as specified in the definition of BDS 0,5. Additional details are specified in the following paragraphs.

2.3.2.1 *COMPACT POSITION REPORTING (CPR) FORMAT (F)*

In order to achieve coding that is unambiguous worldwide, CPR shall use two format types, known as even and odd. This 1-bit field (bit 22) shall be used to define the CPR format type. F = 0 shall denote an even format coding, while F = 1 shall denote an odd format coding (2.6.7).

2.3.2.2 *TIME SYNCHRONIZATION (T)*

This 1-bit field (bit 21) shall indicate whether or not the time of applicability of the message is synchronized with UTC time. T = 0 shall denote that the time is not synchronized to UTC. T = 1 shall denote that the time of applicability is synchronized to UTC time. Synchronization shall only be used for airborne position messages having the top two horizontal position precision categories (format types codes 9, 10, 20 and 21).

When T = 1, the time of validity in the airborne position message format shall be encoded in the 1-bit F field which, in addition to CPR format type, indicates the 0.2 second time tick for UTC time of position validity. The F bit shall alternate between 0 and 1 for successive 0.2 second time ticks, beginning with F = 0 when the time of applicability is an exact even-numbered UTC second.

2.3.2.3 *LATITUDE/LONGITUDE*

The latitude/longitude field in the airborne position message shall be a 34-bit field containing the latitude and longitude of the aircraft airborne position. The latitude and longitude shall each occupy 17 bits. The airborne latitude and longitude encodings shall contain the high-order 17 bits of the 19-bit CPR-encoded values defined in 2.6.

Note.— The unambiguous range for the local decoding of airborne messages is 666 km (360 NM). The positional accuracy maintained by the airborne CPR encoding is approximately 5.1 metres. The latitude/longitude encoding is also a function of the CPR format value (the "F" bit) described above.

2.3.2.3.1 *Extrapolating position (when T = 1)*

If T is set to one, airborne position messages with format type codes 9, 10, 20 and 21 shall have times of applicability which are exact 0.2 s UTC epochs. In that case, the F bit shall be 0 if the time of applicability is an even-numbered 0.2 s UTC epoch, or 1 if the time of applicability is an odd-numbered 0.2 s UTC epoch.

Note.— In such a case, an "even-numbered 0.2 s epoch" means an epoch which occurs an even number of 200-ms time intervals after an even-numbered UTC second. An "odd-numbered 0.2 s epoch" means an epoch which occurs an odd number of 200-ms time intervals after an even-numbered UTC second. Examples of even-numbered 0.2 s UTC epochs are 12.0 s, 12.4 s, 12.8 s, 13.2 s, 13.6 s, etc. Examples of odd-numbered UTC epochs are 12.2 s, 12.6 s, 13.0 s, 13.4 s, 13.8 s, etc.

The CPR-encoded latitude and longitude that are loaded into the airborne position register shall comprise an estimate of the aircraft/vehicle (A/V) position at the time of applicability of that latitude and longitude, which is an exact 0.2 s UTC epoch. The register shall be loaded no earlier than 150 ms before the time of applicability of the data being loaded, and no later than 50 ms before the time of applicability of that data.

This timing shall ensure that the receiving ADS-B system may recover the time of applicability of the data in the airborne position message, as follows:

1) If F = 0, the time of applicability shall be the nearest even-numbered 0.2 s UTC epoch to the time that the airborne position message is received.

2) If F = 1, the time of applicability shall be the nearest odd-numbered 0.2 s UTC epoch to the time that the airborne position message is received.

Recommendation.— *If the airborne position register is updated at its minimum (every 200 ms), that register should be loaded 100 ms before the time of applicability. The register should then be reloaded, with data applicable at the next subsequent 0.2 s UTC epoch, 100 ms before that next subsequent 0.2 s epoch.*

Note 1.— In this way, the time of transmission of an airborne position message would never differ by more than 100 ms from the time of applicability of the data in that message. By specifying "100 ms ± 50 ms" rather than 100 ms exactly, some tolerance is allowed for variations in implementation.

Note 2.— The position may be estimated by extrapolating the position from the time of validity of the fix (included in the position fix) to the time of applicability of the data in the register (which, if T = 1, is an exact 0.2 s UTC time tick). This may be done by a simple linear extrapolation using the velocity provided with the position fix and the time difference between the position fix validity time and the time of applicability of the transmitted data. Alternatively, other methods of estimating the position, such as alpha-beta trackers or Kalman filters, may be used.

Every 200 ms, the contents of the position registers shall be updated by estimating the A/V position at the next subsequent 0.2 s UTC epoch. This process shall continue with new position fixes as they become available from the source of navigation data.

2.3.2.3.2 *Extrapolating position (when T = 0)*

T shall be set to zero if the time of applicability of the data being loaded into the position register is not synchronized to any particular UTC epoch. In that case, the position register shall be reloaded with position data at intervals that are no more than 200 ms apart. The position being loaded into the register shall have a time of applicability that is never more than 200 ms different from any time during which the register holds that data.

Note.— This may be accomplished by loading the airborne position register at intervals that are, on average, no more than 200 ms apart, with data for which the time of applicability is between the time the register is loaded and the time that it is loaded again. (Shorter intervals than 200 ms are permitted, but not required.)

If T = 0, receiving ADS-B equipment shall accept airborne position messages as being current as of the time of receipt. The transmitting ADS-B equipment shall reload the airborne position register with updated estimates of the A/V position, at intervals that are no more than 200 ms apart. The process shall continue with new position reports as they become available.

2.3.2.3.3 *Timeout when new position data are unavailable*

In the event that the navigation input ceases, the extrapolation described in 2.3.2.3.1 and 2.3.2.3.2 shall be limited to no more than two seconds. At the end of this timeout of two seconds, all fields of the airborne position register, except the altitude field, shall be cleared (set to zero). When the appropriate register fields are cleared, the zero type code field shall serve to notify ADS-B receiving equipment that the data in the latitude and longitude fields are invalid.

2.3.2.4 *ALTITUDE*

This 12-bit field shall provide the aircraft altitude. Depending on the type code, this field shall contain either:

1) Barometric altitude encoded in 25 or 100 foot increments (as indicated by the Q bit) or,

2) GNSS height above ellipsoid (HAE).

"Baro-Altitude" shall be interpreted as barometric pressure altitude, relative to a standard pressure of 1013.25 hectopascals (29.92 in Hg). It shall not be interpreted as baro corrected altitude.

Format type code 20 to 22 shall be reserved for the reporting of GNSS height (HAE) which represents the height above the surface of the WGS-84 ellipsoid and may be used when baro altitude is not available.

Note.— GNSS altitude (MSL) is not accurate enough for use in the position report.

2.3.2.5 *SINGLE ANTENNA FLAG (SAF)*

This 1-bit field shall indicate the type of antenna system that is being used to transmit extended squitters. SAF = 1 shall signify a single transmit antenna. SAF = 0 shall signify a dual transmit antenna system.

At any time that the diversity configuration cannot guarantee that both antenna channels are functional, then the single antenna subfield shall be set to ONE.

2.3.2.6 *SURVEILLANCE STATUS*

The surveillance status field in the airborne position message format shall encode information from the aircraft's Mode A code and SPI condition indication as specified in Annex 10, Volume IV, 3.1.2.8.6.3.1.1.

2.3.3 SURFACE POSITION FORMAT

The surface position squitter shall be formatted as specified in the definition of register number 06_{16} in the following paragraphs.

2.3.3.1 *MOVEMENT*

This 7-bit field shall provide information on the ground speed of the aircraft. A non-linear scale shall be used as defined in the following table where speeds are given in km/h (kt).

Encoding	*Meaning*	*Quantization*
0	no information available	
1	aircraft stopped (ground speed < 0.2315 km/h (0.125 kt))	
2-8	0.2315 km/h (0.125 kt) ≤ ground speed < 1.852 km/h (1 kt)	(in 0.2315 km/h (0.125 kt) steps)
9-12	1.852 km/h (1 kt) ≤ ground speed < 3.704 km/h (2 kt)	(in 0.463 km/h (0.25 kt) steps)

Encoding	*Meaning*	*Quantization*
13-38	3.704 km/h (2 kt) ≤ ground speed < 27.78 km/h (15 kt)	(in 0.926 km/h (0.5 kt) steps)
39-93	27.78 km/h (15 kt) ≤ ground speed < 129.64 km/h (70 kt)	(in 1.852 km/h (1.0 kt) steps)
94-108	129.64 km/h (70 kt) ≤ ground speed < 185.2 km/h (100 kt)	(in 3.704 km/h (2.0 kt) steps)
109-123	185.2 km/h (100 kt) ≤ ground speed < 324.1 km/h (175 kt)	(in 9.26 km/h (5.0 kt) steps)
124	ground speed ≥ 324.1 km/h (175 kt)	
125	Reserved	
126	Reserved	
127	Reserved	

2.3.3.2 *GROUND TRACK (TRUE)*

2.3.3.2.1 *Ground track status*

This 1-bit field shall define the validity of the ground track value. Coding for this field shall be as follows: 0 = invalid and 1 = valid.

2.3.3.2.2 *Ground track value*

This 7-bit (14-20) field shall define the direction (in degrees clockwise from true north) of aircraft motion on the surface. The ground track shall be encoded as an unsigned angular weighted binary numeral, with an MSB of 180 degrees and an LSB of 360/128 degrees, with zero indicating true north. The data in the field shall be rounded to the nearest multiple of 360/128 degrees.

2.3.3.3 *COMPACT POSITION REPORTING (CPR) FORMAT (F)*

The 1-bit (22) CPR format field for the surface position message shall be encoded as specified for the airborne message. That is, F = 0 shall denote an even format coding, while F = 1 shall denote an odd format coding (2.6.7).

2.3.3.4 *TIME SYNCHRONIZATION (T)*

This 1-bit field (21) shall indicate whether or not the time of applicability of the message is synchronized with UTC time. T = 0 shall denote that the time is not synchronized to UTC. T = 1 shall denote that time of applicability is synchronized to UTC time. Synchronization shall only be used for surface position messages having the top two horizontal position precision categories (format type codes 5 and 6).

When T = 1, the time of validity in the surface message format shall be encoded in the 1-bit F field which (in addition to CPR format type) indicates the 0.2 second time tick for UTC time of position validity. The F bit shall alternate between 0 and 1 for successive 0.2 second time ticks, beginning with F = 0 when the time of applicability is an exact even-numbered UTC second.

2.3.3.5 *LATITUDE/LONGITUDE*

The latitude/longitude field in the surface message shall be a 34-bit field containing the latitude and longitude coding of the aircraft's surface position. The latitude (*Y*) and longitude (*X*) shall each occupy 17 bits. The surface latitude and longitude encodings shall contain the low-order 17 bits of the 19-bit CPR-encoded values defined in 2.6.

Note.— The unambiguous range for local decoding of surface messages is 166.5 km (90 NM). The positional accuracy maintained by the surface CPR encoding is approximately 1.25 metres. The latitude/longitude encoding is also a function of the CPR format value (the "F" bit) described above.

2.3.3.5.1 *Extrapolating position (when T = 1)*

This extrapolation shall conform to 2.3.2.3.1 (substitute “surface” for “airborne” where appropriate).

2.3.3.5.2 *Extrapolating position (when T = 0)*

This extrapolation shall conform to 2.3.2.3.2 (substitute “surface” for “airborne” where appropriate).

2.3.3.5.3 *Timeout when new position data are unavailable*

This timeout shall conform to 2.3.2.3.3 (substitute “surface” for “airborne” where appropriate).

2.3.4 IDENTIFICATION AND CATEGORY FORMAT

The identification and category squitter shall be formatted as specified in the definition of BDS 0,8.

2.3.5 AIRBORNE VELOCITY FORMAT

The airborne velocity squitter shall be formatted as specified in the definition of register number 09_{16} and in the following paragraphs.

2.3.5.1 *SUBTYPES 1 AND 2*

Subtypes 1 and 2 of the airborne velocity format shall be used when the transmitting aircraft’s velocity over ground is known. Subtype 1 shall be used at subsonic velocities while subtype 2 shall be used when the velocity exceeds 1 022 kt.

This message shall not be broadcast if the only valid data are the intent change flag and the IFR capability flag (2.3.5.3, 2.3.5.4). After initialization, the broadcast shall be suppressed by loading register 09_{16} with all zeros and then discontinuing the updating of the register until data input is available again.

The supersonic version of the velocity coding shall be used if either the east-west OR north-south velocities exceed 1 022 kt. A switch to the normal velocity coding shall be made if both the east-west AND north-south velocities drop below 1 000 kt.

2.3.5.2 *SUBTYPES 3 AND 4*

Subtypes 3 and 4 of the airborne velocity format shall be used when the transmitting aircraft’s velocity over ground is not known. These subtypes substitute airspeed and heading for the velocity over ground. Subtype 3 shall be used at subsonic velocities, while subtype 4 shall be used when the velocity exceeds 1 022 kt.

This message shall not be broadcast if the only valid data are the intent change flag and the IFR capability flag (2.3.5.3, 2.3.5.4). After initialization, broadcast shall be suppressed by loading register 09_{16} with all zeros and then discontinuing the updating of the register until data input is available again.

The supersonic version of the velocity coding shall be used if the airspeed exceeds 1 022 kt. A switch to the normal velocity coding shall be made if the airspeed drops below 1 000 kt.

2.3.5.3 *INTENT CHANGE FLAG IN AIRBORNE VELOCITY MESSAGES*

An intent change event shall be triggered 4 seconds after the detection of new information being inserted in registers 4,0 to 4,2. The code shall remain set for 18 ± 1 second following an intent change.

Intent change flag coding:
0 = no change in intent
1 = intent change

Note 1.— Register 43_{16} is not included since it contains dynamic data which will be continuously changing.

Note 2.— A four-second delay is required to provide for settling time for intent data derived from manually set devices.

2.3.5.4 *IFR CAPABILITY FLAG (IFR) IN AIRBORNE VELOCITY MESSAGES*

The IFR capability flag shall be a 1-bit (bit 10) subfield in the subtypes 1, 2, 3 and 4 airborne velocity messages. IFR = 1 shall signify that the transmitting aircraft has a capability for applications requiring ADS-B equipage class A1 or above. Otherwise, IFR shall be set to 0.

2.3.5.5 *MAGNETIC HEADING IN AIRBORNE VELOCITY MESSAGES*

2.3.5.5.1 *Magnetic heading status*

This 1-bit field shall define the availability of the magnetic heading value. Coding for this field shall be: 0 = not available and 1 = available.

2.3.5.6 *MAGNETIC HEADING VALUE*

This 10-bit field shall contain the aircraft magnetic heading (in degrees clockwise from magnetic north) when velocity over ground is not available. The magnetic heading shall be encoded as an unsigned angular weighted binary numeral with an MSB of 180 degrees and an LSB of 360/1 024 degrees, with zero indicating magnetic north. The data in the field shall be rounded to the nearest multiple of 360/1 024 degrees.

2.3.5.7 *DIFFERENCE FROM BARO ALTITUDE IN AIRBORNE VELOCITY MESSAGES*

This 8-bit field shall contain the signed difference between barometric and GNSS altitude. (Coding for this field shall be as indicated in Tables 2-9a and 2-9b.)

The difference between baro altitude and GNSS height above ellipsoid (HAE) shall be used if available. If GNSS HAE is not available, GNSS altitude (MSL) shall be used when airborne position is being reported using format type codes 11 through 18.

If airborne position is being reported using format type code 9 or 10, only GNSS (HAE) shall be used. For format type code 9 or 10, if GNSS (HAE) is not available, the field shall be coded with all zeros. The basis for the baro altitude difference (either GNSS (HAE) or GNSS altitude MSL) shall be used consistently for the reported difference.

2.3.6 STATUS REGISTER FORMAT

The status register shall be formatted as specified in the definition of register number 07_{16} and in the following paragraphs.

2.3.6.1 *PURPOSE*

Unlike the other extended squitter registers, the contents of this register shall not be broadcast. The purpose of this register shall be to serve as an interface between the transponder function and the general formatter/manager function (GFM, 2.5). The two fields defined for this format shall be the transmission rate subfield and the altitude type subfield.

2.3.6.2 *TRANSMISSION RATE SUBFIELD (TRS)*

This field is only used for a transponder implementation of extended squitter.

The TRS shall be used to notify the transponder of the aircraft motion status while on the surface. If the aircraft is moving, the surface position squitter shall be broadcast at a rate of twice per second, and identity squitters at a rate of once per 5 seconds. If the aircraft is stationary, the surface position squitter shall be broadcast at a rate of once per 5 seconds and the identity squitter at a rate of once per 10 seconds.

The algorithm specified in the definition of register number 07_{16} shall be used by the GFM (2.5) to determine motion status and the appropriate code shall be set in the TRS subfield. The transponder shall examine the TRS subfield to determine which rate to use when it is broadcasting surface squitters.

2.3.6.3 *ALTITUDE TYPE SUBFIELD (ATS)*

This field shall only be used for a transponder implementation of extended squitter.

The transponder shall load the altitude field of the airborne position squitter from the same digital source as used for addressed replies.

Note.— This is done to minimize the possibility that the altitude in the squitter is different from the altitude that would be obtained by direct interrogation.

If the GFM (2.5) inserts GNSS height (HAE) into the airborne position squitter, it shall instruct the transponder not to insert the baro altitude into the altitude field. The ATS subfield shall be set to ONE for this purpose.

2.3.7 EVENT-DRIVEN PROTOCOL

The event-driven protocol register shall be as specified in the definition of register numbers $0A_{16}$ in 2.5.5 and in the following paragraphs.

2.3.7.1 *PURPOSE*

The event-driven protocol shall be used as a flexible means to support the broadcast of messages beyond those defined for position, velocity, and identification.

Note.— These typically will be messages that are broadcast regularly for a period of time based on the occurrence of an event. An example is the broadcast of emergency/priority status every second during a declared aircraft emergency. A second example is the periodic broadcast of intent information for the duration of the operational condition.

2.3.8 EMERGENCY/PRIORITY STATUS

The emergency/priority status squitter shall be formatted as specified in the definition of register number 61_{16} and in the following paragraphs.

2.3.8.1 *TRANSMISSION RATE*

This message shall be broadcast once per second for the duration of the emergency.

2.3.8.2 *MESSAGE DELIVERY*

Message delivery shall be accomplished using the event-driven protocol (2.3.7). The broadcast of this message shall take priority over the event-driven protocol broadcast of all other message types, as specified in 2.5.5.3.

2.3.9 CURRENT/NEXT TRAJECTORY CHANGE POINT (TCP/TCP+1)

The current/next trajectory change point (TCP) squitter shall be formatted as specified in the definition of register numbers 62_{16} and 63_{16} and in the following paragraphs.

2.3.9.1 *TRANSMISSION RATE*

This message shall be broadcast once per 1.7 seconds for the duration of the operation.

2.3.9.2 *MESSAGE DELIVERY*

Message delivery shall be accomplished using the event-driven protocol (2.3.7).

2.3.9.3 *TRAJECTORY POINT/LEG TYPE*

This 4-bit (7-10) subfield shall be used to identify the type of TCP for which data are being provided in the message. The TCP type subfield shall be encoded as follows:

Encoding	*Meaning*
0000	No specific trajectory change point description information
0001	“Straight” (geodesic) course to a “fly by” waypoint
0010	“Straight” (geodesic) course to a “fly over” waypoint
0011	“Straight” (geodesic) course to a “speed change” waypoint
0100	“Straight” (geodesic) course to a “vertical speed change” waypoint
0101	Arc course to a “fly by” waypoint
0110	Arc course to a “fly over” waypoint
0111	Arc course to a “speed change” waypoint
1000	Arc course to a “vertical speed change” waypoint
1001	Holding pattern to a holding fix
1010	Course FROM the waypoint, termination point unknown
1011	Reserved for future use
1100	Reserved for future use
1101	Reserved for future use
1110	Reserved for future use
1111	Reserved for future use

If the trajectory point/leg can be classified in more than one of the categories identified in the table above, then the type having the largest encoded value shall be used.

2.3.9.4 *TCP DATA VALID*

This 1-bit (11) subfield shall be used to indicate the validity of the TCP/TCP+1 message. A value of ONE shall indicate a valid message. A value of ZERO shall indicate an invalid message.

2.3.9.5 *TCP FORMAT*

This 1-bit (12) subfield shall indicate whether the TCP is specified as position and time (4D), or position only (3D). A value ZERO shall indicate a 4D TCP. A value ONE shall indicate a 3D TCP. The 3D TCP/TCP+1 format shall be used if the distance to the TCP/TCP+1 is greater than 160 NM from the current position of the aircraft transmitting the TCP/TCP+1 message.

2.3.9.6 *TCP/TCP + 1 ALTITUDE*

This 10-bit subfield (13-22) shall be used to provide the binary encoded altitude of the current TCP/TCP+1 message. The altitude subfield shall be encoded as follows:

TCP/TCP + 1 ALTITUDE

Coding (binary)	*Coding (decimal)*	*Meaning (TCP altitude in feet)*
00 0000 0000	0	No TCP altitude information available
00 0000 0001	1	TCP altitude is ZERO
00 0000 0010	2	TCP altitude = 128 feet
00 0000 0011	3	TCP altitude = 256 feet
***	***	***
11 1111 1110	1022	TCP altitude = 130 688 feet
11 1111 1111	1023	TCP altitude > 130 752 feet

2.3.9.7 *TCP/TCP + 1 LATITUDE*

2.3.9.7.1 *4D TCP latitude*

This 14-bit (23-36) subfield shall be used to provide the airborne CPR encoded latitude for the 4D TCP or TCP + 1 message.

Encoding of the 4D TCP/TCP + 1 latitude data shall be accomplished as specified in 2.6.3.

2.3.9.7.2 *3D TCP latitude*

This 17-bit (23-39) subfield shall be used to provide the angular weighted binary encoded latitude for the 3D TCP or TCP + 1 message. The latitude shall be encoded as a 17-bit two's complement signed binary numeral in which the LSB (bit 39) has a weight of 2^{-17} times 360 degrees. North latitudes shall have a positive sign, and south latitudes shall have a negative sign.

2.3.9.8 *TCP/TCP + 1 LONGITUDE*

2.3.9.8.1 *4D TCP/TCP + 1 longitude*

This 14-bit (37-50) subfield shall be used to provide the airborne CPR encoded longitude for the 4D TCP or TCP + 1 message.

Encoding of the 4D TCP/TCP +1 longitude data shall be accomplished as specified in 2.6.3.

2.3.9.8.2 *3D TCP/TCP + 1 longitude*

This 17-bit (40-56) subfield shall be used to provide the angular weighted binary encoded longitude for the 3D TCP or TCP + 1 message. The field shall be encoded as a 17-bit two's complement signed binary numeral, in which the LSB (bit 56) has a weight of 2^{-17} times 360 degrees. The prime (Greenwich) meridian shall be defined as zero longitude. Longitudes to the east of Greenwich shall be positive, and those to the west of Greenwich shall be negative.

2.3.9.9 *TCP/TCP + 1 TIME-TO-GO (TTG)*

This 6-bit (51-56) subfield shall be used to provide the binary encoded time-to-go to the TCP or TCP + 1 message. The TCP time-to-go subfield shall be encoded as follows:

TCP/TCP + 1 time-to-go (TTG)

Coding (binary)	*Coding (decimal)*	*Meaning (TCP/TCP + 1 time-to-go in minutes)*
00 0000	0	No TCP time-to-go information available
00 0001	1	TCP time-to-go is ZERO
00 0010	2	TCP time-to-go = 0.25 minutes
00 0011	3	TCP time-to-go = 0.50 minutes
***	***	***
11 1110	62	TCP time-to-go = 15.25 minutes
11 1111	63	TCP time-to-go > 15.375 minutes

2.3.10 AIRCRAFT OPERATIONAL COORDINATION MESSAGE

The aircraft operational coordination message squitter shall be formatted as specified in the definition of register number 64_{16} and in the following paragraphs.

2.3.10.1 *TRANSMISSION RATE*

This message shall be broadcast once per 5 seconds for the duration of the operation, except that it shall be broadcast once per 2 seconds for 30 seconds when the message content changes.

2.3.10.2 *MESSAGE DELIVERY*

Message delivery shall be accomplished using the event-driven protocol (2.3.7).

2.3.10.3 *PAIRED ADDRESS*

This 24-bit (9-32) subfield shall be used to provide the ICAO 24-bit address of the aircraft that the ADS-B transmitting aircraft is paired with when participating in coordinated operations with another aircraft.

2.3.10.4 *RUNWAY THRESHOLD SPEED*

This 5-bit subfield (33-37) shall be used to provide the runway threshold speed of the aircraft. Encoding of the subfield shall be as follows:

RUNWAY THRESHOLD SPEED

Coding (binary)	*Coding (decimal)*	*Meaning (Runway threshold speed in knots)*
0 0000	0	No runway threshold speed information available
0 0001	1	Runway threshold speed < 100 knots
0 0010	2	Runway threshold speed = 100 knots
0 0011	3	Runway threshold speed = 105 knots
0 0100	4	Runway threshold speed = 110 knots
***	***	***
1 1110	30	Runway threshold speed = 240 knots
1 1111	31	Runway threshold speed > 242.5 knots

Note.— The encoding shown in the table represents positive magnitude data only.

2.3.10.5 *Roll angle sign*

This 1-bit (38) subfield shall be used to provide the direction or sign of the roll angle of the aircraft. Encoding of the subfield shall be as follows:

ROLL ANGLE SIGN BIT

Coding	*Meaning*
0	Roll angle is +, i.e. right wing down
1	Roll angle is –, i.e. left wing down

2.3.10.6 *Roll angle*

This 5-bit subfield (39-43) shall be used to provide the roll angle of the aircraft. Encoding of the subfield shall be as follows:

ROLL ANGLE

Coding (binary)	*Coding (decimal)*	*Meaning (Roll angle in degrees)*
0 0000	0	No roll angle information available
0 0001	1	Roll angle is ZERO
0 0010	2	Roll angle = 1.0 degree
0 0011	3	Roll angle = 2.0 degrees
***	***	***
1 1110	30	Roll angle = 29.0 degrees
1 1111	31	Roll angle > 29.5 degrees

Note.— The encoding shown in the table represents positive magnitude data only. The direction is given completely by the roll angle sign bit.

2.3.10.7 *GO-AROUND*

This 2-bit (44-45) subfield shall be used to indicate the condition when the aircraft is executing a go-around. Encoding of the subfield shall be as follows:

GO-AROUND SUBFIELD

Coding	*Meaning*
0	No information
1	Aircraft IS NOT executing a “go-around”
2	Aircraft IS executing a “go-around”
3	Reserved

2.3.10.8 *ENGINE-OUT*

This 2-bit (46-47) subfield shall be used to indicate an engine-out condition on the aircraft. Encoding of the subfield shall be as follows:

ENGINE-OUT SUBFIELD

Coding	*Meaning*
0	No information
1	Aircraft IS NOT experiencing an engine-out condition
2	Aircraft IS experiencing an engine-out condition
3	Reserved

2.3.11 AIRCRAFT OPERATIONAL STATUS

The aircraft operational status message squitter shall be formatted as specified in the definition of register number 64_{16} and in the following paragraphs.

2.3.11.1 *TRANSMISSION RATE*

This message shall be broadcast once per 1.7 seconds for the duration of the operation.

2.3.11.2 *MESSAGE DELIVERY*

Message delivery shall be accomplished using the event-driven protocol (2.3.7).

2.3.11.3 *EN-ROUTE OPERATIONAL CAPABILITIES (CC-4)*

This 4-bit (9-12) subfield shall be used to indicate en-route operational capabilities of the ADS-B transmitting system to other aircraft as specified by the following encoding.

CC-4 ENCODING: EN-ROUTE OPERATIONAL CAPABILITIES

CC-4 CODING		
Bit 9, 10	*Bit 11, 12*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.4 TERMINAL AREA OPERATIONAL CAPABILITIES (CC-3)

This 4-bit (13-16) subfield shall be used to indicate terminal area operational capabilities of the ADS-B transmitting system to other aircraft as specified by the following encoding.

CC-3 ENCODING: TERMINAL AREA OPERATIONAL CAPABILITIES

CC-3 CODING		
Bit 13, 14	*Bit 15, 16*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.5 *APPROACH AND LANDING OPERATIONAL CAPABILITIES (CC-2)*

This 4-bit (17-20) subfield shall be used to indicate approach and landing operational capabilities of the ADS-B transmitting system to other aircraft as specified by the following encoding.

CC-2 ENCODING: APPROACH AND LANDING OPERATIONAL CAPABILITIES

CC-2 CODING		
Bit 17, 18	*Bit 19, 20*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.6 *SURFACE OPERATIONAL CAPABILITIES (CC-1)*

This 4-bit (21-24) subfield shall be used to indicate surface operational capabilities of the ADS-B transmitting system to other aircraft as specified by the following encoding.

CC-1 ENCODING: SURFACE OPERATIONAL CAPABILITIES

CC-1 CODING		
Bit 21, 22	*Bit 23, 24*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.7 *EN-ROUTE OPERATIONAL CAPABILITY STATUS (OM-4)*

This 4-bit (25-28) subfield shall be used to indicate the en-route operational capability status of the ADS-B transmitting system to other aircraft as specified by the following encoding.

OM-4 ENCODING: EN-ROUTE OPERATIONAL CAPABILITY STATUS

OM-4 CODING		
Bit 25, 26	*Bit 27, 28*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.8 *TERMINAL AREA OPERATIONAL CAPABILITY STATUS (OM-3)*

This 4-bit (29-32) subfield shall be used to indicate the terminal area operational capability status of the ADS-B transmitting system to other aircraft as specified by the following encoding.

OM-3 ENCODING: TERMINAL AREA OPERATIONAL CAPABILITY STATUS

OM-3 CODING		
Bit 29, 30	*Bit 31, 32*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.9 *Approach and landing operational capability status (OM-2)*

This 4-bit (33-36) subfield shall be used to indicate the approach and landing operational capability status of the ADS-B transmitting system to other aircraft as specified by the following encoding.

OM-2 ENCODING: APPROACH AND LANDING OPERATIONAL CAPABILITY STATUS

OM-2 CODING		
Bit 33, 34	*Bit 35, 36*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.3.11.10 *Surface operational capability status (OM-1)*

This 4-bit (37-40) subfield shall be used to indicate the surface operational capability status of the ADS-B transmitting system to other aircraft as specified by the following encoding.

OM-1 ENCODING: SURFACE OPERATIONAL CAPABILITY STATUS

OM-1 CODING		
Bit 37, 38	*Bit 39, 40*	*MEANING*
0 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

0 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 0	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*
1 1	0 0	*Reserved*
	0 1	*Reserved*
	1 0	*Reserved*
	1 1	*Reserved*

2.4 EXTENDED SQUITTER INITIALIZATION AND TIMEOUT

Initialization and timeout functions for extended squitter broadcast shall be performed by the transponder and are specified in Annex 10, 3.1.2.

Note.— A description of these functions is presented in the following paragraphs to serve as reference material for the section on the general formatter/manager (GFM) (see 2.5).

2.4.1 INITIATION OF EXTENDED SQUITTER BROADCAST

At power-up initialization, the transponder shall commence operation in a mode in which it broadcasts only acquisition squitters. The transponder shall initiate the broadcast of extended squitters for airborne position, surface position, airborne velocity and aircraft identification when data are inserted into register numbers 05_{16}, 06_{16}, 09_{16} and 08_{16}, respectively. This determination shall be made individually for each squitter type. The insertion of altitude or surveillance status data into register number 05_{16} by the transponder shall not satisfy the minimum requirement for broadcast of the airborne position squitter.

Note.— This suppresses the transmission of extended squitters from aircraft that are unable to report position, velocity or identity information.

2.4.2 REGISTER TIMEOUT

The transponder shall clear all but the altitude and surveillance status subfields in the airborne position register (register 05_{16}) and all 56 bits of the surface position, squitter status and airborne velocity registers (register numbers 06_{16}, 07_{16} and 09_{16}) if these registers are not updated within two seconds of the previous update. This timeout shall be determined separately for each of these registers. The insertion of altitude or surveillance status data by the transponder into these registers shall not qualify as a register update for the purposes of this timeout condition.

Note 1.— These registers are cleared to prevent the reporting of outdated position, velocity and squitter rate information.

Note 2.— The identification register, 08_{16}, is not cleared since it contains data that rarely changes in flight and is less frequently updated. The event-driven register, $0A_{16}$ or equivalent transmit register, does not need to be cleared since its contents are only broadcast once each time that the register is loaded (2.5.5).

Note 3.— During a register timeout event, the ME field of the extended squitter may contain all zeros, except for any data inserted by the transponder.

2.4.3 Termination of extended squitter broadcast

If input to the register for a squitter type stops for 60 seconds, broadcast of that extended squitter type shall be discontinued until data insertion is resumed. The insertion of altitude by the transponder satisfies the minimum requirement for continuing to broadcast the airborne position squitter.

Note 1.— Until timeout, a squitter type may contain an ME field of all zeros.

Note 2.— Continued transmission for 60 seconds is required so that receiving aircraft will know that the data source for the message has been lost.

2.5 GENERAL FORMATTER/MANAGER (GFM)

The general formatter/manager (GFM) shall format messages for insertion in the transponder registers.

Note.— In addition to data formatting, there are other tasks that are performed by this function.

2.5.1 Navigation source selection

The GFM shall be responsible for the selection of the default source for aircraft position and velocity, the commanded altitude source, and for the reporting of the associated position and altitude errors.

2.5.2 Loss of input data

The GFM shall be responsible for loading the registers for which it is programmed at the required update rate. If for any reason data are unavailable for a time equal to twice the update interval or 2 seconds (whichever is greater), the GFM shall zero old data (on a per field basis) and insert the resulting message into the appropriate register.

For register 05_{16} and 06_{16}, a loss of position data shall cause the GFM to set the format type code to zero as the means of indicating “no position data” since all zeros in the latitude/longitude fields is a legal value.

2.5.3 Special processing for format type code zero

2.5.3.1 *Significance of format type code equal to zero*

Format type code 0 shall signify “no position information”. This shall be used when the latitude/longitude information is not available or invalid and still permit the reporting of baro altitude loaded by the transponder.

Note 1.— The principal use of this message is to provide ACAS the ability to passively receive altitude.

Note 2.— Special handling is required for the airborne and surface position messages because a CPR encoded value of all zeros in the latitude/longitude field is a valid value.

2.5.3.2 *Broadcast of format type code equal to zero*

Format type code 0 shall only be set by the following events:

1) An extended squitter register monitored by the transponder (register numbers 05_{16}, 06_{16}, 07_{16} and 09_{16}) has not been loaded by the GFM for 2 seconds. In this case, the transponder shall clear the entire 56 bits of the register that timed out. In the case of the airborne position register, the altitude subfield shall only be zeroed if no altitude data are available. Transmission of the extended squitter that broadcasts the timed out register shall itself stop in 60 seconds. Broadcast of this extended squitter shall resume when the GFM begins to insert data into the register.

2) The GFM determines that all navigation sources that can be used for the extended squitter airborne or surface position message are either missing or invalid. In this case, the GFM shall clear the format type code and all other fields of the airborne or surface position message and insert this zeroed message in the appropriate register. This shall only be done once so that the transponder can detect the loss of data insertion and suppress the broadcast of the related squitter.

Note.— In all of the above cases, a format type code of zero contains a message of all zeros. The only exception is the airborne position format that may contain barometric altitude and surveillance status data as set by the transponder. There is no analogous case for the other extended squitter message types, since a zero value in any of the fields indicates no information.

2.5.3.3 *RECEPTION OF FORMAT TYPE CODE EQUAL TO ZERO*

If a squitter with a format type code equal to zero is received, it shall be checked to see if the altitude is present. If the altitude is not present, the message shall be discarded. An extended squitter containing format type code zero shall only be used to update the altitude of an aircraft already in track.

2.5.4 TRANSPONDER CAPABILITY REPORTING

The GFM shall be responsible for setting the transponder capability register numbers 10_{16}, and 18_{16} to $1C_{16}$. It shall also clear individual bits in register number 17_{16} in the event of a loss of a data source or an application.

A particular bit shall remain set if at least one field in the corresponding register message is being updated.

2.5.4.1 *COMMON USAGE CAPABILITY REPORT (REGISTER NUMBER 17_{16})*

A bit in register number 17_{16} shall be cleared if there is a loss of corresponding input data (2.5.2) and shall be set when data insertion into the register resumes. Bit 36 of register 10_{16} shall be toggled to indicate a change of capability.

2.5.4.2 *MODE S SPECIFIC SERVICES CAPABILITY REPORT (REGISTER NUMBERS 18_{16} to $1C_{16}$)*

A bit set in one of these registers shall indicate that the service loading the register indicated by that bit has been installed on the aircraft. In this regard, these bits shall not be cleared to reflect a real time loss of an application, as is done for register 17_{16}.

2.5.4.3 *TRANSPONDER MONITORING*

As indicated in 2.4, the transponder's role in this process shall be to serve as a backup in the event of the loss of GFM functionality. For this reason, the transponder shall:

1) clear the extended squitter registers (05_{16}, 06_{16}, 07_{16} and 09_{16}) if they have not been updated in 2 seconds.

2) clear all of the registers loaded by the GFM if it detects a loss of GFM capability (e.g. a bus failure). In this case, it would also clear all of the bits in register number 17_{16} since a bit in this register means "application installed and operational".

The transponder shall not clear the other capability register numbers (18_{16} to $1C_{16}$) since they are intended to mean only "application installed".

2.5.5 HANDLING OF EVENT-DRIVEN PROTOCOL

The event-driven interface protocol provides a general purpose interface into the transponder function for messages beyond those that are regularly transmitted all the time (provided input data are available). This protocol shall operate by having the transponder broadcast a message once each time the event-driven register is loaded by the GFM.

Note.— This gives the GFM complete freedom in setting the update rate (up to a maximum) and duration of broadcast for applications such as emergency status and intent reporting.

In addition to formatting, the GFM shall control the timing of message insertion so that it provides the necessary pseudo-random timing variation and does not exceed the maximum transponder broadcast rate for the event-driven protocol.

2.5.5.1 *TRANSPONDER SUPPORT FOR EVENT-DRIVEN MESSAGES*

A message shall only be transmitted once by the transponder each time that register number $0A_{16}$ is loaded. Transmission shall be delayed if the transponder is busy at the time of insertion.

Note 1.— Delay times are short. They are usually a maximum of several milliseconds for the longest transponder transaction.

The maximum transmission rate for the event-driven protocol shall be limited by the transponder to twice per second. If a message is inserted in the event-driven register and cannot be transmitted due to rate limiting, it shall be held and transmitted when the rate limiting condition has cleared. If a new message is received before transmission is permitted, it shall overwrite the earlier message.

Note 2.— The squitter transmission rate and the duration of squitter transmissions are application dependent. The minimum rate and duration consistent with the needs of the application should be chosen.

2.5.5.2 *GFM USE OF EVENT-DRIVEN PROTOCOL*

An application that selects the event-driven protocol shall notify the GFM of the format type and required update rate. The GFM shall then locate the necessary input data for this format type and begin inserting data into register number $0A_{16}$ at the required rate. The GFM shall also insert this message into the register for this format type. This register image shall be maintained to allow read-out of this information by air-ground or air-air register read-out. When broadcast of a format type ceases, the GFM shall clear the corresponding register assigned to this message.

The maximum rate that shall be supported by the event-driven protocol is twice per second from one or a collection of applications. For each event-driven format type being broadcast, the GFM shall retain the time of the last insertion into register number $0A_{16}$. The next insertion shall be scheduled at a random interval that shall be uniformly distributed over the range of the update interval ± 0.1 second (using a time quantization no greater than 15 ms) relative to the previous insertion into register number $0A_{16}$ for this format type.

The GFM shall monitor the number of insertions scheduled in any one second interval. If more than two would occur, it shall add a delay as necessary to ensure that the limit of two messages per second is observed.

2.5.5.3 *EVENT-DRIVEN PRIORITY*

If the event-driven message transmission rate must be reduced in order not to exceed the maximum rate specified in 2.5.5.2, transmission priority shall be assigned as follows:

1) If the emergency/priority status message (2.3.8) is active, it shall be transmitted at the specified rate of once per second. Other active event-driven messages shall be assigned equal priority for the remaining capacity.

2) If the emergency/priority status message is not active, transmission priority shall be allocated equally to all active event-driven messages.

2.5.6 DERIVATION OF MODE FIELD BITS FOR AIRCRAFT INTENTION PARAMETERS

For aircraft architectures that do not present the GFM with a dedicated status word (containing the mode field definitions associated with aircraft intention parameters), the GFM shall derive the status from each of the appropriate FCC status words in order to set the respective bits in each of the mode fields of the register number 40_{16}.

2.6 LATITUDE/LONGITUDE CODING USINGCOMPACT POSITION REPORTING (CPR)

2.6.1 PRINCIPLE OF THE CPR ALGORITHM

The Mode S extended squitters use compact position reporting (CPR) to encode latitude and longitude efficiently into messages.

Notes.—

1. *The resulting messages are compact in the sense that several higher-order bits, which are normally constant for long periods of time, are not transmitted in every message. For example, in a direct binary representation of latitude, one bit would designate whether the aircraft is in the northern or southern hemisphere. This bit would remain constant for a long time, possibly the entire life of the aircraft. To repeatedly transmit this bit in every position message would be inefficient.*

2. *Because the higher-order bits are not transmitted, it follows that multiple locations on the earth will produce the same encoded position. If only a single position message were received, the decoding would involve ambiguity as to which of the multiple solutions is the correct location of the aircraft. The CPR technique includes a provision to enable a receiving system to unambiguously determine the location of the aircraft. This is done by encoding in two ways that differ slightly. The two formats, called even-format and odd-format, are each transmitted 50 per cent of the time. Upon reception of both types within a short period (approximately 10 seconds), the receiving system can unambiguously determine the location of the aircraft.*

3. *Once this process has been carried out, the higher-order bits are known at the receiving station, so subsequent single message receptions serve to unambiguously indicate the location of the aircraft as it moves.*

4. *In certain special cases, a single reception can be decoded into the correct location without an even/odd pair. This decoding is based on the fact that the multiple locations are spaced by at least 360 NM. In addition to the correct locations, the other locations are separated by integer multiples of 360 NM to the north and south and also integer multiples of 360 NM to the east and west. In a special case in which it is known that reception is impossible beyond a range of 180 NM, the nearest solution is the correct location of the aircraft.*

5. *The parameter values in the preceding paragraph (360 and 180 NM) apply to the airborne CPR encoding. For aircraft on the surface, the CPR parameters are smaller by a factor of 4. This encoding yields better resolution but reduces the spacing of the multiple solutions.*

2.6.2 CPR ALGORITHM PARAMETERS AND INTERNAL FUNCTIONS

The CPR algorithm shall utilize the following parameters whose values are set as follows for the Mode S extended squitter application:

a) The number of bits used to encode a position coordinate, *Nb*, is set as follows:

For airborne encoding: $Nb = 17$

For surface encoding: $Nb = 19$

For TCP, TCP+1 encoding: $Nb = 14$.

Note 1.— The Nb *parameter determines the encoded position precision (approximately 5 m for the airborne encoding, 1.25 m for the surface encoding, and 41 m for the TCP, TCP+1 encoding).*

b) The number of geographic latitude zones between the equator and a pole, denoted *NZ*, is set to 15.

Note 2.— The NZ *parameter determines the unambiguous airborne range for decoding (360 NM). The surface latitude/longitude encoding omits the high-order 2 bits of the 19-bit CPR encoding, so the effective unambiguous range for surface position reports is 90 NM.*

The CPR algorithm shall define internal functions to be used in the encoding and decoding processes.

c) The notation **floor**(x) denotes the floor of x, which is defined as the greatest integer value k such that $k \leq x$.

*Note 3.— For example, **floor**(3.8) = 3, while **floor**(–3.8) = –4.*

d) The notation $|x|$ denotes the absolute value of x, which is defined as the value x when $x \geq 0$ and the value $-x$ when $x < 0$.

e) The notation **MOD**(x,y) denotes the "modulus" function, which is defined to return the value

$\mathrm{MOD}(x,y) = x - y \cdot \mathrm{floor}\left(\frac{x}{y}\right)$ where $y \neq 0$.

Note 4.— The value y *is always positive in the following CPR algorithms. When* x *is non-negative, **MOD***(x,y) *is equivalent to the remainder of* x *divided by* y. *When* x *represents a negative angle, an alternative way to calculate **MOD***(x,y) *is to return the remainder of* (x+360°) *divided by* y.

For example, MOD(–40°,6°) = MOD(320°,6°) = 2°.

f) The notation **NL**(x) denotes the "number of longitude zones" function of the latitude angle x. The value returned by **NL**(x) is constrained to the range from 1 to 59. **NL**(x) is defined for most latitudes by the equation,

$$\mathrm{NL}(lat) = \mathrm{floor}\left(2\pi \cdot \left[\mathrm{arc\ cos}\left(\frac{1-\cos\left(\frac{\pi}{2 \cdot NZ}\right)}{\cos^2\left(\frac{\pi}{180^\circ} \cdot |lat|\right)}\right)\right]^{-1}\right),$$

where *lat* denotes the latitude argument in degrees. For latitudes at or near the N or S pole, where the above formula would either be undefined or yield **NL**(*lat*) = 0, the value returned by the NL( ) function shall be 1. Likewise, at the equator, where the above formula might otherwise yield NL(*lat*) = 60, the value returned by the NL( ) function shall be 59.

Note 5.— This equation for NL( ) is impractical for real time implementation. A table of transition latitudes can be pre-computed using the following equation:

$$lat = \frac{180^\circ}{\pi} \cdot \mathrm{arc\ cos}\left(\sqrt{\frac{1-\cos\left(\frac{\pi}{2 \cdot NZ}\right)}{1-\cos\left(\frac{2\pi}{NL}\right)}}\right) \text{ for } NL = 2 \text{ to } 4 \cdot NZ - 1,$$

and a table search procedure used to obtain the return value for NL( ). The table value for NL = 1 is 90 degrees.

2.6.3 CPR ENCODING PROCESS

The CPR encoding process shall calculate the encoded position values XZ_i and YZ_i for either airborne, surface or TCP, TCP+1 latitude and longitude fields from the global position *lat* (latitude in degrees), *lon* (longitude in degrees), and the CPR encoding type i (0 for even format and 1 for odd format), by performing the following sequence of computations. The CPR encoding for TCP, TCP+1 shall always use the even format (i = 0), whereas the airborne and surface encoding shall use both even (i = 0) and odd (i = 1) formats.

a) Δlat_i (the latitude zone size in the N-S direction) is computed from the equation:

$$\Delta lat_i = \frac{360^\circ}{4 \cdot NZ - i}$$

YZ_i (the Y-coordinate within the Zone) is then computed from Δlat_i and *lat* using separate equations:

For airborne encoding: $YZ_i = \mathrm{floor}\left(2^{17} \cdot \frac{\mathrm{MOD}(lat, \Delta lat_i)}{\Delta lat_i} + \frac{1}{2}\right)$

For surface encoding: $YZ_i = \text{floor}\left(2^{19} \cdot \frac{\text{MOD}(lat,\Delta lat_i)}{\Delta lat_i} + \frac{1}{2}\right)$

For TCP, TCP+1 encoding: $YZ_0 = \text{floor}\left(2^{14} \cdot \frac{\text{MOD}(lat,\Delta lat_0)}{\Delta lat_i} + \frac{1}{2}\right)$

b) $Rlat_i$ (the latitude that a receiving ADS-B system will extract from the transmitted message) is then computed from *lat*, YZ_i, and Δlat_i using separate equations:

For airborne encoding: $Rlat_i = \Delta lat_i \cdot \left(\frac{YZ_i}{2^{17}} + \text{floor}\left(\frac{lat}{\Delta lat_i}\right)\right)$

For surface encoding: $Rlat_i = \Delta lat_i \cdot \left(\frac{YZ_i}{2^{19}} + \text{floor}\left(\frac{lat}{\Delta lat_i}\right)\right)$

For TCP, TCP+1 encoding: $Rlat_0 = \Delta lat_0 \cdot \left(\frac{YZ_i}{2^{14}} + \text{floor}\left(\frac{lat}{\Delta lat_0}\right)\right)$

c) Δlon_i (the longitude zone size in the E-W direction) is then computed from $Rlat_i$ using the equation:

$$\Delta lon_i = \begin{cases} \dfrac{360°}{\text{NL}(Rlat_i) - i} & \text{when } \text{NL}(Rlat_i) - i > 0 \\ 360°, & \text{when } \text{NL}(Rlat_i) - i = 0 \end{cases}$$

d) XZ_i (the X-coordinate within the Zone) is then computed from *lon* and Δlon_i using separate equations:

For airborne encoding: $XZ_i = \text{floor}\left(2^{17} \cdot \frac{\text{MOD}(lon,\Delta lon_i)}{\Delta lon_i} + \frac{1}{2}\right)$

For surface encoding: $XZ_i = \text{floor}\left(2^{19} \cdot \frac{\text{MOD}(lon,\Delta lon_i)}{\Delta lon_i} + \frac{1}{2}\right)$

For TCP, TCP+1 encoding: $XZ_0 = \text{floor}\left(2^{14} \cdot \frac{\text{MOD}(lon,\Delta lon_0)}{\Delta lon_0} + \frac{1}{2}\right)$

e) Finally, limit the values of XZ_i and YZ_i to fit in the 17-bit or 14-bit field allotted to each coordinate:

For airborne encoding: $YZ_i = \text{MOD}(YZ_i, 2^{17})$,
$XZ_i = \text{MOD}(XZ_i, 2^{17})$

For surface encoding: $YZ_i = \text{MOD}(YZ_i, 2^{17})$,
$XZ_i = \text{MOD}(XZ_i, 2^{17})$

For TCP, TCP+1 encoding: $YZ_0 = \text{MOD}(YZ_0, 2^{14})$,
$XZ_0 = \text{MOD}(XZ_0, 2^{14})$

2.6.4 LOCALLY UNAMBIGUOUS CPR DECODING

The CPR algorithm shall decode a geographic position (latitude, $Rlat_i$, and longitude, $Rlon_i$,) that is locally unambiguous with respect to a reference point (lat_s, lon_s) known to be within 180 NM of the true airborne position (or within 45 NM for a surface message).

Note.— This reference point may be a previously tracked position that has been confirmed by global decoding (see 2.6.7) or it may be the own-aircraft position, which would be used for decoding a new tentative position report.

The encoded position coordinates XZ_i and YZ_i and the CPR encoding type i (0 for the even encoding and 1 for the odd encoding) contained in a Mode S extended squitter message shall be decoded by performing the sequence of computations given in 2.6.5 for the airborne and TCP, TCP+1 format types and in 2.6.6 for the surface format type.

2.6.5 COMPUTATIONS FOR THE AIRBORNE MESSAGE AND TCP, TCP+1 MESSAGE

The following computations shall be performed to obtain the decoded latitude/longitude for the airborne and TCP, TCP+1 message formats. For the TCP, TCP+1 format, i shall always be set to 0 (even encoding), whereas the airborne format shall use both even (i = 0) and odd (i = 1) encoding. For the airborne format, Nb shall equal 17, and for the TCP, TCP+1 format, Nb shall equal 14.

a) Δlat_i is computed from the equation:

$$\Delta lat_i = \frac{360°}{4 \cdot NZ - i}$$

b) The latitude zone index number, j, is then computed from the values of lat_s, Δlat_i and YZ_i using the equation:

$$j = \text{floor}\left(\frac{lat_s}{\Delta lat_i}\right) + \text{floor}\left(\frac{1}{2} + \frac{\text{MOD}(lat_s, \Delta lat_i)}{\Delta lat_i} - \frac{YZ_i}{2^{Nb}}\right)$$

c) The decoded position latitude, $Rlat_i$, is then computed from the values of j, Δlat_i, and YZ_i using the equation:

$$Rlat_i = \Delta lat_i \cdot \left(j + \frac{YZ_i}{2^{Nb}}\right)$$

d) Δlon_i (the longitude zone size in the E-W direction) is then computed from $Rlat_i$ using the equation:

$$\Delta lon_i = \begin{cases} \dfrac{360°}{\text{NL}(Rlat_i) - i}, & \text{when } \text{NL}(Rlat_i) - i > 0 \\ 360°, & \text{when } \text{NL}(Rlat_i) - i = 0 \end{cases}$$

e) The longitude zone coordinate m is then computed from the values of lon_s, Δlon_i, and XZ_i using the equation:

$$m = \text{floor}\left(\frac{lon_s}{\Delta lon_i}\right) + \text{floor}\left(\frac{1}{2} + \frac{\text{MOD}(lon_s, \Delta lon_i)}{\Delta lon_i} - \frac{YZ_i}{2^{Nb}}\right)$$

f) The decoded position longitude, $Rlon_i$, is then computed from the values of m, XZ_i, and Δlon_i using the equation:

$$Rlon_i = \Delta lon_i \cdot \left(m + \frac{YZ_i}{2^{Nb}}\right)$$

2.6.6 COMPUTATIONS FOR THE SURFACE MESSAGE

The following computations shall be performed to obtain the decoded latitude and longitude for the surface position format.

a) Δlat_i is computed from the equation:

$$\Delta lat_i = \frac{90°}{4 \cdot NZ - i}$$

b) The latitude zone index, j, is then computed from the values of lat_s, Δlat_i and YZ_i using the equation:

$$j = \text{floor}\left(\frac{lat_s}{\Delta lat_i}\right) + \text{floor}\left(\frac{1}{2} + \frac{\text{MOD}(lat_s, \Delta lat_i)}{\Delta lat_i} - \frac{YZ_i}{2^{17}}\right)$$

c) The decoded position latitude, $Rlat_i$, is then computed from the values of j, Δlat_i, and YZ_i using the equation:

$$Rlat_i = \Delta lat_i \cdot \left(j + \frac{YZ_i}{2^{17}}\right)$$

d) Δlon_i (the longitude zone size, in the E-W direction) is then computed from $Rlat_i$ using the equation:

$$\Delta lon_i = \begin{cases} \dfrac{90°}{\text{NL}(Rlat_i) - i}, & \text{when } \text{NL}(Rlat_i) - i > 0 \\ 90°, & \text{when } \text{NL}(Rlat_i) - i = 0 \end{cases}$$

e) The longitude zone coordinate m is then computed from the values of lon_s, Δlon_i, and XZ_i using the equation:

$$m = \text{floor}\left(\frac{lon_s}{\Delta lon_i}\right) + \text{floor}\left(\frac{1}{2} + \frac{\text{MOD}(lon_s, \Delta lon_i)}{\Delta lon_i} - \frac{YZ_i}{2^{17}}\right)$$

f) The decoded position longitude, $Rlon_i$, is then computed from the values of m, XZ_i, and Δlon_i using the equation:

$$Rlon_i = \Delta lon_i \cdot \left(m + \frac{YZ_i}{2^{17}}\right)$$

2.6.7 GLOBALLY UNAMBIGUOUS AIRBORNE POSITION DECODING

The CPR algorithm shall utilize one airborne-encoded “**even**” format reception (denoted XZ_0, YZ_0), together with one airborne-encoded “**odd**” format reception (denoted XZ_1, YZ_1), to regenerate the global geographic position latitude, *Rlat*, and longitude, *Rlon*. The time between the “**even**” and “**odd**” format encoded position reports shall be no longer than 10 seconds.

Note 1.— This algorithm might be used to obtain globally unambiguous position reports for aircraft out of the range of ground sensors, whose position reports are coming via satellite data links. It might also be applied to ensure that local positions are being correctly decoded over long ranges from the receiving sensor.

Note 2.— The time difference limit of 10 seconds between the even- and odd-format position reports is determined by the maximum permitted separation of 3 NM. Positions greater than 3 NM apart cannot be used to solve a unique global position. An aircraft capable of a speed of 1 850 km/h (1 000 kt) will fly about 5.1 km (2.8 NM) in 10 seconds. Therefore, the CPR algorithm will be able to unambiguously decode its position over a 10-second delay between position reports.

Given a 17-bit airborne position encoded in the “**even**” format (XZ_0, YZ_0) and another encoded in the “**odd**” format (XZ_1, YZ_1), separated by no more than 10 seconds (= 3 NM), the CPR algorithm shall regenerate the geographic position from the encoded position reports by performing the following sequence of steps:

a) Compute Δlat_0 and Δlat_1 from the equation:

$$\Delta lat_i = \frac{360°}{4 \cdot NZ - i}$$

b) Compute the latitude index:

$$j = \text{floor}\left(\frac{59 \cdot YZ_0 - 60 \cdot YZ_1}{2^{17}} + \frac{1}{2}\right)$$

c) Compute the values of $Rlat_0$ and $Rlat_1$ using the following equation:

$$Rlat_i = \Delta lat_i \cdot \left(\text{MOD}(j, 60 - i) + \frac{YZ_i}{2^{17}}\right)$$

Southern hemisphere values of $Rlat_i$ will fall in the range from 270° to 360°. Subtract 360° from such values, thereby restoring $Rlat_i$ to the range from –90° to +90°.

d) If **NL**($Rlat_0$) is not equal to **NL**($Rlat_1$) then the two positions straddle a transition latitude, thus a solution for global longitude is not possible. Wait for positions where they are equal.

e) If **NL**($Rlat_0$) is equal to **NL**($Rlat_1$) then proceed with computation of Δlon_i, according to whether the most recently received airborne position message was encoded with the even format (i = 0) or the odd format (i = 1) :

$$\Delta lon_i = \frac{360°}{n_i},$$

where n_i = greater of [NL($Rlat_i$) – i] and 1.

f) Compute m, the longitude index:

$$m = \text{floor}\left(\frac{XZ_0 \cdot (NL - 1) - XZ_1 \cdot NL}{2^{17}} + \frac{1}{2}\right),$$

where NL = NL ($Rlat_i$).

g) Compute the global longitude, $Rlon_0$ or $Rlon_1$, according to whether the most recently received airborne position message was encoded using the even format (that is, with i = 0) or the odd format (i = 1):

$$Rlon_i = \Delta lon_i \cdot \left(\text{MOD}(m, n_i) + \frac{YZ_i}{2^{17}}\right),$$

where n_i = greater of [NL($Rlat_i$) – i] and 1.

2.6.8 CPR DECODING OF RECEIVED POSITION REPORTS

2.6.8.1 *OVERVIEW*

The techniques described in the preceding paragraphs (locally and globally unambiguous decoding) shall be used together to decode the latitude/longitude contained in airborne, surface, and TCP or TCP+1 position reports. The process shall begin with globally unambiguous decoding based upon the receipt of an even and an odd encoded position squitter. Once the globally unambiguous position is determined, either of two approaches shall be used to support subsequent decoding based upon a single position report, either even or odd encoding. The two techniques shall be range monitoring and emitter centered local decoding.

2.6.8.2 *Range monitoring local decoding*

2.6.8.2.1 *Range monitoring technique*

In this approach, local decoding for the airborne format (2.6.4) shall be performed based upon the current position of the receiver. This shall provide the position of a transmitting aircraft that is unambiguous to plus or minus 180 NM.

Note 1.— If the transmitting aircraft is within 180 NM, the local decoding technique will correctly decode the location of the aircraft.

The range of the transmitting aircraft shall be checked at detection and tracks shall only be initiated if the range is less than 180 NM. Once initiated, the range of the tracked aircraft shall be checked at each update and the track shall be dropped if the range becomes equal to or greater than 180 NM.

For the surface format, the same process shall be used except that the transmitting aircraft must be within 45 NM for detection and tracking.

Note 2.— The range limits are reduced since the ambiguity limit for the surface position reports is one-fourth that of the airborne case.

2.6.8.2.2 *Range monitoring example*

2.6.8.2.2.1 Decoding of airborne position

2.6.8.2.2.1.1 *Detection.* At detection, a globally unambiguous decode shall be performed. If range is greater than 160 NM, the detection attempt shall be discontinued and the track information discarded. Detection shall be attempted if squitters continue to be received. If the globally decoded range remains greater than 160 NM, the track information shall continue to be discarded.

Note.— If the aircraft is approaching, detection will succeed when the range decreases to less than or equal to 160 NM.

2.6.8.2.2.1.2 *Track monitoring.* After detection, range shall be monitored during each surveillance update. If range is greater than 170 NM, the track shall be dropped.

Note.— The use of 160 NM for detection and 170 NM for track drop provides hysteresis that avoids reacquiring a track that was just dropped due to long range. Thus a track dropped at 170 NM would not be reacquired unless its range dropped to less than or equal to 160 NM.

2.6.8.2.2.2 *Decoding of surface position.* Using the range monitoring technique for decoding squitters in the surface format, the same process as above shall be used except that the track shall be initiated at 40 NM and dropped at 42.5 NM.

2.6.8.2.3 Emitter centered local decoding

In this approach, the most recent position of the emitter shall be used as the basis for the local decoding.

Note.— This produces an unambiguous decoding at each update, since the transmitting aircraft cannot move more than 360 NM between position updates.

2.6.8.2.4 *Technique application*

The range monitoring technique shall only be used for ranges less than or equal to 180 NM, for example in air-to-air applications. For ground stations (i.e. non-aircraft implementations) that are required to operate at ranges in excess of 180 NM, only the emitter centred technique can shall be used.

Note.— The emitter centered technique can be used for both airborne receivers and ground stations.

TABLES FOR SECTION 2

Tables are numbered 2-X where "X" is the decimal equivalent of the BDS code Y,Z where Y is the BDS1 code and Z is the BDS2 code, used to access the data format for a particular register. The following tables are not included:

2-1
2-2 to 2-4 (Used by the linked Comm-B protocol)
2-13 to 2-14 (Reserved for air/air state information)
2-15 (Reserved for ACAS)
2-17 to 2-22
2-35 (Reserved for antenna position)
2-36 (Reserved for aircraft parameters)
2-38 to 2-47
2-49 to 2-63
2-70 to 2-71
2-73 to 2-79
2-87 to 2-94
2-102 to 2-111 (Reserved for extended squitter)
2-112 to 2-224
2-225 to 2-226 (Reserved for Mode S byte)
2-227 to 2-240
2-243 to 2-255

Table 2-5. BDS code 0,5 — Extended squitter airborne position

MB FIELD

Bit	Field
1–5	FORMAT TYPE CODE (specified in 2.3.1)
6–7	SURVEILLANCE STATUS (specified in 2.3.2.6)
8	SINGLE ANTENNA FLAG (SAF) (specified in 2.3.2.5)
9–20	ALTITUDE (specified by the format type code) This is (1) the altitude code (AC) as specified in 3.1.2.6.5.4 of Annex 10, Volume IV but with the M-bit removed or (2) the GNSS height (HAE)
21	TIME (T) (specified in 2.3.2.2)
22	CPR FORMAT (F) (specified in 2.3.2.1)
23	MSB
23–39	ENCODED LATITUDE (CPR airborne format specified in 2.6.1 to 2.6.5)
39	LSB
40	MSB
40–56	ENCODED LONGITUDE (CPR airborne format specified in 2.6.1 to 2.6.5)
56	LSB

PURPOSE: To provide accurate airborne position information.

Surveillance status shall be coded as follows:

0 = No condition information
1 = Permanent alert (emergency condition)
2 = Temporary alert (change in Mode A identity code other than emergency condition)
3 = SPI condition

Codes 1 and 2 shall take precedence over code 3.

When horizontal position information is unavailable, but altitude information is available, the airborne position message shall be transmitted with a format type code of zero in bits 1-5 and the barometric pressure altitude in bits 9 to 20. If neither horizontal position nor barometric altitude information is available, then all 56 bits of BDS 0,5 shall be zeroed. The zero format type code field shall indicate that latitude and longitude information is unavailable, while the zero altitude field shall indicate that altitude information is unavailable.

Table 2-6. BDS code 0,6 — Extended squitter surface position

MB FIELD

Bit	Field
1	
2	FORMAT TYPE CODE
3	(specified in 2.2.3.1)
4	
5	
6	
7	
8	
9	MOVEMENT
10	(specified in 2.3.3.1)
11	
12	
13	STATUS for ground track: 0 = Invalid, 1 = Valid
14	MSB = 180
15	
16	(specified in 2.3.3.2)
17	GROUND TRACK (TRUE)
18	
19	
20	LSB = 360/128
21	TIME (T) (specified in 2.3.2.2)
22	CPR FORMAT (F) (specified in 2.3.2.1)
23	MSB
24	
25	
26	
27	
28	
29	ENCODED LATITUDE 17 bits
30	(specified in 2.6.1 to 2.6.4 and 2.6.6)
31	
32	
33	
34	
35	
36	
37	
38	
39	LSB
40	MSB
41	
42	
43	
44	
45	
46	ENCODED LONGITUDE 17 bits
47	(specified in 2.6.1 to 2.6.4 and 2.6.6)
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB

PURPOSE: To provide accurate surface position information.

Table 2-7. BDS code 0,7 — Extended squitter status

MB FIELD

1	TRANSMISSION RATE
2	SUBFIELD (TRS)
3	ALTITUDE TYPE SUBFIELD (ATS)
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	RESERVED
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	

PURPOSE: To provide information on the capability and status of the extended squitter rate of the transponder.

Transmission rate subfield (TRS) shall be coded as follows:

0 = No capability to determine surface squitter rate
1 = High surface squitter rate selected
2 = Low surface squitter rate selected
3 = Reserved

Altitude type subfield (ATS) shall be coded as follows:

0 = Barometric altitude
1 = GNSS height (HAE)

Aircraft determination of surface squitter rate:

For aircraft that have the capability to automatically determine their surface squitter rate, the method used to switch between the high and low transmission rates shall be as follows:

a) Switching from high to low rate: Aircraft shall switch from high to low rate when the on-board navigation unit reports that the aircraft's position has not changed more than 10 metres in a 30 second sampling interval. The algorithm used to control the squitter rate shall save the aircraft's position at the time that low rate is selected.

b) Switching from low to high rate: Aircraft shall switch from low to high rate as soon as the aircraft's position has changed by 10 metres or more since the low rate was selected

For transponder-based implementations, the automatically selected transmission rate shall be subject to being overridden by commands received from ground control.

Table 2-8. BDS code 0,8 — Extended squitter aircraft identification and category

MB FIELD

1		
2	FORMAT TYPE CODE	
3	(specified in 2.2.3.1)	
4		
5		
6	AIRCRAFT CATEGORY	
7		
8		
9	MSB	
10		
11		CHARACTER 1
12		
13		
14		
15	MSB	
16		
17		CHARACTER 2
18		
19		
20		
21	MSB	
22		
23		CHARACTER 3
24		
25		
26		
27	MSB	
28		
29		CHARACTER 4
30		
31		
32		
33	MSB	
34		
35		CHARACTER 5
36		
37		
38		
39	MSB	
40		
41		CHARACTER 6
42		
43		
44		
45	MSB	
46		
47		CHARACTER 7
48		
49		
50		
51	MSB	
52		
53		CHARACTER 8
54		
55		
56		

PURPOSE: To provide aircraft identification and category.

Note.— Since there is no internationally agreed criteria for wake vortex categorization, code 4 (set "A") should be interpreted as indicating a medium category aircraft exhibiting higher than typical wake vortex characteristics.

Format type shall be coded as follows:

1 = Identification, aircraft category set D
2 = Identification, aircraft category set C
3 = Identification, aircraft category set B
4 = Identification, aircraft category set A

Aircraft/vehicle category shall be coded as follows:

Set A

0 = No aircraft category information
1 = Light (<15 500 lbs or 7 031 kg)
2 = Medium 1 (15 500 to 75 000 lbs or 7 031 to 34 019 kg)
3 = Medium 2 (75 000 to 300 000 lbs or 34 019 to 136 078 kg)
4 = High vortex aircraft
5 = Heavy (>300 000 lbs or 136 078 kg)
6 = High performance (>5 g acceleration) and high speed (> 400 kt)
7 = Rotorcraft

Set B

0 = No aircraft category information
1 = Glider/sailplane
2 = Lighter-than-air
3 = Parachutist/skydiver
4 = Ultralight/hang-glider/paraglider
5 = Reserved
6 = Unmanned aerial vehicle
7 = Space/transatmospheric vehicle

Set C

0 = No aircraft category information
1 = Surface vehicle – emergency vehicle
2 = Surface vehicle – service vehicle
3 = Fixed ground or tethered obstruction
4 - 7 = Reserved

Set D: Reserved

Aircraft identification coding shall be:

As specified in Table 2-32.

Table 2-9a. BDS code 0,9 — Extended squitter airborne velocity (Subtypes 1 and 2: velocity over ground)

MB FIELD

1	MSB	1		
2		0		
3	FORMAT TYPE CODE = 19	0		
4		1		
5	LSB	1		
6	SUBTYPE 1	0	SUBTYPE 2	0
7		0		1
8		1		0
9	INTENT CHANGE FLAG (specified in 2.3.5.3)			
10	IFR CAPABILITY FLAG			
11	NAVIGATION UNCERTAINTY			
12	CATEGORY – VELOCITY			
13	(NUC_R)			
14	DIRECTION BIT for E-W velocity: 0 = East, 1 = West			
15	EAST-WEST VELOCITY			
16	NORMAL: LSB = 1 knot		SUPERSONIC: LSB = 4 knots	
17	All zeros = no velocity information		All zeros = no velocity information	
18	Value	Velocity	Value	Velocity
19	1	0 kt	1	0 kt
20	2	1 kt	2	4 kt
21	3	2 kt	3	8 kt
22	–	–	–	–
23	1 022	1 021 kt	1 022	4 084 kt
24	1 023	>1 021.5 kt	1 023	>4 086 kt
25	DIRECTION BIT for N-S Velocity, 0 = North, 1 = South			
26	NORTH-SOUTH VELOCITY			
27	NORMAL: LSB = 1 knot		SUPERSONIC: LSB = 4 knots	
28	All zeros = no velocity information		All zeros = no velocity information	
29	Value	Velocity	Value	Velocity
30	1	0 kt	1	0 kt
31	2	1 kt	2	4 kt
32	3	2 kt	3	8 kt
33	–	–	–	–
34	1 022	1 021 kt	1 022	4 084 kt
35	1 023	>1 021.5 kt	1 023	>4 086 kt
36	SOURCE BIT for vertical rate: 0 = GNSS, 1 = Baro			
37	SIGN BIT for vertical rate: 0 = Up, 1 = Down			
38	VERTICAL RATE			
39	All zeros = no vertical rate information; LSB = 64 ft/min			
40	Value	Vertical rate		
41	1	0 ft/min		
42	2	64 ft/min		
43		–		
44	510	32 576 ft/min		
45	511	>32 608 ft/min		
46				
47	RESERVED FOR TURN INDICATOR			
48				
49	GNSS ALT. SIGN BIT: 0 = Above baro alt, 1 = Below baro alt			
50	GNSS ALT. DIFFERENCE FROM BARO. ALT.			
51	All zeros = no information; LSB = 25 ft			
52	Value		Difference	
53	1		0 ft	
54	2		25 ft	
55	–		–	
56	126		3 125 ft	
	127		>3 137.5 ft	

PURPOSE: To provide additional state information for both normal and supersonic flight.

Subtype shall be coded as follows:

Code	Velocity	Type
0	Reserved	
1	Ground Speed	Normal
2		Supersonic
3	Airspeed, Heading	Normal
4		Supersonic
5	Reserved	
6	Reserved	
7	Reserved	

IFR capability shall be coded as follows:

0 = Transmitting aircraft has no capability for ADS-B-based conflict detection or higher level applications.

1 = Transmitting aircraft has capability for ADS-B-based conflict detection and higher level applications.

NUC shall be coded as follows:

NUC_R	Horizontal Velocity Error (95%)	Vertical Velocity Error (95%)
0	Unknown	Unknown
1	<10 m/s	<15.2 m/s (50 fps)
2	<3 m/s	<4.6 m/s (15 fps)
3	<1 m/s	<1.5 m/s (5 fps)
4	<0.3 m/s	<0.46 m/s (1.5 fps)

Table 2-9b. BDS code 0,9 — Extended squitter airborne velocity (Subtypes 3 and 4: airspeed and heading)

MB FIELD

1	MSB	1		
2		0		
3	FORMAT TYPE CODE = 19	0		
4		1		
5	LSB	1		
6	SUBTYPE 3	0	SUBTYPE 4	1
7		1		0
8		1		0
9	INTENT CHANGE FLAG (specified in 2.3.5.3)			
10	IFR CAPABILITY FLAG			
11	NAVIGATION UNCERTAINTY			
12	CATEGORY – VELOCITY			
13	(NUC_R)			
14	STATUS BIT – 0 = Magnetic heading not available, 1 = available			
15	MSB = 180°			
16				
17				
18	MAGNETIC HEADING (specified in 2.3.5.5)			
19				
20				
21				
22				
23				
24	LSB = 360/1 024°			
25	AIRSPEED TYPE: 0 = IAS, 1 = TAS			
26	AIRSPEED			
27	NORMAL: LSB = 1 knot		SUPERSONIC: LSB = 4 knots	
28	All zeros = no velocity information		All zeros = no velocity information	
29	Value	Velocity	Value	Velocity
30	1	0 kt	1	0 kt
31	2	1 kt	2	4 kt
32	3	2 kt	3	8 kt
33	–	–	–	–
34	1 022	1 021 kt	1 022	4 084 kt
35	1 023	>1 021.5 kt	1 023	>4 086 kt
36	SOURCE BIT FOR VERTICAL RATE: 0 = GNSS, 1 = Baro			
37	SIGN BIT FOR VERTICAL RATE: 0 = Up, 1 = Down			
38	VERTICAL RATE			
39	All zeros = no vertical rate information; LSB = 64 ft/min			
40	Value	Vertical rate		
41	1	0 ft/min		
42	2	64 ft/min		
43	–	–		
44	510	32 576 ft/min		
45	511	>32 608 ft/min		
46				
47	RESERVED FOR TURN INDICATOR			
48				
49	DIFFERENCE SIGN BIT (0 = Above baro alt, 1 = Below baro alt)			
50	GEOMETRIC HEIGHT DIFFERENCE FROM BARO. ALT.			
51	All zeros = no information; LSB = 25 ft			
52	Value	Difference		
53	1	0ft		
54	2	25 ft		
55	–	–		
56	126	3 125 ft		
	127	>3 137.5 ft		

PURPOSE: To provide additional state information for both normal and supersonic flight based on airspeed and heading.

This format shall only be used if velocity over ground is not available.

Subtype shall be coded as follows:

Code	Velocity	Type
0	Reserved	
1	Ground speed	Normal
2		Supersonic
3	Airspeed, heading	Normal
4		Supersonic
5	Reserved	
6	Reserved	
7	Reserved	

IFR capability shall be coded as follows:

0 = Transmitting aircraft has no capability for ADS-B-based conflict detection or higher level applications.

1 = Transmitting aircraft has capability for ADS-B-based conflict detection and higher level applications.

Table 2-10. BDS code 0,A — Extended squitter event-driven information

MB FIELD

1	
2	
3	
4	
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6	
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9	
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11	
12	
13	
14	
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16	
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32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	

PURPOSE: To provide a flexible means to squitter messages other than position, velocity and identification.

1) A message inserted in this register (or an equivalent transmit buffer) shall be broadcast once by the transponder at the earliest opportunity.

2) Formats for messages using this protocol shall be specified in BDS 6,1 to 6,F.

3) The GFM (2.5) shall be responsible for ensuring pseudo-random timing and for observing the maximum transmission rate for this register of 2 per second (2.5.5.1).

4) Read-out (if required) of this register shall be accomplished by extracting the contents of the appropriate BDS register 6,1 to 6,F.

Note.— The data in this register is not intended for extraction using the GICB or ACAS cross-link protocols.

Table 2-11. BDS code 0,B — Air/air state information 1 (aircraft state)

MB FIELD

1	STATUS
2	MSB = 1 024 kt
3	
4	
5	
6	TRUE AIR SPEED
7	
8	
9	Range = [0-,2 047 kt]
10	
11	
12	LSB = 1,0 kt
13	SWITCH (0 = Magnetic heading, 1 = True heading)
14	STATUS
15	SIGN
16	MSB = 90 degrees
17	
18	HEADING
19	
20	
21	Range = [–180, + 179]
22	
23	
24	LSB = 360/1 024 degrees
25	STATUS
26	SIGN
27	MSB = 90 degrees
28	
29	
30	
31	
32	TRUE TRACK ANGLE
33	
34	
35	Range = [–180, +179]
36	
37	
38	
39	
40	LSB = 360/32 768 degrees
41	MSB = 1 024 kt
42	
43	
44	
45	
46	GROUND SPEED
47	
48	
49	Range = [0, 2 047]
50	
51	
52	
53	
54	
55	LSB = 1/16 kt
56	RESERVED

PURPOSE: To report threat aircraft state information in order to improve the ability of ACAS to evaluate the threat and select a resolution manoeuvre.

Table 2-12. BDS code 0,C — Air/air state information 2 (aircraft intent)

MB FIELD

1	STATUS
2	MSB = 51 200 ft
3	
4	
5	LEVEL OFF ALTITUDE
6	
7	Range = [0, 102 375]
8	
9	
10	
11	
12	
13	LSB = 16 ft
14	STATUS
15	SIGN
16	MSB = 90 degrees
17	
18	
19	NEXT COURSE (TRUE GROUND TRACK)
20	Range = [+179, –180]
21	
22	
23	
24	LSB = 360/1 024 degrees
25	STATUS
26	MSB = 128 seconds
27	
28	
29	TIME TO NEXT WAYPOINT
30	All ones = time exceeds 254 seconds
31	
32	Range = [0, 254]
33	
34	LSB = 1 second
35	STATUS
36	SIGN
37	MSB 8 192 ft/min
38	
39	VERTICAL VELOCITY (UP IS POSITIVE)
40	
41	
42	Range = [+16 352, –16 352]
43	
44	LSB = 32 ft/min
45	STATUS
46	SIGN
47	MSB = 45 degrees
48	
49	ROLL ANGLE
50	Range = [+89, –89]
51	
52	
53	LSB = 360/256 degrees
54	MIL INTERCEPT BIT (0 = no intercept; 1 = intercept)
55	
56	RESERVED

PURPOSE: To provide threat aircraft intent information in order to improve the ability of ACAS to evaluate the threat and select a resolution manoeuvre.

Table 2-16. BDS code 1,0 — Data link capability report

MB FIELD

1–8	BDS code 1,0
9	Continuation flag (see 9)
10–15	RESERVED
16	Reserved for ACAS
17–23	Mode S subnetwork version number
24	Transponder enhanced protocol indicator (see 4)
25	Mode S specific services capability (see 2)
26–28	Uplink ELM capability
29–32	Downlink ELM capability
33	Aircraft identification capability
34	Squitter capability subfield (SCS) (see 5)
35	Surveillance identifier (SI) (see 6)
36	Common usage GICB capability report (see 7)
37–40	RESERVED FOR ACAS
41	MSB
41–56	Bit array indicating the support status of DTE subaddresses 0 to 15 (see 3 and 8)
56	LSB

PURPOSE: To report the data link capability of the Mode S transponder/data link installation.

The coding of this register shall conform to:

1) Annex 10, Volume III, 5.2.9.

2) When bit 25 is set to 1, it shall indicate that at least one Mode S specific service is supported and the particular capability reports shall be checked.

Note.— Registers accessed by BDS codes 0,2; 0,3; 0,4; 1,0; 2,0 and 3,0 do not affect the setting of bit 25.

3) Starting from the MSB, each subsequent bit position shall represent the DTE subaddress in the range from 0 to 15.

4) The enhanced protocol indicator shall denote a Level 5 transponder when set to 1 and a Level 2 to 4 transponder when set to 0.

5) The squitter capability subfield (SCS) shall be interpreted as follows:

0 = squitter registers are not updated
1 = squitter registers are being updated

6) The surveillance identifier (SI) bit shall be interpreted as follows:

0 = no surveillance identifier code capability
1 = surveillance identifier code capability

7) Bit 36 shall be toggled each time the common usage GICB capability report (BDS code 1,7) changes. To avoid the generation of too many broadcast capability report changes, BDS code 1,7 shall be sampled at approximately one minute intervals to check for changes.

8) The current status of the on-board DTE shall be periodically reported to the GDLP by on-board sources. Since a change in this field results in a broadcast of the capability report, status inputs shall be sampled at approximately one minute intervals.

9) In order to determine the extent of any continuation of the data link capability report (into those registers reserved for this purpose: BDS 1,1 to BDS 1,6), bit 9 shall be reserved as a ‘continuation flag’ to indicate if the subsequent register shall be extracted. For example: upon detection of bit 9 = 1 in BDS 1,0 then BDS 1,1 shall be extracted. If bit 9 = 1 in BDS 1,1 then BDS 1,2 shall be extracted, and so on (up to BDS 1,5). Note that if bit 9 = 1 in BDS 1,6 then this shall be considered as an error condition.

Table 2-23. BDS code 1,7 — Common usage GICB capability report

MB FIELD

1	0,5 Extended squitter airborne position
2	0,6 Extended squitter ground position
3	0,7 Extended squitter status
4	0,8 Extended squitter type and identification
5	0,9 Extended squitter airborne velocity information
6	0,A Extended squitter event-driven information
7	2,0 Aircraft identification
8	2,1 Aircraft registration number
9	4,0 Aircraft intention
10	4,1 Next waypoint identifier
11	4,2 Next way-out position
12	4,3 Next way-out information
13	4,4 Meteorological routine report
14	4,5 Meteorological hazard report
15	4,8 VHF channel report
16	5,0 Track and turn report
17	5,1 Position coarse
18	5,2 Position fine
19	5,3 Air-referenced state vector
20	5,4 Waypoint 1
21	5,5 Waypoint 2
22	5,6 Waypoint 3
23	5,F Quasi-static parameter monitoring
24	6,0 Heading and speed report
25	Reserved for aircraft capability
26	Reserved for aircraft capability
27	E,1 Reserved for Mode S byte
28	E,2 Reserved for Mode S byte
29–56	RESERVED

PURPOSE: To indicate common usage GICB services currently supported.

1) Each bit position shall indicate that the associated BDS is available in the aircraft installation when set to 1.

2) Registers 1,8 to 1,C shall be independent of register 1,7

All registers shall be constantly monitored at a rate consistent with their individual required update rate and the corresponding capability bit shall be set to 1 only when valid data is being input to that register at the required rate or above.

The capability bit shall be set to a 1 if at least one field in the register is receiving valid data at the required rate with the status bits for all fields not receiving valid data at the required rate set to ZERO.

Tables 2-24 to 2-28. BDS codes 1,8 to 1,C — Mode S specific services GICB capability reports

MB FIELD

1	MSB
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
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41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB

PURPOSE: To indicate GICB services that are installed.

Each bit position shall indicate that the GICB service that it represents has been implemented in the aircraft installation when set to 1.

Starting from the LSB, each bit position shall represent the register number, in accordance with the following table:

BDS code	Capability installed for
BDS 1,8	BDS 0,1 to 3,8
BDS 1,9	BDS 3,9 to 7,0
BDS 1,A	BDS 7,1 to A,8
BDS 1,B	BDS A,9 to E,0
BDS 1,C	BDS E,1 to F,F

The 25 most significant bits of BDS 1,C shall not be used.

Tables 2-29 to 2-31. BDS codes 1,D to 1,F — Mode S specific services MSP capability reports

MB FIELD

1	MSB	
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		UPLINK
15		MSP
16		CHANNELS
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28	LSB	
29	MSB	
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		DOWNLINK
42		MSP
43		CHANNELS
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56	LSB	

PURPOSE: To indicate MSP services that are installed and require a service.

Each bit shall indicate that the MSP it represents requires service when set to 1.

Starting from the MSB, each bit position shall represent the MSP channel number for both uplink and downlink channel fields, in accordance with the following table:

BDS code	MSP channels
BDS 1,D	1 to 28 up and down
BDS 1,E	29 to 56 up and down
BDS 1,F	57 to 63 up and down

1) In BDS 1,F the least significant bits of both uplink and downlink channel fields shall not be used.

2) The conditions for setting the capability bits shall be as defined in the specification of the corresponding service, see section 3.

Table 2-32. BDS code 2,0 — Aircraft identification

MB FIELD

Bit		
1		
2		
3		
4	BDS code 2,0	
5		
6		
7		
8		
9	MSB	
10		
11		CHARACTER 1
12		
13		
14	LSB	
15	MSB	
16		
17		CHARACTER 2
18		
19		
20	LSB	
21	MSB	
22		
23		CHARACTER 3
24		
25		
26	LSB	
27	MSB	
28		
29		
30		CHARACTER 4
31		
32	LSB	
33	MSB	
34		
35		CHARACTER 5
36		
37		
38	LSB	
39	MSB	
40		
41		CHARACTER 6
42		
43		
44	LSB	
45	MSB	
46		
47		CHARACTER 7
48		
49		
50	LSB	
51	MSB	
52		
53		CHARACTER 8
54		
55		
56	LSB	

PURPOSE: To report aircraft identification to the ground.

1) Annex 10, Volume IV, 3.1.2.9.

2) The character coding to be used shall be identical to that defined in Table 3-6 of Chapter 3, Annex 10, Volume IV.

3) This data may be input to the transponder from sources other than the Mode S ADLP.

4) This format shall be used by the extended squitter application.

5) Capability to support this register shall be indicated by setting bit 33 in BDS 1,0 and the relevant bits in BDS 1,7 and 1,8.

6) The aircraft identification shall be that employed in the flight plan. When no flight plan is available the registration marking of the aircraft shall be used.

Table 2-33. BDS code 2,1 — Aircraft and airline registration markings

MB FIELD

1	STATUS	
2	MSB	
3		
4	CHARACTER 1	
5		
6		
7	LSB	
8	MSB	
9		
10	CHARACTER 2	
11		
12		
13	LSB	
14	MSB	
15		
16	CHARACTER 3	
17		
18		
19	LSB	
20	MSB	
21		
22	CHARACTER 4	AIRCRAFT
23		REGISTRATION
24		NUMBER
25	LSB	
26	MSB	
27		
28	CHARACTER 5	
29		
30		
31	LSB	
32	MSB	
33		
34	CHARACTER 6	
35		
36		
37	LSB	
38	MSB	
39		
40	CHARACTER 7	
41		
42		
43	LSB	
44	STATUS	
45	MSB	
46		
47	CHARACTER 1	
48		
49		
50	LSB	ICAO AIRLINE
51	MSB	REGISTRATION
52		MARKING
53	CHARACTER 2	
54		
55		
56	LSB	

PURPOSE: To permit ground systems to identify the aircraft without the necessity of compiling and maintaining continuously updated data banks.

The character coding shall be as defined in Table 3-6 of Chapter 3, Annex 10, Volume IV.

Table 2-34. BDS code 2,2 — Antenna positions

MB FIELD

1		
2	ANTENNA TYPE	
3		
4	MSB = 32 m	
5		
6	X POSITION	
7	Range = [1,63]	ANTENNA 1
8		
9	LSB = 1 m	
10	MSB = 16 m	
11		
12	Z POSITION	
13	Range = [1,31]	
14	LSB = 1 m	
15		
16	ANTENNA TYPE	
17		
18	MSB = 32 m	
19		
20	X POSITION	
21	Range = [1, 63]	ANTENNA 2
22		
23	LSB = 1 m	
24	MSB = 16 m	
25		
26	Z POSITION	
27	Range = [1, 31]	
28	LSB = 1 m	
29		
30	ANTENNA TYPE	
31		
32	MSB = 32 m	
33		
34	X POSITION	
35	Range = [1, 63]	ANTENNA 3
36		
37	LSB = 1 m	
38	MSB = 16 m	
39		
40	Z POSITION	
41	Range = [1, 31]	
42	LSB = 1 m	
43		
44	ANTENNA TYPE	
45		
46	MSB = 32 m	
47		
48	X POSITION	
49	Range = [1, 63]	ANTENNA 4
50		
51	LSB = 1 m	
52	MSB = 16 m	
53		
54	Z POSITION	
55	Range = [1, 31]	
56	LSB = 1 m	

PURPOSE: To provide information on the position of Mode S and GNSS antennas on the aircraft in order to make very accurate measurements of aircraft position possible.

1) The antenna type field shall be interpreted as follows:

   0 = Invalid
   1 = Mode S bottom antenna
   2 = Mode S top antenna
   3 = GNSS antenna
   4 to 7 = Reserved

2) The X position field shall be the distance in metres along the aircraft centre line measured from the nose of the aircraft. The field shall be interpreted as invalid if the value is 0 and the value of 63 shall mean that the antenna position is 63 metres or more from the nose.

3) The Z position field shall be the distance in metres of the antenna from the ground, measured with the aircraft unloaded and on the ground. The field shall be interpreted as invalid if the value is 0 and the value 31 shall mean that the antenna position is 31 metres or more from the ground.

Table 2-37. BDS code 2,5 — Aircraft type

MB FIELD

Bit	Subfield	
1	MSB	
2		
3	AIRCRAFT TYPE	
4		
5		
6	LSB	
7	MSB	
8	NUMBER OF ENGINES	
9	LSB	
10	MSB	
11		
12	ENGINE TYPE	
13		
14		
15	LSB	
16	MSB	
17		
18	CHARACTER 1	
19		
20		
21	LSB	
22	MSB	
23		
24	CHARACTER 2	
25		
26		
27	LSB	
28	MSB	
29		
30	CHARACTER 3	MODEL
31		DESIGNATION
32		
33	LSB	
34	MSB	
35		
36		
37	CHARACTER 4	
38		
39	LSB	
40	MSB	
41		
42	CHARACTER 5	
43		
44		
45	LSB	
46	MSB	
47		
48	WAKE TURBULENCE	
49	CATEGORY	
50		
51	LSB	
52		
53		
54	RESERVED	
55		
56		

PURPOSE: To provide information on aircraft type.

1) Subfield coding

The coding shall be as in Doc 8643 — *Aircraft Type Designators*. All the subfields that contain characters shall be encoded using the 6-bit subset of 1A-5 as specified in Table 3-6 of Annex 10, Volume IV.

2) Model designation

Coding shall consist of four characters as specified in Doc 8643. The fifth character shall be reserved for future expansion and shall contain all zeros until it is specified. 2222 in the first four characters shall mean that the designator is not specified.

3) Number of engines

This subfield shall be encoded as a binary number where number 7 means 7 or more engines.

Table 2-48. BDS code 3,0 — ACAS active resolution advisory

MB FIELD

Bit	Field
1–8	BDS code 3,0
9–22	ACTIVE RESOLUTION ADVISORIES
23–26	RACs RECORD
27	RA TERMINATED
28	MULTIPLE THREAT ENCOUNTER
29–30	THREAT-TYPE INDICATOR
31–56	THREAT IDENTITY DATA

PURPOSE: To report resolution advisories (RAs) generated by ACAS equipment. The coding of this register shall conform to:

1) Annex 10, Volume IV, 4.3.8.4.2.2.

2) Bit 27 shall mean RA terminated when set to 1.

Table 2-64 BDS 4,0 — Selected Vertical Intention

MB FIELD

1	STATUS
2	MSB = 32 768 ft
3	
4	MCP/FCU SELECTED ALTITUDE
5	
6	
7	
8	Range = 0 to 65 520 ft (Resolution)
9	
10	
11	
12	
13	LSB = 16 ft (Resolution)
14	STATUS
15	MSB = 32 768 ft
16	
17	FMS SELECTED
18	ALTITUDE
19	
20	
21	Range = 0 to 65 520 ft
22	
23	
24	
25	
26	LSB = 16 ft (Resolution)
27	STATUS
28	MSB = 204.8 mb
29	
30	
31	
32	
33	
34	Range = 0 to 409.5 mb
35	
36	
37	
38	
39	BAROMETRIC
40	LSB = 0.1 mb (Resolution) PRESSURE SETTING MINUS 800 mb
41	
42	
43	
44	RESERVED
45	
46	
47	
48	STATUS OF MCP/FCU MODE BITS
49	VNAV MODE
50	ALT HOLD MODE
51	APPROACH MODE
52	
53	RESERVED
54	STATUS OF TARGET ALT SOURCE BITS
55	TARGET ALTITUDE SOURCE
56	TARGET ALTITUDE SOURCE

PURPOSE: To provide ready access to information about the pilot's current vertical intentions, in order to improve the effectiveness of conflict probes and to provide additional tactical information to controllers.

1) Target altitude shall be the short-term intent value, at which the aircraft will level off (or has levelled off) at the end of the current manoeuvre. The data source that the aircraft is currently using to determine the target altitude shall be indicated in the altitude source bits (54 to 56) as detailed below.

   Note.— This information which represents the real "aircraft intent", when available, represented by the altitude control panel selected altitude, the flight management system selected altitude, or the current aircraft altitude according to the aircraft's mode of flight (the intent may not be available at all when the pilot is flying the aircraft).

2) The data entered into bits 1 to 13 shall be derived from the mode control panel/flight control unit or equivalent equipment. Alerting devices may be used to provide data if it is not available from "control" equipment. The associated mode bits for this field (48 to 51) shall be as detailed below.

3) The data entered into bits 14 to 26 shall be derived from the flight management system or equivalent equipment managing the vertical profile of the aircraft.

4) The current barometric pressure setting shall be calculated from the value contained in the field (bits 28 to 39) plus 800 mb.

   When the barometric pressure setting is less than 800 mb or greater than 1 209.5 mb, the status bit for this field (bit 27) shall be set to indicate invalid data.

5) Bits 48 to 56 shall indicate the status of the values provided in bits 1 to 26 as follows:

   Bit 48 shall indicate whether the mode bits (49, 50 and 51) are actively being populated:

   0 = No mode information provided
   1 = Mode information deliberately provided

   Bits 49, 50 and 51:

   0 = Not active
   1 = Active

   Bit 54 shall indicate whether the target altitude source bits (55 and 56) are actively being populated.

   0 = No source information provided
   1 = Source information deliberately provided

   Bits 55 and 56, shall indicate target altitude source:

   00 = Unknown
   01 = Aircraft altitude
   10 = FCU/MCP selected altitude
   11 = FMS selected altitude

Tables 2-65 to 2-67. BDS codes 4,1 to 4,3 — Next waypoint details

PURPOSE: To provide ready access to details about the next waypoint on an aircraft's route, without the need to establish a data link dialogue with the flight management system. This will assist with short- and medium-term tactical control. Register BDS code 4,1 contains 9 characters in the compressed 6-bit character form giving the waypoint name.

	BDS code 4,1 MB FIELD		BDS code 4,2 MB FIELD		BDS code 4,3 MB FIELD
1	STATUS	1	STATUS	1	STATUS
2	MSB	2	SIGN	2	SIGN
3		3	MSB = 90 degrees	3	MSB = 90 degrees
4	CHARACTER 1	4		4	BEARING TO WAYPOINT
5		5		5	
6		6		6	
7	LSB	7		7	
8	MSB	8	WAYPOINT	8	
9		9	LATITUDE	9	
10	CHARACTER 2	10		10	Range = [–180, +180]
11		11		11	
12		12		12	LSB = 360/2 048 degrees
13	LSB	13		13	STATUS
14	MSB	14	Range = [–180, +180]	14	MSB = 204.8 min
15		15		15	
16	CHARACTER 3	16		16	
17		17		17	
18		18		18	TIME TO GO
19	LSB	19		19	
20	MSB	20	LSB = 90/131 072 degrees	20	
21		21	STATUS	21	
22	CHARACTER 4	22	SIGN	22	
23		23	MSB = 90 degrees	23	Range = [0,409.6]
24		24		24	
25	LSB	25		25	LSB = 0.1 min
26	MSB	26		26	STATUS
27		27		27	MSB = 3 276.8 NM
28	CHARACTER 5	28	WAYPOINT	28	
29		29	LONGITUDE	29	
30		30		30	
31	LSB	31		31	
32	MSB	32		32	
33		33		33	DISTANCE TO GO
34	CHARACTER 6	34		34	
35		35		35	
36		36	Range = [–180, +180]	36	
37	LSB	37		37	
38	MSB	38		38	Range = [0, 6 553.6]
39		39		39	
40	CHARACTER 7	40	LSB = 90/131 072 degrees	40	
41		41	STATUS	41	
42		42	SIGN	42	LSB = 0.1 NM
43	LSB	43	MSB = 65 536 ft	43	
44	MSB	44		44	
45		45		45	
46	CHARACTER 8	46	WAYPOINT	46	
47		47	CROSSING	47	
48		48	ALTITUDE	48	
49	LSB	49		49	
50	MSB	50		50	RESERVED
51		51		51	
52	CHARACTER 9	52	Range = [0, 131 068]	52	
53		53		53	
54		54		54	
55	LSB	55		55	
56	RESERVED	56	LSB = 8 ft	56	

Table 2-68. BDS code 4,4 — Meteorological routine air report

MB FIELD

1	
2	FOM/SOURCE
3	
4	
5	STATUS (wind speed and direction)
6	MSB = 256 kt
7	
8	
9	WIND SPEED
10	
11	
12	Range = [0, 512]
13	
14	LSB = 1 kt
15	SIGN
16	MSB = 90 degrees
17	
18	WIND DIRECTION (True)
19	
20	
21	Range = [–180, +180]
22	
23	LSB = 180/256 degrees
24	STATUS
25	SIGN
26	MSB = 64°C
27	
28	
29	STATIC AIR TEMPERATURE
30	
31	
32	Range = [–128, +128]
33	
34	LSB = 0.25°
35	STATUS
36	MSB = 1 024 hPa
37	
38	
39	
40	AVERAGE STATIC PRESSURE
41	
42	
43	Range = [0,2 048]
44	
45	
46	LSB = 1 hPa
47	STATUS
48	TURBULENCE (see 1)
49	
50	STATUS
51	MSB = 100%
52	
53	Range = [0, 100]
54	HUMIDITY
55	
56	LSB = 100/64%

PURPOSE: To allow meteorological data to be collected by ground systems.

FOM/SOURCE coding:

The decimal value of the binary coded (figure of merit) FOM/SOURCE parameter shall be interpreted as follows:

0 = Invalid
1 = INS
2 = GNSS
3 = DME/DME
4 = VOR/DME
5 to 15 = Reserved

1) The interpretation of the two bits assigned to TURBULENCE shall be as shown in the table for BDS code 4,5.

Note.— The average static pressure is not a requirement of ICAO Annex 3.

Table 2-69. BDS code 4,5 — Meteorological hazard report

MB FIELD

1	STATUS
2	TURBULENCE
3	
4	STATUS
5	WIND SHEAR
6	
7	STATUS
8	MICROBURST
9	
10	STATUS
11	ICING
12	
13	STATUS
14	WAKE VORTEX
15	
16	STATUS
17	SIGN
18	MSB = 64°C
19	STATIC AIR TEMPERATURE
20	
21	
22	Range = [–128, +128]
23	
24	
25	
26	LSB = 0.25°C
27	STATUS
28	MSB = 1 024 hPa
29	
30	
31	
32	AVERAGE STATIC PRESSURE
33	
34	
35	
36	Range = [0, 2 048]
37	
38	LSB = 1 hPa
39	STATUS
40	MSB = 32 768 ft
41	
42	
43	RADIO HEIGHT
44	
45	
46	
47	Range = [0, 65 528]
48	
49	
50	
51	LSB = 16 ft
52	
53	
54	RESERVED
55	
56	

PURPOSE: To provide reports on the severity of meteorological hazards, in particular for low flight.

Hazard coding:

The interpretation of the two bits assigned to each hazard shall be as defined in the table below:

Bit 1	**Bit 2**	
0	0	NIL
0	1	LIGHT
1	0	MODERATE
1	1	SEVERE

The definition of the terms LIGHT, MODERATE and SEVERE shall be those defined in the PANS-ATM (Doc 4444), where applicable.

Table 2-72. BDS code 4,8 — VHF channel report

MB FIELD

Bit	Field
1–15	VHF 1
16	STATUS
17–18	VHF 1 AUDIO STATUS
19–33	VHF 2
34	STATUS
35–36	VHF 2 AUDIO STATUS
37–51	VHF 3
52	STATUS
53–54	VHF 3 AUDIO STATUS
55–56	121.5 MHz AUDIO STATUS

PURPOSE: To allow the ATC system to monitor the settings of the VHF communications channel and to determine the manner in which each channel is being monitored by the aircrew.

Channel report coding:
Each VHF communications channel shall be determined from the 15-bit positive binary number, N in kHz, according to the formula.

Channel (MHz) = Base + N $\times$ 0.001 (MHz)

where Base = 118.000 MHz

Notes.—

1) The use of binary to define the channel improves the coding efficiency.

2) This coding is compatible with analogue channels on 25 kHz, 8.33 kHz channel spacing and VDL as described below.

3) VDL has a full four bits allocated such that the active status of each of its four multiplex channels can be ascertained.

25 kHz VDL: Mode 3

Bit	
16	Status
15	MSB (12 800 kHz)
...	range 118.000 to 143.575 136.975 (military uses)
6	LSB (25 kHz)
5	4 × channel active flags
4	
3	
2	
1	VDL indicator = 1

25 kHz analogue

Bit	
16	Status
15	MSB (12 800 kHz)
...	range 118.000 to 143.575 136.975 (military uses)
6	LSB (25 kHz)
5	unused
4	unused
3	unused
2	8.33 indicator = 0
1	VDL indicator = 0

8.33 kHz analogue

Bit	
16	Status
15	MSB (17 066 kHz)
...	range 118.000 to 152.112 136.975 (military uses)
4	LSB (17 066/2 048 kHz)
3	unused
2	8.33 indicator = 1
1	VDL indicator = 0

Audio status coding:

Each pair of audio status bits shall be used to describe the aircrew monitoring of that audio channel according to the following table:

Bit 1	Bit 2	
0	0	UNKNOWN
0	1	NOBODY
1	0	HEADPHONES ONLY
1	1	LOUDSPEAKER

Table 2-80. BDS code 5,0 — Track and turn report

MB FIELD

1	STATUS
2	SIGN 1 = Left (left wing down)
3	MSB = 45 degrees
4	
5	ROLL ANGLE
6	
7	
8	Range = [–90, +90]
9	
10	
11	LSB = 45/256 degrees
12	STATUS
13	SIGN 1 = West (e.g. 315° = –45°)
14	MSB = 90 degrees
15	
16	
17	TRUE TRACK ANGLE
18	
19	
20	Range = [–180, +180]
21	
22	
23	LSB = 90/512 degrees
24	STATUS
25	MSB = 1 024 kt
26	
27	
28	GROUND SPEED
29	
30	
31	Range = [0, 2 046]
32	
33	
34	LSB = 1 024/512 kt
35	STATUS
36	SIGN 1 = Minus
37	MSB = 8 degrees/second
38	
39	TRACK ANGLE RATE
40	
41	
42	Range = [–16, +16]
43	
44	
45	LSB = 8/256 degrees/second
46	STATUS
47	MSB = 1 024 kt
48	
49	TRUE AIRSPEED
50	
51	
52	Range = [0, 2 046]
53	
54	
55	
56	LSB = 1 023/512 kt

PURPOSE: To provide track and turn data to the ground systems.

1) The maximum acceptable data age at time of transmission to the ground shall be 1 second for all parameters.

2) The register update rate shall be sufficient to ensure that the maximum acceptable data age of all parameters is not exceeded in normal operations.

3) If maximum acceptable data age is exceeded for any parameter, then the status bit for that parameter shall be actively set to 0 by the GFM.

   Note.— This applies if any parameter becomes unavailable due to abnormal operations.

4) If the value of a parameter from the data source exceeds the range allowable in the register definition, the maximum allowable value in the correct positive or negative sense shall be used instead.

   Note.— This requires active intervention by the GFM.

5) The data entered into this register shall, whenever possible, be derived from the sources that are controlling the aircraft.

6) If any parameter is not available on an aircraft, all bits corresponding to that parameter shall be actively set to 0 by the BDS servicing process.

7) The LSB of all fields shall be obtained by rounding.

Table 2-81. BDS code 5,1 — Position report coarse

MB FIELD

1	STATUS (see 1)
2	SIGN
3	MSB = 90 degrees
4	
5	
6	
7	
8	
9	LATITUDE
10	
11	
12	
13	
14	Range = [–180, +180]
15	(see 2)
16	
17	
18	
19	
20	
21	LSB = 360/1 048 576 degrees
22	SIGN
23	MSB = 90 degrees
24	
25	
26	
27	
28	LONGITUDE
29	
30	
31	
32	
33	
34	Range = [–180, +180]
35	
36	
37	
38	
39	
40	
41	LSB = 360/1 048 576 degrees
42	SIGN
43	MSB = 65 536 ft
44	
45	
46	
47	PRESSURE
48	ALTITUDE
49	
50	Range = [–1 000, +126 752]
51	
52	
53	
54	
55	
56	LSB = 8 ft

PURPOSE: To provide a three-dimensional report of aircraft position.

1) The single status bit (bit 1) shall be set to 0 if any of the three parameters are invalid and is identical to the status bit in BDS 5,2.

2) The required valid range for latitude is +90 degrees to –90 degrees, but the parameter shall be coded with an MSB of 90 degrees to allow the use of the same coding algorithm as for longitude.

3) The source of the information in this register shall be the same as that indicated in the FOM/SOURCE field of BDS 5,2.

Table 2-82. BDS code 5,2 — Position report fine

MB FIELD

Bit	Field
1	STATUS (see 1)
2	FOM/SOURCE
3	
4	
5	
6	MSB = 90/128 degrees
7	
8	
9	
10	
11	LATITUDE FINE
12	
13	
14	
15	
16	Range = [0, 180/128]
17	
18	
19	
20	
21	
22	
23	LSB = 90/16 777 216 degrees
24	MSB = 90/128 degrees
25	
26	
27	
28	LONGITUDE FINE
29	
30	
31	Range = [0, 180/128]
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	LSB = 90/16 777 216 degrees
42	SIGN
43	MSB = 65 536 ft
44	
45	
46	
47	PRESSURE
48	ALTITUDE
49	or
50	GNSS HEIGHT (HAE)
51	Range = [–1 000, 126 752]
52	
53	
54	
55	
56	LSB = 8 ft

PURPOSE: To provide a high-precision three-dimensional report on aircraft position when used in conjunction with BDS 5,1. Information on the source of the data is included.

FOM/SOURCE coding:

The decimal value of the binary-coded (figure of merit) FOM/SOURCE parameter shall be interpreted as follows:

0	=	Loss of navigational capability
1	=	RNP 20 (e.g. INS data) pressure altitude
2	=	RNP 5 (e.g. VOR/DME) pressure altitude
3	=	RNP 1 (e.g. DME/DME or GNSS) pressure altitude
4	=	Reserved for differential GNSS (circular position error (CPE) 10 m) pressure altitude
5	=	Reserved for differential GNSS (CPE 2.5 m) pressure altitude
6-10	=	Reserved
11	=	RNP 1 (e.g. DME/DME or GNSS) GNSS height
12	=	Reserved for differential GNSS (CPE 10 m) height
13	=	Reserved for differential GNSS (CPE 2.5 m) height
14-15	=	Reserved

Note.— RNP signifies required navigation performance. Suitable RNP categories have not yet been defined for values below 1; therefore, CPE is used.

1) The single status bit (bit 1) shall be set to 0 if any of the three parameters are invalid and is identical to the status bit in BDS 5,1.

2) The LATITUDE (fine) and LONGITUDE (fine) parameters are in 2's complement coding so they shall be interpreted in conjunction with the corresponding parameters in BDS 5,1.

Note.— When GNSS height is contained in bits 42 to 56, the pressure altitude can be obtained from BDS 5,1.

Table 2-83. BDS code 5,3 — Air-referenced state vector

MB FIELD

1	STATUS
2	SIGN
3	MSB = 90 degrees
4	
5	MAGNETIC HEADING
6	
7	
8	Range = [–180, +180]
9	
10	
11	
12	LSB = 90/512 degrees
13	STATUS
14	MSB = 512 kt
15	
16	
17	INDICATED AIRSPEED (IAS)
18	
19	
20	Range = [0, 1 024]
21	
22	
23	LSB = 1 kt
24	STATUS
25	MSB = Mach 2.048
26	
27	MACH NUMBER
28	
29	
30	Range = [0, 4.096]
31	
32	
33	LSB = Mach 0.008
34	STATUS
35	MSB = 1 024 kt
36	
37	
38	
39	TRUE AIRSPEED (TAS)
40	
41	
42	
43	Range = [0, 2 048]
44	
45	
46	LSB = 0,5 kt
47	STATUS
48	SIGN
49	MSB = 8 192 ft/min
50	ALTITUDE RATE
51	
52	
53	Range = [–16 384, +16 384]
54	
55	
56	LSB = 64 ft/min

PURPOSE: To provide the ATC system with the current measured values of magnetic heading IAS/Mach, altitude rate and TAS.

Table 2-84 to 2-86. BDS codes 5,4 to 5,6 — Waypoints 1, 2 and 3

MB FIELD

1	STATUS (see 1)
2	MSB
3	
4	CHARACTER 1
5	
6	
7	LSB
8	MSB
9	
10	CHARACTER 2
11	
12	
13	LSB
14	MSB
15	
16	CHARACTER 3
17	
18	
19	LSB
20	MSB
21	
22	CHARACTER 4
23	
24	
25	LSB
26	MSB
27	
28	CHARACTER 5
29	
30	
31	LSB
32	MSB = 30 min
33	
34	
35	ESTIMATED TIME OF ARRIVAL
36	(NORMAL FLIGHT)
37	
38	Range = [0, 59]
39	
40	LSB = 60/512 min
41	MSB = 320
42	
43	ESTIMATED FLIGHT LEVEL
44	(NORMAL FLIGHT)
45	Range = [0, 640]
46	LSB = 10
47	MSB = 30 min
48	
49	
50	TIME TO GO
51	(DIRECT ROUTE)
52	
53	Range = [0, 59]
54	
55	LSB = 60/512 min
56	RESERVED

PURPOSE: To provide information on the next three waypoints. BDS 5,4 contains details of the next waypoint, BDS 5,5 contains details of the next waypoint plus 1, and BDS 5,6 contains details of the next waypoint plus 2.

1) The single status bit (bit 1) shall be set to 0 if any of the parameters are invalid.

2) The estimated time or flight level shall be calculated from the trajectory scheduled in the FMS.

   Note.— More detailed information on the next waypoint is given in BDS 4,1 to 4,3.

3) When the waypoint identity has only three characters, two leading 0 characters shall be added (e.g. CDN becomes 00CDN).

4) Estimated time is in minutes and a value of all ones shall be used to indicate that the waypoint referred to is more than one hour away.

Table 2-95. BDS code 5,F — Quasi-static parameter monitoring

MB FIELD

1 2	SELECTED ALTITUDE
3 4	SELECTED HEADING
5 6	SELECTED SPEED
7 8	SELECTED MACH NUMBER
9 10	SELECTED ALTITUDE RATE
11 12	SELECTED FLIGHT PATH ANGLE
13 14	NEXT WAYPOINT
15 16	FMS HORIZONTAL MODE
17 18	FMS VERTICAL MODE
19 20	VHF CHANNEL REPORT
21 22	METEOROLOGICAL HAZARDS
23 24	TARGET ALTITUDE
25–56	RESERVED

PURPOSE: To permit the monitoring of changes in parameters that do not normally change very frequently, i.e. those expected to be stable for 5 minutes or more by accessing a single register.

Parameter monitor coding:

The changing of each parameter shall be monitored by 2 bits. The value 00 shall indicate that no valid data are available on this parameter. The decimal value for this 2-bit field shall be cycled through 1,2 and 3, each step indicating a change in the monitored parameter.

The meteorological hazards subfield shall report changes to turbulence, wind shear, wake vortex, icing and microburst, as in register number 45_{16}.

Table 2-96. BDS code 6,0 — Heading and speed report

MB FIELD

Bit	Field
1	STATUS
2	SIGN 1 = West (e.g. 315° = –45°)
3	MSB = 90 degrees
4	
5	
6	MAGNETIC HEADING
7	
8	
9	Range = [–180, +180]
10	
11	
12	LSB = 90/512 degrees
13	STATUS
14	MSB = 512 kt
15	
16	
17	INDICATED AIRSPEED
18	
19	
20	Range = [0, 1 023]
21	
22	
23	LSB = 512/512 = 1 kt
24	STATUS
25	MSB = 2.048
26	
27	MACH
28	
29	
30	Range = [0, 4.096]
31	
32	
33	
34	LSB = 2.048/512
35	STATUS
36	SIGN 1 = Below
37	MSB = 8 192 ft/min
38	
39	BAROMETRIC ALTITUDE
40	RATE
41	
42	Range = [–16 384, +16 352]
43	
44	
45	LSB = 8 192/256 = 32 ft/min
46	STATUS
47	SIGN 1 = Below
48	MSB = 8 192 ft/min
49	
50	INERTIAL VERTICAL
51	VELOCITY
52	
53	Range = [–16 384, +16 352]
54	
55	
56	LSB = 8 192/256 = 32 ft/min

PURPOSE: To provide heading and speed data to ground systems.

1) The maximum acceptable data age at time of transmission to the ground shall be 1 second for all parameters.

2) The register update rate shall be sufficient to ensure that the maximum acceptable data age of all parameters is not exceeded in normal operations.

3) If maximum acceptable data age is exceeded for any parameter, then the status bit for that parameter shall be actively set to 0 by the GFM.

4) If the value of a parameter from the data source exceeds the range allowable in the register definition, the maximum allowable value in the correct positive or negative sense shall be used instead.

Note.— This requires active intervention by the GFM.

5) The data entered into this register shall, whenever possible, be derived from the sources that are controlling the aircraft.

6) All parameters shall be required except for inertial vertical velocity which shall be supplied only by aircraft with a suitable inertial source. If inertial vertical velocity is not available, bits 46 to 56 inclusive shall be actively set to 0 by the GFM.

7) The LSB of all fields shall be obtained by rounding.

Table 2-97. BDS code 6,1 — Emergency/priority status

MB FIELD

Bits	Field
1–5	FORMAT TYPE CODE = 28
6–8	SUBTYPE CODE = 1
9–11	EMERGENCY/PRIORITY STATUS
12–56	RESERVED

PURPOSE: To provide additional information on aircraft status.

Subtype shall be coded as follows:

0 = No information
1 = Emergency/priority status
2 to 7 = Reserved

Emergency/priority status shall be coded as follows:

Value	Meaning
0	No emergency
1	General emergency
2	Lifeguard/Medical
3	Minimum fuel
4	No communications
5	Unlawful interference
6	Reserved
7	Reserved

1) Message delivery shall be accomplished once per second using the event-driven protocol.

2) Termination of emergency state shall be detected by coding in the surveillance status field of the airborne position message.

Table 2-98/99. BDS codes 6,2/6,3 — Current/next trajectory change point (TCP/TCP+1)

MB FIELD

1		
2		
3	FORMAT TYPE CODE = 29	
4		
5		
6	TCP Type (0 = current, 1 = next)	
7	TRAJECTORY POINT/LEG TYPE	
8		
9	(See 2.3.9.3)	
10		
11	TCP DATA VALID (0 = invalid, 1 = valid)	
12	TCP Format (0 = 4D TCP)	TCP Format (1 = 3D TCP)
13	MSB	MSB
14	TCP/TCP+1	TCP/TCP+1
15	ALTITUDE	ALTITUDE
16		
17	(See 2.3.9.6)	(See 2.3.9.6)
18		
19		
20		
21		
22	LSB	LSB
23	MSB = 180 degrees	MSB = 180 degrees
24	TCP/TCP+1	TCP/TCP+1
25	LATITUDE	LATITUDE
26	(CPR even format coding)	(Angular weighted binary coding)
27	(See 2.3.9.7.1)	(See 2.3.9.7.2)
28		
29		
30		
31		
32		
33		
34		
35		
36	LSB	
37	MSB	
38	TCP/TCP+1	
39	LONGITUDE	LSB = 2^{-17} x 360 degrees
40	(CPR even format coding)	MSB = 180 degrees
41		TCP/TCP+1
42	(See 2.3.9.8.1)	LONGITUDE
43		(Angular weighted binary coding)
44		(See 2.3.9.8.2)
45		
46		
47		
48		
49		
50	LSB	
51	MSB	
52	TCP/TCP+1	
53	TIME-TO-GO (TTG)	
54		
55	(See 2.3.9.9)	
56	LSB	LSB = 2^{-17} x 360 degrees

PURPOSE: To provide aircraft intent as defined by the current or next trajectory change point.

1) Message delivery shall be accomplished using the event-driven protocol.

Table 2-100. BDS code 6,4 — Aircraft operational coordination message

MB FIELD

Bits	Field
1–5	FORMAT TYPE CODE = 30
6–8	SUBTYPE CODE = 0
9–32	MSB (9) … LSB (32) PAIRED ADDRESS (specified in 2.3.10.3)
33–37	MSB (33) RUNWAY THRESHOLD SPEED (specified in 2.3.10.4) LSB (37)
38	ROLL ANGLE SIGN BIT (specified in 2.3.10.5)
39–43	MSB (39) ROLL ANGLE (specified in 2.3.10.6) LSB (43)
44–45	GO-AROUND (specified in 2.3.10.7)
46–47	ENGINE-OUT (specified in 2.3.10.8)
48–56	RESERVED

PURPOSE: To provide the current state of the various aircraft parameters required to support operational applications, particularly those involving paired aircraft.

1) Message delivery shall be accomplished using the event-driven protocol.

Table 2-101. BDS code 6,5 — Aircraft operational status

MB FIELD

Bit	Field
1	MSB
2	
3	FORMAT TYPE CODE = 31
4	
5	LSB
6	MSB
7	SUBTYPE CODE = 0
8	LSB
9	MSB
10	EN-ROUTE OPERATIONAL CAPABILITIES (CC-4)
11	(specified in 2.3.11.3)
12	LSB
13	MSB
14	TERMINAL AREA OPERATIONAL CAPABILITIES
15	(CC-3)
16	LSB (specified in 2.3.11.4)
17	MSB
18	APPROACH/LANDING OPERATIONAL
19	CAPABILITIES (CC-2)
20	LSB (specified in 2.3.11.5)
21	MSB
22	SURFACE OPERATIONAL CAPABILITIES (CC-1)
23	(specified in 2.3.11.6)
24	LSB
25	MSB
26	EN-ROUTE OPERATIONAL CAPABILITY
27	STATUS (OM-4)
28	LSB (specified in 2.3.11.7)
29	MSB
30	TERMINAL AREA OPERATIONAL CAPABILITY
31	STATUS (OM-3)
32	LSB (specified in 2.3.11.8)
33	MSB
34	APPROACH/LANDING OPERATIONAL
35	CAPABILITY STATUS (OM-2)
36	LSB (specified in 2.3.11.9)
37	MSB
38	SURFACE OPERATIONAL CAPABILITY
39	STATUS (OM-1)
40	LSB (specified in 2.3.11.10)
41	
42	
43	
44	
45	
46	
47	RESERVED
48	
49	
50	
51	
52	
53	
54	
55	
56	

PURPOSE: To provide the capability class and current operational mode of ATC-related applications on board the aircraft.

1) Message delivery shall be accomplished using the event-driven protocol.

Table 2-241. BDS code F,1 — Military applications

MB FIELD

1	STATUS	
2	Character Field (see 1)	
3	C1	MODE 1 CODE
4	A1	
5	C2	
6	A2	
7	C4	
8	A4	
9	X	
10	B1	
11	D1	
12	B2	
13	D2	
14	B4	
15	D4	
16	STATUS	
17	C1	MODE 2 CODE
18	A1	
19	C2	
20	A2	
21	C4	
22	A4	
23	X	
24	B1	
25	D1	
26	B2	
27	D2	
28	B4	
29	D4	
30–56		RESERVED

PURPOSE: To provide data in support of military applications.

1) The character field shall be used to indicate whether 2 characters or 4 characters are used in the Mode 1 code. The logic shall be as follows:

   0 = 2 octal codes
   (A1-A4 and B1-B4)

   1 = 4 octal codes
   (A1-A4, B1-B4, C1-C4 and D1-D4)

2) The status fields shall be used to indicate whether the data are available or unavailable. The logic shall be as follows:

   0 = Unavailable
   1 = Available

Table 2-242. BDS code F,2 — Military applications

MB FIELD

Bit	Field	
1	TYPE CODE = 0	
2		
3		
4		
5		
6	STATUS	
7	Character Field (see 1)	
8	C1	MODE 1 CODE
9	A1	
10	C2	
11	A2	
12	C4	
13	A4	
14	X	
15	B1	
16	D1	
17	B2	
18	D2	
19	B4	
20	D4	
21	STATUS	
22	C1	MODE 2 CODE
23	A1	
24	C2	
25	A2	
26	C4	
27	A4	
28	X	
29	B1	
30	D1	
31	B2	
32	D2	
33	B4	
34	D4	
35	STATUS	
36	C1	MODE A CODE
37	A1	
38	C2	
39	A2	
40	C4	
41	A4	
42	X	
43	B1	
44	D1	
45	B2	
46	D2	
47	B4	
48	D4	
49	RESERVED	
50		
51		
52		
53		
54		
55		
56		

PURPOSE. This register is used for military applications involving DF=19. Its purpose is to provide data in support of military applications.

'TYPE CODE' shall be encoded as follows:

0 = Mode code information
1 – 31 = Unassigned

1) The character field shall be used to indicate whether 2 characters or 4 characters are used in the Mode 1 code. The logic shall be as follows:

   0 = 2 octal codes
   (A1-A4 and B1-B4)

   1 = 4 octal codes
   (A1-A4, B1-B4, C1-C4, and D1-D4)

2) The status fields shall be used to indicate whether the data are available or unavailable. The logic shall be as follows:

   0 = Unavailable
   1 = Available

3. FORMATS FOR MODE S SPECIFIC PROTOCOLS (MSP)

3.1 MSP CHANNEL NUMBER ALLOCATIONS

The details of protocols and data transfers shall be as specified in the following paragraphs.

Note.— Some MSP channel numbers have been assigned (see Chapter 5, Table 5-25).

3.2 UPLINK MSP CHANNELS

The following sections are numbered 3.2.X, where 'X' is the decimal equivalent of the uplink MSP channel number. This shall be done to allow definitions of the hitherto undefined formats to be inserted without affecting the paragraph numbers.

For MSP packet formats refer to Chapter 5.

3.2.1 UPLINK MSP CHANNEL 1

(Reserved for specific services management)

The description of this channel has not yet been developed.

3.2.2 UPLINK MSP CHANNEL 2

(Traffic information service (TIS))

3.2.2.1 *PURPOSE*

The TIS shall have the capability to generate automatic alert information on any aircraft that carries an operating transponder (Mode A/C or Mode S) or aircraft that are under primary radar tracking integrated with the SSR system.

Note.— The traffic information service (TIS) is intended to improve the safety and efficiency of "see and avoid" flight by providing the pilot with an automatic display of nearby traffic and warnings of any potentially threatening traffic conditions. The TIS is functionally equivalent to ACAS I, providing traffic advisories but no resolution advisory information. By utilizing the surveillance database maintained by Mode S ground interrogators and its data link, the TIS can provide airborne traffic alerting with a minimum airborne equipage requirement. The TIS is provided without any ATC involvement.

3.2.2.2 *TIS UPLINK MESSAGE FORMATS*

All TIS uplink messages shall be structured as shown below. Each TIS uplink message shall be 56 bits. TIS traffic data messages shall consist of one or more short-form MSP packets. There shall be three types of TIS uplink messages as follows:

1) "Keep-alive"

2) "Goodbye"

3) "Traffic data"

Header	*Message type*	*Traffic block 1*	*Traffic block 2*
8 bits	6 bits	21 bits	21 bits

Note.— The formats of TIS downlink messages are defined in section 4 of this appendix under broadcast identifier 02_{16}.

3.2.2.2.1 *Message header*

The 8-bit header shall be present in all TIS messages. The message header for TIS shall have the value 02 (hexadecimal), since all TIS messages utilize the short-form MSP protocol and TIS is assigned MSP channel 2.

3.2.2.2.2 *Message type*

The 6-bit message type field shall be used to differentiate the different types of uplink messages:

Message type value	*TIS message uplink type*
0 to 59	Traffic data, first segment (own-heading)
60	Traffic data, intermediate segment(s)
61	Traffic data, final segment
62	Goodbye
63	Keep-alive

In the case of “first segment” traffic data messages, the 6-bit message type field shall contain the Mode S interrogator-derived tracked own-heading of the aircraft receiving the TIS message. This heading shall be quantized in 6 degree increments and shall be expressed with reference to magnetic north at the interrogator. The own-heading value in traffic data messages shall be provided to permit display heading correction on board the TIS-equipped aircraft by using an airborne heading sensor.

Note.— Such a heading correction may be necessary when the aircraft is manoeuvring or crabbing due to wind.

Since there may be several TIS traffic data messages to a given aircraft during a given scan, TIS processing shall be able to group the TIS traffic data uplinks together correctly. The “first”, “intermediate”, and “final” segment type values shall provide the necessary information to perform this grouping process. The mechanism for this shall be as specified below. Buffer space for at least 4 TIS traffic data messages (eight aircraft) shall be provided.

3.2.2.2.2.1 Keep-alive message

The TIS keep-alive message shall contain the message header and the message type fields as described above. The message type field shall be set to 63 decimal. The remaining bits of the message shall be unused.

3.2.2.2.2.2 Goodbye message

The TIS goodbye message shall contain the message header and the message type fields as described above. The message type field shall be set to 62 decimal. The remaining bits of the message shall be unused.

3.2.2.2.3 *Traffic information block*

Each TIS traffic data message shall contain two 21-bit traffic information blocks whose structure is shown below. The six fields in a traffic information block shall describe one TIS alert aircraft. One TIS traffic data message shall be able to define one or two alert aircraft.

Note.— A number ‘n’ of TIS traffic data messages may be uplinked in a given scan to convey information on up to 2n alert aircraft.

Traffic bearing	*Traffic range*	*Relative altitude*	*Altitude rate*	*Traffic heading*	*Traffic status*
6 bits	4 bits	5 bits	2 bits	3 bits	1 bit

3.2.2.2.3.1 Traffic bearing

The 6-bit traffic bearing field shall contain the bearing angle from the own-aircraft heading to the alert aircraft, quantized in 6 degree increments. The valid range for the traffic bearing field shall be 0 to 59 (with the exception described below).

Note.— Since this bearing angle is defined by TIS with respect to its measured own-aircraft heading, corrections from an airborne heading source can be applied.

If there is only one alert aircraft in a given TIS traffic data message, the traffic bearing field in the unused traffic information block shall be set to the value 63 (a bearing angle greater than 360 degrees) and the remainder of the bits in the traffic information block shall be ignored. This shall be termed as a "null alert" block.

3.2.2.2.3.2 Traffic range

The 4-bit traffic range field shall contain the distance between own-aircraft and the alert aircraft. A non-linear range encoding shall be used to minimize the number of bits required for this field as follows:

Traffic range value (r)	*Range (in increments of 230 m (0.125 NM))*
0	$0 \le r \le 1$
1	$1 < r \le 3$
2	$3 < r \le 5$
3	$5 < r \le 7$
4	$7 < r \le 9$
5	$9 < r \le 11$
6	$11 < r \le 13$
7	$13 < r \le 15$
8	$15 < r \le 18$
9	$18 < r \le 22$
10	$22 < r \le 28$
11	$28 < r \le 36$
12	$36 < r \le 44$
13	$44 < r \le 52$
14	$52 < r \le 56$
15	$r > 56$

3.2.2.2.3.3 Relative altitude

The 5-bit relative altitude field shall contain the difference in altitude between the own-aircraft and the alert aircraft. A non-linear encoding shall be used to minimize the number of bits required for this field. A special encoding value shall be used to indicate that the alert aircraft has no reported altitude. By convention, a positive value in the relative altitude field shall indicate that the alert aircraft is above the own-aircraft.

Relative altitude shall be given by:

$$\text{Relative altitude} = \text{Altitude}_{\text{Alert aircraft}} - \text{Altitude}_{\text{Own-aircraft}}$$

where altitudes are indicated in feet.

The TIS encoding for relative altitude shall be:

Relative altitude value (alt)	*Relative altitude (feet)*
0	$0 \le alt \le +100$
1	$+100 < alt \le +200$
2	$+200 < alt \le +300$
3	$+300 < alt \le +400$
4	$+400 < alt \le +500$

Relative altitude value (alt)	*Relative altitude (feet)*
5	+500 < alt ≤ +600
6	+600 < alt ≤ +700
7	+700 < alt ≤ +800
8	+800 < alt ≤ +900
9	+900 < alt ≤ +1 000
10	+1 000 < alt ≤ +1 500
11	+1 500 < alt ≤ +2 000
12	+2 000 < alt ≤ +2 500
13	+2 500 < alt ≤ +3 000
14	+3 000 < alt ≤ +3 500
15	+3 500 < alt
16	No reported altitude
17	–100 ≤ alt < 0
18	–200 ≤ alt < –100
19	–300 ≤ alt < –200
20	–400 ≤ alt < –300
21	–500 ≤ alt < –400
22	–600 ≤ alt < –500
23	–700 ≤ alt < –600
24	–800 ≤ alt < –700
25	–900 ≤ alt < –800
26	–1 000 ≤ alt < –900
27	–1 500 ≤ alt < –1 000
28	–2 000 ≤ alt < –1 500
29	–2 500 ≤ alt < –2 000
30	–3 000 ≤ alt < –2 500
31	alt < –3 000

3.2.2.2.3.4 Altitude rate

The 2-bit altitude rate field shall indicate whether the alert aircraft is climbing, descending, or level. An altitude rate of 500 ft/min shall be used as a threshold. The encoding of the TIS altitude rate field shall be:

Altitude rate field value	*Altitude rate*
0	Unused
1	Climbing (>500 ft/min)
2	Descending (>500 ft/min)
3	Level

3.2.2.2.3.5 Traffic heading

The 3-bit traffic heading field shall contain the heading of the alert aircraft quantized to 45 degree increments. This heading shall be based on the Mode S ground interrogator track for the alert aircraft.

Note.— The coarse quantization of traffic heading is sufficient to aid the pilot receiving the TIS alert message to visually acquire the traffic alert aircraft.

3.2.2.2.3.6 Traffic status

The 1-bit traffic status field shall identify the type of alert represented by this traffic information block. A status value of “ZERO” shall indicate a “proximity” alert and a status value of “ONE” shall indicate a “threat” alert.

3.2.2.2.4 *Handling multiple TIS alerts*

As described above, the traffic data information for a given scan shall consist of one or more TIS traffic data messages. The last traffic information block of the last TIS uplink message for this scan shall be a null-alert block if there is an odd number of alert aircraft in this message. The null-alert condition shall be indicated by the value 63 decimal in the traffic bearing field of the traffic information block.

3.2.2.2.4.1 The TIS traffic information blocks within a given TIS traffic data message shall be arranged with the highest priority alerts first. All traffic information blocks with the status "threat" shall precede traffic information blocks with the status "proximity". Within a status class, the traffic information blocks shall be put in order of increasing traffic range.

Note.— This ordering ensures that the most critical traffic alerts will be at the head of the list of traffic information blocks. Therefore, TIS will report on the most significant aircraft up to the limit of the number of messages transferable in one scan.

3.2.2.3 *TIS TRAFFIC DATA MESSAGES GROUPING MECHANISM*

3.2.2.3.1 The mechanism for grouping TIS traffic data messages for a given scan shall be based on the message type field in each message as described in 3.2.2.2.

3.2.2.3.2 Since the Mode S Comm-A protocol can deliver multiple copies of the same message, the initial step in message grouping shall be a check to eliminate duplicate messages. This shall be accomplished by a bit comparison of successive messages received with the same message type.

3.2.2.3.3 After duplicate elimination, the TIS traffic data for a given grouping shall always begin with a "first" segment message. This message shall contain the own-heading value for the group. Additional TIS traffic data messages in the grouping (if present) shall be structured as indicated in the table below:

Number of traffic aircraft	*Structure of group*
1	First
2	First
3	First and final
4	First and final
5	First, 1 intermediate, and final
6	First, 1 intermediate, and final
7	First, 2 intermediates, and final
8	First, 2 intermediates, and final
etc.	First, intermediates, and final

3.2.2.3.4 The receipt of a "first" segment shall start the formation of a message group. Subsequent TIS traffic data uplink messages shall be added to the group until one of the following conditions occurs:

a) a TIS uplink of type "final" is received (the final is part of the group);

b) a TIS uplink of type "first" segment, "keep-alive", or "goodbye" is received; or

c) more than 6 seconds have elapsed since the start of the group.

3.2.2.3.5 All the traffic blocks in the TIS traffic data message group (1 to n) shall form the display for the current time. A new group shall then be initiated by the receipt of another TIS traffic data uplink "first" segment message. TIS traffic data uplink messages of type "intermediate" or "final" shall be ignored if a new group has not been initiated by receipt of a "first" segment.

3.2.2.4 *TIS ESTABLISHMENT/DISCONNECTION PROTOCOLS*

The processing required to establish/disconnect TIS with Mode S ground interrogators when coverage boundaries are crossed shall be based upon information contained in the capability registers within the aircraft's Mode S transponder as well as two specific TIS uplink messages.

3.2.2.4.1 *Mode S capability report*

Transponder register 10_{16} within the Mode S transponder shall contain bits that indicate the level of the aircraft with respect to Mode S functions. This register shall be read by each Mode S ground interrogator that acquires the aircraft. Bit 25 of this register shall be set to “ONE” if the aircraft carries any MSP data link services (i.e. TIS).

Note.— This bit merely indicates the presence of MSP data link services on board the aircraft — it does NOT indicate whether any of these services are in use by the aircrew at a given time.

3.2.2.4.2 *MSP capability report*

Transponder registers $1D_{16}$ to $1F_{16}$ within the Mode S transponder contain bits which indicate the dynamic state of certain MSP data services on board the aircraft (where defined in applications, e.g. TIS). These registers shall be read by each Mode S ground interrogator that acquires the aircraft if the Mode S capability report indicates that the aircraft carries MSP data link services. Bit 2 of the MSP capability report register $1D_{16}$ shall be set to “ONE” if TIS support is desired; otherwise, the bit shall be set to “ZERO”. Setting and resetting this bit shall be done in conjunction with the generation of TIS “service connect requests” (TSCR) and “service disconnect requests” (TSDR) downlink messages as specified in section 4 for downlink broadcast identifier 02_{16}.

3.2.2.4.3 *Keep-alive timer*

In the absence of TIS traffic data messages, TIS keep-alive messages shall be uplinked by the Mode S ground interrogator. The TIS airborne processor shall keep a timer that measures the time interval between TIS uplink messages received. The timer shall be reset each time a TIS uplink message is received. If this “keep-alive” timer reaches 60 seconds (the “keep-alive” time parameter for TIS), the TIS ground-to-air service shall be declared to have failed and TIS support is no longer available from the Mode S ground interrogator.

Note.— The data link service processing for TIS must receive periodic uplink messages from the Mode S ground interrogator in order to ensure that the ground-to-air link is maintained and that the ground TIS support is continuing.

3.2.2.4.4 *TIS principal interrogator identifier (II) code protocol*

Each TIS uplink message shall be accompanied by a 4-bit interrogator identifier (II) code that identifies which Mode S ground interrogator (or interrogators cluster) generated it. At any given moment, only one Mode S ground interrogator shall be declared as the “principal interrogator” (PI). In areas having overlapping Mode S coverage by interrogators with different II codes, an “alternate interrogator” (AI) shall also be declared. The TIS protocol for handling II codes shall be as defined below.

Note.— II codes are assigned to Mode S interrogators in such a way that interrogators with overlapping surveillance coverage that are not clustered cannot have identical II codes.

3.2.2.4.5 *TIS display generation*

If TIS messages are received from more than one interrogator at a time, only those TIS messages from the interrogator currently declared as the PI shall be displayed to the pilot. TIS messages from interrogators other than the PI shall be discarded, except for the AI processing described below.

3.2.2.4.6 *Alternate interrogator (AI) identification*

The II code of the most recently received TIS message not from the PI shall be retained as the AI. In the case that no TIS messages have been received from interrogators other than the PI (as described below), no current AI shall be defined. The AI definition shall be initialized to the “none state” when TIS is enabled (TSCR) or disabled (TSDR) by the pilot.

3.2.2.4.7 *Principal interrogator (PI) identification*

The II code of the first Mode S ground interrogator to respond to the TSCR downlink message with a TIS uplink message becomes the PI. The PI shall be retained until either:

a) the PI sends a TIS "goodbye" uplink message; or

b) there is a TIS "keep-alive" time-out on the PI.

In either case, the AI (if one is present) shall be promoted to PI and its TIS messages shall now be displayed. A new AI shall now be identified. If there was no available AI, no PI is now available and the airborne TIS processor shall be in the "no TIS supported" state. This state shall continue until a TIS message (either traffic or keep-alive) is received from a Mode S ground interrogator. When such an uplink message is received, the II code contained in the message shall become the PI and the airborne processing shall resume the display of TIS. The PI definition shall be initialized to the "none" state when TIS is enabled (TSCR) or disabled (TSDR) by the pilot.

3.2.3 UPLINK MSP CHANNEL 3

(Reserved for ground-to-air alert)

The description of this channel has not yet been developed.

3.2.4 UPLINK MSP CHANNEL 4

(Reserved for ground-derived position)

The description of this channel has not yet been developed.

3.2.5 UPLINK MSP CHANNEL 5

(ACAS sensitivity level control)

The description of this channel has not yet been developed.

3.2.6 UPLINK MSP CHANNEL 6

(Ground-to-air request)

3.2.6.1 *PURPOSE*

This service shall provide a means of requesting access to services supported by the aircraft. When implemented, bit 6 of the register accessed by BDS code 1,D shall be set to a 1.

3.2.6.2 *FORMAT*

The request shall be transferred in an uplink MSP packet with the channel number set to 6 and, in the case of a long form MSP packet, with SP set to "ZERO". The first byte of the user data field shall contain a service request (SR) header. The contents and format of the service request are specified by the application.

3.2.6.3 *SR HEADER ASSIGNMENTS*

Decimal value of SR	
0	Unassigned
1	Dataflash
2	Local system management
3 to 255	Unassigned

3.2.6.3.1 *Dataflash*

3.2.6.3.1.1 Dataflash request format

The format of the user data field shall be as specified in Table 3-1. The user data field of the requesting MSP packet shall contain the decimal value of "ONE" in the first byte (SR header), followed by one or more requests for dataflash services. Each request shall contain a 2-byte dataflash request header (DH), followed by a 1-byte field to define the minimum time interval permitted between reports (MT field), a 4-bit field to determine the event criterion (EC field), a 4-bit field to determine stable time (ST field), and if indicated in EC, a change quanta field (CQ) and a change threshold (CT) field. The 4-bit ST field shall indicate the decimal value in seconds and how long the changed data has been stable before a message shall be initiated. All zeros in the dataflash header (DH) shall indicate that there are no more dataflash requests in the packet. When an MSP packet is completely filled with dataflash requests, or when there is not sufficient room in the packet for another dataflash request header, it shall be assumed that the dataflash request sequence is complete.

3.2.6.3.1.1.1 All aircraft dataflash equipment and installations shall support 16 dataflash contracts. Aircraft equipment and installations originally certified after 1 January 2001 shall support 64 dataflash contracts.

Note 1.— A single dataflash contract relates to a single contract number (see 3.2.6.3.1.2.1) for a single register for a particular II code. Therefore, dataflash services, with different DH values for each II code, can be established simultaneously with the same aircraft. These may be modified or discontinued independently of each other.

3.2.6.3.1.1.2 **Recommendation.—** *When a request has been accepted by the aircraft system, a dataflash response should be triggered immediately regardless of thresholds or event criteria. If no response is received in 30 seconds then a check should be made that the aircraft is still available on roll call, and if so a new request should be generated. In order to avoid repeated dataflash requests that produce no response, the number of such requests (N) should be limited (N = 3).*

3.2.6.3.1.1.3 When a new contract request is received for a contract already in existence, the old contract shall be discontinued and replaced immediately by the latest one.

3.2.6.3.1.2 Dataflash header (DH) 16 bits

The 16-bit DH field is divided into four subfields separated by 3 reserved bits (14 through 16) see Table 3-1.

3.2.6.3.1.2.1 Contract number subfield (CNS) 4 bits
(Bits 9 to 12 of the uplink MSP 6
user data field when SR = 1)

This subfield shall be interpreted as a contract number permitting 16 different contracts to be associated with the register specified by the BDS1 and BDS2 codes of this contract request. Contract numbers available are 0 to 15 and shall be associated with the II code of the contract request.

3.2.6.3.1.2.2 Request data subfield (RDS) 1 bit
(Bit 13 of the uplink MSP 6
user data field when SR = 1

This subfield shall indicate whether or not the contents of the register being monitored by the requested contract must be sent in the MSP packets on downlink channel 3 that are sent each time the criterion for the contract is met. The subfield shall be interpreted as follows:

RDS = 0 Send only bits 1 to 40 of the user data field on downlink MSP 3 when the contract criterion is met.

RDS = 1 Send bits 1 to 96 of the user data field on downlink MSP 3 when the contract criterion is met.

Note.— RDS only indicates the length of the user data field in downlink MSP3 when responding with a value zero in the CI field (see 3.3.3.4.3.1).

3.2.6.3.1.2.3 BDS1 and BDS2 codes 8 bits
(Bits 17 to 24 of the uplink MSP6 user data field)

BDS1 and BDS2 codes of the register for which the contract is required shall be as specified in Annex 10, Volume IV.

3.2.6.3.1.3 Minimum time (MT) 8 bits

The decimal value of the 8-bit MT field shall represent the minimum time in seconds that shall elapse after a report has been event-triggered and sent to the transponder, before a new report can be initiated. The report sent to the transponder shall always be the most current data available.

3.2.6.3.1.4 Event initiation

Event initiation shall be controlled by the two following fields.

3.2.6.3.1.4.1 Event criterion subfield (EC) 4 bits

The EC field shall be the four most significant bits following the MT field. If multiple events occur within a single register being monitored by a dataflash contract, (e.g. if more than one parameter shows a significant change) only one message shall be triggered. The decimal value of the EC field shall be interpreted as follows:

0 No report required, discontinue service for the contract specified in the DH field.

1 Report any change.

2 56-bit change field (CQ) follows ST. Only report changes to bits indicated by a “ONE” in CQ.

3 56-bit field CQ follows ST. For each parameter report all status changes and all changes of the parameter greater than the quantum value indicated in the same units and resolution of the field in CQ corresponding to that parameter. A zero in the field in CQ corresponding to the parameter indicates that no reports are required.

4 112 bits of CQ plus CT follow ST. The first 56 bits are as for the EC value 3 above. The second 56 bits are the CT field indicating a threshold value in the field corresponding to the parameter. Report all changes above the threshold where the value in CQ gives the change quantum.

5 112 bits of CQ plus CT follow ST. Same as for the EC value 4 above except: report all changes below the threshold.

6 112 bits of CQ plus CT follows ST. Same as for EC values 4 and 5 above except: report only when the threshold is crossed (in either direction).

7 to 14 Not assigned

15 Cancel all contracts for the II code in this request.

3.2.6.3.1.4.2 Stable time field (ST) 4 bits

The ST field shall be the 4 bits following the EC field. The decimal value of ST shall indicate in seconds how long the changed data have been stable, to within the change quanta specified in the CQ field, before a message shall be initiated. A value of “ZERO” in this subfield shall indicate that there is no minimum stable time and any change immediately initiates a message. The significance of the ST shall be dependent on which EC mode is being used. For EC modes 4 and 5, regarding stability whilst above/below a threshold, if a parameter value remains above/below the defined threshold for greater than the ST time then a dataflash message shall be generated even if the value does not remain stable to within one quantum. Subsequent quantum changes which are stable for greater than the ST time shall generate further dataflash messages until the value falls below/rises above the threshold.

3.2.6.3.1.5 Change fields — change quanta (CQ) and change threshold (CT)

These fields shall be present when indicated in EC. For a transponder register service (i.e. for BDS1 and BDS2 from 1 to 255 inclusive), CQ shall be contained in bits 41 to 96 of the MSP 6 user data field. CT, when required, shall be contained in bits 97 to 152 of the MSP 6 user data field. The quantum value in the CQ field shall be indicated in the same units and resolution as those specified for the register being monitored. It shall specify the amount by which the parameter must change, from its value at the initialization of the contract, and thereafter from the value last reported by a dataflash response, in order to trigger a new dataflash response on downlink MSP channel 3 (see Table 3-1).

3.2.6.3.2 *Local system management*

The purpose of the local system management is to provide a particular ground-air service request that can be defined locally to meet particular requirements (such as for ground station "remote setting" of parameters at the far-field monitor).

3.2.7 UPLINK MSP CHANNEL 7

(Reserved for response to air-to-ground service request)

The description of this channel has not yet been developed.

3.2.8 UPLINK MSP CHANNEL 8

(Reserved for trajectory negotiation)

The description of this channel has not yet been developed.

3.2.9 UPLINK MSP CHANNELS 9 TO 63

These channels have not been assigned.

3.3 DOWNLINK MSP CHANNELS

The following sections are numbered 3.3.X, where "X" is the decimal number equivalent to the downlink MSP channel number. This is done to allow definitions of the hitherto undefined formats to be inserted without affecting paragraph numbers.

3.3.1 DOWNLINK MSP CHANNEL 1

(Reserved for specific services management)

The description of this channel has not yet been developed.

3.3.2 DOWNLINK MSP CHANNEL 2

This channel has not been assigned.

3.3.3 DOWNLINK MSP CHANNEL 3

3.3.3.1 *PURPOSE*

Dataflash is a service which announces the availability of information from air-to-ground on an event-triggered basis. When implemented, bit 31 of the register accessed by BDS code 1,D shall be set to a 1.

Note.— This is an efficient means of downlinking information which changes occasionally and unpredictably.

3.3.3.2 SERVICE INITIATION AND TERMINATION

3.3.3.2.1 The dataflash service shall be initiated or discontinued by a service request and is received on uplink MSP channel 6 with a decimal value of ONE in the service request (SR) header, which is contained in the first byte of the user data field. This indicates that the rest of the user data field shall contain a dataflash request. On the receipt of such a request, a dataflash message from the register concerned with the request shall immediately be made available and announced to the ground regardless of the setting of the RDS field in the contract request and of any event criteria. The response shall be as follows.

3.3.3.2.2 When the requested register is being serviced, the contract shall be established and an MSP packet as specified in Table 3-2 shall be announced to the ground on MSP channel 3. The CI field must be set to a value of 1. The message shall be used by the ground system to confirm that the service has been initiated.

3.3.3.2.3 If the requested register is not being serviced, the contract shall not be established. This shall be indicated by announcing the MSP packet on downlink MSP channel 3 to the ground containing only bits 1 to 40 as specified in Table 3-2, and with a value of 2 in the CI field.

3.3.3.2.4 If the maximum number of contracts that can be supported are already established, then the new contract shall be refused. This shall be indicated by announcing to the ground an MSP packet on downlink channel 3, as specified in Table 3-2, and with a value of 3 in the CI field.

3.3.3.2.5 In the case of a request from the ground to terminate the service for a particular register, the termination of the service shall be confirmed by announcing to the ground an MSP packet on downlink channel 3, as shown in Table 3-2, and with a value of 4 in the CI field.

3.3.3.2.6 In the case of a request from the ground to terminate the service for all contracts to a particular II code, the termination of the service shall be confirmed by announcing to the ground an MSP packet on downlink channel 3, as shown in Table 3-2, and with a value of 5 in the CI field.

3.3.3.2.7 When the transponder register service fails for an established contract, the contract shall be terminated by the airborne application. This will be indicated by announcing to the ground an MSP packet on the downlink channel 3, as shown in Table 3-2, and with a value of 7 in the CI field. Transponder register service shall be deemed to have failed when any of the parameters specified to be monitored in the negotiation of the contract are not being updated at the specified minimum rate.

3.3.3.2.8 When a contract is refused due to an invalid value of the EC field in the contract request, this shall be indicated by announcing to the ground an MSP packet on downlink channel 3, as shown in Table 3-2, and with a value of 15 in the CI field.

3.3.3.2.9 If any message is not extracted from the transponder by a ground interrogator within 30 seconds, the aircraft subnetwork shall cancel the message and generate a delivery failure notice (i.e. the T_Z timer expires), which shall be delivered to the aircraft MSP service provider. When a delivery failure notice is received the service shall be automatically terminated by the dataflash function with no indication to the ground system.

Note.— This is to prevent the transponder message queues being blocked when the ground interrogator stops supplying the message extraction service, either due to a fault or loss of cover. It is the responsibility of the ground application to monitor the dataflash service taking this into account.

3.3.3.2.10 When the transponder has not been selectively interrogated by a Mode S interrogator with a particular II code for 60 seconds (determined by monitoring the IIS subfield in all accepted Mode S interrogations), all dataflash contracts related to that II code shall be cancelled with no indication to the ground system.

3.3.3.3 SERVICE PROVISION

On the receipt of a dataflash request, the requested parameters shall be monitored and transferred to the ground using the Mode S air-initiated protocols directed to the II code that was contained in the requesting interrogation. In order to prevent the flooding of the transponder with dataflash messages, an upper limit of ten messages in a six-second period shall be imposed. When the limit of ten messages within a six-second period is reached, further messages shall be queued until they can be sent. Messages queued in this way shall respond with a CI field value of 6. If after initiating a dataflash message to the ground, the change criterion is met again prior to the message being entered into the transponder for announcement, the message is considered stale and shall be replaced by the most up-to-date information.

3.3.3.4 *DOWNLINK MESSAGE STRUCTURE*

The information shall be transferred in a downlink MSP packet with the channel number M/CH = 3. The format is shown in Table 3-2. The first two bytes of the user data (UD) field shall contain a dataflash header (DH) which shall be identical to the DH field that was contained in the request for service.

3.3.3.4.1 Bits 17 to 31 of UD form the II code contract report (CR) field in which each bit shall indicate that at least one contract is active with the II code, which the bit represents when it is set to a ONE; otherwise, there are no active contracts with that II code.

3.3.3.4.2 Bits 32 to 36 of UD are not assigned.

3.3.3.4.3 Bits 37 to 40 of UD form the contract information (CI) field which shall be interpreted as follows:

CI field value	*Meaning*
0	Response to existing contract
1	New contract established
2	New contract not accepted, or existing contract terminated, due to no transponder register data service
3	New contract not accepted due to maximum number of contracts already being serviced
4	Contract terminated for the DH in this response due to a request from the ground
5	All contracts terminated for the II code that delivered the MSP packet having an EC value of 15 that requested this response
6	Response has been queued due to the limit of six dataflash messages in a ten-second period
7	Contract terminated due to failure of the register data service
8 to 14	Unassigned
15	New contract not accepted due to invalid number in EC field of requested uplink MSP packet

3.3.3.4.3.1 When the CI field is equal to zero, the response shall be as requested by the RDS field in the dataflash header of the contract (see 3.2.6.3.1.2.2). When the CI field is not equal to zero, the response shall only contain bits 1 to 40 of the user data field on downlink MSP 3 (see Table 3-2).

3.3.3.5 *DATA EXTRACTION BY MODE S GROUND STATIONS*

The dataflash transaction shall be announced as a downlink frame in response to interrogations UF 4, 5, 20, or 21. The transaction announced shall be either a single segment Comm-B frame or a two segment Comm-B frame, as requested by the contract negotiations. The air-directed Comm-B first segment shall contain the MSP header, dataflash header, and control information for that particular contract. In the case of a contract for a single segment response, if the data is required, it is acquired directly by the ground station extracting the register in question.

3.3.4 DOWNLINK MSP CHANNEL 4

(Reserved for position request)

The description of this channel has not yet been developed.

3.3.5 DOWNLINK MSP CHANNEL 5

This channel has not been assigned.

3.3.6 DOWNLINK MSP CHANNEL 6

(Reserved for response to ground-to-air service request.) (See Table 3-3.)

The first byte of the user data (UD) field in the downlink MSP channel 6 shall be used to define a response type (RT) field as follows:

RT = 0 Unassigned

RT = 1 (Reserved)

RT = 2 Local system management

RT = 3 to 255 Unassigned

When implemented, bit 34 of register $1D_{16}$ is set to a 1.

Note.— The response to a ground-air service request can be used to transfer information resulting from such a service.

3.3.7 DOWNLINK MSP CHANNEL 7

(Reserved for air-to-ground request)

The description of this channel has not yet been developed.

3.3.8 DOWNLINK MSP CHANNEL 8

(Reserved for trajectory negotiation)

The description of this channel has not yet been developed.

3.3.9 DOWNLINK MSP CHANNELS 9 TO 63

These channels have not been assigned.

TABLES FOR SECTION 3

Table 3-1. Request for dataflash monitoring service

Mode S SLM frame containing uplink MSP packet on channel 6 when SR = 1

MSP 6 USER DATA FIELD

Bits 1 to 40			Bits 41 to 96 (if required)		Bits 97 to 152 (if required)	
	DP = 0 (1 BIT)	UPLINK MSP HEADER (1 BYTE)	41		97	
	MP = 0 (1 BIT)		42		98	
	M/CH = 6 (6 BITS)		43		99	
			44		100	
			45		101	
			46		102	
			47		103	
			48		104	
1	SERVICE REQUEST (SR) = 1		49		105	
2			50		106	
3			51		107	
4			52		108	
5			53		109	
6			54		110	
7			55		111	
8			56		112	
9	CONTRACT NUMBER SUBFIELD (CNS)	DATAFLASH HEADER (DH)	57	CHANGE QUANTA FIELD (CQ)	113	CHANGE THRESHOLD FIELD (CT)
10			58		114	
11			59		115	
12			60		116	
13	REQUEST DATA (RDS)		61		117	
14	RESERVED		62		118	
15			63		119	
16			64		120	
17	BDS1 CODE		65		121	
18			66		122	
19			67		123	
20			68		124	
21	BDS2 CODE		69		125	
22			70		126	
23			71		127	
24			72		128	
25	MINIMUM TIME (MT) INTERVAL		73		129	
26			74		130	
27			75		131	
28			76		132	
29			77		133	
30			78		134	
31			79		135	
32	LSB = 1 second		80		136	
33	EVENT CRITERION (EC)		81		137	
34			82		138	
35			83		139	
36			84		140	
37	STABLE TIME (ST)		85		141	
38			86		142	
39			87		143	
40	LSB = 1 second		88		144	
			89		145	
			90		146	
			91		147	
			92		148	
			93		149	
			94		150	
			95		151	
			96		152	

The last byte of the final MA field shall always be unassigned.

Table 3-2. Dataflash for register monitoring service
Mode S frame containing downlink MSP packet on Channel 3

MSP 3 USER DATA FIELD

Bits 1 to 40	Subfield	Group	Bits 41 to 96	Content
	LINKED COMM B SUBFIELD (LBS) (2 BITS)		41	
			42	
	DP = 0 (1 BIT)	MSP HEADER	43	
	MP = 0 (1 BIT)		44	
	M/CH = 3 (6 BITS)		45	
			46	
			47	
			48	
			49	
			50	
	FILL 1 = 0 (6 BITS)		51	
			52	
			53	
			54	
			55	
			56	
1	CONTRACT NUMBER SUBFIELD (CNS)	DATAFLASH HEADER (DH)	57	REGISTER MESSAGE CONTENT
2			58	
3			59	
4			60	
5	REQUEST DATA (RDS)		61	
6	RESERVED		62	
7			63	
8			64	
9	BDS1 CODE		65	
10			66	
11			67	
12			68	
13	BDS2 CODE		69	
14			70	
15			71	
16			72	
17	II = 1	II CODE CONTRACT REPORT (CR)	73	
18	II = 2		74	
19	II = 3		75	
20	II = 4		76	
21	II = 5		77	
22	II = 6		78	
23	II = 7		79	
24	II = 8		80	
25	II = 9		81	
26	II = 10		82	
27	II = 11		83	
28	II = 12		84	
29	II = 13		85	
30	II = 14		86	
31	II = 15		87	
32	NOT ASSIGNED		88	
33			89	
34			90	
35			91	
36			92	
37	CONTRACT INFORMATION (CI)		93	
38			94	
39			95	
40			96	

See 5.2.7.3 for specification of MSP packets

Table 3-3. Response to ground-to-air service request

Mode S frame containing downlink MSP packet on channel 6

MSP 6 USER DATA FIELD

Bits 1 to 40

Bits	Field	
	LINKED COMM B SUBFIELD (LBS) (2 BITS)	
	DP = 0 (1 BIT)	MSP HEADER
	MP = 0 (1 BIT)	
	M/CH = 6 (6 BITS)	
	FILL 1 = 0 (6 BITS)	
1–16	RESPONSE TYPE	
17–40	USER DEFINED	

Bits 41 to 96

Bits	Field
41–96	REGISTER MESSAGE CONTENT

This packet shall always be sent as a linked Comm-B. The second segment being a direct copy of the relevant register.

4. MODE S BROADCAST PROTOCOLS

4.1 BROADCAST CHANNEL NUMBER ALLOCATIONS

The broadcast identifiers shall be represented as a two-digit hexadecimal number, e.g. “XX_{16}”

Note.— There are 255 broadcast identifiers available on both the uplink and downlink. Broadcast identifier numbers have been assigned for some applications (see Chapter 5, Table 5-23).

The data formats for the data link capability report and for aircraft identification together with the assignment of the broadcast identifiers shall be as defined in Annex 10, Volumes III and IV, respectively.

4.2 UPLINK BROADCAST IDENTIFIERS

The following sections are numbered 4.2.X, where “X” is the decimal equivalent of the uplink broadcast identifier number. This is done to allow definitions of the hitherto undefined formats to be inserted without affecting the paragraph numbering.

4.2.1 UPLINK BROADCAST IDENTIFIER 01_{16}

(Reserved for differential GNSS correction)

The description of this identifier has not yet been developed.

4.2.2 TO 4.2.47 UPLINK BROADCAST IDENTIFIERS 02_{16} to $2F_{16}$

These identifiers have not been assigned.

4.2.48 UPLINK BROADCAST IDENTIFIER 30_{16}

(Not valid)

4.2.49 UPLINK BROADCAST IDENTIFIERS 31_{16}

(Reserved for RA broadcast (see Annex 10, Volume IV, 4.3.8.4.2.3.4)).

4.2.50 UPLINK BROADCAST IDENTIFIERS 32_{16}

(Reserved for ACAS (see Annex 10, Volume IV, 4.3.8.4.2.3.3)).

4.2.51 TO 4.2.255 UPLINK BROADCAST IDENTIFIERS 33_{16} to FF_{16}

These identifiers have not been assigned.

4.3 DOWNLINK BROADCAST IDENTIFIER

The following sections are numbered 4.3.X, where “X” is the decimal equivalent of the downlink broadcast identifier number. This is done to allow definitions of the hitherto undefined formats to be inserted without affecting the paragraph numbering.

4.3.1 DOWNLINK BROADCAST IDENTIFIER 01_{16}

This identifier has not been assigned.

4.3.2 DOWNLINK BROADCAST IDENTIFIER 02_{16}

(Traffic information service)

4.3.2.1 *INTRODUCTION*

The traffic information service shall be provided by uplinking information on proximate aircraft that may be of interest to own-aircraft by a Mode S interrogator on uplink MSP channel 2.

Note.— The service and uplink messages are specified in 3.2.2 under "Uplink MSP Channel 2".

It shall be possible for the aircraft to request to be either connected to or disconnected from the TIS service. These requests shall be made using the Mode S broadcast protocol using broadcast identifier 02_{16}. These requests shall be the only downlink messages used by the TIS.

4.3.2.2 *TIS DOWNLINK MESSAGES*

The TIS airborne data link service shall be able to generate two types of Mode S downlink messages:

a) TIS service connect request (TSCR); and

b) TIS service disconnect request (TSDR).

Both the TSCR and the TSDR shall be sent as Comm-B broadcast messages using the broadcast identifier 02_{16}.

Note.— The use of the Mode S Comm-B broadcast protocol deals with the case of multiple Mode S interrogators with overlapping coverage, which are in contact with a given TIS aircraft at the same time.

The format of a TIS downlink message (either TSCR or TSDR) shall be as specified below:

Header	DIN 1	DIN 2	DIN 3	DIN 4	DIN 5	DIN 6
8 bits	8 bits	8 bits	8 bits	8 bits	8 bits	8 bits

The message header shall be the standard message header for TIS described in uplink MSP channel 2 (see 3.2.2, uplink MSP channels). The 8-bit data link service identifier numbers (DIN) shall be read and processed sequentially from the TCSR or TSDR message until either:

a) DIN i = 0; or

b) all bits of the downlink message have been processed.

Note 1.— This structure and protocol for MSP downlink service requests allow for future expansion and use by other MSP data link services.

Note 2.— The principal and alternate TIS II codes in the TIS process (see 3.2.2, Uplink MSP Channel 2) are set to the "none" state when either a TSCR or TSDR is generated.

4.3.2.2.1 *TCSR format*

This TIS Comm-B downlink message shall be generated when the pilot requests the initiation of TIS service. The TSCR message shall be generated at the same time as the MSP capability report bit for TIS is set to “ONE”. A TSCR shall be identified by a DIN value of 1. The TSCR shall be defined as a Comm-B broadcast message so that any Mode S ground interrogator capable of supporting TIS can respond to it.

4.3.2.2.2 *TSDR format*

This TIS Comm-B broadcast downlink message shall be generated when the pilot requests termination of TIS service. The TSDR message shall be generated at the same time as the MSP capability report bit for TIS is set to “ZERO”. A TDSR shall be identified by a DIN value of 2. The TDSR shall be defined as a Comm-B broadcast message so that any Mode S interrogator supporting TIS can respond to it.

4.3.3 TO 4.3.15 DOWNLINK BROADCAST IDENTIFIERS 03_{16} to $0F_{16}$

These identifiers have not been assigned.

4.3.16 DOWNLINK BROADCAST IDENTIFIER 10_{16}

(Data link capability report)

See Table 2-16.

4.3.17 TO 4.3.31 DOWNLINK BROADCAST IDENTIFIERS 11_{16} to $1F_{16}$

These identifiers have not been assigned.

4.3.32 DOWNLINK BROADCAST IDENTIFIER 20_{16}

(Aircraft identification)

See Table 2-32.

4.3.33 TO 4.3.253 DOWNLINK BROADCAST IDENTIFIERS 21_{16} to FD_{16}

These identifiers have not been assigned.

4.3.254 DOWNLINK BROADCAST IDENTIFIER FE_{16}

(Reserved for update request)

See Chapter 5.

4.3.255 DOWNLINK BROADCAST IDENTIFIER FF_{16}

(Reserved for search request)

See Chapter 5.

CHAPTER 6. VHF AIR-GROUND DIGITAL LINK (VDL)

6.1 DEFINITIONS AND SYSTEM CAPABILITIES

Note 1.— The very high frequency (VHF) digital link (VDL) Mode 2 and the VDL Mode 4 provide data service capabilities. The VDL Mode 3 provides both voice and data service capabilities. The data capability is a constituent mobile subnetwork of the aeronautical telecommunication network (ATN). In addition, the VDL may provide non-ATN functions. Standards and Recommended Practices (SARPs) for the VDL are defined and referenced below.

Note 2.— Additional information on VDL is contained in the Manuals on VDL Mode 2, VDL Mode 3 and VDL Mode 4 Technical Specifications.

Note 3.— Sections 6.1.2 to 6.8.2 contain Standards and Recommended Practices for VDL Modes 2 and 3. Section 6.9 contains Standards and Recommended Practices for VDL Mode 4.

6.1.1 Definitions

Automatic dependent surveillance-broadcast (ADS-B). A surveillance technique in which aircraft automatically provide, via a broadcast mode data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position, and additional data as appropriate.

Broadcast. A transmission of information relating to air navigation that is not addressed to a specific station or stations.

Burst. A time-defined, contiguous set of one or more related signal units which may convey user information and protocols, signalling, and any necessary preamble.

Current slot. The slot in which a received transmission begins.

Data circuit-terminating equipment (DCE). A DCE is a network provider equipment used to facilitate communications between DTEs.

Data link entity (DLE). A protocol state machine capable of setting up and managing a single data link connection.

Data link service (DLS) sublayer. The sublayer that resides above the MAC sublayer. For VDL Mode 4, the DLS sublayer resides above the VSS sublayer. The DLS manages the transmit queue, creates and destroys DLEs for connection-oriented communications, provides facilities for the LME to manage the DLS, and provides facilities for connectionless communications.

Data terminal equipment (DTE). A DTE is an endpoint of a subnetwork connection.

Extended Golay Code. An error correction code capable of correcting multiple bit errors.

Frame. The link layer frame is composed of a sequence of address, control, FCS and information fields. For VDL Mode 2, these fields are bracketed by opening and closing flag sequences, and a frame may or may not include a variable-length information field.

Gaussian filtered frequency shift keying (GFSK). A continuous-phase, frequency shift keying technique using two tones and a Gaussian pulse shape filter.

Global signalling channel (GSC). A channel available on a world-wide basis which provides for communication control.

Link. A link connects an aircraft DLE and a ground DLE and is uniquely specified by the combination of aircraft DLS address and the ground DLS address. A different subnetwork entity resides above every link endpoint.

Link layer. The layer that lies immediately above the physical layer in the Open Systems Interconnection protocol model. The link layer provides for the reliable transfer of information across the physical media. It is subdivided into the data link sublayer and the media access control sublayer.

Link management entity (LME). A protocol state machine capable of acquiring, establishing and maintaining a connection to a single peer system. An LME establishes data link and subnetwork connections, "hands-off" those connections, and manages the media access control sublayer and physical layer. An aircraft LME tracks how well it can communicate with the ground stations of a single ground system. An aircraft VME instantiates an LME for each ground station that it monitors. Similarly, the ground VME instantiates an LME for each aircraft that it monitors. An LME is deleted when communication with the peer system is no longer viable.

M burst. A management channel data block of bits used in VDL Mode 3. This burst contains signalling information needed for media access and link status monitoring.

Media access control (MAC). The sublayer that acquires the data path and controls the movement of bits over the data path.

Mode 2. A data-only VDL mode that uses D8PSK modulation and a carrier sense multiple access (CSMA) control scheme.

Mode 3. A voice and data VDL mode that uses D8PSK modulation and a TDMA media access control scheme.

Mode 4. A data-only VDL mode using a GFSK modulation scheme and self-organizing time division multiple access.

Physical layer. The lowest level layer in the Open Systems Interconnection protocol model. The physical layer is concerned with the transmission of binary information over the physical medium (e.g. VHF radio).

Quality of service. The information relating to data transfer characteristics used by various communication protocols to achieve various levels of performance for network users.

Reed-Solomon code. An error correction code capable of correcting symbol errors. Since symbol errors are collections of bits, these codes provide good burst error correction capabilities.

Self-organizing time division multiple access (STDMA). A multiple access scheme based on time-shared use of a radio frequency (RF) channel employing: (1) discrete contiguous time slots as the fundamental shared resource; and (2) a set of operating protocols that allows users to mediate access to these time slots without reliance on a master control station.

Slot. One of a series of consecutive time intervals of equal duration. Each burst transmission starts at the beginning of a slot.

Subnetwork connection. A long-term association between an aircraft DTE and a ground DTE using successive virtual calls to maintain context across link handoff.

Subnetwork dependent convergence function (SNDCF). A function that matches the characteristics and services of a particular subnetwork to those characteristics and services required by the internetwork facility.

Subnetwork entity. In this document, the phrase "ground DCE" will be used for the subnetwork entity in a ground station communicating with an aircraft; the phrase "ground DTE" will be used for the subnetwork entity in a ground router communicating with an aircraft station; and, the phrase "aircraft DTE" will be used for the subnetwork entity in an aircraft communicating with the station. A subnetwork entity is a packet layer entity as defined in ISO 8208.

Subnetwork layer. The layer that establishes, manages and terminates connections across a subnetwork.

System. A VDL-capable entity. A system comprises one or more stations and the associated VDL management entity. A system may either be an aircraft system or a ground system.

Time division multiple access (TDMA). A multiple access scheme based on time-shared use of an RF channel employing: (1) discrete contiguous time slots as the fundamental shared resource; and (2) a set of operating protocols that allows users to interact with a master control station to mediate access to the channel.

User group. A group of ground and/or aircraft stations which share voice and/or data connectivity. For voice communications, all members of a user group can access all communications. For data, communications include point-to-point connectivity for air-to-ground messages, and point-to-point and broadcast connectivity for ground-to-air messages.

VDL management entity (VME). A VDL-specific entity that provides the quality of service requested by the ATN-defined SN_SME. A VME uses the LMEs (that it creates and destroys) to enquire the quality of service available from peer systems.

VDL Mode 4 burst. A VHF digital link (VDL) Mode 4 burst is composed of a sequence of source address, burst ID, information, slot reservation and frame check sequence (FCS) fields, bracketed by opening and closing flag sequences.

Note.— The start of a burst may occur only at quantized time intervals and this constraint allows the propagation delay between the transmission and reception to be derived.

VDL Mode 4 DLS system. A VDL system that implements the VDL Mode 4 DLS and subnetwork protocols to carry ATN packets or other packets.

VDL Mode 4 specific services (VSS) sublayer. The sublayer that resides above the MAC sublayer and provides VDL Mode 4 specific access protocols including reserved, random and fixed protocols.

VDL station. An aircraft-based or ground-based physical entity, capable of VDL Mode 2, 3 or 4.

Note.— In the context of this chapter, a VDL station is also referred to as a "station".

Vocoder. A low bit rate voice encoder/decoder.

Voice unit. A device that provides a simplex audio and signalling interface between the user and VDL.

VSS user. A user of the VDL Mode 4 specific services. The VSS user could be higher layers in the VDL Mode 4 SARPs or an external application using VDL Mode 4.

6.1.2 Radio channels and functional channels

6.1.2.1 *Aircraft station radio frequency range.* An aircraft station shall be capable of tuning to any of the channels in the range specified in Section 6.1.4.1 within 100 milliseconds after the receipt of an autotune command. In addition, for VDL Mode 3, an aircraft station shall be able to tune to any channel in the range specified in Section 6.1.4.1 within 100 milliseconds after the receipt of any tuning command.

6.1.2.2 *Ground station radio frequency range.* A ground station shall be capable of operating on its assigned channel within the radio frequency range detailed in 6.1.4.1.

6.1.2.3 *Common signalling channel.* Frequency 136.975 MHz shall be reserved as a world-wide common signalling channel (CSC) for VDL Mode 2.

6.1.3 System capabilities

6.1.3.1 *Data transparency.* The VDL system shall provide code-independent, byte-independent transfer of data.

6.1.3.2 *Broadcast.* The VDL system shall provide link layer data broadcast services (Mode 2) and/or voice and data broadcast services (Mode 3). For VDL Mode 3, the data broadcast service shall support network multicasting capability originating from the ground.

6.1.3.3 *Connection management.* The VDL system shall establish and maintain a reliable communications path between the aircraft and the ground system while allowing but not requiring manual intervention.

Note.— In this context "reliable" is defined by the BER requirement specified in 6.3.5.1.

6.1.3.4 *Ground network transition.* A VDL-equipped aircraft shall transition from one ground station to another when circumstances dictate.

6.1.3.5 *Voice capability.* The VDL Mode 3 system shall support a transparent, simplex voice operation based on a "Listen-Before-Push-To-Talk" channel access.

6.1.4 Air-ground VHF digital link communications system characteristics

6.1.4.1 The radio frequencies used shall be selected from the radio frequencies in the band 117.975 – 137 MHz. The lowest assignable frequency shall be 118.000 MHz and the highest assignable frequency shall be 136.975 MHz. The separation between assignable frequencies (channel spacing) shall be 25 kHz.

Note.— Volume V specifies that the block of frequencies from 136.9 – 136.975 MHz inclusive is reserved for VHF air-ground digital communications.

6.1.4.2 The design polarization of emissions shall be vertical.

6.2 SYSTEM CHARACTERISTICS OF THE GROUND INSTALLATION

6.2.1 Ground station transmitting function

6.2.1.1 *Frequency stability.* The radio frequency of VDL ground station equipment operation shall not vary more than plus or minus 0.0002 per cent (2 parts per million) from the assigned frequency.

Note.— The frequency stability for VDL ground stations using DSB-AM modulation is specified in Volume III, Part II, Chapter 2 for 25 kHz channel spacing.

6.2.2 Power

Recommendation.— *The effective radiated power should be such as to provide a field strength of at least 75 microvolts per metre (minus 109 dBW/m^2) within the defined operational coverage of the facility, on the basis of free-space propagation.*

6.2.3 Spurious emissions

6.2.3.1 Spurious emissions shall be kept at the lowest value which the state of the technique and the nature of the service permit.

Note.— Appendix S3 to the Radio Regulations specifies the levels of spurious emissions to which transmitters must conform.

6.2.4 Adjacent channel emissions

6.2.4.1 The amount of power from a VDL ground transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed 0 dBm.

6.2.4.1.1 After 1 January 2002, the amount of power from all new installations of a VDL ground transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed 2 dBm.

6.2.4.2 The amount of power from a VDL ground transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second adjacent channel shall be less than minus 25 dBm and from thereon it shall monotonically decrease at the minimum rate of 5 dB per octave to a maximum value of minus 52 dBm.

6.2.4.2.1 After 1 January 2002, the amount of power from all new installations of a VDL ground transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second adjacent channel shall be less than minus 28 dBm.

6.2.4.2.2 After 1 January 2002, the amount of power from all new installations of a VDL ground transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the fourth adjacent channel shall be less than minus 38 dBm, and from thereon it shall monotonically decrease at the minimum rate of 5 dB per octave to a maximum value of minus 53 dBm.

6.2.4.3 The amount of power from a VDL ground transmitter under all operating conditions when measured over a 16 kHz channel bandwidth centered on the first adjacent channel shall not exceed minus 20 dBm.

6.2.4.3.1 After 1 January 2002, the amount of power from all new installations of a VDL ground transmitter under all operating conditions when measured over a 16 kHz channel bandwidth centred on the first adjacent channel shall not exceed minus 18 dBm.

6.2.4.4 After 1 January 2005, all VDL ground transmitters shall meet the provisions of 6.2.4.1.1, 6.2.4.2.1, 6.2.4.2.2 and 6.2.4.3.1, subject to the conditions of 6.2.4.5.

6.2.4.5 Requirements of mandatory compliance of the provisions of 6.2.4.4 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales. The agreements shall provide at least two years' notice of mandatory compliance of ground systems.

6.3 SYSTEM CHARACTERISTICS OF THE AIRCRAFT INSTALLATION

6.3.1 *Frequency stability.* The radio frequency of VDL aircraft equipment shall not vary more than plus or minus 0.0005 per cent (5 parts per million) from the assigned frequency.

6.3.2 *Power.* The effective radiated power shall be such as to provide a field strength of at least 20 microvolts per metre (minus 120 dBW/m^2) on the basis of free space propagation, at ranges and altitudes appropriate to the operational conditions pertaining to the areas over which the aircraft is operated.

6.3.3 Spurious emissions

6.3.3.1 Spurious emissions shall be kept at the lowest value which the state of the technique and the nature of service permit.

Note.— Appendix S3 to the Radio Regulations specifies the levels of spurious emission to which transmitters must conform.

6.3.4 Adjacent channel emissions

6.3.4.1 The amount of power from a VDL aircraft transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed 0 dBm.

6.3.4.1.1 After 1 January 2002, the amount of power from all new installations of a VDL aircraft transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the first adjacent channel shall not exceed 2 dBm.

6.3.4.2 The amount of power from a VDL aircraft transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second adjacent channel shall be less than minus 25 dBm and from thereon it shall monotonically decrease at the minimum rate of 5 dB per octave to a maximum value of minus 52 dBm.

6.3.4.2.1 After 1 January 2002, the amount of power from all new installations of a VDL aircraft transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the second adjacent channel shall be less than minus 28 dBm.

6.3.4.2.2 After 1 January 2002, the amount of power from all new installations of a VDL aircraft transmitter under all operating conditions when measured over the 25 kHz channel bandwidth of the fourth adjacent channel shall be less than minus 38 dBm, and from thereon it shall monotonically decrease at the minimum rate of 5 dB per octave to a maximum value of minus 53 dBm.

6.3.4.3 The amount of power from a VDL aircraft transmitter under all operating conditions when measured over a 16 kHz channel bandwidth centred on the first adjacent channel shall not exceed minus 20 dBm.

6.3.4.3.1 After 1 January 2002, the amount of power from all new installations of a VDL aircraft transmitter under all operating conditions when measured over a 16 kHz channel bandwidth centred on the first adjacent channel shall not exceed minus 18 dBm.

6.3.4.4 After 1 January 2005, all VDL aircraft transmitters shall meet the provisions of 6.3.4.1.1, 6.3.4.2.1, 6.3.4.2.2 and 6.3.4.3.1, subject to the conditions of 6.3.4.5.

6.3.4.5 Requirements of mandatory compliance of the provisions of 6.3.4.4 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales. The agreements shall provide at least two years' notice of mandatory compliance of aircraft systems.

6.3.5 Receiving function

6.3.5.1 *Specified error rate.* The specified error rate for Mode 2 operation shall be the maximum corrected Bit Error Rate (BER) of 1 in 10^4. The specified error rate for Mode 3 operation shall be the maximum uncorrected BER of 1 in 10^3. The specified error rate for Mode 4 operation shall be the maximum uncorrected BER of 1 in 10^4.

Note.— The above physical layer BER requirements are derived from the BER requirement imposed by ATN at the subnetwork interface.

6.3.5.2 *Sensitivity.* The receiving function shall satisfy the specified error rate with a desired signal strength of not more than 20 microvolts per metre (minus 120 dBW/m^2).

Note.— The required signal strength at the edge of the service volume takes into account the requirements of the system and signal losses within the system, and considers environmental noise sources.

6.3.5.3 *Out-of-band immunity performance.* The receiving function shall satisfy the specified error rate with a desired signal field strength of not more than 40 microvolts per metre (minus 114 dBW/m^2) and with an undesired DSB-AM D8PSK or GFSK signal on the adjacent or any other assignable channel being at least 40 dB higher than the desired signal.

6.3.5.3.1 After 1 January 2002, the receiving function of all new installations of VDL shall satisfy the specified error rate with a desired signal field strength of not more than 40 microvolts per metre (minus 114 dBW/m^2) and with an undesired VHF DSB-AM, D8PSK or GFSK signal at least 60 dB higher than the desired signal on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.

Note.— This level of interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specified in Volume III, Part I, 6.3.4 with an effective isolation transmitter/receiver isolation of 69 dB. Better transmitter and receiver performance could result in less isolation required. Guidance material on the measurement technique is included in Annex 10, Volume V, Attachment A, section 7.

6.3.5.3.2 After 1 January 2005, the receiving function of all installations of VDL shall meet the provisions of 6.3.5.3.1, subject to the conditions of 6.3.5.3.3.

6.3.5.3.3 Requirements of mandatory compliance of the provisions of 6.3.5.3.2 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales. The agreement shall provide for at least two years' notice of mandatory compliance of aircraft systems.

6.3.5.4 INTERFERENCE IMMUNITY PERFORMANCE

6.3.5.4.1 The receiving function shall satisfy the specified error rate with a desired field strength of not more than 40 microvolts per metre, and with one or more out-of-band signals, except for VHF FM broadcast signals, having a total level at the receiver input of minus 33 dBm.

Note.— In areas where adjacent higher band signal interference exceeds this specification, a higher immunity requirement will apply.

6.3.5.4.2 The receiving function shall satisfy the specified error rate with a desired field strength of not more than 40 microvolts per metre, and with one or more VHF FM broadcast signals having a total level at the receiver input of minus 5 dBm.

6.4 PHYSICAL LAYER PROTOCOLS AND SERVICES

The aircraft and ground stations shall access the physical medium operating in simplex mode.

6.4.1 Functions

6.4.1.1 The physical layer shall provide the following functions:

a) transmitter and receiver frequency control;

b) digital reception by the receiver;

c) digital transmission by the transmitter; and

d) notification services.

6.4.1.1.1 *Transmitter/receiver frequency control.* The VDL physical layer shall set the transmitter or receiver frequency as commanded by the link management entity (LME).

Note.— The LME is a link layer entity as contained in the Manuals on VDL Mode 2 and VDL Mode 3 Technical Specifications.

6.4.1.1.2 *Digital reception by the receiver.* The receiver shall decode input signals and forward them to the higher layers for processing.

6.4.1.1.3 *Digital transmission.* The VDL physical layer shall appropriately encode and transmit information received from higher layers over the RF channel.

6.4.2 Modes 2 and 3 common physical layer

6.4.2.1 *Modulation scheme.* Modes 2 and 3 shall use differentially encoded 8 phase shift keying (D8PSK), using a raised cosine filter with $\alpha = 0.6$ (nominal value). The information to be transmitted shall be differentially encoded with 3 bits per symbol (baud) transmitted as changes in phase rather than absolute phase. The data stream to be transmitted shall be divided into groups of 3 consecutive data bits, least significant bit first. Zeros shall be padded to the end of the transmissions if needed for the final channel symbol.

6.4.2.1.1 *Data encoding.* A binary data stream entering a differential data encoder shall be converted into three separate binary streams X, Y, and Z so that bits 3n form X, bits 3n + 1 form Y, and bits 3n + 2 form Z. The triplet at time k (X_k, Y_k, Z_k) shall be converted to a change in phase as shown in Table 6-1*, and the absolute phase ϕ_k is the accumulated series of $\Delta\phi_k$, that is:

$$\phi_k = \phi_{k-1} + \Delta\phi_k$$

6.4.2.1.2 *Transmitted signal form.* The phase-modulated baseband signal as defined in 6.4.2.1.1 shall excite the pulse shape filter.

$$s(t) = \sum_{k=-\infty}^{+\infty} h(\phi_k, t-kT_s)$$

where:

- h is the complex impulse response of the pulse shape filter;
- k is defined in 6.4.2.1.1;
- ϕ is defined by the equation in 6.4.2.1.1;
- t is time;
- T_s is time duration of each symbol.

* All tables are located at the end of this chapter.

The output (function of time) of the pulse shape filter (s(t)) shall modulate the carrier frequency. The pulse shape filter shall have a nominal complex frequency response of a raised-cosine filter with α=0.6.

6.4.2.2 *Modulation rate.* The symbol rate shall be 10 500 symbols/second, resulting in a nominal bit rate of 31 500 bits/s. The modulation stability requirements for Modes 2 and 3 are provided in Table 6-2.

6.4.3 Mode 2 specific physical layer

Note.— The Mode 2 specific physical layer specification includes a description of the Mode 2 training sequence, forward error correction (FEC), interleaving, bit scrambling, channel sensing, and physical layer system parameters.

6.4.3.1 To transmit a sequence of frames, a station shall insert the bit numbers and flags (per the data link service description for Mode 2 as contained in the Manual on VDL Mode 2 Technical Specifications), compute the FEC (per 6.4.3.1.2), interleave (per 6.4.3.1.3), prepend the training sequence (per 6.4.3.1.1), carry out bit scrambling (per 6.4.3.1.4) and finally encode and modulate the RF signal (per 6.4.2.1).

6.4.3.1.1 *Training sequence.* Data transmission shall begin with a demodulator training sequence consisting of five segments:

a) transmitter ramp-up and power stabilization;

b) synchronization and ambiguity resolution;

c) reserved symbol;

d) transmission length; and

e) header FEC.

Note.— Immediately after these segments follows an AVLC frame with the format as contained in the data link service description in the Manual on VDL Mode 2 Technical Specifications.

6.4.3.1.1.1 *Transmitter ramp-up and power stabilization.* The purpose of the first segment of the training sequence, called the ramp-up, is to provide for transmitter power stabilization and receiver AGC settling, and it shall immediately precede the first symbol of the unique word. The duration of the ramp-up shall be five symbol periods. The time reference point (t), for the following specification is the centre of the first unique word symbol, a point that occurs half a symbol period after the end of the ramp-up. Conversely stated, the beginning of the ramp-up starts at t = –5.5 symbol periods. The transmitted power shall be less than –40 dBc prior to time t = –5.5 symbol periods. The ramp-up shall provide that at time t = –3.0 symbol periods the transmitted power is 90 per cent of the manufacturer's stated output power or greater (see Figure 6-1*). Regardless of the method used to implement (or truncate) the raised cosine filter, the output of the transmitter between times t = –3.0 and t = –0.5 will appear as if '000' symbols were transmitted during the ramp-up period.

Note. 1.— For Mode 3, the timing reference point is the same as the "power reference point".

Note 2.— It is desirable to maximize the time allowed for the AGC settling time. Efforts should be made to have power above 90 per cent of nominal output power at t – 3.5 symbol periods.

6.4.3.1.1.2 *Synchronization and ambiguity resolution.* The second segment of the training sequence shall consist of the unique word:

000 010 011 110 000 001 101 110 001 100 011
111 101 111 100 010

and shall be transmitted from left to right.

6.4.3.1.1.3 *Reserved symbol.* The third segment of the training sequence shall consist of the single symbol representing 000.

Note.— This field is reserved for future definition.

6.4.3.1.1.4 *Transmission length.* To allow the receiver to determine the length of the final Reed-Solomon block, the transmitter shall send a 17-bit word, from least significant bit (lsb) to most significant bit (msb), indicating the total number of data bits that follow the header FEC.

Note.— The length does not include those bits transmitted for: the Reed Solomon FEC, extra bits padded to ensure that the interleaver generates an integral number of 8-bit words, or the extra bits padded to ensure that the data encoder generates an integral number of 3-bit symbols.

6.4.3.1.1.5 *Header FEC.* To correct bit errors in the header, a (25, 20) block code shall be computed over the reserved symbol and the transmission length segments. The block code shall be transmitted as the fifth segment. The encoder shall accept the header in the bit sequence that is being transmitted. The five parity bits to be transmitted shall be generated using the following equation:

$$[P_1, \dots, P_5] = [R_1, \dots, R_3, TL_1, \dots, TL_{17}]\, H^T$$

where:

P is the parity symbol (P_1 shall be transmitted first);

R is the reserved symbol;

TL is the transmission Length symbol;

^{T} is the matrix transpose function; and

H is the parity matrix defined below:

$$H = \begin{bmatrix} 0&0&0&0&0&0&0&0&1&1&1&1&1&1&1&1&1&1&1&1 \\ 0&0&1&1&1&1&1&1&0&0&0&0&1&1&1&1&1&1&1&1 \\ 1&1&0&0&0&1&1&1&0&0&1&1&0&0&0&0&1&1&1&1 \\ 1&1&0&1&1&0&1&1&0&1&0&1&0&0&1&1&0&0&1&1 \\ 0&1&1&0&1&0&0&1&1&1&1&0&0&1&0&1&0&1&0&1 \end{bmatrix}$$

6.4.3.1.1.6 *Bit transmission order.* The five parity bits of the resultant vector product shall be transmitted from the left bit first.

6.4.3.1.2 *Forward error correction.* In order to improve the effective channel throughput by reducing the number of required retransmissions, FEC shall be applied after the training sequence, regardless of frame boundaries.

6.4.3.1.2.1 *FEC calculation.* The FEC coding shall be accomplished by means of a systematic fixed-length Reed-Solomon (RS)(255,249) 2^8-ary code.

Note 1.— This code is capable of correcting up to three octets for data blocks of 249 octets (1992 bits). Longer transmissions must be divided up into 1992 bit transmissions and shorter transmissions must be extended by virtual fill with trailing zeros. Six RS-check octets are appended for a total block of 255 octets.

The field defining the primitive polynomial of the code shall be as follows:

$$p(x) = (x^8 + x^7 + x^2 + x + 1)$$

The generator polynomial shall be as follows:

$$\prod_{i=120}^{125} (x - \alpha^i)$$

where:

α is a primitive element of GF(256);
GF(256) is a Galois field (GF) of size 256.

Note 2.— The Reed-Solomon codes are described in the Recommendation for Space Data System Standards Telemetry Channel Coding, by the Consultative Committee for Space Data Systems (see the Appendix).

* All figures are located at the end of this chapter.

6.4.3.1.2.2 *Block lengths.* The six RS-check octets shall be calculated on blocks of 249 octets. Longer transmissions shall be split into blocks of 249 octets, per 6.4.3.1.3. Blocks of shorter length shall be extended to 249 octets by a virtual fill of trailing zeros. The virtual fill shall not be transmitted. Blocks shall be coded according to 6.4.3.1.2.3 through 6.4.3.1.2.3.3.

6.4.3.1.2.3 *No error correction.* For blocks with 2 or fewer non-fill octets, no error correction shall be used.

6.4.3.1.2.3.1 *Single-byte error correction.* For blocks with 3 to 30 non-fill octets, all six RS-check octets shall be generated, but only the first two shall be transmitted. The last four RS-check octets shall be treated as erasures at the decoder.

6.4.3.1.2.3.2 *Two-byte error correction.* For blocks with 31 to 67 non-fill octets, all six RS-check octets shall be generated, but only the first four shall be transmitted. The last two RS-check octets shall be treated as erasures at the decoder.

6.4.3.1.2.3.3 *Three-byte error correction.* For blocks with 68 or more non-fill octets, all six RS-check octets shall be generated and transmitted.

6.4.3.1.3 *Interleaving.* To improve the performance of the FEC, an octet-based table-driven interleaver shall be used. The interleaver shall create a table having 255 octets per row and c rows, where

$$c = \frac{\textit{transmission length (bits)}}{1992 \textit{ (bits)}}$$

where:

a) the transmission length is as defined in 6.4.3.1.1.5; and

b) c = the smallest integer greater than or equal to the value of the fraction.

After extending the data to an even multiple of 1992 bits, the interleaver shall write the transmission stream into the first 249 octets of each row by taking each consecutive group of eight bits and storing them from the first column to the 249th. The first bit in each group of eight bits shall be stored in the eighth bit position; the first group of 1992 bits shall be stored in the first row, the second group of 1992 bits in the second row, etc. After the FEC is computed on each row, the FEC data (or erasures) shall be stored in columns 250 through 255. The interleaver shall then pass the data to the scrambler by reading out column by column, skipping any octet which contains erasures or all fill bits. All of the bits in an octet shall be transmitted from bit 8 to bit 1.

On reception, the de-interleaver shall calculate the number of rows and size of the last (potentially partial) row from the length field in the header. It shall only pass valid data bytes to the higher layer.

6.4.3.1.4 *Bit scrambling.* To aid clock recovery and to stabilize the shape of the transmitted spectrum, bit scrambling shall be applied. The pseudo noise (PN) sequence shall be a 15-stage generator (see Figure 6-2) with the characteristic polynomial:

$$X^{15} + X + 1$$

The PN-sequence shall start after the frame synchronization pattern with the initial value 1101 0010 1011 001 with the left-most bit in the first stage of the register as per Figure 6-2. After processing each bit, the register shall be shifted one bit to the right. For possible encryption in the future this initial value shall be programmed. The sequence shall be added (modulo 2) to the data at the transmit side (scrambling) and to the scrambled data at the receive side (descrambling) per Table 6-3.

Note.— The concept of a PN scrambler is explained in ITU-R Recommendation S.446-4, Annex I, Section 4.3.1, Method 1 (see the Appendix to this Chapter).

6.4.3.2 MODE 2 CHANNEL SENSING

6.4.3.2.1 *Channel busy to idle detection.* When a station receives on-channel power of at least –87 dBm for at least 5 milliseconds, then:

a) with a likelihood of 0.9, it shall continue to consider the channel occupied if the signal level is attenuated to below –92 dBm for less than 1 millisecond; and

b) with a likelihood of 0.9, it shall consider the channel unoccupied if the signal level is attenuated to below –92 dBm for at least 1.5 milliseconds.

Note.— The maximum link throughput available to all users is highly sensitive to the RF channel sense delay (from the time when the channel actually changes state until a station detects and acts on that change) and RF channel seizure delay (from the time when a station decides to transmit until the transmitter is sufficiently ramped up to lock out other stations). Accordingly, it is imperative that all efforts are made to reduce those times as the state-of-the-art advances.

6.4.3.2.2 *Channel idle to busy detection.* With a likelihood of at least 0.9, a station shall consider the channel occupied within 1 millisecond after on-channel power rises to at least –90 dBm.

6.4.3.2.3 **Recommendation.—** *The detection of an occupied channel should occur within 0.5 milliseconds.*

Note.— A higher probability of false alarm is acceptable on the idle to busy detection than the busy to idle detection because of the effects of the two different errors.

6.4.3.3 MODE 2 RECEIVER/TRANSMITTER INTERACTION

6.4.3.3.1 *Receiver to transmitter turnaround time.* A station shall transmit the training sequence such that the centre of the first symbol of the unique word will be transmitted within 1.25 milliseconds after the result of an access attempt is successful (see Figure 6-3). The total frequency change during the transmission of the unique word shall be less than 10 Hz. After transmission of the unique word, the phase acceleration shall be less than 500 Hz per second.

6.4.3.3.2 *Transmitter to receiver turnaround time.* The transmitter power shall be –20 dBc within 2.5 symbol periods of the middle of the final symbol of the burst. The transmitter power leakage when the transmitter is in the "off" state shall be less than –83 dBm. A station shall be capable of receiving and demodulating with nominal performance, an incoming signal within 1.5 milliseconds after transmission of the final information symbol.

Note.— Reference DO-160D section 21, category H for antenna radiated signals.

6.4.3.4 MODE 2 PHYSICAL LAYER SYSTEM PARAMETERS

6.4.3.4.1 The physical layer shall implement the system parameters as defined in Table 6-4.

6.4.3.4.1.1 *Parameter P1 (minimum transmission length).* Parameter P1 defines the minimum transmission length that a receiver shall be capable of demodulating without degradation of BER.

6.4.4 Mode 3 specific physical layer

Note.— The Mode 3 specific physical layer specification includes a description of Mode 3 management (M) burst and handoff check message (H) burst uplink, M burst downlink, voice/data (V/D) burst, and bit scrambling.

6.4.4.1 *Management (M) burst and handoff check message (H) burst uplink.* The M uplink burst (as contained in the Manual on VDL Mode 3 Technical Specifications) shall consist of three segments, the training sequence followed by the system data and the transmitter ramp down. The H uplink burst (as contained in the Manual on VDL Mode 3 Technical Specifications) shall consist of three segments, the training sequence followed by the handoff check message and the transmitter ramp down.

6.4.4.1.1 *Training sequence.* Uplink M burst and H burst training sequences shall consist of two components as follows:

a) transmitter ramp up and power stabilization; and

b) synchronization and ambiguity resolution.

6.4.4.1.1.1 *Transmitter ramp-up and power stabilization.* This shall be as defined in Section 6.4.3.1.1.1.

6.4.4.1.1.2 *Synchronization and ambiguity resolution.* The second component of the training sequence shall consist of the synchronization sequence, known as S_2*, as follows:

000 001 101 100 110 010 111 100 010 011 101 000
111 000 011 001

and shall be transmitted from left to right.

Note.— The sequence S_2 is very closely related to the sequence S_2 (Section 6.4.4.3.1.2). The 15 phase changes between the 16 symbols of S_2* are each exactly 180° out of phase from the 15 phase changes associated with S_2. This relationship can be used to simplify the process of simultaneously searching for both sequences.*

6.4.4.1.2 *System data and handoff check message.* The non-3T configuration (as contained in the Manual on VDL Mode 3 Technical Specifications) system data shall consist of 32 transmitted symbols. The 96 transmitted bits shall include 48 bits of information and 48 parity bits, generated as 4 Golay (24, 12) code words. The 3T configuration as contained in the Manual on VDL Mode 3 Technical Specifications shall consist of 128 transmitted symbols. The 384 transmitted bits shall include 192 bits of information and 192 parity bits, generated as 16 Golay (24, 12) code words. The 3T configuration handoff check message shall consist of 40 transmitted symbols. The 120 transmitted bits shall include 60 bits of information and 60 parity bits, generated as 5 Golay (24,12) code words.

The specific definition of the Golay encoder shall be as follows:

If the 12 bit input bit sequence is written as a row vector **x**, then the 24 bit output sequence can be written as the row vector **y**, where **y** = **x G**, and the matrix **G** shall be given by

$$\mathbf{G} = \begin{matrix}
1&1&0&1&0&1&1&1&0&0&0&1&1&0&0&0&0&0&0&0&0&0&0&0\\
0&1&1&1&1&1&0&0&1&0&0&1&0&1&0&0&0&0&0&0&0&0&0&0\\
1&1&1&0&1&0&0&1&0&1&0&1&0&0&1&0&0&0&0&0&0&0&0&0\\
0&1&1&0&0&0&1&1&1&0&1&1&0&0&0&1&0&0&0&0&0&0&0&0\\
1&1&1&0&0&1&1&0&1&1&0&0&0&0&0&0&1&0&0&0&0&0&0&0\\
1&0&1&1&0&0&1&1&0&1&1&0&0&0&0&0&0&1&0&0&0&0&0&0\\
1&0&0&1&1&0&0&1&1&0&1&1&0&0&0&0&0&0&1&0&0&0&0&0\\
0&1&0&1&1&0&1&1&1&1&0&0&0&0&0&0&0&0&0&1&0&0&0&0\\
0&0&1&0&1&1&0&1&1&1&1&0&0&0&0&0&0&0&0&0&1&0&0&0\\
0&0&0&1&0&1&1&0&1&1&1&1&0&0&0&0&0&0&0&0&0&1&0&0\\
1&1&0&1&1&1&0&0&0&1&1&0&0&0&0&0&0&0&0&0&0&0&1&0\\
1&0&1&0&1&1&1&0&0&0&1&1&0&0&0&0&0&0&0&0&0&0&0&1
\end{matrix}$$

Note.— The extended Golay code allows for the correction of any error pattern with 3 or fewer bit errors and the detection of any 4-bit error pattern.

6.4.4.1.3 *Transmitter ramp-down.* The transmitter power shall be –20 dBc within 2.5 symbol periods of the middle of the final symbol of the burst. The transmitter power leakage when the transmitter is in the "off" state shall be less than –83 dBm.

Note.— Reference RTCA/DO-160D section 21, category H for antenna radiated signals.

6.4.4.2 *Management (M) burst downlink.* The M downlink burst (as contained in the Manual on VDL Mode 3 Technical Specifications) shall consist of three segments, the training sequence followed by the system data and the transmitter ramp down.

6.4.4.2.1 *Training sequence.* The M downlink burst training sequence shall consist of two components as follows:

a) transmitter ramp up and power stabilization; and

b) synchronization and ambiguity resolution.

6.4.4.2.1.1 *Transmitter ramp-up and power stabilization.* This shall be as defined in Section 6.4.4.1.1.1.

6.4.4.2.1.2 *Synchronization and ambiguity resolution.* Three separate synchronization sequences shall be used for this burst type. The standard sequence, known as S_1, shall be as follows:

000 111 001 001 010 110 000 011 100 110 011 111
010 101 100 101

and shall be transmitted from left to right. The special sequence used to identify poll responses shall be as defined in Section 6.4.4.1.1.2.

The special sequence used to identify net entry requests (S_1*) shall use the following sequence:

000 001 111 111 100 000 110 101 010 000 101 001
100 011 010 011

and shall be transmitted from left to right.

Note.— The sequence S_1 is very closely related to the sequence S_1. The 15 phase changes between the 16 symbols of S_1* are each exactly 180° out of phase from the 15 phase changes associated with S_1. This relationship can be used to simplify the process of simultaneously searching for both sequences.*

6.4.4.2.2 *System data.* The system data segment shall consist of 16 transmitted symbols. The 48 transmitted bits shall be encoded as 24 bits of system data and 24 bits of parity bits generated as two consecutive (24, 12) Golay code words. The encoding of the (24, 12) Golay code words should be as defined in Section 6.4.4.1.2.

6.4.4.2.3 *Transmitter ramp-down.* This shall be as defined in Section 6.4.4.1.3.

6.4.4.3 *Voice or data (V/D) burst.* The V/D burst (as contained in the Manual on VDL Mode 3 Technical Specifications) shall consist of four segments: the training sequence followed by the header, the user information segment and the transmitter ramp down. The same V/D burst format shall be used for both uplink and downlink.

6.4.4.3.1 *Training sequence.* V/D burst training sequence shall consist of two components as follows:

a) transmitter ramp-up and power stabilization; and

b) synchronization and ambiguity resolution.

6.4.4.3.1.1 *Transmitter ramp-up and power stabilization.* This shall be as specified in Section 6.4.4.1.1.1.

6.4.4.3.1.2 *Synchronization and ambiguity resolution.* The second component of the training sequence shall consist of the synchronization sequence, known as S_2, as follows:

000 111 011 010 000 100 001 010 100 101 011 110
001 110 101 111

and shall be transmitted from left to right.

6.4.4.3.2 *Header.* The header segment shall consist of 8 transmitted symbols. The 24 transmitted bits shall be encoded as 12 bits of header information and 12 parity bits, generated as a single (24, 12) Golay code word. The encoding of the (24, 12) Golay code word shall be as defined in Section 6.4.4.1.2.

6.4.4.3.3 *User information.* The user information segment shall consist of 192 3-bit symbols. When transmitting voice, FEC shall be applied to the analysis output of the vocoder specified in Section 6.8. The vocoder shall provide satisfactory performance in a BER environment of 10^{-3} (with a design goal of 10^{-2}). The overall bit rate of the vocoder *including FEC* is 4 800 bits/s (except when in the truncated mode in which the bit rate is 4 000 bits/s).

6.4.4.3.3.1 When transmitting user data, the 576 bits shall be encoded as a single Reed-Solomon (72, 62) 2^8–ary code word. For user data input to the Reed-Solomon encoder of length less than 496 bits, input data shall be padded with zeroes at the end to a full length of 496 bits. The field defining the primitive polynomial of the code shall be as described in Section 6.4.3.1.2.1. The generator polynomial shall be as follows:

$$\prod_{i=120}^{129} (x - \alpha^i)$$

Note.— The Reed-Solomon (72, 62) code is capable of correcting up to five 2^8-ary (code word) symbol errors in the received word.

6.4.4.3.4 *Transmitter ramp-down.* This shall be as defined in Section 6.4.4.1.3.

6.4.4.4 *Interleaving.* There shall be no interleaving in Mode 3 operation.

6.4.4.5 *Bit scrambling.* Under Mode 3 operation, bit scrambling, as specified in Section 6.4.3.1.4 shall be performed on each burst, starting after the training sequence. The scrambling sequence shall be reinitialized on each burst effectively providing a constant overlay for each of the Mode 3 fixed length bursts.

6.4.4.6 *Receiver/transmitter interaction.* The switching times in this subsection will be defined as the time between the middle of the last information symbol of one burst and the middle of the first symbol of the synchronization sequence of the subsequent burst.

Note.— This nominal time will be shortened by considerations such as the finite width of each symbol due to Nyquist filtering and the ramp up and power stabilization sequence. Such alternative definitions could yield switching times up to 8 symbol periods shorter.

6.4.4.6.1 *Receiver to transmitter switching time.* An aircraft radio shall be capable of switching from reception to transmission within 17 symbol periods. This time can be relaxed to 33 symbol periods for aircraft radios which do not implement functions requiring discrete addressing.

Note 1.— The shortest R/T switching time for an aircraft radio occurs when the reception of an uplink M channel beacon is followed by a V/D transmission in the same slot. In certain instances where aircraft radios do not implement functions requiring discrete addressing, the R/T switching time can be increased since the last two Golay words of the uplink M channel beacon need not be read.

Note 2.— The minimum turnaround time assumes that in configurations 3V1D, 2V1D, and 3T (as contained in Section 5.5.2.4 of the Manual on VDL Mode 3 Technical Specifications), the aircraft radios will be provided with software that will prevent them from transmitting a downlink M channel message in a slot following the reception of a voice message from another aircraft with a long time delay.

6.4.4.6.2 *Transmitter to receiver switching time.* An aircraft radio shall be capable of switching from transmission to reception within 32 symbol periods.

Note.— The worst case T/R switching time for an aircraft radio occurs when it transmits a downlink M channel message and receives a V/D message in the same slot.

6.4.4.7 *Fringe coverage indication.*

6.4.4.7.1 **Recommendation.**— *Indication of near edge-of-coverage should be provided to the VDL Mode 3 aircraft.*

6.5 LINK LAYER PROTOCOLS AND SERVICES

6.5.1 General information

6.5.1.1 *Functionality.* The VDL link layer shall provide the following sublayer functions:

a) media access control (MAC) sublayer, which requires the use of the carrier sense multiple access (CSMA) algorithm for Mode 2 or TDMA for Mode 3;

b) a data link service (DLS) sublayer:

   1) for Mode 2, the DLS sublayer provides connection-oriented point-to-point links using data link entities (DLE) and connectionless broadcast link over the MAC sublayer; and

   2) for Mode 3, the DLS sublayer provides acknowledged connectionless point-to-point and point-to-multipoint links over a MAC sublayer that guarantees sequencing; and

c) a VDL management entity (VME), which establishes and maintains DLEs between the aircraft and the ground-based systems using link management entities (LME).

6.5.1.2 SERVICE

6.5.1.2.1 *Connection-oriented.* The VDL Mode 2 link layer shall provide a reliable point-to-point service using a connection-oriented DLS sublayer.

6.5.1.2.2 *Connectionless.* The VDL Mode 2 and 3 link layers shall provide an unacknowledged broadcast service using a connectionless DLS sublayer.

6.5.1.2.3 *Acknowledged connectionless.* The VDL Mode 3 link layer shall provide an acknowledged point-to-point service using a connectionless DLS sublayer that relies upon the MAC sublayer to guarantee sequencing.

6.5.2 MAC sublayer

6.5.2.1 The MAC sublayer shall provide for the transparent acquisition of the shared communications path. It makes invisible to the DLS sublayer the way in which supporting communications resources are utilized to achieve this.

Note.— Specific MAC services and procedures for VDL Modes 2 and 3 are contained in the Manuals on VDL Mode 2 and VDL Mode 3 Technical Specifications.

6.5.3 Data link service sublayer

6.5.3.1 For Mode 2, the DLS shall support bit-oriented simplex air-ground communications using the aviation VHF link control (AVLC) protocol.

Note.— Specific data link services, parameters and protocol definitions for VDL Mode 2 are contained in the Manual on VDL Mode 2 Technical Specifications.

6.5.3.2 For Mode 3, the DLS shall support bit-oriented, priority based, simplex air-ground communications using the acknowledged connectionless data link (A-CLDL) protocol.

Note.— Specific data link services, parameter and protocol definitions for VDL Mode 3 are contained in the Manual on VDL Mode 3 Technical Specifications.

6.5.4 VDL management entity

6.5.4.1 *Services.* The VME shall provide link establishment, maintenance and disconnection services as well as support parameter modification. Specific VME services, parameter formats and procedures for Modes 2 and 3 are contained in the Manuals on VDL Mode 2 and Mode 3 Technical Specifications.

6.6 SUBNETWORK LAYER PROTOCOLS AND SERVICES

6.6.1 Architecture for Mode 2

6.6.1.1 The subnetwork layer protocol used across the VHF air-ground subnetwork for VDL Mode 2 is referred to formally as a subnetwork access protocol (SNAcP) and shall conform to ISO 8208, except as contained in the Manual on VDL Mode 2 Technical Specifications. The SNAcP is contained within the Manual on VDL Mode 2 Technical Specifications as the subnetwork protocol. If there are any differences between the Manual on VDL Mode 2 Technical Specifications and the cited specifications, the Manual on VDL Mode 2 Technical Specifications shall have precedence. On the air-ground interface, the aircraft subnetwork entity shall act as a DTE and the ground subnetwork entity shall act as a DCE.

Note.— Specific subnetwork layer protocol access points, services, packet formats, parameters and procedures for VDL Mode 2 are contained in the Manual on VDL Mode 2 Technical Specifications.

6.6.2 Architecture for Mode 3

6.6.2.1 The subnetwork layer used across the VHF air-ground subnetwork for VDL Mode 3 provides the flexibility to simultaneously support multiple subnetwork protocols. The currently defined options are to support ISO 8473 connectionless network protocol and to support ISO 8208, both as contained in the Manual on VDL Mode 3 Technical Specifications. The Manual on VDL Mode 3 Technical Specifications shall have precedence with respect to any differences with the cited specifications. For the ISO 8208 interface, both the air and ground subnetwork entities shall act as DCEs.

Note.— Specific subnetwork layer protocol access points, services, packet formats, parameters and procedures for VDL Mode 3 are contained in the Manual on VDL Mode 3 Technical Specifications.

6.7 THE VDL MOBILE SUBNETWORK DEPENDENT CONVERGENCE FUNCTION (SNDCF)

6.7.1 VDL Mode 2 SNDCF

6.7.1.1 *Introduction.* The VDL Mode 2 mobile SNDCF shall be the standard mobile SNDCF.

6.7.1.2 *New function.* The VDL Mode 2 mobile SNDCF shall support maintaining context (e.g. compression tables) across subnetwork calls. The SNDCF shall use the same context (e.g. compression tables) across all SVCs negotiated to a DTE, when negotiated with the same parameters. The SNDCF shall support at least 2 SVCs sharing a context.

Note 1.— Because handoffs can be expected to reorder packets, certain compression algorithms do not lend themselves to use over VDL Mode 2. Further, implementors of dictionary-based compression algorithms must be sensitive to the problem of updates arriving on either the old or newly established call.

Note 2.— The encoding of the Call User Data field is described in Doc 9705 except with modifications as contained in the Manual on VDL Mode 2 Technical Specifications.

6.7.2 VDL Mode 3 SNDCF

6.7.2.1 The VDL Mode 3 shall support one or more of the defined SNDCFs. The first is the standard ISO 8208 SNDCF as defined in Doc 9705. This is a connection-oriented SNDCF. The second type of SNDCF supported by VDL Mode 3 is denoted frame-based SNDCF. The details of this connectionless oriented SNDCF are contained in the Manual on VDL Mode 3 Technical Specifications, including network layer interface, support for broadcast and unicast network packets, and ATN router support.

Note.— The framed-based SNDCF is termed such because it uses the VDL Mode 3 frames without the need for an additional protocol (viz. ISO 8208 SNDCF) to transfer network packets. The frame-based SNDCF achieves independence from the network protocol by identifying the payload of each frame. Upon receipt of a frame, the payload is examined and control is passed to the protocol identified.

6.8 VOICE UNIT FOR MODE 3

6.8.1 Services

6.8.1.1 The voice unit shall provide for a simplex, "push-to-talk" audio and signalling interface between the user and the VDL. Two separate mutually exclusive voice circuit types shall be supported:

a) Dedicated circuits: This shall provide service to a specific user group on an exclusive basis with no sharing of the circuit with other users outside the group. Access shall be based on a "listen-before-push-to-talk" discipline.

b) Demand assigned circuits: This shall provide voice circuit access which is arbitrated by the ground station in response to an access request received from the aircraft station. This type of operation shall allow dynamic sharing of the channel resource increasing trunking efficiency.

6.8.1.2 *Priority access*. The voice unit operation shall support a priority override access for authorized ground users.

6.8.1.3 *Message source identification*. The voice unit operation shall support notification to the user of the source of a received message (i.e. whether the message originated from an air or ground station).

6.8.1.4 *Coded squelch*. The voice unit shall support a coded squelch operation that offers some degree of rejection of undesired co-channel voice messages based on the burst time of arrival.

6.8.2 Speech encoding, parameters and procedures

6.8.2.1 The VDL Mode 3 shall use the advanced multiband excitation (AMBE) 4.8 kbits/s encoding/decoding algorithm, version number AMBE-ATC-10, developed by Digital Voice Systems, Incorporated (DVSI) for voice communications.

Note 1.— Information on technical characteristics of the 4.8 kbits/s AMBE algorithm is contained in AMBE-ATC-10 Low Level Description, obtainable from DVSI.

Note 2.— The 4.8 kbits/s AMBE encoding/decoding technology described in the document is subject to DVSI patent rights and copyrights. Manufacturers must enter into a license agreement with DVSI prior to obtaining a detailed description of the algorithm before incorporation in equipment operating in the VDL Mode 3 service. By letter to ICAO dated 29 October 1999, DVSI confirmed its commitment to license the technology for the manufacture and sale of aeronautical equipment under reasonable terms and conditions, negotiated on a non-discriminatory basis.

6.8.2.2 Speech encoding definition, voice unit parameters, and procedure descriptions for VDL Mode 3 Voice Unit operation are contained in the Manual on VDL Mode 3 Technical Specifications.

6.9 VDL MODE 4

6.9.1 A Mode 4 station shall conform to the requirements defined in sections 6.1.2.3, 6.1.4.2, 6.2.1.1, 6.2.3.1, 6.2.4, 6.3.1, 6.3.3.1, 6.3.4, 6.3.5.1, 6.3.5.2, 6.3.5.3, 6.3.5.4.1 and 6.9.

6.9.2 VDL Mode 4 radio channels

6.9.2.1 VDL MODE 4 STATION FREQUENCY RANGE

6.9.2.1.1 *Transmitter/receiver tuning range*. A VDL Mode 4 transmitter/receiver shall be capable of tuning to any of the 25 kHz channels from 117.975 MHz through 137 MHz. The transmitter shall have a means for the tuning range to be restricted to a narrower range.

Note.— Operational conditions or certain applications may require the equipment to be operated in a narrower frequency range.

6.9.2.1.2 **Recommendation**.— *A VDL Mode 4 transmitter/receiver should be capable of tuning to any of the 25 kHz channels from 108 to 117.975 MHz.*

Note.— The band 108–117.975 MHz may be utilized in accordance with the relevant provisions of the ITU Radio Regulations.

6.9.2.1.3 *Simultaneous reception.* A VDL Mode 4 station shall be capable of receiving two channels simultaneously.

6.9.2.1.4 **Recommendation.—** *A VDL Mode 4 station should be capable of receiving additional channels simultaneously as required by operational services.*

6.9.2.2 GLOBAL SIGNALLING CHANNELS

6.9.2.2.1 VDL Mode 4 stations shall use two assigned frequencies as global signalling channels (GSC), to support user communications and link management functions.

Note.— Additional channels may be defined in a local domain and notified to mobile users by broadcast from ground stations on the GSCs defined above.

6.9.3 System capabilities

6.9.3.1 *ATN compatibility.* The VDL Mode 4 system shall support ATN-compliant subnetwork services for surveillance applications.

6.9.3.2 *Data transparency.* The VDL Mode 4 system shall provide code-independent, byte-independent transfer of data.

6.9.3.3 *Broadcast.* The VDL Mode 4 system shall provide link layer broadcast services.

6.9.3.4 *Point-to-point.* The VDL Mode 4 system shall provide link layer point-to-point services.

6.9.3.5 *Air-air communications.* The VDL Mode 4 system shall provide air-air communications, without ground support, as well as air-ground communications.

6.9.3.6 *Connection management.* When supporting air-ground operations, the VDL Mode 4 system shall establish and maintain a reliable communications path between the aircraft and the ground system while allowing, but not requiring, manual intervention.

6.9.3.7 *Ground network transition.* A mobile VDL Mode 4 DLS station shall transition from one ground VDL Mode 4 DLS station to another as required.

6.9.3.8 *Derived time capability.* VDL Mode 4 shall provide the capability for deriving time from time-of-arrival measurements of received VDL Mode 4 transmissions whenever externally derived estimates of time are unavailable.

6.9.3.9 *Simplex operations.* Mobile and ground VDL Mode 4 stations shall access the physical medium operating in simplex mode.

6.9.4 Coordination of channel utilization

6.9.4.1 On a regional basis, transmissions shall be scheduled relative to UTC, to ensure efficient use of shared channels and to avoid unintentional slot re-use.

6.9.5 Physical layer protocols and services

Note.— Unless otherwise stated, the requirements defined in this section apply to both mobile and ground stations.

6.9.5.1 FUNCTIONS

6.9.5.1.1 TRANSMITTED POWER

6.9.5.1.1.1 *Airborne installation.* The effective radiated power shall be such as to provide a field strength of at least 35 microvolts per metre (minus 114.5 dBW/m^2) on the basis of free space propagation, at ranges and altitudes appropriate to the conditions pertaining to the areas over which the aircraft is operated.

6.9.5.1.1.2 *Ground installation.*

Recommendation.— *The effective radiated power should be such as to provide a field strength of at least 75 microvolts per metre (minus 109 dBW/m^2) within the defined operational coverage of the facility, on the basis of free-space propagation.*

6.9.5.1.2 TRANSMITTER AND RECEIVER FREQUENCY CONTROL

6.9.5.1.2.1 The VDL Mode 4 physical layer shall set the transmitter or receiver frequency as commanded by the link management entity (LME). Channel selection time shall be less than 13 ms after the receipt of a command from a VSS user.

6.9.5.1.3 DATA RECEPTION BY RECEIVER

6.9.5.1.3.1 The receiver shall decode input signals and forward them to the higher layers for processing.

6.9.5.1.4 DATA TRANSMISSION BY TRANSMITTER

6.9.5.1.4.1 *Data encoding and transmission.* The physical layer shall encode the data received from the data link layer and transmit it over the RF channel. RF transmission shall take place only when permitted by the MAC.

6.9.5.1.4.2 *Order of transmission.* The transmission shall consist of the following stages in the following order:

a) transmitter power stabilization;

b) bit synchronization;

c) ambiguity resolution and data transmission; and

d) transmitter decay.

Note.— The definitions of the stages are given in Sections 6.9.5.2.3.1 to 6.9.5.2.3.4.

6.9.5.1.4.3 *Automatic transmitter shutdown.* A VDL Mode 4 station shall automatically shut-down power to any final stage amplifier in the event that output power from that amplifier exceeds –30 dBm for more than 1 second. Reset to an operational mode for the affected amplifier shall require a manual operation.

Note.— This is intended to protect the shared channel resource against so-called "stuck transmitters".

6.9.5.1.5 NOTIFICATION SERVICES

6.9.5.1.5.1 *Signal quality.* The operational parameters of the equipment shall be monitored at the physical layer. Signal quality analysis shall be performed in the demodulator process and in the receive process.

Note.— Processes that may be evaluated in the demodulator include bit error rate (BER), signal to noise ratio (SNR), and timing jitter. Processes that may be evaluated in the receiver include received signal level and group delay.

6.9.5.1.5.2 *Arrival time.* The arrival time of each received transmission shall be measured with a two-sigma error of 5 microseconds.

6.9.5.1.5.3 **Recommendation.—** *The receiver should be capable of measuring the arrival time within a two-sigma error of 1 microsecond.*

6.9.5.2 PROTOCOL DEFINITION FOR GFSK

6.9.5.2.1 *Modulation scheme.* The modulation scheme shall be GFSK. The first bit transmitted (in the training sequence) shall be a high tone and the transmitted tone shall be toggled before transmitting a 0 (i.e. non-return to zero inverted encoding).

6.9.5.2.2 *Modulation rate.* Binary ones and binary zeros shall be generated with a modulation index of 0.25 ± 0.03 and a BT product of 0.28 ± 0.03, producing data transmission at a bit rate of 19 200 bits/s ± 50 ppm.

6.9.5.2.3 STAGES OF TRANSMISSION

6.9.5.2.3.1 *Transmitter power stabilization.* The first segment of the training sequence is the transmitter power stabilization, which shall have a duration of 16 symbol periods. The transmitter power level shall be no less than 90 per cent of the steady state power level at the end of the transmitter power stabilization segment.

6.9.5.2.3.2 *Bit synchronization.* The second segment of the training sequence shall be the 24-bit binary sequence 0101 0101 0101 0101 0101 0101, transmitted from left to right immediately before the start of the data segment.

6.9.5.2.3.3 *Ambiguity resolution and data transmission.* The transmission of the first bit of data shall start 40 bit intervals (approximately 2083.3 microseconds) ± 1 microsecond after the nominal start of transmission.

Note 1.— This is referenced to emissions at the output of the antenna.

Note 2.— Ambiguity resolution is performed by the link layer.

6.9.5.2.3.4 *Transmitter decay.* The transmitted power level shall decay at least by 20 dB within 300 microseconds after completing a transmission. The transmitter power level shall be less than -90 dBm within 832 microseconds after completing a transmission.

6.9.5.3 CHANNEL SENSING

6.9.5.3.1 *Estimation of noise floor.* A VDL Mode 4 station shall estimate the noise floor based on power measurements of the channel whenever a valid training sequence has not been detected.

6.9.5.3.2 The algorithm used to estimate the noise floor shall be such that the estimated noise floor shall be lower than the maximum power value measured on the channel over the last minute when the channel is regarded as idle.

Note.— The VDL Mode 4 receiver uses an energy sensing algorithm as one of the means to determine the state of the channel (idle or busy). One algorithm that can be used to estimate the noise floor is described in the Manual on VDL Mode 4 Technical Specifications.

6.9.5.3.3 *Channel idle to busy detection.* A VDL Mode 4 station shall employ the following means to determine the channel idle to busy transition at the physical layer.

6.9.5.3.3.1 *Detection of a training sequence.* The channel shall be declared busy if a VDL Mode 4 station detects a valid training sequence followed by a frame flag.

6.9.5.3.3.2 *Measurement of channel power.* Regardless of the ability of the demodulator to detect a valid training sequence, a VDL Mode 4 station shall consider the channel busy with at least a 95 per cent probability within 1 ms after on-channel power rises to the equivalent of at least four times the estimated noise floor for at least 0.5 milliseconds.

6.9.5.3.4 *Channel busy to idle detection*

6.9.5.3.4.1 A VDL Mode 4 station shall employ the following means to determine the channel busy to idle transition.

6.9.5.3.4.2 *Measurement of transmission length.* When the training sequence has been detected, the channel busy state shall be held for a period of time at least equal to 5 milliseconds, and subsequently allowed to transition to the idle state based on measurement of channel power.

6.9.5.3.4.3 *Measurement of channel power.* When not otherwise held in the channel busy state, a VDL Mode 4 station shall consider the channel idle with at least a 95 per cent probability if on-channel power falls below the equivalent of twice the estimated noise floor for at least 0.9 milliseconds.

6.9.5.4 RECEIVER/TRANSMITTER INTERACTION

6.9.5.4.1 *Receiver to transmitter turnaround time.* A VDL Mode 4 station shall be capable of beginning the transmission of the transmitter power stabilization sequence within 16 microseconds after terminating the receiver function.

6.9.5.4.2 *Frequency change during transmission.* The phase acceleration of the carrier from the start of the synchronization sequence to the data end flag shall be less than 300 Hz per second.

6.9.5.4.3 *Transmitter to receiver turnaround time.* A VDL Mode 4 station shall be capable of receiving and demodulating with nominal performance an incoming signal within 1 ms after completing a transmission.

Note.— Nominal performance is defined as a bit error rate (BER) of 10^{-4}.

6.9.5.5 PHYSICAL LAYER SYSTEM PARAMETERS

6.9.5.5.1 *Parameter P1 (minimum transmission length)*

6.9.5.5.1.1 A receiver shall be capable of demodulating a transmission of minimum length P1 without degradation of BER.

6.9.5.5.1.2 The value of P1 shall be 19 200 bits.

6.9.5.5.2 *Parameter P2 (nominal co-channel interference performance)*

6.9.5.5.2.1 The parameter P2 shall be the nominal co-channel interference at which a receiver shall be capable of demodulating without degradation in BER.

6.9.5.5.2.2 The value of P2 shall be 12 dB.

6.9.5.6 FM BROADCAST INTERFERENCE IMMUNITY PERFORMANCE FOR VDL MODE 4 RECEIVING SYSTEMS

6.9.5.6.1 A VDL Mode 4 station shall conform to the requirements defined in section 6.3.5.4 when operating in the band 117.975–137 MHz.

6.9.5.6.2 A VDL Mode 4 station shall conform to the requirements defined below when operating in the band 108–117.975 MHz.

6.9.5.6.2.1 The VDL Mode 4 receiving system shall meet the requirements specified in 6.3.5.1 in the presence of two-signal, third-order intermodulation products caused by VHF FM broadcast signals having levels in accordance with the following:

$$2N_1 + N_2 + 72 \leq 0$$

for VHF FM sound broadcasting signals in the range 107.7–108.0 MHz

and

$$2N_1 + N_2 + 3\left\{24 - 20\ \log\ \frac{\Delta f}{0.4}\right\} \leq 0$$

for VHF FM sound broadcasting signals below 107.7 MHz,

where the frequencies of the two VHF FM sound broadcasting signals produce, within the receiver, a two-signal, third-order intermodulation product on the desired VDL Mode 4 frequency.

N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the VDL Mode 4 receiver input. Neither level shall exceed the desensitization criteria set forth in 6.9.5.6.2.2.

$\Delta f = 108.1 - f_1$, where f_1 is the frequency of N_1, the VHF FM sound broadcasting signal closer to 108.1 MHz.

Note.— The FM intermodulation immunity requirements are not applied to a VDL Mode 4 channel operating below 108.1 MHz, and hence frequencies below 108.1 MHz are not intended for general assignments.

6.9.5.6.2.2 The VDL Mode 4 receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with Tables 6-5 and 6-6.

6.9.6 Link layer

Note.— Details on link layer functions are contained in the Manual on VDL Mode 4 Technical Specifications.

6.9.7 Subnetwork layer and SNDCF

Note.— Details on subnetwork layer functions and SNDCF are contained in the Manual on VDL Mode 4 Technical Specifications.

6.9.8 ADS-B applications

Note.— Details on ADS-B application functions are contained in the Manual on VDL Mode 4 Technical Specifications.

TABLES FOR CHAPTER 6

Table 6-1. Modes 2 and 3 data encoding

X_k	Y_k	Z_k	$\Delta\phi_k$
0	0	0	0 π / 4
0	0	1	1 π / 4
0	1	1	2 π / 4
0	1	0	3 π / 4
1	1	0	4 π / 4
1	1	1	5 π / 4
1	0	1	6 π / 4
1	0	0	7 π / 4

Table 6-2. Modes 2 and 3 modulation stability

VDL Mode	Aircraft Modulation Stability	Ground Modulation Stability
Mode 2	± 0.0050 per cent	± 0.0050 per cent
Mode 3	± 0.0005 per cent	± 0.0002 per cent

Table 6-3. Scrambler functions

Function	Data in	Data out
scrambling	clean data	scrambled data
descrambling	scrambled data	clean data

Table 6-4. Physical services system parameters

Symbol	Parameter name	Mode 2 value
P1	Minimum transmission length	131071 bits

Table 6-5. VDL Mode 4 operating on frequencies between 108.0–111.975 MHz

Frequency (MHz)	Maximum level of unwanted signal at receiver input (dBm)
88–102	+15
104	+10
106	+5
107.9	–10

Table 6-6. VDL Mode 4 operating on frequencies between 112.0–117.975 MHz

Frequency (MHz)	Maximum level of unwanted signal at receiver input (dBm)
88–104	+15
106	+10
107	+5
107.9	0

Note.— The relationship is linear between adjacent points designated by the above frequencies.

FIGURES FOR CHAPTER 6

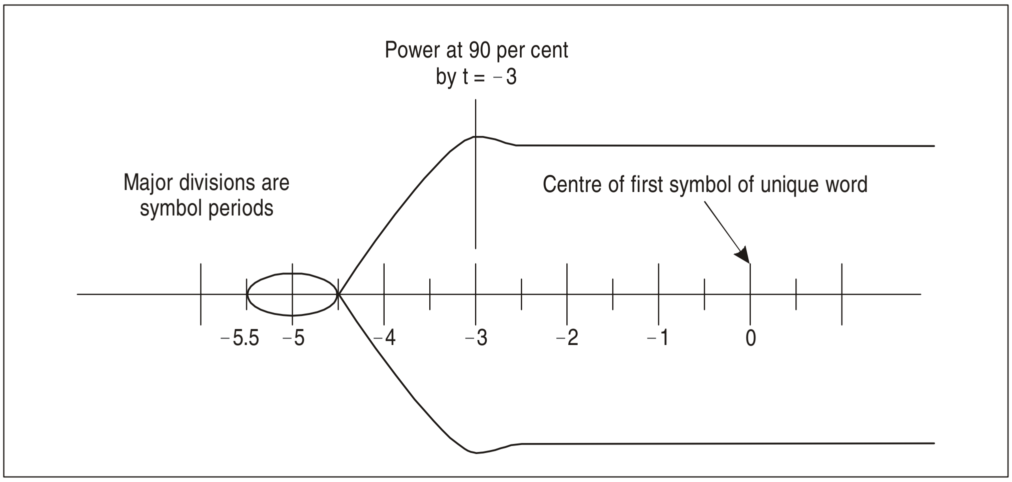

Figure 6-1. Transmitter Power Stabilization

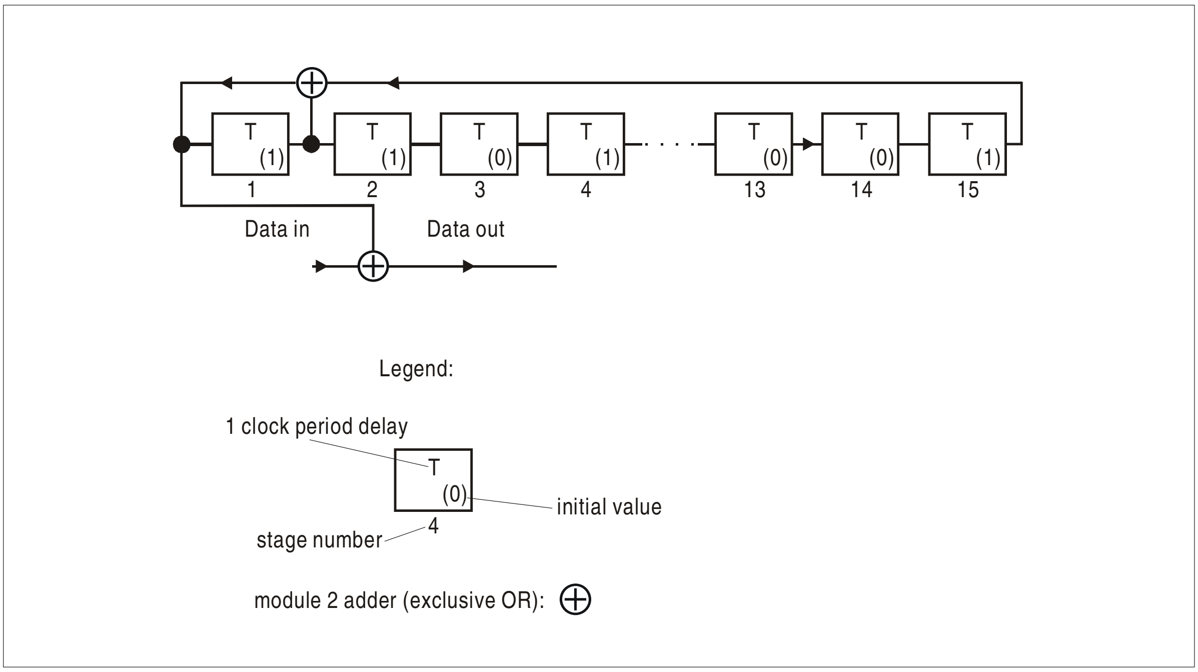

Figure 6-2. PN-generator for bit scrambling sequence

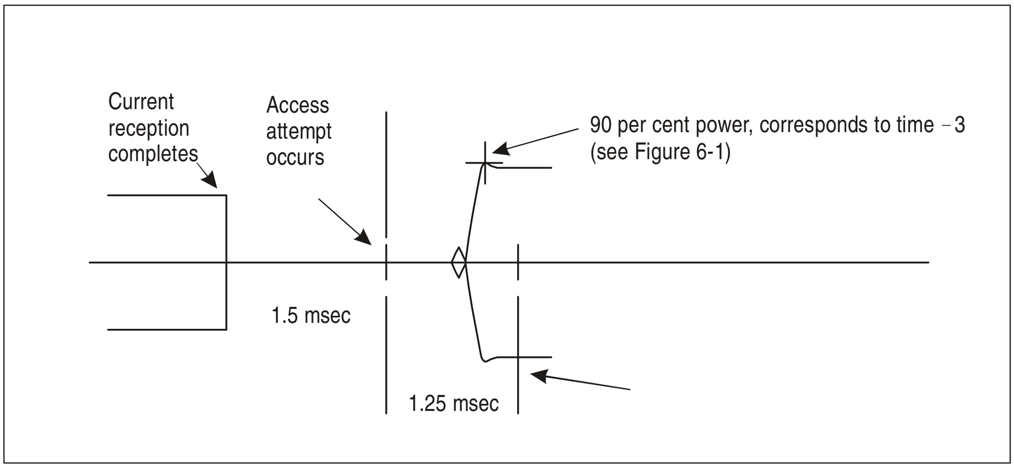

Figure 6-3. Receive to Transmit Turnaround Time

Appendix to Chapter 6

REFERENCES

1. REFERENCES

References to Standards from the International Organization for Standardization (ISO) are as specified (including date published) below. These ISO Standards shall apply to the extent specified in the SARPs.

2. NORMATIVE REFERENCES

These SARPs reference the following ISO documents:

ISO	*Title*	*Date published*
646	*Information technology — ISO 7-bit coded character set for information interchange*	12/91
3309	*HDLC Procedures — Frame Structure, Version 3*	12/93
4335	*HDLC Elements of Procedures*, Version 3	12/93
7498	*OSI Basic Reference Model, Version 1*	11/94
7809	*HDLC Procedures — Consolidation of Classes of Procedures, Version 1*	12/93
8208	*Information Processing Systems — Data Communications — X.25 Packet Level Protocol for Data Terminal Equipment*	3/90 2nd ed.
8885	*HDLC Procedures — General Purpose XID Frame Information Field Content and Format*, Version [1]	12/93
8886.3	*OSI Data Link Service Definition*, Version 3	6/92
10039	*Local Area Networks — MAC Service Definition*, Version 1	6/91

3. BACKGROUND REFERENCES

The following documents are listed as reference material.

Originator	*Title*	*Date published*
ITU-R	Recommendation S.446.4, Annex I	
CCSDS	*Telemetry Channel Coding, Recommendation for Space Data System Standards*, Consultative Committee for Space Date Systems, CCSDS 101.0-B-3, Blue Book	5/92

CHAPTER 7. SUBNETWORK INTERCONNECTION

[to be developed]

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CHAPTER 8. AFTN NETWORK

8.1 DEFINITIONS

Data signalling rate. Data signalling rate refers to the passage of information per unit of time, and is expressed in bits/second. Data signalling rate is given by the formula:

$$\sum_{i=1}^{i=m} \frac{1}{T_i} \log_2 n_i$$

where m is the number of parallel channels, T_i is the minimum interval for the ith channel expressed in seconds, n_i is the number of significant conditions of the modulation in the ith channel.

Note 1.—

a) *For a single channel (serial transmission) it reduces to* (1/T)$\log_2$n; *with a two-condition modulation* (n = 2), *it is* 1/T.

b) *For a parallel transmission with equal minimum intervals and equal number of significant conditions on each channel, it is* m(1/T)$\log_2$n (m(1/T) *in case of a two-condition modulation).*

Note 2.— In the above definition, the term "parallel channels" is interpreted to mean: channels, each of which carries an integral part of an information unit, e.g. the parallel transmission of bits forming a character. In the case of a circuit comprising a number of channels, each of which carries information "independently", with the sole purpose of increasing the traffic handling capacity, these channels are not to be regarded as parallel channels in the context of this definition.

Degree of standardized test distortion. The degree of distortion of the restitution measured during a specific period of time when the modulation is perfect and corresponds to a specific text.

Effective margin. That margin of an individual apparatus which could be measured under actual operating conditions.

Low modulation rates. Modulation rates up to and including 300 bauds.

Margin. The maximum degree of distortion of the circuit at the end of which the apparatus is situated which is compatible with the correct translation of all the signals which it may possibly receive.

Medium modulation rates. Modulation rates above 300 and up to and including 3 000 bauds.

Modulation rate. The reciprocal of the unit interval measured in seconds. This rate is expressed in bauds.

Note.— Telegraph signals are characterized by intervals of time of duration equal to or longer than the shortest or unit interval. The modulation rate (formerly telegraph speed) is therefore expressed as the inverse of the value of this unit interval. If, for example, the unit interval is 20 milliseconds, the modulation rate is 50 bauds.

Synchronous operation. Operation in which the time interval between code units is a constant.

8.2 TECHNICAL PROVISIONS RELATING TO TELETYPEWRITER APPARATUS AND CIRCUITS USED IN THE AFTN

8.2.1 In international teletypewriter circuits of the AFTN, using a 5-unit code, the International Telegraph Alphabet No. 2 (see Table 8-1) shall be used only to the extent prescribed in 4.1.2 of Volume II.

8.2.2 **Recommendation.—** *The modulation rate should be determined by bilateral or multilateral agreement between administrations concerned, taking into account primarily traffic volume.*

8.2.3 **Recommendation.—** *The nominal duration of the transmitting cycle should be at least 7.4 units (preferably 7.5), the stop element lasting for at least 1.4 units (preferably 1.5).*

8.2.3.1 **Recommendation.—** *The receiver should be able to translate correctly in service the signals coming from a transmitter with a nominal transmitting cycle of 7 units.*

8.2.4 **Recommendation.—** *Apparatus in service should be maintained and adjusted in such a manner that its net effective margin is never less than 35 per cent.*

8.2.5 **Recommendation.—** *The number of characters which the textual line of the page-printing apparatus may contain should be fixed at 69.*

Table 8-1. International Telegraph Alphabets No. 2 and No. 3

Number of signal	*Letter case*	*Figure case*	*Impulses 5-unit code*		
			Start	12345	*Stop*
				International Code No. 2	
1	A	—	A	ZZAAA	Z
2	B	?	A	ZAAZZ	Z
3	C	:	A	AZZZA	Z
4	D	Note 1	A	ZAAZA	Z
5	E	3	A	ZAAAA	Z
6	F		A	ZAZZA	Z
7	G		A	AZAZZ	Z
8	H		A	AAZAZ	Z
9	I	8	A	AZZAA	Z
10	J	Attention signal	A	ZZAZA	Z
11	K	(	A	ZZZZA	Z
12	L	)	A	AZAAZ	Z
13	M	.	A	AAZZZ	Z
14	N	,	A	AAZZA	Z
15	O	9	A	AAAZZ	Z
16	P	0	A	AZZAZ	Z
17	Q	1	A	ZZZAZ	Z
18	R	4	A	AZAZA	Z
19	S	'	A	ZAZAA	Z
20	T	5	A	AAAAZ	Z
21	U	7	A	ZZZAA	Z
22	V	=	A	AZZZZ	Z
23	W	2	A	ZZAAZ	Z
24	X	/	A	ZAZZZ	Z
25	Y	6	A	ZAZAZ	Z
26	Z	+	A	ZAAAZ	Z
27	carriage return		A	AAAZA	Z
28	line feed		A	AZAAA	Z
29	letters		A	ZZZZZ	Z
30	figures		A	ZZAZZ	Z
31	space		A	AAZAA	Z
32	unperforated tape		A	AAAAA	Z
33	signal repetition				
34	signal α				
35	signal β				

Sign	*Closed circuit*	*Double current*
A	No current	Negative current
Z	Positive current	Positive current

Note 1. Used for answer-back facility.

8.2.6 **Recommendation.—** *In start-stop apparatus fitted with automatic time delay switches, the disconnection of the power supply to the motor should not take place before the lapse of at least 45 seconds after the reception of the last signal.*

8.2.7 **Recommendation.—** *Arrangements should be made to avoid the mutilation of signals transmitted at the head of a message and received on start-stop reperforating apparatus.*

8.2.7.1 **Recommendation.—** *If the reperforating apparatus is provided with local means for feeding the paper, not more than one mutilated signal should be tolerated.*

8.2.8 **Recommendation.—** *Complete circuits should be so engineered and maintained that their degree of standardized test distortion does not exceed 28 per cent on the standardized text:*

THE QUICK BROWN FOX JUMPS
OVER THE LAZY DOG

or

VOYEZ LE BRICK GEANT QUE
JEXAMINE PRES DU WHARF

8.2.9 **Recommendation.—** *The degree of isochronous distortion on the standardized text of each of the parts of a complete circuit should be as low as possible, and in any case should not exceed 10 per cent.*

8.2.10 **Recommendation.—** *The over-all distortion in transmitting equipment used on teletypewriter channels should not exceed 5 per cent.*

8.2.11 **Recommendation.—** *AFTN circuits should be equipped with a system of continuous check of channel condition. Additionally, controlled circuit protocols should be applied.*

8.3 TERMINAL EQUIPMENT ASSOCIATED WITH AERONAUTICAL RADIOTELETYPEWRITER CHANNELS OPERATING IN THE BAND 2.5 – 30 MHZ

8.3.1 Selection of type of modulation and code

8.3.1.1 **Recommendation.—** *Frequency shift modulation (F1B) should be employed in radioteletypewriter systems used in the aeronautical fixed service (AFS), except where the characteristics of the independent sideband (ISB) method of operation are of advantage.*

Note.— F1B type of modulation is accomplished by shifting a radio frequency carrier between two frequencies representing "position A" (start signal polarity) and "position Z" (stop signal polarity) of the start-stop 5-unit telegraphic code.

8.3.2 System characteristics

8.3.2.1 **Recommendation.—** *The characteristics of signals from radioteletypewriter transmitters utilizing F1B modulation should be as follows:*

a) Frequency shift: *the lowest possible value.*

b) Frequency shift tolerance: *within plus or minus 3 per cent of the nominal value of the frequency shift.*

c) Polarity: single channel circuits: *the higher frequency corresponds to "position A" (start signal polarity).*

8.3.2.2 **Recommendation.—** *The variation of the mean between the radio frequencies representing respectively "position A" and "position Z" should not exceed 100 Hz during any two-hour period.*

8.3.2.3 **Recommendation.—** *The over-all distortion of the teletypewriter signal, as monitored at the output of the radio transmitter or in its immediate vicinity, should not exceed 10 per cent.*

Note.— Such distortion means the displacement in time of the transitions between elements from their proper positions, expressed as a percentage of unit element time.

8.3.2.4 **Recommendation.—** *Radioteletypewriter receivers concerned with F1B modulation should be capable of operating satisfactorily on signals having the characteristics set out in 8.3.2.1 and 8.3.2.2 above.*

8.3.2.5 **Recommendation.—** *The characteristics of multichannel transmission of teletypewriter signals over a radio circuit should be established by agreement between the Administrations concerned.*

8.4 CHARACTERISTICS OF INTERREGIONAL AFS CIRCUITS

8.4.1 **Recommendation.—** *Interregional AFS circuits being implemented or upgraded should employ high quality telecommunications service. Modulation rate should take into account traffic volumes expected under both normal and alternate route conditions.*

8.5 TECHNICAL PROVISIONS RELATING TO ATS MESSAGE TRANSMISSION

8.5.1 *Interconnection by direct or omnibus channels — low modulation rates — 5-unit code.*

Note.— See 8.6 below for medium modulation rates.

8.5.1.1 **Recommendation.—** *AFTN techniques (cf. 8.2 above) should be used.*

8.6 TECHNICAL PROVISIONS RELATING TO INTERNATIONAL GROUND-GROUND DATA INTERCHANGE AT MEDIUM AND HIGHER SIGNALLING RATES

Note.— Throughout this section in the context of coded character sets, the term "unit" means the unit of selective information, and is essentially equivalent to the term "bit".

8.6.1 General

8.6.1.1 **Recommendation.—** *In international data interchange of characters, a 7-unit coded character set providing a repertoire of 128 characters and designated as International Alphabet No. 5 (IA-5) should be used. Compatibility with the 5-unit coded character set of International Telegraph Alphabet No. 2 (ITA-2) should be ensured where applicable.*

8.6.1.2 When the provisions of 8.6.1.1 above are applied, International Alphabet No. 5 (IA-5) contained in Table 8-2 shall be used.

8.6.1.2.1 The serial transmission of units comprising an individual character of IA-5 shall be with the low order unit (b_1) transmitted first.

8.6.1.2.2 **Recommendation.—** *When IA-5 is used, each character should include an additional unit for parity in the eighth level position.*

8.6.1.2.3 When the provisions of 8.6.1.2.2 above are applied, the sense of the character parity bit shall produce even parity in links which operate on the start-stop principle, and odd parity in links using end-to-end synchronous operations.

8.6.1.2.4 Character-for-character conversion shall be as listed in Tables 8-3 and 8-4 for all characters which are authorized in the AFTN format for transmission on the AFS in both IA-5 and ITA-2.

8.6.1.2.5 Characters which appear in only one code set, or which are not authorized for transmission on the AFS shall be as depicted in the code conversion tables.

8.6.2 Data transmission characteristics

8.6.2.1 **Recommendation.—** *The data signalling rate should be chosen from among the following:*

600 bits/s	*4 800 bits/s*
1 200 bits/s	*9 600 bits/s*
2 400 bits/s	

8.6.2.2 **Recommendation.—** *The type of transmission for each data signalling rate should be chosen as follows:*

Data signalling rate	Type of transmission
600 bits/s	*Synchronous or asynchronous serial transmission*
1 200 bits/s	*Synchronous or asynchronous serial transmission*
2 400 bits/s	*Synchronous serial transmission*
4 800 bits/s	*Synchronous serial transmission*
9 600 bits/s	*Synchronous serial transmission*

8.6.2.3 **Recommendation.—** *The type of modulation for each data signalling rate should be chosen as follows:*

Data signalling rate	Type of modulation
600 bits/s	*Frequency*
1 200 bits/s	*Frequency*
2 400 bits/s	*Phase*
4 800 bits/s	*Phase*
9 600 bits/s	*Phase-amplitude*

Note.— This recommendation does not necessarily apply to ground-ground extensions of air-ground links used exclusively for the transfer of air-ground data, inasmuch as such circuits may be considered as part of the air-ground link.

8.6.2.4 CHARACTER STRUCTURE ON DATA LINKS

8.6.2.4.1 Character parity shall not be used for error checking on CIDIN links. Parity appended to IA-5 coded characters per 8.6.1.2.2 above, prior to entry to the CIDIN shall be ignored. For messages exiting the CIDIN, parity shall be generated in accordance with 8.6.1.2.3 above.

Table 8-2. International Alphabet No. 5 (IA-5)
(international reference version)

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC_7 (DLE)	SP	0	@	P	`	p
0	0	0	1	1	TC_1 (SOH)	DC_1	!	1	A	Q	a	q
0	0	1	0	2	TC_2 (STX)	DC_2	" ④	2	B	R	b	r
0	0	1	1	3	TC_3 (ETX)	DC_3	#	3	C	S	c	s
0	1	0	0	4	TC_4 (EOT)	DC_4	¤ ②	4	D	T	d	t
0	1	0	1	5	TC_5 (ENQ)	TC_8 (NAK)	%	5	E	U	e	u
0	1	1	0	6	TC_6 (ACK)	TC_9 (SYN)	&	6	F	V	f	v
0	1	1	1	7	BEL	TC_{10} (ETB)	' ④	7	G	W	g	w
1	0	0	0	8	FE_0 (BS)	CAN	(	8	H	X	h	x
1	0	0	1	9	FE_1 (HT)	EM	)	9	I	Y	i	y
1	0	1	0	10	FE_2 ① (LF)	SUB	*	:	J	Z	j	z
1	0	1	1	11	FE_3 (VT)	ESC	+	;	K	[	k	{
1	1	0	0	12	FE_4 (FF)	IS_4 (FS)	, ④	<	L	\	l	|
1	1	0	1	13	FE_5 ① (CR)	IS_3 (GS)	–	=	M	]	m	}
1	1	1	0	14	SO	IS_2 (RS)	.	>	N	^ ④	n	‾ ③
1	1	1	1	15	SI	IS_1 (US)	/	?	O	_	o	DEL

NOTES

Note 1.— The format effectors are intended for equipment in which horizontal and vertical movements are effected separately. If equipment requires the action of CARRIAGE RETURN to be combined with a vertical movement, the format effector for that vertical movement may be used to effect the combined movement. Use of FE 2 for a combined CR and LF operation is not allowed for international transmission on AFS networks.

Note 2.— The symbol ¤ does not designate the currency of a specific country.

Note 3.— Position 7/14 is used for graphic character ‾ (OVERLINE), the graphical representation of which may vary according to national use to represent (TILDE) or another diacritical sign provided that there is no risk of confusion with another graphic character included in the table.

Note 4.— The graphic characters in position 2/2, 2/7, 2/12 and 5/14 have respectively the significance of QUOTATION MARK, APOSTROPHE, COMMA and UPWARD ARROW HEAD; however, these characters take on the significance of the diacritical signs DIAERESIS, ACUTE ACCENT, CEDILLA and CIRCUMFLEX ACCENT when they are preceded or followed by the BACKSPACE character (0/8).

Note 5.— When graphical representation of the control characters of IA-5 is required, it is permissible to use the symbols specified in International Organization for Standardization (ISO) Standard 2047-1975.

Table 8-2 (cont.)

CONTROL CHARACTERS

Abbreviation	Meaning	Position in the code table
ACK	Acknowledge	0/6
BEL	Bell	0/7
BS	Backspace	0/8
CAN	Cancel	1/8
CR	Carriage return*	0/13
DC	Device control	—
DEL	Delete	7/15
DLE	Data link escape	1/0
EM	End of medium	1/9
ENQ	Enquiry	0/5
EOT	End of transmission	0/4
ESC	Escape	1/11
ETB	End of transmission block	1/7
ETX	End of text	0/3
FE	Format effector	—
FF	Form feed	0/12
FS	File separator	1/12
GS	Group separator	1/13
HT	Horizontal tabulation	0/9
IS	Information separator	—
LF	Line feed*	0/10
NAK	Negative acknowledge	1/5
NUL	Null	0/0
RS	Record separator	1/14
SI	Shift-in	0/15
SO	Shift-out	0/14
SOH	Start of heading	0/1
SP	Space	2/0
STX	Start of text	0/2
SUB	Substitute character	1/10
SYN	Synchronous idle	1/6
TC	Transmission control	—
US	Unit separator	1/15
VT	Vertical tabulation	0/11

* See Note 1.

GRAPHIC CHARACTERS

Graphic	Note	Name	Position in the code table
(space)		Space (*see* 7.2)	2/0
!		Exclamation mark	2/1
"	4	Quotation mark, Diaeresis	2/2
#		Number sign	2/3
¤	2	Currency sign	2/4
%		Percent sign	2/5
&		Ampersand	2/6
'	4	Apostrophe, Acute accent	2/7
(		Left parenthesis	2/8
)		Right parenthesis	2/9
*		Asterisk	2/10
+		Plus sign	2/11
,	4	Comma, Cedilla	2/12
—		Hyphen, Minus sign	2/13
.		Full stop (period)	2/14
/		Solidus	2/15
:		Colon	3/10
;		Semi-colon	3/11
<		Less-than sign	3/12
=		Equal sign	3/13
>		Greater-than sign	3/14
?		Question mark	3/15
@		Commercial 'at'	4/0
[		Left square bracket	5/11
\		Reverse solidus	5/12
]		Right square bracket	5/13
^	4	Upward arrow head, Circumflex accent	5/14
_		Underline	5/15
`		Grave accent	6/0
{		Left curly bracket	7/11
|		Vertical line	7/12
}		Right curly bracket	7/13
‾	3	Overline, Tilde	7/14

DIACRITICAL SIGNS

In the character set, some printing symbols may be designed to permit their use for the composition of accented letters when necessary for general interchange of information. A sequence of three characters, comprising a letter, BACKSPACE and one of these symbols, is needed for this composition, and the symbol is then regarded as a diacritical sign. It should be noted that these symbols take on their diacritical significance only when they are preceded or followed by the BACKSPACE character; for example, the symbol corresponding to the code combination 2/7 (') normally has the significance of APOSTROPHE, but becomes the diacritical sign ACUTE ACCENT when it precedes or follows the BACKSPACE character.

NAMES, MEANINGS AND FONTS OF GRAPHIC CHARACTERS

At least one name is assigned to denote each of the graphic characters. These names are intended to reflect their customary meanings and are not intended to define or restrict the meanings of graphic characters. No particular style or font design is specified for the graphic characters.

UNIQUENESS OF CHARACTER ALLOCATION

A character allocated to a position in the table may not be placed elsewhere in the table.

Table 8-2 (cont.)

FUNCTIONAL CHARACTERISTICS RELATED TO CONTROL CHARACTERS

Some definitions given below are stated in general terms and more explicit definitions of use may be needed for specific implementation of the code table on recording media or on transmission channels. These more explicit definitions and the use of these characters are the subject of ISO publications.

General designations of control characters

The general designation of control characters involves a specific class name followed by a subscript number.

They are defined as follows:

TC — *Transmission control characters* — Control characters intended to control or facilitate transmission of information over telecommunication networks.

The use of the TC characters on the general telecommunication networks is the subject of ISO publications.

The transmission control characters are:

ACK, DLE, ENQ, EOT, ETB, ETX, NAK, SOH, STX and SYN.

FE — *Format effectors* — Control characters mainly intended for the control of the layout and positioning of information on printing and /or display devices. In the definitions of specific format effectors, any reference to printing devices should be interpreted as including display devices. The definitions of format effectors use the following concept:

a) a page is composed of a number of lines of characters;

b) the characters forming a line occupy a number of positions called character positions;

c) the active position is that character position in which the character about to be processed would appear if it were to be printed. The active position normally advances one character position at a time.

The format effector characters are:

BS, CR, FF, HT, LF and VT (see also Note 1 to Table 8-2).

DC — *Device control characters* — Control characters for the control of a local or remote ancillary device (or devices) connected to a data processing and/or telecommunication system. These control characters are not intended to control telecommunication systems; this should be achieved by the use of TCs.

Certain preferred uses of the individual DCs are given below under *Specific control characters*.

IS — *Information separators* — Control characters that are used to separate and qualify data logically. There are four such characters. They may be used either in hierarchical order or non-hierarchically; in the latter case their specific meanings depend on their applications.

When they are used hierarchically, the ascending order is: US, RS, GS, FS.

In this case data normally delimited by a particular separator cannot be split by a higher order separator but will be considered as delimited by any higher order separator.

Specific control characters

Individual members of the classes of controls are sometimes referred to by their abbreviated class name and a subscript number (e.g. TC_5) and sometimes by a specific name indicative of their use (e.g. ENQ).

Different but related meanings may be associated with some of the control characters but in an interchange of data this normally requires agreement between the sender and the recipient.

ACK — *Acknowledge* — A transmission control character transmitted by a receiver as an affirmative response to the sender.

BEL — *Bell* — A control character that is used when there is a need to call for attention; it may control alarm or attention devices.

BS — *Backspace* — A format effector which moves the active position one character position backwards on the same line.

CAN — *Cancel* — A character, or the first character of a sequence, indicating that the data preceding it are in error. As a result these data are to be ignored. The specific meaning of this character must be defined for each application and/or between sender and recipient.

CR — *Carriage return* — A format effector which moves the active position to the first character position on the same line.

Device controls

DC_1 — A device control character which is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to restore a device to the basic mode of operation (*see also* DC_2 and DC_3), or for any other device control function not provided by other DCs.

DC_2 — A device control character which is primarily intended for turning on or starting an ancillary device. If it is not required for this purpose, it may be used to set a device to a special mode of operation (in which case DC_1 is used to restore the device to the basic mode), or for any other device control function not provided by other DCs.

DC_3 — A device control character which is primarily intended for turning off or stopping an ancillary device. This function may be a secondary level stop, e.g. wait, pause, stand-by or halt (in which case DC_1 is used to restore normal operation). If it is not required for this purpose, it may be used for any other device control function not provided by other DCs.

DC_4 — A device control character which is primarily intended for turning off, stopping or interrupting an ancillary device. If it is not required for this purpose, it may be used for any other device control function not provided by other DCs.

Examples of use of the device controls

1) One switching			
		on — DC_2	off — DC_4
2) Two independent switchings			
	First one	on — DC_2	off — DC_4
	Second one	on — DC_1	off — DC_3
3) Two dependent switchings			
	General	on — DC_2	off — DC_4
	Particular	on — DC_1	off — DC_3
4) Input and output switching			
	Output	on — DC_2	off — DC_4
	Input	on — DC_1	off — DC_3

DEL — *Delete* — A character used primarily to erase or obliterate an erroneous or unwanted character in punched tape. DEL characters may also serve to accomplish media-fill or time-fill. They may be inserted into or removed from a stream of data without affecting the information content of that stream, but then the addition or removal of these characters may affect the information layout and/or the control of equipment.

Table 8-2 (cont.)

DLE — *Data link escape* — A transmission control character which will change the meaning of a limited number of contiguously following characters. It is used exclusively to provide supplementary data transmission control functions. Only graphic characters and transmission control characters can be used in DLE sequences.

EM — *End of medium* — A control character that may be used to identify the physical end of a medium, or the end of the used portion of a medium, or the end of the wanted portion of data recorded on a medium. The position of this character does not necessarily correspond to the physical end of the medium.

ENQ — *Enquiry* — A transmission control character used as a request for a response from a remote station — the response may include station identification and/or station status. When a "Who are you?" function is required on the general switched transmission network, the first use of ENQ after the connection is established shall have the meaning "Who are you?" (station identification). Subsequent use of ENQ may, or may not, include the function "Who are you?", as determined by agreement.

EOT — *End of transmission* — A transmission control character used to indicate the conclusion of the transmission of one or more texts.

ESC — *Escape* — A control character which is used to provide an additional control function. It alters the meaning of a limited number of contiguously following bit combinations which constitute the escape sequence.

Escape sequences are used to obtain additional control functions which may provide among other things graphic sets outside the standard set. Such control functions must not be used as additional transmission controls.

The use of the character ESC and of the escape sequences in conjunction with code extension techniques is the subject of an ISO Standard.

ETB — *End of transmission block* — A transmission control character used to indicate the end of a transmission block of data where data are divided into such blocks for transmission purposes.

ETX — *End of text* — A transmission control character which terminates a text.

FF — *Form feed* — A format effector which advances the active position to the same character position on a pre-determined line of the next form or page.

HT — *Horizontal tabulation* — A format effector which advances the active position to the next pre-determined character position on the same line.

Information separators

IS_1 (US) — A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a UNIT.

IS_2 (RS) — A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a RECORD.

IS_3 (GS) — A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a GROUP.

IS_4 (FS) — A control character used to separate and qualify data logically; its specific meaning has to be defined for each application. If this character is used in hierarchical order as specified in the general definition of IS, it delimits a data item called a FILE.

LF — *Line feed* — A format effector which advances the active position to the same character position of the next line.

NAK — *Negative acknowledge* — A transmission control character transmitted by a receiver as a negative response to the sender.

NUL — *Null* — A control character used to accomplish media-fill or time-fill. NUL characters may be inserted into or removed from a stream of data without affecting the information content of that stream, but then the addition or removal of these characters may affect the information layout and/or the control of equipment.

SI — *Shift-in* — A control character which is used in conjunction with SHIFT-OUT and ESCAPE to extend the graphic character set of the code. It may reinstate the standard meanings of the bit combinations which follow it. The effect of this character when using code extension techniques is described in an ISO Standard.

SO — *Shift-out* — A control character which is used in conjunction with SHIFT-IN and ESCAPE to extend the graphic character set of the code. It may alter the meaning of the bit combinations of columns 2 to 7 which follow it until a SHIFT-IN character is reached. However, the characters SPACE (2/0) and DELETE (7/15) are unaffected by SHIFT-OUT. The effect of this character when using code extension techniques is described in an ISO Standard.

SOH — *Start of heading* — A transmission control character used as the first character of a heading of an information message.

SP — *Space* — A character which advances the active position one character position on the same line. This character is also regarded as a non-printing graphic.

STX — *Start of text* — A transmission control character which precedes a text and which is used to terminate a heading.

SUB — *Substitute character* — A control character used in the place of a character that has been found to be invalid or in error. SUB is intended to be introduced by automatic means.

SYN — *Synchronous idle* — A transmission control character used by a synchronous transmission system in the absence of any other character (idle condition) to provide a signal from which synchronism may be achieved or retained between data-terminal equipment.

VT — *Vertical tabulation* — A format effector which advances the active position to the same character position on the next pre-determined line.

Table 8-3. Conversion from the International Telegraph Alphabet No. 2 (ITA-2) to the International Alphabet No. 5 (IA-5)

ITA-2 letter case of signal No.		*IA-5 column/row*		*ITA-2 figure case of signal No.*		*IA-5 column/row*	
1	A	4/1	A	1	–	2/13	–
2	B	4/2	B	2	?	3/15	?
3	C	4/3	C	3	:	3/10	:
4	D	4/4	D	4		3/15	?
5	E	4/5	E	5	3	3/3	3
6	F	4/6	F	6		3/15	?
7	G	4/7	G	7		3/15	?
8	H	4/8	H	8		3/15	?
9	I	4/9	I	9	8	3/8	8
10	J	4/10	J	10	Attention signal *(Note 3)*	0/7	Bel
11	K	4/11	K	11	(	2/8	(
12	L	4/12	L	12	)	2/9	)
13	M	4/13	M	13	.	2/14	.
14	N	4/14	N	14	,	2/12	,
15	O	4/15	O	15	9	3/9	9
16	P	5/0	P	16	0	3/0	0
17	Q	5/1	Q	17	1	3/1	1
18	R	5/2	R	18	4	3/4	4
19	S	5/3	S	19	'	2/7	'
20	T	5/4	T	20	5	3/5	5
21	U	5/5	U	21	7	3/7	7
22	V	5/6	V	22	=	3/13	=
23	W	5/7	W	23	2	3/2	2
24	X	5/8	X	24	/	2/15	/
25	Y	5/9	Y	25	6	3/6	6
26	Z	5/10	Z	26	+	2/11	+
27	CR	0/13	CR	27	CR	0/13	CR
28	LF	0/10	LF	28	LF	0/10	LF
29	LTRS	*		29	LTRS	*	
30	FIGS	*		30	FIGS	*	
31	SP	2/0	SP	31	SP	2/0	SP
32		*		32		*	

* *No conversion shall be made for these positions and the signal/character shall be removed from the data.*

Note 1.— The end-of-message signal NNNN (in letter and figure case) shall convert to ETX (0/3).
Note 2.— The start-of-message signal ZCZC (in letter and figure case) shall convert to SOH (0/1).
Note 3.— Figures case of Signal No. 10 shall only be converted upon detection of the AFTN priority alarm which shall convert to five occurrences of BEL (0/7).
Note 4.— When converting from ITA-2, a STX (0/2) character shall be inserted once at the beginning of the next line following detection of CR LF or LF CR at the end of the Origin Line.
Note 5.— The sequence of seven signal 28 (LF) shall convert to one VT (0/11) character.

Table 8-4. Conversion from the International Telegraph Alphabet No. 5 (IA-5) to the International Alphabet No. 2 (ITA-2)

Row \ Col.	0	1	2	3	4	5	6	7
0	*	*	31FL	16F	2F	16L	2F	16L
1	Note 5	*	2F	17F	1L	17L	1L	17L
2	*	*	2F	23F	2L	18L	2L	18L
3	Note 1	*	2F	5F	3L	19L	3L	19L
4	*	*	2F	18F	4L	20L	4L	20L
5	*	*	2F	20F	5L	21L	5L	21L
6	*	*	2F	25F	6L	22L	6L	22L
7	Note 2	*	19F	21F	7L	23L	7L	23L
8	*	*	11F	9F	8L	24L	8L	24L
9	*	*	12F	15F	9L	25L	9L	25L
10	28FL	*	2F	3F	10L	26L	10L	26L
11	Note 3	*	26F	2F	11L	2F	11L	2F
12	*	*	14F	2F	12L	2F	12L	2F
13	27FL	*	1F	22F	13L	2F	13L	2F
14	*	*	13F	2F	14L	2F	14L	2F
15	*	*	24F	2F	15L	2F	15L	*

* *No conversion shall be made for these positions and the signal/character shall be removed from the data.*

Example: *To find the ITA-2 signal to which the charater 3/6 of IA-5 is to be converted, look at column 3, row 6.*

25F means figure case of signal No. 25

(L = letter case, FL = either case designation).

Note 1.— *The character 0/3 (ETX) shall convert to the ITA-2 sequence signals 14L, 14L, 14L, 14L (NNNN).*

Note 2.— *The signal 0/7 (BEL) shall only be converted when a sequence of 5 occurrences is detected, which shall convert to the ITA-2 sequence signals 30, 10F, 10F, 10F, 10F, 10F, 29.*

Note 3.— *The character sequence CR CR LF VT (0/11) ETX (0/3) shall convert to the ITA-2 sequence signals 29, 27, 27, 28, 28, 28, 28, 28, 28, 28, 28, 14L, 14L, 14L, 14L.*

Note 4.— *To prevent redundant generation of figure and letter characters in ITA-2 when converting from IA-5, no case designation shall be assigned to ITA-2 non-printing functions (signals No. 27, 28, 29, 30, 31).*

Note 5.— *The character 0/1 (SOH) shall convert to the ITA-2 sequence signals 26L, 3L, 26L, 3L (ZCZC).*

8.6.2.4.2 Characters of less than eight bits in length shall be padded out to eight bits in length before transmission over any octet based or bit-oriented communications network. The padding bits shall occupy the higher order end of the octet, i.e. bit 8, bit 7 as required, and shall have the binary values 0.

8.6.2.5 When exchanging data over CIDIN links using bit-oriented procedures, the entry centre address, exit centre addresses and destination addresses in the Transport and CIDIN Packet Headers shall be in the IA-5 character set contained in Table 8-2.

8.6.2.6 **Recommendation.—** *When transmitting messages in AFTN format over CIDIN links using bit-oriented procedures, the messages should be in the IA-5 character set contained in Table 8-2.*

8.6.3 Ground-ground character-oriented data link control procedures

Note.— The provisions of this section pertain to ground-ground data interchange applications using IA-5 prescribed by 8.6.1 above and which employ the ten transmission control characters (SOH, STX, ETX, EOT, ENQ, ACK, DLE, NAK, SYN, and ETB) for data link control, over synchronous or asynchronous transmission facilities.

8.6.3.1 *Descriptions.* The following descriptions shall apply to data link applications contained in this section:

a) A master station is that station which has control of the data link at a given instant.

b) A slave station is one that has been selected to receive a transmission from the master station.

c) A control station is the single station on a multipoint link that is permitted to assume master status and deliver messages to one or more individually selected (non-control) tributary stations, or it is permitted to assign temporary master status to any of the other tributary stations.

8.6.3.2 MESSAGE COMPOSITION

a) A transmission shall consist of characters from IA-5 transmitted in accordance with 8.6.1.2.2 above and shall be either an information message or a supervisory sequence.

b) An information message used for the exchange of data shall take one of the following forms:

```
1)  S              E  B
    T  ---TEXT---  T  C
    X              X  C

2)  S              E  B
    T  ---TEXT---  T  C
    X              B  C

3)  S                 S              E  B
    O  ---HEADING---  T  ---TEXT---  T  C
    H                 X              X  C

4)  S                 S              E  B
    O  ---HEADING---  T  ---TEXT---  T  C
    H                 X              B  C

5)  S                 E  B
    O  ---HEADING---  T  C
    H                 B  C
```

Note 1.— BCC is a block check character (BCC).

Note 2.— In formats 2), 4), and 5) above which end with ETB, some continuation is required.

c) A supervisory sequence shall be composed of either a single transmission control character (EOT, ENQ, ACK, or NAK) or a single transmission control (ENQ) preceded by a prefix of up to 15 non-control characters, or the character DLE used in conjunction with other graphic and control characters to provide additional communication control functions.

8.6.3.3 Three system categories are specified in terms of their respective circuit characteristics, terminal configurations, and message transfer procedures as follows:

System category A: two-way alternate, multipoint allowing either centralized or non-centralized operation and single or multiple message-oriented information transfers without replies (but with delivery verification).

System category B: two-way simultaneous, point-to-point employing message associated blocking and modulo 8 numbering of blocks and acknowledgements.

System category C: two-way alternate, multipoint allowing only centralized (computer-to-terminal) operation, single or multiple message transfers with replies.

8.6.3.3.1 In addition to the characteristics prescribed in the paragraphs that follow for both system categories A and B, other parameters that shall be accounted for in order to ensure viable, operationally reliable communications include:

a) the number of SYN characters required to establish and maintain synchronization;

Note.— Normally the transmitting station sends three contiguous SYN characters and the receiving station detects at least two before any action is taken.

b) the values of system time-outs for such functions as "idle line" and "no response" as well as the number of automatic retries that are to be attempted before manual intervention is signalled;

c) the composition of prefixes within a 15 character maximum.

Note.— By agreement between the administrations concerned, it is permissible for supervisory signals to contain a station identification prefix using characters selected from columns 4 through 7 of IA-5.

8.6.3.3.2 **Recommendation.—** *For multipoint implementations designed to permit only centralized (computer-to-terminal) operations, the provisions of 8.6.3.7 should be employed.*

8.6.3.4 BLOCK CHECK CHARACTER

8.6.3.4.1 Both system category A and B shall utilize a block check character to determine the validity of a transmission.

8.6.3.4.2 The block check character shall be composed of 7 bits plus a parity bit.

8.6.3.4.3 Each of the first 7 bits of the block check character shall be the modulo 2 binary sum of every element in the same bit 1 to bit 7 column of the successive characters of the transmitted block.

8.6.3.4.4 The longitudinal parity of each column of the block, including the block check character, shall be even.

8.6.3.4.5 The sense of the parity bit of the block check character shall be the same as for the information characters (see 8.6.1.2.3 above).

8.6.3.4.6 *SUMMATION*

8.6.3.4.6.1 The summation to obtain the block check character shall be started by the first appearance of either SOH (start of heading) or STX (start of text).

8.6.3.4.6.2 The starting character shall not be included in the summation.

8.6.3.4.6.3 If an STX character appears after the summation has been started by SOH, then the STX character shall be included in the summation as if it were a text character.

8.6.3.4.6.4 With the exception of SYN (synchronous idle), all the characters which are transmitted after the start of the block check summation shall be included in the summation, including the ETB (end of transmission/block) or ETX (end of text) control character which signals that the following character is the block check character.

8.6.3.4.7 No character, SYN or otherwise, shall be inserted between the ETB or ETX character and the block check character.

8.6.3.5 *Description of system category A.* System category A is one in which a number of stations are connected by a multipoint link and one station is permanently designated as the control station which monitors the link at all times to ensure orderly operation.

8.6.3.5.1 *LINK ESTABLISHMENT PROCEDURE*

8.6.3.5.1.1 To establish the link for transmission, the control station shall either:

a) poll one of the tributary stations to assign it master status; or

b) assume master status and select one or more tributary (slave) stations to receive a transmission.

8.6.3.5.1.2 Polling shall be accomplished by the control station sending a polling supervisory sequence consisting of a prefix identifying a single tributary station and ending in ENQ.

8.6.3.5.1.3 A tributary station detecting its assigned polling supervisory sequence shall assume master status and respond in one of two ways:

a) if the station has a message to send, it shall initiate a selection supervisory sequence as described in 8.6.3.5.1.5 below;

b) if the station has no message to send, it shall send EOT, and master status shall revert to the control station.

8.6.3.5.1.4 If the control station detects an invalid or no response resulting from a poll, it shall terminate by sending EOT prior to resuming polling or selection.

8.6.3.5.1.5 Selection shall be accomplished by the designated master station sending a selection supervisory sequence consisting of a prefix identifying a single station and ending in ENQ.

8.6.3.5.1.6 A station detecting its assigned selection supervisory sequence shall assume slave status and send one of two replies:

a) if the station is ready to receive, it shall send a prefix followed by ACK. Upon detecting this reply, the master station shall either select another station or proceed with message transfer;

b) if the station is not ready to receive, it shall send a prefix followed by NAK and thereby relinquish slave status. If the master station receives NAK, or no reply, it shall either select another or the same tributary station or terminate;

c) it shall be permissible for N retries ($N \geq 0$) to be made to select a station for which NAK, an invalid reply, or no response has been received.

8.6.3.5.1.7 If one or more stations have been selected and have properly responded with ACK, the master station shall proceed with message transfer.

8.6.3.5.2 *MESSAGE TRANSFER PROCEDURE*

8.6.3.5.2.1 The master station shall send a message or series of messages, with or without headings to the selected slave station(s).

8.6.3.5.2.2 The transmission of a message shall:

a) begin with:

— SOH if the message has a heading,
— STX if the message has no heading;

b) be continuous, ending with ETX, immediately followed by a block check character (BCC).

8.6.3.5.2.3 After transmitting one or more messages, the master station shall verify successful delivery at each selected slave station.

8.6.3.5.3 *DELIVERY VERIFICATION PROCEDURE*

8.6.3.5.3.1 The master station shall send a delivery verification supervisory sequence consisting of a prefix identifying a single slave station and ending in ENQ.

8.6.3.5.3.2 A slave station detecting its assigned delivery verification supervisory sequence shall send one of two replies:

a) if the slave station properly received all of the transmission, it shall send an optional prefix followed by ACK;

b) if the slave station did not receive all of the transmission properly, it shall send an optional prefix followed by NAK.

8.6.3.5.3.3 If the master station receives no reply or an invalid reply, it shall request a reply from the same or another slave station until all selected stations have been properly accounted for.

8.6.3.5.3.4 If the master station receives a negative reply (NAK) or, after $N \geq 0$ repeat attempts, no reply, it shall repeat that transmission to the appropriate slave stations at a later opportunity.

8.6.3.5.3.5 After all messages have been sent and delivery verified, the master station shall proceed with link termination.

8.6.3.5.4 *LINK TERMINATION PROCEDURE*

8.6.3.5.4.1 The terminate function, negating the master or slave status of all stations and returning master status to the control station, shall be accomplished by the master station transmitting EOT.

8.6.3.6 *Description of system category B.* System category B is one in which two stations are on a point-to-point, full-duplex link and each station has the capability to maintain concurrent master and slave status, i.e. master status on its transmit side and slave status on its receive side and both stations can transmit simultaneously.

8.6.3.6.1 *LINK ESTABLISHMENT PROCEDURE*

8.6.3.6.1.1 To establish the link for message transfers (from the calling to the called station), the calling station shall request the identity of the called station by sending an identification supervisory sequence consisting of a DLE character followed by a colon character, an optional prefix, and ENQ.

8.6.3.6.1.2 The called station, upon detecting ENQ, shall send one of two replies:

a) if ready to receive, it shall send a sequence consisting of a DLE followed by a colon, a prefix which includes its identity and ended by ACK0 (see 8.6.3.6.2.5 below). This establishes the link for message transfers from the calling to the called station;

b) if not ready to receive, it shall send the above sequence with the ACK0 replaced by NAK.

8.6.3.6.1.3 Establishment of the link for message transfers in the opposite direction can be initiated at any time following circuit connection in a similar manner to that described above.

8.6.3.6.2 *MESSAGE TRANSFER PROCEDURE*

8.6.3.6.2.1 System category B message transfer provides for message associated blocking with longitudinal checking and modulo 8 numbered acknowledgements.

8.6.3.6.2.2 It is permissible for a transmission block to be a complete message or a portion of a message. The sending station shall initiate the transmission with SOTB N followed by:

a) SOH if it is the beginning of a message that contains a heading;

b) STX if it is the beginning of a message that has no heading;

c) SOH if it is an intermediate block that continues a heading;

d) STX if it is an intermediate block that continues a text.

Note.— SOTB N is the two-character transmission control sequence DLE = (characters 1/0, and 3/13) followed by the block number, N, where N is one of the IA-5 characters 0, 1 ... 7 (characters 3/0, 3/1 ... 3/7).

8.6.3.6.2.3 A block which ends at an intermediate point within a message shall be ended with ETB; a block which ends at the end of a message shall be ended with ETX.

8.6.3.6.2.4 It shall be permissible for each station to initiate and continue to send messages to the other concurrently according to the following sequence.

a) It shall be permissible for the sending station (master side) to send blocks, containing messages or parts of messages, continuously to the receiving station (slave side) without waiting for a reply.

b) It shall be permissible for replies, in the form of slave responses, to be transmitted by the receiving station while the sending station is sending subsequent blocks.

Note.— By use of modulo 8 numbering of blocks and replies, it shall be permissible for the sending station to send as many as seven blocks ahead of the received replies before being required to stop transmission until six or less blocks are outstanding.

c) If a negative reply is received, the sending station (master side) shall start retransmission with the block following the last block for which the proper affirmative acknowledgement was received.

8.6.3.6.2.5 Slave responses shall be according to one of the following:

a) if a transmission block is received without error and the station is ready to receive another block, it shall send DLE, a colon, an optional prefix, and the appropriate acknowledgement ACKN (referring to the received block beginning with SOTB N, e.g. ACK0, transmitted as DLE0 is used as the affirmative reply to the block numbered SOTB0, DLE1 for SOTB1, etc.);

b) if a transmission block is not acceptable, the receiving station shall send DLE, a colon, an optional prefix, and NAK.

8.6.3.6.2.6 **Recommendation.—** *Slave responses should be interleaved between message blocks and transmitted at the earliest possible time.*

8.6.3.6.3 *LINK TERMINATION PROCEDURE*

8.6.3.6.3.1 If the link has been established for message transfers in either or both directions, the sending of EOT by a station shall signal the end of message transfers in that direction. To resume message transfers after sending EOT, the link shall be re-established in that direction.

8.6.3.6.3.2 EOT shall only be transmitted by a station after all outstanding slave responses have been received or otherwise accounted for.

8.6.3.6.4 *CIRCUIT DISCONNECTION*

8.6.3.6.4.1 On switched connections, the data links in both directions shall be terminated before the connection is cleared. In addition, the station initiating clearing of the connection shall first announce its intention to do so by transmitting the two-character sequence DLE EOT, followed by any other signals required to clear the connection.

8.6.3.7 *Description of system category C (centralized).* System category C (centralized) is one (like system category A) in which a number of stations are connected by a multipoint link and one station is designated as the control station but (unlike system category A) provides only for centralized (computer-to-terminal) operations where message interchange (with replies) shall be constrained to occur only between the control and a selected tributary station.

8.6.3.7.1 *LINK ESTABLISHMENT PROCEDURE*

8.6.3.7.1.1 To establish the link for transmission the control station shall either:

a) poll one of the tributary stations to assign it master status; or

b) assume master status and select a tributary station to assume slave status and receive a transmission according to either of two prescribed selection procedures:

1) selection with response (see 8.6.3.7.1.5 below); or

2) fast select (see 8.6.3.7.1.7 below).

8.6.3.7.1.2 Polling is accomplished by the control station sending a polling supervisory sequence consisting of a prefix identifying a single tributary station and ending in ENQ.

8.6.3.7.1.3 A tributary station detecting its assigned polling supervisory sequence shall assume master status and respond in one of two ways:

a) if the station has a message to send, it shall initiate message transfer. The control station assumes slave status;

b) if the station has no message to send, it shall send EOT and master status shall revert to the control station.

8.6.3.7.1.4 If the control station detects an invalid or no response resulting from a poll, it shall terminate by sending EOT prior to resuming polling or selection.

8.6.3.7.1.5 Selection with response is accomplished by the control station assuming master status and sending a selection supervisory sequence consisting of a prefix identifying a single tributary station and ending in ENQ.

8.6.3.7.1.6 A tributary station detecting its assigned selection supervisory sequence shall assume slave status and send one of two replies:

a) if the station is ready to receive, it shall send an optional prefix followed by ACK. Upon detecting this reply, the master station shall proceed with message transfer;

b) if the station is not ready to receive, it shall send an optional prefix followed by NAK. Upon detecting NAK, it shall be permissible for the master station to again attempt selecting the same tributary station or initiate termination by sending EOT.

Note.— If the control station receives an invalid or no reply, it is permitted to attempt again to select the same tributary or after N retries (N ≥ 0) either to exit to a recovery procedure or to initiate termination by sending EOT.

8.6.3.7.1.7 Fast select is accomplished by the control station assuming master status and sending a selection supervisory sequence, and without ending this transmission with ENQ or waiting for the selected tributary to respond, proceeding directly to message transfer.

8.6.3.7.2 *MESSAGE TRANSFER PROCEDURE*

8.6.3.7.2.1 The station with master status shall send a single message to the station with slave status and wait for a reply.

8.6.3.7.2.2 The message transmission shall:

a) begin with:

— SOH if the message has a heading,

— STX if the message has no heading;

and

b) be continuous, ending with ETX, immediately followed by BCC.

8.6.3.7.2.3 The slave station, upon detecting ETX followed by BCC, shall send one of two replies:

a) if the messages were accepted and the slave station is ready to receive another message, it shall send an optional prefix followed by ACK. Upon detecting ACK, the master station shall be permitted either to transmit the next message or initiate termination;

b) if the message was not accepted and the slave station is ready to receive another message, it shall send an optional prefix followed by NAK. Upon detecting NAK, the master station may either transmit another message or initiate termination. Following the NAK reply, the next message transmitted need not be a retransmission of the message that was not accepted.

8.6.3.7.2.4 If the master station receives an invalid or no reply to a message, it shall be permitted to send a delivery verification supervisory sequence consisting of an optional prefix followed by ENQ. Upon receipt of a delivery verification supervisory sequence, the slave station repeats its last reply.

8.6.3.7.2.5 *N* retries ($N \geq 0$) may be made by the master station in order to get a valid slave reply. If a valid reply is not received after *N* retries, the master station exits to a recovery procedure.

8.6.3.7.3 *LINK TERMINATION PROCEDURE*

8.6.3.7.3.1 The station with master status shall transmit EOT to indicate that it has no more messages to transmit. EOT shall negate the master/slave status of both stations and return master status to the control station.

8.6.4 Ground-ground bit-oriented data link control procedures

Note.— The provisions of this section pertain to ground-ground data interchange applications using bit-oriented data link control procedures enabling transparent, synchronous *transmission that is independent of any encoding; data link control functions are accomplished by interpreting designated bit positions in the transmission envelope of a frame.*

8.6.4.1 The following descriptions shall apply to data link applications contained in this section:

a) Bit-oriented data link control procedures enable transparent transmission that is independent of any encoding.

b) A data link is the logical association of two interconnected stations, including the communication control capability of the interconnected stations.

c) A station is a configuration of logical elements, from or to which messages are transmitted on a data link, including those elements which control the message flow on the link via communication control procedures.

d) A combined station sends and receives both commands and responses and is responsible for control of the data link.

e) Data communication control procedures are the means used to control and protect the orderly interchange of information between stations on a data link.

f) A component is defined as a number of bits in a prescribed order within a sequence for the control and supervision of the data link.

g) An octet is a group of 8 consecutive bits.

h) A sequence is one or more components in prescribed order comprising an integral number of octets.

i) A field is a series of a specified number of bits or specified maximum number of bits which performs the functions of data link or communications control or constitutes data to be transferred.

j) A frame is a unit of data to be transferred over the data link, comprising one or more fields in a prescribed order.

k) A common ICAO data interchange network (CIDIN) switching centre is that part of an automatic AFTN switching centre which provides for the entry, relay, and exit centre functions using the bit-oriented link and CIDIN network procedures specified in this section and includes the appropriate interface(s) with other parts of the AFTN and with other networks.

8.6.4.2 BIT-ORIENTED DATA LINK CONTROL PROCEDURES FOR POINT-TO-POINT, GROUND-GROUND DATA INTERCHANGE APPLICATIONS EMPLOYING SYNCHRONOUS TRANSMISSION FACILITIES

Note.— The following link level procedures are the same as the LAPB link level procedures described in ITU CCITT Recommendation X.25, Section 2, Yellow Book (1981 version). Later versions of Recommendation X.25 will be reviewed as they are released to ascertain whether or not they should be adopted.

8.6.4.2.1 *Frame format.* Frames shall contain not less than 32 bits, excluding the opening and closing flags, and shall conform to the following format:

FLAG F	ADDRESS A	CONTROL C	INFORMATION I	FCS	FLAG F

8.6.4.2.1.1 A frame shall consist of an opening flag (F), an address field (A), a control field (C), an optional information field (I), a frame check sequence (FCS), and a closing flag sequence (F), and shall be transmitted in that order.

Note.— In relation to CIDIN, the opening flag, the fields A and C, the FCS and the closing flag form together the Data Link Control Field (DLCF). The field I is denoted as the Link Data Field (LDF).

8.6.4.2.1.1.1 The flag (F) shall be the 8-bit sequence 01111110 which delimits the beginning and ending of each frame. It shall be permissible for the closing flag of a frame to also serve as the opening flag of the next frame.

8.6.4.2.1.1.2 The address (A) field shall consist of one octet, excluding 0 bits added to achieve transparent transmission, which shall contain the link address of the combined station.

8.6.4.2.1.1.3 The control (C) field shall consist of one octet, excluding 0 bits added to achieve transparent transmission, and shall contain the commands, responses, and frame sequence number components for the control of the data link.

8.6.4.2.1.1.4 The information (I) field shall contain digital data which may be presented in any code or sequence but shall not exceed a maximum of 259 octets, excluding 0 bits added to achieve transparent transmission. The I field shall always be a multiple of 8 bits in length.

8.6.4.2.1.1.5 The frame check sequence (FCS) shall consist of two octets, excluding 0 bits added to achieve transparent transmission, and shall contain the error detecting bits.

8.6.4.2.2 A frame check sequence (FCS) shall be included in each frame for the purpose of error checking.

8.6.4.2.2.1 The error checking algorithm shall be a cyclic redundancy check (CRC).

8.6.4.2.2.2 The CRC polynominal ($P(x)$) shall be

$$x^{16} + x^{12} + x^5 + 1.$$

8.6.4.2.2.3 The FCS shall be a 16-bit sequence. This FCS shall be the ones' complement of the remainder, $R(x)$, obtained from the modulo 2 division of

$$x^{16}[G(x)] + x^K(x^{15} + x^{14} + x^{13} + ... + x^2 + x^1 + 1)$$

by the CRC polynomial, $P(x)$.

$G(x)$ shall be the contents of the frame existing between, but including neither, the final bit of the opening flag nor the first bit of the FCS, excluding bits inserted for transparent transmission.

K shall be the length of $G(x)$ (number of bits).

8.6.4.2.2.4 The generation and checking of the FCS accumulation shall be as follows:

a) the transmitting station shall initiate the FCS accumulation with the first (least significant) bit of the address (A) field and shall include all bits up to and including the last bit preceding the FCS sequence, but shall exclude all 0 bits (if any) inserted to achieve transparent transmission;

b) upon completion of the accumulation the FCS shall be transmitted, starting with bit *b1* (highest order coefficient) and proceeding in sequence to bit b16 (lowest order coefficient) as shown below;

First bit transmitted ↓

b16	b15	b14	-------	b3	b2	b1
x^0	x^1	x^2		x^{13}	x^{14}	x^{15}

c) the receiving station shall carry out the cyclic redundancy check (CRC) on the content of the frame commencing with the first bit received following the opening flag, and shall include all bits up to and including the last bit preceding the closing flag, but shall exclude all 0 bits (if any) deleted according to the rules for achievement of transparency;

d) upon completion of the FCS accumulation, the receiving station shall examine the remainder. In the absence of transmission error, the remainder shall be 1111000010111000 (x^0 through x^{15}, respectively).

8.6.4.2.3 *Achievement of transparency.* The frame format contents (A, C, link data field, and FCS) shall be capable of containing any bit configuration.

8.6.4.2.3.1 The following rules shall apply to all frame contents, except flag sequences:

a) the transmitting station shall examine the frame contents before transmission, and shall insert a single 0 bit immediately following each sequence of 5 consecutive 1 bits;

b) the receiving station shall examine the received frame contents for patterns consisting of 5 consecutive 1 bits immediately followed by one (or more) 0 bit(s) and shall remove the 0 bit which directly follows 5 consecutive 1 bits.

8.6.4.2.4 *Special transmission sequences and related link states.* In addition to employing the prescribed repertoire of commands and responses to manage the interchange of data and control information, stations shall use the following conventions to signal the indicated conditions:

a) *Abort* is the procedure by which a station in the process of sending a frame ends the frame in an unusual manner such that the receiving station shall ignore the frame. The conventions for aborting a frame shall be:

   1) transmitting at least seven, but less than fifteen, one bits (with no inserted zeros);

   2) receiving seven one bits.

b) *Active link state.* A link is in an active state when a station is transmitting a frame, an abort sequence, or interframe time fill. When the link is in the active state, the right of the transmitting station to continue transmission shall be reserved.

c) *Interframe time fill.* Interframe time fill shall be accomplished by transmitting continuous flags between frames. There is no provision for time fill within a frame.

d) *Idle link state.* A link is in an idle state when a continuous one condition is detected that persists for 15 bit times, or longer. Idle link time fill shall be a continuous one condition on the link.

e) *Invalid frame.* An invalid frame is one that is not properly bounded by two flags or one which is shorter than 32 bits between flags.

Table 8-5. Control field formats

Control field format for	Control field bits 1	2	3	4	5	6	7	8
Information transfer (I frame)	0		*N(S)*		*P*		*N(R)*	
Supervisory commands/responses (S frame)	1	0	*S*	*S*	*P/F*		*N(R)*	
Unnumbered commands/responses	1	1	*M*	*M*	*P/F*	*M*	*M*	*M*

where:

N(S) = send sequence count (bit 2 = low order bit)
N(R) = receive sequence count (bit 6 = low order bit)
S = supervisory function bits
M = modifier function bits
P = poll bit (in commands)
F = final bit (in responses)

8.6.4.2.5 *MODES*

8.6.4.2.5.1 *Operational mode.* The operational mode shall be the asynchronous balanced mode (ABM).

8.6.4.2.5.1.1 It shall be permissible for a combined station in ABM to transmit without invitation from the associated station.

8.6.4.2.5.1.2 A combined station in ABM shall be permitted to transmit any command or response type frame except DM.

8.6.4.2.5.2 *Non-operational mode.* The non-operational mode shall be the asynchronous disconnected mode (ADM) in which a combined station is logically disconnected from the data link.

8.6.4.2.5.2.1 It shall be permissible for a combined station in ADM to transmit without invitation from the associated station.

8.6.4.2.5.2.2 A combined station in ADM shall transmit only SABM, DISC, UA and DM frames. (See 8.6.4.2.7 below for a description of the commands and responses to which these frame types refer.)

8.6.4.2.5.2.3 A combined station in ADM shall transmit a DM when a DISC is received, and shall discard all other received command frames except SABM. If a discarded command frame has the P bit set to "1", the combined station shall transmit a DM with the F bit set to "1".

8.6.4.2.6 *Control field functions and parameters.* Control fields contain a command or a response and sequence numbers where applicable. Three types of control fields shall be used to perform:

a) numbered information transfer (I-frames);

b) numbered supervisory functions (S-frames); and

c) unnumbered control functions (U-frames).

The control field formats shall be as shown in Table 8-5. The functional frame designation associated with each type control field as well as the control field parameters employed in performing these functions shall be described in the following paragraphs.

8.6.4.2.6.1 The I-frame type is used to perform information transfers. Except for some special cases it is the only format which shall be permitted to contain an information field.

8.6.4.2.6.2 The S-frame type is used for supervisory commands and responses that perform link supervisory control functions such as acknowledge information frames, request transmission or retransmission of information frames, and to request a temporary suspension of transmission of I-frames. No information field shall be contained in the S-frame.

8.6.4.2.6.3 The U-frame type is used for unnumbered commands and responses that provide additional link control functions. One of the U-frame responses, the frame reject (FRMR) response, shall contain an information field; all other frames of the U-frame type shall not contain an information field.

8.6.4.2.6.4 The station parameters associated with the three control field types shall be as follows:

a) *Modulus.* Each I-frame shall be sequentially numbered with a send sequence count, N(S), having value 0 through modulus minus one (where modulus is the modulus of the sequence numbers). The modulus shall be 8. The maximum number of sequentially numbered I-frames that a station shall have outstanding (i.e. unacknowledged) at any given time shall never exceed one less than the modulus of the sequence numbers. This restriction on the number of outstanding frames is to prevent any ambiguity in the association of transmission frames with sequence numbers during normal operation and/or error recovery.

b) The send state variable *V(S)* shall denote the sequence number of the next in-sequence I-frame to be transmitted.

   1) The send state variable shall take on the value 0 through modulus minus one (modulus is the modulus of the sequence numbering and the numbers cycle through the entire range).

   2) The value of *V(S)* shall be incremented by one with each successive in-sequence I-frame transmission, but shall not exceed the value of *N(R)* contained in the last received frame by more than the maximum permissible number of outstanding I-frames (*k*). See i) below for the definition of *k*.

c) Prior to transmission of an in-sequence I-frame, the value of *N(S)* shall be updated to equal the value of *V(S)*.

d) The receive state variable *V(R)* shall denote the sequence number of the next in-sequence I-frame to be received.

   1) *V(R)* shall take on the values 0 through modulus minus one.

   2) The value of *V(R)* shall be incremented by one after the receipt of an error-free, in-sequence I-frame whose send sequence number *N(S)*, equals *V(R)*.

e) All I-frames and S-frames shall contain *N(R)*, the expected sequence number of the next received frame. Prior to transmission of either an I or an S type frame, the value of *N(R)* shall be updated to equal the current value of the receive state variable. *N(R)* indicates that the station transmitting the *N(R)* has correctly received all I-frames numbered up to and including *N(R)* – 1.

f) Each station shall maintain an independent send state variable, *V(S)*, and receive state variable, *V(R)*, on the I-frames it sends and receives. That is, each combined station shall maintain a *V(S)* count on the I-frames it transmits and a *V(R)* count on the I-frames it has correctly received from the remote combined station.

g) The poll (P/F) bit shall be used by a combined station to solicit (poll) a response or sequence of responses from the remote combined station.

h) The final (P/F) bit shall be used by the remote combined station to indicate the response frame transmitted as the result of a soliciting (poll) command.

i) The maximum number (*k*) of sequentially numbered I-frames that a station may have outstanding (i.e. unacknowledged) at any given time is a station parameter which shall never exceed the modulus.

Note.— k is determined by station buffering limitations and should be the subject of bilateral agreement at the time of circuit establishment.

8.6.4.2.7 *Commands and responses.* It shall be permissible for a combined station to generate either commands or responses. A command shall contain the remote station address while a response shall contain the sending station address. The mnemonics associated with all of the commands and responses prescribed for each of the three frame types (I, S, and U) and the corresponding encoding of the control field are as shown in Table 8-6.

8.6.4.2.7.1 The I-frame command provides the means for transmitting sequentially numbered frames, each of which shall be permitted to contain an information field.

8.6.4.2.7.2 The S-frame commands and responses shall be used to perform numbered supervisory functions (such as acknowledgement, polling, temporary suspension of information transfer, or error recovery).

8.6.4.2.7.2.1 The receive ready command or response (RR) shall be used by a station to:

a) indicate that it is ready to receive an I-frame;

b) acknowledge previously received I-frames numbered up to and including *N(R)* – 1;

c) clear a busy condition that was initiated by the transmission of RNR.

Note.— It is permissible for a combined station to use the RR command to solicit a response from the remote combined station with the poll bit set to "1".

8.6.4.2.7.2.2 It shall be permissible to issue a reject command or response (REJ) to request retransmission of frames starting with the I-frame numbered *N(R)* where:

a) I-frames numbered *N(R)* – 1 and below are acknowledged;

Table 8-6. Commands and responses

Type	*Commands*		*Responses*		*C field encoding* 1	2	3	4	5	6	7	8
Information transfer	I	(information)			0		*N(S)*		*P*		*N(R)*	
Supervisory	RR	(receive ready)	RR	(receive ready)	1	0	0	0	*P/F*		*N(R)*	
	RNR	(receive not ready)	RNR	(receive not ready)	1	0	1	0	*P/F*		*N(R)*	
	REJ	(reject)	REJ	(reject)	1	0	0	1	*P/F*		*N(R)*	
Unnumbered			DM	(disconnected mode)	1	1	1	1	*P/F*	0	0	0
	SABM	(set asynchronous balanced mode)			1	1	1	1	*P*	1	0	0
	DISC	(disconnect)			1	1	0	0	*P*	0	1	0
			UA	(unnumbered acknowledgement)	1	1	0	0	*F*	1	1	0
			FRMR	(frame reject)	1	1	1	0	*F*	0	0	1

b) additional I-frames pending initial transmission are to be transmitted following the retransmitted I-frame(s);

c) only one REJ exception condition, from one given station to another station, shall be established at any given time: another REJ shall not be issued until the first REJ exception condition has been cleared;

d) the REJ exception condition is cleared (reset) upon the receipt of an I-frame with an $N(S)$ count equal to the $N(R)$ of the REJ command/response.

8.6.4.2.7.2.3 The receive not ready command or response (RNR) shall be used to indicate a busy condition, i.e. temporary inability to accept additional incoming I-frames, where:

a) frames numbered up to and including $N(R) - 1$ are acknowledged;

b) frame $N(R)$ and any subsequent I-frames received, if any, are not acknowledged (the acceptance status of these frames shall be indicated in subsequent exchanges);

c) the clearing of a busy condition shall be indicated by the transmission of an RR, REJ, SABM, or UA with or without the P/F bit set to "1".

8.6.4.2.7.2.3.1 **Recommendation.—**

a) A station receiving an RNR frame when in the process of transmitting should stop transmitting I-frames at the earliest possible time.

b) Any REJ command or response which was received prior to the RNR should be actioned before the termination of transmission.

c) It should be permissible for a combined station to use the RNR command with the poll bit set to "1" to obtain a supervisory frame with the final bit set to "1" from the remote combined station.

8.6.4.2.7.2.4 It shall be permissible for the selective reject command or response (SREJ) to be used to request retransmission of the single I-frame numbered $N(R)$ where:

a) frames numbered up to $N(R) - 1$ are acknowledged; frame $N(R)$ is not accepted; the only I-frames accepted are those received correctly and in sequence following the I-frame requested; the specific I-frame to be retransmitted is indicated by the $N(R)$ in the SREJ command/response;

b) the SREJ exception condition is cleared (reset) upon receipt of an I-frame with an $N(S)$ count equal to the $N(R)$ of the SREJ;

c) after a station transmits a SREJ it is not permitted to transmit SREJ or REJ for an additional sequence error until the first SREJ error condition has been cleared;

d) I-frames that have been permitted to be transmitted following the I-frame indicated by the SREJ are not retransmitted as the result of receiving a SREJ; and

e) it is permissible for additional I-frames pending initial transmission to be transmitted following the retransmission of the specific I-frame requested by the SREJ.

8.6.4.2.7.3 The U-frame commands and responses shall be used to extend the number of link control functions. Transmitted U-frames do not increment the sequence counts at either the transmitting or receiving station.

a) The U-frame mode-setting commands (SABM, and DISC) shall be used to place the addressed station in the appropriate response mode (ABM or ADM) where:

1) upon acceptance of the command, the station send and receive state variables, $V(S)$ and $V(R)$, are set to zero;

2) the addressed station confirms acceptance at the earliest possible time by transmission of a single unnumbered acknowledgement, UA;

3) previously transmitted frames that are unacknowledged when the command is actioned remain unacknowledged;

4) the DISC command is used to perform a logical disconnect, i.e. to inform the addressed combined station that the transmitting combined station is suspending operation. No information field shall be permitted with the DISC command.

b) The unnumbered acknowledge response (UA) shall be used by a combined station to acknowledge the receipt and acceptance of an unnumbered command. Received unnumbered commands are not actioned until the UA response is transmitted. No information field shall be permitted with the UA response.

c) The frame reject response (FRMR), employing the information field described below, shall be used by a combined station in the operational mode (ABM) to report that one of the following conditions resulted from the receipt of a frame without an FCS error:

1) a command/response that is invalid or not implemented;

2) a frame with an information field that exceeds the size of the buffer available;

3) a frame having an invalid $N(R)$ count.

Note.— An invalid N(R) is a count which points to an I-frame which has previously been transmitted and acknowledged or to an I-frame which has not been transmitted and is not the next sequential I-frame pending transmission.

d) The disconnected mode response (DM) shall be used to report a non-operational status where the station is logically disconnected from the link. No information field shall be permitted with the DM response.

Note.— The DM response shall be sent to request the remote combined station to issue a mode-setting command or, if sent in response to the reception of a mode-setting command, to inform the remote combined station that the transmitting station is still in ADM and cannot action the mode-setting command.

8.6.4.3 Exception condition reporting and recovery. This section specifies the procedures that shall be employed to effect recovery following the detection or occurrence of an exception condition at the link level. Exception conditions described are those situations that may occur as the result of transmission errors, station malfunction, or operational situations.

8.6.4.3.1 *Busy condition.* A busy condition occurs when a station temporarily cannot receive or continue to receive I-frames due to internal constraints, e.g. due to buffering limitations. The busy condition shall be reported to the remote combined station by the transmission of an RNR frame with the $N(R)$ number of the next I-frame that is expected. It shall be permissible for traffic pending transmission at the busy station to be transmitted prior to or following the RNR.

Note.— The continued existence of a busy condition must be reported by retransmission of RNR at each P/F frame exchange.

8.6.4.3.1.1 Upon receipt of an RNR, a combined station in ABM shall cease transmitting I-frames at the earliest possible time by completing or aborting the frame in process. The combined station receiving an RNR shall perform a time-out operation before resuming asynchronous transmission of I-frames unless the busy condition is reported as cleared by the remote combined station. If the RNR was received as a command with the P bit set to "1", the receiving station shall respond with an S-frame with the F bit set to "1".

8.6.4.3.1.2 The busy condition shall be cleared at the station which transmitted the RNR when the internal constraint ceases. Clearance of the busy condition shall be reported to the remote station by transmission of an RR, REJ, SABM, or UA frame (with or without the P/F bit set to "1").

FRMR INFORMATION FIELD BITS FOR BASIC (SABM) OPERATION

First bit transmitted

1 8	9	10 12	13	14 16	17	18	19	20	21 24
rejected basic control field	0	*V(S)*	*v*	*V(R)*	*w*	*x*	*y*	*z*	set to zero

where:

rejected basic control field is the control field of the received frame which caused the frame reject;

V(S) is the current value of the send state variable at the remote combined station reporting the error condition (bit 10 = low order bit);

V(R) is the current value of the receive state variable at the remote combined station reporting the error condition (bit 14 = low order bit);

v set to "1" indicates that the received frame which caused rejection was a response;

w set to "1" indicates that the control field received and returned in bits 1 through 8 are invalid or not implemented;

x set to "1" indicates that the control field received and returned in bits 1 through 8 was considered invalid because the frame contained an information field which is not permitted with this command. Bit *w* must be set to "1" in conjunction with this bit;

y set to "1" indicates that the information field received exceeded the maximum information field length which can be accommodated by the station reporting the error condition. This bit is mutually exclusive with bits *w* and *x* above;

z set to "1" indicates that the control field received and returned in bits 1 through 8 contained an invalid *N(R)* count. This bit is mutually exclusive with bit *w*.

8.6.4.3.2 *N(S) sequence error.* An *N*(*S*) sequence exception shall be established in the receiving station when an I-frame that is received error free (no FCS error) contains an *N*(*S*) sequence number that is not equal to the receive variable *V*(*R*) at the receiving station. The receiving station shall not acknowledge (shall not increment its receive variable *V*(*R*)) the frame causing the sequence error, or any I-frames which may follow, until an I-frame with the correct *N*(*S*) number is received. A station that receives one or more I-frames having sequence errors, but which are otherwise error free, shall accept the control information contained in the *N*(*R*) field and the P/F bit to perform link control functions, e.g. to receive acknowledgement of previously transmitted I-frames (via the *N*(*R*)), to cause the station to respond (P bit set to "1").

8.6.4.3.2.1 The means specified in 8.6.4.3.2.1.1 and 8.6.4.3.2.1.2 below shall be available for initiating the retransmission of lost or errored I-frames following the occurrence of a sequence error.

8.6.4.3.2.1.1 Where the REJ command/response is used to initiate an exception recovery following the detection of a sequence error, only one "sent REJ" exception condition, from one station to another station, shall be established at a time. A "sent REJ" exception shall be cleared when the requested I-frame is received. A station receiving REJ shall initiate sequential (re)transmission of I-frames starting with the I-frame indicated by the *N*(*R*) contained in the REJ frame.

8.6.4.3.2.1.2 In the event a receiving station, due to a transmission error, does not receive (or receives and discards) a single I-frame or the last I-frame(s) in a sequence of I-frames, it shall not detect an out-of-sequence exception and, therefore, shall not transmit REJ. The station which transmitted the unacknowledged I-frame(s) shall, following the completion of a system-specified time-out period, take appropriate recovery action to determine the sequence number at which retransmission must begin.

8.6.4.3.2.1.3 **Recommendation.—** *A combined station which has timed out waiting for a response should not retransmit all unacknowledged frames immediately. The station may enquire about status with a supervisory frame.*

Note 1.— If a station does retransmit all unacknowledged I-frames after a time-out, it must be prepared to receive a subsequent REJ frame with an N(R) *greater than its send variable* V(S).

Note 2.— Since contention may occur in the case of two-way alternate communications in ABM or ADM, the time-out interval employed by one combined station must be greater than that employed by the other combined station so as to permit contention to be resolved.

8.6.4.3.3 *FCS error.* Any frame with an FCS error shall not be accepted by the receiving station and will be discarded. No action shall be taken by the receiving station as the result of that frame.

8.6.4.3.4 *Frame reject exception condition.* A frame reject exception condition shall be established upon the receipt of an error-free frame which contains an invalid or unimplemented control field, an invalid *N(R),* or an information field which has exceeded the maximum established storage capability. If a frame reject exception condition occurs in a combined station, the station shall either:

a) take recovery action without reporting the condition to the remote combined station; or

b) report the condition to the remote combined station with a FRMR response. The remote station will then be expected to take recovery action; if, after waiting an appropriate time, no recovery action appears to have been taken, the combined station reporting the frame reject exception condition may take recovery action.

Recovery action for balanced operation includes the transmission of an implemented mode-setting command. Higher level functions may also be involved in the recovery.

8.6.4.3.5 *Mode-setting contention.* A mode-setting contention situation exists when a combined station issues a mode-setting command and, before receiving an appropriate response (UA or DM), receives a mode-setting command from the remote combined station. Contention situations shall be resolved in the following manner:

a) when the send and receive mode-setting commands are the same, each combined station shall send a UA response at the earliest respond opportunity. Each combined station shall either enter the indicated mode immediately or defer entering the indicated mode until receiving a UA response. In the latter case, if the UA response is not received:

   1) the mode may be entered when the response timer expires; or

   2) the mode-setting command may be reissued;

b) when the mode-setting commands are different, each combined station shall enter ADM and issue a DM response at the earliest respond opportunity. In the case of DISC contention with a different mode-setting command, no further action is required.

8.6.4.3.6 *Time-out functions.* Time-out functions shall be used to detect that a required or expected acknowledging action or response to a previously transmitted frame has not been received. Expiration of the time-out function shall initiate appropriate action, e.g. error recovery or reissuance of the P bit. The duration of the following time-out functions is system dependent and subject to bilateral agreement:

a) combined stations shall provide a time-out function to determine that a response frame with F bit set to "1" to a command frame with the P bit set to "1" has not been received. The time-out function shall automatically cease upon receipt of a valid frame with the F bit set to "1";

b) a combined station which has no P bit outstanding, and which has transmitted one or more frames for which responses are anticipated shall start a time-out function to detect the no-response condition. The time-out function shall cease when an I- or S-frame is received with the *N(R)* higher than the last received *N(R)* (actually acknowledging one or more I-frames).

8.6.5 Common ICAO data interchange network (CIDIN)

8.6.5.1 Introduction

Note 1.— The common ICAO data interchange network (CIDIN) is an element of the aeronautical fixed service (AFS) which uses bit-oriented procedures, store and forward techniques and packet switching techniques based on CCITT Recommendation X.25 to carry messages of specific applications of the AFS such as AFTN and operational meteorological information (OPMET).

Note 2.— The CIDIN provides a reliable common network service for the conveyance of application messages in binary or text form to air traffic service providers and aircraft operating agencies.

8.6.5.1.1 CIDIN entry and exit centres or stations shall be used to connect application entities to the CIDIN.

Note.— The interfacing between CIDIN and application entities is a matter for local implementation.

8.6.5.1.2 CIDIN relay centres shall be used to forward packets between CIDIN entry and exit centres or stations which are not directly connected.

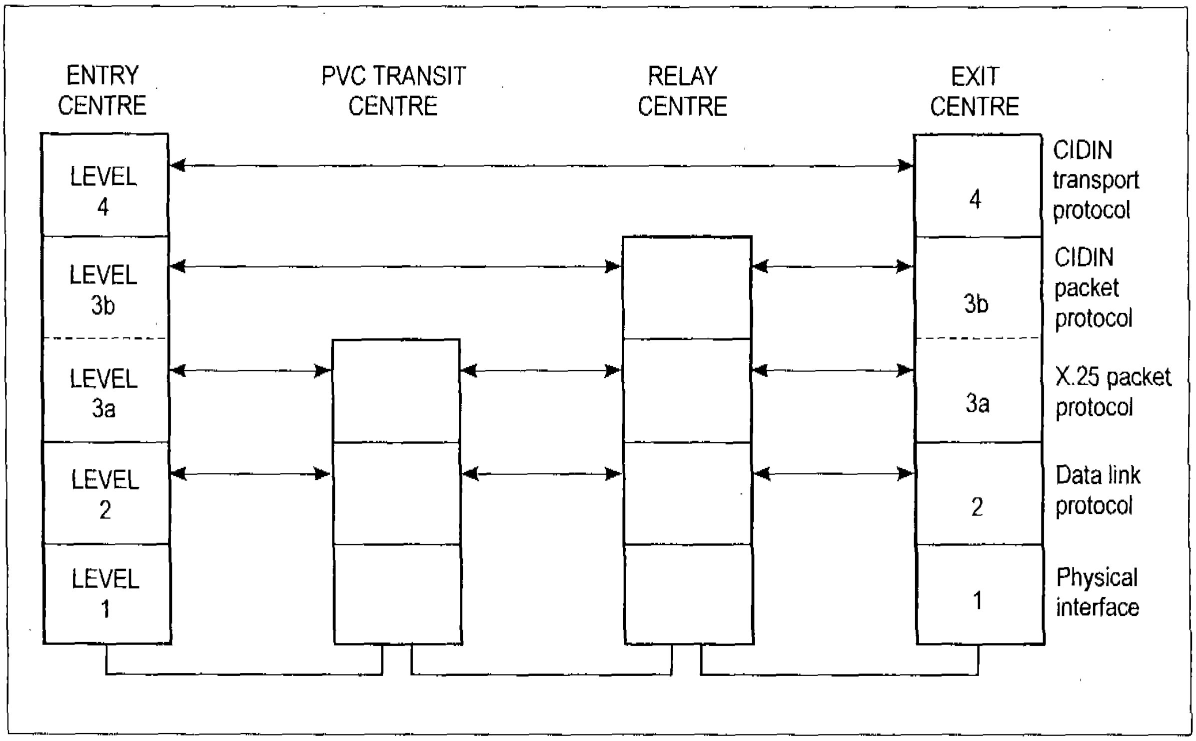

Figure 8-1. CIDIN Protocol Levels

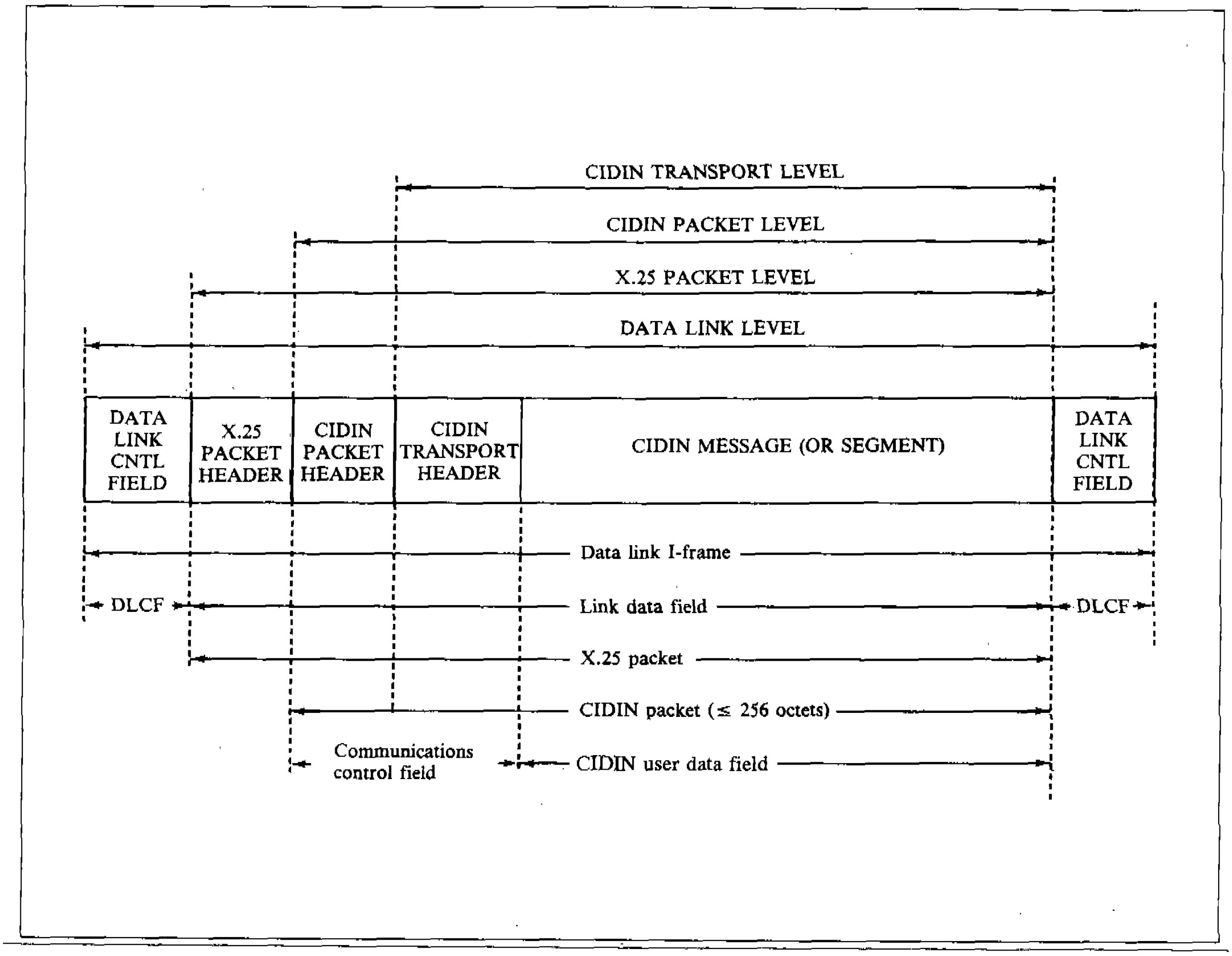

Figure 8-2. CIDIN Terminology

8.6.5.2 GENERAL

8.6.5.2.1 There shall be four protocol levels defined to control the transfer of messages between CIDIN switching centres:

— the data link protocol level

— the X.25 packet protocol level

— the CIDIN packet protocol level

— the CIDIN transport protocol level

Note 1.— The relationship of the terms used is shown in Figures 8-1 and 8-2.

Note 2.— The details of CIDIN communication procedures and system specifications, as implemented in Europe, are shown in the EUR CIDIN Manual *(EUR Doc 005).*

8.6.5.2.2 *THE DATA LINK PROTOCOL LEVEL*

8.6.5.2.2.1 X.25 packets to be transferred between two CIDIN switching centres or a CIDIN switching centre and a packet switched data network, shall be formatted into data link frames.

8.6.5.2.2.2 Each data link frame shall consist of a data link control field (DLCF), possibly followed by a link data field, and shall be terminated by a frame check sequence and flag (being the second part of the DLCF). If a link data field is present, the frame shall be denoted as an information frame.

8.6.5.2.2.3 X.25 packets shall be transmitted within the link data field of information frames. Only one packet shall be contained in the link data field.

8.6.5.2.3 *THE X.25 PACKET PROTOCOL LEVEL*

8.6.5.2.3.1 Each CIDIN packet to be transferred on CIDIN circuits between CIDIN switching centres shall be formatted into one X.25 packet. When a packet switched data network is used, it shall be permissible to format the CIDIN packet into more than one X.25 packet.

8.6.5.2.3.2 The integrity of each CIDIN packet shall be preserved by the X.25 packet protocol by mapping each CIDIN packet onto one complete X.25 packet sequence, as defined in CCITT Recommendation X.25.

8.6.5.2.3.3 Each X.25 packet shall consist of an X.25 packet header, possibly followed by a user data field (UDF).

8.6.5.2.3.4 The X.25 packet protocol is based on the application of virtual circuit procedures. A virtual circuit shall be defined as a logical path between two CIDIN switching centres. If a packet switched data network is used to interconnect two CIDIN switching centres, the procedure shall provide full compatibility with the procedures to be followed for virtual circuits according to CCITT Recommendation X.25.

8.6.5.2.4 *THE CIDIN PACKET PROTOCOL LEVEL*

8.6.5.2.4.1 Each transport header and the associated segment shall be preceded by a CIDIN packet header. No further segmentation of the CIDIN message shall be used between transport protocol level and CIDIN packet protocol level. Both headers, therefore, shall be used in combination. Together they shall be referred to as the communications control field (CCF). Together with the message segment they form CIDIN packets that shall be transmitted from entry centre to exit centre(s), when necessary through one or more relay centres, as an entity.

8.6.5.2.4.2 CIDIN packets of one CIDIN message shall be relayed independently via predetermined routes through the network thus allowing alternative routing on a CIDIN packet basis as necessary.

8.6.5.2.4.3 The CIDIN packet header shall contain information to enable relay centres to handle CIDIN packets in the order of priority, to transmit the CIDIN packets on the proper outgoing circuit(s) and to duplicate or multiplicate CIDIN packets when required for multiple dissemination purposes. The information shall be sufficient to apply address stripping on the exit addresses as well as on the addressee indicators of messages in AFTN format.

8.6.5.2.5 *THE TRANSPORT PROTOCOL LEVEL*

8.6.5.2.5.1 Information exchanged over the CIDIN shall be transmitted as CIDIN messages.

8.6.5.2.5.2 The length of a CIDIN message shall be defined by the CIDIN packet sequence number (CPSN). The maximum permissible length is 2^{15} packets which in effect results in no practical limitation.

8.6.5.2.5.3 If the length of a CIDIN message and its transport and packet headers (as defined below) exceeds 256 octets, the message shall be divided into segments and placed in the CIDIN user data field of CIDIN packets. Each segment shall be preceded by a transport header containing information to enable the re-assembly of the CIDIN message at the exit centre(s) from individually received segments and to determine further handling of the received complete CIDIN message.

8.6.5.2.5.4 All segments of one CIDIN message shall be provided with the same message identification information in the transport header. Only the CPSN and final CIDIN packet (FCP) indicator shall be different.

8.6.5.2.5.5 Recovery of messages shall be performed at the transport level.

AS A RESULT OF AMENDMENT NO. 76
PAGES 310 TO 328 HAVE BEEN REMOVED

CHAPTER 9. AIRCRAFT ADDRESSING SYSTEM

9.1 The aircraft address shall be one of 16 777 214 twenty-four-bit aircraft addresses allocated by ICAO to the State of Registry or common mark registering authority and assigned as prescribed in the Appendix to this Chapter.

APPENDIX TO CHAPTER 9. A WORLD-WIDE SCHEME FOR THE ALLOCATION, ASSIGNMENT AND APPLICATION OF AIRCRAFT ADDRESSES

1. General

1.1 Global communications, navigation and surveillance systems shall use an individual aircraft address composed of 24 bits. At any one time, no address shall be assigned to more than one aircraft. The assignment of aircraft addresses requires a comprehensive scheme providing for a balanced and expandable distribution of aircraft addresses applicable world-wide.

2. Description of the scheme

2.1 Table 9-1 provides for blocks of consecutive addresses available to States for assignment to aircraft. Each block is defined by a fixed pattern of the first 4, 6, 9, 12 or 14 bits of the 24-bit address. Thus, blocks of different sizes (1 048 576, 262 144, 32 768, 4 096 and 1 024 consecutive addresses respectively) are made available.

3. Management of the scheme

3.1 The International Civil Aviation Organization (ICAO) shall administer the scheme so that appropriate international distribution of aircraft addresses can be maintained.

4. Allocation of aircraft addresses

4.1 Blocks of aircraft addresses shall be allocated by ICAO to the State of Registry or common mark registering authority. Address allocations to States shall be as shown in Table 9-1.

4.2 A State of Registry or common mark registering authority shall notify ICAO when allocation to that State of an additional block of addresses is required for assignment to aircraft.

4.3 In the future management of the scheme, advantage shall be taken of the blocks of aircraft addresses not yet allocated. These spare blocks shall be distributed on the basis of the relevant ICAO region:

Addresses starting with bit combination 00100: AFI region

Addresses starting with bit combination 00101: SAM region

Addresses starting with bit combination 0101: EUR and NAT regions

Addresses starting with bit combination 01100: MID region

Addresses starting with bit combination 01101: ASIA region

Addresses starting with bit combination 1001: NAM and PAC regions

Addresses starting with bit combination 111011: CAR region

In addition, aircraft addresses starting with bit combinations 1011, 1101 and 1111 have been reserved for future use.

4.4 Any future requirement for additional aircraft addresses shall be accommodated through co-ordination between ICAO and the States of Registry or common mark registering authority concerned. A request for additional aircraft addresses shall only be made by a registering authority when at least 75 per cent of the number of addresses already allocated to that registering authority have been assigned to aircraft.

4.5 ICAO shall allocate blocks of aircraft addresses to non-Contracting States upon request.

5. Assignment of aircraft addresses

5.1 When required for use by suitably equipped aircraft entered on a national or international register, individual aircraft addresses within each block shall be assigned to aircraft by the State of Registry or common mark registering authority.

5.2 Aircraft addresses shall be assigned to aircraft in accordance with the following principles:

a) at any one time, no address shall be assigned to more than one aircraft;

b) only one address shall be assigned to an aircraft, irrespective of the composition of equipment on board;

c) the address shall not be changed except under exceptional circumstances and shall not be changed during flight;

d) when an aircraft changes its State of Registry, the previously assigned address shall be relinquished and a new address shall be assigned by the new registering authority;

e) the address shall serve only a technical role for addressing and identification of aircraft and shall not be used to convey any specific information; and

f) the addresses composed of 24 ZEROs or 24 ONEs shall not be assigned to aircraft.

6. Application of aircraft addresses

6.1 The aircraft addresses shall be used in applications which require the routing of information to or from individual suitably equipped aircraft.

Note 1.— Examples of such applications are the aeronautical telecommunication network (ATN), SSR Mode S and airborne collision avoidance system (ACAS).

Note 2.— This Standard does not preclude assigning the aircraft addresses for special applications associated with the general applications defined therein. Examples of such special applications are the utilization of the 24-bit address in a pseudo-aeronautical earth station to monitor the aeronautical mobile-satellite service ground earth station and in the fixed Mode S transponders (reporting the on-the-ground status as specified in Annex 10, Volume IV, 3.1.2.6.10.1.2) to monitor the Mode S ground station operation. Address assignments for special applications are to be carried out in conformance with the procedure established by the State to manage the 24-bit address assignments to aircraft.

6.2 An address consisting of 24 ZEROs shall not be used for any application.

7. Administration of the temporary aircraft address assignments

7.1 Temporary addresses shall be assigned to aircraft in exceptional circumstances, such as when operators have been unable to obtain an address from their individual States of Registry or Common Mark Registering Authority in a timely manner. ICAO shall assign temporary addresses from the block ICAO[1] shown in Table 9-1.

7.2 When requesting a temporary address, the aircraft operator shall supply to ICAO: aircraft identification, type and make of aircraft, name and address of the operator, and an explanation of the reason for the request.

7.2.1 Upon issuance of the temporary address to the aircraft operators, ICAO shall inform the State of Registry of the issuance of the temporary address, reason and duration.

7.3 The aircraft operator shall:

a) inform the State of Registry of the temporary assignment and reiterate the request for a permanent address; and

b) inform the airframe manufacturer.

7.4 When the permanent aircraft address is obtained from the State of Registry, the operator shall:

a) inform ICAO without delay;

b) relinquish his/her temporary address; and

c) arrange for encoding of the valid unique address within 180 calendar days.

7.5 If a permanent address is not obtained within one year, the aircraft operator shall re-apply for a new temporary aircraft address. Under no circumstances shall a temporary aircraft address be used by the aircraft operator for over one year.

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Table 9-1. Allocation of aircraft addresses to States

Note.— The left-hand column of the 24-bit address patterns represents the most significant bit (MSB) of the address.

	Number of addresses in block					*Allocation of blocks of addresses (a dash represents a bit value equal to 0 or 1)*
	1 024	*4 096*	*32 768*	*262 144*	*1 048 576*	
Afghanistan		*				0 1 1 1 0 0 0 0 0 0 0 0 – – – – – – – – – – – –
Albania	*					0 1 0 1 0 0 0 0 0 0 0 1 0 0 – – – – – – – – – –
Algeria			*			0 0 0 0 1 0 1 0 0 – – – – – – – – – – – – – – –
Angola		*				0 0 0 0 1 0 0 1 0 0 0 0 – – – – – – – – – – – –
Antigua and Barbuda	*					0 0 0 0 1 1 0 0 1 0 1 0 0 0 – – – – – – – – – –
Argentina				*		1 1 1 0 0 0 – – – – – – – – – – – – – – – – – –
Armenia	*					0 1 1 0 0 0 0 0 0 0 0 0 0 0 – – – – – – – – – –
Australia				*		0 1 1 1 1 1 – – – – – – – – – – – – – – – – – –
Austria			*			0 1 0 0 0 1 0 0 0 – – – – – – – – – – – – – – –
Azerbaijan	*					0 1 1 0 0 0 0 0 0 0 0 0 1 0 – – – – – – – – – –
Bahamas		*				0 0 0 0 1 0 1 0 1 0 0 0 – – – – – – – – – – – –
Bahrain		*				1 0 0 0 1 0 0 1 0 1 0 0 – – – – – – – – – – – –
Bangladesh		*				0 1 1 1 0 0 0 0 0 0 1 0 – – – – – – – – – – – –
Barbados	*					0 0 0 0 1 0 1 0 1 0 1 0 0 0 – – – – – – – – – –
Belarus	*					0 1 0 1 0 0 0 1 0 0 0 0 0 0 – – – – – – – – – –
Belgium			*			0 1 0 0 0 1 0 0 1 – – – – – – – – – – – – – – –
Belize	*					0 0 0 0 1 0 1 0 1 0 1 1 0 0 – – – – – – – – – –
Benin	*					0 0 0 0 1 0 0 1 0 1 0 0 0 0 – – – – – – – – – –
Bhutan	*					0 1 1 0 1 0 0 0 0 0 0 0 0 0 – – – – – – – – – –
Bolivia		*				1 1 1 0 1 0 0 1 0 1 0 0 – – – – – – – – – – – –
Bosnia and Herzegovina	*					0 1 0 1 0 0 0 1 0 0 1 1 0 0 – – – – – – – – – –
Botswana	*					0 0 0 0 0 0 1 1 0 0 0 0 0 0 – – – – – – – – – –
Brazil				*		1 1 1 0 0 1 – – – – – – – – – – – – – – – – – –
Brunei Darussalam	*					1 0 0 0 1 0 0 1 0 1 0 1 0 0 – – – – – – – – – –
Bulgaria			*			0 1 0 0 0 1 0 1 0 – – – – – – – – – – – – – – –
Burkina Faso		*				0 0 0 0 1 0 0 1 1 1 0 0 – – – – – – – – – – – –
Burundi		*				0 0 0 0 0 0 1 1 0 0 1 0 – – – – – – – – – – – –
Cambodia		*				0 1 1 1 0 0 0 0 1 1 1 0 – – – – – – – – – – – –
Cameroon		*				0 0 0 0 0 0 1 1 0 1 0 0 – – – – – – – – – – – –
Canada				*		1 1 0 0 0 0 – – – – – – – – – – – – – – – – – –
Cape Verde	*					0 0 0 0 1 0 0 1 0 1 1 0 0 0 – – – – – – – – – –
Central African Republic		*				0 0 0 0 0 1 1 0 1 1 0 0 – – – – – – – – – – – –
Chad		*				0 0 0 0 1 0 0 0 0 1 0 0 – – – – – – – – – – – –
Chile		*				1 1 1 0 1 0 0 0 0 0 0 0 – – – – – – – – – – – –
China				*		0 1 1 1 1 0 – – – – – – – – – – – – – – – – – –
Colombia		*				0 0 0 0 1 0 1 0 1 1 0 0 – – – – – – – – – – – –
Comoros	*					0 0 0 0 0 0 1 1 0 1 0 1 0 0 – – – – – – – – – –
Congo		*				0 0 0 0 0 0 1 1 0 1 1 0 – – – – – – – – – – – –
Cook Islands	*					1 0 0 1 0 0 0 0 0 0 0 1 0 0 – – – – – – – – – –

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	Number of addresses in block					*Allocation of blocks of addresses (a dash represents a bit value equal to 0 or 1)*
	1 024	*4 096*	*32 768*	*262 144*	*1 048 576*	
Costa Rica		*				0000 10 101 110 –– ––––––––––
Côte d'Ivoire		*				0000 00 111 000 –– ––––––––––
Croatia	*					0101 00 000 001 11 ––––––––––
Cuba		*				0000 10 110 000 –– ––––––––––
Cyprus	*					0100 11 001 000 00 ––––––––––
Czech Republic			*			0100 10 011 ––– –– ––––––––––
Democratic People's Republic of Korea			*			0111 00 100 ––– –– ––––––––––
Democratic Republic of the Congo		*				0000 10 001 100 –– ––––––––––
Denmark			*			0100 01 011 ––– –– ––––––––––
Djibouti	*					0000 10 011 000 00 ––––––––––
Dominican Republic		*				0000 11 000 100 –– ––––––––––
Ecuador		*				1110 10 000 100 –– ––––––––––
Egypt			*			0000 00 010 ––– –– ––––––––––
El Salvador		*				0000 10 110 010 –– ––––––––––
Equatorial Guinea		*				0000 01 000 010 –– ––––––––––
Eritrea	*					0010 00 000 010 00 ––––––––––
Estonia	*					0101 00 010 001 00 ––––––––––
Ethiopia		*				0000 01 000 000 –– ––––––––––
Fiji		*				1100 10 001 000 –– ––––––––––
Finland			*			0100 01 100 ––– –– ––––––––––
France				*		0011 10 ––– ––– –– ––––––––––
Gabon		*				0000 00 111 110 –– ––––––––––
Gambia		*				0000 10 011 010 –– ––––––––––
Georgia	*					0101 00 010 100 00 ––––––––––
Germany				*		0011 11 ––– ––– –– ––––––––––
Ghana		*				0000 01 000 100 –– ––––––––––
Greece			*			0100 01 101 ––– –– ––––––––––
Grenada	*					0000 11 001 100 00 ––––––––––
Guatemala		*				0000 10 110 100 –– ––––––––––
Guinea		*				0000 01 000 110 –– ––––––––––
Guinea-Bissau	*					0000 01 001 000 00 ––––––––––
Guyana		*				0000 10 110 110 –– ––––––––––
Haiti		*				0000 10 111 000 –– ––––––––––
Honduras		*				0000 10 111 010 –– ––––––––––
Hungary			*			0100 01 110 ––– –– ––––––––––
Iceland		*				0100 11 001 100 –– ––––––––––
India				*		1000 00 ––– ––– –– ––––––––––
Indonesia			*			1000 10 100 ––– –– ––––––––––
Iran, Islamic Republic of			*			0111 00 110 ––– –– ––––––––––
Iraq			*			0111 00 101 ––– –– ––––––––––

	Number of addresses in block					*Allocation of blocks of addresses (a dash represents a bit value equal to 0 or 1)*
	1 024	*4 096*	*32 768*	*262 144*	*1 048 576*	
Ireland		*				0 1 0 0 1 1 0 0 1 0 1 0 – – – – – – – – – – – –
Israel			*			0 1 1 1 0 0 1 1 1 – – – – – – – – – – – – – – –
Italy				*		0 0 1 1 0 0 – – – – – – – – – – – – – – – – – –
Jamaica		*				0 0 0 0 1 0 1 1 1 1 1 0 – – – – – – – – – – – –
Japan				*		1 0 0 0 0 1 – – – – – – – – – – – – – – – – – –
Jordan			*			0 1 1 1 0 1 0 0 0 – – – – – – – – – – – – – – –
Kazakhstan	*					0 1 1 0 1 0 0 0 0 0 1 1 0 0 – – – – – – – – – –
Kenya		*				0 0 0 0 0 1 0 0 1 1 0 0 – – – – – – – – – – – –
Kiribati	*					1 1 0 0 1 0 0 0 1 1 1 0 0 0 – – – – – – – – – –
Kuwait		*				0 1 1 1 0 0 0 0 0 1 1 0 – – – – – – – – – – – –
Kyrgyzstan	*					0 1 1 0 0 0 0 0 0 0 0 1 0 0 – – – – – – – – – –
Lao People's Democratic Republic		*				0 1 1 1 0 0 0 0 1 0 0 0 – – – – – – – – – – – –
Latvia	*					0 1 0 1 0 0 0 0 0 0 1 0 1 1 – – – – – – – – – –
Lebanon			*			0 1 1 1 0 1 0 0 1 – – – – – – – – – – – – – – –
Lesotho	*					0 0 0 0 0 1 0 0 1 0 1 0 0 0 – – – – – – – – – –
Liberia		*				0 0 0 0 0 1 0 1 0 0 0 0 – – – – – – – – – – – –
Libyan Arab Jamahiriya			*			0 0 0 0 0 0 0 1 1 – – – – – – – – – – – – – – –
Lithuania	*					0 1 0 1 0 0 0 0 0 0 1 1 1 1 – – – – – – – – – –
Luxembourg	*					0 1 0 0 1 1 0 1 0 0 0 0 0 0 – – – – – – – – – –
Madagascar		*				0 0 0 0 0 1 0 1 0 1 0 0 – – – – – – – – – – – –
Malawi		*				0 0 0 0 0 1 0 1 1 0 0 0 – – – – – – – – – – – –
Malaysia			*			0 1 1 1 0 1 0 1 0 – – – – – – – – – – – – – – –
Maldives	*					0 0 0 0 0 1 0 1 1 0 1 0 0 0 – – – – – – – – – –
Mali		*				0 0 0 0 0 1 0 1 1 1 0 0 – – – – – – – – – – – –
Malta	*					0 1 0 0 1 1 0 1 0 0 1 0 0 0 – – – – – – – – – –
Marshall Islands	*					1 0 0 1 0 0 0 0 0 0 0 0 0 0 – – – – – – – – – –
Mauritania	*					0 0 0 0 0 1 0 1 1 1 1 0 0 0 – – – – – – – – – –
Mauritius	*					0 0 0 0 0 1 1 0 0 0 0 0 0 0 – – – – – – – – – –
Mexico			*			0 0 0 0 1 1 0 1 0 – – – – – – – – – – – – – – –
Micronesia, Federated States of	*					0 1 1 0 1 0 0 0 0 0 0 1 0 0 – – – – – – – – – –
Monaco	*					0 1 0 0 1 1 0 1 0 1 0 0 0 0 – – – – – – – – – –
Mongolia	*					0 1 1 0 1 0 0 0 0 0 1 0 0 0 – – – – – – – – – –
Morocco			*			0 0 0 0 0 0 1 0 0 – – – – – – – – – – – – – – –
Mozambique		*				0 0 0 0 0 0 0 0 0 1 1 0 – – – – – – – – – – – –
Myanmar		*				0 1 1 1 0 0 0 0 0 1 0 0 – – – – – – – – – – – –
Namibia	*					0 0 1 0 0 0 0 0 0 0 0 1 0 0 – – – – – – – – – –
Nauru	*					1 1 0 0 1 0 0 0 1 0 1 0 0 0 – – – – – – – – – –
Nepal		*				0 1 1 1 0 0 0 0 1 0 1 0 – – – – – – – – – – – –
Netherlands, Kingdom of the			*			0 1 0 0 1 0 0 0 0 – – – – – – – – – – – – – – –
New Zealand			*			1 1 0 0 1 0 0 0 0 – – – – – – – – – – – – – – –

	Number of addresses in block					*Allocation of blocks of addresses (a dash represents a bit value equal to 0 or 1)*
	1 024	*4 096*	*32 768*	*262 144*	*1 048 576*	
Nicaragua		*				0 0 0 0 1 1 0 0 0 0 0 0 – – – – – – – – – – – –
Niger		*				0 0 0 0 0 1 1 0 0 0 1 0 – – – – – – – – – – – –
Nigeria		*				0 0 0 0 0 1 1 0 0 1 0 0 – – – – – – – – – – – –
Norway			*			0 1 0 0 0 1 1 1 1 – – – – – – – – – – – – – – –
Oman	*					0 1 1 1 0 0 0 0 1 1 0 0 0 0 – – – – – – – – – –
Pakistan			*			0 1 1 1 0 1 1 0 0 – – – – – – – – – – – – – – –
Palau	*					0 1 1 0 1 0 0 0 0 1 0 0 0 0 – – – – – – – – – –
Panama		*				0 0 0 0 1 1 0 0 0 0 1 0 – – – – – – – – – – – –
Papua New Guinea		*				1 0 0 0 1 0 0 1 1 0 0 0 – – – – – – – – – – – –
Paraguay		*				1 1 1 0 1 0 0 0 1 0 0 0 – – – – – – – – – – – –
Peru		*				1 1 1 0 1 0 0 0 1 1 0 0 – – – – – – – – – – – –
Philippines			*			0 1 1 1 0 1 0 1 1 – – – – – – – – – – – – – – –
Poland			*			0 1 0 0 1 0 0 0 1 – – – – – – – – – – – – – – –
Portugal			*			0 1 0 0 1 0 0 1 0 – – – – – – – – – – – – – – –
Qatar	*					0 0 0 0 0 1 1 0 1 0 1 0 0 0 – – – – – – – – – –
Republic of Korea			*			0 1 1 1 0 0 0 1 1 – – – – – – – – – – – – – – –
Republic of Moldova	*					0 1 0 1 0 0 0 0 0 1 0 0 1 1 – – – – – – – – – –
Romania			*			0 1 0 0 1 0 1 0 0 – – – – – – – – – – – – – – –
Russian Federation					*	0 0 0 1 – – – – – – – – – – – – – – – – – – – –
Rwanda		*				0 0 0 0 0 1 1 0 1 1 1 0 – – – – – – – – – – – –
Saint Lucia	*					1 1 0 0 1 0 0 0 1 1 0 0 0 0 – – – – – – – – – –
Saint Vincent and the Grenadines	*					0 0 0 0 1 0 1 1 1 1 0 0 0 0 – – – – – – – – – –
Samoa	*					1 0 0 1 0 0 0 0 0 0 1 0 0 0 – – – – – – – – – –
San Marino	*					0 1 0 1 0 0 0 0 0 0 0 0 0 0 – – – – – – – – – –
Sao Tome and Principe	*					0 0 0 0 1 0 0 1 1 1 1 0 0 0 – – – – – – – – – –
Saudi Arabia			*			0 1 1 1 0 0 0 1 0 – – – – – – – – – – – – – – –
Senegal		*				0 0 0 0 0 1 1 1 0 0 0 0 – – – – – – – – – – – –
Seychelles	*					0 0 0 0 0 1 1 1 0 1 0 0 0 0 – – – – – – – – – –
Sierra Leone	*					0 0 0 0 0 1 1 1 0 1 1 0 0 0 – – – – – – – – – –
Singapore			*			0 1 1 1 0 1 1 0 1 – – – – – – – – – – – – – – –
Slovakia	*					0 1 0 1 0 0 0 0 0 1 0 1 1 1 – – – – – – – – – –
Slovenia	*					0 1 0 1 0 0 0 0 0 1 1 0 1 1 – – – – – – – – – –
Solomon Islands	*					1 0 0 0 1 0 0 1 0 1 1 1 0 0 – – – – – – – – – –
Somalia		*				0 0 0 0 0 1 1 1 1 0 0 0 – – – – – – – – – – – –
South Africa			*			0 0 0 0 0 0 0 0 1 – – – – – – – – – – – – – – –
Spain				*		0 0 1 1 0 1 – – – – – – – – – – – – – – – – – –
Sri Lanka			*			0 1 1 1 0 1 1 1 0 – – – – – – – – – – – – – – –
Sudan		*				0 0 0 0 0 1 1 1 1 1 0 0 – – – – – – – – – – – –
Suriname		*				0 0 0 0 1 1 0 0 1 0 0 0 – – – – – – – – – – – –
Swaziland	*					0 0 0 0 0 1 1 1 1 0 1 0 0 0 – – – – – – – – – –
Sweden			*			0 1 0 0 1 0 1 0 1 – – – – – – – – – – – – – – –

	Number of addresses in block					Allocation of blocks of addresses (a dash represents a bit value equal to 0 or 1)
	1 024	4 096	32 768	262 144	1 048 576	
Switzerland			*			0 1 0 0 1 0 1 1 0 – – – – – – – – – – – – – – –
Syrian Arab Republic			*			0 1 1 1 0 1 1 1 1 – – – – – – – – – – – – – – –
Tajikistan	*					0 1 0 1 0 0 0 1 0 1 0 1 0 0 – – – – – – – – – –
Thailand			*			1 0 0 0 1 0 0 0 0 – – – – – – – – – – – – – – –
The former Yugoslav Republic of Macedonia	*					0 1 0 1 0 0 0 1 0 0 1 0 0 0 – – – – – – – – – –
Togo		*				0 0 0 0 1 0 0 0 1 0 0 0 – – – – – – – – – – – –
Tonga	*					1 1 0 0 1 0 0 0 1 1 0 1 0 0 – – – – – – – – – –
Trinidad and Tobago		*				0 0 0 0 1 1 0 0 0 1 1 0 – – – – – – – – – – – –
Tunisia			*			0 0 0 0 0 0 1 0 1 – – – – – – – – – – – – – – –
Turkey			*			0 1 0 0 1 0 1 1 1 – – – – – – – – – – – – – – –
Turkmenistan	*					0 1 1 0 0 0 0 0 0 0 0 1 1 0 – – – – – – – – – –
Uganda		*				0 0 0 0 0 1 1 0 1 0 0 0 – – – – – – – – – – – –
Ukraine			*			0 1 0 1 0 0 0 0 1 – – – – – – – – – – – – – – –
United Arab Emirates		*				1 0 0 0 1 0 0 1 0 1 1 0 – – – – – – – – – – – –
United Kingdom				*		0 1 0 0 0 0 – – – – – – – – – – – – – – – – – –
United Republic of Tanzania		*				0 0 0 0 1 0 0 0 0 0 0 0 – – – – – – – – – – – –
United States					*	1 0 1 0 –
Uruguay		*				1 1 1 0 1 0 0 1 0 0 0 0 – – – – – – – – – – – –
Uzbekistan	*					0 1 0 1 0 0 0 0 0 1 1 1 1 1 – – – – – – – – – –
Vanuatu	*					1 1 0 0 1 0 0 1 0 0 0 0 0 0 – – – – – – – – – –
Venezuela			*			0 0 0 0 1 1 0 1 1 – – – – – – – – – – – – – – –
Viet Nam			*			1 0 0 0 1 0 0 0 1 – – – – – – – – – – – – – – –
Yemen		*				1 0 0 0 1 0 0 1 0 0 0 0 – – – – – – – – – – – –
Yugoslavia			*			0 1 0 0 1 1 0 0 0 – – – – – – – – – – – – – – –
Zambia		*				0 0 0 0 1 0 0 0 1 0 1 0 – – – – – – – – – – – –
Zimbabwe	*					0 0 0 0 0 0 0 0 0 1 0 0 0 0 – – – – – – – – – –
Other allocations						
ICAO[1]			*			1 1 1 1 0 0 0 0 0 – – – – – – – – – – – – – – –
ICAO[2]	*					1 0 0 0 1 0 0 1 1 0 0 1 0 0 – – – – – – – – – –
ICAO[2]	*					1 1 1 1 0 0 0 0 1 0 0 1 0 0 – – – – – – – – – –

1. ICAO administers this block for assigning temporary aircraft addresses as described in section 7.
2. Block allocated for special use in the interest of flight safety.

CHAPTER 10. POINT-TO-MULTIPOINT COMMUNICATIONS

10.1 SERVICE VIA SATELLITE FOR THE DISSEMINATION OF AERONAUTICAL INFORMATION

10.1.1 Point-to-multipoint telecommunication service via satellite to support the dissemination of aeronautical information shall be based on full-time, non pre-emptible, protected services as defined in the relevant CCITT Recommendations.

10.2 SERVICE VIA SATELLITE FOR THE DISSEMINATION OF WAFS PRODUCTS

10.2.1 **Recommendation.—** *System characteristics should include the following:*

a) frequency — C-band, earth-to-satellite, 6 GHz band, satellite-to-earth, 4 GHz band;

b) capacity with effective signalling rate of not less than 9 600 bits/s;

c) bit error rates — better than 1 in 10^7;

d) forward error correction; and

e) availability 99.95 per cent.

CHAPTER 11. HF DATA LINK

11.1 DEFINITIONS AND SYSTEM CAPABILITIES

Note.— The following Standards and Recommended Practices are specific to the high frequency data link (HFDL) and are in addition to the requirements specified in the ITU Radio Regulations (Appendix 27). The HFDL is a constituent mobile subnetwork of the aeronautical telecommunication network (ATN), operating in the aeronautical mobile (R) high frequency bands. In addition, the HFDL may provide non-ATN functions, such as direct link service (DLS). The HFDL system must enable aircraft to exchange data with ground-based users.

11.1.1 Definitions

Coded chip. A “1” or “0” output of the rate ½ or ¼ convolutional code encoder.

Designated operational coverage (DOC) area. The area in which a particular service is provided and in which the service is afforded frequency protection.

Note.— This area may, after proper co-ordination to ensure frequency protection, extend to areas outside the allotment areas contained in Appendix S27 to the Radio Regulations.

Direct link service (DLS). A data communications service which makes no attempt to automatically correct errors, detected or undetected, at the link layer of the air-ground communications path. (Error control may be effected by end-user systems.)

High frequency network protocol data unit (HFNPDU). User data packet.

Link protocol data unit (LPDU). Data unit which encapsulates a segment of an HFNPDU.

Media access protocol data unit (MPDU). Data unit which encapsulates one or more LPDUs.

M-ary phase shift keying (M-PSK) modulation. A digital phase modulation that causes the phase of the carrier waveform to take on one of a set of M values.

M-PSK symbol. One of the M possible phase shifts of the M-PSK modulated carrier representing a group of $\log_2$ M coded chips.

Peak envelope power (PEP). The peak power of the modulated signal supplied by the transmitter to the antenna transmission line.

Physical layer protocol data unit (PPDU). Data unit passed to the physical layer for transmission, or decoded by the physical layer after reception.

Quality of service (QOS). The information relating to data transfer characteristics used by various communications protocols to achieve various levels of performance for network users.

Reliable link service (RLS). A data communications service provided by the subnetwork which automatically provides for error control over its link through error detection and requested retransmission of signal units found to be in error.

Squitter protocol data unit (SPDU). Data packet which is broadcast every 32 seconds by an HFDL ground station on each of its operating frequencies, and which contains link management information.

11.2 HF DATA LINK SYSTEM

11.2.1 System architecture

The HFDL system shall consist of one or more ground and aircraft station sub-systems, which implement the HFDL protocol (see 11.3). The HFDL system shall also include a ground management sub-system (see 11.4).

11.2.1.1 AIRCRAFT AND GROUND STATION SUB-SYSTEMS

The HFDL aircraft station sub-system and the HFDL ground station sub-system shall include the following functions:

a) HF transmission and reception;

b) data modulation and demodulation; and

c) HFDL protocol implementation and frequency selection.

11.2.2 Operational coverage

Frequency assignments for HFDL shall be protected throughout their designated operational coverage (DOC) area.

Note 1.— Designated operational coverage (DOC) areas may be different from current MWARAs or RDARAs as defined in Appendix 27 to the ITU Radio Regulations.

Note 2.— Additional co-ordination with ITU is required in cases where DOC areas are not in conformity with the allotment areas specified in the ITU Radio Regulations.

11.2.3 Requirements for carriage of HFDL equipment

Requirements for mandatory carriage of HFDL equipment shall be made on the basis of regional air navigation agreements that specify the airspace of operation and the implementation time-scale.

11.2.3.1 NOTICE

The agreement above shall provide advance notice of at least two years for the mandatory carriage of airborne systems.

11.2.4 Ground station networking

11.2.4.1 **Recommendation.—** *HFDL ground station sub-systems should interconnect through a common ground management sub-system.*

Note.— This provides a distributed subnetwork, with a subnetwork point of attachment (SNPA), depending on the method of implementation, which allows for the maintenance of virtual circuit connections as aircraft stations transition between designated operational coverage areas. The distribution may be multi-regional or world-wide.

11.2.5 Ground station synchronization

Synchronization of HFDL ground station sub-systems shall be to within ±25 ms of UTC. For any station not operating within ±25 ms of UTC, appropriate notification shall be made to all aircraft and ground station sub-systems to allow for continued system operation.

11.2.6 Quality of service

11.2.6.1 RESIDUAL PACKET ERROR RATE

The undetected error rate for a network user packet which contains between 1 and 128 octets of user data shall be equal to or less than 1 in 10^6.

11.2.6.2 SPEED OF SERVICE

Transit and transfer delays for network user packets (128 octets) with priorities defined in Part I, Chapter 4, Table 4-26 for message priorities 7 through 14, shall not exceed the values of Table 11-1.

Table 11-1. Transfer delays

	Direction	*Priority*	*Delay*
Transit delay	To-aircraft	7 through 14	45 s
	From-aircraft	7 through 14	60 s
Transfer delay (95 percentile)	To-aircraft	11 through 14 7 through 10	90 s 120 s
	From-aircraft	11 through 14 7 through 10	150 s 250 s

11.3 HF DATA LINK PROTOCOL

The HFDL protocol shall consist of a physical layer, a link layer, and a subnetwork layer, as specified below.

Note.— The HFDL protocol is a layered protocol and is compatible with the open systems interconnection (OSI) reference model. It permits the HFDL to function as an aeronautical telecommunication network (ATN)-compatible subnetwork. The details of the protocol are described in the Manual on HF Data Link *(Doc 9741).*

11.3.1 Physical layer RF characteristics

The aircraft and ground stations shall access the physical medium operating in simplex mode.

11.3.1.1 FREQUENCY BANDS

HFDL installations shall be capable of operating at any single sideband (SSB) carrier (reference) frequency available to the aeronautical mobile (R) service in the band 2.8 to 22 MHz, and in compliance with the relevant provisions of the Radio Regulations.

11.3.1.2 CHANNELS

Channel utilization shall be in conformity with the table of carrier (reference) frequencies of Appendix 27 to the ITU Radio Regulations.

11.3.1.3 TUNING

The equipment shall be capable of operating on integral multiples of 1 kHz.

11.3.1.4 SIDEBAND

The sideband used for transmission shall be on the higher side of its carrier (reference) frequency.

11.3.1.5 MODULATION

HFDL shall employ M-ary phase shift keying (M-PSK) to modulate the radio frequency carrier at the assigned frequency. The symbol rate shall be 1 800 symbols per second ±10 parts per million (i.e. 0.018 symbols per second). The value of M and the information data rate shall be as specified in Table 11-2.

Table 11-2. Value of M and information data rate

M	*Information data rate (bits per second)*
2	300 or 600
4	1 200
8	1 800

Note.— When M equals the value 2, the data rate may be 300 or 600 bits per second as determined by the channel coding rate. The value of M may change from one data transmission to another depending on the data rate selected. The channel coding rate is described in the Manual on HF Data Link *(Doc 9741).*

11.3.1.5.1 *M-PSK CARRIER*

The M-PSK carrier expressed mathematically shall be defined as:

$s(t) = A\Sigma(p(t-kT)\cos[2\pi f_0 t + \varphi(k)])$, $k = 0, 1 \ldots, N-1$

where:

N	=	number of M-PSK symbols in transmitted physical layer protocol data unit (PPDU)
s(t)	=	analog waveform or signal at time t
A	=	peak amplitude
f_0	=	SSB carrier (reference) + 1 440 Hz
T	=	M-PSK symbol period (1/1 800 s)
φ(k)	=	phase of kth M-PSK symbol
p(t-kT)	=	pulse shape of kth M-PSK symbol at time t.

Note.— The number of M-PSK symbols sent, N, defines the length (duration = NT seconds) of the PPDU. These parameters are defined in the Manual on HF Data Link *(Doc 9741).*

11.3.1.5.2 *PULSE SHAPE*

The pulse shape, p(t), shall determine the spectral distribution of the transmitted signal. The Fourier transform of the pulse shape, P(f), shall be defined by:

$P(f) = 1$, if $0 < |f| < (1 - b)/2T$
$P(f) = \cos\{\pi(2|f|T - 1 + b)/4b\}$, if $(1 - b)/2T < |f| < (1 + b)/2T$
$P(f) = 0$, if $|f| > (1 + b)/2T$

where the spectral roll-off parameter, b = 0.31, has been chosen so that the –20 dB points of the signal are at SSB carrier (reference) + 290 Hz and SSB carrier (reference) + 2 590 Hz and the peak-to-average power ratio of the waveform is less than 5 dB.

11.3.1.6 TRANSMITTER STABILITY

The basic frequency stability of the transmitting function shall be better than:

a) ±20 Hz for HFDL aircraft station sub-systems; and

b) ±10 Hz for HFDL ground station sub-systems.

11.3.1.7 RECEIVER STABILITY

The basic frequency stability of the receiving function shall be such that, with the transmitting function stability specified in 11.3.1.6, the over-all frequency difference between ground and airborne functions achieved in service does not exceed 70 Hz.

11.3.1.8 PROTECTION

A 15 dB desired to undesired (D/U) signal ratio shall apply for the protection of co-channel assignments for HFDL as follows:

a) data versus data;

b) data versus voice; and

c) voice versus data.

11.3.1.9 CLASS OF EMISSION

The class of emission shall be 2K80J2DEN.

11.3.1.10 ASSIGNED FREQUENCY

The HFDL assigned frequency shall be 1 400 Hz higher than the SSB carrier (reference) frequency.

Note.— By convention, the HFDL assigned frequency is offset from the SSB carrier (reference) frequency by 1 400 Hz. The HFDL M-PSK carrier of the digital modulation is offset from the SSB carrier (reference) frequency by 1 440 Hz. The digital modulation is fully contained within the same overall channel bandwidth as the voice signal and complies with the provisions of Appendix 27 to the ITU Radio Regulations.

11.3.1.11 EMISSION LIMITS

For HFDL aircraft and ground station transmitters, the peak envelope power (P_p) of any emission on any discrete frequency shall be less than the peak envelope power (P_p) of the transmitter in accordance with the following (see Figure 11-1):

a) on any frequency between 1.5 kHz and 4.5 kHz lower than the HFDL assigned frequency, and on any frequency between 1.5 kHz and 4.5 kHz higher than the HFDL assigned frequency: at least 30 dB;

b) on any frequency between 4.5 kHz and 7.5 kHz lower than the HFDL assigned frequency, and on any frequency between 4.5 kHz and 7.5 kHz higher than the HFDL assigned frequency: at least 38 dB; and

c) on any frequency lower than 7.5 kHz below the HFDL assigned frequency and on any frequency higher than 7.5 kHz above the HFDL assigned frequency:

1) HFDL aircraft station transmitters: 43 dB;

2) HFDL ground station transmitters up to and including 50 W:

$[43 + 10 \log_{10} P_p(W)]$ dB; and

3) HFDL ground station transmitters more than 50 W: 60 dB.

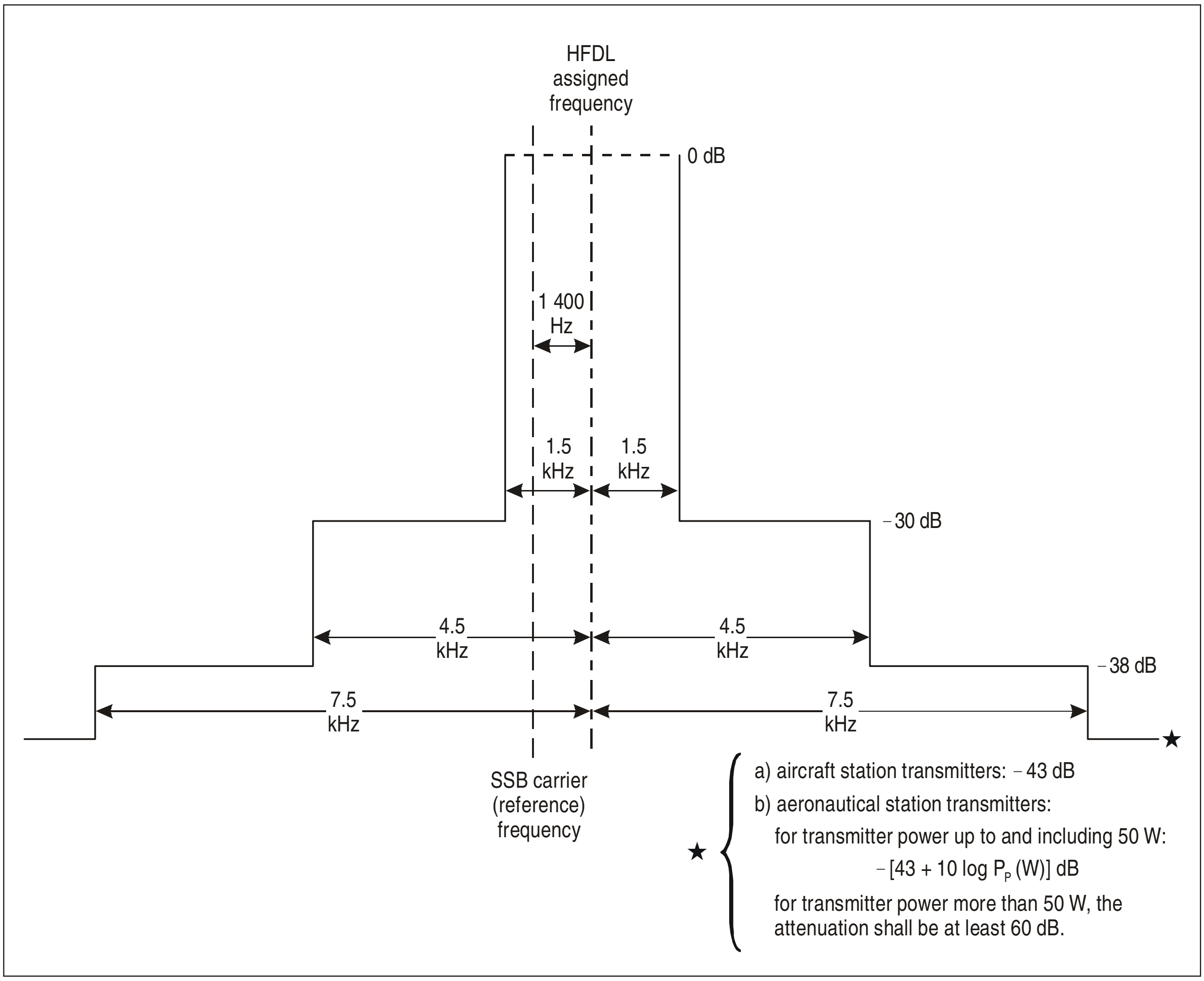

Figure 11-1. Required spectrum limits (in terms of peak power) for HFDL aircraft and ground station transmitters

11.3.1.12 POWER

11.3.1.12.1 *Ground station installations*. The peak envelope power (P_p) supplied to the antenna transmission line shall not exceed a maximum value of 6 kW as provided for in Appendix 27 of the Radio Regulations.

11.3.1.12.2 *Aircraft station installations*. The peak envelope power supplied to the antenna transmission line shall not exceed 400 W, except as provided for in Appendix 27/62 of the Radio Regulations.

11.3.1.13 UNDESIRED SIGNAL REJECTION

For HFDL aircraft and ground station receivers, undesired input signals shall be attenuated in accordance with the following:

a) on any frequency between f_c and (f_c – 300 Hz), or between (f_c + 2 900 Hz) and (f_c + 3 300 Hz): at least 35 dB below the peak of the desired signal level; and

b) on any frequency below (f_c – 300 Hz), or above (f_c + 3 300 Hz): at least 60 dB below the peak of the desired signal level,

where f_c is the carrier (reference) frequency.

11.3.1.14 RECEIVER RESPONSE TO TRANSIENTS

Recommendation.— *The receiving function should recover from an instantaneous increase in RF power at the antenna terminal of 60 dB within 10 milliseconds. The receiving function should recover from an instantaneous decrease in RF power at the antenna terminal of 60 dB within 25 milliseconds.*

11.3.2 Physical layer functions

11.3.2.1 FUNCTIONS

The functions provided by the physical layer shall include the following:

a) transmitter and receiver control;

b) transmission of data; and

c) reception of data.

11.3.2.2 TRANSMITTER AND RECEIVER CONTROL

The HFDL physical layer shall implement the transmitter/receiver switching and frequency tuning as commanded by the link layer. The physical layer shall perform transmitter keying on demand from the link layer to transmit a packet.

11.3.2.2.1 *TRANSMITTER TO RECEIVER TURNAROUND TIME*

The transmitted power level shall decay at least by 10 dB within 100 milliseconds after completing a transmission. An HFDL station sub-system shall be capable of receiving and demodulating, with nominal performance, an incoming signal within 200 milliseconds of the start of the subsequent receive slot.

11.3.2.2.2 *RECEIVER TO TRANSMITTER TURNAROUND TIME*

An HFDL station sub-system shall provide nominal output power within plus or minus 1 dB to the antenna transmission line within 200 milliseconds of the start of the transmit slot.

11.3.2.3 TRANSMISSION OF DATA

Transmission of data shall be accomplished using a time division multiple access (TDMA) technique. The HFDL data link ground station sub-systems shall maintain TDMA frame and slot synchronization for the HFDL system. To ensure that slot synchronization is maintained, each HF data link modulator shall begin outputting a pre-key segment at the beginning of a time slot plus or minus 10 milliseconds.

11.3.2.3.1 *TDMA STRUCTURE*

Each TDMA frame shall be 32 seconds. Each TDMA frame shall be divided into thirteen equal duration slots as follows:

a) the first slot of each TDMA frame shall be reserved for use by the HFDL ground station sub-system to broadcast link management data in SPDU packets; and

b) the remaining slots shall be designated either as uplink slots, downlink slots reserved for specific HFDL aircraft station sub-systems, or as downlink random access slots for use by all HFDL aircraft station sub-systems on a contention basis. These TDMA slots shall be assigned on a dynamic basis using a combination of reservation, polling and random access assignments.

11.3.2.3.2 *BROADCAST*

The HFDL ground station sub-system shall broadcast a squitter protocol data unit (SPDU) every 32 seconds on each of its operating frequencies.

Note.— Details on the TDMA frame and slot structures, pre-key segment, data structures, including the SPDU, are contained in the Manual on HF Data Link *(Doc 9741).*

11.3.2.4 RECEPTION OF DATA

11.3.2.4.1 *FREQUENCY SEARCH*

Each HFDL aircraft station shall automatically search the assigned frequencies until it detects an operating frequency.

11.3.2.4.2 *RECEPTION OF PPDUS*

The HF data link receiver shall provide the means to detect, synchronize, demodulate and decode PPDUs modulated according to the waveform defined in 11.3.1.5, subject to the following distortion:

a) the 1 440 Hz audio carrier offset by plus or minus 70 Hz;

b) discrete and/or diffuse multipath distortion with up to 5 ms multipath spread;

c) multipath amplitude fading with up to 2 Hz two-sided RMS Doppler spread and Rayleigh statistics; and

d) additive Gaussian and broadband impulsive noise with varying amplitude and random arrival times.

Note.— Reference CCIR Report 549-2.

11.3.2.4.3 *DECODING OF PPDUS*

Upon receipt of the preamble segment the receiver shall:

a) detect the beginning of a burst of data;

b) measure and correct the frequency offset between the transmitter and receiver due to Doppler shift and transmitter/receiver frequency offsets;

c) determine the data rate and interleaver settings to use during data demodulation;

d) achieve M-PSK symbol synchronization; and

e) train the equalizer.

11.3.2.4.4 *SYNCHRONIZATION*

Each HFDL aircraft station sub-system shall synchronize its slot timing to that of its corresponding ground station with respect to the reception time of the last received SPDU.

11.3.2.4.5 *SPECIFIED PACKET ERROR RATE PERFORMANCE*

The number of HFDL media access protocol data units (MPDUs) received with one or more bit errors shall not exceed 5 per cent of the total number of MPDUs received, when using a 1.8 second interleaver and under the signal-in-space conditions shown in Table 11-3.

Recommendation.— *The number of HFDL MPDUs received with one or more bit errors should not exceed 5 per cent of the total number of MPDUs received, when using a 1.8 second interleaver under the conditions shown in Table 11-3a.*

11.3.3 Link layer

Note.— Details on link layer functions are contained in the Manual on HF Data Link *(Doc 9741).*

The link layer shall provide control functions for the physical layer, link management and data service protocols.

11.3.3.1 CONTROL FUNCTIONS

The link layer shall pass commands for frequency tuning, transmitter keying and transmitter/receiver switching to the physical layer.

11.3.3.2 LINK MANAGEMENT

The link layer shall manage TDMA slot assignments, log-on and log-off procedures, ground station and aircraft station TDMA synchronization, and other functions necessary, taking into account message priority, for the establishment and maintenance of communications.

11.3.3.3 DATA SERVICE PROTOCOLS

The link layer shall support a reliable link service (RLS) protocol and a direct link service (DLS) protocol.

11.3.3.3.1 *RLS*

The RLS protocol shall be used to exchange acknowledged user data packets between aircraft and ground peer link layers.

11.3.3.3.2 *DLS*

The DLS protocol shall be used to broadcast unsegmented uplink high frequency network protocol data units (HFNPDUs) and other HFNPDUs not requiring automatic retransmission by the link layer.

11.3.4 Subnetwork layer

Note.— Details on subnetwork layer protocols and services are contained in the Manual on HF Data Link *(Doc 9741).*

11.3.4.1 PACKET DATA

The HFDL subnetwork layer in the HFDL aircraft station sub-system and HFDL ground station sub-system shall provide connection-oriented packet data service by establishing subnetwork connections between subnetwork service users.

11.3.4.2 CONNECTIVITY NOTIFICATION SERVICE

The HFDL subnetwork layer in the HFDL aircraft station sub-system shall provide the additional connectivity notification service by sending connectivity notification event messages to the attached ATN router.

11.3.4.2.1 *CONNECTIVITY NOTIFICATION EVENT MESSAGES*

The connectivity notification service shall send connectivity notification event messages to the attached ATN router through the subnetwork access function.

11.3.4.3 HFDL SUBNETWORK LAYER FUNCTIONS

The HFDL subnetwork layer in both the HFDL aircraft station sub-system and HFDL ground station sub-system shall include the following three functions:

a) HFDL subnetwork dependent (HFSND) function;

b) subnetwork access function; and

c) interworking function.

11.3.4.3.1 *HFSND FUNCTION*

The HFSND function shall perform the HFSND protocol between each pair of HFDL aircraft station sub-systems and HFDL ground station sub-systems by exchanging HFNPDUs. It shall perform the HFSND protocol aircraft function in the HFDL aircraft station sub-system and the HFSND protocol ground function in the HFDL ground station sub-system.

11.3.4.3.2 *SUBNETWORK ACCESS FUNCTION*

The subnetwork access function shall perform the ISO 8208 protocol between the HFDL aircraft station sub-system or HFDL ground station sub-system and the attached routers by exchanging ISO 8208 packets. It shall perform the ISO 8208 DCE function in the HFDL aircraft station sub-system and the HFDL ground station sub-system.

11.3.4.3.3 *INTERWORKING FUNCTION*

The interworking function shall provide the necessary harmonization functions between the HFSND, the subnetwork access and the connectivity notification functions.

11.4 GROUND MANAGEMENT SUB-SYSTEM

Note.— Details on the ground management sub-system functions and interfaces are contained in the Manual on HF Data Link *(Doc 9741).*

11.4.1 Management functions

The ground management sub-system shall perform the functions necessary to establish and maintain communications channels between the HFDL ground and aircraft station sub-systems.

11.4.2 Management/control information exchange

The ground management sub-system shall interface with the ground station sub-system in order to exchange control information required for frequency management, system table management, log status management, channel management, and quality of service (QOS) data collection.

Table 11-3. HF signal-in-space conditions

Data rate (bits per second)	*Number of channel paths*	*Multipath spread (milliseconds)*	*Fading bandwidth (Hz) per CCIR Report 549-2*	*Frequency offset (Hz)*	*Signal to noise ratio (dB) in a 3 kHz bandwidth*	*MPDU size (octets)*
1 200	1 fixed	–	–	40	4	256
1 800	2 fading	2	1	40	16	400
1 200	2 fading	2	1	40	11.5	256
600	2 fading	2	1	40	8	128
300	2 fading	2	1	40	5	64

Table 11-3a. HF signal-in-space conditions

Data rate (bits per second)	*Number of channel paths*	*Multipath spread (milliseconds)*	*Fading bandwidth (Hz) per CCIR Report 549-2*	*Frequency offset (Hz)*	*Signal to noise ratio (dB) in a 3 kHz bandwidth*	*MPDU size (octets)*
1 200	2 fading	4	1	40	13	256
1 200	2 fading	2	2	40	11.5	256

11.3.2.4 RECEPTION OF DATA

11.3.2.4.1 *FREQUENCY SEARCH*

Each HFDL aircraft station shall automatically search the assigned frequencies until it detects an operating frequency.

11.3.2.4.2 *RECEPTION OF PPDUS*

The HF data link receiver shall provide the means to detect, synchronize, demodulate and decode PPDUs modulated according to the waveform defined in 11.3.1.5, subject to the following distortion:

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c) multipath amplitude fading with up to 2 Hz two-sided RMS Doppler spread and Rayleigh statistics; and

d) additive Gaussian and broadband impulsive noise with varying amplitude and random arrival times.

Note.— Reference CCIR Report 549-2.

11.3.2.4.3 *DECODING OF PPDUS*

Upon receipt of the preamble segment the receiver shall:

a) detect the beginning of a burst of data;

b) measure and correct the frequency offset between the transmitter and receiver due to Doppler shift and transmitter/receiver frequency offsets;

c) determine the data rate and interleaver settings to use during data demodulation;

d) achieve M-PSK symbol synchronization; and

e) train the equalizer.

11.3.2.4.4 *SYNCHRONIZATION*

Each HFDL aircraft station sub-system shall synchronize its slot timing to that of its corresponding ground station with respect to the reception time of the last received SPDU.

11.3.2.4.5 *SPECIFIED PACKET ERROR RATE PERFORMANCE*

The number of HFDL media access protocol data units (MPDUs) received with one or more bit errors shall not exceed 5 per cent of the total number of MPDUs received, when using a 1.8 second interleaver and under the signal-in-space conditions shown in Table 11-3.

Recommendation.— *The number of HFDL MPDUs received with one or more bit errors should not exceed 5 per cent of the total number of MPDUs received, when using a 1.8 second interleaver under the conditions shown in Table 11-3a.*

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The RLS protocol shall be used to exchange acknowledged user data packets between aircraft and ground peer link layers.

11.3.3.3.2 *DLS*

The DLS protocol shall be used to broadcast unsegmented uplink high frequency network protocol data units (HFNPDUs) and other HFNPDUs not requiring automatic retransmission by the link layer.

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Note.— Details on subnetwork layer protocols and services are contained in the Manual on HF Data Link *(Doc 9741).*

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11.3.4.3.1 *HFSND FUNCTION*

The HFSND function shall perform the HFSND protocol between each pair of HFDL aircraft station sub-systems and HFDL ground station sub-systems by exchanging HFNPDUs. It shall perform the HFSND protocol aircraft function in the HFDL aircraft station sub-system and the HFSND protocol ground function in the HFDL ground station sub-system.

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The subnetwork access function shall perform the ISO 8208 protocol between the HFDL aircraft station sub-system or HFDL ground station sub-system and the attached routers by exchanging ISO 8208 packets. It shall perform the ISO 8208 DCE function in the HFDL aircraft station sub-system and the HFDL ground station sub-system.

11.3.4.3.3 *INTERWORKING FUNCTION*

The interworking function shall provide the necessary harmonization functions between the HFSND, the subnetwork access and the connectivity notification functions.

11.4 GROUND MANAGEMENT SUB-SYSTEM

Note.— Details on the ground management sub-system functions and interfaces are contained in the Manual on HF Data Link *(Doc 9741).*

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1 200	2 fading	2	1	40	11.5	256
600	2 fading	2	1	40	8	128
300	2 fading	2	1	40	5	64

Table 11-3a. HF signal-in-space conditions

Data rate (bits per second)	*Number of channel paths*	*Multipath spread (milliseconds)*	*Fading bandwidth (Hz) per CCIR Report 549-2*	*Frequency offset (Hz)*	*Signal to noise ratio (dB) in a 3 kHz bandwidth*	*MPDU size (octets)*
1 200	2 fading	4	1	40	13	256
1 200	2 fading	2	2	40	11.5	256

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART II — VOICE COMMUNICATION SYSTEMS

CHAPTER 1. DEFINITIONS

Note.— Material on secondary power supply and guidance material concerning reliability and availability for communication systems is contained in Annex 10, Volume I, 2.9 and Volume I, Attachment F, respectively.

CHAPTER 2. AERONAUTICAL MOBILE SERVICE

2.1 AIR-GROUND VHF COMMUNICATION SYSTEM CHARACTERISTICS

Note.— In the following text the channel spacing for 8.33 kHz channel assignments is defined as 25 kHz divided by 3 which is 8.3333 ... kHz.

2.1.1 The characteristics of the air-ground VHF communication system used in the International Aeronautical Mobile Service shall be in conformity with the following specifications:

2.1.1.1 Radiotelephone emissions shall be double sideband (DSB) amplitude modulated (AM) carriers. The designation of emission is A3E, as specified in the ITU Radio Regulations.

2.1.1.2 Spurious emissions shall be kept at the lowest value which the state of technique and the nature of the service permit.

Note.— Appendix S3 to the ITU Radio Regulations specifies the levels of spurious emissions to which transmitters must conform.

2.1.1.3 The radio frequencies used shall be selected from the radio frequencies in the band 117.975 – 137 MHz. The separation between assignable frequencies (channel spacing) and frequency tolerances applicable to elements of the system shall be as specified in Volume V.

Note.— The band 117.975 – 132 MHz was allocated to the Aeronautical Mobile (R) Service in the ITU Radio Regulations (1947). By subsequent revisions at ITU World Administrative Radio Conferences the bands 132 – 136 MHz and 136 – 137 MHz were added under conditions which differ for ITU Regions, or for specified countries or combinations of countries (see RRs S5.203, S5.203A and S5.203B for additional allocations in the band 136 – 137 MHz, and S5.201 for the band 132 – 136 MHz).

2.1.1.4 The design polarization of emissions shall be vertical.

2.2 SYSTEM CHARACTERISTICS OF THE GROUND INSTALLATION

2.2.1 Transmitting function

2.2.1.1 *Frequency stability.* The radio frequency of operation shall not vary more than plus or minus 0.005 per cent from the assigned frequency. Where 25 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.002 per cent from the assigned frequency. Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

Note.— The above tolerances will not be suitable for offset carrier systems.

2.2.1.1.1 Offset carrier systems in 25 kHz, 50 kHz and 100 kHz channel spaced environments. The stability of individual carriers of an offset carrier system shall be such as to prevent first-order heterodyne frequencies of less than 4 kHz and, additionally, the maximum frequency excursion of the outer carrier frequencies from the assigned carrier frequency shall not exceed 8 kHz. Offset carrier systems shall not be used on 8.33 kHz spaced channels.

Note.— Examples of the required stability of the individual carriers of offset carrier systems may be found at Attachment A to Part II.

2.2.1.2 POWER

Recommendation.— *On a high percentage of occasions, the effective radiated power should be such as to provide a field strength of a least 75 microvolts per metre (minus 109 dBW/m^2) within the defined operational coverage of the facility, on the basis of free space propagation.*

2.2.1.3 *Modulation.* A peak modulation factor of at least 0.85 shall be achievable.

2.2.1.4 **Recommendation.—** *Means should be provided to maintain the average modulation factor at the highest practicable value without overmodulation.*

2.2.2 Receiving function

2.2.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0001 per cent from the assigned frequency.

2.2.2.2 *Sensitivity.* After due allowance has been made for feeder loss and antenna polar diagram variation, the sensitivity of the receiving function shall be such as to provide on a high percentage of occasions an audio output signal with a wanted/unwanted ratio of 15 dB, with a 50 per cent amplitude modulated (A3E) radio signal having a field strength of 20 microvolts per metre (minus 120 dBW/m^2) or more.

2.2.2.3 *Effective acceptance bandwidth.* When tuned to a channel having a width of 25 kHz, 50 kHz or 100 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 above has a carrier frequency within plus or minus 0.005 per cent of the assigned frequency. When tuned to a channel having a width of 8.33 kHz, the receiving system shall provide an adequate and intelligible audio output when the signal specified at 2.2.2.2 above has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in Attachment A to Part II.

Note.— The effective acceptance bandwidth includes Doppler shift.

2.2.2.4 *Adjacent channel rejection.* The receiving system shall ensure an effective rejection of 60 dB or more at the next assignable channel.

Note.— The next assignable frequency will normally be plus or minus 50 kHz. Where this channel spacing will not suffice, the next assignable frequency will be plus or minus 25 kHz, or plus or minus 8.33 kHz, implemented in accordance with the provisions of Volume V. It is recognized that in certain areas of the world receivers designed for 25 kHz, 50 kHz or 100 kHz channel spacing may continue to be used.

2.3 SYSTEM CHARACTERISTICS OF THE AIRBORNE INSTALLATION

2.3.1 Transmitting function

2.3.1.1 *Frequency stability.* The radio frequency of operation shall not vary more than plus or minus 0.005 per cent from the assigned frequency. Where 25 kHz channel spacing is introduced, the radio frequency of operation shall not vary more than plus or minus 0.003 per cent from the assigned frequency. Where 8.33 kHz channel spacing is introduced, the radio frequency of operation shall not vary more than plus or minus 0.0005 per cent from the assigned frequency.

2.3.1.2 *Power.* On a high percentage of occasions, the effective radiated power shall be such as to provide a field strength of at least 20 microvolts per metre (minus 120 dBW/m^2) on the basis of free space propagation, at ranges and altitudes appropriate to the operational conditions pertaining to the areas over which the aircraft is operated.

2.3.1.3 *Adjacent channel power.* The amount of power from a 8.33 kHz airborne transmitter under all operating conditions when measured over a 7 kHz channel bandwidth centred on the first 8.33 kHz adjacent channel shall not exceed –45 dB below the transmitter carrier power. The above adjacent channel power shall take into account the typical voice spectrum.

Note.— The voice spectrum is assumed to be a constant level between 300 and 800 Hz and attenuated by 10 dB per octave above 800 Hz.

2.3.1.4 *Modulation.* A peak modulation factor of at least 0.85 shall be achievable.

2.3.1.5 **Recommendation.—** *Means should be provided to maintain the average modulation factor at the highest practicable value without overmodulation.*

2.3.2 Receiving function

2.3.2.1 *Frequency stability.* Where 8.33 kHz channel spacing is introduced in accordance with Volume V, the radio frequency of operation shall not vary more than plus or minus 0.0005 per cent from the assigned frequency.

2.3.2.2 SENSITIVITY

2.3.2.2.1 **Recommendation.—** *After due allowance has been made for aircraft feeder mismatch, attenuation loss and antenna polar diagram variation, the sensitivity of the receiving function should be such as to provide on a high percentage of occasions an audio output signal with a wanted/unwanted ratio of 15 dB, with a 50 per cent amplitude modulated (A3E) radio signal having a field strength of 75 microvolts per metre (minus 109 dBW/m^2).*

Note.— For planning extended range VHF facilities, an airborne receiving function sensitivity of 30 microvolts per metre may be assumed.

2.3.2.3 *Effective acceptance bandwidth for 100 kHz, 50 kHz and 25 kHz channel spacing receiving installations.* When tuned to a channel designated in Volume V as having a width of 25 kHz, 50 kHz or 100 kHz, the receiving function shall ensure an effective acceptance bandwidth as follows:

a) in areas where offset carrier systems are employed, the receiving function shall provide an adequate audio output when the signal specified at 2.3.2.2 above has a carrier frequency within 8 kHz of the assigned frequency;

b) in areas where offset carrier systems are not employed, the receiving function shall provide an adequate audio output when the signal specified at 2.3.2.2 above has a carrier frequency of plus or minus 0.005 per cent of the assigned frequency.

2.3.2.4 *Effective acceptance bandwidth for 8.33 kHz channel spacing receiving installations.* When tuned to a channel designated in Volume V, as having a width of 8.33 kHz, the receiving function shall provide an adequate audio output when the signal specified at 2.3.2.2 above has a carrier frequency within plus or minus 0.0005 per cent of the assigned frequency. Further information on the effective acceptance bandwidth is contained in Attachment A to Part II.

Note.— The effective acceptance bandwidth includes Doppler shift.

2.3.2.5 *Adjacent channel rejection.* The receiving function shall ensure an effective adjacent channel rejection as follows:

a) *8.33 kHz channels:* 60 dB or more at plus or minus 8.33 kHz with respect to the assigned frequency, and 40 dB or more at plus or minus 6.5 kHz;

Note.— The receiver local oscillator phase noise should be sufficiently low to avoid any degradation of the receiver capability to reject off carrier signals. A phase noise level better than minus 99 dBc/Hz 8.33 kHz away from the carrier is necessary to comply with 45 dB adjacent channel rejection under all operating conditions.

b) *25 kHz channel spacing environment:* 50 dB or more at plus or minus 25 kHz with respect to the assigned frequency and 40 dB or more at plus or minus 17 kHz;

c) *50 kHz channel spacing environment:* 50 dB or more at plus or minus 50 kHz with respect to the assigned frequency and 40 dB or more at plus or minus 35 kHz;

d) *100 kHz channel spacing environment:* 50 dB or more at plus or minus 100 kHz with respect to the assigned frequency.

2.3.2.6 **Recommendation.—** *Whenever practicable, the receiving system should ensure an effective adjacent channel rejection characteristic of 60 dB or more at plus or minus 25 kHz, 50 kHz and 100 kHz from the assigned frequency for receiving systems intended to operate in channel spacing environments of 25 kHz, 50 kHz and 100 kHz respectively.*

Note.— Frequency planning is normally based on an assumption of 60 dB effective adjacent channel rejection at plus or minus 25 kHz, 50 kHz or 100 kHz from the assigned frequency as appropriate to the channel spacing environment.

2.3.2.7 **Recommendation.—** *In the case of receivers complying with 2.3.2.3 above used in areas where offset carrier systems are in force, the characteristics of the receiver should be such that:*

a) the audio frequency response precludes harmful levels of audio heterodynes resulting from the reception of two or more offset carrier frequencies;

b) the receiver muting circuits, if provided, operate satisfactorily in the presence of audio heterodynes resulting from the reception of two or more offset carrier frequencies.

2.3.2.8 *VDL — Interference immunity performance*

2.3.2.8.1 For equipment intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft, the receiving function shall provide an adequate and intelligible audio output with a desired signal field strength of not more than 150 microvolts per metre (minus 102 dBW/m^2) and with an undesired VDL signal field strength of at least 50 dB above the desired field strength on any assignable channel 100 kHz or more away from the assigned channel of the desired signal.

Note.— This level of VDL interference immunity performance provides a receiver performance consistent with the influence of the VDL RF spectrum mask as specified in Volume III, Part I, 6.3.4 with an effective transmitter/receiver isolation of 68 dB. Better transmitter and receiver performance could result in less isolation required.

2.3.2.8.2 After 1 January 2002, the receiving function of all new installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 2.3.2.8.1.

2.3.2.8.3 After 1 January 2005, the receiving function of all installations intended to be used in independent operations of services applying DSB-AM and VDL technology on board the same aircraft shall meet the provisions of 2.3.2.8.1, subject to the conditions of 2.3.2.8.4.

2.3.2.8.4 Requirements for mandatory compliance of the provisions of 2.3.2.8.3 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales.

2.3.2.8.4.1 The agreement indicated in 2.3.2.8.4 shall provide at least two years' notice of mandatory compliance of airborne systems.

2.3.3 Interference immunity performance

2.3.3.1 After 1 January 1998, the VHF communications receiving system shall provide satisfactory performance in the presence of two signal, third-order intermodulation products caused by VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

2.3.3.2 After 1 January 1998, the VHF communications receiving system shall not be desensitized in the presence of VHF FM broadcast signals having levels at the receiver input of minus 5 dBm.

Note.— Guidance material on immunity criteria to be used for the performance quoted in 2.3.3.1 and 2.3.3.2 above is contained in Attachment A to Part II, 1.3.

2.3.3.3 After 1 January 1995, all new installations of airborne VHF communications receiving systems shall meet the provisions of 2.3.3.1 and 2.3.3.2 above.

2.3.3.4 **Recommendation.—** *Airborne VHF communications receiving systems meeting the immunity performance Standards of 2.3.3.1 and 2.3.3.2 above should be placed into operation at the earliest possible date.*

2.4 SINGLE SIDEBAND (SSB) HF COMMUNICATION SYSTEM CHARACTERISTICS FOR USE IN THE AERONAUTICAL MOBILE SERVICE

2.4.1 The characteristics of the air-ground HF SSB system, where used in the Aeronautical Mobile Service, shall be in conformity with the following specifications.

2.4.1.1 FREQUENCY RANGE

2.4.1.1.1 HF SSB installations shall be capable of operation at any SSB carrier (reference) frequency available to the Aeronautical Mobile (R) Service in the band 2.8 MHz to 22 MHz and necessary to meet the approved assignment plan for the region(s) in which the system is intended to operate, and in compliance with the relevant provisions of the Radio Regulations.

Note 1.— See Introduction to Volume V, Chapter 3, and Figures 2-1 and 2-2.

Note 2.— The ITU World Administrative Radio Conference, Aeronautical Mobile (R) Service, Geneva, 1978, established a new Allotment Plan (Appendix 27, Aer to the Radio Regulations) based on single sideband replacing the earlier double sideband Allotment Plan. The World Radiocommunication Conference 1995 redesignated it as Appendix S.27. Minor editorial changes were made at the World Radiocommunication Conference 1997.

2.4.1.1.2 The equipment shall be capable of operating on integral multiples of 1 kHz.

2.4.1.2 SIDEBAND SELECTION

2.4.1.2.1 The sideband transmitted shall be that on the higher frequency side of its carrier (reference) frequency.

2.4.1.3 CARRIER (REFERENCE) FREQUENCY

2.4.1.3.1 Channel utilization shall be in conformity with the table of carrier (reference) frequencies at 27/16 and the Allotment Plan at 27/186 to 27/207 inclusive (or frequencies established on the basis of 27/21, as may be appropriate) of Appendix S27.

Note.— It is intended that only the carrier (reference) frequency be promulgated in Regional Plans and Aeronautical Publications.

2.4.1.4 CLASSES OF EMISSION AND CARRIER SUPPRESSION

2.4.1.4.1 The system shall utilize the suppressed carrier class of emission J3E (also J7B and J9B as applicable). When SELCAL is employed as specified in Chapter 3 of Part II, the installation shall utilize class H2B emission.

2.4.1.4.2 By 1 February 1982 aeronautical stations and aircraft stations shall have introduced the appropriate class(es) of emission prescribed in 2.4.1.4.1 above. Effective this date the use of class A3E emission shall be discontinued except as provided in 2.4.1.4.4 below.

2.4.1.4.3 Until 1 February 1982 aeronautical stations and aircraft stations equipped for single sideband operations shall also be equipped to transmit class H3E emission where required to be compatible with reception by double sideband equipment. Effective this date the use of class H3E emission shall be discontinued except as provided in 2.4.1.4.4 below.

2.4.1.4.4 **Recommendation.—** *For stations directly involved in co-ordinated search and rescue operations using the frequencies 3 023 kHz and 5 680 kHz, the class of emission J3E should be used; however, since maritime mobile and land mobile services may be involved, A3E and H3E classes of emission may be used.*

2.4.1.4.5 After 1 April 1981 no new DSB equipment shall be installed.

2.4.1.4.6 Aircraft station transmitters shall be capable of at least 26 dB carrier suppression with respect to peak envelope power (P_p) for classes of emission J3E, J7B or J9B.

2.4.1.4.7 Aeronautical station transmitters shall be capable of 40 dB carrier suppression with respect to peak envelope power (P_p) for classes of emission J3E, J7B or J9B.

2.4.1.5 AUDIO FREQUENCY BANDWIDTH

2.4.1.5.1 For radiotelephone emissions the audio frequencies shall be limited to between 300 and 2 700 Hz and the occupied bandwidth of other authorized emissions shall not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension shall be implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see 2.4.1.7 below).

Note.— For aircraft and aeronautical station transmitter types first installed before 1 February 1983 the audio frequencies will be limited to 3 000 Hz.

2.4.1.5.2 For other authorized classes of emission the modulation frequencies shall be such that the required spectrum limits of 2.4.1.7 below will be met.

2.4.1.6 FREQUENCY TOLERANCE

2.4.1.6.1 The basic frequency stability of the transmitting function for classes of emission J3E, J7B or J9B shall be such that the difference between the actual carrier of the transmission and the carrier (reference) frequency shall not exceed:

— 20 Hz for airborne installations;

— 10 Hz for ground installations.

2.4.1.6.2 The basic frequency stability of the receiving function shall be such that, with the transmitting function stabilities specified in 2.4.1.6.1 above, the over-all frequency difference between ground and airborne functions achieved in service and including Doppler shift, does not exceed 45 Hz. However, a greater frequency difference shall be permitted in the case of supersonic aircraft.

2.4.1.7 SPECTRUM LIMITS

2.4.1.7.1 For aircraft station transmitter types and for aeronautical station transmitters first installed before 1 February 1983 and using single sideband classes of emission H2B, H3E, J3E, J7B or J9B the mean power of any emission on any discrete frequency shall be less than the mean power (P_m) of the transmitter in accordance with the following:

— on any frequency removed by 2 kHz or more up to 6 kHz from the assigned frequency: at least 25 dB;

— on any frequency removed by 6 kHz or more up to 10 kHz from the assigned frequency: at least 35 dB;

— on any frequency removed from the assigned frequency by 10 kHz or more:

a) aircraft station transmitters: 40 dB;

b) aeronautical station transmitters:

$$[43 + 10 \log_{10} P_m\ (W)]\ dB$$

2.4.1.7.2 For aircraft station transmitters first installed after 1 February 1983 and for aeronautical station transmitters in use as of 1 February 1983 and using single sideband classes of emission H2B, H3E, J3E, J7B or J9B, the peak envelope power (P_p) of any emission on any discrete frequency shall be less than the peak envelope power (P_p) of the transmitter in accordance with the following:

— on any frequency removed by 1.5 kHz or more up to 4.5 kHz from the assigned frequency: at least 30 dB;

— on any frequency removed by 4.5 kHz or more up to 7.5 kHz from the assigned frequency: at least 38 dB;

— on any frequency removed from the assigned frequency by 7.5 kHz or more:

a) aircraft station transmitters: 43 dB;

b) aeronautical station transmitters: for transmitter power up to and including 50 W:

$$[43 + 10 \log_{10} P_p\ (W)]\ dB$$

For transmitter power more than 50 W: 60 dB.

Note.— See Figures 2-1 and 2-2.

2.4.1.8 POWER

2.4.1.8.1 *Aeronautical station installations.* Except as permitted by the relevant provisions of Appendix S27 to the ITU Radio Regulations, the peak envelope power (P_p) supplied to the antenna transmission line for H2B, H3E, J3E, J7B or J9B classes of emissions shall not exceed a maximum value of 6 kW.

2.4.1.8.2 *Aircraft station installations.* The peak envelope power supplied to the antenna transmission line for H2B, H3E, J3E, J7B or J9B classes of emission shall not exceed 400 W except as provided for in Appendix S27 of the ITU Radio Regulations as follows:

S27/68 It is recognized that the power employed by aircraft transmitters may, in practice, exceed the limits specified in No. 27/60. However, the use of such increased power (which normally should not exceed 600 W P_p) shall not cause harmful interference to stations using frequencies in accordance with the technical principles on which the Allotment Plan is based.

S27/60 Unless otherwise specified in Part II of this Appendix, the peak envelope powers supplied to the antenna transmission line shall not exceed the maximum values indicated in the table below; the corresponding peak effective radiated powers being assumed to be equal to two-thirds of these values:

Class of emission	*Stations*	*Max. peak envelope power* (P_p)
H2B, J3E, J7B, J9B, A3E*, H3E* (100% modulation)	Aeronautical stations Aircraft stations	6 kW 400 W
Other emission such as A1A, F1B	Aeronautical stations Aircraft stations	1.5 kW 100 W

* A3E and H3E to be used only on 3 023 kHz and 5 680 kHz.

2.4.1.9 *Method of operation.* Single channel simplex shall be employed.

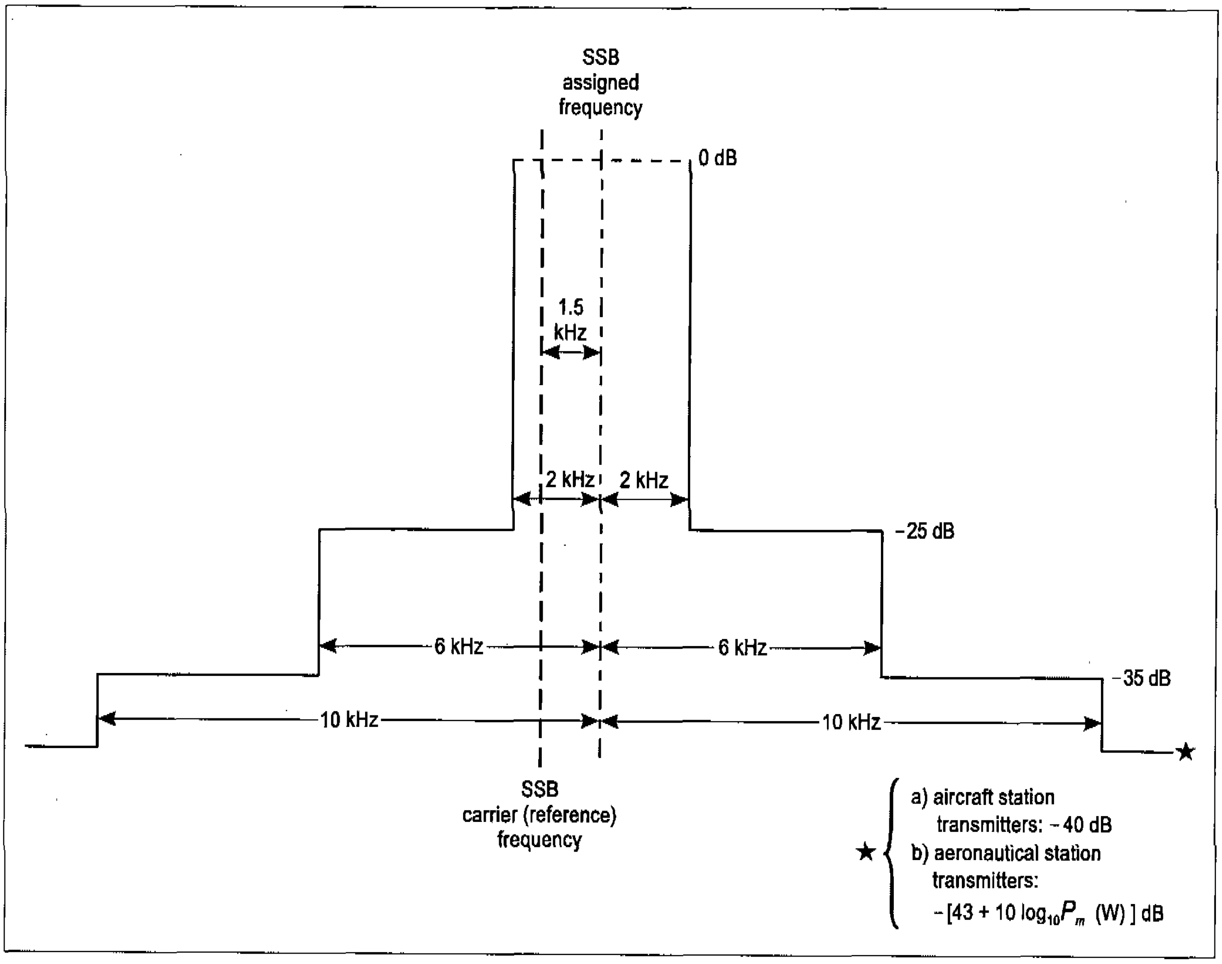

Figure 2-1. Required spectrum limits (in terms of mean power) for aircraft station transmitter types and for aeronautical station transmitters first installed before 1 February 1983

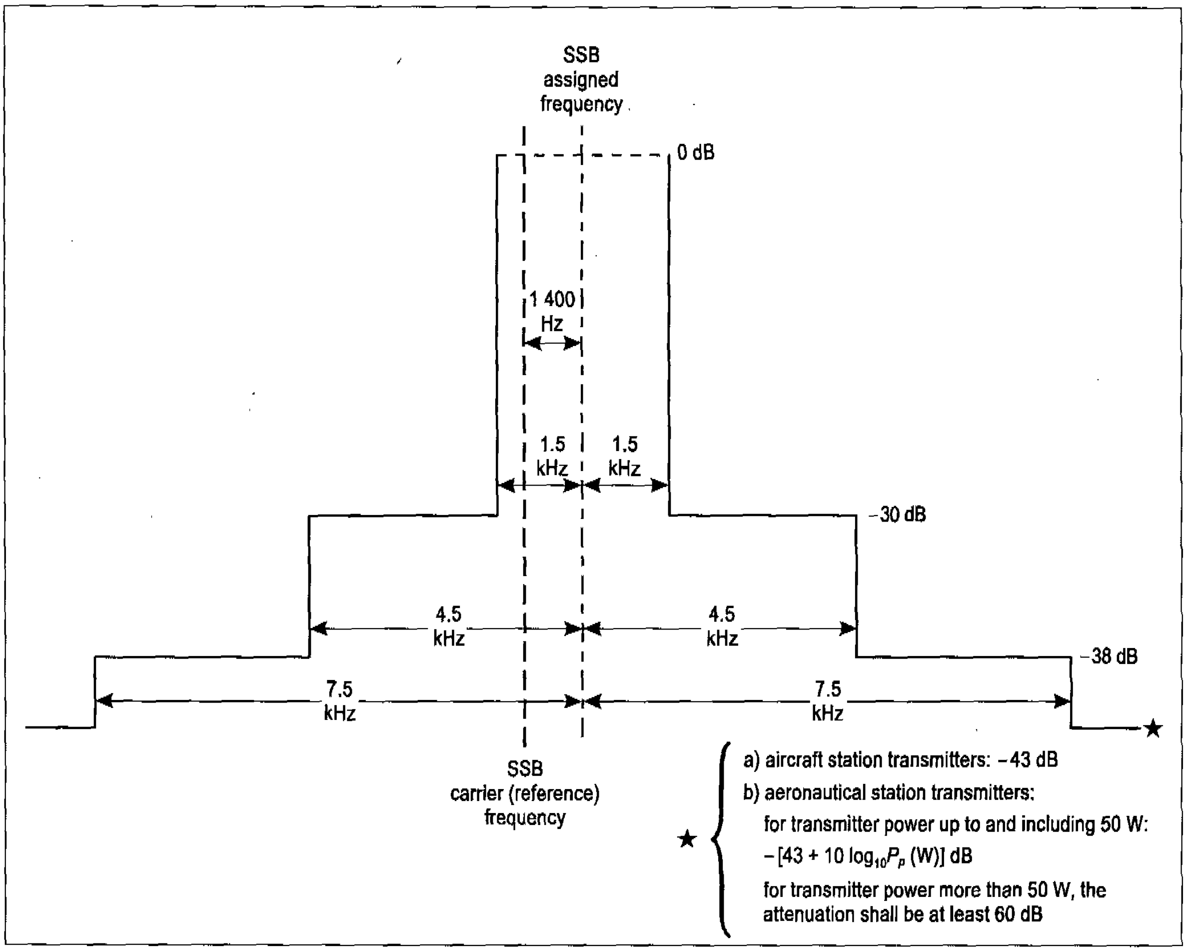

Figure 2-2. Required spectrum limits (in terms of peak power) for aircraft station transmitters first installed after 1 February 1983 and aeronautical station transmitters in use after 1 February 1983

CHAPTER 3. SELCAL SYSTEM

3.1 **Recommendation.**— *Where a SELCAL system is installed, the following system characteristics should be applied:*

a) Transmitted code. *Each transmitted code should be made up of two consecutive tone pulses, with each pulse containing two simultaneously transmitted tones. The pulses should be of 1.0 plus or minus 0.25 seconds duration, separated by an interval of 0.2 plus or minus 0.1 second.*

b) Stability. *The frequency of transmitted tones should be held to plus or minus 0.15 per cent tolerance to ensure proper operation of the airborne decoder.*

c) Distortion. *The over-all audio distortion present on the transmitted RF signal should not exceed 15 per cent.*

d) Per cent modulation. *The RF signal transmitted by the ground radio station should contain, within 3 dB, equal amounts of the two modulating tones. The combination of tones should result in a modulation envelope having a nominal modulation percentage as high as possible and in no case less than 60 per cent.*

e) Transmitted tones. *Tone codes should be made up of various combinations of the tones listed in the following table and designated by colour and letter as indicated:*

Designation	*Frequency (Hz)*
Red A	*312.6*
Red B	*346.7*
Red C	*384.6*
Red D	*426.6*
Red E	*473.2*
Red F	*524.8*
Red G	*582.1*
Red H	*645.7*
Red J	*716.1*
Red K	*794.3*
Red L	*881.0*
Red M	*977.2*
Red P	*1 083.9*
Red Q	*1 202.3*
Red R	*1 333.5*
Red S	*1 479.1*

Note 1.— It should be noted that the tones are spaced by Log^{-1} 0.045 to avoid the possibility of harmonic combinations.

Note 2.— In accordance with the application principles developed by the Sixth Session of the Communications Division, the only codes at present used internationally are selected from the red group.

Note 3.— Guidance material on the use of SELCAL systems is contained in Attachment A to Part II.

Note 4.— The tones Red P, Red Q, Red R, and Red S are applicable after 1 September 1985, in accordance with 3.2 below.

3.2 As from 1 September 1985, aeronautical stations which are required to communicate with SELCAL-equipped aircraft shall have SELCAL encoders in accordance with the red group in the table of tone frequencies of 3.1 above. After 1 September 1985, SELCAL codes using the tones Red P, Red Q, Red R, and Red S may be assigned.

CHAPTER 4. AERONAUTICAL SPEECH CIRCUITS

4.1 TECHNICAL PROVISIONS RELATING TO INTERNATIONAL AERONAUTICAL SPEECH CIRCUIT SWITCHING AND SIGNALLING FOR GROUND-GROUND APPLICATIONS

Note.— Guidance material on the implementation of aeronautical speech circuit switching and signalling for ground-ground applications is contained in the Manual on Air Traffic Services (ATS) Ground-Ground Voice Switching and Signalling *(Doc 9804). The material includes explanation of terms, perfor-mance parameters, guidance on basic call types and additional functions, references to appropriate ISO/IEC international standards and ITU-T recommendations, guidance on the use of signalling systems, details of the recommended numbering scheme and guidance on migration to future schemes.*

4.1.1 The use of circuit switching and signalling to provide speech circuits to interconnect ATS units not interconnected by dedicated circuits shall be by agreement between the Administrations concerned.

4.1.2 The application of aeronautical speech circuit switching and signalling shall be made on the basis of regional air navigation agreements.

4.1.3 **Recommendation.—** *The ATC communication requirements defined in Annex 11, Section 6.2 should be met by implementation of one or more of the following basic three call types:*

a) instantaneous access;

b) direct access; and

c) indirect access.

4.1.4 **Recommendation.—** *In addition to the ability to make basic telephone calls, the following functions should be provided in order to meet the requirements set out in Annex 11:*

a) means of indicating the calling/called party identity;

b) means of initiating urgent/priority calls; and

c) conference capabilities.

4.1.5 **Recommendation.—** *The characteristics of the circuits used in aeronautical speech circuit switching and signalling should conform to appropriate ISO/IEC international standards and ITU-T recommendations.*

4.1.6 **Recommendation.—** *Digital signalling systems should be used wherever their use can be justified in terms of any of the following:*

a) improved quality of service;

b) improved user facilities; or

c) reduced costs where quality of service is maintained.

4.1.7 **Recommendation.—** *The characteristics of supervisory tones to be used (such as ringing, busy, number unobtainable) should conform to appropriate ITU-T recommendations.*

4.1.8 **Recommendation.—** *To take advantage of the benefits of interconnecting regional and national aeronautical speech networks, the international aeronautical telephone network numbering scheme should be used.*

CHAPTER 5. EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

5.1 GENERAL

5.1.1 Until 1 January 2005, emergency locator transmitters shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

Note.— From 1 January 2000, ELTs operating on 121.5 MHz will be required to meet the improved technical characteristics contained in 5.2.1.8.

5.1.2 All installations of emergency locator transmitters operating on 406 MHz shall meet the provisions of 5.3.

5.1.3 All installations of emergency locator transmitters operating on 121.5 MHz shall meet the provisions of 5.2.

5.1.4 From 1 January 2005, emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously.

5.1.5 All emergency locator transmitters installed on or after 1 January 2002 shall operate simultaneously on 406 MHz and 121.5 MHz.

5.1.6 The technical characteristics for the 406 MHz component of an integrated ELT shall be in accordance with 5.3.

5.1.7 The technical characteristics for the 121.5 MHz component of an integrated ELT shall be in accordance with 5.2.

5.1.8 States shall make arrangements for a 406 MHz ELT register. Register information regarding the ELT shall be immediately available to search and rescue authorities. States shall ensure that the register is updated whenever necessary.

5.1.9 ELT register information shall include the following:

a) transmitter identification (expressed in the form of an alphanumerical code of 15 hexadecimal characters);

b) transmitter manufacturer, model and, when available, manufacturer's serial number;

c) COSPAS-SARSAT* type approval number;

d) name, address (postal and e-mail) and emergency telephone number of the owner and operator;

e) name, address (postal and e-mail) and telephone number of other emergency contacts (two, if possible) to whom the owner or the operator is known;

f) aircraft manufacturer and type; and

g) colour of the aircraft.

Note 1.— Various coding protocols are available to States. Depending on the protocol adopted, States may, at their discretion, include one of the following as supplementary identification information to be registered:

a) aircraft operating agency designator and operator's serial number; or

b) 24-bit aircraft address; or

c) aircraft nationality and registration marks.

The aircraft operating agency designator is allocated to the operator by ICAO through the State administration, and the operator's serial number is allocated by the operator from the block 0001 to 4096.

Note 2.— At their discretion, depending on arrangements in place, States may include other relevant information to be registered such as the last date of register, battery expiry date and place of ELT in the aircraft (e.g. "primary ELT" or "life-raft No. 1").

5.2 SPECIFICATION FOR THE 121.5 MHZ COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

Note 1.— Information on technical characteristics and operational performance of 121.5 MHz ELTs is contained in RTCA Document DO-183 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED.62.

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* COSPAS = Space system for search of vessels in distress;
SARSAT = Search and rescue satellite-aided tracking.

Note 2.— Technical characteristics of emergency locator transmitters operating on 121.5 MHz are contained in ITU-R Recommendation M.690-1. The ITU designation for an ELT is Emergency Position — Indicating Radio Beacon (EPIRB).

5.2.1 Technical characteristics

5.2.1.1 Emergency locator transmitters (ELT) shall operate on 121.5 MHz. The frequency tolerance shall not exceed plus or minus 0.005 per cent.

5.2.1.2 The emission from an ELT under normal conditions and attitudes of the antenna shall be vertically polarized and essentially omnidirectional in the horizontal plane.

5.2.1.3 Over a period of 48 hours of continuous operation, at an operating temperature of minus 20°C, the peak effective radiated power (PERP) shall at no time be less than 50 mW.

5.2.1.4 The type of emission shall be A3X. Any other type of modulation that meets the requirements of 5.2.1.5, 5.2.1.6 and 5.2.1.7 below may be used provided that it will not prejudice precise location of the beacon by homing equipment.

Note.— Some ELTs are equipped with an optional voice capability (A3E) in addition to the A3X emission.

5.2.1.5 The carrier shall be amplitude modulated at a modulation factor of at least 0.85.

5.2.1.6 The modulation applied to the carrier shall have a minimum duty cycle of 33 per cent.

5.2.1.7 The emission shall have a distinctive audio characteristic achieved by amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700 Hz within the range 1 600 Hz to 300 Hz and with a sweep repetition rate of between 2 Hz and 4 Hz.

5.2.1.8 After 1 January 2000, the emission shall include a clearly defined carrier frequency distinct from the modulation sideband components; in particular, at least 30 per cent of the power shall be contained at all times within plus or minus 30 Hz of the carrier frequency on 121.5 MHz.

5.3 SPECIFICATION FOR THE 406 MHZ COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

5.3.1 Technical characteristics

Note 1.— Transmission characteristics for 406 MHz emergency locator transmitters are contained in ITU-R M.633.

Note 2.— Information on technical characteristics and operational performance of 406 MHz ELTs is contained in RTCA Document DO-204 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-62.

5.3.1.1 Emergency locator transmitters shall operate on one of the frequency channels assigned for use in the frequency band 406.0 to 406.1 MHz.

Note.— The COSPAS-SARSAT 406 MHz channel assignment plan is contained in COSPAS-SARSAT Document C/S T.012.

5.3.1.2 The period between transmissions shall be 50 seconds plus or minus 5 per cent.

5.3.1.3 Over a period of 24 hours of continuous operation at an operating temperature of –20°C, the transmitter power output shall be within the limits of 5 W plus or minus 2 dB.

5.3.1.4 The 406 MHz ELT shall be capable of transmitting a digital message.

5.3.2 Transmitter identification coding

5.3.2.1 Emergency locator transmitters operating on 406 MHz shall be assigned a unique coding for identification of the transmitter or aircraft on which it is carried.

5.3.2.2 The emergency locator transmitter shall be coded in accordance with either the aviation user protocol or one of the serialized user protocols described in Appendix 1 to this chapter, and shall be registered with the appropriate authority.

APPENDIX 1 TO CHAPTER 5. EMERGENCY LOCATOR TRANSMITTER CODING

(see Chapter 5, 5.3.2)

Note.— A detailed description of beacon coding is contained in Specification for COSPAS-SARSAT 406 MHz Distress Beacons (C/S T.001). The following technical specifications are specific to emergency locator transmitters used in aviation.

1. GENERAL

1.1 The emergency locator transmitter (ELT) operating on 406 MHz shall have the capacity to transmit a programmed digital message which contains information related to the ELT and/or the aircraft on which it is carried.

1.2 The ELT shall be uniquely coded in accordance with 1.3 below and be registered with the appropriate authority.

1.3 The ELT digital message shall contain either the transmitter serial number or one of the following information elements:

a) aircraft operating agency designator and a serial number;

b) 24-bit aircraft address;

c) aircraft nationality and registration marks.

1.4 All ELTs shall be designed for operation with the COSPAS-SARSAT* system and be type approved.

Note.— Transmission characteristics of the ELT signal can be confirmed by making use of the COSPAS-SARSAT Type Approval Standard (C/S T.007).

2. ELT CODING

2.1 The ELT digital message shall contain information relating to the message format, coding protocol, country code, identification data and location data, as appropriate.

2.2 For ELTs with no navigation data provided, the short message format C/S T.001 shall be used, making use of bits 1 through 112. For ELTs with navigation data, if provided, the long message format shall be used, making use of bits 1 through 144.

2.3 Protected data field

2.3.1 The protected data field consisting of bits 25 through 85 shall be protected by an error correcting code, and shall be the portion of the message which shall be unique in every distress ELT.

2.3.2 A message format flag indicated by bit 25 shall be set to "0" to indicate the short message format or set to "1" to indicate the long format for ELTs capable of providing location data.

2.3.3 A protocol flag shall be indicated by bit 26 and shall be set to "1" for user and user location protocols, and "0" for location protocols.

2.3.4 A country code, which indicates the State where additional data are available on the aircraft on which the ELT is carried, shall be contained in bits 27 through 36 which designate a three-digit decimal country code number expressed in binary notation.

Note.— Country codes are based on the International Telecommunication Union (ITU) country codes shown in Table 4 of Part I, Volume I of the ITU List of Call Signs and Numerical Identities.

2.3.5 Bits 37 through 39 (user and user location protocols) or bits 37 through 40 (location protocols) shall designate one of the protocols where values "001" and "011" or "0011", "0100", "0101", and "1000" are used for aviation as shown in the examples contained in this Appendix.

2.3.6 The ELT digital message shall contain either the transmitter serial number or an identification of the aircraft or operator as shown below.

2.3.7 In the serial user and serial user location protocol (designated by bit 26=1 and bits 37 through 39 being "011"), the serial identification data shall be encoded in binary notation with the least significant bit on the right. Bits 40 through 42 shall indicate type of ELT serial identification data encoded where:

— "000" indicates ELT serial number (binary notation) is encoded in bits 44 through 63;

— "001" indicates aircraft operator (3 letter encoded using modified Baudot code shown in Table 5-1) and a serial number (binary notation) are encoded in bits 44 through 61 and 62 through 73, respectively;

* COSPAS = Space system for search of vessels in distress; SARSAT = Search and rescue satellite-aided tracking.

— “011” indicates the 24-bit aircraft address is encoded in bits 44 through 67 and each additional ELT number (binary notation) on the same aircraft is encoded in bits 68 through 73.

Note.— States will ensure that each beacon, coded with the country code of the State, is uniquely coded and registered in a data base. Unique coding of serialized coded beacons can be facilitated by including the COSPAS-SARSAT Type Approval Certificate Number which is a unique number assigned by COSPAS-SARSAT for each approved ELT model, as part of the ELT message.

2.3.8 In the aviation user or user location protocol (designated by bit 26=1 and bits 37 through 39 being “001”), the aircraft nationality and registration marking shall be encoded in bits 40 through 81, using the modified Baudot code shown in Table 5-1 to encode seven alpha-numeric characters. This data shall be right justified with the modified Baudot “space” (“100100”) being used where no character exists.

2.3.9 Bits 84 and 85 (user or user location protocol) or bit 112 (location protocols) shall indicate any homing transmitter that may be integrated in the ELT.

2.3.10 In standard and national location protocols, all identification and location data shall be encoded in binary notation with the least significant bit right justified. The aircraft operator designator (3 letter code) shall be encoded in 15 bits using a modified Baudot code (Table 5-1) using only the 5 right most bits per letter and dropping the left most bit which has a value of 1 for letters.

Table 5-1. Modified Baudot Code

Letter	*Code* *MSB LSB*	*Figure*	*Code* *MSB LSB*
A	111000	(-)*	011000
B	110011		
C	101110		
D	110010		
E	110000	3	010000
F	110110		
G	101011		
H	100101		
I	101100		
J	111010	8	001100
K	111110		
L	101001		
M	100111		
N	100110		
O	100011	9	000011
P	101101	0	001101
Q	111101	1	011101
R	101010	4	001010
S	110100		
T	100001	5	000001
U	111100	7	011100
V	101111		
W	111001	2	011001
X	110111	/	010111
Y	110101	6	010101
Z	110001		
( )**	100100		

MSB = most significant bit
LSB = least significant bit
* = hyphen
** = space

EXAMPLES OF CODING

ELT serial number

25		27 36	37			40				44 63	64 73	74 83		85
F	1	COUNTRY	0	1	1	T	T	T	C	SERIAL NUMBER DATA (20 BITS)	SEE NOTE 1	SEE NOTE 2	A	A

Aircraft address

25		27 36	37			40				44 67	68 73	74 83		85
F	1	COUNTRY	0	1	1	T	T	T	C	AIRCRAFT ADDRESS (24 BITS)	SEE NOTE 3	SEE NOTE 2	A	A

Aircraft operator designator and serial number

25		27 36	37			40				44 61	62 73	74 83		85
F	1	COUNTRY	0	1	1	T	T	T	C	OPERATOR 3-LETTER DESIGNATOR	SERIAL NUMBER 1-4096	SEE NOTE 2	A	A

Aircraft registration marking

25		27 36	37			40 81		83		85
F	1	COUNTRY	0	0	1	AIRCRAFT REGISTRATION MARKING (UP TO 7 ALPHANUMERIC CHARACTERS) (42 BITS)	0	0	A	A

T = Beacon type TTT = 000 indicates ELT serial number is encoded;
= 001 indicates operating agency and serial number are encoded;
= 011 indicates 24-bit aircraft address is encoded.

C = Certificate flag bit: 1 = to indicate that COSPAS-SARSAT Type Approval Certificate number is encoded in bits 74 through 83 and
0 = otherwise

F = Format flag: 0 = Short Message
1 = Long Message

A = Auxiliary radio-locating device: 00 = no auxiliary radio-locating device
01 = 121.5 MHz
11 = other auxiliary radio-locating device

Note 1.— 10 bits, all 0s or National use.

Note 2.— COSPAS-SARSAT Type Approval Certificate number in binary notation with the least significant bit on the right, or National use.

Note 3.— Serial number, in binary notation with the least significant bit on the right, of additional ELTs carried in the same aircraft or default to 0s when only one ELT is carried.

EXAMPLE OF CODING (USER LOCATION PROTOCOL)

25	26	←27 36→	←37 39→	←40 83→	85→	←86 106→	←107 112→	←113					132→	←133 144→
1	1	10	3	44	2	21	1	12			13			12
1	1	CC	T	IDENTIFICATION DATA (AS IN ANY OF USER PROTOCOLS ABOVE)	A	21-BIT BCH ERROR CORRECTING CODE	E	LATITUDE			LONGITUDE			12-BIT BCH ERROR CORRECTING CODE
								1	7	4	1	8	4	
								N / S	DEG 0–90 (1 d)	MIN 0–56 (4 m)	E / W	DEG 0–180 (1 d)	MIN 0–56 (4 m)	

CC = Country Code;
E = Encoded position data source: 1 = Internal navigation device, 0 = External navigation device

EXAMPLE OF CODING (STANDARD LOCATION PROTOCOL)

25	26	←27 36→	←37 40→	←41					85→	←86 106→	107 112	←113					132→	←133 144→
← 61 BITS →											← 26 BITS →							
1	1	10	4	45						21	6	20						12
1	0	CC	PC	IDENTIFICATION DATA		LATITUDE		LONGITUDE			SD	Δ LATITUDE			Δ LONGITUDE			
				24		1	9	1	10			1	5	4	1	5	4	
			0011	AIRCRAFT 24 BIT ADDRESS		N = 0	LAT DEG	E = 0	LON DEG	21-BIT BCH CODE		− = 0 + = 1	MINUTES	SECONDS	− = 0 + = 1	MINUTES	SECONDS	12-BIT BCH CODE
			0101	15	9	S = 1	0–90	W = 1	0–180									
				AIRCRAFT OPER. DESIGNATOR	SERIAL No 1–511								0–30	0–56		0–30	0–56	
			0100	10	14		(1/4 d)		(1/4 d)				(1 m)	(4 s)		(1 m)	(4 s)	
				C/S TA No 1–1023	SERIAL No 1–16383													

CC = Country Code;
PC = Protocol Code 0011 indicates 24-bit aircraft address is encoded;
0101 indicates operating agency and serial number are encoded;
0100 indicates ELT serial number is encoded.
SD = Supplementary Data bits 107 – 110 = 1101;
bit 111 = Encoded Position Data Source (1 = internal; 0 = external)
bit 112: 1 = 121.5 MHz auxiliary radio locating device;
0 = other or no auxiliary radio locating device.

Note 1.— Further details on protocol coding can be found in Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

Note 2. — All identification and location data are to be encoded in binary notation with the least significant bit on the right except for the aircraft operator designator (3 letter code).

Note 3. — For details on BCH error correcting code see Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

Part II *Annex 10 — Aeronautical Telecommunications*

EXAMPLE OF CODING (NATIONAL LOCATION PROTOCOL)

25	26	←27 36→	←37 40→	←41						85→	←86 106→	107 112	←113					132→		←133 144→
← 61 BITS PDF-1 →											BCH-1	← 26 BITS PDF-2 →								BCH-2
1	1	10	4	45							21	6	7			7			6	12
1	0	CC	1000	18 bits ID	27 bits LATITUDE LONGITUDE							SD	Δ LATITUDE			Δ LONGITUDE				
				18	1	7	5	1	8	5			1	2	4	1	2	4	NU	
				NATIONAL ID NUMBER	N = 0 S = 1	DEGREES 0–90 (1 d)	MINUTES 0–58 (2 m)	E = 0 W = 1	DEGREES 0–180 (1 d)	MINUTES 0–58 (2 m)	21-BIT BCH CODE		– = 0 + = 1	MINUTES 0–3 (1 m)	SECONDS 0–56 (4 s)	– = 0 + = 1	MINUTES 0–3 (1 m)	SECONDS 0–56 (4 s)		12-BIT BCH CODE

CC = Country Code;
ID = Identification Data = 8-bit identification data consisting of a serial number assigned by the appropriate national authority
SD = Supplementary Data = bits 107 – 109 = 110;
bit 110 = Additional Data Flag describing the use of bits 113 to 132:
1 = Delta position; 0 = National assignment;
bit 111 = Encoded Position Data Source: 1 = internal, 0 = external;
bit 112: 1 = 121.5 MHz auxiliary radio locating device;
0 = other or no device
NU = National use = 6 bits reserved for national use (additional beacon type identification or other uses).

Note 1.— Further details on protocol coding can be found in Specification for COSPAS-SARSAT 406 MHz Distress Beacon (C/S T.001).

Note 2.— All identification and location data are to be encoded in binary notation with the least significant bit on the right.

Note 3.— For details on BCH error correcting code see Specification for COSPAS-SARSAT 406 MHZ Distress Beacon (C/S T.001).

Attachment A to Part I

GUIDANCE MATERIAL FOR AERONAUTICAL MOBILE-SATELLITE SERVICE

1. INTRODUCTION

Note.— The aeronautical mobile-satellite service (AMSS) Standards and Recommended Practices (SARPs) referred to are contained in Annex 10, Volume III, Part I, Chapter 4.

1.1 Overview

1.1.1 The major elements of the aeronautical mobile-satellite service (AMSS) are the space segment (the satellites and their controlling earth stations); the ground earth stations (GESs) that provide interfaces between the satellite and fixed terrestrial voice and data networks; and the aircraft earth stations (AESs) that comprise the avionics and antenna systems on-board the aircraft.

Note.— Several operators of AMS(R)S may operate independent but compatible satellite networks. The different operators should co-operate in order for AESs to move seamlessly among the different networks.

1.1.2 The system architecture is capable of meeting a range of communication requirements which may include ATS, AOC, AAC and APC. The same system architecture is used for various service levels, from the basic low data-rate service to a multi-channel high data-rate service.

1.1.3 The level of capability of an AMSS system can be chosen to suit the performance required by the application.

Note 1.— The performance of a service will be set by the lowest level of capability available in the chain of GES, space segment and AES.

Note 2.— While a low level of capability service will have lower capital costs, it may have higher satellite user charges for the same data flow.

1.1.4 The capabilities are summarized in Table A-1* of this guidance material.

1.1.5 The examples of performance given in this section are to give a quick look at the over-all system performance. If exact figures are required, the relevant paragraphs of Annex 10, Volume III, Part I, Chapter 4 should be studied.

System capabilities: Annex 10, Volume III, Part I, Chapter 4, 4.1.3

Packet data performance: Annex 10, Volume III, Part I, Chapter 4, 4.7.2

1.1.6 CIRCUIT MODE VOICE PERFORMANCE

Assuming that the AES is logged on to a GES, the AMSS will typically take the following times to set up a call:

from-aircraft:

— Use of abbreviated access request SU: 10 to 14 seconds (average)

— Use of general access request SU: less than 17 seconds (average)

to-aircraft: 9 to 11 seconds (average).

Note.— The call set-up time may be affected by the performance of the associated terrestrial network.

1.2 Levels of capability

1.2.1 The various levels of capability for the aircraft earth station (AES) and ground earth station (GES) defined in Annex 10, Volume III, Part I, Chapter 4, 4.1.3 allow various capabilities to exist which have different performance characteristics. A Level 1 capability is the minimum capability required for aeronautical mobile-satellite (route) service (AMS(R)S) providing basic packet data communications. A Level 3 is required as a minimum when, in addition to packet communications, circuit voice communications are required. All levels of capability require that the AES be under positive control either by receiving a P channel signal or through the C channel sub-band. Only one of the channel rates indicated below is required to operate at any given time.

1.2.2 The Level 1 capability provides for basic packet data communications by requiring an AES to receive and process a P channel signal operating at channel rates of 0.6 and 1.2 kbits/s. It also requires the capability for an AES to transmit on an R channel or on a T channel at these channel

* All tables are located at the end of this attachment.

rates. Both R and T channel capabilities are required. The channel rate used will depend on the link quality determined by the GES measurement of bit error rate (BER) or the estimate of that BER. Major factors that determine the channel rate are the antenna gain of the satellite and AES, and the RF power output of the satellite and AES. Level 1 requires one transmit channel (for R or T channel) and one receive channel (for P channel).

1.2.3 The Level 2 capability provides for channel rates of 0.6 and 10.5 kbits/s for the P channel; and 0.6 and 10.5 kbits/s for the R channel and the T channel. The major factor determining when to use these channel rates is the AES antenna gain, which must be at least 12 dBic when working with a "global" beam satellite. This capability provides greater data communications throughput, faster message delivery and may decrease operational cost. Level 2 requires one transmit channel and one receive channel as in Level 1.

1.2.4 The Level 3 capability adds to Level 2 packet data communications a circuit capability for voice or communications using a transmit and a receive C channel. These C channels are capable of operating at channel rates of 10.5 or 21.0 kbits/s to support 9.6 kbits/s vocoders for voice communications. The C channel can also provide circuit-mode data communications but this is not considered part of the safety services. The C channel rate used depends on the use of 1/2 rate forward error correction (FEC) coding (1/2 rate coding requires 21.0 kbits/s). Provision has been made to allow use of lower vocoder rates that could operate at channel rates of 5.25 or 6.0 kbits/s. Level 3 requires one transmit channel (R, T or C channel) and two receive channels (P channel and C channel). Simultaneous operation of two-way packet and circuit communications is not possible, but near-simultaneous operation is possible by switching between transmit channel types.

1.2.5 Level 4 capability adds to Level 3 capability additional transmit channel capability to provide simultaneous operation of two-way packet and circuit communications. Level 4 capability requires two or more transmit channels (R or T, and C channel) and two or more receive channels (P channel and C channel), power control for each channel carrier and a linear power amplifier. Channel rates are the same as Level 3. Both R and T channel capabilities are required on a transmit channel but not simultaneously.

1.2.6 The AMS(R)S is the first aeronautical safety communications service which integrates both voice and data, as well as non-safety services. This integration of services must respect message priority. Pre-emption of one data message by another data message of higher priority is handled easily within the system without loss of information. Pre-emption of a voice call by a higher priority data call, or vice versa, will not normally be necessary in an AES which has two transmitters. However, in a Level 3 AES which has only one transmitter such a pre-emption may occasionally be necessary.

1.2.7 Although a Level 4 AES is not required to provide simultaneous packet data communications with more than one GES, such a capability is not precluded.

2. BROADBAND RF CHARACTERISTICS

2.1 Use of AMS(R)S bands

2.1.1 *Message categories.* The transmission sequence at any aircraft earth station (AES) or ground earth station (GES) will be ordered in accordance with a given priority scheme. At the subnetwork interface to the AMSS, the priority scheme for packet data is as described in Annex 10, Volume III, Part I, Chapter 4, Table 4-26. Within the AMSS, this external priority scheme is augmented with internal priorities assigned to various signalling and voice-related functions. At the link layer this augmented priority scheme is referred to as the Q-precedence number and the resulting internal priority scheme is given in Table A-3 of this guidance material. This "Q-precedence" number list conforms to Annex 10 priorities, which in turn are derived from Article S44 of the ITU Radio Regulations. The single Q-precedence list includes both voice and data traffic, and also includes the signalling necessary to integrate voice and data. The Q-precedence numbers associated with the signalling were chosen to optimize the over-all system performance and integrity.

2.1.2 *Receive frequency band.* For historical reasons, most AESs may be capable of receiving more than the required band of 1 544 to 1 555 MHz but not the full band suggested by the recommendations. Typically, they cover the frequency band 1 530 to 1 559 MHz, and may not cover 1 525 to 1 530 MHz.

2.2 Frequency accuracy and compensation

2.2.1 *Frequency accuracy.* The Standard contained in Annex 10, Volume III, Part I, Chapter 4, 4.2.2 reflects a requirement on the signal received by the GES. There are several contributors to the frequency error observed at the GES. These include frequency errors due to the satellite oscillator, due to relative motion between the aircraft and spacecraft, due to the local oscillator of the GES (for a closed loop compensation system) and the local oscillator of the AES. Efforts are made to reduce the error caused by the first two as described below. This Standard characterizes that portion of the frequency error which is due to the AES and the aircraft motion relative to the satellite. Consequently, the proper frame of reference for measuring the transmit frequency is the satellite. A practical test of this requirement would use the AES frame of reference, and the corresponding value in the satellite frame of reference would be calculated based on the aircraft position and velocity, and the satellite position.

2.2.2 *Frequency compensation by the GES.* To reduce the error due to the spacecraft oscillators, the GES should listen to an L-band pilot frequency transmitted (at C-band) by a designated GES and correct its transmission frequency to minimize the frequency error at L-band. In the from-aircraft direction a designated GES transmits an L-band pilot frequency which all GESs listen to at C-band and adjust their receiver local oscillators accordingly. This approach may not be possible in the case of satellite spot beams where the GES is not within the footprint of the spot beam of interest.

2.2.3 *Doppler shift compensation by the AES.* There are at least two methods of implementing Doppler-shift compensation. One approach is to use aircraft navigational aids to estimate the velocity of the aircraft in the direction of the satellite and then, estimate the Doppler shift from this. A second approach is to estimate the Doppler shift by measuring the frequency offset of the received P channel or C channel. For this latter approach, the frequency of any transmission to that ground earth station is then the basic channel frequency offset by the receive frequency, offset with opposite sign and a scaling factor of approximately 1.07. This approximately corrects the component of the frequency error due to aircraft motion (Doppler shift) but does not correct errors in the AES local oscillator.

2.2.4 *Frequency error budget.* The frequency error budgets used in arriving at the accuracy requirements for the GES-AES link are presented in Tables A-4 and A-5 of this guidance material. Note that in Table A-4 the Doppler shift due to aircraft motion is not included, and in Table A-5 it is assumed to be compensated for.

2.3 Aircraft earth station antenna characteristics

2.3.1 *Antennas and level of capability.* The Standards contained in Annex 10, Volume III, Chapter 4 specify high, intermediate and low-gain antenna systems, but one should note that these are not linked directly to a level of capability of AES. A high-gain antenna, with the supporting avionics, will mean a Level 2, 3 or 4 AES installation; and a low- or intermediate-gain antenna, with the supporting avionics will always lead to at least a Level 1 AES installation. In the future, different system characteristics may be capable of providing a Level 2 or higher service. For example, the combination of satellite spot beam antennas and a low- or intermediate-gain aircraft antenna may be capable of providing a Level 2 or higher service. The level of service provided to an aircraft will depend not only on its capabilities but those of the service providers as well.

2.3.2 Higher-gain future satellites could serve AESs with lower G/T and EIRP, but may have an effect of potentially higher service costs and reduced system capacity. AES antennas with gain less than 12 dBic may be considered similar operationally to low-gain antennas because they have too broad a beam to discriminate against other satellite interference.

2.4 Receiver requirements

2.4.1 *Gain-to-noise temperature ratio.* The following factors influence the aircraft earth station receive system gain-to-noise temperature ratio (G/T):

a) climatic conditions;

b) antenna elevation angles to the satellite;

c) residual antenna pointing errors (including the effects of errors introduced by the antenna beam steering system);

d) the noise contribution of the receiver low noise amplifier at the operating temperature;

e) the transmitter power amplifier output level;

f) the attenuation and noise temperature contributions of a radome, where a radome is fitted; and

g) the RF environmental conditions in which the aircraft earth station is intended to operate.

2.4.2 *Typical link carrier to noise densities.* Tables A-6, A-7 and A-8 of this guidance material show typical carrier-to-noise spectral density ratios (C/N_0's) for the P, R, T and C channel services. In these tables modem implementation losses refer to losses in the practical implementation of a modem relative to ideal. This includes the effects due to non-ideal filtering, non-ideal synchronization in either time or frequency, non-ideal modulation, and non-linearities in the up- and down-converter chains. The analysis of the RF link is provided in the appendix to this guidance material.

2.4.3 *Receiver linearity.* There are multiple satellite systems being planned which have maximum L-band EIRP of 58 dBW at the centre of the antenna beam. Considering the worst case where the antenna beams of two such satellite systems overlap, the receiver must tolerate a total in-band power flux density of -100 dBW/m^2. This is derived from the combined two-satellite EIRP (62 dBW), minus a spreading loss of 162 dB.

2.4.4 *Receiver out-of-band performance.* Potential threats to receiver performance include terrestrial mobile communications systems and high-power sources, including television transmitters with EIRP in the megawatt range and surveillance radars which are naturally located at airports and may occur along the flight route.

2.4.4.1 Under radio environmental conditions where high-power, out-of-band signals may be near the flight path, the receiver's RF filter should protect against receiver saturation, which could reduce gain and degrade performance. Additionally, performance may be affected by such sources due to receiver image and spurious responses. As an example, a power flux density at the AES antenna of +3 dBW/m^2 could occur at a distance of a kilometre from a multi-megawatt transmitter such as permitted for television at frequencies from 470 to near 800 MHz. To protect from saturation, the RF filter would need a minimum of 75 dB rejection. Protection from degradation due to image and spurious responses is specific to the receiver design.

2.4.4.2 For a 5 000 kW peak power radar with a boresight gain of 34 dB, power levels can reach 100 dBW in the main beam. It has been calculated that, for an AES located 500 metres from an airport-located weather radar, the flux density could be as high as 30 dBW/m^2 below 1 459 MHz, and 38 dBW/m^2 from 1 675 to 18 000 MHz. It is not necessary to operate under these levels, but the equipment should survive without damage.

2.4.5 *Received phase noise.* The phase noise that the AES receiver must tolerate while operating within the AMSS SARPs is illustrated in Figure A-1* of this guidance material. This mask includes phase noise contributions of the transmitter and of the satellite. In practice, the receiver must be able to tolerate larger amounts of phase noise that are due to fading of the received signal.

2.5 Transmitter requirements

2.5.1 *EIRP limits.* An AES that is capable of an EIRP of 13.5 dBW should always be able to use the 0.6 kbit/s R and T channels when the satellite elevation angle exceeds 5 degrees. An AES that is capable of an EIRP of 25.5 dBW, and has the supporting avionics, will be capable of Level 2, 3 and 4 service grade portions of Levels 3 and 4. In practice, the transmitted power will usually be backed off from these settings, by an amount that depends on the system configuration.

2.5.1.1 The "maximum allowable operating EIRP" is based on a limit established from combined effects of HPA IM (active) and passive-component IM.

2.5.2 *EIRP control.* The requirement for control for the AES EIRP by the GES is for two reasons. The first reason is for dynamic power control of the C channel to optimize the system capacity. The second is to make optimal use of future spot beam satellite systems.

2.5.2.1 In initial AMSS operations using satellites with global beam coverage, an AES EIRP control range of 16 dB is required for both Class C (Levels 1-3) and Class A (Level 4 multi-channel) high-power amplifiers to cover selectable channel rates and variables in AES antenna gain. In C channel operation the AES EIRP is also frequently adjusted according to the GES-measured bit error rate. Therefore, for Level 4 AESs an additional 16 dB of control is presently required.

2.5.2.2 In future systems, AES transmission within an EIRP range satisfactory to satellite service operators may require a different control range. For example, the higher G/T of future spot beam satellites could require less AES EIRP, leading to a need for a larger control range. The range cannot be closely predetermined because spot beam size that affects satellite G/T is a future operator design choice.

2.5.3 *Out-of-band EIRP spectral density.* The out-of-band EIRP including discrete spurious, harmonics, intermodulation products and noise radiated by the AES should not cause harmful interference to other radio services. In particular, they should not interfere with other aeronautical communications/ navigation radio services such as global positioning system (GPS) operating in the band 1 559 to 1 585 MHz, global orbiting navigation satellite system (GLONASS) operating in the band 1 598 to 1 610 MHz (1 597 to 1 605 MHz after the year 2005), the AMSS receive band 1 525 to 1 559 MHz, and the VHF band 108 to 137 MHz. Intermodulation product levels in the 1 598 to 1 610 MHz band should be checked when satellite navigation receiver operation in this band is planned on the same aircraft. Frequency management, additional filtering or increased antenna separation (for greater than 40 dB isolation) may be required aboard the same aircraft if interference potential to navigation equipment exists.

2.5.3.1 Table 4-3 contained in Annex 10, Volume III, Part I, Chapter 4, provides for a maximum EIRP density of –155 dBc/1 MHz in the 1 559 to 1 585 MHz band, which protects GPS receiver operation on the same aircraft as AMSS, and also GPS operation on nearby aircraft.

2.5.3.2 Table 4-3 contained in Annex 10, Volume III, Part I, Chapter 4, also indicates that the maximum EIRP spectral density shall be –143 dBc/1 MHz in the 1 585 to 1 605 MHz band and –117 dBc/1 MHz in the 1 605 to 1 610 MHz band. These limits will provide protection for GLONASS receiver operation on the same aircraft as AMSS assuming a minimum 40 dB antenna isolation and on nearby aircraft. The 40 dB isolation is measured from the AMSS antenna port to the GLONASS antenna port at the GLONASS frequencies, with the AMSS antenna steered for maximum coupling with the GLONASS antenna. This also holds for the GPS antenna.

2.5.4 *Intermodulation (IM) products.* Control of unwanted emissions from the AES is important to system operations in order to avoid blocking channels and reducing needed spectrum. Intermodulation occurs during multicarrier (Level 4) operation on predictable frequencies related to wanted signals due to component non-linearities. Potential sources are many, but can be controlled. Minimizing IM effects is accomplished both in AES design for linearity meeting the standards and in operation.

* All figures are located at the end of this attachment.

2.5.4.1 Intermodulation products (IM) that may be emitted by a Level 4 AES in multicarrier operation arise both from the high-power amplifier (HPA) and from other passive components that are subject to high AES RF power levels. Passive components causing IM may include connectors, particularly if they are subject to corrosion or looseness; and the diodes used in phased-array antennas. Depending on the choice of frequencies and levels in the GES, such IM can appear at frequencies and levels in the AES receiver that will degrade BER, disable reception, or affect reception of signals by other aircraft equipment.

2.5.4.2 AES-transmitted IM can block GES receivers. The HPA is a primary IM source because its linearity is limited by technology and heat dissipation.

2.5.4.3 Intersystem effects may arise from Level 4 AESs that may radiate IM. An AES operating with a global beam satellite must transmit higher EIRP than an AES operating with a more sensitive spot beam satellite. Therefore, this higher level of IM would be more readily received by the spot beam satellite for relay to its GES, where it could impair reception of that channel. Even if the two satellites are using separated portions of the frequency band and therefore cannot reuse the same assigned channel frequencies, the global beam AES transmitter's IM that is out of assigned channels could fall into the spot beam satellite's band. All GES frequency and EIRP level assignments should account for this possibility.

2.5.4.4 Frequency management techniques are used to eliminate 3rd and 5th order products below 1 610 MHz as described in 4.2.3.5.7. If GLONASS is to be installed on the same aircraft as AMSS, it may be necessary to employ frequency management techniques or other methods to ensure that AMSS 7th and higher order intermodulation products will not cause harmful interference to GLONASS operations.

2.5.5 *Frequency management.* Careful frequency management is needed because:

a) AMSS includes safety services;

b) there is concern about the availability of adequate AMSS spectrum, and adequate capacity for AMSS safety services; and

c) the difficulty in co-ordinating mobile satellite networks due to the poor discrimination characteristics of mobile station antennas.

Guidelines that should be considered when co-ordinating frequency plans to minimize intra and interservice interference include:

a) compliance with the relevant ITU Radio Regulations;

b) each provider should provide monitoring facilities to identify the actual usage of AMS(R)S and non-AMS(R)S communications;

c) in those AMSS systems with global and spot beams, operational measures to minimize the amount of global bandwidth used and to maximize the use of spot beams;

d) using the ITU-R Recommendations M.1089 and M.1233 technical co-ordination method, wherever possible;

e) efficient spectrum use including the following:

1) using other system providers' satellite transponder guard bands;
2) using frequency assignment by aircraft location;
3) taking advantage of improvements in aircraft earth station antenna sidelobe discrimination;
4) using offset and interleaved carriers;
5) using satellite spot/shaped beams;
6) reducing spacecraft antenna sidelobe levels;
7) increasing the resistance of systems to interference;
8) using earth station power control;
9) using satellite transponder adjustable gain setting;
10) using knowledge of operational schedules to take advantage of the difference in time zones;
11) appropriately grouping carriers;
12) repositioning satellites; and
13) taking advantage of high-gain AES antennas and the resulting ability to use lower carrier powers.

2.5.6 *Transmitted phase noise.* The phase noise mask that the AES transmitter must meet is illustrated in Figure A-2 of this guidance material. The purpose of this mask is to minimize the contribution of the AES transmitter phase noise to the degradation of GES performance.

2.6 Interference

2.6.1 *Intrasystem interference.* Intrasystem interference refers to interference among AMS(R)S services. Some examples would be co-channel, adjacent channel interference and intermodulation noise. Due to disparate satellite system designs, there is no single specification for intrasystem interference. Each satellite system operator must be able to show that intrasystem interference to AMS(R)S services, when combined with other noise sources in the link, does not degrade the achieved link C/N_0 below the required C/N_0 for a given performance.

2.6.2 *Intersystem interference.* Intersystem interference refers to interference to an AMS(R)S service from any other system, whether it is providing AMS(R)S services or otherwise. Required performance should be maintained at whatever level of interference is adopted as operable through co-ordination among the particular satellite system operators. As a minimum, the AMSS satellite system should provide adequate performance in the presence of single-entry interference resulting in a $\Delta T/T$ of 6 per cent, as adopted by WARC-ORB-88 as the threshold requiring co-ordination between satellite systems. A suggested criterion for aggregate interference due to all sources, including intrasystem interference, is a $\Delta T/T$ of 20 per cent.

3. RF CHANNEL CHARACTERISTICS

3.1 Modulation characteristics

3.1.1 *Modulation types.* Two modulation types are used in aeronautical mobile-satellite service (AMSS), each providing a system advantage. A form of binary phase shift keying (BPSK) is used for channel rates up to 2.4 kbits/s, providing more robustness against phase noise generated in frequency conversion processes in the aircraft earth station (AES), satellite, and ground earth station (GES). Above 2.4 kbits/s, phase noise effects on the demodulation process are diminished, and conservation of bandwidth at these higher channel rates becomes important. Therefore, a more bandwidth-efficient modulation type, quaternary phase shift keying (QPSK), is used.

3.1.2 *Aviation BPSK.* Aviation BPSK is a form of phase shift keyed modulation with shaped filters especially adapted to perform in an RF environment subject to fading. It has four possible phase states of which only two are permissible during any symbol period. The modulation technique maps binary "0"s into a phase shift of –90° and binary "1"s into +90°. This results in differential encoding of the transmitted data, and implies that during any symbol period two decisions separated by 180° are possible, and that these two decisions are rotated by 90° from the possible decisions in the previous symbol period. This modulation strategy is illustrated conceptually in Figures A-3 and A-4 of this guidance material. Consequently, A-BPSK is almost identical to minimum shift keying (MSK), except that the pulse shaping has a 40 per cent root raised cosine spectral shape, as opposed to sinusoidal weighting. The amplitude and phase masks which this pulse-shaping filter must satisfy are illustrated in Figures A-5 and A-7 of this guidance material. These correspond to the transmit filter requirements given in the definition of A-BPSK. Those requirements apply to the transmitted signal before it undergoes any non-linear amplification; their purpose is to limit and control the distortion and corresponding degradation in performance caused by nonlinear amplification. A-BPSK is a linear modulation with nearly constant envelope. Consequently, it may be transmitted through a "Class C" amplifier with little spectral spreading and performance degradation.

3.1.3 *Aviation QPSK.* Aviation QPSK is a form of offset QPSK modulation that is used for data rates above 2.4 kbits/s and is illustrated conceptually in Figures A-3 and A-4 of this guidance material. The A-QPSK data encoder is driven by a binary data sequence (a_i) at the bit rate 2/T. The "even" bits are switched onto the I line and the "odd" bits onto the Q line, generating two data streams at rate 1/T. The synchronous samplers S operate at rate 1/T and generate ideal positive and negative impulses depending on whether the data bits are "1" or "0". The pulse shaping filters in each channel have a 100 per cent root raised cosine spectral shape, except for the 8 400 bits/s C channel, which has a 60 per cent root raised cosine spectral shape. The outputs of the I and Q pulse shaping filters modulate the same carrier in quadrature and are combined linearly. The amplitude and phase masks that the 100 per cent raised cosine pulse shaping filter must satisfy are shown in Figures A-6 and A-7 of this guidance material, while those of the 60 per cent root raised cosine filter are shown in Figures A-23 and A-24. These correspond to the transmit filter requirements given in the definition of A-QPSK. Those requirements apply to the transmitted signal before it undergoes any non-linear amplification; their purpose is to limit and control the distortion and corresponding degradation in performance caused by non-linear amplification. There is no requirement for actual modulators to be implemented in this way, as long as the modulated RF signal is indistinguishable from one that was generated by an ideal modulator.

3.2 Bounds on radiated power spectral density

3.2.1 *Spectrum masks.* These spectrum masks allow for degradation from the ideal Nyquist model that could occur due to non-ideal system characteristics, e.g. saturation in the amplifier chain.

3.2.2 *From-aircraft.* The spectral mask that must be satisfied by any A-BPSK signal transmitted in the from-aircraft direction is shown in Figure A-8 of this guidance material. This mask is applicable for 100 per cent root raised cosine filtering. This was derived assuming a non-linear amplifier (Class C) is used on board the AES, but it is applicable to Class A linear amplifiers as well. The same spectral mask (Figure A-8) applies to A-QPSK. The spectral mask (Figure A-22) applies to A-QPSK with a 60 per cent root raised cosine filter.

3.2.3 *To-aircraft.* The spectral mask that must be met in the to-aircraft direction with A-BPSK is shown in Figure A-9 of this guidance material. This was derived assuming that all amplifiers in the to-aircraft transmission path are operating linearly. The corresponding spectral mask for A-QPSK is shown in Figure A-10 of this guidance material.

3.3 Demodulator performance

3.3.1 The performance specified in the Standards can be attained using coherent detection and a Viterbi decoder with 3-bit soft decisions. The R and T channel demodulators are allowed more E_b/N_0 to achieve the bit error rate of 10^{-5} because of the short bursty nature of communications over these channels. The theoretical performance of A-QPSK in additive white Gaussian noise is better than that of A-BPSK because the bits are not differentially encoded. However, for A-QPSK modulation, more margin is included (relative to theoretical) because of its poorer performance over fading channels.

3.3.2 The relative motion of the aircraft and the satellite means that any signal reflections from aircraft wings or tail, or the sea or ground below can result in time-varying multipath. This is in part due to the rather broad beamwidth of the AES antenna. The characteristics of this multipath depend on a number of characteristics including the aircraft velocity, the look-angle of the satellite with respect to the aircraft and the slope of the reflecting surface. The rate of these variations (Doppler bandwidth) increases with aircraft velocity and elevation angle to the satellite. However, the multipath intensity is inversely proportional to the aircraft velocity and the satellite elevation angle. Consequently, it is primarily below elevation angles of 20 degrees that multipath is a significant problem. At elevation angles of 5 to 20 degrees the Doppler bandwidth can vary from 20 to 100 Hz or more and the multipath power can be as much as –7 dB relative to the direct path signal.

3.4 Acquisition delay

This delay requirement is a high-level specification composed of a number of components due to various sub-systems including satellite acquisition, frequency and bit acquisition, and frame synchronization. The total delay of 16 seconds is the worst-case delay allowed. This is the time from when one first commands the AES to find the satellite until the time at which the AES can attempt to log-on. Once logged on, typical times for setting up a voice call or transmitting a packet data message will be much less than this.

4. CHANNEL FORMAT TYPES AND DATA RATES

4.1 General

4.1.1 *System timing.* All timing of the different transmission channels is derived from the P channel. If required, synchronization of the P channels of each ground earth station (GES) to universal co-ordinated time (UTC) is one way of ensuring a world-wide timing reference for all aircraft using aeronautical mobile-satellite service (AMSS). The synchronization of all P channels to UTC is currently not required because there has not been an application identified which would benefit significantly enough to warrant the increased cost.

4.1.2 *Channel spacings.* The channel spacings in Table A-9 of this guidance material make adequate provision for separation to reduce adjacent channel interference and to ensure correct channel tuning in the presence of Doppler shifts due to all causes. In the case of the channels at the lowest bit rate, the possible spacings for the to-aircraft direction (P channels) and from-aircraft directions (R and T channels) are different. This is due to the uncorrected Doppler shift on to-aircraft channels, and the use of automatic frequency control (AFC) to minimize Doppler shift in the from-aircraft direction. Note that the requirement on the aircraft earth station (AES) to be capable of tuning in steps of 2.5 kHz accommodates all the potential channel spacings listed below and allows the interleaving of channels between adjacent satellite spot beams.

4.1.3 *P channel synchronization/loss/degradation.* Actions by the AES management depend upon indications of the signal quality of the received P channel. These include an indicator of when the AES is synchronized to the P channel, and when it is degraded and/or lost. The AES must synchronize to a P channel before it can receive P channel signal units, or transmit over the R or T channel. A degraded/lost P channel indicates reduced operational performance and is usually an indication that a switching operation, for example, a satellite or spot beam handover, should be performed.

4.1.3.1 These indicators of signal quality generally are based on physical measurements exceeding a threshold. However, the measurements used and the threshold settings depend upon the AES implementation. P channel synchronization is declared whenever the P channel unique word is detected reliably. Synchronization is lost whenever the unique word is not detected reliably.

4.1.3.2 Either of two conditions will cause a declaration of degradation/loss of the P channel. The first condition corresponds to a "degraded" P channel and has two cases: 1) if the bit error rate rises above 10^{-4} in a three-minute averaging period; and 2) if synchronization is lost ten or more times during a three-minute period. This three-minute averaging period provides confidence that the degradation is not temporary, due, for example, to an aircraft manoeuvre. The second condition corresponds to a "lost" P channel, which is declared if synchronization is lost continuously for ten seconds. There is a single indicator for either of these conditions and, consequently, the action by the AES management for either event is the same.

4.2 P channel

4.2.1 *General.* At least one P channel is transmitted continuously by each GES that forms part of the AMSS service. Each AES must continuously monitor the P channel transmitted by the GES to which it is logged on. The P channel implements a time division multiplexing strategy to send small packets of information to the AESs that are monitoring it. The functional blocks at the GES end of each P channel are as follows:

a) data scrambler;

b) forward error correction (FEC) encoder;

c) interleaver;

d) timing mark inserter (unique word); and

e) modulator.

The functional blocks at the receive end of each P channel are complementary to those at the transmit end. The complete series of functional blocks from transmit end to receive end is shown in Figure A-11 of this guidance material.

4.2.2 FUNCTIONAL BLOCKS

4.2.2.1 *Data scrambler.* A data scrambler is a logical device which multiplies the data sequence by a known pseudo-random sequence. The data is unscrambled at the receiver by multiplying by the same sequence of random bits. This has no direct effect on the bit error rate performance on the link. However, it prevents the possibility of transmitting long sequences of 1's or 0's over the link. The latter could be detrimental to the performance of acquisition and tracking circuitry.

4.2.2.2 *Forward error correction coding.* Satellite communications are, in general, power-limited due to the limited resources at the satellite. One can reduce the amount of power required for communications by introducing forward error correction coding, which adds redundancy to the transmitted signal at the expense of requiring more bandwidth. At the receiver, a decoder uses the redundancy to correct those errors which normally occur when transmitting at a lower power.

4.2.2.3 *Interleaving.* Mobile communications are generally subject to fading due to reflections from nearby objects. The fading is correlated with time and when it occurs, can cause a sequence of correlated errors in the data detected at the receiver. These errors can be corrected by the forward error correction coding. However, most decoders work best with uncorrelated errors. The purpose of the (transmit) interleaver and its inverse, the (receive) de-interleaver, is to randomize the order of bits presented to the channel compared to those presented to the decoder, thus reducing any correlation between the errors which may be caused by the channel.

4.2.2.4 *Timing mark.* A unique word is inserted in each data stream, at periodic intervals, to provide timing information to the receiver. This timing information is needed in order to properly synchronize the de-scrambler, the decoder, and the de-interleaver with their counterparts on the transmit side. It also allows recovery of this synchronization if the signal happens to be lost momentarily.

4.2.3 *P channel frame duration.* The frame duration is either 500 milliseconds (channel rates of 2.4 kbits/s and higher) or a multiple of 500 milliseconds to provide simple derivation of a superframe used for R channel slotting and the reservation TDMA T channel. Scrambling and FEC coding of rate 1/2 is used on all P channels. The FEC encoder is not reset between frames, but starts a new frame in the state resulting from the previous frame. With the exception of the 0.6 kbits/s P channel, the duration of the interleaver is 500 milliseconds. For the 0.6 kbits/s, the interleaver is 384 bits corresponding to 2/3 second.

4.2.4 *P channel frame format.* All P channel frame formats include a 16-bit field (uncoded) as a format identifier and for derivation of the superframe that has a duration of 8 seconds. The format identifier is a 4-bit field and is always set to the value 0001 when the channel is a P channel. The remaining 12 bits of this field are used as a superframe counter. To achieve this, the field is subdivided into three 4-bit fields, of which the first is used to indicate the start of a new superframe, while the remaining two are used to indicate the frame number. It is advisable for AES implementations to make use of all 12 bits to achieve reliable superframe synchronization in the presence of bit errors.

4.2.5 For P channels of 4.8 and 10.5 kbits/s, a small number of "dummy" bits are included in the frame just after the framing bits. This matches the number of bits of the interleaver to the number of bits required to be transmitted on the channel.

4.2.6 To facilitate the re-synchronization of an AES transferring from one P channel to another on the same GES, all P channels transmitted by the same GES are synchronized.

4.3 R channel

4.3.1 *General.* All AESs will log on to AMSS using an R channel that has been designated for that purpose in the particular service area of the AES. For the duration of its log-on period an AES will be assigned one or more R channels (at the appropriate channel rates). Over these R channels, the AES can transmit signalling, short data packets, and requests for additional capacity on the T channel. The burst mode data channel characteristics for the R channel have been specified in the AMSS SARPs as has been the slot structure used for its slotted-ALOHA random access protocol. The functional blocks at the transmit (AES) end of each channel are as follows:

a) data scrambler;

b) FEC encoder;

c) interleaver;

d) preamble and unique word generator; and

e) modulator.

The functional blocks at the receive end of each R channel are complementary to those at the transmit end. The complete series of functional blocks form transmit end to receive end is shown in Figure A-12 of this guidance material.

4.3.2 *R channel transmit timing.* The R channel transmits in slots derived from the P channel superframe. The R channel slot length varies according to the channel bit rate. The start of any given R channel slot is referenced to the leading edge of the first bit in the P channel format identifier field. An R channel burst may begin at an integer number of slot durations after this time. For the R channel, the nominal starting instant of the first bit of the preamble is the beginning of the slot.

4.4 T channel

4.4.1 *General.* For the duration of its log-on period an AES will be assigned one or more T channel frequencies (at the appropriate channel rates). These channels are shared with a number of other AESs on a demand-assigned basis. That is, these channels are assigned on a conflict-free basis to individual AESs by the GES for short periods of time. The requests for T channel capacity can be made over the R channel, or over the T channel, if capacity has already been assigned. The burst mode data channel characteristics for the T channel have been specified in the SARPs, as has been the slot structure used for its reservation TDMA protocol. The functional blocks at the transmit (AES) end of each channel are as follows:

a) data scrambler;

b) FEC encoder;

c) interleaver;

d) preamble and unique word generator; and

e) modulator.

The functional blocks at the receive end of each T channel are complementary to those at the transmit end. The complete series of functional blocks form transmit end to receive end is shown in Figure A-12 of this guidance material.

4.4.2 *T channel format.* The T channel burst length can vary from 2 to 31 signal units. The number of columns used in the interleaver varies with the transmission bit rate and the burst length according to the AMSS SARPs. Each burst includes a special short signal unit, the burst identifier, which ensures that the originating AES and destination GES are always known. If a GES receives a burst in which the burst identifier is lost, absent or indicates a different GES, the GES would discard the burst.

4.4.3 *T channel transmit timing.* The T channel is also synchronized to the P channel superframe, but in this case the superframe is subdivided into 1 024 slots of approximately 7.8 milliseconds. The shortest guard time between the burst of two different AESs is under control of the receiving GES and is set to approximately 39 milliseconds (5 slots).

4.5 C channel

4.5.1 *General.* The C channel is a circuit-mode channel used for digital voice or data communications. A C channel can be requested by an AES over the R channel, and assigned by the GES over the P channel. The functional blocks at the transmit end of each C channel are as follows:

a) interfaces for primary (e.g. voice) and sub-band channel;

b) primary channel/sub-band channel data multiplexor;

c) data scrambler;

d) FEC encoder (unless it is not used);

e) interleaver (unless FEC is not used);

f) preamble and unique word generator; and

g) modulator.

The functional blocks at the receive end of each C channel are complementary to those at the transmit end. The complete series of functional blocks from transmit end to receive end is shown in Figure A-13 of this guidance material.

4.5.1.1 The C channel has been specified at a number of different channel rates: 5.25, 6.0, 8.4, 10.5 and 21.0 kbits/s. The underlying motivation is to allow the evolution of the system to lower channel rates as voice processing technology improves. Two of these channel rates, 5.25 and 10.5 kbits/s, do not include coding. Potential applications of these uncoded channels include transmitting 4.8 and 9.6 kbits/s vocoded speech in satellite systems that have limited spectrum but are not power limited. Alternative applications could include the use of vocoders that include their own coding, protecting the important bits more than the others; this could eliminate the need for coding in the channel modem.

4.5.2 *C channel frame.* The frame duration at all channel rates is 500 milliseconds. Carrier activation (burst mode) based on speech activity is used in the to-aircraft direction. At each activation, a preamble and unique word are transmitted to commence the burst, and from then on further unique words occur every 500 milliseconds. Thus the phasing of the unique word depends on the instant when activation commences. A postamble is sent when there is no voice content in the interleaver block.

4.5.3 *Voice activation.* In the to-aircraft direction, carrier activation is controlled by an electrical signal at the C channel interface. When the C channel is used for voice, this signal is controlled by the voice encoder. The voice encoder turns the signal on as soon as it detects voice, but applies a hangover time before turning the signal off to avoid excessive turn-offs between syllables. In addition, the forward carrier is activated by sub-band channel signalling as required.

4.5.3.1 The channel unit starts a new burst immediately after the "active" state is signalled. When the "not active" state is signalled, the channel unit continues transmission for a period and then drops the carrier. In the case of channels with FEC and an interleaver, the channel unit completes transmission of the current interleaver block, plus another complete interleaver block, which ends with a postamble to terminate the C channel carrier burst. In the case of channels with no FEC or interleaver, the channel unit continues transmission for 20 milliseconds. For both cases, during this period the required bits are taken from the primary channel interface as usual.

4.5.3.2 The same timing rules apply to the corresponding control signal from the sub-band signalling channel equipment.

4.5.3.3 In the from-aircraft direction, the carrier is transmitted continuously during the call regardless of speech activity. The start of the transmission is the same as for the forward direction, with a preamble and unique word transmitted at the beginning, followed by further unique words at 500 millisecond intervals.

4.5.4 *Data activation.* The capability to use the C channel for data other than vocoded speech is not required for safety applications. However, the C channel may be used for the transmission of data by non-safety services and some details of its operation are included here. In the to-aircraft direction the forward carrier is operated in burst mode for circuit-mode data transfer. Circuit 109 (CF) as defined in CCITT Recommendation V.24 (termed DCD in EIA RS-232C), from the GES voice band modem controls the activation interface of the C channel. The interface is initially activated when the call enters data mode, which is indicated by the circuit 109 transition to ON state. The interface normally remains activated until deactivation of data mode by the AES. If the circuit 109 changes to the OFF state indicating loss of received carrier from the far-end modem, the transmit circuit-mode interface unit finishes sending the contents of the plesiochronous buffer and then changes to "not active". The C channel activation interface is reactivated again when (if) the circuit 109 changes to the ON state.

4.5.5 *Interleaver size.* In any data transmission system where interleaving is required to randomize the errors, the interleaver size is always a trade-off between the delay incurred and its effectiveness at randomizing the errors. The interleaver blocksize for the 21 kbits/s C channel is 384 bits, which corresponds to 192 information bits. This 192 bits is the frame size (20 milliseconds) of most 9.6 kbits/s vocoders. This direct mapping between vocoder frames and interleaver buffers minimizes the delay caused by interleaving and its effect on voice communications. The resulting over-all transmission delay is around 30 milliseconds (rising to 50 milliseconds at the lowest channel rate). To match the number of interleaver bits to the required number of channel bits, a small number of "dummy" bits are included in the frame just after the framing bits.

4.5.5.1 The delay at the transmitter arising from the interleaver depends on the relationship between the voice frame and the interleaver size. The full de-interleaver delay of around 20 milliseconds will be experienced at the receiving end.

4.5.6 *Voice channel delay.* To maintain voice circuit quality, the CCITT recommends that the end-to-end delay should be limited to 440 milliseconds or less. Given that the nominal satellite delay is 270 milliseconds, the voice processing system delay should not exceed 65 milliseconds. This assumes that the terrestrial network is allotted 40 milliseconds of delay, and the modem and RF sub-systems are allotted 65 milliseconds of delay. It is to be noted that with current voice processing algorithms, the processing delay tends to increase as the vocoder rate decreases. Consequently, this end-to-end delay objective may be difficult to meet with low-rate vocoders, e.g. 2.4 and 4.8 kbits/s.

4.5.7 *Sub-band C channel.* The data transferred by the sub-band C channel includes control and signalling for the call set-up of the C channel, continuity checks, and power control. In each frame, the first 24 half-octets of the sub-band C channel are combined to form a standard length 96-bit signal unit. Successive groups of 24 half-octets are combined in the same way, if available. The 25th data field of the last voice/data block in the frame is discarded. When the C channel is activated, and there are no other signal units to be sent, fill-in signal units are sent.

5. LINK LAYER P CHANNEL AND R CHANNEL PROTOCOLS

5.1 General

The P and R channels are used for signalling and data communications in the to-aircraft and from-aircraft directions, respectively. Data transmission on the R channel is restricted to short messages (less than 33 octet link service data units (LSDUs)). This section of the guidance material describes issues related to the R and the P channel link layer protocols.

5.2 SU set generation

5.2.1 In both the aircraft earth station (AES) and the ground earth station (GES) link layers, an SU set cannot be generated from a received LIDU as described in Annex 10, Volume III, Part I, Chapter 4, 4.5.3.2.3 until a reference number is assigned to it, except for system table broadcast LIDUs and LIDUs received from the circuit-mode service entities to be transmitted, either on the R channel at the AES, or the P channel at the GES. System table broadcast LIDUs do not require reference numbers. Circuit-mode services LIDUs are assigned application reference numbers by the circuit-mode service entities at the AES and the GES, thus an SU set is generated upon receipt of the LIDU. For all LIDUs exchanged between the link layer, at the AES or the GES, and any of its service users, no formats have been specified in the SARPs. Such formats are implementation dependent.

5.2.2 When an LIDU received from the subnetwork layer is assigned a reference number, the LSDU of the LIDU is encoded in the data field of the ISU/SSU(s) of a P channel SU set or in the data field of the SUs of an R channel SU set. The number of SUs needed in the SU set depends on the LSDU length. Each SU, except the last one, will contain the maximum permitted number of user data octets. The number of user data octets in the last SU which belong to the set may have less than the maximum length. In a P channel SU set, the number of octets in the final SU (ISU or SSU) is encoded in the "No. of octets in the final SSU" field of the ISU. On the R channel, the number of octets in the last SU is encoded in the SU's "SU type" field (Annex 10, Volume III, Part I, Appendix 3 to Chapter 4, Item 67).

5.3 SUs transmission according to precedence

At the AES and the GES, in order to meet the SUs transmission requirements of Annex 10, Volume III, Part I, Chapter 4, 4.5.8.2.3, the R and P channel protocols may employ several first-in-first-out (FIFO) queues, one queue per valid Q number, to store the SUs prior to transmission. For the R channel, the SUs of an SU set would be queued according to the ascending order of their sequence indicators (Annex 10, Volume III, Part I, Appendix 3 to Chapter 4, Item 58). For the P channel, the SUs of an SU set would be queued with the ISU, or RTX SU for a retransmission set, first followed by the SSUs according to the descending order of the SSUs sequence numbers. At the instance of transmission, an SU would be selected from the highest priority queue with one or more SUs in it.

5.4 P channel protocol

5.4.1 The P channel link layer protocol is used in the to-aircraft direction for processing the transmission of: 1) the LIDUs received from the GES management, 2) the LIDUs received from the circuit-mode services with routing parameters indicating transmission on the P channel, and 3) all LIDUs received from the subnetwork layer. The P channel protocol reliable link service (RLS) is used for processing the transmission of the LIDUs received from the subnetwork layer only. The transmission of all other LIDUs is processed according to the P channel protocol direct link service (DLS). The P channel is also used for the transmission of the following link layer signalling SUs:

a) T channel reservation (RES) and reservation forthcoming (RFC) SUs associated with the T channel reservation protocol (Annex 10, Volume III, Part I, Chapter 4, 4.6);

b) T channel acknowledgement (TACK) SU; and

c) R channel acknowledgement (RACK) SU.

The above SUs are transmitted in accordance with the P channel protocol DLS service.

5.4.2 At a given time, the P channel protocol may be processing the transmission of several LSDUs (a reference number has been assigned and an SU set has been generated from each LIDU to transmit the LSDU). However, for RLS, at each Q number only one LSDU of the LSDUs destined to the same AES is permitted to be in process for transmission at one time. The other RLS LSDUs with the same Q number and destined to the same AES will be stored until the transmission of the current LSDU at that Q number is over, either successfully or unsuccessfully. Thus, at the AES, only one RLS SU set per Q number could be in the reassembly process at a given time and the AES will discard an incomplete RLS SU set if it starts receiving another RLS SU set with the same Q number and a different reference number. After either a successful or an unsuccessful transmission of an SU set, the GES link layer releases all link layer resources associated with that SU set, i.e. the assigned reference number, activated timers, memory allocation, etc.

5.4.3 For RLS, the P channel protocol implements a selective-repeat-ARQ scheme for error control. Accordingly, upon transmitting an SU set the GES expects to receive a P channel acknowledgement (PACK) SU from the AES. The PACK SU may indicate either complete or incomplete reception of the SU set using its acknowledgement control field. In the latter case, this field also indicates whether a complete or a partial retransmission of the SU set is required. For a partial retransmission request, this field, which is present in every PACK SU, further indicates the number of PACK SUs identifying the remainder of the missing SSUs of the SU set to follow; each PACK SU can identify, at most, three missing SSUs. A partial retransmission from the GES is assembled by the AES as any other SU set; however, a retransmission SU set is headed by an RTX SU rather than an ISU and the retransmitted SSUs' Sequence Numbers are as prescribed in Annex 10, Volume III, Part I, Appendix 3 to Chapter 4, Item 59. Failure to receive an acknowledgement from the AES would cause the GES to solicit such acknowledgement by sending a request for acknowledgement (RQA) SU to that AES. The AES keeps track of the status of the RLS SU set that the AES is currently processing at a given Q number in order to correctly respond to an RQA.

5.4.4 In an SU set, original or retransmitted, only the ISU, or the RTX SU, identifies the destination AES ID. In order to avoid erroneous processing due to the broadcast nature of the P channel, the AES discards an SSU if received without previously receiving the corresponding (same reference number and Q-number) ISU or RTX SU.

5.5 R channel protocol

5.5.1 The R channel link layer protocol is used in the from-aircraft direction for processing the transmission of: 1) the LIDUs received from the AES management, 2) the LIDUs received from the circuit-mode services with routing parameter indicating transmission on the R channel, and 3) some of the LIDUs carrying LSDUs of 33 or less octets received from the subnetwork layer. The R channel protocol reliable link service (RLS) is used for processing the transmission of the LIDUs received from the subnetwork layer only. The transmission of all other LIDUs is processed according to the R channel protocol direct link service (DLS).

5.5.2 The R channel is also used for the transmission of the following link layer signalling SUs:

a) P channel acknowledgements (PACKs);

b) T channel request for acknowledgement (RQA); and

c) T channel request for reservation (REQ).

The above SUs are transmitted in accordance with the R channel protocol DLS service.

5.5.3 At a given time, the R channel protocol at the AES may be processing the transmission of several LSDUs (reference number is assigned and an SU set is generated from each LIDU to transmit the LSDU). However, for RLS, at each Q number only one LSDU is permitted to be in process for transmission to the GES at one time. Other RLS LSDUs with the same Q number will be stored in the AES until the transmission of the current RLS LSDU at that Q number is over, either successfully or unsuccessfully. Thus, at the GES, only one RLS SU set per Q number per AES could be in the reassembly process at a given time and the GES will discard an incomplete RLS SU set if it starts receiving another RLS SU set with the same Q number from the same AES. After either a successful or an unsuccessful transmission of an SU set, the AES link layer releases all link layer resources associated with that SU set, i.e. the assigned reference number, activated timers, memory allocation, etc.

5.5.4 For RLS, the R channel protocol implements a selective-repeat-ARQ scheme for error control. Accordingly, upon transmitting an SU set, the AES expects to receive an R channel acknowledgement (RACK) SU from the GES. The RACK SU may indicate either complete or incomplete reception using its acknowledgement control field. In the latter case, the RACK SU also indicates the missing SUs of the SU set by identifying their sequence indicators. The AES transmits the indicated missing SUs without any alterations to their contents. The largest SU set on the R channel contains three SUs, thus, the GES may identify at the most two missing SUs in a RACK SU, one SU of the set must be correctly received at the GES in order to detect an attempt of an SU set transmission.

5.5.5 The R channel is a multiple access channel, therefore, the GES concurrently receives SUs from all AES assigned to one set of R channel frequencies. Each received SU contains the source AES ID. Thus, the received SUs are first sorted out according to their AES IDs and then independently processed. Annex 10, Volume III, Part I, 4.5.8.3 contains the R channel protocol requirements corresponding to the processing of SUs from a given AES.

6. LINK LAYER T CHANNEL AND SUB-BAND C CHANNEL PROTOCOLS

6.1 General

The link layer T channel protocols specified in Annex 10, Volume III, Part I, Chapter 4, 4.6 applies to link service data units (LSDUs) in the from-aircraft direction which cannot be transmitted via the R channel (e.g. because its length exceeds 33 octets). There are two T channel protocols: one for requesting the T channel capacity and the other for the transmission of SUs in assigned capacity. The link layer sub-band C channel protocol specified in Annex 10, Volume III, Part I, Chapter 4, 4.6 applies to the transmission of signalling SUs corresponding to the circuit-mode services in the to-aircraft and from-aircraft directions.

6.2 SU set generation

An SU set cannot be generated from the received LIDU as described in Annex 10, Volume III, Part I, Chapter 4, 4.6.4.2.1 until a reference number is assigned to it by the T channel reservation protocol. The LSDU (used data) is encoded in the user data field of the ISU/SSU of a T channel SU set. The number of SUs needed in the SU set depends on the LSDU length. Each SU, except the last one, will contain a maximum permitted number of user data octets. The number of user data octets of the last SU which belongs to the set may have less than the maximum length; unused octets are then padded with dummy bits. The number of octets in the final SSU is encoded in the "No. of octets in the final SSU" field of the ISU.

6.3 T channel transmission protocol

6.3.1 GENERAL

6.3.1.1 The T channel transmission protocol is used when there are LSDUs present for transmission on the T channel and the AES has received a requested T channel burst reservation. The T channel transmission protocol specifies reliable link service (RLS) for data transfer.

6.3.2 AIRCRAFT EARTH STATION (AES)

6.3.2.1 The aircraft earth station (AES) is the transmitting end of the T channel transmission protocol. The oldest SU of the SUs with the highest Q number is transmitted first. If an SU set is waiting for transmission in an allocated burst reservation and a higher precedence SU set is submitted for transmission then the higher precedence SUs will displace the lower precedence SUs. Thus, a burst reservation may carry SUs corresponding to an LSDU other than the one which initiated the original request for reservation.

6.3.2.2 The AES, after transmitting the SU set to the ground earth station (GES), waits for T channel acknowledgement (TACK) SU(s) from the GES. The TACK SUs are received at the AES by the receiving end of the P channel protocol, which then passes them to the T channel transmission protocol. The AES may receive more than one TACK SU indicating the missing SUs of an SU set at the GES. Each TACK SU can identify up to three missing SUs. The receipt of a TACK SU of the TACK SU set identifying the missing SUs, initiates a timer tA5 in the AES and indicates the number of additional TACK SUs that are expected. If the timer tA5 expires before another TACK SU of the TACK SU set is received, the AES transmits the missing SUs identified in the so far received TACK SUs. If TACK SU(s) are received after the corresponding timer tA5 has expired and the AES has not yet transmitted the retransmission SU set identified in the received TACK SU(s), the AES discards the received TACK SU(s).

6.3.2.3 The AES computes the length of the expected reservation for retransmission based upon the number of missing SUs indicated in the received TACK SUs of the TACK SU set. This length is associated with the timer tA8 initiated by the T channel reservation protocol to supervise the receipt of reservation for retransmission. This length may be less than the length of the reservation actually assigned for retransmission by the GES if, for example, some TACK SUs of the TACK SU set are not received by the AES.

6.3.2.4 The AES saves a copy of an SU set for retransmission purposes. After passing the transmission status indication LIDU to the subnetwork layer indicating success or failure, the AES destroys the saved copy.

6.3.2.5 If after several retries, an expected reservation from the GES is not received, the AES discards at least the number of SUs for which the reservation was requested. The SUs discarded may not be those which initiated the original request for reservation because of the fact that the transmission of SUs is based upon the precedence described in Annex 10, Volume III, Part I, Chapter 4, 4.6.4.2.2, but will be of equal or lower precedence. If an ISU is among the SUs discarded at the AES, the complete SU set headed by the discarded ISU is discarded. This may result in discarding more SUs than required. If the SU discarded is a REQ SU, then the AES retransmits the REQ SU on either the T or R channel. If the SU discarded is a last SU of an SU set, then the AES starts a timer for the supervision of TACK SU(s) for that SU set.

6.3.3 GROUND EARTH STATION (GES)

6.3.3.1 This is the receiving end of the T channel transmission protocol. The GES, upon receipt of an SU set, reassembles it into an LSDU. Before reassembling the SU set, the GES checks whether or not all the SUs of the SU set have been received. If the SU set is not complete after no more SUs of the SU set are expected (determined by the criterion specified in the AMSS SARPs), the GES requests for the retransmission of the missing SUs by transmitting appropriate number of TACK SUs, indicating error, on the P channel to the AES.

6.3.3.2 If while waiting for retransmissions from the AES, the GES receives an ISU with the same AES ID and Q number as the SU set awaiting completion and with a reference number belonging to a pair whose other member is the reference number of the SU set awaiting completion, the GES discards the SU set awaiting completion and proceeds with the new SU set. The receipt of the ISU with the parameters described above indicates that the AES has given up on the transmission of the previous SU set and has released the reference number, thus making available the other member of the pair for assignment.

6.3.3.3 The GES may receive an RQA SU from the AES in the following circumstances:

a) initial SU set loss (i.e. loss of at least the ISU): the RQA SU does not refer to an SU set which has been processed just before;

b) negative acknowledgement loss or retransmission loss: the RQA SU refers to an SU set under correction; and

c) positive acknowledgement loss: the RQA SU refers to an SU set which has been processed just before.

When the initial SU set has been lost, the GES determines the initial SU set length from the message length parameter in the RQA SU in order to reserve and send the correct T channel capacity along with the request for complete retransmission.

6.4 T channel reservation protocol

6.4.1 GENERAL

The T channel reservation protocol is used to request reservations for the transmission of data on the T channel.

6.4.2 AIRCRAFT EARTH STATION (AES)

6.4.2.1 The T channel reservation protocol in the AES assigns reference numbers to the LIDUs received from the subnetwork layer for transmission on the T channel. The reference numbers are assigned in such a way that no two consecutive LIDUs with the same Q number transmitted from an AES to a GES have the same reference number. The reference number assigned to an LSDU is used by the T channel reservation protocol in the request for reservation (REQ) SU and by all the associated signalling and by the T channel transmission protocol in the data SUs and by the associated acknowledgements and request for acknowledgement SUs.

6.4.2.2 The REQ SU is transmitted to the GES on the T channel or on the R channel. Every time the REQ SU is transmitted on the T channel, the requested length in the REQ SU is incremented by one in order to account for the T channel capacity used to transmit the REQ SU.

6.4.2.3 The timer tA8 in the AES is used to supervise the receipt of expected T channel reservation (RES) SUs associated with either previously received reservation forthcoming (RFC) SUs or received TACK SUs. Due to the priority scheme for the transmission of SU sets, resulting in higher priority SU sets potentially occupying reservation assignments for lower priority SU sets, there will be instances of time where multiple tA8 timers associated with the same SU set might have been initiated at the AES. Upon receipt of an awaited RES SU for that SU set, the AES must stop the corresponding tA8 timer (Annex 10, Volume III, Part I, Chapter 4, 4.6.5.2.6 and 4.6.5.2.7). However, since a one-to-one correspondence between a tA8 timer and a received RES SU is not guaranteed, a selection of a most suitable tA8 timer must be made. Such selection is implementation dependent. For instance, the selection could be made dependent on the time-out values of all outstanding tA8 timers, such that the tA8 timer with the shortest remaining time to time-out is selected regardless of the size of reservation in the received RES SU. In this case, care must be taken in the implementation to request reservations for any resulting deficit in the total size of outstanding reservations associated with an SU set at the AES when all tA8 timers have been stopped. Other criteria for the selection may be used; however, the constraint that at least the total size of all outstanding reservations associated with any given SU set must be received prior to releasing the reference number assigned to that SU set must always be observed.

6.4.2.4 Reservations may not be received in chronological order. The minimum inter-reservation gap between two reservations on two different T channels is made adequate to allow for frequency (T channel) switching at the AES. A reservation (RES) SU defines one or more burst allocations on one T channel. The starting frame number of the initial burst is encoded within the RES SU and is known as belonging to one of the sixteen frames following the reception of the RES SU (the time window). Thereafter, further reservations (if any) occur every 2BI frames until the number of reserved bursts is reached. BI is the encoding of the burst interval information element within the RES SU. The AES computes the starting frame for each reserved burst using both the starting frame number of the initial burst and the burst interval information. Once a reserved burst has elapsed, the AES deletes it from its time plan.

6.4.3 GROUND EARTH STATION (GES)

6.4.3.1 The GES assigns reservations in response to requests for reservations from its logged-on AESs. The GES also assigns reservations for retransmissions of missing SUs of an SU set transmitted by the AES. So, whenever the T channel transmission protocol at the GES transmits a TACK SU set comprised of one or more TACK SUs indicating errors, the T channel reservation protocol at the GES makes reservations for the retransmissions.

6.4.3.2 The GES assigns reservations to an AES for any one of the four T channels that may have been assigned to the AES at the time of log-on. The GES indicates the T channel on which the reservation has been made to the AES in the RES SU. A procedure to select a T channel, out of the possible four assigned to the AES at the time of log-on, is implementation dependent. The following methods may be utilized for selecting the T channel:

a) all T channels available to a particular AES are polled. Reservations are assigned to any T channel on which the minimum allowable reservation delay is achievable, or to the channel offering the shortest reservation delay if no T channel offers the minimum allowable reservation delay;

b) each T channel assigned to a particular AES is associated with one or more message precedence. A T channel is selected according to the precedence of the message identified in the REQ SU; and

c) reservations for all non-safety messages are made on a single T channel; reservations for all safety messages are made on a T channel which offers a shortest reservation delay.

6.4.3.3 The GES transmits the RES SU to the AES whenever the start of the reservation is within eight seconds of the current time. This is done to avoid any misinterpretation of the reservation start time at the AES. The reservation start time in the RES SU is specified in terms of start frame number within a superframe. The superframe number is not specified. So, if the RES SU is not received by the AES within the superframe which actually includes the start frame number, the AES will apply the information incorrectly to the superframe within which the RES SU is received by the AES. If the frames in this superframe have been assigned to another AES, then there could be a collision of the T channel transmissions from the two AESs. Because of the fact that the RES SU should be received by the AES within the correct superframe, the precedence of the RES SU is set to 15 in order to minimize the P channel queuing delays that otherwise can be experienced by the RES SU.

6.4.3.4 If the start of the burst reservation is outside the eight second time window from the time the reservation was made, the GES transmits a reservation forthcoming (RFC) SU to the AES in order to prevent a timeout resulting in another request for reservation. The RFC SU gives an upper limit for the delay to the start of burst reservation in entire number of super frames (8 seconds). The time-plan in the GES is limited in length. Whenever the GES is not capable to assign a reservation within its current time-plan, it sends an RFC SU with the delay to RES set equal to its maximum time-plan length and saves the request for later assignment. Subsequently, when the GES is capable of serving the request, the GES sends a further RFC SU giving the delay to reservation which is now known. The size of the GES time-plan is implementation dependent and has not been specified in the AMSS SARPs.

6.4.3.5 The TACK SUs transmission must always precede the associated T channel reservation. As the precedence level of an RES SU is higher than the one of the TACK SU, the GES must wait until all TACK SUs have been effectively transmitted before allocating a reservation for retransmission. The TACK SUs transmitted to the AES by the T channel transmission protocol in the GES includes an estimation for the delay before the RES SU will be sent to the AES by the GES; this estimation is a function of the T channel(s) loading. Subsequently, if the reservation cannot be assigned within the estimated delay specified in the TACK SU, the GES transmits an RFC SU with the actual delay or with the maximum delay value corresponding to its time-plan length if it has not been able to assign a reservation within its current time-plan. In the latter case, the GES will delay T channel burst assignment until capacity is available. The length of the reservation for retransmission is the number of missing SUs identified by the TACK SU set indicating missing SUs at the GES plus one.

6.4.3.6 The GES assigns reservations such that no two AESs use the same T channel for transmission at the same time. The length of a reservation is such that the AES is always capable to send at least one REQ SU in addition to the SUs for which the reservation is made. This prevents delaying either the transmission of an REQ SU when its precedence level is lower than the precedence level of the SUs awaiting transmission, or the transmission of the complete SU set when interrupted by a single REQ SU. Long LSDUs are assigned burst reservation in multiple bursts of equal length, each burst being separated from the precedent one by a fixed burst interval. The intervals between bursts can be assigned to AESs for transmission or retransmissions. The burst interval between two bursts and the burst length of each burst corresponding to the same LSDU are made such that the transfer delay for the entire LSDU meets the performance requirements specified in Annex 10, Volume III, Part I, Chapter 4, 4.7. Since the transmitter in the AES could be shared between the R and T channels and the T channel mode of the transmitter has higher priority than its R channel mode, the assignment of reservations on the T channel will affect the R channel transmissions. The reservations are assigned on the T channel in such a way that most of the time there is at least one R channel burst every eight seconds from each AES logged on to the GES assigning reservations. The burst length and burst interval are not specified in the AMSS SARPs; they are implementation dependent.

6.4.3.7 Typical values for the length of an individual burst are as follows:

a) 18 SUs for a T channel operating at 600 bits/s;

b) 17 SUs for a T channel operating at 1 200 bits/s;

c) 31 SUs for a T channel operating at 2 400 bits/s; and

d) 31 SUs for a T channel operating at 10 500 bits/s.

Typical values for the burst interval are as follows:

a) 16 frames for a T channel operating at 600 bits/s;

b) 8 frames for a T channel operating at 1 200 bits/s;

c) 4 frames for a T channel operating at 2 400 bits/s; and

d) 1 frame for a T channel operating at 10 500 bits/s.

6.4.3.8 The earliest starting time that a reservation can be made by the GES must be such that the AES can receive the reservation in time to transmit at the start of the assigned reservation. This time takes into account the processing time at both the GES and the AES as well as coding and decoding delays. The value for the earliest starting time is implementation dependent and is computed according to the formula given below:

Minimum delay to start of reservation = P channel unit delay + GES processing delay + P channel queuing delay + R-slot duration + 0.2 sec(*) + propagation delay + AES processing delay.

* 0.2 seconds is the R/T channel switching time.

A system implementor has obtained the typical values shown in Table A-10 for some of the components. A typical value for GES processing delay is in the order of 200 msec.

6.4.3.9 The GES, upon receipt of either a log-on to another GES or log-off information about an AES which was logged on to it, may discard the reservations assigned to the AES, making the slots available for assignment to its other logged on AESs.

6.5 Sub-band C channel to-aircraft and from-aircraft protocol

6.5.1 GENERAL

The sub-band C channel protocol defined in AMSS SARPs contained in Annex 10, Volume III, Part I, Chapter 4, 4.6 specifies direct link service (DLS) for signalling SUs. The sub-band C channel carries signalling for circuit-mode services to set-up, maintain or release the C channel.

7. SATELLITE SUBNETWORK LAYER

7.1 General provisions

7.1.1 ARCHITECTURE

To facilitate the development of interoperability specifications, the subnetwork layer has been divided into functional areas. This functional division is not intended to preclude implementations that aggregate functions in other ways, so long as the airborne and ground implementations of the subnetwork layer each behaves (to an external observer) as if it conformed with the provisions of this section.

7.1.1.1 *SSND function*

Each SSNDPX function contains one or more SSNDPX entities. Each entity communicates with the peer SSNDPX entity using the SSNDP.

7.1.1.2 *SNAc function*

Each SNAc function contains one or more ISO 8208 DCE entities. Each ISO 8208 DCE entity communicates with the peer ISO 8208 data terminal equipment (DTE) entity in the attached aeronautical telecommunication network (ATN) router using the ISO 8208 protocol.

7.1.1.3 (Reserved)

7.1.1.4 *IW function*

Each IW function contains one IW entity. The IW function performs the necessary harmonization between the SSND and the SNAc functions. It forwards ISO 8208 packets between the ISO 8208 DCE and SSNDPX entities.

7.1.2 BACKGROUND FOR THE USE OF ISO 8208 AND THE ASSOCIATED SUBNETWORK DEPENDENT PROTOCOL

In the satellite subnetwork, data may be received out-of-sequence or duplicated. The subnetwork dependent convergence function (SNDCF) in the ATN router which uses the services provided by the satellite subnetwork assumes an underlying connection-mode service which provides sequenced delivery of data. The SNDCF does not perform any error recovery function to handle data duplication and data received out-of-sequence. Therefore, it requires a reliable connection-mode service which is provided by the ISO 8208 and SSND protocols. Furthermore, for the satellite subnetwork, it is more efficient to use these connection-mode protocols. Finally, ISO 8208 is the most mature connection-mode protocol available.

7.1.3 SERVICES

7.1.3.1 The packet data interface allows AMSS to function as the satellite subnetwork of the ATN. The satellite subnetwork transfers data packets from air to ground and from ground to air. Packet data transfers are provided in the form of connection-mode service, using ISO 8208 as a subnetwork access protocol (see Figure A-14 of this guidance material).

7.1.3.2 The subnetwork user must initiate the set-up of each connection by sending an ISO 8208 CALL REQUEST packet. In normal operation, this action results in the establishment of a switched virtual circuit (SVC) between the calling subnetwork user and the called subnetwork user. SVCs can be released by either subnetwork user (when the connection is no longer needed) or by the subnetwork (when the connection is no longer supportable).

7.1.3.3 One or more subnetwork users on an aircraft may be connected to one or more subnetwork users on the ground, but all ground users will normally interface via a single ground earth station (GES) at any given time. Handovers from one GES to another may result in the temporary interruption of service.

7.1.3.4 The originator of a CALL REQUEST packet will normally identify both the called and calling subnetwork user. The originator may also identify quality of service requirements by invoking the appropriate ISO 8208 facilities.

7.1.3.5 Implementations of a satellite subnetwork will normally contain elements that are not standardized by ICAO. One of these elements is a packet switch that interprets DTE addresses and delivers packets to the appropriate DTE. The AMSS SARPs permit (but do not require) the connection of multiple DTEs with an aircraft earth station (AES) or with a GES, or with both. AMSS SARPs also permit the use of any DTE address format, subject to the limitations of ISO 8208. Subnetwork users are responsible for co-ordinating the DTE address formats (and address compression schemes, if employed) between the air and the ground.

7.1.3.6 The satellite subnetwork provides connectivity notification event messages to the attached ATN routers. Since CN event messages are not transferred across the subnetwork, the standardization of formats and media for these messages are considered to be local matters.

7.1.4 ERROR HANDLING FOR COMMUNICATION FAILURES

If communication between an AES and a GES is abruptly terminated (e.g. due to a loss of physical connectivity), it is possible for the subnetwork layer to remain in its last state until connections are cleared by the user. The GES subnetwork layer is particularly susceptible, since it may not immediately be aware of the loss of communication. Users and/or implementors may use supplemental means to detect and correct such conditions.

7.2 Packet data performance

7.2.1 GENERAL

7.2.1.1 *The need for ICAO performance specifications*

7.2.1.1.1 AMSS minimum system performance standards apply over a geographic coverage area to be identified by each AMSS service provider. In general, the minimum system performance should be continuously available to each AES within the identified coverage area. However, AES antennas are not required to provide full coverage in all directions; multiple antennas and/or multiple satellites may be needed in order to achieve the minimum system performance.

7.2.1.1.2 AMSS minimum system performance standards do not represent the fundamental limits of system performance. Under favourable conditions, the achievable AMSS system performance may be significantly better than the minimum standards reflected in the AMSS SARPs. States are not precluded from seeking AMSS service arrangements that would provide system performance that exceeds the minimum requirements of the AMSS SARPs. However, such arrangements should take into consideration the minimum AES configurations and the minimum AES performance requirements of the AMSS SARPs.

7.2.1.2 *Physical layer*

The basic performance standard for the physical layer is the maximum bit error rate, which is specified as 10^{-3} for digital voice and 10^{-5} for packet data and associated signalling. These system specifications avert the need to specify detailed satellite link budgets, thus allowing the flexibility to implement a variety of satellite and GES architectures.

7.2.1.3 *Packet data subnetwork layer*

7.2.1.3.1 The specification of subnetwork service performance will allow flexibility in the design and operation of GESs while assuring a uniform minimum level of performance for the packet data user. In general, the subnetwork performance parameters are based on the definitions given in Section 10 of ISO 8348, "Information processing systems — Data communications — Network service definition" (1987), which are incorporated into the AMSS SARPs by reference. The mapping between packets and subnetwork service primitives is defined in ISO 8878, "Information processing systems — Data communications — Use of X.25 to provide the OSI connection mode network service".

7.2.1.3.2 The term "subnetwork service" in the context of packet data performance refers to the service provided by the subnetwork to the higher layer user. The term "service provider" in this same context refers to the protocols within the satellite subnetwork and to the net effect of their operation. These terms should not be confused with the services of the satellite communication provider or GES operator. Packet data service depends on all elements of the system: AES, satellite, GES, and the physical paths between them.

7.2.1.3.3 The values of the performance parameters in the AMSS SARPs are intended to permit economical and spectrum-efficient operation. They are calculated under nominal worst case conditions, including maximum physical bit error rate and peak busy hour traffic loading. Improved speed of service performance (relative to the specified values) may be achieved by increasing the number of physical channels used to serve a given traffic load, thus decreasing the traffic load per channel. Using this technique, cost of service may be expected to increase (and spectrum efficiency may be expected to decrease) as the speed of service is improved.

7.2.1.3.4 AMSS subnetwork performance does not include the effects of other links in the end-to-end data path. Subnetwork performance includes the effects of all operations beginning with the ISO 8208 DCE protocol at the sending end of the satellite subnetwork and terminating with the ISO 8208 DCE operations at the receiving end of the satellite subnetwork, including:

a) the satellite subnetwork interworking functions;

b) the satellite subnetwork dependent protocols;

c) the satellite data link layers; and

d) the satellite physical layers.

ISO 8208 operations associated with the DTE are not part of the satellite subnetwork, and are excluded from AMSS packet data performance specifications, as are data link layer and physical layer operations between the DCE and the DTE.

7.2.2 Speed of service

7.2.2.1 Speed of service is determined by a number of factors, including:

a) the system architecture;

b) the channel rate(s) in use;

c) the priority of the traffic for which speed of service is being measured;

d) the length of the messages for which speed of service is being measured, the traffic loading on the system; and

e) data processing delays.

Finally, the actual speed of service in the from-aircraft direction depends on the amount and type of traffic being transmitted from each aircraft, to the extent that packets may be delayed on the aircraft while other packets are being transmitted to the GES.

7.2.2.2 In accordance with current industry practice, speed of service is specified in terms of packets containing 128 octets of subnetwork user data.

7.2.2.3 There is no specification for the maximum amount of traffic to be handled on P or T channels. However, the speed of service performance standards are based on a maximum utilization of approximately 70 per cent (of theoretical capacity) for these channel types. Higher utilizations are permitted, provided that all of the applicable performance standards are met. For example, a GES that operates multiple T channels in an appropriate multiserver configuration may be able to achieve T channel utilization factors of 80 per cent or more within the constraints imposed by the speed of service requirements. P channels may be operated at utilization factors higher than 70 per cent if the total P channel utilization by traffic at and above the lowest priority associated with safety and regularity of flight does not exceed 70 per cent.

7.2.2.4 A GES that is intended to serve as a backup to a another GES should be appropriately sized to provide the required performance in the event of the failure of the primary GES.

7.2.2.5 The term "highest priority service" denotes priority 14 service, which is reserved for distress, urgency and certain infrequent network/system management messages. The term "lowest priority service" denotes the lowest priority used for safety and regularity of flight, under peak-hour traffic loading. Performance for priority levels not used for safety or regularity of flight is not specified.

7.2.2.6 *Transit delay and 95 per cent data transfer delay*

7.2.2.6.1 Transit delay is a standard speed of service performance measure for single DATA packets; transit delay is defined as an average value. Because the civil aviation community typically does not rely on average values for the most critical performance measures, the 95 per cent data transfer delay is also specified. Under actual operational conditions, the relationship between the average and 95 per cent delay values is not fixed, but may depend on the distribution of traffic. A typical statistical distribution of to-aircraft delays, under projected peak traffic loading and at the lowest P channel rate, is illustrated in Figure A-15 of this guidance material for the highest and lowest priority of data. A typical statistical distribution of from-aircraft delays under similar conditions is shown in Figure A-16 of this guidance material. From-aircraft delays are independent of priority unless two or more from-aircraft packets contend for resources within a particular AES. The extent to which such internal contention may occur within a particular AES will depend on the avionics architecture of the aircraft in which the AES is installed.

7.2.2.6.2 Transit delay and 95 per cent data transfer delay are specified on the basis of a standard reference DATA packet containing 128 octets of subnetwork user data. Actual delays for shorter packets may be reduced, but not necessarily in proportion to the packet length. The delay parameters associated with DATA packets shorter than 128 octets (of subnetwork user data) should not exceed the corresponding parameters for 128 octet DATA packets.

7.2.2.7 *Throughput*

Throughput is the standard speed of service performance parameter for the transfer of multiple DATA packets. In accordance with current industry practices, throughput is computed on the basis of standard reference DATA packets containing 128 octets of subnetwork user data. Throughput is computed for the transfer of multiple independent packets. Throughput performance for the transfer of M-bit sequences may be substantially higher. The subnetwork is expected to support the minimum throughput values shown in Table A-11.

7.2.2.8 *Connection establishment delay, connection release delay*

7.2.2.8.1 *Connection establishment delay.* The maximum connection establishment delay is based on a connection request of the lowest priority, containing a total of 15 octets of DTE address information and 42 octets of facility fields and optional data. The specified value for each channel rate applies to an equal mix of GES-originated requests and AES-originated requests. The maximum connection establishment delay is the standard speed of service specification for the connection establishment phase; it is not intended to limit in any way the future use of optional facilities, user data fields, or address fields.

7.2.2.8.2 *Connection release delay.* The maximum connection release delay is based on a disconnect request at the lowest priority, containing no user data, invoking no optional facilities and carrying no address information. The specified value for each channel rate applies to an equal mix of GES-originated requests and AES-originated requests, when the connection release is not delayed by the presence of packets in transit on the connection. The maximum connection release delay is the standard speed of service specification for the connection release phase; it is not intended to limit in any way the future use of optional facilities, user data fields, or address fields.

7.2.3 RELIABILITY OF SERVICE

7.2.3.1 Reliability of service is determined by the system architecture, by the physical layer bit error rate, and by the average rate of "collisions" on R channels. There is no specification on the rate of R channel collisions. However, the system performance specifications for both speed of service and reliability of service are based on an average R channel occupancy factor (i.e. the ratio of occupied R channel slots to the total number of R channel slots during a given interval) of approximately 0.15. Higher R channel occupancies are permitted, provided that all of the applicable performance standards are met.

7.2.3.2 The standard reliability of service parameter for the transfer of a single DATA packet is residual error probability, which is the probability that an attempt to transfer a single DATA packet is not entirely successful. It is based on a standard reference DATA packet containing 128 octets of subnetwork user data. The undetected error probability for AMSS packet data service is expected to be less than 3×10^{-7} for standard reference DATA packets containing 128 octets of subnetwork user data. The undetected error probability for shorter packets is reduced approximately in proportion to the packet length.

7.2.3.3 Other reliability of service parameters are resilience of the virtual circuit or logical channel with respect to reset and release, i.e. the probability that the subnetwork service provider invokes a reset or release over some period of time. Reset and release operations may result in the loss of user data, whether invoked by the subnetwork user or by the subnetwork service provider.

7.3 Satellite subnetwork dependent protocol services and operations

7.3.1 LOGICAL CHANNELS

The requirements for selecting logical channel numbers are intended to prevent call collisions.

7.3.2 CONNECTION ESTABLISHMENT

7.3.2.1 The following describes a normal connection establishment between two SNS users.

7.3.2.2 When a subnetwork connection is initiated by one of the SNS users, an ISO 8208 DCE entity in the satellite subnetwork receives an ISO 8208 CALL REQUEST packet from the ISO 8208 DTE. This packet is forwarded to the IWF. The IWF forwards this packet to the appropriate SSNDPX entity. This SSNDPX entity forwards this packet as a CONNECTION REQUEST SNPDU to the remote SSNDPX. When the remote SSNDPX receives this SNPDU, it forwards this to the IWF as an ISO 8208 INCOMING CALL packet. The IWF forwards this packet to the appropriate ISO 8208 DCE entity. The ISO 8208 DCE entity forwards this packet to the peer ISO 8208 DTE entity. The ISO 8208 DTE forwards this connection request to the receiving SNS user. After the receiving SNS user has accepted this connection request, the ISO 8208 DTE entity forwards an ISO 8208 CALL ACCEPTED packet to the peer ISO 8208 DCE entity. The ISO 8208 DCE entity forwards this packet to the IWF. The IWF forwards this packet to the appropriate SSNDPX entity. This SSNDPX entity forwards this packet as a CONNECTION CONFIRM SNPDU to the peer SSNDPX entity. When the remote SSNDPX entity receives this SNPDU, it forwards this as an ISO 8208 CALL CONNECTED packet to the IWF. The IWF forwards this packet to the appropriate ISO 8208 DCE entity. This ISO 8208 DCE entity forwards this packet to the peer ISO 8208 DTE entity. When the ISO 8208 DTE entity receives this packet, it informs the originating SNS user about the establishment of a connection to the remote SNS user.

7.3.2.3 A connection between two SNS users consists of a series of logical channels. Each logical channel is selected based on the established rule by the receiving entity. Therefore, these logical channels may not have the same number. Figure A-17 of this guidance material shows an example of connection establishment between three pairs of SNS users.

7.3.2.4 *Throughput negotiation*

Since the GES has the knowledge of available throughput based on the throughputs that have been assigned to the existing subnetwork connections (SNCs), it should assign the throughput classes for each direction of data transmission. The recommended actions by the GES are given in 7.3.6.1 and 7.3.7.1 of this guidance material.

7.3.3 CONNECTION RELEASE

7.3.3.1 *SSNDPX*

To avoid unnecessary releases at the SSNDPG caused by residual DATA/INTERRUPT SNPDUs from the SSNDPA, the SSNDPA waits until all DATA/INTERRUPT SNPDUs in transmission and pertaining to that connection have been transmitted before forwarding a CONNECTION RELEASED or a CONNECTION RELEASE COMPLETE SNPDU to the SSNDPG. The SSNDPA need not correlate the transmission status of each DATA/INTERRUPT SNPDU with transmission status indications from the data link layer. However, the SSNDPA waits until all outstanding DATA/INTERRUPT SNPDUs have been acknowledged by the link layer (success/ fail LIDU) before sending a CONNECTION RELEASED or CONNECTION RELEASE COMPLETE SNPDU. Since to-aircraft SNPDUs are always delivered in proper sequence by the link layer, the SSNDPG may send a CONNECTION RELEASED or CONNECTION RELEASE COMPLETE SNPDU without waiting for acknowledgement of previously sent DATA/INTERRUPT SNPDUs.

7.3.4 DATA TRANSFER

7.3.4.1 *IWF*

The IWF should forward the DATA packets between the appropriate SSNDPX and ISO 8208 DCE entities and supply these entities with sufficient information to identify the appropriate logical channel.

7.3.4.2 *SSNDPG*

Since the DATA SNPDUs from the AES are sent through either the R or T channel, they may be received out-of-sequence at the GES. Therefore, the SSNDPG should have sufficient storage to reorder the out-of-sequence DATA SNPDUs before forwarding the data in these SNDPUs to the IWF.

7.3.4.3 *Flow control procedure*

7.3.4.3.1 Memory management mechanisms are implementation dependent. In order to minimize the possibility of memory overflow and the consequent loss of data, the satellite subnetwork layer provides flow control, which may be invoked by the AES, the GES, or the subnetwork user. The SSNDPX uses start-stop flow control, while the DCE uses ISO 8208 window flow control. ISO 8208 RECEIVE READY and RECEIVE NOT READY packets are produced locally; they are never transferred across the subnetwork. If the SSNDPX remains in the "flow control not ready" state for 60 seconds, the subnetwork initiates a reset of the connection, regardless of whether flow control was suspended by the subnetwork or by the subnetwork user. The timer (tN7) is associated with the receiving SSNDPX, i.e. the SSNDPX that originated the FLOW CONTROL SUSPEND SNPDU.

7.3.4.3.2 System designs should minimize the possibility that flow control will be invoked on priority 14 connections, e.g. by dynamic memory allocation or by providing additional fixed memory allocation for priority 14 connections. Dynamic memory allocation procedures, if used, should take connection priority into consideration.

7.3.4.3.3 *SSNDPX*

7.3.4.3.3.1 When the SSNDPX surpasses a storage threshold or receives a FLOW CONTROL (suspend) SNPDU from the remote SSNDPX, it should notify the IWF of this condition.

7.3.4.3.3.2 If the SSNDPX falls below a storage threshold or receives a FLOW CONTROL (resume) SNPDU from the remote SSNDPX after it has informed the IWF of the flow control suspend condition, it should notify the IWF of this condition.

7.3.4.3.3.3 When the SSNDPX surpasses a storage threshold or receives flow control suspend information from the IWF, it should forward a FLOW CONTROL (suspend) SNPDU to the remote SSNDPX when the next DATA SNPDU is received on that VC, providing the situation has not cleared by then.

7.3.4.3.3.4 If the SSNDPX falls below a storage threshold or receives flow control resume information from the IWF after forwarding a FLOW CONTROL (suspend) SNPDU to the remote SSNDPX, it should forward a FLOW CONTROL (resume) SNPDU to the remote SSNDPX.

7.3.4.3.4 *ISO 8208 DCE*

7.3.4.3.4.1 When the ISO 8208 DCE surpasses a storage threshold or receives flow control suspend information from the IWF, it should suspend the updating of the lower window edge of the local DTE or forward a RECEIVE NOT READY packet to the local DTE.

7.3.4.3.4.2 If the ISO 8208 DCE falls below a storage threshold or receives a flow control resume information from the IWF after it has suspended the updating of the lower window edge of the local DTE or forwarded a RECEIVE NOT READY packet to the local DTE, it should resume updating the lower window edge of the local DTE or forward a RECEIVE READY packet to the local DTE.

7.3.4.3.4.3 When the ISO 8208 DCE surpasses a storage threshold or receives a RECEIVE NOT READY packet from the local DTE, it should notify the IWF of this condition.

7.3.4.3.4.4 If the ISO 8208 DCE falls below a storage threshold or receives a RECEIVE READY packet from the local DTE after it has informed the IWF of the flow control suspend condition, it should notify the IWF of this condition.

7.3.4.4 *Data loss*

7.3.4.4.1 In a connection release or connection reset, DATA SNPDUs and ISO 8208 DATA packets on that connection may be lost. To guarantee end-to-end delivery of end-user data, a confirmed service such as the one provided by a transport protocol may be used.

7.3.4.4.2 System designs should minimize the possibility that flow control will be invoked on priority 14 connections, e.g. by dynamic memory allocation or by providing additional fixed memory allocation for priority 14 connections. Dynamic memory allocation procedures, if used, should take connection priority into consideration.

7.3.4.5 *Expedited data transfer*

7.3.4.5.1 It is expected that the ATN will not require expedited data transfer service. However, expedited data transfer service is supported in accordance with ISO 8208.

7.3.4.5.2 For each logical channel, the expedited data transfer allows an interrupt SNPDU packet to be sent in a given direction while data transfer in that direction is suspended. This is accomplished by sending the interrupt SNPDU or interrupt packet ahead of data SNPDUs or data packets that have been suspended.

7.3.4.6 *Connection reset*

7.3.4.6.1 SSNDPX. To avoid resets at the SSNDPG caused by residual DATA/INTERRUPT SNPDUs from the SSNDPA, the SSNDPA waits until all DATA/INTERRUPT SNPDUs in transmission and pertaining to that connection have been transmitted before forwarding RESET or RESET CONFIRM SNPDUs to the SSNDPG. The SSNDPA need not correlate the transmission status of each DATA/INTERRUPT SNPDU with transmission status indications from the data link layer. However, the SSNDPA waits until all outstanding DATA/INTERRUPT SNPDUs have been acknowledged by the link layer (success/fail LIDU) before sending a RESET SNPDU. Since to-aircraft SNPDUs are always delivered in proper sequence by the link layer, the SSNDPG may send a RESET SNPDU without waiting for acknowledgement of previously sent DATA/INTERRUPT SNPDUs.

7.3.5 SNPDU FORMATS

7.3.5.1 *Fast select facility*

The fast select facility with parameter set to "use not permitted" may be included in the CONNECTION REQUEST SNPDU to explicitly indicate that no user data may be transferred in the CONNECTION CONFIRM and CONNECTION RELEASED SNPDUs. If this facility is not included in the CONNECTION REQUEST SNPDU, then up to 128 octets of user data may be transferred in the CONNECTION CONFIRM and CONNECTION RELEASED SNPDUs.

7.3.6 PACKET TO SNPDU MAPPING RULES

7.3.6.1 *GES actions*

7.3.6.1.1 The selected throughput class in the CALL ACCEPTED packet should be transferred to the TCN value in the CONNECTION CONFIRM SNPDU.

7.3.6.1.2 If the throughput class in the CALL REQUEST packet is less than or equal to the calculated available value, then the throughput class should be transferred to the TCN value in the CONNECTION REQUEST SNPDU; otherwise, the calculated available throughput, rounded down to the nearest standard value, should be transferred to the TCN value.

7.3.7 SNPDU TO PACKET MAPPING RULES

7.3.7.1 *GES actions*

7.3.7.1.1 If the throughput class negotiation (TCN) value in the CONNECTION REQUEST SNPDU is less than or equal to the calculated available throughput value, the throughput class in the INCOMING CALL packet should be set equal to the TCN value; otherwise, the throughput class in the INCOMING CALL packet should be set equal to the calculated available throughput, rounded down to the nearest standard value.

7.3.7.1.2 The selected throughput class in the CALL CONNECTED packet should be transferred from the TCN value in the CONNECTION CONFIRM SNPDU.

7.4 ISO 8208 DCE protocol operations

7.4.1 CONFORMANCE REQUIREMENTS

The capabilities which the ISO 8208 DCE is not required to support include the following:

a) modulo 128 packet sequencing;

b) default window size of more than 2; and

c) either the use of the D-bit or the optional mechanism for negotiating use or non-use of the D-bit since these capabilities are not required by the subnetwork users.

Note.— The use of D-bit or the optional mechanism for negotiating use or non-use of the D-bit is strongly discouraged.

7.5 Management interface

7.5.1 AES MANAGEMENT INTERFACE

When an AES logs off or otherwise terminates communication with a GES, the SSNL clears all connections and SVCs associated with that GES. This may be done by sending CLEAR INDICATION packets to each ISO 8208 DCE logical channel associated with these connections and releasing the resources for the logical channels in the associated SSNDPA entity.

7.5.1.1 (Reserved)

7.5.2 GES MANAGEMENT INTERFACE

When an AES logs-off from a GES, the SSNL should clear the connections between the SNS user(s) and the logged-off AES. This may be done by sending CLEAR INDICATION packets to each ISO 8208 DCE logical channel associated with these connections and releasing resources for the logical channels in the associated SSNDPG entity.

8. CIRCUIT-MODE SERVICES

8.1 Circuit-mode voice signalling protocols

8.1.1 *General.* The circuit-mode logic processes defined in Annex 10, Volume III, Part I, Chapter 4, 4.8 represent the minimum set of protocol interactions necessary to ensure interoperability of aircraft earth stations (AESs) and ground earth stations (GESs) operating in the safety service. The protocol interactions necessary to support air and ground-originated calls arriving at the AES or GES are defined via separate signalling procedures in each.

8.1.2 *Logic for air-originations.* The AES and GES air-origination signalling procedures for the prevalent aeronautical mobile-satellite service (AMSS) and for the aeronautical mobile satellite (route) service (AMS(R)S) are the same. Provisions are made for an abbreviated call establishment procedure, specifically voice calls at the safety priorities (i.e. distress/urgency, flight safety and regularity/meteorological).

8.1.3 *Link layer services.* Circuit-mode services use the R, P, and C channel sub-band link layer protocols defined in Annex 10, Volume III, Part I, Chapter 4, 4.5 and 4.6 for all call signalling information exchanged between the AES and GES. This information is exchanged with the link layer via circuit-mode link interface data units (CM-LIDUs). Link layer services perform conversions between CM-LIDUs and the respective AMS(R)S circuit-mode signalling units (SUs). In all cases, only the direct link service (DLS) is used since circuit-mode services are responsible for recovering from missing SUs.

8.1.4 AIR-ORIGINATION PROCEDURES

8.1.4.1 *Aircraft earth station (AES) procedure*

8.1.4.1.1 *Call origination*

8.1.4.1.1.1 *General call establishment.* The AES commences an air-origination by transmitting to the GES an "access request" CM-LIDU. The AES then awaits receipt from the GES of a C channel assignment CM-LIDU for a period of tA50 seconds. This sequence is repeated four times before aborting the call attempt. Calls aborted by the AES in this manner must be re-attempted by the user.

8.1.4.1.1.2 *Abbreviated call establishment.* The AES commences an air-origination by transmitting to the GES a series of four, three, or two contiguous "access request" CM-LIDUs. The series length is determined by whether the call priority is distress/urgency, flight safety or regularity/meteorological, respectively. The purpose of the multiple transmissions is to mitigate the effects of an SU lost due to R channel collisions. The AES then awaits receipt from the GES of a C channel assignment CM-LIDU for a period of tA50 seconds. This sequence will be repeated four times before aborting the call attempt. Calls aborted by the AES in this manner must be re-attempted by the user.

8.1.4.1.2 At the instant at which the call origination begins, if sufficient AES resources for the call are not available due to blockage attributable to a lower priority call at the AES, the AES will defer pre-emption of these resources and proceed as per 8.1.4.1.1 until a C channel assignment is received from the GES. This will allow the AES to make a proper pre-emption decision based on the exact EIRP assignment from the GES. Upon receipt of the C channel assignment, all required AES C channel resources (i.e. channel unit and AES EIRP) are pre-empted from a lower priority call (if necessary) and allocated to the call. This is followed immediately by further signalling and continuity checks on the C channel sub-band while the GES is engaged in completing the call to the ground destination.

Note.— As a secondary benefit, by requiring that the AES defer pre-emption until a C channel assignment is received, the future development of an alternative procedure incorporating reuse of an existing C channel is facilitated.

8.1.4.1.3 *Address digits*

8.1.4.1.3.1 *General call establishment.* The "access request" CM-LIDU contains the first two digits of the AMS(R)S ground address. The remaining digits are provided on the C channel sub-band as "call information — service address" CM-LIDUs which serve as a basis for the C channel continuity check procedure.

8.1.4.1.3.2 *Abbreviated call establishment.* The "access request" CM-LIDU contains all digits of the fixed-length 10-digit AMS(R)S ground address. Providing this information concurrent with the access request allows the GES to begin forward completion of the call across the ground network while it proceeds simultaneously with C channel establishment. These address digits are repeated on the C channel sub-band as "call information — service address" CM-LIDUs which serve as a basis for the C channel continuity check procedure. However, their presence in these CM-LIDUs serves no purpose for the AMS(R)S air-origination procedure other than to allow the AES to interwork with a GES which supports prevalent non-safety AMSS circuit-mode procedures rather than the SARPs-specific air-origination procedure.

8.1.4.2 *Ground earth station (GES) procedure*

8.1.4.2.1 *Processing of call initiation*

8.1.4.2.1.1 *General call establishment.* Upon receipt of an "access request" CM-LIDU from an AES, the GES immediately allocates C channel resources and responds with a "C channel assignment" CM-LIDU. Simultaneously, the GES analyses the network-ID contained in the access request and awaits the completion of the receipt of the service address. Forward call set-up across the ground network is then completed.

8.1.4.2.1.2 *Abbreviated call establishment.* Upon receipt of an "access request" CM-LIDU from an AES, the GES immediately allocates C channel resources and responds with a "C channel assignment" CM-LIDU. Simultaneously, the GES analyses the network-ID contained in the access request and begins forward call completion across the selected ground network.

8.1.4.2.2 The GES circuit-mode procedure monitors the status of the from-aircraft C channel carrier throughout the call. Loss of carrier for more than tG13 seconds will result in termination of the call by the GES. When this happens, the GES will send six "call progress — channel release" CM-LIDUs during this phase so as to ensure that the AES's call state is cleared. If the AES carrier were to reappear (possibly indicative of anomalous propagation conditions non-conducive to call continuance) the GES will attempt to again clear the AES call by sending six additional "call progress — channel release" CM-LIDUs on the C channel sub-band and one on the P channel.

8.1.4.2.3 When the GES passes the forward call origination to the selected ground network, it must also convey the call priority and the AES and terminal IDs of the originator. This will ensure that the ground network can be sensitive to the call's priority during routing; and that the ground user is always advised of the identity of the originator so as to facilitate return calls to aircraft that a controller may not otherwise be aware of. In those cases where a call is blocked due to an engaged (busy) condition at the ground destination, the GES may, as an option: (1) interpret a specific backward signal from the ground network which indicates that the call attempt has been recorded at the ground destination, and then (2) forward a corresponding CM-LIDU to the AES. This is accomplished by a specific combination of cause codes in the "call progress — channel release" CM-LIDU and the BITE 16 telephony event at the interworking interfaces with the external aircraft and terrestrial networks. This will serve to alert an aircrew that a ground user has been alerted to the existence of the unsuccessful call attempt and has been provided the information necessary to initiate a return call at a later time.

8.1.5 GROUND-ORIGINATION PROCEDURES

8.1.5.1 *Ground earth station (GES) procedure*

8.1.5.1.1 Upon receipt of a call origination from a ground network, the GES commences a ground-origination by allocating GES resources to the call and then sending to the AES via the P channel a "call announcement" CM-LID followed by a "C channel assignment" CM-LID. The GES will then await receipt of the from-aircraft C channel carrier prior to conducting a continuity check on the C channel sub-band. The AES will initiate the continuity check by sending a "call progress — test" CM-LIDU to which the GES will respond with a "call progress — test" CM-LIDU every tG35 seconds until the call is either completed to the aircraft destination or terminated unsuccessfully (e.g. destination busy, call clearing, etc.). The AES will acknowledge receipt of a "call progress — test" CM-LIDU, thereby completing the continuity check, by sending either a positive "telephony acknowledge" CM-LIDU or a "call progress — connect" CM-LIDU. (The latter will have been sent in lieu of the former if the aircraft user answered the call immediately after the continuity check procedure.) The GES will react to either CM-LIDU by forwarding an "address complete" BITE to the ground network and, in the case of the latter CM-LIDU, an "answer" BITE as well. At this point the talk phase of the call may proceed.

8.1.5.1.2 The GES will monitor the status of the C channel for the duration of the call. If a "call progress — connect" CM-LIDU is received during this phase and subsequent to the completion of the continuity check phase, the GES will forward an "answer" BITE to the ground network and maintain the C channel. The GES monitors the status of the from-aircraft C channel carrier throughout the call. Loss of carrier for more than tG19 seconds will result in termination of the call by the GES. When this happens, the GES will send six "call progress — channel release" CM-LIDUs during this phase so as to ensure that the AES's call state is cleared. If the AES carrier were to reappear (possibly indicative of anomalous propagation conditions non-conducive to a usable call) the GES will attempt to again clear the AES call by sending twelve additional "call progress — channel release" CM-LIDUs on the C channel sub-band and one on the P channel.

8.1.5.1.3 If the GES receives a "call progress — channel release" CM-LIDU (indicating that the aircraft user has terminated the call) the GES will forward a "clear back" BITE to the ground network and terminate the call. Similarly, if the GES receives a "clear forward" FITE from the ground network (indicating that the ground user has terminated the call) the GES will send six "call progress — channel release" CM-LIDUs over the C channel sub-band and then monitor the AES to ensure that it has terminated its from-aircraft C channel carrier.

8.1.5.1.4 Events such as unsuccessful continuity checks and call clearing will result in the eventual termination of C channel transmissions from the AES. While these various termination events are progressing, the GES will monitor the from-aircraft carrier to ensure that the AES is performing similar call termination activities. If the from-aircraft carrier has not terminated within tG17 seconds after the transmission of an initial series of "call progress — channel release" CM-LIDUs, the GES will send twelve additional of these CM-LIDUs via the C channel sub-band and a thirteenth via the P channel. If these transmissions are not successful in causing the AES to terminate its C channel transmission within tG18 seconds after the last transmission, the GES will terminate all call activities unilaterally.

8.1.5.2 *Aircraft earth station (AES) procedure*

8.1.5.2.1 An incoming call to an AES is announced by the receipt of "call announcement" and "C channel assignment" CM-LIDUs. Since these are sent on the direct link service, circuit-mode services implements an error recovery procedure whereby the AES can infer that one of these CM-LIDUs is missing (e.g. due to bit errors on the P channel) and request that it be repeated by the GES. The AES initiates the request by transmitting an appropriately encoded "telephony acknowledge" CM-LIDU via the R channel. When an AES has received a "call announcement" CM-LIDU and its associated "C channel assignment" CM-LIDU it will initially verify that the called terminal is available and that adequate C channel resources (i.e. channel unit and AES EIRP) are either available or pre-emptable. If the foregoing requirements are not all met the AES will send an appropriately encoded "call progress — call attempt result" CM-LIDU via the R channel and then terminate all activities for the call. Otherwise, it will activate a C channel unit on the assigned C channel frequency pair and begin the C channel continuity check procedure by sending a "call progress — test" CM-LIDU via the C channel sub-band.

8.1.5.2.2 The AES will send an additional "call progress — test" CM-LIDU every tA26 seconds for tA41 seconds until an identical CM-LIDU is received from the GES. This constitutes a successful continuity check and will immediately cause the AES to: (1) enable the voice circuit between the aircraft voice channel and the C channel unit, (2) forward a "call origination" FITE to the aircraft destination, and (3) send a "telephony acknowledge" CM-LIDU via the C channel sub-band to the GES. The AES will then await tA42 seconds for the aircraft destination to answer the call. If the call is not answered within this time period the AES will clear the call toward the aircraft destination, send six "call progress — channel release" CM-LIDUs to the GES, and then terminate the call. Otherwise, if the aircraft destination answers within this time limit the AES will send a "call progress — connect" CM-LIDU to the GES and maintain the C channel during the talk phase of the call.

8.1.5.2.3 When the "call progress — connect" CM-LIDU is sent, the AES will initiate an error recovery procedure to ensure its receipt at the GES. (The talk phase progresses in the interim.) Timer tA26 is used to implement a transmission repeat cycle for this CM-LIDU which must result in receipt at the AES of a "telephony acknowledge" CM-LIDU within tA30 seconds of the original transmission. Failure to receive the acknowledgement within tA30 seconds will cause the AES to terminate the call.

8.2 Interworking of circuit-mode services with other voice networks

8.2.1 *AMS(R)S circuit-mode procedures.* A standardized set of circuit-mode procedures within the AES and GES implement the AMS(R)S circuit-mode protocols and provide specific interfaces with non-AMS(R)S telephony interworking procedures. The AMS(R)S circuit-mode procedures correspond to specific AES and GES circuit-mode processes and represent the highest level of functionality contained in the AMSS SARPs. The interworking procedures, although physically contained within the AES and GES equipment, represent the initial "layer" of functionality immediately adjacent to and external from the AMS(R)S circuit-mode procedures. The interworking procedures represent the functional area where specific conversions between the AMS(R)S circuit-mode procedures and user or service provider-specific signalling implementations are effected. The interworking protocol between the AMS(R)S circuit-mode procedures and the interworking procedures is defined using a standard set of interworking telephony events.

8.2.2 *Interworking with external telephony systems.* Interworking is the controlled transfer of signalling information across the interface between different signalling systems where the significance of the information is identical or where the significance is translated in a defined manner.

8.2.2.1 *Interworking protocol basis.* The interworking protocol is defined through the use of a set of forward and backward interworking telephone events (FITEs and BITEs). The interworking telephone events that are used herein to define the interworking protocol are a subset derived from the standardized definitions contained in CCITT Recommendation Q.608. Defining the interworking protocols on the basis of FITEs and BITEs is in conformance with standard telephony system practice. It should be noted that the use of FITEs and BITEs is merely a convenient nomenclature and in no way places dependencies on specific equipment implementations.

8.2.2.1.1 *FITE.* A FITE is an event where telephony signalling information is transferred in the forward direction from an incoming signalling system to an outgoing signalling system. The "forward" direction of a FITE is referenced to the fact that a FITE propagates in a direction that is away from the originating end of a call. Certain FITEs may also carry mandatory and optional information elements pertinent to the event (e.g. address digits).

8.2.2.1.2 *BITE.* A BITE is an event where telephony signalling information is transferred in the reverse direction from an outgoing signalling system to an incoming signalling system. The "backward" direction of a BITE is referenced to the fact that a BITE propagates in a direction that is toward the originating end of a call. Certain BITEs may also carry mandatory and optional information elements pertinent to the event (e.g. call attempt result information).

8.2.3 AES TELEPHONY INTERWORKING

8.2.3.1 *Relationship of AES signalling systems.* Figure A-18 of this guidance material depicts the relationship between the AES circuit-mode procedures, their respective interworking procedures, and aircraft-specific telephony signalling implementations. In particular, the referenced figure defines both the usage of "incoming" and "outgoing" procedures from the viewpoint of the originating call party and the external interface of the AES circuit-mode procedures.

8.2.3.2 *AES interworking telephony event definition.* The AES circuit-mode procedures interwork with aircraft telephony signalling systems via the forward and backward interworking telephony events defined in the Standards. The AES circuit-mode procedures must map specific interworking telephony events to specific protocol interactions in the AES circuit-mode logic procedures where interactions with an aircraft signalling system are required. This mapping must also include parameter mapping where indicated in the Standards.

8.2.3.3 *Aircraft telephony interworking.* An on-aircraft telephony network is not to be required to implement any type or manner of physical network implementation. Any particular implementation is at the option of the aircraft operator as long as that implementation is made to interwork with the AES circuit-mode procedure's interworking protocol.

Note 1.— An aircraft operator might choose to not implement a discrete aircraft telephony signalling network external to the AES equipments. At their option, a "call control agent" function could be integrated within the AES equipments in such a manner as to eliminate the need for a discrete aircraft signalling network.

Note 2.— In those cases where an AES is configured to sustain more than one simultaneous ATS call, the aircraft's called terminal addresses should be configured into one or more appropriate "hunt groups". This will reduce the incidence of ground-originated calls to a specific called terminal being blocked by an engaged condition when an equally appropriate called terminal is available.

8.2.4 GES TELEPHONY INTERWORKING

8.2.4.1 *Relationship of GES signalling systems.* Figure A-19 of this guidance material depicts the relationship between the GES circuit-mode procedures, their respective interworking procedures, and ground-specific telephony signalling implementations. In particular, the referenced figure defines both the usage of "incoming" and "outgoing" procedures from the viewpoint of the originating call party and the interworking interface of the GES circuit-mode procedures.

8.2.4.2 *GES interworking telephony event definition.* The GES circuit-mode procedures interwork with terrestrial network telephony signalling systems via the forward and backward interworking telephony events defined in the Standards. The GES circuit-mode procedures must map specific interworking telephony events to specific protocol interactions in the GES circuit-mode logic procedures where interactions with a terrestrial network signalling system are required. This mapping must also include parameter mapping where indicated in the Standards.

8.3 Implementing satellite voice in the ATS environment

8.3.1 *Overview.* The AMS(R)S voice service has basic operational attributes which fundamentally differ with prevalent very high frequency (VHF) and high frequency (HF) voice operations. This will require close attention to how satellite voice is implemented in a data link-oriented ATS environment. These differences include a statistical delay in speech channel establishment, a perceptible delay in speech propagation, circuit-switched operation, full-duplex operation, and the inability for aircraft to monitor communications between the ground and other aircraft. Additionally, the AMS(R)S voice service places functional requirements on terrestrial facilities which are external to the GES (e.g. terrestrial networks and ACF automation equipment) in order to maximize its utility.

8.3.2 *Channel establishment delay.* Upon call origination, each user must provide to its respective AES or GES the telephone number of the desired destination and then wait for the system to establish a speech channel. This is in sharp contrast with conventional radio operations where typically each user maintains a continuous listening watch on a radio channel. In addition, the channel establishment delay is statistical in nature and is dependent upon the over-all traffic load on the AMSS system.

8.3.3 *Call annunciation.* It is anticipated that aircraft operators will integrate the satellite voice equipment with other aircraft systems in a manner very similar to current VHF and HF radio equipment. This may lead to minor inconsistencies in how voice calls are managed on different aircraft. For instance, interwiring satellite voice equipment with existing aircraft audio control panels may lead to inherently half-duplex operation on certain aircraft even though all of the intervening speech channels are full-duplex. Incoming air-originated calls will, in many cases, be annunciated to the aircrew via a SELCAL chime or other audible indication, and will require a crew action to answer the call. This means that a ground user must await a positive answer indication (e.g. crew voice response) before speech can begin. Otherwise, there would be no assurance to the ground user that the call is audible to the crew. This particular aspect is quite important given the expectation that:

a) satellite voice calls will be very infrequent in a data link oriented environment; and

b) the inability of an aircrew to monitor satellite voice communications by other aircraft precludes positive, routine assurance that the proper aircraft audio panel selections have been made.

8.3.4 *Aircraft call management.* Aircraft flight management computer systems can be useful in managing routine aspects of voice call management for the aircrew. For instance, ground number directories and selection menus can be provided by these systems so that the need for an aircrew to enter discrete telephone numbers on a control/display device can be minimized. These systems could also correlate with directory information the associated data link end-system address information or the aircraft's position in order to recommend an appropriate ground address for use in an ATC call. However, it should be noted that the crew must be able to select or otherwise imply the appropriate priority of a call attempt prior to origination.

8.3.5 *Air-originated call information.* When the GES forwards an air-originated call to the terrestrial network, the call indication will include, in addition to the desired ground address, the call's priority, and the AES-ID and calling terminal-ID associated with the call. (Annex 10, Volume III, Part I, Appendix 5 to Chapter 4, Figure A5-28 refers). The call priority can be used by the terrestrial network to facilitate a potential pre-emption action within that network and to notify the ground destination of the call's priority in cases where the ground user might be servicing other calls. The AES and terminal ID information is provided so as to facilitate correlated routing (8.3.6) of the call (by an ACF or other facility) to the proper destination within that facility as determined by the facility's information concerning the aircraft.

8.3.6 *Correlated routing.* Call routing functions within a facility should be able to determine the proper internal destination to which a call should be routed based on the facility's current data pertaining to the aircraft. This requires that the facility correlate the originating aircraft's AES-ID (see 8.3.5) with information that it may have concerning the aircraft and then route the call to the relevant ground user. Consideration should be given to the establishment of a universal default agent code in the AMS(R)S ground numbering plan (e.g. "000") which would be known to all facilities to be an implied request by the aircrew to provide the correlation function. The remaining 999 code values in the agent code field would remain available for discrete ground user addresses within a facility.

8.3.7 *Facility incoming call management.* The ground user should have several options available for those instances when an air-originated call arrives while they are conducting a pre-existing call with another aircraft. A ground user should be able to combine any reasonable number of satellite voice calls in a conference so that the communications service can be managed in a manner similar to a VHF radio channel if the ground user so chooses. This can be implemented with a conventional telephony conference bridge situated between the ground user and the terrestrial voice network. In addition, the ground user should receive an immediate presentation of the call information listed in 8.3.5 for all arriving calls so as to facilitate a proper call handling decision. Examples of two possible operational modes are as follows:

a) *Barge-in.* All arriving calls for an individual destination are automatically answered by an automation function on behalf of the ground user; and are placed in a multi-way conference consisting of the ground user and any existing calls. This is intrinsically the simplest mode of operation in that it allows all users to immediately contend for the ground user's attention by listening for any active conversation just as in VHF radio. Barging in to an active conversation, however, would require that the caller tie up a C channel resource while waiting for the previous conversation to end.

b) *Serial access with priority override.* An arriving call for an individual destination is automatically answered by an automation function on behalf of the ground user. Any additional calls arriving at a priority equal to or lower than an existing call receive a "busy" indication and are cleared automatically. Any additional calls arriving at a priority higher than an existing call are answered automatically and conferenced with any call(s) that the ground user is currently conducting. This allows only higher priority calls to "barge-in" on existing calls. It also allows a calling aircrew (at the higher priority) to gain the ground user's attention verbally without needlessly terminating an existing lower priority call.

8.3.8 *Aircraft microphone push-to-talk operation.* The AMSS voice channel provides a bi-directional audio path which is inherently full-duplex. However, it is strongly recommended that conventional (i.e. VHF-like) half-duplex push-to-talk (PTT) operation be maintained in all aircraft installations — but only to the extent that the flight crew must actuate a PTT key in order to be heard by the ground user. In other words, to-aircraft audio should always be audible in headphones without muting when the PTT key is actuated. (Designers should still pay due attention to cockpit speaker muting when a microphone is keyed.) This will allow the crew to manage the satellite voice conversation in consideration of other concurrent flight deck activities. In addition, enforced PTT operation will help ensure that the potential future use of audio conferencing at a ground user workstation is not impaired by uncontrolled cockpit ambient noise (i.e. from "hot" microphones) in those instances where a controller has several satellite voice calls operating simultaneously.

8.3.8.1 Flight crews should be able to override enforced half-duplex operation so they can take advantage of the full-duplex voice channel when the operational situation warrants (e.g. in-flight medical emergencies).

8.4 Terrestrial voice network considerations

8.4.1 *Overview.* The AMSS SARPs provide for the implementation of a shared, common-user terrestrial voice switching network that interconnects each GES with one or more ground facilities expressly for aeronautical safety communications. This network can be composed of one or more subnetworks operating in tandem to provide the appearance of a single cohesive network service between GESs and external ground facilities (e.g. ACF, aircraft dispatch, etc.) This network should be separate and distinct from other networks which may be attached to a GES for non-safety purposes (e.g. the public switched telephone network).

8.4.2 *Access control.* For air-originated calls, access to the terrestrial safety network is achieved by the AES encoding the access request signalling with a network-ID value of "10". This value will indicate to the GES that the call shall be routed to the terrestrial safety network and that all specific signalling information must be included with the call indication. AES implementations should be subject to certification provisions that ensure that it will not be possible for non-safety users on an aircraft to gain access to the terrestrial safety network.

8.4.3 *Routing analysis.* For air-originated calls, the GES will not analyze the ground address information contained within an access request other than to interpret the network-ID value for selection of the proper terrestrial network (i.e. "10"). Upon receipt of the call indication from the GES, the terrestrial safety network must interpret the country and facility code fields contained in the call information and route the call to the proper facility as required. For ground-originated calls, the originating facility must provide the terrestrial safety network with the ID of the desired GES along with the other call information (i.e. AES-ID, terminal-ID, and call priority) when the call indication is conveyed to the network.

8.4.4 *Call routing functions.* Call routing functions external to the GES can be categorized as being either high-level routing between GESs and ground facilities, and low-level routing carried out within a facility.

8.4.4.1 *High-level routing.* For air-originated calls, high-level routing consists of the terrestrial safety network interpreting the country and facility codes which are contained in the ground address and routing the call to the network's terminus with the proper facility. For ground-originated calls, high-level routing consists of the terrestrial safety network interpreting the GES-ID which was received in the call information from the originating facility and routing the call to the network's terminus with the proper GES.

8.4.4.2 *Low-level routing.* When an air-originated call reaches the desired facility over the terrestrial safety network, a low-level routing function within the facility must interpret the agent code contained within the call information and then route the call to the indicated ground user. It should be noted that, if the agent code value indicates that the call must be correlated with other aircraft information at the facility, the low-level routing function must also interpret the AES-ID contained within the call information and then route the call within the facility based on the correlation results.

8.4.5 *Terrestrial network implementation alternative.* Particular switching network architectures are not mandated for the terrestrial safety network. For instance, individual agreements between AMSS service providers and either administrations or aircraft operators may provide for the integration into the GES equipments of some or all of the high-level routing functions. This would then require that the GES perform the routing tasks described in 8.4.4.1 and route calls to individual facilities via dedicated GES-to-facility trunk groups.

8.4.6 *Pre-emption.* The terrestrial safety network, and/or its individual tandem subnetworks are required to pre-empt and reallocate any resource assigned to an existing call when that call is blocking the completion of a higher-priority call attempt. The incidence of pre-empted calls can be minimized by reserving one or more channels within all voice trunk group for high priority calls (e.g. distress/urgency).

8.5 Implementing the group call/broadcast functions

8.5.1 *Overview.* Under certain conditions a ground user may desire to establish a ground-originated conference call (a group call) with several aircraft at once. Similarly, there may be occasions where there is a need to establish a one-way broadcast to a group of aircraft (a group broadcast). Although the group call and group broadcast functions are not explicitly provided for in the AMS(R)S system protocols, equivalent functions can be readily catered for by implementing several basic call origination functions in the facility automation system.

8.5.2 *Group call.* The group call function can be effected by requiring that the ground user (or an associated automation service) place independent calls to each aircraft designated by the user to be in the group call or "conference". Separate, parallel calls through the terrestrial network and AMSS satellite service would then be established for each aircraft in the conference. The use of individual voice calls for each aircraft in the group can be easily implemented and it also facilitates the centralized management of aircraft entry-to and exit-from the conference by the user. Except for the facility automation functions and the low-level voice switching equipment serving the ground user, no other intervening tandem network (terrestrial or AMSS) need do any specialized call processing in order to establish a group call.

8.5.2.1 The terrestrial network equipment immediately adjacent to the ground user should provide an audio conference function on behalf of the user whereby all aircraft in the conference can hear speech audio generated by other aircraft as well as the ground user. This will provide a passive means to serialize access to the ground user that is identical to that of VHF radio except for the satellite delay effects. Additionally, the facility automation function should also manage the "list" of aircraft in the group so that the ground user can be constantly aware of the presence — or absence — of each aircraft in the group call.

8.5.2.2 During group call origination, the individual aircraft speech channels in a group call cannot be expected to begin operation simultaneously. This is because: (1) the call announcement signalling arriving over the P channel will not reach all aircraft in the group call simultaneously, (2) C channel establishment delay after receipt of this signalling will vary, and (3) all aircrew in the group may not be able to answer the incoming call simultaneously due to primary attention to flight deck duties. This latter human factors issue has the potential to cause considerable confusion as various aircrew answer the call and enter the group conference, especially if the aircrew are not aware that an incoming call is a group call. The risk of this confusion can be mitigated if the aircrew can be advised that an incoming call is actually a group call so that they can remain quiet on the circuit until the ground user begins speaking. One way to accomplish this is for the facility automation function to transmit a repetitive audio alert tone sequence or recorded verbal advisory until all aircraft have answered the call and are ready to participate in the conference.

8.5.3 *Group broadcast.* The procedures for group broadcast can be identical to those of group call except that the conference function provided by the facility should not convey or relay any air-to-ground audio that might inadvertently arrive from aircraft in the broadcast group. As in the case of group call, human factors considerations may require that there be some way to indicate the arrival of a one-way group broadcast to the aircrew.

8.6 Implementing the call registration function

8.6.1 *General.* Under normal circumstances, an ATS specialist who has available an AMS(R)S voice communications service should be able to receive and maintain concurrent air-originated calls from a reasonable number of aircraft. (Paragraph 8.3 provides further guidance on how this may be implemented.) However, there may be operational situations where the ATS specialist wishes either to bar incoming calls or to service arriving calls one at a time — in other words return a "busy" indication to calling aircraft. In these instances, good operational practice should include both making an automatic record of the call attempt for the ATS specialist (call "registration") and advising the aircrew that their failed call attempt has been registered. This notification to the aircrew would carry an implied intent on the part of the ATS specialist to originate a subsequent reciprocal call to the originating aircraft at the first opportunity.

Note.— Paragraph 8.3.5 describes the air-originated call information elements that can be used by the terrestrial facilities to accomplish call registration. The GES and terrestrial network facilities are required to convey this information to the ground user facility.

8.6.2 *Signalling of the call registration event.* The AMSS SARPs require that a call attempt to a busy destination be deemed unsuccessful and that a "call unsuccessful — called party busy" event (BITE 16) then be generated by the end-user's network facilities. (Intervening telephony signalling systems, including those of the AMS(R)S subnetwork, convey this event to the aircrew.) The call registration event is considered a variation of the BITE 16 event and it is carried over the AMS(R)S subnetwork by a unique code value in the cause value parameter of the AMS(R)S "call progress — channel release" LIDU (Annex 10, Volume III, Part I, Appendix 5 to Chapter 4, Figures A5-7 and A5-34 refer). Both terrestrial network facilities and network-specific telephony interworking logic within the GES must support the conveyance of this backward signal to the GES's air-origination logic procedure if the recommended call registration facility is implemented.

8.7 Notes on the abbreviated air-origination procedures

8.7.1 *General.* The procedures defined in the AMSS SARPs for use in air-originated calls provide for a general call set-up and an abbreviated call set-up. The abbreviated procedures provide comparatively shorter and more consistent access delay performance.

8.7.2 ACCESS REQUEST PHASE

8.7.2.1 *Abbreviated access request SU.* An "abbreviated access request" SU is used in the AMS(R)S procedures as a means to deliver all call information (i.e. ground address and calling terminal-ID) to the GES concurrent with the R channel access request. This eliminates the need for the GES to await receipt of this information on the C channel sub-band as is the case for the general access request procedure.

8.7.2.2 *Series transmission of redundant access requests.* In order to mitigate the effects of R channel collisions on circuit-mode access delay performance, the AES will send a short series of identical abbreviated access request SUs upon both the initial access attempt and each of the four subsequent attempts (which are initiated by expiry of timer tA50) for a total of five attempts. The quantity of identical SUs in the series increases with increasing call priority. The probability of receiving at least one abbreviated access request SU at the GES upon each of the five attempts over an R channel loaded to 15 per cent is depicted in Table A-12 of this guidance material. (The table brackets the expected performance by depicting two cases where all conflicting R channel traffic from other AESs comprises either 1-SU bursts or 3-SU bursts.)

8.7.3 *Simultaneous set-up of circuit segments by the GES.* In addition to the enhanced delivery reliability for the abbreviated access request SU as described in 8.7.2.2, end-to-end access delay performance is further aided by the GES beginning forward completion of the call across the terrestrial network at the same instant at which the GES allocates C channel resources and begins C channel establishment in the backward direction. Immediate initiation of forward call completion is possible because the abbreviated access request SU contains **all** necessary call information as described in 8.7.2.1. By establishing both the satellite and terrestrial segments of the end-to-end call concurrently, the limiting factor in end-to-end access delay (after receipt of the abbreviated access request SU) is the longer of either the terrestrial network call completion delay **or** the C channel establishment delay — but not the sum total of both delays as would be typical of the general call origination procedure.

8.7.4 *AES interworking with non-compliant GES.* There may be certain AMS(R)S service areas where one or more GESs are not equipped to support the abbreviated air-origination procedure (e.g. prior to a mandatory ICAO implementation date). The abbreviated procedure as defined for the AES accommodates this by being inherently compatible with both equipped and non-equipped GESs (mode switching or crew intervention are not necessary). Specific attributes of the abbreviated air-origination procedure that allow an equipped AES to interwork with both types of GESs are as follows:

a) the format of the abbreviated access request SU is identical to that of the equivalent general access request SU except that the digit No. 2-9 and terminal ID fields are designated as reserved in the latter SU. This allows a non-equipped GES to interpret the call attempt as it would for a general call (i.e. the call information extracted from the SU is identical to that for a general call);

b) equipped and non-equipped GESs will discard any redundant copies of an access request SU. Therefore, receipt by the GES of multiple copies of the abbreviated access request SU will not result in call processing logic errors (multiple receipt may occur in the absence of R channel collisions or if timer tA50 has expired before the AES has received a C channel assignment SU); and

c) the C channel sub-band signalling and continuity test logic for equipped and non-equipped AESs and GESs is identical. Of particular note is the fact that an equipped AES will repeat the digit No. 2-9 and terminal ID fields (from the abbreviated access request SU) on the C channel sub-band in a manner identical to that of a non-equipped AES. This particular aspect of the AMS(R)S procedure is key to the ability for an equipped AES to interwork with any GES.

Note.— The end-to-end access delay performance through a non-equipped GES will not correspond to that realized when an equipped GES is in use.

8.8 Circuit-mode access delay performance

Note.— Except where noted, projections of end-to-end circuit-mode access delay performance are based on R and P channels operating at channel rates of 10 500 bits/s.

8.8.1 *Air-originated calls.* Paragraphs 8.7.2 and 8.7.3 describe the special attributes of the abbreviated air-origination procedure that result in enhanced access delay performance for the safety versus non-safety user. With respect to the concurrent set-up of both C channel and terrestrial network resources (8.7.3), the benefits of this improved procedure are most apparent when the access delay component that is incurred within the terrestrial network facilities is no greater than that which is incurred by C channel establishment. As a point of reference it should be noted that the GES will require a minimum of six seconds (latency) to establish a C channel — measured from the time at which the C channel assignment SU is enqueued for P channel service. This implies that to derive maximum benefit from the enhanced air-origination procedure, the terrestrial network facilities should impart no more than an equivalent delay component to the end-to-end access delay performance — including the time for the answer indication to flow in the backward direction.

8.8.1.1 *GES C channel demodulator acquisition delay.* Annex 10, Volume III, Part I, Chapter 4, 4.3.4.4 allows three seconds (99 per cent) for the GES C channel demodulator to recover the received carrier and achieve frame lock (this is included in the aforementioned six-second minimum for the GES to establish a C channel after it has received a request). The AMSS SARPs further recommends that implementors achieve shorter acquisition times. This delay has a direct effect on the minimum achievable end-to-end delay in those cases where the terrestrial network is able to provide an access delay component of less than six seconds (8.8.1).

8.8.1.2 *End-to-end access delay for air-originations.* If one can assume that the delay component which is attributable to the terrestrial network facilities can be constrained to be no greater than the component attributable to C channel establishment, then end-to-end access delay in the absence of any significant contending P channel traffic can be as short as eight seconds (95 per cent) for air-originations. If a GES is provisioned with C channel demodulators which exhibit acquisition performance akin to that of the AES's burst mode of operation, then a five second (95 per cent) end-to-end access delay figure is possible provided that the terrestrial network facilities can provide an equivalent improvement in performance.

8.8.2 *Ground-originated calls.* The AES and GES logic procedures for ground-originated AMS(R)S calls are essentially identical to those of the prevalent non-safety AMSS procedures. The expected access delay component that is attributable to the AMS(R)S subnetwork in the absence of any significant contending P channel traffic is projected to be six seconds (95 per cent). (Inclusive of three seconds for GES C channel demodulator acquisition overhead). A terrestrial network facility delay component of four to six seconds will result in an expected end-to-end access delay of 10 to 12 seconds (95 per cent). Improvements in either terrestrial network or GES demodulator overhead will yield an equivalent improvement in the end-to-end delay performance.

8.8.3 *Projections of AMS(R)S subnetwork call set-up delay.* The call processing delays in Annex 10, Volume III, Part I, Chapter 4, 4.8.4.1 specify only the components of AMS(R)S call set-up delay attributable to the performance of AES and GES equipment. These performance parameters, while not entirely deterministic in nature, are not likely to exhibit a significant statistical variance. This is because the parameters are specified as maximum internal processing delays exclusive of any transmission delays or queuing delays for link layer service such as that which might be experienced by a telephony signalling CM-LIDU awaiting P channel transmission. However, the over-all AMS(R)S subnetwork delay to establish an air or ground-originated call, which will be subject to the statistical performance of the link layer, is likely to be of interest to system planners. Based on simulation studies using a traffic model identical to that used to determine the packet-mode performance requirements in Annex 10, Volume III, Chapter 4, 4.7. AMS(R)S subnetwork call set-up delay performance for abbreviated air and ground-originated calls is projected to be as depicted in Table A-13 of this guidance material.

Note.— Each performance parameter is applicable to all AMS(R)S priorities except for those parameters expressed as a range of values for highest to lowest priority.

8.8.4 *PSTN end-to-end call set-up delay.* End-to-end call set-up delay may be excessive when the AMS(R)S subnetwork is interconnected with the PSTN unless a specific performance is specified for the PSTN.

8.9 Subjective voice quality evaluation

8.9.1 BT Laboratories 9.6 kbits/s LPC codec

8.9.1.1 Vocoders employing the algorithm described in Appendix 7, among others, were evaluated by BT Research Laboratories (BTRL) and the U.K. CAA. The results of these evaluations were used in the selection of this algorithm from the three finalist contenders.

8.9.1.2 *Intelligibility.* The BTRL evaluation used the mean opinion score (MOS) assessment methodology. In the BTRL evaluation, an MOS of about 3.1 was obtained under conditions of optimized input and listen levels, no channel noise and no ambient aircraft noise. When a channel bit error rate (BER) of 0.001 or greater was introduced and aircraft ambient noise was added, the MOS ranking decreased.

8.9.1.3 The U.K. CAA evaluations used a specially constructed test environment in which the test subject, a controller, was placed in a simulated work situation. A "pseudo-pilot" read typical ATC messages to the controller and responded to the controller's queries and instructions. Varying levels of channel bit error rates were introduced. The qualitative conclusion was that the vocoder was acceptable for ATC purposes in low-density airspace, such as oceanic.

8.9.2 DVSI 4.8 KBITS/S AMBE CODEC

8.9.2.1 The acceptability of the DVSI codec as a suitable alternative was assessed based on comparative tests against the BTRL 9.6 kbits/s LPC codec. These comparative tests were carried out by Comsat Laboratories based on test requirements agreed at RTCA Special Committee 165 and had the objective of determining whether this codec had an equivalent or better performance than the BTRL codec. Diagnostic rhyme test (DRT) and MOS were used in this assessment.

8.9.2.2 The results of the comparative tests led to the conclusion that the DVSI codec was statistically equivalent to the BTRL codec under most conditions and that it was suitable for operations in the same environment, e.g. oceanic airspace.

Note.— Test results have also shown that the use of noise reduction or cancelling techniques for operation under high propeller background noise is recommended.

9. AIRCRAFT EARTH STATION (AES) MANAGEMENT

9.1 General

Annex 10, Volume III, Part I, Chapter 4, 4.9 defines the minimum set of requirements that the AES management must meet in order to ensure interoperability. This chapter of the guidance material describes issues related to the AES management SARPs.

9.2 AES management interfaces

The AES management is described in the AMSS SARPs as an entity which interfaces to other AES entities, such as the link and subnetwork layers. The interfaces are defined in terms of the information exchanged between the AES management and these other entities and are shown in Figure A-20 of this guidance material. No formats of the exchanged information are specified in the AMSS SARPs. Such formats are considered to be implementation dependent.

9.3 AES management functions

9.3.1 AES TABLE MANAGEMENT

9.3.1.1 Two sets of information are required to be maintained by the AES. These sets of information are given in the AMSS SARPs in the form of tables, namely the system table and the log-on confirm table. The specifics of storing this information in the AES are not regulated by the AMSS SARPs, they are implementation dependent.

9.3.1.2 The information listed under "system table" is provided by the GES. This information contains the necessary search frequencies to enable the AES to select a satellite, a beam, and a GES in order to carry out the log-on procedure. Thus, it is mandatory that this information be current in the AES prior to logging on. The currency of the system table information is maintained at the AES by monitoring the system table broadcast sequences transmitted by the GES as stated in Annex 10, Volume III, Part I, Chapter 4, 4.9.3.2.3.1.

9.3.2 AES LOG STATUS MANAGEMENT

9.3.2.1 *Satellite, beam and GES selections*

9.3.2.1.1 Depending on the geographical location of the aircraft, the AES may have more than one option for the selection of a satellite, beam, and GES combination. The AMSS SARPs provide the flexibility of allowing the AES management to select the most desirable combination at a given time. The only requirement imposed on the selection is the AES capability of receiving an adequate signal on the selected GES P_{smc} channel.

9.3.2.1.2 The information used by the AES management in making its selection is contained in the AES system table. A GES is uniquely identified by the frequency of its P_{smc} channel transmitted within a specific beam in the service area of a given satellite. A satellite is uniquely identified by one or more sets of satellite/beam-identifying P_{smc} channel frequencies. Each set contains at least two frequencies and is associated with the ID of the beam within which the associated P channels are transmitted. If the satellite identification is made via the global beam (beam ID=0), the AES management may further attempt to select a spot beam, if any exist. For a satellite service area with spot beam only, the satellite identification will be made via a spot beam, thus the satellite and the spot beam selections are made concurrently.

9.3.2.1.3 AESs commonly have a programmable owner preference table by which there may be preferential selection of certain systems, satellites, and/or GESs and communication requirements. There are several criteria by which preferential selection for log on can be made; e.g. service provider identity, cost, service options. If this capability were misused (e.g. to exclude particular systems, satellites or GESs), safety could be derogated due to restricted availability of alternate/diverse communication paths. If exclusion is permitted in an AES owner preference table, it should be verified that the safety communication availability requirements for that aircraft's installation are met.

9.3.2.2 *Log-on procedure*

9.3.2.2.1 *Log-on initiation.* As prescribed by the AES management AMSS SARPs, the log-on procedure could be initiated by the receipt of a log-on command. The log-on command could specify the GES and/or the satellite to be selected to log on. These AMSS SARPs specify neither the source nor the format of such command. The source could be external to the AES relaying the command to the AES management on a specific interface. The format is implementation dependent.

9.3.2.2.2 *Log-on rejection.* Several reasons have been identified for the GES rejection of an AES log-on request. A list of these reasons is given in Annex 10, Volume III, Appendix 3 to Chapter 4. No specific AES responses corresponding to the specified rejection reasons have been given in the AMSS SARPs. Such responses are implementation dependent. However, the AMSS SARPs further classify the rejection reasons into three categories: permanent unavailability, temporary unavailability, and invalid parameters. The response of the AES management to a rejection reason could be defined in accordance with the category of the rejection reason in the following manner:

permanent unavailability: cease further log-on attempts to the same GES;
temporary unavailability: reattempt log on to the same GES only after a suitable period of time, or after attempting to log on to other suitable GES;
invalid parameters: reattempt log on to the same GES, only with different parameters.

9.3.2.3 *Universal time broadcast*

Some applications on the aircraft may need to be synchronized with the counterpart applications on the ground. The AMSS SARPs contain recommendations for support of a time synchronization facility at the AES and the GES. Thus, for interoperability consideration, a universal time signal unit (Annex 10, Volume III, Part I, Appendix 2 to Chapter 4, Figure A2-35) containing the current time to the nearest second, synchronized to the UTC standard has been defined in the AMSS SARPs. Upon receipt of a universal time SU from the GES, the AES may provide the received time information to the appropriate applications on the aircraft. The method selected by the AES to provide this time information to an application is implementation dependent.

9.3.2.4 *User commands*

9.3.2.4.1 The AMSS SARPs specify the AES responses to a minimum set of commands intended to influence some of the AES operations. Such commands may be initiated either prior to (Annex 10, Volume III, Part I, Chapter 4, 4.9.3.3.3.1) or after (Annex 10, Volume III, Part I, Chapter 4, 4.9.3.3.4.2) the AES log-on. Neither the sources nor the formats of such commands are specified in the AMSS SARPs. Such sources may be internal or external to the AES and operating in accordance with some stimulus criteria to satisfy a particular user requirement, such as continuity of service. For example, a stimulus criterion to invoke a beam-to-beam handover could be based on the knowledge of the beam pattern of a given satellite and the position and heading of the aircraft. The formats of the handover commands are implementation dependent.

9.3.2.4.2 *Handover commands.* The handover commands specified in the AMSS SARPs are intended to enable the AES user to alter the AES log-on conditions in various ways, as deemed suitable by the user.

9.3.2.4.2.1 A GES-to-GES handover command could be issued by the AES user in order to:

a) renew the log-on to the same GES but through a different spot beam;

b) to switch the log-on to a different GES in the same satellite service area, either through the same or a different spot beam.

Such command may have to specify the GES ID and spot beam ID when those IDs are different than the current values. Circuit-mode calls in a Level-4 AES (multiple transmit and receive channel units) are not effected by the execution of this command. Level-3 AES operation is as specified in Annex 10, Volume III, Part I, Chapter 4, 4.9.3.3.4.2 b).

9.3.2.4.2.2 A satellite-to-satellite handover command could be issued by the AES user in order to switch the AES log-on to a new GES within the service area of another satellite. Any circuit-mode call established through the current satellite will have to be forcibly terminated after a fixed period of time prior to switching to the new satellite. In the AMSS SARPs, this period of time is set to 3 minutes. If the AES was unable to tune to any of the listed satellite/beam-identifying P_{smc} channels of the new satellite, the AES may revert back to the previous satellite or any other satellite in view.

9.3.2.5 *P channel loss/degradation*

9.3.2.5.1 P channel loss/degradation declaration is conveyed to the AES management in the form of an indication from the AES physical layer (P channel receiver). The criteria on which such declaration is based are given in 4.1.3 of Attachment A. If the P channel loss or degradation is caused by the aircraft flying out of the selected beam coverage, the P channel loss/degradation declaration will cause the AES management to search for a new GES, within the same or a different satellite service area, and log-on to it. However, the loss/degradation of the P channel would cause an undesirable discontinuity of both data and voice services. Therefore, the use of such practice is not advisable as a means to invoke an

AES handover. The handover commands described in Annex 10, Volume III, Part I, Chapter 4, 4.9.3.3.4.2 b) and c) provide a more controlled means to invoke AES handovers.

9.3.2.5.2 Because all R and T channel transmissions are synchronized to the framing format of the P channel, and in order to ensure positive control of the AES from the GES, such transmissions must cease with the loss of the P channel.

9.3.3 AES CHANNEL MANAGEMENT

9.3.3.1 *Voice-voice pre-emption*

9.3.3.1.1 Several circuit-mode calls could be contending for the limited resources in the AES. In such cases, the establishment and continuation of a circuit-mode call is regulated by the priority and pre-emption requirement of Annex 10, Volume III, Part I, Chapter 4, 4.8.3.2 according to the precedence of the Q number assigned to the C channels carrying the calls. The C channels Q number assignment for the various categories of voice transactions is given in Annex 10, Volume III, Part I, Chapter 4, Table 4-43.

9.3.3.1.2 Various requirements are included in the AMSS SARPs in order to enforce the priority and pre-emption statement of Annex 10, Volume III, Part I, Chapter 4, 4.8.3.2 in the AES. In this regard, the circuit-mode services will only request the assignment of a transmit/receive channel unit pair from the AES management if, and only if, there are either sufficient resources available or at least one of the circuit-mode calls in progress has at a Q number strictly lower than the Q number of the call being established. In the latter case, the AES management will make available the channel units being used by the call in progress to support the call being established.

9.3.3.2 *Level 3 AES voice/data arbitration*

In a Level 3 AES, a single transmit channel unit is shared among the R, T and C channels. The arbitration between the R channel and the T channel is resolved in the AMSS SARPs by considering that the T channel signal unit (SU) transmissions, regardless of the Q number of the SUs, have precedence over the SUs transmission on the R channel. However, a minimum number of "gaps" in the T channel slot reservations to a particular aircraft are required to ensure that the R channel transmission are not totally blocked (Annex 10, Volume III, Part I, Chapter 4, 4.6.5.3.3). Arbitration between the C channel and the R or T channels is accomplished according to the priorities of the transactions on these channels. The specific requirements for such arbitration are given in Annex 10, Volume III, Part I, Chapter 4, 4.9.3.4.1.4. It should be noted that the AMSS SARPs do not require that an established voice call be terminated if the transmission of a higher precedence data message is required; rather, such action is optional. An alternative scheme allowed by the AMSS SARPs would be to cease transmission on the C channel long enough to transmit any higher precedence signal units in the AES link layer and then reassign the transmit channel unit to the C channel.

10. GROUND EARTH STATION (GES) MANAGEMENT

10.1 General

10.1.1 Ground earth station (GES) management functions specified in Annex 10, Volume III, Part I, Chapter 4, 4.10 are mandatory for each GES implementation. The GES management includes functions to manage the AES log-on to a GES, to control the assignment of P, R and T channels for data and signalling transfer, to reassign new channels on detection of an excess loading on a channel, to assign C channel frequencies on-demand, to control the power of the assigned C channels, to update the system table and time information in the AES and to verify the operational status of its logged-on AESs.

10.2 GES management architecture

10.2.1 SATELLITE SERVICE AREA

A service area of a satellite is defined as the satellite coverage area within which a satellite provider provides services. Different satellites can have overlapping satellite service areas.

10.2.2 SATELLITE SYSTEM CONFIGURATIONS

The following are the three satellite system configurations:

a) *Satellite with global beam only.* In this configuration, there is only one beam per satellite. This beam is referred to as a global beam. In this configuration, two GESs may be required per satellite in a satellite service area to account for two satellite-identifying P_{smc} channels for satellite identification.

b) *Satellite with global beam and spot beams.* In this configuration, a satellite supports multiple beams with some beams enclosed within another beam. The beams enclosed within a beam are called spot beams and the enclosing beam is referred to as a global beam. In this configuration, two GESs may be required per satellite in a satellite service area to account for two satellite-identifying P_{smc} channels for satellite identification. The satellite-identifying P_{smc} channels for satellite identification in this configuration are transmitted in the global beam.

c) *Satellite with spot beams only.* In this configuration, the satellite supports spot beams only, with no global beam. In order that a satellite/beam-identifying P_{smc} channel is available throughout a satellite service area for satellite and beam identification, at least one P_{smc} channel frequencies must be transmitted in each spot beam in the satellite service area. A GES in a satellite service area can support more than one spot beam by transmitting and receiving a unique set of frequencies in each spot beam.

10.2.3 GES CAPABILITY

At a minimum, the GES should be capable of operating through a space segment with a Level 4 AES. This implies that the GES should support voice channels for ATC and AOC services and interface with public switched telephone network or leased circuits at the option of the GES operator. The GES should also have provision for the highest specified rate data channels and interface with private or public switched networks at the option of the GES operator. The number of AESs that a GES can support depends upon the channel loading and the channel frequencies allocated to a GES. The loading on the channel should be such that the packet-mode data transfer meets the performance requirements specified in Annex 10, Volume III, Part I, Chapter 4, 4.7.

10.2.4 GES-TO-GES COMMUNICATION

GES-to-GES communication link is used to transfer information regarding the status of logged-on AESs to other GESs within the same satellite service area. It is also to be used to transfer the C channel access requests and C channel call announcements/C channel assignments between the log-on GES and the GES handling the particular call.

10.3 GES management interfaces

10.3.1 GES management interfaces to other GES entities are defined in Annex 10, Volume III, Part I, Chapter 4, 4.10 in terms of the information exchanged over these interfaces. The format of the information exchanged is not specified; it is implementation dependent.

10.3.2 The GES management interfaces with the link layer to use its services to transfer the management LIDUs to its peer in the AES. The GES management interfaces with the subnetwork layer to inform the subnetwork layer about the AES connectivity. The GES management interfaces with the circuit-mode services to pass the C channel frequencies and channel units assigned to a circuit-mode call. The GES management interfaces with the physical layer to control the frequency and power of the transmitted and received channels and to pre-empt the channel units for higher precedence voice or data calls.

10.4 GES management functions

10.4.1 GES TABLE MANAGEMENT

10.4.1.1 The term "table" refers to the system information stored at a GES. The information stored at the log-on GES includes the status of logged-on AESs and the status of AESs logged on to other GESs within the same satellite service area. It also includes information about the satellite — its identifying frequencies, its location, the beams supported by the satellite, the GESs within the satellite service area and the frequencies and bit rates of the P_{smc}/R_{smc} channels supported by each GES within the satellite service area. The format and the storage capacity for the information is not specified in the AMSS SARPs; it is implementation dependent.

10.4.1.2 The AES system table specified in Annex 10, Volume III, Part I, Chapter 4, 4.10 can be used for any satellite configuration. The initial search data for a satellite service area served by a satellite with spot beams may include two or more satellite-identifying P_{smc} channel frequencies per satellite plus a spot beam map, indicating the geographical coverage of the spot beams of that satellite. The regional data of the AES system table for a satellite service area served by a satellite with a global beam will include the GES ID for each GES within the satellite service area and the P_{smc} and R_{smc} channel frequencies supported by each GES in the global beam as well as the services each GES supports in the global and spot beams.

10.4.1.3 *AES log-on status table*

The AES log-on status table maintained by a GES other than the log-on GES contains information about each AES logged-on to any GES within the same satellite service area. This information can be used by a GES for call routing purposes such as to reject a ground-initiated call request destined for an AES not logged-on to any GES in the satellite service area or to forward the call request to the GES to which the destined AES is logged-on.

10.4.1.4 Each GES also maintains an authorization table. This table contains the list of all aircraft addresses for those AESs whose operators have successfully completed the administrative requirements necessary to enable the AES to operate within an AMS(R)S system. These administrative steps include, but are not limited to: confirmation that the aircraft address is correct and issued by an appropriate body; AES equipment has successfully passed unit testing; and contact and billing details for the AES operator are correct.

10.4.2 GES LOG-ON STATUS MANAGEMENT

10.4.2.1 *GES handover functions*

10.4.2.1.1 A log-on GES, upon receipt of an AES log-on information from another GES in the satellite service area served by the same satellite as the one serving the log-on GES, suspends any data transaction in progress with the AES if this AES was previously logged on to it. The voice calls in progress via the previous log-on GES does not have to be cleared since the AES can establish calls via a GES other than its log-on GES. The previous log-on GES does not indicate the AES in its AES log-on status table as being its logged on AES; however, it still retains the required information about the AES.

10.4.2.1.2 If the log-on information about an AES is received from a GES in a different satellite service area, then the received GES suspends the data transaction and clears voice calls in progress with the AES if this AES was previously logged-on to it and then deletes the AES from its AES log-on status table completely. The old log-on GES then transmits log-off information to other GESs in its satellite service area.

10.4.2.2 *Log-on verification*

10.4.2.2.1 The AMSS SARPs on GES management specify two methods of verifying the operational status of an AES. The direct verification method is utilized by the GES if the log-on verification (LOV) bit in the log-on request LIDU is set to zero by the AES; otherwise, indirect verification method is used.

10.4.2.2.2 The purpose of log-on verification is to optimize the use of resources among AESs. If an AES is not active for a period of time specified in the AMSS SARPs (i.e. it is not transmitting data or does not have a voice call set up to the log-on GES or to any other GES in the same satellite service area), the log-on GES logs-off the AES if the AES does not respond to log-on interrogation (for direct log-on verification) or remains inactive for 12 hours (for indirect verification). The resources released can thus be made available to other AESs that are trying to log on but cannot succeed due to insufficient resources at the GES.

10.4.2.2.3 The reason for an AES logged on to a GES to be inactive is that the AES has either landed without logging off or has switched satellites. Under such conditions, it is appropriate for the log-on GES to log off the AES.

10.4.2.3 *Log-on prompt*

The log-on prompt facility at a GES is used to prompt an AES to log on when the GES link layer receives a signal unit (SU) from an AES on an R_d channel and the AES is not in its AES log-on status table. This situation can occur if the GES has not updated its AES log-on status table after the initial log-on. The GES transmits the log-on prompt LIDU to the AES on all P channel frequencies.

10.4.2.4 *Assignment of data channels*

The GES management assign data channels (P, R, and T channels) at the highest bit rate, which is provided at both the GES and the AES and is supported by the combination of a satellite in use and the level of the AES. The decision as to which channels and with what EIRP to assign, can be made by the GES management from the following information:

a) the satellite in use (its return link sensitivity); and

b) the level of AES.

The GES management can assign up to eight R channels and up to four T channels at the time of log-on.

10.4.3 GES CHANNEL MANAGEMENT

10.4.3.1 *C channel frequency management*

On the basis of known/planned/predicted traffic capacity requirements, the GES can be pre-assigned a number of SCPC frequencies for use as a forward and return C channels. The total number of frequencies assigned to GESs within the same satellite service area is normally less than the total capacity available for the satellite in operation. On demand, each GES assigns the frequencies for a circuit-mode call from its own pool. However, lack of channel frequency for a call at the GES results in the initiation of a channel frequency reassignment request to a central authority which initially made the pre-assignment. The central authority can then make an assignment of frequency to the GES utilizing the frequencies held in a common pool.

10.4.3.2 *C channel power management*

10.4.3.2.1 The GES calculates the initial EIRP of the C channel according to the value derived from the worst case link budget.

10.4.3.2.2 The GESs can be assigned power budgets consistent with performance requirements of the channels operating to the satellite. Once this power budget is fully utilized, the GES management rejects further channels/call requests until sufficient power has been released to be assigned to the new requests or until the log-on request LIDU indicates AES in distress. The C channel power can be controlled for example in accordance with the following power control decision table:

for the 21 000 bits/s, rate 1/2 FEC channel, if the average number of errors per 2 560 channel bits (before decoding) is:

greater than 172:	increase EIRP by 2 dB
between 119 and 172:	increase EIRP by 1 dB
between 76 and 119:	leave EIRP unchanged
between 44 and 76:	decrease EIRP by 1 dB
less than 44:	decrease EIRP by 2 dB.

Note.— These values correspond to the input bit error rates to a rate 1/2 Viterbi decoder as specified for the C channel that provide an output bit error rate of 10^{-3} (nominal) to 10^{-4} (1 dB above nominal), with a margin of 1.5 dB.

10.4.4 GES PRE-EMPTION MANAGEMENT

10.4.4.1 *Voice versus voice pre-emption*

The purpose of this capability at the GES is to make resources available for a higher precedence voice call if there are no additional resources available at the GES and lower precedence voice calls are being serviced. The GES management, upon receipt of a request from circuit-mode services for a channel unit for a voice call, checks if the precedence of the new request for voice call set-up is higher than any call already in progress. If the precedence of new call request is higher than any one call-in-progress, the GES management then ruthlessly pre-empts the lowest precedence call in progress to make resources available for the higher precedence call. If there are more than one call at the lowest precedence in progress at a given time then it is at the discretion of the GES operator to pre-empt a call. One option could be to pre-empt the call which has been in progress for the longest time.

10.4.4.2 *Data versus voice pre-emption*

The purpose of this capability at the GES is to make resources available to set up an additional P channel for higher precedence data traffic when there are no additional resources available at the GES to set up an additional P channel, and lower precedence voice calls are being serviced and transmission of additional data traffic on the already operational P channels would violate the data transfer delay requirements specified in Annex 10, Volume III, Part I, Chapter 4, 4.7. However, a higher precedence voice call does not pre-empt an operational P channel to make resources available for setting up a higher precedence voice call because doing so will be detrimental to data transmissions from the AES.

10.4.5 GES SYSTEM BROADCAST

10.4.5.1 *System table broadcast*

10.4.5.1.1 This facility at the GES allows the GES to update the system table information and spot beam map information stored in an AES. The system table and spot beam map updates are transmitted to AESs as complete or partial sequences.

10.4.5.1.2 The initial search data in the system table contains satellite-identifying P_{smc} channel frequencies for all satellites. Any changes to the system table are made centrally by the satellite system provider and are disseminated to all GESs within all the satellite service areas provided by the satellite system provider, as required. The revision number for a system table and spot beam map are unique to each satellite service area.

10.4.5.1.3 The complete sequence is transmitted by the designated GES on the satellite-identifying P_{smc} channel and it comprises all broadcast LIDUs headed by a broadcast index LIDU. The partial sequence comprises one or more broadcast LIDUs headed by a broadcast index LIDU. The partial sequence contains the most recent updates only. The broadcast index LIDU identifies the presence of individual LIDU series within both the complete and partial sequences. Each GES broadcasts a partial sequence on all its operational P channels. Each satellite service area has its own system table and spot beam map broadcast information.

10.4.5.1.4 The system table complete and partial sequence broadcast rates may be reduced due to high P channel loading. This may delay the initiation of the log-on procedure at the AES. It is recommended that the GES management monitor such broadcast rates and provide further P channel capacity to maintain these rates at acceptable levels.

10.4.5.1.5 The system table consists of :

a) system table broadcast index SU (Figure A2-30, Chapter 4, Annex 10, Volume III);

b) system table broadcast satellite/beam ID channel advice SU (Figure A2-32, Chapter 4, Annex 10, Volume III);

c) system table broadcast GES P/R channel advice SU (Figure A2-31, Chapter 4, Annex 10, Volume III);

d) system table broadcast GES beam support advice SU (Figures A2-34 and A2-61, Chapter 4, Annex 10, Volume III); and

e) system table broadcast data channel EIRP SU (Figure A2-62, Chapter 4, Annex 10, Volume III).

The system table broadcast data channel EIRP SU is used by the AES in accordance with 4.10.4.4.3.1.1 of Annex 10, Volume III.

10.4.5.1.6 Where a satellite supports spot beam service, a GES transmits the spot beam map series consisting of SUs as shown in Figure A-21 of this guidance material. This sequence is independent to the system table broadcast series and contains the definition of the spot beam coverage areas and the GES services supported in the spot beams. The AES, upon receiving the complete series, will then know what spot beam(s) it is currently in and the services that are available to it. The AES may use this information to determine which GES to log on to. The message types for the spot beam map series are:

18 spot beam map broadcast — complete sequence — initial SU
19 spot beam map broadcast — complete sequence — SSU
26 spot beam map broadcast partial sequence — initial SU
27 spot beam map broadcast partial sequence — SSU

10.5 Considerations for GES services

10.5.1 The AMSS system, which forms part of the ICAO communications, navigation, and surveillance/air traffic management (CNS/ATM) systems concept, provides communication services on a global basis. The AMSS system architecture consists of a number of satellites and a limited number of GESs. All States/administrations can have full access to the AMSS, but most of them will not need to have their own GES; rather they will connect to the network through service providers.

10.5.2 Although a small number of GESs are sufficient for AMSS in a given geographical area, some States or administrations may feel it is necessary to install and operate their own GES for reasons such as:

a) redundancy — reducing the impact of GES failure;

b) less dependency on other States (who operate GESs) and service providers; and

c) exerting authority and control in their airspace.

10.5.3 However, the proliferation of GESs can lead to problems such as:

a) increased demand for spectrum because of the inefficiencies introduced by dividing the available spectrum into small pieces;

b) degraded packet data performance as AESs are subjected to more log-on/log-off cycles as they transit between various flight information regions (FIRs) which operate their own GESs;

c) increased workload for the flight crew (or cost and complexity of the AES) as they transit between various FIRs which operate their own GESs.

10.5.4 Additional factors which affect the number of GESs are the following:

a) available satellite power will limit the number of 600 bit/s P-channels, i.e. GESs, which can be supported per satellite; and

b) the cost of installing and operating a GES will not be economical for most administrations.

Given this, some States may be concerned about their dependency on other States or service providers, for GES services. This concern can be alleviated by several considerations:

a) For packet services, the ATN will allow States without GESs to choose between a number of different States or service providers to obtain GES services.

b) In States where the ATN is less developed, fixed satellite links between a GES and the air traffic control centre could provide an alternative to terrestrial links. This approach could be a source of both cost-competitiveness and redundancy. If designed properly, the extra delay introduced by a second satellite link will have a negligible effect on the packet data performance. A second satellite link may not be adequate for voice communications, at least not in a normal conversation mode. However, its effect on verbal exchanges typical of ATC applications has not been studied.

c) States should have adequate institutional arrangements with service providers based on ICAO guidelines for AMSS.

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TABLES FOR ATTACHMENT A

Table A-1. Typical implementation versus levels of capability

Levels of capability	Packet data service (kbits/s)	Circuit mode service (kbits/s)	Number of channels	AES antenna gain	Comments
1	0.6 1.2	Not available	1 transmit 1 receive	0 dB	
2	0.6 4.8 10.5	Not available	1 transmit 1 receive	12 dB or 6 dB (6 dB does not support 10.5 kbits/s data channels)	Higher speed for packet data
3	0.6 4.8 10.5	Voice 21.0 and/or 8.4	1 transmit 2 receive	12 dB or 6 dB (6 dB does not support 21.0 kbits/s voice or 10.5 kbits/s data channels)	Provides digitized voice and packet data, but not simultaneously
4	0.6 4.8 10.5	Voice 21.0 and/or 8.4	2 or more transmit 2 or more receive	12 dB or 6 dB (6 dB does not support 21.0 kbits/s voice or 10.5 kbits/s data channels)	Simultaneous two-way packet and voice. Needs linear amplifier and power control for each carrier

NOTES:

1. Circuit mode data services may be supported by some implementation, but these are not defined in the AMSS SARPs.
2. The 4.8 kbits/s channel applies only to the P channel.

Table A-2. Worst case data performance versus channel rate

Minimum channel rate in use by AES (bit/s)	Maximum connection establishment delay (95th percentile) (seconds)	Transit delay (average) (seconds)			Data transfer delay (95th percentile) (seconds)		
		To-aircraft		From-aircraft	To-aircraft		From-aircraft
		Highest priority	Lowest priority	Highest priority	Highest priority	Lowest priority	Highest priority
600	70	12	40	40	15	110	80
1 200	45	8	25	30	9	60	65
2 400	25	5	12	15	6	30	35
4 800	25	4	7	13	5	20	30
10 500	25	4	5	13	4	10	30

Residual error rate:
from-aircraft direction: 10^{-4} per SNSDU (maximum)
to-aircraft direction: 10^{-6} per SNSDU (maximum)

NOTES:

1. In any particular AES, lower priority from aircraft traffic may be subject to additional delay, depending on the amount and rate of from-aircraft traffic loading.
2. The values of the transfer delays are based on packet sizes of 128 octets.

Table A-3. Q-precedence structure for AMSS transmissions

AMSS Q-number	Function
15	Distress/urgency voice; signalling
14	Distress/urgency data messages
13	Reserved for signalling
12	Flight safety voice; signalling
11	Flight safety data messages; communications related to direction finding
10	Meteorological and flight regularity voice; signalling
9	Reserved for signalling
8	Meteorological data messages
7	Flight regularity data messages
6	Aeronautical Information Service Messages
5	Aeronautical administrative data messages, network/systems administrative data messages
4	Routine cockpit and cabin voice; signalling
3-0	Various AAC and APC categories; other

Table A-4. Frequency error budget for receiving the P channel

	Specification	Standard deviation
GES transmit reference error	±100 Hz	57.7 Hz
AFC pilot transmit error	±100 Hz	57.7 Hz
GES AFC error	±100 Hz	57.7 Hz
AES receive reference error	±155 Hz	89.5 Hz
Oscillator related errors at AES		
— standard deviation		134.2 Hz
— 99 per cent contour		±345.6 Hz

NOTES:

1. It is assumed that oscillator specifications define a uniform error distribution.
2. The contribution of a number of oscillators to the overall error is estimated using a root-sum-square calculation.

Table A-5. AES-to-GES frequency error budget with a P channel reference

	Specification (Hz)	Standard deviation (Hz)
AES receive reference error × 1.07[1]		107
AES transmit/receive reference error	(165 + 155) = 320	184.8
AES AFC error	100	57.5
AFC pilot transmit frequency error[2]	75	43.3
GES AFC error[2]	100	57.7
Frequency error at GES demodulator — standard deviation — 99 per cent contour[3]		 232.6 ±600

1. This is the total of the first three contributors to frequency error for the P channel. The factor of 1.07 is the approximate ratio of the transmit and receive frequencies.
2. The combination of the GES AFC error and the AFC pilot transmit error produce the frequency error of the satellite translation oscillators on the return link.
3. This is the GES demodulator specification.

Table A-6. Typical C channel carrier-to-noise densities required

	To-aircraft link C channels (voice)		From-aircraft link C channels (voice)	
Elevation angle to the satellite (degrees)	5	20	5	20
Objective FEC decoder output BER	10^{-3}	10^{-3}	10^{-3}	10^{-3}
AES minimum antenna gain (dB)	12	12	12	12
Carrier/multipath ratio (dB)	10	12	10	12
Multipath fading bandwidth (Hz)	20 to 100	20 to 100	20 to 100	20 to 100
FEC coding rate	½	½	½	½
Modulation method	A-QPSK	A-QPSK	A-QPSK	A-QPSK
Theoretical required E_s/N_0 (dB)	1.2	0.6	1.2	0.6
Modem implementation loss (dB)	1.1	0.9	1.1	0.9
Imperfect interleaving loss (dB)	3.0	1.2	3.0	1.2
Adjacent channel interference loss (dB)	0.1	0.1	0.8	0.8
Modem E_0/N_0 (dB) required	5.4	2.8	6.1	3.5
REQUIRED C/N_0 (dBHz)				
21.0 kbits/s	48.6	46.0	49.3	46.7

Table A-7. Typical P channel carrier-to-noise densities required

	To-aircraft link P channels (low rate data)		To-aircraft link P channel (high rate data)	
Elevation angle to the satellite (degrees)	5	20	5	20
Objective FEC decoder output BER	10^{-5}	10^{-5}	10^{-5}	10^{-5}
AES minimum antenna gain (dB)	0	0	12	12
Carrier/multipath ratio (dB)	7	12	10	12
Multipath fading bandwidth (Hz)	20 to 100	20 to 100	20 to 100	20 to 100
FEC coding rate	½	½	½	½
Modulation method	A-BPSK	A-BPSK	A-QPSK	A-QPSK
Theoretical required E_s/N_0 (dB)	5.0	3.5	2.8	2.4
Modem implementation loss (dB)	1.2	1.1	1.5	1.1
Imperfect interleaving loss (dB)	1.0	0.5	1.0	0.5
Adjacent channel interference loss (dB)[1]	0.1	0.1	0.1	0.1
Modem E_s/N_0 (dB) required	7.3	5.2	5.4	4.1
REQUIRED C/N_0 (dBHz)				
0.6 kbits/s	35.0	32.9		
1.2 kbits/s	38.1	36.0		
2.4 kbits/s	41.1	39.0		
4.8 kbits/s			42.2	40.9
10.5 kbits/s			45.6	44.3

NOTES:

1. The adjacent channel interference loss is a function of channel spacing. The example losses are for channel rates of 2.4 and 10.5 kbits/s, for A-BPSK and A-QPSK, respectively. The losses should be no greater for the other channel rates because the channel spacing, relative to the channel rate, will be larger.
2. The low data rates (A-BPSK) can also be used with high gain antennas with potentially less C/N_0 required.

Table A-8. Typical R/T channel carrier to noise densities required

	From-aircraft link R/T channels (low rate data)		From-aircraft link R/T channel (high rate data)	
Elevation angle to the satellite (degrees)	5	20	5	20
Objective FEC decoder output BER	10^{-5}	10^{-5}	10^{-5}	10^{-5}
AES minimum antenna gain (dB)	0	0	12	12
Carrier/multipath ratio (dB)	7	12	10	12
Multipath fading bandwidth (Hz)	20 to 100	20 to 100	20 to 100	20 to 100
FEC coding rate	½	½	½	½
Modulation method	A-BPSK	A-BPSK	A-QPSK	A-QPSK
Theoretical required E_s/N_0 (dB)	5.0	3.5	2.8	2.4
Modem implementation loss (dB)	1.2	1.1	1.5	1.1
Imperfect interleaving loss (dB)[1]	1.2	0.6	1.0	0.5
Adjacent channel interference loss (dB)[2]	0.1	0.1	0.4	0.4
Modem E_s/N_0 (dB) required	7.5	5.3	5.7	4.4
REQUIRED C/N_0 (dBHz)				
0.6 kbits/s	35.0	32.9		
1.2 kbits/s	38.1	36.0		
2.4 kbits/s	41.3	39.1		
4.8 kbits/s			42.5	41.2
10.5 kbits/s			45.9	44.6

NOTES:

1. The interleaver loss is a function of channel rate, the example losses correspond to channel rates of 2.4 and 10.5 kbits/s for A-BPSK and A-QPSK, respectively.
2. The adjacent channel interference loss is a function of channel spacing, the example losses correspond to channel rates of 2.4 and 10.5 kbits/s for A-BPSK and A-QPSK, respectively. The losses should be no greater for the other channel rates because the channel spacing, relative to the channel rate, will be larger.
3. The low data rates (A-BPSK) can also be used with high gain antennas with potentially less C/N_0 required.

Table A-9. Channel spacings

Channel rate (kbits/s)	Channel spacing (kHz)	Modulation
21.0	17.5	A-QPSK
10.5	10.0/7.5[1]	A-QPSK
8.4	7.5	A-QPSK
6.0	5.0	A-QPSK
5.25	5.0	A-QPSK
4.8	5.0	A-QPSK
2.4	5.0	A-BPSK
1.2	5.0/2.5[2]	A-BPSK
0.6	5.0/2.5[2]	A-BPSK

NOTES:

1. Channel spacing for 10.5 kbits/s channels may be 10.0 or 7.5 kHz, according to the relative availability of power and bandwidth in the operating satellite.
2. Channel spacing of 5.0 kHz applies to the P channel and 2.5 kHz applies to the R and T channel.

Table A-10. Typical values for computing earliest starting time

P Channel bit rate bits/s	P Channel unit delay(s)	Queuing delay(s)	AES processing delay(s)
600	3.0	0.7	1.8
1200	2.0	0.5	1.2
≥1200	1.5	0.5	1.0

Table A-11. Minimum throughput values
(minimum achievable throughput on a subnetwork connection, bits/s, with 128-octet packets)

Minimum channel rate in use by AES (bits/s)	To-aircraft		From-aircraft	
	Highest priority service	Lowest priority service	Highest priority service	Lowest priority service
600	70	35	35	30
1 200	130	70	100	80
2 400	150	90	300	275
4 800	160	110	500	475
10 500	165	115	500	475

Table A-12. Probability of delivering at least one abbreviated access request SU (per cent)

Call priority (series length)	Conflicting traffic comprising 1-SU bursts	Conflicting traffic comprising 3-SU bursts
Distress/urgency (4)	99.99	97.9
Flight safety (3)	99.7	93.7
Regularity/meteorological (2)	97.5	89.2

Table A-13. Projected AMS(R)S subnetwork abbreviated call set-up delay performance, (seconds) (R and P channels operating at 600 and 10 500 bits/s)

		Average	95 percentile
AIR-ORIGINATIONS	**AMS(R)S subnetwork signalling transit delay**		
	(Difference between the time at which an air-originated call request (incoming FITE 18) is received at the AES interworking interface and the time at which the GES forwards the resultant call indication (outgoing FITE 18) to the terrestrial network.)	4 [@ 600 bits/s] 3 [@ 10 500 bits/s]	6 to 11 [@ 600 bits/s] 3 to 7 [@ 10 500 bits/s]
	Call set-up delay		
	(Difference between the time at which an air-originated call request (incoming FITE 18) is received at the AES interworking interface and the time at which the C channel is ready for speech).	12 to 14 [@ 600 bits/s] 10 to 11 [@ 10 500 bits/s]	14 to 23 [@ 600 bits/s] 11 to 14 [@ 10 500 bits/s]
GROUND-ORIGINATIONS	**Call set-up delay**		
	(Difference between the time at which a ground-originated call request (incoming FITE 18) is received at the GES interworking interface and the time at which the C channel is ready for speech and the AES forwards the resultant call indication (outgoing FITE 18) to the AES interworking interface.)	9 to 11 [@ 600 bits/s] 9 [@ 10 500 bits/s]	10 to 17 [@ 600 bits/s] 10 [@ 10 500 bits/s]

FIGURES FOR ATTACHMENT A

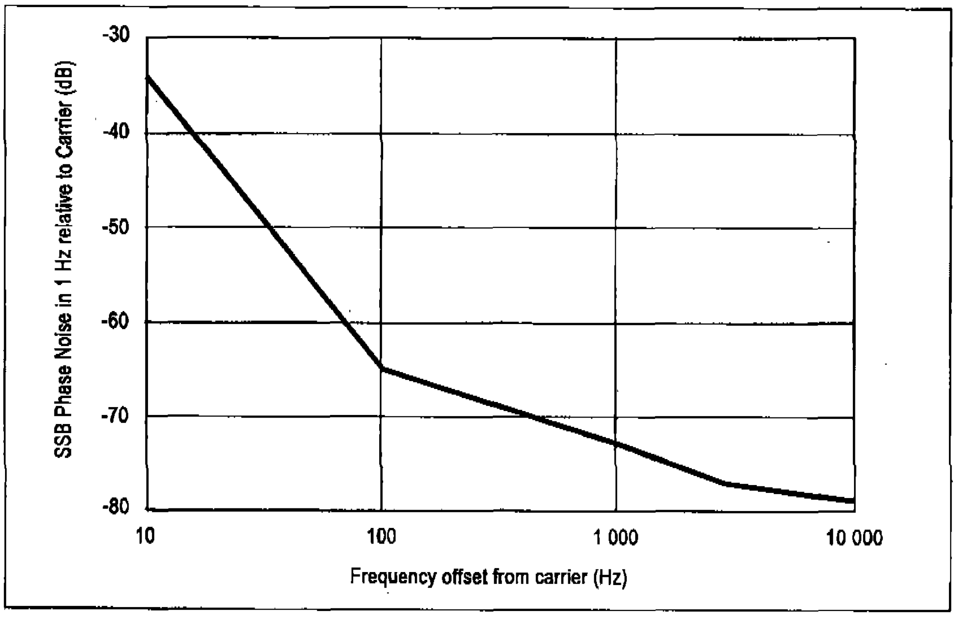


Figure A-1. Phase noise of L-band signals received by AES

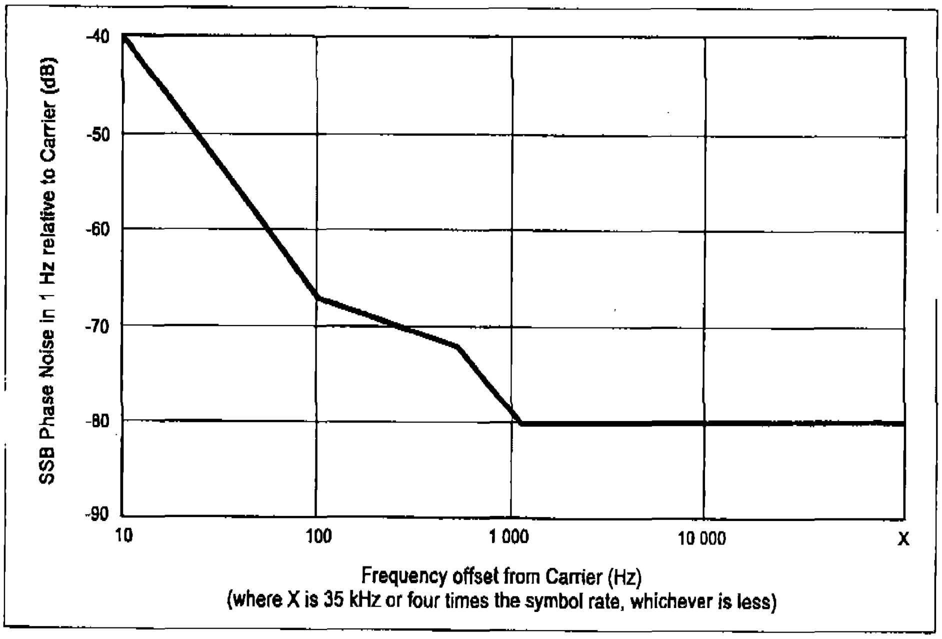


Figure A-2. AES transmit phase noise mask

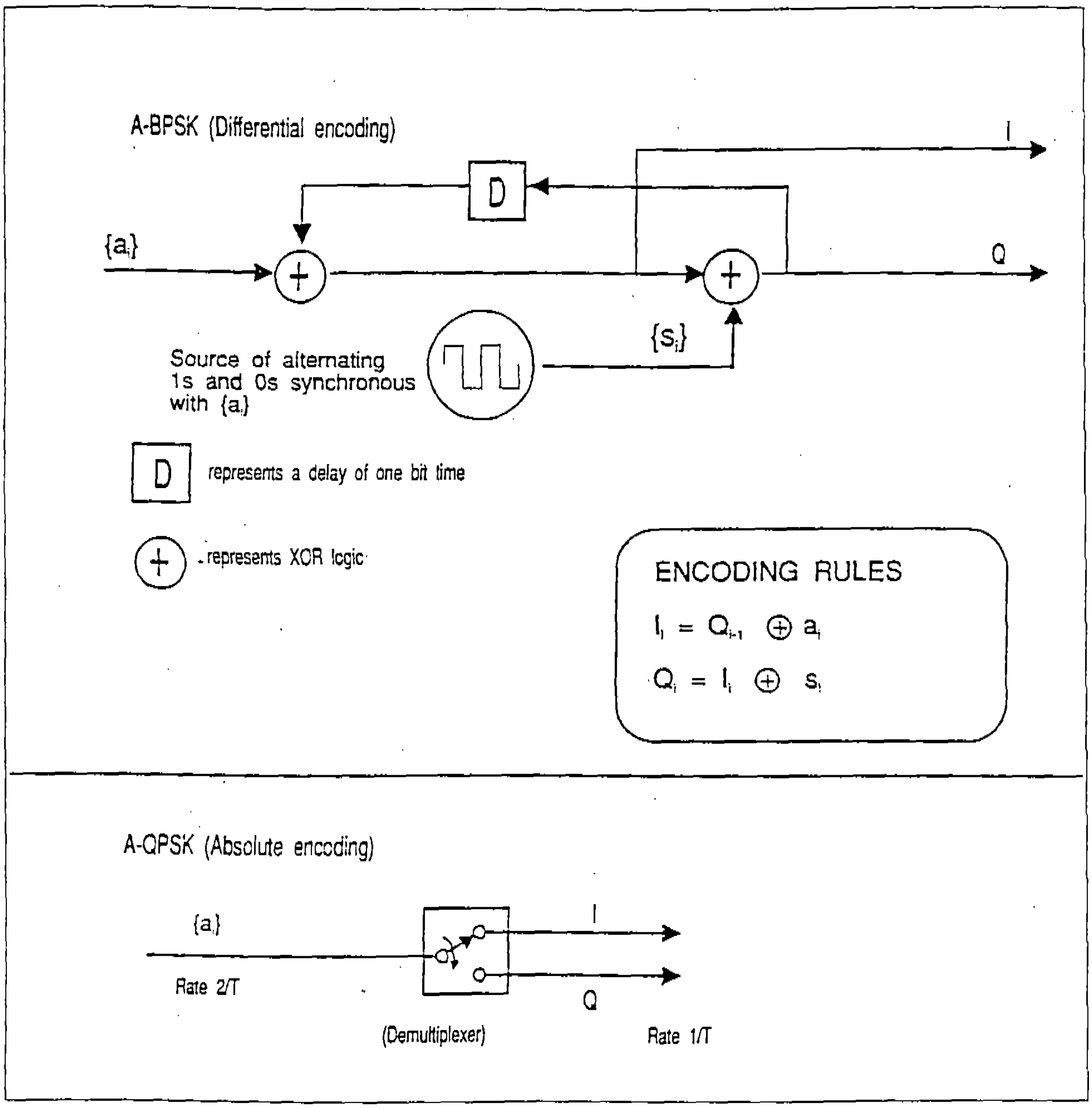
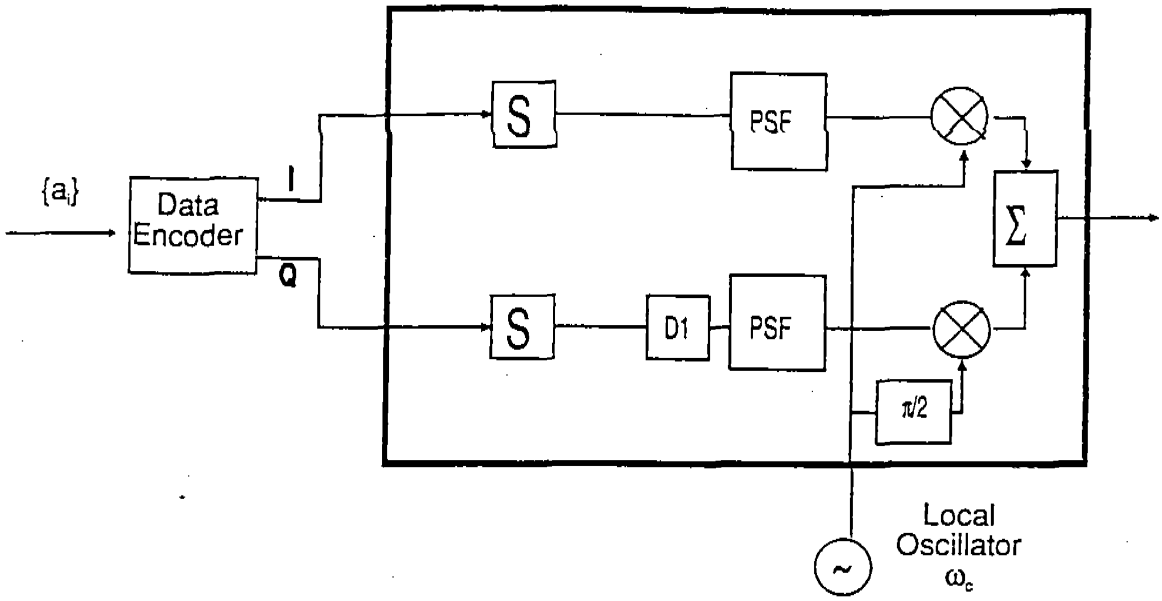


Figure A-3. Data encoders for modulator model



{a_i} is input data sequence. Channel rate is
1/T for A-BPSK
2/T for A-QPSK

{a_i} is mapped into two bit streams on the I and Q lines, each with bit rate 1/T

S is an ideal sampling process:
input = "1", output = $\delta(t)$
input = "0", output = $-\delta(t)$

D1 is a delay of: 0 for A-BPSK
T/2 for A-QPSK

PSF are Pulse Shaping Filters

⊗ represents an ideal linear modulator

Σ represents an ideal combiner

Figure A-4. Ideal modulator (A-BPSK and A-QPSK)

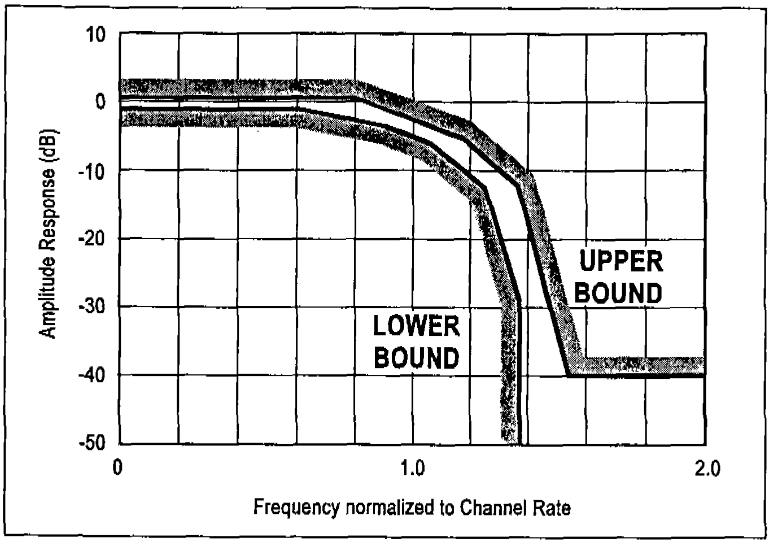


Figure A-5. AES A-BPSK transmit filter response mask

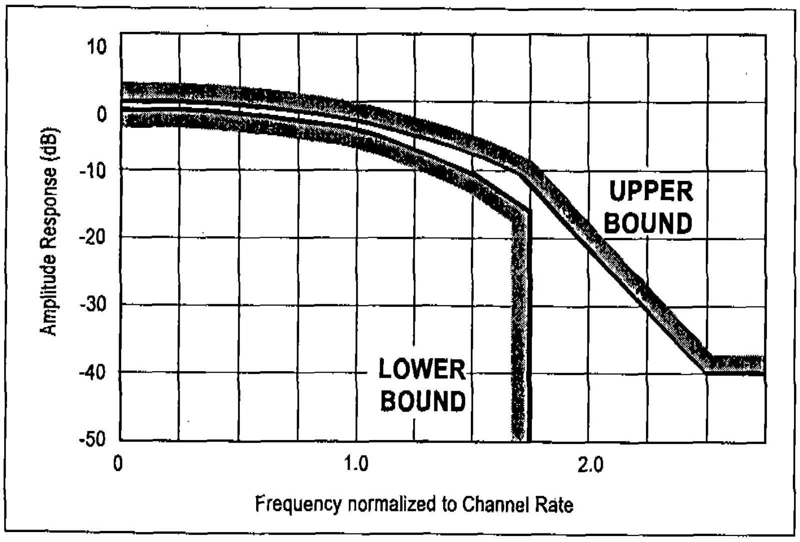


Figure A-6. AES A-QPSK transmit filter response mask for 100 per cent roll-off

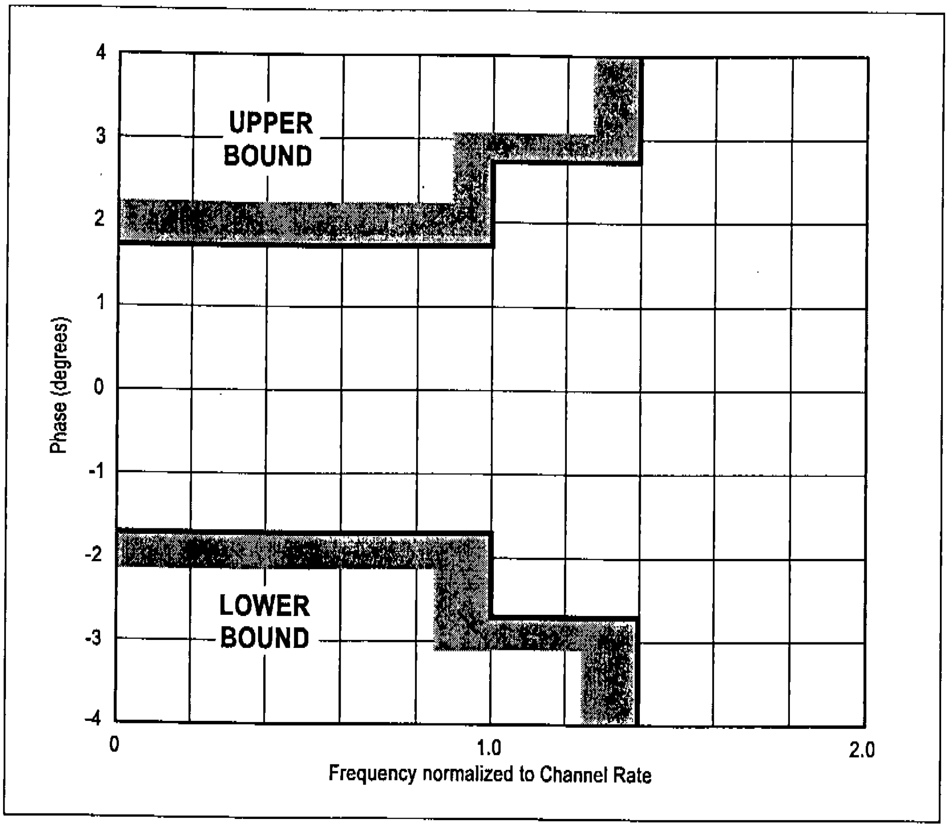
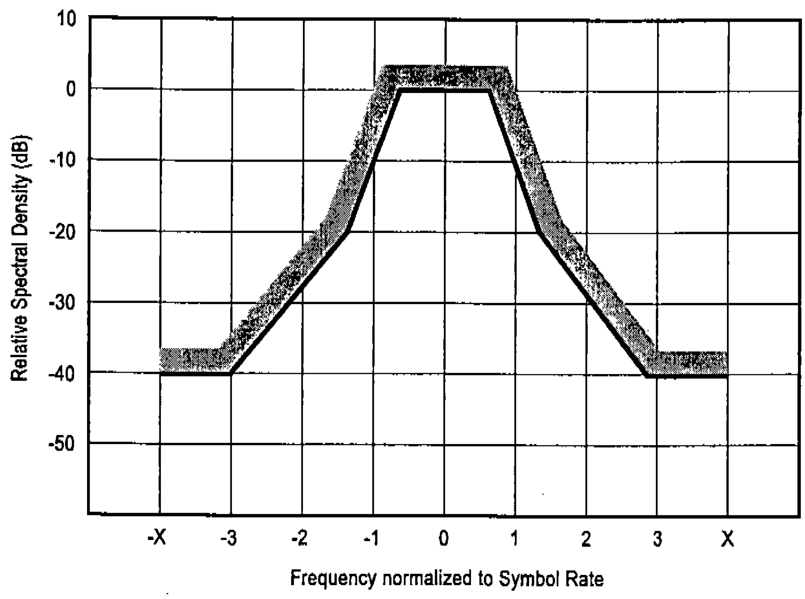


Figure A-7. Phase deviation tolerance for A-BPSK and A-QPSK transmit filter response mask for 100 per cent roll-off



NOTE:
1. The symbol rate is equal to the channel rate for A-BPSK and is half the channel rate with A-QPSK.
2. The frequency X is 35 kHz.

Figure A-8. Required spectral limits for AES transmissions for 100 per cent roll-off

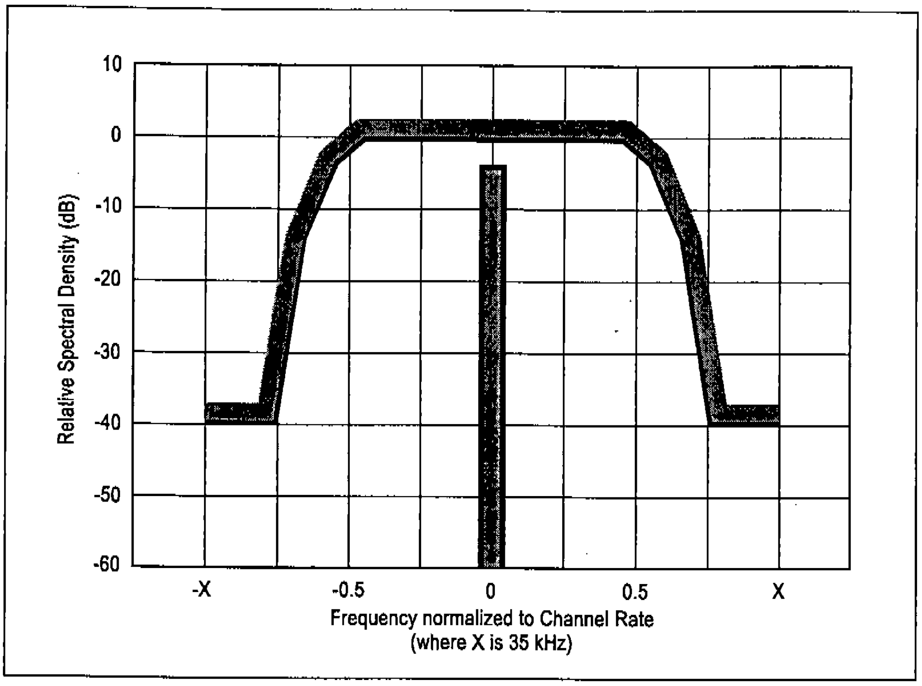


Figure A-9. Spectral mask of A-BPSK received by AES

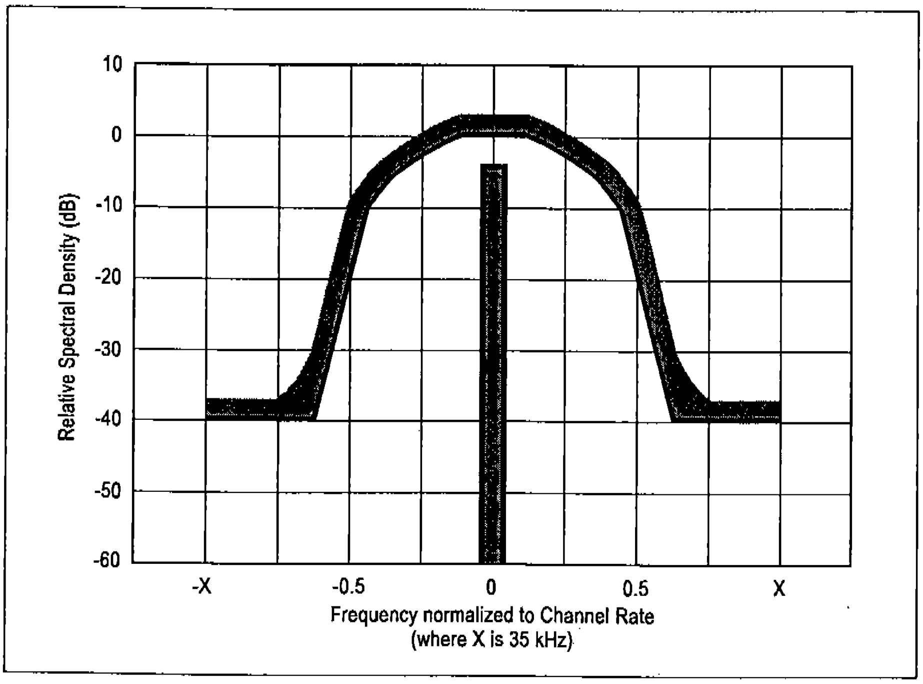


Figure A-10. Spectral mask of A-QPSK received by AES

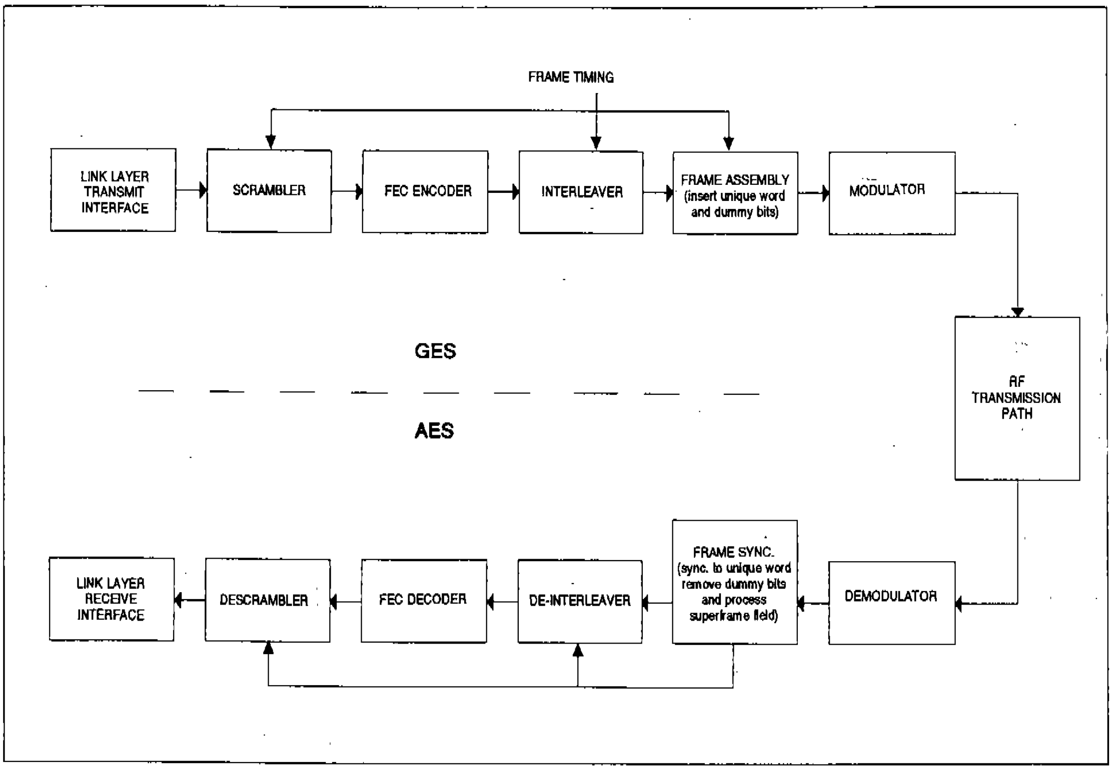


Figure A-11. P channel functional blocks

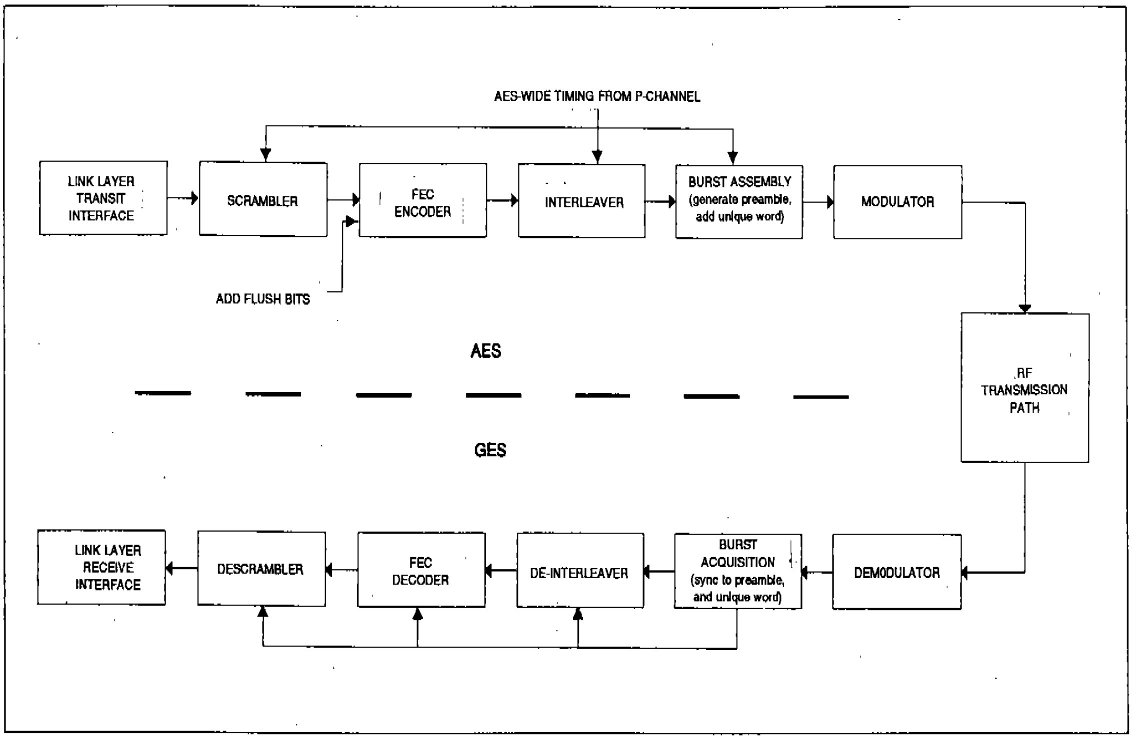


Figure A-12. R and T channel functional blocks

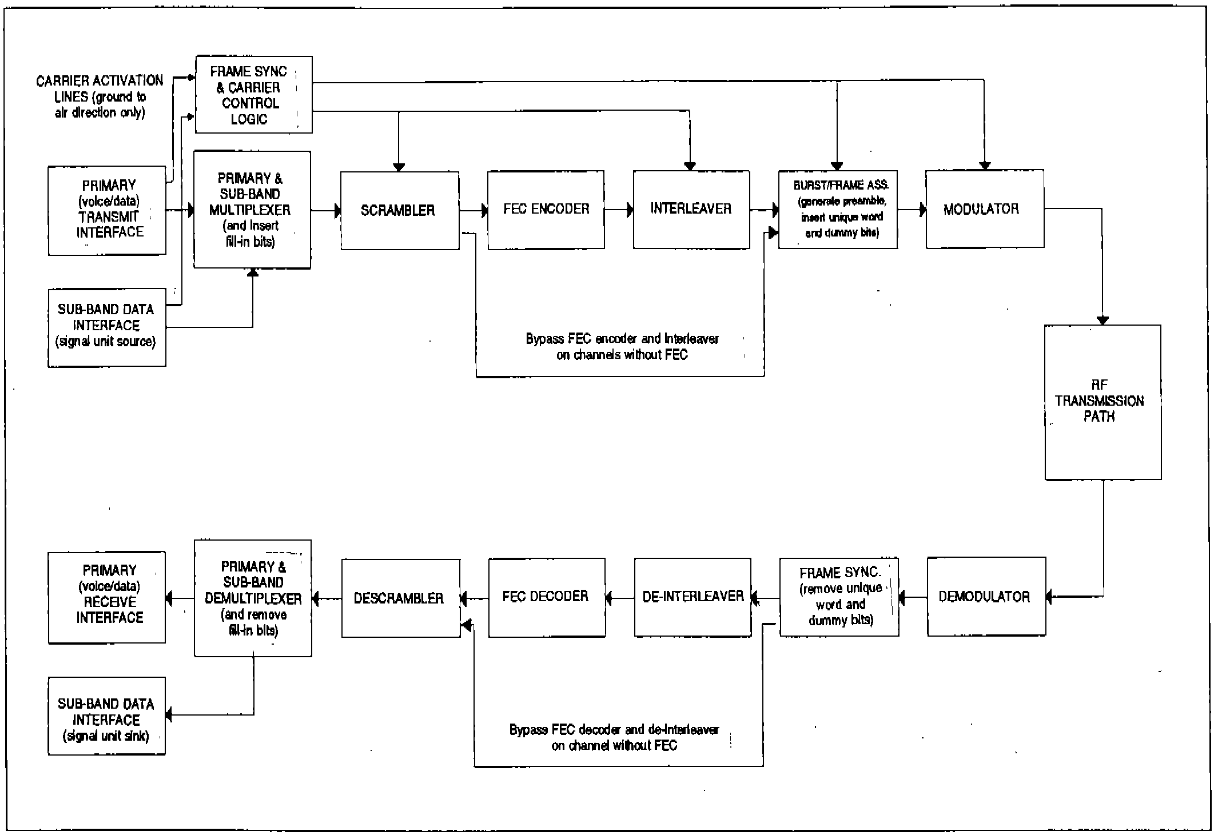


Figure A-13. C channel functional blocks

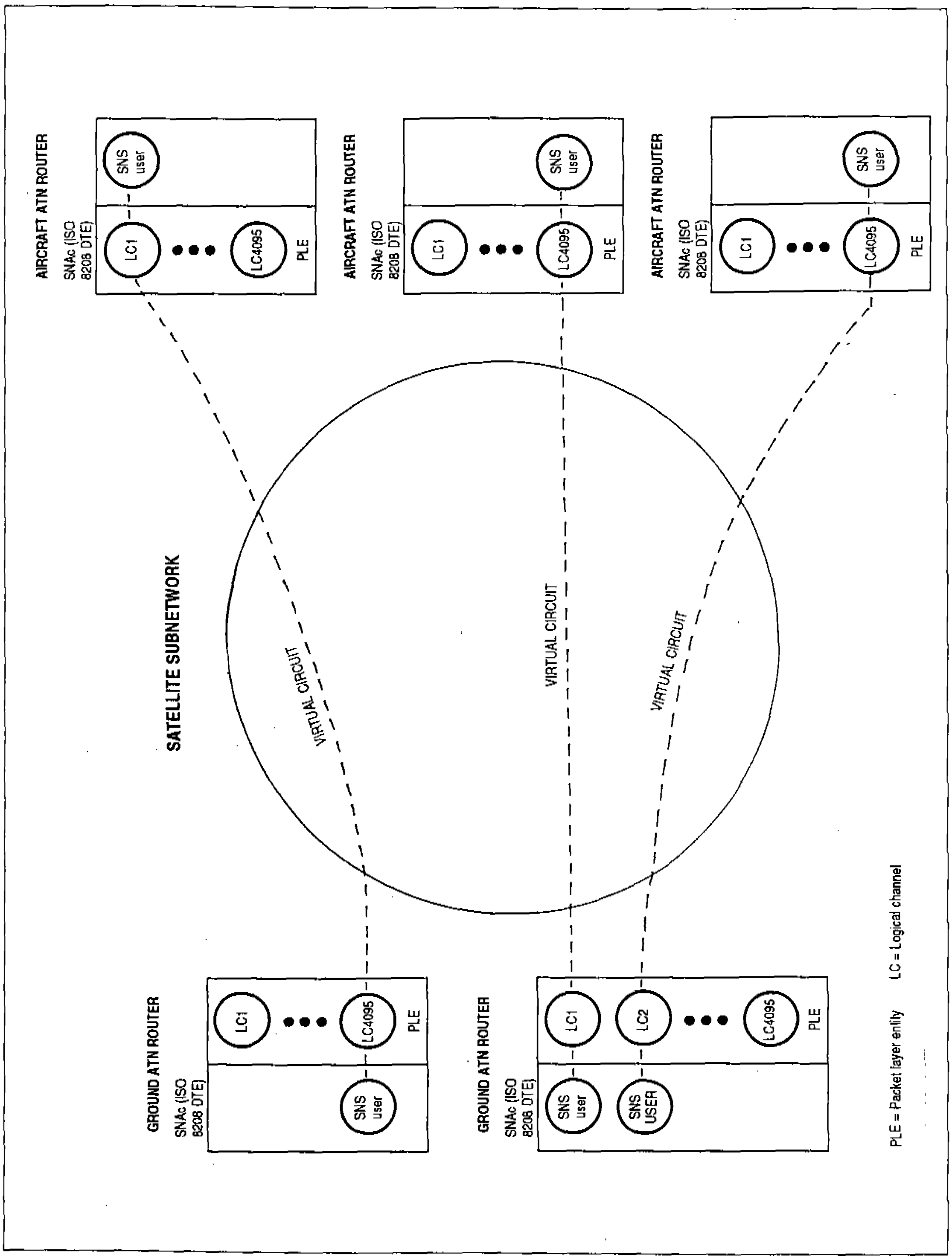


Figure A-14. Satellite subnetwork connection-oriented packet data service

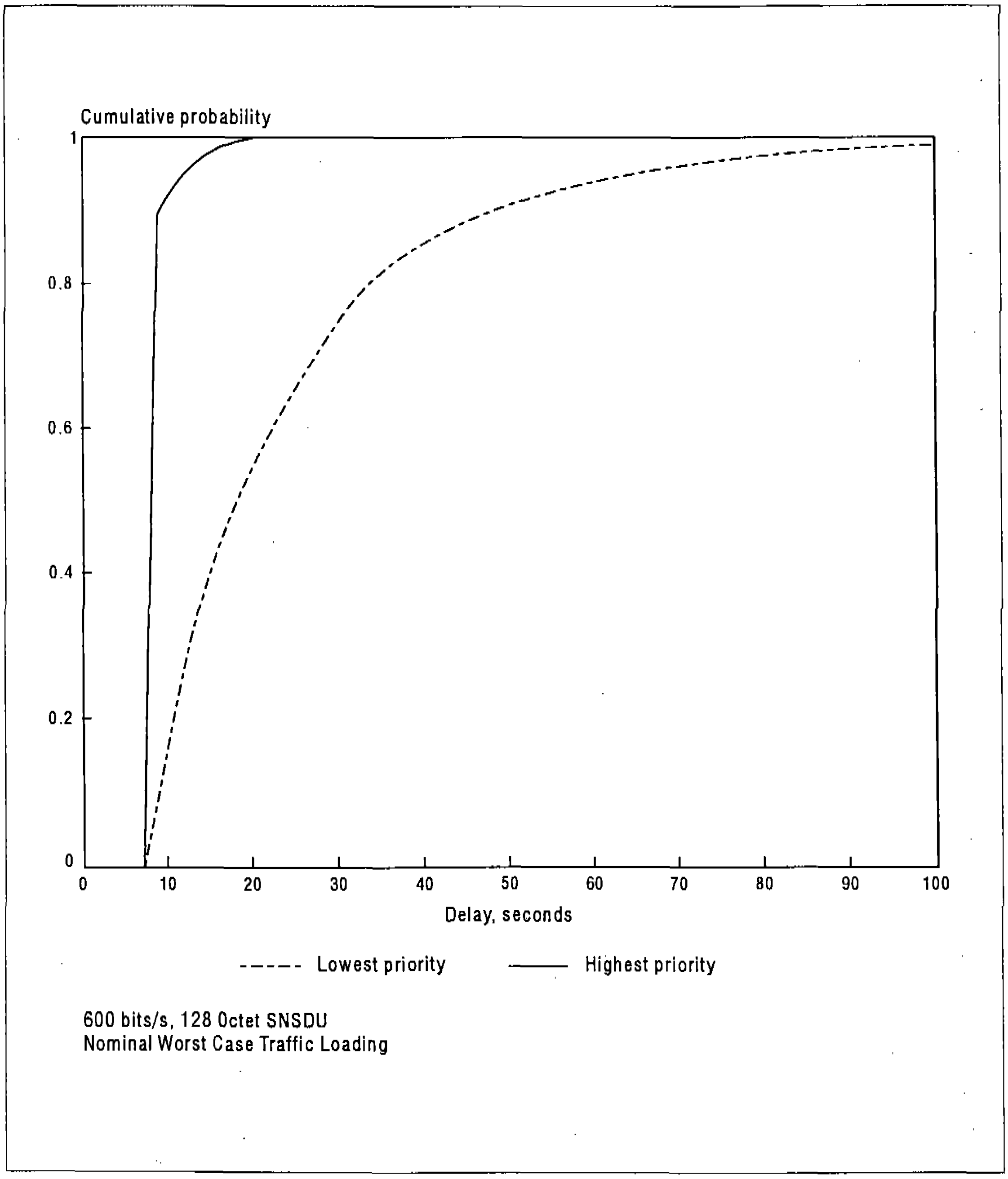


Figure A-15. Typical to-aircraft delay distributions

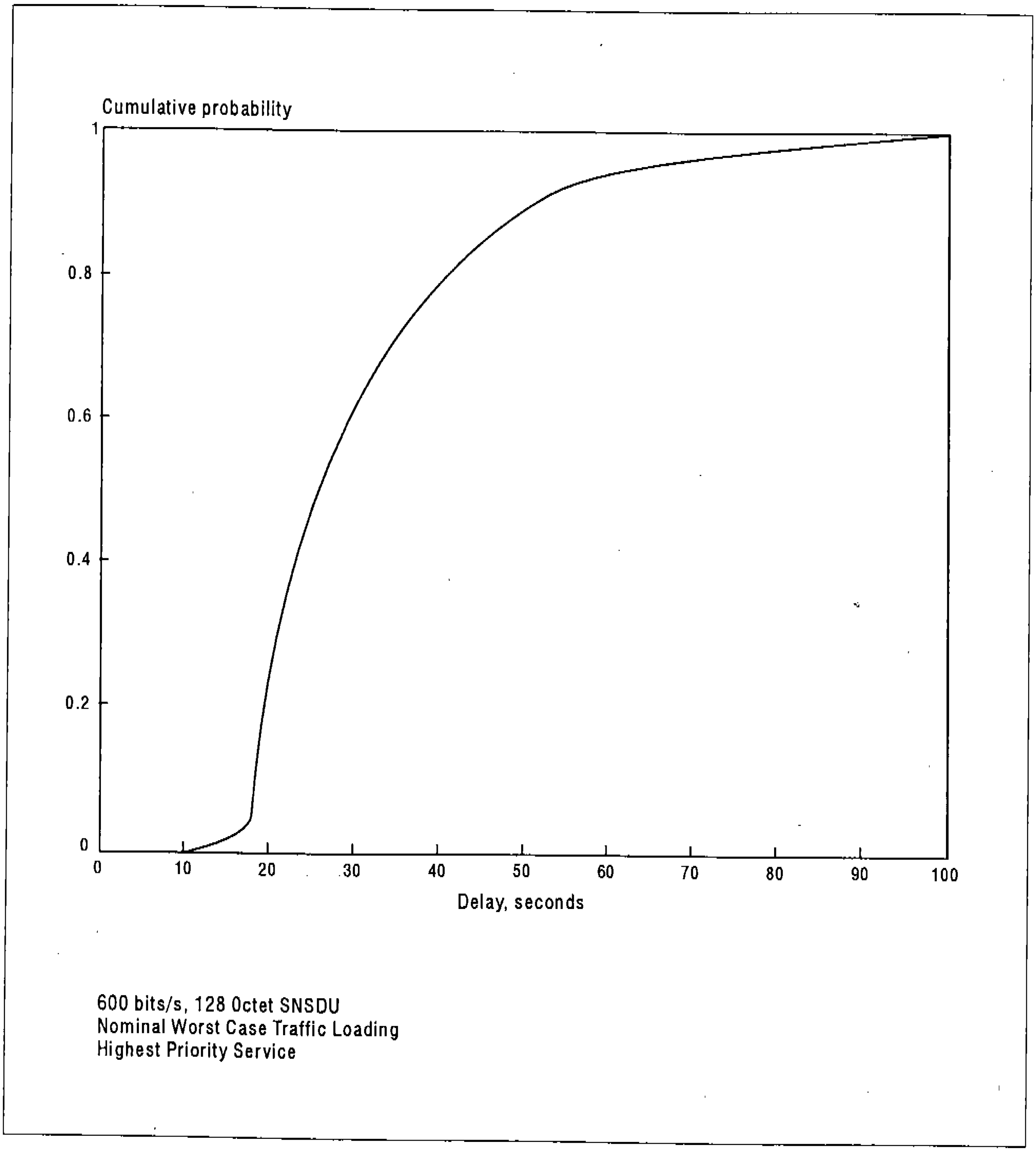


Figure A-16. Typical from-aircraft delay distribution

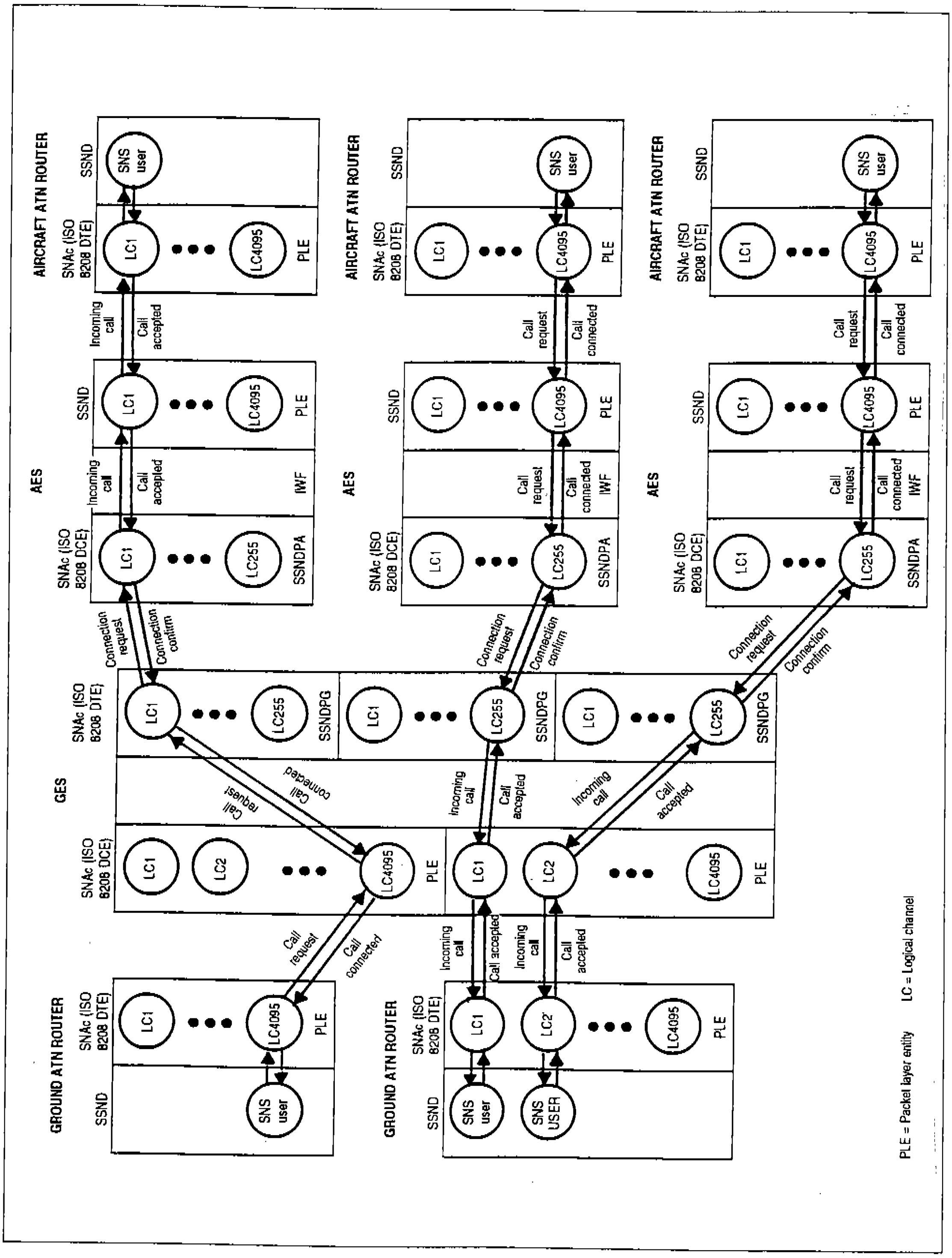


Figure A-17. Satellite subnetwork protocol entities and virtual circuit establishment

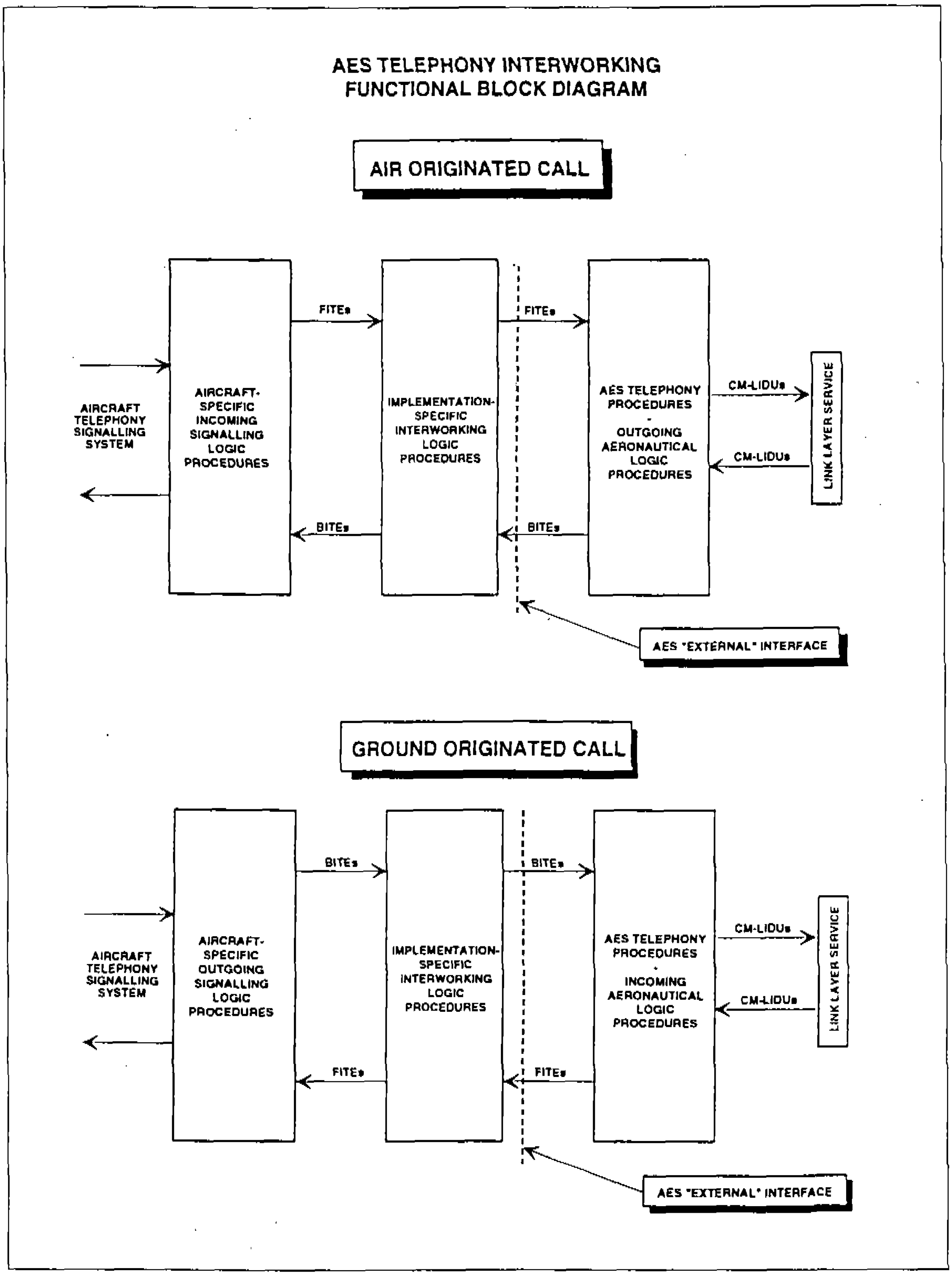


Figure A-18. AES telephony interworking block diagram

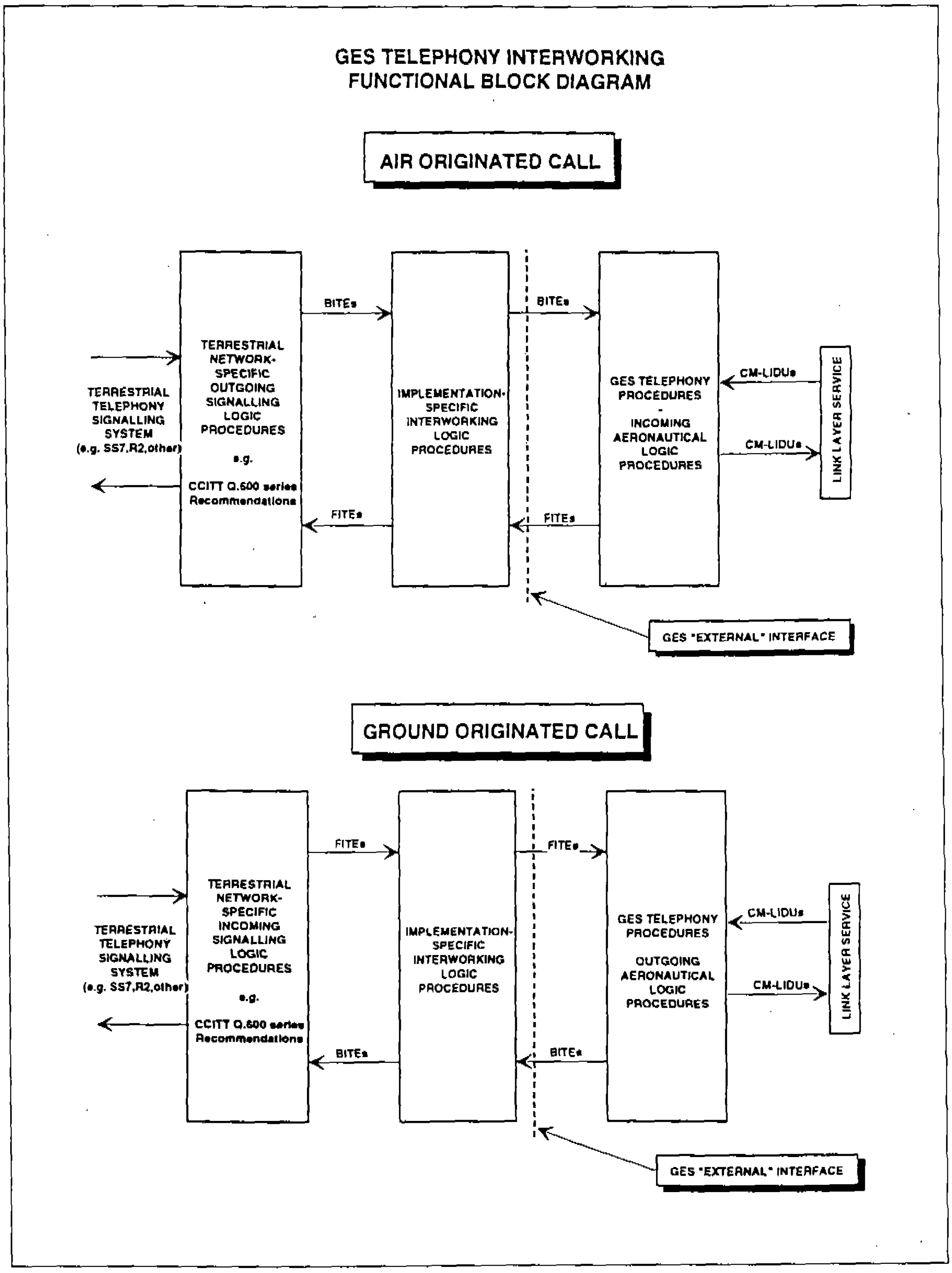


Figure A-19. GES telephony interworking block diagram

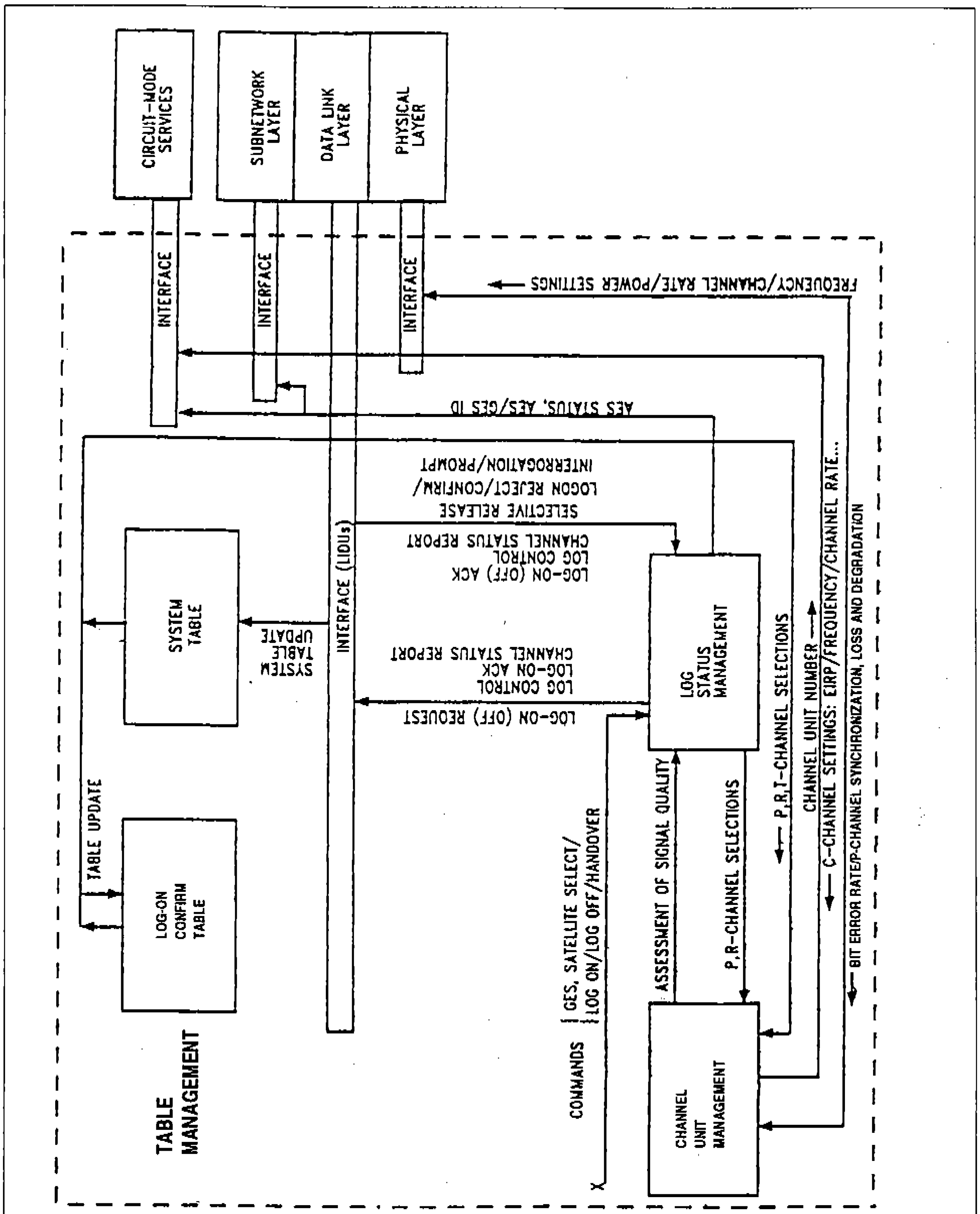


Figure A-20. AES management and interfaces

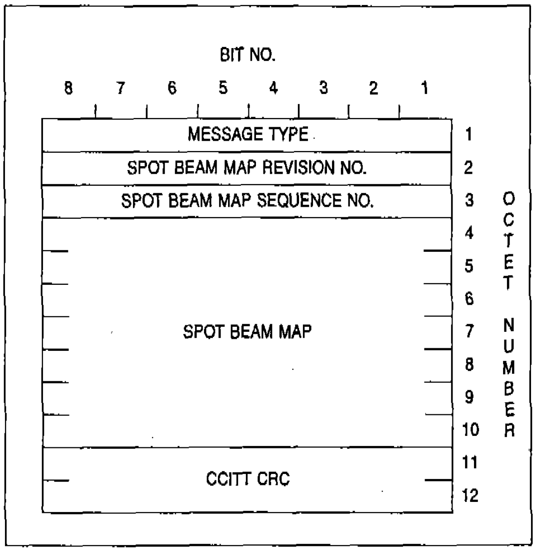


Figure A-21. Spot beam map broadcast

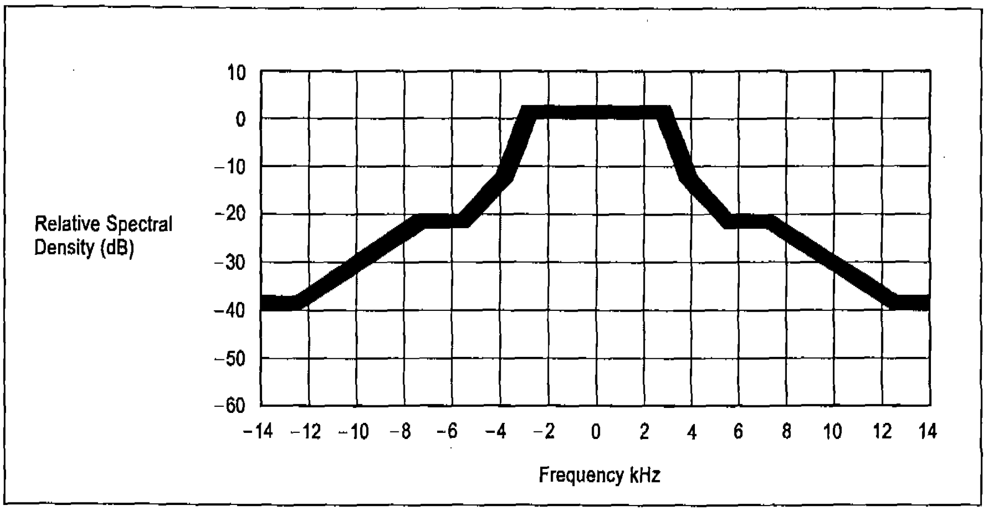


Figure A-22. Required spectral limits for AES transmissions for 60 per cent roll off

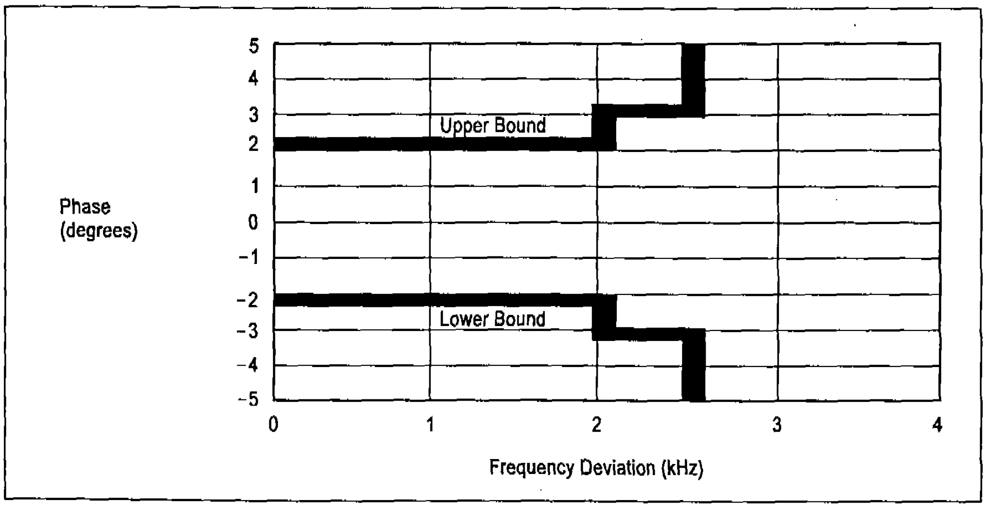


Figure A-23. Phase deviation tolerance for A-QPSK transmit filter response mask for 60 per cent roll off

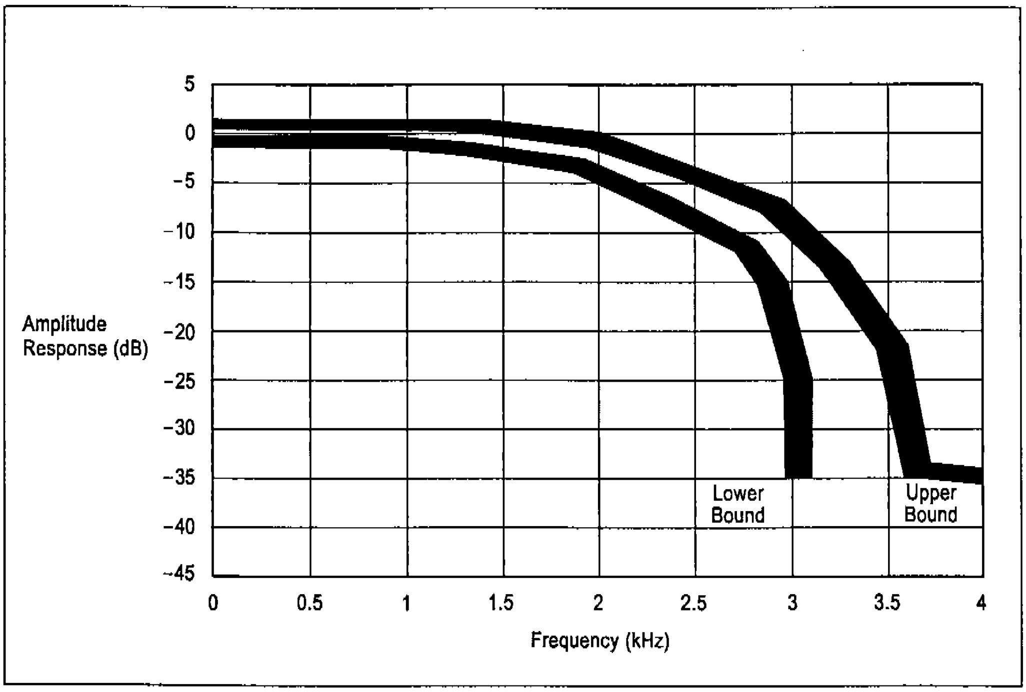


Figure A-24. AES A-QPSK transmit filter response mask for 60 per cent roll-off

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Appendix to Attachment A
PERFORMANCE ANALYSIS

A1. RF link analysis

The typical performance measure for an RF link is the average bit error rate (BER). The satellite subnetwork end-to-end performance is related to the RF link performance by a required average BER. The relationship between a channel BER and the achieved carrier-to-noise density performance depends upon the modulation technique and the channel conditions. For the case of ideal linear modulation techniques and an additive white Gaussian noise channel, this relationship can be derived analytically. For the case of a random fading channel this relationship can be derived through simulation, or using a worst case assumption that all multipath energy is equivalent to noise.

The digital RF communications link can be assured of satisfactory average BER performance if the achieved carrier-to-noise power density ratio is greater than or equal to the carrier-to-noise power density ratio required for communication at the desired average BER:

$$\left(\frac{C}{N_O}\right)_{ACHIEVED} \geq \left(\frac{C}{N_O}\right)_{REQ} \qquad [A.1]$$

where:

$\left(\frac{C}{N_O}\right)_{REQ}$ is the minimum required carrier-to-noise density ratio for communication at the desired average BER.

$\left(\frac{C}{N_O}\right)_{ACHIEVED}$ is the carrier-to-noise density ratio achieved by the end-to-end link.

The required carrier-to-noise density ratio is determined by the particular signalling wave-form used and by the noise and propagation characteristics of the channel. Statistical methods can be used to determine the minimum required carrier-to-noise ratio needed to assure operation at an average BER. Statistical methods can also be used to include the effects of propagation environment and other random losses in the form of a required margin.

Hence, for operation at a desired average BER the following relationship must hold:

$$M_P \times \left(\frac{C}{N_O}\right)_{REQ} \leq \left(\frac{C}{N_O}\right)_{ACHIEVED} \qquad [A.2]$$

where: M_P is the link margin required for the propagation environment and various random RF parameter variations.

The carrier-to-noise performance measures must be allocated to various portions of the RF link, which are discussed below.

A1.1 To-aircraft link analysis

The achieved carrier-to-noise density ratio on the forward link is determined by a number of noise sources in the RF link. With simple, frequency translating transponders, the achieved signal (carrier)-to-noise power ratio can be computed from the expression:

$$\left(\frac{C}{N_{0\,ACHIEVED}}\right)^{-1} = \left(\frac{C}{N_{UF}}\right)^{-1} + \left(\frac{C}{N_D}\right)^{-1} + \left(\frac{C}{I_M}\right)^{-1} + \left(\frac{C}{I_{IS}}\right)^{-1} + \left(\frac{C}{I_{OD}}\right)^{-1} + \left(\frac{C}{I_{OUF}}\right)^{-1} \qquad [A.3]$$

where:

N_{UF} = the thermal noise power density of the uplink feeder link.

N_D = the thermal noise power density of the L-band downlink.

I_M = the intermodulation power density on the L-band downlink due to the satellite transponder.

I_{IS} = the intrasystem interference power density.

I_{OD} = the downlink L-band intersystem interference power density at the receiver.

I_{OUF} = the intersystem interference power density on the feeder link uplink.

An important assumption is inherent in equation [A.3]. It is assumed that in an individual channel bandwidth all the noise sources can be considered to be "white Gaussian" in nature.

A1.2 From-aircraft link analysis

In the same manner as the forward link, the achieved carrier-to-noise density ratio is determined by a number of noise sources in the return link. The achieved carrier-to-noise power density ratio can be obtained from the expression:

$$\left(\frac{C}{N_{0\,ACHIEVED}}\right)^{-1} = \left(\frac{C}{N_{DF}}\right)^{-1} + \left(\frac{C}{N_U}\right)^{-1} + \left(\frac{C}{I_{M\,AES}}\right)^{-1} + \left(\frac{C}{I_{ISR}}\right)^{-1} + \left(\frac{C}{I_{OU}}\right)^{-1} + \left(\frac{C}{I_{ODF}}\right)^{-1} \qquad [A.4]$$

where:

N_{DF} = the thermal noise power density of the downlink feeder link.

N_U = the thermal noise power density of the L-band uplink.

$I_{M\,AES}$ = the minimum operable intermodulation power density expected on the L-band uplink from the multi-carrier operation of the AES high power amplifiers.

I_{ISR} = the intrasystem interference power density.

I_{OU} = the intersystem interference power density at L-band expected on the uplink.

I_{ODF} = the intersystem interference power density on the feeder link downlink.

A1.3 Propagation anomalies and required margins

An idealized RF link can be adversely affected by a number of factors which can be divided into two basic classes: deterministic and nondeterministic. Deterministic factors influencing RF link margin requirements depend on the propagation path established by the relative locations of the aircraft, satellite and earth in a particular situation. Other deterministic factors are fixed by the system design, such as, information bit rates, modulation type, interleaver depths, coding schemes, etc.

The nondeterministic factors that influence the RF link requirements are system design and operational elements specified by the service provider, degradation due to interference and other propagation-related random losses.

Many factors that influence the RF link requirements may be viewed as losses that reduce the available carrier power and degrade link performance. Detailed discussions of several of these factors are included in the following sections.

A1.3.1 Multipath fading

The term "multipath" refers to a condition in which energy reaches the receiver of a telecommunications system by more than one path. Multipath propagation may result from reflection from land and water surfaces and man-made structures. Multipath operation is generally undesirable, because signals arriving over the different paths arrive with variable relative phase, with the result that they alternatively add constructively or destructively in space. Hence, the total received signal will be characterized by fading, involving repeated minima which may fall below the signal level required for acceptable communications performance. Fading is also significantly higher over water as opposed to land. Furthermore, the signals arriving over the different paths also have different time delays, and in digital systems intersymbol interference can result.

A number of investigators have researched the effects of multipath fading on aeronautical satellite communications. The statistical nature of multipath fading for aeronautical channels is therefore well understood. The amplitude of fading is known to have a Rician distribution. Furthermore, the carrier-to-multipath ratio is known to be a function of the elevation angle to the satellite, and can be expected to be less than 10 dB for elevation angles below 10 degrees.

The carrier-to-noise ratio for a channel is affected by multipath and the particular form of modulation and coding. It is appropriate to include the effects of multipath in setting the carrier-to-noise requirement rather than including it in a separate margin; a conservative approach is to treat the multipath energy as equivalent to additive Gaussian noise, and then, in a coded system, to add additional margin for imperfect interleaving.

A1.3.2 Scintillation

Ionospheric scintillation is a phenomenon involving the effects of the sun and the earth's magnetic field that produces random variations in electromagnetic waves traversing the ionosphere. The phenomenon is manifested in satellite-earth station RF links as "scintillation fading"; positive and negative (loss) changes in the amplitude of the received signal that can be significant at the L-band frequencies used for the satellite-to-AES link. Values as high as 27 dB have been observed for short periods of time during severe scintillation events; however, the expected value is substantially lower. Phase shifting is also associated with scintillation fading, the effects of which can further degrade RF link performance.

As satellite RF link power margins are normally small for economic reasons, a loss value due to scintillation fading as low as 0.3 dB could be significant. Scintillation loss is highly correlated with the position and local time of the aircraft, thus is of major concern to certain routes and times of flight. Scintillation events also exhibit a seasonal influence, peaking during the vernal and autumnal equinoxes. Significant scintillation loss can be expected for aircraft located near the geomagnetic equator (between 15 degrees latitude North and South) at aircraft local time between 2130 and 0230 hours, and for aircraft located in polar regions (latitudes greater than ±65 degrees although coverage by geosynchronous satellites is effectively limited of latitudes to 80 degrees or less) at any time of day. Available data indicate that scintillation fading is about twice as intense in the equatorial region as compared with the polar regions. For a stationary earth station, about 1 per cent of equatorial region fades exceed 20 dB, and stay above 15 dB for several seconds. Eastward motions of the ionosphere at rates of 50 to 200 metres/second are typically seen, implying correlation distances of 10 to 100 metres. It would be possible for an eastbound aircraft's velocity to become "synchronized", resulting in substantially longer fading periods.

Fading in the polar regions is less intense, (about 10 dB for a stationary earth station) as compared with the equatorial region. Also, the velocity of the polar ionosphere is typically higher and more variable, in the range of 100 to 1 000 metres/second.

Data regarding the scintillation effects on earth stations in motion — in particular, on the signal-in-space used by AMSS — is currently limited. Further, the probability of an aircraft experiencing significant effects of scintillation is highly sensitive to its route and timing of its flight. Consequently, the effects of scintillation fading have not been accounted for herein.

A1.3.3 POLARIZATION LOSS

The transmission loss between two antennas due to imperfect circular polarization can be calculated by:

$$L_{POL} = 10\ LOG\left(\frac{\left(R_1^2+1\right)\left(R_2^2+1\right)}{\left(R_1R_2+1\right)^2\cos^2(\theta) + \left(R_1+R_2\right)^2\sin^2(\theta)}\right) \qquad \text{[A.5]}$$

where it is assumed that the antennas have the same sense (e.g. righthand circular) and where:

R_i = the voltage axial ratio (AR) of the ith antenna.

θ = the angle between the major axes of the two elliptically polarized waves that would be radiated, one from each antenna.

The polarization loss is determined completely by the axial ratios and relative orientation of their major axes. The worst case situation is when the major axes are orthogonal, i.e. $\theta = 90°$. Various forms of equation [A.5] are possible, depending upon the assumptions about the reference antenna. For link budget calculations, one typically might consider the worst case satellite antenna orientation, and a statistical estimate of the effects of AES antenna orientation.

A1.3.4 PATH LOSS

The path loss due to space is a function only of the frequency and range. The path loss is easily calculated by:

$$L = \left(\frac{4\pi r}{\lambda}\right)^2 \qquad \text{[A.6]}$$

where:

r = the range from the AES to the satellite in metres.

λ = the wavelength in metres.

In general, the range to the satellite, r, is a function of the geographical position of the AES. Conveniently, the range to the satellite is simply a function of the observed elevation to the satellite and is given by:

$$r = \sqrt{R^2 + (R+h)^2 - 2R\,(R+h)\cos\beta} \qquad \text{[A.7]}$$

where:

R = the Earth's mean radius ≅ 6 378 km

h = the geosynchronous altitude = 35 786 km (from earth surface at the subsatellite point).

β = $\cos^{-1}\left[\frac{R\cos(\theta)}{R+h}\right] - \theta$

where:

θ = the elevation angle of the satellite relative to level flight.

With the satellite directly overhead, the path loss at 1 545 MHz is 187.3 dB. At 5° elevation, the path loss is 188.5 dB. Therefore, the path loss for aircraft operating with a 5° elevation angle to the satellite is 1.2 dB greater than an aircraft with the satellite directly overhead. In practice, the path loss is calculated for a specific elevation angle to the satellite.

A1.3.5 PRECIPITATION LOSS

Raindrops cause attenuation to radio waves by both absorption and scatter. The magnitude of attenuation is a function of frequency, average droplet size, aircraft latitude, elevation angle and rainfall rate. The relationships among these factors are well established through years of research and experimental measurement, making it possible to predict performance with confidence.

In general, attenuation due to rainfall is not significant at the L-band frequencies used for the AMSS service links. However, the feeder links for the AMSS services will be at much higher frequencies where the rain attenuation could be very significant. Feeder link design must take into account the expected rainfall for the location of the ground earth station, particularly as regards link availability.

The effect of rain attenuation on the feeder link in the forward direction can be compensated for by GES power control. The GES power is increased such that the signal maintains the required level when received at the satellite. One consequence of this increase in power can be to increase the intermodulation products originating at the GES. The link must be designed so that this additional interference will not degrade the over-all achieved carrier-to-noise performance below the required level.

In the return direction, rain attenuation will lower the carrier power to thermal noise ratio for the feeder link. Again, this additional interference must not degrade the over-all achieved carrier-to-noise performance below the required level.

There is no specific allotment in the required margin to account for the effects of rain fading. It is the responsibility of the satellite system designer to ensure that the satellite and GES design is such that the over-all link carrier-to-noise ratio can be maintained under the expected rain conditions in the stated coverage areas.

ATTACHMENT B TO PART I. GUIDANCE MATERIAL FOR THE VHF DIGITAL LINK (VDL)

1. GUIDANCE MATERIAL FOR THE VHF DIGITAL LINK (VDL)

Note.— The Standards and Recommended Practices (SARPs) referred to are contained in Annex 10, Volume III, Part 1, Chapter 6.

2. SYSTEM DESCRIPTION

2.1 The VDL system provides an air-ground data communications link within the aeronautical telecommunications network (ATN). The VDL will operate in parallel with the other ATN air-ground subnetworks.

2.2 VDL ground stations consist of a VHF radio and a computer capable of handling the VDL protocol throughout the coverage area. The VDL stations offer connectivity via a ground-based telecommunications network (e.g. X.25 based) to ATN intermediate systems which will provide access to ground-based ATN end systems.

2.3 In order to communicate with the VDL ground stations, aircraft are required to be equipped with VDL avionics which will include a VHF radio and a computer capable of handling the VDL protocol. The air-ground communication will utilize 25 kHz channels in the VHF aeronautical mobile (route) service band.

3. VDL PRINCIPLES

3.1 Communications transfer principles

3.1.1 Connectivity between applications running in ATN end systems (ES) using the ATN and its subnetworks, including the VDL, for air-ground communication is provided by the transport layer entities in these end systems. Transport connections between airborne and ground end systems shall be maintained through controlled changes of the precise ATN intermediate systems (IS) and VDL network elements that provide this connectivity.

3.1.2 Transport connections between ATN ES are not linked to a particular subnetwork and ISO 8473 network protocol data units transmitted by an ES can pass via any air-ground ATN compatible subnetwork (such as aeronautical mobile-satellite service (AMSS) data link, SSR Mode S data link or VDL) that meets the quality of service (QOS) requirements. A transport connection between an aircraft ES and a ground ES shall be maintained as long as there is at least one air-ground subnetwork connection between the aircraft IS and a ground IS which has connectivity to the ground ES. In order to maximize subnetwork connectivity, aircraft are expected to maintain air-ground subnetwork connections via any subnetwork (AMSS, Mode S or VDL) with which link layer connectivity can be established.

3.1.3 The VDL subnetwork provides connectivity in the form of switched virtual circuits between ISO 8208 data terminal equipment (DTE) entities of aircraft and ground-based ATN intermediate systems. Due to the fact that VHF signals have only line-of-sight propagation, it is necessary for aircraft in flight to regularly establish link connections with new VDL ground stations in order to maintain VHF coverage. An established VDL virtual circuit between an aircraft DTE and a ground DTE is maintained through a controlled change to a ground station through which the ground DTE can be accessed.

3.1.4 VDL virtual circuits may be cleared when the aircraft or ground IS identifies a policy situation where the virtual circuit to the ground DTE is no longer necessary but this shall only happen if another VDL virtual circuit remains established. A policy situation is a situation where considerations other than coverage influence the decision to establish a connection. This could be, for example, a situation where an aircraft is within the designated operational coverage area of ground stations operated by different operators and a decision must be made with which operator to establish a connection. The case where an aircraft crosses a border between two States needs special attention. An aircraft has to establish a virtual circuit to the DTE in the IS of the State entered before clearing the virtual circuit with the DTE in the IS of the State left.

3.1.5 The scenarios for subnetwork connection maintenance are shown in Figure B-1[1]. If the ground stations on each side of a State border do not offer ISO 8208 connectivity to

1. All figures are located at the end of this attachment.

the DTEs of the IS in both States, aircraft crossing the border will have to set up a link connection to a ground station in the State entered before being able to establish a virtual circuit to the IS of that State. Only after establishment of the new link connection and virtual circuit, the aircraft will clear the virtual circuit with the DTE of the IS of the country left over the link which gave access to that IS. If the VDL aeronautical stations on both sides of the State border offer connectivity to the IS in both States, the changeover of the virtual circuits has to take place over the same link connection.

3.2 VDL quality of service for ATN routing

3.2.1 The use of the VDL system for air-ground communications will depend on the routing decisions of aircraft and ground-based ATN intermediate systems (IS). These ISs will decide on the path to be used for air-ground communications based on quality of service values requested by transmitting end systems (ESs).

3.2.2 The IS at each end of the air-ground connections must interpret the requested QOS value and decide which of the available connections can best be met. It is important that the level of QOS which a VDL connection is perceived as providing is set at a level which corresponds to its true performance.

3.2.3 In cases where the VDL is the only data link with which an aircraft has been equipped, all communications must be routed via a VDL connection and the value set for QOS to be provided by the connection must not block the communication.

3.2.4 In other cases where aircraft are equipped with other air-ground data links (such as AMSS and SSR Mode S) there may be simultaneous parallel connections over multiple subnetworks. In these cases, the values for QOS provided by each subnetwork must be set so as to ensure that the VDL connection will be used where appropriate.

3.2.5 It is necessary that co-ordination take place between aircraft operators, ground station operators and ground system operators to ensure that the right balance is achieved between different subnetworks.

4. VDL GROUND STATION NETWORK CONCEPT

4.1 Access

4.1.1 A VDL ground station will provide access for aircraft to the ground ATN IS using the VDL protocol over a VHF channel.

4.2 Institutional issues concerning VDL ground station network operators

4.2.1 An ATS provider wishing to use VDL for air traffic service (ATS) communications needs to ensure that the VDL service is available. The ATS provider can either operate the VDL ground station network itself or arrange for the operation of the VDL stations (or VDL network) by a telecommunications service provider. It seems likely that individual States will make different arrangements for the provision of VDL service to aircraft. Operation and implementation of VDL need to be co-ordinated at a regional level in order to ensure acceptable service on international routes.

4.2.2 The use of a VDL ground station network by entities external to the ATS provider will be subject to service agreements between the ATS provider and the telecommunications service provider. These agreements set out the obligations of the two parties and need, in particular, to be specific on the quality of service provided as well as the characteristics of the user interface.

4.2.3 It seems likely that some VDL ground station network operators will levy user charges. These are expected to be levied either on the aircraft operators and/or on the ATS providers. It is necessary to ensure that the use of VDL is feasible for those aircraft operators intended to use VDL for ATS/AOC communications.

4.3 VDL ground station equipment

4.3.1 A VDL ground station will consist of a VHF radio and a computer which may be separate or integrated with the radio. The VDL functionality of the VHF radio equipment will be similar to that installed in aircraft.

4.3.2 The provision of network status monitoring is an important element in the maintenance of the highest availability possible.

4.4 Ground station siting

4.4.1 The line of sight limitations of VHF propagation is an important factor in the siting of ground stations. It is necessary to ensure that the ground stations are installed in a manner which provides coverage throughout the designated operational coverage area (DOC).

4.4.2 The coverage requirements for VDL depend on the applications that are intended to operate over the VDL. These applications may function, for example, when an aircraft is at en-route altitude, in a terminal area or on the ground at an airport.

4.4.3 En-route coverage can be provided using a small number of ground stations with a large DOC (for example, the range of a VHF signal from a station at sea level and an aircraft at 37 000 ft is approximately 200 NM). Hence, it is in fact desirable that the smallest number of ground stations possible be used to provide en-route coverage in order to minimize the possibility of simultaneous uplink transmissions from ground stations which may cause message collisions on the VHF channel. The factors limiting en-route coverage will be availability of landmass and the availability of a communications link from a ground station to other ground systems.

4.4.4 Terminal area coverage requires, in general, the installation of ground stations at all airports where VDL operation is required in order to ensure coverage throughout the terminal area.

4.4.5 Aerodrome surface communication coverage must be provided by a ground station at the airport but, due to the physical structure of the airport, it may not be possible to guarantee coverage in all areas with a single station.

4.5 Ground station frequency engineering

4.5.1 The choice of the VHF channel on which a ground station will operate depends on the coverage that the ground station will be required to provide. Coverage on a particular channel is provided by a collection of ground stations operating on that channel and the communications on that channel will occupy the channel for all the ground stations in a coverage area.

4.5.2 As with VHF voice communications, VDL communications cannot be limited to propagating only within States and frequency co-ordination between States will be required in the allocation of VDL frequencies. The nature of the protocol does, however, allow for frequency re-use by several ground stations within the same coverage area and hence the rules for the assignment of frequencies are not the same as for voice communications.

4.5.3 The carrier sense multiple access (CSMA) media access control protocol (MAC) layer used in VDL cannot exclude message collisions if some stations using a frequency channel cannot receive the transmissions of other stations, a situation known as a hidden transmitter situation. Hidden transmitters lead to simultaneous transmissions which can cause the intended receiver of one or both transmissions to be unable to decode the received signal.

4.5.4 A frequency will be assigned to providing en-route coverage and all the en-route stations will be set to operate on this frequency. In order to minimize the probability of simultaneous transmissions on the channel by hidden transmitters in a CSMA environment, this channel may not be used for terminal area or aerodrome surface communications except in areas of very low channel loading.

4.5.5 The VDL SARPs call for the provision of a common signalling channel (CSC) on which access to VDL service will be guaranteed in all areas where VDL Mode 2 service is available. This is especially important at airports and on the edge of VDL en-route coverage zones where aircraft are likely to establish initial VDL connectivity. Since the characteristics of Mode 1 and Mode 2 radio frequency transmissions are not compatible, the CSC cannot be used for Mode 1 communications. There is no requirement for a CSC for VDL Mode 1.

4.6 Ground station connection to intermediate systems

4.6.1 In order to provide access to the ground systems which are connected to the aeronautical telecommunications network, a VDL ground station needs to be connected to one or more ATN IS. The purpose of a VDL ground station is to interconnect aircraft with the ground-based ATN via which communications with terrestrial ATN ES can take place.

4.6.2 The ground-based ATN IS can be co-hosted in the VDL ground station computer in which case the VDL subnetwork virtual circuit will end in that computer. This architecture will have an impact on the exchanges required when an aircraft establishes a VDL link with a new ground station. The exact exchange will depend on whether the ground stations contain separate IS or elements of the same distributed intermediate system.

4.6.3 If the IS is not contained in the VDL ground station, it will be connected to the ground station by one of the following means:

a) wide area network (WAN);

b) local area network (LAN); and

c) dedicated communications line.

4.6.4 In all cases, in order to be in accordance with the *Manual of the Aeronautical Telecommunication Network (ATN)* (Doc 9578) for providing an open systems interconnection (OSI) compatible connection-oriented subnetwork service between the aircraft IS and the ground-based IS, the VDL ground station computer will be required to extend the VDL virtual circuit across the terrestrial network or link.

4.6.5 In order to provide simultaneous virtual circuits to several terrestrial ISs, the VDL ground station computer needs to contain a VDL subnetwork entity capable of converting addresses in VDL subnetwork call requests into addresses in the ground-based network.

5. VDL AIRBORNE OPERATING CONCEPT

5.1 Avionics

5.1.1 *VDL avionics.* In order to operate in a VDL network, aircraft need to be equipped with an avionics system providing the VDL subnetwork user (ISO 8208 DTE) function. The system providing this function will also provide the subnetwork user functions for the other air-ground ATN-compatible subnetworks and the aircraft ATN intermediate system function and, hence, its development is necessary in order to provide ATN communications to multiple end-systems or over multiple air-ground subnetworks.

5.2 VDL avionics certification

5.2.1 The VHF digital radio may also provide for double-side band amplitude modulation (DSB-AM) voice capability for emergency back-up to VHF radios used for voice communications. It would be necessary in this case to demonstrate that the VDL functionality of the VDR does not interfere with the DSB-AM voice functionality.

5.2.2 The VDL function in the VHF digital radio provides an air-ground data link service to the VDL subnetwork user entity of the aircraft ATN intermediate system. If the provision of a VHF subnetwork service to an ATN intermediate system were considered an essential service for a particular installation, the VDL functionality of the VDR would need to be certified as an essential function. The use of VDL for ATS communications is not, however, intended to require two aircraft radios to operate simultaneously in VDL mode.

5.3 Registration of aircraft with VDL network operators

5.3.1 For normal communications service, it is to be expected that aircraft operators will be required to register their aircraft with the network operators. In emergency or back-up situations, it must be possible for any VDL-equipped aircraft to establish connectivity over any VDL ground station network.

5.3.2 Registration of aircraft VDL stations with VDL network operators is desirable for network management since, for example, a network operator may identify a temporary fault in the VDL communications from an aircraft and would wish to contact the operator of the aircraft in order to have the fault resolved. Registration of aircraft is also useful in planning the required ground station network capacity. Registration with a VDL ground station network operator does not necessarily imply that the aircraft operator will be charged for use of the VDL ground station network.

FIGURE FOR ATTACHMENT B

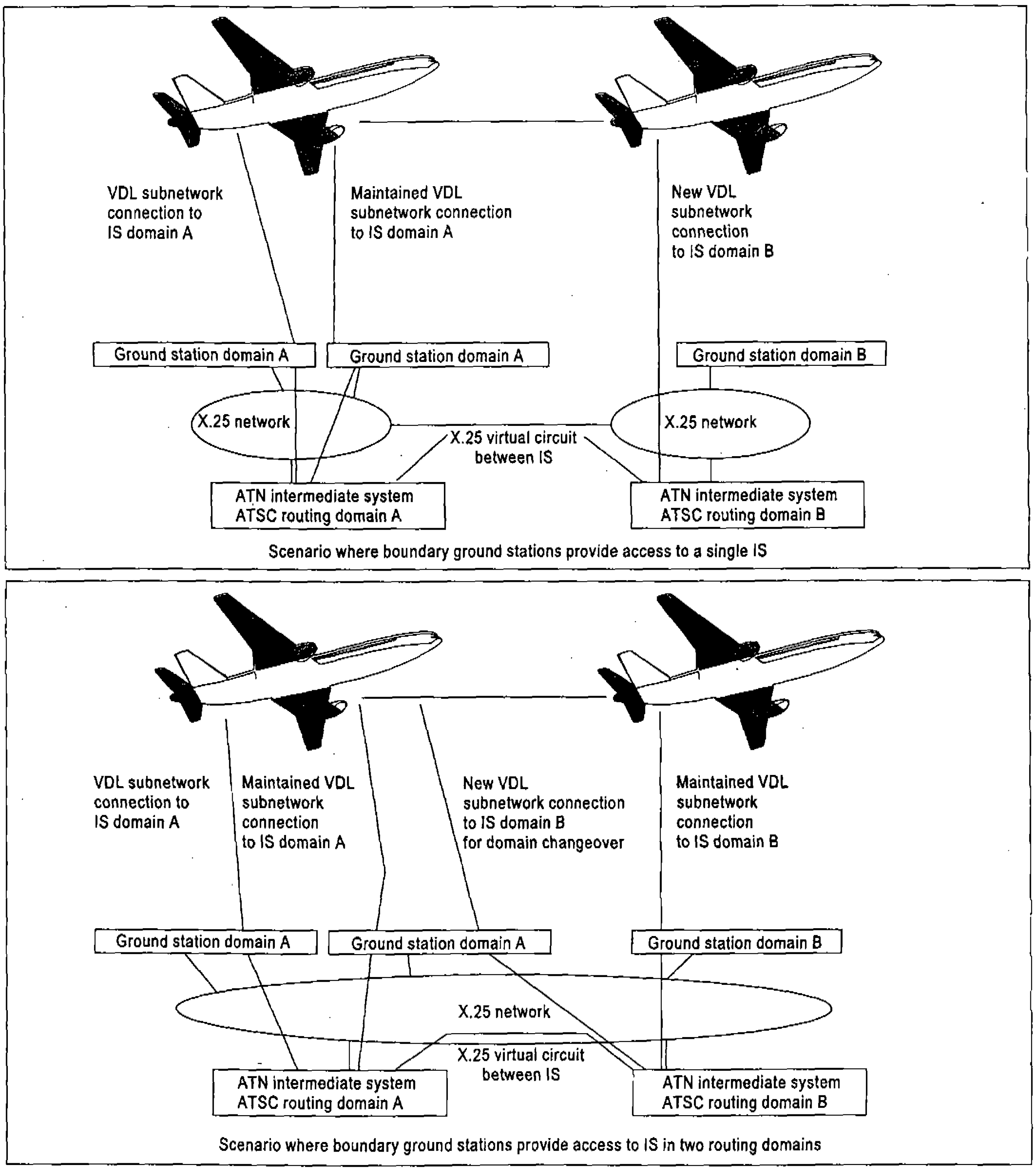


Figure B-1

ATTACHMENT A TO PART II. GUIDANCE MATERIAL FOR COMMUNICATION SYSTEMS

1. VHF COMMUNICATIONS

1.1 Audio characteristics of VHF communication equipment

1.1.1 The aeronautical radiotelephony services represent a special case of the application of radiotelephony, in that the requirement is for the transmission of messages in such a way that fidelity of wave form is of secondary importance, emphasis being upon fidelity of basic intelligence. This means that it is not necessary to transmit those parts of the wave form which are solely concerned with individuality, accent and emphasis.

1.1.2 The effective acceptance bandwidth for 8.33 kHz equipment is required to be at least plus and minus 3 462 Hz. This value considers the general case, i.e. air-to-ground transmissions and consists of 2 500 Hz audio bandwidth, 685 Hz for an aircraft transmitter instability of 5 ppm, 137 Hz for a ground receiver instability of 1 ppm and 140 Hz due to Doppler shift (2.2.2.4 and 2.3.2.6 of Part II refer).

1.2 Off-set carrier system

The following are examples of offset carrier systems which meet the requirements of Part II, 2.2.1.1.1.

a) *2-carrier system.* Carriers should be spaced at plus and minus 5 kHz. This requires a frequency stability of plus or minus 2 kHz (15.3 parts per million at 130 MHz).

b) *3-carrier system.* Carriers should be spaced at zero and plus and minus 7.3 kHz. This requires a frequency stability of plus or minus 0.65 kHz (5 parts per million at 130 MHz).

The following are examples or 4- and 5-carrier systems which meet the requirements of Part II, 2.2.1.1.1.

c) *4-carrier system.* Carriers should be spaced at plus and minus 2.5 kHz and plus and minus 7.5 kHz. This requires a frequency stability of plus or minus 0.5 kHz (3.8 parts per million at 130 MHz).

d) *5-carrier system.* Carriers should be spaced at zero, plus and minus 4 kHz and plus and minus 8 kHz. A frequency stability in the order of plus or minus 40 Hz (0.3 parts per million at 130 MHz) is an achievable and practicable interpretation of the requirement in this case.

Note 1.— The carrier frequency spacings referred to above are with respect to the assigned channel frequency.

Note 2.— In aircraft receivers which employ a measurement of the received carrier-to-noise ratio to operate the mute, the audio heterodynes caused by the reception of two or more off-set carriers can be interpreted as noise and cause the audio output to be muted even when an adequate wanted signal is present. In order that the airborne receiving system can conform with the sensitivity recommendations contained in Part II, 2.3.2.2, the design of the receivers may need to ensure that their sensitivity is maintained at a high level when receiving off-set carrier transmissions. The use of a carrier level override is an unsatisfactory solution to this requirement, but where it is employed, setting the override level as low as possible can ameliorate the problem.

1.3 Immunity performance of COM receiving systems in the presence of VHF FM broadcast interference

1.3.1 With reference to the Note of 2.3.3.2 of Part II, the immunity performance defined there must be measured against an agreed measure of derogation of the receiving system's normal performance, and in the presence of, and under standard conditions for the input wanted signal. This is necessary to ensure that the checking of receiving station equipment on bench test can be performed to a repeatable set of conditions, and results, and to facilitate their subsequent approval. An adequate measure of immunity performance may be obtained by the use of wanted signal of minus 87 dBm into the receiving equipment and the signal modulated with a 1 kHz tone at 30 per cent modulation depth. The signal-to-noise ratio should not fall below 6 dB when the interfering signals specified at Part II, 2.3.3.1 and 2.3.3.2 are applied. The broadcast signals should be selected from frequencies in the range between 87.5 and 107.9 MHz and should be modulated with a representative broadcast type signal.

Note 1.— The signal level of minus 87 dBm assumes a combined antenna and feeder gain of 0 dB.

Note 2.— The reduction in the signal-to-noise ratio quoted above is for the purpose of standardization when checking that receiving station equipment on bench measurements meet the required immunity. In the planning of frequencies and in the assessment of protection from FM broadcast interference, a value not less than this, and in many cases higher, depending on the operational circumstances in individual cases, should be chosen as the basis of the interference assessment.

2. SELCAL SYSTEM

2.1 This material is intended to provide information and guidance relating to the operation of the SELCAL system. It is associated with the Recommended Practices contained in Part II, Chapter 3.

1) *Function.* The purpose of the SELCAL system is to permit the selective calling of individual aircraft over radiotelephone channels linking the ground station with the aircraft, and is intended to operate on en-route frequencies with existing HF and VHF ground-to-air communications transmitters and receivers with a minimum of electrical and mechanical modification. The normal functioning of the ground-to-air communications link should be unaffected, except at such time as the selective calling function is being formed.

2) *Principles of operation.* Selective calling is accomplished by the coder of the ground transmitter sending a single group of coded tone pulses to the aircraft receiver and decoder. The airborne receiver and decoder equipment is capable of receiving and interpreting, by means of an indicator, the correct code and rejecting all other codes in the presence of random noise and interference. The ground portion of the coding device (ground selective calling unit) supplies coded information to the ground-to-air transmitter. The airborne selective calling unit is the special airborne equipment which operates with existing communications receivers on the aircraft to permit decoding of the ground-to-air signals for display on the signal indicator. The type of signal indicator can be chosen to suit operational requirements of the user and may consist of a lamp, a bell, a chime or any combination of such indicating devices.

— END —

International Standards
and Recommended Practices

Annex 10
to the Convention on
International Civil Aviation

Aeronautical Telecommunications

Volume IV
Surveillance Radar and
Collision Avoidance Systems

This edition incorporates all amendments adopted by the Council prior to 28 February 2002 and supersedes, on 28 November 2002, all previous editions of Annex 10, Volume IV.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Third Edition
July 2002

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
70-77	Incorporated in this edition		
78	Did not affect this volume		
79	Did not affect this volume		
80	Did not affect this volume		
81	Did not affect this volume		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Telecommunications were first adopted by the Council on 30 May 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 10 to the Convention. They became effective on 1 March 1950. The Standards and Recommended Practices were based on recommendations of the Communications Division at its Third Session in January 1949.

Up to and including the Seventh Edition, Annex 10 was published in one volume containing four Parts together with associated attachments: Part I — Equipment and Systems, Part II — Radio Frequencies, Part III — Procedures, and Part IV — Codes and Abbreviations.

By Amendment 42, Part IV was deleted from the Annex; the codes and abbreviations contained in that Part were transferred to a new document, Doc 8400.

As a result of the adoption of Amendment 44 on 31 May 1965, the Seventh Edition of Annex 10 was replaced by two volumes: Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communication Procedures.

As a result of the adoption of Amendment 70 on 20 March 1995, Annex 10 was restructured to include five volumes: Volume I — Radio Navigation Aids; Volume II — Communication Procedures; Volume III — Communication Systems; Volume IV — Surveillance Radar and Collision Avoidance Systems; and Volume V — Aeronautical Radio Frequency Spectrum Utilization. By Amendment 70, Volumes III and IV were published in 1995 and Volume V was planned for publication with Amendment 71.

Table A shows the origin of amendments to Annex 10, Volume IV subsequent to Amendment 70, together with a summary of the principal subjects involved and the dates on which the Annex and the amendments were adopted by Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards, Recommended Practices and Procedures specified in Annex 10 should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been deliberately written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper*:

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*:

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Disclaimer regarding patents

Attention is drawn to the possibility that certain elements of Standards and Recommended Practices in this Annex may be the subject of patents or other intellectual property rights. ICAO shall not be responsible or liable for not identifying any or all such rights. ICAO takes no position regarding the existence, validity, scope or applicability of any claimed patents or other intellectual property rights, and accepts no responsibility or liability therefore or relating thereto.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use on non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 10, Volume IV

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
70	Air Navigation Commission; Fifth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel	Creation of Volume IV and introduction of Standards and Recommended Practices and related guidance material for the airborne collision avoidance system (ACAS).	20 March 1995 24 July 1995 9 November 1995
71	Air Navigation Commission; Fourth and fifth meetings of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP)	Changes to material related to SSR Mode S air-ground data link system and the carriage of SSR transponders.	12 March 1996 15 July 1996 7 November 1996
72	—	No change.	—
73 (2nd edition)	Air Navigation Commission; Sixth meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP)	Addition of specifications for the SSR Mode S system; introduction of material related to the performance of the collision avoidance logic; changes to guidance material related to the airborne collision avoidance system; introduction of Human Factors related material.	19 March 1998 20 July 1998 5 November 1998
74	Air Navigation Commission	Note related to the waiving of patent rights on Mode S extended squitter technique.	18 March 1999 18 March 1999 —
75	—	No change.	—
76	Seventh meeting of the Aeronautical Mobile Communications Panel (AMCP)	Note related to update of references to the ITU Radio Regulations.	12 March 2001 12 March 2001 —
77 (3rd edition)	Seventh meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP)	SSR Mode S (Chapters 2 and 3); and ACAS (Chapters 1 and 4).	27 February 2002 15 July 2002 28 November 2002
78	—	No change.	—
79	—	No change.	—
80	—	No change.	—
81	—	No change.	—

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

Note 1.— All references to "Radio Regulations" are to the Radio Regulations published by the International Telecommunication Union (ITU). Radio Regulations are amended from time to time by the decisions embodied in the Final Acts of World Radiocommunication Conferences held normally every two to three years. Further information on the ITU processes as they relate to aeronautical radio system frequency use is contained in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc 9718).*

Note 2.— The Mode S extended squitter system is subject to patent rights from the Massachusetts Institute of Technology (MIT) Lincoln Laboratory. On 22 August 1996, MIT Lincoln Laboratory issued a notice in the Commerce Business Daily *(CBD), a United States Government publication, of its intent not to assert its rights as patent owner against any and all persons in the commercial or non-commercial practice of the patent, in order to promote the widest possible use of the Mode S extended squitter technology. Further, by letter to ICAO dated 27 August 1998, MIT Lincoln Laboratory confirmed that the CBD notice has been provided to satisfy ICAO requirements for a statement of patent rights for techniques that are included in SARPs, and that the patent holders offer this technique free of charge for any use.*

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

Note.— SSR transponders referred to above are those operating in Mode C or Mode S.

Aircraft address. A unique combination of twenty-four bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance.

Collision avoidance logic. The sub-system or part of ACAS that analyses data relating to an intruder and own aircraft, decides whether or not advisories are appropriate and, if so, generates the advisories. It includes the following functions: range and altitude tracking, threat detection and RA generation. It excludes surveillance.

Human Factors principles. Principles which apply to design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Secondary surveillance radar (SSR). A surveillance radar system which uses transmitters/receivers (interrogators) and transponders.

Note.— The requirements for interrogators and transponders are specified in Chapter 3.

Surveillance radar. Radar equipment used to determine the position of an aircraft in range and azimuth.

CHAPTER 2. GENERAL

2.1 SECONDARY SURVEILLANCE RADAR (SSR)

2.1.1 When SSR is installed and maintained in operation as an aid to air traffic services, it shall conform with the provisions of 3.1 unless otherwise specified in this 2.1.

Note.— As referred to in this Annex, Mode A/C transponders are those which conform to the characteristics prescribed in 3.1.1. Mode S transponders are those which conform to the characteristics prescribed in 3.1.2. The functional capabilities of Mode A/C transponders are an integral part of those of Mode S transponders.

2.1.2 Interrogation modes (ground-to-air)

2.1.2.1 Interrogation for air traffic services shall be performed on the modes described in 3.1.1.4.3 or 3.1.2. The uses of each mode shall be as follows:

1) *Mode A* — to elicit transponder replies for identity and surveillance.

2) *Mode C* — to elicit transponder replies for automatic pressure-altitude transmission and surveillance.

3) *Intermode* —

   a) *Mode A/C/S all-call:* to elicit replies for surveillance of Mode A/C transponders and for the acquisition of Mode S transponders.

   b) *Mode A/C-only all-call:* to elicit replies for surveillance of Mode A/C transponders. Mode S transponders do not reply.

4) *Mode S* —

   a) *Mode S-only all-call:* to elicit replies for acquisition of Mode S transponders.

   b) *Broadcast:* to transmit information to all Mode S transponders. No replies are elicited.

   c) *Selective:* for surveillance of, and communication with, individual Mode S transponders. For each interrogation, a reply is elicited only from the transponder uniquely addressed by the interrogation.

Note 1.— Mode A/C transponders are suppressed by Mode S interrogations and do not reply.

Note 2.— There are 25 possible interrogation (uplink) formats and 25 possible Mode S reply (downlink) formats. For format assignment see 3.1.2.3.2, Figures 3-7 and 3-8.

2.1.2.1.1 **Recommendation.—** *Administrations should coordinate with appropriate national and international authorities those implementation aspects of the SSR system which will permit its optimum use.*

Note.— In order to permit the efficient operation of ground equipment designed to eliminate interference from unwanted aircraft transponder replies to adjacent interrogators (defruiting equipment), States may need to develop coordinated plans for the assignment of pulse recurrence frequencies (PRF) to SSR interrogators.

2.1.2.1.2 The assignment of interrogator identifier (II) codes, where necessary in areas of overlapping coverage, across international boundaries of flight information regions, shall be the subject of regional air navigation agreements.

2.1.2.1.3 The assignment of surveillance identifier (SI) codes, where necessary in areas of overlapping coverage, shall be the subject of regional air navigation agreements.

Note.— The SI lockout facility cannot be used unless all Mode S transponders within coverage range are equipped for this purpose.

2.1.2.2 Mode A and Mode C interrogations shall be provided.

Note.— This requirement may be satisfied by intermode interrogations which elicit Mode A and Mode C replies from Mode A/C transponders.

2.1.2.3 **Recommendation.—** *In areas where improved aircraft identification is necessary to enhance the effectiveness of the ATC system, SSR ground facilities having Mode S features should include aircraft identification capability.*

Note.— Aircraft identification reporting through the Mode S data link provides unambiguous identification of aircraft suitably equipped.

2.1.2.4 SIDE-LOBE SUPPRESSION CONTROL INTERROGATION

2.1.2.4.1 Side-lobe suppression shall be provided in accordance with the provisions of 3.1.1.4 and 3.1.1.5 on all Mode A, Mode C and intermode interrogations.

2.1.2.4.2 Side-lobe suppression shall be provided in accordance with the provisions of 3.1.2.1.5.2.1 on all Mode S-only all-call interrogations.

2.1.3 Transponder reply modes (air-to-ground)

2.1.3.1 Transponders shall respond to Mode A interrogations in accordance with the provisions of 3.1.1.7.12.1 and to Mode C interrogations in accordance with the provisions of 3.1.1.7.12.2.

Note.— If pressure-altitude information is not available, transponders reply to Mode C interrogations with framing pulses only.

2.1.3.1.1 The pressure altitude reports contained in Mode S replies shall be derived as specified in 3.1.1.7.12.2.

Note.— 3.1.1.7.12.2 is intended to relate to Mode C replies and specifies, inter alia*, that Mode C pressure altitude reports be referenced to a standard pressure setting of 1 013.25 hectopascals. The intention of 2.1.3.1.1 is to ensure that all transponders, not just Mode C transponders, report uncorrected pressure altitude.*

2.1.3.2 Where the need for Mode C automatic pressure-altitude transmission capability within a specified airspace has been determined, transponders, when used within the airspace concerned, shall respond to Mode C interrogations with pressure-altitude encoding in the information pulses.

2.1.3.2.1 From 1 January 1999, all transponders, regardless of the airspace in which they will be used, shall respond to Mode C interrogations with pressure-altitude information.

Note.— Operation of the airborne collision avoidance system (ACAS) depends upon intruder aircraft reporting pressure-altitude in Mode C replies.

2.1.3.2.2 **Recommendation.—** *For aircraft with 7.62 m (25 ft) or better pressure altitude sources, the pressure-altitude information provided by Mode S transponders in response to selective interrogations (i.e. in the AC field, 3.1.2.6.5.4) should be reported in 7.62 m (25 ft) increments.*

Note.— Performance of the ACAS is significantly enhanced when an intruder aircraft is reporting pressure-altitude in 7.62 m (25 ft) increments.

2.1.3.2.3 All Mode A/C transponders installed on or after 1 January 1992 shall report pressure-altitude encoded in the information pulses in Mode C replies.

2.1.3.2.4 All Mode S transponders installed on or after 1 January 1992 shall report pressure-altitude encoded in the information pulses in Mode C replies and in the AC field of Mode S replies.

2.1.3.2.5 All Mode S transponder equipped aircraft with 7.62 m (25 ft) or better pressure altitude sources shall report pressure altitude encoded in 7.62 m (25 ft) increments in the AC field of Mode S replies from 1 January 2005.

2.1.3.2.6 When a Mode S transponder reports altitude in 7.62 m (25 ft) increments, the reported value of the altitude shall be the value obtained by expressing the measured value of the uncorrected pressure altitude of the aircraft in 7.62 m (25 ft) increments.

Note.— This requirement relates to the installation and use of the Mode S transponder. The purpose is to ensure that altitude data obtained from a 30.48 m (100 ft) increment source are not reported using the formats intended for 7.62 m (25 ft) data.

2.1.3.3 Transponders used within airspace where the need for Mode S airborne capability has been determined shall also respond to intermode and Mode S interrogations in accordance with the applicable provisions of 3.1.2.

2.1.3.3.1 Requirements for mandatory carriage of SSR Mode S transponders shall be on the basis of regional air navigation agreements which shall specify the airspace and the airborne implementation timescales.

2.1.3.3.2 **Recommendation.—** *The agreements indicated in 2.1.3.3.1 should provide at least five years' notice.*

2.1.4 Mode A reply codes (information pulses)

2.1.4.1 All transponders shall be capable of generating 4 096 reply codes conforming to the characteristics given in 3.1.1.6.2.

2.1.4.1.1 **Recommendation.—** *ATS authorities should establish the procedures for the allotment of SSR codes in conformity with Regional Air Navigation agreements, taking into account other users of the system.*

Note.— Principles for the allocation of SSR codes are given in Doc 4444, Chapter 8.

2.1.4.2 The following Mode A codes shall be reserved for special purposes:

2.1.4.2.1 Code 7700 to provide recognition of an aircraft in an emergency.

2.1.4.2.2 Code 7600 to provide recognition of an aircraft with radiocommunication failure.

2.1.4.2.3 Code 7500 to provide recognition of an aircraft which is being subjected to unlawful interference.

2.1.4.3 Appropriate provisions shall be made in ground decoding equipment to ensure immediate recognition of Mode A codes 7500, 7600 and 7700.

2.1.4.4 **Recommendation.—** *Mode A code 0000 should be reserved for allocation subject to regional agreement, as a general purpose code.*

2.1.4.5 Mode A code 2000 shall be reserved to provide recognition of an aircraft which has not received any instructions from air traffic control units to operate the transponder.

2.1.5 Mode S airborne equipment capability

2.1.5.1 All Mode S transponders shall conform to one of the following five levels:

2.1.5.1.1 Level 1 — Level 1 transponders shall have the capabilities prescribed for:

a) Mode A identity and Mode C pressure-altitude reporting (3.1.1);

b) intermode and Mode S all-call transactions (3.1.2.5);

c) addressed surveillance altitude and identity transaction (3.1.2.6.1, 3.1.2.6.3, 3.1.2.6.5 and 3.1.2.6.7);

d) lockout protocols (3.1.2.6.9);

e) basic data protocols except data link capability reporting (3.1.2.6.10); and

f) air-air service and squitter transactions (3.1.2.8).

Note.— Level 1 permits SSR surveillance based on pressure-altitude reporting and the Mode A identity code. In an SSR Mode S environment, technical performance relative to a Mode A/C transponder is improved due to Mode S selective aircraft interrogation.

2.1.5.1.2 Level 2 — Level 2 transponders shall have the capabilities of 2.1.5.1.1 and also those prescribed for:

a) standard length communications (Comm-A and Comm-B) (3.1.2.6.2, 3.1.2.6.4, 3.1.2.6.6, 3.1.2.6.8 and 3.1.2.6.11);

b) data link capability reporting (3.1.2.6.10.2.2); and

c) aircraft identification reporting (3.1.2.9).

Note.— Level 2 permits aircraft identification reporting and other standard length data link communications from ground to air and air to ground. The aircraft identification reporting capability requires an interface and appropriate input device.

2.1.5.1.3 Level 3 — Level 3 transponders shall have the capabilities of 2.1.5.1.2 and also those prescribed for ground-to-air extended length message (ELM) communications (3.1.2.7.1 to 3.1.2.7.5).

Note.— Level 3 permits extended length data link communications from ground to air and thus may provide retrieval from ground-based data banks and receipt of other air traffic services which are not available with Level 2 transponders.

2.1.5.1.4 Level 4 — Level 4 transponders shall have the capabilities of 2.1.5.1.3 and also those prescribed for air-to-ground extended length message (ELM) communications (3.1.2.7.7 and 3.1.2.7.8).

Note.— Level 4 permits extended length data link communications from air to ground and thus may provide access from the ground to airborne data sources and the transmission of other data required by air traffic services which are not available with Level 2 transponders.

2.1.5.1.5 Level 5 — Level 5 transponders shall have the capabilities of 2.1.5.1.4 and also those prescribed for enhanced Comm-B and extended length message (ELM) communications (3.1.2.6.11.3.4, 3.1.2.7.6 and 3.1.2.7.9).

Note.— Level 5 permits Comm-B and extended length data link communications with multiple interrogators without requiring the use of multisite reservations. This level of transponder has a higher minimum data link capacity than the other transponder levels.

2.1.5.1.6 *Extended squitter* — Extended squitter transponders shall have the capabilities of 2.1.5.1.2, 2.1.5.1.3, 2.1.5.1.4 or 2.1.5.1.5 and also those prescribed for extended squitter operation (3.1.2.8.6). Transponders with this capability shall be designated with a suffix “e”.

Note.— For example, a level 4 transponder with extended squitter capability would be designated “level 4e”.

2.1.5.1.7 *SI capability* — Transponders with the ability to process SI codes shall have the capabilities of 2.1.5.1.2, 2.1.5.1.3, 2.1.5.1.4 or 2.1.5.1.5 and also those prescribed for SI code operation (3.1.2.3.2.1.4, 3.1.2.5.2.1, 3.1.2.6.1.3, 3.1.2.6.1.4.1. 3.1.2.6.9.1.1 and 3.1.2.6.9.2). Transponders with this capability shall be designated with a suffix "s".

Note.— For example, a level 4 transponder with extended squitter capability and SI capability would be designated "level 4es".

2.1.5.1.7.1 SI code capability shall be provided in accordance with the provisions of 2.1.5.1.7 for all Mode S transponders installed on or after 1 January 2003 and by all Mode S transponders by 1 January 2005.

Note.— Mandates from certain States may require applicability in advance of these dates.

2.1.5.1.8 *Extended squitter non-transponder devices.* Devices that are capable of broadcasting extended squitters that are not part of a Mode S transponder shall conform to all of the 1 090 MHz RF signals in space requirements specified for a Mode S transponder.

2.1.5.2 All Mode S transponders used by international civil air traffic shall conform, at least, to the requirements of Level 2 prescribed in 2.1.5.1.2.

Note 1.— Level 1 may be admitted for use within an individual State or within the terms of a regional air navigation agreement. The Mode S Level 1 transponder comprises the minimum set of features for compatible operation of Mode S transponders with SSR Mode S interrogators. It is defined to prevent a proliferation of transponder types below Level 2 which would be incompatible with SSR Mode S interrogators.

Note 2.— The intent of the requirement for a Level 2 capability is to ensure the widespread use of an ICAO standard transponder capability to allow worldwide planning of Mode S ground facilities and services. The requirement also discourages an initial installation with Level 1 transponders that would be rendered obsolete by later requirements in certain airspace for mandatory carriage of transponders having Level 2 capabilities.

2.1.5.3 Mode S transponders installed on aircraft with gross mass in excess of 5 700 kg or a maximum cruising true airspeed capability in excess of 463 km/h (250 kt) shall operate with antenna diversity as prescribed in 3.1.2.10.4 if:

a) the aircraft individual certificate of airworthiness is first issued on or after 1 January 1990; or

b) Mode S transponder carriage is required on the basis of regional air navigation agreement in accordance with 2.1.3.3.1 and 2.1.3.3.2.

Note.— Aircraft with maximum cruising true airspeed exceeding 324 km/h (175 kt) are required to operate with a peak power of not less than 21.0 dBW as specified in 3.1.2.10.2 c).

2.1.5.4 CAPABILITY REPORTING IN MODE S SQUITTERS

2.1.5.4.1 Capability reporting in Mode S acquisition squitters (unsolicited downlink transmissions) shall be provided in accordance with the provisions of 3.1.2.8.5.1 for all Mode S transponders installed on or after 1 January 1995.

2.1.5.4.2 **Recommendation.—** *Transponders equipped for extended squitter operation should have a means to disable acquisition squitters when extended squitters are being emitted.*

Note.— This will facilitate the suppression of acquisition squitters if all ACAS units have been converted to receive the extended squitter.

2.1.5.5 EXTENDED LENGTH MESSAGE (ELM) TRANSMIT POWER

In order to facilitate the conversion of existing Mode S transponders to include full Mode S capability, transponders originally manufactured before 1 January 1999 shall be permitted to transmit a burst of 16 ELM segments at a minimum power level of 20 dBW.

Note.— This represents a 1 dB relaxation from the power requirement specified in 3.1.2.10.2.

2.1.6 SSR Mode S address (aircraft address)

The SSR Mode S address shall be one of 16 777 214 twenty-four-bit aircraft addresses allocated by ICAO to the State of Registry or common mark registering authority and assigned as prescribed in 3.1.2.4.1.2.3.1.1 and the Appendix to Chapter 9, Part I, Volume III, Annex 10.

2.2 HUMAN FACTORS CONSIDERATIONS

Recommendation.— *Human Factors principles should be observed in the design and certification of surveillance radar and collision avoidance systems.*

Note.— Guidance material on Human Factors principles can be found in Doc 9683, Human Factors Training Manual *and Circular 249* (Human Factors Digest No. 11 — Human Factors in CNS/ATM Systems).

CHAPTER 3. SURVEILLANCE RADAR SYSTEMS

3.1 SECONDARY SURVEILLANCE RADAR (SSR) SYSTEM CHARACTERISTICS

Note 1.— Section 3.1.1 prescribes the technical characteristics of SSR systems having only Mode A and Mode C capabilities. Section 3.1.2 prescribes the characteristics of systems with Mode S capabilities.

Note 2.— Systems using Mode S capabilities are generally used for air traffic control surveillance systems. In addition, certain ATC applications may use Mode S emitters, e.g. for vehicle surface surveillance or for fixed target detection on surveillance systems. Under such specific conditions, the term "aircraft" can be understood as "aircraft or vehicle (A/V)". While those applications may use a limited set of data, any deviation from standard physical characteristics must be considered very carefully by the appropriate authorities. They must take into account not only their own surveillance (SSR) environment but also possible effects on other systems like ACAS.

Note 3.— Non-Standard-International alternative units are used as permitted by Annex 5, Chapter 3, 3.2.2.

3.1.1 Systems having only Mode A and Mode C capabilities

Note 1.— In this section, SSR modes are designated by letters A and C. Suffixed letters, e.g. A_2, C_4, are used to designate the individual pulses used in the air-to-ground pulse trains. This common use of letters is not to be construed as implying any particular association of modes and codes.

Note 2.— Provisions for the recording and retention of radar data are contained in Annex 11, Chapter 6.

3.1.1.1 INTERROGATION AND CONTROL (INTERROGATION SIDE-LOBE SUPPRESSION) RADIO FREQUENCIES (GROUND-TO-AIR)

3.1.1.1.1 The carrier frequency of the interrogation and control transmissions shall be 1 030 MHz.

3.1.1.1.2 The frequency tolerance shall be plus or minus 0.2 MHz.

3.1.1.1.3 The carrier frequencies of the control transmission and of each of the interrogation pulse transmissions shall not differ from each other by more than 0.2 MHz.

3.1.1.2 REPLY CARRIER FREQUENCY (AIR-TO-GROUND)

3.1.1.2.1 The carrier frequency of the reply transmission shall be 1 090 MHz.

3.1.1.2.2 The frequency tolerance shall be plus or minus 3 MHz.

3.1.1.3 POLARIZATION

Polarization of the interrogation, control and reply transmissions shall be predominantly vertical.

3.1.1.4 INTERROGATION MODES (SIGNALS-IN-SPACE)

3.1.1.4.1 The interrogation shall consist of two transmitted pulses designated P_1 and P_3. A control pulse P_2 shall be transmitted following the first interrogation pulse P_1.

3.1.1.4.2 Interrogation Modes A and C shall be as defined in 3.1.1.4.3.

3.1.1.4.3 The interval between P_1 and P_3 shall determine the mode of interrogation and shall be as follows:

Mode A	8 ±0.2 microseconds
Mode C	21 ±0.2 microseconds

3.1.1.4.4 The interval between P_1 and P_2 shall be 2.0 plus or minus 0.15 microseconds.

3.1.1.4.5 The duration of pulses P_1, P_2 and P_3 shall be 0.8 plus or minus 0.1 microsecond.

3.1.1.4.6 The rise time of pulses P_1, P_2 and P_3 shall be between 0.05 and 0.1 microsecond.

Note 1.— The definitions are contained in Figure 3-1 "Definitions of secondary surveillance radar waveform shapes, intervals and the reference point for sensitivity and power".

Note 2.— The intent of the lower limit of rise time (0.05 microsecond) is to reduce sideband radiation. Equipment will meet this requirement if the sideband radiation is no greater than that which, theoretically, would be produced by a trapezoidal wave having the stated rise time.

3.1.1.4.7 The decay time of pulses P_1, P_2 and P_3 shall be between 0.05 and 0.2 microsecond.

Note.— The intent of the lower limit of decay time (0.05 microsecond) is to reduce sideband radiation. Equipment will meet this requirement if the sideband radiation is no greater than that which, theoretically, would be produced by a trapezoidal wave having the stated decay time.

3.1.1.5 Interrogator and control transmission characteristics (interrogation side-lobe suppression — signals-in-space)

3.1.1.5.1 The radiated amplitude of P_2 at the antenna of the transponder shall be:

a) equal to or greater than the radiated amplitude of P_1 from the side-lobe transmissions of the antenna radiating P_1; and

b) at a level lower than 9 dB below the radiated amplitude of P_1, within the desired arc of interrogation.

3.1.1.5.2 Within the desired beam width of the directional interrogation (main lobe), the radiated amplitude of P_3 shall be within 1 dB of the radiated amplitude of P_1.

3.1.1.6 Reply transmission characteristics (signals-in-space)

3.1.1.6.1 Framing pulses. The reply function shall employ a signal comprising two framing pulses spaced 20.3 microseconds as the most elementary code.

3.1.1.6.2 Information pulses. Information pulses shall be spaced in increments of 1.45 microseconds from the first framing pulse. The designation and position of these information pulses shall be as follows:

Pulses	*Position (microseconds)*
C_1	1.45
A_1	2.90
C_2	4.35
A_2	5.80
C_4	7.25
A_4	8.70
X	10.15

B_1	11.60
D_1	13.05
B_2	14.50
D_2	15.95
B_4	17.40
D_4	18.85

Note.— The Standard relating to the use of these pulses is given in 2.1.4.1. However, the position of the "X" pulse is specified only as a technical standard to safeguard possible future use.

3.1.1.6.3 *Special position identification pulse (SPI).* In addition to the information pulses provided, a special position identification pulse shall be transmitted but only as a result of manual (pilot) selection. When transmitted, it shall be spaced at an interval of 4.35 microseconds following the last framing pulse of Mode A replies only.

3.1.1.6.4 *Reply pulse shape.* All reply pulses shall have a pulse duration of 0.45 plus or minus 0.1 microsecond, a pulse rise time between 0.05 and 0.1 microsecond and a pulse decay time between 0.05 and 0.2 microsecond. The pulse amplitude variation of one pulse with respect to any other pulse in a reply train shall not exceed 1 dB.

Note.— The intent of the lower limit of rise and decay times (0.05 microsecond) is to reduce sideband radiation. Equipment will meet this requirement if the sideband radiation is not greater than that which, theoretically, would be produced by a trapezoidal wave having the stated rise and decay times.

3.1.1.6.5 *Reply pulse position tolerances.* The pulse spacing tolerance for each pulse (including the last framing pulse) with respect to the first framing pulse of the reply group shall be plus or minus 0.10 microsecond. The pulse interval tolerance of the special position identification pulse with respect to the last framing pulse of the reply group shall be plus or minus 0.10 microsecond. The pulse spacing tolerance of any pulse in the reply group with respect to any other pulse (except the first framing pulse) shall not exceed plus or minus 0.15 microsecond.

3.1.1.6.6 *Code nomenclature.* The code designation shall consist of digits between 0 and 7 inclusive, and shall consist of the sum of the subscripts of the pulse numbers given in 3.1.1.6.2 above, employed as follows:

Digit	*Pulse Group*
First (most significant)	A
Second	B
Third	C
Fourth	D

3.1.1.7 TECHNICAL CHARACTERISTICS OF TRANSPONDERS WITH MODE A AND MODE C CAPABILITIES ONLY

3.1.1.7.1 *Reply.* The transponder shall reply (not less than 90 per cent triggering) when all of the following conditions have been met:

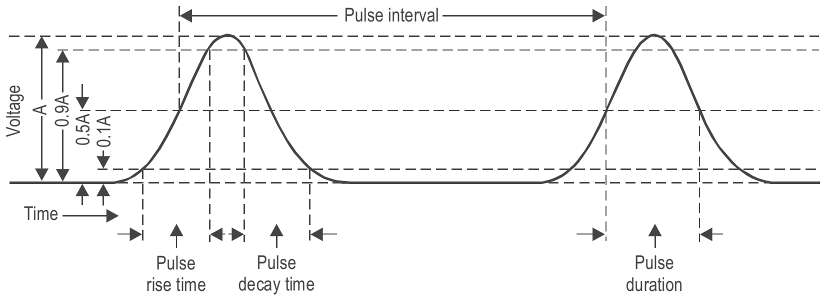
a) the received amplitude of P_3 is in excess of a level 1 dB below the received amplitude of P_1 but no greater than 3 dB above the received amplitude of P_1;

b) either no pulse is received in the interval 1.3 microseconds to 2.7 microseconds after P_1, or P_1 exceeds by more than 9 dB any pulse received in this interval;

c) the received amplitude of a proper interrogation is more than 10 dB above the received amplitude of random pulses where the latter are not recognized by the transponder as P_1, P_2 or P_3.

3.1.1.7.2 The transponder shall not reply under the following conditions:

a) to interrogations when the interval between pulses P_1 and P_3 differs from those specified in 3.1.1.4.3 by more than plus or minus 1.0 microsecond;



Definitions

Phase reversal. A 180-degree change in the phase of the radio frequency carrier.

Phase reversal duration. The time between the 10-degree and 170-degree points of a phase reversal.

Pulse amplitude A. The peak voltage amplitude of the pulse envelope.

Pulse decay time. The time between 0.9A and 0.1A on the trailing edge of the pulse envelope.

Pulse duration. The time interval between 0.5A points on leading and trailing edges of the pulse envelope.

Pulse interval. The time interval between the 0.5A point on the leading edge of the first pulse and the 0.5A point on the leading edge of the second pulse.

Pulse rise time. The time between 0.1A and 0.9A on the leading edge of the pulse envelope.

Time intervals. The intervals are referenced to:

a) the 0.5A point on the leading edge of a pulse;
b) the 0.5A point on the trailing edge of a pulse; or
c) the 90-degree point of a phase reversal.

Transponder sensitivity and power reference point. The antenna end of the transmission line of the transponder.

Note.— The 90-degree point of a phase reversal can be approximated by the minimum amplitude point on the envelope amplitude transient associated with the phase reversal and the phase reversal duration can be approximated by the time between the 0.8A points of the envelope amplitude transient.

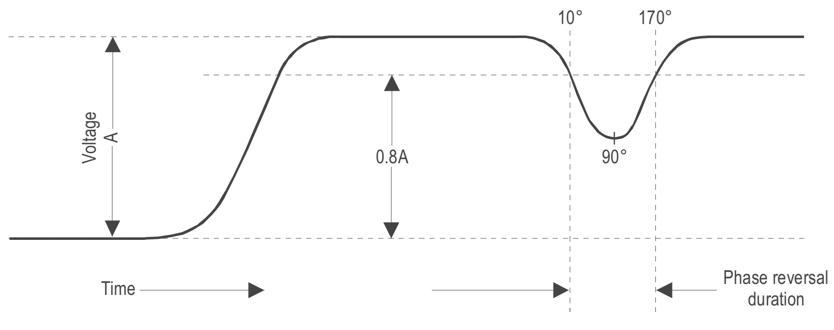


Figure 3-1. Definitions of secondary surveillance radar waveform shapes, intervals and the reference point for sensitivity and power

b) upon receipt of any single pulse which has no amplitude variations approximating a normal interrogation condition.

3.1.1.7.3 *Dead time.* After recognition of a proper interrogation, the transponder shall not reply to any other interrogation, at least for the duration of the reply pulse train. This dead time shall end no later than 125 microseconds after the transmission of the last reply pulse of the group.

3.1.1.7.4 *SUPPRESSION*

Note.— This characteristic is used to prevent replies to interrogations received via the side lobes of the interrogator antenna, and to prevent Mode A/C transponders from replying to Mode S interrogations.

3.1.1.7.4.1 The transponder shall be suppressed when the received amplitude of P_2 is equal to, or in excess of, the received amplitude of P_1 and spaced 2.0 plus or minus 0.15 microseconds. The detection of P_3 is not required as a prerequisite for initiation of suppression action.

3.1.1.7.4.2 The transponder suppression shall be for a period of 35 plus or minus 10 microseconds.

3.1.1.7.4.2.1 The suppression shall be capable of being reinitiated for the full duration within 2 microseconds after the end of any suppression period.

3.1.1.7.5 *RECEIVER SENSITIVITY AND DYNAMIC RANGE*

3.1.1.7.5.1 The minimum triggering level of the transponder shall be such that replies are generated to at least 90 per cent of the interrogation signals when:

a) the two pulses P_1 and P_3 constituting an interrogation are of equal amplitude and P_2 is not detected; and

b) the amplitude of these signals is nominally 71 dB below 1 mW, with limits between 69 dB and 77 dB below 1 mW.

3.1.1.7.5.2 The reply and suppression characteristics shall apply over a received amplitude of P_1 between minimum triggering level and 50 dB above that level.

3.1.1.7.5.3 The variation of the minimum triggering level between modes shall not exceed 1 dB for nominal pulse spacings and pulse widths.

3.1.1.7.6 *Pulse duration discrimination.* Signals of received amplitude between minimum triggering level and 6 dB above this level, and of a duration less than 0.3 microsecond, shall not cause the transponder to initiate reply or suppression action. With the exception of single pulses with amplitude variations approximating an interrogation, any single pulse of a duration more than 1.5 microseconds shall not cause the transponder to initiate reply or suppression action over the signal amplitude range of minimum triggering level (MTL) to 50 dB above that level.

3.1.1.7.7 *Echo suppression and recovery.* The transponder shall contain an echo suppression facility designed to permit normal operation in the presence of echoes of signals-in-space. The provision of this facility shall be compatible with the requirements for suppression of side lobes given in 3.1.1.7.4.1.

3.1.1.7.7.1 *Desensitization.* Upon receipt of any pulse more than 0.7 microsecond in duration, the receiver shall be desensitized by an amount that is within at least 9 dB of the amplitude of the desensitizing pulse but shall at no time exceed the amplitude of the desensitizing pulse, with the exception of possible overshoot during the first microsecond following the desensitizing pulse.

Note.— Single pulses of duration less than 0.7 microsecond are not required to cause the specified desensitization nor to cause desensitization of duration greater than permitted by 3.1.1.7.7.1 and 3.1.1.7.7.2.

3.1.1.7.7.2 *Recovery.* Following desensitization, the receiver shall recover sensitivity (within 3 dB of minimum triggering level) within 15 microseconds after reception of a desensitizing pulse having a signal strength up to 50 dB above minimum triggering level. Recovery shall be at an average rate not exceeding 4.0 dB per microsecond.

3.1.1.7.8 *Random triggering rate.* In the absence of valid interrogation signals, Mode A/C transponders shall not generate more than 30 unwanted Mode A or Mode C replies per second as integrated over an interval equivalent to at least 300 random triggers, or 30 seconds, whichever is less. This random triggering rate shall not be exceeded when all possible interfering equipments installed in the same aircraft are operating at maximum interference levels.

3.1.1.7.9 *REPLY RATE*

3.1.1.7.9.1 The transponder shall be capable of at least 1 200 replies per second for a 15-pulse coded reply, except that, for transponder installations used solely below 4 500 m (15 000 ft), or below a lesser altitude established by the appropriate authority or by regional air navigation agreement, transponders capable of at least 1 000 replies per second for a 15-pulse coded reply shall be permitted.

3.1.1.7.9.2 *Reply rate limit control.* To protect the system from the effects of transponder over-interrogation by preventing response to weaker signals when a predetermined reply rate has been reached, a sensitivity reduction type reply limit control shall be incorporated in the equipment. The range of this control shall permit adjustment, as a minimum, to any value between 500 and 2 000 replies per second, or to the maximum reply rate capability if less than 2 000 replies per second, without regard to the number of pulses in each reply. Sensitivity reduction in excess of 3 dB shall not take effect until 90 per cent of the selected value is exceeded. Sensitivity reduction shall be at least 30 dB for rates in excess of 150 per cent of the selected value.

3.1.1.7.9.3 **Recommendation.—** *The reply rate limit should be set at 1 200 replies per second, or the maximum value below 1 200 replies per second of which the transponder is capable.*

3.1.1.7.10 *Reply delay and jitter.* The time delay between the arrival, at the transponder receiver, of the leading edge of P_3 and the transmission of the leading edge of the first pulse of the reply shall be 3 plus or minus 0.5 microseconds. The total jitter of the reply pulse code group, with respect to P_3, shall not exceed 0.1 microsecond for receiver input levels between 3 dB and 50 dB above minimum triggering level. Delay variations between modes on which the transponder is capable of replying shall not exceed 0.2 microsecond.

3.1.1.7.11 *TRANSPONDER POWER OUTPUT AND DUTY CYCLE*

3.1.1.7.11.1 The peak pulse power available at the antenna end of the transmission line of the transponder shall be at least 21 dB and not more than 27 dB above 1 W, except that for transponder installations used solely below 4 500 m (15 000 ft), or below a lesser altitude established by the appropriate authority or by regional air navigation agreement, a peak pulse power available at the antenna end of the transmission line of the transponder of at least 18.5 dB and not more than 27 dB above 1 W shall be permitted.

3.1.1.7.11.2 **Recommendation.—** *The peak pulse power specified in 3.1.1.7.11.1 should be maintained over a range of replies from code 0000 at a rate of 400 replies per second to a maximum pulse content at a rate of 1 200 replies per second or a maximum value below 1 200 replies per second of which the transponder is capable.*

3.1.1.7.12 *REPLY CODES*

3.1.1.7.12.1 *Identification.* The reply to a Mode A interrogation shall consist of the two framing pulses specified in 3.1.1.6.1 together with the information pulses (Mode A code) specified in 3.1.1.6.2.

Note.— The Mode A code designation is a sequence of four digits in accordance with 3.1.1.6.6.

3.1.1.7.12.1.1 The Mode A code shall be manually selected from the 4 096 codes available.

3.1.1.7.12.2 *Pressure-altitude transmission.* The reply to Mode C interrogation shall consist of the two framing pulses specified in 3.1.1.6.1 above. When digitized pressure-altitude information is available, the information pulses specified in 3.1.1.6.2 shall also be transmitted.

3.1.1.7.12.2.1 Transponders shall be provided with means to remove the information pulses but to retain the framing pulses when the provision of 3.1.1.7.12.2.4 below is not complied with in reply to Mode C interrogation.

3.1.1.7.12.2.2 The information pulses shall be automatically selected by an analog-to-digital converter connected to a pressure-altitude data source in the aircraft referenced to the standard pressure setting of 1 013.25 hectopascals.

Note.— The pressure setting of 1 013.25 hectopascals is equal to 29.92 inches of mercury.

3.1.1.7.12.2.3 Pressure-altitude shall be reported in 100-ft increments by selection of pulses as shown in the Appendix to this chapter.

3.1.1.7.12.2.4 The digitizer code selected shall correspond to within plus or minus 38.1 m (125 ft), on a 95 per cent probability basis, with the pressure-altitude information (referenced to the standard pressure setting of 1 013.25 hectopascals), used on board the aircraft to adhere to the assigned flight profile.

3.1.1.7.13 *Transmission of the special position identification (SPI) pulse.* When required, this pulse shall be transmitted with Mode A replies, as specified in 3.1.1.6.3, for a period of between 15 and 30 seconds.

3.1.1.7.14 ANTENNA

3.1.1.7.14.1 The transponder antenna system, when installed on an aircraft, shall have a radiation pattern which is essentially omnidirectional in the horizontal plane.

3.1.1.7.14.2 **Recommendation.—** *The vertical radiation pattern should be nominally equivalent to that of a quarter-wave monopole on a ground plane.*

3.1.1.8 TECHNICAL CHARACTERISTICS OF GROUND INTERROGATORS WITH MODE A AND MODE C CAPABILITIES ONLY

3.1.1.8.1 *Interrogation repetition frequency.* The maximum interrogation repetition frequency shall be 450 interrogations per second.

3.1.1.8.1.1 **Recommendation.—** *To minimize unnecessary transponder triggering and the resulting high density of mutual interference, all interrogators should use the lowest practicable interrogator repetition frequency that is consistent with the display characteristics, interrogator antenna beam width and antenna rotation speed employed.*

3.1.1.8.2 RADIATED POWER

Recommendation.— *In order to minimize system interference the effective radiated power of interrogators should be reduced to the lowest value consistent with the operationally required range of each individual interrogator site.*

3.1.1.8.3 **Recommendation.—** *When Mode C information is to be used from aircraft flying below transition levels, the altimeter pressure reference datum should be taken into account.*

Note.— Use of Mode C below transition levels is in accordance with the philosophy that Mode C can usefully be employed in all environments.

3.1.1.9 INTERROGATOR RADIATED FIELD PATTERN

Recommendation.— *The beam width of the directional interrogator antenna radiating* P_3 *should not be wider than is operationally required. The side- and back-lobe radiation of the directional antenna should be at least 24 dB below the peak of the main-lobe radiation.*

3.1.1.10 INTERROGATOR MONITOR

3.1.1.10.1 The range and azimuth accuracy of the ground interrogator shall be monitored at sufficiently frequent intervals to ensure system integrity.

Note.— Interrogators that are associated with and operated in conjunction with primary radar may use the primary radar as the monitoring device; alternatively, an electronic range and azimuth accuracy monitor would be required.

3.1.1.10.2 **Recommendation.—** *In addition to range and azimuth monitoring, provision should be made to monitor continuously the other critical parameters of the ground interrogator for any degradation of performance exceeding the allowable system tolerances and to provide an indication of any such occurrence.*

3.1.1.11 SPURIOUS EMISSIONS AND SPURIOUS RESPONSES

3.1.1.11.1 *SPURIOUS RADIATION*

Recommendation.— *CW radiation should not exceed 76 dB below 1 W for the interrogator and 70 dB below 1 W for the transponder.*

3.1.1.11.2 *SPURIOUS RESPONSES*

Recommendation.— *The response of both airborne and ground equipment to signals not within the receiver pass band should be at least 60 dB below normal sensitivity.*

3.1.2 Systems having Mode S capabilities

3.1.2.1 *Interrogation signals-in-space characteristics.* The paragraphs herein describe the signals-in-space as they can be expected to appear at the antenna of the transponder.

Note.— Because signals can be corrupted in propagation, certain interrogation pulse duration, pulse spacing and pulse amplitude tolerances are more stringent for interrogators as described in 3.1.2.11.4.

3.1.2.1.1 *Interrogation carrier frequency.* The carrier frequency of all interrogations (uplink transmissions) from ground facilities with Mode S capabilities shall be 1 030 plus or minus 0.01 MHz.

3.1.2.1.2 *Interrogation spectrum.* The spectrum of a Mode S interrogation about the carrier frequency shall not exceed the limits specified in Figure 3-2.

Note.— The Mode S interrogation spectrum is data dependent. The broadest spectrum is generated by an interrogation that contains all binary ONEs.

3.1.2.1.3 *Polarization.* Polarization of the interrogation and control transmissions shall be nominally vertical.

3.1.2.1.4 *Modulation.* For Mode S interrogations, the carrier frequency shall be pulse modulated. In addition, the data pulse, P_6, shall have internal phase modulation.

3.1.2.1.4.1 *Pulse modulation.* Intermode and Mode S interrogations shall consist of a sequence of pulses. The pulses which may be used to form a specific interrogation are designated P_1, P_2, P_3, P_4, P_5 and P_6. Pulse shapes shall be as defined in Table 3-1. All values are in microseconds.

Note.— The 0.8 microsecond pulses used in intermode and Mode S interrogations are identical in shape to those used in Modes A and C as defined in 3.1.1.4.

3.1.2.1.4.2 *Phase modulation.* The short (16.25-microsecond) and long (30.25-microsecond) P_6 pulses of 3.1.2.1.4.1 shall have internal binary differential phase modulation consisting of 180-degree phase reversals of the carrier at a 4 megabit per second rate.

3.1.2.1.4.2.1 *Phase reversal duration.* The duration of the phase reversal shall be less than 0.08 microsecond and the phase shall advance (or retard) monotonically throughout the transition region. There shall be no amplitude modulation applied during the phase transition.

Table 3-1. Pulse shapes — Mode S and intermode interrogations

		Duration	*(Rise time)*		*(Decay time)*	
Pulse	*Duration*	*tolerance*	*Min.*	*Max.*	*Min.*	*Max.*
P_1, P_2, P_3, P_5	0.8	±0.1	0.05	0.1	0.05	0.2
P_4 (short)	0.8	±0.1	0.05	0.1	0.05	0.2
P_4 (long)	1.6	±0.1	0.05	0.1	0.05	0.2
P_6 (short)	16.25	±0.25	0.05	0.1	0.05	0.2
P_6 (long)	30.25	±0.25	0.05	0.1	0.05	0.2

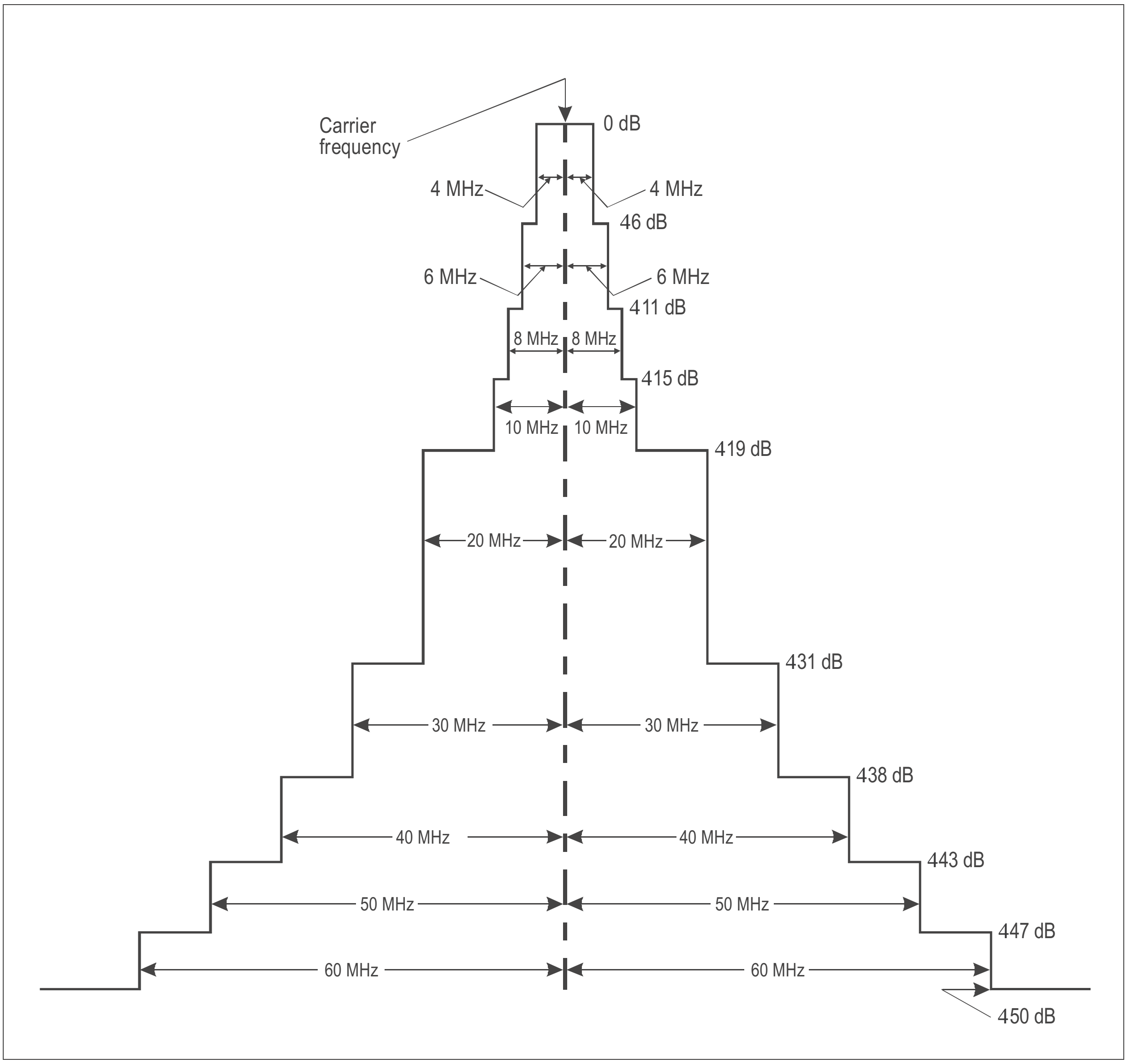


Figure 3-2. Required spectrum limits for interrogator transmitter

Note.— The minimum duration of the phase reversal is not specified. Nonetheless, the spectrum requirements of 3.1.2.1.2 must be met.

3.1.2.1.4.2.2 *Phase relationship.* The tolerance on the 0 and 180-degree phase relationship between successive chips and on the sync phase reversal (3.1.2.1.5.2.2) within the P_6 pulse shall be plus or minus 5 degrees.

Note.— In Mode S a "chip" is the 0.25 microsecond carrier interval between possible data phase reversals.

3.1.2.1.5 *Pulse and phase reversal sequences.* Specific sequences of the pulses or phase reversals described in 3.1.2.1.4 shall constitute interrogations.

3.1.2.1.5.1 *Intermode interrogation*

3.1.2.1.5.1.1 *Mode A/C/S all-call interrogation.* This interrogation shall consist of three pulses: P_1, P_3, and the long P_4 as shown in Figure 3-3. One or two control pulses (P_2 alone, or P_1 and P_2) shall be transmitted using a separate antenna pattern to suppress responses from aircraft in the side lobes of the interrogator antenna.

Note.— The Mode A/C/S all-call interrogation elicits a Mode A or Mode C reply (depending on the P_1-P_3 *pulse spacing) from a Mode A/C transponder because it does not recognize the* P_4 *pulse. A Mode S transponder recognizes the long* P_4 *pulse and responds with a Mode S reply. This interrogation was originally planned for use by isolated or clustered interrogators. Lockout for this interrogation was based on the use of II equals 0. The development of the Mode S subnetwork now dictates the use of a non-zero II code for communication purposes. For this reason, II equals 0 has been reserved for use in support of a form of Mode S acquisition that uses stochastic/lockout override (3.1.2.5.2.1.4 and 3.1.2.5.2.1.5). The Mode A/C/S all-call cannot be used with full Mode S operation since II equals 0 can only be locked out for short time periods (3.1.2.5.2.1.5.2.1). This interrogation cannot be used with stochastic/lockout override, since probability of reply cannot be specified.*

3.1.2.1.5.1.2 *Mode A/C-only all-call interrogation.* This interrogation shall be identical to that of the Mode A/C/S all-call interrogation except that the short P_4 pulse shall be used.

Note.— The Mode A/C-only all-call interrogation elicits a Mode A or Mode C reply from a Mode A/C transponder. A Mode S transponder recognizes the short P_4 *pulse and does not reply to this interrogation.*

3.1.2.1.5.1.3 *Pulse intervals.* The pulse intervals between P_1, P_2 and P_3 shall be as defined in 3.1.1.4.3 and 3.1.1.4.4. The pulse interval between P_3 and P_4 shall be 2 plus or minus 0.05 microsecond.

3.1.2.1.5.1.4 *Pulse amplitudes.* Relative amplitudes between pulses P_1, P_2 and P_3 shall be in accordance with 3.1.1.5. The amplitude of P_4 shall be within 1 dB of the amplitude of P_3.

3.1.2.1.5.2 *Mode S interrogation.* The Mode S interrogation shall consist of three pulses: P_1, P_2 and P_6 as shown in Figure 3-4.

Note.— P_6 *is preceded by a* P_1 *—* P_2 *pair which suppresses replies from Mode A/C transponders to avoid synchronous garble due to random triggering by the Mode S interrogation. The sync phase reversal within* P_6 *is the timing mark for demodulation of a series of time intervals (chips) of 0.25 microsecond duration. This series of chips starts 0.5 microsecond after the sync phase reversal and ends 0.5 microsecond before the trailing edge of* P_6*. A phase reversal may or may not precede each chip to encode its binary information value.*

3.1.2.1.5.2.1 *Mode S side-lobe suppression.* The P_5 pulse shall be used with the Mode S-only all-call interrogation (UF = 11, see 3.1.2.5.2) to prevent replies from aircraft in the side and back lobes of the antenna (3.1.2.1.5.2.5). When used, P_5 shall be transmitted using a separate antenna pattern.

Note 1.— The action of P_5 *is automatic. Its presence, if of sufficient amplitude at the receiving location, masks the sync phase reversal of* P_6.

Note 2.— The P_5 *pulse may be used with other Mode S interrogations.*

3.1.2.1.5.2.2 *Sync phase reversal.* The first phase reversal in the P_6 pulse shall be the sync phase reversal. It shall be the timing reference for subsequent transponder operations related to the interrogation.

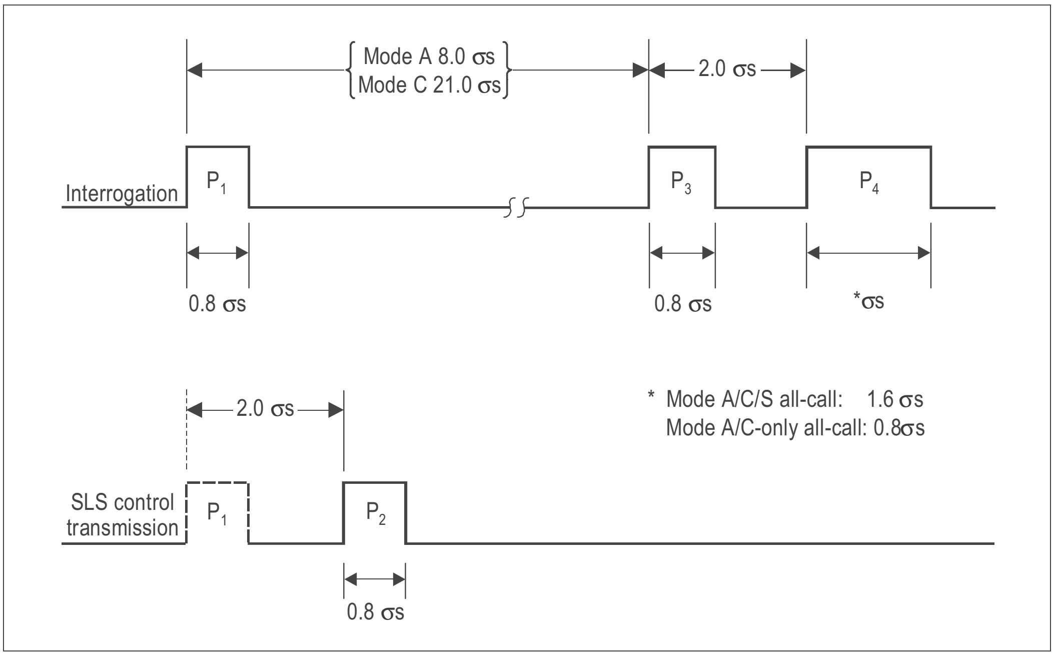


Figure 3-3. Intermode interrogation pulse sequence

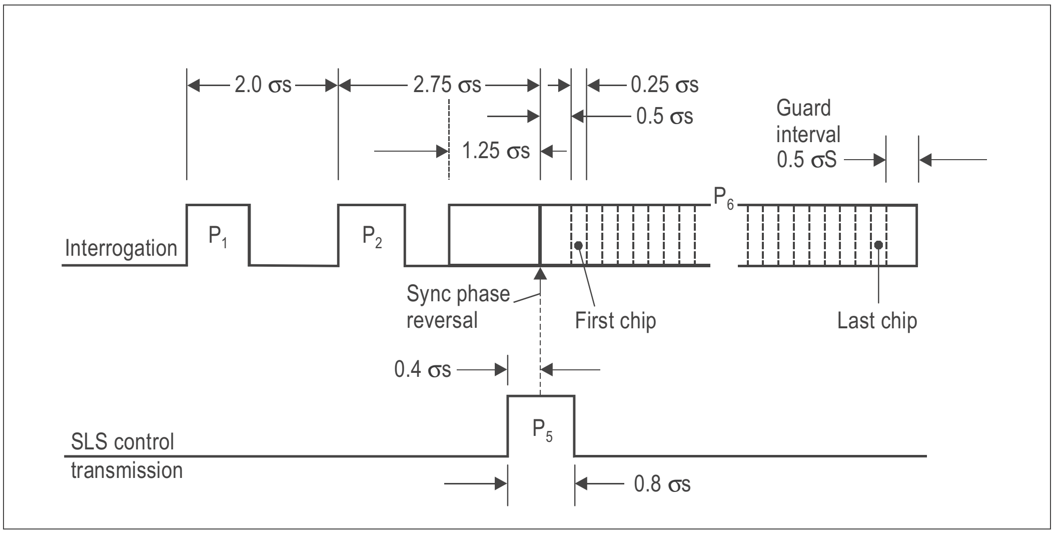


Figure 3-4. Mode S interrogation pulse sequence

3.1.2.1.5.2.3 *Data phase reversals.* Each data phase reversal shall occur only at a time interval (N times 0.25) plus or minus 0.02 microsecond (N equal to, or greater than 2) after the sync phase reversal. The 16.25-microsecond P_6 pulse shall contain at most 56 data phase reversals. The 30.25-microsecond P_6 pulse shall contain at most 112 data phase reversals. The last chip, that is the 0.25-microsecond time interval following the last data phase reversal position, shall be followed by a 0.5-microsecond guard interval.

Note.— The 0.5-microsecond guard interval following the last chip prevents the trailing edge of P_6 *from interfering with the demodulation process.*

3.1.2.1.5.2.4 *Intervals.* The pulse interval between P_1 and P_2 shall be 2 plus or minus 0.05 microsecond. The interval between the leading edge of P_2 and the sync phase reversal of P_6 shall be 2.75 plus or minus 0.05 microsecond. The leading edge of P_6 shall occur 1.25 plus or minus 0.05 microsecond before the sync phase reversal. P_5, if transmitted, shall be centred over the sync phase reversal; the leading edge of P_5 shall occur 0.4 plus or minus 0.05 microsecond before the sync phase reversal.

3.1.2.1.5.2.5 *Pulse amplitudes*. The amplitude of P_2 and the amplitude of the first microsecond of P_6 shall be greater than the amplitude of P_1 minus 0.25 dB. Exclusive of the amplitude transients associated with phase reversals, the amplitude variation of P_6 shall be less than 1 dB and the amplitude variation between successive chips in P_6 shall be less than 0.25 dB. The radiated amplitude of P_5 at the antenna of the transponder shall be:

a) equal to or greater than the radiated amplitude of P_6 from the side-lobe transmissions of the antenna radiating P_6; and

b) at a level lower than 9 dB below the radiated amplitude of P_6 within the desired arc of interrogation.

3.1.2.2 REPLY SIGNALS-IN-SPACE CHARACTERISTICS

3.1.2.2.1 *Reply carrier frequency.* The carrier frequency of all replies (downlink transmissions) from transponders with Mode S capabilities shall be 1 090 plus or minus 1 MHz.

3.1.2.2.2 *Reply spectrum.* The spectrum of a Mode S reply about the carrier frequency shall not exceed the limits specified in Figure 3-5.

3.1.2.2.3 *Polarization.* Polarization of the reply transmissions shall be nominally vertical.

3.1.2.2.4 *Modulation.* The Mode S reply shall consist of a preamble and a data block. The preamble shall be a 4-pulse sequence and the data block shall be binary pulse-position modulated at a 1 megabit per second data rate.

3.1.2.2.4.1 *Pulse shapes.* Pulse shapes shall be as defined in Table 3-2. All values are in microseconds.

3.1.2.2.5 *Mode S reply.* The Mode S reply shall be as shown in Figure 3-6. The data block in Mode S replies shall consist of either 56 or 112 information bits.

3.1.2.2.5.1 *Pulse intervals.* All reply pulses shall start at a defined multiple of 0.5 microsecond from the first transmitted pulse. The tolerance in all cases shall be plus or minus 0.05 microsecond.

3.1.2.2.5.1.1 *Reply preamble.* The preamble shall consist of four pulses, each with a duration of 0.5 microsecond. The pulse intervals from the first transmitted pulse to the second, third and fourth transmitted pulses shall be 1, 3.5 and 4.5 microseconds, respectively.

3.1.2.2.5.1.2 *Reply data pulses.* The reply data block shall begin 8 microseconds after the leading edge of the first transmitted pulse. Either 56 or 112 one-microsecond bit intervals shall be assigned to each transmission. A 0.5-microsecond pulse shall be transmitted either in the first or in the second half of each interval. When a pulse transmitted in the second half of one interval is followed by another pulse transmitted in the first half of the next interval, the two pulses merge and a one-microsecond pulse shall be transmitted.

3.1.2.2.5.2 *Pulse amplitudes.* The pulse amplitude variation between one pulse and any other pulse in a Mode S reply shall not exceed 2 dB.

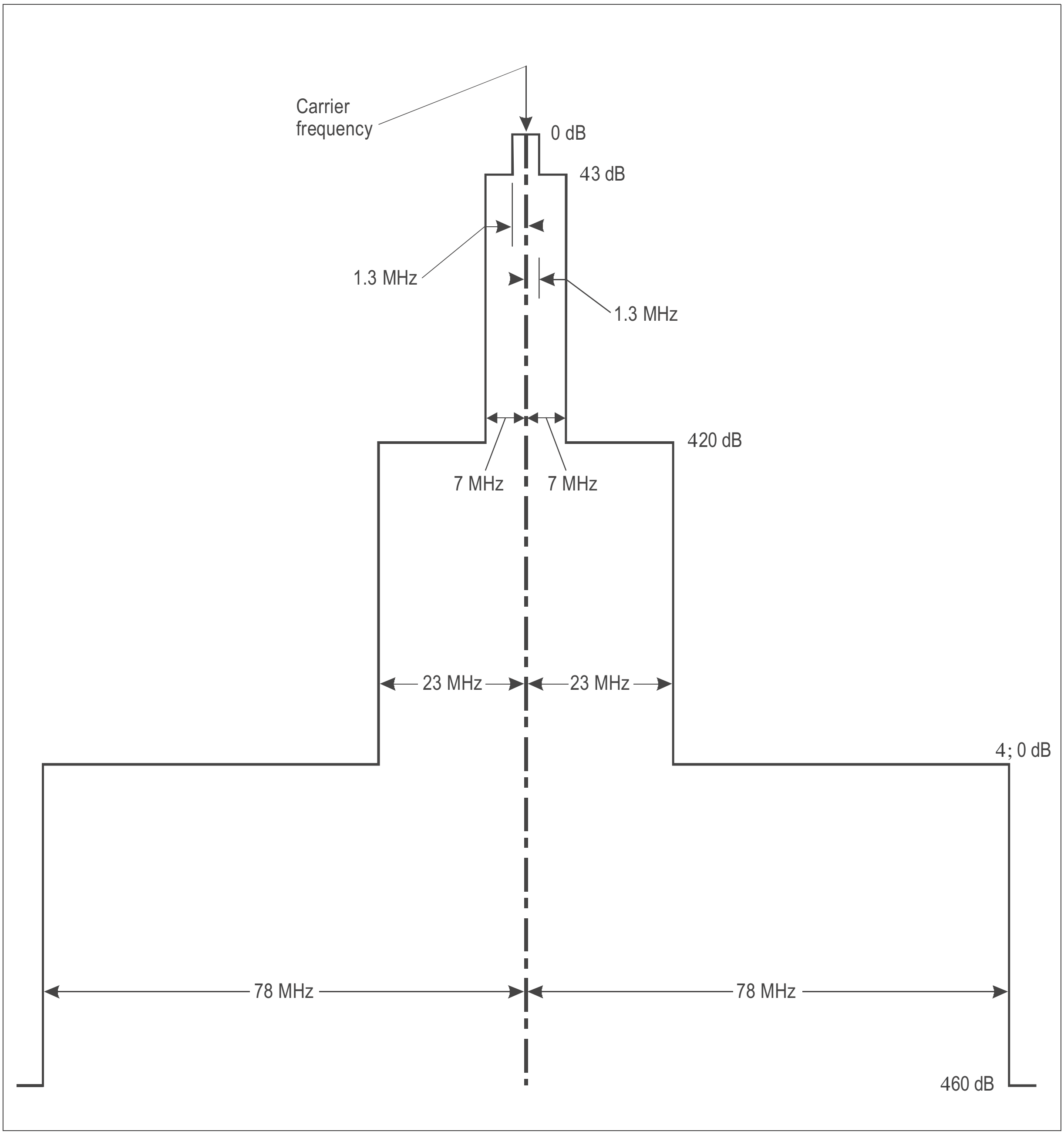


Figure 3-5. Required spectrum limits for transponder transmitter

Note.— This figure shows the spectrum centred on the carrier frequency and will therefore shift in its entirety plus or minus 1 MHz along with the carrier frequency.

Table 3-2. Pulse shapes — Mode S replies

Pulse duration	*Duration tolerance*	*(Rise time)* *Min.*	*(Rise time)* *Max.*	*(Decay time)* *Min.*	*(Decay time)* *Max.*
0.5	±0.05	0.05	0.1	0.05	0.2
1.0	±0.05	0.05	0.1	0.05	0.2

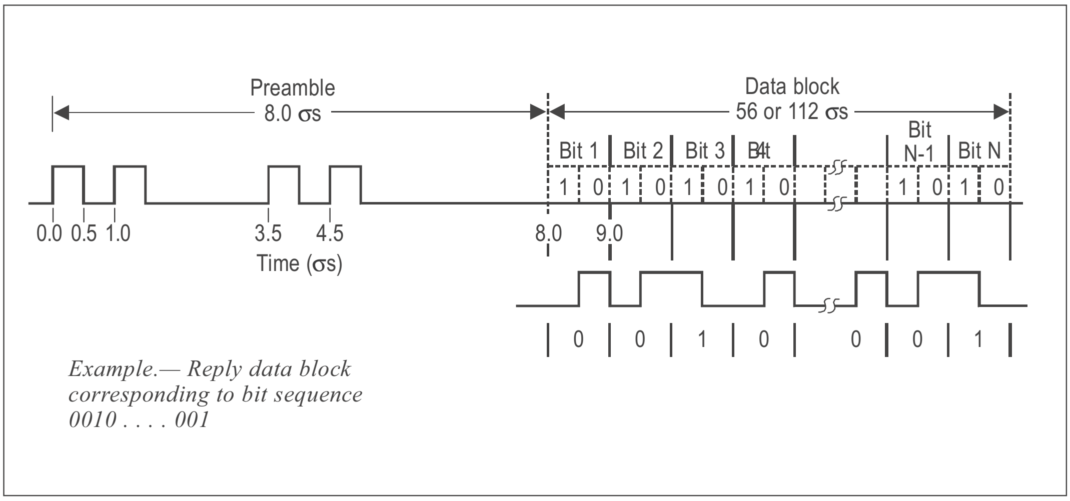


Figure 3-6. Mode S reply

3.1.2.3 MODE S DATA STRUCTURE

3.1.2.3.1 *DATA ENCODING*

3.1.2.3.1.1 *Interrogation data.* The interrogation data block shall consist of the sequence of 56 or 112 data chips positioned after the data phase reversals within P_6 (3.1.2.1.5.2.3). A 180-degree carrier phase reversal preceding a chip shall characterize that chip as a binary ONE. The absence of a preceding phase reversal shall denote a binary ZERO.

3.1.2.3.1.2 *Reply data.* The reply data block shall consist of 56 or 112 data bits formed by binary pulse position modulation encoding of the reply data as described in 3.1.2.2.5.1.2. A pulse transmitted in the first half of the interval shall represent a binary ONE whereas a pulse transmitted in the second half shall represent a binary ZERO.

3.1.2.3.1.3 *Bit numbering.* The bits shall be numbered in the order of their transmission, beginning with bit 1. Unless otherwise stated, numerical values encoded by groups (fields) of bits shall be encoded using positive binary notation and the first bit transmitted shall be the most significant bit (MSB). Information shall be coded in fields which consist of at least one bit.

Note.— In the description of Mode S formats the decimal equivalent of the binary code formed by the bit sequence within a field is used as the designator of the field function or command.

3.1.2.3.2 *FORMATS OF MODE S INTERROGATIONS AND REPLIES*

Note.— A summary of all Mode S interrogation and reply formats is presented in Figures 3-7 and 3-8. A summary of all fields appearing in uplink and downlink formats is given in Table 3-3 and a summary of all subfields is given in Table 3-4.

3.1.2.3.2.1 *Essential fields.* Every Mode S transmission shall contain two essential fields. One is a descriptor which shall uniquely define the format of the transmission. This shall appear at the beginning of the transmission for all formats. The descriptors are designated by the UF (uplink format) or DF (downlink format) fields. The second essential field shall be a 24-bit field appearing at the end of each transmission and shall contain parity information. In all uplink and in currently defined downlink formats parity information shall be overlaid either on the aircraft address (3.1.2.4.1.2.3.1) or on the interrogator identifier according to 3.1.2.3.3.2. The designators are AP (address/parity) or PI (parity/interrogator identifier).

Note.— The remaining coding space is used to transmit the mission fields. For specific functions, a specific set of mission fields is prescribed. Mode S mission fields have two-letter designators. Subfields may appear within mission fields. Mode S subfields are labelled with three-letter designators.

3.1.2.3.2.1.1 *UF: Uplink format.* This uplink format field (5 bits long except in format 24 where it is 2 bits long) shall serve as the uplink format descriptor in all Mode S interrogations and shall be coded according to Figure 3-7.

3.1.2.3.2.1.2 *DF: Downlink format.* This downlink format field (5 bits long except in format 24 where it is 2 bits long) shall serve as the downlink format descriptor in all Mode S replies and shall be coded according to Figure 3-8.

3.1.2.3.2.1.3 *AP: Address/parity.* This 24-bit (33-56 or 89-112) field shall appear in all uplink and currently defined downlink formats except the Mode S-only all-call reply, DF = 11. The field shall contain parity overlaid on the aircraft address according to 3.1.2.3.3.2.

3.1.2.3.2.1.4 *PI: Parity/interrogator identifier.* This 24-bit (33-56) or (89-112) downlink field shall have parity overlaid on the interrogator's identity code according to 3.1.2.3.3.2 and shall appear in the Mode S all-call reply, DF = 11 and in the extended squitter, DF = 17 or DF = 18. If the reply is made in response to a Mode A/C/S all-call, a Mode S-only all-call with CL field (3.1.2.5.2.1.3) and IC field (3.1.2.5.2.1.2) equal to 0, or is an acquisition or an extended squitter (3.1.2.8.5, 3.1.2.8.6 or 3.1.2.8.7), the II and the SI codes shall be 0.

3.1.2.3.2.2 *Unassigned coding space.* Unassigned coding space shall contain all ZEROs as transmitted by interrogators and transponders.

Note.— Certain coding space indicated as unassigned in this section is reserved for other applications such as ACAS, data link, etc.

3.1.2.3.2.3 *Zero and unassigned codes.* A zero code assignment in all defined fields shall indicate that no action is required by the field. In addition, codes not assigned within the fields shall indicate that no action is required.

Note.— The provisions of 3.1.2.3.2.2 and 3.1.2.3.2.3 ensure that future assignments of previously unassigned coding space will not result in ambiguity. That is, Mode S equipment in which the new coding has not been implemented will clearly indicate that no information is being transmitted in newly assigned coding space.

3.1.2.3.3 *ERROR PROTECTION*

3.1.2.3.3.1 *Technique.* Parity check coding shall be used within Mode S interrogations and replies to provide protection against the occurrence of errors.

3.1.2.3.3.1.1 *Parity check sequence.* A sequence of 24 parity check bits shall be generated by the rule described in 3.1.2.3.3.1.2 and shall be incorporated into the field formed by the last 24 bits of all Mode S transmissions. The 24 parity check bits shall be combined with either the address coding or the interrogator identifier coding as described in 3.1.2.3.3.2. The resulting combination then forms either the AP (address/parity, 3.1.2.3.2.1.3) field or the PI (parity/interrogator identifier, 3.1.2.3.2.1.4) field.

Format No.	UF								
0	00000	3	RL:1	4	AQ:1	18		AP:24	.... Short air-air surveillance (ACAS)
1	00001	27 or 83						AP:24	
2	00010	27 or 83						AP:24	
3	00011	27 or 83						AP:24	
4	00100	PC:3	RR:5	DI:3	SD:16			AP:24	.... Surveillance, altitude request
5	00101	PC:3	RR:5	DI:3	SD:16			AP:24	.... Surveillance, identify request
6	00110	27 or 83						AP:24	
7	00111	27 or 83						AP:24	
8	01000	27 or 83						AP:24	
9	01001	27 or 83						AP:24	
10	01010	27 or 83						AP:24	
11	01011	PR:4	IC:4	CL:3	16			AP:24	.... Mode S only all-call
12	01100	27 or 83						AP:24	
13	01101	27 or 83						AP:24	
14	01110	27 or 83						AP:24	
15	01111	27 or 83						AP:24	
16	10000	3	RL:1	4	AQ:1	18	MU:56	AP:24	.... Long air-air surveillance (ACAS)
17	10001	27 or 83						AP:24	
18	10010	27 or 83						AP:24	
19	10011	27 or 83						AP:24	
20	10100	PC:3	RR:5	DI:3	SD:16	MA:56		AP:24	.... Comm-A, altitude request
21	10101	PC:3	RR:5	DI:3	SD:16	MA:56		AP:24	.... Comm-A, identify request
22	10110	27 or 83						AP:24	
23	10111	27 or 83						AP:24	
24	11	RC:2	NC:4	MC:80				AP:24	.... Comm-C (ELM)

NOTES:

1. XX:M denotes a field designated "XX" which is assigned M bits.

2. N denotes unassigned coding space with N available bits. These shall be coded as ZEROs for transmission.

3. For uplink formats (UF) 0 to 23 the format number corresponds to the binary code in the first five bits of the interrogation. Format number 24 is defined as the format beginning with "11" in the first two bit positions while the following three bits vary with the interrogation content.

4. All formats are shown for completeness, although a number of them are unused. Those formats for which no application is presently defined remain undefined in length. Depending on future assignment they may be short (56 bits) or long (112 bits) formats. Specific formats associated with Mode S capability levels are described in later paragraphs.

5. The PC, RR, DI and SD fields do not apply to a Comm-A broadcast interrogation.

Figure 3-7. Summary of Mode S interrogation or uplink formats

Format No.	DF								
0	00000	VS:1	7	RI:4	2	AC:13	AP:24		.... Short air-air surveillance (ACAS)
1	00001	27 or 83	P:24						
2	00010	27 or 83	P:24						
3	00011	27 or 83	P:24						
4	00100	FS:3	DR:5	UM:6	AC:13	AP:24			.... Surveillance, altitude reply
5	00101	FS:3	DR:5	UM:6	ID:13	AP:24			.... Surveillance, identify reply
6	00110	27 or 83	P:24						
7	00111	27 or 83	P:24						
8	01000	27 or 83	P:24						
9	01001	27 or 83	P:24						
10	01010	27 or 83	P:24						
11	01011	CA:3	AA:24	PI:24					.... All-call repy
12	01100	27 or 83	P:24						
13	01101	27 or 83	P:24						
14	01110	27 or 83	P:24						
15	01111	27 or 83	P:24						
16	10000	VS:1	7	RI:4	2	AC:13	MV:56	AP:24	.... Long air-air surveillance (ACAS)
17	10001	CA:3	AA:24	ME:56	PI:24				
18	10010	CF:3	AA:24	ME:56	PI:24				... Extended squitter/non transponder
19	10011	AF:3	104						... Military extended squitter
20	10100	FS:3	DR:5	UM:6	AC:13	MB:56	AP:24		.... Comm-B, altitude reply
21	10101	FS:3	DR:5	UM:6	ID:13	MB:56	AP:24		.... Comm-B, identify reply
22	10110	27 or 83	P:24						
23	10111	27 or 83	P:24						
24	11	1	KE:1	ND:4	MD:80	AP:24			.... Comm-D (ELM)

NOTES:

1. $\boxed{\text{XX:M}}$ denotes a field designated "XX" which is assigned M bits.

   $\boxed{\text{P:24}}$ denotes a 24-bit field reserved for parity information.

2. N denotes unassigned coding space with N available bits. These shall be coded as ZEROs for transmission.

3. For downlink formats (DF) 0 to 23 the format number corresponds to the binary code in the first five bits of the reply. Format number 24 is defined as the format beginning with "11" in the first two bit positions while the following three bits may vary with the reply content.

4. All formats are shown for completeness, although a number of them are unused. Those formats for which no application is presently defined remain undefined in length. Depending on future assignment they may be short (56 bits) or long (112 bits) formats. Specific formats associated with Mode S capability levels are described in later paragraphs.

Figure 3-8. Summary of Mode S reply or downlink formats

Table 3-3. Field definitions

Field		*Format*		
Designator	*Function*	*UF*	*DF*	*Reference*
AA	Address announced		11, 17, 18	3.1.2.5.2.2.2
AC	Altitude code		4, 20	3.1.2.6.5.4
AF	Application field		19	3.1.2.8.8.2
AP	Address/parity	All	0, 4, 5, 16, 20, 21, 24	3.1.2.3.2.1.3
AQ	Acquisition	0		3.1.2.8.1.1
CA	Capability		11, 17	3.1.2.5.2.2.1
CC	Cross-link capability		0	3.1.2.8.2.3
CF	Control field		18	3.1.2.8.7.2
CL	Code label	11		3.1.2.5.2.1.3
DF	Downlink format		All	3.1.2.3.2.1.2
DI	Designator identification	4, 5, 20, 21		3.1.2.6.1.3
DR	Downlink request		4, 5, 20, 21	3.1.2.6.5.2
DS	Data selector	0		3.1.2.8.1.3
FS	Flight status		4, 5, 20, 21	3.1.2.6.5.1
IC	Interrogator code	11		3.1.2.5.2.1.2
ID	Identity		5, 21	3.1.2.6.7.1
KE	Control, ELM		24	3.1.2.7.3.1
MA	Message, Comm-A	20, 21		3.1.2.6.2.1
MB	Message, Comm-B		20, 21	3.1.2.6.6.1
MC	Message, Comm-C	24		3.1.2.7.1.3
MD	Message, Comm-D		24	3.1.2.7.3.3
ME	Message, extended squitter		17, 18	3.1.2.8.6.2
MU	Message, ACAS	16		4.3.8.4.2.3
MV	Message, ACAS		16	3.1.2.8.3.1, 4.3.8.4.2.4
NC	Number of C-segment	24		3.1.2.7.1.2
ND	Number of D-segment		24	3.1.2.7.3.2
PC	Protocol	4, 5, 20, 21		3.1.2.6.1.1
PI	Parity/interrogator identifier		11, 17, 18	3.1.2.3.2.1.4
PR	Probability of reply	11		3.1.2.5.2.1.1
RC	Reply control	24		3.1.2.7.1.1
RI	Reply information		0	3.1.2.8.2.2
RL	Reply length	0		3.1.2.8.1.2
RR	Reply request	4, 5, 20, 21		3.1.2.6.1.2
SD	Special designator	4, 5, 20, 21		3.1.2.6.1.4
UF	Uplink format	All		3.1.2.3.2.1.1
UM	Utility message		4, 5, 20, 21	3.1.2.6.5.3
VS	Vertical status		0	3.1.2.8.2.1

Table 3-4. Subfield definitions

Subfield			
Designator	*Function*	*Field*	*Reference*
ACS	Altitude code subfield	ME	3.1.2.8.6.3.1.2
AIS	Aircraft identification subfield	MB	3.1.2.9.1.1
ATS	Altitude type subfield	MB	3.1.2.8.6.8.2
BDS 1	Comm-B data selector subfield 1	MB	3.1.2.6.11.2.1
BDS 2	Comm-B data selector subfield 2	MB	3.1.2.6.11.2.1
IDS	Identifier designator subfield	UM	3.1.2.6.5.3.1
IIS	Interrogator identifier subfield	SD	3.1.2.6.1.4.1 a)
		UM	3.1.2.6.5.3.1
LOS	Lockout subfield	SD	3.1.2.6.1.4.1 d)
LSS	Lockout surveillance subfield	SD	3.1.2.6.1.4.1 g)
MBS	Multisite Comm-B subfield	SD	3.1.2.6.1.4.1 c)
MES	Multisite ELM subfield	SD	3.1.2.6.1.4.1 c)
RCS	Rate control subfield	SD	3.1.2.6.1.4.1 f)
RRS	Reply request subfield	SD	3.1.2.6.1.4.1 e) and g)
RSS	Reservation status subfield	SD	3.1.2.6.1.4.1 c)
SAS	Surface antenna subfield	SD	3.1.2.6.1.4.1 f)
SCS	Squitter capability subfield	MB	3.1.2.6.10.2.2.1
SIC	Surveillance identifier capability	MB	3.1.2.6.10.2.2.1
SIS	Surveillance identifier subfield	SD	3.1.2.6.1.4.1 g)
SRS	Segment request subfield	MC	3.1.2.7.7.2.1
SSS	Surveillance status subfield	ME	3.1.2.8.6.3.1.1
TAS	Transmission acknowledgement subfield	MD	3.1.2.7.4.2.6
TCS	Type control subfield	SD	3.1.2.6.1.4.1 f)
TMS	Tactical message subfield	SD	3.1.2.6.1.4.1 d)
TRS	Transmission rate subfield	MB	3.1.2.8.6.8.1

3.1.2.3.3.1.2 *Parity check sequence generation.* The sequence of 24 parity bits ($p_1, p_2, ..., p_{24}$) shall be generated from the sequence of information bits ($m_1, m_2, ..., m_k$) where k is 32 or 88 for short or long transmissions respectively. This shall be done by means of a code generated by the polynomial:

$$G(x) = 1 + x^3 + x^{10} + x^{12} + x^{13} + x^{14} + x^{15} + x^{16}$$

$$+ x^{17} + x^{18} + x^{19} + x^{20} + x^{21} + x^{22} + x^{23} + x^{24}$$

When by the application of binary polynomial algebra, x^{24} [$M(x)$] is divided by $G(x)$ where the information sequence $M(x)$ is:

$$m_k + m_{k-1}x + m_{k-2}x^2 + ... + m_1x^{k-1}$$

the result is a quotient and a remainder $R(x)$ of degree less than 24. The bit sequence formed by this remainder represents the parity check sequence. Parity bit p_i, for any i from 1 to 24, is the coefficient of x^{24-i} in $R(x)$.

Note.— The effect of multiplying M(x) by x^{24} is to append 24 ZERO bits to the end of the sequence.

3.1.2.3.3.2 *AP and PI field generation.* Different address parity sequences shall be used for the uplink and downlink.

Note.— The uplink sequence is appropriate for a transponder decoder implementation. The downlink sequence facilitates the use of error correction in downlink decoding.

The code used in uplink AP field generation shall be formed as specified below from either the aircraft address (3.1.2.4.1.2.3.1.1), the all-call address (3.1.2.4.1.2.3.1.2) or the broadcast address (3.1.2.4.1.2.3.1.3).

The code used in downlink AP field generation shall be formed directly from the sequence of 24 Mode S address bits (a_1, a_2,..., a_{24}), where a_i is the *i*-th bit transmitted in the aircraft address (AA) field of an all-call reply (3.1.2.5.2.2.2).

The code used in downlink PI field generation shall be formed by a sequence of 24 bits (a_1, a_2,..., a_{24}), where the first 17 bits are ZEROs, the next three bits are a replica of the code label (CL) field (3.1.2.5.2.1.3) and the last four bits are a replica of the interrogator code (IC) field (3.1.2.5.2.1.2).

Note.— The PI code is not used in uplink transmissions.

A modified sequence (b_1, b_2,..., b_{24}) shall be used for uplink AP field generation. Bit b_i is the coefficient of x^{48-i} in the polynomial *G(x)A(x)*, where:

$$A(x) = a_1x^{23} + a_2x^{22} + ... + a_{24}$$

and

G(x) is as defined in 3.1.2.3.3.1.2.

In the aircraft address a_i shall be the *i*-th bit transmitted in the AA field of an all-call reply. In the all-call and broadcast addresses a_i shall equal 1 for all values of *i*.

3.1.2.3.3.2.1 *Uplink transmission order.* The sequence of bits transmitted in the uplink AP field is:

$$t_{k+1}, t_{k+2} \dots t_{k+24}$$

where the bits are numbered in order of transmission, starting with $k + 1$.

In uplink transmissions:

$$t_{k+i} = b_i \oplus p_i$$

where "⊕" prescribes modulo-2 addition: *i* equals 1 is the first bit transmitted in the AP field.

3.1.2.3.3.2.2 *Downlink transmission order.* The sequence of bits transmitted in the downlink AP and PI field is:

$$t_{k+1}, t_{k+2} \dots t_{k+24}$$

where the bits are numbered in order of transmission, starting with $k + 1$. In downlink transmissions:

$$t_{k+i} = a_i \oplus p_i$$

where "⊕" prescribes modulo-2 addition: *i* equals 1 is the first bit transmitted in the AP or PI field.

3.1.2.4 GENERAL INTERROGATION-REPLY PROTOCOL

3.1.2.4.1 *Transponder transaction cycle.* A transponder transaction cycle shall begin when the SSR Mode S transponder has recognized an interrogation. The transponder shall then evaluate the interrogation and determine whether it shall be accepted. If accepted, it shall then process the received interrogation and generate a reply, if appropriate. The transaction cycle shall end when:

a) any one of the necessary conditions for acceptance has not been met, or

b) an interrogation has been accepted and the transponder has either:

1) completed the processing of the accepted interrogation if no reply is required, or

2) completed the transmission of a reply.

A new transponder transaction cycle shall not begin until the previous cycle has ended.

3.1.2.4.1.1 *Interrogation recognition.* SSR Mode S transponders shall be capable of recognizing the following distinct types of interrogations:

a) Modes A and C;

b) intermode; and

c) Mode S.

Note.— The recognition process is dependent upon the signal input level and the specified dynamic range (3.1.2.10.1).

3.1.2.4.1.1.1 *Mode A and Mode C interrogation recognition.* A Mode A or Mode C interrogation shall be recognized when a P_1 - P_3 pulse pair meeting the requirements of 3.1.1.4 has been received, and the leading edge of a P_4 pulse with an amplitude that is greater than a level 6 dB below the amplitude of P_3 is not received within the interval from 1.7 to 2.3 microseconds following the leading edge of P_3.

If a P_1 - P_2 suppression pair and a Mode A or Mode C interrogation are recognized simultaneously, the transponder shall be suppressed. An interrogation shall not be recognized as Mode A or Mode C if the transponder is in suppression (3.1.2.4.2). If a Mode A and a Mode C interrogation are recognized simultaneously the transponder shall complete the transaction cycle as if only a Mode C interrogation had been recognized.

3.1.2.4.1.1.2 *Intermode interrogation recognition.* An intermode interrogation shall be recognized when a P_1 - P_3 -P_4 pulse triplet meeting the requirements of 3.1.2.1.5.1 is received. An interrogation shall not be recognized as an intermode interrogation if:

a) the received amplitude of the pulse in the P_4 position is smaller than 6 dB below the amplitude of P_3; or

b) the pulse interval between P_3 and P_4 is larger than 2.3 microseconds or shorter than 1.7 microseconds; or

c) the received amplitude of P_1 and P_3 is between MTL and –45 dBm and the pulse duration of P_1 or P_3 is less than 0.3 microsecond; or

d) the transponder is in suppression (3.1.2.4.2).

If a P_1 – P_2 suppression pair and a Mode A or Mode C intermode interrogation are recognized simultaneously the transponder shall be suppressed.

3.1.2.4.1.1.3 *Mode S interrogation recognition.* A Mode S interrogation shall be recognized when a P_6 pulse is received with a sync phase reversal within the interval from 1.20 to 1.30 microseconds following the leading edge of P_6. A Mode S interrogation shall not be recognized if a sync phase reversal is not received within the interval from 1.05 to 1.45 microseconds following the leading edge of P_6.

3.1.2.4.1.2 *Interrogation acceptance.* Recognition according to 3.1.2.4.1 shall be a prerequisite for acceptance of any interrogation.

3.1.2.4.1.2.1 *Mode A and Mode C interrogation acceptance.* Mode A and Mode C interrogations shall be accepted when recognized (3.1.2.4.1.1.1).

3.1.2.4.1.2.2 *Intermode interrogation acceptance*

3.1.2.4.1.2.2.1 *Mode A/C/S all-call interrogation acceptance.* A Mode A/C/S all-call interrogation shall be accepted if the trailing edge of P_4 is received within 3.45 to 3.75 microseconds following the leading edge of P_3 and no lockout condition (3.1.2.6.9) prevents acceptance. A Mode A/C/S all-call shall not be accepted if the trailing edge of P_4 is received earlier than 3.3 or later than 4.2 microseconds following the leading edge of P_3, or if a lockout condition (3.1.2.6.9) prevents acceptance.

3.1.2.4.1.2.2.2 *Mode A/C-only all-call interrogation acceptance.* A Mode A/C-only all-call interrogation shall not be accepted by a Mode S transponder.

Note.— The technical condition for non-acceptance of a Mode A/C-only all-call is given in the preceding paragraph by the requirement for rejecting an intermode interrogation with a P_4 pulse having a trailing edge following the leading edge of P_3 by less than 3.3 microseconds.

3.1.2.4.1.2.3 *Mode S interrogation acceptance.* A Mode S interrogation shall only be accepted if:

a) the transponder is capable of processing the uplink format (UF) of the interrogation (3.1.2.3.2.1.1);

b) the address of the interrogation matches one of the addresses as defined in 3.1.2.4.1.2.3.1 implying that parity is established, as defined in 3.1.2.3.3;

c) no all-call lockout condition applies, as defined in 3.1.2.6.9; and

d) the transponder is capable of processing the uplinked data and presenting it at an output interface as prescribed in 3.1.2.10.5.2.2.1.

3.1.2.4.1.2.3.1 *Addresses.* Mode S interrogations shall contain either:

a) aircraft address; or

b) the all-call address; or

c) the broadcast address.

3.1.2.4.1.2.3.1.1 *Aircraft address.* If the aircraft's address is identical to the address extracted from a received interrogation according to the procedure of 3.1.2.3.3.2 and 3.1.2.3.3.2.1, the extracted address shall be considered correct for purposes of Mode S interrogation acceptance.

3.1.2.4.1.2.3.1.2 *All-call address.* A Mode S-only all-call interrogation (uplink format UF = 11) shall contain an address, designated the all-call address, consisting of twenty-four consecutive ONEs. If the all-call address is extracted from a received interrogation with format UF = 11 according to the procedure of 3.1.2.3.3.2 and 3.1.2.3.3.2.1, the address shall be considered correct for Mode S-only all-call interrogation acceptance.

3.1.2.4.1.2.3.1.3 *Broadcast address.* To broadcast a message to all Mode S transponders within the interrogator beam, a Mode S interrogation uplink format 20 or 21 shall be used and an address of twenty-four consecutive ONEs shall be substituted for the aircraft address. If the UF code is 20 or 21 and this broadcast address is extracted from a received interrogation according to the procedure of 3.1.2.3.3.2 and 3.1.2.3.3.2.1, the address shall be considered correct for Mode S broadcast interrogation acceptance.

Note.— Transponders associated with airborne collision avoidance systems also accept a broadcast with UF = 16.

3.1.2.4.1.3 *Transponder replies.* Mode S transponders shall transmit the following reply types:

a) Mode A and Mode C replies; and

b) Mode S replies.

3.1.2.4.1.3.1 *Mode A and Mode C replies.* A Mode A (Mode C) reply shall be transmitted as specified in 3.1.1.6 when a Mode A (Mode C) interrogation has been accepted.

3.1.2.4.1.3.2 *Mode S replies.* Replies to other than Mode A and Mode C interrogations shall be Mode S replies.

3.1.2.4.1.3.2.1 *Replies to intermode interrogations.* A Mode S reply with downlink format 11 shall be transmitted in accordance with the provisions of 3.1.2.5.2.2 when a Mode A/C/S all-call interrogation has been accepted.

Note.— Since Mode S transponders do not accept Mode A/C-only all-call interrogations, no reply is generated.

3.1.2.4.1.3.2.2 *Replies to Mode S interrogations.* The information content of a Mode S reply shall reflect the conditions existing in the transponder after completion of all processing of the interrogation eliciting that reply. The correspondence between uplink and downlink formats shall be as summarized in Table 3-5.

Note.— Four categories of Mode S replies may be transmitted in response to Mode S interrogations:

a) Mode S all-call replies (DF = 11);

b) surveillance and standard-length communications replies (DF = 4, 5, 20 and 21);

c) extended length communications replies (DF = 24); and

d) air-air surveillance replies (DF = 0 and 16).

Table 3-5. Interrogation — reply protocol summary

Interrogation UF	*Special conditions*	*Reply DF*
0	RL (3.1.2.8.1.2) equals 0	0
	RL (3.1.2.8.1.2) equals 1	16
4	RR (3.1.2.6.1.2) less than 16	4
	RR (3.1.2.6.1.2) equal to or greater than 16	20
5	RR (3.1.2.6.1.2) less than 16	5
	RR (3.1.2.6.1.2) equal to or greater than 16	21
11	Transponder locked out to interrogator code, IC (3.1.2.5.2.1.2)	No reply
	Stochastic reply test fails (3.1.2.5.4)	No reply
	Otherwise	11
20	RR (3.1.2.6.1.2) less than 16	4
	RR (3.1.2.6.1.2) equal to or greater than 16	20
	AP contains broadcast address (3.1.2.4.1.2.3.1.3)	No reply
21	RR (3.1.2.6.1.2) less than 16	5
	RR (3.1.2.6.1.2) equal to or greater than 16	21
	AP contains broadcast address (3.1.2.4.1.2.3.1.3)	No reply
24	RC (3.1.2.7.1.1) equals 0 or 1	No reply
	RC (3.1.2.7.1.1) equals 2 or 3	24

3.1.2.4.1.3.2.2.1 *Replies to SSR Mode S-only all-call interrogations.* The downlink format of the reply to a Mode S-only all-call interrogation (if required) shall be DF = 11. The reply content and rules for determining the requirement to reply shall be as defined in 3.1.2.5.

Note.— A Mode S reply may or may not be transmitted when a Mode S interrogation with UF = 11 has been accepted.

3.1.2.4.1.3.2.2.2 *Replies to surveillance and standard length communications interrogations.* A Mode S reply shall be transmitted when a Mode S interrogation with UF = 4, 5, 20 or 21 and an aircraft address has been accepted. The contents of these interrogations and replies shall be as defined in 3.1.2.6.

Note.— If a Mode S interrogation with UF = 20 or 21 and a broadcast address is accepted, no reply is transmitted (3.1.2.4.1.2.3.1.3).

3.1.2.4.1.3.2.2.3 *Replies to extended length communications interrogations.* A series of Mode S replies ranging in number from 0 to 16 shall be transmitted when a Mode S interrogation with UF = 24 has been accepted. The downlink format of the reply (if any) shall be DF = 24. Protocols defining the number and content of the replies shall be as defined in 3.1.2.7.

3.1.2.4.1.3.2.2.4 *Replies to air-air surveillance interrogations.* A Mode S reply shall be transmitted when a Mode S interrogation with UF = 0 and an aircraft address has been accepted. The contents of these interrogations and replies shall be as defined in 3.1.2.8.

3.1.2.4.2 *SUPPRESSION*

3.1.2.4.2.1 *Effects of suppression.* A transponder in suppression (3.1.1.7.4) shall not recognize Mode A, Mode C or intermode interrogations if either the P_1 pulse alone or both the P_1 and P_3 pulses of the interrogation are received during the suppression interval. Suppression shall not affect the recognition of, acceptance of, or replies to Mode S interrogations.

3.1.2.4.2.2 *Suppression pairs.* The two-pulse Mode A/C suppression pair defined in 3.1.1.7.4.1 shall initiate suppression in a Mode S transponder regardless of the position of the pulse pair in a group of pulses, provided the transponder is not already suppressed or in a transaction cycle.

Note.— The P_3 - P_4 pair of the Mode A/C-only all-call interrogation both prevents a reply and initiates suppression. Likewise, the P_1 - P_2 preamble of a Mode S interrogation initiates suppression independently of the waveform that follows it.

3.1.2.5 INTERMODE AND MODE S ALL-CALL TRANSACTIONS

3.1.2.5.1 *INTERMODE TRANSACTIONS*

Note.— Intermode transactions permit the surveillance of Mode A/C-only aircraft and the acquisition of Mode S aircraft. The Mode A/C/S all-call interrogation allows Mode A/C-only and Mode S transponders to be interrogated by the same transmissions. The Mode A/C-only all-call interrogation makes it possible to elicit replies only from Mode A/C transponders. In multisite scenarios, the interrogator must transmit its identifier code in the Mode S only all-call interrogation. Thus, a pair of Mode S-only and Mode A/C-only all-call interrogations are used. The intermode interrogations are defined in 3.1.2.1.5.1 and the corresponding interrogation-reply protocols are defined in 3.1.2.4.

3.1.2.5.2 *MODE S-ONLY ALL-CALL TRANSACTIONS*

Note.— These transactions allow the ground to acquire Mode S aircraft by use of an interrogation addressed to all Mode S-equipped aircraft. The reply is via downlink format 11 which returns the aircraft address. The interrogation-reply protocols are defined in 3.1.2.4.

3.1.2.5.2.1 *Mode S-only all-call interrogation, uplink format 11*

1	6	10	14	17	33
UF	PR	IC	CL		AP
5	9	13	16	32	56

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
PR probability of reply	3.1.2.5.2.1.1
IC interrogator code	3.1.2.5.2.1.2
CL code label	3.1.2.5.2.1.3
spare — 16 bits	
AP address/parity	3.1.2.3.2.1.3

3.1.2.5.2.1.1 *PR: Probability of reply.* This 4-bit (6-9) uplink field shall contain commands to the transponder specifying the probability of reply to that interrogation (3.1.2.5.4). Codes are as follows:

0	signifies reply with probability of 1
1	signifies reply with probability of 1/2
2	signifies reply with probability of 1/4
3	signifies reply with probability of 1/8
4	signifies reply with probability of 1/16
5, 6, 7	not assigned
8	signifies disregard lockout, reply with probability of 1
9	signifies disregard lockout, reply with probability of 1/2
10	signifies disregard lockout, reply with probability of 1/4
11	signifies disregard lockout, reply with probability of 1/8
12	signifies disregard lockout, reply with probability of 1/16
13, 14, 15	not assigned.

3.1.2.5.2.1.2 *IC: Interrogator code.* This 4-bit (10-13) uplink field shall contain either the 4-bit interrogator identifier code (3.1.2.5.2.1.2.3) or the lower 4 bits of the 6-bit surveillance identifier code (3.1.2.5.2.1.2.4) depending on the value of the CL field (3.1.2.5.2.1.3).

3.1.2.5.2.1.2.1 **Recommendation.—** *It is recommended that whenever possible an interrogator should operate using a single interrogator code.*

3.1.2.5.2.1.2.2 *The use of multiple interrogator codes by one interrogator.* An interrogator may use more than one interrogator code and may use different interrogator codes in different interrogations. An interrogator shall only use multiple interrogator codes on a sector basis and shall not use more than two interrogator codes.

3.1.2.5.2.1.2.3 *II: Interrogator identifier.* This 4-bit value shall define an interrogator identifier (II) code. These II codes shall be assigned to interrogators in the range from 0 to 15. The II code value of 0 shall only be used for supplementary acquisition in conjunction with acquisition based on lockout override (3.1.2.5.2.1.4 and 3.1.2.5.2.1.5). When two II codes are assigned to one interrogator only, one II code shall be used for full data link purposes. Limited data link activity including single segment Comm-A, uplink and downlink broadcast protocols and GICB extraction may be performed by both II codes.

3.1.2.5.2.1.2.4 *SI: Surveillance identifier.* This 6-bit value shall define a surveillance identifier (SI) code. These SI codes shall be assigned to interrogators in the range from 1 to 63. The SI code value of 0 shall not be used. The SI codes shall be used with the multisite lockout protocols (3.1.2.6.9.1). The SI codes shall not be used with the multisite communications protocols (3.1.2.6.11.3.2, 3.1.2.7.4 or 3.1.2.7.7).

3.1.2.5.2.1.3 *CL: Code label.* This 3-bit (14-16) uplink field shall define the contents of the IC field.

Coding (in binary)

000 signifies that the IC field contains the II code
001 signifies that the IC field contains SI codes 1 to 15
010 signifies that the IC field contains SI codes 16 to 31
011 signifies that the IC field contains SI codes 32 to 47
100 signifies that the IC field contains SI codes 48 to 63

The other values of the CL field shall not be used.

3.1.2.5.2.1.3.1 *Surveillance identifier (SI) code capability report.* Transponders which process the SI codes (3.1.2.5.2.1.2.4) shall report this capability by setting bit 35 to 1 in the surveillance identifier capability (SIC) subfield of the MB field of the data link capability report (3.1.2.6.10.2.2).

3.1.2.5.2.1.4 *Operation based on lockout override for an interrogator without an assigned interrogator code*

Note.— The Mode S-only all-call can provide the basis for acquisition of Mode S aircraft for interrogators that need the identity information available via Mode S but are not able to have an II code assigned for full Mode S operation.

3.1.2.5.2.1.4.1 *Maximum Mode S-only all-call interrogation rate.* The maximum rate of Mode S-only all-call interrogations made by an interrogator using acquisition based on lockout override shall depend on the reply probability as follows:

a) for a reply probability equal to 1.0:

the smaller of 3 interrogations per 3 dB beam dwell or 30 interrogations per second;

b) for a reply probability equal to 0.5:

the smaller of 5 interrogations per 3 dB beam dwell or 60 interrogations per second; and

c) for a reply probability equal to 0.25 or less:

the smaller of 10 interrogations per 3 dB beam dwell or 125 interrogations per second.

3.1.2.5.2.1.4.2 *Field content for a selectively addressed interrogation.* Selectively addressed interrogations used in connection with acquisition using lockout override shall have interrogation field contents restricted as follows:

UF = 4, 5, 20 or 21
PC = 0
RR ≠ 16 if RRS = 0
DI = 7
IIS = 0
LOS = 0 except as specified in 3.1.2.5.2.1.5
TMS = 0

Note.— These restrictions permit surveillance and GICB transactions, but prevent the interrogation from making any changes to transponder multisite lockout or communications protocol states.

3.1.2.5.2.1.5 *Supplementary acquisition using II equals 0*

Note.— The acquisition technique defined in 3.1.2.5.2.1.4 provides rapid acquisition for most aircraft. Due to the probabilistic nature of the process, it may take many interrogations to acquire the last aircraft of a large set of aircraft in the same beam dwell and near the same range (termed a local garble zone). Acquisition performance is greatly improved for the acquisition of these aircraft through the use of limited selective lockout using II equals 0.

3.1.2.5.2.1.5.1 *Lockout within a beam dwell*

3.1.2.5.2.1.5.1.1 **Recommendation.—** *When II equals 0 lockout is used to supplement the acquisition technique of 3.1.2.5.2.1.4, all aircraft within the beam dwell of the aircraft being acquired should be commanded to lockout to II equals 0, not just those in the garble zone.*

Note.— Lockout of all aircraft in the beam dwell will reduce the amount of all-call fruit replies generated to the II equals 0 all-call interrogations.

3.1.2.5.2.1.5.2 *Duration of lockout*

Note 1.— Supplementary acquisition consists of locking out acquired aircraft to II = 0 followed by acquisitions by means of the Mode S-only all-call interrogation with II equals 0.

Note 2.— Minimizing the lockout time reduces the probability of conflict with the acquisition activities of a neighbouring interrogator that is also using II equals 0 for supplementary acquisition.

3.1.2.5.2.1.5.2.1 **Recommendation.—** *Interrogators performing supplementary acquisition using II equals 0 (in connection with the technique of 3.1.2.5.2.1.4) should perform acquisition by transmitting a lockout command for no more than a single scan to each of the acquired aircraft in the beam dwell containing the garble zone.*

3.1.2.5.2.1.5.2.2 **Recommendation.—** *Mode S only all-call interrogations with II = 0 for the purpose of supplementary acquisition should take place over no more than two consecutive scans.*

3.1.2.5.2.2 *All-call reply, downlink format 11*

1	6	9	33
DF	CA	AA	PI
5	8	32	56

The reply to the Mode S-only all-call or the Mode A/C/S all-call interrogation shall be the Mode S all-call reply, downlink format 11. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
CA capability	3.1.2.5.2.2.1
AA address announced	3.1.2.5.2.2.2
PI parity/interrogator identifier	3.1.2.3.2.1.4

3.1.2.5.2.2.1 *CA: Capability.* This 3-bit (6-8) downlink field shall contain an encoded definition of the communications capability of the transponder and shall be used in the all-call reply format (DF = 11).

Coding

0 signifies no communications capability (surveillance only), and no ability to set CA code 7 and either airborne or on the ground
1 reserved
2 reserved
3 reserved
4 signifies at least Comm-A and Comm-B capability and ability to set CA code 7 and on the ground
5 signifies at least Comm-A and Comm-B capability and ability to set CA code 7 and airborne
6 signifies at least Comm-A and Comm-B capability and ability to set CA code 7 and either airborne or on the ground
7 signifies the DR field is not equal to 0 or the FS field equals 2, 3, 4 or 5, and either airborne or on the ground

When the conditions for CA code 7 are not satisfied, installations that have communications capability but do not have automatic means to set the on-the-ground condition shall use CA code 6. Aircraft with automatic on-the-ground determination shall use CA code 4 or 5. Data link capability reports (3.1.2.6.10.2.2) shall be available from aircraft installations that set CA code 4, 5, 6 or 7.

Note.— CA codes 1 to 3 are reserved for use by Mode S transponders that do not have the ability to set CA code 7. Transponders with these codes will provide a data link capability report (3.1.2.6.10.2.2). No data link transactions other than GICB extraction including aircraft identity, ACAS RA extraction, and downlink broadcast extraction, should be attempted with these transponders.

3.1.2.5.2.2.2 *AA: Address announced.* This 24-bit (9-32) downlink field shall contain the aircraft address which provides unambiguous identification of the aircraft.

3.1.2.5.3 *Lockout protocol.* The all-call lockout protocol defined in 3.1.2.6.9 shall be used by the interrogator with respect to an aircraft once the address of that specific aircraft has been acquired by an interrogator.

Note.— Following acquisition, a transponder is interrogated by discretely addressed interrogations as prescribed in 3.1.2.6, 3.1.2.7 and 3.1.2.8 and the all-call lockout protocol is used to inhibit replies to further all-call interrogations.

3.1.2.5.4 *Stochastic all-call protocol.* The transponder shall execute a random process upon acceptance of a Mode S-only all-call with a PR code equal to 1 to 4 or 9 to 12. A decision to reply shall be made in accordance with the probability specified in the interrogation. A transponder shall not reply if a PR code equal to 5, 6, 7, 13, 14 or 15 is received (3.1.2.5.2.1.1).

Note.— The random occurrence of replies makes it possible for the interrogator to acquire closely spaced aircraft, replies from which would otherwise synchronously garble each other.

3.1.2.6 ADDRESSED SURVEILLANCE AND STANDARD LENGTH COMMUNICATION TRANSACTIONS

Note 1.— The interrogations described in this section are addressed to specific aircraft. There are two basic interrogation and reply types, short and long. The short interrogations and replies are UF 4 and 5 and DF 4 and 5, while the long interrogations and replies are UF 20 and 21 and DF 20 and 21.

Note 2.— The communications protocols are given in 3.1.2.6.11. These protocols describe the control of the data exchange.

3.1.2.6.1 SURVEILLANCE, ALTITUDE REQUEST, UPLINK FORMAT 4

1	6	9	14	17	33
UF	PC	RR	DI	SD	AP
5	8	13	16	32	56

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
PC protocol	3.1.2.6.1.1
RR reply request	3.1.2.6.1.2
DI designator identification	3.1.2.6.1.3
SD special designator	3.1.2.6.1.4
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.1.1 *PC: Protocol.* This 3-bit, (6-8) uplink field shall contain operating commands to the transponder. The PC field shall be ignored for the processing of surveillance or Comm-A interrogations containing DI = 3 (3.1.2.6.1.4.1).

Coding

0	signifies no action
1	signifies non-selective all-call lockout (3.1.2.6.9.2)
2	not assigned
3	not assigned
4	signifies close out Comm-B (3.1.2.6.11.3.2.3)
5	signifies close out uplink ELM (3.1.2.7.4.2.8)
6	signifies close out downlink ELM (3.1.2.7.7.3)
7	not assigned.

3.1.2.6.1.2 *RR: Reply request.* This 5-bit, (9-13) uplink field shall command the length and content of a requested reply.

The last four bits of the 5-bit RR code, transformed into their decimal equivalent, shall designate the BDS1 code (3.1.2.6.11.2 or 3.1.2.6.11.3) of the requested Comm-B message if the most significant bit (MSB) of the RR code is 1 (RR is equal to or greater than 16).

Coding

RR = 0-15 shall be used to request a reply with surveillance format (DF = 4 or 5);
RR = 16-31 shall be used to request a reply with Comm-B format (DF = 20 or 21);
RR = 16 shall be used to request transmission of an air-initiated Comm-B according to 3.1.2.6.11.3;
RR = 17 shall be used to request a data link capability report according to 3.1.2.6.10.2.2;
RR = 18 shall be used to request aircraft identification according to 3.1.2.9;
19-31 are not assigned in section 3.1.

Note.— Codes 19-31 are reserved for applications such as data link communications, airborne collision avoidance systems (ACAS), etc.

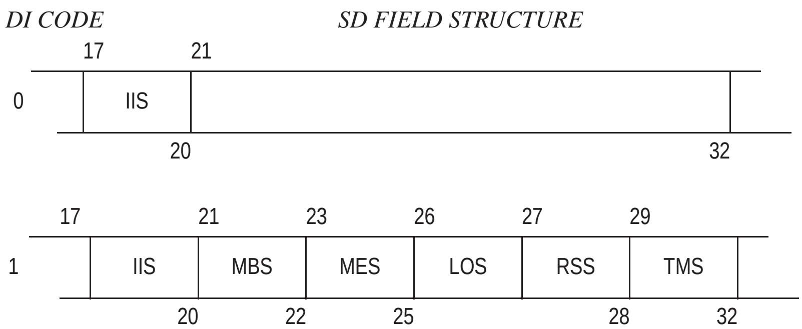
3.1.2.6.1.3 *DI: Designator identification.* This 3-bit (14-16) uplink field shall identify the structure of the SD field (3.1.2.6.1.4).

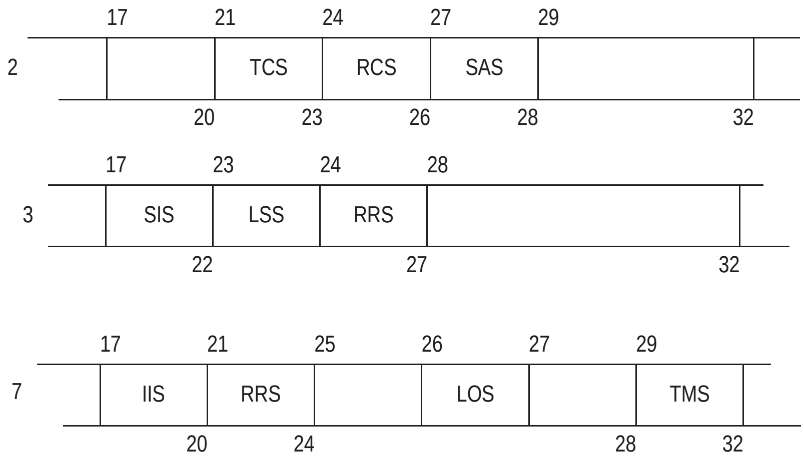
Coding

0	signifies SD not assigned except for IIS
1	signifies SD contains multisite and communications control information
2	signifies SD contains control data for extended squitter
3	signifies SD contains SI multisite lockout, broadcast and GICB control information
4-6	signifies SD not assigned
7	signifies SD contains extended data readout request, multisite and communications control information.

3.1.2.6.1.4 *SD: Special designator.* This 16-bit (17-32) uplink field shall contain control codes which depend on the coding in the DI field.

Note.— The special designator (SD) field is provided to accomplish the transfer of multisite, lockout and communications control information from the ground station to the transponder.





3.1.2.6.1.4.1 *Subfields in SD.* The SD field shall contain information as follows:

a) If DI = 0, 1 or 7:

IIS, the 4-bit (17-20) interrogator identifier subfield shall contain an assigned identifier code of the interrogator (3.1.2.5.2.1.2.3).

b) If DI = 0:

bits 21-32 are not assigned.

c) If DI = 1:

MBS, the 2-bit (21, 22) multisite Comm-B subfield shall have the following codes:

0 signifies no Comm-B action
1 signifies air-initiated Comm-B reservation request (3.1.2.6.11.3.1)
2 signifies Comm-B closeout (3.1.2.6.11.3.2.3)
3 not assigned.

MES, the 3-bit (23-25) multisite ELM subfield shall contain reservation and closeout commands for ELM as follows:

0 signifies no ELM action
1 signifies uplink ELM reservation request (3.1.2.7.4.1)
2 signifies uplink ELM closeout (3.1.2.7.4.2.8)
3 signifies downlink ELM reservation request (3.1.2.7.7.1.1)
4 signifies downlink ELM closeout (3.1.2.7.7.3)
5 signifies uplink ELM reservation request and downlink ELM closeout
6 signifies uplink ELM closeout and downlink ELM reservation request
7 signifies uplink ELM and downlink ELM closeouts.

RSS, the 2-bit (27, 28) reservation status subfield shall request the transponder to report its reservation status in the UM field. The following codes have been assigned:

0 signifies no request
1 signifies report Comm-B reservation status in UM
2 signifies report uplink ELM reservation status in UM
3 signifies report downlink ELM reservation status in UM.

d) If DI = 1 or 7:

LOS, the 1-bit (26) lockout subfield, if set to 1, shall signify a multisite lockout command from the interrogator indicated in IIS. LOS set to 0, shall be used to signify that no change in lockout state is commanded.

TMS, the 4-bit (29-32) tactical message subfield shall contain communications control information used by the data link avionics.

e) If DI = 7:

RRS, the 4-bit (21-24) reply request subfield in SD shall give the BDS2 code of a requested Comm-B reply.

Bits 25, 27 and 28 are not assigned.

f) If DI = 2:

TCS, the 3-bit (21-23) type control subfield in SD shall control the position type used by the transponder. The following codes have been assigned:

0 signifies no position type command
1 signifies use surface position type for the next 15 seconds
2 signifies use surface position type for the next 60 seconds
3 signifies cancel surface type command
4-7 not assigned.

RCS, the 3-bit (24-26) rate control subfield in SD shall control the squitter rate of the transponder when it is reporting the surface format. This subfield shall have no effect on the transponder squitter rate when it is reporting the airborne position type. The following codes have been assigned:

0 signifies no surface squitter rate command
1 signifies report high surface squitter rate for 60 seconds
2 signifies report low surface squitter rate for 60 seconds
3 signifies suppress all surface squitters for 60 seconds
4 signifies suppress all surface squitters for 120 seconds
5-7 not assigned.

Note.— The definition of high and low squitter rate is given in 3.1.2.8.6.4.3.

SAS, the 2-bit (27-28) surface antenna subfield in SD shall control the selection of the transponder diversity antenna that is used for (1) the extended squitter when the transponder is reporting the surface format, and (2) the acquisition squitter when the transponder is reporting the on-the-ground status. This subfield shall have no effect on the transponder diversity antenna selection when it is reporting the airborne status. The following codes have been assigned:

0 signifies no antenna command
1 signifies alternate top and bottom antennas for 120 seconds
2 signifies use bottom antenna for 120 seconds
3 signifies return to the default.

Note.— The top antenna is the default condition (3.1.2.8.6.5).

g) If DI = 3:

SIS, the 6-bit (17-22) surveillance identifier subfield in SD shall contain an assigned surveillance identifier code of the interrogator (3.1.2.5.2.1.2.4).

LSS, the 1-bit (23) lockout surveillance subfield, if set to 1, shall signify a multisite lockout command from the interrogator indicated in SIS. If set to 0, LSS shall signify that no change in lockout state is commanded.

RRS, the 4-bit (24-27) reply request subfield in SD shall contain the BDS2 code of a requested GICB register.

Bits 28 to 32 are not assigned.

3.1.2.6.1.5 *PC and SD field processing.* When DI = 1, PC field processing shall be completed before processing the SD field.

3.1.2.6.2 COMM-A ALTITUDE REQUEST, UPLINK FORMAT 20

1	6	9	14	17	33	89
UF	PC	RR	DI	SD	MA	AP
5	8	13	16	32	88	112

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
PC protocol	3.1.2.6.1.1
RR reply request	3.1.2.6.1.2
DI designator identification	3.1.2.6.1.3
SD special designator	3.1.2.6.1.4
MA message, Comm-A	3.1.2.6.2.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.2.1 *MA: Message, Comm-A.* This 56-bit (33-88) field shall contain a data link message to the aircraft.

3.1.2.6.3 SURVEILLANCE IDENTITY REQUEST, UPLINK FORMAT 5

1	6	9	14	17	33
UF	PC	RR	DI	SD	AP
5	8	13	16	32	56

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
PC protocol	3.1.2.6.1.1
RR reply request	3.1.2.6.1.2
DI designator identification	3.1.2.6.1.3
SD special designator	3.1.2.6.1.4
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.4 COMM-A IDENTITY REQUEST, UPLINK FORMAT 21

1	6	9	14	17	33	89
UF	PC	RR	DI	SD	MA	AP
5	8	13	16	32	88	112

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
PC protocol	3.1.2.6.1.1
RR reply request	3.1.2.6.1.2
DI designator identification	3.1.2.6.1.3
SD special designator	3.1.2.6.1.4
MA message, Comm-A	3.1.2.6.2.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.5 SURVEILLANCE ALTITUDE REPLY, DOWNLINK FORMAT 4

1	6	9	14	20	33
DF	FS	DR	UM	AC	AP
5	8	13	19	32	56

This reply shall be generated in response to an interrogation UF 4 or 20 with an RR field value less than 16. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
FS flight status	3.1.2.6.5.1
DR downlink request	3.1.2.6.5.2
UM utility message	3.1.2.6.5.3
AC altitude code	3.1.2.6.5.4
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.5.1 *FS: Flight status.* This 3-bit (6-8) downlink field shall contain the following information:

Coding	
0	signifies no alert and no SPI, aircraft is airborne
1	signifies no alert and no SPI, aircraft is on the ground
2	signifies alert, no SPI, aircraft is airborne
3	signifies alert, no SPI, aircraft is on the ground
4	signifies alert and SPI, aircraft is airborne or on the ground
5	signifies no alert and SPI, aircraft is airborne or on the ground
6	reserved
7	not assigned

Note.— The conditions which cause an alert are given in 3.1.2.6.10.1.1.

3.1.2.6.5.2 *DR: Downlink request.* This 5-bit (9-13) downlink field shall contain requests to downlink information.

Coding	
0	signifies no downlink request
1	signifies request to send Comm-B message
2	reserved for ACAS
3	reserved for ACAS
4	signifies Comm-B broadcast message 1 available
5	signifies Comm-B broadcast message 2 available
6	reserved for ACAS
7	reserved for ACAS
8-15	not assigned
16-31	see downlink ELM protocol (3.1.2.7.7.1)

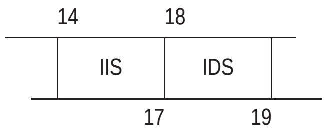
Codes 1-15 shall take precedence over codes 16-31.

Note.— Giving precedence to codes 1-15 permits the announcement of a Comm-B message to interrupt the announcement of a downlink ELM. This gives priority to the announcement of the shorter message.

3.1.2.6.5.3 *UM: Utility message.* This 6-bit (14-19) downlink field shall contain transponder communications status information as specified in 3.1.2.6.1.4.1 and 3.1.2.6.5.3.1.

3.1.2.6.5.3.1 Subfields in UM for multisite protocols

UM FIELD STRUCTURE



The following subfields shall be inserted by the transponder into the UM field of the reply if a surveillance or Comm-A interrogation (UF equals 4, 5, 20, 21) contains DI = 1 and RSS other than 0:

IIS: The 4-bit (14-17) interrogator identifier subfield reports the identifier of the interrogator that is reserved for multisite communications.

IDS: The 2-bit (18, 19) identifier designator subfield reports the type of reservation made by the interrogator identified in IIS.

Assigned coding is:

0 signifies no information
1 signifies IIS contains Comm-B II code
2 signifies IIS contains Comm-C II code
3 signifies IIS contains Comm-D II code.

3.1.2.6.5.3.2 *Multisite reservation status.* The interrogator identifier of the ground station currently reserved for multisite Comm-B delivery (3.1.2.6.11.3.1) shall be transmitted in the IIS subfield together with code 1 in the IDS subfield if the UM content is not specified by the interrogation (when DI = 0 or 7, or when DI = 1 and RSS = 0).

The interrogator identifier of the ground station currently reserved for downlink ELM delivery (3.1.2.7.6.1), if any, shall be transmitted in the IIS subfield together with code 3 in the IDS subfield if the UM content is not specified by the interrogation and there is no current Comm-B reservation.

3.1.2.6.5.4 *AC: Altitude code.* This 13-bit (20-32) field shall contain altitude coded as follows:

a) Bit 26 is designated as the M bit, and shall be 0 if the altitude is reported in feet. M equals 1 shall be reserved to indicate that the altitude reporting is in metric units.

b) If M equals 0, then bit 28 is designated as the Q bit. Q equals 0 shall be used to indicate that the altitude is reported in 100-foot increments. Q equals 1 shall be used to indicate that the altitude is reported in 25-foot increments.

c) If the M bit (bit 26) and the Q bit (bit 28) equal 0, the altitude shall be coded according to the pattern for Mode C replies of 3.1.1.7.12.2.3. Starting with bit 20 the sequence shall be C1, A1, C2, A2, C4, A4, ZERO, B1, ZERO, B2, D2, B4, D4.

d) If the M bit equals 0 and the Q bit equals 1, the 11-bit field represented by bits 20 to 25, 27 and 29 to 32 shall represent a binary coded field with a least significant bit (LSB) of 25 ft. The binary value of the positive decimal integer "N" shall be encoded to report pressure-altitude in the range [(25 N – 1 000) plus or minus 12.5 ft]. The coding of 3.1.2.6.5.4 c) shall be used to report pressure-altitude above 50 187.5 ft.

Note 1.— This coding method is only able to provide values between minus 1 000 ft and plus 50 175 ft.

Note 2.— The most significant bit (MSB) of this field is bit 20 as required by 3.1.2.3.1.3.

e) If the M bit equals 1, the 12-bit field represented by bits 20 to 25 and 27 to 31 shall be reserved for encoding altitude in metric units.

f) 0 shall be transmitted in each of the 13 bits of the AC field if altitude information is not available or if the altitude has been determined invalid.

3.1.2.6.6 *COMM-B ALTITUDE REPLY, DOWNLINK FORMAT 20*

1	6	9	14	20	33	89
DF	FS	DR	UM	AC	MB	AP
5	8	13	19	32	88	112

This reply shall be generated in response to an interrogation UF 4 or 20 with an RR field value greater than 15. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
FS flight status	3.1.2.6.5.1
DR downlink request	3.1.2.6.5.2
UM utility message	3.1.2.6.5.3
AC altitude code	3.1.2.6.5.4
MB message, Comm-B	3.1.2.6.6.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.6.1 *MB: Message, Comm-B.* This 56-bit (33-88) downlink field shall be used to transmit data link messages to the ground.

3.1.2.6.7 *SURVEILLANCE IDENTITY REPLY, DOWNLINK FORMAT 5*

1	6	9	14	20	33
DF	FS	DR	UM	ID	AP
5	8	13	19	32	56

This reply shall be generated in response to an interrogation UF 5 or 21 with an RR field value less than 16. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
FS flight status	3.1.2.6.5.1
DR downlink request	3.1.2.6.5.2
UM utility message	3.1.2.6.5.3
ID identity	3.1.2.6.7.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.7.1 *ID: Identity (Mode A code).* This 13-bit (20-32) field shall contain aircraft identity code, in accordance with the pattern for Mode A replies in 3.1.1.6. Starting with bit 20, the sequence shall be C1, A1, C2, A2, C4, A4, ZERO, B1, D1, B2, D2, B4, D4.

3.1.2.6.8 *COMM-B IDENTITY REPLY, DOWNLINK FORMAT 21*

1	6	9	14	20	33	89
DF	FS	DR	UM	ID	MB	AP
5	8	13	19	32	88	112

This reply shall be generated in response to an interrogation UF 5 or 21 with an RR field value greater than 15. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
FS flight status	3.1.2.6.5.1
DR downlink request	3.1.2.6.5.2
UM utility message	3.1.2.6.5.3
ID identity	3.1.2.6.7.1
MB message, Comm-B	3.1.2.6.6.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.6.9 *LOCKOUT PROTOCOLS*

3.1.2.6.9.1 *Multisite all-call lockout*

Note.— The multisite lockout protocol prevents transponder acquisition from being denied one ground station by lockout commands from an adjacent ground station that has overlapping coverage.

3.1.2.6.9.1.1 The multisite lockout command shall be transmitted in the SD field (3.1.2.6.1.4.1). A lockout command for an II code shall be transmitted in an SD with DI = 1 or DI = 7. An II lockout command shall be indicated by LOS code equals 1 and the presence of a non-zero interrogator identifier in the IIS subfield of SD. A lockout command for an SI code shall be transmitted in an SD with DI = 3. SI lockout shall be indicated by LSS equals 1 and the presence of a non-zero interrogator identifier in the SIS subfield of SD. After a transponder has accepted an interrogation containing a multisite lockout command, that transponder shall commence to lock out (i.e. not accept) any Mode S-only all-call interrogation which includes the identifier of the interrogator that commanded the lockout. The lockout shall persist for an interval T_L (3.1.2.10.3.9) after the last acceptance of an interrogation containing the multisite lockout command. Multisite lockout shall not prevent acceptance of a Mode S-only all-call interrogation containing PR codes 8 to 12. If a lockout command (LOS = 1) is received together with IIS = 0, it shall be interpreted as a non-selective all-call lockout (3.1.2.6.9.2).

Note 1.— Fifteen interrogators can send independent multisite II lockout commands. In addition, 63 interrogators can send independent SI lockout commands. Each of these lockout commands must be timed separately.

Note 2.— Multisite lockout (which only uses non-zero II codes) does not affect the response of the transponder to Mode S-only all-call interrogations containing II equals 0 or to Mode A/C/S all-call interrogations.

3.1.2.6.9.2 *Non-selective all-call lockout*

Note 1.— In cases where the multisite lockout protocol for II codes is not required (e.g. there is no overlapping coverage or there is ground station coordination via ground-to-ground communications) the non-selective lockout protocol may be used.

On acceptance of an interrogation containing code 1 in the PC field, a transponder shall commence to lock out (i.e. not accept) two types of all-call interrogations:

a) the Mode S-only all-call (UF = 11), with II equals 0; and

b) the Mode A/C/S all-call of 3.1.2.1.5.1.1.

This lockout condition shall persist for an interval T_D (3.1.2.10.3.9) after the last receipt of the command. Non-selective lockout shall not prevent acceptance of a Mode S-only all-call interrogation containing PR codes 8 to 12.

Note 2.— Non-selective lockout does not affect the response of the transponder to Mode S-only all-call interrogations containing II not equal to 0.

3.1.2.6.10 BASIC DATA PROTOCOLS

3.1.2.6.10.1 *Flight status protocol.* Flight status shall be reported in the FS field (3.1.2.6.5.1).

3.1.2.6.10.1.1 *Alert.* An alert condition shall be reported in the FS field if the Mode A identity code transmitted in Mode A replies and in downlink formats DF equals 5 and DF equals 21 are changed by the pilot.

3.1.2.6.10.1.1.1 *Permanent alert condition.* The alert condition shall be maintained if the Mode A identity code is changed to 7500, 7600 or 7700.

3.1.2.6.10.1.1.2 *Temporary alert condition.* The alert condition shall be temporary and shall cancel itself after T_C seconds if the Mode A identity code is changed to a value other than those listed in 3.1.2.6.10.1.1.1.

Note.— The value of T_C *is given in 3.1.2.10.3.9.*

3.1.2.6.10.1.1.3 *Termination of the permanent alert condition.* The permanent alert condition shall be terminated and replaced by a temporary alert condition when the Mode A identity code is set to a value other than 7500, 7600 or 7700.

3.1.2.6.10.1.2 *Ground report.* The on-the-ground status of the aircraft shall be reported in the FS field and the VS field (3.1.2.8.2.1) and the CA field (3.1.2.8.1.1). If a means for automatically indicating the on-the-ground condition (e.g. a weight on wheels or strut switch) is available at the transponder data interface, it shall be used as the basis for the reporting of vertical status. If a means for automatically indicating the on-the-ground condition is not available at the transponder data interface (3.1.2.10.5.1.3), the FS and VS codes shall indicate that the aircraft is airborne and the CA field shall indicate that the aircraft is either airborne or on the ground (CA = 6).

3.1.2.6.10.1.3 *Special position identification (SPI).* An equivalent of the SPI pulse shall be transmitted by Mode S transponders in the FS field and the surveillance status subfield (SSS) when manually activated. This pulse shall be transmitted for T_I seconds after initiation (3.1.1.6.3, 3.1.1.7.13 and 3.1.2.8.6.3.1.1).

Note.— The value of T_I *is given in 3.1.2.10.3.9.*

3.1.2.6.10.2 *Capability reporting protocol*

Note.— Aircraft capability is reported in special fields as defined in the following paragraphs.

3.1.2.6.10.2.1 *Capability report.* The 3-bit CA field, contained in the all-call reply, DF equals 11, shall report the basic capability of the Mode S transponder as described in 3.1.2.5.2.2.1.

3.1.2.6.10.2.2 *Data link capability report.* The data link capability report shall provide the interrogator with a description of the data link capability of the Mode S installation. The report shall be obtained by a ground-initiated Comm-B reply in response to an interrogation containing RR equals 17 and DI is not equal to 7 or DI equals 7 and RRS equals 0 (3.1.2.6.11.2). The definition of this register is described in 5.2.9.2 of Volume III to Annex 10.

3.1.2.6.10.2.2.1 *Subfields in MB for data link capability report.* The subfields within the MB field of all data link capability reports shall be: (3.1.2.6.11.2.1)

BDS1 A value of 1 shall be inserted in this 4-bit (33-36) subfield as a first part of Comm-B data selector (BDS) code.

BDS2 A value of 0 shall be inserted in this 4-bit (37-40) subfield as a second part of Comm-B data selector (BDS) code.

SCS This 1-bit (66) squitter capability subfield shall report the capability of the transponder to transmit extended squitter position reports. It shall be set to 1 if BDS registers 05 and 06 {HEX} have been updated within the last ten plus or minus one seconds. Otherwise, it shall be set to 0.

Note.— BDS registers 05 and 06 {HEX} are used for the extended squitter airborne and surface position reports, respectively.

SIC This 1-bit (67) surveillance identifier capability subfield shall report the capability of the transponder to support the surveillance identifier (SI) codes.

3.1.2.6.10.2.2.2 *Updating of the data link capability report.* The transponder shall, at intervals not exceeding four seconds, compare the current data link capability status with that last reported and shall, if a difference is noted, initiate a revised data link capability report by Comm-B broadcast (3.1.2.6.11.4) for BDS1 = 1 (33-36) and BDS 2 = 0 (37-40). The transponder shall initiate, generate and transmit the revised capability report even if the aircraft data link capability is degraded or lost. The transponder shall set the BDS code for the data link capability report.

Note.— The setting of the BDS code by the transponder ensures that a broadcast change of capability report will contain the BDS code for all cases of data link failure (e.g. the loss of the transponder data link interface).

3.1.2.6.10.3 *Validation of declared on-the-ground status*

Note.— For aircraft with an automatic means of determining vertical status, the CA field reports whether the aircraft is airborne or on the ground. ACAS II acquires aircraft using the short or extended squitter, both of which contain the CA field. If an aircraft reports on-the-ground status, that aircraft will not be interrogated by ACAS II in order to reduce unnecessary interrogation activity. If the aircraft is equipped to report extended squitter messages, the function that formats these messages may have information available to validate that an aircraft reporting "on-the-ground" is actually airborne.

3.1.2.6.10.3.1 Aircraft with an automatic means for determining the on-the-ground condition that are equipped to format extended squitter messages shall perform the following validation check:

If the automatically determined air/ground status is not available or is "airborne", no validation shall be performed. If the automatically determined air/ground status is available and "on-the-ground" condition is being reported, the air/ground status shall be overridden and changed to "airborne" if the conditions given for the vehicle category in Table 3-6 are satisfied.

Note.— While this test is only required for aircraft that are equipped to format extended squitter messages, this feature is desirable for all aircraft.

3.1.2.6.11 *STANDARD LENGTH COMMUNICATIONS PROTOCOLS*

Note 1.— The two types of standard length communications protocols are Comm-A and Comm-B; messages using these protocols are transferred under the control of the interrogator. Comm-A messages are sent directly to the transponder and are completed within one transaction. A Comm-B message is used to transfer information from air to ground and can be initiated either by the interrogator or the transponder. In the case of ground-initiated Comm-B transfers, the interrogator requests data to be read out from the transponder, which delivers the message in the same transaction. In the case of air-initiated Comm-B transfers, the transponder announces the intention to transmit a message; in a subsequent transaction an interrogator will extract the message.

Note 2.— In a non-selective air-initiated Comm-B protocol all transactions necessary can be controlled by any interrogator.

Note 3.— In some areas of overlapping interrogator coverage there may be no means for coordinating interrogator activities via ground communications. Air-initiated Comm-B communications protocols require more than one

Table 3-6. Validation of on-the-ground status

Determination of airborne status					
A/V category	*Ground Speed*		*Airspeed*		*Radio Altitude*
No information	No change to on-the-ground status				
Weight < 15 500 lbs (7 031 kg)	No change to on-the-ground status				
Weight ≥15 500 lbs (7 031 kg)	>100 knots	or	>100 knots	or	>50 feet
High performance (>5 g acceleration and >400 knots)	>100 knots	or	>100 knots	or	>50 feet
Rotorcraft	No change to on-the-ground status				

transaction for completion. Provision is made to ensure that a Comm-B message is closed out only by the interrogator that actually transferred the message. This can be accomplished through the use of the multisite Comm-B communications protocols or through the use of the enhanced Comm-B communications protocols.

Note 4.— The multisite and the non-selective communications protocols cannot be used simultaneously in a region of overlapping interrogator coverage unless the interrogators coordinate their communications activities via ground communications.

Note 5.— The multisite communications protocol is independent of the multisite lockout protocol. That is, the multisite communications protocol may be used with the non-selective lockout protocol and vice versa. The choice of lockout and communications protocols to be used depends upon the network management technique being used.

Note 6.— The broadcast Comm-B protocol can be used to make a message available to all active interrogators.

3.1.2.6.11.1 *Comm-A.* The interrogator shall deliver a Comm-A message in the MA field of an interrogation UF = 20 or 21.

3.1.2.6.11.1.1 *Comm-A technical acknowledgement.* Acceptance of a Comm-A interrogation shall be automatically technically acknowledged by the transponder, by the transmission of the requested reply (3.1.2.10.5.2.2.1).

Note.— The receipt of a reply from the transponder according to the rules of 3.1.2.4.1.2.3 d) and 3.1.2.4.1.3.2.2.2 is the acknowledgement to the interrogator that the message has been received and stored by the transponder. If either uplink or downlink fail, this reply will be missing and the interrogator will normally send the message again. In the case of downlink failure the transponder may receive the message more than once.

3.1.2.6.11.1.2 *Comm-A broadcast.* If a Comm-A broadcast interrogation is accepted (3.1.2.4.1.2.3.1.3) information transfer shall be handled according to 3.1.2.10.5.2.1.1 but other transponder functions shall not be affected and a reply shall not be transmitted.

Note 1.— There is no technical acknowledgement to a Comm-A broadcast message.

Note 2.— Since the transponder does not process the control fields of a Comm-A broadcast interrogation, the 27 bits following the UF field are also available for user data.

3.1.2.6.11.2 *Ground-initiated Comm-B*

3.1.2.6.11.2.1 *Comm-B data selector, BDS.* The 8-bit BDS code shall determine the register whose contents shall be transferred in the MB field of the Comm-B reply. It shall be expressed in two groups of 4 bits each, BDS1 (most significant 4 bits) and BDS2 (least significant 4 bits).

Note 1.— The transponder register allocation is specified in Annex 10, Volume III, Part I, Chapter 5, Table 5-24.

Note 2.— The only registers defined in this section are those for aircraft identification (3.1.2.9.1.2), datalink capability reporting (3.1.2.6.10.2.2), extended squitter (3.1.2.8.6.2) and downlink aircraft parameters (DAPs) (3.1.2.10.5.2.3).

3.1.2.6.11.2.2 *BDS1 code.* The BDS1 code shall be as defined in the RR field of a surveillance or Comm-A interrogation.

3.1.2.6.11.2.3 *BDS2 code.* The BDS2 code shall be as defined in the RRS subfield of the SD field (3.1.2.6.1.4.1) when DI = 7. If no BDS2 code is specified (i.e. DI is not equal to 7) it shall signify that BDS2 = 0.

3.1.2.6.11.2.4 *Protocol.* On receipt of such a request, the MB field of the reply shall contain the contents of the requested ground-initiated Comm-B register.

3.1.2.6.11.3 *Air-initiated Comm-B*

3.1.2.6.11.3.1 *General protocol.* The transponder shall announce the presence of an air-initiated Comm-B message with the insertion of code 1 in the DR field. To extract an air-initiated Comm-B message, the interrogator shall transmit a request for a Comm-B message reply in a subsequent interrogation with RR equal to 16 and, if DI equals 7, RRS must be equal to 0 (3.1.2.6.11.3.2.1 and 3.1.2.6.11.3.3.1). Receipt of this request code shall cause the transponder to transmit the air-initiated Comm-B message. If a command to transmit an air-initiated Comm-B message is received while no message is waiting to be transmitted, the reply shall contain all ZEROs in the MB field.

The reply that delivers the message shall continue to contain code 1 in the DR field. After a Comm-B closeout has been accomplished, the message shall be cancelled and the DR code belonging to this message immediately removed. If another air-initiated Comm-B message is waiting to be transmitted, the transponder shall set the DR code to 1, so that the reply contains the announcement of this next message.

Note.— The announcement and cancellation protocol ensures that an air-initiated message will not be lost due to uplink or downlink failures that occur during the delivery process.

3.1.2.6.11.3.2 *Additional protocol for multisite air-initiated Comm-B*

Note.— The announcement of an air-initiated Comm-B message waiting to be delivered may be accompanied by a multisite reservation status report in the UM field (3.1.2.6.5.3.2).

Recommendation.— *An interrogator should not attempt to extract a message if it has determined that it is not the reserved site.*

3.1.2.6.11.3.2.1 *Message transfer.* An interrogator shall request a Comm-B reservation and extract an air-initiated Comm-B message by transmitting a surveillance or Comm-A interrogation UF equals 4, 5, 20 or 21 containing:

RR = 16
DI = 1
IIS = assigned interrogator identifier
MBS = 1 (Comm-B reservation request)

Note.— A Comm-B multisite reservation request is normally accompanied by a Comm-B reservation status request (RSS = 1). This causes the interrogator identifier of the reserved site to be inserted in the UM field of the reply.

3.1.2.6.11.3.2.1.1 Protocol procedure in response to this interrogation shall depend upon the state of the B-timer which indicates if a Comm-B reservation is active. This timer shall run for T_R seconds.

Note 1.— The value of T_R *is given in 3.1.2.10.3.9.*

a) If the B-timer is not running, the transponder shall grant a reservation to the requesting interrogator by:

1) storing the IIS of the interrogation as the Comm-B II; and

2) starting the B-timer.

A multisite Comm-B reservation shall not be granted by the transponder unless an air-initiated Comm-B message is waiting to be transmitted and the requesting interrogation contains RR equals 16, DI equals 1, MBS equals 1 and IIS is not 0.

b) If the B-timer is running and the IIS of the interrogation equals the Comm-B II, the transponder shall restart the B-timer.

c) If the B-timer is running and the IIS of the interrogation does not equal the Comm-B II, then there shall be no change to the Comm-B II or the B-timer.

Note 2.— In case c) the reservation request has been denied.

3.1.2.6.11.3.2.1.2 In each case the transponder shall reply with the Comm-B message in the MB field.

3.1.2.6.11.3.2.1.3 An interrogator shall determine if it is the reserved site for this message through coding in the UM field. If it is the reserved site it shall attempt to close out the message in a subsequent interrogation. If it is not the reserved site it shall not attempt to close out the message.

3.1.2.6.11.3.2.2 *Multisite-directed Comm-B transmissions.* To direct an air-initiated Comm-B message to a specific interrogator, the multisite Comm-B protocol shall be used. When the B-timer is not running, the interrogator identifier of the desired destination shall be stored as the Comm-B II. Simultaneously the B-timer shall be started and the DR code shall be set to 1. For a multisite-directed Comm-B message, the B-timer shall not automatically time out but shall continue to run until:

a) the message is read and closed out by the reserved site; or

b) the message is cancelled (3.1.2.10.5.4) by the data link avionics.

Note.— The protocols of 3.1.2.6.5.3 and 3.1.2.6.11.3.2.1 will then result in delivery of the message to the reserved site. The data link avionics may cancel the message if delivery to the reserved site cannot be accomplished.

3.1.2.6.11.3.2.3 *Multisite Comm-B closeout.* The interrogator shall close out a multisite air-initiated Comm-B by transmitting either a surveillance or a Comm-A interrogation containing:

either DI = 1
IIS = assigned interrogator identifier
MBS = 2 (Comm-B closeout)

or DI = 0, 1 or 7
IIS = assigned interrogator identifier
PC = 4 (Comm-B closeout)

The transponder shall compare the IIS of the interrogation to the Comm-B II and if the interrogator identifiers do not match, the message shall not be cleared and the status of the Comm-B II, B-timer, and DR code shall not be changed. If the interrogator identifiers match, the transponder shall set the Comm-B II to 0, reset the B-timer, clear the DR code for this message and clear the message itself. The transponder shall not close out a multisite air-initiated Comm-B message unless it has been read out at least once by the reserved site.

3.1.2.6.11.3.2.4 *Automatic expiration of Comm-B reservation.* If the B-timer period expires before a multisite closeout has been accomplished, the Comm-B II shall be set to 0 and the B-timer reset. The Comm-B message and the DR field shall not be cleared by the transponder.

Note.— This makes it possible for another site to read and clear this message.

3.1.2.6.11.3.3 *Additional protocol for non-selective air-initiated Comm-B*

Note.— In cases where the multisite protocols are not required (i.e. no overlapping coverage or sensor coordination via ground-to-ground communication), the non-selective air-initiated Comm-B protocol may be used.

3.1.2.6.11.3.3.1 *Message transfer.* The interrogator shall extract the message by transmitting either RR equals 16 and DI is not equal to 7, or RR equals 16, DI equals 7 and RRS equals 0 in a surveillance or Comm-A interrogation.

3.1.2.6.11.3.3.2 *Comm-B closeout.* The interrogator shall close out a non-selective air-initiated Comm-B message by transmitting PC equals 4 (Comm-B closeout). On receipt of this command, the transponder shall perform closeout, unless the B-timer is running. If the B-timer is running, indicating that a multisite reservation is in effect, closeout shall be accomplished as per 3.1.2.6.11.3.2.3. The transponder shall not close out a non-selective air-initiated Comm-B message unless it has been read out at least once by an interrogation using non-selective protocols.

3.1.2.6.11.3.4 *Enhanced air-initiated Comm-B protocol*

Note.— The enhanced air-initiated Comm-B protocol provides a higher data link capacity by permitting parallel delivery of air-initiated Comm-B messages by up to sixteen interrogators, one for each II code. Operation without the need for multisite Comm-B reservations is possible in regions of overlapping coverage for interrogators equipped for the enhanced air-initiated Comm-B protocol. The protocol is fully conformant to the standard multisite protocol and thus is compatible with interrogators that are not equipped for the enhanced protocol.

3.1.2.6.11.3.4.1 The transponder shall be capable of storing each of the sixteen II codes: (1) an air-initiated or multisite-directed Comm-B message and (2) the contents of GICB registers 2 through 4.

Note.— GICB registers 2 through 4 are used for the Comm-B linking protocol defined in the Mode S subnetwork SARPs (Annex 10, Volume III, Part I, Chapter 5).

3.1.2.6.11.3.4.2 *Enhanced multisite air-initiated Comm-B protocol*

3.1.2.6.11.3.4.2.1 *Initiation.* An air-initiated Comm-B message input into the transponder shall be stored in the registers assigned to II = 0.

3.1.2.6.11.3.4.2.2 *Announcement and extraction.* A waiting air-initiated Comm-B message shall be announced in the DR field of the replies to all interrogators for which a multisite directed Comm-B message is not waiting. The UM field of the announcement reply shall indicate that the message is not reserved for any II code, i.e., the IIS subfield shall be set to 0. When a command to read this message is received from a given interrogator, the reply containing the message shall contain an IIS subfield content indicating that the message is reserved for the II code contained in the interrogation from that interrogator. After readout and until closeout, the message shall continue to be assigned to that II code. Once a message is assigned to a specific II code, announcement of this message shall be no longer made in the replies to interrogators with other II codes. If the message is not closed out by the assigned interrogator for the period of the B-timer, the message shall revert back to multisite air-initiated status and the process shall repeat. Only one multisite air-initiated Comm-B message shall be in process at a time.

3.1.2.6.11.3.4.2.3 *Closeout.* A closeout for a multisite air-initiated message shall only be accepted from the interrogator that is currently assigned to transfer the message.

3.1.2.6.11.3.4.2.4 *Announcement of the next message waiting.* The DR field shall indicate a message waiting in the reply to an interrogation containing a Comm-B closeout if an unassigned air-initiated message is waiting and has not been assigned to a II code, or if a multisite-directed message is waiting for that II code (3.1.2.6.11.3.4.3).

3.1.2.6.11.3.4.3 *Enhanced multisite directed Comm-B protocol*

3.1.2.6.11.3.4.3.1 *Initiation.* When a multisite directed message is input into the transponder, it shall be placed in the Comm-B registers assigned to the II code specified for the message. If the registers for this II code are already occupied, (i.e. a multisite directed message is already in process to this II code) the new message shall be queued until the current transaction with that II code is closed out.

3.1.2.6.11.3.4.3.2 *Announcement.* Announcement of a Comm-B message waiting transfer shall be made using the DR field as specified in 3.1.2.6.5.2 with the destination interrogator II code contained in the IIS subfield as specified in 3.1.2.6.5.3.2. The DR field and IIS subfield contents shall be set specifically for the interrogator that is to receive the reply. A waiting multisite directed message shall only be announced in the replies to the intended interrogator. It shall not be announced in the replies to other interrogators.

Note 1.— If a multisite-directed message is waiting for II = 2, the surveillance replies to that interrogator will contain DR = 1 and IIS = 2. If this is the only message in process, replies to all other interrogators will indicate that no message is waiting.

Note 2.— In addition to permitting parallel operation, this form of announcement enables a greater degree of announcement of downlink ELMs. The announcements for the downlink ELM and the Comm-B share the DR field. Only one announcement can take place at a time due to coding limitations. In case both a Comm-B and a downlink ELM are waiting, announcement preference is given to the Comm-B. In the example above, if an air-directed Comm-B was waiting for II = 2 and a multisite-directed downlink ELM was waiting for II = 6, both interrogators would see their respective announcements on the first scan since there would be no Comm-B announcement to II = 6 to block the announcement of the waiting downlink ELM.

3.1.2.6.11.3.4.3.3 *Closeout.* Closeout shall be accomplished as specified in 3.1.2.6.11.3.2.3.

3.1.2.6.11.3.4.3.4 *Announcement of the next message waiting.* The DR field shall indicate a message waiting in the reply to an interrogation containing a Comm-B closeout if another multisite directed message is waiting for that II code, or if an air-initiated message is waiting and has not been assigned to a II code. (See 3.1.2.6.11.3.4.2.4.)

3.1.2.6.11.3.4.4 *Enhanced non-selective Comm-B protocol.* The availability of a non-selective Comm-B message shall be announced to all interrogators. Otherwise, the protocol shall be as specified in 3.1.2.6.11.3.3.

3.1.2.6.11.4 *Comm-B broadcast*

Note 1.— A Comm-B message may be broadcast to all active interrogators within range. Messages are alternately numbered 1 and 2 and are self-cancelling after 18 seconds. Interrogators have no means to cancel Comm-B broadcast messages.

Note 2.— Use of the Comm-B broadcast is restricted to transmission of information which does not require a subsequent ground-initiated uplink response.

Note 3.— The timer used for the Comm-B broadcast cycle is the same as that used for the Comm-B multisite protocol.

3.1.2.6.11.4.1 *Initiation.* A Comm-B broadcast cycle shall not be initiated when an air-initiated Comm-B is waiting to be transmitted. A Comm-B broadcast cycle shall begin with:

a) the insertion of DR code 4 or 5, (3.1.2.6.5.2) into replies with DF 4, 5, 20 or 21; and

b) the starting of the B-timer.

3.1.2.6.11.4.2 *Extraction.* To extract the broadcast message, an interrogator shall transmit RR equals 16 and DI not equal to 7 or RR equals 16 and DI equals 7 with RRS equals 0 in a subsequent interrogation.

3.1.2.6.11.4.3 *Expiration.* When the B-timer period expires, the transponder shall clear the DR code for this message, discard the present broadcast message and change the broadcast message number (from 1 to 2 or 2 to 1) in preparation for a subsequent Comm-B broadcast.

3.1.2.6.11.4.4 *Interruption.* In order to prevent a Comm-B broadcast cycle from delaying the delivery of an air-initiated Comm-B message, provision shall be made for an air-initiated Comm-B to interrupt a Comm-B broadcast cycle. If a broadcast cycle is interrupted, the B-timer shall be reset, the interrupted broadcast message shall be retained and the message number shall not be changed. Delivery of the interrupted broadcast message shall recommence when no air-initiated Comm-B transaction is in effect. The message shall then be broadcast for the full duration of the B-timer.

3.1.2.6.11.4.5 *Enhanced broadcast Comm-B protocol.* A broadcast Comm-B message shall be announced to all interrogators using II codes. The message shall remain active for the period of the B-timer for each II code. The provision for interruption of a broadcast by non-broadcast Comm-B as specified in 3.1.2.6.11.4.4 shall apply separately to each II code. When the B-timer period has been achieved for all II codes, the broadcast message shall be automatically cleared as specified in 3.1.2.6.11.4.3. A new broadcast message shall not be initiated until the current broadcast has been cleared.

Note.— Due to the fact that broadcast message interruption occurs independently for each II code, it is possible that the broadcast message timeout will occur at different times for different II codes.

3.1.2.6.11.4.6 The data formats for broadcast Comm-B shall be as specified in Appendix 1 to Chapter 5 of Annex 10, Volume III, Part I.

3.1.2.7 EXTENDED LENGTH COMMUNICATION TRANSACTIONS

Note 1.— Long messages, either on the uplink or the downlink, can be transferred by the extended length message (ELM) protocols through the use of Comm-C (UF = 24) and Comm-D (DF = 24) formats respectively. The ELM uplink protocol provides for the transmission on the uplink of up to sixteen 80-bit message segments before requiring a reply from the transponder. They also allow a corresponding procedure on the downlink.

Note 2.— In some areas of overlapping interrogator coverage there may be no means for coordinating interrogator activities via ground communications. However, the ELM communication protocols require more than one transaction for completion; coordination is thus necessary to ensure that segments from different messages are not interleaved and that transactions are not inadvertently closed out by the wrong interrogator. This can be accomplished through the use of the multisite communications protocols or through the use of the enhanced ELM protocols.

Note 3.— Downlink extended length messages are transmitted only after authorization by the interrogator. The segments to be transmitted are contained in Comm-D replies. As with air-initiated Comm-B messages, downlink ELMs are either announced to all interrogators or directed to a specific interrogator. In the former case an individual interrogator can use the multisite protocol to reserve for itself the ability to close out the downlink ELM transaction. A transponder can be instructed to identify the interrogator that has reserved the transponder for an ELM transaction. Only that interrogator can close out the ELM transaction and reservation.

Note 4.— The multisite protocol and the non-selective protocol cannot be used simultaneously in a region of overlapping interrogator coverage unless the interrogators coordinate their communications activities via ground communications.

3.1.2.7.1 *COMM-C, UPLINK FORMAT 24*

1	3	5	9	89
UF	RC	NC	MC	AP
2	4	8	88	112

The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
RC reply control	3.1.2.7.1.1
NC number of C-segment	3.1.2.7.1.2
MC message, Comm-C	3.1.2.7.1.3
AP address/parity	3.1.2.3.2.1.3

3.1.2.7.1.1 *RC: Reply control.* This 2-bit (3-4) uplink field shall designate segment significance and reply decision.

Coding
RC = 0 signifies uplink ELM initial segment in MC
= 1 signifies uplink ELM intermediate segment in MC
= 2 signifies uplink ELM final segment in MC
= 3 signifies a request for downlink ELM delivery (3.1.2.7.7.2)

3.1.2.7.1.2 *NC: Number of C-segment.* This 4-bit (5-8) uplink field shall designate the number of the message segment contained in MC (3.1.2.7.4.2.1). NC shall be coded as a binary number.

3.1.2.7.1.3 *MC: Message, Comm-C.* This 80-bit (9-88) uplink field shall contain:

a) one of the segments of a sequence used to transmit an uplink ELM to the transponder containing the 4-bit (9-12) IIS subfield; or

b) control codes for a downlink ELM, the 16-bit (9-24) SRS subfield (3.1.2.7.7.2.1) and the 4-bit (25-28) IIS subfield.

Note.— Message content and codes are not included in this chapter except for 3.1.2.7.7.2.1.

3.1.2.7.2 INTERROGATION-REPLY PROTOCOL FOR *UF24*

Note.— Interrogation-reply coordination for the above format follows the protocol outlined in Table 3-5 (3.1.2.4.1.3.2.2).

3.1.2.7.3 COMM-D, DOWNLINK FORMAT *24*

1		4	5	9	89
DF		KE	ND	MD	AP
2			8	88	112

The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
spare — 1 bit	
KE control, ELM	3.1.2.7.3.1
ND number of D-segment	3.1.2.7.3.2
MD message, Comm-D	3.1.2.7.3.3
AP address/parity	3.1.2.3.2.1.3

3.1.2.7.3.1 *KE: Control, ELM.* This 1-bit (4) downlink field shall define the content of the ND and MD fields.

Coding
KE = 0 signifies downlink ELM transmission
1 signifies uplink ELM acknowledgement

3.1.2.7.3.2 *ND: Number of D-segment.* This 4-bit (5-8) downlink field shall designate the number of the message segment contained in MD (3.1.2.7.7.2). ND shall be coded as a binary number.

3.1.2.7.3.3 *MD: Message, Comm-D.* This 80-bit (9-88) downlink field shall contain:

a) one of the segments of a sequence used to transmit a downlink ELM to the interrogator; or

b) control codes for an uplink ELM.

3.1.2.7.4 *MULTISITE UPLINK ELM PROTOCOL*

3.1.2.7.4.1 *Multisite uplink ELM reservation.* An interrogator shall request a reservation for an uplink ELM by transmitting a surveillance or Comm-A interrogation containing:

DI = 1
IIS = assigned interrogator identifier
MES = 1 or 5 (uplink ELM reservation request)

Note.— A multisite uplink ELM reservation request is normally accompanied by an uplink ELM reservation status request (RSS = 2). This causes the interrogator identifier of the reserved site to be inserted in the UM field of the reply.

3.1.2.7.4.1.1 Protocol procedure in response to this interrogation shall depend upon the state of the C-timer which indicates if an uplink ELM reservation is active. This timer shall run for T_R seconds.

Note 1.— The value of T_R *is given in 3.1.2.10.3.9.*

a) If the C-timer is not running the transponder shall grant a reservation to the requesting interrogator by:

   1) storing the IIS of the interrogation as the Comm-C II and,

   2) starting the C-timer.

b) If the C-timer is running and the IIS of the interrogation equals the Comm-C II, the transponder shall restart the C-timer.

c) If the C-timer is running and the IIS of the interrogation does not equal the Comm-C II, there shall be no change to the Comm-C II or the C-timer.

Note 2.— In case c) the reservation request has been denied.

3.1.2.7.4.1.2 An interrogator shall not start ELM activity unless, during the same scan, having requested an uplink ELM status report, it has received its own interrogator identifier as the reserved interrogator for uplink ELM in the UM field.

Note.— If ELM activity is not started during the same scan as the reservation, a new reservation request may be made during the next scan.

3.1.2.7.4.1.3 If uplink ELM delivery is not completed on the current scan, the interrogator shall ensure that it still has a reservation before delivering additional segments on a subsequent scan.

3.1.2.7.4.2 *Multisite uplink ELM delivery.* The minimum length of an uplink ELM shall be 2 segments, the maximum length shall be 16 segments.

3.1.2.7.4.2.1 *Initial segment transfer.* The interrogator shall begin the ELM uplink delivery for an n-segment message (NC values from 0 to n-1) by a Comm-C transmission containing RC equals 0. The message segment transmitted in the MC field shall be the last segment of the message and shall carry NC equals n-1.

On receipt of an initializing segment (RC = 0) the transponder shall establish a "setup" defined as:

a) clearing the number and content of previous segment storage registers and the associated TAS field;

b) assigning storage space for the number of segments announced in NC of this interrogation; and

c) storing the MC field of the segment received.

The transponder shall not reply to this interrogation.

Receipt of another initializing segment shall result in a new setup within the transponder.

3.1.2.7.4.2.2 *Transmission acknowledgement.* The transponder shall use the TAS subfield to report the segments received so far in an uplink ELM sequence. The information contained in the TAS subfield shall be continually updated by the transponder as segments are received.

Note.— Segments lost in uplink transmission are noted by their absence in the TAS report and are retransmitted by the interrogator which will then send further final segments to assess the extent of message completion.

3.1.2.7.4.2.2.1 *TAS, transmission acknowledgement subfield in MD.* This 16-bit (17-32) downlink subfield in MD reports the segment numbers received so far in an uplink ELM sequence. Starting with bit 17, which denotes segment number 0, each of the following bits shall be set to ONE if the corresponding segment of the sequence has been received. TAS shall appear in MD if KE equals 1 in the same reply.

3.1.2.7.4.2.3 *Intermediate segment transfer.* The interrogator shall transfer intermediate segments by transmitting Comm-C interrogations with RC equals 1. The transponder shall store the segments and update TAS only if the setup of 3.1.2.7.4.2.1 is in effect and if the received NC is smaller than the value stored at receipt of the initial segment. No reply shall be generated on receipt of an intermediate segment.

Note.— Intermediate segments may be transmitted in any order.

3.1.2.7.4.2.4 *Final segment transfer.* The interrogator shall transfer a final segment by transmitting a Comm-C interrogation with RC equals 2. This interrogation may contain any message segment. The transponder shall store the content of the MC field and update TAS if the setup of 3.1.2.7.4.2.1 is in effect and if the received NC is smaller than the value of the initial segment NC. The transponder shall reply under all circumstances as per 3.1.2.7.4.2.5.

Note.— RC equals 2 is transmitted any time that the interrogator wants to receive the TAS subfield in the reply. Therefore, more than one "final" segment may be transferred during the delivery of an uplink ELM.

3.1.2.7.4.2.5 *Acknowledgement reply.* On receipt of a final segment, the transponder shall transmit a Comm-D reply (DF = 24), with KE equals 1 and with the TAS subfield in the MD field. This reply shall be transmitted at 128 microseconds plus or minus 0.25 microsecond following the sync phase reversal of the interrogation delivering the final segment.

3.1.2.7.4.2.6 *Completed message.* The transponder shall deem the message complete if all segments announced by NC in the initializing segment have been received. If the message is complete, the message content shall be delivered to the outside via the ELM interface of 3.1.2.10.5.2.1.3 and cleared. No later-arriving segments shall be stored. The TAS content shall remain unchanged until either a new setup is called for (3.1.2.7.4.2.1) or until closeout (3.1.2.7.4.2.8).

3.1.2.7.4.2.7 *C-timer restart.* The C-timer shall be restarted each time that a received segment is stored and the Comm-C II is not 0.

Note.— The requirement for the Comm-C II to be non-zero prevents the C-timer from being restarted during a non-selective uplink ELM transaction.

3.1.2.7.4.2.8 *Multisite uplink ELM closeout.* The interrogator shall close out a multisite uplink ELM by transmitting either a surveillance or a Comm-A interrogation containing:

either DI = 1
IIS = assigned interrogator identifier
MES = 2, 6 or 7 (uplink ELM closeout)

or DI = 0, 1 or 7
IIS = assigned interrogator identifier
PC = 5 (uplink ELM closeout)

The transponder shall compare the IIS of the interrogation to the Comm-C II and if the interrogator identifiers do not match, the state of the ELM uplink process shall not be changed.

If the interrogator identifiers match, the transponder shall set the Comm-C II to 0, reset the C-timer, clear the stored TAS and discard any stored segments of an incomplete message.

3.1.2.7.4.2.9 *Automatic multisite uplink ELM closeout.* If the C-timer period expires before a multisite closeout has been accomplished the closeout actions described in 3.1.2.7.4.2.8 shall be initiated automatically by the transponder.

3.1.2.7.5 *NON-SELECTIVE UPLINK ELM*

Note.— In cases where the multisite protocols are not required (for example, no overlapping coverage or sensor coordination via ground-to-ground communication), the non-selective uplink ELM protocol may be used.

Non-selective uplink ELM delivery shall take place as for multisite uplink ELMs described in 3.1.2.7.4.2. The interrogator shall close out an uplink ELM by transmitting PC equals 5 (uplink ELM closeout) in a surveillance or Comm-A interrogation. On receipt of this command, the transponder shall perform closeout, unless the C-timer is running. If the C-timer is running, indicating that a multisite reservation is in effect, the closeout shall be accomplished as per 3.1.2.7.4.2.8. An uncompleted message, present when the closeout is accepted, shall be cancelled.

3.1.2.7.6 *ENHANCED UPLINK ELM PROTOCOL*

Note.— The enhanced uplink ELM protocol provides a higher data link capacity by permitting parallel delivery of uplink ELM messages by up to sixteen interrogators, one for each II code. Operation without the need for multisite uplink ELM reservations is possible in regions of overlapping coverage for interrogators equipped for the enhanced uplink ELM protocol. The protocol is fully conformant to the standard multisite protocol and thus is compatible with interrogators that are not equipped for the enhanced protocol.

3.1.2.7.6.1 *General*

3.1.2.7.6.1.1 The interrogator shall determine from the data link capability report whether the transponder supports the enhanced protocols. If the enhanced protocols are supported, uplink ELMs delivered using the multisite protocol may be delivered without a prior reservation. If the enhanced protocols are not supported by both the interrogator and the transponder, the multisite reservation protocols specified in 3.1.2.7.4.1 shall be used.

3.1.2.7.6.1.2 **Recommendation.—** *If the transponder and the interrogator are equipped for the enhanced protocol, the interrogator should use the enhanced uplink protocol.*

3.1.2.7.6.1.3 The transponder shall be capable of storing a sixteen segment message for each of the sixteen II codes.

3.1.2.7.6.2 *Reservation processing.* The transponder shall support reservation processing for each II code as specified in 3.1.2.7.4.1

Note 1.— Reservation processing is required for interrogators that do not support the enhanced protocol.

Note 2.— Since the transponder can process simultaneous uplink ELMs for all sixteen II codes, a reservation will always be granted.

3.1.2.7.6.3 *Enhanced uplink ELM delivery and closeout.* The transponder shall process received segments separately by II code. For each value of II code, uplink ELM delivery and closeout shall be performed as specified in 3.1.2.7.4.2 except that the MD field used to transmit the technical acknowledgment shall also contain the 4-bit (33-36) IIS subfield.

Note.— The interrogator may use the II code contained in the technical acknowledgement in order to verify that it has received the correct technical acknowledgement.

3.1.2.7.7 *MULTISITE DOWNLINK ELM PROTOCOL*

3.1.2.7.7.1 *Initialization.* The transponder shall announce the presence of a downlink ELM of n segments by making the binary code corresponding to the decimal value $15 + n$ available for insertion in the DR field of a surveillance or Comm-B reply, DF equals 4, 5, 20, 21. This announcement shall remain active until the ELM is closed out (3.1.2.7.7.3, 3.1.2.7.8.1).

3.1.2.7.7.1.1 *Multisite downlink ELM reservation.* An interrogator shall request a reservation for extraction of a downlink ELM by transmitting a surveillance or Comm-A interrogation containing:

DI = 1
IIS = assigned interrogator identifier
MES = 3 or 6 (downlink ELM reservation request)

Note.— A multisite downlink ELM reservation request is normally accompanied by a downlink ELM reservation status request (RSS = 3). This causes the interrogator identifier of the reserved interrogator to be inserted in the UM field of the reply.

3.1.2.7.7.1.1.1 Protocol procedure in response to this interrogation shall depend upon the state of the D-timer which indicates if a downlink ELM reservation is active. This timer shall run for T_R seconds.

Note 1.— The value of $\mathrm{T_R}$ *is given in 3.1.2.10.3.9.*

a) if the D-timer is not running, the transponder shall grant a reservation to the requesting interrogator by:

   1) storing the IIS of the interrogation as the Comm-D II; and

   2) starting the D-timer.

   A multisite downlink ELM reservation shall not be granted by the transponder unless a downlink ELM is waiting to be transmitted.

b) if the D-timer is running and the IIS of the interrogation equals the Comm-D II, the transponder shall restart the D-timer; and

c) if the D-timer is running and the IIS of the interrogation does not equal the Comm-D II, there shall be no change to the Comm-D II or D-timer.

Note 2.— In case c) the reservation request has been denied.

3.1.2.7.7.1.1.2 An interrogator shall determine if it is the reserved site through coding in the UM field and, if so, it may proceed to request delivery of the downlink ELM. Otherwise, ELM activity shall not be started during this scan and a new reservation request may be made during the next scan.

3.1.2.7.7.1.1.3 If downlink ELM activity is not completed on the current scan, the interrogator shall ensure that it still has a reservation before requesting additional segments on a subsequent scan.

3.1.2.7.7.1.2 *Multisite-directed downlink ELM transmissions.* To direct a downlink ELM message to a specific interrogator, the multisite downlink ELM protocol shall be used. When the D-timer is not running, the interrogator identifier of the desired destination shall be stored as the Comm-D II. Simultaneously, the D-timer shall be started and the DR code (3.1.2.7.7.1) shall be set. For a multisite-directed downlink ELM, the D-timer shall not automatically time out but shall continue to run until:

a) the message is read and closed out by the reserved site; or

b) the message is cancelled (3.1.2.10.5.4) by the data link avionics.

Note.— The protocols of 3.1.2.7.7.1 will then result in the delivery of the message to the reserved site. The data link avionics may cancel the message if delivery to the reserved site cannot be accomplished.

3.1.2.7.7.2 *Delivery of downlink ELMs.* The interrogator shall extract a downlink ELM by transmitting a Comm-C interrogation with RC equals 3. This interrogation shall carry the SRS subfield which specifies the segments to be transmitted. On receipt of this request, the transponder shall transfer the requested segments by means of Comm-D replies with KE equals 0 and ND corresponding to the number of the segment in MD. The first segment shall be transmitted 128 microseconds plus or minus 0.25 microsecond following the sync phase reversal of the interrogation requesting delivery and subsequent segments shall be transmitted at a rate of one every 136 microseconds plus or minus 1 microsecond. If a request is received to transmit downlink ELM segments and no message is waiting, each reply segment shall contain all ZEROs in the MD field.

Note 1.— The requested segments may be transmitted in any order.

Note 2.— Segments lost in downlink transmissions will be requested again by the interrogator on a subsequent interrogation carrying the SRS subfield. This process is repeated until all segments have been transferred.

3.1.2.7.7.2.1 *SRS, segment request subfield in MC*. This 16-bit (9-24) uplink subfield in MC shall request the transponder to transfer downlink ELM segments. Starting with bit 9, which denotes segment number 0, each of the following bits shall be set to ONE if the transmission of the corresponding segment is requested. SRS shall appear in MC if RC equals 3 in the same interrogation.

3.1.2.7.7.2.2 *D-timer restart.* The D-timer shall be restarted each time that a request for Comm-D segments is received if the Comm-D II is non-zero.

Note.— The requirement for the Comm-D II to be non-zero prevents the D-timer from being restarted during a non-selective downlink ELM transaction.

3.1.2.7.7.3 *Multisite downlink ELM closeout.* The interrogator shall close out a multisite downlink ELM by transmitting either a surveillance or a Comm-A interrogation containing:

either DI = 1
IIS = assigned interrogator identifier
MES = 4, 5 or 7 (downlink ELM closeout)

or DI = 0, 1 or 7
IIS = assigned interrogator identifier
PC = 6 (downlink ELM closeout).

The transponder shall compare the IIS of the interrogation to the Comm-D II and if the interrogator identifiers do not match, the state of the downlink process shall not be changed.

If the interrogator identifiers match, and if a request for transmission has been complied with at least once, the transponder shall set the Comm-D II to 0, reset the D-timer, clear the DR code for this message and clear the message itself.

If another downlink ELM is waiting to be transmitted, the transponder shall set the DR code (if no Comm-B message is waiting to be delivered) so that the reply contains the announcement of the next message.

3.1.2.7.7.4 *Automatic expiration of downlink ELM reservation.* If the D-timer period expires before a multisite closeout has been accomplished, the Comm-D II shall be set to 0, and the D-timer reset. The message and DR code shall not be cleared.

Note.— This makes it possible for another site to read and clear this message.

3.1.2.7.8 *NON-SELECTIVE DOWNLINK ELM*

Note.— In cases where the multisite protocols are not required (i.e. no overlapping coverage or sensor coordination via ground-to-ground communication), the non-selective downlink ELM protocol may be used.

Non-selective downlink ELM delivery shall take place as described in 3.1.2.7.7.2.

3.1.2.7.8.1 *Non-selective downlink ELM closeout.* The interrogator shall close out a non-selective downlink ELM by transmitting PC equals 6 (downlink ELM closeout) in a surveillance or Comm-A interrogation. On receipt of this command, and if a request for transmission has been complied with at least once, the transponder shall perform closeout unless the D-timer is running. If the D-timer is running, indicating that a multisite reservation is in effect, the closeout shall be accomplished as per 3.1.2.7.7.3.

3.1.2.7.9 ENHANCED DOWNLINK ELM PROTOCOL

Note.— The enhanced downlink ELM protocol provides a higher data link capacity by permitting parallel delivery of downlink ELM messages by up to sixteen interrogators, one for each II code. Operation without the need for multisite downlink ELM reservations is possible in regions of overlapping coverage for interrogators equipped for the enhanced downlink ELM protocol. The protocol is fully conformant to the standard multisite protocol and thus is compatible with interrogators that are not equipped for the enhanced protocol.

3.1.2.7.9.1 *General*

3.1.2.7.9.1.1 The interrogator shall determine from the data link capability report whether the transponder supports the enhanced protocols. If the enhanced protocols are supported, downlink ELMs delivered using the multisite-directed protocol may be delivered without a prior reservation. If the enhanced protocols are not supported by both the interrogator and the transponder, the multisite reservation protocols specified in 3.1.2.6.11 shall be used for multisite and multisite-directed downlink ELMs.

3.1.2.7.9.1.2 **Recommendation.—** *If the transponder and the interrogator are equipped for the enhanced protocol, the interrogator should use the enhanced downlink protocol.*

3.1.2.7.9.2 *Enhanced multisite downlink ELM protocol*

3.1.2.7.9.2.1 The transponder shall be capable of storing a sixteen segment message for each of the sixteen II codes.

3.1.2.7.9.2.2 *Initialization.* A multisite message input into the transponder shall be stored in the registers assigned to II = 0.

3.1.2.7.9.2.3 *Announcement and extraction.* A waiting multisite downlink ELM message shall be announced in the DR field of the replies to all interrogators for which a multisite directed downlink ELM message is not waiting. The UM field of the announcement reply shall indicate that the message is not reserved for any II code, i.e. the IIS subfield shall be set to 0. When a command to reserve this message is received from a given interrogator, the message shall be reserved for the II code contained in the interrogation from that interrogator. After readout and until closeout, the message shall continue to be assigned to that II code. Once a message is assigned to a specific II code, announcement of this message shall no longer be made in the replies to interrogators with other II codes. If the message is not closed out by the associated interrogator for the period of the D-timer, the message shall revert back to multisite status and the process shall repeat. Only one multisite downlink ELM message shall be in process at a time.

3.1.2.7.9.2.4 *Closeout.* A closeout for a multisite message shall only be accepted from the interrogator that was assigned most recently to transfer the message.

3.1.2.7.9.2.5 *Announcement of the next message waiting.* The DR field shall indicate a message waiting in the reply to an interrogation containing a downlink ELM closeout if an unassigned multisite downlink ELM is waiting, or if a multisite directed message is waiting for that II code (3.1.2.7.9.2).

3.1.2.7.9.3 *Enhanced multisite directed downlink ELM protocol*

3.1.2.7.9.3.1 *Initialization.* When a multisite directed message is input into the transponder, it shall be placed in the downlink ELM registers assigned to the II code specified for the message. If the registers for this II code are already in use (i.e. a multisite directed downlink ELM message is already in process for this II code), the new message shall be queued until the current transaction with that II code is closed out.

3.1.2.7.9.3.2 *Announcement.* Announcement of a downlink ELM message waiting transfer shall be made using the DR field as specified in 3.1.2.7.7.1 with the destination interrogator II code contained in the IIS subfield as specified in 3.1.2.6.5.3.2. The DR field and IIS subfield contents shall be set specifically for the interrogator that is to receive the reply. A waiting multisite directed message shall only be announced in the replies to the intended interrogator. It shall not be announced in replies to other interrogators.

3.1.2.7.9.3.3 *Delivery.* An interrogator shall determine if it is the reserved site through coding in the UM field and, if so, it may proceed to request delivery of the downlink ELM. The delivery shall be performed as specified in 3.1.2.7.7.2. The transponder shall transmit the message contained in the buffer associated with the II code specified in the IIS subfield of the segment request interrogation.

3.1.2.7.9.3.4 *Closeout.* Closeout shall be accomplished as specified in 3.1.2.7.7.3 except that a message closeout shall only be accepted from the interrogator with a II code equal to the one that transferred the message.

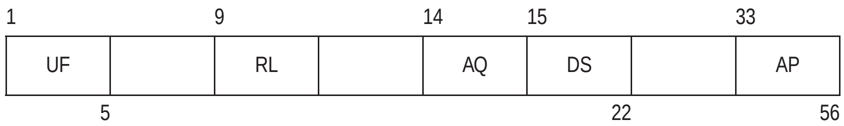
3.1.2.7.9.3.5 *Announcement of the next message waiting.* The DR field shall indicate a message waiting in the reply to an interrogation containing a downlink ELM closeout if another multisite directed message is waiting for that II code, or if a downlink message is waiting that has not been assigned a II code (3.1.2.7.9.2).

3.1.2.7.9.4 *Enhanced non-selective downlink ELM protocol.* The availability of a non-selective downlink ELM message shall be announced to all interrogators. Otherwise, the protocol shall be as specified in 3.1.2.7.7.

3.1.2.8 AIR-AIR SERVICE AND SQUITTER TRANSACTIONS

Note.— Airborne collision avoidance system (ACAS) equipment uses the formats UF or DF equals 0 or 16 for air-air surveillance.

3.1.2.8.1 *SHORT AIR-AIR SURVEILLANCE, UPLINK FORMAT 0*



The format of this interrogation shall consist of these fields:

Field	*Reference*
UF uplink format	3.1.2.3.2.1.1
spare — 3 bits	
RL reply length	3.1.2.8.1.2
spare — 4 bits	
AQ acquisition	3.1.2.8.1.1
DS data selector	3.1.2.8.1.3
spare — 10 bits	
AP address/parity	3.1.2.3.2.1.3

3.1.2.8.1.1 *AQ: Acquisition.* This 1-bit (14) uplink field shall contain a code which controls the content of the RI field.

3.1.2.8.1.2 *RL: Reply length.* This 1-bit (9) uplink field shall command the format to be used for the reply.

Coding
0 signifies a reply with DF = 0
1 signifies no reply

Note.— A transponder associated with airborne collision avoidance equipment would reply with DF equals 16 in response to an interrogation with RL equals 1.

3.1.2.8.1.3 *DS: Data selector.* This 8-bit (15-22) uplink field shall contain the BDS code (3.1.2.6.11.2.1) of the GICB register whose contents shall be returned to the corresponding reply with DF equals 16.

3.1.2.8.2 *SHORT AIR-AIR SURVEILLANCE, DOWNLINK FORMAT 0*

1	6	7		14		20	33
DF	VS	CC		RI		AC	AP
5				17		32	56

This reply shall be sent in response to an interrogation with UF equals 0 and RL equals 0. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
VS vertical status	3.1.2.8.2.1
CC cross-link capability	3.1.2.8.2.3
spare — 6 bits	
RI reply information	3.1.2.8.2.2
spare — 2 bits	
AC altitude code	3.1.2.6.5.4
AP address/parity	3.1.2.3.2.1.3

3.1.2.8.2.1 *VS: Vertical status:* This 1-bit (6) downlink field shall indicate the status of the aircraft (3.1.2.6.10.1.2).

Coding
0 signifies that the aircraft is airborne
1 signifies that the aircraft is on the ground

3.1.2.8.2.2 *RI: Reply information, air-air.* This 4-bit (14-17) downlink field shall report the aircraft's maximum cruising true airspeed capability and type of reply to interrogating aircraft. The coding shall be as follows:

0 signifies a reply to an air-air interrogation UF = 0 with AQ = 0, no operating ACAS
1-7 reserved for ACAS
8-15 signifies a reply to an air-air interrogation UF = 0 with AQ = 1 and that the maximum airspeed is as follows:
8 no maximum airspeed data available
9 maximum airspeed is .LE. 140 km/h (75 kt)
10 maximum airspeed is .GT. 140 and .LE. 280 km/h (75 and 150 kt)
11 maximum airspeed is .GT. 280 and .LE. 560 km/h (150 and 300 kt)
12 maximum airspeed is .GT. 560 and .LE. 1 110 km/h (300 and 600 kt)
13 maximum airspeed is .GT. 1 110 and .LE. 2 220 km/h (600 and 1 200 kt)
14 maximum airspeed is more than 2 220 km/h (1 200 kt)
15 not assigned.

Note.— ".LE." means "less than or equal to" and ".GT." means "greater than".

3.1.2.8.2.3 *CC: Cross-link capability.* This 1-bit (7) downlink field shall indicate the ability of the transponder to support the cross-link capability, i.e. decode the contents of the DS field in an interrogation with UF equals 0 and respond with the contents of the specified GICB register in the corresponding reply with DF equals 16.

Coding
0 signifies that the transponder cannot support the cross-link capability
1 signifies that the transponder supports the cross-link capability.

3.1.2.8.3 *LONG AIR-AIR SURVEILLANCE, DOWNLINK FORMAT 16*

1	6		14		20	33	89
DF	VS		RI		AC	MV	AP
5			17		32	88	112

This reply shall be sent in response to an interrogation with UF equals 0 and RL equals 1. The format of this reply shall consist of these fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
VS vertical status	3.1.2.8.2.1
spare — 7 bits	
RI reply information	3.1.2.8.2.2
spare — 2 bits	
AC altitude code	3.1.2.6.5.4
MV message, ACAS	3.1.2.8.3.1
AP address/parity	3.1.2.3.2.1.3

3.1.2.8.3.1 *MV: Message, ACAS.* This 56-bit (33-88) downlink field shall contain GICB information as requested in the DS field of the UF 0 interrogation that elicited the reply.

Note.— The MV field is also used by ACAS for air-air coordination (4.3.8.4.2.4).

3.1.2.8.4 *AIR-AIR TRANSACTION PROTOCOL*

Note.— Interrogation-reply coordination for the air-air formats follows the protocol outlined in Table 3-5 (3.1.2.4.1.3.2.2).

The most significant bit (bit 14) of the RI field of an air-air reply shall replicate the value of the AQ field (bit 14) received in an interrogation with UF equals 0.

If AQ equals 0 in the interrogation, the RI field of the reply shall contain the value 0.

If AQ equals 1 in the interrogation, the RI field of the reply shall contain the maximum cruising true airspeed capability of the aircraft as defined in 3.1.2.8.2.2.

In response to a UF = 0 with RL = 1 and DS ≠ 0, the transponder shall reply with a DF = 16 reply in which the MV field shall contain the contents of the GICB register designated by the DS value. In response to a UF = 0 with RL = 1 and DS = 0, the transponder shall reply with a DF = 16 with an MV field of all zeros. Receipt of a UF = 0 with DS ≠ 0 but RL = 0 shall have no associated ACAS cross-link action, and the transponder shall reply as specified in 3.1.2.8.2.2.

3.1.2.8.5 *ACQUISITION SQUITTER*

Note.— SSR Mode S transponders transmit acquisition squitters (unsolicited downlink transmissions) to permit passive acquisition by interrogators with broad antenna beams, where active acquisition may be hindered by all-call synchronous garble. Examples of such interrogators are an airborne collision avoidance system and an airport surface surveillance system.

3.1.2.8.5.1 *Acquisition squitter format.* The format used for acquisition squitter transmissions shall be the all-call reply, (DF = 11) with II = 0.

3.1.2.8.5.2 *Acquisition squitter rate.* Acquisition squitter transmissions shall be emitted at random intervals that are uniformly distributed over the range from 0.8 to 1.2 seconds using a time quantization of no greater than 15 milliseconds relative to the previous acquisition squitter, with the following exceptions:

a) the scheduled acquisition squitter shall be delayed if the transponder is in a transaction cycle (3.1.2.4.1);

b) the acquisition squitter shall be delayed if an extended squitter is in process;

c) the scheduled acquisition squitter shall be delayed if a mutual suppression interface is active (see Note 1 below); or

d) acquisition squitters shall only be transmitted on the surface if the transponder is not reporting the surface position type of Mode S extended squitter.

An acquisition squitter shall not be interrupted by link transactions or mutual suppression activity after the squitter transmission has begun.

Note 1.— A mutual suppression system may be used to connect onboard equipment operating in the same frequency band in order to prevent mutual interference. Acquisition squitter action resumes as soon as practical after a mutual suppression interval.

Note 2.— The surface report type may be selected automatically by the aircraft or by commands from a squitter ground station (3.1.2.8.6.7).

3.1.2.8.5.3 *Acquisition squitter antenna selection.* Transponders operating with antenna diversity (3.1.2.10.4) shall transmit acquisition squitters as follows:

a) when airborne (3.1.2.8.6.7), the transponder shall transmit acquisition squitters alternately from the two antennas; and

b) when on the surface (3.1.2.8.6.7), the transponder shall transmit acquisition squitters under control of SAS (3.1.2.6.1.4.1 f)). In the absence of any SAS commands, use of the top antenna only shall be the default.

Note.— Acquisition squitters are not emitted on the surface if the transponder is reporting the surface type of extended squitter (3.1.2.8.6.4.3).

3.1.2.8.6 *EXTENDED SQUITTER, DOWNLINK FORMAT 17*

1	6	9	33	89
DF	CA	AA	ME	PI
5	8	32	88	112

Note.— SSR Mode S transponders transmit extended squitters to support the broadcast of aircraft-derived position for surveillance purposes. The broadcast of this type of information is a form of automatic dependent surveillance (ADS) known as ADS-broadcast (ADS-B).

3.1.2.8.6.1 *Extended squitter format.* The format used for the extended squitter shall be a 112-bit downlink format (DF = 17) containing the following fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
CA capability	3.1.2.5.2.2.1
AA address, announced	3.1.2.5.2.2.2
ME message, extended squitter	3.1.2.8.6.2
PI parity/interrogator identifier	3.1.2.3.2.1.4

The PI field shall be encoded with II equal to 0.

3.1.2.8.6.2 *ME: Message, extended squitter.* This 56-bit (33-88) downlink field in DF = 17 shall be used to transmit broadcast messages. The formats and update rates for each register used to support extended squitter (BDS 0,5; BDS 0,6; BDS 0,7; BDS 0,8; BDS 0,9; BDS 0,A) shall be as defined in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5.

Note.— Guidance material on transponder register formats and data sources is included in the Manual on Mode S Specific Services *(Doc 9688).*

3.1.2.8.6.3 *Extended squitter types*

3.1.2.8.6.3.1 *Airborne position squitter.* The airborne position extended squitter type shall use format DF = 17 with the contents of GICB register 05 {HEX} inserted in the ME field.

Note.— A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 5 will cause the resulting reply to contain the airborne position report in its MB field.

3.1.2.8.6.3.1.1 *SSS, surveillance status subfield in ME.* The transponder shall report the surveillance status of the transponder in this 2-bit (38, 39) subfield of ME when ME contains an airborne position squitter report.

Coding

0 signifies no status information
1 signifies transponder reporting permanent alert condition (3.1.2.6.10.1.1.1)
2 signifies transponder reporting a temporary alert condition (3.1.2.6.10.1.1.2)
3 signifies transponder reporting SPI condition (3.1.2.6.10.1.3)

Codes 1 and 2 shall take precedence over code 3.

3.1.2.8.6.3.1.2 *ACS, altitude code subfield in ME.* Under control of ATS (3.1.2.8.6.3.1.3), the transponder shall report either navigation-derived altitude, or the barometric altitude code in this 12-bit (41-52) subfield of ME when ME contains an airborne position report. When barometric altitude is reported, the contents of the ACS shall be as specified for the 13-bit AC field (3.1.2.6.5.4) except that the M-bit (bit 26) shall be omitted.

3.1.2.8.6.3.1.3 *Control of ACS reporting.* Transponder reporting of altitude data in ACS shall depend on the altitude type subfield (ATS) as specified in 3.1.2.8.6.8.2. Transponder insertion of barometric altitude data in ACS shall be inhibited when ATS has the value 1.

3.1.2.8.6.3.2 *Surface position squitter.* The surface position extended squitter type shall use format DF = 17 with the contents of GICB register 06 {HEX} inserted in the ME field.

Note.— A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 6 will cause the resulting reply to contain the surface position report in its MB field.

3.1.2.8.6.3.3 *Aircraft identification squitter.* The aircraft identification extended squitter type shall use format DF = 17 with the contents of GICB register 08 {HEX} inserted in the ME field.

Note.— A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 8 will cause the resulting reply to contain the aircraft identification report in its MB field.

3.1.2.8.6.3.4 *Airborne velocity squitter.* The airborne velocity extended squitter type shall use format DF = 17 with the contents of GICB register 09 {HEX} inserted in the ME field.

Note.— A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 9 will cause the resulting reply to contain the airborne velocity report in its MB field.

3.1.2.8.6.3.5 *Event-driven squitter.* The event-driven extended squitter type shall use format DF = 17 with the contents of GICB register 0A {HEX} inserted in the ME field.

Note.— A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 10 will cause the resulting reply to contain the event-driven report in its MB field.

3.1.2.8.6.4 *Extended squitter rate*

3.1.2.8.6.4.1 *Initialization.* At power up initialization, the transponder shall commence operation in a mode in which it broadcasts only acquisition squitters (3.1.2.8.5). The transponder shall initiate the broadcast of extended squitters for airborne position, surface position, airborne velocity and aircraft identification when data are inserted into transponder registers 05, 06, 09 and 08 {HEX}, respectively. This determination shall be made individually for each squitter type. When extended squitters are broadcast, transmission rates shall be as indicated in the following paragraphs. Acquisition squitters shall be reported in addition to extended squitters unless the acquisition squitter is inhibited (2.1.5.4). Acquisition squitters shall always be reported if position or velocity extended squitters are not reported.

Note 1.— This suppresses the transmission of extended squitters from aircraft that are unable to report position, velocity or identity. If input to the register for a squitter type stops for 60 seconds, broadcast of that extended squitter type will be discontinued until data insertion is resumed.

Note 2.— After timeout (3.1.2.8.6.6), this squitter type may contain an ME field of all zeroes.

3.1.2.8.6.4.2 *Airborne position squitter rate.* Airborne position squitter transmissions shall be emitted when the aircraft is airborne (3.1.2.8.6.7) at random intervals that are uniformly distributed over the range from 0.4 to 0.6 seconds using a time quantization of no greater than 15 milliseconds relative to the previous airborne position squitter, with the exceptions as specified in 3.1.2.8.6.4.7.

3.1.2.8.6.4.3 *Surface position squitter rate.* Surface position squitter transmissions shall be emitted when the aircraft is on the surface (3.1.2.8.6.7) using one of two rates depending upon whether the high or low squitter rate has been selected (3.1.2.8.6.9). When the high squitter rate has been selected, surface position squitters shall be emitted at random intervals that are uniformly distributed over the range from 0.4 to 0.6 seconds using a time quantization of no greater than 15 milliseconds relative to the previous surface position squitter (termed the high rate). When the low squitter rate has been selected, surface position squitters shall be emitted at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization of no greater than 15 milliseconds relative to the previous surface position squitter (termed the low rate). Exceptions to these transmission rates are specified in 3.1.2.8.6.4.7.

3.1.2.8.6.4.4 *Aircraft identification squitter rate.* Aircraft identification squitter transmissions shall be emitted at random intervals that are uniformly distributed over the range of 4.8 to 5.2 seconds using a time quantization of no greater than 15 milliseconds relative to the previous identification squitter when the aircraft is reporting the airborne position squitter type, or when the aircraft is reporting the surface position squitter type and the high surface squitter rate has been selected. When the surface position squitter type is being reported at the low surface rate, the aircraft identification squitter shall be emitted at random intervals that are uniformly distributed over the range of 9.8 to 10.2 seconds using a time quantization of no greater than 15 milliseconds relative to the previous identification squitter. Exceptions to these transmission rates are specified in 3.1.2.8.6.4.7.

3.1.2.8.6.4.5 *Airborne velocity squitter rate.* Airborne velocity squitter transmissions shall be emitted when the aircraft is airborne (3.1.2.8.6.7) at random intervals that are uniformly distributed over the range from 0.4 to 0.6 seconds using a time quantization of no greater than 15 milliseconds relative to the previous airborne velocity squitter, with the exceptions as specified in 3.1.2.8.6.4.7.

3.1.2.8.6.4.6 *Event-driven squitter rate.* The event-driven squitter shall be transmitted once, each time that GICB register 0A {HEX} is loaded, while observing the delay conditions specified in 3.1.2.8.6.4.7. The maximum transmission rate for the event-driven squitter shall be limited by the transponder to twice per second. If a message is inserted in the event-driven register and cannot be transmitted due to rate limiting, it shall be held and transmitted when the rate limiting condition has cleared. If a new message is received before transmission is permitted, it shall overwrite the earlier message.

Note.— The squitter transmission rate and the duration of squitter transmissions is application-dependent. Choices made for each application must take into account interference considerations (Manual of the Secondary Surveillance Radar (SSR) Systems *(Doc 9684), Chapter 8 refers).*

3.1.2.8.6.4.7 *Delayed transmission.* Extended squitter transmission shall be delayed in the following circumstances:

a) if the transponder is in a transaction cycle (3.1.2.4.1);

b) if an acquisition or another type of extended squitter is in process; or

c) if a mutual suppression interface is active.

The delayed squitter shall be transmitted as soon as the transponder becomes available.

3.1.2.8.6.5 *Extended squitter antenna selection.* Transponders operating with antenna diversity (3.1.2.10.4) shall transmit extended squitters as follows:

a) when airborne (3.1.2.8.6.7), the transponder shall transmit each type of extended squitter alternately from the two antennas; and

b) when on the surface (3.1.2.8.6.7), the transponder shall transmit extended squitters under control of SAS (3.1.2.6.1.4.1 f)).

In the absence of any SAS commands, use of the top antenna only shall be the default condition.

3.1.2.8.6.6 *Register time-out*. The transponder shall clear all 56-bits of the airborne position, surface position, squitter status and airborne velocity information transponder registers 05, 06, 07 and 09 {HEX} if these registers are not updated within two seconds of the previous update. This time-out shall be determined separately for each of these registers. Termination of extended squitter broadcast shall be as specified in Annex 10, Volume III, Part I.

Note.— These registers are cleared to prevent the reporting of outdated position, velocity and squitter rate information.

3.1.2.8.6.7 *Airborne/surface state determination.* Aircraft with an automatic means of determining on-the-ground conditions shall use this input to select whether to report the airborne or surface message types. Aircraft without such means shall report the airborne type messages. Aircraft with or without such automatic on-the-ground determination shall use position message types as commanded by control codes in TCS (3.1.2.6.1.4.1 f)). After time-out of the TCS commands, control of airborne/surface determination shall revert to the means described above.

Note.— Extended squitter ground stations determine aircraft airborne or surface status by monitoring aircraft position, altitude and ground speed. Aircraft determined to be on the ground that are not reporting the surface position message type will be commanded to report the surface format via TCS (3.1.2.6.1.4.1 f)). The normal return to the airborne position message type is via a ground command to report the airborne message type. To guard against loss of communications after take-off, commands to report the surface position message type automatically time-out.

3.1.2.8.6.8 *Squitter status reporting.* A GICB request (3.1.2.6.11.2) containing RR equals 16 and DI equals 7 and RRS equals 7 shall cause the resulting reply to contain the squitter status report in its MB field.

3.1.2.8.6.8.1 *TRS, transmission rate subfield in MB.* The transponder shall report the capability of the aircraft to automatically determine its surface squitter rate and its current squitter rate in this 2-bit (33, 34) subfield of MB.

Coding

0	signifies no capability to automatically determine surface squitter rate
1	signifies that the high surface squitter rate has been selected
2	signifies that the low surface squitter rate has been selected
3	unassigned

Note 1.— High and low squitter rate is determined on board the aircraft.

Note 2.— The low rate is used when the aircraft is stationary and the high rate is used when the aircraft is moving. For details of how “moving” is determined, see Table 2-7 in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5.

3.1.2.8.6.8.2 *ATS, altitude type subfield in MB*. The transponder shall report the type of altitude being provided in the airborne position extended squitter in this 1-bit (35) subfield of MB when the reply contains the contents of transponder register 07 {HEX}.

Coding

0 signifies that barometric altitude shall be reported in the ACS (3.1.2.8.6.3.1.2) of transponder register 05 {HEX}.

1 signifies that navigation-derived altitude shall be reported in the ACS (3.1.2.8.6.3.1.2) of transponder register 05 {HEX}.

Note.— For details of the contents of transponder registers 05 {HEX} and 07 {HEX} see Annex 10, Volume III, Part I, Appendix 1 to Chapter 5.

3.1.2.8.6.9 *Surface squitter rate control.* Surface squitter rate shall be determined as follows:

a) once per second the contents of the TRS shall be read. If the value of TRS is 0 or 1, the transponder shall transmit surface squitters at the high rate. If the value of TRS is 2, the transponder shall transmit surface squitters at the low rate;

b) the squitter rate determined via TRS shall be subject to being overridden by commands received via RCS (3.1.2.6.1.4.1 f)). RCS code 1 shall cause the transponder to squitter at the high rate for 60 seconds. RCS code 2 shall cause the transponder to squitter at the low rate for 60 seconds. These commands shall be able to be refreshed for a new 60 second period before time-out of the prior period; and

c) after time-out and in the absence of RCS codes 1 and 2, control shall return to TRS.

3.1.2.8.6.10 *Latitude/longitude coding using compact position reporting (CPR).* Mode S extended squitter uses compact position reporting (CPR) to encode latitude and longitude efficiently into messages. The method used to encode/decode CPR shall comply with the equations in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5.

3.1.2.8.7 *EXTENDED SQUITTER/NON TRANSPONDER (ES/NT), DOWNLINK FORMAT 18*

10010	CF:3	AA:24	ME:56	PI:24

Note.— This format supports the broadcast of extended squitter ADS-B messages by non-transponder devices, i. e. they are not incorporated into a Mode S transponder. A separate format is used to clearly identify this non-transponder case to prevent ACAS II or extended squitter ground stations from attempting to interrogate these devices.

3.1.2.8.7.1 *ES/NT format.* The format used for ES/NT shall be a 112-bit downlink format (DF = 18) containing the following fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
CF control field	3.1.2.8.7.2
AA address, announced	3.1.2.5.2.2.2
ME message, extended squitter	3.1.2.8.6.2
PI parity/interrogator identifier	3.1.2.3.2.1.4

The PI field shall be encoded with II or SI equal to zero.

3.1.2.8.7.2 *Control field*. This 3-bit (6-8) downlink field in DF = 18 shall be used to define the format of the 112-bit transmission.

Code 0 = ADS-B
Code 1 to 7 = Reserved

3.1.2.8.7.3 *ES/NT squitter types*

3.1.2.8.7.3.1 *Airborne position squitter.* The airborne position type ES/NT shall use format DF = 18 with the format for register 05 {HEX} as defined in 3.1.2.8.6.2 inserted in the ME field.

3.1.2.8.7.3.2 *Surface position squitter.* The surface position type ES/NT shall use format DF = 18 with the format for register 06 {HEX} as defined in 3.1.2.8.6.2 inserted in the ME field.

3.1.2.8.7.3.3 *Aircraft identification squitter.* The aircraft identification type ES/NT shall use format DF = 18 with the format for register 08 {HEX} as defined in 3.1.2.8.6.2 inserted in the ME field.

3.1.2.8.7.3.4 *Airborne velocity squitter.* The airborne velocity type ES/NT shall use format DF = 18 with the format for register 09 {HEX} as defined in 3.1.2.8.6.2 inserted in the ME field.

3.1.2.8.7.3.5 *Event-driven squitter.* The event-driven type ES/NT shall use format DF = 18 with the format for register 0A {HEX} as defined in 3.1.2.8.6.2 inserted in the ME field.

3.1.2.8.7.4 *ES/NT squitter rate*

3.1.2.8.7.4.1 *Initialization.* At power up initialization, the non-transponder device shall commence operation in a mode in which it does not broadcast any squitters. The non-transponder device shall initiate the broadcast of ES/NT squitters for airborne position, surface position, airborne velocity and aircraft identification when data are available for inclusion in the ME field of these squitter types. This determination shall be made individually for each squitter type. When ES/NT squitters are broadcast, transmission rates shall be as indicated in 3.1.2.8.6.4.2 to 3.1.2.8.6.4.6.

Note 1.— This suppresses the transmission of extended squitters from aircraft that are unable to report position, velocity or identity. If input to the register for squitter types stops for 60 seconds, broadcast for this extended squitter type will cease until data insertion resumes.

Note 2.— After timeout (3.1.2.8.7.6) this squitter type may contain an ME field of all zeros.

3.1.2.8.7.4.2 *Delayed transmission.* ES/NT squitter transmission shall be delayed if the non-transponder device is busy broadcasting one of the other squitter types.

3.1.2.8.7.4.2.1 The delayed squitter shall be transmitted as soon as the non-transponder device becomes available.

3.1.2.8.7.5 *ES/NT antenna selection.* Non-transponder devices operating with antenna diversity (3.1.2.10.4) shall transmit ES/NT squitters as follows:

a) when airborne (3.1.2.8.6.7), the non-transponder device shall transmit each type of ES/NT squitter alternately from the two antennas; and

b) when on the surface (3.1.2.8.6.7), the non-transponder device shall transmit ES/NT squitters using the top antenna.

3.1.2.8.7.6 *Register timeout.* The non-transponder device shall clear all 56 bits of the airborne position, surface position and velocity registers used for these messages if these registers are not updated within two seconds of the previous update. This timeout shall be determined separately for each of these registers. Termination of extended squitter broadcast shall be as specified in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5, 2.4.3.

Note.— These registers are cleared to prevent the reporting of outdated position and velocity information.

3.1.2.8.7.7 *Airborne/surface state determination.* Aircraft with an automatic means of determining on-the-ground condition shall use this input to select whether to report the airborne or surface message types. Aircraft without such means shall report the airborne type messages.

3.1.2.8.7.8 *Surface squitter rate control.* Once per second the algorithm for aircraft motion specified in Table 2-7 in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5 shall be executed. The surface squitter rate shall be set according to the results of this algorithm.

3.1.2.8.8 *EXTENDED SQUITTER MILITARY APPLICATION, DOWNLINK FORMAT 19*

10011	AF:3	

Note.— This format supports the broadcast of extended squitter ADS-B messages in support of military applications. A separate format is used to distinguish these extended squitters from the standard ADS-B message set broadcast using DF = 17 or 18.

3.1.2.8.8.1 *Military format.* The format used for DF = 19 shall be a 112-bit downlink format containing the following fields:

Field	*Reference*
DF downlink format	3.1.2.3.2.1.2
AF control field	3.1.2.8.8.2

3.1.2.8.8.2 *Application field.* This 3-bit (6-8) downlink field in DF = 19 shall be used to define the format of the 112-bit transmission.

Code 0 to 7 = Reserved

3.1.2.8.9 *EXTENDED SQUITTER MAXIMUM TRANSMISSION RATE*

3.1.2.8.9.1 The maximum total number of extended squitters (DF = 17, 18 or 19) emitted by any extended squitter installation shall not exceed 6.2 per second.

3.1.2.9 AIRCRAFT IDENTIFICATION PROTOCOL

3.1.2.9.1 *Aircraft identification reporting.* A ground-initiated Comm-B request (3.1.2.6.11.2) containing RR equals 18 and either DI does not equal 7 or DI equals 7 and RRS equals 0 shall cause the resulting reply to contain the aircraft identification in its MB field.

3.1.2.9.1.1 *AIS, aircraft identification subfield in MB.* The transponder shall report the aircraft identification in the 48-bit (41-88) AIS subfield of MB. The aircraft identification transmitted shall be that employed in the flight plan. When no flight plan is available, the registration marking of the aircraft shall be inserted in this subfield.

Note.— When the registration marking of the aircraft is used, it is classified as "fixed direct data" (3.1.2.10.5.1.1). When another type of aircraft identification is used, it is classified as "variable direct data" (3.1.2.10.5.1.3).

3.1.2.9.1.2 *Coding of the AIS subfield.* The AIS subfield shall be coded as follows:

33	41	47	53	59	65	71	77	83
BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
40	46	52	58	64	70	76	82	88

Note.— Aircraft identification coding provides up to eight characters.

The BDS code for the aircraft identification message shall be BDS1 equals 2 (33-36) and BDS2 equals 0 (37-40).

Each character shall be coded as a 6-bit subset of the International Alphabet Number 5 (IA-5) as illustrated in Table 3-7. The character code shall be transmitted with the high order unit (b_6) first and the reported aircraft identification shall be transmitted with its left-most character first. Characters shall be coded consecutively without intervening SPACE code. Any unused character spaces at the end of the subfield shall contain a SPACE character code.

Table 3-7. Character coding for transmission of aircraft identification by data link (subset of IA-5 — see 3.1.2.9.1.2)

				b_6	0	0	1	1
				b_5	0	1	0	1
b_4	b_3	b_2	b_1					
0	0	0	0			P	SP	0
0	0	0	1		A	Q		1
0	0	1	0		B	R		2
0	0	1	1		C	S		3
0	1	0	0		D	T		4
0	1	0	1		E	U		5
0	1	1	0		F	V		6
0	1	1	1		G	W		7
1	0	0	0		H	X		8
1	0	0	1		I	Y		9
1	0	1	0		J	Z		
1	0	1	1		K			
1	1	0	0		L			
1	1	0	1		M			
1	1	1	0		N			
1	1	1	1		O			

3.1.2.9.1.3 *Aircraft identification capability report.* Transponders which respond to a ground-initiated request for aircraft identification shall report this capability in the data link capability report (3.1.2.6.10.2.2.2) by setting bit 33 of the MB subfield to 1.

3.1.2.9.1.4 *Change of aircraft identification.* If the aircraft identification reported in the AIS subfield is changed in flight, the transponder shall report the new identification to the ground by use of the Comm-B broadcast message protocol of 3.1.2.6.11.4.

3.1.2.10 ESSENTIAL SYSTEM CHARACTERISTICS OF THE SSR MODE S TRANSPONDER

3.1.2.10.1 *Transponder sensitivity and dynamic range.* Transponder sensitivity shall be defined in terms of a given interrogation signal input level and a given percentage of corresponding replies. Only correct replies containing the required bit pattern for the interrogation received shall be counted. Given an interrogation that requires a reply according to 3.1.2.4, the minimum triggering level, MTL, shall be defined as the minimum input power level for 90 per cent reply-to-interrogation ratio. The MTL shall be –74 dBm ±3 dB. The reply-to-interrogation ratio of a Mode S transponder shall be:

a) at least 99 per cent for signal input levels between 3 dB above MTL and –21 dBm; and

b) no more than 10 per cent at signal input levels below –81 dBm.

Note.— Transponder sensitivity and output power are described in this section in terms of signal level at the terminals of the antenna. This gives the designer freedom to arrange the installation, optimizing cable length and receiver-transmitter design, and does not exclude receiver and/or transmitter components from becoming an integral part of the antenna subassembly.

3.1.2.10.1.1 *Reply ratio in the presence of interference*

Note.— The following paragraphs present measures of the performance of the Mode S transponder in the presence of interfering Mode A/C interrogation pulses.

3.1.2.10.1.1.1 *Reply ratio in the presence of an interfering pulse.* Given a Mode S interrogation which requires a reply (3.1.2.4), the reply ratio of a transponder shall be at least 95 per cent in the presence of an interfering Mode A/C interrogation pulse if the level of the interfering pulse is 6 dB or more below the signal level for Mode S input signal levels between –68 dBm and –21 dBm and the interfering pulse overlaps the P_6 pulse of the Mode S interrogation anywhere after the sync phase reversal.

Under the same conditions, the reply ratio shall be at least 50 per cent if the interference pulse level is 3 dB or more below the signal level.

3.1.2.10.1.1.2 *Reply ratio in the presence of pulse pair interference.* Given an interrogation which requires a reply (3.1.2.4), the reply ratio of a transponder shall be at least 90 per cent in the presence of an interfering P_1 - P_2 pulse pair if the level of the interfering pulse pair is 9 dB or more below signal level for input signal levels between –68 dBm and –21 dBm and the P_1 pulse of the interfering pair occurs no earlier than the P_1 pulse of the Mode S signal.

3.1.2.10.1.1.3 *Reply ratio in the presence of low level asynchronous interference.* For all received signals between –65 dBm and –21 dBm and given a Mode S interrogation that requires a reply according to 3.1.2.4 and if no lockout condition is in effect, the transponder shall reply correctly with at least 95 per cent reply ratio in the presence of asynchronous interference. Asynchronous interference shall be taken to be a single Mode A/C interrogation pulse occurring at all repetition rates up to 10 000 Hz at a level 12 dB or more below the level of the Mode S signal.

Note.— Such pulses may combine with the P_1 *and* P_2 *pulses of the Mode S interrogation to form a valid Mode A/C-only all-call interrogation. The Mode S transponder does not respond to Mode A/C-only all-call interrogations. A preceding pulse may also combine with the* P_2 *of the Mode S interrogation to form a valid Mode A or Mode C interrogation. However, the* P_1 - P_2 *pair of the Mode S preamble takes precedence (3.1.2.4.1.1.1). The Mode S decoding process is independent of the Mode A/Mode C decoding process and the Mode S interrogation is accepted.*

3.1.2.10.1.1.4 *Spurious response*

Recommendation.— *The response to signals not within the receiver pass band should be at least 60 dB below normal sensitivity.*

3.1.2.10.2 *Transponder peak pulse power.* The peak power of each pulse of a reply shall:

a) not be less than 18.5 dBW for aircraft not capable of operating at altitudes exceeding 4 570 m (15 000 ft);

b) not be less than 21.0 dBW for aircraft capable of operating above 4 570 m (15 000 ft);

c) not be less than 21.0 dBW for aircraft with maximum cruising speed exceeding 324 km/h (175 kt); and

d) not exceed 27.0 dBW.

3.1.2.10.2.1 *Inactive state transponder output power.* When the transponder is in the inactive state the peak pulse power at 1 090 MHz plus or minus 3 MHz shall not exceed –50 dBm. The inactive state is defined to include the entire period between transmissions less 10-microsecond transition periods preceding the first pulse and following the last pulse of the transmission.

Note.— Inactive state transponder power is constrained in this way to ensure that an aircraft, when located as near as 185 m (0.1 NM) to a Mode A/C or Mode S interrogator, does not cause interference to that installation. In certain applications of Mode S, airborne collision avoidance for example, where a 1 090 MHz transmitter and receiver are in the same aircraft, it may be necessary to further constrain the inactive state transponder power.

3.1.2.10.2.2 *Spurious emission radiation*

Recommendation.— *CW radiation should not exceed 70 dB below 1 watt.*

3.1.2.10.3 SPECIAL CHARACTERISTICS

3.1.2.10.3.1 *Mode S side-lobe suppression*

Note.— Side-lobe suppression for Mode S formats occurs when a P_5 *pulse overlays the location of the sync phase reversal of* P_6*, causing the transponder to fail to recognize the interrogation (3.1.2.4.1.1.3).*

Given a Mode S interrogation that requires a reply, the transponder shall:

a) at all signal levels between MTL +3 dB and –21 dBm, have a reply ratio of less than 10 per cent if the received amplitude of P_5 exceeds the received amplitude of P_6 by 3 dB or more;

b) at all signal levels between MTL +3 dB and –21 dBm, have a reply ratio of at least 99 per cent if the received amplitude of P_6 exceeds the received amplitude of P_5 by 12 dB or more.

3.1.2.10.3.2 *Mode S dead time.* Dead time shall be defined as the time interval beginning at the end of a reply transmission and ending when the transponder has regained sensitivity to within 3 dB of MTL. Mode S transponders shall not have more than 125 microseconds' dead time.

3.1.2.10.3.3 *Mode S receiver desensitization.* The transponder's receiver shall be desensitized according to 3.1.1.7.7.1 on receipt of any pulse of more than 0.7 microseconds duration.

3.1.2.10.3.3.1 *Recovery from desensitization.* Recovery from desensitization shall begin at the trailing edge of each pulse of a received signal and shall occur at the rate prescribed in 3.1.1.7.7.2, provided that no reply or data transfer is made in response to the received signal.

3.1.2.10.3.4 *Recovery after Mode S interrogations that do not elicit replies*

3.1.2.10.3.4.1 *Recovery after a single Mode S interrogation*

3.1.2.10.3.4.1.1 The transponder shall recover sensitivity to within 3 dB of MTL no later than 128 microseconds after receipt of the sync phase reversal following a Mode S interrogation that is not accepted (3.1.2.4.1.2) or that is accepted but requires no reply.

3.1.2.10.3.4.1.2 **Recommendation.—** *The transponder should recover sensitivity to within 3 dB of MTL no later than 45 microseconds after receipt of the sync phase reversal following a Mode S interrogation that is not accepted (3.1.2.4.1.2) or that is accepted but requires no reply.*

3.1.2.10.3.4.1.3 All Mode S transponders installed on or after 1 January 1999 shall recover sensitivity to within 3 dB of MTL no later than 45 microseconds after receipt of the sync phase reversal following a Mode S interrogation that is not accepted (3.1.2.4.1.2) or that is accepted but requires no reply.

3.1.2.10.3.4.2 *Recovery after a Mode S Comm-C interrogation.* A Mode S transponder with Comm-C capability shall recover sensitivity to within 3 dB of MTL no later than 45 microseconds after receipt of the sync phase reversal following acceptance of a Comm-C interrogation for which no reply is required.

3.1.2.10.3.5 *Unwanted Mode S replies.* Mode S transponders shall not generate unwanted Mode S replies more often than once in 10 seconds. Installation in the aircraft shall be made in such a manner that this standard shall be achieved when all possible interfering equipments installed in the same aircraft are operating at maximum interference levels.

3.1.2.10.3.6 *Reply rate limiting*

Note.— Reply rate limiting is prescribed separately for Modes A and C and for Mode S.

3.1.2.10.3.6.1 *Mode S reply rate limiting.* Reply rate limiting is not required for the Mode S formats of a transponder. If such limiting is incorporated for circuit protection, it shall permit the minimum reply rates required in 3.1.2.10.3.7.2 and 3.1.2.10.3.7.3.

3.1.2.10.3.6.2 *Modes A and C reply rate limiting.* Reply rate limiting for Modes A and C shall be effected according to 3.1.1.7.9.1. The prescribed sensitivity reduction (3.1.1.7.9.2) shall not affect the Mode S performance of the transponder.

3.1.2.10.3.7 *Minimum reply rate capability, Modes A, C and S*

3.1.2.10.3.7.1 All reply rates specified in 3.1.2.10.3.7 shall be in addition to any squitter transmissions that the transponder is required to make.

3.1.2.10.3.7.2 *Minimum reply rate capability, Modes A and C.* The minimum reply rate capability for Modes A and C shall be in accordance with 3.1.1.7.9.

3.1.2.10.3.7.3 *Minimum reply rate capability, Mode S.* A transponder capable of transmitting only short Mode S replies shall be able to generate replies at the following rates:

50 Mode S replies in any 1-second interval
18 Mode S replies in a 100-millisecond interval
8 Mode S replies in a 25-millisecond interval
4 Mode S replies in a 1.6-millisecond interval

In addition to any downlink ELM transmissions, a level 2, 3 or 4 transponder shall be able to generate as long replies at least:

16 of 50 Mode S replies in any 1-second interval
6 of 18 Mode S replies in a 100-millisecond interval
4 of 8 Mode S replies in a 25-millisecond interval
2 of 4 Mode S replies in a 1.6-millisecond interval

In addition to downlink ELM transmissions, a level 5 transponder shall be able to generate as long replies at least:

24 of 50 Mode S replies in any 1-second interval
9 of 18 Mode S replies in a 100-millisecond interval
6 of 8 Mode S replies in a 25-millisecond interval
2 of 4 Mode S replies in a 1.6-millisecond interval

In addition, a transponder within an ACAS installation shall be able to generate as ACAS coordination replies at least 3 of 50 Mode S replies in any 1-second interval.

3.1.2.10.3.7.4 *Minimum Mode S ELM peak reply rate*

Note 1.— When a downlink ELM is initialized (3.1.2.7.7.1), the Mode S transponder announces the length (in segments) of the waiting message. The transponder must be able to transmit this number of segments, plus an additional margin to make up for missed replies, during the beam dwell of the ground interrogator.

At least once every second a Mode S transponder equipped for ELM downlink operation shall be capable of transmitting in a 25-millisecond interval, at least 25 per cent more segments than have been announced in the initialization (3.1.2.7.7.1). The minimum length downlink ELM capability for level 4 and 5 transponders shall be as specified in 3.1.2.10.5.2.2.2.

Note 2.— A transponder capable of processing the maximum length downlink ELM (16 segments) is therefore required to be able to transmit 20 long replies under the above conditions. Level 4 transponders may be built which process less than the maximum message length. These transponders cannot initialize a message length that exceeds their transmitter capability. For example, a transponder that can transmit at most 10 long replies under the above conditions can never announce a message of more than 8 segments.

3.1.2.10.3.8 *Reply delay and jitter*

Note.— After an interrogation has been accepted and if a reply is required, this reply transmission begins after a fixed delay needed to carry out the protocols. Different values for this delay are assigned for Modes A and C, for Mode S and for Modes A/C/S all-call replies.

3.1.2.10.3.8.1 *Reply delay and jitter for Modes A and C.* The reply delay and jitter for Modes A and C transactions shall be as prescribed in 3.1.1.7.10.

3.1.2.10.3.8.2 *Reply delay and jitter for Mode S.* For all input signal levels between MTL and –21 dBm, the leading edge of the first preamble pulse of the reply (3.1.2.2.5.1.1) shall occur 128 plus or minus 0.25 microsecond after the sync phase reversal (3.1.2.1.5.2.2) of the received P_6. The jitter of the reply delay shall not exceed 0.08 microsecond, peak (99.9 percentile).

3.1.2.10.3.8.3 *Reply delay and jitter for Modes A/C/S all call.* For all input signal levels between MTL +3 dB and –21 dBm the leading edge of the first preamble pulse of the reply (3.1.2.2.5.1.1) shall occur 128 plus or minus 0.5 microseconds after the leading edge of the P_4 pulse of the interrogation (3.1.2.1.5.1.1). Jitter shall not exceed 0.1 microsecond, peak (99.9 percentile).

Note.— A peak jitter of 0.1 microsecond is consistent with the jitter prescribed in 3.1.1.7.10.

3.1.2.10.3.9 *Timers.* Duration and features of timers shall be as shown in Table 3-8.

All timers shall be capable of being restarted. On receipt of any start command, they shall run for their specified times. This shall occur regardless of whether they are in the running or the non-running state at the time that the start command is received. A command to reset a timer shall cause the timer to stop running and to return to its initial state in preparation for a subsequent start command.

3.1.2.10.3.10 *Inhibition of replies.* Replies to Mode A/C/S all-call and Mode S-only all-call interrogations shall always be inhibited when the aircraft declares the on-the-ground state. It shall not be possible to inhibit replies to discretely addressed Mode S interrogations regardless of whether the aircraft is airborne or on the ground.

3.1.2.10.3.10.1 **Recommendation.—** *Aircraft should provide means to determine the on-the-ground state automatically and provide that information to the transponder.*

3.1.2.10.3.10.2 **Recommendation.—** *Mode A/C replies should be inhibited when the aircraft is on the ground to prevent interference when in close proximity to an interrogator or other aircraft.*

Note.— Mode S discretely addressed interrogations do not give rise to such interference and may be required for data link communications with aircraft on the airport surface. Acquisition squitter transmissions may be used for passive surveillance of aircraft on the airport surface.

Table 3-8. Timer characteristics

Timer				*Duration*	*Tolerance*	
Name	*Number*	*Reference*	*Symbol*	*s*	*s*	*Resettable*
Non-selective lock-out	1	3.1.2.6.9.2	T_D	18	±1	no
Temporary alert	1	3.1.2.6.10.1.1.2	T_C	18	±1	no
SPI	1	3.1.2.6.10.1.3	T_I	18	±1	no
Reservations B, C, D	3*	3.1.2.6.11.3.1	T_R	18	±1	yes
Multisite lockout	78	3.1.2.6.9.1	T_L	18	±1	no

* As required

3.1.2.10.3.10.3 *Inhibition of squitter transmissions.* It shall not be possible to inhibit extended squitter transmissions except as specified in 3.1.2.8.6 or acquisition squitter transmissions except as specified in 3.1.2.8.5 regardless of whether the aircraft is airborne or on the ground.

Note.— For additional information on squitter inhibition see the Manual of the Secondary Surveillance Radar (SSR) Systems *(Doc 9684).*

3.1.2.10.4 *Transponder antenna system and diversity operation.* Mode S transponders equipped for diversity operation shall have two RF ports for operation with two antennas, one antenna on the top and the other on the bottom of the aircraft's fuselage. The received signal from one of the antennas shall be selected for acceptance and the reply shall be transmitted from the selected antenna only.

3.1.2.10.4.1 *Radiation pattern.* The radiation pattern of Mode S antennas when installed on an aircraft shall be nominally equivalent to that of a quarter-wave monopole on a ground plane.

Note.— Transponder antennas designed to increase gain at the expense of vertical beamwidth are undesirable because of their poor performance during turns.

3.1.2.10.4.2 *Antenna location.* The top and bottom antennas shall be mounted as near as possible to the centre line of the fuselage. Antennas shall be located so as to minimize obstruction to their fields in the horizontal plane.

3.1.2.10.4.2.1 **Recommendation.—** *The horizontal distance between the top and bottom antennas should not be greater than 7.6 m (25 ft).*

Note.— This recommendation is intended to support the operation of any diversity transponder (including cables) with any diversity antenna installation and still satisfy the requirement of 3.1.2.10.4.5.

3.1.2.10.4.3 *Antenna selection.* Mode S transponders equipped for diversity operation shall have the capability to evaluate a pulse sequence simultaneously received on both antenna channels to determine individually for each channel if the P_1 pulse and the P_2 pulse of a Mode S interrogation preamble meet the requirements for a Mode S interrogation as defined in 3.1.2.1 and if the P_1 pulse and the P_3 pulse of a Mode A, Mode C or intermode interrogation meet the requirements for Mode A and Mode C interrogations as defined in 3.1.1.

Note.— Transponders equipped for diversity operation may optionally have the capability to evaluate additional characteristics of the received pulses of the interrogations in making a diversity channel selection. The transponder may as an option evaluate a complete Mode S interrogation simultaneously received on both channels to determine individually for each channel if the interrogation meets the requirements for Mode S interrogation acceptance as defined in 3.1.2.4.1.2.3.

3.1.2.10.4.3.1 If the two channels simultaneously receive at least a P_1 - P_2 pulse pair that meets the requirements for a Mode S interrogation, or a P_1 - P_3 pulse pair that meets the requirements for a Mode A or Mode C interrogation, or if the two channels simultaneously accept a complete interrogation, the antenna at which the signal strength is greater shall be selected for the reception of the remainder (if any) of the interrogation and for the transmission of the reply.

3.1.2.10.4.3.2 If only one channel receives a pulse pair that meets the requirements for an interrogation, or if only one channel accepts an interrogation, the antenna associated with that channel shall be selected regardless of received signal strength.

3.1.2.10.4.3.3 *Selection threshold.* If antenna selection is based on signal level, it shall be carried out at all signal levels between MTL and –21 dBm.

Note.— Either antenna may be selected if the difference in signal level is less than 3 dB.

3.1.2.10.4.3.4 *Received signal delay tolerance.* If an interrogation is received at one antenna 0.125 microsecond or less in advance of reception at the other antenna, the interrogations shall be considered to be simultaneous interrogations, and the above antenna selection criteria applied. If an accepted interrogation is received at either antenna 0.375 microsecond or more in advance of reception at the other antenna, the antenna selected for the reply shall be that which received the earlier interrogation. If the relative time of receipt is between 0.125 and 0.375 microsecond, the transponder shall select the antenna for reply either on the basis of the simultaneous interrogation criteria or on the basis of the earlier time of arrival.

3.1.2.10.4.4 *Diversity transmission channel isolation.* The peak RF power transmitted from the selected antenna shall exceed the power transmitted from the non-selected antenna by at least 20 dB.

3.1.2.10.4.5 *Reply delay of diversity transponders.* The total two-way transmission difference in mean reply delay between the two antenna channels (including the differential delay caused by transponder-to-antenna cables and the horizontal distance along the aircraft centre line between the two antennas) shall not exceed 0.13 microsecond for interrogations of equal amplitude. This requirement shall hold for interrogation signal strengths between MTL +3 dB and –21 dBm. The jitter requirements on each individual channel shall remain as specified for non-diversity transponders.

Note.— This requirement limits apparent jitter caused by antenna switching and by cable delay differences.

3.1.2.10.5 *DATA PROCESSING AND INTERFACES*

3.1.2.10.5.1 *Direct data.* Direct data shall be those which are required for the surveillance protocol of the Mode S system.

3.1.2.10.5.1.1 *Fixed direct data.* Fixed direct data are data from the aircraft which do not change in flight and shall be:

a) the aircraft address (3.1.2.4.1.2.3.1.1 and 3.1.2.5.2.2.2);

b) the maximum airspeed (3.1.2.8.2.2); and

c) the registration marking if used for flight identification (3.1.2.9.1.1).

3.1.2.10.5.1.2 *Interfaces for fixed direct data*

Recommendation.— *Interfaces from the transponder to the aircraft should be designed such that the values of the fixed direct data become a function of the aircraft installation rather than of the transponder configuration.*

Note.— The intent of this recommendation is to encourage an interface technique which permits transponder exchange without manipulation of the transponder itself for setting the fixed direct data.

3.1.2.10.5.1.3 *Variable direct data.* Variable direct data are data from the aircraft which may change in flight and shall be:

a) the Mode C altitude code (3.1.2.6.5.4);

b) the Mode A identity code (3.1.2.6.7.1);

c) the on-the-ground condition (3.1.2.6.5.1 and 3.1.2.8.2.1);

d) the aircraft identification if different from the registration marking (3.1.2.9.1.1); and

e) the SPI condition (3.1.2.6.10.1.3).

3.1.2.10.5.1.4 *Interfaces for variable direct data.* A means shall be provided for the Mode A identity code, the SPI condition and, for transponders of Level 2 and above, the aircraft identification to be inserted by the pilot via a variable data interface.

Interfaces shall be included to accept the pressure altitude and on-the-ground coding.

Note.— A specific interface design for the variable direct data is not prescribed.

3.1.2.10.5.2 *Indirect data*

Note.— Indirect data are those which pass through the transponder in either direction but which do not affect the surveillance function.

If origins and/or destinations of indirect data are not within the transponder's enclosure, interfaces shall be used for the necessary connections.

3.1.2.10.5.2.1 *The function of interfaces*

Note.— Indirect data interfaces for standard transactions serve interrogations which require a reply and the broadcast function. Indirect data interfaces for ELM serve that system and require buffering and protocol circuitry within the transponder. Interface ports can be separate for each direction and for each service or can be combined in any manner.

3.1.2.10.5.2.1.1 *Uplink standard length transaction interface.* The uplink standard length transaction interface shall transfer all bits of accepted interrogations, (with the possible exception of the AP field), except for UF = 0, 11 or 16.

Note.— AP can also be transferred to aid in integrity implementation.

3.1.2.10.5.2.1.2 *Downlink standard length transaction interface.* A transponder which transmits information originating in a peripheral device shall be able to receive bits or bit patterns for insertion at appropriate locations within the transmission. These locations shall not include those into which bit patterns generated internally by the transponder are inserted, nor the AP field of the reply.

A transponder which transmits information using the Comm-B format shall have immediate access to requested data in the sense that the transponder shall respond to an interrogation with data requested by that interrogation.

Note.— This requirement may be met in two ways:

a) the transponder may have provisions for internal data and protocol buffering;

b) the transponder may employ a "real time" interface which operates such that uplink data leave the transponder before the corresponding reply is generated and downlink data enter the transponder in time to be incorporated in the reply.

3.1.2.10.5.2.1.3 *Extended length message interface*

Note.— The ELM interface extracts from, and enters into, the transponder the data exchanged between air and ground by means of the ELM protocol (3.1.2.7).

3.1.2.10.5.2.2 *Indirect data transaction rates*

3.1.2.10.5.2.2.1 *Standard length transactions.* A transponder equipped for information transfer to and from external devices shall be capable of processing the data of at least as many replies as prescribed for minimum reply rates in 3.1.2.10.3.7.2 and uplink data from interrogations being delivered at a rate of at least:

50 long interrogations in any 1-second interval
18 long interrogations in a 100-millisecond interval
8 long interrogations in a 25-millisecond interval
4 long interrogations in a 1.6-millisecond interval.

Note 1.— A transponder capable of reply rates higher than the minimum of 3.1.2.10.3.7.2 need not accept long interrogations after reaching the uplink data processing limits above.

Note 2.— The Mode S reply is the sole means of acknowledging receipt of the data content of a Mode S interrogation. Thus, if the transponder is capable of replying to an interrogation, the Mode S installation must be capable of accepting the data contained in that interrogation regardless of the timing between it and other accepted *interrogations. Overlapping Mode S beams from several interrogators could lead to the requirement for considerable data processing and buffering. The minimum described here reduces data processing to a realistic level and the non-acceptance provision provides for notification to the interrogator that data will temporarily not be accepted.*

3.1.2.10.5.2.2.2 *Extended length transactions.* Level 3 (2.1.5.1.3) and level 4 (2.1.5.1.4) transponders shall be able to transfer data from at least four complete sixteen segment uplink ELMs (3.1.2.7.4) in any four second interval. A level 5 transponder (2.1.5.1.5) shall be able to transfer the data from at least four complete sixteen segment uplink ELMs in any one second interval and shall be capable of accepting at least two complete sixteen segment uplink ELMs with the same II code in a 250 millisecond interval. A level 4 transponder shall be able to transmit at least one four-segment downlink ELM (3.1.2.7.7 and 3.1.2.10.3.7.3) in any one second interval. A level 5 transponder shall be able to transmit at least one sixteen segment downlink ELM in any one second interval.

3.1.2.10.5.2.2.2.1 **Recommendation.—** *Level 3 and level 4 transponders should be able to accept at least two complete sixteen segment uplink ELMs in a 250 millisecond interval.*

3.1.2.10.5.2.3 *Data formats for downlink aircraft parameter (DAP) standard length transactions.* The downlink standard length transaction interface is used to deliver downlink aircraft parameters (DAPs) to the transponder which makes them available to the ground. Each DAP is packed into the Comm-B format ('MB' field) and can be extracted using either the ground-initiated Comm-B (GICB) protocol, or using MSP downlink channel 3 via the dataflash application (as defined in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5). The formats and update rates of each register used to support DAPs (BDS 1,7; BDS 1,8 to 1,C; BDS 1,D to 1,F; BDS 4,0; BDS 5,0; BDS 6,0) shall be as defined in Annex 10, Volume III, Part I, Appendix 1 to Chapter 5.

Note.— Guidance material on transponder register formats and data sources is included in the Manual on Mode S Specific Services *(Doc 9688).*

3.1.2.10.5.3 *Integrity of data content transfer.* A transponder which employs data interfaces shall include sufficient protection to ensure error rates of less than one error in 10^3 messages and less than one undetected error in 10^7 112-bit transmissions in both directions between the antenna and each interface port.

3.1.2.10.5.4 *Message cancellation.* The downlink standard length transaction interface and the extended length message interface shall include the capability to cancel a message sent to the transponder for delivery to the ground, but whose delivery cycle has not been completed (i.e. a closeout has not been accomplished by a ground interrogator).

Note.— One example of the need for this capability is to cancel a message if delivery is attempted when the aircraft is not within coverage of a Mode S ground station. The message must then be cancelled to prevent it from being read and interpreted as a current message when the aircraft re-enters Mode S airspace.

3.1.2.10.5.5 *Air-directed messages.* The transfer of this type of message requires all of the actions indicated in 3.1.2.10.5.4 plus the transfer to the transponder of the interrogator identifier of the site that is to receive the message.

3.1.2.11 ESSENTIAL SYSTEM CHARACTERISTICS OF THE GROUND INTERROGATOR

Note.— To ensure that Mode S interrogator action is not detrimental to Mode A/C interrogators, performance limits exist for Mode S interrogators.

3.1.2.11.1 *Interrogation repetition rates.* Mode S interrogators shall use the lowest practicable interrogation repetition rates for all interrogation modes.

Note.— Accurate azimuth data at low interrogation rates can be obtained with monopulse techniques.

3.1.2.11.1.1 *All-call interrogation repetition rate.* The interrogation repetition rate for the Mode A/C/S all-call, used for acquisition, shall be less than 250 per second. This rate shall also apply to the paired Mode S-only and Mode A/C-only all-call interrogations used for acquisition in the multisite mode.

3.1.2.11.1.2 *Interrogation repetition rate to a single aircraft*

3.1.2.11.1.2.1 *Interrogations requiring a reply.* Mode S interrogations requiring a reply shall not be transmitted to a single aircraft at intervals shorter than 400 microseconds.

3.1.2.11.1.2.2 *Uplink ELM interrogations.* The minimum time between the beginning of successive Comm-C interrogations shall be 50 microseconds.

3.1.2.11.1.3 *Transmission rate for selective interrogations*

3.1.2.11.1.3.1 For all Mode S interrogators, the transmission rate for selective interrogations shall be:

a) less than 2 400 per second averaged over a 40-millisecond interval; and

b) less than 480 into any 3-degree sector averaged over a 1-second interval.

3.1.2.11.1.3.2 Additionally, for a Mode S interrogator that has overlapping coverage with the sidelobes of any other Mode S interrogator, the transmission rate for selective interrogations shall be:

a) less than 1 200 per second averaged over a 4-second interval; and

b) less than 1 800 per second averaged over a 1-second interval.

Note.— Typical minimum distance to ensure sidelobe separation between interrogators is 35 km.

3.1.2.11.2 INTERROGATOR-EFFECTIVE RADIATED POWER

Recommendation.— *The effective radiated power of all interrogation pulses should be minimized as described in 3.1.1.8.2.*

3.1.2.11.3 *Inactive-state interrogator output power.* When the interrogator transmitter is not transmitting an interrogation, its output shall not exceed –5 dBm effective radiated power at any frequency between 960 MHz and 1 215 MHz.

Note.— This constraint ensures that aircraft flying near the interrogator (as close as 1.85 km (1 NM)) will not receive interference that would prevent them from being tracked by another interrogator. In certain instances even smaller interrogator-to-aircraft distances are of significance, for example if Mode S surveillance on the airport surface is used. In such cases a further restraint on inactive state interrogator output power may be necessary.

3.1.2.11.3.1 *Spurious emission radiation*

Recommendation.— *CW radiation should not exceed 76 dB below 1 watt.*

3.1.2.11.4 *Tolerances on transmitted signals.* In order that the signal-in-space be received by the transponder as described in 3.1.2.1, the tolerances on the transmitted signal shall be as summarized in Table 3-9.

3.1.2.11.5 SPURIOUS RESPONSE

Recommendation.— *The response to signals not within the passband should be at least 60 dB below normal sensitivity.*

3.1.2.11.6 *Lockout coordination.* A Mode S interrogator shall not be operated using all-call lockout until coordination has been achieved with all other operating Mode S interrogators having any overlapping coverage volume in order to ensure that no interrogator can be denied the acquisition of Mode S-equipped aircraft.

Note.— This coordination may be via ground network or by the allocation of interrogator identifier (II) codes and will involve regional agreements where coverage overlaps international boundaries.

3.1.2.11.7 *MOBILE INTERROGATORS*

Recommendation.— *Mobile interrogators should acquire, whenever possible, Mode S aircraft through the reception of squitters.*

Note.— Passive squitter acquisition reduces channel loading and can be accomplished without the need for coordination.

Table 3-9. Transmitted signal tolerances

Reference	*Function*	*Tolerance*
3.1.2.1.4.1	Pulse duration P_1, P_2, P_3, P_4, P_5 Pulse duration P_6	±0.09 microsecond ±0.20 microsecond
3.1.1.4	Pulse duration $P_1 – P_3$ Pulse duration $P_1 – P_2$	±0.18 microsecond ±0.10 microsecond
3.1.2.1.5.1.3	Pulse duration $P_3 – P_4$	±0.04 microsecond
3.1.2.1.5.2.4	Pulse duration $P_1 – P_2$ Pulse duration P_2 — sync phase reversal Pulse duration P_6 — sync phase reversal Pulse duration P_5 — sync phase reversal	±0.04 microsecond ±0.04 microsecond ±0.04 microsecond ±0.05 microsecond
3.1.1.5	Pulse amplitude P_3	P_1 ±0.5 dB
3.1.2.1.5.1.4	Pulse amplitude P_4	P_3 ±0.5 dB
3.1.2.1.5.2.5	Pulse amplitude P_6	Equal to or greater than P_2 – 0.25 dB
3.1.2.1.4.1	Pulse rise times	0.05 microsecond minimum, 0.1 microsecond maximum
3.1.2.1.4.1	Pulse decay times	0.05 microsecond minimum, 0.2 microsecond maximum

APPENDIX TO CHAPTER 3

SSR automatic pressure altitude transmission code
(pulse position assignment)

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
–1 000 to –950	0	0	0	0	0	0	0	0	0	1	0
–950 to –850	0	0	0	0	0	0	0	0	1	1	0
–850 to –750	0	0	0	0	0	0	0	0	1	0	0
–750 to –650	0	0	0	0	0	0	0	1	1	0	0
–650 to –550	0	0	0	0	0	0	0	1	1	1	0
–550 to –450	0	0	0	0	0	0	0	1	0	1	0
–450 to –350	0	0	0	0	0	0	0	1	0	1	1
–350 to –250	0	0	0	0	0	0	0	1	0	0	1
–250 to –150	0	0	0	0	0	0	1	1	0	0	1
–150 to –50	0	0	0	0	0	0	1	1	0	1	1
–50 to 50	0	0	0	0	0	0	1	1	0	1	0
50 to 150	0	0	0	0	0	0	1	1	1	1	0
150 to 250	0	0	0	0	0	0	1	1	1	0	0
250 to 350	0	0	0	0	0	0	1	0	1	0	0
350 to 450	0	0	0	0	0	0	1	0	1	1	0
450 to 550	0	0	0	0	0	0	1	0	0	1	0
550 to 650	0	0	0	0	0	0	1	0	0	1	1
650 to 750	0	0	0	0	0	0	1	0	0	0	1
750 to 850	0	0	0	0	0	1	1	0	0	0	1
850 to 950	0	0	0	0	0	1	1	0	0	1	1
950 to 1 050	0	0	0	0	0	1	1	0	0	1	0
1 050 to 1 150	0	0	0	0	0	1	1	0	1	1	0
1 150 to 1 250	0	0	0	0	0	1	1	0	1	0	0
1 250 to 1 350	0	0	0	0	0	1	1	1	1	0	0
1 350 to 1 450	0	0	0	0	0	1	1	1	1	1	0
1 450 to 1 550	0	0	0	0	0	1	1	1	0	1	0
1 550 to 1 650	0	0	0	0	0	1	1	1	0	1	1
1 650 to 1 750	0	0	0	0	0	1	1	1	0	0	1
1 750 to 1 850	0	0	0	0	0	1	0	1	0	0	1
1 850 to 1 950	0	0	0	0	0	1	0	1	0	1	1
1 950 to 2 050	0	0	0	0	0	1	0	1	0	1	0
2 050 to 2 150	0	0	0	0	0	1	0	1	1	1	0
2 150 to 2 250	0	0	0	0	0	1	0	1	1	0	0
2 250 to 2 350	0	0	0	0	0	1	0	0	1	0	0
2 350 to 2 450	0	0	0	0	0	1	0	0	1	1	0
2 450 to 2 550	0	0	0	0	0	1	0	0	0	1	0
2 550 to 2 650	0	0	0	0	0	1	0	0	0	1	1
2 650 to 2 750	0	0	0	0	0	1	0	0	0	0	1

RANGE	PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
2 750 to 2 850	0	0	0	0	1	1	0	0	0	0	1
2 850 to 2 950	0	0	0	0	1	1	0	0	0	1	1
2 950 to 3 050	0	0	0	0	1	1	0	0	0	1	0
3 050 to 3 150	0	0	0	0	1	1	0	0	1	1	0
3 150 to 3 250	0	0	0	0	1	1	0	0	1	0	0
3 250 to 3 350	0	0	0	0	1	1	0	1	1	0	0
3 350 to 3 450	0	0	0	0	1	1	0	1	1	1	0
3 450 to 3 550	0	0	0	0	1	1	0	1	0	1	0
3 550 to 3 650	0	0	0	0	1	1	0	1	0	1	1
3 650 to 3 750	0	0	0	0	1	1	0	1	0	0	1
3 750 to 3 850	0	0	0	0	1	1	1	1	0	0	1
3 850 to 3 950	0	0	0	0	1	1	1	1	0	1	1
3 950 to 4 050	0	0	0	0	1	1	1	1	0	1	0
4 050 to 4 150	0	0	0	0	1	1	1	1	1	1	0
4 150 to 4 250	0	0	0	0	1	1	1	1	1	0	0
4 250 to 4 350	0	0	0	0	1	1	1	0	1	0	0
4 350 to 4 450	0	0	0	0	1	1	1	0	1	1	0
4 450 to 4 550	0	0	0	0	1	1	1	0	0	1	0
4 550 to 4 650	0	0	0	0	1	1	1	0	0	1	1
4 650 to 4 750	0	0	0	0	1	1	1	0	0	0	1
4 750 to 4 850	0	0	0	0	1	0	1	0	0	0	1
4 850 to 4 950	0	0	0	0	1	0	1	0	0	1	1
4 950 to 5 050	0	0	0	0	1	0	1	0	0	1	0
5 050 to 5 150	0	0	0	0	1	0	1	0	1	1	0
5 150 to 5 250	0	0	0	0	1	0	1	0	1	0	0
5 250 to 5 350	0	0	0	0	1	0	1	1	1	0	0
5 350 to 5 450	0	0	0	0	1	0	1	1	1	1	0
5 450 to 5 550	0	0	0	0	1	0	1	1	0	1	0
5 550 to 5 650	0	0	0	0	1	0	1	1	0	1	1
5 650 to 5 750	0	0	0	0	1	0	1	1	0	0	1
5 750 to 5 850	0	0	0	0	1	0	0	1	0	0	1
5 850 to 5 950	0	0	0	0	1	0	0	1	0	1	1
5 950 to 6 050	0	0	0	0	1	0	0	1	0	1	0
6 050 to 6 150	0	0	0	0	1	0	0	1	1	1	0
6 150 to 6 250	0	0	0	0	1	0	0	1	1	0	0
6 250 to 6 350	0	0	0	0	1	0	0	0	1	0	0
6 350 to 6 450	0	0	0	0	1	0	0	0	1	1	0
6 450 to 6 550	0	0	0	0	1	0	0	0	0	1	0
6 550 to 6 650	0	0	0	0	1	0	0	0	0	1	1
6 650 to 6 750	0	0	0	0	1	0	0	0	0	0	1
6 750 to 6 850	0	0	0	1	1	0	0	0	0	0	1
6 850 to 6 950	0	0	0	1	1	0	0	0	0	1	1
6 950 to 7 050	0	0	0	1	1	0	0	0	0	1	0
7 050 to 7 150	0	0	0	1	1	0	0	0	1	1	0
7 150 to 7 250	0	0	0	1	1	0	0	0	1	0	0

RANGE	PULSE POSITIONS (*0 or 1 in a pulse position denotes absence or presence of a pulse, respectively*)										
INCREMENTS (*Feet*)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
7 250 to 7 350	0	0	0	1	1	0	0	1	1	0	0
7 350 to 7 450	0	0	0	1	1	0	0	1	1	1	0
7 450 to 7 550	0	0	0	1	1	0	0	1	0	1	0
7 550 to 7 650	0	0	0	1	1	0	0	1	0	1	1
7 650 to 7 750	0	0	0	1	1	0	0	1	0	0	1
7 750 to 7 850	0	0	0	1	1	0	1	1	0	0	1
7 850 to 7 950	0	0	0	1	1	0	1	1	0	1	1
7 950 to 8 050	0	0	0	1	1	0	1	1	0	1	0
8 050 to 8 150	0	0	0	1	1	0	1	1	1	1	0
8 150 to 8 250	0	0	0	1	1	0	1	1	1	0	0
8 250 to 8 350	0	0	0	1	1	0	1	0	1	0	0
8 350 to 8 450	0	0	0	1	1	0	1	0	1	1	0
8 450 to 8 550	0	0	0	1	1	0	1	0	0	1	0
8 550 to 8 650	0	0	0	1	1	0	1	0	0	1	1
8 650 to 8 750	0	0	0	1	1	0	1	0	0	0	1
8 750 to 8 850	0	0	0	1	1	1	1	0	0	0	1
8 850 to 8 950	0	0	0	1	1	1	1	0	0	1	1
8 950 to 9 050	0	0	0	1	1	1	1	0	0	1	0
9 050 to 9 150	0	0	0	1	1	1	1	0	1	1	0
9 150 to 9 250	0	0	0	1	1	1	1	0	1	0	0
9 250 to 9 350	0	0	0	1	1	1	1	1	1	0	0
9 350 to 9 450	0	0	0	1	1	1	1	1	1	1	0
9 450 to 9 550	0	0	0	1	1	1	1	1	0	1	0
9 550 to 9 650	0	0	0	1	1	1	1	1	0	1	1
9 650 to 9 750	0	0	0	1	1	1	1	1	0	0	1
9 750 to 9 850	0	0	0	1	1	1	0	1	0	0	1
9 850 to 9 950	0	0	0	1	1	1	0	1	0	1	1
9 950 to 10 050	0	0	0	1	1	1	0	1	0	1	0
10 050 to 10 150	0	0	0	1	1	1	0	1	1	1	0
10 150 to 10 250	0	0	0	1	1	1	0	1	1	0	0
10 250 to 10 350	0	0	0	1	1	1	0	0	1	0	0
10 350 to 10 450	0	0	0	1	1	1	0	0	1	1	0
10 450 to 10 550	0	0	0	1	1	1	0	0	0	1	0
10 550 to 10 650	0	0	0	1	1	1	0	0	0	1	1
10 650 to 10 750	0	0	0	1	1	1	0	0	0	0	1
10 750 to 10 850	0	0	0	1	0	1	0	0	0	0	1
10 850 to 10 950	0	0	0	1	0	1	0	0	0	1	1
10 950 to 11 050	0	0	0	1	0	1	0	0	0	1	0
11 050 to 11 150	0	0	0	1	0	1	0	0	1	1	0
11 150 to 11 250	0	0	0	1	0	1	0	0	1	0	0
11 250 to 11 350	0	0	0	1	0	1	0	1	1	0	0
11 350 to 11 450	0	0	0	1	0	1	0	1	1	1	0
11 450 to 11 550	0	0	0	1	0	1	0	1	0	1	0
11 550 to 11 650	0	0	0	1	0	1	0	1	0	1	1
11 650 to 11 750	0	0	0	1	0	1	0	1	0	0	1

RANGE	PULSE POSITIONS (*0 or 1 in a pulse position denotes absence or presence of a pulse, respectively*)										
INCREMENTS (*Feet*)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
11 750 to 11 850	0	0	0	1	0	1	1	1	0	0	1
11 850 to 11 950	0	0	0	1	0	1	1	1	0	1	1
11 950 to 12 050	0	0	0	1	0	1	1	1	0	1	0
12 050 to 12 150	0	0	0	1	0	1	1	1	1	1	0
12 150 to 12 250	0	0	0	1	0	1	1	1	1	0	0
12 250 to 12 350	0	0	0	1	0	1	1	0	1	0	0
12 350 to 12 450	0	0	0	1	0	1	1	0	1	1	0
12 450 to 12 550	0	0	0	1	0	1	1	0	0	1	0
12 550 to 12 650	0	0	0	1	0	1	1	0	0	1	1
12 650 to 12 750	0	0	0	1	0	1	1	0	0	0	1
12 750 to 12 850	0	0	0	1	0	0	1	0	0	0	1
12 850 to 12 950	0	0	0	1	0	0	1	0	0	1	1
12 950 to 13 050	0	0	0	1	0	0	1	0	0	1	0
13 050 to 13 150	0	0	0	1	0	0	1	0	1	1	0
13 150 to 13 250	0	0	0	1	0	0	1	0	1	0	0
13 250 to 13 350	0	0	0	1	0	0	1	1	1	0	0
13 350 to 13 450	0	0	0	1	0	0	1	1	1	1	0
13 450 to 13 550	0	0	0	1	0	0	1	1	0	1	0
13 550 to 13 650	0	0	0	1	0	0	1	1	0	1	1
13 650 to 13 750	0	0	0	1	0	0	1	1	0	0	1
13 750 to 13 850	0	0	0	1	0	0	0	1	0	0	1
13 850 to 13 950	0	0	0	1	0	0	0	1	0	1	1
13 950 to 14 050	0	0	0	1	0	0	0	1	0	1	0
14 050 to 14 150	0	0	0	1	0	0	0	1	1	1	0
14 150 to 14 250	0	0	0	1	0	0	0	1	1	0	0
14 250 to 14 350	0	0	0	1	0	0	0	0	1	0	0
14 350 to 14 450	0	0	0	1	0	0	0	0	1	1	0
14 450 to 14 550	0	0	0	1	0	0	0	0	0	1	0
14 550 to 14 650	0	0	0	1	0	0	0	0	0	1	1
14 650 to 14 750	0	0	0	1	0	0	0	0	0	0	1
14 750 to 14 850	0	0	1	1	0	0	0	0	0	0	1
14 850 to 14 950	0	0	1	1	0	0	0	0	0	1	1
14 950 to 15 050	0	0	1	1	0	0	0	0	0	1	0
15 050 to 15 150	0	0	1	1	0	0	0	0	1	1	0
15 150 to 15 250	0	0	1	1	0	0	0	0	1	0	0
15 250 to 15 350	0	0	1	1	0	0	0	1	1	0	0
15 350 to 15 450	0	0	1	1	0	0	0	1	1	1	0
15 450 to 15 550	0	0	1	1	0	0	0	1	0	1	0
15 550 to 15 650	0	0	1	1	0	0	0	1	0	1	1
15 650 to 15 750	0	0	1	1	0	0	0	1	0	0	1
15 750 to 15 850	0	0	1	1	0	0	1	1	0	0	1
15 850 to 15 950	0	0	1	1	0	0	1	1	0	1	1
15 950 to 16 050	0	0	1	1	0	0	1	1	0	1	0
16 050 to 16 150	0	0	1	1	0	0	1	1	1	1	0
16 150 to 16 250	0	0	1	1	0	0	1	1	1	0	0

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
16 250	to	16 350	0	0	1	1	0	0	1	0	1	0	0
16 350	to	16 450	0	0	1	1	0	0	1	0	1	1	0
16 450	to	16 550	0	0	1	1	0	0	1	0	0	1	0
16 550	to	16 650	0	0	1	1	0	0	1	0	0	1	1
16 650	to	16 750	0	0	1	1	0	0	1	0	0	0	1
16 750	to	16 850	0	0	1	1	0	1	1	0	0	0	1
16 850	to	16 950	0	0	1	1	0	1	1	0	0	1	1
16 950	to	17 050	0	0	1	1	0	1	1	0	0	1	0
17 050	to	17 150	0	0	1	1	0	1	1	0	1	1	0
17 150	to	17 250	0	0	1	1	0	1	1	0	1	0	0
17 250	to	17 350	0	0	1	1	0	1	1	1	1	0	0
17 350	to	17 450	0	0	1	1	0	1	1	1	1	1	0
17 450	to	17 550	0	0	1	1	0	1	1	1	0	1	0
17 550	to	17 650	0	0	1	1	0	1	1	1	0	1	1
17 650	to	17 750	0	0	1	1	0	1	1	1	0	0	1
17 750	to	17 850	0	0	1	1	0	1	0	1	0	0	1
17 850	to	17 950	0	0	1	1	0	1	0	1	0	1	1
17 950	to	18 050	0	0	1	1	0	1	0	1	0	1	0
18 050	to	18 150	0	0	1	1	0	1	0	1	1	1	0
18 150	to	18 250	0	0	1	1	0	1	0	1	1	0	0
18 250	to	18 350	0	0	1	1	0	1	0	0	1	0	0
18 350	to	18 450	0	0	1	1	0	1	0	0	1	1	0
18 450	to	18 550	0	0	1	1	0	1	0	0	0	1	0
18 550	to	18 650	0	0	1	1	0	1	0	0	0	1	1
18 650	to	18 750	0	0	1	1	0	1	0	0	0	0	1
18 750	to	18 850	0	0	1	1	1	1	0	0	0	0	1
18 850	to	18 950	0	0	1	1	1	1	0	0	0	1	1
18 950	to	19 050	0	0	1	1	1	1	0	0	0	1	0
19 050	to	19 150	0	0	1	1	1	1	0	0	1	1	0
19 150	to	19 250	0	0	1	1	1	1	0	0	1	0	0
19 250	to	19 350	0	0	1	1	1	1	0	1	1	0	0
19 350	to	19 450	0	0	1	1	1	1	0	1	1	1	0
19 450	to	19 550	0	0	1	1	1	1	0	1	0	1	0
19 550	to	19 650	0	0	1	1	1	1	0	1	0	1	1
19 650	to	19 750	0	0	1	1	1	1	0	1	0	0	1
19 750	to	19 850	0	0	1	1	1	1	1	1	0	0	1
19 850	to	19 950	0	0	1	1	1	1	1	1	0	1	1
19 950	to	20 050	0	0	1	1	1	1	1	1	0	1	0
20 050	to	20 150	0	0	1	1	1	1	1	1	1	1	0
20 150	to	20 250	0	0	1	1	1	1	1	1	1	0	0
20 250	to	20 350	0	0	1	1	1	1	1	0	1	0	0
20 350	to	20 450	0	0	1	1	1	1	1	0	1	1	0
20 450	to	20 550	0	0	1	1	1	1	1	0	0	1	0
20 550	to	20 650	0	0	1	1	1	1	1	0	0	1	1
20 650	to	20 750	0	0	1	1	1	1	1	0	0	0	1

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
20 750	to	20 850	0	0	1	1	1	0	1	0	0	0	1
20 850	to	20 950	0	0	1	1	1	0	1	0	0	1	1
20 950	to	21 050	0	0	1	1	1	0	1	0	0	1	0
21 050	to	21 150	0	0	1	1	1	0	1	0	1	1	0
21 150	to	21 250	0	0	1	1	1	0	1	0	1	0	0
21 250	to	21 350	0	0	1	1	1	0	1	1	1	0	0
21 350	to	21 450	0	0	1	1	1	0	1	1	1	1	0
21 450	to	21 550	0	0	1	1	1	0	1	1	0	1	0
21 550	to	21 650	0	0	1	1	1	0	1	1	0	1	1
21 650	to	21 750	0	0	1	1	1	0	1	1	0	0	1
21 750	to	21 850	0	0	1	1	1	0	0	1	0	0	1
21 850	to	21 950	0	0	1	1	1	0	0	1	0	1	1
21 950	to	22 050	0	0	1	1	1	0	0	1	0	1	0
22 050	to	22 150	0	0	1	1	1	0	0	1	1	1	0
22 150	to	22 250	0	0	1	1	1	0	0	1	1	0	0
22 250	to	22 350	0	0	1	1	1	0	0	0	1	0	0
22 350	to	22 450	0	0	1	1	1	0	0	0	1	1	0
22 450	to	22 550	0	0	1	1	1	0	0	0	0	1	0
22 550	to	22 650	0	0	1	1	1	0	0	0	0	1	1
22 650	to	22 750	0	0	1	1	1	0	0	0	0	0	1
22 750	to	22 850	0	0	1	0	1	0	0	0	0	0	1
22 850	to	22 950	0	0	1	0	1	0	0	0	0	1	1
22 950	to	23 050	0	0	1	0	1	0	0	0	0	1	0
23 050	to	23 150	0	0	1	0	1	0	0	0	1	1	0
23 150	to	23 250	0	0	1	0	1	0	0	0	1	0	0
23 250	to	23 350	0	0	1	0	1	0	0	1	1	0	0
23 350	to	23 450	0	0	1	0	1	0	0	1	1	1	0
23 450	to	23 550	0	0	1	0	1	0	0	1	0	1	0
23 550	to	23 650	0	0	1	0	1	0	0	1	0	1	1
23 650	to	23 750	0	0	1	0	1	0	0	1	0	0	1
23 750	to	23 850	0	0	1	0	1	0	1	1	0	0	1
23 850	to	23 950	0	0	1	0	1	0	1	1	0	1	1
23 950	to	24 050	0	0	1	0	1	0	1	1	0	1	0
24 050	to	24 150	0	0	1	0	1	0	1	1	1	1	0
24 150	to	24 250	0	0	1	0	1	0	1	1	1	0	0
24 250	to	24 350	0	0	1	0	1	0	1	0	1	0	0
24 350	to	24 450	0	0	1	0	1	0	1	0	1	1	0
24 450	to	24 550	0	0	1	0	1	0	1	0	0	1	0
24 550	to	24 650	0	0	1	0	1	0	1	0	0	1	1
24 650	to	24 750	0	0	1	0	1	0	1	0	0	0	1
24 750	to	24 850	0	0	1	0	1	1	1	0	0	0	1
24 850	to	24 950	0	0	1	0	1	1	1	0	0	1	1
24 950	to	25 050	0	0	1	0	1	1	1	0	0	1	0
25 050	to	25 150	0	0	1	0	1	1	1	0	1	1	0
25 150	to	25 250	0	0	1	0	1	1	1	0	1	0	0

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
25 250	to	25 350	0	0	1	0	1	1	1	1	1	0	0
25 350	to	25 450	0	0	1	0	1	1	1	1	1	1	0
25 450	to	25 550	0	0	1	0	1	1	1	1	0	1	0
25 550	to	25 650	0	0	1	0	1	1	1	1	0	1	1
25 650	to	25 750	0	0	1	0	1	1	1	1	0	0	1
25 750	to	25 850	0	0	1	0	1	1	0	1	0	0	1
25 850	to	25 950	0	0	1	0	1	1	0	1	0	1	1
25 950	to	26 050	0	0	1	0	1	1	0	1	0	1	0
26 050	to	26 150	0	0	1	0	1	1	0	1	1	1	0
26 150	to	26 250	0	0	1	0	1	1	0	1	1	0	0
26 250	to	26 350	0	0	1	0	1	1	0	0	1	0	0
26 350	to	26 450	0	0	1	0	1	1	0	0	1	1	0
26 450	to	26 550	0	0	1	0	1	1	0	0	0	1	0
26 550	to	26 650	0	0	1	0	1	1	0	0	0	1	1
26 650	to	26 750	0	0	1	0	1	1	0	0	0	0	1
26 750	to	26 850	0	0	1	0	0	1	0	0	0	0	1
26 850	to	26 950	0	0	1	0	0	1	0	0	0	1	1
26 950	to	27 050	0	0	1	0	0	1	0	0	0	1	0
27 050	to	27 150	0	0	1	0	0	1	0	0	1	1	0
27 150	to	27 250	0	0	1	0	0	1	0	0	1	0	0
27 250	to	27 350	0	0	1	0	0	1	0	1	1	0	0
27 350	to	27 450	0	0	1	0	0	1	0	1	1	1	0
27 450	to	27 550	0	0	1	0	0	1	0	1	0	1	0
27 550	to	27 650	0	0	1	0	0	1	0	1	0	1	1
27 650	to	27 750	0	0	1	0	0	1	0	1	0	0	1
27 750	to	27 850	0	0	1	0	0	1	1	1	0	0	1
27 850	to	27 950	0	0	1	0	0	1	1	1	0	1	1
27 950	to	28 050	0	0	1	0	0	1	1	1	0	1	0
28 050	to	28 150	0	0	1	0	0	1	1	1	1	1	0
28 150	to	28 250	0	0	1	0	0	1	1	1	1	0	0
28 250	to	28 350	0	0	1	0	0	1	1	0	1	0	0
28 350	to	28 450	0	0	1	0	0	1	1	0	1	1	0
28 450	to	28 550	0	0	1	0	0	1	1	0	0	1	0
28 550	to	28 650	0	0	1	0	0	1	1	0	0	1	1
28 650	to	28 750	0	0	1	0	0	1	1	0	0	0	1
28 750	to	28 850	0	0	1	0	0	0	1	0	0	0	1
28 850	to	28 950	0	0	1	0	0	0	1	0	0	1	1
28 950	to	29 050	0	0	1	0	0	0	1	0	0	1	0
29 050	to	29 150	0	0	1	0	0	0	1	0	1	1	0
29 150	to	29 250	0	0	1	0	0	0	1	0	1	0	0
29 250	to	29 350	0	0	1	0	0	0	1	1	1	0	0
29 350	to	29 450	0	0	1	0	0	0	1	1	1	1	0
29 450	to	29 550	0	0	1	0	0	0	1	1	0	1	0
29 550	to	29 650	0	0	1	0	0	0	1	1	0	1	1
29 650	to	29 750	0	0	1	0	0	0	1	1	0	0	1

RANGE	PULSE POSITIONS (*0 or 1 in a pulse position denotes absence or presence of a pulse, respectively*)										
INCREMENTS (*Feet*)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
29 750 to 29 850	0	0	1	0	0	0	0	1	0	0	1
29 850 to 29 950	0	0	1	0	0	0	0	1	0	1	1
29 950 to 30 050	0	0	1	0	0	0	0	1	0	1	0
30 050 to 30 150	0	0	1	0	0	0	0	1	1	1	0
30 150 to 30 250	0	0	1	0	0	0	0	1	1	0	0
30 250 to 30 350	0	0	1	0	0	0	0	0	1	0	0
30 350 to 30 450	0	0	1	0	0	0	0	0	1	1	0
30 450 to 30 550	0	0	1	0	0	0	0	0	0	1	0
30 550 to 30 650	0	0	1	0	0	0	0	0	0	1	1
30 650 to 30 750	0	0	1	0	0	0	0	0	0	0	1
30 750 to 30 850	0	1	1	0	0	0	0	0	0	0	1
30 850 to 30 950	0	1	1	0	0	0	0	0	0	1	1
30 950 to 31 050	0	1	1	0	0	0	0	0	0	1	0
31 050 to 31 150	0	1	1	0	0	0	0	0	1	1	0
31 150 to 31 250	0	1	1	0	0	0	0	0	1	0	0
31 250 to 31 350	0	1	1	0	0	0	0	1	1	0	0
31 350 to 31 450	0	1	1	0	0	0	0	1	1	1	0
31 450 to 31 550	0	1	1	0	0	0	0	1	0	1	0
31 550 to 31 650	0	1	1	0	0	0	0	1	0	1	1
31 650 to 31 750	0	1	1	0	0	0	0	1	0	0	1
31 750 to 31 850	0	1	1	0	0	0	1	1	0	0	1
31 850 to 31 950	0	1	1	0	0	0	1	1	0	1	1
31 950 to 32 050	0	1	1	0	0	0	1	1	0	1	0
32 050 to 32 150	0	1	1	0	0	0	1	1	1	1	0
32 150 to 32 250	0	1	1	0	0	0	1	1	1	0	0
32 250 to 32 350	0	1	1	0	0	0	1	0	1	0	0
32 350 to 32 450	0	1	1	0	0	0	1	0	1	1	0
32 450 to 32 550	0	1	1	0	0	0	1	0	0	1	0
32 550 to 32 650	0	1	1	0	0	0	1	0	0	1	1
32 650 to 32 750	0	1	1	0	0	0	1	0	0	0	1
32 750 to 32 850	0	1	1	0	0	1	1	0	0	0	1
32 850 to 32 950	0	1	1	0	0	1	1	0	0	1	1
32 950 to 33 050	0	1	1	0	0	1	1	0	0	1	0
33 050 to 33 150	0	1	1	0	0	1	1	0	1	1	0
33 150 to 33 250	0	1	1	0	0	1	1	0	1	0	0
33 250 to 33 350	0	1	1	0	0	1	1	1	1	0	0
33 350 to 33 450	0	1	1	0	0	1	1	1	1	1	0
33 450 to 33 550	0	1	1	0	0	1	1	1	0	1	0
33 550 to 33 650	0	1	1	0	0	1	1	1	0	1	1
33 650 to 33 750	0	1	1	0	0	1	1	1	0	0	1
33 750 to 33 850	0	1	1	0	0	1	0	1	0	0	1
33 850 to 33 950	0	1	1	0	0	1	0	1	0	1	1
33 950 to 34 050	0	1	1	0	0	1	0	1	0	1	0
34 050 to 34 150	0	1	1	0	0	1	0	1	1	1	0
34 150 to 34 250	0	1	1	0	0	1	0	1	1	0	0

RANGE			PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
34 250	to	34 350	0	1	1	0	0	1	0	0	1	0	0
34 350	to	34 450	0	1	1	0	0	1	0	0	1	1	0
34 450	to	34 550	0	1	1	0	0	1	0	0	0	1	0
34 550	to	34 650	0	1	1	0	0	1	0	0	0	1	1
34 650	to	34 750	0	1	1	0	0	1	0	0	0	0	1
34 750	to	34 850	0	1	1	0	1	1	0	0	0	0	1
34 850	to	34 950	0	1	1	0	1	1	0	0	0	1	1
34 950	to	35 050	0	1	1	0	1	1	0	0	0	1	0
35 050	to	35 150	0	1	1	0	1	1	0	0	1	1	0
35 150	to	35 250	0	1	1	0	1	1	0	0	1	0	0
35 250	to	35 350	0	1	1	0	1	1	0	1	1	0	0
35 350	to	35 450	0	1	1	0	1	1	0	1	1	1	0
35 450	to	35 550	0	1	1	0	1	1	0	1	0	1	0
35 550	to	35 650	0	1	1	0	1	1	0	1	0	1	1
35 650	to	35 750	0	1	1	0	1	1	0	1	0	0	1
35 750	to	35 850	0	1	1	0	1	1	1	1	0	0	1
35 850	to	35 950	0	1	1	0	1	1	1	1	0	1	1
35 950	to	36 050	0	1	1	0	1	1	1	1	0	1	0
36 050	to	36 150	0	1	1	0	1	1	1	1	1	1	0
36 150	to	36 250	0	1	1	0	1	1	1	1	1	0	0
36 250	to	36 350	0	1	1	0	1	1	1	0	1	0	0
36 350	to	36 450	0	1	1	0	1	1	1	0	1	1	0
36 450	to	36 550	0	1	1	0	1	1	1	0	0	1	0
36 550	to	36 650	0	1	1	0	1	1	1	0	0	1	1
36 650	to	36 750	0	1	1	0	1	1	1	0	0	0	1
36 750	to	36 850	0	1	1	0	1	0	1	0	0	0	1
36 850	to	36 950	0	1	1	0	1	0	1	0	0	1	1
36 950	to	37 050	0	1	1	0	1	0	1	0	0	1	0
37 050	to	37 150	0	1	1	0	1	0	1	0	1	1	0
37 150	to	37 250	0	1	1	0	1	0	1	0	1	0	0
37 250	to	37 350	0	1	1	0	1	0	1	1	1	0	0
37 350	to	37 450	0	1	1	0	1	0	1	1	1	1	0
37 450	to	37 550	0	1	1	0	1	0	1	1	0	1	0
37 550	to	37 650	0	1	1	0	1	0	1	1	0	1	1
37 650	to	37 750	0	1	1	0	1	0	1	1	0	0	1
37 750	to	37 850	0	1	1	0	1	0	0	1	0	0	1
37 850	to	37 950	0	1	1	0	1	0	0	1	0	1	1
37 950	to	38 050	0	1	1	0	1	0	0	1	0	1	0
38 050	to	38 150	0	1	1	0	1	0	0	1	1	1	0
38 150	to	38 250	0	1	1	0	1	0	0	1	1	0	0
38 250	to	38 350	0	1	1	0	1	0	0	0	1	0	0
38 350	to	38 450	0	1	1	0	1	0	0	0	1	1	0
38 450	to	38 550	0	1	1	0	1	0	0	0	0	1	0
38 550	to	38 650	0	1	1	0	1	0	0	0	0	1	1
38 650	to	38 750	0	1	1	0	1	0	0	0	0	0	1

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
38 750 to 38 850	0	1	1	1	1	0	0	0	0	0	1
38 850 to 38 950	0	1	1	1	1	0	0	0	0	1	1
38 950 to 39 050	0	1	1	1	1	0	0	0	0	1	0
39 050 to 39 150	0	1	1	1	1	0	0	0	1	1	0
39 150 to 39 250	0	1	1	1	1	0	0	0	1	0	0
39 250 to 39 350	0	1	1	1	1	0	0	1	1	0	0
39 350 to 39 450	0	1	1	1	1	0	0	1	1	1	0
39 450 to 39 550	0	1	1	1	1	0	0	1	0	1	0
39 550 to 39 650	0	1	1	1	1	0	0	1	0	1	1
39 650 to 39 750	0	1	1	1	1	0	0	1	0	0	1
39 750 to 39 850	0	1	1	1	1	0	1	1	0	0	1
39 850 to 39 950	0	1	1	1	1	0	1	1	0	1	1
39 950 to 40 050	0	1	1	1	1	0	1	1	0	1	0
40 050 to 40 150	0	1	1	1	1	0	1	1	1	1	0
40 150 to 40 250	0	1	1	1	1	0	1	1	1	0	0
40 250 to 40 350	0	1	1	1	1	0	1	0	1	0	0
40 350 to 40 450	0	1	1	1	1	0	1	0	1	1	0
40 450 to 40 550	0	1	1	1	1	0	1	0	0	1	0
40 550 to 40 650	0	1	1	1	1	0	1	0	0	1	1
40 650 to 40 750	0	1	1	1	1	0	1	0	0	0	1
40 750 to 40 850	0	1	1	1	1	1	1	0	0	0	1
40 850 to 40 950	0	1	1	1	1	1	1	0	0	1	1
40 950 to 41 050	0	1	1	1	1	1	1	0	0	1	0
41 050 to 41 150	0	1	1	1	1	1	1	0	1	1	0
41 150 to 41 250	0	1	1	1	1	1	1	0	1	0	0
41 250 to 41 350	0	1	1	1	1	1	1	1	1	0	0
41 350 to 41 450	0	1	1	1	1	1	1	1	1	1	0
41 450 to 41 550	0	1	1	1	1	1	1	1	0	1	0
41 550 to 41 650	0	1	1	1	1	1	1	1	0	1	1
41 650 to 41 750	0	1	1	1	1	1	1	1	0	0	1
41 750 to 41 850	0	1	1	1	1	1	0	1	0	0	1
41 850 to 41 950	0	1	1	1	1	1	0	1	0	1	1
41 950 to 42 050	0	1	1	1	1	1	0	1	0	1	0
42 050 to 42 150	0	1	1	1	1	1	0	1	1	1	0
42 150 to 42 250	0	1	1	1	1	1	0	1	1	0	0
42 250 to 42 350	0	1	1	1	1	1	0	0	1	0	0
42 350 to 42 450	0	1	1	1	1	1	0	0	1	1	0
42 450 to 42 550	0	1	1	1	1	1	0	0	0	1	0
42 550 to 42 650	0	1	1	1	1	1	0	0	0	1	1
42 650 to 42 750	0	1	1	1	1	1	0	0	0	0	1
42 750 to 42 850	0	1	1	1	0	1	0	0	0	0	1
42 850 to 42 950	0	1	1	1	0	1	0	0	0	1	1
42 950 to 43 050	0	1	1	1	0	1	0	0	0	1	0
43 050 to 43 150	0	1	1	1	0	1	0	0	1	1	0
43 150 to 43 250	0	1	1	1	0	1	0	0	1	0	0

RANGE			PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
43 250	to	43 350	0	1	1	1	0	1	0	1	1	0	0
43 350	to	43 450	0	1	1	1	0	1	0	1	1	1	0
43 450	to	43 550	0	1	1	1	0	1	0	1	0	1	0
43 550	to	43 650	0	1	1	1	0	1	0	1	0	1	1
43 650	to	43 750	0	1	1	1	0	1	0	1	0	0	1
43 750	to	43 850	0	1	1	1	0	1	1	1	0	0	1
43 850	to	43 950	0	1	1	1	0	1	1	1	0	1	1
43 950	to	44 050	0	1	1	1	0	1	1	1	0	1	0
44 050	to	44 150	0	1	1	1	0	1	1	1	1	1	0
44 150	to	44 250	0	1	1	1	0	1	1	1	1	0	0
44 250	to	44 350	0	1	1	1	0	1	1	0	1	0	0
44 350	to	44 450	0	1	1	1	0	1	1	0	1	1	0
44 450	to	44 550	0	1	1	1	0	1	1	0	0	1	0
44 550	to	44 650	0	1	1	1	0	1	1	0	0	1	1
44 650	to	44 750	0	1	1	1	0	1	1	0	0	0	1
44 750	to	44 850	0	1	1	1	0	0	1	0	0	0	1
44 850	to	44 950	0	1	1	1	0	0	1	0	0	1	1
44 950	to	45 050	0	1	1	1	0	0	1	0	0	1	0
45 050	to	45 150	0	1	1	1	0	0	1	0	1	1	0
45 150	to	45 250	0	1	1	1	0	0	1	0	1	0	0
45 250	to	45 350	0	1	1	1	0	0	1	1	1	0	0
45 350	to	45 450	0	1	1	1	0	0	1	1	1	1	0
45 450	to	45 550	0	1	1	1	0	0	1	1	0	1	0
45 550	to	45 650	0	1	1	1	0	0	1	1	0	1	1
45 650	to	45 750	0	1	1	1	0	0	1	1	0	0	1
45 750	to	45 850	0	1	1	1	0	0	0	1	0	0	1
45 850	to	45 950	0	1	1	1	0	0	0	1	0	1	1
45 950	to	46 050	0	1	1	1	0	0	0	1	0	1	0
46 050	to	46 150	0	1	1	1	0	0	0	1	1	1	0
46 150	to	46 250	0	1	1	1	0	0	0	1	1	0	0
46 250	to	46 350	0	1	1	1	0	0	0	0	1	0	0
46 350	to	46 450	0	1	1	1	0	0	0	0	1	1	0
46 450	to	46 550	0	1	1	1	0	0	0	0	0	1	0
46 550	to	46 650	0	1	1	1	0	0	0	0	0	1	1
46 650	to	46 750	0	1	1	1	0	0	0	0	0	0	1
46 750	to	46 850	0	1	0	1	0	0	0	0	0	0	1
46 850	to	46 950	0	1	0	1	0	0	0	0	0	1	1
46 950	to	47 050	0	1	0	1	0	0	0	0	0	1	0
47 050	to	47 150	0	1	0	1	0	0	0	0	1	1	0
47 150	to	47 250	0	1	0	1	0	0	0	0	1	0	0
47 250	to	47 350	0	1	0	1	0	0	0	1	1	0	0
47 350	to	47 450	0	1	0	1	0	0	0	1	1	1	0
47 450	to	47 550	0	1	0	1	0	0	0	1	0	1	0
47 550	to	47 650	0	1	0	1	0	0	0	1	0	1	1
47 650	to	47 750	0	1	0	1	0	0	0	1	0	0	1

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
47 750 to 47 850	0	1	0	1	0	0	1	1	0	0	1
47 850 to 47 950	0	1	0	1	0	0	1	1	0	1	1
47 950 to 48 050	0	1	0	1	0	0	1	1	0	1	0
48 050 to 48 150	0	1	0	1	0	0	1	1	1	1	0
48 150 to 48 250	0	1	0	1	0	0	1	1	1	0	0
48 250 to 48 350	0	1	0	1	0	0	1	0	1	0	0
48 350 to 48 450	0	1	0	1	0	0	1	0	1	1	0
48 450 to 48 550	0	1	0	1	0	0	1	0	0	1	0
48 550 to 48 650	0	1	0	1	0	0	1	0	0	1	1
48 650 to 48 750	0	1	0	1	0	0	1	0	0	0	1
48 750 to 48 850	0	1	0	1	0	1	1	0	0	0	1
48 850 to 48 950	0	1	0	1	0	1	1	0	0	1	1
48 950 to 49 050	0	1	0	1	0	1	1	0	0	1	0
49 050 to 49 150	0	1	0	1	0	1	1	0	1	1	0
49 150 to 49 250	0	1	0	1	0	1	1	0	1	0	0
49 250 to 49 350	0	1	0	1	0	1	1	1	1	0	0
49 350 to 49 450	0	1	0	1	0	1	1	1	1	1	0
49 450 to 49 550	0	1	0	1	0	1	1	1	0	1	0
49 550 to 49 650	0	1	0	1	0	1	1	1	0	1	1
49 650 to 49 750	0	1	0	1	0	1	1	1	0	0	1
49 750 to 49 850	0	1	0	1	0	1	0	1	0	0	1
49 850 to 49 950	0	1	0	1	0	1	0	1	0	1	1
49 950 to 50 050	0	1	0	1	0	1	0	1	0	1	0
50 050 to 50 150	0	1	0	1	0	1	0	1	1	1	0
50 150 to 50 250	0	1	0	1	0	1	0	1	1	0	0
50 250 to 50 350	0	1	0	1	0	1	0	0	1	0	0
50 350 to 50 450	0	1	0	1	0	1	0	0	1	1	0
50 450 to 50 550	0	1	0	1	0	1	0	0	0	1	0
50 550 to 50 650	0	1	0	1	0	1	0	0	0	1	1
50 650 to 50 750	0	1	0	1	0	1	0	0	0	0	1
50 750 to 50 850	0	1	0	1	1	1	0	0	0	0	1
50 850 to 50 950	0	1	0	1	1	1	0	0	0	1	1
50 950 to 51 050	0	1	0	1	1	1	0	0	0	1	0
51 050 to 51 150	0	1	0	1	1	1	0	0	1	1	0
51 150 to 51 250	0	1	0	1	1	1	0	0	1	0	0
51 250 to 51 350	0	1	0	1	1	1	0	1	1	0	0
51 350 to 51 450	0	1	0	1	1	1	0	1	1	1	0
51 450 to 51 550	0	1	0	1	1	1	0	1	0	1	0
51 550 to 51 650	0	1	0	1	1	1	0	1	0	1	1
51 650 to 51 750	0	1	0	1	1	1	0	1	0	0	1
51 750 to 51 850	0	1	0	1	1	1	1	1	0	0	1
51 850 to 51 950	0	1	0	1	1	1	1	1	0	1	1
51 950 to 52 050	0	1	0	1	1	1	1	1	0	1	0
52 050 to 52 150	0	1	0	1	1	1	1	1	1	1	0
52 150 to 52 250	0	1	0	1	1	1	1	1	1	0	0

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (*Feet*)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
52 250	to	52 350	0	1	0	1	1	1	1	0	1	0	0
52 350	to	52 450	0	1	0	1	1	1	1	0	1	1	0
52 450	to	52 550	0	1	0	1	1	1	1	0	0	1	0
52 550	to	52 650	0	1	0	1	1	1	1	0	0	1	1
52 650	to	52 750	0	1	0	1	1	1	1	0	0	0	1
52 750	to	52 850	0	1	0	1	1	0	1	0	0	0	1
52 850	to	52 950	0	1	0	1	1	0	1	0	0	1	1
52 950	to	53 050	0	1	0	1	1	0	1	0	0	1	0
53 050	to	53 150	0	1	0	1	1	0	1	0	1	1	0
53 150	to	53 250	0	1	0	1	1	0	1	0	1	0	0
53 250	to	53 350	0	1	0	1	1	0	1	1	1	0	0
53 350	to	53 450	0	1	0	1	1	0	1	1	1	1	0
53 450	to	53 550	0	1	0	1	1	0	1	1	0	1	0
53 550	to	53 650	0	1	0	1	1	0	1	1	0	1	1
53 650	to	53 750	0	1	0	1	1	0	1	1	0	0	1
53 750	to	53 850	0	1	0	1	1	0	0	1	0	0	1
53 850	to	53 950	0	1	0	1	1	0	0	1	0	1	1
53 950	to	54 050	0	1	0	1	1	0	0	1	0	1	0
54 050	to	54 150	0	1	0	1	1	0	0	1	1	1	0
54 150	to	54 250	0	1	0	1	1	0	0	1	1	0	0
54 250	to	54 350	0	1	0	1	1	0	0	0	1	0	0
54 350	to	54 450	0	1	0	1	1	0	0	0	1	1	0
54 450	to	54 550	0	1	0	1	1	0	0	0	0	1	0
54 550	to	54 650	0	1	0	1	1	0	0	0	0	1	1
54 650	to	54 750	0	1	0	1	1	0	0	0	0	0	1
54 750	to	54 850	0	1	0	0	1	0	0	0	0	0	1
54 850	to	54 950	0	1	0	0	1	0	0	0	0	1	1
54 950	to	55 050	0	1	0	0	1	0	0	0	0	1	0
55 050	to	55 150	0	1	0	0	1	0	0	0	1	1	0
55 150	to	55 250	0	1	0	0	1	0	0	0	1	0	0
55 250	to	55 350	0	1	0	0	1	0	0	1	1	0	0
55 350	to	55 450	0	1	0	0	1	0	0	1	1	1	0
55 450	to	55 550	0	1	0	0	1	0	0	1	0	1	0
55 550	to	55 650	0	1	0	0	1	0	0	1	0	1	1
55 650	to	55 750	0	1	0	0	1	0	0	1	0	0	1
55 750	to	55 850	0	1	0	0	1	0	1	1	0	0	1
55 850	to	55 950	0	1	0	0	1	0	1	1	0	1	1
55 950	to	56 050	0	1	0	0	1	0	1	1	0	1	0
56 050	to	56 150	0	1	0	0	1	0	1	1	1	1	0
56 150	to	56 250	0	1	0	0	1	0	1	1	1	0	0
56 250	to	56 350	0	1	0	0	1	0	1	0	1	0	0
56 350	to	56 450	0	1	0	0	1	0	1	0	1	1	0
56 450	to	56 550	0	1	0	0	1	0	1	0	0	1	0
56 550	to	56 650	0	1	0	0	1	0	1	0	0	1	1
56 650	to	56 750	0	1	0	0	1	0	1	0	0	0	1

RANGE	PULSE POSITIONS (*0 or 1 in a pulse position denotes absence or presence of a pulse, respectively*)										
INCREMENTS (*Feet*)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
56 750 to 56 850	0	1	0	0	1	1	1	0	0	0	1
56 850 to 56 950	0	1	0	0	1	1	1	0	0	1	1
56 950 to 57 050	0	1	0	0	1	1	1	0	0	1	0
57 050 to 57 150	0	1	0	0	1	1	1	0	1	1	0
57 150 to 57 250	0	1	0	0	1	1	1	0	1	0	0
57 250 to 57 350	0	1	0	0	1	1	1	1	1	0	0
57 350 to 57 450	0	1	0	0	1	1	1	1	1	1	0
57 450 to 57 550	0	1	0	0	1	1	1	1	0	1	0
57 550 to 57 650	0	1	0	0	1	1	1	1	0	1	1
57 650 to 57 750	0	1	0	0	1	1	1	1	0	0	1
57 750 to 57 850	0	1	0	0	1	1	0	1	0	0	1
57 850 to 57 950	0	1	0	0	1	1	0	1	0	1	1
57 950 to 58 050	0	1	0	0	1	1	0	1	0	1	0
58 050 to 58 150	0	1	0	0	1	1	0	1	1	1	0
58 150 to 58 250	0	1	0	0	1	1	0	1	1	0	0
58 250 to 58 350	0	1	0	0	1	1	0	0	1	0	0
58 350 to 58 450	0	1	0	0	1	1	0	0	1	1	0
58 450 to 58 550	0	1	0	0	1	1	0	0	0	1	0
58 550 to 58 650	0	1	0	0	1	1	0	0	0	1	1
58 650 to 58 750	0	1	0	0	1	1	0	0	0	0	1
58 750 to 58 850	0	1	0	0	0	1	0	0	0	0	1
58 850 to 58 950	0	1	0	0	0	1	0	0	0	1	1
58 950 to 59 050	0	1	0	0	0	1	0	0	0	1	0
59 050 to 59 150	0	1	0	0	0	1	0	0	1	1	0
59 150 to 59 250	0	1	0	0	0	1	0	0	1	0	0
59 250 to 59 350	0	1	0	0	0	1	0	1	1	0	0
59 350 to 59 450	0	1	0	0	0	1	0	1	1	1	0
59 450 to 59 550	0	1	0	0	0	1	0	1	0	1	0
59 550 to 59 650	0	1	0	0	0	1	0	1	0	1	1
59 650 to 59 750	0	1	0	0	0	1	0	1	0	0	1
59 750 to 59 850	0	1	0	0	0	1	1	1	0	0	1
59 850 to 59 950	0	1	0	0	0	1	1	1	0	1	1
59 950 to 60 050	0	1	0	0	0	1	1	1	0	1	0
60 050 to 60 150	0	1	0	0	0	1	1	1	1	1	0
60 150 to 60 250	0	1	0	0	0	1	1	1	1	0	0
60 250 to 60 350	0	1	0	0	0	1	1	0	1	0	0
60 350 to 60 450	0	1	0	0	0	1	1	0	1	1	0
60 450 to 60 550	0	1	0	0	0	1	1	0	0	1	0
60 550 to 60 650	0	1	0	0	0	1	1	0	0	1	1
60 650 to 60 750	0	1	0	0	0	1	1	0	0	0	1
60 750 to 60 850	0	1	0	0	0	0	1	0	0	0	1
60 850 to 60 950	0	1	0	0	0	0	1	0	0	1	1
60 950 to 61 050	0	1	0	0	0	0	1	0	0	1	0
61 050 to 61 150	0	1	0	0	0	0	1	0	1	1	0
61 150 to 61 250	0	1	0	0	0	0	1	0	1	0	0

RANGE	PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
65 750 to 65 850	1	1	0	0	0	1	0	1	0	0	1
65 850 to 65 950	1	1	0	0	0	1	0	1	0	1	1
65 950 to 66 050	1	1	0	0	0	1	0	1	0	1	0
66 050 to 66 150	1	1	0	0	0	1	0	1	1	1	0
66 150 to 66 250	1	1	0	0	0	1	0	1	1	0	0
66 250 to 66 350	1	1	0	0	0	1	0	0	1	0	0
66 350 to 66 450	1	1	0	0	0	1	0	0	1	1	0
66 450 to 66 550	1	1	0	0	0	1	0	0	0	1	0
66 550 to 66 650	1	1	0	0	0	1	0	0	0	1	1
66 650 to 66 750	1	1	0	0	0	1	0	0	0	0	1
66 750 to 66 850	1	1	0	0	1	1	0	0	0	0	1
66 850 to 66 950	1	1	0	0	1	1	0	0	0	1	1
66 950 to 67 050	1	1	0	0	1	1	0	0	0	1	0
67 050 to 67 150	1	1	0	0	1	1	0	0	1	1	0
67 150 to 67 250	1	1	0	0	1	1	0	0	1	0	0
67 250 to 67 350	1	1	0	0	1	1	0	1	1	0	0
67 350 to 67 450	1	1	0	0	1	1	0	1	1	1	0
67 450 to 67 550	1	1	0	0	1	1	0	1	0	1	0
67 550 to 67 650	1	1	0	0	1	1	0	1	0	1	1
67 650 to 67 750	1	1	0	0	1	1	0	1	0	0	1
67 750 to 67 850	1	1	0	0	1	1	1	1	0	0	1
67 850 to 67 950	1	1	0	0	1	1	1	1	0	1	1
67 950 to 68 050	1	1	0	0	1	1	1	1	0	1	0
68 050 to 68 150	1	1	0	0	1	1	1	1	1	1	0
68 150 to 68 250	1	1	0	0	1	1	1	1	1	0	0
68 250 to 68 350	1	1	0	0	1	1	1	0	1	0	0
68 350 to 68 450	1	1	0	0	1	1	1	0	1	1	0
68 450 to 68 550	1	1	0	0	1	1	1	0	0	1	0
68 550 to 68 650	1	1	0	0	1	1	1	0	0	1	1
68 650 to 68 750	1	1	0	0	1	1	1	0	0	0	1
68 750 to 68 850	1	1	0	0	1	0	1	0	0	0	1
68 850 to 68 950	1	1	0	0	1	0	1	0	0	1	1
68 950 to 69 050	1	1	0	0	1	0	1	0	0	1	0
69 050 to 69 150	1	1	0	0	1	0	1	0	1	1	0
69 150 to 69 250	1	1	0	0	1	0	1	0	1	0	0
69 250 to 69 350	1	1	0	0	1	0	1	1	1	0	0
69 350 to 69 450	1	1	0	0	1	0	1	1	1	1	0
69 450 to 69 550	1	1	0	0	1	0	1	1	0	1	0
69 550 to 69 650	1	1	0	0	1	0	1	1	0	1	1
69 650 to 69 750	1	1	0	0	1	0	1	1	0	0	1
69 750 to 69 850	1	1	0	0	1	0	0	1	0	0	1
69 850 to 69 950	1	1	0	0	1	0	0	1	0	1	1
69 950 to 70 050	1	1	0	0	1	0	0	1	0	1	0
70 050 to 70 150	1	1	0	0	1	0	0	1	1	1	0
70 150 to 70 250	1	1	0	0	1	0	0	1	1	0	0

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
70 250 to 70 350	1	1	0	0	1	0	0	0	1	0	0
70 350 to 70 450	1	1	0	0	1	0	0	0	1	1	0
70 450 to 70 550	1	1	0	0	1	0	0	0	0	1	0
70 550 to 70 650	1	1	0	0	1	0	0	0	0	1	1
70 650 to 70 750	1	1	0	0	1	0	0	0	0	0	1
70 750 to 70 850	1	1	0	1	1	0	0	0	0	0	1
70 850 to 70 950	1	1	0	1	1	0	0	0	0	1	1
70 950 to 71 050	1	1	0	1	1	0	0	0	0	1	0
71 050 to 71 150	1	1	0	1	1	0	0	0	1	1	0
71 150 to 71 250	1	1	0	1	1	0	0	0	1	0	0
71 250 to 71 350	1	1	0	1	1	0	0	1	1	0	0
71 350 to 71 450	1	1	0	1	1	0	0	1	1	1	0
71 450 to 71 550	1	1	0	1	1	0	0	1	0	1	0
71 550 to 71 650	1	1	0	1	1	0	0	1	0	1	1
71 650 to 71 750	1	1	0	1	1	0	0	1	0	0	1
71 750 to 71 850	1	1	0	1	1	0	1	1	0	0	1
71 850 to 71 950	1	1	0	1	1	0	1	1	0	1	1
71 950 to 72 050	1	1	0	1	1	0	1	1	0	1	0
72 050 to 72 150	1	1	0	1	1	0	1	1	1	1	0
72 150 to 72 250	1	1	0	1	1	0	1	1	1	0	0
72 250 to 72 350	1	1	0	1	1	0	1	0	1	0	0
72 350 to 72 450	1	1	0	1	1	0	1	0	1	1	0
72 450 to 72 550	1	1	0	1	1	0	1	0	0	1	0
72 550 to 72 650	1	1	0	1	1	0	1	0	0	1	1
72 650 to 72 750	1	1	0	1	1	0	1	0	0	0	1
72 750 to 72 850	1	1	0	1	1	1	1	0	0	0	1
72 850 to 72 950	1	1	0	1	1	1	1	0	0	1	1
72 950 to 73 050	1	1	0	1	1	1	1	0	0	1	0
73 050 to 73 150	1	1	0	1	1	1	1	0	1	1	0
73 150 to 73 250	1	1	0	1	1	1	1	0	1	0	0
73 250 to 73 350	1	1	0	1	1	1	1	1	1	0	0
73 350 to 73 450	1	1	0	1	1	1	1	1	1	1	0
73 450 to 73 550	1	1	0	1	1	1	1	1	0	1	0
73 550 to 73 650	1	1	0	1	1	1	1	1	0	1	1
73 650 to 73 750	1	1	0	1	1	1	1	1	0	0	1
73 750 to 73 850	1	1	0	1	1	1	0	1	0	0	1
73 850 to 73 950	1	1	0	1	1	1	0	1	0	1	1
73 950 to 74 050	1	1	0	1	1	1	0	1	0	1	0
74 050 to 74 150	1	1	0	1	1	1	0	1	1	1	0
74 150 to 74 250	1	1	0	1	1	1	0	1	1	0	0
74 250 to 74 350	1	1	0	1	1	1	0	0	1	0	0
74 350 to 74 450	1	1	0	1	1	1	0	0	1	1	0
74 450 to 74 550	1	1	0	1	1	1	0	0	0	1	0
74 550 to 74 650	1	1	0	1	1	1	0	0	0	1	1
74 650 to 74 750	1	1	0	1	1	1	0	0	0	0	1

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
74 750 to 74 850	1	1	0	1	0	1	0	0	0	0	1
74 850 to 74 950	1	1	0	1	0	1	0	0	0	1	1
74 950 to 75 050	1	1	0	1	0	1	0	0	0	1	0
75 050 to 75 150	1	1	0	1	0	1	0	0	1	1	0
75 150 to 75 250	1	1	0	1	0	1	0	0	1	0	0
75 250 to 75 350	1	1	0	1	0	1	0	1	1	0	0
75 350 to 75 450	1	1	0	1	0	1	0	1	1	1	0
75 450 to 75 550	1	1	0	1	0	1	0	1	0	1	0
75 550 to 75 650	1	1	0	1	0	1	0	1	0	1	1
75 650 to 75 750	1	1	0	1	0	1	0	1	0	0	1
75 750 to 75 850	1	1	0	1	0	1	1	1	0	0	1
75 850 to 75 950	1	1	0	1	0	1	1	1	0	1	1
75 950 to 76 050	1	1	0	1	0	1	1	1	0	1	0
76 050 to 76 150	1	1	0	1	0	1	1	1	1	1	0
76 150 to 76 250	1	1	0	1	0	1	1	1	1	0	0
76 250 to 76 350	1	1	0	1	0	1	1	0	1	0	0
76 350 to 76 450	1	1	0	1	0	1	1	0	1	1	0
76 450 to 76 550	1	1	0	1	0	1	1	0	0	1	0
76 550 to 76 650	1	1	0	1	0	1	1	0	0	1	1
76 650 to 76 750	1	1	0	1	0	1	1	0	0	0	1
76 750 to 76 850	1	1	0	1	0	0	1	0	0	0	1
76 850 to 76 950	1	1	0	1	0	0	1	0	0	1	1
76 950 to 77 050	1	1	0	1	0	0	1	0	0	1	0
77 050 to 77 150	1	1	0	1	0	0	1	0	1	1	0
77 150 to 77 250	1	1	0	1	0	0	1	0	1	0	0
77 250 to 77 350	1	1	0	1	0	0	1	1	1	0	0
77 350 to 77 450	1	1	0	1	0	0	1	1	1	1	0
77 450 to 77 550	1	1	0	1	0	0	1	1	0	1	0
77 550 to 77 650	1	1	0	1	0	0	1	1	0	1	1
77 650 to 77 750	1	1	0	1	0	0	1	1	0	0	1
77 750 to 77 850	1	1	0	1	0	0	0	1	0	0	1
77 850 to 77 950	1	1	0	1	0	0	0	1	0	1	1
77 950 to 78 050	1	1	0	1	0	0	0	1	0	1	0
78 050 to 78 150	1	1	0	1	0	0	0	1	1	1	0
78 150 to 78 250	1	1	0	1	0	0	0	1	1	0	0
78 250 to 78 350	1	1	0	1	0	0	0	0	1	0	0
78 350 to 78 450	1	1	0	1	0	0	0	0	1	1	0
78 450 to 78 550	1	1	0	1	0	0	0	0	0	1	0
78 550 to 78 650	1	1	0	1	0	0	0	0	0	1	1
78 650 to 78 750	1	1	0	1	0	0	0	0	0	0	1
78 750 to 78 850	1	1	1	1	0	0	0	0	0	0	1
78 850 to 78 950	1	1	1	1	0	0	0	0	0	1	1
78 950 to 79 050	1	1	1	1	0	0	0	0	0	1	0
79 050 to 79 150	1	1	1	1	0	0	0	0	1	1	0
79 150 to 79 250	1	1	1	1	0	0	0	0	1	0	0

RANGE			PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
79 250	to	79 350	1	1	1	1	0	0	0	1	1	0	0
79 350	to	79 450	1	1	1	1	0	0	0	1	1	1	0
79 450	to	79 550	1	1	1	1	0	0	0	1	0	1	0
79 550	to	79 650	1	1	1	1	0	0	0	1	0	1	1
79 650	to	79 750	1	1	1	1	0	0	0	1	0	0	1
79 750	to	79 850	1	1	1	1	0	0	1	1	0	0	1
79 850	to	79 950	1	1	1	1	0	0	1	1	0	1	1
79 950	to	80 050	1	1	1	1	0	0	1	1	0	1	0
80 050	to	80 150	1	1	1	1	0	0	1	1	1	1	0
80 150	to	80 250	1	1	1	1	0	0	1	1	1	0	0
80 250	to	80 350	1	1	1	1	0	0	1	0	1	0	0
80 350	to	80 450	1	1	1	1	0	0	1	0	1	1	0
80 450	to	80 550	1	1	1	1	0	0	1	0	0	1	0
80 550	to	80 650	1	1	1	1	0	0	1	0	0	1	1
80 650	to	80 750	1	1	1	1	0	0	1	0	0	0	1
80 750	to	80 850	1	1	1	1	0	1	1	0	0	0	1
80 850	to	80 950	1	1	1	1	0	1	1	0	0	1	1
80 950	to	81 050	1	1	1	1	0	1	1	0	0	1	0
81 050	to	81 150	1	1	1	1	0	1	1	0	1	1	0
81 150	to	81 250	1	1	1	1	0	1	1	0	1	0	0
81 250	to	81 350	1	1	1	1	0	1	1	1	1	0	0
81 350	to	81 450	1	1	1	1	0	1	1	1	1	1	0
81 450	to	81 550	1	1	1	1	0	1	1	1	0	1	0
81 550	to	81 650	1	1	1	1	0	1	1	1	0	1	1
81 650	to	81 750	1	1	1	1	0	1	1	1	0	0	1
81 750	to	81 850	1	1	1	1	0	1	0	1	0	0	1
81 850	to	81 950	1	1	1	1	0	1	0	1	0	1	1
81 950	to	82 050	1	1	1	1	0	1	0	1	0	1	0
82 050	to	82 150	1	1	1	1	0	1	0	1	1	1	0
82 150	to	82 250	1	1	1	1	0	1	0	1	1	0	0
82 250	to	82 350	1	1	1	1	0	1	0	0	1	0	0
82 350	to	82 450	1	1	1	1	0	1	0	0	1	1	0
82 450	to	82 550	1	1	1	1	0	1	0	0	0	1	0
82 550	to	82 650	1	1	1	1	0	1	0	0	0	1	1
82 650	to	82 750	1	1	1	1	0	1	0	0	0	0	1
82 750	to	82 850	1	1	1	1	1	1	0	0	0	0	1
82 850	to	82 950	1	1	1	1	1	1	0	0	0	1	1
82 950	to	83 050	1	1	1	1	1	1	0	0	0	1	0
83 050	to	83 150	1	1	1	1	1	1	0	0	1	1	0
83 150	to	83 250	1	1	1	1	1	1	0	0	1	0	0
83 250	to	83 350	1	1	1	1	1	1	0	1	1	0	0
83 350	to	83 450	1	1	1	1	1	1	0	1	1	1	0
83 450	to	83 550	1	1	1	1	1	1	0	1	0	1	0
83 550	to	83 650	1	1	1	1	1	1	0	1	0	1	1
83 650	to	83 750	1	1	1	1	1	1	0	1	0	0	1

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
83 750 to 83 850	1	1	1	1	1	1	1	1	0	0	1
83 850 to 83 950	1	1	1	1	1	1	1	1	0	1	1
83 950 to 84 050	1	1	1	1	1	1	1	1	0	1	0
84 050 to 84 150	1	1	1	1	1	1	1	1	1	1	0
84 150 to 84 250	1	1	1	1	1	1	1	1	1	0	0
84 250 to 84 350	1	1	1	1	1	1	1	0	1	0	0
84 350 to 84 450	1	1	1	1	1	1	1	0	1	1	0
84 450 to 84 550	1	1	1	1	1	1	1	0	0	1	0
84 550 to 84 650	1	1	1	1	1	1	1	0	0	1	1
84 650 to 84 750	1	1	1	1	1	1	1	0	0	0	1
84 750 to 84 850	1	1	1	1	1	0	1	0	0	0	1
84 850 to 84 950	1	1	1	1	1	0	1	0	0	1	1
84 950 to 85 050	1	1	1	1	1	0	1	0	0	1	0
85 050 to 85 150	1	1	1	1	1	0	1	0	1	1	0
85 150 to 85 250	1	1	1	1	1	0	1	0	1	0	0
85 250 to 85 350	1	1	1	1	1	0	1	1	1	0	0
85 350 to 85 450	1	1	1	1	1	0	1	1	1	1	0
85 450 to 85 550	1	1	1	1	1	0	1	1	0	1	0
85 550 to 85 650	1	1	1	1	1	0	1	1	0	1	1
85 650 to 85 750	1	1	1	1	1	0	1	1	0	0	1
85 750 to 85 850	1	1	1	1	1	0	0	1	0	0	1
85 850 to 85 950	1	1	1	1	1	0	0	1	0	1	1
85 950 to 86 050	1	1	1	1	1	0	0	1	0	1	0
86 050 to 86 150	1	1	1	1	1	0	0	1	1	1	0
86 150 to 86 250	1	1	1	1	1	0	0	1	1	0	0
86 250 to 86 350	1	1	1	1	1	0	0	0	1	0	0
86 350 to 86 450	1	1	1	1	1	0	0	0	1	1	0
86 450 to 86 550	1	1	1	1	1	0	0	0	0	1	0
86 550 to 86 650	1	1	1	1	1	0	0	0	0	1	1
86 650 to 86 750	1	1	1	1	1	0	0	0	0	0	1
86 750 to 86 850	1	1	1	0	1	0	0	0	0	0	1
86 850 to 86 950	1	1	1	0	1	0	0	0	0	1	1
86 950 to 87 050	1	1	1	0	1	0	0	0	0	1	0
87 050 to 87 150	1	1	1	0	1	0	0	0	1	1	0
87 150 to 87 250	1	1	1	0	1	0	0	0	1	0	0
87 250 to 87 350	1	1	1	0	1	0	0	1	1	0	0
87 350 to 87 450	1	1	1	0	1	0	0	1	1	1	0
87 450 to 87 550	1	1	1	0	1	0	0	1	0	1	0
87 550 to 87 650	1	1	1	0	1	0	0	1	0	1	1
87 650 to 87 750	1	1	1	0	1	0	0	1	0	0	1
87 750 to 87 850	1	1	1	0	1	0	1	1	0	0	1
87 850 to 87 950	1	1	1	0	1	0	1	1	0	1	1
87 950 to 88 050	1	1	1	0	1	0	1	1	0	1	0
88 050 to 88 150	1	1	1	0	1	0	1	1	1	1	0
88 150 to 88 250	1	1	1	0	1	0	1	1	1	0	0

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
88 250 to 88 350	1	1	1	0	1	0	1	0	1	0	0
88 350 to 88 450	1	1	1	0	1	0	1	0	1	1	0
88 450 to 88 550	1	1	1	0	1	0	1	0	0	1	0
88 550 to 88 650	1	1	1	0	1	0	1	0	0	1	1
88 650 to 88 750	1	1	1	0	1	0	1	0	0	0	1
88 750 to 88 850	1	1	1	0	1	1	1	0	0	0	1
88 850 to 88 950	1	1	1	0	1	1	1	0	0	1	1
88 950 to 89 050	1	1	1	0	1	1	1	0	0	1	0
89 050 to 89 150	1	1	1	0	1	1	1	0	1	1	0
89 150 to 89 250	1	1	1	0	1	1	1	0	1	0	0
89 250 to 89 350	1	1	1	0	1	1	1	1	1	0	0
89 350 to 89 450	1	1	1	0	1	1	1	1	1	1	0
89 450 to 89 550	1	1	1	0	1	1	1	1	0	1	0
89 550 to 89 650	1	1	1	0	1	1	1	1	0	1	1
89 650 to 89 750	1	1	1	0	1	1	1	1	0	0	1
89 750 to 89 850	1	1	1	0	1	1	0	1	0	0	1
89 850 to 89 950	1	1	1	0	1	1	0	1	0	1	1
89 950 to 90 050	1	1	1	0	1	1	0	1	0	1	0
90 050 to 90 150	1	1	1	0	1	1	0	1	1	1	0
90 150 to 90 250	1	1	1	0	1	1	0	1	1	0	0
90 250 to 90 350	1	1	1	0	1	1	0	0	1	0	0
90 350 to 90 450	1	1	1	0	1	1	0	0	1	1	0
90 450 to 90 550	1	1	1	0	1	1	0	0	0	1	0
90 550 to 90 650	1	1	1	0	1	1	0	0	0	1	1
90 650 to 90 750	1	1	1	0	1	1	0	0	0	0	1
90 750 to 90 850	1	1	1	0	0	1	0	0	0	0	1
90 850 to 90 950	1	1	1	0	0	1	0	0	0	1	1
90 950 to 91 050	1	1	1	0	0	1	0	0	0	1	0
91 050 to 91 150	1	1	1	0	0	1	0	0	1	1	0
91 150 to 91 250	1	1	1	0	0	1	0	0	1	0	0
91 250 to 91 350	1	1	1	0	0	1	0	1	1	0	0
91 350 to 91 450	1	1	1	0	0	1	0	1	1	1	0
91 450 to 91 550	1	1	1	0	0	1	0	1	0	1	0
91 550 to 91 650	1	1	1	0	0	1	0	1	0	1	1
91 650 to 91 750	1	1	1	0	0	1	0	1	0	0	1
91 750 to 91 850	1	1	1	0	0	1	1	1	0	0	1
91 850 to 91 950	1	1	1	0	0	1	1	1	0	1	1
91 950 to 92 050	1	1	1	0	0	1	1	1	0	1	0
92 050 to 92 150	1	1	1	0	0	1	1	1	1	1	0
92 150 to 92 250	1	1	1	0	0	1	1	1	1	0	0
92 250 to 92 350	1	1	1	0	0	1	1	0	1	0	0
92 350 to 92 450	1	1	1	0	0	1	1	0	1	1	0
92 450 to 92 550	1	1	1	0	0	1	1	0	0	1	0
92 550 to 92 650	1	1	1	0	0	1	1	0	0	1	1
92 650 to 92 750	1	1	1	0	0	1	1	0	0	0	1

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
92 750	to	92 850	1	1	1	0	0	0	1	0	0	0	1
92 850	to	92 950	1	1	1	0	0	0	1	0	0	1	1
92 950	to	93 050	1	1	1	0	0	0	1	0	0	1	0
93 050	to	93 150	1	1	1	0	0	0	1	0	1	1	0
93 150	to	93 250	1	1	1	0	0	0	1	0	1	0	0
93 250	to	93 350	1	1	1	0	0	0	1	1	1	0	0
93 350	to	93 450	1	1	1	0	0	0	1	1	1	1	0
93 450	to	93 550	1	1	1	0	0	0	1	1	0	1	0
93 550	to	93 650	1	1	1	0	0	0	1	1	0	1	1
93 650	to	93 750	1	1	1	0	0	0	1	1	0	0	1
93 750	to	93 850	1	1	1	0	0	0	0	1	0	0	1
93 850	to	93 950	1	1	1	0	0	0	0	1	0	1	1
93 950	to	94 050	1	1	1	0	0	0	0	1	0	1	0
94 050	to	94 150	1	1	1	0	0	0	0	1	1	1	0
94 150	to	94 250	1	1	1	0	0	0	0	1	1	0	0
94 250	to	94 350	1	1	1	0	0	0	0	0	1	0	0
94 350	to	94 450	1	1	1	0	0	0	0	0	1	1	0
94 450	to	94 550	1	1	1	0	0	0	0	0	0	1	0
94 550	to	94 650	1	1	1	0	0	0	0	0	0	1	1
94 650	to	94 750	1	1	1	0	0	0	0	0	0	0	1
94 750	to	94 850	1	0	1	0	0	0	0	0	0	0	1
94 850	to	94 950	1	0	1	0	0	0	0	0	0	1	1
94 950	to	95 050	1	0	1	0	0	0	0	0	0	1	0
95 050	to	95 150	1	0	1	0	0	0	0	0	1	1	0
95 150	to	95 250	1	0	1	0	0	0	0	0	1	0	0
95 250	to	95 350	1	0	1	0	0	0	0	1	1	0	0
95 350	to	95 450	1	0	1	0	0	0	0	1	1	1	0
95 450	to	95 550	1	0	1	0	0	0	0	1	0	1	0
95 550	to	95 650	1	0	1	0	0	0	0	1	0	1	1
95 650	to	95 750	1	0	1	0	0	0	0	1	0	0	1
95 750	to	95 850	1	0	1	0	0	0	1	1	0	0	1
95 850	to	95 950	1	0	1	0	0	0	1	1	0	1	1
95 950	to	96 050	1	0	1	0	0	0	1	1	0	1	0
96 050	to	96 150	1	0	1	0	0	0	1	1	1	1	0
96 150	to	96 250	1	0	1	0	0	0	1	1	1	0	0
96 250	to	96 350	1	0	1	0	0	0	1	0	1	0	0
96 350	to	96 450	1	0	1	0	0	0	1	0	1	1	0
96 450	to	96 550	1	0	1	0	0	0	1	0	0	1	0
96 550	to	96 650	1	0	1	0	0	0	1	0	0	1	1
96 650	to	96 750	1	0	1	0	0	0	1	0	0	0	1
96 750	to	96 850	1	0	1	0	0	1	1	0	0	0	1
96 850	to	96 950	1	0	1	0	0	1	1	0	0	1	1
96 950	to	97 050	1	0	1	0	0	1	1	0	0	1	0
97 050	to	97 150	1	0	1	0	0	1	1	0	1	1	0
97 150	to	97 250	1	0	1	0	0	1	1	0	1	0	0

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
97 250	to	97 350	1	0	1	0	0	1	1	1	1	0	0
97 350	to	97 450	1	0	1	0	0	1	1	1	1	1	0
97 450	to	97 550	1	0	1	0	0	1	1	1	0	1	0
97 550	to	97 650	1	0	1	0	0	1	1	1	0	1	1
97 650	to	97 750	1	0	1	0	0	1	1	1	0	0	1
97 750	to	97 850	1	0	1	0	0	1	0	1	0	0	1
97 850	to	97 950	1	0	1	0	0	1	0	1	0	1	1
97 950	to	98 050	1	0	1	0	0	1	0	1	0	1	0
98 050	to	98 150	1	0	1	0	0	1	0	1	1	1	0
98 150	to	98 250	1	0	1	0	0	1	0	1	1	0	0
98 250	to	98 350	1	0	1	0	0	1	0	0	1	0	0
98 350	to	98 450	1	0	1	0	0	1	0	0	1	1	0
98 450	to	98 550	1	0	1	0	0	1	0	0	0	1	0
98 550	to	98 650	1	0	1	0	0	1	0	0	0	1	1
98 650	to	98 750	1	0	1	0	0	1	0	0	0	0	1
98 750	to	98 850	1	0	1	0	1	1	0	0	0	0	1
98 850	to	98 950	1	0	1	0	1	1	0	0	0	1	1
98 950	to	99 050	1	0	1	0	1	1	0	0	0	1	0
99 050	to	99 150	1	0	1	0	1	1	0	0	1	1	0
99 150	to	99 250	1	0	1	0	1	1	0	0	1	0	0
99 250	to	99 350	1	0	1	0	1	1	0	1	1	0	0
99 350	to	99 450	1	0	1	0	1	1	0	1	1	1	0
99 450	to	99 550	1	0	1	0	1	1	0	1	0	1	0
99 550	to	99 650	1	0	1	0	1	1	0	1	0	1	1
99 650	to	99 750	1	0	1	0	1	1	0	1	0	0	1
99 750	to	99 850	1	0	1	0	1	1	1	1	0	0	1
99 850	to	99 950	1	0	1	0	1	1	1	1	0	1	1
99 950	to	100 050	1	0	1	0	1	1	1	1	0	1	0
100 050	to	100 150	1	0	1	0	1	1	1	1	1	1	0
100 150	to	100 250	1	0	1	0	1	1	1	1	1	0	0
100 250	to	100 350	1	0	1	0	1	1	1	0	1	0	0
100 350	to	100 450	1	0	1	0	1	1	1	0	1	1	0
100 450	to	100 550	1	0	1	0	1	1	1	0	0	1	0
100 550	to	100 650	1	0	1	0	1	1	1	0	0	1	1
100 650	to	100 750	1	0	1	0	1	1	1	0	0	0	1
100 750	to	100 850	1	0	1	0	1	0	1	0	0	0	1
100 850	to	100 950	1	0	1	0	1	0	1	0	0	1	1
100 950	to	101 050	1	0	1	0	1	0	1	0	0	1	0
101 050	to	101 150	1	0	1	0	1	0	1	0	1	1	0
101 150	to	101 250	1	0	1	0	1	0	1	0	1	0	0
101 250	to	101 350	1	0	1	0	1	0	1	1	1	0	0
101 350	to	101 450	1	0	1	0	1	0	1	1	1	1	0
101 450	to	101 550	1	0	1	0	1	0	1	1	0	1	0
101 550	to	101 650	1	0	1	0	1	0	1	1	0	1	1
101 650	to	101 750	1	0	1	0	1	0	1	1	0	0	1

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
101 750	to	101 850	1	0	1	0	1	0	0	1	0	0	1
101 850	to	101 950	1	0	1	0	1	0	0	1	0	1	1
101 950	to	102 050	1	0	1	0	1	0	0	1	0	1	0
102 050	to	102 150	1	0	1	0	1	0	0	1	1	1	0
102 150	to	102 250	1	0	1	0	1	0	0	1	1	0	0
102 250	to	102 350	1	0	1	0	1	0	0	0	1	0	0
102 350	to	102 450	1	0	1	0	1	0	0	0	1	1	0
102 450	to	102 550	1	0	1	0	1	0	0	0	0	1	0
102 550	to	102 650	1	0	1	0	1	0	0	0	0	1	1
102 650	to	102 750	1	0	1	0	1	0	0	0	0	0	1
102 750	to	102 850	1	0	1	1	1	0	0	0	0	0	1
102 850	to	102 950	1	0	1	1	1	0	0	0	0	1	1
102 950	to	103 050	1	0	1	1	1	0	0	0	0	1	0
103 050	to	103 150	1	0	1	1	1	0	0	0	1	1	0
103 150	to	103 250	1	0	1	1	1	0	0	0	1	0	0
103 250	to	103 350	1	0	1	1	1	0	0	1	1	0	0
103 350	to	103 450	1	0	1	1	1	0	0	1	1	1	0
103 450	to	103 550	1	0	1	1	1	0	0	1	0	1	0
103 550	to	103 650	1	0	1	1	1	0	0	1	0	1	1
103 650	to	103 750	1	0	1	1	1	0	0	1	0	0	1
103 750	to	103 850	1	0	1	1	1	0	1	1	0	0	1
103 850	to	103 950	1	0	1	1	1	0	1	1	0	1	1
103 950	to	104 050	1	0	1	1	1	0	1	1	0	1	0
104 050	to	104 150	1	0	1	1	1	0	1	1	1	1	0
104 150	to	104 250	1	0	1	1	1	0	1	1	1	0	0
104 250	to	104 350	1	0	1	1	1	0	1	0	1	0	0
104 350	to	104 450	1	0	1	1	1	0	1	0	1	1	0
104 450	to	104 550	1	0	1	1	1	0	1	0	0	1	0
104 550	to	104 650	1	0	1	1	1	0	1	0	0	1	1
104 650	to	104 750	1	0	1	1	1	0	1	0	0	0	1
104 750	to	104 850	1	0	1	1	1	1	1	0	0	0	1
104 850	to	104 950	1	0	1	1	1	1	1	0	0	1	1
104 950	to	105 050	1	0	1	1	1	1	1	0	0	1	0
105 050	to	105 150	1	0	1	1	1	1	1	0	1	1	0
105 150	to	105 250	1	0	1	1	1	1	1	0	1	0	0
105 250	to	105 350	1	0	1	1	1	1	1	1	1	0	0
105 350	to	105 450	1	0	1	1	1	1	1	1	1	1	0
105 450	to	105 550	1	0	1	1	1	1	1	1	0	1	0
105 550	to	105 650	1	0	1	1	1	1	1	1	0	1	1
105 650	to	105 750	1	0	1	1	1	1	1	1	0	0	1
105 750	to	105 850	1	0	1	1	1	1	0	1	0	0	1
105 850	to	105 950	1	0	1	1	1	1	0	1	0	1	1
105 950	to	106 050	1	0	1	1	1	1	0	1	0	1	0
106 050	to	106 150	1	0	1	1	1	1	0	1	1	1	0
106 150	to	106 250	1	0	1	1	1	1	0	1	1	0	0

RANGE			PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
106 250	to	106 350	1	0	1	1	1	1	0	0	1	0	0
106 350	to	106 450	1	0	1	1	1	1	0	0	1	1	0
106 450	to	106 550	1	0	1	1	1	1	0	0	0	1	0
106 550	to	106 650	1	0	1	1	1	1	0	0	0	1	1
106 650	to	106 750	1	0	1	1	1	1	0	0	0	0	1
106 750	to	106 850	1	0	1	1	0	1	0	0	0	0	1
106 850	to	106 950	1	0	1	1	0	1	0	0	0	1	1
106 950	to	107 050	1	0	1	1	0	1	0	0	0	1	0
107 050	to	107 150	1	0	1	1	0	1	0	0	1	1	0
107 150	to	107 250	1	0	1	1	0	1	0	0	1	0	0
107 250	to	107 350	1	0	1	1	0	1	0	1	1	0	0
107 350	to	107 450	1	0	1	1	0	1	0	1	1	1	0
107 450	to	107 550	1	0	1	1	0	1	0	1	0	1	0
107 550	to	107 650	1	0	1	1	0	1	0	1	0	1	1
107 650	to	107 750	1	0	1	1	0	1	0	1	0	0	1
107 750	to	107 850	1	0	1	1	0	1	1	1	0	0	1
107 850	to	107 950	1	0	1	1	0	1	1	1	0	1	1
107 950	to	108 050	1	0	1	1	0	1	1	1	0	1	0
108 050	to	108 150	1	0	1	1	0	1	1	1	1	1	0
108 150	to	108 250	1	0	1	1	0	1	1	1	1	0	0
108 250	to	108 350	1	0	1	1	0	1	1	0	1	0	0
108 350	to	108 450	1	0	1	1	0	1	1	0	1	1	0
108 450	to	108 550	1	0	1	1	0	1	1	0	0	1	0
108 550	to	108 650	1	0	1	1	0	1	1	0	0	1	1
108 650	to	108 750	1	0	1	1	0	1	1	0	0	0	1
108 750	to	108 850	1	0	1	1	0	0	1	0	0	0	1
108 850	to	108 950	1	0	1	1	0	0	1	0	0	1	1
108 950	to	109 050	1	0	1	1	0	0	1	0	0	1	0
109 050	to	109 150	1	0	1	1	0	0	1	0	1	1	0
109 150	to	109 250	1	0	1	1	0	0	1	0	1	0	0
109 250	to	109 350	1	0	1	1	0	0	1	1	1	0	0
109 350	to	109 450	1	0	1	1	0	0	1	1	1	1	0
109 450	to	109 550	1	0	1	1	0	0	1	1	0	1	0
109 550	to	109 650	1	0	1	1	0	0	1	1	0	1	1
109 650	to	109 750	1	0	1	1	0	0	1	1	0	0	1
109 750	to	109 850	1	0	1	1	0	0	0	1	0	0	1
109 850	to	109 950	1	0	1	1	0	0	0	1	0	1	1
109 950	to	110 050	1	0	1	1	0	0	0	1	0	1	0
110 050	to	110 150	1	0	1	1	0	0	0	1	1	1	0
110 150	to	110 250	1	0	1	1	0	0	0	1	1	0	0
110 250	to	110 350	1	0	1	1	0	0	0	0	1	0	0
110 350	to	110 450	1	0	1	1	0	0	0	0	1	1	0
110 450	to	110 550	1	0	1	1	0	0	0	0	0	1	0
110 550	to	110 650	1	0	1	1	0	0	0	0	0	1	1
110 650	to	110 750	1	0	1	1	0	0	0	0	0	0	1

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
110 750 to 110 850	1	0	0	1	0	0	0	0	0	0	1
110 850 to 110 950	1	0	0	1	0	0	0	0	0	1	1
110 950 to 111 050	1	0	0	1	0	0	0	0	0	1	0
111 050 to 111 150	1	0	0	1	0	0	0	0	1	1	0
111 150 to 111 250	1	0	0	1	0	0	0	0	1	0	0
111 250 to 111 350	1	0	0	1	0	0	0	1	1	0	0
111 350 to 111 450	1	0	0	1	0	0	0	1	1	1	0
111 450 to 111 550	1	0	0	1	0	0	0	1	0	1	0
111 550 to 111 650	1	0	0	1	0	0	0	1	0	1	1
111 650 to 111 750	1	0	0	1	0	0	0	1	0	0	1
111 750 to 111 850	1	0	0	1	0	0	1	1	0	0	1
111 850 to 111 950	1	0	0	1	0	0	1	1	0	1	1
111 950 to 112 050	1	0	0	1	0	0	1	1	0	1	0
112 050 to 112 150	1	0	0	1	0	0	1	1	1	1	0
112 150 to 112 250	1	0	0	1	0	0	1	1	1	0	0
112 250 to 112 350	1	0	0	1	0	0	1	0	1	0	0
112 350 to 112 450	1	0	0	1	0	0	1	0	1	1	0
112 450 to 112 550	1	0	0	1	0	0	1	0	0	1	0
112 550 to 112 650	1	0	0	1	0	0	1	0	0	1	1
112 650 to 112 750	1	0	0	1	0	0	1	0	0	0	1
112 750 to 112 850	1	0	0	1	0	1	1	0	0	0	1
112 850 to 112 950	1	0	0	1	0	1	1	0	0	1	1
112 950 to 113 050	1	0	0	1	0	1	1	0	0	1	0
113 050 to 113 150	1	0	0	1	0	1	1	0	1	1	0
113 150 to 113 250	1	0	0	1	0	1	1	0	1	0	0
113 250 to 113 350	1	0	0	1	0	1	1	1	1	0	0
113 350 to 113 450	1	0	0	1	0	1	1	1	1	1	0
113 450 to 113 550	1	0	0	1	0	1	1	1	0	1	0
113 550 to 113 650	1	0	0	1	0	1	1	1	0	1	1
113 650 to 113 750	1	0	0	1	0	1	1	1	0	0	1
113 750 to 113 850	1	0	0	1	0	1	0	1	0	0	1
113 850 to 113 950	1	0	0	1	0	1	0	1	0	1	1
113 950 to 114 050	1	0	0	1	0	1	0	1	0	1	0
114 050 to 114 150	1	0	0	1	0	1	0	1	1	1	0
114 150 to 114 250	1	0	0	1	0	1	0	1	1	0	0
114 250 to 114 350	1	0	0	1	0	1	0	0	1	0	0
114 350 to 114 450	1	0	0	1	0	1	0	0	1	1	0
114 450 to 114 550	1	0	0	1	0	1	0	0	0	1	0
114 550 to 114 650	1	0	0	1	0	1	0	0	0	1	1
114 650 to 114 750	1	0	0	1	0	1	0	0	0	0	1
114 750 to 114 850	1	0	0	1	1	1	0	0	0	0	1
114 850 to 114 950	1	0	0	1	1	1	0	0	0	1	1
114 950 to 115 050	1	0	0	1	1	1	0	0	0	1	0
115 050 to 115 150	1	0	0	1	1	1	0	0	1	1	0
115 150 to 115 250	1	0	0	1	1	1	0	0	1	0	0

RANGE	PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
115 250 to 115 350	1	0	0	1	1	1	0	1	1	0	0
115 350 to 115 450	1	0	0	1	1	1	0	1	1	1	0
115 450 to 115 550	1	0	0	1	1	1	0	1	0	1	0
115 550 to 115 650	1	0	0	1	1	1	0	1	0	1	1
115 650 to 115 750	1	0	0	1	1	1	0	1	0	0	1
115 750 to 115 850	1	0	0	1	1	1	1	1	0	0	1
115 850 to 115 950	1	0	0	1	1	1	1	1	0	1	1
115 950 to 116 050	1	0	0	1	1	1	1	1	0	1	0
116 050 to 116 150	1	0	0	1	1	1	1	1	1	1	0
116 150 to 116 250	1	0	0	1	1	1	1	1	1	0	0
116 250 to 116 350	1	0	0	1	1	1	1	0	1	0	0
116 350 to 116 450	1	0	0	1	1	1	1	0	1	1	0
116 450 to 116 550	1	0	0	1	1	1	1	0	0	1	0
116 550 to 116 650	1	0	0	1	1	1	1	0	0	1	1
116 650 to 116 750	1	0	0	1	1	1	1	0	0	0	1
116 750 to 116 850	1	0	0	1	1	0	1	0	0	0	1
116 850 to 116 950	1	0	0	1	1	0	1	0	0	1	1
116 950 to 117 050	1	0	0	1	1	0	1	0	0	1	0
117 050 to 117 150	1	0	0	1	1	0	1	0	1	1	0
117 150 to 117 250	1	0	0	1	1	0	1	0	1	0	0
117 250 to 117 350	1	0	0	1	1	0	1	1	1	0	0
117 350 to 117 450	1	0	0	1	1	0	1	1	1	1	0
117 450 to 117 550	1	0	0	1	1	0	1	1	0	1	0
117 550 to 117 650	1	0	0	1	1	0	1	1	0	1	1
117 650 to 117 750	1	0	0	1	1	0	1	1	0	0	1
117 750 to 117 850	1	0	0	1	1	0	0	1	0	0	1
117 850 to 117 950	1	0	0	1	1	0	0	1	0	1	1
117 950 to 118 050	1	0	0	1	1	0	0	1	0	1	0
118 050 to 118 150	1	0	0	1	1	0	0	1	1	1	0
118 150 to 118 250	1	0	0	1	1	0	0	1	1	0	0
118 250 to 118 350	1	0	0	1	1	0	0	0	1	0	0
118 350 to 118 450	1	0	0	1	1	0	0	0	1	1	0
118 450 to 118 550	1	0	0	1	1	0	0	0	0	1	0
118 550 to 118 650	1	0	0	1	1	0	0	0	0	1	1
118 650 to 118 750	1	0	0	1	1	0	0	0	0	0	1
118 750 to 118 850	1	0	0	0	1	0	0	0	0	0	1
118 850 to 118 950	1	0	0	0	1	0	0	0	0	1	1
118 950 to 119 050	1	0	0	0	1	0	0	0	0	1	0
119 050 to 119 150	1	0	0	0	1	0	0	0	1	1	0
119 150 to 119 250	1	0	0	0	1	0	0	0	1	0	0
119 250 to 119 350	1	0	0	0	1	0	0	1	1	0	0
119 350 to 119 450	1	0	0	0	1	0	0	1	1	1	0
119 450 to 119 550	1	0	0	0	1	0	0	1	0	1	0
119 550 to 119 650	1	0	0	0	1	0	0	1	0	1	1
119 650 to 119 750	1	0	0	0	1	0	0	1	0	0	1

RANGE	PULSE POSITIONS (0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)										
INCREMENTS (Feet)	D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
119 750 to 119 850	1	0	0	0	1	0	1	1	0	0	1
119 850 to 119 950	1	0	0	0	1	0	1	1	0	1	1
119 950 to 120 050	1	0	0	0	1	0	1	1	0	1	0
120 050 to 120 150	1	0	0	0	1	0	1	1	1	1	0
120 150 to 120 250	1	0	0	0	1	0	1	1	1	0	0
120 250 to 120 350	1	0	0	0	1	0	1	0	1	0	0
120 350 to 120 450	1	0	0	0	1	0	1	0	1	1	0
120 450 to 120 550	1	0	0	0	1	0	1	0	0	1	0
120 550 to 120 650	1	0	0	0	1	0	1	0	0	1	1
120 650 to 120 750	1	0	0	0	1	0	1	0	0	0	1
120 750 to 120 850	1	0	0	0	1	1	1	0	0	0	1
120 850 to 120 950	1	0	0	0	1	1	1	0	0	1	1
120 950 to 121 050	1	0	0	0	1	1	1	0	0	1	0
121 050 to 121 150	1	0	0	0	1	1	1	0	1	1	0
121 150 to 121 250	1	0	0	0	1	1	1	0	1	0	0
121 250 to 121 350	1	0	0	0	1	1	1	1	1	0	0
121 350 to 121 450	1	0	0	0	1	1	1	1	1	1	0
121 450 to 121 550	1	0	0	0	1	1	1	1	0	1	0
121 550 to 121 650	1	0	0	0	1	1	1	1	0	1	1
121 650 to 121 750	1	0	0	0	1	1	1	1	0	0	1
121 750 to 121 850	1	0	0	0	1	1	0	1	0	0	1
121 850 to 121 950	1	0	0	0	1	1	0	1	0	1	1
121 950 to 122 050	1	0	0	0	1	1	0	1	0	1	0
122 050 to 122 150	1	0	0	0	1	1	0	1	1	1	0
122 150 to 122 250	1	0	0	0	1	1	0	1	1	0	0
122 250 to 122 350	1	0	0	0	1	1	0	0	1	0	0
122 350 to 122 450	1	0	0	0	1	1	0	0	1	1	0
122 450 to 122 550	1	0	0	0	1	1	0	0	0	1	0
122 550 to 122 650	1	0	0	0	1	1	0	0	0	1	1
122 650 to 122 750	1	0	0	0	1	1	0	0	0	0	1
122 750 to 122 850	1	0	0	0	0	1	0	0	0	0	1
122 850 to 122 950	1	0	0	0	0	1	0	0	0	1	1
122 950 to 123 050	1	0	0	0	0	1	0	0	0	1	0
123 050 to 123 150	1	0	0	0	0	1	0	0	1	1	0
123 150 to 123 250	1	0	0	0	0	1	0	0	1	0	0
123 250 to 123 350	1	0	0	0	0	1	0	1	1	0	0
123 350 to 123 450	1	0	0	0	0	1	0	1	1	1	0
123 450 to 123 550	1	0	0	0	0	1	0	1	0	1	0
123 550 to 123 650	1	0	0	0	0	1	0	1	0	1	1
123 650 to 123 750	1	0	0	0	0	1	0	1	0	0	1
123 750 to 123 850	1	0	0	0	0	1	1	1	0	0	1
123 850 to 123 950	1	0	0	0	0	1	1	1	0	1	1
123 950 to 124 050	1	0	0	0	0	1	1	1	0	1	0
124 050 to 124 150	1	0	0	0	0	1	1	1	1	1	0
124 150 to 124 250	1	0	0	0	0	1	1	1	1	0	0

RANGE			PULSE POSITIONS *(0 or 1 in a pulse position denotes absence or presence of a pulse, respectively)*										
INCREMENTS *(Feet)*			D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
124 250	to	124 350	1	0	0	0	0	1	1	0	1	0	0
124 350	to	124 450	1	0	0	0	0	1	1	0	1	1	0
124 450	to	124 550	1	0	0	0	0	1	1	0	0	1	0
124 550	to	124 650	1	0	0	0	0	1	1	0	0	1	1
124 650	to	124 750	1	0	0	0	0	1	1	0	0	0	1
124 750	to	124 850	1	0	0	0	0	0	1	0	0	0	1
124 850	to	124 950	1	0	0	0	0	0	1	0	0	1	1
124 950	to	125 050	1	0	0	0	0	0	1	0	0	1	0
125 050	to	125 150	1	0	0	0	0	0	1	0	1	1	0
125 150	to	125 250	1	0	0	0	0	0	1	0	1	0	0
125 250	to	125 350	1	0	0	0	0	0	1	1	1	0	0
125 350	to	125 450	1	0	0	0	0	0	1	1	1	1	0
125 450	to	125 550	1	0	0	0	0	0	1	1	0	1	0
125 550	to	125 650	1	0	0	0	0	0	1	1	0	1	1
125 650	to	125 750	1	0	0	0	0	0	1	1	0	0	1
125 750	to	125 850	1	0	0	0	0	0	0	1	0	0	1
125 850	to	125 950	1	0	0	0	0	0	0	1	0	1	1
125 950	to	126 050	1	0	0	0	0	0	0	1	0	1	0
126 050	to	126 150	1	0	0	0	0	0	0	1	1	1	0
126 150	to	126 250	1	0	0	0	0	0	0	1	1	0	0
126 250	to	126 350	1	0	0	0	0	0	0	0	1	0	0
126 350	to	126 450	1	0	0	0	0	0	0	0	1	1	0
126 450	to	126 550	1	0	0	0	0	0	0	0	0	1	0
126 550	to	126 650	1	0	0	0	0	0	0	0	0	1	1
126 650	to	126 750	1	0	0	0	0	0	0	0	0	0	1

CHAPTER 4. AIRBORNE COLLISION AVOIDANCE SYSTEM

Note 1.— Guidance material relating to the airborne collision avoidance system is contained in Attachment A.

Note 2.— Non-SI alternative units are used as permitted by Annex 5, Chapter 3, 3.2.2. In limited cases, to ensure consistency at the level of the logic calculations, units such as ft/s, NM/s and kt/s are used.

4.1 DEFINITIONS RELATING TO AIRBORNE COLLISION AVOIDANCE SYSTEM

ACAS I. An ACAS which provides information as an aid to "see and avoid" action but does not include the capability for generating resolution advisories (RAs).

Note.— ACAS I is not intended for international implementation and standardization by ICAO. Therefore, only ACAS I characteristics required to ensure compatible operation with other ACAS configurations and interference limiting are defined in 4.2.

ACAS II. An ACAS which provides vertical resolution advisories (RAs) in addition to traffic advisories (TAs).

ACAS III. An ACAS which provides vertical and horizontal resolution advisories (RAs) in addition to traffic advisories (TAs).

ACAS broadcast. A long Mode S air-air surveillance interrogation (UF = 16) with the broadcast address.

Active RAC. An RAC is active if it currently constrains the selection of the RA. RACs that have been received within the last six seconds and have not been explicitly cancelled are active.

Altitude crossing RA. A resolution advisory is altitude crossing if own ACAS aircraft is currently at least 30 m (100 ft) below or above the threat aircraft for upward or downward sense advisories, respectively.

Climb RA. A positive RA recommending a climb but not an increased climb.

Closest approach. The occurrence of minimum range between own ACAS aircraft and the intruder. Thus range at closest approach is the smallest range between the two aircraft and time of closest approach is the time at which this occurs.

Coordination. The process by which two ACAS-equipped aircraft select compatible resolution advisories (RAs) by the exchange of resolution advisory complements (RACs).

Coordination interrogation. A Mode S interrogation (uplink transmission) radiated by ACAS II or III and containing a resolution message.

Coordination reply. A Mode S reply (downlink transmission) acknowledging the receipt of a coordination interrogation by the Mode S transponder that is part of an ACAS II or III installation.

Corrective RA. A resolution advisory that advises the pilot to deviate from the current flight path.

Cycle. The term "cycle" used in this chapter refers to one complete pass through the sequence of functions executed by ACAS II or ACAS III, nominally once a second.

Descend RA. A positive RA recommending a descent but not an increased descent.

Established track. A track generated by ACAS air-air surveillance that is treated as the track of an actual aircraft.

Increased rate RA. A resolution advisory with a strength that recommends increasing the altitude rate to a value exceeding that recommended by a previous climb or descend RA.

Intruder. An SSR transponder-equipped aircraft within the surveillance range of ACAS for which ACAS has an established track.

Own aircraft. The aircraft fitted with the ACAS that is the subject of the discourse, which ACAS is to protect against possible collisions, and which may enter a manoeuvre in response to an ACAS indication.

Positive RA. A resolution advisory that advises the pilot either to climb or to descend (applies to ACAS II).

Potential threat. An intruder deserving special attention either because of its close proximity to own aircraft or because successive range and altitude measurements indicate that it could be on a collision or near-collision course with own aircraft. The warning time provided against a potential threat is sufficiently small that a traffic advisory (TA) is justified but not so small that a resolution advisory (RA) would be justified.

Preventive RA. A resolution advisory that advises the pilot to avoid certain deviations from the current flight path but does not require any change in the current flight path.

RA sense. The sense of an ACAS II RA is "upward" if it requires climb or limitation of descent rate and "downward" if it requires descent or limitation of climb rate. It can be both upward and downward simultaneously if it requires limitation of the vertical rate to a specified range.

Note.— The RA sense may be both upward and downward when, having several simultaneous threats, ACAS generates an RA aimed at ensuring adequate separation below some threat(s) and above some other threat(s).

Resolution advisory (RA). An indication given to the flight crew recommending:

a) a manoeuvre intended to provide separation from all threats; or

b) a manoeuvre restriction intended to maintain existing separation.

Resolution advisory complement (RAC). Information provided by one ACAS to another via a Mode S interrogation in order to ensure complementary manoeuvres by restricting the choice of manoeuvres available to the ACAS receiving the RAC.

Resolution advisory complements record (RAC record). A composite of all currently active vertical RACs (VRCs) and horizontal RACs (HRCs) that have been received by ACAS. This information is provided by one ACAS to another ACAS or to a Mode S ground station via a Mode S reply.

Resolution advisory strength. The magnitude of the manoeuvre indicated by the RA. An RA may take on several successive strengths before being cancelled. Once a new RA strength is issued, the previous one automatically becomes void.

Resolution message. The message containing the resolution advisory complement (RAC).

Reversed sense RA. A resolution advisory that has had its sense reversed.

Sensitivity level (S). An integer defining a set of parameters used by the traffic advisory (TA) and collision avoidance algorithms to control the warning time provided by the potential threat and threat detection logic, as well as the values of parameters relevant to the RA selection logic.

Threat. An intruder deserving special attention either because of its close proximity to own aircraft or because successive range and altitude measurements indicate that it could be on a collision or near-collision course with own aircraft. The warning time provided against a threat is sufficiently small that an RA is justified.

Track. A sequence of at least three measurements representing positions that could reasonably have been occupied by an aircraft.

Traffic advisory (TA). An indication given to the flight crew that a certain intruder is a potential threat.

Vertical speed limit (VSL) RA. A resolution advisory advising the pilot to avoid a given range of altitude rates. A VSL RA can be either corrective or preventive.

Warning time. The time interval between potential threat or threat detection and closest approach when neither aircraft accelerates.

4.2 ACAS I GENERAL PROVISIONS AND CHARACTERISTICS

4.2.1 *Functional requirements.* ACAS I shall perform the following functions:

a) surveillance of nearby SSR transponder-equipped aircraft; and

b) provide indications to the flight crew identifying the approximate position of nearby aircraft as an aid to visual acquisition.

Note.— ACAS I is intended to operate using Mode A/C interrogations only. Furthermore, it does not coordinate with other ACAS. Therefore, a Mode S transponder is not required as a part of an ACAS I installation.

4.2.2 *Signal format.* The RF characteristics of all ACAS I signals shall conform to the provisions of Chapter 3, 3.1.1.1 through 3.1.1.6 and 3.1.2.1 through 3.1.2.4.

4.2.3 Interference control

4.2.3.1 *Maximum radiated RF power.* The effective radiated power of an ACAS I transmission at 0 degree elevation relative to the longitudinal axis of the aircraft shall not exceed 24 dBW.

4.2.3.2 *Unwanted radiated power.* When ACAS I is not transmitting an interrogation, the effective radiated power in any direction shall not exceed –70 dBm.

Note.— This requirement is to ensure that, when not transmitting an interrogation, ACAS I does not radiate RF energy that could interfere with, or reduce the sensitivity of, the SSR transponder or radio equipment in other nearby aircraft or ground facilities.

4.2.3.3 *Interference limiting.* Each ACAS I interrogator shall control its interrogation rate or power or both in all SSR modes to minimize interference effects (4.2.3.3.3 and 4.2.3.3.4).

Note.— These limits are a means of ensuring that all interference effects resulting from these interrogations, together with the interrogations from all other ACAS I, ACAS II and ACAS III interrogators in the vicinity are kept to a low level.

4.2.3.3.1 *Determination of own transponder reply rate.* ACAS I shall monitor the rate that own transponder replies to interrogations to ensure that the provisions in 4.2.3.3.3 are met.

4.2.3.3.2 *Determination of the number of ACAS II and ACAS III interrogators.* ACAS I shall count the number of ACAS II and ACAS III interrogators in the vicinity to ensure that the provisions in 4.2.3.3.3 or 4.2.3.3.4 are met. This count shall be obtained by monitoring ACAS broadcasts (UF = 16), (4.3.7.1.2.4) and shall be updated as the number of distinct ACAS aircraft addresses received within the previous 20-s period at a nominal frequency of at least 1 Hz.

4.2.3.3.3 *Mode A/C ACAS I interference limits.* The interrogator power shall not exceed the following limits:

n_a	Upper limit for $\{\sum_{k=1}^{k_1} P_a(k)\}$	
	If $f_r \leq 240$	*If* $f_r > 240$
0	250	118
1	250	113
2	250	108
3	250	103
4	250	98
5	250	94
6	250	89
7	250	84
8	250	79
9	250	74
10	245	70
11	228	65
12	210	60
13	193	55
14	175	50
15	158	45
16	144	41
17	126	36
18	109	31
19	91	26
20	74	21
21	60	17
≥22	42	12

where:

n_a = number of operating ACAS II and ACAS III equipped aircraft near own (based on ACAS broadcasts received with a transponder receiver threshold of –74 dBm);

{ } = average value of the expression within the brackets over last 8 interrogation cycles;

P_a(k) = peak power radiated from the antenna in all directions of the pulse having the largest amplitude in the group of pulses comprising a single interrogation during the *k*th Mode A/C interrogation in a 1 s interrogation cycle, W;

k = index number for Mode A/C interrogations, $k = 1, 2,..., k_t$;

k_t = number of Mode A/C interrogations transmitted in a 1 s interrogation cycle;

f_r = Mode A/C reply rate of own transponder.

4.2.3.3.4 *Mode S ACAS I interference limits.* An ACAS I that uses Mode S interrogations shall not cause greater interference effects than an ACAS I using Mode A/C interrogations only.

4.3 GENERAL PROVISIONS RELATING TO ACAS II AND ACAS III

Note 1.— The acronym ACAS is used in this section to indicate either ACAS II or ACAS III.

Note 2.— Carriage requirements for ACAS equipment are addressed in Annex 6, Part I, Chapter 6.

Note 3.— The term "equipped threat" is used in this section to indicate a threat fitted with ACAS II or ACAS III.

4.3.1 Functional requirements

4.3.1.1 *ACAS functions.* ACAS shall perform the following functions:

a) surveillance;

b) generation of TAs;

c) threat detection;

d) generation of RAs;

e) coordination; and

f) communication with ground stations.

The equipment shall execute functions b) through e) on each cycle of operation.

Note.— Certain features of these functions must be standardized to ensure that ACAS units cooperate satisfactorily with other ACAS units, with Mode S ground stations and with the ATC system. Each of the features that are standardized is discussed below. Certain other features are given herein as recommendations.

4.3.1.1.1 The duration of a cycle shall not exceed 1.2 s.

4.3.2 Surveillance performance requirements

4.3.2.1 *General surveillance requirements.* ACAS shall interrogate SSR Mode A/C and Mode S transponders in other aircraft and detect the transponder replies. ACAS shall measure the range and relative bearing of responding aircraft. Using these measurements and information conveyed by transponder replies, ACAS shall estimate the relative positions of each responding aircraft. ACAS shall include provisions for achieving such position determination in the presence of ground reflections, interference and variations in signal strength.

4.3.2.1.1 *Track establishment probability.* ACAS shall generate an established track, with at least a 0.90 probability that the track is established 30 s before closest approach, on aircraft equipped with transponders when all of the following conditions are satisfied:

a) the elevation angles of these aircraft are within ±10 degrees relative to the ACAS aircraft pitch plane;

b) the magnitudes of these aircraft's rates of change of altitude are less than or equal to 51 m/s (10 000 ft/min);

c) the transponders and antennas of these aircraft meet the Standards of Chapter 3, 3.1.1 and 3.1.2;

d) the closing speeds and directions of these aircraft, the local density of SSR transponder-equipped aircraft and the number of other ACAS interrogators in the vicinity (as determined by monitoring ACAS broadcasts, 4.3.7.1.2.4) satisfy the conditions specified in Table 4-1; and

e) the minimum slant range is equal to or greater than 300 m (1 000 ft).

Table 4-1

Conditions									*Performance*
Quadrant						*Maximum traffic density*		*Maximum number of other ACAS within 56 km (30 NM)*	*Probability of success*
Forward		*Side*		*Back*					
Maximum closing speed									
m/s	*kt*	*m/s*	*kt*	*m/s*	*kt*	*aircraft/ km2*	*aircraft/ NM2*		
260	500	150	300	93	180	0.087	0.30	30	0.90
620	1 200	390	750	220	430	0.017	0.06	30	0.90

4.3.2.1.1.1 ACAS shall continue to provide surveillance with no abrupt degradation in track establishment probability as any one of the condition bounds defined in 4.3.2.1.1 is exceeded.

4.3.2.1.1.2 ACAS shall not track Mode S aircraft that report that they are on the ground.

Note.— A Mode S aircraft may report that it is on the ground by coding in the capability (CA) field in a DF = 11 or DF = 17 transmission (Chapter 3, 3.1.2.5.2.2.1) or by coding in the vertical status (VS) field in a DF = 0 transmission (Chapter 3, 3.1.2.8.2.1). Alternatively, if the aircraft is under Mode S ground surveillance, ground status may be determined by monitoring the flight status (FS) field in downlink formats DF = 4, 5, 20 or 21 (Chapter 3, 3.1.2.6.5.1).

4.3.2.1.1.3 **Recommendation.—** *ACAS should achieve the required tracking performance when the average SSR Mode A/C asynchronous reply rate from transponders in the vicinity of the ACAS aircraft is 240 replies per second and when the peak interrogation rate received by the individual transponders under surveillance is 500 per second.*

Note.— The peak interrogation rate mentioned above includes interrogations from all sources.

4.3.2.1.2 *False track probability.* The probability that an established Mode A/C track does not correspond in range and altitude, if reported, to an actual aircraft shall be less than 10^{-2}. For an established Mode S track this probability shall be less than 10^{-6}. These limits shall not be exceeded in any traffic environment.

4.3.2.1.3 *RANGE AND BEARING ACCURACY*

4.3.2.1.3.1 Range shall be measured with a resolution of 14.5 m (1/128 NM) or better.

4.3.2.1.3.2 **Recommendation.—** *The errors in the relative bearings of the estimated positions of intruders should not exceed 10 degrees rms.*

Note.— This accuracy in the relative bearing of intruders is practicable and sufficient as an aid to the visual acquisition of potential threats. In addition, such relative bearing information has been found useful in threat detection, where it can indicate that an intruder is a threat. However, this accuracy is not sufficient as a basis for horizontal RAs, nor is it sufficient for reliable predictions of horizontal miss distance.

4.3.2.2 INTERFERENCE CONTROL

4.3.2.2.1 *Maximum radiated RF power.* The effective radiated power of an ACAS transmission at 0 degree elevation relative to the longitudinal axis of the aircraft shall not exceed 27 dBW.

4.3.2.2.1.1 *Unwanted radiated power.* When ACAS is not transmitting an interrogation, the effective radiated power in any direction shall not exceed –70 dBm.

4.3.2.2.2 *Interference limiting.* Each ACAS interrogator operating below a pressure altitude of 5 490 m (18 000 ft) shall control its interrogation rate or power or both so as to conform with specific inequalities (4.3.2.2.2.2).

4.3.2.2.2.1 *Determination of the number of other ACAS.* ACAS shall count the number of other ACAS II and III interrogators in the vicinity to ensure that the interference limits are met. This count shall be obtained by monitoring ACAS broadcasts (UF = 16), (4.3.7.1.2.4). Each ACAS shall monitor such broadcast interrogations to determine the number of other ACAS within detection range.

4.3.2.2.2.2 *ACAS interference limiting inequalities.* ACAS shall adjust its interrogation rate and interrogation power such that the following three inequalities remain true, except as provided in 4.3.2.2.2.2.1.

$$\{ \sum_{i=1}^{i_1} \left[\frac{p(i)}{250}\right]^{\alpha} \} < minimum \left[\frac{280}{1+n_a}, \frac{11}{\alpha^2}\right] \qquad (1)$$

$$\{ \sum_{i=1}^{i_1} m(i) \} < 0.01 \qquad (2)$$

$$\{ \frac{1}{B} \sum_{k=1}^{k_1} \frac{P_a(k)}{250} \} < minimum \left[\frac{80}{1+n_a}, 3\right] \qquad (3)$$

The variables in these inequalities shall be defined as follows:

i_t = number of interrogations (Mode A/C and Mode S) transmitted in a 1 s interrogation cycle;

i = index number for Mode A/C and Mode S interrogations, $i = 1, 2,..., i_t$;

α = the minimum of α_1 calculated as 1/4 $[n_b/n_c]$ subject to the special conditions given below and α_2 calculated as $\mathrm{Log}_{10}\, [n_a/n_b] / \mathrm{Log}_{10}\, 25$, where n_b and n_c are defined as the number of operating ACAS II and ACAS III equipped aircraft (airborne or on the ground) within 11.2 km (6 NM) and 5.6 km (3 NM) respectively, of own ACAS (based on ACAS surveillance). ACAS aircraft operating at or below a radio altitude of 610 m (2 000 ft) AGL shall include both airborne and on-ground ACAS II and ACAS III aircraft in the value for n_b and n_c. Otherwise, ACAS shall include only airborne ACAS II and ACAS III aircraft in the value for n_b and n_c. The value of α is further constrained to a minimum of 0.5 and a maximum of 1.0.

In addition;

IF $[(n_b \le 1)$ OR $(n_b > 4n_c)$ OR $(n_b \le 4$ AND $n_c \le 2$ AND $n_a > 25)]$ THEN $\alpha_1 = 1.0$,

IF $[(n_c > 2)$ AND $(n_b > 2\, n_c)$ AND $(n_a < 40)]$ THEN $\alpha_1 = 0.5$;

p(i) = peak power radiated from the antenna in all directions of the pulse having the largest amplitude in the group of pulses comprising a single interrogation during the *i*th interrogation in a 1 s interrogation cycle, W;

m(i) = duration of the mutual suppression interval for own transponder associated with the *i*th interrogation in a 1 s interrogation cycle, s;

B = beam sharpening factor (ratio of 3 dB beam width to beamwidth resulting from interrogation side-lobe suppression). For ACAS interrogators that employ transmitter side-lobe suppression (SLS), the appropriate beamwidth shall be the extent in azimuth angle of the Mode A/C replies from one transponder as limited by SLS, averaged over the transponder population;

{ } see 4.2.3.3.3
$P_a(k)$ "
k "
k_t "
n_a "

Note.— RA and ACAS broadcasts (4.3.6.2.1 and 4.3.7.1.2.4) are interrogations.

4.3.2.2.2.2.1 *Transmissions during RAs.* All air-to-air coordination interrogations and RA and ACAS broadcasts shall be transmitted at full power and these interrogations shall be excluded from the summations of Mode S interrogations in the left-hand terms of inequalities (1) and (2) in 4.3.2.2.2.2 for the duration of the RA.

4.3.2.2.2.2.2 *Transmissions from ACAS units on the ground.* Whenever the ACAS aircraft indicates that it is on the ground, ACAS interrogations shall be limited by setting the number of other ACAS II and III aircraft (n_a) count in the interference limiting inequalities to a value that is three times the value obtained based on ACAS broadcasts received with a transponder receiver threshold of –74 dBm. Whenever Mode A/C interrogation power is reduced because of interference limiting, the Mode A/C interrogation power in the forward beam shall be reduced first until the forward sequence matches the right and left sequences. The forward, right and left interrogation powers shall then sequentially be reduced until they match the rear interrogation power. Further reduction of Mode A/C power shall be accomplished by sequentially reducing the forward, side and rear interrogation powers.

4.3.2.2.2.2.3 *Transmissions from ACAS units above 5 490 m (18 000 ft) altitude.* Each ACAS interrogator operating above a pressure altitude of 5 490 m (18 000 ft) shall control its interrogation rate or power or both such that inequalities (1) and (3) in 4.3.2.2.2.2 remain true when n_a and α are equal to 1, except as provided in 4.3.2.2.2.2.1.

4.3.3 Traffic advisories (TAs)

4.3.3.1 *TA function.* ACAS shall provide TAs to alert the flight crew to potential threats. Such TAs shall be accompanied by an indication of the approximate relative position of potential threats.

4.3.3.2 Proximate traffic display

Recommendation.— *While any RA and/or TA are displayed, proximate traffic within 11 km (6 NM) range and, if altitude reporting, ±370 m (1 200 ft) altitude should be displayed. This proximate traffic should be distinguished (e.g. by colour or symbol type) from threats and potential threats, which should be more prominently displayed.*

4.3.3.3 *TAs as RA precursors.* The criteria for TAs shall be such that they are satisfied before those for an RA.

4.3.3.3.1 *TA warning time.* For intruders reporting altitude, the nominal TA warning time shall not be greater than (T+20 s) where T is the nominal warning time for the generation of the resolution advisory.

Note.— Ideally, RAs would always be preceded by a TA but this is not always possible, e.g. the RA criteria might be already satisfied when a track is first established, or a sudden and sharp manoeuvre by the intruder could cause the TA lead time to be less than a cycle.

4.3.4 Threat detection

4.3.4.1 *Declaration of threat.* ACAS shall evaluate appropriate characteristics of each intruder to determine whether or not it is a threat.

4.3.4.1.1 *Intruder characteristics.* As a minimum, the characteristics of an intruder that are used to identify a threat shall include:

a) tracked altitude;

b) tracked rate of change of altitude;

c) tracked slant range;

d) tracked rate of change of slant range; and

e) sensitivity level of intruder's ACAS, S_i.

For an intruder not equipped with ACAS II or ACAS III, S_i shall be set to 1.

4.3.4.1.2 *Own aircraft characteristics.* As a minimum, the characteristics of own aircraft that are used to identify a threat shall include:

a) altitude;

b) rate of change of altitude; and

c) sensitivity level of own ACAS (4.3.4.3).

4.3.4.2 *Sensitivity levels.* ACAS shall be capable of operating at any of a number of sensitivity levels. These shall include:

a) $S = 1$, a "standby" mode in which the interrogation of other aircraft and all advisories are inhibited;

b) $S = 2$, a "TA only" mode in which RAs are inhibited; and

c) $S = 3\text{-}7$, further levels that enable the issue of RAs that provide the warning times indicated in Table 4-2 as well as TAs.

4.3.4.3 *Selection of own sensitivity level (S_o).* The selection of own ACAS sensitivity level shall be determined by sensitivity level control (SLC) commands which shall be accepted from a number of sources as follows:

a) SLC command generated automatically by ACAS based on altitude band or other external factors;

b) SLC command from pilot input; and

c) SLC command from Mode S ground stations.

4.3.4.3.1 *Permitted SLC command codes.* As a minimum, the acceptable SLC command codes shall include:

	Coding
for SLC based on altitude band	2-7
for SLC from pilot input	0,1,2
for SLC from Mode S ground stations	0,2-6

4.3.4.3.2 *Altitude-band SLC command.* Where ACAS selects an SLC command based on altitude, hysteresis shall be applied to the nominal altitude thresholds at which SLC command value changes are required as follows: for a climbing ACAS aircraft the SLC command shall be increased at the appropriate altitude threshold plus the hysteresis value; for a descending ACAS aircraft the SLC command shall be decreased at the appropriate altitude threshold minus the hysteresis value.

4.3.4.3.3 *Pilot SLC command.* For the SLC command set by the pilot the value 0 shall indicate the selection of the "automatic" mode for which the sensitivity level selection shall be based on the other commands.

Table 4-2

Sensitivity level	*2*	*3*	*4*	*5*	*6*	*7*
Nominal warning time	no RAs	15s	20s	25s	30s	35s

4.3.4.3.4 *Mode S ground station SLC command.* For SLC commands transmitted via Mode S ground stations (4.3.8.4.2.1.1), the value 0 shall indicate that the station concerned is not issuing an SLC command and that sensitivity level selection shall be based on the other commands, including non-0 commands from other Mode S ground stations. ACAS shall not process an uplinked SLC value of 1.

4.3.4.3.4.1 *ATS selection of SLC command code.* ATS authorities shall ensure that procedures are in place to inform pilots of any ATS selected SLC command code other than 0 (4.3.4.3.1).

4.3.4.3.5 *Selection rule.* Own ACAS sensitivity level shall be set to the smallest non-0 SLC command received from any of the sources listed in 4.3.4.3.

4.3.4.4 *Selection of parameter values for RA generation.* When the sensitivity level of own ACAS is 3 or greater, the parameter values used for RA generation that depend on sensitivity level shall be based on the greater of the sensitivity level of own ACAS, S_o, and the sensitivity level of the intruder's ACAS, S_i.

4.3.4.5 *Selection of parameter values for TA generation.* The parameter values used for TA generation that depend on sensitivity level shall be selected on the same basis as those for RAs (4.3.4.4) except when an SLC command with a value of 2 ("TA only" mode) has been received from either the pilot or a Mode S ground station. In this case, the parameter values for TA generation shall retain the values they would have had in the absence of the SLC command from the pilot or Mode S ground station.

4.3.5 Resolution advisories (RAs)

4.3.5.1 *RA generation.* For all threats, ACAS shall generate an RA except where it is not possible to select an RA that can be predicted to provide adequate separation either because of uncertainty in the diagnosis of the intruder's flight path or because there is a high risk that a manoeuvre by the threat will negate the RA.

4.3.5.1.1 *RA cancellation.* Once an RA has been generated against a threat or threats it shall be maintained or modified until tests that are less stringent than those for threat detection indicate on two consecutive cycles that the RA may be cancelled, at which time it shall be cancelled.

4.3.5.2 *RA selection.* ACAS shall generate the RA that is predicted to provide adequate separation from all threats and that has the least effect on the current flight path of the ACAS aircraft consistent with the other provisions in this chapter.

4.3.5.3 *RA effectiveness.* The RA shall not recommend or continue to recommend a manoeuvre or manoeuvre restriction that, considering the range of probable threat trajectories, is more likely to reduce separation than increase it, subject to the provisions in 4.3.5.5.1.1 and 4.3.5.6.

Note.— See also 4.3.5.8.

4.3.5.4 *Aircraft capability.* The RA generated by ACAS shall be consistent with the performance capability of the aircraft.

4.3.5.4.1 *Proximity to the ground.* Descend RAs shall not be generated or maintained when own aircraft is below 300 m (1 000 ft) AGL.

4.3.5.4.2 ACAS shall not operate in sensitivity levels 3-7 when own aircraft is below 300 m (1 000 ft) AGL.

4.3.5.5 *Reversals of sense.* ACAS shall not reverse the sense of an RA from one cycle to the next, except as permitted in 4.3.5.5.1 to ensure coordination or when the predicted separation at closest approach for the existing sense is inadequate.

4.3.5.5.1 *Sense reversals against equipped threats.* If an RAC received from an equipped threat is incompatible with the current RA sense, ACAS shall modify the RA sense to conform with the received RAC if own aircraft address is higher in value than that of the threat.

Note.— 4.3.6.1.3 requires that the own ACAS RAC for the threat is also reversed.

4.3.5.5.1.1 ACAS shall not modify an RA sense in a way that makes it incompatible with an RAC received from an equipped threat if own aircraft address is higher in value than that of the threat.

4.3.5.6 *RA strength retention.* Subject to the requirement that a descend RA is not generated at low altitude (4.3.5.4.1), an RA shall not be modified if the time to closest approach is too short to achieve a significant response or if the threat is diverging in range.

4.3.5.7 *Weakening an RA.* An RA shall not be weakened if it is likely that it would subsequently need to be strengthened.

4.3.5.8 *ACAS-equipped threats.* The RA shall be compatible with all the RACs transmitted to threats (4.3.6.1.3). If an RAC is received from a threat before own ACAS generates an RAC for that threat, the RA generated shall be compatible with the RAC received unless such an RA is more likely to reduce separation than increase it and own aircraft address is lower in value than that of the threat.

Note.— In encounters with more than one threat where it is necessary to pass above some threats and below other threats, this standard can be interpreted as referring to the whole duration of the RA. Specifically, it is permissible to retain an RA to climb (descend) towards a threat that is above (below) own aircraft provided there is a calculated intention to provide adequate separation from all threats by subsequently levelling-off.

4.3.5.9 *Encoding of ARA subfield.* On each cycle of an RA, the RA sense, strength and attributes shall be encoded in the active RA (ARA) subfield (4.3.8.4.2.2.1.1). If the ARA subfield has not been refreshed for an interval of 6 s, it shall be set to 0, along with the MTE subfield in the same message (4.3.8.4.2.2.1.3).

4.3.5.10 *System response time.* The system delay from receipt of the relevant SSR reply to presentation of an RA sense and strength to the pilot shall be as short as possible and shall not exceed 1.5 s.

4.3.6 Coordination and communication

4.3.6.1 PROVISIONS FOR COORDINATION WITH ACAS-EQUIPPED THREATS

4.3.6.1.1 *Multi-aircraft coordination.* In a multi-aircraft situation, ACAS shall coordinate with each equipped threat individually.

4.3.6.1.2 *Data protection during coordination.* ACAS shall prevent simultaneous access to stored data by concurrent processes, in particular, during resolution message processing.

4.3.6.1.3 *Coordination interrogation.* Each cycle ACAS shall transmit a coordination interrogation to each equipped threat, unless generation of an RA is delayed because it is not possible to select an RA that can be predicted to provide adequate separation (4.3.5.1). The resolution message transmitted to a threat shall include an RAC selected for that threat. If an RAC has been received from the threat before ACAS selects an RAC for that threat, the selected RAC shall be compatible with the received RAC unless no more than three cycles have elapsed since the RAC was received, the RAC is altitude-crossing, and own aircraft address is lower in value than that of the threat in which case ACAS shall select its RA independently. If an RAC received from an equipped threat is incompatible with the RAC own ACAS has selected for that threat, ACAS shall modify the selected RAC to be compatible with the received RAC if own aircraft address is higher in value than that of the threat.

Note.— The RAC included in the resolution message is in the form of a vertical RAC (VRC) for ACAS II (4.3.8.4.2.3.2.2) and a vertical RAC (VRC) and/or horizontal RAC (HRC) for ACAS III.

4.3.6.1.3.1 *Coordination termination*. Within the cycle during which an intruder ceases to be a reason for maintaining the RA, ACAS shall send a resolution message to that intruder by means of a coordination interrogation. The resolution message shall include the cancellation code for the last RAC sent to that intruder while it was a reason for maintaining the RA.

Note.— During an encounter with a single threat, the threat ceases to be a reason for the RA when the conditions for cancelling the RA are met. During an encounter with multiple threats, a threat ceases to be a reason for the RA when the conditions for cancelling the RA are met in respect of that threat, even though the RA may have to be maintained because of other threats.

4.3.6.1.3.2 ACAS coordination interrogations shall be transmitted until a coordination reply is received from the threat, up to a maximum of not less than six and not more than twelve attempts. The successive interrogations shall be nominally equally spaced over a period of 100 ±5 ms. If the maximum number of attempts is made and no reply is received, ACAS shall continue its regular processing sequence.

4.3.6.1.3.3 ACAS shall provide parity protection (4.3.8.4.2.3.2.6 and 4.3.8.4.2.3.2.7) for all fields in the coordination interrogation that convey RAC information.

Note.— This includes the vertical RAC (VRC), the cancel vertical RAC (CVC), the horizontal RAC (HRC) and the cancel horizontal RAC (CHC).

4.3.6.1.3.4 Whenever own ACAS reverses its sense against an equipped threat, the resolution message that is sent on the current and subsequent cycles to that threat shall contain both the newly selected RAC and the cancellation code for the RAC sent before the reversal.

4.3.6.1.3.5 When a vertical RA is selected, the vertical RAC (VRC) (4.3.8.4.2.3.2.2) that own ACAS includes in a resolution message to the threat shall be as follows:

a) “do not pass above” when the RA is intended to provide separation above the threat;

b) “do not pass below” when the RA is intended to provide separation below the threat.

4.3.6.1.4 *Resolution message processing.* Resolution messages shall be processed in the order in which they are received and with delay limited to that required to prevent possible concurrent access to stored data and delays due to the processing of previously received resolution messages. Resolution messages that are being delayed shall be temporarily queued to prevent possible loss of messages. Processing a resolution message shall include decoding the message and updating the appropriate data structures with the information extracted from the message.

Note.— According to 4.3.6.1.2, resolution message processing must not access any data whose usage is not protected by the coordination lock state.

4.3.6.1.4.1 An RAC or an RAC cancellation received from another ACAS shall be rejected if the encoded sense bits indicate the existence of a parity error or if undefined value(s) are detected in the resolution message. An RAC or an RAC cancellation received without parity errors and without undefined resolution message values shall be considered valid.

4.3.6.1.4.2 *RAC storage.* A valid RAC received from another ACAS shall be stored or shall be used to update the previously stored RAC corresponding to that ACAS. A valid RAC cancellation shall cause the previously stored RAC to be deleted. A stored RAC that has not been updated for an interval of 6 s shall be deleted.

4.3.6.1.4.3 *RAC record update.* A valid RAC or RAC cancellation received from another ACAS shall be used to update the RAC record. If a bit in the RAC record has not been refreshed for an interval of 6 s by any threat, that bit shall be set to 0.

4.3.6.2 PROVISIONS FOR ACAS COMMUNICATION WITH GROUND STATIONS

4.3.6.2.1 *Air-initiated downlink of ACAS RAs.* When an ACAS RA exists, ACAS shall:

a) transfer to its Mode S transponder an RA report for transmission to the ground in a Comm-B reply (4.3.11.4.1); and

b) transmit periodic RA broadcasts (4.3.7.3.2).

4.3.6.2.2 *Sensitivity level control (SLC) command.* ACAS shall store SLC commands from Mode S ground stations. An SLC command received from a Mode S ground station shall remain effective until replaced by an SLC command from the same ground station as indicated by the site number contained in the IIS subfield of the interrogation. If an existing stored command from a Mode S ground station is not refreshed within 4 minutes, or if the SLC command received has the value 15 (4.3.8.4.2.1.1), the stored SLC command for that Mode S ground station shall be set to 0.

4.3.6.3 PROVISIONS FOR DATA TRANSFER BETWEEN ACAS AND ITS MODE S TRANSPONDER

4.3.6.3.1 *Data transfer from ACAS to its Mode S transponder:*

a) ACAS shall transfer RA information to its Mode S transponder for transmission in an RA report (4.3.8.4.2.2.1) and in a coordination reply (4.3.8.4.2.4.2);

b) ACAS shall transfer current sensitivity level to its Mode S transponder for transmission in a sensitivity level report (4.3.8.4.2.5); and

c) ACAS shall transfer capability information to its Mode S transponder for transmission in a data link capability report (4.3.8.4.2.2.2).

4.3.6.3.2 *Data transfer from Mode S transponder to its ACAS*:

a) ACAS shall receive from its Mode S transponder sensitivity level control commands (4.3.8.4.2.1.1) transmitted by Mode S ground stations;

b) ACAS shall receive from its Mode S transponder ACAS broadcast messages (4.3.8.4.2.3.3) transmitted by other ACAS; and

c) ACAS shall receive from its Mode S transponder resolution messages (4.3.8.4.2.3.2) transmitted by other ACAS for air-air coordination purposes.

4.3.7 ACAS protocols

4.3.7.1 SURVEILLANCE PROTOCOLS

4.3.7.1.1 *Surveillance of Mode A/C transponders.* ACAS shall use the Mode C-only all-call interrogation (Chapter 3, 3.1.2.1.5.1.2) for surveillance of aircraft equipped with Mode A/C transponders.

4.3.7.1.2 *SURVEILLANCE OF MODE S TRANSPONDERS*

4.3.7.1.2.1 *Detection.* ACAS shall monitor 1 090 MHz for Mode S acquisition squitters (DF = 11). ACAS shall detect the presence and determine the address of Mode S-equipped aircraft using their Mode S acquisition squitters (DF = 11) or extended squitters (DF = 17).

Note 1.— It is acceptable to acquire individual aircraft using either acquisition or extended squitters (DF = 11 or DF = 17), and to monitor for both squitters. However, ACAS must monitor for acquisition squitters because, at any time, not all aircraft will transmit the extended squitter.

Note 2.— If, in the future, it becomes permitted for aircraft not to transmit the acquisition squitter, relying instead on continual transmission of the extended squitter, it would become essential for all ACAS units to monitor for both the acquisition and the extended squitters.

4.3.7.1.2.2 *Surveillance interrogations.* On first receipt of a 24-bit aircraft address from an aircraft that is determined to be within the reliable surveillance range of ACAS based on reception reliability and that is within an altitude band 3 050 m (10 000 ft) above and below own aircraft, ACAS shall transmit a short air-air interrogation (UF = 0) for range acquisition. Surveillance interrogations shall be transmitted at least once every five cycles when this altitude condition is satisfied. Surveillance interrogations shall be transmitted each cycle if the range of the detected aircraft is less than 5.6 km (3 NM) or the calculated time to closest approach is less than 60 s, assuming that both the detected and own aircraft proceed from their current positions with unaccelerated motion and that the range at closest approach equals 5.6 km (3 NM). Surveillance interrogations shall be suspended for a period of five cycles if:

a) a reply was successfully received; and

b) own aircraft and intruder aircraft are operating below a pressure altitude of 5 490 m (18 000 ft); and

c) the range of the detected aircraft is greater than 5.6 km (3 NM) and the calculated time to closest approach exceeds 60 seconds, assuming that both the detected and own aircraft proceed from their current positions with unaccelerated motion and that the range at closest approach equals 5.6 km (3 NM).

4.3.7.1.2.2.1 *Range acquisition interrogations.* ACAS shall use the short air-air surveillance format (UF = 0) for range acquisition. ACAS shall set AQ = 1 (Chapter 3, 3.1.2.8.1.1) and RL = 0 (Chapter 3, 3.1.2.8.1.2) in an acquisition interrogation.

Note 1.— Setting AQ = 1 results in a reply with bit 14 of the RI field equal to 1 and serves as an aid in distinguishing the reply to own interrogation from replies elicited from other ACAS units (4.3.7.1.2.2.2).

Note 2.— In the acquisition interrogation RL is set to 0 to command a short acquisition reply (DF = 0).

4.3.7.1.2.2.2 *Tracking interrogations.* ACAS shall use the short air-air surveillance format (UF = 0) with RL = 0 and AQ = 0 for tracking interrogations.

4.3.7.1.2.3 *Surveillance replies.* These protocols are described in 4.3.11.3.1.

4.3.7.1.2.4 *ACAS broadcast.* An ACAS broadcast shall be made nominally every 8 to 10 s at full power from the top antenna. Installations using directional antennas shall operate such that complete circular coverage is provided nominally every 8 to 10 s.

Note.— A broadcast causes other Mode S transponders to accept the interrogation without replying and to present the interrogation content containing the MU field at the transponder output data interface. The UDS1 = 3, UDS2 = 2 combination identifies the data as an ACAS broadcast containing the 24-bit address of the interrogating ACAS aircraft. This provides each ACAS with a means of determining the number of other ACAS within its detection range for limiting interference. The format of the MU field is described in 4.3.8.4.2.3.

4.3.7.2 AIR-AIR COORDINATION PROTOCOLS

4.3.7.2.1 *Coordination interrogations.* ACAS shall transmit UF = 16 interrogations (Chapter 3, 3.1.2.3.2, Figure 3-7) with AQ = 0 and RL = 1 when another aircraft reporting RI = 3 or 4 is declared a threat (4.3.4). The MU field shall contain the resolution message in the subfields specified in 4.3.8.4.2.3.2.

Note 1.— A UF = 16 interrogation with AQ = 0 and RL = 1 is intended to cause a DF = 16 reply from the other aircraft.

Note 2.— An aircraft reporting RI = 3 or RI = 4 is an aircraft equipped with an operating ACAS which has vertical only or vertical and horizontal resolution capability, respectively.

4.3.7.2.2 *Coordination reply.* These protocols are described in 4.3.11.3.2.

4.3.7.3 PROTOCOLS FOR ACAS COMMUNICATION WITH GROUND STATIONS

4.3.7.3.1 *RA reports to Mode S ground stations.* These protocols are described in 4.3.11.4.1.

4.3.7.3.2 *RA broadcasts.* RA broadcasts shall be transmitted at full power from the bottom antenna at jittered, nominally 8 s intervals for the period that the RA is indicated. The RA broadcast shall include the MU field as specified in 4.3.8.4.2.3.4. The RA broadcast shall describe the most recent RA that existed during the preceding 8 s period. Installations using directional antennas shall operate such that complete circular coverage is provided nominally every 8 s and the same RA sense and strength is broadcast in each direction.

4.3.7.3.3 *Data link capability report.* These protocols are described in 4.3.11.4.2.

4.3.7.3.4 *ACAS sensitivity level control.* ACAS shall act upon an SLC command if and only if TMS (Chapter 3, 3.1.2.6.1.4.1) has the value 0 and DI is either 1 or 7 in the same interrogation.

4.3.8 Signal formats

4.3.8.1 The RF characteristics of all ACAS signals shall conform to the Standards of Chapter 3, 3.1.1.1 through 3.1.1.6, 3.1.2.1 through 3.1.2.3, 3.1.2.5 and 3.1.2.8.

4.3.8.2 RELATIONSHIP BETWEEN ACAS AND MODE S SIGNAL FORMATS

Note.— ACAS uses Mode S transmissions for surveillance and communications. ACAS air-air communication functions permit RA decisions to be coordinated with ACAS-equipped threats. ACAS air-ground communication functions permit the reporting of RAs to ground stations and the uplinking of commands to ACAS-equipped aircraft to control parameters of the collision avoidance algorithms.

4.3.8.3 *Signal format conventions.* The data encoding of all ACAS signals shall conform to the Standards of Chapter 3, 3.1.2.3.

Note.— In air-air transmissions used by ACAS, interrogations transmitted at 1 030 MHz are designated as uplink transmissions and contain uplink format (UF) codes. Replies received at 1 090 MHz are designated as downlink transmissions and contain downlink format (DF) codes.

4.3.8.4 FIELD DESCRIPTION

Note 1.— The air-air surveillance and communication formats which are used by ACAS but not fully described in Chapter 3, 3.1.2 are given in Figure 4-1.

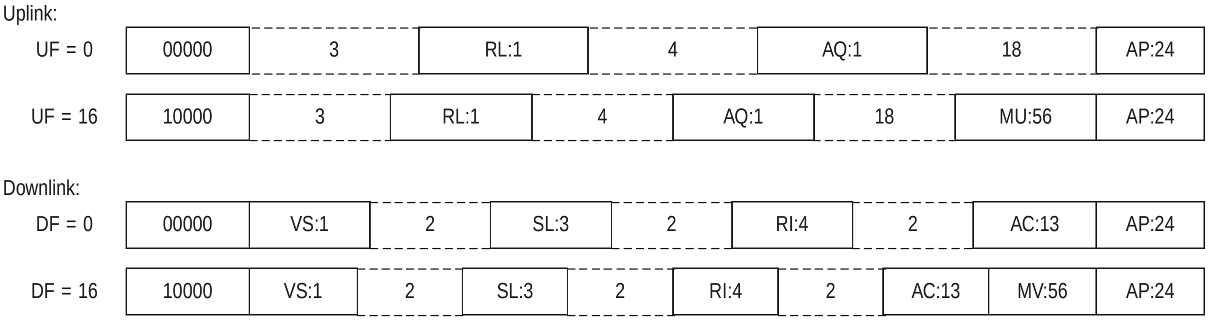


Figure 4-1. Surveillance and communication formats used by ACAS

Note 2.— This section defines the Mode S fields (and their subfields) that are processed by ACAS to accomplish ACAS functions. Some of the ACAS fields (those also used for other SSR Mode S functions) are described with unassigned ACAS codes in Chapter 3, 3.1.2.6. Such codes are assigned in 4.3.8.4.1. Fields and subfields used only by ACAS equipment are assigned in 4.3.8.4.2.

Note 3.— The bit numbering convention used in 4.3.8.4 reflects the bit numbering within the entire uplink or downlink format rather than the bits within individual fields or subfields.

4.3.8.4.1 *FIELDS AND SUBFIELDS INTRODUCED IN CHAPTER 3, 3.1.2*

Note.— Codes for mission fields and subfields that are designated "reserved for ACAS" in Chapter 3, 3.1.2, are specified in this section.

4.3.8.4.1.1 *DR (downlink request).* The significance of the coding of the downlink request field shall be as follows:

Coding	
0-1	See Chapter 3, 3.1.2.6.5.2
2	ACAS message available
3	Comm-B message available and ACAS message available
4-5	See Chapter 3, 3.1.2.6.5.2
6	Comm-B broadcast message 1 available and ACAS message available
7	Comm-B broadcast message 2 available and ACAS message available
8-31	See Chapter 3, 3.1.2.6.5.2

4.3.8.4.1.2 *RI (air-air reply information).* The significance of the coding in the RI field shall be as follows:

Coding	
0	No operating ACAS
1	Not assigned
2	ACAS with resolution capability inhibited
3	ACAS with vertical-only resolution capability
4	ACAS with vertical and horizontal resolution capability
5-7	Not assigned
8-15	See Chapter 3, 3.1.2.8.2.2

Bit 14 of the reply format containing this field shall replicate the AQ bit of the interrogation. The RI field shall report "no operating ACAS" (RI = 0) if the ACAS unit has failed or is in standby. The RI field shall report "ACAS with resolution capability inhibited" (RI = 2) if sensitivity level is 2 or TA only mode has been selected.

Note.— Codes 0-7 in the RI field indicate that the reply is a tracking reply and also give the ACAS capability of the interrogated aircraft. Codes 8-15 indicate that the reply is an acquisition reply and also give the maximum true airspeed capability of the interrogated aircraft.

4.3.8.4.1.3 *RR (reply request).* The significance of the coding in the reply request field shall be as follows:

Coding	
0-18	See Chapter 3, 3.1.2.6.1.2
19	Transmit a resolution advisory report
20-31	See Chapter 3, 3.1.2.6.1.2

4.3.8.4.2 *ACAS FIELDS AND SUBFIELDS*

Note.— The following paragraphs describe the location and coding of those fields and subfields that are not defined in Chapter 3, 3.1.2 but are used by aircraft equipped with ACAS.

4.3.8.4.2.1 *Subfield in MA*

4.3.8.4.2.1.1 *ADS (A-definition subfield).* This 8-bit (33-40) subfield shall define the remainder of MA.

Note.— For convenience of coding, ADS is expressed in two groups of four bits each, ADS1 and ADS2.

4.3.8.4.2.1.2 When ADS1 = 0 and ADS2 = 5, the following subfield shall be contained in MA:

4.3.8.4.2.1.3 *SLC (ACAS sensitivity level control (SLC) command).* This 4-bit (41-44) subfield shall denote a sensitivity level command for own ACAS.

Coding	
0	No command issued
1	Not assigned
2	Set ACAS sensitivity level to 2
3	Set ACAS sensitivity level to 3
4	Set ACAS sensitivity level to 4
5	Set ACAS sensitivity level to 5
6	Set ACAS sensitivity level to 6
7-14	Not assigned
15	Cancel previous SLC command from this ground station

Note.— Structure of MA for a sensitivity level control command:

33	37	41	45
ADS1 = 0	ADS2 = 5	SLC	– – – – 44 – – – –
36	40	44	88

4.3.8.4.2.2 *Subfields in MB*

4.3.8.4.2.2.1 *Subfields in MB for an RA report.* When BDS1 = 3 and BDS2 = 0, the subfields indicated below shall be contained in MB. For 18±1 s following the end of an RA, all MB subfields in the RA report with the exception of bit 59 (RA terminated indicator) shall retain the information reported at the time the RA was last active.

4.3.8.4.2.2.1.1 *ARA (active RAs).* This 14-bit (41-54) subfield shall indicate the characteristics of the RA, if any, generated by the ACAS associated with the transponder transmitting the subfield (4.3.6.2.1 a)). The bits in ARA shall have meanings determined by the value of the MTE subfield (4.3.8.4.2.2.1.4) and, for vertical RAs, the value of bit 41 of ARA. The meaning of bit 41 of ARA shall be as follows:

Coding	
0	There is more than one threat and the RA is intended to provide separation below some threat(s) and above some other threat(s) or no RA has been generated (when MTE = 0)
1	Either there is only one threat or the RA is intended to provide separation in the same direction for all threats

When ARA bit 41 = 1 and MTE = 0 or 1, bits 42-47 shall have the following meanings:

Bit	*Coding*	
42	0	RA is preventive
	1	RA is corrective
43	0	Upward sense RA has been generated
	1	Downward sense RA has been generated
44	0	RA is not increased rate
	1	RA is increased rate

45	0	RA is not a sense reversal
	1	RA is a sense reversal
46	0	RA is not altitude crossing
	1	RA is altitude crossing
47	0	RA is vertical speed limit
	1	RA is positive
48-54		Reserved for ACAS III

When ARA bit 41 = 0 and MTE = 1, bits 42-47 shall have the following meanings:

Bit	*Coding*	
42	0	RA does not require a correction in the upward sense
	1	RA requires a correction in the upward sense
43	0	RA does not require a positive climb
	1	RA requires a positive climb
44	0	RA does not require a correction in the downward sense
	1	RA requires a correction in the downward sense
45	0	RA does not require a positive descend
	1	RA requires a positive descend
46	0	RA does not require a crossing
	1	RA requires a crossing
47	0	RA is not a sense reversal
	1	RA is a sense reversal
48-54		Reserved for ACAS III

Note.— When ARA bit 41 = 0 and MTE = 0, no vertical RA has been generated.

4.3.8.4.2.2.1.2 *RAC (RACs record).* This 4-bit (55-58) subfield shall indicate all the currently active RACs, if any, received from other ACAS aircraft. The bits in RAC shall have the following meanings:

Bit	Resolution advisory complement
55	Do not pass below
56	Do not pass above
57	Do not turn left
58	Do not turn right

A bit set to 1 shall indicate that the associated RAC is active. A bit set to 0 shall indicate that the associated RAC is inactive.

4.3.8.4.2.2.1.3 *RAT (RA terminated indicator).* This 1-bit (59) subfield shall indicate when an RA previously generated by ACAS has ceased being generated.

Coding	
0	ACAS is currently generating the RA indicated in the ARA subfield
1	The RA indicated by the ARA subfield has been terminated (4.3.11.4.1)

Note 1.— After an RA has been terminated by ACAS, it is still required to be reported by the Mode S transponder for 18±1 s (4.3.11.4.1). The RA terminated indicator may be used, for example, to permit timely removal of an RA indication from an air traffic controller's display, or for assessments of RA duration within a particular airspace.

Note 2.— RAs may terminate for a number of reasons: normally, when the conflict has been resolved and the threat is diverging in range; or when the threat's Mode S transponder for some reason ceases to report altitude during the conflict. The RA terminated indicator is used to show that the RA has been removed in each of these cases.

4.3.8.4.2.2.1.4 *MTE (multiple threat encounter).* This 1-bit (60) subfield shall indicate whether two or more simultaneous threats are currently being processed by the ACAS threat resolution logic.

Coding

0	One threat is being processed by the resolution logic (when ARA bit 41 = 1); or no threat is being processed by the resolution logic (when ARA bit 41 = 0)
1	Two or more simultaneous threats are being processed by the resolution logic

4.3.8.4.2.2.1.5 *TTI (threat type indicator subfield).* This 2-bit subfield (61-62) shall define the type of identity data contained in the TID subfield.

Coding

0	No identity data in TID
1	TID contains a Mode S transponder address
2	TID contains altitude, range and bearing data
3	Not assigned

4.3.8.4.2.2.1.6 *TID (threat identity data subfield).* This 26-bit subfield (63-88) shall contain the Mode S address of the threat or the altitude, range, and bearing if the threat is not Mode S equipped. If two or more threats are simultaneously processed by the ACAS resolution logic, TID shall contain the identity or position data for the most recently declared threat. If TTI = 1, TID shall contain in bits 63-86 the aircraft address of the threat, and bits 87 and 88 shall be set to 0. If TTI = 2, TID shall contain the following three subfields.

4.3.8.4.2.2.1.6.1 *TIDA (threat identity data altitude subfield).* This 13-bit subfield (63-75) shall contain the most recently reported Mode C altitude code of the threat.

Coding

Bit	63	64	65	66	67	68	69	70	71	72	73	74	75
Mode C code bit	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

4.3.8.4.2.2.1.6.2 *TIDR (threat identity data range subfield).* This 7-bit subfield (76-82) shall contain the most recent threat range estimated by ACAS.

Coding (n)

n	*Estimated range (NM)*
0	No range estimate available
1	Less than 0.05
2-126	$(n\text{-}1)/10 \pm 0.05$
127	Greater than 12.55

4.3.8.4.2.2.1.6.3 *TIDB (threat identity data bearing subfield).* This 6-bit subfield (83-88) shall contain the most recent estimated bearing of the threat aircraft, relative to the ACAS aircraft heading.

Coding (n)

n	*Estimated bearing (degrees)*
0	No bearing estimate available
1-60	Between $6(n\text{-}1)$ and $6n$
61-63	Not assigned

Note.— Structure of MB for an RA report:

33–36	37–40	41–54	55–58	59–59	60–60	61–62	63–88
BDS1 = 3	BDS2 = 0	ARA	RAC	RAT	MTE	TTI = 1	TID

33–36	37–40	41–54	55–58	59–59	60–60	61–62	63–75	76–82	83–88
BDS1 = 3	BDS2 = 0	ARA	RAC	RAT	MTE	TTI = 2	TIDA	TIDR	TIDB

4.3.8.4.2.2.2 *Subfields in MB for the data link capability report.* When BDS1 = 1 and BDS2 = 0, the following bit patterns shall be provided to the transponder for its data link capability report:

Bit	*Coding*
48	0 ACAS failed or on standby
	1 ACAS operating
69	0 ACAS II
	1 ACAS III
70	0 ACAS generating TAs only
	1 ACAS generating TAs and RAs
71	0 ACAS not fitted
	1 ACAS fitted
72	0 Hybrid surveillance not fitted
	1 Hybrid surveillance fitted

Note 1.— A summary of the MB subfields for the data link capability report structure is described in Chapter 3, 3.1.2.6.10.2.2.

Note 2.— The use of hybrid surveillance to limit ACAS active interrogations is described in 4.5.1. The ability only to support decoding of DF = 17 extended squitter messages is not sufficient to set bit 72.

4.3.8.4.2.3 *MU field.* This 56-bit (33-88) field of long air-air surveillance interrogations (Figure 4-1) shall be used to transmit resolution messages, ACAS broadcasts and RA broadcasts.

4.3.8.4.2.3.1 *UDS (U-definition subfield).* This 8-bit (33-40) subfield shall define the remainder of MU.

Note.— For convenience in coding, UDS is expressed in two groups of four bits each, UDS1 and UDS2.

4.3.8.4.2.3.2 *Subfields in MU for a resolution message.* When UDS1 = 3 and UDS2 = 0 the following subfields shall be contained in MU:

4.3.8.4.2.3.2.1 *MTB (multiple threat bit).* This 1-bit (42) subfield shall indicate the presence or absence of multiple threats.

Coding	
0	Interrogating ACAS has one threat
1	Interrogating ACAS has more than one threat

4.3.8.4.2.3.2.2 *VRC (vertical RAC).* This 2-bit (45-46) subfield shall denote a vertical RAC relating to the addressed aircraft.

Coding	
0	No vertical RAC sent
1	Do not pass below
2	Do not pass above
3	Not assigned

4.3.8.4.2.3.2.3 *CVC (cancel vertical RAC).* This 2-bit (43-44) subfield shall denote the cancellation of a vertical RAC previously sent to the addressed aircraft. This subfield shall be set to 0 for a new threat.

Coding	
0	No cancellation
1	Cancel previously sent “Do not pass below”
2	Cancel previously sent “Do not pass above”
3	Not assigned

4.3.8.4.2.3.2.4 *HRC (horizontal RAC).* This 3-bit (50-52) subfield shall denote a horizontal RAC relating to the addressed aircraft.

Coding

0	No horizontal RAC or no horizontal resolution capability
1	Other ACAS sense is turn left; do not turn left
2	Other ACAS sense is turn left; do not turn right
3	Not assigned
4	Not assigned
5	Other ACAS sense is turn right; do not turn left
6	Other ACAS sense is turn right; do not turn right
7	Not assigned

4.3.8.4.2.3.2.5 *CHC (cancel horizontal RAC).* This 3-bit (47-49) subfield shall denote the cancellation of a horizontal RAC previously sent to the addressed aircraft. This subfield shall be set to 0 for a new threat.

Coding

0	No cancellation or no horizontal resolution capability
1	Cancel previously sent "Do not turn left"
2	Cancel previously sent "Do not turn right"
3-7	Not assigned

4.3.8.4.2.3.2.6 *VSB (vertical sense bits subfield).* This 4-bit (61-64) subfield shall be used to protect the data in the CVC and VRC subfields. For each of the 16 possible combinations of bits 43-46 the following VSB code shall be transmitted:

	CVC		VRC		VSB			
Coding	43	44	45	46	61	62	63	64
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	1	1	0
2	0	0	1	0	0	1	1	1
3	0	0	1	1	1	0	0	1
4	0	1	0	0	1	0	1	1
5	0	1	0	1	0	1	0	1
6	0	1	1	0	1	1	0	0
7	0	1	1	1	0	0	1	0
8	1	0	0	0	1	1	0	1
9	1	0	0	1	0	0	1	1
10	1	0	1	0	1	0	1	0
11	1	0	1	1	0	1	0	0
12	1	1	0	0	0	1	1	0
13	1	1	0	1	1	0	0	0
14	1	1	1	0	0	0	0	1
15	1	1	1	1	1	1	1	1

Note.— The rule used to generate the VSB subfield bit setting is a distance 3 Hamming code augmented with a parity bit, producing the ability to detect up to three errors in the eight transmitted bits.

4.3.8.4.2.3.2.7 *HSB (horizontal sense bits subfield).* This 5-bit (56-60) subfield shall be used to protect the data in the CHC and HRC subfields. For each of the 64 possible combinations of bits 47-52 the following HSB code shall be transmitted:

	CHC			HRC			HSB				
Coding	47	48	49	50	51	52	56	57	58	59	60
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	0	1	0	1	1
2	0	0	0	0	1	0	1	0	0	1	1
3	0	0	0	0	1	1	1	1	0	0	0
4	0	0	0	1	0	0	1	1	1	0	0
5	0	0	0	1	0	1	1	0	1	1	1
6	0	0	0	1	1	0	0	1	1	1	1
7	0	0	0	1	1	1	0	0	1	0	0
8	0	0	1	0	0	0	0	1	1	0	1
9	0	0	1	0	0	1	0	0	1	1	0
10	0	0	1	0	1	0	1	1	1	1	0
11	0	0	1	0	1	1	1	0	1	0	1
12	0	0	1	1	0	0	1	0	0	0	1
13	0	0	1	1	0	1	1	1	0	1	0
14	0	0	1	1	1	0	0	0	0	1	0
15	0	0	1	1	1	1	0	1	0	0	1
16	0	1	0	0	0	0	1	0	1	0	1
17	0	1	0	0	0	1	1	1	1	1	0
18	0	1	0	0	1	0	0	0	1	1	0
19	0	1	0	0	1	1	0	1	1	0	1
20	0	1	0	1	0	0	0	1	0	0	1
21	0	1	0	1	0	1	0	0	0	1	0
22	0	1	0	1	1	0	1	1	0	1	0
23	0	1	0	1	1	1	1	0	0	0	1
24	0	1	1	0	0	0	1	1	0	0	0
25	0	1	1	0	0	1	1	0	0	1	1
26	0	1	1	0	1	0	0	1	0	1	1
27	0	1	1	0	1	1	0	0	0	0	0
28	0	1	1	1	0	0	0	0	1	0	0
29	0	1	1	1	0	1	0	1	1	1	1
30	0	1	1	1	1	0	1	0	1	1	1
31	0	1	1	1	1	1	1	1	1	0	0
32	1	0	0	0	0	0	1	1	0	0	1
33	1	0	0	0	0	1	1	0	0	1	0
34	1	0	0	0	1	0	0	1	0	1	0
35	1	0	0	0	1	1	0	0	0	0	1
36	1	0	0	1	0	0	0	0	1	0	1
37	1	0	0	1	0	1	0	1	1	1	0
38	1	0	0	1	1	0	1	0	1	1	0
39	1	0	0	1	1	1	1	1	1	0	1
40	1	0	1	0	0	0	1	0	1	0	0
41	1	0	1	0	0	1	1	1	1	1	1
42	1	0	1	0	1	0	0	0	1	1	1
43	1	0	1	0	1	1	0	1	1	0	0
44	1	0	1	1	0	0	0	1	0	0	0
45	1	0	1	1	0	1	0	0	0	1	1
46	1	0	1	1	1	0	1	1	0	1	1
47	1	0	1	1	1	1	1	0	0	0	0
48	1	1	0	0	0	0	0	1	1	0	0
49	1	1	0	0	0	1	0	0	1	1	1
50	1	1	0	0	1	0	1	1	1	1	1
51	1	1	0	0	1	1	1	0	1	0	0
52	1	1	0	1	0	0	1	0	0	0	0
53	1	1	0	1	0	1	1	1	0	1	1
54	1	1	0	1	1	0	0	0	0	1	1
55	1	1	0	1	1	1	0	1	0	0	0

	CHC			HRC			HSB				
Coding	47	48	49	50	51	52	56	57	58	59	60
56	1	1	1	0	0	0	0	0	0	0	1
57	1	1	1	0	0	1	0	1	0	1	0
58	1	1	1	0	1	0	1	0	0	1	0
59	1	1	1	0	1	1	1	1	0	0	1
60	1	1	1	1	0	0	1	1	1	0	1
61	1	1	1	1	0	1	1	0	1	1	0
62	1	1	1	1	1	0	0	1	1	1	0
63	1	1	1	1	1	1	0	0	1	0	1

Note.— The rule used to generate the HSB subfield bit setting is a distance 3 Hamming code augmented with a parity bit, producing the ability to detect up to three errors in the eleven transmitted bits.

4.3.8.4.2.3.2.8 *MID (Aircraft address).* This 24-bit (65-88) subfield shall contain the 24-bit aircraft address of the interrogating ACAS aircraft.

Note.— Structure of MU for a resolution message:

33	37	41	42	43	45	47	50	53	56	61	65
UDS1 = 3	UDS2 = 0	-1-	MTB	CVC	VRC	CHC	HRC	-3-	HSB	VSB	MID
36	40	41	42	44	46	49	52	55	60	64	88

4.3.8.4.2.3.3 *Subfield in MU for an ACAS broadcast.* When UDS1 = 3 and UDS2 = 2, the following subfield shall be contained in MU:

4.3.8.4.2.3.3.1 *MID (Aircraft address).* This 24-bit (65-88) subfield shall contain the 24-bit aircraft address of the interrogating ACAS aircraft.

Note.— Structure of MU for an ACAS broadcast:

33	37	41	65
UDS1 = 3	UDS2 = 2	– – – – – 24 – – – – –	MID
36	40	64	88

4.3.8.4.2.3.4 *Subfields in MU for an RA broadcast.* When UDS1 = 3 and UDS2 = 1, the following subfields shall be contained in MU:

4.3.8.4.2.3.4.1 *ARA (active RAs).* This 14-bit (41-54) subfield shall be coded as defined in 4.3.8.4.2.2.1.1.

4.3.8.4.2.3.4.2 *RAC (RACs record).* This 4-bit (55-58) subfield shall be coded as defined in 4.3.8.4.2.2.1.2.

4.3.8.4.2.3.4.3 *RAT (RA terminated indicator).* This 1-bit (59) subfield shall be coded as defined in 4.3.8.4.2.2.1.3.

4.3.8.4.2.3.4.4 *MTE (multiple threat encounter).* This 1-bit (60) subfield shall be coded as defined in 4.3.8.4.2.2.1.4.

4.3.8.4.2.3.4.5 *AID (Mode A identity code).* This 13-bit (63-75) subfield shall denote the Mode A identity code of the reporting aircraft.

Coding

Bit	63	64	65	66	67	68	69	70	71	72	73	74	75
Mode A code bit	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

4.3.8.4.2.3.4.6 *CAC (Mode C altitude code).* This 13-bit (76-88) subfield shall denote the Mode C altitude code of the reporting aircraft.

Coding

Bit	76	77	78	79	80	81	82	83	84	85	86	87	88
Mode C code bit	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

Note.— Structure of MU for an RA broadcast:

33	37	41	55	59	60	61	63	76
UDS1 = 3	UDS2 = 1	ARA	RAC	RAT	MTE	-2-	AID	CAC
36	40	54	58	59	60	62	75	88

4.3.8.4.2.4 *MV field.* This 56-bit (33-88) field of long air-air surveillance replies (Figure 4-1) shall be used to transmit air-air coordination reply messages.

4.3.8.4.2.4.1 *VDS (V-definition subfield).* This 8-bit (33-40) subfield shall define the remainder of MV.

Note.— For convenience in coding, VDS is expressed in two groups of four bits each, VDS1 and VDS2.

4.3.8.4.2.4.2 *Subfields in MV for a coordination reply.* When VDS1 = 3 and VDS2 = 0, the following subfields shall be contained in MV:

4.3.8.4.2.4.2.1 *ARA (active RAs).* This 14-bit (41-54) subfield shall be coded as defined in 4.3.8.4.2.2.1.1.

4.3.8.4.2.4.2.2 *RAC (RACs record).* This 4-bit (55-58) subfield shall be coded as defined in 4.3.8.4.2.2.1.2.

4.3.8.4.2.4.2.3 *RAT (RA terminated indicator).* This 1-bit (59) subfield shall be coded as defined in 4.3.8.4.2.2.1.3.

4.3.8.4.2.4.2.4 *MTE (multiple threat encounter).* This 1-bit (60) subfield shall be coded as defined in 4.3.8.4.2.2.1.4.

Note.— Structure of MV for a coordination reply:

33	37	41	55	59	60	61
VDS1 = 3	VDS2 = 0	ARA	RAC	RAT	MTE	-28-
36	40	54	58	59	60	88

4.3.8.4.2.5 *SL (sensitivity level report).* This 3-bit (9-11) downlink field shall be included in both short and long air-air reply formats (DF = 0 and 16). This field shall denote the sensitivity level at which ACAS is currently operating.

Coding

0 ACAS inoperative
1 ACAS is operating at sensitivity level 1
2 ACAS is operating at sensitivity level 2
3 ACAS is operating at sensitivity level 3
4 ACAS is operating at sensitivity level 4
5 ACAS is operating at sensitivity level 5
6 ACAS is operating at sensitivity level 6
7 ACAS is operating at sensitivity level 7

4.3.9 ACAS equipment characteristics

4.3.9.1 *Interfaces.* As a minimum, the following input data shall be provided to the ACAS:

a) aircraft address code;

b) air-air and ground-air Mode S transmissions received by the Mode S transponder for use by ACAS (4.3.6.3.2);

c) own aircraft's maximum cruising true airspeed capability (Chapter 3, 3.1.2.8.2.2);

d) pressure altitude; and

e) radio altitude.

Note.— Specific requirements for additional inputs for ACAS II and III are listed in the appropriate sections below.

4.3.9.2 *Aircraft antenna system.* ACAS shall transmit interrogations and receive replies via two antennas, one mounted on the top of the aircraft and the other on the bottom of the aircraft. The top-mounted antenna shall be directional and capable of being used for direction finding.

4.3.9.2.1 *Polarization.* Polarization of ACAS transmissions shall be nominally vertical.

4.3.9.2.2 *Radiation pattern.* The radiation pattern in elevation of each antenna when installed on an aircraft shall be nominally equivalent to that of a quarter-wave monopole on a ground plane.

4.3.9.2.3 *ANTENNA SELECTION*

4.3.9.2.3.1 *Squitter reception*. ACAS shall be capable of receiving squitters via the top and bottom antennas.

4.3.9.2.3.2 *Interrogations.* ACAS interrogations shall not be transmitted simultaneously on both antennas.

4.3.9.3 *Pressure altitude source*. The altitude data for own aircraft provided to ACAS shall be obtained from the source that provides the basis for own Mode C or Mode S reports and they shall be provided at the finest quantization available.

4.3.9.3.1 **Recommendation.—** *A source providing a resolution finer than 7.62 m (25 ft) should be used.*

4.3.9.3.2 Where a source providing a resolution finer than 7.62 m (25 ft) is not available, and the only altitude data available for own aircraft is Gilham encoded, at least two independent sources shall be used and compared continuously in order to detect encoding errors.

4.3.9.3.3 **Recommendation.—** *Two altitude data sources should be used and compared in order to detect errors before provision to ACAS.*

4.3.9.3.4 The provisions of 4.3.10.3 shall apply when the comparison of the two altitude data sources indicates that one of the sources is in error.

4.3.10 Monitoring

4.3.10.1 *Monitoring function.* ACAS shall continuously perform a monitoring function in order to provide a warning if any of the following conditions at least are satisfied:

a) there is no interrogation power limiting due to interference control (4.3.2.2.2) and the maximum radiated power is reduced to less than that necessary to satisfy the surveillance requirements specified in 4.3.2; or

b) any other failure in the equipment is detected which results in a reduced capability of providing TAs or RAs; or

c) data from external sources indispensable for ACAS operation are not provided, or the data provided are not credible.

4.3.10.2 *Effect on ACAS operation.* The ACAS monitoring function shall not adversely affect other ACAS functions.

4.3.10.3 *Monitoring response.* When the monitoring function detects a failure (4.3.10.1), ACAS shall:

a) indicate to the flight crew that an abnormal condition exists;

b) prevent any further ACAS interrogations; and

c) cause any Mode S transmission containing own aircraft's resolution capability to indicate that ACAS is not operating.

4.3.11 Requirements for a Mode S transponder used in conjunction with ACAS

4.3.11.1 *Transponder capabilities.* In addition to the minimum transponder capabilities defined in Chapter 3, 3.1, the Mode S transponder used in conjunction with ACAS shall have the following capabilities:

a) ability to handle the following formats:

Format No.	*Format name*
UF = 16	Long air-air surveillance interrogation
DF = 16	Long air-air surveillance reply

b) ability to receive long Mode S interrogations (UF = 16) and generate long Mode S replies (DF = 16) at a continuous rate of 16.6 ms (60 per second);

c) means for delivering the ACAS data content of all accepted interrogations addressed to the ACAS equipment;

d) antenna diversity (as specified in Chapter 3, 3.1.2.10.4);

e) mutual suppression capability; and

f) inactive state transponder output power restriction.

When the Mode S transponder transmitter is in the inactive state, the peak pulse power at 1 090 MHz ±3 MHz at the terminals of the Mode S transponder antenna shall not exceed –70 dBm.

4.3.11.2 Data transfer between ACAS and its Mode S transponder

4.3.11.2.1 *Data transfer from ACAS to its Mode S transponder:*

a) The Mode S transponder shall receive from its ACAS RA information for transmission in an RA report (4.3.8.4.2.2.1) and in a coordination reply (4.3.8.4.2.4.2);

b) the Mode S transponder shall receive from its ACAS current sensitivity level for transmission in a sensitivity level report (4.3.8.4.2.5);

c) the Mode S transponder shall receive from its ACAS capability information for transmission in a data link capability report (4.3.8.4.2.2.2) and for transmission in the RI field of air-air downlink formats DF = 0 and DF = 16 (4.3.8.4.1.2); and

d) the Mode S transponder shall receive from its ACAS an indication that RAs are enabled or inhibited for transmission in the RI field of downlink formats 0 and 16.

4.3.11.2.2 *Data transfer from Mode S transponder to its ACAS:*

a) The Mode S transponder shall transfer to its ACAS received sensitivity level control commands (4.3.8.4.2.1.1) transmitted by Mode S stations;

b) the Mode S transponder shall transfer to its ACAS received ACAS broadcast messages (4.3.8.4.2.3.3) transmitted by other ACASs;

c) the Mode S transponder shall transfer to its ACAS received resolution messages (4.3.8.4.2.3.2) transmitted by other ACASs for air-air coordination purposes; and

d) the Mode S transponder shall transfer to its ACAS own aircraft's Mode A identity data for transmission in an RA broadcast (4.3.8.4.2.3.4.5).

4.3.11.3 COMMUNICATION OF ACAS INFORMATION TO OTHER ACAS

4.3.11.3.1 *Surveillance reply.* The ACAS Mode S transponder shall use the short (DF = 0) or long (DF = 16) surveillance formats for replies to ACAS surveillance interrogations. The surveillance reply shall include the VS field as specified in Chapter 3, 3.1.2.8.2, the RI field as specified in Chapter 3, 3.1.2.8.2 and in 4.3.8.4.1.2, and the SL field as specified in 4.3.8.4.2.5.

4.3.11.3.2 *Coordination reply.* The ACAS Mode S transponder shall transmit a coordination reply upon receipt of a coordination interrogation from an equipped threat subject to the conditions of 4.3.11.3.2.1. The coordination reply shall use the long air-air surveillance reply format, DF = 16, with the VS field as specified in Chapter 3, 3.1.2.8.2, the RI field as specified in Chapter 3, 3.1.2.8.2 and in 4.3.8.4.1.2, the SL field as specified in 4.3.8.4.2.5 and the MV field as specified in 4.3.8.4.2.4. Coordination replies shall be transmitted even if the minimum reply rate limits of the transponder (Chapter 3, 3.1.2.10.3.7.2) are exceeded.

4.3.11.3.2.1 The ACAS Mode S transponder shall reply with a coordination reply to a coordination interrogation received from another ACAS if and only if the transponder is able to deliver the ACAS data content of the interrogation to its associated ACAS.

4.3.11.4 COMMUNICATION OF ACAS INFORMATION TO GROUND STATIONS

4.3.11.4.1 *RA reports to Mode S ground stations.* During the period of an RA and for 18±1 s following the end of the RA, the ACAS Mode S transponder shall indicate that it has an RA report by setting the appropriate DR field code in replies to a Mode S sensor as specified in 4.3.8.4.1.1. The RA report shall include the MB field as specified in 4.3.8.4.2.2.1. The RA report shall describe the most recent RA that existed during the preceding 18±1 s period.

Note.— Upon receipt of a reply with DR = 2, 3, 6 or 7, a Mode S ground station may request downlink of the RA report by setting RR = 19 and either DI ≠ 7, or DI = 7 and RRS = 0 in a surveillance or Comm-A interrogation to the ACAS aircraft. When this interrogation is received, the transponder replies with a Comm-B reply whose MB field contains the RA report.

4.3.11.4.2 *Data link capability report.* The presence of an ACAS shall be indicated by its Mode S transponder to a ground station in the Mode S data link capability report.

Note.— This indication causes the transponder to set codes in a data link capability report as specified in 4.3.8.4.2.2.2.

4.3.12 Indications to the flight crew

4.3.12.1 CORRECTIVE AND PREVENTIVE RAS

Recommendation.— *Indications to the flight crew should distinguish between preventive and corrective RAs.*

4.3.12.2 ALTITUDE CROSSING RAs

Recommendation.— *If ACAS generates an altitude crossing RA, a specific indication should be given to the flight crew that it is crossing.*

4.4 PERFORMANCE OF THE ACAS II COLLISION AVOIDANCE LOGIC

Note.— Caution is to be observed when considering potential improvements to the reference ACAS II system described in Section 4 of the guidance material in Attachment A since changes may affect more than one aspect of the system performance. It is essential that alternative designs would not degrade the performances of other designs and that such compatibility is demonstrated with a high degree of confidence.

4.4.1 Definitions relating to the performance of the collision avoidance logic

Note.— The notation $[t_1, t_2]$ is used to indicate the interval between t_1 and t_2.

Altitude layer. Each encounter is attributed to one of six altitude layers as follows:

Layer	*1*	*2*	*3*	*4*	*5*	*6*
from		2 300 ft	5000 ft	10 000 ft	20 000 ft	41 000 ft
to	2 300 ft	5 000 ft	10 000 ft	20 000 ft	41 000 ft	

The altitude layer of an encounter is determined by the average altitude of the two aircraft at closest approach.

Note.— For the purposes of defining the performance of the collision avoidance logic, there is no need to specify the physical basis of the altitude measurement or the relationship between altitude and ground level.

Approach angle. The difference in the ground headings of the two aircraft at closest approach, with 180 degrees defined as head on and 0 degrees defined as parallel.

Crossing encounter. An encounter in which the altitude separation of the two aircraft exceeds 100 ft at the beginning and at the end of the encounter window, and the relative vertical position of two aircraft at the end of the encounter window is reversed from that at the beginning of the encounter window.

Encounter. For the purposes of defining the performance of the collision avoidance logic, an encounter consists of two simulated aircraft trajectories. The horizontal coordinates of the aircraft represent the actual position of the aircraft but the vertical coordinate represents an altimeter measurement of altitude.

Encounter class. Encounters are classified according to whether or not the aircraft are transitioning at the beginning and end of the encounter window, and whether or not the encounter is crossing.

Encounter window. The time interval [*tca* – 40 s, *tca* + 10 s].

Horizontal miss distance (hmd). The minimum horizontal separation observed in an encounter.

Level aircraft. An aircraft that is not transitioning.

Original trajectory. The original trajectory of an ACAS-equipped aircraft is that followed by the aircraft in the same encounter when it was not ACAS equipped.

Original rate. The original rate of an ACAS-equipped aircraft at any time is its altitude rate at the same time when it followed the original trajectory.

Required rate. For the standard pilot model, the required rate is that closest to the original rate consistent with the RA.

tca. Nominally, the time of closest approach. For encounters in the standard encounter model (4.4.2.6), a reference time for the construction of the encounter at which various parameters, including the vertical and horizontal separation (*vmd* and *hmd*), are specified.

Note.— Encounters in the standard encounter model (4.4.2.6) are constructed by building the trajectories of the two aircraft outwards starting at tca. *When the process is complete,* tca *may not be the precise time of closest approach and differences of a few seconds are acceptable.*

Transitioning aircraft. An aircraft having an average vertical rate with a magnitude exceeding 400 feet per minute (ft/min), measured over some period of interest.

Turn extent. A heading difference defined as an aircraft's ground heading at the end of a turn minus its ground heading at the beginning of the turn.

Vertical miss distance (**vmd*****).*** Notionally, the vertical separation at closest approach. For encounters in the standard encounter model (4.4.2.6), by construction the vertical separation at the time *tca*.

4.4.2 Conditions under which the requirements apply

4.4.2.1 The following assumed conditions shall apply to the performance requirements specified in 4.4.3 and 4.4.4:

a) range and bearing measurements and an altitude report are available for the intruder each cycle as long as it is within 14 NM, but not when the range exceeds 14 NM;

b) the errors in the range and bearing measurements conform to standard range and bearing error models (4.4.2.2 and 4.4.2.3);

c) the intruder's altitude reports, which are its Mode C replies, are expressed in 100 ft quanta;

d) an altitude measurement that has not been quantized and is expressed with a precision of 1 ft or better is available for own aircraft;

e) errors in the altitude measurements for both aircraft are constant throughout any particular encounter;

f) the errors in the altitude measurements for both aircraft conform to a standard altimetry error model (4.4.2.4);

g) the pilot responses to RAs conform to a standard pilot model (4.4.2.5);

h) the aircraft operate in an airspace in which close encounters, including those in which ACAS generates an RA, conform to a standard encounter model (4.4.2.6);

i) ACAS-equipped aircraft are not limited in their ability to perform the manoeuvres required by their RAs; and

j) as specified in 4.4.2.7:

1) the intruder involved in each encounter is not equipped (4.4.2.7 a)); or

2) the intruder is ACAS-equipped but follows a trajectory identical to that in the unequipped encounter (4.4.2.7 b)); or

3) the intruder is equipped with an ACAS having a collision avoidance logic identical to that of own ACAS (4.4.2.7 c)).

Note.— The phrase "altitude measurement" refers to a measurement by an altimeter prior to any quantization.

4.4.2.1.1 The performance of the collision avoidance logic shall not degrade abruptly as the statistical distribution of the altitude errors or the statistical distributions of the various parameters that characterize the standard encounter model or the response of pilots to the advisories are varied, when surveillance reports are not available on every cycle or when the quantization of the altitude measurements for the intruder is varied or the altitude measurements for own aircraft are quantized.

4.4.2.2 Standard range error model

The errors in the simulated range measurements shall be taken from a Normal distribution with mean 0 ft and standard deviation 50 ft.

4.4.2.3 Standard bearing error model

The errors in the simulated bearing measurements shall be taken from a Normal distribution with mean 0.0 degrees and standard deviation 10.0 degrees.

4.4.2.4 Standard altimetry error model

4.4.2.4.1 The errors in the simulated altitude measurements shall be assumed to be distributed as a Laplacian distribution with zero mean having probability density

$$p(e) = \frac{1}{2\lambda}\exp\left(-\frac{|e|}{\lambda}\right)$$

4.4.2.4.2 The parameter λ required for the definition of the statistical distribution of altimeter error for each aircraft shall have one of two values, λ_1 and λ_2, which depend on the altitude layer of the encounter as follows:

Layer	*1*		*2*		*3*		*4*		*5*		*6*	
	m	*ft*	*m*	*ft*	*m*	*ft*	*m*	*ft*	*m*	*ft*	*m*	*ft*
λ_1	10	35	11	38	13	43	17	58	22	72	28	94
λ_2	18	60	18	60	21	69	26	87	30	101	30	101

4.4.2.4.3 For an aircraft equipped with ACAS the value of λ shall be λ_1.

4.4.2.4.4 For aircraft not equipped with ACAS, the value of λ shall be selected randomly using the following probabilities:

Layer	*1*	*2*	*3*	*4*	*5*	*6*
prob(λ_1)	0.391	0.320	0.345	0.610	0.610	0.610
prob(λ_2)	0.609	0.680	0.655	0.390	0.390	0.390

4.4.2.5 Standard pilot model

The standard pilot model used in the assessment of the performance of the collision avoidance logic shall be that:

a) any RA is complied with by accelerating to the required rate (if necessary) after an appropriate delay;

b) when the aircraft's current rate is the same as its original rate and the original rate complies with the RA, the aircraft continues at its original rate, which is not necessarily constant due to the possibility of acceleration in the original trajectory;

c) when the aircraft is complying with the RA, its current rate is the same as the original rate and the original rate changes and consequently becomes inconsistent with the RA, the aircraft continues to comply with the RA;

d) when an initial RA requires a change in altitude rate, the aircraft responds with an acceleration of 0.25 *g* after a delay of 5 s from the display of the RA;

e) when an RA is modified and the original rate complies with the modified RA, the aircraft returns to its original rate (if necessary) with the acceleration specified in g) after the delay specified in h);

f) when an RA is modified and the original rate does not comply with the modified RA, the aircraft responds to comply with the RA with the acceleration specified in g) after the delay specified in h);

g) the acceleration used when an RA is modified is 0.25 *g* unless the modified RA is a reversed sense RA or an increased rate RA in which case the acceleration is 0.35 *g*;

h) the delay used when an RA is modified is 2.5 s unless this results in the acceleration starting earlier than 5 s from the initial RA in which case the acceleration starts 5 s from the initial RA; and

i) when an RA is cancelled, the aircraft returns to its original rate (if necessary) with an acceleration of 0.25 *g* after a delay of 2.5 s.

4.4.2.6 STANDARD ENCOUNTER MODEL

4.4.2.6.1 *ELEMENTS OF THE STANDARD ENCOUNTER MODEL*

4.4.2.6.1.1 In order to calculate the effect of ACAS on the risk of collision (4.4.3) and the compatibility of ACAS with air traffic management (ATM) (4.4.4), sets of encounters shall be created for each of:

a) the two aircraft address orderings;

b) the six altitude layers;

c) nineteen encounter classes; and

d) nine or ten *vmd* bins as specified in 4.4.2.6.2.4.

The results for these sets shall be combined using the relative weightings given in 4.4.2.6.2.

4.4.2.6.1.1.1 Each set of encounters shall contain at least 500 independent, randomly generated encounters.

4.4.2.6.1.1.2 The two aircraft trajectories in each encounter shall be constructed with the following randomly selected characteristics:

a) in the vertical plane:

1) a *vmd* from within the appropriate *vmd* bin;

2) a vertical rate for each aircraft at the beginning of the encounter window, $\dot{z}_1$, and at the end of the encounter window, $\dot{z}_2$;

3) a vertical acceleration; and

4) a start time for the vertical acceleration; and

b) and in the horizontal plane:

1) an *hmd*;

2) an approach angle;

3) a speed for each aircraft at closest approach;

4) a decision for each aircraft whether or not it turns;

5) the turn extent; the bank angle; and the turn end time;

6) a decision for each aircraft whether or not its speed changes; and

7) the magnitude of the speed change.

Note.— It is possible for the selections made for the various characteristics of an encounter to be irreconcilable. When this occurs, the problem can be resolved by discarding either the selection for a particular characteristic or the whole encounter, as most appropriate.

4.4.2.6.1.3 Two models shall be used for the statistical distribution of *hmd* (4.4.2.6.4.1). For calculations of the effect of ACAS on the risk of collision (4.4.3), *hmd* shall be constrained to be less than 500 ft. For calculations of the compatibility of ACAS with ATM (4.4.4), *hmd* shall be selected from a larger range of values (4.4.2.6.4.1.2).

Note.— 4.4.2.6.2 and 4.4.2.6.3 specify vertical characteristics for the aircraft trajectories in the standard encounter model that depend on whether the hmd *is constrained to be small ("for calculating risk ratio") or can take larger values ("for ATM compatibility"). Otherwise, the characteristics of the encounters in the vertical and horizontal planes are independent.*

4.4.2.6.2 ENCOUNTER CLASSES AND WEIGHTS

4.4.2.6.2.1 *Aircraft address.* Each aircraft shall be equally likely to have the higher aircraft address.

4.4.2.6.2.2 *Altitude layers.* The relative weights of the altitude layers shall be as follows:

Layer	*1*	*2*	*3*	*4*	*5*	*6*
prob(layer)	0.13	0.25	0.32	0.22	0.07	0.01

4.4.2.6.2.3 *Encounter classes*

4.4.2.6.2.3.1 The encounters shall be classified according to whether the aircraft are level (L) or transitioning (T) at the beginning (before *tca*) and end (after *tca*) of the encounter window and whether or not the encounter is crossing, as follows:

	Aircraft No. 1		*Aircraft No. 2*		
Class	*before* tca	*after* tca	*before* tca	*after* tca	*Crossing*
1	L	L	T	T	yes
2	L	L	L	T	yes
3	L	L	T	L	yes
4	T	T	T	T	yes
5	L	T	T	T	yes
6	T	T	T	L	yes
7	L	T	L	T	yes
8	L	T	T	L	yes
9	T	L	T	L	yes
10	L	L	L	L	no
11	L	L	T	T	no
12	L	L	L	T	no
13	L	L	T	L	no
14	T	T	T	T	no

Class	*Aircraft No. 1* *before* tca	*after* tca	*Aircraft No. 2* *before* tca	*after* tca	*Crossing*
15	L	T	T	T	no
16	T	T	T	L	no
17	L	T	L	T	no
18	L	T	T	L	no
19	T	L	T	L	no

4.4.2.6.2.3.2 The relative weights of the encounter classes shall depend on layer as follows:

Class	*for calculating risk ratio* *Layers 1-3*	*Layers 4-6*	*for ATM compatibility* *Layers 1-3*	*Layers 4-6*
1	0.00502	0.00319	0.06789	0.07802
2	0.00030	0.00018	0.00408	0.00440
3	0.00049	0.00009	0.00664	0.00220
4	0.00355	0.00270	0.04798	0.06593
5	0.00059	0.00022	0.00791	0.00549
6	0.00074	0.00018	0.00995	0.00440
7	0.00002	0.00003	0.00026	0.00082
8	0.00006	0.00003	0.00077	0.00082
9	0.00006	0.00003	0.00077	0.00082
10	0.36846	0.10693	0.31801	0.09011
11	0.26939	0.41990	0.23252	0.35386
12	0.06476	0.02217	0.05590	0.01868
13	0.07127	0.22038	0.06151	0.18571
14	0.13219	0.08476	0.11409	0.07143
15	0.02750	0.02869	0.02374	0.02418
16	0.03578	0.06781	0.03088	0.05714
17	0.00296	0.00098	0.00255	0.00082
18	0.00503	0.00522	0.00434	0.00440
19	0.01183	0.03651	0.01021	0.03077

4.4.2.6.2.4 vmd *bins*

4.4.2.6.2.4.1 The *vmd* of each encounter shall be taken from one of ten *vmd* bins for the non-crossing encounter classes, and from one of nine or ten *vmd* bins for the crossing encounter classes. Each *vmd* bin shall have an extent of 100 ft for calculating risk ratio, or an extent of 200 ft for calculating compatibility with ATM. The maximum *vmd* shall be 1 000 ft for calculating risk ratio, and 2 000 ft otherwise.

4.4.2.6.2.4.2 For non-crossing encounter classes, the relative weights of the *vmd* bins shall be as follows:

vmd *bin*	*for calculating risk ratio*	*for ATM compatibility*
1	0.013	0.128
2	0.026	0.135
3	0.035	0.209
4	0.065	0.171
5	0.100	0.160
6	0.161	0.092
7	0.113	0.043
8	0.091	0.025
9	0.104	0.014
10	0.091	0.009

Note.— The weights for the vmd *bins do not sum to 1.0. The weights specified are based on an analysis of encounters captured in ATC ground radar data. The missing proportion reflects the fact that the encounters captured included some with* vmd *exceeding the maximum* vmd *in the model.*

4.4.2.6.2.4.3 For the crossing classes, the relative weights of the *vmd* bins shall be as follows:

vmd *bin*	*for calculating risk ratio*	*for ATM compatibility*
1	0.0	0.064
2	0.026	0.144
3	0.036	0.224
4	0.066	0.183
5	0.102	0.171
6	0.164	0.098
7	0.115	0.046
8	0.093	0.027
9	0.106	0.015
10	0.093	0.010

Note.— For the crossing classes, vmd *must exceed 100 ft so that the encounter qualifies as a crossing encounter. Thus, for the calculation of risk ratio there is no* vmd *bin 1, and for calculations of the compatibility with ATM* vmd *bin 1 is limited to [100 ft, 200 ft].*

4.4.2.6.3 CHARACTERISTICS OF THE AIRCRAFT TRAJECTORIES IN THE VERTICAL PLANE

4.4.2.6.3.1 *vmd*. The *vmd* for each encounter shall be selected randomly from a distribution that is uniform in the interval covered by the appropriate *vmd* bin.

4.4.2.6.3.2 *Vertical rate*

4.4.2.6.3.2.1 For each aircraft in each encounter, either the vertical rate shall be constant ($\dot{z}$) or the vertical trajectory shall be constructed so that the vertical rate at *tca* – 35 s is $\dot{z}_1$ and the vertical rate at *tca* + 5 s is $\dot{z}_2$. Each vertical rate, $\dot{z}$, $\dot{z}_1$ or $\dot{z}_2$, shall be determined by first selecting randomly an interval within which it lies and then selecting the precise value from a distribution that is uniform over the interval selected.

4.4.2.6.3.2.2 The intervals within which the vertical rates lie shall depend on whether the aircraft is level, i.e. marked "L" in 4.4.2.6.2.3.1, or transitioning, i.e. marked "T" in 4.4.2.6.2.3.1, and shall be as follows:

L	*T*
[240 ft/min, 400 ft/min]	[3 200 ft/min, 6 000 ft/min]
[80 ft/min, 240 ft/min]	[400 ft/min, 3200 ft/min]
[–80 ft/min, 80 ft/min]	[–400 ft/min, 400 ft/min]
[–240 ft/min, –80 ft/min]	[–3 200 ft/min, –400 ft/min]
[–400 ft/min, –240 ft/min]	[–6 000 ft/min, –3 200 ft/min]

4.4.2.6.3.2.3 For aircraft that are level over the entire encounter window, the vertical rate $\dot{z}$ shall be constant. The probabilities for the intervals within which $\dot{z}$ lies shall be as follows:

$\dot{z}$ *(ft/min)*	*prob(*$\dot{z}$*)*
[240 ft/min, 400 ft/min]	0.0382
[80 ft/min, 240 ft/min]	0.0989
[–80 ft/min, 80 ft/min]	0.7040
[–240 ft/min, –80 ft/min]	0.1198
[–400 ft/min, –240 ft/min]	0.0391

4.4.2.6.3.2.4 For aircraft that are not level over the entire encounter window, the intervals for $\dot{z}_1$ and $\dot{z}_2$ shall be determined jointly by random selection using joint probabilities that depend on altitude layer and on whether the aircraft is transitioning at the beginning of the encounter window (Rate-to-Level), at the end of the encounter window (Level-to-Rate) or at both the beginning and the end (Rate-to-Rate). The joint probabilities for the vertical rate intervals shall be as follows:

for aircraft with Rate-to-Level trajectories in layers 1 to 3,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[240 ft/min, 400 ft/min]	0.0019	0.0169	0.0131	0.1554	0.0000
[80 ft/min, 240 ft/min]	0.0000	0.0187	0.0019	0.1086	0.0000
[–80 ft/min, 80 ft/min]	0.0037	0.1684	0.0094	0.1124	0.0075
[–240 ft/min, –80 ft/min]	0.0037	0.1461	0.0094	0.0243	0.0037
[–400 ft/min, –240 ft/min]	0.0000	0.1742	0.0094	0.0094	0.0019

–6 000 ft/min –3 200 ft/min –400 ft/min 400 ft/min 3 200 ft/min 6 000 ft/min $\dot{z}_1$

for aircraft with Rate-to-Level trajectories in layers 4 to 6,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[240 ft/min, 400 ft/min]	0.0105	0.0035	0.0000	0.1010	0.0105
[80 ft/min, 240 ft/min]	0.0035	0.0418	0.0035	0.1776	0.0279
[–80 ft/min, 80 ft/min]	0.0279	0.1219	0.0000	0.2403	0.0139
[–240 ft/min, –80 ft/min]	0.0035	0.0767	0.0000	0.0488	0.0105
[–400 ft/min, –240 ft/min]	0.0105	0.0453	0.0035	0.0174	0.0000

–6 000 ft/min –3 200 ft/min –400 ft/min 400 ft/min 3 200 ft/min 6 000 ft/min $\dot{z}_1$

for aircraft with Level-to-Rate trajectories in layers 1 to 3,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[3 200 ft/min, 6 000 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000
[400 ft/min, 3 200 ft/min]	0.0074	0.0273	0.0645	0.0720	0.1538
[–400 ft/min, 400 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000
[–3 200 ft/min, –400 ft/min]	0.2978	0.2084	0.1365	0.0273	0.0050
[–6 000ft/min, –3 200ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000

–400 ft/min –240 ft/min –80 ft/min 80 ft/min 240 ft/min 400 ft/min $\dot{z}_1$

for aircraft with Level-to-Rate trajectories in layers 4 to 6,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[3 200 ft/min, 6 000 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0192
[400 ft/min, 3 200 ft/min]	0.0000	0.0000	0.0962	0.0577	0.1154
[–400 ft/min, 400 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000
[–3 200 ft/min, –400 ft/min]	0.1346	0.2692	0.2308	0.0577	0.0192
[–6 000 ft/min, –3 200 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000

–400 ft/min –240 ft/min –80 ft/min 80 ft/min 240 ft/min 400 ft/min $\dot{z}_1$

for aircraft with Rate-to-Rate trajectories in layers 1 to 3,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[3 200 ft/min, 6 000 ft/ min]	0.0000	0.0000	0.0007	0.0095	0.0018
[400 ft/min, 3 200 ft/min]	0.0000	0.0018	0.0249	0.2882	0.0066
[–400 ft/min, 400 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000
[–3 200 ft/min, –400 ft/min]	0.0048	0.5970	0.0600	0.0029	0.0011
[–6 000 ft/min, –3 200 ft/min]	0.0000	0.0007	0.0000	0.0000	0.0000

−6 000 ft/min −3 200 ft/min –400 ft/min 400 ft/min 3 200 ft/min 6 000 ft/min $\dot{z}_1$

for aircraft with Rate-to-Rate trajectories in layers 4 to 6,

$\dot{z}_2$ interval	*joint probability of $\dot{z}_1$ and $\dot{z}_2$ intervals*				
[3 200 ft/min, 6 000 ft/ min]	0.0014	0.0000	0.0028	0.0110	0.0069
[400 ft/min, 3 200 ft/min]	0.0028	0.0028	0.0179	0.4889	0.0523
[–400 ft/min, 400 ft/min]	0.0000	0.0000	0.0000	0.0000	0.0000
[–3 200 ft/min, –400 ft/min]	0.0317	0.3029	0.0262	0.0152	0.0028
[–6 000 ft/min, –3 200 ft/min]	0.0110	0.0220	0.0014	0.0000	0.0000

−6 000 ft/min −3 200 ft/min –400 ft/min 400 ft/min 3 200 ft/min 6 000 ft/min $\dot{z}_1$

4.4.2.6.3.2.5 For a Rate-to-Rate track, if line $|\dot{z}_2 - \dot{z}_1| < 566$ ft/min then the track shall be constructed with a constant rate equal to $\dot{z}_1$.

4.4.2.6.3.3 *Vertical acceleration*

4.4.2.6.3.3.1 Subject to 4.4.2.6.3.2.5, for aircraft that are not level over the entire encounter window, the rate shall be constant and equal to $\dot{z}_1$ over at least the interval [*tca* – 40 s, *tca* – 35 s] at the beginning of the encounter window, and shall be constant and equal to $\dot{z}_2$ over at least the interval [*tca* + 5 s, *tca* + 10 s] at the end of the encounter window. The vertical acceleration shall be constant in the intervening period.

4.4.2.6.3.3.2 The vertical acceleration ($\ddot{z}$) shall be modelled as follows:

$$\ddot{z} = (A\dot{z}_2 - \dot{z}_1) + \varepsilon$$

where the parameter A is case-dependent as follows:

	$A(s^{-1})$	
Case	*Layers 1-3*	*Layers 4-6*
Rate-to-Level	0.071	0.059
Level-to-Rate	0.089	0.075
Rate-to-Rate	0.083	0.072

and the error ε is selected randomly using the following probability density:

$$p(\varepsilon) = \frac{1}{2\mu}\exp\left(-\frac{|\varepsilon|}{\mu}\right)$$

where $\mu = 0.3$ ft s^{-2}.

Note.— The sign of the acceleration $\ddot{z}$ is determined by $\dot{z}_1$ and $\dot{z}_2$. An error ε that reverses this sign must be rejected and the error reselected.

4.4.2.6.3.4 *Acceleration start time*. The acceleration start time shall be distributed uniformly in the time interval [*tca* – 35 *s, tca* – 5 s] and shall be such that $\dot{z}_2$ is achieved no later than *tca* + 5 s.

4.4.2.6.4 CHARACTERISTICS OF THE AIRCRAFT TRAJECTORIES IN THE HORIZONTAL PLANE

4.4.2.6.4.1 *Horizontal miss distance*

4.4.2.6.4.1.1 For calculations of the effect of ACAS on the risk of collision (4.4.3), *hmd* shall be uniformly distributed in the range [0, 500 ft].

4.4.2.6.4.1.2 For calculations concerning the compatibility of ACAS with ATM (4.4.4), *hmd* shall be distributed so that the values of *hmd* have the following cumulative probabilities:

	cumulative probability			*cumulative probability*	
hmd *(ft)*	*Layers 1-3*	*Layers 4-6*	hmd *(ft)*	*Layers 1-3*	*Layers 4-6*
0	0.000	0.000	17 013	0.999	0.868
1 215	0.152	0.125	18 228	1.000	0.897
2 430	0.306	0.195	19 443		0.916
3 646	0.482	0.260	20 659		0.927
4 860	0.631	0.322	21 874		0.939
6 076	0.754	0.398	23 089		0.946
7 921	0.859	0.469	24 304		0.952
8 506	0.919	0.558	25 520		0.965
9 722	0.954	0.624	26 735		0.983
10 937	0.972	0.692	27 950		0.993
12 152	0.982	0.753	29 165		0.996
13 367	0.993	0.801	30 381		0.999
14 582	0.998	0.821	31 596		1.000
15 798	0.999	0.848			

4.4.2.6.4.2 *Approach angle.* The cumulative distribution for the horizontal approach angle shall be as follows:

approach	*cumulative probability*		*approach*	*cumulative probability*	
angle (deg.)	*Layers 1-3*	*Layers 4-6*	*angle (deg.)*	*Layers 1-3*	*Layers 4-6*
0	0.00	0.00	100	0.38	0.28
10	0.14	0.05	110	0.43	0.31
20	0.17	0.06	120	0.49	0.35
30	0.18	0.08	130	0.55	0.43
40	0.19	0.08	140	0.62	0.50
50	0.21	0.10	150	0.71	0.59
60	0.23	0.13	160	0.79	0.66
70	0.25	0.14	170	0.88	0.79
80	0.28	0.19	180	1.00	1.00
90	0.32	0.22			

4.4.2.6.4.3 *Aircraft speed.* The cumulative distribution for each aircraft's horizontal ground speed at closest approach shall be as follows:

ground speed (kt)	*cumulative probability Layers 1-3*	*Layers 4-6*	*ground speed (kt)*	*cumulative probability Layers 1-3*	*Layers 4-6*
45	0.000		325	0.977	0.528
50	0.005		350	0.988	0.602
75	0.024	0.000	375	0.997	0.692
100	0.139	0.005	400	0.998	0.813
125	0.314	0.034	425	0.999	0.883
150	0.486	0.064	450	1.000	0.940
175	0.616	0.116	475		0.972
200	0.700	0.171	500		0.987
225	0.758	0.211	525		0.993
250	0.821	0.294	550		0.998
275	0.895	0.361	575		0.999
300	0.949	0.427	600		1.000

4.4.2.6.4.4 *Horizontal manoeuvre probabilities.* For each aircraft in each encounter, the probability of a turn, the probability of a speed change given a turn, and the probability of a speed change given no turn shall be as follows:

Layer	*Prob(turn)*	*Prob(speed change) given a turn*	*Prob(speed change) given no turn*
1	0.31	0.20	0.50
2	0.29	0.20	0.25
3	0.22	0.10	0.15
4, 5, 6	0.16	0.05	0.10

4.4.2.6.4.4.1 Given a speed change, the probability of a speed increase shall be 0.5 and the probability of a speed decrease shall be 0.5.

4.4.2.6.4.5 *Turn extent.* The cumulative distribution for the extent of any turn shall be as follows:

Turn extent (deg.)	*cumulative probability Layers 1-3*	*Layers 4-6*
15	0.00	0.00
30	0.43	0.58
60	0.75	0.90
90	0.88	0.97
120	0.95	0.99
150	0.98	1.00
180	0.99	
210	1.00	

4.4.2.6.4.5.1 The direction of the turn shall be random, with the probability of a left turn being 0.5 and the probability of a right turn being 0.5.

4.4.2.6.4.6 *Bank angle.* An aircraft's bank angle during a turn shall not be less than 15 degrees. The probability that it equals 15 degrees shall be 0.79 in layers 1-3 and 0.54 in layers 4-5. The cumulative distribution for larger bank angles shall be as follows:

Bank angle (deg.)	*cumulative probability Layers 1-3*	*Layers 4-6*
15	0.79	0.54
25	0.96	0.82
35	0.99	0.98
50	1.00	1.00

4.4.2.6.4.7 *Turn end time.* The cumulative distribution for each aircraft's turn end time shall be as follows:

Turn end time (seconds before tca)	*cumulative probability*	
	Layers 1-3	*Layers 4-6*
0	0.42	0.28
5	0.64	0.65
10	0.77	0.76
15	0.86	0.85
20	0.92	0.94
25	0.98	0.99
30	1.00	1.00

4.4.2.6.4.8 *Speed change.* A constant acceleration or deceleration shall be randomly selected for each aircraft performing a speed change in a given encounter, and shall be applied for the duration of the encounter. Accelerations shall be uniformly distributed between 2 kt/s and 6 kt/s. Decelerations shall be uniformly distributed between 1 kt/s and 3 kt/s.

4.4.2.7 ACAS EQUIPAGE OF THE INTRUDER

The performance requirements specified in 4.4.3 and 4.4.4 each apply to three distinct situations in which the following conditions concerning the intruder's ACAS and trajectory shall apply:

a) where the intruder involved in each encounter is not equipped (4.4.2.1 j) 1)), it follows a trajectory identical to that which it follows when own aircraft is not equipped;

b) where the intruder is ACAS-equipped but follows a trajectory identical to that in the unequipped encounter (4.4.2.1 j) 2)):

   1) it follows the identical trajectory regardless of whether or not there is an RA;

   2) the intruder ACAS generates an RA and transmits an RAC that is received immediately after any RA is first announced to the pilot of own aircraft;

   3) the sense of the RAC generated by the intruder ACAS and transmitted to own aircraft is opposite to the sense of the first RAC selected and transmitted to the intruder by own aircraft (4.3.6.1.3);

   4) the RAC transmitted by the intruder is received by own aircraft; and

   5) the requirements apply both when own aircraft has the lower aircraft address and when the intruder aircraft has the lower aircraft address; and

c) where the intruder is equipped with an ACAS having a collision avoidance logic identical to that of own ACAS (4.4.2.1 j) 3)):

   1) the conditions relating to the performance of own aircraft, ACAS and pilot apply equally to the intruder aircraft, ACAS and pilot;

   2) RACs transmitted by one aircraft are received by the other; and

   3) the requirements apply both when own aircraft has the lower aircraft address and when the intruder aircraft has the lower aircraft address.

4.4.2.8 COMPATIBILITY BETWEEN DIFFERENT COLLISION AVOIDANCE LOGIC DESIGNS

Recommendation.— *When considering alternative collision avoidance logic designs, certification authorities should verify that:*

a) the performances of the alternative design are acceptable in encounters involving ACAS units that use existing designs; and

b) the performances of the existing designs are not degraded by the use of the alternative design.

Note.— To address the compatibility between different collision avoidance logic designs, the conditions described in 4.4.2.7 b) are the most severe that can be anticipated in this respect.

4.4.3 Reduction in the risk of collision

Under the conditions of 4.4.2, the collision avoidance logic shall be such that the expected number of collisions is reduced to the following proportions of the number expected in the absence of ACAS:

a) when the intruder is not ACAS equipped 0.18;
b) when the intruder is equipped but does not respond 0.32; and
c) when the intruder is equipped and responds 0.04.

4.4.4 Compatibility with air traffic management (ATM)

4.4.4.1 Nuisance alert rate

4.4.4.1.1 Under the conditions of 4.4.2, the collision avoidance logic shall be such that the proportion of RAs which are a "nuisance" (4.4.4.1.2) shall not exceed:

.06 when own aircraft's vertical rate at the time the RA is first issued is less than 400 ft/min; or

.08 when own aircraft's vertical rate at the time the RA is first issued exceeds 400 ft/min.

Note.— This requirement is not qualified by the ACAS equipage of the intruder (4.4.2.7) since it has negligible effect on the occurrence and frequency of nuisance RAs.

4.4.4.1.2 An RA shall be considered a "nuisance" for the purposes of 4.4.4.1.1 unless, at some point in the encounter in the absence of ACAS, the horizontal separation and the vertical separation are simultaneously less than the following values:

	horizontal separation	*vertical separation*
above FL100	2.0 NM	750 ft
below FL100	1.2 NM	750 ft

4.4.4.2 Compatible sense selection

Under the conditions of 4.4.2, the collision avoidance logic shall be such that the proportion of encounters in which following the RA results in an altitude separation at closest approach with the opposite sign to that occurring in the absence of ACAS shall not exceed the following values:

a) when the intruder is not ACAS equipped .08;
b) when the intruder is equipped but does not respond .08; and
c) when the intruder is equipped and responds .12.

4.4.4.3 DEVIATIONS CAUSED BY ACAS

4.4.4.3.1 Under the conditions of 4.4.2, the collision avoidance logic shall be such that the number of RAs resulting in "deviations" (4.4.4.3.2) greater than the values indicated shall not exceed the following proportions of the total number of RAs:

	when own aircraft's vertical rate at the time the RA is first issued	
	is less than 400 ft/min	*exceeds 400 ft/min*
when the intruder is not ACAS equipped,		
for deviations ≥300ft	.15	.23
for deviations ≥600ft	.04	.13
for deviations ≥1 000ft	.01	.07
when the intruder is equipped but does not respond,		
for deviations ≥300ft	.23	.35
for deviations ≥600ft	.06	.16
for deviations ≥1 000ft	.02	.07
when the intruder is equipped and responds,		
for deviations ≥300ft	.11	.23
for deviations ≥600ft	.02	.12
for deviations ≥1 000ft	.01	.06

4.4.4.3.2 For the purposes of 4.4.4.3.1, the "deviation" of the equipped aircraft from the original trajectory shall be measured in the interval from the time at which the RA is first issued until the time at which, following cancellation of the RA, the equipped aircraft has recovered its original altitude rate. The deviation shall be calculated as the largest altitude difference at any time in this interval between the trajectory followed by the equipped aircraft when responding to its RA and its original trajectory.

4.4.5 Relative value of conflicting objectives

Recommendation.— *The collision avoidance logic should be such as to reduce as much as practicable the risk of collision (measured as defined in 4.4.3) and limit as much as practicable the disruption to ATM (measured as defined in 4.4.4).*

4.5 ACAS USE OF EXTENDED SQUITTER REPORTS

4.5.1 ACAS hybrid surveillance using extended squitter position data

Note.— Hybrid surveillance is the technique used by ACAS to take advantage of passive position information available via extended squitter. Using hybrid surveillance, ACAS validates the position provided by extended squitter through direct active range measurement. An initial validation is performed at track initiation. Revalidation is performed once per 10 seconds if the intruder becomes a near threat in altitude or range. Finally, regular active surveillance is performed once per second on intruders that become a near threat in both altitude and range. In this manner, passive surveillance (once validated) is used for non-threatening intruders thus lowering the ACAS interrogation rate. Active surveillance is used whenever an intruder becomes a near threat in order to preserve ACAS independence as an independent safety monitor.

4.5.1.1 DEFINITIONS

Active surveillance. The process of tracking an intruder by using the information gained from the replies to own aircraft's interrogations.

Active track. A track formed by measurements gained by active interrogation.

Hybrid surveillance. The process of using active surveillance to validate and monitor other aircraft being tracked principally using passive surveillance in order to preserve ACAS independence.

Initial acquisition. The process of starting the formation of a new track upon receipt of a squitter from a Mode S aircraft for which there is no track by making an active interrogation.

Initial validation. The process of verifying the relative position of a new track using passive information by comparing it to the relative position obtained by active interrogation.

Passive surveillance. The process of tracking another aircraft without interrogating it, by using the other aircraft's extended squitters. ACAS uses the information contained in passive tracks to monitor the need for active surveillance, but not for any other purpose.

Passive track. After initial acquisition, a track maintained without active interrogation, using information contained in extended squitters.

4.5.1.2 An ACAS equipped to receive extended squitter position reports for passive surveillance of non-threatening intruders shall utilize this passive position information in the following manner.

4.5.1.3 PASSIVE SURVEILLANCE

4.5.1.3.1 *Initial validation*. At initial acquisition of an aircraft reporting extended squitter information, ACAS shall determine the relative range and bearing as computed from the position of own aircraft and the intruder's position as reported in the extended squitter. This derived range and bearing and the altitude reported in the squitter shall be compared to the range, bearing and altitude determined by active ACAS interrogation of the aircraft. Differences between the derived and measured range and bearing and the squitter and squitter and reply altitude shall be computed and used in tests to determine whether the extended squitter data is valid. If these tests are satisfied the passive position shall be considered to be validated and the track shall be maintained on passive data. If any of the above tests fail, the track shall be declared an active track and no further use shall be made of the subsequent passive surveillance data received for this track.

4.5.1.3.2 **Recommendation.—** *The following tests should be used to validate the position reported in the extended squitter message:*

| *slant range difference* | ≤ *200 m; and*

| *bearing difference* | ≤ *45 degrees; and*

| *altitude difference* | ≤ *100 ft.*

4.5.1.3.3 *Supplementary active interrogations*. In order to ensure that an intruder's track is updated at least as frequently as required in the absence of extended squitter data (4.3.7.1.2.2), each time a track is updated using squitter information the time at which an active interrogation would next be required shall be calculated. An active interrogation shall be made at that time if a further squitter has not been received before the interrogation is due.

4.5.1.4 *Revalidation and monitoring.* If the following condition is met for a track being updated using passive surveillance data:

a) $|a| \leq 10\,000$ ft and either;

b) $|a| \leq 3\,000$ ft or $|a - 3\,000 \text{ ft}| / |\dot{a}| \leq 60$ s; or

c) $r \leq 3$ NM or $(r - 3 \text{ NM}) / |\dot{r}| \leq 60$ s;

where:
a = intruder altitude separation in ft
$\dot{a}$ = altitude rate estimate in ft/s
r = intruder slant range in NM
$\dot{r}$ = range rate estimate in NM/s

an active interrogation shall be made every 10 seconds to continuously revalidate and monitor the extended squitter data for as long as the above condition is met. The tests required in 4.5.1.3.1 shall be performed for each active surveillance. If any of these tests fail, the track shall be declared an active track.

4.5.1.5 *Full active surveillance.* If the following condition is met for a track being updated via passive surveillance data:

a) $|a| \leq 10\ 000$ ft and both;

b) $|a| \leq 3\ 000$ ft or $|a - 3\ 000 \text{ ft}| / |\dot{a}| \leq 60$ s; and

c) $r \leq 3$ NM or $(r - 3 \text{ NM}) / |\dot{r}| \leq 60$ s;

where: a = intruder altitude separation in ft
$\dot{a}$ = altitude rate estimate in ft/s
r = intruder slant range in NM
$\dot{r}$ = range rate estimate in NM/s

the aircraft shall be declared an active track and shall be updated on active range measurements once per second for as long as the above condition is met.

4.5.2 ACAS operation with an improved receiver MTL

Note.— Applications of extended squitter that are independent of ACAS might be implemented (for convenience) using the ACAS receiver. The use of an improved receiver minimum triggering level (MTL) will make it possible to receive extended squitters from ranges of up to 60 NM and beyond in support of such applications.

4.5.2.1 An ACAS operating with a receiver having a MTL more sensitive than –74 dBm shall implement the capabilities specified in the following paragraphs.

4.5.2.2 *Dual minimum triggering levels*. The ACAS receiver shall be capable of setting an indication for each squitter reception as to whether the reply would have been detected by an ACAS operating with a conventional MTL (–74 dBm). Squitter receptions received at the conventional MTL shall be passed to the ACAS surveillance function for further processing. Squitter receptions that do not meet this condition shall be not be passed to the ACAS surveillance function.

Note 1.— Extended squitters containing position report information will be disseminated for display in connection with an extended squitter application.

Note 2.— Use of the conventional MTL for the ACAS surveillance function preserves the current operation of ACAS surveillance when operating with a receiver with an improved MTL.

4.5.2.3 *Dual or re-triggerable reply processor.* The ACAS Mode S reply processing function shall:

a) use separate reply processors for Mode S reply formats received at or above the conventional MTL and a separate reply processor for Mode S reply formats received below the conventional MTL; or,

b) use a Mode S reply processor that will re-trigger if it detects a Mode S preamble that is 2 to 3 dB stronger than the reply that is currently being processed.

Note.— Care must be taken to ensure that low-level squitters (i.e. those below the conventional MTL) do not interfere with the processing of acquisition squitters for ACAS. This could happen if the low-level squitter is allowed to capture the reply processor. This can be prevented by using a separate reply processor for each function, or by requiring the reply processor to be re-triggered by a higher level squitter.

ATTACHMENT TO VOLUME IV

Guidance material related to airborne collision avoidance system (ACAS)

Note 1.— The following material is intended to provide guidance concerning the technical characteristics of the airborne collision avoidance system (ACAS) having vertical resolution capability (ACAS II, unless stated otherwise). ACAS SARPs are contained in Chapter 4.

Note 2.— Non-SI alternative units are used as permitted by Annex 5, Chapter 3, Section 3.2.2. In limited cases, to ensure consistency at the level of the logic calculations, units such as ft/s, NM/s and kt/s are used.

1. EQUIPMENT, FUNCTIONS AND CAPABILITIES

1.1 ACAS equipment characteristics

1.1.1 ACAS equipment includes an ACAS processing unit, Mode S transponder, control unit, appropriate antennas and means of providing advisories.

1.1.2 ACAS equipment in the aircraft interrogates SSR transponders on other aircraft in its vicinity and listens for the transponder replies. By computer analysis of these replies, the ACAS equipment determines which aircraft represent potential collision threats and provides appropriate indications (advisories) to the flight crew to avoid collisions.

1.1.3 ACAS equipment is capable of providing two classes of advisories. Traffic advisories (TAs) indicate the approximate positions of intruding aircraft that may later cause resolution advisories. Resolution advisories (RAs) propose vertical manoeuvres that are predicted to increase or maintain separation from threatening aircraft.

1.2 Advisories provided

1.2.1 Traffic advisories

TAs may indicate the range, range rate, altitude, altitude rate, and bearing of the intruding aircraft relative to own aircraft. TAs without altitude information may also be provided on Mode C or Mode S-equipped aircraft that do not have an automatic altitude reporting capability. The information conveyed in ACAS TAs is intended to assist the flight crew in sighting nearby traffic.

1.2.2 Resolution advisories

1.2.2.1 If the threat detection logic in the ACAS computer determines that an encounter with a nearby aircraft could lead to a near-collision or collision, the computer threat resolution logic determines an appropriate vertical manoeuvre that will ensure the safe vertical separation of the ACAS aircraft. The selected manoeuvre ensures adequate vertical separation within constraints imposed by the climb rate capability and proximity to the ground of the ACAS aircraft.

1.2.2.2 The RAs provided to the pilot can be divided into two categories: corrective advisories, which instruct the pilot to deviate from the current flight path (e.g. “CLIMB” when the aircraft is in level flight); and preventive advisories, which advise the pilot to maintain or avoid certain vertical speeds (e.g. “DON’T CLIMB” when the aircraft is in level flight).

1.2.2.3 Under normal circumstances, ACAS issues only one RA during an encounter with one or multiple intruders. The RA is issued when, or shortly after, the (first) intruder becomes a threat, is maintained as long as the (any) intruder remains a threat, and is cancelled when the (last) intruder ceases to be a threat. However, the indication given to the flight crew as part of that RA may be modified. It may be strengthened or even reversed when a threat modifies its altitude profile or when the detection of a second or third threat changes the initial assessment of the encounter. It may also be weakened when adequate separation has been achieved but the (any) intruder temporarily remains a threat.

1.2.3 Warning times

If a threat is detected, the ACAS equipment generates an RA some time before the closest approach of the aircraft. The amount of warning time depends on the protected volume selected for ACAS system use. The nominal resolution advisory time before closest approach used by ACAS varies from 15 to 35 seconds. A TA will nominally be issued between 5 and 20 seconds in advance of an RA. Warning times depend on sensitivity level as described in 3.5.12.

1.2.4 AIR-AIR COORDINATION OF RESOLUTION ADVISORIES

1.2.4.1 If the aircraft detected by the ACAS equipment has only a Mode A/C transponder and automatic pressure altitude reporting equipment, its pilot will not be aware that it is being tracked by the ACAS-equipped aircraft. When the pilot of the ACAS aircraft receives an RA in an encounter with such an aircraft and manoeuvres as advised, the ACAS aircraft will be able to avoid the intruding aircraft provided the intruder does not accelerate so as to defeat the manoeuvre of the ACAS aircraft.

1.2.4.2 If the intruding aircraft is equipped with ACAS, a coordination procedure is performed via the air-to-air Mode S data link in order to ensure that the ACAS RAs are compatible.

1.2.5 AIR-GROUND COMMUNICATION

1.2.5.1 ACAS may communicate with ground stations using the Mode S air-ground data link. The transmission of sensitivity level control commands to ACAS equipment by Mode S ground stations is one aspect of communication. This feature permits a Mode S ground station to adapt the RA warning time to the local traffic environment as an ACAS aircraft moves through the region of coverage of the station. An effective trade-off between collision warning time and alert rate is thereby ensured.

1.2.5.2 The Mode S air-ground data link may also be used to transmit ACAS RAs to Mode S ground stations. This information can then be used by air traffic services to monitor ACAS RAs within an airspace of interest.

1.2.6 FUNCTIONS PERFORMED BY ACAS

1.2.6.1 The functions executed by ACAS are illustrated in Figure A-1. To keep the illustration simple, the functions “own aircraft tracking” and “intruder aircraft tracking” have been represented once in Figure A-1, under “surveillance”. However, the trackers that are intended to support the collision avoidance function may not be suitable to support the surveillance function. Separate tracking functions may be required to adequately support both the collision avoidance and the surveillance functions.

1.2.6.2 Surveillance is normally executed once per cycle; however, it may be executed more frequently or less frequently for some intruders. For example, surveillance may be executed less frequently for some non-threatening intruders to respect interference limiting inequalities or it may be executed more frequently for some intruders to improve the azimuth estimate.

1.2.6.3 Parameters used in the implementation of the ACAS functions are adjusted automatically or manually to maintain collision avoidance protection with minimal interference to normal air traffic control (ATC) operations.

1.3 Intruder characteristics

1.3.1 TRANSPONDER EQUIPAGE OF INTRUDER

ACAS provides RAs on aircraft equipped with altitude reporting Mode A/C or Mode S transponders. Some aircraft are equipped with SSR transponders but do not have altitude encoders. ACAS cannot generate RAs in conflicts with such aircraft because, without altitude information, a collision threat assessment cannot be made. ACAS equipment can generate only TAs on such aircraft, describing their ranges, range rates and bearings. Aircraft equipped with Mode A only transponders and those not equipped with or not operating Mode A/C or Mode S transponders cannot be tracked by ACAS.

1.3.2 INTRUDER CLOSING SPEEDS AND TRAFFIC DENSITIES

1.3.2.1 ACAS equipment designed for operation in high density airspace is capable of providing overall surveillance performance on intruders as defined in Chapter 4, 4.3.2 and Table 4-1.

1.3.2.2 The conditions enumerated in Table 4-1, which define two distinct density regions in the multi-dimensional condition space that affects ACAS performance, were extrapolated from airborne measurements of the performance of a typical ACAS. The airborne measurement data indicated that the track establishment probability will not drop abruptly when any of the condition bounds is exceeded.

1.3.2.3 The performance is stated in terms of probability of tracking a target of interest at a maximum closing speed in a given traffic density at least 30 seconds before the point of closest approach. The maximum traffic density associated with each of the two density regions is defined as:

$$\rho = n(r)/\pi r^2$$

where n(r) is the maximum 30-second time average of the count of SSR transponder-equipped aircraft (not counting own aircraft) above a circular area of radius r about the ACAS aircraft ground position. In the airborne measurements, the radii were different for the two density regions. In the high-density measurements the radius was 9.3 km (5 NM). In the low-density measurements the radius was 19 km (10 NM). Traffic density outside the limits of the circular area of constant density may be assumed to decrease inversely proportional to range so that the number of aircraft is given by:

$$n(r) = n(r_o)r/r_o$$

where r_o is the radius of the constant density region.

1.3.2.4 When the density is greater than 0.017 aircraft/km^2 (0.06 aircraft/NM^2), the nominal radius of uniform density r_o is taken to be 9.3 km (5 NM). When the density is equal to or less than indicated above, r_o is nominally 18.5 km (10 NM).

1.3.2.5 The table is based on an additional assumption that at least 25 per cent of the total transponder-equipped aircraft in the highest density 0.087 aircraft/km^2 (0.3 aircraft/NM^2) airspace are Mode S equipped. If fewer than 25 per cent are Mode S equipped, the track probability for Mode A/C aircraft may be less than 0.90 because of increased synchronous garble. If the traffic density within r_o exceeds the limits given in the table or if the traffic count outside of r_o continues increasing faster than *r*, the actual track establishment probability for Mode A/C aircraft may also be less than 0.90 because of increased synchronous garble. If the closing speed exceeds the given limits, the tracks for Mode A/C and Mode S aircraft may be established late. If the number of other ACAS in the area exceeds the limits given in the table, the interference limiting requirements of Chapter 4, 4.3.2.2 require that the ACAS transmitter power and receiver sensitivity be further reduced, thereby resulting in a later establishment time. However, the track probability is expected to degrade gradually as any of these limits is exceeded.

1.3.2.6 The table reflects the fact that the ACAS tracking performance involves a compromise between closing speed and traffic density. Although it may not be possible to maintain a high probability of track when the traffic density and the intruder closing speed are both simultaneously large, the ACAS design is capable of reliable track establishment on high-speed intruders when operating in relatively low-density en-route airspace (typically characterized by densities of less than 0.017 aircraft/km^2, i.e. 0.06 aircraft/NM^2) or when operating in higher density, low-altitude terminal airspace where the closing speeds are typically below 260 m/s (500 kt) for operational reasons.

1.3.2.7 The table also accounts for the fact that higher closing speeds are associated with the forward direction than with the side or back directions so that the ACAS surveillance design is not required to provide reliable detection for the highest closing speeds in the side or back directions.

1.3.3 SYSTEM RANGE LIMITATIONS

The required nominal tracking range of the ACAS is 26 km (14 NM). However, when operating in high density, the interference limiting feature may reduce system range to approximately 9.3 km (5 NM). A 9.3 km (5 NM) range is adequate to provide protection for a 260 m/s (500 kt) encounter.

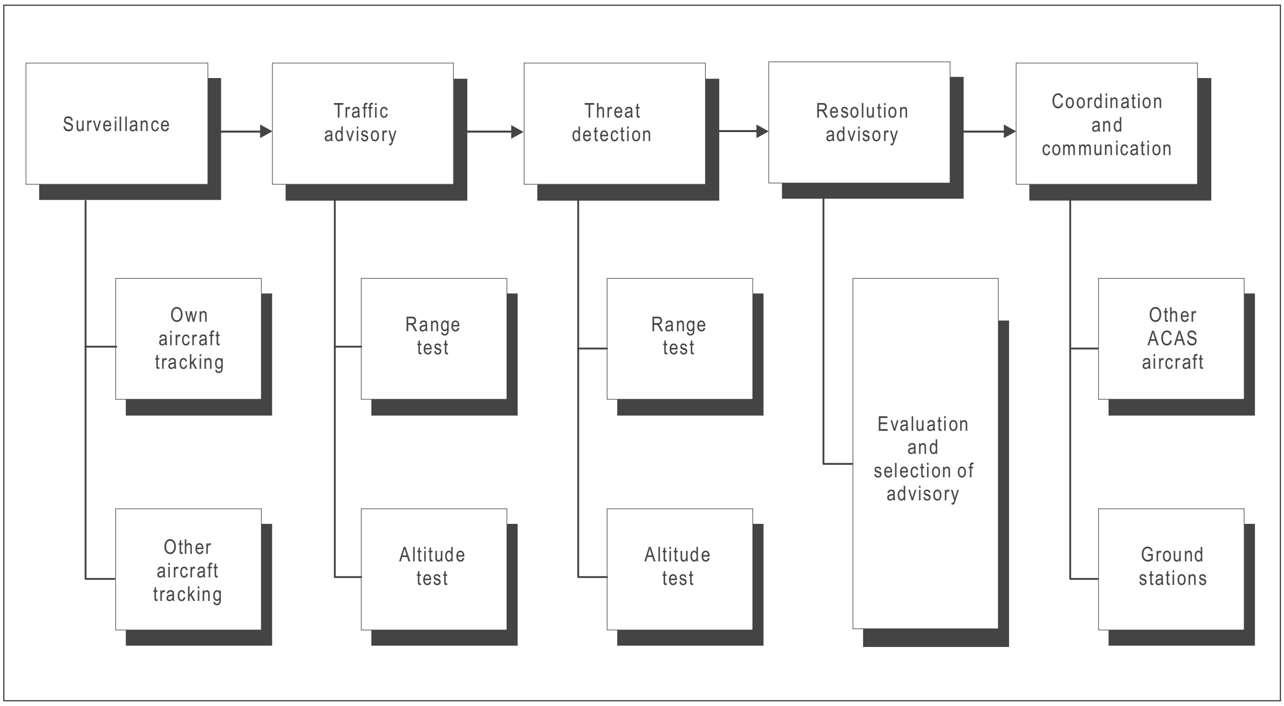


Figure A-1. Illustration of ACAS functions

1.4 Control of interference to the electromagnetic environment

1.4.1 The ACAS equipment is capable of operating in all traffic densities without degrading the electromagnetic environment. Each ACAS equipment knows the number of other ACAS units operating in the local airspace. This knowledge is used to ensure that no transponder is suppressed by ACAS activity for more than 2 per cent of the time and to ensure that ACAS does not contribute to an unacceptably high fruit rate that would degrade ground SSR surveillance performance. Multiple ACAS units in the vicinity cooperatively limit their own transmissions. As the number of such ACAS units increases, the interrogation allocation for each of them decreases. Thus, every ACAS unit monitors the number of other ACAS units within detection range. This information is then used to limit its own interrogation rate and power as necessary. When this limiting is in full effect, the effective range of the ACAS units may not be adequate to provide acceptable warning times in encounters in excess of 260 m/s (500 kt). This condition is normally encountered at low altitude where this closing speed capability is sufficient. Whenever the ACAS aircraft is on the ground, ACAS automatically limits the power of its interrogations. This limiting is done by setting the ACAS count (n_a) in the interference limiting inequalities to a value three times the measured value. This value is selected to ensure that an ACAS unit on the ground does not contribute any more interference to the electromagnetic environment than is unavoidable. This value will provide an approximate surveillance range of 5.6 km (3 NM) in the highest density terminal areas to support reliable ground ACAS surveillance of local airborne traffic and a 26 km (14 NM) range in very low density airspace to provide wide area surveillance in the absence of an SSR.

1.4.2 The presence of an ACAS unit is announced to other ACAS units by the periodic transmission of an ACAS interrogation containing a message that gives the address of the ACAS aircraft. This transmission is sent nominally every 8 to 10 seconds using a Mode S broadcast address. Mode S transponders are designed to accept message data from a broadcast interrogation without replying. The announcement messages received by the ACAS aircraft's Mode S transponder are monitored by the interference limiting algorithms to develop an estimate of the number of ACAS units in the vicinity.

2. FACTORS AFFECTING SYSTEM PERFORMANCE

2.1 Synchronous garble

When a Mode C interrogation is transmitted, all the transponders that detect it reply. Since the reply duration is 21 microseconds, aircraft whose ranges from ACAS are within about 2.8 km (1.5 NM) of each other generate replies that persistently and synchronously overlap each other at the interrogating aircraft. The number of overlapping replies is proportional to the density of aircraft and their range from ACAS. Ten or more overlapping replies might be received in moderate density terminal areas. It is possible to decode reliably only about three overlapping replies. Hence, there is a need to reduce the number of transponders that reply to each interrogation. Whisper-shout and directional transmit techniques are available for controlling such synchronous garble (see 3.2 and 3.3). They are both needed in ACAS equipment operating in the highest traffic densities.

2.2 Multipath from terrain reflections

2.2.1 SSR transponders use quarter-wave monopole antennas mounted on the bottom of the aircraft. A stub antenna of this sort has a peak elevation gain at an angle of 20 to 30 degrees below the horizontal plane. This is suitable for ground-air surveillance, but the direct air-air surveillance path may operate at a disadvantage relative to the ground reflection path, particularly over water.

2.2.2 If the ACAS unit uses a bottom-mounted antenna, there are geometries for which the reflected signal is consistently stronger than the direct signal. However, when a top-mounted antenna is used for interrogation, its peak gain occurs at a positive elevation angle and the signal-to-multipath ratio is improved. Thus, when ACAS transmits from the top-mounted antenna, the effects of multipath are reduced significantly. Even when a top-mounted antenna is used, the multipath will still occasionally exceed the receiver threshold. Thus, there is need to reject low-level multipath. ACAS can achieve this rejection through the use of variable receiver thresholds (see 3.4).

2.3 Altimetry data quality

2.3.1 MEASUREMENT ERRORS

2.3.1.1 The vertical separation between two conflicting aircraft is measured as the difference between own altitude and the intruder's altitude as reported in its Mode C or Mode S reply. If the ACAS aircraft is an air carrier, it will normally have accurate altimetry; an intruding aircraft might have less accurate altimetry.

2.3.1.2 Errors in altimetry can cause two types of effects: first, if the aircraft are on a near collision course, errors could indicate safe passage, and the impending near mid-air collision might not be resolved by ACAS; second, if the aircraft are on a near collision course, but are separated in altitude, errors could lead to an ACAS manoeuvre in the wrong direction which could induce an even closer encounter.

2.3.1.3 ACAS attempts to achieve a difference of at least 90 m (300 ft) between aircraft at closest approach based on reported altitude. Thus, if the combination of intruder and ACAS altimetry errors approached 90 m (300 ft), there would be finite risk of inadequate vertical separation despite the presence of ACAS. Studies of the expected altimetry errors of both ACAS and non-ACAS aircraft at altitudes from sea level to FL 400 have concluded that the risk is essentially negligible if both aircraft are equipped with high accuracy altimetry systems that can achieve root-sum-square (RSS) errors of approximately 15 m (50 ft). It was further concluded that if an ACAS with high accuracy altimetry operates in a traffic environment consisting of typical general aviation aircraft (with RSS errors of approximately 30 m (100 ft), normally distributed), then altimetry errors will occasionally lead to inadequate ACAS RAs. However, this will not occur often enough to seriously interfere with the effectiveness of the system. Performance was considered to be inadequate if both aircraft in an encounter had a low accuracy altimetry system. This led to the requirement that ACAS possess a high accuracy system.

2.3.2 ALTITUDE BIT FAILURE

If the Mode C or Mode S altitude reports from the intruding aircraft or the altitude data for own aircraft contain bit errors, ACAS may develop erroneous estimates of the corresponding vertical position or rate. These errors can have effects similar to the effects of measurement errors. Such errors are most likely to occur when the altitude data source is a Gilham encoder, and the use of Gilham encoded data for own aircraft altitude can have serious adverse consequences. When there is no alternative source than Gilham encoded data, two encoders must be used and a comparison function in the Mode S transponder used to detect errors in the altitude data before they are provided to ACAS.

2.3.3 CREDIBILITY OF OWN AIRCRAFT ALTITUDE

All sources of own altitude data are required to be checked for credibility, including fine altitude data (which can come from various sources: gyro, air data computer, etc.) and radar altitude data.

2.4 Potential for ground-based SSR site monitors (PARROTs) to cause spurious traffic and resolution advisories

An ACAS interrogates all SSR transponders within range, including ground-based transponder installations used to monitor the operation of ground radar systems, or test transponders. If these ground-based transponders reply with false altitude data, the potential exists for an ACAS to generate spurious TAs and RAs. To prevent this problem, information on the operation of position adjustable range reference orientation transponders (PARROTs) and transponder test facilities is provided in the *Manual of Secondary Surveillance Radar (SSR) Systems* (Doc 9684).

2.5 Allocation and assignment of SSR Mode S addresses

To ensure safe operation, the system requires that all Mode S-equipped aircraft have unique addresses. Multiple aircraft with the same address or aircraft with addresses not compliant with Annex 10, Volume III, Part I, Chapter 9, can adversely affect the surveillance and coordination functions.

2.6 Potential for TCAS I systems to affect ACAS II performance

Note.— For the purpose of this material, TCAS I is defined as a system that uses SSR interrogations to provide aircrew with traffic alert warning information as an aid to the "see and avoid" principle.

Some TCAS I systems employ ACAS II interference limiting techniques with resolution advisories suppressed. These systems do not comply with ACAS I SARPs. Because ACAS II interference limiting relies on direct interaction with other ACAS II aircraft (using the ACAS broadcast and Mode S transponder replies), the presence of such TCAS I aircraft can directly influence the surveillance performance of nearby ACAS II aircraft. If such TCAS I systems are fitted to aircraft that are known to operate in close proximity to each other (e.g. rotorcraft or gliders) then the effect may reduce the surveillance range of other ACAS II aircraft and delay the provision of collision avoidance warnings. In light of these concerns, TCAS I systems (which employ ACAS II interference limiting techniques) must not be used for aircraft which are known to operate in close proximity to each other for sustained periods of time. Care must be taken to ensure that the effect on the SSR electromagnetic environment is acceptable, since these TCAS I units may be fitted in very large numbers.

3. CONSIDERATIONS ON TECHNICAL IMPLEMENTATION

3.1 System operation

3.1.1 SURVEILLANCE OF INTRUDERS

3.1.1.1 The main purposes of the surveillance processes described below are to obtain position reports and to correlate these to form tracks. This involves the use of trackers and requires the estimation of rates.

3.1.1.2 The ACAS unit transmits an interrogation sequence nominally once per second. The interrogations are transmitted at a nominal effective radiated power level of +54 ±2 dBm as measured at zero degree elevation relative to the longitudinal axis of the aircraft. When these interrogations are received by Mode A/C and Mode S altitude reporting transponders, the transponders transmit replies that report their altitude. The ACAS unit computes the range of each intruding aircraft by using the round-trip time between the transmission of the interrogation and the receipt of the reply. Altitude rate and range rate are determined by tracking the reply information.

3.1.1.3 In the absence of interference, overload, interference-limiting conditions, or other degrading effects, the equipment will nominally be capable of providing surveillance for Mode A/C and Mode S targets out to a range of 26 km (14 NM). However, because the surveillance reliability degrades as the range increases, the equipment should assess as possible collision threats only those targets within a maximum range of 22 km (12 NM). No target outside of this range should be eligible to generate an RA. However, ACAS is able to detect ACAS broadcast interrogations from ACAS-equipped aircraft out to a nominal range of 56 km (30 NM).

3.1.1.4 The equipment should have the capacity for surveillance of any mix of Mode A/C or Mode S targets up to a total peak target capacity of 30 aircraft. ACAS equipment is nominally capable of reliable surveillance of high-closing-speed targets in a peak traffic density of up to 0.017 aircraft per square km (0.06 aircraft per square NM) or approximately 27 aircraft in a 26 km (14 NM) radius.

3.1.1.5 When the average traffic density exceeds the above value, the reliable surveillance range decreases. ACAS equipment is capable of providing reliable surveillance of targets closing only up to 260 m/s (500 kt) in an average traffic density of 0.087 aircraft per square km (0.3 aircraft per square NM). The surveillance range required for 260 m/s (500 kt) targets is about 9.3 km (5 NM). It is possible to provide 9.3 km (5 NM) surveillance in a short-term peak traffic density of 0.087 aircraft/km^2 (0.3 aircraft/NM^2) or more without exceeding a total target capacity of 30. If the overall target count ever exceeds 30 at any range up to 26 km (14 NM), the long-range targets may always be dropped without compromising the ability to provide reliable surveillance of lower-speed targets. Thus a peak capability of 30 targets (any mix of Mode A/C or Mode S) is adequate for ACAS and if the number of Mode A/C plus Mode S targets under surveillance exceeds 30, excess targets are to be deleted in order of decreasing range without regard to target type.

3.1.2 SURVEILLANCE OF INTRUDERS WITH MODE A/C TRANSPONDERS

3.1.2.1 Surveillance of Mode A/C transponders is accomplished by the periodic transmission of a Mode C-only all-call (intermode) interrogation (Chapter 3, 3.1.2.1.5.1.2). This elicits replies from Mode A/C transponders, but not from Mode S transponders, thus preventing the replies of Mode S transponders from synchronously garbling the replies of Mode A/C transponders. Other techniques for reducing synchronous garble are (1) the use of directional antennas to interrogate only those aircraft in an azimuth wedge, and (2) the use of a sequence of variable power suppressions and interrogations (known as “whisper-shout”) that interrogates only aircraft that have similar link margins (see 3.2.2). The use of both of these techniques together provides a powerful tool for overcoming the effects of synchronous garble.

3.1.2.2 Whisper-shout employs a sequence of interrogations at different power levels transmitted during each surveillance update period. Each of the interrogations in the sequence, other than the one at lowest power, is preceded by a suppression transmission, where the first pulse of the interrogation serves as the second pulse of the suppression transmission. The suppression transmission pulse begins at a time 2 microseconds before the first pulse of the interrogation. The suppression pulse is transmitted at a power level lower than the accompanying interrogation so that the transponders that reply are only those that detect the interrogation and do not detect the suppression. To guard against the possibility that some transponders do not reply to any interrogation in the sequence, the suppression pulse is transmitted at a power level somewhat lower than that of the next lower interrogation. The time interval between successive interrogations should be at least 1 millisecond. This ensures that replies from transponders at long range are not mistaken for replies to the subsequent interrogation. All interrogations in the sequence are transmitted within a single surveillance update interval.

3.1.2.3 Responses to each Mode C-only all-call interrogation are processed to determine the range and altitude code of each reply. It is possible to determine the altitude codes for up to three overlapping replies if care is taken to identify the location of each of the received pulses.

3.1.2.4 After all of the replies are received in response to the whisper/shout sequence, duplicate replies should be merged so that only one “report” is produced for each detected aircraft. Reports may be correlated in range and altitude with the predicted positions of known intruders (i.e., with existing tracks). Since intruding aircraft are interrogated at a high rate (nominally once per second), good correlation performance is achieved using range and altitude. Mode A code is not needed for correlation. Reports that correlate are used to extend the associated tracks. Reports that do not correlate with existing tracks may be compared to previously uncorrelated reports to start new tracks. Before a new track is started, the replies that lead to its initiation may be tested to ensure that they agree in all of the most significant altitude code bits. A geometric calculation may be performed to identify and suppress specular false targets caused by multipath reflections from the terrain.

3.1.2.5 Tracks being initiated may be tested against track validity criteria prior to being passed to the collision avoidance algorithms. The purpose of these tests is to reject spurious tracks caused by garble and multipath. Spurious tracks are generally characterized by short track life.

3.1.2.6 Aircraft not reporting altitude in Mode C replies are detected using the Mode C reply framing pulses. These aircraft are tracked using range as the correlation criterion. The additional use of bearing for correlation will help to reduce the number of false non-Mode C tracks.

3.1.2.7 *Reply merging.* Multiple replies may be generated by a Mode A/C target that responds to more than one whisper-shout interrogation during each whisper-shout sequence or by a target that responds to interrogations from both the top and bottom antennas. The equipment is expected to generate no more than one position report for any target even though that target may respond to more than one interrogation during each surveillance update interval.

3.1.2.8 *Mode A/C surveillance initiation.* The equipment will pass the initial position reports to the collision avoidance algorithms only if the conditions in a) and b) below are satisfied:

a) initially, a Mode C reply is received from the target in each of three consecutive surveillance update periods, and:

   1) the replies do not correlate with surveillance replies associated with other tracks;

   2) the range rate indicated by the two most recent replies is less than 620 m/s (1 200 kt);

   3) the oldest reply is consistent with the above range rate in the sense that its range lies within 95.3 m (312.5 ft) of a straight line passing through the two most recent replies;

   4) the replies correlate with each other in their altitude code bits;

b) a fourth correlating reply is received within five surveillance update intervals following the third reply of the three consecutive replies in a) above and is within ±60 m (±200 ft) of the predicted altitude code estimate determined in a) 4) above.

3.1.2.8.1 The following is an example of an acceptable set of rules for assessing correlation of reply code bits and determining the initial altitude track code estimate for a target. Three replies correlate only if:

a) all eight of their D, A and B code pulses agree; or

b) seven of their D, A, and B code pulses agree and at least one of their C code pulses agree.

3.1.2.8.2 The test for code agreement among the three replies is made individually for each of the reply pulse positions. This test is based on the presence of code pulses alone; agreement occurs for a given reply pulse position if all three replies are detected with ONE in the position or all three replies are detected with a ZERO in that position. The confidence associated with those pulse detections does not affect agreement.

3.1.2.8.3 The confidence flag for a reply pulse position is set "low" whenever there exists another received reply (either real or phantom) that could have had a pulse within ±0.121 microsecond of the same position. Otherwise, the confidence flag is set "high".

3.1.2.8.4 When agreement among the three replies does not occur for a given reply pulse position, the initial track pulse code estimate for that position is based on the values of the individual pulse codes and the confidence flags associated with those pulse codes in three replies.

3.1.2.8.5 When agreement fails for a given pulse position, the rules for estimating the initial track code for that position are based on the principle that "low" confidence ONEs are suspect. The rules are as follows:

a) If in the most recent (third) reply the detected code for a given pulse position is "high" confidence or a ZERO, the initial track pulse code estimate for that position is the same as the code detected in that position in the most recent reply.

b) If in the most recent reply the detected code for a given pulse position is a "low" confidence ONE, the initial track pulse code estimate for the position is the same as the code detected in that position in the second reply provided that was not also a "low" confidence ONE. If the second was also a "low" confidence ONE, the initial track pulse code estimate is the same as the code detected in that position in the first reply.

3.1.2.9 *MODE A/C SURVEILLANCE EXTENSION*

3.1.2.9.1 *General.* The equipment should continue to pass position reports for a target to the collision avoidance algorithms only if:

a) the track has not been identified as an image (see 3.1.2.9.6); and

b) the reply altitudes occur within an altitude window of ±60 m (200 ft) centred on the altitude predicted from previous reply history; and

c) all replies used for threat assessment after the initiation procedure occur within a range window centred on the range predicted from previous reply history.

3.1.2.9.2 *Range correlation.* The following is an example of an acceptable set of rules for determining the size of the range window:

a) The tracks are processed individually in increasing range order with input range precision of at least 15 m (50 ft) and retained computational accuracy of at least 1.8 m (6 ft). Range is estimated and predicted by a recursive (alpha-beta) tracker with alpha of 0.67 and beta of 0.25.

b) After each surveillance update a new range measurement is available for each target. Since the measurement includes errors, it must be smoothed based on previous measurements to obtain improved estimates of the current target position and velocity. The range and range rate estimation equations are as follows:

$$r(t) \text{ estimate} = r(t) \text{ prediction} + [\text{alpha} \times (r(t) \text{ measurement} - r(t) \text{ prediction})]$$

$$\dot{r}(\text{t}) \text{ estimate} = \dot{r}(t - T_p) \text{ estimate} + [(\text{beta}/T_p) \times (r(t) \text{ measurement} - r(t) \text{ prediction})],$$

where T_p is the time difference between the current and previous measurements.

c) The gains, alpha and beta determine the relative degree of reliance on current and previous measurements; gains of unity would place complete reliance on the current measurement and result in no smoothing.

d) The estimates obtained from the above equations are subsequently used to predict the range at the time of the next measurement as follows:

$$r(t + T_n) \text{ prediction} = r(t) \text{ estimate} + [\dot{r}(t) \text{ estimate} \times T_n]$$

where T_n is the time difference between the next measurement and the current measurement.

e) The range correlation window is centred at the predicted range and has a half-window width as follows:

[760 ft if coasted last interval 570 ft if updated last interval]	+	[**if track is not established:** 0 **if track is established:** 2 000 ft, if 0.00 NM ≤ r < 0.17 NM 1 000 ft, if 0.17 NM ≤ r < 0.33 NM 600 ft, if 0.33 NM ≤ r < 1.00 NM 240 ft, if 1.00 NM ≤ r < 1.50 NM 0 ft, if 1.50 NM ≤ r]

f) If the track is above 3 050 m (10 000 ft), the term contained within the second pair of brackets is multiplied by four.

3.1.2.9.3 *Altitude correlation.* For the purposes of altitude correlation, altitude is estimated and predicted by an alpha-beta tracker with alpha of 0.28 and beta of 0.06. The tracker has retained computational accuracy of (30 m) (100 ft) divided by 16. The altitude prediction is rounded to the nearest 30 m (100 ft) increment and converted to grey code. The grey codes of the predicted altitude ±30 m (100 ft) are also computed. The longer-term altitude predictions performed by the threat detection logic require a more accurate altitude tracking procedure (see 3.5.3). The reply(ies) that lies in the range correlation window is tested for altitude correlation in increasing range order. The track is updated with the first reply that has exact agreement (in all bits) with any of the three grey codes computed above. If no reply matches, two additional grey codes are computed and the process tried again. The two codes are the predicted altitude ±60 m (200 ft).

3.1.2.9.4 *Track updating — establishment.* The updating reply (if any) is eliminated from further consideration in updating other tracks, or in the track initiation process. If there is no updating reply, the range and altitude estimates are set equal to the corresponding predicted values. If this is the sixth consecutive interval having no updating reply, the track is dropped. If there is an updating reply, and if the track is not identified as an image (see 3.1.2.9.6), the track is flagged as established, that is, it is now available for use by the threat detection logic. Once established, a track remains established until it is dropped, even if it subsequently satisfies the conditions for an image track.

3.1.2.9.5 *Test for track splits.* When all tracks have been processed, they are combined with the tracks that are newly initiated during the current scan, and then all the tracks are examined pairwise to determine if a given pair of tracks is likely to represent the same intruder. If:

a) the ranges differ by at most 150 m (500 ft)

b) the range rates differ by at most 4.6 m/s (8.9 kt)

c) either

1) the altitudes differ by at most 30 m (100 ft), or

2) the altitude rates differ by at most 3 m/s (10 ft/s) and both tracks were initiated during the same scan,

only one of the tracks is retained, preference being given to the track showing the larger number of replies since initiation.

3.1.2.9.6 *Image track processing.* Those tracks that could have been formed by replies specularly reflected from the ground are referred to as image tracks. A track is identified as an image if there exists a track at shorter range (referred to as the real track) such that:

a) the difference between the real altitude and the image altitude is less than or equal to 60 m (200 ft) for altitude-reporting targets, or both the image track and the real track are non-altitude-reporting; and

b) the difference between the measured image range rate and the calculated image range rate $\dot{r}_i$ is less than or equal to 21 m/s (40 kt), where the calculated image range rate is either (for the single-reflection case):

$$\dot{r}_i = \left(\frac{1}{2}\right)[\dot{r} + \left(\frac{1}{2r_i - r}\right)[((2r_i - r)^2 - r^2 + (Z_0 - Z)^2)^{\frac{1}{2}}(\dot{Z}_0 + \dot{Z}) + r\dot{r} - (Z_0 - Z)(\dot{Z}_0 - \dot{Z})]]$$

or (for the double-reflection case):

$$\dot{r}_i = \left(\frac{1}{r_i}\right)\left[\left(r_i^2 - r^2 + (Z_0 - Z)^2\right)^{\frac{1}{2}}(\dot{Z}_0 + \dot{Z}) + r\dot{r} - (Z_0 - Z)\ (\dot{Z}_0 - \dot{Z})\right]$$

where:

r_i is the image range,

r is the real range,

Z is the real altitude, for altitude reporting targets or Z is set to own altitude for non-altitude reporting targets, and

Z_0 is own altitude

If a track is identified as an image, it may be retained, but it cannot be flagged as established for use by the threat detection logic.

3.1.2.10 *Missing Mode A/C reports.* The equipment continues to pass to the collision avoidance algorithms predicted position reports for Mode A/C targets for six surveillance update intervals following the receipt of the last valid correlating reply. The equipment does not pass position reports for more than six surveillance update intervals following the receipt of the last valid correlating reply unless the target again satisfies the surveillance initiation criteria of 3.1.2.8.

3.1.3 SURVEILLANCE OF INTRUDERS WITH MODE S TRANSPONDERS

3.1.3.1 Efficient air-air surveillance techniques have been developed for intruders equipped with Mode S transponders. Because of Mode S selective address, there is no synchronous garble associated with surveillance of Mode S transponders. However, multipath must be dealt with and the surveillance of Mode S transponders should be accomplished with as few interrogations as possible to minimize interference.

3.1.3.2 The Mode S modulation formats are inherently more resistant to multipath than are the Mode A/C modulation formats. However, the greater length of the Mode S transmission makes it more likely to be overlapped by multipath. The use of top-mounted antennas and variable receiver thresholds (to protect the Mode S reply preamble) increases the multipath resistance to an acceptable level for reliable air-air surveillance. The use of antenna diversity transponders on ACAS aircraft provides an additional reliability margin for coordination between pairs of conflicting ACAS aircraft.

3.1.3.3 Mode S interrogation rates are kept low by passive detection of transponder transmissions and by interrogating once per second only those intruders that could become immediate threats. Intruders that are not likely to become immediate threats should be interrogated less frequently (i.e. once every 5 seconds). Passive address acquisition prevents unnecessary interference with other elements of the SSR and ACAS system. ACAS listens to Mode S all-call replies (DF = 11, acquisition squitter transmissions, Chapter 3, 3.1.2.8.5.1 or DF = 17, extended squitter transmissions, Chapter 3, 3.1.2.8.6.1). These may occur in response to Mode S ground station all-call interrogations or as spontaneous transmission (called squitters) at intervals ranging from 0.8 to 1.2 seconds for the acquisition squitter, and at shorter intervals for the extended squitter. Reception of squitters may be alternated between the top and bottom antennas. If reception is switched, it will be necessary to control the switching times to avoid undesirable synchronism with the squitters transmitted by Mode S antenna diversity transponders.

3.1.3.4 The 24-bit aircraft address in the squitter is protected by error coding to ensure a high probability of obtaining a correct address. Since the squitter transmission does not contain altitude information, ACAS attempts to obtain altitude passively from Mode S replies generated in response to ground interrogations or interrogations from other ACAS aircraft. If altitude is not received shortly after address detection, the Mode S aircraft is actively interrogated to obtain altitude.

3.1.3.5 After ACAS has determined the altitude of a detected Mode S aircraft, it compares the altitude of this aircraft to its own altitude to determine whether or not the target can be ignored or should be interrogated to determine its range and range rate. If the measured range and the estimated range rate indicate that it is (or could soon be) a collision threat, the intruder should be interrogated once per second and the resulting track data fed to the collision avoidance algorithms. An aircraft at longer range should be interrogated only as often as necessary to maintain track and ensure that it will be interrogated once per second before it becomes a collision threat.

3.1.3.6 The use of passive detection in combination with altitude comparison and a less frequent interrogation of non-threat intruders reduces the Mode S interrogation rate automatically when the local densities of other ACAS aircraft are very high. Therefore, a higher interrogation power level is available to improve surveillance performance.

3.1.3.7 *MODE S SURVEILLANCE INITIATION*

3.1.3.7.1 The equipment is intended to provide Mode S surveillance with a minimum of Mode S interrogations. The identity of Mode S targets is determined by passively monitoring transmissions received with DF = 11 or DF = 17. Error detection and correction is applied to the received squitters to reduce the number of addresses to be processed. The altitude of the Mode S targets from which a squitter has been received is determined by passive monitoring transmissions received with DF = 0 (short air-air surveillance replies, Chapter 3, 3.1.2.8.2) or DF = 4 (surveillance altitude replies, Chapter 3, 3.1.2.6.5) or active selective interrogations (air-air surveillance interrogation, Chapter 4, 4.3.8.4) and monitoring the corresponding air-air surveillance replies. The equipment monitors squitter and altitude replies whenever it is not transmitting, or receiving replies to, Mode S or Mode C interrogations. Each received reply is examined to determine what further action should be taken.

3.1.3.7.2 To reduce the number of unnecessary interrogations, a squitter target is not interrogated if so few squitters and altitude replies are received from it that no threat is indicated. Targets that might be a threat are called valid targets. The equipment is not intended to interrogate a target unless the altitude information indicates that it is within 3 050 m (10 000 ft) of own altitude. The ACAS aircraft interrogates targets from which it does not receive altitude information but does continue to receive error-free squitters. In order to establish timely acquisition of targets that transition the 3 050 m (10 000 ft) relative altitude boundary, the altitude of targets that are beyond 3 050 m (10 000 ft) of own altitude are monitored using unsolicited DF = 0 or DF = 4 replies, or in the absence of such replies, by periodically interrogating to elicit a DF = 0 reply.

3.1.3.7.3 The following is an example of one acceptable means of processing squitters and altitude replies to reduce unneeded interrogations:

a) When a valid squitter is first received, a running sum initialized at 0 is associated with it. During each succeeding surveillance update interval the sum is decremented by 1 if no squitters or altitude replies with a particular address are received, and the sum is incremented by 16 for each reception of either a squitter or an altitude reply. The process continues until the sum equals or exceeds 20. When the sum becomes less than or equal to –20, the address is removed from the system. When it equals or exceeds +20, the target is declared to be valid.

b) When a target has been declared to be valid, it is interrogated unless its altitude differed from the ACAS altitude by more than 3 050 m (10 000 ft). Otherwise, its altitude is monitored using DF = 0 or DF = 4 replies, or in the absence of such replies, by interrogating once every 10 seconds to elicit a DF = 0 reply.

c) When any of these conditions are satisfied, the running sum continues to be incremented and decremented even though its value may exceed 20.

3.1.3.8 *MODE S RANGE ACQUISITION*

3.1.3.8.1 The equipment should transmit an acquisition interrogation (UF = 0, 16, AQ = 1, Chapter 3, 3.1.2.8.1.1) to determine the range of each valid target with relative altitude as defined above, or from which inadequate altitude information has been received.

3.1.3.8.2 If an acquisition interrogation fails to elicit a valid reply, additional interrogations should be transmitted. The total number of acquisition interrogations addressed to a single target must not exceed three within a single surveillance update period. The first acquisition interrogation is to be transmitted using the top antenna. If two acquisition interrogations to a target fail to elicit valid replies, the next two acquisition interrogations to that target are to be transmitted using the bottom antenna. If in the acquisition attempt in the first surveillance update period, valid replies are not received, ACAS transmits a total of nine acquisition interrogations distributed over the first six successive surveillance update periods. If acquisition interrogations fail to elicit replies within six surveillance update intervals, the acquisition process is to cease until enough additional squitters/fruit are received indicating that a successful acquisition is likely. One means of accomplishing this is to process subsequent squitters/fruit as described in 3.1.3.7, but with the increment 16 replaced by 8. If a second failure to acquire occurs, the process is repeated with an increment of 4. After any subsequent failure, an increment of 2 is used.

3.1.3.8.3 If additional attempts are made to acquire the target, they conform to the pattern described above except that:

a) On the second and third attempt, only one interrogation is to be made during a single surveillance update interval; and in the absence of valid replies, six interrogations are to be transmitted during the first six surveillance update intervals.

b) Any further attempts consist of a single interrogation during the entire six update intervals.

3.1.3.8.4 When a valid acquisition reply is received, the VS field in the reply is examined to determine the vertical status of a target. If a target is determined to be on the ground, its vertical status is periodically monitored by interrogating as often as necessary to ensure timely acquisition when airborne. When a valid acquisition reply is received from an airborne target, one or more interrogations are to be transmitted to the target within two surveillance update intervals in order to confirm the reliability of the altitude data and the altitude quantization bit. When two replies have been received from an airborne target that have altitude values within 150 m (500 ft) of each other and within 3 050 m (10 000 ft) of own altitude and have identical quantization bit values, periodic surveillance interrogations (designated as "tracking" interrogations) are to be initiated for that target.

3.1.3.8.5 The range of the target is used with its estimated range rate to determine its potential threat to ACAS. If the target is not an immediate potential threat, it can be interrogated less frequently than if it were a potential threat for which an advisory would soon most likely be issued. Each 1-second surveillance update interval, the potential threat level *(TAU)* of the target is calculated as follows:

$$TAU = -(r - \mathrm{SMOD}^2/r)/\dot{r},$$

where r is the tracked range, $\dot{r}$ is the estimated relative range rate and *SMOD* is a surveillance distance modifier which is equivalent to 5.6 km (3 NM). If the estimated relative range rate is either a negative value of less than –6 kt or positive (either a slow convergence or the aircraft are diverging), the $\dot{r}$ value used to calculate *TAU* is –6 kt. An *SMOD* value of 5.6 km ensures that ACAS will always use the nominal 1-second interrogation cycle in situations where the value of *TAU* can change rapidly, such as in a parallel approach. A target with a *TAU* value of equal to or less than 60 seconds is interrogated at the nominal rate of once every second. A target with a *TAU* value greater than 60 seconds is interrogated at a rate of once every five seconds if the altitude of the target and own aircraft are both less than 5 490 m (18 000 ft) and at a rate of at least once every five seconds if the altitude of the target or own aircraft is greater than 5 490 m (18 000 ft).

3.1.3.9 *MODE S SURVEILLANCE EXTENSION*

3.1.3.9.1 The equipment passes position reports for a Mode S target to the collision avoidance algorithms only if all replies used for threat assessment after the initial range acquisition occur within range and altitude windows centred on range and altitude predicted from previous reply history, the altitude quantization bit matches the previous value, and the VS field in the short special surveillance reply indicates the target to be airborne at least once during the previous three surveillance update cycles. The range and altitude windows are the same as those used for Mode A/C tracking in 3.1.2.9.2 and 3.1.2.9.3 respectively.

3.1.3.9.2 If a tracking interrogation fails to elicit a valid reply, additional interrogations are transmitted. The total number of tracking interrogations addressed to a single target is not expected to exceed five during a single surveillance update period or sixteen distributed over six successive surveillance update periods. The first tracking interrogation is transmitted using the antenna that was used in the last successful interrogation of that target. If two successive tracking interrogations fail to elicit valid replies from a target, the next two interrogations to that target are transmitted using the other antenna.

3.1.3.10 *Missing Mode S replies.* The equipment continues to pass to the collision avoidance algorithms predicted position reports for Mode S targets for six surveillance update intervals following the receipt of the last valid reply to a tracking interrogation if the target is interrogated once every second or for eleven 1-second surveillance update intervals following receipt of the last valid reply to a tracking interrogation if the target is interrogated once every five seconds. The equipment does not pass position reports for Mode S targets for more than six surveillance update intervals following the receipt of the last reply to a tracking interrogation whose rate is once every second or for more than eleven 1-second surveillance update intervals following receipt of the last reply to a tracking interrogation whose rate is once every five seconds unless the target again satisfies the range acquisition criteria of 3.1.3.7. The Mode S address of a dropped track is retained for four additional seconds to shorten the reacquisition process if squitters are received.

3.1.3.11 *Mode S overload.* The equipment passes position reports for all Mode S targets regardless of the distribution of targets in range, provided the total peak target count does not exceed 30.

3.1.3.12 *Mode S power programming.* The transmit power level of Mode S tracking interrogations to targets (but not air-to-air coordination interrogations) is to be automatically reduced as a function of range for targets within 18.5 km (10 NM) as follows:

$$P_T = P_{\max} + 20 \log \frac{r}{10},$$

where P_T is the adjusted power level, $P_{\max}$ is the nominal power level (typically 250 W), which is transmitted to targets at ranges of 18.5 km (10 NM) or more, and r is the predicted range of the target. The actual transmitted power is the lesser of P_T and the limit imposed by the interference limiting inequalities of Chapter 4, 4.3.2.2.2.2.

3.1.3.13 *Mode S track capacity.* When the aircraft density is nominally 0.087 Mode S aircraft per km^2 (0.3 aircraft per NM^2) in the vicinity of the ACAS aircraft, there will be about 24 aircraft within 9.3 km (5 NM) and about 142 aircraft within 56 km (30 NM) of the ACAS aircraft. Thus, the ACAS equipment is expected to have capacity for at least 150 aircraft addresses.

3.1.3.14 *USE OF BEARING ESTIMATES FOR MODE S SURVEILLANCE*

3.1.3.14.1 Bearing estimation capability is not required for high-density Mode S surveillance. However, if bearing estimates are available, it is seen that the use of directional Mode S interrogations significantly reduces the transmitter power requirement of the equipment. Directional Mode S interrogations may also be used in the absence of bearing information, provided the interference limits are not exceeded.

3.1.3.14.2 Bearing estimates may also be used in conjunction with knowledge of own airspeed to reduce the overall Mode S interrogation rate. The following is one possible way of achieving such a reduction.

3.1.3.14.3 Instead of calculating time-to-endanger based on the conservative assumption that the two aircraft are on a head-on collision course, the time-to-endanger can be increased by taking into account the threat bearing and the limited turn-rate of own aircraft and allowing for the time that would be required for own aircraft to turn in the direction of the threat. Such computation would continue to assume that the target aircraft is travelling at its reported maximum capable speed directly toward the collision point.

3.2 Transmitter

3.2.1 Power levels

3.2.1.1 In the absence of interference and when using an antenna whose pattern is identical to that of a quarter-wave monopole above a ground plane, it is possible to provide reliable air-to-air surveillance of transponders at ranges of 26 km (14 NM) by using a nominal effective radiated power of 54 dBm (250 W).

3.2.1.2 The transmitter output power is to be carefully limited between transmissions because any leakage may severely affect the performance of the Mode S transponder on board the ACAS aircraft. The leakage power into the transponder at 1 030 MHz is generally to be kept at a level below –90 dBm. If the physical separation between the transponder antenna and the ACAS antenna is no less than 50 cm, the coupling loss between the two antennas will exceed 20 dB. Thus, if the RF power at 1 030 MHz at the ACAS antenna terminal does not exceed –70 dBm in the inactive state, and if a minimum antenna spacing of 50 cm is adhered to, the direct interference from the ACAS antenna to the transponder antenna will not exceed –90 dBm. This requirement is to ensure that, when not transmitting an interrogation, ACAS does not radiate RF energy that could interfere with, or reduce the sensitivity of, the SSR transponder or other radio equipment in nearby aircraft or ground facilities.

3.2.1.3 Measures must also be taken to ensure that direct 1 030 MHz leakage from the ACAS enclosure to the transponder enclosure is below –110 dBm when the two units are mounted side-by-side in a typical aircraft installation.

3.2.1.4 It is expected that the ACAS equipment be tested side-by-side with Mode S transponders of equivalent classification to ensure that each unit meets its sensitivity requirements in the presence of transmitter leakage from the other.

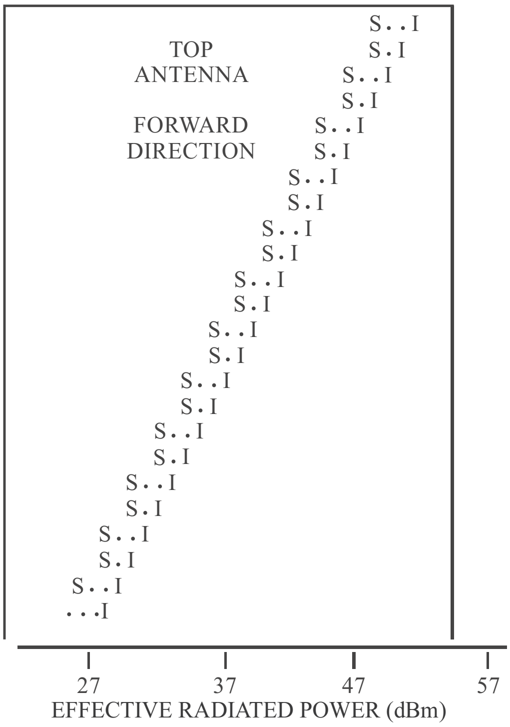
3.2.2 Control of synchronous interference by whisper-shout

3.2.2.1 To control Mode A/C synchronous interference and facilitate ACAS operation in airspace with higher traffic densities, a sequence of interrogations at different power levels may be transmitted during each surveillance update period. Each of the interrogations in the sequence, other than the one at lowest power, is preceded by a suppression pulse (designated S_1) 2 microseconds preceding the P_1 pulse. The combination of S_1 and P_1 serves as a suppression transmission. S_1 is transmitted at a power level lower than that of P_1. The minimum time between successive interrogations is to be 1 millisecond. All interrogations in the sequence should be transmitted within a single surveillance update interval.

3.2.2.2 Because the suppression transmission in each step is always at a lower power level than the following interrogation, this technique is referred to as whisper-shout. The intended mechanism is that each aircraft replies to only one or two of the interrogations in a sequence. A typical population of Mode A/C transponders at any given range may have a large spread in effective sensitivity due to variation in receivers, cable losses, and antenna shielding. Ideally, each transponder in the population will respond to two interrogations in the sequence, and will be turned off by the higher power suppression transmissions accompanying higher-power interrogations in the sequence. Given a situation in which several aircraft are near enough to each other in range for their replies to synchronously interfere, it is unlikely they would all reply to the same interrogation and, as a result, the severity of synchronous interference is reduced. Use of whisper-shout also reduces the severity of the effects of multipath on the interrogation link.

3.2.2.3 Figure A-2a defines a whisper-shout sequence that is matched to the requirements for high-density Mode A/C surveillance and Figure A-2b defines a whisper-shout sequence that is matched to the requirements for low-density Mode A/C surveillance. Five distinct subsequences are defined; one for each of the four beams of the top-mounted antenna and one for the bottom-mounted omnidirectional antenna. The interrogations may be transmitted in any order. When the high density sequence of Figure A-2a is truncated to limit interference, the steps are dropped in the order shown in the column Interference limiting priority. When the low-density sequence of Figure A-2b is reduced in power to limit interference, each interrogation and its related MTL value, as indicated in the last column, is reduced by 1 dB in the order shown in the column Interference limiting priority. The lowest numbered steps in the sequence are dropped or reduced first. The timing of individual pulses or steps in either sequence is defined in Figure A-3 which illustrates the three lowest-power steps in the top-forward antenna sequence. The first pulse of the interrogation serves as the second pulse of the suppression.

3.2.2.4 The minimum triggering level (MTL) values tabulated in Figure A-2a and Figure A-2b are based on the assumption that replies to all interrogations are received



STEP NUMBER	MINIMUM EFFECTIVE RADIATED INTERROGATION POWER (dBm)	INTERFERENCE LIMITING PRIORITY	MTL (-dBm)
1	52	1	74
2	51	5	74
3	50	9	74
4	49	13	74
5	48	17	74
6	47	21	74
7	46	25	74
8	45	29	73
9	44	33	72
10	43	37	71
11	42	41	70
12	41	45	69
13	40	49	68
14	39	53	67
15	38	57	66
16	37	61	65
17	36	64	64
18	35	67	63
19	34	70	62
20	33	73	61
21	32	76	60
22	31	77	59
23	30	78	58
24	29	79	57

NOTES.— "I" indicates ERP of P_1, P_3, and P_4 interrogation pulses.

"S" indicates ERP of S_1 suppression pulse.

"S • I" means that the S_1 ERP is 2 dB less than the interrogation ERP.

"S • • I" means that the S_1 ERP is 3 dB less than the interrogation ERP.

In steps 24, 63, 64, 79 and 83, no S_1 pulses are transmitted.

Figure A-2a. Example of high-density whisper-shout sequence

STEP NUMBER		MINIMUM EFFECTIVE RADIATED INTERROGATION POWER (dBm)	INTERFERENCE LIMITING PRIORITY	MTL (-dBm)
	TOP ANTENNA, LEFT & RIGHT DIRECTIONS			
25, 26	S • • I	48	2, 3	74
27, 28	S • I	47	6, 7	74
29, 30	S • • I	46	10, 11	74
31, 32	S • I	45	14, 15	73
33, 34	S • • I	44	18, 19	72
35, 36	S • I	43	22, 23	71
37, 38	S • • I	42	26, 27	70
39, 40	S • I	41	30, 31	69
41, 42	S • • I	40	34, 35	68
43, 44	S • I	39	38, 39	67
45, 46	S • • I	38	42, 43	66
47, 48	S • I	37	46, 47	65
49, 50	S • • I	36	50, 51	64
51, 52	S • I	35	54, 55	63
53, 54	S • • I	34	58, 59	62
55, 56	S • I	33	62, 63	61
57, 58	S • • I	32	65, 66	60
59, 60	S • I	31	68, 69	59
61, 62	S • • I	30	71, 72	58
63, 64	• • • • I	29	74, 75	57
	TOP ANTENNA, AFT DIRECTION			
65	S • I	43	4	71
66	S • • I	42	8	70
67	S • I	41	12	69
68	S • • I	40	16	68
69	S • I	39	20	67
70	S • • I	38	24	66
71	S • I	37	28	65
72	S • • I	36	32	64
73	S • I	35	36	63
74	S • • I	34	40	62
75	S • I	33	44	61
76	S • • I	32	48	60
77	S • I	31	52	59
78	S • • I	30	56	58
79	• • • • I	29	60	57
	BOTTOM OMNI ANTENNA			
80	S • • I	34	80	62
81	S • • I	32	81	60
82	S • • I	30	82	58
83	• • I	28	83	56

27 37 47 57

EFFECTIVE RADIATED POWER (dBm)

NOTES.— “I” indicates ERP of P_1, P_3, and P_4 interrogation pulses.

“S” indicates ERP of S_1 suppression pulse.

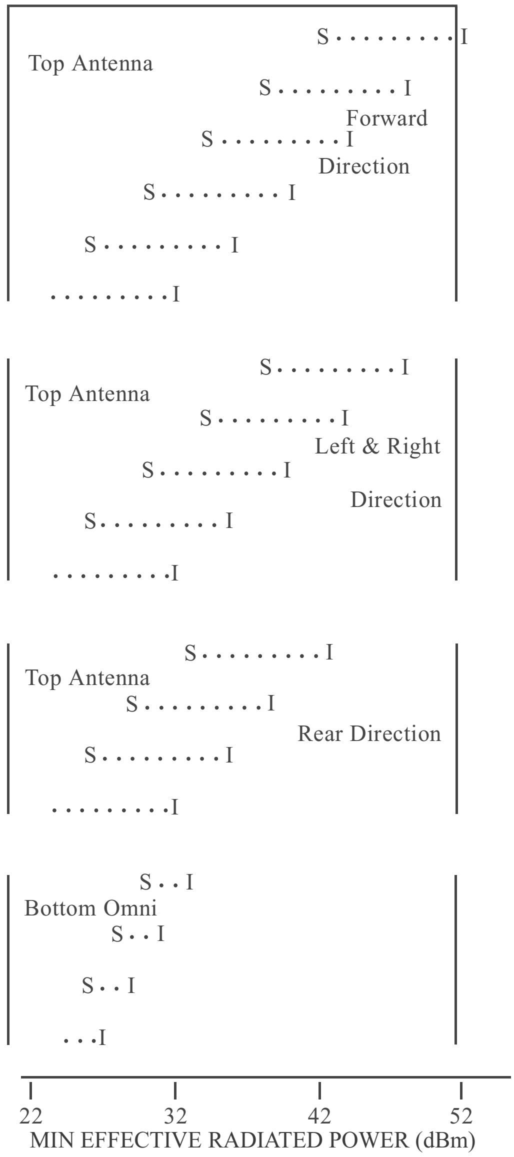
“S • I” means that the S_1 ERP is 2 dB less than the interrogati

“S • • I” means that the S_1 ERP is 3 dB less than the interrogatio

In steps 24, 63, 64, 79 and 83, no S_1 pulses are transmitted.

Figure A-2a. Example of high-density whisper-shout sequence (con’t)

STEP NUMBER	MINIMUM EFFECTIVE RADIATED INTERROGATION POWER (dBm)	INTERFERENCE LIMITING PRIORITY	MTL (-dBm)
1	52	*Note.— Each 1 dB reduction in the sequence follows the priority for the forward beam in Figure A-2a.*	74
2	48		74
3	44		72
4	40		68
5	36		64
6	32		60
7, 8	48	*Note.— Each 1 db reduction in the sequence follows the priority for the right/left beam in Figure A-2a.*	74
9, 10	44		72
11, 12	40		68
13, 14	36		64
15, 16	32		60
17	43	*Note.— Each 1 db reduction in the sequence follows the priority for the rear beam in Figure A-2a.*	71
18	39		67
19	35		63
20	31		59
21	34	*Note.— Each 1 db reduction in the sequence follows the priority for the bottom beam in Figure A-2a.*	62
22	32		60
23	30		58
24	28		56



NOTES.— “I” indicates ERP of P_1, P_3, and P_4 interrogation pulses.

“S” indicates ERP of S_1 suppression pulse.

“S • • I” means th a t the S_1 ERP is 3 dB less than the interrogat

“S • • • • • • • • • I” mea ns that the S_1 ERP is 9 dB less than the interr

In the last steps of each quadrant, no S_1 pulses are transmit ted.

Figure A-2b. Example of low-density whisper-shout sequence

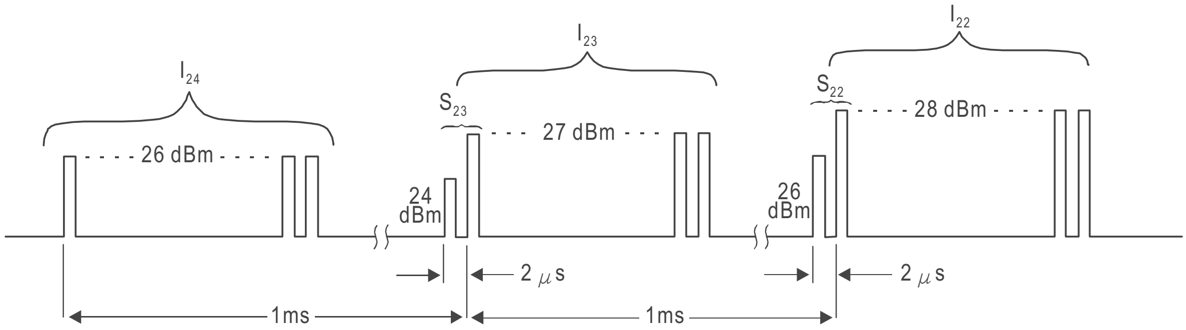


Figure A-3. Timing for lowest power steps in omnidirectional whisper-shout sequence for top antenna

omnidirectionally. If a directional-receive antenna is used, the MTL values must be adjusted to account for the antenna gain. For example, for a net antenna gain of 3 dB, all MTL values in the table would be raised by 3 dB; and the MTL for step number 1 would be –71 dBm rather than –74 dBm.

3.2.2.5 The power is defined as the effective radiated power for the interrogation. All power levels are to be within ±2 dB of nominal. The tolerance of the step increments is to be ±1/2 dB and the increments are to be monotonic throughout the entire power range of the sequence.

3.2.2.6 Most of the interrogations are transmitted from the top antenna because it is less susceptible to multipath interference from the ground.

3.2.2.7 Selection of the appropriate whisper-shout subsequence for a particular antenna beam is performed each interrogation cycle based on the current or anticipated level of Mode A/C synchronous garble in that beam as determined by ACAS surveillance. The high density whisper-shout subsequence is selected for an antenna beam whenever synchronous garble is present in that beam as evident from the existence of at least one low confidence altitude code bit in two consecutive Mode C replies. The 6-level whisper-shout sequence is selected for an antenna beam if either:

a) a single Mode A/C aircraft exists within the surveillance range of that beam and synchronous garble is not present; or

b) synchronous garble is not present, Mode A/C targets are not within garble range of each other, and the Mode A/C aircraft density within the reliable surveillance range is equal to or less than 0.23 aircraft/km (0.43 aircraft/NM). Whenever a TA is generated on a threat within a particular antenna beam, the high level sequence is used for that beam for the duration of the advisory. Whenever an RA is generated, the high level sequence is used for all antenna beams for the duration of the advisory.

3.2.2.8 If no established Mode A/C surveillance track nor any candidate track, consisting of three correlating Mode C acquisition replies, exists within the surveillance range of an antenna beam, degarbling is unnecessary and ACAS transmits a single Mode C interrogation in that beam. The power level of the single interrogation and its associated MTL in each beam is equivalent to the highest allowable power level of the corresponding low level whisper-shout subsequence as determined by interference limiting. Single Mode C interrogations are susceptible to uplink mode conversion due to multipath and may result in a mixture of Mode A and Mode C replies from an intruder that are separated by 13 microseconds. ACAS, therefore, selects the low level whisper-shout subsequence for a beam for reliable surveillance acquisition and tracking whenever:

a) a single interrogation in that beam results in a Mode A/C reply that occurs within a 1 525 m (5 000 ft) range window centred either at the measured range of a Mode A/C reply received in the previous surveillance update interval or at a range offset from the previous reply range by ±13 microseconds; or

b) an established Mode C track or a Mode C track in the process of being acquired traverses into that beam from another beam. ACAS switches back to the single interrogation after ten surveillance update intervals in which two correlating acquisition replies were not received.

3.2.3 INTERFERENCE LIMITING

3.2.3.1 ACAS equipment conforms to a set of three specific inequalities (Chapter 4, 4.3.2.2.2.2) for controlling interference effects. The three inequalities, applicable to ACAS operating below a pressure altitude of 5 490 m (18 000 ft), are associated with the following physical mechanisms: (1) reduction in "on" time of other transponders caused by ACAS interrogations, (2) reduction in "on" time of own transponder caused by mutual suppression during transmission of interrogations, and (3) Mode A/C fruit caused by ACAS Mode A/C interrogations. Setting n_a to 1 in inequalities (1) and (3) for ACAS operating above pressure altitude of 5 490 m (18 000 ft), prevents a single ACAS from transmitting unlimited power by providing an upper limit on the ACAS one-second interrogation power/rate product.

3.2.3.2 Inequality (1) ensures that a "victim" transponder will never detect more than 280 ACAS interrogations in a one-second period from all the ACAS interrogators within 56 km (30 NM) for any ACAS distribution, surrounding the "victim" transponder, within the limits of uniform-in-range to uniform-in-area. The left-hand side of the inequality allows an ACAS unit to increase its interrogation rate if it transmits at less than 250 W since low power transmissions are detected by fewer transponders. Each normalized power value within the summation in the left-hand side of this inequality contains an exponent α which serves to match the inequality to the localized ACAS distribution. The value of α defines the local ACAS aircraft distribution curve and is derived from own ACAS measurement of the distribution and number of other ACAS within 56 km (30 NM) range. As the ACAS distribution varies from uniform-in-area (α = 1) to uniform-in-range (α = 0.5), the density, and therefore the electromagnetic impact, of ACAS aircraft in the vicinity of a "victim" transponder becomes greater. This increased potential for ACAS interference is offset by the greater degree of interference limiting that results from using an exponent of less than one in the normalized power values of the inequality. The denominator of the first term on the right-hand side of this inequality accounts for other ACAS interrogators in the vicinity and the fact that all ACAS units must limit their interrogation rate and power in a similar manner so that, as the number of ACAS units in a region increases, the interrogation rate and power from each of them decreases and the total ACAS interrogation rate for any transponder remains less than 280 per second.

3.2.3.3 Within an airspace in which ACAS aircraft are distributed between the limits of uniform-in-range to uniform-in-area, and provided that the "victim" is taken off the air for 35 microseconds by suppression or reply dead time whenever it receives an ACAS interrogation, the total "off" time caused by ACAS interrogations will then never exceed 1 per cent. Measurements and simulations indicate that the total "off" time can be higher than 1 per cent in high-density terminal areas because of ACAS aircraft distributions that are beyond the region defined by uniform-in-area to uniform-in-range and because of a Mode S transponder recovery time to certain interrogations that is expected to be greater than 35 microseconds. The second term on the right-hand side of this inequality limits the maximum value of the interrogation power-rate product for ACAS II, regardless of n_a, in order to allow a portion of the total interference limiting allocation to be used by ACAS I. The term, which is matched to the ACAS distribution by the value of α in the denominator, ensures that an individual ACAS II unit never transmits more average power than it would if there were approximately 26 other ACAS II nearby distributed uniformly-in-area or approximately 6 other ACAS II nearby distributed nearly uniformly-in-range.

3.2.3.3.1 High-density terminal areas will suffer from higher loads due to violation of the 1 per cent estimate at approximately 14.8 – 18.5 km (8 – 10 NM) from touch down. To ensure sufficient surveillance performance for both ACAS and ground surveillance systems in such areas, ACAS flying below 610 m (2 000 ft) AGL include also ACAS II and ACAS III operating on ground in the calculation of n_b and n_c. This value was chosen for practical reasons:

a) the use of a radio altimeter allows sufficient measurement accuracy at and below 610 m (2 000 ft); and

b) it assumes aircraft are approaching on an ILS glide path. In that case, 610 m (2 000 ft) AGL corresponds to a distance of approximately 11.2 km (6 NM) from an airport.

New approach procedures (e.g. based on MLS or GNSS) may require additional considerations to limit interference. And even with ILS approach, it is recommended to establish procedures switching ACAS II and ACAS III to "stand-by" while the aircraft is not on an active runway.

3.2.3.4 Inequality (2) ensures that the transponder on board the ACAS aircraft will not be turned off by mutual suppression signals from the ACAS unit on the same aircraft more than 1 per cent of the time.

3.2.3.5 Inequality (3) ensures that a "victim" Mode A/C transponder will not generate more than 40 Mode A/C replies in a one-second period in response to interrogations from all the ACAS interrogators within its detection range. Like inequality (1) it includes terms to account for reduced transmit power, to account for the other ACAS interrogators in the vicinity, and to limit the power of a single ACAS unit. Forty Mode A/C replies per second is approximately 20 per cent of the reply rate for a transponder operating without ACAS in a busy area of multiple Mode A/C ground sensor coverage.

3.2.3.6 *EXAMPLE OF INTERFERENCE LIMITING*

3.2.3.6.1 As an example, when interrogation limiting is not invoked, the overall Mode A/C and Mode S interrogation rates of a directional ACAS unit would typically be as follows: the Mode A/C interrogation rate k_t is typically constant at 83 whisper-shout interrogations per second. Assume that the sum of the normalized whisper-shout powers, i.e. the Mode A/C contribution to the left-hand side of inequality (1), is approximately 3. The Mode S interrogation rate depends on the number of Mode S aircraft in the vicinity. In en-route airspace it is typically an average of about 0.08 interrogations per second for each Mode S aircraft within 56 km (30 NM). In a uniform aircraft density of 0.006 aircraft per square km (0.02 aircraft per square NM), the number of aircraft within 56 km (30 NM) is 57. If 20 per cent of these are ACAS equipped, n_a = 12 and the variable term on the right-hand side of inequality (1) is 21.5. If the number of ACAS aircraft in the area does not exceed 26, the fixed term continues to govern and no limiting occurs until there are approximately 100 Mode S aircraft within 56 km (30 NM).

3.2.3.6.2 Similar considerations hold for inequalities (2) and (3). In inequality (2) the mutual suppression interval associated with each top antenna interrogation is 70 microseconds. The bottom antenna mutual suppression interval is 90 microseconds. Thus the Mode A/C contribution to the left-hand side of inequality (2) is 0.0059 and the Mode S interrogation rate can be as high as 59 top antenna interrogations per second before violating the limit. With a typical whisper-shout sequence, the left-hand side of inequality (3) is approximately 3. The number of ACAS aircraft within 56 km (30 NM) can be as high as 26 without violating inequality (3).

3.2.3.6.3 When the interrogation rate or density increases to the point at which one of the limits is violated, either the Mode A/C or Mode S normalized interrogation rate or both must be reduced to satisfy the inequality. If the density were to reach 0.029 aircraft per km^2 (0.1 aircraft per NM^2) uniformly out to 56 km (30 NM), there would be 283 aircraft within a 56 km (30 NM) radius. If 10 per cent of these were equipped with ACAS, n_a = 28. The right-hand limits in inequalities (1) and (3) would then be 9.66 and 2.76 respectively. To satisfy these lower limits, the Mode A/C and Mode S contributions to the left-hand side of inequality (1) would both have to be reduced. As a result, the surveillance range of both Mode A/C and Mode S targets would be less.

3.2.3.6.4 Inequality (1) contains an exponent α which serves to match the inequalities to the specific local ACAS aircraft density such that a "victim" transponder operating in the vicinity of ACAS that are distributed within the limits of uniform-in-area to uniform-in-range will never detect more than 280 ACAS interrogations in a one-second period.

The value of α defines the local ACAS distribution characteristic within the vicinity of own ACAS.

It is based on the relative numbers of ACAS within 56 km (30 NM), within 11.2 km (6 NM) and within 5.6 km (3 NM) as derived from ACAS broadcast interrogations and from ACAS surveillance. The value of α is the minimum of:

a) the logarithm of the ratio of the number of ACAS aircraft, n_a , within 56 km (30 NM) to the number of ACAS aircraft, n_b, within 11.2 km (6 NM) divided by the logarithm of 25; and

b) one fourth of the ratio of the number of ACAS aircraft, n_b, within 11.2 km (6 NM) to the number of ACAS aircraft, n_c, within 5.6 km (3 NM).

A uniform-in-area distribution of ACAS aircraft within 56 km results in an α value of 1.0 and a uniform-in-range distribution results in a value of 0.5. Since decreasing values of α result in greater power reduction and therefore shorter surveillance ranges, the minimum value of α is constrained to 0.5 in order to preserve adequate surveillance range for collision avoidance in the highest density terminal areas. Additional constraints are imposed on the value of α_1 to account for special situations in which the measured local ACAS distribution is:

1) based on numbers so small as to be inconclusive ($n_b = 1$), in which case α_1 is constrained to 1;

2) is inconsistent with a relatively high overall ACAS count ($n_b \leq 4$, $n_c \leq 2$, $n_a > 25$), in which case α_1 is constrained to 1; or

3) is inconsistent with a relatively low overall ACAS count, ($n_c > 2$, $n_b > 2n_c$, $n_a < 40$), in which case α_1 is constrained to 0.5.

3.2.3.7 *INTERFERENCE LIMITING PROCEDURES*

3.2.3.7.1 At the beginning of each surveillance update interval, n_a, n_b and n_c are to be determined as indicated above. n_a is then used to evaluate the current right-hand limits in inequalities (1) and (3). Smoothed values of the Mode S variables in the inequalities are also to be calculated.

n_b and n_c are used to compute the value of α_1 according to the following expression:

$$\alpha_1 = 1/4\ [n_b/n_c]$$

n_a and n_b are used to compute the value of a α_2 according to the following expression:

$$\alpha_2 = \frac{Log_{10}[n_a/n_b]}{Log_{10}25}$$

In addition:

IF $[(n_b \leq 1)$ OR $(n_b > 4n_c)$ OR $(n_b \leq 4$ AND $n_c \leq 2$ AND $n_a > 25)]$ THEN $\alpha_1 = 1.0$;
IF $[(n_b < 2n_c)$ OR $((n_c > 2)$ AND $(n_b > 2n_c)$ AND $(n_a < 40))]$ THEN $\alpha_1 = 0.5$;
IF $(n_a > 25n_b)$ THEN $\alpha_2 = 1.0$;
IF $(n_a < 5n_b)$ THEN $\alpha_2 = 0.5$;
the value of α is the minimum of α_1 and α_2.

3.2.3.7.2 All air-to-air coordination interrogations and RA and ACAS broadcast interrogations are transmitted at full power. Air-to-air coordination interrogations and RA and ACAS broadcast interrogations are not included in the summations of Mode S interrogations in the left-hand terms of these inequalities. Whenever an RA is posted, surveillance interrogations to that intruder may be transmitted at full power to allow for maximum link reliability. Because the frequency of RAs is very low, these transmissions do not result in a measurable increase in interference.

3.2.3.7.3 If the smoothed value of the left-hand side of either inequality (1) or (2) equals or exceeds the current limit and own ACAS aircraft are operating below a pressure altitude of 5 490 m (18 000 ft), both the Mode S and Mode A/C surveillance parameters are to be modified to satisfy the inequalities. If the left-hand side of inequality (3) exceeds the current limit and own ACAS aircraft are operating below a pressure altitude of 5 490 m (18 000 ft), Mode A/C surveillance parameters are modified to satisfy the inequalities.

3.2.3.7.4 Mode A/C surveillance can be modified by sequentially eliminating steps from the whisper-shout sequence described in 3.2.2. Each whisper-shout step is uniquely associated with a receiver MTL setting. Thus, the receiver sensitivity in Mode A/C surveillance periods will be automatically tailored to match these power reductions.

3.2.3.7.5 The overall surveillance sensitivity for Mode S targets can be reduced by reducing the interrogation power and by increasing the receiver MTL during all Mode S squitter listening periods. This will indirectly reduce the Mode S interrogation rate by reducing the target count. Many Mode S interrogations are acquisition interrogations transmitted to targets of unknown range. It is thus not effective to directly control the Mode S interrogation rate simply by dropping long-range targets from the track file.

3.2.3.7.6 For airborne ACAS, the Mode A/C and Mode S surveillance power and sensitivity reductions are to be accomplished such that equality between the surveillance ranges for Mode S and Mode A/C targets exists in the forward beam. In order to provide a reliable 11.2 km (6 NM) surveillance range in all directions for n_b, the maximum allowed interference limiting power reduction in any beam for an airborne ACAS unit is 10 dB for Mode S and 7 dB for Mode A/C. Mode A/C surveillance power and sensitivity reductions for ACAS on the ground are to be accomplished such as to achieve equal whisper-shout capability in each beam. This requires that Mode A/C power and sensitivity reduction be accomplished in the forward beam until it is equivalent to the side beams and then in the forward and side beams until they are equivalent to the rear beam. In order to provide a reliable 5.6 km (3 NM) surveillance range in all directions for surveillance prior to departure, the maximum allowed interference limiting power reduction for an ACAS unit on the ground is as follows:

a) forward beam: 13 dB for Mode S and 10 dB for Mode A/C;

b) side beam: 13 dB for Mode S and 6 dB for Mode A/C; and

c) rear beam: 13 dB for Mode S and 1 dB for Mode A/C.

In addition, the Mode A/C and Mode S surveillance power and sensitivity reductions for ACASs that are airborne or on the ground are to be accomplished such that the ACAS equipment is not prematurely limited and has the capability of using at least 75 per cent of the allowance specified in the three limiting equations for all mixes of target types and for all densities up to the maximum density capability of the system. When the value of any of the smoothed limits is exceeded, the appropriate action is required to limit interference within one surveillance update interval. Means are to be provided for gradually restoring the surveillance sensitivity when the environment subsequently improves enough to allow the interference limits to be relaxed.

3.2.3.7.7 ACAS cross-link interrogations are included in the summation of Mode S interrogations in the left-hand terms of the interference limiting inequalities.

3.2.3.8 *IMPLEMENTATION OF A TYPICAL INTERFERENCE LIMITING PROCEDURE*

3.2.3.8.1 The following describes one possible implementation of an interference limiting procedure. It varies the system parameters appearing in inequalities (1), (2) and (3) to maximize and maintain approximate equality between the estimated surveillance ranges for Mode S and Mode A/C targets. In evaluating these inequalities, 8-second averages of the Mode S parameters are used, and current or anticipated values of the Mode A/C parameters are used. The procedure is illustrated in the flow chart of Figure A-4.

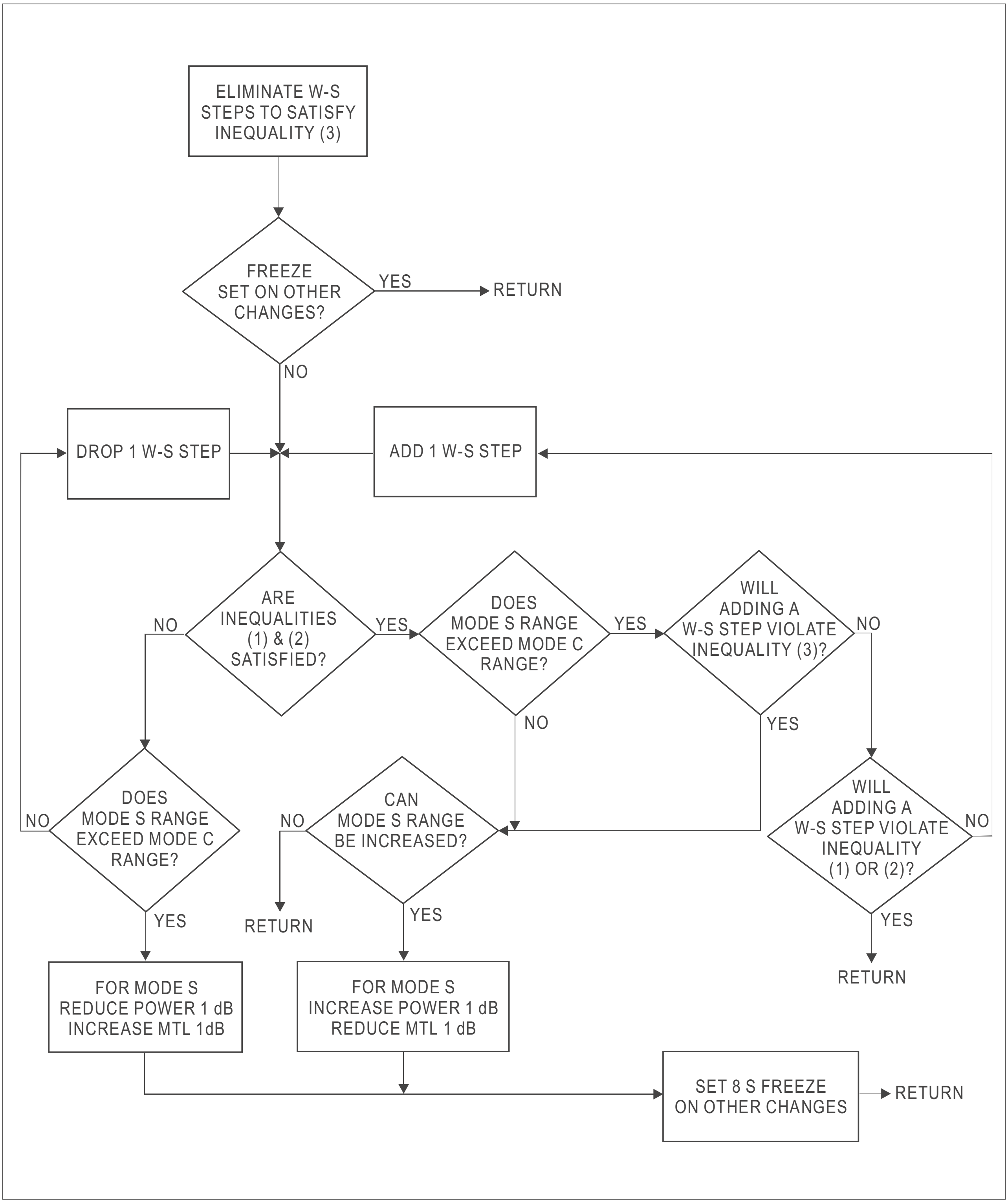


Figure A-4. Interference limiting flow diagram

3.2.3.8.2 *Step 1.* The first step in the control process is to reduce the number of whisper-shout steps tentatively scheduled for use during the present scan if either:

a) inequality (3) is violated; or

b) inequality (1) or (2) is violated and the Mode S surveillance range of the last scan does not exceed the Mode A/C surveillance range that would result from use of the scheduled whisper-shout sequence.

Whisper-shout steps are eliminated in the order dictated by the design of the Mode A/C processor and the number of steps eliminated is just large enough to ensure that neither of the above conditions is satisfied. The value of the number of whisper-shout steps tentatively scheduled for use is initialized at the number used on the last scan.

The relative magnitudes of the Mode S and Mode A/C surveillance ranges are determined from the estimated effective radiated power (ERP) seen by targets with Mode S and Mode A/C transponders located directly ahead of the ACAS aircraft. The ERP in a given direction is determined by the product of the power input to the antenna, and the antenna pattern gain in that direction. If the transponder sensitivities were identical, the Mode S range would be more or less than the Mode A/C range according to whether the Mode S transmitted power was more or less than the Mode A/C transmitted power. Since Mode A/C transponders may have somewhat lower sensitivities than Mode S transponders, the Mode A/C range is assumed to be greater than the Mode S range if, and only if, the Mode A/C power exceeds the Mode S power by 3 dB.

3.2.3.8.3 *Step 2.* The second step in the controlling process is to reduce the Mode S interrogation power for acquisition by 1 dB, and to increase the MTL for Mode S squitter listening by 1 dB from the values last used, if inequality (1) or (2) is violated and the Mode S surveillance range of the last scan exceeds the Mode A/C surveillance range that would result from use of the scheduled whisper-shout sequence.

Once such a change has been made, the only change allowed during the ensuing 8 seconds is a reduction in the number of whisper-shout steps if needed to satisfy inequality (3). This 8-second freeze allows the effect of the Mode S changes to become apparent since the 8-second averages used in inequalities (1) and (2) then will be determined by the behaviour of the system since the change.

3.2.3.8.4 *Step 3.* The third step is to add a whisper-shout step to those tentatively scheduled, when it is not prevented by an 8-second freeze, and the following conditions are satisfied:

a) inequalities (1), (2) and (3) are satisfied and will continue to be satisfied after the step is added; and

b) the Mode S surveillance range of the last scan exceeds the Mode A/C surveillance range that would result from use of the scheduled sequence; and

As many steps are added as possible without violating a) or b) above.

3.2.3.8.5 *Step 4.* Finally, if condition a) of 3.2.3.8.4 above is satisfied, but condition b) is not, an estimate is made of the effects of increasing the Mode S interrogation power for acquisition by 1 dB and reducing the MTL for Mode S squitters/fruit by 1 dB. If the estimate indicates that inequalities (1) and (2) will not continue to be satisfied, the 1 dB change is not made. If the estimate indicates that they will continue to be satisfied, the 1 dB change is made and no further changes in either the Mode A/C or Mode S parameters are made for the ensuing 8 seconds, except as described in 3.2.3.8.3 above.

3.2.4 INTERROGATION JITTER

Mode A/C interrogations from ACAS equipment are intentionally jittered to avoid chance synchronous interference with other ground-based and airborne interrogators. It is not necessary to jitter the Mode S surveillance interrogations because of the inherently random nature of the Mode S interrogation scheduling process for ACAS.

3.3 Antennas

3.3.1 USE OF DIRECTIONAL INTERROGATIONS

3.3.1.1 A directional antenna is recommended for reliable surveillance of Mode A/C targets in aircraft densities up to 0.087 aircraft per square km (0.3 aircraft per square NM). The recommended antenna system consists of a four-beam antenna mounted on top of the aircraft and an omnidirectional antenna on the bottom. A directional antenna may also be used instead of the omnidirectional antenna on the bottom of the aircraft. The directional antenna sequentially generates beams that point in the forward, aft, left, and right directions. Together these provide surveillance coverage for targets at all azimuth angles without the need for intermediate pointing angles.

3.3.1.2 The directional antenna typically has a 3-dB beam width (BW) in azimuth of 90 ±10 degrees for all elevation angles between +20 and –15 degrees. The interrogation beamwidth is to be limited by transmission of a P_2 side-lobe suppression pulse following each P_1 interrogation pulse by 2 microseconds. The P_2 pulse is transmitted on a separate control pattern (which may be omnidirectional).

3.3.1.3 There is need for timely detection of aircraft approaching with low closing speeds from above and below. Detection of such aircraft suggests a need for sufficient antenna gain within a ±10 degree elevation angle relative to the ACAS aircraft pitch plane. An ACAS directional antenna typically has a nominal 3 dB vertical beamwidth of 30 degrees.

3.3.1.4 The shape of the directional antenna patterns and the relative amplitude of the P_2 transmissions is controlled such that a) a maximum suppression transponder located at any azimuth angle between 0 and 360 degrees and at any elevation angle between +20 and –15 degrees would reply to interrogations from at least one of the four directional beams and b) a minimum suppression transponder would reply to interrogations from no more than two adjacent directional beams. A maximum suppression transponder is defined as one that replies only when the received ratio of P_1 to P_2 exceeds 3 dB. A minimum suppression transponder is defined as one that replies when the received ratio of P_1 to P_2 exceeds 0 dB.

3.3.1.5 The effective radiated power (ERP) from each antenna beam (forward, left, right, aft, omni) is expected to be within ±2 dB of its respective nominal value as given in Figure A-2a.

3.3.1.6 A forward directional transmission, for which TRP = 49 dBm and BW = 90° has a power gain product at beam centre of approximately,

$$PG = \frac{TRP}{BW/360^{\circ}} = 55 \text{ dBm}$$

This is 1 dB greater than the nominal and allows for adequate coverage at the cross-over points of the directional beams. The TRP of the side and aft beams is reduced relative to the front beam to account for the lower closing speeds that occur when aircraft approach from these directions. Mode A/C surveillance performance will generally improve as the directivity (and hence the number of beams) is increased for the top-mounted antenna. However, the use of a directional antenna on the bottom would provide only marginal improvement in detectability and would, if used at full power, degrade the overall performance of the equipment by increasing the false track rate due to ground-bounce multipath.

3.3.2 Direction finding

The angle-of-arrival of the transmissions from the replying transponders can be determined with better than 10-degree RMS accuracy by means of several simple and practical direction-finding techniques. These techniques typically employ a set of four or five monopole radiating elements mounted on the aircraft surface in a square array with quarter-wave spacing. The signals from these elements may be combined so as to generate from two to four distinct beams which may be compared in phase or amplitude to provide an estimate of the direction of arrival of the received signal. This level of direction-finding accuracy is adequate to provide the pilot with TAs to effectively aid the visual acquisition of intruding aircraft.

3.3.3 Directional transmission for control of synchronous garble

3.3.3.1 The use of directional interrogation is one technique for reducing synchronous garble. The directional interrogation can reduce the size of the interrogation region. Coverage must be provided in all directions. Hence, multiple beams are used to elicit replies from all aircraft in the vicinity of the ACAS-equipped aircraft. Care must be taken to overlap the beams so that gaps in coverage do not exist between beams.

3.3.3.2 The antenna may be a relatively simple array capable of switching among typically four or eight discrete beam positions. For four beam positions, the antenna beam-width is expected to be on the order of 100°. The effective antenna beamwidth for interrogating Mode A/C transponders can be made more narrow than the 3-dB beamwidth by means of transmitter side-lobe suppression.

3.3.4 Antenna location

The top-mounted directional antenna is to be located on the aircraft centre line and as far forward as possible. The ACAS antennas and the Mode S transponder antennas are to be mounted as far apart as possible on the airframe to minimize coupling of leakage energy from unit to unit. The spacing must never be less than 0.5 m (1.5 ft), as this spacing results in a coupling loss of at least 20 dB.

3.4 Receiver and processor

3.4.1 Sensitivity

A sensitivity equivalent to that of a Mode S transponder (minimum triggering level of –74 dBm) will provide adequate link margin to provide reliable detection of near co-altitude aircraft in level flight at a range of 26 km (14 NM) provided those aircraft are themselves equipped with transponders of nominal transmit power.

3.4.2 Control of receiver threshold

3.4.2.1 ACAS receivers use a variable (dynamic) threshold to control the effects of multipath. When the first pulse of a reply is received, the variable receiver threshold technique raises the receiver threshold from the minimum triggering level (MTL) to a level at a fixed amount (e.g. 9 dB) below the peak level of the received pulse. The receiver threshold is maintained at this level for the duration of a Mode A/C reply, at which time it returns to the MTL. When multi-path returns are weak compared to the direct-path reply, the first pulse of the direct-path reply raises the receiver threshold sufficiently so that the multipath returns are not detected.

3.4.2.2 Variable receiver thresholds have historically been avoided in Mode A/C reply processors because such thresholding tends to discriminate against weak replies. However, when used in conjunction with whisper-shout interrogations, this disadvantage is largely overcome. On any given step of the interrogation sequence it is possible for a strong reply to raise the threshold and cause the rejection of a weaker overlapping reply. However, with whisper-shout interrogations, the overlapping replies received in response to each interrogation are of approximately equal amplitudes since the whisper-shout process sorts the targets into groups by signal strength.

3.4.2.3 The ACAS receiver MTL used in the reply listening period following each whisper-shout interrogation relates to the interrogation power in a prescribed manner. In particular, less sensitive MTLs are used with the lower interrogation powers in order to control the Mode A/C fruit rate in the ACAS receiver while still maintaining a balance between the interrogation link and the reply link so that all elicited replies are detected.

3.4.3 Pulse processing

3.4.3.1 A relatively wide dynamic range receiver faithfully reproduces the received pulses. Provisions may be included for locating the edges of received pulses with accuracy, and logic may be provided for eliminating false framing pulses that are synthesized by code pulses from real replies. The processor is capable of resolving pulses in situations where overlapped pulse edges are clearly distinguishable. It is also capable of reconstructing the positions of hidden pulses when overlapping pulses of nearly the same amplitude cause the following pulses to be obscured. The reply processor has the capacity for handling and correctly decoding at least three overlapping replies. Means are also provided for rejecting out-of-band signals and for rejecting pulses with rise times exceeding 0.5 microsecond (typically, DME pulses).

3.4.3.2 If a Mode S reply is received during a Mode C listening period, a string of false Mode C fruit replies may be generated. The ACAS equipment is expected to reject these false replies.

3.4.4 Error detection and correction

3.4.4.1 ACAS avionics intended for use in airspace characterized by closing speeds greater than 260 m/s (500 kt) and densities greater than 0.009 aircraft per km^2 (0.03 aircraft per NM^2) or closing speeds less than 260 m/s (500 kt) and densities greater than 0.04 aircraft per km^2 (0.14 aircraft per NM^2) requires a capability for Mode S reply error correction. In these high densities, error correction is necessary to overcome the effects of Mode A/C fruit. Mode S error correction permits successful reception of a Mode S reply in the presence of one overlapping Mode A/C reply.

3.4.4.2 Error correction decoding is to be used for the following replies: DF = 11 all-call replies, DF = 0 short air-air surveillance replies, and DF = 16 long air-air surveillance replies (both acquisition and non-acquisition). In addition, passive monitoring of DF = 4 short surveillance altitude replies requires error correction decoding.

3.4.4.3 If two or more acquisition replies requiring error correction are received within the Mode S range acquisition window, it may be impractical to apply error correction to more than the first received reply. Acquisition replies other than the first do not need to be corrected when this occurs.

3.4.5 Receiver side-lobe suppression

ACAS equipment that interrogates directionally may use receiver side-lobe suppression techniques to eliminate replies (fruit) generated by nearby aircraft that are outside the interrogated sector. This reduces the number of replies processed during the surveillance update period.

3.4.6 Dual minimum triggering levels

If the MTL of the receiver used by ACAS is lowered to obtain longer range operation with extended squitter, provision must be made to label squitter receptions that were received at the MTL that would have been used by an unmodified ACAS receiver. Squitter receptions that are received at the conventional MTL or higher are fed to the ACAS surveillance function. Squitter receptions that are received below the conventional MTL are not used for ACAS surveillance but are routed directly to the extended squitter application. This filtering by MTL is necessary to prevent ACAS from attempting to interrogate aircraft that are beyond the range of its active surveillance capability. This would increase the ACAS interrogation rate without providing any improved surveillance performance. Use of the conventional MTL for the ACAS surveillance function preserves the current operation of ACAS surveillance when operating with a receiver with an improved MTL.

3.5 Collision avoidance algorithms

Note.— The guidance material on the collision avoidance logic of ACAS II is organized in two sections. This section addresses the Standards in the ACAS SARPs and elaborates on *important concepts using the design features of a specific implementation of the ACAS logic as examples. Section 4 provides further details on the algorithms and parameters used by this particular ACAS implementation. As a consequence of this arrangement, paragraphs in this section often refer to paragraphs in the next one.*

3.5.1 GENERAL

3.5.1.1 The ACAS algorithms operate in a cycle repeated nominally once per second. At the beginning of the cycle, surveillance reports are used to update the tracks of all intruders and to initiate new tracks as required. Each intruder is then represented by a current estimate of its range, range rate, altitude, altitude rate, and perhaps, its bearing. Own aircraft altitude and altitude rate estimates are also updated.

3.5.1.2 After the tracks have been updated, the threat detection algorithms are used to determine which intruders are potential collision threats. Two threat levels are defined: potential threat and threat. Potential threats warrant TAs while threats warrant RAs.

3.5.1.3 The resolution algorithms generate an RA intended to provide vertical separation from all threats identified by the threat-detection algorithms. Coordination with each equipped threat occurs as part of the process of selecting the RA. Pairwise coordination with each equipped threat is necessary to establish which aircraft is to pass above the other and thus guarantee avoidance manoeuvres that are compatible.

3.5.2 THREAT DETECTION

3.5.2.1 Collision threat detection is based on simultaneous proximity in range and altitude. ACAS uses range rate and altitude rate data to extrapolate the positions of the intruder and own aircraft. If within a short time interval (e.g. 25 seconds hence) the range of the intruder is expected to be "small" and the altitude separation is expected to be "small", the intruder is declared a threat. Alternatively, the threat declaration may be based on current range and altitude separations which are "small". The algorithm parameters which establish how far into the future positions are extrapolated, and which establish thresholds for determining when separations are "small", are selected in accordance with the sensitivity level at which the threat detection algorithms are operating.

3.5.2.2 Each sensitivity level defines a specific set of values for the detection parameters used by the algorithms. These include threshold values for the predicted time to closest approach, the minimum slant range, and the vertical separation. Through the process of sensitivity level control, these parameters are assigned different values to account for the smaller aircraft separations that occur in dense terminal airspace. Sensitivity level may be selected automatically using the altitude of own aircraft, or may be selected by command from a Mode S ground station, or by a manual pilot switch (see 3.5.12).

3.5.2.3 The values used for threat detection parameters cannot be optimum for all situations because ACAS is handicapped by its lack of knowledge of intruder intent. The result is that a balance has to be struck between the need to give adequate warning of an impending collision and the possible generation of unnecessary alerts. The latter may result from encounters that are resolved at the last moment by intruder manoeuvres. A feature of ACAS that helps in this respect is the variability of the protected volume of airspace. This volume is automatically coupled in size to the relative speed between the two aircraft, and is automatically aligned in a direction parallel to the relative velocity vector. Bearing plays no part in this process. Each encounter gives rise to a protected volume tailored to that encounter. In a multi-aircraft situation there is an individual protected volume for the ACAS aircraft paired with each threat.

3.5.3 PROTECTED VOLUME

An intruder becomes a threat when it penetrates a protected volume enclosing own aircraft. The protected volume is defined by means of a range test (using range data only) and an altitude test (using altitude and range data). Application of these tests delivers a positive or a negative result (implying that the threat is inside or outside the appropriate part of the protected volume). An intruder is declared a threat when both tests give a positive result.

3.5.3.1 *PROTECTED VOLUME TERMS' DESCRIPTION*

Collision plane. The plane containing the range vector and the instantaneous relative velocity vector originating at the intruder.

Critical cross-sectional area. The maximum cross-sectional area of the protected volume in a plane orthogonal to the major axis.

Instantaneous relative velocity(ies). The modulus of the current value of relative velocity.

Linear miss distance (m_a). The minimum value that range will take on the assumption that both the intruder and own aircraft proceed from their current positions with unaccelerated motions.

Linear time to closest approach (t_a). The time it would take to reach closest approach if both the intruder and own aircraft proceed from their current positions with unaccelerated motions.

Given that the only information available to ACAS to make range predictions are range and range rate estimates, both the linear miss distance and the linear time to closest approach are unobservable quantities.

The unobservable quantities, linear miss distance and linear time to closest approach, are related to the observable quantities range r and range rate $\dot{r}$ by the following equality:

$$t_a = \frac{(r^2 - m_a^2)}{(-r\dot{r})}$$

Major axis. In the context of the protected volume, the line through the ACAS II aircraft which is parallel to the instantaneous relative velocity vector.

Range convergence. The aircraft is deemed to be converging in range if the range rate is less than or equal to zero.

3.5.4 RANGE TEST

3.5.4.1 The protected volume resulting from the range test used in the ACAS implementation described in Section 4 can be defined in terms of the maximum dimensions of a realizable implementation of the test which is illustrated by Figure A-5. This shows a section through the protected volume generated by a range test in the plane containing both aircraft and the instantaneous relative velocity vector. The protected volume is that which would be produced by rotating the solid curve about the x axis. Note that the length of the major axis is a function of the relative speed, s. For the realizable range test, the radius of the maximum cross section through the protected volume in a plane normal to the instantaneous relative velocity vector is m_c. This represents the maximum miss distance for which an alert can be generated if the relative velocity at the time of entry to the protected volume is maintained to closest approach. The length of the major axis is the principal feature determining warning time while m_c controls the projected miss distance which is likely to generate an alert. Ideally, the warning time would be T seconds and m_c would be such that only intruders projected to have miss distances less than D_m (the radius of the broken-line circle in Figure A-5) would qualify for an alert. The significance of D_m, when specified as in the ACAS implementation described in Section 4, is that, to a good approximation, it represents the lateral displacement experienced by an aircraft over the time T when turning with a constant acceleration of g/3 (bank angle = 18°). Thus an encounter with a projected miss distance of D_m when the time to closest approach is T can result in a collision if either aircraft is manoeuvring with an acceleration of g/3. In the absence of adequate bearing rate or range acceleration data, ACAS cannot achieve the ideal. Figure A-6 shows the maximum value for m_c (i.e. $\hat{m}_c$ as a function of relative speed and sensitivity level). When the relative speed is very low, as can occur in a tail-chase, the protected volume produced by the range test becomes a sphere of radius D_m centred on the ACAS aircraft.

3.5.4.2 Essentially, the range test gives a positive result if, when approximately T seconds remain before closest approach, the relative velocity vector can be projected to pass through a circle of radius m_c centred on the ACAS aircraft and placed in the plane normal to the relative velocity vector. Since the value of m_c is very large compared to the value for adequate vertical separation, the use of the range test alone would generate a large number of unnecessary alerts. It is therefore necessary to tailor the range test protected volume to more modest proportions using altitude data. Inevitably, this reduces the immunity to manoeuvres in the vertical plane.

3.5.4.3 The constraints on the range test are designed to give a nominal warning time of T seconds allowing for a manoeuvre producing a displacement of D_m normal to the relative velocity vector. It may be demonstrated that, for an encounter having a reasonably large relative velocity, the relative acceleration produced by a turning aircraft is nearly normal to the relative velocity vector. For low relative speed there can be a substantial component of acceleration in the direction of a relative velocity. Erosion of the warning time due to this component is compensated by having a minimum length for the major axis of the protected volume which is greater than sT.

3.5.5 ALTITUDE TEST

3.5.5.1 The objective of the altitude test is to filter out intruders that give a positive result for the range test but are nevertheless adequately separated in the vertical dimension. The altitude test is used to reduce alert rate in the knowledge that the standard vertical separation distances for aircraft are normally much less than the standard horizontal separation distances. An inevitable result is that the acceleration protection, nominally provided by the range test in all planes, is largely restricted to the horizontal plane. Also, even in the absence of relative acceleration, the altitude test can delay warnings if some vertical separation at closest approach is predicted to exist. A view in elevation of the relative motion of two aircraft is shown in Figure A-7. AOB represents a plane normal to the relative velocity vector and containing the ACAS aircraft. The intruder may be horizontally displaced from the ACAS so it is not necessarily in the plane of the diagram. The essential feature of the altitude test is that it aims to give a positive result if the projected vertical miss distance is less than Z_m. In the ACAS implementation described in Section 4, Z_m varies with altitude in steps from 180 m (600 ft) to 240 m (800 ft).

3.5.5.2 Since the main interest is in intruders with projected miss distances less than D_m, an ideal altitude test (in combination with an ideal range test) would give a positive result if, *inter alia*, the relative velocity vector were projected to pass through the critical area shown by the solid outline in Figure A-7. In practice, the altitude test and the range test outlined in 3.5.1.2 tend to be satisfied if the vector passes

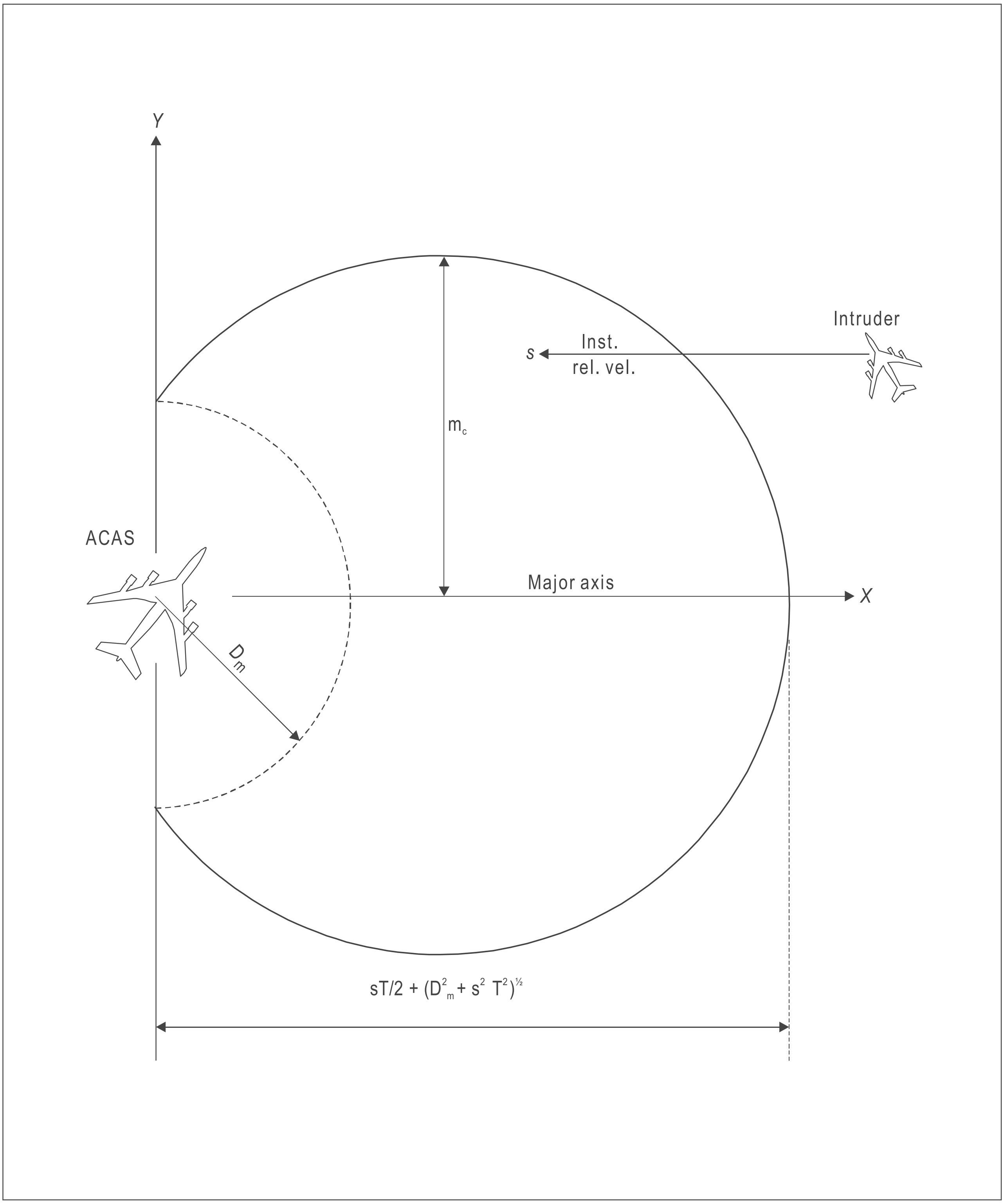


Figure A-5. Section through protected volume in the instantaneous collision plane

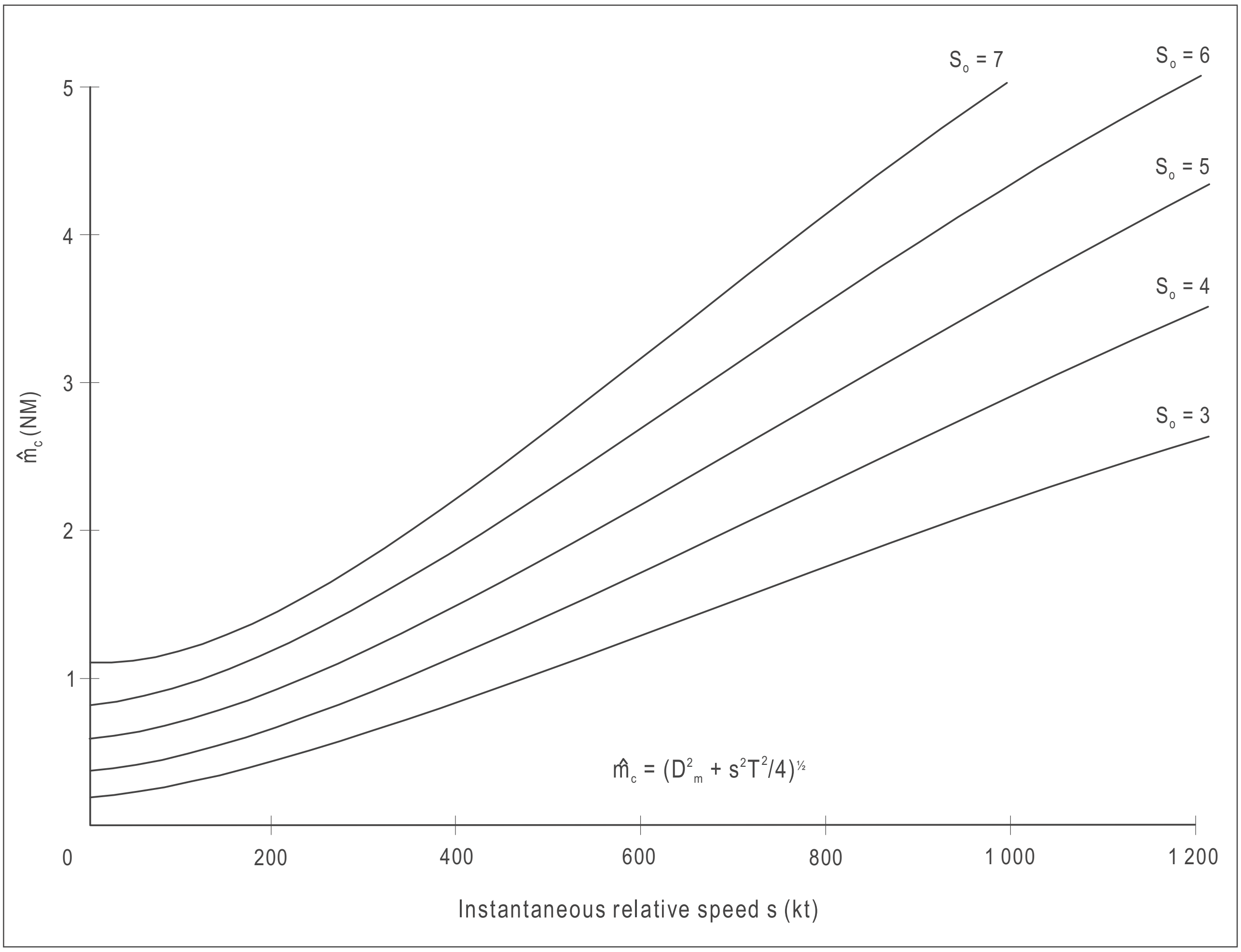


Figure A-6. Critical miss distance

through the larger area defined by the broken outline. Those intruders passing through the shaded areas are likely to give rise to unnecessary alerts.

3.5.5.3 The altitude test is no better placed to predict the time to closest approach than is the range test. This means that, if no other conditions are applied, the range test determines the time of the alert. However, an additional feature of the altitude test of the ACAS implementation described in Section 4 attempts to guard against the eventuality that one of the aircraft levels off above or below the other, thus avoiding a close encounter. Two types of encounter are recognized: the first in which the current altitude separation is less than Z_t (see 4.3.4.2); and a second, in which the current altitude separation is greater than Z_t and the aircraft are converging in altitude. For the first type, the altitude test requires only that the critical area is projected to be penetrated. For the second an additional condition is that the time to reach co-altitude is to be less than or equal to a time threshold that is sometimes less than *T*, the nominal warning time. The effect is that warning time is controlled by the range test for intruders that are projected to cross in altitude before closest approach while later warnings are given for altitude crossings beyond closest approach.

3.5.6 ESTABLISHED THREATS

3.5.6.1 An established threat is an intruder that has been declared a threat and still merits a resolution advisory.

3.5.6.2 The need to give a positive result for both the range test and the altitude test on the same cycle of operation before declaring an intruder to be a threat (3.5.2.1) applies only for new threats. Subsequently, only the range test is applied and a positive result has the effect of maintaining threat status. The reason for omitting the altitude test is that a rapid pilot response, or the fact that the intruder initially only just satisfied the altitude criteria, may result in cancellation of threat status before reaching closest approach.

3.5.7 ALERT RATE

3.5.7.1 The principal variables controlling alert rate are relative velocity, miss distance and the ambient aircraft density. The principal parameters affecting alert rate are *T*, D_m and Z_m. Alert rates can be calculated for constant velocity random traffic but the influences of see-and-avoid and ATC make such calculations for real traffic very difficult. Figure A-6 gives some guidance on some features of an encounter that might give rise to an alert although it gives no assistance concerning the result of the altitude test. For example, it can be seen that, for sensitivity level 5 (altitudes between FL 50 and FL 100) there can be no alert if the horizontal separation is greater than 5.5 km (3 NM) and the relative speed is less than about 440 m/s (850 kt).

3.5.7.2 Simulations using ground-based radar surveillance data and initial experience with ACAS equipments have indicated that the overall alert rate ranges from about 1 in 30 flight hours to 1 in 50 flight hours in typical busy airspaces.

3.5.8 THREAT RESOLUTION

3.5.8.1 *COORDINATION*

If the threat aircraft is equipped with ACAS II or ACAS III, own ACAS is required to coordinate with the threat aircraft's ACAS via the Mode S data link to ensure that compatible RAs are selected. The nature of the advisory selected can also be influenced by the fact that the threat is ACAS-equipped.

3.5.8.2 *CLASSIFICATION OF RESOLUTION ADVISORIES*

3.5.8.2.1 ACAS escape manoeuvres are confined to the vertical plane and can be characterized by a sense (up or down) and a strength. The objective of an RA with an upward sense is to ensure that own aircraft will safely pass above the threat. The objective of an RA with a downward sense is to

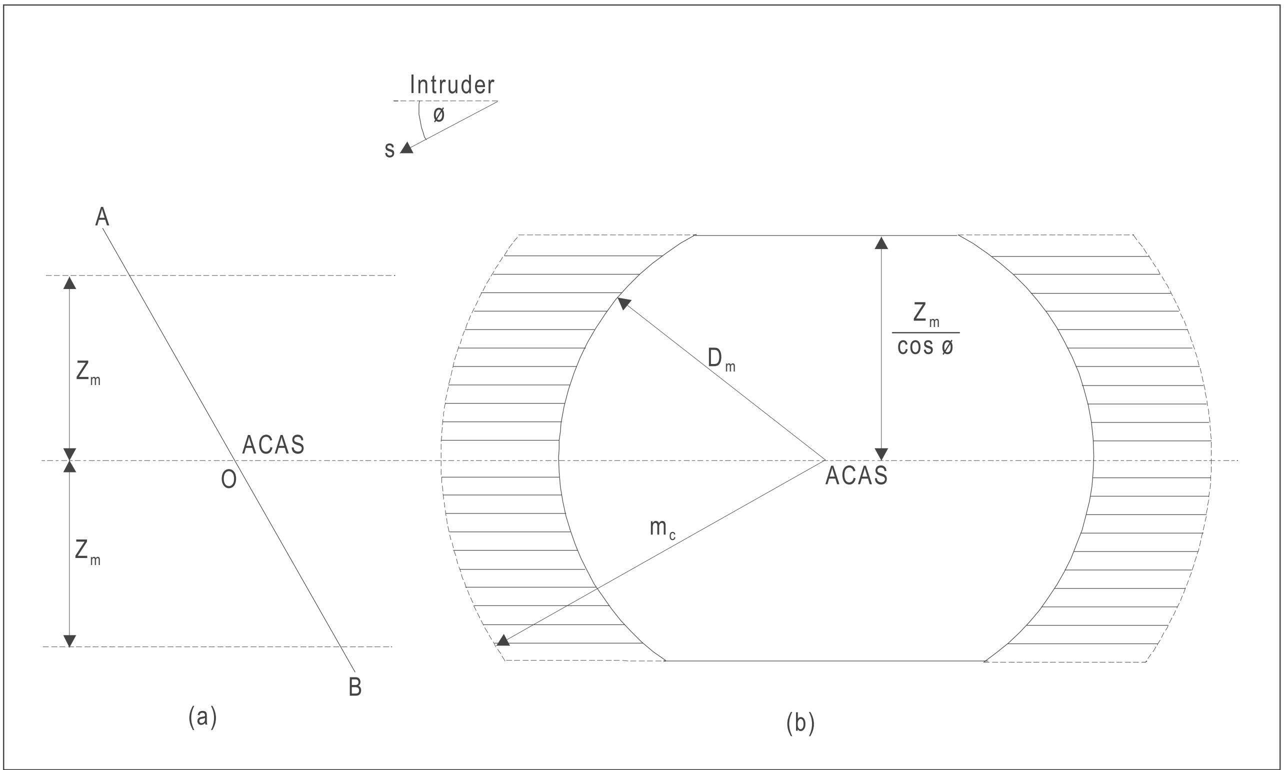


Figure A-7. Critical area for ideal altitude test

ensure that own aircraft will safely pass below the threat. Examples of RA strengths with the upward sense are "limit vertical speed" (to a specified target descent speed), "do not descend", or "climb". Examples of equivalent RA strengths with the downward sense are "limit vertical speed" (to a specified target climb speed), "do not climb", or "descend". RAs are of two types: "positive", meaning a requirement to climb or descend at a particular rate; and "vertical speed limit", meaning that a prescribed range of vertical speed must be avoided. Any advisory may be "corrective" or "preventive". A corrective advisory requires a change in own aircraft's current vertical rate whereas a preventive advisory does not.

3.5.8.2.2 It is expected that the RA generated be consistent with flight path limitations in some regimes of flight, due to flight envelope restrictions and aircraft configurations that reduce climb capability. It is expected that the aircraft's manoeuvre limitation indications available to ACAS will offer a conservative assessment of the actual aircraft performance capabilities. This is particularly true of climb inhibit. In the rare and urgent case of a high altitude downward sense RA being reversed to a climb, it is expected that, very often, the aircraft performance capabilities needed to comply with the RA will be available despite the climb inhibit. When such capabilities are not available, it is expected that the pilot will always be able to comply with the reversal at least partially by promptly levelling-off.

3.5.8.3 *ALTITUDE SEPARATION GOAL*

3.5.8.3.1 To be certain of avoiding a collision, ACAS must provide a true altitude separation at closest approach which is commensurate with aircraft dimensions and worst-case orientation of the aircraft. Since only measured altitude data are available, due allowance must be made for altimetry errors in both aircraft. Furthermore, the avoiding action must be commenced before closest approach so it is possible that this action will be based on predicted altitude separation at closest approach, which introduces a further source of error. These factors lead to a requirement that the RA provided to the pilot should be such that the desired altitude separation at closest approach can be achieved in the time available. This altitude separation goal, A_l, must vary as a function of altitude in order to adequately compensate for altimetry errors. In the ACAS implementation described in Section 4, A_l varies from 90 m (300 ft) to 210 m (700 ft).

3.5.8.3.2 The time to closest approach cannot be estimated accurately because the miss distance is not known, the threat could manoeuvre and the range observations are imperfect. However, limits that have been found useful and acceptable are the times to closest approach assuming the miss distance to take the largest value of concern (D_m) and the value zero, and that all other sources of error have been neglected. This interval is critical for encounters in which the range rate takes on very small values. By maintaining the altitude separation over the entire interval, the selection of the RA is made immune to potentially large errors in estimating the time of minimum range. Such errors can result from small absolute errors in estimating range rate. For preventive RAs, the assumption of an immediate change of rate to the limit recommended by the RA will cause the calculation to deliver a bound (upper for downward RAs, lower for upward RAs) on the altitude of own aircraft at closest approach.

3.5.8.4 *MINIMUM DISRUPTION*

3.5.8.4.1 In principle, the larger altitude separations goals could be achieved by a more vigorous escape manoeuvre but constraints are passenger comfort, aircraft capability and deviation from ATC clearance. The ACAS parameters described in Section 4 below are based on an anticipation that the typical altitude rate needed to avoid a collision is 1 500 ft/min.

3.5.8.4.2 The initial choice of the sense and strength of the RA is intended, subject to the exceptions described below, to require the smallest possible change in the vertical trajectory of the ACAS aircraft. And the advisory is expected to be appropriately weakened, if possible, at later stages of the encounter, and removed altogether when the desired separation has been achieved at closest approach. A prime consideration is the minimization of any departure from an ATC clearance.

3.5.8.5 *PILOT RESPONSE*

Since the pilot exercises such a major influence on the effectiveness of the system, it is necessary for any ACAS design to make certain assumptions concerning the response of the pilot. The ACAS implementation described in Section 4 uses a response delay of 5 seconds for a new advisory and a vertical acceleration of $g/4$ to establish the escape velocity. The response time reduces to 2.5 seconds for subsequent advisory changes. ACAS may not provide adequate vertical separation if the pilot response delay exceeds the expected pilot response delay assumed by the design.

3.5.8.6 *INTRUDERS IN LEVEL FLIGHT*

3.5.8.6.1 Intruders that are flying level at the time of the alert and continue thereafter in level flight present few problems for ACAS. If own aircraft is also in level flight, the altitude prediction problem does not exist. All the ACAS aircraft has to do is to move in the direction which increases the current altitude separation to the target value. Possible obstacles to this simple logic are that the ACAS aircraft may be unable to climb, or may be too close to the ground to descend safely.

3.5.8.6.2 The manoeuvre limitation problems largely disappear when the ACAS aircraft is in climb or descent since separation can then often be obtained simply by levelling-off. And the prediction problem is likely to be a minor one if ACAS is fed with high resolution data for own altitude.

3.5.8.7 *INTRUDERS IN CLIMB/DESCENT*

Intruders in climb or descent provide more difficulty than intruders in level flight. It is often a problem to determine their altitude rates. There is also evidence that a climbing or descending threat that is projected to pass close to own aircraft is more likely to level-off than to maintain its observed altitude rate thus avoiding the close encounter. Therefore the selection of RAs by ACAS should be biased by an expectation that threats might level-off, e.g. in response to ATC. A low confidence in the threat's tracked altitude rate may cause RA generation to be delayed pending a better estimate of this rate.

3.5.8.8 *ALTITUDE CROSSING RAS*

3.5.8.8.1 Intruders that are projected to cross the altitude of an ACAS aircraft make the design of a totally effective ACAS extremely difficult because such intruders might level-off. Some of the altitude crossing RAs occasionally generated have been found counter-intuitive by pilots. Indeed, such RAs require the pilot to initially manoeuvre toward the intruder, temporarily losing vertical separation. Nevertheless, encounters for which altitude crossing RAs are clearly appropriate have been observed, and it is not yet demonstrated that it is desirable or possible to avoid them entirely. The frequency of altitude crossing RAs is likely to depend on the management and behaviour of aircraft. It is known that aircraft climbing and descending at high rates more frequently give rise to RAs, including crossing RAs, than other aircraft. The potential effect of approaching a cleared flight level at high speed and then levelling-off in close horizontal and vertical proximity to another aircraft is described below. Measures to mitigate these effects are described in 3.5.8.9.

3.5.8.8.2 For the scenario illustrated in Figure A-8, suppose that the alert occurs while the intruder is climbing towards the level ACAS aircraft. Given that the climb continues, the best escape strategy would be for own aircraft to descend towards the threat, in so doing crossing through the threat's altitude. A climb away could possibly provide enough vertical clearance but, for the same escape velocity, a descent will give greater clearance. If own aircraft does descend it can be seen that a hazardous situation arises if the threat levels off at the cardinal flight level below own aircraft. Such

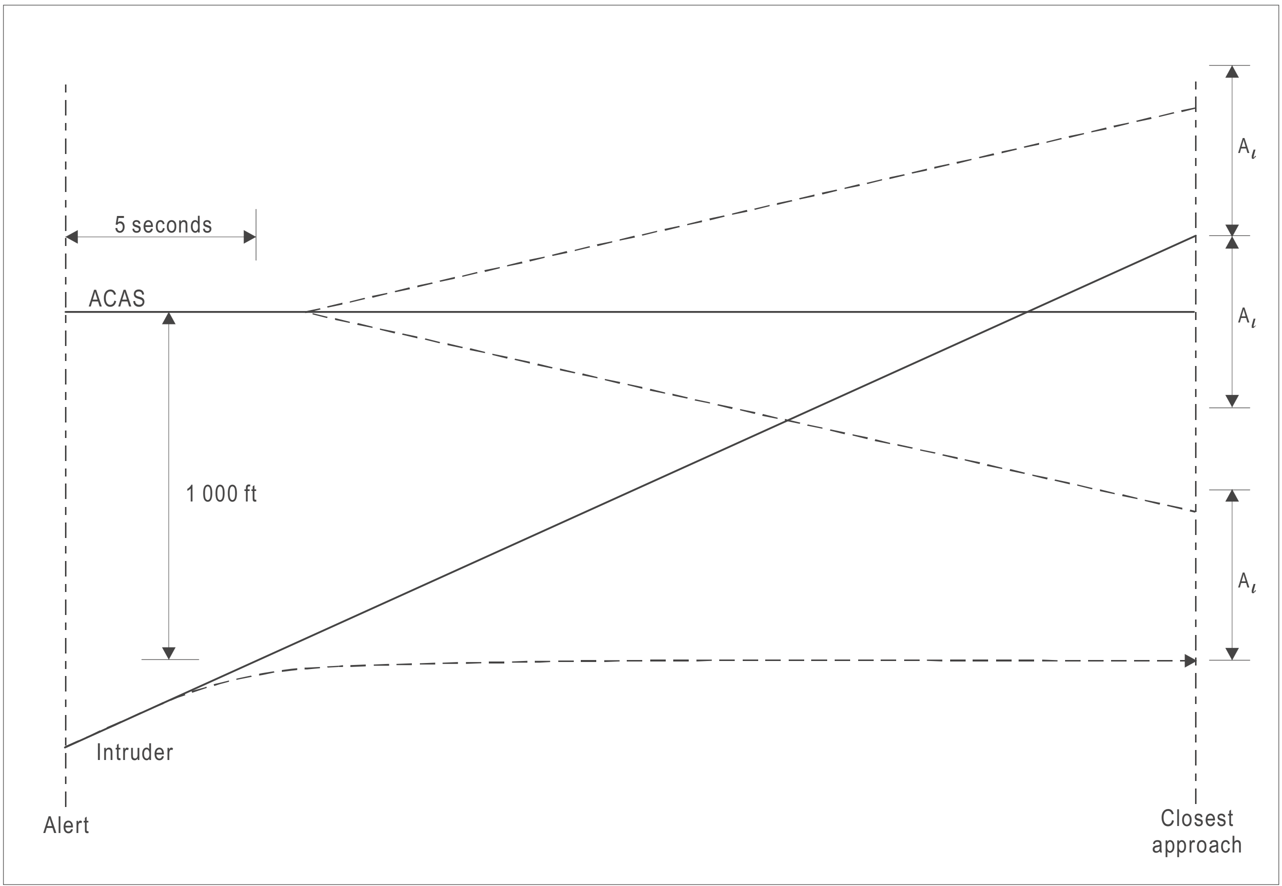


Figure A-8. Induced close encounter

manoeuvres are common-place in some controlled airspaces since they are used by controllers to cross aircraft safely with the required altitude separation in situations where the horizontal separation is small. An ACAS design based on the choice of sense likely to give the greatest altitude separation could induce a close encounter where one would not otherwise occur. An ACAS design must include provisions to make it as immune as possible to such an eventuality.

3.5.8.9 *Provisions for avoiding induced close encounters.* In the absence of any knowledge concerning the intent of the threat, it appears reasonable to assume that the threat will continue with its current altitude rate but chooses the RA in an attempt to mitigate the effect of a likely threat manoeuvre. Other features must provide for the contingency that a subsequent threat manoeuvre is detected. For example, the implementation described in Section 4 uses the logic described below.

3.5.8.9.1 *Biasing the choice of sense.* If a positive non-altitude crossing advisory is predicted to give at least adequate altitude separation at closest approach (A_l), then preference is given to the sense that prevents the aircraft from crossing in altitude before closest approach if the threat does not level-off. There is evidence that, in some circumstances, altitude crossing RAs are more disruptive than non-altitude-crossing RAs.

3.5.8.9.2 *Increased rate resolution advisory.* If the sense chosen as a result of the process described in 3.5.8.9.1 results in own aircraft moving away from the threat the encounter may still not be resolved if the threat increases its altitude rate. In such a case the pilot of the ACAS aircraft can be invited to increase own altitude rate in an attempt to outrun the threat.

3.5.8.9.3 *Altitude separation test.* Sense choice biasing will not always result in an RA to move away from the threat and the altitude separation test is provided further to decrease the chance of an induced close encounter due to a threat levelling off or reducing its altitude rate. The test involves delaying the issue of the RA until the intent of the threat can be deduced with greater confidence. It is therefore not without risk of causing ACAS to be unable to resolve the encounter. The ACAS implementation described in Section 4 balances these conflicting risks with the logic described below.

3.5.8.9.3.1 For a scenario of the type shown in Figure A-8 illustrating a threat with a significant altitude rate, the alert, without this delay, would be given when the aircraft were still well separated in altitude. For example, when the warning time is 25 seconds and the altitude rate is 900 m/min (3 000 ft/min), the initial separation is 380 m (1 250 ft). If the situation is such that an altitude crossing RA would be required, i.e. biased sense choice is ineffective, ACAS delays the issue of an advisory until the current altitude separation falls below a threshold (A_c) that is smaller than the standard IFR separation. If the threat actually levels off at any altitude before crossing that threshold, as is most likely, the alert state will either be cancelled (for level-offs outside Z_m), or a non-altitude crossing advisory will be generated. Otherwise, apart from the possibility that the threat has just overshot its cleared altitude, there is every indication that it is carrying on to, or through, own aircraft's level and the altitude crossing advisory can be issued with more confidence. If the situation is such that non-altitude crossing advisory would be required, a reduced time threshold (T_v) is used for the altitude test. This vertical threshold test (VTT) is designed to hold off the RA just long enough so that a level-off manoeuvre initiated by the intruder might be detected.

3.5.8.9.3.2 The altitude separation test was intended principally to alleviate problems experienced in an IFR traffic-only environment. It may appear to be desirable to select the value for A_c such that altitude overshoots or even non-IFR separations are covered. However, the risk of ACAS to be unable to resolve the encounters is to be taken into careful consideration.

3.5.8.9.3.3 The test takes advantage of the cooperation between two equipped aircraft by causing the ACAS in the level aircraft to delay the choice of an RA until it has received a resolution message from the equipped intruder. The ACAS in the latter must almost certainly choose a reduction in its own altitude rate and the coordination process would then result in the level aircraft being able to maintain its level status. In practice the delay in starting to resolve the encounter will be small, but the risk of failure to resolve is less sensitive to delay because both aircraft are taking avoiding action. The delay is limited to 3.0 s, which is normally sufficient for the threat to have initiated coordination.

3.5.8.9.4 *Sense reversal.* In spite of the precautions taken to avoid induced close encounters described above, there are still situations which are not covered. For example, in airspace containing VFR traffic, threat levelling-off can occur with a nominal separation of 150 m (500 ft). The altitude separation test could be less effective in such circumstances. When ACAS determines that a threat manoeuvre has defeated its initial choice of RA, the advisory sense can be reversed. The requirement to achieve the target altitude separation at closest approach may be relaxed when this course of action is taken.

3.5.8.10 *OTHER CAUSES OF INDUCED CLOSE ENCOUNTERS*

3.5.8.10.1 *Altimetry errors.* The altitude separation parameter representing the separation goal (A_l) must include an allowance for altimetry error that is sufficient to give a high probability of not causing an ACAS-equipped aircraft to provoke a close encounter where none really existed. For gross altimetry errors, however, there remains a low probability that a close encounter will be induced when the original separation is adequate. Similarly, there is a low probability that ACAS will be unable to resolve a close encounter due to altimetry error.

3.5.8.10.1.1 The use of Gilham encoded data for either aircraft is a particular cause of altitude report errors, and induced close encounters have resulted. In the case of own aircraft, such errors can be prevented by using an altitude source that has not been Gilham encoded.

3.5.8.10.2 *Mode C errors*

3.5.8.10.2.1 Errors in encoding the threat's altitude to provide Mode C data can, when sufficiently large, induce close encounters in much the same way as gross altimetry error. The incidence of such encounters will be very low in airspaces where ATC takes steps to advise the pilot that an aircraft's reported altitude is incorrect.

3.5.8.10.2.2 A more severe form of Mode C error occurs when the error is confined to the C-bits. These are unchecked by ATC, which is normally content to find that an aircraft is within the specified tolerance value of its reported altitude. A stuck or missing C-bit can produce an error of only 30 m (100 ft). However, such a fault can have a more serious effect on the intruder's altitude rate as perceived by ACAS and in this way can cause an induced close encounter or result in failure to resolve a close encounter.

3.5.8.10.3 *Contrary pilot response.* Manoeuvres opposite to the sense of an RA may result in a reduction in vertical separation with the threat aircraft and therefore must be avoided. This is particularly true in the case of an ACAS-ACAS coordinated encounter.

3.5.8.11 *MULTI-AIRCRAFT ENCOUNTERS*

3.5.8.11.1 ACAS takes account of the possibility of three or more aircraft being in close proximity and it is required to produce an overall RA that is consistent with each of the advisories that it would give against each threat treated on an individual basis. In such circumstances it cannot always be expected that the ACAS aircraft will achieve an altitude separation of A_l with respect to all threats.

3.5.8.11.2 Simulations based on recorded ground-based radar surveillance data and initial experience with ACAS equipment have indicated that multi-aircraft conflicts are rare. Also, there is no evidence of a "domino" effect whereby the ACAS aircraft's manoeuvre to avoid a threat brings it into an encounter with a third aircraft which is equipped and so on. Such an event might be expected to take place in a holding pattern, but the available evidence does not confirm this.

3.5.9 VERTICAL RATE ESTIMATION

3.5.9.1 The vertical tracking algorithm must be capable of using altitude information quantized in either 25 or 100 ft increments to produce estimates of aircraft vertical rates. This tracker must avoid overestimating vertical rate when a jump in reported altitude occurs because an aircraft with a small vertical rate moves from one quantized altitude level to another. But response limitation cannot be achieved by merely increasing tracker smoothing, since the tracker would then be slow to respond to actual rate changes. For altitude reports quantized to 100 ft, the altitude tracker (in Section 4) uses special track update procedures that suppress the response to an isolated altitude transition (altitude report that differs from the preceding altitude report) without sacrificing response to acceleration. The tracker also includes several features that contribute to reliability.

3.5.9.2 Some key features of the vertical tracking algorithm are as follows:

a) Before any altitude report is accepted for use by the update routines, tests are made to determine if the report appears reasonable, given the sequence of reports previously received. If the report appears unreasonable, it is discarded, although it may subsequently be used in checking the credibility of later reports.

b) The algorithm recursively averages the time between altitude transitions rather than altitude reports.

c) The tracker strictly limits the response to isolated altitude transitions (i.e. transitions that are not part of any trend in altitude). An isolated altitude transition results in initialization of the rate estimate to a specified modest rate in the direction of the transition. The rate estimate will be decayed toward zero on each successive scan without a transition.

d) When a transition is observed that is consistent in direction with the preceding transition, a trend is declared. The altitude rate is initialized to a value consistent with the time between the two transitions.

e) Rate oscillations due to quantization effects are suppressed when a trend or level track has been declared. During a trend period, altitude reports that indicate no altitude transition are tested to determine if the lack of a transition is consistent with the previously estimated rate. If not consistent, the rate is reset to a lower value. If consistent, the rate remains unchanged.

f) When a trend has been declared and a transition is observed, then a test is made to see if the transition is consistent in both direction and timing with the previously estimated rate. If not consistent, the rate is reset. If consistent, the rate is updated by smoothing. The transition may be due to jitter and in reality the trend may be continuing.

g) During each scan the tracker provides a track confidence index that indicates the degree of confidence that can be placed in the altitude rate estimate. "High" confidence is declared when recent altitude reports are consistent with both altitude and altitude rate estimates of the tracker. "Low" confidence is declared when altitude reports are not consistent, implying a possible vertical acceleration or when altitude reports are missing for two or more successive cycles. "Low" confidence might justify a delay in the generation of an RA.

h) The tracker provides upper and lower bounds within which the true altitude rate is expected to lie. The altitude rate bounds are used to determine if RA generation is to be delayed and in assessing the need for a sense reversal when the altitude rate confidence is "low".

3.5.10 AIR-AIR COORDINATION

3.5.10.1 *Coordination interrogations.* When ACAS declares a similarly equipped intruder to be a threat, interrogations are transmitted to the latter for RA coordination via the Mode S data link. These interrogations, which contain resolution messages, are made once per processing cycle as long as the intruder remains a threat. The equipped threat always acknowledges receipt of a resolution message by transmitting a coordination reply.

3.5.10.2 *COORDINATION INTERROGATION PROCESSING*

3.5.10.2.1 ACAS processes a resolution message received from another ACAS-equipped intruder by storing the RAC for that intruder and by updating the RAC record.

3.5.10.2.2 RAC is a general term that is used to mean a vertical RAC (VRC) and/or a horizontal RAC (HRC) as appropriate. Specifically, the information provided in the Mode S interrogation is the VRC for ACAS II and the VRC and/or HRC for ACAS III.

3.5.10.2.3 The RAC record is a composite of all currently active RACs (VRCs and/or HRCs) that have been received by ACAS. The four bits in the RAC record correspond to the two VRC values ("do not pass below" and "do not pass above") followed by the two HRC values ("do not turn left" and "do not turn right"). If a bit in the RAC record is set, it means that the corresponding RAC has been received from one or more ACAS. Each time an RAC is received from another ACAS, the corresponding bit(s) in the RAC record is (are) set. Each time an RAC cancellation is received from another ACAS, the corresponding bit(s) is (are) cleared so long as no other ACAS is also currently causing the bit(s) to be set.

3.5.10.3 *COORDINATION SEQUENCE*

The sequence of coordination messages and associated processing is illustrated in Figure A-9. Failure to complete the coordination may result in the choice by the threat of an incompatible RA sense.

3.5.10.4 *COORDINATION PROTOCOL*

3.5.10.4.1 After declaring an equipped intruder to be a threat, ACAS first checks to see if it has received a resolution message from that threat. If so, ACAS selects an RA that is compatible with the threat's vertical sense. If not, ACAS selects an RA based on the geometry of the encounter (3.5.2). In either case, ACAS begins to transmit vertical sense information to the threat once per scan in the form of an RA complement in a resolution message. The RA complement is "don't pass above" when ACAS has elected to pass above the threat and "don't pass below" when ACAS has elected to pass below the threat.

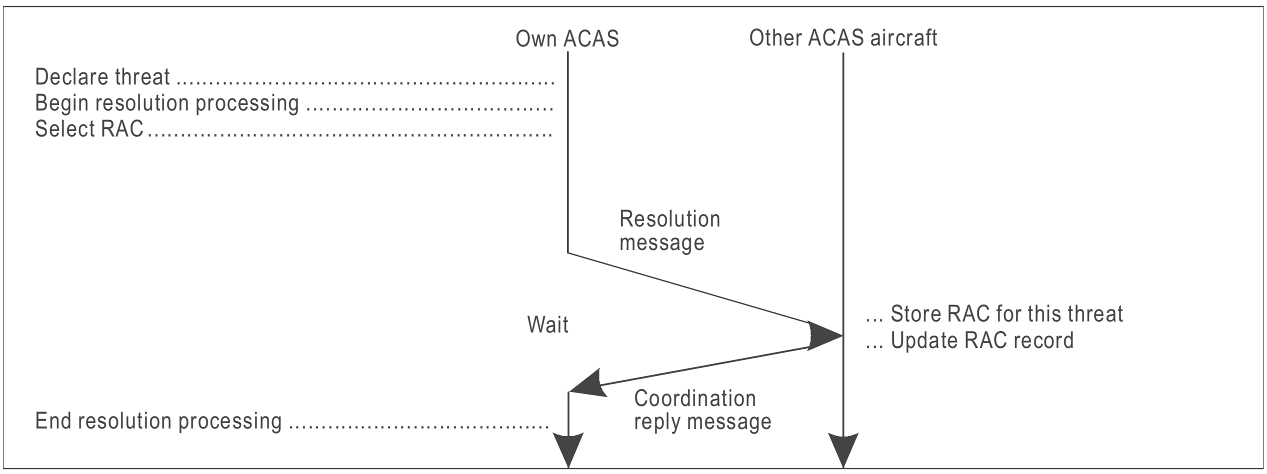


Figure A-9. Coordination sequence

3.5.10.4.2 Upon detecting ACAS as a threat, the threat goes through a comparable process. If for any reason the two aircraft select the same (incompatible) separation sense, the aircraft with the higher 24-bit aircraft address reverses its sense. This could happen if the two aircraft detect each other as threats simultaneously or if there were a temporary link failure preventing successful communication.

3.5.10.5 COORDINATION DATA PROTECTION

ACAS stores the current RA and the active RAC(s) received from other ACAS-equipped aircraft that perceive own aircraft to be a threat. In order to ensure that the stored information is not modified in response to one or more ACAS while it is being used for RA selection by own ACAS, the data must be protected so that it is available to, or capable of being modified in response to, only one ACAS at a time. For example, this may be accomplished by entering the coordination lock state whenever the data store is accessed by own ACAS or offered new data from a threat ACAS. If a resolution message is received while the coordination lock state is active, the data is held until the current coordination lock state is ended. The potential for simultaneous data access by different processes within ACAS exists because incoming threat resolution messages are received asynchronously to the ACAS processing, effectively interrupting this processing.

3.5.11 GROUND COMMUNICATION

3.5.11.1 *Report of ACAS resolution advisories to the ground.* Whenever an RA exists, ACAS indicates to the aircraft's Mode S transponder that it has an RA report available for a Mode S ground station. This causes the transponder to set a flag indicating that a message is waiting to be transmitted to the ground. Upon receipt of this flag a Mode S sensor may request transmission of the RA report. When this request is received, own Mode S transponder provides the message in a Comm-B reply format. In addition, ACAS generates periodic broadcasts at 8-second intervals for the time during which an RA is indicated to the pilot. The broadcast reports the last values taken by the parameters of the RA during the previous 8-second period even if the advisory has been terminated. This allows ACAS RA activity to be monitored in areas where Mode S ground station surveillance coverage does not exist by using special RA broadcast signal receivers on the ground. RA broadcasts are normally destined for ground equipment but are defined as uplink transmissions.

3.5.11.2 *Ground station control of threat detection parameters.* Threat detection parameters can be controlled by one or more Mode S ground stations by transmitting interrogations containing sensitivity level control (SLC) command messages addressed to the ACAS aircraft. Upon receipt of an SLC command message from a given Mode S ground station, ACAS stores the SLC command value indexed by ground station number. ACAS uses the lowest of the values received if more than one ground station has sent such a message. ACAS times out each site's SLC command separately and cancels it if it is not refreshed by another message from that site within 4 minutes. ACAS can also immediately cancel an SLC command from a ground station if a specified cancellation code is received from that station. SLC commands cannot be used within linked Comm-A interrogations.

3.5.12 SENSITIVITY LEVEL CONTROL

Control of the ACAS threat detection parameters can be effected by means of SLC commands provided as follows:

a) an internally generated value based on altitude band;

b) from a Mode S ground station (see 3.5.11.2); and

c) from a pilot-operated switch.

The sensitivity level used by ACAS is set by the smallest non-zero SLC command provided by these three sources. When a Mode S ground station or the pilot has no particular interest in the sensitivity level setting, the value zero is delivered to ACAS from that source and it is not considered in the selection process. The sensitivity level will normally be set by the internally generated value based on altitude band. Hysteresis is used around the altitude thresholds to prevent fluctuations in the SLC command value when the ACAS aircraft remains in the region of an altitude threshold.

3.6 Compatibility with on-board Mode S transponders

3.6.1 Compatible operation of ACAS and the Mode S transponder is achieved by coordinating their activities via the avionics suppression bus. The Mode S transponder is suppressed during and shortly after an ACAS transmission. Typical suppression periods are a) 70 microseconds from the top antenna and b) 90 microseconds from the bottom antenna. These suppression periods prevent multipath caused by the ACAS interrogation from eliciting an SSR reply from the Mode S transponder.

3.6.2 Unwanted power restriction on a Mode S transponder associated with ACAS is more stringent than in Chapter 3, 3.1.2.10.2.1 in order to ensure that the Mode S transponder does not prevent ACAS from meeting its requirements. Assuming a transponder undesired radiation power level of –70 dBm (Chapter 4, 4.3.11.1) and a transponder to ACAS antenna isolation of –20 dBm, the resultant interference level at the ACAS RF port will then be below –90 dBm.

3.6.3 An additional compatibility requirement is to keep the leakage power of the ACAS transmitter at a low level (see 3.2.1).

3.7 Indications to the flight crew

3.7.1 DISPLAYS

3.7.1.1 ACAS implementations will typically display resolution advisory information on one or two displays. The TA display presents the crew with a plan view of nearby traffic. The RA display presents the crew with manoeuvres to be executed or avoided in the vertical plane. The TA display and the RA display may utilize separate indicators or instruments to convey information to the pilot, or the two functions may be combined on a single display. The displayed RA information can either be integrated with existing displays available on the flight deck or presented on a dedicated display.

3.7.1.2 *TRAFFIC ADVISORIES*

3.7.1.2.1 The TA display presents the flight crew with a plan view of nearby traffic. The information thus conveyed is intended to assist the flight crew in sighting nearby traffic. Simulation has demonstrated that tabular alphanumeric displays of traffic are difficult for the flight crew to read and assimilate, and the use of this type of display as the primary means of displaying traffic information is not recommended. The TA display provides the capability to display the following information for intruders:

a) position (range and bearing);

b) altitude (relative or absolute if the intruder is reporting altitude); and

c) altitude rate indication for an altitude reporting intruder (climbing or descending).

3.7.1.2.2 The TA display may use shapes and colours to indicate the threat level of each displayed intruder, i.e. RAs, TAs, and proximate traffic. The essential differences between the tests for TA generation and the tests for threat detection are the uses of larger values for warning time.

3.7.1.2.3 The continuous display of proximate traffic is not a required component of ACAS. However, pilots need guidance concerning proximate traffic as well as potential threats to ensure that they identify the correct aircraft as the potential threat. The word “display” is not intended to imply that a visual display is the only acceptable means of indicating the position of intruders.

3.7.1.2.4 Ideally, an RA would always be preceded by a TA, but this is not always possible; e.g. the RA criteria might be already satisfied when a track is first established, or a sudden and sharp manoeuvre by the intruder could cause the TA lead time to be less than a cycle.

3.7.1.3 *RESOLUTION ADVISORIES*

The RA display presents the flight crew with an indication of vertical speed to be attained or avoided. The RA display may be incorporated into the instantaneous vertical speed indicator (IVSI) or into the primary flight display (PFD). The RA display may provide a means to differentiate between preventive and corrective RAs.

3.7.2 AURAL AND VOICE ALERTS

Aural alerts are used to alert the flight crew that a TA or RA has been issued. When the vocabulary used to announce RAs is selected, care must be taken to select phrases that minimize the probability of a misunderstood command. An aural annunciation is also provided to the flight crew to indicate that the ACAS aircraft is clear of conflict with all threatening aircraft.

3.8 Crew control functions

As a minimum, it is expected that a means be provided manually through flight crew action for either selecting an “AUTOMATIC” mode in which sensitivity levels are based on other inputs, selecting a mode in which only TAs are able to be issued, or selecting specific sensitivity levels including at least sensitivity level 1. When sensitivity level 1 is selected, the ACAS equipment is essentially in a “stand-by” condition. The term STAND-BY may be used to designate this selection. The current ACAS sensitivity level may be different from that selected by the flight crew. Provisions are to be made for indicating to the flight crew when ACAS is in STAND-BY or when only TAs will be issued. The control for ACAS may be integrated with the controls for the Mode S transponder, or the two systems may have separate controls. If the ACAS and Mode S controls are integrated, a means must be provided to allow the flight crew to select a transponder-only mode of operation.

3.9 Performance monitoring

ACAS equipment is expected to include an automatic performance monitoring function for determining on a continuing basis the technical status of all critical ACAS functions without interfering with or otherwise interrupting the normal operation of the equipment. Provisions are to be made for indicating to the flight crew the existence of abnormal conditions as determined by this monitoring function.

4. TYPICAL ALGORITHMS AND PARAMETERS FOR THREAT DETECTION AND GENERATION OF ADVISORIES

Note 1.— The characteristics given below describe a reference design for the ACAS II collision avoidance logic. This description, however, does not preclude the use of alternative designs of equal or better performance.

Note 2.— Lower case mathematical symbols are used to represent variables throughout this chapter. Upper case symbols are used for parameters. The dot notation used for some parameters does not indicate that they are derived quantities but rather that they have the dimensions suggested by the notation, e.g. distance/time for a speed parameter.

4.1 Tracking performance characteristics

4.1.1 RANGE TRACKING

Range, range rate, and range acceleration ($r, \dot{r}, \ddot{r}$) are estimated by means of an adaptive α-ß-γ tracker using for its coefficients α, ß, and γ values that are decreasing with each successive range measurement until they reach their minimum values equal to 0.40, 0.10 and 0.01, respectively. The range acceleration estimate is used to estimate the expected miss distance in range at closest approach, *m*, using the following formula:

$$m^2 = r^2 - \frac{r^2}{1 + r\ddot{r}/\dot{r}^2}$$

This estimate is not calculated when further calculations indicate that it may not be reliable either because of the magnitude of the estimation errors or because of a possible manoeuvre by one of the aircraft in the horizontal plane. The latter calculations rely on the age of the track, the observed accuracy of the successive range predictions, the observed consistency of the range acceleration estimates, the observed consistency of a second range track based on a linearized trajectory agreeing with the previously estimated miss distance, and the observed consistency of a rough bearing track.

4.1.2 ALTITUDE TRACKING

4.1.2.1 *Sources of altitude data.* Intruder aircraft's altitude is obtained from intruder Mode C or Mode S reports. Own aircraft's altitude is obtained from the source that provides the basis for own Mode C or Mode S reports and is required to be at the finest quantization available.

4.1.2.1.1 *Altitude report credibility.* Before any altitude report is accepted, a test is made to determine whether the report is credible. A credibility window is calculated on the basis of the previous estimated altitude and altitude rate. The altitude report is discarded and the altitude track updated as though the report was missing (4.1.2.3.7) if the report is outside the credibility window.

4.1.2.2 *Own altitude rate.* Own ACAS aircraft's altitude rate is obtained from a source having errors that are as small as possible and in any event no greater than those of the rate output of the tracker described in 4.1.2.3.6.

4.1.2.3 INTRUDER ALTITUDE TRACKING

4.1.2.3.1 *Altitude tracking terms' description*

Established rate track. An altitude track for which the pattern of the last few altitude reports received from the intruder allows the inference that that intruder is climbing or descending with a constant, non-zero altitude rate.

Level track. An altitude track for which the pattern of the last few altitude reports received from the intruder allows the inference that that intruder is level.

New track. An altitude track newly initialized.

Oscillating track. An altitude track for which the pattern of the last few altitude reports received from the intruder oscillates between two or more values in a way that allows the inference that that intruder is level.

Transition. An altitude report for a track that is different from the last credible altitude report for that track.

Trend. A trend exists for the altitude rate if the two most recent altitude level transitions were in the same direction.

Unconfirmed rate track. An altitude track for which the pattern of the last few altitude reports received from the intruder does not allow the track to be classified in any other way.

4.1.2.3.1.1 On any cycle of tracking, each track is attributed one and only one track classification.

4.1.2.3.1.2 Any track classification is maintained until conditions for another track classification are satisfied.

4.1.2.3.2 The ACAS II tracks the altitudes of intruders. Tracking is based on automatic pressure altitude reports from their transponders, using altitude reports quantized as received. For every intruder on every cycle the tracker provides altitude and altitude rate estimates.

Note.— The function that associates Mode C altitude data with tracks is specified in Chapter 4, 4.3.2.1. The altitude *tracker specified below assumes that this function has been performed prior to application of the tracker.*

4.1.2.3.2.1 The reference altitude tracking design assumes that, for each track, altitude reports are received at the nominal rate of one altitude report per second. However, it allows for missing reports, in other words, cases in which no altitude report has been received for a given track prior to a tracking cycle.

4.1.2.3.2.2 Intruder altitude tracks of one of two types are created and maintained. So-called 100-ft tracks are obtained when altitude reports are supplied in units of 100 ft. Such tracks are updated by a dedicated tracker referred to as the 100-ft altitude tracker. So-called 25-ft tracks are obtained when altitude reports are supplied in units of 25 ft. Such tracks are updated by a dedicated tracker referred to as the 25-ft altitude tracker.

4.1.2.3.2.3 Special logic automatically switches intruder altitude tracks between the 100-ft altitude tracker and the 25-ft altitude tracker following a confirmed change in the units in which altitude reports are supplied. Such a change is considered confirmed when three successive valid altitude reports expressed in the same units have been received.

4.1.2.3.2.4 When an altitude reporting unit change has been observed but not yet been confirmed, the existing track is coasted and the altitude report is temporarily stored. Once the unit change is confirmed, the track is re-initialized using the last altitude rate estimate computed before the change as well as all temporarily stored altitude reports.

4.1.2.3.2.5 The 25-ft tracker is an adaptive alpha-beta tracker. It is briefly described in 4.1.2.3.5.

4.1.2.3.2.6 The design of the 100-ft altitude tracker is motivated by the need for a stable altitude rate estimate when the true altitude rate of the intruder is less than 100 ft/s, in other words, less than one quantization interval per tracking cycle. This tracker estimates the altitude rate indirectly by estimating the time taken to cross one quantization level. Further details on this design are provided in 4.1.2.3.6.

4.1.2.3.3 *Altitude rate confidence.* For every intruder on every cycle, the tracker provides an indication of either "high" or "low" confidence in the altitude rate estimate (4.1.2.3.6.9 and 4.1.2.3.6.10).

4.1.2.3.4 *Altitude rate reasonableness.* The tracker provides a "best estimate" altitude rate and upper and lower bounds for this altitude rate consistent with the received sequence of reports.

4.1.2.3.5 *25-ft quantization reports*

4.1.2.3.5.1 For altitude reports quantized to 25-ft increments, an adaptive α-ß tracker is used. This tracker is adaptive in the sense that it selects among three sets of α and ß values depending on the magnitude of the prediction error, i.e., the difference between the predicted altitude and the reported altitude, as well as on the magnitude of the rate estimate. These α and ß values are:

- α = 0.4 and ß = 0.100 when the current altitude rate estimate is less than 7.0 ft/s; otherwise,
- α = 0.5 and ß = 0.167 when the prediction error is less than 22.5 ft; and otherwise,
- α = 0.6 and ß = 0.257.

4.1.2.3.5.2 The tracker maintains two distinctive sets of altitude and altitude rate estimates. The first one is derived directly from the standard α-ß smoothing equations. This set is purely internal to the tracker. The second set contains the estimates passed to the collision avoidance logic. It differs from the first set as follows. The altitude estimate passed to the logic is constrained to be within one-half quantization interval of the reported altitude (±12.5 ft). The altitude rate estimate passed to the logic is set equal to zero when the internal estimate decreases below 2.5 ft/s in absolute value and is kept equal to zero until the internal estimate increases beyond 5.0 ft/s in absolute value.

4.1.2.3.5.3 The tracker uses only two of the previously defined track classifications: level track and established rate track (4.1.2.3.1). It declares a track to be a level track when at least seven tracking cycles have elapsed since the last altitude transition (4.1.2.3.1). The internal rate estimate is then reset to zero. It declares the track to be an established rate track when, following two sufficiently closely spaced altitude transitions, the internal rate estimate (and thus also the rate estimate passed to the logic) increases beyond 5.0 ft/s.

4.1.2.3.5.4 Confidence in the estimates is declared "high" when the track has existed for at least four tracking cycles and the prediction error has been no greater than 22.5 ft on at least two successive tracking cycles. It is set to "low" when the prediction error is larger than 22.5 ft. It is also set to "low" when altitude reports have been missing on two successive cycles.

4.1.2.3.6 *100-ft quantization reports.* For altitude reports quantized to 100-ft increments, the performance of the altitude tracker is, in all respects, equal to or better than that of a reference tracker setting the altitude rate estimate to have an appropriate sign and the magnitude as described in this paragraph.

4.1.2.3.6.1 *Tracker variables.* The reference tracker uses the following variables:

$\dot{z}$ altitude rate estimate, m/s (ft/s);

$\dot{Z}_{gu}$ see 4.1.2.3.6.5.1;

Δz altitude difference between the current report and the most recent credible report;

T_n 1 s;

Q 30.5 m (100 ft);

t_r time since the most recent credible report, *s*;

t_p time between the two most recent altitude level transitions or, for multiple transitions within one cycle, the average time between these transitions, *s*;

t_b estimated level occupancy time after the most recent transition, *s*;

t_{bm} calculated lower bound on level occupancy time, *s*;

ß computed smoothing coefficient for t_b;

$ß_l$ limit for ß based on t_b;

b_t number of altitude levels crossed between the two most recent altitude level transitions;

$b_{\dot{z}}$ number of altitude levels crossed at the most recent rate;

ε smoothed error estimate of t_b, s;

d_t sign of the most recent altitude transition (= +1 for an increase in altitude; = –1 for a decrease); and

x^* value of any variable x before being updated following an altitude level transition.

4.1.2.3.6.2 *Report credibility.* The altitude report is regarded as being credible if either of the following conditions is satisfied:

a) $\Delta z = 0$

b) $|\Delta z - \dot{z}\, t_r| - Q\ t_r / T_n - \dot{Z}_{gu}\, t_r \le 0$

4.1.2.3.6.3 *Track classification scheme*

Established rate track. An altitude track is classified as established rate if two or more successive transitions are observed in the same direction and the time interval between the two transitions is sufficiently short that the track classification would not be changed to level track during that interval (see the definition of level track), or if an observed transition is opposite in direction to an existing trend and the time since the previous transition is "unexpectedly small" (4.1.2.3.6.8.1).

Level track. An altitude track is classified as level if reports are received at the same level for longer than T_1 after the time at which the next transition was expected, if one was expected, or for more than T_2 whether or not a transition was expected (4.1.2.3.6.3.1).

New track. An altitude track is classified as new during the period between the time of the first altitude report and the first transition or until T_2 has elapsed (4.1.2.3.6.3.1).

Oscillating track. An altitude track is classified as oscillating if a transition occurs in the opposite direction to that of the immediately preceding transition, only one level has been crossed, the time interval between the two transitions is sufficiently short that the track classification would not be changed to level track during that interval (see the definition of level track) and, if the track was classified as established rate, the time since that transition is not "unexpectedly small" (4.1.2.3.6.8.1).

Unconfirmed rate track. An altitude track is classified as unconfirmed rate if a transition occurs for a new or for a level track or if a transition in the opposite direction to the previous transition occurs and more than one level has been crossed for an established, oscillating or unconfirmed rate track.

4.1.2.3.6.3.1 The following values are used:

$T_1 = 4.0$ s

$T_2 = 20$ s

4.1.2.3.6.3.2 If a track is already classified as unconfirmed rate and a transition occurs in the opposite direction to the previous one and more than one level has been crossed, the altitude rate is determined as if the track had just become classified as unconfirmed rate (4.1.2.3.6.5).

4.1.2.3.6.3.3 The tracks are classified (4.1.2.3.6.3), and the transitions between track classifications are shown in Figure A-10. Tracks are classified in order to determine how new measurements should be used to update the altitude rate estimate.

4.1.2.3.6.4 The magnitude of the rate is set to zero if the track is new, level or oscillating.

4.1.2.3.6.4.1 The quantities ε and $b_{\dot{z}}$ are set to zero and t_b to 100 s.

4.1.2.3.6.4.2 When a track is classified as level, all earlier transitions and any current trend are disregarded.

4.1.2.3.6.5 The magnitude of the rate is set to $\dot{Z}_{gu}$ when a track first becomes unconfirmed rate and then decayed each cycle from the value determined the previous cycle until another transition is observed.

4.1.2.3.6.5.1 The value of $\dot{Z}_{gu}$ is 2.4 m/s (480 ft/min) and the decay constant is 0.9.

Attachment *Annex 10 — Aeronautical Telecommunications*

4.1.2.3.6.5.2 The quantities ε and $b_{\dot{z}}$ are set to zero and t_b to $Q/|\dot{z}|$.

4.1.2.3.6.6 For established rate tracks the magnitude of the rate is set to the quantization interval divided by the estimated level occupancy time. The level occupancy time is estimated on receipt of transitions in the direction of the trend and held constant until the next transition either occurs or becomes overdue (4.1.2.3.6.7).

4.1.2.3.6.6.1 When a track is first established, the quantities ε, $b_{\dot{z}}$ and t_b are set as follows:

$$\varepsilon = 0,\ b_{\dot{z}} = 1,\ t_b = \text{maximum}\ (t_p,\ 1.4\ \text{s})$$

4.1.2.3.6.6.2 Unless the transition is early or late (4.1.2.3.6.6.3), the quantities ε, $b_{\dot{z}}$ and t_b are calculated by recursive averaging following the third and subsequent transitions as follows:

$$\varepsilon' = 0.8\varepsilon^* + (t_p - t_b^*)$$

$$\beta_{\ell} = \frac{(t_b^* - T_n)^2}{[(t_b^*)^2 + 64T_n^2]}$$

$$b_{\dot{z}} = b_{\dot{z}}^* + b_t \text{ and}$$

$$\beta = \text{maximum}\ \left(\frac{b_t}{b_{\dot{z}}},\ \beta_{\ell}\right) \text{ and}$$

$$\varepsilon = \varepsilon'$$

for $|\varepsilon'| \leq 1.35$ (or 2.85 if the most recent transition was observed following one or more missing reports);

$$b_{\dot{z}} = 3 \text{ and}$$

$$\beta = 0.5 \text{ and}$$

$$\varepsilon = 0.3\varepsilon' \text{ otherwise;}$$

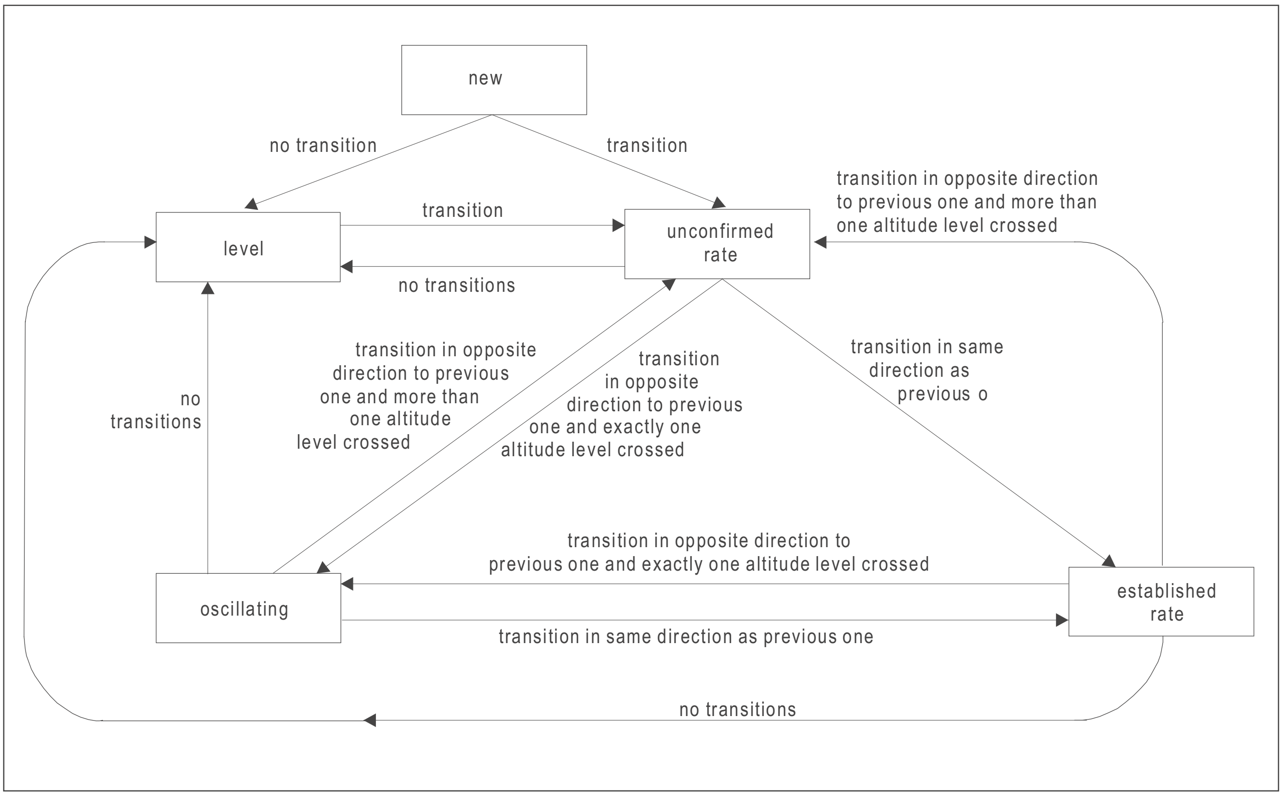


Figure A-10. Changes between track classifications

and in both cases: $t_b = t_b^* + ß(t_p - t_b^*)$.

4.1.2.3.6.6.3 *Early or late transitions*

If $|t_p - t_b^*| > 1.5$ s (or 3.0 s if the most recent transition was observed following one or more missing reports) or b_t lies outside the range $(t_r/t_b^* + 1.1) \geq b_t \geq (t_r/t_b^* - 1.1)$, then the quantities ε, $b_{\dot{z}}$ and t_b are set as follows:

$b_{\dot{z}} = 1$
$\varepsilon = 0$
t_{bm} = minimum $((0.7t_p + 0.3t_b^*), 1.4 \text{ s})$
t_b = maximum (t_p, t_{bm}).

The rate is calculated as: $\dot{z} = d_tQ/t_b$.

4.1.2.3.6.7 *Overdue transition.* The magnitude of the rate is decayed on each cycle from the value obtained on the previous cycle if reports are received at the same level for at least T_3 after the time of the next expected transition (or T_4 if the most recent transition was observed following one or more missing reports). The value of t_b is not changed in these circumstances.

4.1.2.3.6.7.1 The following values are used:

$T_3 = 1.5$ s

$T_4 = 3.0$ s

The following formula for rate decay is used:

$$\dot{z} = d_tQ/[t_b + (0.3t_b + 0.5T_n)\ (0.7 + (t_l - t_b)/T_n)^2]$$

where t_l = time since the most recent transition, s.

4.1.2.3.6.7.2 The quantity $b_{\dot{z}}$ is set to maximum $(2, b_{\dot{z}}^* - 1)$.

4.1.2.3.6.8 *Transitions due to jitter.* The magnitude of the rate is set to the value obtained on the previous cycle if a transition is observed opposite in direction to that of the trend, the immediately preceding transition followed the trend, only one level has been crossed and the time since the immediately preceding transition is "unexpectedly small". Such a transition is subsequently treated as missing except for the requirements of 4.1.2.3.4 and 4.1.2.3.6.10 e).

4.1.2.3.6.8.1 The time since the immediately preceding transition is declared "unexpectedly small" when $t_p \leq 0.24\ t_b^*$.

4.1.2.3.6.8.2 The quantities ε, $b_{\dot{z}}$ and t_b are not changed.

4.1.2.3.6.9 *Track high confidence declaration.* "High" confidence in the tracked rate is declared when the current altitude report is credible and one or more of the following conditions are met:

a) a new track has been observed for longer than T_5 (4.1.2.3.6.9.1) without an altitude transition; or

b) an unconfirmed rate track has been observed for longer than T_6 (4.1.2.3.6.9.1) without an altitude transition; or

c) a track is classified as level; or

d) a track is first classified as established rate; or

e) for an established rate track when a transition has occurred the ratio of the observed transition time to the expected transition time (before being updated) falls between $\mathfrak{R}_1$ and $\mathfrak{R}_2$ (4.1.2.3.6.9.1); or the absolute value of the difference between these times is less than T_8; or the time between the most recently observed and the previous transition is longer than T_8 (4.1.2.3.6.9.1); or

f) for an established rate track when a transition has occurred, the previous report was missing, $|t_p - t_b^*| \geq T_7$, $t_p/t_b^* \geq 1$ and $-t_p - T_9 \leq (t_b - t_p)\ b_t \leq T_9$; or

g) a track is classified as oscillating; or

h) confidence was previously set to "high" upon processing of the last credible altitude report and conditions a) to e) of 4.1.2.3.6.10 for "low" confidence declaration are not satisfied.

4.1.2.3.6.9.1 The following values are used:

$T_5 = 9$ s
$T_6 = 9$ s
$T_7 = 1.1$ s
$T_8 = 8.5$ s
$T_9 = 1.25$ s
$\mathfrak{R}_1 = 2/3$
$\mathfrak{R}_2 = 3/2$

4.1.2.3.6.10 *Track low confidence declaration.* "Low" confidence in the tracked rate is declared when one or more of the following conditions are satisfied:

a) for a new track until condition a) in 4.1.2.3.6.9 is satisfied; or

b) for an unconfirmed rate track until condition b) in 4.1.2.3.6.9 is satisfied; or

c) when an observed transition time for an established rate track does not satisfy condition e) or condition f) in 4.1.2.3.6.9; or

d) when an expected transition is more than T_{10} (4.1.2.3.6.10.1) late; or

e) for an established rate track when the condition in 4.1.2.3.6.8 is satisfied; or

f) confidence was previously “low” and the conditions for “high” confidence declaration are not satisfied (4.1.2.3.6.9).

4.1.2.3.6.10.1 The value T_{10} = 0.25 s is used.

4.1.2.3.7 *Missing altitude reports.* When altitude reports are missing:

a) the previous value of the altitude rate estimate is maintained; and

b) confidence in the tracked rate is declared “low” when altitude reports are missing for two or more successive cycles.

4.2 Traffic advisories (TAs)

4.2.1 TA GENERATION

4.2.1.1 A TA is generated for an intruder reporting Mode C altitude when the application of both a range test (4.2.3) and an altitude test (4.2.4) gives a positive result for each in the same cycle of operation.

4.2.1.2 A TA is generated for an intruder equipped with a non-altitude-reporting transponder when the result of applying a range test (4.2.3) is positive.

4.2.2 TA WARNING TIME

For intruders reporting altitude, the range test for TAs gives a nominal warning time as follows:

S	2	3	4	5	6	7
TA warning time	T+10	T+10	T+10	T+15	T+15	T+13

where S = sensitivity level

4.2.2.1 The values for T for sensitivity levels 3 to 7 are those given in 4.3.3.3.1. The value for T for sensitivity level 2 is 10 s.

4.2.3 TA RANGE TEST

The range test for TAs has the same form as that used for threat detection (4.3.3). The values used for D_m for sensitivity levels 3 to 7 are those given in 4.3.3.1.1 incremented by $g(T_w - T)^2/6$ where T_w is the desired TA warning time. The base value for D_m for sensitivity level 2 is 0.19 km (0.10 NM).

4.2.4 TA ALTITUDE TEST

The altitude test gives a positive result if one of the following sets of conditions is satisfied:

a) current altitude separation is “small”; or

b) the aircraft are converging in altitude and the time to co-altitude is “small”.

These terms and conditions are defined in 4.3.4.1, 4.3.4.2, 4.3.4.3 and 4.3.4.5. The time threshold for time to co-altitude is the TA warning time (4.2.2) and the values used for Z_t are as follows:

z_o FL	below 300	above 300
Z_t m	260	370
(Z_t ft	850	1 200)

4.3 Threat definition

4.3.1 THREAT DETECTION CHARACTERISTICS

4.3.1.1 *Intruder characteristics.* The characteristics of an intruder that are used to define a threat are:

a) tracked altitude: z_i

b) tracked rate of change of altitude: $\dot{z}_i$

c) tracked slant range: r

d) tracked rate of change of slant range: $\dot{r}$

e) sensitivity level of intruder’s ACAS: S_i

For an intruder not equipped with ACAS II or ACAS III, S_i is set to 1.

4.3.1.2 *Own aircraft characteristics.* The following characteristics of own aircraft are used in threat definition:

a) altitude: z_o

b) rate of change of altitude: $\dot{z}_o$

c) sensitivity level of own ACAS (Chapter 4, 4.3.4.3): S_o.

4.3.1.3 *Altitude-band SLC command.* The reference logic selects the SLC command based altitude band as indicated in Table A-1.

4.3.2 *Criteria for threat declaration.* An intruder becomes a threat if and only if both the following apply on the same cycle:

Table A-1

Nominal altitude band	*SLC command code*	*Altitude threshold at which sensitivity level value changes*	*Hysteresis values*
0 to 1 000 ft AGL	2	1 000 ft AGL	±100 ft
1 000 ft to 2 350 ft AGL	3	2 350 ft AGL	±200 ft
2 350 ft AGL to FL 50	4	FL 50	±500 ft
FL 50 to FL 100	5	FL 100	±500 ft
FL 100 to FL 200	6	FL 200	±500 ft
above FL 200	7		

a) the range test gives a positive result; and

b) either:

1) the altitude test gives a positive result; or

2) an altitude-crossing RAC has been received from the threat.

4.3.2.1 *Established threat.* The threat status of an established threat is maintained on successive cycles if, as a minimum, the range test gives a positive result.

4.3.3 RANGE TEST

4.3.3.1 *Range convergence.* Aircraft are considered converging in range if the estimated range rate is less than $\dot{R}_t$. In this case the range rate estimate used in the range test is the minimum of the estimated range rate and $-\dot{R}_t$.

4.3.3.1.1 The value 3 m/s (6 kt) is used for $\dot{R}_t$.

4.3.3.2 *Range divergence.* Aircraft that are not considered converging in range are considered diverging in range. Range divergence is considered "slow" if the product of the estimated range multiplied by the estimated range rate is less than $\dot{P}_m$.

4.3.3.2.1 The following values are used for $\dot{P}_m$:

S	*3*	*4 to 6*	*7*
$\dot{P}_m$ km^2/s	0.0069	0.0096	0.0137
($\dot{P}_m$ NM^2/s	0.0020	0.0028	0.0040)

4.3.3.3 *Range test criteria.* The range test gives a positive result when one of the following conditions is satisfied:

a) both

1) the aircraft are converging in range; and

2) the following inequality is satisfied:

$(r - D_m^2\ /r)/\left|\dot{r}'\right| < T;$

where $\dot{r}' = \text{minimum}\ (\dot{r}, -\dot{R}_t)$; *or*

b) the aircraft are diverging in range but the range is less than D_m and the range divergence is "slow"; or

c) either a miss distance estimate could not be calculated on the current cycle or the calculated miss distance is less than H_m;

and for all other conditions the result of the range test is negative.

Note.— The formula in item a) 2) above provides a practical text for the following condition: the range and range rate estimates indicate that the encounter could be such that the linear miss distance is less than or equal to D_m and the linear time to closest approach is less than T.

4.3.3.3.1 The values of the parameters T, D_m and H_m are as follows:

S	*3*	*4*	*5*	*6*	*7*
T s	15	20	25	30	35
D_m (km)	0.37	0.65	1.0	1.5	2.0
(D_m (NM)	0.20	0.35	0.55	0.80	1.1)
H_m (m)	382	648	1 019	1 483	2 083
(H_m (ft)	1 251	2 126	3 342	4 861	6 683)

4.3.4 ALTITUDE TEST

4.3.4.1 *ALTITUDE TEST TERMS' DESCRIPTION*

Altitude divergence rate $(\dot{a})$. The rate of change of a.

Current altitude separation (a). The modulus of the current tracked altitude separation between own aircraft and the intruder.

Times to closest approach (τ_u, τ_m). The estimated time which will be taken to reach minimum range. τ_u is the maximum value (assuming rectilinear relative motion and zero miss distance) and τ_m is the minimum value (assuming rectilinear relative motion and the maximum miss distance of interest, D_m).

Time to co-altitude (τ_v). The estimated time which will be taken to reach co-altitude.

Vertical miss distance (v_m). An estimated lower bound for the projected altitude separation at the estimated time of closest approach.

4.3.4.2 *Current altitude separation.* Current altitude separation is declared "small" if $a < Z_t$ where Z_t is set equal to Z_m (4.3.4.4.2) in the reference logic.

4.3.4.3 *ALTITUDE CONVERGENCE*

4.3.4.3.1 $\dot{a}$ is calculated as follows:

$$\dot{a} = \dot{z}_o - \dot{z}_i \text{ for } z_o - z_i \geq 0$$

$$\dot{a} = \dot{z}_i - \dot{z}_o \text{ for } z_o - z_i < 0$$

4.3.4.3.2 The aircraft are declared converging in altitude if $\dot{a} < -\dot{Z}_c$.

4.3.4.3.3 The value of $\dot{Z}_c$ is positive and not greater than 0.3 m/s (60 ft/min).

4.3.4.4 *VERTICAL MISS DISTANCE*

4.3.4.4.1 When the aircraft are converging in range ($\dot{r} \leq 0$), time to closest approach and vertical miss distance are calculated as follows:

$$\dot{r}' = \text{minimum}\ (\dot{r}, -\dot{R}_t)$$

$$\tau_u = \text{minimum}\ (|r/\dot{r}'|, T)$$

$$\tau_m = |(r - D_m^2/r)/\dot{r}'| \text{ for } r \geq D_m$$

$$= 0 \text{ for } r < D_m$$

$$v_{m1} = (z_o - z_i) + (\dot{z}_o - \dot{z}_i)\ \tau_u$$

$$v_{m2} = (z_o - z_i) + (\dot{z}_o - \dot{z}_i)\ \tau_m$$

v_m = 0 for $v_{m1}v_{m2} \leq 0$, otherwise
v_m = minimum (v_{m1}, v_{m2}) for $v_{m1} > 0$
= maximum (v_{m1}, v_{m2}) for $v_{m1} < 0$

4.3.4.4.2 Vertical miss distance is declared "small" if $|v_m| < Z_m$. The maximum values for Z_m are given by:

z_o *FL*	*below 200*	*200 to 420*	*above 420*
Z_m (m)	183	213	244
(Z_m (ft)	600	700	800)

4.3.4.5 *TIME TO CO-ALTITUDE*

4.3.4.5.1 The time to co-altitude for $\dot{a}$ less than $-\dot{Z}_c$ is calculated as follows:

$$\tau_v = -a/\dot{a}$$

Note.— τ_v is not used if the aircraft are not converging in altitude and range.

4.3.4.5.2 τ_v is declared "small" if $\tau_v < T_v$ for encounters in which the magnitude of own aircraft's vertical rate is not more than 600 ft/min or own aircraft's vertical rate has the same sign as but smaller magnitude than that of the intruder. For all other encounters τ_v is declared "small" if $\tau_v < T$. The values of the parameters T_v are as follows:

S	*3*	*4*	*5*	*6*	*7*
T_v s	15	18	20	22	25

4.3.4.6 *Altitude test criteria.* The altitude test of the reference logic gives a positive result when any of the three following conditions are satisfied:

a) the aircraft are converging in range, the current altitude separation is "small" and the vertical miss distance is "small"; or

b) the aircraft are converging in range and altitude, the time to co-altitude is "small" and either the vertical miss distance is "small", or co-altitude is predicted to occur before closest approach ($\tau_v < \tau_u$); or

c) the aircraft are diverging in range and the current altitude separation is "small";

and for all other conditions the results of the altitude test are negative.

4.4 Generation of RAs

4.4.1 RA types are defined in Chapter 4, 4.1.

4.4.2 DELAY IN RA GENERATION

Note.— An RA will be generated for all threats except in the circumstances described here or for coordination purposes.

The reference logic does not generate a new RA or modify an existing RA for a new threat when any of the following conditions are satisfied:

a) an altitude-crossing RAC has not been received from the threat; and

b) either:

1) the altitude separation test (4.4.2.1) gives a negative result; or

2) confidence in the tracked altitude rate of the intruder is "low" and no resolution manoeuvre would provide a predicted separation of at least A_t (4.4.2.2), whether the threat had an altitude rate equal to the upper altitude rate bound, to the lower altitude rate bound, or to any altitude rate between these bounds (4.1.3.3.4); or

3) there is "low" confidence in the threat's tracked altitude rate, the current altitude separation is greater than 46 m (150 ft), and the RA that would be selected against the threat when considered separately from other possible threats would be altitude crossing.

4.4.2.1 *ALTITUDE SEPARATION TEST*

4.4.2.1.1 The altitude rate of own aircraft is declared "small" if $|\dot{z}_o| \leq \dot{Z}_\ell$.

4.4.2.1.2 The value 3.0 m/s (600 ft/min) is used for $\dot{Z}_\ell$.

4.4.2.1.3 The delay in threat declaration is declared "acceptable" if it is less than 3.0 s.

4.4.2.1.4 The maximum altitude separation threshold, A_c, is given a value of 260 m (850 ft), when the vertical rates of own and of the threat are in the opposite directions and neither of them is "small", and a value of 183 m (600 ft) otherwise.

4.4.2.1.5 Altitude separation is declared "minimum" if it is equal to 100 ft.

4.4.2.1.6 An encounter is declared "slow closing" if the range rate is greater than D_m/T.

4.4.2.1.7 *Test conditions.* The altitude separation test gives a negative result if the threat is a new threat and the RA that would be selected against the new threat when considered separately from other possible simultaneous threats would be either:

a) altitude crossing and either:

1) the current altitude separation exceeds A_c; or

2) the threat is equipped, a valid RAC has not been received from it, the altitude rate of own aircraft is "small", the altitude rate of the threat is not "small", and the delay in issuing an RA or modifying the existing RA is "acceptable"; or

b) unable to generate at least "minimum" separation over the critical interval if the encounter is not "slow closing"; or

c) unable to generate at least "minimum" separation at closest approach (τ_u) if the encounter is "slow closing" and either range is less than D_m or time to a range of D_m, τ_m, is less than 5 s.

Otherwise, the result of the altitude separation test is positive.

4.4.2.2 The following values are used for A_t:

z_o	A_t m	(A_t ft)
less than FL 100	61	(200)
FL 100 to FL 200	73	(240)
FL 201 to FL 420	122	(400)
greater than FL 420	146	(480)

4.4.2.2.1 Hysteresis of ±500 ft is applied to the boundaries between adjacent altitude layers.

4.4.3 *Altitude separation goal.* The initial strength of the RA is selected to meet the goal of an altitude separation of at least A_l at closest approach except in the circumstances described in 4.4.3.2.

4.4.3.1 The following values are used for the parameter A_l:

z_o	A_t m	(A_t ft)
less than FL 50	91	(300)
FL 50 to FL 100	107	(350)
FL 100 to FL 200	122	(400)
FL 201 to FL 420	183	(600)
greater than FL 420	213	(700)

4.4.3.1.1 Hysteresis of ±500 ft is applied to the boundaries between adjacent altitude layers.

4.4.3.2 *Inadequate vertical separation.* If the restrictions on RAs (Chapter 4, 4.3.5 and 4.4.4 below) preclude the generation of an RA predicted to provide an altitude separation at closest approach of at least A_l, the RA is that predicted to provide the largest altitude separation at closest approach consistent with the other provisions in this chapter.

4.4.3.3 *Critical interval.* Predictions for closest approach are for the period of time during which a collision could occur.

4.4.3.3.1 The critical interval is that time between $\tau_{m\ell}$ and $\tau_{u\ell}$ where:

$\dot{r}' \;=\;$ minimum $(\dot{r}, -\dot{R}_t)$

$\tau_{u\ell} \;=\;$ minimum $(\tau^*_{u\ell}, \; |r/\dot{r}'|, T_e)$

$\tau_{m\ell} \;=\;$ minimum $(\tau^*_{m\ell}, \; |(r - D_m^2/r)/\dot{r}'|)$

for $r \geq D_m$

$T_{ml} = 0$ for $r < D_m$

where $\tau^*_{u\ell}$ and $\tau^*_{m\ell}$ are both equal to T_e for a threat that has newly passed the range test (4.3.3) and are the values of $\tau_{u\ell}$ and $\tau_{m\ell}$, respectively, on the previous cycle otherwise.

4.4.3.3.1.1 The following parameter values are used:

S	*3*	*4*	*5*	*6*	*7*
T_e, s	25	30	30	35	40

4.4.3.4 *The threat trajectory.* The RA is designed to provide altitude separations sufficient to avoid collisions with threats that:

a) continue with their current altitude rates; or

b) are climbing or descending when they first become threats and reduce their altitude rates or manoeuvre to level flight.

4.4.3.4.1 Predicted altitude separation is based on the assumption that the threat will maintain its current altitude rate except as described in 4.4.4.4 for ACAS equipped threats.

4.4.3.5 *Own aircraft trajectory.* Predicted altitude separation at closest approach is based on the following assumptions concerning the response of the ACAS II aircraft to the RA:

a) for preventive RAs, the altitude rate of own aircraft will remain within the limits specified by the RA;

b) for corrective RAs, the trajectory of own aircraft will consist of unaccelerated flight at the current rate for $T_p + T_s$, followed by a constant acceleration ($\ddot{Z}_g$) in the vertical plane to achieve the selected altitude rate ($\dot{Z}_g$) and thereafter unaccelerated motion at this rate.

Note.— The predicted time to closest approach might be so short that the selected altitude rate, $\dot{Z}_g$, cannot be achieved.

4.4.3.5.1 The parameter T_p, which represents pilot reaction time, takes the value 5 s for the initial RA strength or 2.5 s for any subsequent RA strength.

4.4.3.5.2 The value of the parameter T_s is chosen so that it models the system delay from receipt of the relevant SSR reply to the presentation of the RA to the pilot (Chapter 4, 4.3.5.10).

4.4.3.5.3 The parameter $\ddot{Z}_g$ takes the value 0.35g for a reversed sense RA or an increased rate RA or 0.25g otherwise.

4.4.3.5.4 If the selected altitude rate, $\dot{Z}_g$, exceeds the performance capabilities of the aircraft, a value suitable for the aircraft is substituted.

4.4.4 RESTRICTIONS ON RAS

4.4.4.1 *Range of available RA strengths.* The reference logic has a capability to provide the vertical RA strength options of Table A-2 in resolving encounters.

4.4.4.1.1 *Increased rate RAs.* The reference logic does not consider the increase climb and increase descend strength when selecting the initial strength of the RA. These RA strengths are only used when the predicted separation for the existing RA is inadequate and reversing the sense of the RA is not an acceptable option. These RA strengths are intended to convey an increased sense of urgency to the pilot. They correspond to increases in the selected altitude rate $\dot{Z}_g$ beyond $\dot{Z}_{clm}$ or $\dot{Z}_{des}$, as appropriate.

4.4.4.1.1.1 Increases in the selected altitude rate to 13 m/s (2 500 ft/min) are generated when all the following conditions are satisfied:

a) a positive RA with the same sense is currently displayed and has been displayed for more than one cycle; and either

1) if the threat is equipped or the current RA is not altitude crossing, confidence in the threat's tracked altitude rate is "high" (4.1.2.3.6.9), and the current RA strength is predicted to provide an altitude separation at closest approach of less than 61 m (200 ft); or

2) the threat is not equipped and the current RA is altitude crossing, and 10 s or less remain until closest approach and the threat's altitude at closest approach is currently predicted to be less than 61 m (200 ft) above or below the current altitude of own aircraft in the case of a descend or a climb RA respectively;

Table A-2. RA strength options

Constraint	*Type*	$\dot{Z}_g$
Upward sense RA		
Increased climb	Positive	$>\dot{Z}_{clm}$
Climb	Positive	$\dot{Z}_{clm}$
Do not descend	VSL	0
Do not descend faster than 2.5 m/s	VSL	–2.5 m/s (–500 ft/min)
Do not descend faster than 5.1 m/s	VSL	–5.1 m/s (–1 000 ft/min)
Do not descend faster than 10 m/s	VSL	–10 m/s (–2 000 ft/min)
Downward sense RA		
Increased climb	Positive	$<\dot{Z}_{des}$
Descend	Positive	$\dot{Z}_{des}$
Do not climb	VSL	0
Do not climb faster than 2.5 m/s	VSL	+2.5 m/s (+500 ft/min)
Do not climb faster than 5.1 m/s	VSL	+5.1 m/s (+1 000 ft/min)
Do not climb faster than 10 m/s	VSL	+10 m/s (+2 000 ft/min)

b) the time remaining to closest approach is less than T_{ir} and greater than 4 s;

c) own aircraft is either descending and above 1 450 ft AGL or climbing and above 1 650 ft AGL, and increase climb RAs are not inhibited by aircraft performance limits, and

d) either τ_u (4.3.4.4.1) is not increasing or, if it is, the range to the threat is less than 3.2 km (1.7 NM).

The following values are used for T_{ir}.

S	*3*	*4*	*5*	*6*	*7*
T_{ir}, *s*	13	18	20	24	26

Note 1.— Condition 2) of a) above allows the use of an increased rate RA against a levelling-off, unequipped threat in an altitude-crossing encounter which does not qualify for a sense reversal (4.4.4.3.1). This situation can arise because the threat is levelling off with a low deceleration such that its predicted altitude at the point of closest approach follows the ACAS II aircraft's current altitude on each succeeding cycle. An increased rate RA could generate additional altitude separation.

Note 2.— Condition c) prevents undesirable interactions between the collision avoidance logic and the ground proximity warning system (GPWS).

4.4.4.1.2 The default values for $\dot{Z}_{clm}$ and $\dot{Z}_{des}$ are 7.6 m/s (1 500 ft/min) and –7.6 m/s (–1 500 ft/min), respectively. If 7.6 m/s (1 500 ft/min) exceeds the aircraft's climb capability, a suitable value may be substituted to enable the generation of climb RAs. If the actual rate of climb or descent exceeds the default rate, the actual rate is substituted, if it is less than a maximum rate of 4 400 ft/min; otherwise the maximum rate of 4 400 ft/min is used.

Note.— Climbs may be inhibited in response to discrete indications e.g. that the aircraft is at its ceiling. However, it is possible that certain aircraft will have such limited climb capability that RAs to climb at 7.6 m/s (1 500 ft/min) have to be permanently inhibited to comply with Chapter 4, 4.3.5.4.

4.4.4.1.3 *RA retention.* Subject to the requirement that a descend RA is neither generated nor maintained below a specified altitude (Chapter 4, 4.3.5.4.1), the RA is not modified (Chapter 4, 4.3.5.6) if any of the following apply:

a) the range test has given a negative result but the intruder remains a threat (4.3.5.1.1); or

b) less than 2.5 s remain until closest approach; or

c) the intruder is diverging in range but the RA has not yet been cancelled (4.3.5.1.1).

4.4.4.1.4 *Weakening RAs.* Subject to the requirement that a descend RA is not generated at low altitude (Chapter 4, 4.3.5.4.1), an RA is not weakened (Chapter 4, 4.3.5.7) if any of the following conditions apply:

a) it is positive and current altitude separation is less than A_l; or

b) it (any strength) has been displayed for less than 10 s or, for a reversed sense RA, 5 s; or

c) there is “low” confidence in the threat’s tracked altitude rate; or

d) the RA is a vertical speed limit RA.

Furthermore, positive RAs are not weakened beyond an RA strength allowing a return to level flight (“do not climb” for a downward RA; “do not descend” for an upward RA).

Note.— This limitation on weakening RAs does not apply to the declaration of an aircraft to be not a threat (Chapter 4, 4.3.5.1.1).

4.4.4.2 *Initial bias against altitude crossing.* A newly generated RA is non-crossing provided:

a) a non-crossing RA is predicted to provide an altitude separation of at least A_l at closest approach; and

b) responding to a non-crossing RA with a standard response (4.4.3.5) is predicted to preserve at least “minimum” vertical separation (4.4.2.1) throughout the entire time interval until closest approach.

4.4.4.3 *Sense reversal for an established threat.* Sense reversals are generated when the following conditions apply:

a) the threat is not equipped or the threat is equipped, has a higher aircraft address, and at least 9 s have elapsed since it became a threat and own ACAS has not previously reversed its RA; and

b) more than 4 s remain before closest approach; and

c) the value of τ_u (4.3.4.4.1) was not already rising by the time the range to the threat was 3.2 km (1.7 NM); and

d) either:

1) i) the current RA is altitude crossing; and

ii) current altitude separation is at least 61 m (200 ft), or 30 m (100 ft) if more than 10 s remain before closest approach; and

iii) either

— at the time the RA was generated the threat was predicted to cross the initial altitude of own aircraft, but currently the threat’s altitude at closest approach is predicted to be above or below the current altitude of own aircraft in the case of a climb or descend RA, respectively; or

— at the time the RA was generated the threat was not predicted to cross the initial altitude of own aircraft, but current estimates of the separations predicted to be achievable for climb and descend RAs at closest approach show that greater separation will be obtained for a reversed sense RA; and

iv) by the time of reaching closest approach, own aircraft will, with reversed sense, be able to exceed the maximum bound on the threat’s altitude at closest approach (projected using the maximum altitude rate bound (4.1.2.3.4)); or

2) i) the current RA is not altitude crossing; and

ii) at least one of the following:

— the threat has crossed own aircraft’s altitude by at least 30 m (100 ft) in the direction of the RA sense; or

— the threat is not equipped and own aircraft has not yet crossed the altitude of the threat, but its vertical rate is opposite to the RA and an immediate manoeuvre to comply with the RA would not prevent an altitude crossing before closest approach; or

— the threat is not equipped and current separation does not exceed A_c (4.4.2.1.4), the vertical rates of own and the threat exceed 1 000 ft/min in the same direction, the RA has been positive for at least 9 s, confidence in the tracked rate of the threat is high, and either an altitude crossing is predicted to occur before closest approach or vertical separation at closest approach is predicted to be less than 30 m (100 ft).

Note.— The sense of an RA for an established threat cannot be reversed except for coordination purposes or because the predicted separation at closest approach for the existing sense is inadequate (Chapter 4, 4.3.5.5).

4.4.4.3.1 Climb RAs occurring as a result of reversals of downward-sense RAs are issued regardless of manoeuvre limitation indications.

4.4.4.4 *Strength selection for non-crossing RAs against ACAS-equipped threats.* In a conflict with an ACAS-equipped threat, in which the reference logic would normally generate a non-crossing climb or descend RA that is opposite in direction to own aircraft's existing vertical rate, an RA to limit the vertical rate to 0 ft/min will be generated instead, if the following conditions are met:

a) own aircraft and the threat are converging vertically;

b) own aircraft's vertical rate exceeds $\dot{Z}_{lo}$;

c) the threat aircraft's vertical rate is less than $\dot{Z}_{lo}$; and

d) the vertical separation that would be achieved at closest approach if both aircraft were to level off exceeds Z_{losep}.

4.4.4.4.1 The vertical speed limit 0 ft/min RA generated in accordance with 4.4.4.4 is retained if neither aircraft accelerates vertically toward the other with a change in rate in excess of $\dot{Z}_{l}$. Otherwise, the reference logic will immediately generate a climb or descend RA as appropriate for the RA sense.

4.4.4.4.2 The value 6 m/s (1 000 ft/min) is used for $\dot{Z}_{lo}$. The value 244 m (800 ft) is used for Z_{losep}.

5. ACAS II USE OF HYBRID SURVEILLANCE TECHNIQUES

5.1 Overview

5.1.1 Hybrid surveillance is the technique used by ACAS to take advantage of passive position information available via extended squitter. Using hybrid surveillance, ACAS validates the position provided by extended squitter through direct active range measurement. Initial validation is performed at track initiation. Revalidation is performed once per 10 seconds if the intruder becomes a near threat in altitude or range. Finally, regular once-per-second active surveillance is performed on intruders that become a near threat in both altitude and range. In this manner, passive surveillance (once validated) is used for non-threatening intruders thus lowering the ACAS interrogation rate. Active surveillance is used whenever an intruder becomes a near threat in order to preserve ACAS independence as an independent safety monitor. A block diagram of the hybrid surveillance algorithm is presented in Figure A-11.

5.1.2 The reported altitude in the extended squitter position report is loaded within the Mode S transponder from the same source used to provide the altitude reported in the reply to an ACAS addressed interrogation. The altitude reported in an extended squitter position report may therefore be used to update the altitude of a track undergoing active surveillance, in the event that the transponder fails to reply to active interrogations.

5.2 Hybrid surveillance equipment characteristics

5.2.1 INITIAL VALIDATION

5.2.1.1 A passive track is initiated by the receipt of an extended squitter with a 24-bit address that is not in the track file, nor is associated with a track undergoing active surveillance. This latter case can occur if the short squitter established an active track before an extended squitter containing position reports is received.

5.2.1.2 ACAS will handle an extended squitter acquisition the same way that it handles a short squitter acquisition. After receiving the required number of squitters at the ACAS MTL (the same number as specified for short squitters in Chapter 3, 3.1.2.8.5), an attempt is made at active surveillance for a prescribed number of times. A successful reply will lead to track acquisition. An unsuccessful attempt will lead to discarding acquisition for this aircraft address, since the ADS data could not be validated. Continued receipt of extended squitters will lead to a subsequent acquisition attempt.

5.2.1.3 In the case of an aircraft providing extended squitter information, a successful acquisition reply will provide the opportunity to validate the information. But in either case (short or long squitter), the same criteria for track acquisition are followed, in terms of the number of correlating squitters that are required and the number of interrogation attempts that are made.

5.2.1.4 Initial ADS information validation is performed at passive track initiation to determine if the track can be maintained on passive data. An active surveillance measurement is made using a short addressed interrogation which carries an ACAS cross-link command to provide the contents of register 05[HEX] (extended squitter airborne position) in the reply. The reply to this interrogation also provides the aircraft speed capability and the reported barometric altitude in addition to the ADS-B airborne position report. The relative range and bearing computed from own and intruder reported positions is compared to the active range and bearing measurements and the altitude provided in the position report is compared to the altitude obtained from the active interrogation. If the reported information does not agree with the range, bearing or altitude obtained via the active interrogation within limits recommended in Chapter 4, 4.5.1.3.2, the track is declared to be an active track and future extended squitters from this aircraft are ignored by ACAS.

5.2.2 REVALIDATION AND MONITORING

If the following condition is met for an aircraft with a relative altitude ≤ 10 000 ft:

(Intruder altitude difference ≤ 3 000 ft OR vertical *TAU* to 3 000 ft ≤ 60 seconds) OR

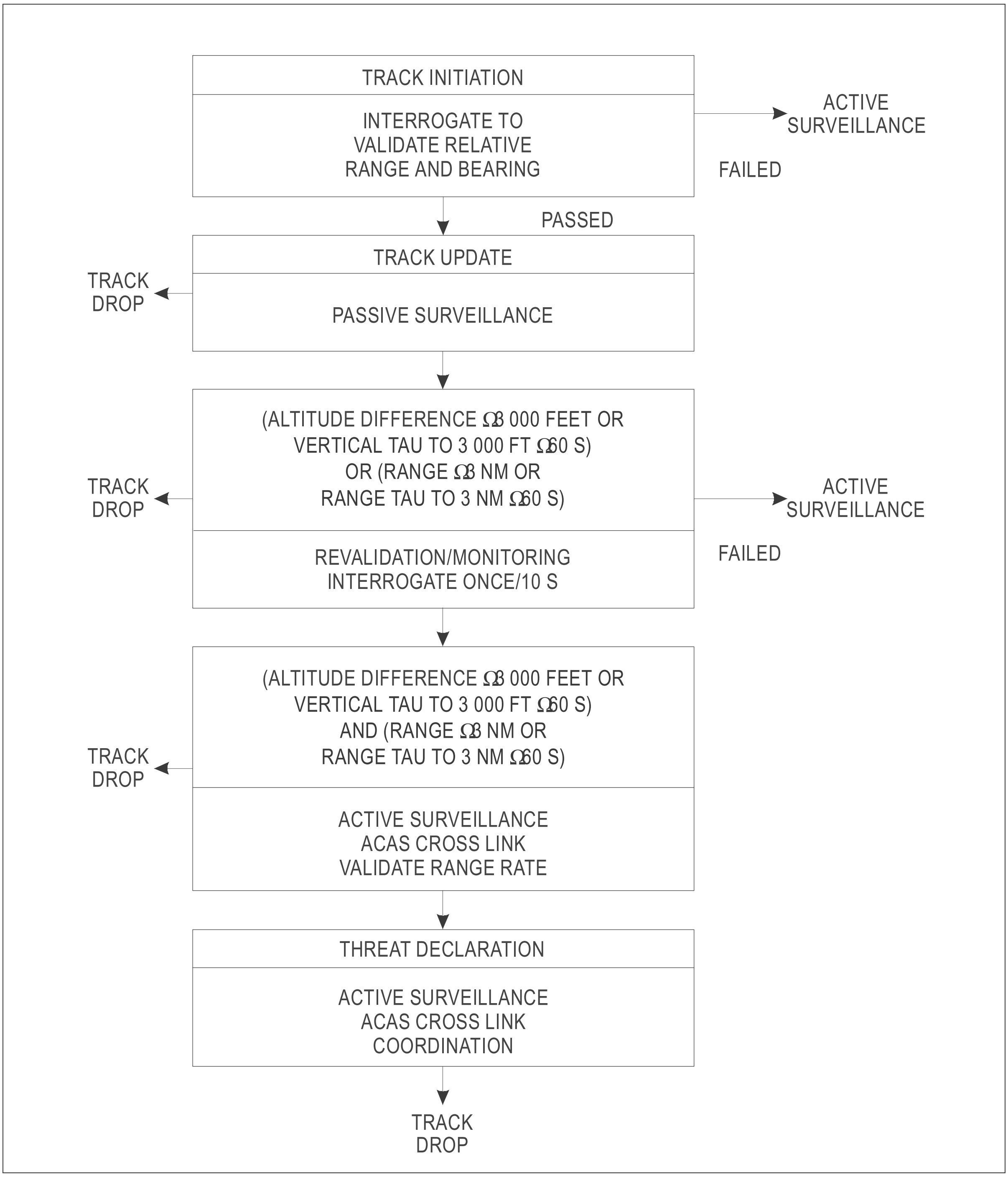


Figure A-11. ACAS hybrid surveillance algorithm

(Range difference ≤ 3 NM OR range *TAU* to 3 NM ≤ 60 seconds)

an active interrogation is made every 10 seconds to continuously revalidate and monitor the position reports. Any detected difference will result in the aircraft being declared an active track.

5.2.3 ACTIVE SURVEILLANCE

If the following condition is met for an aircraft with a relative altitude ≤ 10 000 ft:

(Intruder altitude difference ≤ 3 000 ft OR vertical *TAU* to 3 000 ft ≤ 60 seconds) AND

(Range difference ≤ 3 NM OR range *TAU* to 3 NM ≤ 60 seconds)

the aircraft is declared an active track and is updated on active range measurements once per second.

5.2.4 THREAT EVALUATION DECLARATION

If the intruder aircraft is declared to be a threat or potential threat, active range measurement continues.

6. PERFORMANCE OF THE COLLISION AVOIDANCE LOGIC

6.1 Purpose of the performance requirements

6.1.1 The ACAS collision avoidance logic is the part of ACAS that receives information relating to identified intruders (i.e. any aircraft for which ACAS has established a track) and generates collision avoidance advisories on the basis of that information. In any ACAS equipment it is likely to take the form of software residing in a microprocessor and this software will implement a collection of mathematical algorithms. These algorithms might vary from one ACAS to another and the purpose of the performance requirements for the collision avoidance logic is to ensure that the performance of the mathematical algorithms is acceptable.

6.1.2 The development of the collision avoidance algorithms and their implementation as software are thought of as separate processes and these standards relate to the algorithms, even though, in practice, the software used to demonstrate that the algorithms are satisfactory might be closely related to that installed with ACAS. The performance requirements for the collision avoidance logic are not intended to guarantee that the collision avoidance software is satisfactory as software, though they are an essential ingredient of such a guarantee. Satisfactory performance of the software is to be achieved by using sound software engineering practices to ensure that the algorithms are implemented reliably.

6.1.3 The interoperability of the collision avoidance logics in any two equipments is achieved by ensuring that their RAs are consistent and that either RA alone is sufficient for the purpose of the system as a whole. Consistency is ensured by the requirements relating to coordination (Chapter 4, 4.3.5.5.1, 4.3.5.8 and 4.3.6.1.3). That either RA is sufficient is guaranteed by the collision avoidance logic performance requirements and, in particular, the requirement of satisfactory performance when the other aircraft is ACAS equipped but does not cooperate (Chapter 4, 4.4.2.1 j) 2)).

6.1.4 The performance requirements are intended to provide a global guarantee that the ACAS logic in question has an overall performance that is comparable with or superior to that of other ACAS logics. They do not describe the performance of the logic in any particular airspace. For many purposes, the best method of determining or studying the performance of an ACAS logic in a particular airspace is by means of simulations based on ATC ground radar data. This possibility is discussed further in 6.4.4.

6.2 Conditions under which the requirements apply

6.2.1 COMMENT

The conditions given in Chapter 4, 4.4.2 are specified in order to define the subsequent requirements, but satisfactory performance is required in all normal operating conditions. This is to be demonstrated by varying the conditions in which the performance measures are calculated in a way that reflects the normal variations that might be expected and ensuring that the calculated performance measures are robust, i.e. that they do not degrade sharply as the conditions assumed deteriorate.

6.2.2 SURVEILLANCE ERRORS

6.2.2.1 Surveillance errors can take a number of forms:

a) a track is not formed for the intruder;

b) a track is formed late;

c) a track is dropped prematurely;

d) a track is formed but reports are not available each cycle; and

e) the reports, e.g. of range, will be subject to measurement errors.

6.2.2.2 While any assessment of the effectiveness of ACAS as a whole must take failure to form tracks, item a), into account, there is no need to prove that the logic is effective when it has no data.

6.2.2.3 Late track formation, item b), could delay the generation of RAs (perhaps because the various trackers in the logic have not converged and the RA is delayed by low confidence) or result in an inappropriate initial RA (perhaps because the output of the trackers is used before it has converged). Best practice would be to determine the frequency of late track formation for the actual surveillance system to be used with the logic being tested.

6.2.2.4 Once a track is formed, missing reports can degrade the accuracy of the track or cause low confidence in the track, both of which could delay the initial RA, result in an inappropriate RA or delay changes in an RA after it has been generated. Best practice would be to determine the frequency of missing reports for the actual surveillance system to be used with the logic being tested. The probability that a report is missing on any given cycle will be a function of the range of the intruder, altitude and whether or not a report was missing on the previous cycle.

6.2.2.5 Actual bearing measurement errors are highly dependant on the airframe and the siting of the ACAS antenna and other antennas and obstacles fitted to the same airframe. The bearing measurements are characteristically so poor that early ACAS designs made no use of them in the collision avoidance logic. A later design, which includes a filter that inhibits RAs when the sequence of range measurements indicates a significant horizontal miss distance, used the bearing and bearing rate measurements to verify that neither aircraft is accelerating; the filter is disabled if the bearing measurements are not consistent with the diagnosed miss distance. The conditions specified in Chapter 4, 4.4.2 are intended to cover this sort of feature in the logic.

6.2.2.6 It is most unlikely that any ACAS installation will provide bearing measurements of sufficient accuracy to provide the primary basis of a miss distance filter or any other aspect of the collision avoidance logic.

6.2.2.7 Range and bearing measurements are also used to determine the relative position of the intruder for use in the traffic display. The requirements for this use are much less stringent than those of the collision avoidance logic, and the models specified in Chapter 4, 4.4.2.2 and 4.4.2.3 have no bearing on this use.

6.2.3 Altitude quantization

6.2.3.1 The intruder's altitude could be available as either Mode C or Mode S reports and is thus expressed in 100 ft or 25 ft quanta. Chapter 4, 4.4.2.1 c) specifies that 100 ft quanta be assumed for the purposes of confirming that the performance requirements are met. The performance of the collision avoidance logic is expected to be improved when the intruder's altitude is available as 25 ft quanta and it is desirable to confirm that this is the case.

6.2.3.2 In most cases, the altitude of own aircraft will be available to ACAS as a measurement prior to the formation of a Mode C or Mode S report and Chapter 4, 4.4.2.1 d) specifies that this is assumed. For installations where it is not possible to provide the original altitude measurement to ACAS, the collision avoidance logic will have to use the Mode C or Mode S reports made by own aircraft. This is expected to degrade the performance of the logic but Chapter 4, 4.4.2.1.1 requires that this degradation be acceptable. The logic is not expected to meet the performance requirement when altitude reports (as opposed to measurements) are used for own aircraft. The test is whether the resulting measures are judged acceptable given that they result from an installation where it has been necessary to compromise performance by using input that does not match the normal standards, and whether they indicate that the logic is unduly sensitive to quantization of the altitude data for own aircraft.

6.2.4 Standard altimetry error model

6.2.4.1 The standard altimetry error model is needed for the calculation of the effect of ACAS on the risk of collision (6.3.2). Although it is based on the observed performance of operational altimeters, there is no intention that the model be used as a reference recording that performance. Still less is there an implied requirement for altimeters to match the performance described in the model whether or not they are used in conjunction with ACAS. The model is standardized solely for the purpose of defining the conditions under which the requirements relating to the performance of the collision avoidance logic apply.

6.2.4.2 The model describes the distribution that is to be assumed for the errors in altimeter measurements. It excludes the effect of the quantization that is needed to create Mode C or Mode S altitude reports. Nevertheless, the calculation of the effect of ACAS on the risk of collision must take full account of this quantization and this is to be achieved by quantizing the simulated altitude measurements and thus forming simulated reports that are provided to the simulated ACAS logic.

6.2.4.3 The simulations of the effect of ACAS will include precise knowledge of the aircrafts' measured altitudes. Their actual altitudes are not known either to ATC or to the aircraft; they are the sum of the simulated measurement and the random altimeter error. In every encounter where the horizontal miss distance is very small, there is some risk of collision and it equals the probability that the difference in the actual altitudes of the two aircraft is small enough for them to collide. Thus the calculation of the effect of ACAS on the risk of collision (6.3.2) involves forming the statistical distribution of the error in the measured difference in the altitudes of the two aircraft: the convolution of two statistical distributions, one for each aircraft.

6.2.4.4 For the standard altimetry error model specified in Chapter 4, 4.4.2.4, the probability that the actual vertical separation d is less than a threshold value h (which is taken to be 100 ft in 6.3.2) is as follows:

for $\lambda_1 = \lambda_2$ and $a \geq h$

$$Prob(|d| \leq h) = \frac{1}{4\lambda}\exp\left(\frac{-(a+h)}{\lambda}\right)\left[\exp\left(\frac{2h}{\lambda}\right)(2\lambda + a - h) - (2\lambda + a + h)\right]$$

for $\lambda_1 = \lambda_2$ and $a < h$

$$Prob(|d| \leq h) = 1 - \frac{1}{4\lambda}\exp\left(\frac{-(a+h)}{\lambda}\right)\left[\exp\left(\frac{2a}{\lambda}\right)(2\lambda - a + h) + (2\lambda + a + h)\right]$$

for $\lambda_1 \neq \lambda_2$ and $a \geq h$

$$Prob(|d| \leq h) = \frac{\lambda_1^2\exp\left(\frac{-a}{\lambda_1}\right)\sinh\left(\frac{h}{\lambda_1}\right) - \lambda_2^2\exp\left(\frac{-a}{\lambda_2}\right)\sinh\left(\frac{h}{\lambda_2}\right)}{\lambda_1^2 - \lambda_2^2}$$

and for $\lambda_1 \neq \lambda_2$ and $a < h$

$$Prob(|d| \leq h) = \frac{\lambda_1^2\left[1 - \exp\left(\frac{-h}{\lambda_1}\right)\cosh\left(\frac{a}{\lambda_1}\right)\right] - \lambda_2^2\left[1 - \exp\left(\frac{-h}{\lambda_2}\right)\cosh\left(\frac{a}{\lambda_2}\right)\right]}{\lambda_1^2 - \lambda_2^2}$$

where λ_1 and λ_2 are the values of λ for the two aircraft, and a is the apparent vertical separation as in 6.3.2, i.e. the altitude separation as measured by the altimeters in the two aircraft.

6.2.5 STANDARD PILOT MODEL

6.2.5.1 The standard pilot model represents a reasonable expectation of pilots' normal reaction to RAs. However, it does not capture the full range of potential responses, for example, slow responses that undermine collision avoidance and excessively violent reactions that cause large deviations from clearance. For some responses, for example, failure to respond or a decision to move to the next flight level in response to a climb RA, it is not appropriate to examine the performance of the logic, but the following modifications to the standard model will provide an indication whether the logic is unduly dependent on an accurate pilot response.

6.2.5.2 In the context of Chapter 4, 4.4.3, the reduction in the risk of collision, a suggested deficient pilot response is:

a) the pilot responds slowly, *viz.* in 8 s to an initial RA and in 5 s to a changed RA; and

b) the pilot aims for an inadequate rate, *viz.* 200 ft/min less than the rate required.

6.2.5.3 In the context of Chapter 4, 4.4.4, the effect of ACAS on air traffic management (ATM), a suggested excessive response is:

a) the pilot responds quickly, *viz.* in 3 s to an initial RA and in 1 s to a changed RA;

b) the pilot aims for an excessive rate, *viz.* 500 ft/min more than the rate required; and

c) the pilot fails to respond to weakening RAs.

6.2.5.4 The logic is not expected to meet the performance requirements when the pilot responds as described above, but calculation of the performance measures using these non-standard pilot responses will provide some insight into the sensitivity of the logic to the accuracy of the pilot's response. The test is whether the changes in the measures are judged acceptable given that they result from an inaccurate response, and whether they indicate that the logic is unduly sensitive to the response assumed from the pilot.

6.2.6 STANDARD ENCOUNTER MODEL

6.2.6.1 Effectively, there are two encounter models, one for use in risk ratio calculations (where the horizontal miss distance is small) and the other for use when assessing the compatibility of the logic design with ATM (where the horizontal miss distance can be comparable with the ATC horizontal separation minimum). This overcomes what would otherwise be an unacceptable simplification: both models treat the horizontal and vertical characteristics of the encounters independently.

6.2.6.2 The standard model is the result of an analysis of a large amount of ground radar data collected in two States. This means that one can expect the performance measures calculated using this standard model to be related to operational reality even though that is not the purpose of the calculations. The data analysed revealed very considerable variation in the airspace characteristics expressed in the encounter model depending on the location of the radar providing the data. The characteristics of the data from the two States were radically different. This implies that a standard encounter model cannot provide predictions of performance that will be valid for any specific location. However, given that a standard model is essential to the definition of standard performance, the model standardized is considered sufficiently complex and representative.

6.2.6.3 To determine the parameters of the standard encounter model (Chapter 4, 4.4.2.6), for example the relative weights of the encounter classes, encounters were reconstructed from ground radar data. This required a re-interpretation of aspects of the encounters, examples of which are given below.

6.2.6.3.1 The definition of "Altitude layer" given for the standard encounter model (Chapter 4, 4.4.1) is simple because it is made solely for the purpose of standardizing the collision avoidance logic. When, in the real encounters observed in the ground radar data, ground level did not correspond to a pressure altitude of 0 ft, it was necessary to distinguish between height above the ground and pressure altitude with respect to mean sea level (MSL). The method used to determine the altitude layer appropriate for an encounter observed in real radar data was to place it in Layer 1 if it occurred less than 2 300 ft above ground level (AGL), and to use the pressure altitude with respect to MSL otherwise. At locations of high altitude, one or more layers were sometimes missing.

6.2.6.3.2 The vertical rates of an aircraft at the beginning and the end of an encounter, $\dot{z}_1$ and $\dot{z}_2$ are, in the standard encounter model, values at precise times, *viz. tca* – 35 s and *tca* + 5 s. When processing the data for real encounters observed in the ground radar data, the values used for $\dot{z}_1$ and $\dot{z}_2$ were the average vertical rates over the first 10 s, i.e. [*tca* – 40 s, *tca* – 30 s], and the last 10 s, i.e. [*tca, tca* + 10 s], of the encounter.

6.2.6.3.3 In similar vein, in the real encounters *tca* was the actual time of closest approach, and *hmd* was the actual horizontal separation at closest approach. The vertical miss distance, *vmd*, was either the vertical separation at closest approach, for encounters in which *hmd* ≥ 500 ft, or it was the minimum vertical separation during the period of time in which the horizontal separation of the two aircraft was less than 500 ft.

6.2.6.3.4 Some aspects of the standard encounter model, e.g. the magnitude of speed changes during an encounter, could not be determined from examination of the ground radar data (because of the nature of the data) and had to be specified using a general understanding of aircraft dynamics.

6.2.6.3.5 To put the lack of precise correspondence between the model encounters and those observed in radar data into context, it is necessary to bear in mind that the purpose of the standard encounter model is to provide a basis for standardizing the performance of the collision avoidance logic. While, naturally, every realistic effort was made to ensure that the model is as faithful as possible to operational reality, precise fidelity is not required and will not have been achieved. This is not a reason for using an alternative model; the only model that is valid for assessing the performance of the collision avoidance logic against the requirements stated here is the model specified here for that purpose.

6.2.6.4 Any construction of the standard encounter model that can be proved equivalent to that specified in Chapter 4, 4.4.2.6 is acceptable. Two examples of such equivalent alternatives are given below.

6.2.6.4.1 Chapter 4, 4.4.2.6.1 specifies that the performance measures be calculated by creating sets of encounters defined by broad characteristics (specifically: the ordering of the aircraft addresses; the altitude layer; the encounter class; and the approximate value for the vertical miss distance) and combining the results from these sets by using the weights specified in Chapter 4, 4.4.2.6.2. This will involve as many simulations of relatively rare types of encounters, e.g. crossing encounters, as of the more common types of encounters, e.g. non-crossing encounters. This approach ensures that the full range of possibilities within each set is properly investigated. However, the same end can be achieved by creating a number of encounters for each set that is proportional to the specified weight and combining all the encounters into one much larger pool. The only caveat on this alternative approach is that the total number of encounters must be large enough to ensure that the results from the smallest set, considered in isolation, are statistically reliable.

6.2.6.4.2 The statistical distributions for each of the vertical rates have been specified by requiring that first an interval is selected within which the final value is to lie, and then the final value is selected using a distribution that is uniform within the interval. This is merely a device adopted for the sake of clear presentation of the tables in Chapter 4, 4.4.2.6.3.2.4. It would be equivalent to select the value directly using a statistical distribution that is linear within each of the intervals and for which the cumulative probability increases across each interval by an amount equal to the specified probability for that interval.

6.2.6.5 The encounters in the standard encounter model are constructed from a notional closest approach outwards. The time of this notional closest approach is fixed and written "*tca*" in Chapter 4, 4.4.2.6. In the vertical plane, the vertical rates 35 s before *tca* and 5 s after *tca* are selected and joined by a period of acceleration if necessary, and then the altitudes in the trajectory are fixed by requiring that the vertical separation at *tca* equals the selected value for "*vmd*". In the horizontal plane, selected values for "*hmd*", the approach angle, and the aircraft speeds define the relative trajectories of the two aircraft at the time *tca*. The aircraft turns and speed changes are then imposed by modifying the trajectories before and after *tca*. At the conclusion of this process, the time of closest approach only approximates *tca*.

6.2.7 ACAS EQUIPAGE OF THE INTRUDER

6.2.7.1 The standards specify three sets of conditions concerning the equipage of the intruder and the way the intruder aircraft is to be assumed to behave:

a) the other aircraft involved in each encounter is not equipped;

b) the other aircraft is ACAS equipped but follows a trajectory identical to that in the unequipped encounter; and

c) the other aircraft is equipped with an ACAS having a collision avoidance logic identical to that of own ACAS.

6.2.7.2 The first circumstance a) ensures that the logic performs satisfactorily in encounters with an unequipped intruder. The other two circumstances both test the collision avoidance logic when the other aircraft is equipped but do so from different perspectives. Circumstance b) ensures that the logic performs satisfactorily under the constraints of the coordination process, while circumstance c) ensures that the benefits to be expected when both aircraft are equipped are realized.

6.2.7.3 The conditions applying in circumstance b) are intended to allow own ACAS to select its initial RA but to then apply the most pessimistic reasonable assumptions about the effect of the need for coordination on the performance of the own ACAS logic. When own aircraft has the lower aircraft address, the conditions of the test imply that the sense of the RA cannot be reversed. Furthermore, the intruder does not generate an RA and an RAC until the own ACAS RA is announced because an early design included an initial coordination delay (the purpose of which was to allow the coordination to complete and avoid the pilot seeing rapid changes in the RA); the intention of the requirement is to ensure that performance is satisfactory in spite of the deleterious effects of any such delay.

6.2.7.4 Circumstance c) requires that the behaviour of the two aircraft be fully cooperative, but the fact that both ACAS are using the subject logic ensures that the performance measure relates to the subject logic and that the subject logic is effective.

6.2.7.5 As discussed above, the performance specifications are intended to ensure satisfactory operation of the logic and not the system as a whole. To the extent that they are capable of wider interpretation in terms of the benefits of the system as a whole in an operational environment, circumstance c) might be thought to provide the more credible performance measure for ACAS-ACAS encounters. The specified performance of the logic in circumstance b) is worse than that where the intruder is not equipped, because circumstance b) invokes only the constraints imposed by coordination. However, the fact that the cooperation of an intruder cannot be guaranteed and that some pilots will fail to respond to RAs on occasion means that all three measures have operational relevance.

6.3 Reduction in the risk of collision

6.3.1 STATUS OF THE LOGIC RISK RATIO

6.3.1.1 The risk ratio calculated for the purposes of Chapter 4, 4.4.3 is a measure of the performance of the logic and not the ACAS as a whole. For example, ACAS can prevent a collision by prompting the pilot to carry out a successful visual search for the intruder and it can fail because a track is not established or the pilot ignores the RA; these are aspects of the total system that are not reflected in the calculations required for Chapter 4, 4.4.3.

6.3.1.2 When considering the relevance of the "logic risk ratio" figures calculated for Chapter 4, 4.4.3 to operations or policy decisions, it might be helpful to regard them as solely the reliability that can be attached to RAs. They express the effect that following an RA will have on the immediate risk of collision when, at the time it is issued, the pilot has no information other than the RA on which to base a decision whether to follow the RA or ignore it. As a rough guide, the collision risk created by ACAS arises from following the RA so the logic risk ratio overstates this "induced risk ratio"; on the other hand, it also overstates the capability of ACAS to prevent collisions because of the many other failure modes in the total system.

6.3.1.3 The figures calculated for the purposes of Chapter 4, 4.4.3 are unsuitable as guidance concerning the effect of ACAS on the overall risk of collision in an airspace or faced by an airline.

6.3.2 CALCULATION OF THE LOGIC RISK RATIO

6.3.2.1 The risk ratio R can be written:

$$R = \frac{\sum \textit{probability of a collision with ACAS}}{\sum \textit{probability of a collision without ACAS}}$$

where the summation is over all encounters, or, more practically, all encounters that contribute to the total risk of collision with or without ACAS. The need for the characteristics and statistics of the encounters to be representative of operational realities is standardized in Chapter 4, 4.4.2.6 and discussed in 6.2.6.

6.3.2.2 The estimated risk of collision depends on the interpretation of the word "collision". While this problem is largely avoided by expressing the requirement in terms of the ratio between the risks of collision with and without ACAS, it is important that realistic allowance is made for the size of the largest aircraft. It would be reasonable to treat a vertical separation of less than 100 ft between the centre points of the two aircraft as if it were small enough to allow a collision. It would not be advisable to use significantly larger miss distances as approximations to collisions because it has been found that the calculated risk ratio is sensitive to the definition of "collision" even though it is a ratio.

6.3.2.3 If the approximation is made that a collision occurs when

$|d| < 100$ ft, where d is the actual vertical separation

Then $$R = \frac{\sum \text{prob}(|d| < \textit{100 ft with ACAS})}{\sum \text{prob}(|d| < \textit{100 ft without ACAS})}$$

where now the summation is over all encounters with zero or extremely small horizontal miss distance.

6.3.2.4 Now introduce e, the altimeter error and a, the apparent vertical separation and note that

$$a = d + e$$

a is conceptually the altitude separation as measured by altimeters. It should not be necessary to consider quantization errors because the modelled altimeter readings can be known with arbitrary precision in the computer simulations. They are quantized before they are provided to ACAS as modelled Mode C reports, which ACAS tracks. This is why the standard Chapter 4, 4.4.2 excludes quantization effects.

6.3.2.5 Define a_{with} to be the apparent vertical separation with ACAS and $a_{without}$ to be the apparent vertical separation without ACAS. Then

$|d| < 100\ ft$ with ACAS

if and only if $|a_{with} - e| < 100\ ft$

i.e. $a_{with} - 100\ ft < e < a_{with} + 100\ ft$

and similarly

$|d| < 100\ ft$ without ACAS

if and only if $|a_{without} - 100\ ft < e < a_{without} + 100\ ft$

6.3.2.6 Risk ratio is thus given by

$$R = \frac{\sum \text{prob}(a_{with} - 100\ ft < e < a_{with} + 100\ ft)}{\sum \text{prob}(a_{without} - 100\ ft < e < a_{without} + 100\ ft)}$$

In order to use this formula to calculate risk ratio, the values of a_{with} and $a_{without}$ must be determined for a collection of encounters that is fully representative of all the potential actual encounters in which there is both a risk of collision without ACAS and a risk that ACAS will induce a collision. When these values of hypothetically measured altitude separation are known, knowledge of the errors in altitude measurement completes the calculation.

6.3.3 Induced and unresolved risk

6.3.3.1 It is not sufficient to demonstrate that ACAS will prevent collisions that might occur in its absence. The risk that ACAS logic could cause collisions in otherwise safe circumstances must be fully considered, not least because in managed airspace the number of encounters potentially facing an induced risk greatly exceeds the number of near collisions.

6.3.3.2 The upper limit on the logic risk ratio standardized at Chapter 4, 4.4.3 effectively places an approximate upper limit on the ACAS induced risk of collision. Although some other failures could cause ACAS to induce a collision, e.g. pilots manoeuvring on a TA or an RA directing the aircraft into the trajectory of an unseen third party, the induced risk is largely attributable to following RAs. In operational conditions, failure to raise or follow an RA will reduce the risk of an induced collision (even though it increases the absolute risk).

6.3.3.3 The requirement is that the logic is designed to reduce the risk of collision and no distinction is drawn between risk induced by the logic and risk that it is unable to resolve. It is possible to draw such a distinction and even to subdivide the risk into that due to altimeter error and that due to inappropriate operation of the logic but it is considered that this exercise has little value for the design of the logic.

6.3.4 Use of ground radar data to calculate risk ratio

It is possible to use encounters observed in ground radar data as the basis of the safety calculations described in 6.3.2. However, it is difficult to interpret the results because the calculation concerns extremely rare events and, even when many months of data are used, trajectories have to be modified to insert a risk of collision that was absent in the actual encounters. It is more practicable to use the radar data to inform the choice of the weights to be ascribed to the various encounter classes in the encounter model and thus produce a version of the idealized encounter model that is more representative of the airspace in question than the standard model presented here.

6.4 Compatibility with ATM

6.4.1 NUISANCE ALERT RATE

6.4.1.1 ACAS is required to diagnose a risk of imminent collision on the basis of incomplete information. Furthermore, this information has to be independent of that providing the primary basis for aircraft separation. It follows that there will be alerts in encounters where, from an operational perspective, there would seem to be no risk of collision. Standard Chapter 4, 4.4.4.1 requires that these nuisance alerts be as infrequent as possible.

6.4.1.2 The specification of a nuisance RA given in Chapter 4, 4.4.4.1.2 is made with the view that an RA is a nuisance if normal standard separation is not clearly lost. Additionally, it is intended that the horizontal separation threshold is sufficiently stringent to require the use of a horizontal miss distance filter. The horizontal separation threshold has been set at 40 per cent of normal separation, and the vertical separation threshold has been set at a figure based on an ATC tolerance of deviations of 200 ft from altitude clearance.

6.4.2 COMPATIBLE SENSE SELECTION

The requirement at Chapter 4, 4.4.4.2 is not intended to constrain the manner in which dangerous encounters are resolved, but rather is based on an appreciation that the majority of RAs are likely to be generated in encounters where there is no danger of collision. It places a statistical limit on the frequency with which ACAS disrupts ATC or the normal operation of the aircraft by inverting the vertical separation of two aircraft.

6.4.3 DEVIATIONS CAUSED BY ACAS

The restrictions on the deviations that may be caused by following RAs, Chapter 4, 4.4.4.3, limit the disruption to normal aircraft operation as well as to ATC. While deviations from altitude clearances are the most obviously disruptive to ATC, other deviations, such as that caused by an RA to climb when the aircraft is descending, could be viewed equally seriously by ATC.

6.4.4 USE OF GROUND RADAR DATA OR THE STANDARD ENCOUNTER MODEL

6.4.4.1 Conformance with the requirement for compatibility with ATM can be tested most convincingly using simulations based on reconstructions of actual operational encounters occurring within the coverage of ATC ground radars, provided that only a small proportion of the aircraft thus observed are equipped with ACAS. However, the results of such simulations based on actual data will reflect the particular properties of the airspace (or airspaces) in which the data were collected as much as those of the collision avoidance logic used. Thus, there are considerable practical difficulties in using real encounter data to validate collision avoidance logic, and the provisions of Chapter 4, 4.4.4 assume the use of artificial encounters based on the standard encounter model specified in Chapter 4, 4.4.2.6.

6.4.4.2 The use of the standard encounter model to obtain performance measures describing the operation of the collision avoidance logic will provide only indirect evidence concerning its operation in any particular airspace. Authorities that have access to ground radar data and wish to understand the interaction of ACAS with local ATC practices are advised to use simulations based on their ground radar data rather than the standard encounter model. In doing so, they need to note that the results can be subverted if the aircraft observed are already equipped with ACAS. They will also need to collect sufficient data to ensure that the simulated RAs derived from the data are statistically representative; for example, data collected over 100 days in one State contained very few examples of some types of RAs.

6.5 Relative value of conflicting objectives

The design of the collision avoidance logic for ACAS must strike an operationally acceptable balance between the reduction in the risk of collision and the disruption caused by ACAS alerts. The requirements relating to the risk of collision (Chapter 4, 4.4.3) and the disruption to ATC (Chapter 4, 4.4.4) are minimum standards that are known to be achievable from work with a prototype system. Other designs are only acceptable when it can be demonstrated that the risk of collision and the disruption to ATC have both been minimized as much as practicable in the context of a need to minimize the other.

— END —

International Standards and Recommended Practices

Annex 10
to the Convention on International Civil Aviation

Aeronautical Telecommunications

Volume V
Aeronautical Radio Frequency Spectrum Utilization

This edition incorporates all amendments adopted by the Council prior to 13 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 10, Volume V.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Second Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
71-76	Incorporated in this edition		
77	28/11/02		ICAO
78	Did not affect this volume		
79	Did not affect this volume		
80	Did not affect this volume		
81	Did not affect this volume		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	29/1/02		ICAO

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FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Telecommunications were first adopted by the Council on 30 May 1949 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 10 to the Convention. They became effective on 1 March 1950. The Standards and Recommended Practices were based on recommendations of the Communications Division at its Third Session in January 1949.

Up to and including the Seventh Edition, Annex 10 was published in one volume containing four parts together with associated attachments: Part I — Equipment and Systems, Part II — Radio Frequencies, Part III — Procedures, and Part IV — Codes and Abbreviations.

By Amendment 42, Part IV was deleted from the Annex; the codes and abbreviations contained in that part were transferred to a new document, Doc 8400.

As a result of the adoption of Amendment 44 on 31 May 1965, the Seventh Edition of Annex 10 was replaced by two volumes: Volume I (First Edition) containing Part I — Equipment and Systems, and Part II — Radio Frequencies, and Volume II (First Edition) containing Communication Procedures.

As a result of the adoption of Amendment 70 on 20 March 1995, Annex 10 was restructured to include five volumes: Volume I — *Radio Navigation Aids*; Volume II — *Communication Procedures*; Volume III — *Communication Systems*; Volume IV — *Surveillance Radar and Collision Avoidance Systems*; and Volume V — *Aeronautical Radio Frequency Spectrum Utilization*. By Amendment 70, Volumes III and IV were published in 1995 and Volume V was published in 1996 with Amendment 71.

Table A shows the origin of amendments to Annex 10, Volume V subsequent to Amendment 71, together with a summary of the principal subjects involved and the dates on which the Annex and the amendments were adopted by Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards, Recommended Practices and Procedures specified in Annex 10 should be notified and take effect in accordance with the provisions of Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been deliberately written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper*:

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices*:

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption;

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text;

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices;

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Disclaimer regarding patents

Attention is drawn to the possibility that certain elements of Standards and Recommended Practices in this Annex may be the subject of patents or other intellectual property rights. ICAO shall not be responsible or liable for not identifying any or all such rights. ICAO takes no position regarding the existence, validity, scope or applicability of any claimed patents or other intellectual property rights, and accepts no responsibility or liability therefore or relating thereto.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 10, Volume V

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
71	Air Navigation Commission; SP COM/OPS/95 Divisional Meeting; third meeting of the Aeronautical Mobile Communications Panel (AMCP)	Introduction of new Volume V consisting of existing Annex material and addition of material relating to the introduction of 8.33 kHz channel spacing and changes to material related to the protection of air-ground communications in the VHF band.	12 March 1996 15 July 1996 7 November 1996
72	Air Navigation Commission; fourth meeting of the Aeronautical Mobile Communications Panel (AMCP)	Definition for VHF digital link; amendment to Table 4-1 *(bis)*.	12 March 1997 21 July 1997 6 November 1997
73	—	No change.	—
74	Air Navigation Commission	Introduction of: a) an interpilot air-to-air channel; and b) changes to specifications on emergency locator transmitters.	18 March 1999 19 July 1999 4 November 1999
75	Air Navigation Commission; sixth meeting of the Aeronautical Mobile Communications Panel (AMCP)	Clarification of guidance material on VDL interference immunity performance.	13 March 2000 17 July 2000 2 November 2000
76 (2nd Edition)	Seventh meeting of the Aeronautical Mobile Communications Panel (AMCP)	Integrated voice and data link system (VDL Mode 3); data link satisfying surveillance applications (VDL Mode 4); update of references to the ITU Radio Regulations.	12 March 2001 16 July 2001 1 November 2001
77	Secretariat	Consequential changes resulting from GNSS SARPs which provide for GBAS data broadcast in the band 108 – 117.975 MHz.	27 February 2002 15 July 2002 28 November 2002
78	—	No change.	—
79	—	No change.	—
80	—	No change.	—
81	—	No change.	—

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

Note.— All references to "Radio Regulations" are to the Radio Regulations published by the International Telecommunication Union (ITU). Radio Regulations are amended from time to time by the decisions embodied in the Final Acts of World Radiocommunication Conferences held normally every two to three years. Further information on the ITU processes as they relate to aeronautical radio system frequency use is contained in the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies *(Doc 9718).*

When the following terms are used in this volume of the Annex, they have the following meanings:

Alternative means of communication. A means of communication provided with equal status, and in addition to the primary means.

Double channel simplex. Simplex using two frequency channels, one in each direction.

Note.— This method was sometimes referred to as crossband.

Duplex. A method in which telecommunication between two stations can take place in both directions simultaneously.

Frequency channel. A continuous portion of the frequency spectrum appropriate for a transmission utilizing a specified class of emission.

Note.— The classification of emissions and information relevant to the portion of the frequency spectrum appropriate for a given type of transmission (bandwidths) are specified in the Radio Regulations, Article S2 and Appendix S1.

Offset frequency simplex. A variation of single channel simplex wherein telecommunication between two stations is effected by using in each direction frequencies that are intentionally slightly different but contained within a portion of the spectrum allotted for the operation.

Operational control communications. Communications required for the exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of a flight.

Note.— Such communications are normally required for the exchange of messages between aircraft and aircraft operating agencies.

Primary means of communication. The means of communication to be adopted normally by aircraft and ground stations as a first choice where alternative means of communication exist.

Simplex. A method in which telecommunication between two stations takes place in one direction at a time.

Note.— In application to the aeronautical mobile service, this method may be subdivided as follows:

a) single channel simplex;

b) double channel simplex;

c) offset frequency simplex.

Single channel simplex. Simplex using the same frequency channel in each direction.

VHF digital link (VDL). A constituent mobile subnetwork of the aeronautical telecommunication network (ATN), operating in the aeronautical mobile VHF frequency band. In addition, the VDL may provide non-ATN functions such as, for instance, digitized voice.

CHAPTER 2. DISTRESS FREQUENCIES

Introduction

Note.— ITU Radio Regulations Article S30 provides general conditions for distress and safety communications for all mobile services. Appendix S13 designates the frequencies to be used for these situations. The aeronautical mobile service is also permitted under Appendix S13, Part A1, Section 1 to conform to special arrangements between governments where these have been agreed. ICAO Annexes constitute such agreements.

The Standards and Recommended Practices relating to radio frequencies for distress communications take into account certain procedures that have been adopted by ICAO and also certain provisions made by the ITU in its Radio Regulations.

Annex 10, Volume II requires that an aircraft in distress when it is airborne should use the frequency in use for normal communications with aeronautical stations at the time. However, it is recognized that, after an aircraft has crashed or ditched, there is a need for designating a particular frequency or frequencies to be used in order that uniformity may be attained on a worldwide basis, and so that a guard may be maintained or set up by as many stations as possible including direction-finding stations, and stations of the maritime mobile service.

The frequency 2 182 kHz also offers possibilities for communication between aircraft and stations of the maritime mobile service. The ITU Radio Regulations specify in Appendix S13, Part A2 that the frequency 2 182 kHz is the international distress frequency for radiotelephony to be used for that purpose by ship, aircraft and survival craft stations using frequencies in the authorized bands between 1 605 kHz and 4 000 kHz when requesting assistance from the maritime service.

With respect to emergency locator transmitters (ELTs) designed to be detected and located by satellite, the Radio Regulations authorize the use of these devices, which are referenced in ITU as satellite emergency position indicating radio beacons (EPIRBs). Radio Regulations Appendix S13, Part A2 specifies that the band 406 – 406.1 MHz is used exclusively by satellite emergency position indicating radio beacons in the earth-to-space direction.

The frequency 4 125 kHz is also authorized by the ITU to enable communications between stations in the maritime mobile service and aircraft stations in distress. The current ITU Radio Regulations (RR S5.130 and Appendix S13) state that the carrier frequency 4 125 kHz may be used by aircraft stations to communicate with stations of the maritime mobile service for distress and safety purposes. The aeronautical mobile (R) service frequencies 3 023 kHz and 5 680 kHz may be employed for coordinated search and rescue operations with the maritime mobile service under RR S5.115.

Similarly, the frequency 500 kHz (RR S5.83) is the international distress frequency for Morse radiotelegraphy to be used for that purpose by ship, aircraft and survival craft stations using frequencies in the bands between 415 kHz and 535 kHz when requesting assistance from the maritime service (RR Appendix S13, Part A2).

With respect to survival craft stations, the Radio Regulations provide for the use of the frequency(ies) 500 kHz, 8 364 kHz, 2 182 kHz, 121.5 MHz and 243 MHz, if the survival craft is capable of operating in the bands 415 – 535 kHz, 4 000 – 27 500 kHz, 1 605 – 2 850 kHz, 117.975 – 137 MHz and 235 – 328.6 MHz respectively (RR Appendix S13, Part A2).

2.1 Frequencies for emergency locator transmitters (ELTs) for search and rescue

2.1.1 Until 1 January 2005 emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

2.1.2 All emergency locator transmitters installed on or after 1 January 2002 and carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5 MHz.

2.1.3 From 1 January 2005, emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5 MHz.

Note 1.— ITU Radio Regulations (S5.256 and Appendix S13) provide for the use of 243 MHz in addition to the above frequencies.

Note 2.— Specifications for ELTs are found in Annex 10, Volume III, Part II, Chapter 5.

2.2 Search and rescue frequencies

2.2.1 Where there is a requirement for the use of high frequencies for search and rescue scene of action coordination purposes, the frequencies 3 023 kHz and 5 680 kHz shall be employed.

2.2.2 **Recommendation.—** *Where specific frequencies are required for communication between rescue coordination centres and aircraft engaged in search and rescue operations, they should be selected regionally from the appropriate aeronautical mobile frequency bands in light of the nature of the provisions made for the establishment of search and rescue aircraft.*

Note.— Where civil commercial aircraft take part in search and rescue operations, they will normally communicate on the appropriate en-route channels with the flight information centre associated with the rescue coordination centre concerned.

CHAPTER 3. UTILIZATION OF FREQUENCIES BELOW 30 MHz

Introduction

High frequency bands allocated to the
aeronautical mobile (R) service

The frequency bands between 2.8 MHz and 22 MHz allocated to the aeronautical mobile (R) service are given in Article S5 of the ITU Radio Regulations. The utilization of these bands must be in accordance with the relevant provisions of the Radio Regulations. Prior to 1 September 1979, the provisions are contained in the Final Acts of the ITU Extraordinary Administrative Radio Conference (Geneva 1966). On 1 September 1979, revised provisions came into force, details of which are contained in the Final Acts of the World Administrative Radio Conference for the Aeronautical Mobile (R) Service (Geneva 1978) and Appendix 27 Aer2 to the Radio Regulations, except the Frequency Allotment Plan which entered into force at 0001 hours UTC, 1 February 1983. In the Radio Regulations, 1998 version, based on the World Administrative Radio Conference for the Mobile Services (1987), Appendix S27 now incorporates editorial amendments to Appendix 27 Aer2. In the utilization of these bands, States' attention is drawn to the possibility of harmful radio interference from non-aeronautical sources of radio frequency energy and the need to take appropriate measures to minimize its effects.

3.1 Method of operations

3.1.1 In the aeronautical mobile service, single channel simplex shall be used in radiotelephone communications utilizing radio frequencies below 30 MHz in the bands allocated exclusively to the aeronautical mobile (R) service.

3.1.2 Assignment of single sideband channels

3.1.2.1 Single sideband channels shall be assigned in accordance with Volume III, Part II, Chapter 2, 2.4.

3.1.2.2 For the operational use of the channels concerned administrations shall take into account the provisions of S27/19 of Appendix S27 of the ITU Radio Regulations.

3.1.2.3 **Recommendation.—** *The use of aeronautical mobile (R) frequencies below 30 MHz for international operations should be coordinated as specified in Appendix S27 of the ITU Radio Regulations as follows:*

S27/19 The International Civil Aviation Organization (ICAO) co-ordinates radiocommunications of the aeronautical mobile (R) service with international aeronautical operations and this Organization should be consulted in all appropriate cases in the operational use of the frequencies in the Plan.

3.1.2.4 **Recommendation.—** *Where international operating requirements for HF communications cannot be satisfied by the Frequency Allotment Plan at Part 2 of Appendix S27 to the Radio Regulations, an appropriate frequency may be assigned as specified in Appendix S27 by the application of the following provisions:*

S27/20 It is recognized that not all the sharing possibilities have been exhausted in the Allotment Plan contained in this Appendix. Therefore, in order to satisfy particular operational requirements which are not otherwise met by this Allotment Plan, administrations may assign frequencies from the aeronautical mobile (R) bands in areas other than those to which they are allotted in this Plan. However, the use of the frequencies so assigned must not reduce the protection to the same frequencies in the areas where they are allotted by the Plan below that determined by the application of the procedure defined in Part I, Section II B of this Appendix.

Note.— Part I, Section II B of Appendix S27 relates to Interference Range Contours, and application of the procedure results in a protection ratio of 15 dB.

S27/21 When necessary to satisfy the needs of international air operations administrations may adapt the allotment procedure for the assignment of aeronautical mobile (R) frequencies, which assignments shall then be the subject of prior agreement between administrations affected.

S27/22 The co-ordination described in No. S27/21 shall be effected where appropriate and desirable for the efficient utilization of the frequencies in question, and especially when the procedures of No. S27/19 are unsatisfactory.

3.1.2.5 The use of classes of emission J7B and J9B shall be subject to the following provisions of Appendix S27:

S27/12 For radiotelephone emissions the audio frequencies will be limited to between 300 and 2 700 Hz and the occupied bandwidth of other authorized emissions will not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension is implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met (see Nos. S27/73 and S27/74).

S27/14 On account of the possibility of interference, a given channel should not be used in the same allotment area for radiotelephony and data transmissions.

S27/15 The use of channels derived from the frequencies indicated in S27/18 for the various classes of emissions other than J3E and H2B will be subject to special arrangements by the administrations concerned and affected in order to avoid harmful interference which may result from the simultaneous use of the same channel for several classes of emission.

3.1.3 Assignment of frequencies for aeronautical operational control communications

3.1.3.1 Worldwide frequencies for aeronautical operational control communications are required to enable aircraft operating agencies to meet the obligations prescribed in Annex 6, Part I. Assignment of these frequencies shall be in accordance with the following provisions of Appendix S27:

S27/9 A world-wide allotment area is one in which frequencies are allotted to provide long distance communications between an aeronautical station within that allotment area and aircraft operating anywhere in the world.*

S27/217 The world-wide frequency allotments appearing in the tables at No. S27/213 and Nos. S27/218 to S27/231, except for carrier (reference) frequencies 3 023 kHz and 5 680 kHz, are reserved for assignment by administrations to stations operating under authority granted by the administration concerned for the purpose of serving one or more aircraft operating agencies. Such assignments are to provide communications between an appropriate aeronautical station and an aircraft station anywhere in the world for exercising control over regularity of flight and for safety of aircraft. World-wide frequencies are not to be assigned by administrations for MWARA, RDARA and VOLMET purposes. Where the operational area of an aircraft lies wholly within a RDARA or sub-RDARA boundary, frequencies allotted to those RDARAs and sub-RDARAs shall be used.

* The type of communications referred to in S27/9 may be regulated by administrations.

Note 1.— Tables S27/213 and S27/218 to S27/231 appearing in Appendix S27 to the ITU Radio Regulations refer to, respectively, the Frequency Allotment Plan, listing frequencies by areas, and the Frequency Allotment Plan, listing frequencies in numerical order.

Note 2.— Guidance material on the assignment of worldwide frequencies is contained in Attachment C.

3.2 NDB frequency management

3.2.1 **Recommendation.—** *NDB frequency management should take into account the following:*

a) the interference protection required at the edge of the rated coverage;

b) the application of the figures shown for typical ADF equipment;

c) the geographical spacings and the respective rated coverages;

d) the possibility of interference from spurious radiation generated by non-aeronautical sources (e.g. electric power services, power line communication systems, industrial radiation, etc.).

Note 1.— Guidance material to assist in determining the application of the foregoing is given in Attachment B.

Note 2.— Attention is drawn to the fact that some portions of the bands available for aeronautical beacons are shared with other services.

3.2.2 **Recommendation.—** *To alleviate frequency congestion problems at locations where two separate ILS facilities serve opposite ends of a single runway, the assignment of a common frequency to both of the outer locators should be permitted, and the assignment of a common frequency to both of the inner locators should be permitted, provided that:*

a) the operational circumstances permit;

b) each locator is assigned a different identification signal; and

c) arrangements are made whereby locators using the same frequency cannot radiate simultaneously.

Note.— The Standard in Volume I, 3.4.4.4, specifies the equipment arrangements to be made.

CHAPTER 4. UTILIZATION OF FREQUENCIES ABOVE 30 MHz

4.1 Utilization in the band 117.975 – 137 MHz

Introduction

The band 118 – 132 MHz was allocated in 1947 by the Atlantic City ITU Radio Conference, and again in 1959 by the Geneva Conference, but with extension downwards to 117.975 MHz, for the exclusive use by the aeronautical mobile (R) service.

ITU Radio Conferences subsequent to 1947 also made provisions for the use of the band 132 – 136 MHz for the aeronautical mobile (R) service under conditions which vary for the different ITU Regions, countries or combination of countries. The utilization of this band has been included in the Allotment Table in this chapter. The ITU World Administrative Radio Conference (1979) made provisions for the use of the band 136 – 137 MHz by the aeronautical mobile (R) service, subject to conditions of Nos. S5.203, S5.203A and S5.203B of the Radio Regulations. The use of frequencies in the 136 – 137 MHz part of the band must take account of the conditions contained in these notes. In the utilization of these bands, States' attention is drawn to the possibility of harmful radio interference from non-aeronautical sources of radio frequency energy and the need to take appropriate measures to minimize its effects.

This chapter deals with Standards and Recommended Practices relating to this band and includes matters pertaining to the selection of particular frequencies for various aeronautical purposes. These Standards are introduced by the following preface, which sets out the principles upon which the utilization of VHF on a worldwide basis with due regard to economy has been planned.

Preface

The utilization of VHF on a worldwide basis with due regard to economy and practicability requires a plan that will take into account:

a) the need for an orderly evolution towards improved operation and the required degree of worldwide standardization;

b) the desirability of providing for an economic transition from present utilization to optimum utilization of the frequencies available, taking into account the maximum possible utilization of existing equipment;

c) the need to provide for coordination between international and national utilization so as to ensure mutual protection from interference;

d) the need for providing a framework for the integrated development of Regional Plans;

e) the desirability of incorporating in any group of frequencies to be used those now in use for international air services;

f) the need for keeping the total number of frequencies and their grouping in appropriate relation to the airborne equipment known to be widely used by international air services;

g) a requirement for the provision of a single frequency that may be used for emergency purposes on a worldwide basis and, also, in certain regions, for another frequency that may be used as a common frequency for special purposes; and

h) the need for providing sufficient flexibility to allow for the differences in application necessitated by regional conditions.

4.1.1 General allotment of frequency band 117.975 – 137 MHz

Note.— The plan includes a general Allotment Table that subdivides the complete band 117.975 – 137 MHz, the chief subdivisions being the bands of frequencies allocated to both national and international services, and the bands allocated to national services. Observance of this general subdivision should keep to a minimum the problem of coordinating national and international application.

4.1.1.1 The block allotment of the frequency band 117.975 – 137 MHz shall be as shown in Table 4-1.

4.1.1.2 **Recommendation.—** *In the case of the band 136 – 137 MHz, international applications have not yet been agreed, and these frequencies should be brought into use on a regional basis where and in the manner required.*

4.1.2 Frequency separation and limits of assignable frequencies

Note.— In the following text the channel spacing for 8.33 kHz channel assignments is defined as 25 kHz divided by 3 which is 8.333 ... kHz.

4.1.2.1 The minimum separation between assignable frequencies in the aeronautical mobile (R) service shall be 8.33 kHz.

Note.— It is recognized that in some regions or areas, 100 kHz, 50 kHz or 25 kHz channel spacing provides an adequate number of frequencies suitably related to international and national air services and that equipment designed specifically for 100 kHz, 50 kHz or 25 kHz channel spacing will remain adequate for services operating within such regions or areas. It is further recognized that assignments based on 25 kHz channel spacing as well as 8.33 kHz channel spacing may continue to co-exist within one region or area.

4.1.2.2 Until at least 1 January 2005, DSB-AM equipment specifically designed for 25 kHz channel spacing shall be safeguarded with respect to its suitability for the aeronautical mozbile (R) service (AM(R)S) except in those regions or areas where regional agreement permits the use of equipment specifically designed for 8.33 kHz channel spacing or for VDL Mode 3 when used for air-ground voice communications.

Table 4-1. Allotment table

Block allotment of frequencies (MHz)	*Worldwide utilization*	*Remarks*
a) 118 – 121.4 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in the light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
b) 121.5	Emergency frequency	In order to provide a guard band for the protection of the aeronautical emergency frequency, the nearest assignable frequencies on either side of 121.5 MHz are 121.4 MHz and 121.6 MHz, except that by regional agreement it may be decided that the nearest assignable frequencies are 121.3 MHz and 121.7 MHz.
c) 121.6 – 121.9917 inclusive	International and National Aerodrome Surface Communications	Reserved for ground movement, pre-flight checking, air traffic services clearances, and associated operations.
d) 122 – 123.05 inclusive	National Aeronautical Mobile Services	Reserved for national allotments.
e) 123.1	Auxiliary frequency SAR	See 4.1.4.1.
f) 123.15 – 123.6917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments, with the exception of 123.45 MHz which is also used as the worldwide air-to-air communications channel (see g)).
g) 123.45	Air-to-air communications	Designated for use as provided for in 4.1.3.2.1.
h) 123.7 – 129.6917 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9.
i) 129.7 – 130.8917 inclusive	National Aeronautical Mobile Services	Reserved for national allotments but may be used in whole or in part, subject to regional agreement, to meet the requirements mentioned in 4.1.8.1.3.
j) 130.9 – 136.875 inclusive	International and National Aeronautical Mobile Services	Specific international allotments will be determined in light of regional agreement. National assignments are covered by the provisions in 4.1.5.9. (See the Introduction to 4.1 regarding the band 132 – 137 MHz.)
k) 136.9 – 136.975 inclusive	International and National Aeronautical Mobile Services	Reserved for VHF air-ground data link communications.

4.1.2.2.1 Requirements for mandatory carriage of equipment specifically designed for 8.33 kHz channel spacing shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

Note.— No changes will be required to aircraft systems or ground systems operating solely in regions not using 8.33 kHz channel spacing.

4.1.2.2.2 Until at least 1 January 2005, equipment specifically designed for 8.33 kHz channel spacing shall be safeguarded with respect to its suitability for the AM(R)S.

4.1.2.2.3 Requirements for mandatory carriage of equipment specifically designed for VDL Mode 3 and VDL Mode 4 shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

4.1.2.2.3.1 The agreement indicated in 4.1.2.2.3 shall provide at least two years' notice of mandatory carriage of airborne systems.

4.1.2.2.4 Until at least 1 January 2010, equipment specifically designed to the VDL Mode 3 and VDL Mode 4 SARPs shall be safeguarded with respect to its suitability for the AM(R)S.

4.1.2.3 In the band 117.975 – 137 MHz, the lowest assignable frequency shall be 118 MHz and the highest 136.975 MHz.

4.1.2.4 In regions where 25 kHz channel spacing (DSB-AM and VHF digital link (VDL)) and 8.33 kHz DSB-AM channel spacing are in operation, the publication of the assigned frequency or channel of operation shall conform to the channel contained in Table 4-1 (*bis*).

Note.— Table 4-1 (bis) *provides the frequency channel pairing plan which retains the numerical designator of the 25 kHz DSB-AM environment and allows unique identification of a 25 kHz VDL and 8.33 kHz channel.*

4.1.3 Frequencies used for particular functions

4.1.3.1 *Emergency channel*

4.1.3.1.1 The emergency channel (121.5 MHz) shall be used only for genuine emergency purposes, as broadly outlined in the following:

a) to provide a clear channel between aircraft in distress or emergency and a ground station when the normal channels are being utilized for other aircraft;

Table 4-1 *(bis)*. Channelling/frequency pairing

Frequency (MHz)	*Time slot**	*Channel spacing (kHz)*	*Channel*
118.0000		25	118.000
118.0000	A	25	118.001
118.0000	B	25	118.002
118.0000	C	25	118.003
118.0000	D	25	118.004
118.0000		8.33	118.005
118.0083		8.33	118.010
118.0167		8.33	118.015
118.0250	A	25	118.021
118.0250	B	25	118.022
118.0250	C	25	118.023
118.0250	D	25	118.024
118.0250		25	118.025
118.0250		8.33	118.030
118.0333		8.33	118.035
118.0417		8.33	118.040
118.0500		25	118.050
118.0500	A	25	118.051
118.0500	B	25	118.052
118.0500	C	25	118.053
118.0500	D	25	118.054
118.0500		8.33	118.055
118.0583		8.33	118.060
118.0667		8.33	118.065
118.0750	A	25	118.071
118.0750	B	25	118.072
118.0750	C	25	118.073
118.0750	D	25	118.074
118.0750		25	118.075
118.0750		8.33	118.080
118.0833		8.33	118.085
118.0917		8.33	118.090
118.1000		25	118.100
etc.			

* Time slot indication is for VDL Mode 3 channels. (Ref. Annex 10, Volume III, Part I, Chapter 6 for characteristics of VDL Mode 3 operation)

b) to provide a VHF communication channel between aircraft and aerodromes, not normally used by international air services, in case of an emergency condition arising;

c) to provide a common VHF communication channel between aircraft, either civil or military, and between such aircraft, and surface services, involved in common search and rescue operations, prior to changing when necessary to the appropriate frequency;

d) to provide air-ground communication with aircraft when airborne equipment failure prevents the use of the regular channels;

e) to provide a channel for the operation of emergency locator transmitters (ELTs), and for communication between survival craft and aircraft engaged in search and rescue operations;

f) to provide a common VHF channel for communication between civil aircraft and intercepting aircraft or intercept control units and between civil or intercepting aircraft and air traffic services units in the event of interception of the civil aircraft.

Note 1.— The use of the frequency 121.5 MHz for the purpose outlined in c) is to be avoided if it interferes in any way with the efficient handling of distress traffic.

Note 2.— The current Radio Regulations make provisions that the aeronautical emergency frequency 121.5 MHz may also be used by mobile stations of the maritime mobile service, using A3E emission to communicate on this frequency for safety purposes with stations of the aeronautical mobile service (RR S5.200 and Appendix S13, Part A2).

4.1.3.1.2 The frequency 121.5 MHz shall be provided at:

a) all area control centres and flight information centres;

b) aerodrome control towers and approach control offices serving international aerodromes and international alternate aerodromes; and

c) any additional location designated by the appropriate ATS authority,

where the provision of that frequency is considered necessary to ensure immediate reception of distress calls or to serve the purposes specified in 4.1.3.1.1.

Note.— Where two or more of the above facilities are collocated, provision of 121.5 MHz at one would meet the requirement.

4.1.3.1.3 The frequency 121.5 MHz shall be available to intercept control units where considered necessary for the purpose specified in 4.1.3.1.1 f).

4.1.3.1.4 The emergency channel shall be guarded continuously during the hours of service of the units at which it is installed.

4.1.3.1.5 The emergency channel shall be guarded on a single channel simplex operation basis.

4.1.3.1.6 The emergency channel (121.5 MHz) shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.3.2 *Air-to-air communications channel*

4.1.3.2.1 An air-to-air VHF communications channel on the frequency of 123.45 MHz shall be designated to enable aircraft engaged in flights over remote and oceanic areas out of range of VHF ground stations to exchange necessary operational information and to facilitate the resolution of operational problems.

Note.— Use of the air-to-air channel can cause interference to and from aircraft using the same frequency for air-ground communications.

4.1.3.2.2 In remote and oceanic areas out of range of VHF ground stations, the air-to-air VHF communications channel on the frequency 123.45 MHz shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.3.3 *Common signalling channel.* The frequency 136.975 MHz is reserved on a worldwide basis to provide a common signalling channel (CSC) to the VHF digital link (VDL). This CSC uses the Mode 2 VDL modulation scheme and carrier sense multiple access (CSMA).

4.1.4 Auxiliary frequencies for search and rescue operations

4.1.4.1 Where a requirement is established for the use of a frequency auxiliary to 121.5 MHz, as described in 4.1.3.1.1 c), the frequency 123.1 MHz shall be used.

4.1.4.2 The auxiliary search and rescue channel (123.1 MHz) shall be available only with the characteristics as contained in Annex 10, Volume III, Part II, Chapter 2.

4.1.5 Provisions concerning the deployment of VHF frequencies and the avoidance of harmful interference

4.1.5.1 In the case of those VHF facilities providing service up to the radio horizon, the geographical separation between facilities working on the same frequency shall, except where there is an operational requirement for the use of common frequencies for groups of facilities, be such that points at the protection heights and at the limit of the functional service range of each facility are separated by distances not less than that required to provide a desired to undesired signal ratio of 14 dB. This provision shall be implemented on the basis of a regional air navigation agreement. For areas where frequency assignment congestion is not severe or is not anticipated to become severe, a 20 dB (10 to 1 distance ratio) separation criteria or radio line-of-sight (RLOS) separation criteria (whichever is smaller) may be used.

Note.— Guidance material relating to the establishment of the minimum separation distance based on the desired to undesired signal protection ratio of 14 dB is contained in Attachment A.

4.1.5.2 In the case of those VHF facilities providing service beyond the radio horizon, except where there is an operational requirement for the use of common frequencies for groups of facilities, planning for co-channel operations shall be such that points at the protection heights and at the limits of the functional service area of each facility are separated by distances not less than the sum of distances from each point to its associated radio horizon.

Note 1.— The distance to the radio horizon from a station in an aircraft is normally given by the formula:

$$D = K \sqrt{h}$$

where D = *distance in nautical miles;*
h = *height of the aircraft station above earth;*
K = *(corresponding to an effective earth's radius of 4/3 of the actual radius);*
= *2.22 when* h *is expressed in metres; and*
= *1.23 when* h *is expressed in feet.*

Note 2.— In calculating the radio line-of-sight distance between a ground station and an aircraft station, the distance from the radio horizon of the aircraft station computed from Note 1 must be added to the distance from the radio horizon of the ground station. In calculating the latter the same formula is employed, taking for h *the height of the ground station transmitting antenna.*

Note 3.— The criterion contained in 4.1.5.2 is applicable in establishing minimum geographical separation between VHF facilities, with the object of avoiding co-channel air-to-air interference. Guidance material relating to the establishment of separation distances between ground stations and between aircraft and ground stations for co-channel operations is contained in Section 3 of Attachment A. Guidance material relating to adjacent channel frequency deployment is contained in Section 2 of Attachment A.

Note 4.— Guidance material on the interpretation of 4.1.5.1 and 4.1.5.2 is contained in Attachment A.

4.1.5.3 The geographical separation between facilities working on adjacent channels shall be such that points at the protection heights and at the limit of the functional service range of each facility are separated by a distance sufficient to ensure operations free from harmful interference.

Note.— Guidance material covering separation distances and related system characteristics is contained in Attachment A.

4.1.5.4 The protection height shall be a height above a specified datum associated with a particular facility, such that below it harmful interference is improbable.

4.1.5.5 The protection height to be applied to functions or to specific facilities shall be determined regionally, taking into consideration the following factors:

a) the nature of the service to be provided;

b) the air traffic pattern involved;

c) the distribution of communication traffic;

d) the availability of frequency channels in airborne equipment;

e) probable future developments.

4.1.5.6 **Recommendation.—** *Where the protection heights determined are less than those operationally desirable, separation between facilities operating on the same frequency should not be less than that necessary to ensure that an aircraft at the limit of the functional service range and the operationally desirable protection height of one facility does not come above the radio horizon with respect to adjacent facilities.*

Note.— The effect of this recommendation is to establish a geographical separation distance below which harmful interference is probable.

4.1.5.7 The geographical separation between VHF VOLMET stations shall be determined regionally and, generally, shall be such that operations free from harmful interference are secured at the highest altitude flown by aircraft in the area concerned.

Note.— Guidance material on the interpretation of 4.1.5.7 is contained in Attachment A.

4.1.5.8 Frequencies in the aeronautical mobile VHF band used for national services, unless worldwide or regionally allotted to this specific purpose, shall be so deployed that minimum interference is caused to facilities for the international air services in this band.

4.1.5.9 **Recommendation.—** *The problem of inter-State interference on frequencies allotted worldwide or on a regional basis to national services, should be resolved by consultation between the administrations concerned.*

4.1.5.10 The communication coverage provided by a VHF ground transmitter shall, in order to avoid harmful interference to other stations, be kept to the minimum consistent with the operational requirement for the function.

4.1.5.11 **Recommendation.—** *For ground VHF facilities which provide service beyond the radio horizon, any spurious or harmonic radiation outside the band ±250 kHz from the assigned carrier frequency should not exceed an effective radiated power of 1 mW in any azimuth.*

4.1.6 Equipment requirements

Note 1.— Frequency tolerances to which stations operating in the aeronautical mobile band (117.975 – 137 MHz) must conform are contained in Appendix 3 to the Radio Regulations. Tolerances for transmitters used for aeronautical services are not mentioned in this Annex, except in those cases where tighter tolerances than those contained in the Radio Regulations are required (e.g. the equipment specifications in Volume III contain several such instances).

Note 2.— The frequency tolerance applicable to individual components of a multi-carrier or similar system will be determined by the characteristics of the specific system.

4.1.6.1 **Recommendation.—** *The antenna gain of an extended range VHF facility should preferably be such as to ensure that, beyond the limits of ±2 Φ about the centre line of the angular width Φ of the area to be served, it does not exceed 3 dB above that of a dipole. But, in any case, it should be such as to ensure freedom from harmful interference with other radio services.*

Note 1.— The actual azimuth, the angular width of the service area, and the effective radiated power would have to be taken into account in each individual case.

Note 2.— Guidance material on the interpretation of 4.1.6.1 is contained in Attachment A.

4.1.7 Method of operation

4.1.7.1 Single channel simplex operation shall be used in the VHF band 117.975 – 137 MHz at all stations providing for aircraft engaged in international air navigation.

4.1.7.2 In addition to the above, the ground-to-air voice channel associated with an ICAO standard radio navigational aid may be used, subject to regional agreement, for broadcast or communication purposes or both.

4.1.8 Plan of assignable VHF radio frequencies for use in the international aeronautical mobile service

Introduction

This plan designates the list of frequencies available for assignment, together with provision for the use by the aeronautical mobile (R) service of all frequencies with a channel spacing of 25 kHz, and of all frequencies with a channel width and spacing of 8.33 kHz, with the frequencies in Group A continuing to be used wherever they provide a sufficient number to meet the operational requirements.

The plan provides that the total number of frequencies required in any region would be determined regionally. The effect of this will be that frequencies assignable in any particular region may be restricted to a limited number of the frequencies in the list, the actual number being selected as outlined herein.

In order that the assignable frequencies may be coordinated between regions as far as practicable, the plan requires that, whenever the number of frequencies contained in Group A of 4.1.8.1.2 is sufficient to meet the requirements of a region, the frequencies of this Group be used in a sequence commencing with 118 MHz. This ensures that all regions will have in common the frequencies used in the region requiring the least number of frequencies and, in respect to any two regions, the region with the greater number will have in use all the frequencies used by the other.

Group A provides for frequency planning based on 100 kHz channel spacing.

Group B of the list at 4.1.8.1.2 contains the frequencies in the band 117.975 – 132 MHz ending in 50 kHz. Together with the frequencies in Group A, they provide for frequency planning based on 50 kHz channel spacing. In Group C are listed the frequency channels in the band 132 – 137 MHz based upon 50 kHz channel spacing. Group D contains the frequency channels in the band 132 – 137 MHz ending in 25 kHz, and Group E similarly lists the frequency channels in the band 117.975 – 132 MHz. The utilization of channels in Groups B, C, D and E is explained below.

Group F of the list at 4.1.8.1.2 contains the frequencies in the band 117.975 – 137 MHz when 8.33 kHz channel width is used. The utilization of the channels in this Group is explained below.

Whenever the number of frequencies required in a particular region exceeds the number in Group A, frequencies may be selected from the other Groups taking into account the provisions of 4.1.8.1 with respect to the use of channels based on 25 kHz channel spacing and, with regard to the band 132 – 137 MHz, the provisions of the Radio Regulations (see Introduction to 4.1). Although for Groups B, C, D and E a preferred order of selection is not indicated, regional planning may require a particular selection of frequencies from these Groups in order to cater for specific regional circumstances. This may apply particularly to the utilization of frequencies from the band 132 – 137 MHz for reasons of available airborne equipment and/or availability of particular frequency channels for the aeronautical mobile (R) service. It may also be found that, in a particular region, it is desirable to select frequencies from Group B first, before selecting frequencies from Groups C, D or E.

Where all the channels of Groups A, B, C, D and E of the list at 4.1.8.1.2 are insufficient to meet the requirements of a region, a part or parts of the band may be designated as containing 8.33 kHz width channels or designated as supporting VDL Mode 3. For parts of the band containing 8.33 kHz width channels, the appropriate frequencies from Group F should be used in accordance with 4.1.8.1.1.1 and 4.1.8.1.2. It should be noted that the designation of frequencies in Group F differs from that of the corresponding frequencies in Groups A to E to emphasize the difference in channel width. For part of the bands supporting VDL Mode 3, frequencies from Groups A, B, C, D and E are utilized on a time-division basis. A single frequency supports multiple channels, each utilizing the frequency in periodic time frames or time slots. Specific time slots for VDL Mode 3 are identified using the numeric designators of Table 4-1 (bis).

Although for Group F a preferred order of selection is not indicated, regional planning may require a particular selection of frequencies from this group in order to cater for specific regional circumstances.

In many regions particular frequencies have already been assigned for particular functions as, for instance, aerodrome or approach control. The plan does not make such assignments (except in respect to the emergency channel and ground service frequencies), such action being taken regionally if considered desirable.

4.1.8.1 The frequencies in the band 117.975 – 137 MHz for use in the aeronautical mobile (R) service shall be selected from the list in 4.1.8.1.2.

4.1.8.1.1 When the number of frequencies required in a particular region does not exceed the number of frequencies contained in Group A of 4.1.8.1.2, the frequencies to be used shall be selected in sequence, in so far as practicable, from those in Group A of 4.1.8.1.2.

4.1.8.1.1.1 When the number of frequencies required in a particular region exceeds those available in Groups A to E of 4.1.8.1.2, parts of the band shall be designated as containing 8.33 kHz width channels (voice) or as containing VDL Mode 3. Appropriate frequencies shall be selected from Group F of 4.1.8.1.2 for 8.33 kHz channel assignments or from Groups A to E in accordance with the time-slot assignments in accordance with Table 4-1 *(bis)* for VDL Mode 3. The remainder of the band shall continue to be used for 25 kHz width channels selected from the appropriate parts of Groups A to E.

Note 1.— The frequencies 121.425 – 121.575 MHz inclusive, 123.075 – 123.125 MHz inclusive and 136.500 – 136.975 MHz inclusive are not available for assignment to channels of less than 25 kHz width.

Note 2.— Services that continue operation using 25 kHz assignments will be protected in regions implementing 8.33 kHz channel spacing.

4.1.8.1.2 *List of assignable frequencies*

The list of assignable frequencies is shown in the Appendix to this chapter.

4.1.8.1.3 **Recommendation.—** *Frequencies for operational control communications may be required to enable aircraft operating agencies to meet the obligations prescribed in Annex 6, Part I, in which case they should be selected from the bands 128.825 – 132.025 MHz. These frequencies should be chosen, in so far as practicable, from the upper end of the band and in sequential order.*

Note.— It is recognized that the assignment of such frequencies and the licensing of the operation of the related facilities are matters for national determination. However, in regions where a problem exists with respect to the provision of frequencies for operational control purposes, it may be advantageous if States endeavour to coordinate the requirements of aircraft operating agencies for such channels prior to regional meetings.

4.1.8.2 The frequencies that may be allotted for use in the aeronautical mobile (R) service in a particular region shall be limited to the number determined as being necessary for operational needs in the region.

Note.— The number of frequencies required in a particular region is normally determined by the Council on the recommendations of Regional Air Navigation Meetings. The capabilities of VHF airborne equipment known to be widely used in the region will be taken into account in this determination.

4.2 Utilization in the band 108 – 117.975 MHz

4.2.1 The block allotment of the frequency band 108 – 117.975 MHz shall be as follows:

— Band 108 – 111.975 MHz:

a) ILS in accordance with 4.2.2 and Annex 10, Volume I, 3.1.3;

b) VOR provided that:

   1) no harmful adjacent channel interference is caused to ILS;

   2) only frequencies ending in either *even tenths* or *even tenths plus a twentieth* of a megahertz are used.

c) GNSS ground-based augmentation system (GBAS) in accordance with Annex 10, Volume I, 3.7.3.5, provided that no harmful interference is caused to ILS and VOR.

Note.— ILS/GBAS geographical separation criteria and geographical separation criteria for GBAS and VHF *communication services operating in the 118 – 137 MHz band are under development. Until these criteria are defined and included in the SARPs, it is intended that frequencies in the band 112.050 – 117.900 MHz will be used for GBAS assignments.*

— *Band 111.975 – 117.975 MHz:*

a) VOR;

b) GNSS ground-based augmentation system (GBAS) in accordance with Annex 10, Volume I, 3.7.3.5, provided that no harmful interference is caused to VOR.

Note 1.— Guidance material relating to the distance separation required to prevent harmful interference between ILS and VOR when using the band 108 – 111.975 MHz is found in Section 3 of Attachment C to Annex 10, Volume I.

Note 2.— Guidance material relating to the distance separation required to prevent harmful interference between VOR and GBAS when using the band 112.05 0–117.900 MHz is found in Section 7.2.1 of Attachment D to Annex 10, Volume I.

4.2.2 For regional assignment planning, the frequencies for ILS facilities shall be selected in the following order:

a) localizer channels ending in *odd tenths* of a megahertz and their associated glide path channels;

b) localizer channels ending in *odd tenths plus a twentieth* of a megahertz and their associated glide path channels.

4.2.2.1 ILS channels identified by localizer frequencies ending in an *odd tenth plus one twentieth* of a megahertz in the band 108 – 111.975 MHz shall be permitted to be utilized on the basis of regional agreement when they become applicable in accordance with the following:

a) for restricted use commencing 1 January 1973;

b) for general use on or after 1 January 1976.

Note.— See Note to 4.2.3.1.

4.2.3 For regional assignment planning, the frequencies for VOR facilities shall be selected in the following order:

a) frequencies ending in *odd tenths* of a megahertz in the band 111.975 – 117.975 MHz;

b) frequencies ending in *even tenths* of a megahertz in the band 111.975 – 117.975 MHz;

c) frequencies ending in *even tenths* of a megahertz in the band 108 – 111.975 MHz;

d) frequencies ending in *50 kHz* in the band 111.975 – 117.975 MHz, except as provided in 4.2.3.1;

e) frequencies ending in *even tenths plus a twentieth* of a megahertz in the band 108 – 111.975 MHz except as provided in 4.2.3.1.

4.2.3.1 Frequencies for VOR facilities ending in *even tenths plus a twentieth* of a megahertz in the band 108 – 111.975 MHz and all frequencies ending in *50 kHz* in the band 111.975 – 117.975 MHz shall be permitted to be utilized on the basis of a regional agreement when they have become applicable in accordance with the following:

a) in the band 111.975 – 117.975 MHz for restricted use;

b) for general use in the band 111.975 – 117.975 MHz at a date fixed by the Council but at least one year after the approval of the regional agreement concerned;

c) for general use in the band 108 – 111.975 MHz at a date fixed by the Council but giving a period of two years or more after the approval of the regional agreement concerned.

Note.— "Restricted use", where mentioned in 4.2.2.1 a) and 4.2.3.1 a), is intended to refer to the limited use of the frequencies by only suitably equipped aircraft and in such a manner that:

a) the performance of ILS or VOR equipment not capable of operating on these frequencies will be protected from harmful interference;

b) a general requirement for the carriage of ILS or VOR airborne equipment capable of operation on these frequencies will not be imposed; and

c) operational service provided to international operators using 100 kHz airborne equipment is not derogated.

4.2.4 To protect the operation of airborne equipment during the initial stages of deploying VORs utilizing 50 kHz channel spacing in an area where the existing facilities may not fully conform with the Standards in Annex 10, Volume I, Chapter 3, all existing VORs within interference range of a facility utilizing 50 kHz channel spacing shall be modified to comply with the provisions of Annex 10, Volume I, 3.3.5.7.

4.2.5 *Frequency deployment.* The geographical separation between facilities operating on the same and adjacent frequencies shall be determined regionally and shall be based on the following criteria:

a) the required functional service radii of the facilities;

b) the maximum flight altitude of the aircraft using the facilities;

c) the desirability of keeping the minimum IFR altitude as low as the terrain will permit.

Table 4-2

Group	*DME channels*	*Associated paired VHF channels*	*Remarks*	*Assignment procedure*
1	EVEN 18X to 56X	ILS 100 kHz spacings	Would normally be used if a single DME is paired with ILS and is part of MLS	for general use (see 4.3.1)
2	EVEN 18Y to 56Y	ILS 50 kHz spacings		
3	EVEN 80Y to 118Y	VOR 50 kHz spacings Odd tenths of a MHz		
4	ODD 17Y to 55Y	VOR 50 kHz spacings		
5	ODD 81Y to 119Y	VOR 50 kHz spacings Even tenths of a MHz		
6	EVEN 18W to 56W	No associated paired VHF channel		for later use (see 4.3.2)
7	EVEN 18Z to 56Z	No associated paired VHF channel		
8	EVEN 80Z to 118Z	No associated paired VHF channel		
9	ODD 17Z to 55Z	No associated paired VHF channel		
10	ODD 81Z to 119Z	No associated paired VHF channel		

Note.— DME channels in Groups 1 and 2 may be used in association with ILS and/or MLS. DME channels in Groups 3, 4 and 5 may be used in association with VOR or MLS.

Note.— Guidance material on this subject is contained in the Attachments to this Annex.

4.2.6 **Recommendation.—** *To alleviate frequency congestion problems at locations where two separate ILS facilities serve opposite ends of the same runway or different runways at the same airport, the assignment of identical ILS localizer and glide path paired frequencies should be permitted provided that:*

a) the operational circumstances permit;

b) each localizer is assigned a different identification signal; and

c) arrangements are made whereby the localizer and glide path not in operational use cannot radiate.

Note.— The Standards in Annex 10, Volume I, 3.1.2.7.2 and 3.1.3.9, specify the equipment arrangements to be made.

4.3 Utilization in the band 960 – 1 215 MHz for DME

Note.— Guidance on the frequency planning of channels for DME systems is given in Annex 10, Volume I, Attachment C, Section 7.

4.3.1 DME operating channels bearing the suffix “X” or “Y” in Table A, Chapter 3 of Annex 10, Volume I shall be chosen on a general basis without restriction.

Note.— The channel pairing plan provides for the use of certain Y channels with either VOR or MLS. The guidance material in Annex 10, Volume I, Attachment C, Section 7, includes specific provisions relating to situations where the same, or adjacent channel, is used in the same area for both systems.

4.3.2 DME channels bearing the suffix “W” or “Z” in Table A, Chapter 3 of Annex 10, Volume I, shall be chosen on the basis of regional agreement when they become applicable in accordance with the following:

a) for restricted regional use on or after, whichever is the later:

1) 1 January 1989; or

2) a date prescribed by the Council giving a period of two years or more following approval of the regional agreement concerned;

b) for general use on or after, whichever is the later:

1) 1 January 1995; or

2) a date prescribed by the Council giving a period of two years or more following approval of the regional agreement concerned.

Note.— "Restricted use" is intended to refer to the limited use of the channel by only suitably equipped aircraft and in such a manner that:

a) the performance of existing DME equipment not capable of operating on these multiplexed channels will be protected from harmful interference;

b) a general requirement for the carriage of DME airborne equipment capable of operating on these multiplexed channels will not be imposed; and

c) operational service provided to international operators using existing DME equipment without the multiplexed channel capability is not derogated.

4.3.3 For regional assignment planning, the channels for DME associated with MLS shall be selected from Table 4-2.

4.3.3.1 *Groups 1 to 5.* These DME channels shall be permitted to be used generally. In selecting channels for assignment purposes the following rules are applicable:

a) when an MLS/DME is intended to operate on a runway in association with an ILS, the DME channel, if possible, shall be selected from Group 1 or 2 and paired with the ILS frequency as indicated in the DME channelling and pairing table in Table A of Annex 10, Volume I, Chapter 3. In cases where the composite frequency protection cannot be satisfied for all three components, the MLS channel may be selected from Group 3, 4 or 5;

b) when an MLS/DME is intended to operate on a runway without the coexistence of an ILS, the DME channel to be used shall preferably be selected from Group 3, 4 or 5.

4.3.3.2 *Groups 6 to 10.* These DME channels shall be permitted to be used on the basis of a regional agreement when they have become applicable in accordance with the conditions specified at 4.3.2.

4.3.4 **Recommendation.—** *Coordination of regional DME channel assignments should be effected through ICAO.*

4.4 Utilization in the band 5 030.4 – 5 150.0 MHz

Note 1.— Guidance material on the frequency protection planning of MLS facilities is contained in Attachment G to Annex 10, Volume I.

Note 2.— Guidance on determining coordination distances between MLS facilities and ground stations providing feeder links to non-geostationary mobile satellites is contained in ITU-R Recommendation S.1342.

4.4.1 The MLS channels shall be selected from Table A, Chapter 3 of Annex 10, Volume I.

4.4.2 For regional planning purposes MLS channels shall be selected in accordance with the conditions specified in 4.3.3 for the associated DME facility.

4.4.3 Channel assignments in addition to those specified in 4.4.1 shall be made within the 5 030.4 – 5 150.0 MHz sub-band as necessary to satisfy future air navigation requirements.

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APPENDIX TO CHAPTER 4. LIST OF ASSIGNABLE FREQUENCIES

Frequency (MHz)	Annotations
121.5	Emergency frequency
123.1	Auxiliary frequency SAR
121.60 121.65 121.70 121.75 121.80 121.85 121.90	Reserved for aerodrome surface communications [see Table 4-1, Item c)]
121.95 121.625 121.675 121.725 121.775 121.825 121.875 121.925 121.975	Reserved for aerodrome surface communications [see Table 4-1, Item c)]

GROUP A
Frequencies (MHz)

118.00	118.90	119.80	120.70	123.80	124.70	125.60	126.50	127.40	128.30	129.20	131.20
118.10	119.00	119.90	120.80	123.90	124.80	125.70	126.60	127.50	128.40	129.30	131.30
118.20	119.10	120.00	120.90	124.00	124.90	125.80	126.70	127.60	128.50	129.40	131.40
118.30	119.20	120.10	121.00	124.10	125.00	125.90	126.80	127.70	128.60	129.50	131.50
118.40	119.30	120.20	121.10	124.20	125.10	126.00	126.90	127.80	128.70	129.60	131.60
118.50	119.40	120.30	121.20	124.30	125.20	126.10	127.00	127.90	128.80	130.90	131.70
118.60	119.50	120.40	121.30	124.40	125.30	126.20	127.10	128.00	128.90	131.00	131.80
118.70	119.60	120.50	121.40	124.50	125.40	126.30	127.20	128.10	129.00	131.10	131.90
118.80	119.70	120.60	123.70	124.60	125.50	126.40	127.30	128.20	129.10		

GROUP B
Frequencies (MHz)

118.05	118.95	119.85	120.75	123.95	124.85	125.75	126.65	127.55	128.45	129.25	131.25
118.15	119.05	119.95	120.85	124.05	124.95	125.85	126.75	127.65	128.55	129.35	131.35
118.25	119.15	120.05	120.95	124.15	125.05	125.95	126.85	127.75	128.65	129.45	131.45
118.35	119.25	120.15	121.05	124.25	125.15	126.05	126.95	127.85	128.75	129.55	131.55
118.45	119.35	120.25	121.15	124.35	125.25	126.15	127.05	127.95	128.85	129.65	131.65
118.55	119.45	120.35	121.25	124.45	125.35	126.25	127.15	128.05	128.95	130.95	131.75
118.65	119.55	120.45	121.35	124.55	125.45	126.35	127.25	128.15	129.05	131.05	131.85
118.75	119.65	120.55	123.75	124.65	125.55	126.45	127.35	128.25	129.15	131.15	131.95
118.85	119.75	120.65	123.85	124.75	125.65	126.55	127.45	128.35			

GROUP C
Frequencies (MHz)

132.00	132.35	132.70	133.05	133.40	133.75	134.10	134.45	134.80	135.10	135.40	135.70
132.05	132.40	132.75	133.10	133.45	133.80	134.15	134.50	134.85	135.15	135.45	135.75
132.10	132.45	132.80	133.15	133.50	133.85	134.20	134.55	134.90	135.20	135.50	135.80
132.15	132.50	132.85	133.20	133.55	133.90	134.25	134.60	134.95	135.25	135.55	135.85
132.20	132.55	132.90	133.25	133.60	133.95	134.30	134.65	135.00	135.30	135.60	135.90
132.25	132.60	132.95	133.30	133.65	134.00	134.35	134.70	135.05	135.35	135.65	135.95
132.30	132.65	133.00	133.35	133.70	134.05	134.40	134.75				

GROUP D
Frequencies (MHz)

132.025	132.525	133.025	133.525	134.025	134.525	135.025	135.525	136.000	136.250	136.500	136.750
132.075	132.575	133.075	133.575	134.075	134.575	135.075	135.575	136.025	136.275	136.525	136.775
132.125	132.625	133.125	133.625	134.125	134.625	135.125	135.625	136.050	136.300	136.550	136.800
132.175	132.675	133.175	133.675	134.175	134.675	135.175	135.675	136.075	136.325	136.575	136.825
132.225	132.725	133.225	133.725	134.225	134.725	135.225	135.725	136.100	136.350	136.600	136.850
132.275	132.775	133.275	133.775	134.275	134.775	135.275	135.775	136.125	136.375	136.625	136.875
132.325	132.825	133.325	133.825	134.325	134.825	135.325	135.825	136.150	136.400	136.650	136.900
132.375	132.875	133.375	133.875	134.375	134.875	135.375	135.875	136.175	136.425	136.675	136.925
132.425	132.925	133.425	133.925	134.425	134.925	135.425	135.925	136.200	136.450	136.700	136.950
132.475	132.975	133.475	133.975	134.475	134.975	135.475	135.975	136.225	136.475	136.725	136.975

GROUP E
Frequencies (MHz)

118.025	118.925	119.825	120.725	123.925	124.825	125.725	126.575	127.425	128.275	129.125	131.175
118.075	118.975	119.875	120.775	123.975	124.875	125.775	126.625	127.475	128.325	129.175	131.225
118.125	119.025	119.925	120.825	124.025	124.925	125.825	126.675	127.525	128.375	129.225	131.275
118.175	119.075	119.975	120.875	124.075	124.975	125.875	126.725	127.575	128.425	129.275	131.325
118.225	119.125	120.025	120.925	124.125	125.025	125.925	126.775	127.625	128.475	129.325	131.375
118.275	119.175	120.075	120.975	124.175	125.075	125.975	126.825	127.675	128.525	129.375	131.425
118.325	119.225	120.125	121.025	124.225	125.125	126.025	126.875	127.725	128.575	129.425	131.475
118.375	119.275	120.175	121.075	124.275	125.175	126.075	126.925	127.775	128.625	129.475	131.525
118.425	119.325	120.225	121.125	124.325	125.225	126.125	126.975	127.825	128.675	129.525	131.575
118.475	119.375	120.275	121.175	124.375	125.275	126.175	127.025	127.875	128.725	129.575	131.625
118.525	119.425	120.325	121.225	124.425	125.325	126.225	127.075	127.925	128.775	129.625	131.675
118.575	119.475	120.375	121.275	124.475	125.375	126.275	127.125	127.975	128.825	129.675	131.725
118.625	119.525	120.425	121.325	124.525	125.425	126.325	127.175	128.025	128.875	130.925	131.775
118.675	119.575	120.475	121.375	124.575	125.475	126.375	127.225	128.075	128.925	130.975	131.825
118.725	119.625	120.525	123.725	124.625	125.525	126.425	127.275	128.125	128.975	131.025	131.875
118.775	119.675	120.575	123.775	124.675	125.575	126.475	127.325	128.175	129.025	131.075	131.925
118.825	119.725	120.625	123.825	124.725	125.625	126.525	127.375	128.225	129.075	131.125	131.975
118.875	119.775	120.675	123.875	124.775	125.675						

GROUP F
(see also Table 4-1 *(bis)*)

118.000 – 121.400 in 8.33 kHz steps	121.600 – 123.050 in 8.33 kHz steps	123.150 – 136.475 in 8.33 kHz steps

ATTACHMENT A. CONSIDERATIONS AFFECTING THE DEPLOYMENT OF VHF COMMUNICATION FREQUENCIES

Introduction

Paragraphs 4.1.5.2 and 4.1.5.3 specify the geographical separation required for co-channel operation of VHF facilities in the aeronautical mobile service. in Figure A-1 the distance AB indicates the separation required between facilities in order that aircraft a *and* b *operating at the protection heights and at the limits of the functional service range of stations A and B respectively, will not experience harmful interference.*

Paragraph 4.1.6.1 recommends the maximum antenna gain outside the main beam of facilities which provide service beyond the radio horizon. Figure A-2 illustrates the azimuthal angle to be protected and the method of derivation. Smaller beamwidths than 30 degrees are not considered practical at present.

Note.— The term "main beam" includes all azimuths where antenna gain exceeds 3 dB above that of a dipole.

1. Criteria employed in establishing geographical separation between ground stations for co-channel operation of VHF facilities that have a service area up to the radio horizon

1.1 To provide co-channel interference protection of 14 dB (5 to 1 distance ratio, as shown below) desired signal to undesired signal (D/U), the free-space loss (FSL) formula is used to calculate both the free-space loss of the desired signal (FSL_D) and the free-space loss of the undesired signal (FSL_U):

$$\begin{aligned} FSL \text{ (in dB)} &= 32.4 + 20 \log f + 20 \log d \\ \text{where } f &= \text{frequency in MHz} \\ d &= \text{distance in km.} \end{aligned}$$

In comparing the FSL_D versus the FSL_U, the subtraction of the formula results in:

$$\begin{aligned} FSL_U - FSL_D &= 20 \log dU - 20 \log dD \\ &= 20 \log dU/dD \end{aligned}$$

$$\begin{aligned} \text{If } FSL_U - FSL_D &= 14 \text{ dB,} \\ \text{then } \log dU/dD &= 14/20 = 0.7; \\ \text{then } dU/dD &= 5.01. \end{aligned}$$

Note.— It is necessary to take into account that the effective radiated powers of transmitting stations may not be equal.

1.2 The desired distance (dD) is the distance between the desired ground facility and the limit of the functional service range of that ground facility (see Figure A-3).

Note.— When making assignments using a 14 dB D/U signal ratio, the potential effects of interference caused by mute lifts due to high communications loading on co-channel assignments should be considered.

1.3 The undesired distance (dU) is the distance between the limit of the functional service ranges of the desired facility and that of the undesired facility (i.e. the distance between the aircraft at the edges of the respective service ranges). See Figure A-1.

1.4 The required geographical separation between the desired and the undesired facility is therefore dD + dU plus the service range of the undesired facility (see Figure A-1).

1.5 If the calculated dU exceeds the RLOS between the aircraft, then a distance as small as the RLOS can be used as the distance between the edges of the service volumes.

2. Criteria employed in establishing adjacent channel frequency deployment with respect to receiver rejection and other system characteristics

2.1 For aircraft receivers designed for operation in a 50 kHz channel spacing environment and a ground station frequency tolerance of 50 parts in 10^6 (±0.005 per cent), an effective adjacent channel rejection characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance between the nearest limits of the functional service ranges of the two facilities of at least 5.6 km (3 NM).

2.2 For aircraft receivers designed for operation in a 25 kHz channel spacing environment and a ground station frequency tolerance of ±0.002 per cent, and for aircraft receivers designed for operation in a 8.33 kHz spacing environment, and a ground station frequency tolerance of ±.0001 per cent, an effective adjacent channel rejection

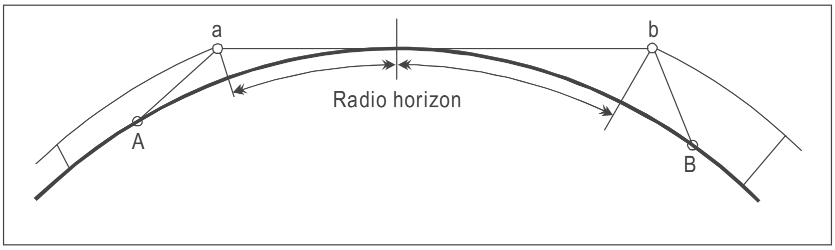


Figure A-1. Geographical separation required for co-channel operation of VHF facilities

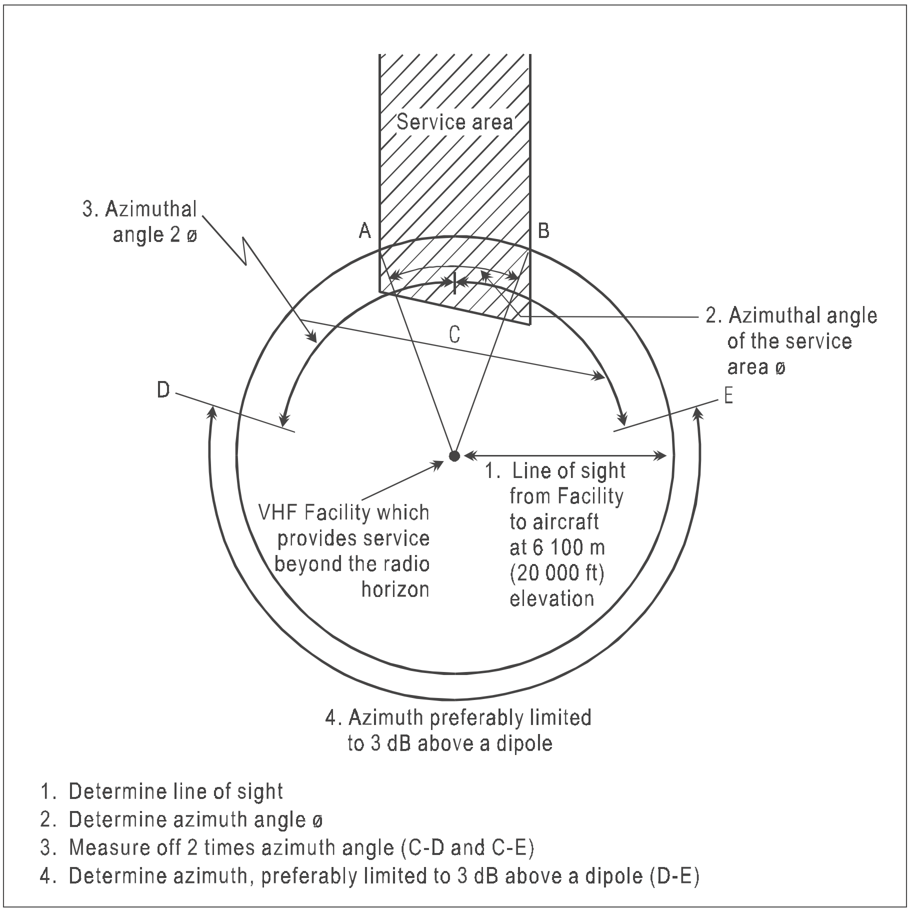


Figure A-2. Limit of azimuth protection for VHF facilities which provide a service beyond the radio horizon

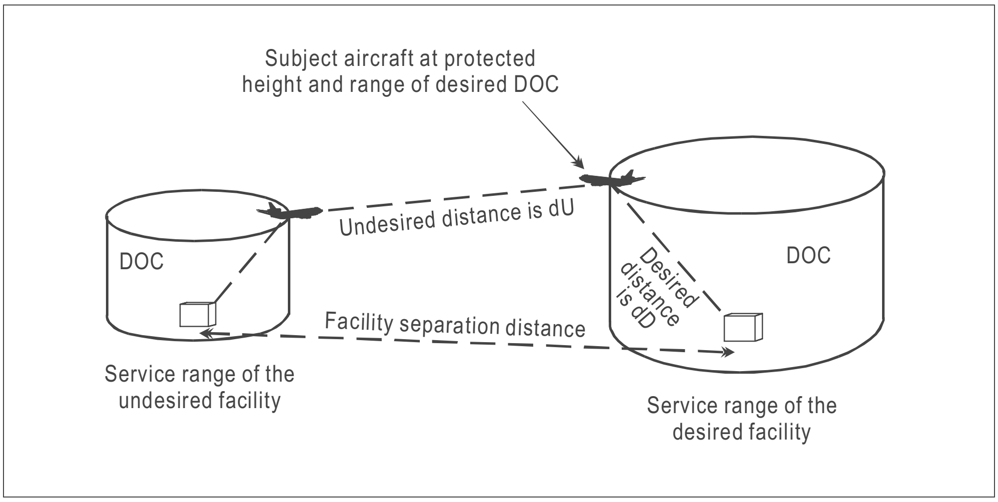


Figure A-3. Co-channel configuration for undesired/desired distance ratio

characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance between the nearest limits of the functional service ranges between two facilities using 25 kHz spacing or between two facilities using 8.33 kHz spacing of at least 5.6 km (3 NM).

2.3 The above criteria are based on the concept of protection by receiver muting, except in the case of area control and FIR channels where a minimum field strength is specified in order to secure the desired wanted-to-unwanted signal ratio.

2.4 The following additional assumptions were made in establishing the criteria:

1) *Propagation*: free space propagation between aircraft. The ITU-R curves for 100 MHz vertical polarization over land in conjunction with an assumed ground antenna height of 20 m (65 ft) were used in computing ground-air field strengths.

2) *Minimum field strength at limit of functional service range*: 45 dB above 1 microvolt per metre at 3 000 m (10 000 ft) in the case of area control and FIR channels.

Note.— To meet this requirement, a station radiating 100 W from an antenna 20 m (65 ft) high should be not more than 185 km (100 NM) from the limit of its functional service range.

3) *Effective radiated power (ERP)*: a maximum ERP of 20 W from ground and airborne stations with the exception that, in case of ground stations providing flight information or area control service communications, it was necessary to assume a minimum ERP of 100 W.

4) *Airborne antenna polar patterns*: total variations not exceeding 10 dB. Since a maximum ERP was assumed (and therefore all variations are downwards from this figure), no allowance was necessary in respect of airborne transmitter polar diagrams.

5) *Wanted-to-unwanted signal ratio*: 20 dB at the receiver output.

6) *Receiver muting characteristics*: a muting threshold corresponding to a received field strength of 5 microvolts per metre.

2.5 The following criteria were based on all relevant assumptions made in 2.4. Two cases related to adjacent channel interference are considered separately:

a) receiver mute lift; and

b) desired-to-undesired signal ratio.

These cases might cause different planning criteria to be observed.

2.5.1 Where it is necessary to take account on a regional basis of receivers not specifically designed for an 8.33 kHz environment, the following characteristics should be assumed:

a) an 8.33 kHz channel, which is assigned 8.33 kHz away from the assigned frequency of a 25 kHz channel, is assumed to be co-channel with that 25 kHz channel;

b) an 8.33 kHz channel, spaced ±16.67 kHz from the assigned frequency of a 25 kHz channel is assumed under all operating conditions (including all instabilities and doppler shifts), to have an adjacent channel rejection ratio of:

i) 23 dB aircraft against ground offset carrier systems;

ii) 30 dB aircraft against ground non-offset carrier systems; and

iii) 27 dB aircraft against aircraft systems.

Worst case conditions for planning purposes are used here for a mixed environment of 8.33 kHz and 25 kHz systems.

c) an 8.33 kHz channel which is assigned 25 kHz away from the assigned frequency of a 25 kHz channel is assumed to have an effective adjacent channel characteristic of at least 60 dB.

2.5.2 Where it is necessary to take account of the implementation of VHF stations which use 8.33 kHz channel spacing, in a region where 25 kHz assignments occur, the assumptions of 2.5.1 a) to c) result in the following:

a) where 8.33 kHz services are spaced ±8.33 kHz away from the assigned frequency of a 25 kHz channel, the regionally agreed planning criteria for co-channel assignments should be used, applying either the radio horizon method (assumed to give at least 20 dB D/U) or a desired-to-undesired signal ratio of 14 dB;

b) where 8.33 kHz services are spaced ±16.67 kHz away from the assigned frequency of a 25 kHz channel, the following criteria should be applied:

i) Receiver mute lift criteria.

The minimum separation distance required for the prevention of receiver mute lifts is:

187 NM aircraft against ground offset carrier systems;

84 NM aircraft against ground non-offset carrier systems; and

118 NM aircraft against aircraft systems.

ii) Desired-to-undesired signal ratio.

The minimum distance required to provide sufficient adjacent channel protection based upon a D/U ratio (assuming equal ERP from the wanted and unwanted signals) can be calculated given the maximum service range of the wanted signal by:

Dadj = service range/(10 (*ACR – D/U*)/20)

Dadj = distance required between the edges of the two service ranges operating on adjacent channels

ACR = adjacent channel rejection

Dadj and service range expressed in the same units.

The D/U ratio used will depend on regionally agreed planning criteria.

Note.— The application of the 14 dB planning criteria assumes that it is highly unlikely that two aircraft will be at the maximum edge of their respective service volumes and at the closest point between these two volumes.

c) 8.33 kHz channels spaced 25 kHz away from an assigned frequency of a 25 kHz channel should be planned in accordance with 2.2.

3. Criteria to be employed in establishing adjacent channel frequency deployment of VHF facilities that have a service range beyond the radio horizon

For the most economical use of frequencies and to ensure freedom from interference, planning must be based on an accurate knowledge of equipment used. When the equipment characteristics and field strength (or attenuation) curves are on hand for the troposcatter regions, it is relatively easy to determine the required geographical separation. When these are not known, the maximum permitted antenna gain stipulated in 4.1.6.1 will be assumed. There are several conditions that must be calculated and compared to determine the appropriate separation to be used. The conditions to be compared are:

1) ground facility-to-aircraft;

2) aircraft-to-ground facility;

3) aircraft-to-aircraft; and

4) ground facility-to-ground facility.

Case 1.— For the case of protection of aircraft A from a ground facility (see Figure A-4):

A. Determine the signal level *S* (dB rel. 1 μV/m) received from the desired station at the limit of the service radius at the protection altitude.

B. Assign the desired protection ratio *P* (dB) required at the aircraft receiver.

C. Let receiver adjacent channel rejection be represented by *A* (dB). Then the level *L* (dB rel. 1 μV/m) that can be tolerated at the receiver antenna can be determined by:

$$L = S - P + A$$

D. Distance *d* (km) from protection point to undesired facility to provide protection established by "C", is found by application of *L* to the appropriate curves.

Note 1.— Figures A-8 to A-15 are field strength curves appropriate for the average temperate climate over land or sea, which may be used to determine geographical separation for situations where these field strengths will not normally be exceeded more than 5 per cent of the time. These curves were established by the Institute for Telecommunications Sciences and Aeronomy of the Environmental Science Services Administration of the United States.

Note 2.— For power levels other than 1 kW the necessary corrections under "C" would have to be made. For example, 5 kW ERP requires a minus 7 dB correction.

E. The facility-to-facility separation D is d (km) plus service radius (km).

Case 2.— Aircraft (A)-to-ground facility (see Figure A-4):

A. Determine signal level *Sg* at the ground facility receiving antenna for proper system operation.

B. Proceed as in Case 1, where

$$L = Sg - P + A$$

C. Ground facility-to-ground facility separation will also be determined as in Case 1 (D = d + service radius (km)).

Note.— Where ground facility receivers have sensitivities of less than 1 microvolt across 50 ohms, Case 2 is most likely to yield the separation to be used.

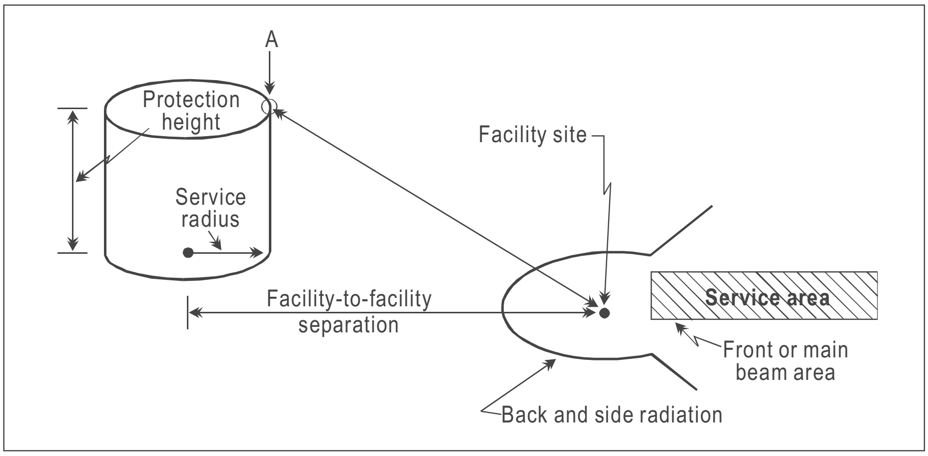


Figure A-4. Air-to-ground (facility from A) and ground-to-air (A from facility)

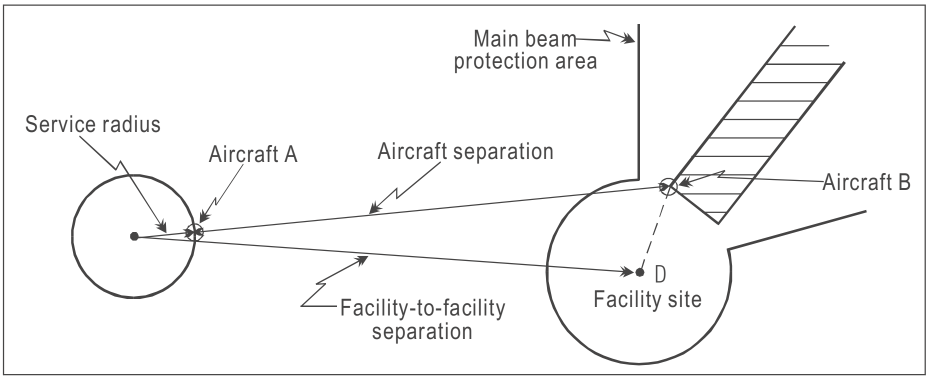


Figure A-5. Facility-to-facility separation based on air-to-air (A from B) and ground-to-ground (C and D)

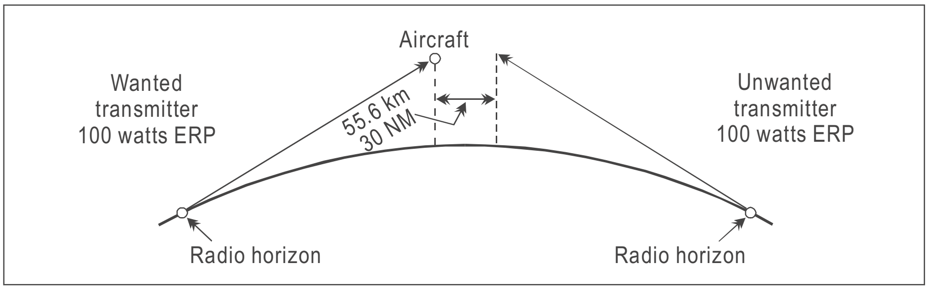


Figure A-6. VOLMET planning (illustrating co-channel protection)

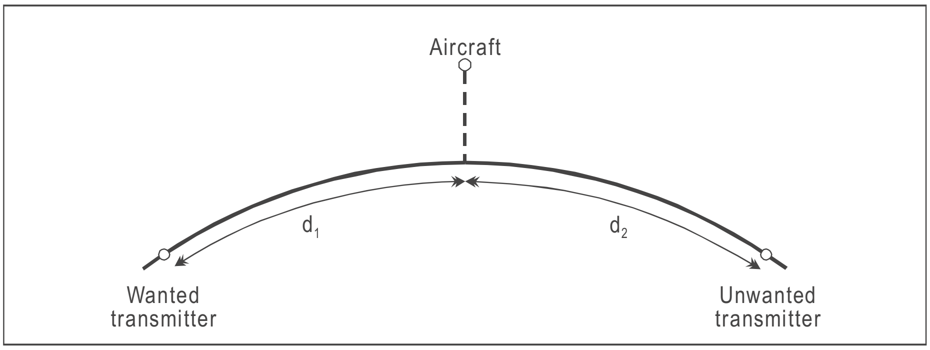


Figure A-7. VOLMET planning (illustrating adjacent channel protection)

Case 3.— Aircraft (A)-to-aircraft (B) (see Figure A-5):

A. Establish service radius and protection altitude for facility to be protected (see aircraft A in Figure A-5).

B. Determine closest point to aircraft A that aircraft B will be transmitting to the ground facility site and the altitude where this will take place.

C. Proceed as in Case 1, using the aircraft (B) contacting ground facilities as the undesired signal.

D. Then $L = S - P + A$

E. The distance d to aircraft B (undesired) obtained from the curves, plus the service radius of the facility to be protected, will determine the separation between aircraft B and the ground facility protected.

F. Facility-to-facility separation may then be determined graphically or by trigonometric means.

Case 4.— Ground facility-to-ground facility (see Figure A-5).

A. Determine signal level that can be tolerated at the receiver antenna at one facility by $L = Sg - P + A$ (see Case 1).

B. Then facility-to-facility separation for these conditions is read directly from the curves (after correcting for transmitter power of other facilities if different from 1 kW).

C. Should equipment at the two facilities have different characteristics, repeat procedure in "A" and "B" for the other combinations of equipment.

D. Of the two distances derived, use the greater to compare with other cases (see below).

Note.— In most instances, it will be found that the facility-to-facility consideration will not be the controlling factor in determining geographical separation.

Facility separation will then be the greatest distance derived for Cases 1 to 4.

4. Criteria to be employed in establishing geographical separation between ground stations and between aircraft and ground stations for co-channel operation of VHF facilities that have a service area beyond the radio horizon

Geographical separation of co-channel facilities can be calculated by using the method given in 2 above except that the adjacent channel rejection A is omitted from consideration.

5. Criteria employed in establishing co-channel frequency deployment of VHF VOLMET facilities

In the case of VHF VOLMET services, the geographical separation between co-channel stations should be 55.6 km (30 NM) plus twice the distance to the radio horizon from an aircraft at the highest altitude flown by aircraft in the area concerned. (See Figure A-6.)

Note.— At 27.8 km (15 NM) beyond the radio horizon, the field strength at 13 500 m (45 000 ft), from a transmitter of 100 W ERP, will be approximately at the receiver muting level of 5 microvolts per metre.

6. Criteria employed in establishing adjacent channel frequency deployment of VHF VOLMET facilities

6.1 For aircraft receivers designed for operation in a 25 kHz channel spacing environment, an effective adjacent channel rejection characteristic of 60 dB or better is assumed. This assumption will result in a geographical separation distance D between VHF VOLMET ground transmitters derived as follows (nautical miles may be substituted for kilometres):

$$D = (d_1 + d_2) \text{ km}$$

where

d_1 = distance between aircraft and wanted ground station

= radio horizon + 27.8 km (15 NM)

and

d_2 = distance between aircraft and unwanted ground station

= 24.1 km (13 NM).

(See Figure A-7.)

6.2 Where it is necessary to take account, on a regional basis, of receivers not specifically designed for 25 kHz channel spacing and used in a 25 kHz channel spacing environment, an effective adjacent channel rejection characteristic of the receiver of the order of 40 dB is assumed. This assumption will result in a minimum geographical separation distance D between VHF VOLMET ground transmitters derived as follows:

$$D = (d_1 + d_2) \text{ km}$$

where

d_1 = distance between aircraft and wanted ground station

= radio horizon + 27.8 km (15 NM)

d_2 = distance between aircraft and unwanted ground station

= 240.9 km (130 NM).

6.3 Application of the above criteria in the case of aircraft altitudes of 13 500 m (45 000 ft) and 20 000 m (66 000 ft) results in the following separation distances:

Altitude	*Receiver rejection characteristic*	d_1 *km (NM)*	d_2 *km (NM)*	*D km (NM)*
13 500 m (45 000 ft)	60 dB	491 (265)	24.1 (13)	515 (278)
13 500 m (45 000 ft)	40 dB	491 (265)	241 (130)	732 (395)
20 000 m (66 000 ft)	60 dB	619 (334)	24.1 (13)	643 (347)
20 000 m (66 000 ft)	40 dB	619 (334)	241 (130)	860 (464)

6.4 The above criteria are based on the following additional assumptions:

1) *Effective radiated power*: an ERP of 100 W for the ground stations.

Note.— If an ERP of 20 W is assumed, this would result in separation distances for 13 500 m (45 000 ft) of 472 km (255 NM) for 60 dB receiver adjacent channel rejection and 572 km (309 NM) for 40 dB receiver adjacent channel rejection.

2) *Interfering signal strength*: if the received signal strength is in excess of the free space propagation value, then the maximum value will not exceed the free space value by more than 5 dB over average earth. This condition is satisfied when transmitters of 20 W ERP or more are used in conjunction with a receiver adjacent channel rejection of not less than 35 dB. Thus, the minimum distance for d_2 can be derived from a consideration of receiver muting level, receiver adjacent channel rejection and transmitter ERP.

7. RF — Characteristics for digital VHF systems, interference immunity performance

7.1 *Receiving function — interference immunity performance*. The standard measurement technique for digital systems provides that the desired signal field strength be doubled, and that the undesired signal be applied in increasing levels until the channel performance, that is the specified error rate, degrades to a value equal to the value found at the specified receiver sensitivity.

For the VDL, the effect of the measurement technique is that the desired signal strength is increased from 20 microvolts per metre to 40 microvolts per metre. Then the undesired signal on the adjacent or any other assignable channel is raised to the specified level higher than the desired signal until the specified error rate is exceeded.

Care should be taken to ensure that on-channel noise power is not included in the measurement of the undesired signal.

7.2 *Assignment criteria.* Assignment of frequencies for VHF digital link should take into account the VDL RF system characteristics in order to avoid harmful interference to or from co-channel and adjacent channel assignments, in keeping with regionally and nationally agreed spectrum management policies.

Figures A-8 to A-15. Propagation curves for standard atmosphere (301) for frequency of 127 MHz

ESSA/I.T.S.A.—1966 Propagation Model

These curves labelled "5 per cent time availability" represent only a statistically expected value; i.e., a probability of 0.05 that a particular situation will result in the specified field strength or greater during 5 per cent of the time.

The parameters used to develop these curves include:

1) frequency of 127 MHz;

2) horizontal or vertical polarization;

3) smooth earth with land or sea surface;

4) reflection coefficient of unity magnitude;

5) standard atmosphere with a 301 surface refractivity;

6) continental temperate climate;

7) Nakagami-Rice statistics for within-the-horizon fading;

8) an effective radiated power (ERP) corresponding to 1 kilowatt input power into a lossless half-wave dipole.

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz

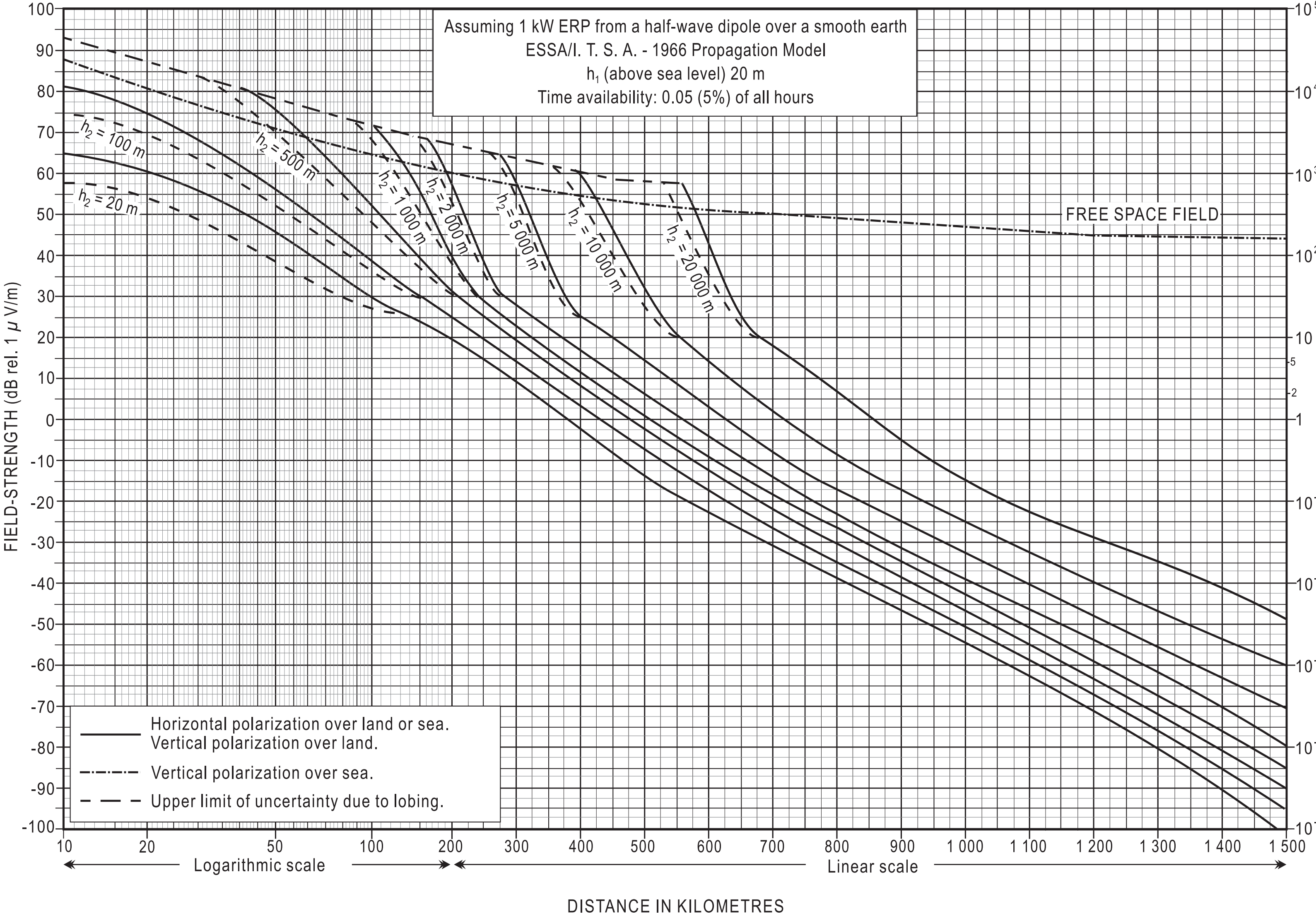


Figure A-8

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz

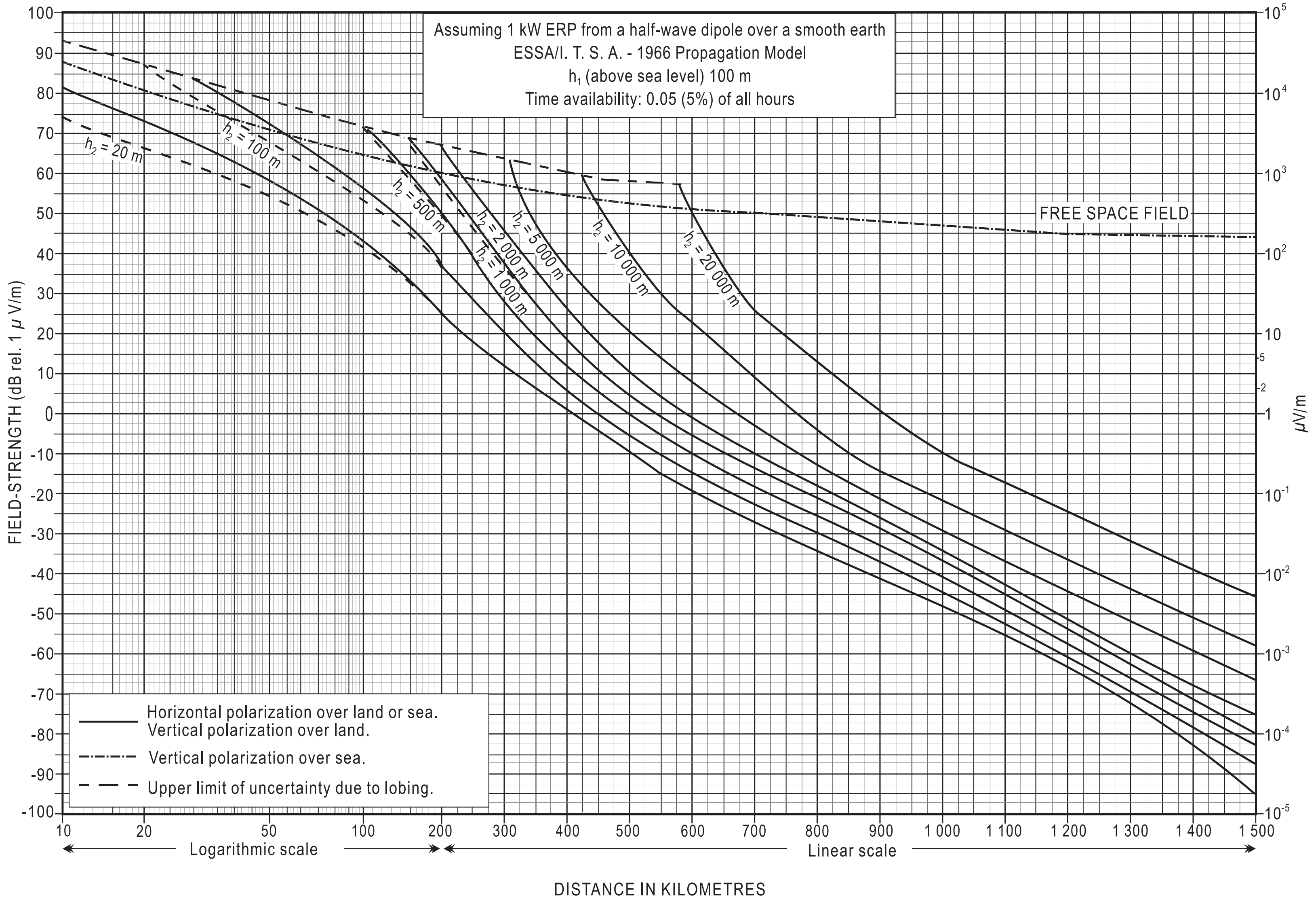


Figure A-9

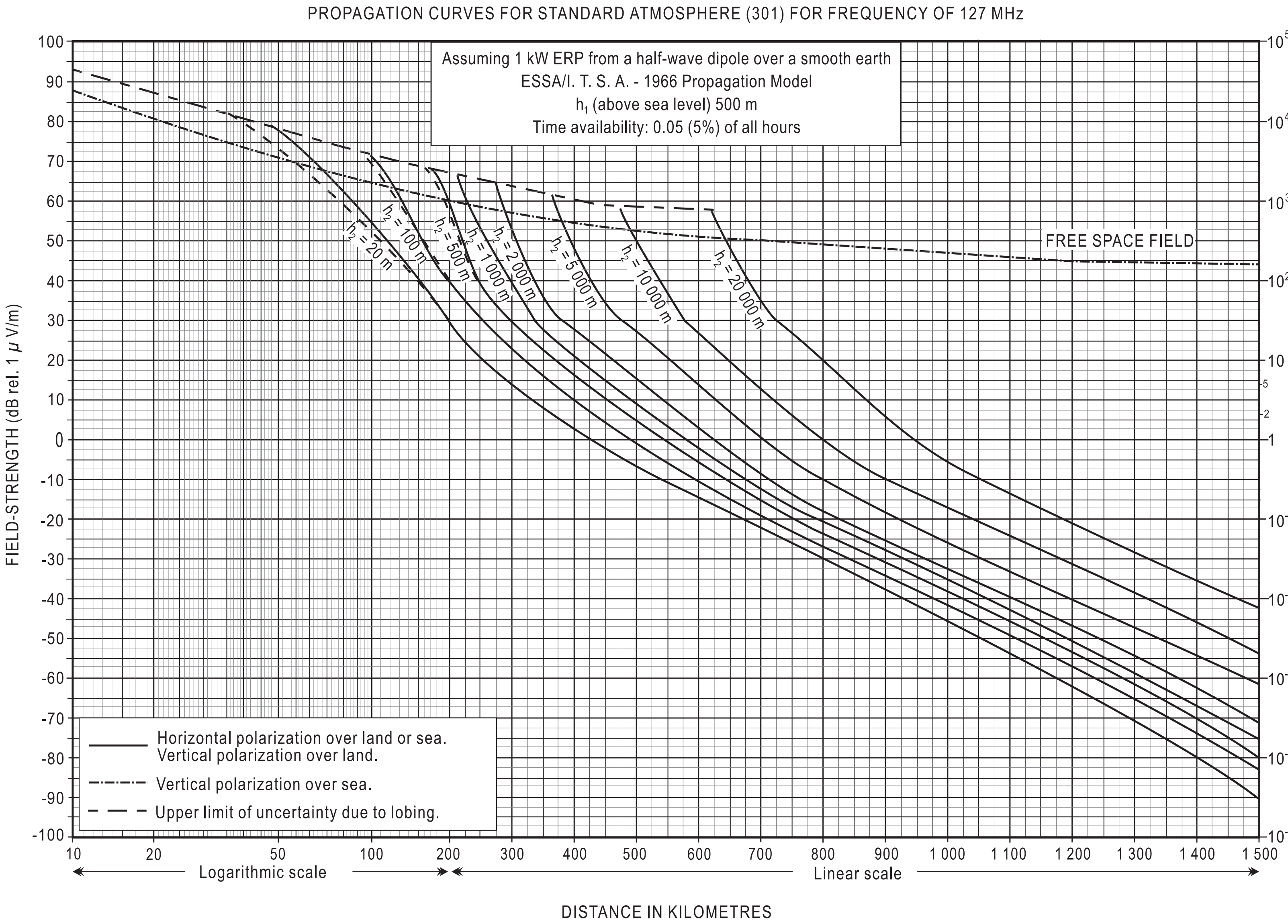
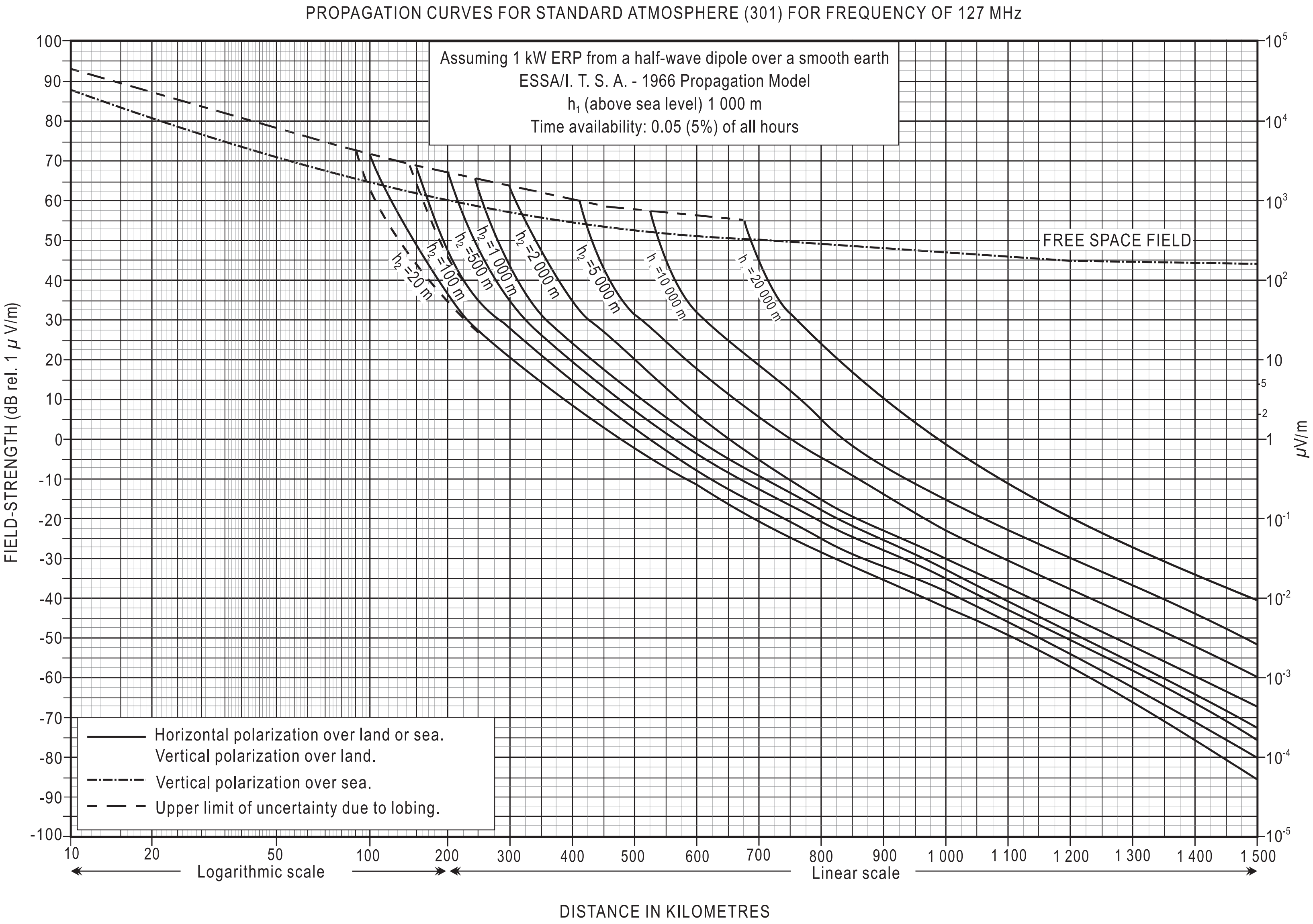

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz
Assuming 1 kW ERP from a half-wave dipole over a smooth earth
ESSA/I. T. S. A. - 1966 Propagation Model
h1 (above sea level) 500 m
Time availability: 0.05 (5%) of all hours
FREE SPACE FIELD
h2 = 20 m
h2 = 100 m
h2 = 500 m
h2 = 1 000 m
h2 = 2 000 m
h2 = 5 000 m
h2 = 10 000 m
h2 = 20 000 m
FIELD-STRENGTH (dB rel. 1 μ V/m)
μV/m
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
10^5
10^4
10^3
10^2
10
5
2
1
10^-1
10^-2
10^-3
10^-4
10^-5
10
20
50
100
200
300
400
500
600
700
800
900
1 000
1 100
1 200
1 300
1 400
1 500
Logarithmic scale
Linear scale
DISTANCE IN KILOMETRES
Horizontal polarization over land or sea.
Vertical polarization over land.
Vertical polarization over sea.
Upper limit of uncertainty due to lobing.

Figure A-10



PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz
Assuming 1 kW ERP from a half-wave dipole over a smooth earth
ESSA/I. T. S. A. - 1966 Propagation Model
h1 (above sea level) 1 000 m
Time availability: 0.05 (5%) of all hours
FIELD-STRENGTH (dB rel. 1 μ V/m)
μV/m
FREE SPACE FIELD
h2 =20 m
h2 =100 m
h2 =500 m
h2 =1 000 m
h2 =2 000 m
h2 =5 000 m
h2 =10 000 m
h2 =20 000 m
Horizontal polarization over land or sea.
Vertical polarization over land.
Vertical polarization over sea.
Upper limit of uncertainty due to lobing.
Logarithmic scale
Linear scale
DISTANCE IN KILOMETRES

Figure A-11

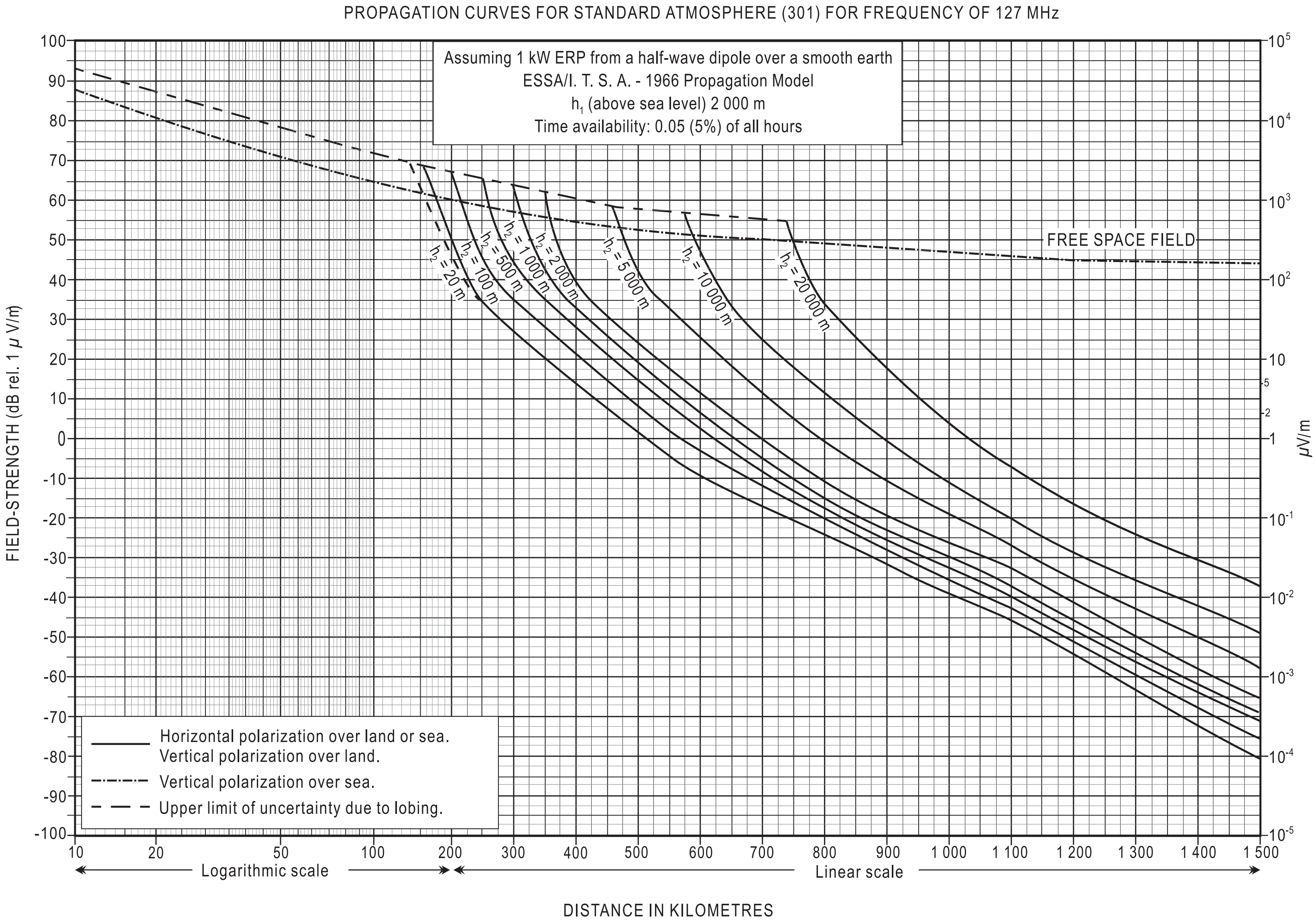

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz
Assuming 1 kW ERP from a half-wave dipole over a smooth earth
ESSA/I. T. S. A. - 1966 Propagation Model
h_1 (above sea level) 2 000 m
Time availability: 0.05 (5%) of all hours
FREE SPACE FIELD
h_2 = 20 m
h_2 = 100 m
h_2 = 500 m
h_2 = 1 000 m
h_2 = 2 000 m
h_2 = 5 000 m
h_2 = 10 000 m
h_2 = 20 000 m
FIELD-STRENGTH (dB rel. 1 μ V/m)
μV/m
Horizontal polarization over land or sea.
Vertical polarization over land.
Vertical polarization over sea.
Upper limit of uncertainty due to lobing.
Logarithmic scale
Linear scale
DISTANCE IN KILOMETRES

Figure A-12

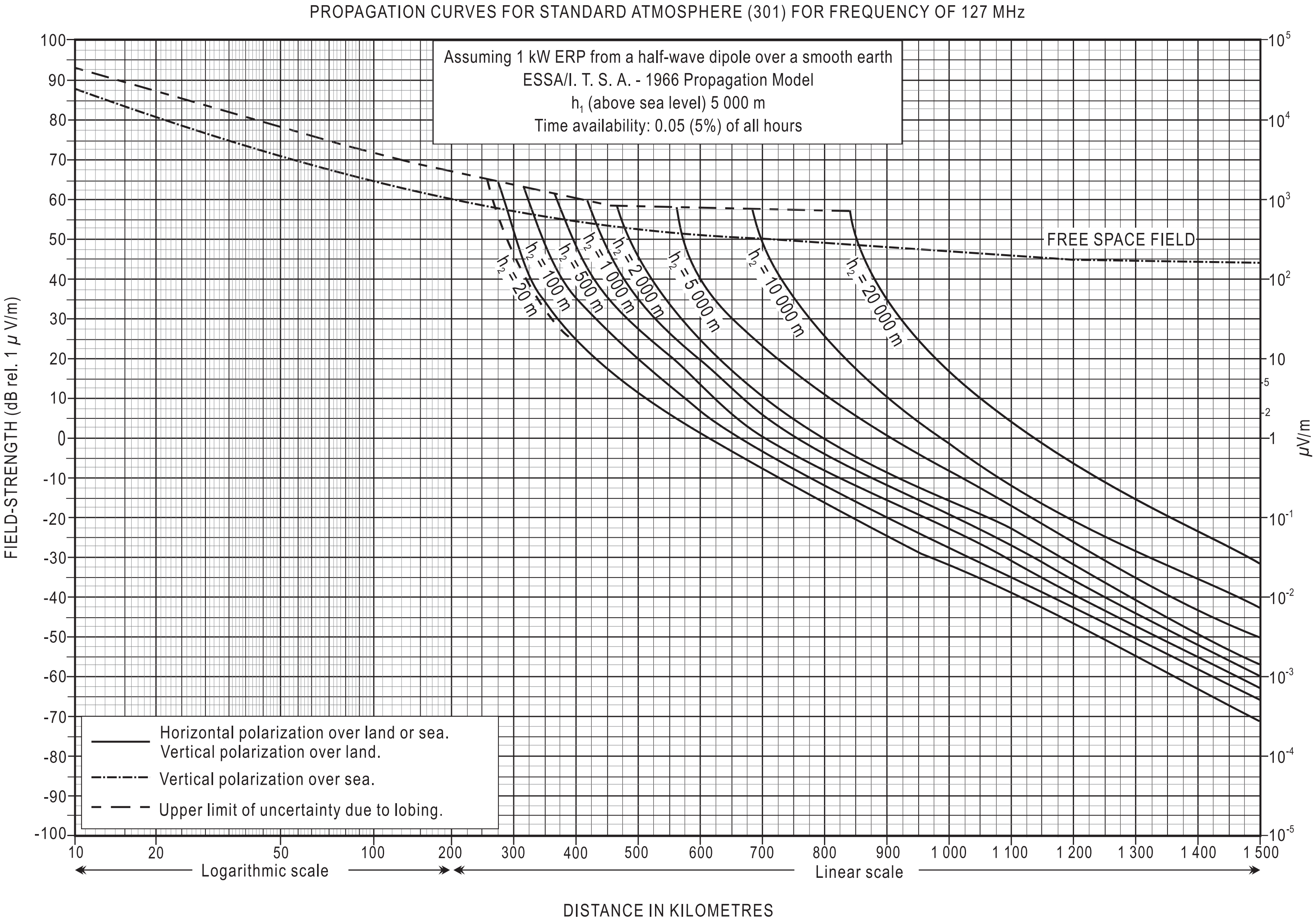

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz
Assuming 1 kW ERP from a half-wave dipole over a smooth earth
ESSA/I. T. S. A. - 1966 Propagation Model
h1 (above sea level) 5 000 m
Time availability: 0.05 (5%) of all hours
FREE SPACE FIELD
h2 = 20 m
h2 = 100 m
h2 = 500 m
h2 = 1 000 m
h2 = 2 000 m
h2 = 5 000 m
h2 = 10 000 m
h2 = 20 000 m
FIELD-STRENGTH (dB rel. 1 μ V/m)
μV/m
Horizontal polarization over land or sea.
Vertical polarization over land.
Vertical polarization over sea.
Upper limit of uncertainty due to lobing.
Logarithmic scale
Linear scale
DISTANCE IN KILOMETRES

Figure A-13

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz

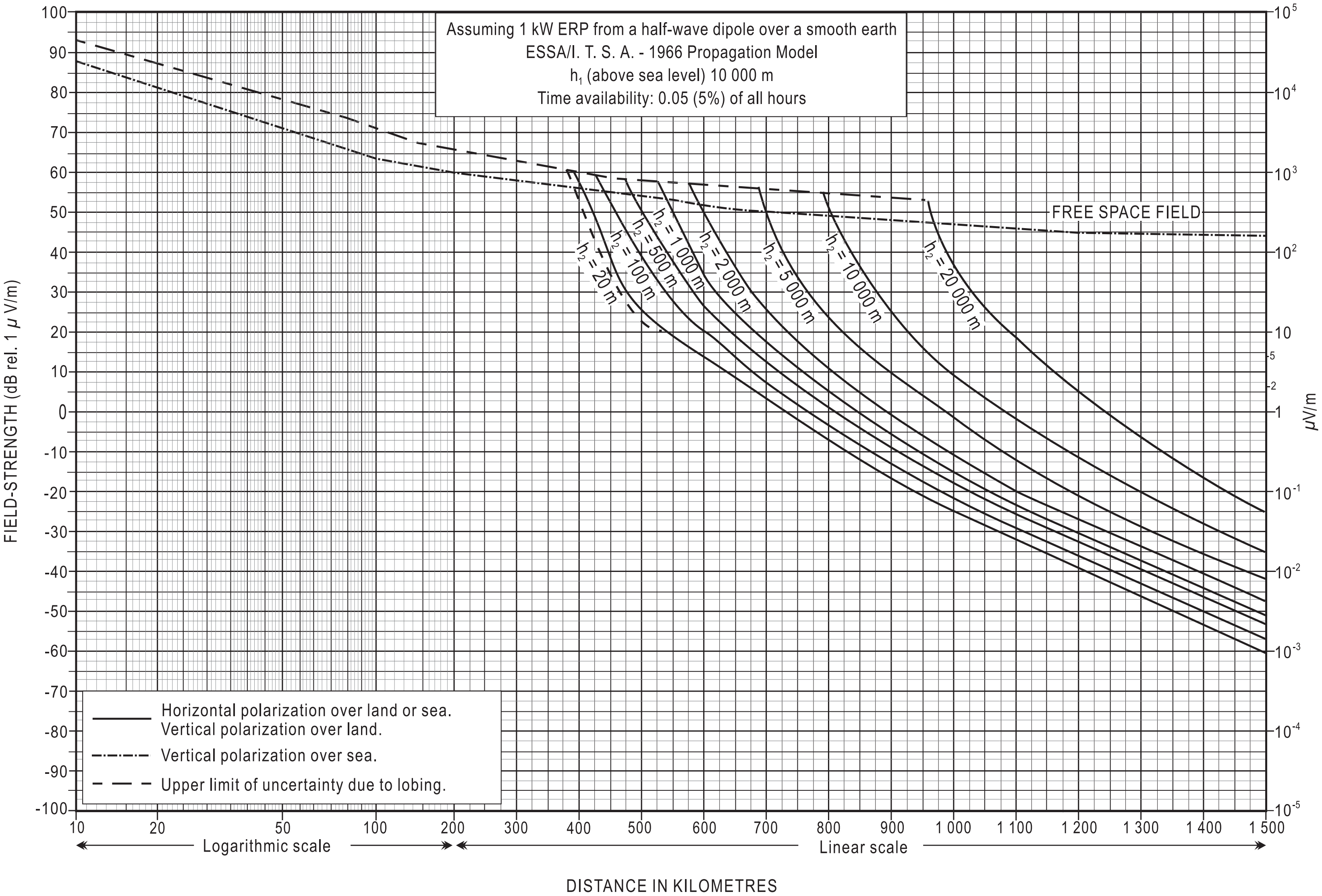


Figure A-14

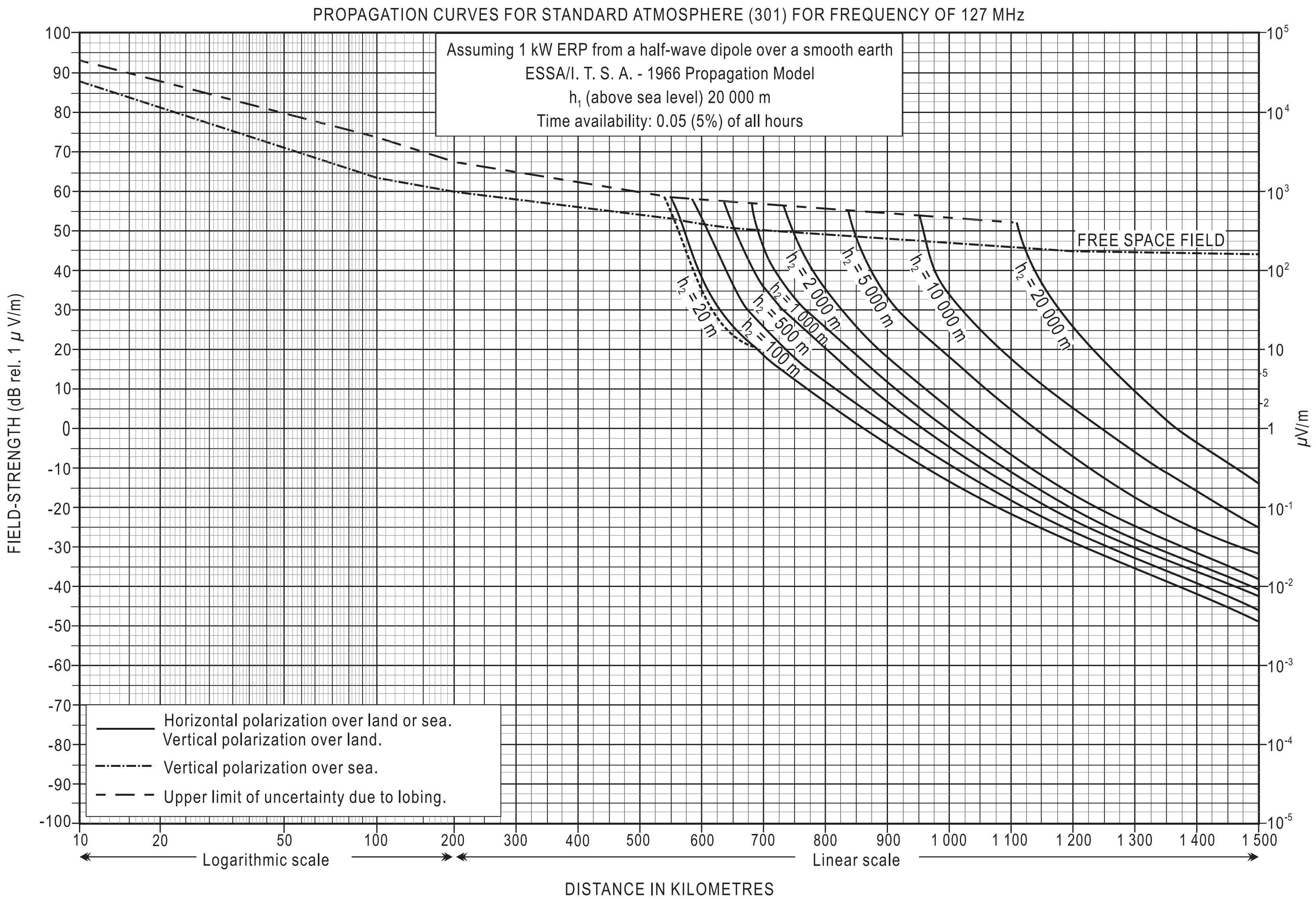

PROPAGATION CURVES FOR STANDARD ATMOSPHERE (301) FOR FREQUENCY OF 127 MHz
Assuming 1 kW ERP from a half-wave dipole over a smooth earth
ESSA/I. T. S. A. - 1966 Propagation Model
h1 (above sea level) 20 000 m
Time availability: 0.05 (5%) of all hours
FREE SPACE FIELD
h2 = 20 m
h2 = 100 m
h2 = 500 m
h2 = 1 000 m
h2 = 2 000 m
h2 = 5 000 m
h2 = 10 000 m
h2 = 20 000 m
FIELD-STRENGTH (dB rel. 1 μ V/m)
μV/m
Horizontal polarization over land or sea.
Vertical polarization over land.
Vertical polarization over sea.
Upper limit of uncertainty due to lobing.
Logarithmic scale
Linear scale
DISTANCE IN KILOMETRES

Figure A-15

ATTACHMENT B. CONSIDERATIONS AFFECTING THE DEPLOYMENT OF LF/MF FREQUENCIES AND THE AVOIDANCE OF HARMFUL INTERFERENCE

1. Particularly in areas of high density of NDBs, it is recognized that efficient planning is essential in order to: a) ensure satisfactory operation of ADF equipment, and b) provide the most efficient usage of the limited frequency spectrum available for the NDB service. It is axiomatic that regional meetings will so plan facilities as to ensure that all facilities will receive the best possible protection from harmful interference. Nevertheless, in certain regions, congestion of facilities has been such that regional meetings have had to plan in terms of a *minimum* protection ratio.

Regional meetings include in their planning consideration of such factors as:

a) the possibility of reducing the number of NDBs required, by coordination of system plans;

b) the possibility of reducing the coverage where a lesser grade of service than that obtainable within the rated coverage is acceptable;

c) the characteristics of ADF equipment in use;

d) the atmospheric noise grades, appropriate to the area concerned;

e) ground conductivity; and

f) interference protection required at the edge of the rated coverage.

Of the foregoing factors, that which is most susceptible to improvement of a technical kind is c).

2. The 1979 World Administrative Radio Conference adopted regulations concerning the assignment of frequencies for aeronautical radio beacons operating in the LF/MF frequency bands. A minimum protection ratio (wanted/unwanted signal ratio) of 15 dB is to be used as the basis for frequency assignment planning (RR Appendix S12). The following data concerning the attenuation characteristics of ADF equipment was used in the EUR region to aid in the frequency assignment process:

Frequency difference (kHz)	*Attenuation (dB)*
0	0
1	1
2	6
2.4	10
3	20
3.6	30
4.3	40
5	50
6	65
7	80

The above figures (or distance separation criteria derived from them) have also been applied in other regions in determining the minimum protection ratio.

Where a bearing accuracy of ±5 degrees is required at the edge of cover, a minimum protection of 15 dB by day should be used as the basis for LF/MF channel assignment planning.

3. In view of the fact that in many regions there is a need to improve the planning criteria it is considered that the main source from which improvement can be derived is recognition of higher attenuation figures than those given above. Regional meetings are accordingly advised that, when the congestion is such that the use of the above figures no longer permits efficient planning of the LF/MF frequency spectrum available, the following figures represent from a technical point of view the best that can be accepted in determining distance separation criteria:

Frequency difference (kHz)	*Attenuation (dB)*
0	0
1	6
3	35
5	65
6	80

When using these figures, it should be noted that the RF selectivity of modern ADF equipment is in general better than these figures and that, while the RF selectivity of older ADF equipment is not better than these figures, consideration of the dynamic characteristic of this older equipment shows this to be better. It could therefore be expected that frequency planning based on the new figures would considerably improve the service provided to users of modern equipment, and would not materially reduce the service presently provided to those aircraft using the older equipment.

Nevertheless, in their planning, regional meetings would need to consider this question most carefully.

4. It is further noted that, in certain regions, many NDBs are used with voice channels and that this usage is aligned with the Note at the head of Volume I, 3.4.6. It is expected that regional meetings will take this fact into account when establishing criteria for frequency planning.

ATTACHMENT C. GUIDING PRINCIPLES FOR LONG DISTANCE OPERATIONAL CONTROL COMMUNICATIONS

Note.— The numerical sequence of the clauses below does not signify any order of relative importance.

1. Aeronautical Operational Control (AOC) HF Stations should be authorized where no other means for the exercise of long distance operational control are available or where the use of the normal communication services provided for safety and regularity of flights are unsuitable or inadequate.

2. The total number of ground stations on the worldwide radio channels should be kept to a minimum consistent with economic and operational efficiency. Consequently,

a) there should normally be not more than one station per State; and

b) where an agreed affinity of interest exists between adjoining States, a single station may be provided by agreement among them to serve the needs of all the aircraft operating agencies requiring a service into those States.

3. Depending on the national policy of the State or States, aeronautical stations could be operated by States on behalf of one or more aircraft operating agencies provided that the agencies' requirements for flexibility and direct communication to their aircraft can be met, or aeronautical stations could be operated by an aircraft operating agency or a communication agency serving the interests of one or more aircraft operating agencies and operating under licence issued by the State or States concerned.

4. The licences should be issued on a regular renewal basis and, pursuant to RR S4.11 and in accordance with RR S43.4, should prohibit "public correspondence", or point-to-point type traffic, or other communications traffic not meeting the definition of operational control communications.

5. VHF (general purpose or AOC channels) and not HF should be used when an aircraft is within the coverage of an appropriate VHF aeronautical station.

Note.— The specific categories of messages that may be handled on aeronautical mobile (R) service channels are prescribed in Annex 10, Volume II, Chapter 5, 5.1.8. The same chapter defines the standard communications procedures for the service including the requirements for maintaining watch in Annex 10, Volume II, Chapter 5, 5.2.2. In accordance with RR S18.6 of the ITU Radio Regulations, licences should define the purpose of the station for aeronautical operational control (as defined in Annex 6, Part I) and should specify the general characteristics in accordance with Appendix S27 of the Radio Regulations.

— END —

International Standards and Recommended Practices

Annex 11
to the Convention on International Civil Aviation

Air Traffic Services

Air Traffic Control Service
Flight Information Service
Alerting Service

This edition incorporates all amendments adopted by the Council prior to 13 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 11.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Thirteenth Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-40	Incorporated in this edition		
41	28/11/02	—	ICAO
42	27/11/03	—	ICAO
43	24/11/05	—	ICAO
44	23/11/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	31/10/03	—	ICAO

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FOREWORD

Historical background

In October 1945, the Rules of the Air and Air Traffic Control (RAC) Division at its first session made recommendations for Standards, Practices and Procedures for Air Traffic Control. These were reviewed by the then Air Navigation Committee and approved by the Council on 25 February 1946. They were published as *Recommendations for Standards, Practices and Procedures — Air Traffic Control* in the second part of Doc 2010, published in February 1946.

The RAC Division, at its second session in December 1946 – January 1947, reviewed Doc 2010 and proposed Standards and Recommended Practices for Air Traffic Control. It did not appear possible, however, to finalize those Standards prior to basic principles being established by the RAC Division for the organization of the relevant services.

These were established by the RAC Division at its third session in April–May 1948 and a draft Annex was thereafter submitted to States. This was adopted by the Council on 18 May 1950, pursuant to Article 37 of the Convention on International Civil Aviation (Chicago, 1944), and designated as Annex 11 to the Convention with the title *International Standards and Recommended Practices — Air Traffic Services*. It became effective on 1 October 1950. This new title — *Air Traffic Services* — was preferred to the title *Air Traffic Control*, in order to make it clear that air traffic control service was a part of the services covered by Annex 11, together with flight information service and alerting service.

Table A shows the origin of subsequent amendments, together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The Standards and Recommended Practices in this document, together with the Standards in Annex 2, govern the application of the *Procedures for Air Navigation Services — Air Traffic Management* (Doc 4444, PANS-ATM) and the *Regional Supplementary Procedures* — Rules of the Air and Air Traffic Services, contained in Doc 7030, in which latter document will be found subsidiary procedures of regional application.

Annex 11 pertains to the establishment of airspace, units and services necessary to promote a safe, orderly and expeditious flow of air traffic. A clear distinction is made between air traffic control service, flight information service and alerting service. Its purpose, together with Annex 2, is to ensure that flying on international air routes is carried out under uniform conditions designed to improve the safety and efficiency of air operation.

The Standards and Recommended Practices in Annex 11 apply in those parts of the airspace under the jurisdiction of a Contracting State wherein air traffic services are provided and also wherever a Contracting State accepts the responsibility of providing air traffic services over the high seas or in airspace of undetermined sovereignty. A Contracting State accepting such responsibility may apply the Standards and Recommended Practices in a manner consistent with that adopted for airspace under its jurisdiction.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the establishment and withdrawal of, and changes to, facilities, services and procedures affecting aircraft operations provided according to the Standards specified in this Annex should be notified and take effect in accordance with Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1. — *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2. — *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

It is to be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb “shall”, while Recommended Practices employ the operative verb “should”.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Table A. Amendments to Annex 11

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
1st Edition	Rules of the Air and Air Traffic Control (RAC) Division, Third Session (1948)	International Standards and Recommended Practices — *Air Traffic Services.*	18 May 1950 1 October 1950 1 June 1951
1 to 6 (2nd Edition)	Rules of the Air and Air Traffic Control (RAC) Division, Fourth Session (1950)	Aerodrome traffic; transfer of control; contents of clearance; distress phase; requirements for communications; upper flight information regions and upper control areas; vertical separation.	27 November 1951 1 April 1952 1 September 1952
7	Air Navigation Commission	Deletion of guidance material on the dissemination of information on ATS facilities.	22 February 1956 — —
8 (3rd Edition)	Second Air Navigation Conference (1955)	Definitions; establishment of authority; designations of airspace; separation of aircraft; requirements for communications; requirements for meteorological information; determination and establishment of controlled airspaces; diagrams of communications.	11 May 1956 15 September 1956 1 December 1956
9 (4th Edition)	Rules of the Air, Air Traffic Services and Search and Rescue (RAC/SAR) Divisions (1958)	Definitions; objectives of air traffic services; designations of airspace and controlled aerodromes; specifications for airspace; air traffic control service; alerting service; requirements for communications; determination and establishment of controlled airspaces, naming of reporting points; automation of air traffic control.	8 December 1959 1 May 1960 1 August 1960
10	Panel for Coordinating Procedures Respecting the Supply of Information for Air Operations (1959)	SIGMET information; delegation and application of flight information service; requirements for meteorological information.	2 December 1960 1 April 1961 1 July 1961
11	Air Navigation Commission	Deletion of guidance material illustrating the depiction on charts of air traffic services information.	26 June 1961 — —
12	Air Navigation Commission	Guidance material relating to the selection of designators for routes within controlled airspace.	15 December 1961 — —
13	Air Navigation Commission	Notification of rescue coordination centres during uncertainty, alert and distress phases.	13 April 1962 1 August 1962 1 November 1962
14	Air Navigation Commission	Requirements for other aircraft in the vicinity of an aircraft in a state of emergency to be informed of the nature of emergency.	19 June 1964 1 November 1964 1 February 1965

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
15 (5th Edition)	Rules of the Air, Air Traffic Services/ Operations (RAC/OPS) Divisional Meeting (1963); Air Navigation Commission	Application of vertical separation for flights above FL 290; provision of air traffic control service to VFR flights; delineation of airspace; vertical limits of flight information regions; ATS routes and reporting point designators; coordination with operators; methods of separation; requirements for communications; guidance material on the determination and establishment of controlled airspace.	17 March 1965 29 March 1966 25 August 1966
16	Air Traffic Control Automation Panel (ATCAP), Fifth Meeting (1966)	Transfer of responsibility for control; control of air traffic flow.	7 June 1967 5 October 1967 8 February 1968
17	Fifth Air Navigation Conference (1967)	Air traffic services reporting office and its communication requirements; clearances and separation; scope of the flight information service; communications for control of vehicles at aerodromes; ATS requirements for meteorological information; information on aerodrome conditions and operational status of navigation aids.	23 January 1969 23 May 1969 18 September 1969
18 (6th Edition)	Sixth Air Navigation Conference (1969); Air Navigation Commission	Definitions; terminology for designating controlled airspace; vertical limits of ATS airspaces; minimum flight altitudes; establishment and application of separation minima; clearances and separation; standard departure and arrival routes; establishment and identification of reporting points and reporting lines; provision of flight information service to IFR flights over water areas; establishment of air-ground communications for ATS purposes.	25 May 1970 25 September 1970 4 February 1971
19	Air Navigation Commission	Authority over aircraft over the high seas; SIGMET information.	15 November 1972 15 March 1973 16 August 1973
20	Seventh Air Navigation Conference (1972)	Definitions; area navigation (RNAV); designators for ATS routes and reporting points.	23 March 1973 30 July 1973 23 May 1974
21	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	Practices to be followed by ATS units in the event that an aircraft is subjected to unlawful interference.	7 December 1973 7 April 1974 23 May 1974
22	Technical Panel on Supersonic Transport Operations (SSTP), Fourth Meeting (1973); Air Navigation Commission	Clearance for transonic acceleration and deceleration of supersonic flights; cooperation between military authorities and air traffic services and requirements for communications.	4 February 1975 4 June 1975 9 October 1975
23	Air Navigation Commission	Use of SSR code 7500 in the event of unlawful interference; requirements for communications between ATS units and meteorological offices.	12 December 1975 12 April 1976 12 August 1976
24	Air Navigation Commission	Definitions; time-keeping accuracy.	7 April 1976 7 August 1976 30 December 1976
25 (7th Edition)	Ninth Air Navigation Conference (1976)	Definitions; VOR change-over points; identification of ATS routes; establishment and identification of significant points; flight information service; ATS requirements for information.	7 December 1977 7 April 1978 10 August 1978

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
26	Air Navigation Commission	Designation of standard departure and arrival routes.	3 December 1979 3 April 1980 27 November 1980
27	Air Navigation Commission	Coordination of activities constituting a potential hazard to flights of civil aircraft; unmanned free balloons.	4 March 1981 4 July 1981 26 November 1981
28	Air Navigation Commission	Requirements for communications between ATS units and military units.	1 April 1981 1 August 1981 26 November 1981
29	Operational Flight Information Service (OFIS) Panel, Second Meeting (1980); Review of the General Concept of Separation Panel (RGCSP), Fourth Meeting (1980); Air Navigation Commission	Provision of integrated AIS, ATS, MET and other pertinent operational information to aircraft in flight; composite separation; automatic recording of radar data; traffic information broadcasts by aircraft.	2 April 1982 2 August 1982 25 November 1982
30	ATS Data Acquisition, Processing and Transfer (ADAPT) Panel, Third Meeting (1981); AGA Divisional Meeting (1981); Air Navigation Commission	ATS requirements for communications; marking of surface wind indicators; surface movement guidance and control systems; units of measurement; definitions.	16 March 1983 29 July 1983 24 November 1983
31	Council; Air Navigation Commission	Civil-military coordination; in-flight contingencies involving strayed or unidentified aircraft and/or interception of civil aircraft; requirements for communications; traffic information broadcasts by aircraft.	12 March 1986 27 July 1986 20 November 1986
32 (8th Edition)	Review of the General Concept of Separation Panel (RGCSP), Fifth Meeting (1985); Air Navigation Commission	Definitions; Coordinated Universal Time (UTC); volcanic ash warnings; establishment of ATS routes defined by VOR; deletion of Attachments A, B, C, D, F and G.	18 March 1987 27 July 1987 19 November 1987
33 (9th Edition)	Secretariat; Visual Flight Rules Operations Panel, Third Meeting (1986); Air Navigation Commission; amendments consequential to the adoption of amendments to Annex 6	Operation of aircraft in mixed VFR/IFR; ATS requirements for NOTAM action; surface movement guidance and control; and ATS responsibilities regarding acts of unlawful interference.	12 March 1990 30 July 1990 14 November 1991
34	Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel, Fourth Meeting (SICASP/4) (1989)	Definitions; provision of air traffic services irrespective of airborne collision avoidance system (ACAS) operation.	26 February 1993 26 July 1993 11 November 1993

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
35 (10th Edition)	Review of the General Concept of Separation Panel (RGCSP), Sixth Meeting (1988), Seventh Meeting (1990), Eighth Meeting (1993); Automatic Dependent Surveillance Panel (ADSP), Second Meeting (1992); Air Navigation Commission	Definitions; reduced vertical separation minimum of 300 m (1 000 ft) vertical separation minimum above FL 290; integration of helicopter traffic with conventional aeroplane traffic; establishment of ATS routes defined by VOR and establishment of ATS routes for use by RNAV-equipped aircraft; required navigation performance; automatic dependent surveillance; provisions relating to the World Geodetic System — 1984 (WGS-84) geodetic datum; transmission of information to aircraft on radioactive material and toxic chemical "clouds".	18 March 1994 25 July 1994 10 November 1994
36	Fourth Meeting of the Secondary Surveillance Radar Improvements and Collision Avoidance Systems Panel (SICASP/4); Thirteenth and Fourteenth Meetings of the All Weather Operations Panel (AWOP/13 and 14); Tenth Meeting of the Obstacle Clearance Panel (OCP/10)	Pressure-altitude reporting transponders; microwave landing system; en-route obstacle clearance criteria.	8 March 1996 15 July 1996 7 November 1996
37 (11th Edition)	Air Navigation Commission; Amendment 70 to Annex 3	Aeronautical databases; AIRMET information; wind shear.	20 March 1997 21 July 1997 6 November 1997
38 (12th Edition)	Automatic Dependent Surveillance Panel, Fourth Meeting (1996); Review of the General Concept of Separation Panel, Ninth Meeting (1996); Amendment 71 to Annex 3; Air Navigation Commission	Definitions; automatic dependent surveillance systems and procedures; data interchange between automated ATS systems; ATS applications for air-ground data links; separation between aircraft; RNP and RNAV for en-route operations; requirements for the uplink of OPMET information to aircraft in flight; volcanic ash advisories; Human Factors.	19 March 1998 20 July 1998 5 November 1998
39	Air Navigation Commission	ATS airspace classifications; visual meteorological conditions; and minimum safe altitude warning.	10 March 1999 19 July 1999 4 November 1999
40 (13th Edition)	Air Navigation Commission; Fifth Meeting of the Automatic Dependent Surveillance Panel (ADSP/5); Thirty-ninth Meeting of the European Air Navigation Planning Group (EANPG); Twelfth Meeting of the Obstacle Clearance Panel (OCP/12); Amendments 25, 20 and 7 to Annex 6, Parts I, II and III, respectively; Secretariat	Definitions; ATS safety management; ADS to indicate state of aircraft emergency; flexible use of airspace; minimum flight altitudes; terrain clearance during radar vectoring; downstream clearance delivery service; transfer of responsibility for control; read-back of clearances; air traffic flow management; automatic terminal information service; VOLMET and D-VOLMET; equipment in ATS units and criteria for indicators(s) for RVR values; editorial amendments.	12 March 2001 16 July 2001 1 November 2001

Amendment(s)	*Source(s)*	*Subject(s)*	*Adopted/approved* *Effective* *Applicable*
41	Tenth meeting of the Review of the General Concept of Separation Panel (RGCSP/10); Seventeenth meeting of the Dangerous Goods Panel (DGP/17)	Spacing between parallel area navigation (RNAV) routes; and notification of dangerous goods information to rescue coordination centres (RCCs).	21 February 2002 15 July 2002 28 November 2002
42	Laser Emitters and Flight Safety Study Group; Secretariat; the Proficiency Requirements in Common English Study Group; Air Navigation Commission	Laser beam emissions; language proficiency requirements; and air traffic contingency measures.	7 March 2003 14 July 2003 27 November 2003
43	Secretariat; Aeronautical Information Services/ Aeronautical Charts (AIS/MAP) Divisional Meeting (1998)	Definitions; use of surface movement radar; ATS requirements for communications; meteorology information; height-keeping performance by aircraft; ATS safety management; electronic terrain and obstacle data; editorial amendments.	2 March 2005 11 July 2005 24 November 2005
44	35th Session of the ICAO Assembly; Eleventh Air Navigation Conference; Air Navigation Commission	ATS safety management; recording devices.	14 March 2006 17 July 2006 23 November 2006

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

Note 1.— Throughout the text of this document the term "service" is used as an abstract noun to designate functions, or service rendered; the term "unit" is used to designate a collective body performing a service.

Note 2.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU) (see Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including statement of approved ICAO policies (*Doc 9718)).*

When the following terms are used in the Standards and Recommended Practices for Air Traffic Services, they have the following meanings:

Accepting unit. Air traffic control unit next to take control of an aircraft.

Accident. An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:

— being in the aircraft, or

— direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or

— direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

— adversely affects the structural strength, performance or flight characteristics of the aircraft, and

— would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Advisory airspace. An airspace of defined dimensions, or designated route, within which air traffic advisory service is available.

Advisory route. A designated route along which air traffic advisory service is available.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome control service. Air traffic control service for aerodrome traffic.

Aerodrome control tower. A unit established to provide air traffic control service to aerodrome traffic.

Aerodrome traffic. All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome.

Note.— An aircraft is in the vicinity of an aerodrome when it is in, entering or leaving an aerodrome traffic circuit.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical telecommunication station. A station in the aeronautical telecommunication service.

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Air-ground communication. Two-way communication between aircraft and stations or locations on the surface of the earth.

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

Air-taxiing. Movement of a helicopter/VTOL above the surface of an aerodrome, normally in ground effect and at a ground speed normally less than 37 km/h (20 kt).

Note.— The actual height may vary, and some helicopters may require air-taxiing above 8 m (25 ft) AGL to reduce ground effect turbulence or provide clearance for cargo slingloads.

Air traffic. All aircraft in flight or operating on the manoeuvring area of an aerodrome.

Air traffic advisory service. A service provided within advisory airspace to ensure separation, in so far as practical, between aircraft which are operating on IFR flight plans.

Air traffic control clearance. Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.

Note 1.— For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.

Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates.

Air traffic control service. A service provided for the purpose of:

a) preventing collisions:

   1) between aircraft, and

   2) on the manoeuvring area between aircraft and obstructions; and

b) expediting and maintaining an orderly flow of air traffic.

Air traffic control unit. A generic term meaning variously, area control centre, approach control unit or aerodrome control tower.

Air traffic flow management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Air traffic service. A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services airspaces. Airspaces of defined dimensions, alphabetically designated, within which specific types of flights may operate and for which air traffic services and rules of operation are specified.

Note.— ATS airspaces are classified as Class A to G as described in 2.6.

Air traffic services reporting office. A unit established for the purpose of receiving reports concerning air traffic services and flight plans submitted before departure.

Note.— An air traffic services reporting office may be established as a separate unit or combined with an existing unit, such as another air traffic services unit, or a unit of the aeronautical information service.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Airway. A control area or portion thereof established in the form of a corridor.

ALERFA. The code word used to designate an alert phase.

Alerting service. A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Alert phase. A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

ETOPS en-route alternate. A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shutdown or other abnormal or emergency condition while en route in an ETOPS operation.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level.

Approach control service. Air traffic control service for arriving or departing controlled flights.

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Apron management service. A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.

Area control centre. A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Area control service. Air traffic control service for controlled flights in control areas.

Area navigation (RNAV). A method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Area navigation route. An ATS route established for the use of aircraft capable of employing area navigation.

ATS route. A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term "ATS route" is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.

Note 2.— An ATS route is defined by route specifications which include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

Automatic dependent surveillance (ADS). A surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Base turn. A turn executed by the aircraft during the initial approach between the end of the outbound track and the beginning of the intermediate or final approach track. The tracks are not reciprocal.

Note.— Base turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Change-over point. The point at which an aircraft navigating on an ATS route segment defined by reference to very high frequency omnidirectional radio ranges is expected to transfer its primary navigational reference from the facility behind the aircraft to the next facility ahead of the aircraft.

Note.— Change-over points are established to provide the optimum balance in respect of signal strength and quality between facilities at all levels to be used and to ensure a common source of azimuth guidance for all aircraft operating along the same portion of a route segment.

Clearance limit. The point to which an aircraft is granted an air traffic control clearance.

Conference communications. Communication facilities whereby direct speech conversation may be conducted between three or more locations simultaneously.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

Controlled aerodrome. An aerodrome at which air traffic control service is provided to aerodrome traffic.

Note.— The term "controlled aerodrome" indicates that air traffic control service is provided to aerodrome traffic but does not necessarily imply that a control zone exists.

Controlled airspace. An airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification.

Note.— Controlled airspace is a generic term which covers ATS airspace Classes A, B, C, D and E as described in 2.6.

Controlled flight. Any flight which is subject to an air traffic control clearance.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Control zone. A controlled airspace extending upwards from the surface of the earth to a specified upper limit.

Cruising level. A level maintained during a significant portion of a flight.

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Data link communications. A form of communication intended for the exchange of messages via a data link.

Data quality. A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Declared capacity. A measure of the ability of the ATC system or any of its subsystems or operating positions to provide service to aircraft during normal activities. It is expressed as the number of aircraft entering a specified portion of airspace in a given period of time, taking due account of weather, ATC unit configuration, staff and equipment available, and any other factors that may affect the workload of the controller responsible for the airspace.

DETRESFA. The code word used to designate a distress phase.

Distress phase. A situation wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

***Downstream clearance*.** A clearance issued to an aircraft by an air traffic control unit that is not the current controlling authority of that aircraft.

Emergency phase. A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.

Final approach. That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or

b) at the point of interception of the last track specified in the approach procedure; and

ends at a point in the vicinity of an aerodrome from which:

1) a landing can be made; or

2) a missed approach procedure is initiated.

* All ISO Standards are listed at the end of this chapter.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region. An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight information service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Note.— Specifications for flight plans are contained in Annex 2. When the expression "flight plan form" is used it denotes the model flight plan form at Appendix 2 to the PANS-ATM.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

IFR. The symbol used to designate the instrument flight rules.

IFR flight. A flight conducted in accordance with the instrument flight rules.

IMC. The symbol used to designate instrument meteorological conditions.

INCERFA. The code word used to designate an uncertainty phase.

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual (ADREP Manual) *(Doc 9156).*

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Annex 2.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

International NOTAM office. An office designated by a State for the exchange of NOTAM internationally.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Meteorological office. An office designated to provide meteorological service for international air navigation.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Printed communications. Communications which automatically provide a permanent printed record at each terminal of a circuit of all messages which pass over such circuit.

Radiotelephony. A form of radiocommunication primarily intended for the exchange of information in the form of speech.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Rescue coordination centre. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

RNP type. A containment value expressed as a distance in nautical miles from the intended position within which flights would be for at least 95 per cent of the total flying time.

Example.— RNP 4 represents a navigation accuracy of plus or minus 7.4 km (4 NM) on a 95 per cent containment basis.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Safety programme. An integrated set of regulations and activities aimed at improving safety.

Safety management system. A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

Significant point. A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.

Special VFR flight. A VFR flight cleared by air traffic control to operate within a control zone in meteorological conditions below VMC.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Taxiing. Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Terminal control area. A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Traffic avoidance advice. Advice provided by an air traffic services unit specifying manoeuvres to assist a pilot to avoid a collision.

Traffic information. Information issued by an air traffic services unit to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of flight and to help the pilot avoid a collision.

Transfer of control point. A defined point located along the flight path of an aircraft, at which the responsibility for providing air traffic control service to the aircraft is transferred from one control unit or control position to the next.

Transferring unit. Air traffic control unit in the process of transferring the responsibility for providing air traffic control service to an aircraft to the next air traffic control unit along the route of flight.

Uncertainty phase. A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

VFR. The symbol used to designate the visual flight rules.

VFR flight. A flight conducted in accordance with the visual flight rules.

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.

Note.— The specified minima are contained in Annex 2.

VMC. The symbol used to designate visual meteorological conditions.

Waypoint. A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. Waypoints are identified as either:

Fly-by waypoint. A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure, or

Flyover waypoint. A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.

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* ISO Standard
19104 — *Geographic information — Terminology*
19108 — *Geographic information — Temporal schema*

CHAPTER 2. GENERAL

2.1 Establishment of authority

2.1.1 Contracting States shall determine, in accordance with the provisions of this Annex and for the territories over which they have jurisdiction, those portions of the airspace and those aerodromes where air traffic services will be provided. They shall thereafter arrange for such services to be established and provided in accordance with the provisions of this Annex, except that, by mutual agreement, a State may delegate to another State the responsibility for establishing and providing air traffic services in flight information regions, control areas or control zones extending over the territories of the former.

Note.— If one State delegates to another State the responsibility for the provision of air traffic services over its territory, it does so without derogation of its national sovereignty. Similarly, the providing State's responsibility is limited to technical and operational considerations and does not extend beyond those pertaining to the safety and expedition of aircraft using the concerned airspace. Furthermore, the providing State in providing air traffic services within the territory of the delegating State will do so in accordance with the requirements of the latter which is expected to establish such facilities and services for the use of the providing State as are jointly agreed to be necessary. It is further expected that the delegating State would not withdraw or modify such facilities and services without prior consultation with the providing State. Both the delegating and providing States may terminate the agreement between them at any time.

2.1.2 Those portions of the airspace over the high seas or in airspace of undetermined sovereignty where air traffic services will be provided shall be determined on the basis of regional air navigation agreements. A Contracting State having accepted the responsibility to provide air traffic services in such portions of airspace shall thereafter arrange for the services to be established and provided in accordance with the provisions of this Annex.

Note 1.— The phrase "regional air navigation agreements" refers to the agreements approved by the Council of ICAO normally on the advice of Regional Air Navigation Meetings.

Note 2.— The Council, when approving the Foreword to this Annex, indicated that a Contracting State accepting the responsibility for providing air traffic services over the high seas or in airspace of undetermined sovereignty may apply the Standards and Recommended Practices in a manner consistent with that adopted for airspace under its jurisdiction.

2.1.3 When it has been determined that air traffic services will be provided, the States concerned shall designate the authority responsible for providing such services.

Note 1.— The authority responsible for establishing and providing the services may be a State or a suitable Agency.

Note 2.— Situations which arise in respect of the establishment and provision of air traffic services to either part or whole of an international flight are as follows:

Situation 1: *A route, or portion of a route, contained within airspace under the sovereignty of a State establishing and providing its own air traffic services.*

Situation 2: *A route, or portion of a route, contained within airspace under the sovereignty of a State which has, by mutual agreement, delegated to another State, responsibility for the establishment and provision of air traffic services.*

Situation 3: *A portion of a route contained within airspace over the high seas or in airspace of undetermined sovereignty for which a State has accepted the responsibility for the establishment and provision of air traffic services.*

For the purpose of this Annex, the State which designates the authority responsible for establishing and providing the air traffic services is:

in Situation 1: *the State having sovereignty over the relevant portion of the airspace;*

in Situation 2: *the State to whom responsibility for the establishment and provision of air traffic services has been delegated;*

in Situation 3: *the State which has accepted the responsibility for the establishment and provision of air traffic services.*

2.1.4 Where air traffic services are established, information shall be published as necessary to permit the utilization of such services.

2.2 Objectives of the air traffic services

The objectives of the air traffic services shall be to:

a) prevent collisions between aircraft;

b) prevent collisions between aircraft on the manoeuvring area and obstructions on that area;

c) expedite and maintain an orderly flow of air traffic;

d) provide advice and information useful for the safe and efficient conduct of flights;

e) notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

2.3 Divisions of the air traffic services

The air traffic services shall comprise three services identified as follows.

2.3.1 The *air traffic control service*, to accomplish objectives a), b) and c) of 2.2, this service being divided in three parts as follows:

a) *Area control service:* the provision of air traffic control service for controlled flights, except for those parts of such flights described in 2.3.1 b) and c), in order to accomplish objectives a) and c) of 2.2;

b) *Approach control service:* the provision of air traffic control service for those parts of controlled flights associated with arrival or departure, in order to accomplish objectives a) and c) of 2.2;

c) *Aerodrome control service:* the provision of air traffic control service for aerodrome traffic, except for those parts of flights described in 2.3.1 b), in order to accomplish objectives a), b) and c) of 2.2.

2.3.2 The *flight information service*, to accomplish objective d) of 2.2.

2.3.3 The *alerting service,* to accomplish objective e) of 2.2.

2.4 Determination of the need for air traffic services

2.4.1 The need for the provision of air traffic services shall be determined by consideration of the following:

a) the types of air traffic involved;

b) the density of air traffic;

c) the meteorological conditions;

d) such other factors as may be relevant.

Note.— Due to the number of elements involved, it has not been possible to develop specific data to determine the need for air traffic services in a given area or at a given location. For example:

a) a mixture of different types of air traffic with aircraft of varying speeds (conventional jet, etc.) might necessitate the provision of air traffic services, whereas a relatively greater density of traffic where only one type of operation is involved would not;

b) meteorological conditions might have considerable effect in areas where there is a constant flow of air traffic (e.g. scheduled traffic), whereas similar or worse meteorological conditions might be relatively unimportant in an area where air traffic would be discontinued in such conditions (e.g. local VFR flights);

c) open stretches of water, mountainous, uninhabited or desert areas might necessitate the provision of air traffic services even though the frequency of operations is extremely low.

2.4.2 The carriage of airborne collision avoidance systems (ACAS) by aircraft in a given area shall not be a factor in determining the need for air traffic services in that area.

2.5 Designation of the portions of the airspace and controlled aerodromes where air traffic services will be provided

2.5.1 When it has been determined that air traffic services will be provided in particular portions of the airspace or at particular aerodromes, then those portions of the airspace or those aerodromes shall be designated in relation to the air traffic services that are to be provided.

2.5.2 The designation of the particular portions of the airspace or the particular aerodromes shall be as follows:

2.5.2.1 *Flight information regions.* Those portions of the airspace where it is determined that flight information service and alerting service will be provided shall be designated as flight information regions.

2.5.2.2 *Control areas and control zones*

2.5.2.2.1 Those portions of the airspace where it is determined that air traffic control service will be provided to IFR flights shall be designated as control areas or control zones.

Note.— The distinction between control areas and control zones is made in 2.9.

2.5.2.2.1.1 Those portions of controlled airspace wherein it is determined that air traffic control service will also be provided to VFR flights shall be designated as Classes B, C, or D airspace.

2.5.2.2.2 Where designated within a flight information region, control areas and control zones shall form part of that flight information region.

2.5.2.3 *Controlled aerodromes.* Those aerodromes where it is determined that air traffic control service will be provided to aerodrome traffic shall be designated as controlled aerodromes.

2.6 Classification of airspaces

2.6.1 ATS airspaces shall be classified and designated in accordance with the following:

Class A. IFR flights only are permitted, all flights are provided with air traffic control service and are separated from each other.

Class B. IFR and VFR flights are permitted, all flights are provided with air traffic control service and are separated from each other.

Class C. IFR and VFR flights are permitted, all flights are provided with air traffic control service and IFR flights are separated from other IFR flights and from VFR flights. VFR flights are separated from IFR flights and receive traffic information in respect of other VFR flights.

Class D. IFR and VFR flights are permitted and all flights are provided with air traffic control service, IFR flights are separated from other IFR flights and receive traffic information in respect of VFR flights, VFR flights receive traffic information in respect of all other flights.

Class E. IFR and VFR flights are permitted, IFR flights are provided with air traffic control service and are separated from other IFR flights. All flights receive traffic information as far as is practical. Class E shall not be used for control zones.

Class F. IFR and VFR flights are permitted, all participating IFR flights receive an air traffic advisory service and all flights receive flight information service if requested.

Note.— Where air traffic advisory service is implemented, this is considered normally as a temporary measure only until such time as it can be replaced by air traffic control. (See also PANS-ATM, Chapter 9.)

Class G. IFR and VFR flights are permitted and receive flight information service if requested.

2.6.2 States shall select those airspace classes appropriate to their needs.

2.6.3 The requirements for flights within each class of airspace shall be as shown in the table in Appendix 4.

Note.— Where the ATS airspaces adjoin vertically, i.e. one above the other, flights at a common level would comply with requirements of, and be given services applicable to, the less restrictive class of airspace. In applying these criteria, Class B airspace is therefore considered less restrictive than Class A airspace; Class C airspace less restrictive than Class B airspace, etc.

2.7 Required navigation performance (RNP) for en-route operations

2.7.1 RNP types shall be prescribed by States. When applicable, the RNP type(s) for designated areas, tracks or ATS routes shall be prescribed on the basis of regional air navigation agreements.

2.7.2 **Recommendation.—** *For the en-route phase of flight, RNP types RNP 1, RNP 4, RNP 10, RNP 12.6 and RNP 20 should be implemented as soon as practicable.*

2.7.3 The prescribed RNP type shall be appropriate to the level of communications, navigation and air traffic services provided in the airspace concerned.

Note.— Applicable RNP types and associated procedures are published in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

2.8 Establishment and designation of the units providing air traffic services

The air traffic services shall be provided by units established and designated as follows:

2.8.1 Flight information centres shall be established to provide flight information service and alerting service within flight information regions, unless the responsibility of providing such services within a flight information region is assigned to an air traffic control unit having adequate facilities for the discharge of such responsibility.

Note.— This does not preclude delegating to other units the function of providing certain elements of the flight information service.

2.8.2 Air traffic control units shall be established to provide air traffic control service, flight information service and alerting service within control areas, control zones and at controlled aerodromes.

Note.— The services to be provided by various air traffic control units are indicated in 3.2.

2.9 Specifications for flight information regions, control areas and control zones

2.9.1 **Recommendation.—** *The delineation of airspace, wherein air traffic services are to be provided, should be related to the nature of the route structure and the need for efficient service rather than to national boundaries.*

Note 1.— Agreements to permit the delineation of airspace lying across national boundaries are advisable when such action will facilitate the provision of air traffic services (see 2.1.1). Agreements which permit delineation of airspace boundaries by straight lines will, for example, be most convenient where data processing techniques are used by air traffic services units.

Note 2.— Where delineation of airspace is made by reference to national boundaries there is a need for suitably sited transfer points to be mutually agreed upon.

2.9.2 Flight information regions

2.9.2.1 Flight information regions shall be delineated to cover the whole of the air route structure to be served by such regions.

2.9.2.2 A flight information region shall include all airspace within its lateral limits, except as limited by an upper flight information region.

2.9.2.3 Where a flight information region is limited by an upper flight information region, the lower limit specified for the upper flight information region shall constitute the upper vertical limit of the flight information region and shall coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.

Note.— In cases where an upper flight information region is established the procedures applicable therein need not be identical with those applicable in the underlying flight information region.

2.9.3 Control areas

2.9.3.1 Control areas including, *inter alia,* airways and terminal control areas shall be delineated so as to encompass sufficient airspace to contain the flight paths of those IFR flights or portions thereof to which it is desired to provide the applicable parts of the air traffic control service, taking into account the capabilities of the navigation aids normally used in that area.

Note.— In a control area other than one formed by a system of airways, a system of routes may be established to facilitate the provision of air traffic control.

2.9.3.2 A lower limit of a control area shall be established at a height above the ground or water of not less than 200 m (700 ft).

Note.— This does not imply that the lower limit has to be established uniformly in a given control area (see Figure A-5 of the Air Traffic Services Planning Manual *(Doc 9426), Part I, Section 2, Chapter 3).*

2.9.3.2.1 **Recommendation.—** *The lower limit of a control area should, when practicable and desirable in order to allow freedom of action for VFR flights below the control area, be established at a greater height than the minimum specified in 2.9.3.2.*

2.9.3.2.2 **Recommendation.—** *When the lower limit of a control area is above 900 m (3 000 ft) MSL it should coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.*

Note.— This implies that the selected VFR cruising level be such that expected local atmospheric pressure variations do not result in a lowering of this limit to a height of less than 200 m (700 ft) above ground or water.

2.9.3.3 An upper limit of a control area shall be established when either:

a) air traffic control service will not be provided above such upper limit; or

b) the control area is situated below an upper control area, in which case the upper limit shall coincide with the lower limit of the upper control area.

When established, such upper limit shall coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.

2.9.4 Flight information regions or control areas in the upper airspace

Recommendation.— *Where it is desirable to limit the number of flight information regions or control areas through which high flying aircraft would otherwise have to operate, a flight information region or control area, as appropriate, should be delineated to include the upper airspace within the lateral limits of a number of lower flight information regions or control areas.*

2.9.5 Control zones

2.9.5.1 The lateral limits of control zones shall encompass at least those portions of the airspace, which are not within control areas, containing the paths of IFR flights arriving at and departing from aerodromes to be used under instrument meteorological conditions.

Note.— Aircraft holding in the vicinity of aerodromes are considered as arriving aircraft.

2.9.5.2 The lateral limits of a control zone shall extend to at least 9.3 km (5 NM) from the centre of the aerodrome or aerodromes concerned in the directions from which approaches may be made.

Note.— A control zone may include two or more aerodromes situated close together.

2.9.5.3 If a control zone is located within the lateral limits of a control area, it shall extend upwards from the surface of the earth to at least the lower limit of the control area.

Note.— An upper limit higher than the lower limit of the overlying control area may be established when desired.

2.9.5.4 **Recommendation.—** *If a control zone is located outside of the lateral limits of a control area, an upper limit should be established.*

2.9.5.5 **Recommendation.—** *If it is desired to establish the upper limit of a control zone at a level higher than the lower limit of the control area established above it, or if the control zone is located outside of the lateral limits of a control area, its upper limit should be established at a level which can easily be identified by pilots. When this limit is above 900 m (3 000 ft) MSL it should coincide with a VFR cruising level of the tables in Appendix 3 to Annex 2.*

Note.— This implies that, if used, the selected VFR cruising level be such that expected local atmospheric pressure variations do not result in a lowering of this limit to a height of less than 200 m (700 ft) above ground or water.

2.10 Identification of air traffic services units and airspaces

2.10.1 **Recommendation.—** *An area control centre or flight information centre should be identified by the name of a nearby town or city or geographic feature.*

2.10.2 **Recommendation.—** *An aerodrome control tower or approach control unit should be identified by the name of the aerodrome at which it is located.*

2.10.3 **Recommendation.—** *A control zone, control area or flight information region should be identified by the name of the unit having jurisdiction over such airspace.*

2.11 Establishment and identification of ATS routes

2.11.1 When ATS routes are established, a protected airspace along each ATS route and a safe spacing between adjacent ATS routes shall be provided.

2.11.2 **Recommendation**.— *When warranted by density, complexity or nature of the traffic, special routes should be established for use by low-level traffic, including helicopters operating to and from helidecks on the high seas. When determining the lateral spacing between such routes, account should be taken of the navigational means available and the navigation equipment carried on board helicopters.*

2.11.3 ATS routes shall be identified by designators.

2.11.4 Designators for ATS routes other than standard departure and arrival routes shall be selected in accordance with the principles set forth in Appendix 1.

2.11.5 Standard departure and arrival routes and associated procedures shall be identified in accordance with the principles set forth in Appendix 3.

Note 1.— Guidance material relating to the establishment of ATS routes is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

Note 2.— Guidance material relating to the establishment of ATS routes defined by VOR is contained in Attachment A.

Note 3.— The spacing between parallel tracks or between parallel ATS route centre lines for which an RNP type is required will be dependent upon the relevant RNP type specified. Guidance material relating to the establishment of ATS routes for use by RNAV-equipped aircraft and to the spacing between routes based on RNP type is contained in Attachment B.

2.12 Establishment of change-over points

2.12.1 **Recommendation.—** *Change-over points should be established on ATS route segments defined by reference to very high frequency omnidirectional radio ranges where this will assist accurate navigation along the route segments. The establishment of change-over points should be limited to route segments of 110 km (60 NM) or more, except where the complexity of ATS routes, the density of navigation aids or other technical and operational reasons warrant the establishment of change-over points on shorter route segments.*

2.12.2 **Recommendation.—** *Unless otherwise established in relation to the performance of the navigation aids or frequency protection criteria, the change-over point on a route segment should be the mid-point between the facilities in the case of a straight route segment or the intersection of radials in the case of a route segment which changes direction between the facilities.*

Note.— Guidance on the establishment of change-over points is contained in Attachment A.

2.13 Establishment and identification of significant points

2.13.1 Significant points shall be established for the purpose of defining an ATS route and/or in relation to the requirements of air traffic services for information regarding the progress of aircraft in flight.

2.13.2 Significant points shall be identified by designators.

2.13.3 Significant points shall be established and identified in accordance with the principles set forth in Appendix 2.

2.14 Establishment and identification of standard routes for taxiing aircraft

2.14.1 **Recommendation.—** *Where necessary, standard routes for taxiing aircraft should be established on an aerodrome between runways, aprons and maintenance areas. Such routes should be direct, simple and where practicable, designed to avoid traffic conflicts.*

2.14.2 **Recommendation.—** *Standard routes for taxiing aircraft should be identified by designators distinctively different from those of the runways and ATS routes.*

2.15 Coordination between the operator and air traffic services

2.15.1 Air traffic services units, in carrying out their objectives, shall have due regard for the requirements of the operators consequent on their obligations as specified in Annex 6, and, if so required by the operators, shall make available to them or their designated representatives such information as may be available to enable them or their designated representatives to carry out their responsibilities.

2.15.2 When so requested by an operator, messages (including position reports) received by air traffic services units and relating to the operation of the aircraft for which operational control service is provided by that operator shall, so far as practicable, be made available immediately to the operator or a designated representative in accordance with locally agreed procedures.

2.16 Coordination between military authorities and air traffic services

2.16.1 Air traffic services authorities shall establish and maintain close cooperation with military authorities responsible for activities that may affect flights of civil aircraft.

2.16.2 Coordination of activities potentially hazardous to civil aircraft shall be effected in accordance with 2.17.

2.16.3 Arrangements shall be made to permit information relevant to the safe and expeditious conduct of flights of civil aircraft to be promptly exchanged between air traffic services units and appropriate military units.

2.16.3.1 Air traffic services units shall, either routinely or on request, in accordance with locally agreed procedures, provide appropriate military units with pertinent flight plan and other data concerning flights of civil aircraft. In order to eliminate or reduce the need for interceptions, air traffic services authorities shall designate any areas or routes where the requirements of Annex 2 concerning flight plans, two-way communications and position reporting apply to all flights to ensure that all pertinent data is available in appropriate air traffic services units specifically for the purpose of facilitating identification of civil aircraft.

2.16.3.2 Special procedures shall be established in order to ensure that:

a) air traffic services units are notified if a military unit observes that an aircraft which is, or might be, a civil aircraft is approaching, or has entered, any area in which interception might become necessary;

b) all possible efforts are made to confirm the identity of the aircraft and to provide it with the navigational guidance necessary to avoid the need for interception.

2.17 Coordination of activities potentially hazardous to civil aircraft

2.17.1 The arrangements for activities potentially hazardous to civil aircraft, whether over the territory of a State or over the high seas, shall be coordinated with the appropriate air traffic services authorities. The coordination shall be effected early enough to permit timely promulgation of information regarding the activities in accordance with the provisions of Annex 15.

2.17.1.1 **Recommendation.—** *If the appropriate ATS authority is not that of the State where the organization planning the activities is located, initial coordination should be effected through the ATS authority responsible for the airspace over the State where the organization is located.*

2.17.2 The objective of the coordination shall be to achieve the best arrangements which will avoid hazards to civil aircraft and minimize interference with the normal operations of such aircraft.

2.17.2.1 **Recommendation.—** *In determining these arrangements the following should be applied:*

a) the locations or areas, times and durations for the activities should be selected to avoid closure or realignment of established ATS routes, blocking of the most economic flight levels, or delays of scheduled aircraft operations, unless no other options exist;

b) the size of the airspace designated for the conduct of the activities should be kept as small as possible;

c) direct communication between the appropriate ATS authority or air traffic services unit and the organization or unit conducting the activities should be provided for use in the event that civil aircraft emergencies or other unforeseen circumstances require discontinuation of the activities.

2.17.3 The appropriate ATS authorities shall be responsible for initiating the promulgation of information regarding the activities.

2.17.4 **Recommendation.—** *If activities potentially hazardous to civil aircraft take place on a regular or continuing basis, special committees should be established as required to ensure that the requirements of all parties concerned are adequately coordinated.*

2.17.5 Adequate steps shall be taken to prevent emission of laser beams from adversely affecting flight operations.

Note 1.— Guidance material regarding the hazardous effects of laser emitters on flight operations is contained in the Manual on Laser Emitters and Flight Safety (*Doc 9815*).

Note 2.— See also Annex 14 — Aerodromes, *Volume I —* Aerodrome Design and Operations, *Chapter 5.*

2.17.6 **Recommendation.—** *In order to provide added airspace capacity and to improve efficiency and flexibility of aircraft operations, States should establish procedures providing for a flexible use of airspace reserved for military or other special activities. The procedures should permit all airspace users to have safe access to such reserved airspace.*

2.18 Aeronautical data

2.18.1 Determination and reporting of air traffic services-related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables 1 to 5 contained in Appendix 5 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level, and in that respect three types of positional data shall be identified: surveyed points (e.g. navigation aids positions), calculated points (mathematical calculations from the known surveyed points of points in space/fixes) and declared points (e.g. flight information region boundary points).

Note.— Specifications governing the quality system are given in Annex 15, Chapter 3.

2.18.2 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classifications and data integrity levels shall apply:

a) critical data, integrity level 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data, integrity level 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) routine data, integrity level 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

2.18.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.18.2, a 32- or 24-bit CRC algorithm shall apply respectively.

2.18.4 **Recommendation.—** *To achieve protection of the integrity level of routine aeronautical data as classified in 2.18.2, a 16-bit CRC algorithm should apply.*

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendix 5 related to accuracy and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 —* Industry Requirements for Aeronautical Information.

2.18.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Appendix 5, Table 1.

2.18.6 The order of accuracy of the field work and determinations and calculations derived therefrom shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated in the tables contained in Appendix 5.

Note 1.— An appropriate reference frame is that which enables WGS-84 to be realized on a given position and with respect to which all coordinate data are related.

Note 2.— Specifications governing the publication of aeronautical data are given in Annex 4, Chapter 2 and Annex 15, Chapter 3.

Note 3.— For those fixes and points that are serving a dual purpose, e.g. holding point and missed approach point, the higher accuracy applies.

2.19 Coordination between meteorological and air traffic services authorities

2.19.1 To ensure that aircraft receive the most up-to-date meteorological information for aircraft operations, arrangements shall be made, where necessary, between meteorological and air traffic services authorities for air traffic services personnel:

a) in addition to using indicating instruments, to report, if observed by air traffic services personnel or communicated by aircraft, such other meteorological elements as may be agreed upon;

b) to report as soon as possible to the associated meteorological office meteorological phenomena of operational significance, if observed by air traffic services personnel or communicated by aircraft, which have not been included in the aerodrome meteorological report;

c) to report as soon as possible to the associated meteorological office pertinent information concerning pre-eruption volcanic activity, volcanic eruptions and information concerning volcanic ash cloud. In addition, area control centres and flight information centres shall report the information to the associated meteorological watch office and volcanic ash advisory centres (VAACs).

Note 1.— VAACs are designated by regional air navigation agreements in accordance with Annex 3, Chapter 3, 3.5.1.

Note 2.— See 4.2.3 regarding transmission of special air-reports.

2.19.2 Close coordination shall be maintained between area control centres, flight information centres and associated meteorological watch offices to ensure that information on volcanic ash included in NOTAM and SIGMET messages is consistent.

2.20 Coordination between aeronautical information services and air traffic services authorities

2.20.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and air traffic services authorities responsible for air traffic services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on aerodrome conditions;

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) the occurrence of volcanic activity observed by air traffic services personnel or reported by aircraft; and

d) any other information considered to be of operational significance.

2.20.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issuance of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close coordination between those services concerned is therefore required.

2.20.3 Of particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the Aeronautical Information Regulation and Control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible air traffic services when submitting the raw information/data to aeronautical information services.

2.20.4 The air traffic services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do so while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 5 to this Annex.

Note 1.— Specifications for the issue of a NOTAM, SNOWTAM and ASHTAM are contained in Annex 15, Chapter 5.

Note 2.— Reports of volcanic activity comprise the information detailed in Annex 3, Chapter 4.

Note 3.— AIRAC information is distributed by the aeronautical information service at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 4.— The schedule of the predetermined, internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997, and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual *(Doc 8126, Chapter 2, 2.6).*

2.21 Minimum flight altitudes

Minimum flight altitudes shall be determined and promulgated by each Contracting State for each ATS route and control area over its territory. The minimum flight altitudes determined shall provide a minimum clearance above the controlling obstacle located within the areas concerned.

Note.— The requirements for publication by States of minimum flight altitudes and of the criteria used to determine them are contained in Annex 15, Appendix I. Detailed obstacle clearance criteria are contained in PANS-OPS (Doc 8168), Volume I, Part VI and Volume II, Part III and Part VI.

2.22 Service to aircraft in the event of an emergency

2.22.1 An aircraft known or believed to be in a state of emergency, including being subjected to unlawful interference, shall be given maximum consideration, assistance and priority over other aircraft as may be necessitated by the circumstances.

Note.— To indicate that it is in a state of emergency, an aircraft equipped with an appropriate data link capability and/ or an SSR transponder might operate the equipment as follows:

a) on Mode A, Code 7700; or

b) on Mode A, Code 7500, to indicate specifically that it is being subjected to unlawful interference; or

c) activate the appropriate emergency and/or urgency capability of ADS; or

d) transmit the appropriate emergency message via CPDLC.

2.22.1.1 **Recommendation.—** *In communications between ATS units and aircraft in the event of an emergency, Human Factors principles should be observed.*

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual *(Doc 9683).*

2.22.2 When an occurrence of unlawful interference with an aircraft takes place or is suspected, ATS units shall attend promptly to requests by the aircraft. Information pertinent to the safe conduct of the flight shall continue to be transmitted and necessary action shall be taken to expedite the conduct of all phases of the flight, especially the safe landing of the aircraft.

2.23 In-flight contingencies

2.23.1 Strayed or unidentified aircraft

Note 1.— The terms "strayed aircraft" and "unidentified aircraft" in this paragraph have the following meanings:

Strayed aircraft. *An aircraft which has deviated significantly from its intended track or which reports that it is lost.*

Unidentified aircraft. *An aircraft which has been observed or reported to be operating in a given area but whose identity has not been established.*

Note 2.— An aircraft may be considered, at the same time, as a "strayed aircraft" by one unit and as an "unidentified aircraft" by another unit.

2.23.1.1 As soon as an air traffic services unit becomes aware of a strayed aircraft it shall take all necessary steps as outlined in 2.23.1.1.1 and 2.23.1.1.2 to assist the aircraft and to safeguard its flight.

Note.— Navigational assistance by an air traffic services unit is particularly important if the unit becomes aware of an aircraft straying, or about to stray, into an area where there is a risk of interception or other hazard to its safety.

2.23.1.1.1 If the aircraft's position is not known, the air traffic services unit shall:

a) attempt to establish two-way communication with the aircraft, unless such communication already exists;

b) use all available means to determine its position;

c) inform other ATS units into whose area the aircraft may have strayed or may stray, taking into account all the factors which may have affected the navigation of the aircraft in the circumstances;

d) inform, in accordance with locally agreed procedures, appropriate military units and provide them with pertinent flight plan and other data concerning strayed aircraft;

e) request from the units referred to in c) and d) and from other aircraft in flight every assistance in establishing communication with the aircraft and determining its position.

Note.— The requirements in d) and e) apply also to ATS units informed in accordance with c).

2.23.1.1.2 When the aircraft's position is established, the air traffic services unit shall:

a) advise the aircraft of its position and corrective action to be taken; and

b) provide, as necessary, other ATS units and appropriate military units with relevant information concerning the strayed aircraft and any advice given to that aircraft.

2.23.1.2 As soon as an air traffic services unit becomes aware of an unidentified aircraft in its area, it shall endeavour to establish the identity of the aircraft whenever this is necessary for the provision of air traffic services or required by the appropriate military authorities in accordance with locally agreed procedures. To this end, the air traffic services unit shall take such of the following steps as are appropriate in the circumstances:

a) attempt to establish two-way communication with the aircraft;

b) inquire of other air traffic services units within the flight information region about the flight and request their assistance in establishing two-way communication with the aircraft;

c) inquire of air traffic services units serving the adjacent flight information regions about the flight and request their assistance in establishing two-way communication with the aircraft;

d) attempt to obtain information from other aircraft in the area.

2.23.1.2.1 The air traffic services unit shall, as necessary, inform the appropriate military unit as soon as the identity of the aircraft has been established.

2.23.2 Interception of civil aircraft

2.23.2.1 As soon as an air traffic services unit learns that an aircraft is being intercepted in its area of responsibility, it shall take such of the following steps as are appropriate in the circumstances:

a) attempt to establish two-way communication with the intercepted aircraft via any means available, including the emergency radio frequency 121.5 MHz, unless such communication already exists;

b) inform the pilot of the intercepted aircraft of the interception;

c) establish contact with the intercept control unit maintaining two-way communication with the intercepting aircraft and provide it with available information concerning the aircraft;

d) relay messages between the intercepting aircraft or the intercept control unit and the intercepted aircraft, as necessary;

e) in close coordination with the intercept control unit take all necessary steps to ensure the safety of the intercepted aircraft;

f) inform ATS units serving adjacent flight information regions if it appears that the aircraft has strayed from such adjacent flight information regions.

2.23.2.2 As soon as an air traffic services unit learns that an aircraft is being intercepted outside its area of responsibility, it shall take such of the following steps as are appropriate in the circumstances:

a) inform the ATS unit serving the airspace in which the interception is taking place, providing this unit with available information that will assist in identifying the aircraft and requesting it to take action in accordance with 2.23.2.1;

b) relay messages between the intercepted aircraft and the appropriate ATS unit, the intercept control unit or the intercepting aircraft.

2.24 Time in air traffic services

2.24.1 Air traffic services units shall use Coordinated Universal Time (UTC) and shall express the time in hours and minutes and, when required, seconds of the 24-hour day beginning at midnight.

2.24.2 Air traffic services units shall be equipped with clocks indicating the time in hours, minutes and seconds, clearly visible from each operating position in the unit concerned.

2.24.3 Air traffic services unit clocks and other time-recording devices shall be checked as necessary to ensure correct time to within plus or minus 30 seconds of UTC. Wherever data link communications are utilized by an air traffic services unit, clocks and other time-recording devices shall be checked as necessary to ensure correct time to within 1 second of UTC.

2.24.4 The correct time shall be obtained from a standard time station or, if not possible, from another unit which has obtained the correct time from such station.

2.24.5 Aerodrome control towers shall, prior to an aircraft taxiing for take-off, provide the pilot with the correct time, unless arrangements have been made for the pilot to obtain it from other sources. Air traffic services units shall, in addition, provide aircraft with the correct time on request. Time checks shall be given to the nearest half minute.

2.25 Establishment of requirements for carriage and operation of pressure-altitude reporting transponders

States shall establish requirements for carriage and operation of pressure-altitude reporting transponders within defined portions of airspace.

Note.— This provision is intended to improve the effectiveness of air traffic services as well as airborne collision avoidance systems.

2.26 Safety management

2.26.1 States shall establish a safety programme, in order to achieve an acceptable level of safety in the provision of ATS.

2.26.2 The acceptable level of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes and on defining acceptable levels of safety is contained in Attachment E and the Safety Management Manual (SMM) *(Doc 9859).*

2.26.3 States shall require, as part of their safety programme, that an air traffic services provider implements a safety management system acceptable to the State that, as a minimum:

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

2.26.4 A safety management system shall clearly define lines of safety accountability throughout the air traffic services provider, including a direct accountability for safety on the part of senior management.

Note.— Guidance on safety management systems is contained in the Safety Management Manual (SMM) *(Doc 9859), and associated procedures are contained in the* PANS-ATM *(Doc 4444).*

2.26.5 Any significant safety-related change to the ATS system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When appropriate, the responsible authority shall ensure that adequate provision is made for post-implementation monitoring to verify that the defined level of safety continues to be met.

Note.— When, due to the nature of the change, the acceptable level of safety cannot be expressed in quantitative terms, the safety assessment may rely on operational judgment.

2.27 Common reference systems

2.27.1 Horizontal reference system

World Geodetic System — 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system for air navigation. Reported aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674).*

2.27.2 Vertical reference system

Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system for air navigation.

Note.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

2.27.3 Temporal reference system

2.27.3.1 The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system for air navigation.

2.27.3.2 When a different temporal reference system is used, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP).

2.28 Language proficiency

2.28.1 An air traffic services provider shall ensure that air traffic controllers speak and understand the language(s) used for radiotelephony communications as specified in Annex 1.

2.28.2 Except when communications between air traffic control units are conducted in a mutually agreed language, the English language shall be used for such communications.

2.29 Contingency arrangements

Air traffic services authorities shall develop and promulgate contingency plans for implementation in the event of disruption, or potential disruption, of air traffic services and related supporting services in the airspace for which they are responsible for the provision of such services. Such contingency plans shall be developed with the assistance of ICAO as necessary, in close coordination with the air traffic services authorities responsible for the provision of services in adjacent portions of airspace and with airspace users concerned.

Note 1.— Guidance material relating to the development, promulgation and implementation of contingency plans is contained in Attachment D.

Note 2.— Contingency plans may constitute a temporary deviation from the approved regional air navigation plans; such deviations are approved, as necessary, by the President of the ICAO Council on behalf of the Council.

CHAPTER 3. AIR TRAFFIC CONTROL SERVICE

3.1 Application

Air traffic control service shall be provided:

a) to all IFR flights in airspace Classes A, B, C, D and E;

b) to all VFR flights in airspace Classes B, C and D;

c) to all special VFR flights;

d) to all aerodrome traffic at controlled aerodromes.

3.2 Provision of air traffic control service

The parts of air traffic control service described in 2.3.1 shall be provided by the various units as follows:

a) *Area control service:*

1) by an area control centre; or

2) by the unit providing approach control service in a control zone or in a control area of limited extent which is designated primarily for the provision of approach control service and where no area control centre is established.

b) *Approach control service:*

1) by an aerodrome control tower or area control centre when it is necessary or desirable to combine under the responsibility of one unit the functions of the approach control service with those of the aerodrome control service or the area control service;

2) by an approach control unit when it is necessary or desirable to establish a separate unit.

c) *Aerodrome control service:* by an aerodrome control tower.

Note.— The task of providing specified services on the apron, e.g. apron management service, may be assigned to an aerodrome control tower or to a separate unit.

3.3 Operation of air traffic control service

3.3.1 In order to provide air traffic control service, an air traffic control unit shall:

a) be provided with information on the intended movement of each aircraft, or variations therefrom, and with current information on the actual progress of each aircraft;

b) determine from the information received, the relative positions of known aircraft to each other;

c) issue clearances and information for the purpose of preventing collision between aircraft under its control and of expediting and maintaining an orderly flow of traffic;

d) coordinate clearances as necessary with other units:

1) whenever an aircraft might otherwise conflict with traffic operated under the control of such other units;

2) before transferring control of an aircraft to such other units.

3.3.2 Information on aircraft movements, together with a record of air traffic control clearances issued to such aircraft, shall be so displayed as to permit ready analysis in order to maintain an efficient flow of air traffic with adequate separation between aircraft.

3.3.3 **Recommendation.—** *Air traffic control units should be equipped with devices that record background communication and the aural environment at air traffic controller work stations, capable of retaining the information recorded during at least the last twenty-four hours of operation.*

Note.— Provisions related to the non-disclosure of recordings and transcripts of recordings from air traffic control units are contained in Annex 13, 5.12.

3.3.4 Clearances issued by air traffic control units shall provide separation:

a) between all flights in airspace Classes A and B;

b) between IFR flights in airspace Classes C, D and E;

c) between IFR flights and VFR flights in airspace Class C;

d) between IFR flights and special VFR flights;

e) between special VFR flights when so prescribed by the appropriate ATS authority,

except that, when requested by an aircraft and if so prescribed by the appropriate ATS authority for the cases listed under b) above in airspace Classes D and E, a flight may be cleared without separation being so provided in respect of a specific portion of the flight conducted in visual meteorological conditions.

3.3.5 Separation by an air traffic control unit shall be obtained by at least one of the following:

a) vertical separation, obtained by assigning different levels selected from:

   1) the appropriate table of cruising levels in Appendix 3 of Annex 2, or

   2) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 of Annex 2 for flight above FL 410,

   except that the correlation of levels to track as prescribed therein shall not apply whenever otherwise indicated in appropriate aeronautical information publications or air traffic control clearances;

b) horizontal separation, obtained by providing:

   1) longitudinal separation, by maintaining an interval between aircraft operating along the same, converging or reciprocal tracks, expressed in time or distance; or

   2) lateral separation, by maintaining aircraft on different routes or in different geographical areas;

c) composite separation, consisting of a combination of vertical separation and one of the other forms of separation contained in b) above, using minima for each which may be lower than, but not less than half of, those used for each of the combined elements when applied individually. Composite separation shall only be applied on the basis of regional air navigation agreements.

Note.— Guidance material relating to the implementation of composite lateral/vertical separation is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

3.3.5.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the implementation and continued application of this vertical separation minimum meets the safety objectives. The coverage of the height-monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators that operate in RVSM airspace.

Note.— The number of separate monitoring programmes should be restricted to the minimum necessary to effectively provide the required services for the region.

3.3.5.2 Arrangements shall be put in place, through interregional agreement, for the sharing between regions of data from monitoring programmes.

Note.— Guidance material relating to vertical separation and monitoring of height-keeping performance is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

3.4 Separation minima

3.4.1 The selection of separation minima for application within a given portion of airspace shall be as follows:

a) the separation minima shall be selected from those prescribed by the provisions of the PANS-ATM and the *Regional Supplementary Procedures* as applicable under the prevailing circumstances except that, where types of aids are used or circumstances prevail which are not covered by current ICAO provisions, other separation minima shall be established as necessary by:

   1) the appropriate ATS authority, following consultation with operators, for routes or portions of routes contained within the sovereign airspace of a State;

   2) regional air navigation agreements for routes or portions of routes contained within airspace over the high seas or over areas of undetermined sovereignty.

   Note.— Details of current separation minima prescribed by ICAO are contained in the PANS-ATM (Doc 4444) and Part 1 of the Regional Supplementary Procedures *(Doc 7030).*

b) the selection of separation minima shall be made in consultation between the appropriate ATS authorities responsible for the provision of air traffic services in neighbouring airspace when:

   1) traffic will pass from one into the other of the neighbouring airspaces;

   2) routes are closer to the common boundary of the neighbouring airspaces than the separation minima applicable in the circumstances.

Note.— The purpose of this provision is to ensure, in the first case, compatibility on both sides of the line of transfer of traffic, and, in the other case, adequate separation between aircraft operating on both sides of the common boundary.

3.4.2 Details of the selected separation minima and of their areas of application shall be notified:

a) to the ATS units concerned; and

b) to pilots and operators through aeronautical information publications, where separation is based on the use by aircraft of specified navigation aids or specified navigation techniques.

3.5 Responsibility for control

3.5.1 Responsibility for control of individual flights

A controlled flight shall be under the control of only one air traffic control unit at any given time.

3.5.2 Responsibility for control within a given block of airspace

Responsibility for the control of all aircraft operating within a given block of airspace shall be vested in a single air traffic control unit. However, control of an aircraft or groups of aircraft may be delegated to other air traffic control units provided that coordination between all air traffic control units concerned is assured.

3.6 Transfer of responsibility for control

3.6.1 Place or time of transfer

The responsibility for the control of an aircraft shall be transferred from one air traffic control unit to another as follows:

3.6.1.1 *Between two units providing area control service.* The responsibility for the control of an aircraft shall be transferred from a unit providing area control service in a control area to the unit providing area control service in an adjacent control area at the time of crossing the common control area boundary as estimated by the area control centre having control of the aircraft or at such other point or time as has been agreed between the two units.

3.6.1.2 *Between a unit providing area control service and a unit providing approach control service.* The responsibility for the control of an aircraft shall be transferred from a unit providing area control service to a unit providing approach control service, and vice versa, at a point or time agreed between the two units.

3.6.1.3 *Between a unit providing approach control service and an aerodrome control tower*

3.6.1.3.1 *Arriving aircraft.* The responsibility for the control of an arriving aircraft shall be transferred from the unit providing approach control service to the aerodrome control tower, when the aircraft:

a) is in the vicinity of the aerodrome, and:

1) it is considered that approach and landing will be completed in visual reference to the ground, or

2) it has reached uninterrupted visual meteorological conditions, or

b) is at a prescribed point or level, as specified in letters of agreement or ATS unit instructions; or

c) has landed.

Note.— Even though there is an approach control unit, control of certain flights may be transferred directly from an area control centre to an aerodrome control tower and vice versa, by prior arrangement between the units concerned for the relevant part of approach control service to be provided by the area control centre or the aerodrome control tower, as applicable.

3.6.1.3.2 *Departing aircraft.* The responsibility for control of a departing aircraft shall be transferred from the aerodrome control tower to the unit providing approach control service:

a) *when visual meteorological conditions prevail in the vicinity of the aerodrome:*

1) prior to the time the aircraft leaves the vicinity of the aerodrome, or

2) prior to the aircraft entering instrument meteorological conditions, or

3) at a prescribed point or level,

as specified in letters of agreement or ATS unit instructions;

b) *when instrument meteorological conditions prevail at the aerodrome:*

1) immediately after the aircraft is airborne, or

2) at a prescribed point or level,

as specified in letters of agreement or ATS unit instructions.

Note.— See Note following 3.6.1.3.1.

3.6.1.4 *Between control sectors/positions within the same air traffic control unit*

The responsibility for control of an aircraft shall be transferred from one control sector/position to another control sector/position within the same air traffic control unit at a point, level or time, as specified in ATS unit instructions.

3.6.2 Coordination of transfer

3.6.2.1 Responsibility for control of an aircraft shall not be transferred from one air traffic control unit to another without the consent of the accepting control unit, which shall be obtained in accordance with 3.6.2.2, 3.6.2.2.1, 3.6.2.2.2 and 3.6.2.3.

3.6.2.2 The transferring control unit shall communicate to the accepting control unit the appropriate parts of the current flight plan and any control information pertinent to the transfer requested.

3.6.2.2.1 Where transfer of control is to be effected using radar data, the control information pertinent to the transfer shall include information regarding the position and, if required, the track and speed of the aircraft, as observed by radar immediately prior to the transfer.

3.6.2.2.2 Where transfer of control is to be effected using ADS data, the control information pertinent to the transfer shall include the four-dimensional position and other information as necessary.

3.6.2.3 The accepting control unit shall:

a) indicate its ability to accept control of the aircraft on the terms specified by the transferring control unit, unless by prior agreement between the two units concerned, the absence of any such indication is understood to signify acceptance of the terms specified, or indicate any necessary changes thereto; and

b) specify any other information or clearance for a subsequent portion of the flight, which it requires the aircraft to have at the time of transfer.

3.6.2.4 The accepting control unit shall notify the transferring control unit when it has established two-way voice and/or data link communications with and assumed control of the aircraft concerned, unless otherwise specified by agreement between the two control units concerned.

3.6.2.5 Applicable coordination procedures, including transfer of control points, shall be specified in letters of agreement and ATS unit instructions as appropriate.

3.7 Air traffic control clearances

Air traffic control clearances shall be based solely on the requirements for providing air traffic control service.

3.7.1 Contents of clearances

3.7.1.1 An air traffic control clearance shall indicate:

a) aircraft identification as shown in the flight plan;

b) clearance limit;

c) route of flight;

d) level(s) of flight for the entire route or part thereof and changes of levels if required;

Note.— If the clearance for the levels covers only part of the route, it is important for the air traffic control unit to specify a point to which the part of the clearance regarding levels applies whenever necessary to ensure compliance with 3.6.5.2.2 a) of Annex 2.

e) any necessary instructions or information on other matters such as approach or departure manoeuvres, communications and the time of expiry of the clearance.

Note.— The time of expiry of the clearance indicates the time after which the clearance will be automatically cancelled if the flight has not been commenced.

3.7.1.2 **Recommendation.—** *Standard departure and arrival routes and associated procedures should be established when necessary to facilitate:*

a) the safe, orderly and expeditious flow of air traffic;

b) the description of the route and procedure in air traffic control clearances.

Note.— Material relating to the establishment of standard departure and arrival routes and associated procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426). The design criteria are contained in PANS-OPS, Volume II (Doc 8168).*

3.7.2 Clearances for transonic flight

3.7.2.1 The air traffic control clearance relating to the transonic acceleration phase of a supersonic flight shall extend at least to the end of that phase.

3.7.2.2 **Recommendation.—** *The air traffic control clearance relating to the deceleration and descent of an aircraft from supersonic cruise to subsonic flight should provide for uninterrupted descent, at least during the transonic phase.*

3.7.3 Read-back of clearances and safety-related information

3.7.3.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

a) ATC route clearances;

b) clearances and instructions to enter, land on, take off from, hold short of, cross and backtrack on any runway; and

c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.

3.7.3.1.1 Other clearances or instructions, including conditional clearances, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.

3.7.3.1.2 The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.

3.7.3.2 Unless specified by the appropriate ATS authority, voice read-back of CPDLC messages shall not be required.

Note.— The procedures and provisions relating to the exchange and acknowledgement of CPDLC messages are contained in Annex 10, Volume II, and PANS-ATM, Chapter 14.

3.7.4 Coordination of clearances

An air traffic control clearance shall be coordinated between air traffic control units to cover the entire route of an aircraft or a specified portion thereof as follows.

3.7.4.1 An aircraft shall be cleared for the entire route to the aerodrome of first intended landing:

a) when it has been possible, prior to departure, to coordinate the clearance between all the units under whose control the aircraft will come; or

b) when there is reasonable assurance that prior coordination will be effected between those units under whose control the aircraft will subsequently come.

Note.— Where a clearance is issued covering the initial part of the flight solely as a means of expediting departing traffic, the succeeding en-route clearance will be as specified above even though the aerodrome of first intended landing is under the jurisdiction of an area control centre other than the one issuing the en-route clearance.

3.7.4.2 When coordination as in 3.7.4.1 has not been achieved or is not anticipated, the aircraft shall be cleared only to that point where coordination is reasonably assured; prior to reaching such point, or at such point, the aircraft shall receive further clearance, holding instructions being issued as appropriate.

3.7.4.2.1 When prescribed by the appropriate ATS authority, aircraft shall contact a downstream air traffic control unit, for the purpose of receiving a downstream clearance prior to the transfer of control point.

3.7.4.2.1.1 Aircraft shall maintain the necessary two-way communication with the current air traffic control unit whilst obtaining a downstream clearance.

3.7.4.2.1.2 A clearance issued as a downstream clearance shall be clearly identifiable as such to the pilot.

3.7.4.2.1.3 Unless coordinated, downstream clearances shall not affect the aircraft's original flight profile in any airspace, other than that of the air traffic control unit responsible for the delivery of the downstream clearance.

Note.— Requirements relating to the application of downstream clearance delivery service are specified in Annex 10, Volume II. Guidance material is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

3.7.4.2.1.4 **Recommendation.—** *Where practicable, and where data link communications are used to facilitate downstream clearance delivery, two-way voice communications between the pilot and the air traffic control unit providing the downstream clearance should be available.*

3.7.4.3 When an aircraft intends to depart from an aerodrome within a control area to enter another control area within a period of thirty minutes, or such other specific period of time as has been agreed between the area control centres concerned, coordination with the subsequent area control centre shall be effected prior to issuance of the departure clearance.

3.7.4.4 When an aircraft intends to leave a control area for flight outside controlled airspace, and will subsequently re-enter the same or another control area, a clearance from point of departure to the aerodrome of first intended landing may be issued. Such clearance or revisions thereto shall apply only to those portions of the flight conducted within controlled airspace.

3.7.5 Air traffic flow management

3.7.5.1 Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

Note.— The capacity of the air traffic control services concerned will normally be declared by the appropriate ATS authority.

3.7.5.2 **Recommendation**.— *ATFM should be implemented on the basis of regional air navigation agreements or, if appropriate, through multilateral agreements. Such agreements should make provision for common procedures and common methods of capacity determination.*

3.7.5.3 When it becomes apparent to an ATC unit that traffic additional to that already accepted cannot be accommodated within a given period of time at a particular location or in a particular area, or can only be accommodated at a given rate, that unit shall so advise the ATFM unit, when such is established, as well as, when appropriate, ATS units concerned. Flight crews of aircraft destined to the location or area in question and operators concerned shall also be advised of the delays expected or the restrictions that will be applied.

Note.— Operators concerned will normally be advised, in advance where possible, of restrictions imposed by the air traffic flow management unit when such is established.

3.8 Control of persons and vehicles at aerodromes

3.8.1 The movement of persons or vehicles including towed aircraft on the manoeuvring area of an aerodrome shall be controlled by the aerodrome control tower as necessary to avoid hazard to them or to aircraft landing, taxiing or taking off.

3.8.2 In conditions where low visibility procedures are in operation:

a) persons and vehicles operating on the manoeuvring area of an aerodrome shall be restricted to the essential minimum, and particular regard shall be given to the requirements to protect the ILS/MLS sensitive area(s) when Category II or Category III precision instrument operations are in progress;

b) subject to the provisions in 3.8.3, the minimum separation between vehicles and taxiing aircraft shall be as prescribed by the appropriate ATS authority taking into account the aids available;

c) when mixed ILS and MLS Category II or Category III precision instrument operations are taking place to the same runway continuously, the more restrictive ILS or MLS critical and sensitive areas shall be protected.

Note.— The period of application of low visibility procedures is determined in accordance with ATS unit instructions. Guidance on low visibility operations on an aerodrome is contained in the Manual of Surface Movement Guidance and Control Systems (SMGCS) *(Doc 9476).*

3.8.3 Emergency vehicles proceeding to the assistance of an aircraft in distress shall be afforded priority over all other surface movement traffic.

3.8.4 Subject to the provisions in 3.8.3, vehicles on the manoeuvring area shall be required to comply with the following rules:

a) vehicles and vehicles towing aircraft shall give way to aircraft which are landing, taking off or taxiing;

b) vehicles shall give way to other vehicles towing aircraft;

c) vehicles shall give way to other vehicles in accordance with ATS unit instructions;

d) notwithstanding the provisions of a), b) and c), vehicles and vehicles towing aircraft shall comply with instructions issued by the aerodrome control tower.

3.9 Provision of radar

Recommendation.— *Radar systems should provide for the display of safety-related alerts and warnings, including conflict alert, conflict prediction, minimum safe altitude warning and unintentionally duplicated SSR codes.*

3.10 Use of surface movement radar (SMR)

Recommendation.— *In the absence of visual observation of all or part of the manoeuvring area or to supplement visual observation, surface movement radar (SMR) provided in accordance with the provisions of Annex 14, Volume I, or other suitable surveillance equipment, should be utilized to:*

a) monitor the movement of aircraft and vehicles on the manoeuvring area;

b) provide directional information to pilots and vehicle drivers as necessary; and

c) provide advice and assistance for the safe and efficient movement of aircraft and vehicles on the manoeuvring area.

Note.— See the Manual of Surface Movement Guidance and Control Systems (SMGCS) *(Doc 9476), the* Advanced-Surface Movement Guidance and Control Systems (A-SMGCS) Manual *(Doc 9830) and the* Air Traffic Services Planning Manual *(Doc 9426) for guidance on the use of SMR.*

CHAPTER 4. FLIGHT INFORMATION SERVICE

4.1 Application

4.1.1 Flight information service shall be provided to all aircraft which are likely to be affected by the information and which are:

a) provided with air traffic control service; or

b) otherwise known to the relevant air traffic services units.

Note.— Flight information service does not relieve the pilot-in-command of an aircraft of any responsibilities and the pilot-in-command has to make the final decision regarding any suggested alteration of flight plan.

4.1.2 Where air traffic services units provide both flight information service and air traffic control service, the provision of air traffic control service shall have precedence over the provision of flight information service whenever the provision of air traffic control service so requires.

Note.— It is recognized that in certain circumstances aircraft on final approach, landing, take-off and climb may require to receive without delay essential information other than that pertaining to the provision of air traffic control service.

4.2 Scope of flight information service

4.2.1 Flight information service shall include the provision of pertinent:

a) SIGMET and AIRMET information;

b) information concerning pre-eruption volcanic activity, volcanic eruptions and volcanic ash clouds;

c) information concerning the release into the atmosphere of radioactive materials or toxic chemicals;

d) information on changes in the serviceability of navigation aids;

e) information on changes in condition of aerodromes and associated facilities, including information on the state of the aerodrome movement areas when they are affected by snow, ice or significant depth of water;

f) information on unmanned free balloons;

and of any other information likely to affect safety.

4.2.2 Flight information service provided to flights shall include, in addition to that outlined in 4.2.1, the provision of information concerning:

a) weather conditions reported or forecast at departure, destination and alternate aerodromes;

b) collision hazards, to aircraft operating in airspace Classes C, D, E, F and G;

c) for flight over water areas, in so far as practicable and when requested by a pilot, any available information such as radio call sign, position, true track, speed, etc., of surface vessels in the area.

Note 1.— The information in b), including only known aircraft the presence of which might constitute a collision hazard to the aircraft informed, will sometimes be incomplete and air traffic services cannot assume responsibility for its issuance at all times or for its accuracy.

Note 2.— When there is a need to supplement collision hazard information provided in compliance with b), or in case of temporary disruption of flight information service, traffic information broadcasts by aircraft may be applied in designated airspaces. Guidance on traffic information broadcasts by aircraft and related operating procedures is contained in Attachment C.

4.2.3 **Recommendation.—** *ATS units should transmit, as soon as practicable, special air-reports to other aircraft concerned, to the associated meteorological office, and to other ATS units concerned. Transmissions to aircraft should be continued for a period to be determined by agreement between the meteorological and air traffic services authorities concerned.*

4.2.4 Flight information service provided to VFR flights shall include, in addition to that outlined in 4.2.1, the provision of available information concerning traffic and weather conditions along the route of flight that are likely to make operation under the visual flight rules impracticable.

4.3 Operational flight information service broadcasts

4.3.1 Application

4.3.1.1 The meteorological information and operational information concerning navigation aids and aerodromes included in the flight information service shall, whenever available, be provided in an operationally integrated form.

4.3.1.2 **Recommendation.—** *Where integrated operational flight information messages are to be transmitted to aircraft, they should be transmitted with the content and, where specified, in the sequence indicated, for the various phases of flight.*

4.3.1.3 **Recommendation.—** *Operational flight information service broadcasts, when provided, should consist of messages containing integrated information regarding selected operational and meteorological elements appropriate to the various phases of flight. These broadcasts should be of three major types, i.e. HF, VHF and ATIS.*

4.3.1.4 *Use of the OFIS messages in directed request/reply transmissions*

When requested by the pilot, the applicable OFIS message(s) shall be transmitted by the appropriate ATS unit.

4.3.2 HF operational flight information service (OFIS) broadcasts

4.3.2.1 **Recommendation.—** *HF operational flight information service (OFIS) broadcasts should be provided when it has been determined by regional air navigation agreements that a requirement exists.*

4.3.2.2 **Recommendation.—** *Whenever such broadcasts are provided:*

a) the information should be in accordance with 4.3.2.5, as applicable, subject to regional air navigation agreements;

b) the aerodromes for which reports and forecasts are to be included should be as determined by regional air navigation agreements;

c) the time-sequencing of stations participating in the broadcast should be as determined by regional air navigation agreements;

d) the HF OFIS broadcast message should take into consideration human performance. The broadcast message should not exceed the length of time allocated for it by regional air navigation agreements, care being taken that the readability is not impaired by the speed of the transmission;

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

e) each aerodrome message should be identified by the name of the aerodrome to which the information applies;

f) when information has not been received in time for a broadcast, the latest available information should be included together with the time of that observation;

g) the full broadcast message should be repeated if this is feasible within the remainder of the time allotted to the broadcasting station;

h) the broadcast information should be updated immediately a significant change occurs; and

i) the HF OFIS message should be prepared and disseminated by the most appropriate unit(s) as designated by each State.

4.3.2.3 **Recommendation.—** *Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, HF OFIS broadcasts concerning aerodromes designated for use by international air services should be available in the English language.*

4.3.2.4 **Recommendation.—** *Where HF OFIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.2.5 **Recommendation.—** *HF operational flight information service broadcast messages should contain the following information in the sequence indicated or as determined by regional air navigation agreements:*

a) En-route weather information

Information on significant en-route weather phenomena should be in the form of available SIGMET as prescribed in Annex 3.

b) Aerodrome information including:

1) name of aerodrome;

2) time of observation;

3) essential operational information;

4) surface wind direction and speed; if appropriate, maximum wind speed;

**5) visibility and, when applicable, runway visual range (RVR);*

**6) present weather;*

**7) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available; and*

8) aerodrome forecast.

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* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapter 11 prevail.

4.3.3 VHF operational flight information service (OFIS) broadcasts

4.3.3.1 **Recommendation.—** *VHF operational flight information service broadcasts should be provided as determined by regional air navigation agreements.*

4.3.3.2 **Recommendation.—** *Whenever such broadcasts are provided:*

a) the aerodromes for which reports and forecasts are to be included should be as determined by regional air navigation agreements;

b) each aerodrome message should be identified by the name of the aerodrome to which the information applies;

c) when information has not been received in time for a broadcast, the latest available information should be included together with the time of that observation;

d) the broadcasts should be continuous and repetitive;

e) The VHF OFIS broadcast message should take into consideration human performance. The broadcast message should, whenever practicable, not exceed five minutes, care being taken that the readability is not impaired by the speed of the transmission;

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

f) the broadcast message should be updated on a scheduled basis as determined by regional air navigation agreements. In addition it should be expeditiously updated immediately a significant change occurs; and

g) the VHF OFIS message should be prepared and disseminated by the most appropriate unit(s) as designated by each State.

4.3.3.3 **Recommendation.—** *Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications, VHF OFIS broadcasts concerning aerodromes designated for use by international air services should be available in the English language.*

4.3.3.4 **Recommendation.—** *Where VHF OFIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.3.5 **Recommendation.—** *VHF operational flight information service broadcast messages should contain the following information in the sequence indicated:*

a) name of aerodrome;

b) time of observation;

c) landing runway;

d) significant runway surface conditions and, if appropriate, braking action;

e) changes in the operational state of the navigation aids, if appropriate;

f) holding delay, if appropriate;

g) surface wind direction and speed; if appropriate, maximum wind speed;

**h) visibility and, when applicable, runway visual range (RVR);*

**i) present weather;*

**j) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility, when available;*

†k) air temperature;

†l) dew point temperature;

†m) QNH altimeter setting;

n) supplementary information on recent weather of operational significance and, where necessary, wind shear;

o) trend forecast, when available; and

p) notice of current SIGMET messages.

4.3.4 Voice-automatic terminal information service (Voice-ATIS) broadcasts

4.3.4.1 Voice-automatic terminal information service (Voice-ATIS) broadcasts shall be provided at aerodromes where there is a requirement to reduce the communication load on the ATS VHF air-ground communication channels. When provided, they shall comprise:

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* These elements are replaced by the term "CAVOK", whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapte r11 prevail.

† As determined on the basis of regional air navigation agreements.

a) one broadcast serving arriving aircraft; or

b) one broadcast serving departing aircraft; or

c) one broadcast serving both arriving and departing aircraft; or

d) two broadcasts serving arriving and departing aircraft respectively at those aerodromes where the length of a broadcast serving both arriving and departing aircraft would be excessively long.

4.3.4.2 A discrete VHF frequency shall, whenever practicable, be used for Voice-ATIS broadcasts. If a discrete frequency is not available, the transmission may be made on the voice channel(s) of the most appropriate terminal navigation aid(s), preferably a VOR, provided the range and readability are adequate and the identification of the navigation aid is sequenced with the broadcast so that the latter is not obliterated.

4.3.4.3 Voice-ATIS broadcasts shall not be transmitted on the voice channel of an ILS.

4.3.4.4 Whenever Voice-ATIS is provided, the broadcast shall be continuous and repetitive.

4.3.4.5 The information contained in the current broadcast shall immediately be made known to the ATS unit(s) concerned with the provision to aircraft of information relating to approach, landing and take-off, whenever the message has not been prepared by that (those) unit(s).

Note.— The requirements for the provision of ATIS that applies to both Voice-ATIS and D-ATIS are contained in 4.3.6 below.

4.3.4.6 Voice-ATIS broadcasts provided at designated aerodromes for use by international air services shall be available in the English language as a minimum.

4.3.4.7 **Recommendation.—** *Where Voice-ATIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

4.3.4.8 **Recommendation.—** *The Voice-ATIS broadcast message should, whenever practicable, not exceed 30 seconds, care being taken that the readability of the ATIS message is not impaired by the speed of the transmission or by the identification signal of a navigation aid used for transmission of ATIS. The ATIS broadcast message should take into consideration human performance.*

Note.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

4.3.5 Data link-automatic terminal information service (D-ATIS)

4.3.5.1 Where a D-ATIS supplements the existing availability of Voice-ATIS, the information shall be identical in both content and format to the applicable Voice-ATIS broadcast.

4.3.5.1.1 Where real-time meteorological information is included but the data remains within the parameters of the significant change criteria, the content, for the purpose of maintaining the same designator, shall be considered identical.

Note.— Significant change criteria are specified in 2.3.2 of Appendix 3 to Annex 3.

4.3.5.2 Where a D-ATIS supplements the existing availability of Voice-ATIS and the ATIS requires updating, Voice-ATIS and D-ATIS shall be updated simultaneously.

Note.— Guidance material relating to D-ATIS is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694). The technical requirements for the D-ATIS application are contained in Annex 10, Volume III, Part I, Chapter 3.*

4.3.6 Automatic terminal information service (voice and/or data link)

4.3.6.1 Whenever Voice-ATIS and/or D-ATIS is provided:

a) the information communicated shall relate to a single aerodrome;

b) the information communicated shall be updated immediately a significant change occurs;

c) the preparation and dissemination of the ATIS message shall be the responsibility of the air traffic services;

d) individual ATIS messages shall be identified by a designator in the form of a letter of the ICAO spelling alphabet. Designators assigned to consecutive ATIS messages shall be in alphabetical order;

e) aircraft shall acknowledge receipt of the information upon establishing communication with the ATS unit providing approach control service or the aerodrome control tower, as appropriate;

f) the appropriate ATS unit shall, when replying to the message in e) above or, in the case of arriving aircraft, at such other time as may be prescribed by the appropriate ATS authority, provide the aircraft with the current altimeter setting; and

g) the meteorological information shall be extracted from the local meteorological routine or special report.

Note.— In accordance with Sections 4.1 and 4.3 of Appendix 3 to Annex 3, the surface wind direction and speed and runway visual range (RVR) are to be averaged over 2 minutes and 1 minute, respectively; and the wind information is to refer to conditions along the runway for departing aircraft and to conditions at the touchdown zone for arriving aircraft. A template for the local meteorological report, including the corresponding ranges and resolutions of each element, are in Appendix 3 to Annex 3. Additional criteria for the local meteorological report are contained in Chapter 4 of, and in Attachment D to, Annex 3.

4.3.6.2 When rapidly changing meteorological conditions make it inadvisable to include a weather report in the ATIS, the ATIS messages shall indicate that the relevant weather information will be given on initial contact with the appropriate ATS unit.

4.3.6.3 Information contained in a current ATIS, the receipt of which has been acknowledged by the aircraft concerned, need not be included in a directed transmission to the aircraft, with the exception of the altimeter setting, which shall be provided in accordance with 4.3.6.1 f).

4.3.6.4 If an aircraft acknowledges receipt of an ATIS that is no longer current, any element of information that needs updating shall be transmitted to the aircraft without delay.

4.3.6.5 **Recommendation.—** *Contents of ATIS should be kept as brief as possible. Information additional to that specified in 4.3.7 to 4.3.9, for example information already available in aeronautical information publications (AIPs) and NOTAM, should only be included when justified in exceptional circumstances.*

4.3.7 ATIS for arriving and departing aircraft

ATIS messages containing both arrival and departure information shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) arrival and/or departure indicator;

c) contract type, if communication is via D-ATIS;

d) designator;

e) time of observation, if appropriate;

f) type of approach(es) to be expected;

g) the runway(s) in use; status of arresting system constituting a potential hazard, if any;

h) significant runway surface conditions and, if appropriate, braking action;

i) holding delay, if appropriate;

j) transition level, if applicable;

k) other essential operational information;

l) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*m) visibility and, when applicable, RVR;

*n) present weather;

*o) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

p) air temperature;

†q) dew point temperature;

r) altimeter setting(s);

s) any available information on significant meteorological phenomena in the approach and climb-out areas including wind shear, and information on recent weather of operational significance;

t) trend forecast, when available; and

u) specific ATIS instructions.

4.3.8 ATIS for arriving aircraft

ATIS messages containing arrival information only shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) arrival indicator;

c) contract type, if communication is via D-ATIS;

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* These elements are replaced by the term “CAVOK”, whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapter 11 prevail.

† As determined on the basis of regional air navigation agreements.

d) designator;

e) time of observation, if appropriate;

f) type of approach(es) to be expected;

g) main landing runway(s); status of arresting system constituting a potential hazard, if any;

h) significant runway surface conditions and, if appropriate, braking action;

i) holding delay, if appropriate;

j) transition level, if applicable;

k) other essential operational information;

l) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*m) visibility and, when applicable, RVR;

*n) present weather;

*o) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

p) air temperature;

†q) dew point temperature;

r) altimeter setting(s);

s) any available information on significant meteorological phenomena in the approach area including wind shear, and information on recent weather of operational significance;

t) trend forecast, when available; and

u) specific ATIS instructions.

4.3.9 ATIS for departing aircraft

ATIS messages containing departure information only shall contain the following elements of information in the order listed:

a) name of aerodrome;

b) departure indicator;

c) contract type, if communication is via D-ATIS;

d) designator;

e) time of observation, if appropriate;

f) runway(s) to be used for take-off; status of arresting system constituting a potential hazard, if any;

g) significant surface conditions of runway(s) to be used for take-off and, if appropriate, braking action;

h) departure delay, if appropriate;

i) transition level, if applicable;

j) other essential operational information;

k) surface wind direction and speed, including significant variations and, if surface wind sensors related specifically to the sections of runway(s) in use are available and the information is required by operators, the indication of the runway and the section of the runway to which the information refers;

*l) visibility and, when applicable, RVR;

*m) present weather;

*n) cloud below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater; cumulonimbus; if the sky is obscured, vertical visibility when available;

o) air temperature;

†p) dew point temperature;

q) altimeter setting(s);

r) any available information on significant meteorological phenomena in the climb-out area including wind shear;

s) trend forecast, when available; and

t) specific ATIS instructions.

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* These elements are replaced by the term “CAVOK”, whenever the conditions as specified in the PANS-ATM (Doc 4444), Chapter 11 prevail.

† As determined on the basis of regional air navigation agreements.

4.4 VOLMET broadcasts and D-VOLMET service

4.4.1 **Recommendation**.— *HF and/or VHF VOLMET broadcasts and/or D-VOLMET service should be provided when it has been determined by regional air navigation agreements that a requirement exists.*

Note.— Annex 3, 11.5 and 11.6 provide details of VOLMET broadcasts and D-VOLMET service.

4.4.2 **Recommendation**.— *VOLMET broadcasts should use standard radiotelephony phraseologies.*

Note.— Guidance on standard radiotelephony phraseologies to be used in VOLMET broadcasts is given in the Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services *(Doc 9377), Appendix 1.*

CHAPTER 5. ALERTING SERVICE

5.1 Application

5.1.1 Alerting service shall be provided:

a) for all aircraft provided with air traffic control service;

b) in so far as practicable, to all other aircraft having filed a flight plan or otherwise known to the air traffic services; and

c) to any aircraft known or believed to be the subject of unlawful interference.

5.1.2 Flight information centres or area control centres shall serve as the central point for collecting all information relevant to a state of emergency of an aircraft operating within the flight information region or control area concerned and for forwarding such information to the appropriate rescue coordination centre.

5.1.3 In the event of a state of emergency arising to an aircraft while it is under the control of an aerodrome control tower or approach control unit, such unit shall notify immediately the flight information centre or area control centre responsible which shall in turn notify the rescue coordination centre, except that notification of the area control centre, flight information centre, or rescue coordination centre shall not be required when the nature of the emergency is such that the notification would be superfluous.

5.1.3.1 Nevertheless, whenever the urgency of the situation so requires, the aerodrome control tower or approach control unit responsible shall first alert and take other necessary steps to set in motion all appropriate local rescue and emergency organizations which can give the immediate assistance required.

5.2 Notification of rescue coordination centres

5.2.1 Without prejudice to any other circumstances that may render such notification advisable, air traffic services units shall, except as prescribed in 5.5.1, notify rescue coordination centres immediately an aircraft is considered to be in a state of emergency in accordance with the following:

a) *Uncertainty phase* when:

1) no communication has been received from an aircraft within a period of thirty minutes after the time a communication should have been received, or from the time an unsuccessful attempt to establish communication with such aircraft was first made, whichever is the earlier, or when

2) an aircraft fails to arrive within thirty minutes of the estimated time of arrival last notified to or estimated by air traffic services units, whichever is the later,

except when no doubt exists as to the safety of the aircraft and its occupants.

b) *Alert phase* when:

1) following the uncertainty phase, subsequent attempts to establish communication with the aircraft or inquiries to other relevant sources have failed to reveal any news of the aircraft, or when

2) an aircraft has been cleared to land and fails to land within five minutes of the estimated time of landing and communication has not been re-established with the aircraft, or when

3) information has been received which indicates that the operating efficiency of the aircraft has been impaired, but not to the extent that a forced landing is likely,

except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants, or when

4) an aircraft is known or believed to be the subject of unlawful interference.

c) *Distress phase* when:

1) following the alert phase, further unsuccessful attempts to establish communication with the aircraft and more widespread unsuccessful inquiries point to the probability that the aircraft is in distress, or when

2) the fuel on board is considered to be exhausted, or to be insufficient to enable the aircraft to reach safety, or when

3) information is received which indicates that the operating efficiency of the aircraft has been impaired to the extent that a forced landing is likely, or when

4) information is received or it is reasonably certain that the aircraft is about to make or has made a forced landing,

except when there is reasonable certainty that the aircraft and its occupants are not threatened by grave and imminent danger and do not require immediate assistance.

5.2.2 The notification shall contain such of the following information as is available in the order listed:

a) INCERFA, ALERFA or DETRESFA, as appropriate to the phase of the emergency;

b) agency and person calling;

c) nature of the emergency;

d) significant information from the flight plan;

e) unit which made last contact, time and means used;

f) last position report and how determined;

g) colour and distinctive marks of aircraft;

h) dangerous goods carried as cargo;

i) any action taken by reporting office; and

j) other pertinent remarks.

5.2.2.1 **Recommendation.—** *Such part of the information specified in 5.2.2, which is not available at the time notification is made to a rescue coordination centre, should be sought by an air traffic services unit prior to the declaration of a distress phase, if there is reasonable certainty that this phase will eventuate.*

5.2.3 Further to the notification in 5.2.1, the rescue coordination centre shall, without delay, be furnished with:

a) any useful additional information, especially on the development of the state of emergency through subsequent phases; or

b) information that the emergency situation no longer exists.

Note.— The cancellation of action initiated by the rescue coordination centre is the responsibility of that centre.

5.3 Use of communication facilities

Air traffic services units shall, as necessary, use all available communication facilities to endeavour to establish and maintain communication with an aircraft in a state of emergency, and to request news of the aircraft.

5.4 Plotting aircraft in a state of emergency

When a state of emergency is considered to exist, the flight of the aircraft involved shall be plotted on a chart in order to determine the probable future position of the aircraft and its maximum range of action from its last known position. The flights of other aircraft known to be operating in the vicinity of the aircraft involved shall also be plotted in order to determine their probable future positions and maximum endurance.

5.5 Information to the operator

5.5.1 When an area control or a flight information centre decides that an aircraft is in the uncertainty or the alert phase, it shall, when practicable, advise the operator prior to notifying the rescue coordination centre.

Note.— If an aircraft is in the distress phase, the rescue coordination centre has to be notified immediately in accordance with 5.2.1.

5.5.2 All information notified to the rescue coordination centre by an area control or flight information centre shall, whenever practicable, also be communicated, without delay, to the operator.

5.6 Information to aircraft operating in the vicinity of an aircraft in a state of emergency

5.6.1 When it has been established by an air traffic services unit that an aircraft is in a state of emergency, other aircraft known to be in the vicinity of the aircraft involved shall, except as provided in 5.6.2, be informed of the nature of the emergency as soon as practicable.

5.6.2 When an air traffic services unit knows or believes that an aircraft is being subjected to unlawful interference, no reference shall be made in ATS air-ground communications to the nature of the emergency unless it has first been referred to in communications from the aircraft involved and it is certain that such reference will not aggravate the situation.

CHAPTER 6. AIR TRAFFIC SERVICES REQUIREMENTS FOR COMMUNICATIONS

6.1 Aeronautical mobile service (air-ground communications)

6.1.1 General

6.1.1.1 Radiotelephony and/or data link shall be used in air-ground communications for air traffic services purposes.

Note.— Requirements for ATS units to be provided with and to maintain guard on the emergency channel 121.5 MHz are specified in Annex 10, Volumes II and V.

6.1.1.2 When direct pilot-controller two-way radiotelephony or data link communications are used for the provision of air traffic control service, recording facilities shall be provided on all such air-ground communication channels.

Note.— Requirements for retention of all automatic recordings of communications in ATC are specified in Annex 10, Volume II, 3.5.1.5.

6.1.1.3 Recordings of communications channels as required in paragraph 6.1.1.2 shall be retained for a period of at least thirty days.

6.1.2 For flight information service

6.1.2.1 Air-ground communication facilities shall enable two-way communications to take place between a unit providing flight information service and appropriately equipped aircraft flying anywhere within the flight information region.

6.1.2.2 **Recommendation.—** *Whenever practicable, air-ground communication facilities for flight information service should permit direct, rapid, continuous and static-free two-way communications.*

6.1.3 For area control service

6.1.3.1 Air-ground communication facilities shall enable two-way communications to take place between a unit providing area control service and appropriately equipped aircraft flying anywhere within the control area(s).

6.1.3.2 **Recommendation.—** *Whenever practicable, air-ground communication facilities for area control service should permit direct, rapid, continuous and static-free two-way communications.*

6.1.3.3 **Recommendation.—** *Where air-ground voice communication channels are used for area control service and are worked by air-ground communicators, suitable arrangements should be made to permit direct pilot-controller voice communications, as and when required.*

6.1.4 For approach control service

6.1.4.1 Air-ground communication facilities shall enable direct, rapid, continuous and static-free two-way communications to take place between the unit providing approach control service and appropriately equipped aircraft under its control.

6.1.4.2 Where the unit providing approach control service functions as a separate unit, air-ground communications shall be conducted over communication channels provided for its exclusive use.

6.1.5 For aerodrome control service

6.1.5.1 Air-ground communication facilities shall enable direct, rapid, continuous and static-free two-way communications to take place between an aerodrome control tower and appropriately equipped aircraft operating at any distance within 45 km (25 NM) of the aerodrome concerned.

6.1.5.2 **Recommendation.—** *Where conditions warrant, separate communication channels should be provided for the control of traffic operating on the manoeuvring area.*

6.2 Aeronautical fixed service (ground-ground communications)

6.2.1 General

6.2.1.1 Direct-speech and/or data link communications shall be used in ground-ground communications for air traffic services purposes.

Note 1.— Indication by time of the speed with which the communication should be established is provided as a guide to communication services, particularly to determine the types of communication channels required, e.g. that "instantaneous" is intended to refer to communications which effectively provide *for immediate access between controllers; "fifteen seconds" to accept switchboard operation and "five minutes" to mean methods involving retransmission.*

Note 2.— Requirements for retention of all automatic recordings of communications in ATC are specified in Annex 10, Volume II, 3.5.1.5.

6.2.2 Communications within a flight information region

6.2.2.1 *Communications between air traffic services units*

6.2.2.1.1 A flight information centre shall have facilities for communications with the following units providing a service within its area of responsibility:

a) the area control centre, unless collocated;

b) approach control units;

c) aerodrome control towers.

6.2.2.1.2 An area control centre, in addition to being connected to the flight information centre as prescribed in 6.2.2.1.1, shall have facilities for communications with the following units providing a service within its area of responsibility:

a) approach control units;

b) aerodrome control towers;

c) air traffic services reporting offices, when separately established.

6.2.2.1.3 An approach control unit, in addition to being connected to the flight information centre and the area control centre as prescribed in 6.2.2.1.1 and 6.2.2.1.2, shall have facilities for communications with the associated aerodrome control tower(s) and, when separately established, the associated air traffic services reporting office(s).

6.2.2.1.4 An aerodrome control tower, in addition to being connected to the flight information centre, the area control centre and the approach control unit as prescribed in 6.2.2.1.1, 6.2.2.1.2 and 6.2.2.1.3, shall have facilities for communications with the associated air traffic services reporting office, when separately established.

6.2.2.2 *Communications between air traffic services units and other units*

6.2.2.2.1 A flight information centre and an area control centre shall have facilities for communications with the following units providing a service within their respective area of responsibility:

a) appropriate military units;

b) the meteorological office serving the centre;

c) the aeronautical telecommunications station serving the centre;

d) appropriate operator's offices;

e) the rescue coordination centre or, in the absence of such centre, any other appropriate emergency service;

f) the international NOTAM office serving the centre.

6.2.2.2.2 An approach control unit and an aerodrome control tower shall have facilities for communications with the following units providing a service within their respective area of responsibility:

a) appropriate military units;

b) rescue and emergency services (including ambulance, fire, etc.);

c) the meteorological office serving the unit concerned;

d) the aeronautical telecommunications station serving the unit concerned;

e) the unit providing apron management service, when separately established.

6.2.2.2.3 The communication facilities required under 6.2.2.2.1 a) and 6.2.2.2.2 a) shall include provisions for rapid and reliable communications between the air traffic services unit concerned and the military unit(s) responsible for control of interception operations within the area of responsibility of the air traffic services unit.

6.2.2.3 *Description of communication facilities*

6.2.2.3.1 The communication facilities required under 6.2.2.1, 6.2.2.2.1 a) and 6.2.2.2.2 a), b) and c) shall include provisions for:

a) communications by direct speech alone, or in combination with data link communications, whereby for the purpose of transfer of radar control the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds; and

b) printed communications, when a written record is required; the message transit time for such communications being no longer than five minutes.

6.2.2.3.2 **Recommendation.—** *In all cases not covered by 6.2.2.3.1, the communication facilities should include provisions for:*

a) *communications by direct speech alone, or in combination with data link communications, whereby the communications can normally be established within fifteen seconds; and*

b) *printed communications, when a written record is required; the message transit time for such communications being no longer than five minutes.*

6.2.2.3.3 In all cases where automatic transfer of data to and/or from air traffic services computers is required, suitable facilities for automatic recording shall be provided.

6.2.2.3.4 **Recommendation.—** *The communication facilities required in accordance with 6.2.2.1 and 6.2.2.2 should be supplemented, as and where necessary, by facilities for other forms of visual or audio communications, for example, closed circuit television or separate information processing systems.*

6.2.2.3.5 The communication facilities required under 6.2.2.2.2 a), b) and c) shall include provisions for communications by direct speech arranged for conference communications.

6.2.2.3.6 **Recommendation.—** *The communication facilities required under 6.2.2.2.2 d) should include provisions for communications by direct speech arranged for conference communications, whereby the communications can normally be established within fifteen seconds.*

6.2.2.3.7 All facilities for direct-speech or data link communications between air traffic services units and between air traffic services units and other units described under 6.2.2.2.1 and 6.2.2.2.2 shall be provided with automatic recording.

6.2.2.3.8 Recordings of data and communications as required in 6.2.2.3.3 and 6.2.2.3.7 shall be retained for a period of at least thirty days.

6.2.3 Communications between flight information regions

6.2.3.1 Flight information centres and area control centres shall have facilities for communications with all adjacent flight information centres and area control centres.

6.2.3.1.1 These communication facilities shall in all cases include provisions for messages in a form suitable for retention as a permanent record, and delivery in accordance with transit times specified by regional air navigation agreements.

6.2.3.1.2 Unless otherwise prescribed on the basis of regional air navigation agreements, facilities for communications between area control centres serving contiguous control areas shall, in addition, include provisions for direct-speech and, where applicable, data link communications, with automatic recording, whereby for the purpose of transfer of control using radar or ADS data, the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds.

6.2.3.1.3 When so required by agreement between the States concerned in order to eliminate or reduce the need for interceptions in the event of deviations from assigned track, facilities for communications between adjacent flight information centres or area control centres other than those mentioned in 6.2.3.1.2 shall include provisions for direct speech alone, or in combination with data link communications. The communication facilities shall be provided with automatic recording.

6.2.3.1.4 **Recommendation.—** *The communication facilities in 6.2.3.1.3 should permit communications to be established normally within fifteen seconds.*

6.2.3.2 **Recommendation.—** *Adjacent ATS units should be connected in all cases where special circumstances exist.*

Note.— Special circumstances may be due to traffic density, types of aircraft operations and/or the manner in which the airspace is organized and may exist even if the control areas and/or control zones are not contiguous or have not (yet) been established.

6.2.3.3 **Recommendation.—** *Wherever local conditions are such that it is necessary to clear aircraft into an adjacent control area prior to departure, an approach control unit and/or aerodrome control tower should be connected with the area control centre serving the adjacent area.*

6.2.3.4 **Recommendation.—** *The communication facilities in 6.2.3.2 and 6.2.3.3 should include provisions for communications by direct speech alone, or in combination with data link communications, with automatic recording, whereby for the purpose of transfer of control using radar or ADS data, the communications can be established instantaneously and for other purposes the communications can normally be established within fifteen seconds.*

6.2.3.5 In all cases where automatic exchange of data between air traffic services computers is required, suitable facilities for automatic recording shall be provided.

6.2.3.6 Recordings of data and communications as required in 6.2.3.5 shall be retained for a period of at least thirty days.

6.2.4 Procedures for direct-speech communications

Recommendation.— *Appropriate procedures for direct-speech communications should be developed to permit* *immediate connections to be made for very urgent calls concerning the safety of aircraft, and the interruption, if necessary, of less urgent calls in progress at the time.*

6.3 Surface movement control service

6.3.1 Communications for the control of vehicles other than aircraft on manoeuvring areas at controlled aerodromes

6.3.1.1 Two-way radiotelephony communication facilities shall be provided for aerodrome control service for the control of vehicles on the manoeuvring area, except where communication by a system of visual signals is deemed to be adequate.

6.3.1.2 Where conditions warrant, separate communication channels shall be provided for the control of vehicles on the manoeuvring area. Automatic recording facilities shall be provided on all such channels.

6.3.1.3 Recordings of communications as required in 6.3.1.2 shall be retained for a period of at least thirty days.

Note.— See also Annex 10, Volume II, 3.5.1.5.

6.4 Aeronautical radio navigation service

6.4.1 Automatic recording of surveillance data

6.4.1.1 Surveillance data from primary and secondary radar equipment or obtained through ADS or other surveillance systems, used as an aid to air traffic services, shall be automatically recorded for use in accident and incident investigations, search and rescue, air traffic control and surveillance systems evaluation and training.

6.4.1.2 Automatic recordings shall be retained for a period of at least thirty days. When the recordings are pertinent to accident and incident investigations, they shall be retained for longer periods until it is evident that they will no longer be required.

CHAPTER 7. AIR TRAFFIC SERVICES REQUIREMENTS FOR INFORMATION

7.1 Meteorological information

7.1.1 General

7.1.1.1 Air traffic services units shall be supplied with up-to-date information on existing and forecast meteorological conditions as necessary for the performance of their respective functions. The information shall be supplied in such a form as to require a minimum of interpretation on the part of air traffic services personnel and with a frequency which satisfies the requirements of the air traffic services units concerned.

7.1.1.2 **Recommendation.—** *Meteorological offices should be so situated as to facilitate personal consultation between meteorological personnel and personnel of units providing air traffic services. Where collocation is not practicable, the required consultation should be achieved by other means.*

7.1.1.3 **Recommendation.—** *Air traffic services units should be supplied with available detailed information on the location, vertical extent, direction and rate of movement of meteorological phenomena in the vicinity of the aerodrome, and particularly in the climb-out and approach areas, which could be hazardous to aircraft operations.*

Note.— The meteorological phenomena are listed in Annex 3, Chapter 4, 4.6.8.1.

7.1.1.4 **Recommendation.—** *When computer-processed upper air data are made available to air traffic services units in digital form for use by air traffic services computers, the contents, format and transmission arrangements should be as agreed between the Meteorological Authority and the appropriate ATS Authority.*

7.1.2 Flight information centres and area control centres

7.1.2.1 Flight information centres and area control centres shall be supplied with SIGMET and AIRMET information, special air-reports, current meteorological reports and forecasts, particular emphasis being given to the occurrence or expected occurrence of deterioration in a weather element as soon as this can be determined. These reports and forecasts shall cover the flight information region or control area and such other areas as may be determined on the basis of regional air navigation agreements.

Note.— For the purpose of this provision, certain changes in meteorological conditions are construed as deterioration in a weather element, although they are not ordinarily considered as such. An increase in temperature may, for example, adversely affect the operation of certain types of aircraft.

7.1.2.2 Flight information centres and area control centres shall be provided, at suitable intervals, with current pressure data for setting altimeters, for locations specified by the flight information centre or area control centre concerned.

7.1.3 Units providing approach control service

7.1.3.1 Units providing approach control service shall be supplied with current meteorological reports and forecasts for the airspace and the aerodromes with which they are concerned. Special reports and amendments to forecasts shall be communicated to the units providing approach control service as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast. Where multiple sensors are used, the displays to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each sensor.

Note.— See Note following 7.1.2.1.

7.1.3.2 Units providing approach control service shall be provided with current pressure data for setting altimeters, for locations specified by the unit providing approach control service.

7.1.3.3 Units providing approach control service for final approach, landing and take-off shall be equipped with surface wind display(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding display(s) in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.4 Units providing approach control service for final approach, landing and take-off at aerodromes where runway visual range values are assessed by instrumental means shall be equipped with display(s) permitting read-out of the current runway visual range value(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding displays in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.5 **Recommendation**.— *Units providing approach control service for final approach, landing and take-off at aerodromes where the height of cloud base is assessed by instrumental means should be equipped with display(s) permitting read-out of the current value(s) of the height of cloud base. The displays should be related to the same location(s) of observations and be fed from the same sensor(s) as the corresponding display(s) in the aerodrome control tower and in the meteorological station, where such a station exists.*

7.1.3.6 Units providing approach control service for final approach, landing and take-off shall be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach.

Note.— Provisions concerning the issuance of wind shear warnings and ATS requirements for meteorological information are given in Annex 3, Chapters 7, 10 and Appendix 6.

7.1.4 Aerodrome control towers

7.1.4.1 Aerodrome control towers shall be supplied with current meteorological reports and forecasts for the aerodrome with which they are concerned. Special reports and amendments to forecasts shall be communicated to the aerodrome control towers as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast.

Note.— See Note following 7.1.2.1.

7.1.4.2 Aerodrome control towers shall be provided with current pressure data for setting altimeters for the aerodrome concerned.

7.1.4.3 Aerodrome control towers shall be equipped with surface wind display(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists. Where multiple sensor(s) are used, the displays to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each sensor.

7.1.4.4 Aerodrome control towers at aerodromes where runway visual range values are measured by instrumental means shall be equipped with display(s) permitting read-out of the current runway visual range value(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists.

7.1.4.5 **Recommendation**.— *Aerodrome control towers at aerodromes where the height of cloud base is assessed by instrumental means should be equipped with display(s) permitting read-out of the current value(s) of the height of cloud base. The displays should be related to the same location(s) of observations and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists.*

7.1.4.6 Aerodrome control towers shall be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach and aircraft on the runway during the landing roll or take-off run.

7.1.4.7 **Recommendation.—** *Aerodrome control towers and/or other appropriate units should be supplied with aerodrome warnings.*

Note.— The meteorological conditions for which aerodrome warnings are issued are listed in Annex 3, Appendix 6, 5.1.2.

7.1.5 Communication stations

Where necessary for flight information purposes, current meteorological reports and forecasts shall be supplied to communication stations. A copy of such information shall be forwarded to the flight information centre or the area control centre.

7.2 Information on aerodrome conditions and the operational status of associated facilities

Aerodrome control towers and units providing approach control service shall be kept currently informed of the operationally significant conditions of the movement area, including the existence of temporary hazards, and the operational status of any associated facilities at the aerodrome(s) with which they are concerned.

7.3 Information on the operational status of navigation aids

7.3.1 ATS units shall be kept currently informed of the operational status of non-visual navigation aids, and those visual aids essential for take-off, departure, approach and landing procedures within their area of responsibility and those visual and non-visual aids essential for surface movement.

7.3.2 **Recommendation.—** *Information on the operational status, and any changes thereto, of visual and non-visual aids as referred to in 7.3.1 should be received by the appropriate ATS unit(s) on a timely basis consistent with the use of the aid(s) involved.*

Note.— Guidance material regarding the provision of information to ATS units in respect to visual and non-visual navigation aids is contained in the Air Traffic Services Planning Manual *(Doc 9426). Specifications for monitoring* *visual aids are contained in Annex 14, Volume I, and related guidance material is in the* Aerodrome Design Manual *(Doc 9157), Part 5. Specifications for monitoring non-visual aids are contained in Annex 10, Volume I.*

7.4 Information on unmanned free balloons

Operators of unmanned free balloons shall keep the appropriate air traffic services units informed of details of flights of unmanned free balloons in accordance with the provisions contained in Annex 2.

7.5 Information concerning volcanic activity

7.5.1 ATS units shall be informed, in accordance with local agreement, of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud which could affect airspace used by flights within their area of responsibility.

7.5.2 Area control centres and flight information centres shall be provided with volcanic ash advisory information issued by the associated VAAC.

Note.— VAACs are designated by regional air navigation agreements in accordance with Annex 3, 3.5.1.

7.6 Information concerning radioactive materials and toxic chemical "clouds"

ATS units shall be informed, in accordance with local agreement, of the release into the atmosphere of radioactive materials or toxic chemicals which could affect airspace used by flights within their area of responsibility.

APPENDIX 1. PRINCIPLES GOVERNING THE IDENTIFICATION OF RNP TYPES AND THE IDENTIFICATION OF ATS ROUTES OTHER THAN STANDARD DEPARTURE AND ARRIVAL ROUTES

(Chapter 2, Sections 2.7 and 2.11 refer)

Note.— See Appendix 3 concerning the identification of standard departure and arrival routes and associated procedures. Guidance material on the establishment of these routes and procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

1. Designators for ATS routes and RNP types

1.1 The purpose of a system of route designators and required navigation performance (RNP) type(s) applicable to specified ATS route segment(s), route(s) or area is to allow both pilots and ATS, taking into account automation requirements:

a) to make unambiguous reference to any ATS route without the need to resort to the use of geographical coordinates or other means in order to describe it;

b) to relate an ATS route to a specific vertical structure of the airspace, as applicable;

c) to indicate a required level of navigation performance accuracy, when operating along an ATS route or within a specified area; and

d) to indicate that a route is used primarily or exclusively by certain types of aircraft.

Note 1.— Prior to the global introduction of RNP, all references in this appendix to RNP also apply to area navigation (RNAV) routes, where navigation performance accuracy requirements have been specified.

Note 2.— Specifications governing the publication of RNP types are given in Annex 4, Chapter 7, and Annex 15, Appendix 1.

Note 3.— In relation to this appendix and for flight planning purposes, a prescribed RNP type is not considered an integral part of the ATS route designator.

1.2 In order to meet this purpose, the designation system shall:

a) permit the identification of any ATS route in a simple and unique manner;

b) avoid redundancy;

c) be usable by both ground and airborne automation systems;

d) permit utmost brevity in operational use; and

e) provide sufficient possibility of extension to cater for any future requirements without the need for fundamental changes.

1.3 Controlled, advisory and uncontrolled ATS routes, with the exception of standard arrival and departure routes, shall therefore be identified as specified hereafter.

2. Composition of designator

2.1 The ATS route designator shall consist of a basic designator supplemented, if necessary, by:

a) one prefix as prescribed in 2.3; and

b) one additional letter as prescribed in 2.4.

2.1.1 The number of characters required to compose the designator shall not exceed six characters.

2.1.2 The number of characters required to compose the designator should, whenever possible, be kept to a maximum of five characters.

2.2 The basic designator shall consist of one letter of the alphabet followed by a number from 1 to 999.

2.2.1 Selection of the letter shall be made from those listed hereunder:

a) A, B, G, R for routes which form part of the regional networks of ATS routes and are not area navigation routes;

b) L, M, N, P for area navigation routes which form part of the regional networks of ATS routes;

c) H, J, V, W for routes which do not form part of the regional networks of ATS routes and are not area navigation routes;

d) Q, T, Y, Z for area navigation routes which do not form part of the regional networks of ATS routes.

2.3 Where applicable, one supplementary letter shall be added as a prefix to the basic designator in accordance with the following:

a) K to indicate a low-level route established for use primarily by helicopters;

b) U to indicate that the route or portion thereof is established in the upper airspace;

c) S to indicate a route established exclusively for use by supersonic aircraft during acceleration, deceleration and while in supersonic flight.

2.4 When prescribed by the appropriate ATS authority or on the basis of regional air navigation agreements, a supplementary letter may be added after the basic designator of the ATS route in question in order to indicate the type of service provided or the turn performance required on the route in question in accordance with the following:

a) for RNP 1 routes at and above FL 200, the letter Y to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 22.5 NM (e.g. A123Y[1]);

b) for RNP 1 routes at and below FL 190, the letter Z to indicate that all turns on the route between 30 and 90 degrees shall be made within the allowable RNP tolerance of a tangential arc between the straight leg segments defined with a radius of 15 NM (e.g. G246Z[1]);

c) the letter F to indicate that on the route or portion thereof advisory service only is provided;

d) the letter G to indicate that on the route or portion thereof flight information service only is provided.

Note 1.— Due to limitations in the display equipment on board aircraft, the supplementary letters "F", "G", "Y" or "Z" may not be displayed to the pilot.

Note 2.— Implementation of a route or a portion thereof as controlled route, advisory route or flight information route is indicated in aeronautical charts and aeronautical information publications in accordance with the provisions in Annexes 4 and 15.

Note 3.— The conditions under which States may specify the controlled turn performance referred to in 2.4 a) and b) are discussed in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

3. Assignment of basic designators

3.1 Basic ATS route designators shall be assigned in accordance with the following principles.

3.1.1 The same basic designator shall be assigned to a main trunk route throughout its entire length, irrespective of terminal control areas, States or regions traversed.

Note.— This is of particular importance where automated ATS data processing and computerized airborne navigation equipment is used.

3.1.2 Where two or more trunk routes have a common segment, the segment in question shall be assigned each of the designators of the routes concerned, except where this would present difficulties in the provision of air traffic service, in which case, by common agreement, one designator only shall be assigned.

3.1.3 A basic designator assigned to one route shall not be assigned to any other route.

3.1.4 States' requirements for designators shall be notified to the Regional Offices of ICAO for coordination.

4. Use of designators in communications

4.1 In printed communications, the designator shall be expressed at all times by not less than two and not more than six characters.

4.2 In voice communications, the basic letter of a designator shall be spoken in accordance with the ICAO spelling alphabet.

4.3 Where the prefixes K, U or S specified in 2.3 are used, they shall, in voice communications, be spoken as follows:

K — KOPTER
U — UPPER
S — SUPERSONIC

The word "kopter" shall be pronounced as in the word "helicopter" and the words "upper" and "supersonic" as in the English language.

4.4 Where the letters "F", "G", "Y" or "Z" specified in 2.4 above are used, the flight crew should not be required to use them in voice communications.

APPENDIX 2. PRINCIPLES GOVERNING THE ESTABLISHMENT AND IDENTIFICATION OF SIGNIFICANT POINTS

(Chapter 2, Section 2.13 refers)

1. Establishment of significant points

1.1 Significant points should, whenever possible, be established with reference to ground-based radio navigation aids, preferably VHF or higher frequency aids.

1.2 Where such ground-based radio navigation aids do not exist, significant points shall be established at locations which can be determined by self-contained airborne navigation aids, or, where navigation by visual reference to the ground is to be effected, by visual observation. Specific points may be designated as ''transfer of control'' points by agreement between adjacent air traffic control units or control positions concerned.

2. Designators for significant points marked by the site of a radio navigation aid

2.1 Plain language name for significant points marked by the site of a radio navigation aid

2.1.1 Whenever practicable, significant points shall be named with reference to an identifiable and preferably prominent geographical location.

2.1.2 In selecting a name for the significant point, care shall be taken to ensure that the following conditions are met:

a) the name shall not create difficulties in pronunciation for pilots or ATS personnel when speaking in the language used in ATS communications. Where the name of a geographical location in the national language selected for designating a significant point gives rise to difficulties in pronunciation, an abbreviated or contracted version of this name, which retains as much of its geographical significance as possible, shall be selected;

   Example: FUERSTENFELDBRUCK = FURSTY

b) the name shall be easily recognizable in voice communications and shall be free of ambiguity with those of other significant points in the same general area. In addition, the name shall not create confusion with respect to other communications exchanged between air traffic services and pilots;

c) the name should, if possible, consist of at least six letters and form two syllables and preferably not more than three;

d) the selected name shall be the same for both the significant point and the radio navigation aid marking it.

2.2 Composition of coded designators for significant points marked by the site of a radio navigation aid

2.2.1 The coded designator shall be the same as the radio identification of the radio navigation aid. It shall be so composed, if possible, as to facilitate association with the name of the point in plain language.

2.2.2 Coded designators shall not be duplicated within 1 100 km (600 NM) of the location of the radio navigation aid concerned, except as noted hereunder.

Note.— When two radio navigation aids operating in different bands of the frequency spectrum are situated at the same location, their radio identifications are normally the same.

2.3 States' requirements for coded designators shall be notified to the Regional Offices of ICAO for coordination.

3. Designators for significant points not marked by the site of a radio navigation aid

3.1 Where a significant point is required at a position not marked by the site of a radio navigation aid, the significant point shall be designated by a unique five-letter pronounceable "name-code". This name-code designator then serves as the name as well as the coded designator of the significant point.

3.2 This name-code designator shall be selected so as to avoid any difficulties in pronunciation by pilots or ATS personnel when speaking in the language used in ATS communications.

Examples: ADOLA, KODAP

3.3 The name-code designator shall be easily recognizable in voice communications and shall be free of ambiguity with those used for other significant points in the same general area.

3.4 The name-code designator assigned to a significant point shall not be assigned to any other significant point.

3.5 States' requirements for name-code designators shall be notified to the Regional Offices of ICAO for coordination.

3.6 In areas where no system of fixed routes is established or where the routes followed by aircraft vary depending on operational considerations, significant points shall be determined and reported in terms of World Geodetic System — 1984 (WGS-84) geographical coordinates, except that permanently established significant points serving as exit and/or entry points into such areas shall be designated in accordance with the applicable provisions in 2 or 3.

4. Use of designators in communications

4.1 Normally the name selected in accordance with 2 or 3 shall be used to refer to the significant point in voice communications. If the plain language name for a significant point marked by the site of a radio navigation aid selected in accordance with 2.1 is not used, it shall be replaced by the coded designator which, in voice communications, shall be spoken in accordance with the ICAO spelling alphabet.

4.2 In printed and coded communications, only the coded designator or the selected name-code shall be used to refer to a significant point.

5. Significant points used for reporting purposes

5.1 In order to permit ATS to obtain information regarding the progress of aircraft in flight, selected significant points may need to be designated as reporting points.

5.2 In establishing such points, consideration shall be given to the following factors:

a) the type of air traffic services provided;

b) the amount of traffic normally encountered;

c) the accuracy with which aircraft are capable of adhering to the current flight plan;

d) the speed of the aircraft;

e) the separation minima applied;

f) the complexity of the airspace structure;

g) the control method(s) employed;

h) the start or end of significant phases of a flight (climb, descent, change of direction, etc.);

i) transfer of control procedures;

j) safety and search and rescue aspects;

k) the cockpit and air-ground communication workload.

5.3 Reporting points shall be established either as "compulsory" or as "on-request".

5.4 In establishing "compulsory" reporting points the following principles shall apply:

a) compulsory reporting points shall be limited to the minimum necessary for the routine provision of information to air traffic services units on the progress of aircraft in flight, bearing in mind the need to keep cockpit and controller workload and air-ground communications load to a minimum;

b) the availability of a radio navigation aid at a location should not necessarily determine its designation as a compulsory reporting point;

c) compulsory reporting points should not necessarily be established at flight information region or control area boundaries.

5.5 "On-request" reporting points may be established in relation to the requirements of air traffic services for additional position reports when traffic conditions so demand.

5.6 The designation of compulsory and on-request reporting points shall be reviewed regularly with a view to keeping the requirements for routine position reporting to the minimum necessary to ensure efficient air traffic services.

5.7 Routine reporting over compulsory reporting points should not systematically be made mandatory for all flights in all circumstances. In applying this principle, particular attention shall be given to the following:

a) high-speed, high-flying aircraft should not be required to make routine position reports over all reporting points established as compulsory for low-speed, low-flying aircraft;

b) aircraft transiting through a terminal control area should not be required to make routine position reports as frequently as arriving and departing aircraft.

5.8 In areas where the above principles regarding the establishment of reporting points would not be practicable, a reporting system with reference to meridians of longitude or parallels of latitude expressed in whole degrees may be established.

APPENDIX 3. PRINCIPLES GOVERNING THE IDENTIFICATION OF STANDARD DEPARTURE AND ARRIVAL ROUTES AND ASSOCIATED PROCEDURES

(See Chapter 2, 2.11.3)

Note.— Material relating to the establishment of standard departure and arrival routes and associated procedures is contained in the Air Traffic Services Planning Manual *(Doc 9426).*

1. Designators for standard departure and arrival routes and associated procedures

Note.— In the following text the term "route" is used in the meaning of "route and associated procedures".

1.1 The system of designators shall:

a) permit the identification of each route in a simple and unambiguous manner;

b) make a clear distinction between:

— departure routes and arrival routes;

— departure or arrival routes and other ATS routes;

— routes requiring navigation by reference to ground-based radio aids or self-contained airborne aids, and routes requiring navigation by visual reference to the ground;

c) be compatible with ATS and aircraft data processing and display requirements;

d) be of utmost brevity in its operational application;

e) avoid redundancy;

f) provide sufficient possibility for extension to cater for any future requirements without the need for fundamental changes.

1.2 Each route shall be identified by a plain language designator and a corresponding coded designator.

1.3 The designators shall, in voice communications, be easily recognizable as relating to a standard departure or arrival route and shall not create any difficulties in pronunciation for pilots and ATS personnel.

2. Composition of designators

2.1 Plain language designator

2.1.1 The plain language designator of a standard departure or arrival route shall consist of:

a) a basic indicator; followed by

b) a validity indicator; followed by

c) a route indicator, where required; followed by

d) the word "departure" or "arrival"; followed by

e) the word "visual", if the route has been established for use by aircraft operating in accordance with the visual flight rules (VFR).

2.1.2 The basic indicator shall be the name or name-code of the significant point where a standard departure route terminates or a standard arrival route begins.

2.1.3 The validity indicator shall be a number from 1 to 9.

2.1.4 The route indicator shall be one letter of the alphabet. The letters "I" and "O" shall not be used.

2.2 Coded designator

The coded designator of a standard departure or arrival route, instrument or visual, shall consist of:

a) the coded designator or name-code of the significant point described in 2.1.1 a); followed by

b) the validity indicator in 2.1.1 b); followed by

c) the route indicator in 2.1.1 c), where required.

Note.— Limitations in the display equipment on board aircraft may require shortening of the basic indicator, if that indicator is a five-letter name-code, e.g. KODAP. The manner in which such an indicator is shortened is left to the discretion of operators.

3. Assignment of designators

3.1 Each route shall be assigned a separate designator.

3.2 To distinguish between two or more routes which relate to the same significant point (and therefore are assigned the same basic indicator), a separate route indicator as described in 2.1.4 shall be assigned to each route.

4. Assignment of validity indicators

4.1 A validity indicator shall be assigned to each route to identify the route which is currently in effect.

4.2 The first validity indicator to be assigned shall be the number "1".

4.3 Whenever a route is amended, a new validity indicator, consisting of the next higher number, shall be assigned. The number "9" shall be followed by the number "1".

5. Examples of plain language and coded designators

5.1 *Example 1*: Standard departure route — instrument:

a) Plain language designator: BRECON ONE DEPARTURE

b) Coded designator: BCN 1

5.1.1 *Meaning*: The designator identifies a standard instrument departure route which terminates at the significant point BRECON (basic indicator). BRECON is a radio navigation facility with the identification BCN (basic indicator of the coded designator). The validity indicator ONE (1 in the coded designator) signifies either that the original version of the route is still in effect or that a change has been made from the previous version NINE (9) to the now effective version ONE (1) (see 4.3). The absence of a route indicator (see 2.1.4 and 3.2) signifies that only one route, in this case a departure route, has been established with reference to BRECON.

5.2 *Example 2*: Standard arrival route — instrument:

a) Plain language designator: KODAP TWO ALPHA ARRIVAL

b) Coded designator: KODAP 2 A

5.2.1 *Meaning*: This designator identifies a standard instrument arrival route which begins at the significant point KODAP (basic indicator). KODAP is a significant point not marked by the site of a radio navigation facility and therefore assigned a five-letter name-code in accordance with Appendix 2. The validity indicator TWO (2) signifies that a change has been made from the previous version ONE (1) to the now effective version TWO (2). The route indicator ALPHA (A) identifies one of several routes established with reference to KODAP and is a specific character assigned to this route.

5.3 *Example 3*: Standard departure route — visual:

a) Plain language designator ADOLA FIVE BRAVO DEPARTURE VISUAL

b) Coded designator: ADOLA 5 B

5.3.1 *Meaning*: This designator identifies a standard departure route for controlled VFR flights which terminates at ADOLA, a significant point not marked by the site of a radio navigation facility. The validity indicator FIVE (5) signifies that a change has been made from the previous version FOUR (4) to the now effective version FIVE (5). The route indicator BRAVO (B) identifies one of several routes established with reference to ADOLA.

6. Composition of designators for MLS/RNAV approach procedures

6.1 Plain language designator

6.1.1 The plain language designator of an MLS/RNAV approach procedure shall consist of:

a) "MLS"; followed by

b) a basic indicator; followed by

c) a validity indicator; followed by

d) a route indicator; followed by

e) the word "approach"; followed by

f) the designator of the runway for which the procedure is designed.

6.1.2 The basic indicator shall be the name or name-code of the significant point where the approach procedure begins.

6.1.3 The validity indicator shall be a number from 1 to 9.

6.1.4 The route indicator shall be one letter of the alphabet. The letters "I" and "O" shall not be used.

6.1.5 The designator of the runway shall be in accordance with Annex 14, Volume I, 5.2.2.

6.2 Coded designator

6.2.1 The coded designator of an MLS/RNAV approach procedure shall consist of:

a) "MLS"; followed by

b) the coded designator or name-code of the significant point described in 6.1.1 b); followed by

c) the validity indicator in 6.1.1 c); followed by

d) the route indicator in 6.1.1 d); followed by

e) the runway designator in 6.1.1 f).

6.3 Assignment of designators

6.3.1 The assignment of designators for MLS/RNAV approach procedures shall be in accordance with paragraph 3. Procedures having identical tracks but different flight profiles shall be assigned separate route indicators.

6.3.2 The route indicator letter for MLS/RNAV approach procedures shall be assigned uniquely to all approaches at an airport until all the letters have been used. Only then shall the route indicator letter be repeated. The use of the same route indicator for two routes using the same MLS ground facility shall not be permitted.

6.3.3 The assignment of validity indicator for approach procedures shall be in accordance with paragraph 4.

6.4 Example of plain language and coded designators

6.4.1 *Example:*

a) Plain language designator: MLS HAPPY ONE ALPHA APPROACH RUNWAY ONE EIGHT LEFT

b) Coded designator: MLS HAPPY 1 A 18L

6.4.2 *Meaning:* The designator identifies an MLS/RNAV approach procedure which begins at the significant point HAPPY (basic indicator). HAPPY is a significant point not marked by the site of a radio navigation facility and therefore assigned a five-letter name-code in accordance with Appendix 2. The validity indicator ONE (1) signifies that either the original version of the route is still in effect or a change has been made from the previous version NINE (9) to the now effective version ONE (1). The route indicator ALPHA (A) identifies one of several routes established with reference to HAPPY and is a specific character assigned to this route.

7. Use of designators in communications

7.1 In voice communications, only the plain language designator shall be used.

Note.— For the purpose of identification of routes, the words "departure", "arrival" and "visual" described in 2.1.1 d) and 2.1.1 e) are considered to be an integral element of the plain language designator.

7.2 In printed or coded communications, only the coded designator shall be used.

8. Display of routes and procedures to air traffic control

8.1 A detailed description of each currently effective standard departure and/or arrival route/approach procedure, including the plain language designator and the coded designator, shall be displayed at the working positions at which the routes/procedures are assigned to aircraft as part of an ATC clearance, or are otherwise of relevance in the provision of air traffic control services.

8.2 Whenever possible, a graphic portrayal of the routes/procedures shall also be displayed.

APPENDIX 4. ATS AIRSPACE CLASSES — SERVICES PROVIDED AND FLIGHT REQUIREMENTS

(Chapter 2, 2.6 refers)

Class	*Type of flight*	*Separation provided*	*Service provided*	*Speed limitation**	*Radio communication requirement*	*Subject to an ATC clearance*
A	IFR only	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
B	IFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	All aircraft	Air traffic control service	Not applicable	Continuous two-way	Yes
C	IFR	IFR from IFR IFR from VFR	Air traffic control service	Not applicable	Continuous two-way	Yes
	VFR	VFR from IFR	1) Air traffic control service for separation from IFR; 2) VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
D	IFR	IFR from IFR	Air traffic control service, traffic information about VFR flights (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
	VFR	Nil	IFR/VFR and VFR/VFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
E	IFR	IFR from IFR	Air traffic control service and, as far as practical, traffic information about VFR flights	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	Yes
	VFR	Nil	Traffic information as far as practical	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No
F	IFR	IFR from IFR as far as practical	Air traffic advisory service; flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No
G	IFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	250 kt IAS below 3 050 m (10 000 ft) AMSL	No	No

* When the height of the transition altitude is lower than 3 050 m (10 000 ft) AMSL, FL 100 should be used in lieu of 10 000 ft.

APPENDIX 5. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Flight information region boundary points	2 km declared	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	2 km declared	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	100 m calculated	1×10^{-5} essential
CTA/CTZ boundary points	100 m calculated	1×10^{-5} essential
En-route navaids and fixes, holding, STAR/SID points	100 m surveyed/calculated	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	50 m surveyed	1×10^{-3} routine
Obstacles in Area 2 (the part outside the aerodrome/heliport boundary)	5 m surveyed	1×10^{-5} essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	3 m surveyed/calculated	1×10^{-5} essential

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data are to be collected in accordance with the Area 1 numerical requirements specified in Annex 15, Appendix 8, Table A8-2.

Note 3.— Implementation of Annex 15 provisions 10.6.1.1 and 10.6.1.2 concerning the availability, as of 20 November 2008 and 18 November 2010, of obstacle data according to Area 1 and Area 2 specifications, respectively, would be facilitated by appropriate advance planning for the collection and processing of such data.

Table 2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Threshold crossing height, precision approaches	0.5 m calculated	1×10^{-8} critical
Obstacle clearance altitude/height (OCA/H).	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory), elevations	30 m surveyed	1×10^{-3} routine
Obstacles in Area 2 (the part outside the aerodrome/heliport boundary)	3 m surveyed	1×10^{-5} essential
Distance measuring equipment (DME), elevation	30 m (100 ft) surveyed	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes.	50 m calculated	1×10^{-3} routine

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of the obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data are to be collected in accordance with the Area 1 numerical requirements specified in Annex 15, Appendix 8, Table A8-2.

Note 3.— Implementation of Annex 15 provisions 10.6.1.1 and 10.6.1.2 concerning the availability, as of 20 November 2008 and 18 November 2010, of obstacle data according to Area 1 and Area 2 specifications, respectively, would be facilitated by appropriate advance planning for the collection and processing of such data.

Table 3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Integrity Classification
VHF NAVAID station declination used for technical line-up.	1 degree surveyed	1×10^{-5} essential
NDB NAVAID magnetic variation.	1 degree surveyed	1×10^{-3} routine

Table 4. Bearing

Bearing	Accuracy Data type	Integrity Classification
Airway segments	1/10 degree calculated	1×10^{-3} routine
En-route and terminal fix formations	1/10 degree calculated	1×10^{-3} routine
Terminal arrival/departure route segments	1/10 degree calculated	1×10^{-3} routine
Instrument approach procedure fix formations	1/100 degree calculated	1×10^{-5} essential

Table 5. Length/distance/dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
Airway segments length	1/10 km calculated	1×10^{-3} routine
En-route fix formations distance	1/10 km calculated	1×10^{-3} routine
Terminal arrival/departure route segments length	1/100 km calculated	1×10^{-5} essential
Terminal and instrument approach procedure fix formations distance	1/100 km calculated	1×10^{-5} essential

ATTACHMENT A. MATERIAL RELATING TO A METHOD OF ESTABLISHING ATS ROUTES DEFINED BY VOR

(Paragraph 2.7.1 and Section 2.11 refer)

1. Introduction

1.1 The guidance material in this Attachment results from comprehensive studies, carried out in Europe in 1972 and the United States in 1978, which were in general agreement.

Note.— Details of the European studies are contained in Circular 120 — Methodology for the Derivation of Separation Minima Applied to the Spacing between Parallel Tracks in ATS Route Structures.

1.2 In applying the guidance material in 3 and 4, it should be recognized that the data on which it is based are generally representative of navigation using VOR meeting the full requirements of Doc 8071 — *Manual on Testing of Radio Navigation Aids*, Volume I. Any additional factors, such as those due to particular operational requirements, frequency of aircraft passings or information available regarding the actual track-keeping performance of aircraft within a given portion of airspace should be taken into account.

1.3 Attention is also invited to the basic assumptions in 4.2 and to the fact that the values given in 4.1 represent a conservative approach. Before applying these values, account should therefore be taken of any practical experience gained in the airspace under consideration, as well as the possibility of achieving improvements in the overall navigation performance of aircraft.

1.4 States are encouraged to keep ICAO fully informed of the results of the application of this guidance material.

2. Determination of VOR system performance values

The large variability of the values which are likely to be associated with each of the factors that make up the total VOR system, and the limitation of presently available methods to measure all these effects individually with the required precision, have led to the conclusion that an assessment of the total system error provides a more realistic method for determining the VOR system performance. The material contained in 3 and 4 should be applied only after study of Circular 120 especially with respect to the environmental conditions.

Note.— Guidance material on overall VOR system accuracy is also contained in Annex 10, Volume I, Attachment C.

3. Determination of protected airspace along VOR-defined routes

Note 1.— The material of this section has not been derived by means of the collision-risk/target level of safety method.

Note 2.— The word "containment" as used in this section is intended to indicate that the protected airspace provided will contain the traffic for 95 per cent of the total flying time (i.e. accumulated over all aircraft) for which the traffic operates along the route in question. Where, for example 95 per cent containment is provided, it is implicit that for 5 per cent of the total flying time traffic will be outside *the protected airspace. It is not possible to quantify the maximum distance which such traffic is likely to deviate beyond the protected airspace.*

3.1 For VOR-defined routes where radar is not used to assist aircraft in remaining within the protected airspace, the following guidance is provided. However, when the lateral deviations of aircraft are being controlled with the aid of radar monitoring, the size of the protected airspace required may be reduced, as indicated by practical experience gained in the airspace under consideration.

3.2 As a minimum, protection against activity in airspace adjacent to the routes should provide 95 per cent containment.

3.3 The work described in Circular 120 indicates that a VOR system performance based on the probability of 95 per cent containment would require the following protected airspace around the centre line of the route to allow for possible deviations:

— VOR routes with 93 km (50 NM) or less between VORs: ±7.4 km (4 NM);

— VOR routes with up to 278 km (150 NM) between VORs: ±7.4 km (4 NM) up to 46 km (25 NM) from the VOR then expanding protected airspace up to ±11.1 km (6 NM) at 139 km (75 NM) from the VOR.

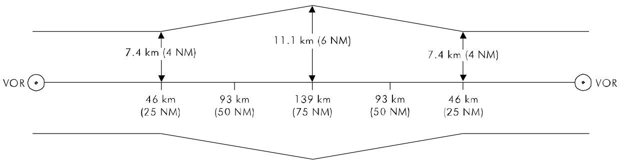

Figure A-1

3.4 If the appropriate ATS authority considers that a better protection is required, e.g. because of the proximity of prohibited, restricted or danger areas, climb or descent paths of military aircraft, etc., it may decide that a higher level of containment should be provided. For delineating the protected airspace the following values should then be used:

— for segments with 93 km (50 NM) or less between VORs, use the values in line A of the table below;

— for segments with more than 93 km (50 NM) and less than 278 km (150 NM) between the VORs use the values given in line A of the table up to 46 km (25 NM), then expand linearly to the value given in line B at 139 km (75 NM) from the VOR.

	Percentage containment					
	95	*96*	*97*	*98*	*99*	*99.5*
A (km)	±7.4	±7.4	±8.3	±9.3	±10.2	±11.1
(NM)	±4.0	±4.0	±4.5	±5.0	±5.5	±6.0
B (km)	±11.1	±11.1	±12.0	±12.0	±13.0	±15.7
(NM)	±6.0	±6.0	±6.5	±6.5	±7.0	±8.5

For example, the protected area for a route of 222 km (120 NM) between VORs and for which 99.5 per cent containment is required should have the following shape:

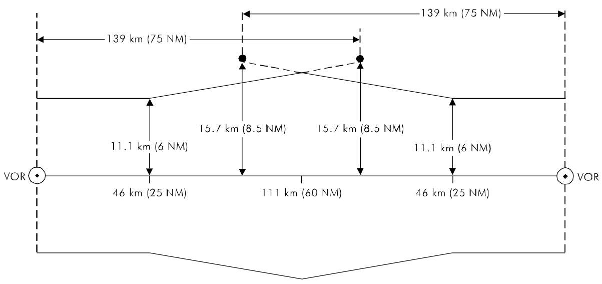

Figure A-2

3.5 If two segments of a VOR-defined ATS route intersect at an angle of more than 25 degrees, additional protected airspace should be provided on the outside of the turn and also on the inside of the turn as necessary. This additional space is to act as a buffer for increased lateral displacement of aircraft, observed in practice, during changes of direction exceeding 25 degrees. The amount of airspace added varies with the angle of intersection. The greater the angle, the greater the additional airspace to be used. Guidance is provided for protected airspace required at turns of no more than 90 degrees. For the exceptional circumstances which require an ATS route with a turn of more than 90 degrees, States should ensure that adequate protected airspace is provided on both the inside and outside of such turns.

3.6 The following examples have been synthesized from the practices of two States which use templates to facilitate the diagramming of airspace for planning purposes. Design of the turning area templates took into account factors such as aircraft speed, bank angle in turns, probable wind velocity, position errors, pilot delays and an intercept angle of at least 30 degrees to achieve the new track, and provides at least 95 per cent containment.

3.7 A template was used to establish the additional airspace required on the outside of turns to contain aircraft executing turns of 30, 45, 60, 75 and 90 degrees. The simplified figures below represent the outer limits of this airspace with the fairing curves removed to allow easy construction. In each case, the additional airspace is shown for aircraft flying in the direction of the large arrow. Where routes are used in both directions, the same additional airspace should be provided on the other outside boundary.

3.8 Figure A-3 illustrates the application of two segments intersecting at a VOR, at an angle of 60 degrees.

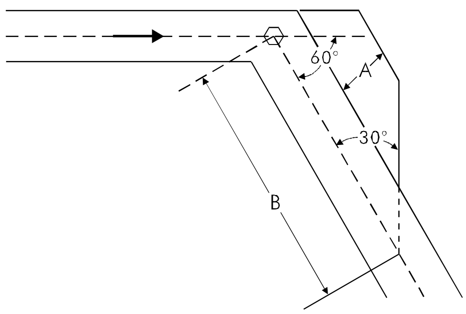

Figure A-3

3.9 Figure A-4 illustrates the application for two segments meeting at a VOR intersection at an angle of 60 degrees beyond the point where boundary splay is required in order to comply with 3.3 and Figure A-1.

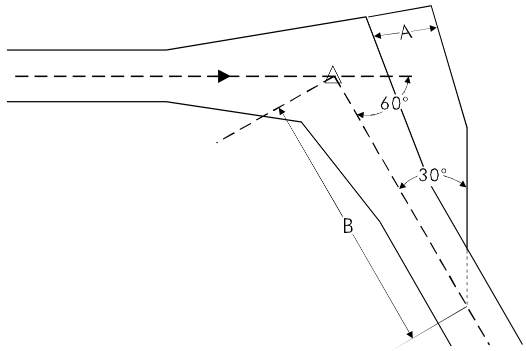

Figure A-4

3.10 The following table outlines the distances to be used in sample cases when providing additional protected airspace for route segments at and below FL 450, intersecting at a VOR or meeting at a VOR intersection not more than 139 km (75 NM) from each VOR.

Note.— Refer to Figures A-3 and A-4.

Angle of intersection		*30°*	*45°*	*60°*	*75°*	*90°*
VOR						
*Distance "A"	(km)	5	9	13	17	21
	(NM)	3	5	7	9	11
*Distance "B"	(km)	46	62	73	86	92
	(NM)	25	34	40	46	50
Intersection						
*Distance "A"	(km)	7	11	17	23	29
	(NM)	4	6	9	13	16
*Distance "B"	(km)	66	76	88	103	111
	(NM)	36	41	48	56	60

*Distances are rounded up to the next whole kilometre/nautical mile.

Note.— For behaviour of aircraft at turns, see Circular 120, 4.4.

3.11 Figure A-5 illustrates a method to construct the required additional protected airspace on the inside of turns for turns of 90 degrees or less:

> Locate a point on the airway centre line, equal to the radius of turn plus the along-track tolerance prior to the nominal turning point.
>
> From this point, drop a perpendicular line to intersect the edge of the airway on the inside of the turn.
>
> From this point on the inner edge of the airway, construct a line to intersect the airway centre line beyond the turn at an angle of half of the angle of turn.
>
> The resulting triangle on the inside of the turn depicts the additional airspace which should be protected for the change of direction. For any turn of 90 degrees or less, the extra space on the inside will serve for aircraft approaching the turn from either direction.

Note 1.— Criteria for the calculation of the along-track tolerance are contained in PANS-OPS (Doc 8168), Volume II, Part III, Appendix to Chapter 31.

Note 2.— Guidance on the calculation of radius of turn is provided in Section 7.

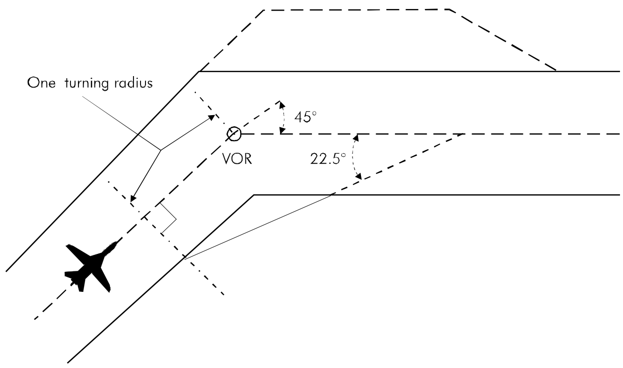

Figure A-5

3.12 For turns at VOR intersections, the principles of construction for extra airspace on the inside of a turn as described in 3.11 can be applied. Depending on the distance of the intersection from one or both VORs, one or both airways may have a splay at the intersection. Depending upon the situation, the extra airspace may be inside, partially inside, or outside of the 95 per cent containment. If the route is used in both directions, the construction should be completed separately for each direction.

3.13 Measured data for routes longer than 278 km (150 NM) between VORs are not yet available. To determine protected airspace beyond 139 km (75 NM) from the VOR, the use of an angular value of the order of 5 degrees as representing the probable system performance would appear satisfactory. The following figure illustrates this application.

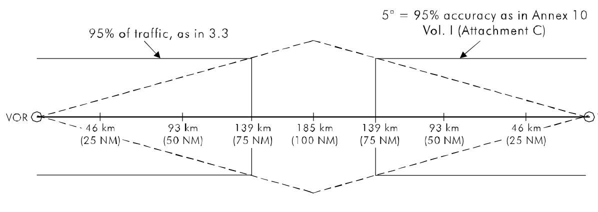

Figure A-6

4. Spacing of parallel routes defined by VORs

Note.— The material of this section has been derived from measured data using the collision-risk/target level of safety method.

4.1 The collision risk calculation, performed with the data of the European study mentioned in 1.1 indicates that, in the type of environment investigated, the distance between route centre lines (S in Figure A-7) for distances between VORs of 278 km (150 NM) or less should normally be a minimum of:

a) 33.3 km (18 NM) for parallel routes where the aircraft on the routes fly in opposite direction; and

b) 30.6 km (16.5 NM) for parallel routes where the aircraft on the two routes fly in the same direction.

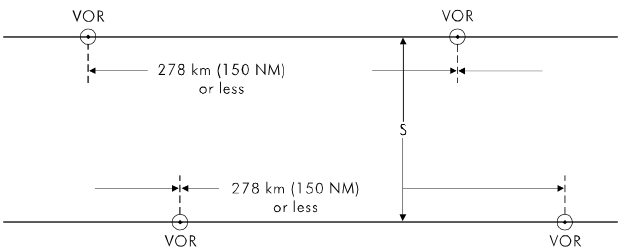

Figure A-7

Note.— Two route segments are considered parallel when:

— they have about the same orientation, i.e. the angular difference does not exceed 10 degrees;

— they are not intersecting, i.e. another form of separation must exist at a defined distance from the intersection;

— traffic on each route is independent of traffic on the other route, i.e. it does not lead to restrictions on the other route.

4.2 This spacing of parallel routes assumes:

a) aircraft may either during climb or descent or during level flight be at the same flight levels on the two routes;

b) traffic densities of 25 000 to 50 000 flights per busy two-month period;

c) VOR transmissions which are regularly flight checked in accordance with Doc 8071 — *Manual on Testing of Radio Navigation Aids,* Volume I, and have been found to be satisfactory in accordance with the procedures in that document for navigational purposes on the defined routes; and

d) no real-time radar monitoring or control of the lateral deviations is exercised.

4.3 Preliminary work indicates that, in the circumstances described in a) to c) below, it may be possible to reduce the minimum distance between routes. However, the figures given have not been precisely calculated and in each case a detailed study of the particular circumstances is essential:

a) if the aircraft on adjacent routes are not assigned the same flight levels, the distance between the routes may be reduced; the magnitude of the reduction will depend on the vertical separation between aircraft on the adjacent tracks and on the percentage of climbing and descending traffic, but is not likely to be more than 5.6 km (3 NM);

b) if the traffic characteristics differ significantly from those contained in Circular 120, the minima contained in 4.1 may require adjustment. For example, for traffic densities of about 10 000 flights per busy two-month period a reduction of 900 to 1 850 m (0.5 to 1.0 NM) may be possible;

c) the relative locations of the VORs defining the two tracks and the distance between the VORs will have an effect on the spacing, but this has not been quantified.

4.4 Application of radar monitoring and control of the lateral deviations of the aircraft may have a large effect on the minimum allowable distance between routes. Studies on the effect of radar monitoring indicate that:

— further work is necessary before a fully satisfactory mathematical model can be developed;

— any reduction of separation is closely related to:

  — traffic (volume, characteristics);
  — radar coverage and processing, availability of an automatic alarm;
  — monitoring continuity;
  — sector workload; and
  — radiotelephony quality.

According to these studies and taking into account the experience some States have accumulated over many years with parallel route systems under continuous radar control, it can be expected that a reduction to the order of 15 to 18.5 km (8 to 10 NM), but most probably not less than 13 km (7 NM), may be possible as long as radar monitoring workload is not increased substantially by that reduction. Actual operations of such systems using reduced lateral spacing have shown that:

— it is very important to define and publish change-over points (see also 6);

— large turns should be avoided when possible; and

— where large turns cannot be avoided, required turn profiles should be defined for turns larger than 20 degrees.

Even where the probability of total radar failure is very small, procedures to cover that case should be considered.

5. Spacing of adjacent VOR-defined routes that are not parallel

Note 1.— The material of this section is intended to provide guidance for situations where non-intersecting VOR-defined routes are adjacent and have an angular difference exceeding 10 degrees.

Note 2.— The material of this section has not been derived by means of the collision-risk/target level of safety method.

5.1 For adjacent non-intersecting VOR-defined routes that are not parallel, the collision-risk/target level of safety method is not, at its present state of development, fully appropriate. For this reason use should be made of the material in 3.

5.2 The protected airspace between such routes should not be less than that which will provide, without overlap, the 99.5 per cent containment values given in the table in 3.4 (see example in Figure A-8).

5.3 Where there is an angular difference of more than 25 degrees between route segments, additional protected airspace, as indicated in 3.5 to 3.10, should be provided.

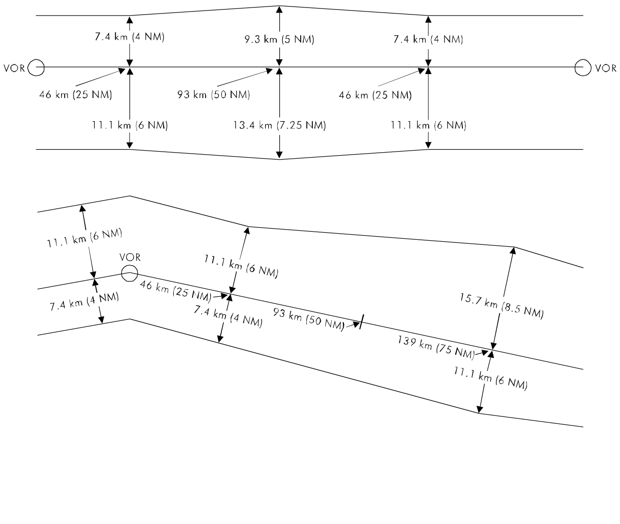

Figure A-8

6. Change-over points for VORs

6.1 When considering the establishment of points for changeover from one VOR to another for primary navigational guidance on VOR-defined ATS routes, States should bear in mind that:

a) the establishment of change-over points should be made on the basis of performance of the VOR stations concerned, including an evaluation of the interference protection criteria. The process should be verified by flight checking (see Doc 8071, Volume I, Part II);

b) where frequency protection is critical, flight inspection should be undertaken at the highest altitudes to which the facility is protected.

6.2 Nothing in 6.1 should be interpreted as placing a restriction on the service ranges of VOR installations meeting the specifications in Annex 10, Volume I, 3.3.

7. Calculation of radius of turn

7.1 The method used to calculate turn radii and the turn radii indicated below are applicable to aircraft performing a constant radius turn. The material has been derived from the turn performance criteria developed for RNP 1 ATS routes and can be used in the construction of the required additional protected airspace on the inside of turns also for ATS routes other than those defined by VOR.

7.2 Turn performance is dependent on two parameters — ground speed and bank angle. Due to the effect of the wind component changing with the change of heading, the ground speed and hence bank angle will change during a constant radius turn. However, for turns not greater than approximately 90 degrees and for the speed values considered below, the following formula can be used to calculate the achievable constant radius of turn, where the ground speed is the sum of the true airspeed and the wind speed:

$$\text{Radius of turn} = \frac{(\text{Ground speed})^2}{\text{Constant 'G'} * \text{TAN(bank angle)}}$$

7.3 The greater the ground speed, the greater will be the required bank angle. To ensure that the turn radius is representative for all foreseeable conditions, it is necessary to consider extreme parameters. A true airspeed of 1 020 km/h (550 kt) is considered probably the greatest to be encountered in the upper levels. Combined with maximum anticipated wind speeds in the medium and upper flight levels of 370 km/h (200 kt) [99.5 per cent values based on meteorological data], a maximum ground speed of 1 400 km/h (750 kt) should be considered. Maximum bank angle is very much a function of individual aircraft. Aircraft with high wing loadings flying at or near their maximum flight level are highly intolerant of extreme angles. Most transport aircraft are certified to fly no slower than 1.3 times their stall speed for any given configuration. Because the stall speed rises with TAN(bank angle), many operators try not to cruise below 1.4 times the stall speed to protect against gusts or turbulence. For the same reason, many transport aircraft fly at reduced maximum angles of bank in cruise conditions. Hence, it can be assumed that the highest bank angle which can be tolerated by all aircraft types is in the order of 20 degrees.

7.4 By calculation, the radius of turn of an aircraft flying at 1 400 km/h (750 kt) ground speed, with a bank angle of 20 degrees, is 22.51 NM (41.69 km). For purposes of expediency, this has been reduced to 22.5 NM (41.6 km). Following the same logic for the lower airspace, it is considered that up to FL 200 (6 100 m) the maximum figures to be encountered are a true airspeed of 740 km/h (400 kt), with a tailwind of 370 km/h (200 kt). Keeping the maximum bank angle of 20 degrees, and following the same formula, the turn would be defined along a radius of 14.45 NM (26.76 km). For expediency, this figure may be rounded up to 15 NM (27.8 km).

7.5 Given the above, the most logical break point between the two ground speed conditions is between FL 190 (5 800 m) and FL 200 (6 100 m). In order to encompass the range of turn anticipation algorithms used in current flight management systems (FMS) under all foreseeable conditions, the turn radius at FL 200 and above should be defined as 22.5 NM (41.6 km) and at FL 190 and below as 15 NM (27.8 km).

ATTACHMENT B. METHOD OF ESTABLISHING ATS ROUTES FOR USE BY RNAV-EQUIPPED AIRCRAFT

(Paragraph 2.7.1 and Section 2.11 refer)

1. Introduction

1.1 This guidance material is the result of studies carried out in several States. It also reflects the long existence of RNAV criteria in several States. It must be noted that some of the values contained herein have not been derived by means of the collision-risk/target level of safety method. This is indicated where applicable.

1.2 States are encouraged to keep ICAO fully informed of the results of their application of the provisions of this guidance material.

2. Operational applications of RNAV routes based on RNP 4

2.1 General

2.1.1 This guidance material is meant for use on RNAV routes that are established within the coverage area of electronic navigation aids that will provide necessary updates and guard against RNAV "blunder" errors.

2.1.2 Only those aircraft that have been granted airworthiness/operational approval in accordance with Sections 5.5 and 5.6, *Manual on Required Navigation Performance (RNP)* (Doc 9613) are to be afforded air traffic services on RNAV routes developed in accordance with this material.

2.1.3 The use of RNAV equipment should be permitted for navigation along ATS routes defined by VOR. Additionally, RNAV routes may be provided where practicable and when justified by the number of aircraft with RNAV capability. The routes may be:

a) fixed RNAV routes;

b) contingency RNAV routes; and

c) random RNAV routings.

2.1.4 The navigational performance required of such RNAV equipment envisages a level of navigational accuracy for en-route purposes having a navigation performance equal to or better than a track-keeping accuracy of ±11.1 km (6 NM) for 99.5 per cent of the flight time of all aircraft using RNAV equipment. Navigational performance of this type is expected to be consistent with a track-keeping accuracy of ±7.4 km (4 NM) for 95 per cent of flight time of all aircraft using RNAV equipment. This level is similar to that currently achieved by aircraft without RNAV capability operating on existing routes defined by VOR or VOR/DME, where the VORs are less than 93 km (50 NM) apart.

2.2 Protected airspace for RNAV ATS routes based on RNP 4

2.2.1 The minimum protected airspace provided for RNAV ATS routes should be 11.1 km (6 NM) either side of the intended track, within which RNAV-equipped aircraft can be expected to remain for 99.5 per cent of the flight time. Before applying the values stemming from this concept, account should be taken of any practical experience gained in the airspace under consideration as well as the possibility of achieving improvements in the overall navigation performance of aircraft. In this context, when lateral deviations are being controlled with the aid of radar monitoring, the size of the protected airspace required may be reduced in accordance with the following:

	Percentage containment					
	95	*96*	*97*	*98*	*99*	*99.5*
km	±7.4	±7.4	±8.3	±9.3	±10.2	±11.1
NM	±4.0	±4.0	±4.5	±5.0	±5.5	±6.0

2.2.2 Radar monitoring studies indicate that any potential reduction of the protected airspace is closely related to traffic characteristics, information available to the controller, and sector workload. Finally, it is worth considering that the analysis of RNAV accuracy performed in terms of containment measurements by some European States has shown that flights with RNAV capability were within 5 NM of the route centre line for 99.5 per cent of the time (EUR Doc 001, RNAV/4 refers). If the appropriate ATS authority considers that more protection is required, e.g. because of proximity of prohibited, restricted or danger areas, climb and descent paths of military aircraft, etc., additional buffers should be provided.

2.2.3 Where there is an angular difference of more than 25 degrees between route segments, additional protected airspace, as indicated in Attachment A, 3.5 to 3.12 and Section 7, should be provided.

Note.— Different levels of navigation accuracy may be required by States for operations of RNAV-equipped aircraft. These requirements are not covered by this guidance material and may necessitate changes to protected airspace criteria.

2.3 Spacing between parallel RNAV routes based on RNP 4

When utilizing protected airspace as described in 2.2, route centre lines may be spaced such that the protected airspaces encompassing the 99.5 per cent containment values do not overlap. When implementing a spacing encompassing less than the 99.5 per cent containment values, radar monitoring is required.

3. Spacing between parallel tracks or between parallel RNAV route centre lines based on RNP type

3.1 It should be noted that, where indicated, the spacings depicted below are based on safety assessments performed specifically for a particular network of tracks or routes. As such, the assessments evaluated traffic characteristics which might be unique to the network being assessed. For example, some of these characteristics are traffic density, the frequency of aircraft passing with minimum separation, communication and surveillance facilities, etc. Additional information on performing safety assessments is contained in the *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc 9689).

3.2 When determining the spacing between parallel tracks or ATS routes (hereinafter referred to as a “system”), the safety assessment, involving an examination of items such as those listed in 3.1 above, should be performed against a minimum acceptable safety level.

3.2.1 Where “fatal accidents per flight hour” is considered to be an appropriate metric, a target level of safety (TLS) of 5×10^{-9} fatal accidents per flight hour per dimension should be applied for determining the acceptability of future en-route systems that will be implemented after the year 2000. Until then, a TLS of 2×10^{-8} fatal accidents per flight hour per dimension may be applied for this purpose.

3.2.2 However, where “fatal accidents per flight hour” is not considered to be an appropriate metric, justifiable alternative metrics and methods of assessment providing an acceptable level of safety may be established by States and, as appropriate, be implemented by regional agreements.

3.3 If, at the time a system is established or upon a subsequent system safety assessment, it is determined that the system does not meet the appropriate level of safety for the method of assessment being used, a reassessment should be considered. This assessment should be undertaken in accordance with Doc 9689 to determine if a level of safety equivalent to or better than the minimum acceptable level can be met.

3.4 Examples of spacings for systems in specific areas or regions based on RNP type are provided below. Where these spacings are based on the characteristics of a specific area or region (reference system), other States or regions will need to evaluate their own systems for comparability with the reference system.

3.4.1 For procedural environments:

a) **RNP 20**

Spacing: 185 km (100 NM);

Basis: Existing usage, based on long-standing, operational experience; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 20 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports.

b) **RNP 12.6**

Spacing: 110 km (60 NM);

Basis: Collision risk model performed for NAT Organized Track Structure (*Report of the Limited/North Atlantic Regional Air Navigation Meeting (1976)* (Doc 9182)); and

Minimum ATS requirements:

NAV — All aircraft need RNP type 12.6 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports

Other — System safety must be evaluated periodically.

Note.— Direct controller/pilot communications may be desirable in certain areas, such as areas of known convective weather.

c) **RNP 10**

Spacing: 93 km (50 NM);

Basis: Collision risk model performed by the United States Federal Aviation Administration for the Pacific Region based on North Pacific traffic characteristics; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 10 approval appropriate for the routes/tracks to be flown

COM — Voice communications through a third party

SUR — Procedural-pilot position reports

Other — System safety must be evaluated periodically.

Note.— Direct controller/pilot communications may be desirable in certain areas, such as areas of known convective weather.

d) **RNP 5 (or RNP 4 or better)**

Spacing: 30.6 km (16.5 NM) in a unidirectional system
33.3 km (18 NM) in a bi-directional system;

Basis: Comparison to a high-density continental reference system (VOR spacing) as described in Attachment A; and

Minimum ATS requirements:

NAV — All aircraft need RNP type 5 approval appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 5 operations

COM — Direct VHF controller/pilot voice communications

SUR — Procedural-pilot position reports.

Note 1.— Guidance material relating to the use of RNP 5 is contained in the Manual on Required Navigation Performance (RNP) *(Doc 9613).*

Note 2.— This spacing was not developed for applicability in remote and/or oceanic airspace where an appropriate VOR infrastructure is not available.

e) **RNP 4**

Spacing: 55.5 km (30 NM);

Basis 1: Safety assessment performed by the United States Federal Aviation Administration based on analysis of acceptable rate of gross lateral errors in a parallel route system using 55.5 km (30 NM) track spacing while meeting a target level of safety of 5×10^{-9} fatal accidents per flight hour.

Basis 2: Minimum requirements for communications and surveillance listed below are operationally necessary to manage contingency and emergency events in a 55.5 km (30 NM) route system.

Note.— Further information on the safety assessment performed is contained in the Manual on Airspace Planning Methodology for the Determination of Separation Minima (*Doc 9689*).

Minimum ATS requirements:

NAV — RNP 4 shall be prescribed for the designated area, tracks or ATS routes

COM — Direct controller-pilot voice communications or controller-pilot data link communications (CPDLC)

SUR — An ADS system in which an event contract must be set that includes a lateral deviation event report whenever a deviation from track centre line greater than 9.3 km (5 NM) occurs.

Other — Prior to implementation, a system verification of sufficient duration and integrity shall be performed to demonstrate that the maximum acceptable rate of lateral deviations greater than or equal to 27.8 km (15 NM) will not exceed those listed in Table B-1 and that the system meets operational and technical requirements. The verification should be conducted after the minimum navigation, communications and surveillance requirements listed above have been met. Following implementation, a monitoring programme must be established to periodically verify that the system's actual rate of lateral deviations greater than or equal to 27.8 km (15 NM) does not exceed the maximum prescribed in Table B-1 (information pertaining to monitoring can be found in the *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc 9689), Chapter 8.

Note 1.— The airspace planner should first decide which of the four system descriptions applies in the airspace under consideration. If the system is not identical to one of the four cases described in Table B-1, the planner should conservatively interpolate between the cases by taking from the two cases that resemble the system, the one with the lower lateral deviation rate. Next, select from the first column, the value of system lateral occupancy that the system is not expected to exceed over the planning horizon. By reading the table at the row and column selected, the airspace planner obtains the value of the lateral deviation rate that should not be exceeded in the system to meet the TLS of 5×10^{-9} fatal accidents per flight hour.

Note 2.— Lateral deviations that should be considered for the purposes of assessing the system safety are any deviation from track of a magnitude greater than or equal to 27.8 km (15 NM) which are not associated with the execution of an approved contingency procedure.

Note 3.— Procedures pertaining to the use of ADS and CPDLC are contained in the PANS-ATM (Doc 4444), Chapters 13 and 14, respectively. Criteria for CPDLC and ADS should be established by an appropriate safety assessment. Information on safety assessments is contained in the Manual on Airspace Planning Methodology for the Determination of Separation Minima *(Doc 9689).*

Note 4.— This spacing was developed for applicability in remote and/or oceanic airspace where an appropriate VOR infrastructure is not available.

Note 5.— In this material, lateral occupancy means a number equal to twice the number of laterally proximate pairs of aircraft divided by the total number of aircraft. A detailed explanation of the terms used in collision risk modelling is contained in the Air Traffic Services Planning Manual *(Doc 9426), Part II, Chapter 4, Appendices A and C.*

3.4.2 For radar environments:

a) **RNP 4**

Spacing: 14.8-22.2 km (8-12 NM);

Basis: Comparison to a reference system — containment areas, determined in accordance with 2.2.1, do not overlap; and

Minimum ATS requirements:

NAV — All aircraft need at least RNP type 4 approval appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 4 operations

COM — Direct VHF controller/pilot voice communications

SUR — Radar which meets existing standards

Other — System safety, including controller workload, must be evaluated.

b) **RNP 5**

Spacing: 18.5-27.8 km (10-15 NM);

Basis: Comparison to a reference system — containment areas, adapted from the provisions of 2.2.1 above to reflect RNP 5, do not overlap; and

Minimum ATS requirements:

NAV — All aircraft need at least RNP type 5 appropriate for the routes/tracks to be flown, and the NAVAID infrastructure must be provided sufficient to support RNP 5 operations

COM — Direct VHF controller/pilot voice communications

SUR — Radar which meets existing standards

Other — System safety, including controller workload, must be evaluated.

Table B-1. Maximum acceptable rates of lateral deviations greater than or equal to 27.8 km (15 NM)

Maximum expected route system lateral occupancy	*Rate for two same-direction routes*	*Rate for four same-direction routes*	*Rate for seven same-direction routes*	*Rate for two opposite-direction routes*
0.1	1.99×10^{-4}	1.75×10^{-4}	1.52×10^{-4}	3.14×10^{-5}
0.2	1.06×10^{-4}	9.39×10^{-5}	8.27×10^{-5}	2.23×10^{-5}
0.3	7.50×10^{-5}	6.70×10^{-5}	5.95×10^{-5}	1.92×10^{-5}
0.4	5.95×10^{-5}	5.35×10^{-5}	4.79×10^{-5}	1.77×10^{-5}
0.5	5.03×10^{-5}	4.55×10^{-5}	4.10×10^{-5}	1.68×10^{-5}
0.6	4.41×10^{-5}	4.01×10^{-5}	3.64×10^{-5}	1.62×10^{-5}
0.7	3.97×10^{-5}	3.62×10^{-5}	3.30×10^{-5}	1.58×10^{-5}
0.8	3.64×10^{-5}	3.34×10^{-5}	3.06×10^{-5}	1.55×10^{-5}
0.9	3.38×10^{-5}	3.11×10^{-5}	2.86×10^{-5}	1.52×10^{-5}
1.0	3.17×10^{-5}	2.93×10^{-5}	2.71×10^{-5}	1.50×10^{-5}
1.1	3.00×10^{-5}	2.79×10^{-5}	2.58×10^{-5}	1.48×10^{-5}
1.2	2.86×10^{-5}	2.66×10^{-5}	2.48×10^{-5}	1.47×10^{-5}
1.3	2.74×10^{-5}	2.56×10^{-5}	2.39×10^{-5}	1.46×10^{-5}
1.4	2.64×10^{-5}	2.47×10^{-5}	2.31×10^{-5}	1.45×10^{-5}
1.5	2.55×10^{-5}	2.39×10^{-5}	2.25×10^{-5}	1.44×10^{-5}
1.6	2.48×10^{-5}	2.33×10^{-5}	2.19×10^{-5}	1.43×10^{-5}
1.7	2.41×10^{-5}	2.27×10^{-5}	2.14×10^{-5}	1.42×10^{-5}
1.8	2.35×10^{-5}	2.22×10^{-5}	2.09×10^{-5}	1.42×10^{-5}
1.9	2.29×10^{-5}	2.17×10^{-5}	2.05×10^{-5}	1.41×10^{-5}
2.0	2.24×10^{-5}	2.13×10^{-5}	2.01×10^{-5}	1.41×10^{-5}

ATTACHMENT C. TRAFFIC INFORMATION BROADCASTS BY AIRCRAFT (TIBA) AND RELATED OPERATING PROCEDURES

(See Chapter 4, 4.2.2, Note 2)

1. Introduction and applicability of broadcasts

1.1 Traffic information broadcasts by aircraft are intended to permit reports and relevant supplementary information of an advisory nature to be transmitted by pilots on a designated VHF radiotelephone (RTF) frequency for the information of pilots of other aircraft in the vicinity.

1.2 TIBAs should be introduced only when necessary and as a temporary measure.

1.3 The broadcast procedures should be applied in designated airspace where:

a) there is a need to supplement collision hazard information provided by air traffic services outside controlled airspace; or

b) there is a temporary disruption of normal air traffic services.

1.4 Such airspaces should be identified by the States responsible for provision of air traffic services within these airspaces, if necessary with the assistance of the appropriate ICAO Regional Office(s), and duly promulgated in aeronautical information publications or NOTAM, together with the VHF RTF frequency, the message formats and the procedures to be used. Where, in the case of 1.3 a), more than one State is involved, the airspace should be designated on the basis of regional air navigation agreements and promulgated in Doc 7030.

1.5 When establishing a designated airspace, dates for the review of its applicability at intervals not exceeding 12 months should be agreed by the appropriate ATS authority(ies).

2. Details of broadcasts

2.1 VHF RTF frequency to be used

2.1.1 The VHF RTF frequency to be used should be determined and promulgated on a regional basis. However, in the case of temporary disruption occurring in controlled airspace, the States responsible may promulgate, as the VHF RTF frequency to be used within the limits of that airspace, a frequency used normally for the provision of air traffic control service within that airspace.

2.1.2 Where VHF is used for air-ground communications with ATS and an aircraft has only two serviceable VHF sets, one should be tuned to the appropriate ATS frequency and the other to the TIBA frequency.

2.2 Listening watch

A listening watch should be maintained on the TIBA frequency 10 minutes before entering the designated airspace until leaving this airspace. For an aircraft taking off from an aerodrome located within the lateral limits of the designated airspace listening watch should start as soon as appropriate after take-off and be maintained until leaving the airspace.

2.3 Time of broadcasts

A broadcast should be made:

a) 10 minutes before entering the designated airspace or, for a pilot taking off from an aerodrome located within the lateral limits of the designated airspace, as soon as appropriate after take-off;

b) 10 minutes prior to crossing a reporting point;

c) 10 minutes prior to crossing or joining an ATS route;

d) at 20-minute intervals between distant reporting points;

e) 2 to 5 minutes, where possible, before a change in flight level;

f) at the time of a change in flight level; and

g) at any other time considered necessary by the pilot.

2.4 Forms of broadcast

2.4.1 The broadcasts other than those indicating changes in flight level, i.e. the broadcasts referred to in 2.3 a), b), c), d) and g), should be in the following form:

ALL STATIONS (necessary to identify a traffic information broadcast)

(call sign)

FLIGHT LEVEL (number) (or CLIMBING* TO FLIGHT LEVEL (number))

(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

POSITION (position**) AT (time)

ESTIMATING (next reporting point, or the point of crossing or joining a designated ATS route) AT (time)

(call sign)

FLIGHT LEVEL (number)

(direction)

Fictitious example:

"ALL STATIONS WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND DIRECT FROM PUNTA SAGA TO PAMPA POSITION 5040 SOUTH 2010 EAST AT 2358 ESTIMATING CROSSING ROUTE LIMA THREE ONE AT 4930 SOUTH 1920 EAST AT 0012 WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND OUT"

2.4.2 Before a change in flight level, the broadcast (referred to in 2.3 e)) should be in the following form:

ALL STATIONS

(call sign)

(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

LEAVING FLIGHT LEVEL (number) FOR FLIGHT LEVEL (number) AT (position and time)

* For the broadcast referred to in 2.3 a) in the case of an aircraft taking off from an aerodrome located within the lateral limits of the designated airspace.

** For broadcasts made when the aircraft is not near an ATS significant point, the position should be given as accurately as possible and in any case to the nearest 30 minutes of latitude and longitude.

2.4.3 Except as provided in 2.4.4, the broadcast at the time of a change in flight level (referred to in 2.3 f)) should be in the following form:

ALL STATIONS

(call sign)
(direction)

(ATS route) (or DIRECT FROM (position) TO (position))

LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)

followed by:

ALL STATIONS

(call sign)

MAINTAINING FLIGHT LEVEL (number)

2.4.4 Broadcasts reporting a temporary flight level change to avoid an imminent collision risk should be in the following form:

ALL STATIONS

(call sign)

LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)

followed as soon as practicable by:

ALL STATIONS

(call sign)

RETURNING TO FLIGHT LEVEL (number) NOW

2.5 Acknowledgement of the broadcasts

The broadcasts should not be acknowledged unless a potential collision risk is perceived.

3. Related operating procedures

3.1 Changes of cruising level

3.1.1 Cruising level changes should not be made within the designated airspace, unless considered necessary by pilots to avoid traffic conflicts, for weather avoidance or for other valid operational reasons.

3.1.2 When cruising level changes are unavoidable, all available aircraft lighting which would improve the visual detection of the aircraft should be displayed while changing levels.

3.2 Collision avoidance

If, on receipt of a traffic information broadcast from another aircraft, a pilot decides that immediate action is necessary to avoid an imminent collision risk, and this cannot be achieved in accordance with the right-of-way provisions of Annex 2, the pilot should:

a) unless an alternative manoeuvre appears more appropriate, immediately descend 150 m (500 ft), or 300 m (1 000 ft) if above FL 290 in an area where a vertical separation minimum of 600 m (2 000 ft) is applied;

b) display all available aircraft lighting which would improve the visual detection of the aircraft;

c) as soon as possible, reply to the broadcast advising action being taken;

d) notify the action taken on the appropriate ATS frequency; and

e) as soon as practicable, resume normal flight level, notifying the action on the appropriate ATS frequency.

3.3 Normal position reporting procedures

Normal position reporting procedures should be continued at all times, regardless of any action taken to initiate or acknowledge a traffic information broadcast.

ATTACHMENT D. MATERIAL RELATING TO CONTINGENCY PLANNING

(see 2.29)

1. Introduction

1.1 Guidelines for contingency measures for application in the event of disruptions of air traffic services and related supporting services were first approved by the Council on 27 June 1984 in response to Assembly Resolution A23-12, following a study by the Air Navigation Commission and consultation with States and international organizations concerned, as required by the Resolution. The guidelines were subsequently amended and amplified in the light of experience gained with the application of contingency measures in various parts of the world and in differing circumstances.

1.2 The purpose of the guidelines is to assist in providing for the safe and orderly flow of international air traffic in the event of disruptions of air traffic services and related supporting services and in preserving the availability of major world air routes within the air transportation system in such circumstances.

1.3 The guidelines have been developed in recognition of the fact that circumstances before and during events causing disruptions of services to international civil aviation vary widely and that contingency measures, including access to designated aerodromes for humanitarian reasons, in response to specific events and circumstances must be adapted to these circumstances. They set forth the allocation of responsibility among States and ICAO for the conduct of contingency planning and the measures to be taken into consideration in developing, applying and terminating the application of such plans.

1.4 The guidelines are based on experience which has shown, inter alia, that the effects of disruption of services in particular portions of airspace are likely to affect significantly the services in adjacent airspace, thereby creating a requirement for international coordination, with the assistance of ICAO as appropriate. Hence, the role of ICAO in the field of contingency planning and coordination of such plans is described in the guidelines. They also reflect the experience that ICAO's role in contingency planning must be global and not limited to airspace over the high seas and areas of undetermined sovereignty, if the availability of major world air routes within the air transportation system is to be preserved. Finally, they further reflect the fact that international organizations concerned, such as the International Air Transport Association (IATA) and the International Federation of Airline Pilots' Associations (IFALPA), are valuable advisers on the practicability of overall plans and elements of such plans.

2. Status of contingency plans

Contingency plans are intended to provide alternative facilities and services to those provided for in the regional air navigation plan when those facilities and services are temporarily not available. Contingency arrangements are therefore temporary in nature, remain in effect only until the services and facilities of the regional air navigation plan are reactivated and, accordingly, do not constitute amendments to the regional plan requiring processing in accordance with the "Procedure for the Amendment of Approved Regional Plans". Instead, in cases where the contingency plan would temporarily deviate from the approved regional air navigation plan, such deviations are approved, as necessary, by the President of the ICAO Council on behalf of the Council.

3. Responsibility for developing, promulgating and implementing contingency plans

3.1 The State(s) responsible for providing air traffic services and related supporting services in particular portions of airspace is (are) also responsible, in the event of disruption or potential disruption of these services, for instituting measures to ensure the safety of international civil aviation operations and, where possible, for making provisions for alternative facilities and services. To that end the State(s) should develop, promulgate and implement appropriate contingency plans. Such plans should be developed in consultation with other States and airspace users concerned and with ICAO, as appropriate, whenever the effects of the service disruption(s) are likely to affect the services in adjacent airspace.

3.2 The responsibility for appropriate contingency action in respect of airspace over the high seas continues to rest with the State(s) normally responsible for providing the services until, and unless, that responsibility is temporarily reassigned by ICAO to (an)other State(s).

3.3 Similarly, the responsibility for appropriate contingency action in respect of airspace where the responsibility for providing the services has been delegated by another State continues to rest with the State providing the services until, and unless, the delegating State terminates temporarily the delegation. Upon termination, the delegating State assumes responsibility for appropriate contingency action.

3.4 ICAO will initiate and coordinate appropriate contingency action in the event of disruption of air traffic services and related supporting services affecting international civil aviation operations provided by a State wherein, for some reason, the authorities cannot adequately discharge the responsibility referred to in 3.1. In such circumstances, ICAO will work in coordination with States responsible for airspace adjacent to that affected by the disruption and in close consultation with international organizations concerned. ICAO will also initiate and coordinate appropriate contingency action at the request of States.

4. Preparatory action

4.1 Time is essential in contingency planning if hazards to air navigation are to be reasonably prevented. Timely introduction of contingency arrangements requires decisive initiative and action, which again presupposes that contingency plans have, as far as practicable, been completed and agreed among the parties concerned before the occurrence of the event requiring contingency action, including the manner and timing of promulgating such arrangements.

4.2 For the reasons given in 4.1, States should take preparatory action, as appropriate, for facilitating timely introduction of contingency arrangements. Such preparatory action should include:

a) preparation of general contingency plans for introduction in respect of generally foreseeable events such as industrial action or labour unrest affecting the provision of air traffic services and/or supporting services. In recognition of the fact that the world aviation community is not party to such disputes, States providing services in airspace over the high seas or of undetermined sovereignty should take appropriate action to ensure that adequate air traffic services will continue to be provided to international civil aviation operations in non-sovereign airspace. For the same reason, States providing air traffic services in their own airspace or, by delegation, in the airspace of (an)other State(s) should take appropriate action to ensure that adequate air traffic services will continue to be provided to international civil aviation operations concerned, which do not involve landing or take-off in the State(s) affected by industrial action;

b) assessment of risk to civil air traffic due to military conflict or acts of unlawful interference with civil aviation as well as a review of the likelihood and possible consequences of natural disasters. Preparatory action should include initial development of special contin-gency plans in respect of natural disasters, military conflicts or acts of unlawful interference with civil aviation that are likely to affect the availability of airspace for civil aircraft operations and/or the provision of air traffic services and supporting services. It should be recognized that avoidance of particular portions of airspace on short notice will require special efforts by States responsible for adjacent portions of airspace and by international aircraft operators with regard to planning of alternative routings and services, and the air traffic services authorities of States should therefore, as far as practicable, endeavour to anticipate the need for such alternative actions;

c) monitoring of any developments that might lead to events requiring contingency arrangements to be developed and applied. States should consider designating persons/administrative units to undertake such monitoring and, when necessary, to initiate effective follow-up action; and

d) designation/establishment of a central agency which, in the event of disruption of air traffic services and introduction of contingency arrangements, would be able to provide, 24 hours a day, up-to-date information on the situation and associated contingency measures until the system has returned to normal. A coordinating team should be designated within, or in association with, such a central agency for the purpose of coordinating activities during the disruption.

4.3 ICAO will be available for monitoring developments that might lead to events requiring contingency arrangements to be developed and applied and will, as necessary, assist in the development and application of such arrangements. During the emergence of a potential crisis, a coordinating team will be established in the Regional Office(s) concerned and at ICAO Headquarters in Montreal, and arrangements will be made for competent staff to be available or reachable 24 hours a day. The tasks of these teams will be to monitor continuously information from all relevant sources, to arrange for the constant supply of relevant information received by the State aeronautical information service at the location of the Regional Office and Headquarters, to liaise with international organizations concerned and their regional organizations, as appropriate, and to exchange up-to-date information with States directly concerned and States which are potential participants in contingency arrangements. Upon analysis of all available data, authority for initiating the action considered necessary in the circumstances will be obtained from the State(s) concerned.

5. Coordination

5.1 A contingency plan should be acceptable to providers and users of contingency services alike, i.e. in terms of the ability of the providers to discharge the functions assigned to them and in terms of safety of operations and traffic handling capacity provided by the plan in the circumstances.

5.2 Accordingly, States which anticipate or experience disruption of air traffic services and/or related supporting services should advise, as early as practicable, the ICAO Regional Office accredited to them, and other States whose services might be affected. Such advice should include information on associated contingency measures or a request for assistance in formulating contingency plans.

5.3 Detailed coordination requirements should be determined by States and/or ICAO, as appropriate, keeping the above in mind. In the case of contingency arrangements not appreciably affecting airspace users or service provided outside the airspace of the (single) State involved, coordination requirements are naturally few or non-existent. Such cases are believed to be few.

5.4 In the case of multi-State ventures, detailed coordination leading to formal agreement of the emerging contingency plan should be undertaken with each State which is to participate. Such detailed coordination should also be undertaken with those States whose services will be significantly affected, for example by re-routing of traffic, and with international organizations concerned who provide invaluable operational insight and experience.

5.5 Whenever necessary to ensure orderly transition to contingency arrangements, the coordination referred to in this section should include agreement on a detailed, common NOTAM text to be promulgated at a commonly agreed effective date.

6. Development, promulgation and application of contingency plans

6.1 Development of a sound contingency plan is dependent upon circumstances, including the availability, or not, of the airspace affected by the disruptive circumstances for use by international civil aviation operations. Sovereign airspace can be used only on the initiative of, or with the agreement or consent of, the authorities of the State concerned regarding such use. Otherwise, the contingency arrangements must involve bypassing the airspace and should be developed by adjacent States or by ICAO in cooperation with such adjacent States. In the case of airspace over the high seas or of undetermined sovereignty, development of the contingency plan might involve, depending upon circumstances, including the degree of erosion of the alternative services offered, temporary reassignment by ICAO of the responsibility for providing air traffic services in the airspace concerned.

6.2 Development of a contingency plan presupposes as much information as possible on current and alternative routes, navigational capability of aircraft and availability or partial availability of navigational guidance from ground-based aids, surveillance and communications capability of adjacent air traffic services units, volume and types of aircraft to be accommodated and the actual status of the air traffic services, communications, meteorological and aeronautical information services. Following are the main elements to be considered for contingency planning depending upon circumstances:

a) re-routing of traffic to avoid the whole or part of the airspace concerned, normally involving establishment of additional routes or route segments with associated conditions for their use;

b) establishment of a simplified route network through the airspace concerned, if it is available, together with a flight level allocation scheme to ensure lateral and vertical separation, and a procedure for adjacent area control centres to establish longitudinal separation at the entry point and to maintain such separation through the airspace;

c) reassignment of responsibility for providing air traffic services in airspace over the high seas or in delegated airspace;

d) provision and operation of adequate air-ground communications, AFTN and ATS direct speech links, including reassignment, to adjacent States, of the responsibility for providing meteorological information and information on status of navigation aids;

e) special arrangements for collecting and disseminating in-flight and post-flight reports from aircraft;

f) a requirement for aircraft to maintain continuous listening watch on a specified pilot-pilot VHF frequency in specified areas where air-ground communications are uncertain or non-existent and to broadcast on that frequency, preferably in English, position information and estimates, including start and completion of climb and descent;

g) a requirement for all aircraft in specified areas to display navigation and anti-collision lights at all times;

h) a requirement and procedures for aircraft to maintain an increased longitudinal separation that may be established between aircraft at the same cruising level;

i) a requirement for climbing and descending well to the right of the centre line of specifically identified routes;

j) establishment of arrangements for controlled access to the contingency area to prevent overloading of the contingency system; and

k) a requirement for all operations in the contingency area to be conducted in accordance with IFR, including allocation of IFR flight levels, from the relevant Table of Cruising Levels in Appendix 3 of Annex 2, to ATS routes in the area.

6.3 Notification, by NOTAM, of anticipated or actual disruption of air traffic services and/or related supporting services should be dispatched to users of air navigation services as early as practicable. The NOTAM should include the associated contingency arrangements. In the case of foreseeable disruption, the advance notice should in any case not be less than 48 hours.

6.4 Notification by NOTAM of discontinuance of contingency measures and reactivation of the services set forth in the regional air navigation plan should be dispatched as early as practicable to ensure an orderly transfer from contingency conditions to normal conditions.

ATTACHMENT E. ACCEPTABLE LEVEL OF SAFETY

1. Introduction

1.1 The introduction of the concept of acceptable level of safety responds to the need to complement the prevailing approach to the management of safety based upon regulatory compliance, with a performance based approach that aims for continuous improvement to the overall level of safety.

1.2 Acceptable level of safety expresses the safety goals of an oversight authority, an operator, or a services provider. From the perspective of the relationship between oversight authorities and operators/services providers, it provides the minimum safety objective(s) acceptable to the oversight authority to be achieved by the operators/services providers while conducting their core business functions. It is a reference against which the oversight authority can measure safety performance.

1.3 Establishing acceptable level(s) of safety for the safety programme does not replace legal, regulatory, or other established requirements, nor does it relieve States from their obligations regarding the Convention on International Civil Aviation and its related provisions.

1.4 Establishing acceptable level(s) of safety for the safety management system does not relieve operators/services providers from their obligations under relevant national regulations and the Convention on International Civil Aviation.

2. Scope

2.1 Within each State, different acceptable levels of safety may be established between the oversight authority and individual operators/services providers.

2.2 Each agreed established level of safety should be commensurate with the complexity of individual operator/ service providers operational contexts, and the level to which safety deficiencies can be tolerated and realistically addressed.

3. Implementation

3.1 The concept of acceptable level of safety is expressed in terms of safety performance indicators and safety performance targets, and implemented through safety requirements.

3.2 The relationship between acceptable level of safety, safety performance indicators, safety performance targets and safety requirements is as follows: acceptable level of safety is the overarching concept; safety performance indicators are the measures or metrics to determine if the acceptable level of safety has been achieved, safety performance targets are the quantified objectives pertinent to the acceptable level of safety, and safety requirements are the tools or means required to achieve the safety performance targets.

3.3 The safety performance indicators of an acceptable level of safety should be uncomplicated and linked to major components of a State safety programme, or an operator/services provider safety management system (SMS). They are generally expressed in numerical terms.

3.4 The safety performance targets of an acceptable level of safety should be determined after weighing what is desirable and what is realistic for individual operator/services providers. Safety performance targets should be measurable, acceptable to the parties involved, and consistent with the acceptable level of safety.

3.5 The safety requirements to achieve the safety performance targets of an acceptable level of safety should be expressed in terms of operational procedures, technology and systems, programmes, contingency arrangements and so forth, to which measures of reliability, availability and/or accuracy may be added.

3.6 An acceptable level of safety should be expressed by several safety performance indicators and translated into several safety performance targets, rather than by single ones.

— END —

International Standards and Recommended Practices

Annex 12
to the Convention on International Civil Aviation

Search and Rescue

This edition incorporates all amendments adopted by the Council prior to 24 February 2004 and supersedes, on 25 November 2004, all previous editions of Annex 12.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Eighth Edition
July 2004

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-17	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

In December 1946, the Search and Rescue Division, at its second session, made recommendations for Standards and Recommended Practices for Search and Rescue. These were developed by the Secretariat and the then existent Air Navigation Committee, and were duly submitted to the Council. The proposals were not accepted by the Council in the form in which they were presented and, on 20 April 1948, were referred back to the Air Navigation Committee for further consideration.

A further draft Annex was then developed in the light of experience gained at Regional Air Navigation Meetings and eventually was approved in principle by the Air Navigation Commission and circulated to States for comment. Further development was made by the Air Navigation Commission as a result of States' comments and the resulting proposals were adopted by the Council on 25 May 1950 and designated as Annex 12 to the Convention on International Civil Aviation. The Annex became effective on 1 December 1950 and came into force on 1 March 1951.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

The Standards and Recommended Practices in this document govern the application of the *Regional Supplementary Procedures* — Search and Rescue, contained in Doc 7030, in which document will be found subsidiary procedures of regional application.

Annex 12 is applicable to the establishment, maintenance and operation of search and rescue services in the territories of Contracting States and over the high seas, and to the coordination of such services between States.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each Amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided according to the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice. Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.*

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

Throughout this document:

a) measurements are given in the metric system followed in parentheses by corresponding measurements in the foot-pound system; and

b) the use of the male gender should be understood to include male and female persons.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 12

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
1st Edition	Search and Rescue Division, Second Session (1946) Air Navigation Commission	International Standards and Recommended Practices — Search and Rescue Services.	25 May 1950 1 December 1950 1 March 1951
1 (2nd Edition)	Search and Rescue Division, Third Session (1951)	Search and rescue organization; communications; appraisals of search and rescue operations; procedures for search and rescue; air-to-ground signals.	31 March 1952 1 September 1952 1 January 1953
2 (3rd Edition)	Second Air Navigation Conference (1955)	Rescue sub-centres; servicing and refuelling rescue units of other Contracting States.	8 May 1956 1 September 1956 1 December 1956
3	Third Air Navigation Conference (1956). Amendment 140 to Annex 6, Chapter 6	Marking of areas of the fuselage suitable for break-in.	13 June 1957 1 October 1957 1 December 1957
4 (4th Edition)	Rules of the Air, Air Traffic Services and Search and Rescue Divisions (1958)	Cooperation between States; information concerning emergencies; procedures for rescue coordination centres.	8 December 1959 1 May 1960 1 August 1960
5	Amendment 13 to Annex 11	Notification of rescue coordination centres by air traffic services units.	13 April 1962 — 1 November 1962
6	Amendment 4 to Annex 9	Temporary entry of rescue units from other Contracting States.	— — 1 July 1964
7	Amendment 14 to Annex 11, Chapter 5	Alerting of surface vessels and en-route aircraft to assist an aircraft in distress.	19 June 1964 1 November 1964 1 February 1965
8	International Convention for the Safety of Life at Sea. Amendment 15 to Annex 11	Updating of reference; alerting service.	10 December 1965 — 25 August 1966
9 (5th Edition)	Air Navigation Commission review of the Regional Supplementary Procedures	Cooperation between Contracting States; servicing and refuelling of rescue units of other Contracting States; testing search and rescue communications facilities; assistance in search and rescue operations by additional units or services.	25 May 1970 25 September 1970 4 February 1971
10	Air Navigation Commission	Carriage of the International Code of Signals by search and rescue aircraft; equipment of search and rescue aircraft with frequency 2182 kHz; information on position of merchant ships.	11 December 1972 11 April 1973 16 August 1973

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
11 (6th Edition)	Complete review of the Annex by the Air Navigation Commission	New signal to surface craft; provision of search and rescue services on a 24-hour basis; dissemination of information on position of merchant ships; appraisals of search and rescue operations; improvement of cooperation between neighbouring States; equipment of rescue units; availability of information on air traffic services; location of droppable survival equipment; methods for assisting aircraft in distress and being compelled to ditch to rendezvous with surface craft; methods for assisting search and rescue or other aircraft to rendezvous with aircraft in distress.	25 November 1974 25 March 1975 9 October 1975
12	Amendment 60 to Annex 3	Supplementary communication facilities between meteorological offices and search and rescue units.	8 December 1975 8 April 1976 12 August 1976
13	Air Navigation Commission	Ground-air visual signal code for use by survivors.	15 December 1980 15 April 1981 26 November 1981
14	Air Navigation Commission	Rescue coordination centre (RCC) responsibilities regarding preparatory measures in the event an aircraft is subject to unlawful interference.	12 March 1990 30 July 1990 15 November 1990
15	Air Navigation Commission	Definition for search and rescue aircraft; communications requirements for rescue coordination centres (RCCs) and equipment of search and rescue (SAR) aircraft; SAR point of contact (SPOC).	12 March 1993 26 July 1993 11 November 1993
16 (7th Edition)	Amendments 25, 20 and 7 to Annex 6, Parts I, II and III, respectively; Air Navigation Commission	Revised definition of "pilot-in-command"; editorial amendments.	12 March 2001 16 July 2001 1 November 2001
17	ICAO Secretariat/Air Navigation Commission	Updating to align provisions with the IMO Convention to the extent practicable; harmonization of definitions between aeronautical and maritime SAR documents; regional approach to SAR system establishment; policy agreement between States and operational coordination between aeronautical and maritime SAR services; ready availability of essential data to RCC.	23 February 2004 12 July 2004 25 November 2004

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

Note.— This Annex is supplemented by the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual, *Volume I* — Organization and Management, *Volume II* — Mission Co-ordination, *and Volume III* — Mobile Facilities *(Doc 9731), the purpose of which is to assist States in meeting their search and rescue (SAR) needs and obligations accepted under the Convention on International Civil Aviation. These obligations, as they relate to the provision of SAR services, are specified in this Annex as Standards and Recommended Practices. The three volumes of the IAMSAR Manual provide guidance for a common aviation and maritime approach to organizing and providing SAR services. States are encouraged, by use of the manual, to develop and improve their SAR services and to cooperate with neighbouring States.*

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for search and rescue, they have the following meanings:

Alerting post. Any facility intended to serve as an intermediary between a person reporting an emergency and a rescue coordination centre or rescue subcentre.

Alert phase. A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

Distress phase. A situation wherein there is a reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger and require immediate assistance.

Ditching. The forced landing of an aircraft on water.

Emergency phase. A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.

Joint rescue coordination centre (JRCC). A rescue coordination centre responsible for both aeronautical and maritime search and rescue operations.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Rescue. An operation to retrieve persons in distress, provide for their initial medical or other needs, and deliver them to a place of safety.

Rescue coordination centre (RCC). A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

Rescue subcentre (RSC). A unit subordinate to a rescue coordination centre, established to complement the latter according to particular provisions of the responsible authorities.

Search. An operation normally coordinated by a rescue coordination centre or rescue subcentre using available personnel and facilities to locate persons in distress.

Search and rescue aircraft. An aircraft provided with specialized equipment suitable for the efficient conduct of search and rescue missions.

Search and rescue facility. Any mobile resource, including designated search and rescue units, used to conduct search and rescue operations.

Search and rescue service. The performance of distress monitoring, communication, coordination and search and rescue functions, initial medical assistance or medical evacuation, through the use of public and private resources, including cooperating aircraft, vessels and other craft and installations.

Search and rescue region (SRR). An area of defined dimensions, associated with a rescue coordination centre, within which search and rescue services are provided.

Search and rescue unit. A mobile resource composed of trained personnel and provided with equipment suitable for the expeditious conduct of search and rescue operations.

State of Registry. The State on whose register the aircraft is entered.

Uncertainty phase. A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

CHAPTER 2. ORGANIZATION

2.1 Search and rescue services

2.1.1 Contracting States shall, individually or in cooperation with other States, arrange for the establishment and prompt provision of search and rescue services within their territories to ensure that assistance is rendered to persons in distress. Such services shall be provided on a 24-hour basis.

2.1.1.1 Those portions of the high seas or areas of undetermined sovereignty for which search and rescue services will be established shall be determined on the basis of regional air navigation agreements. Contracting States having accepted the responsibility to provide search and rescue services in such areas shall thereafter, individually or in cooperation with other States, arrange for the services to be established and provided in accordance with the provisions of this Annex.

Note.— The phrase "regional air navigation agreements" refers to the agreements approved by the Council of ICAO normally on the advice of Regional Air Navigation Meetings.

2.1.1.2 Basic elements of search and rescue services shall include a legal framework, a responsible authority, organized available resources, communication facilities and a workforce skilled in coordination and operational functions.

2.1.1.3 Search and rescue services shall establish processes to improve service provision, including the aspects of planning, domestic and international cooperative arrangements and training.

2.1.2 In providing assistance to aircraft in distress and to survivors of aircraft accidents, Contracting States shall do so regardless of the nationality or status of such persons or the circumstances in which such persons are found.

2.1.3 Contracting States having accepted responsibility to provide search and rescue services shall use search and rescue units and other available facilities to assist any aircraft or its occupants that are or appear to be in a state of emergency.

2.1.4 Where separate aeronautical and maritime rescue coordination centres serve the same area, States shall ensure the closest practicable coordination between the centres.

2.1.5 **Recommendation.—** *Contracting States should facilitate consistency and cooperation between their aeronautical and maritime search and rescue services.*

2.1.6 **Recommendation.—** *Contracting States should establish joint rescue coordination centres to coordinate aeronautical and maritime search and rescue operations, where practical.*

2.2 Search and rescue regions

2.2.1 Contracting States shall delineate the search and rescue regions within which they will provide search and rescue services. Such regions shall not overlap and neighbouring regions shall be contiguous.

Note 1.— Search and rescue regions are established to ensure the provision of adequate communication infrastructure, efficient distress alert routing and proper operational coordination to effectively support search and rescue services. Neighbouring States may cooperate to establish search and rescue services within a single SAR region.

Note 2.— The delineation of search and rescue regions is determined on the basis of technical and operational considerations and is not related to the delineation of boundaries between States.

2.2.1.1 **Recommendation.—** *Search and rescue regions should, in so far as practicable, be coincident with corresponding flight information regions and, with respect to those areas over the high seas, maritime search and rescue regions.*

2.3 Rescue coordination centres and rescue subcentres

2.3.1 Contracting States shall establish a rescue coordination centre in each search and rescue region.

Note.— A Contracting State may establish a rescue coordination centre with an associated search and rescue region that, in accordance with regional air navigation agreement, extends over an area greater than its sovereign airspace.

2.3.2 **Recommendation.—** *Where all or part of the airspace of a Contracting State is included within a search and rescue region associated with a rescue coordination centre in another Contracting State, that former State should establish a rescue subcentre subordinate to the rescue coordination centre wherever this would improve the efficiency of search and rescue services within its territory.*

2.3.3 Each rescue coordination centre and, as appropriate, rescue subcentre, shall be staffed 24 hours a day by trained personnel proficient in the use of the language used for radiotelephony communications.

2.3.4 **Recommendation**.— *RCC personnel involved in the conduct of radiotelephony communications should be proficient in the use of the English language.*

2.3.5 **Recommendation.—** *In areas where public telecommunications facilities would not permit persons observing an aircraft in emergency to notify the rescue coordination centre concerned directly and promptly, Contracting States should designate suitable units of public or private services as alerting posts.*

2.4 Search and rescue communications

2.4.1 Each rescue coordination centre shall have means of rapid and reliable two-way communication with:

a) associated air traffic services units;

b) associated rescue subcentres;

c) appropriate direction-finding and position-fixing stations;

d) where appropriate, coastal radio stations capable of alerting and communicating with surface vessels in the region;

e) the headquarters of search and rescue units in the region;

f) all maritime rescue coordination centres in the region and aeronautical, maritime or joint rescue coordination centres in adjacent regions;

g) a designated meteorological office or meteorological watch office;

h) search and rescue units;

i) alerting posts; and

j) the Cospas-Sarsat Mission Control Centre servicing the search and rescue region.

Note.— Maritime rescue coordination centres are identified in relevant documents of the International Maritime Organization.

2.4.2 Each rescue subcentre shall have means of rapid and reliable two-way communication with:

a) adjacent rescue subcentres;

b) a meteorological office or meteorological watch office;

c) search and rescue units; and

d) alerting posts.

2.5 Search and rescue units

2.5.1 Contracting States shall designate as search and rescue units elements of public or private services suitably located and equipped for search and rescue operations.

Note.— The minimum units and facilities necessary for provision of search and rescue operations within a search and rescue region are determined by regional air navigation agreements and are specified in the appropriate Air Navigation Plan and Facilities and Services Implementation Document publications.

2.5.2 Contracting States shall designate as parts of the search and rescue plan of operation, elements of public or private services that do not qualify as search and rescue units but are nevertheless able to participate in search and rescue operations.

2.6 Search and rescue equipment

2.6.1 Search and rescue units shall be provided with equipment for locating promptly, and for providing adequate assistance at, the scene of an accident.

2.6.2 **Recommendation.—** *Each search and rescue unit should have means of rapid and reliable two-way communication with other search and rescue facilities engaged in the same operation.*

2.6.3 Each search and rescue aircraft shall be equipped to be able to communicate on the aeronautical distress and on-scene frequencies and on such other frequencies as may be prescribed.

2.6.4 Each search and rescue aircraft shall be equipped with a device for homing on distress frequencies.

Note 1. — Emergency locator transmitter (ELT) carriage requirements are given in Annex 6, Parts I, II and III.

Note 2.— Specifications for ELTs are given in Annex 10, Volume III.

2.6.5 Each search and rescue aircraft, when used for search and rescue over maritime areas, shall be equipped to be able to communicate with vessels.

Note.— Many vessels can communicate with aircraft on 2182 kHz, 4125 kHz and 121.5 MHz. However, these frequencies, and in particular 121.5 MHz, may not be routinely monitored by vessels.

2.6.6 Each search and rescue aircraft, when used for search and rescue over maritime areas shall carry a copy of the *International Code of Signals* to enable it to overcome language difficulties that may be experienced in communicating with ships.

Note.— The International Code of Signals *is published in English, French and Spanish by the International Maritime Organization as documents I994E, I995F and I996S.*

2.6.7 **Recommendation.—** *Unless it is known that there is no need to provide supplies to survivors by air, at least one of the aircraft participating in a search and rescue operation should carry droppable survival equipment.*

2.6.8 **Recommendation.—** *States should locate, at appropriate aerodromes, survival equipment suitably packed for dropping by aircraft.*

CHAPTER 3. COOPERATION

3.1 Cooperation between States

3.1.1 Contracting States shall coordinate their search and rescue organizations with those of neighbouring States.

3.1.2 **Recommendation.—** *Contracting States should, whenever necessary, coordinate their search and rescue operations with those of neighbouring States especially when these operations are proximate to adjacent search and rescue regions.*

3.1.2.1 **Recommendation.—** *Contracting States should, in so far as practicable, develop common search and rescue plans and procedures to facilitate coordination of search and rescue operations with those of neighbouring States.*

3.1.3 Subject to such conditions as may be prescribed by its own authorities, a Contracting State shall permit immediate entry into its territory of search and rescue units of other States for the purpose of searching for the site of aircraft accidents and rescuing survivors of such accidents.

3.1.4 The authorities of a Contracting State who wish their search and rescue units to enter the territory of another Contracting State for search and rescue purposes shall transmit a request, giving full details of the projected mission and the need for it, to the rescue coordination centre of the State concerned or to such other authority as has been designated by that State.

3.1.4.1 The authorities of Contracting States shall:

— immediately acknowledge the receipt of such a request, and

— as soon as possible, indicate the conditions, if any, under which the projected mission may be undertaken.

3.1.5 **Recommendation.—** *Contracting States should enter into agreements with neighbouring States to strengthen search and rescue cooperation and coordination, setting forth the conditions for entry of each other's search and rescue units into their respective territories. These agreements should also provide for expediting entry of such units with the least possible formalities.*

3.1.6 **Recommendation.—** *Each Contracting State should authorize its rescue coordination centres to:*

a) request from other rescue coordination centres such assistance, including aircraft, vessels, persons or equipment, as may be needed;

b) grant any necessary permission for the entry of such aircraft, vessels, persons or equipment into its territory; and

c) make the necessary arrangements with the appropriate customs, immigration or other authorities with a view to expediting such entry.

3.1.7 **Recommendation.—** *Each Contracting State should authorize its rescue coordination centres to provide, when requested, assistance to other rescue coordination centres, including assistance in the form of aircraft, vessels, persons or equipment.*

3.1.8 **Recommendation.—** *Contracting States should make arrangements for joint training exercises involving their search and rescue units, those of other States and operators, in order to promote search and rescue efficiency.*

3.1.9 **Recommendation.—** *Contracting States should make arrangements for periodic liaison visits by personnel of their rescue coordination centres and subcentres to the centres of neighbouring States.*

3.2 Cooperation with other services

3.2.1 Contracting States shall arrange for all aircraft, vessels and local services and facilities which do not form part of the search and rescue organization to cooperate fully with the latter in search and rescue and to extend any possible assistance to the survivors of aircraft accidents.

3.2.2 **Recommendation**.— *Contracting States should ensure the closest practicable coordination between the relevant aeronautical and maritime authorities to provide for the most effective and efficient search and rescue services.*

3.2.3 Contracting States shall ensure that their search and rescue services cooperate with those responsible for investigating accidents and with those responsible for the care of those who suffered from the accident.

3.2.4 **Recommendation.—** *To facilitate accident investigation, rescue units should, when practicable, be accompanied by persons qualified in the conduct of aircraft accident +investigations.*

3.2.5 States shall designate a search and rescue point of contact for the receipt of Cospas-Sarsat distress data.

3.3 Dissemination of information

3.3.1 Each Contracting State shall publish and disseminate all information necessary for the entry of search and rescue units of other States into its territory or, alternatively, include this information in search and rescue service arrangements.

3.3.2 **Recommendation.—** *When such information could benefit the provision of search and rescue services, Contracting States should make available, through the rescue coordination centres or other agencies, information regarding their search and rescue plans of operation.*

3.3.3 **Recommendation.—** *Contracting States should, to the extent desirable and practicable, disseminate information to the general public and emergency response authorities regarding actions to be taken when there is reason to believe that an aircraft's emergency situation may become cause for public concern or require a general emergency response.*

CHAPTER 4. PREPARATORY MEASURES

4.1 Preparatory information

4.1.1 Each rescue coordination centre shall have readily available at all times up-to-date information concerning the following in respect of its search and rescue region:

a) search and rescue units, rescue subcentres and alerting posts;

b) air traffic services units;

c) means of communication that may be used in search and rescue operations;

d) addresses and telephone numbers of all operators, or their designated representatives, engaged in operations in the region; and

e) any other public and private resources including medical and transportation facilities that are likely to be useful in search and rescue.

4.1.2 **Recommendation.—** *Each rescue coordination centre should have readily available all other information of interest to search and rescue, including information regarding:*

a) the locations, call signs, hours of watch, and frequencies of all radio stations likely to be employed in support of search and rescue operations;

b) the locations and hours of watch of services keeping radio watch, and the frequencies guarded;

c) locations where supplies of droppable emergency and survival equipment are stored; and

d) objects which it is known might be mistaken for unlocated or unreported wreckage, particularly if viewed from the air.

4.1.3 **Recommendation.—** *Each rescue coordination centre whose search and rescue region includes maritime areas should have ready access to information regarding the position, course and speed of ships within such areas that may be able to provide assistance to aircraft in distress and information on how to contact them.*

Note.— This information may either be kept in the rescue coordination centres or be readily accessible.

4.1.4 **Recommendation**.— *Contracting States should, individually or in cooperation with other States, either establish ship reporting systems in cooperation with maritime authorities or arrange communication links with Amver or regional ship reporting systems to facilitate search and rescue operations at sea.*

Note.— Amver is a cooperative international ship reporting system with worldwide coverage that is available for interrogation by all rescue coordination centres. A number of Contracting States also operate regional ship reporting systems.

4.2 Plans of operation

4.2.1 Each rescue coordination centre shall prepare detailed plans of operation for the conduct of search and rescue operations within its search and rescue region.

4.2.2 **Recommendation**.— *Search and rescue plans of operations should be developed jointly with representatives of the operators and other public or private services that may assist in providing search and rescue services or benefit from them, taking into account that the number of survivors could be large.*

4.2.3 The plans of operation shall specify arrangements for the servicing and refuelling, to the extent possible, of aircraft, vessels and vehicles employed in search and rescue operations, including those made available by other States.

4.2.4 **Recommendation.—** *The search and rescue plans of operation should contain details regarding actions to be taken by those persons engaged in search and rescue, including:*

a) the manner in which search and rescue operations are to be conducted in the search and rescue region;

b) the use of available communication systems and facilities;

c) the actions to be taken jointly with other rescue coordination centres;

d) the methods of alerting en-route aircraft and ships at sea;

e) the duties and prerogatives of persons assigned to search and rescue;

f) the possible redeployment of equipment that may be necessitated by meteorological or other conditions;

g) the methods for obtaining essential information relevant to search and rescue operations, such as weather reports and forecasts, appropriate NOTAM, etc.;

h) the methods for obtaining, from other rescue coordination centres, such assistance, including aircraft, vessels, persons or equipment, as may be needed;

i) the methods for assisting distressed aircraft being compelled to ditch to rendezvous with surface craft;

j) the methods for assisting search and rescue or other aircraft to proceed to aircraft in distress; and

k) cooperative actions taken in conjunction with air traffic services units and other authorities concerned to assist aircraft known or believed to be subject to unlawful interference.

4.2.5 **Recommendation.—** *Search and rescue plans of operation should be integrated with airport emergency plans to provide for rescue services in the vicinity of aerodromes including, for coastal aerodromes, areas of water.*

4.3 Search and rescue units

4.3.1 Each search and rescue unit shall:

a) be cognizant of all parts of the plans of operation prescribed in 4.2 that are necessary for the effective conduct of its duties; and

b) keep the rescue coordination centre informed of its preparedness.

4.3.2 Contracting States shall:

a) maintain in readiness the required number of search and rescue facilities; and

b) maintain adequate supplies of rations, medical stores, signalling devices and other survival and rescue equipment.

4.4 Training and exercises

To achieve and maintain maximum efficiency in search and rescue, Contracting States shall provide for regular training of their search and rescue personnel and arrange appropriate search and rescue exercises.

4.5 Wreckage

Recommendation.— *Each Contracting State should ensure that wreckage resulting from aircraft accidents within its territory or, in the case of accidents on the high seas or in areas of undetermined sovereignty, within the search and rescue regions for which it is responsible, is removed, obliterated or charted following completion of the accident investigation, if its presence might constitute a hazard or confuse subsequent search and rescue operations.*

CHAPTER 5. OPERATING PROCEDURES

5.1 Information concerning emergencies

5.1.1 Any authority or any element of the search and rescue organization having reason to believe that an aircraft is in an emergency shall give immediately all available information to the rescue coordination centre concerned.

5.1.2 Rescue coordination centres shall, immediately upon receipt of information concerning aircraft in emergency, evaluate such information and assess the extent of the operation required.

5.1.3 When information concerning aircraft in emergency is received from other sources than air traffic services units, the rescue coordination centre shall determine to which emergency phase the situation corresponds and shall apply the procedures applicable to that phase.

5.2 Procedures for rescue coordination centres during emergency phases

5.2.1 Uncertainty phase

Upon the occurrence of an uncertainty phase, the rescue coordination centre shall cooperate to the utmost with air traffic services units and other appropriate agencies and services in order that incoming reports may be speedily evaluated.

5.2.2 Alert phase

Upon the occurrence of an alert phase the rescue coordination centre shall immediately alert search and rescue units and initiate any necessary action.

5.2.3 Distress phase

Upon the occurrence of a distress phase, the rescue coordination centre shall:

a) immediately initiate action by search and rescue units in accordance with the appropriate plan of operation;

b) ascertain the position of the aircraft, estimate the degree of uncertainty of this position, and, on the basis of this information and the circumstances, determine the extent of the area to be searched;

c) notify the operator, where possible, and keep the operator informed of developments;

d) notify other rescue coordination centres, the help of which seems likely to be required, or which may be concerned in the operation;

e) notify the associated air traffic services unit, when the information on the emergency has been received from another source;

f) request at an early stage such aircraft, vessels, coastal stations and other services not specifically included in the appropriate plan of operation and able to assist to:

1) maintain a listening watch for transmissions from the aircraft in distress, survival radio equipment or an ELT;

Note.— The frequencies contained in the specifications for ELTs given in Annex 10, Volume III, are 121.5 MHz and 406 MHz.

2) assist the aircraft in distress as far as practicable; and

3) inform the rescue coordination centre of any developments;

g) from the information available, draw up a detailed plan of action for the conduct of the search and/or rescue operation required and communicate such plan for the guidance of the authorities immediately directing the conduct of such an operation;

h) amend as necessary, in the light of evolving circumstances, the detailed plan of action;

i) notify the appropriate accident investigation authorities; and

j) notify the State of Registry of the aircraft.

The order in which these actions are described shall be followed unless circumstances dictate otherwise.

5.2.4 Initiation of search and rescue action in respect of an aircraft whose position is unknown

In the event that an emergency phase is declared in respect of an aircraft whose position is unknown and may be in one of two or more search and rescue regions, the following shall apply:

a) When a rescue coordination centre is notified of the existence of an emergency phase and is unaware of other centres taking appropriate action, it shall assume responsibility for initiating suitable action in accordance with 5.2 and confer with neighbouring rescue coordination centres with the objective of designating one rescue coordination centre to assume responsibility forthwith.

b) Unless otherwise decided by common agreement of the rescue coordination centres concerned, the rescue coordination centre to coordinate search and rescue action shall be the centre responsible for:

— the region in which the aircraft last reported its position; or

— the region to which the aircraft was proceeding when its last reported position was on the line separating two search and rescue regions; or

— the region to which the aircraft was destined when it was not equipped with suitable two-way radio communication or not under obligation to maintain radio communication; or

— the region in which the distress site is located as identified by the Cospas-Sarsat system.

c) After declaration of the distress phase, the rescue coordination centre with overall coordination responsibility shall inform all rescue coordination centres that may become involved in the operation of all the circumstances of the emergency and subsequent developments. Likewise, all rescue coordination centres becoming aware of any information pertaining to the emergency shall inform the rescue coordination centre that has overall responsibility.

5.2.5 Passing of information to aircraft in respect of which an emergency phase has been declared

Whenever applicable, the rescue coordination centre responsible for search and rescue action shall forward to the air traffic services unit serving the flight information region in which the aircraft is operating, information of the search and rescue action initiated, in order that such information can be passed to the aircraft.

5.3 Procedures where responsibility for operations extends to two or more Contracting States

Where the conduct of operations over the entire search and rescue region is the responsibility of more than one Contracting State, each involved State shall take action in accordance with the relevant plan of operations when so requested by the rescue coordination centre of the region.

5.4 Procedures for authorities in the field

The authorities immediately directing the conduct of operations or any part thereof shall:

a) give instructions to the units under their direction and inform the rescue coordination centre of such instructions; and

b) keep the rescue coordination centre informed of developments.

5.5 Procedures for rescue coordination centres — termination and suspension of operations

5.5.1 Search and rescue operations shall continue, when practicable, until all survivors are delivered to a place of safety or until all reasonable hope of rescuing survivors has passed.

5.5.2 The responsible rescue coordination centre shall normally be responsible for determining when to discontinue search and rescue operations.

Note.— Contracting States may require input from other appropriate State authorities in the decision-making process leading to termination of SAR operations.

5.5.3 When a search and rescue operation has been successful or when a rescue coordination centre considers, or is informed, that an emergency no longer exists, the emergency phase shall be cancelled, the search and rescue operation shall be terminated and any authority, facility or service that has been activated or notified shall be promptly informed.

5.5.4 If a search and rescue operation becomes impracticable and the rescue coordination centre concludes that there might still be survivors, the centre shall temporarily suspend on-scene activities pending further developments and shall promptly inform any authority, facility or service which has been activated or notified. Relevant information subsequently received shall be evaluated and search and rescue operations resumed when justified and practicable.

5.6 Procedures at the scene of an accident

5.6.1 When multiple facilities are engaged in search and rescue operations on-scene, the rescue coordination centre or rescue subcentre shall designate one or more units on-scene to coordinate all actions to help ensure the safety and effectiveness of air and surface operations, taking into account facility capabilities and operational requirements.

5.6.2 When a pilot-in-command observes that either another aircraft or a surface craft is in distress, the pilot shall, if possible and unless considered unreasonable or unnecessary:

a) keep the craft in distress in sight until compelled to leave the scene or advised by the rescue coordination centre that it is no longer necessary;

b) determine the position of the craft in distress;

c) as appropriate, report to the rescue coordination centre or air traffic services unit as much of the following information as possible:

— type of craft in distress, its identification and condition;

— its position, expressed in geographical or grid coordinates or in distance and true bearing from a distinctive landmark or from a radio navigation aid;

— time of observation expressed in hours and minutes Coordinated Universal Time (UTC);

— number of persons observed;

— whether persons have been seen to abandon the craft in distress;

— on-scene weather conditions;

— apparent physical condition of survivors;

— apparent best ground access route to the distress site; and

d) act as instructed by the rescue coordination centre or the air traffic services unit.

5.6.2.1 If the first aircraft to reach the scene of an accident is not a search and rescue aircraft, it shall take charge of on-scene activities of all other aircraft subsequently arriving until the first search and rescue aircraft reaches the scene of the accident. If, in the meantime, such aircraft is unable to establish communication with the appropriate rescue coordination centre or air traffic services unit, it shall, by mutual agreement, hand over to an aircraft capable of establishing and maintaining such communications until the arrival of the first search and rescue aircraft.

5.6.3 When it is necessary for an aircraft to convey information to survivors or surface rescue units, and two-way communication its not available, it shall, if practicable, drop communication equipment that would enable direct contact to be established, or convey the information by dropping a hard copy message.

5.6.4 When a ground signal has been displayed, the aircraft shall indicate whether the signal has been understood or not by the means described in 5.6.3 or, if this is not practicable, by making the appropriate visual signal.

5.6.5 When it is necessary for an aircraft to direct a surface craft to the place where an aircraft or surface craft is in distress, the aircraft shall do so by transmitting precise instructions by any means at its disposal. If no radio communication can be established, the aircraft shall make the appropriate visual signal.

Note.— Air-to-surface and surface-to-air visual signals are published in Volume III of Doc 9731.

5.7 Procedures for a pilot-in-command intercepting a distress transmission

Whenever a distress transmission is intercepted by a pilot-in-command of an aircraft, the pilot shall, if feasible:

a) acknowledge the distress transmission;

b) record the position of the craft in distress if given;

c) take a bearing on the transmission;

d) inform the appropriate rescue coordination centre or air traffic services unit of the distress transmission, giving all available information; and

e) at the pilot's discretion, while awaiting instructions, proceed to the position given in the transmission.

5.8 Search and rescue signals

5.8.1 The air-to-surface and surface-to-air visual signals in the Appendix shall, when used, have the meaning indicated therein. They shall be used only for the purpose indicated and no other signals likely to be confused with them shall be used.

5.8.2 Upon observing any of the signals in the Appendix, aircraft shall take such action as may be required by the interpretation of the signal given in that Appendix.

5.9 Maintenance of records

5.9.1 **Recommendation.—** *Each rescue coordination centre should keep a record of the operational efficiency of the search and rescue organization in its region.*

5.9.2 **Recommendation.—** *Each rescue coordination centre should prepare appraisals of actual search and rescue operations in its region. These appraisals should comprise any pertinent remarks on the procedures used and on the emergency and survival equipment, and any suggestions for improvement of those procedures and equipment. Those appraisals which are likely to be of interest to other States should be submitted to ICAO for information and dissemination as appropriate.*

APPENDIX. SEARCH AND RESCUE SIGNALS

(Note.— See Chapter 5, 5.8 of the Annex)

1. Signals with surface craft

1.1 The following manoeuvres performed in sequence by an aircraft mean that the aircraft wishes to direct a surface craft towards an aircraft or a surface craft in distress:

a) circling the surface craft at least once;

b) crossing the projected course of the surface craft close ahead at low altitude and:

1) rocking the wings; or

2) opening and closing the throttle; or

3) changing the propeller pitch.

Note.— Due to high noise level on board surface craft, the sound signals in 2) and 3) may be less effective than the visual signal in 1) and are regarded as alternative means of attracting attention.

c) heading in the direction in which the surface craft is to be directed.

Repetition of such manoeuvres has the same meaning.

1.2 The following manoeuvres by an aircraft means that the assistance of the surface craft to which the signal is directed is no longer required:

— crossing the wake of the surface craft close astern at a low altitude and:

1) rocking the wings; or

2) opening and closing the throttle; or

3) changing the propeller pitch.

Note.— The following replies may be made by surface craft to the signal in 1.1:

— for acknowledging receipt of signals:

1) the hoisting of the "code pennant" (vertical red and white stripes) close up (meaning understood);

2) the flashing of a succession of "T's" by signal lamp in the Morse code;

3) the changing of heading to follow the aircraft.

— for indicating inability to comply:

1) the hoisting of the international flag "N" (a blue and white checkered square);

2) the flashing of a succession of "N's" in the Morse code.

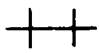
Note.— See Note following 1.1 b), 3).

2. Ground-air visual signal code

2.1 Ground-air visual signal code for use by survivors

No.	*Message*	*Code symbol*
1	Require assistance	V
2	Require medical assistance	X
3	No or Negative	N
4	Yes or Affirmative	Y
5	Proceeding in this direction	↑

2.2 Ground-air visual signal code for use by rescue units

No.	*Message*	*Code symbol*
1	Operation completed	
2	We have found all personnel	
3	We have found only some personnel	
4	We are not able to continue. Returning to base	
5	Have divided into two groups. Each proceeding in direction indicated	
6	Information received that aircraft is in this direction	
7	Nothing found. Will continue to search	

2.3 Symbols shall be at least 2.5 metres (8 feet) long and shall be made as conspicuous as possible.

Note 1.— Symbols may be formed by any means such as: strips of fabric, parachute material, pieces of wood, stones or such like material; marking the surface by tramping, or staining with oil.

Note 2.— Attention to the above signals may be attracted by other means such as radio, flares, smoke and reflected light.

3. Air-to-ground signals

3.1 The following signals by aircraft mean that the ground signals have been understood:

a) during the hours of daylight:

— by rocking the aircraft's wings;

b) during the hours of darkness:

— flashing on and off twice the aircraft's landing lights or, if not so equipped, by switching on and off twice its navigation lights.

3.2 Lack of the above signal indicates that the ground signal is not understood.

— END —

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Aircraft Accident and Incident Investigation

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For information regarding the applicability of Standards and Recommended Practices, *see* Chapter 2 and the Foreword.

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AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-10	Incorporated in this edition		
11	23/11/06	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

Standards and Recommended Practices for Aircraft Accident Inquiries were first adopted by the Council on 11 April 1951 pursuant to Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and were designated as Annex 13 to the Convention. The Standards and Recommended Practices were based on recommendations of the Accident Investigation Division at its First Session in February 1946 which were further developed at the Second Session of the Division in February 1947.

The Fourteenth Session of the Assembly (Rome, August–September 1962) considered the subject of aircraft accident investigation and adopted Resolutions A14-22 and A14-27, Appendix P.* The first of these:

1) *directed* "the Council to:

"a) study the possibility of initiating a uniform procedure to be used by States to make available promptly the reports of aircraft accident investigations and inquiries, particularly when related to large modern transport aircraft, so that the dissemination of such reports by all Contracting States may be improved;

"b) study whether it is practicable to establish procedures by which the State of Manufacture or the State that first certificated the aircraft type, would, in appropriate cases and upon invitation, make available competent experts for advice or consultation in the investigation of accidents, and in the light of the results of such study:

"i) determine the most practicable means of ensuring that the fullest possible advantage will be taken of the specialized knowledge of such experts and notify all Contracting States accordingly, and

"ii) urge all Contracting States to co-operate in the use of such experts so as to contribute to the safety of air navigation;"

and

2) *urged* "all Contracting States to provide timely notification of aircraft accidents, especially those involving large modern transport aircraft, to the State of Manufacture or the State that first certificated the aircraft type, whenever it is considered that such action would be appropriate."

In addition, by Resolution A14-27, Appendix P, the Assembly resolved that, "in respect of accident investigation, that it is of great importance for the general improvement of the safety of air navigation that, to the greatest practicable extent, a Contracting State in which an accident has occurred involving aircraft other than of its manufacture communicate to the State of Manufacture as soon as possible any pertinent information which results from the inquiry and which may reflect on the airworthiness of the aircraft type or its equipment, or which might be used to effect improvement in safety."

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

While the Annex has been adopted pursuant to the provisions of Article 37 of the Convention, Aircraft Accident Inquiry is itself the subject of Article 26 of the Convention. This Article imposes an obligation on the State in which the aircraft accident occurs to institute an inquiry in certain circumstances and, as far as its laws permit, to conduct the inquiry in accordance with ICAO procedure. However, Article 26 does not preclude the taking of further action in the field of aircraft accident investigation and the procedures set forth in this Annex are not limited solely to an inquiry instituted under the requirements of Article 26, but under prescribed circumstances apply in the event of an inquiry into any "aircraft accident" within the terms of the definition herein. In order to maintain the correct relationship between the provisions of Article 26 and those of the Annex, the following principles have been observed:

a) Article 37 of the Convention is the Controlling Article in the development of an Aircraft Accident Inquiry Annex, but nothing in the Annex must contravene the express terms of Article 26, or any other Article of the

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* The Fifteenth Session of the Assembly (Montreal, June–July 1965) subsequently adopted Resolution A15-8, Appendix P, which consolidated and superseded resolving clause 2 of Resolution A14-22 and Resolution A14-27, Appendix P.

Convention, nor should it contain any provision which would do violence to the spirit and intent of the Convention.

b) Subject to a) the Annex may deal with any relevant matter whether or not expressly dealt with by Article 26 or by any other Article of the Convention. For instance it is not a contravention of the Convention for the Annex to deal with the rights or obligations of States other than the State of Registry and the State in which the accident occurred; similarly the Annex may deal with the privileges to be accorded to observers entitled by Article 26 to be "present" at the inquiry. These are matters upon which Article 26 is silent. The Annex may also deal with accidents of a kind which do not fall within the provisions of Article 26.

Relationship between Annex 13 and Article 26 of the Convention

In order to clarify the relationship between the provisions of Article 26 and those of the present Annex the Council, at the 20th meeting of its Twelfth Session on 13 April 1951, adopted the following additional resolution:

"*Whereas* Article 26 of the Convention provides that a State in which an accident to an aircraft occurs within the terms of the Article, 'will institute an inquiry into the circumstances of the accident in accordance, in so far as its laws permit, with the procedure which may be recommended by the International Civil Aviation Organization'; and

"*Whereas* the Council, at the 18th meeting of its Twelfth Session on 11 April 1951, adopted Annex 13 on Aircraft Accident Inquiry;

"*The Council recommends* the Standards and Recommended Practices for Aircraft Accident Inquiry contained in Annex 13 to the Convention, as the procedure to be followed by Contracting States for inquiries into accidents involving death or serious injury and instituted in accordance with the provisions of Article 26;

"*It being understood:*

"1) that States may in accordance with Article 38 of the Convention, deviate from any provision of Annex 13, except that, with respect to accidents covered by terms of Article 26 of the Convention and pursuant to this Article, 'the State in which the accident occurs will institute an inquiry', 'the State in which the aircraft is registered shall be given the opportunity to appoint observers to be present at the inquiry' and 'the State holding the inquiry shall communicate the report and findings in the matter to that State'; and

"2) that the procedure here recommended is not applicable when an accident to an aircraft not involving death or serious injury 'indicates serious technical defect in the aircraft or air navigation facilities', in which cases and until ICAO recommends a procedure to this effect, the inquiry shall be conducted in accordance with the national procedure of the State concerned, subject to the obligations deriving from the provisions of Article 26."

The accredited representative and the advisers referred to in the Annex together comprise the observers that are given the right to be present at an inquiry under Article 26.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto.s Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. However, the Standards and Recommended Practices of Annex 13 while of general applicability will, in many cases, require amplification in order to enable a complete national code to be formulated.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Provisions* governing the applicability of the Standards and Recommended Practices.

d) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should” is used.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Throughout this Annex, the use of the male gender should be understood to include male and female persons.

Table A. Amendments to Annex 13

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	First and Second Sessions of the Accident Investigation Division	—	11 April 1951 1 September 1951 1 December 1951
1 (2nd Edition)	Assembly Resolutions A14-22 and A14-27, Appendix P Third Session of the Accident Investigation Division	New definitions; rights and obligations of the State of Manufacture; initial and subsequent notification of an accident; attendance of representatives of the operator; report on the inquiry; summary of the Report and its format.	24 November 1965 24 March 1966 25 August 1966
2	Third Session of the Accident Investigation Division	Communication procedures for sending aircraft accident notification.	5 December 1966 5 April 1967 24 August 1967
3	Personnel Licensing/ Training Practices/ Medical Divisional Meeting (1970)	Autopsy of victims of aircraft accidents and reporting of the results.	27 March 1972 27 July 1972 7 December 1972
4 (3rd Edition)	Air Navigation Commission study	Notification of all accidents to multi-engined aircraft of over 2 250 kg (5 000 lb); notification and exchange of information on incidents.	12 December 1972 12 April 1973 16 August 1973
5 (4th Edition)	Accident Investigation and Prevention Divisional Meeting (AIG/1974) Committee on Unlawful Interference	Change of title; deletion and addition of definitions; objective of an investigation; use of flight recorders and privileged status to be granted to certain investigation records; action to be taken by a State receiving safety recommendations; responsibility of the State of Registry to participate in the investigation of certain accidents when requested, to provide flight recorders under certain circumstances and to request participation of the State of Manufacture when the former State conducts the investigation and matters of airworthiness are involved; rights and obligations of the State of Manufacture to participate in certain investigations; rights and entitlement of the State having special interest in an accident by virtue of fatalities to its citizens; the Accident/Incident Data Reporting (ADREP) system; Investigator-in-charge to inform aviation security authorities, when necessary.	18 December 1975 18 April 1976 12 August 1976
6 (5th Edition)	Accident Investigation and Prevention Divisional Meeting (AIG/1974)	Addition of the words “on the basis of his qualifications” in the definitions of accredited representative, adviser and investigator-in-charge; new definition and specifications regarding the State of the Operator in the case of aircraft leased, chartered or interchanged; responsibility of the State of Registry for sending accident notification any time that State institutes the investigation; coordination between investigator-in-charge and judicial authorities; elimination of reference to number of engines; new specification for publication of the Final Report.	24 November 1978 24 March 1979 29 November 1979
7 (6th Edition)	Accident Investigation and Prevention Divisional Meeting (AIG/1979)	Addition, in the definition of accident, of injuries inflicted by parts of an aircraft or by jet blast; strengthening of the general specification concerning the conduct of the investigation; strengthening of the specification regarding disclosure of records; strengthening of the specification for consultation on the Final Report; deletion of the specifications regarding a “Summary of the Final Report” and references thereto; change of the specification concerning the forwarding to ICAO of the Final Report; expansion of the specification on publication of the Final Report or related documents; new chapter on accident prevention measures; new attachment regarding exchange of Final Reports between States and a list of Final Reports available in States.	24 November 1980 24 March 1981 26 November 1981

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
8 (7th Edition)	Air Navigation Commission	Addition, in the definition of serious injury, of exposure to infectious substances and injurious radiation; new attachment regarding disclosure of records; editorial changes.	22 January 1988 22 May 1988 17 November 1988
9 (8th Edition)	Accident Investigation Divisional Meeting (AIG/1992)	Change of title; new or revised definitions of causes, investigation, serious incident, State of Design, State of Manufacture, and State of the Operator; strengthening of the specifications concerning applicability and the objective of the investigation; strengthening of the specifications concerning the responsibilities, rights and entitlements of the State of Design and the State of Manufacture; new specifications concerning the notification and investigation of serious incidents; strengthening of the specifications concerning notification of accidents and serious incidents; new specification concerning assistance by States nearest to an accident in international waters; new specification concerning the separation of any judicial or administrative proceedings to apportion blame or liability from an accident investigation; strengthening of the specifications concerning the use and read-out of the flight recorders; strengthening of the specifications concerning autopsy examinations and coordination with the judicial authorities; strengthening of the specifications concerning disclosure of records and deletion of the related attachment; strengthening of the specifications concerning the responsibility of other States to provide information and their rights of participation; new specification concerning organizational information and strengthening of the specifications concerning the participation of the operator; strengthening of the specifications concerning the entitlement of accredited representatives and a new specification concerning their obligations; strengthening of the specification concerning participation of States having suffered fatalities or serious injuries to its citizens; strengthening of the specifications concerning the ADREP preliminary report and the accident/incident data report; strengthening of the specifications concerning consultation, publication and dissemination of the Final Report; new and strengthened specifications concerning accident prevention measures; new sub-paragraph and changes to the format of the Final Report in the Appendix; updated notification and reporting checklist in Attachment B; list of examples of serious incidents as a new Attachment D.	23 March 1994 25 July 1994 10 November 1994
10 (9th Edition)	Accident Investigation and Prevention (AIG) Divisional Meeting (1999)	Changes to the notification of an accident or serious incident and new provisions to acknowledge receipt of the notification; new provisions to provide details of dangerous goods; widening the provisions for responsibility to initiate, conduct and delegate the investigation; new provisions for medical examinations; aligning the rights and obligations of the State of Registry and the State of the Operator with those of the State of Design and the State of Manufacture; strengthening of the provisions of participation of States having suffered fatalities to its citizens; new title for Chapter 6 which contains the provisions related to the Final Report; strengthening of the consultation procedure and inclusion of the operator and the manufacturer; new provision for interim reports; new title for Chapter 7 which contains the provisions for ADREP reporting; strengthening of the provisions on mandatory incident reporting systems; new provisions on voluntary incident reporting systems and non-punitive environment; strengthening of the provisions on database systems, analysis of data and preventive actions; new provision on exchange of safety information; updating of Attachment B; deletion of Attachment C; new Attachment on guidelines for flight recorder read-out and analysis.	26 February 2001 16 July 2001 1 November 2001
11	Accident Investigation and Prevention (AIG) Divisional Meeting (1999); Air Navigation Commission; Assembly Resolution A35-17	a) participation of other States in investigations; b) non-disclosure of recordings and transcripts of recordings from air traffic control units; and c) legal guidance for the protection of information from safety data collection and processing systems.	3 March 2006 17 July 2006 23 November 2006

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for Aircraft Accident and Incident Investigation, they have the following meaning:

Accident. An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

a) a person is fatally or seriously injured as a result of:

— being in the aircraft, or
— direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
— direct exposure to jet blast,

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew; or

b) the aircraft sustains damage or structural failure which:

— adversely affects the structural strength, performance or flight characteristics of the aircraft, and
— would normally require major repair or replacement of the affected component,

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or

c) the aircraft is missing or is completely inaccessible.

Note 1.— For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

Note 2.— An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

Accredited representative. A person designated by a State, on the basis of his or her qualifications, for the purpose of participating in an investigation conducted by another State.

Adviser. A person appointed by a State, on the basis of his or her qualifications, for the purpose of assisting its accredited representative in an investigation.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Causes. Actions, omissions, events, conditions, or a combination thereof, which led to the accident or incident.

Flight recorder. Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Note.— See Annex 6, Parts I, II and III, for specifications relating to flight recorders.

Incident. An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in the Accident/Incident Reporting Manual *(Doc 9156).*

Investigation. A process conducted for the purpose of accident prevention which includes the gathering and analysis of information, the drawing of conclusions, including the determination of causes and, when appropriate, the making of safety recommendations.

Investigator-in-charge. A person charged, on the basis of his or her qualifications, with the responsibility for the organization, conduct and control of an investigation.

Note.— Nothing in the above definition is intended to preclude the functions of an investigator-in-charge being assigned to a commission or other body.

Maximum mass. Maximum certificated take-off mass.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Preliminary Report. The communication used for the prompt dissemination of data obtained during the early stages of the investigation.

Safety recommendation. A proposal of the accident investigation authority of the State conducting the investigation, based on information derived from the investigation, made with the intention of preventing accidents or incidents.

Serious incident. An incident involving circumstances indicating that an accident nearly occurred.

Note 1.— The difference between an accident and a serious incident lies only in the result.

Note 2.— Examples of serious incidents can be found in Attachment C of Annex 13 and in the Accident/Incident Reporting Manual *(Doc 9156).*

Serious injury. An injury which is sustained by a person in an accident and which:

a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or

b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or

c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or

d) involves injury to any internal organ; or

e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or

f) involves verified exposure to infectious substances or injurious radiation.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft.

State of Occurrence. The State in the territory of which an accident or incident occurs.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

State of Registry. The State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

CHAPTER 2. APPLICABILITY

2.1 Unless otherwise stated, the specifications in this Annex apply to activities following accidents and incidents wherever they occurred.

Note.— The application of this specification with respect to accidents or serious incidents occurring in the territory of a non-Contracting State, in an area of undetermined sovereignty or on the high seas is addressed in 5.2 and 5.3.

2.2 In this Annex the specifications concerning the State of the Operator apply only when an aircraft is leased, chartered or interchanged and when that State is not the State of Registry and if it discharges, in respect of this Annex, in part or in whole, the functions and obligations of the State of Registry.

CHAPTER 3. GENERAL

Note.— Guidance material relating to the rights and obligations of the State of the Operator in respect of accidents and incidents involving leased, chartered or interchanged aircraft is provided in Attachment A.

OBJECTIVE OF THE INVESTIGATION

3.1 The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

PROTECTION OF EVIDENCE, CUSTODY AND REMOVAL OF AIRCRAFT

RESPONSIBILITY OF THE STATE OF OCCURRENCE

General

3.2 The State of Occurrence shall take all reasonable measures to protect the evidence and to maintain safe custody of the aircraft and its contents for such a period as may be necessary for the purposes of an investigation. Protection of evidence shall include the preservation, by photographic or other means of any evidence which might be removed, effaced, lost or destroyed. Safe custody shall include protection against further damage, access by unauthorized persons, pilfering and deterioration.

Note 1.— Control over the wreckage is dealt with in 5.6.

Note 2.— Protection of flight recorder evidence requires that the recovery and handling of the recorder and its recordings be assigned only to qualified personnel.

Request from State of Registry, State of the Operator, State of Design or State of Manufacture

3.3 If a request is received from the State of Registry, the State of the Operator, the State of Design or the State of Manufacture that the aircraft, its contents, and any other evidence remain undisturbed pending inspection by an accredited representative of the requesting State, the State of Occurrence shall take all necessary steps to comply with such request, so far as this is reasonably practicable and compatible with the proper conduct of the investigation; provided that the aircraft may be moved to the extent necessary to extricate persons, animals, mail and valuables, to prevent destruction by fire or other causes, or to eliminate any danger or obstruction to air navigation, to other transport or to the public, and provided that it does not result in undue delay in returning the aircraft to service where this is practicable.

Release from custody

3.4 Subject to the provisions of 3.2 and 3.3, the State of Occurrence shall release custody of the aircraft, its contents or any parts thereof as soon as they are no longer required in the investigation, to any person or persons duly designated by the State of Registry or the State of the Operator, as applicable. For this purpose the State of Occurrence shall facilitate access to the aircraft, its contents or any parts thereof, provided that, if the aircraft, its contents, or any parts thereof lie in an area within which the State finds it impracticable to grant such access, it shall itself effect removal to a point where access can be given.

CHAPTER 4. NOTIFICATION

Note 1.— Attachment B provides a notification and reporting checklist.

Note 2.— A list of addresses of aircraft accident and incident investigation authorities can be found in the Manual of Aircraft Accident and Incident Investigation, *Part I —* Organization and Planning *(Doc 9756) and on the ICAO/AIG web site when it becomes available.*

ACCIDENTS OR SERIOUS INCIDENTS IN THE TERRITORY OF A CONTRACTING STATE TO AIRCRAFT OF ANOTHER CONTRACTING STATE

RESPONSIBILITY OF THE STATE OF OCCURRENCE

Forwarding

4.1 The State of Occurrence shall forward a notification of an accident or serious incident with a minimum of delay and by the most suitable and quickest means available to:

a) the State of Registry;

b) the State of the Operator;

c) the State of Design;

d) the State of Manufacture; and

e) the International Civil Aviation Organization, when the aircraft involved is of a maximum mass of over 2 250 kg.

However, when the State of Occurrence is not aware of a serious incident, the State of Registry or the State of the Operator, as appropriate, shall forward a notification of such an incident to the State of Design, the State of Manufacture and the State of Occurrence.

Note 1.— Telephone, facsimile, e-mail or the Aeronautical Fixed Telecommunication Network (AFTN) will in most cases constitute "the most suitable and quickest means available". More than one means of communication may be appropriate.

Note 2.— Provision for the notification of a distress phase to the State of Registry by the rescue coordination centre is contained in Annex 12.

Format and content

4.2 The notification shall be in plain language and contain as much of the following information as is readily available, but its dispatch shall not be delayed due to the lack of complete information:

a) for accidents the identifying abbreviation ACCID, for serious incidents INCID;

b) manufacturer, model, nationality and registration marks, and serial number of the aircraft;

c) name of owner, operator and hirer, if any, of the aircraft;

d) name of the pilot-in-command, and nationality of crew and passengers;

e) date and time (local time or UTC) of the accident or serious incident;

f) last point of departure and point of intended landing of the aircraft;

g) position of the aircraft with reference to some easily defined geographical point and latitude and longitude;

h) number of crew and passengers; aboard, killed and seriously injured; others, killed and seriously injured;

i) description of the accident or serious incident and the extent of damage to the aircraft so far as is known;

j) an indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence;

k) physical characteristics of the accident or serious incident area, as well as an indication of access difficulties or special requirements to reach the site;

l) identification of the originating authority and means to contact the investigator-in-charge and the accident investigation authority of the State of Occurrence at any time; and

m) presence and description of dangerous goods on board the aircraft.

Note 1.— The 4-letter designator "YLYX" in association with an ICAO 4-letter location indicator forms the 8-letter addressee indicator for messages sent over the AFTN to authorities responsible for aircraft accident and serious incident investigations. For messages sent over the public telecommunication service the addressee indicator cannot be used and a postal or telegraphic address must be substituted.

The 8-letter addressee indicators and the corresponding postal and telegraphic addresses, when notified to ICAO, are published in the Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services *(Doc 8585).*

Note 2.— The Manual of Aircraft Accident and Incident Investigation, *Part I* — Organization and Planning *(Doc 9756) contains guidance material concerning the preparation of notification messages and the arrangements to be made for their prompt delivery to the addressee.*

Language

4.3 The notification shall be prepared in one of the working languages of ICAO, taking into account the language of the recipient(s), whenever it is possible to do so without causing undue delay.

Additional information

4.4 As soon as it is possible to do so, the State of Occurrence shall dispatch the details omitted from the notification as well as other known relevant information.

RESPONSIBILITY OF THE STATE OF REGISTRY, THE STATE OF THE OPERATOR, THE STATE OF DESIGN AND THE STATE OF MANUFACTURE

Information — Participation

4.5 **Recommendation.—** *The State of Registry, the State of the Operator, the State of Design and the State of Manufacture should acknowledge receipt of the notification of an accident or serious incident (4.1 refers).*

4.6 Upon receipt of the notification, the State of Registry, the State of the Operator, the State of Design and the State of Manufacture shall, as soon as possible, provide the State of Occurrence with any relevant information available to them regarding the aircraft and flight crew involved in the accident or serious incident. Each State shall also inform the State of Occurrence whether it intends to appoint an accredited representative and if such an accredited representative is appointed, the name and contact details; as well as the expected date of arrival if the accredited representative will travel to the State of Occurrence.

Note 1.— In accordance with 5.18, the State of Registry, the State of the Operator, the State of Design and the State of Manufacture have the right to appoint an accredited representative to participate in the investigation.

Note 2.— In accordance with 5.22, the attention of the State of Registry, the State of the Operator, the State of Design and the State of Manufacture is drawn to their obligation to appoint an accredited representative when specifically requested to do so by the State conducting the investigation of an accident to an aircraft over 2 250 kg. Their attention is also drawn to the usefulness of their presence and participation in the investigation.

4.7 Upon receipt of the notification, the State of the Operator shall, with a minimum of delay and by the most suitable and quickest means available, provide the State of Occurrence with details of dangerous goods on board the aircraft.

ACCIDENTS OR SERIOUS INCIDENTS IN THE TERRITORY OF THE STATE OF REGISTRY, IN A NON-CONTRACTING STATE OR OUTSIDE THE TERRITORY OF ANY STATE

RESPONSIBILITY OF THE STATE OF REGISTRY

Forwarding

4.8 When the State of Registry institutes the investigation of an accident or serious incident, that State shall forward a notification, in accordance with 4.2 and 4.3 above, with a minimum of delay and by the most suitable and quickest means available, to:

a) the State of the Operator;

b) the State of Design;

c) the State of Manufacture; and

d) the International Civil Aviation Organization, when the aircraft involved is of a maximum mass of over 2 250 kg.

Note 1.— Telephone, facsimile, e-mail or the Aeronautical Fixed Telecommunication Network (AFTN) will in most cases constitute "the most suitable and quickest means available". More than one means of communication may be appropriate.

Note 2.— Provision for the notification of a distress phase to the State of Registry by the rescue coordination centre is contained in Annex 12.

RESPONSIBILITY OF THE STATE OF THE OPERATOR, THE STATE OF DESIGN AND THE STATE OF MANUFACTURE

Information — Participation

4.9 **Recommendation.—** *The State of the Operator, the State of Design and the State of Manufacture should acknowledge receipt of the notification of an accident or serious incident (4.1 refers).*

4.10 Upon receipt of the notification, the State of the Operator, the State of Design and the State of Manufacture shall, upon request, provide the State of Registry with any relevant information available to them regarding the flight crew and the aircraft involved in the accident or serious incident. Each State shall also inform the State of Registry whether it intends to appoint an accredited representative, and if such an accredited representative is appointed, the name and contact details; as well as the expected date of arrival if the accredited representative will be present at the investigation.

Note 1.— In accordance with 5.18, the State of the Operator, the State of Design and the State of Manufacture have the right to appoint an accredited representative to participate in the investigation.

Note 2.— In accordance with 5.22, the attention of the State of the Operator, the State of Design and the State of Manufacture is drawn to their obligation to appoint an accredited representative when specifically requested to do so by the State conducting the investigation of an accident to an aircraft over 2 250 kg. Their attention is also drawn to the usefulness of their presence and participation in the investigation.

4.11 Upon receipt of the notification, the State of the Operator shall, with a minimum of delay and by the most suitable and quickest means available, provide the State of Registry with details of dangerous goods on board the aircraft.

CHAPTER 5. INVESTIGATION

RESPONSIBILITY FOR INSTITUTING AND CONDUCTING THE INVESTIGATION

ACCIDENTS OR INCIDENTS IN THE TERRITORY OF A CONTRACTING STATE

State of Occurrence

5.1 The State of Occurrence shall institute an investigation into the circumstances of the accident and be responsible for the conduct of the investigation, but it may delegate the whole or any part of the conducting of such investigation to another State by mutual arrangement and consent. In any event the State of Occurrence shall use every means to facilitate the investigation.

5.1.1 **Recommendation.—** *The State of Occurrence should institute an investigation into the circumstances of a serious incident. Such a State may delegate the whole or any part of the conducting of such investigation to another State by mutual arrangement and consent. In any event the State of Occurrence should use every means to facilitate the investigation.*

Note 1.— The above provision does not exclude other already existing types of investigation of incidents (serious or not) by other organizations.

Note 2.— When the whole investigation is delegated to another State, such a State is expected to be responsible for the conduct of the investigation, including the issuance of the Final Report and the ADREP reporting. When a part of the investigation is delegated, the State of Occurrence usually retains the responsibility for the conduct of the investigation.

ACCIDENTS OR INCIDENTS IN THE TERRITORY OF A NON-CONTRACTING STATE

State of Registry

5.2 **Recommendation.—** *When the accident or the serious incident has occurred in the territory of a non-Contracting State which does not intend to conduct an investigation in accordance with Annex 13, the State of Registry or, failing that, the State of the Operator, the State of Design or the State of Manufacture should endeavour to institute and conduct an investigation in cooperation with the State of Occurrence but, failing such cooperation, should itself conduct an investigation with such information as is available.*

ACCIDENTS OR INCIDENTS OUTSIDE THE TERRITORY OF ANY STATE

State of Registry

5.3 When the location of the accident or the serious incident cannot definitely be established as being in the territory of any State, the State of Registry shall institute and conduct any necessary investigation of the accident or serious incident. However, it may delegate the whole or any part of the investigation to another State by mutual arrangement and consent.

5.3.1 States nearest the scene of an accident in international waters shall provide such assistance as they are able and shall, likewise, respond to requests by the State of Registry.

5.3.2 **Recommendation.—** *If the State of Registry is a non-Contracting State which does not intend to conduct an investigation in accordance with Annex 13, the State of the Operator or, failing that, the State of Design or the State of Manufacture should endeavour to institute and conduct an investigation. However, such a State may delegate the whole or any part of the investigation to another State by mutual arrangement and consent.*

ORGANIZATION AND CONDUCT OF THE INVESTIGATION

Note.— The Manual of Aircraft Accident Investigation *(Doc 6920) contains guidance material for the organization, conduct and control of an investigation.*

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

Note.— Nothing in the following provisions is intended to preclude the State conducting the investigation from calling upon the best technical expertise from any source.

General

5.4 The accident investigation authority shall have independence in the conduct of the investigation and have unrestricted authority over its conduct, consistent with the provisions of this Annex. The investigation shall include:

a) the gathering, recording and analysis of all available information on that accident or incident;

b) if appropriate, the issuance of safety recommendations;

c) if possible, the determination of the causes; and

d) the completion of the final report.

When possible, the scene of the accident shall be visited, the wreckage examined and statements taken from witnesses.

5.4.1 **Recommendation.—** *Any judicial or administrative proceedings to apportion blame or liability should be separate from any investigation conducted under the provisions of this Annex.*

Investigator-in-charge — Designation

5.5 The State conducting the investigation shall designate the investigator-in-charge of the investigation and shall initiate the investigation immediately.

Investigator-in-charge — Access and control

5.6 The investigator-in-charge shall have unhampered access to the wreckage and all relevant material, including flight recorders and ATS records, and shall have unrestricted control over it to ensure that a detailed examination can be made without delay by authorized personnel participating in the investigation.

Flight recorders — Accidents and incidents

5.7 Effective use shall be made of flight recorders in the investigation of an accident or an incident. The State conducting the investigation shall arrange for the read-out of the flight recorders without delay.

5.8 **Recommendation.—** *In the event that the State conducting the investigation of an accident or an incident does not have adequate facilities to read out the flight recorders, it should use the facilities made available to it by other States, giving consideration to the following:*

a) the capabilities of the read-out facility;

b) the timeliness of the read-out; and

c) the location of the read-out facility.

Note.— The requirements for the recording of radar data and ATS communications are contained in Annex 11, Chapter 6.

Autopsy examinations

5.9 The State conducting the investigation into a fatal accident shall arrange for complete autopsy examination of fatally injured flight crew and, subject to the particular circumstances, of fatally injured passengers and cabin attendants, by a pathologist, preferably experienced in accident investigation. These examinations shall be expeditious and complete.

Note.— Guidance material related to autopsies is provided in detail in the Manual of Civil Aviation Medicine *(Doc 8984) and the* Manual of Aircraft Accident Investigation *(Doc 6920), the former containing detailed guidance on toxicological testing.*

Medical examinations

5.9.1 **Recommendation.—** *When appropriate, the State conducting the investigation should arrange for medical examination of the crew, passengers and involved aviation personnel, by a physician, preferably experienced in accident investigation. These examinations should be expeditious.*

Note 1.— Such examinations may also determine whether the level of physical and psychological fitness of flight crew and other personnel directly involved in the occurrence is sufficient for them to contribute to the investigation.

Note 2.— The Manual of Civil Aviation Medicine *(Doc 8984) contains guidance on medical examinations.*

Coordination — Judicial authorities

5.10 The State conducting the investigation shall recognize the need for coordination between the investigator-in-charge and the judicial authorities. Particular attention shall be given to evidence which requires prompt recording and analysis for the investigation to be successful, such as the examination and identification of victims and read-outs of flight recorder recordings.

Note 1.— The responsibility of the State of Occurrence for such coordination is set out in 5.1.

Note 2.— Possible conflicts between investigating and judicial authorities regarding the custody of flight recorders and their recordings may be resolved by an official of the *judicial authority carrying the recordings to the place of read-out, thus maintaining custody.*

Informing aviation security authorities

5.11 If, in the course of an investigation it becomes known, or it is suspected, that an act of unlawful interference was involved, the investigator-in-charge shall immediately initiate action to ensure that the aviation security authorities of the State(s) concerned are so informed.

Non-disclosure of records

5.12 The State conducting the investigation of an accident or incident shall not make the following records available for purposes other than accident or incident investigation, unless the appropriate authority for the administration of justice in that State determines that their disclosure outweighs the adverse domestic and international impact such action may have on that or any future investigations:

a) all statements taken from persons by the investigation authorities in the course of their investigation;

b) all communications between persons having been involved in the operation of the aircraft;

c) medical or private information regarding persons involved in the accident or incident;

d) cockpit voice recordings and transcripts from such recordings; and

e) recordings and transcriptions of recordings from air traffic control units; and

f) opinions expressed in the analysis of information, including flight recorder information.

5.12.1 These records shall be included in the final report or its appendices only when pertinent to the analysis of the accident or incident. Parts of the records not relevant to the analysis shall not be disclosed.

Note 1.— Information contained in the records listed above, which includes information given voluntarily by persons interviewed during the investigation of an accident or incident, could be utilized inappropriately for subsequent disciplinary, civil, administrative and criminal proceedings. If such information is distributed, it may, in the future, no longer be openly disclosed to investigators. Lack of access to such information would impede the investigation process and seriously affect flight safety.

Note 2.— Attachment E contains legal guidance for the protection of information from safety data collection and processing systems.

Re-opening of investigation

5.13 If, after the investigation has been closed, new and significant evidence becomes available, the State which conducted the investigation shall re-open it. However, when the State which conducted the investigation did not institute it, that State shall first obtain the consent of the State which instituted the investigation.

RESPONSIBILITY OF ANY OTHER STATE

Information — Accidents and incidents

5.14 Any State shall, on request from the State conducting the investigation of an accident or an incident, provide that State with all the relevant information available to it.

Note.— See also 5.16.

5.15 Any State, the facilities or services of which have been, or would normally have been, used by an aircraft prior to an accident or an incident, and which has information pertinent to the investigation, shall provide such information to the State conducting the investigation.

RESPONSIBILITY OF THE STATE
OF REGISTRY AND
THE STATE OF THE OPERATOR

Flight recorders — Accidents and serious incidents

5.16 When an aircraft involved in an accident or a serious incident lands in a State other than the State of Occurrence, the State of Registry or the State of the Operator shall, on request from the State conducting the investigation, furnish the latter State with the flight recorder records and, if necessary, the associated flight recorders.

Note.— In implementing 5.16, the State of Registry or the State of the Operator may request the cooperation of any other State in the retrieval of the flight recorder records.

Organizational information

5.17 The State of Registry and the State of the Operator, on request from the State conducting the investigation, shall provide pertinent information on any organization whose activities may have directly or indirectly influenced the operation of the aircraft.

PARTICIPATION IN THE INVESTIGATION

Note.— Nothing in this Annex is intended to imply that the accredited representative and advisers of a State have to be *always present in the State in which the investigation is conducted.*

PARTICIPATION OF THE STATE OF REGISTRY, THE STATE OF THE OPERATOR, THE STATE OF DESIGN AND THE STATE OF MANUFACTURE

Rights

5.18 The State of Registry, the State of the Operator, the State of Design and the State of Manufacture shall each be entitled to appoint an accredited representative to participate in the investigation.

Note.— Nothing in this Standard is intended to preclude the State that designed or manufactured the powerplant or major components of the aircraft from requesting participation in the investigation of an accident.

5.19 The State of Registry or the State of the Operator shall appoint one or more advisers, proposed by the operator, to assist its accredited representative.

5.19.1 **Recommendation.—** *When neither the State of Registry, nor the State of the Operator appoint an accredited representative, the State conducting the investigation should invite the operator to participate, subject to the procedures of the State conducting the investigation.*

5.20 The State of Design and the State of Manufacture shall be entitled to appoint one or more advisers, proposed by the organizations responsible for the type design and the final assembly of the aircraft, to assist their accredited representatives.

5.21 **Recommendation.—** *When neither the State of Design nor the State of Manufacture appoint an accredited representative, the State conducting the investigation should invite the organizations responsible for the type design and the final assembly of the aircraft to participate, subject to the procedures of the State conducting the investigation.*

Obligations

5.22 When the State conducting an investigation of an accident to an aircraft of a maximum mass of over 2 250 kg specifically requests participation by the State of Registry, the State of the Operator, the State of Design or the State of Manufacture, the State(s) concerned shall each appoint an accredited representative.

Note 1.— Nothing in 5.22 is intended to preclude the State conducting an investigation from requesting the State that designed or manufactured the powerplant or major components of the aircraft to appoint an accredited representative whenever the former State believes that a useful contribution can be made to the investigation or when such participation might result in increased safety.

Note 2.— Nothing in 5.22 is intended to preclude the State conducting an investigation from requesting the State of Design and the State of Manufacture to give assistance in the investigation of accidents other than those in 5.22.

PARTICIPATION OF OTHER STATES

Rights

5.23 Any State which on request provides information, facilities or experts to the State conducting the investigation shall be entitled to appoint an accredited representative to participate in the investigation.

Note.— Any State that provides an operational base for field investigations, or is involved in search and rescue or wreckage recovery operations, or is involved as a State of a code-share or alliance partner of the operator, may also be invited to appoint an accredited representative to participate in the investigation.

ENTITLEMENT OF ACCREDITED REPRESENTATIVES

Advisers

5.24 A State entitled to appoint an accredited representative shall also be entitled to appoint one or more advisers to assist the accredited representative in the investigation.

Note 1.— Nothing in the above provisions is intended to preclude a State participating in an investigation from calling upon the best technical experts from any source and appointing such experts as advisers to its accredited representative.

Note 2.— Facilitation of the entry of the accredited representatives, their advisers and equipment is covered in Annex 9 — Facilitation*. The carriage of an official or service passport may expedite the entry.*

5.24.1 Advisers assisting accredited representatives shall be permitted, under the accredited representatives' supervision, to participate in the investigation to the extent necessary to enable the accredited representatives to make their participation effective.

Chapter 5

Participation

5.25 Participation in the investigation shall confer entitlement to participate in all aspects of the investigation, under the control of the investigator-in-change, in particular to:

a) visit the scene of the accident;

b) examine the wreckage;

c) obtain witness information and suggest areas of questioning;

d) have full access to all relevant evidence as soon as possible;

e) receive copies of all pertinent documents;

f) participate in read-outs of recorded media;

g) participate in off-scene investigative activities such as component examinations, technical briefings, tests and simulations;

h) participate in investigation progress meetings including deliberations related to analysis, findings, causes and safety recommendations; and

i) make submissions in respect of the various elements of the investigation.

However, participation of States other than the State of Registry, the State of the Operator, the State of Design and the State of Manufacture may be limited to those matters which entitled such States to participation under 5.23.

Note 1.— It is recognized that the form of participation would be subject to the procedures of the State in which the investigation, or part thereof, is being conducted.

Note 2.— The collection and recording of information need not be delayed to await the arrival of an accredited representative.

Note 3.— Nothing in this Standard precludes the State conducting the investigation from extending participation beyond the entitlement enumerated.

Note 4.— The pertinent documents referred to in subparagraph e) also include documents such as the reports on examinations of components or studies performed within the framework of the investigation.

Obligations

5.26 Accredited representatives and their advisers:

a) shall provide the State conducting the investigation with all relevant information available to them; and

b) shall not divulge information on the progress and the findings of the investigation without the express consent of the State conducting the investigation.

Note.— Nothing in this Standard precludes prompt release of facts when authorized by the State conducting the investigation, nor does this Standard preclude accredited representatives from reporting to their respective States in order to facilitate appropriate safety actions.

PARTICIPATION OF STATES HAVING SUFFERED FATALITIES OR SERIOUS INJURIES TO ITS CITIZENS

Rights and entitlement

5.27 A State which has a special interest in an accident by virtue of fatalities or serious injuries to its citizens shall, upon making a request to do so, be permitted by the State conducting the investigation to appoint an expert who shall be entitled to:

a) visit the scene of the accident;

b) have access to the relevant factual information;

c) participate in the identification of the victims;

d) assist in questioning surviving passengers who are citizens of the expert's State; and

e) receive a copy of the Final Report.

CHAPTER 6. FINAL REPORT

6.1 **Recommendation.—** *The format of the Final Report in the Appendix should be used. However, it may be adapted to the circumstances of the accident or incident.*

RESPONSIBILITY OF ANY STATE

Release of information — Consent

6.2 States shall not circulate, publish or give access to a draft report or any part thereof, or any documents obtained during an investigation of an accident or incident, without the express consent of the State which conducted the investigation, unless such reports or documents have already been published or released by that latter State.

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

Consultation

6.3 The State conducting the investigation shall send a copy of the draft Final Report to the State that instituted the investigation and to all States that participated in the investigation, inviting their significant and substantiated comments on the report as soon as possible. The draft Final Report of the investigation shall be sent for comments to:

a) the State of Registry;

b) the State of the Operator;

c) the State of Design; and

d) the State of Manufacture.

If the State conducting the investigation receives comments within sixty days of the date of the transmittal letter, it shall either amend the draft Final Report to include the substance of the comments received or, if desired by the State that provided comments, append the comments to the Final Report. If the State conducting the investigation receives no comments within sixty days of the date of the first transmittal letter, it shall issue the Final Report in accordance with 6.4, unless an extension of that period has been agreed by the States concerned.

Note 1.— Nothing in this Standard is intended to preclude the State conducting the investigation from consulting other States, such as those States which provided relevant information, significant facilities, or experts who participated in the investigation under 5.27.

Note 2.— Comments to be appended to the Final Report are restricted to non-editorial-specific technical aspects of the Final Report upon which no agreement could be reached.

Note 3.— When sending the draft Final Report to recipient States, the State conducting the investigation may consider using the most suitable and quickest means available, such as facsimile, e-mail, courier service or express mail.

6.3.1 **Recommendation.—** *The State conducting the investigation should send, through the State of the Operator, a copy of the draft Final Report to the operator to enable the operator to submit comments on the draft Final Report.*

6.3.2 **Recommendation.—** *The State conducting the investigation should send, through the State of Design and the State of Manufacture, a copy of the draft Final Report to the organizations responsible for the type design and the final assembly of the aircraft to enable them to submit comments on the draft Final Report.*

Recipient States

6.4 The Final Report of the investigation of an accident shall be sent with a minimum of delay by the State conducting the investigation to:

a) the State that instituted the investigation;

b) the State of Registry;

c) the State of the Operator;

d) the State of Design;

e) the State of Manufacture;

f) any State having suffered fatalities or serious injuries to its citizens; and

g) any State that provided relevant information, significant facilities or experts.

Release of the Final Report

6.5 In the interest of accident prevention, the State conducting the investigation of an accident or incident shall release the Final Report as soon as possible.

6.6 **Recommendation.—** *The State conducting the investigation should release the Final Report in the shortest possible time and, if possible, within twelve months of the date of the occurrence. If the report cannot be released within twelve months, the State conducting the investigation should release an interim report on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised.*

6.7 When the State that has conducted an investigation into an accident or an incident involving an aircraft of a maximum mass of over 5 700 kg has released a Final Report, that State shall send to the International Civil Aviation Organization a copy of the Final Report.

Note.— Whenever practicable, the Final Report sent to ICAO is to be prepared in one of the working languages of the Organization and in the form shown in the Appendix.

Safety recommendations

6.8 At any stage of the investigation of an accident or incident, the accident or incident investigation authority of the State conducting the investigation shall recommend to the appropriate authorities, including those in other States, any preventive action that it considers necessary to be taken promptly to enhance aviation safety.

6.9 A State conducting investigations of accidents or incidents shall address, when appropriate, any safety recommendations arising out of its investigations to the accident investigation authorities of other State(s) concerned and, when ICAO documents are involved, to ICAO.

Note.— When Final Reports contain safety recommendations addressed to ICAO, because ICAO documents are involved, these reports must be accompanied by a letter outlining the specific action proposed.

RESPONSIBILITY OF A STATE RECEIVING SAFETY RECOMMENDATIONS

Action on safety recommendations

6.10 A State that receives safety recommendations shall inform the proposing State of the preventive action taken or under consideration, or the reasons why no action will be taken.

Note.— Nothing in this Standard is intended to preclude the State conducting the investigation from making proposals for preventive action other than safety recommendations.

CHAPTER 7. ADREP REPORTING

Note 1.— Attachment B provides a notification and reporting checklist.

Note 2.— The provisions of this chapter may require two separate reports for any one accident or incident. They are:

Preliminary Report
Accident/Incident Data Report

Note 3.— Guidance for preparing the Preliminary Report and the Accident/Incident Data Report is given in the Accident/Incident Reporting Manual *(Doc 9156).*

PRELIMINARY REPORT

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

Accidents to aircraft over 2 250 kg

7.1 When the aircraft involved in an accident is of a maximum mass of over 2 250 kg, the State conducting the investigation shall send the Preliminary Report to:

a) the State of Registry or the State of Occurrence, as appropriate;

b) the State of the Operator;

c) the State of Design;

d) the State of Manufacture;

e) any State that provided relevant information, significant facilities or experts; and

f) the International Civil Aviation Organization.

Accidents to aircraft of 2 250 kg or less

7.2 When an aircraft, not covered by 7.1, is involved in an accident and when airworthiness or matters considered to be of interest to other States are involved, the State conducting the investigation shall forward the Preliminary Report to:

a) the State of Registry or the State of Occurrence, as appropriate;

b) the State of the Operator;

c) the State of Design;

d) the State of Manufacture; and

e) any State that provided relevant information, significant facilities or experts.

Language

7.3 The Preliminary Report shall be submitted to appropriate States and to the International Civil Aviation Organization in one of the working languages of ICAO.

Dispatch

7.4 The Preliminary Report shall be sent by facsimile, e-mail, or airmail within thirty days of the date of the accident unless the Accident/Incident Data Report has been sent by that time. When matters directly affecting safety are involved, it shall be sent as soon as the information is available and by the most suitable and quickest means available.

ACCIDENT/INCIDENT DATA REPORT

RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

Accidents to aircraft over 2 250 kg

7.5 When the aircraft involved in an accident is of a maximum mass of over 2 250 kg, the State conducting the investigation shall send, as soon as practicable after the investigation, the Accident Data Report to the International Civil Aviation Organization.

Additional information

7.6 **Recommendation.—** *The State conducting the investigation should, upon request, provide other States with pertinent information additional to that made available in the Accident/Incident Data Report.*

Incidents to aircraft over 5 700 kg

7.7 If a State conducts an investigation into an incident to an aircraft of a maximum mass of over 5 700 kg, that State shall send, as soon as is practicable after the investigation, the Incident Data Report to the International Civil Aviation Organization.

Note.— The types of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies are listed in Attachment C.

CHAPTER 8. ACCIDENT PREVENTION MEASURES

Note.— The objective of these specifications is to promote accident prevention by analysis of accident and incident data and by a prompt exchange of information.

Incident reporting systems

8.1 A State shall establish a mandatory incident reporting system to facilitate collection of information on actual or potential safety deficiencies.

8.2 **Recommendation.—** *A State should establish a voluntary incident reporting system to facilitate the collection of information that may not be captured by a mandatory incident reporting system.*

8.3 A voluntary incident reporting system shall be non-punitive and afford protection to the sources of the information.

Note 1.— A non-punitive environment is fundamental to voluntary reporting.

Note 2.— States are encouraged to facilitate and promote the voluntary reporting of events that could affect aviation safety by adjusting their applicable laws, regulations and policies, as necessary.

Note 3.— Guidance related to both mandatory and voluntary incident reporting systems is contained in the Safety Management Manual (SMM) *(Doc 9859).*

Note 4.— Attachment E contains legal guidance for the protection of information from safety data collection and processing systems.

Database systems

8.4 **Recommendation.—** *A State should establish an accident and incident database to facilitate the effective analysis of information obtained, including that from its incident rep*

8.5 **Recommendation.—** *The database systems should use standardized formats to facilitate data exchange.*

Note 1.— Guidance material related to the specification for such databases will be provided by ICAO upon request from States.

Note 2.— States are encouraged to foster regional arrangements, as appropriate, when implementing 8.4.

Analysis of data — Preventive actions

8.6 A State having established an accident and incident database and an incident reporting system shall analyse the information contained in its accident/incident reports and the database to determine any preventive actions required.

Note.— Additional information on which to base preventive actions may be contained in the Final Reports on investigated accidents and incidents.

8.7 **Recommendation.—** *If a State, in the analysis of the information contained in its database, identifies safety matters considered to be of interest to other States, that State should forward such safety information to them as soon as possible.*

8.8 **Recommendation.—** *In addition to safety recommendations arising from accident and incident investigations, safety recommendations may result from diverse sources, including safety studies. If safety recommendations are addressed to an organization in another State, they should also be transmitted to that State's investigation authority.*

Exchange of safety information

8.9 **Recommendation.—** *States should promote the establishment of safety information sharing networks among all users of the aviation system and should facilitate the free exchange of information on actual and potential safety deficiencies.*

Note.— Standardized definitions, classifications and formats are needed to facilitate data exchange. Guidance material on the specifications for such information-sharing networks will be provided by ICAO upon request.

APPENDIX. FORMAT OF THE FINAL REPORT

(See Chapter 6)

PURPOSE

The purpose of this format is to present the Final Report in a convenient and uniform manner.

Detailed guidance on completing each section of the Final Report is found in the *Manual of Aircraft Accident Investigation* (Doc 6920).

FORMAT

Title. The Final Report begins with a title comprising:

name of the operator; manufacturer, model, nationality and registration marks of the aircraft; place and date of the accident or incident.

Synopsis. Following the title is a synopsis describing briefly all relevant information regarding:

notification of accident to national and foreign authorities; identification of the accident investigation authority and accredited representation; organization of the investigation; authority releasing the report and date of publication;

and concluding with a brief résumé of the circumstances leading to the accident.

Body. The body of the Final Report comprises the following main headings:

1. Factual information
2. Analysis
3. Conclusions
4. Safety recommendations

each heading consisting of a number of sub-headings as outlined in the following.

Appendices. Include as appropriate.

Note.— In preparing a Final Report, using this format, ensure that:

a) all information relevant to an understanding of the factual information, analysis and conclusions is included under each appropriate heading;

b) where information in respect of any of the items in 1.— Factual information is not available, or is irrelevant to the circumstances leading to the accident, a note to this effect is included under the appropriate sub-headings.

1. FACTUAL INFORMATION

1.1 ***History of the flight.*** A brief narrative giving the following information:

— Flight number, type of operation, last point of departure, time of departure (local time or UTC), point of intended landing.

— Flight preparation, description of the flight and events leading to the accident, including reconstruction of the significant portion of the flight path, if appropriate.

— Location (latitude, longitude, elevation), time of the accident (local time or UTC), whether day or night.

1.2 ***Injuries to persons.*** Completion of the following (in numbers):

Injuries	*Crew*	*Passengers*	*Others*
Fatal			
Serious			
Minor/None			

Note.— Fatal injuries include all deaths determined to be a direct result of injuries sustained in the accident. Serious injury is defined in Chapter 1 of the Annex.

1.3 ***Damage to aircraft.*** Brief statement of the damage sustained by aircraft in the accident (destroyed, substantially damaged, slightly damaged, no damage).

1.4 ***Other damage.*** Brief description of damage sustained by objects other than the aircraft.

1.5 ***Personnel information:***

a) Pertinent information concerning each of the flight crew members including: age, validity of licences, ratings, mandatory checks, flying experience (total and on type) and relevant information on duty time.

b) Brief statement of qualifications and experience of other crew members.

c) Pertinent information regarding other personnel, such as air traffic services, maintenance, etc., when relevant.

1.6 ***Aircraft information:***

a) Brief statement on airworthiness and maintenance of the aircraft (indication of deficiencies known prior to and during the flight to be included, if having any bearing on the accident).

b) Brief statement on performance, if relevant, and whether the mass and centre of gravity were within the prescribed limits during the phase of operation related to the accident. (If not and if of any bearing on the accident give details.)

c) Type of fuel used.

1.7 ***Meteorological information:***

a) Brief statement on the meteorological conditions appropriate to the circumstances including both forecast and actual conditions, and the availability of meteorological information to the crew.

b) Natural light conditions at the time of the accident (sunlight, moonlight, twilight, etc.).

1.8 ***Aids to navigation.*** Pertinent information on navigation aids available, including landing aids such as ILS, MLS, NDB, PAR, VOR, visual ground aids, etc., and their effectiveness at the time.

1.9 ***Communications.*** Pertinent information on aeronautical mobile and fixed service communications and their effectiveness.

1.10 ***Aerodrome information.*** Pertinent information associated with the aerodrome, its facilities and condition, or with the take-off or landing area if other than an aerodrome.

1.11 ***Flight recorders.*** Location of the flight recorder installations in the aircraft, their condition on recovery and pertinent data available therefrom.

1.12 ***Wreckage and impact information.*** General information on the site of the accident and the distribution pattern of the wreckage; detected material failures or component malfunctions. Details concerning the location and state of the different pieces of the wreckage are not normally required unless it is necessary to indicate a break-up of the aircraft prior to impact. Diagrams, charts and photographs may be included in this section or attached in the Appendices.

1.13 ***Medical and pathological information.*** Brief description of the results of the investigation undertaken and pertinent data available therefrom.

Note.— Medical information related to flight crew licences should be included in 1.5 — Personnel information.

1.14 ***Fire.*** If fire occurred, information on the nature of the occurrence, and of the fire fighting equipment used and its effectiveness.

1.15 ***Survival aspects.*** Brief description of search, evacuation and rescue, location of crew and passengers in relation to injuries sustained, failure of structures such as seats and seat-belt attachments.

1.16 ***Tests and research.*** Brief statements regarding the results of tests and research.

1.17 ***Organizational and management information.*** Pertinent information concerning the organizations and their management involved in influencing the operation of the aircraft. The organizations include, for example, the operator; the air traffic services, airway, aerodrome and weather service agencies; and the regulatory authority. The information could include, but not be limited to, organizational structure and functions, resources, economic status, management policies and practices, and regulatory framework.

1.18 ***Additional information.*** Relevant information not already included in 1.1 to 1.17.

1.19 ***Useful or effective investigation techniques.*** When useful or effective investigation techniques have been used during the investigation, briefly indicate the reason for using these techniques and refer here to the main features as well as describing the results under the appropriate sub-headings 1.1 to 1.18.

2. ANALYSIS

Analyse, as appropriate, only the information documented in 1. — Factual information and which is relevant to the determination of conclusions and causes.

3. CONCLUSIONS

List the findings and causes established in the investigation. The list of causes should include both the immediate and the deeper systemic causes.

4. SAFETY RECOMMENDATIONS

As appropriate, briefly state any recommendations made for the purpose of accident prevention and any resultant corrective action.

APPENDICES

Include, as appropriate, any other pertinent information considered necessary for the understanding of the report.

ATTACHMENTS

These Attachments do not constitute a part of Annex 13 — Aircraft Accident and Incident Investigation*.*
The material contained herein is intended to assist in the application of Annex 13.

ATTACHMENT A. RIGHTS AND OBLIGATIONS OF THE STATE OF THE OPERATOR IN RESPECT OF ACCIDENTS AND INCIDENTS INVOLVING LEASED, CHARTERED OR INTERCHANGED AIRCRAFT

The Standards and Recommended Practices of Annex 13 — *Aircraft Accident and Incident Investigation* were developed when the State of Registry and the State of the Operator normally were the same. In recent years, however, international aircraft leasing and interchanging arrangements have developed so that in many instances the State of the Operator is different from the State of Registry.

Leasing or interchange arrangements sometimes include the provision of flight crews from the State of Registry. However, more often, flight crews are provided by the State of the Operator and the aircraft operated under national legislation of the State of the Operator. Similarly, a variety of arrangements for airworthiness can emerge from these arrangements. Airworthiness responsibility may rest, wholly or partly, with the State of the Operator or State of Registry. Sometimes the operator, in conformity with an airworthiness control system specified by the State of Registry, carries out maintenance and keeps records.

In the event of an accident or an incident, it is important that any State which has assumed responsibility for the safety of an aircraft has the right to participate in an investigation, at least in respect of that responsibility. It is also important that the State conducting the investigation should have speedy access to all documents and other information relevant to that investigation.

When the location of an accident or an incident cannot definitely be established as being in the territory of another State, the State of the Operator, after consultation with the State of Registry, should accept full or partial responsibility for the conduct of the investigation.

ATTACHMENT B. NOTIFICATION AND REPORTING CHECKLIST

Note.— In this checklist, the following terms have the meaning indicated below:
— International occurrences: *accidents and serious incidents occurring in the territory of a Contracting State to aircraft registered in another Contracting State;*
— Domestic occurrences: *accidents and serious incidents occurring in the territory of the State of Registry;*
— Other occurrences: *accidents and serious incidents occurring in the territory of a non-Contracting State, or outside the territory of any State.*

1. NOTIFICATION — ACCIDENTS AND SERIOUS INCIDENTS

From	*For*	*Send to*	*Annex 13 reference*
State of Occurrence	International occurrences: All aircraft	State of Registry State of the Operator State of Design State of Manufacture ICAO (when aircraft over 2 250 kg)	4.1
State of Registry	Domestic and other occurrences: Aircraft over 2 250 kg	State of the Operator State of Design State of Manufacture ICAO (when aircraft over 2 250 kg)	4.8

2. FINAL REPORT

Accidents and serious incidents wherever they occurred

From	*Type of report*	*Concerning*	*Send to*	*Annex 13 reference*
State conducting the investigation	FINAL REPORT	All aircraft	State instituting the investigation State of Registry State of the Operator State of Design State of Manufacture State having interest because of fatalities State providing information, significant facilities or experts	6.4
		Aircraft over 5 700 kg	ICAO	6.7

3. ADREP REPORT

Accidents and serious incidents wherever they occurred

From	*Type of report*	*Concerning*	*Send to*	*Annex 13 reference*
State conducting the investigation	PRELIMINARY REPORT	Accidents to aircraft over 2 250 kg	State of Registry or State of Occurrence State of the Operator State of Design State of Manufacture State providing information, significant facilities or experts ICAO	7.1
		Accidents to aircraft of 2 250 kg or less if airworthiness or matters of interest are involved	Same as above, *except* ICAO	7.2
	ACCIDENT DATA REPORT	Accidents to aircraft over 2 250 kg	ICAO	7.5
	INCIDENT DATA REPORT	Incidents to aircraft over 5 700 kg	ICAO	7.7

4. ACCIDENT PREVENTION MEASURES

Safety matters of interest to other States

From	*Type of report*	*Concerning*	*Send to*	*Annex 13 reference*
State analysing safety data	any	Matters considered to be of interest to other States	States having an interest	8.7
States making safety recommendations	safety recommendations	Recommendations made to another State	Accident investigation authority in that State	6.8 8.8

ATTACHMENT C. LIST OF EXAMPLES OF SERIOUS INCIDENTS

1. The term “serious incident” is defined in Chapter 1 as follows:

Serious incident. An incident involving circumstances indicating that an accident nearly occurred.

2. The incidents listed are typical examples of incidents that are likely to be serious incidents. The list is not exhaustive and only serves as guidance to the definition of serious incident.

Near collisions requiring an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.

Controlled flight into terrain only marginally avoided.

Aborted take-offs on a closed or engaged runway.

Take-offs from a closed or engaged runway with marginal separation from obstacle(s).

Landings or attempted landings on a closed or engaged runway.

Gross failures to achieve predicted performance during take-off or initial climb.

Fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents.

Events requiring the emergency use of oxygen by the flight crew.

Aircraft structural failures or engine disintegrations not classified as an accident.

Multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft.

Flight crew incapacitation in flight.

Fuel quantity requiring the declaration of an emergency by the pilot.

Take-off or landing incidents. Incidents such as under-shooting, overrunning or running off the side of runways.

System failures, weather phenomena, operations outside the approved flight envelope or other occurrences which could have caused difficulties controlling the aircraft.

Failures of more than one system in a redundancy system mandatory for flight guidance and navigation.

ATTACHMENT D. GUIDELINES FOR FLIGHT RECORDER READ-OUT AND ANALYSIS

Initial response

The aftermath of a major accident is a demanding time for any State's investigation authority. One of the immediate items requiring a decision is where to have the flight recorders read out and analysed. It is essential that the flight recorders be read out as early as possible after an accident. Early identification of problem areas can affect the investigation at the accident site where evidence is sometimes transient. Early identification of problem areas may also result in urgent safety recommendations which may be necessary to prevent a similar occurrence.

Many States do not have their own facilities for the playback and analysis of flight recorder information (both voice and data) and consequently request assistance from other States. It is essential, therefore, that the accident investigation authority of the State conducting the investigation make timely arrangements to read out the flight recorders at a suitable readout facility.

Choice of facility

The investigating State may request assistance from any State that, in its opinion, can best serve the investigation. The manufacturer's standard replay equipment and playback software, which is typically used by airlines and maintenance facilities, is not considered adequate for investigation purposes. Special recovery and analysis techniques are usually required if the recorders have been damaged.

Facilities for the read-out of flight recorders should have the following capabilities:

a) the ability to disassemble and read out recorders that have sustained substantial damage;

b) the ability to play back the original recording/memory module without the need for the use of a manufacturer's copy device or the recorder housing that was involved in the accident or incident;

c) the ability to manually analyse the raw binary waveform from digital tape flight data recorders;

d) the ability to enhance and filter voice recordings digitally by means of suitable software; and

e) the capability to graphically analyse data, to derive additional parameters not explicitly recorded, to validate the data by cross-checking and other analytical methods to determine data accuracy and limitations.

Participation by the State of Manufacture (or Design) and the State of the Operator

The State of Manufacture (or Design) has airworthiness responsibilities and the expertise normally required to read out and analyse flight recorder information. Since flight recorder information can often reveal airworthiness problems, the State of Manufacture (or Design) should have a representative present when the flight recorder read-out and analysis are being conducted in a State other than the State of Manufacture (or Design).

The State of the Operator has regulatory responsibilities regarding the flight operation and can provide insights into operational issues which may be specific to the operator. Since flight recorder information can reveal operational problems, the State of the Operator should also have a representative present when the flight recorder read-out and analysis are being conducted.

Recommended procedures

The flight data recorder and the cockpit voice recorder should be read out by the same facility, because they contain complementary data which can help validate each recording and aid in determining timing and synchronization.

Flight recorders should not be opened or powered up and original recordings should not be copied (particularly not by high-speed copy devices) prior to the read-out because of the risk of damage to the recordings.

The facility at which the flight recorders are read out for another State should be given an opportunity to comment on the Final Report in order to ensure that the characteristics of the flight recorder analysis have been taken into account.

The facility at which the flight recorders are read out may require the expertise of the aircraft manufacturer and the operator in order to verify the calibration data and validate the recorded information.

The State conducting the investigation may leave the original recordings, or a copy of them, with the read-out facility until the investigation is completed, in order to facilitate the timely resolution of additional requests or clarifications, providing that the facility has adequate security procedures to safeguard the recordings.

ATTACHMENT E. LEGAL GUIDANCE FOR THE PROTECTION OF INFORMATION FROM SAFETY DATA COLLECTION AND PROCESSING SYSTEMS

1. INTRODUCTION

1.1 The protection of safety information from inappropriate use is essential to ensure its continued availability, since the use of safety information for other than safety-related purposes may inhibit the future availability of such information, with an adverse effect on safety. This fact was recognized by the 35th Assembly of ICAO, which noted that existing national laws and regulations in many States may not adequately address the manner in which safety information is protected from inappropriate use.

1.2 The guidance contained in this Attachment is therefore aimed at assisting States enact national laws and regulations to protect information gathered from safety data collection and processing systems (SDCPS), while allowing for the proper administration of justice. The objective is to prevent the inappropriate use of information collected solely for the purpose of improving aviation safety.

1.3 Because of the different legal systems in States, the legal guidance must allow States the flexibility to draft their laws and regulations in accordance with their national policies and practices.

1.4 The guidance contained in this Attachment, therefore, takes the form of a series of principles that have been distilled from examples of national laws and regulations provided by States. The concepts described in these principles could be adapted or modified to meet the particular needs of the State enacting laws and regulations to protect safety information.

1.5 Throughout this Attachment:

a) *safety information* refers to information contained in SDCPS established for the sole purpose of improving aviation safety, and qualified for protection under specified conditions in accordance with 3.1 below;

b) *operational personnel* refers to personnel involved in aviation operations who are in a position to report safety information to SDCPS. Such personnel include, but are not limited to, flight crews, air traffic controllers, aeronautical station operators, maintenance technicians, cabin crews, flight dispatchers and apron personnel;

c) *inappropriate use* refers to the use of safety information for purposes different from the purposes for which it was collected, namely, use of the information for disciplinary, civil, administrative and criminal proceedings against operational personnel, and/or disclosure of the information to the public;

d) SDCPS refers to processing and reporting systems, databases, schemes for exchange of information, and recorded information and include:

   1) records pertaining to accident and incident investigations, as described in Chapter 5;

   2) mandatory incident reporting systems, as described in Chapter 8;

   3) voluntary incident reporting systems, as described in Chapter 8; and

   4) self-disclosure reporting systems, including automatic data capture systems, as described in Annex 6, Part I, Chapter 3, as well as manual data capture systems.

Note.— Information on safety data collection and processing systems can be found in the Safety Management Manual (SMM) *(Doc 9859).*

2. GENERAL PRINCIPLES

2.1 The sole purpose of protecting safety information from inappropriate use is to ensure its continued availability so that proper and timely preventive actions can be taken and aviation safety improved.

2.2 It is not the purpose of protecting safety information to interfere with the proper administration of justice in States.

2.3 National laws and regulations protecting safety information should ensure that a balance is struck between the need for the protection of safety information in order to improve aviation safety, and the need for the proper administration of justice.

2.4 National laws and regulations protecting safety information should prevent its inappropriate use.

2.5 Providing protection to qualified safety information under specified conditions is part of a State's safety responsibilities.

3. PRINCIPLES OF PROTECTION

3.1 Safety information should qualify for protection from inappropriate use according to specified conditions that should include, but not necessarily be limited to: the collection of information was for explicit safety purposes and the disclosure of the information would inhibit its continued availability.

3.2 The protection should be specific for each SDCPS, based upon the nature of the safety information it contains.

3.3 A formal procedure should be established to provide protection to qualified safety information, in accordance with specified conditions.

3.4 Safety information should not be used in a way different from the purposes for which it was collected.

3.5 The use of safety information in disciplinary, civil, administrative and criminal proceedings should be carried out only under suitable safeguards provided by national law.

4. PRINCIPLES OF EXCEPTION

Exceptions to the protection of safety information should only be granted by national laws and regulations when:

a) there is evidence that the occurrence was caused by an act considered, in accordance with the law, to be conduct with intent to cause damage, or conduct with knowledge that damage would probably result, equivalent to reckless conduct, gross negligence or wilful misconduct;

b) an appropriate authority considers that circumstances reasonably indicate that the occurrence may have been caused by conduct with intent to cause damage, or conduct with knowledge that damage would probably result, equivalent to reckless conduct, gross negligence or wilful misconduct; or

c) a review by an appropriate authority determines that the release of the safety information is necessary for the proper administration of justice, and that its release outweighs the adverse domestic and international impact such release may have on the future availability of safety information.

5. PUBLIC DISCLOSURE

5.1 Subject to the principles of protection and exception outlined above, any person seeking disclosure of safety information should justify its release.

5.2 Formal criteria for disclosure of safety information should be established and should include, but not necessarily be limited to, the following:

a) disclosure of the safety information is necessary to correct conditions that compromise safety and/or to change policies and regulations;

b) disclosure of the safety information does not inhibit its future availability in order to improve safety;

c) disclosure of relevant personal information included in the safety information complies with applicable privacy laws; and

d) disclosure of the safety information is made in a de-identified, summarized or aggregate form.

6. RESPONSIBILITY OF THE CUSTODIAN OF SAFETY INFORMATION

Each SDCPS should have a designated custodian. It is the responsibility of the custodian of safety information to apply all possible protection regarding the disclosure of the information, unless:

a) the custodian of the safety information has the consent of the originator of the information for disclosure; or

b) the custodian of the safety information is satisfied that the release of the safety information is in accordance with the principles of exception.

7. PROTECTION OF RECORDED INFORMATION

Considering that ambient workplace recordings required by legislation, such as cockpit voice recorders (CVRs), may be perceived as constituting an invasion of privacy for operational personnel that other professions are not exposed to:

a) subject to the principles of protection and exception above, national laws and regulations should consider ambient workplace recordings required by legislation as privileged protected information, i.e. information deserving enhanced protection; and

b) national laws and regulations should provide specific measures of protection to such recordings as to their confidentiality and access by the public. Such specific measures of protection of workplace recordings required by legislation may include the issuance of orders of non-public disclosure.

— END —

ICAO TECHNICAL PUBLICATIONS

he follo ing summary gi es the status and also describes in general terms the contents of the arious series of technical publications issued by the International i il iation rgani ation. It does not include speciali ed publications that do not fall specifically ithin one of the series such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

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he follo ing publications are prepared by authority of the ecretary eneral in accordance ith the principles and policies appro ed by the ouncil.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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International Standards and Recommended Practices

Annex 14
to the Convention on International Civil Aviation

Aerodromes

Volume I
Aerodrome Design and Operations

This edition incorporates all amendments adopted by the Council prior to 28 February 2004 and supersedes, on 25 November 2004, all previous editions of Annex 14, Volume I.

For information regarding the applicability of Standards and Recommended Practices, *see* Chapter 1,1.2 and Foreword.

Fourth Edition
July 2004

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-6	Incorporated in this edition		
7	24/11/05		ICAO
8	23/11/06	—	ICAO
9	15/6/06 (approved date)	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

ABBREVIATIONS AND SYMBOLS
(used in Annex 14, Volume I)

Abbreviations

ACN	Aircraft classification number
aprx	Approximately
ASDA	Accelerate-stop distance available
ATS	Air traffic services
cd	Candela
C	Degree Celsius
CBR	California bearing ratio
CIE	Commission Internationale de l'Éclairage
cm	Centimetre
DME	Distance measuring equipment
ft	Foot
ILS	Instrument landing system
IMC	Instrument meteorological conditions
K	Degree Kelvin
kg	Kilogram
km	Kilometre
km/h	Kilometre per hour
kt	Knot
L	Litre
LDA	Landing distance available
m	Metre
max	Maximum
mm	Millimetre
mnm	Minimum
MN	Meganewton
MPa	Megapascal
NM	Nautical mile
NU	Not usable
OCA/H	Obstacle clearance altitude/height
OFZ	Obstacle free zone
PCN	Pavement classification number
RESA	Runway end safety area
RVR	Runway visual range
TODA	Take-off distance available
TORA	Take-off run available
VMC	Visual meteorological conditions
VOR	Very high frequency omnidirectional radio range

Symbols

°	Degree
=	Equals
′	Minute of arc
µ	Friction coefficient
>	Greater than
<	Less than
%	Percentage
±	Plus or minus

PUBLICATIONS

(related to the specifications of this Annex)

Aerodrome Design Manual (Doc 9157)
Part 1 — *Runways*
Part 2 — *Taxiways, Aprons and Holding Bays*
Part 3 — *Pavements*
Part 4 — *Visual Aids*
Part 5 — *Electrical Systems*
Part 6 — *Frangibility*

Aeronautical Information Services Manual (Doc 8126)

Airport Planning Manual (Doc 9184)
Part 1 — *Master Planning*
Part 2 — *Land Use and Environmental Control*
Part 3 — *Guidelines for Consultant/Construction Services*

Airport Services Manual (Doc 9137)
Part 1 — *Rescue and Fire Fighting*
Part 2 — *Pavement Surface Conditions*
Part 3 — *Bird Control and Reduction*
Part 5 — *Removal of Disabled Aircraft*
Part 6 — *Control of Obstacles*
Part 7 — *Airport Emergency Planning*
Part 8 — *Airport Operational Services*
Part 9 — *Airport Maintenance Practices*

Air Traffic Services Planning Manual (Doc 9426)

Airworthiness Manual (Doc 9760)
Volume I — *Organization and Procedures*
Volume II — *Design Certification and Continuing Airworthiness*

Guidance on the Balanced Approach to Aircraft Noise Management (Doc 9829)

Heliport Manual (Doc 9261)

Human Factors Training Manual (Doc 9683)

Manual of Aircraft Ground De-icing/Anti-icing Operations (Doc 9640)

Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476)

Manual on Certification of Aerodromes (Doc 9774)

Manual on Laser Emitters and Flight Safety (Doc 9815)

Manual on the ICAO Bird Strike Information System (IBIS) (Doc 9332)

Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS) (Doc 8168)
Volume I — *Flight Procedures*
Volume II — *Construction of Visual and Instrument Flight Procedures*

Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM) (Doc 4444)

Safety Management Manual (SMM) (Doc 9859)

Stolport Manual (Doc 9150)

World Geodetic System — 1984 (WGS-84) Manual (Doc 9674)

FOREWORD

Historical background

Standards and Recommended Practices for Aerodromes were first adopted by the Council on 29 May 1951 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 14 to the Convention. The Standards and Recommended Practices were based on recommendations of the Aerodromes, Air Routes and Ground Aids Division at its third session in September 1947 and at its fourth session in November 1949.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specified request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

   Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

   Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in five languages — English, Arabic, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 14, Volume I

Amendment	Source(s)	Subject(s)	Adopted/Approved Effective Applicable
1st Edition	Third and Fourth Sessions of the Aerodromes, Air Routes and Ground Aids Division	—	29 May 1951 1 November 1951 1 June 1952* 1 June 1954
1 to 6	Fifth Session of the Aerodromes, Air Routes and Ground Aids Division	Physical characteristics of runways, strips, clearways, stopways, taxiways and aprons; physical characteristics of channels, turning basins, taxi channels and mooring areas; approach areas; clearing and restriction of obstructions; obstruction marking; marking of unserviceable portions of the movement area; secondary power supply; aerodrome beacon; runway markings; stopway markers; approach, lead-in and runway lighting.	20 May 1953 1 September 1953 1 April 1954* 1 January 1955
7 to 13	Sixth Session of the Aerodromes, Air Routes and Ground Aids Division	Physical characteristics of runways, strips, taxiways and aprons; approach and take-off areas and surfaces; clearing and restriction of obstructions; obstruction markings; runway markings; stopway markers; taxiway markings; approach, runway and taxiway lighting; circling guidance lights; rescue and fire fighting services.	12 May 1958 1 September 1958 1 December 1958
14	Correspondence	Precision approach lighting system.	7 May 1959 1 October 1959 1 October 1959
15	Vertical Separation Panel	Pre-flight altimeter check-point.	15 May 1959 1 October 1959 1 October 1959
16	Correspondence	Extinguishing agents.	2 December 1960 2 December 1960 2 December 1960
17	Correspondence	Pre-flight altimeter check-point.	2 December 1960 2 December 1960 2 December 1960
18	First Meeting of the ANC Visual Aids Panel	VASIS	9 June 1961 1 October 1961 1 October 1961
19	Seventh Session of the Aerodromes, Air Routes and Ground Aids Division	Physical characteristics of runways, clearways, stopways, taxiways and aprons; take-off and approach areas; clearing and restriction of obstructions; obstruction markings; wind direction indicator; landing direction indicator; aerodrome beacon; runway markings; approach lighting system; runway alignment indicator; runway centre line; touchdown zone and taxiway lighting; rescue and fire fighting services.	23 March 1964 1 August 1964 1 November 1964
20	Second Meeting of the ANC Visual Aids Panel	Visual aids for use in operational performance category II conditions.	13 December 1965 13 April 1966 25 August 1966

* Two applicability dates approved.

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved Effective Applicable*
21	Fourth Air Navigation Conference and Fourth Meeting of the ANC Visual Aids Panel	Emergency lighting; threshold marking; fixed distance marking; approach light beacons; taxiway centre line lighting; secondary power supply; maintenance of aerodrome lighting and marking aids; monitoring of visual aids.	28 June 1967 28 October 1967 8 February 1968
22	Correspondence and ANC Visual Aids Panel	VOR aerodrome check-point marking and sign.	28 June 1968 28 October 1968 18 September 1969
23	Fifth Air Navigation Conference	Declared distances; strength of pavements; information on aerodrome conditions; reference code letters; runway length correction for slope; runway strips; taxiway clearances; holding bays; taxi-holding position markings; approach lighting systems; visual approach slope indicator systems; secondary power supply; rescue and fire fighting services; bird hazard reduction services.	23 January 1969 23 May 1969 18 September 1969
24	Fifth Meeting of the ANC Visual Aids Panel and First Meeting of the ANC Rescue and Fire Fighting Panel	Marking of unusable or unserviceable portions of the movement area; touchdown zone markings; category II holding position marking and sign; T-VASIS and AT-VASIS; runway edge lighting; exit taxiway centre line lighting; stop bars and clearance bars; emergency access roads; colour specifications for lights.	31 March 1971 6 September 1971 6 January 1972
25	ANC Visual Aids Panel	Visual approach slope guidance for long-bodied aircraft.	26 May 1971 26 September 1971 6 January 1972
26	Seventeenth Session of the Assembly and Middle East/South East Asia Regional Air Navigation Meeting	Aerodrome security; water rescue vehicles.	15 December 1971 15 April 1972 7 December 1972
27	ANC Visual Aids Panel and Middle East/South East Asia Regional Air Navigation Meeting	Runway centre line light colour coding; maintenance services.	20 March 1972 20 July 1972 7 December 1972
28	Secretariat and Sixth Meeting of the ANC Visual Aids Panel	Definition for snow on the ground; frangibility of light fixtures; runway centre line marking; taxiway centre line lighting; colour specifications for lights.	11 December 1972 11 April 1973 16 August 1973
29	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	Aerodrome security.	7 December 1973 7 April 1974 23 May 1974
30	Eighth Air Navigation Conference and editorial revision of the Annex	Runway shoulders and strips; runway end safety areas; aerodrome reference temperature; clearways; holding bays; physical characteristics of taxiways; taxiway shoulders and strips; pavement strength; runway transverse slopes; runway braking action; obstacle limitation surfaces; category III runway lighting and marking; taxiway lighting; stop bars; rescue and fire fighting services; disabled aircraft removal.	3 February 1976 3 June 1976 30 December 1976

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved Effective Applicable*
31	Seventh Meeting of the ANC Visual Aids Panel and Fifth Meeting of the ANC Obstacle Clearance Panel	Obstacle limitation surfaces; light intensity control; inset light temperatures; taxiway centre line lights; apron floodlighting; visual docking guidance systems; signs; maintenance of visual aids.	13 December 1976 13 April 1977 6 October 1977
32	Correspondence and ANC Visual Aids Panel	Definition of frangibility; siting and construction of equipment and installations on operational areas; colour specifications for lights and markings.	14 December 1977 14 April 1978 10 August 1978
33	Correspondence and Secretariat	Reporting of information on visual approach slope indicator systems; runway, taxiway and taxi-holding position markings; approach lighting for displaced thresholds; runway edge and centre line lights; aerodrome emergency planning.	26 March 1979 26 July 1979 29 November 1979
34	Eighth Meeting of the ANC Visual Aids Panel	Apron markings; precision approach lighting systems; visual approach slope indicator systems; circling guidance lights; runway lead-in lighting systems; stop bars; visual docking guidance system; aircraft stand manoeuvring guidance lights; aircraft stand identification signs; marking and lighting of obstacles.	30 November 1979 30 March 1980 27 November 1980
35	Secretariat and the ANC Visual Aids Panel	Reporting of pavement strength; visual approach slope indicator systems; approach lighting systems; maintenance of lighting.	23 March 1981 23 July 1981 26 November 1981
36	Aerodromes, Air Routes and Ground Aids Divisional Meeting (1981), Ninth Meeting of the ANC Visual Aids Panel and Secretariat	Aerodrome reference code; runway friction characteristics; runway end safety areas; taxiway separation distances; rapid exit taxiways; taxiways on bridges; holding bays; obstacle limitation surfaces; PAPI; taxi-holding position marking and lights; runway centre line guidance; visual ground signals; rescue and fire fighting; apron management service; declared distances; ground servicing of aircraft; units of measure.	22 November 1982 23 March 1983 24 November 1983
37	Secretariat	Fuelling.	29 March 1983 29 July 1983 24 November 1983
38	Secretariat and the ANC Visual Aids Panel	Aerodrome data; APAPI; colour coding of exit taxiway centre line lights; stop bars; taxi-holding position lights; taxiway edge markers; markers for overhead wires; obstacle lighting of lighthouses; maintenance of taxiway centre line lights; surface marking colours.	17 March 1986 27 July 1986 20 November 1986
39 (Annex 14, Volume I, 1st Edition)	Secretariat and the ANC Visual Aids Panel	1. Annex to be issued in two volumes as follows: Volume I — *Aerodrome Design and Operations* (incorporating provisions in the eighth edition of Annex 14 as amended by Amendment 39) and Volume II — *Heliports*. 2. Take-off runways; aerodrome reference code; reporting of pavement strength; runway friction characteristics; conditions of movement area; separation of parallel runways; taxiway minimum separation distances; taxi-holding position marking; installation tolerances for PAPI; obstacle protection surface; stop bars; signs; taxiway centre line markers; aerodrome security; surface movement guidance and control; aerodrome emergency planning; rescue and fire fighting; maintenance; runway pavement overlay; bird hazard reduction; apron management service; colours for transilluminated signs and panels; aeronautical ground light characteristics.	9 March 1990 30 July 1990 15 November 1990

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved* *Effective* *Applicable*
1 (Annex 14, Volume I, 2nd Edition)	Twelfth Meeting of the ANC Visual Aids Panel and Secretariat	Definitions of frangible object, precision approach runways, road, road-holding position, runway guard lights, and taxi-holding position; standard geodetic reference system; radio altimeter operating area, minimum distance between parallel runways; frangibility; runway and taxiway markings, aeronautical beacons, lighting aids for MLS operations, deletion of specifications on VASIS (AVASIS) and 3-BAR VASIS (3-BAR AVASIS), stop bars, runway guard lights, visual docking guidance system, taxiing guidance signs; obstacle lighting; visual aids for denoting restricted use areas; secondary power supply, electrical systems, monitoring, airport design, surface movement guidance and control systems; rescue and fire fighting, maintenance of visual aids; aeronautical ground light characteristics; form and proportions of information marking; design of taxiing guidance signs; friction characteristics of wet runways.	13 March 1995 24 July 1995 9 November 1995
2	Air Navigation Commission	Aeronautical data bases and vertical component of the World Geodetic System — 1984 (WGS-84).	20 March 1997 21 July 1997 6 November 1997
3 (Annex 14, Volume I, 3rd Edition)	Thirteenth Meeting of the ANC Visual Aids Panel and Secretariat	Definitions of aerodrome traffic density, de-icing/anti-icing facility, de-icing/anti-icing pad, holdover time, Human Factors principles, human performance, intermediate holding position, runway-holding position, signs, switch-over time; new aerodrome reference code letter F in Table 1-1; runways, taxiways and taxiway minimum separation distances related to code letter F aeroplane operations, sight distance, runway strips, runway end safety areas, clearways, stopways, taxiways on bridges, holding bays, runway-holding positions, intermediate holding positions and road holding positions, de-icing/anti-icing facilities; obstacle-free zone width for code letter F; runway-holding position marking, intermediate holding position marking, mandatory instruction marking, marking of de-icing/anti-icing facilities, approach lighting systems, runway and taxiway centre line lights, stop bars, intermediate holding position lights, lighting of de-icing/anti-icing facilities, runway guard lights, variable message signs, intersection take-off signs; visual aids for denoting obstacles; secondary power supply switch-over time, security measures in airport design, frangibility of non-visual aids on operational areas; Human Factors principles applied to aerodrome emergency planning, rescue and fire fighting, and maintenance, system of preventive maintenance for precision approach runways, categories II and III; colour measurement of aeronautical ground lights; isocandela diagrams for high-intensity taxiway centre line lights and runway guard lights; measurement of the average luminance of a sign, Table 4.1 of Appendix 4; Appendix 6.	5 March 1999 19 July 1999 4 November 1999
4	Secretariat and the Twelfth Meeting of the ANC Obstacle Clearance Panel	Definitions of aerodrome certificate, certified aerodrome, safety management system; certification of aerodromes; obstacle limitation surfaces; specifications concerning aerodrome emergency planning; rescue and fire fighting.	12 March 2001 16 July 2001 1 November 2001
5	Secretariat	Laser-beam free flight zones and bird hazard reduction.	7 March 2003 14 July 2003 27 November 2003
6 (Annex 14, Volume I, 4th Edition)	Fourteenth Meeting of the ANC Visual Aids Panel and Secretariat	Definitions of runway turn pad, calendar, datum and Gregorian calendar; common reference systems; aerodrome dimensions and related information; physical characteristics of runway turn pads; runway turn pad markings and lights; rapid exit taxiway indicator lights; information marking; stop bars; runway guard lights; intensity of taxiway centre line lights on rapid exit taxiways; Figure 6-2, Examples of marking and lighting of tall structures; electrical power supply systems for air navigation facilities; monitoring of lighting systems; Appendix 1, Colours for Aeronautical Ground Lights, Markings, Signs and Panels; Appendix 2, Aeronautical Ground Light Characteristics; Appendix 5, Aeronautical Data Quality Requirements.	27 February 2004 12 July 2004 25 November 2004

Amendment	*Source(s)*	*Subject(s)*	*Adopted/Approved* *Effective* *Applicable*
7	Secretariat, Sixth Meeting of the Committee on Aviation Environmental Protection	Note to the definition of runway holding position; certification of aerodromes; references to land-use planning and to the balanced approach to aircraft noise management; runway turn pads; taxiways; bird hazard reduction; fencing; pavement maintenance.	2 March 2005 11 July 2005 24 November 2005
8	35th Session of the ICAO Assembly; Fourteenth Meeting of the ANC Obstacle Clearance Panel; Eleventh Air Navigation Conference	Definitions of balked landing, safety programme and safety management system; safety management; obstacle free zone	14 March 2006 17 July 2006 23 November 2006
9	Secretariat	Note on the applicability of wheel-to-edge clearances on taxiways.	15 June 2006 — —

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. GENERAL

Introductory Note.— This Annex contains Standards and Recommended Practices (specifications) that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at aerodromes, and certain facilities and technical services normally provided at an aerodrome. It is not intended that these specifications limit or regulate the operation of an aircraft.

To a great extent, the specifications for individual facilities detailed in Annex 14, Volume I, have been interrelated by a reference code system, described in this chapter, and by the designation of the type of runway for which they are to be provided, as specified in the definitions. This not only simplifies the reading of Volume I of this Annex, but in most cases, provides for efficiently proportioned aerodromes when the specifications are followed.

This document sets forth the minimum aerodrome specifications for aircraft which have the characteristics of those which are currently operating or for similar aircraft that are planned for introduction. Accordingly, any additional safeguards that might be considered appropriate to provide for more demanding aircraft are not taken into account. Such matters are left to appropriate authorities to evaluate and take into account as necessary for each particular aerodrome. Guidance on some possible effects of future aircraft on these specifications is given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

It is to be noted that the specifications for precision approach runways categories II and III are only applicable to runways intended to be used by aeroplanes in code numbers 3 and 4.

Annex 14, Volume I, does not include specifications relating to the overall planning of aerodromes (such as separation between adjacent aerodromes or capacity of individual aerodromes), impact on the environment, or to economic and other non-technical factors that need to be considered in the development of an aerodrome. Information on these subjects is included in the Airport Planning Manual *(Doc 9184), Part 1. Guidance material on the environmental aspects of the development and operation of an aerodrome is included in the* Airport Planning Manual*, Part 2.*

Aviation security is an integral part of aerodrome planning and operations. Annex 14, Volume I, contains several specifications aimed at enhancing the level of security at aerodromes. Specifications on other facilities related to security are given in Annex 17 and detailed guidance on the subject is contained in the ICAO Security Manual.

1.1 Definitions

When the following terms are used in this Annex they have the following meanings:

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data, the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome beacon. Aeronautical beacon used to indicate the location of an aerodrome from the air.

Aerodrome certificate. A certificate issued by the appropriate authority under applicable regulations for the operation of an aerodrome.

Aerodrome elevation. The elevation of the highest point of the landing area.

Aerodrome identification sign. A sign placed on an aerodrome to aid in identifying the aerodrome from the air.

Aerodrome reference point. The designated geographical location of an aerodrome.

Aerodrome traffic density.

a) *Light*. Where the number of movements in the mean busy hour is not greater than 15 per runway or typically less than 20 total aerodrome movements.

b) *Medium*. Where the number of movements in the mean busy hour is of the order of 16 to 25 per runway or typically between 20 to 35 total aerodrome movements.

c) *Heavy.* Where the number of movements in the mean busy hour is of the order of 26 or more per runway or typically more than 35 total aerodrome movements.

Note 1.— The number of movements in the mean busy hour is the arithmetic mean over the year of the number of movements in the daily busiest hour.

Note 2.— Either a take-off or a landing constitutes a movement.

Aeronautical beacon. An aeronautical ground light visible at all azimuths, either continuously or intermittently, to designate a particular point on the surface of the earth.

Aeronautical ground light. Any light specially provided as an aid to air navigation, other than a light displayed on an aircraft.

Aeroplane reference field length. The minimum field length required for take-off at maximum certificated take-off mass, sea level, standard atmospheric conditions, still air and zero runway slope, as shown in the appropriate aeroplane flight manual prescribed by the certificating authority or equivalent data from the aeroplane manufacturer. Field length means balanced field length for aeroplanes, if applicable, or take-off distance in other cases.

Note.— Attachment A, Section 2 provides information on the concept of balanced field length and the Airworthiness Manual *(Doc 9760) contains detailed guidance on matters related to take-off distance.*

Aircraft classification number (ACN). A number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade category.

Note.— The aircraft classification number is calculated with respect to the center of gravity (CG) position which yields the critical loading on the critical gear. Normally the aftmost CG position appropriate to the maximum gross apron (ramp) mass is used to calculate the ACN. In exceptional cases the forwardmost CG position may result in the nose gear loading being more critical.

Aircraft stand. A designated area on an apron intended to be used for parking an aircraft.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Apron management service. A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.

Balked landing. A landing manoeuvre that is unexpectedly discontinued at any point below the obstacle clearance altitude/height (OCA/H).

Barrette. Three or more aeronautical ground lights closely spaced in a transverse line so that from a distance they appear as a short bar of light.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Capacitor discharge light. A lamp in which high-intensity flashes of extremely short duration are produced by the discharge of electricity at high voltage through a gas enclosed in a tube.

Certified aerodrome. An aerodrome whose operator has been granted an aerodrome certificate.

Clearway. A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height.

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Data quality. A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

De-icing/anti-icing facility. A facility where frost, ice or snow is removed (de-icing) from the aeroplane to provide clean surfaces, and/or where clean surfaces of the aeroplane receive protection (anti-icing) against the formation of frost or ice and accumulation of snow or slush for a limited period of time.

Note.— Further guidance is given in the Manual of Aircraft Ground De-icing/Anti-icing Operations *(Doc 9640).*

De-icing/anti-icing pad. An area comprising an inner area for the parking of an aeroplane to receive de-icing/anti-icing treatment and an outer area for the manoeuvring of two or more mobile de-icing/anti-icing equipment.

Declared distances.

a) *Take-off run available (TORA).* The length of runway declared available and suitable for the ground run of an aeroplane taking off.

b) *Take-off distance available (TODA).* The length of the take-off run available plus the length of the clearway, if provided.

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* All ISO Standards are listed at the end of this chapter.

c) *Accelerate-stop distance available (ASDA).* The length of the take-off run available plus the length of the stopway, if provided.

d) *Landing distance available (LDA).* The length of runway which is declared available and suitable for the ground run of an aeroplane landing.

Dependent parallel approaches. Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are prescribed.

Displaced threshold. A threshold not located at the extremity of a runway.

Effective intensity. The effective intensity of a flashing light is equal to the intensity of a fixed light of the same colour which will produce the same visual range under identical conditions of observation.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Fixed light. A light having constant luminous intensity when observed from a fixed point.

Frangible object. An object of low mass designed to break, distort or yield on impact so as to present the minimum hazard to aircraft.

Note.— Guidance on design for frangibility is contained in the Aerodrome Design Manual *(Doc 9157), Part 6.*

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Hazard beacon. An aeronautical beacon used to designate a danger to air navigation.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Holding bay. A defined area where aircraft can be held, or bypassed, to facilitate efficient surface movement of aircraft.

Holdover time. The estimated time the anti-icing fluid (treatment) will prevent the formation of ice and frost and the accumulation of snow on the protected (treated) surfaces of an aeroplane.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Identification beacon. An aeronautical beacon emitting a coded signal by means of which a particular point of reference can be identified.

Independent parallel approaches. Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are not prescribed.

Independent parallel departures. Simultaneous departures from parallel or near-parallel instrument runways.

Instrument runway. One of the following types of runways intended for the operation of aircraft using instrument approach procedures:

a) *Non-precision approach runway.* An instrument runway served by visual aids and a non-visual aid providing at least directional guidance adequate for a straight-in approach.

b) *Precision approach runway, category I.* An instrument runway served by ILS and/or MLS and visual aids intended for operations with a decision height not lower than 60 m (200 ft) and either a visibility not less than 800 m or a runway visual range not less than 550 m.

c) *Precision approach runway, category II.* An instrument runway served by ILS and/or MLS and visual aids intended for operations with a decision height lower than 60 m (200 ft) but not lower than 30 m (100 ft) and a runway visual range not less than 350 m.

d) *Precision approach runway, category III.* An instrument runway served by ILS and/or MLS to and along the surface of the runway and:

A — intended for operations with a decision height lower than 30 m (100 ft), or no decision height and a runway visual range not less than 200 m.

B — intended for operations with a decision height lower than 15 m (50 ft), or no decision height and a runway visual range less than 200 m but not less than 50 m.

C — intended for operations with no decision height and no runway visual range limitations.

Note 1.— See Annex 10, Volume I for related ILS and/or MLS specifications.

Note 2.— Visual aids need not necessarily be matched to the scale of non-visual aids provided. The criterion for the selection of visual aids is the conditions in which operations are intended to be conducted.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Intermediate holding position. A designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower.

Landing area. That part of a movement area intended for the landing or take-off of aircraft.

Landing direction indicator. A device to indicate visually the direction currently designated for landing and for take-off.

Laser-beam critical flight zone (LCFZ). Airspace in the proximity of an aerodrome but beyond the LFFZ where the irradiance is restricted to a level unlikely to cause glare effects.

Laser-beam free flight zone (LFFZ). Airspace in the immediate proximity to the aerodrome where the irradiance is restricted to a level unlikely to cause any visual disruption.

Laser-beam sensitive flight zone (LSFZ). Airspace outside, and not necessarily contiguous with, the LFFZ and LCFZ where the irradiance is restricted to a level unlikely to cause flash-blindness or after-image effects.

Lighting system reliability. The probability that the complete installation operates within the specified tolerances and that the system is operationally usable.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Marker. An object displayed above ground level in order to indicate an obstacle or delineate a boundary.

Marking. A symbol or group of symbols displayed on the surface of the movement area in order to convey aeronautical information.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

Near-parallel runways. Non-intersecting runways whose extended centre lines have an angle of convergence/divergence of 15 degrees or less.

Non-instrument runway. A runway intended for the operation of aircraft using visual approach procedures.

Normal flight zone (NFZ). Airspace not defined as LFFZ, LCFZ or LSFZ but which must be protected from laser radiation capable of causing biological damage to the eye.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Obstacle free zone (OFZ). The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.

Orthometric height. Height of a point related to the geoid, generally presented as an MSL elevation.

Pavement classification number (PCN). A number expressing the bearing strength of a pavement for unrestricted operations.

Precision approach runway, see ***Instrument runway.***

Primary runway(s). Runway(s) used in preference to others whenever conditions permit.

Protected flight zones. Airspace specifically designated to mitigate the hazardous effects of laser radiation.

Road. An established surface route on the movement area meant for the exclusive use of vehicles.

Road-holding position. A designated position at which vehicles may be required to hold.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway end safety area (RESA). An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway.

Runway guard lights. A light system intended to caution pilots or vehicle drivers that they are about to enter an active runway.

Runway-holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

Runway strip. A defined area including the runway and stopway, if provided, intended:

a) to reduce the risk of damage to aircraft running off a runway; and

b) to protect aircraft flying over it during take-off or landing operations.

Runway turn pad. A defined area on a land aerodrome adjacent to a runway for the purpose of completing a 180-degree turn on a runway.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Safety programme. An integrated set of regulations and activities aimed at improving safety.

Safety management system. A systematic approach to managing safety including the necessary organizational structure, accountabilities, policies and procedures.

Segregated parallel operations. Simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for approaches and the other runway is used exclusively for departures.

Shoulder. An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface.

Sign.

a) *Fixed message sign*. A sign presenting only one message.

b) *Variable message sign*. A sign capable of presenting several pre-determined messages or no message, as applicable.

Signal area. An area on an aerodrome used for the display of ground signals.

Slush. Water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter; specific gravity: 0.5 up to 0.8.

Note.— Combinations of ice, snow and/or standing water may, especially when rain, rain and snow, or snow is falling, produce substances with specific gravities in excess of 0.8. These substances, due to their high water/ice content, will have a transparent rather than a cloudy appearance and, at the higher specific gravities, will be readily distinguishable from slush.

Snow (on the ground).

a) *Dry snow*. Snow which can be blown if loose or, if compacted by hand, will fall apart again upon release; specific gravity: up to but not including 0.35.

b) *Wet snow*. Snow which, if compacted by hand, will stick together and tend to or form a snowball; specific gravity: 0.35 up to but not including 0.5.

c) *Compacted snow*. Snow which has been compressed into a solid mass that resists further compression and will hold together or break up into lumps if picked up; specific gravity: 0.5 and over.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Stopway. A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take off.

Switch-over time (light). The time required for the actual intensity of a light measured in a given direction to fall from 50 per cent and recover to 50 per cent during a power supply changeover, when the light is being operated at intensities of 25 per cent or above.

Take-off runway. A runway intended for take-off only.

Taxiway. A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including:

a) *Aircraft stand taxilane.* A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.

b) *Apron taxiway.* A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

c) *Rapid exit taxiway.* A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times.

Taxiway intersection. A junction of two or more taxiways.

Taxiway strip. An area including a taxiway intended to protect an aircraft operating on the taxiway and to reduce the risk of damage to an aircraft accidentally running off the taxiway.

Threshold. The beginning of that portion of the runway usable for landing.

Touchdown zone. The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Usability factor. The percentage of time during which the use of a runway or system of runways is not restricted because of the cross-wind component.

Note.— Cross-wind component means the surface wind component at right angles to the runway centre line.

1.2 Applicability

1.2.1 The interpretation of some of the specifications in the Annex expressly requires the exercising of discretion, the taking of a decision or the performance of a function by the appropriate authority. In other specifications, the expression appropriate authority does not actually appear although its inclusion is implied. In both cases, the responsibility for whatever determination or action is necessary shall rest with the State having jurisdiction over the aerodrome.

1.2.2 The specifications, unless otherwise indicated in a particular context, shall apply to all aerodromes open to public use in accordance with the requirements of Article 15 of the Convention. The specifications of Annex 14, Volume I, Chapter 3 shall apply only to land aerodromes. The specifications in this volume shall apply, where appropriate, to heliports but shall not apply to stolports.

Note.— Although there are at present no specifications relating to stolports, it is intended that specifications for these aerodromes will be included as they are developed. In the interim, guidance material on stolports is given in the Stolport Manual *(Doc 9150).*

1.2.3 Wherever a colour is referred to in this Annex, the specifications for that colour given in Appendix 1 shall apply.

1.3 Common reference systems

1.3.1 Horizontal reference system

World Geodetic System — 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system. Reported aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674).*

1.3.2 Vertical reference system

Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

Note 1.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

Note 2.— Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

1.3.3 Temporal reference system

1.3.3.1 The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.

1.3.3.2 When a different temporal reference system is used, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP), see Annex 15, Appendix 1.

1.4 Certification of aerodromes

Note.— The intent of these specifications is to ensure the establishment of a regulatory regime so that compliance with the specifications in this Annex can be effectively enforced. It is recognized that the methods of ownership, operation and surveillance of aerodromes differ among States. The most effective and transparent means of ensuring compliance with applicable specifications is the availability of a separate safety oversight entity and a well-defined safety oversight mechanism with support of appropriate legislation to be able to carry out the function of safety regulation of aerodromes.

1.4.1 As of 27 November 2003, States shall certify aerodromes used for international operations in accordance with the specifications contained in this Annex as well as other relevant ICAO specifications through an appropriate regulatory framework.

1.4.2 **Recommendation.—** *States should certify aerodromes open to public use in accordance with these specifications as well as other relevant ICAO specifications through an appropriate regulatory framework.*

1.4.3 The regulatory framework shall include the establishment of criteria for the certification of aerodromes.

Note.— Guidance on a regulatory framework is given in the Manual on Certification of Aerodromes.

1.4.4 As part of the certification process, States shall ensure that an aerodrome manual which will include all pertinent information on the aerodrome site, facilities, services, equipment, operating procedures, organization and management including a safety management system, is submitted by the applicant for approval/acceptance prior to granting the aerodrome certificate.

Note.— The intent of a safety management system is to have in place an organized and orderly approach in the management of aerodrome safety by the aerodrome operator. Guidance on an aerodrome safety management system is given in the Safety Management Manual (SMM) *(Doc 9859) and in the* Manual on Certification of Aerodromes *(Doc 9774).*

1.5 Safety management

1.5.1 States shall establish a safety programme in order to achieve an acceptable level of safety in aerodrome operations.

1.5.2 The acceptable level(s) of safety to be achieved shall be established by the State(s) concerned.

Note.— Guidance on safety programmes and on defining acceptable levels of safety is contained in Attachment E to Annex 11 and in the Safety Management Manual (SMM) *(Doc 9859).*

1.5.3 States shall require, as part of their safety programme, that a certified aerodrome operator implements a safety management system acceptable to the State that, as a minimum:

a) identifies safety hazards;

b) ensures that remedial action necessary to maintain an acceptable level of safety is implemented;

c) provides for continuous monitoring and regular assessment of the safety level achieved; and

d) aims to make continuous improvement to the overall level of safety.

1.5.4 A safety management system shall clearly define lines of safety accountability throughout a certified aerodrome operator, including a direct accountability for safety on the part of senior management.

Note.— Guidance on safety management systems is contained in the Safety Management Manual (SMM) *(Doc 9859), and in the* Manual on Certification of Aerodromes *(Doc 9774).*

1.6 Airport design

1.6.1 Architectural and infrastructure-related requirements for the optimum implementation of international civil aviation security measures shall be integrated into the design and construction of new facilities and alterations to existing facilities at an aerodrome.

Note.— Guidance on all aspects of the planning of aerodromes including security considerations is contained in the Airport Planning Manual *(Doc 9184), Part 1.*

1.6.2 **Recommendation.—** *The design of aerodromes should take into account, where appropriate, land-use and environmental control measures.*

Note.— Guidance on land-use planning and environmental control measures is contained in the Airport Planning Manual *(Doc 9184), Part 2.*

1.7 Reference code

Introductory Note.— The intent of the reference code is to provide a simple method for interrelating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the aeroplanes that are intended to operate at the aerodrome. The code is not intended to be used for determining runway length or pavement strength requirements. The code is composed of two elements which are related to the aeroplane performance characteristics and dimensions. Element 1 is a number based on the aeroplane reference field length and element 2 is a letter based on the aeroplane wing span and outer main gear wheel span. A particular specification is related to the more appropriate of the two elements of the code or to an appropriate combination of the two code elements. The code letter or number within an element selected for design purposes is related to the critical aeroplane characteristics for which the facility is provided. When applying Annex 14, Volume I, the aeroplanes which the aerodrome is intended to serve are first identified and then the two elements of the code.

1.7.1 An aerodrome reference code — code number and letter — which is selected for aerodrome planning purposes shall be determined in accordance with the characteristics of the aeroplane for which an aerodrome facility is intended.

1.7.2 The aerodrome reference code numbers and letters shall have the meanings assigned to them in Table 1-1.

1.7.3 The code number for element 1 shall be determined from Table 1-1, column 1, selecting the code number corresponding to the highest value of the aeroplane reference field lengths of the aeroplanes for which the runway is intended.

Note.— The determination of the aeroplane reference field length is solely for the selection of a code number and is not intended to influence the actual runway length provided.

1.7.4 The code letter for element 2 shall be determined from Table 1-1, column 3, by selecting the code letter which corresponds to the greatest wing span, or the greatest outer main gear wheel span, whichever gives the more demanding code letter of the aeroplanes for which the facility is intended.

Note.— Guidance to assist the appropriate authority in determining the aerodrome reference code is given in the Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

* ISO Standard
19104, *Geographic information — Terminology*
19108, *Geographic information — Temporal schema*

Table 1-1. Aerodrome reference code
(see 1.7.2 to 1.7.4)

Code element 1		Code element 2		
Code number (1)	Aeroplane reference field length (2)	Code letter (3)	Wing span (4)	Outer main gear wheel span[a] (5)
1	Less than 800 m	A	Up to but not including 15 m	Up to but not including 4.5 m
2	800 m up to but not including 1 200 m	B	15 m up to but not including 24 m	4.5 m up to but not including 6 m
3	1 200 m up to but not including 1 800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1 800 m and over	D	36 m up to but not including 52 m	9 m up to but not including 14 m
		E	52 m up to but not including 65 m	9 m up to but not including 14 m
		F	65 m up to but not including 80 m	14 m up to but not including 16 m

a. Distance between the outside edges of the main gear wheels.

Note.— Guidance on planning for aeroplanes with wing spans greater than 80 m is given in the Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

CHAPTER 2. AERODROME DATA

2.1 Aeronautical data

2.1.1 Determination and reporting of aerodrome related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables 1 to 5 contained in Appendix 5 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level and in that respect, three types of positional data shall be identified: surveyed points (e.g. runway threshold), calculated points (mathematical calculations from the known surveyed points of points in space, fixes) and declared points (e.g. flight information region boundary points).

Note.— Specifications governing the quality system are given in Annex 15, Chapter 3.

2.1.2 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

a) *critical data, integrity level* 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) *essential data, integrity level* 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) *routine data, integrity level* 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

2.1.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.1.2, a 32 or 24 bit CRC algorithm shall apply respectively.

2.1.4 **Recommendation. —** *To achieve protection of the integrity level of routine aeronautical data as classified in 2.1.2, a 16 bit CRC algorithm should apply.*

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendix 5 related to accuracy and integrity of aeronautical data, is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77, entitled* Industry Requirements for Aeronautical Information*.*

2.1.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Appendix 5, Table A5-1.

2.1.6 The order of accuracy of the field work shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated in tables contained in Appendix 5.

2.1.7 In addition to the elevation (referenced to mean sea level) of the specific surveyed ground positions at aerodromes, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions as indicated in Appendix 5, shall be determined and reported to the aeronautical information services authority.

Note 1.— An appropriate reference frame is that which enables WGS-84 to be realized on a given aerodrome and with respect to which all coordinate data are related.

Note 2.— Specifications governing the publication of WGS-84 coordinates are given in Annex 4, Chapter 2 and Annex 15, Chapter 3.

2.2 Aerodrome reference point

2.2.1 An aerodrome reference point shall be established for an aerodrome.

2.2.2 The aerodrome reference point shall be located near the initial or planned geometric centre of the aerodrome and shall normally remain where first established.

2.2.3 The position of the aerodrome reference point shall be measured and reported to the aeronautical information services authority in degrees, minutes and seconds.

2.3 Aerodrome and runway elevations

2.3.1 The aerodrome elevation and geoid undulation at the aerodrome elevation position shall be measured to the accuracy of one-half metre or foot and reported to the aeronautical information services authority.

2.3.2 For an aerodrome used by international civil aviation for non-precision approaches, the elevation and geoid undulation of each threshold, the elevation of the runway end and any significant high and low intermediate points along the runway shall be measured to the accuracy of one-half metre or foot and reported to the aeronautical information services authority.

2.3.3 For precision approach runway, the elevation and geoid undulation of the threshold, the elevation of the runway end and the highest elevation of the touchdown zone shall be measured to the accuracy of one-quarter metre or foot and reported to the aeronautical information services authority.

Note.— Geoid undulation must be measured in accordance with the appropriate system of coordinates.

2.4 Aerodrome reference temperature

2.4.1 An aerodrome reference temperature shall be determined for an aerodrome in degrees Celsius.

2.4.2 **Recommendation.—** *The aerodrome reference temperature should be the monthly mean of the daily maximum temperatures for the hottest month of the year (the hottest month being that which has the highest monthly mean temperature). This temperature should be averaged over a period of years.*

2.5 Aerodrome dimensions and related information

2.5.1 The following data shall be measured or described, as appropriate, for each facility provided on an aerodrome:

a) runway — true bearing to one-hundredth of a degree, designation number, length, width, displaced threshold location to the nearest metre or foot, slope, surface type, type of runway and, for a precision approach runway category I, the existence of an obstacle free zone when provided;

b) strip
runway end safety area
stopway } length, width to the nearest metre or foot, surface type;

c) taxiway — designation, width, surface type;

d) apron — surface type, aircraft stands;

e) the boundaries of the air traffic control service;

f) clearway — length to the nearest metre or foot, ground profile;

g) visual aids for approach procedures, marking and lighting of runways, taxiways and aprons, other visual guidance and control aids on taxiways and aprons, including taxi-holding positions and stopbars, and location and type of visual docking guidance systems;

h) location and radio frequency of any VOR aerodrome check-point;

i) location and designation of standard taxi-routes; and

j) distances to the nearest metre or foot of localizer and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of microwave landing system (MLS) in relation to the associated runway extremities.

2.5.2 The geographical coordinates of each threshold shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.3 The geographical coordinates of appropriate taxiway centre line points shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.4 The geographical coordinates of each aircraft stand shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.5.5 The geographical coordinates of obstacles in Area 2 (the part within the aerodrome boundary) and in Area 3 shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles shall be reported to the aeronautical information services authority.

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Areas 2 and 3.

Note 2.— Appendix 5 provides requirements for obstacle data determination in Areas 2 and 3.

Note 3.— Implementation of Annex 15 provision 10.6.1.2 concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

2.6 Strength of pavements

2.6.1 The bearing strength of a pavement shall be determined.

2.6.2 The bearing strength of a pavement intended for aircraft of apron (ramp) mass greater than 5 700 kg shall be made available using the aircraft classification number — pavement classification number (ACN-PCN) method by reporting all of the following information:

a) the pavement classification number (PCN);

b) pavement type for ACN-PCN determination;

c) subgrade strength category;

d) maximum allowable tire pressure category or maximum allowable tire pressure value; and

e) evaluation method.

Note.— If necessary, PCNs may be published to an accuracy of one-tenth of a whole number.

2.6.3 The pavement classification number (PCN) reported shall indicate that an aircraft with an aircraft classification number (ACN) equal to or less than the reported PCN can operate on the pavement subject to any limitation on the tire pressure, or aircraft all-up mass for specified aircraft type(s).

Note.— Different PCNs may be reported if the strength of the pavement is subject to significant seasonal variation.

2.6.4 The ACN of an aircraft shall be determined in accordance with the standard procedures associated with the ACN-PCN method.

Note.— The standard procedures for determining the ACN of an aircraft are given in the Aerodrome Design Manual, *Part 3. For convenience several aircraft types currently in use have been evaluated on rigid and flexible pavements founded on the four subgrade categories in 2.6.6 b) below and the results tabulated in that manual.*

2.6.5 For the purposes of determining the ACN, the behaviour of a pavement shall be classified as equivalent to a rigid or flexible construction.

2.6.6 Information on pavement type for ACN-PCN determination, subgrade strength category, maximum allowable tire pressure category and evaluation method shall be reported using the following codes:

a) *Pavement type for ACN-PCN determination:*

	Code
Rigid pavement	R
Flexible pavement	F

Note.— If the actual construction is composite or non-standard, include a note to that effect (see example 2 below).

b) *Subgrade strength category:*

	Code
High strength: characterized by K = 150 MN/m^3 and representing all K values above 120 MN/m^3 for rigid pavements, and by CBR = 15 and representing all CBR values above 13 for flexible pavements.	A
Medium strength: characterized by K = 80 MN/m^3 and representing a range in K of 60 to 120 MN/m^3 for rigid pavements, and by CBR = 10 and representing a range in CBR of 8 to 13 for flexible pavements.	B
Low strength: characterized by K = 40 MN/m^3 and representing a range in K of 25 to 60 MN/m^3 for rigid pavements, and by CBR = 6 and representing a range in CBR of 4 to 8 for flexible pavements.	C
Ultra low strength: characterized by K = 20 MN/m^3 and representing all K values below 25 MN/m^3 for rigid pavements, and by CBR = 3 and representing all CBR values below 4 for flexible pavements.	D

c) *Maximum allowable tire pressure category:*

	Code
High: no pressure limit	W
Medium: pressure limited to 1.50 MPa	X
Low: pressure limited to 1.00 MPa	Y
Very low: pressure limited to 0.50 MPa	Z

d) *Evaluation method:*

	Code
Technical evaluation: representing a specific study of the pavement characteristics and application of pavement behaviour technology.	T
Using aircraft experience: representing a knowledge of the specific type and mass of aircraft satisfactorily being supported under regular use.	U

Note.— The following examples illustrate how pavement strength data are reported under the ACN-PCN method.

Example 1.— If the bearing strength of a rigid pavement, resting on a medium strength subgrade, has been assessed by technical evaluation to be PCN 80 and there is no tire pressure limitation, then the reported information would be:

PCN 80 / R / B / W / T

Example 2.— If the bearing strength of a composite pavement, behaving like a flexible pavement and resting on a high strength subgrade, has been assessed by using aircraft experience to be PCN 50 and the maximum tire pressure allowable is 1.00 MPa, then the reported information would be:

PCN 50 / F / A / Y / U

Note.— Composite construction.

Example 3.— If the bearing strength of a flexible pavement, resting on a medium strength subgrade, has been assessed by technical evaluation to be PCN 40 and the maximum allowable tire pressure is 0.80 MPa, then the reported information would be:

PCN 40 / F / B / 0.80 MPa /T

Example 4.— If a pavement is subject to a B747-400 all-up mass limitation of 390 000 kg, then the reported information would include the following note.

Note.— The reported PCN is subject to a B747-400 all-up mass limitation of 390 000 kg.

2.6.7 **Recommendation.—** *Criteria should be established to regulate the use of a pavement by an aircraft with an ACN higher than the PCN reported for that pavement in accordance with 2.6.2 and 2.6.3.*

Note.— Attachment A, Section 19 details a simple method for regulating overload operations while the Aerodrome Design Manual, *Part 3 includes the descriptions of more detailed procedures for evaluation of pavements and their suitability for restricted overload operations.*

2.6.8 The bearing strength of a pavement intended for aircraft of apron (ramp) mass equal to or less than 5 700 kg shall be made available by reporting the following information:

a) maximum allowable aircraft mass; and

b) maximum allowable tire pressure.

Example: 4 000 kg/0.50 MPa.

2.7 Pre-flight altimeter check location

2.7.1 One or more pre-flight altimeter check locations shall be established for an aerodrome.

2.7.2 **Recommendation.—** *A pre-flight check location should be located on an apron.*

Note 1.— Locating a pre-flight altimeter check location on an apron enables an altimeter check to be made prior to obtaining taxi clearance and eliminates the need for stopping for that purpose after leaving the apron.

Note 2.— Normally an entire apron can serve as a satisfactory altimeter check location.

2.7.3 The elevation of a pre-flight altimeter check location shall be given as the average elevation, rounded to the nearest metre or foot, of the area on which it is located. The elevation of any portion of a pre-flight altimeter check location shall be within 3 m (10 ft) of the average elevation for that location.

2.8 Declared distances

The following distances shall be calculated to the nearest metre or foot for a runway intended for use by international commercial air transport:

a) take-off run available;

b) take-off distance available;

c) accelerate-stop distance available; and

d) landing distance available.

Note.— Guidance on calculation of declared distances is given in Attachment A, Section 3.

2.9 Condition of the movement area and related facilities

2.9.1 Information on the condition of the movement area and the operational status of related facilities shall be provided to the appropriate aeronautical information service units, and similar information of operational significance to the air traffic services units, to enable those units to provide the necessary information to arriving and departing aircraft. The information shall be kept up to date and changes in conditions reported without delay.

2.9.2 The condition of the movement area and the operational status of related facilities shall be monitored and reports on matters of operational significance or affecting aircraft performance given, particularly in respect of the following:

a) construction or maintenance work;

b) rough or broken surfaces on a runway, a taxiway or an apron;

c) snow, slush or ice on a runway, a taxiway or an apron;

d) water on a runway, a taxiway or an apron;

e) snow banks or drifts adjacent to a runway, a taxiway or an apron;

f) anti-icing or de-icing liquid chemicals on a runway or a taxiway;

g) other temporary hazards, including parked aircraft;

h) failure or irregular operation of part or all of the aerodrome visual aids; and

i) failure of the normal or secondary power supply.

2.9.3 **Recommendation.—** *To facilitate compliance with 2.9.1 and 2.9.2 inspections of the movement area should be carried out each day at least once where the code number is 1 or 2 and at least twice where the code number is 3 or 4.*

Note.— Guidance on carrying out daily inspections of the movement area is given in the Airport Services Manual, *Part 8 and in the* Manual of Surface Movement Guidance and Control Systems (SMGCS).

Water on a runway

2.9.4 **Recommendation.—** *Whenever water is present on a runway, a description of the runway surface conditions on the centre half of the width of the runway, including the possible assessment of water depth, where applicable, should be made available using the following terms:*

DAMP — the surface shows a change of colour due to moisture.
WET — the surface is soaked but there is no standing water.
WATER PATCHES — significant patches of standing water are visible.
FLOODED — extensive standing water is visible.

2.9.5 Information that a runway or portion thereof may be slippery when wet shall be made available.

2.9.6 A runway or portion thereof shall be determined as being slippery when wet when the measurements specified in 10.2.3 show that the runway surface friction characteristics as measured by a continuous friction measuring device are below the minimum friction level specified by the State.

Note.— Guidance on determining and expressing the minimum friction level is provided in Attachment A, Section 7.

2.9.7 Information on the minimum friction level specified by the State for reporting slippery runway conditions and the type of friction measuring device used shall be made available.

2.9.8 **Recommendation.—** *When it is suspected that a runway may become slippery under unusual conditions, then additional measurements should be made when such conditions occur, and information on the runway surface friction characteristics made available when these additional measurements show that the runway or a portion thereof has become slippery.*

Snow, slush or ice on a runway

Note 1.— The intent of these specifications is to satisfy the SNOWTAM and NOTAM promulgation requirements contained in Annex 15.

Note 2.— Runway surface condition sensors may be used to detect and continuously display current or predicted information on surface conditions such as the presence of moisture, or imminent formation of ice on pavements.

2.9.9 **Recommendation.—** *Whenever a runway is affected by snow, slush or ice, and it has not been possible to clear the precipitant fully, the condition of the runway should be assessed, and the friction coefficient measured.*

Note.— Guidance on determining and expressing the friction characteristics of snow- and ice-covered paved surfaces is provided in Attachment A, Section 6.

2.9.10 **Recommendation.—** *The readings of the friction measuring device on snow-, slush-, or ice-covered surfaces should adequately correlate with the readings of one other such device.*

Note.— The principal aim is to measure surface friction in a manner that is relevant to the friction experienced by an aircraft tire, thereby providing correlation between the friction measuring device and aircraft braking performance.

2.9.11 **Recommendation.—** *Whenever dry snow, wet snow or slush is present on a runway, an assessment of the mean depth over each third of the runway should be made to an accuracy of approximately 2 cm for dry snow, 1 cm for wet snow and 0.3 cm for slush.*

2.10 Disabled aircraft removal

Note.— See 9.3 for information on disabled aircraft removal services.

2.10.1 **Recommendation.—** *The telephone/telex number(s) of the office of the aerodrome coordinator of operations for the removal of an aircraft disabled on or adjacent to the movement area should be made available, on request, to aircraft operators.*

2.10.2 **Recommendation.—** *Information concerning the capability to remove an aircraft disabled on or adjacent to the movement area should be made available.*

Note.— The capability to remove a disabled aircraft may be expressed in terms of the largest type of aircraft which the aerodrome is equipped to remove.

2.11 Rescue and fire fighting

Note.— See 9.2 for information on rescue and fire fighting services.

2.11.1 Information concerning the level of protection provided at an aerodrome for aircraft rescue and fire fighting purposes shall be made available.

2.11.2 **Recommendation.—** *The level of protection normally available at an aerodrome should be expressed in terms of the category of the rescue and fire fighting services as described in 9.2 and in accordance with the types and amounts of extinguishing agents normally available at the aerodrome.*

2.11.3 Significant changes in the level of protection normally available at an aerodrome for rescue and fire fighting shall be notified to the appropriate air traffic services units and aeronautical information units to enable those units to provide the necessary information to arriving and departing aircraft. When such a change has been corrected, the above units shall be advised accordingly.

Note.— A significant change in the level of protection is considered to be a change in the category of the rescue and fire fighting service from the category normally available at the aerodrome, resulting from a change in availability of extinguishing agents, equipment to deliver the agents or personnel to operate the equipment, etc.

2.11.4 **Recommendation.—** *A significant change should be expressed in terms of the new category of the rescue and fire fighting service available at the aerodrome.*

2.12 Visual approach slope indicator systems

The following information concerning a visual approach slope indicator system installation shall be made available:

a) associated runway designation number;

b) type of system according to 5.3.5.2. For an AT-VASIS, PAPI or APAPI installation, the side of the runway on which the lights are installed, i.e. left or right, shall be given;

c) where the axis of the system is not parallel to the runway centre line, the angle of displacement and the direction of displacement, i.e. left or right shall be indicated;

d) nominal approach slope angle(s). For a T-VASIS or an AT-VASIS this shall be angle θ according to the formula in Figure 5-17 and for a PAPI and an APAPI this shall be angle (B + C) ÷ 2 and (A + B) ÷ 2, respectively as in Figure 5-19; and

e) minimum eye height(s) over the threshold of the on-slope signal(s). For a T-VASIS or an AT-VASIS this shall be the lowest height at which only the wing bar(s) are visible; however, the additional heights at which the wing bar(s) plus one, two or three fly down light units come into view may also be reported if such information would be of benefit to aircraft using the approach. For a PAPI this shall be the setting angle of the third unit from the runway minus 2′, i.e. angle B minus 2′, and for an APAPI this shall be the setting angle of the unit farther from the runway minus 2′, i.e. angle A minus 2′.

2.13 Coordination between aeronautical information services and aerodrome authorities

2.13.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and aerodrome authorities responsible for aerodrome services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on aerodrome conditions (ref. 2.9, 2.10, 2.11 and 2.12);

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) any other information considered to be of operational significance.

2.13.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issue of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close coordination between those services concerned is therefore required.

2.13.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible aerodrome services when submitting the raw information/data to aeronautical information services.

2.13.4 The aerodrome services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do that while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 5 to this Annex.

Note 1.— Specifications for the issue of a NOTAM and SNOWTAM are contained in Annex 15, Chapter 5 and Appendices 6 and 2, respectively.

Note 2.— AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 3.— The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997 and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual *(Doc 8126, Chapter 2).*

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 Runways

Number and orientation of runways

Introductory Note.— Many factors affect the determination of the orientation, siting and number of runways.

One important factor is the usability factor, as determined by the wind distribution, which is specified hereunder. Another important factor is the alignment of the runway to facilitate the provision of approaches conforming to the approach surface specifications of Chapter 4. In Attachment A, Section 1, information is given concerning these and other factors.

When a new instrument runway is being located, particular attention needs to be given to areas over which aeroplanes will be required to fly when following instrument approach and missed approach procedures, so as to ensure that obstacles in these areas or other factors will not restrict the operation of the aeroplanes for which the runway is intended.

3.1.1 **Recommendation.—** *The number and orientation of runways at an aerodrome should be such that the usability factor of the aerodrome is not less than 95 per cent for the aeroplanes that the aerodrome is intended to serve.*

3.1.2 **Recommendation.—** *The siting and orientation of runways at an aerodrome should, where possible, be such that the arrival and departure tracks minimize interference with areas approved for residential use and other noise sensitive areas close to the aerodrome in order to avoid future noise problems.*

Note.— Guidance on how to address noise problems is provided in the Airport Planning Manual*, Part 2, and in* Guidance on the Balanced Approach to Aircraft Noise Management *(Doc 9829).*

3.1.3 Choice of maximum permissible cross-wind components

Recommendation.— *In the application of 3.1.1 it should be assumed that landing or take-off of aeroplanes is, in normal circumstances, precluded when the cross-wind component exceeds:*

— 37 km/h (20 kt) in the case of aeroplanes whose reference field length is 1 500 m or over, except that when poor runway braking action owing to an insufficient longitudinal coefficient of friction is experienced with some frequency, a cross-wind component not exceeding 24 km/h (13 kt) should be assumed;

— 24 km/h (13 kt) in the case of aeroplanes whose reference field length is 1 200 m or up to but not including 1 500 m; and

— 19 km/h (10 kt) in the case of aeroplanes whose reference field length is less than 1 200 m.

Note.— In Attachment A, Section 1, guidance is given on factors affecting the calculation of the estimate of the usability factor and allowances which may have to be made to take account of the effect of unusual circumstances.

3.1.4 Data to be used

Recommendation.— *The selection of data to be used for the calculation of the usability factor should be based on reliable wind distribution statistics that extend over as long a period as possible, preferably of not less than five years. The observations used should be made at least eight times daily and spaced at equal intervals of time.*

Note.— These winds are mean winds. Reference to the need for some allowance for gusty conditions is made in Attachment A, Section 1.

Location of threshold

3.1.5 **Recommendation.—** *A threshold should normally be located at the extremity of a runway unless operational considerations justify the choice of another location.*

Note.— Guidance on the siting of the threshold is given in Attachment A, Section 10.

3.1.6 **Recommendation.—** *When it is necessary to displace a threshold, either permanently or temporarily, from its normal location, account should be taken of the various factors which may have a bearing on the location of the threshold. Where this displacement is due to an unserviceable runway condition, a cleared and graded area of at least 60 m in length should be available between the unserviceable area and the displaced threshold. Additional distance should also be provided to meet the requirements of the runway end safety area as appropriate.*

Note.— Guidance on factors which may be considered in the determination of the location of a displaced threshold is given in Attachment A, Section 10.

Actual length of runways

3.1.7 Primary runway

Recommendation.— *Except as provided in 3.1.9, the actual runway length to be provided for a primary runway should be adequate to meet the operational requirements of the aeroplanes for which the runway is intended and should be not less than the longest length determined by applying the corrections for local conditions to the operations and performance characteristics of the relevant aeroplanes.*

Note 1.— This specification does not necessarily mean providing for operations by the critical aeroplane at its maximum mass.

Note 2.— Both take-off and landing requirements need to be considered when determining the length of runway to be provided and the need for operations to be conducted in both directions of the runway.

Note 3.— Local conditions that may need to be considered include elevation, temperature, runway slope, humidity and the runway surface characteristics.

Note 4.— When performance data on aeroplanes for which the runway is intended are not known, guidance on the determination of the actual length of a primary runway by application of general correction factors is given in the Aerodrome Design Manual, *Part 1.*

3.1.8 Secondary runway

Recommendation.— *The length of a secondary runway should be determined similarly to primary runways except that it needs only to be adequate for those aeroplanes which require to use that secondary runway in addition to the other runway or runways in order to obtain a usability factor of at least 95 per cent.*

3.1.9 Runways with stopways or clearways

Recommendation.— *Where a runway is associated with a stopway or clearway, an actual runway length less than that resulting from application of 3.1.7 or 3.1.8, as appropriate, may be considered satisfactory, but in such a case any combination of runway, stopway and clearway provided should permit compliance with the operational requirements for take-off and landing of the aeroplanes the runway is intended to serve.*

Note.— Guidance on use of stopways and clearways is given in Attachment A, Section 2.

Width of runways

3.1.10 **Recommendation.—** *The width of a runway should be not less than the appropriate dimension specified in the following tabulation:*

	Code letter					
Code number	A	B	C	D	E	F
1[a]	*18 m*	*18 m*	*23 m*	–	–	–
2[a]	*23 m*	*23 m*	*30 m*	–	–	–
3	*30 m*	*30 m*	*30 m*	*45 m*	–	–
4	–	–	*45 m*	*45 m*	*45 m*	*60 m*

a. The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.

Note 1.— The combinations of code numbers and letters for which widths are specified have been developed for typical aeroplane characteristics.

Note 2.— Factors affecting runway width are given in the Aerodrome Design Manual*, Part 1.*

Minimum distance between parallel runways

3.1.11 **Recommendation.—** *Where parallel non-instrument runways are intended for simultaneous use, the minimum distance between their centre lines should be:*

— 210 m where the higher code number is 3 or 4;

— 150 m where the higher code number is 2; and

— 120 m where the higher code number is 1.

Note.— Procedures for wake turbulence categorization of aircraft and wake turbulence separation minima are contained in the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM)*, Doc 4444, Chapter 4, 4.9 and Chapter 5, 5.8, respectively.*

3.1.12 **Recommendation.—** *Where parallel instrument runways are intended for simultaneous use subject to conditions specified in the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168), Volume I, the minimum distance between their centre lines should be:*

— 1 035 m for independent parallel approaches;

— 915 m for dependent parallel approaches;

— 760 m for independent parallel departures;

— 760 m for segregated parallel operations;

except that:

a) for segregated parallel operations the specified minimum distance:

1) may be decreased by 30 m for each 150 m that the arrival runway is staggered toward the arriving aircraft, to a minimum of 300 m; and

2) should be increased by 30 m for each 150 m that the arrival runway is staggered away from the arriving aircraft;

b) for independent parallel approaches, combinations of minimum distances and associated conditions other than those specified in the PANS-ATM (Doc 4444) may be applied when it is determined that such combinations would not adversely affect the safety of aircraft operations.

Note.— Procedures and facilities requirements for simultaneous operations on parallel or near-parallel instrument runways are contained in the PANS-ATM (Doc 4444), Chapter 6 and the PANS-OPS (Doc 8168), Volume I, Part VII and Volume II, Parts II and III and relevant guidance is contained in the Manual of Simultaneous Operations on Parallel or Near-Parallel Instrument Runways *(Doc 9643).*

Slopes on runways

3.1.13 Longitudinal slopes

Recommendation.— *The slope computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length should not exceed:*

— 1 per cent where the code number is 3 or 4; and

— 2 per cent where the code number is 1 or 2.

3.1.14 **Recommendation.—** *Along no portion of a runway should the longitudinal slope exceed:*

— 1.25 per cent where the code number is 4, except that for the first and last quarter of the length of the runway the longitudinal slope should not exceed 0.8 per cent;

— 1.5 per cent where the code number is 3, except that for the first and last quarter of the length of a precision approach runway category II or III the longitudinal slope should not exceed 0.8 per cent; and

— 2 per cent where the code number is 1 or 2.

3.1.15 Longitudinal slope changes

Recommendation.— *Where slope changes cannot be avoided, a slope change between two consecutive slopes should not exceed:*

— 1.5 per cent where the code number is 3 or 4; and

— 2 per cent where the code number is 1 or 2.

Note.— Guidance on slope changes before a runway is given in Attachment A, Section 4.

3.1.16 **Recommendation.—** *The transition from one slope to another should be accomplished by a curved surface with a rate of change not exceeding:*

— 0.1 per cent per 30 m (minimum radius of curvature of 30 000 m) where the code number is 4;

— 0.2 per cent per 30 m (minimum radius of curvature of 15 000 m) where the code number is 3; and

— 0.4 per cent per 30 m (minimum radius of curvature of 7 500 m) where the code number is 1 or 2.

3.1.17 Sight distance

Recommendation.— *Where slope changes cannot be avoided, they should be such that there will be an unobstructed line of sight from:*

— any point 3 m above a runway to all other points 3 m above the runway within a distance of at least half the length of the runway where the code letter is C, D, E or F.

— any point 2 m above a runway to all other points 2 m above the runway within a distance of at least half the length of the runway where the code letter is B; and

— any point 1.5 m above a runway to all other points 1.5 m above the runway within a distance of at least half the length of the runway where the code letter is A.

Note.— Consideration will have to be given to providing an unobstructed line of sight over the entire length of a single runway where a full-length parallel taxiway is not available. Where an aerodrome has intersecting runways, additional criteria on the line of sight of the intersection area would need to be considered for operational safety. See the Aerodrome Design Manual, *Part 1.*

3.1.18 Distance between slope changes

Recommendation.— *Undulations or appreciable changes in slopes located close together along a runway should be avoided. The distance between the points of intersection of two successive curves should not be less than:*

a) the sum of the absolute numerical values of the corresponding slope changes multiplied by the appropriate value as follows:

— 30 000 m where the code number is 4;

— 15 000 m where the code number is 3; and

— 5 000 m where the code number is 1 or 2; or

b) 45 m;

whichever is greater.

Note.— Guidance on implementing this specification is given in Attachment A, Section 4.

3.1.19 Transverse slopes

Recommendation.— *To promote the most rapid drainage of water, the runway surface should, if practicable, be cambered except where a single crossfall from high to low in the direction of the wind most frequently associated with rain would ensure rapid drainage. The transverse slope should ideally be:*

— 1.5 per cent where the code letter is C, D, E or F; and

— 2 per cent where the code letter is A or B;

but in any event should not exceed 1.5 per cent or 2 per cent, as applicable, nor be less than 1 per cent except at runway or taxiway intersections where flatter slopes may be necessary.

For a cambered surface the transverse slope on each side of the centre line should be symmetrical.

Note.— On wet runways with cross-wind conditions the problem of aquaplaning from poor drainage is apt to be accentuated. In Attachment A, Section 7, information is given concerning this problem and other relevant factors.

3.1.20 **Recommendation.—** *The transverse slope should be substantially the same throughout the length of a runway except at an intersection with another runway or a taxiway where an even transition should be provided taking account of the need for adequate drainage.*

Note.— Guidance on transverse slope is given in the Aerodrome Design Manual, *Part 3.*

Strength of runways

3.1.21 **Recommendation.—** *A runway should be capable of withstanding the traffic of aeroplanes the runway is intended to serve.*

Surface of runways

3.1.22 The surface of a runway shall be constructed without irregularities that would result in loss in friction characteristics or otherwise adversely affect the take-off or landing of an aeroplane.

Note 1.— Surface irregularities may adversely affect the take-off or landing of an aeroplane by causing excessive bouncing, pitching, vibration, or other difficulties in the control of an aeroplane.

Note 2.— Guidance on design tolerances and other information is given in Attachment A, Section 5. Additional guidance is included in the Aerodrome Design Manual, *Part 3.*

3.1.23 The surface of a paved runway shall be so constructed as to provide good friction characteristics when the runway is wet.

3.1.24 **Recommendation.—** *Measurements of the friction characteristics of a new or resurfaced runway should be made with a continuous friction measuring device using self-wetting features in order to assure that the design objectives with respect to its friction characteristics have been achieved.*

Note.— Guidance on friction characteristics of new runway surfaces is given in Attachment A, Section 7. Additional guidance is included in the Airport Services Manual, *Part 2.*

3.1.25 **Recommendation.—** *The average surface texture depth of a new surface should be not less than 1.0 mm.*

Note 1.— This normally requires some form of special surface treatment.

Note 2.— Guidance on methods used to measure surface texture is given in the Airport Services Manual, *Part 2.*

3.1.26 **Recommendation.—** *When the surface is grooved or scored, the grooves or scorings should be either perpendicular to the runway centre line or parallel to non-perpendicular transverse joints, where applicable.*

Note.— Guidance on methods for improving the runway surface texture is given in the Aerodrome Design Manual, *Part 3.*

3.2 Runway shoulders

General

Note.— Guidance on characteristics and treatment of runway shoulders is given in Attachment A, Section 8, and in the Aerodrome Design Manual, *Part 1.*

3.2.1 **Recommendation.—** *Runway shoulders should be provided for a runway where the code letter is D or E, and the runway width is less than 60 m.*

3.2.2 **Recommendation.—** *Runway shoulders should be provided for a runway where the code letter is F.*

Width of runway shoulders

3.2.3 **Recommendation.—** *The runway shoulders should extend symmetrically on each side of the runway so that the overall width of the runway and its shoulders is not less than:*

— 60 m where the code letter is D or E; and

— 75 m where the code letter is F.

Slopes on runway shoulders

3.2.4 **Recommendation.—** *The surface of the shoulder that abuts the runway should be flush with the surface of the runway and its transverse slope should not exceed 2.5 per cent.*

Strength of runway shoulders

3.2.5 **Recommendation.—** *A runway shoulder should be prepared or constructed so as to be capable, in the event of an aeroplane running off the runway, of supporting the aeroplane without inducing structural damage to the aeroplane and of supporting ground vehicles which may operate on the shoulder.*

Note.— Guidance on strength of runway shoulders is given in the Aerodrome Design Manual*, Part 1.*

3.3 Runway turn pads

General

3.3.1 Where the end of a runway is not served by a taxiway or a taxiway turnaround and where the code letter is D, E or F, a runway turn pad shall be provided to facilitate a 180-degree turn of aeroplanes. (See Figure 3-1.)

3.3.2 **Recommendation.—** *Where the end of a runway is not served by a taxiway or a taxiway turnaround and where the code letter is A, B or C, a runway turn pad should be provided to facilitate a 180-degree turn of aeroplanes.*

Note 1.— Such areas may also be useful if provided along a runway to reduce taxiing time and distance for aeroplanes which may not require the full length of the runway.

Note 2.— Guidance on the design of the runway turn pads is available in the Aerodrome Design Manual, *Part 1. Guidance on taxiway turnaround as an alternate facility is available in the* Aerodrome Design Manual, *Part 2.*

3.3.3 **Recommendation.—** *The runway turn pad may be located on either the left or right side of the runway and adjoining the runway pavement at both ends of the runway and at some intermediate locations where deemed necessary.*

Note.— The initiation of the turn would be facilitated by locating the turn pad on the left side of the runway, since the left seat is the normal position of the pilot-in-command.

3.3.4 **Recommendation.—** *The intersection angle of the runway turn pad with the runway should not exceed 30 degrees.*

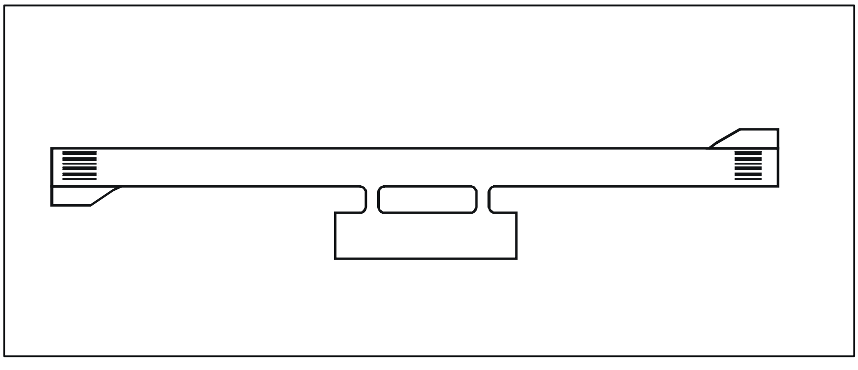


Figure 3-1. Typical turn pad layout

3.3.5 **Recommendation.**— *The nose wheel steering angle to be used in the design of the runway turn pad should not exceed 45 degrees.*

3.3.6 The design of a runway turn pad shall be such that, when the cockpit of the aeroplane for which the turn pad is intended remains over the turn pad marking, the clearance distance between any wheel of the aeroplane landing gear and the edge of the turn pad shall be not less than that given by the following tabulation:

Code letter	*Clearance*
A	1.5 m
B	2.25 m
C	3 m if the turn pad is intended to be used by aeroplanes with a wheel base less than 18 m;
	4.5 m if the turn pad is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.
D	4.5 m
E	4.5 m
F	4.5 m

Note.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.

3.3.7 **Recommendation.—** *Where severe weather conditions and resultant lowering of surface friction characteristics prevail, a larger wheel-to-edge clearance of 6 m should be provided where the code letter is E or F.*

Slopes on runway turn pads

3.3.8 **Recommendation.—** *The longitudinal and transverse slopes on a runway turn pad should be sufficient to prevent the accumulation of water on the surface and facilitate rapid drainage of surface water. The slopes should be the same as those on the adjacent runway pavement surface.*

Strength of runway turn pads

3.3.9 **Recommendation.—** *The strength of a runway turn pad should be at least equal to that of the adjoining runway which it serves, due consideration being given to the fact that the turn pad will be subjected to slow-moving traffic making hard turns and consequent higher stresses on the pavement.*

Note.— Where a runway turn pad is provided with flexible pavement, the surface would need to be capable of withstanding the horizontal shear forces exerted by the main landing gear tires during turning manoeuvres.

Surface of runway turn pads

3.3.10 The surface of a runway turn pad shall not have surface irregularities that may cause damage to an aeroplane using the turn pad.

3.3.11 **Recommendation.—** *The surface of a runway turn pad should be so constructed as to provide good friction characteristics for aeroplanes using the facility when the surface is wet.*

Shoulders for runway turn pads

3.3.12 **Recommendation.—** *The runway turn pads should be provided with shoulders of such width as is necessary to prevent surface erosion by the jet blast of the most demanding aeroplane for which the turn pad is intended, and any possible foreign object damage to the aeroplane engines.*

Note.— As a minimum, the width of the shoulders would need to cover the outer engine of the most demanding aeroplane and thus may be wider than the associated runway shoulders.

3.3.13 **Recommendation.—** *The strength of runway turn pad shoulders should be capable of withstanding the occasional passage of the aeroplane it is designed to serve without inducing structural damage to the aeroplane and to the supporting ground vehicles that may operate on the shoulder.*

3.4 Runway strips

General

3.4.1 A runway and any associated stopways shall be included in a strip.

Length of runway strips

3.4.2 A strip shall extend before the threshold and beyond the end of the runway or stopway for a distance of at least:

— 60 m where the code number is 2, 3 or 4;

— 60 m where the code number is 1 and the runway is an instrument one; and

— 30 m where the code number is 1 and the runway is a non-instrument one.

Width of runway strips

3.4.3 A strip including a precision approach runway shall, wherever practicable, extend laterally to a distance of at least:

— 150 m where the code number is 3 or 4; and

— 75 m where the code number is 1 or 2;

on each side of the centre line of the runway and its extended centre line throughout the length of the strip.

3.4.4 **Recommendation.—** *A strip including a non-precision approach runway should extend laterally to a distance of at least:*

— 150 m where the code number is 3 or 4; and

— 75 m where the code number is 1 or 2;

on each side of the centre line of the runway and its extended centre line throughout the length of the strip.

3.4.5 **Recommendation.—** *A strip including a non-instrument runway should extend on each side of the centre line of the runway and its extended centre line throughout the length of the strip, to a distance of at least:*

— 75 m where the code number is 3 or 4;

— 40 m where the code number is 2; and

— 30 m where the code number is 1.

Objects on runway strips

Note.— See 9.9 for information regarding siting of equipment and installations on runway strips.

3.4.6 **Recommendation.—** *An object situated on a runway strip which may endanger aeroplanes should be regarded as an obstacle and should, as far as practicable, be removed.*

3.4.7 No fixed object, other than visual aids required for air navigation purposes and satisfying the relevant frangibility requirement in Chapter 5, shall be permitted on a runway strip:

a) within 77.5 m of the runway centre line of a precision approach runway category I, II or III where the code number is 4 and the code letter is F; or

b) within 60 m of the runway centre line of a precision approach runway category I, II or III where the code number is 3 or 4; or

c) within 45 m of the runway centre line of a precision approach runway category I where the code number is 1 or 2.

No mobile object shall be permitted on this part of the runway strip during the use of the runway for landing or take-off.

Grading of runway strips

3.4.8 **Recommendation.—** *That portion of a strip of an instrument runway within a distance of at least:*

— 75 m where the code number is 3 or 4; and

— 40 m where the code number is 1 or 2;

from the centre line of the runway and its extended centre line should provide a graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

Note.— Guidance on grading of a greater area of a strip including a precision approach runway where the code number is 3 or 4 is given in Attachment A, Section 8.

3.4.9 **Recommendation.—** *That portion of a strip of a non-instrument runway within a distance of at least:*

— 75 m where the code number is 3 or 4;

— 40 m where the code number is 2; and

— 30 m where the code number is 1;

from the centre line of the runway and its extended centre line should provide a graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

3.4.10 The surface of that portion of a strip that abuts a runway, shoulder or stopway shall be flush with the surface of the runway, shoulder or stopway.

3.4.11 **Recommendation.—** *That portion of a strip to at least 30 m before a threshold should be prepared against blast erosion in order to protect a landing aeroplane from the danger of an exposed edge.*

Slopes on runway strips

3.4.12 Longitudinal slopes

Recommendation.— *A longitudinal slope along that portion of a strip to be graded should not exceed:*

— 1.5 per cent where the code number is 4;

— 1.75 per cent where the code number is 3; and

— 2 per cent where the code number is 1 or 2.

3.4.13 Longitudinal slope changes

Recommendation.— *Slope changes on that portion of a strip to be graded should be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.*

3.4.14 Transverse slopes

Recommendation.— *Transverse slopes on that portion of a strip to be graded should be adequate to prevent the accumulation of water on the surface but should not exceed:*

— 2.5 per cent where the code number is 3 or 4; and

— 3 per cent where the code number is 1 or 2;

except that to facilitate drainage the slope for the first 3 m outward from the runway, shoulder or stopway edge should be negative as measured in the direction away from the runway and may be as great as 5 per cent.

3.4.15 **Recommendation.—** *The transverse slopes of any portion of a strip beyond that to be graded should not exceed an upward slope of 5 per cent as measured in the direction away from the runway.*

Strength of runway strips

3.4.16 **Recommendation.—** *That portion of a strip of an instrument runway within a distance of at least:*

— 75 m where the code number is 3 or 4; and

— 40 m where the code number is 1 or 2;

from the centre line of the runway and its extended centre line should be so prepared or constructed as to minimize hazards arising from differences in load bearing capacity to aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

Note.— Guidance on preparation of runway strips is given in the Aerodrome Design Manual, *Part 1.*

3.4.17 **Recommendation.—** *That portion of a strip containing a non-instrument runway within a distance of at least:*

— 75 m where the code number is 3 or 4;

— 40 m where the code number is 2; and

— 30 m where the code number is 1;

from the centre line of the runway and its extended centre line should be so prepared or constructed as to minimize hazards arising from differences in load bearing capacity to aeroplanes which the runway is intended to serve in the event of an aeroplane running off the runway.

3.5 Runway end safety areas

General

3.5.1 A runway end safety area shall be provided at each end of a runway strip where:

— the code number is 3 or 4; and

— the code number is 1 or 2 and the runway is an instrument one.

Note.— Guidance on runway end safety areas is given in Attachment A, Section 9.

Dimensions of runway end safety areas

3.5.2 A runway end safety area shall extend from the end of a runway strip to a distance of at least 90 m.

3.5.3 **Recommendation.—** *A runway end safety area should, as far as practicable, extend from the end of a runway strip to a distance of at least:*

— 240 m where the code number is 3 or 4; and

— 120 m where the code number is 1 or 2.

3.5.4 The width of a runway end safety area shall be at least twice that of the associated runway.

3.5.5 **Recommendation.—** *The width of a runway end safety area should, wherever practicable, be equal to that of the graded portion of the associated runway strip.*

Objects on runway end safety areas

Note.— See 9.9 for information regarding siting of equipment and installations on runway end safety areas.

3.5.6 **Recommendation.—** *An object situated on a runway end safety area which may endanger aeroplanes should be regarded as an obstacle and should, as far as practicable, be removed.*

Clearing and grading of runway end safety areas

3.5.7 **Recommendation.—** *A runway end safety area should provide a cleared and graded area for aeroplanes which the runway is intended to serve in the event of an aeroplane undershooting or overrunning the runway.*

Note.— The surface of the ground in the runway end safety area does not need to be prepared to the same quality as the runway strip. See, however, 3.5.11.

Slopes on runway end safety areas

3.5.8 General

Recommendation.— *The slopes of a runway end safety area should be such that no part of the runway end safety area penetrates the approach or take-off climb surface.*

3.5.9 Longitudinal slopes

Recommendation.— *The longitudinal slopes of a runway end safety area should not exceed a downward slope of 5 per cent. Longitudinal slope changes should be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided.*

3.5.10 Transverse slopes

Recommendation.— *The transverse slopes of a runway end safety area should not exceed an upward or downward slope of 5 per cent. Transitions between differing slopes should be as gradual as practicable.*

Strength of runway end safety areas

3.5.11 **Recommendation.—** *A runway end safety area should be so prepared or constructed as to reduce the risk of damage to an aeroplane undershooting or overrunning the runway, enhance aeroplane deceleration and facilitate the movement of rescue and fire fighting vehicles as required in 9.2.26 to 9.2.28.*

Note.— Guidance on strength of a runway end safety area is given in the Aerodrome Design Manual, *Part 1.*

3.6 Clearways

Note.— The inclusion of detailed specifications for clearways in this section is not intended to imply that a clearway has to be provided. Attachment A, Section 2 provides information on the use of clearways.

Location of clearways

3.6.1 **Recommendation.—** *The origin of a clearway should be at the end of the take-off run available.*

Length of clearways

3.6.2 **Recommendation.—** *The length of a clearway should not exceed half the length of the take-off run available.*

Width of clearways

3.6.3 **Recommendation.—** *A clearway should extend laterally to a distance of at least 75 m on each side of the extended centre line of the runway.*

Slopes on clearways

3.6.4 **Recommendation.—** *The ground in a clearway should not project above a plane having an upward slope of 1.25 per cent, the lower limit of this plane being a horizontal line which:*

a) is perpendicular to the vertical plane containing the runway centre line; and

b) passes through a point located on the runway centre line at the end of the take-off run available.

Note.— Because of transverse or longitudinal slopes on a runway, shoulder or strip, in certain cases the lower limit of the clearway plane specified above may be below the corresponding elevation of the runway, shoulder or strip. It is not intended that these surfaces be graded to conform with the lower limit of the clearway plane nor is it intended that terrain or objects which are above the clearway plane beyond the end of the strip but below the level of the strip be removed unless it is considered they may endanger aeroplanes.

3.6.5 **Recommendation.—** *Abrupt upward changes in slope should be avoided when the slope on the ground in a clearway is relatively small or when the mean slope is upward. In such situations, in that portion of the clearway within a* *distance of 22.5 m or half the runway width whichever is greater on each side of the extended centre line, the slopes, slope changes and the transition from runway to clearway should generally conform with those of the runway with which the clearway is associated.*

Objects on clearways

Note.— See 9.9 for information regarding siting of equipment and installations on clearways.

3.6.6 **Recommendation.—** *An object situated on a clearway which may endanger aeroplanes in the air should be regarded as an obstacle and should be removed.*

3.7 Stopways

Note.— The inclusion of detailed specifications for stopways in this section is not intended to imply that a stopway has to be provided. Attachment A, Section 2 provides information on the use of stopways.

Width of stopways

3.7.1 A stopway shall have the same width as the runway with which it is associated.

Slopes on stopways

3.7.2 **Recommendation.—** *Slopes and changes in slope on a stopway, and the transition from a runway to a stopway, should comply with the specifications of 3.1.13 to 3.1.19 for the runway with which the stopway is associated except that:*

a) the limitation in 3.1.14 of a 0.8 per cent slope for the first and last quarter of the length of a runway need not be applied to the stopway; and

b) at the junction of the stopway and runway and along the stopway the maximum rate of slope change may be 0.3 per cent per 30 m (minimum radius of curvature of 10 000 m) for a runway where the code number is 3 or 4.

Strength of stopways

3.7.3 **Recommendation.—** *A stopway should be prepared or constructed so as to be capable, in the event of an abandoned take-off, of supporting the aeroplane which the stopway is intended to serve without inducing structural damage to the aeroplane.*

Note.— Attachment A, Section 2 presents guidance relative to the support capability of a stopway.

Surface of stopways

3.7.4 **Recommendation.—** *The surface of a paved stopway should be so constructed as to provide a good coefficient of friction to be compatible with that of the associated runway when the stopway is wet.*

3.7.5 **Recommendation.—** *The friction characteristics of an unpaved stopway should not be substantially less than that of the runway with which the stopway is associated.*

3.8 Radio altimeter operating area

General

3.8.1 **Recommendation.—** *A radio altimeter operating area should be established in the pre-threshold area of a precision approach runway.*

Length of the area

3.8.2 **Recommendation.—** *A radio altimeter operating area should extend before the threshold for a distance of at least 300 m.*

Width of the area

3.8.3 **Recommendation.—** *A radio altimeter operating area should extend laterally, on each side of the extended centre line of the runway, to a distance of 60 m, except that, when special circumstances so warrant, the distance may be reduced to no less than 30 m if an aeronautical study indicates that such reduction would not affect the safety of operations of aircraft.*

Longitudinal slope changes

3.8.4 **Recommendation.—** *On a radio altimeter operating area, slope changes should be avoided or kept to a minimum. Where slope changes cannot be avoided, the slope changes should be as gradual as practicable and abrupt changes or sudden reversals of slopes avoided. The rate of change between two consecutive slopes should not exceed 2 per cent per 30 m.*

Note.— Guidance on radio altimeter operating area is given in Attachment A, Section 4.3 and in the Manual of All-Weather Operations, *(Doc 9365), Section 5.2. Guidance on the use of radio altimeter is given in the PANS-OPS, Volume II, Part III, Chapter 21.*

3.9 Taxiways

Note.— Unless otherwise indicated the requirements in this section are applicable to all types of taxiways.

General

3.9.1 **Recommendation.—** *Taxiways should be provided to permit the safe and expeditious surface movement of aircraft.*

Note.— Guidance on layout of taxiways is given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

3.9.2 **Recommendation.—** *Sufficient entrance and exit taxiways for a runway should be provided to expedite the movement of aeroplanes to and from the runway and provision of rapid exit taxiways considered when traffic volumes are high.*

3.9.3 **Recommendation.—** *The design of a taxiway should be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway should be not less than that given by the following tabulation:*

Code letter	Clearance
A	*1.5 m*
B	*2.25 m*
C	*3 m if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;* *4.5 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.*
D	*4.5 m*
E	*4.5 m*
F	*4.5 m*

Note 1.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.

Note 2.— Where the code letter is F and the traffic density is high, a wheel-to-edge clearance greater than 4.5 m may be provided to permit higher taxiing speeds.

3.9.4 As of 20 November 2008, the design of a taxiway shall be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway shall be not less than that given by the following tabulation:

Code letter	*Clearance*
A	1.5 m
B	2.25 m
C	3 m if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m; 4.5 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.
D	4.5 m
E	4.5 m
F	4.5 m

Note 1.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.

Note 2.— Where the code letter is F and the traffic density is high, a wheel-to-edge clearance greater than 4.5 m may be provided to permit higher taxiing speeds.

Note 3.— This provision applies to taxiways first put into service on or after 20 November 2008.

Width of taxiways

3.9.5 **Recommendation.—** *A straight portion of a taxiway should have a width of not less than that given by the following tabulation:*

Code letter	Taxiway width
A	*7.5 m*
B	*10.5 m*
C	*15 m if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;* *18 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.*
D	*18 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span of less than 9 m;* *23 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span equal to or greater than 9 m.*
E	*23 m*
F	*25 m*

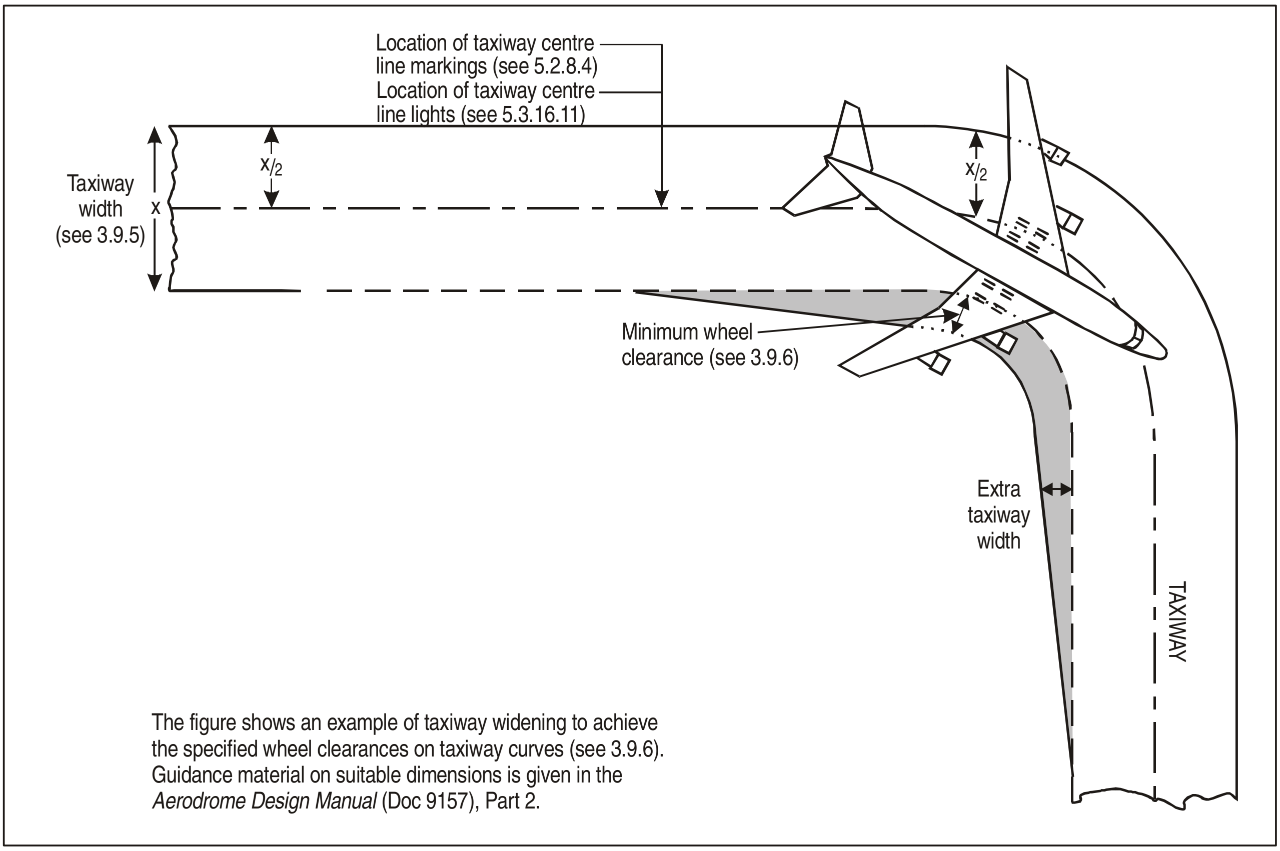


Figure 3-2. Taxiway curve

Note.— Guidance on width of taxiways is given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

Taxiway curves

3.9.6 **Recommendation.—** *Changes in direction of taxiways should be as few and small as possible. The radii of the curves should be compatible with the manoeuvring capability and normal taxiing speeds of the aeroplanes for which the taxiway is intended. The design of the curve should be such that, when the cockpit of the aeroplane remains over the taxiway centre line markings, the clearance distance between the outer main wheels of the aeroplane and the edge of the taxiway should not be less than those specified in 3.9.3.*

Note 1.— An example of widening taxiways to achieve the wheel clearance specified is illustrated in Figure 3-2. Guidance on the values of suitable dimensions is given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

Note 2.— The location of taxiway centre line markings and lights is specified in 5.2.8.4 and 5.3.16.11.

Note 3.— Compound curves may reduce or eliminate the need for extra taxiway width.

Junctions and intersections

3.9.7 **Recommendation.—** *To facilitate the movement of aeroplanes, fillets should be provided at junctions and intersections of taxiways with runways, aprons and other taxiways. The design of the fillets should ensure that the minimum wheel clearances specified in 3.9.3 are maintained when aeroplanes are manoeuvring through the junctions or intersections.*

Note.— Consideration will have to be given to the aeroplane datum length when designing fillets. Guidance on the design of fillets and the definition of the term aeroplane datum length are given in the Aerodrome Design Manual *(Doc 9157), Part 2.*

Taxiway minimum separation distances

3.9.8 **Recommendation.—** *The separation distance between the centre line of a taxiway and the centre line of a runway, the centre line of a parallel taxiway or an object should not be less than the appropriate dimension specified in Table 3-1, except that it may be permissible to operate with lower separation distances at an existing aerodrome if an*

Table 3-1. Taxiway minimum separation distances

Code letter	Distance between taxiway centre line and runway centre line (metres) — Instrument runways — Code number 1	2	3	4	Non-instrument runways — Code number 1	2	3	4	Taxiway centre line to taxiway centre line (metres)	Taxiway, other than aircraft stand taxilane, centre line to object (metres)	Aircraft stand taxilane centre line to object (metres)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A	82.5	82.5	–	–	37.5	47.5	–	–	23.75	16.25	12
B	87	87	–	–	42	52	–	–	33.5	21.5	16.5
C	–	–	168	–	–	–	93	–	44	26	24.5
D	–	–	176	176	–	–	101	101	66.5	40.5	36
E	–	–	–	182.5	–	–	–	107.5	80	47.5	42.5
F	–	–	–	190	–	–	–	115	97.5	57.5	50.5

Note 1.— The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways. The basis for development of these distances is given in the Aerodrome Design Manual, *Part 2.*

Note 2.— The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway. See the Aerodrome Design Manual*, Part 2.*

aeronautical study indicates that such lower separation distances would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

Note 1.— Guidance on factors which may be considered in the aeronautical study is given in the Aerodrome Design Manual, *Part 2.*

Note 2.— ILS and MLS installations may also influence the location of taxiways due to interferences to ILS and MLS signals by a taxiing or stopped aircraft. Information on critical and sensitive areas surrounding ILS and MLS installations is contained in Annex 10, Volume I, Attachments C and G (respectively).

Note 3.— The separation distances of Table 3-1, column 10, do not necessarily provide the capability of making a normal turn from one taxiway to another parallel taxiway. Guidance for this condition is given in the Aerodrome Design Manual, *Part 2.*

Note 4.— The separation distance between the centre line of an aircraft stand taxilane and an object shown in Table 3-1, column 12, may need to be increased when jet exhaust wake velocity may cause hazardous conditions for ground servicing.

Slopes on taxiways

3.9.9 Longitudinal slopes

Recommendation.— *The longitudinal slope of a taxiway should not exceed:*

— 1.5 per cent where the code letter is C, D, E or F; and

— 3 per cent where the code letter is A or B.

3.9.10 Longitudinal slope changes

Recommendation.— *Where slope changes on a taxiway cannot be avoided, the transition from one slope to another slope should be accomplished by a curved surface with a rate of change not exceeding:*

— 1 per cent per 30 m (minimum radius of curvature of 3 000 m) where the code letter is C, D, E or F; and

— 1 per cent per 25 m (minimum radius of curvature of 2 500 m) where the code letter is A or B.

3.9.11 Sight distance

Recommendation.— *Where a change in slope on a taxiway cannot be avoided, the change should be such that, from any point:*

— *3 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 300 m from that point, where the code letter is C, D, E or F;*

— *2 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 200 m from that point, where the code letter is B; and*

— *1.5 m above the taxiway, it will be possible to see the whole surface of the taxiway for a distance of at least 150 m from that point, where the code letter is A.*

3.9.12 Transverse slopes

Recommendation.— *The transverse slopes of a taxiway should be sufficient to prevent the accumulation of water on the surface of the taxiway but should not exceed:*

— *1.5 per cent where the code letter is C, D, E or F; and*

— *2 per cent where the code letter is A or B.*

Note.— See 3.13.4 regarding transverse slopes on an aircraft stand taxilane.

Strength of taxiways

3.9.13 **Recommendation.—** *The strength of a taxiway should be at least equal to that of the runway it serves, due consideration being given to the fact that a taxiway will be subjected to a greater density of traffic and, as a result of slow moving and stationary aeroplanes, to higher stresses than the runway it serves.*

Note.— Guidance on the relation of the strength of taxiways to the strength of runways is given in the Aerodrome Design Manual, *Part 3.*

Surface of taxiways

3.9.14 **Recommendation.—** *The surface of a taxiway should not have irregularities that cause damage to aeroplane structures.*

3.9.15 **Recommendation.—** *The surface of a paved taxiway should be so constructed as to provide good friction characteristics when the taxiway is wet.*

Rapid exit taxiways

Note.— The following specifications detail requirements particular to rapid exit taxiways. See Figure 3-3. General requirements for taxiways also apply to this type of taxiway. Guidance on the provision, location and design of rapid exit taxiways is included in the Aerodrome Design Manual, *Part 2.*

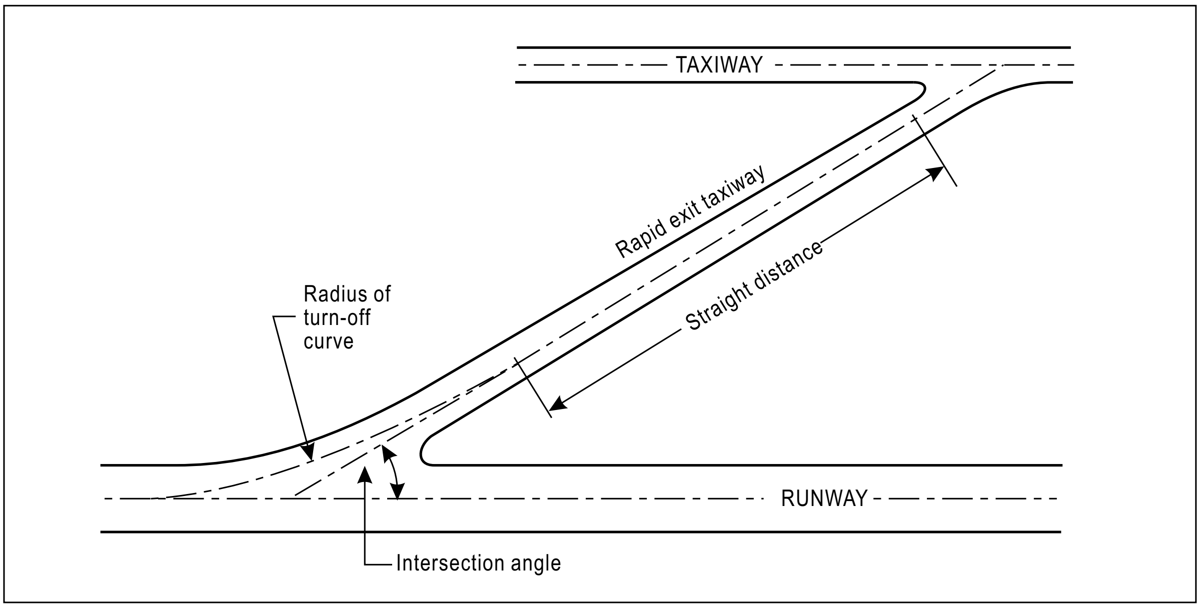


Figure 3-3. Rapid exit taxiway

3.9.16 **Recommendation.—** *A rapid exit taxiway should be designed with a radius of turn-off curve of at least:*

— 550 m where the code number is 3 or 4; and

— 275 m where the code number is 1 or 2;

to enable exit speeds under wet conditions of:

— 93 km/h where the code number is 3 or 4; and

— 65 km/h where the code number is 1 or 2.

Note.— The locations of rapid exit taxiways along a runway are based on several criteria described in the Aerodrome Design Manual, *Part 2, in addition to different speed criteria.*

3.9.17 **Recommendation.—** *The radius of the fillet on the inside of the curve at a rapid exit taxiway should be sufficient to provide a widened taxiway throat in order to facilitate early recognition of the entrance and turn-off onto the taxiway.*

3.9.18 **Recommendation.—** *A rapid exit taxiway should include a straight distance after the turn-off curve sufficient for an exiting aircraft to come to a full stop clear of any intersecting taxiway.*

3.9.19 **Recommendation.—** *The intersection angle of a rapid exit taxiway with the runway should not be greater than 45° nor less than 25° and preferably should be 30°.*

Taxiways on bridges

3.9.20 The width of that portion of a taxiway bridge capable of supporting aeroplanes, as measured perpendicularly to the taxiway centre line, shall not be less than the width of the graded area of the strip provided for that taxiway, unless a proven method of lateral restraint is provided which shall not be hazardous for aeroplanes for which the taxiway is intended.

3.9.21 **Recommendation.—** *Access should be provided to allow rescue and fire fighting vehicles to intervene in both directions within the specified response time to the largest aeroplane for which the taxiway bridge is intended.*

Note.— If aeroplane engines overhang the bridge structure, protection of adjacent areas below the bridge from engine blast may be required.

3.9.22 **Recommendation.—** *A bridge should be constructed on a straight section of the taxiway with a straight section on both ends of the bridge to facilitate the alignment of aeroplanes approaching the bridge.*

3.10 Taxiway shoulders

Note.— Guidance on characteristics of taxiway shoulders and on shoulder treatment is given in the Aerodrome Design Manual, *Part 2.*

3.10.1 **Recommendation.—** *Straight portions of a taxiway where the code letter is C, D, E or F should be provided with shoulders which extend symmetrically on each side of the taxiway so that the overall width of the taxiway and its shoulders on straight portions is not less than:*

— 60 m where the code letter is F;

— 44 m where the code letter is E;

— 38 m where the code letter is D; and

— 25 m where the code letter is C.

On taxiway curves and on junctions or intersections where increased pavement is provided, the shoulder width should be not less than that on the adjacent straight portions of the taxiway.

3.10.2 **Recommendation.—** *When a taxiway is intended to be used by turbine-engined aeroplanes, the surface of the taxiway shoulder should be so prepared as to resist erosion and the ingestion of the surface material by aeroplane engines.*

3.11 Taxiway strips

Note.— Guidance on characteristics of taxiway strips is given in the Aerodrome Design Manual, *Part 2.*

General

3.11.1 A taxiway, other than an aircraft stand taxilane, shall be included in a strip.

Width of taxiway strips

3.11.2 **Recommendation.—** *A taxiway strip should extend symmetrically on each side of the centre line of the taxiway throughout the length of the taxiway to at least the distance from the centre line given in Table 3-1, column 11.*

Objects on taxiway strips

Note.— See 9.9 for information regarding siting of equipment and installations on taxiway strips.

3.11.3 **Recommendation.—** *The taxiway strip should provide an area clear of objects which may endanger taxiing aeroplanes.*

Note.— Consideration will have to be given to the location and design of drains on a taxiway strip to prevent damage to an aeroplane accidentally running off a taxiway. Suitably designed drain covers may be required.

Grading of taxiway strips

3.11.4 **Recommendation.—** *The centre portion of a taxiway strip should provide a graded area to a distance from the centre line of the taxiway of at least:*

— 11 m where the code letter is A;

— 12.5 m where the code letter is B or C;

— 19 m where the code letter is D;

— 22 m where the code letter is E; and

— 30 m where the code letter is F.

Slopes on taxiway strips

3.11.5 **Recommendation.—** *The surface of the strip should be flush at the edge of the taxiway or shoulder, if provided, and the graded portion should not have an upward transverse slope exceeding:*

— 2.5 per cent for strips where the code letter is C, D, E or F; and

— 3 per cent for strips of taxiways where the code letter is A or B;

the upward slope being measured with reference to the transverse slope of the adjacent taxiway surface and not the horizontal. The downward transverse slope should not exceed 5 per cent measured with reference to the horizontal.

3.11.6 **Recommendation.—** *The transverse slopes on any portion of a taxiway strip beyond that to be graded should not exceed an upward or downward slope of 5 per cent as measured in the direction away from the taxiway.*

3.12 Holding bays, runway-holding positions, intermediate holding positions and road-holding positions

General

3.12.1 **Recommendation.—** *Holding bay(s) should be provided when the traffic density is medium or heavy.*

3.12.2 A runway-holding position or positions shall be established:

a) on the taxiway, at the intersection of a taxiway and a runway; and

b) at an intersection of a runway with another runway when the former runway is part of a standard taxi-route.

3.12.3 A runway-holding position shall be established on a taxiway if the location or alignment of the taxiway is such that a taxiing aircraft or vehicle can infringe an obstacle limitation surface or interfere with the operation of radio navigation aids.

3.12.4 **Recommendation.—** *An intermediate holding position should be established on a taxiway at any point other than a runway-holding position where it is desirable to define a specific holding limit.*

3.12.5 A road-holding position shall be established at an intersection of a road with a runway.

Location

3.12.6 The distance between a holding bay, runway-holding position established at a taxiway/runway intersection or road-holding position and the centre line of a runway shall be in accordance with Table 3-2 and, in the case of a precision approach runway, such that a holding aircraft or vehicle will not interfere with the operation of radio navigation aids.

3.12.7 **Recommendation.—** *At elevations greater than 700 m (2 300 ft) the distance of 90 m specified in Table 3-2 for a precision approach runway code number 4 should be increased as follows:*

a) up to an elevation of 2 000 m (6 600 ft); 1 m for every 100 m (330 ft) in excess of 700 m (2 300 ft);

b) elevation in excess of 2 000 m (6 600 ft) and up to 4 000 m (13 320 ft); 13 m plus 1.5 m for every 100 m (330 ft) in excess of 2 000 m (6 600 ft); and

c) elevation in excess of 4 000 m (13 320 ft) and up to 5 000 m (16 650 ft); 43 m plus 2 m for every 100 m (330 ft) in excess of 4 000 m (13 320 ft).

3.12.8 **Recommendation.—** *If a holding bay, runway-holding position or road-holding position for a precision approach runway code number 4 is at a greater elevation compared to the threshold, the distance of 90 m or 107.5 m, as appropriate, specified in Table 3-2 should be further increased 5 m for every metre the bay or position is higher than the threshold.*

3.12.9 The location of a runway-holding position established in accordance with 3.12.3 shall be such that a holding aircraft or vehicle will not infringe the obstacle free zone, approach surface, take-off climb surface or ILS/MLS critical/sensitive area or interfere with the operation of radio navigation aids.

Table 3-2. Minimum distance from the runway centre line to a holding bay, runway-holding position or road-holding position

	Code number			
Type of runway	1	2	3	4
Non-instrument	30 m	40 m	75 m	75 m
Non-precision approach	40 m	40 m	75 m	75 m
Precision approach category I	60 m[b]	60 m[b]	90 m[a,b]	90 m[a,b,c]
Precision approach categories II and III	–	–	90 m[a,b]	90 m[a,b,c]
Take-off runway	30 m	40 m	75 m	75 m

a. If a holding bay, runway-holding position or road-holding position is at a lower elevation compared to the threshold, the distance may be decreased 5 m for every metre the bay or holding position is lower than the threshold, contingent upon not infringing the inner transitional surface.

b. This distance may need to be increased to avoid interference with radio navigation aids, particularly the glide path and localizer facilities. Information on critical and sensitive areas of ILS and MLS is contained in Annex 10, Volume I, Attachments C and G, respectively (see also 3.12.6).

Note 1.— The distance of 90 m for code number 3 or 4 is based on an aircraft with a tail height of 20 m, a distance from the nose to the highest part of the tail of 52.7 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone and not accountable for the calculation of OCA/H.

Note 2.— The distance of 60 m for code number 2 is based on an aircraft with a tail height of 8 m, a distance from the nose to the highest part of the tail of 24.6 m and a nose height of 5.2 m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone.

c. Where the code letter is F, this distance should be 107.5 m.

Note.— The distance of 107.5 m for code number 4 where the code letter is F is based on an aircraft with a tail height of 24 m, a distance from the nose to the highest part of the tail of 62.2 m and a nose height of 10 m holding at an angle of 45° or more with respect to the runway centre line, being clear of the obstacle free zone.

3.13 Aprons

General

3.13.1 **Recommendation.—** *Aprons should be provided where necessary to permit the on- and off-loading of passengers, cargo or mail as well as the servicing of aircraft without interfering with the aerodrome traffic.*

Size of aprons

3.13.2 **Recommendation.—** *The total apron area should be adequate to permit expeditious handling of the aerodrome traffic at its maximum anticipated density.*

Strength of aprons

3.13.3 **Recommendation.—** *Each part of an apron should be capable of withstanding the traffic of the aircraft it is intended to serve, due consideration being given to the fact that some portions of the apron will be subjected to a higher density of traffic and, as a result of slow moving or stationary aircraft, to higher stresses than a runway.*

Slopes on aprons

3.13.4 **Recommendation.—** *Slopes on an apron, including those on an aircraft stand taxilane, should be sufficient to prevent accumulation of water on the surface of the apron but should be kept as level as drainage requirements permit.*

3.13.5 **Recommendation.—** *On an aircraft stand the maximum slope should not exceed 1 per cent.*

Clearance distances on aircraft stands

3.13.6 **Recommendation.—** *An aircraft stand should provide the following minimum clearances between an aircraft using the stand and any adjacent building, aircraft on another stand and other objects:*

Code letter	Clearance
A	*3 m*
B	*3 m*
C	*4.5 m*
D	*7.5 m*
E	*7.5 m*
F	*7.5 m*

When special circumstances so warrant, these clearances may be reduced at a nose-in aircraft stand, where the code letter is D, E or F:

a) between the terminal, including any fixed passenger bridge, and the nose of an aircraft; and

b) over any portion of the stand provided with azimuth guidance by a visual docking guidance system.

Note.— On aprons, consideration also has to be given to the provision of service roads and to manoeuvring and storage area for ground equipment (see the Aerodrome Design Manual*, Part 2, for guidance on storage of ground equipment).*

3.14 Isolated aircraft parking position

3.14.1 An isolated aircraft parking position shall be designated or the aerodrome control tower shall be advised of an area or areas suitable for the parking of an aircraft which is known or believed to be the subject of unlawful interference, or which for other reasons needs isolation from normal aerodrome activities.

3.14.2 **Recommendation.—** *The isolated aircraft parking position should be located at the maximum distance practicable and in any case never less than 100 m from other parking positions, buildings or public areas, etc. Care should be taken to ensure that the position is not located over underground utilities such as gas and aviation fuel and, to the extent feasible, electrical or communication cables.*

3.15 De-icing/anti-icing facilities

Note.— Safe and efficient aeroplane operations are of primary importance in the development of an aeroplane de-icing/anti-icing facility. For further guidance, see the Manual on Aircraft Ground De-icing/Anti-icing Operations *(Doc 9640).*

General

3.15.1 **Recommendation.—** *Aeroplane de-icing/anti-icing facilities should be provided at an aerodrome where icing conditions are expected to occur.*

Location

3.15.2 **Recommendation.—** *De-icing/anti-icing facilities should be provided either at aircraft stands or at specified remote areas along the taxiway leading to the runway meant for take-off, provided that adequate drainage arrangements for the collection and safe disposal of excess de-icing/anti-icing fluids are available to prevent ground water contamination. The effect of volume of traffic and departure flow rates should also be considered.*

Note 1.— One of the primary factors influencing the location of a de-icing/anti-icing facility is to ensure that the holdover time of the anti-icing treatment is still in effect at the end of taxiing and when take-off clearance of the treated aeroplane is given.

Note 2.— Remote facilities compensate for changing weather conditions when icing conditions or blowing snow are expected to occur along the taxi route taken by the aeroplane to the runway meant for take-off.

3.15.3 **Recommendation.—** *The remote de-icing/anti-icing facility should be located to be clear of the obstacle limitation surfaces specified in Chapter 4, not cause interference to the radio navigation aids and be clearly visible from the air traffic control tower for clearing the treated aeroplane.*

3.15.4 **Recommendation.—** *The remote de-icing/anti-icing facility should be so located as to provide for an expeditious traffic flow, perhaps with a bypass configuration, and not require unusual taxiing manoeuvre into and out of the pads.*

Note. — The jet blast effects caused by a moving aeroplane on other aeroplanes receiving the anti-icing treatment or taxiing behind will have to be taken into account to prevent degradation of the treatment.

Size and number of de-icing/anti-icing pads

Note.— An aeroplane de-icing/anti-icing pad consists of a) an inner area for parking of an aeroplane to be treated, and b) an outer area for movement of two or more mobile de-icing/anti-icing equipment.

3.15.5 **Recommendation.—** *The size of a de-icing/anti-icing pad should be equal to the parking area required by the most demanding aeroplane in a given category with at least 3.8 m clear paved area all round the aeroplane for the movement of the de-icing/anti-icing vehicles.*

Note.— Where more than one de-icing/anti-icing pad is provided, consideration will have to be given to providing de-icing/anti-icing vehicle movement areas of adjacent pads that *do not overlap, but are exclusive for each pad. Consideration will also need to be given to bypassing of the area by other aeroplanes with the clearances specified in 3.15.9 and 3.15.10.*

3.15.6 **Recommendation.—** *The number of de-icing/anti-icing pads required should be determined based on the meteorological conditions, the type of aeroplanes to be treated, the method of application of de-icing/anti-icing fluid, the type and capacity of the dispensing equipment used, and the departure flow rates.*

Note.— See the Aerodrome Design Manual, *Part 2*.

Slopes on de-icing/anti-icing pads

3.15.7 **Recommendation.—** *The de-icing/anti-icing pads should be provided with suitable slopes to ensure satisfactory drainage of the area and to permit collection of all excess de-icing/anti-icing fluid running off an aeroplane. The maximum longitudinal slope should be as little as practicable and the transverse slope should not exceed 1 per cent.*

Strength of de-icing/anti-icing pads

3.15.8 **Recommendation.—** *The de-icing/anti-icing pad should be capable of withstanding the traffic of the aircraft it is intended to serve, due consideration being given to the fact that the de-icing/anti-icing pad (like an apron) will be subjected to a higher density of traffic and, as a result of slow-moving or stationary aircraft, to higher stresses than a runway.*

Clearance distances on a de-icing/anti-icing pad

3.15.9 **Recommendation.—** *A de-icing/anti-icing pad should provide the minimum clearances specified in 3.13.6 for aircraft stands. If the pad layout is such as to include bypass configuration, the minimum separation distances specified in Table 3-1, column 12, should be provided.*

3.15.10 **Recommendation.—** *Where the de-icing/anti-icing facility is located adjoining a regular taxiway, the taxiway minimum separation distance specified in Table 3-1, column 11, should be provided. (See Figure 3-4.)*

Environmental considerations

Note.— The excess de-icing/anti-icing fluid running off an aeroplane poses the risk of contamination of ground water in addition to affecting the pavement surface friction characteristics.

3.15.11 **Recommendation.—** *Where de-icing/anti-icing activities are carried out, the surface drainage should be planned to collect the run-off separately, preventing its mixing with the normal surface run-off so that it does not pollute the ground water.*

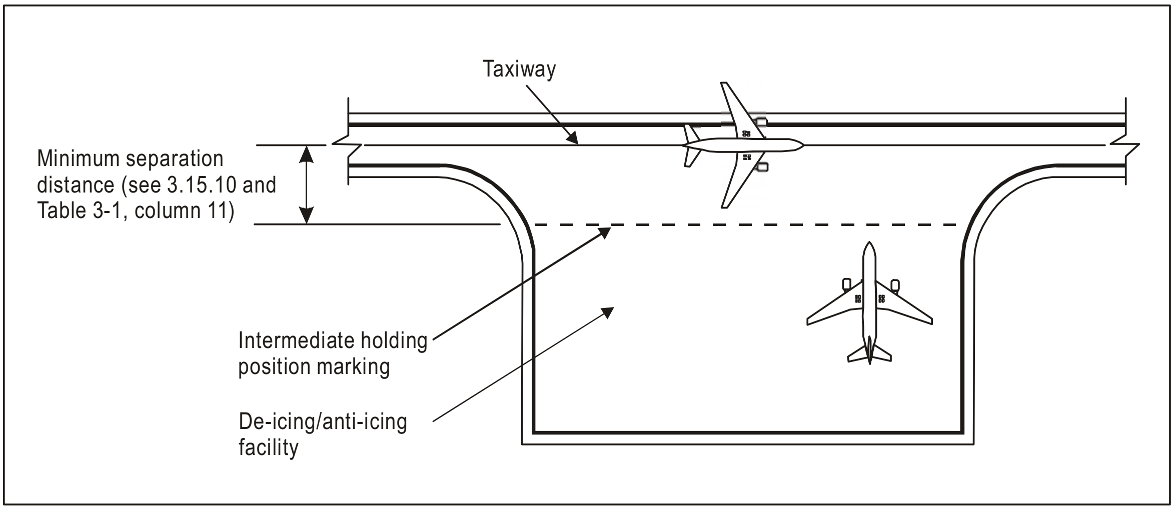


Figure 3-4. Minimum separation distance on a de-icing/anti-icing facility

CHAPTER 4. OBSTACLE RESTRICTION AND REMOVAL

Note 1.— The objectives of the specifications in this chapter are to define the airspace around aerodromes to be maintained free from obstacles so as to permit the intended aeroplane operations at the aerodromes to be conducted safely and to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.

Note 2.— Objects which penetrate the obstacle limitation surfaces contained in this chapter may in certain circumstances cause an increase in the obstacle clearance altitude/height for an instrument approach procedure or any associated visual circling procedure or have other operational impact on flight procedure design. Criteria for flight procedure design are contained in Procedures for Air Navigation Services – Aircraft Operations *(PANS-OPS, Doc 8168).*

Note 3.— The establishment of, and requirements for, an obstacle protection surface for visual approach slope indicator systems are specified in 5.3.5.41 to 5.3.5.45.

4.1 Obstacle limitation surfaces

Note.— See Figure 4-1.

Outer horizontal surface

Note.— Guidance on the need to provide an outer horizontal surface and its characteristics is contained in the Airport Services Manual *(Doc 9137), Part 6.*

Conical surface

4.1.1 *Description.— Conical surface.* A surface sloping upwards and outwards from the periphery of the inner horizontal surface.

4.1.2 *Characteristics.—* The limits of the conical surface shall comprise:

a) a lower edge coincident with the periphery of the inner horizontal surface; and

b) an upper edge located at a specified height above the inner horizontal surface.

4.1.3 The slope of the conical surface shall be measured in a vertical plane perpendicular to the periphery of the inner horizontal surface.

Inner horizontal surface

4.1.4 *Description.— Inner horizontal surface.* A surface located in a horizontal plane above an aerodrome and its environs.

4.1.5 *Characteristics.—* The radius or outer limits of the inner horizontal surface shall be measured from a reference point or points established for such purpose.

Note.— The shape of the inner horizontal surface need not necessarily be circular. Guidance on determining the extent of the inner horizontal surface is contained in the Airport Services Manual *(Doc 9137), Part 6.*

4.1.6 The height of the inner horizontal surface shall be measured above an elevation datum established for such purpose.

Note.— Guidance on determining the elevation datum is contained in the Airport Services Manual *(Doc 9137), Part 6.*

Approach surface

4.1.7 *Description.— Approach surface.* An inclined plane or combination of planes preceding the threshold.

4.1.8 *Characteristics.—* The limits of the approach surface shall comprise:

a) an inner edge of specified length, horizontal and perpendicular to the extended centre line of the runway and located at a specified distance before the threshold;

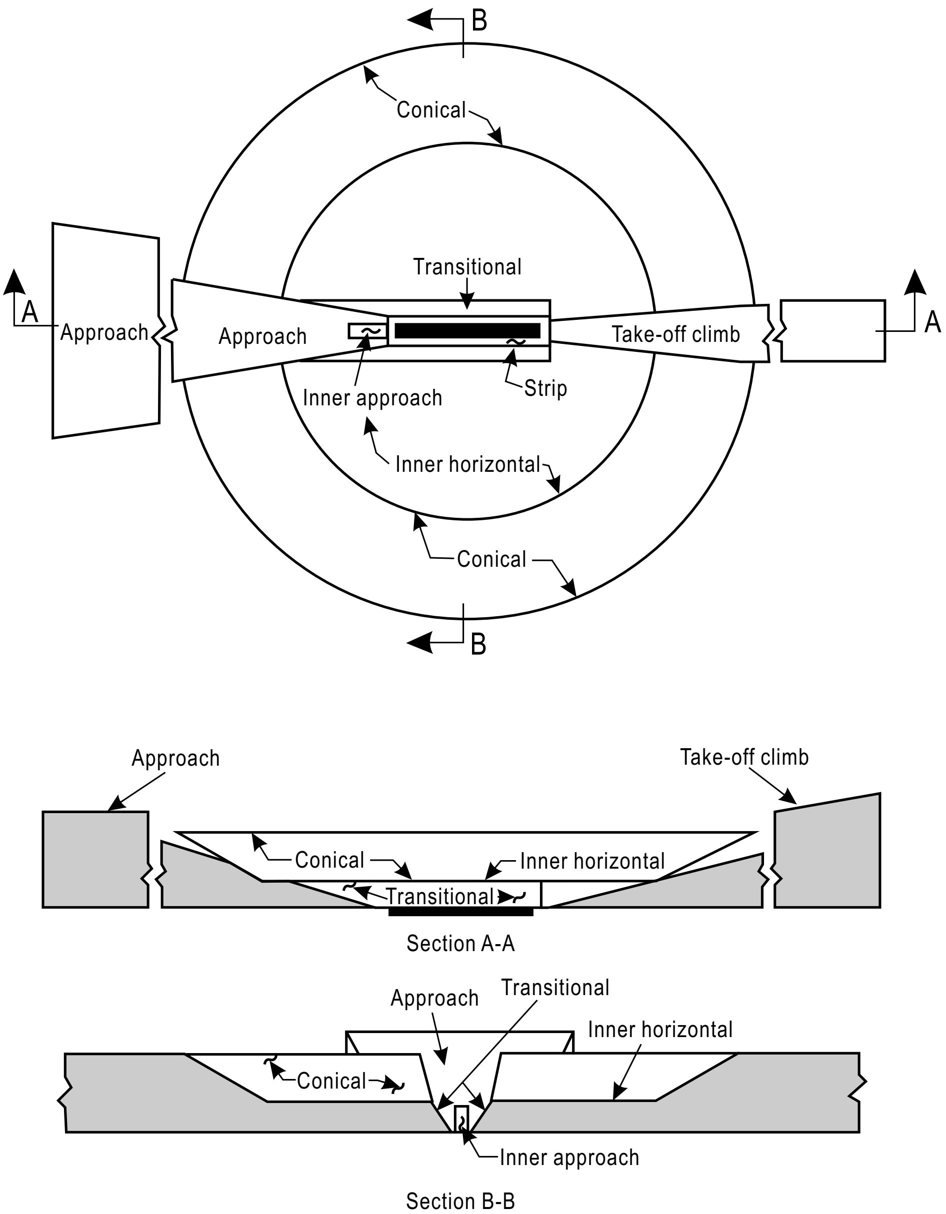
b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the runway;

c) an outer edge parallel to the inner edge; and

d) The above surfaces shall be varied when lateral offset, offset or curved approaches are utilized, specifically, two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, offset or curved ground track.

4.1.9 The elevation of the inner edge shall be equal to the elevation of the mid-point of the threshold.

4.1.10 The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the runway and shall continue containing the centre line of any lateral offset or curved ground track.



See Figure 4-2 for inner transitional and balked landing obstacle limitation surfaces and Attachment B for a three-dimensional view

Figure 4-1. Obstacle limitation surfaces

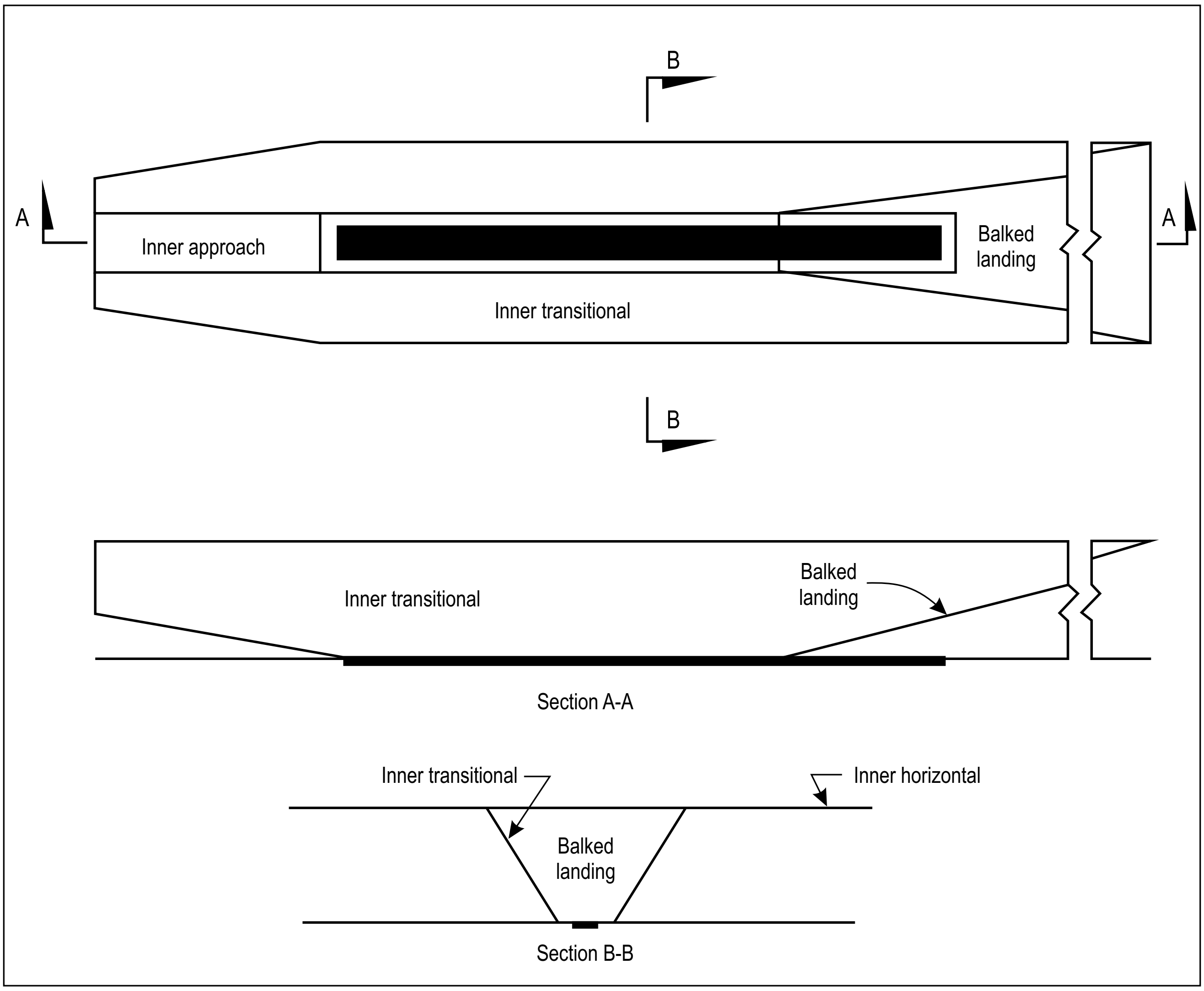


Figure 4-2. Inner approach, inner transitional and balked landing obstacle limitation surfaces

Inner approach surface

4.1.11 *Description.— Inner approach surface.* A rectangular portion of the approach surface immediately preceding the threshold.

4.1.12 *Characteristics.—* The limits of the inner approach surface shall comprise:

a) an inner edge coincident with the location of the inner edge of the approach surface but of its own specified length;

b) two sides originating at the ends of the inner edge and extending parallel to the vertical plane containing the centre line of the runway; and

c) an outer edge parallel to the inner edge.

Transitional surface

4.1.13 *Description.— Transitional surface.* A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface.

4.1.14 *Characteristics.—* The limits of a transitional surface shall comprise:

a) a lower edge beginning at the intersection of the side of the approach surface with the inner horizontal surface and extending down the side of the approach surface to the inner edge of the approach surface and from there along the length of the strip parallel to the runway centre line; and

b) an upper edge located in the plane of the inner horizontal surface.

4.1.15 The elevation of a point on the lower edge shall be:

a) along the side of the approach surface — equal to the elevation of the approach surface at that point; and

b) along the strip — equal to the elevation of the nearest point on the centre line of the runway or its extension.

Note.— As a result of b) the transitional surface along the strip will be curved if the runway profile is curved, or a plane if the runway profile is a straight line. The intersection of the transitional surface with the inner horizontal surface will also be a curved or a straight line depending on the runway profile.

4.1.16 The slope of the transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

Inner transitional surface

Note.— It is intended that the inner transitional surface be the controlling obstacle limitation surface for navigation aids, aircraft and other vehicles that must be near the runway and which is not to be penetrated except for frangible objects. The transitional surface described in 4.1.13 is intended to remain as the controlling obstacle limitation surface for buildings, etc.

4.1.17 *Description.— Inner transitional surface.* A surface similar to the transitional surface but closer to the runway.

4.1.18 *Characteristics.—* The limits of an inner transitional surface shall comprise:

a) a lower edge beginning at the end of the inner approach surface and extending down the side of the inner approach surface to the inner edge of that surface, from there along the strip parallel to the runway centre line to the inner edge of the balked landing surface and from there up the side of the balked landing surface to the point where the side intersects the inner horizontal surface; and

b) an upper edge located in the plane of the inner horizontal surface.

4.1.19 The elevation of a point on the lower edge shall be:

a) along the side of the inner approach surface and balked landing surface — equal to the elevation of the particular surface at that point; and

b) along the strip — equal to the elevation of the nearest point on the centre line of the runway or its extension.

Note.— As a result of b) the inner transitional surface along the strip will be curved if the runway profile is curved or a plane if the runway profile is a straight line. The intersection of the inner transitional surface with the inner horizontal surface will also be a curved or straight line depending on the runway profile.

4.1.20 The slope of the inner transitional surface shall be measured in a vertical plane at right angles to the centre line of the runway.

Balked landing surface

4.1.21 *Description.— Balked landing surface.* An inclined plane located at a specified distance after the threshold, extending between the inner transitional surface.

4.1.22 *Characteristics.—* The limits of the balked landing surface shall comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located at a specified distance after the threshold;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the runway; and

c) an outer edge parallel to the inner edge and located in the plane of the inner horizontal surface.

4.1.23 The elevation of the inner edge shall be equal to the elevation of the runway centre line at the location of the inner edge.

4.1.24 The slope of the balked landing surface shall be measured in the vertical plane containing the centre line of the runway.

Take-off climb surface

4.1.25 *Description.— Take-off climb surface.* An inclined plane or other specified surface beyond the end of a runway or clearway.

4.1.26 *Characteristics.—* The limits of the take-off climb surface shall comprise:

a) an inner edge horizontal and perpendicular to the centre line of the runway and located either at a specified distance beyond the end of the runway or at the end of the clearway when such is provided and its length exceeds the specified distance;

b) two sides originating at the ends of the inner edge, diverging uniformly at a specified rate from the take-off track to a specified final width and continuing thereafter at that width for the remainder of the length of the take-off climb surface; and

c) an outer edge horizontal and perpendicular to the specified take-off track.

4.1.27 The elevation of the inner edge shall be equal to the highest point on the extended runway centre line between the end of the runway and the inner edge, except that when a clearway is provided the elevation shall be equal to the highest point on the ground on the centre line of the clearway.

4.1.28 In the case of a straight take-off flight path, the slope of the take-off climb surface shall be measured in the vertical plane containing the centre line of the runway.

4.1.29 In the case of a take-off flight path involving a turn, the take-off climb surface shall be a complex surface containing the horizontal normals to its centre line, and the slope of the centre line shall be the same as that for a straight take-off flight path.

4.2 Obstacle limitation requirements

Note.— The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a runway, i.e. take-off or landing and type of approach, and are intended to be applied when such use is made of the runway. In cases where operations are conducted to or from both directions of a runway, then the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.

Non-instrument runways

4.2.1 The following obstacle limitation surfaces shall be established for a non-instrument runway:

— conical surface;
— inner horizontal surface;
— approach surface; and
— transitional surfaces.

4.2.2 The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1.

4.2.3 New objects or extensions of existing objects shall not be permitted above an approach or transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual *(Doc 9137), Part 6.*

4.2.4 **Recommendation.—** *New objects or extensions of existing objects should not be permitted above the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

4.2.5 **Recommendation.—** *Existing objects above any of the surfaces required by 4.2.1 should as far as practicable be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.— Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

4.2.6 **Recommendation.—** *In considering proposed construction, account should be taken of the possible future development of an instrument runway and consequent requirement for more stringent obstacle limitation surfaces.*

Non-precision approach runways

4.2.7 The following obstacle limitation surfaces shall be established for a non-precision approach runway:

— conical surface;
— inner horizontal surface;
— approach surface; and
— transitional surfaces.

4.2.8 The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1, except in the case of the horizontal section of the approach surface (see 4.2.9).

4.2.9 The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

a) a horizontal plane 150 m above the threshold elevation; or

b) the horizontal plane passing through the top of any object that governs the obstacle clearance altitude/height (OCA/H);

whichever is the higher.

Table 4-1. Dimensions and slopes of obstacle limitation surfaces —Approach runways

APPROACH RUNWAYS

	RUNWAY CLASSIFICATION									
	Non-instrument				Non-precision approach			Precision approach category I		Precision approach category II or III
	Code number				Code number			Code number		Code number
Surface and dimensions[a]	1	2	3	4	1,2	3	4	1,2	3,4	3,4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CONICAL										
Slope	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Height	35 m	55 m	75 m	100 m	60 m	75 m	100 m	60 m	100 m	100 m
INNER HORIZONTAL										
Height	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m
Radius	2 000 m	2 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m
INNER APPROACH										
Width	—	—	—	—	—	—	—	90 m	120 m[e]	120 m[e]
Distance from threshold	—	—	—	—	—	—	—	60 m	60 m	60 m
Length	—	—	—	—	—	—	—	900 m	900 m	900 m
Slope								2.5%	2%	2%
APPROACH										
Length of inner edge	60 m	80 m	150 m	150 m	150 m	300 m	300 m	150 m	300 m	300 m
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%	15%	15%	15%	15%	15%	15%
First section										
Length	1 600 m	2 500 m	3 000 m	3 000 m	2 500 m	3 000 m	3 000 m	3 000 m	3 000 m	3 000 m
Slope	5%	4%	3.33%	2.5%	3.33%	2%	2%	2.5%	2%	2%
Second section										
Length	—	—	—	—	—	3 600 m[b]	3 600 m[b]	12 000 m	3 600 m[b]	3 600 m[b]
Slope	—	—	—	—	—	2.5%	2.5%	3%	2.5%	2.5%
Horizontal section										
Length	—	—	—	—	—	8 400 m[b]	8 400 m[b]	—	8 400 m[b]	8 400 m[b]
Total length	—	—	—	—	—	15 000 m	15 000 m	15 000 m	15 000 m	15 000 m
TRANSITIONAL										
Slope	20%	20%	14.3%	14.3%	20%	14.3%	14.3%	14.3%	14.3%	14.3%
INNER TRANSITIONAL										
Slope	—	—	—	—	—	—	—	40%	33.3%	33.3%
BALKED LANDING SURFACE										
Length of inner edge	—	—	—	—	—	—	—	90 m	120 m[e]	120 m[e]
Distance from threshold	—	—	—	—	—	—	—	[c]	1 800 m[d]	1 800 m[d]
Divergence (each side)	—	—	—	—	—	—	—	10%	10%	10%
Slope	—	—	—	—	—	—	—	4%	3.33%	3.33%

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see 4.2.9 or 4.2.17).
c. Distance to the end of strip.
d. Or end of runway whichever is less.
e. Where the code letter is F (Column (3) of Table 1-1), the width is increased to 155 m. For information on code letter F aeroplanes equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre, see Circular 301 — *New Larger Aeroplanes — Infringement of the Obstacle Free Zone: Operational Measures and Aeronautical Study*.

4.2.10 New objects or extensions of existing objects shall not be permitted above an approach surface within 3 000 m of the inner edge or above a transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.11 **Recommendation.—** *New objects or extensions of existing objects should not be permitted above the approach surface beyond 3 000 m from the inner edge, the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

4.2.12 **Recommendation.—** *Existing objects above any of the surfaces required by 4.2.7 should as far as practicable be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.— Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

Precision approach runways

Note 1.— See 9.9 for information regarding siting of equipment and installations on operational areas.

Note 2.— Guidance on obstacle limitation surfaces for precision approach runways is given in the Airport Services Manual, *Part 6.*

4.2.13 The following obstacle limitation surfaces shall be established for a precision approach runway category I:

— conical surface;
— inner horizontal surface;
— approach surface; and
— transitional surfaces.

4.2.14 **Recommendation.—** *The following obstacle limitation surfaces should be established for a precision approach runway category I:*

— *inner approach surface;*
— *inner transitional surfaces; and*
— *balked landing surface.*

4.2.15 The following obstacle limitation surfaces shall be established for a precision approach runway category II or III:

— conical surface;
— inner horizontal surface;
— approach surface and inner approach surface;
— transitional surfaces;
— inner transitional surfaces; and
— balked landing surface.

4.2.16 The heights and slopes of the surfaces shall not be greater than, and their other dimensions not less than, those specified in Table 4-1, except in the case of the horizontal section of the approach surface (see 4.2.17).

4.2.17 The approach surface shall be horizontal beyond the point at which the 2.5 per cent slope intersects:

a) a horizontal plane 150 m above the threshold elevation; or

b) the horizontal plane passing through the top of any object that governs the obstacle clearance limit;

whichever is the higher.

4.2.18 Fixed objects shall not be permitted above the inner approach surface, the inner transitional surface or the balked landing surface, except for frangible objects which because of their function must be located on the strip. Mobile objects shall not be permitted above these surfaces during the use of the runway for landing.

4.2.19 New objects or extensions of existing objects shall not be permitted above an approach surface or a transitional surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.20 **Recommendation.—** *New objects or extensions of existing objects should not be permitted above the conical surface and the inner horizontal surface except when, in the opinion of the appropriate authority, an object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

4.2.21 **Recommendation.—** *Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface should as far as practicable be removed except when, in the opinion of the appropriate* *authority, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.— Because of transverse or longitudinal slopes on a strip, in certain cases the inner edge or portions of the inner edge of the approach surface may be below the corresponding elevation of the strip. It is not intended that the strip be graded to conform with the inner edge of the approach surface, nor is it intended that terrain or objects which are above the approach surface beyond the end of the strip, but below the level of the strip, be removed unless it is considered they may endanger aeroplanes.

Runways meant for take-off

4.2.22 The following obstacle limitation surface shall be established for a runway meant for take-off:

— take-off climb surface.

4.2.23 The dimensions of the surface shall be not less than the dimensions specified in Table 4-2, except that a lesser length may be adopted for the take-off climb surface where such lesser length would be consistent with procedural measures adopted to govern the outward flight of aeroplanes.

4.2.24 **Recommendation.—** *The operational characteristics of aeroplanes for which the runway is intended should be examined to see if it is desirable to reduce the slope specified in Table 4-2 when critical operating conditions are to be catered to. If the specified slope is reduced, corresponding adjustment in the length of take-off climb surface should be made so as to provide protection to a height of 300 m.*

Note.— When local conditions differ widely from sea level standard atmospheric conditions, it may be advisable for the slope specified in Table 4-2 to be reduced. The degree of this reduction depends on the divergence between local conditions and sea level standard atmospheric conditions, and on the performance characteristics and operational requirements of the aeroplanes for which the runway is intended.

4.2.25 New objects or extensions of existing objects shall not be permitted above a take-off climb surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.26 **Recommendation.—** *If no object reaches the 2 per cent (1:50) take-off climb surface, new objects should be limited to preserve the existing obstacle free surface or a surface down to a slope of 1.6 per cent (1:62.5).*

Table 4-2. Dimensions and slopes of obstacle limitation surfaces

RUNWAYS MEANT FOR TAKE-OFF

	Code number		
Surface and dimensions[a]	1	2	3 or 4
(1)	(2)	(3)	(4)
TAKE-OFF CLIMB			
Length of inner edge	60 m	80 m	180 m
Distance from runway end[b]	30 m	60 m	60 m
Divergence (each side)	10%	10%	12.5%
Final width	380 m	580 m	1 200 m 1 800 m[c]
Length	1 600 m	2 500 m	15 000 m
Slope	5%	4%	2%[d]

a. All dimensions are measured horizontally unless specified otherwise.
b. The take-off climb surface starts at the end of the clearway if the clearway length exceeds the specified distance.
c. 1 800 m when the intended track includes changes of heading greater than 15° for operations conducted in IMC, VMC by night.
d. See 4.2.24 and 4.2.26.

4.2.27 **Recommendation.—** *Existing objects that extend above a take-off climb surface should as far as practicable be removed except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

Note.— Because of transverse slopes on a strip or clearway, in certain cases portions of the inner edge of the take-off climb surface may be below the corresponding elevation of the strip or clearway. It is not intended that the strip or clearway be graded to conform with the inner edge of the take-off climb surface, nor is it intended that terrain or objects which are above the take-off climb surface beyond the end of the strip or clearway, but below the level of the strip or clearway, be removed unless it is considered they may endanger aeroplanes. Similar considerations apply at the junction of a clearway and strip where differences in transverse slopes exist.

4.3 Objects outside the obstacle limitation surfaces

4.3.1 **Recommendation.—** *Arrangements should be made to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that authority, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.*

4.3.2 **Recommendation.—** *In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 150 m or more above ground elevation should be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes.*

Note.— This study may have regard to the nature of operations concerned and may distinguish between day and night operations.

4.4 Other objects

4.4.1 **Recommendation.—** *Objects which do not project through the approach surface but which would nevertheless adversely affect the optimum siting or performance of visual or non-visual aids should, as far as practicable, be removed.*

4.4.2 **Recommendation.—** *Anything which may, in the opinion of the appropriate authority after aeronautical study, endanger aeroplanes on the movement area or in the air within the limits of the inner horizontal and conical surfaces should be regarded as an obstacle and should be removed in so far as practicable.*

Note.— In certain circumstances, objects that do not project above any of the surfaces enumerated in 4.1 may constitute a hazard to aeroplanes as, for example, where there are one or more isolated objects in the vicinity of an aerodrome.

CHAPTER 5. VISUAL AIDS FOR NAVIGATION

5.1 Indicators and signalling devices

5.1.1 Wind direction indicators

Application

5.1.1.1 An aerodrome shall be equipped with at least one wind direction indicator.

Location

5.1.1.2 A wind direction indicator shall be located so as to be visible from aircraft in flight or on the movement area and in such a way as to be free from the effects of air disturbances caused by nearby objects.

Characteristics

5.1.1.3 **Recommendation.—** *The wind direction indicator should be in the form of a truncated cone made of fabric and should have a length of not less than 3.6 m and a diameter, at the larger end, of not less than 0.9 m. It should be constructed so that it gives a clear indication of the direction of the surface wind and a general indication of the wind speed. The colour or colours should be so selected as to make the wind direction indicator clearly visible and understandable from a height of at least 300 m, having regard to background. Where practicable, a single colour, preferably white or orange, should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and should be arranged in five alternate bands, the first and last bands being the darker colour.*

5.1.1.4 **Recommendation.—** *The location of at least one wind direction indicator should be marked by a circular band 15 m in diameter and 1.2 m wide. The band should be centred about the wind direction indicator support and should be in a colour chosen to give adequate conspicuity, preferably white.*

5.1.1.5 **Recommendation.—** *Provision should be made for illuminating at least one wind indicator at an aerodrome intended for use at night.*

5.1.2 Landing direction indicator

Location

5.1.2.1 Where provided, a landing direction indicator shall be located in a conspicuous place on the aerodrome.

Characteristics

5.1.2.2 **Recommendation.—** *The landing direction indicator should be in the form of a "T".*

5.1.2.3 The shape and minimum dimensions of a landing "T" shall be as shown in Figure 5-1. The colour of the landing "T" shall be either white or orange, the choice being dependent on the colour that contrasts best with the background against which the indicator will be viewed. Where required for use at night the landing "T" shall either be illuminated or outlined by white lights.

5.1.3 Signalling lamp

Application

5.1.3.1 A signalling lamp shall be provided at a controlled aerodrome in the aerodrome control tower.

Characteristics

5.1.3.2 **Recommendation.—** *A signalling lamp should be capable of producing red, green and white signals, and of:*

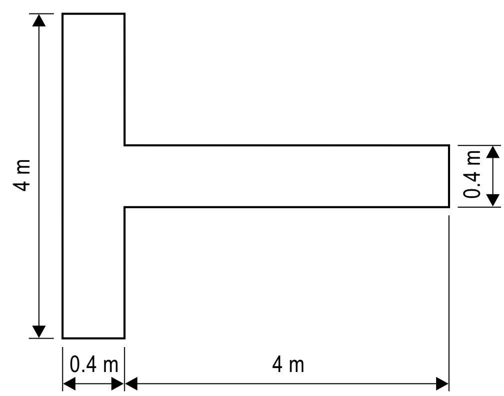


Figure 5-1. Landing direction indicator

a) being aimed manually at any target as required;

b) giving a signal in any one colour followed by a signal in either of the two other colours; and

c) transmitting a message in any one of the three colours by Morse Code up to a speed of at least four words per minute.

When selecting the green light, use should be made of the restricted boundary of green as specified in Appendix 1, 2.1.2.

5.1.3.3 **Recommendation.—** *The beam spread should be not less than 1° nor greater than 3°, with negligible light beyond 3°. When the signalling lamp is intended for use in the daytime the intensity of the coloured light should be not less than 6 000 cd.*

5.1.4 Signal panels and signal area

Note.— The inclusion of detailed specifications for a signal area in this section is not intended to imply that one has to be provided. Attachment A, Section 16 provides guidance on the need to provide ground signals. Annex 2, Appendix 1 specifies the shape, colour and use of visual ground signals. The Aerodrome Design Manual *(Doc 9157), Part 4 provides guidance on their design.*

Location of signal area

5.1.4.1 **Recommendation.—** *The signal area should be located so as to be visible for all angles of azimuth above an angle of 10° above the horizontal when viewed from a height of 300 m.*

Characteristics of signal area

5.1.4.2 The signal area shall be an even horizontal surface at least 9 m square.

5.1.4.3 **Recommendation.—** *The colour of the signal area should be chosen to contrast with the colours of the signal panels used, and it should be surrounded by a white border not less than 0.3 m wide.*

5.2 Markings

5.2.1 General

Interruption of runway markings

5.2.1.1 At an intersection of two (or more) runways the markings of the more important runway, except for the runway side stripe marking, shall be displayed and the markings of the other runway(s) shall be interrupted. The runway side stripe marking of the more important runway may be either continued across the intersection or interrupted.

5.2.1.2 **Recommendation.—** *The order of importance of runways for the display of runway markings should be as follows:*

1st — precision approach runway;

2nd — non-precision approach runway; and

3rd — non-instrument runway.

5.2.1.3 At an intersection of a runway and taxiway the markings of the runway shall be displayed and the markings of the taxiway interrupted, except that runway side stripe markings may be interrupted.

Note.— See 5.2.8.5 regarding the manner of connecting runway and taxiway centre line markings.

Colour and conspicuity

5.2.1.4 Runway markings shall be white.

Note 1.— It has been found that, on runway surfaces of light colour, the conspicuity of white markings can be improved by outlining them in black.

Note 2.— It is preferable that the risk of uneven friction characteristics on markings be reduced in so far as practicable by the use of a suitable kind of paint.

Note 3.— Markings may consist of solid areas or a series of longitudinal stripes providing an effect equivalent to the solid areas.

5.2.1.5 Taxiway markings, runway turn pad markings and aircraft stand markings shall be yellow.

5.2.1.6 Apron safety lines shall be of a conspicuous colour which shall contrast with that used for aircraft stand markings.

5.2.1.7 **Recommendation.—** *At aerodromes where operations take place at night, pavement markings should be made with reflective materials designed to enhance the visibility of the markings.*

Note.— Guidance on reflective materials is given in the Aerodrome Design Manual *(Doc 9157), Part 4.*

Unpaved taxiways

5.2.1.8 **Recommendation.—** *An unpaved taxiway should be provided, so far as practicable, with the markings prescribed for paved taxiways.*

5.2.2 Runway designation marking

Application

5.2.2.1 A runway designation marking shall be provided at the thresholds of a paved runway.

5.2.2.2 **Recommendation.—** *A runway designation marking should be provided, so far as practicable, at the thresholds of an unpaved runway.*

Location

5.2.2.3 A runway designation marking shall be located at a threshold as shown in Figure 5-2 as appropriate.

Note.— If the runway threshold is displaced from the extremity of the runway, a sign showing the designation of the runway may be provided for aeroplanes taking off.

Characteristics

5.2.2.4 A runway designation marking shall consist of a two-digit number and on parallel runways shall be supplemented with a letter. On a single runway, dual parallel runways and triple parallel runways the two-digit number shall be the whole number nearest the one-tenth of the magnetic North when viewed from the direction of approach. On four or more parallel runways, one set of adjacent runways shall be numbered to the nearest one-tenth magnetic azimuth and the other set of adjacent runways numbered to the next nearest one-tenth of the magnetic azimuth. When the above rule would give a single digit number, it shall be preceded by a zero.

5.2.2.5 In the case of parallel runways, each runway designation number shall be supplemented by a letter as follows, in the order shown from left to right when viewed from the direction of approach:

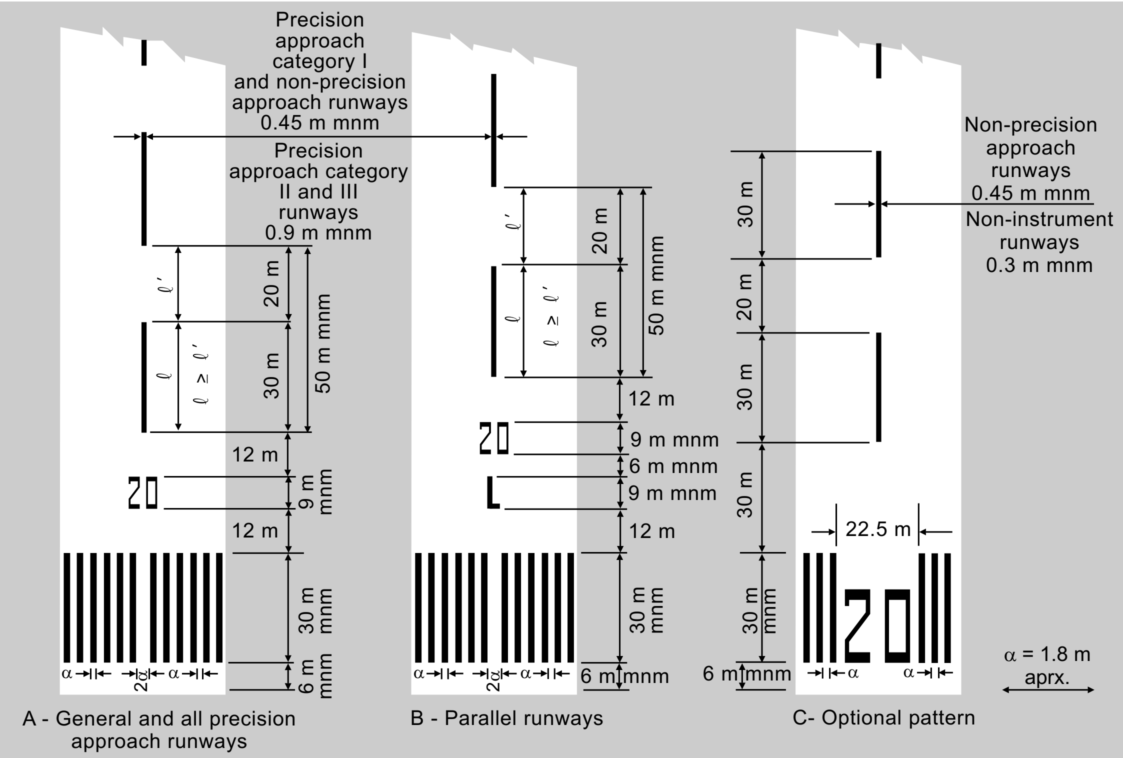
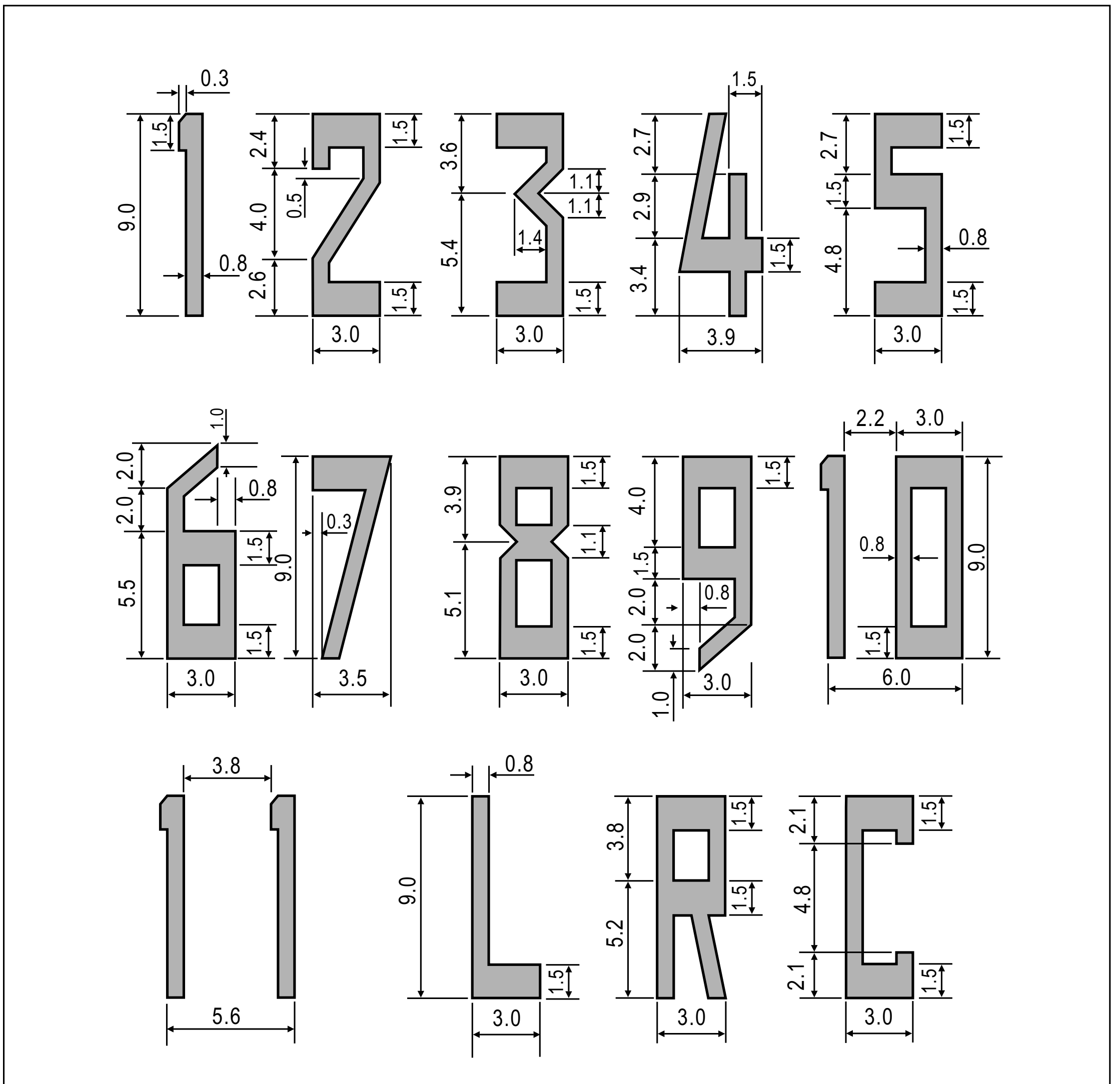


Figure 5-2. Runway designation, centre line and threshold markings



Note.— All units are expressed in metres.

Figure 5-3. Form and proportions of numbers and letters for runway designation markings

— for two parallel runways: "L" "R";

— for three parallel runways: "L" "C" "R";

— for four parallel runways: "L" "R" "L" "R";

— for five parallel runways: "L" "C" "R" "L" "R" or "L" "R" "L" "C" "R"; and

— for six parallel runways: "L" "C" "R" "L" "C" "R".

5.2.2.6 The numbers and letters shall be in the form and proportion shown in Figure 5-3. The dimensions shall be not less than those shown in Figure 5-3, but where the numbers are incorporated in the threshold marking, larger dimensions shall be used in order to fill adequately the gap between the stripes of the threshold marking.

5.2.3 Runway centre line marking

Application

5.2.3.1 A runway centre line marking shall be provided on a paved runway.

Location

5.2.3.2 A runway centre line marking shall be located along the centre line of the runway between the runway designation markings as shown in Figure 5-2, except when interrupted in compliance with 5.2.1.1.

Characteristics

5.2.3.3 A runway centre line marking shall consist of a line of uniformly spaced stripes and gaps. The length of a stripe plus a gap shall be not less than 50 m or more than 75 m. The length of each stripe shall be at least equal to the length of the gap or 30 m, whichever is greater.

5.2.3.4 The width of the stripes shall be not less than:

— 0.90 m on precision approach category II and III runways;

— 0.45 m on non-precision approach runways where the code number is 3 or 4, and precision approach category I runways; and

— 0.30 m on non-precision approach runways where the code number is 1 or 2, and on non-instrument runways.

5.2.4 Threshold marking

Application

5.2.4.1 A threshold marking shall be provided at the threshold of a paved instrument runway, and of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by international commercial air transport.

5.2.4.2 **Recommendation.—** *A threshold marking should be provided at the threshold of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by other than international commercial air transport.*

5.2.4.3 **Recommendation.—** *A threshold marking should be provided, so far as practicable, at the thresholds of an unpaved runway.*

Note.— The Aerodrome Design Manual, *Part 4, shows a form of marking which has been found satisfactory for the marking of downward slopes immediately before the threshold.*

Location

5.2.4.4 The stripes of the threshold marking shall commence 6 m from the threshold.

Characteristics

5.2.4.5 A runway threshold marking shall consist of a pattern of longitudinal stripes of uniform dimensions disposed symmetrically about the centre line of a runway as shown in Figure 5-2 (A) and (B) for a runway width of 45 m. The number of stripes shall be in accordance with the runway width as follows:

Runway width	*Number of stripes*
18 m	4
23 m	6
30 m	8
45 m	12
60 m	16

except that on non-precision approach and non-instrument runways 45 m or greater in width, they may be as shown in Figure 5-2 (C).

5.2.4.6 The stripes shall extend laterally to within 3 m of the edge of a runway or to a distance of 27 m on either side of a runway centre line, whichever results in the smaller lateral distance. Where a runway designation marking is placed within a threshold marking there shall be a minimum of three stripes on each side of the centre line of the runway. Where a runway designation marking is placed above a threshold marking, the stripes shall be continued across the runway. The stripes shall be at least 30 m long and approximately 1.80 m wide with spacings of approximately 1.80 m between them except that, where the stripes are continued across a runway, a double spacing shall be used to separate the two stripes nearest the centre line of the runway, and in the case where the designation marking is included within the threshold marking this spacing shall be 22.5 m.

Transverse stripe

5.2.4.7 **Recommendation.—** *Where a threshold is displaced from the extremity of a runway or where the extremity of a runway is not square with the runway centre line, a transverse stripe as shown in Figure 5-4 (B) should be added to the threshold marking.*

5.2.4.8 A transverse stripe shall be not less than 1.80 m wide.

Arrows

5.2.4.9 Where a runway threshold is permanently displaced, arrows conforming to Figure 5-4 (B) shall be provided on the portion of the runway before the displaced threshold.

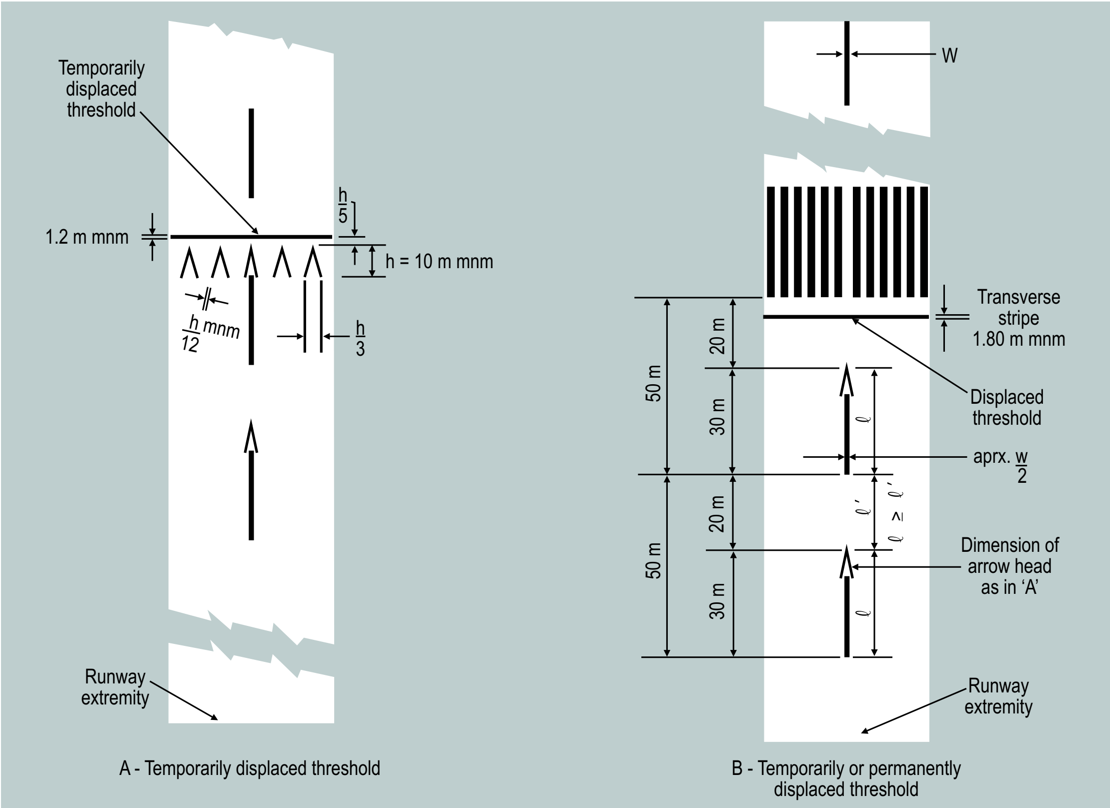


Figure 5-4. Displaced threshold markings

5.2.4.10 When a runway threshold is temporarily displaced from the normal position, it shall be marked as shown in Figure 5-4 (A) or 5-4 (B) and all markings prior to the displaced threshold shall be obscured except the runway centre line marking, which shall be converted to arrows.

Note 1.— In the case where a threshold is temporarily displaced for only a short period of time, it has been found satisfactory to use markers in the form and colour of a displaced threshold marking rather than attempting to paint this marking on the runway.

Note 2.— When the runway before a displaced threshold is unfit for the surface movement of aircraft, closed markings, as described in 7.1.4, are required to be provided.

5.2.5 Aiming point marking

Application

5.2.5.1 The provisions of Sections 5.2.5 and 5.2.6 shall not require the replacement of existing markings before 1 January 2005.

5.2.5.2 An aiming point marking shall be provided at each approach end of a paved instrument runway where the code number is 2, 3 or 4.

5.2.5.3 **Recommendation.—** *An aiming point marking should be provided at each approach end of:*

a) a paved non-instrument runway where the code number is 3 or 4,

b) a paved instrument runway where the code number is 1,

when additional conspicuity of the aiming point is desirable.

Location

5.2.5.4 The aiming point marking shall commence no closer to the threshold than the distance indicated in the appropriate column of Table 5-1, except that, on a runway equipped with a visual approach slope indicator system, the beginning of the marking shall be coincident with the visual approach slope origin.

Table 5-1. Location and dimensions of aiming point marking

Location and dimensions (1)	Landing distance available Less than 800 m (2)	800 m up to but not including 1 200 m (3)	1 200 m up to but not including 2 400 m (4)	2 400 m and above (5)
Distance from threshold to beginning of marking	150 m	250 m	300 m	400 m
Length of stripe[a]	30-45 m	30-45 m	45-60 m	45-60 m
Width of stripe	4 m	6 m	6-10 m[b]	6-10 m[b]
Lateral spacing between inner sides of stripes	6 m[c]	9 m[c]	18-22.5 m	18-22.5 m

a. The greater dimensions of the specified ranges are intended to be used where increased conspicuity is required.
b. The lateral spacing may be varied within these limits to minimize the contamination of the marking by rubber deposits.
c. These figures were deduced by reference to the outer main gear wheel span which is element 2 of the aerodrome reference code at Chapter 1, Table 1-1.

5.2.5.5 An aiming point marking shall consist of two conspicuous stripes. The dimensions of the stripes and the lateral spacing between their inner sides shall be in accordance with the provisions of the appropriate column of Table 5-1. Where a touchdown zone marking is provided, the lateral spacing between the markings shall be the same as that of the touchdown zone marking.

5.2.6 Touchdown zone marking

Application

5.2.6.1 A touchdown zone marking shall be provided in the touchdown zone of a paved precision approach runway where the code number is 2, 3 or 4.

5.2.6.2 **Recommendation.—** *A touchdown zone marking should be provided in the touchdown zone of a paved non-precision approach or non-instrument runway where the code number is 3 or 4 and additional conspicuity of the touchdown zone is desirable.*

Location and characteristics

5.2.6.3 A touchdown zone marking shall consist of pairs of rectangular markings symmetrically disposed about the runway centre line with the number of such pairs related to the landing distance available and, where the marking is to be displayed at both the approach directions of a runway, the distance between the thresholds, as follows:

Landing distance available or the distance between thresholds	*Pair(s) of markings*
less than 900 m	1
900 m up to but not including 1 200 m	2
1 200 m up to but not including 1 500 m	3
1 500 m up to but not including 2 400 m	4
2 400 m or more	6

5.2.6.4 A touchdown zone marking shall conform to either of the two patterns shown in Figure 5-5. For the pattern shown in Figure 5-5 (A), the markings shall be not less than 22.5 m long and 3 m wide. For the pattern shown in Figure 5-5 (B), each stripe of each marking shall be not less than 22.5 m long and 1.8 m wide with a spacing of 1.5 m between adjacent stripes. The lateral spacing between the inner sides of the rectangles shall be equal to that of the aiming point marking where provided. Where an aiming point marking is not provided, the lateral spacing between the inner sides of the rectangles shall correspond to the lateral spacing specified for the aiming point marking in Table 5-1 (columns 2, 3, 4 or 5, as appropriate). The pairs of markings shall be provided at longitudinal spacings of 150 m beginning from the threshold

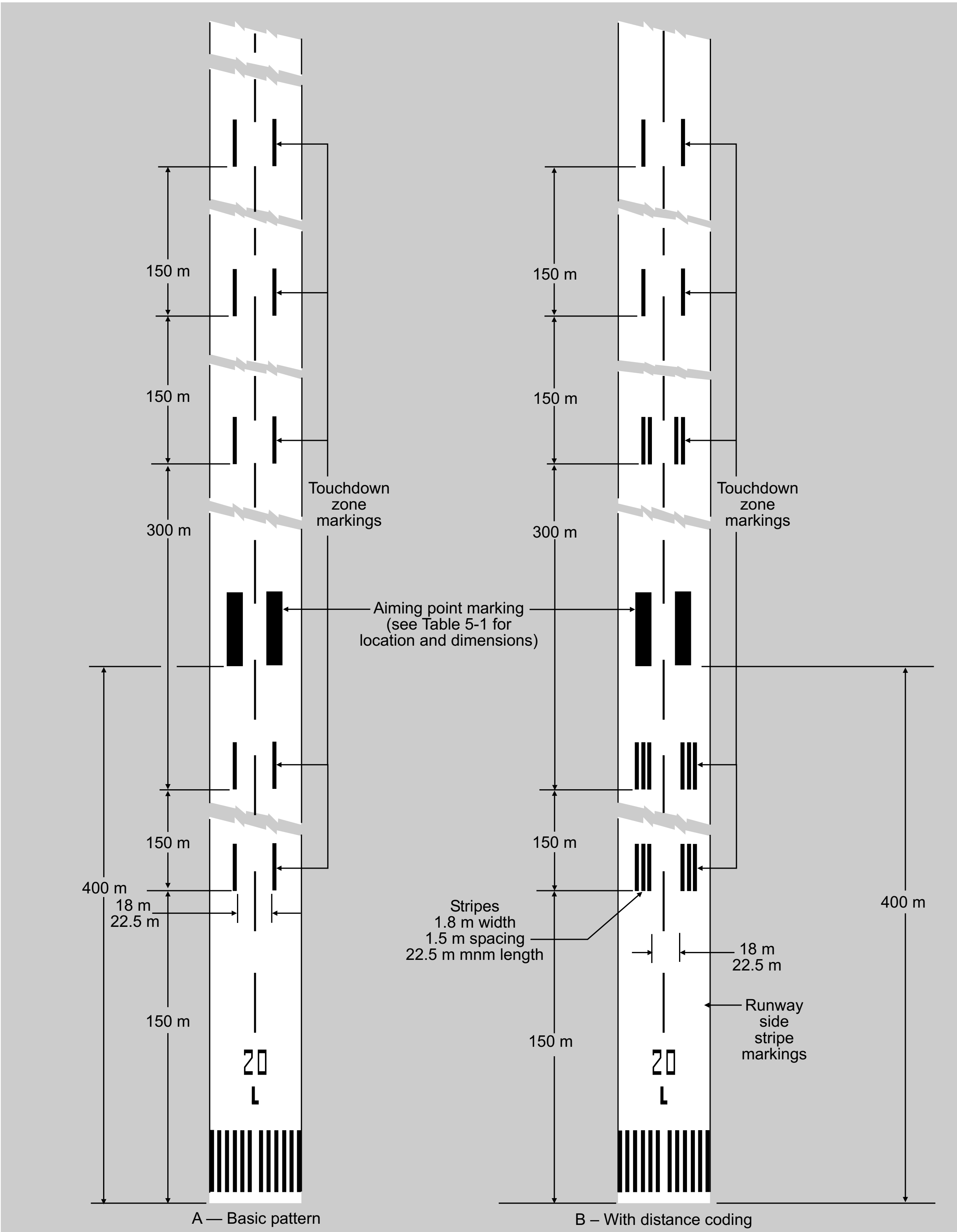


Figure 5-5. Aiming point and touchdown zone markings
(illustrated for a runway with a length of 2 400 m or more)

except that pairs of touchdown zone markings coincident with or located within 50 m of an aiming point marking shall be deleted from the pattern.

5.2.6.5 **Recommendation.—** *On a non-precision approach runway where the code number is 2, an additional pair of touchdown zone marking stripes should be provided 150 m beyond the beginning of the aiming point marking.*

5.2.7 Runway side stripe marking

Application

5.2.7.1 A runway side stripe marking shall be provided between the thresholds of a paved runway where there is a lack of contrast between the runway edges and the shoulders or the surrounding terrain.

5.2.7.2 **Recommendation.—** *A runway side stripe marking should be provided on a precision approach runway irrespective of the contrast between the runway edges and the shoulders or the surrounding terrain.*

Location

5.2.7.3 **Recommendation.—** *A runway side stripe marking should consist of two stripes, one placed along each edge of the runway with the outer edge of each stripe approximately on the edge of the runway, except that, where the runway is greater than 60 m in width, the stripes should be located 30 m from the runway centre line.*

5.2.7.4 **Recommendation.—** *Where a runway turn pad is provided, the runway side stripe marking should be continued between the runway and the runway turn pad.*

Characteristics

5.2.7.5 **Recommendation.—** *A runway side stripe should have an overall width of at least 0.9 m on runways 30 m or more in width and at least 0.45 m on narrower runways.*

5.2.8 Taxiway centre line marking

Application

5.2.8.1 Taxiway centre line marking shall be provided on a paved taxiway, de-icing/anti-icing facility and apron where the code number is 3 or 4 in such a way as to provide continuous guidance between the runway centre line and aircraft stands.

5.2.8.2 **Recommendation.—** *Taxiway centre line marking should be provided on a paved taxiway, de-icing/anti-icing facility and apron where the code number is 1 or 2 in such a way as to provide continuous guidance between the runway centre line and aircraft stands.*

5.2.8.3 Taxiway centre line marking shall be provided on a paved runway when the runway is part of a standard taxi-route and:

a) there is no runway centre line marking; or

b) where the taxiway centre line is not coincident with the runway centre line.

Location

5.2.8.4 **Recommendation.—** *On a straight section of a taxiway the taxiway centre line marking should be located along the taxiway centre line. On a taxiway curve the marking should continue from the straight portion of the taxiway at a constant distance from the outside edge of the curve.*

Note.— See 3.9.6 and Figure 3-2.

5.2.8.5 **Recommendation.—** *At an intersection of a taxiway with a runway where the taxiway serves as an exit from the runway, the taxiway centre line marking should be curved into the runway centre line marking as shown in Figures 5-6 and 5-25. The taxiway centre line marking should be extended parallel to the runway centre line marking for a distance of at least 60 m beyond the point of tangency where the code number is 3 or 4, and for a distance of at least 30 m where the code number is 1 or 2.*

5.2.8.6 **Recommendation.—** *Where taxiway centre line marking is provided on a runway in accordance with 5.2.8.3, the marking should be located on the centre line of the designated taxiway.*

Characteristics

5.2.8.7 A taxiway centre line marking shall be at least 15 cm in width and continuous in length except where it intersects with a runway-holding position marking or an intermediate holding position marking as shown in Figure 5-6.

5.2.9 Runway turn pad marking

Application

5.2.9.1 Where a runway turn pad is provided, a runway turn pad marking shall be provided for continuous guidance to enable an aeroplane to complete a 180-degree turn and align with the runway centre line.

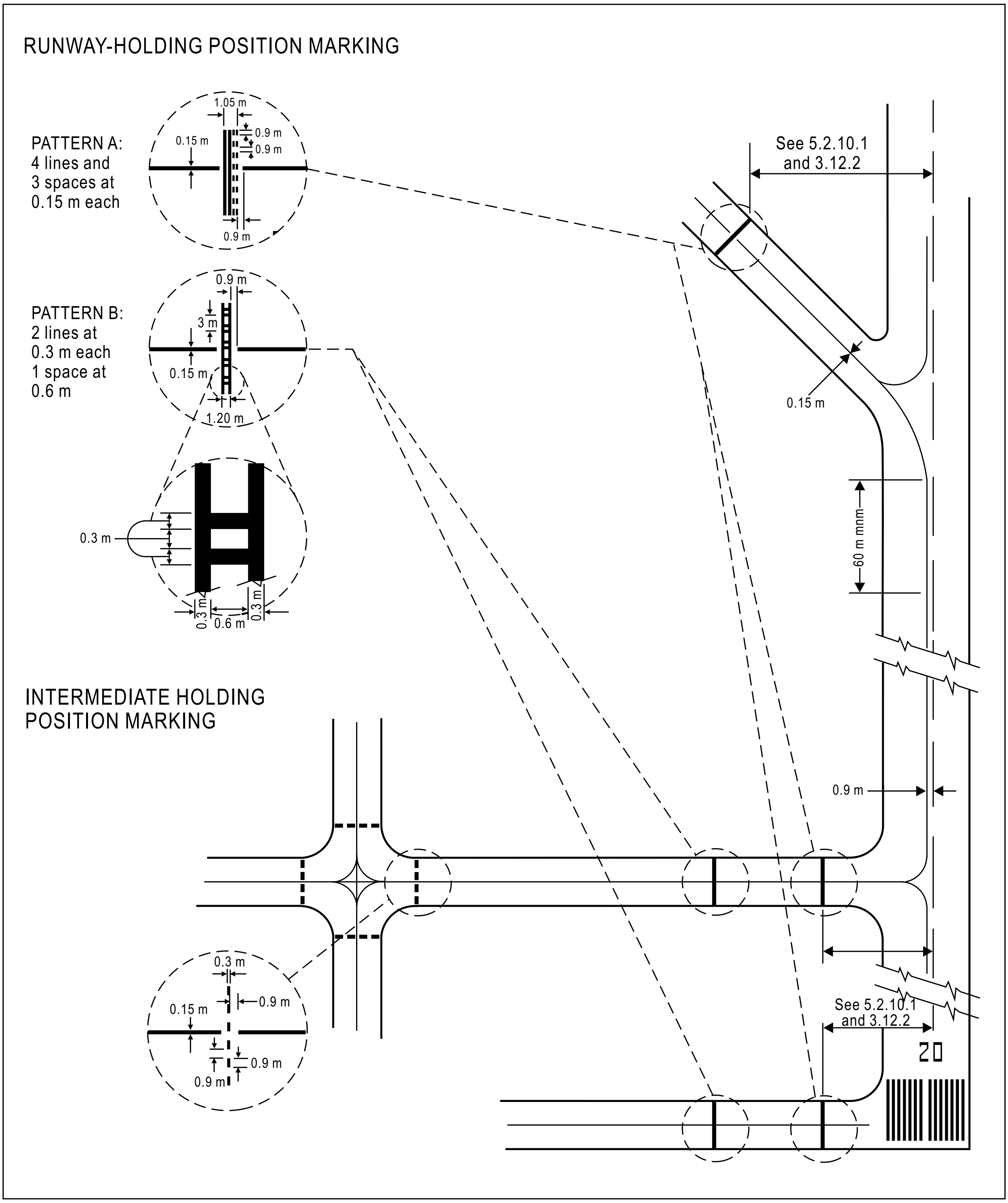


Figure 5-6. Taxiway markings
(shown with basic runway markings)

Location

5.2.9.2 **Recommendation.—** *The runway turn pad marking should be curved from the runway centre line into the turn pad. The radius of the curve should be compatible with the manoeuvring capability and normal taxiing speeds of the aeroplanes for which the runway turn pad is intended. The intersection angle of the runway turn pad marking with the runway centre line should not be greater than 30 degrees.*

5.2.9.3 **Recommendation.—** *The runway turn pad marking should be extended parallel to the runway centre line marking for a distance of at least 60 m beyond the point of tangency where the code number is 3 or 4, and for a distance of at least 30 m where the code number is 1 or 2.*

5.2.9.4 **Recommendation.—** *A runway turn pad marking should guide the aeroplane in such a way as to allow a straight portion of taxiing before the point where a 180-degree turn is to be made. The straight portion of the runway turn pad marking should be parallel to the outer edge of the runway turn pad.*

5.2.9.5 **Recommendation.—** *The design of the curve allowing the aeroplane to negotiate a 180-degree turn should be based on a nose wheel steering angle not exceeding 45 degrees.*

5.2.9.6 **Recommendation.—** *The design of the turn pad marking should be such that, when the cockpit of the aeroplane remains over the runway turn pad marking, the clearance distance between any wheel of the aeroplane landing gear and the edge of the runway turn pad should be not less than those specified in 3.3.6.*

Note.— For ease of manoeuvring, consideration may be given to providing a larger wheel-to-edge clearance for codes E and F aeroplanes. See 3.3.7.

Characteristics

5.2.9.7 A runway turn pad marking shall be at least 15 cm in width and continuous in length.

5.2.10 Runway-holding position marking

Application and location

5.2.10.1 A runway-holding position marking shall be displayed along a runway-holding position.

Note.— See 5.4.2 concerning the provision of signs at runway-holding positions.

Characteristics

5.2.10.2 At an intersection of a taxiway and a non-instrument, non-precision approach or take-off runway, the runway-holding position marking shall be as shown in Figure 5-6, pattern A.

5.2.10.3 Where a single runway-holding position is provided at an intersection of a taxiway and a precision approach category I, II or III runway, the runway-holding position marking shall be as shown in Figure 5-6, pattern A. Where two or three runway-holding positions are provided at such an intersection, the runway-holding position marking closer (closest) to the runway shall be as shown in Figure 5-6, pattern A and the markings farther from the runway shall be as shown in Figure 5-6, pattern B.

5.2.10.4 The runway-holding position marking displayed at a runway-holding position established in accordance with 3.12.3 shall be as shown in Figure 5-6, pattern A.

5.2.10.5 **Recommendation.—** *Where increased conspicuity of the runway-holding position is required, the runway-holding position marking should be as shown in Figure 5-7, pattern A or pattern B, as appropriate.*

5.2.10.6 **Recommendation.—** *Where a pattern B runway-holding position marking is located on an area where it would exceed 60 m in length, the term "CAT II" or "CAT III" as appropriate should be marked on the surface at the ends of the runway-holding position marking and at equal intervals of 45 m maximum between successive marks. The letters should be not less than 1.8 m high and should be placed not more than 0.9 m beyond the holding position marking.*

5.2.10.7 The runway-holding position marking displayed at a runway/runway intersection shall be perpendicular to the centre line of the runway forming part of the standard taxi-route. The pattern of the marking shall be as shown in Figure 5-7, pattern A.

5.2.11 Intermediate holding position marking

Application and location

5.2.11.1 **Recommendation.—** *An intermediate holding position marking should be displayed along an intermediate holding position.*

5.2.11.2 **Recommendation.—** *An intermediate holding position marking should be displayed at the exit boundary of a remote de-icing/anti-icing facility adjoining a taxiway.*

5.2.11.3 Where an intermediate holding position marking is displayed at an intersection of two paved taxiways, it shall be located across the taxiway at sufficient distance from the near edge of the intersecting taxiway to ensure safe clearance between taxiing aircraft. It shall be coincident with a stop bar or intermediate holding position lights, where provided.

5.2.11.4 The distance between an intermediate holding position marking at the exit boundary of a remote de-icing/anti-icing facility and the centre line of the adjoining taxiway shall not be less than the dimension specified in Table 3-1, column 11.

Characteristics

5.2.11.5 An intermediate holding position marking shall consist of a single broken line as shown in Figure 5-6.

5.2.12 VOR aerodrome check-point marking

Application

5.2.12.1 When a VOR aerodrome check-point is established, it shall be indicated by a VOR aerodrome check-point marking and sign.

Note.— See 5.4.4 for VOR aerodrome check-point sign.

5.2.12.2 *Site selection*

Note.— Guidance on the selection of sites for VOR aerodrome check-points is given in Annex 10, Volume I, Attachment E.

Location

5.2.12.3 A VOR aerodrome check-point marking shall be centred on the spot at which an aircraft is to be parked to receive the correct VOR signal.

Characteristics

5.2.12.4 A VOR aerodrome check-point marking shall consist of a circle 6 m in diameter and have a line width of 15 cm (see Figure 5-8 (A)).

5.2.12.5 **Recommendation.—** *When it is preferable for an aircraft to be aligned in a specific direction, a line should be provided that passes through the centre of the circle on the desired azimuth. The line should extend 6 m outside the circle in the desired direction of heading and terminate in an arrowhead. The width of the line should be 15 cm (see Figure 5-8 (B)).*

5.2.12.6 **Recommendation.—** *A VOR aerodrome check-point marking should preferably be white in colour but should differ from the colour used for the taxiway markings.*

Note.— To provide contrast, markings may be bordered with black.

5.2.13 Aircraft stand markings

Note.— Guidance on the layout of aircraft stand markings is contained in the Aerodrome Design Manual, *Part 4.*

Application

5.2.13.1 **Recommendation.—** *Aircraft stand markings should be provided for designated parking positions on a paved apron and on a de-icing/anti-icing facility.*

Location

5.2.13.2 **Recommendation.—** *Aircraft stand markings on a paved apron and on a de-icing/anti-icing facility should be located so as to provide the clearances specified in 3.13.6 and in 3.15.9 respectively, when the nose wheel follows the stand marking.*

Characteristics

5.2.13.3 **Recommendation.—** *Aircraft stand markings should include such elements as stand identification, lead-in line, turn bar, turning line, alignment bar, stop line and lead-out line, as are required by the parking configuration and to complement other parking aids.*

5.2.13.4 **Recommendation.—** *An aircraft stand identification (letter and/or number) should be included in the lead-in line a short distance after the beginning of the lead-in line. The height of the identification should be adequate to be readable from the cockpit of aircraft using the stand.*

5.2.13.5 **Recommendation.—** *Where two sets of aircraft stand markings are superimposed on each other in order to permit more flexible use of the apron and it is difficult to identify which stand marking should be followed, or safety would be impaired if the wrong marking was followed, then identification of the aircraft for which each set of markings is intended should be added to the stand identification.*

Note.— Example: 2A-B747, 2B-F28.

5.2.13.6 **Recommendation.—** *Lead-in, turning and lead-out lines should normally be continuous in length and have a width of not less than 15 cm. Where one or more sets of stand markings are superimposed on a stand marking, the lines should be continuous for the most demanding aircraft and broken for other aircraft.*

5.2.13.7 **Recommendation.—** *The curved portions of lead-in, turning and lead-out lines should have radii appropriate to the most demanding aircraft type for which the markings are intended.*

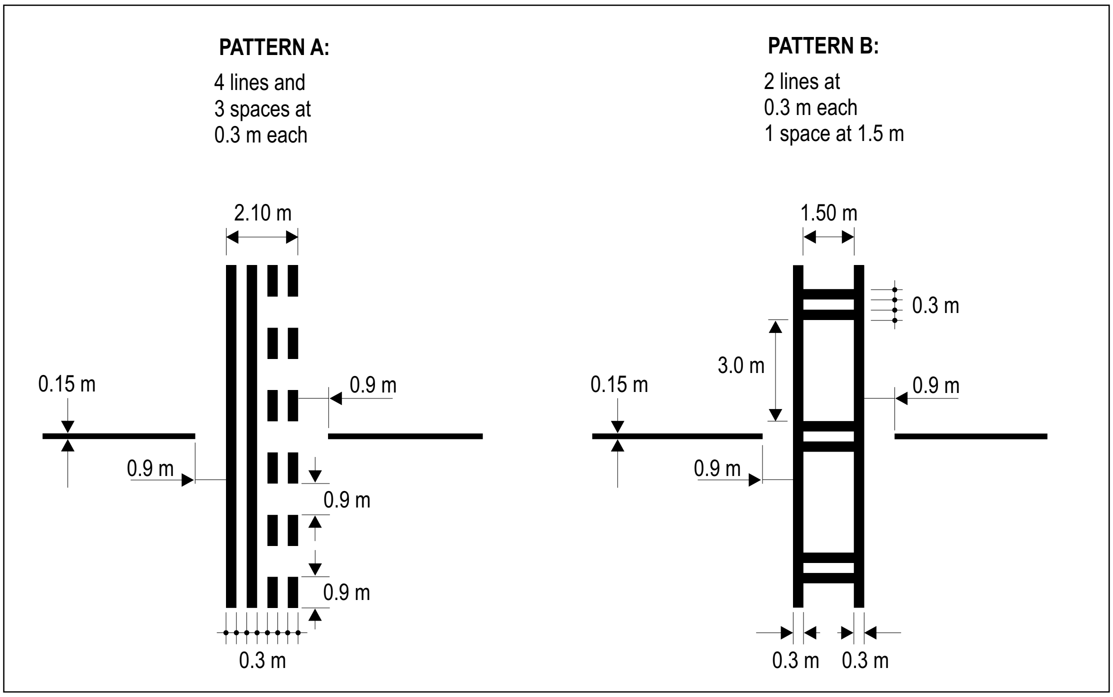


Figure 5-7. Runway-holding position markings

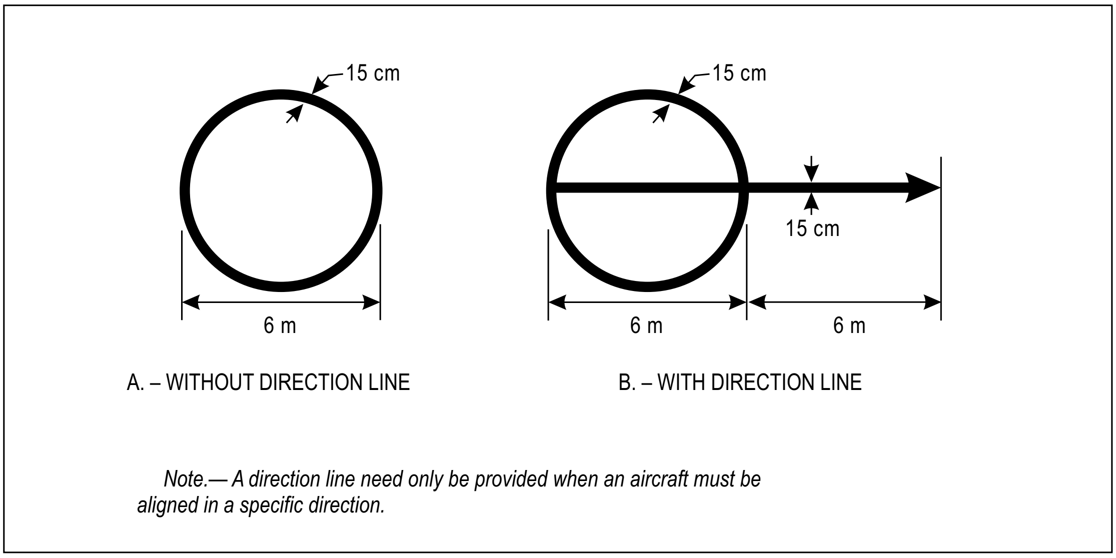


Figure 5-8. VOR aerodrome check-point marking

5.2.13.8 **Recommendation.—** *Where it is intended that an aircraft proceed in one direction only, arrows pointing in the direction to be followed should be added as part of the lead-in and lead-out lines.*

5.2.13.9 **Recommendation.—** *A turn bar should be located at right angles to the lead-in line, abeam the left pilot position at the point of initiation of any intended turn. It should have a length and width of not less than 6 m and 15 cm, respectively, and include an arrowhead to indicate the direction of turn.*

Note.— The distances to be maintained between the turn bar and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view.

5.2.13.10 **Recommendation.—** *If more than one turn bar and/or stop line is required, they should be coded.*

5.2.13.11 **Recommendation.—** *An alignment bar should be placed so as to be coincident with the extended centre line of the aircraft in the specified parking position and visible to the pilot during the final part of the parking manoeuvre. It should have a width of not less than 15 cm.*

5.2.13.12 **Recommendation.—** *A stop line should be located at right angles to the alignment bar, abeam the left pilot position at the intended point of stop. It should have a length and width of not less than 6 m and 15 cm, respectively.*

Note.— The distances to be maintained between the stop line and the lead-in line may vary according to different aircraft types, taking into account the pilot's field of view.

5.2.14 Apron safety lines

Note.— Guidance on apron safety lines is contained in the Aerodrome Design Manual, *Part 4.*

Application

5.2.14.1 **Recommendation.—** *Apron safety lines should be provided on a paved apron as required by the parking configurations and ground facilities.*

Location

5.2.14.2 Apron safety lines shall be located so as to define the areas intended for use by ground vehicles and other aircraft servicing equipment, etc., to provide safe separation from aircraft.

Characteristics

5.2.14.3 **Recommendation.—** *Apron safety lines should include such elements as wing tip clearance lines and service road boundary lines as required by the parking configurations and ground facilities.*

5.2.14.4 **Recommendation.—** *An apron safety line should be continuous in length and at least 10 cm in width.*

5.2.15 Road-holding position marking

Application

5.2.15.1 A road-holding position marking shall be provided at all road entrances to a runway.

Location

5.2.15.2 The road-holding position marking shall be located across the road at the holding position.

Characteristics

5.2.15.3 The road-holding position marking shall be in accordance with the local road traffic regulations.

5.2.16 Mandatory instruction marking

Note.— Guidance on mandatory instruction marking is given in the Aerodrome Design Manual, *Part 4.*

Application

5.2.16.1 Where it is impracticable to install a mandatory instruction sign in accordance with 5.4.2.1, a mandatory instruction marking shall be provided on the surface of the pavement.

5.2.16.2 **Recommendation.—** *Where operationally required, such as on taxiways exceeding 60 m in width, a mandatory instruction sign should be supplemented by a mandatory instruction marking.*

Location

5.2.16.3 The mandatory instruction marking shall be located on the left-hand side of the taxiway centre line marking and on the holding side of the runway-holding position marking as shown in Figure 5-9. The distance between the nearest edge of the marking and the runway-holding position marking or the taxiway centre line marking shall be not less than 1 m.

5.2.16.4 **Recommendation.—** *Except where operationally required, a mandatory instruction marking should not be located on a runway.*

Characteristics

5.2.16.5 A mandatory instruction marking shall consist of an inscription in white on a red background. Except for a NO ENTRY marking, the inscription shall provide information identical to that of the associated mandatory instruction sign.

5.2.16.6 A NO ENTRY marking shall consist of an inscription in white reading NO ENTRY on a red background.

5.2.16.7 Where there is insufficient contrast between the marking and the pavement surface, the mandatory instruction marking shall include an appropriate border, preferably white or black.

5.2.16.8 **Recommendation.—** *The character height should be 4 m. The inscriptions should be in the form and proportions shown in Appendix 3.*

5.2.16.9 **Recommendation.—** *The background should be rectangular and extend a minimum of 0.5 m laterally and vertically beyond the extremities of the inscription.*

5.2.17 Information marking

Note.— Guidance on information marking is contained in the Aerodrome Design Manual *(Doc 9157), Part 4.*

Application

5.2.17.1 Where an information sign would normally be installed and is impractical to install, as determined by the appropriate authority, an information marking shall be displayed on the surface of the pavement.

5.2.17.2 **Recommendation.—** *Where operationally required an information sign should be supplemented by an information marking.*

5.2.17.3 **Recommendation.—** *An information (location/ direction) marking should be displayed prior to and following complex taxiway intersections and where operational experience has indicated the addition of a taxiway location marking could assist flight crew ground navigation.*

5.2.17.4 **Recommendation.—** *An information (location) marking should be displayed on the pavement surface at regular intervals along taxiways of great length.*

Location

5.2.17.5 **Recommendation.—** *The information marking should be displayed across the surface of the taxiway or apron where necessary and positioned so as to be legible from the cockpit of an approaching aircraft.*

Characteristics

5.2.17.6 An information marking shall consist of:

a) an inscription in yellow upon a black background, when it replaces or supplements a location sign; and

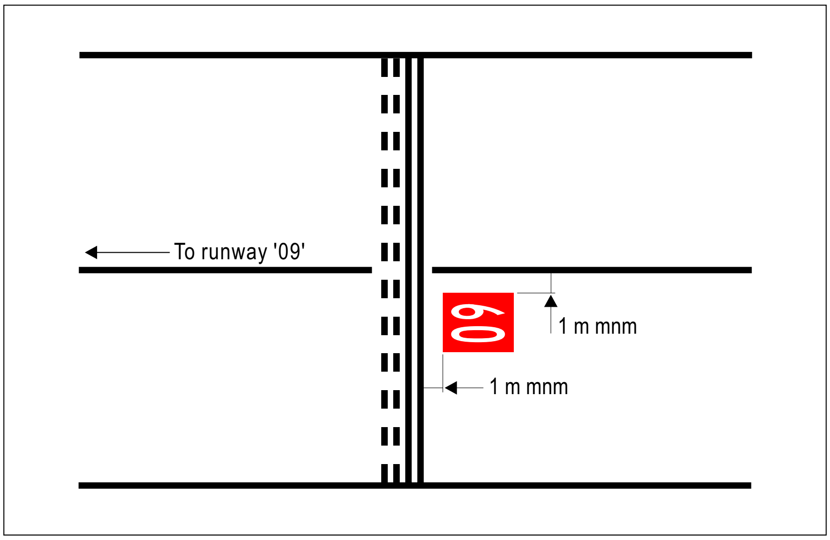


Figure 5-9. Mandatory instruction marking

b) an inscription in black upon a yellow background, when it replaces or supplements a direction or destination sign.

5.2.17.7 Where there is insufficient contrast between the marking background and the pavement surface, the marking shall include:

a) a black border where the inscriptions are in black; and

b) a yellow border where the inscriptions are in yellow.

5.2.17.8 **Recommendation.—** *The character height should be 4 m. The inscriptions should be in the form and proportions shown in Appendix 3.*

5.3 Lights

5.3.1 General

Lights which may endanger the safety of aircraft

5.3.1.1 A non-aeronautical ground light near an aerodrome which might endanger the safety of aircraft shall be extinguished, screened or otherwise modified so as to eliminate the source of danger.

Laser emissions which may endanger the safety of aircraft

5.3.1.2 **Recommendation.—***To protect the safety of aircraft against the hazardous effects of laser emitters, the following protected zones should be established around aerodromes:*

— a laser-beam free flight zone (LFFZ)
— a laser-beam critical flight zone (LCFZ)
— a laser-beam sensitive flight zone (LSFZ).

Note 1.— Figures 5-10, 5-11 and 5-12 may be used to determine the exposure levels and distances that adequately protect flight operations.

Note 2.— The restrictions on the use of laser beams in the three protected flight zones, LFFZ, LCFZ and LSFZ, refer to visible laser beams only. Laser emitters operated by the authorities in a manner compatible with flight safety are excluded. In all navigable air space, the irradiance level of any laser beam, visible or invisible, is expected to be less than or equal to the maximum permissible exposure (MPE) unless such emission has been notified to the authority and permission obtained.

Note 3.— The protected flight zones are established in order to mitigate the risk of operating laser emitters in the vicinity of aerodromes.

Note 4.— Further guidance on how to protect flight operations from the hazardous effects of laser emitters is contained in the Manual on Laser Emitters and Flight Safety *(Doc 9815).*

Note 5.— See also Annex 11 — Air Traffic Services, *Chapter 2.*

Lights which may cause confusion

5.3.1.3 **Recommendation.—** *A non-aeronautical ground light which, by reason of its intensity, configuration or colour, might prevent, or cause confusion in, the clear interpretation of aeronautical ground lights should be extinguished, screened or otherwise modified so as to eliminate such a possibility. In particular, attention should be directed to a non-aeronautical ground light visible from the air within the areas described hereunder:*

a) Instrument runway — code number 4:

within the areas before the threshold and beyond the end of the runway extending at least 4 500 m in length from the threshold and runway end and 750 m either side of the extended runway centre line in width.

b) Instrument runway — code number 2 or 3:

as in a), except that the length should be at least 3 000 m.

c) Instrument runway — code number 1; and non-instrument runway:

within the approach area.

Aeronautical ground lights which may cause confusion to mariners

Note.— In the case of aeronautical ground lights near navigable waters, consideration needs to be given to ensuring that the lights do not cause confusion to mariners.

Light fixtures and supporting structures

Note.— See 9.9 for information regarding siting of equipment and installations on operational areas, and the Aerodrome Design Manual *(Doc 9157), Part 6 or guidance on frangibility of light fixtures and supporting structures.*

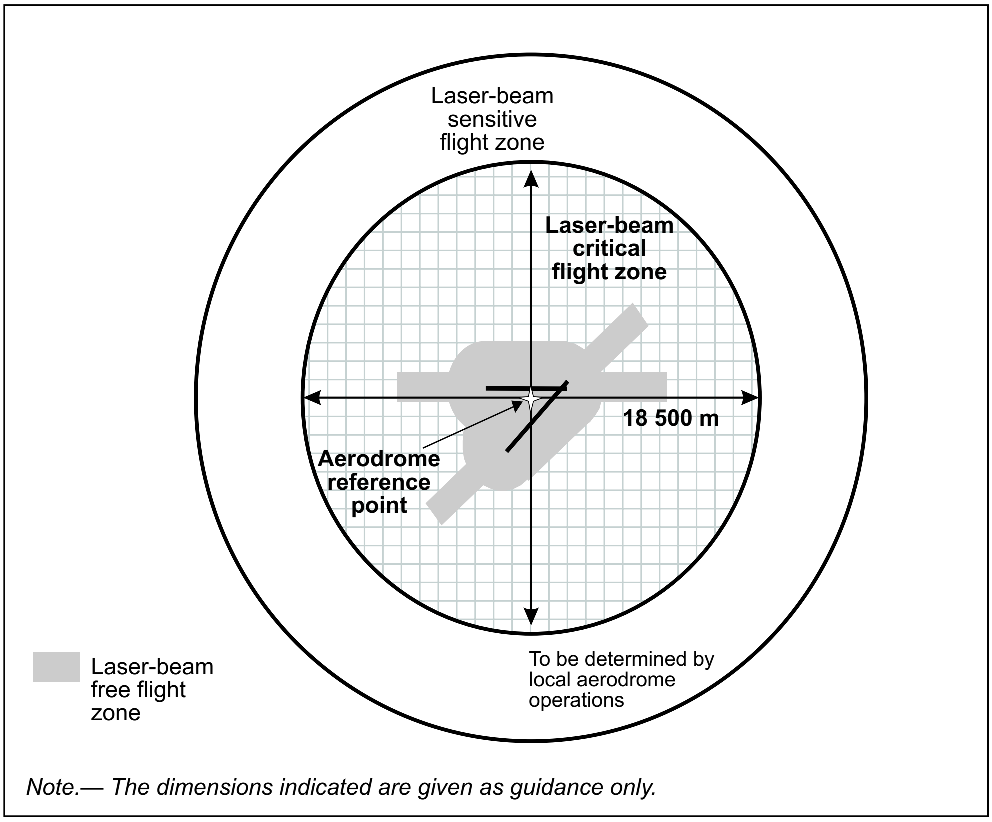


Figure 5-10. Protected flight zones

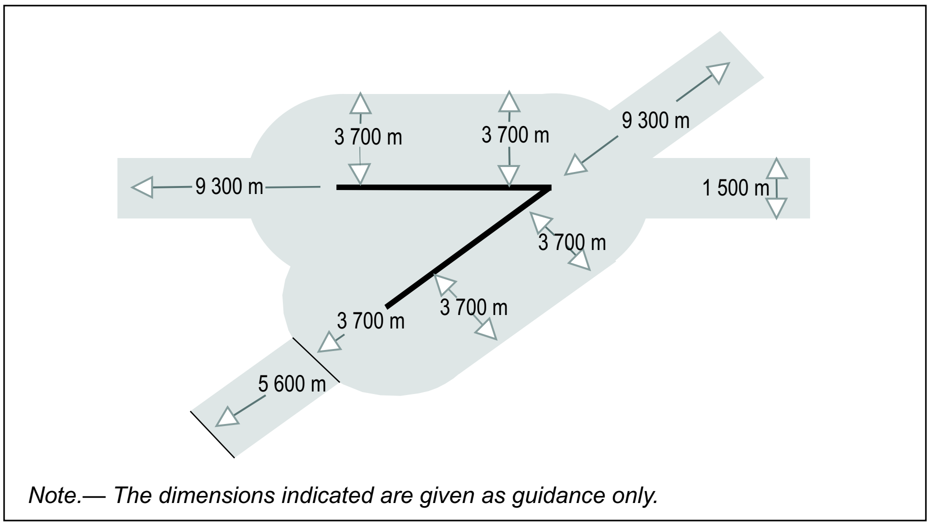


Figure 5-11. Multiple runway laser-beam free flight zone

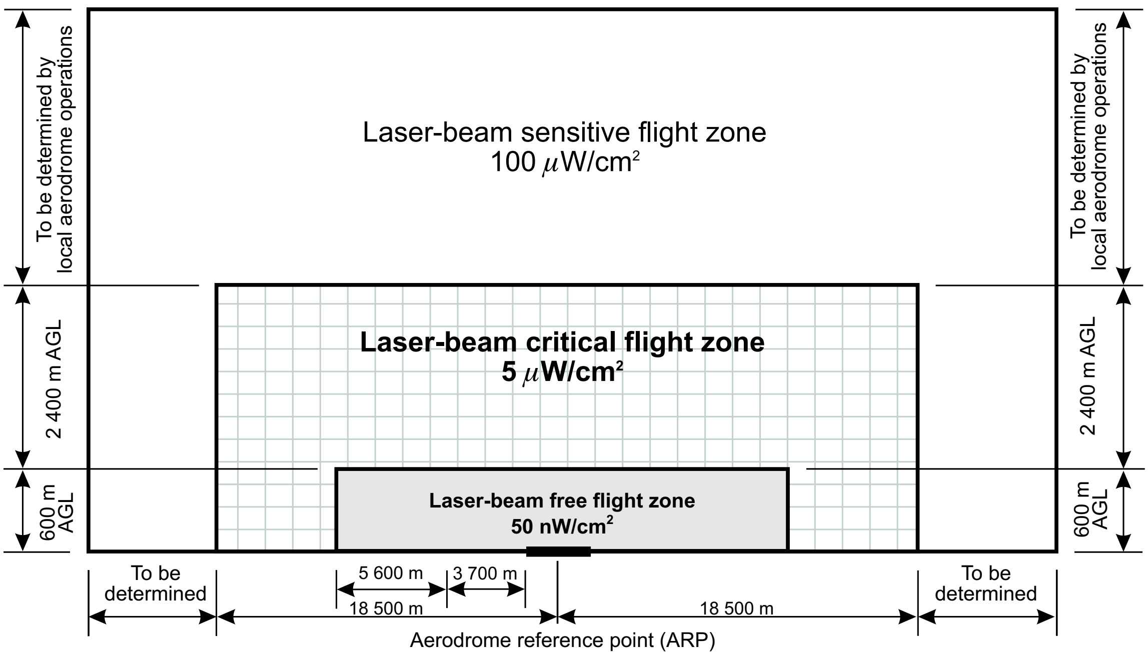


Figure 5-12. Protected flight zones with indication of maximum irradiance levels for visible laser beams

Elevated approach lights

5.3.1.4 Elevated approach lights and their supporting structures shall be frangible except that, in that portion of the approach lighting system beyond 300 m from the threshold:

a) where the height of a supporting structure exceeds 12 m, the frangibility requirement shall apply to the top 12 m only; and

b) where a supporting structure is surrounded by non-frangible objects, only that part of the structure that extends above the surrounding objects shall be frangible.

5.3.1.5 The provisions of 5.3.1.4 shall not require the replacement of existing installations before 1 January 2005.

5.3.1.6 When an approach light fixture or supporting structure is not in itself sufficiently conspicuous, it shall be suitably marked.

Elevated lights

5.3.1.7 Elevated runway, stopway and taxiway lights shall be frangible. Their height shall be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft.

Surface lights

5.3.1.8 Light fixtures inset in the surface of runways, stopways, taxiways and aprons shall be so designed and fitted as to withstand being run over by the wheels of an aircraft without damage either to the aircraft or to the lights themselves.

5.3.1.9 **Recommendation.—** *The temperature produced by conduction or radiation at the interface between an installed inset light and an aircraft tire should not exceed 160°C during a 10-minute period of exposure.*

Note.— Guidance on measuring the temperature of inset lights is given in the Aerodrome Design Manual, *Part 4.*

Light intensity and control

Note.— In dusk or poor visibility conditions by day, lighting can be more effective than marking. For lights to be effective in such conditions or in poor visibility by night, they must be of adequate intensity. To obtain the required intensity, it will usually be necessary to make the light directional, in which case the arcs over which the light shows will have to be adequate and so orientated as to meet the operational requirements. The runway lighting system will have to be considered as a whole, to ensure that the relative light intensities are suitably matched to the same end. (See Attachment A, Section 14, and the Aerodrome Design Manual, *Part 4.)*

5.3.1.10 The intensity of runway lighting shall be adequate for the minimum conditions of visibility and ambient light in which use of the runway is intended, and compatible with that of the nearest section of the approach lighting system when provided.

Note.— While the lights of an approach lighting system may be of higher intensity than the runway lighting, it is good practice to avoid abrupt changes in intensity as these could give a pilot a false impression that the visibility is changing during approach.

5.3.1.11 Where a high-intensity lighting system is provided, a suitable intensity control shall be incorporated to allow for adjustment of the light intensity to meet the pre-vailing conditions. Separate intensity controls or other suitable methods shall be provided to ensure that the following systems, when installed, can be operated at compatible intensities:

— approach lighting system;

— runway edge lights;

— runway threshold lights;

— runway end lights;

— runway centre line lights;

— runway touchdown zone lights; and

— taxiway centre line lights.

5.3.1.12 On the perimeter of and within the ellipse defining the main beam in Appendix 2, Figures A2-1 to A2-10, the maximum light intensity value shall not be greater than three times the minimum light intensity value measured in accord-ance with Appendix 2, collective notes for Figures A2-1 to A2-11, Note 2.

5.3.1.13 On the perimeter of and within the rectangle defining the main beam in Appendix 2, Figures A2-12 to A2-20, the maximum light intensity value shall not be greater than three times the minimum light intensity value measured in accordance with Appendix 2, collective notes for Figures A2-12 to A2-21, Note 2.

5.3.2 Emergency lighting

Application

5.3.2.1 **Recommendation.—** *At an aerodrome provided with runway lighting and without a secondary power supply, sufficient emergency lights should be conveniently available for installation on at least the primary runway in the event of failure of the normal lighting system.*

Note.— Emergency lighting may also be useful to mark obstacles or delineate taxiways and apron areas.

Location

5.3.2.2 **Recommendation.—** *When installed on a runway the emergency lights should, as a minimum, conform to the configuration required for a non-instrument runway.*

Characteristics

5.3.2.3 **Recommendation.—** *The colour of the emergency lights should conform to the colour requirements for runway lighting, except that, where the provision of coloured lights at the threshold and the runway end is not practicable, all lights may be variable white or as close to variable white as practicable.*

5.3.3 Aeronautical beacons

Application

5.3.3.1 Where operationally necessary an aerodrome beacon or an identification beacon shall be provided at each aerodrome intended for use at night.

5.3.3.2 The operational requirement shall be determined having regard to the requirements of the air traffic using the aerodrome, the conspicuity of the aerodrome features in relation to its surroundings and the installation of other visual and non-visual aids useful in locating the aerodrome.

Aerodrome beacon

5.3.3.3 An aerodrome beacon shall be provided at an aerodrome intended for use at night if one or more of the following conditions exist:

a) aircraft navigate predominantly by visual means;

b) reduced visibilities are frequent; or

c) it is difficult to locate the aerodrome from the air due to surrounding lights or terrain.

Location

5.3.3.4 The aerodrome beacon shall be located on or adjacent to the aerodrome in an area of low ambient background lighting.

5.3.3.5 **Recommendation.—** *The location of the beacon should be such that the beacon is not shielded by objects in significant directions and does not dazzle a pilot approaching to land.*

Characteristics

5.3.3.6 The aerodrome beacon shall show either coloured flashes alternating with white flashes, or white flashes only. The frequency of total flashes shall be from 20 to 30 per minute. Where used, the coloured flashes emitted by beacons at land aerodromes shall be green and coloured flashes emitted by beacons at water aerodromes shall be yellow. In the case of a combined water and land aerodrome, coloured flashes, if used, shall have the colour characteristics of whichever section of the aerodrome is designated as the principal facility.

5.3.3.7 The light from the beacon shall show at all angles of azimuth. The vertical light distribution shall extend upwards from an elevation of not more than 1° to an elevation determined by the appropriate authority to be sufficient to provide guidance at the maximum elevation at which the beacon is intended to be used and the effective intensity of the flash shall be not less than 2 000 cd.

Note.— At locations where a high ambient background lighting level cannot be avoided, the effective intensity of the flash may be required to be increased by a factor up to a value of 10.

Identification beacon

Application

5.3.3.8 An identification beacon shall be provided at an aerodrome which is intended for use at night and cannot be easily identified from the air by other means.

Location

5.3.3.9 The identification beacon shall be located on the aerodrome in an area of low ambient background lighting.

5.3.3.10 **Recommendation.—** *The location of the beacon should be such that the beacon is not shielded by objects in significant directions and does not dazzle a pilot approaching to land.*

Characteristics

5.3.3.11 An identification beacon at a land aerodrome shall show at all angles of azimuth. The vertical light distribution shall extend upwards from an elevation of not more than 1° to an elevation determined by the appropriate authority to be sufficient to provide guidance at the maximum elevation at which the beacon is intended to be used and the effective intensity of the flash shall be not less than 2 000 cd.

Note.— At locations where a high ambient background lighting level cannot be avoided, the effective intensity of the flash may be required to be increased by a factor up to a value of 10.

5.3.3.12 An identification beacon shall show flashing-green at a land aerodrome and flashing-yellow at a water aerodrome.

5.3.3.13 The identification characters shall be transmitted in the International Morse Code.

5.3.3.14 **Recommendation.—** *The speed of transmission should be between six and eight words per minute, the corresponding range of duration of the Morse dots being from 0.15 to 0.2 seconds per dot.*

5.3.4 Approach lighting systems

Note.— It is intended that existing lighting systems not conforming to the specifications in 5.3.4.21, 5.3.4.39, 5.3.9.10, 5.3.10.10, 5.3.10.11, 5.3.11.5, 5.3.12.8, 5.3.13.6 and 5.3.16.8 be replaced not later than 1 January 2005.

Application

5.3.4.1 *Application*

A.— Non-instrument runway

Recommendation.— *Where physically practicable, a simple approach lighting system as specified in 5.3.4.2 to 5.3.4.9 should be provided to serve a non-instrument runway where the code number is 3 or 4 and intended for use at night, except when the runway is used only in conditions of good visibility, and sufficient guidance is provided by other visual aids.*

Note.— A simple approach lighting system can also provide visual guidance by day.

B.— Non-precision approach runway

Where physically practicable, a simple approach lighting system as specified in 5.3.4.2 to 5.3.4.9 shall be provided to serve a non-precision approach runway, except when the runway is used only in conditions of good visibility or sufficient guidance is provided by other visual aids.

Note.— It is advisable to give consideration to the installation of a precision approach category I lighting system or to the addition of a runway lead-in lighting system.

C.— Precision approach runway category I

Where physically practicable, a precision approach category I lighting system as specified in 5.3.4.10 to 5.3.4.21 shall be provided to serve a precision approach runway category I.

D.— Precision approach runway categories II and III

A precision approach category II and III lighting system as specified in 5.3.4.22 to 5.3.4.39 shall be provided to serve a precision approach runway category II or III.

Simple approach lighting system

Location

5.3.4.2 A simple approach lighting system shall consist of a row of lights on the extended centre line of the runway extending, whenever possible, over a distance of not less than 420 m from the threshold with a row of lights forming a crossbar 18 m or 30 m in length at a distance of 300 m from the threshold.

5.3.4.3 The lights forming the crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights of the crossbar shall be spaced so as to produce a linear effect, except that, when a crossbar of 30 m is used, gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6 m.

Note 1.— Spacings for the crossbar lights between 1 m and 4 m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and fire fighting vehicles.

Note 2.— See Attachment A, Section 11 for guidance on installation tolerances.

5.3.4.4 The lights forming the centre line shall be placed at longitudinal intervals of 60 m, except that, when it is desired to improve the guidance, an interval of 30 m may be used. The innermost light shall be located either 60 m or 30 m from the threshold, depending on the longitudinal interval selected for the centre line lights.

5.3.4.5 **Recommendation.—** *If it is not physically possible to provide a centre line extending for a distance of 420 m from the threshold, it should be extended to 300 m so as to include the crossbar. If this is not possible, the centre line lights should be extended as far as practicable, and each centre line light should then consist of a barrette at least 3 m in length. Subject to the approach system having a crossbar at 300 m from the threshold, an additional crossbar may be provided at 150 m from the threshold.*

5.3.4.6 The system shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no object other than an ILS or MLS azimuth antenna shall protrude through the plane of the approach lights within a distance of 60 m from the centre line of the system; and

b) no light other than a light located within the central part of a crossbar or a centre line barrette (not their extremities) shall be screened from an approaching aircraft.

Any ILS or MLS azimuth antenna protruding through the plane of the lights shall be treated as an obstacle and marked and lighted accordingly.

Characteristics

5.3.4.7 The lights of a simple approach lighting system shall be fixed lights and the colour of the lights shall be such as to ensure that the system is readily distinguishable from other aeronautical ground lights, and from extraneous lighting if present. Each centre line light shall consist of either:

a) a single source; or

b) a barrette at least 3 m in length.

Note 1.— When the barrette as in b) is composed of lights approximating to point sources, a spacing of 1.5 m between adjacent lights in the barrette has been found satisfactory.

Note 2.— It may be advisable to use barrettes 4 m in length if it is anticipated that the simple approach lighting system will be developed into a precision approach lighting system.

Note 3.— At locations where identification of the simple approach lighting system is difficult at night due to surrounding lights, sequence flashing lights installed in the outer portion of the system may resolve this problem.

5.3.4.8 **Recommendation.—** *Where provided for a non-instrument runway, the lights should show at all angles in* *azimuth necessary to a pilot on base leg and final approach. The intensity of the lights should be adequate for all conditions of visibility and ambient light for which the system has been provided.*

5.3.4.9 **Recommendation.—** *Where provided for a non-precision approach runway, the lights should show at all angles in azimuth necessary to the pilot of an aircraft which on final approach does not deviate by an abnormal amount from the path defined by the non-visual aid. The lights should be designed to provide guidance during both day and night in the most adverse conditions of visibility and ambient light for which it is intended that the system should remain usable.*

Precision approach category I lighting system

Location

5.3.4.10 A precision approach category I lighting system shall consist of a row of lights on the extended centre line of the runway extending, wherever possible, over a distance of 900 m from the runway threshold with a row of lights forming a crossbar 30 m in length at a distance of 300 m from the runway threshold.

Note.— The installation of an approach lighting system of less than 900 m in length may result in operational limitations on the use of the runway. See Attachment A, Section 11.

5.3.4.11 The lights forming the crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights of the crossbar shall be spaced so as to produce a linear effect, except that gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6 m.

Note 1.— Spacings for the crossbar lights between 1 m and 4 m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and fire fighting vehicles.

Note 2.— See Attachment A, Section 11 for guidance on installation tolerances.

5.3.4.12 The lights forming the centre line shall be placed at longitudinal intervals of 30 m with the innermost light located 30 m from the threshold.

5.3.4.13 The system shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no object other than an ILS or MLS azimuth antenna shall protrude through the plane of the approach lights within a distance of 60 m from the centre line of the system; and

b) no light other than a light located within the central part of a crossbar or a centre line barrette (not their extremities) shall be screened from an approaching aircraft.

Any ILS or MLS azimuth antenna protruding through the plane of the lights shall be treated as an obstacle and marked and lighted accordingly.

Characteristics

5.3.4.14 The centre line and crossbar lights of a precision approach category I lighting system shall be fixed lights showing variable white. Each centre line light position shall consist of either:

a) a single light source in the innermost 300 m of the centre line, two light sources in the central 300 m of the centre line and three light sources in the outer 300 m of the centre line to provide distance information; or

b) a barrette.

5.3.4.15 Where the serviceability level of the approach lights specified as a maintenance objective in 10.4.10 can be demonstrated, each centre line light position may consist of either:

a) a single light source; or

b) a barrette.

5.3.4.16 The barrettes shall be at least 4 m in length. When barrettes are composed of lights approximating to point sources, the lights shall be uniformly spaced at intervals of not more than 1.5 m.

5.3.4.17 **Recommendation.—** *If the centre line consists of barrettes as described in 5.3.4.14 b) or 5.3.4.15 b), each barrette should be supplemented by a capacitor discharge light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.18 Each capacitor discharge light as described in 5.3.4.17 shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

5.3.4.19 If the centre line consists of lights as described in 5.3.4.14 a) or 5.3.4.15 a), additional crossbars of lights to the crossbar provided at 300 m from the threshold shall be provided at 150 m, 450 m, 600 m and 750 m from the threshold. The lights forming each crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights shall be spaced so as to produce a linear effect, except that gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6 m.

Note.— See Attachment A, Section 11 for detailed configuration.

5.3.4.20 Where the additional crossbars described in 5.3.4.19 are incorporated in the system, the outer ends of the crossbars shall lie on two straight lines that either are parallel to the line of the centre line lights or converge to meet the runway centre line 300 m from threshold.

5.3.4.21 The lights shall be in accordance with the specifications of Appendix 2, Figure A2-1.

Note.— The flight path envelopes used in the design of these lights are given in Attachment A, Figure A-4.

Precision approach category II and III lighting system

Location

5.3.4.22 The approach lighting system shall consist of a row of lights on the extended centre line of the runway, extending, wherever possible, over a distance of 900 m from the runway threshold. In addition, the system shall have two side rows of lights, extending 270 m from the threshold, and two crossbars, one at 150 m and one at 300 m from the threshold, all as shown in Figure 5-13. Where the serviceability level of the approach lights specified as maintenance objectives in 10.4.7 can be demonstrated, the system may have two side rows of lights, extending 240 m from the threshold, and two crossbars, one at 150 m and one at 300 m from the threshold, all as shown in Figure 5-14.

Note.— The length of 900 m is based on providing guidance for operations under category I, II and III conditions. Reduced lengths may support category II and III operations but may impose limitations on category I operations. See Attachment A, Section 11.

5.3.4.23 The lights forming the centre line shall be placed at longitudinal intervals of 30 m with the innermost lights located 30 m from the threshold.

5.3.4.24 The lights forming the side rows shall be placed on each side of the centre line, at a longitudinal spacing equal to that of the centre line lights and with the first light located 30 m from the threshold. Where the serviceability level of the approach lights specified as maintenance objectives in 10.4.7 can be demonstrated, lights forming the side rows may be placed on each side of the centre line, at a longitudinal spacing of 60 m with the first light located 60 m from the threshold. The lateral spacing (or gauge) between the innermost lights of the side rows shall be not less than 18 m nor more than 22.5 m, and preferably 18 m, but in any event shall be equal to that of the touchdown zone lights.

5.3.4.25 The crossbar provided at 150 m from the threshold shall fill in the gaps between the centre line and side row lights.

5.3.4.26 The crossbar provided at 300 m from the threshold shall extend on both sides of the centre line lights to a distance of 15 m from the centre line.

5.3.4.27 If the centre line beyond a distance of 300 m from the threshold consists of lights as described in 5.3.4.31 b) or 5.3.4.32 b), additional crossbars of lights shall be provided at 450 m, 600 m and 750 m from the threshold.

5.3.4.28 Where the additional crossbars described in 5.3.4.27 are incorporated in the system, the outer ends of these crossbars shall lie on two straight lines that either are parallel to the centre line or converge to meet the runway centre line 300 m from the threshold.

5.3.4.29 The system shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no object other than an ILS or MLS azimuth antenna shall protrude through the plane of the approach lights within a distance of 60 m from the centre line of the system; and

b) no light other than a light located within the central part of a crossbar or a centre line barrette (not their extremities) shall be screened from an approaching aircraft.

Any ILS or MLS azimuth antenna protruding through the plane of the lights shall be treated as an obstacle and marked and lighted accordingly.

Characteristics

5.3.4.30 The centre line of a precision approach category II and III lighting system for the first 300 m from the threshold shall consist of barrettes showing variable white, except that, where the threshold is displaced 300 m or more, the centre line may consist of single light sources showing variable white. Where the serviceability level of the approach lights specified as maintenance objectives in 10.4.7 can be demonstrated, the centre line of a precision approach category II and III lighting system for the first 300 m from the threshold may consist of either:

a) barrettes, where the centre line beyond 300 m from the threshold consists of barrettes as described in 5.3.4.32 a); or

b) alternate single light sources and barrettes, where the centre line beyond 300 m from the threshold consists of

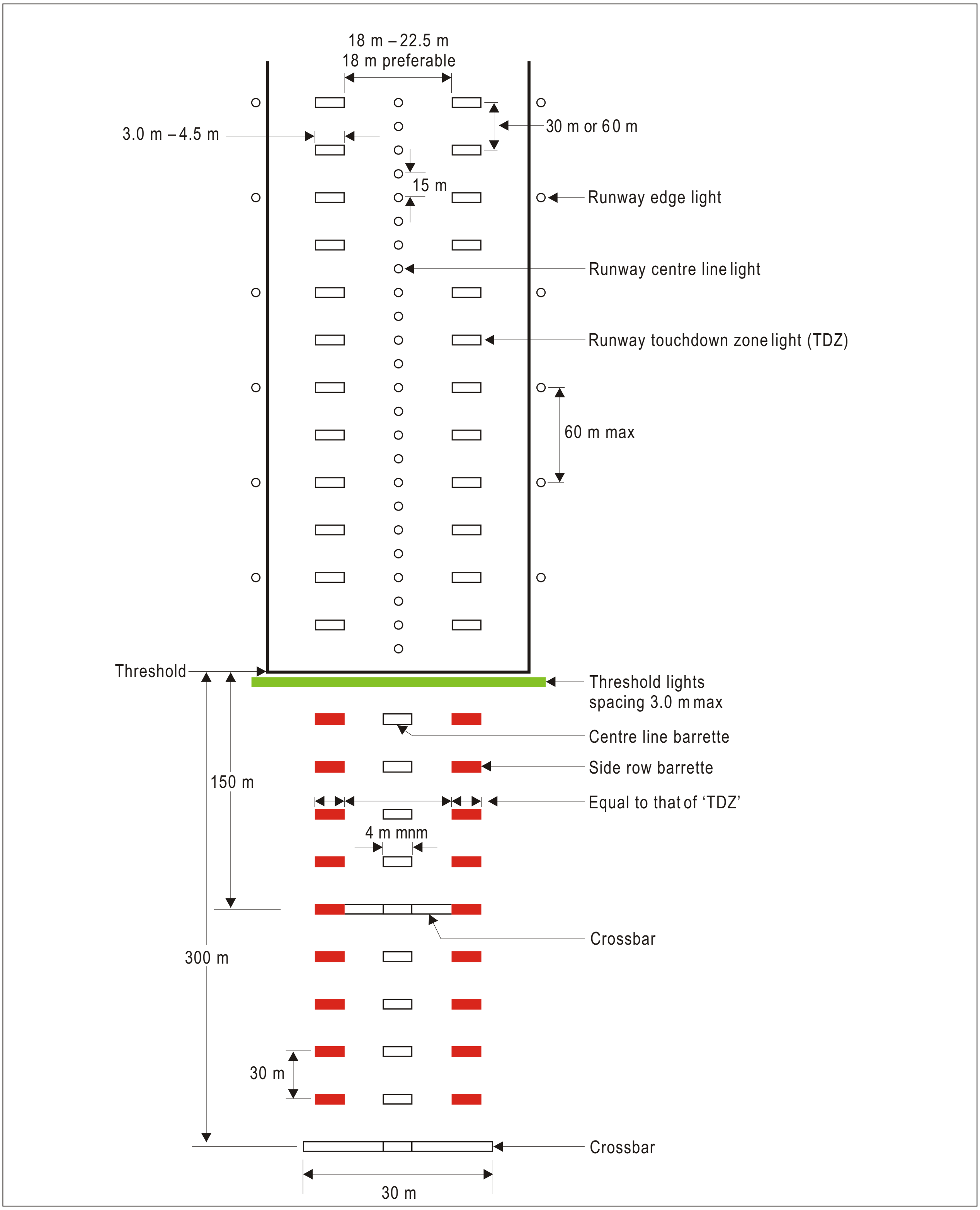


Figure 5-13. Inner 300 m approach and runway lighting for precision approach runways categories II and III

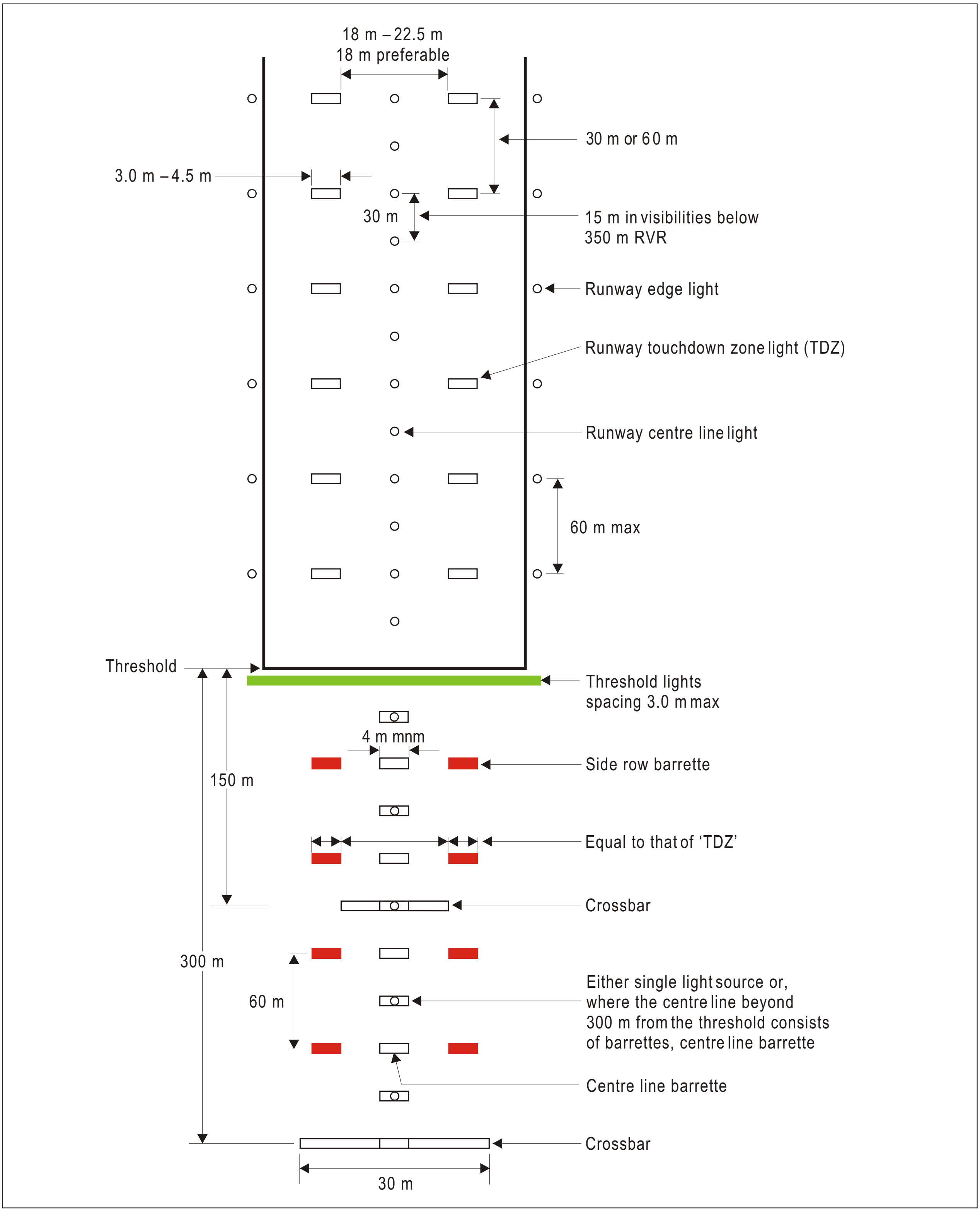


Figure 5-14. Inner 300 m approach and runway lighting for precision approach runways categories II and III where the serviceability levels of the lights specified as maintenance objectives in Chapter 10 can be demonstrated

single light sources as described in 5.3.4.32 b), with the innermost single light source located 30 m and the innermost barrette located 60 m from the threshold; or

c) single light sources where the threshold is displaced 300 m or more;

all of which shall show variable white.

5.3.4.31 Beyond 300 m from the threshold each centre line light position shall consist of either:

a) a barrette as used on the inner 300 m; or

b) two light sources in the central 300 m of the centre line and three light sources in the outer 300 m of the centre line;

all of which shall show variable white.

5.3.4.32 Where the serviceability level of the approach lights specified as maintenance objectives in 10.4.7 can be demonstrated, beyond 300 m from the threshold each centre line light position may consist of either:

a) a barrette; or

b) a single light source;

all of which shall show variable white.

5.3.4.33 The barrettes shall be at least 4 m in length. When barrettes are composed of lights approximating to point sources, the lights shall be uniformly spaced at intervals of not more than 1.5 m.

5.3.4.34 **Recommendation.—** *If the centre line beyond 300 m from the threshold consists of barrettes as described in 5.3.4.31 a) or 5.3.4.32 a), each barrette beyond 300 m should be supplemented by a capacitor discharge light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.35 Each capacitor discharge light shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

5.3.4.36 The side row shall consist of barrettes showing red. The length of a side row barrette and the spacing of its lights shall be equal to those of the touchdown zone light barrettes.

5.3.4.37 The lights forming the crossbars shall be fixed lights showing variable white. The lights shall be uniformly spaced at intervals of not more than 2.7 m.

5.3.4.38 The intensity of the red lights shall be compatible with the intensity of the white lights.

5.3.4.39 The lights shall be in accordance with the specifications of Appendix 2, Figures A2-1 and A2-2.

Note.— The flight path envelopes used in the design of these lights are given in Attachment A, Figure A-4.

5.3.5 Visual approach slope indicator systems

Application

5.3.5.1 A visual approach slope indicator system shall be provided to serve the approach to a runway whether or not the runway is served by other visual approach aids or by non-visual aids, where one or more of the following conditions exist:

a) the runway is used by turbojet or other aeroplanes with similar approach guidance requirements;

b) the pilot of any type of aeroplane may have difficulty in judging the approach due to:

1) inadequate visual guidance such as is experienced during an approach over water or featureless terrain by day or in the absence of sufficient extraneous lights in the approach area by night, or

2) misleading information such as is produced by deceptive surrounding terrain or runway slopes;

c) the presence of objects in the approach area may involve serious hazard if an aeroplane descends below the normal approach path, particularly if there are no non-visual or other visual aids to give warning of such objects;

d) physical conditions at either end of the runway present a serious hazard in the event of an aeroplane undershooting or overrunning the runway; and

e) terrain or prevalent meteorological conditions are such that the aeroplane may be subjected to unusual turbulence during approach.

Note.— Guidance on the priority of installation of visual approach slope indicator systems is contained in Attachment A, Section 12.

5.3.5.2 The standard visual approach slope indicator systems shall consist of the following:

a) T-VASIS and AT-VASIS conforming to the specifications contained in 5.3.5.6 to 5.3.5.22 inclusive;

b) PAPI and APAPI systems conforming to the specifications contained in 5.3.5.23 to 5.3.5.40 inclusive;

as shown in Figure 5-15.

5.3.5.3 PAPI, T-VASIS or AT-VASIS shall be provided where the code number is 3 or 4 when one or more of the conditions specified in 5.3.5.1 exist.

5.3.5.4 PAPI or APAPI shall be provided where the code number is 1 or 2 when one or more of the conditions specified in 5.3.5.1 exist.

5.3.5.5 **Recommendation.—** *Where a runway threshold is temporarily displaced from the normal position and one or more of the conditions specified in 5.3.5.1 exist, a PAPI should be provided except that where the code number is 1 or 2 an APAPI may be provided.*

T-VASIS and AT-VASIS

Description

5.3.5.6 The T-VASIS shall consist of twenty light units symmetrically disposed about the runway centre line in the form of two wing bars of four light units each, with bisecting longitudinal lines of six lights, as shown in Figure 5-16.

5.3.5.7 The AT-VASIS shall consist of ten light units arranged on one side of the runway in the form of a single wing bar of four light units with a bisecting longitudinal line of six lights.

5.3.5.8 The light units shall be constructed and arranged in such a manner that the pilot of an aeroplane during an approach will:

a) when above the approach slope, see the wing bar(s) white, and one, two or three fly-down lights, the more fly-down lights being visible the higher the pilot is above the approach slope;

b) when on the approach slope, see the wing bar(s) white; and

c) when below the approach slope, see the wing bar(s) and one, two or three fly-up lights white, the more fly-up lights being visible the lower the pilot is below the approach slope; and when well below the approach slope, see the wing bar(s) and the three fly-up lights red.

When on or above the approach slope, no light shall be visible from the fly-up light units; when on or below the approach slope, no light shall be visible from the fly-down light units.

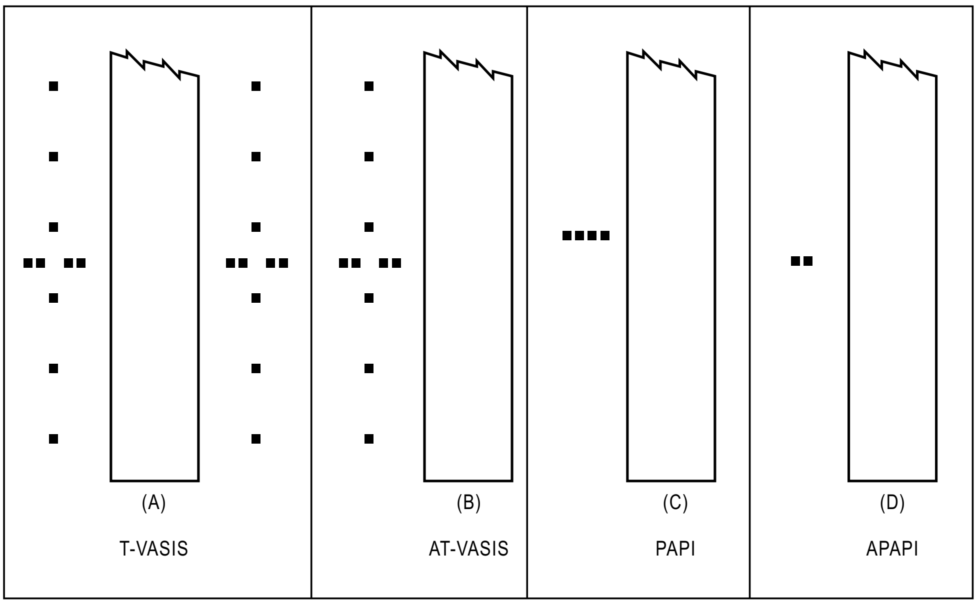


Figure 5-15. Visual approach slope indicator systems

Siting

5.3.5.9 The light units shall be located as shown in Figure 5-16, subject to the installation tolerances given therein.

Note.— The siting of T-VASIS will provide, for a 3° slope and a nominal eye height over the threshold of 15 m (see 5.3.5.6 and 5.3.5.19), a pilot's eye height over threshold of 13 m to 17 m when only the wing bar lights are visible. If increased eye height at the threshold is required (to provide adequate wheel clearance), then the approaches may be flown with one or more fly-down lights visible. The pilot's eye height over the threshold is then of the following order:

Wing bar lights and one fly-down light visible	*17 m to 22 m*
Wing bar lights and two fly-down lights visible	*22 m to 28 m*
Wing bar lights and three fly-down lights visible	*28 m to 54 m*

Characteristics of the light units

5.3.5.10 The systems shall be suitable for both day and night operations.

5.3.5.11 The light distribution of the beam of each light unit shall be of fan shape showing over a wide arc in azimuth in the approach direction. The wing bar light units shall produce a beam of white light from 1°54′ vertical angle up to 6° vertical angle and a beam of red light from 0° to 1°54′ vertical angle. The fly-down light units shall produce a white beam extending from an elevation of 6° down to approximately the approach slope, where it shall have a sharp cut-off. The fly-up light units shall produce a white beam from approximately the approach slope down to 1°54′ vertical angle and a red beam below a 1°54′ vertical angle. The angle of the top of the red beam in the wing bar units and fly-up units may be increased to comply with 5.3.5.21.

5.3.5.12 The light intensity distribution of the fly-down, wing bar and fly-up light units shall be as shown in Appendix 2, Figure A2-22.

5.3.5.13 The colour transition from red to white in the vertical plane shall be such as to appear to an observer, at a distance of not less than 300 m, to occur over a vertical angle of not more than 15′.

5.3.5.14 At full intensity the red light shall have a Y coordinate not exceeding 0.320.

5.3.5.15 A suitable intensity control shall be provided to allow adjustments to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.

5.3.5.16 The light units forming the wing bars, or the light units forming a fly-down or a fly-up matched pair, shall be mounted so as to appear to the pilot of an approaching aeroplane to be substantially in a horizontal line. The light units shall be mounted as low as possible and shall be frangible.

5.3.5.17 The light units shall be so designed that deposits of condensation, dirt, etc., on optically transmitting or reflecting surfaces shall interfere to the least possible extent with the light signals and shall in no way affect the elevation of the beams or the contrast between the red and white signals. The construction of the light units shall be such as to minimize the probability of the slots being wholly or partially blocked by snow or ice where these conditions are likely to be encountered.

Approach slope and elevation setting of light beams

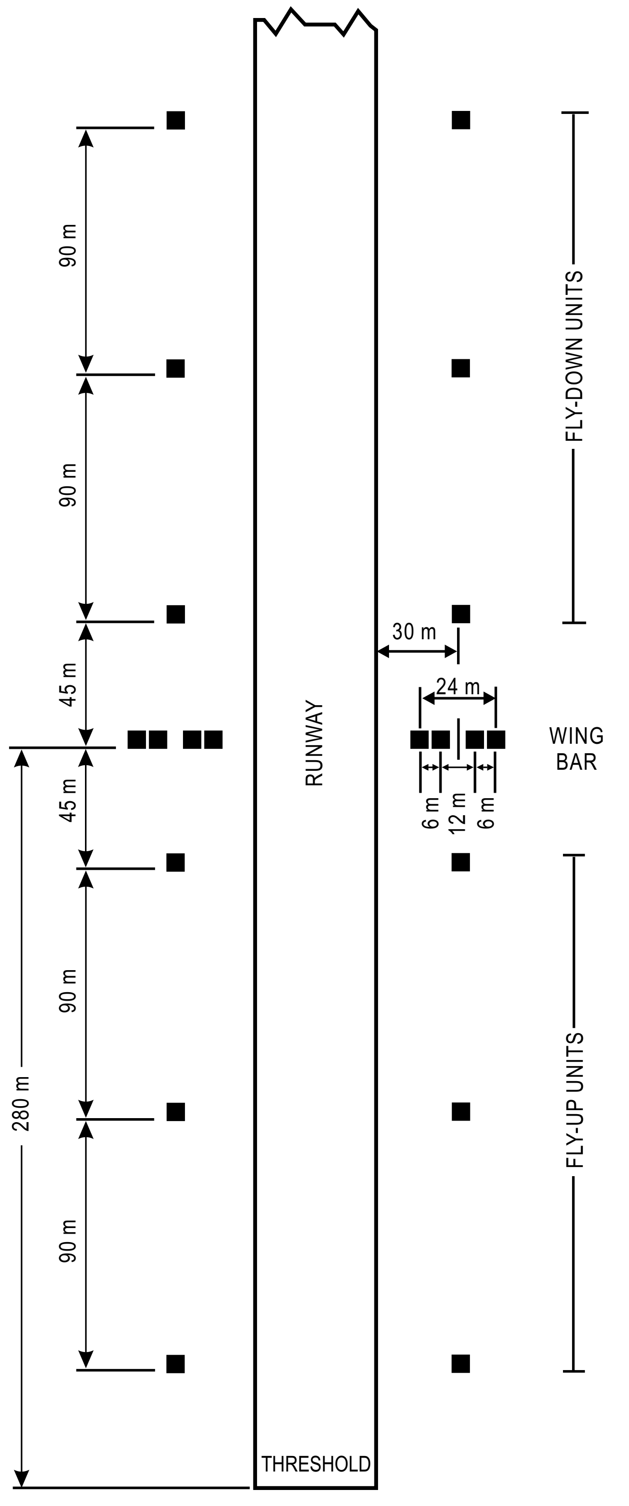
5.3.5.18 The approach slope shall be appropriate for use by the aeroplanes using the approach.

5.3.5.19 When the runway on which a T-VASIS is provided is equipped with an ILS and/or MLS, the siting and elevations of the light units shall be such that the visual approach slope conforms as closely as possible with the glide path of the ILS and/or the minimum glide path of the MLS, as appropriate.

5.3.5.20 The elevation of the beams of the wing bar light units on both sides of the runway shall be the same. The elevation of the top of the beam of the fly-up light unit nearest to each wing bar, and that of the bottom of the beam of the fly-down light unit nearest to each wing bar, shall be equal and shall correspond to the approach slope. The cut-off angle of the top of the beams of successive fly-up light units shall decrease by 5′ of arc in angle of elevation at each successive unit away from the wing bar. The cut-in angle of the bottom of the beam of the fly-down light units shall increase by 7′ of arc at each successive unit away from the wing bar (see Figure 5-17).

5.3.5.21 The elevation setting of the top of the red light beams of the wing bar and fly-up light units shall be such that, during an approach, the pilot of an aeroplane to whom the wing bar and three fly-up light units are visible would clear all objects in the approach area by a safe margin if any such light did not appear red.

5.3.5.22 The azimuth spread of the light beam shall be suitably restricted where an object located outside the obstacle protection surface of the system, but within the lateral limits of its light beam, is found to extend above the plane of the obstacle protection surface and an aeronautical study indicates that the object could adversely affect the safety of operations. The extent of the restriction shall be such that the object remains outside the confines of the light beam.



INSTALLATION TOLERANCES

The appropriate authority may:

a) vary the nominal eye height over the threshold of the on-slope signal between the limits of 12 m and 16 m, except in cases where a standard ILS glide path and/or MLS minimum glide path is available; the height over threshold should be varied to avoid any conflict between the visual approach slope indications and the usable portion of the ILS glide path and/or MLS minimum glide path indications;

b) vary the longitudinal distance between individual light units or the overall length of the system by not more than 10 per cent;

c) vary the lateral displacement of the system from the runway edge by not more than ± 3 m;

Note.— The system must be symmetrically displaced about the runway centre line.

d) where there is a longitudinal slope of the ground, adjust the longitudinal distance of a light unit to compensate for its difference in level from that of the threshold; and

e) where there is a transverse slope in the ground, adjust the longitudinal distance of two light units or two wing bars to compensate for the difference in level between them as necessary to meet the requirements of 5.3.5.16.

The distance between the wing bar and the threshold is based on an approach slope of 3° to a level runway with a nominal eye height over the threshold of 15 m. In practice, the threshold to wing bar distance is determined by:

a) the selected approach slope;

b) the longitudinal slope of the runway; and

c) the selected nominal eye height over the threshold.

Figure 5-16. Siting of light units for T-VASIS

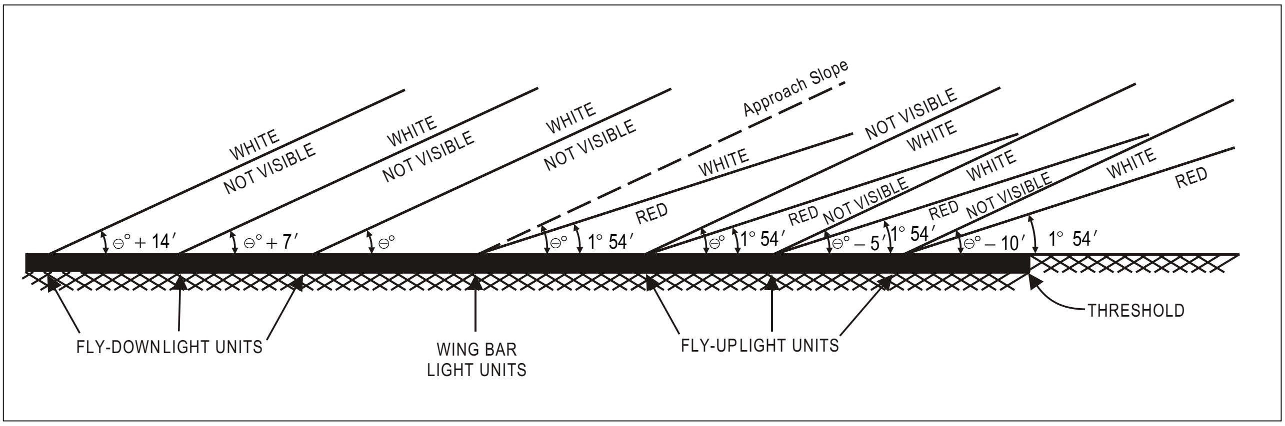


Figure 5-17. Light beams and elevation settings of T-VASIS and AT-VASIS

Note.— See 5.3.5.41 to 5.3.5.45 concerning the related obstacle protection surface.

PAPI and APAPI

Description

5.3.5.23 The PAPI system shall consist of a wing bar of 4 sharp transition multi-lamp (or paired single lamp) units equally spaced. The system shall be located on the left side of the runway unless it is physically impracticable to do so.

Note.— Where a runway is used by aircraft requiring visual roll guidance which is not provided by other external means, then a second wing bar may be provided on the opposite side of the runway.

5.3.5.24 The APAPI system shall consist of a wing bar of 2 sharp transition multi-lamp (or paired single lamp) units. The system shall be located on the left side of the runway unless it is physically impracticable to do so.

Note.— Where a runway is used by aircraft requiring visual roll guidance which is not provided by other external means, then a second wing bar may be provided on the opposite side of the runway.

5.3.5.25 The wing bar of a PAPI shall be constructed and arranged in such a manner that a pilot making an approach will:

a) when on or close to the approach slope, see the two units nearest the runway as red and the two units farthest from the runway as white;

b) when above the approach slope, see the one unit nearest the runway as red and the three units farthest from the runway as white; and when further above the approach slope, see all the units as white; and

c) when below the approach slope, see the three units nearest the runway as red and the unit farthest from the runway as white; and when further below the approach slope, see all the units as red.

5.3.5.26 The wing bar of an APAPI shall be constructed and arranged in such a manner that a pilot making an approach will:

a) when on or close to the approach slope, see the unit nearer the runway as red and the unit farther from the runway as white;

b) when above the approach slope, see both the units as white; and

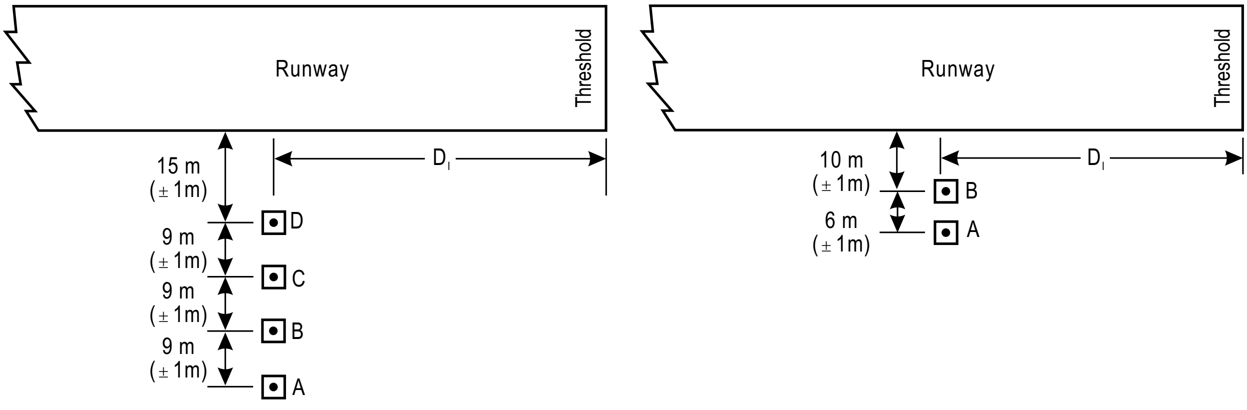
c) when below the approach slope, see both the units as red.

Siting

5.3.5.27 The light units shall be located as in the basic configuration illustrated in Figure 5-18, subject to the installation tolerances given therein. The units forming a wing bar shall be mounted so as to appear to the pilot of an approaching aeroplane to be substantially in a horizontal line. The light units shall be mounted as low as possible and shall be frangible.

Characteristics of the light units

5.3.5.28 The system shall be suitable for both day and night operations.



Typical PAPI wing bar

Typical APAPI wing bar

INSTALLATION TOLERANCES

a) Where a PAPI or APAPI is installed on a runway not equipped with an ILS or MLS, the distance D_1 shall be calculated to ensure that the lowest height at which a pilot will see a correct approach path indication (Figure 5-19, angle B for a PAPI and angle A for an APAPI) provides the wheel clearance over the threshold specified in Table 5-2 for the most demanding amongst aeroplanes regularly using the runway.

b) Where a PAPI or APAPI is installed on a runway equipped with an ILS and/or MLS, the distance D_1 shall be calculated to provide the optimum compatibility between the visual and non-visual aids for the range of eye-to-antenna heights of the aeroplanes regularly using the runway. The distance shall be equal to that between the threshold and the effective origin of the ILS glide path or MLS minimum glide path, as appropriate, plus a correction factor for the variation of eye-to-antenna heights of the aeroplanes concerned. The correction factor is obtained by multiplying the average eye-to-antenna height of those aeroplanes by the cotangent of the approach angle. However, the distance shall be such that in no case will the wheel clearance over the threshold be lower than that specified in column (3) of Table 5-2.

Note.— See Section 5.2.5 for specifications on aiming point marking. Guidance on the harmonization of PAPI, ILS and/or MLS signals is contained in the *Aerodrome Design Manual,* Part 4.

c) If a wheel clearance, greater than that specified in a) above is required for specific aircraft, this can be achieved by increasing D_1.

d) Distance D_1 *shall be adjusted to compensate for differences in elevation between the lens centres of the light units and the threshold.*

e) To ensure that units are mounted as low as possible and to allow for any transverse slope, small height adjustments of up to 5 cm between units are acceptable. A lateral gradient not greater that 1.25 per cent can be accepted provided it is uniformly applied across the units.

f) A spacing of 6 m (±1 m) between PAPI units should be used on code numbers 1 and 2. In such an event, the inner PAPI unit shall be located not less than 10 m (±1 m) from the runway edge.

Note.— Reducing the spacing between light units results in a reduction in usable range of the system.

g) The lateral spacing between APAPI units may be increased to 9 m (±1 m) if greater range is required or later conversion to a full PAPI is anticipated. In the latter case, the inner APAPI unit shall be located 15 m (±1 m) from the runway edge.

Figure 5-18. Siting of PAPI and APAPI

5.3.5.29 The colour transition from red to white in the vertical plane shall be such as to appear to an observer, at a distance of not less than 300 m, to occur within a vertical angle of not more than 3′.

5.3.5.30 At full intensity the red light shall have a Y coordinate not exceeding 0.320.

5.3.5.31 The light intensity distribution of the light units shall be as shown in Appendix 2, Figure A2-23.

Note.— See the Aerodrome Design Manual, *Part 4 for additional guidance on the characteristics of light units.*

5.3.5.32 Suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.

5.3.5.33 Each light unit shall be capable of adjustment in elevation so that the lower limit of the white part of the beam may be fixed at any desired angle of elevation between 1°30′ and at least 4°30′ above the horizontal.

5.3.5.34 The light units shall be so designed that deposits of condensation, snow, ice, dirt, etc., on optically transmitting or reflecting surfaces shall interfere to the least possible extent with the light signals and shall not affect the contrast between the red and white signals and the elevation of the transition sector.

Approach slope and elevation setting of light units

5.3.5.35 The approach slope as defined in Figure 5-19 shall be appropriate for use by the aeroplanes using the approach.

5.3.5.36 When the runway is equipped with an ILS and/or MLS, the siting and the angle of elevation of the light units shall be such that the visual approach slope conforms as closely as possible with the glide path of the ILS and/or the minimum glide path of the MLS, as appropriate.

5.3.5.37 The angle of elevation settings of the light units in a PAPI wing bar shall be such that, during an approach, the pilot of an aeroplane observing a signal of one white and three reds will clear all objects in the approach area by a safe margin.

5.3.5.38 The angle of elevation settings of the light units in an APAPI wing bar shall be such that, during an approach, the pilot of an aeroplane observing the lowest onslope signal, i.e. one white and one red, will clear all objects in the approach area by a safe margin.

5.3.5.39 The azimuth spread of the light beam shall be suitably restricted where an object located outside the obstacle protection surface of the PAPI or APAPI system, but within the lateral limits of its light beam, is found to extend above the plane of the obstacle protection surface and an aeronautical study indicates that the object could adversely affect the safety of operations. The extent of the restriction shall be such that the object remains outside the confines of the light beam.

Note.— See 5.3.5.41 to 5.3.5.45 concerning the related obstacle protection surface.

5.3.5.40 Where wing bars are installed on each side of the runway to provide roll guidance, corresponding units shall be set at the same angle so that the signals of each wing bar change symmetrically at the same time.

Obstacle protection surface

Note.— The following specifications apply to T-VASIS, AT-VASIS, PAPI and APAPI.

5.3.5.41 An obstacle protection surface shall be established when it is intended to provide a visual approach slope indicator system.

5.3.5.42 The characteristics of the obstacle protection surface, i.e. origin, divergence, length and slope shall correspond to those specified in the relevant column of Table 5-3 and in Figure 5-20.

5.3.5.43 New objects or extensions of existing objects shall not be permitted above an obstacle protection surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

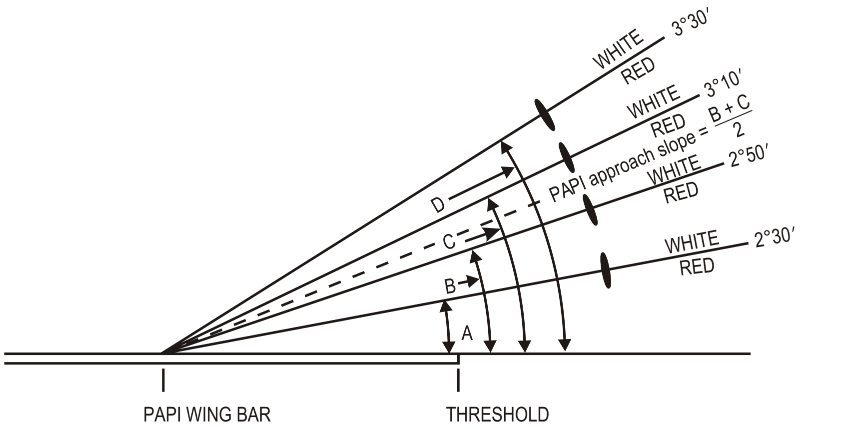
Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

5.3.5.44 Existing objects above an obstacle protection surface shall be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of aeroplanes.

5.3.5.45 Where an aeronautical study indicates that an existing object extending above an obstacle protection surface could adversely affect the safety of operations of aeroplanes one or more of the following measures shall be taken:

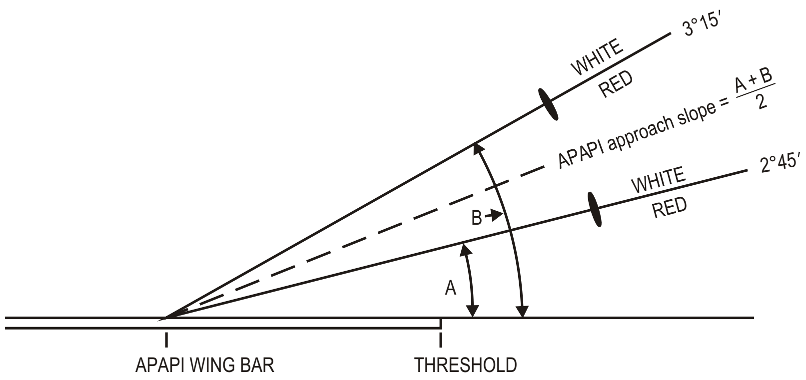
a) suitably raise the approach slope of the system;

b) reduce the azimuth spread of the system so that the object is outside the confines of the beam;



The height of the pilot's eye above the aircraft's ILS glide path/MLS antenna varies with the type of aeroplane and approach attitude. Harmonization of the PAPI signal and ILS glide path and/or MLS minimum glide path to a point closer to the threshold may be achieved by increasing the on-course sector from 20′ to 30′. The setting angles for a 3° glide slope would then be 2°25′, 2°45′, 3°15′ and 3°35′.

A — 3° PAPI ILLUSTRATED



B — 3° APAPI ILLUSTRATED

Figure 5-19. Light beams and angle of elevation setting of PAPI and APAPI

Table 5-2. Wheel clearance over threshold for PAPI and APAPI

Eye-to-wheel height of aeroplane in the approach configuration[a]	Desired wheel clearance (metres)[b,c]	Minimum wheel clearance (metres)[d]
(1)	(2)	(3)
up to but not including 3 m	6	3[e]
3 m up to but not including 5 m	9	4
5 m up to but not including 8 m	9	5
8 m up to but not including 14 m	9	6

a. In selecting the eye-to-wheel height group, only aeroplanes meant to use the system on a regular basis shall be considered. The most demanding amongst such aeroplanes shall determine the eye-to-wheel height group.

b. Where practicable the desired wheel clearances shown in column (2) shall be provided.

c. The wheel clearances in column (2) may be reduced to no less than those in column (3) where an aeronautical study indicates that such reduced wheel clearances are acceptable.

d. When a reduced wheel clearance is provided at a displaced threshold it shall be ensured that the corresponding desired wheel clearance specified in column (2) will be available when an aeroplane at the top end of the eye-to-wheel height group chosen overflies the extremity of the runway.

e. This wheel clearance may be reduced to 1.5 m on runways used mainly by light-weight non-turbo-jet aeroplanes.

Table 5-3. Dimensions and slopes of the obstacle protection surface

	Runway type/code number							
	Non-instrument Code number				Instrument Code number			
Surface dimensions	1	2	3	4	1	2	3	4
Length of inner edge	60 m	80 m[a]	150 m	150 m	150 m	150 m	300 m	300 m
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%	15%	15%	15%	15%
Total length	7 500 m	7 500 m[b]	15 000 m	15 000 m	7 500 m	7 500 m[b]	15 000 m	15 000 m
Slope								
a) T-VASIS and AT-VASIS	–[c]	1.9°	1.9°	1.9°	–	1.9°	1.9°	1.9°
b) PAPI[d]	–	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°	A–0.57°
c) APAPI[d]	A–0.9°	A–0.9°	–	–	A–0.9°	A–0.9°	–	–

a. This length is to be increased to 150 m for a T-VASIS or AT-VASIS.
b. This length is to be increased to 15 000 m for a T-VASIS or AT-VASIS.
c. No slope has been specified if a system is unlikely to be used on runway type/code number indicated.
d. Angles as indicated in Figure 5-19.

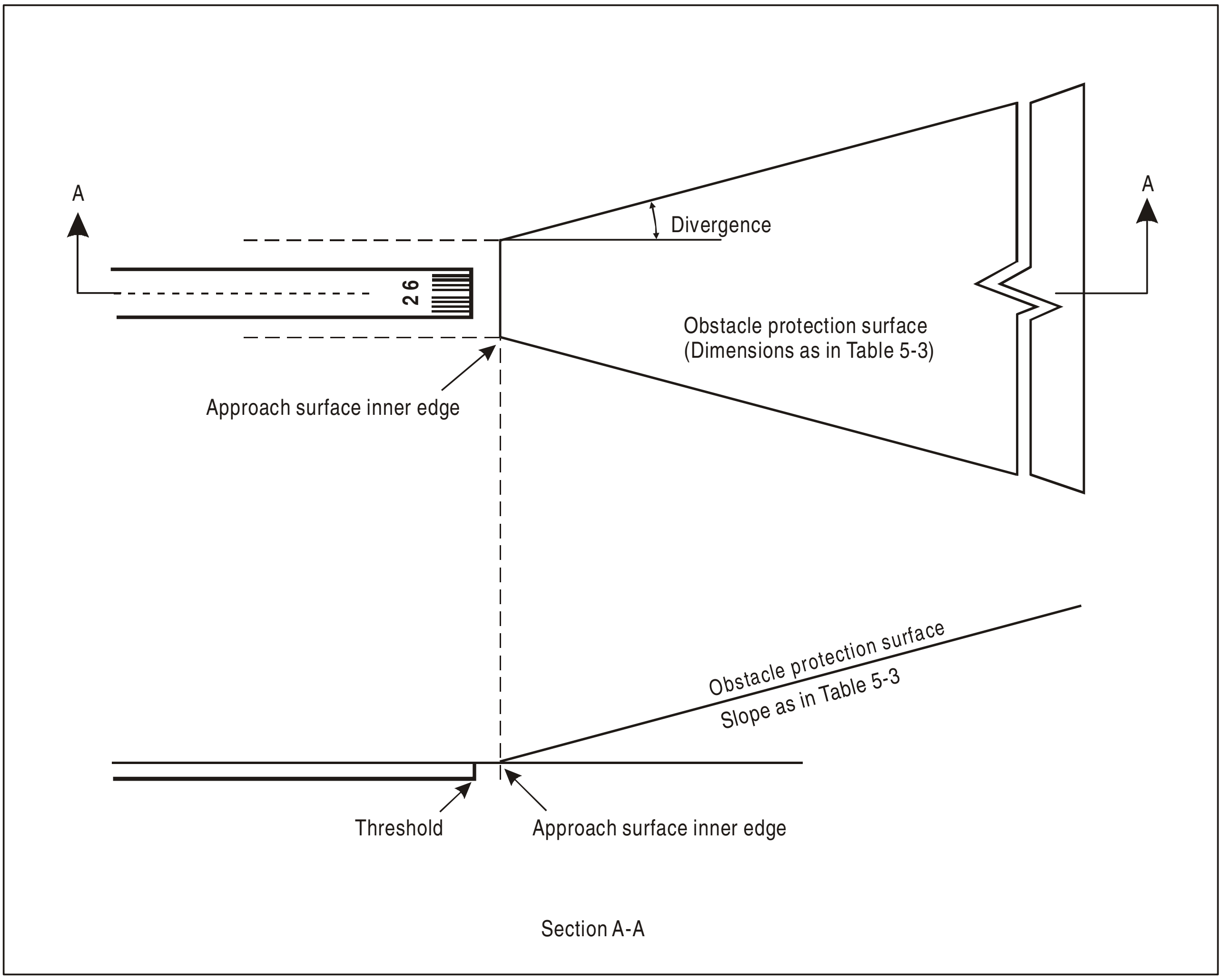


Figure 5-20. Obstacle protection surface for visual approach slope indicator systems

c) displace the axis of the system and its associated obstacle protection surface by no more than 5°;

d) suitably displace the threshold; and

e) where d) is found to be impracticable, suitably displace the system upwind of the threshold to provide an increase in threshold crossing height equal to the height of the object penetration.

Note.— Guidance on this issue is contained in the Aerodrome Design Manual, *Part 4.*

5.3.6 Circling guidance lights

Application

5.3.6.1 **Recommendation.—** *Circling guidance lights should be provided when existing approach and runway lighting systems do not satisfactorily permit identification of the runway and/or approach area to a circling aircraft in the conditions for which it is intended the runway be used for circling approaches.*

Location

5.3.6.2 **Recommendation.—** *The location and number of circling guidance lights should be adequate to enable a pilot, as appropriate, to:*

a) join the downwind leg or align and adjust the aircraft's track to the runway at a required distance from it and to distinguish the threshold in passing; and

b) keep in sight the runway threshold and/or other features which will make it possible to judge the turn on to base leg and final approach, taking into account the guidance provided by other visual aids.

5.3.6.3 **Recommendation.—** *Circling guidance lights should consist of:*

a) lights indicating the extended centre line of the runway and/or parts of any approach lighting system; or

b) lights indicating the position of the runway threshold; or

c) lights indicating the direction or location of the runway;

or a combination of such lights as is appropriate to the runway under consideration.

Note.— Guidance on installation of circling guidance lights is given in the Aerodrome Design Manual, *Part 4.*

Characteristics

5.3.6.4 **Recommendation.—** *Circling guidance lights should be fixed or flashing lights of an intensity and beam spread adequate for the conditions of visibility and ambient light in which it is intended to make visual circling approaches. The flashing lights should be white, and the steady lights either white or gaseous discharge lights.*

5.3.6.5 **Recommendation.—** *The lights should be designed and be installed in such a manner that they will not dazzle or confuse a pilot when approaching to land, taking off or taxiing.*

5.3.7 Runway lead-in lighting systems

Application

5.3.7.1 **Recommendation.—** *A runway lead-in lighting system should be provided where it is desired to provide visual guidance along a specific approach path, for reasons such as avoiding hazardous terrain or for purposes of noise abatement.*

Note.— Guidance on providing lead-in lighting systems is given in the Aerodrome Design Manual, *Part 4.*

Location

5.3.7.2 **Recommendation.—** *A runway lead-in lighting system should consist of groups of lights positioned so as to define the desired approach path and so that one group may be sighted from the preceding group. The interval between adjacent groups should not exceed approximately 1 600 m.*

Note.— Runway lead-in lighting systems may be curved, straight or a combination thereof.

5.3.7.3 **Recommendation.—** *A runway lead-in lighting system should extend from a point as determined by the appropriate authority, up to a point where the approach lighting system, if provided, or the runway or the runway lighting system is in view.*

Characteristics

5.3.7.4 **Recommendation.—** *Each group of lights of a runway lead-in lighting system should consist of at least three flashing lights in a linear or cluster configuration. The system may be augmented by steady burning lights where such lights would assist in identifying the system.*

5.3.7.5 **Recommendation.—** *The flashing lights should be white, and the steady burning lights gaseous discharge lights.*

5.3.7.6 **Recommendation.—** *Where practicable, the flashing lights in each group should flash in sequence towards the runway.*

5.3.8 Runway threshold identification lights

Application

5.3.8.1 **Recommendation.—** *Runway threshold identification lights should be installed:*

a) at the threshold of a non-precision approach runway when additional threshold conspicuity is necessary or where it is not practicable to provide other approach lighting aids; and

b) where a runway threshold is permanently displaced from the runway extremity or temporarily displaced from the normal position and additional threshold conspicuity is necessary.

Location

5.3.8.2 Runway threshold identification lights shall be located symmetrically about the runway centre line, in line with the threshold and approximately 10 m outside each line of runway edge lights.

Characteristics

5.3.8.3 **Recommendation.—** *Runway threshold identification lights should be flashing white lights with a flash frequency between 60 and 120 per minute.*

5.3.8.4 The lights shall be visible only in the direction of approach to the runway.

5.3.9 Runway edge lights

Application

5.3.9.1 Runway edge lights shall be provided for a runway intended for use at night or for a precision approach runway intended for use by day or night.

5.3.9.2 **Recommendation.—** *Runway edge lights should be provided on a runway intended for take-off with an operating minimum below an RVR of the order of 800 m by day.*

Location

5.3.9.3 Runway edge lights shall be placed along the full length of the runway and shall be in two parallel rows equidistant from the centre line.

5.3.9.4 Runway edge lights shall be placed along the edges of the area declared for use as the runway or outside the edges of the area at a distance of not more than 3 m.

5.3.9.5 **Recommendation.—** *Where the width of the area which could be declared as runway exceeds 60 m, the distance between the rows of lights should be determined taking into account the nature of the operations, the light distribution characteristics of the runway edge lights, and other visual aids serving the runway.*

5.3.9.6 The lights shall be uniformly spaced in rows at intervals of not more than 60 m for an instrument runway, and at intervals of not more than 100 m for a non-instrument runway. The lights on opposite sides of the runway axis shall be on lines at right angles to that axis. At intersections of runways, lights may be spaced irregularly or omitted, provided that adequate guidance remains available to the pilot.

Characteristics

5.3.9.7 Runway edge lights shall be fixed lights showing variable white, except that:

a) in the case of a displaced threshold, the lights between the beginning of the runway and the displaced threshold shall show red in the approach direction; and

b) a section of the lights 600 m or one-third of the runway length, whichever is the less, at the remote end of the runway from the end at which the take-off run is started, may show yellow.

5.3.9.8 The runway edge lights shall show at all angles in azimuth necessary to provide guidance to a pilot landing or taking off in either direction. When the runway edge lights are intended to provide circling guidance, they shall show at all angles in azimuth (see 5.3.6.1).

5.3.9.9 In all angles of azimuth required in 5.3.9.8, runway edge lights shall show at angles up to 15° above the horizontal with an intensity adequate for the conditions of visibility and ambient light in which use of the runway for take-off or landing is intended. In any case, the intensity shall be at least 50 cd except that at an aerodrome without extraneous lighting the intensity of the lights may be reduced to not less than 25 cd to avoid dazzling the pilot.

5.3.9.10 Runway edge lights on a precision approach runway shall be in accordance with the specifications of Appendix 2, Figure A2-9 or A2-10.

5.3.10 Runway threshold and wing bar lights (see Figure 5-21)

Application of runway threshold lights

5.3.10.1 Runway threshold lights shall be provided for a runway equipped with runway edge lights except on a non-instrument or non-precision approach runway where the threshold is displaced and wing bar lights are provided.

Location of runway threshold lights

5.3.10.2 When a threshold is at the extremity of a runway, the threshold lights shall be placed in a row at right angles to the runway axis as near to the extremity of the runway as possible and, in any case, not more than 3 m outside the extremity.

5.3.10.3 When a threshold is displaced from the extremity of a runway, threshold lights shall be placed in a row at right angles to the runway axis at the displaced threshold.

5.3.10.4 Threshold lighting shall consist of:

a) on a non-instrument or non-precision approach runway, at least six lights;

b) on a precision approach runway category I, at least the number of lights that would be required if the lights were uniformly spaced at intervals of 3 m between the rows of runway edge lights; and

c) on a precision approach runway category II or III, lights uniformly spaced between the rows of runway edge lights at intervals of not more than 3 m.

5.3.10.5 **Recommendation.—** *The lights prescribed in 5.3.10.4 a) and b) should be either:*

a) equally spaced between the rows of runway edge lights, or

b) symmetrically disposed about the runway centre line in two groups, with the lights uniformly spaced in each group and with a gap between the groups equal to the gauge of the touchdown zone marking or lighting, where such is provided, or otherwise not more than half the distance between the rows of runway edge lights.

Application of wing bar lights

5.3.10.6 **Recommendation.—** *Wing bar lights should be provided on a precision approach runway when additional conspicuity is considered desirable.*

5.3.10.7 Wing bar lights shall be provided on a non-instrument or non-precision approach runway where the threshold is displaced and runway threshold lights are required, but are not provided.

Location of wing bar lights

5.3.10.8 Wing bar lights shall be symmetrically disposed about the runway centre line at the threshold in two groups, i.e. wing bars. Each wing bar shall be formed by at least five lights extending at least 10 m outward from, and at right angles to, the line of the runway edge lights, with the innermost light of each wing bar in the line of the runway edge lights.

Characteristics of runway threshold and wing bar lights

5.3.10.9 Runway threshold and wing bar lights shall be fixed unidirectional lights showing green in the direction of approach to the runway. The intensity and beam spread of the lights shall be adequate for the conditions of visibility and ambient light in which use of the runway is intended.

5.3.10.10 Runway threshold lights on a precision approach runway shall be in accordance with the specifications of Appendix 2, Figure A2-3.

5.3.10.11 Threshold wing bar lights on a precision approach runway shall be in accordance with the specifications of Appendix 2, Figure A2-4.

5.3.11 Runway end lights (see Figure 5-21)

Application

5.3.11.1 Runway end lights shall be provided for a runway equipped with runway edge lights.

Note.— When the threshold is at the runway extremity, fittings serving as threshold lights may be used as runway end lights.

Location

5.3.11.2 Runway end lights shall be placed on a line at right angles to the runway axis as near to the end of the runway as possible and, in any case, not more than 3 m outside the end.

5.3.11.3 **Recommendation.—** *Runway end lighting should consist of at least six lights. The lights should be either:*

a) equally spaced between the rows of runway edge lights, or

b) symmetrically disposed about the runway centre line in two groups with the lights uniformly spaced in each group and with a gap between the groups of not more than half the distance between the rows of runway edge lights.

For a precision approach runway category III, the spacing between runway end lights, except between the two innermost lights if a gap is used, should not exceed 6 m.

Characteristics

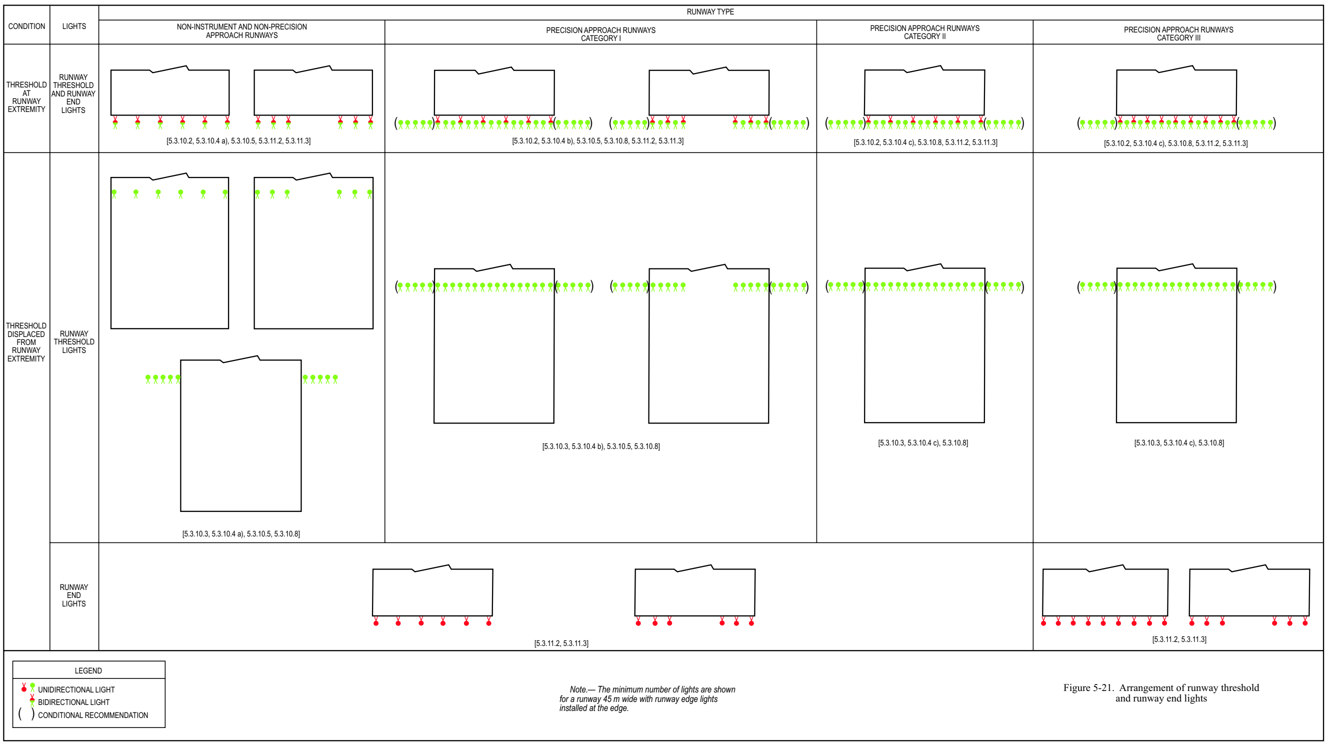
5.3.11.4 Runway end lights shall be fixed unidirectional lights showing red in the direction of the runway. The intensity and beam spread of the lights shall be adequate for the conditions of visibility and ambient light in which use of the runway is intended.

5.3.11.5 Runway end lights on a precision approach runway shall be in accordance with the specifications of Appendix 2, Figure A2-8.

5.3.12 Runway centre line lights

Application

5.3.12.1 Runway centre line lights shall be provided on a precision approach runway category II or III.



Note.— The minimum number of lights are shown for a runway 45 m wide with runway edge lights installed at the edge.

Figure 5-21. Arrangement of runway threshold and runway end lights

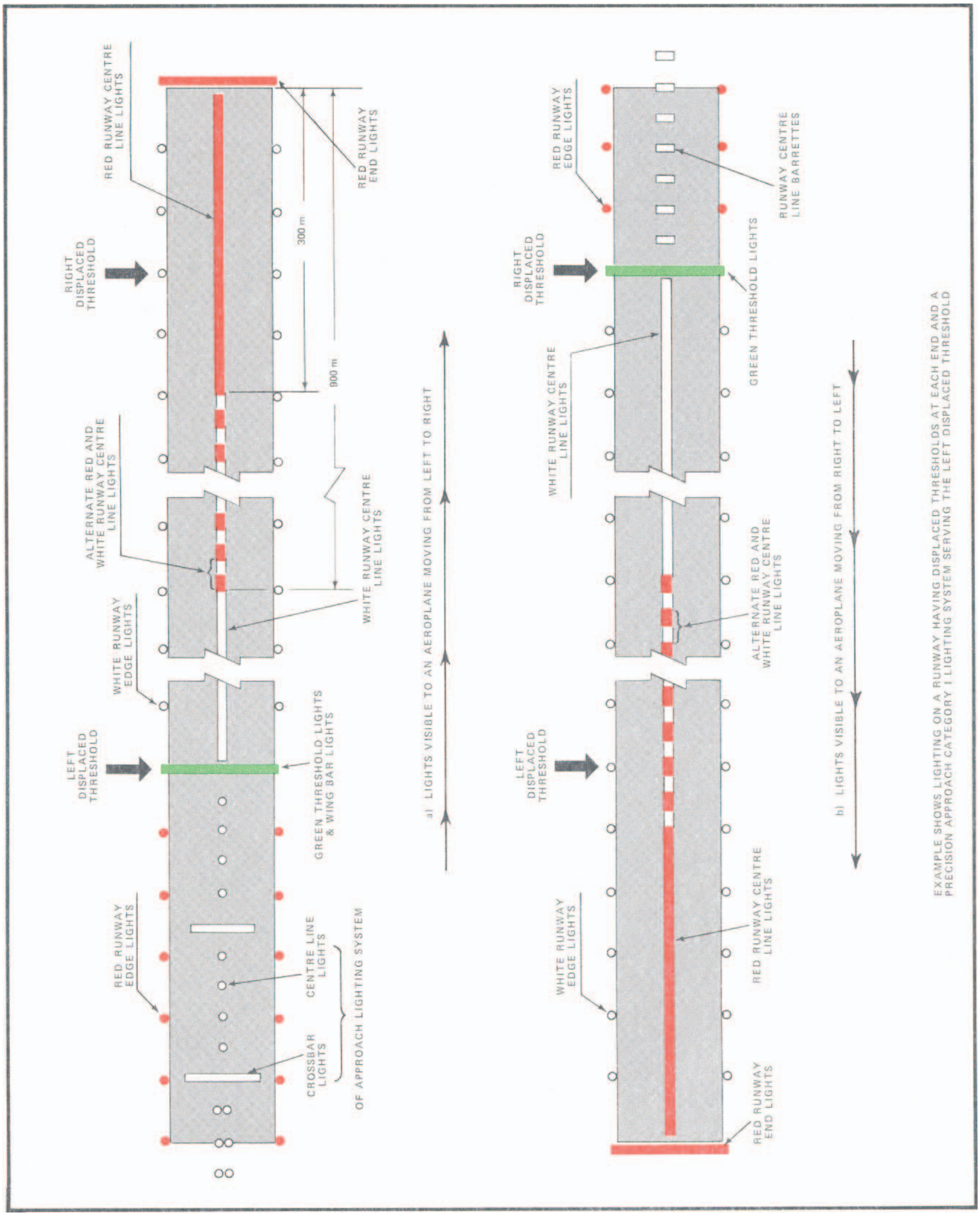


Figure 5-22. Example of approach and runway lighting
for runway with displaced thresholds

5.3.12.2 **Recommendation.—** *Runway centre line lights should be provided on a precision approach runway category I, particularly when the runway is used by aircraft with high landing speeds or where the width between the runway edge lights is greater than 50 m.*

5.3.12.3 Runway centre line lights shall be provided on a runway intended to be used for take-off with an operating minimum below an RVR of the order of 400 m.

5.3.12.4 **Recommendation.—** *Runway centre line lights should be provided on a runway intended to be used for take-off with an operating minimum of an RVR of the order of 400 m or higher when used by aeroplanes with a very high take-off speed, particularly where the width between the runway edge lights is greater than 50 m.*

Location

5.3.12.5 Runway centre line lights shall be located along the centre line of the runway, except that the lights may be uniformly offset to the same side of the runway centre line by not more than 60 cm where it is not practicable to locate them along the centre line. The lights shall be located from the threshold to the end at longitudinal spacing of approximately 15 m. Where the serviceability level of the runway centre line lights specified as maintenance objectives in 10.4.7 or 10.4.11, as appropriate, can be demonstrated and the runway is intended for use in runway visual range conditions of 350 m or greater, the longitudinal spacing may be approximately 30 m.

Note.— Existing centre line lighting where lights are spaced at 7.5 m need not be replaced.

5.3.12.6 **Recommendation.—** *Centre line guidance for take-off from the beginning of a runway to a displaced threshold should be provided by:*

a) an approach lighting system if its characteristics and intensity settings afford the guidance required during take-off and it does not dazzle the pilot of an aircraft taking off; or

b) runway centre line lights; or

c) barrettes of at least 3 m length and spaced at uniform intervals of 30 m, as shown in Figure 5-22, designed so that their photometric characteristics and intensity setting afford the guidance required during take-off without dazzling the pilot of an aircraft taking off.

Where necessary, provision should be made to extinguish those centre line lights specified in b) or reset the intensity of the approach lighting system or barrettes when the runway is being used for landing. In no case should only the single source runway centre line lights show from the beginning of the runway to a displaced threshold when the runway is being used for landing.

Characteristics

5.3.12.7 Runway centre line lights shall be fixed lights showing variable white from the threshold to the point 900 m from the runway end; alternate red and variable white from 900 m to 300 m from the runway end; and red from 300 m to the runway end, except that for runways less than 1 800 m in length, the alternate red and variable white lights shall extend from the mid-point of the runway usable for landing to 300 m from the runway end.

Note.— Care is required in the design of the electrical system to ensure that failure of part of the electrical system will not result in a false indication of the runway distance remaining.

5.3.12.8 Runway centre line lights shall be in accordance with the specifications of Appendix 2, Figure A2-6 or A2-7.

5.3.13 Runway touchdown zone lights

Application

5.3.13.1 Touchdown zone lights shall be provided in the touchdown zone of a precision approach runway category II or III.

Location

5.3.13.2 Touchdown zone lights shall extend from the threshold for a longitudinal distance of 900 m, except that, on runways less than 1 800 m in length, the system shall be shortened so that it does not extend beyond the midpoint of the runway. The pattern shall be formed by pairs of barrettes symmetrically located about the runway centre line. The lateral spacing between the innermost lights of a pair of barrettes shall be equal to the lateral spacing selected for the touchdown zone marking. The longitudinal spacing between pairs of barrettes shall be either 30 m or 60 m.

Note.— To allow for operations at lower visibility minima, it may be advisable to use a 30 m longitudinal spacing between barrettes.

Characteristics

5.3.13.3 A barrette shall be composed of at least three lights with a spacing between the lights of not more than 1.5 m.

5.3.13.4 **Recommendation.—** *A barrette should be not less than 3 m nor more than 4.5 m in length.*

5.3.13.5 Touchdown zone lights shall be fixed unidirectional lights showing variable white.

5.3.13.6 Touchdown zone lights shall be in accordance with the specifications of Appendix 2, Figure A2-5.

5.3.14 Rapid exit taxiway indicator lights

Note.— The purpose of rapid exit taxiway indicator lights (RETILs) is to provide pilots with distance-to-go information to the nearest rapid exit taxiway on the runway, to enhance situational awareness in low visibility conditions and enable pilots to apply braking action for more efficient roll-out and runway exit speeds. It is essential that pilots operating at aerodromes with runway(s) displaying rapid exit taxiway indicator lights be familiar with the purpose of these lights.

Application

5.3.14.1 **Recommendation.—** *Rapid exit taxiway indicator lights should be provided on a runway intended for use in runway visual range conditions less than a value of 350 m and/or where the traffic density is heavy.*

Note.— See Attachment A, Section 14.

5.3.14.2 Rapid exit taxiway indicator lights shall not be displayed in the event of any lamp failure or other failure that prevents the display of the light pattern depicted in Figure 5-23, in full.

Location

5.3.14.3 A set of rapid exit taxiway indicator lights shall be located on the runway on the same side of the runway centre line as the associated rapid exit taxiway, in the configuration shown in Figure 5-23. In each set, the lights shall be located 2 m apart and the light nearest to the runway centre line shall be displaced 2 m from the runway centre line.

5.3.14.4 Where more than one rapid exit taxiway exists on a runway, the set of rapid exit taxiway indicator lights for each exit shall not overlap when displayed.

Characteristics

5.3.14.5 Rapid exit taxiway indicator lights shall be fixed unidirectional yellow lights, aligned so as to be visible to the pilot of a landing aeroplane in the direction of approach to the runway.

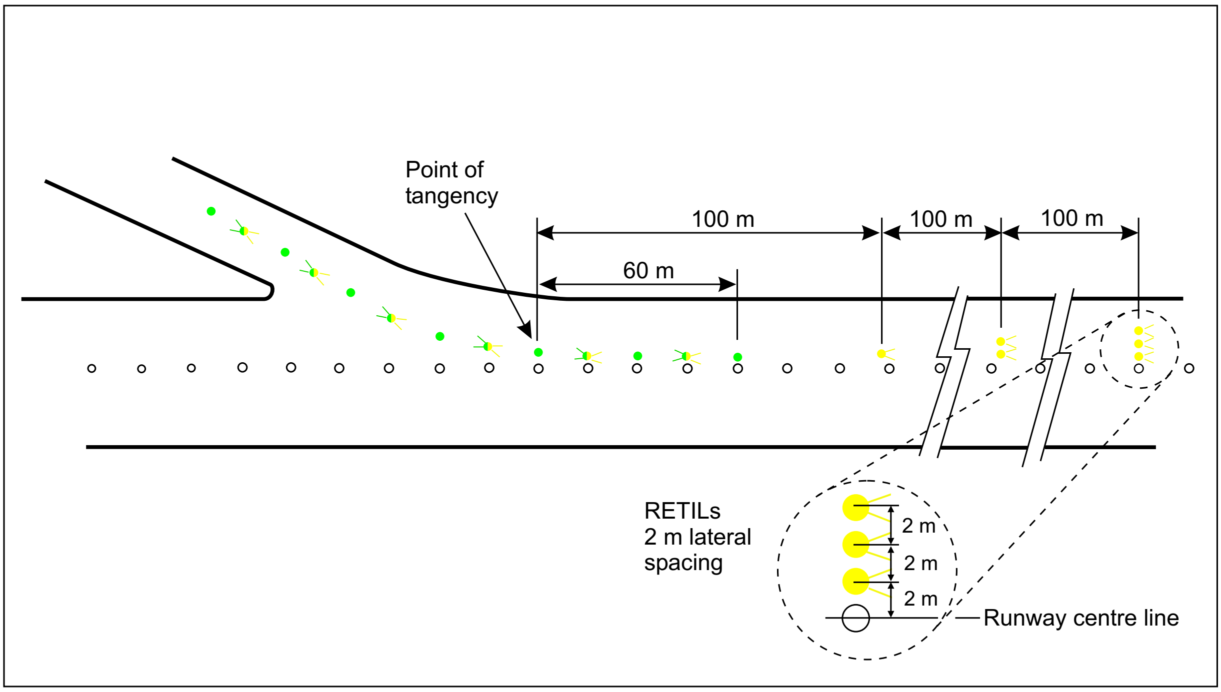


Figure 5-23. Rapid exit taxiway indicator lights (RETILS)

5.3.14.6 Rapid exit taxiway indicator lights shall be in accordance with the specifications in Appendix 2, Figure A2-6 or Figure A2-7, as appropriate.

5.3.14.7 **Recommendation.—** *Rapid exit taxiway indicator lights should be supplied with power on a separate circuit to other runway lighting so that they may be used when other lighting is switched off.*

5.3.15 Stopway lights

Application

5.3.15.1 Stopway lights shall be provided for a stopway intended for use at night.

Location

5.3.15.2 Stopway lights shall be placed along the full length of the stopway and shall be in two parallel rows that are equidistant from the centre line and coincident with the rows of the runway edge lights. Stopway lights shall also be provided across the end of a stopway on a line at right angles to the stopway axis as near to the end of the stopway as possible and, in any case, not more than 3 m outside the end.

Characteristics

5.3.15.3 Stopway lights shall be fixed unidirectional lights showing red in the direction of the runway.

5.3.16 Taxiway centre line lights

Application

5.3.16.1 Taxiway centre line lights shall be provided on an exit taxiway, taxiway, de-icing/anti-icing facility and apron intended for use in runway visual range conditions less than a value of 350 m in such a manner as to provide continuous guidance between the runway centre line and aircraft stands, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.

5.3.16.2 **Recommendation.—** *Taxiway centre line lights should be provided on a taxiway intended for use at night in runway visual range conditions of 350 m or greater, and particularly on complex taxiway intersections and exit taxiways, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.*

Note.— Where there may be a need to delineate the edges of a taxiway, e.g. on a rapid exit taxiway, narrow taxiway or in snow conditions, this may be done with taxiway edge lights or markers.

5.3.16.3 **Recommendation.—** *Taxiway centre line lights should be provided on an exit taxiway, taxiway, de-icing/anti-icing facility and apron in all visibility conditions where specified as components of an advanced surface movement guidance and control system in such a manner as to provide continuous guidance between the runway centre line and aircraft stands.*

5.3.16.4 Taxiway centre line lights shall be provided on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of 350 m, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance.

Note.— See 8.2.3 for provisions concerning the interlocking of runway and taxiway lighting systems.

5.3.16.5 **Recommendation.—** *Taxiway centre line lights should be provided in all visibility conditions on a runway forming part of a standard taxi-route where specified as components of an advanced surface movement guidance and control system.*

Characteristics

5.3.16.6 Taxiway centre line lights on a taxiway other than an exit taxiway and on a runway forming part of a standard taxi-route shall be fixed lights showing green with beam dimensions such that the light is visible only from aeroplanes on or in the vicinity of the taxiway.

5.3.16.7 Taxiway centre line lights on an exit taxiway shall be fixed lights. Alternate taxiway centre line lights shall show green and yellow from their beginning near the runway centre line to the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface, whichever is farthest from the runway; and thereafter all lights shall show green (Figure 5-24). The light nearest to the perimeter shall always show yellow. Where aircraft may follow the same centre line in both directions, all the centre line lights shall show green to aircraft approaching the runway.

Note 1.— Care is necessary to limit the light distribution of green lights on or near a runway so as to avoid possible confusion with threshold lights.

Note 2.— For yellow filter characteristics see Appendix 1, 2.2.

Note 3.— The size of the ILS/MLS critical/sensitive area depends on the characteristics of the associated ILS/MLS and other factors. Guidance is provided in Annex 10, Volume I, Attachments C and G.

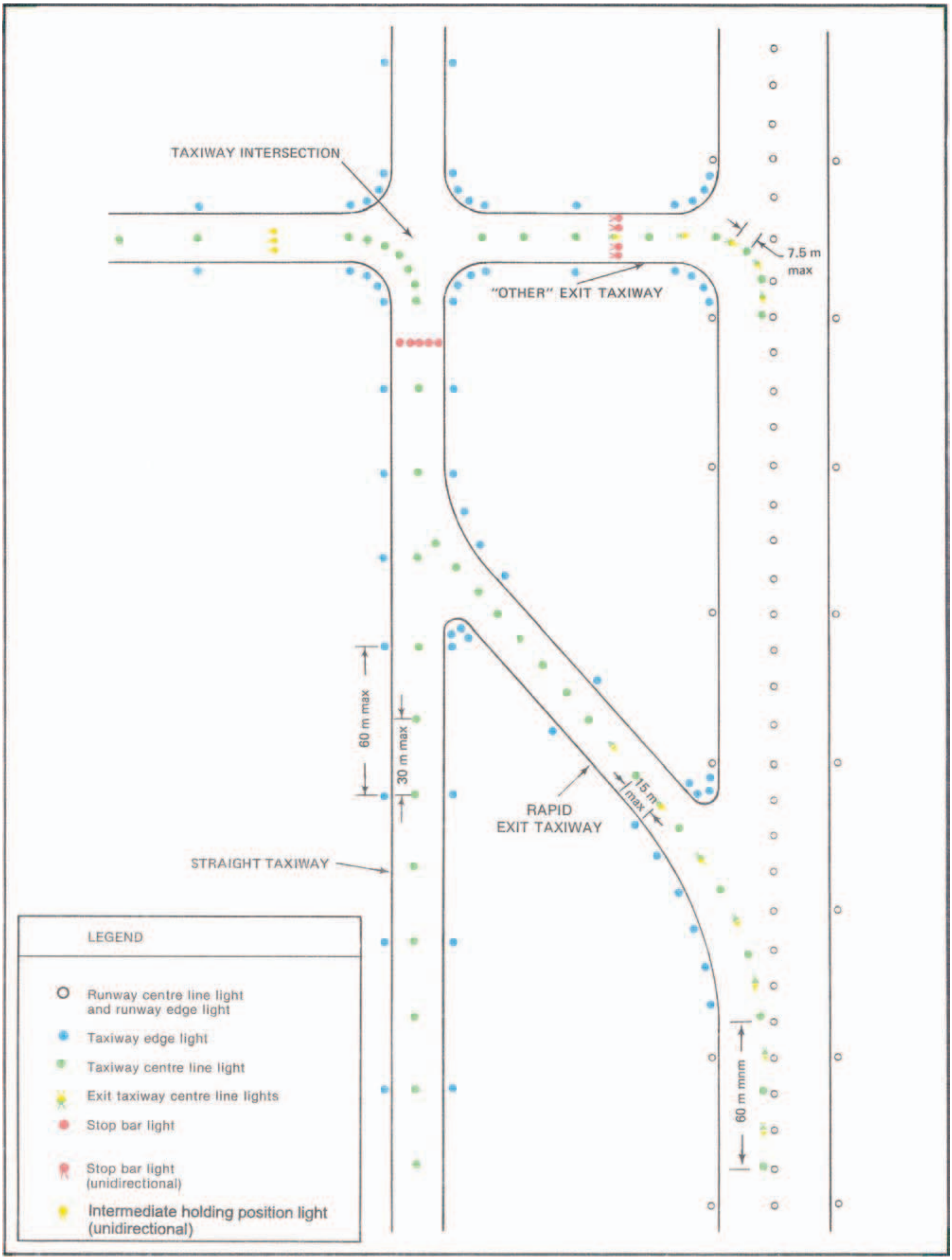


Figure 5-24. Taxiway lighting

Note 4.— See 5.4.3 for specifications on runway vacated signs.

5.3.16.8 Taxiway centre line lights shall be in accordance with the specifications of:

a) Appendix 2, Figure A2-12, A2-13, or A2-14 for taxiways intended for use in runway visual range conditions of less than a value of 350 m; and

b) Appendix 2, Figure A2-15 or A2-16 for other taxiways.

5.3.16.9 **Recommendation.—** *Where higher intensities are required, from an operational point of view, taxiway centre line lights on rapid exit taxiways intended for use in runway visual range conditions less than a value of 350 m should be in accordance with the specifications of Appendix 2, Figure A2-12. The number of levels of brilliancy settings for these lights should be the same as that for the runway centre line lights.*

5.3.16.10 **Recommendation**.— *Where taxiway centre line lights are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, taxiway centre line lights should be in accordance with the specifications of Appendix 2, Figure A2-17, A2-18 or A2-19.*

Note.— High-intensity centre line lights should only be used in case of an absolute necessity and following a specific study.

Location

5.3.16.11 **Recommendation.—** *Taxiway centre line lights should normally be located on the taxiway centre line marking, except that they may be offset by not more than 30 cm where it is not practicable to locate them on the marking.*

Taxiway centre line lights on taxiways

Location

5.3.16.12 **Recommendation.—** *Taxiway centre line lights on a straight section of a taxiway should be spaced at longitudinal intervals of not more than 30 m, except that:*

a) larger intervals not exceeding 60 m may be used where, because of the prevailing meteorological conditions, adequate guidance is provided by such spacing;

b) intervals less than 30 m should be provided on short straight sections; and

c) on a taxiway intended for use in RVR conditions of less than a value of 350 m, the longitudinal spacing should not exceed 15 m.

5.3.16.13 **Recommendation.—** *Taxiway centre line lights on a taxiway curve should continue from the straight portion of the taxiway at a constant distance from the outside edge of the taxiway curve. The lights should be spaced at intervals such that a clear indication of the curve is provided.*

5.3.16.14 **Recommendation.—** *On a taxiway intended for use in RVR conditions of less than a value of 350 m, the lights on a curve should not exceed a spacing of 15 m and on a curve of less than 400 m radius the lights should be spaced at intervals of not greater than 7.5 m. This spacing should extend for 60 m before and after the curve.*

Note 1.— Spacings on curves that have been found suitable for a taxiway intended for use in RVR conditions of 350 m or greater are:

Curve radius	Light spacing
up to 400 m	*7.5 m*
401 m to 899 m	*15 m*
900 m or greater	*30 m*

Note 2.— See 3.9.6 and Figure 3-2.

Taxiway centre line lights on rapid exit taxiways

Location

5.3.16.15 **Recommendation.—** *Taxiway centre line lights on a rapid exit taxiway should commence at a point at least 60 m before the beginning of the taxiway centre line curve and continue beyond the end of the curve to a point on the centre line of the taxiway where an aeroplane can be expected to reach normal taxiing speed. The lights on that portion parallel to the runway centre line should always be at least 60 cm from any row of runway centre line lights, as shown in Figure 5-25.*

5.3.16.16 **Recommendation.—** *The lights should be spaced at longitudinal intervals of not more than 15 m, except that, where runway centre line lights are not provided, a greater interval not exceeding 30 m may be used.*

Taxiway centre line lights on other exit taxiways

Location

5.3.16.17 **Recommendation.—** *Taxiway centre line lights on exit taxiways other than rapid exit taxiways should commence at the point where the taxiway centre line marking* *begins to curve from the runway centre line, and follow the curved taxiway centre line marking at least to the point where the marking leaves the runway. The first light should be at least 60 cm from any row of runway centre line lights, as shown in Figure 5-25.*

5.3.16.18 **Recommendation.—** *The lights should be spaced at longitudinal intervals of not more than 7.5 m.*

Taxiway centre line lights on runways

Location

5.3.16.19 **Recommendation.—** *Taxiway centre line lights on a runway forming part of a standard taxi-route and intended for taxiing in runway visual range conditions less than a value of 350 m should be spaced at longitudinal intervals not exceeding 15 m.*

5.3.17 Taxiway edge lights

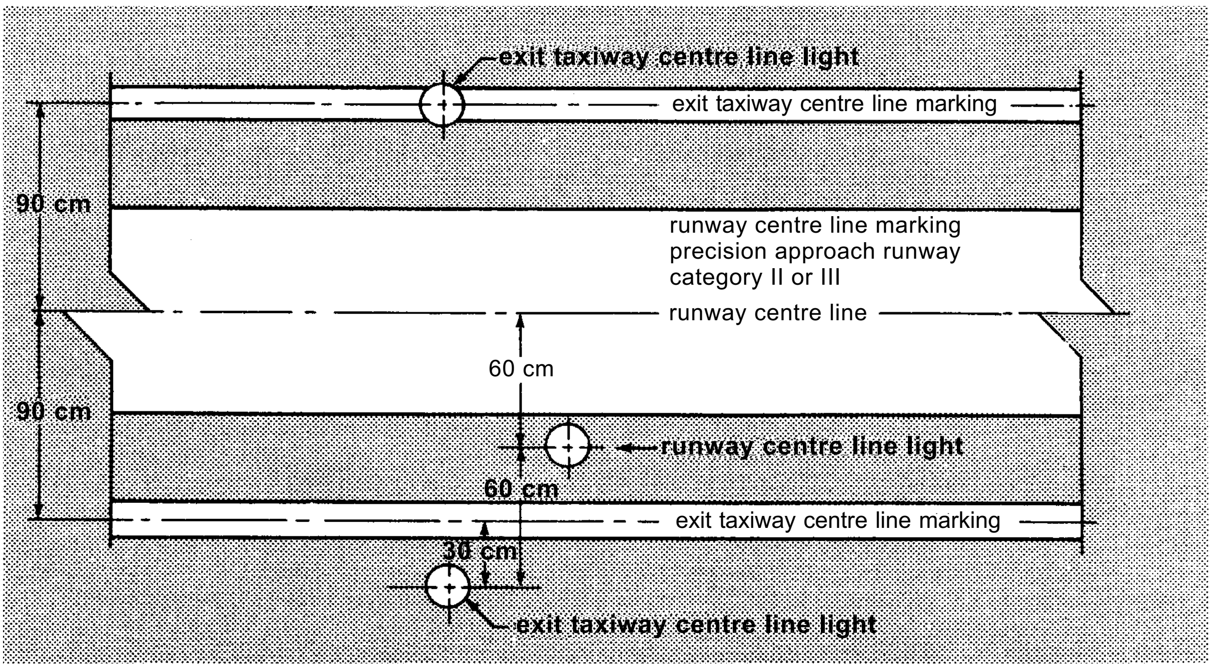
Application

5.3.17.1 Taxiway edge lights shall be provided at the edges of a runway turn pad, holding bay, de-icing/anti-icing facility, apron, etc. intended for use at night and on a taxiway not provided with taxiway centre line lights and intended for use at night, except that taxiway edge lights need not be provided where, considering the nature of the operations, adequate guidance can be achieved by surface illumination or other means.

Note.— See 5.5.5 for taxiway edge markers.

5.3.17.2 Taxiway edge lights shall be provided on a runway forming part of a standard taxi-route and intended for taxiing at night where the runway is not provided with taxiway centre line lights.

Note.— See 8.2.3 for provisions concerning the inter-locking of runway and taxiway lighting systems.



Tolerances for offset runway centre line lights and taxiway centre line lights to maintain 60 cm separation.

Figure 5-25. Offset runway and taxiway centre line lights

Location

5.3.17.3 **Recommendation.—** *Taxiway edge lights on a straight section of a taxiway and on a runway forming part of a standard taxi-route should be spaced at uniform longitudinal intervals of not more than 60 m. The lights on a curve should be spaced at intervals less than 60 m so that a clear indication of the curve is provided.*

Note.— Guidance on the spacing of taxiway edge lights on curves is given in the Aerodrome Design Manual, *Part 4.*

5.3.17.4 **Recommendation.—** *Taxiway edge lights on a holding bay, de-icing/anti-icing facility, apron, etc. should be spaced at uniform longitudinal intervals of not more than 60 m.*

5.3.17.5 **Recommendation.—** *Taxiway edge lights on a runway turn pad should be spaced at uniform longitudinal intervals of not more than 30 m.*

5.3.17.6 **Recommendation.—** *The lights should be located as near as practicable to the edges of the taxiway, runway turn pad, holding bay, de-icing/anti-icing facility, apron or runway, etc. or outside the edges at a distance of not more than 3 m.*

Characteristics

5.3.17.7 Taxiway edge lights shall be fixed lights showing blue. The lights shall show up to at least 30° above the horizontal and at all angles in azimuth necessary to provide guidance to a pilot taxiing in either direction. At an intersection, exit or curve the lights shall be shielded as far as practicable so that they cannot be seen in angles of azimuth in which they may be confused with other lights.

5.3.18 Runway turn pad lights

Application

5.3.18.1 Runway turn pad lights shall be provided for continuous guidance on a runway turn pad intended for use in runway visual range conditions less than a value of 350 m, to enable an aeroplane to complete a 180-degree turn and align with the runway centre line.

5.3.18.2 **Recommendation.—** *Runway turn pad lights should be provided on a runway turn pad intended for use at night.*

Location

5.3.18.3 **Recommendation.—** *Runway turn pad lights should normally be located on the runway turn pad marking, except that they may be offset by not more than 30 cm where it is not practicable to locate them on the marking.*

5.3.18.4 **Recommendation.—** *Runway turn pad lights on a straight section of the runway turn pad marking should be spaced at longitudinal intervals of not more than 15 m.*

5.3.18.5 **Recommendation.—** *Runway turn pad lights on a curved section of the runway turn pad marking should not exceed a spacing of 7.5 m.*

Characteristics

5.3.18.6 Runway turn pad lights shall be unidirectional fixed lights showing green with beam dimensions such that the light is visible only from aeroplanes on or approaching the runway turn pad.

5.3.18.7 Runway turn pad lights shall be in accordance with the specifications of Appendix 2, Figure A2-13, A2-14 or A2-15, as appropriate.

5.3.19 Stop bars

Application

Note 1.— The provision of stop bars requires their control either manually or automatically by air traffic services.

Note 2.— Runway incursions may take place in all visibility or weather conditions. The provision of stop bars at runway holding positions and their use at night and in visibility conditions greater than 550 m runway visual range can form part of effective runway incursion prevention measures.

5.3.19.1 A stop bar shall be provided at every runway-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 350 m, except where:

a) appropriate aids and procedures are available to assist in preventing inadvertent incursions of aircraft and vehicles onto the runway; or

b) operational procedures exist to limit, in runway visual range conditions less than a value of 550 m, the number of:

   1) aircraft on the manoeuvring area to one at a time; and

   2) vehicles on the manoeuvring area to the essential minimum.

5.3.19.2 A stop bar shall be provided at every runway-holding position, serving a runway when it is intended that the runway will be used in runway visual range conditions of values between 350 m and 550 m, except where:

a) appropriate aids and procedures are available to assist in preventing inadvertent incursions of aircraft and vehicles onto the runway; or

b) operational procedures exist to limit, in runway visual range conditions less than a value of 550 m, the number of:

   1) aircraft on the manoeuvring area to one at a time; and

   2) vehicles on the manoeuvring area to the essential minimum.

5.3.19.3 **Recommendation.—** *A stop bar should be provided at an intermediate holding position when it is desired to supplement markings with lights and to provide traffic control by visual means.*

5.3.19.4 **Recommendation.—** *Where the normal stop bar lights might be obscured (from a pilot's view), for example, by snow or rain, or where a pilot may be required to stop the aircraft in a position so close to the lights that they are blocked from view by the structure of the aircraft, then a pair of elevated lights should be added to each end of the stop bar.*

Location

5.3.19.5 Stop bars shall be located across the taxiway at the point where it is desired that traffic stop. Where the additional lights specified in 5.3.19.4 are provided, these lights shall be located not less than 3 m from the taxiway edge.

Characteristics

5.3.19.6 Stop bars shall consist of lights spaced at intervals of 3 m across the taxiway, showing red in the intended direction(s) of approach to the intersection or runway-holding position.

5.3.19.7 Stop bars installed at a runway-holding position shall be unidirectional and shall show red in the direction of approach to the runway.

5.3.19.8 Where the additional lights specified in 5.3.19.4 are provided, these lights shall have the same characteristics as the lights in the stop bar, but shall be visible to approaching aircraft up to the stop bar position.

5.3.19.9 Selectively switchable stop bars shall be installed in conjunction with at least three taxiway centre line lights (extending for a distance of at least 90 m from the stop bar) in the direction that it is intended for an aircraft to proceed from the stop bar.

Note.— See 5.3.16.12 for provisions concerning the spacing of taxiway centre line lights.

5.3.19.10 The intensity in red light and beam spreads of stop bar lights shall be in accordance with the specifications in Appendix 2, Figures A2-12 through A2-16, as appropriate.

5.3.19.11 **Recommendation.—** *Where stop bars are specified as components of an advanced surface movement guidance and control system and where, from an operational point of view, higher intensities are required to maintain ground movements at a certain speed in very low visibilities or in bright daytime conditions, the intensity in red light and beam spreads of stop bar lights should be in accordance with the specifications of Appendix 2, Figure A2-17, A2-18 or A2-19.*

Note.— High-intensity stop bars should only be used in case of an absolute necessity and following a specific study.

5.3.19.12 **Recommendation.—** *Where a wide beam fixture is required, the intensity in red light and beam spreads of stop bar lights should be in accordance with the specifications of Appendix 2, Figure A2-17 or A2-19.*

5.3.19.13 The lighting circuit shall be designed so that:

a) stop bars located across entrance taxiways are selectively switchable;

b) stop bars located across taxiways intended to be used only as exit taxiways are switchable selectively or in groups;

c) when a stop bar is illuminated, any taxiway centre line lights installed beyond the stop bar shall be extinguished for a distance of at least 90 m; and

d) stop bars shall be interlocked with the taxiway centre line lights so that when the centre line lights beyond the stop bar are illuminated the stop bar is extinguished and vice versa.

Note 1.— A stop bar is switched on to indicate that traffic stop and switched off to indicate that traffic proceed.

Note 2.— Care is required in the design of the electrical system to ensure that all of the lights of a stop bar will not fail at the same time. Guidance on this issue is given in the Aerodrome Design Manual, *Part 5.*

5.3.20 Intermediate holding position lights

Note.— See 5.2.11 for specifications on intermediate holding position marking.

Application

5.3.20.1 Except where a stop bar has been installed, intermediate holding position lights shall be provided at an intermediate holding position intended for use in runway visual range conditions less than a value of 350 m.

5.3.20.2 **Recommendation.—** *Intermediate holding position lights should be provided at an intermediate holding position where there is no need for stop-and-go signals as provided by a stop bar.*

Location

5.3.20.3 Intermediate holding position lights shall be located along the intermediate holding position marking at a distance of 0.3 m prior to the marking.

Characteristics

5.3.20.4 Intermediate holding position lights shall consist of three fixed unidirectional lights showing yellow in the direction of approach to the intermediate holding position with a light distribution similar to taxiway centre line lights if provided. The lights shall be disposed symmetrically about and at right angle to the taxiway centre line, with individual lights spaced 1.5 m apart.

5.3.21 De-icing/anti-icing facility exit lights

Application

5.3.21.1 **Recommendation.—** *De-icing/anti-icing facility exit lights should be provided at the exit boundary of a remote de-icing/anti-icing facility adjoining a taxiway.*

Location

5.3.21.2 De-icing/anti-icing facility exit lights shall be located 0.3 m inward of the intermediate holding position marking displayed at the exit boundary of a remote de-icing/anti-icing facility.

Characteristics

5.3.21.3 De-icing/anti-icing facility exit lights shall consist of in-pavement fixed unidirectional lights spaced at intervals of 6 m showing yellow in the direction of the approach to the exit boundary with a light distribution similar to taxiway centre line lights (see Figure 5-26).

5.3.22 Runway guard lights

Note.— The purpose of runway guard lights is to warn pilots, and drivers of vehicles when they are operating on taxiways, that they are about to enter an active runway. There are two standard configurations of runway guard lights as illustrated in Figure 5-27.

Application

5.3.22.1 Runway guard lights, Configuration A, shall be provided at each taxiway/runway intersection associated with a runway intended for use in:

a) runway visual range conditions less than a value of 550 m where a stop bar is not installed; and

b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is heavy.

5.3.22.2 **Recommendation.—** *Runway guard lights, Configuration A, should be provided at each taxiway/runway intersection associated with a runway intended for use in:*

a) runway visual range conditions of values less than a value of 550 m where a stop bar is installed; and

b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is medium or light.

5.3.22.3 **Recommendation.—** *Runway guard lights, Configuration A or Configuration B or both, should be provided at each taxiway/runway intersection where enhanced conspicuity of the taxiway/runway intersection is needed, such as on a wide-throat taxiway, except that Configuration B should not be collocated with a stop bar.*

Location

5.3.22.4 Runway guard lights, Configuration A, shall be located at each side of the taxiway at a distance from the runway centre line not less than that specified for a take-off runway in Table 3-2.

5.3.22.5 Runway guard lights, Configuration B, shall be located across the taxiway at a distance from the runway centre line not less than that specified for a take-off runway in Table 3-2.

Characteristics

5.3.22.6 Runway guard lights, Configuration A, shall consist of two pairs of yellow lights.

5.3.22.7 **Recommendation.—** *Where there is a need to enhance the contrast between the on and off state of runway*

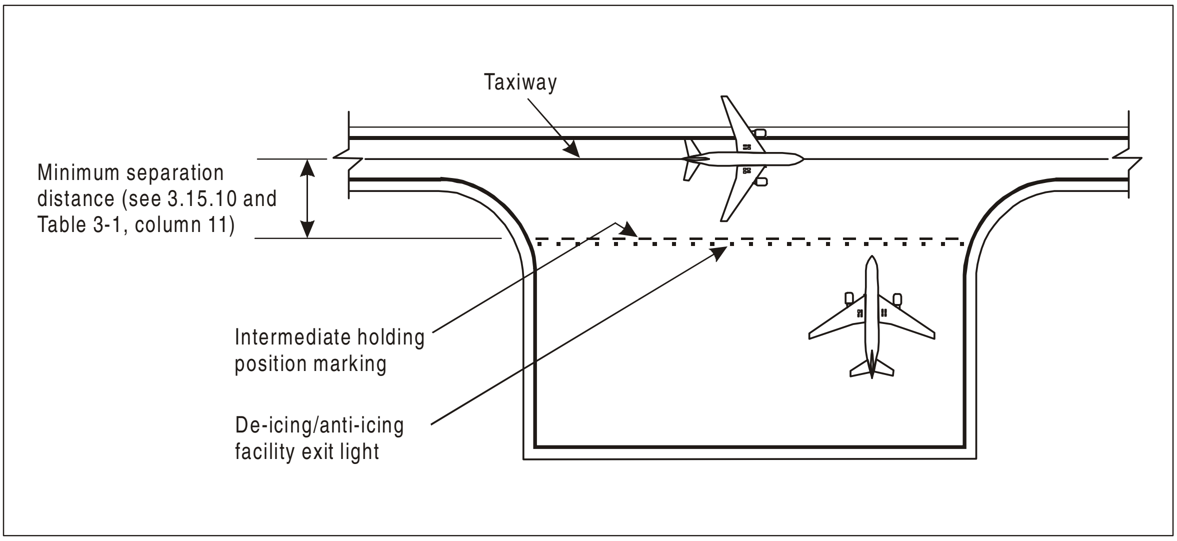


Figure 5-26. Typical remote de-icing/anti-icing facility

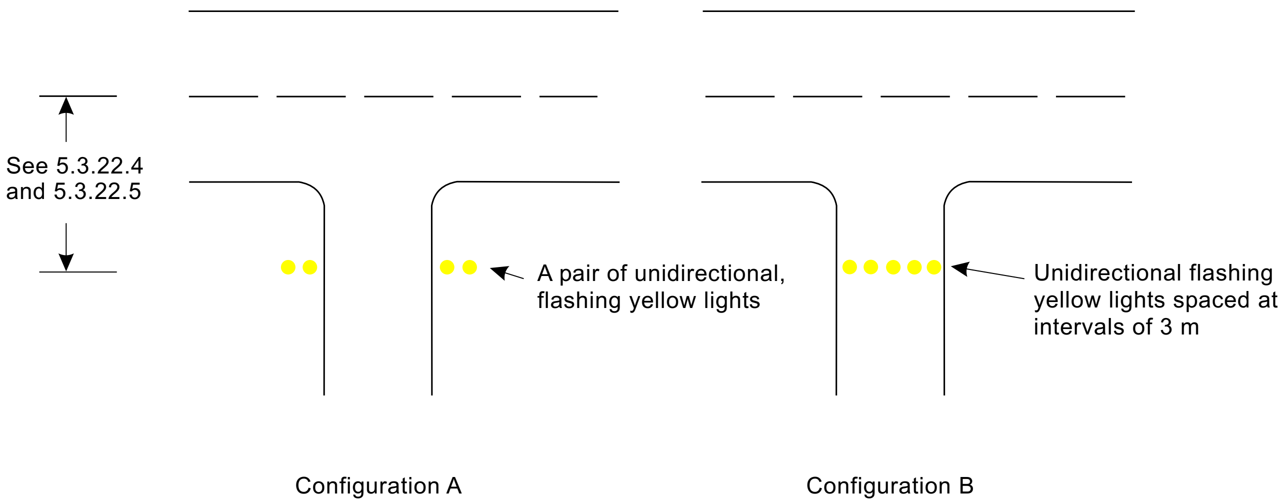


Figure 5-27. Runway guard lights

guard lights, Configuration A, intended for use during the day, a visor of sufficient size to prevent sunlight from entering the lens without interfering with the function of the fixture should be located above each lamp.

Note.— Some other device or design, e.g. specially designed optics, may be used in lieu of the visor.

5.3.22.8 Runway guard lights, Configuration B, shall consist of yellow lights spaced at intervals of 3 m across the taxiway.

5.3.22.9 The light beam shall be unidirectional and aligned so as to be visible to the pilot of an aeroplane taxiing to the holding position.

5.3.22.10 **Recommendation.—** *The intensity in yellow light and beam spreads of lights of Configuration A should be in accordance with the specifications in Appendix 2, Figure A2-24.*

5.3.22.11 **Recommendation.—** *Where runway guard lights are intended for use during the day, the intensity in yellow light and beam spreads of lights of Configuration A should be in accordance with the specifications in Appendix 2, Figure A2-25.*

5.3.22.12 **Recommendation.—** *Where runway guard lights are specified as components of an advanced surface movement guidance and control system where higher light intensities are required, the intensity in yellow light and beam spreads of lights of Configuration A should be in accordance with the specifications in Appendix 2, Figure A2-25.*

Note.— Higher light intensities may be required to maintain ground movement at a certain speed in low visibilities.

5.3.22.13 **Recommendation.—** *The intensity in yellow light and beam spreads of lights of Configuration B should be in accordance with the specifications in Appendix 2, Figure A2-12.*

5.3.22.14 **Recommendation.—** *Where runway guard lights are intended for use during the day, the intensity in yellow light and beam spreads of lights of Configuration B should be in accordance with the specifications in Appendix 2, Figure A2-20.*

5.3.22.15 **Recommendation.—** *Where runway guard lights are specified as components of an advanced surface movement guidance and control system where higher light intensities are required, the intensity in yellow light and beam spreads of lights of Configuration B should be in accordance with the specifications in Appendix 2, Figure A2-20.*

5.3.22.16 The lights in each unit of Configuration A shall be illuminated alternately.

5.3.22.17 For Configuration B, adjacent lights shall be alternately illuminated and alternative lights shall be illuminated in unison.

5.3.22.18 The lights shall be illuminated between 30 and 60 cycles per minute and the light suppression and illumination periods shall be equal and opposite in each light.

Note.— The optimum flash rate is dependent on the rise and fall times of the lamps used. Runway guard lights, Configuration A, installed on 6.6 ampere series circuits have been found to look best when operated at 45 to 50 flashes per minute per lamp. Runway guard lights, Configuration B, installed on 6.6 ampere series circuits have been found to look best when operated at 30 to 32 flashes per minute per lamp.

5.3.23 Apron floodlighting
(see also 5.3.16.1 and 5.3.17.1)

Application

5.3.23.1 **Recommendation.—** *Apron floodlighting should be provided on an apron, on a de-icing/anti-icing facility and on a designated isolated aircraft parking position intended to be used at night.*

Note 1.— Where a de-icing/anti-icing facility is located in close proximity to the runway and permanent floodlighting could be confusing to pilots, other means of illumination of the facility may be required.

Note 2.— The designation of an isolated aircraft parking position is specified in 3.14.

Note 3.— Guidance on apron floodlighting is given in the Aerodrome Design Manual, *Part 4.*

Location

5.3.23.2 **Recommendation.—** *Apron floodlights should be located so as to provide adequate illumination on all apron service areas, with a minimum of glare to pilots of aircraft in flight and on the ground, aerodrome and apron controllers, and personnel on the apron. The arrangement and aiming of floodlights should be such that an aircraft stand receives light from two or more directions to minimize shadows.*

Characteristics

5.3.23.3 The spectral distribution of apron floodlights shall be such that the colours used for aircraft marking connected with routine servicing, and for surface and obstacle marking, can be correctly identified.

5.3.23.4 **Recommendation.—** *The average illuminance should be at least the following:*

Aircraft stand:

— *horizontal illuminance — 20 lux with a uniformity ratio (average to minimum) of not more than 4 to 1; and*

— *vertical illuminance — 20 lux at a height of 2 m above the apron in relevant directions.*

Other apron areas:

— *horizontal illuminance — 50 per cent of the average illuminance on the aircraft stands with a uniformity ratio (average to minimum) of not more than 4 to 1.*

5.3.24 Visual docking guidance system

Application

5.3.24.1 A visual docking guidance system shall be provided when it is intended to indicate, by a visual aid, the precise positioning of an aircraft on an aircraft stand and other alternative means, such as marshallers, are not practicable.

Note.— The factors to be considered in evaluating the need for a visual docking guidance system are in particular: the number and type(s) of aircraft using the aircraft stand, weather conditions, space available on the apron and the precision required for manoeuvring into the parking position due to aircraft servicing installation, passenger loading bridges, etc. See the Aerodrome Design Manual, *Part 4 —* Visual Aids *for guidance on the selection of suitable systems.*

5.3.24.2 The provisions of 5.3.24.3 to 5.3.24.7, 5.3.24.9, 5.3.24.10, 5.3.24.12 to 5.3.24.15, 5.3.24.17, 5.3.24.18 and 5.3.24.20 shall not require the replacement of existing installations before 1 January 2005.

Characteristics

5.3.24.3 The system shall provide both azimuth and stopping guidance.

5.3.24.4 The azimuth guidance unit and the stopping position indicator shall be adequate for use in all weather, visibility, background lighting and pavement conditions for which the system is intended both by day and night, but shall not dazzle the pilot.

Note.— Care is required in both the design and on-site installation of the system to ensure that reflection of sunlight, or other light in the vicinity, does not degrade the clarity and conspicuity of the visual cues provided by the system.

5.3.24.5 The azimuth guidance unit and the stopping position indicator shall be of a design such that:

a) a clear indication of malfunction of either or both is available to the pilot; and

b) they can be turned off.

5.3.24.6 The azimuth guidance unit and the stopping position indicator shall be located in such a way that there is continuity of guidance between the aircraft stand markings, the aircraft stand manoeuvring guidance lights, if present, and the visual docking guidance system.

5.3.24.7 The accuracy of the system shall be adequate for the type of loading bridge and fixed aircraft servicing installations with which it is to be used.

5.3.24.8 **Recommendation.—** *The system should be usable by all types of aircraft for which the aircraft stand is intended, preferably without selective operation.*

5.3.24.9 If selective operation is required to prepare the system for use by a particular type of aircraft, then the system shall provide an identification of the selected aircraft type to both the pilot and the system operator as a means of ensuring that the system has been set properly.

Azimuth guidance unit

Location

5.3.24.10 The azimuth guidance unit shall be located on or close to the extension of the stand centre line ahead of the aircraft so that its signals are visible from the cockpit of an aircraft throughout the docking manoeuvre and aligned for use at least by the pilot occupying the left seat.

5.3.24.11 **Recommendation.—** *The azimuth guidance unit should be aligned for use by the pilots occupying both the left and right seats.*

Characteristics

5.3.24.12 The azimuth guidance unit shall provide unambiguous left/right guidance which enables the pilot to acquire and maintain the lead-in line without overcontrolling.

5.3.24.13 When azimuth guidance is indicated by colour change, green shall be used to identify the centre line and red for deviations from the centre line.

Stopping position indicator

Location

5.3.24.14 The stopping position indicator shall be located in conjunction with, or sufficiently close to, the azimuth guidance unit so that a pilot can observe both the azimuth and stop signals without turning the head.

5.3.24.15 The stopping position indicator shall be usable at least by the pilot occupying the left seat.

5.3.24.16 **Recommendation.—** *The stopping position indicator should be usable by the pilots occupying both the left and right seats.*

Characteristics

5.3.24.17 The stopping position information provided by the indicator for a particular aircraft type shall account for the anticipated range of variations in pilot eye height and/or viewing angle.

5.3.24.18 The stopping position indicator shall show the stopping position for the aircraft for which guidance is being provided, and shall provide closing rate information to enable the pilot to gradually decelerate the aircraft to a full stop at the intended stopping position.

5.3.24.19 **Recommendation.—** *The stopping position indicator should provide closing rate information over a distance of at least 10 m.*

5.3.24.20 When stopping guidance is indicated by colour change, green shall be used to show that the aircraft can proceed and red to show that the stop point has been reached except that for a short distance prior to the stop point a third colour may be used to warn that the stopping point is close.

5.3.25 Aircraft stand manoeuvring guidance lights

Application

5.3.25.1 **Recommendation.—** *Aircraft stand manoeuvring guidance lights should be provided to facilitate the positioning of an aircraft on an aircraft stand on a paved apron or on a de-icing/anti-icing facility intended for use in poor visibility conditions, unless adequate guidance is provided by other means.*

Location

5.3.25.2 Aircraft stand manoeuvring guidance lights shall be collocated with the aircraft stand markings.

Characteristics

5.3.25.3 Aircraft stand manoeuvring guidance lights, other than those indicating a stop position, shall be fixed yellow lights, visible throughout the segments within which they are intended to provide guidance.

5.3.25.4 **Recommendation.—** *The lights used to delineate lead-in, turning and lead-out lines should be spaced at intervals of not more than 7.5 m on curves and 15 m on straight sections.*

5.3.25.5 The lights indicating a stop position shall be fixed, unidirectional lights, showing red.

5.3.25.6 **Recommendation.—** *The intensity of the lights should be adequate for the condition of visibility and ambient light in which the use of the aircraft stand is intended.*

5.3.25.7 **Recommendation.—** *The lighting circuit should be designed so that the lights may be switched on to indicate that an aircraft stand is to be used and switched off to indicate that it is not to be used.*

5.3.26 Road-holding position light

Application

5.3.26.1 A road-holding position light shall be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 350 m.

5.3.26.2 **Recommendation.—** *A road-holding position light should be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions of values between 350 m and 550 m.*

Location

5.3.26.3 A road-holding position light shall be located adjacent to the holding position marking 1.5 m (± 0.5 m) from one edge of the road, i.e. left or right as appropriate to the local traffic regulations.

Note.— See 9.9 for the mass and height limitations and frangibility requirements of navigation aids located on runway strips.

Characteristics

5.3.26.4 The road-holding position light shall comprise:

a) a controllable red (stop)/green (go) traffic light; or

b) a flashing-red light.

Note.— It is intended that the lights specified in sub-paragraph a) be controlled by the air traffic services.

5.3.26.5 The road-holding position light beam shall be unidirectional and aligned so as to be visible to the driver of a vehicle approaching the holding position.

5.3.26.6 The intensity of the light beam shall be adequate for the conditions of visibility and ambient light in which the use of the holding position is intended, but shall not dazzle the driver.

Note.— The commonly used traffic lights are likely to meet the requirements in 5.3.26.5 and 5.3.26.6.

5.3.26.7 The flash frequency of the flashing-red light shall be between 30 and 60 per minute.

5.4 Signs

5.4.1 General

Note.— Signs shall be either fixed message signs or variable message signs. Guidance on signs is contained in the Aerodrome Design Manual, *Part 4.*

Application

5.4.1.1 Signs shall be provided to convey a mandatory instruction, information on a specific location or destination on a movement area or to provide other information to meet the requirements of 9.8.1.

Note.— See 5.2.17 for specifications on information marking.

5.4.1.2 **Recommendation.—** *A variable message sign should be provided where:*

a) the instruction or information displayed on the sign is relevant only during a certain period of time; and/or

b) there is a need for variable pre-determined information to be displayed on the sign to meet the requirements of 9.8.1.

Characteristics

5.4.1.3 Signs shall be frangible. Those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft. The installed height of the sign shall not exceed the dimension shown in the appropriate column of Table 5-4.

5.4.1.4 Signs shall be rectangular, as shown in Figures 5-28 and 5-29 with the longer side horizontal.

5.4.1.5 The only signs on the movement area utilizing red shall be mandatory instruction signs.

5.4.1.6 The inscriptions on a sign shall be in accordance with the provisions of Appendix 4.

5.4.1.7 Signs shall be illuminated in accordance with the provisions of Appendix 4 when intended for use:

a) in runway visual range conditions less than a value of 800 m; or

b) at night in association with instrument runways; or

c) at night in association with non-instrument runways where the code number is 3 or 4.

Table 5-4. Location distances for taxiing guidance signs including runway exit signs

Code number	Sign height (mm) Legend	Face (min.)	Installed (max.)	Perpendicular distance from defined taxiway pavement edge to near side of sign	Perpendicular distance from defined runway pavement edge to near side of sign
1 or 2	200	400	700	5-11 m	3-10 m
1 or 2	300	600	900	5-11 m	3-10 m
3 or 4	300	600	900	11-21 m	8-15 m
3 or 4	400	800	1 100	11-21 m	8-15 m

5.4.1.8 Signs shall be retroreflective and/or illuminated in accordance with the provisions of Appendix 4 when intended for use at night in association with non-instrument runways where the code number is 1 or 2.

5.4.1.9 A variable message sign shall show a blank face when not in use.

5.4.1.10 In case of failure, a variable message sign shall not provide information that could lead to unsafe action from a pilot or a vehicle driver.

5.4.1.11 **Recommendation.—** *The time interval to change from one message to another on a variable message sign should be as short as practicable and should not exceed 5 seconds.*

5.4.2 Mandatory instruction signs

Note.— See Figure 5-28 for pictorial representation of mandatory instruction signs and Figure 5-30 for examples of locating signs at taxiway/runway intersections.

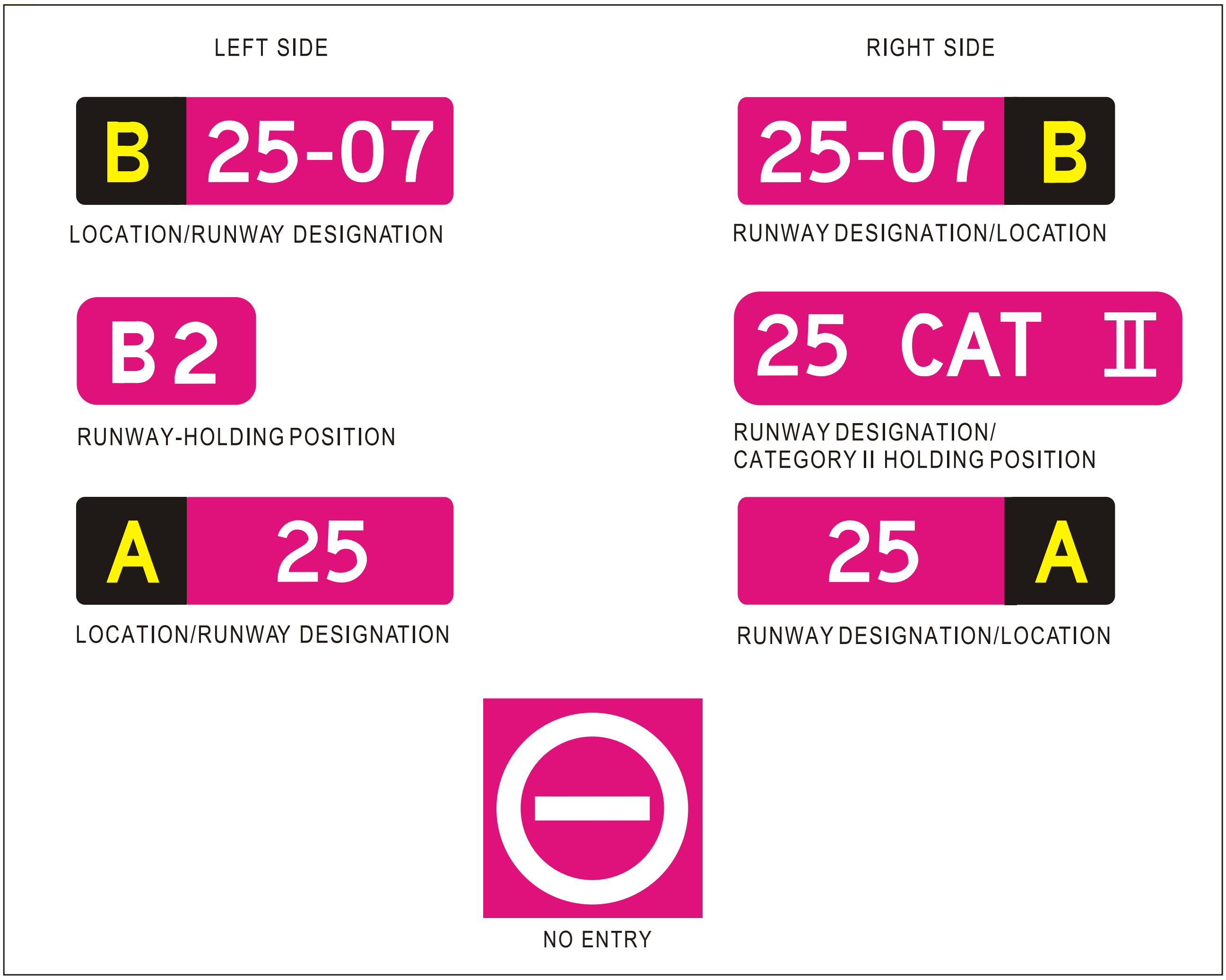


Figure 5-28. Mandatory instruction signs

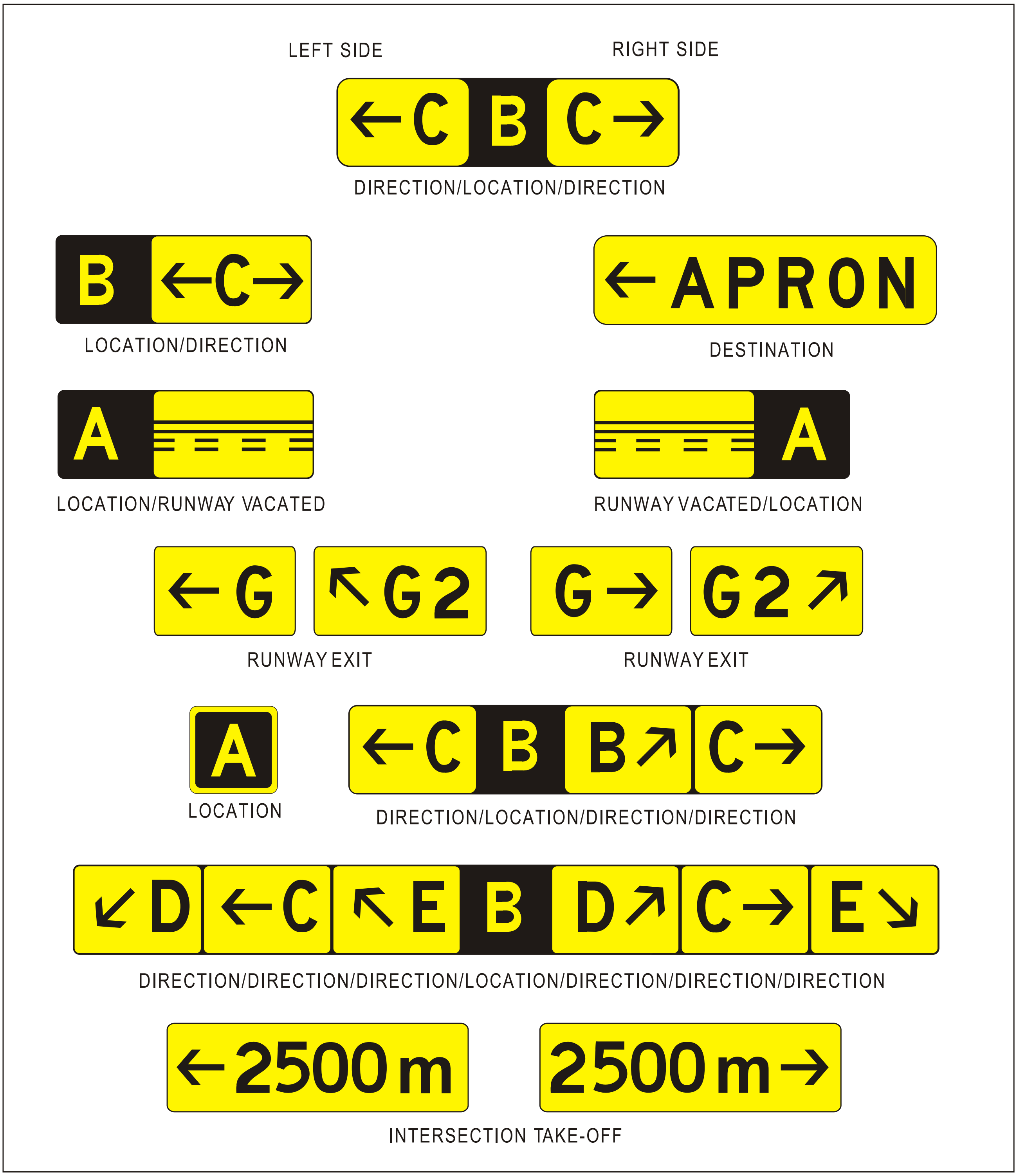
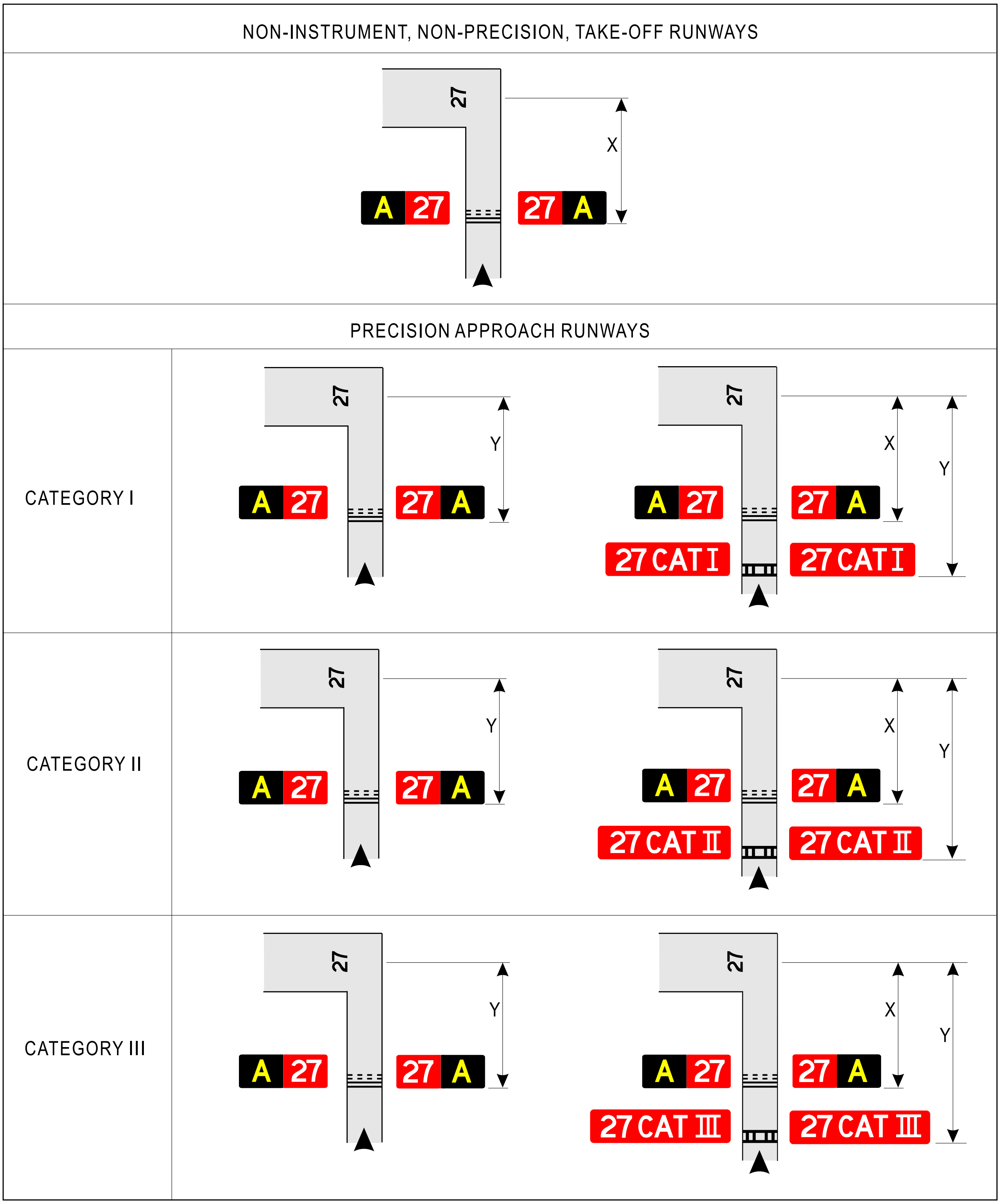


Figure 5-29. Information signs



Note: Distance X is established in accordance with Table 3-2. Distance Y is established at the edge of the ILS/MLS critical/sensitive area.

Figure 5-30. Examples of sign positions at taxiway/runway intersections

Application

5.4.2.1 A mandatory instruction sign shall be provided to identify a location beyond which an aircraft taxiing or vehicle shall not proceed unless authorized by the aerodrome control tower.

5.4.2.2 Mandatory instruction signs shall include runway designation signs, category I, II or III holding position signs, runway-holding position signs, road-holding position signs and NO ENTRY signs.

Note.— See 5.4.7 for specifications on road-holding position signs.

5.4.2.3 A pattern "A" runway-holding position marking shall be supplemented at a taxiway/runway intersection or a runway/runway intersection with a runway designation sign.

5.4.2.4 A pattern "B" runway-holding position marking shall be supplemented with a category I, II or III holding position sign.

5.4.2.5 A pattern "A" runway-holding position marking at a runway-holding position established in accordance with 3.12.3 shall be supplemented with a runway-holding position sign.

Note.— See 5.2.10 for specifications on runway-holding position marking.

5.4.2.6 **Recommendation.—** *A runway designation sign at a taxiway/runway intersection should be supplemented with a location sign in the outboard (farthest from the taxiway) position, as appropriate.*

Note.— See 5.4.3 for characteristics of location signs.

5.4.2.7 A NO ENTRY sign shall be provided when entry into an area is prohibited.

Location

5.4.2.8 A runway designation sign at a taxiway/runway intersection or a runway/runway intersection shall be located on each side of the runway-holding position marking facing the direction of approach to the runway.

5.4.2.9 A category I, II or III holding position sign shall be located on each side of the runway-holding position marking facing the direction of the approach to the critical area.

5.4.2.10 A NO ENTRY sign shall be located at the beginning of the area to which entrance is prohibited on each side of the taxiway as viewed by the pilot.

5.4.2.11 A runway-holding position sign shall be located on each side of the runway-holding position established in accordance with 3.12.3, facing the approach to the obstacle limitation surface or ILS/MLS critical/sensitive area, as appropriate.

Characteristics

5.4.2.12 A mandatory instruction sign shall consist of an inscription in white on a red background.

5.4.2.13 The inscription on a runway designation sign shall consist of the runway designations of the intersecting runway properly oriented with respect to the viewing position of the sign, except that a runway designation sign installed in the vicinity of a runway extremity may show the runway designation of the concerned runway extremity only.

5.4.2.14 The inscription on a category I, II, III or joint II/III holding position sign shall consist of the runway designator followed by CAT I, CAT II, CAT III or CAT II/III, as appropriate.

5.4.2.15 The inscription on a NO ENTRY sign shall be in accordance with Figure 5-28.

5.4.2.16 The inscription on a runway-holding position sign at a runway-holding position established in accordance with 3.12.3 shall consist of the taxiway designation and a number.

5.4.2.17 Where appropriate, the following inscriptions/ symbol shall be used:

Inscription/ symbol	*Use*
Runway designation of a runway extremity	To indicate a runway-holding position at a runway extremity
OR	
Runway designation of both extremities of a runway	To indicate a runway-holding position located at other taxiway/runway intersections or runway/runway intersections
25 CAT I (Example)	To indicate a category I runway-holding position at the threshold of runway 25
25 CAT II (Example)	To indicate a category II runway-holding position at the threshold of runway 25

25 CAT III (Example)	To indicate a category III runway-holding position at the threshold of runway 25
25 CAT II/III (Example)	To indicate a joint category II/III runway-holding position at the threshold of runway 25
NO ENTRY symbol	To indicate that entry to an area is prohibited
B2 (Example)	To indicate a runway-holding position established in accordance with 3.12.3

5.4.3 Information signs

Note.— See Figure 5-29 for pictorial representations of information signs.

Application

5.4.3.1 An information sign shall be provided where there is an operational need to identify by a sign, a specific location, or routing (direction or destination) information.

5.4.3.2 Information signs shall include: direction signs, location signs, destination signs, runway exit signs, runway vacated signs and intersection take-off signs.

5.4.3.3 A runway exit sign shall be provided where there is an operational need to identify a runway exit.

5.4.3.4 A runway vacated sign shall be provided where the exit taxiway is not provided with taxiway centre line lights and there is a need to indicate to a pilot leaving a runway the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface whichever is farther from the runway centre line.

Note.— See 5.3.16 for specifications on colour coding taxiway centre line lights.

5.4.3.5 **Recommendation.—** *An intersection take-off sign should be provided when there is an operational need to indicate the remaining take-off run available (TORA) for intersection take-offs.*

5.4.3.6 **Recommendation.—** *Where necessary, a destination sign should be provided to indicate the direction to a specific destination on the aerodrome, such as cargo area, general aviation, etc.*

5.4.3.7 A combined location and direction sign shall be provided when it is intended to indicate routing information prior to a taxiway intersection.

5.4.3.8 A direction sign shall be provided when there is an operational need to identify the designation and direction of taxiways at an intersection.

5.4.3.9 **Recommendation.—** *A location sign should be provided at an intermediate holding position.*

5.4.3.10 A location sign shall be provided in conjunction with a runway designation sign except at a runway/runway intersection.

5.4.3.11 A location sign shall be provided in conjunction with a direction sign, except that it may be omitted where an aeronautical study indicates that it is not needed.

5.4.3.12 **Recommendation.—** *Where necessary, a location sign should be provided to identify taxiways exiting an apron or taxiways beyond an intersection.*

5.4.3.13 **Recommendation.—** *Where a taxiway ends at an intersection such as a "T" and it is necessary to identify this, a barricade, direction sign and/or other appropriate visual aid should be used.*

Location

5.4.3.14 Except as specified in 5.4.3.16 and 5.4.3.24 information signs shall, wherever practicable, be located on the left-hand side of the taxiway in accordance with Table 5-4.

5.4.3.15 At a taxiway intersection, information signs shall be located prior to the intersection and in line with the taxiway intersection marking. Where there is no taxiway intersection marking, the signs shall be installed at least 60 m from the centre line of the intersecting taxiway where the code number is 3 or 4 and at least 40 m where the code number is 1 or 2.

Note.— A location sign installed beyond a taxiway intersection may be installed on either side of a taxiway.

5.4.3.16 A runway exit sign shall be located on the same side of the runway as the exit is located (i.e. left or right) and positioned in accordance with Table 5-4.

5.4.3.17 A runway exit sign shall be located prior to the runway exit point in line with a position at least 60 m prior to the point of tangency where the code number is 3 or 4, and at least 30 m where the code number is 1 or 2.

5.4.3.18 A runway vacated sign shall be located at least on one side of the taxiway. The distance between the sign and the centre line of a runway shall be not less than the greater of the following:

a) the distance between the centre line of the runway and the perimeter of the ILS/MLS critical/sensitive area; or

b) the distance between the centre line of the runway and the lower edge of the inner transitional surface.

5.4.3.19 Where provided in conjunction with a runway vacated sign, the taxiway location sign shall be positioned outboard of the runway vacated sign.

5.4.3.20 An intersection take-off sign shall be located at the left-hand side of the entry taxiway. The distance between the sign and the centre line of the runway shall be not less than 60 m where the code number is 3 or 4 and not less than 45 m where the code number is 1 or 2.

5.4.3.21 A taxiway location sign installed in conjunction with a runway designation sign shall be positioned outboard of the runway designation sign.

5.4.3.22 **Recommendation.—** *A destination sign should not normally be collocated with a location or direction sign.*

5.4.3.23 An information sign other than a location sign shall not be collocated with a mandatory instruction sign.

5.4.3.24 **Recommendation.—** *A direction sign, barricade and/or other appropriate visual aid used to identify a "T" intersection should be located on the opposite side of the intersection facing the taxiway.*

Characteristics

5.4.3.25 An information sign other than a location sign shall consist of an inscription in black on a yellow background.

5.4.3.26 A location sign shall consist of an inscription in yellow on a black background and where it is a stand-alone sign shall have a yellow border.

5.4.3.27 The inscription on a runway exit sign shall consist of the designator of the exit taxiway and an arrow indicating the direction to follow.

5.4.3.28 The inscription on a runway vacated sign shall depict the pattern A runway-holding position marking as shown in Figure 5-29.

5.4.3.29 The inscription on an intersection take-off sign shall consist of a numerical message indicating the remaining take-off run available in metres plus an arrow, appropriately located and oriented, indicating the direction of the take-off as shown in Figure 5-29.

5.4.3.30 The inscription on a destination sign shall comprise an alpha, alphanumerical or numerical message identifying the destination plus an arrow indicating the direction to proceed as shown in Figure 5-29.

5.4.3.31 The inscription on a direction sign shall comprise an alpha or alphanumerical message identifying the taxiway(s) plus an arrow or arrows appropriately oriented as shown in Figure 5-29.

5.4.3.32 The inscription on a location sign shall comprise the designation of the location taxiway, runway or other pavement the aircraft is on or is entering and shall not contain arrows.

5.4.3.33 **Recommendation.—** *Where it is necessary to identify each of a series of intermediate holding positions on the same taxiway, the location sign should consist of the taxiway designation and a number.*

5.4.3.34 Where a location sign and direction signs are used in combination:

a) all direction signs related to left turns shall be placed on the left side of the location sign and all direction signs related to right turns shall be placed on the right side of the location sign, except that where the junction consists of one intersecting taxiway, the location sign may alternatively be placed on the left hand side;

b) the direction signs shall be placed such that the direction of the arrows departs increasingly from the vertical with increasing deviation of the corresponding taxiway;

c) an appropriate direction sign shall be placed next to the location sign where the direction of the location taxiway changes significantly beyond the intersection; and

d) adjacent direction signs shall be delineated by a vertical black line as shown in Figure 5-29.

5.4.3.35 A taxiway shall be identified by a designator comprising a letter, letters or a combination of a letter or letters followed by a number.

5.4.3.36 **Recommendation.—** *When designating taxiways, the use of the letters I, O or X and the use of words such as inner and outer should be avoided wherever possible to avoid confusion with the numerals 1, 0 and closed marking.*

5.4.3.37 The use of numbers alone on the manoeuvring area shall be reserved for the designation of runways.

5.4.4 VOR aerodrome check-point sign

Application

5.4.4.1 When a VOR aerodrome check-point is established, it shall be indicated by a VOR aerodrome check-point marking and sign.

Note.— See 5.2.12 for VOR aerodrome check-point marking.

Location

5.4.4.2 A VOR aerodrome check-point sign shall be located as near as possible to the check-point and so that the inscriptions are visible from the cockpit of an aircraft properly positioned on the VOR aerodrome check-point marking.

Characteristics

5.4.4.3 A VOR aerodrome check-point sign shall consist of an inscription in black on a yellow background.

5.4.4.4 **Recommendation.—** *The inscriptions on a VOR check-point sign should be in accordance with one of the alternatives shown in Figure 5-31 in which:*

VOR *is an abbreviation identifying this as a VOR check-point;*

116.3 *is an example of the radio frequency of the VOR concerned;*

147° *is an example of the VOR bearing, to the nearest degree, which should be indicated at the VOR check-point; and*

4.3 NM *is an example of the distance in nautical miles to a DME collocated with the VOR concerned.*

Note.— Tolerances for the bearing value shown on the sign are given in Annex 10, Volume I, Attachment E. It will be noted that a check-point can only be used operationally when periodic checks show it to be consistently within ± 2 degrees of the stated bearing.

5.4.5 Aerodrome identification sign

Application

5.4.5.1 **Recommendation.—** *An aerodrome identification sign should be provided at an aerodrome where there is insufficient alternative means of visual identification.*

Location

5.4.5.2 **Recommendation.—** *The aerodrome identification sign should be placed on the aerodrome so as to be legible, in so far as is practicable, at all angles above the horizontal.*

Characteristics

5.4.5.3 The aerodrome identification sign shall consist of the name of the aerodrome.

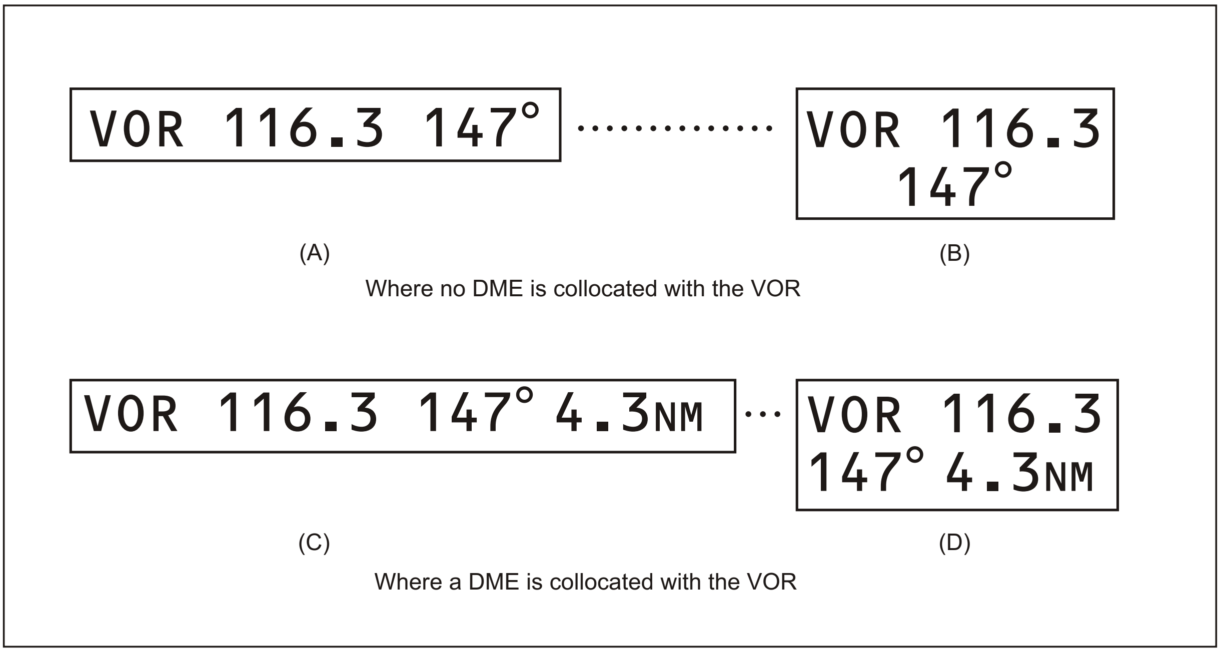


Figure 5-31. VOR aerodrome check-point sign

5.4.5.4 **Recommendation.—** *The colour selected for the sign should give adequate conspicuity when viewed against its background.*

5.4.5.5 **Recommendation.—** *The characters should have a height of not less than 3 m.*

5.4.6 Aircraft stand identification signs

Application

5.4.6.1 **Recommendation.—** *An aircraft stand identification marking should be supplemented with an aircraft stand identification sign where feasible.*

Location

5.4.6.2 **Recommendation.—** *An aircraft stand identification sign should be located so as to be clearly visible from the cockpit of an aircraft prior to entering the aircraft stand.*

Characteristics

5.4.6.3 **Recommendation.—** *An aircraft stand identification sign should consist of an inscription in black on a yellow background.*

5.4.7 Road-holding position sign

5.4.7.1 A road-holding position sign shall be provided at all road entrances to a runway.

Location

5.4.7.2 The road-holding position sign shall be located 1.5 m from one edge of the road (left or right as appropriate to the local traffic regulations) at the holding position.

Characteristics

5.4.7.3 A road-holding position sign shall consist of an inscription in white on a red background.

5.4.7.4 The inscription on a road-holding position sign shall be in the national language, be in conformity with the local traffic regulations and include the following:

a) a requirement to stop; and

b) where appropriate:

1) a requirement to obtain ATC clearance; and

2) location designator.

Note.— Examples of road-holding position signs are contained in the Aerodrome Design Manual *(Doc 9157), Part 4.*

5.4.7.5 A road-holding position sign intended for night use shall be retroreflective or illuminated.

5.5 Markers

5.5.1 General

Markers shall be frangible. Those located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft.

Note 1.— Anchors or chains, to prevent markers which have broken from their mounting from blowing away, are sometimes used.

Note 2.— Guidance on frangibility of markers is given in the Aerodrome Design Manual *(Doc 9157), Part 6.*

5.5.2 Unpaved runway edge markers

Application

5.5.2.1 **Recommendation.—** *Markers should be provided when the extent of an unpaved runway is not clearly indicated by the appearance of its surface compared with that of the surrounding ground.*

Location

5.5.2.2 **Recommendation.—** *Where runway lights are provided, the markers should be incorporated in the light fixtures. Where there are no lights, markers of flat rectangular or conical shape should be placed so as to delimit the runway clearly.*

Characteristics

5.5.2.3 **Recommendation.—** *The flat rectangular markers should have a minimum size of 1 m by 3 m and should be placed with their long dimension parallel to the runway centre line. The conical markers should have a height not exceeding 50 cm.*

5.5.3 Stopway edge markers

Application

5.5.3.1 **Recommendation.—** *Stopway edge markers should be provided when the extent of a stopway is not clearly indicated by its appearance compared with that of the surrounding ground.*

Characteristics

5.5.3.2 The stopway edge markers shall be sufficiently different from any runway edge markers used to ensure that the two types of markers cannot be confused.

Note.— Markers consisting of small vertical boards camouflaged on the reverse side, as viewed from the runway, have proved operationally acceptable.

5.5.4 Edge markers for snow-covered runways

Application

5.5.4.1 **Recommendation.—** *Edge markers for snow-covered runways should be used to indicate the usable limits of a snow-covered runway when the limits are not otherwise indicated.*

Note.— Runway lights could be used to indicate the limits.

Location

5.5.4.2 **Recommendation.—** *Edge markers for snow-covered runways should be placed along the sides of the runway at intervals of not more than 100 m, and should be located symmetrically about the runway centre line at such a distance from the centre line that there is adequate clearance for wing tips and power plants. Sufficient markers should be placed across the threshold and end of the runway.*

Characteristics

5.5.4.3 **Recommendation.—** *Edge markers for snow-covered runways should consist of conspicuous objects such as evergreen trees about 1.5 m high, or light-weight markers.*

5.5.5 Taxiway edge markers

Application

5.5.5.1 **Recommendation.—** *Taxiway edge markers should be provided on a taxiway where the code number is 1 or 2 and taxiway centre line or edge lights or taxiway centre line markers are not provided.*

Location

5.5.5.2 **Recommendation.—** *Taxiway edge markers should be installed at least at the same locations as would the taxiway edge lights had they been used.*

Characteristics

5.5.5.3 A taxiway edge marker shall be retroreflective blue.

5.5.5.4 **Recommendation.—** *The marked surface as viewed by the pilot should be a rectangle and should have a minimum viewing area of 150 cm^2.*

5.5.5.5 Taxiway edge markers shall be frangible. Their height shall be sufficiently low to preserve clearance for propellers and for the engine pods of jet aircraft.

5.5.6 Taxiway centre line markers

Application

5.5.6.1 **Recommendation.—** *Taxiway centre line markers should be provided on a taxiway where the code number is 1 or 2 and taxiway centre line or edge lights or taxiway edge markers are not provided.*

5.5.6.2 **Recommendation.—** *Taxiway centre line markers should be provided on a taxiway where the code number is 3 or 4 and taxiway centre line lights are not provided if there is a need to improve the guidance provided by the taxiway centre line marking.*

Location

5.5.6.3 **Recommendation.—** *Taxiway centre line markers should be installed at least at the same location as would taxiway centre line lights had they been used.*

Note.— See 5.3.16.12 for the spacing of taxiway centre line lights.

5.5.6.4 **Recommendation.—** *Taxiway centre line markers should normally be located on the taxiway centre line marking except that they may be offset by not more than 30 cm where it is not practicable to locate them on the marking.*

Characteristics

5.5.6.5 A taxiway centre line marker shall be retro-reflective green.

5.5.6.6 **Recommendation.—** *The marked surface as viewed by the pilot should be a rectangle and should have a minimum viewing area of 20 cm^2.*

5.5.6.7 Taxiway centre line markers shall be so designed and fitted as to withstand being run over by the wheels of an aircraft without damage either to the aircraft or to the markers themselves.

5.5.7 Unpaved taxiway edge markers

Application

5.5.7.1 **Recommendation.—** *Where the extent of an unpaved taxiway is not clearly indicated by its appearance compared with that of the surrounding ground, markers should be provided.*

Location

5.5.7.2 **Recommendation.—** *Where taxiway lights are provided, the markers should be incorporated in the light fixtures. Where there are no lights, markers of conical shape should be placed so as to delimit the taxiway clearly.*

5.5.8 Boundary markers

Application

5.5.8.1 Boundary markers shall be provided at an aerodrome where the landing area has no runway.

Location

5.5.8.2 Boundary markers shall be spaced along the boundary of the landing area at intervals of not more than 200 m, if the type shown in Figure 5-32 is used, or approximately 90 m, if the conical type is used with a marker at any corner.

Characteristics

5.5.8.3 **Recommendation.—** *Boundary markers should be of a form similar to that shown in Figure 5-32, or in the form of a cone not less than 50 cm high and not less than 75 cm in diameter at the base. The markers should be coloured to contrast with the background against which they will be seen. A single colour, orange or red, or two contrasting colours, orange and white or alternatively red and white, should be used, except where such colours merge with the background.*

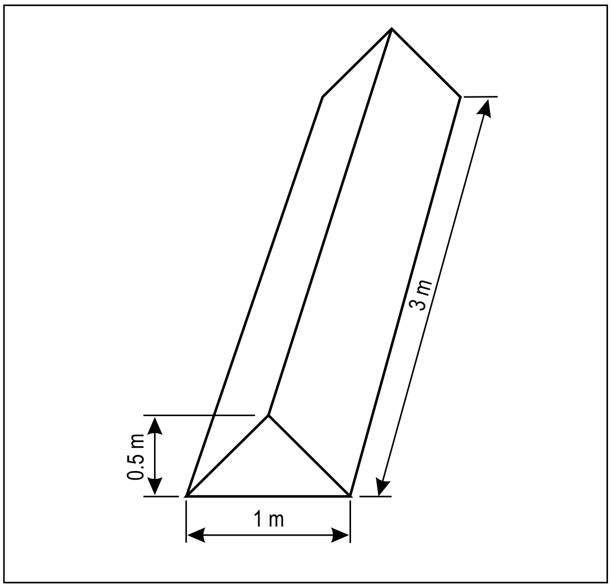


Figure 5-32. Boundary markers

CHAPTER 6. VISUAL AIDS FOR DENOTING OBSTACLES

6.1 Objects to be marked and/or lighted

Note.— The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of the obstacles. It does not necessarily reduce operating limitations which may be imposed by an obstacle.

6.1.1 **Recommendation.—** *A fixed obstacle that extends above a take-off climb surface within 3 000 m of the inner edge of the take-off climb surface should be marked and, if the runway is used at night, lighted, except that:*

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle;

b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

6.1.2 **Recommendation.—** *A fixed object, other than an obstacle, adjacent to a take-off climb surface should be marked and, if the runway is used at night, lighted if such marking and lighting is considered necessary to ensure its avoidance, except that the marking may be omitted when:*

a) the object is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m; or

b) the object is lighted by high-intensity obstacle lights by day.

6.1.3 A fixed obstacle that extends above an approach or transitional surface within 3 000 m of the inner edge of the approach surface shall be marked and, if the runway is used at night, lighted, except that:

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle;

b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

6.1.4 **Recommendation.—** *A fixed obstacle above a horizontal surface should be marked and, if the aerodrome is used at night, lighted except that:*

a) such marking and lighting may be omitted when:

1) the obstacle is shielded by another fixed obstacle; or

2) for a circuit extensively obstructed by immovable objects or terrain, procedures have been established to ensure safe vertical clearance below prescribed flight paths; or

3) an aeronautical study shows the obstacle not to be of operational significance;

b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m;

c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and

d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

6.1.5 A fixed object that extends above an obstacle protection surface shall be marked and, if the runway is used at night, lighted.

Note.— See 5.3.5 for information on the obstacle protection surface.

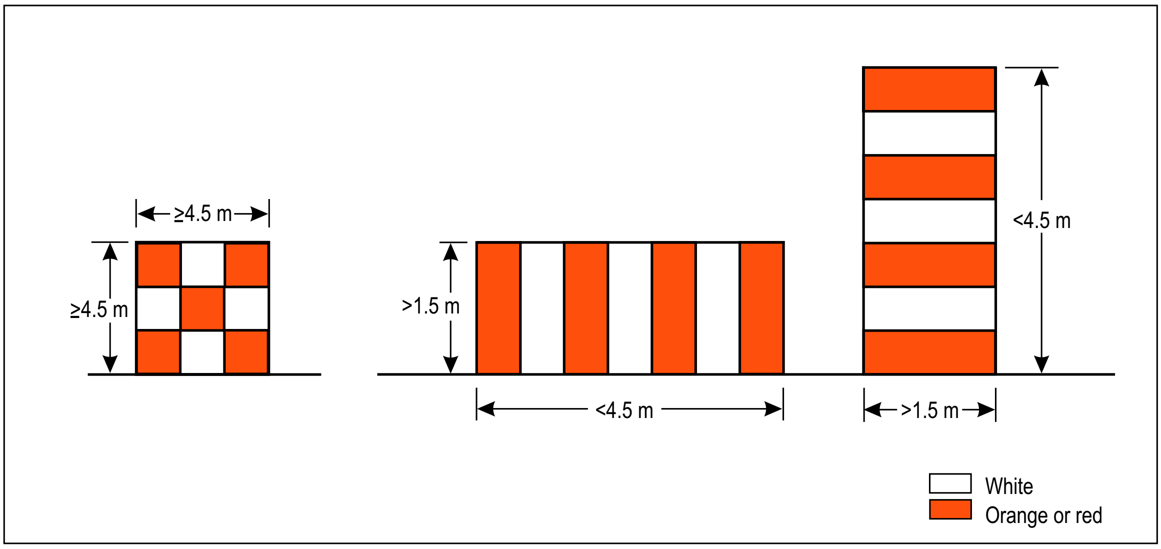


Figure 6-1. Basic marking patterns

6.1.6 Vehicles and other mobile objects, excluding aircraft, on the movement area of an aerodrome are obstacles and shall be marked and, if the vehicles and aerodrome are used at night or in conditions of low visibility, lighted, except that aircraft servicing equipment and vehicles used only on aprons may be exempt.

6.1.7 Elevated aeronautical ground lights within the movement area shall be marked so as to be conspicuous by day. Obstacle lights shall not be installed on elevated ground lights or signs in the movement area.

6.1.8 All obstacles within the distance specified in Table 3-1, column 11 or 12, from the centre line of a taxiway, an apron taxiway or aircraft stand taxilane shall be marked and, if the taxiway, apron taxiway or aircraft stand taxilane is used at night, lighted.

6.1.9 **Recommendation.—** *Obstacles in accordance with 4.3.2 should be marked and lighted, except that the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day.*

6.1.10 **Recommendation.—** *Overhead wires, cables, etc., crossing a river, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables could constitute a hazard to aircraft, except that the marking of the supporting towers may be omitted when they are lighted by high-intensity obstacle lights by day.*

6.1.11 **Recommendation.—** *When it has been determined that an overhead wire, cable, etc., needs to be marked but it is not practicable to install markers on the wire, cable, etc., then high-intensity obstacle lights, Type B, should be provided on their supporting towers.*

6.2 Marking of objects

General

6.2.1 All fixed objects to be marked shall, whenever practicable, be coloured, but if this is not practicable, markers or flags shall be displayed on or above them, except that objects that are sufficiently conspicuous by their shape, size or colour need not be otherwise marked.

6.2.2 All mobile objects to be marked shall be coloured or display flags.

Use of colours

6.2.3 **Recommendation.—** *An object should be coloured to show a chequered pattern if it has essentially unbroken surfaces and its projection on any vertical plane equals or exceeds 4.5 m in both dimensions. The pattern should consist of rectangles of not less than 1.5 m and not more than 3 m on a side, the corners being of the darker colour. The colours of the pattern should contrast each with the other and with the background against which they will be seen. Orange and white or alternatively red and white should be used, except where such colours merge with the background. (See Figure 6-1.)*

6.2.4 **Recommendation.—** *An object should be coloured to show alternating contrasting bands if:*

a) it has essentially unbroken surfaces and has one dimension, horizontal or vertical, greater than 1.5 m, and the other dimension, horizontal or vertical, less than 4.5 m; or *b) it is of skeletal type with either a vertical or a horizontal dimension greater than 1.5 m.*

The bands should be perpendicular to the longest dimension and have a width approximately 1/7 of the longest dimension or 30 m, whichever is less. The colours of the bands should contrast with the background against which they will be seen. Orange and white should be used, except where such colours are not conspicuous when viewed against the background. The bands on the extremities of the object should be of the darker colour. (See Figures 6-1 and 6-2.)

Note.— Table 6-1 shows a formula for determining band widths and for having an odd number of bands, thus permitting both the top and bottom bands to be of the darker colour.

6.2.5 **Recommendation.—** *An object should be coloured in a single conspicuous colour if its projection on any vertical plane has both dimensions less than 1.5 m. Orange or red should be used, except where such colours merge with the background.*

Note.— Against some backgrounds it may be found necessary to use a different colour from orange or red to obtain sufficient contrast.

6.2.6 **Recommendation.—** *When mobile objects are marked by colour, a single conspicuous colour, preferably red or yellowish green for emergency vehicles and yellow for service vehicles should be used.*

Table 6-1. Marking band widths

Longest dimension		
Greater than	Not exceeding	Band width
1.5 m	210 m	1/7 of longest dimension
210 m	270 m	1/9 ’’ ’’ ’’
270 m	330 m	1/11 ’’ ’’ ’’
330 m	390 m	1/13 ’’ ’’ ’’
390 m	450 m	1/15 ’’ ’’ ’’
450 m	510 m	1/17 ’’ ’’ ’’
510 m	570 m	1/19 ’’ ’’ ’’
570 m	630 m	1/21 ’’ ’’ ’’

Use of markers

6.2.7 Markers displayed on or adjacent to objects shall be located in conspicuous positions so as to retain the general definition of the object and shall be recognizable in clear weather from a distance of at least 1 000 m for an object to be viewed from the air and 300 m for an object to be viewed from the ground in all directions in which an aircraft is likely to approach the object. The shape of markers shall be distinctive to the extent necessary to ensure that they are not mistaken for markers employed to convey other information, and they shall be such that the hazard presented by the object they mark is not increased.

6.2.8 **Recommendation.—** *A marker displayed on an overhead wire, cable, etc., should be spherical and have a diameter of not less than 60 cm.*

6.2.9 **Recommendation.—** *The spacing between two consecutive markers or between a marker and a supporting tower should be appropriate to the diameter of the marker, but in no case should the spacing exceed:*

a) 30 m where the marker diameter is 60 cm progressively increasing with the diameter of the marker to

b) 35 m where the marker diameter is 80 cm and further progressively increasing to a maximum of

c) 40 m where the marker diameter is of at least 130 cm.

Where multiple wires, cables, etc. are involved, a marker should be located not lower than the level of the highest wire at the point marked.

6.2.10 **Recommendation.—** *A marker should be of one colour. When installed, white and red, or white and orange markers should be displayed alternately. The colour selected should contrast with the background against which it will be seen.*

Use of flags

6.2.11 Flags used to mark objects shall be displayed around, on top of, or around the highest edge of, the object. When flags are used to mark extensive objects or groups of closely spaced objects, they shall be displayed at least every 15 m. Flags shall not increase the hazard presented by the object they mark.

6.2.12 Flags used to mark fixed objects shall not be less than 0.6 m square and flags used to mark mobile objects, not less than 0.9 m square.

6.2.13 **Recommendation.—** *Flags used to mark fixed objects should be orange in colour or a combination of two triangular sections, one orange and the other white, or one red and the other white, except that where such colours merge with the background, other conspicuous colours should be used.*

6.2.14 Flags used to mark mobile objects shall consist of a chequered pattern, each square having sides of not less than 0.3 m. The colours of the pattern shall contrast each with the other and with the background against which they will be seen. Orange and white or alternatively red and white shall be used, except where such colours merge with the background.

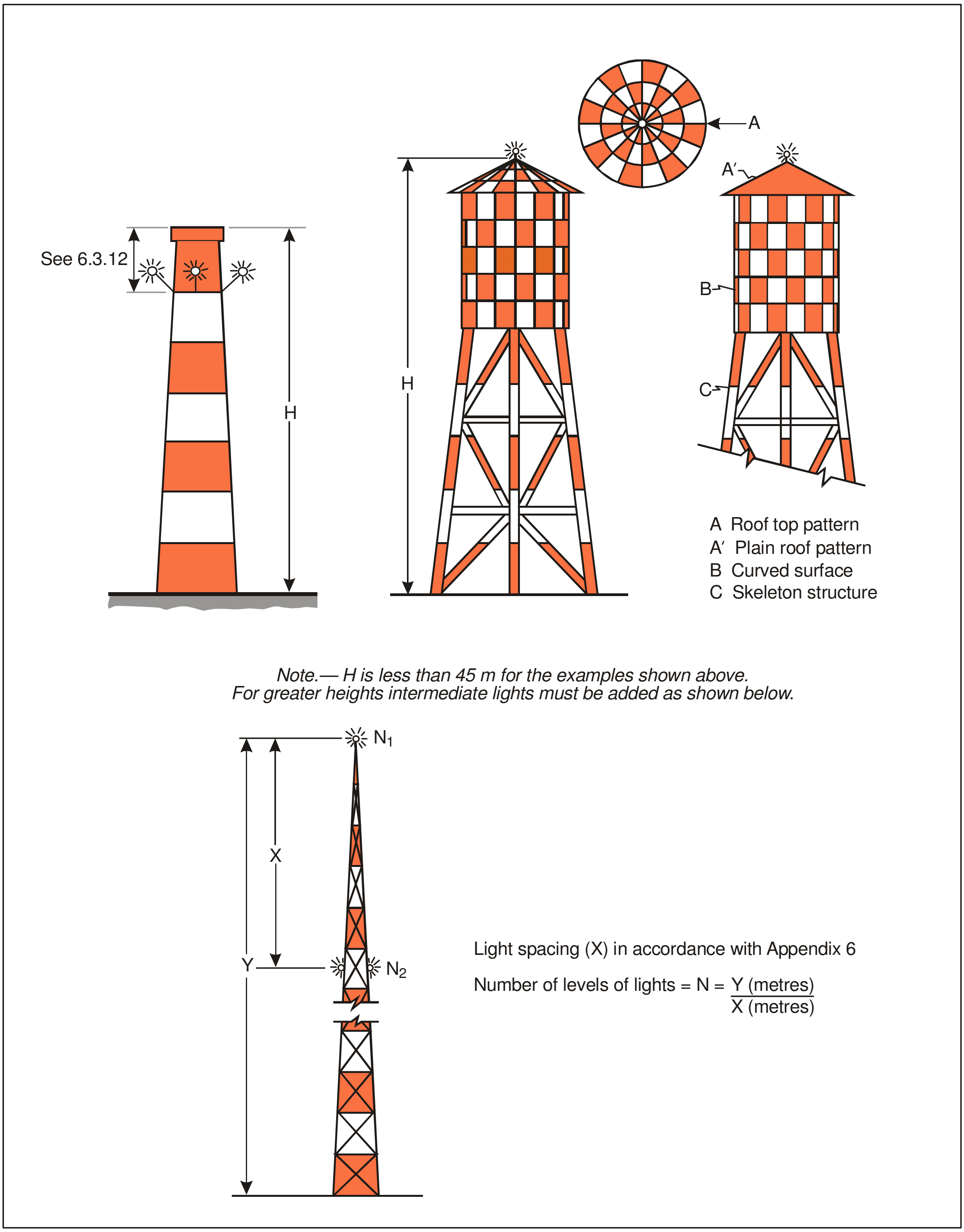


Figure 6-2. Examples of marking and lighting of tall structures

6.3 Lighting of objects

Use of obstacle lights

6.3.1 The presence of objects which must be lighted, as specified in 6.1, shall be indicated by low-, medium- or high-intensity obstacle lights, or a combination of such lights.

Note.— High-intensity obstacle lights are intended for day use as well as night use. Care is needed to ensure that these lights do not create disconcerting dazzle. Guidance on the design, location and operation of high-intensity obstacle lights is given in the Aerodrome Design Manual, *Part 4*.

6.3.2 **Recommendation**.— *Low-intensity obstacle lights, Type A or B, should be used where the object is a less extensive one and its height above the surrounding ground is less than 45 m.*

6.3.3 **Recommendation.—** *Where the use of low-intensity obstacle lights, Type A or B, would be inadequate or an early special warning is required, then medium- or high-intensity obstacle lights should be used.*

6.3.4 Low-intensity obstacle lights, Type C, shall be displayed on vehicles and other mobile objects excluding aircraft.

6.3.5 Low-intensity obstacle lights, Type D, shall be displayed on follow-me vehicles.

6.3.6 **Recommendation**.— *Low-intensity obstacle lights, Type B, should be used either alone or in combination with medium-intensity obstacle lights, Type B, in accordance with 6.3.7.*

6.3.7 **Recommendation.—** *Medium-intensity obstacle lights, Type A, B or C, should be used where the object is an extensive one or its height above the level of the surrounding ground is greater than 45 m. Medium-intensity obstacle lights, Types A and C, should be used alone, whereas medium-intensity obstacle lights, Type B, should be used either alone or in combination with low-intensity obstacle lights, Type B.*

Note.— A group of trees or buildings is regarded as an extensive object.

6.3.8 **Recommendation.—** *High-intensity obstacle lights, Type A, should be used to indicate the presence of an object if its height above the level of the surrounding ground exceeds 150 m and an aeronautical study indicates such lights to be essential for the recognition of the object by day.*

6.3.9 **Recommendation.—** *High-intensity obstacle lights, Type B, should be used to indicate the presence of a tower supporting overhead wires, cables, etc., where:*

a) an aeronautical study indicates such lights to be essential for the recognition of the presence of wires, cables, etc.; or

b) it has not been found practicable to install markers on the wires, cables, etc.

6.3.10 **Recommendation.—** *Where, in the opinion of the appropriate authority, the use of high-intensity obstacle lights, Type A or B, or medium-intensity obstacle lights, Type A, at night may dazzle pilots in the vicinity of an aerodrome (within approximately 10 000 m radius) or cause significant environmental concerns, a dual obstacle lighting system should be provided. This system should be composed of high-intensity obstacle lights, Type A or B, or medium-intensity obstacle lights, Type A, as appropriate, for daytime and twilight use and medium-intensity obstacle lights, Type B or C, for night-time use.*

Location of obstacle lights

Note.— Recommendations on how a combination of low-, medium-, and/or high-intensity lights on obstacles should be displayed are given in Appendix 6.

6.3.11 One or more low-, medium- or high-intensity obstacle lights shall be located as close as practicable to the top of the object. The top lights shall be so arranged as to at least indicate the points or edges of the object highest in relation to the obstacle limitation surface.

6.3.12 **Recommendation.—** *In the case of chimney or other structure of like function, the top lights should be placed sufficiently below the top so as to minimize contamination by smoke etc. (see Figures 6-2 and 6-3).*

6.3.13 In the case of a tower or antenna structure indicated by high-intensity obstacle lights by day with an appurtenance, such as a rod or an antenna, greater than 12 m where it is not practicable to locate a high-intensity obstacle light on the top of the appurtenance, such a light shall be located at the highest practicable point and, if practicable, a medium-intensity obstacle light, Type A, mounted on the top.

6.3.14 In the case of an extensive object or of a group of closely spaced objects, top lights shall be displayed at least on the points or edges of the objects highest in relation to the obstacle limitation surface, so as to indicate the general definition and the extent of the objects. If two or more edges are of the same height, the edge nearest the landing area shall be marked. Where low-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 45 m. Where medium-intensity lights are used, they shall be spaced at longitudinal intervals not exceeding 900 m.

6.3.15 **Recommendation.—** *When the obstacle limitation surface concerned is sloping and the highest point above the* *obstacle limitation surface is not the highest point of the object, additional obstacle lights should be placed on the highest point of the object.*

6.3.16 Where an object is indicated by medium-intensity obstacle lights, Type A, and the top of the object is more than 105 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 105 m (see 6.3.7).

6.3.17 Where an object is indicated by medium-intensity obstacle lights, Type B, and the top of the object is more than 45 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be alternately low-intensity obstacle lights, Type B, and medium-intensity obstacle lights, Type B, and shall be spaced as equally as practicable between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

6.3.18 Where an object is indicated by medium-intensity obstacle lights, Type C, and the top of the object is more than 45 m above the level of the surrounding ground or the elevation of tops of nearby buildings (when the object to be marked is surrounded by buildings), additional lights shall be provided at intermediate levels. These additional intermediate lights shall be spaced as equally as practicable, between the top lights and ground level or the level of tops of nearby buildings, as appropriate, with the spacing not exceeding 52 m.

6.3.19 Where high-intensity obstacle lights, Type A, are used, they shall be spaced at uniform intervals not exceeding 105 m between the ground level and the top light(s) specified in 6.3.11 except that where an object to be marked is surrounded by buildings, the elevation of the tops of the buildings may be used as the equivalent of the ground level when determining the number of light levels.

6.3.20 Where high-intensity obstacle lights, Type B, are used, they shall be located at three levels:

— at the top of the tower;
— at the lowest level of the catenary of the wires or cables; and
— at approximately midway between these two levels.

Note.— In some cases, this may require locating the lights off the tower.

6.3.21 **Recommendation.—** *The installation setting angles for high-intensity obstacle lights, Types A and B, should be in accordance with Table 6-2.*

6.3.22 The number and arrangement of low-, medium- or high-intensity obstacle lights at each level to be marked shall be such that the object is indicated from every angle in azimuth. Where a light is shielded in any direction by another part of the object, or by an adjacent object, additional lights shall be provided on that object in such a way as to retain the

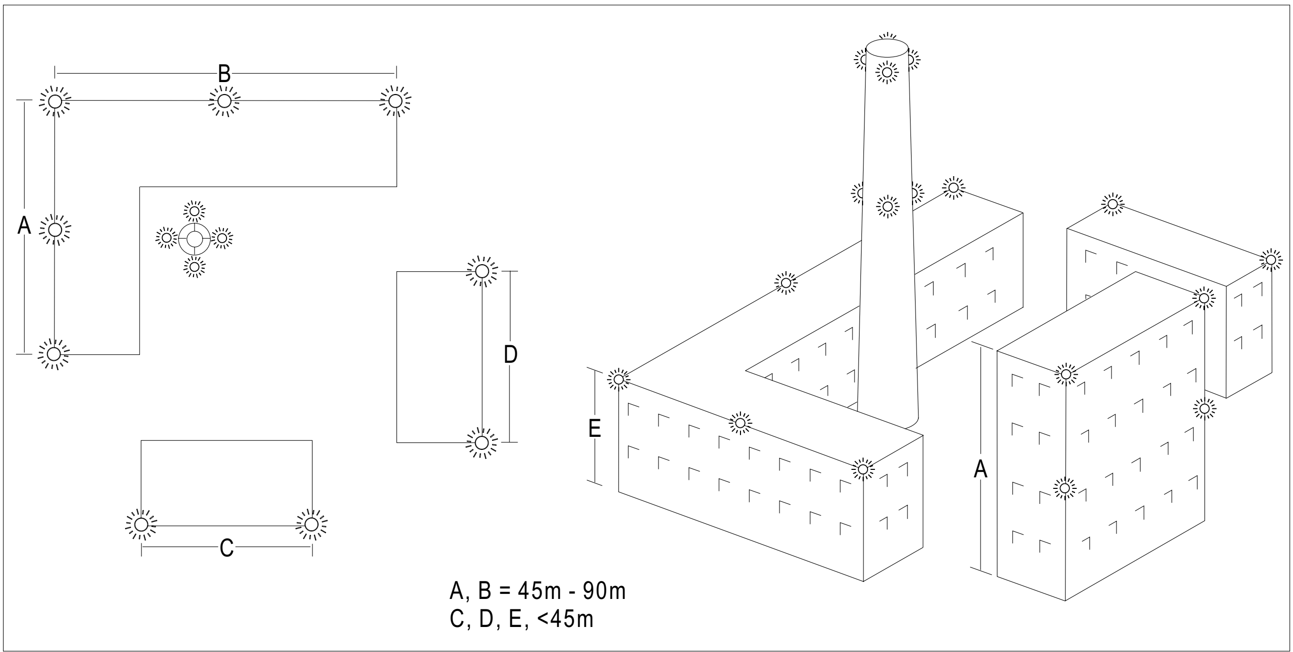


Figure 6-3. Lighting of buildings

general definition of the object to be lighted. If the shielded light does not contribute to the definition of the object to be lighted, it may be omitted.

Table 6-2. Installation setting angles for high-intensity obstacle lights

Height of light unit above terrain	*Angle of the peak of the beam above the horizontal*
greater than 151 m AGL	0°
122 m to 151 m AGL	1°
92 m to 122 m AGL	2°
less than 92 m AGL	3°

Low-intensity obstacle light — Characteristics

6.3.23 Low-intensity obstacle lights on fixed objects, Types A and B, shall be fixed-red lights.

6.3.24 Low-intensity obstacle lights, Types A and B, shall be in accordance with the specifications in Table 6-3.

6.3.25 Low-intensity obstacle lights, Type C, displayed on vehicles associated with emergency or security shall be flashing-blue and those displayed on other vehicles shall be flashing-yellow.

6.3.26 Low-intensity obstacle lights, Type D, displayed on follow-me vehicles shall be flashing-yellow.

6.3.27 Low-intensity obstacle lights, Types C and D, shall be in accordance with the specifications in Table 6-3.

6.3.28 Low-intensity obstacle lights on objects with limited mobility such as aerobridges shall be fixed-red. The intensity of the lights shall be sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general levels of illumination against which they would normally be viewed.

Note.— See Annex 2 for lights to be displayed by aircraft.

6.3.29 Low-intensity obstacle lights on objects with limited mobility shall as a minimum be in accordance with the specifications for low-intensity obstacle lights, Type A, in Table 6-3.

Medium-intensity obstacle light — Characteristics

6.3.30 Medium-intensity obstacle lights, Type A, shall be flashing-white lights, Type B shall be flashing-red lights and Type C shall be fixed-red lights.

6.3.31 Medium-intensity obstacle lights, Types A, B and C, shall be in accordance with the specifications in Table 6-3.

6.3.32 Medium-intensity obstacle lights, Types A and B, located on an object shall flash simultaneously.

High-intensity obstacle light — Characteristics

6.3.33 High-intensity obstacle lights, Types A and B, shall be flashing-white lights.

6.3.34 High-intensity obstacle lights, Types A and B, shall be in accordance with the specifications in Table 6-3.

6.3.35 High-intensity obstacle lights, Type A, located on an object shall flash simultaneously.

6.3.36 **Recommendation.—** *High-intensity obstacle lights, Type B, indicating the presence of a tower supporting overhead wires, cables, etc., should flash sequentially; first the middle light, second the top light and last, the bottom light. The intervals between flashes of the lights should approximate the following ratios:*

Flash interval between	*Ratio of cycle time*
middle and top light	*1/13*
top and bottom light	*2/13*
bottom and middle light	*10/13.*

Table 6-3. Characteristics of obstacle lights

1	2	3	4	5	6	7	8	9	10	11	12
			Peak intensity (cd) at given Background Luminance			Vertical Beam Spread (c)	Intensity (cd) at given Elevation Angles when the light unit is levelled (d)				
Light Type	Colour	Signal type/ (flash rate)	Above 500 cd/m^2	50-500 cd/m^2	Below 50 cd/m^2		–10° (e)	–1° (f)	±0° (f)	+6°	+10°
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	10 mnm	10 mnm	10°	—	—	—	10 mnm (g)	10 mnm (g)
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	32 mnm	32 mnm	10°	—	—	—	32 mnm (g)	32 mnm (g)
Low-intensity, Type C (mobile obstacle)	Yellow/Blue (a)	Flashing (60-90 fpm)	N/A	40 mnm (b) 400 max	40 mnm (b) 400 max	12° (h)	—	—	—	—	—
Low-intensity, Type D Follow-me Vehicle	Yellow	Flashing (60-90 fpm)	N/A	200 mnm (b) 400 max	200 mnm (b) 400 max	12° (i)	—	—	—	—	—
Medium-intensity, Type A	White	Flashing (20-60 fpm)	20 000 (b) ± 25%	20 000 (b) ± 25%	2 000 (b) ± 25%	3° mnm	3% max	50% mnm 75% max	100% mnm	—	—
Medium-intensity, Type B	Red	Flashing (20-60 fpm)	N/A	N/A	2 000 (b) ± 25%	3° mnm	—	50% mnm 75% max	100% mnm	—	—
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2 000 (b) ± 25%	3° mnm	—	50% mnm 75% max	100% mnm	—	—
High-intensity, Type A	White	Flashing (40-60 fpm)	200 000 (b) ± 25%	20 000 (b) ± 25%	2 000 (b) ± 25%	3°-7°	3% max	50% mnm 75% max	100% mnm	—	—
High-intensity, Type B	White	Flashing (40-60 fpm)	100 000 (b) ± 25%	20 000 (b) ± 25%	2 000 (b) ± 25%	3°-7°	3% max	50% mnm 75% max	100% mnm	—	—

Note.— This table does not include recommended horizontal beam spreads. 6.3.22 requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required.

a) See 6.3.25
b) Effective intensity, as determined in accordance with the *Aerodrome Design Manual*, Part 4.
c) Beam spread is defined as the angle between two directions in a plane for which the intensity is equal to 50% of the lower tolerance value of the intensity shown in columns 4, 5 and 6. The beam pattern is not necessarily symmetrical about the elevation angle at which the peak intensity occurs.
d) Elevation (vertical) angles are referenced to the horizontal.
e) Intensity at any specified horizontal radial as a percentage of the actual peak intensity at the same radial when operated at each of the intensities shown in columns 4, 5 and 6.
f) Intensity at any specified horizontal radial as a percentage of the lower tolerance value of the intensity shown in columns 4, 5 and 6.
g) In addition to specified values, lights shall have sufficient intensity to ensure conspicuity at elevation angles between ± 0° and 50°.
h) Peak intensity should be located at approximately 2.5° vertical.
i) Peak intensity should be located at approximately 17° vertical.

fpm — flashes per minute; N/A — not applicable

CHAPTER 7. VISUAL AIDS FOR DENOTING RESTRICTED USE AREAS

7.1 Closed runways and taxiways, or parts thereof

Application

7.1.1 A closed marking shall be displayed on a runway or taxiway, or portion thereof, which is permanently closed to the use of all aircraft.

7.1.2 **Recommendation.—** *A closed marking should be displayed on a temporarily closed runway or taxiway or portion thereof, except that such marking may be omitted when the closing is of short duration and adequate warning by air traffic services is provided.*

Location

7.1.3 On a runway a closed marking shall be placed at each end of the runway, or portion thereof, declared closed, and additional markings shall be so placed that the maximum interval between markings does not exceed 300 m. On a taxiway a closed marking shall be placed at least at each end of the taxiway or portion thereof closed.

Characteristics

7.1.4 The closed marking shall be of the form and proportions as detailed in Figure 7-1, Illustration a), when displayed on a runway, and shall be of the form and proportions as detailed in Figure 7-1, Illustration b), when displayed on a taxiway. The marking shall be white when displayed on a runway and shall be yellow when displayed on a taxiway.

Note.— When an area is temporarily closed, frangible barriers or markings utilizing materials other than paint or other suitable means may be used to identify the closed area.

7.1.5 When a runway or taxiway or portion thereof is permanently closed, all normal runway and taxiway markings shall be obliterated.

7.1.6 Lighting on a closed runway or taxiway or portion thereof shall not be operated, except as required for maintenance purposes.

7.1.7 In addition to closed markings, when the runway or taxiway or portion thereof closed is intercepted by a usable runway or taxiway which is used at night, unserviceability lights shall be placed across the entrance to the closed area at intervals not exceeding 3 m (see 7.4.4).

7.2 Non-load-bearing surfaces

Application

7.2.1 Shoulders for taxiways, runway turn pads, holding bays and aprons and other non-load bearing surfaces which cannot readily be distinguished from load-bearing surfaces and which, if used by aircraft, might result in damage to the aircraft shall have the boundary between such areas and the load-bearing surface marked by a taxi side stripe marking.

Note.— The marking of runway sides is specified in 5.2.7.

Location

7.2.2 **Recommendation.—** *A taxi side stripe marking should be placed along the edge of the load-bearing pavement, with the outer edge of the marking approximately on the edge of the load-bearing pavement.*

Characteristics

7.2.3 **Recommendation.—** *A taxi side stripe marking should consist of a pair of solid lines, each 15 cm wide and spaced 15 cm apart and the same colour as the taxiway centre line marking.*

Note.— Guidance on providing additional transverse stripes at an intersection or a small area on the apron is given in the Aerodrome Design Manual, *Part 4.*

7.3 Pre-threshold area

Application

7.3.1 **Recommendation.—** *When the surface before a threshold is paved and exceeds 60 m in length and is not suitable for normal use by aircraft, the entire length before the threshold should be marked with a chevron marking.*

Location

7.3.2 **Recommendation.—** *A chevron marking should point in the direction of the runway and be placed as shown in Figure 7-2.*

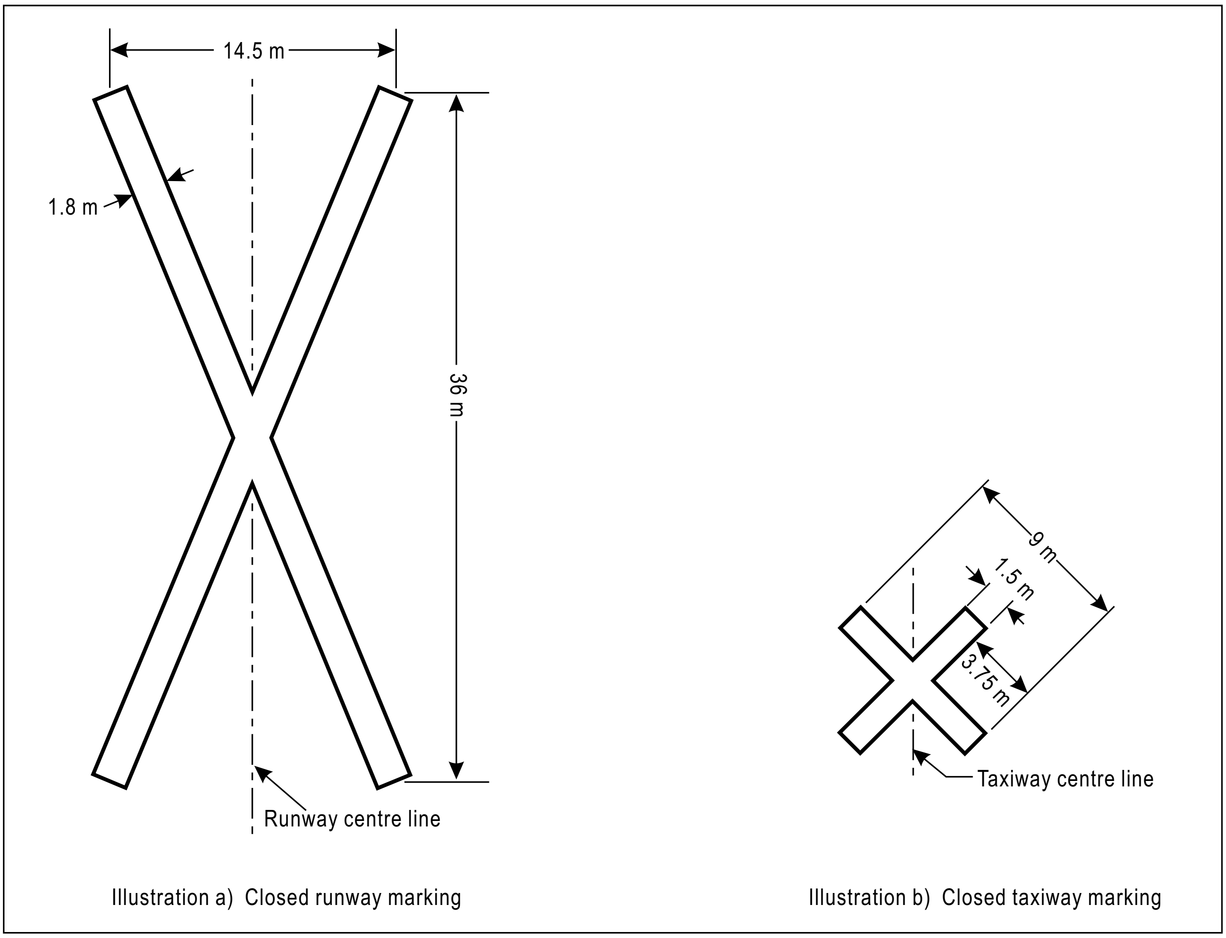


Figure 7-1. Closed runway and taxiway markings

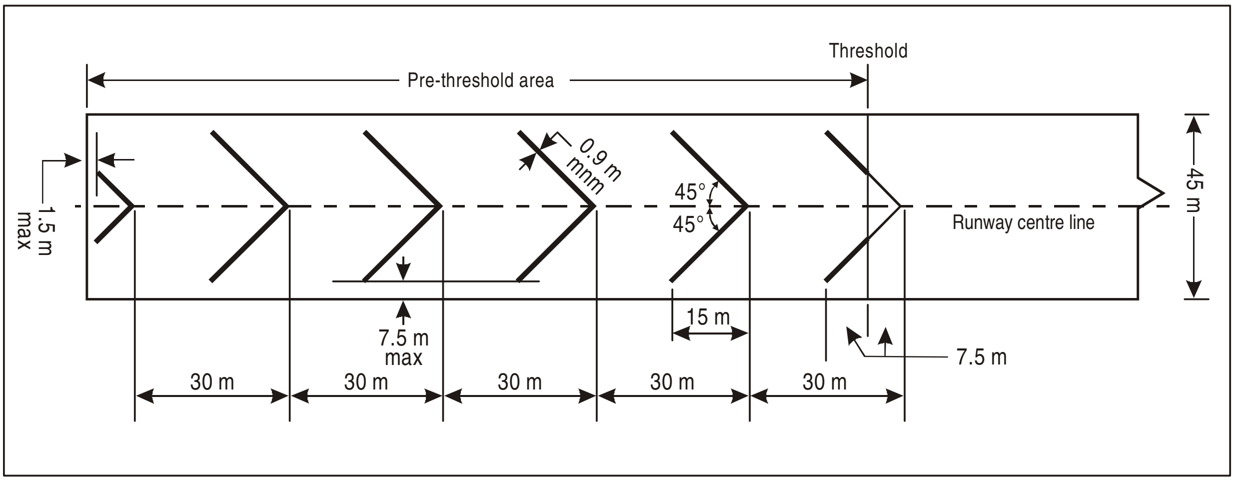


Figure 7-2. Pre-threshold marking

Characteristics

7.3.3 **Recommendation.—** *A chevron marking should be of conspicuous colour and contrast with the colour used for the runway markings; it should preferably be yellow. It should have an overall width of at least 0.9 m.*

7.4 Unserviceable areas

Application

7.4.1 Unserviceability markers shall be displayed wherever any portion of a taxiway, apron or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely. On a movement area used at night, unserviceability lights shall be used.

Note.— Unserviceability markers and lights are used for such purposes as warning pilots of a hole in a taxiway or apron pavement or outlining a portion of pavement, such as on an apron, that is under repair. They are not suitable for use when a portion of a runway becomes unserviceable, nor on a taxiway when a major portion of the width becomes unserviceable. In such instances, the runway or taxiway is normally closed.

Location

7.4.2 Unserviceability markers and lights shall be placed at intervals sufficiently close so as to delineate the unserviceable area.

Note.— Guidance on the location of unserviceability lights is given in Attachment A, Section 13.

Characteristics of unserviceability markers

7.4.3 Unserviceability markers shall consist of conspicuous upstanding devices such as flags, cones or marker boards.

Characteristics of unserviceability lights

7.4.4 An unserviceability light shall consist of a red fixed light. The light shall have an intensity sufficient to ensure conspicuity considering the intensity of the adjacent lights and the general level of illumination against which it would normally be viewed. In no case shall the intensity be less than 10 cd of red light.

Characteristics of unserviceability cones

7.4.5 **Recommendation.—** *An unserviceability cone should be at least 0.5 m in height and red, orange or yellow or any one of these colours in combination with white.*

Characteristics of unserviceability flags

7.4.6 **Recommendation.—** *An unserviceability flag should be at least 0.5 m square and red, orange or yellow or any one of these colours in combination with white.*

Characteristics of unserviceability marker boards

7.4.7 **Recommendation.—** *An unserviceability marker board should be at least 0.5 m in height and 0.9 m in length, with alternate red and white or orange and white vertical stripes.*

CHAPTER 8. ELECTRICAL SYSTEMS

8.1 Electrical power supply systems for air navigation facilities

Introductory Note.— The safety of operations at aerodromes depends on the quality of the supplied power. The total electrical power supply system may include connections to one or more external sources of electric power supply, one or more local generating facilities and to a distribution network including transformers and switchgear. Many other aerodrome facilities supplied from the same system need to be taken into account while planning the electrical power system at aerodromes.

8.1.1 Adequate primary power supply shall be available at aerodromes for the safe functioning of air navigation facilities.

8.1.2 The design and provision of electrical power systems for aerodrome visual and radio navigation aids shall be such that an equipment failure will not leave the pilot with inadequate visual and non-visual guidance or misleading information.

Note.— The design and installation of the electrical systems need to take into consideration factors that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in the Aerodrome Design Manual, *Part 5.*

8.1.3 **Recommendation.—** *Electric power supply connections to those facilities for which secondary power is required should be so arranged that the facilities are automatically connected to the secondary power supply on failure of the primary source of power.*

8.1.4 **Recommendation.—** *The time interval between failure of the primary source of power and the complete restoration of the services required by 8.1.10 should be as short as practicable, except that for visual aids associated with non-precision, precision approach or take-off runways the requirements of Table 8-1 for maximum switch-over times should apply.*

Note.— A definition of switch-over time is given in Chapter 1.

8.1.5 The provision of a definition of switch-over time shall not require the replacement of an existing secondary power supply before 1 January 2010. However, for a secondary power supply installed after 4 November 1999, the electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are capable of meeting the requirements of Table 8-1 for maximum switch-over times as defined in Chapter 1.

Visual aids

Application

8.1.6 For a precision approach runway, a secondary power supply capable of meeting the requirements of Table 8-1 for the appropriate category of precision approach runway shall be provided. Electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are automatically connected to the secondary power supply on failure of the primary source of power.

8.1.7 For a runway meant for take-off in runway visual range conditions less than a value of 800 m, a secondary power supply capable of meeting the relevant requirements of Table 8-1 shall be provided.

8.1.8 **Recommendation.—** *At an aerodrome where the primary runway is a non-precision approach runway, a secondary power supply capable of meeting the requirements of Table 8-1 should be provided except that a secondary power supply for visual aids need not be provided for more than one non-precision approach runway.*

8.1.9 **Recommendation.—** *At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of 8.1.4 should be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system in accordance with the specification of 5.3.2 is provided and capable of being deployed in 15 minutes.*

8.1.10 **Recommendation.—** *The following aerodrome facilities should be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:*

a) the signalling lamp and the minimum lighting necessary to enable air traffic services personnel to carry out their duties;

Note.— The requirement for minimum lighting may be met by other than electrical means.

b) *all obstacle lights which, in the opinion of the appropriate authority, are essential to ensure the safe operation of aircraft;*

c) *approach, runway and taxiway lighting as specified in 8.1.6 to 8.1.9;*

d) *meteorological equipment;*

e) *essential security lighting, if provided in accordance with 9.11;*

f) *essential equipment and facilities for the aerodrome responding emergency agencies;*

g) *floodlighting on a designated isolated aircraft parking position if provided in accordance with 5.3.23.1; and*

h) *illumination of apron areas over which passengers may walk.*

Note.— Specifications for secondary power supply for radio navigation aids and ground elements of communications systems are given in Annex 10, Volume I, Chapter 2.

8.1.11 **Recommendation.—** *Requirements for a secondary power supply should be met by either of the following:*

— *independent public power, which is a source of power supplying the aerodrome service from a substation other than the normal substation through a transmission line following a route different from the normal power supply route and such that the possibility of a simultaneous failure of the normal and independent public power supplies is extremely remote; or*

— *standby power unit(s), which are engine generators, batteries, etc., from which electric power can be obtained.*

Note.— Guidance on electrical systems is included in the Aerodrome Design Manual, *Part 5.*

8.2 System design

8.2.1 For a runway meant for use in runway visual range conditions less than a value of 550 m, the electrical systems for the power supply, lighting and control of the lighting systems included in Table 8-1 shall be so designed that an equipment failure will not leave the pilot with inadequate visual guidance or misleading information.

Note.— Guidance on means of providing this protection is given in the Aerodrome Design Manual, *Part 5.*

8.2.2 Where the secondary power supply of an aerodrome is provided by the use of duplicate feeders, such supplies shall be physically and electrically separate so as to ensure the required level of availability and independence.

8.2.3 Where a runway forming part of a standard taxi-route is provided with runway lighting and taxiway lighting, the lighting systems shall be interlocked to preclude the possibility of simultaneous operation of both forms of lighting.

8.3 Monitoring

Note.— Guidance on this subject is given in the Aerodrome Design Manual, *Part 5.*

8.3.1 **Recommendation.—** *A system of monitoring should be employed to indicate the operational status of the lighting systems.*

8.3.2 Where lighting systems are used for aircraft control purposes, such systems shall be monitored automatically so as to provide an indication of any fault which may affect the control functions. This information shall be automatically relayed to the air traffic service unit.

8.3.3 **Recommendation.—** *Where a change in the operational status of lights has occurred, an indication should be provided within two seconds for a stop bar at a runway-holding position and within five seconds for all other types of visual aids.*

8.3.4 **Recommendation.—** *For a runway meant for use in runway visual range conditions less than a value of 550 m, the lighting systems detailed in Table 8-1 should be monitored automatically so as to provide an indication when the serviceability level of any element falls below the minimum serviceability level specified in 10.4.7 to 10.4.11, as appropriate. This information should be automatically relayed to the maintenance crew.*

8.3.5 **Recommendation.—** *For a runway meant for use in runway visual range conditions less than a value of 550 m, the lighting systems detailed in Table 8-1 should be monitored automatically to provide an indication when the serviceability level of any element falls below the minimum level specified by the appropriate authority below which operations should not continue. This information should be automatically relayed to the air traffic services unit and displayed in a prominent position.*

Note.— Guidance on air traffic control interface and visual aids monitoring is included in the Aerodrome Design Manual, *Part 5.*

Table 8-1. Secondary power supply requirements
(see 8.1.4)

Runway	Lighting aids requiring power	Maximum switch-over time
Non-instrument	Visual approach slope indicators[a]	See 8.1.4 and 8.1.9
	Runway edge[b]	
	Runway threshold[b]	
	Runway end[b]	
	Obstacle[a]	
Non-precision approach	Approach lighting system	15 seconds
	Visual approach slope indicators[a, d]	15 seconds
	Runway edge[d]	15 seconds
	Runway threshold[d]	15 seconds
	Runway end	15 seconds
	Obstacle[a]	15 seconds
Precision approach category I	Approach lighting system	15 seconds
	Runway edge[d]	15 seconds
	Visual approach slope indicators[a, d]	15 seconds
	Runway threshold[d]	15 seconds
	Runway end	15 seconds
	Essential taxiway[a]	15 seconds
	Obstacle[a]	15 seconds
Precision approach category II/III	Inner 300 m of the approach lighting system	1 second
	Other parts of the approach lighting system	15 seconds
	Obstacle[a]	15 seconds
	Runway edge	15 seconds
	Runway threshold	1 second
	Runway end	1 second
	Runway centre line	1 second
	Runway touchdown zone	1 second
	All stop bars	1 second
	Essential taxiway	15 seconds
Runway meant for take-off in runway visual range conditions less than a value of 800 m	Runway edge	15 seconds[c]
	Runway end	1 second
	Runway centre line	1 second
	All stop bars	1 second
	Essential taxiway[a]	15 seconds
	Obstacle[a]	15 seconds

a. Supplied with secondary power when their operation is essential to the safety of flight operation.
b. See Chapter 5, 5.3.2 regarding the use of emergency lighting.
c. One second where no runway centre line lights are provided.
d. One second where approaches are over hazardous or precipitous terrain.

CHAPTER 9. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

9.1 Aerodrome emergency planning

General

Introductory Note.— Aerodrome emergency planning is the process of preparing an aerodrome to cope with an emergency occurring at the aerodrome or in its vicinity. The objective of aerodrome emergency planning is to minimize the effects of an emergency, particularly in respect of saving lives and maintaining aircraft operations. The aerodrome emergency plan sets forth the procedures for coordinating the response of different aerodrome agencies (or services) and of those agencies in the surrounding community that could be of assistance in responding to the emergency. Guidance material to assist the appropriate authority in establishing aerodrome emergency planning is given in the Airport Services Manual, *Part 7.*

9.1.1 An aerodrome emergency plan shall be established at an aerodrome, commensurate with the aircraft operations and other activities conducted at the aerodrome.

9.1.2 The aerodrome emergency plan shall provide for the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

Note.— Examples of emergencies are: aircraft emergencies, sabotage including bomb threats, unlawfully seized aircraft, dangerous goods occurrences, building fires and natural disasters.

9.1.3 The plan shall coordinate the response or participation of all existing agencies which, in the opinion of the appropriate authority, could be of assistance in responding to an emergency.

Note.— Examples of agencies are:

— on the aerodrome: air traffic control unit, rescue and fire fighting services, aerodrome administration, medical and ambulance services, aircraft operators, security services, and police;

— off the aerodrome: fire departments, police, medical and ambulance services, hospitals, military, and harbour patrol or coast guard.

9.1.4 **Recommendation.—** *The plan should provide for cooperation and coordination with the rescue coordination centre, as necessary.*

9.1.5 **Recommendation.—** *The aerodrome emergency plan document should include at least the following:*

a) types of emergencies planned for;

b) agencies involved in the plan;

c) responsibility and role of each agency, the emergency operations centre and the command post, for each type of emergency;

d) information on names and telephone numbers of offices or people to be contacted in the case of a particular emergency; and

e) a grid map of the aerodrome and its immediate vicinity.

9.1.6 The plan shall observe Human Factors principles to ensure optimum response by all existing agencies participating in emergency operations.

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual.

Emergency operations centre and command post

9.1.7 **Recommendation.—** *A fixed emergency operations centre and a mobile command post should be available for use during an emergency.*

9.1.8 **Recommendation.—** *The emergency operations centre should be a part of the aerodrome facilities and should be responsible for the overall coordination and general direction of the response to an emergency.*

9.1.9 **Recommendation.—** *The command post should be a facility capable of being moved rapidly to the site of an emergency, when required, and should undertake the local coordination of those agencies responding to the emergency.*

9.1.10 **Recommendation.—** *A person should be assigned to assume control of the emergency operations centre and, when appropriate, another person the command post.*

Communication system

9.1.11 **Recommendation.—** *Adequate communication systems linking the command post and the emergency* *operations centre with each other and with the participating agencies should be provided in accordance with the plan and consistent with the particular requirements of the aerodrome.*

Aerodrome emergency exercise

9.1.12 The plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

Note.— The plan includes all participating agencies and associated equipment.

9.1.13 The plan shall be tested by conducting:

a) a full-scale aerodrome emergency exercise at intervals not exceeding two years; and

b) partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; and

reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

Note.— The purpose of a full-scale exercise is to ensure the adequacy of the plan to cope with different types of emergencies. The purpose of a partial exercise is to ensure the adequacy of the response to individual participating agencies and components of the plan, such as the communications system.

Emergencies in difficult environments

9.1.14 The plan shall include the ready availability of and coordination with appropriate specialist rescue services to be able to respond to emergencies where an aerodrome is located close to water and/or swampy areas and where a significant portion of approach or departure operations takes place over these areas.

9.1.15 **Recommendation.—** *At those aerodromes located close to water and/or swampy areas, or difficult terrain, the aerodrome emergency plan should include the establishment, testing and assessment at regular intervals of a pre-determined response for the specialist rescue services.*

9.2 Rescue and fire fighting

General

Introductory Note.— The principal objective of a rescue and fire fighting service is to save lives. For this reason, the provision of means of dealing with an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome assumes primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following an aircraft accident or incident, or at any time during rescue operations.

The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.

Requirements to combat building and fuel farm fires, or to deal with foaming of runways, are not taken into account.

Application

9.2.1 Rescue and fire fighting equipment and services shall be provided at an aerodrome.

Note.— Public or private organizations, suitably located and equipped, may be designated to provide the rescue and fire fighting service. It is intended that the fire station housing these organizations be normally located on the aerodrome, although an off-aerodrome location is not precluded provided the response time can be met.

9.2.2 Where an aerodrome is located close to water/ swampy areas, or difficult terrain, and where a significant portion of approach or departure operations takes place over these areas, specialist rescue services and fire fighting equipment appropriate to the hazard and risk shall be available.

Note 1.— Special fire fighting equipment need not be provided for water areas; this does not prevent the provision of such equipment if it would be of practical use, such as when the areas concerned include reefs or islands.

Note 2.— The objective is to plan and deploy the necessary life-saving flotation equipment as expeditiously as possible in a number commensurate with the largest aeroplane normally using the aerodrome.

Note 3.— Additional guidance is available in Chapter 13 of the Airport Services Manual, *Part 1.*

Level of protection to be provided

9.2.3 The level of protection provided at an aerodrome for rescue and fire fighting shall be appropriate to the aerodrome category determined using the principles in 9.2.5 and 9.2.6, except that, where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months, the level of protection provided shall be not less than one category below the determined category.

Note.— Either a take-off or a landing constitutes a movement.

9.2.4 **Recommendation.—** *From 1 January 2005, the level of protection provided at an aerodrome for rescue and fire fighting should be equal to the aerodrome category determined using the principles in 9.2.5 and 9.2.6.*

9.2.5 The aerodrome category shall be determined from Table 9-1 and shall be based on the longest aeroplanes normally using the aerodrome and their fuselage width.

Note.— To categorize the aeroplanes using the aerodrome, first evaluate their overall length and second, their fuselage width.

9.2.6 If, after selecting the category appropriate to the longest aeroplane's overall length, that aeroplane's fuselage width is greater than the maximum width in Table 9-1, column 3 for that category, then the category for that aeroplane shall actually be one category higher.

Note.— Guidance on categorizing aerodromes for rescue and fire fighting purposes and on providing rescue and fire fighting equipment and services is given in Attachment A, Section 17 and in the Airport Services Manual, *Part 1.*

9.2.7 During anticipated periods of reduced activity, the level of protection available shall be no less than that needed for the highest category of aeroplane planned to use the aerodrome during that time irrespective of the number of movements.

Extinguishing agents

9.2.8 **Recommendation.—** *Both principal and complementary agents should normally be provided at an aerodrome.*

Note.— Descriptions of the agents may be found in the Airport Services Manual, *Part 1.*

9.2.9 **Recommendation.—** *The principal extinguishing agent should be:*

a) a foam meeting the minimum performance level A; or

b) a foam meeting the minimum performance level B; or

c) a combination of these agents;

except that the principal extinguishing agent for aerodromes in categories 1 to 3 should preferably meet the minimum performance level B.

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level A or B rating is given in the Airport Services Manual, *Part 1.*

9.2.10 **Recommendation.—** *The complementary extinuishing agent should be a dry chemical powder suitable for extinguishing hydrocarbon fires.*

Note 1.— When selecting dry chemical powders for use with foam, care must be exercised to ensure compatibility.

Note 2.— Alternate complementary agents having equivalent fire fighting capability may be utilized. Additional information on extinguishing agents is given in the Airport Services Manual, *Part 1.*

9.2.11 The amounts of water for foam production and the complementary agents to be provided on the rescue and fire fighting vehicles shall be in accordance with the aerodrome category determined under 9.2.3, 9.2.4, 9.2.5, 9.2.6 and Table 9-2, except that these amounts may be modified as follows:

a) for aerodrome categories 1 and 2 up to 100 per cent of the water may be replaced by complementary agent; or

b) for aerodrome categories 3 to 10 when a foam meeting performance level A is used, up to 30 per cent of the water may be replaced by complementary agent.

For the purpose of agent substitution, the following equivalents shall be used:

1 kg *complementary agent*	=	1.0 L water for production of a foam meeting performance level A
1 kg *complementary agent*	=	0.66 L water for production of a foam meeting performance level B

Note 1.— The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m^2 for a foam meeting performance level A, and 5.5 L/min/m^2 for a foam meeting performance level B.

Note 2.— When any other complementary agent is used, the substitution ratios need to be checked.

9.2.12 The quantity of foam concentrates separately provided on vehicles for foam production shall be in proportion to the quantity of water provided and the foam concentrate selected.

9.2.13 **Recommendation.—** *The amount of foam concentrate provided on a vehicle should be sufficient to produce at least two loads of foam solution.*

9.2.14 **Recommendation.—** *Supplementary water supplies, for the expeditious replenishment of rescue and fire fighting vehicles at the scene of an aircraft accident, should be provided.*

9.2.15 **Recommendation.—** *When both a foam meeting performance level A and a foam meeting performance level B*

Table 9-1. Aerodrome category for rescue and fire fighting

Aerodrome category (1)	Aeroplane overall length (2)	Maximum fuselage width (3)
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m
5	24 m up to but not including 28 m	4 m
6	28 m up to but not including 39 m	5 m
7	39 m up to but not including 49 m	5 m
8	49 m up to but not including 61 m	7 m
9	61 m up to but not including 76 m	7 m
10	76 m up to but not including 90 m	8 m

Table 9-2. Minimum usable amounts of extinguishing agents

	Foam meeting performance level A		Foam meeting performance level B		Complementary agents
Aerodrome category (1)	Water[1] (L) (2)	Discharge rate foam solution/ minute (L) (3)	Water[1] (L) (4)	Discharge rate foam solution/ minute (L) (5)	Dry[2] chemical powders (kg) (6)
1	350	350	230	230	45
2	1 000	800	670	550	90
3	1 800	1 300	1 200	900	135
4	3 600	2 600	2 400	1 800	135
5	8 100	4 500	5 400	3 000	180
6	11 800	6 000	7 900	4 000	225
7	18 200	7 900	12 100	5 300	225
8	27 300	10 800	18 200	7 200	450
9	36 400	13 500	24 300	9 000	450
10	48 200	16 600	32 300	11 200	450

Note 1.— The quantities of water shown in columns 2 and 4 are based on the average overall length of aeroplanes in a given category. Where operations of an aeroplane larger than the average size are expected, the quantities of water would need to be recalculated. See the Airport Services Manual, *Part 1 for additional guidance.*

Note 2.— Any other complementary agent having equivalent fire fighting capability may be used.

are to be used, the total amount of water to be provided for foam production should first be based on the quantity which would be required if only a foam meeting performance level A were used, and then reduced by 3 L for each 2 L of water provided for the foam meeting performance level B.

9.2.16 The discharge rate of the foam solution shall not be less than the rates shown in Table 9-2.

9.2.17 **Recommendation.—** *The complementary agents should comply with the appropriate specifications of the International Organization for Standardization (ISO).**

9.2.18 **Recommendation.—** *The discharge rate of complementary agents should be selected for optimum effectiveness of the agent.*

9.2.19 **Recommendation.—** *A reserve supply of foam concentrate and complementary agent, equivalent to 200 per cent of the quantities of these agents to be provided in the rescue and fire fighting vehicles, should be maintained on the aerodrome for vehicle replenishment purposes. Where a major delay in the replenishment of this supply is anticipated, the amount of reserve supply should be increased.*

Rescue equipment

9.2.20 **Recommendation.—** *Rescue equipment commensurate with the level of aircraft operations should be provided on the rescue and fire fighting vehicle(s).*

Note.— Guidance on the rescue equipment to be provided at an aerodrome is given in the Airport Services Manual, *Part 1.*

Response time

9.2.21 The operational objective of the rescue and fire fighting service shall be to achieve a response time not exceeding three minutes to any point of each operational runway, in optimum visibility and surface conditions.

9.2.22 **Recommendation.—** *The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding two minutes to any point of each operational runway, in optimum visibility and surface conditions.*

9.2.23 **Recommendation.—** *The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding three minutes to any other part of the movement area in optimum visibility and surface conditions.*

Note 1.— Response time is considered to be the time between the initial call to the rescue and fire fighting service, and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in Table 9-2.

Note 2.— To meet the operational objective as nearly as possible in less than optimum conditions of visibility, it may be necessary to provide suitable guidance and/or procedures for rescue and fire fighting vehicles.

Note 3.— Optimum visibility and surface conditions are defined as daytime, good visibility, no precipitation with normal response route free of surface contamination e.g. water, ice or snow.

9.2.24 **Recommendation.—** *Any other vehicles required to deliver the amounts of extinguishing agents specified in Table 9-2 should arrive no more than one minute after the first responding vehicle(s) so as to provide continuous agent application.*

9.2.25 **Recommendation.—** *A system of preventive maintenance of rescue and fire fighting vehicles should be employed to ensure effectiveness of the equipment and compliance with the specified response time throughout the life of the vehicle.*

Emergency access roads

9.2.26 **Recommendation.—** *Emergency access roads should be provided on an aerodrome where terrain conditions permit their construction, so as to facilitate achieving minimum response times. Particular attention should be given to the provision of ready access to approach areas up to 1 000 m from the threshold, or at least within the aerodrome boundary. Where a fence is provided, the need for convenient access to outside areas should be taken into account.*

Note.— Aerodrome service roads may serve as emergency access roads when they are suitably located and constructed.

9.2.27 **Recommendation.—** *Emergency access roads should be capable of supporting the heaviest vehicles which will use them, and be usable in all weather conditions. Roads within 90 m of a runway should be surfaced to prevent surface erosion and the transfer of debris to the runway. Sufficient vertical clearance should be provided from overhead obstructions for the largest vehicles.*

9.2.28 **Recommendation.—** *When the surface of the road is indistinguishable from the surrounding area, or in areas where snow may obscure the location of the roads, edge markers should be placed at intervals of about 10 m.*

* See ISO Publications 5923 (Carbon Dioxide), 7201 (Halogenated Hydrocarbons) and 7202 (Powder).

Fire stations

9.2.29 **Recommendation.—** *All rescue and fire fighting vehicles should normally be housed in a fire station. Satellite fire stations should be provided whenever the response time cannot be achieved from a single fire station.*

9.2.30 **Recommendation.—** *The fire station should be located so that the access for rescue and fire fighting vehicles into the runway area is direct and clear, requiring a minimum number of turns.*

Communication and alerting systems

9.2.31 **Recommendation.—** *A discrete communication system should be provided linking a fire station with the control tower, any other fire station on the aerodrome and the rescue and fire fighting vehicles.*

9.2.32 **Recommendation.—** *An alerting system for rescue and fire fighting personnel, capable of being operated from that station, should be provided at a fire station, any other fire station on the aerodrome and the aerodrome control tower.*

Number of rescue and fire fighting vehicles

9.2.33 **Recommendation.—** *The minimum number of rescue and fire fighting vehicles provided at an aerodrome should be in accordance with the following tabulation:*

Aerodrome category	Rescue and fire fighting vehicles
1	*1*
2	*1*
3	*1*
4	*1*
5	*1*
6	*2*
7	*2*
8	*3*
9	*3*
10	*3*

Note.— Guidance on minimum characteristics of rescue and fire fighting vehicles is given in the Airport Services Manual, *Part 1.*

Personnel

9.2.34 All rescue and fire fighting personnel shall be properly trained to perform their duties in an efficient manner and shall participate in live fire drills commensurate with the types of aircraft and type of rescue and fire fighting equipment in use at the aerodrome, including pressure-fed fuel fires.

Note 1.— Guidance to assist the appropriate authority in providing proper training is given in Attachment A, Section 17; Airport Services Manual, *Part 1; and* Training Manual, *Part E-2.*

Note 2.— Fires associated with fuel discharged under very high pressure from a ruptured fuel tank are known as "pressure-fed fuel fires".

9.2.35 The rescue and fire fighting personnel training programme shall include training in human performance, including team coordination.

Note.— Guidance material to design training programmes on human performance and team coordination can be found in the Human Factors Training Manual.

9.2.36 **Recommendation.—** *During flight operations, sufficient trained personnel should be detailed and be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. These trained personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application at the appropriate rate can be fully maintained. Consideration should also be given for personnel to use hand lines, ladders and other rescue and fire fighting equipment normally associated with aircraft rescue and fire fighting operations.*

9.2.37 **Recommendation.—** *In determining the number of personnel required to provide for rescue, consideration should be given to the types of aircraft using the aerodrome.*

9.2.38 All responding rescue and fire fighting personnel shall be provided with protective clothing and respiratory equipment to enable them to perform their duties in an effective manner.

9.3 Disabled aircraft removal

Note.— Guidance on removal of a disabled aircraft, including recovery equipment, is given in the Airport Services Manual, *Part 5. See also Annex 13 concerning protection of evidence, custody and removal of aircraft.*

9.3.1 **Recommendation.—** *A plan for the removal of an aircraft disabled on, or adjacent to, the movement area should be established for an aerodrome, and a coordinator designated to implement the plan, when necessary.*

9.3.2 **Recommendation.—** *The disabled aircraft removal plan should be based on the characteristics of the aircraft that may normally be expected to operate at the aerodrome, and include among other things:*

a) a list of equipment and personnel on, or in the vicinity of, the aerodrome which would be available for such purpose; and *b) arrangements for the rapid receipt of aircraft recovery equipment kits available from other aerodromes.*

9.4 Bird hazard reduction

9.4.1 The bird strike hazard on, or in the vicinity of, an aerodrome shall be assessed through:

a) the establishment of a national procedure for recording and reporting bird strikes to aircraft; and

b) the collection of information from aircraft operators, airport personnel, etc. on the presence of birds on or around the aerodrome constituting a potential hazard to aircraft operations.

Note.— See Annex 15, Chapter 8.

9.4.2 Bird strike reports shall be collected and forwarded to ICAO for inclusion in the ICAO Bird Strike Information System (IBIS) database.

Note.— The IBIS is designed to collect and disseminate information on bird strikes to aircraft. Information on the system is included in the Manual on the ICAO Bird Strike Information System (IBIS).

9.4.3 When a bird strike hazard is identified at an aerodrome, the appropriate authority shall take action to decrease the number of birds constituting a potential hazard to aircraft operations by adopting measures for discouraging their presence on, or in the vicinity of, an aerodrome.

Note.— Guidance on effective measures for establishing whether or not birds, on or near an aerodrome, constitute a potential hazard to aircraft operations, and on methods for discouraging their presence, is given in the Airport Services Manual, *Part 3*.

9.4.4 The appropriate authority shall take action to eliminate or to prevent the establishment of garbage disposal dumps or any such other source attracting bird activity on, or in the vicinity of, an aerodrome unless an appropriate aeronautical study indicates that they are unlikely to create conditions conducive to a bird hazard problem.

Note.— Due consideration needs to be given to airport operators' concerns related to land developments close to the airport boundary that may attract birds/wildlife.

9.5 Apron management service

9.5.1 **Recommendation.—** *When warranted by the volume of traffic and operating conditions, an appropriate apron management service should be provided on an apron by an aerodrome ATS unit, by another aerodrome operating authority, or by a cooperative combination of these, in order to:*

a) regulate movement with the objective of preventing collisions between aircraft, and between aircraft and obstacles;

b) regulate entry of aircraft into, and coordinate exit of aircraft from, the apron with the aerodrome control tower; and

c) ensure safe and expeditious movement of vehicles and appropriate regulation of other activities.

9.5.2 **Recommendation.—** *When the aerodrome control tower does not participate in the apron management service, procedures should be established to facilitate the orderly transition of aircraft between the apron management unit and the aerodrome control tower.*

Note.— Guidance on an apron management service is given in the Airport Services Manual, *Part 8 and in the* Manual of Surface Movement Guidance and Control Systems (SMGCS).

9.5.3 An apron management service shall be provided with radiotelephony communications facilities.

9.5.4 Where low visibility procedures are in effect, persons and vehicles operating on an apron shall be restricted to the essential minimum.

Note.— Guidance on related special procedures is given in the Manual of Surface Movement Guidance and Control Systems (SMGCS).

9.5.5 An emergency vehicle responding to an emergency shall be given priority over all other surface movement traffic.

9.5.6 A vehicle operating on an apron shall:

a) give way to an emergency vehicle; an aircraft taxiing, about to taxi, or being pushed or towed; and

b) give way to other vehicles in accordance with local regulations.

9.5.7 An aircraft stand shall be visually monitored to ensure that the recommended clearance distances are provided to an aircraft using the stand.

9.6 Ground servicing of aircraft

9.6.1 Fire extinguishing equipment suitable for at least initial intervention in the event of a fuel fire and personnel trained in its use shall be readily available during the ground servicing of an aircraft, and there shall be a means of quickly summoning the rescue and fire fighting service in the event of a fire or major fuel spill.

9.6.2 When aircraft refuelling operations take place while passengers are embarking, on board or disembarking, ground equipment shall be positioned so as to allow:

a) the use of a sufficient number of exits for expeditious evacuation; and

b) a ready escape route from each of the exits to be used in an emergency.

9.7 Aerodrome vehicle operations

Note 1.— Guidance on aerodrome vehicle operations is contained in Attachment A, Section 18 and on traffic rules and regulations for vehicles in the Manual of Surface Movement Guidance and Control Systems (SMGCS).

Note 2.— It is intended that roads located on the movement area be restricted to the exclusive use of aerodrome personnel and other authorized persons, and that access to the public buildings by an unauthorized person will not require use of such roads.

9.7.1 A vehicle shall be operated:

a) on a manoeuvring area only as authorized by the aerodrome control tower; and

b) on an apron only as authorized by the appropriate designated authority.

9.7.2 The driver of a vehicle on the movement area shall comply with all mandatory instructions conveyed by markings and signs unless otherwise authorized by:

a) the aerodrome control tower when on the manoeuvring area; or

b) the appropriate designated authority when on the apron.

9.7.3 The driver of a vehicle on the movement area shall comply with all mandatory instructions conveyed by lights.

9.7.4 The driver of a vehicle on the movement area shall be appropriately trained for the tasks to be performed and shall comply with the instructions issued by:

a) the aerodrome control tower, when on the manoeuvring area; and

b) the appropriate designated authority, when on the apron.

9.7.5 The driver of a radio-equipped vehicle shall establish satisfactory two-way radio communication with the aerodrome control tower before entering the manoeuvring area and with the appropriate designated authority before entering the apron. The driver shall maintain a continuous listening watch on the assigned frequency when on the movement area.

9.8 Surface movement guidance and control systems

Application

9.8.1 A surface movement guidance and control system shall be provided at an aerodrome.

Note.— Guidance on surface movement guidance and control systems is contained in the Manual of Surface Movement Guidance and Control Systems (SMGCS).

Characteristics

9.8.2 **Recommendation.—** *The design of a surface movement guidance and control system should take into account:*

a) the density of air traffic;

b) the visibility conditions under which operations are intended;

c) the need for pilot orientation;

d) the complexity of the aerodrome layout; and

e) movements of vehicles.

9.8.3 **Recommendation.—** *The visual aid components of a surface movement guidance and control system, i.e. markings, lights and signs should be designed to conform with the relevant specifications in 5.2, 5.3 and 5.4, respectively.*

9.8.4 **Recommendation.—** *A surface movement guidance and control system should be designed to assist in the prevention of inadvertent incursions of aircraft and vehicles onto an active runway.*

9.8.5 **Recommendation.—** *The system should be designed to assist in the prevention of collisions between aircraft, and between aircraft and vehicles or objects, on any part of the movement area.*

Note.— Guidance on control of stop bars through induction loops and on a visual taxiing guidance and control system is contained in the Aerodrome Design Manual, *Part 4.*

9.8.6 Where a surface movement guidance and control system is provided by selective switching of stop bars and taxiway centre line lights, the following requirements shall be met:

a) taxiway routes which are indicated by illuminated taxiway centre line lights shall be capable of being terminated by an illuminated stop bar;

b) the control circuits shall be so arranged that when a stop bar located ahead of an aircraft is illuminated, the appropriate section of taxiway centre line lights beyond it is suppressed; and

c) the taxiway centre line lights are activated ahead of an aircraft when the stop bar is suppressed.

Note 1.— See Sections 5.3.16 and 5.3.19 for specifications on taxiway centre line lights and stop bars, respectively.

Note 2.— Guidance on installation of stop bars and taxiway centre line lights in surface movement guidance and control systems is given in the Aerodrome Design Manual, *Part 4.*

9.8.7 **Recommendation.—** *Surface movement radar for the manoeuvring area should be provided at an aerodrome intended for use in runway visual range conditions less than a value of 350 m.*

9.8.8 **Recommendation.—** *Surface movement radar for the manoeuvring area should be provided at an aerodrome other than that in 9.8.7 when traffic density and operating conditions are such that regularity of traffic flow cannot be maintained by alternative procedures and facilities.*

Note.— Guidance on the use of surface movement radar is given in the Manual of Surface Movement Guidance and Control Systems (SMGCS) *and in the* Air Traffic Services Planning Manual *(Doc 9426).*

9.9 Siting of equipment and installations on operational areas

Note 1.— Requirements for obstacle limitation surfaces are specified in 4.2.

Note 2.— The design of light fixtures and their supporting structures, light units of visual approach slope indicators, signs, and markers, is specified in 5.3.1, 5.3.5, 5.4.1 and 5.5.1, respectively. Guidance on the frangible design of visual and non-visual aids for navigation is given in the Aerodrome Design Manual *(Doc 9157), Part 6.*

9.9.1 Unless its function requires it to be there for air navigation purposes, no equipment or installation shall be:

a) on a runway strip, a runway end safety area, a taxiway strip or within the distances specified in Table 3-1, column 11, if it would endanger an aircraft; or

b) on a clearway if it would endanger an aircraft in the air.

9.9.2 Any equipment or installation required for air navigation purposes which must be located:

a) on that portion of a runway strip within:

   1) 75 m of the runway centre line where the code number is 3 or 4; or

   2) 45 m of the runway centre line where the code number is 1 or 2; or

b) on a runway end safety area, a taxiway strip or within the distances specified in Table 3-1; or

c) on a clearway and which would endanger an aircraft in the air;

shall be frangible and mounted as low as possible.

9.9.3 Existing non-visual aids need not meet the requirement of 9.9.2 until 1 January 2010.

9.9.4 **Recommendation.—** *Any equipment or installation required for air navigation purposes which must be located on the non-graded portion of a runway strip should be regarded as an obstacle and should be frangible and mounted as low as possible.*

Note.— Guidance on the siting of navigation aids is contained in the Aerodrome Design Manual *(Doc 9157), Part 6.*

9.9.5 Unless its function requires it to be there for air navigation purposes, no equipment or installation shall be located within 240 m from the end of the strip and within:

a) 60 m of the extended centre line where the code number is 3 or 4; or

b) 45 m of the extended centre line where the code number is 1 or 2;

of a precision approach runway category I, II or III.

9.9.6 Any equipment or installation required for air navigation purposes which must be located on or near a strip of a precision approach runway category I, II or III and which:

a) is situated on that portion of the strip within 77.5 m of the runway centre line where the code number is 4 and the code letter is F; or

b) is situated within 240 m from the end of the strip and within:

1) 60 m of the extended runway centre line where the code number is 3 or 4; or

2) 45 m of the extended runway centre line where the code number is 1 or 2; or

c) penetrates the inner approach surface, the inner transitional surface or the balked landing surface;

shall be frangible and mounted as low as possible.

9.9.7 Existing non-visual aids need not meet the requirement of 9.9.6 b) until 1 January 2010.

Note.— See 5.3.1.5 for the protection date for existing elevated approach lights.

9.9.8 **Recommendation.—** *Any equipment or installation required for air navigation purposes which is an obstacle of operational significance in accordance with 4.2.4, 4.2.11, 4.2.20 or 4.2.27 should be frangible and mounted as low as possible.*

9.10 Fencing

Application

9.10.1 **Recommendation.—** *A fence or other suitable barrier should be provided on an aerodrome to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft.*

9.10.2 As of 23 November 2006, a fence or other suitable barrier shall be provided on an aerodrome to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft.

9.10.3 **Recommendation.—** *A fence or other suitable barrier should be provided on an aerodrome to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.*

Note 1.— This is intended to include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access.

Note 2.— Special measures may be required to prevent the access of an unauthorized person to runways or taxiways which overpass public roads.

9.10.4 As of 23 November 2006, a fence or other suitable barrier shall be provided on an aerodrome to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.

Note 1.— This is intended to include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access.

Note 2.— Special measures may be required to prevent the access of an unauthorized person to runways or taxiways which overpass public roads.

9.10.5 **Recommendation.—** *Suitable means of protection should be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome.*

9.10.6 As of 23 November 2006, suitable means of protection shall be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome.

Location

9.10.7 **Recommendation.—** *The fence or barrier should be located so as to separate the movement area and other facilities or zones on the aerodrome vital to the safe operation of aircraft from areas open to public access.*

9.10.8 As of 23 November 2006, the fence or barrier shall be located so as to separate the movement area and other facilities or zones on the aerodrome vital to the safe operation of aircraft from areas open to public access.

9.10.9 **Recommendation.—** *When greater security is thought necessary, a cleared area should be provided on both sides of the fence or barrier to facilitate the work of patrols and to make trespassing more difficult. Consideration should be given to the provision of a perimeter road inside the aerodrome fencing for the use of both maintenance personnel and security patrols.*

9.11 Security lighting

Recommendation.— *At an aerodrome where it is deemed desirable for security reasons, a fence or other barrier provided for the protection of international civil aviation and its facilities should be illuminated at a minimum essential level. Consideration should be given to locating lights so that the ground area on both sides of the fence or barrier, particularly at access points, is illuminated.*

CHAPTER 10. AERODROME MAINTENANCE

10.1 General

10.1.1 **Recommendation.—** *A maintenance programme, including preventive maintenance where appropriate, should be established at an aerodrome to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air navigation.*

Note 1.— Preventive maintenance is programmed maintenance work done in order to prevent a failure or degradation of facilities.

Note 2.— "Facilities" are intended to include such items as pavements, visual aids, fencing, drainage systems and buildings.

10.1.2 **Recommendation.** — *The design and application of the maintenance programme should observe Human Factors principles.*

Note.— Guidance material on Human Factors principles can be found in the Human Factors Training Manual.

10.2 Pavements

10.2.1 The surface of pavements (runways, taxiways, aprons and adjacent areas) shall be kept clear of any loose stones or other objects that might cause damage to aircraft structures or engines, or impair the operation of aircraft systems.

Note.— Guidance on precautions to be taken in regard to the surface of shoulders is given in Attachment A, Section 8, and the Aerodrome Design Manual*, Part 2.*

10.2.2 The surface of a runway shall be maintained in a condition such as to prevent formation of harmful irregularities.

Note.— See Attachment A, Section 5.

10.2.3 Measurements of the friction characteristics of a runway surface shall be made periodically with a continuous friction measuring device using self-wetting features.

Note.— Guidance on evaluating the friction characteristics of a runway is provided in Attachment A, Section 7. Additional guidance is included in the Airport Services Manual*, Part 2.*

10.2.4 Corrective maintenance action shall be taken when the friction characteristics for either the entire runway or a portion thereof are below a minimum friction level specified by the State.

Note.— A portion of runway in the order of 100 m long may be considered significant for maintenance or reporting action.

10.2.5 **Recommendation.—** *Corrective maintenance action should be considered when the friction characteristics for either the entire runway or a portion thereof are below a maintenance planning level specified by the State.*

10.2.6 **Recommendation.—** *When there is reason to believe that the drainage characteristics of a runway, or portions thereof, are poor due to slopes or depressions, then the runway friction characteristics should be assessed under natural or simulated conditions that are representative of local rain and corrective maintenance action should be taken as necessary.*

10.2.7 **Recommendation.—** *When a taxiway is used by turbine-engined aeroplanes, the surface of the taxiway shoulders should be maintained so as to be free of any loose stones or other objects that could be ingested by the aeroplane engines.*

Note.— Guidance on this subject is given in the Aerodrome Design Manual*, Part 2.*

10.2.8 The surface of a paved runway shall be maintained in a condition so as to provide good friction characteristics and low rolling resistance. Snow, slush, ice, standing water, mud, dust, sand, oil, rubber deposits and other contaminants shall be removed as rapidly and completely as possible to minimize accumulation.

Note.— Guidance on determining and expressing the friction characteristics when conditions of snow or ice cannot be avoided is given in Attachment A, Section 6. The Airport Services Manual*, Part 2, contains further information on this subject, on improving friction characteristics and on clearing of runways.*

10.2.9 **Recommendation.—** *A taxiway should be kept clear of snow, slush, ice, etc., to the extent necessary to enable aircraft to be taxied to and from an operational runway.*

10.2.10 **Recommendation.—** *Aprons should be kept clear of snow, slush, ice, etc., to the extent necessary to enable* *aircraft to manoeuvre safely or, where appropriate, to be towed or pushed.*

10.2.11 **Recommendation.—** *Whenever the clearance of snow, slush, ice, etc., from the various parts of the movement area cannot be carried out simultaneously, the order of priority should be as follows but may be altered following, as necessary, consultation with the aerodrome users:*

1st — runway(s) in use;

2nd — taxiways serving runway(s) in use;

3rd — apron(s);

4th — holding bays; and

5th — other areas.

10.2.12 **Recommendation.—** *Chemicals to remove or to prevent the formation of ice and frost on aerodrome pavements should be used when conditions indicate their use could be effective. Caution should be exercised in the application of the chemicals so as not to create a more slippery condition.*

Note.— Guidance on the use of chemicals for aerodrome pavements is given in the Airport Services Manual, *Part 2.*

10.2.13 Chemicals which may have harmful effects on aircraft or pavements, or chemicals which may have toxic effects on the aerodrome environment, shall not be used.

10.3 Runway pavement overlays

Note.— The following specifications are intended for runway pavement overlay projects when the runway is to be returned to an operational status before overlay of the entire runway is complete thus normally necessitating a temporary ramp between the new and old runway surfaces. Guidance on overlaying pavements and assessing their operational status is given in the Aerodrome Design Manual, *Part 3.*

10.3.1 The longitudinal slope of the temporary ramp, measured with reference to the existing runway surface or previous overlay course, shall be:

a) 0.5 to 1.0 per cent for overlays up to and including 5 cm in thickness; and

b) not more than 0.5 per cent for overlays more than 5 cm in thickness.

10.3.2 **Recommendation.—** *Overlaying should proceed from one end of the runway toward the other end so that based on runway utilization most aircraft operations will experience a down ramp.*

10.3.3 **Recommendation.—** *The entire width of the runway should be overlaid during each work session.*

10.3.4 Before a runway being overlaid is returned to a temporary operational status, a runway centre line marking conforming to the specifications in Section 5.2.3 shall be provided. Additionally, the location of any temporary threshold shall be identified by a 3.6 m wide transverse stripe.

10.4 Visual aids

Note.— These specifications are intended to define the maintenance performance level objectives. They are not intended to define whether the lighting system is operationally out of service.

10.4.1 A light shall be deemed to be unserviceable when the main beam average intensity is less than 50 per cent of the value specified in the appropriate figure in Appendix 2. For light units where the designed main beam average intensity is above the value shown in Appendix 2, the 50 per cent value shall be related to that design value.

10.4.2 A system of preventive maintenance of visual aids shall be employed to ensure lighting and marking system reliability.

Note.— Guidance on preventive maintenance of visual aids is given in the Airport Services Manual, *Part 9.*

10.4.3 **Recommendation.—** *The system of preventive maintenance employed for a precision approach runway category II or III should include at least the following checks:*

a) visual inspection and in-field measurement of the intensity, beam spread and orientation of lights included in the approach and runway lighting systems;

b) control and measurement of the electrical characteristics of each circuitry included in the approach and runway lighting systems; and

c) control of the correct functioning of light intensity settings used by air traffic control.

10.4.4 **Recommendation.—** *In-field measurement of intensity, beam spread and orientation of lights included in approach and runway lighting systems for a precision approach runway category II or III should be undertaken by measuring all lights, as far as practicable, to ensure conformance with the applicable specification of Appendix 2.*

10.4.5 **Recommendation.—** *Measurement of intensity, beam spread and orientation of lights included in approach and runway lighting systems for a precision approach runway* *category II or III should be undertaken using a mobile measuring unit of sufficient accuracy to analyze the characteristics of the individual lights.*

10.4.6 **Recommendation.—** *The frequency of measurement of lights for a precision approach runway category II or III should be based on traffic density, the local pollution level, the reliability of the installed lighting equipment and the continuous assessment of the results of the in-field measurements but in any event should not be less than twice a year for in-pavement lights and not less than once a year for other lights.*

10.4.7 The system of preventive maintenance employed for a precision approach runway category II or III shall have as its objective that, during any period of category II or III operations, all approach and runway lights are serviceable, and that in any event at least:

a) 95 per cent of the lights are serviceable in each of the following particular significant elements:

   1) precision approach category II and III lighting system, the inner 450 m;

   2) runway centre line lights;

   3) runway threshold lights; and

   4) runway edge lights;

b) 90 per cent of the lights are serviceable in the touchdown zone lights;

c) 85 per cent of the lights are serviceable in the approach lighting system beyond 450 m; and

d) 75 per cent of the lights are serviceable in the runway end lights.

In order to provide continuity of guidance, the allowable percentage of unserviceable lights shall not be permitted in such a way as to alter the basic pattern of the lighting system. Additionally, an unserviceable light shall not be permitted adjacent to another unserviceable light, except in a barrette or a crossbar where two adjacent unserviceable lights may be permitted.

Note.— With respect to barrettes, crossbars and runway edge lights, lights are considered to be adjacent if located consecutively and:

— *laterally: in the same barrette or crossbar; or*

— *longitudinally: in the same row of edge lights or barrettes.*

10.4.8 The system of preventive maintenance employed for a stop bar provided at a runway-holding position used in conjunction with a runway intended for operations in runway visual range conditions less than a value of 350 m shall have the following objectives:

a) no more than two lights will remain unserviceable; and

b) two adjacent lights will not remain unserviceable unless the light spacing is significantly less than that specified.

10.4.9 The system of preventive maintenance employed for a taxiway intended for use in runway visual range conditions less than a value of 350 m shall have as its objective that no two adjacent taxiway centre line lights be unserviceable.

10.4.10 The system of preventive maintenance employed for a precision approach runway category I shall have as its objective that, during any period of category I operations, all approach and runway lights are serviceable, and that in any event at least 85 per cent of the lights are serviceable in each of the following:

a) precision approach category I lighting system;

b) runway threshold lights;

c) runway edge lights; and

d) runway end lights.

In order to provide continuity of guidance an unserviceable light shall not be permitted adjacent to another unserviceable light unless the light spacing is significantly less than that specified.

Note.— In barrettes and crossbars, guidance is not lost by having two adjacent unserviceable lights.

10.4.11 The system of preventive maintenance employed for a runway meant for take-off in runway visual range conditions less than a value of 550 m shall have as its objective that, during any period of operations, all runway lights are serviceable and that in any event:

a) at least 95 per cent of the lights are serviceable in the runway centre line lights (where provided) and in the runway edge lights; and

b) at least 75 per cent of the lights are serviceable in the runway end lights.

In order to provide continuity of guidance, an unserviceable light shall not be permitted adjacent to another unserviceable light.

10.4.12 The system of preventive maintenance employed for a runway meant for take-off in runway visual range conditions of a value of 550 m or greater shall have as its objective that, during any period of operations, all runway lights are serviceable and that, in any event, at least 85 per cent of the lights are serviceable in the runway edge lights and runway end lights. In order to provide continuity of guidance, an unserviceable light shall not be permitted adjacent to another unserviceable light.

10.4.13 **Recommendation.—** *During low visibility procedures the appropriate authority should restrict construction or maintenance activities in the proximity of aerodrome electrical systems.*

APPENDIX 1. COLOURS FOR AERONAUTICAL GROUND LIGHTS, MARKINGS, SIGNS AND PANELS

1. General

Introductory Note.— The following specifications define the chromaticity limits of colours to be used for aeronautical ground lights, markings, signs and panels. The specifications are in accord with the 1983 specifications of the International Commission on Illumination (CIE).

It is not possible to establish specifications for colours such that there is no possibility of confusion. For reasonably certain recognition, it is important that the eye illumination be well above the threshold of perception, that the colour not be greatly modified by selective atmospheric attenuations and that the observer's colour vision be adequate. There is also a risk of confusion of colour at an extremely high level of eye illumination such as may be obtained from a high-intensity source at very close range. Experience indicates that satisfactory recognition can be achieved if due attention is given to these factors.

*The chromaticities are expressed in terms of the standard observer and coordinate system adopted by the International Commission on Illumination (CIE) at its Eighth Session at Cambridge, England, in 1931.**

2. Colours for aeronautical ground lights

2.1 Chromaticities

2.1.1 The chromaticities of aeronautical ground lights shall be within the following boundaries:

CIE Equations (see Figure A1-1):

a) Red
- Purple boundary $y = 0.980 - x$
- Yellow boundary $y = 0.335$

b) Yellow
- Red boundary $y = 0.382$
- White boundary $y = 0.790 - 0.667x$
- Green boundary $y = x - 0.120$

c) Green
- Yellow boundary $x = 0.360 - 0.080y$
- White boundary $x = 0.650y$
- Blue boundary $y = 0.390 - 0.171x$

d) Blue
- Green boundary $y = 0.805x + 0.065$
- White boundary $y = 0.400 - x$
- Purple boundary $x = 0.600y + 0.133$

e) White
- Yellow boundary $x = 0.500$
- Blue boundary $x = 0.285$
- Green boundary $y = 0.440$ and $y = 0.150 + 0.640x$
- Purple boundary $y = 0.050 + 0.750x$ and $y = 0.382$

f) Variable white
- Yellow boundary $x = 0.255 + 0.750y$ and $x = 1.185 - 1.500y$
- Blue boundary $x = 0.285$
- Green boundary $y = 0.440$ and $y = 0.150 + 0.640x$
- Purple boundary $y = 0.050 + 0.750x$ and $y = 0.382$

Note.— Guidance on chromaticity changes resulting from the effect of temperature on filtering elements is given in the Aerodrome Design Manual, *Part 4.*

2.1.2 **Recommendation.—** *Where dimming is not required, or where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:*

Yellow boundary $y = 0.726 - 0.726x$
White boundary $x = 0.650y$
Blue boundary $y = 0.390 - 0.171x$

2.1.3 **Recommendation.—** *Where increased certainty of recognition is more important than maximum visual range, green signals should be within the following boundaries:*

Yellow boundary $y = 0.726 - 0.726x$
White boundary $x = 0.625y - 0.041$
Blue boundary $y = 0.390 - 0.171x$

* See CIE Publication No. 15, *Colorimetry* (1971).

2.2 Discrimination between lights

2.2.1 **Recommendation.—** *If there is a requirement to discriminate yellow and white from each other, they should be displayed in close proximity of time or space as, for example, by being flashed successively from the same beacon.*

2.2.2 **Recommendation.—** *If there is a requirement to discriminate yellow from green and/or white, as for example on exit taxiway centre line lights, the y coordinates of the yellow light should not exceed a value of 0.40.*

Note.— The limits of white have been based on the assumption that they will be used in situations in which the characteristics (colour temperature) of the light source will be substantially constant.

2.2.3 **Recommendation.—** *The colour variable white is intended to be used only for lights that are to be varied in intensity, e.g. to avoid dazzling. If this colour is to be discriminated from yellow, the lights should be so designed and operated that:*

a) the x coordinate of the yellow is at least 0.050 greater than the x coordinate of the white; and

b) the disposition of the lights will be such that the yellow lights are displayed simultaneously and in close proximity to the white lights.

2.2.4 The colour of aeronautical ground lights shall be verified as being within the boundaries specified in Figure A1-1 by measurement at five points within the area limited by the innermost isocandela curve (isocandela diagrams in Appendix 2 refer), with operation at rated current or voltage. In the case of elliptical or circular isocandela curves, the colour measurements shall be taken at the centre and at the horizontal and vertical limits. In the case of rectangular isocandela curves, the colour measurements shall be taken at the centre and the limits of the diagonals (corners). In addition, the colour of the light shall be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion to the pilot.

Note 1.— For the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability by the appropriate authority.

Note 2.— Certain light units may have application so that they may be viewed and used by pilots from directions beyond that of the outermost isocandela curve (e.g. stop bar lights at significantly wide runway-holding positions). In such instances, the appropriate authority should assess the actual application and if necessary require a check of colour shift at angular ranges beyond the outermost curve.

2.2.5 In the case of visual approach slope indicators and other light units having a colour transition sector, the colour shall be measured at points in accordance with 2.2.4, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.

3. Colours for markings, signs and panels

Note 1.— The specifications of surface colours given below apply only to freshly coloured surfaces. Colours used for markings, signs and panels usually change with time and therefore require renewal.

Note 2.— Guidance on surface colours is contained in the CIE document entitled Recommendations for Surface Colours for Visual Signalling — *Publication No. 39-2 (TC-106) 1983.*

Note 3.— The specifications recommended in 3.4 below for transilluminated panels are interim in nature and are based on the CIE specifications for transilluminated signs. It is intended that these specifications will be reviewed and updated as and when CIE develops specifications for transilluminated panels.

3.1 The chromaticities and luminance factors of ordinary colours, colours of retro-reflective materials and colours of transilluminated (internally illuminated) signs and panels shall be determined under the following standard conditions:

a) angle of illumination: 45°;

b) direction of view: perpendicular to surface; and

c) illuminant: CIE standard illuminant D_{65}.

3.2 **Recommendation.—** *The chromaticity and luminance factors of ordinary colours for markings and externally illuminated signs and panels should be within the following boundaries when determined under standard conditions.*

CIE Equations (see Figure A1-2):

a) Red

Purple boundary	$y = 0.345 - 0.051x$
White boundary	$y = 0.910 - x$
Orange boundary	$y = 0.314 + 0.047x$
Luminance factor	*ß = 0.07 (mnm)*

b) Orange

Red boundary	$y = 0.285 + 0.100x$
White boundary	$y = 0.940 - x$
Yellow boundary	$y = 0.250 + 0.220x$
Luminance factor	*ß = 0.20 (mnm)*

c) Yellow

Orange boundary	*y = 0.108 + 0.707x*
White boundary	*y = 0.910 – x*
Green boundary	*y = 1.35x – 0.093*
Luminance factor	*ß = 0.45 (mnm)*

d) White

Purple boundary	*y = 0.010 + x*
Blue boundary	*y = 0.610 – x*
Green boundary	*y = 0.030 + x*
Yellow boundary	*y = 0.710 – x*
Luminance factor	*ß = 0.75 (mnm)*

e) Black

Purple boundary	*y = x – 0.030*
Blue boundary	*y = 0.570 – x*
Green boundary	*y = 0.050 + x*
Yellow boundary	*y = 0.740 – x*
Luminance factor	*ß = 0.03 (max)*

f) Yellowish green

Green boundary	*y = 1.317x + 0.4*
White boundary	*y = 0.910 – x*
Yellow boundary	*y = 0.867x + 0.4*

Note.— The small separation between surface red and surface orange is not sufficient to ensure the distinction of these colours when seen separately.

3.3 **Recommendation.—** *The chromaticity and luminance factors of colours of retro-reflective materials for markings, signs and panels should be within the following boundaries when determined under standard conditions.*

CIE Equations (see Figure A1-3):

a) Red

Purple boundary	*y = 0.345 – 0.051x*
White boundary	*y = 0.910 – x*
Orange boundary	*y = 0.314 + 0.047x*
Luminance factor	*ß = 0.03 (mnm)*

b) Orange

Red boundary	*y = 0.265 + 0.205x*
White boundary	*y = 0.910 – x*
Yellow boundary	*y = 0.207 + 0.390x*
Luminance factor	*ß = 0.14 (mnm)*

c) Yellow

Orange boundary	*y = 0.160 + 0.540x*
White boundary	*y = 0.910 – x*
Green boundary	*y = 1.35x – 0.093*
Luminance factor	*ß = 0.16 (mnm)*

d) White

Purple boundary	*y = x*
Blue boundary	*y = 0.610 – x*
Green boundary	*y = 0.040 + x*
Yellow boundary	*y = 0.710 – x*
Luminance factor	*ß = 0.27 (mnm)*

e) Blue

Green boundary	*y = 0.118 + 0.675x*
White boundary	*y = 0.370 – x*
Purple boundary	*y = 1.65x – 0.187*
Luminance factor	*ß = 0.01 (mnm)*

f) Green

Yellow boundary	*y = 0.711 – 1.22x*
White boundary	*y = 0.243 + 0.670x*
Blue boundary	*y = 0.405 – 0.243x*
Luminance factor	*ß = 0.03 (mnm)*

3.4 **Recommendation.—** *The chromaticity and luminance factors of colours for transilluminated (internally illuminated) signs and panels should be within the following boundaries when determined under standard conditions.*

CIE Equations (see Figure A1-4):

a) Red

Purple boundary	*y = 0.345 – 0.051x*
White boundary	*y = 0.910 – x*
Orange boundary	*y = 0.314 + 0.047x*
Luminance factor (day condition)	*ß = 0.07 (mnm)*
Relative luminance to white (night condition)	*5% (mnm)* *20% (max)*

b) Yellow

Orange boundary	*y = 0.108 + 0.707x*
White boundary	*y = 0.910 – x*
Green boundary	*y = 1.35x – 0.093*
Luminance factor (day condition)	*ß = 0.45 (mnm)*
Relative luminance to white (night condition)	*30% (mnm)* *80% (max)*

c) White

Purple boundary	*y = 0.010 + x*
Blue boundary	*y = 0.610 – x*
Green boundary	*y = 0.030 + x*
Yellow boundary	*y = 0.710 – x*
Luminance factor (day condition)	*ß = 0.75 (mnm)*
Relative luminance to white (night condition)	*100%*

d) Black

Purple boundary	*y = x – 0.030*
Blue boundary	*y = 0.570 – x*
Green boundary	*y = 0.050 + x*
Yellow boundary	*y = 0.740 – x*
Luminance factor (day condition)	*ß = 0.03 (max)*
Relative luminance to white (night condition)	*0% (mnm)* *2% (max)*

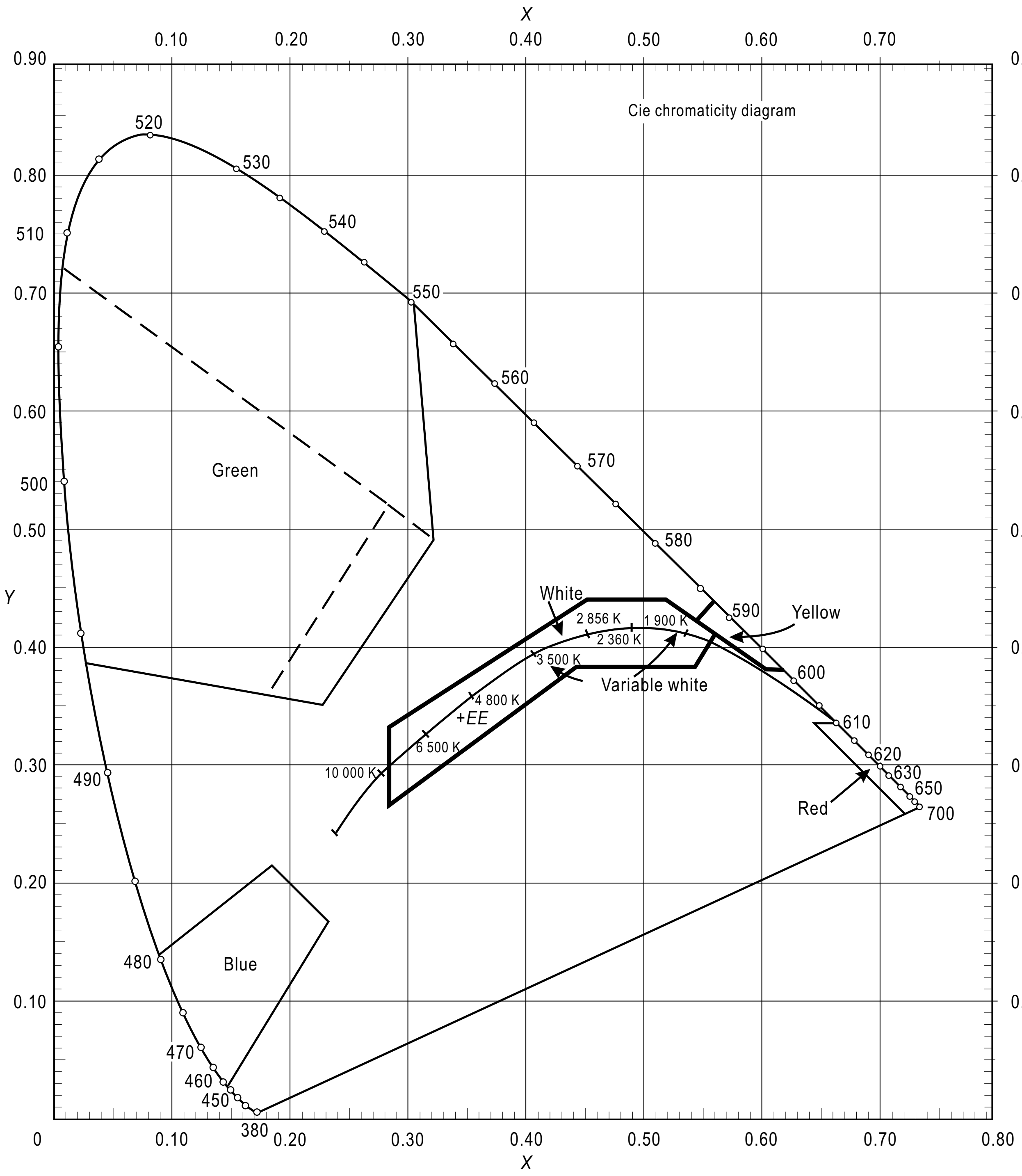


Figure A1-1. Colours for aeronautical ground lights

Appendix 1 *Annex 14 — Aerodromes*

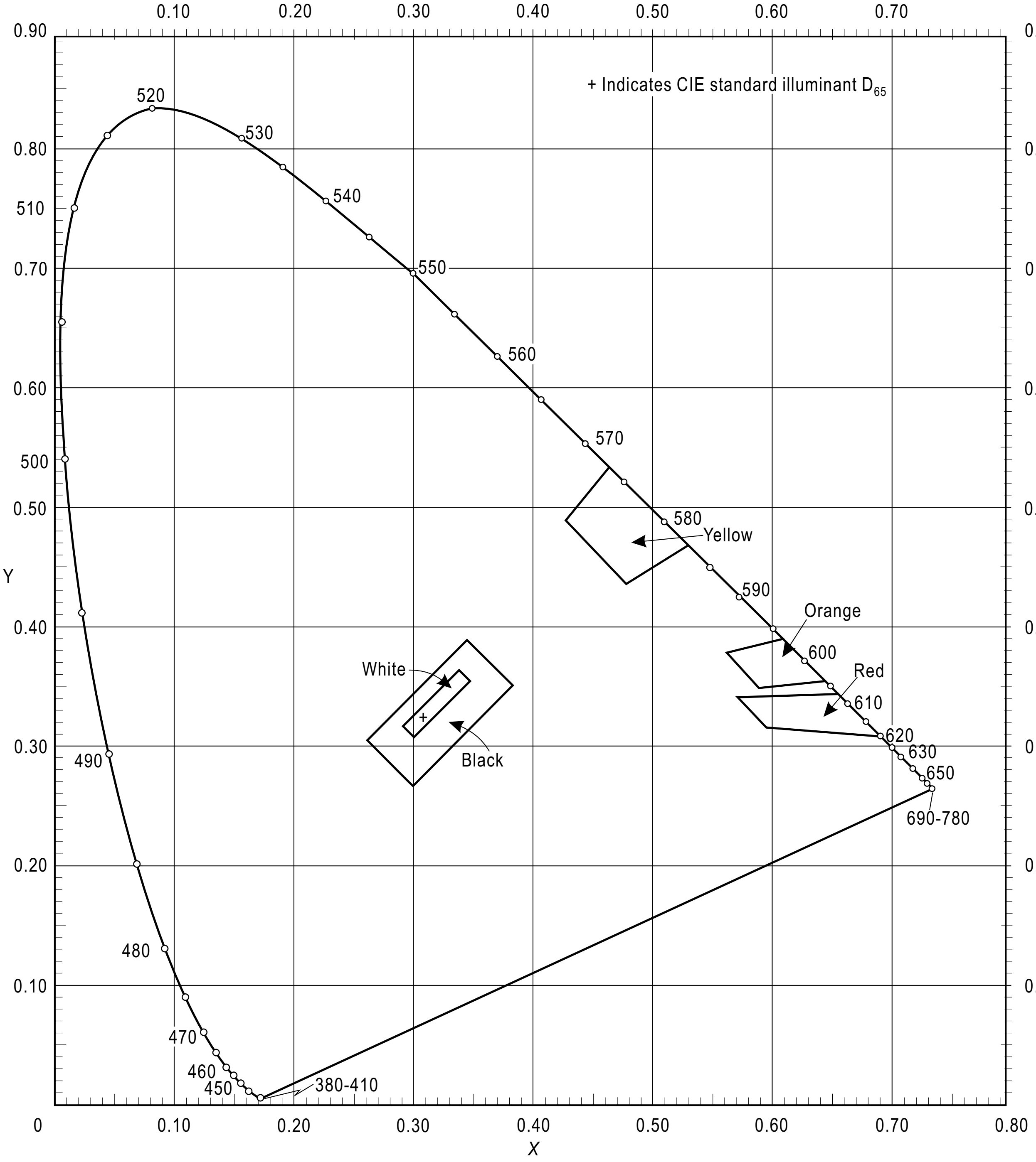


Figure A1-2. Ordinary colours for markings and externally illuminated signs and panels

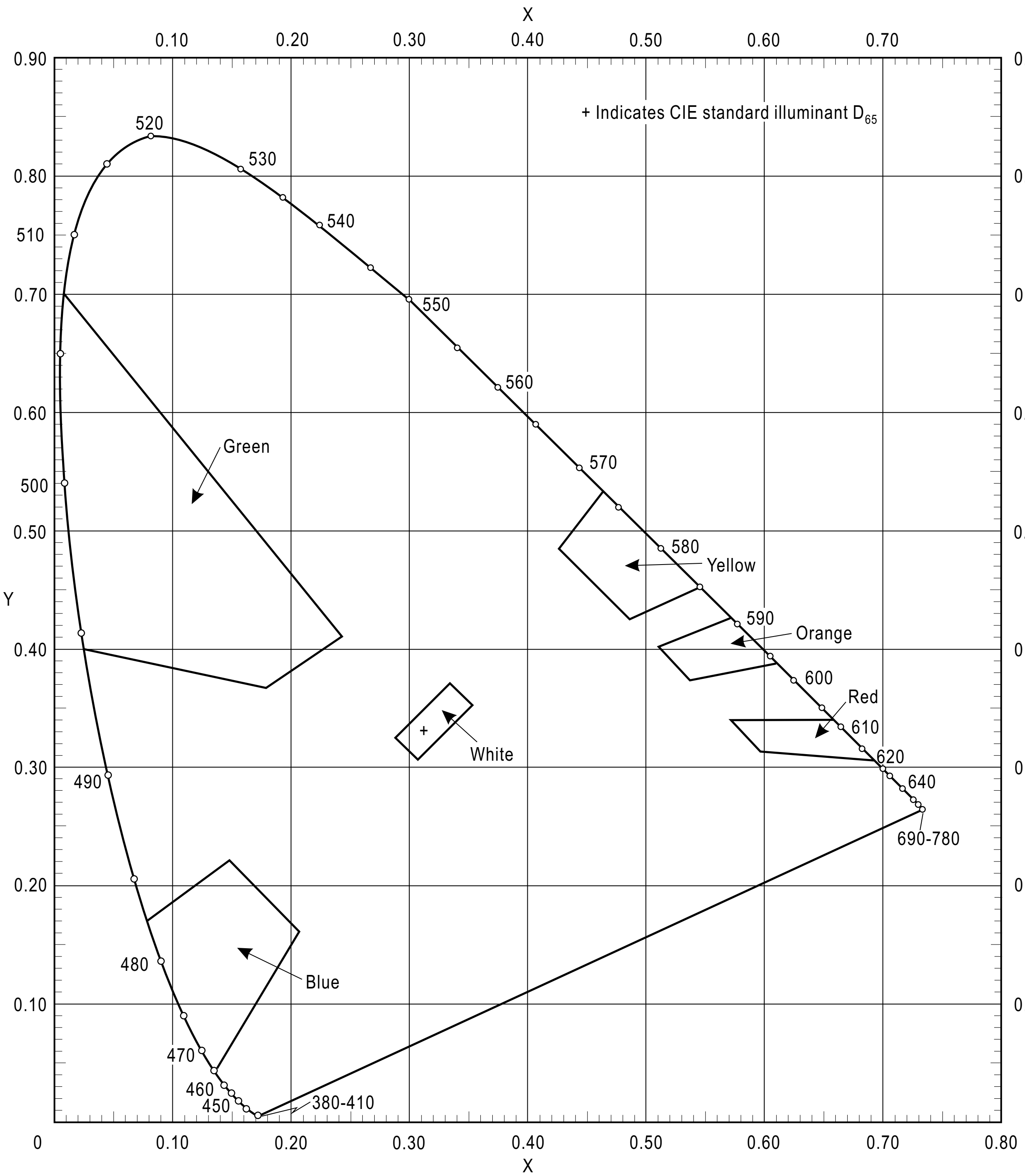


Figure A1-3. Colours of retro-reflective materials for markings, signs and panels

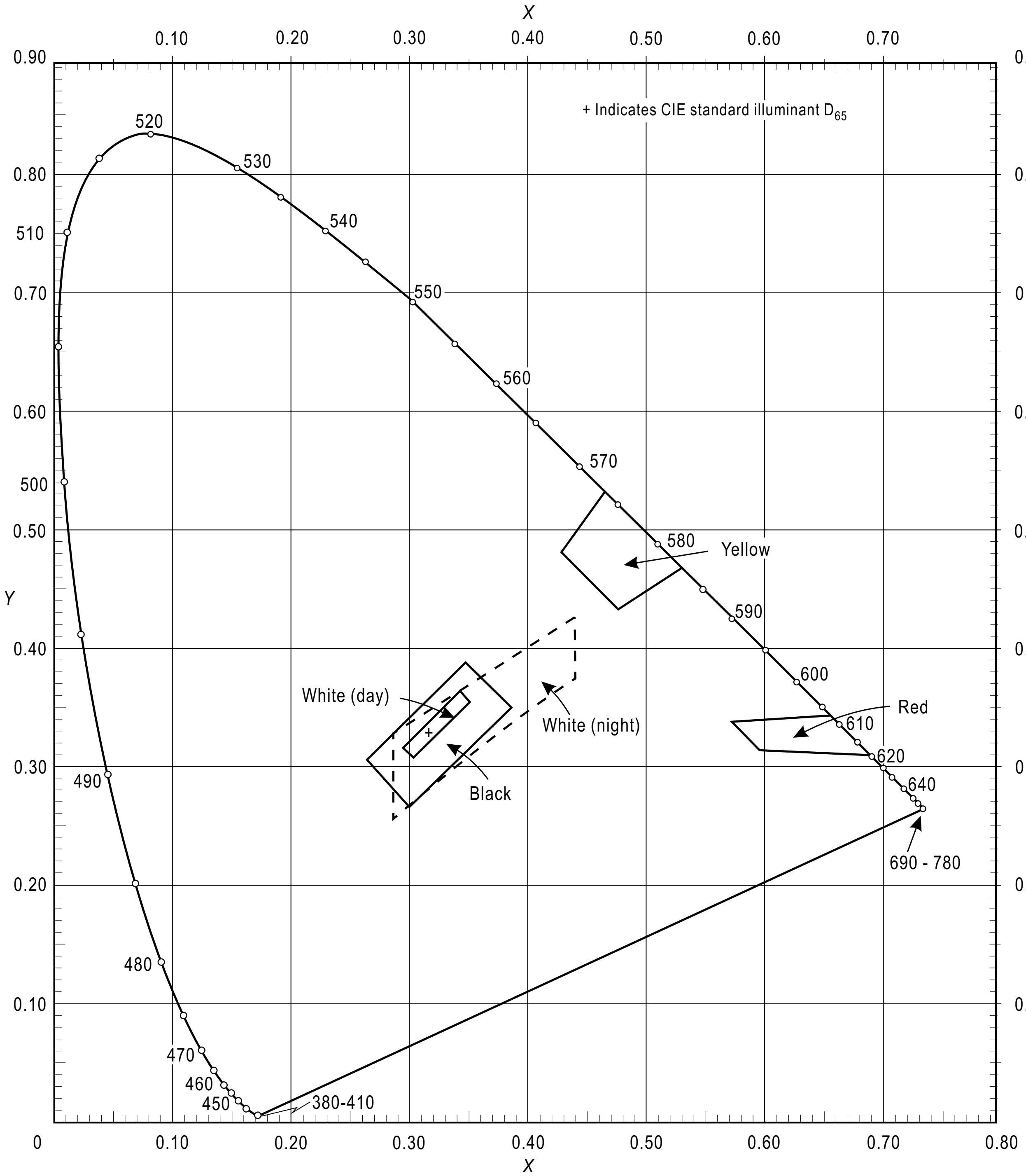
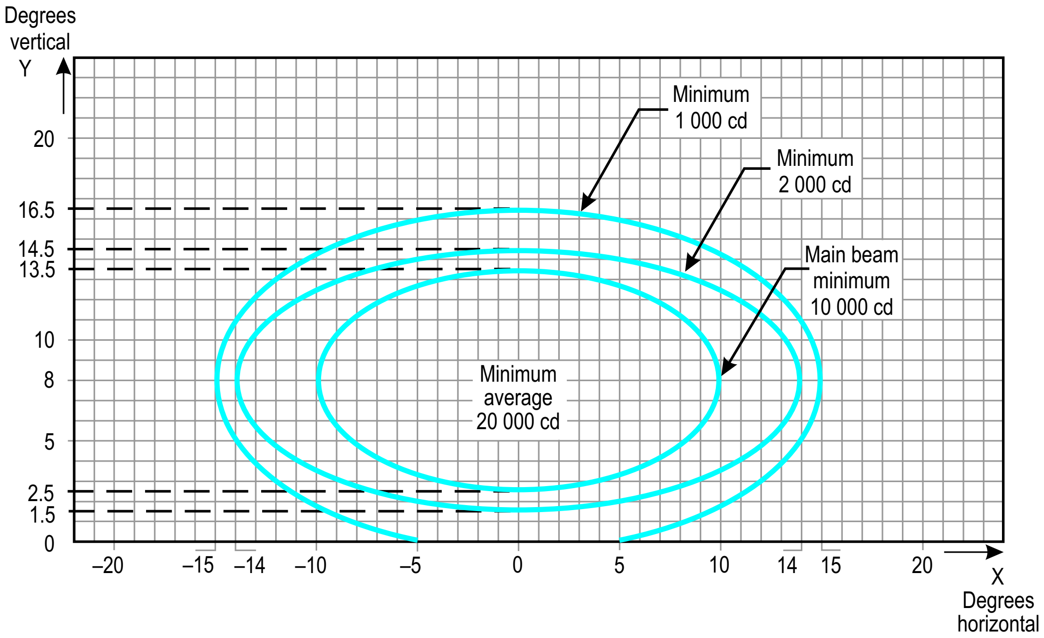


Figure A1-4. Colours of transilluminated (internally illuminated) signs and panels

APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS



Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	10	14	15
b	5.5	6.5	8.5

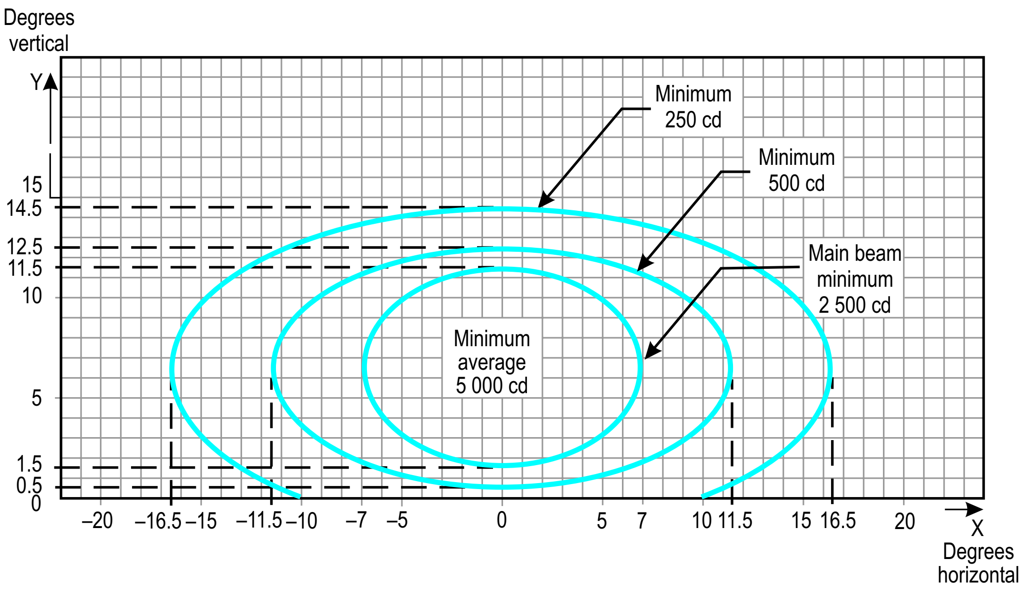
2. Vertical setting angles of the lights shall be such that the following vertical coverage of the main beam will be met:

distance from threshold	vertical main beam coverage
threshold to 315 m	0° — 11°
316 m to 475 m	0.5° — 11.5°
476 m to 640 m	1.5° — 12.5°
641 m and beyond	2.5° — 13.5° (as illustrated above)

3. Lights in crossbars beyond 22.5 m from the centre line shall be toed-in 2 degrees. All other lights shall be aligned parallel to the centre line of the runway.

4. See collective notes for Figures A2-1 to A2-11.

Figure A2-1. Isocandela diagram for approach centre line light and crossbars (white light)



Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	7.0	11.5	16.5
b	5.0	6.0	8.0

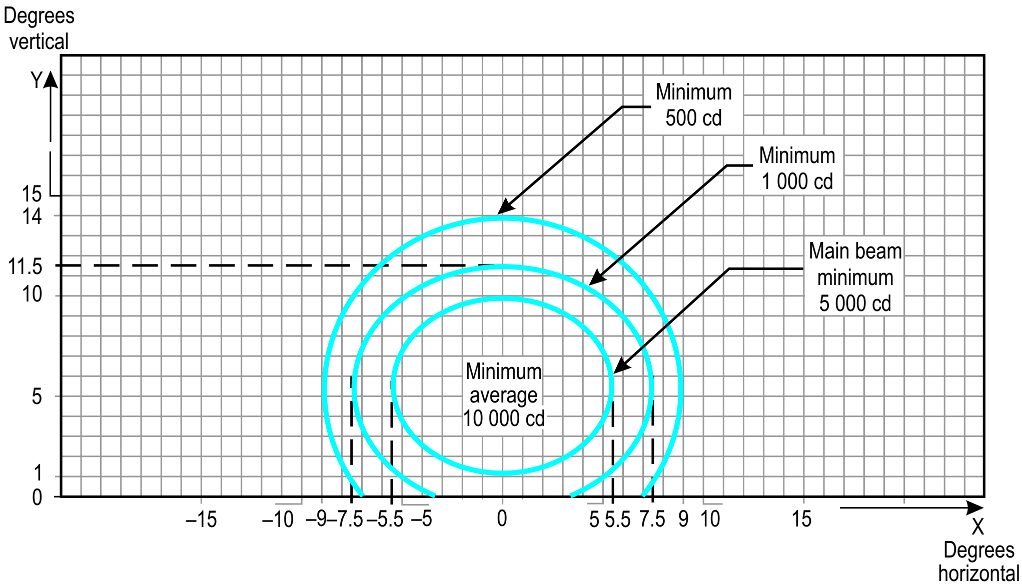
2. Toe-in 2 degrees

3. Vertical setting angles of the lights shall be such that the following vertical coverage of the main beam will be met:

distance from threshold	vertical main beam coverage
threshold to 115 m	0.5° — 10.5°
116 m to 215 m	1° — 11°
216 m and beyond	1.5° — 11.5° (as illustrated above)

4. See collective notes for Figures A2-1 to A2-11.

Figure A2-2. Isocandela diagram for approach side row light (red light)



Notes:

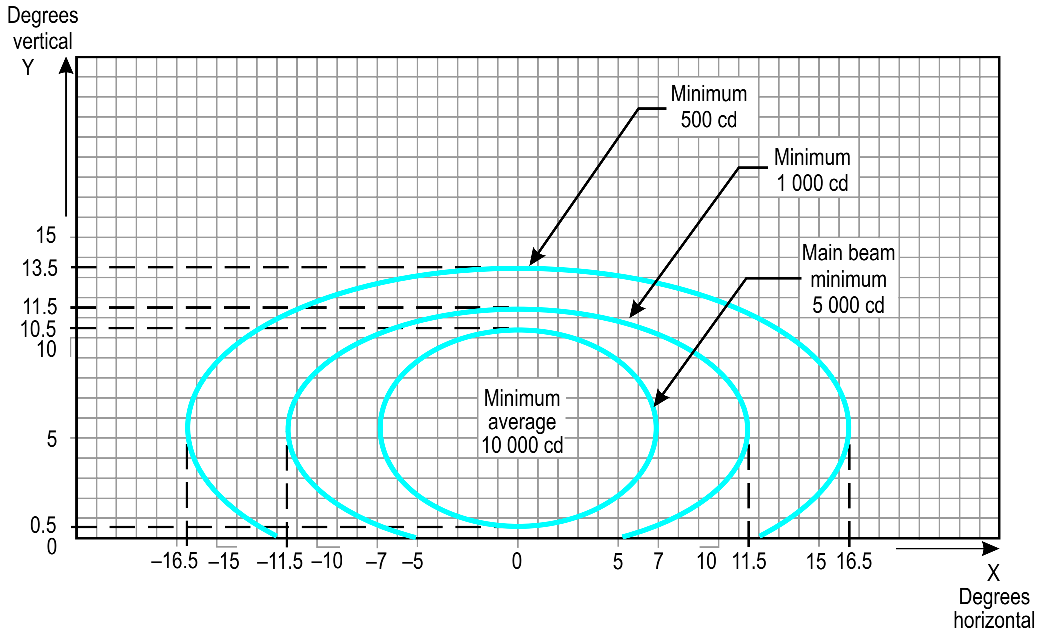
1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.5	7.5	9.0
b	4.5	6.0	8.5

2. Toe-in 3.5 degrees

3. See collective notes for Figures A2-1 to A2-11.

Figure A2-3. Isocandela diagram for threshold light (green light)



Notes:

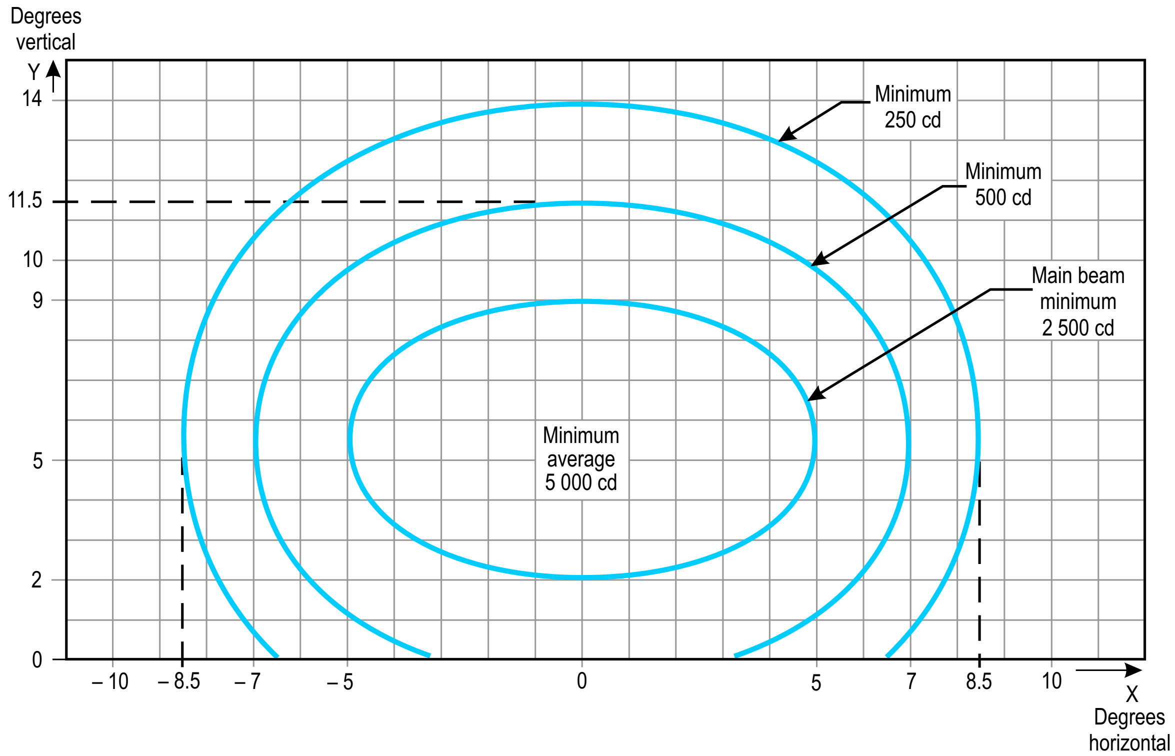
1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	7.0	11.5	16.5
b	5.0	6.0	8.0

2. Toe-in 2 degrees

3. See collective notes for Figures A2-1 to A2-11.

Figure A2-4. Isocandela diagram for threshold wing bar light (green light)



Notes:

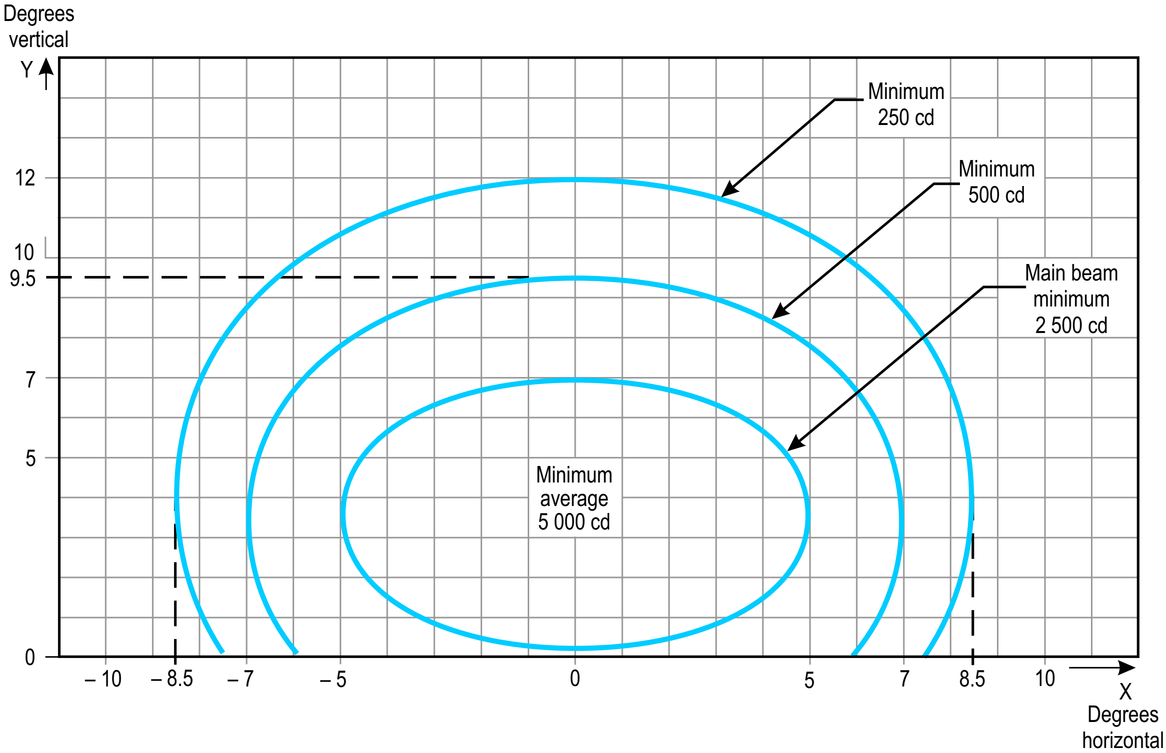
1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.0	7.0	8.5
b	3.5	6.0	8.5

2. Toe-in 4 degrees

3. See collective notes for Figures A2-1 to A2-11.

Figure A2-5. Isocandela diagram for touchdown zone light (white light)



Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

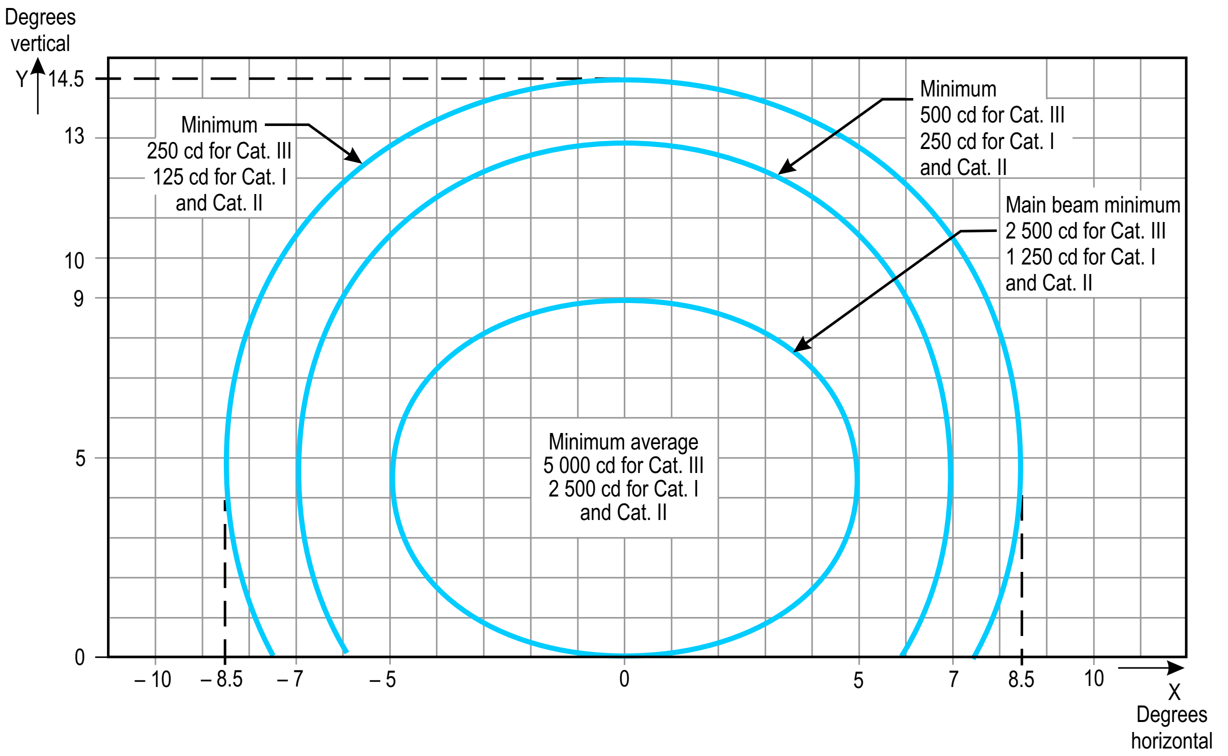
a	5.0	7.0	8.5
b	3.5	6.0	8.5

2. For red light, multiply values by 0.15.

3. For yellow light, multiply values by 0.40.

4. See collective notes for Figures A2-1 to A2-11.

Figure A2-6. Isocandela diagram for runway centre line light with 30 m longitudinal spacing (white light) and rapid exit taxiway indicator light (yellow light)



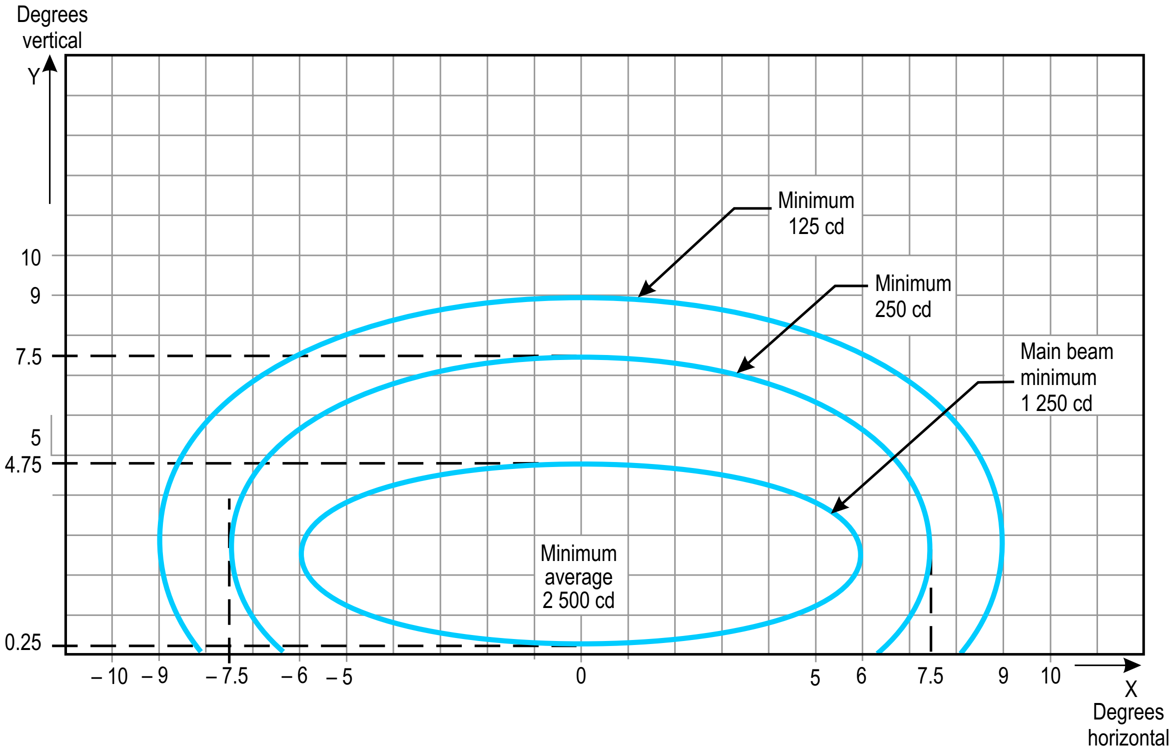
Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.0	7.0	8.5
b	4.5	8.5	10

2. For red light, multiply values by 0.15.
3. For yellow light, multiply values by 0.40.
4. See collective notes for Figures A2-1 to A2-11.

Figure A2-7. Isocandela diagram for runway centre line light with 15 m longitudinal spacing (white light) and rapid exit taxiway indicator light (yellow light)



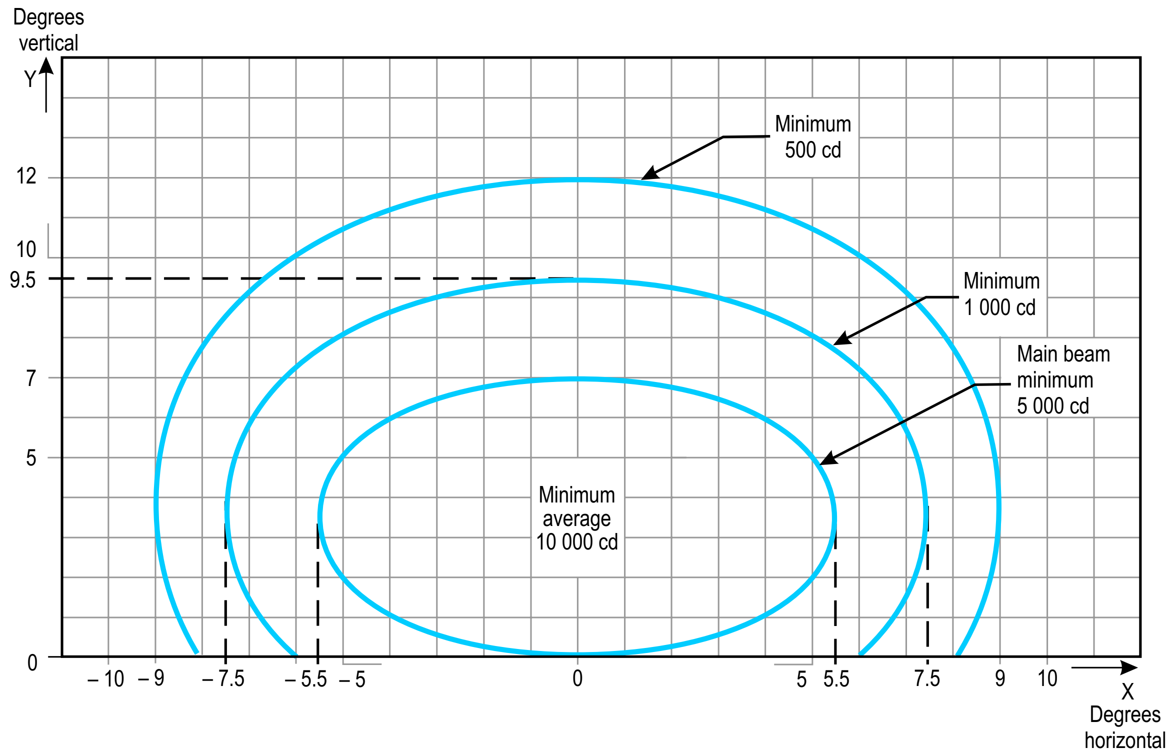
Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	6.0	7.5	9.0
b	2.25	5.0	6.5

2. See collective notes for Figures A2-1 to A2-11.

Figure A2-8. Isocandela diagram for runway end light (red light)



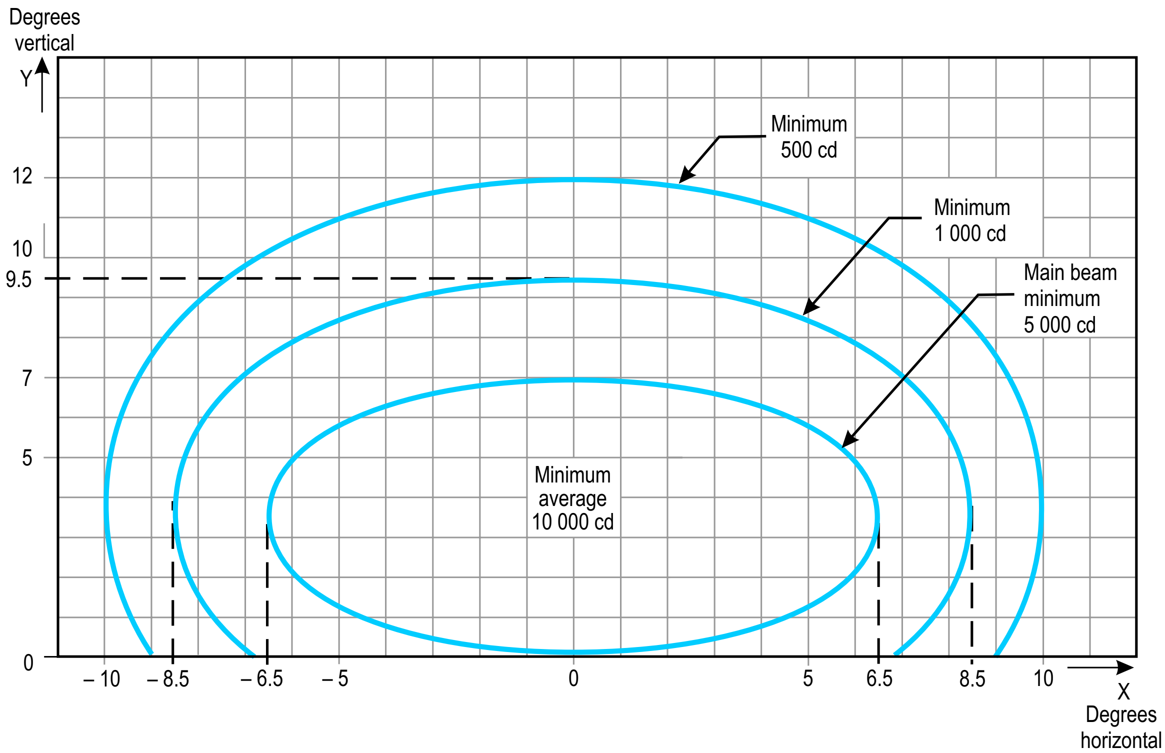
Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	5.5	7.5	9.0
b	3.5	6.0	8.5

2. Toe-in 3.5 degrees
3. For yellow light, multiply values by 0.40.
4. See collective notes for Figures A2-1 to A2-11.

Figure A2-9. Isocandela diagram for runway edge light where width of runway is 45 m (white light)



Notes:

1. Curves calculated on formula $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

a	6.5	8.5	10.0
b	3.5	6.0	8.5

2. Toe-in 4.5 degrees
3. For yellow light, multiply values by 0.40.
4. See collective notes for Figures A2-1 to A2-11.

Figure A2-10. Isocandela diagram for runway edge light where width of runway is 60 m (white light)

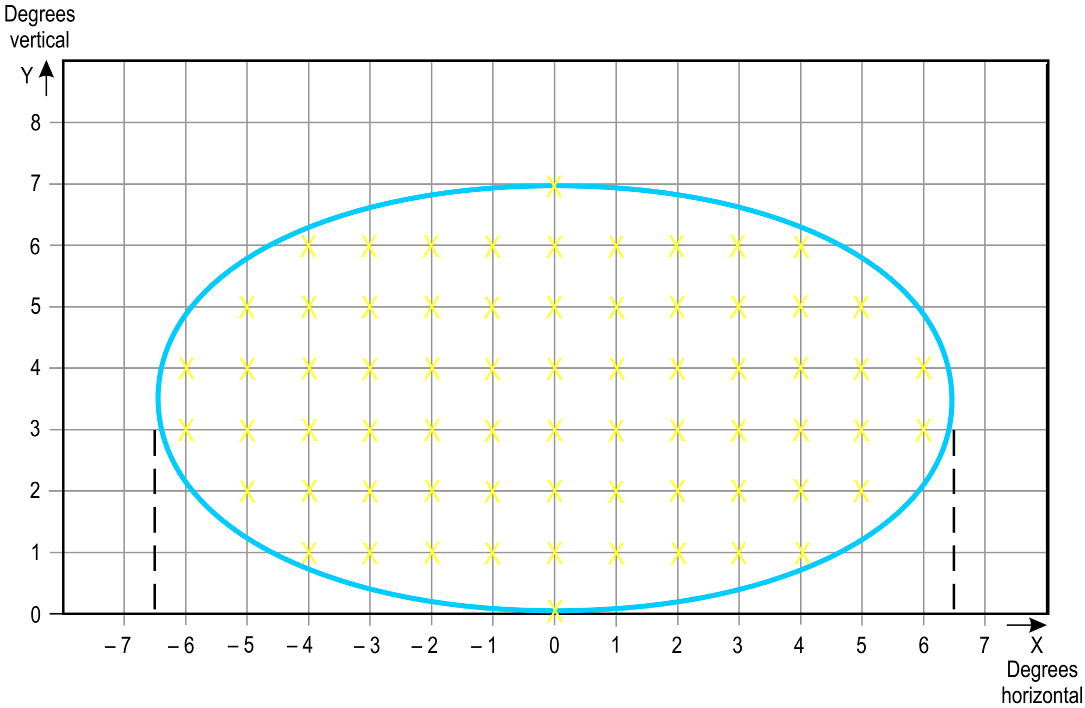


Figure A2-11. Grid points to be used for the calculation of average intensity of approach and runway lights

Collective notes to Figures A2-1 to A2-11

1. The ellipses in each figure are symmetrical about the common vertical and horizontal axes.

2. Figures A2-1 to A2-10 show the minimum allowable light intensities. The average intensity of the main beam is calculated by establishing grid points as shown in Figure A2-11 and using the intensity values measures at all grid points located within and on the perimeter of the ellipse representing the main beam. The average value is the arithmetic average of light intensities measured at all considered grid points.

3. No deviations are acceptable in the main beam pattern when the lighting fixture is properly aimed.

4. Average intensity ratio. The ratio between the average intensity within the ellipse defining the main beam of a typical new light and the average light intensity of the main beam of a new runway edge light shall be as follows:

Figure A2-1	Approach centre line and crossbars	1.5 to 2.0 (white light)
Figure A2-2	Approach side row	0.5 to 1.0 (red light)
Figure A2-3	Threshold	1.0 to 1.5 (green light)
Figure A2-4	Threshold wing bar	1.0 to 1.5 (green light)
Figure A2-5	Touchdown zone	0.5 to 1.0 (white light)
Figure A2-6	Runway centre line (longitudinal spacing 30 m)	0.5 to 1.0 (white light)
Figure A2-7	Runway centre line (longitudinal spacing 15 m)	0.5 to 1.0 for CAT III (white light)
		0.25 to 0.5 for CAT I, II (white light)
Figure A2-8	Runway end	0.25 to 0.5 (red light)
Figure A2-9	Runway edge (45 m runway width)	1.0 (white light)
Figure A2-10	Runway edge (60 m runway width)	1.0 (white light)

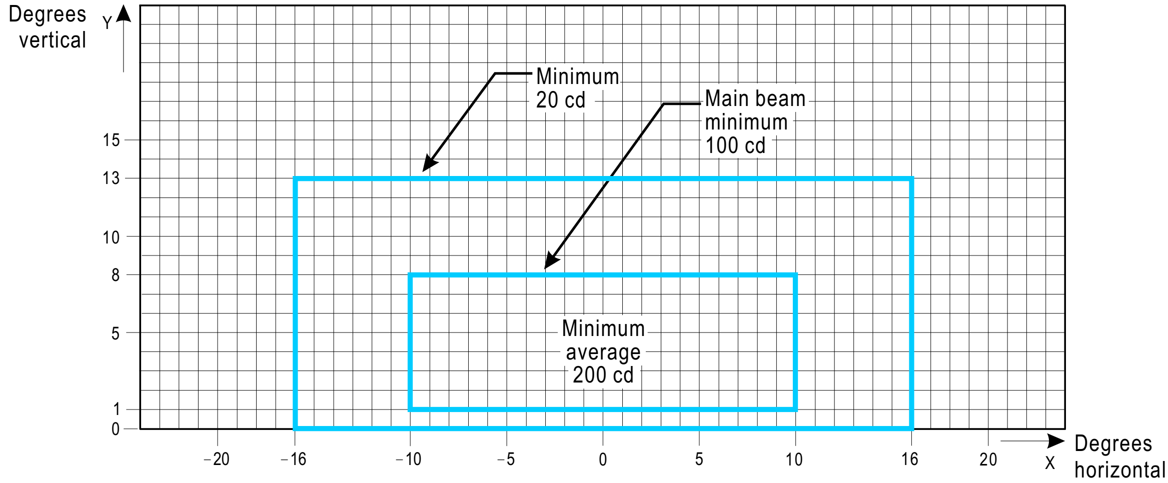
5. The beam coverages in the figures provide the necessary guidance for approaches down to an RVR of the order of 150 m and take-offs down to an RVR of the order of 100 m.

6. Horizontal angles are measured with respect to the vertical plane through the runway centre line. For lights other than centre line lights, the direction towards the runway centre line is considered positive. Vertical angles are measured with respect to the horizontal plane.

7. Where, for approach centre line lights and crossbars and for approach side row lights, inset lights are used in lieu of elevated lights, e.g. on a runway with a displaced threshold, the intensity requirements can be met by installing two or three fittings (lower intensity) at each position.

8. The importance of adequate maintenance cannot be over-emphasized. The average intensity should never fall to a value less than 50 per cent of the value shown in the figures and it should be the aim of airport authorities to maintain a level of light output close to the specified minimum average intensity.

9. The light unit shall be installed so that the main beam is aligned within one-half degree of the specified requirement.



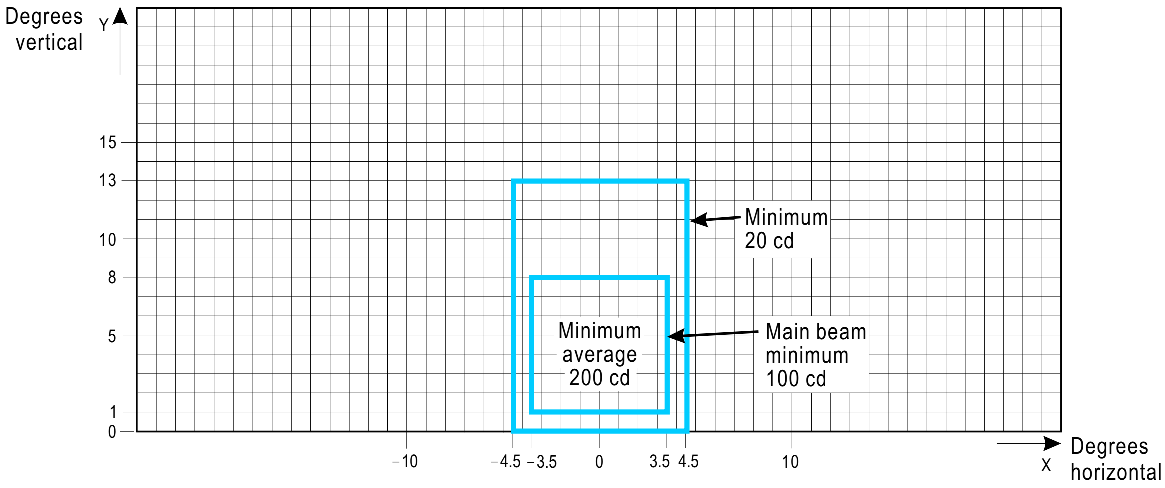
Notes:

1. These beam coverages allow for displacement of the cockpit from the centre line up to distances of the order of 12 m and are intended for use before and after curves.

2. See collective notes for Figures A2-12 to A2-21.

3. Increased intensities for enhanced rapid exit taxiway centre line lights as recommended in 5.3.16.9 are four times the respective intensities in the figure (i.e. 800 cd for minimum average main beam).

Figure A2-12. Isocandela diagram for taxiway centre line (15 m spacing) and stop bar lights in straight sections intended for use in runway visual range conditions of less than a value of 350 m where large offsets can occur and for low-intensity runway guard lights, Configuration B

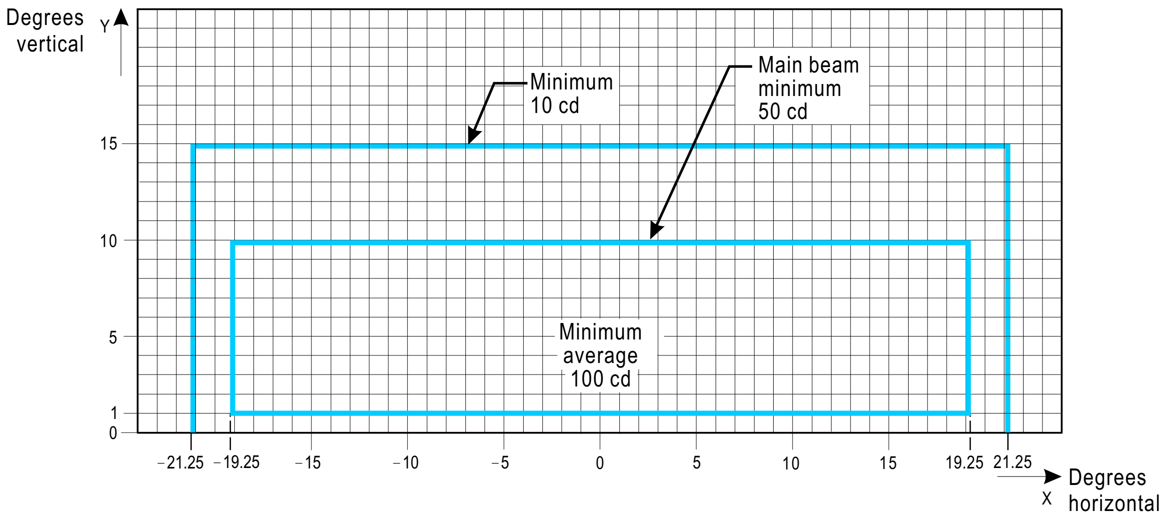


Notes:

1. These beam coverages are generally satisfactory and cater for a normal displacement of the cockpit from the centre line of approximately 3 m.

2. See collective notes for Figures A2-12 to A2-21.

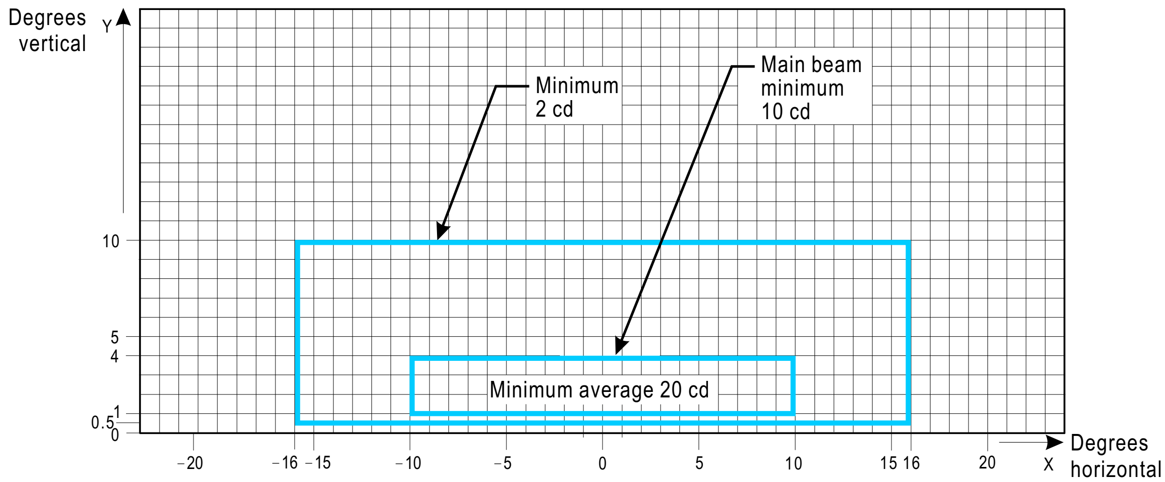
Figure A2-13. Isocandela diagram for taxiway centre line (15 m spacing) and stop bar lights in straight sections intended for use in runway visual range conditions of less than a value of 350 m



Notes:

1. Lights on curves to be toed-in 15.75 degrees with respect to the tangent of the curve.
2. See collective notes for Figures A2-12 to A2-21.

Figure A2-14. Isocandela diagram for taxiway centre line (7.5 m spacing) and stop bar lights in curved sections intended for use in runway visual range conditions of less than a value of 350 m



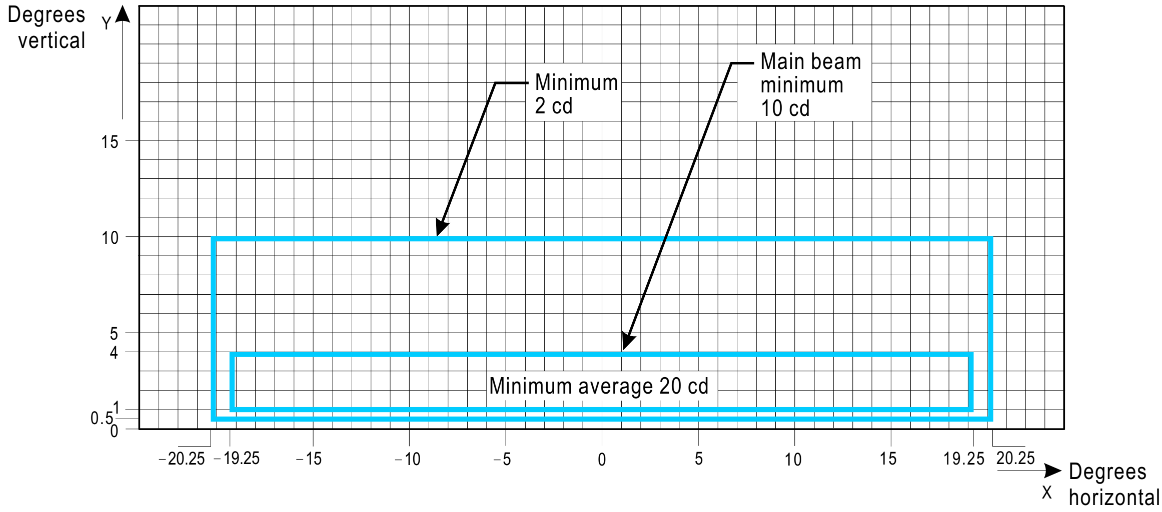
Notes:

1. At locations where high background luminance is usual and where deterioration of light output resulting from dust, snow and local contamination is a significant factor, the cd-values should be multiplied by 2.5.

2. Where omnidirectional lights are used they shall comply with the vertical beam requirements in this figure.

3. See collective notes for Figures A2-12 to A2-21.

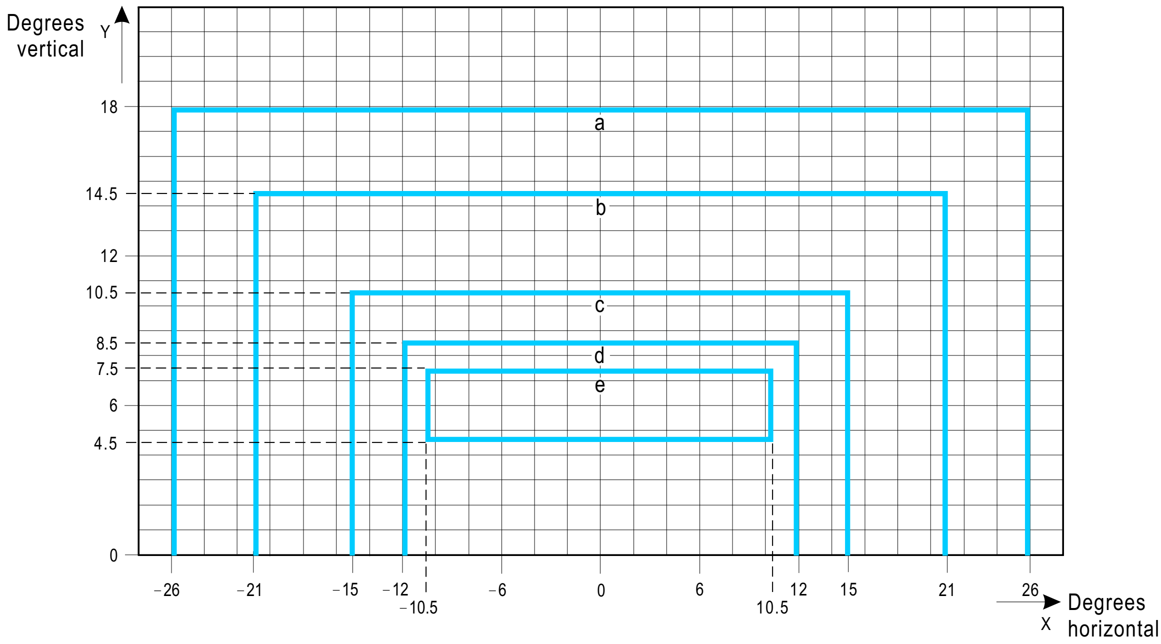
Figure A2-15. Isocandela diagram for taxiway centre line (30 m, 60 m spacing) and stop bar lights in straight sections intended for use in runway visual range conditions of 350 m or greater



Notes:

1. Lights on curves to be toed-in 15.75 degrees with respect to the tangent of the curve.
2. At locations where high background luminance is usual and where deterioration of light output resulting from dust, snow and local contamination is a significant factor, the cd-values should be multiplied by 2.5.
3. These beam coverages allow for displacement of the cockpit from the centre line up to distances of the order of 12 m as could occur at the end of curves.
4. See collective notes for Figures A2-12 to A2-21.

Figure A2-16. Isocandela diagram for taxiway centre line (7.5 m, 15 m, 30 m spacing) and stop bar lights in curved sections intended for use in runway visual range conditions of 350 m or greater

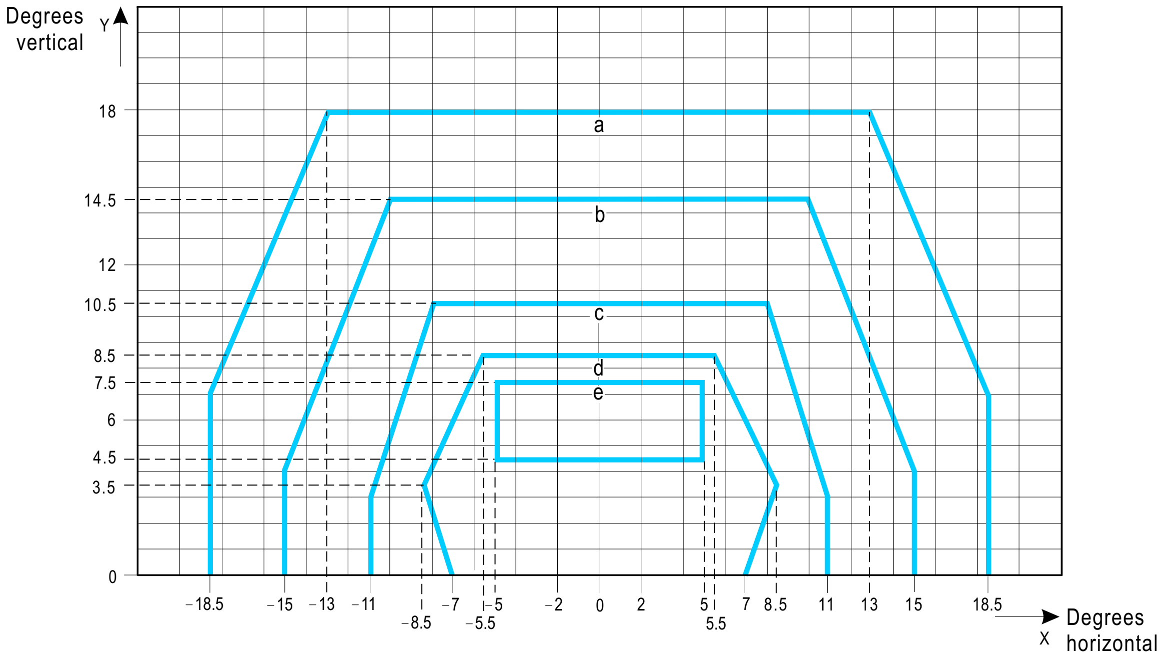


Curve	a	b	c	d	e
Intensity (cd)	8	20	100	450	1 800

Notes:

1. These beam coverages allow for displacement of the cockpit from the centre line up to distances of the order of 12 m and are intended for use before and after curves.
2. See collective notes for Figures A2-12 to A2-21.

Figure A2-17. Isocandela diagram for high-intensity taxiway centre line (15 m spacing) and stop bar lights in straight sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required and where large offsets can occur



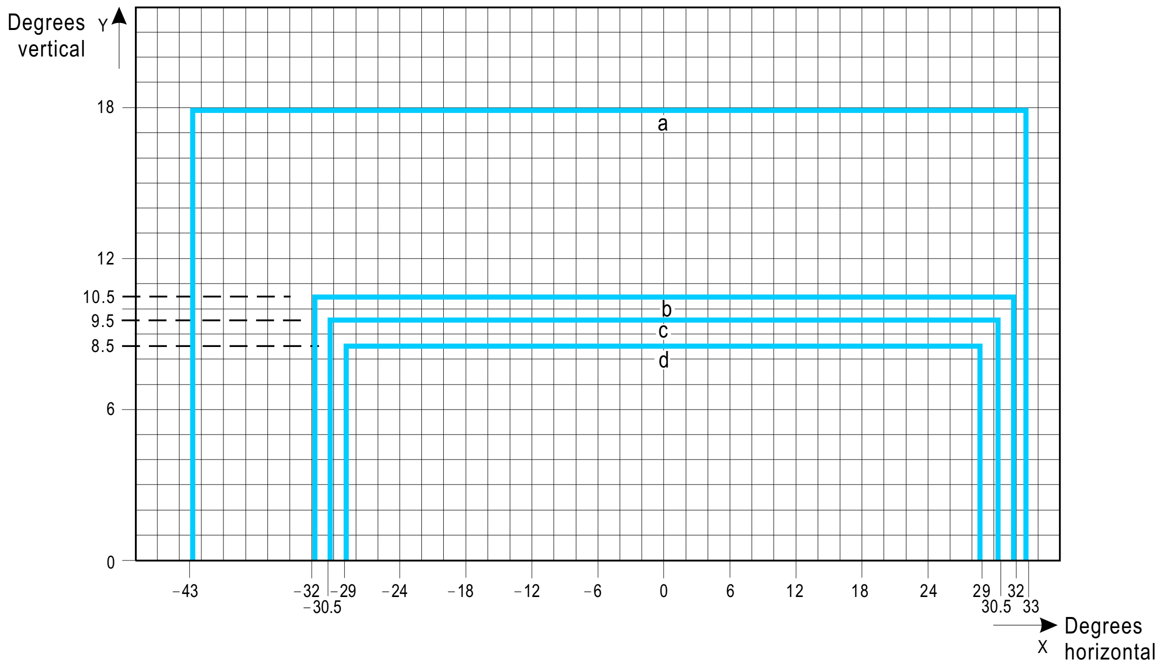
Curve	a	b	c	d	e
Intensity (cd)	8	20	100	450	1 800

Notes:

1. These beam coverages are generally satisfactory and cater for a normal displacement of the cock-pit corresponding to the outer main gear wheel on the taxiway edge.

2. See collective notes for Figures A2-12 to A2-21.

Figure A2-18. Isocandela diagram for high-intensity taxiway centre line (15 m spacing) and stop bar lights in straight sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required

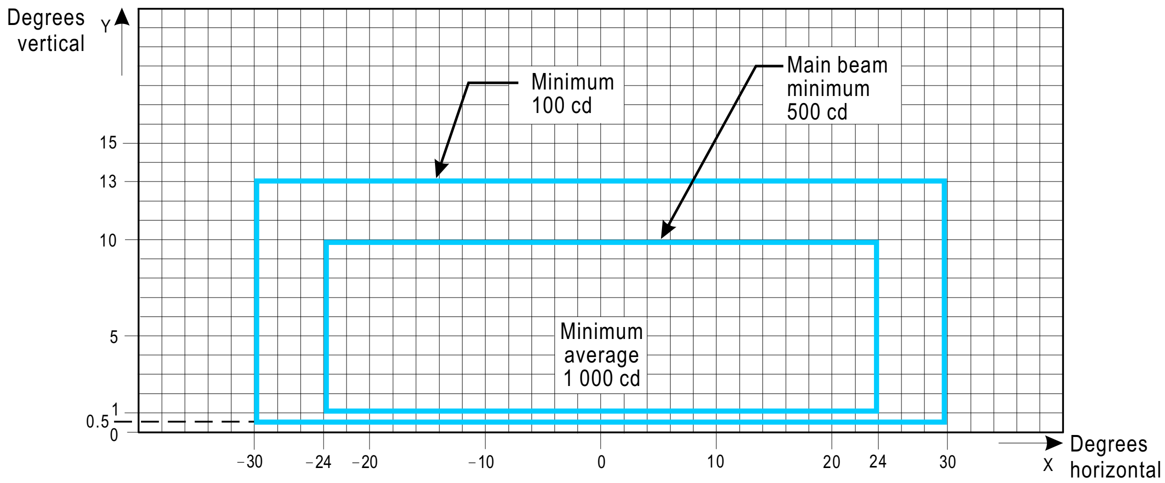


Curve	a	b	c	d
Intensity (cd)	8	100	200	400

Notes:

1. Lights on curves to be toed-in 17 degrees with respect to the tangent of the curve.
2. See collective notes for Figures A2-12 to A2-21.

Figure A2-19. Isocandela diagram for high-intensity taxiway centre line (7.5 m spacing) and stop bar lights in curved sections intended for use in an advanced surface movement guidance and control system where higher light intensities are required



Notes:

1. Although the lights flash in normal operation, the light intensity is specified as if the lights were fixed for incandescent lamps.

2. See collective notes for Figures A2-12 to A2-21.

Figure A2-20. Isocandela diagram for high-intensity runway guard lights, Configuration B

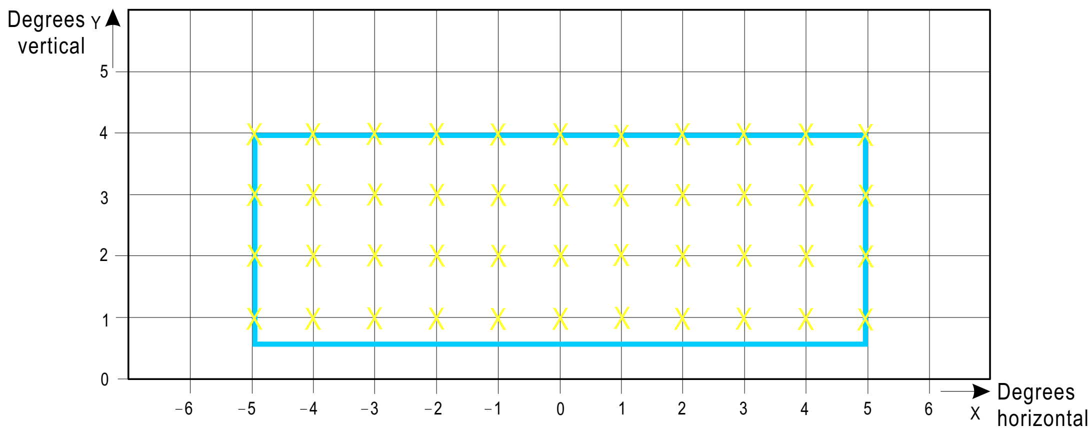


Figure A2-21. Grid points to be used for calculation of average intensity of taxiway centre line and stop bar lights

Collective notes to Figures A2-12 to A2-21

1. The intensities specified in Figures A2-12 to A2-20 are in green and yellow light for taxiway centre line lights, yellow light for runway guard lights and red light for stop bar lights.

2. Figures A2-12 to A2-20 show the minimum allowable light intensities. The average intensity of the main beam is calculated by establishing grid points as shown in Figure A2-21 and using the intensity values measured at all grid points located within and on the perimeter of the rectangle representing the main beam. The average value is the arithmetic average of the light intensities measured at all considered grid points.

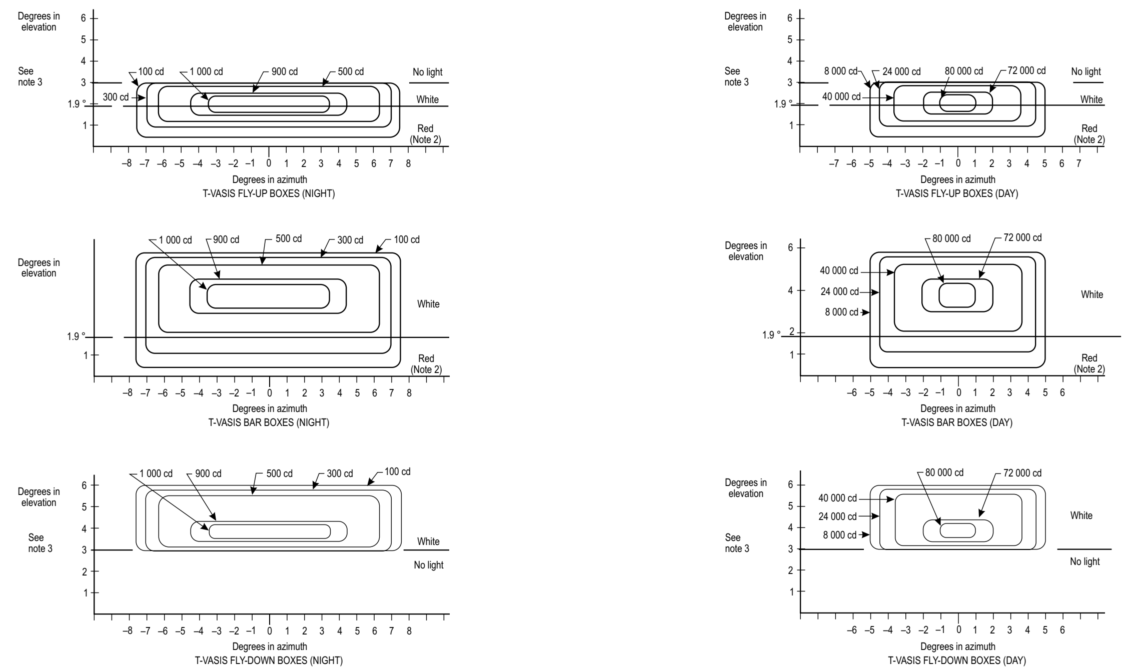
3. No deviations are acceptable in the main beam or in the innermost beam, as applicable, when the lighting fixture is properly aimed.

4. Horizontal angles are measured with respect to the vertical plane through the taxiway centre line except on curves where they are measured with respect to the tangent to the curve.

5. Vertical angles are measured from the longitudinal slope of the taxiway surface.

6. The importance of adequate maintenance cannot be over-emphasized. The intensity, either average where applicable or as specified on the corresponding isocandela curves, should never fall to a value less than 50 per cent of the value shown in the figures, and it should be the aim of airport authorities to maintain a level of light output close to the specified minimum average intensity.

7. The light unit shall be installed so that the main beam or the innermost beam, as applicable, is aligned within one-half degree of the specified requirement.

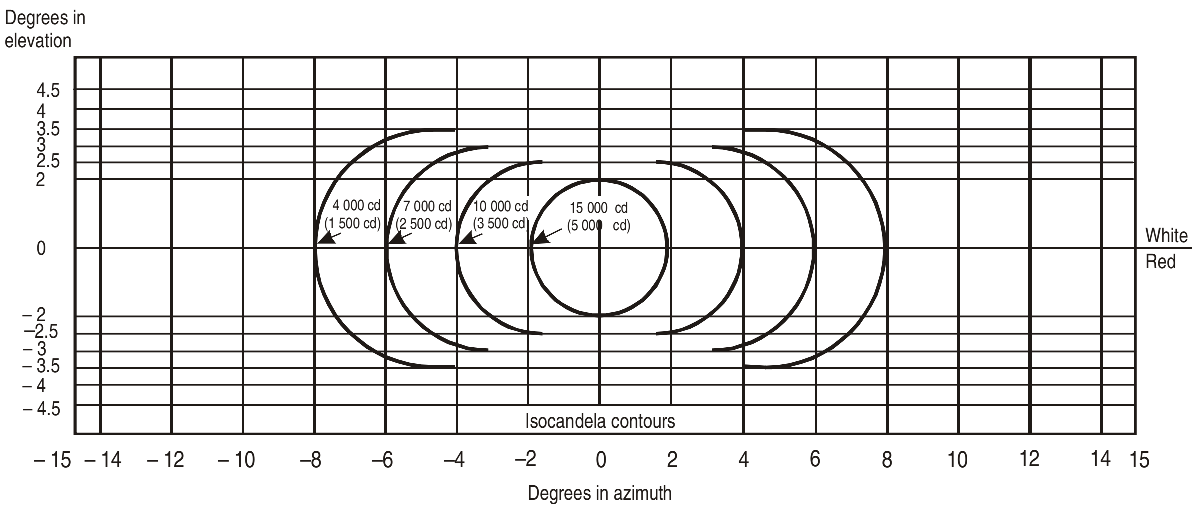


Note 1.— These curves are for minimum intensities in white light.

Note 2.— Filter transmissivity for all red signals is 15 per cent minimum at operating temperature.

Note 3.— A sharp transition from white to no light in elevation is essential to T-VASIS operation. For exact elevation settings, see Figure 5-17.

Figure A2-22. Light intensity distribution of T-VASIS and AT-VASIS

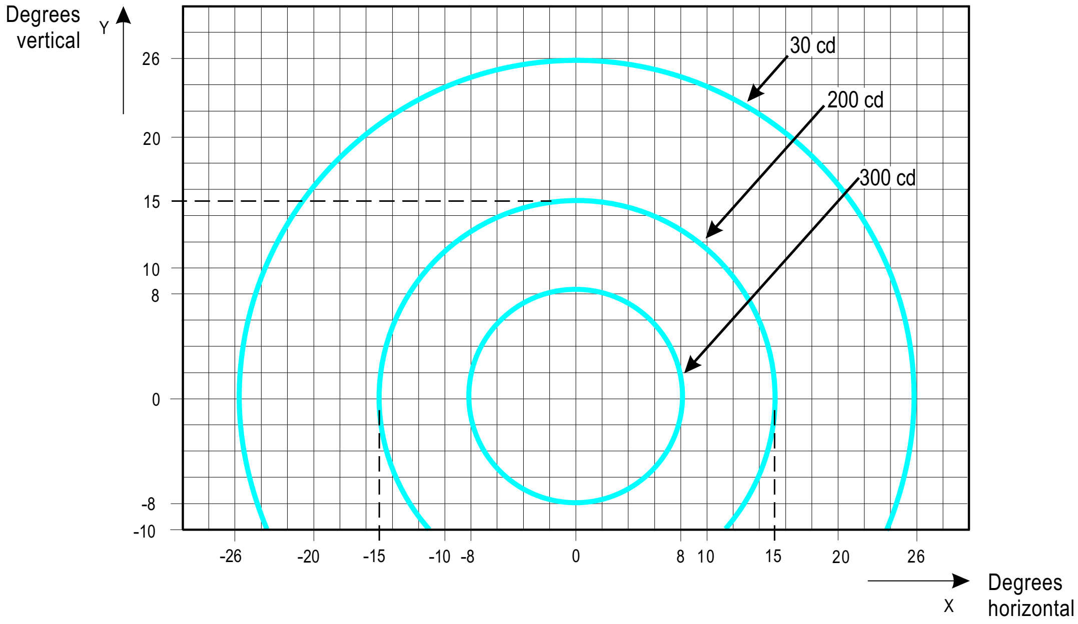


Note 1.— These curves are for minimum intensities in red light.

Note 2.— The intensity value in the white sector of the beam is no less than 2 and may be as high as 6.5 times the corresponding intensity in the red sector.

Note 3.— The intensity values shown in brackets are for APAPI.

Figure A2-23. Light intensity distribution of PAPI and APAPI

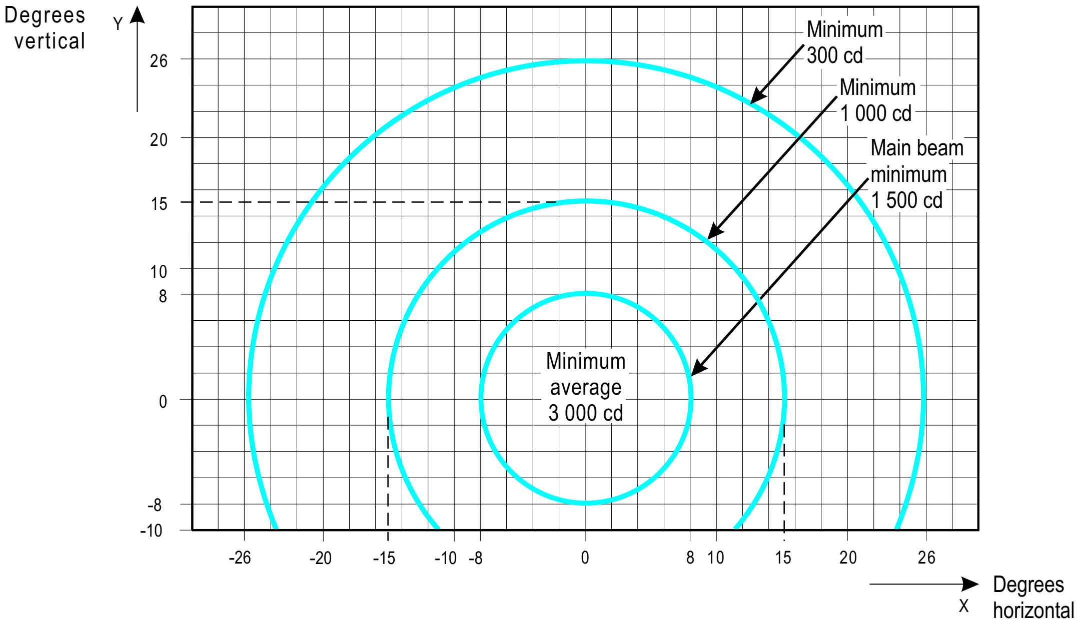


Notes:

1. Although the lights flash in normal operation, the light intensity is specified as if the lights were fixed for incandescent lamps.

2. The intensities specified are in yellow light.

Figure A2-24. Isocandela diagram for each light in low-intensity runway guard lights, Configuration A



Notes:

1. Although the lights flash in normal operation, the light intensity is specified as if the lights were fixed for incandescent lamps.

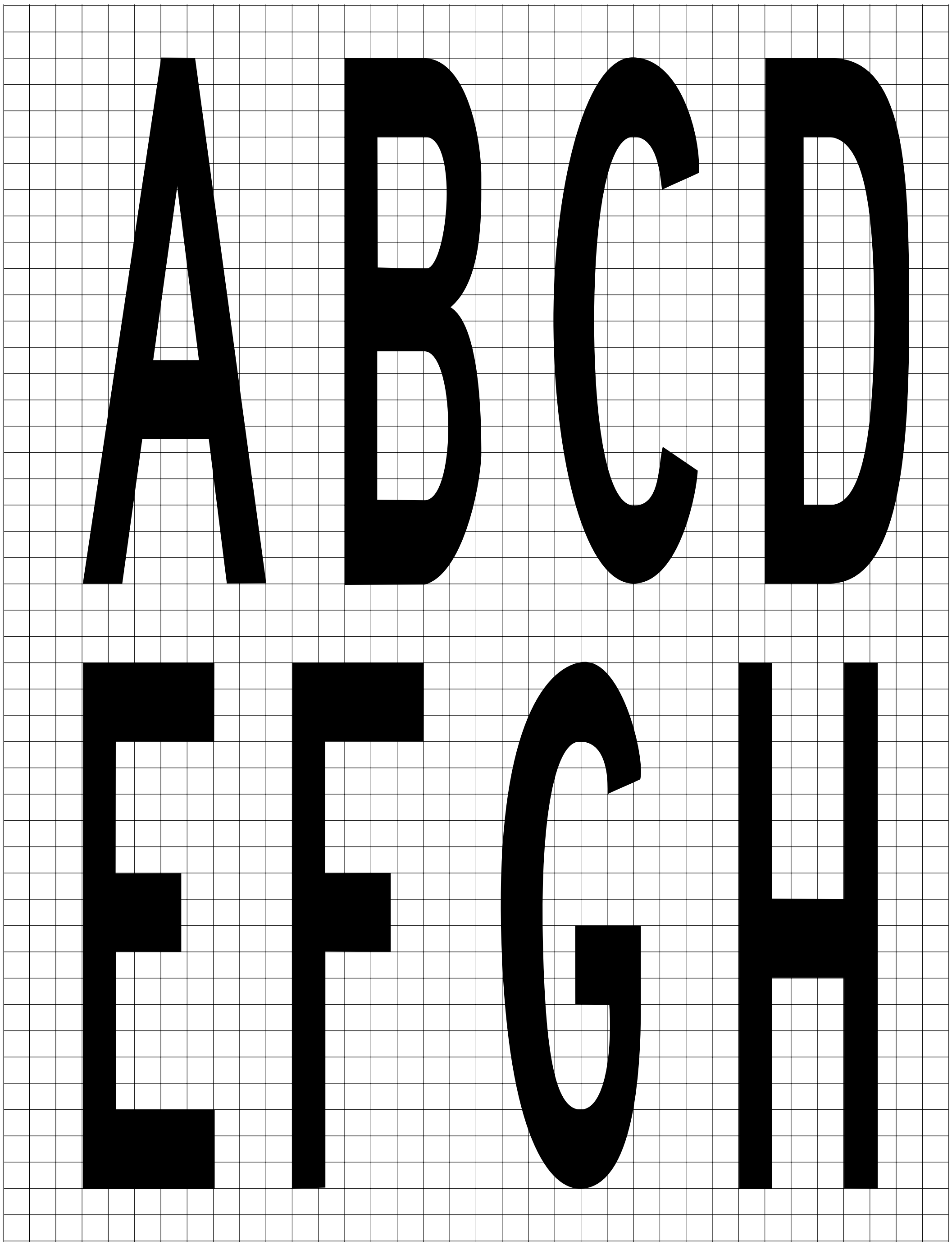
2. The intensities specified are in yellow light.

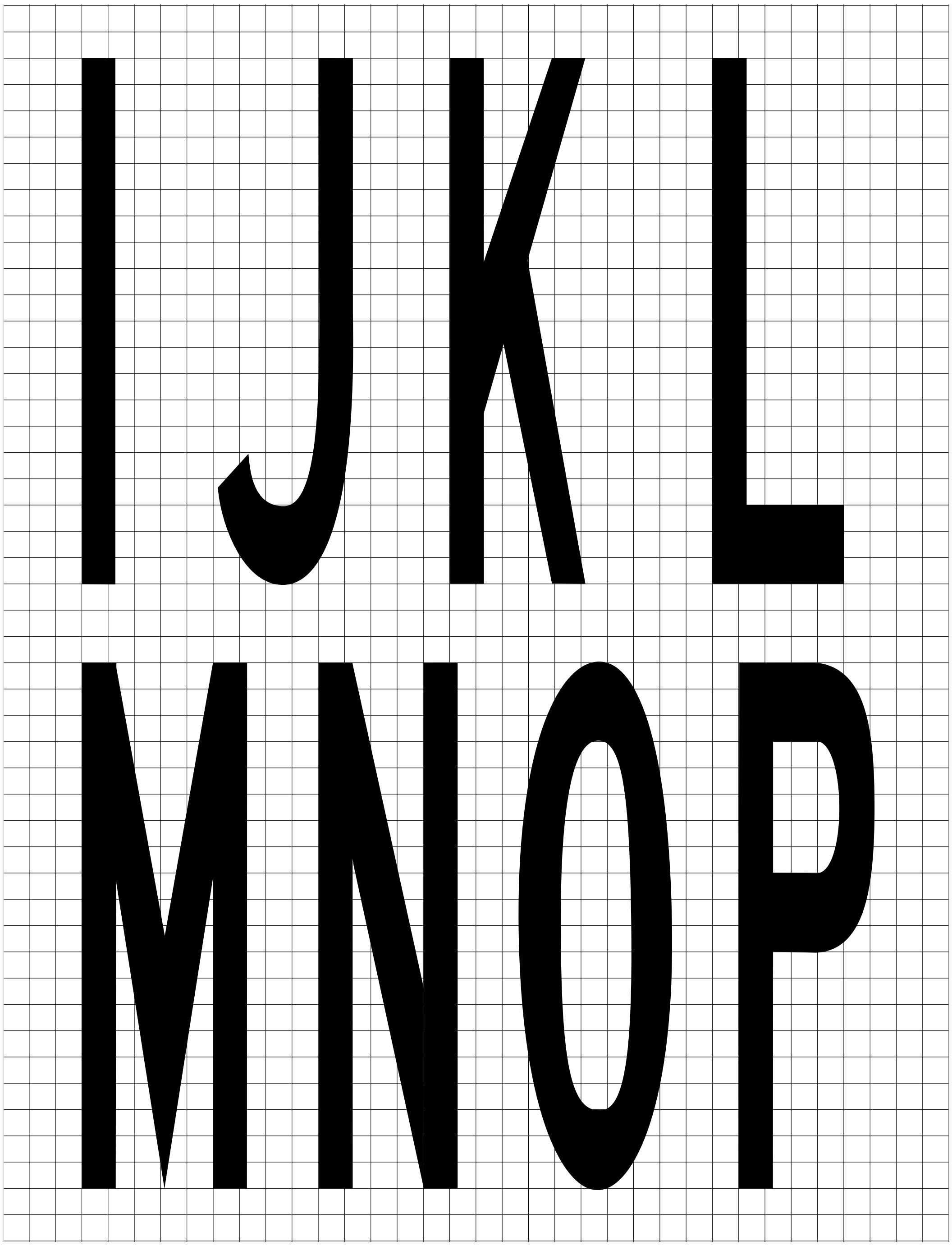
Figure A2-25. Isocandela diagram for each light in high-intensity runway guard lights, Configuration A

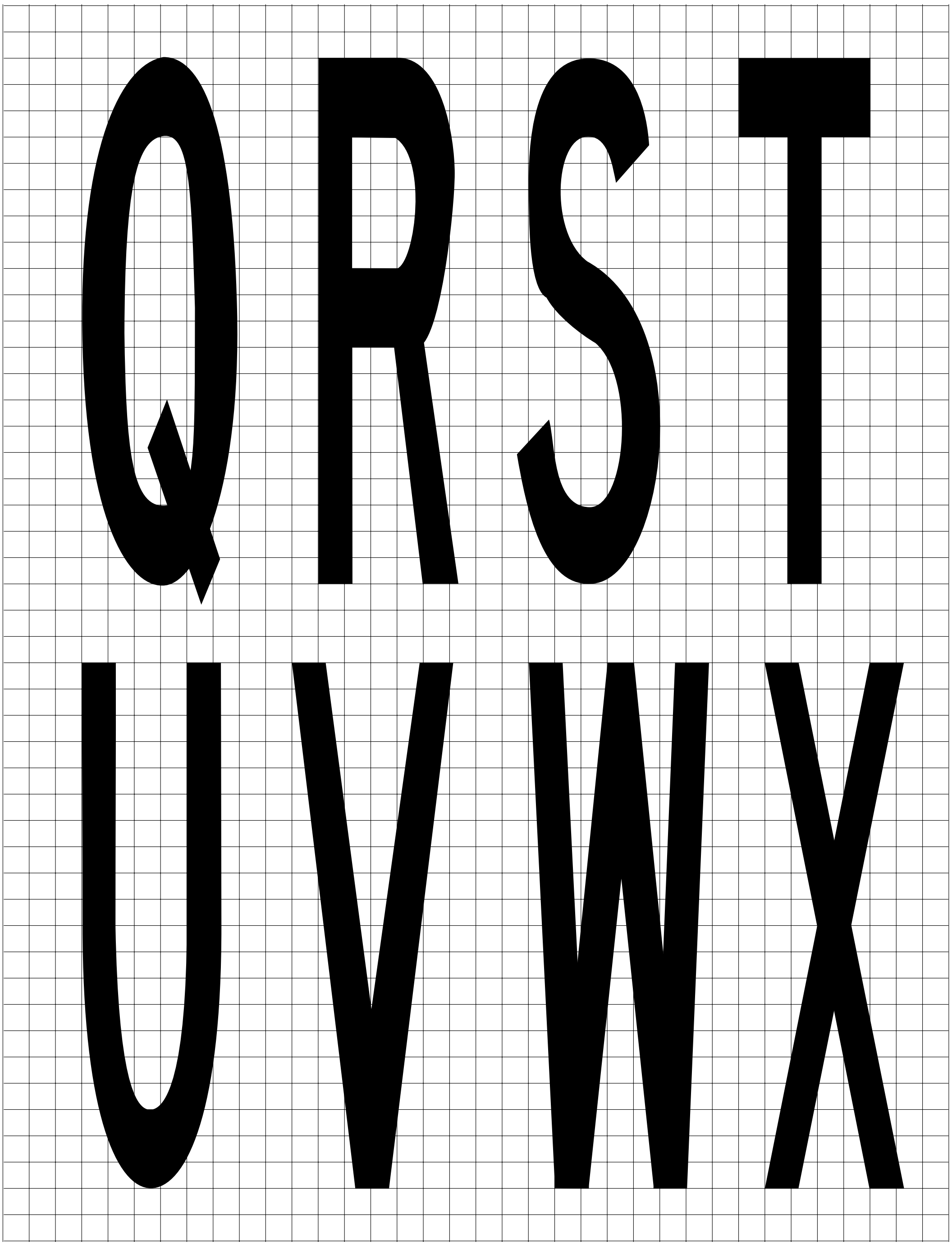
APPENDIX 3. MANDATORY INSTRUCTION MARKINGS AND INFORMATION MARKINGS

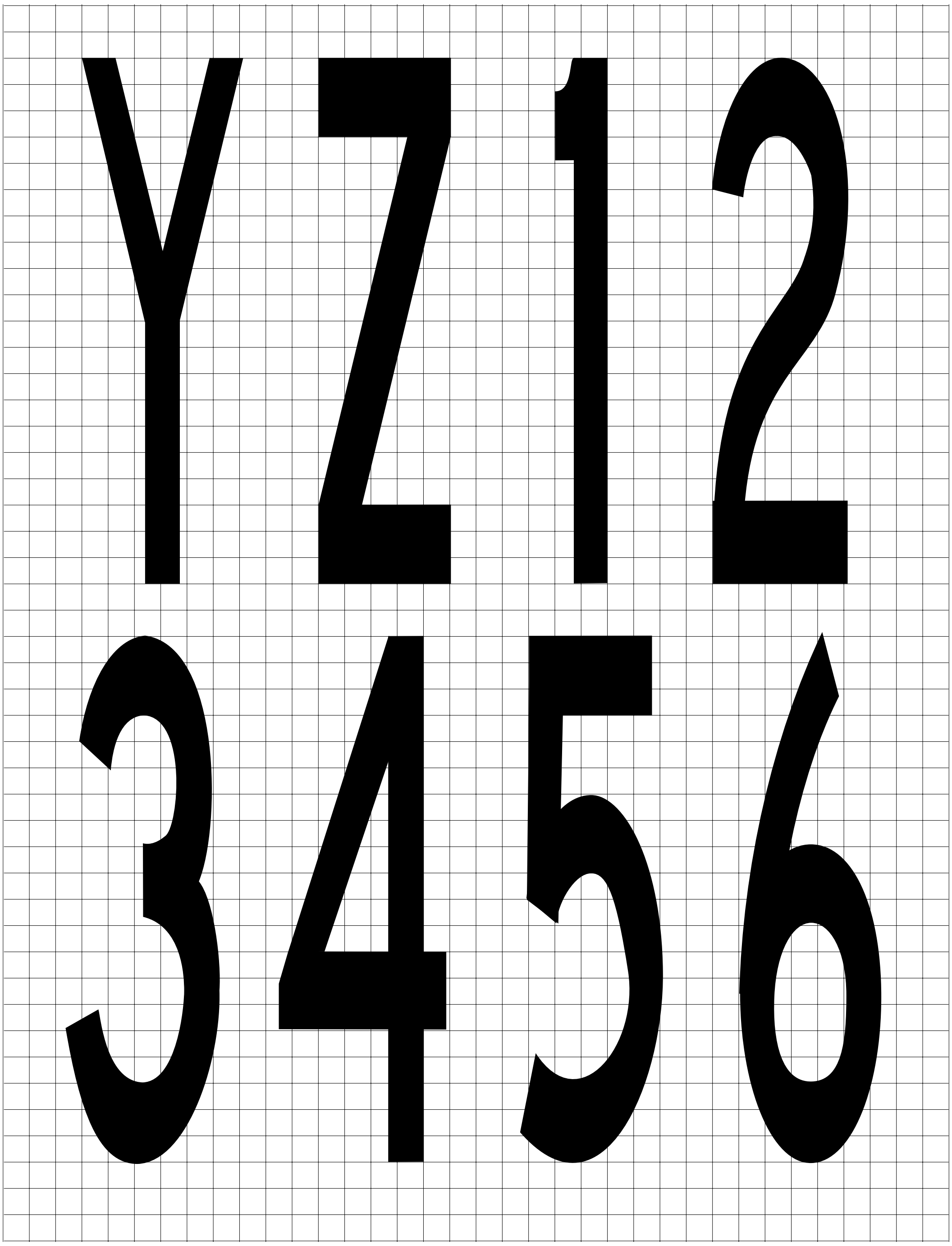
Note 1.— See Chapter 5, Sections 5.2.16 and 5.2.17 for specifications on the application, location and characteristics of mandatory instruction markings and information markings.

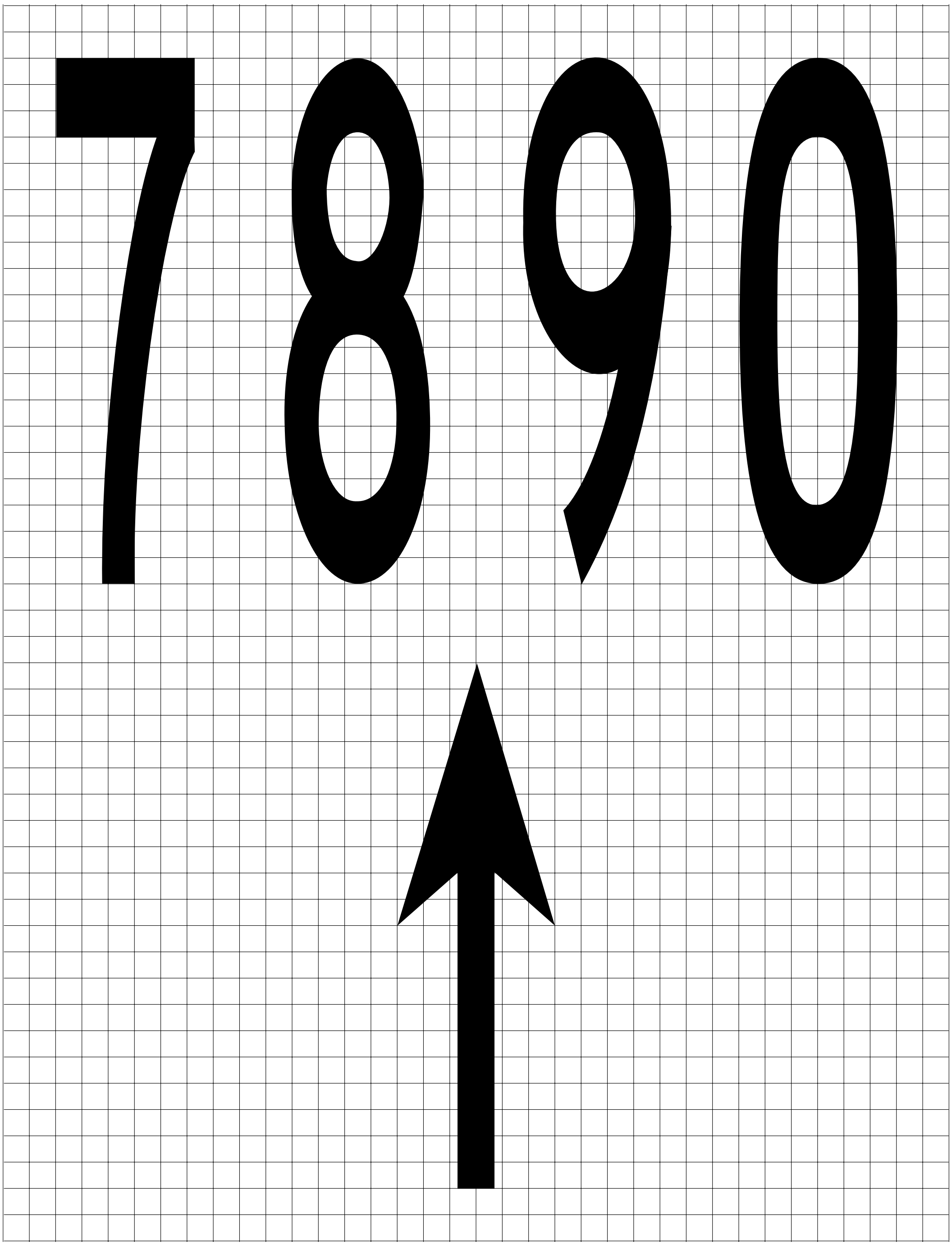
Note 2.— This appendix details the form and proportions of the letters, numbers and symbols of mandatory instruction markings and information markings on a 20 cm grid.


A B C D
E F G H


I J K L
M N O P


Q R S T
U V W X


Y Z 1 2
3 4 5 6


7890

APPENDIX 4. REQUIREMENTS CONCERNING DESIGN OF TAXIING GUIDANCE SIGNS

Note.— See Chapter 5, Section 5.4 for specifications on the application, location and characteristics of signs.

1. Inscription heights shall conform to the following tabulation.

Runway code number	Minimum character height		
	Mandatory instruction sign	Information sign	
		Runway exit and runway vacated signs	Other signs
1 or 2	300 mm	300 mm	200 mm
3 or 4	400 mm	400 mm	300 mm

Note.— Where a taxiway location sign is installed in conjunction with a runway designation sign (see 5.4.3.22), the character size shall be that specified for mandatory instruction signs.

2. Arrow dimensions shall be as follows:

Legend height	*Stroke*
200 mm	32 mm
300 mm	48 mm
400 mm	64 mm

3. Stroke width for single letter shall be as follows:

Legend height	*Stroke*
200 mm	32 mm
300 mm	48 mm
400 mm	64 mm

4. Sign luminance shall be as follows:

a) Where operations are conducted in runway visual range conditions less than a value of 800 m, average sign luminance shall be at least:

Red	30 cd/m^2
Yellow	150 cd/m^2
White	300 cd/m^2

b) Where operations are conducted in accordance with 5.4.1.7 b) and c) and 5.4.1.8, average sign luminance shall be at least:

Red	10 cd/m^2
Yellow	50 cd/m^2
White	100 cd/m^2

Note.— In runway visual range conditions less than a value of 400 m, there will be some degradation in the performance of signs.

5. The luminance ratio between red and white elements of a mandatory sign shall be between 1:5 and 1:10.

6. The average luminance of the sign is calculated by establishing grid points as shown in Figure A4-1 and using the luminance values measured at all grid points located within the rectangle representing the sign.

7. The average value is the arithmetic average of the luminance values measured at all considered grid points.

Note.— Guidance on measuring the average luminance of a sign is contained in the Aerodrome Design Manual, Part 4.

8. The ratio between luminance values of adjacent grid points shall not exceed 1.5:1. For areas on the sign face where the grid spacing is 7.5 cm, the ratio between luminance values of adjacent grid points shall not exceed 1.25:1. The ratio between the maximum and minimum luminance value over the whole sign face shall not exceed 5:1.

9. The forms of characters, i.e. letters, numbers, arrows and symbols, shall conform to those shown in Figure A4-2. The width of characters and the space between individual characters shall be determined as indicated in Table A4-1.

10. The face height of signs shall be as follows:

Legend height	*Face height (min)*
200 mm	400 mm
300 mm	600 mm
400 mm	800 mm

11. The face width of signs shall be determined using Figure A4-3 except that, where a mandatory instruction sign is provided on one side of a taxiway only, the face width shall not be less than:

a) 1.94 m where the code number is 3 or 4; and

b) 1.46 m where the code number is 1 or 2.

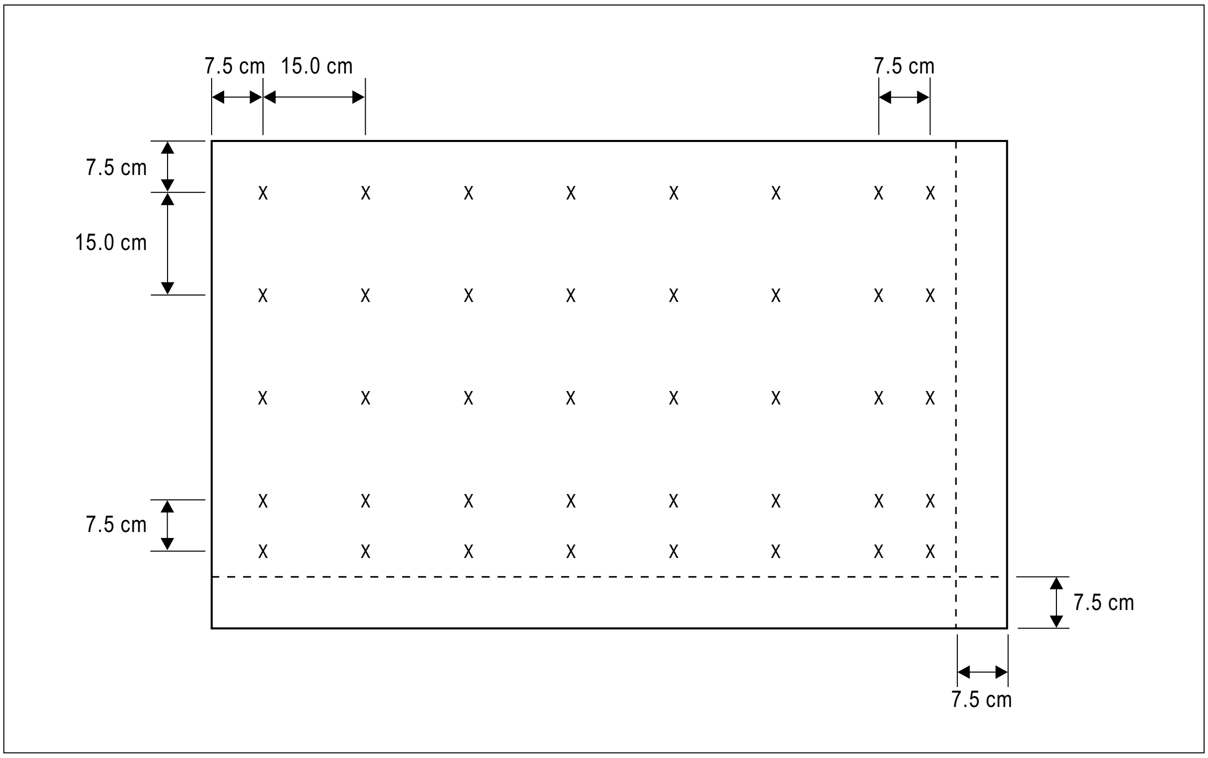
Note.— Additional guidance on determining the face width of a sign is contained in the Aerodrome Design Manual, *Part 4*.

12. Borders

a) The black vertical delineator between adjacent direction signs should have a width of approximately 0.7 of the stroke width.

b) The yellow border on a stand-alone location sign should be approximately 0.5 stroke width.

13. The colours of signs shall be in accordance with the appropriate specifications in Appendix 1.



Note 1.— The average luminance of a sign is calculated by establishing grid points on a sign face showing typical inscriptions and a background of the appropriate colour (red for mandatory instruction signs and yellow for direction and destination signs) as follows:

a) Starting at the top left corner of the sign face, establish a reference grid point at 7.5 cm from the left edge and the top of the sign face.

b) Create a grid of 15 cm spacing horizontally and vertically from the reference grid point. Grid points within 7.5 cm of the edge of the sign face shall be excluded.

c) Where the last point in a row/column of grid points is located between 22.5 cm and 15 cm from the edge of the sign face (but not inclusive), an additional point shall be added 7.5 cm from this point.

d) Where a grid point falls on the boundary of a character and the background, the grid point shall be slightly shifted to be completely outside the character.

Note 2.— Additional grid points may be required to ensure that each character includes at least five evenly spaced grid points.

Note 3.— Where one unit includes two types of signs, a separate grid shall be established for each type.

Figure A4-1. Grid points for calculating average luminance of a sign

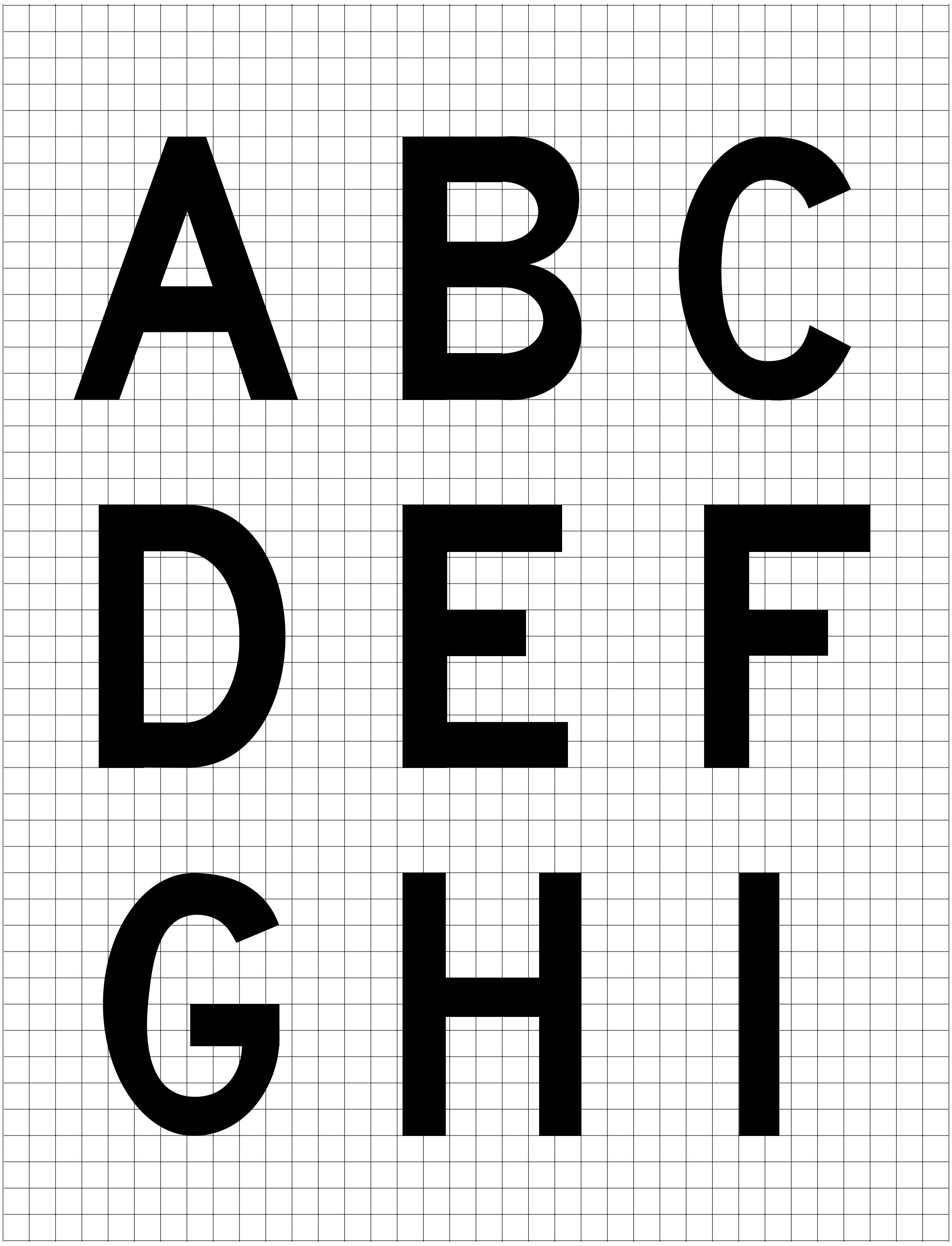


Figure A4-2. Forms of characters

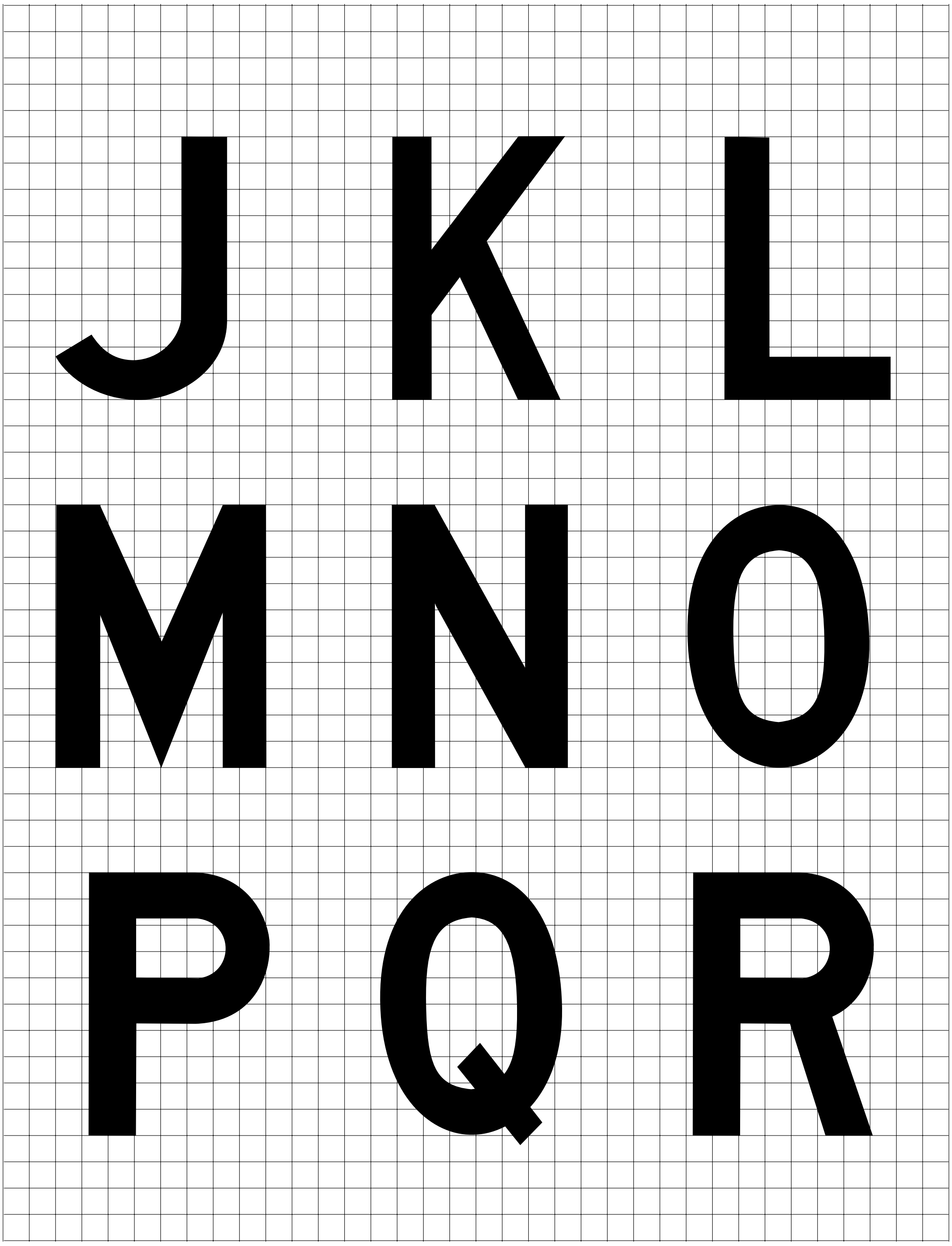


Figure A4-2. (cont.)

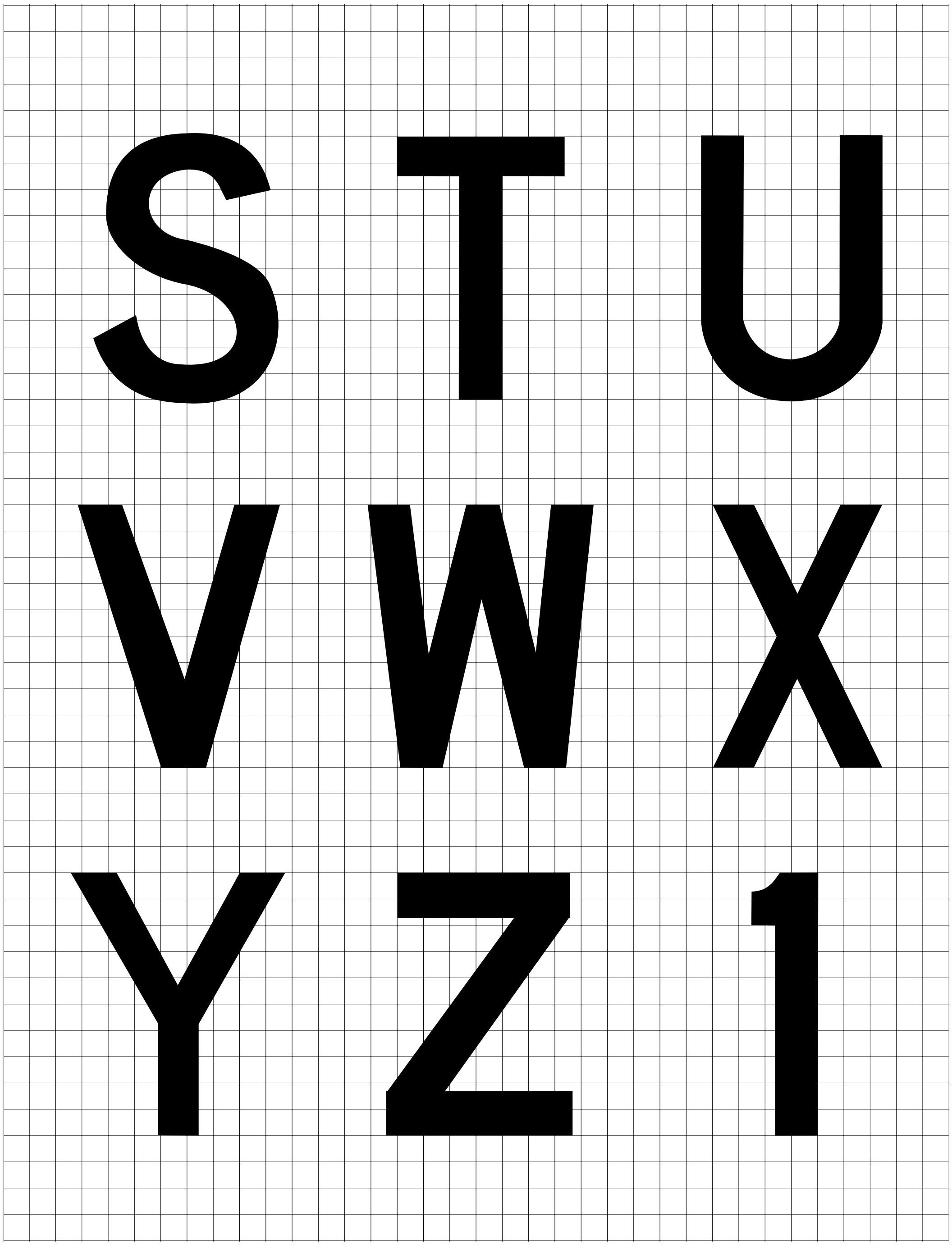


Figure A4-2. (cont.)

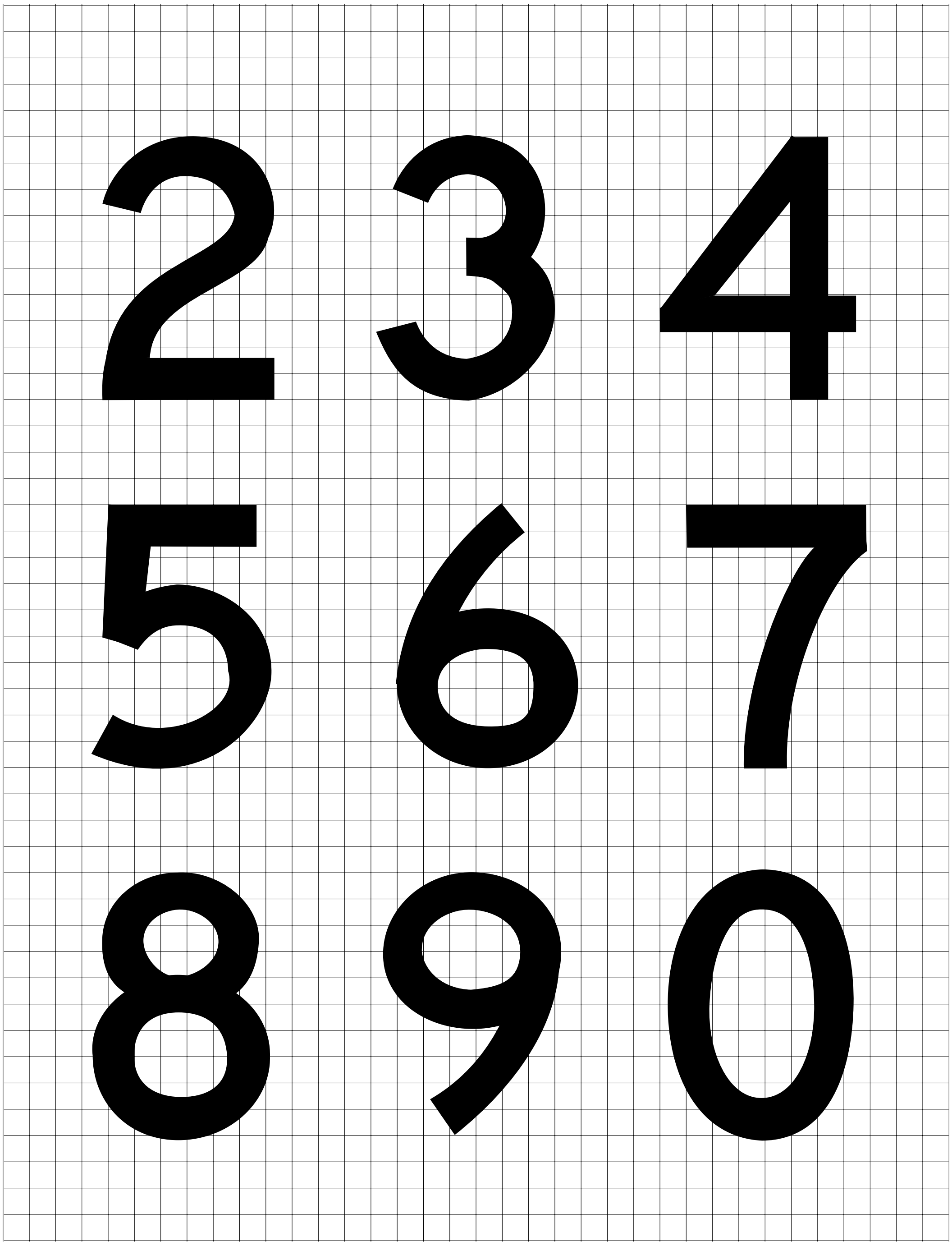


Figure A4-2. (cont.)

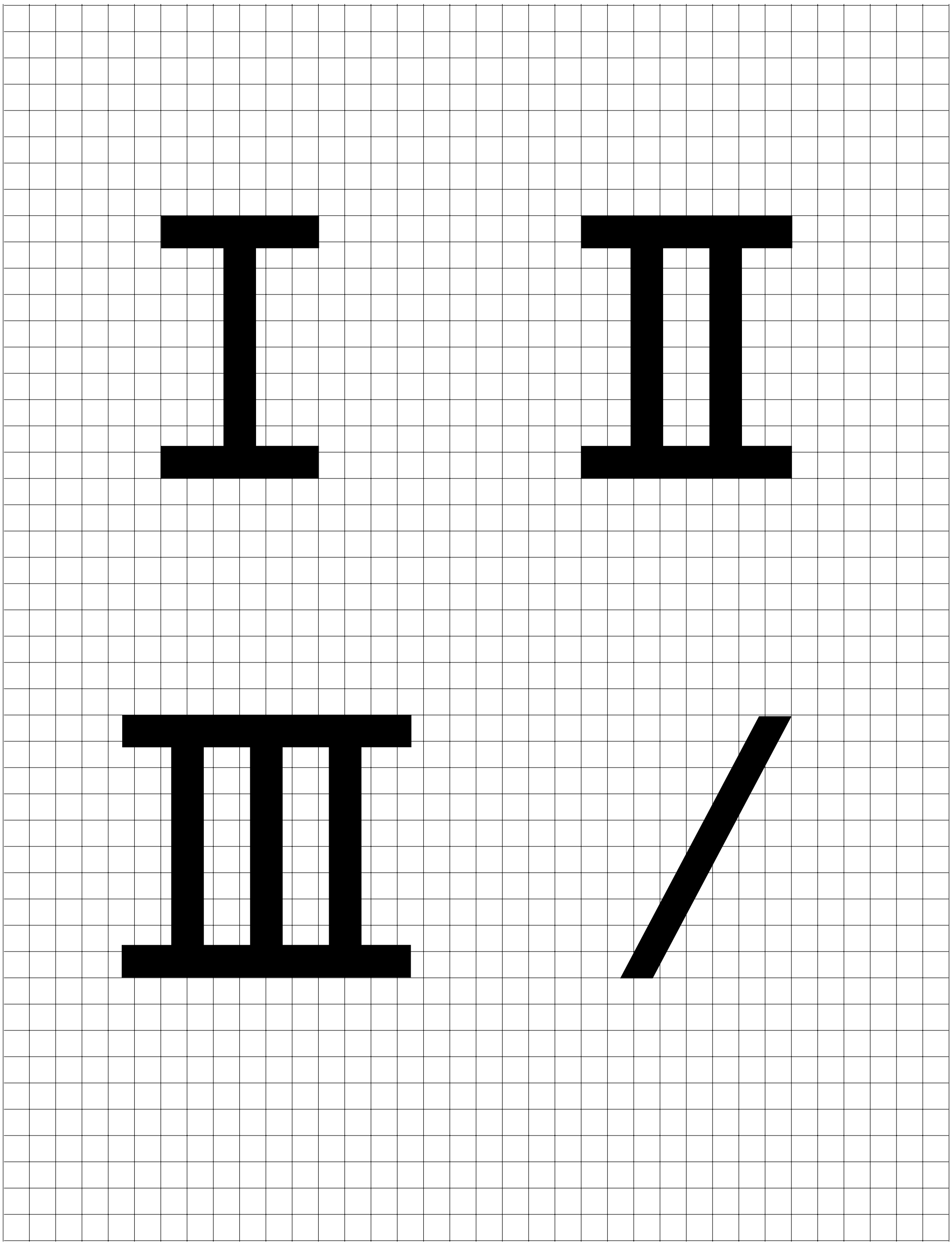
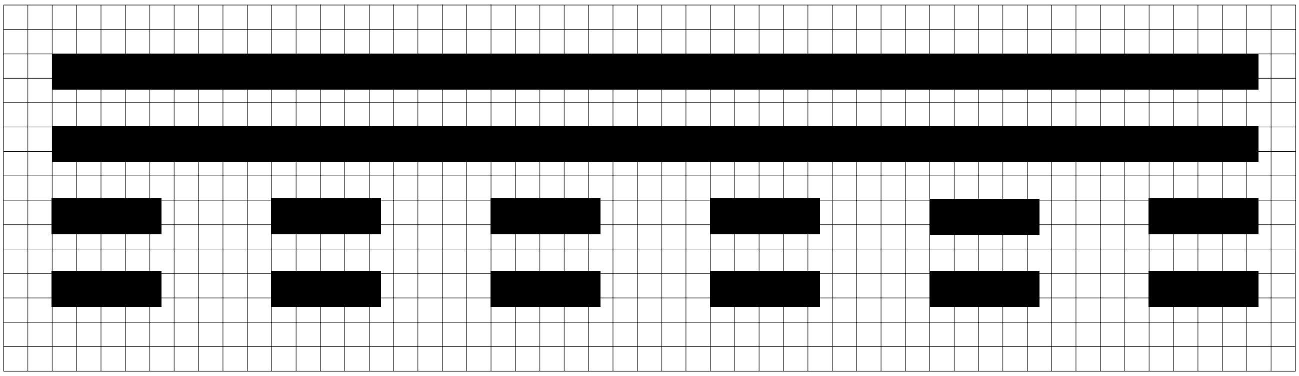
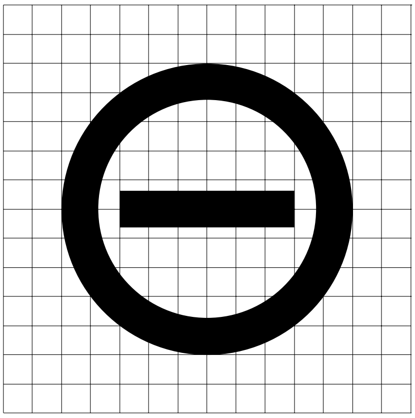


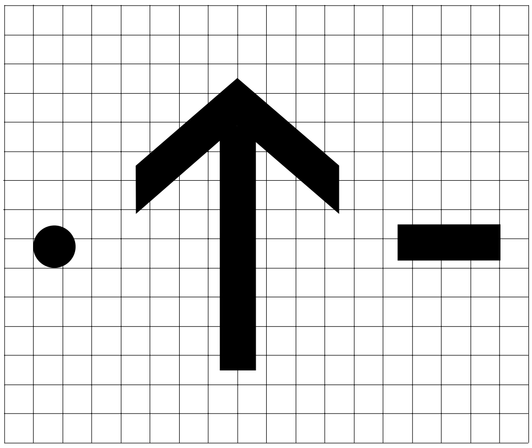
Figure A4-2. (cont.)



Runway vacated sign



NO ENTRY sign



Arrow, dot and dash

Note 1.— The arrow stroke width, diameter of the dot, and both width and length of the dash shall be proportioned to the character stroke widths.

Note 2.— The dimensions of the arrow shall remain constant for a particular sign size, regardless of orientation.

Figure A4-2. (cont.)

Table A4-1. Letter and numeral widths and space between letters or numerals

a) Letter to letter code number

Preceding Letter	Following Letter: B, D, E, F, H, I, K, L, M, N, P, R, U	C, G, O, Q, S, X, Z	A, J, T, V, W, Y
	Code number		
A	2	2	4
B	1	2	2
C	2	2	3
D	1	2	2
E	2	2	3
F	2	2	3
G	1	2	2
H	1	1	2
I	1	1	2
J	1	1	2
K	2	2	3
L	2	2	4
M	1	1	2
N	1	1	2
O	1	2	2
P	1	2	2
Q	1	2	2
R	1	2	2
S	1	2	2
T	2	2	4
U	1	1	2
V	2	2	4
W	2	2	4
X	2	2	3
Y	2	2	4
Z	2	2	3

b) Numeral to numeral code number

Preceding Numeral	Following number: 1, 5	2, 3, 6, 8, 9, 0	4, 7
	Code number		
1	1	1	2
2	1	2	2
3	1	2	2
4	2	2	4
5	1	2	2
6	1	2	2
7	2	2	4
8	1	2	2
9	1	2	2
0	1	2	2

c) Space between characters

Code No.	Letter Height (mm) 200	300	400
	Space (mm)		
1	48	71	96
2	38	57	76
3	25	38	50
4	13	19	26

d) Width of letter

Letter	Letter height (mm) 200	300	400
	Width (mm)		
A	170	255	340
B	137	205	274
C	137	205	274
D	137	205	274
E	124	186	248
F	124	186	248
G	137	205	274
H	137	205	274
I	32	48	64
J	127	190	254
K	140	210	280
L	124	186	248
M	157	236	314
N	137	205	274
O	143	214	286
P	137	205	274
Q	143	214	286
R	137	205	274
S	137	205	274
T	124	186	248
U	137	205	274
V	152	229	304
W	178	267	356
X	137	205	274
Y	171	257	342
Z	137	205	274

e) Width of numeral

Letter	Numeral height (mm) 200	300	400
	Width (mm)		
1	50	74	98
2	137	205	274
3	137	205	274
4	149	224	298
5	137	205	274
6	137	205	274
7	137	205	274
8	137	205	274
9	137	205	274
0	143	214	286

INSTRUCTIONS

1. To determine the proper SPACE between letters or numerals, obtain the code number from table a or b and enter table c for that code number to the desired letter or numeral height.
2. The space between words or groups of characters forming an abbreviation or symbol should be equal to 0.5 to 0.75 of the height of the characters used except that where an arrow is located with a single character such as ‘A →‘, the space may be reduced to not less than one quarter of the height of the character in order to provide a good visual balance.
3. Where the numeral follows a letter or vice versa use Code 1.
4. Where a hyphen, dot, or diagonal stroke follows a character or vice versa use Code 1.

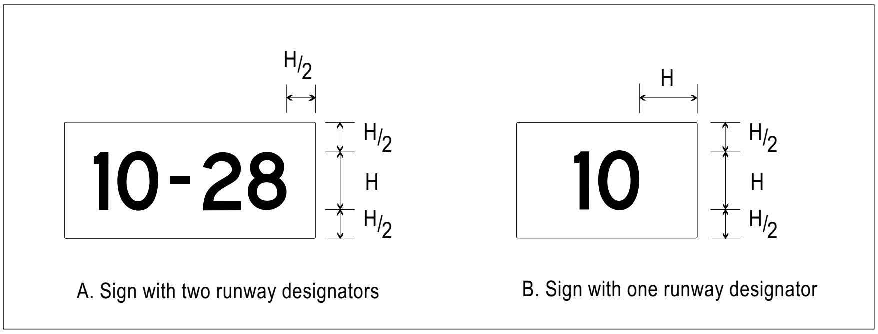


Figure A4-3. Sign dimensions

APPENDIX 5. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A5-1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Aerodrome reference point	30 m surveyed/calculated	1×10^{-3} routine
Navaids located at the aerodrome	3 m surveyed	1×10^{-5} essential
Obstacles in Area 3	0.5 m surveyed	1×10^{-5} essential
Obstacles in Area 2 (the part within the aerodrome boundary)	5 m surveyed	1×10^{-5} essential
Runway thresholds	1 m surveyed	1×10^{-8} critical
Runway end (flight path alignment point)	1 m surveyed	1×10^{-8} critical
Runway centre line points	1 m surveyed	1×10^{-8} critical
Runway holding position	0.5 m surveyed	1×10^{-8} critical
Taxiway centre line/parking guidance line points	0.5 m surveyed	1×10^{-5} essential
Taxiway intersection marking line	0.5 m surveyed	1×10^{-5} essential
Exit guidance line	0.5 m surveyed	1×10^{-5} essential
Apron boundaries (polygon)	1 m surveyed	1×10^{-3} routine
De-icing/anti-icing facility (polygon)	1 m surveyed	1×10^{-3} routine
Aircraft stand points/INS checkpoints	0.5 m surveyed	1×10^{-3} routine

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— Implementation of Annex 15 provision 10.6.1.2 concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

Table A5-2. Elevation/altitude/height

Elevatioln/altitude/height	Accuracy Data type	Integrity Classification
Aerodrome elevation	0.5 m surveyed	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome elevation position	0.5 m surveyed	1×10^{-5} essential
Runway threshold, non-precision approaches	0.5 m surveyed	1×10^{-5} essential
WGS-84 geoid undulation at runway threshold, non-precision approaches	0.5 m surveyed	1×10^{-5} essential
Runway threshold, precision approaches	0.25 m surveyed	1×10^{-8} critical
WGS-84 geoid undulation at runway threshold, precision approaches	0.25 m surveyed	1×10^{-8} critical
Runway centre line points.	0.25 m surveyed	1×10^{-8} critical
Taxiway centre line/parking guidance line points	1 m surveyed	1×10^{-5} essential
Obstacles in Area 2 (the part within the aerodrome boundary)	3 m surveyed	1×10^{-5} essential
Obstacles in Area 3	0.5 m surveyed	1×10^{-5} essential
Distance measuring equipment/precision (DME/P)	3 m surveyed	1×10^{-5} essential

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— Implementation of Annex 15 provision 10.6.1.2 concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

Table A5-3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Integrity Classification
Aerodrome magnetic variation	1 degree surveyed	1×10^{-5} essential
ILS localizer antenna magnetic variation	1 degree surveyed	1×10^{-5} essential
MLS azimuth antenna magnetic variation	1 degree surveyed	1×10^{-5} essential

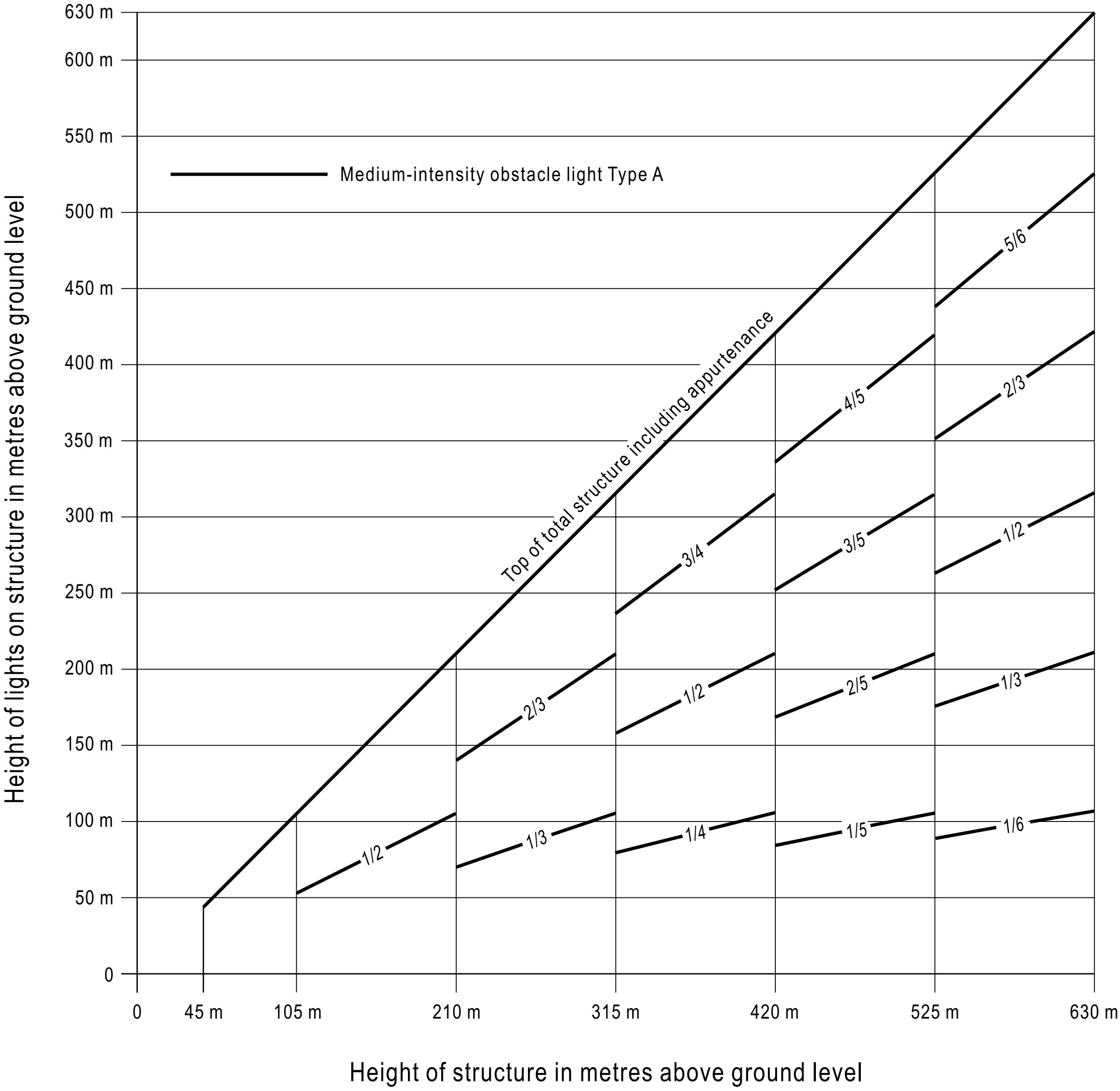
Table A5-4. Bearing

Bearing	Accuracy Data type	Integrity Classification
ILS localizer alignment	1/100 degree surveyed	1×10^{-5} essential
MLS zero azimuth alignment	1/100 degree surveyed	1×10^{-5} essential
Runway bearing (True)	1/100 degree surveyed	1×10^{-3} routine

Table A5-5. Length/Distance/Dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
Runway length	1 m surveyed	1×10^{-8} critical
Runway width	1 m surveyed	1×10^{-5} essential
Displaced threshold distance	1 m surveyed	1×10^{-3} routine
Stopway length and width	1 m surveyed	1×10^{-8} critical
Clearway length and width	1 m surveyed	1×10^{-5} essential
Landing distance available	1 m surveyed	1×10^{-8} critical
Take-off run available	1 m surveyed	1×10^{-8} critical
Take-off distance available	1 m surveyed	1×10^{-8} critical
Accelerate-stop distance available	1 m surveyed	1×10^{-8} critical
Runway shoulder width	1 m surveyed	1×10^{-5} essential
Taxiway width	1 m surveyed	1×10^{-5} essential
Taxiway shoulder width	1 m surveyed	1×10^{-5} essential
ILS localizer antenna-runway end, distance	3 m calculated	1×10^{-3} routine
ILS glide slope antenna-threshold, distance along centre line	3 m calculated	1×10^{-3} routine
ILS marker-threshold distance	3 m calculated	1×10^{-5} essential
ILS DME antenna-threshold, distance along centre line	3 m calculated	1×10^{-5} essential
MLS azimuth antenna-runway end, distance	3 m calculated	1×10^{-3} routine
MLS elevation antenna-threshold, distance along centre line	3 m calculated	1×10^{-3} routine
MLS DME/P antenna-threshold, distance along centre line	3 m calculated	1×10^{-5} essential

APPENDIX 6. LOCATION OF LIGHTS ON OBSTACLES



Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure A6-1. Medium-intensity flashing-white obstacle lighting system, Type A

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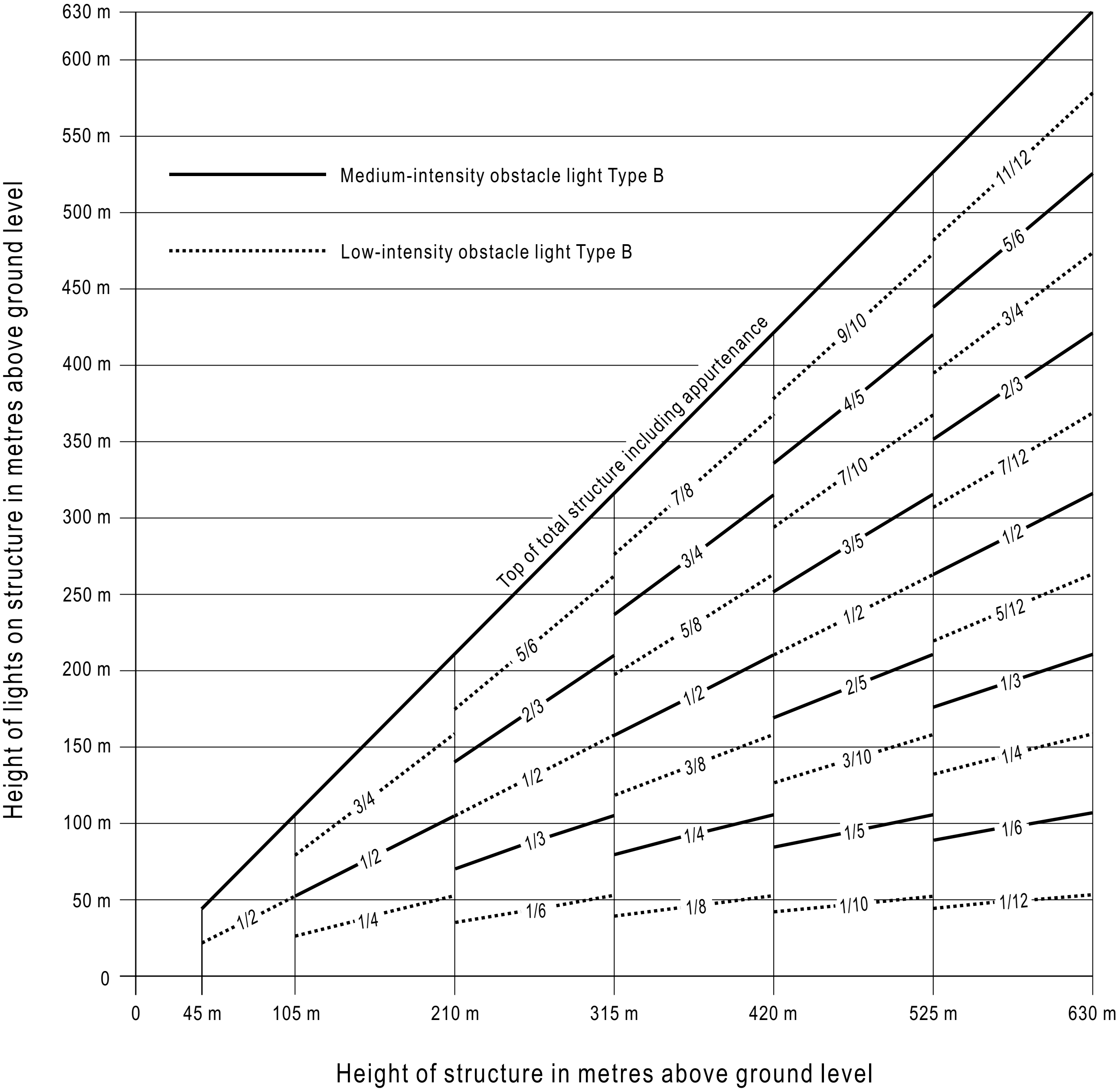
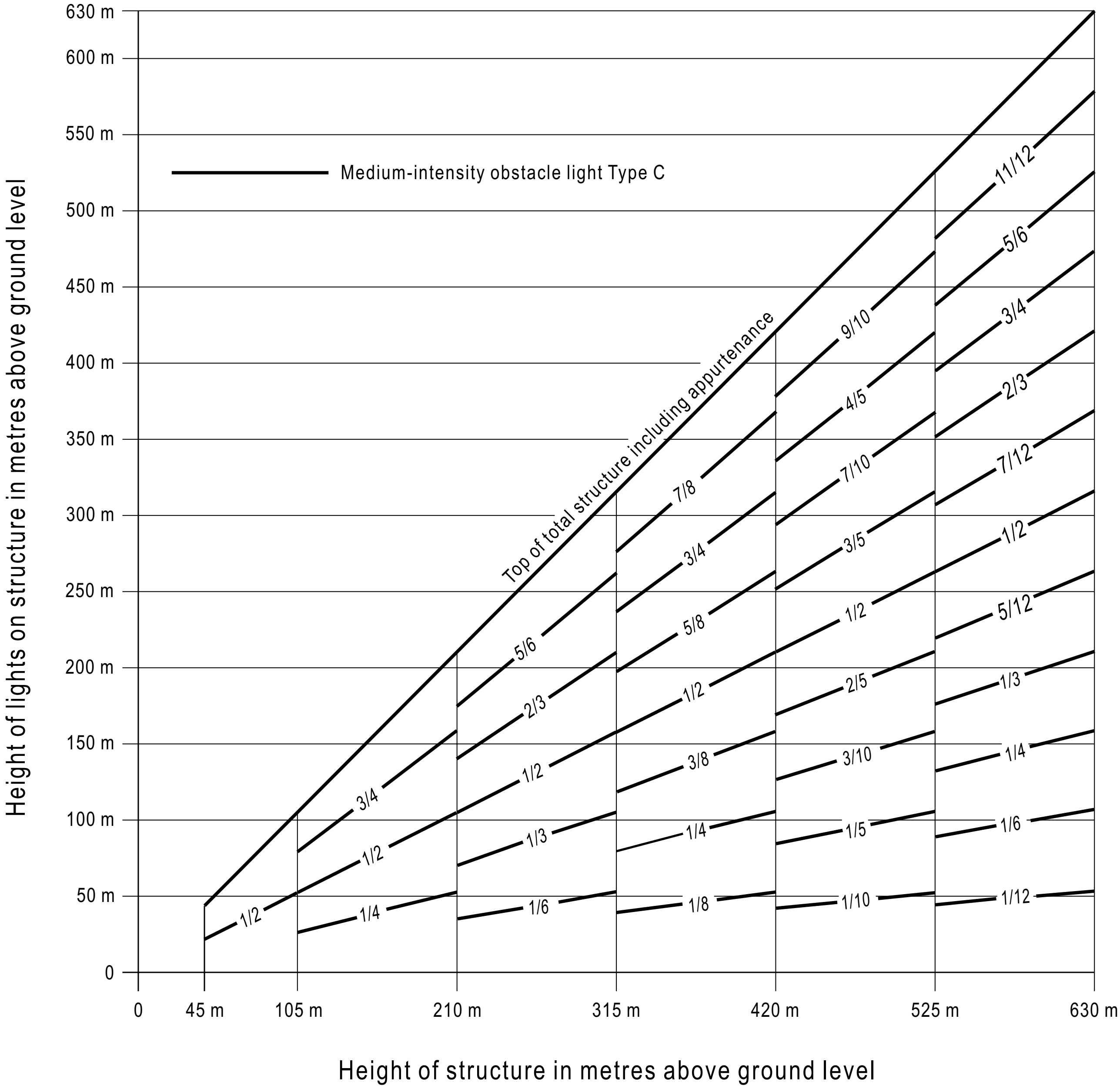


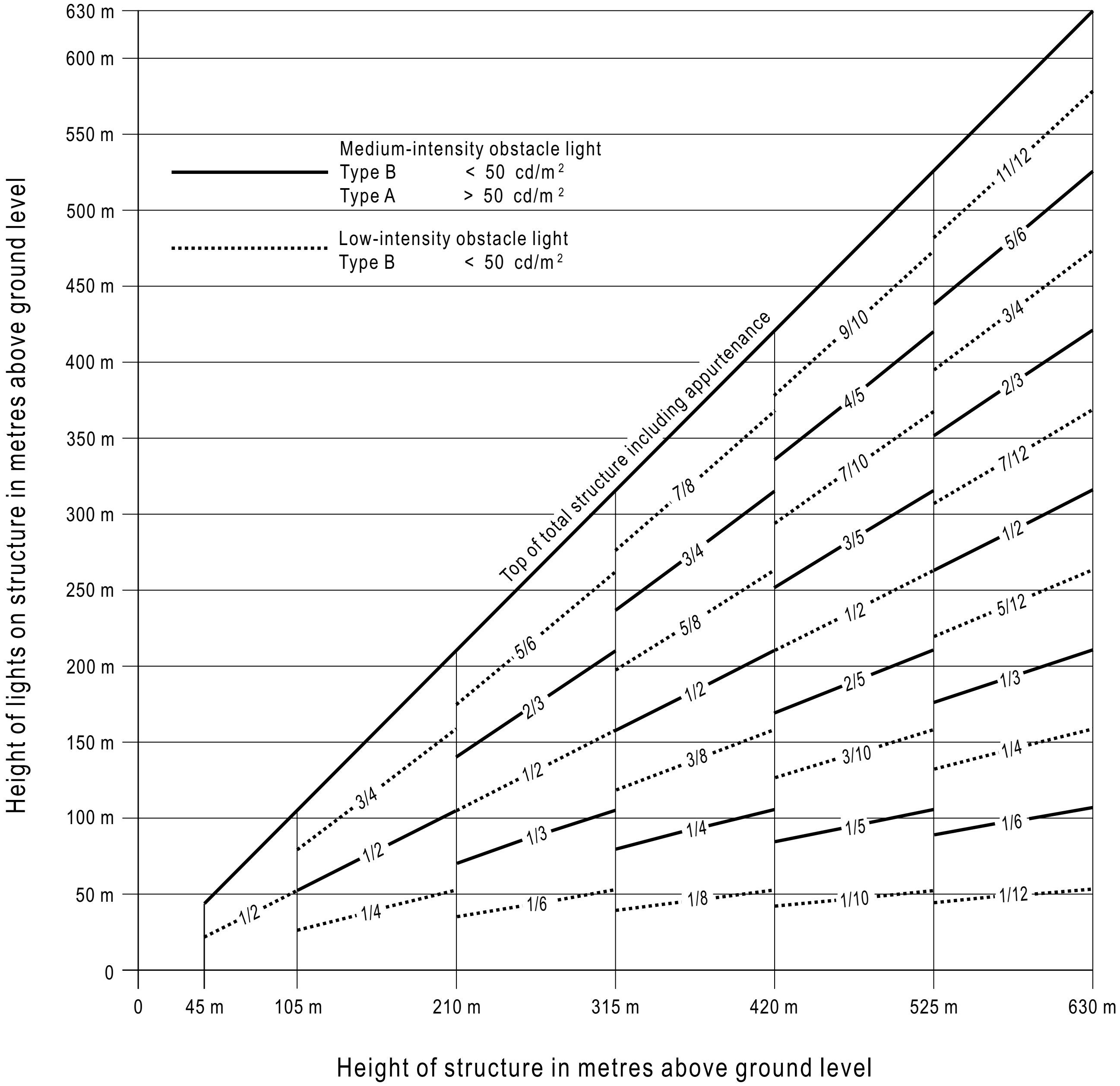
Note.— For night-time use only.

Figure A6-2. Medium-intensity flashing-red obstacle lighting system, Type B



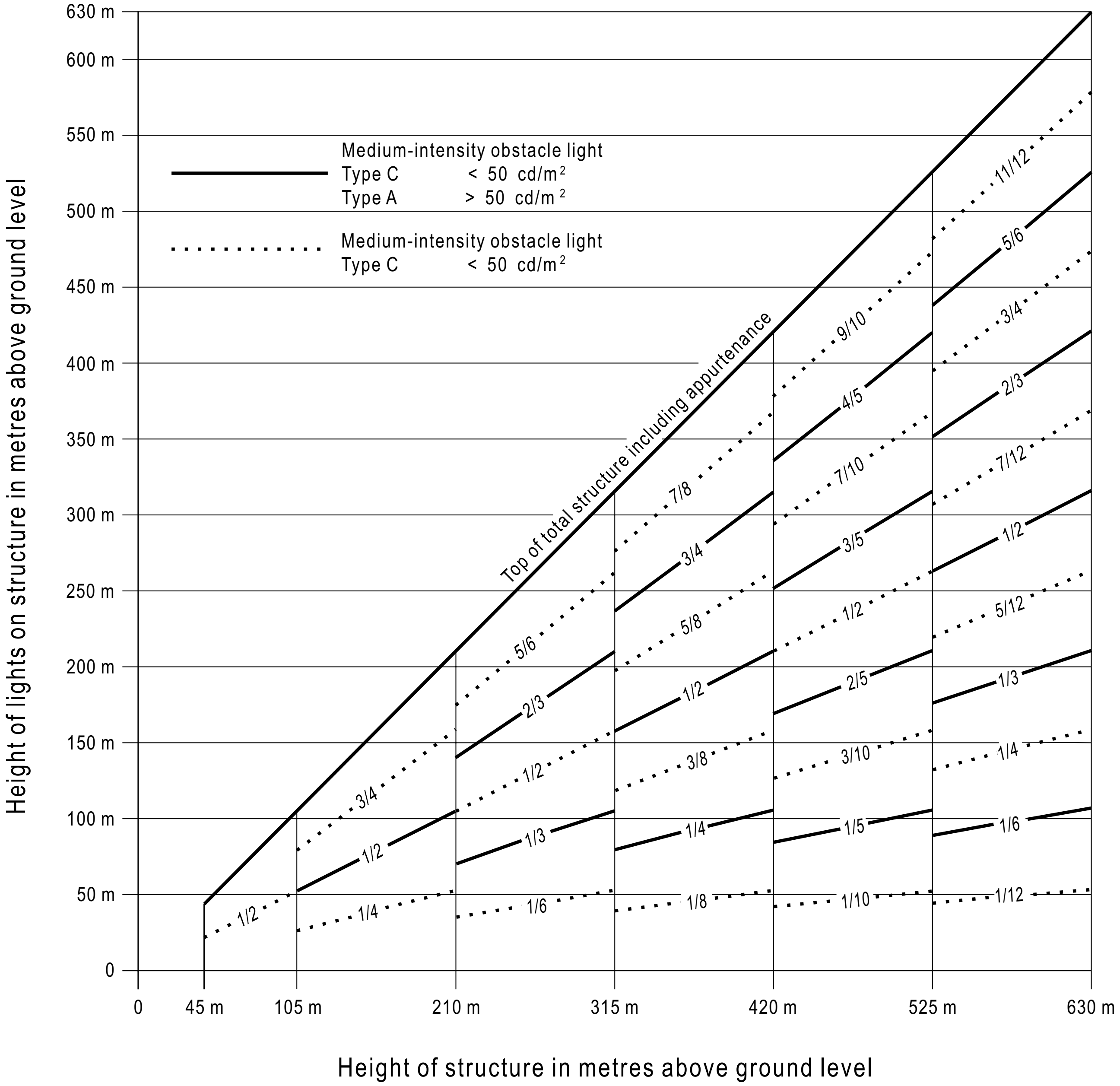
Note.— For night-time use only.

Figure A6-3. Medium-intensity fixed-red obstacle lighting system, Type C



Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure A6-4. Medium-intensity dual obstacle lighting system, Type A/Type B



Note.— High-intensity obstacle lighting is recommended on structures with a height of more than 150 m above ground level. If medium-intensity lighting is used, marking will also be required.

Figure A6-5. Medium-intensity dual obstacle lighting system, Type A/Type C

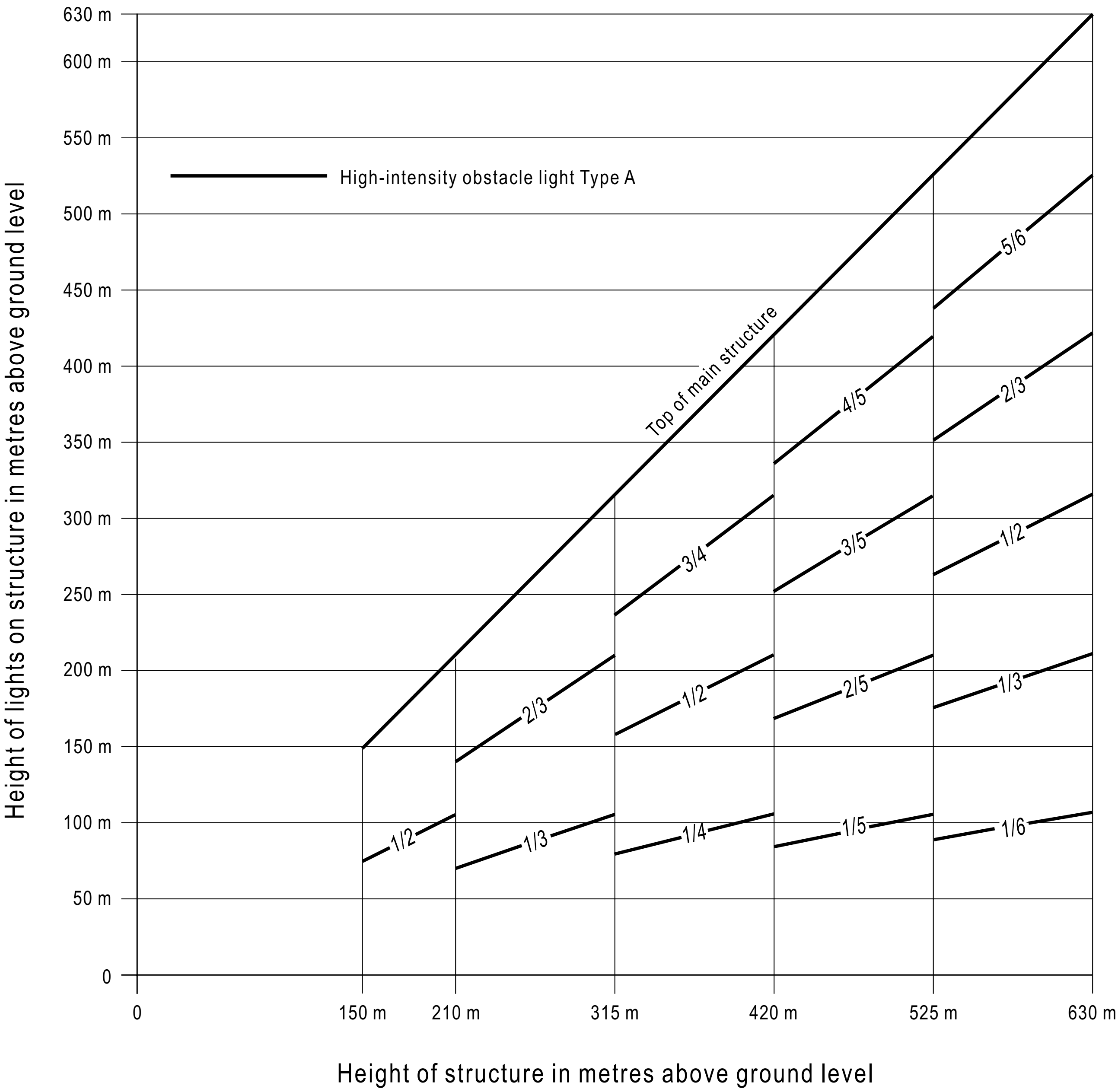


Figure A6-6. High-intensity flashing-white obstacle lighting system, Type A

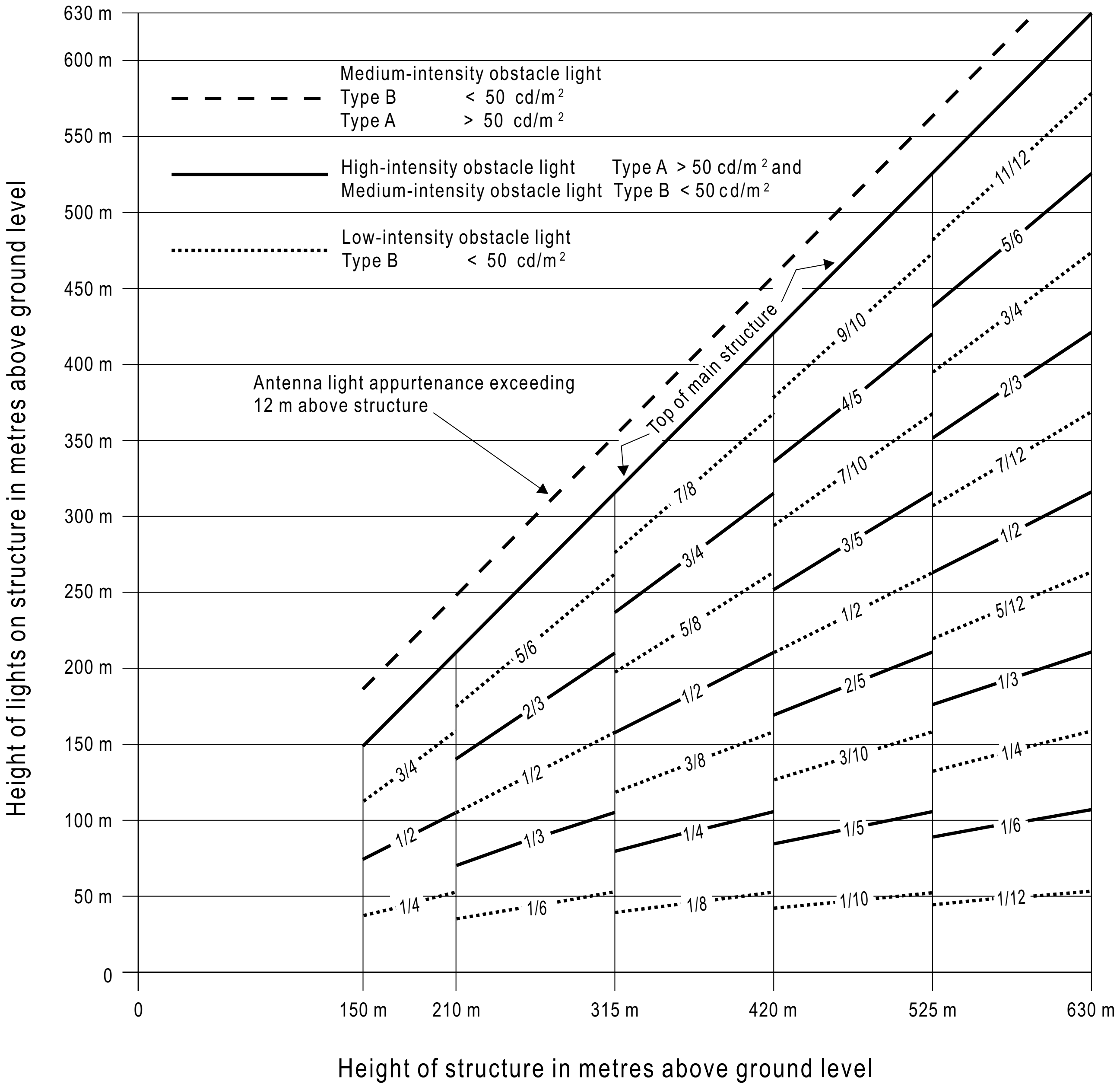


Figure A6-7. High-/medium-intensity dual obstacle lighting system, Type A/Type B

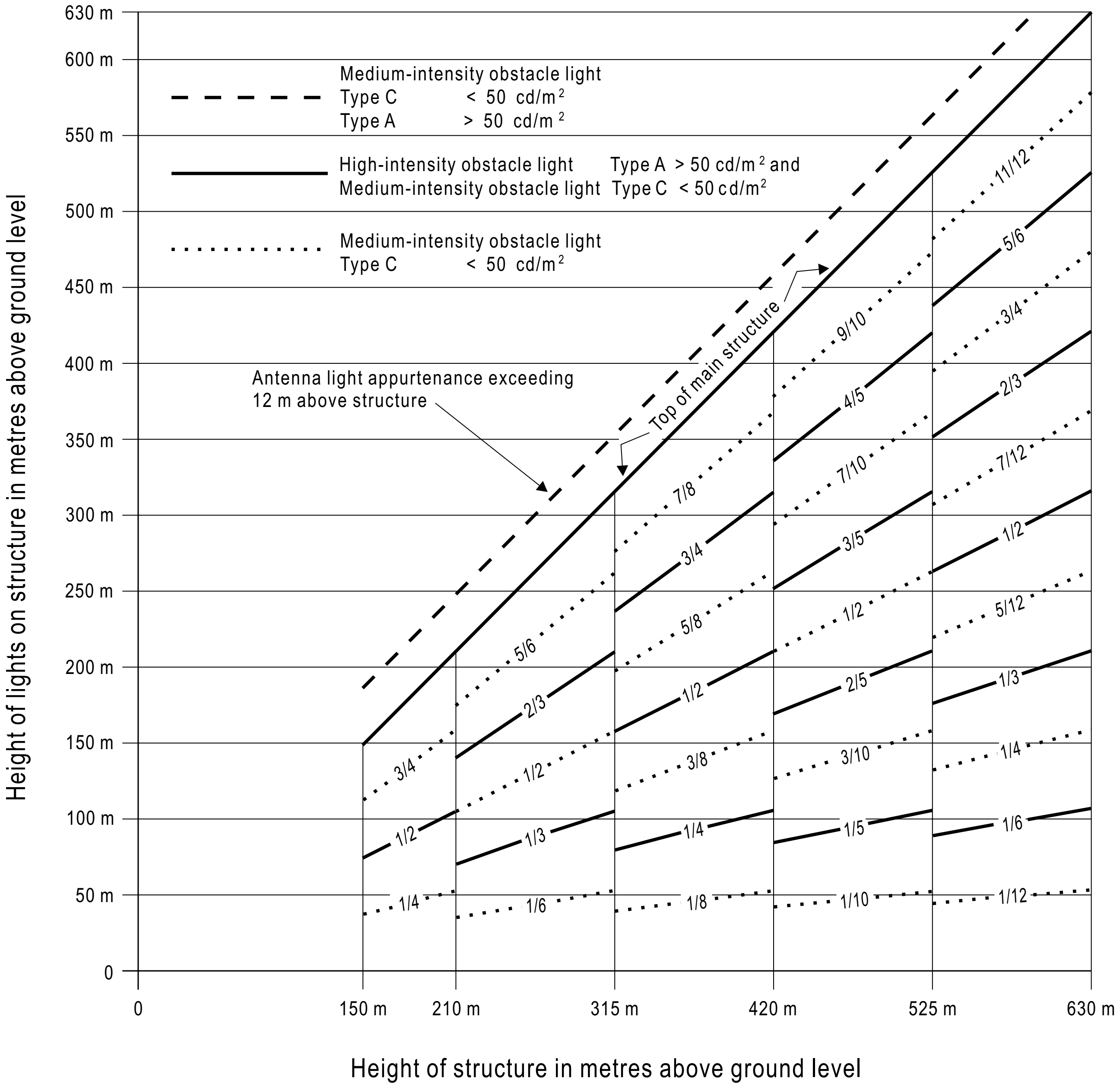


Figure A6-8. High-/medium-intensity dual obstacle lighting system, Type A/Type C

ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I

1. Number, siting and orientation of runways

Siting and orientation of runways

1.1 Many factors should be taken into account in the determination of the siting and orientation of runways. Without attempting to provide an exhaustive list of these factors nor an analysis of their effects, it appears useful to indicate those which most frequently require study. These factors may be classified under four headings:

1.1.1 *Type of operation.* Attention should be paid in particular to whether the aerodrome is to be used in all meteorological conditions or only in visual meteorological conditions, and whether it is intended for use by day and night, or only by day.

1.1.2 *Climatological conditions.* A study of the wind distribution should be made to determine the usability factor. In this regard, the following comments should be taken into account:

a) Wind statistics used for the calculation of the usability factor are normally available in ranges of speed and direction, and the accuracy of the results obtained depends, to a large extent, on the assumed distribution of observations within these ranges. In the absence of any sure information as to the true distribution, it is usual to assume a uniform distribution since, in relation to the most favourable runway orientations, this generally results in a slightly conservative for the usability factor.

b) The maximum mean cross-wind components given in Chapter 3, 3.1.3 refer to normal circumstances. There are some factors which may require that a reduction of those maximum values be taken into account at a particular aerodrome. These include:

   1) the wide variations which may exist, in handling characteristics and maximum permissible cross-wind components, among diverse types of aeroplanes (including future types) within each of the three groups given in 3.1.3;

   2) prevalence and nature of gusts;

   3) prevalence and nature of turbulence;

   4) the availability of a secondary runway;

   5) the width of runways;

   6) the runway surface conditions — water, snow and ice on the runway materially reduce the allowable cross-wind component; and

   7) the strength of the wind associated with the limiting cross-wind component.

A study should also be made of the occurrence of poor visibility and/or low cloud base. Account should be taken of their frequency as well as the accompanying wind direction and speed.

1.1.3 *Topography of the aerodrome site, its approaches, and surroundings,* particularly:

a) compliance with the obstacle limitation surfaces;
b) current and future land use. The orientation and layout should be selected so as to protect as far as possible the particularly sensitive areas such as residential, school and hospital zones from the discomfort caused by aircraft noise. Detailed information on this topic is provided in the *Airport Planning Manual*, Part 2, and in *Guidance on the Balanced Approach to Aircraft Noise Management* (Doc 9829);
c) current and future runway lengths to be provided;
d) construction costs; and
e) possibility of installing suitable non-visual and visual aids for approach-to-land.

1.1.4 *Air traffic in the vicinity of the aerodrome,* particularly:

a) proximity of other aerodromes or ATS routes;
b) traffic density; and
c) air traffic control and missed approach procedures.

Number of runways in each direction

1.2 The number of runways to be provided in each direction depends on the number of aircraft movements to be catered to.

2. Clearways and stopways

2.1 The decision to provide a stopway and/or a clearway as an alternative to an increased length of runway will depend on the physical characteristics of the area beyond the runway end, and on the operating performance requirements of the prospective aeroplanes. The runway, stopway and clearway lengths to be provided are determined by the aeroplane take-off performance, but a check should also be made of the landing distance required by the aeroplanes using the runway to ensure that adequate runway length is provided for landing. The length of a clearway, however, cannot exceed half the length of take-off run available.

2.2 The aeroplane performance operating limitations require a length which is enough to ensure that the aeroplane can, after starting a take-off, either be brought safely to a stop or complete the take-off safely. For the purpose of discussion it is supposed that the runway, stopway and clearway lengths provided at the aerodrome are only just adequate for the aeroplane requiring the longest take-off and accelerate-stop distances, taking into account its take-off mass, runway characteristics and ambient atmospheric conditions. Under these circumstances there is, for each take-off, a speed, called the decision speed; below this speed, the take-off must be abandoned if an engine fails, while above it the take-off must be completed. A very long take-off run and take-off distance would be required to complete a take-off when an engine fails before the decision speed is reached, because of the insufficient speed and the reduced power available. There would be no difficulty in stopping in the remaining accelerate-stop distance available provided action is taken immediately. In these circumstances the correct course of action would be to abandon the take-off.

2.3 On the other hand, if an engine fails after the decision speed is reached, the aeroplane will have sufficient speed and power available to complete the take-off safely in the remaining take-off distance available. However, because of the high speed, there would be difficulty in stopping the aeroplane in the remaining accelerate-stop distance available.

2.4 The decision speed is not a fixed speed for any aeroplane, but can be selected by the pilot within limits to suit the accelerate-stop and take-off distance available, aeroplane take-off mass, runway characteristics, and ambient atmospheric conditions at the aerodrome. Normally, a higher decision speed is selected as the accelerate-stop distance available increases.

2.5 A variety of combinations of accelerate-stop distances required and take-off distances required can be obtained to accommodate a particular aeroplane, taking into account the aeroplane take-off mass, runway characteristics, and ambient atmospheric conditions. Each combination requires its particular length of take-off run.

2.6 The most familiar case is where the decision speed is such that the take-off distance required is equal to the accelerate-stop distance required; this value is known as the balanced field length. Where stopway and clearway are not provided, these distances are both equal to the runway length. However, if landing distance is for the moment ignored, runway is not essential for the whole of the balanced field length, as the take-off run required is, of course, less than the balanced field length. The balanced field length can, therefore, be provided by a runway supplemented by an equal length of clearway and stopway, instead of wholly as a runway. If the runway is used for take-off in both directions, an equal length of clearway and stopway has to be provided at each runway end. The saving in runway length is, therefore, bought at the cost of a greater overall length.

2.7 In case economic considerations preclude the provision of stopway and, as a result, only runway and clearway are to be provided, the runway length (neglecting landing requirements) should be equal to the accelerate-stop distance required or the take-off run required, whichever is the greater. The take-off distance available will be the length of the runway plus the length of clearway.

2.8 The minimum runway length and the maximum stopway or clearway length to be provided may be determined as follows, from the data in the aeroplane flight manual for the aeroplane considered to be critical from the viewpoint of runway length requirements:

a) if a stopway is economically possible, the lengths to be provided are those for the balanced field length. The runway length is the take-off run required or the landing distance required, whichever is the greater. If the accelerate-stop distance required is greater than the runway length so determined, the excess may be provided as stopway, usually at each end of the runway. In addition, a clearway of the same length as the stopway must also be provided;

b) if a stopway is not to be provided, the runway length is the landing distance required, or if it is greater, the accelerate-stop distance required, which corresponds to the lowest practical value of the decision speed. The excess of the take-off distance required over the runway length may be provided as clearway, usually at each end of the runway.

2.9 In addition to the above consideration, the concept of clearways in certain circumstances can be applied to a situation where the take-off distance required for all engines operating exceeds that required for the engine failure case.

2.10 The economy of a stopway can be entirely lost if, after each usage, it must be regraded and compacted. Therefore, it should be designed to withstand at least a certain number of loadings of the aeroplane which the stopway is intended to serve without inducing structural damage to the aeroplane.

3. Calculation of declared distances

3.1 The declared distances to be calculated for each runway direction comprise: the take-off run available (TORA), take-off distance available (TODA), accelerate-stop distance available (ASDA), and landing distance available (LDA).

3.2 Where a runway is not provided with a stopway or clearway and the threshold is located at the extremity of the runway, the four declared distances should normally be equal to the length of the runway, as shown in Figure A-1 (A).

3.3 Where a runway is provided with a clearway (CWY), then the TODA will include the length of clearway, as shown in Figure A-1 (B).

3.4 Where a runway is provided with a stopway (SWY), then the ASDA will include the length of stopway, as shown in Figure A-1 (C).

3.5 Where a runway has a displaced threshold, then the LDA will be reduced by the distance the threshold is displaced, as shown in Figure A-1 (D). A displaced threshold affects only the LDA for approaches made to that threshold; all declared distances for operations in the reciprocal direction are unaffected.

3.6 Figures A-1 (B) through A-1 (D) illustrate a runway provided with a clearway or a stopway or having a displaced threshold. Where more than one of these features exist, then more than one of the declared distances will be modified — but the modification will follow the same principle illustrated. An example showing a situation where all these features exist is shown in Figure A-1 (E).

3.7 A suggested format for providing information on declared distances is given in Figure A-1 (F). If a runway direction cannot be used for take-off or landing, or both, because it is operationally forbidden, then this should be declared and the words “not usable” or the abbreviation “NU” entered.

4. Slopes on a runway

4.1 Distance between slope changes

The following example illustrates how the distance between slope changes is to be determined (see Figure A-2):

D for a runway where the code number is 3 should be at least:

$15\,000\,(|x - y| + |y - z|)$ m
$|x - y|$ being the absolute numerical value of $x - y$
$|y - z|$ being the absolute numerical value of $y - z$

Assuming $x = +0.01$
$y = -0.005$
$z = +0.005$
then $|x - y| = 0.015$
$|y - z| = 0.01$

To comply with the specifications, D should be not less than:

$15\,000\,(0.015 + 0.01)$ m,
that is, $15\,000 \times 0.025 = 375$ m

4.2 Consideration of longitudinal and transverse slopes

When a runway is planned that will combine the extreme values for the slopes and changes in slope permitted under Chapter 3, 3.1.13 to 3.1.19, a study should be made to ensure that the resulting surface profile will not hamper the operation of aeroplanes.

4.3 Radio altimeter operating area

In order to accommodate aeroplanes making auto-coupled approaches and automatic landings (irrespective of weather conditions) it is desirable that slope changes be avoided or kept to a minimum, on a rectangular area at least 300 m long before the threshold of a precision approach runway. The area should be symmetrical about the extended centre line, 120 m wide. When special circumstances so warrant, the width may be reduced to no less than 60 m if an aeronautical study indicates that such reduction would not affect the safety of operations of aircraft. This is desirable because these aeroplanes are equipped with a radio altimeter for final height and flare guidance, and when the aeroplane is above the terrain immediately prior to the threshold, the radio altimeter will begin to provide information to the automatic pilot for auto-flare. Where slope changes cannot be avoided, the rate of change between two consecutive slopes should not exceed 2 per cent per 30 m.

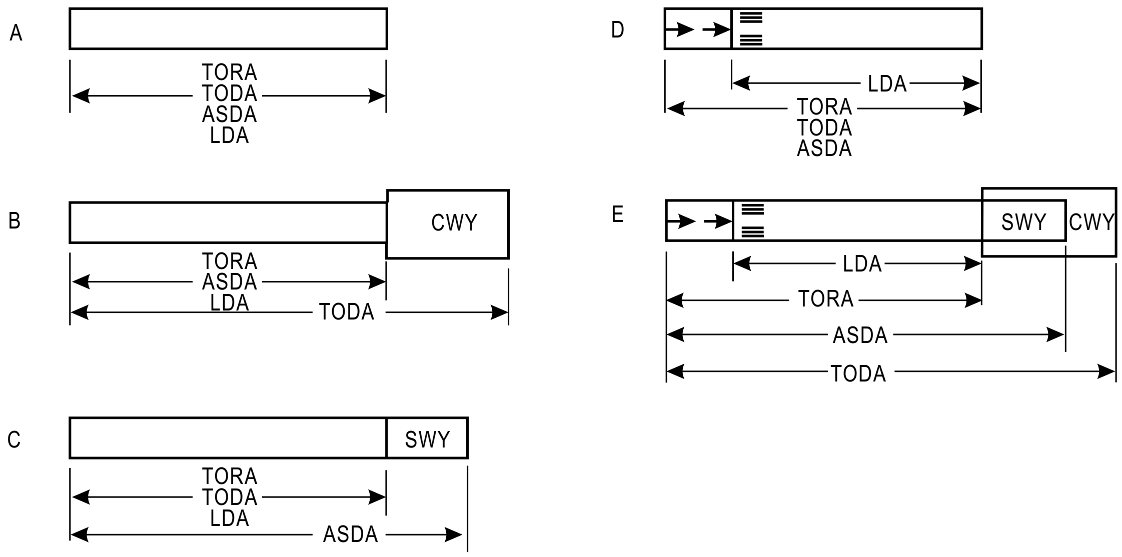
5. Runway surface evenness

5.1 In adopting tolerances for runway surface irregularities, the following standard of construction is achievable for short distances of 3 m and conforms to good engineering practice:

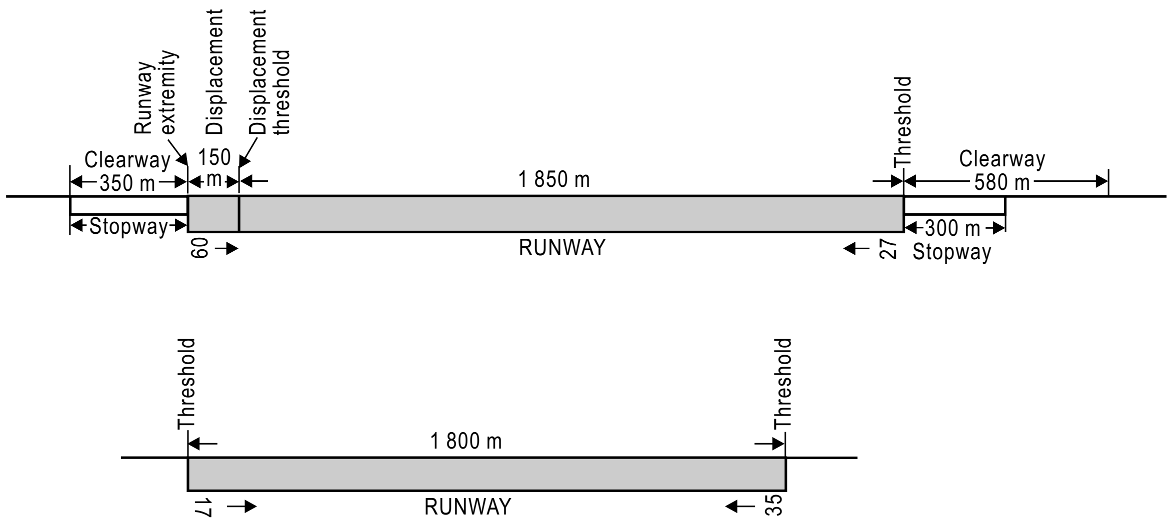
> Except across the crown of a camber or across drainage channels, the finished surface of the wearing course is to be of such regularity that, when tested with a 3 m straight-edge placed anywhere in any direction on the surface, there is no deviation greater than 3 mm between the bottom of the straight-edge and the surface of the pavement anywhere along the straight edge.

5.2 Caution should also be exercised when inserting runway lights or drainage grilles in runway surfaces to ensure that adequate smoothness of the surface is maintained.

5.3 The operation of aircraft and differential settlement of surface foundations will eventually lead to increases in surface irregularities. Small deviations in the above tolerances will not seriously hamper aircraft operations. In general, isolated irregularities of the order of 2.5 cm to 3 cm over a 45 m distance are tolerable. Exact information of the maximum acceptable deviation cannot be given, as it varies with the type and speed of an aircraft.



Note.— All declared distances are illustrated for operations from left to right.



F

RUNWAY	TORA	ASDA	TODA	LDA
	m	m	m	m
09	2 000	2 300	2 580	1 850
27	2 000	2 350	2 350	2 000
17	NU	NU	NU	1 800
35	1 800	1 800	1 800	NU

Figure A-1. Illustration of declared distances

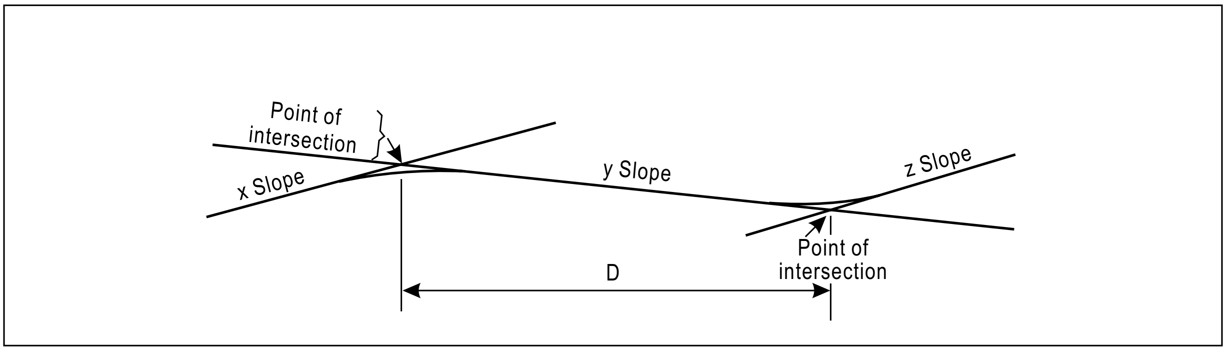


Figure A-2. Profile on centre line of runway

5.4 Deformation of the runway with time may also increase the possibility of the formation of water pools. Pools as shallow as approximately 3 mm in depth, particularly if they are located where they are likely to be encountered at high speed by landing aeroplanes, can induce aquaplaning, which can then be sustained on a wet runway by a much shallower depth of water. Improved guidance regarding the significant length and depth of pools relative to aquaplaning is the subject of further research. It is, of course, especially necessary to prevent pools from forming whenever there is a possibility that they might become frozen.

6. Determining and expressing the friction characteristics of snow- and ice-covered paved surfaces

6.1 There is an operational need for reliable and uniform information concerning the friction characteristics of ice- and snow-covered runways. Accurate and reliable indications of surface friction characteristics can be obtained by friction measuring devices; however, further experience is required to correlate the results obtained by such equipment with aircraft performance, owing to the many variables involved, such as: aircraft mass, speed, braking mechanism, tire and under-carriage characteristics.

6.2 The friction coefficient should be measured if a runway is covered wholly or partly by snow or ice and repeated as conditions change. Friction measurements and/or braking action assessments on surfaces other than runways should be made when an unsatisfactory friction condition can be expected on such surfaces.

6.3 The measurement of the friction coefficient provides the best basis for determining surface friction conditions. The value of surface friction should be the maximum value which occurs when a wheel is slipping but still rolling. Various friction measuring devices may be used. As there is an operational need for uniformity in the method of assessing and reporting runway friction conditions, the measurements should preferably be made with equipment which provides continuous measuring of the maximum friction along the entire runway. Measuring techniques and information on limitations of the various friction measuring devices and precautions to be observed are given in the *Airport Services Manual*, Part 2.

6.4 A chart, based on results of tests conducted on selected ice- or snow-covered surfaces, showing the correlation between certain friction measuring devices on ice- or snow-covered surfaces is presented in the *Airport Services Manual*, Part 2.

6.5 The friction conditions of a runway should be expressed as "braking action information" in terms of the measured friction coefficient μ or estimated braking action. Specific numerical μ values are necessarily related to the design and construction of each friction measuring device as well as to the surface being measured and the speed employed.

6.6 The table below with associated descriptive terms was developed from friction data collected only in compacted snow and ice and should not therefore be taken to be absolute values applicable in all conditions. If the surface is affected by snow or ice and the braking action is reported as "good", pilots should not expect to find conditions as good as on a clean dry runway (where the available friction may well be greater than that needed in any case). The value "good" is a comparative value and is intended to mean that aeroplanes should not experience directional control or braking difficulties, especially when landing.

Measured coefficient	*Estimated braking action*	*Code*
0.40 and above	Good	5
0.39 to 0.36	Medium to good	4
0.35 to 0.30	Medium	3
0.29 to 0.26	Medium to poor	2
0.25 and below	Poor	1

6.7 It has been found necessary to provide surface friction information for each third of a runway. The thirds are called

A, B and C. For the purpose of reporting information to aeronautical service units, section A is always the section associated with the lower runway designation number. When giving landing information to a pilot before landing, the sections are however referred to as first, second or third part of the runway. The first part always means the first third of the runway as seen in the direction of landing. Friction measurements are made along two lines parallel to the runway, i.e. along a line on each side of the centre line approximately 3 m or that distance from the centre line at which most operations take place. The objective of the tests is to determine the mean friction value for sections A, B and C. In cases where a continuous friction measuring device is used, the mean values are obtained from the friction values recorded for each section. The distance between each test point should be approximately 10 per cent of the usable length of the runway. If it is decided that a single test line on one side of the runway centre line gives adequate coverage of the runway, then it follows that each third of the runway should have three tests carried out on it. Test results and calculated mean friction values are entered in a special form (see *Airport Services Manual,* Part 2).

Note.— Where applicable, figures for stopway friction value should also be made available on request.

6.8 A continuous friction measuring device (e.g. Skiddometer, Surface Friction Tester, Mu-meter, Runway Friction Tester or Grip Tester), can be used for measuring the friction values for compacted snow- and ice-covered runways. A decelerometer (e.g. Tapley Meter or Brakemeter — Dynometer) may be used on certain surface conditions, e.g. compacted snow, ice and very thin layers of dry snow. Other friction measuring devices can be used, provided they have been correlated with at least one of the types mentioned above. A decelerometer should not be used in loose snow or slush, as it can give misleading friction values. Other friction measuring devices can also give misleading friction values under certain combinations of contaminants and air/pavement temperature.

6.9 The *Airport Services Manual,* Part 2 provides guidance on the uniform use of test equipment to achieve compatible test results and other information on removal of surface contamination and improvement of friction conditions.

7. Determination of friction characteristics of wet paved runways

7.1 The friction of a wet paved runway should be measured to:

a) verify the friction characteristics of new or resurfaced paved runways when wet (Chapter 3, 3.1.24);

b) assess periodically the slipperiness of paved runways when wet (Chapter 10, 10.2.3);

c) determine the effect on friction when drainage characteristics are poor (Chapter 10, 10.2.6); and

d) determine the friction of paved runways that become slippery under unusual conditions (Chapter 2, 2.9.8).

7.2 Runways should be evaluated when first constructed or after resurfacing to determine the wet runway surface friction characteristics. Although it is recognized that friction reduces with use, this value will represent the friction of the relatively long central portion of the runway that is uncontaminated by rubber deposits from aircraft operations and is therefore of operational value. Evaluation tests should be made on clean surfaces. If it is not possible to clean a surface before testing, then for purposes of preparing an initial report a test could be made on a portion of clean surface in the central part of the runway.

7.3 Friction tests of existing surface conditions should be taken periodically in order to identify runways with low friction when wet. A State should define what minimum friction level it considers acceptable before a runway is classified as slippery when wet and publish this value in the State's aeronautical information publication (AIP). When the friction of a runway is found to be below this reported value, then such information should be promulgated by NOTAM. The State should also establish a maintenance planning level, below which, appropriate corrective maintenance action should be initiated to improve the friction. However, when the friction characteristics for either the entire runway or a portion thereof are below the minimum friction level, corrective maintenance action must be taken without delay. Friction measurements should be taken at intervals that will ensure identification of runways in need of maintenance or special surface treatment before the condition becomes serious. The time interval between measurements will depend on factors such as: aircraft type and frequency of usage, climatic conditions, pavement type, and pavement service and maintenance requirements.

7.4 For uniformity and to permit comparison with other runways, friction tests of existing, new or resurfaced runways should be made with a continuous friction measuring device provided with a smooth tread tire. The device should have a capability of using self-wetting features to enable measurements of the friction characteristics of the surface to be made at a water depth of at least 1 mm.

7.5 When it is suspected that the friction characteristics of a runway may be reduced because of poor drainage, owing to inadequate slopes or depressions, then an additional test should be made, but this time under natural conditions representative of a local rain. This test differs from the previous one in that water depths in the poorly cleared areas are normally greater in a local rain condition. The test results are thus more apt to identify problem areas having low friction values that could induce aquaplaning than the previous test. If circumstances do not permit tests to be conducted during natural conditions representative of a rain, then this condition may be simulated.

7.6 Even when the friction has been found to be above the level set by the State to define a slippery runway, it may be known that under unusual conditions, such as after a long dry period, the runway may have become slippery. When such a condition is known to exist, then a friction measurement should be made as soon as it is suspected that the runway may have become slippery.

7.7 When the results of any of the measurements identified in 7.3 through 7.6 indicate that only a particular portion of a runway surface is slippery, then action to promulgate this information and, if appropriate, take corrective action is equally important.

7.8 When conducting friction tests on wet runways, it is important to note that, unlike compacted snow and ice conditions, in which there is very limited variation of the friction coefficient with speed, a wet runway produces a drop in friction with an increase in speed. However, as the speed increases, the rate at which the friction is reduced becomes less. Among the factors affecting the friction coefficient between the tire and the runway surface, texture is particularly important. If the runway has a good macro-texture allowing the water to escape beneath the tire, then the friction value will be less affected by speed. Conversely, a low macro-texture surface will produce a larger drop in friction with increase in speed. Accordingly, when testing runways to determine their friction characteristics and whether maintenance action is necessary to improve it, a speed high enough to reveal these friction/speed variations should be used.

7.9 Annex 14, Volume I requires States to specify two friction levels as follows:

a) a maintenance friction level below which corrective maintenance action should be initiated; and

b) a minimum friction level below which information that a runway may be slippery when wet should be made available.

Furthermore, States should establish criteria for the friction characteristics of new or resurfaced runway surfaces. Table A-1 provides guidance on establishing the design objective for new runway surfaces and maintenance planning and minimum friction levels for runway surfaces in use.

7.10 The friction values given above are absolute values and are intended to be applied without any tolerance. These values were developed from a research study conducted in a State. The two friction measuring tires mounted on the Mu-meter were smooth tread and had a special rubber formulation, i.e. Type A. The tires were tested at a 15 degree included angle of alignment along the longitudinal axis of the trailer. The single friction measuring tires mounted on the Skiddometer, Surface Friction Tester, Runway Friction Tester and TATRA were smooth tread and used the same rubber formulation, i.e. Type B. The GRIPTESTER was tested with a single smooth tread tire having the same rubber formulation as Type B but the size was smaller, i.e. Type C. The specifications of these tires (i.e. Types A, B and C) are contained in the *Airport Services Manual*, Part 2. Friction measuring devices using rubber formulation, tire tread/groove patterns, water depth, tire pressures, or test speeds different from those used in the programme described above, cannot be directly equated with the friction values given in the table. The values in columns (5), (6) and (7) are averaged values representative of

Table A-1.

Test equipment	Test tire		Test speed (km/h)	Test water depth (mm)	Design objective for new surface	Maintenance planning level	Minimum friction level
	Type	Pressure (kPa)					
(1)	(2)		(3)	(4)	(5)	(6)	(7)
Mu-meter Trailer	A	70	65	1.0	0.72	0.52	0.42
	A	70	95	1.0	0.66	0.38	0.26
Skiddometer Trailer	B	210	65	1.0	0.82	0.60	0.50
	B	210	95	1.0	0.74	0.47	0.34
Surface Friction	B	210	65	1.0	0.82	0.60	0.50
Tester Vehicle	B	210	95	1.0	0.74	0.47	0.34
Runway Friction	B	210	65	1.0	0.82	0.60	0.50
Tester Vehicle	B	210	95	1.0	0.74	0.54	0.41
TATRA Friction	B	210	65	1.0	0.76	0.57	0.48
Tester Vehicle	B	210	95	1.0	0.67	0.52	0.42
GRIPTESTER	C	140	65	1.0	0.74	0.53	0.43
Trailer	C	140	95	1.0	0.64	0.36	0.24

the runway or significant portion thereof. It is considered desirable to test the friction characteristics of a paved runway at more than one speed.

7.11 Other friction measuring devices can be used, provided they have been correlated with at least one test equipment mentioned above. The *Airport Services Manual,* Part 2 provides guidance on the methodology for determining the friction values corresponding to the design objective, maintenance planning level and minimum friction level for a friction tester not identified in the above table.

8. Strips

8.1 Shoulders

8.1.1 The shoulder of a runway or stopway should be prepared or constructed so as to minimize any hazard to an aeroplane running off the runway or stopway. Some guidance is given in the following paragraphs on certain special problems which may arise, and on the further question of measures to avoid the ingestion of loose stones or other objects by turbine engines.

8.1.2 In some cases, the bearing strength of the natural ground in the strip may be sufficient, without special preparation, to meet the requirements for shoulders. Where special preparation is necessary, the method used will depend on local soil conditions and the mass of the aeroplanes the runway is intended to serve. Soil tests will help in determining the best method of improvement (e.g. drainage, stabilization, surfacing, light paving).

8.1.3 Attention should also be paid when designing shoulders to prevent the ingestion of stones or other objects by turbine engines. Similar considerations apply here to those which are discussed for the margins of taxiways in the *Aerodrome Design Manual*, Part 2, both as to the special measures which may be necessary and as to the distance over which such special measures, if required, should be taken.

8.1.4 Where shoulders have been treated specially, either to provide the required bearing strength or to prevent the presence of stones or debris, difficulties may arise because of a lack of visual contrast between the runway surface and that of the adjacent strip. This difficulty can be overcome either by providing a good visual contrast in the surfacing of the runway or strip, or by providing a runway side stripe marking.

8.2 Objects on strips

Within the general area of the strip adjacent to the runway, measures should be taken to prevent an aeroplane's wheel, when sinking into the ground, from striking a hard vertical face. Special problems may arise for runway light fittings or other objects mounted in the strip or at the intersection with a taxiway or another runway. In the case of construction, such as runways or taxiways, where the surface must also be flush with the strip surface, a vertical face can be eliminated by chamfering from the top of the construction to not less than 30 cm below the strip surface level. Other objects, the functions of which do not require them to be at surface level, should be buried to a depth of not less than 30 cm.

8.3 Grading of a strip for precision approach runways

Chapter 3, 3.4.8 recommends that the portion of a strip of an instrument runway within at least 75 m from the centre line should be graded where the code number is 3 or 4. For a precision approach runway, it may be desirable to adopt a greater width where the code number is 3 or 4. Figure A-3 shows the shape and dimensions of a wider strip that may be considered for such a runway. This strip has been designed using information on aircraft running off runways. The portion to be graded extends to a distance of 105 m from the centre line, except that the distance is gradually reduced to 75 m from the centre line at both ends of the strip, for a length of 150 m from the runway end.

9. Runway end safety areas

9.1 Where a runway end safety area is provided in accordance with Chapter 3, consideration should be given to providing an area long enough to contain overruns and undershoots resulting from a reasonably probable combination of adverse operational factors. On a precision approach runway, the ILS localizer is normally the first upstanding obstacle, and the runway end safety area should extend up to this facility. In other circumstances and on a non-precision approach or non-instrument runway, the first upstanding obstacle may be a road, a railroad or other constructed or natural feature. In such circumstances, the runway end safety area should extend as far as the obstacle.

9.2 Where provision of a runway end safety area may involve encroachment in areas where it would be particularly prohibitive to implement, and the appropriate authority considers a runway end safety area essential, consideration may have to be given to reducing some of the declared distances.

10. Location of threshold

10.1 General

10.1.1 The threshold is normally located at the extremity of a runway, if there are no obstacles penetrating above the

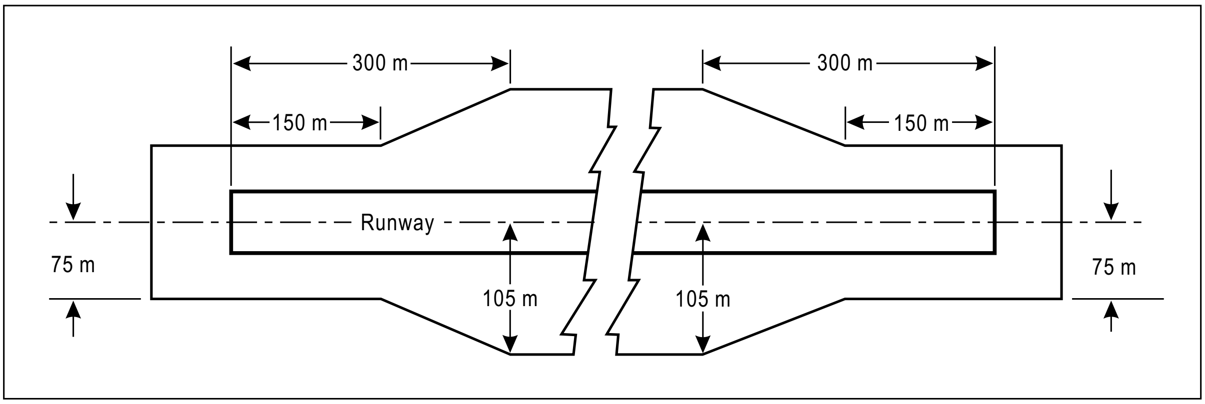


Figure A-3. Graded portion of a strip including a precision approach runway where the code number is 3 or 4

approach surface. In some cases, however, due to local conditions it may be desirable to displace the threshold permanently (see below). When studying the location of a threshold, consideration should also be given to the height of the ILS reference datum and/or MLS approach reference datum and the determination of the obstacle clearance limits. (Specifications concerning the height of the ILS reference datum and MLS approach reference datum are given in Annex 10, Volume I.)

10.1.2 In determining that no obstacle penetrate above the approach surface, account should be taken of mobile objects (vehicles on roads, trains, etc.) at least within that portion of the approach area within 1 200 m longitudinally from the threshold and of an overall width of not less than 150 m.

10.2 Displaced threshold

10.2.1 If an object extends above the approach surface and the object cannot be removed, consideration should be given to displacing the threshold permanently.

10.2.2 To meet the obstacle limitation objectives of Chapter 4, the threshold should ideally be displaced down the runway for the distance necessary to provide that the approach surface is cleared of obstacles.

10.2.3 However, displacement of the threshold from the runway extremity will inevitably cause reduction of the landing distance available, and this may be of greater operational significance than penetration of the approach surface by marked and lighted obstacles. A decision to displace the threshold, and the extent of such displacement, should therefore have regard to an optimum balance between the considerations of clear approach surfaces and adequate landing distance. In deciding this question, account will need to be taken of the types of aeroplanes which the runway is intended to serve, the limiting visibility and cloud base conditions under which the runway will be used, the position of the obstacles in relation to the threshold and extended centre line and, in the case of a precision approach runway, the significance of the obstacles to the determination of the obstacle clearance limit.

10.2.4 Notwithstanding the consideration of landing distance available, the selected position for the threshold should not be such that the obstacle-free surface to the threshold is steeper than 3.3 per cent where the code number is 4 or steeper than 5 per cent where the code number is 3.

10.2.5 In the event of a threshold being located according to the criteria for obstacle-free surfaces in the preceding paragraph, the obstacle marking requirements of Chapter 6 should continue to be met in relation to the displaced threshold.

11. Approach lighting systems

11.1 Types and characteristics

11.1.1 The specifications in this volume provide for the basic characteristics for simple and precision approach lighting systems. For certain aspects of these systems, some latitude is permitted, for example, in the spacing between centre line lights and crossbars. The approach lighting patterns that have been generally adopted are shown in Figures A-5 and A-6. A diagram of the inner 300 m of the precision approach category II and III lighting system is shown in Figure 5-13.

11.1.2 The approach lighting configuration is to be provided irrespective of the location of the threshold, i.e. whether the threshold is at the extremity of the runway or displaced from the runway extremity. In both cases, the approach lighting system should extend up to the threshold. However, in the case of a displaced threshold, inset lights are used from the runway extremity up to the threshold to obtain the specified configuration. These inset lights are designed to satisfy the structural requirements specified in Chapter 5, 5.3.1.9, and the photometric requirements specified in Appendix 2, Figure A2-1 or A2-2.

11.1.3 Flight path envelopes to be used in designing the lighting are shown in Figure A-4.

11.2 Installation tolerances

Horizontal

11.2.1 The dimensional tolerances are shown in Figure A-6.

11.2.2 The centre line of an approach lighting system should be as coincident as possible with the extended centre line of the runway with a maximum tolerance of ± 15′.

11.2.3 The longitudinal spacing of the centre line lights should be such that one light (or group of lights) is located in the centre of each crossbar, and the intervening centre line lights are spaced as evenly as practicable between two crossbars or a crossbar and a threshold.

11.2.4 The crossbars and barrettes should be at right angles to the centre line of the approach lighting system with a tolerance of ± 30′, if the pattern in Figure A-6 (A) is adopted or ± 2°, if Figure A-6 (B) is adopted.

11.2.5 When a crossbar has to be displaced from its standard position, any adjacent crossbar should, where possible, be displaced by appropriate amounts in order to reduce the differences in the crossbar spacing.

11.2.6 When a crossbar in the system shown in Figure A-6 (A) is displaced from its standard position, its overall length should be adjusted so that it remains one-twentieth of the actual distance of the crossbar from the point of origin. It is not necessary, however, to adjust the standard 2.7 m spacing between the crossbar lights, but the crossbars should be kept symmetrical about the centre line of the approach lighting.

Vertical

11.2.7 The ideal arrangement is to mount all the approach lights in the horizontal plane passing through the threshold (see Figure A-7), and this should be the general aim as far as local conditions permit. However, buildings, trees, etc., should not obscure the lights from the view of a pilot who is assumed to be 1° below the electronic glide path in the vicinity of the outer marker.

11.2.8 Within a stopway or clearway, and within 150 m of the end of a runway, the lights should be mounted as near to the ground as local conditions permit in order to minimize risk of damage to aeroplanes in the event of an overrun or undershoot. Beyond the stopway and clearway, it is not so necessary for the lights to be mounted close to the ground and therefore undulations in the ground contours can be compensated for by mounting the lights on poles of appropriate height.

11.2.9 It is desirable that the lights be mounted so that, as far as possible, no object within a distance of 60 m on each side of the centre line protrudes through the plane of the approach lighting system. Where a tall object exists within 60 m of the centre line and within 1 350 m from the threshold for a precision approach lighting system, or 900 m for a simple approach lighting system, it may be advisable to install the lights so that the plane of the outer half of the pattern clears the top of the object.

11.2.10 In order to avoid giving a misleading impression of the plane of the ground, the lights should not be mounted below a gradient of 1 in 66 downwards from the threshold to a point 300 m out, and below a gradient of 1 in 40 beyond the 300 m point. For a precision approach category II and III lighting system, more stringent criteria may be necessary, e.g. negative slopes not permitted within 450 m of the threshold.

11.2.11 *Centre line.* The gradients of the centre line in any section (including a stopway or clearway) should be as small as practicable, and the changes in gradients should be as few and small as can be arranged and should not exceed 1 in 60. Experience has shown that as one proceeds outwards from the runway, rising gradients in any section of up to 1 in 66, and falling gradients of down to 1 in 40, are acceptable.

11.2.12 *Crossbars.* The crossbar lights should be so arranged as to lie on a straight line passing through the associated centre line lights, and wherever possible this line should be horizontal. It is permissible, however, to mount the lights on a transverse gradient not more than 1 in 80, if this enables crossbar lights within a stopway or clearway to be mounted nearer to the ground on sites where there is a cross-fall.

11.3 Clearance of obstacles

11.3.1 An area, hereinafter referred to as the light plane, has been established for obstacle clearance purposes, and all lights of the system are in this plane. This plane is rectangular in shape and symmetrically located about the approach lighting system's centre line. It starts at the threshold and extends 60 m beyond the approach end of the system, and is 120 m wide.

11.3.2 No objects are permitted to exist within the boundaries of the light plane which are higher than the light plane except as designated herein. All roads and highways are considered as obstacles extending 4.8 m above the crown of the road, except aerodrome service roads where all vehicular traffic is under control of the aerodrome authorities and co-ordinated with the aerodrome traffic control tower. Railroads, regardless of the amount of traffic, are considered as obstacles extending 5.4 m above the top of the rails.

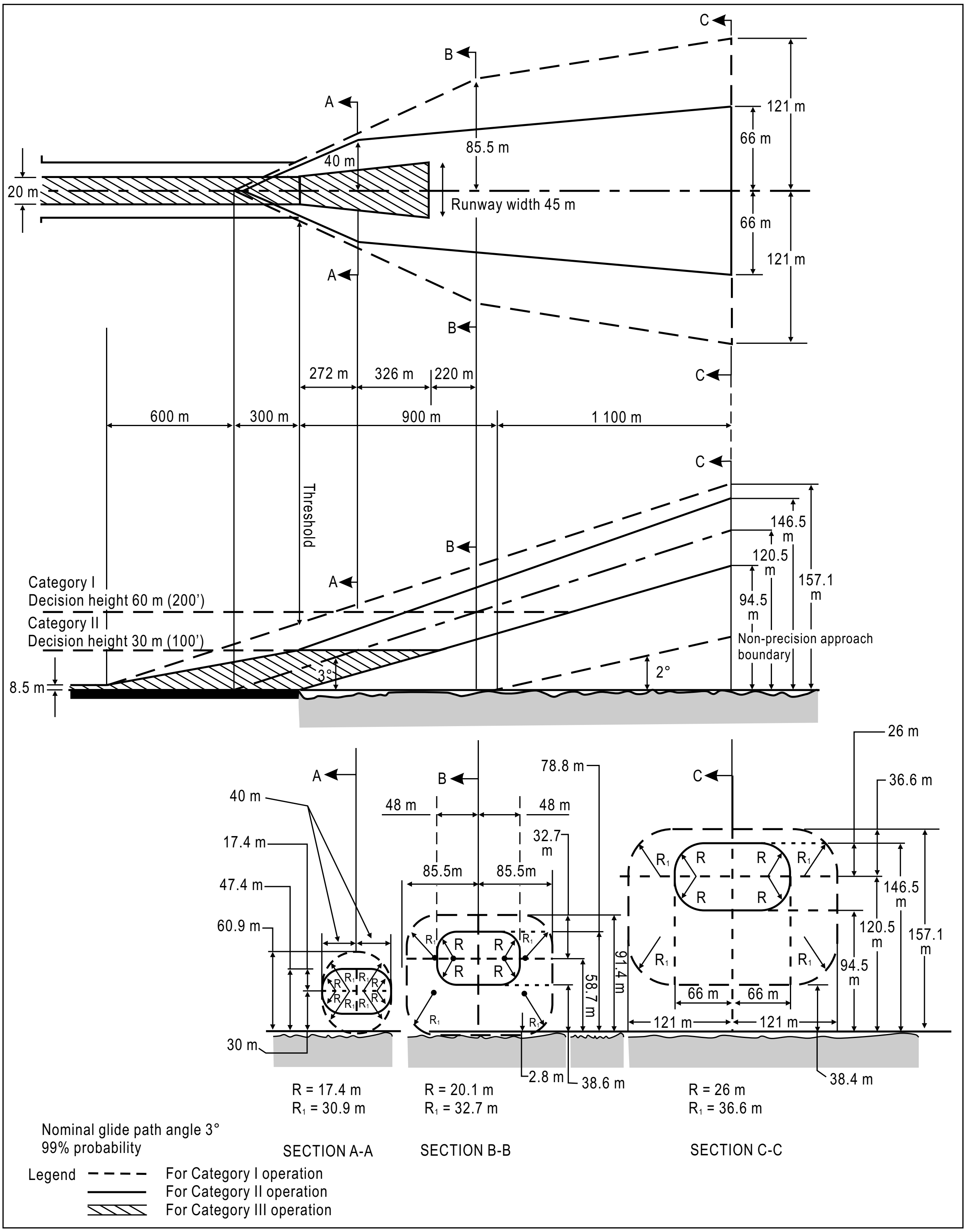


Figure A-4. Flight path envelopes to be used for lighting design for category I, II and III operations

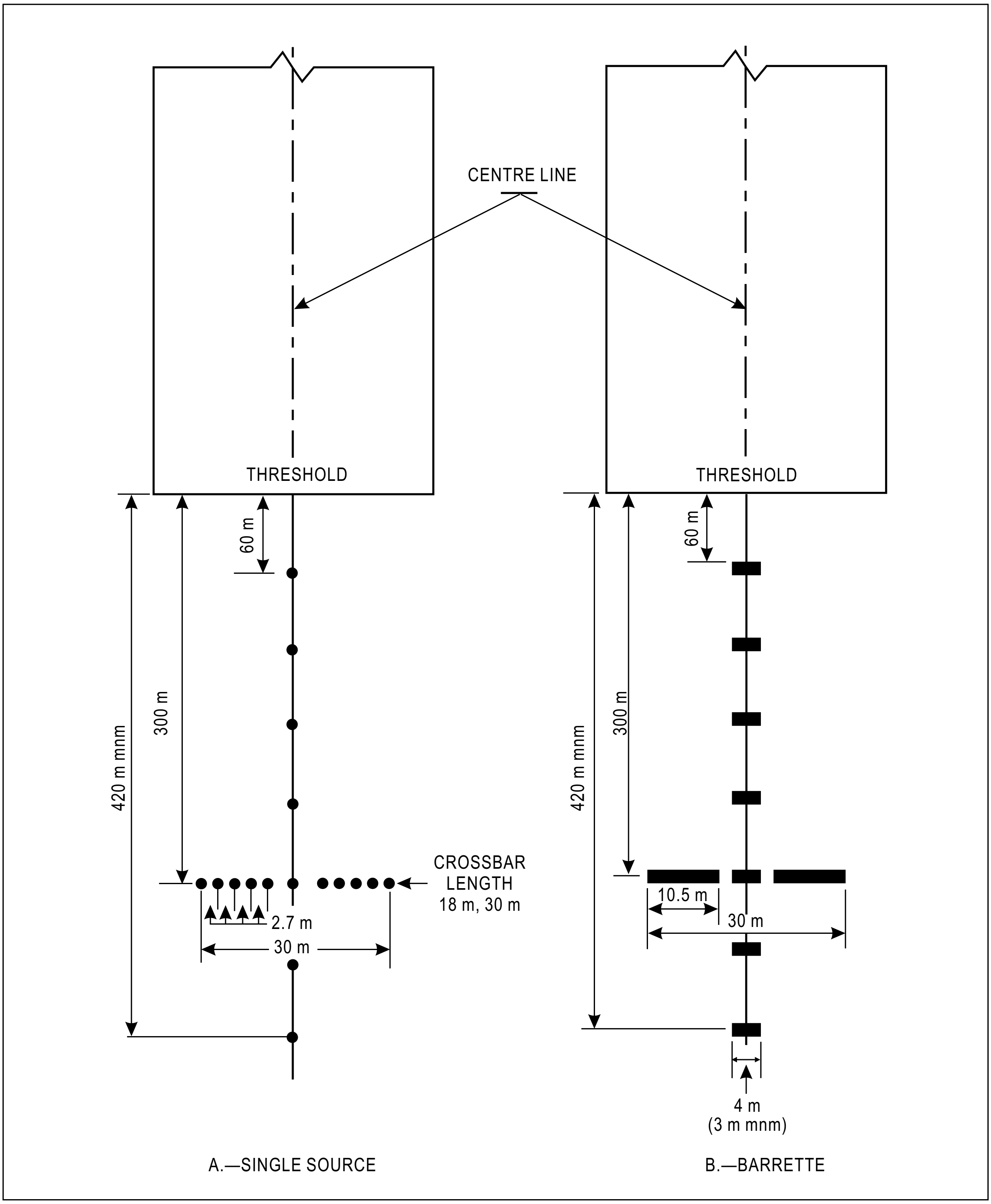


Figure A-5. Simple approach lighting systems

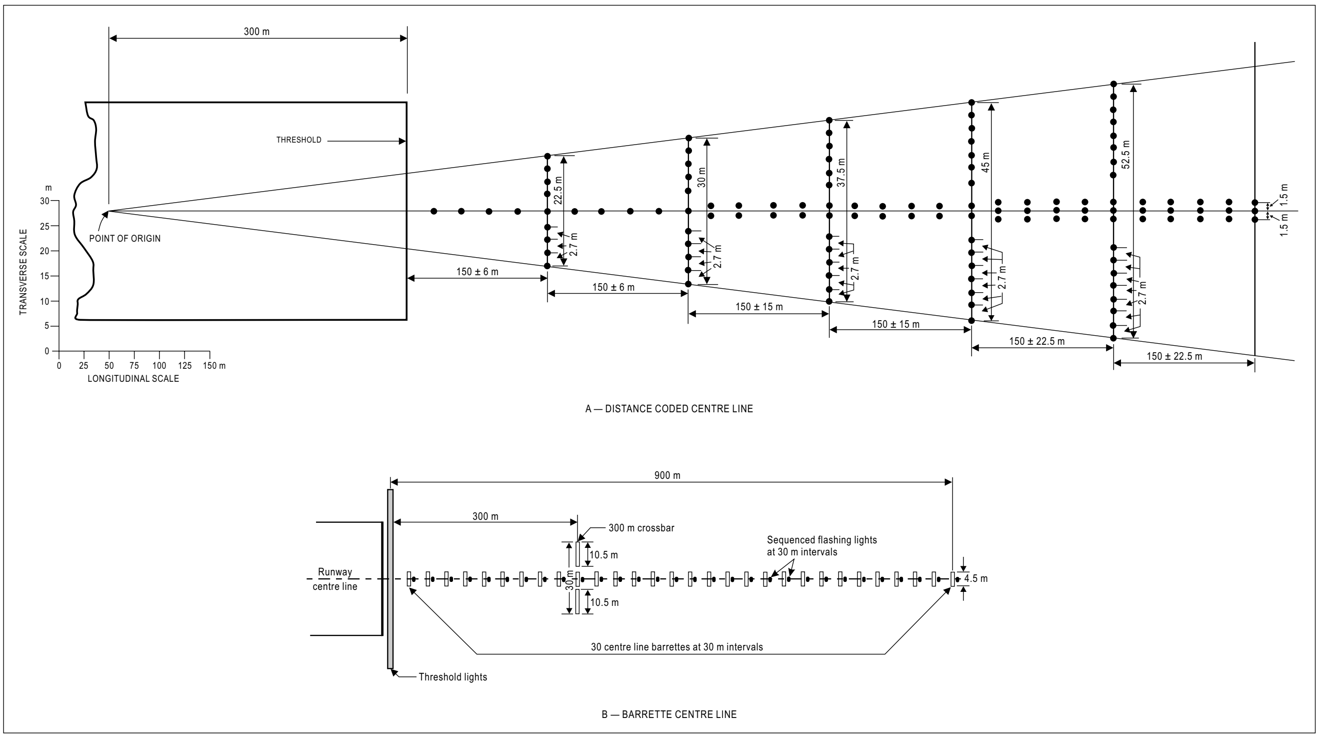


Figure A-6. Precision appraoch category I lighting systems

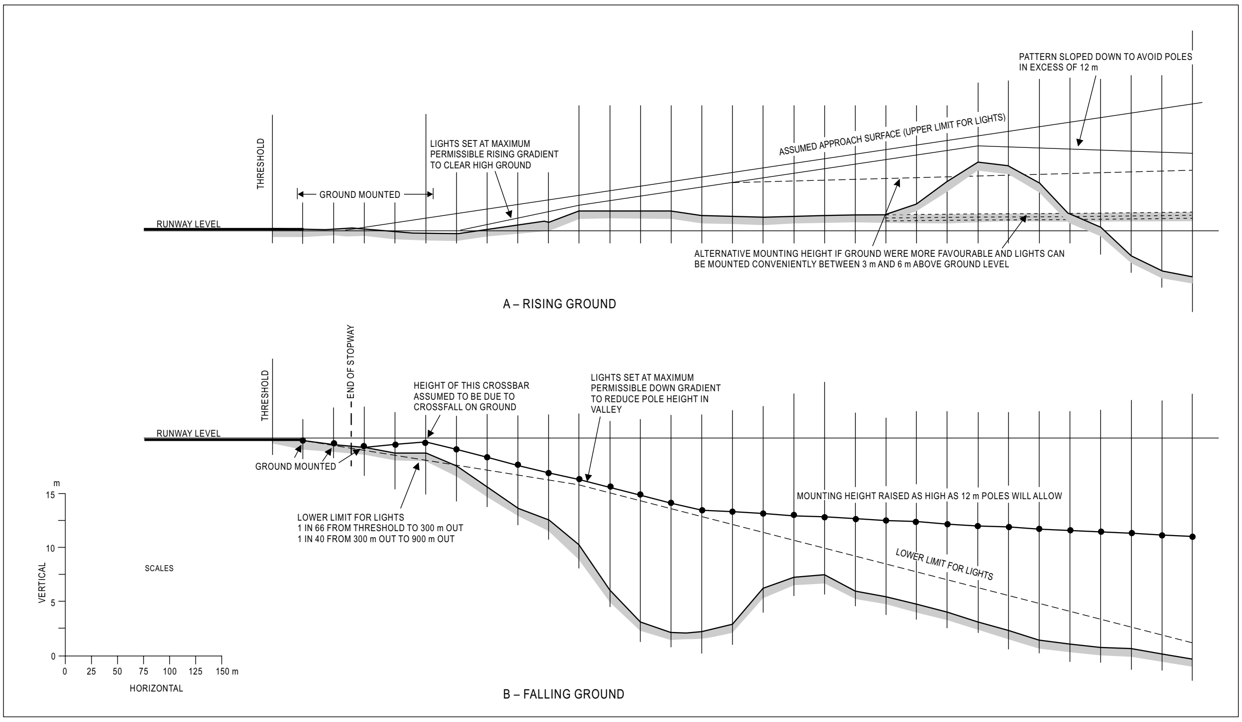


Figure A-7. Vertical installation tolerances

11.3.3 It is recognized that some components of electronic landing aids systems, such as reflectors, antennas, monitors, etc., must be installed above the light plane. Every effort should be made to relocate such components outside the boundaries of the light plane. In the case of reflectors and monitors, this can be done in many instances.

11.3.4 Where an ILS localizer is installed within the light plane boundaries, it is recognized that the localizer, or screen if used, must extend above the light plane. In such cases the height of these structures should be held to a minimum and they should be located as far from the threshold as possible. In general the rule regarding permissible heights is 15 cm for each 30 m the structure is located from the threshold. As an example, if the localizer is located 300 m from the threshold, the screen will be permitted to extend above the plane of the approach lighting system by 10 × 15 = 150 cm maximum, but preferably should be kept as low as possible consistent with proper operation of the ILS.

11.3.5 In locating an MLS azimuth antenna the guidance contained in Annex 10, Volume I, Attachment G should be followed. This material, which also provides guidance on collocating an MLS azimuth antenna with an ILS localizer antenna, suggests that the MLS azimuth antenna may be sited within the light plane boundaries where it is not possible or practical to locate it beyond the outer end of the approach lighting for the opposite direction of approach. If the MLS azimuth antenna is located on the extended centre line of the runway, it should be as far as possible from the closest light position to the MLS azimuth antenna in the direction of the runway end. Furthermore, the MLS azimuth antenna phase centre should be at least 0.3 m above the light centre of the light position closest to the MLS azimuth antenna in the direction of the runway end. (This could be relaxed to 0.15 m if the site is otherwise free of significant multipath problems.) Compliance with this requirement, which is intended to ensure that the MLS signal quality is not affected by the approach lighting system, could result in the partial obstruction of the lighting system by the MLS azimuth antenna. To ensure that the resulting obstruction does not degrade visual guidance beyond an acceptable level, the MLS azimuth antenna should not be located closer to the runway end than 300 m and the preferred location is 25 m beyond the 300 m crossbar (this would place the antenna 5 m behind the light position 330 m from the runway end). Where an MLS azimuth antenna is so located, a central part of the 300 m crossbar of the approach lighting system would alone be partially obstructed. Nevertheless, it is important to ensure that the unobstructed lights of the crossbar remain serviceable all the time.

11.3.6 Objects existing within the boundaries of the light plane, requiring the light plane to be raised in order to meet the criteria contained herein, should be removed, lowered or relocated where this can be accomplished more economically than raising the light plane.

11.3.7 In some instances objects may exist which cannot be removed, lowered or relocated economically. These objects may be located so close to the threshold that they cannot be cleared by the 2 per cent slope. Where such conditions exist and no alternative is possible, the 2 per cent slope may be exceeded or a “stair step” resorted to in order to keep the approach lights above the objects. Such “step” or increased gradients should be resorted to only when it is impracticable to follow standard slope criteria, and they should be held to the absolute minimum. Under this criterion no negative slope is permitted in the outermost portion of the system.

11.4 Consideration of the effects of reduced lengths

11.4.1 The need for an adequate approach lighting system to support precision approaches where the pilot is required to acquire visual references prior to landing, cannot be stressed too strongly. The safety and regularity of such operations is dependent on this visual acquisition. The height above runway threshold at which the pilot decides there are sufficient visual cues to continue the precision approach and land will vary, depending on the type of approach being conducted and other factors such as meteorological conditions, ground and airborne equipment, etc. The required length of approach lighting system which will support all the variations of such approaches is 900 m, and this shall always be provided whenever possible.

11.4.2 However, there are some runway locations where it is impossible to provide the 900 m length of approach lighting system to support precision approaches.

11.4.3 In such cases, every effort should be made to provide as much approach lighting system as possible. The appropriate authority may impose restrictions on operations to runways equipped with reduced lengths of lighting. There are many factors which determine at what height the pilot must have decided to continue the approach to land or execute a missed approach. It must be understood that the pilot does not make an instantaneous judgement upon reaching a specified height. The actual decision to continue the approach and landing sequence is an accumulative process which is only concluded at the specified height. Unless lights are available prior to reaching the decision point, the visual assessment process is impaired and the likelihood of missed approaches will increase substantially. There are many operational considerations which must be taken into account by the appropriate authorities in deciding if any restrictions are necessary to any precision approach and these are detailed in Annex 6.

12. Priority of installation of visual approach slope indicator systems

12.1 It has been found impracticable to develop guidance material that will permit a completely objective analysis to be made of which runway on an aerodrome should receive first priority for the installation of a visual approach slope indicator system. However, factors that must be considered when making such a decision are:

a) frequency of use;

b) seriousness of the hazard;

c) presence of other visual and non-visual aids;

d) type of aeroplanes using the runway; and

e) frequency and type of adverse weather conditions under which the runway will be used.

12.2 With respect to the seriousness of the hazard, the order given in the application specifications for a visual approach slope indicator system, 5.3.5.1 b) to e) of Chapter 5 may be used as a general guide. These may be summarized as:

a) inadequate visual guidance because of:

   1) approaches over water or featureless terrain, or absence of sufficient extraneous light in the approach area by night;

   2) deceptive surrounding terrain;

b) serious hazard in approach;

c) serious hazard if aeroplanes undershoot or overrun; and

d) unusual turbulence.

12.3 The presence of other visual or non-visual aids is a very important factor. Runways equipped with ILS or MLS would generally receive the lowest priority for a visual approach slope indicator system installation. It must be remembered, though, that visual approach slope indicator systems are visual approach aids in their own right and can supplement electronic aids. When serious hazards exist and/or a substantial number of aeroplanes not equipped for ILS or MLS use a runway, priority might be given to installing a visual approach slope indicator on this runway.

12.4 Priority should be given to runways used by turbo-jet aeroplanes.

13. Lighting of unserviceable areas

Where a temporarily unserviceable area exists, it may be marked with fixed-red lights. These lights should mark the most potentially dangerous extremities of the area. A minimum of four such lights should be used, except where the area is triangular in shape where a minimum of three lights may be employed. The number of lights should be increased when the area is large or of unusual configuration. At least one light should be installed for each 7.5 m of peripheral distance of the area. If the lights are directional, they should be orientated so that as far as possible their beams are aligned in the direction from which aircraft or vehicles will approach. Where aircraft or vehicles will normally approach from several directions, consideration should be given to adding extra lights or using omnidirectional lights to show the area from these directions. Unserviceable area lights should be frangible. Their height should be sufficiently low to preserve clearance for propellers and for engine pods of jet aircraft.

14. Rapid exit taxiway indicator lights

14.1 Rapid exit taxiway indicator lights (RETILs) comprise a set of yellow unidirectional lights installed in the runway adjacent to the centre line. The lights are positioned in a 3-2-1 sequence at 100 m intervals prior to the point of tangency of the rapid exit taxiway centre line. They are intended to give an indication to pilots of the location of the next available rapid exit taxiway.

14.2 In low visibility conditions, RETILs provide useful situational awareness cues while allowing the pilot to concentrate on keeping the aircraft on the runway centre line.

14.3 Following a landing, runway occupancy time has a significant effect on achievable runway capacity. RETILs allow pilots to maintain a good roll-out speed until it is necessary to decelerate to an appropriate speed for the turn into a rapid exit turn-off. A roll-out speed of 60 knots until the first RETIL (three-light barrette) is reached is seen as the optimum.

15. Intensity control of approach and runway lights

15.1 The conspicuity of a light depends on the impression received of contrast between the light and its background. If a light is to be useful to a pilot by day when on approach, it must have an intensity of at least 2 000 or 3 000 cd, and in the case of approach lights an intensity of the order of 20 000 cd is desirable. In conditions of very bright daylight fog it may not be possible to provide lights of sufficient intensity to be effective. On the other hand, in clear weather on a dark night, an intensity of the order of 100 cd for approach lights and 50 cd for the runway edge lights may be found suitable. Even then, owing to the closer range at which they are viewed, pilots have sometimes complained that the runway edge lights seemed unduly bright.

15.2 In fog the amount of light scattered is high. At night this scattered light increases the brightness of the fog over the approach area and runway to the extent that little increase in the visual range of the lights can be obtained by increasing their intensity beyond 2 000 or 3 000 cd. In an endeavour to increase the range at which lights would first be sighted at night, their intensity must not be raised to an extent that a pilot might find excessively dazzling at diminished range.

15.3 From the foregoing will be evident the importance of adjusting the intensity of the lights of an aerodrome lighting system according to the prevailing conditions, so as to obtain the best results without excessive dazzle that would disconcert the pilot. The appropriate intensity setting on any particular occasion will depend both on the conditions of background brightness and the visibility. Detailed guidance material on selecting intensity setting for different conditions is given in the *Aerodrome Design Manual,* Part 4.

16. Signal area

A signal area need be provided only when it is intended to use visual ground signals to communicate with aircraft in flight. Such signals may be needed when the aerodrome does not have an aerodrome control tower or an aerodrome flight information service unit, or when the aerodrome is used by aeroplanes not equipped with radio. Visual ground signals may also be useful in the case of failure of two-way radio communication with aircraft. It should be recognized, however, that the type of information which may be conveyed by visual ground signals should normally be available in AIPs or NOTAM. The potential need for visual ground signals should therefore be evaluated before deciding to provide a signal area.

17. Rescue and fire fighting services

17.1 Administration

17.1.1 The rescue and fire fighting service at an aerodrome should be under the administrative control of the aerodrome management, which should also be responsible for ensuring that the service provided is organized, equipped, staffed, trained and operated in such a manner as to fulfil its proper functions.

17.1.2 In drawing up the detailed plan for the conduct of search and rescue operations in accordance with 4.2.1 of Annex 12, the aerodrome management should coordinate its plans with the relevant rescue coordination centres to ensure that the respective limits of their responsibilities for an aircraft accident within the vicinity of an aerodrome are clearly delineated.

17.1.3 Coordination between the rescue and fire fighting service at an aerodrome and public protective agencies, such as local fire brigade, police force, coast guard and hospitals, should be achieved by prior agreement for assistance in dealing with an aircraft accident.

17.1.4 A grid map of the aerodrome and its immediate vicinity should be provided for the use of the aerodrome services concerned. Information concerning topography, access roads and location of water supplies should be indicated. This map should be conspicuously posted in the control tower and fire station, and available on the rescue and fire fighting vehicles and such other supporting vehicles required to respond to an aircraft accident or incident. Copies should also be distributed to public protective agencies as desirable.

17.1.5 Coordinated instructions should be drawn up detailing the responsibilities of all concerned and the action to be taken in dealing with emergencies. The appropriate authority should ensure that such instructions are promulgated and observed.

17.2 Training

The training curriculum should include initial and recurrent instruction in at least the following areas:

a) airport familiarization;

b) aircraft familiarization;

c) rescue and fire fighting personnel safety;

d) emergency communications systems on the aerodrome, including aircraft fire related alarms;

e) use of the fire hoses, nozzles, turrets and other appliances required for compliance with Chapter 9, 9.2;

f) application of the types of extinguishing agents required for compliance with Chapter 9, 9.2;

g) emergency aircraft evacuation assistance;

h) fire fighting operations;

i) adaptation and use of structural rescue and fire fighting equipment for aircraft rescue and fire fighting;

j) dangerous goods;

k) familiarization with fire fighters' duties under the aerodrome emergency plan; and

l) protective clothing and respiratory protection.

17.3 Level of protection to be provided

17.3.1 In accordance with Chapter 9, 9.2 aerodromes should be categorized for rescue and fire fighting purposes and the level of protection provided should be appropriate to the aerodrome category.

17.3.2 However, Chapter 9, 9.2.3 permits a lower level of protection to be provided for a limited period where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months. It is important to note that the concession included in 9.2.3 is applicable only where there is a wide range of difference between the dimensions of the aeroplanes included in reaching 700 movements.

17.4 Rescue equipment for difficult environments

17.4.1 Suitable rescue equipment and services should be available at an aerodrome where the area to be covered by the service includes water, swampy areas or other difficult environment that cannot be fully served by conventional wheeled vehicles. This is particularly important where a significant portion of approach/departure operations takes place over these areas.

17.4.2 The rescue equipment should be carried on boats or other vehicles such as helicopters and amphibious or air cushion vehicles, capable of operating in the area concerned. The vehicles should be so located that they can be brought into action quickly to respond to the areas covered by the service.

17.4.3 At an aerodrome bordering the water, the boats or other vehicles should preferably be located on the aerodrome, and convenient launching or docking sites provided. If these vehicles are located off the aerodrome, they should preferably be under the control of the aerodrome rescue and fire fighting service or, if this is not practicable, under the control of another competent public or private organization working in close coordination with the aerodrome rescue and fire fighting service (such as police, military services, harbour patrol or coast guard).

17.4.4 Boats or other vehicles should have as high a speed as practicable so as to reach an accident site in minimum time. To reduce the possibility of injury during rescue operations, water jet-driven boats are preferred to water propeller-driven boats unless the propellers of the latter boats are ducted. Should the water areas to be covered by the service be frozen for a signficant period of the year, the equipment should be selected accordingly. Vehicles used in this service should be equipped with life rafts and life preservers related to the requirements of the larger aircraft normally using the aerodrome, with two-way radio communication, and with floodlights for night operations. If aircraft operations during periods of low visibility are expected, it may be necessary to provide guidance for the responding emergency vehicles.

17.4.5 The personnel designated to operate the equipment should be adequately trained and drilled for rescue services in the appropriate environment.

17.5 Facilities

17.5.1 The provision of special telephone, two-way radio communication and general alarm systems for the rescue and fire fighting service is desirable to ensure the dependable transmission of essential emergency and routine information. Consistent with the individual requirements of each aerodrome, these facilities serve the following purposes:

a) direct communication between the activating authority and the aerodrome fire station in order to ensure the prompt alerting and dispatch of rescue and fire fighting vehicles and personnel in the event of an aircraft accident or incident;

b) emergency signals to ensure the immediate summoning of designated personnel not on standby duty;

c) as necessary, summoning essential related services on or off the aerodrome; and

d) maintaining communication by means of two-way radio with the rescue and fire fighting vehicles in attendance at an aircraft accident or incident.

17.5.2 The availability of ambulance and medical facilities for the removal and after-care of casualties arising from an aircraft accident should receive the careful consideration of the appropriate authority and should form part of the overall emergency plan established to deal with such emergencies.

18. Operators of vehicles

18.1 The authorities responsible for the operation of vehicles on the movement area should ensure that the operators are properly qualified. This may include, as appropriate to the driver's function, knowledge of:

a) the geography of the aerodrome;

b) aerodrome signs, markings and lights;

c) radiotelephone operating procedures;

d) terms and phrases used in aerodrome control including the ICAO spelling alphabet;

e) rules of air traffic services as they relate to ground operations;

f) airport rules and procedures; and

g) specialist functions as required, for example, in rescue and fire fighting.

18.2 The operator should be able to demonstrate competency, as appropriate, in:

a) the operation or use of vehicle transmit/receive equipment;

b) understanding and complying with air traffic control and local procedures;

c) vehicle navigation on the aerodrome; and

d) special skills required for the particular function.

In addition, as required for any specialist function, the operator should be the holder of a State driver's licence, a State radio operator's licence or other licences.

18.3 The above should be applied as is appropriate to the function to be performed by the operator and it is not necessary that all operators be trained to the same level, for example, operators whose functions are restricted to the apron.

18.4 If special procedures apply for operations in low visibility conditions, it is desirable to verify an operator's knowledge of the procedures through periodic checks.

19. The ACN-PCN method of reporting pavement strength

19.1 Overload operations

19.1.1 Overloading of pavements can result either from loads too large, or from a substantially increased application rate, or both. Loads larger than the defined (design or evaluation) load shorten the design life, whilst smaller loads extend it. With the exception of massive overloading, pavements in their structural behaviour are not subject to a particular limiting load above which they suddenly or catastrophically fail. Behaviour is such that a pavement can sustain a definable load for an expected number of repetitions during its design life. As a result, occasional minor over-loading is acceptable, when expedient, with only limited loss in pavement life expectancy and relatively small acceleration of pavement deterioration. For those operations in which magnitude of overload and/or the frequency of use do not justify a detailed analysis, the following criteria are suggested:

a) for flexible pavements, occasional movements by aircraft with ACN not exceeding 10 per cent above the reported PCN should not adversely affect the pavement;

b) for rigid or composite pavements, in which a rigid pavement layer provides a primary element of the structure, occasional movements by aircraft with ACN not exceeding 5 per cent above the reported PCN should not adversely affect the pavement;

c) if the pavement structure is unknown, the 5 per cent limitation should apply; and

d) the annual number of overload movements should not exceed approximately 5 per cent of the total annual aircraft movements.

19.1.2 Such overload movements should not normally be permitted on pavements exhibiting signs of distress or failure. Furthermore, overloading should be avoided during any periods of thaw following frost penetration, or when the strength of the pavement or its subgrade could be weakened by water. Where overload operations are conducted, the appropriate authority should review the relevant pavement condition regularly, and should also review the criteria for overload operations periodically since excessive repetition of overloads can cause severe shortening of pavement life or require major rehabilitation of pavement.

19.2 ACNs for several aircraft types

For convenience, several aircraft types currently in use have been evaluated on rigid and flexible pavements founded on the four subgrade strength categories in Chapter 2, 2.6.6 b) and the results tabulated in the *Aerodrome Design Manual,* Part 3.

ATTACHMENT B. OBSTACLE LIMITATION SURFACES

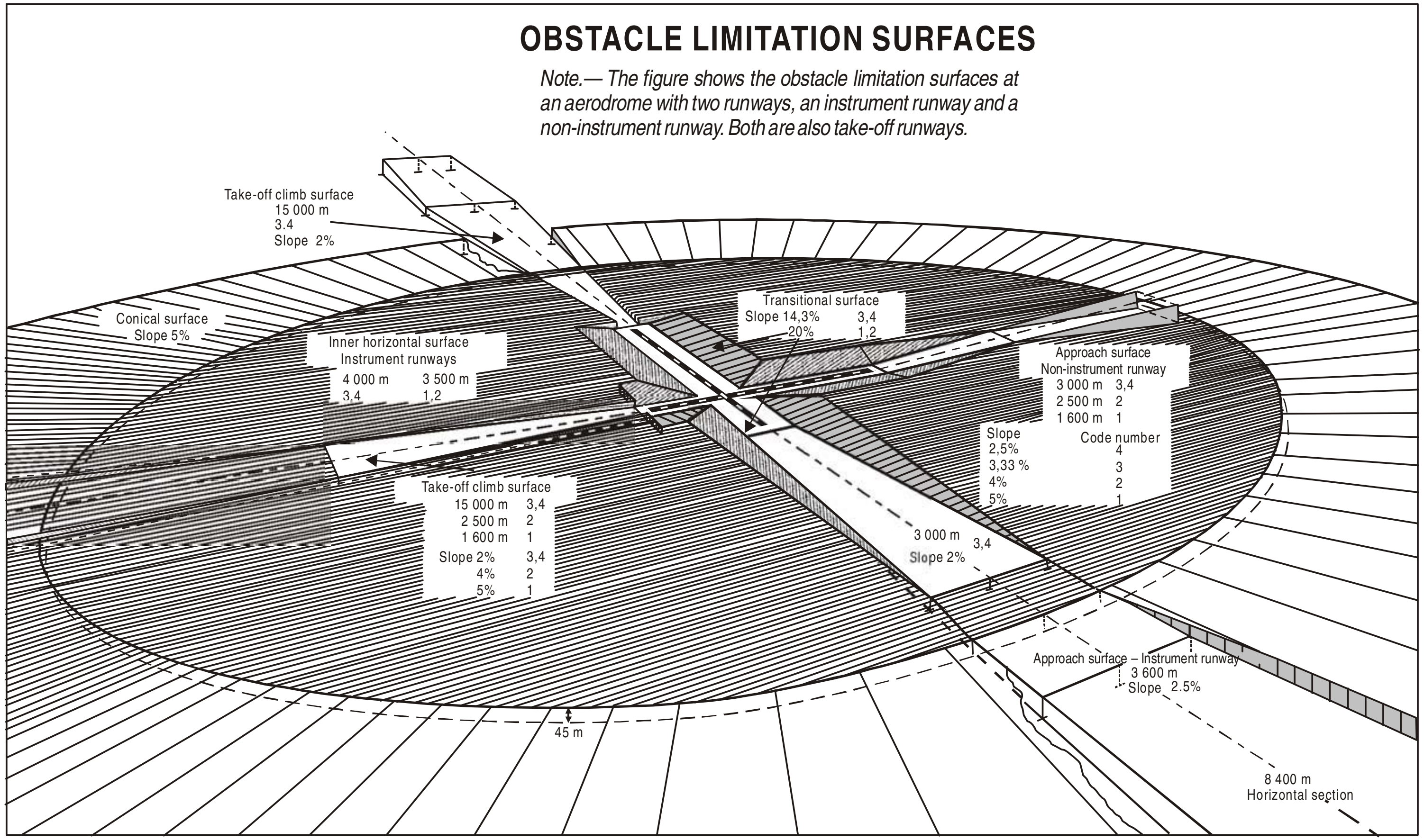


Figure B-1

LIMITED INDEX OF SIGNIFICANT SUBJECTS INCLUDED IN ANNEX 14, VOLUME I

*Those specifications which relate to the daily operation of an aerodrome as compared with those which relate to its design or facilities to be provided.

— **END** —

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME II
HELIPORTS

SECOND EDITION — JULY 1995

This edition incorporates all amendments to Annex 14, Volume II, adopted by the Council prior to 14 March 1995 and supersedes on 9 November 1995 all previous editions of Annex 14, Volume II.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword and the relevant clauses in each Chapter

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1	Incorporated in this edition		
2	6/11/97	—	ICAO
3	25/11/04	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	20/10/95	—	ICAO

TABLE OF CONTENTS

ABBREVIATIONS AND SYMBOLS

(used in Annex 14, Volume II)

Abbreviations

cd	Candela
cm	Centimeter
D	Helicopter largest over-all dimension
FATO	Final approach and take-off area
ft	Foot
HAPI	Helicopter approach path indicator
Hz	Hertz
IMC	Instrument meteorological conditions
kg	Kilogram
km/h	Kilometre per hour
kt	Knot
L	Litre
LDAH	Landing distance available
L/min	Litre per minute
m	Metre

Abbreviations

RD	Diameter of the largest rotor
RTODAH	Rejected take-off distance available
s	Second
TLOF	Touchdown and lift-off area
TODAH	Take-off distance available
VMC	Visual meteorological conditions

Symbols

°	Degree
=	Equals
%	Percentage
±	Plus or minus

MANUALS

(related to the specifications of this Annex)

Aerodrome Design Manual (Doc 9157)
- Part 1 — Runways
- Part 2 — Taxiways, Aprons and Holding Bays
- Part 3 — Pavements
- Part 4 — Visual Aids
- Part 5 — Electrical Systems

Airport Planning Manual (Doc 9184)
- Part 1 — Master Planning
- Part 2 — Land Use and Environmental Control
- Part 3 — Guidelines for Consultant/Construction Services

Airport Services Manual (Doc 9137)
- Part 1 — Rescue and Fire Fighting
- Part 2 — Pavement Surface Conditions
- Part 3 — Bird Control and Reduction
- Part 4 — Fog Dispersal (withdrawn)
- Part 5 — Removal of Disabled Aircraft
- Part 6 — Control of Obstacles
- Part 7 — Airport Emergency Planning
- Part 8 — Airport Operational Services
- Part 9 — Airport Maintenance Practices

Heliport Manual (Doc 9261)

Stolport Manual (Doc 9150)

Manual on the ICAO Bird Strike Information System (IBIS) (Doc 9332)

Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476)

FOREWORD

Historical background

Standards and Recommended Practices for aerodromes were first adopted by the Council on 29 May 1951 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as Annex 14 to the Convention. The document containing these Standards and Recommended Practices is now designated as Annex 14, Volume I to the Convention. In general, Volume I addresses planning, design and operations of aerodromes but is not specifically applicable to heliports.

Therefore, Volume II is being introduced as a means of including provisions for heliports. Proposals for comprehensive Standards and Recommended Practices covering all aspects of heliport planning, design and operations have been developed with the assistance of the ANC Visual Aids Panel and the ANC Helicopter Operations Panel.

Table A shows the origin of the provisions in this volume, together with a list of the principal subjects involved and the dates on which the Annex was adopted by the Council, when it became effective and when it became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specified request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. The establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1. — *Material comprising the Annex proper:*

a) *Standards and Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specifications.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comsprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in five languages — English, Arabic, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb “shall” is used, and for Recommended Practices the operative verb “should'' is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 14, Volume II

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	Fourth Meeting of the ANC Helicopter Operations Panel; Eleventh Meeting of the ANC Visual Aids Panel and Secretariat	Physical characteristics; obstacle limitation surfaces; visual aids for visual meteorological conditions; rescue and fire fighting services.	9 March 1990 30 July 1990 15 November 1990
1 (2nd Edition)	Twelfth Meeting of the ANC Visual Aids Panel and Secretariat	Standard geodetic reference system (WGS-84); frangibility; visual aids for helicopter non-precision approaches; and visual alignment guidance system.	13 March 1995 24 July 1995 9 November 1995
2	Air Navigation Commission	Aeronautical data bases and vertical component of the World Geodetic System — 1984 (WGS-84).	21 March 1997 21 July 1997 6 November 1997
3	Fourteenth Meeting of the ANC Visual Aids Panel and Secretariat	Definitions of calendar, datum, Gregorian calendar and obstacle; common reference systems; heliport dimensions and related information; touchdown and lift-off area lighting system; Appendix 1 — Aeronautical Data Quality Requirements.	27 February 2004 12 July 2004 25 November 2004

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. GENERAL

Introductory Note.— Volume II of this Annex contains Standards and Recommended Practices (specifications) that prescribe the physical characteristics and obstacle limitation surfaces to be provided for at heliports, and certain facilities and technical services normally provided at a heliport. It is not intended that these specifications limit or regulate the operation of an aircraft.

The specifications in this volume modify or complement those in Volume I which, where appropriate, are also applicable to heliports. In other words, where a particular issue is a subject of a specification in this volume that specification will supersede any other specification on that particular issue in Volume I. Throughout this volume the term "heliport" is used; however, it is intended that these specifications also apply to areas for the exclusive use of helicopters at an aerodrome primarily meant for the use of aeroplanes.

It is to be noted that provisions for helicopter flight operations are contained in Annex 6, Part III.

1.1 Definitions

When the following terms are used in this volume, they have the meanings given below. Annex 14, Volume I, contains definitions for those terms which are used in both volumes.

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data, the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Air taxiway. A defined path on the surface established for the air taxiing of helicopters.

Air transit route. A defined path on the surface established for the air transitting of helicopters.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Data quality. A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Declared distances — heliports.

a) *Take-off distance available (TODAH).* The length of the final approach and take-off area plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off.

b) *Rejected take-off distance available (RTODAH).* The length of the final approach and take-off area declared available and suitable for performance class 1 helicopters to complete a rejected take-off.

c) *Landing distance available (LDAH).* The length of the final approach and take-off area plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

Elevated heliport. A heliport located on a raised structure on land.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance class 1 helicopters, the defined area includes the rejected take-off area available.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

* All ISO Standards are listed at the end of this chapter.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Helicopter clearway. A defined area on the ground or water under the control of the appropriate authority, selected and/ or prepared as a suitable area over which a performance class 1 helicopter may accelerate and achieve a specific height.

Helicopter ground taxiway. A ground taxiway for use by helicopters only.

Helicopter stand. An aircraft stand which provides for parking a helicopter and, where air taxiing operations are contemplated, the helicopter touchdown and lift-off.

Helideck. A heliport located on a floating or fixed off-shore structure.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Orthometric height. Height of a point related to the geoid, generally presented as an MSL elevation.

Safety area. A defined area on a heliport surrounding the FATO which is free of obstacles, other than those required for air navigation purposes, and intended to reduce the risk of damage to helicopters accidentally diverging from the FATO.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Surface level heliport. A heliport located on the ground or on the water.

Touchdown and lift-off area (TLOF). A load bearing area on which a helicopter may touch down or lift off.

1.2 Applicability

1.2.1 The interpretation of some of the specifications in the Annex expressly requires the exercising of discretion, the taking of a decision or the performance of a function by the appropriate authority. In other specifications, the expression appropriate authority does not actually appear although its inclusion is implied. In both cases, the responsibility for whatever determination or action is necessary shall rest with the State having jurisdiction over the heliport.

1.2.2 The specifications in Annex 14, Volume II, shall apply to all heliports intended to be used by helicopters in international civil aviation. The specifications of Annex 14, Volume I, shall apply, where appropriate, to these heliports as well.

1.2.3 Wherever a colour is referred to in this volume, the specifications for that colour given in Appendix 1 to Annex 14, Volume I, shall apply.

1.3 Common reference systems

1.3.1 Horizontal reference system

1.3.1.1 World Geodetic System — 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system. Reported aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual (Doc 9674).

1.3.2 Vertical reference system

1.3.2.1 Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system.

Note 1.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

Note 2.— Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

1.3.3 Temporal reference system

1.3.3.1 The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.

1.3.3.2 When a different temporal reference system is used, this shall be indicated in GEN 2.1.2 of the Aeronautical Information Publication (AIP).

* ISO Standard
19104, *Geographic information — Terminology*
19108, *Geographic information — Temporal schema*

CHAPTER 2. HELIPORT DATA

2.1 Aeronautical data

2.1.1 Determination and reporting of heliport related aeronautical data shall be in accordance with the accuracy and integrity requirements set forth in Tables 1 to 5 contained in Appendix 1 while taking into account the established quality system procedures. Accuracy requirements for aeronautical data are based upon a 95 per cent confidence level and in that respect, three types of positional data shall be identified: surveyed points (e.g. FATO threshold), calculated points (mathematical calculations from the known surveyed points of points in space, fixes) and declared points (e.g. flight information region boundary points).

Note. — Specifications governing the quality system are given in Annex 15, Chapter 3.

2.1.2 Contracting States shall ensure that integrity of aeronautical data is maintained throughout the data process from survey/origin to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classification and data integrity level shall apply:

a) *critical data, integrity level 1×10^{-8}*: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) *essential data, integrity level 1×10^{-5}*: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) *routine data, integrity level 1×10^{-3}*: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

2.1.3 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 2.1.2, a 32- or 24-bit CRC algorithm shall apply respectively.

2.1.4 **Recommendation.—** *To achieve protection of the integrity level of routine aeronautical data as classified in 2.1.2, a 16-bit CRC algorithm should apply.*

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendix 1 related to accuracy and integrity of aeronautical data, is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 —* Industry Requirements for Aeronautical Information.

2.1.5 Geographical coordinates indicating latitude and longitude shall be determined and reported to the aeronautical information services authority in terms of the World Geodetic System — 1984 (WGS-84) geodetic reference datum, identifying those geographical coordinates which have been transformed into WGS-84 coordinates by mathematical means and whose accuracy of original field work does not meet the requirements in Appendix 1, Table 1.

2.1.6 The order of accuracy of the field work shall be such that the resulting operational navigation data for the phases of flight will be within the maximum deviations, with respect to an appropriate reference frame, as indicated in tables contained in Appendix 1.

2.1.7 In addition to the elevation (referenced to mean sea level) of the specific surveyed ground positions at heliports, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions as indicated in Appendix 1, shall be determined and reported to the aeronautical information services authority.

Note 1.— An appropriate reference frame is that which enables WGS-84 to be realized on a given heliport and with respect to which all coordinate data are related.

Note 2.— Specifications governing the publication of WGS-84 coordinates are given in Annex 4, Chapter 2, and Annex 15, Chapter 3.

2.2 Heliport reference point

2.2.1 A heliport reference point shall be established for a heliport not co-located with an aerodrome.

Note.— When the heliport is co-located with an aerodrome, the established aerodrome reference point serves both aerodrome and heliport.

2.2.2 The heliport reference point shall be located near the initial or planned geometric centre of the heliport and shall normally remain where first established.

2.2.3 The position of the heliport reference point shall be measured and reported to the aeronautical information services authority in degrees, minutes and seconds.

2.3 Heliport elevation

2.3.1 The heliport elevation and geoid undulation at the heliport elevation position shall be measured and reported to the aeronautical information services authority to the accuracy of one-half metre or foot.

2.3.2 For a heliport used by international civil aviation, the elevation of the touchdown and lift-off area and/or the elevation and geoid undulation of each threshold of the final approach and take-off area (where appropriate) shall be measured and reported to the aeronautical information services authority to the accuracy of:

— one-half metre or foot for non-precision approaches; and

— one-quarter metre or foot for precision approaches.

Note.— Geoid undulation must be measured in accordance with the appropriate system of coordinates.

2.4 Heliport dimensions and related information

2.4.1 The following data shall be measured or described, as appropriate, for each facility provided on a heliport:

a) heliport type — surface-level, elevated or helideck;

b) touchdown and lift-off area — dimensions to the nearest metre or foot, slope, surface type, bearing strength in tonnes (1 000 kg);

c) final approach and take-off area — type of FATO, true bearing to one-hundredth of a degree, designation number (where appropriate), length, width to the nearest metre or foot, slope, surface type;

d) safety area — length, width and surface type;

e) helicopter ground taxiway, air taxiway and air transit route — designation, width, surface type;

f) apron — surface type, helicopter stands;

g) clearway — length, ground profile;

h) visual aids for approach procedures, marking and lighting of FATO, TLOF, taxiways and aprons; and

i) distances to the nearest metre or foot of localizer and glide path elements comprising an instrument landing system (ILS) or azimuth and elevation antenna of microwave landing system (MLS) in relation to the associated TLOF or FATO extremities.

2.4.2 The geographical coordinates of the geometric centre of the touchdown and lift-off area and/or of each threshold of the final approach and take-off area (where appropriate) shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.3 The geographical coordinates of appropriate centre line points of helicopter ground taxiways, air taxiways and air transit routes shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.4 The geographical coordinates of each helicopter stand shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and hundredths of seconds.

2.4.5 The geographical coordinates of obstacles in Area 2 (the part within the heliport boundary) and in Area 3 shall be measured and reported to the aeronautical information services authority in degrees, minutes, seconds and tenths of seconds. In addition, the top elevation, type, marking and lighting (if any) of obstacles shall be reported to the aeronautical information services authority.

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Areas 2 and 3.

Note 2.— Appendix 1 to this Annex provides requirements for obstacle data determination in Areas 2 and 3.

Note 3. — Implementation of Annex 15, provision 10.6.1.2, concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

2.5 Declared distances

The following distances to the nearest metre or foot shall be declared, where relevant, for a heliport:

a) take-off distance available;

b) rejected take-off distance available; and

c) landing distance available.

2.6 Co-ordination between aeronautical information services and heliport authorities

2.6.1 To ensure that aeronautical information services units obtain information to enable them to provide up-to-date pre-flight information and to meet the need for in-flight information, arrangements shall be made between aeronautical information services and heliport authorities responsible for heliport services to report to the responsible aeronautical information services unit, with a minimum of delay:

a) information on heliport conditions;

b) the operational status of associated facilities, services and navigation aids within their area of responsibility;

c) any other information considered to be of operational significance.

2.6.2 Before introducing changes to the air navigation system, due account shall be taken by the services responsible for such changes of the time needed by the aeronautical information service for the preparation, production and issue of relevant material for promulgation. To ensure timely provision of the information to the aeronautical information service, close co-ordination between those services concerned is therefore required.

2.6.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible heliport services when submitting the raw information/data to aeronautical information services.

2.6.4 The heliport services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do that while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 1 to this Annex.

Note 1.— Specifications for the issue of a NOTAM and SNOWTAM are contained in Annex 15, Chapter 5, and Appendices 6 and 2, respectively.

Note 2.— The AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

Note 3.— The schedule of the predetermined internationally agreed AIRAC common effective dates at intervals of 28 days, including 6 November 1997, and guidance for the AIRAC use are contained in the Aeronautical Information Services Manual *(Doc 8126, Chapter 2, 2.6).*

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 Surface-level heliports

Note.— The following specifications are for surface-level land heliports (except where specified).

Final approach and take-off areas

3.1.1 A surface-level heliport shall be provided with at least one FATO.

Note.— A FATO may be located on or near a runway strip or taxiway strip.

3.1.2 The dimensions of a FATO shall be:

a) for a heliport intended to be used by performance class 1 helicopters, as prescribed in the helicopter flight manual except that, in the absence of width specifications, the width shall be not less than 1.5 times the over-all length/width, whichever is greater, of the longest/widest helicopter the heliport is intended to serve;

b) for a water heliport intended to be used by performance class 1 helicopters, as prescribed in a) above, plus 10 per cent;

c) for a heliport intended to be used by performance class 2 and 3 helicopters, of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than 1.5 times the over-all length/width, whichever is greater, of the longest/widest helicopter the heliport is intended to serve; and

d) for a water heliport intended to be used by performance class 2 and 3 helicopters, of sufficient size to contain an area within which can be drawn a circle of diameter not less than two times the over-all length/width, whichever is greater, of the longest/widest helicopter the heliport is intended to serve.

Note.— Local conditions, such as elevation and temperature, may need to be considered when determining the size of a FATO. Guidance is given in the Heliport Manual.

3.1.3 The over-all slope in any direction on the FATO shall not exceed 3 per cent. No portion of a FATO shall have a local slope exceeding:

a) 5 per cent where the heliport is intended to be used by performance class 1 helicopters; and

b) 7 per cent where the heliport is intended to be used by performance class 2 and 3 helicopters.

3.1.4 The surface of the FATO shall:

a) be resistant to the effects of rotor downwash;

b) be free of irregularities that would adversely affect the take-off or landing of helicopters; and

c) have bearing strength sufficient to accommodate a rejected take-off by performance class 1 helicopters.

3.1.5 **Recommendation.—** *The FATO should provide ground effect.*

Helicopter clearways

3.1.6 When it is necessary to provide a helicopter clearway, it shall be located beyond the upwind end of the rejected take-off area available.

3.1.7 **Recommendation.—** *The width of a helicopter clearway should not be less than that of the associated safety area.*

3.1.8 **Recommendation.—** *The ground in a helicopter clearway should not project above a plane having an upward slope of 3 per cent, the lower limit of this plane being a horizontal line which is located on the periphery of the FATO.*

3.1.9 **Recommendation.—** *An object situated on a helicopter clearway which may endanger helicopters in the air should be regarded as an obstacle and should be removed.*

Touchdown and lift-off areas

3.1.10 At least one touchdown and lift-off area shall be provided at a heliport.

Note.— The touchdown and lift-off area may or may not be located within the FATO.

3.1.11 The touchdown and lift-off area (TLOF) shall be of sufficient size to contain a circle of diameter 1.5 times the length or width of the undercarriage, whichever is the greater, of the largest helicopter the area is intended to serve.

Note.— A touchdown and lift-off area may be any shape.

3.1.12 Slopes on a touchdown and lift-off area shall be sufficient to prevent accumulation of water on the surface of the area, but shall not exceed 2 per cent in any direction.

3.1.13 A touchdown and lift-off area shall be capable of withstanding the traffic of helicopters that the area is intended to serve.

Safety areas

3.1.14 A FATO shall be surrounded by a safety area.

3.1.15 A safety area surrounding a FATO intended to be used in visual meteorological conditions (VMC) shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 times the over-all length/width, whichever is greater, of the longest/widest helicopter the area is intended to serve.

3.1.16 A safety area surrounding a FATO intended to be used by helicopter operations in instrument meteorological conditions (IMC) shall extend:

a) laterally to a distance of at least 45 m on each side of the centre line; and

b) longitudinally to a distance of at least 60 m beyond the ends of the FATO.

Note.— See Figure 3-1.

3.1.17 No fixed object shall be permitted on a safety area, except for frangible objects, which, because of their function, must be located on the area. No mobile object shall be permitted on a safety area during helicopter operations.

3.1.18 Objects whose functions require them to be located on the safety area shall not exceed a height of 25 cm when located along the edge of the FATO nor penetrate a plane originating at a height of 25 cm above the edge of the FATO and sloping upwards and outwards from the edge of the FATO at a gradient of 5 per cent.

3.1.19 The surface of the safety area shall not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

3.1.20 The surface of the safety area shall be treated to prevent flying debris caused by rotor downwash.

3.1.21 The surface of the safety area abutting the FATO shall be continuous with the FATO and be capable of supporting, without structural damage, the helicopters that the heliport is intended to serve.

Helicopter ground taxiways

Note.— A helicopter ground taxiway is intended to permit the surface movement of a wheeled helicopter under its own power. The specifications for taxiways, taxiway shoulders and taxiway strips included in Annex 14, Volume I are equally applicable to heliports as modified below. When a taxiway is intended for use by aeroplanes and helicopters, the provisions for taxiways and helicopter ground taxiways will be examined and the more stringent requirements will be applied.

3.1.22 The width of a helicopter ground taxiway shall not be less than:

Helicopter main gear span	Helicopter ground taxiway width
Up to but not including 4.5 m	7.5 m
4.5 m up to but not including 6 m	10.5 m
6 m up to but not including 10 m	15 m
10 m and over	20 m

3.1.23 The separation distance between a helicopter ground taxiway and another helicopter ground taxiway, an air taxiway, an object or helicopter stand shall not be less than the appropriate dimension specified in Table 3-1.

3.1.24 The longitudinal slope of a helicopter ground taxiway shall not exceed 3 per cent.

3.1.25 **Recommendation.—** *A helicopter ground taxiway should be capable of withstanding the traffic of helicopters that the helicopter ground taxiway is intended to serve.*

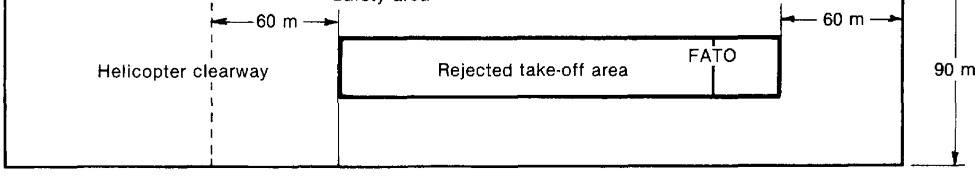


Figure 3-1. Safety area for instrument FATO

3.1.26 **Recommendation.—** *A helicopter ground taxiway should be provided with shoulders which extend symmetrically on each side of the helicopter ground taxiway for at least one-half the greatest over-all width of the helicopters that the helicopter ground taxiway is intended to serve.*

3.1.27 The helicopter ground taxiway and its shoulder shall provide rapid drainage but the helicopter ground taxiway transverse slope shall not exceed 2 per cent.

3.1.28 **Recommendation.—** *The surface of a helicopter ground taxiway shoulder should be resistant to the effect of rotor downwash.*

Air taxiways

Note.— An air taxiway is intended to permit the movement of a helicopter above the surface at a height normally associated with ground effect and at groundspeed less than 37 km/h (20 kt).

3.1.29 The width of an air taxiway shall be at least two times the greatest over-all width of the helicopters that the air taxiway is intended to serve.

3.1.30 The surface of an air taxiway shall:

a) be resistant to the effects of rotor downwash; and

b) be suitable for emergency landings.

3.1.31 **Recommendation.—** *The surface of an air taxiway should provide ground effect.*

3.1.32 **Recommendation.—** *The transverse slope of the surface of an air taxiway should not exceed 10 per cent and the longitudinal slope should not exceed 7 per cent. In any event, the slopes should not exceed the slope landing limitations of the helicopters the air taxiway is intended to serve.*

3.1.33 The separation distance between an air taxiway and another air taxiway, a helicopter ground taxiway, an object or a helicopter stand shall not be less than the appropriate dimension in Table 3-1.

Air transit route

Note.— An air transit route is intended to permit the movement of a helicopter above the surface, normally at heights not above 30 m (100 ft) above ground level and at ground speeds exceeding 37 km/h (20 kt).

3.1.34 The width of an air transit route shall not be less than:

a) 7.0 times RD when the air transit route is intended for use by day only; and

b) 10.0 times RD when the air transit route is intended for use at night;

when RD is the diameter of the largest rotor of the helicopters that the air transit route is intended to serve.

3.1.35 Any variation in the direction of the centre line of an air transit route shall not exceed 120° and be designed so as not to necessitate a turn of radius less than 270 m.

Note.— It is intended that air transit routes be selected so as to permit autorotative or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water, or damage to property are minimized.

Aprons

Note.— The specifications for aprons included in Chapter 3 of Annex 14, Volume I are equally applicable to heliports as modified below.

Table 3-1. Helicopter ground taxiway and air taxiway separation distances (expressed in multiples of greatest over-all width of helicopter with rotor turning)

Facility	Helicopter ground taxiway	Air taxiway	Object	Helicopter stand
Helicopter ground taxiway	2 (between edges)	4 (between centre lines)	1 (edge to object)	2 (between edges)
Air taxiway	4 (between centre lines)	4 (between centre lines)	1½ (centre line to object)	4 (centre line to edge)

3.1.36 The slope in any direction on a helicopter stand shall not exceed 2 per cent.

3.1.37 The minimum clearance between a helicopter using a helicopter stand and an object or any aircraft on another stand shall not be less than half the greatest over-all width of the helicopters that the stand is intended to serve.

Note.— Where simultaneous hover operations are to be provided for, the separation distances specified in Table 3-1 between two air taxiways are to be applied.

3.1.38 A helicopter stand shall be of sufficient size to contain a circle of diameter of at least the largest over-all dimension of the largest helicopter the stand is expected to serve.

Location of a final approach and take-off area in relation to a runway or taxiway

3.1.39 Where a FATO is located near a runway or taxiway, and simultaneous VMC operations are planned, the separation distance between the edge of a runway or taxiway and the edge of a FATO shall not be less than the appropriate dimension in Table 3-2.

3.1.40 **Recommendation.—** *A FATO should not be located:*

a) near taxiway intersections or holding points where jet engine efflux is likely to cause high turbulence; or

b) near areas where aeroplane vortex wake generation is likely to exist.

Table 3-2. FATO minimum separation distance

If aeroplane mass and/or helicopter mass are	Distance between FATO edge and runway edge or taxiway edge
up to but not including 2 720 kg	60 m
2 720 kg up to but not including 5 760 kg	120 m
5 760 kg up to but not including 100 000 kg	180 m
100 000 kg and over	250 m

3.2 Elevated heliports

Final approach and take-off area and touchdown and lift-off area

Note.— On elevated heliports it is presumed that the FATO and the touchdown and lift-off area will be coincidental.

3.2.1 An elevated heliport shall be provided with at least one FATO.

3.2.2 The dimensions of the FATO shall be:

a) for a heliport intended to be used by performance class 1 helicopters, as prescribed in the helicopter flight manual except that, in the absence of width specifications, the width shall be not less than 1.5 times the over-all length/width, whichever is greater, of the longest/widest helicopter the heliport is intended to serve; and

b) for a heliport intended to be used by performance class 2 helicopters, of sufficient size and shape to contain an area within which can be drawn a circle of diameter not less than 1.5 times the over-all length/ width, whichever is greater, of the longest/widest helicopter the heliport is intended to serve.

3.2.3 **Recommendation.—** *The slope requirements for elevated heliports should conform to the requirements for surface level heliports specified in 3.1.3.*

3.2.4 The FATO shall be capable of withstanding the traffic of helicopters the heliport is intended to serve. Design considerations shall take into account additional loading resulting from the presence of personnel, snow, freight, refuelling, fire fighting equipment, etc.

Note.— Guidance on structural design for elevated heliports is given in the Heliport Manual.

Safety area

3.2.5 The FATO shall be surrounded by a safety area.

3.2.6 The safety area shall extend outwards from the periphery of the FATO for a distance of at least 3 m or 0.25 times the over-all length/width, whichever is greater, of the longest/widest helicopter intended to use the elevated heliport.

3.2.7 No fixed object shall be permitted on a safety area, except for frangible objects, which, because of their function, must be located on the area. No mobile object shall be permitted on a safety area during helicopter operations.

3.2.8 Objects whose function require them to be located on the safety area shall not exceed a height of 25 cm when located along the edge of the FATO nor penetrate a plane originating at a height of 25 cm above the edge of the FATO and sloping upwards and outwards from the edge of the FATO at a gradient of 5 per cent.

3.2.9 The surface of the safety area shall not exceed an upward slope of 4 per cent outwards from the edge of the FATO.

3.2.10 The surface of the safety area abutting the FATO shall be continuous with the FATO and be capable of supporting, without structural damage, the helicopters that the heliport is intended to serve.

3.3 Helidecks

Note.— The following specifications are for helidecks located on structures engaged in such activities as mineral exploitation, research or construction. See 3.4 for shipboard heliport provisions.

Final approach and take-off area and touchdown and lift-off area

Note.— On helidecks it is presumed that the FATO and the touchdown and lift-off area will be coincidental. Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperatures from gas turbine exhausts or flare radiated heat on the location of the FATO is given in the Heliport Manual.

3.3.1 A helideck shall be provided with at least one FATO.

3.3.2 A FATO may be any shape but shall, for a single main rotor helicopter or side-by-side twin main rotor helicopter, be of sufficient size to contain an area within which can be drawn a circle of diameter not less than 1.0 times D of the largest helicopter the helideck is intended to serve, where D is the largest dimension of the helicopter when the rotors are turning.

3.3.3 Where omnidirectional landings by helicopters having tandem main rotors are intended, the FATO shall be of sufficient size to contain an area within which can be drawn a circle of diameter not less than 0.9 times the distance across the rotors in a fore and aft line. Where these provisions cannot be met, the FATO may be in the form of a rectangle with a small side not less than 0.75 D and a long side not less than 0.9 D but within this rectangle, bi-directional landings only will be permitted in the direction of the 0.9 D dimension.

3.3.4 No fixed object shall be permitted around the edge of the FATO except for frangible objects, which, because of their function, must be located thereon.

3.3.5 Objects whose function require them to be located on the edge of the FATO shall not exceed a height of 25 cm.

3.3.6 The surface of the FATO shall be skid-resistant to both helicopters and persons and be sloped to prevent pooling of liquids. Where the helideck is constructed in the form of a grating, the underdeck design shall be such that ground effect is not reduced.

Note.— Guidance on rendering the surface of the FATO skid-resistant is contained in the Heliport Manual.

3.4 Shipboard heliports

3.4.1 When helicopter operating areas are provided in the bow or stern of a ship or are purpose-built above the ship's structure, they shall be regarded as helidecks and the criteria given in 3.3 shall apply.

Final approach and take-off area and touchdown and lift-off area

Note.— On heliports located in other areas of ships it is presumed that the FATO and the touchdown and lift-off area will be coincidental. Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperature from gas turbine exhausts or flare radiated heat on the location of the FATO is given in the Heliport Manual.

3.4.2 Shipboard heliports shall be provided with at least one FATO.

3.4.3 A FATO on a shipboard heliport shall be circular and shall be of sufficient size to contain a diameter not less than 1.0 times D of the largest helicopter the heliport is intended to serve where D is the largest dimension of the helicopter when the rotors are turning.

3.4.4 The surface of the FATO shall be skid-resistant to both helicopters and persons.

CHAPTER 4. OBSTACLE RESTRICTION AND REMOVAL

Note.— The objectives of the specifications in this chapter are to define the airspace around heliports to be maintained free from obstacles so as to permit the intended helicopter operations at the heliports to be conducted safely and to prevent the heliports becoming unusable by the growth of obstacles around them. This is achieved by establishing a series of obstacle limitation surfaces that define the limits to which objects may project into the airspace.

4.1 Obstacle limitation surfaces and sectors

Approach surface

4.1.1 *Description.* An inclined plane or a combination of planes sloping upwards from the end of the safety area and centred on a line passing through the centre of the FATO.

Note.— See Figure 4-1.

4.1.2 *Characteristics.* The limits of an approach surface shall comprise:

a) an inner edge horizontal and equal in length to the minimum specified width of the FATO plus the safety area, perpendicular to the centre line of the approach surface and located at the outer edge of the safety area;

b) two side edges originating at the ends of the inner edge and:

   1) for other than a precision approach FATO, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO,

   2) for a precision approach FATO, diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO, to a specified height above FATO, and then diverging uniformly at a specified rate to a specified final width and continuing thereafter at that width for the remaining length of the approach surface; and

c) an outer edge horizontal and perpendicular to the centre line of the approach surface and at a specified height above the elevation of the FATO.

4.1.3 The elevation of the inner edge shall be the elevation of the safety area at the point on the inner edge that is intersected by the centre line of the approach surface.

4.1.4 The slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the surface.

Note.— For heliports used by performance class 2 and 3 helicopters, it is intended that approach paths be selected so as to permit safe forced landing or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water or damage to property are minimized. Provisions for forced landing areas are expected to minimize risk of injury to the occupants of the helicopter. The most critical helicopter type for which the heliport is intended and the ambient conditions will be factors in determining the suitability of such areas.

Transitional surface

4.1.5 *Description.* A complex surface along the side of the safety area and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface or a predetermined height.

Note.— See Figure 4-1.

4.1.6 *Characteristics.* The limits of a transitional surface shall comprise:

a) a lower edge beginning at the intersection of the side of the approach surface with the inner horizontal surface, or beginning at a specified height above the lower edge when an inner horizontal surface is not provided, and extending down the side of the approach surface to the inner edge of the approach surface and from there along the length of the side of the safety area parallel to the centre line of the FATO; and

b) an upper edge located in the plane of the inner horizontal surface, or at a specified height above the lower edge when an inner horizontal surface is not provided.

4.1.7 The elevation of a point on the lower edge shall be:

a) along the side of the approach surface — equal to the elevation of the approach surface at that point; and

b) along the safety area — equal to the elevation of the centre line of the FATO opposite that point.

Note.— As a result of b) the transitional surface along the safety area will be curved if the profile of the FATO is curved, *or a plane if the profile is a straight line. The intersection of the transitional surface with the inner horizontal surface, or upper edge when an inner horizontal surface is not provided, will also be a curved or a straight line depending on the profile of the FATO.*

4.1.8 The slope of the transitional surface shall be measured in a vertical plane at right angles to the centre line of the FATO.

Inner horizontal surface

Note.— The intent of the inner horizontal surface is to allow safe visual manoeuvring.

4.1.9 *Description.* A circular surface located in a horizontal plane above a FATO and its environs.

Note.— See Figure 4-1.

4.1.10 *Characteristics.* The radius of the inner horizontal surface shall be measured from the mid-point of the FATO.

4.1.11 The height of the inner horizontal surface shall be measured above an elevation datum established for such purpose.

Note.— Guidance on determining the elevation datum is contained in the Heliport Manual.

Conical surface

4.1.12 *Description.* A surface sloping upwards and outwards from the periphery of the inner horizontal surface, or from the outer limit of the transitional surface if an inner horizontal surface is not provided.

Note.— See Figure 4-1.

4.1.13 *Characteristics.* The limits of the conical surface shall comprise:

a) a lower edge coincident with the periphery of the inner horizontal surface, or outer limit of the transitional surface if an inner horizontal surface is not provided; and

b) an upper edge located at a specified height above the inner horizontal surface, or above the elevation of the lowest end of the FATO if an inner horizontal surface is not provided.

4.1.14 The slope of the conical surface shall be measured above the horizontal.

Take-off climb surface

4.1.15 *Description.* An inclined plane, a combination of planes or, when a turn is involved, a complex surface sloping upwards from the end of the safety area and centred on a line passing through the centre of the FATO.

Note.— See Figure 4-1.

4.1.16 *Characteristics.* The limits of a take-off climb surface shall comprise:

a) an inner edge horizontal and equal in length to the minimum specified width of the FATO plus the safety area, perpendicular to the centre line of the take-off climb surface and located at the outer edge of the safety area or clearway;

b) two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate from the vertical plane containing the centre line of the FATO; and

c) an outer edge horizontal and perpendicular to the centre line of the take-off climb surface and at a specified height above the elevation of the FATO.

4.1.17 The elevation of the inner edge shall be the elevation of the safety area at the point on the inner edge that is intersected by the centre line of the take-off climb surface, except that when a clearway is provided, the elevation shall be equal to the highest point on the ground on the centre line of the clearway.

4.1.18 In the case of a straight take-off climb surface, the slope shall be measured in the vertical plane containing the centre line of the surface.

4.1.19 In the case of a take-off climb surface involving a turn, the surface shall be a complex surface containing the horizontal normals to its centre line and the slope of the centre line shall be the same as that for a straight take-off climb surface. That portion of the surface between the inner edge and 30 m above the inner edge shall be straight.

4.1.20 Any variation in the direction of the centre line of a take-off climb surface shall be designed so as not to necessitate a turn of radius less than 270 m.

Note.— For heliports used by performance class 2 and 3 helicopters, it is intended that departure paths be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or water or damage to property are minimized. Provisions for forced landing areas are expected to minimize risk of injury to the occupants of the helicopter. The most critical helicopter type for which the heliport is intended and the ambient conditions will be factors in determining the suitability of such areas.

Obstacle-free sector/surface — helidecks

4.1.21 *Description.* A complex surface originating at a reference point on the edge of the FATO of a helideck and extending to a specified distance.

4.1.22 *Characteristics.* An obstacle-free sector/surface shall subtend an arc of specified angle.

4.1.23 For helidecks the obstacle-free sector shall subtend an arc of 210° and extend outwards to a distance compatible with the one-engine inoperative capability of the most critical helicopter the helideck is intended to serve. The surface shall be a horizontal plane level with the elevation of the helideck except that, over an arc of 180° passing through the centre of the FATO, the surface shall be at water level, extending outwards for a distance compatible with the take-off space required for the most critical helicopter the helideck is intended to serve (see Figure 4-2).

Limited obstacle surface — helidecks

4.1.24 *Description.* A complex surface originating at the reference point for the obstacle-free sector and extending over the arc not covered by the obstacle-free sector as shown in Figures 4-3, 4-4 and 4-5 and within which the height of obstacles above the level of the FATO will be prescribed.

4.1.25 *Characteristics.* The limited obstacle surface shall not subtend an arc greater than a specified angle and shall be sufficient to include that area not covered by the obstacle-free sector.

4.2 Obstacle limitation requirements

Note.— The requirements for obstacle limitation surfaces are specified on the basis of the intended use of a FATO, i.e. approach manoeuvre to hover or landing, or take-off manoeuvre and type of approach, and are intended to be applied when such use is made of the FATO. In cases where operations are conducted to or from both directions of a FATO, then the function of certain surfaces may be nullified because of more stringent requirements of another lower surface.

Surface level heliports

4.2.1 The following obstacle limitation surfaces shall be established for a precision approach FATO:

a) take-off climb surface;

b) approach surface;

c) transitional surfaces; and

d) conical surface.

4.2.2 The following obstacle limitation surfaces shall be established for a non-precision approach FATO:

a) take-off climb surface;

b) approach surface;

c) transitional surfaces; and

d) conical surface if an inner horizontal surface is not provided.

4.2.3 The following obstacle limitation surfaces shall be established for a non-instrument FATO:

a) take-off climb surface; and

b) approach surface.

4.2.4 **Recommendation.—** *The following obstacle limitation surfaces should be established for a non-precision approach FATO:*

a) inner horizontal surface; and

b) conical surface.

Note.— An inner horizontal surface may not be required if a straight-in non-precision approach is provided at both ends.

4.2.5 The slopes of the surfaces shall not be greater than, and their other dimensions not less than those specified in Tables 4-1 to 4-4 and shall be located as shown in Figures 4-6 to 4-10.

4.2.6 New objects or extensions of existing objects shall not be permitted above any of the surfaces in 4.2.1 to 4.2.4 above except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6.*

4.2.7 **Recommendation.—** *Existing objects above any of the surfaces in 4.2.1 to 4.2.4 above should, as far as practicable, be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of helicopters.*

Note.— The application of curved take-off climb surfaces as specified in 4.1.19 may alleviate the problems created by objects infringing these surfaces.

4.2.8 A surface level heliport shall have at least two take-off climb and approach surfaces, separated by not less than 150°.

4.2.9 **Recommendation.—** *The number and orientation of take-off climb and approach surfaces should be such that the usability factor of a heliport is not less than 95 per cent for the helicopters the heliport is intended to serve.*

Elevated heliports

4.2.10 The obstacle limitation requirements for elevated heliports shall conform to the requirements for surface level heliports specified in 4.2.1 to 4.2.7.

4.2.11 An elevated heliport shall have at least two take-off climb and approach surfaces separated by not less than 150°.

Helidecks

Note.— The following specifications are for helidecks located on a structure and engaged in such activities as mineral exploitation, research, or construction, but excluding heliports on ships.

4.2.12 A helideck shall have an obstacle-free sector and, where necessary, a limited obstacle sector.

4.2.13 There shall be no fixed obstacles within the obstacle-free sector above the obstacle-free surface.

4.2.14 In the immediate vicinity of the helideck, obstacle protection for helicopters shall be provided below the heliport level. This protection shall extend over an arc of at least 180° with the origin at the centre of the FATO, with a descending gradient having a ratio of one unit horizontally to five units vertically from the edges of the FATO within the 180° sector.

4.2.15 Where a mobile obstacle or combination of obstacles within the obstacle-free sector is essential for the operation of the installation, the obstacle(s) shall not subtend an arc exceeding 30°, as measured from the centre of the FATO.

4.2.16 For single-main-rotor and side-by-side twin rotor helicopters, within the 150° limited obstacle surface/sector out to a distance of 0.62 D, measured from the centre of the FATO, objects shall not exceed a height of 0.05 D above the FATO. Beyond that arc, out to an over-all distance of 0.83 D the limited obstacle surface rises at a rate of one unit vertically for each two units horizontally (see Figure 4-3).

4.2.17 For omnidirectional operations by tandem-main-rotor helicopters within the 150° limited obstacle surface/sector out to a distance of 0.62 D, measured from the centre of the FATO, there shall be no fixed obstacles. Beyond that arc, out to an over-all distance of 0.83 D, objects shall not penetrate a level surface which has a height equivalent to 0.05 D above the FATO (see Figure 4-4).

4.2.18 For bi-directional operations by tandem-main-rotor helicopters, within the 0.62 D arc in the 150° limited obstacle surface/sector, objects shall not penetrate a level surface which has a height equivalent to 1.1 m above the FATO (see Figure 4-5).

Shipboard heliports

Amidships location

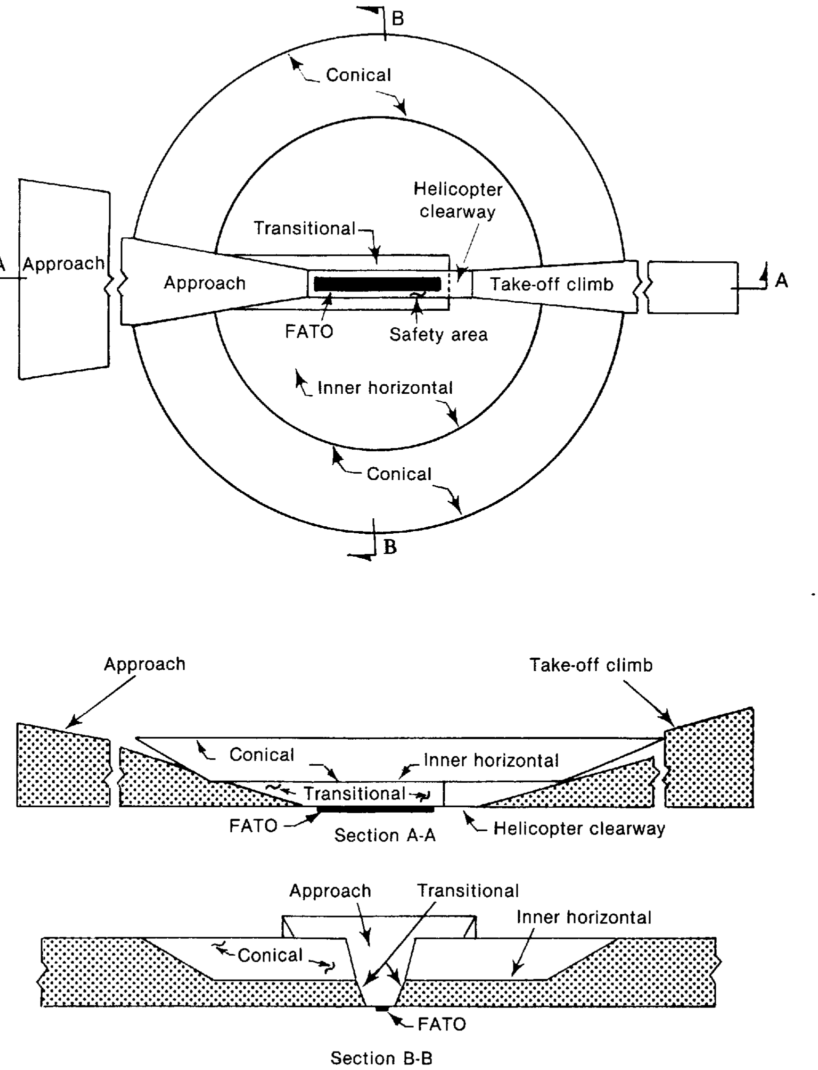
4.2.19 Forward and aft of the FATO shall be two symmetrically located sectors, each covering an arc of 150°, with their apexes on the periphery of the FATO D reference circle. Within the area enclosed by these two sectors, there shall be no objects rising above the level of the FATO, except those aids essential for the safe operation of a helicopter and then only up to a maximum height of 25 cm.

4.2.20 To provide further protection from obstacles fore and aft of the FATO, rising surfaces with gradients of one unit vertically to five units horizontally shall extend from the entire length of the edges of the two 150° sectors. These surfaces shall extend for a horizontal distance equal to at least the diameter of the FATO and shall not be penetrated by any obstacle (see Figure 4-11).

Ship's side location

4.2.21 From the fore and aft mid-points of the D reference circle, an area shall extend to the ship's rail to a fore and aft distance of 1.5 times the diameter of the FATO, located symmetrically about the athwartships bisector of the reference circle. Within this sector there shall be no objects rising above the level of the FATO, except those aids essential to the safe operation of the helicopter and then only up to a maximum height of 25 cm (see Figure 4-12).

4.2.22 A horizontal surface shall be provided, at least 0.25 times the diameter of the D reference circle, which shall surround the FATO and the obstacle-free sector, at a height of 0.05 times the diameter of the reference circle, which no object shall penetrate.



Note.— The figure shows the obstacle limitation surfaces at a heliport with a non-precision approach FATO and a clearway.

Figure 4-1. Obstacle limitation surfaces

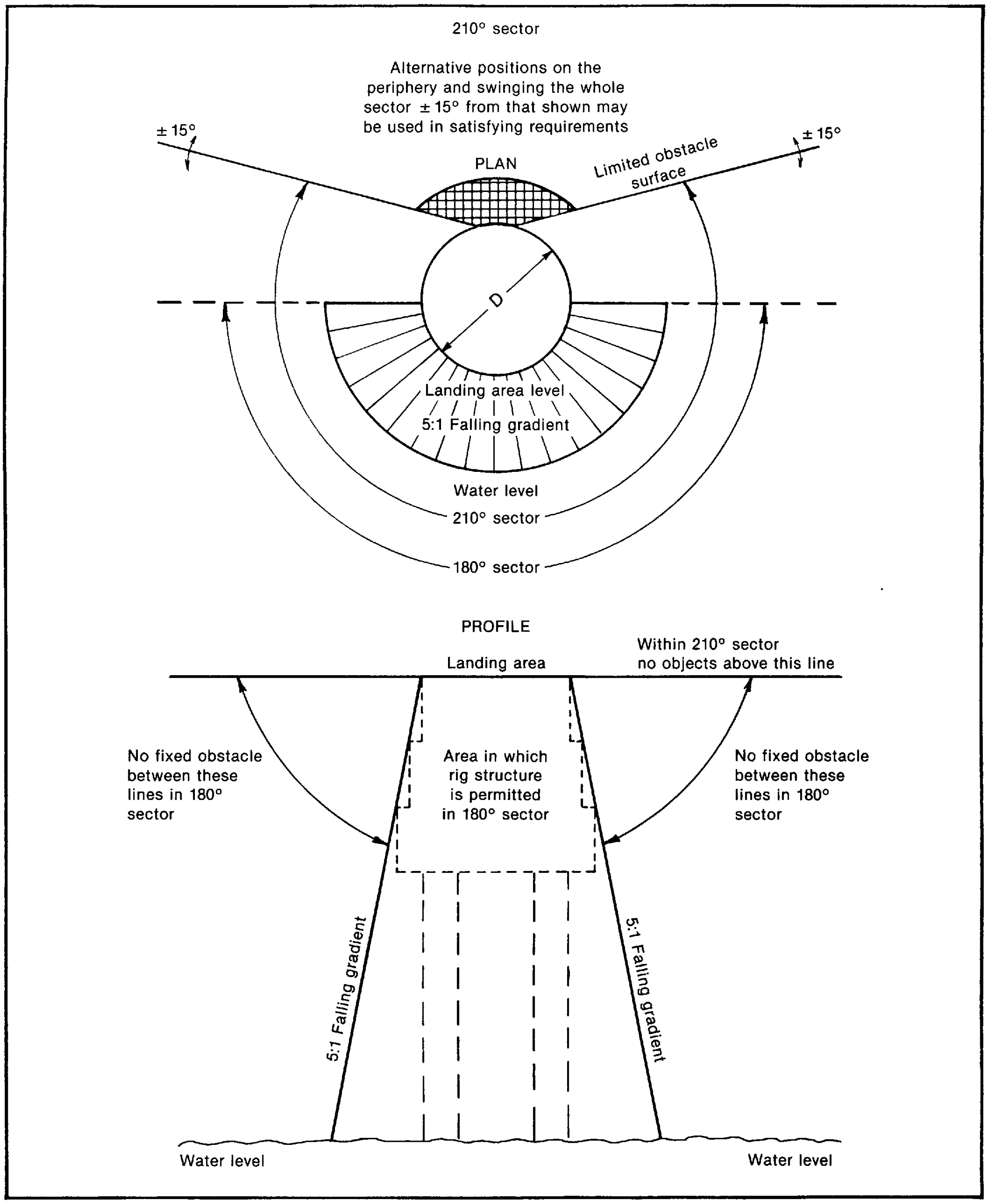


Figure 4-2. Helideck obstacle-free sector

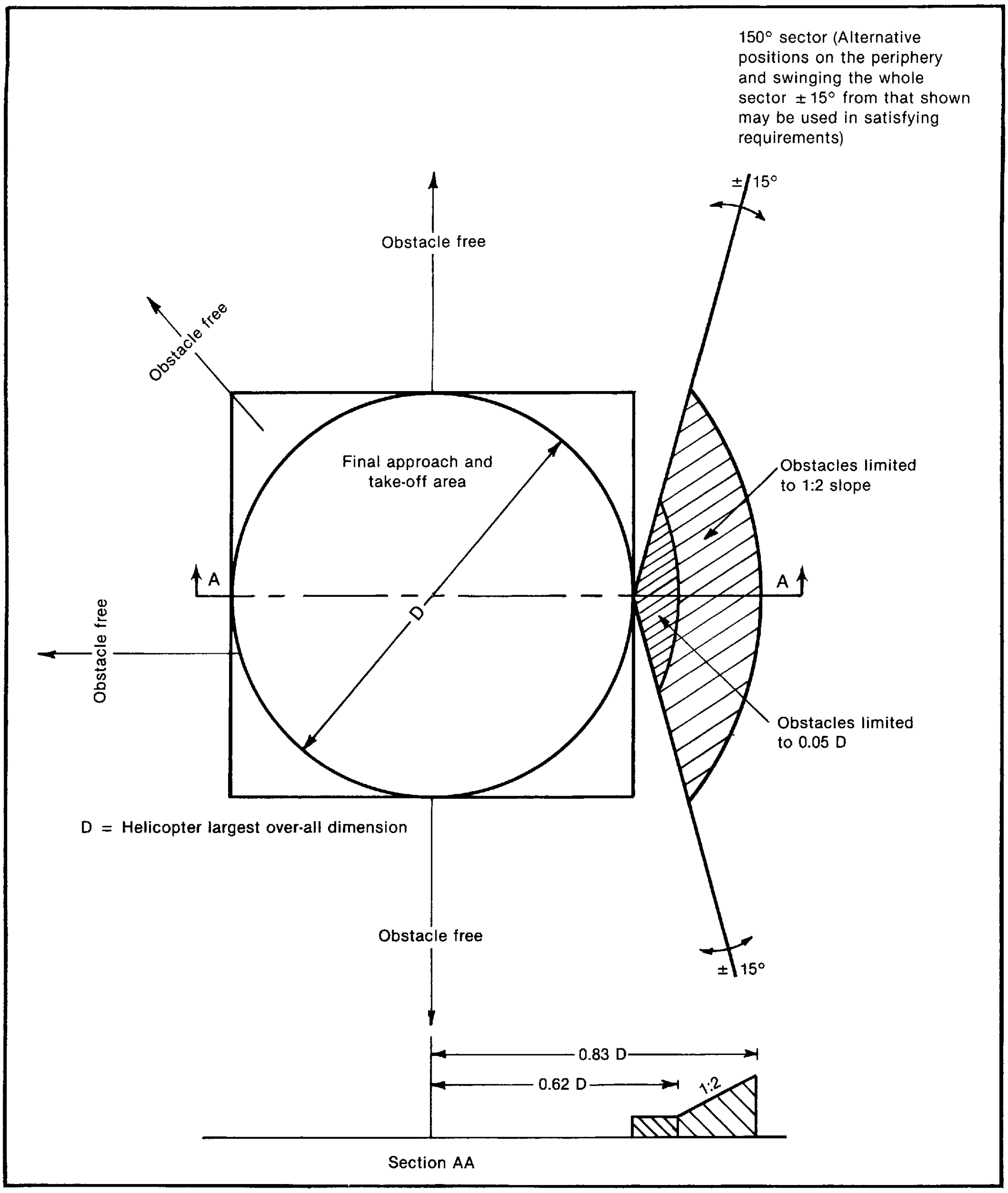


Figure 4-3. Helideck obstacle limitation sectors
Single-main-rotor and side-by-side twin rotor helicopters

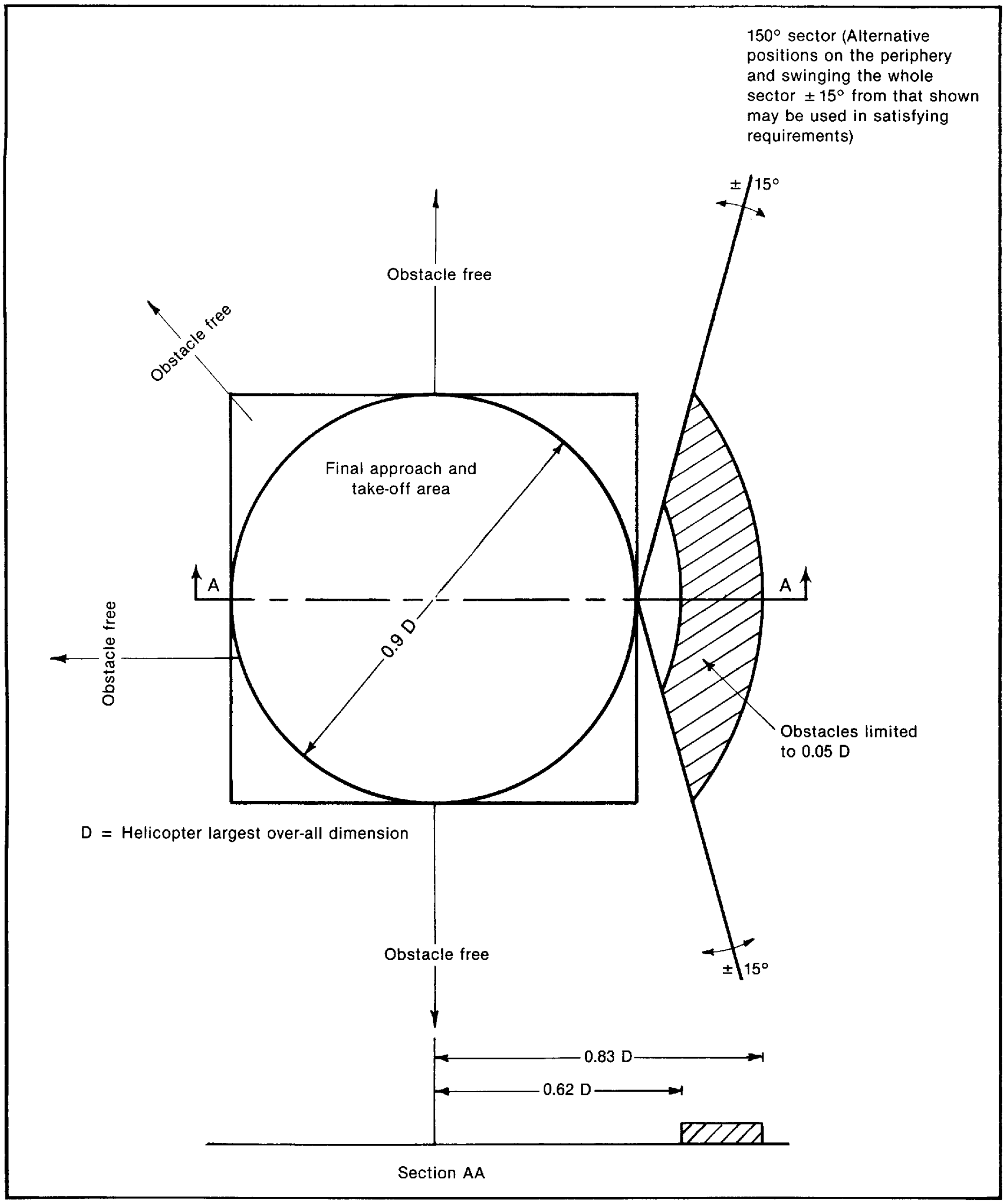


Figure 4-4. Helideck obstacle limitation sectors
Tandem-main-rotor helicopters — Omnidirectional operations

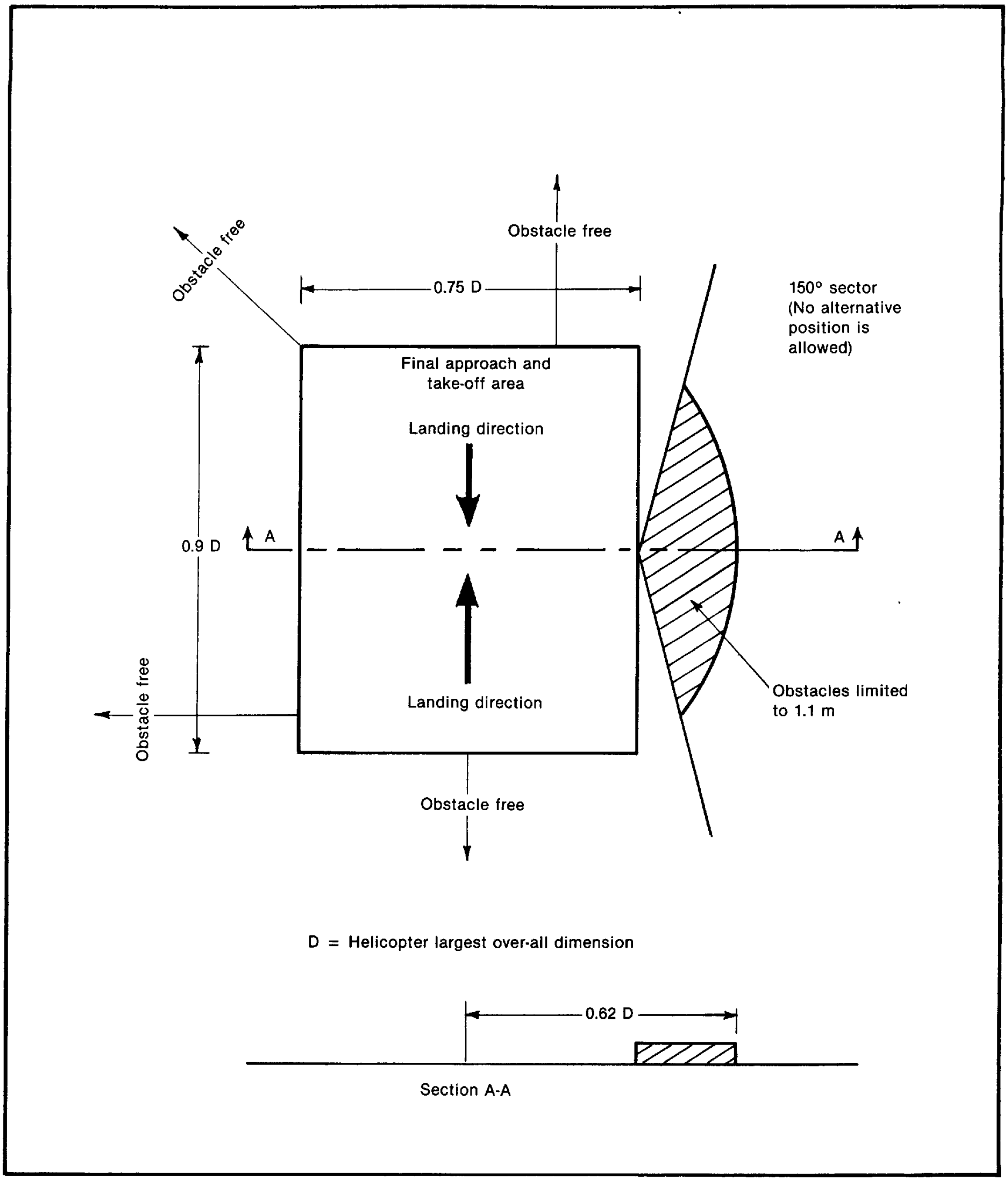


Figure 4-5. Helideck obstacle limitation sectors
Tandem-main-rotor helicopters — Bi-directional operations

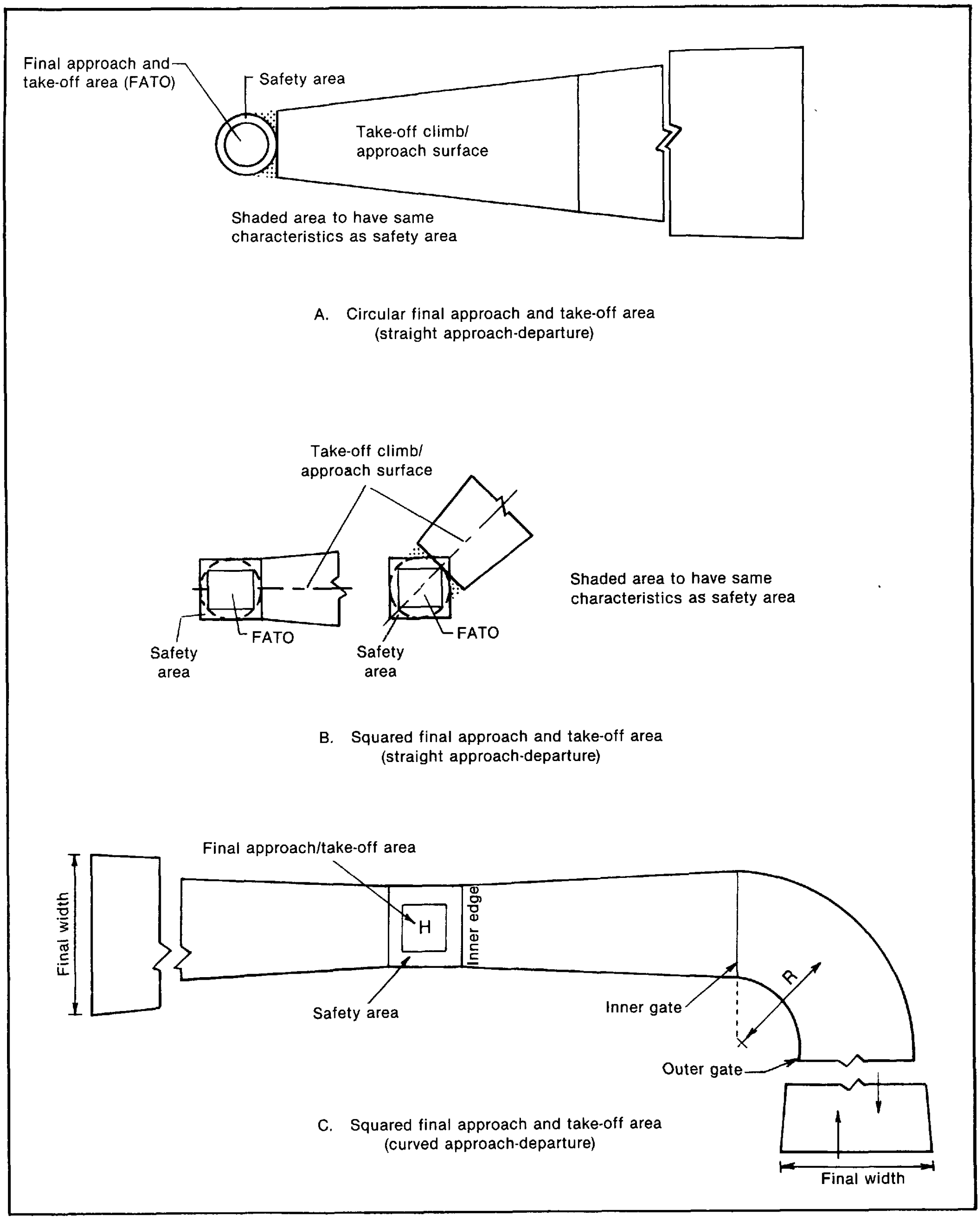


Figure 4-6. Take-off climb/approach surface (non-instrument FATO)

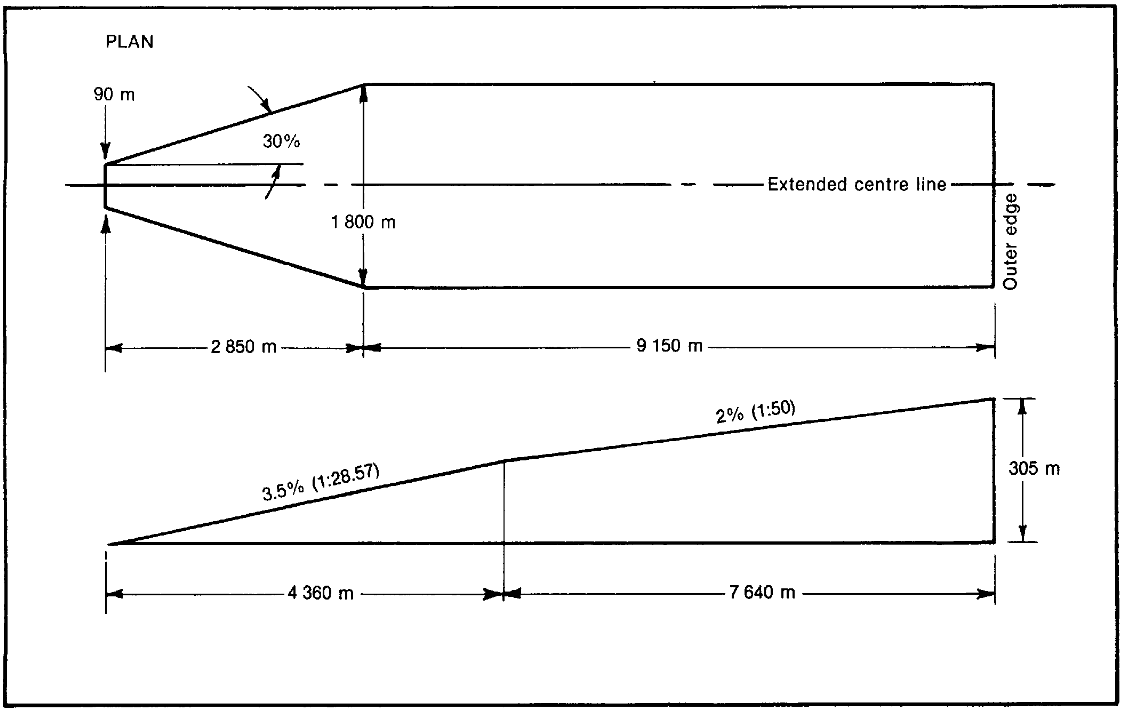


Figure 4-7. Take-off climb surface for instrument FATO

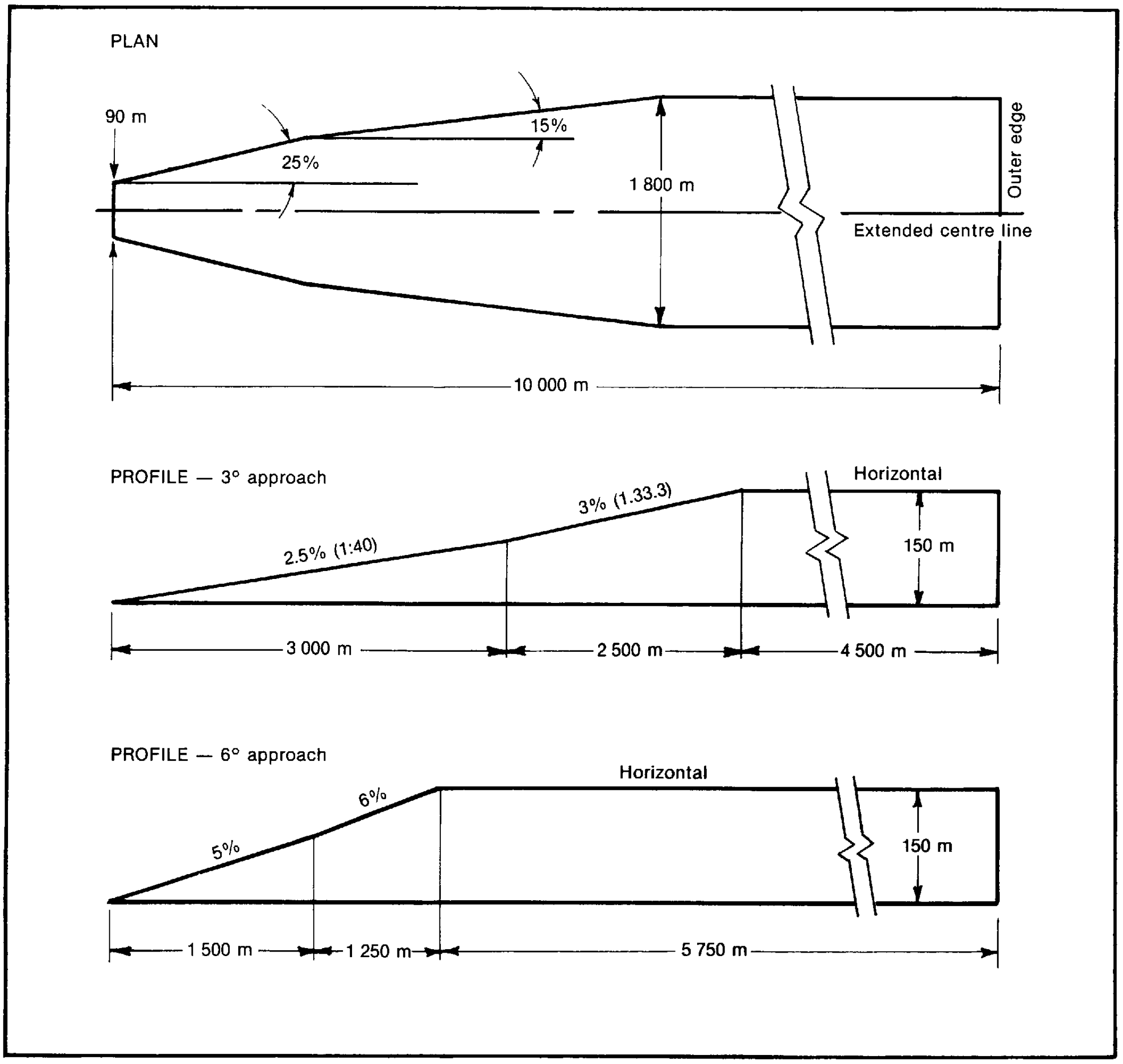


Figure 4-8. Approach surface for precision approach FATO

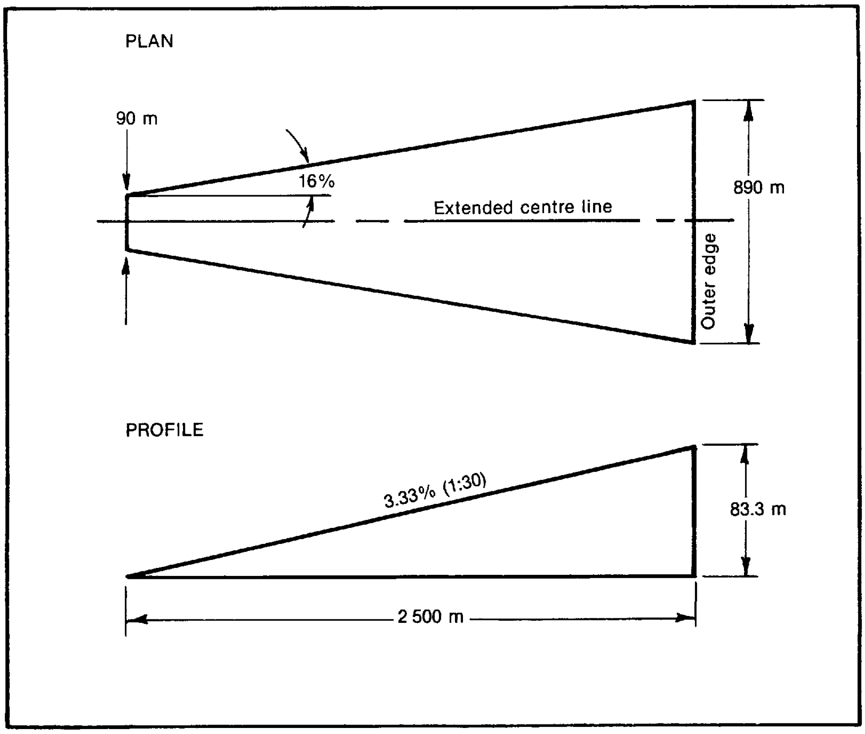


Figure 4-9. Approach surface for non-precision approach FATO

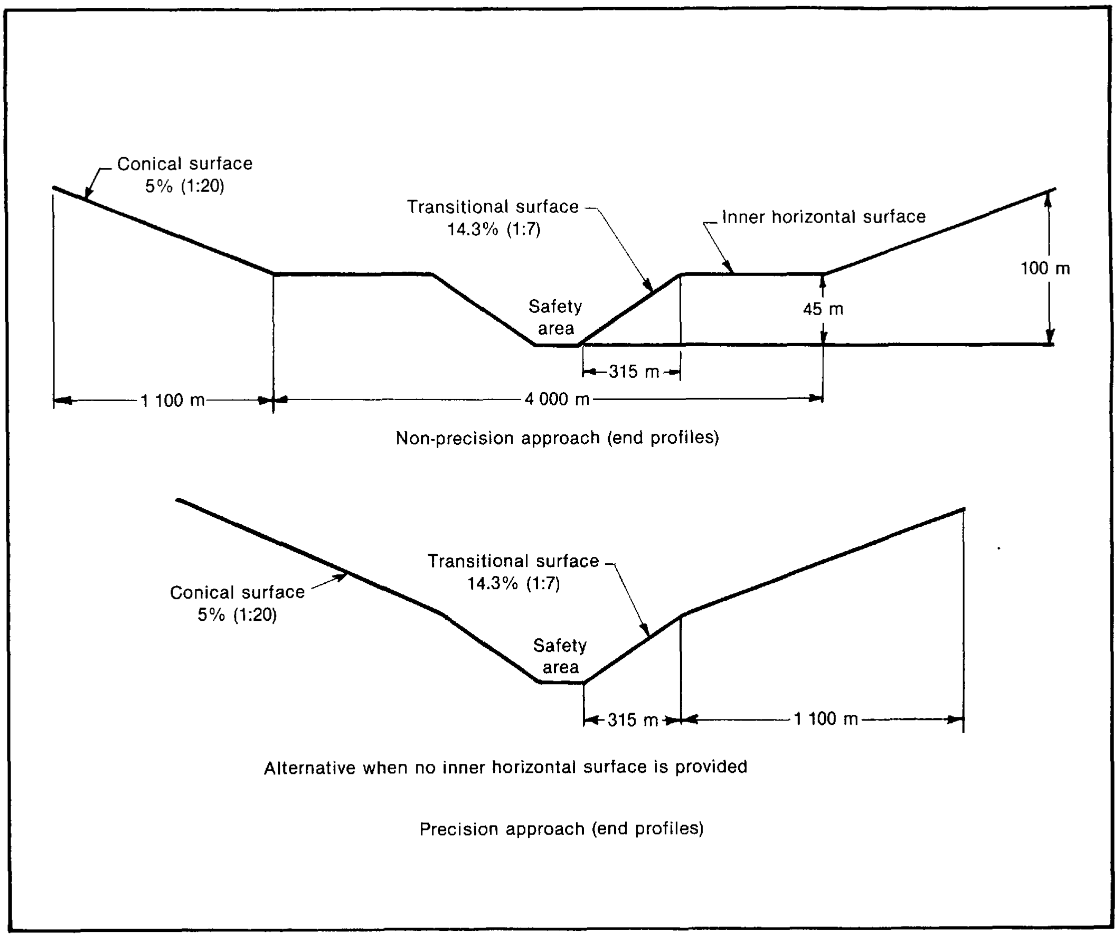


Figure 4-10. Transitional, inner horizontal and
conical obstacle limitation surfaces

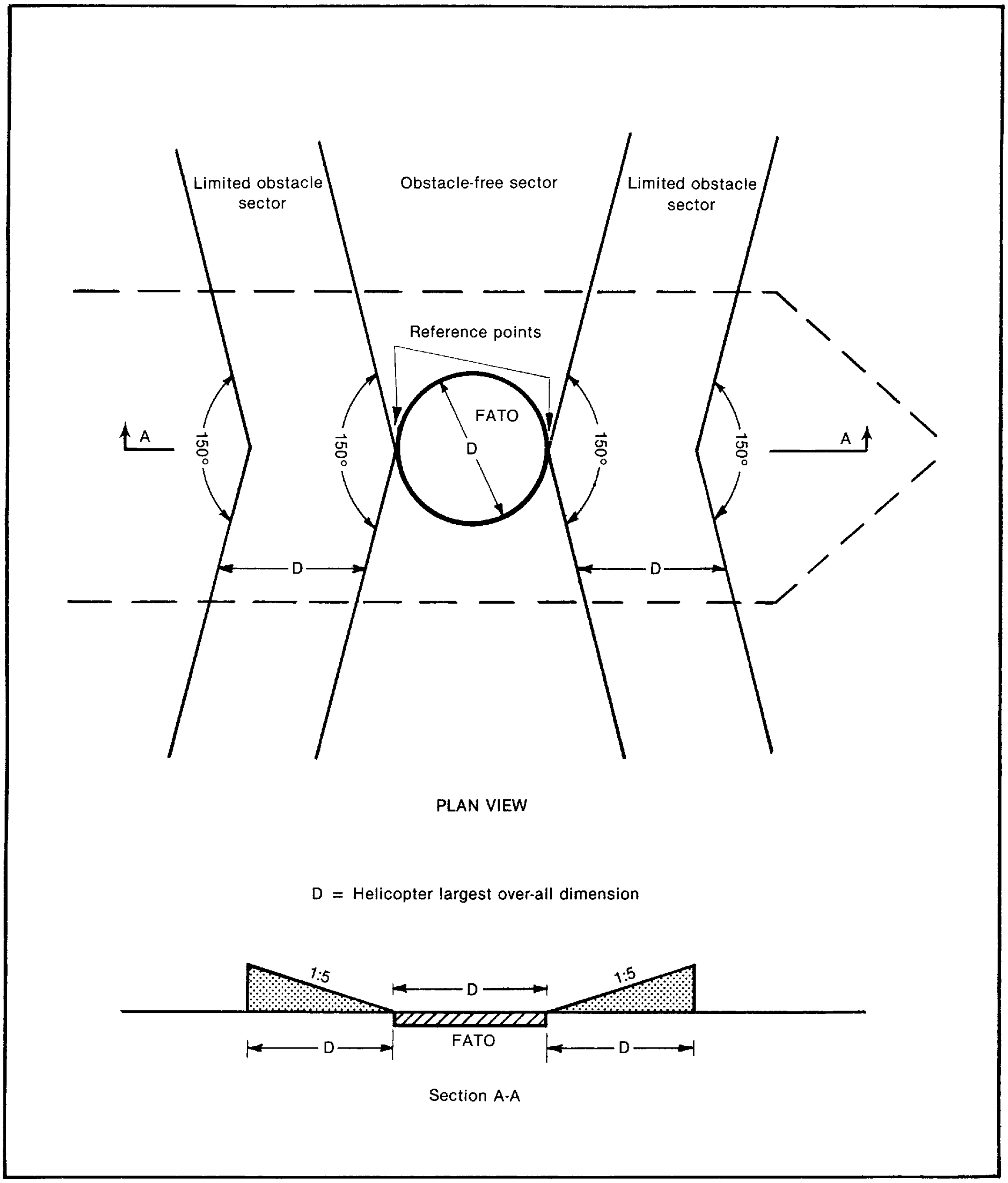


Figure 4-11. Midship non-purpose built heliport obstacle limitation surfaces

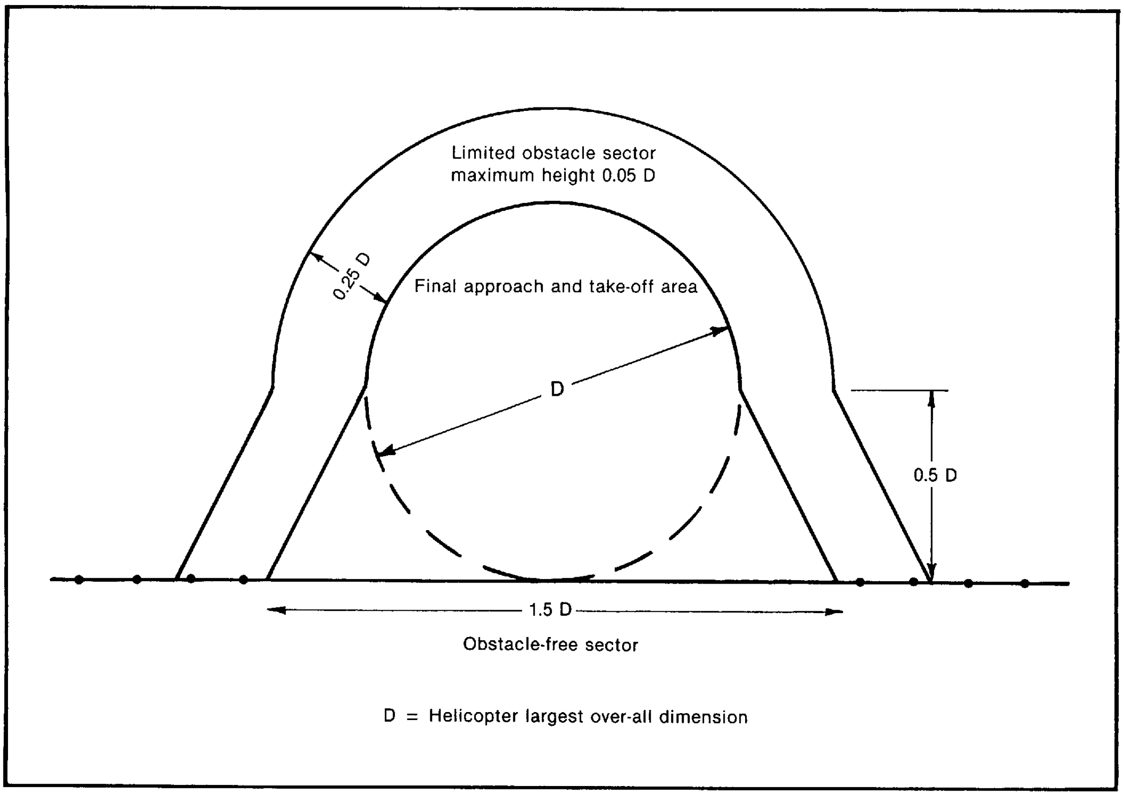


Figure 4-12. Ships-side non-purpose built heliport
obstacle limitation surfaces

Table 4-1. Dimensions and slopes of obstacle limitation surfaces

NON-INSTRUMENT AND NON-PRECISION FATO

Surface and dimensions		Non-instrument (visual) FATO — Helicopter performance class 1	2	3	Non-precision (instrument approach) FATO
APPROACH SURFACE					
Width of inner edge		Width of safety area			Width of safety area
Location of inner edge		Boundary			Boundary
First section					
Divergence	— day	10%	10%	10%	16%
	— night	15%	15%	15%	
Length	— day	245 m[a]	245 m[a]	245 m[a]	2 500 m
	— night	245 m[a]	245 m[a]	245 m[a]	
Outer width	— day	49 m[b]	49 m[b]	49 m[b]	890 m
	— night	73.5 m[b]	73.5 m[b]	73.5 m[b]	
Slope (maximum)		8%[a]	8%[a]	8%[a]	3.33%
Second section					
Divergence	— day	10%	10%	10%	—
	— night	15%	15%	15%	
Length	— day	c	c	c	—
	— night	c	c	c	
Outer width	— day	d	d	d	—
	— night	d	d	d	
Slope (maximum)		12.5%	12.5%	12.5%	—
Third section					
Divergence		parallel	parallel	parallel	—
Length	— day	e	e	e	—
	— night	e	e	e	
Outer width	— day	d	d	d	—
	— night	d	d	d	
Slope (maximum)		15%	15%	15%	—
INNER HORIZONTAL					
Height		—	—	—	45 m
Radius		—	—	—	2 000 m
CONICAL					
Slope		—	—	—	5%
Height		—	—	—	55 m
TRANSITIONAL					
Slope		—	—	—	20%
Height		—	—	—	45 m

a. Slope and length enables helicopters to decelerate for landing while observing "avoid" areas.
b. The width of the inner edge shall be added to this dimension.
c. Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations or 10 rotor diameters for night operations.
d. Seven rotor diameters over-all width for day operations or 10 rotor diameters over-all width for night operations.
e. Determined by the distance from inner edge to where the approach surface reaches a height of 150 m above the elevation of the inner edge.

Table 4-2. Dimensions and slopes of obstacle limitation surfaces

INSTRUMENT (PRECISION APPROACH) FATO

	3° approach				6° approach			
	Height above FATO				Height above FATO			
Surface and dimensions	90 m (300 ft)	60 m (200 ft)	45 m (150 ft)	30 m (100 ft)	90 m (300 ft)	60 m (200 ft)	45 m (150 ft)	30 m (100 ft)
APPROACH SURFACE								
Length of inner edge	90 m	90 m	90 m	90 m	90 m	90 m	90 m	90 m
Distance from end of FATO	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60m
Divergence each side to height above FATO	25%	25%	25%	25%	25%	25%	25%	25%
Distance to height above FATO	1 745 m	1 163 m	872 m	581 m	870 m	580 m	435 m	290 m
Width at height above FATO	962 m	671 m	526 m	380 m	521 m	380 m	307.5 m	235 m
Divergence to parallel section	15%	15%	15%	15%	15%	15%	15%	15%
Distance to parallel section	2 793 m	3 763 m	4 246 m	4 733 m	4 250 m	4 733 m	4 975 m	5 217 m
Width of parallel section	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m
Distance to outer edge	5 462 m	5 074 m	4 882 m	4 686 m	3 380 m	3 187 m	3 090 m	2 993 m
Width at outer edge	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m	1 800 m
Slope of first section	2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	5% (1:20)	5% (1:20)	5% (1:20)	5% (1:20)
Length of first section	3 000 m	3 000 m	3 000 m	3 000 m	1 500 m	1 500 m	1 500 m	1 500 m
Slope of second section	3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)
Length of second section	2 500 m	2 500 m	2 500 m	2 500 m	1 250 m	1 250 m	1 250 m	1 250 m
Total length of surface	10 000 m	10 000 m	10 000 m	10 000 m	8 500 m	8 500 m	8 500 m	8 500 m
CONICAL								
Slope	5%	5%	5%	5%	5%	5%	5%	5%
Height	55 m	55 m	55 m	55 m	55 m	55 m	55 m	55 m
TRANSITIONAL								
Slope	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%
Height	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m

Table 4-3. Dimensions and slopes of obstacle limitation surfaces

STRAIGHT TAKE-OFF

Surface and dimensions		Non-instrument (visual) Helicopter performance class 1	2	3	Instrument
TAKE-OFF CLIMB					
Width of inner edge		Width of safety area			90 m
Location of inner edge		Boundary or end of clearway			Boundary or end of clearway
First section					
Divergence	— day	10%	10%	10%	30%
	— night	15%	15%	15%	
Length	— day	[a]	245 m[b]	245 m[b]	2 850 m
	— night	[a]	245 m[b]	245 m[b]	
Outer width	— day	[c]	49 m[d]	49 m[d]	1 800 m
	— night	[c]	73.5 m[d]	73.5 m[d]	
Slope (maximum)		4.5%*	8%[b]	8%[b]	3.5%
Second section					
Divergence	— day	parallel	10%	10%	parallel
	— night	parallel	15%	15%	
Length	— day	[e]	[a]	[a]	1 510 m
	— night	[e]	[a]	[a]	
Outer width	— day	[c]	[c]	[c]	1 800 m
	— night	[c]	[c]	[c]	
Slope (maximum)		4.5%*	15%	15%	3.5%*
Third section					
Divergence		—	parallel	parallel	parallel
Length	— day	—	[e]	[e]	7 640 m
	— night	—	[e]	[e]	
Outer width	— day	—	[c]	[c]	1 800 m
	— night	—	[c]	[c]	
Slope (maximum)		—	15%	15%	2%

a. Determined by the distance from the inner edge to the point where the divergence produces a width of 7 rotor diameters for day operations or 10 rotor diameters for night operations.
b. Slope and length provides helicopters with an area to accelerate and climb while observing "avoid" areas.
c. Seven rotor diameters over-all width for day operations or 10 rotor diameters over-all width for night operations.
d. The width of the inner edge shall be added to this dimension.
e. Determined by the distance from the inner edge to where the surface reaches a height of 150 m above the elevation of the inner edge.

* This slope exceeds the maximum mass one-engine-inoperative climb gradient of many helicopters which are currently operating.

Table 4-4. Criteria for curved take-off climb/approach area

NON-INSTRUMENT FINAL APPROACH AND TAKE-OFF

Facility	Requirement
Directional change	As required (120° max).
Radius of turn on centre line	Not less than 270 m.
Distance to inner gate*	(a) For performance class 1 helicopters — not less than 305 m from the end of the safety area or helicopter clearway. (b) For performance class 2 and 3 helicopters — not less than 370 m from the end of the FATO.
Width of inner gate — day	Width of the inner edge plus 20% of distance to inner gate.
— night	Width of the inner edge plus 30% of distance to inner gate.
Width of outer gate — day	Width of inner edge plus 20% of distance to inner gate out to minimum width of 7 rotor diameters.
— night	Width of inner edge plus 30% of distance to inner gate out to a minimum width of 10 rotor diameters.
Elevation of inner and outer gates	Determined by the distance from the inner edge and the designated gradient(s).
Slopes	As given in Tables 4-1 and 4-3.
Divergence	As given in Tables 4-1 and 4-3.
Total length of area	As given in Tables 4-1 and 4-3.

* This is the minimum distance required prior to initiating a turn after take-off or completing a turn in the final phase.

Note.— More than one turn may be necessary in the total length of the take-off climb/approach area. The same criteria will apply for each subsequent turn except that the widths of the inner and outer gates will normally be the maximum width of the area.

CHAPTER 5. VISUAL AIDS

5.1 Indicators

5.1.1 Wind direction indicators

Application

5.1.1.1 A heliport shall be equipped with at least one wind direction indicator.

Location

5.1.1.2 A wind direction indicator shall be located so as to indicate the wind conditions over the final approach and take-off area and in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash. It shall be visible from a helicopter in flight, in a hover or on the movement area.

5.1.1.3 **Recommendation.—** *Where a touchdown and lift-off area may be subject to a disturbed air flow, then additional wind direction indicators located close to the area should be provided to indicate the surface wind on the area.*

Note.— Guidance on the location of wind direction indicators is given in the Heliport Manual.

Characteristics

5.1.1.4 A wind direction indicator shall be constructed so that it gives a clear indication of the direction of the wind and a general indication of the wind speed.

5.1.1.5 **Recommendation.—** *An indicator should be a truncated cone made of lightweight fabric and should have the following minimum dimensions:*

	Surface level heliports	Elevated heliports and helidecks
Length	*2.4 m*	*1.2 m*
Diameter (larger end)	*0.6 m*	*0.3 m*
Diameter (smaller end)	*0.3 m*	*0.15 m*

5.1.1.6 **Recommendation.—** *The colour of the wind direction indicator should be so selected as to make it clearly visible and understandable from a height of at least 200 m (650 ft) above the heliport, having regard to background. Where practicable, a single colour, preferably white or orange, should be used. Where a combination of two colours is required to give adequate conspicuity against changing backgrounds, they should preferably be orange and white, red and white, or black and white, and should be arranged in five alternate bands the first and last band being the darker colour.*

5.1.1.7 A wind direction indicator at a heliport intended for use at night shall be illuminated.

5.2 Markings and markers

Note.— See Annex 14, Volume I, 5.2.1.4, Note 1, concerning improving conspicuity of markings.

5.2.1 Winching area marking

Application

5.2.1.1 **Recommendation.—** *A winching area marking should be provided at a winching area.*

Location

5.2.1.2 A winching area marking shall be located so that its centre coincides with the centre of the clear zone of the winching area.

Characteristics

5.2.1.3 A winching area marking shall consist of a solid circle of not less than 5 m in diameter and painted yellow.

5.2.2 Heliport identification marking

Application

5.2.2.1 A heliport identification marking shall be provided at a heliport.

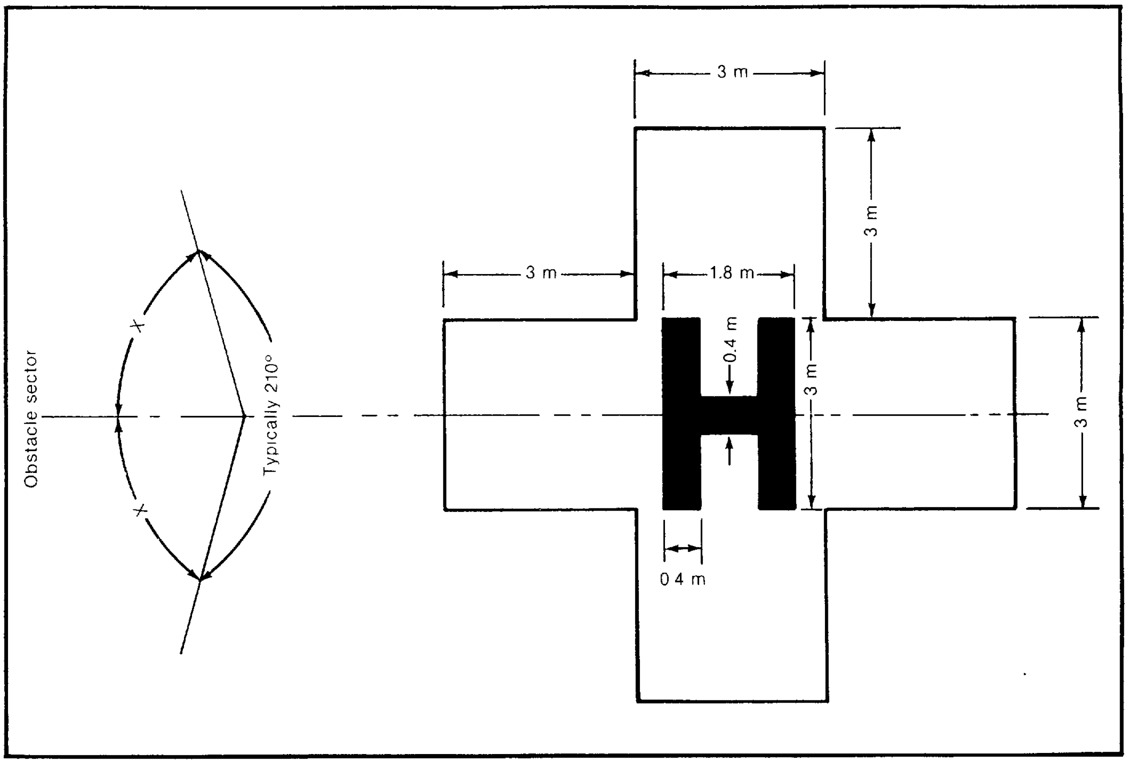


Figure 5-1. Heliport identification marking (shown with hospital cross and orientation with obstacle-free sector)

Location

5.2.2.2 A heliport identification marking shall be located within the final approach and take-off area, at or near the centre of the area or when used in conjunction with runway designation markings at each end of the area.

Characteristics

5.2.2.3 A heliport identification marking, except for a heliport at a hospital, shall consist of a letter H, white in colour. The dimensions of the marking shall be no less than those shown in Figure 5-1 and where the marking is used in conjunction with the final approach and take-off area designation marking specified in 5.2.5 its dimensions shall be increased by a factor of 3.

Note.— On a helideck covered with a rope netting, it may be advantageous to increase the height of the marking to 4 m and the other dimensions proportionally.

5.2.2.4 A heliport identification marking for a heliport at a hospital shall consist of a letter H, red in colour, on a white cross made of squares adjacent to each of the sides of a square containing the H as shown in Figure 5-1.

5.2.2.5 A heliport identification marking shall be oriented with the cross arm of the H at right angles to the preferred final approach direction. For a helideck the cross arm shall be on or parallel to the bisector of the obstacle-free sector as shown in Figure 5-1.

5.2.3 Maximum allowable mass marking

Application

5.2.3.1 **Recommendation.—** *A maximum allowable mass marking should be displayed at an elevated heliport and at a helideck.*

Location

5.2.3.2 **Recommendation.—** *A maximum allowable mass marking should be located within the touchdown and lift-off area and so arranged as to be readable from the preferred final approach direction.*

Characteristics

5.2.3.3 A maximum allowable mass marking shall consist of a two digit number followed by a letter "t" to indicate the allowable helicopter mass in tonnes (1 000 kg).

5.2.3.4 **Recommendation.—** *The numbers and the letter of the marking should have a colour contrasting with the background and should be in the form and proportion shown in Figure 5-2.*

5.2.4 Final approach and take-off area marking or marker

Application

5.2.4.1 Final approach and take-off area marking or markers shall be provided at a surface level heliport on ground where the extent of the final approach and take-off area is not self-evident.

Location

5.2.4.2 Final approach and take-off area marking or markers shall be located on the boundary of the final approach and take-off area.

Characteristics

5.2.4.3 Final approach and take-off area marking or markers shall be spaced:

a) for a square or rectangular area at equal intervals of not more than 50 m with at least three markings or markers on each side including a marking or marker at each corner; and

b) for any other shaped area, including a circular area, at equal intervals of not more than 10 m with a minimum number of five markings or markers.

5.2.4.4 A final approach and take-off area marking shall be a rectangular stripe with a length of 9 m or one-fifth of the side of the final approach and take-off area which it defines and a width of 1 m. Where a marker is used its characteristics shall conform to those specified in Annex 14, Volume I, 5.5.8.3 except that the height of the marker shall not exceed 25 cm above ground or snow level.

5.2.4.5 A final approach and take-off area marking shall be white.

5.2.5 Final approach and take-off area designation marking

Application

5.2.5.1 **Recommendation.—** *A final approach and take-off area designation marking should be provided where it is necessary to designate the final approach and take-off area to the pilot.*

Location

5.2.5.2 A final approach and take-off area designation marking shall be located at the beginning of the final approach and take-off area as shown in Figure 5-3.

Characteristics

5.2.5.3 A final approach and take-off area designation marking shall consist of a runway designation marking described in Annex 14, Volume I, 5.2.2.4 and 5.2.2.5 supplemented by an H, specified in 5.2.2 above, and as shown in Figure 5-3.

5.2.6 Aiming point marking

Application

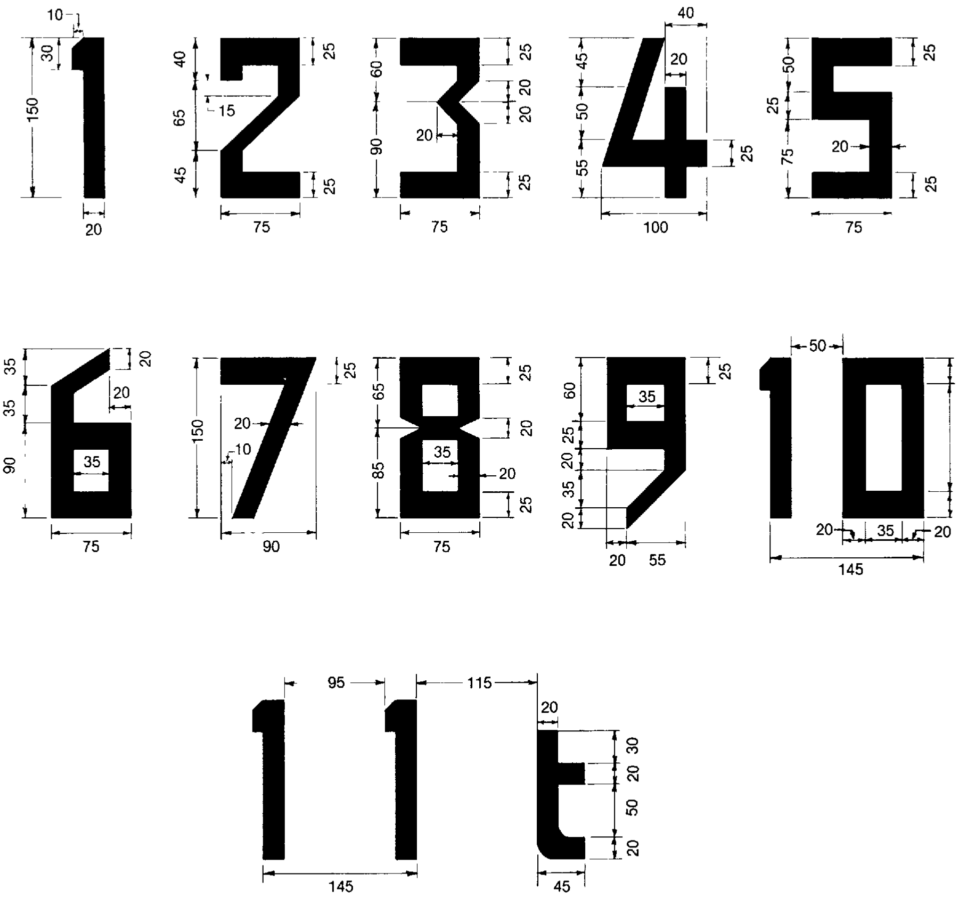
5.2.6.1 **Recommendation.—** *An aiming point marking should be provided at a heliport where it is necessary for a pilot to make an approach to a particular point before proceeding to the touchdown and lift-off area.*

Location

5.2.6.2 The aiming point marking shall be located within the final approach and take-off area.

Characteristics

5.2.6.3 The aiming point marking shall be an equilateral triangle with the bisector of one of the angles aligned with the preferred approach direction. The marking shall consist of continuous white lines and the dimensions of the marking shall conform to those shown in Figure 5-4.



Note.— All units are expressed in centimetres.

Figure 5-2. Form and proportions of numbers and letter for maximum allowable mass marking

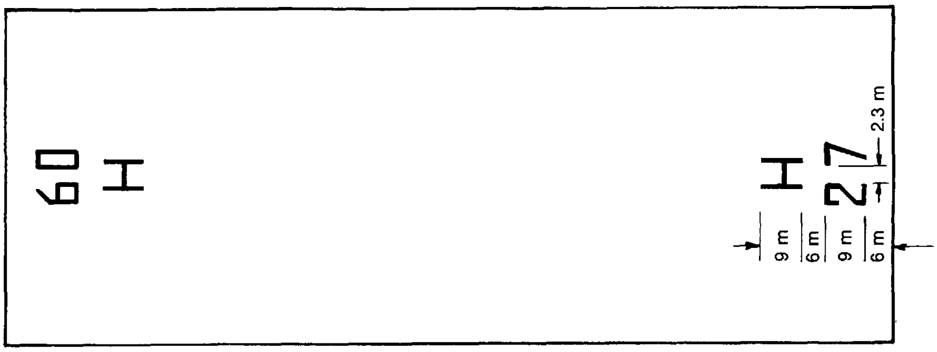


Figure 5-3. Final approach and take-off area designation marking

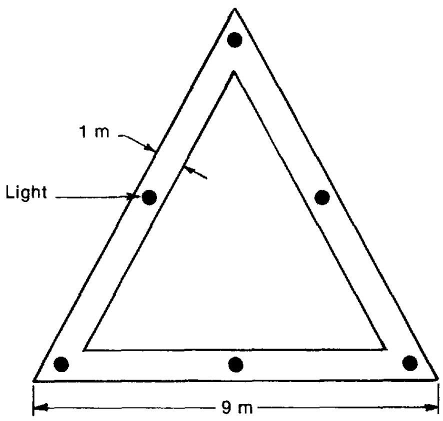


Figure 5-4. Aiming point marking

5.2.7 Touchdown and lift-off area marking

Application

5.2.7.1 A touchdown and lift-off area marking shall be provided on a helideck.

5.2.7.2 **Recommendation.—** *A touchdown and lift-off area marking should be provided on a heliport other than a helideck if the perimeter of the touchdown and lift-off area is not self-evident.*

Location

5.2.7.3 The touchdown and lift-off area marking shall be located along the perimeter of the touchdown and lift-off area.

Characteristics

5.2.7.4 A touchdown and lift-off area marking shall consist of a continuous white line with a width of at least 30 cm.

5.2.8 Touchdown marking

Application

5.2.8.1 **Recommendation.—** *A touchdown marking should be provided where it is necessary for a helicopter to touch down in a specific position.*

Location

5.2.8.2 A touchdown marking shall be located so that when a helicopter for which the marking is intended is positioned, with the main undercarriage inside the marking and the pilot situated over the marking, all parts of the helicopter will be clear of any obstacle by a safe margin.

5.2.8.3 On a helideck or on an elevated heliport the centre of the touchdown marking shall be located at the centre of the touchdown and lift-off area except that the marking may be offset away from the origin of the obstacle-free sector by no more than 0.1 D where an aeronautical study indicates such offsetting to be necessary and that a marking so offset would not adversely affect the safety.

Characteristics

5.2.8.4 A touchdown marking shall be a yellow circle and have a line width of at least 0.5 m. For a helideck the line width shall be at least 1 m.

5.2.8.5 On helidecks the inner diameter of the circle shall be half the D value of the helideck or 6 m whichever is the greater.

5.2.9 Heliport name marking

Application

5.2.9.1 **Recommendation.—** *A heliport name marking should be provided at a heliport where there is insufficient alternative means of visual identification.*

Location

5.2.9.2 **Recommendation.—** *The heliport name marking should be placed on the heliport so as to be visible, as far as practicable, at all angles above the horizontal. Where an obstacle sector exists the marking should be located on the obstacle side of the H identification marking.*

Characteristics

5.2.9.3 A heliport name marking shall consist of the name or the alphanumeric designator of the heliport as used in the R/T communications.

5.2.9.4 **Recommendation.—** *The characters of the marking should be not less than 3 m in height at surface level heliports and not less than 1.2 m on elevated heliports and helidecks. The colour of the marking should contrast with the background.*

5.2.9.5 A heliport name marking intended for use at night or during conditions of poor visibility shall be illuminated, either internally or externally.

5.2.10 Helideck obstacle-free sector marking

Application

5.2.10.1 **Recommendation.—** *A helideck obstacle-free sector marking should be provided at a helideck.*

Location

5.2.10.2 A helideck obstacle-free sector marking shall be located on the touchdown and lift-off area marking.

Characteristics

5.2.10.3 The helideck obstacle-free sector marking shall indicate the origin of the obstacle free sector, the directions of the limits of the sector and the D value of the helideck as shown in Figure 5-5 for a hexagonal-shaped helideck.

Note.— D is the largest dimension of the helicopter when the rotors are turning.

5.2.10.4 The height of the chevron shall equal the width of the touchdown and lift-off area marking.

5.2.10.5 The chevron shall be black.

5.2.11 Marking for taxiways

Note.— The specifications for taxiway centre line marking and taxi-holding position markings in Annex 14, Volume I, 5.2.8 and 5.2.9 are equally applicable to taxiways intended for ground taxiing of helicopters.

5.2.12 Air taxiway markers

Application

5.2.12.1 **Recommendation.—** *An air taxiway should be marked with air taxiway markers.*

Note.— These markers are not meant to be used on helicopter ground taxiways.

Location

5.2.12.2 Air taxiway markers shall be located along the centre line of the air taxiway and shall be spaced at intervals of not more than 30 m on straight sections and 15 m on curves.

Characteristics

5.2.12.3 An air taxiway marker shall be frangible and when installed shall not exceed 35 cm above ground or snow level. The surface of the marker as viewed by the pilot shall be a rectangle with a height to width ratio of approximately 3 to 1 and shall have a minimum area of 150 cm^2 as shown in Figure 5-6.

5.2.12.4 An air taxiway marker shall be divided into three equal, horizontal bands coloured yellow, green and yellow, respectively. If the air taxiway is to be used at night, the markers shall be internally illuminated or retro-reflective.

5.2.13 Air transit route markers

Application

5.2.13.1 **Recommendation.—** *When established an air transit route should be marked with air transit route markers.*

Location

5.2.13.2 Air transit route markers shall be located along the centre line of the air transit route and shall be spaced at intervals of not more than 60 m on straight sections and 15 m on curves.

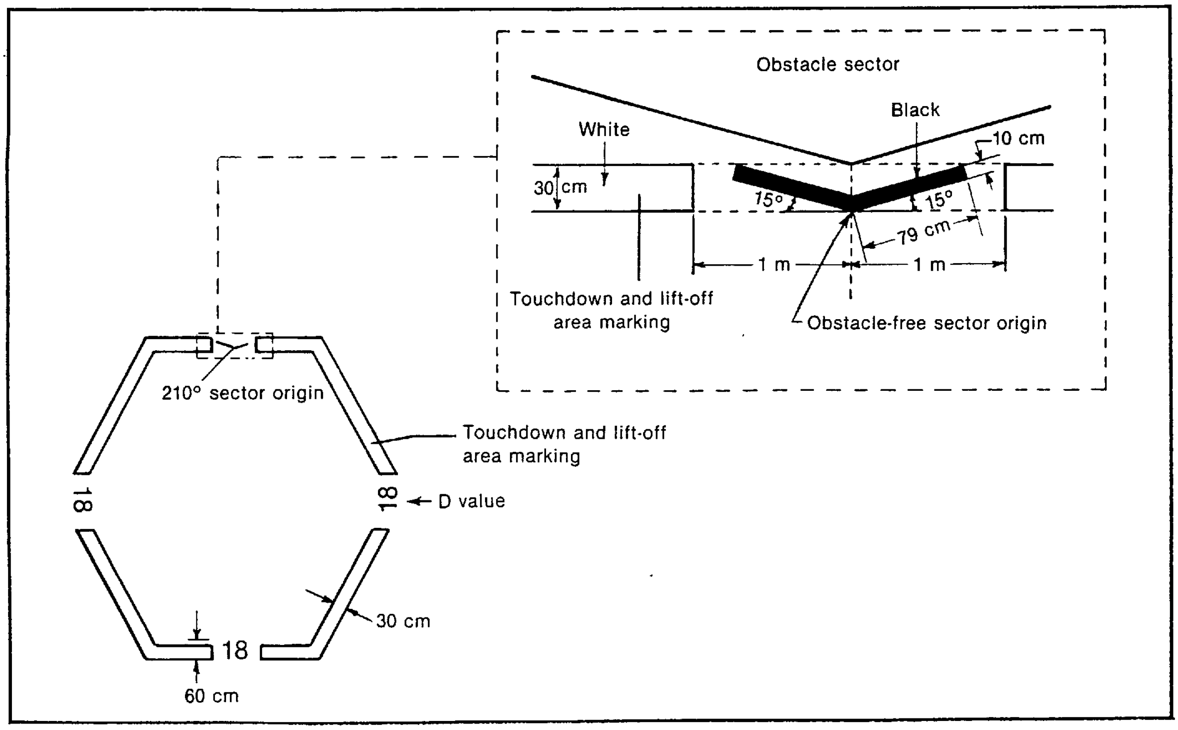


Figure 5-5. Helideck obstacle-free sector marking

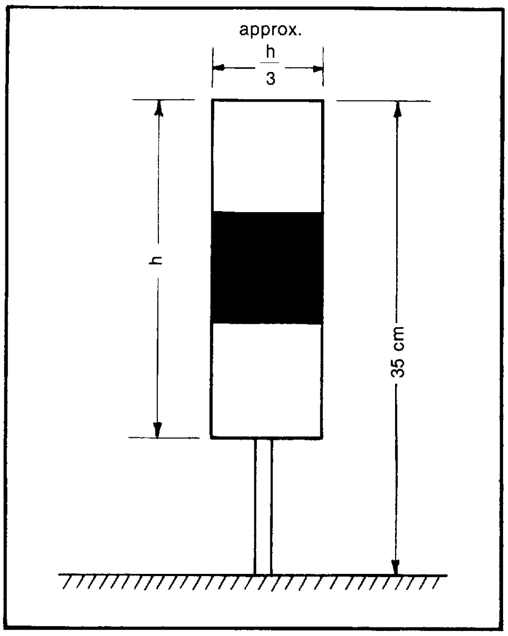


Figure 5-6. Air taxiway marker

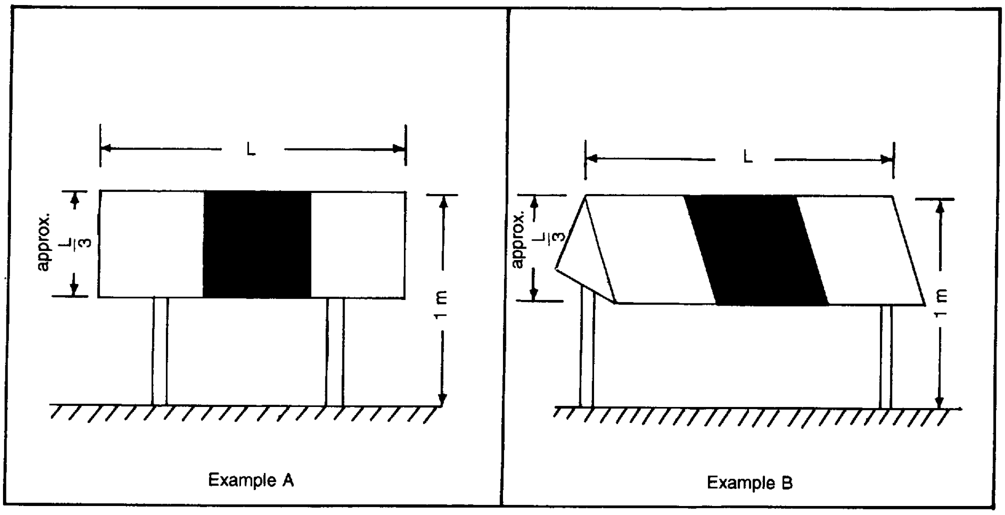


Figure 5-7. Air transit route marker

Characteristics

5.2.13.3 An air transit route marker shall be frangible and when installed shall not exceed 1 m above ground or snow level. The surface of the marker as viewed by the pilot shall be a rectangle with a height to width ratio of approximately 1 to 3 and shall have a minimum area of 1 500 cm^2 as shown in the examples in Figure 5-7.

5.2.13.4 An air transit route marker shall be divided into three equal, vertical bands coloured yellow, green and yellow, respectively. If the air transit route is to be used by night, the marker shall be internally illuminated or retro-reflective.

5.3 Lights

5.3.1 General

Note 1.— See Annex 14, Volume I, 5.3.1 concerning specifications on screening of non-aeronautical ground lights. and design of elevated and inset lights.

Note 2.— In the case of helidecks and heliports located near navigable waters, consideration needs to be given to ensuring that aeronautical ground lights do not cause confusion to mariners.

Note 3.— As helicopters will generally come very close to extraneous light sources, it is particularly important to ensure that, unless such lights are navigation lights exhibited in accordance with international regulations, they are screened or located so as to avoid direct and reflected glare.

Note 4.— The following specifications have been developed for systems intended for use in conjunction with a non-instrument or non-precision final approach and take-off area.

5.3.2 Heliport beacon

Application

5.3.2.1 **Recommendation.—** *A heliport beacon should be provided at a heliport where:*

a) long-range visual guidance is considered necessary and is not provided by other visual means; or

b) identification of the heliport is difficult due to surrounding lights.

Location

5.3.2.2 The heliport beacon shall be located on or adjacent to the heliport preferably at an elevated position and so that it does not dazzle a pilot at short range.

Note.— Where a heliport beacon is likely to dazzle pilots at short range it may be switched off during the final stages of the approach and landing.

Characteristics

5.3.2.3 The heliport beacon shall emit repeated series of equispaced short duration white flashes in the format in Figure 5-8.

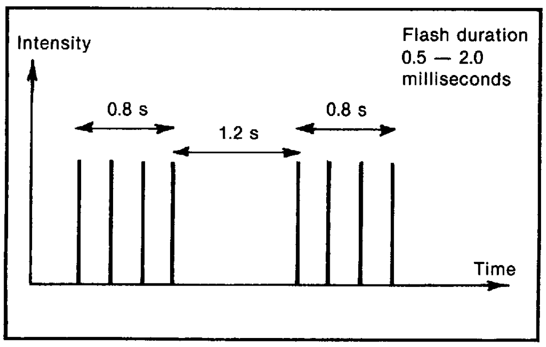


Figure 5-8. Heliport beacon flash characteristics

5.3.2.4 The light from the beacon shall show at all angles of azimuth.

5.3.2.5 **Recommendation.—** *The effective light intensity distribution of each flash should be as shown in Figure 5-9, Illustration 1.*

Note.— Where brilliancy control is desired, settings of 10 per cent and 3 per cent have been found to be satisfactory. In addition, shielding may be necessary to ensure that pilots are not dazzled during the final stages of the approach and landing.

5.3.3 Approach lighting system

Application

5.3.3.1 **Recommendation.—** *An approach lighting system should be provided at a heliport where it is desirable and practicable to indicate a preferred approach direction.*

Location

5.3.3.2 The approach lighting system shall be located in a straight line along the preferred direction of approach.

Characteristics

5.3.3.3 **Recommendation.—** *An approach lighting system should consist of a row of three lights spaced uniformly at 30 m intervals and of a crossbar 18 m in length at a distance of 90 m from the perimeter of the final approach and take-off area as shown in Figure 5-10. The lights forming the crossbar should be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights and spaced at 4.5 m intervals. Where there is the need to make the final approach course more conspicuous additional lights spaced uniformly at 30 m intervals should be added beyond the crossbar. The lights beyond the crossbar may be steady or sequenced flashing, depending upon the environment.*

Note.— Sequenced flashing lights may be useful where identification of the approach lighting system is difficult due to surrounding lights.

5.3.3.4 **Recommendation.—** *Where an approach lighting system is provided for a non-precision final approach and take-off area, the system should not be less than 210 m in length.*

5.3.3.5 The steady lights shall be omnidirectional white lights.

5.3.3.6 **Recommendation.—** *The light distribution of steady lights should be as indicated in Figure 5-9, Illustration 2 except that the intensity should be increased by a factor of 3 for a non-precision final approach and take-off area.*

5.3.3.7 Sequenced flashing lights shall be omnidirectional white lights.

5.3.3.8 **Recommendation.—** *The flashing lights should have a flash frequency of one per second and their light distribution should be as shown in Figure 5-9, Illustration 3. The flash sequence should commence from the outermost light and progress towards the crossbar.*

5.3.3.9 **Recommendation.—** *A suitable brilliancy control should be incorporated to allow for adjustment of light intensity to meet the prevailing conditions.*

Note.— The following intensity settings have been found suitable:

a) steady lights — 100 per cent, 30 per cent and 10 per cent; and

b) flashing lights — 100 per cent, 10 per cent and 3 per cent.

5.3.4 Visual alignment guidance system

Application

5.3.4.1 **Recommendation.—** *A visual alignment guidance system should be provided to serve the approach to a heliport where one or more of the following conditions exist especially at night:*

a) obstacle clearance, noise abatement or traffic control procedures require a particular direction to be flown;

b) the environment of the heliport provides few visual surface cues; and

c) it is physically impracticable to install an approach lighting system.

Location

5.3.4.2 The visual alignment guidance system shall be located such that a helicopter is guided along the prescribed track towards the final approach and take-off area.

5.3.4.3 **Recommendation.—** *The system should be located at the downwind edge of the final approach and take-off area and aligned along the preferred approach direction.*

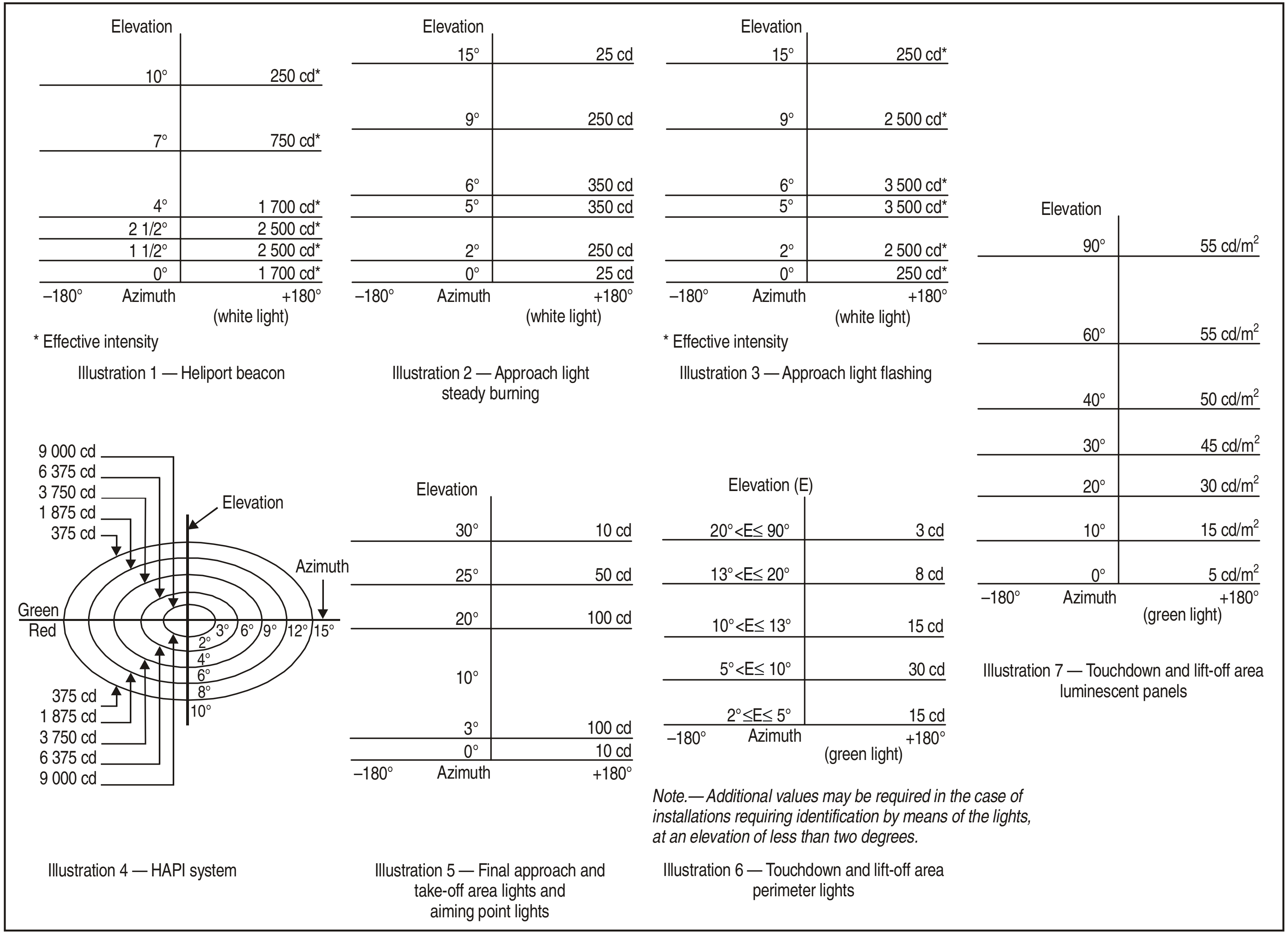


Figure 5-9. Isocandela diagrams of lights meant for helicopter non-instrument and non-precision approaches

5.3.4.4 The light units shall be frangible and mounted as low as possible.

5.3.4.5 Where the lights of the system need to be seen as discrete sources, light units shall be located such that at the extremes of system coverage the angle subtended between units as seen by the pilot shall not be less than 3 minutes of arc.

5.3.4.6 The angles subtended between light units of the system and other units of comparable or greater intensities shall also be not less than 3 minutes of arc.

Note.— Requirements of 5.3.4.5 and 5.3.4.6 can be met for lights on a line normal to the line of sight if the light units are separated by 1 metre for every kilometre of viewing range.

Signal format

5.3.4.7 The signal format of the alignment guidance system shall include a minimum of three discrete signal sectors providing "offset to the right", "on track" and "offset to the left" signals.

5.3.4.8 The divergence of the "on track" sector of the system shall be as shown in Figure 5-11.

5.3.4.9 The signal format shall be such that there is no possibility of confusion between the system and any associated visual approach slope indicator or other visual aids.

5.3.4.10 The system shall avoid the use of the same coding as any associated visual approach slope indicator.

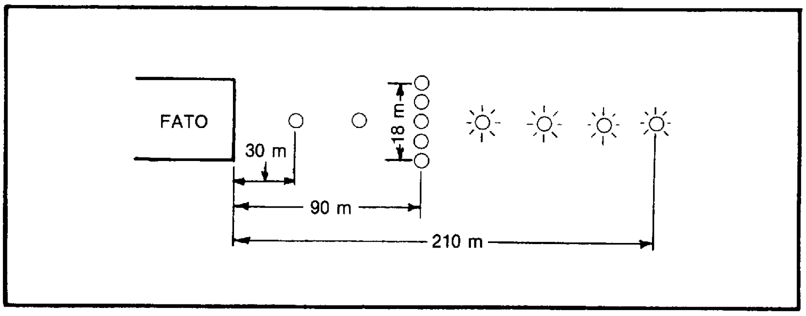


Figure 5-10. Approach lighting system

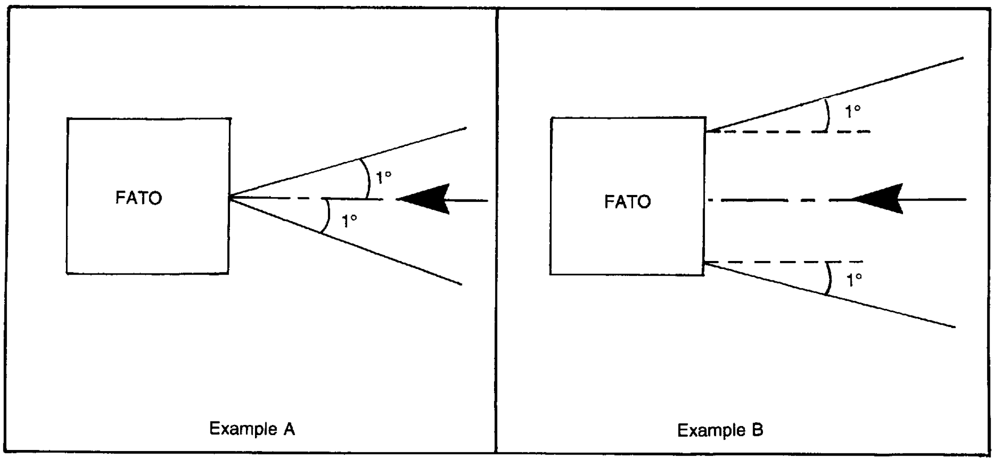


Figure 5-11. Divergence of the "on track" sector

5.3.4.11 The signal format shall be such that the system is unique and conspicuous in all operational environments.

5.3.4.12 The system shall not significantly increase the pilot workload.

Light distribution

5.3.4.13 The useable coverage of the visual alignment guidance system shall be equal to or better than that of the visual approach slope indicator system, with which it is associated.

5.3.4.14 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.

Approach track and azimuth setting

5.3.4.15 A visual alignment guidance system shall be capable of adjustment in azimuth to within ± 5 minutes of arc of the desired approach path.

5.3.4.16 The angle of azimuth guidance system shall be such that during an approach the pilot of a helicopter at the boundary of the "on track" signal will clear all objects in the approach area by a safe margin.

5.3.4.17 The characteristics of the obstacle protection surface specified in 5.3.5.23, Table 5-1 and Figure 5-13 shall equally apply to the system.

Characteristics of the visual alignment guidance system

5.3.4.18 In the event of the failure of any component affecting the signal format the system shall be automatically switched off.

5.3.4.19 The light units shall be so designed that deposits of condensation, ice, dirt, etc. on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

5.3.5 Visual approach slope indicator

Application

5.3.5.1 **Recommendation.—** *A visual approach slope indicator should be provided to serve the approach to a heliport, whether or not the heliport is served by other visual approach aids or by non-visual aids, where one or more of the following conditions exist especially at night:*

a) obstacle clearance, noise abatement or traffic control procedures require a particular slope to be flown;

b) the environment of the heliport provides few visual surface cues; and

c) the characteristics of the helicopter require a stabilized approach.

5.3.5.2 The standard visual approach slope indicator systems for helicopter operations shall consist of the following:

a) PAPI and APAPI systems conforming to the specifications contained in Annex 14, Volume I, 5.3.5.23 to 5.3.5.40 inclusive except that the angular size of the on-slope sector of the systems shall be increased to 45 minutes; or

b) helicopter approach path indicator (HAPI) system conforming to the specifications in 5.3.5.6 to 5.3.5.21 inclusive.

Location

5.3.5.3 A visual approach slope indicator shall be located such that a helicopter is guided to the desired position within the final approach and take-off area and so as to avoid dazzling the pilot during final approach and landing.

5.3.5.4 **Recommendation.—** *A visual approach slope indicator should be located adjacent to the nominal aiming point and aligned in azimuth with the preferred approach direction.*

5.3.5.5 The light unit(s) shall be frangible and mounted as low as possible.

HAPI signal format

5.3.5.6 The signal format of the HAPI shall include four discrete signal sectors, providing an "above slope", an "on slope", a "slightly below" and a "below slope" signal.

5.3.5.7 The signal format of the HAPI shall be as shown in Figure 5-12, Illustrations A and B.

Note.— Care is required in the design of the unit to minimize spurious signals between the signal sectors and at the azimuth coverage limits.

5.3.5.8 The signal repetition rate of the flashing sector of the HAPI shall be at least 2 Hz.

5.3.5.9 **Recommendation.—** *The on-to-off ratio of pulsing signals of the HAPI should be 1 to 1 and the modulation depth should be at least 80 per cent.*

5.3.5.10 The angular size of the "on-slope" sector of the HAPI shall be 45 minutes.

5.3.5.11 The angular size of the "slightly below" sector of the HAPI shall be 15 minutes.

Light distribution

5.3.5.12 **Recommendation.—** *The light intensity distribution of the HAPI in red and green colours should be as shown in Figure 5-9, Illustration 4.*

Note.— A larger azimuth coverage can be obtained by installing the HAPI system on a turntable.

5.3.5.13 Colour transition of the HAPI in the vertical plane shall be such as to appear to an observer at a distance of not less than 300 m to occur within a vertical angle of not more than three minutes.

5.3.5.14 The transmission factor of a red or green filter shall be not less than 15 per cent at the maximum intensity setting.

5.3.5.15 At full intensity the red light of the HAPI shall have a Y-coordinate not exceeding 0.320 and the green light shall be within the boundaries specified in Annex 14, Volume I, Appendix 1, 2.1.3.

5.3.5.16 A suitable intensity control shall be provided so as to allow adjustment to meet the prevailing conditions and to avoid dazzling the pilot during approach and landing.

Approach slope and elevation setting

5.3.5.17 A HAPI system shall be capable of adjustment in elevation at any desired angle between 1 degree and 12 degrees above the horizontal with an accuracy of ±5 minutes of arc.

5.3.5.18 The angle of elevation setting of HAPI shall be such that during an approach, the pilot of a helicopter observing the upper boundary of the "below slope" signal will clear all objects in the approach area by a safe margin.

Characteristics of the light unit

5.3.5.19 The system shall be so designed that:

a) in the event the vertical misalignment of a unit exceeds ± 0.5° (± 30 minutes), the system will switch off automatically; and

b) if the flashing mechanism fails, no light will be emitted in the failed flashing sector(s).

Table 5-1. Dimensions and slopes of the obstacle protection surface

SURFACE AND DIMENSIONS	NON-INSTRUMENT FATO		NON-PRECISION FATO
Length of inner edge	Width of safety area		Width of safety area
Distance from end of FATO	3 m minimum		60 m
Divergence	10%		15%
Total length	2 500 m		2 500 m
Slope	PAPI	A[a] - 0.57°	A[a] - 0.57°
	HAPI	A[b] - 0.65°	A[b] - 0.65°
	APAPI	A[a] - 0.9°	A[a] -0.9°

a. As indicated in Annex 14, Volume I, Figure 5-13.
b. The angle of the upper boundary of the "below slope" signal.

Sector	*Format*
Above	Flashing green
On slope	Green
Slightly below	Red
Below	Flashing red

Illustration A

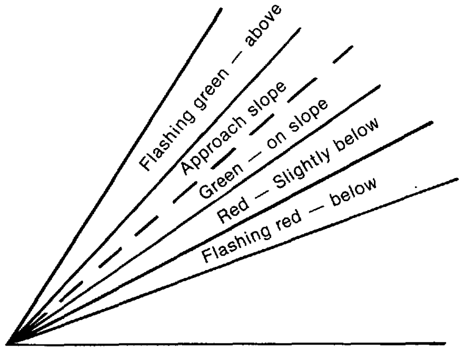


Illustration B

Figure 5-12. HAPI signal format

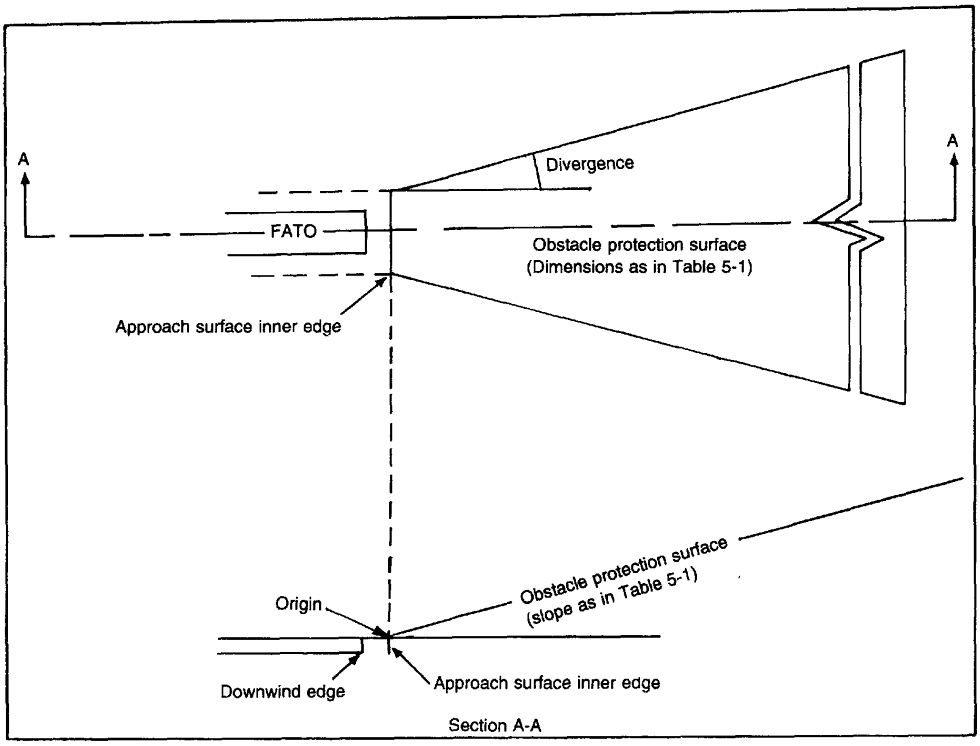


Figure 5-13. Obstacle protection surface for visual approach slope indicator systems

5.3.5.20 The light unit of the HAPI shall be so designed that deposits of condensation, ice, dirt, etc. on optically transmitting or reflecting surfaces will interfere to the least possible extent with the light signal and will not cause spurious or false signals to be generated.

5.3.5.21 **Recommendation.—** *A HAPI system intended for installation on a floating helideck should afford a stabilization of the beam to an accuracy of ±1/4 degree within ±3-degree pitch and roll movement of the heliport.*

Obstacle protection surface

Note.— The following specifications apply to PAPI, APAPI and HAPI.

5.3.5.22 An obstacle protection surface shall be established when it is intended to provide a visual approach slope indicator system.

5.3.5.23 The characteristics of the obstacle protection surface, i.e. origin, divergence, length and slope shall correspond to those specified in the relevant column of Table 5-1 and in Figure 5-13.

5.3.5.24 New objects or extensions of existing objects shall not be permitted above an obstacle protection surface except when, in the opinion of the appropriate authority, the new object or extension would be shielded by an existing immovable object.

Note.— Circumstances in which the shielding principle may reasonably be applied are described in the Airport Services Manual, *Part 6, (Doc 9137).*

5.3.5.25 Existing objects above an obstacle protection surface shall be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of helicopters.

5.3.5.26 Where an aeronautical study indicates that an existing object extending above an obstacle protection surface could adversely affect the safety of operations of helicopters one or more of the following measures shall be taken:

a) suitably raise the approach slope of the system;

b) reduce the azimuth spread of the system so that the object is outside the confines of the beam;

c) displace the axis of the system and its associated obstacle protection surface by no more than 5 degrees;

d) suitably displace the final approach and take-off area; and

e) install a visual alignment guidance system specified in 5.3.4.

Note.— Guidance on this issue is contained in the Heliport Manual (*Doc 9261*).

5.3.6 Final approach and take-off area lights

Application

5.3.6.1 Where a final approach and take-off area is established at a surface level heliport on ground intended for use at night, final approach and take-off area lights shall be provided except that they may be omitted where the final approach and take-off area and the touchdown and lift-off area are nearly coincidental or the extent of the final approach and take-off area is self-evident.

Location

5.3.6.2 Final approach and take-off area lights shall be placed along the edges of the final approach and take-off area. The lights shall be uniformly spaced as follows:

a) for an area in the form of a square or rectangle, at intervals of not more than 50 m with a minimum of four lights on each side including a light at each corner; and

b) for any other shaped area, including a circular area, at intervals of not more than 5 m with a minimum of ten lights.

Characteristics

5.3.6.3 Final approach and take-off area lights shall be fixed omnidirectional lights showing white. Where the intensity of the lights is to be varied the lights shall show variable white.

5.3.6.4 **Recommendation.—** *The light distribution of final approach and take-off area lights should be as shown in Figure 5-9, Illustration 5.*

5.3.6.5 **Recommendation.—** *The lights should not exceed a height of 25 cm and should be inset when a light extending above the surface would endanger helicopter operations. Where a final approach and take-off area is not meant for lift-off or touchdown, the lights should not exceed a height of 25 cm above ground or snow level.*

5.3.7 Aiming point lights

Application

5.3.7.1 **Recommendation.—** *Where an aiming point marking is provided at a heliport intended for use at night, aiming point lights should be provided.*

Location

5.3.7.2 Aiming point lights shall be collocated with the aiming point marking.

Characteristics

5.3.7.3 Aiming point lights shall form a pattern of at least six omnidirectional white lights as shown in Figure 5-4. The lights shall be inset when a light extending above the surface could endanger helicopter operations.

5.3.7.4 **Recommendation.—** *The light distribution of aiming point lights should be as shown in Figure 5-9, Illustration 5.*

5.3.8 Touchdown and lift-off area lighting system

Application

5.3.8.1 A touchdown and lift-off area lighting system shall be provided at a heliport intended for use at night.

5.3.8.2 The touchdown and lift-off area lighting system for a surface level heliport shall consist of one or more of the following:

a) perimeter lights; or

b) floodlighting; or

c) arrays of segmented point source lighting (ASPSL) or luminescent panel (LP) lighting to identify the touchdown and lift-off area when a) and b) are not practicable and final approach and take-off area lights are available.

5.3.8.3 The touchdown and lift-off area lighting system for an elevated heliport or helideck shall consist of:

a) perimeter lights; and

b) ASPSL and/or LPs to identify the touchdown marking where it is provided and/or floodlighting to illuminate the touchdown and lift-off area.

Note. — At elevated heliports and helidecks, surface texture cues within the touchdown and lift-off area are essential for helicopter positioning during the final approach and landing. Such cues can be provided using various forms of lighting (ASPSL, LP, floodlights or a combination of these lights, etc.) in addition to perimeter lights. Best results have been demonstrated by the combination of perimeter lights and ASPSL in the form of encapsulated strips of light emitting diodes (LEDs) to identify the touchdown and heliport identification markings.

5.3.8.4 **Recommendation.—** *Touchdown and lift-off area ASPSL and/or LPs to identify the touchdown marking and/or floodlighting should be provided at a surface-level heliport intended for use at night when enhanced surface texture cues are required.*

Location

5.3.8.5 Touchdown and lift-off area perimeter lights shall be placed along the edge of the area designated for use as the touchdown and lift-off area or within a distance of 1.5 m from the edge. Where the touchdown and lift-off area is a circle the lights shall be:

a) located on straight lines in a pattern which will provide information to pilots on drift displacement; and

b) where a) is not practicable, evenly spaced around the perimeter of the touchdown and lift-off area at the appropriate interval except that over a sector of 45 degrees the lights shall be spaced at half spacing.

5.3.8.6 Touchdown and lift-off area perimeter lights shall be uniformly spaced at intervals of not more than 3 m for elevated heliports and helidecks and not more than 5 m for surface level heliports. There shall be a minimum number of four lights on each side including a light at each corner. For a circular touchdown and lift-off area, where lights are installed in accordance with 5.3.8.5 b) there shall be a minimum of fourteen lights.

Note.— Guidance on this issue is contained in the Heliport Manual *(Doc 9261).*

5.3.8.7 The touchdown and lift-off area perimeter lights shall be installed at an elevated heliport or fixed helideck such that the pattern cannot be seen by the pilot from below the elevation of the touchdown and lift-off area.

5.3.8.8 The touchdown and lift-off area perimeter lights shall be installed at a floating helideck, such that the pattern cannot be seen by the pilot from below the elevation of the touchdown and lift-off area when the helideck is level.

5.3.8.9 On surface level heliports, ASPSL or LPs, if provided to identify the touchdown and lift-off area, shall be placed along the marking designating the edge of the touchdown and lift-off area. Where the touchdown and lift-off area is a circle, they shall be located on straight lines circumscribing the area.

5.3.8.10 On surface level heliports the minimum number of LPs on a touchdown and lift-off area shall be nine. The total length of LPs in a pattern shall not be less than 50 per cent of the length of the pattern. There shall be an odd number with a minimum number of three panels on each side of the touchdown and lift-off area including a panel at each corner. LPs shall be uniformly spaced with a distance between adjacent panel ends of not more than 5 m on each side of the touchdown and lift-off area.

5.3.8.11 **Recommendation.—** *When LPs are used on an elevated heliport or helideck to enhance surface texture cues, the panels should not be placed adjacent to the perimeter lights. They should be placed around a touchdown marking where it is provided or coincident with heliport identification marking.*

5.3.8.12 Touchdown and lift-off area floodlights shall be located so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights shall be such that shadows are kept to a minimum.

Note.— ASPSL and LPs used to designate the touchdown and/or heliport identification marking have been shown to provide enhanced surface texture cues when compared to low-level floodlights. Due to the risk of misalignment, if floodlights are used, there will be a need for them to be checked periodically to ensure they remain within the specifications contained within 5.3.8.

Characteristics

5.3.8.13 The touchdown and lift-off area perimeter lights shall be fixed omnidirectional lights showing green.

5.3.8.14 At a surface level heliport, ASPSL or LPs shall emit green light when used to define the perimeter of the touchdown and lift-off area.

5.3.8.15 The provisions of 5.3.8.13 and 5.3.8.14 shall not require the replacement of existing installations before 1 January 2009.

5.3.8.16 **Recommendation.—** *The chromaticity and luminance of colours of LPs should conform to Annex 14, Volume I, Appendix 1, 3.4.*

5.3.8.17 An LP shall have a minimum width of 6 cm. The panel housing shall be the same colour as the marking it defines.

5.3.8.18 **Recommendation.—** *The perimeter lights should not exceed a height of 25 cm and should be inset when a light extending above the surface could endanger helicopter operations.*

5.3.8.19 **Recommendation.—** *When located within the safety area of a heliport or within the obstacle free sector of a helideck, the touchdown and lift-off area floodlights should not exceed a height of 25 cm.*

5.3.8.20 The LPs shall not extend above the surface by more than 2.5 cm.

5.3.8.21 **Recommendation.—** *The light distribution of the perimeter lights should be as shown in Figure 5-9, Illustration 6.*

5.3.8.22 **Recommendation.—** *The light distribution of the LPs should be as shown in Figure 5-9, Illustration 7.*

5.3.8.23 The spectral distribution of touchdown and lift-off area floodlights shall be such that the surface and obstacle marking can be correctly identified.

5.3.8.24 **Recommendation.—** *The average horizontal illuminance of the floodlighting should be at least 10 lux, with a uniformity ratio (average to minimum) of not more than 8:1 measured on the surface of the touchdown and lift-off area.*

5.3.8.25 **Recommendation.—** *Lighting used to identify the touchdown marking should comprise a segmented circle of omnidirectional ASPSL strips showing yellow. The segments should consist of ASPSL strips, and the total length of the ASPSL strips should not be less than 50 per cent of the circumference of the circle.*

5.3.8.26 **Recommendation.—** *If utilized, the heliport identification marking lighting should be omnidirectional showing green.*

5.3.9 Winching area floodlighting

Application

5.3.9.1 Winching area floodlighting shall be provided at a winching area intended for use at night.

Location

5.3.9.2 Winching area floodlights shall be located so as to avoid glare to pilots in flight or to personnel working on the area. The arrangement and aiming of floodlights shall be such that shadows are kept to a minimum.

Characteristics

5.3.9.3 The spectral distribution of winching area floodlights shall be such that the surface and obstacle markings can be correctly identified.

5.3.9.4 **Recommendation.—** *The average horizontal illuminance should be at least 10 lux, measured on the surface of the winching area.*

5.3.10 Taxiway lights

Note.— The specifications for taxiway centre line lights and taxiway edge lights in Annex 14, Volume I, 5.3.16 and 5.3.17 are equally applicable to taxiways intended for ground taxiing of helicopters.

5.3.11 Visual aids for denoting obstacles

Note.— The specifications for marking and lighting of obstacles included in Annex 14, Volume I, Chapter 6, are equally applicable to heliports and winching areas.

5.3.12 Floodlighting of obstacles

Application

5.3.12.1 At a heliport intended for use at night, obstacles shall be floodlighted if it is not possible to display obstacle lights on them.

Location

5.3.12.2 Obstacle floodlights shall be arranged so as to illuminate the entire obstacle and as far as practicable in a manner so as not to dazzle the helicopter pilots.

Characteristics

5.3.12.3 **Recommendation.—** *Obstacle floodlighting should be such as to produce a luminance of at least 10 cd/m*^{2}.

CHAPTER 6. HELIPORT SERVICES

6.1 Rescue and fire fighting

General

Introductory Note.— These specifications apply to surface level heliports and elevated heliports only. The specifications complement those in Annex 14, Volume I, 9.2 concerning rescue and fire fighting requirements at aerodromes.

The principal objective of a rescue and fire fighting service is to save lives. For this reason, the provision of means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of a heliport assumes primary importance because it is within this area that there are the greatest opportunities of saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following a helicopter accident or incident or at any time during rescue operations.

The most important factors bearing on effective rescue in a survivable helicopter accident are the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use.

For an elevated heliport, requirements to protect any building or structure on which the heliport is located are not taken into account.

Rescue and fire fighting requirements for helidecks may be found in the Heliport Manual.

Level of protection to be provided

6.1.1 **Recommendation.—** *The level of protection to be provided for rescue and fire fighting should be based on the over-all length of the longest helicopter normally using the heliport and in accordance with the heliport fire fighting category determined from Table 6-1, except at an unattended heliport with a low movement rate.*

Note.— Guidance to assist the appropriate authority in providing rescue and fire fighting equipment and services at surface-level and elevated heliports is given in the Heliport Manual.

6.1.2 **Recommendation.—** *During anticipated periods of operations by smaller helicopters, the heliport fire fighting category may be reduced to that of the highest category of helicopter planned to use the heliport during that time.*

Extinguishing agents

6.1.3 **Recommendation.—** *The principal extinguishing agent should be a foam meeting the minimum performance level B.*

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B rating is given in the Airport Services Manual, *Part 1.*

6.1.4 **Recommendation.—** *The amounts of water for foam production and the complementary agents to be provided should be in accordance with the heliport fire fighting category determined under 6.1.1 and Table 6-2 or Table 6-3 as appropriate.*

Note.— The amounts of water specified for elevated heliports do not have to be stored on or adjacent to the heliport if there is a suitable adjacent pressurized water main system capable of sustaining the required discharge rate.

6.1.5 **Recommendation.—** *At a surface-level heliport it is permissible to replace all or part of the amount of water for foam production by complementary agents.*

6.1.6 **Recommendation.—** *The discharge rate of the foam solution should not be less than the rates shown in Table 6-2 or Table 6-3 as appropriate. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.*

6.1.7 **Recommendation.—** *At an elevated heliport, at least one hose spray line capable of delivering foam in a jet*

Table 6-1. Heliport fire fighting category

Category	Helicopter over-all length[a]
H1	up to but not including 15 m
H2	from 15 m up to but not including 24 m
H3	from 24 m up to but not including 35 m

a. Helicopter length, including the tail boom and the rotors.

Table 6-2. Minimum usable amounts of extinguishing agents for surface level heliports

Category	Foam meeting performance level B		Complementary agents				
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg)	or	Halons (kg)	or	CO_2 (kg)
(1)	(2)	(3)	(4)		(5)		(6)
H1	500	250	23		23		45
H2	1 000	500	45		45		90
H3	1 600	800	90		90		180

Table 6-3. Minimum usable amounts of extinguishing agents for elevated heliports

Category	Foam meeting performance level B		Complementary agents				
	Water (L)	Discharge rate foam solution (L/min)	Dry chemical powders (kg)	or	Halons (kg)	or	CO_2 (kg)
(1)	(2)	(3)	(4)		(5)		(6)
H1	2 500	250	45		45		90
H2	5 000	500	45		45		90
H3	8 000	800	45		45		90

spray pattern at 250 L/min should be provided. Additionally at elevated heliports in categories 2 and 3, at least two monitors should be provided each having a capability of achieving the required discharge rate and positioned at different locations around the heliports so as to ensure the application of foam to any part of the heliport under any weather condition and to minimize the possibility of both monitors being impaired by a helicopter accident.

Rescue equipment

6.1.8 **Recommendation.—** *At an elevated heliport rescue equipment should be stored adjacent to the heliport.*

Note.— Guidance on the rescue equipment to be provided at a heliport is given in the Heliport Manual.

Response time

6.1.9 **Recommendation.—** *At a surface-level heliport, the operational objective of the rescue and fire fighting service should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.*

Note.— Response time is considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle(s) (the service) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in Table 6-2.

6.1.10 **Recommendation.—** *At an elevated heliport, the rescue and fire fighting service should be immediately available on or in the vicinity of the heliport while helicopter movements are taking place.*

APPENDIX 1. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Heliport reference point	30 m surveyed/calculated	1×10^{-3} routine
Navaids located at the heliport	3 m surveyed	1×10^{-5} essential
Obstacles in Area 3	0.5 m surveyed	1×10^{-5} essential
Obstacles in Area 2 (the part within the heliport boundary)	5 m surveyed	1×10^{-5} essential
Geometric centre of TLOF or FATO thresholds	1 m surveyed	1×10^{-8} critical
Ground taxiway centre line points, air taxiway and transit route points	0.5 m surveyed/calculated	1×10^{-5} essential
Ground taxiway intersection marking line	0.5 m surveyed	1×10^{-5} essential
Ground exit guidance line	0.5 m surveyed	1×10^{-5} essential
Apron boundaries (polygon)	1 m surveyed	1×10^{-3} routine
De-icing/anti-icing facility (polygon)	1 m surveyed	1×10^{-3} routine
Helicopter standpoints/INS checkpoints	0.5 m surveyed	1×10^{-3} routine

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— Implementation of Annex 15, provision 10.6.1.2, concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

Table 2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Heliport elevation	0.5 m surveyed	1×10^{-5} essential
WGS–84 geoid undulation at heliport elevation position	0.5 m surveyed	1×10^{-5} essential
FATO threshold, non-precision approaches	0.5 m surveyed	1×10^{-5} essential
WGS–84 geoid undulation at FATO threshold, TLOF geometric centre, non-precision approaches	0.5 m surveyed	1×10^{-5} essential
FATO threshold, precision approaches	0.25 m surveyed	1×10^{-8} critical
WGS–84 geoid undulation at FATO threshold, TLOF geometric centre, precision approaches	0.25 m surveyed	1×10^{-8} critical
Ground taxiway centre line points, air taxiway and transit route points	1 m surveyed	1×10^{-5} essential
Obstacles in Area 2 (the part within the heliport boundary)	3 m surveyed	1×10^{-5} essential
Obstacles in Area 3	0.5 m surveyed	1×10^{-5} essential
Distance measuring equipment/precision (DME/P)	3 m surveyed	1×10^{-5} essential

Note 1.— See Annex 15, Appendix 8, for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2. — Implementation of Annex 15, provision 10.6.1.2, concerning the availability, as of 18 November 2010, of obstacle data according to Area 2 and Area 3 specifications would be facilitated by appropriate advanced planning for the collection and processing of such data.

Table 3. Declination and magnetic variation

Declination/variation	Accuracy Data type	Integrity Classification
Heliport magnetic variation	1 degree surveyed	1×10^{-5} essential
ILS localizer antenna magnetic variation	1 degree surveyed	1×10^{-5} essential
MLS azimuth antenna magnetic variation	1 degree surveyed	1×10^{-5} essential

Table 4. Bearing

Bearing	Accuracy Data type	Integrity Classification
ILS localizer alignment	1/100 degree surveyed	1×10^{-5} essential
MLS zero azimuth alignment	1/100 degree surveyed	1×10^{-5} essential
FATO bearing (true)	1/100 degree surveyed	1×10^{-3} routine

Table 5. Length/distance/dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
FATO length, TLOF dimensions	1 m surveyed	1×10^{-8} critical
Clearway length and width	1 m surveyed	1×10^{-5} essential
Landing distance available	1 m surveyed	1×10^{-8} critical
Take-off distance available	1 m surveyed	1×10^{-8} critical
Rejected take-off distance available	1 m surveyed	1×10^{-8} critical
Taxiway width	1 m surveyed	1×10^{-5} essential
ILS localizer antenna-FATO end, distance	3 m calculated	1×10^{-3} routine
ILS glide slope antenna-threshold, distance along centre line	3 m calculated	1×10^{-3} routine
ILS marker-threshold distance	3 m calculated	1×10^{-5} essential
ILS DME antenna-threshold, distance along centre line	3 m calculated	1×10^{-5} essential
MLS azimuth antenna-FATO end, distance	3 m calculated	1×10^{-3} routine
MLS elevation antenna-threshold, distance along centre line	3 m calculated	1×10^{-3} routine
MLS DME/P antenna-threshold, distance along centre line	3 m calculated	1×10^{-5} essential

— END —

International Standards and Recommended Practices

Annex 15
to the Convention on International Civil Aviation

Aeronautical Information Services

This edition incorporates all amendments adopted by the Council prior to 24 February 2004 and supersedes, on 25 November 2004, all previous editions of Annex 15.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Twelfth Edition
July 2004

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-33	Incorporated in this edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

Standards and Recommended Practices for Aeronautical Information Services were first adopted by the Council on 15 May 1953, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944), and were designated as Annex 15 to the Convention.

Annex 15 as now presented has undergone the following development. The first requirements were developed by the Air Navigation Committee as a result of recommendations of Regional Air Navigation Meetings, and were published by authority of the Council as Procedures for International Notices to Airmen (PANS-NOTAM, PICAO Doc 2713) in January 1947. In 1949, the Special NOTAM Meeting reviewed and proposed amendments to these procedures which were later issued as "Procedures for Air Navigation Services (PANS-AIS, Doc 7106)" and which became applicable on 1 August 1951. In 1952, the PANS-AIS were reviewed by the First Session of the Aeronautical Information Services Division which recommended the adoption of Standards and Recommended Practices. Following consideration by all Contracting States, these recommendations were reviewed by the Air Navigation Commission and the first set of Standards and Recommended Practices was adopted by the Council on 15 May 1953 as Annex 15 to the Convention. This Annex became applicable on 1 April 1954.

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

It is to be noted that some Standards in this Annex incorporate, by reference, other specifications having the status of Recommended Practices. In such cases the text of the Recommended Practice becomes part of the Standard.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

The following editorial practice has been followed in the writing of specifications: for Standards the operative verb "shall" is used, and for Recommended Practices the operative verb "should" is used.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 15

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
1st Edition	First Session of the Aeronautical Information Services Division		15 May 1953 1 September 1953 1 April 1954
1	Consultation with States	Editorial amendments for consistency in terminology.	27 May 1955 1 October 1955 1 October 1955
2	Consultation with States	Editorial amendments for consistency in terminology.	15 May 1956 15 September 1956 1 December 1956
3	Consultation with States	Definition and identification of prohibited, restricted and danger areas.	16 April 1957 1 September 1957 1 December 1957

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
4	Consultation with States	Guidance material on the application of the definitions of danger area, prohibited area and restricted area.	14 November 1958 — 14 November 1958
5	Consultation with States	Editorial amendments for consistency in terminology; establishment of worldwide application of location indicators instead of place name abbreviations.	24 March 1959 1 September 1959 1 October 1959
6	Aeronautical Information Services and Aeronautical Charts Division	Contents of Aeronautical Information Publications (AIP); specifications for Aeronautical Information Circulars, and the NOTAM Code.	20 June 1960 1 October 1960 1 January 1961
7	Aeronautical Information Services and Aeronautical Charts Division	Deletion of guidance material.	2 December 1960 — 1 January 1961
8	Correspondence and Council Action to approve new *ABC — ICAO Abbreviations and Codes* (Doc 8400)	Regulated system (AIRAC); deletion of “NOTAM Code” and “Abbreviations for use by aeronautical information services”; minor amendments to Appendix 1.	25 March 1964 1 August 1964 1 November 1964
9	Rules of the Air and Air Traffic Services/Operations Divisional Meeting	Definitions for danger area, prohibited area, and restricted area.	10 December 1965 10 April 1966 25 August 1966
10	Aeronautical Information Services and Aeronautical Charts Division (1966)	Specifications for Snowplan; definition and *pro forma* for SNOWTAM; NOTAM Class I text; content of AIP; identification and delineation of restricted airspace; Aeronautical Information Circulars.	13 June 1967 8 October 1967 8 February 1968
11	Fifth Air Navigation Conference	Pre-flight information service; information on runway visual range systems.	23 January 1969 23 May 1969 18 September 1969
12	Sixth Air Navigation Conference, and transfer from Regional Supplementary Procedures	Publication of information on air traffic services systems, i.e. on reporting points and minimum flight altitudes; NOTAM information on the conduct of search and rescue operations.	15 May 1970 15 September 1970 4 February 1971
13	Aeronautical Information Services and Aeronautical Charts Division; Sixth Air Navigation Conference	Predetermined distribution system of NOTAM Class I; composition of NOTAM; information on aeronautical meteorological facilities and services available for international air navigation.	19 March 1971 6 September 1971 6 January 1972
14	Regional Air Navigation Meeting Recommendations of worldwide applicability. Recommendation 19/29 of CAR IV RAN Meeting (1966); Recommendation 19/10 of SAM/SAT/ III RAN Meeting (1967); Recommendations 19/4 and 19/5 of MID/SEA RAN Meeting (1968); Recommendation 17/5 of NAT/V RAN Meeting (1970)	Availability of Aeronautical Information Service in cases where 24-hour service is not provided; decoding of NOTAM for pre-flight planning; promulgation of information that no NOTAM Class II have been issued; provision of information to the aeronautical information service by each of the State services associated with aircraft operations; publication in AIP of the coordinates of the antennae of stations providing aeronautical mobile and/or aeronautical navigation services, to an accuracy of at least one-tenth of a minute.	15 December 1971 15 April 1972 7 December 1972
15	Amendment 43 to Annex 4 — *Aeronautical Charts*; Amendment 1 to 10th edition of PANS-RAC (Doc 4444); Recommendations 16/3, 16/8, 16/10 b) and 16/15 of the 6th EUM RAN Meeting; Amendment 28 to Annex 14 — *Aerodromes*; Amendment 51 to Annex 10 — *Aeronautical Telecommunications*	Publication in AIP of the locations at aerodromes of VOR and INS check-points; publication in AIP of names, coded designators and geographical coordinates of significant points defining air traffic services routes, and of information on bird concentrations in the vicinity of aerodromes and bird migrations; listing of types of information inappropriate to NOTAM; type of information appropriate to Aeronautical Information Circulars; alignment of the terminology with the definition in Annex 14 for snow on the ground.	19 March 1973 30 July 1973 23 May 1974

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
16	Council's request (78-14) to consult States on publication in AIP of differences from Annexes and PANS; Amendment 6 to the PANS-RAC	Publication in AIP of differences between the national regulations and practices of a State and the related ICAO Standards, Recommended Practices and Procedures; elimination of inconsistencies between requirements in Appendix 1 and parent provisions in the Annex; transfer of requirements for information concerning ATIS from the MET to the RAC part of the AIP.	25 June 1974 25 October 1974 27 February 1975
17	Recommendation 2/6 of the Fourth Meeting of the Technical Panel on Supersonic Transport Operations; study by the Air Navigation Commission concerning interception of aircraft	Dissemination by NOTAM of forecasts of solar cosmic radiation where provided; publication in AIP of interception procedures and visual signals to be used.	4 February 1975 4 June 1975 9 October 1975
18	Recommendations of Regional Air Navigation Meetings (EUM 6 Rec 9/4, AFI/5 Rec 6/2 c), d) and ASIA/PAC Rec 6/3 c)) and request by IATA to amend Annex 14; general review of Annex 14	Publication in AIP of information concerning operations for the removal of disabled aircraft at aerodromes; notification of the status of rescue and firefighting services available at an aerodrome in terms of significant changes in the level of protection; definitions for manoeuvring area and movement area; substitution of expression "altimeter check location" for "altimeter checkpoint".	5 February 1976 5 June 1976 30 December 1976
19	Recommendation 3/16 of the 7th Air Navigation Conference; revision (Amendment No. 60) of Annex 3 — *Meteorological Service for International Air Navigation*	Publication in AIP, in the case of ILS installations, the extent of compliance with the provisions in Annex 10 regarding localizer and glide path beam structure and of the height of the ILS reference datum; realignment of Part 4 — Meteorology with the new specifications and terminology introduced by Amendment 60 to Annex 3.	27 June 1977 27 October 1977 23 February 1978
20	9th Air Navigation Conference	Publication in the AIP of description of ATS routes; North reference (magnetic, true or grid) for tracks or bearings.	9 December 1977 9 April 1978 10 August 1978
21	Proposals submitted by the Federal Republic of Germany (also on behalf of the United Kingdom) and the Union of Soviet Socialist Republics	NOTAM Class I format and the publication of amendments to the AIP.	31 March 1980 31 July 1980 27 November 1980
22	Proposal arising from a study by the Air Navigation Commission and proposal submitted by the Secretariat	Activities which constitute a potential hazard to flights of civil aircraft and receipt of AIRAC NOTAM 28 days in advance of the effective date.	13 March 1981 13 July 1981 26 November 1981
23	Proposals submitted by the Secretariat and the United Kingdom	Plain-language pre-flight information bulletins, interception of civil aircraft and "Nil Notification" of AIRAC NOTAM.	2 April 1982 2 August 1982 25 November 1982
24	Recommendations 7/5, 7/8 and 10/2 of the Aerodromes, Air Routes and Ground Aids Divisional Meeting (1981)	Revised SNOWTAM format; publication in the AIP of wet runway surface friction and of the existence of an obstacle-free zone.	17 November 1982 17 March 1983 24 November 1983
25	Recommendation 7/7 of the Aerodromes, Air Routes and Ground Aids Divisional Meeting (1981)	Method of referencing date/time.	25 March 1985 29 July 1985 21 November 1985

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
26	Various sources, including Conclusions 22/24 and 24/20 of the European Air Navigation Planning Group (EANPG); Recommendation 9 of All Weather Operations Panel (AWOP); Recommendation 1/4 of the Obstacle Clearance Panel (OCP); Amendments 64, 47 and 38 to Annexes 3, 4 and 14 respectively; proposals submitted by the United Kingdom and by the Secretariat	Updating of the provisions relating to the use of A-4 sheet size paper in the AIP; origination and distribution of NOTAM and AIC; adequacy and authenticity of aeronautical information and the regulated system (AIRAC); changes to predetermined distribution system for NOTAM Class I; introduction of an abbreviated heading and changes to the SNOWTAM format and the guidance for its completion; publication in the AIP of the location of the DME zero-range indication point; updating of the list of charts forming part of the AIP; publication in the AIP of additional operational data concerning standard routes for taxiing aircraft, highest elevation of the touchdown zone of a precision approach runway, and geographical coordinates of thresholds and aircraft stands; inclusion of references to the seventh and eighth letters in the address indicators in the predetermined distribution system; and volcanic ash cloud warnings.	6 March 1987 27 July 1987 22 October 1987
27	Various sources, including Conclusion 30/15 of the European Air Navigation Planning Group (EANPG); Air Navigation Commission's review of the Annexes; Recommendation 3/3 of the Visual Flight Rules Operations Panel (VFOP); proposal submitted by some European States; and Amendment 39 to Annex 14	Introduction of Integrated Aeronautical Information Package and revised NOTAM Format; promulgation of information on areas or routes where the possibility of interception exists and information relating to safeguarding international civil aviation against acts of unlawful interference; introduction of new ATS airspace classification; bird hazard reduction; updating of terminology and list of friction devices associated with measuring of paved surfaces; introduction of heliport data.	4 March 1991 28 July 1991 14 November 1991
28	Various sources, including Conclusion 34/12 of the European Air Navigation Planning Group (EANPG); adoption by the Council of WGS-84 as the standard geodetic reference system for international aviation; proposal by RGCSP/8; and the Secretariat	Introduction in Chapter 2 of new and revised definitions relating to heliport and Integrated Aeronautical Information Package; amendments to Chapter 3 related to the exchange of aeronautical information and introduction of new provisions concerning the promulgation of WGS-84 related geographical coordinates; amendments and rearrangements of Chapter 4 concerning the restructured contents and general specifications of AIP, AIP Amendment and AIP Supplement specifications and their distribution; amendments to Chapter 5 concerning NOTAM origination and distribution and introduction of a new provision governing the promulgation of information on the release into the atmosphere of radioactive materials and toxic chemicals; upgrading in Chapter 6 to a Standard, of a provision concerning the use of AIRAC dates for the promulgation of changes requiring cartographic work and for updating of navigation databases; deletion in Chapter 8 of a Recommended Practice relating to the format of pre-flight information bulletins; substitution, in Chapter 9, of the specific term "aeronautical fixed telecommunication network (AFTN)" by the general term "aeronautical fixed service (AFS)"; introduction in Appendix 1 of completely restructured contents of AIP.	28 February 1994 28 June 1994 10 November 1994; 25 April 1996; 1 January 1998
29 (Tenth Edition)	Air Navigation Commission and Volcanic Ash Warnings Study Group (VAWSG)	Aeronautical databases, humanitarian flights, a special series NOTAM for volcanic activity and vertical component of the World Geodetic System — 1984 (WGS-84).	20 March 1997 21 July 1997 6 November 1997; 1 January 1998; 5 November 1998

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
30	Recommendations 1.2/1, 3.3/2 and 4.1/2 of the Aeronautical Information Services/ Aeronautical Charts (AIS/MAP) Divisional Meeting (1998); Air Navigation Commission	Introduction into Chapter 2 of new definitions for aeronautical data, aeronautical information, aeronautical information service, air defence identification zone (ADIZ), AIS product, Human Factors principles, and quality management; new provisions in Chapter 3 concerning the quality system, exchange of aeronautical information/data, copyright, cost recovery, and Human Factors considerations; restructured and new provisions in Chapter 6 dealing with the provision of AIRAC information in electronic form; and introduction into Appendix 1 of new provisions concerning ADIZ.	21 February 2000 17 July 2000 2 November 2000
31	Secretariat	New provisions in Chapter 8 concerning automated aeronautical information systems and harmonized AIS/MET pre-flight briefing and revision of Appendix 1 concerning the provision of information on activities of a dangerous nature and other potential hazards.	7 March 2001 16 July 2001 1 November 2001
32 (Eleventh Edition)	Various sources, including Conclusion 40/51 b) of the European Air Navigation Planning Group (EANPG); Conclusion 13/51 of the AFI Planning and Implementation Regional Group (APIRG); Air Navigation Commission; and the Secretariat	Introduction in Chapter 2 of a revised definition for Integrated Aeronautical Information Package; upgrading to a Standard of a provision in Chapter 3 concerning the use of English text; amendments to Chapter 4 concerning specifications for AIP Amendments and Supplements; restructuring and amending of provisions in Chapter 5 and Appendix 6; promulgation by NOTAM of contingency measures; new provisions in Chapter 8 concerning collection of information on the presence of bird hazards to aircraft operations at aerodromes/heliports; and alignment of Appendix 1 with the provisions of Annex 3.	28 February 2003 14 July 2003 27 November 2003
33 (Twelfth Edition)	Recommendation 4/6 of OCP/12; Recommendation 5.3/2 of OCP/13; Recommendation 3/1 of GNSSP/4; Air Navigation Commission; and the Secretariat	New provisions concerning definitions; the vertical reference system and the temporal reference system for international civil aviation; electronic terrain and obstacle data; aeronautical data quality requirements; inclusion of GNSS-related elements in aeronautical information; and the Radar Minimum Altitude Chart — ICAO; and updating of existing provisions related to the World Geodetic System — 1984 (WGS-84) and the Aeronautical Information Publication (AIP).	23 February 2004 12 July 2004 25 November 2004; 20 November 2008; 18 November 2010

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. INTRODUCTION

The object of the aeronautical information service is to ensure the flow of information/data necessary for the safety, regularity and efficiency of international air navigation. The role and importance of aeronautical information/data changed significantly with the implementation of area navigation (RNAV), required navigation performance (RNP) and airborne computer-based navigation systems. Corrupt or erroneous aeronautical information/data can potentially affect the safety of air navigation.

To satisfy the uniformity and consistency in the provision of aeronautical information/data that is required for the operational use by computer-based navigation systems, States shall, as far as practicable, avoid standards and procedures other than those established for international use.

These Standards and Recommended Practices are to be used in conjunction with the *Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400).

It is recognized that Supplementary Procedures may be required in certain cases in order to meet particular requirements of the ICAO Regions.

Guidance material on the organization and operation of aeronautical information services is contained in the *Aeronautical Information Services Manual* (Doc 8126).

CHAPTER 2. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for aeronautical information services, they have the following meanings:

Accuracy. A degree of conformance between the estimated or measured value and the true value.

Note.— For measured positional data the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.

Aeronautical data. A representation of aeronautical facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing.

Aeronautical information. Information resulting from the assembly, analysis and formatting of aeronautical data.

Aeronautical Information Circular (AIC). A notice containing information that does not qualify for the origination of a NOTAM or for inclusion in the AIP, but which relates to flight safety, air navigation, technical, administrative or legislative matters.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical information service (AIS). A service established within the defined area of coverage responsible for the provision of aeronautical information/data necessary for the safety, regularity and efficiency of air navigation.

AIP Amendment. Permanent changes to the information contained in the AIP.

AIP Supplement. Temporary changes to the information contained in the AIP which are published by means of special pages.

AIRAC. An acronym (aeronautical information regulation and control) signifying a system aimed at advance notification based on common effective dates, of circumstances that necessitate significant changes in operating practices.

Air defence identification zone (ADIZ). Special designated airspace of defined dimensions within which aircraft are required to comply with special identification and/or reporting procedures additional to those related to the provision of air traffic services (ATS).

AIS product. Aeronautical information provided in the form of the elements of the Integrated Aeronautical Information Package (except NOTAM and PIB), including aeronautical charts, or in the form of suitable electronic media.

Application. Manipulation and processing of data in support of user requirements (ISO 19104*).

ASHTAM. A special series NOTAM notifying by means of a specific format change in activity of a volcano, a volcanic eruption and/or volcanic ash cloud that is of significance to aircraft operations.

Assemble. A process of merging data from multiple sources into a database and establishing a baseline for subsequent processing.

Note.— The assemble phase includes checking the data and ensuring that detected errors and omissions are rectified.

Bare Earth. Surface of the Earth including bodies of water and permanent ice and snow, and excluding vegetation and man-made objects.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Canopy. Bare Earth supplemented by vegetation height.

Culture. All man-made features constructed on the surface of the Earth, such as cities, railways and canals.

Cyclic redundancy check (CRC). A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.

Danger area. An airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.

Database. One or more files of data so structured that appropriate applications may draw from the files and update them.

Note.— This primarily refers to data stored electronically and accessed by computer rather than in files of physical records.

* All ISO Standards are listed at the end of this chapter.

Data product. Data set or data set series that conforms to a data product specification (ISO 19131*).

Data product specification. Detailed description of a data set or data set series together with additional information that will enable it to be created, supplied to and used by another party (ISO 19131*).

Note.— A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a data set. It may be used for production, sales, end-use or other purpose.

Data quality. A degree or level of confidence that the data provided meets the requirements of the data user in terms of accuracy, resolution and integrity.

Data set. Identifiable collection of data (ISO 19101*).

Data set series. Collection of data sets sharing the same product specification (ISO 19115*).

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Digital Elevation Model (DEM). The representation of terrain surface by continuous elevation values at all intersections of a defined grid, referenced to common datum.

Note.— Digital Terrain Model (DTM) is sometimes referred to as DEM.

Direct transit arrangements. Special arrangements approved by the public authorities concerned by which traffic which is pausing briefly in its passage through the Contracting State may remain under their direct control.

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

Feature. Abstraction of real world phenomena (ISO 19101*).

Feature attribute. Characteristic of a feature (ISO 19101*).

Note.— A feature attribute has a name, a data type and a value domain associated with it.

Feature operation. Operation that every instance of a feature type may perform (ISO 19110*).

Note.— An operation upon the feature type dam is to raise the dam. The result of this operation is to raise the level of water in the reservoir.

Feature relationship. Relationship that links instances of one feature type with instances of the same or a different feature type (ISO 19101*).

Feature type. Class of real world phenomena with common properties (ISO 19110*).

Note.— In a feature catalogue, the basic level of classification is the feature type.

Geodesic distance. The shortest distance between any two points on a mathematically defined ellipsoidal surface.

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note.— The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note.— In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Height. The vertical distance of a level, point or an object considered as a point, measured from a specific datum.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Integrated Aeronautical Information Package. A package which consists of the following elements:

— AIP, including amendment service;
— Supplements to the AIP;
— NOTAM and PIB;
— AIC; and
— checklists and lists of valid NOTAM.

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendment.

International airport. Any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where the formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

International NOTAM office (NOF). An office designated by a State for the exchange of NOTAM internationally.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Metadata. Data about data (ISO 19115*).

Note.— Data that describes and documents data.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Obstacle/terrain data collection surface. A defined surface intended for the purpose of collecting obstacle/terrain data.

Orthometric height. Height of a point related to the geoid, generally presented as an MSL elevation.

Portrayal. Presentation of information to humans (ISO 19117*).

Position (geographical). Set of coordinates (latitude and longitude) referenced to the mathematical reference ellipsoid which define the position of a point on the surface of the Earth.

Post spacing. Angular or linear distance between two adjacent elevation points.

Precision. The smallest difference that can be reliably distinguished by a measurement process.

Note.— In reference to geodetic surveys, precision is a degree of refinement in performance of an operation or a degree of perfection in the instruments and methods used when taking measurements.

Pre-flight information bulletin (PIB). A presentation of current NOTAM information of operational significance, prepared prior to flight.

Prohibited area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Quality. Totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs (ISO 8402*).

Note.— Entity is an item which can be individually described and considered (ISO 8402).*

Quality assurance. All the planned and systematic activities implemented within the quality system, and demonstrated as needed, to provide adequate confidence that an entity will fulfil requirements for quality (ISO 8402*).

Quality control. The operational techniques and activities that are used to fulfil requirements for quality (ISO 8402*).

Quality management. All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implementing them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system (ISO 8402*).

Quality system. The organizational structure, procedures, processes and resources needed to implement quality management (ISO 8402*).

Relief. The inequalities in elevation of the surface of the Earth represented on aeronautical charts by contours, hypsometric tints, shading or spot elevations.

Requirements for quality. Expression of the needs or their translation into a set of quantitatively or qualitatively stated requirements for the characteristics of an entity to enable its realization and examination (ISO 8402*).

Resolution. A number of units or digits to which a measured or calculated value is expressed and used.

Restricted area. An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Route stage. A route or portion of a route flown without an intermediate landing.

SNOWTAM. A special series NOTAM notifying the presence or removal of hazardous conditions due to snow, ice, slush or standing water associated with snow, slush and ice on the movement area, by means of a specific format.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

Terrain. The surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles.

Note.— In practical terms, depending on the method of data collection used, terrain represents the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as "first reflective surface".

Traceability. Ability to trace the history, application or location of an entity by means of recorded identifications (ISO 8402*).

Validation. Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled (ISO 8402*).

Verification. Confirmation by examination and provision of objective evidence that specified requirements have been fulfilled (ISO 8402*).

Note.— Objective evidence is information which can be proved true, based on facts obtained through observation, measurement, test or other means (ISO 8402).*

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* ISO Standard
8402 — *Quality Management and Quality Assurance — Vocabulary,* Second Edition
19101 — *Geographic information — Reference model*
19104 — *Geographic information — Terminology*
19108 — *Geographic information — Temporal schema*
19109 — *Geographic information — Rules for application schema*
19110 — *Geographic information — Feature cataloguing schema*
19115 — *Geographic information — Metadata*
19117 — *Geographic information — Portrayal*
19131 — *Geographic information — Data product specification*

CHAPTER 3. GENERAL

3.1 Responsibilities and functions

3.1.1 Each Contracting State shall:

a) provide an aeronautical information service; or

b) agree with one or more other Contracting State(s) for the provision of a joint service; or

c) delegate the authority for the provision of the service to a non-governmental agency, provided the Standards and Recommended Practices of this Annex are adequately met.

3.1.1.1 The State concerned shall remain responsible for the information published. Aeronautical information published for and on behalf of a State shall clearly indicate that it is published under the authority of that State.

3.1.1.2 Each Contracting State shall take all necessary measures to ensure that the aeronautical information/data it provides relating to its own territory, as well as areas in which the State is responsible for air traffic services outside its territory, is adequate, of required quality and timely. This shall include arrangements for the timely provision of required information/data to the aeronautical information service by each of the State services associated with aircraft operations.

3.1.1.3 Where 24-hour service is not provided, service shall be available during the whole period an aircraft is in flight in the area of responsibility of an aeronautical information service, plus a period of at least two hours before and after such a period. The service shall also be available at such other time as may be requested by an appropriate ground organization.

3.1.2 An aeronautical information service shall, in addition, obtain information to enable it to provide pre-flight information service and to meet the need for in-flight information.

a) from the aeronautical information services of other States;

b) from other sources that may be available.

Note.— One such source is the subject of a provision in 8.3.

3.1.3 Aeronautical information/data obtained under 3.1.2 a) shall, when distributed, be clearly identified as having the authority of the State of Origin.

3.1.4 Aeronautical information/data obtained under 3.1.2 b) shall, if possible, be verified before distribution and if not verified shall, when distributed, be clearly identified as such.

3.1.5 An aeronautical information service shall promptly make available to the aeronautical information services of other States any information/data necessary for the safety, regularity or efficiency of air navigation required by them, to enable them to comply with 3.1.6 below.

3.1.6 An aeronautical information service shall ensure that aeronautical information/data necessary for the safety, regularity or efficiency of air navigation is made available in a form suitable for the operational requirements of:

a) those involved in flight operations, including flight crews, flight planning and flight simulators; and

b) the air traffic services unit responsible for flight information service and the services responsible for pre-flight information.

3.1.7 An aeronautical information service shall receive and/or originate, collate or assemble, edit, format, publish/store and distribute aeronautical information/data concerning the entire territory of the State as well as areas in which the State is responsible for air traffic services outside its territory. Aeronautical information shall be published as an Integrated Aeronautical Information Package.

3.2 Quality system

3.2.1 Each Contracting State shall take all necessary measures to introduce a properly organized quality system containing procedures, processes and resources necessary to implement quality management at each function stage as outlined in 3.1.7 above. The execution of such quality management shall be made demonstrable for each function stage, when required.

3.2.2 **Recommendation.—** *The quality system established in accordance with 3.2.1 should be in conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance standards, and certified by an approved organization.*

Note.— International Organization for Standardization (ISO) 9000 series of quality assurance standards provide a basic framework for the development of a quality assurance *programme. The details of a successful programme are to be formulated by each State and in most cases are unique to the State organization.*

3.2.3 Within the context of a quality system, the skills and knowledge required for each function shall be identified and personnel assigned to perform those functions shall be appropriately trained. States shall ensure that personnel possess the skills and competencies required to perform specific assigned functions, and appropriate records shall be maintained so that the qualifications of personnel can be confirmed. Initial and periodic assessments shall be established that require personnel to demonstrate the required skills and competencies. Periodic assessments of personnel shall be used as a means to detect and correct shortfalls.

3.2.4 States shall ensure that established procedures exist in order that aeronautical data at any moment is traceable to its origin so as to allow any data anomalies or errors, detected during the production/maintenance phases or in operational use, to be corrected.

3.2.5 The established quality system shall provide users with the necessary assurance and confidence that distributed aeronautical information/data satisfy stated requirements for data quality (accuracy, resolution and integrity) and for data traceability by the use of appropriate procedures in every stage of data production or data modification process. The system shall also provide assurance of the applicability period of intended use of aeronautical data as well as that the agreed distribution dates will be met.

3.2.6 The order of accuracy for aeronautical data, based upon a 95 per cent confidence level, shall be as specified in Annex 11, Chapter 2, and Annex 14, Volumes I and II, Chapter 2. In that respect, three types of positional data shall be identified: surveyed points (runway thresholds, navigation aid positions, etc.), calculated points (mathematical calculations from the known surveyed points of points in space/fixes) and declared points (flight information region boundary points).

3.2.7 States shall ensure that the order of publication resolution of aeronautical data shall be that as specified in Appendices 1 and 7.

3.2.8 Contracting States shall ensure that the integrity of aeronautical data is maintained throughout the data process from survey/origin to distribution to the next intended user. Aeronautical data integrity requirements shall be based upon the potential risk resulting from the corruption of data and upon the use to which the data item is put. Consequently, the following classifications and data integrity levels shall apply:

a) critical data, integrity level 1×10^{-8}: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;

b) essential data, integrity level 1×10^{-5}: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and

c) routine data, integrity level 1×10^{-3}: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.

3.2.9 Aeronautical data quality requirements related to classification and data integrity shall be as provided in Tables A7-1 to A7-5 of Appendix 7.

3.2.10 Protection of electronic aeronautical data while stored or in transit shall be totally monitored by the cyclic redundancy check (CRC). To achieve protection of the integrity level of critical and essential aeronautical data as classified in 3.2.8, a 32- or 24-bit CRC algorithm shall apply respectively.

3.2.11 **Recommendation.—** *To achieve protection of the integrity level of routine aeronautical data as classified in 3.2.8, a 16-bit CRC algorithm should apply.*

3.2.12 Material to be issued as part of the Integrated Aeronautical Information Package shall be thoroughly checked and coordinated with the responsible services before it is submitted to the aeronautical information service, in order to make certain that all necessary information has been included and that it is correct in detail prior to distribution. Validation and verification procedures shall be established which ensure that quality requirements (accuracy, resolution, integrity) and traceability of aeronautical data are met.

Note.— Guidance material on the liaison with other related services is contained in the Aeronautical Information Services Manual *(Doc 8126).*

3.2.13 Demonstration of compliance of the quality system applied shall be by audit. If nonconformity is identified, initiating action to correct its cause shall be determined and taken. All audit observations and remedial actions shall be evidenced and properly documented.

Note.— Guidance material on the aeronautical data quality requirements (accuracy, resolution, integrity, protection and traceability) is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674). Supporting material in respect of the provisions of Appendices 1 and 7 related to publication resolution and integrity of aeronautical data is contained in RTCA Document DO-201A and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-77 —* Industry Requirements for Aeronautical Information.

3.3 Exchange of aeronautical information/data

3.3.1 Each State shall designate the office to which all elements of the Integrated Aeronautical Information Package originated by other States shall be addressed. Such an office shall be qualified to deal with requests for information/data originated by other States.

3.3.2 Where a State designates more than one international NOTAM office, it shall define the extent of responsibility and the territory covered by each office.

3.3.3 An aeronautical information service shall arrange, as necessary, to satisfy operational requirements for the issuance and receipt of NOTAM distributed by telecommunication.

3.3.4 States shall, wherever practicable, establish direct contact between aeronautical information services in order to facilitate the international exchange of aeronautical information/ data.

3.3.5 One copy of each of the elements of the Integrated Aeronautical Information Package, in paper or electronic form or both, that have been requested by the aeronautical information service of an ICAO Contracting State shall be made available by the originating State in the mutually-agreed form(s), without charge, even where authority for publication/ storage and distribution has been delegated to a commercial agency.

3.3.6 **Recommendation.—** *The exchange of more than one copy of the elements of the Integrated Aeronautical Information Package and other air navigation documents, including those containing air navigation legislation and regulations, whether in paper and/or electronic form, should be subject to bilateral agreement between ICAO Contracting States.*

3.3.7 **Recommendation.—** *The procurement of aeronautical information/data, including the elements of the Integrated Aeronautical Information Package, and other air navigation documents, including those containing air navigation legislation and regulations, whether in paper and/or electronic form, by States other than ICAO Contracting States and by other entities should be subject to separate agreement with the originating State.*

3.4 Copyright

Note.— In order to protect the investment in the products of a State's AIS as well as to ensure better control of their use, States may wish to apply copyright to those products in accordance with their national laws.

Any product of a State's AIS which has been granted copyright protection by that State and provided to another State in accordance with 3.3 shall only be made available to a third party on the condition that the third party is made aware that the product is copyright protected and provided that it is appropriately annotated that the product is subject to copyright by the originating State.

3.5 Cost recovery

Recommendation.— *The overhead cost of collecting and compiling aeronautical information/data should be included in the cost basis for airport and air navigation services charges, as appropriate, in accordance with the principles contained in* ICAO's Policies on Charges for Airports and Air Navigation Services *(Doc 9082).*

Note.— When costs of collection and compilation of aeronautical information/data are recovered through airports and air navigation services charges, the charge to an individual customer for the supply of a particular AIS product, either in paper or electronic form, may be based on the costs of printing paper copies or production of electronic media, and costs of distribution.

3.6 General specifications

3.6.1 Each element of the Integrated Aeronautical Information Package for international distribution shall include English text for those parts expressed in plain language.

3.6.2 Place names shall be spelt in conformity with local usage, transliterated, when necessary, into the Latin alphabet.

3.6.3 **Recommendation.—** *Units of measurement used in the distribution of aeronautical information/data should be consistent with the decision taken by the State in respect of the use of the tables contained in Annex 5 —* Units of Measurement to be Used in Air and Ground Operations.

3.6.4 Use of ICAO abbreviations

ICAO abbreviations shall be used in the aeronautical information services whenever they are appropriate and their use will facilitate distribution of information/data.

3.6.5 Use of automation

Recommendation.— *Automation in AIS should be introduced with the objective of improving the speed, accuracy, efficiency and cost-effectiveness of aeronautical information services.*

3.6.6 Identification and delineation of prohibited, restricted and danger areas

3.6.6.1 Each prohibited area, restricted area, or danger area established by a State shall, upon initial establishment, be given an identification and full details shall be promulgated (see ENR 5.1 of Appendix 1).

3.6.6.2 The identification so assigned shall be used to identify the area in all subsequent notifications pertaining to that area.

3.6.6.3 The identification shall be composed of a group of letters and figures as follows:

a) nationality letters for location indicators assigned to the State or territory which has established the airspace;

b) a letter P for prohibited area, R for restricted area and D for danger area as appropriate;

c) a number, unduplicated within the State or territory concerned.

Note.— Nationality letters are those contained in Location Indicators *(Doc 7910).*

3.6.6.4 To avoid confusion, identification numbers shall not be reused for a period of at least one year after cancellation of the area to which they refer.

3.6.6.5 **Recommendation.—** *When a prohibited, restricted or danger area is established, the area should be as small as practicable and be contained within simple geometrical limits, so as to permit ease of reference by all concerned.*

3.6.7 Human Factors considerations

The organization of the aeronautical information services as well as the design, contents, processing and distribution of aeronautical information/data shall take into consideration Human Factors principles which facilitate their optimum utilization.

3.7 Common reference systems for air navigation

3.7.1 Horizontal reference system

3.7.1.1 World Geodetic System — 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system for international air navigation. Consequently, published aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note 1.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System — 1984 (WGS-84) Manual *(Doc 9674).*

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of WGS-84-related aeronautical coordinates for geographical positions established by air traffic services are given in Annex 11, Chapter 2, and Appendix 5, Table 1, and for aerodrome/heliport-related positions, in Annex 14, Volumes I and II, Chapter 2, and Table A5-1 and Table 1 of Appendices 5 and 1, respectively.

3.7.1.2 **Recommendation.—** *In precise geodetic applications and some air navigation applications, temporal changes in the tectonic plate motion and tidal effects on the Earth's crust should be modelled and estimated. To reflect the temporal effect, an epoch should be included with any set of absolute station coordinates.*

Note 1.— The epoch of the WGS-84 (G873) reference frame is 1997.0 while the epoch of the latest updated WGS-84 (G1150) reference frame, which includes plate motion model, is 2001.0. (G indicates that the coordinates were obtained through Global Positioning System (GPS) techniques, and the number following G indicates the GPS week when these coordinates were implemented in the United States of America's National Geospatial-Intelligence Agency's (NGA's) precise ephemeris estimation process.)

Note 2.— The set of geodetic coordinates of globally distributed permanent GPS tracking stations for the most recent realization of the WGS-84 reference frame (WGS-84 (G1150)) is provided in Doc 9674. For each permanent GPS tracking station, the accuracy of an individually estimated position in WGS-84 (G1150) has been in the order of 1 cm (1σ).

Note 3.— Another precise worldwide terrestrial coordinate system is the International Earth Rotation Service (IERS) Terrestrial Reference System (ITRS), and the realization of ITRS is the IERS Terrestrial Reference Frame (ITRF). Guidance material regarding the ITRS is provided in Appendix C of Doc 9674. The most current realization of the WGS-84 (G1150) is referenced to the ITRF 2000 epoch. The WGS-84 (G1150) is consistent with the ITRF 2000 and in practical realization the difference between these two systems is in the one to two centimetre range worldwide, meaning WGS-84 (G1150) and ITRF 2000 are essentially identical.

3.7.1.3 Geographical coordinates which have been transformed into WGS-84 coordinates but whose accuracy of original field work does not meet the requirements in Annex 11, Chapter 2, and Annex 14, Volumes I and II, Chapter 2, shall be identified by an asterisk.

3.7.1.4 The order of publication resolution of geographical coordinates shall be that specified in Appendix 1 and Table A7-1 of Appendix 7 while the order of chart resolution of geographical coordinates shall be that specified in Annex 4, Appendix 6, Table 1.

3.7.2 Vertical reference system

3.7.2.1 Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system for international air navigation.

Note 1.— The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

Note 2.— Gravity-related heights (elevations) are also referred to as orthometric heights while distances of points above the ellipsoid are referred to as ellipsoidal heights.

3.7.2.2 The Earth Gravitational Model — 1996 (EGM-96), containing long wavelength gravity field data to degree and order 360, shall be used by international air navigation as the global gravity model.

Note.— Guidance material concerning EGM-96 is contained in Doc 9674.

3.7.2.3 At those geographical positions where the accuracy of EGM-96 does not meet the accuracy requirements for elevation and geoid undulation specified in Annex 14, Volumes I and II, on the basis of EGM-96 data, regional, national or local geoid models containing high resolution (short wavelength) gravity field data shall be developed and used. When a geoid model other than the EGM-96 model is used, a description of the model used, including the parameters required for height transformation between the model and EGM-96, shall be provided in the Aeronautical Information Publication (AIP).

Note. — Specifications governing determination and reporting (accuracy of field work and data integrity) of elevation and geoid undulation at specific positions at aerodromes/ heliports are given in Annex 14, Volumes I and II, Chapter 2, and Table A5-2 and Table 2 of Appendices 5 and 1, respectively.

3.7.2.4 In addition to elevation referenced to the MSL (geoid), for the specific surveyed ground positions, geoid undulation (referenced to the WGS-84 ellipsoid) for those positions specified in Appendix 1 shall also be published.

3.7.2.5 The order of publication resolution of elevation and geoid undulation shall be that specified in Appendix 1 and Table A7-2 of Appendix 7 while the order of chart resolution of elevation and geoid undulation shall be that specified in Annex 4, Appendix 6, Table 2.

3.7.3 Temporal reference system

3.7.3.1 For international civil aviation, the Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.

Note 1.— A value in the time domain is a temporal position measured relative to a temporal reference system.

Note 2.— Coordinated Universal Time (UTC) is a time scale maintained by the Bureau International de l'Heure (BIH) and the IERS and forms the basis of a coordinated dissemination of standard frequencies and time signals.

Note 3.— See Attachment D of Annex 5 for guidance material relating to UTC.

Note 4.— ISO Standard 8601 specifies the use of the Gregorian calendar and 24-hour local or UTC for information interchange while ISO Standard 19108 prescribes the Gregorian calendar and UTC as the primary temporal reference system for use with geographic information.

3.7.3.2 When a different temporal reference system is used for some applications, the feature catalogue, or the metadata associated with an application schema or a data set, as appropriate, shall include either a description of that system or a citation for a document that describes that temporal reference system.

Note.— ISO Standard 19108, Annex D, describes some aspects of calendars that may have to be considered in such a description.

CHAPTER 4. AERONAUTICAL INFORMATION PUBLICATIONS (AIP)

Note 1.— AIP are intended primarily to satisfy international requirements for the exchange of aeronautical information of a lasting character essential to air navigation. When practicable, the form of presentation is designed to facilitate their use in flight.

Note 2.— AIP constitute the basic information source for permanent information and long duration temporary changes.

4.1 Contents

4.1.1 An Aeronautical Information Publication shall contain, in three parts, sections and subsections uniformly referenced to allow for standardized electronic data storage and retrieval, current information relating to, and arranged under, those subjects enumerated in Appendix 1 that appear in Roman type, except that when the AIP, or volume of the AIP, is designed basically to facilitate operational use in flight, the precise format and arrangement may be left to the discretion of the State provided that an adequate table of contents is included.

4.1.1.1 **Recommendation.—** *Aeronautical Information Publications should, in addition, contain current information relating to those subjects enumerated in Appendix 1 that appear in italic type.*

4.1.2 Aeronautical Information Publications shall include in Part 1 — General (GEN):

a) a statement of the competent authority responsible for the air navigation facilities, services or procedures covered by the AIP;

b) the general conditions under which the services or facilities are available for international use;

c) a list of significant differences between the national regulations and practices of the State and the related ICAO Standards, Recommended Practices and Procedures, given in a form that would enable a user to differentiate readily between the requirements of the State and the related ICAO provisions;

d) the choice made by a State in each significant case where an alternative course of action is provided for in ICAO Standards, Recommended Practices and Procedures.

4.1.3 The aeronautical charts listed alphabetically below shall, when available for designated international aerodromes/heliports, form part of the AIP, or be distributed separately to recipients of the AIP:

a) Aerodrome/Heliport Chart — ICAO;

b) Aerodrome Ground Movement Chart — ICAO;

c) Aerodrome Obstacle Chart — ICAO Type A;

d) Aircraft Parking/Docking Chart — ICAO;

e) Area Chart — ICAO;

f) Radar Minimum Altitude Chart — ICAO;

g) Instrument Approach Chart — ICAO;

h) Precision Approach Terrain Chart — ICAO;

i) Standard Arrival Chart — Instrument (STAR) — ICAO;

j) Standard Departure Chart — Instrument (SID) — ICAO;

k) Visual Approach Chart — ICAO.

4.1.4 Charts, maps or diagrams shall be used, when appropriate, to complement or as a substitute for the tabulations or text of Aeronautical Information Publications.

Note.— Where appropriate, charts produced in conformity with Annex 4 — Aeronautical Charts, *may be used to fulfil this requirement. Guidance material as to the specifications of index maps and diagrams included in Aeronautical Information Publications is contained in the* Aeronautical Information Services Manual *(Doc 8126).*

4.2 General specifications

4.2.1 Each Aeronautical Information Publication shall be self-contained and shall include a table of contents.

Note.— If it is necessary by reason of bulk or for convenience, to publish an AIP in two or more parts or volumes, each of them will indicate that the remainder of the information is to be found in the other part(s) or volume(s).

4.2.1.1 Each AIP shall not duplicate information within itself or from other sources.

4.2.1.2 When two or more States combine to issue a joint AIP, this shall be made clear both on the cover and in the table of contents.

4.2.2 **Recommendation.—** *AIP should be published in loose-leaf form unless the complete publication is reissued at frequent intervals.*

4.2.3 Each Aeronautical Information Publication shall be dated. In the case of Aeronautical Information Publications issued in loose-leaf form, each page shall be dated. The date, consisting of the day, month (by name) and year, shall be the publication date or the effective date of the information.

4.2.4 A checklist giving the current date of each page in the Aeronautical Information Publication series shall be reissued frequently to assist the user in maintaining a current publication. The page number/chart title and date of the checklist shall appear on the checklist itself.

4.2.5 Each Aeronautical Information Publication issued as a bound volume and each page of an Aeronautical Information Publication issued in loose-leaf form shall be so annotated as to indicate clearly:

a) the identity of the Aeronautical Information Publication;

b) the territory covered and subdivisions when necessary;

c) the identification of the issuing State and producing organization (authority);

d) page numbers/chart titles;

e) the degree of reliability if the information is doubtful.

4.2.6 **Recommendation.—** *The sheet size should be no larger than 210 × 297 mm, except that larger sheets may be used provided they are folded to the same size.*

4.2.7 All changes to the AIP, or new information on a reprinted page, shall be identified by a distinctive symbol or annotation.

4.2.8 Operationally significant changes to the AIP shall be published in accordance with AIRAC procedures and shall be clearly identified by the acronym — AIRAC.

4.2.9 AIP shall be amended or reissued at such regular intervals as may be necessary to keep them up to date. Recourse to hand amendments or annotations shall be kept to the minimum. The normal method of amendment shall be by means of replacement sheets.

4.2.9.1 The regular interval referred to in 4.2.9 shall be specified in the AIP, Part 1 — General (GEN).

Note.— Guidance material on the establishment of intervals between publication dates of AIP Amendments is contained in the Aeronautical Information Services Manual *(Doc 8126).*

4.3 Specifications for AIP Amendments

4.3.1 Permanent changes to the AIP shall be published as AIP Amendments.

4.3.2 Each AIP Amendment shall be allocated a serial number, which shall be consecutive.

4.3.3 Each AIP Amendment page, including the cover sheet, shall display a publication date.

4.3.4 Each AIRAC AIP Amendment page, including the cover sheet, shall display an effective date.

4.3.5 When an AIP Amendment is issued, it shall include references to the serial number of those elements, if any, of the Integrated Aeronautical Information Package which have been incorporated into the amendment.

4.3.6 A brief indication of the subjects affected by the amendment shall be given on the AIP Amendment cover sheet.

4.3.7 When an AIP Amendment will not be published at the established interval or publication date, a NIL notification shall be originated and distributed by the monthly printed plain-language list of valid NOTAM required by 5.2.13.3.

4.4 Specifications for AIP Supplements

4.4.1 Temporary changes of long duration (three months or longer) and information of short duration which contains extensive text and/or graphics shall be published as AIP Supplements.

Note.— Guidance material on the use of AIP Supplements together with examples of such use is contained in the Aeronautical Information Services Manual *(Doc 8126).*

4.4.2 Each AIP Supplement shall be allocated a serial number which shall be consecutive and based on the calendar year.

4.4.3 AIP Supplement pages shall be kept in the AIP as long as all or some of their contents remain valid.

4.4.4 When an AIP Supplement is sent in replacement of a NOTAM, it shall include a reference to the serial number of the NOTAM.

4.4.5 A checklist of valid AIP Supplements shall be issued at intervals of not more than one month. This information shall be issued through the medium of the monthly printed plain-language list of valid NOTAM required by 5.2.13.3.

4.4.6 **Recommendation.—** *AIP Supplement pages should be coloured in order to be conspicuous, preferably in yellow.*

4.4.7 **Recommendation.—** *AIP Supplement pages should be kept as the first item in the AIP parts.*

4.5 Distribution

AIP, AIP Amendments and AIP Supplements shall be made available by the most expeditious means.

CHAPTER 5. NOTAM

5.1 Origination

5.1.1 A NOTAM shall be originated and issued promptly whenever the information to be distributed is of a temporary nature and of short duration or when operationally significant permanent changes, or temporary changes of long duration are made at short notice, except for extensive text and/or graphics.

Note 1.— Operationally significant changes concerning circumstances listed in Appendix 4, Part 1, are issued under the Aeronautical Information Regulation and Control (AIRAC) system specified in Chapter 6.

Note 2.— Information of short duration containing extensive text and/or graphics is published as an AIP Supplement (see Chapter 4, 4.4).

5.1.1.1 A NOTAM shall be originated and issued concerning the following information:

a) establishment, closure or significant changes in operation of aerodrome(s)/heliport(s) or runways;

b) establishment, withdrawal and significant changes in operation of aeronautical services (AGA, AIS, ATS, COM, MET, SAR, etc.);

c) establishment or withdrawal of electronic and other aids to air navigation and aerodromes/heliports. This includes: interruption or return to operation, change of frequencies, change in notified hours of service, change of identification, change of orientation (directional aids), change of location, power increase or decrease amounting to 50 per cent or more, change in broadcast schedules or contents, or irregularity or unreliability of operation of any electronic aid to air navigation, and air-ground communication services;

d) establishment, withdrawal or significant changes made to visual aids;

e) interruption of or return to operation of major components of aerodrome lighting systems;

f) establishment, withdrawal or significant changes made to procedures for air navigation services;

g) occurrence or correction of major defects or impediments in the manoeuvring area;

h) changes to and limitations on availability of fuel, oil and oxygen;

i) major changes to search and rescue facilities and services available;

j) establishment, withdrawal or return to operation of hazard beacons marking obstacles to air navigation;

k) changes in regulations requiring immediate action, e.g. prohibited areas for SAR action;

l) presence of hazards which affect air navigation (including obstacles, military exercises, displays, races and major parachuting events outside promulgated sites);

m) erecting or removal of, or changes to, obstacles to air navigation in the take-off/climb, missed approach, approach areas and runway strip;

n) establishment or discontinuance (including activation or deactivation) as applicable, or changes in the status of prohibited, restricted or danger areas;

o) establishment or discontinuance of areas or routes or portions thereof where the possibility of interception exists and where the maintenance of guard on the VHF emergency frequency 121.5 MHz is required;

p) allocation, cancellation or change of location indicators;

q) significant changes in the level of protection normally available at an aerodrome for rescue and firefighting purposes. NOTAM shall be originated only when a change of category is involved and such change of category shall be clearly stated (see Annex 14, Volume I, Chapter 9, and Attachment A, Section 17);

r) presence or removal of, or significant changes in, hazardous conditions due to snow, slush, ice or water on the movement area;

s) outbreaks of epidemics necessitating changes in notified requirements for inoculations and quarantine measures;

t) forecasts of solar cosmic radiation, where provided;

u) an operationally significant change in volcanic activity, the location, date and time of volcanic eruptions and/or horizontal and vertical extent of volcanic ash cloud, including direction of movement, flight levels and routes or portions of routes which could be affected;

v) release into the atmosphere of radioactive materials or toxic chemicals following a nuclear or chemical incident, the location, date and time of the incident, the flight levels and routes or portions thereof which could be affected and the direction of movement;

w) establishment of operations of humanitarian relief missions, such as those undertaken under the auspices of United Nations, together with procedures and/or limitations which affect air navigation; and

x) implementation of short-term contingency measures in cases of disruption, or partial disruption, of air traffic services and related supporting services.

Note.— See Annex 11, 2.28 and Attachment D to that Annex.

5.1.1.2 **Recommendation.—** *The need for origination of a NOTAM should be considered in any other circumstance which may affect the operations of aircraft.*

5.1.1.3 The following information shall not be notified by NOTAM:

a) routine maintenance work on aprons and taxiways which does not affect the safe movement of aircraft;

b) runway marking work, when aircraft operations can safely be conducted on other available runways, or the equipment used can be removed when necessary;

c) temporary obstructions in the vicinity of aerodromes/ heliports that do not affect the safe operation of aircraft;

d) partial failure of aerodrome/heliport lighting facilities where such failure does not directly affect aircraft operations;

e) partial temporary failure of air-ground communications when suitable alternative frequencies are known to be available and are operative;

f) the lack of apron marshalling services and road traffic control;

g) the unserviceability of location, destination or other instruction signs on the aerodrome movement area;

h) parachuting when in uncontrolled airspace under VFR (see 5.1.1.1 l)), when controlled, at promulgated sites or within danger or prohibited areas;

i) other information of a similar temporary nature.

5.1.1.4 At least seven days' advance notice shall be given of the activation of established danger, restricted or prohibited areas and of activities requiring temporary airspace restrictions other than for emergency operations.

5.1.1.4.1 **Recommendation.—** *Notice of any subsequent cancellation of the activities or any reduction of the hours of activity or the dimensions of the airspace should be given as soon as possible.*

Note.— Whenever possible, at least 24 hours' advance notice is desirable, to permit timely completion of the notification process and to facilitate airspace utilization planning.

5.1.1.5 NOTAM notifying unserviceability of aids to air navigation, facilities or communication services shall give an estimate of the period of unserviceability or the time at which restoration of service is expected.

5.1.1.6 When an AIP Amendment or an AIP Supplement is published in accordance with AIRAC procedures, NOTAM shall be originated giving a brief description of the contents, the effective date and the reference number to the amendment or supplement. This NOTAM shall come into force on the same effective date as the amendment or supplement and shall remain valid in the pre-flight information bulletin for a period of fourteen days.

Note.— Guidance material for the origination of NOTAM announcing the existence of AIRAC AIP Amendments or AIP Supplements ("Trigger NOTAM") is contained in the Aeronautical Information Services Manual *(Doc 8126).*

5.2 General specifications

5.2.1 Except as otherwise provided in 5.2.3 and 5.2.4, each NOTAM shall contain the information in the order shown in the NOTAM Format in Appendix 6.

5.2.2 Text of NOTAM shall be composed of the significations/uniform abbreviated phraseology assigned to the ICAO NOTAM Code complemented by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language.

5.2.2.1 When NOTAM is selected for international distribution, English text shall be included for those parts expressed in plain language.

Note.— The ICAO NOTAM Code together with significations/ uniform abbreviated phraseology, and ICAO Abbreviations are those contained in the PANS-ABC (Doc 8400).

5.2.3 Information concerning snow, slush, ice and standing water on aerodrome/heliport pavements shall, when reported by means of a SNOWTAM, contain the information in the order shown in the SNOWTAM Format in Appendix 2.

5.2.4 Information concerning an operationally significant change in volcanic activity, a volcanic eruption and/or volcanic ash cloud shall, when reported by means of an ASHTAM, contain the information in the order shown in the ASHTAM Format in Appendix 3.

5.2.5 The NOTAM originator shall allocate to each NOTAM a series identified by a letter and a four-digit number followed by a stroke and a two-digit number for the year. The four-digit number shall be consecutive and based on the calendar year.

Note.— Letters A to Z, with the exception of S and T, may be used to identify a NOTAM series.

5.2.6 When errors occur in a NOTAM, a NOTAM with a new number to replace the erroneous NOTAM shall be issued.

5.2.7 When a NOTAM is issued which cancels or replaces a previous NOTAM, the series and number of the previous NOTAM shall be indicated. The series, location indicator and subject of both NOTAM shall be the same. Only one NOTAM shall be cancelled or replaced by a NOTAM.

5.2.8 Each NOTAM shall deal with only one subject and one condition of the subject.

Note.— Guidance concerning the combination of a subject and a condition of the subject in accordance with the NOTAM Selection Criteria is contained in the Aeronautical Information Services Manual *(Doc 8126).*

5.2.9 Each NOTAM shall be as brief as possible and so compiled that its meaning is clear without the need to refer to another document.

5.2.10 Each NOTAM shall be transmitted as a single telecommunication message.

5.2.11 A NOTAM containing permanent or temporary information of long duration shall carry appropriate AIP or AIP Supplement references.

5.2.12 Location indicators included in the text of a NOTAM shall be those contained in *Location Indicators* (Doc 7910).

5.2.12.1 In no case shall a curtailed form of such indicators be used.

5.2.12.2 Where no ICAO location indicator is assigned to the location, its place name spelt in accordance with 3.6.2 shall be entered in plain language.

5.2.13 A checklist of valid NOTAM shall be issued as a NOTAM over the Aeronautical Fixed Service (AFS) at intervals of not more than one month using the NOTAM Format specified in Appendix 6. One NOTAM shall be issued for each series.

5.2.13.1 A checklist of NOTAM shall refer to the latest AIP Amendments, AIP Supplements and at least the internationally distributed AIC.

5.2.13.2 A checklist of NOTAM shall have the same distribution as the actual message series to which they refer and shall be clearly identified as checklist.

5.2.13.3 A monthly printed plain-language list of valid NOTAM, including indications of the latest AIP Amendments, AIC issued and a checklist of AIP Supplements, shall be prepared with a minimum of delay and forwarded by the most expeditious means to recipients of the Integrated Aeronautical Information Package.

5.3 Distribution

5.3.1 NOTAM shall be distributed on the basis of a request.

5.3.2 NOTAM shall be prepared in conformity with the relevant provisions of the ICAO communication procedures.

5.3.2.1 The AFS shall, whenever practicable, be employed for NOTAM distribution.

5.3.2.2 When a NOTAM exchanged as specified in 5.3.4 is sent by means other than the AFS, a six-digit date-time group indicating the date and time of NOTAM origination, and the identification of the originator shall be used, preceding the text.

5.3.3 The originating State shall select the NOTAM that are to be given international distribution.

5.3.3.1 **Recommendation.—** *Selective distribution lists should be used when practicable.*

Note.— These lists are intended to obviate superfluous distribution of information. Guidance material relating to this is contained in the Aeronautical Information Services Manual *(Doc 8126).*

5.3.4 International exchange of NOTAM shall take place only as mutually agreed between the international NOTAM offices concerned. The international exchange of ASHTAM (see 5.2.4), and NOTAM where States continue to use NOTAM for distribution of information on volcanic activity, shall include volcanic ash advisory centres, and shall take account of the requirements of long-range operations.

Note.— Arrangements may be made for direct exchange of SNOWTAM (see Appendix 2) between aerodromes/heliports.

5.3.4.1 These exchanges of NOTAM between international NOTAM offices shall, as far as practicable, be limited to the requirements of the receiving States concerned by means of separate series providing for at least international and domestic flights.

5.3.4.2 A predetermined distribution system for NOTAM transmitted on the AFS in accordance with Appendix 5 shall be used whenever possible, subject to the requirements of 5.3.4.

CHAPTER 6. AERONAUTICAL INFORMATION REGULATION AND CONTROL (AIRAC)

6.1 General specifications

6.1.1 Information concerning the circumstances listed in Appendix 4, Part 1, shall be distributed under the regulated system (AIRAC), i.e. basing establishment, withdrawal or significant changes upon a series of common effective dates at intervals of 28 days, including 29 January 1998. The information notified therein shall not be changed further for at least another 28 days after the effective date, unless the circumstance notified is of a temporary nature and would not persist for the full period.

Note.— Guidance material on the procedures applicable to the AIRAC system is contained in the Aeronautical Information Services Manual *(Doc 8126).*

6.1.2 **Recommendation.—** *The regulated system (AIRAC) should also be used for the provision of information relating to the establishment and withdrawal of, and premeditated significant changes in, the circumstances listed in Appendix 4, Part 2.*

6.1.3 When information has not been submitted by the AIRAC date, a NIL notification shall be originated and distributed by NOTAM or other suitable means, not later than one cycle before the AIRAC effective date concerned.

6.1.4 Implementation dates other than AIRAC effective dates shall not be used for pre-planned operationally significant changes requiring cartographic work and/or for updating of navigation databases.

6.1.5 **Recommendation.—** *The use of the date in the AIRAC cycle which occurs between 21 December and 17 January inclusive should be avoided as an effective date for the introduction of significant changes under the AIRAC system.*

6.2 Provision of information in paper copy form

6.2.1 In all instances, information provided under the AIRAC system shall be published in paper copy form and shall be distributed by the AIS unit at least 42 days in advance of the effective date with the objective of reaching recipients at least 28 days in advance of the effective date.

6.2.2 **Recommendation.—** *Whenever major changes are planned and where advance notice is desirable and practicable, a publication date of at least 56 days in advance of the effective date should be used.*

6.3 Provision of information in electronic form

6.3.1 States that have established an aeronautical database shall, when updating its contents concerning the circumstances listed in Appendix 4, Part 1, ensure that the effective dates of data coincide with the established AIRAC effective dates used for the provision of information in paper copy form.

6.3.2 Information provided in electronic form, concerning the circumstances listed in Appendix 4, Part 1, shall be distributed/made available by the AIS unit so as to reach recipients at least 28 days in advance of the AIRAC effective date.

6.3.3 **Recommendation.—** *Whenever major changes are planned and where advance notice is desirable and practicable, information provided in electronic form should be distributed/made available at least 56 days in advance of the effective date.*

CHAPTER 7. AERONAUTICAL INFORMATION CIRCULARS (AIC)

7.1 Origination

7.1.1 An AIC shall be originated whenever it is necessary to promulgate aeronautical information which does not qualify:

a) under the specifications in 4.1 for inclusion in an AIP; or

b) under the specifications in 5.1 for the origination of a NOTAM.

7.1.1.1 An AIC shall be originated whenever it is desirable to promulgate:

a) a long-term forecast of any major change in legislation, regulations, procedures or facilities;

b) information of a purely explanatory or advisory nature liable to affect flight safety;

c) information or notification of an explanatory or advisory nature concerning technical, legislative or purely administrative matters.

This shall include:

1) forecasts of important changes in the air navigation procedures, services and facilities provided;

2) forecasts of implementation of new navigational systems;

3) significant information arising from aircraft accident/incident investigation which has a bearing on flight safety;

4) information on regulations relating to the safeguarding of international civil aviation against acts of unlawful interference;

5) advice on medical matters of special interest to pilots;

6) warnings to pilots concerning the avoidance of physical hazards;

7) effect of certain weather phenomena on aircraft operations;

8) information on new hazards affecting aircraft handling techniques;

9) regulations relating to the carriage of restricted articles by air;

10) reference to the requirements of, and publication of changes in, national legislation;

11) aircrew licensing arrangements;

12) training of aviation personnel;

13) application of, or exemption from, requirements in national legislation;

14) advice on the use and maintenance of specific types of equipment;

15) actual or planned availability of new or revised editions of aeronautical charts;

16) carriage of radio equipment;

17) explanatory information relating to noise abatement;

18) selected airworthiness directives;

19) changes in NOTAM series or distribution, new editions of AIP or major changes in their contents, coverage or format;

20) advance information on the snow plan (see 7.1.1.2);

21) other information of a similar nature.

Note.— The publication of an AIC does not remove the obligations set forth in Chapters 4 and 5.

7.1.1.2 The snow plan published under AD 1.2.2 of Appendix 1 shall be supplemented by seasonal information, to be issued well in advance of the beginning of each winter — not less than one month before the normal onset of winter conditions — and shall contain information such as that listed below:

a) a list of aerodromes/heliports where snow clearance is expected to be performed during the coming winter:

*1) in accordance with the runway and taxiway systems; or

*2) planned snow clearing, deviating from the runway system (length, width and number of runways, affected taxiways and aprons or portions thereof);

* This information, or any part of it, may be included in the AIP, if so desired.

*b) information concerning any centre designated to coordinate information on the current state of progress of clearance and on the current state of runways, taxiways and aprons;

c) a division of the aerodromes/heliports into SNOWTAM distribution lists in order to avoid excessive NOTAM distribution;

*d) an indication, as necessary, of minor changes to the standing snow plan;

*e) a descriptive list of clearance equipment;

*f) a listing of what will be considered as the minimum critical snow bank to be reported at each aerodrome/ heliport at which reporting will commence.

7.2 General specifications

7.2.1 AIC shall be issued in printed form.

Note.— Both text and diagrams may be included.

* This information, or any part of it, may be included in the AIP, if so desired.

7.2.1.1 The originating State shall select the AIC that are to be given international distribution.

7.2.1.2 Each AIC shall be allocated a serial number which shall be consecutive and based on the calendar year.

7.2.1.3 When AIC are distributed in more than one series, each series shall be separately identified by a letter.

7.2.1.4 **Recommendation.—** *Differentiation and identification of AIC topics according to subjects using colour coding should be practised where the numbers of AIC in force are sufficient to make identification in this form necessary.*

Note.— Guidance on colour coding of AIC by subject can be found in the Aeronautical Information Services Manual *(Doc 8126).*

7.2.2 A checklist of AIC currently in force shall be issued at least once a year, with distribution as for the AIC.

7.3 Distribution

States shall give AIC selected for international distribution the same distribution as for the AIP.

CHAPTER 8. PRE-FLIGHT AND POST-FLIGHT INFORMATION/DATA

8.1 Pre-flight information

8.1.1 At any aerodrome/heliport normally used for international air operations, aeronautical information essential for the safety, regularity and efficiency of air navigation and relative to the route stages originating at the aerodrome/heliport shall be made available to flight operations personnel, including flight crews and services responsible for pre-flight information.

8.1.2 Aeronautical information provided for pre-flight planning purposes at the aerodromes/heliports referred to in 8.1.1 shall include relevant:

a) elements of the Integrated Aeronautical Information Package;

b) maps and charts.

Note.— The documentation listed in a) and b) may be limited to national publications and when practicable, those of immediately adjacent States, provided a complete library of aeronautical information is available at a central location and means of direct communications are available between the aerodrome AIS unit and that library.

8.1.2.1 Additional current information relating to the aerodrome of departure shall be provided concerning the following:

a) construction or maintenance work on or immediately adjacent to the manoeuvring area;

b) rough portions of any part of the manoeuvring area, whether marked or not, e.g. broken parts of the surface of runways and taxiways;

c) presence and depth of snow, ice or water on runways and taxiways, including their effect on surface friction;

d) snow drifted or piled on or adjacent to runways or taxiways;

e) parked aircraft or other objects on or immediately adjacent to taxiways;

f) presence of other temporary hazards;

g) presence of birds constituting a potential hazard to aircraft operations;

h) failure or irregular operation of part or all of the aerodrome lighting system including approach, threshold, runway, taxiway, obstruction and manoeuvring area unserviceability lights and aerodrome power supply;

i) failure, irregular operation and changes in the operational status of ILS (including markers), MLS, basic GNSS, SBAS, GBAS, SRE, PAR, DME, SSR, VOR, NDB, VHF aeromobile channels, RVR observing system, and secondary power supply; and

j) presence and operation of humanitarian relief missions, such as those undertaken under the auspices of the United Nations, together with any associated procedures and/or limitations applied thereof.

8.1.3 A recapitulation of current NOTAM and other information of urgent character shall be made available to flight crews in the form of plain-language pre-flight information bulletins (PIB).

Note.— Guidance on the preparation of PIB is contained in the Aeronautical Information Services Manual *(Doc 8126).*

8.2 Automated aeronautical information systems

8.2.1 Where the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) uses automated pre-flight information systems to make aeronautical information/data available to operations personnel including flight crew members for self-briefing, flight planning and flight information service purposes, the information/data made available shall comply with the provisions of 8.1.2 and 8.1.3.

8.2.2 **Recommendation.—** *Automated pre-flight information systems providing a harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical information in accordance with 8.2.1 and meteorological information in accordance with 9.5.1 of Annex 3 —* Meteorological Service for International Air Navigation, *should be established by an agreement between the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) and the relevant meteorological authority.*

8.2.3 Where automated pre-flight information systems are used to provide the harmonized, common point of access by operations personnel, including flight crew members and other aeronautical personnel concerned, to aeronautical information/data and meteorological information, the civil aviation authority or the agency to which the authority to provide service has been delegated in accordance with 3.1.1 c) shall remain responsible for the quality and timeliness of the aeronautical information/ data provided by means of such a system.

Note.— The meteorological authority concerned remains responsible for the quality of the meteorological information provided by means of such system in accordance with 9.5.1 of Annex 3.

8.2.4 Self-briefing facilities of an automated pre-flight information system shall provide for access by operations personnel, including flight crew members and other aeronautical personnel concerned, to consultation as necessary with the aeronautical information service by telephone or other suitable telecommunications means. The human/machine interface of such facilities shall ensure easy access in a guided manner to all relevant information/data.

8.2.5 **Recommendation.—** *Automated pre-flight information systems for the supply of aeronautical information/data for self-briefing, flight planning and flight information service should:*

a) provide for continuous and timely updating of the system database and monitoring of the validity and quality of the aeronautical information stored;

b) permit access to the system by operations personnel including flight crew members, aeronautical personnel concerned and other aeronautical users through suitable telecommunications means;

c) ensure provision, in paper copy form, of the aeronautical information/data accessed, as required;

d) use access and interrogation procedures based on abbreviated plain language and ICAO location indicators, as appropriate, or based on a menu-driven user interface or other appropriate mechanism as agreed between the civil aviation authority and operator concerned; and

e) provide for rapid response to a user request for information.

Note.— ICAO abbreviations and codes and location indicators are given respectively in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (*PANS-ABC, Doc 8400*) *and* Location Indicators (*Doc 7910*).

8.3 Post-flight information

8.3.1 States shall ensure that arrangements are made to receive at aerodromes/heliports information concerning the state and operation of air navigation facilities noted by aircrews and shall ensure that such information is made available to the aeronautical information service for such distribution as the circumstances necessitate.

8.3.2 States shall ensure that arrangements are made to receive at aerodromes/heliports information concerning the presence of birds observed by aircrews and shall ensure that such information is made available to the aeronautical information service for such distribution as the circumstances necessitate.

Note.— See Annex 14, Volume I, Chapter 9, Section 9.4.

CHAPTER 9. TELECOMMUNICATION REQUIREMENTS

9.1 International NOTAM offices shall be connected to the aeronautical fixed service (AFS).

9.1.1 The connections shall provide for printed communications.

9.2 Each international NOTAM office shall be connected, through the aeronautical fixed service (AFS), to the following points within the territory for which it provides service:

a) area control centres and flight information centres;

b) aerodromes/heliports at which an information service is established in accordance with Chapter 8.

CHAPTER 10. ELECTRONIC TERRAIN AND OBSTACLE DATA

10.1 Function

Sets of electronic terrain and obstacle data used in combination with aeronautical data, as appropriate, shall satisfy user requirements necessary to support the following air navigation applications:

a) ground proximity warning system with forward looking terrain avoidance function and minimum safe altitude warning (MSAW) system;

b) determination of contingency procedures for use in the event of an emergency during a missed approach or take-off;

c) aircraft operating limitations analysis;

d) instrument procedure design (including circling procedure);

e) determination of en-route "drift-down" procedure and en-route emergency landing location;

f) advanced surface movement guidance and control system (A-SMGCS);

g) aeronautical chart production and on-board databases;

h) flight simulator;

i) synthetic vision; and

j) aerodrome/heliport obstacle restriction and removal.

10.2 Coverage and terrain and obstacle data numerical requirements

10.2.1 To satisfy requirements necessary to accommodate air navigation systems or functions specified in 10.1, sets of electronic terrain and obstacle data shall be collected and recorded in databases in accordance with the following coverage areas:

— Area 1: entire territory of a State;

— Area 2: terminal control area;

— Area 3: aerodrome/heliport area; and

— Area 4: Category II or III operations area.

Note.— See Appendix 8 for graphical illustrations of the defined coverage areas.

10.2.2 Area 1 shall cover the entire territory of a State, including aerodromes/heliports. Area 2 shall be the terminal control area as published in a State's aeronautical information publication (AIP) or limited to a 45-km radius from the aerodrome/heliport reference point (whichever is smaller). At IFR aerodromes/heliports where a terminal control area has not been established, Area 2 shall be the area within a 45-km radius of the aerodrome/heliport reference point.

10.2.3 At IFR aerodromes/heliports, Area 3 shall cover the area that extends from the edge(s) of the runway(s) to 90 m from the runway centre line(s) and for all other parts of aerodrome/heliport movement area(s), 50 m from the edge(s) of the defined area(s).

10.2.4 Area 4 shall be restricted to those runways where precision approach Category II or III operations have been established and where detailed terrain information is required by operators to enable them to assess, by use of radio altimeters, the effect of terrain on decision height determination. The width of the area shall be 60 m on either side of the extended runway centre line while the length shall be 900 m from the runway threshold measured along the extended runway centre line.

10.2.5 According to the air navigation applications listed in 10.1 and areas of coverage, sets of electronic terrain data shall satisfy the numerical requirements specified in Appendix 8, Table A8-1 while obstacle data shall satisfy the numerical requirements specified in Appendix 8, Table A8-2.

Note 1. — Numerical terrain and obstacle data requirements for Area 2 provided in Appendix 8, Table A8-1 and Table A8-2, respectively, are defined on the basis of the most stringent application requirement (application listed under 10.1 b)).

Note 2.— It is recognized that some applications listed in 10.1 could be adequately accommodated with terrain and obstacle data sets that are of lower requirements than those specified in Appendix 8, Table A8-1 and Table A8-2, respectively. Consequently, careful evaluation of available data sets by data users is necessary in order to determine if the products are fit for their intended use.

10.3 Terrain database — content and structure

10.3.1 A terrain database shall contain digital sets of data representing terrain surface in the form of continuous elevation values at all intersections (points) of a defined grid, referenced to common datum. A terrain grid shall be angular or linear and shall be of regular or irregular shape.

Note.— In regions of higher latitudes, latitude grid spacing may be adjusted to maintain a constant linear density of measurement points.

10.3.2 Sets of electronic terrain data shall include spatial (position and elevation), thematic and temporal aspects for the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles. In practical terms, depending on the acquisition method used, this shall represent the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as "first reflective surface".

10.3.3 Terrain data shall be collected according to the areas specified in 10.2, terrain data collection surfaces and criteria specified in Appendix 8, Figure A8-1, and in accordance with the terrain data numerical requirements provided in Table A8-1 of Appendix 8. In terrain databases, only one feature type, i.e. terrain, shall be recorded. Feature attributes describing terrain shall be those listed in Appendix 8, Table A8-3. The terrain feature attributes listed in Table A8-3 represent the minimum set of terrain attributes, and those annotated as mandatory shall be recorded in the terrain database.

10.4 Obstacle database — content and structure

10.4.1 One obstacle database shall contain a digital set of obstacle data and shall include those features having vertical significance in relation to adjacent and surrounding features that are considered hazardous to air navigation. Obstacle data shall comprise the digital representation of the vertical and horizontal extent of man-made objects. Obstacles shall not be included in terrain databases. Obstacle data elements are features that shall be represented in the database by points, lines or polygons.

10.4.2 Obstacles, which in accordance with the definition, can be fixed (permanent or temporary) or mobile shall be identified within the areas defined in 10.2, on the basis of the obstacle data collection surfaces and criteria specified in Appendix 8, Figure A8-2, and collected in accordance with obstacle data numerical requirements provided in Table A8-2 of Appendix 8. In an obstacle database, all defined obstacle feature types shall be recorded and each of them shall be described according to the list of mandatory attributes provided in Table A8-4 of Appendix 8.

Note.— Specific attributes associated with mobile (feature operations) and temporary types of obstacles are annotated in Appendix 8, Table A8-4, as optional attributes. If these types of obstacles are to be recorded in the database, appropriate attributes describing such obstacles are also required.

10.5 Terrain and obstacle data product specifications

10.5.1 To allow and support the interchange and use of sets of electronic terrain and obstacle data among different data providers and data users, the ISO 19100 series of standards for geographic information shall be used as a general data modelling framework.

10.5.2 A comprehensive statement of available electronic terrain and obstacle data sets shall be provided in the form of terrain data product specifications as well as obstacle data product specifications on which basis air navigation users will be able to evaluate the products and determine whether they fulfil the requirements for their intended use (application).

Note.— ISO Standard 19131 specifies the requirements and outline of data product specifications for geographic information.

10.5.3 Each terrain data product specification shall include an overview, a specification scope, data product identification, data content and structure, reference system, data quality, data capture, data maintenance, data portrayal, data product delivery, additional information, and metadata.

10.5.4 The overview of terrain data product specification or obstacle data product specification shall provide an informal description of the product and shall contain general information about the data product. Specification of terrain data may not be homogenous across the whole data product but may vary for different parts of the data sets. For each such subset of data, a specification scope shall be identified. Identification information concerning both terrain and obstacle data products shall include the title of the product; a brief narrative summary of the content, purpose, and spatial resolution if appropriate (a general statement about the density of spatial data); the geographic area covered by the data product; and supplemental information.

10.5.5 Content information of feature-based terrain data sets or of feature-based obstacle data sets shall each be described in terms of an application schema and a feature catalogue. Application schema shall provide a formal description of the data structure and content of data sets while the feature catalogue shall provide the semantics of all feature types together with their attributes and attribute value domains, association types between feature types and feature operations, inheritance relations and constraints. Coverage is considered a subtype of a feature and can be derived from a collection of features that have common attributes. Both terrain and obstacle data product specifications shall identify clearly the coverage and/or imagery they include and shall provide a narrative description of each of them.

Note 1. — ISO Standard 19109 contains rules for application schema while ISO Standard 19110 describes feature cataloguing methodology for geographic information.

Note 2.— ISO Standard 19123 contains schema for coverage geometry and functions.

10.5.6 Both terrain data product specifications and obstacle data product specifications shall include information that identifies the reference system used in the data product. This shall include the spatial reference system and temporal reference system. Additionally, both data product specifications shall identify the data quality requirements for each data product. This shall include a statement on acceptable conformance quality levels and corresponding data quality measures. This statement shall cover all the data quality elements and data quality sub-elements, even if only to state that a specific data quality element or sub-element is not applicable.

Note.— ISO Standard 19113 contains quality principles for geographic information while ISO Standard 19114 covers quality evaluation procedures.

10.5.7 Terrain data product specifications shall include a data capture statement which shall be a general description of the sources and of processes applied for the capture of terrain data. The principles and criteria applied in the maintenance of terrain data sets and obstacle data sets shall also be provided with the data specifications, including the frequency with which data products are updated. Of particular importance shall be the maintenance information of obstacle data sets and an indication of the principles, methods and criteria applied for obstacle data maintenance.

10.5.8 Terrain data product specifications shall contain information on how data held with data sets is presented, i.e. as a graphic output, as a plot or as an image. The product specifications for both terrain and obstacles shall also contain data product delivery information which shall include delivery formats and delivery medium information.

Note.— ISO Standard 19117 contains a definition of the schema describing the portrayal of geographic information including the methodology for describing symbols and mapping of the schema to an application schema.

10.5.9 The core terrain and obstacle metadata elements shall be included in the data product specifications. Any additional metadata items required to be supplied shall be stated in each product specification together with the format and encoding of the metadata.

Note.— ISO Standard 19115 specifies requirements for geographic information metadata.

10.6 Availability

10.6.1 States shall ensure that electronic terrain and obstacle data related to their entire territory are made available in the manner specified in 10.2, 10.3 and 10.4 for use by international civil aviation.

10.6.1.1 States shall ensure that as of 20 November 2008, electronic terrain and obstacle data are made available in accordance with Area 1 specifications and terrain data in accordance with Area 4 specifications.

10.6.1.2 States shall ensure that as of 18 November 2010, electronic terrain and obstacle data are made available in accordance with Area 2 and Area 3 specifications.

10.6.1.3 **Recommendation.—** *States should ensure that electronic terrain and obstacle data are made available in accordance with Area 1, Area 2 and Area 3 specifications and terrain data in accordance with Area 4 specifications.*

10.6.2 **Recommendation. —** *At those aerodromes located near territorial boundaries, arrangements should be made among States concerned to share terrain and obstacle data for the entire Area 2.*

APPENDIX 1. CONTENTS OF AERONAUTICAL INFORMATION PUBLICATION (AIP)

(see Chapter 4)

PART 1 — GENERAL (GEN)

If an AIP is produced and made available in more than one volume with each having a separate amendment and supplement service, a separate preface, record of AIP Amendments, record of AIP Supplements, checklist of AIP pages and list of current hand amendments must be included in each volume.

GEN 0.1 Preface

Brief description of the Aeronautical Information Publication (AIP), including:

1) name of the publishing authority;

2) applicable ICAO documents;

3) the AIP structure and established regular amendment interval; and

4) service to contact in case of detected AIP errors or omissions.

GEN 0.2 Record of AIP Amendments

A record of AIP Amendments and AIRAC AIP Amendments (published in accordance with the AIRAC system) containing:

1) amendment number;

2) publication date;

3) date inserted (for the AIRAC AIP Amendments, effective date); and

4) initials of officer who inserted the amendment.

GEN 0.3 Record of AIP Supplements

A record of issued AIP Supplements containing:

1) Supplement number;

2) Supplement subject;

3) AIP section(s) affected;

4) period of validity; and

5) cancellation record.

GEN 0.4 Checklist of AIP pages

A checklist of AIP pages containing:

1) page number/chart title; and

2) publication or effective date (day, month by name and year) of the aeronautical information.

GEN 0.5 List of hand amendments to the AIP

A list of current hand amendments to the AIP containing:

1) AIP page(s) affected;

2) amendment text; and

3) AIP Amendment number by which a hand amendment was introduced.

GEN 0.6 Table of contents to Part 1

A list of sections and subsections contained in Part 1 — General (GEN).

Note.— Subsections may be listed alphabetically.

GEN 1. NATIONAL REGULATIONS AND REQUIREMENTS

GEN 1.1 Designated authorities

The addresses of designated authorities concerned with the facilitation of international air navigation (civil aviation, meteorology, customs, immigration, health, en-route and aerodrome/heliport charges, agricultural quarantine and aircraft accident investigation) containing, for each authority:

1) designated authority;

2) name of the authority;

3) postal address;

4) telephone number;

5) telefax number;

6) telex number; and

7) aeronautical fixed service (AFS) address.

GEN 1.2 Entry, transit and departure of aircraft

Regulations and requirements for advance notification and applications for permission concerning entry, transit and departure of aircraft on international flights.

GEN 1.3 Entry, transit and departure of passengers and crew

Regulations (including customs, immigration and quarantine, and requirements for advance notification and applications for permission) concerning entry, transit and departure of non-immigrant passengers and crew.

GEN 1.4 Entry, transit and departure of cargo

Regulations (including customs, and requirements for advance notification and applications for permission) concerning entry, transit and departure of cargo.

Note.— Provisions for facilitating entry and departure for search, rescue, salvage, investigation, repair or salvage in connection with lost or damaged aircraft are detailed in section GEN 3.6, Search and rescue.

GEN 1.5 Aircraft instruments, equipment and flight documents

Brief description of aircraft instruments, equipment and flight documents, including:

1) instruments, equipment (including aircraft communication and navigation equipment) and flight documents to be carried on aircraft, including any special requirement in addition to the provisions specified in Annex 6, Part I, Chapters 6 and 7; and

2) emergency locator transmitter (ELT), signalling devices and life-saving equipment as presented in Annex 6, Part I, 6.6 and Part II, 6.4 where so determined by regional air navigation meetings, for flights over designated land areas.

GEN 1.6 Summary of national regulations and international agreements/conventions

A list of titles and references and, where applicable, summaries of national regulations affecting air navigation, together with a list of international agreements/conventions ratified by State.

GEN 1.7 Differences from ICAO Standards, Recommended Practices and Procedures

A list of significant differences between national regulations and practices of the State and related ICAO provisions, including:

1) provision affected (Annex and edition number, paragraph); and

2) difference in full text.

All significant differences must be listed under this subsection. All Annexes must be listed in numerical order even if there is no difference to an Annex, in which case a NIL notification must be provided. National differences or the degree of non-application of the regional supplementary procedures (SUPPS) must be notified immediately following the Annex to which the supplementary procedure relates.

GEN 2. TABLES AND CODES

GEN 2.1 Measuring system, aircraft markings, holidays

GEN 2.1.1 Units of measurement

Description of units of measurement used including table of units of measurement.

GEN 2.1.2 Temporal reference system

Description of the temporal reference system (calendar and time system) employed, together with an indication of whether or not daylight saving hours are employed and how the temporal reference system is presented throughout the AIP.

GEN 2.1.3 Horizontal reference system

Brief description of the horizontal (geodetic) reference system used, including:

1) name/designation of the reference system;

2) identification of the projection;

3) identification of the ellipsoid used;

4) identification of the datum used;

5) area(s) of application; and

6) an explanation, if applicable, of the asterisk used to identify those coordinates that do not meet Annex 11 and 14 accuracy requirements.

GEN 2.1.4 Vertical reference system

Brief description of the vertical reference system used, including:

1) name/designation of the reference system;

2) description of the geoid model used including the parameters required for height transformation between the model used and EGM-96; and

3) an explanation, if applicable, of the asterisk used to identify those elevations/geoid undulations that do not meet Annex 14 accuracy requirements.

GEN 2.1.5 Aircraft nationality and registration marks

Indication of aircraft nationality and registration marks adopted by the State.

GEN 2.1.6 Public holidays

A list of public holidays with indication of services being affected.

GEN 2.2 Abbreviations used in AIS publications

A list of alphabetically arranged abbreviations and their respective significations used by the State in its AIP and in the distribution of aeronautical information/data with appropriate annotation for those national abbreviations that are different from those contained in the *Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400).

Note.— A list of alphabetically arranged definitions/glossary of terms may also be added.

GEN 2.3 Chart symbols

A list of chart symbols arranged according to the chart series where symbols are applied.

GEN 2.4 Location indicators

A list of alphabetically arranged location indicators assigned to the locations of aeronautical fixed stations to be used for encoding and decoding purposes. An annotation to locations not connected to the Aeronautical Fixed Service (AFS) must be provided.

GEN 2.5 List of radio navigation aids

A list of radio navigation aids arranged alphabetically, containing:

1) identifier;

2) name of the station;

3) type of facility/aid; and

4) indication whether aid serves en-route (E), aerodrome (A) or dual (AE) purposes.

GEN 2.6 Conversion tables

Tables for conversion between:

1) nautical miles and kilometres and vice versa;

2) feet and metres and vice versa;

3) decimal minutes of arc and seconds of arc and vice versa; and

4) other conversion tables, as appropriate.

GEN 2.7 Sunrise/sunset tables

Brief description of criteria used for determination of the times given in the sunrise/sunset tables, together with an alphabetical list of locations for which the times are given with a reference to the related page in the table and the sunrise/sunset tables for the selected stations/locations, including:

1) station name;

2) ICAO location indicator;

3) geographical coordinates in degrees and minutes;

4) date(s) for which times are given;

5) time for the beginning of morning civil twilight;

6) time for sunrise;

7) time for sunset; and

8) time for the end of evening civil twilight.

GEN 3. SERVICES

GEN 3.1 Aeronautical information services

GEN 3.1.1 Responsible service

Description of the Aeronautical Information Service (AIS) provided and its major components, including:

1) service/unit name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address;

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed; and

8) an indication if service is not H24.

GEN 3.1.2 Area of responsibility

The area of responsibility for the aeronautical information service.

GEN 3.1.3 Aeronautical publications

Description of the elements of the Integrated Aeronautical Information Package, including:

1) AIP and related amendment service;

2) AIP Supplements;

3) AIC;

4) NOTAM and pre-flight information bulletins (PIB);

5) checklists and lists of valid NOTAM; and

6) how they may be obtained.

When an AIC is used to promulgate publication prices, that must be indicated in this section of the AIP.

GEN 3.1.4 AIRAC system

Brief description of the AIRAC system provided including a table of present and near future AIRAC dates.

GEN 3.1.5 Pre-flight information service at aerodromes/heliports

A list of aerodromes/heliports at which pre-flight information is routinely available, including an indication of relevant:

1) elements of the Integrated Aeronautical Information Packages held;

2) maps and charts held; and

3) general area of coverage of such data.

GEN 3.1.6 Electronic terrain and obstacle data

Details of how electronic terrain and obstacle data may be obtained, containing:

1) name of the individual, service or organization responsible;

2) street address and e-mail address of the individual, service or organization responsible;

3) telefax number of the individual, service or organization responsible;

4) contact telephone number of the individual, service or organization responsible;

5) hours of service (time period including time zone when contact can be made);

6) online information that can be used to contact the individual, service or organization; and

7) supplemental information, if necessary, on how and when to contact the individual, service or organization.

GEN 3.2 Aeronautical charts

GEN 3.2.1 Responsible service(s)

Description of service(s) responsible for the production of aeronautical charts, including:

1) service name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address;

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed; and

8) an indication if service is not H24.

GEN 3.2.2 Maintenance of charts

Brief description of how aeronautical charts are revised and amended.

GEN 3.2.3 Purchase arrangements

Details of how charts may be obtained, containing:

1) service/sales agency(ies);

2) postal address;

3) telephone number;

4) telefax number;

5) telex number; and

6) AFS address.

GEN 3.2.4 Aeronautical chart series available

A list of aeronautical chart series available followed by a general description of each series and an indication of the intended use.

GEN 3.2.5 List of aeronautical charts available

A list of aeronautical charts available, including:

1) title of series;

2) scale of series;

3) name and/or number of each chart or each sheet in a series;

4) price per sheet; and

5) date of latest revision.

GEN 3.2.6 Index to the World Aeronautical Chart (WAC) — ICAO 1:1 000 000

An index chart showing coverage and sheet layout for the WAC 1:1 000 000 produced by a State. If Aeronautical Chart — ICAO 1:500 000 is produced instead of WAC 1:1 000 000, index charts must be used to indicate coverage and sheet layout for the Aeronautical Chart — ICAO 1:500 000.

GEN 3.2.7 Topographical charts

Details of how topographical charts may be obtained, containing:

1) name of service/agency(ies);

2) postal address;

3) telephone number;

4) telefax number;

5) telex number; and

6) AFS address.

GEN 3.2.8 Corrections to charts not contained in the AIP

A list of corrections to aeronautical charts not contained in the AIP, or an indication where such information can be obtained.

GEN 3.3 Air traffic services

GEN 3.3.1 Responsible service

Description of the air traffic service and its major components, including:

1) service name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address;

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed; and

8) an indication if service is not H24.

GEN 3.3.2 Area of responsibility

Brief description of area of responsibility for which air traffic services are provided.

GEN 3.3.3 Types of services

Brief description of main types of air traffic services provided.

GEN 3.3.4 Coordination between the operator and ATS

General conditions under which coordination between the operator and air traffic services is effected.

GEN 3.3.5 Minimum flight altitude

The criteria used to determine minimum flight altitudes.

GEN 3.3.6 ATS units address list

A list of ATS units and their addresses arranged alphabetically, containing:

1) unit name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number; and

6) AFS address.

GEN 3.4 Communication services

GEN 3.4.1 Responsible service

Description of the service responsible for the provision of telecommunication and navigation facilities, including:

1) service name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address;

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed; and

8) an indication if service is not H24.

GEN 3.4.2 Area of responsibility

Brief description of area of responsibility for which telecommunication service is provided.

GEN 3.4.3 Types of service

Brief description of the main types of service and facilities provided, including:

1) radio navigation services;

2) mobile service;

3) broadcasting service;

4) language(s) used; and

5) an indication of where detailed information can be obtained.

GEN 3.4.4 Requirements and conditions

Brief description concerning the requirements and conditions under which the communication service is available.

GEN 3.5 Meteorological services

GEN 3.5.1 Responsible service

Brief description of the meteorological service responsible for the provision of meteorological information, including:

1) service name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address;

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed; and

8) an indication if service is not H24.

GEN 3.5.2 Area of responsibility

Brief description of area and/or air routes for which meteorological service is provided.

GEN 3.5.3 Meteorological observations and reports

Detailed description of the meteorological observations and reports provided for international air navigation, including:

1) name of the station and the ICAO location indicator;

2) type and frequency of observation including an indication of automatic observing equipment;

3) types of meteorological reports (e.g. METAR) and availability of a trend forecast;

4) specific type of observation system and number of observation sites used to observe and report surface wind, visibility, runway visual range, cloud base, temperature and, where applicable, wind shear (e.g. anemometer at intersection of runways, transmissometer next to touchdown zone, etc.);

5) hours of operation; and

6) indication of aeronautical climatological information available.

GEN 3.5.4 Types of services

Brief description of the main types of service provided, including details of briefing, consultation, display of meteorological information, flight documentation available for operators and flight crew members, and of the methods and means used for supplying the meteorological information.

GEN 3.5.5 Notification required from operators

Minimum amount of advance notice required by the meteorological authority from operators in respect of briefing, consultation and flight documentation and other meteorological information they require or change.

GEN 3.5.6 Aircraft reports

As necessary, requirements of the meteorological authority for the making and transmission of aircraft reports.

GEN 3.5.7 VOLMET service

Description of VOLMET service, including:

1) name of transmitting station;

2) call sign or identification and abbreviation for the radio communication emission;

3) frequency or frequencies used for broadcast;

4) broadcasting period;

5) hours of service;

6) list of aerodromes/heliports for which reports and/or forecasts are included; and

7) reports, forecasts and SIGMET information included and remarks.

GEN 3.5.8 SIGMET and AIRMET service

Description of the meteorological watch provided within flight information regions or control areas for which air traffic services are provided, including a list of the meteorological watch offices with:

1) name of the meteorological watch office, ICAO location indicator;

2) hours of service;

3) flight information region(s) or control area(s) served;

4) types of SIGMET information issued (SIGMET, SST SIGMET) and validity periods;

5) specific procedures applied to SIGMET information (e.g. for volcanic ash and tropical cyclones);

6) procedures applied to AIRMET information (in accordance with relevant regional air navigation agreements);

7) the air traffic services unit(s) provided with SIGMET and AIRMET information; and

8) additional information (e.g. concerning any limitation of service, etc.).

GEN 3.5.9 Other automated meteorological services

Description of available automated services for the provision of meteorological information (e.g. automated pre-flight information service accessible by telephone and/or computer modem) including:

1) service name;

2) information available;

3) areas, routes and aerodromes covered; and

4) telephone, telex and telefax number(s).

GEN 3.6 Search and rescue

GEN 3.6.1 Responsible service(s)

Brief description of service(s) responsible for the provision of search and rescue (SAR), including:

1) service/unit name;

2) postal address;

3) telephone number;

4) telefax number;

5) telex number;

6) AFS address; and

7) a statement concerning the ICAO documents on which the service is based and a reference to the AIP location where differences, if any, are listed.

GEN 3.6.2 Area of responsibility

Brief description of area of responsibility within which search and rescue services are provided.

GEN 3.6.3 Types of service

Brief description and geographical portrayal, where appropriate, of the type of service and facilities provided including indications where SAR aerial coverage is dependent upon significant deployment of aircraft.

GEN 3.6.4 SAR agreements

Brief description of SAR agreements in force, including provisions for facilitating entry and departure of other States' aircraft for search, rescue, salvage, repair or salvage in connection with lost or damaged aircraft, either with airborne notification only or after flight plan notification.

GEN 3.6.5 Conditions of availability

Brief description of provisions for search and rescue, including the general conditions under which the service and facilities are available for international use, including an indication of whether a facility available for search and rescue is specialized in SAR techniques and functions, or is specially used for other purposes but adapted for SAR purposes by training and equipment, or is only occasionally available and has no particular training or preparation for SAR work.

GEN 3.6.6 Procedures and signals used

Brief description of the procedures and signals employed by rescue aircraft and a table showing the signals to be used by survivors.

GEN 4. CHARGES FOR AERODROMES/HELIPORTS AND AIR NAVIGATION SERVICES

Reference may be made to where details of actual charges may be found, if not itemized in this chapter.

GEN 4.1 Aerodrome/heliport charges

Brief description of type of charges which may be applicable at aerodromes/heliports available for international use, including:

1) landing of aircraft;

2) parking, hangarage and long-term storage of aircraft;

3) passenger service;

4) security;

5) noise-related items;

6) other (customs, health, immigration, etc.);

7) exemptions/reductions; and

8) methods of payment.

GEN 4.2 Air navigation services charges

Brief description of charges which may be applicable to air navigation services provided for international use, including:

1) approach control;

2) route air navigation services;

3) cost basis for air navigation services and exemptions/ reductions; and

4) methods of payment.

PART 2 — EN-ROUTE (ENR)

If an AIP is produced and made available in more than one volume with each having a separate amendment and supplement service, a separate preface, record of AIP Amendments, record of AIP Supplements, checklist of AIP pages and list of current hand amendments must be included in each volume. In the case of an AIP being published as one volume, the annotation "not applicable" must be entered against each of the above subsections.

Reference must be made in the appropriate subsection to indicate that differences between national regulations and ICAO SARPs and procedures exist and that they are detailed in GEN 1.7.

ENR 0.6 Table of contents to Part 2

A list of sections and subsections contained in Part 2 — En-route.

Note.— Subsections may be listed alphabetically.

ENR 1. GENERAL RULES AND PROCEDURES

ENR 1.1 General rules

The requirement is for publication of the general rules as applied within the State.

ENR 1.2 Visual flight rules

The requirement is for publication of the visual flight rules as applied within the State.

ENR 1.3 Instrument flight rules

The requirement is for publication of the instrument flight rules as applied within the State.

ENR 1.4 ATS airspace classification

The description of ATS airspace classes in the form of the ATS airspace classification table in Annex 11, Appendix 4, appropriately annotated to indicate those airspace classes not used by the State.

ENR 1.5 Holding, approach and departure procedures

ENR 1.5.1 General

The requirement is for a statement concerning the criteria on which holding, approach and departure procedures are established. If different from ICAO provisions, the requirement is for presentation of criteria used in a tabular form.

ENR 1.5.2 Arriving flights

The requirement is to present procedures (conventional or area navigation or both) for arriving flights which are common to flights into or within the same type of airspace. If different procedures apply within a terminal airspace, a note to this effect must be given together with a reference to where the specific procedures can be found.

ENR 1.5.3 Departing flights

The requirement is to present procedures (conventional or area navigation or both) for departing flights which are common to flights departing from any aerodrome/heliport.

ENR 1.6 Radar services and procedures

ENR 1.6.1 Primary radar

Description of primary radar services and procedures, including:

1) supplementary services;

2) the application of radar control service;

3) radar and radio failure procedures; and

4) graphic portrayal of area of radar coverage.

ENR 1.6.2 Secondary surveillance radar (SSR)

Description of secondary surveillance radar (SSR) operating procedures, including:

1) emergency procedures;

2) radio communication failure and unlawful interference procedures;

3) the system of SSR code assignment; and

4) graphic portrayal of area of SSR coverage.

Note.— The SSR description is of particular importance in area or routes where the possibility of interception exists.

ENR 1.7 Altimeter setting procedures

The requirement is for a statement of altimeter setting procedures in use, containing:

1) brief introduction with a statement concerning the ICAO documents on which the procedures are based together with differences to ICAO provisions, if any;

2) basic altimeter setting procedures;

3) description of altimeter setting region(s);

4) procedures applicable to operators (including pilots); and

5) table of cruising levels.

ENR 1.8 Regional supplementary procedures

The requirement is for presentation of regional supplementary procedures (SUPPS) affecting the entire area of responsibility, with properly annotated national differences, if any.

ENR 1.9 Air traffic flow management

Brief description of air traffic flow management (ATFM) system, including:

1) ATFM structure, service area, service provided, location of unit(s) and hours of operation;

2) types of flow messages and descriptions of the formats; and

3) procedures applicable for departing flights, containing:

   a) service responsible for provision of information on applied ATFM measures;

   b) flight plan requirements; and

   c) slot allocations.

ENR 1.10 Flight planning

The requirement is to indicate any restriction, limitation or advisory information related to the flight planning stage which may assist the user in the presentation of the intended flight operation, including:

1) procedures for the submission of a flight plan;

2) repetitive flight plan system; and

3) changes to the submitted flight plan.

ENR 1.11 Addressing of flight plan messages

The requirement is for an indication, in tabular form, of the addresses allocated to flight plans, showing:

1) category of flight (IFR, VFR or both);

2) route (into or via FIR and/or TMA); and

3) message address.

ENR 1.12 Interception of civil aircraft

The requirement is for a complete statement of interception procedures and visual signals to be used with a clear indication of whether ICAO provisions are applied and if not, a complete presentation of differences.

ENR 1.13 Unlawful interference

The requirement is for presentation of appropriate procedures to be applied in case of unlawful interference.

ENR 1.14 Air traffic incidents

Description of air traffic incidents reporting system, including:

1) definition of air traffic incidents;

2) use of the “Air Traffic Incident Reporting Form”;

3) reporting procedures (including in-flight procedures); and

4) purpose of reporting and handling of the form.

ENR 2. AIR TRAFFIC SERVICES AIRSPACE

ENR 2.1 FIR, UIR, TMA

Detailed description of flight information regions (FIR), upper flight information regions (UIR), and terminal control areas (TMA), including:

1) name, geographical coordinates in degrees and minutes of the FIR/UIR lateral limits and in degrees, minutes and seconds of the TMA lateral limits, vertical limits and class of airspace;

2) identification of unit providing the service;

3) call sign of aeronautical station serving the unit and language(s) used, specifying the area and conditions, when and where to be used, if applicable;

4) frequencies supplemented by indications for specific purposes; and

5) remarks.

Control zones around military air bases not otherwise described in the AIP must be included in this subsection. Where the requirements of Annex 2 concerning flight plans, two-way communications and position reporting apply to all flights in order to eliminate or reduce the need for interceptions and/or where the possibility of interception exists and the maintenance of guard on the VHF emergency channel 121.5 MHz is required, a statement to this effect must be included for the relevant area(s) or portion(s) thereof.

A description of designated areas over which the carriage of an emergency locator transmitter (ELT) is required and where aircraft shall continuously guard the VHF emergency frequency 121.5 MHz, except for those periods when aircraft are carrying out communications on other VHF channels or when airborne equipment limitations or cockpit duties do not permit simultaneous guarding of two channels.

Note.— Other types of airspace around civil aerodromes/heliports such as control zones and aerodrome traffic zones are described in the relevant aerodrome or heliport section.

ENR 2.2 Other regulated airspace

Where established, a detailed description of other types of regulated airspace and airspace classification.

ENR 3. ATS ROUTES

Note 1.— Bearings, tracks and radials are normally magnetic. In areas of high latitude, where it is determined by the appropriate authority that reference to Magnetic North is impractical, another suitable reference, i.e. True North or Grid North, may be used.

Note 2.— Changeover points established at the midpoint between two radio navigation aids, or at the intersection of the two radials in the case of a route which changes direction between the navigation aids, need not be shown for each route segment if a general statement regarding their existence is made.

ENR 3.1 Lower ATS routes

Detailed description of lower ATS routes, including:

1) route designator, required navigation performance (RNP) type(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including “compulsory” or “on-request” reporting points;

2) tracks or VOR radials to the nearest degree, geodesic distance to the nearest tenth of a kilometre or tenth of a nautical mile between each successive designated significant point and, in the case of VOR radials, changeover points;

3) upper and lower limits or minimum flight altitudes to the nearest higher 50 m or 100 ft, and airspace classification;

4) lateral limits;

5) direction of cruising levels; and

6) remarks, including an indication of the controlling unit and its operating frequency.

Note.— In relation to Annex 11, Appendix 1, and for flight planning purposes, the specified RNP type is not considered to be an integral part of the route designator.

ENR 3.2 Upper ATS routes

Detailed description of upper ATS routes, including:

1) route designator, required navigation performance (RNP) type(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including “compulsory” or “on-request” reporting points;

2) tracks or VOR radials to the nearest degree, geodesic distance to the nearest tenth of a kilometre or tenth of a nautical mile between each successive designated significant point and, in the case of VOR radials, changeover points;

3) upper and lower limits and airspace classification;

4) lateral limits;

5) direction of cruising levels; and

6) remarks, including an indication of the controlling unit and its operating frequency.

Note.— In relation to Annex 11, Appendix 1, and for flight planning purposes, the specified RNP type is not considered to be an integral part of the route designator.

ENR 3.3 Area navigation routes

Detailed description of area navigation (RNAV) routes, including:

1) route designator, required navigation performance (RNP) type(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

2) in respect of waypoints defining a VOR/DME area navigation route, additionally:

   a) station identification of the reference VOR/DME;

   b) bearing to the nearest degree and the distance to the nearest tenth of a kilometre or tenth of a nautical mile from the reference VOR/DME, if the waypoint is not collocated with it; and

   c) elevation of the transmitting antenna of DME to the nearest 30 m (100 ft);

3) geodesic distance to the nearest tenth of a kilometre or tenth of a nautical mile between defined end-points and distance between each successive designated significant point;

4) upper and lower limits and airspace classification;

5) direction of cruising levels; and

6) remarks, including an indication of the controlling unit and its operating frequency.

Note.— In relation to Annex 11, Appendix 1, and for flight planning purposes, the specified RNP type is not considered to be an integral part of the route designator.

ENR 3.4 Helicopter routes

Detailed description of helicopter routes, including:

1) route designator, required navigation performance (RNP) type(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

2) tracks or VOR radials to the nearest degree, geodesic distance to the nearest tenth of a kilometre or tenth of a nautical mile between each successive designated significant point and, in the case of VOR radials, changeover points;

3) upper and lower limits and airspace classification;

4) minimum flight altitudes to the nearest higher 50 m or 100 ft; and

5) remarks, including an indication of the controlling unit and its operating frequency.

Note.— In relation to Annex 11, Appendix 1, and for flight planning purposes, the specified RNP type is not considered to be an integral part of the route designator.

ENR 3.5 Other routes

The requirement is to describe other specifically designated routes which are compulsory within specified area(s).

Note.— Arrival, transit and departure routes which are specified in connection with procedures for traffic to and from aerodromes/heliports need not be described since they are described in the relevant section of Part 3 — Aerodromes.

ENR 3.6 En-route holding

The requirement is for a detailed description of en-route holding procedures, containing:

1) holding identification (if any) and holding fix (navigation aid) or waypoint with geographical coordinates in degrees, minutes and seconds;

2) inbound track;

3) direction of the procedure turn;

4) maximum indicated airspeed;

5) minimum and maximum holding level;

6) time/distance outbound; and

7) indication of the controlling unit and its operating frequency.

Note.— Obstacle clearance criteria related to holding procedures are contained in Procedures for Air Navigation Services, Aircraft Operations *(PANS-OPS, Doc 8168), Volumes I and II.*

ENR 4. RADIO NAVIGATION AIDS/SYSTEMS

ENR 4.1 Radio navigation aids — en-route

A list of stations providing radio navigation services established for en-route purposes and arranged alphabetically by name of the station, including:

1) name of the station and magnetic variation to the nearest degree and for VOR, station declination to the nearest degree used for technical line-up of the aid;

2) identification;

3) frequency/channel for each element;

4) hours of operation;

5) geographical coordinates in degrees, minutes and seconds of the position of the transmitting antenna;

6) elevation of the transmitting antenna of DME to the nearest 30 m (100 ft); and

7) remarks.

If the operating authority of the facility is other than the designated governmental agency, the name of the operating authority must be indicated in the remarks column. Facility coverage must be indicated in the remarks column.

ENR 4.2 Special navigation systems

Description of stations associated with special navigation systems (DECCA, LORAN, etc.), including:

1) name of station or chain;

2) type of service available (master signal, slave signal, colour);

3) frequency (channel number, basic pulse rate, recurrence rate, as applicable);

4) hours of operation;

5) geographical coordinates in degrees, minutes and seconds of the position of the transmitting station; and

6) remarks.

If the operating authority of the facility is other than the designated governmental agency, the name of the operating authority must be indicated in the remarks column. Facility coverage must be indicated in the remarks column.

ENR 4.3 Global navigation satellite system (GNSS)

A list and description of elements of the global navigation satellite system (GNSS) providing the navigation service established for en-route purposes and arranged alphabetically by name of the element, including:

1) the name of the GNSS element (GPS, GLONASS, EGNOS, MSAS, WAAS, etc.);

2) frequency(ies), as appropriate;

3) geographical coordinates in degrees, minutes and seconds of the nominal service area and coverage area; and

4) remarks.

If the operating authority of the facility is other than the designated governmental agency, the name of the operating authority must be indicated in the remarks column.

ENR 4.4 Name-code designators for significant points

An alphabetically arranged list of name-code designators (five-letter pronounceable "name-code") established for significant points at positions not marked by the site of radio navigation aids, including:

1) name-code designator;

2) geographical coordinates in degrees, minutes and seconds of the position; and

3) reference to ATS or other routes where the point is located.

ENR 4.5 Aeronautical ground lights — en-route

A list of aeronautical ground lights and other light beacons designating geographical positions which are selected by the State as being significant, including:

1) name of the city or town or other identification of the beacon;

2) type of beacon and intensity of the light in thousands of candelas;

3) characteristics of the signal;

4) operational hours; and

5) remarks.

ENR 5. NAVIGATION WARNINGS

ENR 5.1 Prohibited, restricted and danger areas

Description, supplemented by graphic portrayal where appropriate, of prohibited, restricted and danger areas together with information regarding their establishment and activation, including:

1) identification, name and geographical coordinates of the lateral limits in degrees, minutes and seconds if inside and in degrees and minutes if outside control area/control zone boundaries;

2) upper and lower limits; and

3) remarks, including time of activity.

Type of restriction or nature of hazard and risk of interception in the event of penetration must be indicated in the remarks column.

ENR 5.2 Military exercise and training areas and air defence identification zone (ADIZ)

Description, supplemented by graphic portrayal where appropriate, of established military training areas and military exercises taking place at regular intervals, and established air defence identification zone (ADIZ), including:

1) geographical coordinates of the lateral limits in degrees, minutes and seconds if inside and in degrees and minutes if outside control area/control zone boundaries;

2) upper and lower limits and system and means of activation announcements together with information pertinent to civil flights and applicable ADIZ procedures; and

3) remarks, including time of activity and risk of interception in the event of penetration of ADIZ.

ENR 5.3 Other activities of a dangerous nature and other potential hazards

ENR 5.3.1 Other activities of a dangerous nature

Description, supplemented by charts where appropriate, of activities that could affect flights including:

1) geographical coordinates in degrees and minutes of centre of area and range of influence;

2) vertical limits;

3) advisory measures;

4) authority responsible for the provision of information; and

5) remarks, including time of activity.

ENR 5.3.2 Other potential hazards

Description, supplemented by charts where appropriate, of other potential hazards that could affect flights (e.g. active volcanoes, nuclear power stations, etc.) including:

1) geographical coordinates in degrees and minutes of location of potential hazard;

2) vertical limits;

3) advisory measures;

4) authority responsible for the provision of information; and

5) remarks.

ENR 5.4 Air navigation obstacles

The list of obstacles affecting air navigation in Area 1 (the entire State territory), including:

1) obstacle identification or designation;

2) type of obstacle;

3) obstacle position, represented by geographical coordinates in degrees, minutes and seconds;

4) obstacle elevation and height to the nearest metre or foot;

5) type and colour of obstacle lighting (if any); and

6) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6.

Note 1.— An obstacle whose height above the ground is 100 m and higher is considered an obstacle for Area 1.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations/heights for obstacles in Area 1 are given in Annex 11, Appendix 5, Tables 1 and 2, respectively.

ENR 5.5 Aerial sporting and recreational activities

Brief description, supplemented by graphic portrayal where appropriate, of intensive aerial sporting and recreational activities together with conditions under which they are carried out, including:

1) designation and geographical coordinates of the lateral limits in degrees, minutes and seconds if inside and in degrees and minutes if outside control area/control zone boundaries;

2) vertical limits;

3) operator/user telephone number; and

4) remarks, including time of activity.

Note.— This paragraph may be subdivided into different sections for each different category of activity, giving the indicated details in each case.

ENR 5.6 Bird migration and areas with sensitive fauna

Description, supplemented by charts where practicable, of movements of birds associated with migration, including migration routes and permanent resting areas and areas with sensitive fauna.

ENR 6. EN-ROUTE CHARTS

The requirement is for the En-route Chart — ICAO and index charts to be included in this section.

PART 3 — AERODROMES (AD)

If an AIP is produced and made available in more than one volume with each having a separate amendment and supplement service, a separate preface, record of AIP Amendments, record of AIP Supplements, checklist of AIP pages and list of current hand amendments must be included in each volume. In the case of an AIP being published as one volume, the annotation "not applicable" must be entered against each of the above subsections.

AD 0.6 Table of contents to Part 3

A list of sections and subsections contained in Part 3 — Aerodromes (AD).

Note.— Subsections may be listed alphabetically.

AD 1. AERODROMES/HELIPORTS — INTRODUCTION

AD 1.1 Aerodrome/heliport availability

Brief description of the State's designated authority responsible for aerodromes and heliports, including:

1) the general conditions under which aerodromes/heliports and associated facilities are available for use;

2) a statement concerning the ICAO documents on which the services are based and a reference to the AIP location where differences, if any, are listed;

3) regulations, if any, concerning civil use of military air bases;

4) the general conditions under which the low visibility procedures applicable to Cat II/III operations at aerodromes, if any, are applied;

5) friction measuring device used and the runway friction level below which the State will declare the runway to be slippery when wet; and

6) other information of a similar nature.

AD 1.2 Rescue and firefighting services and snow plan

AD 1.2.1 Rescue and firefighting services

Brief description of rules governing the establishment of rescue and firefighting services at aerodromes and heliports available for public use together with an indication of rescue and firefighting categories established by a State.

AD 1.2.2 Snow plan

Brief description of general snow plan considerations for aerodromes/heliports available for public use at which snow conditions are normally liable to occur, including:

1) organization of the winter service;

2) surveillance of movement areas;

3) measuring methods and measurements taken;

4) actions taken to maintain the usability of movement areas;

5) system and means of reporting;

6) the cases of runway closure; and

7) distribution of information about snow conditions.

Note.— Where different snow plan considerations apply at aerodromes/heliports, this subparagraph may be subdivided accordingly.

AD 1.3 Index to aerodromes and heliports

A list, supplemented by graphic portrayal, of aerodromes and heliports within a State, including:

1) aerodrome/heliport name and ICAO location indicator;

2) type of traffic permitted to use the aerodrome/heliport (international/national, IFR/VFR, scheduled/non-scheduled, private); and

3) reference to AIP, Part 3 subsection in which aerodrome/heliport details are presented.

AD 1.4 Grouping of aerodromes/heliports

Brief description of the criteria applied by the State in grouping aerodromes/heliports for the production/distribution/provision of information purposes (e.g. international/national; primary/secondary; major/other; civil/military; etc.).

AD 2. AERODROMES

Note.— **** is to be replaced by the relevant ICAO location indicator.

**** AD 2.1 Aerodrome location indicator and name

The requirement is for the ICAO location indicator allocated to the aerodrome and the name of aerodrome. An ICAO location indicator must be an integral part of the referencing system applicable to all subsections in section AD 2.

**** AD 2.2 Aerodrome geographical and administrative data

The requirement is for aerodrome geographical and administrative data including:

1) aerodrome reference point (geographical coordinates in degrees, minutes and seconds) and its site;

2) direction and distance of aerodrome reference point from centre of the city or town which the aerodrome serves;

3) aerodrome elevation to the nearest metre or foot, and reference temperature;

4) geoid undulation at the aerodrome elevation position to the nearest metre or foot;

5) magnetic variation to the nearest degree, date of information and annual change;

6) name of aerodrome administration, address, telephone, telefax and telex numbers and AFS address;

7) types of traffic permitted to use the aerodrome (IFR/VFR); and

8) remarks.

**** AD 2.3 Operational hours

Detailed description of the hours of operation of services at the aerodrome, including:

1) aerodrome administration;

2) customs and immigration;

3) health and sanitation;

4) AIS briefing office;

5) ATS reporting office (ARO);

6) MET briefing office;

7) air traffic service;

8) fuelling;

9) handling;

10) security;

11) de-icing; and

12) remarks.

**** AD 2.4 Handling services and facilities

Detailed description of the handling services and facilities available at the aerodrome, including:

1) cargo-handling facilities;

2) fuel and oil types;

3) fuelling facilities and capacity;

4) de-icing facilities;

5) hangar space for visiting aircraft;

6) repair facilities for visiting aircraft; and

7) remarks.

**** AD 2.5 Passenger facilities

Brief description of passenger facilities available at the aerodrome, including:

1) *hotel(s) at or in the vicinity of aerodrome;*

2) *restaurant(s) at or in the vicinity of aerodrome;*

3) *transportation possibilities;*

4) medical facilities;

5) *bank and post office at or in the vicinity of aerodrome;*

6) *tourist office;* and

7) remarks.

**** AD 2.6 Rescue and firefighting services

Detailed description of the rescue and firefighting services and equipment available at the aerodrome, including:

1) aerodrome category for firefighting;

2) rescue equipment;

3) *capability for removal of disabled aircraft;* and

4) remarks.

**** AD 2.7 Seasonal availability — clearing

Detailed description of the equipment and operational priorities established for the clearance of aerodrome movement areas, including:

1) type(s) of clearing equipment;

2) clearance priorities; and

3) remarks.

**** AD 2.8 Aprons, taxiways and check locations/positions data

Details related to the physical characteristics of aprons, taxiways and locations/positions of designated checkpoints, including:

1) surface and strength of aprons;

2) width, surface and strength of taxiways;

3) location and elevation to the nearest metre or foot of altimeter checkpoints;

4) location of VOR checkpoints;

5) position of INS checkpoints in degrees, minutes, seconds and hundredths of seconds; and

6) remarks.

If check locations/positions are presented on an aerodrome chart, a note to that effect must be provided under this subsection.

**** AD 2.9 Surface movement guidance and control system and markings

Brief description of the surface movement guidance and control system and runway and taxiway markings, including:

1) use of aircraft stand identification signs, taxiway guide lines and visual docking/parking guidance system at aircraft stands;

2) runway and taxiway markings and lights;

3) stop bars (if any); and

4) remarks.

**** AD 2.10 Aerodrome obstacles

Detailed description of obstacles, including:

1) obstacles in Area 2:

   a) obstacle identification or designation;

   b) type of obstacle;

   c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;

   d) obstacle elevation and height to the nearest metre or foot;

   e) obstacle marking, and type and colour of obstacle lighting (if any);

   f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and

   g) NIL indication, if appropriate.

Note 1.— Chapter 10, 10.2.2, provides a description of Area 2 while Appendix 8, Figure A8-2, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 2.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 2 are given in Annex 11, Appendix 5, Tables 1 and 2, and in Annex 14, Volume I, Appendix 5, Tables A5-1 and A5-2, respectively.

2) obstacles in Area 3:

   a) obstacle identification or designation;

   b) type of obstacle;

   c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;

   d) obstacle elevation and height to the nearest metre or foot;

   e) obstacle marking, and type and colour of obstacle lighting (if any);

   f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and

   g) NIL indication, if appropriate.

Note 1.— Chapter 10, 10.2.3, provides a description of Area 3 while Appendix 8, Figure A8-3, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 3.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 3 are given in Annex 14, Volume I, Appendix 5, Tables A5-1 and A5-2, respectively.

**** AD 2.11 Meteorological information provided

Detailed description of meteorological information provided at the aerodrome and an indication of which meteorological office is responsible for the service enumerated, including:

1) name of the associated meteorological office;

2) hours of service and, where applicable, the designation of the responsible meteorological office outside these hours;

3) office responsible for preparation of TAFs and periods of validity and interval of issuance of the forecasts;

4) availability of the trend forecasts for the aerodrome, and interval of issuance;

5) information on how briefing and/or consultation is provided;

6) types of flight documentation supplied and language(s) used in flight documentation;

7) charts and other information displayed or available for briefing or consultation;

8) supplementary equipment available for providing information on meteorological conditions, e.g. weather radar and receiver for satellite images;

9) the air traffic services unit(s) provided with meteorological information; and

10) additional information (e.g. concerning any limitation of service, etc.).

**** AD 2.12 Runway physical characteristics

Detailed description of runway physical characteristics, for each runway, including:

1) designations;

2) true bearings to one-hundredth of a degree;

3) dimensions of runways to the nearest metre or foot;

4) strength of pavement (PCN and associated data) and surface of each runway and associated stopways;

5) geographical coordinates in degrees, minutes, seconds and hundredths of seconds for each threshold and runway end, and geoid undulation to the nearest one-half metre or foot for each threshold;

6) elevations of:

   — thresholds of a non-precision approach runway to the nearest metre or foot; and

   — thresholds and the highest elevation of the touchdown zone of a precision approach runway to the nearest one-half metre or foot;

7) slope of each runway and associated stopways;

8) dimensions of stopway (if any) to the nearest metre or foot;

9) dimensions of clearway (if any) to the nearest metre or foot;

10) dimensions of strips;

11) the existence of an obstacle-free zone; and

12) remarks.

****** AD 2.13 Declared distances**

Detailed description of declared distances to the nearest metre or foot for each direction of each runway, including:

1) runway designator;

2) take-off run available;

3) take-off distance available;

4) accelerate-stop distance available;

5) landing distance available; and

6) remarks.

If a runway direction cannot be used for take-off or landing, or both, because it is operationally forbidden, then this must be declared and the words "not usable" or the abbreviation "NU" entered (Annex 14, Volume I, Attachment A, Section 3).

****** AD 2.14 Approach and runway lighting**

Detailed description of approach and runway lighting, including:

1) runway designator;

2) type, length and intensity of approach lighting system;

3) runway threshold lights, colour and wing bars;

4) type of visual approach slope indicator system;

5) length of runway touchdown zone lights;

6) length, spacing, colour and intensity of runway centre line lights;

7) length, spacing, colour and intensity of runway edge lights;

8) colour of runway end lights and wing bars;

9) length and colour of stopway lights; and

10) remarks.

****** AD 2.15 Other lighting, secondary power supply**

Description of other lighting and secondary power supply, including:

1) location, characteristics and hours of operation of aerodrome beacon/identification beacon (if any);

2) location and lighting (if any) of anemometer/landing direction indicator;

3) taxiway edge and taxiway centre line lights;

4) secondary power supply including switch-over time; and

5) remarks.

****** AD 2.16 Helicopter landing area**

Detailed description of helicopter landing area provided at the aerodrome, including:

1) geographical coordinates in degrees, minutes, seconds and hundredths of seconds and geoid undulation to the nearest one-half metre or foot of the geometric centre of touch-down and lift-off (TLOF) or of each threshold of final approach and take-off (FATO) area (where appropriate);

2) TLOF and/or FATO area elevation:

— for non-precision approaches, to the nearest metre or foot; and

— for precision approaches, to the nearest one-half metre or foot;

3) TLOF and FATO area dimensions to the nearest metre or foot, surface type, bearing strength and marking;

4) true bearings to one-hundredth of a degree of FATO;

5) declared distances available, to the nearest metre or foot;

6) approach and FATO lighting; and

7) remarks.

****** AD 2.17 Air traffic services airspace**

Detailed description of air traffic services (ATS) airspace organized at the aerodrome, including:

1) airspace designation and geographical coordinates in degrees, minutes and seconds of the lateral limits;

2) vertical limits;

3) airspace classification;

4) call sign and language(s) of the ATS unit providing service;

5) transition altitude; and

6) remarks.

****** AD 2.18 Air traffic services communication facilities**

Detailed description of air traffic services communication facilities established at the aerodrome, including:

1) service designation;

2) call sign;

3) frequency(ies);

4) hours of operation; and

5) remarks.

****** AD 2.19 Radio navigation and landing aids**

Detailed description of radio navigation and landing aids associated with the instrument approach and the terminal area procedures at the aerodrome, including:

1) type of aids, magnetic variation to the nearest degree, as appropriate, and type of supported operation for ILS/MLS, basic GNSS, SBAS, and GBAS and for VOR/ILS/MLS also station declination to the nearest degree used for technical line-up of the aid;

2) identification, if required;

3) frequency(ies), as appropriate;

4) hours of operation, as appropriate;

5) geographical coordinates in degrees, minutes, seconds and tenths of seconds of the position of the transmitting antenna, as appropriate;

6) elevation of the transmitting antenna of DME to the nearest 30 m (100 ft) and of DME/P to the nearest 3 m (10 ft); and

7) remarks.

When the same aid is used for both en-route and aerodrome purposes, a description must also be given in section ENR 4. If the ground-based augmentation system (GBAS) serves more than one aerodrome, description of the aid must be provided under each aerodrome. If the operating authority of the facility is other than the designated governmental agency, the name of the operating authority must be indicated in the remarks column. Facility coverage must be indicated in the remarks column.

****** AD 2.20 Local traffic regulations**

Detailed description of regulations applicable to the traffic at the aerodrome including standard routes for taxiing aircraft, parking regulations, school and training flights and similar but excluding flight procedures.

****** AD 2.21 Noise abatement procedures**

Detailed description of noise abatement procedures established at the aerodrome.

****** AD 2.22 Flight procedures**

Detailed description of the conditions and flight procedures, including radar procedures, established on the basis of airspace organization at the aerodrome.

****** AD 2.23 Additional information**

Additional information at the aerodrome, such as an indication of bird concentrations at the aerodrome, together with an indication of significant daily movement between resting and feeding areas, to the extent practicable.

****** AD 2.24 Charts related to an aerodrome**

The requirement is for charts related to an aerodrome to be included in the following order:

1) Aerodrome/Heliport Chart — ICAO;

2) Aircraft Parking/Docking Chart — ICAO;

3) Aerodrome Ground Movement Chart — ICAO;

4) Aerodrome Obstacle Chart — ICAO Type A (for each runway);

5) Precision Approach Terrain Chart — ICAO (precision approach Cat II and III runways);

6) Area Chart — ICAO (departure and transit routes);

7) Standard Departure Chart — Instrument — ICAO;

8) Area Chart — ICAO (arrival and transit routes);

9) Standard Arrival Chart — Instrument — ICAO;

10) Radar Minimum Altitude Chart — ICAO;

11) Instrument Approach Chart — ICAO (for each runway and procedure type);

12) Visual Approach Chart — ICAO; and

13) bird concentrations in the vicinity of the aerodrome.

If some of the charts are not produced, a statement to this effect must be given in section GEN 3.2, Aeronautical charts.

AD 3. HELIPORTS

When a helicopter landing area is provided at the aerodrome, associated data must be listed only under **** AD 2.16.

Note.— **** is to be replaced by the relevant ICAO location indicator.

**** AD 3.1 Heliport location indicator and name

The requirement is for the ICAO location indicator assigned to the heliport and the name of heliport. An ICAO location indicator must be an integral part of the referencing system applicable to all subsections in section AD 3.

**** AD 3.2 Heliport geographical and administrative data

The requirement is for heliport geographical and administrative data, including:

1) heliport reference point (geographical coordinates in degrees, minutes and seconds) and its site;
2) direction and distance of heliport reference point from centre of the city or town which the heliport serves;
3) heliport elevation to the nearest metre or foot, and reference temperature;
4) geoid undulation at the heliport elevation position to the nearest metre or foot;
5) magnetic variation to the nearest degree, date of information and annual change;
6) name of heliport administration, address, telephone, telefax and telex numbers and AFS address;
7) types of traffic permitted to use the heliport (IFR/VFR); and
8) remarks.

**** AD 3.3 Operational hours

Detailed description of the hours of operation of services at the heliport, including:

1) heliport administration;
2) customs and immigration;
3) health and sanitation;
4) AIS briefing office;
5) ATS reporting office (ARO);
6) MET briefing office;
7) air traffic service;
8) fuelling;
9) handling;
10) security;
11) de-icing; and
12) remarks.

**** AD 3.4 Handling services and facilities

Detailed description of the handling services and facilities available at the heliport, including:

1) cargo-handling facilities;
2) fuel and oil types;
3) fuelling facilities and capacity;
4) de-icing facilities;
5) hangar space for visiting helicopter;
6) repair facilities for visiting helicopter; and
7) remarks.

**** AD 3.5 Passenger facilities

Brief description of passenger facilities available at the heliport, including:

1) *hotel(s) at or in the vicinity of the heliport;*
2) *restaurant(s) at or in the vicinity of the heliport;*
3) *transportation possibilities;*
4) medical facilities;

5) *bank and post office at or in the vicinity of the heliport;*

6) *tourist office;* and

7) remarks.

****** AD 3.6 Rescue and firefighting services**

Detailed description of the rescue and firefighting services and equipment available at the heliport, including:

1) heliport category for firefighting;

2) rescue equipment;

3) *capability for removal of disabled helicopter;* and

4) remarks.

****** AD 3.7 Seasonal availability — clearing**

Detailed description of the equipment and operational priorities established for the clearance of heliport movement areas, including:

1) type(s) of clearing equipment;

2) clearance priorities; and

3) remarks.

****** AD 3.8 Aprons, taxiways and check locations/positions data**

Details related to the physical characteristics of aprons, taxiways and locations/positions of designated checkpoints, including:

1) surface and strength of aprons, helicopter stands;

2) width, surface type and designation of helicopter ground taxiways;

3) width and designation of helicopter air taxiway and air transit route;

4) location and elevation to the nearest metre or foot of altimeter checkpoints;

5) location of VOR checkpoints;

6) position of INS checkpoints in degrees, minutes, seconds and hundredths of seconds; and

7) remarks.

If check locations/positions are presented on a heliport chart, a note to that effect must be provided under this subsection.

****** AD 3.9 Markings and markers**

Brief description of final approach and take-off area and taxiway markings and markers, including:

1) final approach and take-off markings;

2) taxiway markings, air taxiway markers and air transit route markers; and

3) remarks.

****** AD 3.10 Heliport obstacles**

Detailed description of obstacles, including:

1) obstacles in Area 2:

   a) obstacle identification or designation;

   b) type of obstacle;

   c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;

   d) obstacle elevation and height to the nearest metre or foot;

   e) obstacle marking, and type and colour of obstacle lighting (if any);

   f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and

   g) NIL indication, if appropriate.

Note 1.— Chapter 10, 10.2.2, provides a description of Area 2 while Appendix 8, Figure A8-2, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 2.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 2 are given in Annex 11, Appendix 5, Tables 1 and 2, and in Annex 14, Volume II, Appendix 1, Tables 1 and 2, respectively.

2) obstacles in Area 3:

   a) obstacle identification or designation;

   b) type of obstacle;

c) obstacle position, represented by geographical coordinates in degrees, minutes, seconds and tenths of seconds;

d) obstacle elevation and height to the nearest metre or foot;

e) obstacle marking, and type and colour of obstacle lighting (if any);

f) if appropriate, an indication that the list of obstacles is available in electronic form, and a reference to GEN 3.1.6; and

g) NIL indication, if appropriate.

Note 1.— Chapter 10, 10.2.3, provides a description of Area 3 while Appendix 8, Figure A8-3, contains graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in Area 3.

Note 2.— Specifications governing the determination and reporting (accuracy of field work and data integrity) of positions (latitude and longitude) and elevations for obstacles in Area 3 are given in Annex 14, Volume II, Appendix 1, Tables 1 and 2, respectively.

****** AD 3.11 Meteorological information provided**

Detailed description of meteorological information provided at the heliport and an indication of which meteorological office is responsible for the service enumerated, including:

1) name of the associated meteorological office;

2) hours of service and, where applicable, the designation of the responsible meteorological office outside these hours;

3) office responsible for preparation of TAFs, and periods of validity of the forecasts;

4) availability of the trend forecasts for the heliport, and interval of issuance;

5) information on how briefing and/or consultation is provided;

6) type of flight documentation supplied and language(s) used in flight documentation;

7) charts and other information displayed or available for briefing or consultation;

8) supplementary equipment available for providing information on meteorological conditions, e.g. weather radar and receiver for satellite images;

9) the air traffic services unit(s) provided with meteorological information; and

10) additional information (e.g. concerning any limitation of service, etc.).

****** AD 3.12 Heliport data**

Detailed description of heliport dimensions and related information, including:

1) heliport type — surface-level, elevated or helideck;

2) touchdown and lift-off (TLOF) area dimensions to the nearest metre or foot;

3) true bearings to one-hundredth of a degree of final approach and take-off (FATO) area;

4) dimensions to the nearest metre or foot of FATO, and surface type;

5) surface and bearing strength in tonnes (1 000 kg) of TLOF;

6) geographical coordinates in degrees, minutes, seconds and hundredths of seconds and geoid undulation to the nearest one-half metre or foot of the geometric centre of TLOF or of each threshold of FATO (where appropriate);

7) TLOF and/or FATO slope and elevation:

— for non-precision approaches to the nearest metre or foot; and

— for precision approaches to the nearest one-half metre or foot;

8) dimensions of safety area;

9) dimensions, to the nearest metre or foot, of helicopter clearway;

10) the existence of an obstacle-free sector; and

11) remarks.

****** AD 3.13 Declared distances**

Detailed description of declared distances to the nearest metre or foot, where relevant for a heliport, including:

1) take-off distance available;

2) rejected take-off distance available;

3) landing distance available; and

4) remarks.

****** AD 3.14 Approach and FATO lighting**

Detailed description of approach and FATO lighting, including:

1) type, length and intensity of approach lighting system;

2) type of visual approach slope indicator system;

3) characteristics and location of FATO area lights;

4) characteristics and location of aiming point lights;

5) characteristics and location of TLOF lighting system; and

6) remarks.

****** AD 3.15 Other lighting, secondary power supply**

Description of other lighting and secondary power supply, including:

1) location, characteristics and hours of operation of heliport beacon;

2) location and lighting of wind direction indicator (WDI);

3) taxiway edge and taxiway centre line lights;

4) secondary power supply including switch-over time; and

5) remarks.

****** AD 3.16 Air traffic services airspace**

Detailed description of air traffic services (ATS) airspace organized at the heliport, including:

1) airspace designation and geographical coordinates in degrees, minutes and seconds of the lateral limits;

2) vertical limits;

3) airspace classification;

4) call sign and language(s) of ATS unit providing service;

5) transition altitude; and

6) remarks.

****** AD 3.17 Air traffic services communication facilities**

Detailed description of air traffic services communication facilities established at the heliport, including:

1) service designation;

2) call sign;

3) frequency(ies);

4) hours of operation; and

5) remarks.

****** AD 3.18 Radio navigation and landing aids**

Detailed description of radio navigation and landing aids associated with the instrument approach and the terminal area procedures at the heliport, including:

1) type of aids, magnetic variation (for VOR, station declination used for technical line-up of the aid) to the nearest degree, and type of operation for ILS, MLS, basic GNSS, SBAS, and GBAS;

2) identification, if required;

3) frequency(ies), as appropriate;

4) hours of operation, as appropriate;

5) geographical coordinates in degrees, minutes, seconds and tenths of seconds of the position of the transmitting antenna, as appropriate;

6) elevation of the transmitting antenna of DME to the nearest 30 m (100 ft) and of DME/P to the nearest 3 m (10 ft); and

7) remarks.

When the same aid is used for both en-route and heliport purposes, a description must also be given in section ENR 4. If the ground-based augmentation system (GBAS) serves more than one heliport, description of the aid must be provided under each heliport. If the operating authority of the facility is other than the designated governmental agency, the name of the operating authority must be indicated in the remarks column. Facility coverage must be indicated in the remarks column.

****** AD 3.19 Local traffic regulations**

Detailed description of regulations applicable to traffic at the heliport, including standard routes for taxiing helicopters, parking regulations, school and training flights and similar but excluding flight procedures.

****** AD 3.20 Noise abatement procedures**

Detailed description of noise abatement procedures established at the heliport.

**** AD 3.21 Flight procedures

Detailed description of the conditions and flight procedures, including radar procedures, established on the basis of airspace organization established at the heliport.

**** AD 3.22 Additional information

Additional information about the heliport, such as an indication of bird concentrations at the heliport together with an indication of significant daily movement between resting and feeding areas, to the extent practicable.

**** AD 3.23 Charts related to a heliport

The requirement is for charts related to a heliport to be included in the following order:

1) Aerodrome/Heliport Chart — ICAO;
2) Area Chart — ICAO (departure and transit routes);
3) Standard Departure Chart — Instrument — ICAO;
4) Area Chart — ICAO (arrival and transit routes);
5) Standard Arrival Chart — Instrument — ICAO;
6) Radar Minimum Altitude Chart — ICAO;
7) Instrument Approach Chart — ICAO (for each procedure type);
8) Visual Approach Chart — ICAO; and
9) bird concentrations in the vicinity of heliport.

If some of the charts are not produced, a statement to this effect must be given in section GEN 3.2, Aeronautical charts.

APPENDIX 2. SNOWTAM FORMAT

(see Chapter 5, 5.2.3)

(COM heading)	(PRIORITY INDICATOR)						(ADDRESSES)																		≪≡
	(DATE AND TIME OF FILING)								(ORIGINATOR'S INDICATOR)																≪≡
(Abbreviated heading)	(SWAA* SERIAL NUMBER)								(LOCATION INDICATOR)				DATE/TIME OF OBSERVATION								(OPTIONAL GROUP)				
	S	W	*	*																					≪≡ (

SNOWTAM	(Serial number) →

(AERODROME LOCATION INDICATOR)	A)	→
(DATE/TIME OF OBSERVATION *(Time of completion of measurement in UTC)*)	B)	→
(RUNWAY DESIGNATORS)	C)	→
(CLEARED RUNWAY LENGTH, IF LESS THAN PUBLISHED LENGTH *(m)*)	D)	→
(CLEARED RUNWAY WIDTH, IF LESS THAN PUBLISHED WIDTH *(m; if offset left or right of centre line add "L" or "R")*)	E)	→
(DEPOSITS OVER TOTAL RUNWAY LENGTH *(Observed on each third of the runway, starting from threshold having the lower runway designation number)* NIL — CLEAR AND DRY 1 — DAMP 2 — WET or water patches 3 — RIME OR FROST COVERED *(depth normally less than 1 mm)* 4 — DRY SNOW 5 — WET SNOW 6 — SLUSH 7 — ICE 8 — COMPACTED OR ROLLED SNOW 9 — FROZEN RUTS OR RIDGES)	F)	→
(MEAN DEPTH *(mm)* FOR EACH THIRD OF TOTAL RUNWAY LENGTH)	G)	→
(FRICTION MEASUREMENTS ON EACH THIRD OF RUNWAY AND FRICTION MEASURING DEVICE MEASURED OR CALCULATED COEFFICIENT *or* ESTIMATED SURFACE FRICTION 0.40 and above — GOOD — 5 0.39 to 0.36 — MEDIUM/GOOD — 4 0.35 to 0.30 — MEDIUM — 3 0.29 to 0.26 — MEDIUM/POOR — 2 0.25 and below — POOR — 1 9 — unreliable — UNRELIABLE — 9 *(When quoting a measured coefficient, use the observed two figures, followed by the abbreviation of the friction measuring device used. When quoting an estimate, use single digit)*)	H)	→
(CRITICAL SNOWBANKS *(If present, insert height (cm)/distance from the edge of runway (m) followed by "L", "R" or "LR" if applicable)*)	J)	→
(RUNWAY LIGHTS *(If obscured, insert "YES" followed by "L", "R" or both "LR" if applicable)*)	K)	→
(FURTHER CLEARANCE *(If planned, insert length (m)/width (m) to be cleared or if to full dimensions, insert "TOTAL")*)	L)	→
(FURTHER CLEARANCE EXPECTED TO BE COMPLETED BY . . . *(UTC)*)	M)	→
(TAXIWAY *(If no appropriate taxiway is available, insert "NO")*)	N)	→
(TAXIWAY SNOWBANKS *(If more than 60 cm, insert "YES" followed by distance apart, m)*)	P)	→
(APRON *(If unusable insert "NO")*)	R)	→
(NEXT PLANNED OBSERVATION/MEASUREMENT IS FOR) *(month/day/hour in UTC)*	S)	→
(PLAIN-LANGUAGE REMARKS *(Including contaminant coverage and other operationally significant information, e.g. sanding, de-icing)*)	T)	)≪≡
NOTES: 1. *Enter ICAO nationality letters as given in ICAO Doc 7910, Part 2. 2. Information on other runways, repeat from C to P. 3. Words in brackets ( ) not to be transmitted.		

SIGNATURE OF ORIGINATOR *(not for transmission)*

INSTRUCTIONS FOR THE COMPLETION OF THE SNOWTAM FORMAT

1. *General*

a) When reporting on two or three runways, repeat Items C to P inclusive.

b) Items together with their indicator must be dropped completely, where no information is to be included.

c) Metric units must be used and the unit of measurement not reported.

d) The maximum validity of SNOWTAM is 24 hours. New SNOWTAM must be issued whenever there is a significant change in conditions. The following changes relating to runway conditions are considered as significant:

1) a change in the coefficient of friction of about 0.05;

2) changes in depth of deposit greater than the following: 20 mm for dry snow, 10 mm for wet snow, 3 mm for slush;

3) a change in the available length or width of a runway of 10 per cent or more;

4) any change in the type of deposit or extent of coverage which requires reclassification in Items F or T of the SNOWTAM;

5) when critical snow banks exist on one or both sides of the runway, any change in the height or distance from centre line;

6) any change in the conspicuity of runway lighting caused by obscuring of the lights;

7) any other conditions known to be significant according to experience or local circumstances.

e) The abbreviated heading "TTAAiiii CCCC MMYYGGgg (BBB)" is included to facilitate the automatic processing of SNOWTAM messages in computer data banks. The explanation of these symbols is:

TT = data designator for SNOWTAM = SW;
AA = geographical designator for States, e.g. LF = FRANCE, EG = United Kingdom (see *Location Indicators* (Doc 7910), Part 2, Index to Nationality Letters for Location Indicators);
iiii = SNOWTAM serial number in a four-figure group;
CCCC = four-letter location indicator of the aerodrome to which the SNOWTAM refers (see *Location Indicators* (Doc 7910));
MMYYGGgg = date/time of observation/measurement, whereby:
MM = month, e.g. January = 01, December = 12
YY = day of the month
GGgg = time in hours (GG) and minutes (gg) UTC;
(BBB) = optional group for:
Correction to SNOWTAM message previously disseminated with the same serial number = COR.

Note.— Brackets in (BBB) are used to indicate that this group is optional.

Example: Abbreviated heading of SNOWTAM No. 149 from Zurich, measurement/observation of 7 November at 0620 UTC:

SWLS0149 LSZH 11070620

2. *Item A* — Aerodrome location indicator (four-letter location indicator).

3. *Item B* — Eight-figure date/time group — giving time of observation as month, day, hour and minute in UTC; this item must always be completed.

4. *Item C* — Lower runway designator number.

5. *Item D* — Cleared runway length in metres, if less than published length (see Item T on reporting on part of runway not cleared).

6. *Item E* — Cleared runway width in metres, if less than published width; if offset left or right of centre line, add "L" or "R", as viewed from the threshold having the lower runway designation number.

7. *Item F* — Deposit over total runway length as explained in SNOWTAM Format. Suitable combinations of these numbers may be used to indicate varying conditions over runway segments. If more than one deposit is present on the same portion of the runway, they should be reported in sequence from the top to the bottom. Drifts, depths of deposit appreciably greater than the average values or other significant characteristics of the deposits may be reported under Item T in plain language.

Note.— Definitions for the various types of snow are given at the end of this Appendix.

8. *Item G* — Mean depth in millimetres deposit for each third of total runway length, or "XX" if not measurable or operationally not significant; the assessment to be made to an accuracy of 20 mm for dry snow, 10 mm for wet snow and 3 mm for slush.

9. *Item H* — Friction measurements on each third of the runway and friction measuring device. Measured or calculated coefficient (two digits) or, if not available, estimated surface friction (single digit) in the order from the threshold having the lower runway designation number. Insert a code 9 when surface conditions or available friction measuring device do not permit a reliable surface friction measurement to be made. Use the following abbreviations to indicate the type of friction measuring device used:

BRD	Brakemeter-Dynometer
GRT	Grip tester
MUM	Mu-meter
RFT	Runway friction tester
SFH	Surface friction tester (high-pressure tire)
SFL	Surface friction tester (low-pressure tire)
SKH	Skiddometer (high-pressure tire)
SKL	Skiddometer (low-pressure tire)
TAP	Tapley meter

If other equipment is used, specify in plain language.

10. *Item J* — Critical snowbanks. If present insert height in centimetres and distance from edge of runway in metres, followed by left ("L") or right ("R") side or both sides ("LR"), as viewed from the threshold having the lower runway designation number.

11. *Item K* — If runway lights are obscured, insert "YES" followed by "L", "R" or both "LR", as viewed from the threshold having the lower runway designation number.

12. *Item L* — When further clearance will be undertaken, enter length and width of runway or "TOTAL" if runway will be cleared to full dimensions.

13. *Item M* — Enter the anticipated time of completion in UTC.

14. *Item N* — The code for Item F may be used to describe taxiway conditions; enter "NO" if no taxiways serving the associated runway are available.

15. *Item P* — If applicable, enter "YES" followed by the lateral distance in metres.

16. *Item R* — The code for Item F may be used to describe apron conditions; enter "NO" if the apron is unusable.

17. *Item S* — Enter the anticipated time of next observation/measurement in UTC.

18. *Item T* — Describe in plain language any operationally significant information but always report on length of uncleared runway (Item D) and extent of runway contamination (Item F) for each third of the runway (if appropriate) in accordance with the following scale:

Runway contamination — 10% — if less than 10% of runway contaminated
Runway contamination — 25% — if 11–25% of runway contaminated
Runway contamination — 50% — if 26–50% of runway contaminated
Runway contamination — 100% — if 51–100% of runway contaminated.

EXAMPLE OF COMPLETED SNOWTAM FORMAT

GG EHAMZQZX EDDFZQZX EKCHZQZX
070645 LSZHYNYX
SWLS0149 LSZH 11070620
(SNOWTAM 0149

A) LSZH	B) 11070620	C) 02	D) ... P)
		C) 09	D) ... P)
		C) 12	D) ... P)
R) NO	S)11070920	T) DEICING)	

Definitions of the various types of snow

Slush. Water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter; specific gravity: 0.5 up to 0.8.

Note.— Combinations of ice, snow and/or standing water may, especially when rain, rain and snow, or snow is falling, produce substances with specific gravities in excess of 0.8. These substances, due to their high water/ice content, will have a transparent rather than a cloudy appearance and, at the higher specific gravities, will be readily distinguishable from slush.

Snow (on the ground).

a) *Dry snow.* Snow which can be blown if loose or, if compacted by hand, will fall apart again upon release; specific gravity: up to but not including 0.35.

b) *Wet snow.* Snow which, if compacted by hand, will stick together and tend to or form a snowball; specific gravity: 0.35 up to but not including 0.5.

c) *Compacted snow.* Snow which has been compressed into a solid mass that resists further compression and will hold together or break up into lumps if picked up; specific gravity: 0.5 and over.

APPENDIX 3. ASHTAM FORMAT

(see Chapter 5, 5.2.4)

(COM heading)	(PRIORITY INDICATOR)	(ADDRESSEE INDICATOR(S))[1]		
	(DATE AND TIME OF FILING)	(ORIGINATOR'S INDICATOR)		
(Abbreviated heading)	(VA*[2] SERIAL NUMBER)	(LOCATION INDICATOR)	DATE/TIME OF ISSUANCE	(OPTIONAL GROUP)
	V A *[2] *[2]			

ASHTAM	(SERIAL NUMBER)
(FLIGHT INFORMATION REGION AFFECTED)	A)
(DATE/TIME (UTC) OF ERUPTION)	B)
(VOLCANO NAME AND NUMBER)	C)
(VOLCANO LATITUDE/LONGITUDE OR VOLCANO RADIAL AND DISTANCE FROM NAVAID)	D)
(VOLCANO LEVEL OF ALERT COLOUR CODE, INCLUDING ANY PRIOR LEVEL OF ALERT COLOUR CODE)[3]	E)
(EXISTENCE AND HORIZONTAL/VERTICAL EXTENT OF VOLCANIC ASH CLOUD)[4]	F)
(DIRECTION OF MOVEMENT OF ASH CLOUD)[4]	G)
(AIR ROUTES OR PORTIONS OF AIR ROUTES AND FLIGHT LEVELS AFFECTED)	H)
(CLOSURE OF AIRSPACE AND/OR AIR ROUTES OR PORTIONS OF AIR ROUTES, AND ALTERNATIVE AIR ROUTES AVAILABLE)	I)
(SOURCE OF INFORMATION)	J)
(PLAIN-LANGUAGE REMARKS)	K)

NOTES:
1. See also Appendix 5 regarding addressee indicators used in predetermined distribution systems.
2. *Enter ICAO nationality letter as given in ICAO Doc 7910, Part 2.
3. See paragraph 3.5 below.
4. Advice on the existence, extent and movement of volcanic ash cloud G) and H) may be obtained from the Volcanic Ash Advisory Centre(s) responsible for the FIR concerned.
5. Item titles in brackets ( ) not to be transmitted.

SIGNATURE OF ORIGINATOR *(not for transmission)*

INSTRUCTIONS FOR THE COMPLETION OF THE ASHTAM FORMAT

1. *General*

1.1 The ASHTAM provides information on the status of activity of a volcano when a change in its activity is, or is expected to be of operational significance. This information is provided using the volcano level of alert colour code given in 3.5 below.

1.2 In the event of a volcanic eruption producing ash cloud of operational significance, the ASHTAM also provides information on the location, extent and movement of the ash cloud and the air routes and flight levels affected.

1.3 Issuance of an ASHTAM giving information on a volcanic eruption, in accordance with section 3 below, should **not** be delayed until complete information A) to K) is available but should be issued immediately following receipt of notification that an eruption has occurred or is expected to occur, or a change in the status of activity of a volcano of operational significance has occurred or is expected to occur, or an ash cloud is reported. In the case of an expected eruption, and hence no ash cloud evident at that time, items A) to E) should be completed and items F) to I) indicated as "not applicable". Similarly, if a volcanic ash cloud is reported, e.g. by special air-report, but the source volcano is not known at that time, the ASHTAM should be issued initially with items A) to E) indicated as "unknown", and items F) to K) completed, as necessary, based on the special air-report, pending receipt of further information. In other circumstances, if information for a specific field A) to K) is not available indicate "NIL".

1.4 The maximum period of validity of ASHTAM is 24 hours. New ASHTAM must be issued whenever there is a change in the level of alert.

2. *Abbreviated heading*

2.1 Following the usual AFTN communications header, the abbreviated heading "TT AAiiii CCCC MMYYGGgg (BBB)" is included to facilitate the automatic processing of ASHTAM messages in computer data banks. The explanation of these symbols is:

TT = data designator for ASHTAM = VA;
AA = geographical designator for States, e.g. NZ = New Zealand (see *Location Indicators* (Doc 7910), Part 2, Index to Nationality Letters for Location Indicators);
iiii = ASHTAM serial number in a four-figure group;
CCCC = four-letter location indicator of the flight information region concerned (see *Location Indicators* (Doc 7910), Part 5, addresses of centres in charge of FIR/UIR);
MMYYGGgg = date/time of report, whereby:
MM = month, e.g. January = 01, December = 12
YY = day of the month
GGgg = time in hours (GG) and minutes (gg) UTC;
(BBB) = Optional group for correction to an ASHTAM message previously disseminated with the same serial number = COR.

Note.— Brackets in (BBB) are used to indicate that this group is optional.

Example: Abbreviated heading of ASHTAM for Auckland Oceanic FIR, report on 7 November at 0620 UTC:

VANZ0001 NZZO 11070620

3. *Content of ASHTAM*

3.1 *Item A* — Flight information region affected, plain-language equivalent of the location indicator given in the abbreviated heading, in this example "Auckland Oceanic FIR".

3.2 *Item B* — Date and time (UTC) of first eruption.

3.3 *Item C* — Name of volcano, and number of volcano as listed in the ICAO *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691), Appendix H, and on the World Map of Volcanoes and Principal Aeronautical Features.

3.4 *Item D* — Latitude/Longitude of the volcano in whole degrees or radial and distance of volcano from NAVAID (as listed in the ICAO *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691), Appendix H, and on the World Map of Volcanoes and Principal Aeronautical Features).

3.5 *Item E* — Colour code for level of alert indicating volcanic activity, including any previous level of alert colour code as follows:

Level of alert colour code	Status of activity of volcano
RED ALERT	Volcanic eruption in progress. Ash plume/cloud reported above FL 250. *or* Volcano dangerous, eruption likely, with ash plume/cloud expected to rise above FL 250.
ORANGE ALERT	Volcanic eruption in progress but ash plume/cloud not reaching nor expected to reach FL 250. *or* Volcano dangerous, eruption likely but ash plume/cloud not expected to reach FL 250.
YELLOW ALERT	Volcano known to be active from time to time and volcanic activity has recently increased significantly, volcano not currently considered dangerous but caution should be exercised. *or* (After an eruption, i.e. change in alert to yellow from red or orange.) Volcanic activity has decreased significantly, volcano not currently considered dangerous but caution should be exercised.
GREEN ALERT	Volcanic activity considered to have ceased and volcano reverted to its normal state.

Note.— The colour code for the level of alert indicating the status of activity of the volcano and any change from a previous status of activity should be provided to the area control centre by the responsible vulcanological agency in the State concerned, e.g. "RED ALERT FOLLOWING YELLOW" OR "GREEN ALERT FOLLOWING ORANGE".

3.6 *Item F* — If volcanic ash cloud of operational significance is reported, indicate the horizontal extent and base/top of the ash cloud using latitude/longitude (in whole degrees) and altitudes in thousands of metres (feet) and/or radial and distance from source volcano. Information initially may be based only on special air-report, but subsequent information may be more detailed based on advice from the responsible meteorological watch office and/or volcanic ash advisory centre.

3.7 *Item G* — Indicate forecast direction of movement of the ash cloud at selected levels based on advice from the responsible meteorological watch office and/or volcanic ash advisory centre.

3.8 *Item H* — Indicate air routes and portions of air routes and flight levels affected, or expected to become affected.

3.9 *Item I* — Indicate closure of airspace, air routes or portions of air routes, and availability of alternative routes.

3.10 *Item J* — Source of the information, e.g. "special air-report" or "vulcanological agency", etc. The source of information should always be indicated, whether an eruption has actually occurred or ash cloud reported, or not.

3.11 *Item K* — Include in plain language any operationally significant information additional to the foregoing.

APPENDIX 4. INFORMATION TO BE NOTIFIED BY AIRAC

(see Chapter 6, 6.1.1)

PART 1

1. The establishment, withdrawal of, and premeditated significant changes (including operational trials) to:

1.1 Limits (horizontal and vertical), regulations and procedures applicable to:

a) flight information regions;

b) control areas;

c) control zones;

d) advisory areas;

e) ATS routes;

f) permanent danger, prohibited and restricted areas (including type and periods of activity when known) and ADIZ;

g) permanent areas or routes or portions thereof where the possibility of interception exists.

1.2 Positions, frequencies, call signs, known irregularities and maintenance periods of radio navigation aids and communication facilities.

1.3 Holding and approach procedures, arrival and departure procedures, noise abatement procedures and any other pertinent ATS procedures.

1.4 Meteorological facilities (including broadcasts) and procedures.

1.5 Runways and stopways.

PART 2

2. The establishment and withdrawal of, and premeditated significant changes to:

2.1 Position, height and lighting of navigational obstacles.

2.2 Taxiways and aprons.

2.3 Hours of service: aerodromes, facilities and services.

2.4 Customs, immigration and health services.

2.5 Temporary danger, prohibited and restricted areas and navigational hazards, military exercises and mass movements of aircraft.

2.6 Temporary areas or routes or portions thereof where the possibility of interception exists.

APPENDIX 5. PREDETERMINED DISTRIBUTION SYSTEM FOR NOTAM

(see Chapter 5, 5.3.4.2 and Annex 10, Volume II, Chapter 4, 4.4.14)

1. The predetermined distribution system provides for incoming NOTAM (including SNOWTAM and ASHTAM) to be channelled through the AFTN direct to designated addressees predetermined by the receiving country concerned while concurrently being routed to the international NOTAM office for checking and control purposes.

2. The addressee indicators for those designated addressees are constituted as follows:

1) *First and second letters:*

The first two letters of the location indicator for the AFTN communication centre associated with the relevant international NOTAM office of the receiving country.

2) *Third and fourth letters:*

The letters “ZZ” indicating a requirement for special distribution.

3) *Fifth letter:*

The fifth letter differentiating between NOTAM (letter “N”), SNOWTAM (letter “S”), and ASHTAM (letter “V”).

4) *Sixth and seventh letters:*

The sixth and seventh letters, each taken from the series A to Z and denoting the national and/or international distribution list(s) to be used by the receiving AFTN centre.

Note.— The fifth, sixth and seventh letters replace the three-letter designator YNY which, in the normal distribution system, denotes an international NOTAM office.

5) *Eighth letter:*

The eighth position letter shall be the filler letter “X” to complete the eight-letter addressee indicator.

3. States are to inform the States from which they receive NOTAM of the sixth and seventh letters to be used under different circumstances to ensure proper routing.

APPENDIX 6. NOTAM FORMAT

(see Chapter 5, 5.2.1)

Priority Indicator	⟶
Address	
	≪≡
Date and time of filing	⟶
Originator's Indicator	≪≡ (

Message Series, Number and Identifier

NOTAM containing new information	.... (series and number/year)	NOTAMN
NOTAM replacing a previous NOTAM	.... (series and number/year)	NOTAMR.. (series and number/year of NOTAM to be replaced)
NOTAM cancelling a previous NOTAM	.... (series and number/year)	NOTAMC.. (series and number/year of NOTAM to be cancelled) ≪≡

Qualifiers

	FIR	NOTAM Code	Traffic	Purpose	Scope	Lower Limit	Upper Limit	Coordinates, Radius	
Q)	/	Q /	/	/	/	/	/		≪≡

Identification of ICAO location indicator in which the facility, airspace or condition reported on is located	A) ⟶

Period of Validity

From *(date-time group)*	B)		⟶
To *(PERM or date-time group)*	C)	**EST*** **PERM***	≪≡
Time Schedule *(if applicable)*	D)		⟶
			≪≡

Text of NOTAM; Plain-language Entry (using ICAO Abbreviations)

E)

≪≡

Lower Limit	F) ⟶
Upper Limit	G))≪≡
Signature	

***Delete as appropriate**

INSTRUCTIONS FOR THE COMPLETION OF THE NOTAM FORMAT

1. General

The qualifier line (Item Q) and all identifiers (Items A) to G) inclusive) each followed by a closing parenthesis, as shown in the format, shall be transmitted unless there is no entry to be made against a particular identifier.

2. NOTAM numbering

Each NOTAM shall be allocated a series identified by a letter and a four-digit number followed by a stroke and a two-digit number for the year (e.g. A0023/03).

3. Qualifiers (Item Q)

Item Q) is divided in eight fields, each separated by a stroke. If no entry is to be made in a field, it is not necessary to transmit blanks between the strokes. Examples of how fields are to be filled are shown in the *Aeronautical Information Services Manual* (Doc 8126). The definition of the field is as follows:

1) FIR

a) ICAO location indicator of affected FIR or, if applicable to more than one FIR within a State, the first two letters of the ICAO location indicator of a State plus "XX". The ICAO location indicators of the FIRs concerned shall then be listed in Item A) or indicator of State or non-governmental agency which is responsible for provision of a navigation service in more than one State.

b) If one State issues a NOTAM affecting FIRs in a group of States, the first two letters of the ICAO location indicator of the issuing State plus "XX" shall be included. The location indicators of the FIRs concerned shall then be listed in Item A) or indicator of State or non-governmental agency which is responsible for provision of a navigation service in more than one State.

2) NOTAM CODE

All NOTAM Code groups contain a total of five letters and the first letter is always the letter Q. The second and third letters identify the subject, and the fourth and fifth letters denote the status of the subject reported upon. For combinations of second and third and fourth and fifth letters, insert the ICAO NOTAM codes listed in the PANS-ABC (Doc 8400) or in the NOTAM Selection Criteria contained in the *Aeronautical Information Services Manual* (Doc 8126) or insert one of the following combinations, as appropriate:

a) If the subject is not listed in the NOTAM Code (Doc 8400) or in the NOTAM Selection Criteria (Doc 8126), insert "XX" as the second and third letters (e.g. QXXAK);

b) If the condition of the subject is not listed in the NOTAM Code (Doc 8400) or in the NOTAM Selection Criteria (Doc 8126), insert "XX" as the fourth and fifth letters (e.g. QFAXX);

c) When a NOTAM containing operationally significant information is issued in accordance with Appendix 4 and Chapter 6 and when it is used to announce existence of AIRAC AIP Amendments or Supplements, insert "TT" as the fourth and fifth letters of the NOTAM Code;

d) When a NOTAM is issued containing a checklist of valid NOTAM, insert "KKKK" as the second, third, fourth and fifth letters; and

e) The following fourth and fifth letters of the NOTAM Code shall be used in NOTAM cancellations:

AK : RESUMED NORMAL OPERATION
AL : OPERATIVE (OR RE-OPERATIVE) SUBJECT TO PREVIOUSLY PUBLISHED LIMITATIONS/CONDITIONS
AO : OPERATIONAL
CC : COMPLETED
XX : PLAIN LANGUAGE

3) TRAFFIC

I = IFR
V = VFR
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field TRAFFIC may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126).*

4) PURPOSE

N = NOTAM selected for the immediate attention of aircraft operators
B = NOTAM selected for PIB entry
O = NOTAM concerning flight operations
M = Miscellaneous NOTAM; not subject for a briefing, but it is available on request
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field PURPOSE may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126).*

5) SCOPE

A = Aerodrome
E = En-route
W = Nav Warning
K = NOTAM is a checklist

Note.— Depending on the NOTAM subject and content, the qualifier field SCOPE may contain combined qualifiers. For possible combinations refer to the NOTAM Selection Criteria in the Aeronautical Information Services Manual *(Doc 8126). If the subject is qualified AE, the aerodrome location indicator must be reported in Item A).*

6) and 7) LOWER/UPPER

LOWER and UPPER limits shall always be filled and shall only be expressed in flight levels (FL). In the case of navigation warnings and airspace restrictions, values entered shall be consistent with those provided under Items F) and G).

If the subject does not contain specific height information, insert "000" for LOWER and "999" for UPPER as default values.

8) COORDINATES, RADIUS

The latitude and longitude accurate to one minute, as well as a three-digit distance figure giving the radius of influence in NM (e.g. 4700N01140E043). Coordinates present approximate centre of circle whose radius encompasses the whole area of influence, and if the NOTAM affects the entire FIR/UIR or more than one FIR/UIR, enter the default value "999" for radius.

4. Item A)

Insert the location indicator as contained in ICAO Doc 7910 of the aerodrome or FIR in which the facility, airspace, or condition being reported on is located. More than one FIR/UIR may be indicated when appropriate. If there is no available ICAO location indicator, use the ICAO nationality letter as given in ICAO Doc 7910, Part 2, plus "XX" and followed up in Item E) by the name, in plain language.

If information concerns GNSS, insert the appropriate ICAO location indicator allocated for a GNSS element or the common location indicator allocated for all elements of GNSS (except GBAS).

Note.— In the case of GNSS, the location indicator may be used when identifying a GNSS element outage (e.g. KNMH for a GPS satellite outage).

5. Item B)

For date-time group use a ten-figure group, giving year, month, day, hours and minutes in UTC. This entry is the date-time at which the NOTAMN comes into force. In the cases of NOTAMR and NOTAMC, the date-time group is the actual date and time of the NOTAM origination.

6. Item C)

With the exception of NOTAMC, a date-time group (a ten-figure group giving year, month, day, hours and minutes in UTC) indicating duration of information shall be used unless the information is of a permanent nature in which case the abbreviation "PERM" is inserted instead. If the information on timing is uncertain, the approximate duration shall be indicated using a date-time group followed by the abbreviation "EST". Any NOTAM which includes an "EST" shall be cancelled or replaced before the date-time specified in Item C).

7. Item D)

If the hazard, status of operation or condition of facilities being reported on will be active in accordance with a specific time and date schedule between the dates-times indicated in Items B) and C), insert such information under Item D). If Item D) exceeds 200 characters, consideration shall be given to providing such information in a separate, consecutive NOTAM.

Note.— Guidance concerning a harmonized definition of Item D) content is provided in Doc 8126.

8. Item E)

Use decoded NOTAM Code, complemented where necessary by ICAO abbreviations, indicators, identifiers, designators, call signs, frequencies, figures and plain language. When NOTAM is selected for international distribution, English text shall be included for those parts expressed in plain language. This entry shall be clear and concise in order to provide a suitable PIB entry. In the case of NOTAMC, a subject reference and status message shall be included to enable accurate plausibility checks.

9. Items F) and G)

These items are normally applicable to navigation warnings or airspace restrictions and are usually part of the PIB entry. Insert both lower and upper height limits of activities or restrictions, clearly indicating reference datum and units of measurement.

Note.— For NOTAM examples see Doc 8126 and the PANS-ABC (Doc 8400).

APPENDIX 7. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table A7-1. Latitude and longitude

Latitude and longitude	Publication resolution	Integrity Classification
Flight information region boundary points	1 min	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	1 min	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundaries)	1 sec	1×10^{-5} essential
CTA/CTZ boundary points	1 sec	1×10^{-5} essential
En-route NAVAIDS and fixes, holding, STAR/SID points	1 sec	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	1 sec	1×10^{-3} routine
Aerodrome/heliport reference point	1 sec	1×10^{-3} routine
NAVAIDS located at the aerodrome/heliport	1/10 sec	1×10^{-5} essential
Obstacles in Area 3	1/10 sec	1×10^{-5} essential
Obstacles in Area 2	1/10 sec	1×10^{-5} essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	1/10 sec	1×10^{-5} essential
Runway threshold	1/100 sec	1×10^{-8} critical
Runway end (flight path alignment point)	1/100 sec	1×10^{-8} critical
Runway holding position	1/100 sec	1×10^{-8} critical
Taxiway centre line/parking guidance line points	1/100 sec	1×10^{-5} essential
Taxiway intersection marking line	1/100 sec	1×10^{-5} essential
Exit guidance line	1/100 sec	1×10^{-5} essential
Aircraft stand points/INS checkpoints	1/100 sec	1×10^{-3} routine
Geometric centre of TLOF or FATO thresholds, heliports	1/100 sec	1×10^{-8} critical
Apron boundaries (polygon)	1/10 sec	1×10^{-3} routine
De-icing/anti-icing facility (polygon)	1/10 sec	1×10^{-3} routine

Note.— See Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A7-2. Elevation/altitude/height

Elevation/altitude/height	Publication resolution	Integrity Classification
Aerodrome/heliport elevation	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
Threshold crossing height, precision approaches	0.1 m or 0.1 ft	1×10^{-8} critical
Obstacles in Area 2	1 m or 1 ft	1×10^{-5} essential
Obstacles in Area 3	0.1 m or 0.1 ft	1×10^{-5} essential
Obstacles in Area 1 (the entire State territory)	1 m or 1 ft	1×10^{-3} routine
Distance measuring equipment/precision (DME/P)	3 m (10 ft)	1×10^{-5} essential
Distance measuring equipment (DME)	30 m (100 ft)	1×10^{-5} essential
Minimum altitudes	50 m or 100 ft	1×10^{-3} routine

Note.— See Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Table A7-3. Declination and magnetic variation

Declination/variation	Publication resolution	Integrity Classification
VHF NAVAID station declination used for technical line-up	1 degree	1×10^{-5} essential
NDB NAVAID magnetic variation	1 degree	1×10^{-3} routine
Aerodrome/heliport magnetic variation	1 degree	1×10^{-5} essential
ILS localizer antenna magnetic variation	1 degree	1×10^{-5} essential
MLS azimuth antenna magnetic variation	1 degree	1×10^{-5} essential

Table A7-4. Bearing

Bearing	Publication resolution	Integrity Classification
Airway segments	1 degree	1×10^{-3} routine
En-route and terminal fix formations	1/10 degree	1×10^{-3} routine
Terminal arrival/departure route segments	1 degree	1×10^{-3} routine
Instrument approach procedure fix formations	1/100 degree	1×10^{-5} essential
ILS localizer alignment (True)	1/100 degree	1×10^{-5} essential
MLS zero azimuth alignment (True)	1/100 degree	1×10^{-5} essential
Runway and FATO bearing (True)	1/100 degree	1×10^{-3} routine

Table A7-5. Length/distance/dimension

Length/distance/dimension	Publication resolution	Integrity Classification
Airway segment length	1/10 km or 1/10 NM	1×10^{-3} routine
En-route fix formation distance	1/10 km or 1/10 NM	1×10^{-3} routine
Terminal arrival/departure route segment length	1/100 km or 1/100 NM	1×10^{-5} essential
Terminal and instrument approach procedure fix formation distance	1/100 km or 1/100 NM	1×10^{-5} essential
Runway and FATO length, TLOF dimensions	1 m or 1 ft	1×10^{-8} critical
Runway width	1 m or 1 ft	1×10^{-5} essential
Displaced threshold distance	1 m or 1 ft	1×10^{-3} routine
Clearway length and width	1 m or 1 ft	1×10^{-5} essential
Stopway length and width	1 m or 1 ft	1×10^{-8} critical
Landing distance available	1 m or 1 ft	1×10^{-8} critical
Take-off run available	1 m or 1 ft	1×10^{-8} critical
Take-off distance available	1 m or 1 ft	1×10^{-8} critical
Accelerate-stop distance available	1 m or 1 ft	1×10^{-8} critical
Runway shoulder width	1 m or 1 ft	1×10^{-5} essential
Taxiway width	1 m or 1 ft	1×10^{-5} essential
Taxiway shoulder width	1 m or 1 ft	1×10^{-5} essential
ILS localizer antenna-runway end, distance	1 m or 1 ft	1×10^{-3} routine
ILS glide slope antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-3} routine
ILS marker-threshold distance	1 m or 1 ft	1×10^{-5} essential
ILS DME antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-5} essential
MLS azimuth antenna-runway end, distance	1 m or 1 ft	1×10^{-3} routine
MLS elevation antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-3} routine
MLS DME/P antenna-threshold, distance along centre line	1 m or 1 ft	1×10^{-5} essential

APPENDIX 8. TERRAIN AND OBSTACLE DATA REQUIREMENTS

(see Chapter 10)

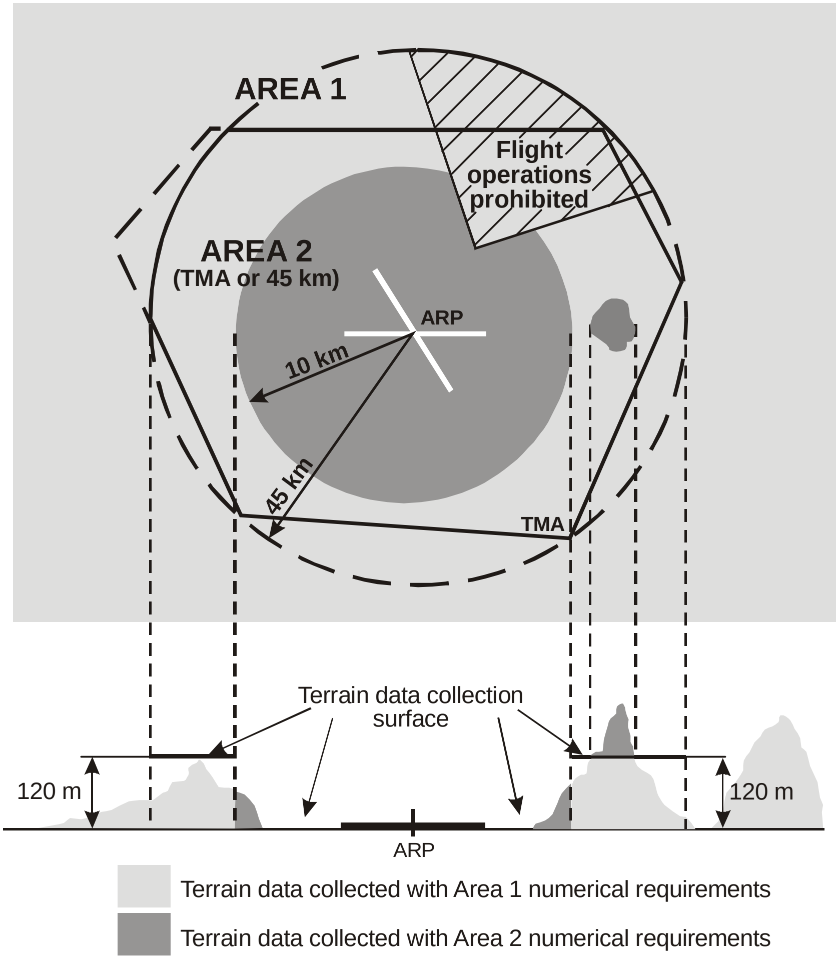

Figure A8-1. Terrain data collection surfaces — Area 1 and Area 2

1. Within the area covered by a 10-km radius from the ARP, terrain data shall be collected and recorded in accordance with the Area 2 numerical requirements.

2. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that penetrates the horizontal plane 120 m above the lowest runway elevation shall be collected and recorded in accordance with the Area 2 numerical requirements.

3. In the area between 10 km and the TMA boundary or 45-km radius (whichever is smaller), data on terrain that does not penetrate the horizontal plane 120 m above the lowest runway elevation shall be collected and recorded in accordance with the Area 1 numerical requirements.

4. In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, terrain data shall only be collected and recorded in accordance with the Area 1 numerical requirements.

Note.— Terrain data numerical requirements for Areas 1 and 2 are specified in Table A8-1.

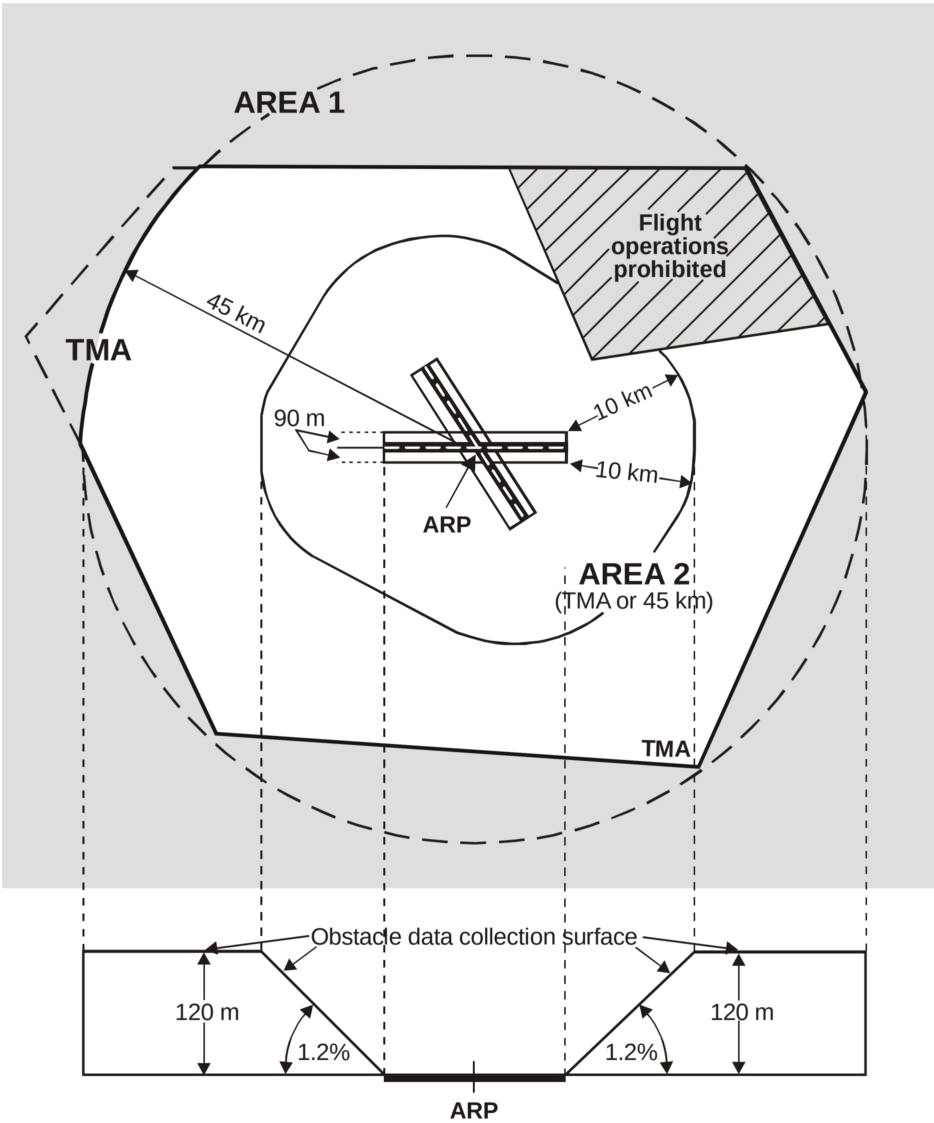

Figure A8-2. Obstacle data collection surfaces — Area 1 and Area 2

1. Obstacle data shall be collected and recorded in accordance with the Area 2 numerical requirements specified in Table A8-2:

   a) any obstacle that penetrates the conical surface whose origin is at the edges of the 180-m wide rectangular area and at the nearest runway elevation measured along the runway centre line, extending at 1.2 per cent slope until it reaches 120 m above the lowest runway elevation of all operational runways at the aerodrome (1.2 per cent slope reaches 120 m at 10 km); in the remainder of Area 2 (between 10 km and the TMA boundary or 45-km radius, whichever is smaller), the horizontal surface 120 m above the lowest runway elevation; and

   b) in those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacle data shall be collected and recorded in accordance with the Area 1 requirements.

2. Data on every obstacle within Area 1 whose height above the ground is 100 m or higher shall be collected and recorded in the database in accordance with the Area 1 numerical requirements specified in Table A8-2.

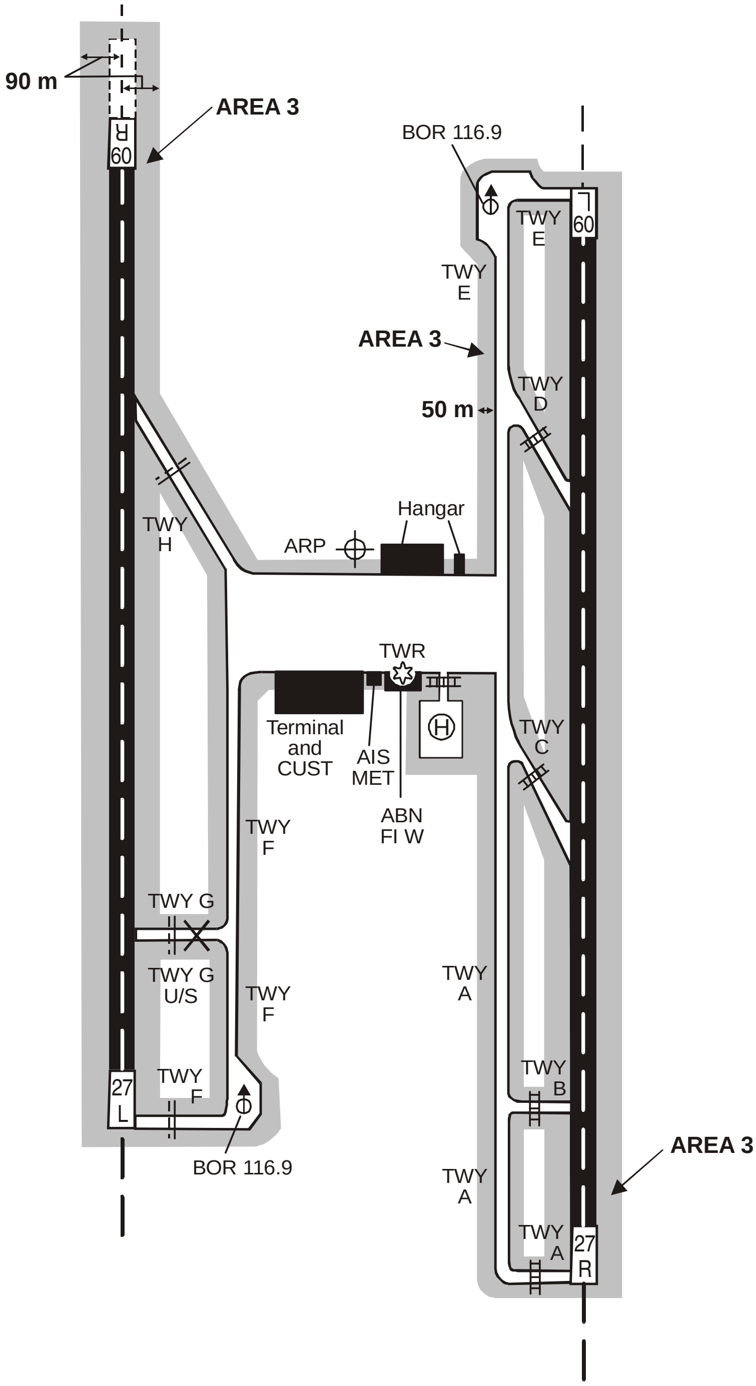

Figure A8-3. Terrain and obstacle data collection surface — Area 3

1. Data on terrain and obstacles that extend more than a half-metre (0.5 m) above the horizontal plane passing through the nearest point on the aerodrome/heliport movement area shall be collected and recorded.

2. Terrain and obstacle data in Area 3 shall be collected and recorded in accordance with numerical requirements specified in Table A8-1 and Table A8-2, respectively.

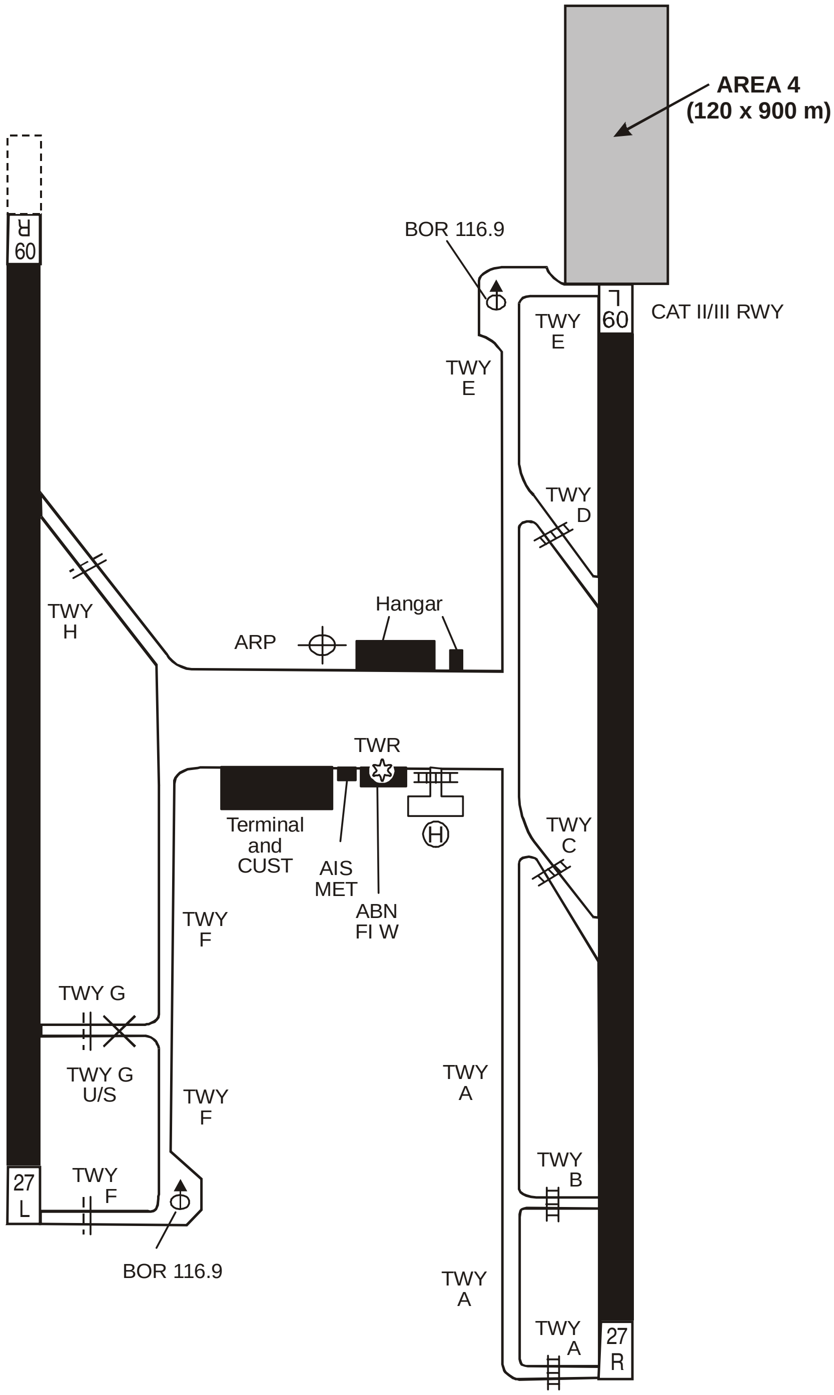

Figure A8-4. Terrain data collection surface — Area 4

Only terrain data shall be collected and recorded in Area 4 in accordance with the numerical requirements specified in Table A8-1.

Table A8-1. Terrain data numerical requirements

	Area 1	Area 2	Area 3	Area 4
Post spacing	3 arc seconds (approx. 90 m)	1 arc second (approx. 30 m)	0.6 arc seconds (approx. 20 m)	0.3 arc seconds (approx. 9 m)
Vertical accuracy	30 m	3 m	0.5 m	1 m
Vertical resolution	1 m	0.1 m	0.01 m	0.1 m
Horizontal accuracy	50 m	5 m	0.5 m	2.5 m
Confidence level (1σ)	90%	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}	essential 1×10^{-5}
Maintenance period	as required	as required	as required	as required

Table A8-2. Obstacle data numerical requirements

	Area 1	Area 2	Area 3
Vertical accuracy	30 m	3 m	0.5 m
Vertical resolution	1 m	0.1 m	0.01 m
Horizontal accuracy	50 m	5 m	0.5 m
Confidence level (1σ)	90%	90%	90%
Data classification Integrity level	routine 1×10^{-3}	essential 1×10^{-5}	essential 1×10^{-5}
Maintenance period	as required	as required	as required

Table A8-3. Terrain attributes

Terrain attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Acquisition method	Mandatory
Post spacing	Mandatory
Horizontal reference system	Mandatory
Horizontal resolution	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Elevation	Mandatory
Elevation reference	Mandatory
Vertical reference system	Mandatory
Vertical resolution	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Surface type	Mandatory
Recorded surface	Mandatory
Penetration level	Optional
Known variations	Optional
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory

Table A8-4. Obstacle attributes

Obstacle attribute	Mandatory/Optional
Area of coverage	Mandatory
Data originator identifier	Mandatory
Obstacle identifier	Mandatory
Horizontal accuracy	Mandatory
Horizontal confidence level	Mandatory
Horizontal position	Mandatory
Horizontal resolution	Mandatory
Horizontal extent	Mandatory
Horizontal reference system	Mandatory
Elevation	Mandatory
Vertical accuracy	Mandatory
Vertical confidence level	Mandatory
Elevation reference	Mandatory
Vertical resolution	Mandatory
Vertical reference system	Mandatory
Obstacle type	Mandatory
Geometry type	Mandatory
Integrity	Mandatory
Date and time stamp	Mandatory
Unit of measurement used	Mandatory
Operations	Optional
Effectivity	Optional

— END —

International Standards and
Recommended Practices

Annex 16
to the Convention on
International Civil Aviation

Environmental Protection

Volume I
Aircraft Noise

This edition incorporates all amendments adopted by the Council prior to 24 February 2005 and supersedes, on 24 November 2005, all previous editions of Annex 16, Volume I.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Fourth Edition
July 2005

International Civil Aviation Organization

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TRANSMITTAL NOTE

NEW EDITIONS OF ANNEXES TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

It has come to our attention that when a new edition of an Annex is published, users have been discarding, along with the previous edition of the Annex, the **Supplement** to the previous edition. Please note that the Supplement to the previous edition should be retained until a new Supplement is issued.

International Standards and Recommended Practices

Annex 16
to the Convention on International Civil Aviation

Environmental Protection

Volume I
Aircraft Noise

This edition incorporates all amendments adopted by the Council prior to 24 February 2005 and supersedes, on 24 November 2005, all previous editions of Annex 16, Volume I.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Fourth Edition
July 2005

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-8	Incorporated in this Edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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Historical background

Standards and Recommended Practices for Aircraft Noise were first adopted by the Council on 2 April 1971 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago, 1944) and designated as Annex 16 to the Convention. The Annex was developed in the following manner:

The Sixteenth Session of the Assembly, Buenos Aires, September 1968, adopted the following Resolution:

A16-3: *Aircraft Noise in the Vicinity of Airports*

Whereas the problem of aircraft noise is so serious in the vicinity of many of the world's airports that public reaction is mounting to a degree that gives cause for great concern and requires urgent solution;

Whereas the noise that concerns the public and civil aviation today is being caused by increase in traffic of existing aircraft;

Whereas the introduction of future aircraft types could increase and aggravate this noise unless action is taken to alleviate the situation;

Whereas the Fifth Air Navigation Conference of ICAO held in Montreal in November 1967 made certain recommendations, based on the principal conclusions of the International Conference on the Reduction of Noise and Disturbance Caused by Civil Aircraft ("The London Noise Conference") held in London in November 1966, with the object of reaching international solutions to the problem through the machinery of ICAO; and

Whereas the Assembly has noted the action being taken by the Council, in consultation with States and the appropriate international organizations, to give effect to the recommendations of the Fifth Air Navigation Conference, as reported to the Assembly by the Secretary General;

THE ASSEMBLY RESOLVES to instruct the Council:

1) to call an international conference within the machinery of ICAO as soon as practicable, bearing in mind the need for adequate preparation, to consider the problem of aircraft noise in the vicinity of airports;

2) to establish international specifications and associated guidance material relating to aircraft noise;

3) to include, in appropriate existing Annexes and other relevant ICAO documents and possibly in a separate Annex on noise, such material as the description and methods of measurement of aircraft noise and suitable limitations on the noise caused by aircraft that is of concern to communities in the vicinity of airports; and

4) to publish such material on a progressive basis, commencing at the earliest possible time.

In response to Assembly Resolution A16-3, a Special Meeting on Aircraft Noise in the Vicinity of Aerodromes was convened in Montreal (November–December 1969) to examine the following aspects related to the problems of aircraft noise:

a) procedures for describing and measuring aircraft noise;

b) human tolerance to aircraft noise;

c) aircraft noise certification;

d) criteria for establishment of aircraft noise abatement operating procedures;

e) land-use control; and

f) ground run-up noise abatement procedures.

Based on the recommendations of the Special Meeting on Aircraft Noise in the Vicinity of Aerodromes, draft International Standards and Recommended Practices for Aircraft Noise were developed and, after amendment following the usual consultation with the Contracting States of the Organization, were adopted by the Council to form the text of this Annex.

With the development of Standards and Recommended Practices dealing with the control of aircraft engine emissions, it was felt that all provisions relating to environmental aspects of aviation should be included into a single document. Accordingly, as part of the Resolution adopting Amendment 5, it was agreed that Annex 16 should be retitled as "Environmental Protection" and Volume I of the Annex should contain the existing provisions (Third Edition) of Annex 16 — *Aircraft Noise* as amended by Amendment 5 and Volume II should contain the provisions related to aircraft engine emissions.

Several Assembly and Council sessions have addressed the issue of aircraft noise since the Special Meeting on Aircraft Noise in the Vicinity of Aerodromes, focusing on the various aspects related to the problems of aircraft noise identified at the Special Meeting. The Thirty-third Session of the Assembly, Montreal, 25 September to 5 October 2001, in Resolution A33-7, issued a Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection to, in significant part, "incorporate new ICAO policies and guidance material regarding aircraft noise" and to reflect the concept of a "balanced approach" to noise management, which had developed over time.

As defined in Appendix C to Assembly Resolution A33-7, the balanced approach to noise management consists of identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements, namely reduction at source, land-use planning and management, noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost-effective manner.

In addition to providing additional detail on the balanced approach concept, Assembly Resolution A33-7 urges States to adopt a balanced approach to noise management.

The principal elements of the balanced approach are addressed in various places in Annex 16, Volume I, and in guidance adopted by ICAO. Reduction of noise at source through aircraft noise certification is addressed in Annex 16, Volume I, Part II. References to the other elements of the balanced approach are contained in Part V.

Table A shows the origin of amendments to the Annex over time together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Applicability

Part I of Volume I of Annex 16 contains definitions and Part II contains Standards, Recommended Practices and guidelines for noise certification applicable to the classification of aircraft specified in individual chapters of that part, where such aircraft are engaged in international air navigation.

Note.— Chapters 2 and 3 exclude jet aeroplanes having short take-off and landing (STOL) capabilities which, pending the development by ICAO of a suitable definition, are described for the purpose of this Annex as those requiring a runway (with no stopway or clearway) of 610 m or less at the maximum certificated mass for airworthiness.

Parts III, IV and V of Volume I of Annex 16 contain Recommended Practices and guidance material for use by States with a view to promoting uniformity in measurement of noise for monitoring purposes, assessing noise around airports, and regarding the balanced approach to noise management.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Use of the Annex text in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of international air navigation. Wherever possible, the provisions of this Annex have been written in such a way as to facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Provisions* governing the applicability of the Standards and Recommended Practices.

d) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light italics, the status being indicated by the prefix *Note*.

It is to be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb "shall" while Recommended Practices employ the operative verb "should".

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in Annex 5 to the Convention on International Civil Aviation. Where Annex 5 permits the use of non-SI alternative units these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Coordination with ISO activity

In the provisions related to certification procedures, extensive use is made of the related specifications developed by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). In most cases these specifications have been incorporated by direct reference. However, in some cases it has been found necessary to modify the specifications to suit ICAO requirements and in such cases the modified material is included in full in this document. The assistance provided by ISO in the development of detailed specifications is recognized.

Table A. Amendments to Annex 16

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	Special Meeting on Aircraft Noise in the Vicinity of Aerodromes (1969)		2 April 1971 2 August 1971 6 January 1972
1	First Meeting of the Committee on Aircraft Noise	Noise certification of future production and derived versions of subsonic jet aeroplanes and updating of terminology used to describe aircraft weight.	6 December 1972 6 April 1973 16 August 1973
2	Third Meeting of the Committee on Aircraft Noise	Noise certification of light propeller-driven aeroplanes and subsonic jet aeroplanes of 5 700 kg and less maximum certificated take-off weight and guidance on discharge of functions by States in the cases of lease, charter and interchange of aircraft.	3 April 1974 3 August 1974 27 February 1975
3 (2nd Edition)	Fourth Meeting of the Committee on Aircraft Noise	Noise certification standards for future subsonic jet aeroplanes and propeller-driven aeroplanes, other than STOL aeroplanes, and guidelines for noise certification of future supersonic aeroplanes, propeller-driven STOL aeroplanes and installed APUs and associated aircraft systems when operating on the ground.	21 June 1976 21 October 1976 6 October 1977
4 (3rd Edition)	Fifth Meeting of the Committee on Aircraft Noise	Introduction of a new parameter viz, number of engines in the noise certification standards for subsonic jet aeroplanes, improvements in detailed test procedures to ensure that the same level of technology is applied to all types of aircraft, and editorial changes to simplify the language and eliminate inconsistencies.	6 March 1978 6 July 1978 10 August 1978
5 (Annex 16, Volume I — 1st Edition)	Sixth Meeting of the Committee on Aircraft Noise	1. Annex retitled *Environmental Protection* and to be issued in two volumes as follows: Volume I — *Aircraft Noise* (incorporating provisions in the third edition of Annex 16 as amended by Amendment 5) and Volume II — *Aircraft Engine Emissions*. 2. Introduction in Volume I of noise certification Standards for helicopters and for future production of existing SST aeroplanes, updating of guidelines for noise certification of installed APU and associated aircraft systems and editorial amendments including changes to units of measurement to bring the Annex in line with Annex 5 provisions.	11 May 1981 11 September 1981 26 November 1981
1	Third Meeting of the Operations Panel	Introduction of SARPs for noise abatement operating procedures and transfer of detailed procedures to PANS-OPS, Volume I.	30 March 1983 29 July 1983 24 November 1983
2	Seventh Meeting of the Committee on Aircraft Noise	a) improvements in the noise certification procedures; and b) relaxation of maximum noise limits for helicopters.	6 March 1985 29 July 1985 21 November 1985
3 (Annex 16, Volume I — 2nd Edition)	First Meeting of the Committee on Aviation Environmental Protection; study by the Air Navigation Commission following a recommendation of the Obstacle Clearance Panel	a) further improvements in the noise certification procedures; b) introduction of a new Chapter 10 for propeller-driven aeroplanes not exceeding 9 000 kg maximum certificated take-off mass; and c) editorial changes in Part V cross-referencing the relevant provisions in the PANS-OPS (Doc 8168).	4 March 1988 31 July 1988 17 November 1988

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
4 (3rd Edition)	Second Meeting of the Committee on Aviation Environmental Protection; Seventh Meeting of the Committee on Aircraft Noise; and Fifth Meeting of the Operations Panel	a) improvements in the noise certification procedures; b) introduction of a new Chapter 11 for light helicopters; c) expansion of Appendix 2 to include helicopters and replacement of Appendix 4; and d) introduction of guidance on applicability.	24 March 1993 26 July 1993 11 November 1993
5	Third Meeting of the Committee on Aviation Environmental Protection	a) simplification and clarification of the noise certification schemes in Chapter 3 for propeller-driven aircraft; b) harmonization of the helicopter Standards in Chapters 8 and 11 with national codes; and c) alignment of the take-off mass in Chapter 10 with airworthiness limits.	19 March 1997 21 July 1997 6 November 1997
6	Fourth Meeting of the Committee on Aviation Environmental Protection	a) introduction of a new definition for human performance in Chapter 1; b) increase in stringency of Chapter 10 noise requirements for light single-engined propeller-driven aeroplanes; c) changes of a detailed technical nature that are intended to improve the consistency of Chapters 3, 8 and 11 as well as Appendices 2 and 4; d) new provisions concerning Human Factors in Part V; and e) changes that have arisen from the ongoing harmonization of the European Joint Aviation Requirements (JARs) and the United States Federal Aviation Regulations (FARs).	26 February 1999 19 July 1999 4 November 1999
7	Fifth Meeting of the Committee on Aviation Environmental Protection; Annex 6, Amendment 26	a) increase in stringency of the turbojet and heavy propeller-driven aeroplane noise requirements (new Chapter 4 — existing Chapter 4 becomes Chapter 12); b) new provision relating to the recertification of Chapter 3 aeroplanes; c) increase in stringency of the helicopter noise requirements of Chapters 8 and 11; d) change to clarify or redefine existing certification procedures, align with harmonized JAR/FAR requirements, introduce new provisions relating to digital instrumentation; e) introduction of guidance material on tilt-rotor aircraft noise certification; and f) inclusion of an English language version of the noise certification documents.	29 June 2001 29 October 2001 21 March 2002

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
8 (4th Edition)	Sixth Meeting of the Committee on Aviation Environmental Protection	a) ambient noise correction procedure including definitions for "background noise", "ambient noise" and "broadband noise"; b) allowable wind speed limits during testing; c) applicability language clarification including temporary changes in type design and provisions to allow the recertification of Chapter 5 aeroplanes to Chapter 4; d) rotorcraft-related technical issues; and e) new Attachments G and H containing guidelines for the administration of noise certification documentation and guidelines for obtaining helicopter noise data for land-use planning purposes, respectively.	23 February 2005 11 July 2005 24 November 2005

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I. DEFINITIONS

Aeroplane. A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Associated aircraft systems. Those aircraft systems drawing electrical/pneumatic power from an auxiliary power unit during ground operations.

Auxiliary power-unit (APU). A self-contained power-unit on an aircraft providing electrical/pneumatic power to aircraft systems during ground operations.

Bypass ratio. The ratio of the air mass flow through the bypass ducts of a gas turbine engine to the air mass flow through the combustion chambers calculated at maximum thrust when the engine is stationary in an international standard atmosphere at sea level.

Derived version of a helicopter. A helicopter which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.

Note 1.— In applying the Standards of this Annex, a helicopter that is based on an existing prototype but which is considered by the certificating authority to be a new type design for airworthiness purposes shall nevertheless be considered as a derived version if the noise source characteristics are judged by the certificating authority to be the same as the prototype.

Note 2.— "Adversely" refers to an increase of more than 0.3 dB in any one of the noise certification levels.

Derived version of an aeroplane. An aeroplane which, from the point of view of airworthiness, is similar to the noise certificated prototype but incorporates changes in type design which may affect its noise characteristics adversely.

Note 1.— Where the certificating authority finds that the proposed change in design, configuration, power or mass is so extensive that a substantially new investigation of compliance with the applicable airworthiness regulations is required, the aeroplane should be considered to be a new type design rather than a derived version.

Note 2.— "Adversely" refers to an increase of more than 0.10 dB in any one of the noise certification levels unless the cumulative effects of changes in type design are tracked by an approved procedure in which case "adversely" refers to a cumulative increase in the noise level in any one of the noise certification levels of more than 0.30 dB or the margin of compliance, whichever is smaller.

External equipment (helicopter). Any instrument, mechanism, part, apparatus, appurtenance, or accessory that is attached to or extends from the helicopter exterior but is not used nor is intended to be used for operating or controlling a helicopter in flight and is not part of an airframe or engine.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Recertification. Certification of an aircraft with or without a revision to its certification noise levels, to a Standard different to that to which it was originally certificated.

Self-sustaining powered sailplane. A powered aeroplane with available engine power which allows it to maintain level flight but not to take off under its own power.

Subsonic aeroplane. An aeroplane incapable of sustaining level flight at speeds exceeding flight Mach number of 1.

PART II. AIRCRAFT NOISE CERTIFICATION

CHAPTER 1. ADMINISTRATION

1.1 The provisions of 1.2 to 1.6 shall apply to all aircraft included in the classifications defined for noise certification purposes in Chapters 2, 3, 4, 5, 6, 8, 10, 11 and 12 of this part where such aircraft are engaged in international air navigation.

1.2 Noise certification shall be granted or validated by the State of Registry of an aircraft on the basis of satisfactory evidence that the aircraft complies with requirements that are at least equal to the applicable Standards specified in this Annex.

1.3 If noise recertification is requested, it shall be granted or validated by the State of Registry of an aircraft on the basis of satisfactory evidence that the aircraft complies with requirements that are at least equal to the applicable Standards specified in this Annex. The date used by a certificating authority to determine the recertification basis shall be the date of acceptance of the first application for recertification.

1.4 The documents attesting noise certification shall be approved by the State of Registry and shall be required by that State to be carried on the aircraft.

Note.— See Annex 6, Part I, 6.13, concerning the translation into English of documents attesting noise certification.

1.5 The documents attesting noise certification for an aircraft shall provide at least the following information:

Item 1. Name of State.

Item 2. Title of the noise document.

Item 3. Number of the document.

Item 4. Nationality or common mark and registration marks.

Item 5. Manufacturer and manufacturer's designation of aircraft.

Item 6. Aircraft serial number.

Item 7. Engine manufacturer, type and model.

Item 8. Propeller type and model for propeller-driven aeroplanes.

Item 9. Maximum take-off mass in kilograms.

Item 10. Maximum landing mass, in kilograms, for certificates issued under Chapters 2, 3, 4, 5 and 12 of this Annex.

Item 11. The chapter and section of this Annex according to which the aircraft was certificated.

Item 12. Additional modifications incorporated for the purpose of compliance with the applicable noise certification Standards.

Item 13. The lateral/full-power noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5 and 12 of this Annex.

Item 14. The approach noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5, 8 and 12 of this Annex.

Item 15. The flyover noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5 and 12 of this Annex.

Item 16. The overflight noise level in the corresponding unit for documents issued under Chapters 6, 8 and 11 of this Annex.

Item 17. The take-off noise level in the corresponding unit for documents issued under Chapters 8 and 10 of this Annex.

Item 18. Statement of compliance, including a reference to Annex 16, Volume I.

Item 19. Date of issuance of the noise certification document.

Item 20. Signature of the officer issuing it.

1.6 Item headings on the noise certification documents shall be uniformly numbered in Arabic numerals, as indicated in 1.5, so that on any noise certification document the number will, under any arrangement, refer to the same item heading, except where the information in Items 1 through 6 and Items 18 through 20 is given in the certificate of airworthiness, in which case the numbering system of the certificate of airworthiness according to Annex 8 shall prevail.

1.7 An administrative system for implementation of noise certification documentation shall be developed by the State of Registry.

Note.— See Attachment G for guidance on the format and structure of noise certification documentation.

1.8 Contracting States shall recognize as valid a noise certification granted by another Contracting State provided that the requirements under which such certification was granted are at least equal to the applicable Standards specified in this Annex.

1.9 A Contracting State shall suspend or revoke the noise certification of an aircraft on its register if the aircraft ceases to comply with the applicable noise Standards. The State of Registry shall not remove the suspension of a noise certification or grant a new noise certification unless the aircraft is found, on reassessment, to comply with the applicable noise Standards.

1.10 Unless otherwise specified in this volume of the Annex, the date to be used by Contracting States in determining the applicability of the Standards in this Annex shall be the date of application for a type certificate, or the date of application under an equivalent prescribed procedure by the certificating authority. The application shall be effective for a duration equal to the period applied in the designation of the airworthiness regulations appropriate to the aircraft type, except in special cases where the certificating authority accepts an extension of this period.

1.11 When this period of effectivity is exceeded, the date to be used in determining the applicability of the Standards in this Annex shall be the date of issue of the type certificate, or the date of issue of approval under an equivalent prescribed procedure, less the duration of effectivity.

CHAPTER 2. SUBSONIC JET AEROPLANES — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 6 OCTOBER 1977

2.1 Applicability

Note.— See also Chapter 1, 1.9.

2.1.1 The Standards of this chapter shall be applicable to all subsonic jet aeroplanes for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 6 October 1977, except those aeroplanes:

a) requiring a runway length[1] of 610 m or less at maximum certificated mass for airworthiness; or

b) powered by engines with a bypass ratio of 2 or more and for which a certificate of airworthiness for the individual aeroplane was first issued before 1 March 1972; or

c) powered by engines with a bypass ratio of less than 2 and for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 1 January 1969, and for which a certificate of airworthiness for the individual aeroplane was first issued before 1 January 1976.

2.1.2 The Standards of this chapter shall also be applicable to derived versions of all aeroplanes covered by 2.1.1 for which the application for certification of a change in type design was accepted, or another equivalent procedure was carried out by the certificating authority, on or after 26 November 1981.

2.1.3 Notwithstanding 2.1.1 and 2.1.2, it may be recognized by a Contracting State that the following situations for jet aeroplanes and propeller-driven heavy aeroplanes on its registry do not require demonstration of compliance with the provisions of the Standards of Annex 16, Volume I:

a) gear down flight with one or more retractable landing gear down during the entire flight;

b) spare engine and nacelle carriage external to the skin of the aeroplane (and return of the pylon or other external mount); and

c) time-limited engine and/or nacelle changes, where the change in type design specifies that the aeroplane may not be operated for a period of more than 90 days unless compliance with the provisions of Annex 16, Volume I, is shown for that change in type design. This applies only to changes resulting from a required maintenance action.

2.2 Noise evaluation measure

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 1.

2.3 Noise measurement points

An aeroplane, when tested in accordance with the flight test procedures of 2.6, shall not exceed the noise levels specified in 2.4 at the following points:

a) *lateral noise measurement point:* the point on a line parallel to and 650 m from the runway centre line, or extended runway centre line, where the noise level is a maximum during take-off;

b) *flyover noise measurement point:* the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll; and

c) *approach noise measurement point:* the point on the ground, on the extended centre line of the runway, 120 m (394 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold. On level ground this corresponds to a position 2 000 m from the threshold.

2.4 Maximum noise levels

2.4.1 The maximum noise levels of those aeroplanes covered by 2.1.1 above, when determined in accordance with the noise evaluation method of Appendix 1, shall not exceed the following:

a) *at lateral and approach noise measurement points:* 108 EPNdB for aeroplanes with maximum certificated take-off mass of 272 000 kg or over, decreasing linearly

1. With no stopway or clearway.

with the logarithm of the mass at the rate of 2 EPNdB per halving of the mass down to 102 EPNdB at 34 000 kg, after which the limit remains constant;

b) *at flyover noise measurement point:* 108 EPNdB for aeroplanes with maximum certificated take-off mass of 272 000 kg or over, decreasing linearly with the logarithm of the mass at the rate of 5 EPNdB per halving of the mass down to 93 EPNdB at 34 000 kg, after which the limit remains constant.

Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.

2.4.2 The maximum noise levels of those aeroplanes covered by 2.1.2, when determined in accordance with the noise evaluation method of Appendix 1, shall not exceed the following:

2.4.2.1 *At lateral noise measurement point*

106 EPNdB for aeroplanes with maximum certificated take-off mass of 400 000 kg or over, decreasing linearly with the logarithm of the mass down to 97 EPNdB at 35 000 kg, after which the limit remains constant.

2.4.2.2 *At flyover noise measurement point*

a) *Aeroplanes with two engines or less*

104 EPNdB for aeroplanes with maximum certificated take-off mass of 325 000 kg or over, decreasing linearly with the logarithm of the mass at the rate of 4 EPNdB per halving of mass down to 93 EPNdB, after which the limit remains constant.

b) *Aeroplanes with three engines*

As a) but with 107 EPNdB for aeroplanes with maximum certificated take-off mass of 325 000 kg or over

or

as defined by 2.4.1 b), whichever is the lower.

c) *Aeroplanes with four engines or more*

As a) but with 108 EPNdB for aeroplanes with maximum certificated take-off mass of 325 000 kg or over

or

as defined by 2.4.1 b), whichever is the lower.

2.4.2.3 *At approach noise measurement point*

108 EPNdB for aeroplanes with maximum certificated take-off mass of 280 000 kg or over, decreasing linearly with the logarithm of the mass down to 101 EPNdB at 35 000 kg, after which the limit remains constant.

Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.

2.5 Trade-offs

If the maximum noise levels are exceeded at one or two measurement points:

a) the sum of excesses shall not be greater than 4 EPNdB, except that in respect of four-engined aeroplanes powered by engines with a bypass ratio of 2 or more and for which the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 1 December 1969, the sum of any excesses shall not be greater than 5 EPNdB;

b) any excess at any single point shall not be greater than 3 EPNdB; and

c) any excesses shall be offset by corresponding reductions at the other point or points.

2.6 Test procedures

2.6.1 Take-off test procedure

2.6.1.1 Average take-off thrust[2] shall be used from the start of take-off to the point at which a height of at least 210 m (690 ft) above the runway is reached and the thrust thereafter shall not be reduced below that thrust which will maintain a climb gradient of at least 4 per cent.

2.6.1.2 A speed of at least V_2 + 19 km/h (V_2 + 10 kt) shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test.

2.6.1.3 A constant take-off configuration selected by the applicant shall be maintained throughout the take-off noise certification demonstration test except that the landing gear may be retracted.

2.6.2 Approach test procedure

2.6.2.1 The aeroplane shall be stabilized and following a 3° ± 0.5° glide path.

2.6.2.2 The approach shall be made at a stabilized airspeed of not less than 1.3 V_S + 19 km/h (1.3 V_S + 10 kt) with thrust stabilized during approach and over the measuring point and continued to a normal touchdown.

2. Take-off thrust representative of the mean characteristics of the production engine.

2.6.2.3 The configuration of the aeroplane shall be with maximum allowable landing flap setting.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

CHAPTER 3. 1.— SUBSONIC JET AEROPLANES — Application for Certificate of Airworthiness for the Prototype accepted on or after 6 October 1977 and before 1 January 2006

2.— PROPELLER-DRIVEN AEROPLANES OVER 5 700 kg — Application for Certificate of Airworthiness for the Prototype accepted on or after 1 January 1985 and before 17 November 1988

3.— PROPELLER-DRIVEN AEROPLANES OVER 8 618 kg — Application for Certificate of Airworthiness for the Prototype accepted on or after 17 November 1988 and before 1 January 2006

3.1 Applicability

Note 1.— See also Chapter 1, 1.9.

Note 2.— See Attachment E for guidance on interpretation of these applicability provisions.

3.1.1 The Standards of this chapter shall be applicable to:

a) all subsonic jet aeroplanes, including their derived versions, other than aeroplanes which require a runway[1] length of 610 m or less at maximum certificated mass for airworthiness, in respect of which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977 and before 1 January 2006;

b) all propeller-driven aeroplanes, including their derived versions, of over 5 700 kg maximum certificated take-off mass (except those described in Chapter 6, 6.1), for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 1985 and before 17 November 1988, except where the Standards of Chapter 10 apply; and

c) all propeller-driven aeroplanes, including their derived versions, of over 8 618 kg maximum certificated take-off mass, for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 17 November 1988 and before 1 January 2006.

3.1.2 Notwithstanding 3.1.1, it may be recognized by a Contracting State that the following situations for jet aeroplanes and propeller-driven heavy aeroplanes on its registry do not require demonstration of compliance with the provisions of the Standards of Annex 16, Volume I:

a) gear down flight with one or more retractable landing gear down during the entire flight;

b) spare engine and nacelle carriage external to the skin of the aeroplane (and return of the pylon or other external mount); and

c) time-limited engine and/or nacelle changes, where the change in type design specifies that the aeroplane may not be operated for a period of more than 90 days unless compliance with the provisions of Annex 16, Volume I, is shown for that change in type design. This applies only to changes resulting from a required maintenance action.

3.2 Noise measurements

3.2.1 Noise evaluation measure

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2.

1. With no stopway or clearway.

3.3 Noise measurement points

3.3.1 Reference noise measurement points

An aeroplane, when tested in accordance with these Standards, shall not exceed the noise levels specified in 3.4 at the following points:

a) *lateral full-power reference noise measurement point*

1) for jet-powered aeroplanes: the point on a line parallel to and 450 m from the runway centre line, where the noise level is a maximum during take-off;

2) for propeller-driven aeroplanes: the point on the extended centre line of the runway 650 m vertically below the climb-out flight path at full take-off power, as defined in 3.6.2. Until 19 March 2002, the requirement for lateral noise in 3.3.1 a) 1) shall alternatively be permitted;

Note.— For aeroplanes specified in 3.1.1 b) and for aeroplanes specified in 3.1.1 c) for which the application for a certificate of airworthiness for the prototype was accepted before 19 March 2002, the lateral noise requirement specified in 3.3.1 a) 1) is permitted as an alternative.

b) *flyover reference noise measurement point:* the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll;

c) *approach reference noise measurement point:* the point on the ground, on the extended centre line of the runway, 2 000 m from the threshold. On level ground this corresponds to a position 120 m (394 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold.

3.3.2 Test noise measurement points

3.3.2.1 If the test noise measurement points are not located at the reference noise measurement points, any corrections for the difference in position shall be made in the same manner as the corrections for the differences between test and reference flight paths.

3.3.2.2 Sufficient lateral test noise measurement points shall be used to demonstrate to the certificating authority that the maximum noise level on the appropriate lateral line has been clearly determined. For jet-powered aeroplanes simultaneous measurements shall be made at one test noise measurement point at a symmetrical position on the other side of the runway. In the case of propeller-driven aeroplanes, because of their inherent asymmetry in lateral noise, simultaneous measurements shall be made at each and every test noise measurement point at a symmetrical position (within ±10 m parallel with the axis of the runway) on the opposite side of the runway.

3.4 Maximum noise levels

3.4.1 The maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

3.4.1.1 *At the lateral full-power reference noise measurement point*

103 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 400 000 kg and over and decreasing linearly with the logarithm of the mass down to 94 EPNdB at 35 000 kg, after which the limit remains constant.

3.4.1.2 *At flyover reference noise measurement point*

a) *Aeroplanes with two engines or less*

101 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 385 000 kg and over and decreasing linearly with the logarithm of the aeroplane mass at the rate of 4 EPNdB per halving of mass down to 89 EPNdB, after which the limit is constant.

b) *Aeroplanes with three engines*

As a) but with 104 EPNdB for aeroplanes with maximum certificated take-off mass of 385 000 kg and over.

c) *Aeroplanes with four engines or more*

As a) but with 106 EPNdB for aeroplanes with maximum certificated take-off mass of 385 000 kg and over.

3.4.1.3 *At approach reference noise measurement point*

105 EPNdB for aeroplanes with maximum certificated take-off mass, at which the noise certification is requested, of 280 000 kg or over, and decreasing linearly with the logarithm of the mass down to 98 EPNdB at 35 000 kg, after which the limit remains constant.

Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.

3.5 Trade-offs

If the maximum noise levels are exceeded at one or two measurement points:

a) the sum of excesses shall not be greater than 3 EPNdB;

b) any excess at any single point shall not be greater than 2 EPNdB; and

c) any excesses shall be offset by corresponding reductions at the other point or points.

3.6 Noise certification reference procedures

3.6.1 General conditions

3.6.1.1 The reference procedures shall comply with the appropriate airworthiness requirements.

3.6.1.2 The calculations of reference procedures and flight paths shall be approved by the certificating authority.

3.6.1.3 Except in conditions specified in 3.6.1.4, the take-off and approach reference procedures shall be those defined in 3.6.2 and 3.6.3 respectively.

3.6.1.4 When it is shown by the applicant that the design characteristics of the aeroplane would prevent flight being conducted in accordance with 3.6.2 and 3.6.3, the reference procedures shall:

a) depart from the reference procedures defined in 3.6.2 and 3.6.3 only to the extent demanded by those design characteristics which make compliance with the procedures impossible; and

b) be approved by the certificating authority.

3.6.1.5 The reference procedures shall be calculated under the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C, i.e. ISA + 10°C;

c) relative humidity of 70 per cent;

d) zero wind; and

e) for the purpose of defining the reference take-off profiles for both take-off and lateral noise measurements, the runway gradient is zero.

Note.— The reference atmosphere in terms of temperature and relative humidity is homogeneous when used for the calculation of atmospheric absorption coefficients.

3.6.2 Take-off reference procedure

Take-off reference flight path shall be calculated as follows:

a) average engine take-off thrust or power shall be used from the start of take-off to the point where at least the following height above runway level is reached:

1) aeroplanes with two engines or less — 300 m (984 ft);

2) aeroplanes with three engines — 260 m (853 ft);

3) aeroplanes with four engines or more — 210 m (689 ft);

b) upon reaching the height specified in a) above, the thrust or power shall not be reduced below that required to maintain:

1) a climb gradient of 4 per cent; or

2) in the case of multi-engined aeroplanes, level flight with one engine inoperative;

whichever thrust or power is greater;

c) for the purpose of determining the lateral full-power noise level, the reference flight path shall be calculated on the basis of using full take-off power throughout without a thrust or power reduction;

d) the speed shall be the all-engines operating take-off climb speed selected by the applicant for use in normal operation, which shall be at least V_2 + 19 km/h (V_2 + 10 kt) but not greater than V_2 + 37 km/h (V_2 + 20 kt) and which shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test;

e) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure except that the landing gear may be retracted. Configuration shall be interpreted as meaning the conditions of the systems and centre of gravity position and shall include the position of lift augmentation devices used, whether the APU is operating, and whether air bleeds and power off-takes are operating;

f) the mass of the aeroplane at the brake release shall be the maximum take-off mass at which the noise certification is requested; and

g) the average engine shall be defined by the average of all the certification compliant engines used during the aeroplane flight tests up to and during certification when operated to the limitations and procedures given in the flight manual. This will establish a technical standard including the relationship of thrust/power to control parameters (e.g. N_1 or EPR). Noise measurements made during certification tests shall be corrected to this standard.

Note.— Take-off thrust/power used shall be the maximum available for normal operations as scheduled in the performance section of the aeroplane flight manual for the reference atmospheric conditions given in 3.6.1.5.

3.6.3 Approach reference procedure

The approach reference flight path shall be calculated as follows:

a) the aeroplane shall be stabilized and following a 3° glide path;

b) a steady approach speed of V_{REF} + 19 km/h (V_{REF} + 10 kt), with thrust or power stabilized, shall be maintained over the measurement point;

Note.— In airworthiness terms V_{REF} is defined as the "reference landing speed". Under this definition reference landing speed means "the speed of the aeroplane, in a specified landing configuration, at the point where it descends through the landing screen height in the determination of the landing distance for manual landings".

c) the constant approach configuration as used in the airworthiness certification tests, but with the landing gear down, shall be maintained throughout the approach reference procedure;

d) the mass of the aeroplane at the touchdown shall be the maximum landing mass permitted in the approach configuration defined in 3.6.3 c) at which noise certification is requested; and

e) the most critical (that which produces the highest noise level) configuration with normal deployment of aerodynamic control surfaces including lift and drag producing devices, at the mass at which certification is requested shall be used. This configuration includes all those items listed in 5.2.5 of Appendix 2 that will contribute to the noisiest continuous state at the maximum landing mass in normal operation.

3.7 Test procedures

3.7.1 The test procedures shall be acceptable to the airworthiness and noise certificating authority of the State issuing the certificate.

3.7.2 The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Appendix 2.

3.7.3 Acoustic data shall be adjusted by the methods outlined in Appendix 2 to the reference conditions specified in this chapter. Adjustments for speed and thrust shall be made as described in Section 9 of Appendix 2.

3.7.4 If the mass during the test is different from the mass at which the noise certification is requested, the necessary EPNL adjustment shall not exceed 2 EPNdB for take-offs and 1 EPNdB for approaches. Data approved by the certificating authority shall be used to determine the variation of EPNL with mass for both take-off and approach test conditions. Similarly the necessary EPNL adjustment for variations in approach flight path from the reference flight path shall not exceed 2 EPNdB.

3.7.5 For the approach conditions the test procedures shall be accepted if the aeroplane follows a steady glide path angle of 3° ± 0.5°.

3.7.6 If equivalent test procedures different from the reference procedures are used, the test procedures and all methods for adjusting the results to the reference procedures shall be approved by the certificating authority. The amounts of the adjustments shall not exceed 16 EPNdB on take-off and 8 EPNdB on approach, and if the adjustments are more than 8 EPNdB and 4 EPNdB respectively, the resulting numbers shall be more than 2 EPNdB below the noise limits specified in 3.4.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

3.7.7 For take-off, lateral, and approach conditions, the variation in instantaneous indicated airspeed of the aeroplane must be maintained within ±3 per cent of the average airspeed between the 10 dB-down points. This shall be determined by reference to the pilot's airspeed indicator. However, when the instantaneous indicated airspeed varies from the average airspeed over the 10 dB-down points by more than ±5.5 km/h (±3 kt), and this is judged by the certificating authority representative on the flight deck to be due to atmospheric turbulence, then the flight so affected shall be rejected for noise certification purposes.

CHAPTER 4. 1.— SUBSONIC JET AEROPLANES — Application for Certificate of Airworthiness for the Prototype accepted on or after 1 January 2006

2.— PROPELLER-DRIVEN AEROPLANES OVER 8 618 kg — Application for Certificate of Airworthiness for the Prototype accepted on or after 1 January 2006

4.1 Applicability

Note. — See also Chapter 1, 1.9.

4.1.1 The Standards of this chapter shall be applicable to:

a) all subsonic jet aeroplanes, including their derived versions, other than aeroplanes which require a runway[1] length of 610 m or less at maximum certificated mass for airworthiness, in respect of which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 2006;

b) all propeller-driven aeroplanes, including their derived versions, of over 8 618 kg maximum certificated take-off mass, for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 2006; and

c) all subsonic jet aeroplanes and all propeller-driven aeroplanes certificated originally as satisfying Annex 16, Volume 1, Chapter 3 or Chapter 5, for which recertification to Chapter 4 is requested.

Note.— Guidance material on applications for recertification is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

4.1.2 Notwithstanding 4.1.1, it may be recognized by a Contracting State that the following situations for jet aeroplanes and propeller-driven heavy aeroplanes on its registry do not require demonstration of compliance with the provisions of the Standards of Annex 16, Volume I:

a) gear down flight with one or more retractable landing gear down during the entire flight;

b) spare engine and nacelle carriage external to the skin of the aeroplane (and return of the pylon or other external mount); and

c) time-limited engine and/or nacelle changes, where the change in type design specifies that the aeroplane may not be operated for a period of more than 90 days unless compliance with the provisions of Annex 16, Volume I, is shown for that change in type design. This applies only to changes resulting from a required maintenance action.

4.2 Noise measurements

4.2.1 Noise evaluation measure

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2.

4.3 Reference noise measurement points

4.3.1 An aeroplane, when tested in accordance with these Standards, shall not exceed the maximum noise level specified in 4.4 of the noise measured at the points specified in Chapter 3, 3.3.1 a), b) and c).

4.3.2 Test noise measurement points

The provisions of Chapter 3, 3.3.2, relating to test noise measurement points shall apply.

4.4 Maximum noise levels

4.4.1 The maximum permitted noise levels are defined in Chapter 3, 3.4.1.1, 3.4.1.2 and 3.4.1.3, and shall not be exceeded at any of the measurement points.

4.4.1.1 The sum of the differences at all three measurement points between the maximum noise levels and the maximum permitted noise levels specified in Chapter 3, 3.4.1.1, 3.4.1.2 and 3.4.1.3, shall not be less than 10 EPNdB.

1. With no stopway or clearway.

4.4.1.2 The sum of the differences at any two measurement points between the maximum noise levels and the corresponding maximum permitted noise levels specified in Chapter 3, 3.4.1.1, 3.4.1.2 and 3.4.1.3, shall not be less than 2 EPNdB.

4.5 Noise certification reference procedures

The noise certification reference procedures shall be as specified in Chapter 3, 3.6.

4.6 Test procedures

The test procedures shall be as specified in Chapter 3, 3.7.

4.7 Recertification

For aeroplanes specified in 4.1.1 c), recertification shall be granted on the basis that the evidence used to determine compliance with Chapter 4 is as satisfactory as the evidence associated with aeroplanes specified in 4.1.1 a) and b).

CHAPTER 5. PROPELLER-DRIVEN AEROPLANES OVER 5 700 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 1 JANUARY 1985

5.1 Applicability

Note 1.— See also Chapter 1, 1.9.

Note 2.— See Attachment E for guidance on interpretation of these applicability provisions.

5.1.1 The Standards defined hereunder are not applicable to:

a) aeroplanes requiring a runway[1] length of 610 m or less at maximum certificated mass for airworthiness;

b) aeroplanes specifically designed for fire fighting;

c) aeroplanes specifically designed for agricultural purposes;

d) aeroplanes to which the Standards of Chapter 6 apply; and

e) aeroplanes to which the Standards of Chapter 10 apply.

5.1.2 The Standards of this chapter shall be applicable to all propeller-driven aeroplanes, including their derived versions, of over 5 700 kg maximum certificated take-off mass for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977 and before 1 January 1985.

5.1.3 The Standards of Chapter 2, with the exception of Sections 2.1 and 2.4.2, shall be applicable to derived versions and individual aeroplanes of over 5 700 kg maximum certificated take-off mass and to which Standards of Chapter 6 do not apply and are of the type for which the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 6 October 1977, and for which a certificate of airworthiness for the individual aeroplane was issued on or after 26 November 1981.

5.1.4 The Standards of Chapter 3, with the exception of Section 3.1, shall be applicable to all propeller-driven aeroplanes, including their derived versions, of over 5 700 kg maximum take-off mass, for which either the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 1985.

Note.— The Standards in Chapters 2 and 3 although developed previously for subsonic jet aeroplanes are considered suitable for application to other aeroplane types regardless of the type of power installed.

5.1.5 Notwithstanding 5.1.2 to 5.1.4, it may be recognized by a Contracting State that the following situations for jet aeroplanes and propeller-driven heavy aeroplanes on its registry do not require demonstration of compliance with the provisions of the Standards of Annex 16, Volume I:

a) gear down flight with one or more retractable landing gear down during the entire flight;

b) spare engine and nacelle carriage external to the skin of the aeroplane (and return of the pylon or other external mount); and

c) time-limited engine and/or nacelle changes, where the change in type design specifies that the aeroplane may not be operated for a period of more than 90 days unless compliance with the provisions of Annex 16, Volume I, is shown for that change in type design. This applies only to changes resulting from a required maintenance action.

5.2 Noise measurements

5.2.1 Noise evaluation measure

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2.

5.3 Noise measurement points

5.3.1 Reference noise measurement points

An aeroplane, when tested in accordance with these Standards, shall not exceed the noise levels specified in 5.4 at the following points:

1. With no stopway or clearway.

a) *lateral reference noise measurement point:* the point on a line parallel to and 450 m from the runway centre line, or extended runway centre line, where the noise level is a maximum during take-off;

b) *flyover reference noise measurement point:* the point on the extended centre line of the runway and at a distance of 6.5 km from the start of roll; and

c) *approach reference noise measurement point:* the point on the ground, on the extended centre line of the runway, 2 000 m from the threshold. On level ground this corresponds to a position 120 m (394 ft) vertically below the 3° descent path originating from a point 300 m beyond the threshold.

5.3.2 Test noise measurement points

5.3.2.1 If the test noise measurement points are not located at the reference noise measurement points, any corrections for the difference in position shall be made in the same manner as the corrections for the differences between test and reference flight paths.

5.3.2.2 Sufficient lateral test noise measurement points shall be used to demonstrate to the certificating authority that the maximum noise level on the appropriate lateral line has been clearly determined. Simultaneous measurements shall be made at one test noise measurement point at a symmetrical position on the other side of the runway.

5.3.2.3 The applicant shall demonstrate to the certificating authority that during flight test, lateral and flyover noise levels were not separately optimized at the expense of each other.

5.4 Maximum noise levels

The maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

a) *at lateral reference noise measurement point:* 96 EPNdB constant limit for aeroplanes with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aeroplane mass at the rate of 2 EPNdB per doubling of mass from that point until the limit of 103 EPNdB is reached, after which the limit is constant;

b) *at flyover reference noise measurement point:* 89 EPNdB constant limit for aeroplanes with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aeroplane mass at the rate of 5 EPNdB per doubling of mass from that point until the limit of 106 EPNdB is reached, after which the limit is constant; and

c) *at approach reference noise measurement point:* 98 EPNdB constant limit for aeroplanes with maximum take-off mass, at which the noise certification is requested, up to 34 000 kg and increasing linearly with the logarithm of aeroplane mass at the rate of 2 EPNdB per doubling of mass from that point until the limit of 105 EPNdB is reached, after which the limit is constant.

Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.

5.5 Trade-offs

If the maximum noise levels are exceeded at one or two measurement points:

a) the sum of excesses shall not be greater than 3 EPNdB;

b) any excess at any single point shall not be greater than 2 EPNdB; and

c) any excesses shall be offset by corresponding reductions at the other point or points.

5.6 Noise certification reference procedures

5.6.1 General conditions

5.6.1.1 The reference procedures shall comply with the appropriate airworthiness requirements.

5.6.1.2 The calculations of reference procedures and flight paths shall be approved by the certificating authority.

5.6.1.3 Except in conditions specified in 5.6.1.4, the take-off and approach reference procedures shall be those defined in 5.6.2 and 5.6.3 respectively.

5.6.1.4 When it is shown by the applicant that the design characteristics of the aeroplane would prevent flight being conducted in accordance with 5.6.2 and 5.6.3, the reference procedures shall:

a) depart from the reference procedures defined in 5.6.2 and 5.6.3 only to the extent demanded by those design characteristics which make compliance with the procedures impossible; and

b) be approved by the certificating authority.

5.6.1.5 The reference procedures shall be calculated under the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C, i.e. ISA + 10°C except that at the discretion of the certificating authority, an alternative reference ambient air temperature of 15°C, i.e. ISA may be used;

c) relative humidity of 70 per cent; and

d) zero wind.

5.6.2 Take-off reference procedure

The take-off flight path shall be calculated as follows:

a) average take-off power shall be used from the start of take-off to the point where at least the height above runway level shown below is reached. The take-off power used shall be the maximum available for normal operations as scheduled in the performance section of the aeroplane flight manual for the reference atmospheric conditions given in 5.6.1.5.

  1) aeroplanes with two engines or less — 300 m (984 ft);

  2) aeroplanes with three engines — 260 m (853 ft);

  3) aeroplanes with four engines or more — 210 m (689 ft);

b) upon reaching the height specified in a) above, the power shall not be reduced below that required to maintain:

  1) a climb gradient of 4 per cent; or

  2) in the case of multi-engined aeroplanes, level flight with one engine inoperative;

  whichever power is the greater;

c) the speed shall be the all-engines operating take-off climb speed selected by the applicant for use in normal operation, which shall be at least V_2 + 19 km/h (V_2 + 10 kt) and which shall be attained as soon as practicable after lift-off and be maintained throughout the take-off noise certification test;

d) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure except that the landing gear may be retracted; and

e) the mass of the aeroplane at the brake release shall be the maximum take-off mass at which the noise certification is requested.

5.6.3 Approach reference procedure

The approach reference flight path shall be calculated as follows:

a) the aeroplane shall be stabilized and following a 3° glide path;

b) the approach shall be made at a stabilized airspeed of not less than 1.3 V_S + 19 km/h (1.3 V_S + 10 kt) with power stabilized during approach and over the measuring point and continued to a normal touchdown;

c) the constant approach configuration used in the airworthiness certification test, but with the landing gear down, shall be maintained throughout the approach reference procedure;

d) the mass of the aeroplane at the touchdown shall be the maximum landing mass permitted in the approach configuration defined in 5.6.3 c) at which noise certification is requested; and

e) the most critical (that which produces the highest noise levels) configuration at the mass at which certification is requested, shall be used.

5.7 Test procedures

5.7.1 The test procedures shall be acceptable to the airworthiness and noise certificating authority of the State issuing the certificate.

5.7.2 The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Appendix 2.

5.7.3 Acoustic data shall be adjusted by the methods outlined in Appendix 2 to the reference conditions specified in this chapter. Adjustments for speed and thrust shall be made as described in Section 9 of Appendix 2.

5.7.4 If the mass during the test is different from the mass at which the noise certification is requested, the necessary EPNL adjustment shall not exceed 2 EPNdB for take-offs and 1 EPNdB for approaches. Data approved by the certificating authority shall be used to determine the variation of EPNL with mass for both take-off and approach test conditions. Similarly, the necessary EPNL adjustment for variations in approach flight path from the reference flight path shall not exceed 2 EPNdB.

5.7.5 For the approach conditions the test procedures shall be accepted if the aeroplane follows a steady glide path angle of 3° ± 0.5°.

5.7.6 If equivalent test procedures different from the reference procedures are used, the test procedures and all methods for adjusting the results to the reference procedures shall be approved by the certificating authority. The amounts of the adjustments shall not exceed 16 EPNdB on take-off and 8 EPNdB on approach, and if the adjustments are more than 8 EPNdB and 4 EPNdB respectively, the resulting numbers shall not be within 2 EPNdB of the limit noise levels specified in 5.4.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

CHAPTER 6. PROPELLER-DRIVEN AEROPLANES NOT EXCEEDING 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 17 NOVEMBER 1988

6.1 Applicability

Note 1.— See also Chapter 1, 1.9.

Note 2.— See Attachment E for guidance on interpretation of these applicability provisions.

The Standards of this chapter shall be applicable to all propeller-driven aeroplanes, except those aeroplanes specifically designed for aerobatic purposes or agricultural or fire fighting uses, of a maximum certificated take-off mass not exceeding 8 618 kg for which:

a) the application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 1975 and before 17 November 1988, except for derived versions for which an application for a certificate of airworthiness was accepted, or another equivalent procedure was carried out by the certificating authority, on or after 17 November 1988, in which case the Standards of Chapter 10 apply; or

b) a certificate of airworthiness for the individual aeroplane was first issued on or after 1 January 1980.

6.2 Noise evaluation measure

The noise evaluation measure shall be a weighted overall sound pressure level as defined in International Electrotechnical Commission (IEC) Publication No. 179.[1] The weighting applied to each sinusoidal component of the sound pressure shall be given as a function of frequency by the standard reference curve called "A".

6.3 Maximum noise levels

For aeroplanes specified in 6.1 a) and b), the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 3, shall not exceed the following:

— a 68 dB(A) constant limit up to an aeroplane mass of 600 kg, varying linearly with mass from that point to 1 500 kg, after which the limit is constant at 80 dB(A) up to 8 618 kg.

Note.— Where an aeroplane comes within the provisions of Chapter 10, 10.1.2, the limit of 80 dB(A) applies up to 8 618 kg.

6.4 Noise certification reference procedures

The reference procedure shall be calculated under the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C, i.e. ISA + 10°C.

6.5 Test procedures

6.5.1 Either the test procedures described in 6.5.2 and 6.5.3 or equivalent test procedures approved by the certificating authority shall be used.

6.5.2 Tests to demonstrate compliance with the maximum noise levels of 6.3 shall consist of a series of level flights overhead the measuring station at a height of

$$300 \begin{smallmatrix}+10\\-30\end{smallmatrix} \text{ m } (985 \begin{smallmatrix}+30\\-100\end{smallmatrix} \text{ ft})$$

The aeroplane shall pass over the measuring point within ±10° from the vertical.

6.5.3 Overflight shall be performed at the highest power in the normal operating range,[2] stabilized airspeed and with the aeroplane in the cruise configuration.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

1. As amended. Available from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

2. This is normally indicated in the aeroplane flight manual and on the flight instruments.

CHAPTER 7. PROPELLER-DRIVEN STOL AEROPLANES

Note.— Standards and Recommended Practices for this chapter are not yet developed. In the meantime, guidelines provided in Attachment B may be used for noise certification of propeller-driven STOL aeroplanes for which a certificate of airworthiness for the individual aeroplane was first issued on or after 1 January 1976.

CHAPTER 8. HELICOPTERS

8.1 Applicability

Note.— See also Chapter 1, 1.9.

8.1.1 The Standards of this chapter shall be applicable to all helicopters for which 8.1.2, 8.1.3, and 8.1.4 apply, except those designed exclusively for agricultural, fire fighting or external load carrying purposes.

8.1.2 For a helicopter for which the application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 1985, except for those helicopters specified in 8.1.4, the noise levels of 8.4.1 shall apply.

8.1.3 For a derived version of a helicopter for which the application for a change of type design was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 17 November 1988, except for those helicopters specified in 8.1.4, the noise levels of 8.4.1 shall apply.

8.1.4 For all helicopters, including their derived versions, for which the application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 21 March 2002, the noise levels of 8.4.2 shall apply.

8.1.5 Certification of helicopters which are capable of carrying external loads or external equipment shall be made without such loads or equipment fitted.

Note.— Helicopters which comply with the Standards with internal loads may be excepted when carrying external loads or external equipment, if such operations are conducted at a gross mass or with other operating parameters which are in excess of those certificated for airworthiness with internal loads.

8.1.6 An applicant under 8.1.1 may alternatively elect to show compliance with Chapter 11 instead of Chapter 8 if the helicopter has a maximum certificated take-off mass of 3 175 kg or less.

8.2 Noise evaluation measure

The noise evaluation measure shall be the effective perceived noise level in EPNdB as described in Appendix 2.

8.3 Reference noise measurement points

A helicopter, when tested in accordance with these Standards, shall not exceed the noise levels specified in 8.4 at the following points:

a) *Take-off reference noise measurement points*

   1) a flight path reference point located on the ground vertically below the flight path defined in the take-off reference procedure and 500 m horizontally in the direction of flight from the point at which transition to climbing flight is initiated in the reference procedure (see 8.6.2);

   2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the take-off reference procedure and lying on a line through the flight path reference point.

b) *Overflight reference noise measurement points*

   1) a flight path reference point located on the ground 150 m (492 ft) vertically below the flight path defined in the overflight reference procedure (see 8.6.3.1);

   2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the overflight reference procedure and lying on a line through the flight path reference point.

c) *Approach reference noise measurement points*

   1) a flight path reference point located on the ground 120 m (394 ft) vertically below the flight path defined in the approach reference procedure (see 8.6.4). On level ground, this corresponds to a position 1 140 m from the intersection of the 6.0° approach path with the ground plane;

   2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the approach reference procedure and lying on a line through the flight path reference point.

Note.— See Attachment H (Guidelines for Obtaining Helicopter Noise Data for Land-use Planning Purposes) *that defines acceptable supplemental land-use planning (LUP) data procedures.*

8.4 Maximum noise levels

8.4.1 For helicopters specified in 8.1.2 and 8.1.3, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

8.4.1.1 *For take-off:* 109 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.

8.4.1.2 *For overflight:* 108 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 88 EPNdB after which the limit is constant.

8.4.1.3 *For approach:* 110 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 90 EPNdB after which the limit is constant.

Note.— See Attachment A for equations for the calculation of noise levels as a function of take-off mass.

8.4.2 For helicopters specified in 8.1.4, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2, shall not exceed the following:

8.4.2.1 *For take-off:* 106 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 86 EPNdB after which the limit is constant.

8.4.2.2 *For overflight:* 104 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 84 EPNdB after which the limit is constant.

8.4.2.3 *For approach:* 109 EPNdB for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the helicopter mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.

8.5 Trade-offs

If the noise level limits are exceeded at one or two measurement points:

a) the sum of excesses shall not be greater than 4 EPNdB;

b) any excess at any single point shall not be greater than 3 EPNdB; and

c) any excess shall be offset by corresponding reductions at the other point or points.

8.6 Noise certification reference procedures

8.6.1 General conditions

8.6.1.1 The reference procedures shall comply with the appropriate airworthiness requirements.

8.6.1.2 The reference procedures and flight paths shall be approved by the certificating authority.

8.6.1.3 Except in conditions specified in 8.6.1.4, the take-off, overflight and approach reference procedures shall be those defined in 8.6.2, 8.6.3 and 8.6.4 respectively.

8.6.1.4 When it is shown by the applicant that the design characteristics of the helicopter would prevent flight being conducted in accordance with 8.6.2, 8.6.3 or 8.6.4, the reference procedures shall:

a) depart from the reference procedures defined in 8.6.2, 8.6.3 or 8.6.4 only to the extent demanded by those design characteristics which make compliance with the reference procedures impossible; and

b) be approved by the certificating authority.

8.6.1.5 The reference procedures shall be established for the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C, i.e. ISA + 10°C;

c) relative humidity of 70 per cent; and

d) zero wind.

8.6.1.6 In 8.6.2 c), 8.6.3.1 c) and 8.6.4 c), the maximum normal operating rpm shall be taken as the highest rotor speed for each reference procedure corresponding to the airworthiness limit imposed by the manufacturer and approved by the certificating authority. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed shall be taken as the highest rotor speed about which that tolerance is given. If the rotor speed is automatically linked with flight condition, the maximum normal operating rotor speed corresponding with that flight condition shall be used during the noise certification procedure. If rotor speed can be changed by pilot action, the highest normal operating rotor speed specified in the flight manual limitation section for power-on conditions shall be used during the noise certification procedure.

8.6.2 Take-off reference procedure

The take-off reference flight procedure shall be established as follows:

a) the helicopter shall be stabilized at the maximum take-off power corresponding to minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower, and along a path starting from a point located 500 m prior to the flight path reference point, at 20 m (65 ft) above the ground;

b) the best rate of climb speed, V_y, or the lowest approved speed for the climb after take-off, whichever is the greater, shall be maintained throughout the take-off reference procedure;

c) the steady climb shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for take-off;

d) a constant take-off configuration selected by the applicant shall be maintained throughout the take-off reference procedure with the landing gear position consistent with the airworthiness certification tests for establishing the best rate of climb speed, V_y;

e) the mass of the helicopter shall be the maximum take-off mass at which noise certification is requested; and

f) the reference take-off path is defined as a straight line segment inclined from the starting point (500 m prior to the centre microphone location and 20 m (65 ft) above ground level) at an angle defined by best rate of climb (BRC) and V_y for minimum specification engine performance.

8.6.3 Overflight reference procedure

8.6.3.1 The overflight reference procedure shall be established as follows:

a) the helicopter shall be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft);

b) a speed of 0.9 V_H or 0.9 V_{NE} or 0.45 V_H + 120 km/h (0.45 V_H + 65 kt) or 0.45 V_{NE} + 120 km/h (0.45 V_{NE} + 65 kt), whichever is the least, shall be maintained throughout the overflight reference procedure;

Note.— For noise certification purposes, V_H is defined as the airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available for sea level pressure (1 013.25 hPa), 25°C ambient conditions at the relevant maximum certificated mass. V_{NE} is defined as the not-to-exceed airworthiness airspeed imposed by the manufacturer and approved by the certificating authority.

c) the overflight shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for level flight;

d) the helicopter shall be in the cruise configuration; and

e) the mass of the helicopter shall be the maximum take-off mass at which noise certification is requested.

8.6.3.2 The value of V_H and/or V_{NE} used for noise certification shall be quoted in the approved flight manual.

8.6.4 Approach reference procedure

The approach reference procedure shall be established as follows:

a) the helicopter shall be stabilized and following a 6.0° approach path;

b) the approach shall be made at a stabilized airspeed equal to the best rate of climb speed, V_y, or the lowest approved speed for the approach, whichever is the greater, with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown;

c) the approach shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for approach;

d) the constant approach configuration used in airworthiness certification tests, with the landing gear extended, shall be maintained throughout the approach reference procedure; and

e) the mass of the helicopter at touchdown shall be the maximum landing mass at which noise certification is requested.

8.7 Test procedures

8.7.1 The test procedures shall be acceptable to the airworthiness and noise certificating authority of the State issuing the certificate.

8.7.2 The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Appendix 2.

8.7.3 Test conditions and procedures shall be closely similar to reference conditions and procedures or the acoustic data shall be adjusted, by the methods outlined in Appendix 2, to the reference conditions and procedures specified in this chapter.

8.7.4 Adjustments for differences between test and reference flight procedures shall not exceed:

a) *for take-off:* 4.0 EPNdB, of which the arithmetic sum of Δ_1 and the term –7.5 log (QK/Q_rK_r) from Δ_2 shall not in total exceed 2.0 EPNdB;

b) *for overflight or approach:* 2.0 EPNdB.

8.7.5 During the test the average rotor rpm shall not vary from the normal maximum operating rpm by more than ±1.0 per cent during the 10 dB-down time period.

8.7.6 The helicopter airspeed shall not vary from the reference airspeed appropriate to the flight demonstration by more than ±9 km/h (5 kt) throughout the 10 dB-down time period.

8.7.7 The number of level overflights made with a headwind component shall be equal to the number of level overflights made with a tailwind component.

8.7.8 The helicopter shall fly within ±10° or ±20 m, whichever is greater, from the vertical above the reference track throughout the 10 dB-down time period (see Figure 8-1).

8.7.9 The helicopter height shall not vary during overflight from the reference height at the overhead point by more than ±9 m (30 ft).

8.7.10 During the approach noise demonstration the helicopter shall be established on a stabilized constant speed approach within the airspace contained between approach angles of 5.5° and 6.5°.

8.7.11 Tests shall be conducted at a helicopter mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 per cent of the relevant maximum certificated mass. For each of the three flight conditions, at least one test must be completed at or above this maximum certificated mass.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

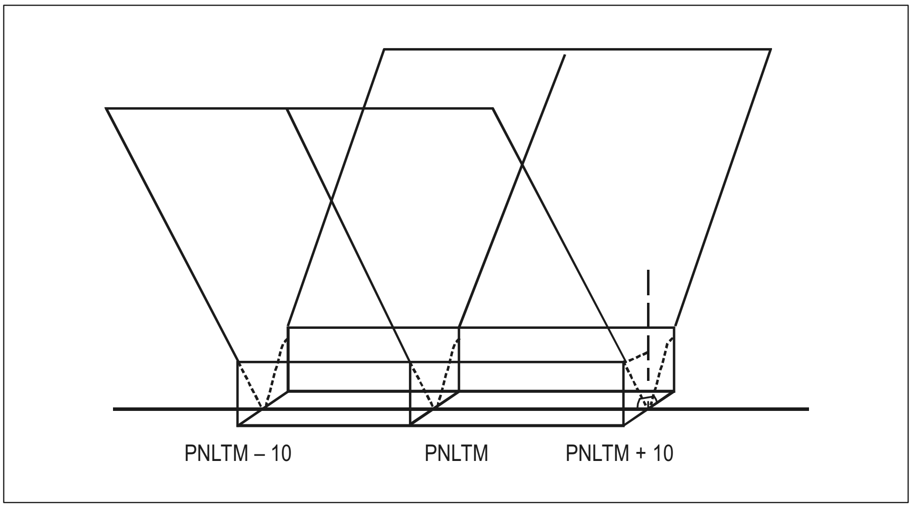

Figure 8-1. Helicopter lateral deviation tolerances

CHAPTER 9. INSTALLED AUXILIARY POWER UNITS (APU) AND ASSOCIATED AIRCRAFT SYSTEMS DURING GROUND OPERATIONS

Note.— Standards and Recommended Practices for this chapter are not yet developed. In the meantime, guidelines provided in Attachment C may be used for noise certification of installed auxiliary power units (APU) and associated aircraft systems in:

a) all aircraft for which the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977; and

b) aircraft of existing type design for which the application for a change of type design involving the basic APU installation was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 6 October 1977.

CHAPTER 10. PROPELLER-DRIVEN AEROPLANES NOT EXCEEDING 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE OR DERIVED VERSION ACCEPTED ON OR AFTER 17 NOVEMBER 1988

10.1 Applicability

Note 1.— See also Chapter 1, 1.9.

Note 2.— See Attachment E for guidance on interpretation of these applicability provisions.

10.1.1 The Standards of this chapter shall be applicable to all propeller-driven aeroplanes and their derived versions, with a certificated take-off mass not exceeding 8 618 kg, except those aeroplanes specifically designed for aerobatic purposes and agricultural or fire fighting uses and self-sustaining powered sailplanes.

10.1.2 For an aeroplane for which the application for the certificate of airworthiness for the prototype or for all derived versions was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 17 November 1988, except for those aeroplanes specified in 10.1.4, the noise limits of 10.4 a) shall apply.

10.1.3 For aeroplanes specified in 10.1.2 which fail to comply with the Standards of this chapter and where the application for the certificate of airworthiness for the prototype or all derived versions was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 17 November 1993, the Standards of Chapter 6 shall apply.

10.1.4 For single-engined aeroplanes, except those aeroplanes specifically designed for aerobatic purposes and agricultural or fire fighting uses, self-sustaining powered sailplanes, float planes and amphibians, for which:

a) the application for the certificate of airworthiness for the prototype or their derived versions was accepted, or another equivalent procedure was carried out by the certificating authority, on or after 4 November 1999, the noise limits of 10.4 b) shall apply;

b) an application for the certificate of airworthiness for the derived version was accepted, or other procedure was carried out, on or after 4 November 1999, but for which the application for the certificate of airworthiness for the prototype, or another equivalent procedure was carried out by the certificating authority, before 4 November 1999, the noise limits of 10.4 b) shall apply;

c) the requirements of b) above apply, but which fail to meet the noise limits of 10.4 b), the noise limits of 10.4 a) shall apply provided that the application for the derived version was made before 4 November 2004.

10.2 Noise evaluation measure

The noise evaluation measure shall be the maximum A-weighted noise level (L_{Amax}) as defined in Appendix 6.

10.3 Reference noise measurement points

10.3.1 An aeroplane, when tested in accordance with these Standards, shall not exceed the noise level specified in 10.4 at the take-off reference noise measurement point.

10.3.2 The take-off reference noise measurement point is the point on the extended centre line of the runway at a distance of 2 500 m from the start of take-off roll.

10.4 Maximum noise levels

The maximum noise levels determined in accordance with the noise evaluation method of Appendix 6 shall not exceed the following:

a) for aeroplanes specified in 10.1.2 and 10.1.4 c), a 76 dB(A) constant limit up to an aeroplane mass of 600 kg varying linearly from that point with the logarithm of aeroplane mass until at 1 400 kg the limit of 88 dB(A) is reached after which the limit is constant up to 8 618 kg; and

b) for aeroplanes specified in 10.1.4 a) and b), a 70 dB(A) constant limit up to an aeroplane mass of 570 kg increasing linearly from that point with the logarithm of aeroplane mass until at 1 500 kg the limit of 85 dB(A) is reached after which the limit is constant up to 8 618 kg.

10.5 Noise certification reference procedures

10.5.1 General conditions

10.5.1.1 The calculations of reference procedures and flight paths shall be approved by the certificating authority.

10.5.1.2 Except in conditions specified in 10.5.1.3, the take-off reference procedure shall be that defined in 10.5.2.

10.5.1.3 When it is shown by the applicant that the design characteristics of the aeroplane would prevent flights being conducted in accordance with 10.5.2, the reference procedures shall:

a) depart from the reference procedures defined only to the extent demanded by those design characteristics which make compliance with the procedures impossible; and

b) be approved by the certificating authority.

10.5.1.4 The reference procedures shall be calculated under the following atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 15°C, i.e. ISA;

c) relative humidity of 70 per cent; and

d) zero wind.

10.5.1.5 The acoustic reference atmospheric conditions shall be the same as the reference atmospheric conditions for flight.

10.5.2 Take-off reference procedure

The take-off flight path shall be calculated taking into account the following two phases.

First phase

a) Take-off power shall be used from the brake release point to the point at which the height of 15 m (50 ft) above the runway is reached.

b) A constant take-off configuration selected by the applicant shall be maintained throughout this first phase.

c) The mass of the aeroplane at the brake release shall be the maximum take-off mass at which the noise certification is requested.

d) The length of this first phase shall correspond to the length given in the airworthiness data for a take-off on a level paved runway.

Second phase

a) The beginning of the second phase corresponds to the end of the first phase.

b) The aeroplane shall be in the climb configuration with landing gear up, if retractable, and flap setting corresponding to normal climb throughout this second phase.

c) The speed shall be the best rate of climb speed, V_y.

d) Take-off power and, for aeroplanes equipped with variable pitch or constant speed propellers, rpm shall be maintained throughout the second phase. If airworthiness limitations do not permit the application of take-off power and rpm up to the reference point, then take-off power and rpm shall be maintained for as long as is permitted by such limitations and thereafter at maximum continuous power and rpm. Limiting of time for which take-off power and rpm shall be used in order to comply with this chapter shall not be permitted. The reference height shall be calculated assuming climb gradients appropriate to each power setting used.

10.6 Test procedures

10.6.1 The test procedures shall be acceptable to the airworthiness and noise certificating authorities of the State issuing the certificate.

10.6.2 The test procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure in units of L_{Amax} as described in Appendix 6.

10.6.3 Acoustic data shall be adjusted by the methods outlined in Appendix 6 to the reference conditions specified in this chapter.

10.6.4 If equivalent test procedures are used, the test procedures and all methods for correcting the results to the reference procedures shall be approved by the certificating authority.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

CHAPTER 11. HELICOPTERS NOT EXCEEDING 3 175 kg MAXIMUM CERTIFICATED TAKE-OFF MASS

11.1 Applicability

Note.— See also Chapter 1, 1.9.

11.1.1 The Standards of this chapter shall be applicable to all helicopters having a maximum certificated take-off mass not exceeding 3 175 kg for which 11.1.2, 11.1.3 and 11.1.4 apply, except those designed exclusively for agricultural, fire fighting or external load carrying purposes.

11.1.2 For a helicopter for which the application for the certificate of airworthiness for the prototype was issued, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 11 November 1993, except for those helicopters specified in 11.1.4, the noise levels of 11.4.1 shall apply.

11.1.3 For a derived version of a helicopter for which the application for the certificate of airworthiness for a change of type design was issued, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 11 November 1993, except for those helicopters specified in 11.1.4, the noise levels of 11.4.1 shall apply.

11.1.4 For all helicopters, including their derived versions, for which the application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 21 March 2002, the noise levels of 11.4.2 shall apply.

11.1.5 Certification of helicopters which are capable of carrying external loads or external equipment shall be made without such loads or equipment fitted.

Note.— Helicopters which comply with the Standards with internal loads may be excepted when carrying external loads or external equipment, if such operations are conducted at a gross mass or with other operating parameters which are in excess of those certificated for airworthiness with internal loads.

11.1.6 An applicant under 11.1.1, 11.1.2, 11.1.3 and 11.1.4 may alternatively elect to show compliance with Chapter 8 instead of complying with this chapter.

11.2 Noise evaluation measure

The noise evaluation measure shall be the sound exposure level (SEL) as described in Appendix 4.

11.3 Reference noise measurement point

A helicopter, when tested in accordance with these Standards, shall not exceed the noise levels specified in 11.4 at a flight path reference point located on the ground 150 m (492 ft) vertically below the flight path defined in the overflight reference procedure (see 11.5.2.1).

Note.— See Attachment H (Guidelines for Obtaining Helicopter Noise Data for Land-use Planning Purposes) *that defines acceptable supplemental land-use planning (LUP) data procedures.*

11.4 Maximum noise level

11.4.1 For helicopters specified in 11.1.2 and 11.1.3, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 4, shall not exceed 82 decibels SEL for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of up to 788 kg and increasing linearly with the logarithm of the helicopter mass at a rate of 3 decibels per doubling of mass thereafter.

11.4.2 For helicopters specified in 11.1.4, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 4, shall not exceed 82 decibels SEL for helicopters with maximum certificated take-off mass, at which the noise certification is requested, of up to 1 417 kg and increasing linearly with the logarithm of the helicopter mass at a rate of 3 decibels per doubling of mass thereafter.

11.5 Noise certification reference procedure

11.5.1 General conditions

11.5.1.1 The reference procedure shall comply with the appropriate airworthiness requirements and shall be approved by the certificating authority.

11.5.1.2 Except as otherwise approved, the overflight reference procedure shall be as defined in 11.5.2.

11.5.1.3 When it is shown by the applicant that the design characteristics of the helicopter would prevent flight being conducted in accordance with 11.5.2 the reference procedure shall be permitted to depart from the standard reference procedure, with the approval of the certificating authority, but only to the extent demanded by those design characteristics which make compliance with the reference procedures impossible.

11.5.1.4 The reference procedure shall be established for the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C;

c) relative humidity of 70 per cent; and

d) zero wind.

11.5.1.5 The maximum normal operating rpm shall be taken as the highest rotor speed corresponding to the airworthiness limit imposed by the manufacturer and approved by the certificating authority for overflight. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed shall be taken as the highest rotor speed about which that tolerance is given. If rotor speed is automatically linked with flight condition, the maximum normal operating rotor speed corresponding with that flight condition shall be used during the noise certification procedure. If rotor speed can be changed by pilot action, the highest normal operating rotor speed specified in the flight manual limitation section for power-on conditions shall be used during the noise certification procedure.

11.5.2 Reference procedure

11.5.2.1 The reference procedure shall be established as follows:

a) the helicopter shall be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft) ± 15 m (50 ft);

b) a speed of 0.9 V_H or 0.9 V_{NE} or 0.45 V_H + 120 km/h (65 kt) or 0.45 V_{NE} + 120 km/h (65 kt), whichever is the least, shall be maintained throughout the overflight procedure. For noise certification purposes, V_H is defined as the airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available for sea level pressure (1 013.25 hPa), 25°C ambient conditions at the relevant maximum certificated mass. V_{NE} is defined as the not-to-exceed airworthiness airspeed imposed by the manufacturer and approved by the certificating authority;

c) the overflight shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for level flight;

d) the helicopter shall be in the cruise configuration; and

e) the mass of the helicopter shall be the maximum take-off mass at which noise certification is requested.

11.5.2.2 The value of V_H and/or V_{NE} used for noise certification shall be quoted in the approved flight manual.

11.6 Test procedures

11.6.1 The test procedures shall be acceptable to the airworthiness and noise certificating authorities of the State issuing the certificate.

11.6.2 The test procedure and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as sound exposure level (SEL), in A-weighted decibels, as described in Appendix 4.

11.6.3 Test conditions and procedures shall be closely similar to reference conditions and procedures or the acoustic data shall be adjusted, by the methods outlined in Appendix 4, to the reference conditions and procedures specified in this chapter.

11.6.4 During the test, flights shall be made in equal numbers with tailwind and headwind components.

11.6.5 Adjustments for differences between test and reference flight procedures shall not exceed 2.0 dB(A).

11.6.6 During the test, the average rotor rpm shall not vary from the normal maximum operating rpm by more than ±1.0 per cent during the 10 dB-down time period.

11.6.7 The helicopter airspeed shall not vary from the reference airspeed appropriate to the flight demonstration as described in Appendix 4 by more than ±5 km/h (±3 kt) throughout the 10 dB-down time period.

11.6.8 The helicopter shall fly within ±10° from the vertical above the reference track through the reference noise measurement position.

11.6.9 Tests shall be conducted at a helicopter mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 per cent of the relevant maximum certificated mass.

Note.— Guidance material on the use of equivalent procedures is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

CHAPTER 12. SUPERSONIC AEROPLANES

12.1 Supersonic aeroplanes — application for certificate of airworthiness for the prototype accepted before 1 January 1975

12.1.1 The Standards of Chapter 2 of this Part, with the exception of maximum noise levels specified in 2.4, shall be applicable to all supersonic aeroplanes, including their derived versions, in respect of which either the application for the certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, before 1 January 1975, and for which a certificate of airworthiness for the individual aeroplane was first issued after 26 November 1981.

12.1.2 The maximum noise levels of those aeroplanes covered by 12.1.1, when determined in accordance with the noise evaluation method of Appendix 1, shall not exceed the measured noise levels of the first certificated aeroplane of the type.

12.2 Supersonic aeroplanes — application for certificate of airworthiness for the prototype accepted on or after 1 January 1975

Note.— Standards and Recommended Practices for these aeroplanes are not yet developed but the noise levels of Chapter 3 of this Part applicable to subsonic jet aeroplanes may be used as guidelines for aeroplanes for which the application for a certificate of airworthiness for the prototype was accepted, or another equivalent prescribed procedure was carried out by the certificating authority, on or after 1 January 1975.

CHAPTER 13. TILT-ROTOR AIRCRAFT

Note 1.— Standards and Recommended Practices for this chapter are not yet developed. In the meantime, guidelines provided in Attachment F may be used for noise certification of tilt-rotor aircraft for which a type certificate of airworthiness was issued on or after 13 May 1998 and to provide data for land-use planning purposes.

Note 2.— Development of these guidelines made extensive use of the Chapter 8 noise certification Standards for helicopters, where applicable.

PART III. NOISE MEASUREMENT FOR MONITORING PURPOSES

Note.— The following Recommendation has been developed to assist States that measure noise for monitoring purposes, until such time as agreement on a single method can be reached.

Recommendation.— *Where the measurement of aircraft noise is made for monitoring purposes, the method of Appendix 5 should be used.*

Note.— These purposes are described as including: monitoring compliance with and checking the effectiveness of such noise abatement requirements as may have been established for aircraft in flight or on the ground. An indication of the degree of correlation between values obtained by the method used for measuring noise for aircraft design purposes and the method(s) used for monitoring purposes would be necessary.

PART IV. ASSESSMENT OF AIRPORT NOISE

Note.— The following Recommendations have been developed for the purpose of promoting international communication between States that have adopted a variety of methods of assessing noise for land-use planning purposes.

1. **Recommendation.—** *Where international comparison of noise assessment around airports is undertaken, the methodology described in* Recommended Method for Computing Noise Contours around Airports *(Cir 205) should be used.*

2. **Recommendation.—** *Contracting States that have not yet adopted, or are considering changing a national noise assessment methodology, should use the methodology described in* Recommended Method for Computing Noise Contours around Airports *(Cir 205).*

PART V. BALANCED APPROACH TO NOISE MANAGEMENT

Note.— Provisions in Part II of this Annex are aimed at noise certification which characterizes the maximum noise emitted by the aircraft. However, noise abatement procedures approved by national authorities and included in operations manuals allow a reduction of noise during aircraft operations.

1. The balanced approach to noise management consists of identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements, namely reduction at source (addressed in Part II of this Annex), land-use planning and management, noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost-effective manner. All the elements of the balanced approach are addressed in the *Guidance on the Balanced Approach to Aircraft Noise Management* (Doc 9829).

2. Aircraft operating procedures for noise abatement shall not be introduced unless the regulatory authority, based on appropriate studies and consultation, determines that a noise problem exists.

3. **Recommendation.—** *Aircraft operating procedures for noise abatement should be developed in consultation with the operators that use the aerodrome concerned.*

4. **Recommendation.—** *The factors to be taken into consideration in the development of appropriate aircraft operating procedures for noise abatement should include the following:*

a) the nature and extent of the noise problem including:

1) the location of noise-sensitive areas; and

2) critical hours;

b) the types of aircraft affected, including aircraft mass, aerodrome elevation, temperature considerations;

c) the types of procedures likely to be most effective;

d) obstacle clearances (PANS-OPS (Doc 8168), Volumes I and II); and

e) human performance in the application of the operating procedures.

Note 1.— See Annex 6, Part I, Chapter 4, for aeroplane noise abatement operating procedures.

Note 2.— Guidance material on human performance can be found in the Human Factors Training Manual *(Doc 9683).*

5. **Recommendation.—** *Although in most countries, land-use planning and management are the responsibility of national and/or local planning authorities rather than aviation authorities, ICAO has developed guidance material which should be used to assist planning authorities in taking appropriate measures to ensure compatible land-use management around airports to the benefit of both the airport and the surrounding communities (*Airport Planning Manual*, Part 2, (Doc 9184)).*

APPENDIX 1. EVALUATION METHOD FOR NOISE CERTIFICATION OF SUBSONIC JET AEROPLANES — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 6 OCTOBER 1977

Note 1.— See Part II, Chapter 2.

Note 2.— The procedures in this appendix also apply to certain aircraft types covered in Chapters 5 and 12.

1. INTRODUCTION

Note 1.— This noise evaluation method includes:

a) noise certification test and measurement conditions;

b) measurement of aeroplane noise received on the ground;

c) calculation of effective perceived noise level from measured noise data; and

d) reporting of data to the certificating authority and correcting measured data.

Note 2.— The instructions and procedures given in the method are clearly delineated to ensure uniformity during compliance tests, and to permit comparison between tests of various types of aeroplanes, conducted in various geographical locations. It applies only to aeroplanes within the applicability clauses of Part II, Chapter 2.

Note 3.— A complete list of symbols and units, the mathematical formulation of perceived noisiness, a procedure for determining atmospheric attenuation of sound, and detailed procedures for correcting noise levels from non-reference to reference conditions are included in Sections 6 to 9 of this appendix.

2. NOISE CERTIFICATION TEST AND MEASUREMENT CONDITIONS

2.1 General

This section prescribes the conditions under which noise certification tests shall be conducted and the measurement procedures that shall be used.

Note.— Many applications for a noise certificate involve only minor changes to the aeroplane type design. The resultant changes in noise can often be established reliably without the necessity of resorting to a complete test as outlined in this appendix. For this reason certificating authorities are encouraged to permit the use of appropriate "equivalent procedures". Also, there are equivalent procedures that may be used in full certification tests, in the interest of reducing costs and providing reliable results. Guidance material on the use of equivalent procedures in the noise certification of subsonic jet aeroplanes is provided in the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

2.2 General test conditions

2.2.1 Tests to show compliance with established noise certification levels shall consist of a series of take-offs and landings during which measurements shall be taken at the measuring points specified by the certificating authority. These points are typically:

a) the flyover noise measurement point;[1]

b) the approach noise measurement point; and

c) the lateral noise measurement point(s),[2]

which for noise certification purposes are specified in Part II, Chapter 2, 2.3. To ensure that the maximum subjective noise level along the lateral is obtained, a sufficient number of lateral stations shall be used. To establish whether any asymmetry exists in the noise field at least one measuring station shall be located along the alternative lateral. On each test take-off simultaneous measurements shall be made at the lateral measuring points on both sides of the runway and also at the take-off flyover measuring point.

1. Sometimes referred to as the take-off noise measurement point.
2. Sometimes referred to as the sideline measurement point(s).

2.2.2 Locations for measuring noise from an aeroplane in flight shall be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as might be caused by thick, matted or tall grass, shrubs or wooded areas. No obstructions which significantly influence the sound field from the aeroplane shall exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75° from this axis. If the height of the ground at any measuring point differs from that of the nearest point on the runway by more than 6 m (20 ft), corrections shall be made.

Note.— Those people carrying out the measurements could themselves constitute such obstructions.

2.2.3 The tests shall be carried out under the following atmospheric conditions:

a) no precipitation;

b) relative humidity not higher than 90 per cent or lower than 30 per cent;

c) ambient temperature not above 30°C and not below 2°C at 10 m (33 ft) above ground;

d) average wind not above 19 km/h (10 kt) and average crosswind component not above 9 km/h (5 kt) at 10 m (33 ft) above ground. A 30-second averaging period spanning the 10 dB-down time interval is recommended; and

e) no temperature inversion or anomalous wind conditions that would significantly affect the noise level of the aeroplane when the noise is recorded at the measuring points specified by the certificating authority.

2.3 Aeroplane testing procedures

2.3.1 The test procedures shall be acceptable to the airworthiness and noise certificating authorities of the State issuing the certificate.

2.3.2 The aeroplane testing procedures and noise measurements shall be conducted and processed in an approved manner to yield the noise evaluation measure designated as effective perceived noise level, EPNL, in units of EPNdB, as described in Section 4 of this appendix.

2.3.3 The aeroplane height and lateral position relative to the extended centre line of the runway shall be determined by a method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation or photographic scaling techniques, to be approved by the certificating authority.

2.3.4 The aeroplane position along the flight path shall be related to the noise recorded at the noise measurement locations by means of synchronizing signals. The position of the aeroplane shall be recorded relative to the runway from a point at least 7.4 km (4 NM) from threshold during the approach and at least 11 km (6 NM) from the start of roll during take-off.

2.3.5 If the take-off test is conducted at a mass different from the maximum take-off mass at which noise certification is requested, the necessary EPNL correction shall not exceed 2 EPNdB. If the approach test is conducted at a mass different from the maximum landing mass at which noise certification is requested, the EPNL correction shall not exceed 1 EPNdB. Data approved by the certificating authority shall be used to determine the variation of EPNL with mass for both take-off and approach test conditions.

2.4 Measurements

2.4.1 Position and performance data required to make the corrections referred to in Section 5 of this appendix shall be automatically recorded at an approved sampling rate. The position of the aeroplane shall be recorded relative to the runway from a point at least 7.4 km (4 NM) from threshold to touchdown during the approach and at least 11 km (6 NM) from the start of roll during the take-off. Measuring equipment shall be approved by the certificating authority.

2.4.2 Position and performance data shall be corrected by the methods outlined in Section 5 of this appendix to the meteorological reference conditions specified in 5.3 a).

2.4.3 Acoustic data shall be corrected by the methods outlined in Section 5 of this appendix to the meteorological reference conditions specified in 5.3 a) 1), 2) and 3). Acoustic data corrections shall also be made for variations of the test minimum distance from the reference minimum distance between the aeroplane's approach path and the approach measuring point, a take-off path vertically above the flyover measuring point and for differences of more than 6 m (20 ft) in elevation of measuring locations relative to the elevation of the nearest point of the runway.

2.4.4 The aerodrome tower or another facility shall be approved for use as the central location at which measurements of atmospheric parameters are representative of those conditions existing over the geographical area in which aeroplane noise measurements are made. However, the surface wind velocity and ambient air temperature shall be measured near the microphone position at the approach, sideline, and take-off measurement locations, and the tests shall not be acceptable unless the conditions conform to Section 2 of this appendix.

3. MEASUREMENT OF AEROPLANE NOISE RECEIVED ON THE GROUND

3.1 General

3.1.1 The measurements shall provide the data for determining one-third octave band noise produced by aeroplanes during flight, at any required observation stations, as a function of time.

3.1.2 Methods for determination of the distance from the observation stations to the aeroplane shall include theodolite triangulation techniques, scaling aeroplane dimensions on photographs made as the aeroplane flies directly over the measurement points, radar altimeters, and radar tracking systems. The method used shall be approved by the certificating authority.

3.1.3 Sound pressure level data for noise evaluation purposes shall be obtained with approved acoustical equipment and measurement practices that conform to the specifications given hereunder (in 3.2 to 3.4).

3.2 Measurement system

The acoustical measurement system shall consist of approved equipment equivalent to the following:

a) a microphone system with frequency response compatible with measurement and analysis system accuracy as stated in 3.3;

b) tripods or similar microphone mountings that minimize interference with the sound being measured;

c) recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of 3.3;

d) acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal shall be described in terms of its average and maximum root-mean-square (rms) value for non-overload signal level;

e) analysis equipment with the response and accuracy requirements of 3.4.

3.3 Sensing, recording and reproducing equipment

3.3.1 The sound produced by the aeroplane shall be recorded in such a way that the complete information, time history included, is retained. A magnetic tape recorder is acceptable.

3.3.2 The characteristics of the system shall comply with the recommendations given in International Electrotechnical Commission (IEC) Publication No. 179[3] with regard to the sections concerning microphone and amplifier characteristics.

Note.— The text and specifications of IEC Publication No. 179[3] entitled "Precision Sound Level Meters" are incorporated by reference into this appendix and are made a part hereof.[4]

3.3.3 The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude shall lie within the tolerance limits specified in IEC Publication No. 179,[3] over the frequency range 45 to 11 200 Hz.

3.3.4 If limitations of the dynamic range of the equipment make it necessary, high frequency pre-emphasis shall be added to the recording channel with the converse de-emphasis on playback. The pre-emphasis shall be so applied that the instantaneous recorded sound pressure level between 800 and 11 200 Hz of the maximum measured noise signal does not vary more than 20 dB between the levels of the maximum and minimum one-third octave bands.

3.3.5 The equipment shall be acoustically calibrated using facilities for acoustic free-field calibration and electronically calibrated as stated in 3.4.

3.3.6 A wind screen shall be employed with the microphone during all measurements of aeroplane noise when the wind speed is in excess of 11 km/h (6 kt). Corrections for any insertion loss produced by the wind screen, as a function of frequency, shall be applied to the measured data and the corrections applied shall be reported.

3.4 Analysis equipment

3.4.1 A frequency analysis of the acoustical signal shall be performed in a manner equivalent to using one-third octave filters complying with the recommendations given in IEC Publication No. 225.[3]

Note.— The text and specifications of IEC Publication No. 225[3] entitled "Octave, Half-Octave and Third-Octave Band Filters Intended for the Analysis of Sounds and Vibrations" are incorporated by reference into this appendix and are made a part hereof.[5]

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3. As amended.
4. This publication was first issued in 1965 by the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.
5. This publication was first issued in 1966 by the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.4.2 A set of 24 consecutive one-third octave filters or its equivalent shall be used. The first filter of the set shall be centred at a geometric mean frequency of 50 Hz and the last shall be centred at a geometric mean frequency of 10 kHz.

3.4.3 The analyser indicating device shall be analogue, digital, or a combination of both. The preferred sequence of signal processing shall be:

a) squaring the one-third octave filter outputs;

b) averaging or integrating; and

c) linear to logarithmic conversion.

The indicating device shall have a minimum crest factor capacity of 3 and shall measure, within a tolerance of ±1.0 dB, the true root-mean-square (rms) level of the signal in each of the 24 one-third octave bands. If other than a true rms device is utilized, it shall be calibrated for nonsinusoidal signals and time varying levels. The calibration shall provide means for converting the output levels to true rms values.

3.4.4 The dynamic response of the analyser to input signals of both full-scale and 20 dB less than full-scale amplitude shall conform to the following two requirements:

a) the maximum output value shall read 4 dB ± 1 dB less than the value obtained for a steady state signal of the same frequency and amplitude when a sinusoidal pulse of 0.5 s duration at the centre frequency of each one-third octave band is applied to the input;

b) the maximum output value shall exceed the final steady state value by 0.5 ± 0.5 dB when a steady state sinusoidal signal at the geometrical mean frequency of each one-third octave band is suddenly applied to the analyser input and held constant.

3.4.5 A single value of the rms level shall be provided every 0.5 ± 0.01 s for each of the 24 one-third octave bands. The levels from all of the 24 one-third octave bands shall be obtained within a 50 ms period. No more than 5 ms of data from any 0.5 s period shall be excluded from the measurement.

3.4.6 The amplitude resolution of the analyser shall be 0.50 dB or less.

3.4.7 Each output level from the analyser shall be accurate within ±1.0 dB with respect to the input signal, after all systematic errors have been eliminated. The total systematic errors for each of the output levels shall not exceed ±3 dB. For contiguous filter systems, the systematic correction between adjacent one-third octave channels shall not exceed 4 dB.

3.4.8 The dynamic range capability of the analyser for display of a single aeroplane noise event shall be at least 45 dB in terms of the difference between full-scale output level and the maximum noise level of the analyser equipment.

3.4.9 The complete electronic system shall be subjected to a frequency and amplitude electrical calibration by the use of sinusoidal or broadband signals at frequencies covering the range of 45 to 11 200 Hz, and of known amplitudes covering the range of signal levels furnished by the microphone. If broadband signals are used, they shall be described in terms of their average and maximum rms values for a non-overload signal level.

3.5 Noise measurement procedures

3.5.1 The microphones shall be oriented in a known direction so that the maximum sound received arrives as nearly as reasonable in the direction for which the microphones are calibrated. The microphones shall be placed so that their sensing elements are approximately 1.2 m (4 ft) above ground.

3.5.2 Immediately prior to and after each test, a recorded acoustic calibration of the system shall be made in the field with an acoustic calibrator for the two purposes of checking system sensitivity and providing an acoustic reference level for the analysis of the sound level data.

3.5.3 For the purpose of minimizing equipment or operator error, field calibrations shall be supplemented whenever practicable with the use of an insert voltage device to place a known signal at the input of the microphone, just prior to and after recording aeroplane noise data.

3.5.4 Background noise, including ambient noise and electrical noise of the measurement systems, shall be recorded and determined in the test area with the system gain set at levels which will be used for aeroplane noise measurements. If aeroplane sound pressure levels do not exceed background sound pressure levels by at least 10 dB in any significant one-third octave band, approved corrections for the contribution of background sound pressure level to the observed sound pressure level shall be applied.

4. CALCULATION OF EFFECTIVE PERCEIVED NOISE LEVEL FROM MEASURED NOISE DATA

4.1 General

4.1.1 The basic element in the noise certification criteria shall be the noise evaluation measure designated effective perceived noise level, EPNL, in units of EPNdB, which is a single number evaluator of the subjective effects of aeroplane noise on human beings. Simply stated, EPNL

Table A1-1. Noys as a function of sound pressure level (29<SPL<89)

SPL (dB)	One-third octave band centre frequencies (Hz)																						
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
29																			1.00	1.00				
30																		1.00	1.07	1.07	1.00			
31																		1.07	1.15	1.15	1.07	1.00		
32																	1.00	1.15	1.23	1.23	1.15	1.07		
33																	1.07	1.23	1.32	1.32	1.23	1.15		
34																1.00	1.15	1.32	1.41	1.41	1.32	1.23		
35																1.07	1.23	1.41	1.51	1.51	1.41	1.32		
36																1.15	1.32	1.51	1.62	1.62	1.51	1.41		
37																1.23	1.41	1.62	1.74	1.74	1.62	1.51	1.00	
38															1.00	1.32	1.51	1.74	1.86	1.86	1.74	1.62	1.10	
39															1.07	1.41	1.62	1.86	1.99	1.99	1.86	1.74	1.21	
40										1.00	1.00	1.00	1.00	1.00	1.15	1.51	1.74	1.99	2.14	2.14	1.99	1.86	1.34	
41										1.07	1.07	1.07	1.07	1.07	1.23	1.62	1.86	2.14	2.29	2.29	2.14	1.99	1.48	1.00
42									1.00	1.15	1.15	1.15	1.15	1.15	1.32	1.74	1.99	2.29	2.45	2.45	2.29	2.14	1.63	1.10
43									1.07	1.23	1.23	1.23	1.23	1.23	1.41	1.86	2.14	2.45	2.63	2.63	2.45	2.29	1.79	1.21
44								1.00	1.15	1.32	1.32	1.32	1.32	1.32	1.52	1.99	2.29	2.63	2.81	2.81	2.63	2.45	1.99	1.34
45								1.08	1.24	1.41	1.41	1.41	1.41	1.41	1.62	2.14	2.45	2.81	3.02	3.02	2.81	2.63	2.14	1.48
46							1.00	1.16	1.33	1.52	1.52	1.52	1.52	1.52	1.74	2.29	2.63	3.02	3.23	3.23	3.02	2.81	2.29	1.63
47							1.08	1.25	1.42	1.62	1.62	1.62	1.62	1.62	1.87	2.45	2.81	3.23	3.46	3.46	3.23	3.02	2.45	1.79
48						1.00	1.17	1.34	1.53	1.74	1.74	1.74	1.74	1.74	2.00	2.63	3.02	3.46	3.71	3.71	3.46	3.23	2.63	1.98
49						1.08	1.26	1.45	1.64	1.87	1.87	1.87	1.87	1.87	2.14	2.81	3.23	3.71	3.97	3.97	3.71	3.46	2.81	2.15
50						1.17	1.36	1.56	1.76	2.00	2.00	2.00	2.00	2.00	2.30	3.02	3.46	3.97	4.26	4.26	3.97	3.71	3.02	2.40
51					1.00	1.26	1.47	1.68	1.89	2.14	2.14	2.14	2.14	2.14	2.46	3.23	3.71	4.26	4.56	4.56	4.26	3.97	3.23	2.63
52					1.08	1.36	1.58	1.80	2.03	2.30	2.30	2.30	2.30	2.30	2.64	3.46	3.97	4.56	4.89	4.89	4.56	4.26	3.46	2.81
53				1.00	1.18	1.47	1.71	1.94	2.17	2.46	2.46	2.46	2.46	2.46	2.83	3.71	4.26	4.89	5.24	5.24	4.89	4.56	3.71	3.02
54				1.09	1.28	1.58	1.85	2.09	2.33	2.64	2.64	2.64	2.64	2.64	3.03	3.97	4.56	5.24	5.61	5.61	5.24	4.89	3.97	3.23
55				1.18	1.38	1.71	2.00	2.25	2.50	2.83	2.83	2.83	2.83	2.83	3.25	4.26	4.89	5.61	6.01	6.01	5.61	5.24	4.26	3.46
56			1.00	1.29	1.50	1.85	2.15	2.42	2.69	3.03	3.03	3.03	3.03	3.03	3.48	4.56	5.24	6.01	6.44	6.44	6.01	5.61	4.56	3.71
57			1.09	1.40	1.63	2.00	2.33	2.61	2.88	3.25	3.25	3.25	3.25	3.25	3.73	4.89	5.61	6.44	6.90	6.90	6.44	6.01	4.89	3.97
58			1.18	1.53	1.77	2.15	2.51	2.81	3.10	3.48	3.48	3.48	3.48	3.48	4.00	5.24	6.01	6.90	7.39	7.39	6.90	6.44	5.24	4.26
59			1.29	1.66	1.92	2.33	2.71	3.03	3.32	3.73	3.73	3.73	3.73	3.73	4.29	5.61	6.44	7.39	7.92	7.92	7.39	6.90	5.61	4.56
60		1.00	1.40	1.81	2.08	2.51	2.93	3.26	3.57	4.00	4.00	4.00	4.00	4.00	4.59	6.01	6.90	7.92	8.49	8.49	7.92	7.39	6.01	4.89
61		1.10	1.53	1.97	2.26	2.71	3.16	3.51	3.83	4.29	4.29	4.29	4.29	4.29	4.92	6.44	7.39	8.49	9.09	9.09	8.49	7.92	6.44	5.24
62		1.21	1.66	2.15	2.45	2.93	3.41	3.78	4.11	4.59	4.59	4.59	4.59	4.59	5.28	6.90	7.92	9.09	9.74	9.74	9.09	8.49	6.90	5.61
63		1.32	1.81	2.34	2.65	3.16	3.69	4.06	4.41	4.92	4.92	4.92	4.92	4.92	5.66	7.39	8.49	9.74	10.4	10.4	9.74	9.09	7.39	6.01
64	1.00	1.45	1.97	2.54	2.88	3.41	3.98	4.38	4.73	5.28	5.28	5.28	5.28	5.28	6.06	7.92	9.09	10.4	11.2	11.2	10.4	9.74	7.92	6.44
65	1.11	1.60	2.15	2.77	3.12	3.69	4.30	4.71	5.08	5.66	5.66	5.66	5.66	5.66	6.50	8.49	9.74	11.2	12.0	12.0	11.2	10.4	8.49	6.90
66	1.22	1.75	2.34	3.01	3.39	3.98	4.64	5.07	5.45	6.06	6.06	6.06	6.06	6.06	6.96	9.09	10.4	12.0	12.8	12.8	12.0	11.2	9.09	7.39
67	1.35	1.92	2.54	3.28	3.68	4.30	5.01	5.46	5.85	6.50	6.50	6.50	6.50	6.50	7.46	9.74	11.2	12.8	13.8	13.8	12.8	12.0	9.74	7.92
68	1.49	2.11	2.77	3.57	3.99	4.64	5.41	5.88	6.27	6.96	6.96	6.96	6.96	6.96	8.00	10.4	12.0	13.8	14.7	14.7	13.8	12.8	10.4	8.49
69	1.65	2.32	3.01	3.88	4.33	5.01	5.84	6.33	6.73	7.46	7.46	7.46	7.46	7.46	8.57	11.2	12.8	14.7	15.8	15.8	14.7	13.8	11.2	9.09
70	1.82	2.55	3.28	4.23	4.69	5.41	6.31	6.81	7.23	8.00	8.00	8.00	8.00	8.00	9.19	12.0	13.8	15.8	16.9	16.9	15.8	14.7	12.0	9.74
71	2.02	2.79	3.57	4.60	5.09	5.84	6.81	7.33	7.75	8.57	8.57	8.57	8.57	8.57	9.85	12.8	14.7	16.9	18.1	18.1	16.9	15.8	12.8	10.4
72	2.23	3.07	3.88	5.01	5.52	6,31	7.36	7.90	8.32	9.19	9.19	9.19	9.19	9.19	10.6	13.8	15.8	18.1	19.4	19.4	18.1	16.9	13.8	11.2
73	2.46	3.37	4.23	5.45	5.99	6.81	7.94	8.50	8.93	9.85	9.85	9.85	9.85	9.85	11.3	14.7	16.9	19.4	20.8	20.8	19.4	18.1	14.7	12.0
74	2.72	3.70	4.60	5.94	6.50	7.36	8.57	9.15	9.59	10.6	10.6	10.6	10.6	10.6	12.1	15.8	18.1	20.8	22.3	22.3	20.8	19.4	15.8	12.8
75	3.01	4.06	5.01	6.46	7.05	7.94	9.19	9.85	10.3	11.3	11.3	11.3	11.3	11.3	13.0	16.9	19.4	22.3	23.9	23.9	22.3	20.8	16.9	13.8
76	3.32	4.46	5.45	7.03	7.65	8.57	9.85	10.6	11.0	12.1	12.1	12.1	12.1	12.1	13.9	18.1	20.8	23.9	25.6	25.6	23.9	22.3	18.1	14.7
77	3.67	4.89	5.94	7.66	8.29	9.19	10.6	11.3	11.8	13.0	13.0	13.0	13.0	13.0	14.9	19.4	22.3	25.6	27.4	27.4	25.6	23.9	19.4	15.8
78	4.06	5.37	6.46	8.33	9.00	9.85	11.3	12.1	12.7	13.9	13.9	13.9	13.9	13.9	16.0	20.8	23.9	27.4	29.4	29.4	27.4	25.6	20.8	16.9
79	4.49	5.90	7.03	9.07	9.76	10.6	12.1	13.0	13.6	14.9	14.9	14.9	14.9	14.9	17.1	22.3	25.6	29.4	31.5	31.5	29.4	27.4	22.3	18.1
80	4.96	6.48	7.66	9.85	10.6	11.3	13.0	13.9	14.6	16.0	16.0	16.0	16.0	16.0	18.4	23.9	27.4	31.5	33.7	33.7	31.5	29.4	23.9	19.4
81	5.48	7.11	8.33	10.6	11.3	12.1	13.9	14.9	15.7	17.1	17.1	17.1	17.1	17.1	19.7	25.6	29.4	33.7	36.1	36.1	33.7	31.5	25.6	20.8
82	6.06	7.81	9.07	11.3	12.1	13.0	14.9	16.0	16.9	18.4	18.4	18.4	18.4	18.4	21.1	27.4	31.5	36.1	38.7	38.7	36.1	33.7	27.4	22.3
83	6.70	8.57	9.87	12.1	13.0	13.9	16.0	17.1	18.1	19.7	19.7	19.7	19.7	19.7	22.6	29.4	33.7	38.7	41.5	41.5	38.7	36.1	29.4	23.9
84	7.41	9.41	10.7	13.0	13.9	14.9	17.1	18.4	19.4	21.1	21.1	21.1	21.1	21.1	24.3	31.5	36.1	41.5	44.4	44.4	41.5	38.7	31.5	25.6
85	8.19	10.3	11.7	13.9	14.9	16.0	18.4	19.7	20.8	22.6	22.6	22.6	22.6	22.6	26.0	33.7	38.7	44.4	47.6	47.6	44.4	41.5	33.7	27.4
86	9.95	11.3	12.7	14.9	16.0	17.1	19.7	21.1	22.4	24.3	24.3	24.3	24.3	24.3	27.9	36.1	41.5	47.6	51.0	51.0	47.6	44.4	36.1	29.4
87	10.0	12.1	13.9	16.0	17.1	18.4	21.1	22.6	24.0	26.0	26.0	26.0	26.0	26.0	29.0	38.7	44.4	51.0	54.7	54.7	51.0	47.6	38.7	31.5
88	11.1	13.0	14.9	17.1	18.4	19.7	22.6	24.3	25.8	27.9	27.9	27.9	27.9	27.9	32.0	41.5	47.6	54.7	58.6	58.6	54.7	51.0	41.5	33.7
89	12.2	13.9	16.0	18.4	19.7	21.1	24.3	26.0	27.7	29.9	29.9	29.9	29.9	29.9	34.3	44.4	51.0	58.6	62.7	62.7	58.6	54.7	44.4	36.1

Table A1-1 (cont.). Noys as a function of sound pressure level (90<SPL<150)

SPL (dB)	One-third octave band centre frequencies (Hz)																						
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
90	13.5	14.9	17.1	19.7	21.1	22.6	26.0	27.9	29.7	32.0	32.0	32.0	32.0	32.0	36.8	47.6	54.7	62.7	67.2	67.2	62.7	58.6	47.6	38.7
91	14.9	16.0	18.4	21.1	22.6	24.3	27.9	29.9	31.8	34.3	34.3	34.3	34.3	34.3	39.4	51.0	58.6	67.2	72.0	72.0	67.2	62.7	51.0	41.5
92	16.0	17.1	19.7	22.6	24.3	26.0	29.9	32.0	34.2	36.8	36.8	36.8	36.8	36.8	42.2	54.7	62.7	72.0	77.2	77.2	72.0	67.2	54.7	44.4
93	17.1	18.4	21.1	24.3	26.0	27.9	32.0	34.3	36.7	39.4	39.4	39.4	39.4	39.4	45.3	58.6	67.2	77.2	82.7	82.7	77.2	72.0	58.6	47.6
94	18.4	19.7	22.6	26.0	27.9	29.9	34.3	36.8	39.4	42.2	42.2	42.2	42.2	42.2	48.5	62.7	72.0	82.7	88.6	88.6	82.7	77.2	62.7	51.0
95	19.7	21.1	24.3	27.9	29.9	32.0	36.8	39.4	42.2	45.3	45.3	45.3	45.3	45.3	52.0	67.2	77.2	88.6	94.9	94.9	88.6	82.7	67.2	54.7
96	21.1	22.6	26.0	29.9	32.0	34.3	39.4	42.2	45.3	48.5	48.5	48.5	48.5	48.5	55.7	72.0	82.7	94.9	102	102	94.9	88.6	72.0	58.6
97	22.6	24.3	27.9	32.0	34.3	36.8	42.2	45.3	48.5	52.0	52.0	52.0	52.0	52.0	59.7	77.2	88.6	102	109	109	102	94.9	77.2	62.7
98	24.3	26.0	29.9	34.3	36.8	39.4	45.3	48.5	52.0	55.7	55.7	55.7	55.7	55.7	64.0	82.7	94.9	109	117	117	109	102	82.7	67.2
99	26.0	27.9	32.0	36.8	39.4	42.2	48.5	52.0	55.7	59.7	59.7	59.7	59.7	59.7	68.6	88.6	102	117	125	125	117	109	88.6	72.0
100	27.9	29.9	34.3	39.4	42.2	45.3	52.0	55.7	59.7	64.0	64.0	64.0	64.0	64.0	73.5	94.9	109	125	134	134	125	117	94.9	77.2
101	29.9	32.0	36.8	42.2	45.3	48.5	55.7	59.7	64.0	68.6	68.6	68.6	68.6	68.6	78.8	102	117	134	144	144	134	125	102	82.7
102	32.0	34.3	39.4	45.3	48.5	52.0	59.7	64.0	68.6	73.5	73.5	73.5	73.5	73.5	84.4	109	125	144	154	154	144	134	109	88.6
103	34.3	36.8	42.2	48.5	52.0	55.7	64.0	68.6	73.5	78.8	78.8	78.8	78.8	78.8	90.5	117	134	154	165	165	154	144	117	94.9
104	36.8	39.4	45.3	52.0	55.7	59.7	68.6	73.5	78.8	84.4	84.4	84.4	84.4	84.4	97.0	125	144	165	177	177	165	154	125	102
105	39.4	42.2	48.5	55.7	59.7	64.0	73.5	78.8	84.4	90.5	90.5	90.5	90.5	90.5	104	134	154	177	189	189	177	165	134	109
106	42.2	45.3	52.0	59.7	64.0	68.6	78.8	84.4	90.5	97.0	97.0	97.0	97.0	97.0	111	144	165	189	203	203	189	177	144	117
107	45.3	48.5	55.7	64.0	68.6	73.5	84.4	90.5	97.0	104	104	104	104	104	119	154	177	203	217	217	203	189	154	125
108	48.5	52.0	59.7	68.6	73.5	78.8	90.5	97.0	104	111	111	111	111	111	128	165	189	217	233	233	217	203	165	134
109	52.0	55.7	64.0	73.5	78.8	84.4	97.0	104	111	119	119	119	119	119	137	177	203	233	249	249	233	217	177	144
110	55.7	59.7	68.6	78.8	84.4	90.5	104	111	119	128	128	128	128	128	147	189	217	249	267	267	249	233	189	154
111	59.7	64.0	73.5	84.4	90.5	97.0	111	119	128	137	137	137	137	137	158	203	233	267	286	286	267	249	203	165
112	64.0	68.6	78.8	90.5	97.0	104	119	128	137	147	147	147	147	147	169	217	249	286	307	307	286	267	217	177
113	68.6	73.5	84.4	97.0	104	111	128	137	147	158	158	158	158	158	181	233	267	307	329	329	307	286	233	189
114	73.5	78.8	90.5	104	111	119	137	147	158	169	169	169	169	169	194	249	286	329	352	352	329	307	249	203
115	78.8	84.4	97.0	111	119	128	147	158	169	181	181	181	181	181	208	267	307	352	377	377	352	329	267	217
116	84.4	90.5	104	119	128	137	158	169	181	194	194	194	194	194	223	286	329	377	404	404	377	352	286	233
117	90.5	97.0	111	128	137	147	169	181	194	208	208	208	208	208	239	307	352	404	433	433	404	377	307	249
118	97.0	104	119	137	147	158	181	194	208	223	223	223	223	223	256	329	377	433	464	464	433	404	329	267
119	104	111	128	147	158	169	194	208	223	239	239	239	239	239	274	352	404	464	497	497	464	433	352	286
120	111	119	137	158	169	181	208	223	239	256	256	256	256	256	294	377	433	497	533	533	497	464	377	307
121	119	128	147	169	181	194	223	239	256	274	274	274	274	274	315	404	464	533	571	571	533	497	404	329
122	128	137	158	181	194	208	239	256	274	294	294	294	294	294	338	433	497	571	611	611	571	533	433	352
123	137	147	169	194	208	223	256	274	294	315	315	315	315	315	362	464	533	611	655	655	611	571	464	377
124	147	158	181	208	223	239	274	294	315	338	338	338	338	338	388	497	571	655	702	702	655	611	497	404
125	158	169	194	223	239	256	294	315	338	362	362	362	362	362	416	533	611	702	752	752	702	655	533	433
126	169	181	208	239	256	274	315	338	362	388	388	388	388	388	446	571	655	752	806	806	752	702	571	464
127	181	194	223	256	274	294	338	362	388	416	416	416	416	416	478	611	702	806	863	863	806	752	611	497
128	194	208	239	274	294	315	362	388	416	446	446	446	446	446	512	655	752	863	925	925	863	806	655	533
129	208	223	256	294	315	338	388	416	446	478	478	478	478	478	549	702	806	925	991	991	925	863	702	571
130	223	239	274	315	338	362	416	446	478	512	512	512	512	512	588	752	863	991	1062	1062	991	925	752	611
131	239	256	294	338	362	388	446	478	512	549	549	549	549	549	630	806	925	1062	1137	1137	1062	991	806	655
132	256	274	315	362	388	416	478	512	549	588	588	588	588	588	676	863	991	1137	1219	1219	1137	1062	863	702
133	274	294	338	388	416	446	512	549	588	630	630	630	630	630	724	925	1062	1219	1306	1306	1219	1137	925	752
134	294	315	362	416	446	478	549	588	630	676	676	676	676	676	776	991	1137	1306	1399	1399	1306	1219	991	806
135	315	338	388	446	478	512	588	630	676	724	724	724	724	724	832	1062	1219	1399	1499	1499	1399	1306	1062	863
136	338	362	416	478	512	549	630	676	724	776	776	776	776	776	891	1137	1306	1499	1606	1606	1499	1399	1137	925
137	362	388	446	512	549	588	676	724	776	832	832	832	832	832	955	1219	1399	1606	1721	1721	1606	1499	1219	991
138	388	416	478	549	588	630	724	776	832	891	891	891	891	891	1024	1306	1499	1721	1844	1844	1721	1606	1306	1062
139	416	446	512	588	630	676	776	832	891	955	955	955	955	955	1098	1399	1606	1844	1975	1975	1844	1721	1399	1137
140	446	478	549	630	676	724	832	891	955	1024	1024	1024	1024	1024	1176	1499	1721	1975			1975	1844	1499	1219
141	478	512	588	676	724	776	891	955	1024	1098	1098	1098	1098	1098	1261	1606	1844					1975	1606	1306
142	512	549	630	724	776	832	955	1024	1098	1176	1176	1176	1176	1176	1351	1721	1975						1721	1399
143	549	588	676	776	832	891	1024	1098	1176	1261	1261	1261	1261	1261	1448	1844							1844	1499
144	588	630	724	832	891	955	1098	1176	1261	1351	1351	1351	1351	1351	1552	1975							1975	1606
145	630	676	776	891	955	1024	1176	1261	1351	1448	1448	1448	1448	1448	1664									1721
146	676	724	832	955	1024	1098	1261	1351	1448	1552	1552	1552	1552	1552	1783									1844
147	724	776	891	1024	1098	1176	1351	1448	1552	1664	1664	1664	1664	1664	1911									1975
148	776	832	955	1098	1176	1261	1448	1552	1664	1783	1783	1783	1783	1783	2048									
149	832	891	1024	1176	1261	1351	1552	1664	1783	1911	1911	1911	1911	1911										
150	891	955	1098	1261	1351	1448	1664	1783	1911	2048	2048	2048	2048	2048										

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shall consist of instantaneous perceived noise level, PNL, corrected for spectral irregularities (the correction, called "tone correction factor", is made for the maximum tone only at each increment of time) and for duration.

4.1.2 Three basic physical properties of sound pressure shall be measured: level, frequency distribution, and time variation. More specifically, the instantaneous sound pressure level in each of 24 one-third octave bands of the noise shall be required for each one-half second increment of time during the aeroplane flyover.

4.1.3 The calculation procedure which utilizes physical measurements of noise to derive the EPNL evaluation measure of subjective response shall consist of the following five steps:

a) the 24 one-third octave bands of sound pressure level are converted to perceived noisiness by means of a noy table.[6] The noy values are combined and then converted to instantaneous perceived noise levels, PNL(k);

b) a tone correction factor, $C(k)$, is calculated for each spectrum to account for the subjective response to the presence of spectral irregularities;

c) the tone correction factor is added to the perceived noise level to obtain tone corrected perceived noise levels, PNLT(k), at each one-half second increment of time:

$$\mathrm{PNLT}(k) = \mathrm{PNL}(k) + C(k)$$

The instantaneous values of tone corrected perceived noise level are derived and the maximum value, PNLTM, is determined;

d) a duration correction factor, D, is computed by integration under the curve of tone corrected perceived noise level versus time;

e) effective perceived noise level, EPNL, is determined by the algebraic sum of the maximum tone corrected perceived noise level and the duration correction factor:

$$\mathrm{EPNL} = \mathrm{PNLTM} + D.$$

6. See Table A1-1.

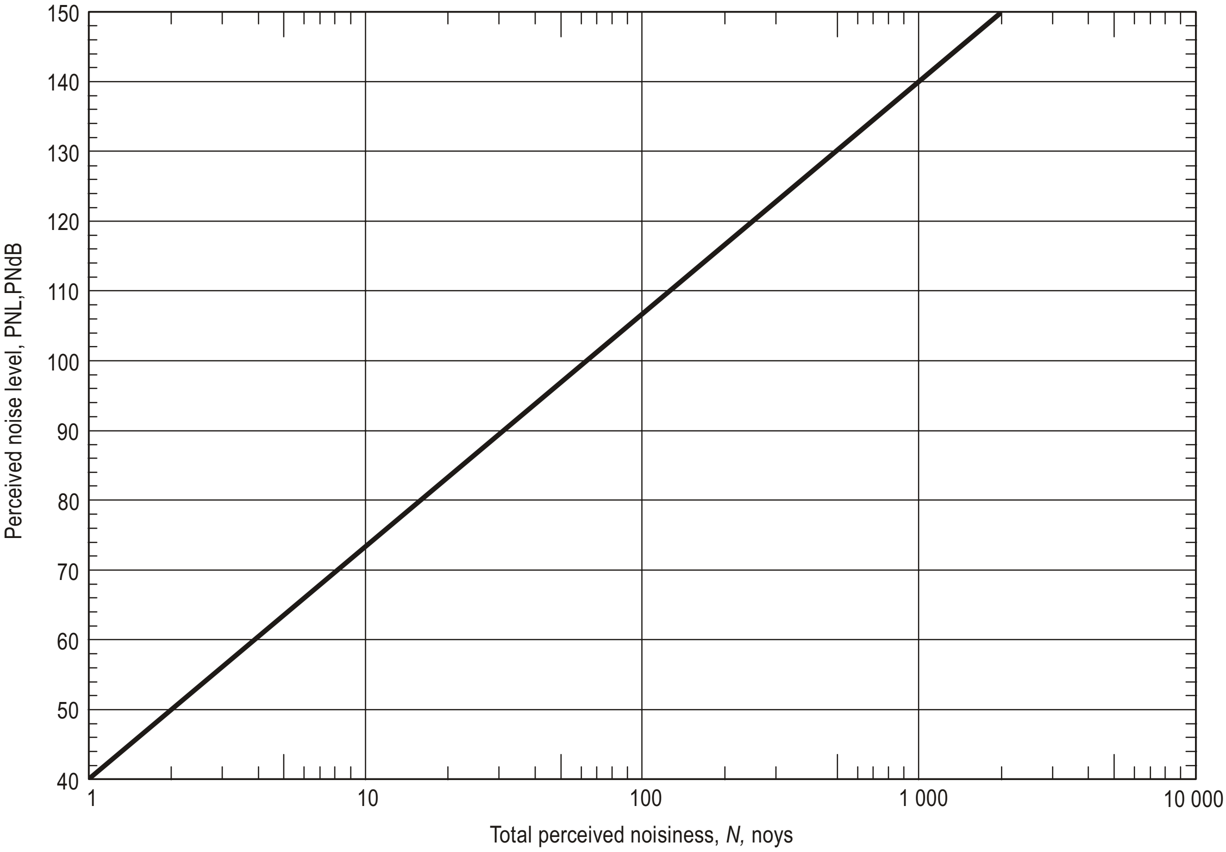


Figure A1-1. Perceived noise level as a function of total perceived noisiness

4.2 Perceived noise level

Instantaneous perceived noise levels, PNL(k), shall be calculated from instantaneous one-third octave band sound pressure levels, SPL(i,k), as follows:

Step 1. Convert each one-third octave band, SPL(i,k), from 50 to 10 000 Hz, to perceived noisiness, $n(i,k)$, by reference to Table A1-1, or to the mathematical formulation of the noy table given in Section 7.

Step 2. Combine the perceived noisiness values, $n(i,k)$, found in Step 1 by the following formula:

$$N(k) = n(k) + 0.15 \left\langle \left[\sum_{i=1}^{24} n\ (i,k)\right] - n(k) \right\rangle$$

$$= 0.85\ n(k) + 0.15 \sum_{i=1}^{24} n\ (i,k)$$

where $n(k)$ is the largest of the 24 values of $n(i,k)$, and $N(k)$ is the total perceived noisiness.

Step 3. Convert the total perceived noisiness, $N(k)$, into perceived noise level, PNL(k), by the following formula:

$$\mathrm{PNL}(k) = 40.0 + \frac{10}{\log 2} \log N(k)$$

which is plotted in Figure A1-1. PNL(k) may also be obtained by choosing $N(k)$ in the 1 000 Hz column of Table A1-1 and then reading the corresponding value of SPL(i,k) which, at 1 000 Hz, equals PNL(k).

4.3 Correction for spectral irregularities

Noise having pronounced spectral irregularities (for example, the maximum discrete frequency components or tones) shall be adjusted by the correction factor, $C(k)$, calculated as follows:

Step 1. Starting with the corrected sound pressure level in the 80 Hz one-third octave band (band number 3), calculate the changes in sound pressure level (or "slopes") in the remainder of the one-third octave bands as follows:

$s(3,k)$ = no value
$s(4,k)$ = SPL($4,k$) – SPL($3,k$)
•
•
•
$s(i,k)$ = SPL(i,k) – SPL[$(i–1),k$]
•
•
•
$s(24,k)$ = SPL($24,k$) – SPL($23,k$)

Step 2. Encircle the value of the slope, $s(i,k)$, where the absolute value of the change in slope is greater than five; that is, where:

$$|\Delta s\ (i,k)| = |s\ (i,k) - s\ [(i-1), k]| > 5$$

Step 3.

a) If the encircled value of the slope $s(i,k)$ is positive and algebraically greater than the slope $s[(i–1),k]$, encircle SPL(i,k).

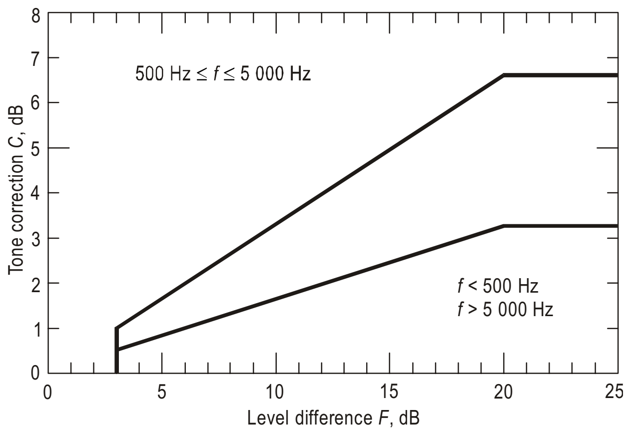
b) If the encircled value of the slope $s(i,k)$ is zero or negative and the slope $s[(i–1),k]$ is positive, encircle SPL[$(i–1),k$].

c) For all other cases, no sound pressure level value is to be encircled.

Step 4. Omit all SPL(i,k) encircled in Step 3 and compute new adjusted sound pressure levels, SPL′(i,k), as follows:

a) For non-encircled sound pressure levels, let the new sound pressure levels equal the original sound pressure levels, SPL′(i,k) = SPL(i,k).

Table A1-2. Tone correction factors



Frequency f, Hz	Level difference F, dB	Tone correction C, dB
$50 \leq f < 500$	$3^* \leq F < 20$ $20 \leq F$	$F/6$ 3⅓
$500 \leq f \leq 5\,000$	$3^* \leq F < 20$ $20 \leq F$	$F/3$ 6⅔
$5\,000 < f \leq 10\,000$	$3^* \leq F < 20$ $20 \leq F$	$F/6$ 3⅓

* See Step 8 of 4.3.

b) For encircled sound pressure levels in bands 1 to 23 inclusive, let the new sound pressure level equal the arithmetic average of the preceding and following sound pressure levels:

$$SPL'(i,k) = (1/2)\ \{\ SPL[(i-1),k] + SPL[(i+1),k]\ \}$$

c) If the sound pressure level in the highest frequency band (i = 24) is encircled, let the new sound pressure level in that band equal:

$$SPL'(24,k) = SPL(23,k) + s(23,k)$$

Step 5. Recompute new slopes $s'(i,k)$, including one for an imaginary 25th band, as follows:

$s'(3,k) = s'(4,k)$
$s'(4,k) = SPL'(4,k) - SPL'(3,k)$
•
•
•
$s'(i,k) = SPL'(i,k) - SPL'[(i-1),k]$
•
•
•
$s'(24,k) = SPL'(24,k) - SPL'(23,k)$
$s'(25,k) = s'(24,k)$

Step 6. For i from 3 to 23, compute the arithmetic average of the three adjacent slopes as follows:

$$\bar{s}(i,k) = (1/3)\ \{\ s'(i,k) + s'[(i+1),k] + s'[(i+2),k]\ \}$$

Step 7. Compute final one-third octave-band background sound pressure levels, $SPL''(i,k)$, by beginning with band number 3 and proceeding to band number 24 as follows:

$SPL''(3,k) = SPL(3,k)$
$SPL''(4,k) = SPL''(3,k) + \bar{s}(3,k)$
•
•
•
$SPL''(i,k) = SPL''[(i-1),k] + \bar{s}(i-1),k]$
•
•
•
$SPL''(24,k) = SPL''(23,k) + \bar{s}(23,k)$

Step 8. Calculate the differences, $F(i,k)$, between the original sound pressure level and the final background sound pressure level as follows:

$$F(i,k) = SPL(i,k) - SPL''(i,k)$$

and note only values equal to or greater than three.

Step 9. For each of the relevant one-third octave bands (3 to 24), determine tone correction factors from the sound pressure level differences, $F(i,k)$, and Table A1-2.

Step 10. Designate the largest of the tone correction factors, determined in Step 9, as $C(k)$. An example of the tone correction procedure is given in Table A1-3.

Tone corrected perceived noise levels PNLT(k) shall be determined by adding the $C(k)$ values to corresponding PNLT(k) values, that is:

$$PNLT(k) = PNL(k) + C(k)$$

For any i-th one-third octave band, at any k-th increment of time, for which the tone correction factor is suspected to result from something other than (or in addition to) an actual tone (or any spectral irregularity other than aeroplane noise), an additional analysis shall be made using a filter with a bandwidth narrower than one-third of an octave. If the narrow band analysis corroborates these suspicions, then a revised value for the background sound pressure level, $SPL''(i,k)$, shall be determined from the narrow band analysis and used to compute a revised tone correction factor for that particular one-third octave band.

4.4 Maximum tone corrected perceived noise level

4.4.1 The maximum tone corrected perceived noise level, PNLTM, shall be the maximum calculated value of the tone corrected perceived noise level PNLT(k). It shall be calculated in accordance with the procedure of 4.3. To obtain a satisfactory noise time history, measurements shall be made at half-second time intervals.

Note.— Figure A1-2 is an example of a flyover noise time history where the maximum value is clearly indicated.

4.4.2 If there are no pronounced irregularities in the spectrum, even when examined by a narrow band analysis, then the procedure of 4.3 shall be disregarded since PNLT(k) would be identically equal to PNL(k). For this case, PNLTM shall be the maximum value of PNL(k) and would equal PNLM.

4.5 Duration correction

4.5.1 The duration correction factor, D, determined by the integration technique shall be defined by the expression:

$$D = 10\log\left[\left(\frac{1}{T}\right)\int_{t(1)}^{t(2)} \text{antilog}\ \frac{\text{PNLT}}{10}\ dt\right] - \text{PNLTM}$$

where T is a normalizing time constant, and PNLTM is the maximum value of PNLT.

Table A1-3. Example of tone correction calculation for a turbofan engine

1	2	3	4	5	6	7	8	9	10	11
Band (i)	f Hz	SPL dB	S dB Step 1	1ΔS1 dB Step 2	SPL′ dB Step 4	S′ dB Step 5	$\bar{s}$ dB Step 6	SPL″ dB Step 7	F dB Step 8	C dB Step 9
1	50	—	—	—	—	—	—	—	—	—
2	63	—	—	—	—	—	—	—	—	—
3	80	70	—	—	70	–8	–2⅓	70	—	
4	100	62	–8	—	62	–8	+3⅓	67⅔	—	
5	125	70	+8	16	71	+9	+6⅔	71	—	
6	160	80	+10	2	80	+9	+2⅔	77⅔	—	
7	200	82	+2	8	82	+2	–1⅓	80⅓	—	
8	250	83	+1	1	79	–3	–1⅓	79	4	⅔
9	315	76	–7	8	76	–3	+⅓	77⅔	—	
10	400	80	+4	11	78	+2	+1	78	—	
11	500	80	0	4	80	+2	0	79	—	
12	630	79	–1	1	79	–1	0	79	—	
13	800	78	–1	0	78	–1	–⅓	79	—	
14	1 000	80	+2	3	80	+2	–⅔	78⅔	—	
15	1 250	78	–2	4	78	–2	–⅓	78	—	
16	1 600	76	–2	0	76	–2	+⅓	77⅔	—	
17	2 000	79	+3	5	79	+3	+1	78	—	
18	2 500	85	+6	3	79	0	–⅓	79	6	2
19	3 150	79	–6	12	79	0	–2⅔	78⅔	—	
20	4 000	78	–1	5	78	–1	–6⅓	76	—	
21	5 000	71	–7	6	71	–7	–8	69⅔	—	
22	6 300	60	–11	4	60	–11	–8⅔	61⅔	—	
23	8 000	54	–6	5	54	–6	–8	53	—	
24	10 000	45	–9	3	45	–9	—	45	—	
						–9				

Step 1	3 (i) – 3 (i – 1)
Step 2	| 4 (i) – 4 (i – 1)|
Step 3	see instructions
Step 4	see instructions
Step 5	6 (i) – 6 (i – 1)

Step 6	[7 (i) + 7 (i + 1) + + 7 (i + 2)] ÷ 3
Step 7	9 (i – 1) + 8 (i – 1)
Step 8	3 (i) – 9 (i)
Step 9	see Table A1-2

4.5.1.1 If PNLTM is greater than 100 TPNdB, $t(1)$ shall be the first point of time after which PNLT becomes greater than PNLTM – 10 and $t(2)$ shall be the point of time after which PNLT remains constantly less than PNLTM – 10.

4.5.1.2 If PNLTM is less than 100 TPNdB, $t(1)$ shall be the first point of time after which PNLT becomes greater than 90 TPNdB and $t(2)$ shall be the point of time after which PNLT remains constantly less than 90 TPNdB.

4.5.1.3 If PNLTM is less than 90 TPNdB, the duration correction shall be taken as equal to 0.

4.5.2 Since PNLT is calculated from measured values of SPL, there will, in general, be no obvious equation for PNLT as a function of time. Consequently, the equation shall be rewritten with a summation sign instead of an integral sign as follows:

$$\mathrm{D} = 10 \log \left[\left(\frac{1}{T}\right) \sum_{k=0}^{d/\Delta t} \Delta t \cdot \operatorname{antilog} \frac{\mathrm{PNLT}(k)}{10} \right] - \mathrm{PNLTM}$$

where Δt is the length of the equal increments of time for which PNLT(k) is calculated and d is the time interval to the nearest 1.0 second during which PNLT(k) remains greater or equal either to PNLTM – 10 or to 90 according to the cases specified in 4.5.1.1 to 4.5.1.3.

4.5.3 To obtain a satisfactory history of the perceived noise level,

a) half-second time intervals for Δt, or

b) a shorter time interval with approved limits and constants,

shall be used.

4.5.4 The following values for T and Δt shall be used in calculating D in the procedure given in 4.5.2:

T = 10 s, and
Δt = 0.5 s

Using the above values, the equation for D becomes

$$\mathrm{D} = 10 \log \left[\sum_{k=0}^{2d} \operatorname{antilog} \frac{\mathrm{PNLT}(k)}{10} \right] - \mathrm{PNLTM} - 13$$

where the integer d is the duration time defined by the points corresponding to the values PNLTM – 10 or 90 as the case may be.

4.5.5 If in the procedures given in 4.5.2, the limits of PNLTM – 10 or 90 fall between the calculated PNLT(k) values (the usual case), the PNLT(k) values defining the

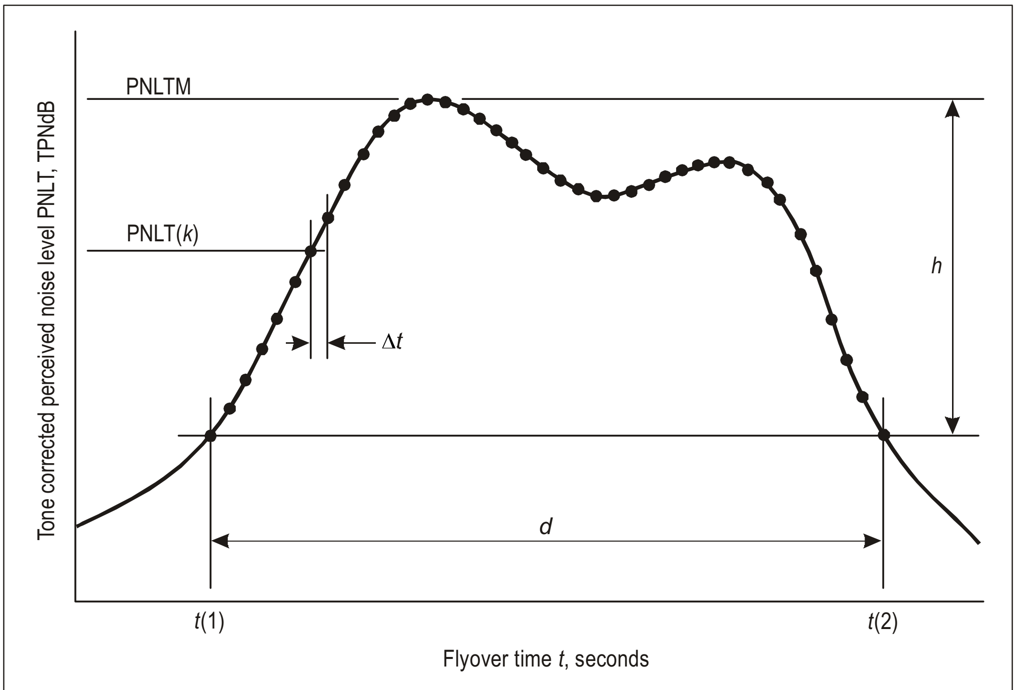


Figure A1-2. Example of perceived noise level corrected for tones as a function of aircraft flyover time

limits of the duration interval shall be chosen from the PNLT(k) values closest to PNLTM – 10 or 90 as the case may be.

4.6 Effective perceived noise level

The total subjective effect of an aeroplane flyover, designated "effective perceived noise level", EPNL, shall be equal to the algebraic sum of the maximum value of the tone corrected perceived noise level, PNLTM, and the duration correction, D. That is:

$$\mathrm{EPNL} = \mathrm{PNLTM} + D$$

where PNLTM and D are calculated in accordance with the procedures given in 4.2, 4.3, 4.4 and 4.5. If the duration correction D is negative and greater than PNLTM – 90 in absolute values, D shall be taken as equal to 90 – PNLTM.

5. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY AND CORRECTING MEASURED DATA

5.1 General

Data representing physical measurements or corrections to measured data shall be recorded in permanent form and appended to the record except that corrections to measurements for normal equipment response deviations need not be reported. All other corrections shall be approved. Attempts shall be made to keep to a minimum the individual errors inherent in each of the operations employed in obtaining the final data.

5.2 Data reporting

5.2.1 Measured and corrected sound pressure levels shall be presented in one-third octave band levels obtained with equipment conforming to the Standards described in Section 3 of this appendix.

5.2.2 The type of equipment used for measurement and analysis of all acoustic aeroplane performance and meteorological data shall be reported.

5.2.3 The following atmospheric environmental data, measured immediately before, after, or during each test at the observation points prescribed in Section 2 of this appendix shall be reported:

a) air temperature and relative humidity;

b) maximum, minimum and average wind velocities;

c) atmospheric pressure.

5.2.4 Comments on local topography, ground cover, and events that might interfere with sound recordings shall be reported.

5.2.5 The following aeroplane information shall be reported:

a) type, model, serial numbers (if any) of aeroplane and engines;

b) gross dimensions of aeroplane and location of engines;

c) aeroplane gross mass for each test run;

d) aeroplane configuration such as flap and landing gear position;

e) indicated airspeed in kilometres per hour (knots);

f) engine performance in terms of net thrust, engine pressure ratios, jet exhaust temperatures and fan or compressor shaft rotational speeds as determined from aeroplane instruments and manufacturer's data;

g) aeroplane height above ground determined by a method independent of cockpit instrumentation, such as radar tracking, theodolite triangulation or photographic scaling techniques, to be approved by the certification authorities.

5.2.6 Aeroplane speed and position and engine performance parameters shall be recorded at an approved sampling rate sufficient to correct to the noise certification reference conditions prescribed in this section and shall be synchronized with the noise measurement.

5.2.6.1 Lateral position relative to the extended centre line of the runway, configuration and gross mass shall be reported.

5.3 Noise certification reference conditions

Aeroplane position and performance data and the noise measurements shall be corrected to the following noise certification reference conditions:

a) meteorological conditions:

1) sea level atmospheric pressure of 1 013.25 hPa;

2) ambient air temperature of 25°C, i.e. ISA + 10°C except that, at the discretion of the certificating authority, an alternative reference ambient air temperature of 15°C, i.e. ISA may be used;

3) relative humidity of 70 per cent; and

4) zero wind;

b) aeroplane conditions:

1) maximum take-off mass and landing mass at which noise certification is requested;

2) approach angle of 3°; and

3) aeroplane height of 120 m (394 ft) above the approach noise measuring station.

5.4 Data correction

5.4.1 The noise data shall be corrected to the noise certification reference conditions as stated in 5.3. The measured atmospheric conditions shall be those obtained in accordance with Section 2 of this appendix. Atmospheric attenuation of sound requirements are given in Section 8 of this appendix. If a reference ambient air temperature of 15°C is used (see 5.3 a) 2)) a further correction of +1 EPNdB shall be added to the noise levels obtained at the flyover measurement point.

5.4.2 The measured flight path shall be corrected by an amount equal to the difference between the applicant's predicted flight paths for the test conditions and for the noise certification reference conditions.

Note.— Necessary corrections relating to aeroplane flight path or performance may be derived from approved data other than certification test data.

5.4.2.1 The flight path correction procedure for approach noise shall be made with reference to a fixed aeroplane reference height and the reference approach angle. The effective perceived noise level correction shall be less than 2 EPNdB to allow for:

a) the aeroplane not passing vertically above the measuring point;

b) the difference between the reference height and the height of the aeroplane's ILS antenna from the approach measuring point; and

c) the difference between the reference and the test approach angles.

Note.— Detailed correction requirements are given in Section 9 of this appendix.

5.4.3 Test results on specific measurement shall not be accepted if the difference in EPNL computed from measured data and that corrected to reference conditions exceeds 15 EPNdB.

5.4.4 If aeroplane sound pressure levels do not exceed the ambient sound pressure levels by at least 10 dB in any one-third octave band, approved corrections for the contribution of ambient sound pressure level to the observed sound pressure level shall be applied.

5.5 Validity of results

5.5.1 Three average EPNL values and their 90 per cent confidence limits shall be produced from the test results, each such value being the arithmetical average of the corrected acoustical measurements for all valid test runs at the appropriate measurement point (take-off, approach or sideline). If more than one acoustic measurement system is used at any single measurement location (such as for the symmetrical sideline measuring points), the resulting data for each test run shall be averaged as a single measurement.

5.5.2 The minimum sample size acceptable for each of the three certification measuring points shall be six. The samples shall be large enough to establish statistically for each of the three average noise certification levels a 90 per cent confidence limit not exceeding ±1.5 EPNdB. No test result shall be omitted from the average process unless otherwise specified by the certification authorities.

5.5.3 The average EPNL values and their 90 per cent confidence limits obtained by the foregoing process shall be those by which the noise performance of the aeroplane is assessed against the noise certification criteria, and shall be reported.

6. NOMENCLATURE

6.1 Symbols and units

Note.— The meanings of the various symbols in this appendix are as follows. It is recognized that differences may exist in the units and meanings of similar symbols in Appendix 2.

Symbol	*Unit*	*Meaning*
antilog	—	*Antilogarithm to the base 10.*
$C(k)$	dB	*Tone correction factor.* The factor to be added to PNL(k) to account for the presence of spectral irregularities such as tones at the k-th increment of time.
d	s	*Duration time.* The length of the significant noise time history being the time interval between the limits of $t(1)$ and $t(2)$ to the nearest second.
D	dB	*Duration correction.* The factor to be added to PNLTM to account for the duration of the noise.
EPNL	EPNdB	*Effective perceived noise level.* The value of PNL adjusted for both the spectral irregularities and the duration of the noise. (The unit EPNdB is used instead of the unit dB.)
$f(i)$	Hz	*Frequency.* The geometrical mean frequency for the i-th one-third octave band.
$F(i,k)$	dB	*Delta-dB.* The difference between the original sound pressure level and the final background sound pressure level in the i-th one-third octave band at the k-th interval of time.
h	dB	*dB-down.* The level to be subtracted from PNLTM that defines the duration of the noise.
H	%	*Relative humidity.* The ambient atmospheric relative humidity.
i	—	*Frequency band index.* The numerical indicator that denotes any one of the 24 one-third octave bands with geometrical mean frequencies from 50 to 10 000 Hz.
k	—	*Time increment index.* The numerical indicator that denotes the number of equal time increments that have elapsed from a reference zero.
log	—	*Logarithm to the base 10.*
log $n(a)$	—	*Noy discontinuity coordinate.* The log n value of the intersection point of the straight lines representing the variation of SPL with log n.
$M(b)$, $M(c)$, etc.	—	*Noy inverse slope.* The reciprocals of the slopes of straight lines representing the variation of SPL with log n.
n	noy	*Perceived noisiness.* The perceived noisiness at any instant of time that occurs in a specified frequency range.
$n(i,k)$	noy	*Perceived noisiness.* The perceived noisiness at the k-th instant of time that occurs in the i-th one-third octave band.
$n(k)$	noy	*Maximum perceived noisiness.* The maximum value of all of the 24 values of $n(i)$ that occurs at the k-th instant of time.
$N(k)$	noy	*Total perceived noisiness.* The total perceived noisiness at the k-th instant of time calculated from the 24 instantaneous values of $n(i,k)$.
$p(b)$, $p(c)$, etc.	—	*Noy slope.* The slopes of straight lines representing the variation of SPL with log n.
PNL	PNdB	*Perceived noise level.* The perceived noise level at any instant of time. (The unit PNdB is used instead of the unit dB.)

Symbol	*Unit*	*Meaning*
PNL(k)	PNdB	*Perceived noise level.* The perceived noise level calculated from the 24 values of SPL(i,k) at the k-th increment of time. (The unit PNdB is used instead of the unit dB.)
PNLM	PNdB	*Maximum perceived noise level.* The maximum value of PNL(k). (The unit PNdB is used instead of the unit dB.)
PNLT	TPNdB	*Tone corrected perceived noise level.* The value of PNL adjusted for the spectral irregularities that occur at any instant of time. (The unit TPNdB is used instead of the unit dB.)
PNLT(k)	TPNdB	*Tone corrected perceived noise level.* The value of PNL(k) adjusted for the spectral irregularities that occur at the k-th increment of time. (The unit TPNdB is used instead of the unit dB.)
PNLTM	TPNdB	*Maximum tone corrected perceived noise level.* The maximum value of PNLT(k). (The unit TPNdB is used instead of the unit dB.)
$s(i,k)$	dB	*Slope of sound pressure level.* The change in level between adjacent one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
$\Delta s(i,k)$	dB	*Change in slope of sound pressure level.*
$s'(i,k)$	dB	*Adjusted slope of sound pressure level.* The change in level between adjacent adjusted one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
$\bar{s}(i,k)$	dB	*Average slope of sound pressure level.*
SPL	dB re 20 μPa	*Sound pressure level.* The sound pressure level at any instant of time that occurs in a specified frequency range.
SPL(a)	dB re 20 μPa	*Noy discontinuity coordinate.* The SPL value of the intersection point of the straight lines representing the variation of SPL with log n.
SPL(b) SPL(c)	dB re 20 μPa	*Noy intercept.* The intercepts on the SPL-axis of the straight lines representing the variation of SPL with log n.
SPL(i,k)	dB re 20 μPa	*Sound pressure level.* The sound pressure level at the k-th instant of time that occurs in the i-th one-third octave band.
SPL′(i,k)	dB re 20 μPa	*Adjusted sound pressure level.* The first approximation to background sound pressure level in the i-th one-third octave band for the k-th instant of time.
SPL(i)	dB re 20 μPa	*Maximum sound pressure level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM.
SPL$(i)_c$	dB re 20 μPa	*Corrected maximum sound pressure level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM corrected for atmospheric sound absorption.
SPL″(i,k)	dB re 20 μPa	*Final background sound pressure level.* The second and final approximation to background sound pressure level in the i-th one-third octave band for the k-th instant of time.
t	s	*Elapsed time.* The length of time measured from a reference zero.
$t1$, $t2$	s	*Time limit.* The beginning and end of the significant noise time history defined by h.
Δt	s	*Time increment.* The equal increments of time for which PNL(k) and PNLT(k) are calculated.
T	s	*Normalizing time constant.* The length of time used as a reference in the integration method for computing duration corrections, where $T = 10$ s.
t(°C)	°C	*Temperature.* The ambient atmospheric temperature.
$\alpha(i)$	dB/100 m	*Test atmospheric absorption.* The atmospheric attenuation of sound that occurs in the i-th one-third octave band for the measured atmospheric temperature and relative humidity.

Symbol	*Unit*	*Meaning*
$\alpha(i)_o$	dB/100 m	*Reference atmospheric absorption.* The atmospheric attenuation of sound that occurs in the *i*-th one-third octave band for a reference atmospheric temperature and relative humidity.
ß	degrees	*First constant* climb angle.*
γ	degrees	*Second constant** climb angle.*
δ ε	degrees degrees	*Thrust cutback angles.* The angles defining the points on the take-off flight path at which thrust reduction is started and ended respectively.
η	degrees	*Approach angle.*
η_r	degrees	*Reference approach angle.*
θ	degrees	*Take-off noise angle.* The angle between the flight path and noise path for take-off operations. It is identical for both measured and corrected flight paths.
λ	degrees	*Approach noise angle.* The angle between the flight path and the noise path for approach operations. It is identical for both measured and corrected flight paths.
Δ_1	EPNdB	*PNLT correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences in atmospheric absorption and noise path length between reference and test conditions.
Δ_2	EPNdB	*Noise path duration correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to the noise duration because of differences in flyover altitude between reference and test conditions.
Δ_3	EPNdB	*Mass correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences between maximum mass and actual mass of the test aeroplane.
Δ_4	EPNdB	*Approach angle correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences between the reference and the test approach angles.
ΔAB Δß $\Delta\gamma$ $\Delta\delta$ $\Delta\varepsilon$	metres degrees degrees degrees degrees	*Take-off profile changes.* The algebraic changes in the basic parameters defining the take-off profile due to differences between reference and test conditions.

* Gear up, speed of at least V_2 + 19 km/h (V_2 + 10 kt), take-off thrust.
** Gear up, speed of at least V_2 + 19 km/h (V_2 + 10 kt), after cutback.

6.2 Flight profile identification positions

Position	*Description*
A	Start of take-off roll.
B	Lift-off.
C	Start of first constant climb.
D	Start of thrust reduction.
E	Start of second constant climb.
E_c	Start of second constant climb on corrected flight path.
F	End of noise certification take-off flight path.
F_c	End of noise certification corrected take-off flight path.
G	Start of noise certification approach flight path.
G_r	Start of noise certification approach on reference flight path.
H	Position on approach path directly above noise measuring station.
H_r	Position on reference approach path directly above noise measuring station.
I	Start of level-off.
I_r	Start of level-off on reference approach flight path.
J	Touchdown.

Position	*Description*
K	Flyover noise measurement point.
L	Lateral noise measurement point(s) (not on flight track).
M	End of noise certification take-off flight track.
N	Approach noise measurement point.
O	Threshold of approach end of runway.
P	Start of noise certification approach flight track.
Q	Position on measured take-off flight path corresponding to apparent PNLTM at station K. See 9.2.
Q_c	Position on corrected take-off flight path corresponding to PNLTM at station K. See 9.2.
R	Position on measured take-off flight path nearest to station K.
R_c	Position on corrected take-off flight path nearest to station K.
S	Position on measured approach flight path corresponding to PNLTM at station N.
S_r	Position on reference approach flight path corresponding to PNLTM at station N.
T	Position on measured approach flight path nearest to station N.
T_r	Position on reference approach flight path nearest to station N.
X	Position on measured take-off flight path corresponding to PNLTM at station L.

6.3 Flight profile distances

Distance	*Unit*	*Meaning*
AB	metres	*Length of take-off roll.* The distance along the runway between the start of take-off roll and lift-off.
AK	metres	*Take-off measurement distance.* The distance from the start of roll to the take-off noise measurement station along the extended centre line of the runway.
AM	metres	*Take-off flight track distance.* The distance from the start of roll to the take-off flight track position along the extended centre line of the runway for which the position of the aeroplane need no longer be recorded.
KQ	metres	*Measured take-off noise path.* The distance from station K to the measured aeroplane position Q.
KQ_c	metres	*Corrected take-off noise path.* The distance from station K to the corrected aeroplane position Q_c.
KR	metres	*Measured take-off minimum distance.* The distance from station K to point R on the measured flight path.
KR_c	metres	*Corrected take-off minimum distance.* The distance from station K to point R_c on the corrected flight path.
LX	metres	*Measured sideline noise path.* The distance from station L to the measured aeroplane position X.
NH	metres (feet)	*Aeroplane approach height.* The height of the aeroplane above the approach measuring station.
NH_r	metres (feet)	*Reference approach height.* The height of the reference approach path above the approach measuring station.
NS	metres	*Measured approach noise path.* The distance from station N to the measured aeroplane position S.
NS_r	metres	*Reference approach noise path.* The distance from station N to the reference aeroplane position S_r.
NT	metres	*Measured approach minimum distance.* The distance from station N to point T on the measured flight path.
NT_r	metres	*Reference approach minimum distance.* The distance from station N to point T_r on the corrected flight path.
ON	metres	*Approach measurement distance.* The distance from the runway threshold to the approach measurement station along the extended centre line of the runway.
OP	metres	*Approach flight track distance.* The distance from the runway threshold to the approach flight track position along the extended centre line of the runway for which the position of the aeroplane need no longer be recorded.

7. MATHEMATICAL FORMULATION OF NOY TABLES

Note 1.— The relationship between sound pressure level and perceived noisiness given in Table A1-1 is illustrated in Figure A1-3. The variation of SPL *with* log *n for a given one-third octave band is expressed by either one or two straight lines depending upon the frequency range. Figure A1-3 a) illustrates the double line case for frequencies below 400 Hz and above 6 300 Hz and Figure A1-3 b) illustrates the single line case for all other frequencies.*

The important aspects of the mathematical formulation are:

a) the slopes of the straight lines p(b) and p(c);

b) the intercepts of the lines on the SPL*-axis,* SPL*(b) and* SPL*(c); and* *c) the coordinates of the discontinuity,* SPL*(a) and* log *n(a).*

Note 2.— Mathematically the relationship is expressed as follows:

Case 1: Figure A1-3 a): $f < 400$ Hz
$f > 6\ 300$ Hz

$$\mathrm{SPL}(a) = \frac{p(c)\ \mathrm{SPL}(b) - p(b)\ \mathrm{SPL}(c)}{p(c) - p(b)}$$

$$\log n(a) = \frac{\mathrm{SPL}(c) - \mathrm{SPL}(b)}{p(b) - p(c)}$$

a) $\mathrm{SPL} < \mathrm{SPL}(a)$

$$n = \mathrm{antilog}\ \frac{\mathrm{SPL} - \mathrm{SPL}(b)}{p(b)}$$

b) $\mathrm{SPL} \geq \mathrm{SPL}(a)$

$$n = \mathrm{antilog}\ \frac{\mathrm{SPL} - \mathrm{SPL}(c)}{p(c)}$$

c) $\log n < \log n(a)$

$$\mathrm{SPL} = p(b) \log n + \mathrm{SPL}(b)$$

d) $\log n \geq \log n(a)$

$$\mathrm{SPL} = p(c) \log n + \mathrm{SPL}(c)$$

Case 2: Figure A1-3 b): $400 \leq f \leq 6\ 300$ Hz

$$n = \mathrm{antilog}\ \frac{\mathrm{SPL} - \mathrm{SPL}(c)}{p(c)}$$

$$\mathrm{SPL} = p(c) \log n + \mathrm{SPL}(c)$$

Note 3.— If the reciprocals of the slopes are defined as:

$$M(b) = 1/p(b)$$

$$M(c) = 1/p(c)$$

the equations in Note 2 can be written,

Case 1: Figure A1-3 a): $f < 400$ Hz
$f > 6\ 300$ Hz

$$\mathrm{SPL}(a) = \frac{M(b)\ \mathrm{SPL}(b) - M(c)\ \mathrm{SPL}(c)}{M(b) - M(c)}$$

$$\log n(a) = \frac{M(b)\ M(c)\ [\mathrm{SPL}(c) - \mathrm{SPL}(b)]}{M(c) - M(b)}$$

a) $\mathrm{SPL} < \mathrm{SPL}(a)$

$$n = \mathrm{antilog}\ M(b)\ [\mathrm{SPL} - \mathrm{SPL}(b)]$$

b) $\mathrm{SPL} \geq \mathrm{SPL}(a)$

$$n = \mathrm{antilog}\ M(c)\ [\mathrm{SPL} - \mathrm{SPL}(c)]$$

c) $\log n < \log n(a)$

$$\mathrm{SPL} = \frac{\log n}{M(b)} + \mathrm{SPL}(b)$$

d) $\log n \geq \log n(a)$

$$\mathrm{SPL} = \frac{\log n}{M(c)} + \mathrm{SPL}(c)$$

Case 2: Figure A1-3 b): $400 \leq f \leq 6\ 300$ Hz

$$n = \mathrm{antilog}\ M(c)\ [\mathrm{SPL} - \mathrm{SPL}(c)]$$

$$\mathrm{SPL} = \frac{\log n}{M(c)} + \mathrm{SPL}(c)$$

Note 4.— Table A1-4 lists the values of the important constants necessary to calculate sound pressure level as a function of perceived noisiness.

8. SOUND ATTENUATION IN AIR

8.1 The atmospheric attenuation of sound shall be determined in accordance with the procedure presented below.

8.2 The relationship between sound attenuation, frequency, temperature and humidity is expressed by the following equations:

$$\alpha(i) = 10^{[2.05 \log (f_o/1000) + 1.1394 \times 10^{-3}\theta - 1.916984]} + \eta(\delta) \times 10^{[\log (f_o) + 8.42994 \times 10^{-3}\theta - 2.755624]}$$

$$\delta = \sqrt{\frac{1010}{f_o}}\ 10^{(\log H - 1.328924 + 3.179768 \times 10^{-2}\theta)} \times 10^{(-2.173716 \times 10^{-4}\theta^2 + 1.7496 \times 10^{-6}\theta^3)}$$

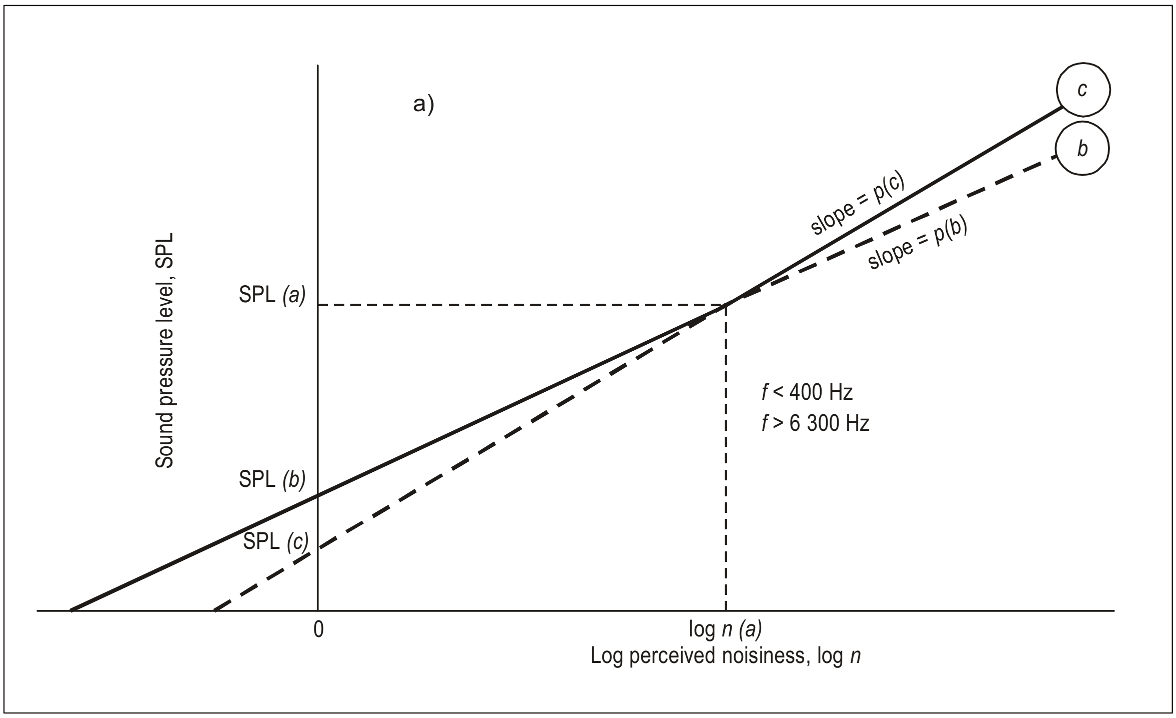
where:

$\eta(\delta)$ is given by Table A1-5 and f_o by Table A1-6;

$\alpha(i)$ being the attenuation coefficient in dB/100 m;

θ being the temperature in °C; and

H being the relative humidity.



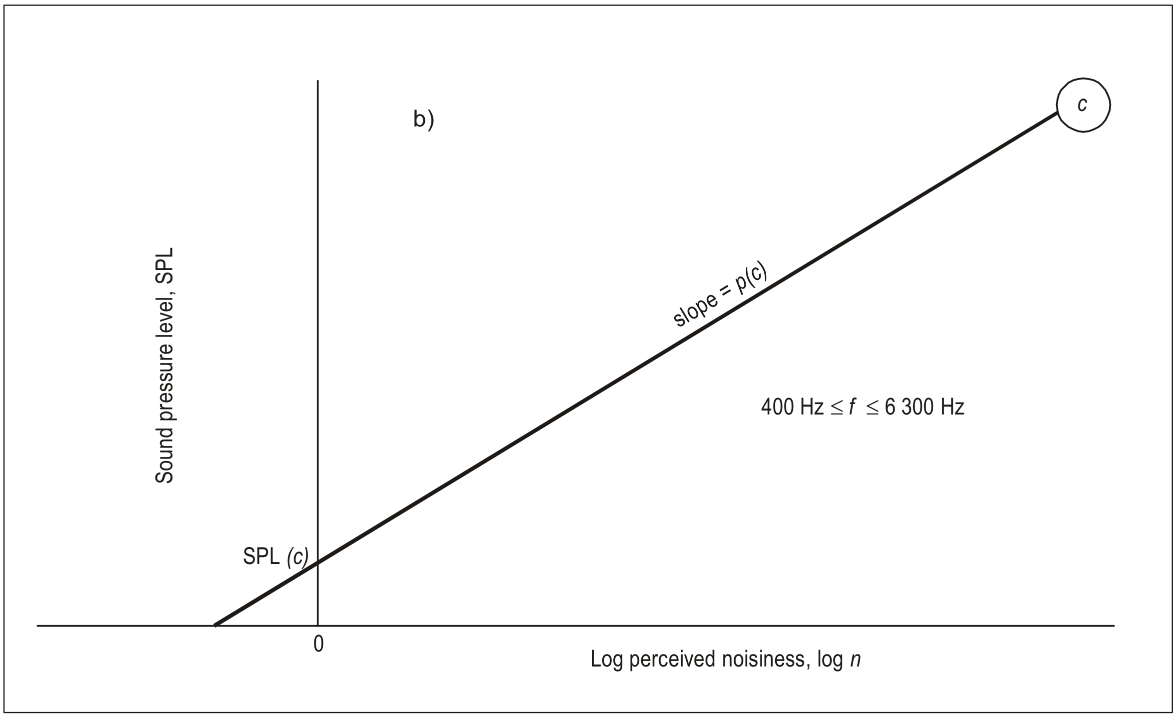


Figure A1-3. Sound pressure level as a function of perceived noisiness

Table A1-4. Constants for mathematically formulated noy values

Band (*i*)	*f* Hz	*M(b)*	SPL *(b)* dB	SPL *(a)* dB	*M(c)*	SPL *(c)* dB
1	50	0.043478	64	91.0	0.030103	52
2	63	0.040570	60	85.9		51
3	80	0.036831	56	87.3		49
4	100	”	53	79.9		47
5	125	0.035336	51	79.8		46
6	160	0.033333	48	76.0		45
7	200	”	46	74.0		43
8	250	0.032051	44	74.9		42
9	315	0.030675	42	94.6		41
10	400	—	—	—		40
11	500	—	—	—		40
12	630	—	—	—		40
13	800	—	—	—		40
14	1 000	—	—	—		40
15	1 250	—	NOT APPLICABLE	—	0.030103	38
16	1 600	—	—	—	0.029960	34
17	2 000	—	—	—		32
18	2 500	—	—	—		30
19	3 150	—	—	—		29
20	4 000	—	—	—		29
21	5 000	—	—	—		30
22	6 300	—	—	—		31
23	8 000	0.042285	37	44.3		34
24	10 000	0.042285	41	50.7	0.029960	37

Table A1-5

δ	η	δ	η
0.00	0.000	2.30	0.495
0.25	0.315	2.50	0.450
0.50	0.700	2.80	0.400
0.60	0.840	3.00	0.370
0.70	0.930	3.30	0.330
0.80	0.975	3.60	0.300
0.90	0.996	4.15	0.260
1.00	1.000	4.45	0.245
1.10	0.970	4.80	0.230
1.20	0.900	5.25	0.220
1.30	0.840	5.70	0.210
1.50	0.750	6.05	0.205
1.70	0.670	6.50	0.200
2.00	0.570	7.00	0.200
		10.00	0.200

Table A1-6

one-third octave centre frequency	f_o *(Hz)*	*one-third octave centre frequency*	f_o *(Hz)*
50	50	800	800
63	63	1 000	1 000
80	80	1 250	1 250
100	100	1 600	1 600
125	125	2 000	2 000
160	160	2 500	2 500
200	200	3 150	3 150
250	250	4 000	4 000
315	315	5 000	4 500
400	400	6 300	5 600
500	500	8 000	7 100
630	630	10 000	9 000

Table A1-7. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 10%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1
100	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
125	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.2	0.2	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
200	0.2	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.2
250	0.2	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2
315	0.2	0.4	0.5	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2
400	0.3	0.5	0.7	0.8	0.6	0.5	0.4	0.3	0.3	0.3	0.3
500	0.3	0.5	0.8	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.4
630	0.3	0.6	0.9	1.2	1.2	1.0	0.9	0.7	0.6	0.5	0.5
800	0.4	0.6	1.0	1.5	1.7	1.5	1.2	1.0	0.8	0.7	0.6
1 000	0.4	0.7	1.2	1.8	2.1	2.0	1.7	1.4	1.2	1.0	0.9
1 250	0.4	0.8	1.3	2.1	2.6	2.8	2.4	2.0	1.7	1.4	1.2
1 600	0.5	0.9	1.4	2.3	3.3	3.8	3.4	2.9	2.4	2.0	1.7
2 000	0.6	1.0	1.6	2.6	3.9	4.7	4.7	4.1	3.4	2.8	2.3
2 500	0.7	1.1	1.8	2.9	4.5	5.8	6.4	5.6	4.8	4.0	3.3
3 150	0.8	1.2	2.0	3.2	5.1	7.1	8.3	7.7	6.8	5.7	4.8
4 000	0.9	1.4	2.3	3.6	5.7	8.5	10.5	11.0	9.6	8.3	6.9
5 000	1.0	1.6	2.4	3.8	6.1	9.2	11.7	12.8	11.3	9.9	8.3
6 300	1.3	1.9	2.8	4.3	6.8	10.4	14.2	16.4	15.5	13.7	11.7
8 000	1.6	2.3	3.4	5.0	7.7	11.8	17.0	20.8	22.0	19.4	16.8
10 000	2.1	2.9	4.1	6.0	8.9	13.4	19.9	25.9	29.5	27.2	24.1
12 500	2.9	3.7	5.0	7.1	10.3	15.3	22.7	31.2	36.9	37.6	33.4

Table A1-8. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 20%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
125	0.2	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
160	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2
315	0.4	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
400	0.5	0.6	0.5	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3
500	0.6	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.4
630	0.7	1.0	1.0	0.8	0.7	0.5	0.4	0.4	0.4	0.4	0.5
800	0.8	1.2	1.4	1.2	0.9	0.7	0.6	0.5	0.5	0.6	0.6
1 000	0.9	1.4	1.8	1.6	1.3	1.0	0.8	0.7	0.7	0.7	0.8
1 250	0.9	1.6	2.2	2.2	1.8	1.5	1.2	1.0	0.9	0.9	1.0
1 600	1.1	1.9	2.7	3.1	2.6	2.1	1.7	1.4	1.2	1.2	1.3
2 000	1.2	2.0	3.2	3.9	3.6	3.0	2.5	2.0	1.7	1.5	1.6
2 500	1.3	2.3	3.7	4.9	5.0	4.2	3.5	2.8	2.3	2.0	2.0
3 150	1.5	2.5	4.2	6.0	6.8	5.8	4.9	4.0	3.3	2.8	2.7
4 000	1.7	2.9	4.8	7.2	8.7	8.2	7.1	5.9	4.9	4.0	3.6
5 000	1.9	3.1	5.1	7.9	9.8	9.7	8.4	7.0	5.9	4.8	4.2
6 300	2.2	3.5	5.7	9.0	12.0	13.3	11.5	9.9	8.2	6.8	5.8
8 000	2.7	4.1	6.5	10.4	14.8	17.4	16.2	14.1	12.0	10.0	8.3
10 000	3.3	4.9	7.5	11.8	17.7	22.0	23.1	20.1	17.2	14.5	12.1
12 500	4.1	5.9	8.8	13.4	20.5	27.1	30.6	27.5	24.2	20.6	17.4

Table A1-9. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 30%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.4	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
400	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4
630	0.9	0.9	0.7	0.5	0.4	0.3	0.3	0.4	0.4	0.4	0.5
800	1.1	1.3	1.0	0.8	0.6	0.5	0.4	0.5	0.5	0.6	0.6
1 000	1.3	1.6	1.4	1.1	0.9	0.7	0.6	0.6	0.6	0.7	0.8
1 250	1.5	2.0	1.9	1.6	1.2	0.9	0.8	0.7	0.8	0.9	1.0
1 600	1.7	2.5	2.7	2.2	1.8	1.4	1.1	1.0	1.0	1.1	1.3
2 000	1.9	3.0	3.6	3.1	2.5	2.0	1.6	1.4	1.3	1.4	1.6
2 500	2.1	3.5	4.4	4.2	3.5	2.8	2.2	1.9	1.7	1.8	2.0
3 150	2.3	4.0	5.5	5.9	4.9	4.0	3.3	2.6	2.3	2.3	2.5
4 000	2.6	4.5	6.8	7.9	6.9	5.8	4.7	3.8	3.3	3.1	3.3
5 000	2.8	4.8	7.4	9.0	8.2	6.9	5.7	4.6	3.9	3.6	3.7
6 300	3.2	5.3	8.6	11.1	11.3	9.6	8.0	6.6	5.4	4.8	4.7
8 000	3.8	6.1	9.9	13.9	15.6	13.6	11.5	9.5	7.9	6.8	6.4
10 000	4.5	7.1	11.4	16.9	20.3	19.1	16.6	13.9	11.6	9.7	8.8
12 500	5.5	8.3	13.0	20.0	25.3	26.6	23.0	19.6	16.4	13.8	12.1

Table A1-10. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 40%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.3	0.2	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.6	0.5	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.9	0.7	0.5	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	1.2	1.0	0.8	0.6	0.4	0.4	0.4	0.5	0.5	0.6	0.6
1 000	1.4	1.4	1.1	0.8	0.6	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.8	1.9	1.5	1.2	0.9	0.7	0.7	0.7	0.8	0.9	1.0
1 600	2.1	2.6	2.1	1.7	1.3	1.0	0.9	0.9	1.0	1.1	1.3
2 000	2.5	3.2	2.9	2.4	1.9	1.5	1.2	1.2	1.3	1.4	1.6
2 500	2.8	4.0	4.1	3.3	2.6	2.1	1.7	1.6	1.7	1.8	2.0
3 150	3.2	4.9	5.6	4.7	3.8	3.0	2.4	2.1	2.1	2.3	2.5
4 000	3.6	5.9	7.2	6.5	5.4	4.3	3.5	3.0	2.8	3.0	3.3
5 000	3.8	6.3	8.1	7.7	6.5	5.2	4.2	3.5	3.3	3.4	3.7
6 300	4.3	7.2	10.0	10.7	9.0	7.3	6.0	4.9	4.4	4.3	4.7
8 000	5.0	8.3	12.3	14.4	12.6	10.6	8.7	7.1	6.1	5.8	6.2
10 000	5.8	9.5	14.8	18.4	17.8	15.2	12.7	10.5	8.8	8.1	8.1
12 500	6.9	10.9	17.2	22.9	24.7	21.2	17.8	14.9	12.4	10.9	10.6

Table A1-11. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 50%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.5	0.4	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.7	0.6	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	1.0	0.8	0.6	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.6
1 000	1.4	1.1	0.9	0.6	0.5	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.8	1.6	1.2	0.9	0.7	0.6	0.7	0.7	0.8	0.9	1.0
1 600	2.3	2.2	1.8	1.3	1.0	0.9	0.9	0.9	1.0	1.1	1.3
2 000	2.8	3.1	2.4	1.9	1.5	1.2	1.1	1.2	1.3	1.4	1.6
2 500	3.4	4.0	3.4	2.7	2.1	1.6	1.5	1.5	1.7	1.8	2.0
3 150	4.0	5.1	4.7	3.8	3.0	2.3	2.0	1.9	2.1	2.3	2.5
4 000	4.6	6.4	6.7	5.5	4.4	3.4	2.8	2.6	2.7	3.0	3.3
5 000	4.9	7.2	7.9	6.5	5.2	4.2	3.4	3.1	3.1	3.4	3.7
6 300	5.4	8.6	10.2	8.9	7.3	5.9	4.7	4.1	4.0	4.3	4.7
8 000	6.2	10.2	13.1	12.5	10.5	8.6	6.9	5.8	5.4	5.7	6.2
10 000	7.2	11.9	16.4	17.8	15.0	12.4	10.2	8.4	7.5	7.4	8.1
12 500	8.4	13.6	20.1	23.4	20.6	17.5	14.4	11.9	10.4	9.9	10.5

Table A1-12. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 60%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.6	0.5	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	0.9	0.7	0.5	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6
1 000	1.2	1.0	0.7	0.5	0.5	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.7	1.3	1.0	0.7	0.6	0.6	0.7	0.7	0.8	0.9	1.0
1 600	2.3	1.9	1.5	1.1	0.9	0.8	0.9	0.9	1.0	1.1	1.3
2 000	2.9	2.6	2.1	1.6	1.2	1.1	1.1	1.2	1.3	1.4	1.6
2 500	3.6	3.6	2.9	2.2	1.7	1.4	1.4	1.5	1.7	1.8	2.0
3 150	4.4	5.0	4.1	3.2	2.5	2.0	1.8	1.9	2.1	2.3	2.5
4 000	5.3	6.6	5.7	4.6	3.6	2.8	2.5	2.5	2.7	3.0	3.3
5 000	5.8	7.4	6.8	5.5	4.3	3.4	2.9	2.9	3.1	3.4	3.7
6 300	6.6	9.2	9.3	7.7	6.1	4.9	4.0	3.8	4.0	4.3	4.7
8 000	7.6	11.4	13.0	10.9	8.9	7.2	5.8	5.2	5.2	5.7	6.2
10 000	8.7	13.8	16.9	15.3	12.8	10.4	8.5	7.3	7.0	7.4	8.1
12 500	10.0	16.1	21.1	21.2	18.0	14.8	12.2	10.2	9.5	9.6	10.5

Table A1-13. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 70%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.2
250	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.2
315	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
630	0.6	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	0.8	0.6	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6
1 000	1.1	0.8	0.6	0.5	0.4	0.5	0.5	0.6	0.7	0.7	0.8
1 250	1.5	1.1	0.9	0.7	0.6	0.6	0.7	0.7	0.8	0.9	1.0
1 600	2.1	1.7	1.2	0.9	0.8	0.8	0.9	1.0	1.0	1.1	1.3
2 000	2.9	2.3	1.8	1.3	1.0	1.0	1.1	1.2	1.3	1.4	1.6
2 500	3.7	3.2	2.5	1.9	1.5	1.3	1.4	1.5	1.7	1.8	2.0
3 150	4.6	4.4	3.5	2.7	2.1	1.8	1.8	1.9	2.1	2.3	2.5
4 000	5.7	6.3	5.1	4.0	3.1	2.5	2.3	2.5	2.7	3.0	3.3
5 000	6.3	7.3	6.0	4.7	3.7	3.0	2.7	2.9	3.1	3.4	3.7
6 300	7.5	9.3	8.2	6.6	5.2	4.2	3.6	3.6	4.0	4.3	4.7
8 000	8.8	11.8	11.6	9.5	7.6	6.1	5.1	4.9	5.2	5.7	6.2
10 000	10.2	14.8	16.4	13.7	11.1	9.0	7.4	6.8	6.8	7.4	8.1
12 500	11.6	18.0	21.4	18.8	15.7	12.8	10.5	9.2	9.0	9.6	10.5

Table A1-14. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 80%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.5	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	0.7	0.5	0.4	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
1 000	1.0	0.7	0.5	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.3	1.0	0.7	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.0
1 600	1.9	1.5	1.1	0.8	0.7	0.8	0.9	0.9	1.0	1.1	1.3
2 000	2.6	2.0	1.5	1.1	1.0	1.0	1.1	1.2	1.3	1.4	1.6
2 500	3.6	2.9	2.2	1.6	1.3	1.3	1.4	1.5	1.7	1.8	2.0
3 150	4.7	4.0	3.1	2.4	1.9	1.7	1.8	1.9	2.1	2.3	2.5
4 000	5.9	5.6	4.5	3.4	2.7	2.3	2.3	2.5	2.7	3.0	3.3
5 000	6.6	6.6	5.3	4.1	3.2	2.7	2.6	2.8	3.1	3.4	3.7
6 300	8.1	9.1	7.4	5.9	4.6	3.7	3.4	3.6	4.0	4.3	4.7
8 000	9.8	12.0	10.4	8.4	6.7	5.4	4.8	4.8	5.2	5.7	6.2
10 000	11.5	15.3	14.8	12.2	9.8	7.8	6.7	6.4	6.8	7.4	8.1
12 500	13.3	18.9	20.5	17.0	13.9	11.3	9.4	8.7	8.9	9.6	10.5

Table A1-15. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 90%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	0.6	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
1 000	0.9	0.6	0.5	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.2	0.9	0.6	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.0
1 600	1.7	1.3	0.9	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.3
2 000	2.4	1.8	1.3	1.0	0.9	1.0	1.1	1.2	1.3	1.4	1.6
2 500	3.3	2.6	1.9	1.4	1.2	1.3	1.4	1.5	1.7	1.8	2.0
3 150	4.6	3.6	2.8	2.1	1.7	1.6	1.8	1.9	2.1	2.3	2.5
4 000	6.0	5.1	4.0	3.0	2.4	2.2	2.3	2.5	2.7	3.0	3.3
5 000	6.7	6.0	4.8	3.7	2.9	2.6	2.6	2.8	3.1	3.4	3.7
6 300	8.3	8.3	6.7	5.2	4.0	3.4	3.3	3.6	4.0	4.3	4.7
8 000	10.4	11.7	9.5	7.6	6.0	4.9	4.5	4.8	5.2	5.7	6.2
10 000	12.6	15.4	13.5	11.0	8.8	7.1	6.3	6.3	6.8	7.4	8.1
12 500	14.8	19.4	18.6	15.4	12.4	10.1	8.7	8.3	8.9	9.6	10.5

Table A1-16. Sound attenuation coefficient in dB/100 m

Band centre frequency	*Relative humidity = 100%*										
	Temperature, °C										
Hz	–10	–5	0	5	10	15	20	25	30	35	40
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
100	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
125	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
160	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
200	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
250	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
315	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
400	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
500	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4
630	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5
800	0.6	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6
1 000	0.8	0.6	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8
1 250	1.1	0.8	0.6	0.5	0.6	0.6	0.7	0.7	0.8	0.9	1.0
1 600	1.6	1.2	0.8	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.3
2 000	2.2	1.6	1.2	0.9	0.9	1.0	1.1	1.2	1.3	1.4	1.6
2 500	3.0	2.3	1.7	1.3	1.2	1.3	1.4	1.5	1.7	1.8	2.0
3 150	4.2	3.3	2.5	1.9	1.6	1.6	1.8	1.9	2.1	2.3	2.5
4 000	5.9	4.7	3.6	2.7	2.2	2.1	2.3	2.5	2.7	3.0	3.3
5 000	6.8	5.6	4.3	3.3	2.6	2.4	2.6	2.8	3.1	3.4	3.7
6 300	8.5	7.6	6.0	4.7	3.7	3.3	3.3	3.6	4.0	4.3	4.7
8 000	10.7	10.8	8.7	6.8	5.3	4.5	4.4	4.8	5.2	5.7	6.2
10 000	13.3	15.1	12.5	10.0	7.9	6.5	6.0	6.3	6.8	7.4	8.1
12 500	16.0	19.5	17.2	14.0	11.3	9.2	8.2	8.2	8.9	9.6	10.5

8.3 The equations given in 8.2 are convenient for calculation by means of a computer. For use in other cases, numerical values determined from the equations are given in Tables A1-7 to A1-16.

9. DETAILED CORRECTION PROCEDURES

9.1 Introduction

9.1.1 When the noise certification test conditions are not identical to the noise certification reference conditions, appropriate corrections shall be made to the EPNL calculated from the measured data by the methods of this section.

Note 1.— Differences between reference and test conditions which lead to corrections can result from the following:

a) atmospheric absorption of sound under test conditions different from reference;

b) test flight path at altitude different from reference; and

c) test mass different from maximum.

Note 2.— Negative correction can arise if the atmospheric absorption of sound under test conditions is less than reference and also if the test flight path is at a lower altitude than reference.

The take-off test flight path can occur at a higher altitude than reference if the meteorological conditions permit superior aeroplane performance ("cold day" effect). Conversely, the "hot day" effect can cause the take-off test flight path to occur at a lower altitude than reference. The approach test flight path can occur at either higher or lower altitudes than reference irrespective of the meteorological conditions.

9.1.2 The measured noise values shall be properly corrected to the reference conditions, either by the correction procedures presented as follows or by an integrated programme which shall be approved as being equivalent.

9.1.2.1 Correction procedures shall consist of one or more values added algebraically to the EPNL calculated as if the tests were conducted completely under the noise certification reference conditions.

9.1.2.2 The flight profiles shall be determined for both take-off and approach, and for both reference and test conditions. The test procedures shall require noise and flight path recordings with a synchronized time signal from which the test profile can be delineated, including the aeroplane position for which PNLTM is observed at the noise measuring station. For take-off, a flight profile corrected to reference conditions shall be derived from data approved by the certificating authority.

Note.— For approach, the reference profile is defined by the reference conditions in 5.3.

9.1.2.3 The differing noise path lengths from the aeroplane to the noise measuring station corresponding to PNLTM shall be determined for the test and reference conditions. The SPL values in the spectrum of PNLTM shall then be corrected for the effects of:

a) change in atmospheric sound absorption;

b) atmospheric sound absorption on the change in noise path length; and

c) inverse square law on the change in noise path length.

9.1.2.4 The corrected values of SPL shall then be converted to PNLT from which PNLTM is subtracted.

Note.— The difference represents the correction to be added algebraically to the EPNL calculated from the measured data.

9.1.3 The minimum distances from both the test and reference profiles to the noise measuring station shall be calculated and used to determine a noise duration correction due to the change in the altitude of aeroplane flyover. The duration correction shall be added algebraically to the EPNL calculated from the measured data.

9.1.4 From manufacturer's data (approved by the certificating authority) in the form of curves, tables or in some other manner giving the variation of EPNL with take-off mass and also for landing mass, corrections shall be determined to be added to the EPNL calculated from the measured data to account for noise level changes due to differences between maximum take-off mass and landing mass and test aeroplane mass.

9.1.5 From manufacturer's data (approved by the certificating authority) in the form of curves, tables or in some manner giving the variation of EPNL with approach angle, corrections shall be determined to be added algebraically to the EPNL calculated from measured data to account for noise level changes due to differences between the reference and the test approach angles.

9.2 Take-off profiles

Note.—

a) Figure A1-4 illustrates a typical take-off profile. The aeroplane begins the take-off roll at point A, *lifts off at point* B, *and initiates the first constant climb at point* C *at an angle β. The noise abatement thrust cutback is started at point* D *and completed at point* E *where the second constant climb is defined by the angle γ (usually expressed in terms of the gradient in per cent).*

b) The end of the noise certification take-off flight path is represented by aeroplane position F *whose vertical projection on the flight track (extended centre line of the runway) is point* M. *The position of the aeroplane is recorded for a distance* AM *of at least 11 km (6 NM).*

c) Position K *is the take-off noise measuring station whose distance* AK *is the specified take-off measurement distance. Position* L *is the sideline noise measuring station located on a line parallel to and the specified distance from the runway centre line where the noise level during take-off is greatest.*

d) The thrust settings after thrust reduction, if used, under the test conditions are such as would produce at least the minimum certification gradient for the reference conditions of atmosphere and mass.

e) The take-off profile is associated with the following five parameters: AB, *the length of take-off roll;* β, *the first constant climb angle;* γ, *the second constant climb angle; and* δ *and* ε, *the thrust cutback angles. These five parameters are functions of the aeroplane performance, mass and atmospheric conditions (ambient air temperature, pressure, and wind velocity). If the test atmospheric conditions are not equal to the reference atmospheric conditions, the corresponding test and reference profile parameters will be different as shown in Figure A1-5. The profile parameter changes (identified as* ΔAB, Δß, Δγ, Δδ *and* Δε) *can be derived from the manufacturer's data (approved by the certificating authority) and are used to define the flight profile corrected to the atmospheric reference conditions, the aeroplane mass being unchanged from that of the test. The relationships between the measured and corrected take-off flight profiles can then be used to determine the corrections which are applied to the EPNL calculated from the measured data.*

f) Figure A1-6 illustrates portions of the measured and corrected take-off flight paths including the significant geometrical relationships influencing sound propagation. EF *represents the second constant measured* *flight path with climb angle* γ*, and* E_c F_c *represents the second constant corrected flight path at different altitude and with different climb angle* $\gamma + \Delta\gamma$.

g) Position Q *represents the aeroplane location on the measured take-off flight path for which PNLTM is observed at the noise measuring station* K*, and* Q_c *is the corresponding position on the corrected flight path. The measured and corrected noise propagation paths are* KQ *and* KQ_c*, respectively, which are assumed to form the same angle* θ *with their flight paths. This assumption of constant angle* θ *is one which may not be valid in all cases. Future refinement shall be sought. However, for the present application of this test procedure, any differences are considered small.*

h) Position R *represents the point on the measured take-off flight path nearest the noise measuring station* K*, and* R_c *is the corresponding position on the corrected flight path. The minimum distance to the measured and corrected flight paths are indicated by the lines* KR *and* KR_c*, respectively, which are normal to their flight paths.*

If two peak values of PNLT are observed during flyover which differ by less than 2 TPNdB that noise level which, when corrected to reference conditions, gives the greater value shall be used in the computation for EPNL at the reference conditions. In that case the point corresponding to the second peak shall be obtained on the corrected flight path by applying manufacturer's approved data.

9.3 Approach profiles

Note.—

a) Figure A1-7 illustrates a typical approach profile. The beginning of the noise certification approach profile is represented by aeroplane position G *whose vertical projection on the flight track (extended centre line of the runway) is point* P*. The position of the aeroplane is recorded for a distance* OP *from the runway threshold* O *of at least 7.4 km (4 NM).*

b) The aeroplane approaches at an angle η*, passes vertically over the noise measuring station* N *at a height of* NH*, begins the level-off at position* I*, and touches down at position* J.

c) The approach profile is defined by the approach angle η *and the height* NH *which are functions of the aeroplane operating conditions controlled by the pilot. If the measured approach profile parameters are different from the corresponding reference approach parameters (Figure A1-8), corrections are applied to the EPNL calculated from the measured data.*

d) Figure A1-9 illustrates portions of the measured and reference approach flight paths including the significant geometrical relationships influencing sound propagation. GI *represents the measured approach path with approach angle* η*, and* G_rI_r *represents the reference approach flight path at reference altitude and the reference approach angle* η_r.

e) Position S *represents the aeroplane location on the measured approach flight path for which PNLTM is observed at the noise measuring station* N*, and* S_r *is the corresponding position on the reference approach flight path. The measured and corrected noise propagation paths are* NS *and* NS_r *respectively, which form the same angle* λ *with their flight paths.*

f) Position T *represents the point on the measured approach flight path nearest the noise measuring station* N*, and* T_r *is the corresponding point on the reference approach flight path. The minimum distances to the measured and reference flight paths are indicated by the lines* NT *and* NT_r*, respectively, which are normal to their flight paths.*

9.4 PNLT corrections

9.4.1 Whenever the ambient atmospheric conditions of temperature and relative humidity differ from the reference conditions and/or whenever the measured take-off and approach flight paths differ from the reference flight paths respectively, corrections to the EPNL values calculated from the measured data shall be applied. These corrections shall be calculated as described below:

9.4.1.1 *Take-off*

9.4.1.1.1 Referring to a typical take-off flight path shown in Figure A1-6, the spectrum of PNLTM observed at station K, for the aeroplane at position Q, shall be decomposed into its individual SPL(i) values. A set of corrected values shall be computed as follows:

$$\begin{aligned} SPL(i)_c = SPL(i) &+ 0.01[\alpha(i) - \alpha(i)_o]\, KQ \\ &+ 0.01\alpha(i)_o\, (KQ - KQ_c) \\ &+ 20 \log (KQ/KQ_c) \end{aligned}$$

— the term $0.01\,[\alpha(i) - \alpha(i)_o]\, KQ$ accounts for the effects of the change in atmospheric sound absorption where $\alpha(i)$ and $\alpha(i)_o$ are the sound absorption coefficients for the test and reference conditions respectively for the i-th one-third octave band and KQ is the measured take-off noise path;

— the term $0.01\,\alpha(i)_o\,(KQ - KQ_c)$ accounts for the effect of atmospheric sound absorption on the change in the noise path length, where KQ_c is the corrected take-off noise path; and

— the term $20 \log (KQ/KQ_c)$ accounts for the effects of the inverse square law on the change in the noise path length.

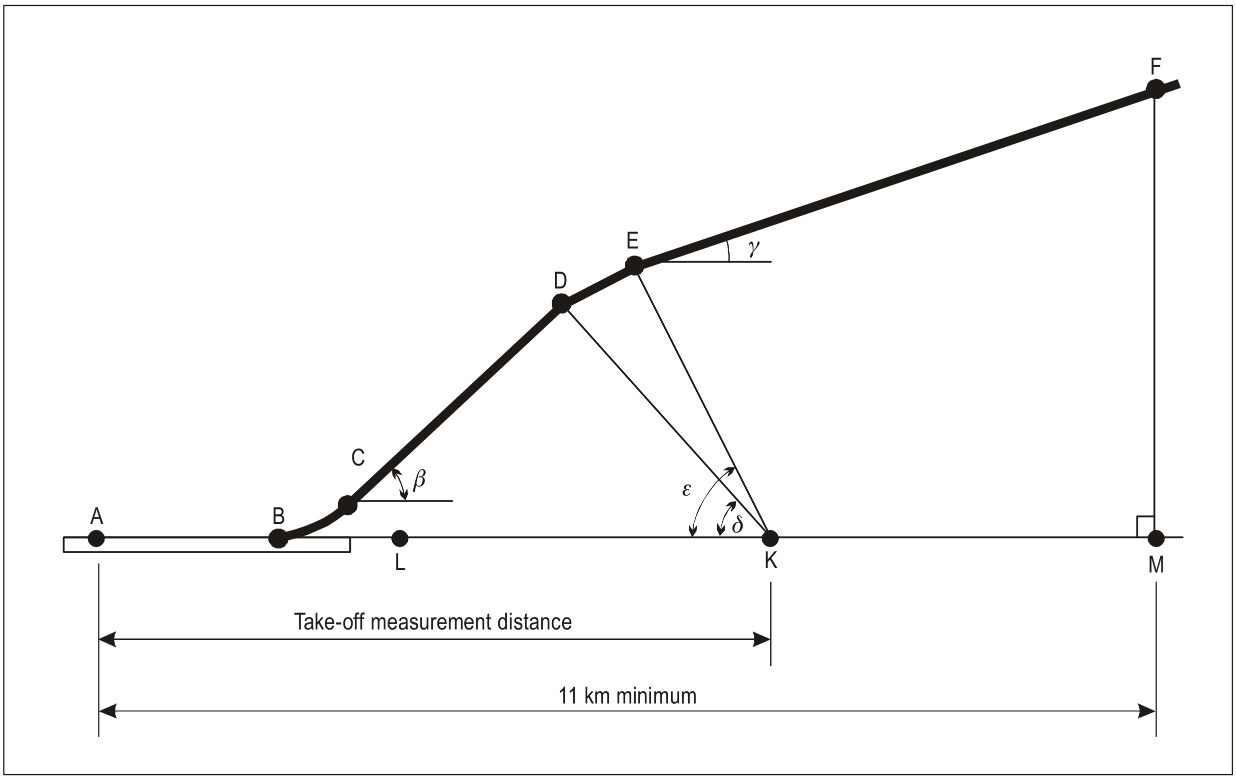


Figure A1-4. Measured take-off profile

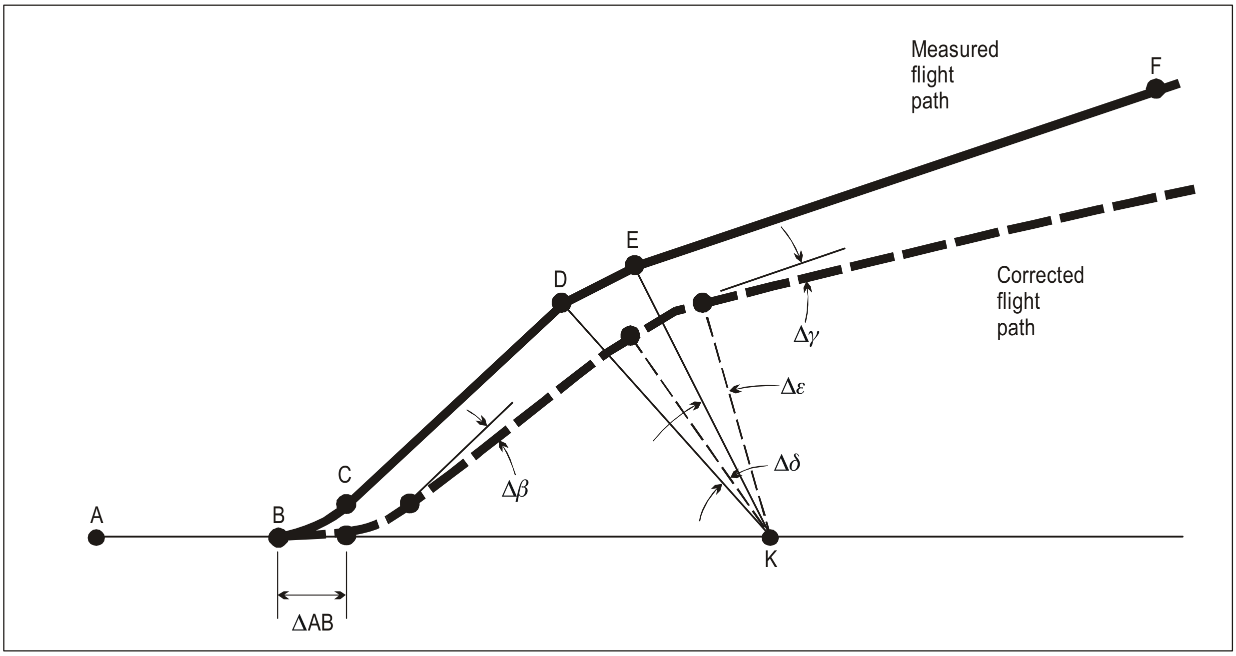


Figure A1-5. Comparison of measured and corrected take-off profiles

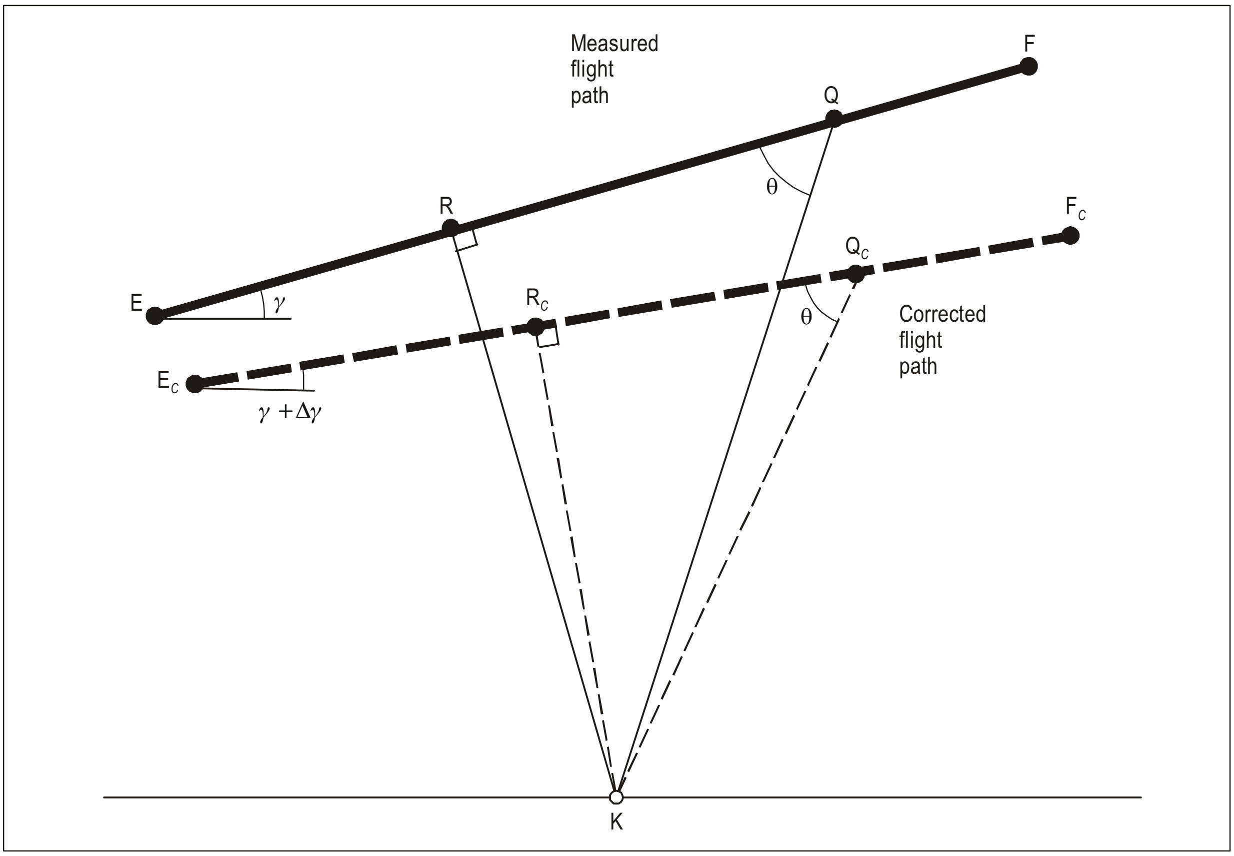


Figure A1-6. Take-off profile characteristics influencing sound level

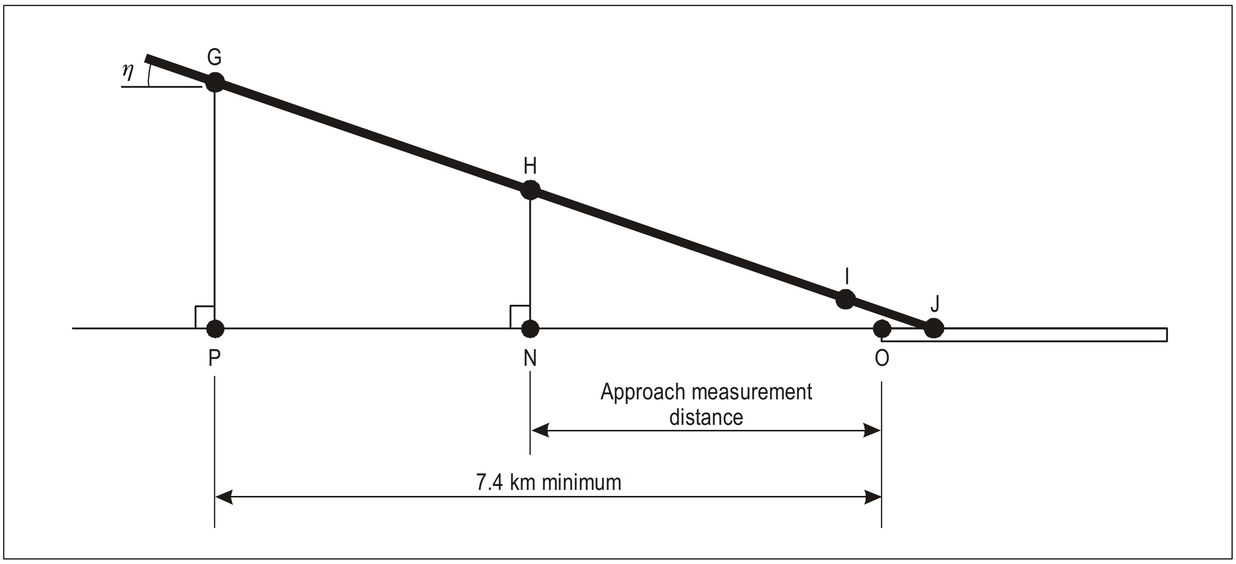


Figure A1-7. Measured approach profile

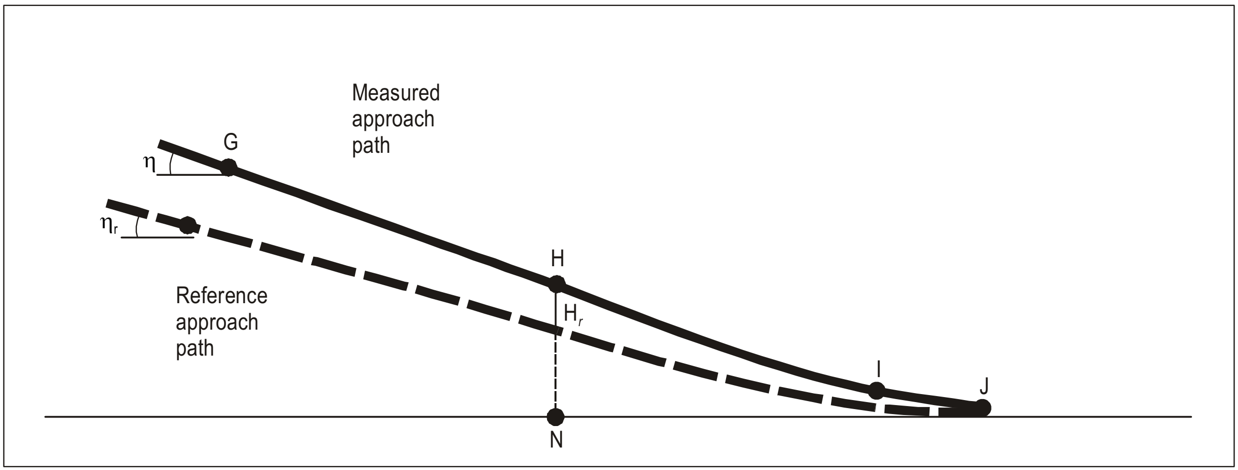


Figure A1-8. Comparison of measured and corrected approach profiles

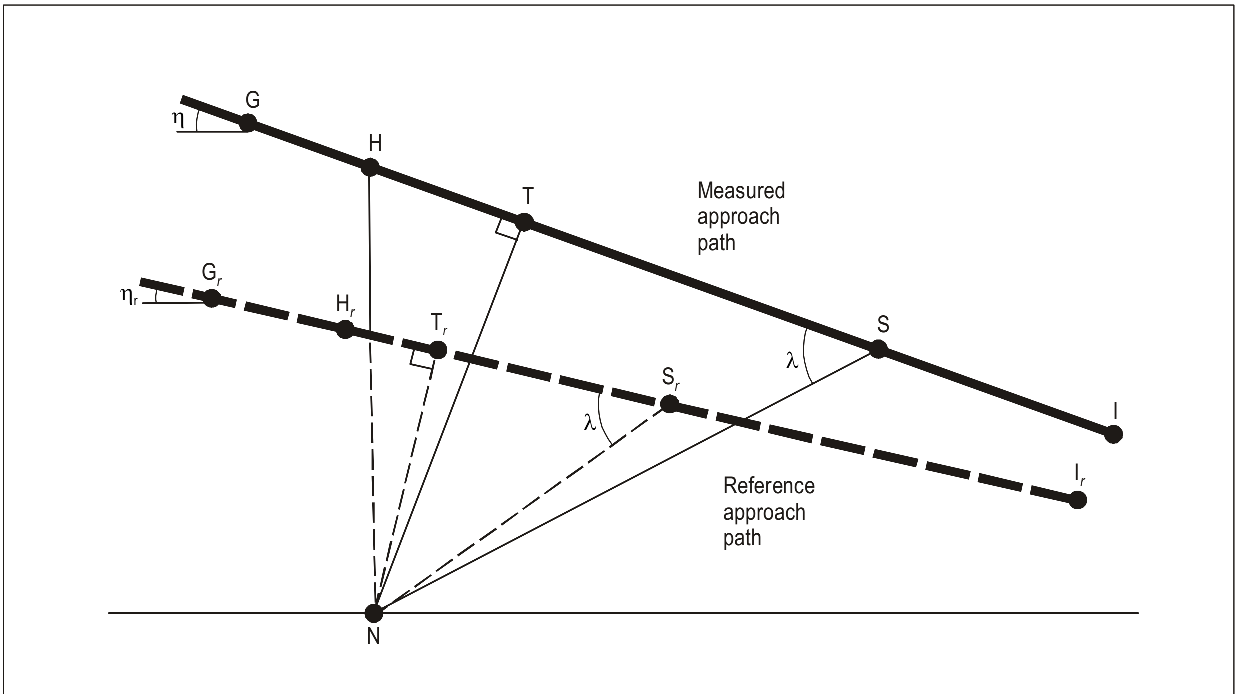


Figure A1-9. Approach profile characteristics influencing sound level

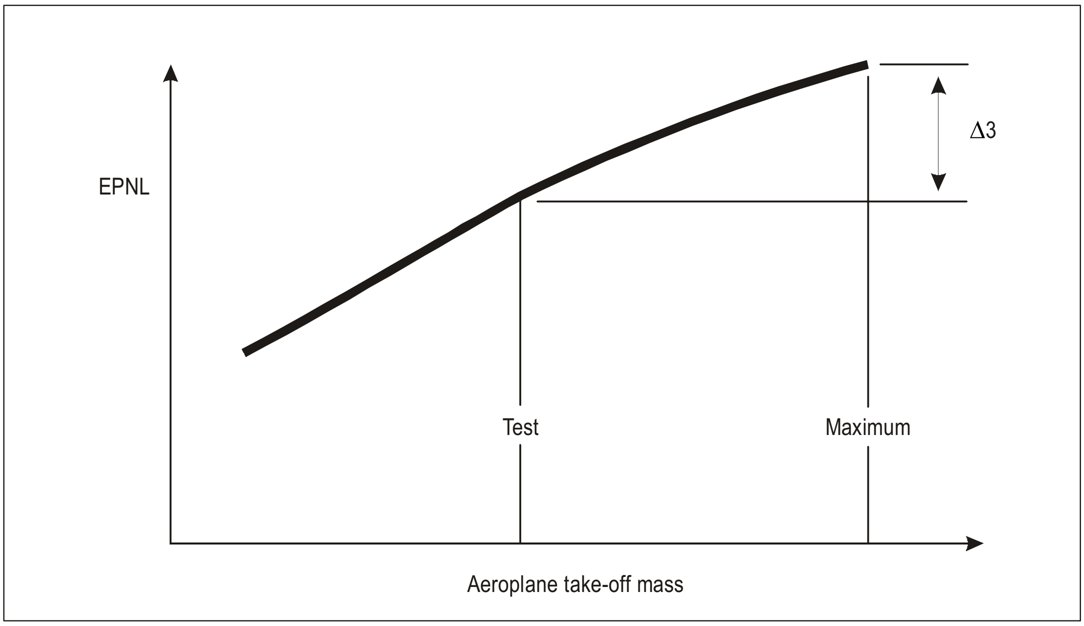


Figure A1-10. Take-off mass correction for EPNL

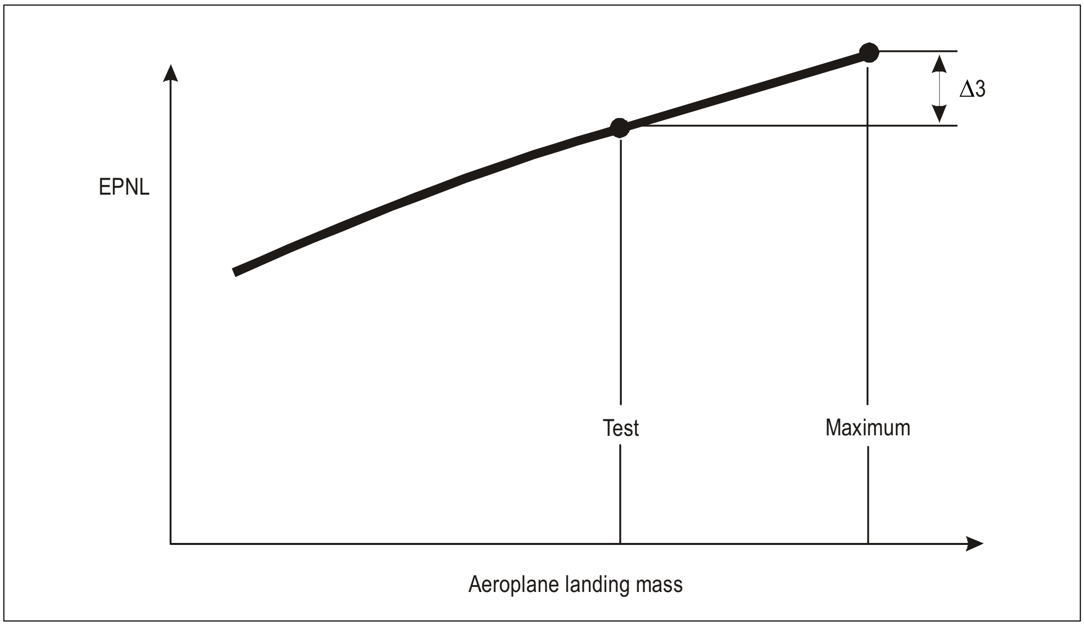


Figure A1-11. Approach mass correction for EPNL

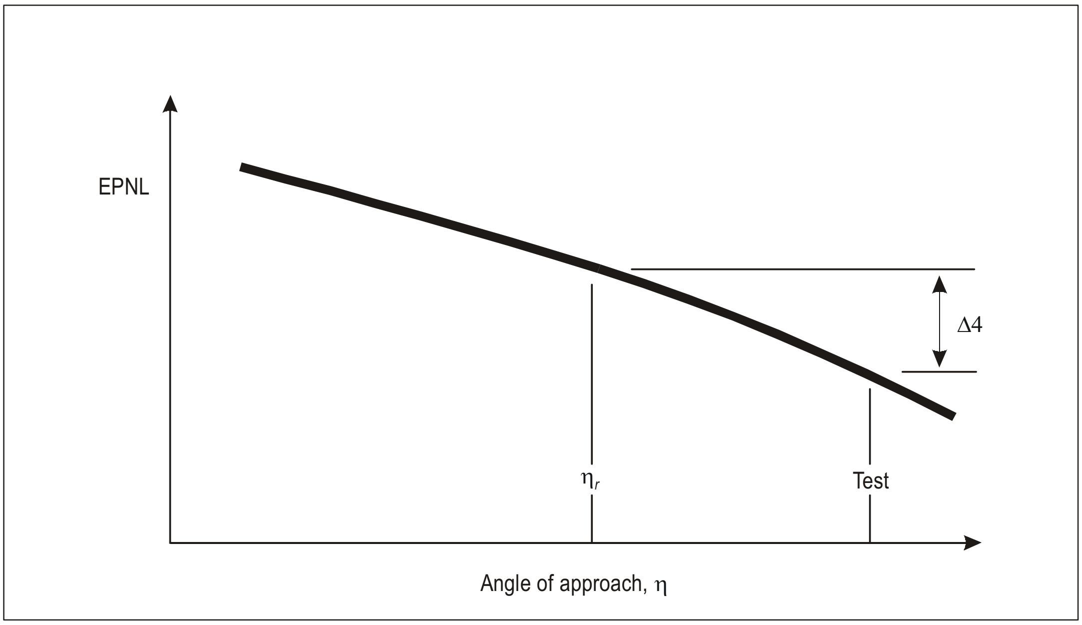


Figure A1-12. Approach angle correction for EPNL

9.4.1.1.2 The corrected values of $SPL(i)_c$ shall then be converted to PNLT and a correction term calculated as follows:

$$\Delta_1 = PNLT - PNLTM$$

which represents the correction to be added algebraically to the EPNL calculated from the measured data.

9.4.1.2 *Approach*

The same procedure shall be used for the approach flight path except that the values for $SPL(i)_c$ relate to the approach noise paths shown in Figure A1-9 as follows:

$$SPL(i)_c = SPL(i) + 0.01\,[\alpha(i) - \alpha(i)_o]\,NS + 0.01\,\alpha(i)_o\,(NS - NS_r) + 20\log(NS/NS_r)$$

where NS and NS_r are the measured and reference approach noise paths, respectively. The remainder of the procedure shall be the same as for the take-off flight path.

9.4.1.3 *Lateral*

The same procedure shall be used for the lateral flight path except that the values for $SPL(i)_c$ relate only to the measured lateral noise path as follows:

$$SPL(i)_c = SPL(i) + 0.01\,[\alpha(i) - \alpha(i)_o]\,LX$$

where LX shall be the measured lateral noise path from station L (Figure A1-4) to position X of the aeroplane for which PNLTM is observed at station L. Only the correction term accounting for the effects of change in atmospheric sound absorption shall be considered. The difference between the measured and corrected noise path lengths shall be assumed negligible for the lateral flight path. The remainder of the procedure shall be the same as for the take-off flight path.

9.5 Duration correction

9.5.1 Whenever the measured take-off and approach flight paths differ from the corrected and reference flight paths, respectively, duration corrections to the EPNL values calculated from the measured data shall be applied. These corrections shall be calculated as described below:

9.5.1.1 *Take-off*

Referring to the take-off flight path shown in Figure A1-6, a correction term shall be calculated as follows:

$$\Delta_2 = -7.5\log(KR/KR_c)$$

which represents the corrections to be added algebraically to the EPNL calculated from the measured data. The lengths KR and KR_c shall be the measured and corrected take-off minimum distances, respectively, from the noise measuring station K to the measured and corrected flight paths. The negative sign shall indicate that, for the particular case of a duration correction, the EPNL calculated from the measured data shall be reduced if the measured flight path is at a greater altitude than the corrected flight path.

9.5.1.2 *Approach*

The same procedure shall be used for the approach flight path except that the correction relates to the approach minimum distances shown in Figure A1-9 as follows:

$$\Delta_2 = -7.5 \log (NT/NT_r)$$

where NT is the measured approach minimum distance from the noise measuring station N to the measured flight path.

9.5.1.3 *Lateral*

No duration correction shall be computed for the lateral flight path because the differences between the measured and corrected flight paths are assumed negligible.

9.6 Mass correction

Whenever the aeroplane mass, during either the noise certification take-off or approach test, is different from the corresponding maximum take-off or landing mass, a correction shall be applied to the EPNL value calculated from the measured data. The corrections shall be determined from the manufacturer's data (approved by the certificating authority) in the form of tables or curves such as schematically indicated in Figures A1-10 and A1-11. The manufacturer's data shall be applicable to the noise certification reference atmospheric conditions.

9.7 Approach angle correction

Whenever the aeroplane approach angle during the noise certification approach test is different from the reference approach angle, a correction shall be applied to the EPNL value calculated from the measured data. The corrections shall be determined from the manufacturer's data (approved by the certificating authority) in the form of tables or curves such as schematically indicated in Figure A1-12. The manufacturer's data shall be applicable to the noise certification reference atmospheric conditions and to the test landing mass.

APPENDIX 2. EVALUATION METHOD FOR NOISE CERTIFICATION OF:

**1.— SUBSONIC JET AEROPLANES —
Application for Certificate of Airworthiness
for the Prototype accepted on or after
6 October 1977**

**2.— PROPELLER-DRIVEN AEROPLANES OVER 5 700 kg —
Application for Certificate of Airworthiness
for the Prototype accepted on or after
1 January 1985 and before 17 November 1988**

**3.— PROPELLER-DRIVEN AEROPLANES OVER 8 618 kg —
Application for Certificate of Airworthiness
for the Prototype accepted on or after
17 November 1988**

4.— HELICOPTERS

Note.— See Part II, Chapters 3, 4 and 8.

1. INTRODUCTION

Note 1.— This noise evaluation method includes:

a) noise certification test and measurement conditions;

b) measurement of aeroplane and helicopter noise received on the ground;

c) calculation of effective perceived noise level from measured noise data; and

d) reporting of data to the certificating authority and correcting measured data.

Note 2.— The instructions and procedures given in the method are clearly delineated to ensure uniformity during compliance tests, and to permit comparison between tests of various types of aircraft conducted in various geographical locations.

Note 3.— A complete list of symbols and units, the mathematical formulation of perceived noisiness, a procedure for determining atmospheric attenuation of sound, and detailed procedures for correcting noise levels from non-reference to reference conditions are included in Sections 6 to 9 of this appendix.

2. NOISE CERTIFICATION TEST AND MEASUREMENT CONDITIONS

2.1 General

This section prescribes the conditions under which noise certification tests shall be conducted and the measurement procedures that shall be used.

Note.— Many applications for a noise certificate involve only minor changes to the aircraft type design. The resultant changes in noise can often be established reliably without the necessity of resorting to a complete test as outlined in this appendix. For this reason certificating authorities are encouraged to permit the use of appropriate “equivalent procedures”. Also, there are equivalent procedures that may be used in full certification tests, in the interest of reducing costs and providing reliable results. Guidance material on the use of *equivalent procedures in the noise certification of subsonic jet and propeller-driven aeroplanes and helicopters is provided in the* Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501)*.

2.2 Test environment

2.2.1 Locations for measuring noise from an aircraft in flight shall be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as might be caused by thick, matted or tall grass, shrubs or wooded areas. No obstructions which significantly influence the sound field from the aircraft shall exist within a conical space above the point on the ground vertically below the microphone, the cone being defined by an axis normal to the ground and by a half-angle 80° from this axis.

Note.— Those people carrying out the measurements could themselves constitute such obstructions.

2.2.2 Except as provided in 2.2.4, the tests shall be carried out under the following atmospheric conditions:

a) no precipitation;

b) ambient air temperature not above 35°C and not below –10°C and relative humidity not above 95 per cent and not below 20 per cent over the whole noise path between a point 10 m (33 ft) above the ground and the aircraft;

Note.— Care should be taken to ensure that the noise measuring, aircraft flight path tracking and meteorological instrumentation are operated within their environmental limitations.

c) relative humidity and ambient temperature over the whole noise path between a point 10 m (33 ft) above the ground and the aircraft such that the sound attenuation in the one-third octave band centred on 8 kHz will not be more than 12 dB/100 m;

d) if the atmospheric absorption coefficients vary over the PNLTM sound propagation path by more than ±0.5 dB/100 m in the 3 150 Hz one-third octave band from the value of the absorption coefficient derived from the meteorological measurement obtained at 10 m above the surface, "layered" sections of the atmosphere must be used to compute equivalent weighted sound attenuations in each one-third octave band, sufficient sections being used to the satisfaction of the certificating authority; where multiple layering is not required, equivalent sound attenuations in each one-third octave band shall be determined by averaging the atmospheric absorption coefficients for each such band at 10 m (33 ft) above ground level and at the flight level of the test aircraft at the time of PNLTM, for each measurement;

e) at 10 m (33 ft) above ground, for aeroplanes, average wind speed shall not exceed 22 km/h (12 kt) and crosswind average wind speed shall not exceed 13 km/h (7 kt); for helicopters, average wind speed shall not exceed 19 km/h (10 kt) and crosswind average wind speed shall not exceed 9 km/h (5 kt); for aeroplanes, the wind gust shall not exceed 28 km/h (15 kt) and the crosswind gust shall not exceed 18 km/h (10 kt);

Note.— Average wind speed is defined over a 30-second time period.

f) no anomalous meteorological or wind conditions that would significantly affect the measured noise levels when the noise is recorded at the measuring points specified by the certificating authority; and

g) meteorological measurements must be obtained within 30 minutes of each noise test measurement; meteorological data shall be interpolated to actual times of each noise measurement.

2.2.3 When a multiple layering calculation is required by 2.2.2 d), the atmosphere between the aircraft and 10 m (33 ft) above the ground shall be divided into layers of equal depth. The depth of the layers shall be set to not more than the depth of the narrowest layer across which the variation in the atmospheric absorption coefficient of the 3 150 Hz one-third octave band is not greater than ±0.5 dB/100 m, with a minimum layer depth of 30 m (100 ft). This shall apply over the propagation path at PNLTM. The mean of the values of the atmospheric absorption coefficients at the top and bottom of each layer may be used to characterize the absorption properties of each layer.

2.2.4 The requirements of 2.2.2 b), c) and d) shall only be applied at a point 10 m (33 ft) above ground for tests of helicopters.

2.2.5 The aerodrome control tower or another facility shall be approved for use as the central location at which measurements of atmospheric parameters are representative of those conditions existing over the geographical area in which noise measurements are made.

2.3 Flight path measurement

2.3.1 The aircraft height and lateral position relative to the flight track shall be determined by a method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation or photographic scaling techniques, to be approved by the certificating authority.

2.3.2 The aircraft position along the flight path shall be related to the noise recorded at the noise measurement locations by means of synchronizing signals over a distance sufficient to assure adequate data during the period that the noise is within 10 dB of the maximum value of PNLT.

2.3.3 Position and performance data required to make the adjustments referred to in Section 8 or 9 of this appendix shall be automatically recorded at an approved sampling rate. Measuring equipment shall be approved by the certificating authority.

3. MEASUREMENT OF AIRCRAFT NOISE RECEIVED ON THE GROUND

3.1 Definitions

For the purposes of this section the following definitions apply:

Ambient noise. The acoustical noise from sources other than the test aircraft present at the microphone site during aircraft noise measurement. Ambient noise is one component of background noise.

Background noise. The combined noise present in a measurement system from sources other than the test aircraft, which can influence or obscure the aircraft noise levels being measured. Typical elements of background noise include (but are not limited to): ambient noise from sources around the microphone site; thermal electrical noise generated by components in the measurement system; magnetic flux noise ("tape hiss") from analogue tape recorders; and digitization noise caused by quantization error in digital converters. Some elements of background noise, such as digitization noise, can obscure the aircraft noise signal, while others, such as ambient noise, can also contribute energy to the measured aircraft noise signal.

Broadband noise. Noise for which the frequency spectrum is continuous (i.e. energy is present at all frequencies in a given range) and which lacks any discrete frequency components (i.e. tones).

Calibration check frequency. In hertz, the nominal frequency of the sinusoidal sound pressure signal produced by the sound calibrator.

Calibration sound pressure level. In decibels, the sound pressure level produced, under reference environmental conditions, in the cavity of the coupler of the sound calibrator that is used to determine the overall acoustical sensitivity of a measurement system.

Free-field sensitivity level of a microphone system. In decibels, twenty times the logarithm to the base ten of the ratio of the free-field sensitivity of a microphone system and the reference sensitivity of one volt per pascal.

Note.— The free-field sensitivity level of a microphone system may be determined by subtracting the sound pressure level (in decibels re 20 μPa) of the sound incident on the microphone from the voltage level (in decibels re 1 V) at the output of the microphone system, and adding 93.98 dB to the result.

Free-field sensitivity of a microphone system. In volts per pascal, for a sinusoidal plane progressive sound wave of specified frequency, at a specified sound-incident angle, the quotient of the root-mean-square voltage at the output of a microphone system and the root-mean-square sound pressure that would exist at the position of the microphone in its absence.

Level difference. In decibels, for any nominal one-third octave midband frequency, the output signal level measured on any level range minus the level of the corresponding electrical input signal.

Level non-linearity. In decibels, the level difference measured on any level range, at a stated one-third octave nominal midband frequency, minus the corresponding reference level difference, all input and output signals being relative to the same reference quantity.

Level range. In decibels, an operating range determined by the setting of the controls that are provided in a measurement system for the recording and one-third octave band analysis of a sound pressure signal. The upper boundary associated with any particular level range shall be rounded to the nearest decibel.

Linear operating range. In decibels, for a stated level range and frequency, the range of levels of steady sinusoidal electrical signals applied to the input of the entire measurement system, exclusive of the microphone but including the microphone preamplifier and any other signal-conditioning elements that are considered to be part of the microphone system, extending from a lower to an upper boundary, over which the level non-linearity is within specified tolerance limits.

Note.— It is not necessary to include microphone extension cables as configured in the field.

Measurement system. The combination of instruments used for the measurement of sound pressure levels, including a sound calibrator, windscreen, microphone system, signal recording and conditioning devices, and a one-third octave band analysis system.

Note.— Practical installations may include a number of microphone systems, the outputs from which are recorded simultaneously by a multi-channel recording/analysis device via signal conditioners as appropriate. For the purpose of this section, each complete measurement channel is considered to be a measurement system to which the requirements apply accordingly.

Microphone system. The components of the measurement system which produce an electrical output signal in response to a sound pressure input signal, and which generally include a microphone, a preamplifier, extension cables, and other devices as necessary.

Reference direction. In degrees, the direction of sound incidence specified by the manufacturer of the microphone, relative to a sound incidence angle of 0°, for which the free-field sensitivity level of the microphone system is within specified tolerance limits.

Reference level difference. In decibels, for a stated frequency, the level difference measured on a level range for an electrical input signal corresponding to the calibration sound pressure level, adjusted as appropriate, for the level range.

Reference level range. In decibels, the level range for determining the acoustical sensitivity of the measurement system and containing the calibration sound pressure level.

Sound incidence angle. In degrees, an angle between the principal axis of the microphone, as defined in IEC 61094-3[1] and IEC 61094-4,[2] as amended and a line from the sound source to the centre of the diaphragm of the microphone.

Note.— When the sound incidence angle is 0°, the sound is said to be received at the microphone at "normal (perpendicular) incident"; when the sound incidence angle is 90°, the sound is said to be received at "grazing incidence".

Time-average band sound pressure level. In decibels, ten times the logarithm to the base ten, of the ratio of the time mean-square of the instantaneous sound pressure during a stated time interval and in a specified one-third octave band, to the square of the reference sound pressure of 20 µPa.

Windscreen insertion loss. In decibels, at a stated nominal one-third octave midband frequency, and for a stated sound incidence angle on the inserted microphone, the indicated sound pressure level without the windscreen installed around the microphone minus the sound pressure level with the windscreen installed.

3.2 Reference environmental conditions

The reference environmental conditions for specifying the performance of a measurement system are:

— air temperature	23°C
— static air pressure	101.325 kPa
— relative humidity	50%.

3.3 General

Note.— Measurements of aircraft noise that utilize instruments that conform to the specifications of this section yield one-third octave band sound pressure levels as a function of time, for the calculation of the effective perceived noise level as described in Section 4.

3.3.1 The measurement system shall consist of equipment approved by the certificating authority and equivalent to the following:

a) a windscreen (see 3.4);

b) a microphone system (see 3.5);

c) a recording and reproducing system to store the measured aircraft noise signals for subsequent analysis (see 3.6);

d) a one-third octave band analysis system (see 3.7); and

e) calibration systems to maintain the acoustical sensitivity of the above systems within specified tolerance limits (see 3.8).

3.3.2 For any component of the measurement system that converts an analogue signal to digital form, such conversion shall be performed so that the levels of any possible aliases or artefacts of the digitization process will be less than the upper boundary of the linear operating range by at least 50 dB at any frequency less than 12.5 kHz. The sampling rate shall be at least 28 kHz. An anti-aliasing filter shall be included before the digitization process.

3.4 Windscreen

In the absence of wind and for sinusoidal sounds at grazing incidence, the insertion loss caused by the windscreen of a stated type installed around the microphone shall not exceed ±1.5 dB at nominal one-third octave midband frequencies from 50 Hz to 10 kHz inclusive.

3.5 Microphone system

3.5.1 The microphone system shall conform to the specifications in 3.5.2 to 3.5.4. Various microphone systems may be approved by the certificating authority on the basis of demonstrated equivalent overall electroacoustical performance. Where two or more microphone systems of the same type are used, demonstration that at least one system conforms to the specifications in full is sufficient to demonstrate conformance.

1. IEC 61094-3:1995 entitled "Measurement microphones — Part 3: Primary method for free-field calibration of laboratory standard microphones by the reciprocity technique". This IEC publication may be obtained from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.
2. IEC 61094-4:1995 entitled "Measurement microphones — Part 4: Specifications for working standard microphones". This IEC publication may be obtained from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

Note.— This demonstration of equivalent performance does not eliminate the need to calibrate and check each system as defined in 3.9.

3.5.2 The microphone shall be mounted with the sensing element 1.2 m (4 ft) above the local ground surface and shall be oriented for grazing incidence, i.e. with the sensing element substantially in the plane defined by the predicted reference flight path of the aircraft and the measuring station. The microphone mounting arrangement shall minimize the interference of the supports with the sound to be measured. Figure A2-1 illustrates sound incidence angles on a microphone.

3.5.3 The free-field sensitivity level of the microphone and preamplifier in the reference direction, at frequencies over at least the range of one-third octave nominal midband frequencies from 50 Hz to 5 kHz inclusive, shall be within ±1.0 dB of that at the calibration check frequency, and within ±2.0 dB for nominal midband frequencies of 6.3 kHz, 8 kHz and 10 kHz.

3.5.4 For sinusoidal sound waves at each one-third octave nominal midband frequency over the range from 50 Hz to 10 kHz inclusive, the free-field sensitivity levels of the microphone system at sound incidence angles of 30°, 60°, 90°, 120° and 150° shall not differ from the free-field sensitivity level at a sound incidence angle of 0° ("normal incidence") by more than the values shown in Table A2-1. The free-field sensitivity level differences at sound incidence angles between any two adjacent sound incidence angles in Table A2-1 shall not exceed the tolerance limit for the greater angle.

3.6 Recording and reproducing systems

3.6.1 A recording and reproducing system, such as a digital or analogue magnetic tape recorder, a computer-based system or other permanent data storage device, shall be used to store sound pressure signals for subsequent analysis. The sound produced by the aircraft shall be recorded in such a way that a record of the complete acoustical signal is retained. The recording and reproducing systems shall conform to the specifications in 3.6.2 to 3.6.9 at the recording speeds and/or data sampling rates used for the noise certification tests. Conformance shall be demonstrated for the frequency bandwidths and recording channels selected for the tests.

3.6.2 The recording and reproducing systems shall be calibrated as described in 3.9.

Note.— For aircraft noise signals for which the high frequency spectral levels decrease rapidly with increasing frequency, appropriate pre-emphasis and complementary de-emphasis networks may be included in the measurement system. If pre-emphasis is included, over the range of nominal one-third octave midband frequencies from 800 Hz to 10 kHz inclusive, the electrical gain provided by the pre-emphasis network shall not exceed 20 dB relative to the gain at 800 Hz.

3.6.3 For steady sinusoidal electrical signals applied to the input of the entire measurement system exclusive of the microphone system, but including the microphone preamplifier, and any other signal-conditioning elements that are

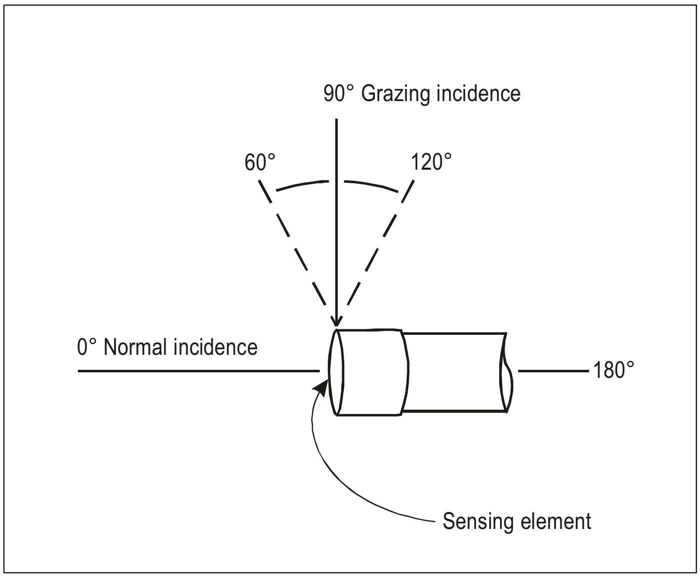


Figure A2-1. Illustration of sound incidence angles on a microphone

Table A2-1. Microphone directional response requirements

Nominal midband frequency kHz	Maximum difference between the free-field sensitivity level of a microphone system at normal incidence and the free-field sensitivity level at specified sound incidence angles (dB) — Sound incidence angle degrees				
	30	60	90	120	150
0.05 to 1.6	0.5	0.5	1.0	1.0	1.0
2.0	0.5	0.5	1.0	1.0	1.0
2.5	0.5	0.5	1.0	1.5	1.5
3.15	0.5	1.0	1.5	2.0	2.0
4.0	0.5	1.0	2.0	2.5	2.5
5.0	0.5	1.5	2.5	3.0	3.0
6.3	1.0	2.0	3.0	4.0	4.0
8.0	1.5	2.5	4.0	5.5	5.5
10.0	2.0	3.5	5.5	6.5	7.5

considered to be part of the microphone system, at a selected signal level within 5 dB of that corresponding to the calibration sound pressure level on the reference level range, the time average signal level indicated by the readout device at any one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive shall be within ±1.5 dB of that at the calibration check frequency. The frequency response of a measurement system, which includes components that convert analogue signals to digital form, shall be within ±0.3 dB of the response at 10 kHz over the frequency range from 10 kHz to 11.2 kHz.

Note.— It is not necessary to include microphone extension cables as configured in the field.

3.6.4 For analogue tape recordings, the amplitude fluctuations of a 1 kHz sinusoidal signal recorded within 5 dB of the level corresponding to the calibration sound pressure level shall not vary by more than ±0.5 dB throughout any reel of the type of magnetic tape utilized. Conformance to this requirement shall be demonstrated using a device which has time-averaging properties equivalent to those of the spectrum analyser.

3.6.5 For all appropriate level ranges and for steady sinusoidal electrical signals applied to the input of the measurement system exclusive of the microphone system, but including the microphone preamplifier, and any other signal-conditioning elements that are considered to be part of the microphone system, at one-third octave nominal midband frequencies of 50 Hz, 1 kHz and 10 kHz, and the calibration check frequency, if it is not one of these frequencies, the level non-linearity shall not exceed ±0.5 dB for a linear operating range of at least 50 dB below the upper boundary of the level range.

Note 1.— Level linearity of measurement system components should be tested according to the methods described in IEC 61265[3] as amended.

Note 2.— It is not necessary to include microphone extension cables as configured in the field.

3.6.6 On the reference level range, the level corresponding to the calibration sound pressure level shall be at least 5 dB, but no more than 30 dB less than the upper boundary of the level range.

3.6.7 The linear operating ranges on adjacent level ranges shall overlap by at least 50 dB minus the change in attenuation introduced by a change in the level range controls.

Note.— It is possible for a measurement system to have level range controls that permit attenuation changes of, for example, either 10 dB or 1 dB. With 10 dB steps, the minimum overlap required would be 40 dB, and with 1 dB steps the minimum overlap would be 49 dB.

3.6.8 Provision shall be made for an overload indication to occur during an overload condition on any relevant level range.

3. IEC 61265:1995 entitled "Electroacoustics — Instruments for measurement of aircraft noise — Performance requirements for systems to measure one-third-octave band sound pressure levels in noise certification of transport-category aeroplanes". This IEC publication may be obtained from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.6.9 Attenuators included in the measurement system to permit range changes shall operate in known intervals of decibel steps.

3.7 Analysis systems

3.7.1 The analysis system shall conform to the specifications in 3.7.2 to 3.7.7 for the frequency bandwidths, channel configurations and gain settings used for analysis.

3.7.2 The output of the analysis system shall consist of one-third octave band sound pressure levels as a function of time, obtained by processing the noise signals (preferably recorded) through an analysis system with the following characteristics:

a) a set of 24 one-third octave band filters, or their equivalent, having nominal midband frequencies from 50 Hz to 10 kHz inclusive;

b) response and averaging properties in which, in principle, the output from any one-third octave filter band is squared, averaged and displayed or stored as time-averaged sound pressure levels;

c) the interval between successive sound pressure level samples shall be 500 ms ± 5 ms for spectral analysis with or without SLOW time weighting;

d) for those analysis systems that do not process the sound pressure signals during the period of time required for readout and/or resetting of the analyser, the loss of data shall not exceed a duration of 5 ms; and

e) the analysis system shall operate in real time from 50 Hz to at least 12 kHz inclusive. This requirement applies to all operating channels of a multichannel spectral analysis system.

3.7.3 The one-third octave band analysis system shall at least conform to the class 2 electrical performance requirements of IEC 61260[4] as amended, over the range of one-third octave nominal midband frequencies from 50 Hz to 10 kHz inclusive.

Note.—Tests of the one-third octave band analysis system should be made according to the methods described in IEC 61260[4] or by an equivalent procedure approved by the certificating authority, for relative attenuation, anti-aliasing filters, real-time operation, level linearity, and filter integrated response (effective bandwidth).

4. IEC 61260:1995 entitled "Electroacoustics — Octave-band and fractional-octave-band filters". This IEC publication may be obtained from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.7.4 When SLOW time averaging is performed in the analyser, the response of the one-third octave band analysis system to a sudden onset or interruption of a constant sinusoidal signal at the respective one-third octave nominal midband frequency shall be measured at sampling instants 0.5, 1, 1.5 and 2 seconds after the onset and 0.5 and 1 seconds after interruption. The rising response shall be –4 ± 1 dB at 0.5 seconds, –1.75 ± 0.75 dB at 1 second, –1 ± 0.5 dB at 1.5 seconds and –0.5 ± 0.5 dB at 2 seconds relative to the steady-state level. The falling response shall be such that the sum of the output signal levels, relative to the initial steady-state level, and the corresponding rising response reading is –6.5 ± 1 dB, at both 0.5 and 1 seconds. At subsequent times the sum of the rising and falling responses shall be –7.5 dB or less. This equates to an exponential averaging process (SLOW weighting) with a nominal 1-second time constant (i.e. 2 seconds averaging time).

3.7.5 When the one-third octave band sound pressure levels are determined from the output of the analyser without SLOW time weighting, SLOW time weighting shall be simulated in the subsequent processing. Simulated SLOW weighted sound pressure levels can be obtained using a continuous exponential averaging process by the following equation:

$$L_s(i,k) = 10 \log [(0.60653)\ 10^{\ 0.1L_s[i,(k-1)]} + (0.39347)\ 10^{0.1\ L(i,k)}]$$

where $L_s(i,k)$ is the simulated SLOW weighted sound pressure level and $L(i,k)$ is the as-measured 0.5 seconds time average sound pressure level determined from the output of the analyser for the k-th instant of time and the i-th one-third octave band. For $k = 1$, the SLOW weighted sound pressure $L_s[i,(k\text{-}1 = 0)]$ on the right-hand side shall be set to 0 dB.

An approximation of the continuous exponential averaging is represented by the following equation for a four sample averaging process for $k = 4$:

$$L_s(i,k) = 10 \log [(0.13)\ 10^{\ 0.1L[i,(k-3)]} + (0.21)\ 10^{\ 0.1L[i,(k-2)]} + (0.27)\ 10^{\ 0.1L[i,(k-1)]} + (0.39)\ 10^{\ 0.1L[i,k]}]$$

where $L_s(i,k)$ is the simulated SLOW weighted sound pressure level and $L(i,k)$ is the as-measured 0.5 seconds time average sound pressure level determined from the output of the analyser for the k-th instant of time and the i-th one-third octave band.

The sum of the weighting factors is 1.0 in the two equations. Sound pressure levels calculated by means of either equation are valid for the sixth and subsequent 0.5 seconds data samples, or for times greater than 2.5 seconds after initiation of data analysis.

Note.— The coefficients in the two equations were calculated for use in determining equivalent SLOW weighted sound pressure levels from samples of 0.5 seconds time average sound pressure levels. The equations should not be used with data samples where the averaging time differs from 0.5 seconds.

3.7.6 The instant in time by which a SLOW time weighted sound pressure level is characterized shall be 0.75 seconds earlier than the actual readout time.

Note.— The definition of this instant in time is required to correlate the recorded noise with the aircraft position when the noise was emitted and takes into account the averaging period of the SLOW weighting. For each one-half second data record this instant in time may also be identified as 1.25 seconds after the start of the associated 2 seconds averaging period.

3.7.7 The resolution of the sound pressure levels, both displayed and stored, shall be 0.1 dB or better.

3.8 Calibration systems

The acoustical sensitivity of the measurement system shall be determined using a sound calibrator generating a known sound pressure level at a known frequency. The sound calibrator shall at least conform to the class 1L requirements of IEC 60942[5] as amended.

3.9 Calibration and checking of system

3.9.1 Calibration and checking of the measurement system and its constituent components shall be carried out to the satisfaction of the certificating authorities by the methods specified in 3.9.2 to 3.9.10. The calibration adjustments, including those for environmental effects on sound calibrator output level, shall be reported to the certificating authority and applied to the measured one-third octave sound pressure levels determined from the output of the analyser. Data collected during an overload indication are invalid and shall not be used. If the overload condition occurred during recording, the associated test data shall be considered as invalid, whereas if the overload occurred during analysis, the analysis shall be repeated with reduced sensitivity to eliminate the overload.

3.9.2 The free-field frequency response of the microphone system may be determined by using an electrostatic actuator in combination with the manufacturer's data or by testing in an anechoic free-field facility. The correction for frequency response shall be determined within 90 days of each test series. The correction for non-uniform frequency response of the microphone system shall be reported to the certificating authority and applied to the measured one-third octave band sound pressure levels determined from the output of the analyser.

5. IEC 60942:1997 entitled "Electroacoustics — Sound calibrators". This IEC publication may be obtained from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.9.3 When the angles of incidence of sound emitted from the aircraft are within ±30º of grazing incidence at the microphone (see Figure A2-1), a single set of free-field corrections based on grazing incidence is considered sufficient for correction of directional response effects. For other cases, the angle of incidence for each one-half second sample shall be determined and applied for the correction of incidence effects.

3.9.4 For analogue magnetic tape recorders, each reel of magnetic tape shall carry at least 30 seconds of pink random or pseudo-random noise at its beginning and end. Data obtained from analogue tape-recorded signals shall be accepted as reliable only if level differences in the 10 kHz one-third octave band are not more than 0.75 dB for the signals recorded at the beginning and end.

3.9.5 The frequency response of the entire measurement system while deployed in the field during the test series, exclusive of the microphone, shall be determined at a level within 5 dB of the level corresponding to the calibration sound pressure level on the level range used during the tests for each one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive, utilizing pink random or pseudo-random noise. The output of the noise generator shall be determined by a method traceable to a national standards laboratory within six months of each test series, and tolerable changes in the relative output from the previous calibration at each one-third octave band shall be not more than 0.2 dB. The correction for frequency response shall be reported to the certificating authority and applied to the measured one-third octave sound pressure levels determined from the output of the analyser.

3.9.6 The performance of switched attenuators in the equipment used during noise certification measurements and calibration shall be checked within six months of each test series to ensure that the maximum error does not exceed 0.1 dB.

3.9.7 The sound pressure level produced in the cavity of the coupler of the sound calibrator shall be calculated for the test environmental conditions using the manufacturer's supplied information on the influence of atmospheric air pressure and temperature. The sound pressure level shall be used to establish the acoustical sensitivity of the measurement system. The output of the sound calibrator shall be determined by a method traceable to a national standards laboratory within six months of each test series and tolerable changes in output from the previous calibration shall be not more than 0.2 dB.

3.9.8 Sufficient sound pressure level calibrations shall be made during each test day to ensure that the acoustical sensitivity of the measurement system is known at the prevailing environmental conditions corresponding with each test series. The measurement system shall be considered satisfactory if the difference is not greater than 0.5 dB between the acoustical sensitivity levels recorded immediately before and immediately after each test series on a given day. The 0.5 dB limit applies after any atmospheric pressure corrections have been determined for the calibrator output level. The arithmetic mean of the before and after measurements shall be used to represent the acoustical sensitivity level of the measurement system for that test series. The calibration corrections shall be reported to the certificating authority and applied to the measured one-third octave band sound pressure levels determined from the output of the analyser.

3.9.9 Each recording medium, such as a reel, cartridge, cassette, or diskette, shall carry a sound pressure level calibration of at least 10 seconds duration at its beginning and end.

3.9.10 The free-field insertion loss of the windscreen for each one-third octave nominal midband frequency from 50 Hz to 10 kHz inclusive shall be determined with sinusoidal sound signals at appropriate incidence angles on the inserted microphone. For a windscreen which is undamaged and uncontaminated, the insertion loss may be taken from the manufacturer's data. In addition, the insertion loss of the windscreen may be determined by a method traceable to a national standards laboratory within six months of each test series, and tolerable changes in the insertion loss from the previous calibration at each one-third octave frequency band shall be not more than 0.4 dB. The correction for the free-field insertion loss of the windscreen shall be reported to the certificating authority and applied to the measured one-third octave sound pressure levels determined from the output of the analyser.

3.10 Adjustments for background noise

3.10.1 Background noise shall be recorded (for at least 30 seconds) at the measurement points with the system gain set at the levels used for the aircraft noise measurements. The recorded background noise sample shall be representative of that which exists during the test run. The recorded aircraft noise data shall be accepted only if the background noise levels, when analysed in the same way and quoted in PNL (see 4.1.3 a)), are at least 20 dB below the maximum PNL of the aircraft.

3.10.2 Aircraft sound pressure levels within the 10 dB-down points (see 4.5.1) shall exceed mean background noise levels determined above by at least 3 dB in each one-third octave band or be adjusted using a method similar to that described in Appendix 3 of Doc 9501.

4. CALCULATION OF EFFECTIVE PERCEIVED NOISE LEVEL FROM MEASURED NOISE DATA

4.1 General

4.1.1 The basic element in the noise certification criteria shall be the noise evaluation measure designated effective perceived noise level, EPNL, in units of EPNdB, which is a single number evaluator of the subjective effects of aircraft noise on human beings. Simply stated, EPNL shall consist of instantaneous perceived noise level, PNL, corrected for spectral irregularities (the correction, called "tone correction factor", is made for the maximum tone only at each increment of time) and for duration.

4.1.2 Three basic physical properties of sound pressure shall be measured: level, frequency distribution, and time variation. More specifically, the instantaneous sound pressure level in each of 24 one-third octave bands of the noise shall be required for each 500 ms increment of time during the aircraft noise measurement.

4.1.3 The calculation procedure which utilizes physical measurements of noise to derive the EPNL evaluation measure of subjective response shall consist of the following five steps:

a) the 24 one-third octave bands of sound pressure level are converted to perceived noisiness by the methods of Section 4.7. The noy values are combined and then converted to instantaneous perceived noise levels, PNL(k);

b) a tone correction factor, $C(k)$, is calculated for each spectrum to account for the subjective response to the presence of spectral irregularities;

c) the tone correction factor is added to the perceived noise level to obtain tone corrected perceived noise levels, PNLT(k), at each one-half second increment of time:

$$\mathrm{PNLT}(k) = \mathrm{PNL}(k) + C(k)$$

The instantaneous values of tone corrected perceived noise level are derived and the maximum value, PNLTM, is determined;

d) a duration correction factor, D, is computed by integration under the curve of tone corrected perceived noise level versus time;

e) effective perceived noise level, EPNL, is determined by the algebraic sum of the maximum tone corrected perceived noise level and the duration correction factor:

$$\mathrm{EPNL} = \mathrm{PNLTM} + D.$$

4.2 Perceived noise level

Instantaneous perceived noise levels, PNL(k), shall be calculated from instantaneous one-third octave band sound pressure levels, SPL(i,k), as follows:

Step 1. Convert each one-third octave band, SPL(i,k), from 50 to 10 000 Hz, to perceived noisiness, $n(i,k)$, by reference to Table A4-1 (Perceived Noisiness) in Appendix 4 of Doc 9501, or to the mathematical formulation of the noy table given in Section 4.7.

Step 2. Combine the perceived noisiness values, $n(i,k)$, found in Step 1 by the following formula:

$$N(k) = n(k) + 0.15 \left\{ [\sum_{i=1}^{24} n(i,k)] - n(k) \right\}$$

$$= 0.85\ n(k) + 0.15 \sum_{i=1}^{24} n(i,k)$$

where $n(k)$ is the largest of the 24 values of $n(i,k)$, and $N(k)$ is the total perceived noisiness.

Step 3. Convert the total perceived noisiness, $N(k)$, into perceived noise level, PNL(k), by the following formula:

$$\text{PNL}(k) = 40.0 + \frac{10}{\log 2} \log N(k)$$

Note.— PNL(k) *is plotted in Figure A4-1 of Appendix 4 of Doc 9501.*

4.3 Correction for spectral irregularities

4.3.1 Noise having pronounced spectral irregularities (for example, the maximum discrete frequency components or tones) shall be adjusted by the correction factor, $C(k)$, calculated as follows:

Step 1. Except for helicopters which start at 50 Hz (band number 1), start with the corrected sound pressure level in the 80 Hz one-third octave band (band number 3), calculate the changes in sound pressure level (or "slopes") in the remainder of the one-third octave bands as follows:

$s(3,k)$ = no value
$s(4,k) = \text{SPL}(4,k) - \text{SPL}(3,k)$
•
•
•
$s(i,k) = \text{SPL}(i,k) - \text{SPL}(i-1,k)$
•
•
•
$s(24,k) = \text{SPL}(24,k) - \text{SPL}(23,k)$

Step 2. Encircle the value of the slope, $s(i,k)$, where the absolute value of the change in slope is greater than five; that is, where:

$$|\Delta s(i,k)| = |s(i,k) - s(i-1,k)| > 5$$

Step 3.

a) If the encircled value of the slope $s(i,k)$ is positive and algebraically greater than the slope $s(i-1,k)$, encircle SPL(i,k).

b) If the encircled value of the slope $s(i,k)$ is zero or negative and the slope $s(i-1,k)$ is positive, encircle SPL($i-1,k$).

c) For all other cases, no sound pressure level value is to be encircled.

Step 4. Compute new adjusted sound pressure levels, SPL′(i,k), as follows:

a) For non-encircled sound pressure levels, let the new sound pressure levels equal the original sound pressure levels, SPL′(i,k) = SPL(i,k).

b) For encircled sound pressure levels in bands 1 to 23 inclusive, let the new sound pressure level equal the arithmetic average of the preceding and following sound pressure levels:

$$\text{SPL}'(i,k) = \tfrac{1}{2}[\text{SPL}(i-1,k) + \text{SPL}(i+1,k)]$$

c) If the sound pressure level in the highest frequency band (i = 24) is encircled, let the new sound pressure level in that band equal:

$$\text{SPL}'(24,k) = \text{SPL}(23,k) + s(23,k)$$

Step 5. Recompute new slopes $s'(i,k)$, including one for an imaginary 25th band, as follows:

$s'(3,k) = s'(4,k)$
$s'(4,k) = \text{SPL}'(4,k) - \text{SPL}'(3,k)$
•
•
•
$s'(i,k) = \text{SPL}'(i,k) - \text{SPL}'(i-1,k)$
•
•
•
$s'(24,k) = \text{SPL}'(24,k) - \text{SPL}'(23,k)$
$s'(25,k) = s'(24,k)$

Step 6. For i from 3 to 23 (or 1 to 23 for helicopters), compute the arithmetic average of the three adjacent slopes as follows:

$$\bar{s}(i,k) = \tfrac{1}{3}[s'(i,k) + s'(i+1,k) + s'(i+2,k)]$$

Step 7. Compute final one-third octave-band sound pressure levels, SPL″(i,k), by beginning with band number 3 (or band number 1 for helicopters) and proceeding to band number 24 as follows:

$\text{SPL}''(3,k) = \text{SPL}(3,k)$
$\text{SPL}''(4,k) = \text{SPL}''(3,k) + \bar{s}(3,k)$
•
•
•
$\text{SPL}''(i,k) = \text{SPL}''(i-1,k) + \bar{s}(i-1,k)$
•
•
•
$\text{SPL}''(24,k) = \text{SPL}''(23,k) + \bar{s}(23,k)$

Step 8. Calculate the differences, $F(i,k)$, between the original sound pressure level and the final broadband sound pressure level as follows:

$$F(i,k) = SPL(i,k) - SPL''(i,k)$$

and note only values equal to or greater than one and a half.

Step 9. For each of the relevant one-third octave bands (3 to 24), determine tone correction factors from the sound pressure level differences, $F(i,k)$, and Table A2-2.

Step 10. Designate the largest of the tone correction factors, determined in Step 9, as $C(k)$. An example of the tone correction procedure is given in Table A4-2 of Appendix 4 of Doc 9501.

Tone corrected perceived noise levels PNLT(k) shall be determined by adding the $C(k)$ values to corresponding PNL(k) values, that is:

$$PNLT(k) = PNL(k) + C(k)$$

For any i-th one-third octave band, at any k-th increment of time, for which the tone correction factor is suspected to result from something other than (or in addition to) an actual tone (or any spectral irregularity other than aircraft noise), an additional analysis may be made using a filter with a bandwidth narrower than one-third of an octave. If the narrow band analysis corroborates these suspicions, then a revised value for the broadband sound pressure level, SPL′(i,k), shall be determined from the narrow band analysis and used to compute a revised tone correction factor for that particular one-third octave band.

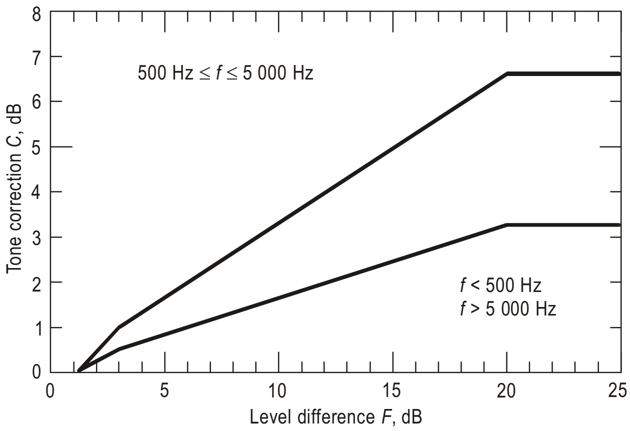
Note.— Other methods of rejecting spurious tone corrections such as those described in Appendix 2 of Doc 9501 may be used.

4.3.2 This procedure will underestimate EPNL if an important tone is of a frequency such that it is recorded in two adjacent one-third octave bands. It shall be demonstrated to the satisfaction of the certificating authority:

either that this has not occurred,

or that if it has occurred that the tone correction has been adjusted to the value it would have had if the tone had been recorded fully in a single one-third octave band.

Table A2-2. Tone correction factors



Frequency f, Hz	Level difference F, dB	Tone correction C, dB
$50 \leq f < 500$	$1\frac{1}{2}^* \leq F < 3$	$F/3 - \frac{1}{2}$
	$3 \leq F < 20$	$F/6$
	$20 \leq F$	$3\frac{1}{3}$
$500 \leq f \leq 5\,000$	$1\frac{1}{2}^* \leq F < 3$	$2F/3 - 1$
	$3 \leq F < 20$	$F/3$
	$20 \leq F$	$6\frac{2}{3}$
$5\,000 < f \leq 10\,000$	$1\frac{1}{2}^* \leq F < 3$	$F/3 - \frac{1}{2}$
	$3 \leq F < 20$	$F/6$
	$20 \leq F$	$3\frac{1}{3}$

* See Step 8 of 4.3.1.

4.4 Maximum tone corrected perceived noise level

4.4.1 The maximum tone corrected perceived noise level, PNLTM, shall be the maximum calculated value of the tone corrected perceived noise level PNLT(k). It shall be calculated in accordance with the procedure of 4.3. To obtain a satisfactory noise time history, measurements shall be made at 500 ms time intervals.

Note 1.— Figure A2-2 is an example of a flyover noise time history where the maximum value is clearly indicated.

Note 2.— In the absence of a tone correction factor, PNLTM would equal PNLM.

4.4.2 After the value of PNLTM is obtained, the frequency band for the largest tone correction factor is identified for the two preceding and two succeeding 500 ms data samples. This is performed in order to identify the possibility of tone suppression at PNLTM by one-third octave band sharing of that tone. If the value of the tone correction factor *C(k)* for PNLTM is less than the average value of *C(k)* for the five consecutive time intervals, the average value of *C(k)* shall be used to compute a new value for PNLTM.

4.5 Duration correction

4.5.1 The duration correction factor, D, determined by the integration technique shall be defined by the expression:

$$D = 10 \log \left[\left(\frac{1}{T}\right) \int_{t1}^{t2} \text{antilog} \ \frac{\text{PNLT}}{10} \ dt \right] - \text{PNLTM}$$

where T is a normalizing time constant, PNLTM is the maximum value of PNLT, $t1$ is the first point of time after which PNLT becomes greater than PNLTM – 10 and $t2$ is the point of time after which PNLT remains constantly less than PNLTM – 10.

4.5.2 Since PNLT is calculated from measured values of SPL, there will, in general, be no obvious equation for PNLT as a function of time. Consequently, the equation shall be rewritten with a summation sign instead of an integral sign as follows:

$$D = 10 \log \left[\left(\frac{1}{T}\right) \sum_{k=0}^{d/\Delta t} \Delta t \cdot \text{antilog} \ \frac{\text{PNLT}(k)}{10} \right] - \text{PNLTM}$$

where Δt is the length of the equal increments of time for which PNLT(k) is calculated and d is the time interval to the nearest 0.5 seconds during which PNLT(k) remains greater or equal to PNLTM – 10.

4.5.3 To obtain a satisfactory history of the perceived noise level,

a) half-second time intervals for Δt, or

b) a shorter time interval with approved limits and constants,

shall be used.

4.5.4 The following values for T and Δt shall be used in calculating D in the procedure given in 4.5.2:

T = 10 s, and
Δt = 0.5 s

Using the above values, the equation for D becomes

$$\text{D} = 10 \log \left[\sum_{k=0}^{2d} \text{antilog} \ \frac{\text{PNLT}(k)}{10} \right] - \text{PNLTM} - 13$$

where d is the duration time defined by the points corresponding to the values PNLTM – 10.

4.5.5 If in the procedures given in 4.5.2, the limits of PNLTM – 10 fall between the calculated PNLT(k) values (the usual case), the PNLT(k) values defining the limits of the duration interval shall be chosen from the PNLT(k) values closest to PNLTM – 10. For those cases with more than one peak value of PNLT(k), the applicable limits must be chosen to yield the largest possible value for the duration time.

4.6 Effective perceived noise level

The total subjective effect of an aircraft noise event, designated "effective perceived noise level", EPNL, shall be equal to the algebraic sum of the maximum value of the tone corrected perceived noise level, PNLTM, and the duration correction D. That is:

$$\text{EPNL} = \text{PNLTM} + D$$

where PNLTM and D are calculated in accordance with the procedures given in 4.2, 4.3, 4.4 and 4.5.

4.7 Mathematical formulation of noy tables

4.7.1 The relationship between sound pressure level (SPL) and the logarithm of perceived noisiness is illustrated in Table A2-3 and Figure A2-3.

4.7.2 The important aspects of the mathematical formulation are:

a) the slopes ($M(b)$, $M(c)$, $M(d)$ and $M(e)$) of the straight lines;

b) the intercepts (SPL(b) and SPL(c)) of the lines on the SPL axis; and

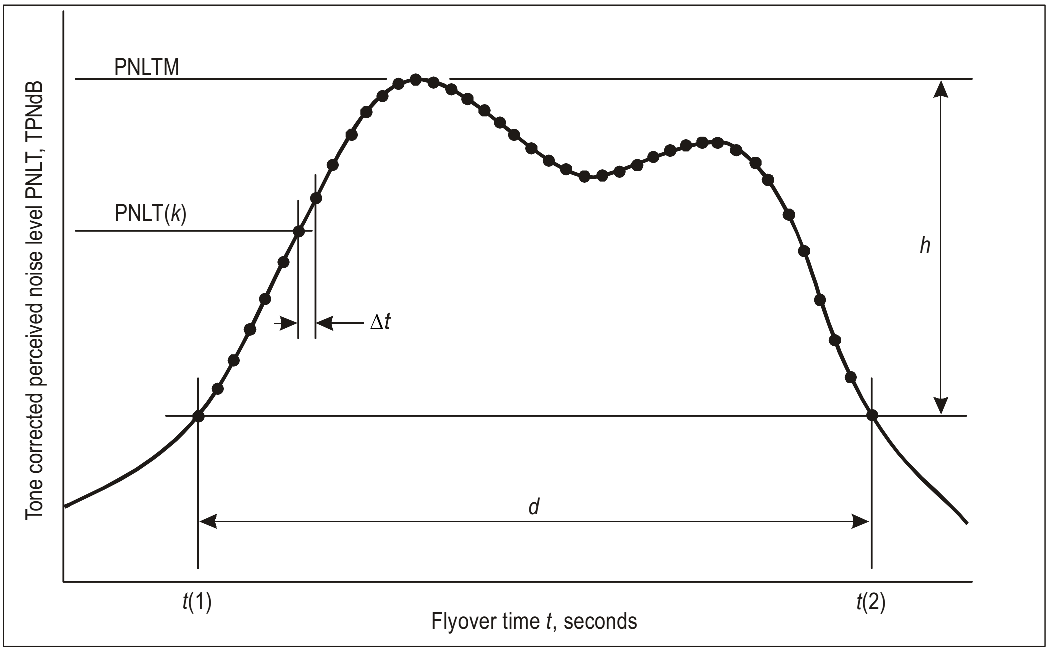


Figure A2-2. Example of perceived noise level corrected for tones as a function of aeroplane flyover time

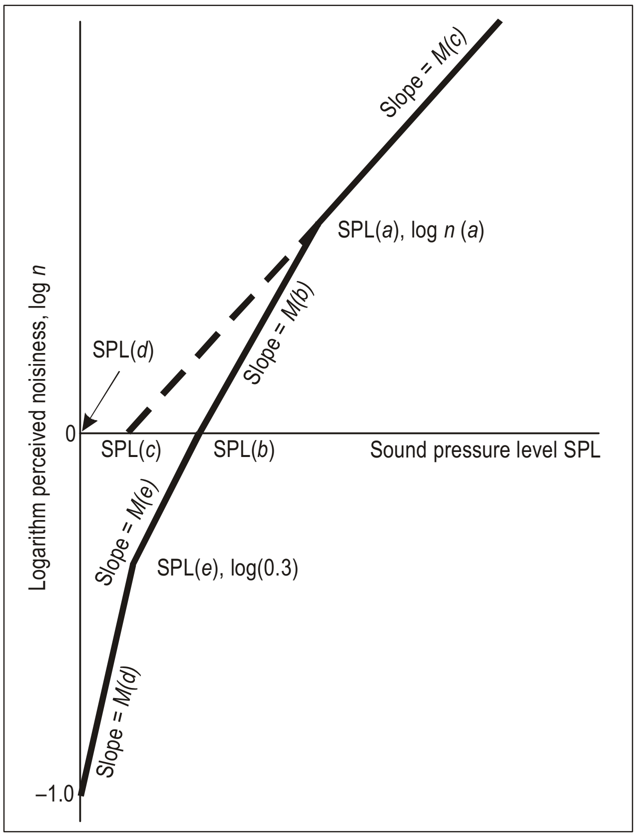


Figure A2-3. Perceived noisiness as a function of sound pressure level

Table A2-3. Constants for mathematically formulated noy values

BAND (i)	f Hz	SPL (a)	SPL (b)	SPL (c)	SPL (d)	SPL (e)	$M(b)$	$M(c)$	$M(d)$	$M(e)$
1	50	91.0	64	52	49	55	0.043478	0.030103	0.079520	0.058098
2	63	85.9	60	51	44	51	0.040570		0.068160	”
3	80	87.3	56	49	39	46	0.036831		”	0.052288
4	100	79.0	53	47	34	42	”		0.059640	0.047534
5	125	79.8	51	46	30	39	0.035336		0.053013	0.043573
6	160	76.0	48	45	27	36	0.033333			”
7	200	74.0	46	43	24	33	”			0.040221
8	250	74.9	44	42	21	30	0.032051			0.037349
9	315	94.6	42	41	18	27	0.030675	0.030103		0.034859
10	400	∞	40	40	16	25	0.030103			
11	500		40	40	16	25				
12	630		40	40	16	25				
13	800		40	40	16	25				
14	1 000		40	40	16	25			0.053013	
15	1 250		38	38	15	23	0.030103	NOT APPLICABLE	0.059640	0.034859
16	1 600		34	34	12	21	0.029960		0.053013	0.040221
17	2 000		32	32	9	18			”	0.037349
18	2 500		30	30	5	15			0.047712	0.034859
19	3 150		29	29	4	14			”	
20	4 000		29	29	5	14			0.053013	
21	5 000		30	30	6	15			”	0.034859
22	6 300	∞	31	31	10	17	0.029960	0.029960	0.068160	0.037349
23	8 000	44.3	37	34	17	23	0.042285		0.079520	”
24	10 000	50.7	41	37	21	29	”	”	0.059640	0.043573

c) the coordinates of the discontinuities, SPL(a) and log $n(a)$; SPL(d) and log n = –1.0; and SPL(e) and log n = log (0.3).

4.7.3 The equations are as follows:

a) SPL ≥ SPL(a)
$n = \text{antilog } \{M(c)\ [\text{SPL} - \text{SPL}(c)]\}$

b) SPL(b) ≤ SPL < SPL(a)
$n = \text{antilog } \{M(b)\ [\text{SPL} - \text{SPL}(b)]\}$

c) SPL(e) ≤ SPL < SPL(b)
$n = 0.3 \text{ antilog}_{10} \{M(e)\ [\text{SPL} - \text{SPL}(e)]\}$

d) SPL(d) ≤ SPL < SPL(e)
$n = 0.1 \text{ antilog } \{M(d)\ [\text{SPL} - \text{SPL}(d)]\}$

4.7.4 Table A2-3 lists the values of the constants necessary to calculate perceived noisiness as a function of sound pressure level.

5. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY

5.1 General

5.1.1 Data representing physical measurements or corrections to measured data shall be recorded in permanent form and appended to the record.

5.1.2 All corrections shall be approved by the certificating authority. In particular the corrections to measurements for equipment response deviations shall be reported.

5.1.3 Estimates of the individual errors inherent in each of the operations employed in obtaining the final data shall be reported, if required.

5.2 Data reporting

5.2.1 Measured and corrected sound pressure levels shall be presented in one-third octave band levels obtained with equipment conforming to the Standards described in Section 3 of this appendix.

5.2.2 The type of equipment used for measurement and analysis of all acoustic performance and meteorological data shall be reported.

5.2.3 The following atmospheric environmental data, measured immediately before, after, or during each test at the observation points prescribed in Section 2 of this appendix shall be reported:

a) air temperature and relative humidity;

b) maximum, minimum and average wind velocities; and

c) atmospheric pressure.

5.2.4 Comments on local topography, ground cover, and events that might interfere with sound recordings shall be reported.

5.2.5 The following information shall be reported:

a) type, model and serial numbers (if any) of aircraft, engines, propellers or rotors (as applicable);

b) gross dimensions of aircraft and location of engines and rotors (if applicable);

c) aircraft gross mass for each test run and centre of gravity range for each series of test runs;

d) aircraft configuration such as flap, air brakes and landing gear positions and propeller pitch angles (if applicable);

e) whether auxiliary power units (APU), when fitted, are operating;

f) conditions of pneumatic engine bleeds and engine power take-offs;

g) indicated airspeed in kilometres per hour (knots);

h) 1) *for jet aeroplanes:* engine performance in terms of net thrust, engine pressure ratios, jet exhaust temperatures and fan or compressor shaft rotational speeds as determined from aeroplane instruments and manufacturer's data;

2) *for propeller-driven aeroplanes:* engine performance in terms of brake horsepower and residual thrust or equivalent shaft horsepower or engine torque and propeller rotational speed as determined from aeroplane instruments and manufacturer's data;

3) *for helicopters:* engine performance and rotor speed in rpm during each demonstration;

i) aircraft flight path and ground speed during each demonstration; and

j) any aircraft modifications or non-standard equipment likely to affect the noise characteristics of the aircraft and approved by the certificating authority.

5.3 Reporting of noise certification reference conditions

Aircraft position and performance data and the noise measurements shall be corrected to the noise certification reference conditions as specified in the relevant chapter of Part II, and these conditions, including reference parameters, procedures and configurations shall be reported.

5.4 Validity of results

5.4.1 Three average reference EPNL values and their 90 per cent confidence limits shall be produced from the test results and reported, each such value being the arithmetical average of the adjusted acoustical measurements for all valid test runs at the appropriate measurement point (take-off, approach, or lateral or overflight, in the case of helicopters). If more than one acoustic measurement system is used at any single measurement location, the resulting data for each test run shall be averaged as a single measurement. For helicopters, the three microphone test results for each flight should be averaged as a single measurement. The calculation shall be performed by:

a) computing the arithmetic average for each flight phase using the values from each reference microphone point;

b) computing the overall arithmetic average for each appropriate reference condition (take-off, overflight or approach) using the values in a) and the related 90 per cent confidence limits.

Note.— For helicopters a flight shall only be considered valid if simultaneous measurements are made at all three noise measurement locations.

5.4.2 The minimum sample size acceptable for each of the three certification measuring points for aeroplanes and for each set of three microphones for helicopters is six. The samples shall be large enough to establish statistically for each of the three average noise certification levels a 90 per cent confidence limit not exceeding ±1.5 EPNdB. No test result shall be omitted from the averaging process unless otherwise specified by the certificating authority.

Note.— Methods for calculating the 90 per cent confidence interval are given in Appendix 1 of Doc 9501.

5.4.3 The average EPNL figures obtained by the foregoing process shall be those by which the noise performance of the aircraft is assessed against the noise certification criteria.

6. NOMENCLATURE: SYMBOLS AND UNITS

Symbol	*Unit*	*Meaning*
antilog	—	*Antilogarithm to the base 10.*
$C(k)$	dB	*Tone correction factor.* The factor to be added to PNL(k) to account for the presence of spectral irregularities such as tones at the k-th increment of time.
d	s	*Duration time.* The length of the significant noise time history being the time interval between the limits of $t(1)$ and $t(2)$ to the nearest 0.5 second.
D	dB	*Duration correction.* The factor to be added to PNLTM to account for the duration of the noise.
EPNL	EPNdB	*Effective perceived noise level.* The value of PNL adjusted for both the spectral irregularities and the duration of the noise. (The unit EPNdB is used instead of the unit dB.)
$f(i)$	Hz	*Frequency.* The geometrical mean frequency for the i-th one-third octave band.
$F(i,k)$	dB	*Delta-dB.* The difference between the original sound pressure level and the final broadband sound pressure level in the i-th one-third octave band at the k-th interval of time.
h	dB	*dB-down.* The level to be subtracted from PNLTM that defines the duration of the noise.
H	%	*Relative humidity.* The ambient atmospheric relative humidity.
i	—	*Frequency band index.* The numerical indicator that denotes any one of the 24 one-third octave bands with geometrical mean frequencies from 50 to 10 000 Hz.
k	—	*Time increment index.* The numerical indicator that denotes the number of equal time increments that have elapsed from a reference zero.
log	—	*Logarithm to the base 10.*
log $n(a)$	—	*Noy discontinuity coordinate.* The log n value of the intersection point of the straight lines representing the variation of SPL with log n.

Symbol	*Unit*	*Meaning*
$M(b)$, $M(c)$, etc.	—	*Noy inverse slope.* The reciprocals of the slopes of straight lines representing the variation of SPL with log n.
n	noy	*Perceived noisiness.* The perceived noisiness at any instant of time that occurs in a specified frequency range.
$n(i,k)$	noy	*Perceived noisiness.* The perceived noisiness at the k-th instant of time that occurs in the i-th one-third octave band.
$n(k)$	noy	*Maximum perceived noisiness.* The maximum value of all of the 24 values of $n(i)$ that occurs at the k-th instant of time.
$N(k)$	noy	*Total perceived noisiness.* The total perceived noisiness at the k-th instant of time calculated from the 24 instantaneous values of $n(i,k)$.
$p(b)$, $p(c)$, etc.	—	*Noy slope.* The slopes of straight lines representing the variation of SPL with log n.
PNL	PNdB	*Perceived noise level.* The perceived noise level at any instant of time. (The unit PNdB is used instead of the unit dB.)
PNL(k)	PNdB	*Perceived noise level.* The perceived noise level calculated from the 24 values of SPL(i,k) at the k-th increment of time. (The unit PNdB is used instead of the unit dB.)
PNLM	PNdB	*Maximum perceived noise level.* The maximum value of PNL(k). (The unit PNdB is used instead of the unit dB.)
PNLT	TPNdB	*Tone corrected perceived noise level.* The value of PNL adjusted for the spectral irregularities that occur at any instant of time. (The unit TPNdB is used instead of the unit dB.)
PNLT(k)	TPNdB	*Tone corrected perceived noise level.* The value of PNL(k) adjusted for the spectral irregularities that occur at the k-th increment of time. (The unit TPNdB is used instead of the unit dB.)
PNLTM	TPNdB	*Maximum tone corrected perceived noise level.* The maximum value of PNLT(k). (The unit TPNdB is used instead of the unit dB.)
PNLT_r	TPNdB	*Tone corrected perceived noise level* adjusted for reference conditions.
$s(i,k)$	dB	*Slope of sound pressure level.* The change in level between adjacent one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
$\Delta s(i,k)$	dB	*Change in slope of sound pressure level.*
$s'(i,k)$	dB	*Adjusted slope of sound pressure level.* The change in level between adjacent adjusted one-third octave band sound pressure levels at the i-th band for the k-th instant of time.
$\bar{s}(i,k)$	dB	*Average slope of sound pressure level.*
SPL	dB re 20 µPa	*Sound pressure level.* The sound pressure level at any instant of time that occurs in a specified frequency range.
SPL(a)	dB re 20 µPa	*Noy discontinuity coordinate.* The SPL value of the intersection point of the straight lines representing the variation of SPL with log n.
SPL(b) SPL(c)	dB re 20 µPa	*Noy intercept.* The intercepts on the SPL-axis of the straight lines representing the variation of SPL with log n.
SPL(i,k)	dB re 20 µPa	*Sound pressure level.* The sound pressure level at the k-th instant of time that occurs in the i-th one-third octave band.
SPL′(i,k)	dB re 20 µPa	*Adjusted sound pressure level.* The first approximation to broadband sound pressure level in the i-th one-third octave band for the k-th instant of time.
SPL(i)	dB re 20 µPa	*Maximum sound pressure level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM.
$\mathrm{SPL}(i)_r$	dB re 20 µPa	*Corrected maximum sound pressure level.* The sound pressure level that occurs in the i-th one-third octave band of the spectrum for PNLTM corrected for atmospheric sound absorption.

Symbol	*Unit*	*Meaning*
SPL″(*i*,*k*)	dB re 20 µPa	*Final broadband sound pressure level.* The second and final approximation to broadband sound pressure level in the *i*-th one-third octave band for the *k*-th instant of time.
t	s	*Elapsed time.* The length of time measured from a reference zero.
$t1$, $t2$	s	*Time limit.* The beginning and end, respectively, of the significant noise time history defined by *h*.
Δt	s	*Time increment.* The equal increments of time for which PNL(*k*) and PNLT(*k*) are calculated.
T	s	*Normalizing time constant.* The length of time used as a reference in the integration method for computing duration corrections, where $T = 10$ s.
t (°C)	°C	*Temperature.* The ambient atmospheric temperature.
$\alpha(i)$	dB/100 m	*Test atmospheric absorption.* The atmospheric attenuation of sound that occurs in the *i*-th one-third octave band for the measured atmospheric temperature and relative humidity.
$\alpha(i)_o$	dB/100 m	*Reference atmospheric absorption.* The atmospheric attenuation of sound that occurs in the *i*-th one-third octave band for a reference atmospheric temperature and relative humidity.
A_1	degrees	*First constant* climb angle.*
A_2	degrees	*Second constant** climb angle.*
δ ε	degrees degrees	*Thrust cutback angles.* The angles defining the points on the take-off flight path at which thrust reduction is started and ended respectively.
η	degrees	*Approach angle.*
η_r	degrees	*Reference approach angle.*
θ	degrees	*Noise angle (relative to flight path).* The angle between the flight path and noise path. It is identical for both measured and corrected flight paths.
ψ	degrees	*Noise angle (relative to ground).* The angle between the noise paths and the ground. It is identified for both measured and corrected flight paths.
μ	degrees	*Engine noise emission parameter.* (See 9.3.4.)
Δ_1	EPNdB	*PNLT correction.* The correction to be added to the EPNL calculated from measured data to account for noise level changes due to differences in atmospheric absorption and noise path length between reference and test conditions.
Δ_2	EPNdB	*Adjustment to duration correction.* The adjustment to be made to the EPNL calculated from measured data to account for noise level changes due to the noise duration between reference and test conditions.
Δ_3	EPNdB	*Source noise adjustment.* The adjustment to be made to the EPNL calculated from measured data to account for noise level changes due to differences between reference and test engine regime.

* Gear up, speed of at least V_2 + 19 km/h (V_2 + 10 kt), take-off thrust.
** Gear up, speed of at least V_2 + 19 km/h (V_2 + 10 kt), after cutback.

7. SOUND ATTENUATION IN AIR

7.1 The atmospheric attenuation of sound shall be determined in accordance with the procedure presented below.

7.2 The relationship between sound attenuation, frequency, temperature and humidity is expressed by the following equations:

$$\alpha(i) = 10^{[2.05 \log (f_0/1000) + 1.1394 \times 10^{-3}\,\theta - 1.916984]}$$

$$+ \eta(\delta) \times 10^{[\log (f_0) + 8.42994 \times 10^{-3}\,\theta - 2.755624]}$$

$$\delta = \sqrt{\frac{1010}{f_0}}\; 10^{(\log H - 1.328924 + 3.179768 \times 10^{-2}\theta)}$$

$$\times\, 10^{(-2.173716 \times 10^{-4}\theta^2 + 1.7496 \times 10^{-6}\theta^3)}$$

where:

$\eta(\delta)$ is given by Table A2-4 and f_0 by Table A2-5;

$\alpha(i)$ being the attenuation coefficient in dB/100 m;

θ being the temperature in °C; and

H being the relative humidity expressed as a percentage.

7.3 The equations given in 7.2 are convenient for calculation by means of a computer.

8. ADJUSTMENT OF HELICOPTER FLIGHT TEST RESULTS

8.1 General

8.1.1 Adjustments shall be made to the measured noise data by the methods of this section. Compliance with the test conditions of Chapter 8, 8.7.5, is necessary for the test to be acceptable. Adjustments shall be made for differences between test and reference flight procedures and shall account for differences in the following:

a) helicopter flight path and velocity relative to the flight path reference point;

b) sound attenuation in air;

c) in the overflight case, parameters affecting the noise generating mechanisms such as those described in 8.5.

8.1.2 Adjustments to the measured noise data shall be made using the methods prescribed in 8.3 and 8.4, for differences in the following:

a) attenuation of the noise along its path as affected by "inverse square" and atmospheric attenuation;

b) duration of the noise as affected by distance and speed of aircraft relative to the flight path reference point;

c) the adjustment procedure described in this section shall apply to the lateral microphones in the take-off, overflight and approach cases. Although the noise emission is strongly dependent on the directivity pattern, variable from one helicopter type to another, the propagation angle θ, defined in Appendix 2, 9.3.2, Figure A2-11, shall be the same for the test and reference flight paths. The elevation angle ψ shall not be constrained as in the third note of Appendix 2, 9.3.2, but must be determined and reported. The certification authority shall specify the acceptable limitations on ψ. Corrections to data obtained when these limits are exceeded shall be applied using procedures approved by the certificating authority. In the particular case of lateral noise measurement, sound propagation is affected not only by "inverse square" and atmospheric attenuation, but also by ground absorption and reflection effects which depend mainly on the angle ψ.

Note 1.— Chapter 8, 8.7.5, in Part II places limits on the maximum adjustments that may be made between test and reference flight procedures and conditions.

Note 2.— Adjustments of noise levels for test to reference conditions may be made, subject to agreement by the certificating authority, by the methods of this section. The corrections are derived from sets of curves linking the instant at which the PNLTM is emitted for each reference procedure with appropriate parameters. The sensitivity curves provide noise level variations as a function of the parameter for which a correction is necessary.

8.2 Flight profiles

Note.— Flight profiles for the test conditions are described by their geometry relative to the ground, together with the associated helicopter speed.

8.2.1 Take-off profile

Note 1.— Figure A2-4 illustrates typical test and reference profiles.

a) *During actual testing the helicopter is initially stabilized in level flight at the best rate of climb speed,* V_y, *at a point* A *and continues to a point* B *where take-off power is applied and a steady climb is initiated. A steady climb shall be maintained throughout the 10 dB-down period and beyond to the end of the certification flight path (point* F*).*

Table A2-4. Values of $\eta(\delta)$

δ	$\eta(\delta)$	δ	$\eta(\delta)$
0.00	0.000	2.50	0.450
0.25	0.315	2.80	0.400
0.50	0.700	3.00	0.370
0.60	0.840	3.30	0.330
0.70	0.930	3.60	0.300
0.80	0.975	4.15	0.260
0.90	0.996	4.45	0.245
1.00	1.000	4.80	0.230
1.10	0.970	5.25	0.220
1.20	0.900	5.70	0.210
1.30	0.840	6.05	0.205
1.50	0.750	6.50	0.200
1.70	0.670	7.00	0.200
2.00	0.570	10.00	0.200
2.30	0.495		

A term of quadratic interpolation shall be used where necessary.

Table A2-5. Value of f_o

Centre frequency of the 1/3 octave band (Hz)	f_o *(Hz)*	*Centre frequency of the 1/3 octave band (Hz)*	f_o *(Hz)*
50	50	800	800
63	63	1 000	1 000
80	80	1 250	1 250
100	100	1 600	1 600
125	125	2 000	2 000
160	160	2 500	2 500
200	200	3 150	3 150
250	250	4 000	4 000
315	315	5 000	4 500
400	400	6 300	5 600
500	500	8 000	7 100
630	630	10 000	9 000

b) Position K_1 *is the take-off flight path reference point and* NK_1 *is the distance from the initiation of the steady climb to the take-off flight path reference point. Positions* K_1' *and* K_1'' *are associated noise measurement points located on a line at right angles to and at the specified distance from the take-off flight track* TM.

c) The distance TM *is the distance over which the helicopter position is measured and synchronized with the noise measurements (see 2.3.2 of this appendix).*

Note 2.— The position of point B *may vary within the limits allowed by the certificating authority.*

8.2.2 Overflight profile

Note.— Figure A2-5 illustrates a typical overflight profile.

a) The helicopter is stabilized in level flight at point D *and flies through point* W, *overhead the flight path reference point, to point* E, *the end of the noise certification overflight flight path.*

b) Position K_2 *is the overflight flight path reference point and* K_2W *is the height of the helicopter overhead the overflight flight path reference point. Positions* K_2' *and* K_2'' *are associated noise measurement points located on a line at right angles to and at the specified distance from the overflight flight track* RS.

c) The distance RS *is the distance over which the helicopter position is measured and synchronized with the noise measurements (see 2.3.2 of this appendix).*

8.2.3 Approach profile

Note.— Figure A2-6 illustrates a typical approach profile.

a) The helicopter is initially stabilized at the specified approach path angle at point G *and continues through point* H, *point* I *and then to touchdown.*

b) Position K_3 *is the approach flight path reference point and* K_3H *is the height of the helicopter overhead the approach flight path reference point. Positions* K_3' *and* K_3'' *are associated noise measurement locations on a line at right angles to and at the specified distance from the approach flight path track* PU.

c) The distance PU *is the distance over which the helicopter position is measured and synchronized with the noise measurements (see 2.3.2 of this appendix).*

8.3 Adjustments of PNL and PNLT

Note.— The portions of the test flight path and reference flight path which are significant for the EPNL calculation are illustrated in Figure A2-7 for take-off, overflight and approach measurements.

a) XY *represents the useful portion of the measured flight path and* X_rY_r *that of the corresponding reference flight path.*

b) Q *represents the helicopter position on the measured flight path at which the noise was emitted and observed as PNLTM at the noise measuring point* K. Q_r *is the corresponding position on the reference flight path and* K_r *the reference noise measuring point.* QK *and* Q_rK_r *are respectively the measured and reference noise propagation paths,* Q_r *being located on the assumption that* QK *and* Q_rK_r *form the same angle* θ *with their respective flight paths.*

8.3.1 The one-third octave band levels SPL(i) comprising PNL (the PNL at the moment of PNLTM observed at K) shall be adjusted to reference levels $SPL(i)_r$ as follows:

$$\begin{aligned}SPL(i)_r = SPL(i) &+ 0.01\,[\alpha(i) - \alpha(i)_o]\,QK\\ &+ 0.01\,\alpha(i)_o\,(QK - Q_rK_r)\\ &+ 20\log(QK/Q_rK_r)\end{aligned}$$

In this expression:

— the term $0.01\,[\alpha(i) - \alpha(i)_o]\,QK$ accounts for the effect of the change in sound attenuation coefficient, and $\alpha(i)$ and $\alpha(i)_o$ are the coefficients for the test and reference atmospheric conditions respectively, obtained from Section 7 of this appendix;

— the term $0.01\,\alpha(i)_o\,(QK - Q_rK_r)$ accounts for the effect of the change in the noise path length on the sound attenuation;

— the term $20\log(QK/Q_rK_r)$ accounts for the effect of the change in the noise path length due to the “inverse square” law;

— QK and Q_rK_r are measured in metres and $\alpha(i)$ and $\alpha(i)_o$ are in dB/100 m.

8.3.2 The corrected values $SPL(i)_r$ shall be converted to $PNLT_r$, and a correction term calculated as follows:

$$\Delta_1 = PNLT_r - PNLTM$$

8.3.3 Δ_1 shall be added algebraically to the EPNL calculated from the measured data.

8.3.4 If, during a test flight, several peak values of PNLT are observed which are within 2 dB of PNLTM, the procedure defined in 8.3.1, 8.3.2 and 8.3.3 shall be applied at each peak, and the adjustment term so calculated shall be added to each peak to give corresponding adjusted peak values of PNLT. If these peak values exceed that at the moment of PNLTM, the maximum value of such excess shall be added as a further adjustment to the EPNL calculated from the measured data.

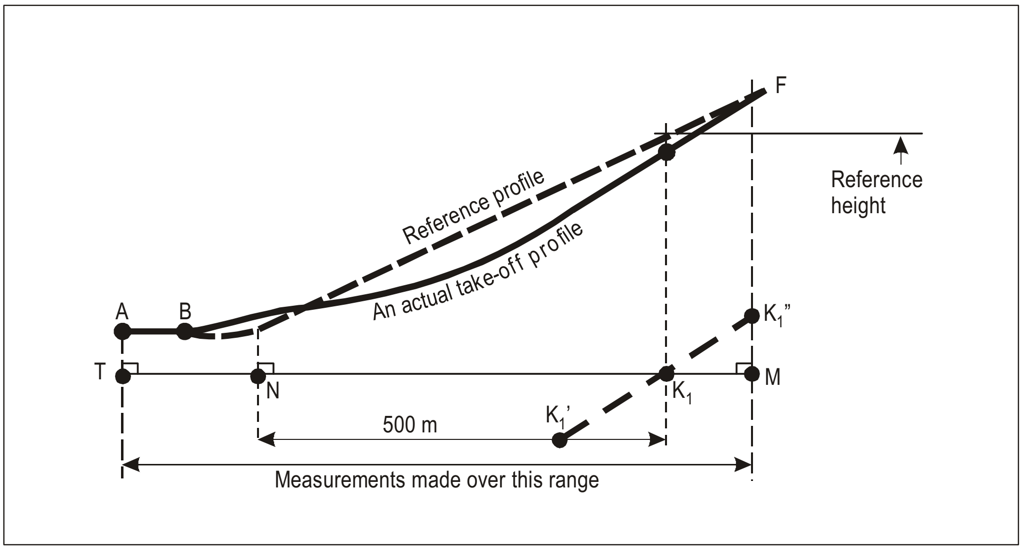


Figure A2-4. Typical test and reference profiles

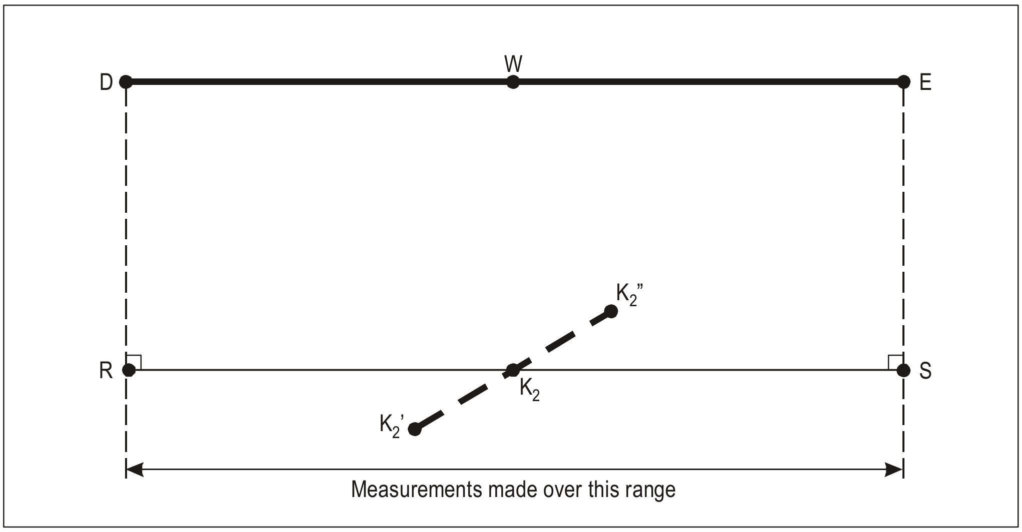


Figure A2-5. Typical overflight profile

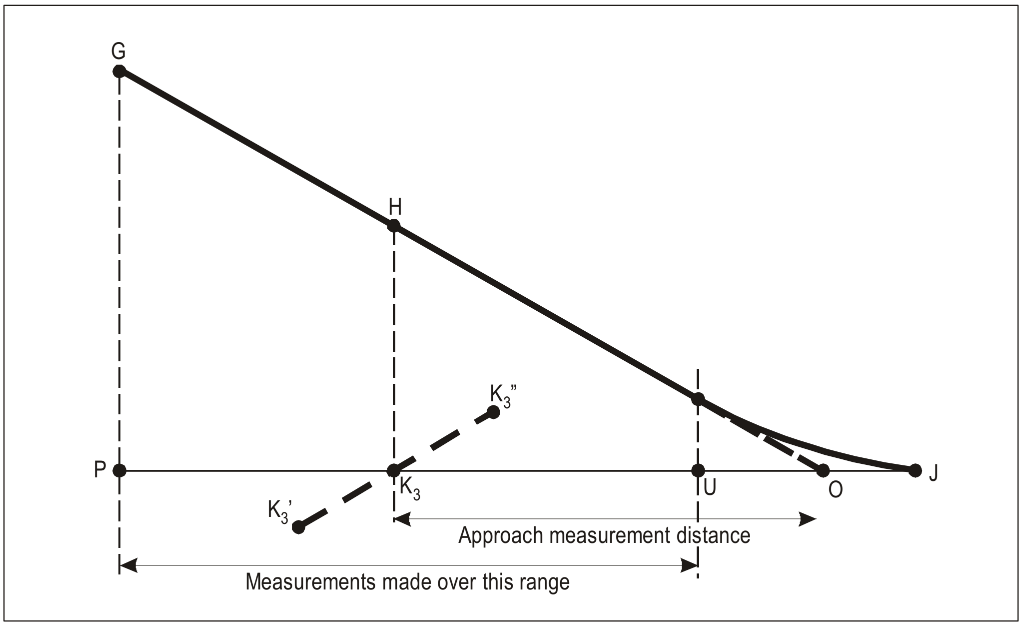


Figure A2-6. Typical approach profile

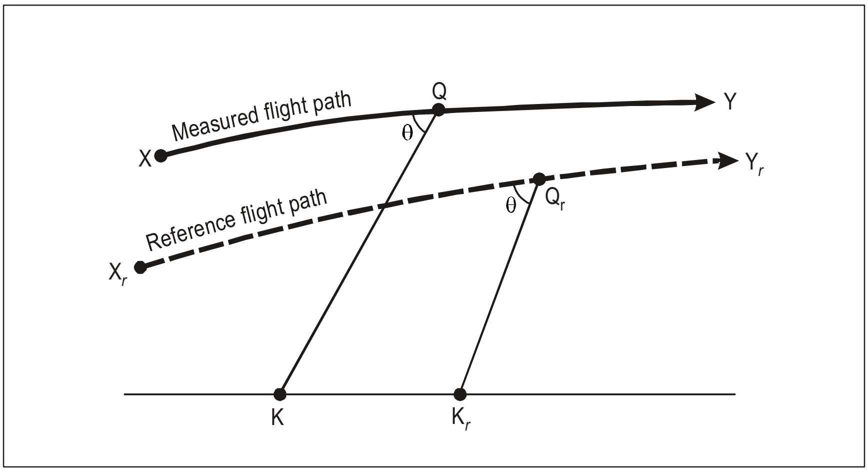


Figure A2-7. Profile characteristics influencing sound level

8.4 Adjustments to duration correction

8.4.1 Whenever the measured flight paths and/or the ground velocities in the test conditions differ from the reference flight paths and/or the ground velocities in the reference conditions, duration adjustments shall be applied to the EPNL values calculated from the measured data. The adjustments shall be calculated as described below.

8.4.2 Referring to the flight path shown in Figure A2-7, the adjustment term shall be calculated as follows:

$$\Delta_2 = -7.5 \log (QK/Q_rK_r) + 10 \log (V/V_r)$$

which represents the adjustment to be added algebraically to the EPNL calculated from the measured data.

8.5 Correction of noise at source

For overflight, if any combination of the following three factors:

a) airspeed deviations from reference;

b) rotor speed deviations from reference;

c) temperature deviations from reference;

results in an agreed noise correlating parameter whose value deviates from the reference value of this parameter, then source noise adjustments shall be determined from manufacturer's data approved by the certificating authority. This correction should normally be made using a sensitivity curve of PNLTM versus advancing blade tip Mach number; however, the correction may be made using an alternative parameter, or parameters, approved by the certificating authority.

Note 1.— If it is not possible to attain the reference value of advancing blade tip Mach number or the agreed reference noise correlating parameter, then an extrapolation of the sensitivity curve is permitted providing that the data cover a range of values of the noise correlating parameter agreed by the certificating authority between test and reference conditions. The advancing blade tip Mach number or agreed noise correlating parameter shall be computed from as measured data. A separate curve of source noise versus advancing blade tip Mach number or another agreed noise correlating parameter shall be derived for each of the three certification microphone locations, centre line, sideline left and sideline right, defined relative to the direction of flight on each test run.

Note 2.— When using advancing blade tip Mach number it should be computed using true airspeed, on-board outside air temperature (OAT), and rotor speed.

8.6 Flight path identification positions and parameters

8.6.1 General

Position/ parameter	*Description*
K	Noise measurement point.
K_r	Reference measurement point.
V	Helicopter test ground speed.
V_r	Helicopter reference ground speed.
V_H	Maximum speed in level flight at power not exceeding maximum continuous power.
V_{NE}	Never exceed speed.
V_y	Speed for best rate of climb.

8.6.2 Take-off (see Figure A2-4)

Position	*Description*
A	Start of noise certification take-off flight path.
B	Start of transition to climb.
F	End of noise certification take-off flight path.
K_1	Take-off flight path reference point.
K_1', K_1''	Associated noise measurement points (of 3-microphone array).
M	End of noise certification take-off flight track.
N	Point on ground vertically below start of transition to climb.
T	Start of noise certification take-off flight track, point on ground vertically below A.

8.6.3 Overflight (see Figure A2-5)

Position	*Description*
D	Start of noise certification overflight flight path.
E	End of noise certification overflight flight path.
K_2	Overflight flight path reference point.
K_2', K_2''	Associated noise measurement points (of 3-microphone array).
R	Start of noise certification overflight flight track.
S	End of noise certification overflight flight track.

8.6.4 Approach (see Figure A2-6)

Position	*Description*
G	Start of noise certification approach flight path.
H	Position on approach path vertically above approach flight path reference point.
I	End of noise certification approach flight path.
J	Touchdown.
K_3	Approach flight path reference point.
K_3', K_3''	Associated noise measurement points (of 3-microphone array).
O	Intersection of the approach path with the ground plane.
P	Start of noise certification approach flight track.
U	Point on ground vertically below start of flare.

8.7 Flight path distance

Distance	*Unit*	*Meaning*
NK_1	metres	*Take-off measurement distance.* The distance from start of transition to climb to the take-off flight path reference point.
TM	metres	*Take-off flight track distance.* The distance over which the position of the helicopter is to be recorded.
K_2W	metres (feet)	*Helicopter overflight height.* The height of the helicopter above the overflight flight reference point.
RS	metres	*Overflight flight track distance.* The distance over which the position of the helicopter is to be recorded.
K_3H	metres (feet)	*Helicopter approach height.* The height of the helicopter above the approach flight reference point.
OK_3	metres	*Approach measurement distance.* The distance from the intersection of the approach path with the ground plane to the approach flight path reference point.
PU	metres	*Approach flight track distance.* The distance over which the position of the aircraft is to be recorded.
QK	metres	*Measured noise path.* The distance from the measured helicopter position Q to the noise measurement position K.
Q_rK_r	metres	*Reference noise path.* The distance from the reference helicopter position Q_r to the reference noise measurement position K_r.

9. ADJUSTMENT OF AEROPLANE FLIGHT TEST RESULTS

9.1 When certification test conditions are not identical to reference conditions, appropriate adjustments shall be made to the measured noise data by the methods of this section.

Note.— Differences between test and reference conditions result in differences in the following:

a) aeroplane flight path and velocity relative to measurement point;

b) sound attenuation in air;

c) parameters affecting engine-noise generating mechanisms.

9.1.1 Adjustments to the measured noise values shall be made by one of the methods described in 9.3 and 9.4 for differences in the following:

a) attenuation of the noise along its path as affected by “inverse square” and atmospheric attenuation;

b) duration of the noise as affected by distance and speed of aeroplane relative to measuring point;

c) source noise emitted by engine as affected by the relevant parameters;

d) aeroplane/engine source noise as affected by large differences between test and reference airspeeds. In addition to the effect on duration, the effects of airspeed on component noise sources can also become significant and must be considered; for conventional aeroplane configurations, when differences between test and reference airspeeds exceed 28 km/h (15 kt) true airspeed, test data and/or analysis approved by the certificating authority shall be used to quantify effects of airspeed adjustment on resulting certification noise levels.

9.1.2 The “integrated” method described in 9.4 shall be used on flyover or approach under the following conditions:

a) when the amount of the adjustments (using the “simplified” method) is greater than 8 dB on flyover, or 4 dB on approach; or

b) when the resulting final EPNL value on flyover or approach (using the “simplified” method) is within 1 dB of the limited noise levels as prescribed in 3.4 of Part II, Chapter 3.

Note.— See also Part II, Chapter 3, 3.7.6.

9.2 Flight profiles

Note.— Flight profiles for both test and reference conditions are described by their geometry relative to the ground, *together with the associated aircraft speed relative to the ground, and the associated engine control parameter(s) used for determining the noise emission of the aeroplane.*

9.2.1 Take-off profile

Note.— Figure A2-8 illustrates a typical take-off profile.

a) The aeroplane begins the take-off roll at point A, *lifts off at point* B *and begins its first climb at constant angle at point* C. *Where thrust or power (as appropriate) cutback is used, it is started at point* D *and completed at point* E. *From here the aeroplane begins a second climb at constant angle up to point* F, *the end of the noise certification take-off flight path.*

b) Position K_1 *is the take-off noise measuring station and* AK_1 *is the distance from start of roll to the flyover noise measuring point. Position* K_2 *is the lateral noise measuring station located on a line parallel to and the specified distance abeam the runway centre line where the noise level during take-off is greatest.*

c) The distance AF *is the distance over which the aeroplane position is measured and synchronized with the noise measurements (see 2.3.2 of this appendix).*

9.2.2 Approach profile

Note.— Figure A2-9 illustrates a typical approach profile.

a) The aeroplane begins its noise certification approach flight path at point G *and touches down on the runway at point* J, *and at a distance* OJ *from the threshold.*

b) Position K_3 *is the approach noise measuring station and* K_3O *is the distance from the approach noise measurement point to the threshold.*

c) The distance GI *is the distance over which the aeroplane position is measured and synchronized with the noise measurements (see 2.3.2 of this appendix).*

The aeroplane reference point during approach measurements shall be the ILS antenna.

9.3 "Simplified" method of adjustment

9.3.1 General

Note.— The "simplified" adjustment method consists of applying adjustments to the EPNL calculated from the measured data for the differences between measured and reference conditions at the moment of PNLTM.

9.3.2 Adjustments to PNL and PNLT

Note 1.— The portions of the test flight path and the reference flight path which are significant for the EPNL calculation are illustrated in Figure A2-10 for the flyover and approach noise measurements.

a) XY *represents the useful portion of the measured flight path, and* X_rY_r *that of the corresponding reference flight path.*

b) Q *represents the aeroplane position on the measured flight path at which the noise was emitted and observed as PNLTM at the noise measuring station* K. Q_r *is the corresponding position on the reference flight path and* K_r *the reference measuring station.* QK *and* Q_rK_r *are respectively the measured and reference noise propagation paths,* Q_r *being found from the assumption that* QK *and* Q_rK_r *form the same angle* θ *with their respective flight paths.*

Note 2.— The portions of test flight path and reference flight path which are significant for the EPNL calculation are illustrated in Figures A2-11 a) and b) for the lateral noise measurements.

a) XY *represents the useful portion of the measured flight path (Figure A2-11 a)), and* X_rY_r *that of the corresponding reference flight path (Figure A2-11 b)).*

b) Q *represents the aeroplane position on the measured flight path at which the noise was emitted and observed as PNLTM at the noise measuring station* K. Q_r *is the corresponding position on the reference flight path and* K_r *the reference measuring station.* QK *and* Q_rK_r *are respectively the measured and reference noise propagation paths. In this case* K_r *is only specified as being on a particular lateral line;* K_r *and* Q_r *are therefore found from the assumptions that* QK *and* Q_rK_r:

1) form the same angle θ *with their respective flight paths, and*

2) form the same angle ψ *with the ground.*

Note 3.— In the particular case of lateral noise measurement, sound propagation is affected not only by "inverse square" and atmospheric attenuation, but also by ground absorption and reflection effects which depend mainly on the angle ψ.

9.3.2.1 The one-third octave band levels SPL(i) comprising PNL (the PNL at the moment of PNLTM observed at K) shall be adjusted to reference levels SPL(i)$_r$ as follows:

$$\begin{aligned} SPL(i)_r = SPL(i) &+ 0.01\,[\alpha(i) - \alpha(i)_o]\,QK \\ &+ 0.01\,\alpha(i)_o\,(QK - Q_rK_r) \\ &+ 20 \log (QK/Q_rK_r) \end{aligned}$$

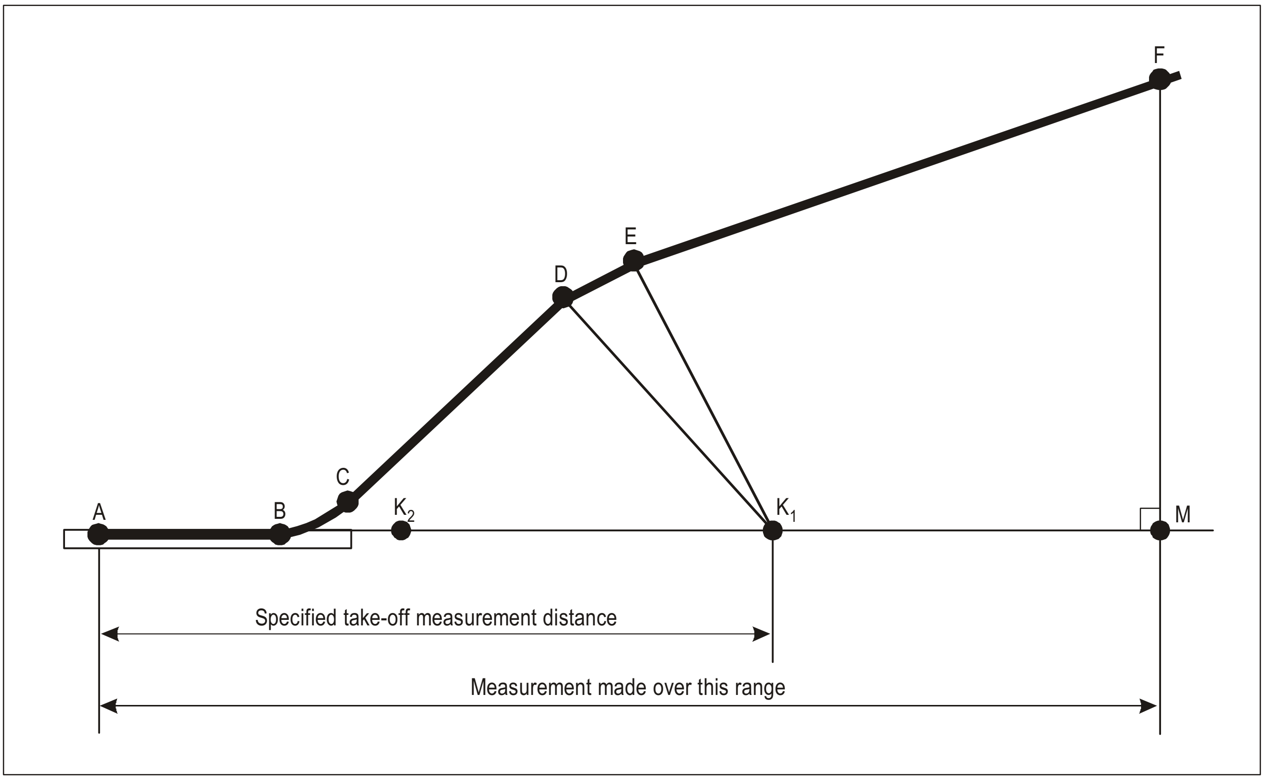


Figure A2-8. Typical take-off profile

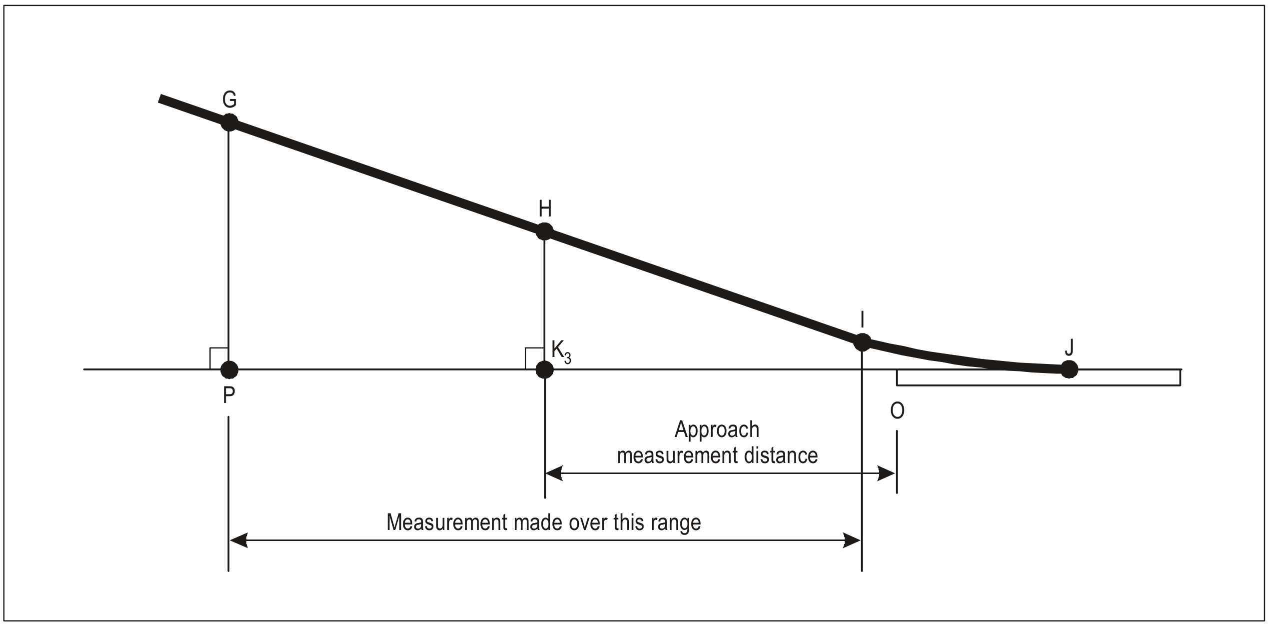


Figure A2-9. Typical approach profile

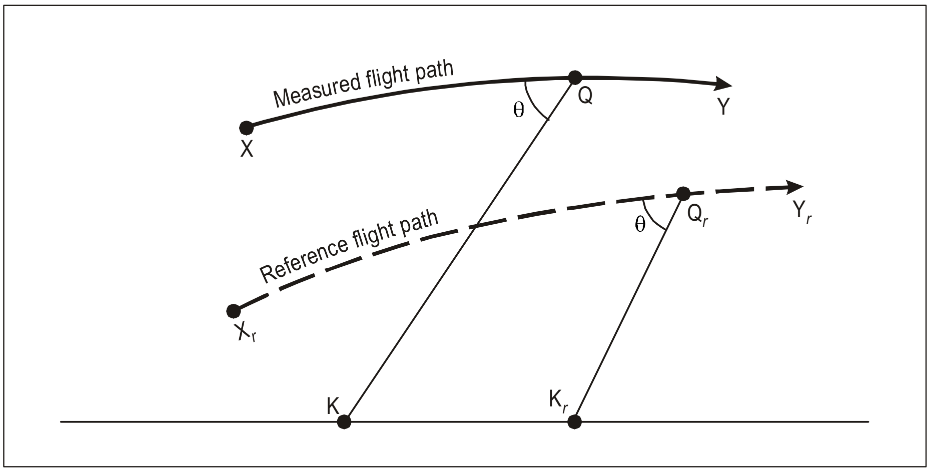


Figure A2-10. Profile characteristics influencing sound level

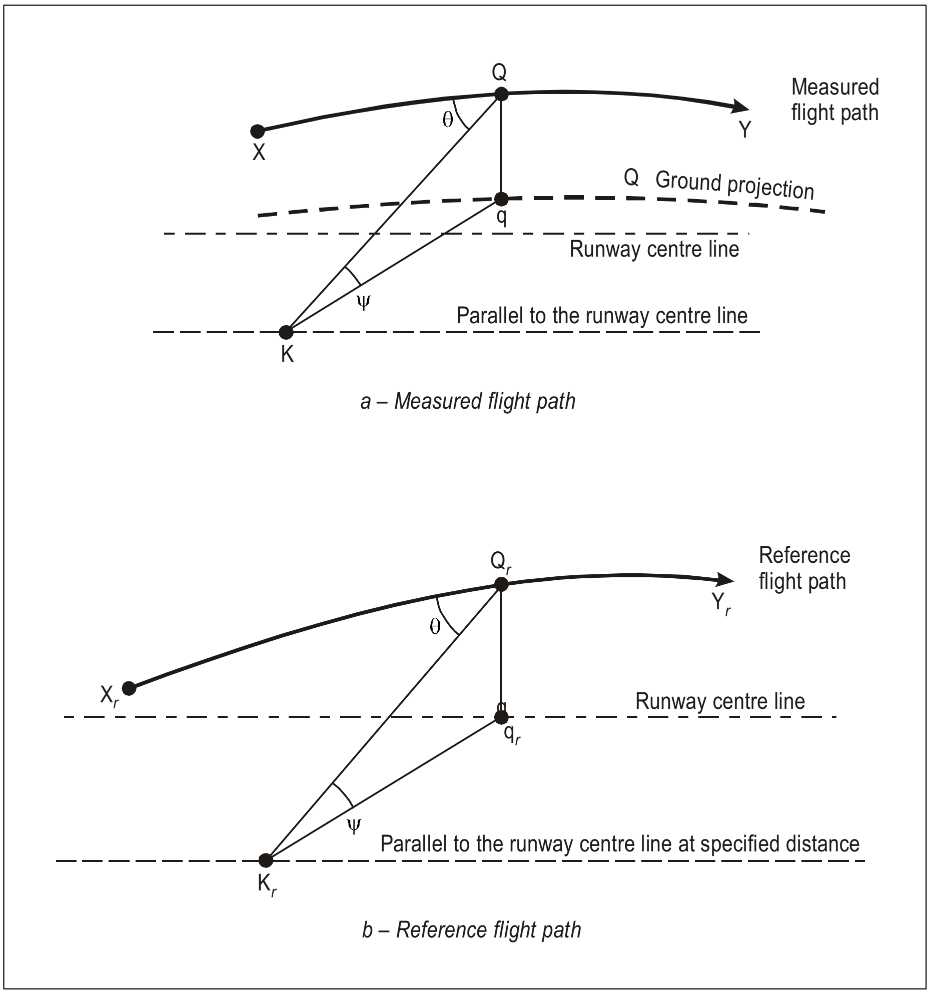


Figure A2-11. Lateral measurement — determination of reference station

In this expression:

— the term 0.01 $[\alpha(i) - \alpha(i)_o]$ QK accounts for the effect of the change in sound attenuation coefficient, and $\alpha(i)$ and $\alpha(i)_o$ are the coefficients for the test and reference atmospheric conditions respectively, obtained from Section 7;

— the term 0.01 $\alpha(i)_o$ (QK – Q_rK_r) accounts for the effect of the change in the noise path length on the sound attenuation;

— the term 20 log (QK/Q_rK_r) accounts for the effect of the change in the noise path length due to the "inverse square" law;

— QK and Q_rK_r are measured in metres and $\alpha(i)$ and $\alpha(i)_o$ are in dB/100 m.

9.3.2.1.1 The corrected values $SPL(i)_r$ shall be converted to $PNLT_r$, and a correction term calculated as follows:

$$\Delta_1 = PNLT_r - PNLTM$$

9.3.2.1.2 Δ_1 shall be added algebraically to the EPNL calculated from the measured data.

9.3.2.2 If, during a test flight, several peak values of PNLT are observed which are within 2 dB of PNLTM, the procedure defined in 9.3.2.1 shall be applied at each peak and the adjustment term calculated as in 9.3.2.1 shall be added to each peak to give corresponding adjusted peak values of PNLT. If these peak values exceed that at the moment of PNLTM, the maximum value of such exceedance shall be added as a further adjustment to the EPNL calculated from the measured data.

9.3.3 Adjustments to duration correction

9.3.3.1 Whenever the measured flight paths and/or the ground velocities in the test conditions differ from the reference flight paths and/or the ground velocities in the reference conditions, duration adjustments shall be applied to the EPNL values calculated from the measured data. The adjustments shall be calculated as described below.

9.3.3.2 Referring to the flight path shown in Figure A2-10, the adjustment term shall be calculated as follows:

$$\Delta_2 = -7.5 \log (QK/Q_rK_r) + 10 \log (V/V_r)$$

which represents the adjustment to be added algebraically to the EPNL calculated from the measured data.

9.3.4 Source noise adjustments

9.3.4.1 The source noise adjustment shall be applied to take account of differences between the parameters affecting engine noise measured in the certification flight tests and those calculated or specified in the reference conditions. The adjustment shall be determined from manufacturers' data approved by the certificating authority.

Note.— Typical data are illustrated in Figure A2-12 which shows a curve of EPNL versus the engine control parameter μ*, the EPNL data being corrected to all the other relevant reference conditions (aeroplane mass, speed and altitude, air temperature) and for the difference in noise between the installed engine and the flight manual standard of engine at each value of* μ*. Data of this type are required around the values of* μ *used for lateral, flyover and approach noise measurements.*

9.3.4.2 The adjustment term Δ_3 shall be obtained by subtracting the EPNL value corresponding to the parameter μ from the EPNL value corresponding to the parameter μ_r and shall be added algebraically to the EPNL value calculated from the measured data.

Note.— See Figure A2-12 in which μ *is the value of the engine control parameter in the flight test conditions,* μ_r *is the corresponding value in the reference conditions.*

9.3.5 Symmetry adjustments

For the lateral noise, a symmetry adjustment shall be made (see Part II, Chapter 3, 3.3.2.2) as follows:

a) if the symmetrical measurement point is opposite the point where the highest noise level is obtained on the main lateral measurement line, the certification noise level shall be the (arithmetical) mean of the noise levels measured at these two points (see Figure A2-13 a));

b) if not, it shall be assumed that the variation of noise with the altitude of the aeroplane is the same on both sides (i.e. there is a constant difference between the lines of noise versus altitude on the two sides (see Figure A2-13 b)). The certification noise level shall then be the maximum value of the mean between these lines.

9.4 "Integrated" method of adjustment

9.4.1 General

Note.— The "integrated" adjustment method consists of recomputing under reference conditions points on the PNLT time history corresponding to measured points obtained during the tests, and computing EPNL directly for the new time history obtained in this way. The main principles are described below.

9.4.2 PNLT computations

Note 1.— The portions of the test flight path and the reference profile which are significant for the EPNL computation are illustrated in Figure A2-14 for the flyover, full-power and approach noise measurements.

a) XY *represents the useful portion of the measured flight path and* X_rY_r *that of the corresponding reference flight path.*

b) The points Q_0, Q_1, Q_n *represent aeroplane positions on the measured flight path at time* t_0, t_1 *and* t_n *respectively. Consider the point* Q_1 *at which the noise was emitted and observed as one-third octave values* $SPL(i)_1$ *at the noise measuring station* K *at time* t_1. *The point* Q_{r1} *represents the corresponding position on the reference flight path for noise observed as* $SPL(i)_{r1}$ *at the reference measuring station* K_r *at time* t_{r1}. Q_1K *and* $Q_{r1}K_r$ *are respectively the measured and reference noise propagation paths which in each case form the angle* θ_1 *with their respective flight paths.* Q_{r0} *and* Q_{rn} *are similarly the points on the reference flight path corresponding to* Q_0 *and* Q_n *on the measured flight path.* Q_0 *and* Q_n *are chosen so that between* Q_{r0} *and* Q_{rn} *all values of* $PNLT_r$ *(computed and described below) within 10 dB of the peak value are included.*

Note 2.— The portions of the test flight path and the reference profile which are significant for the EPNL computation are illustrated in Figures A2-15 a) and b) for the lateral noise measurements.

a) XY *represents the useful portion of the measured flight path and* X_rY_r *that of the corresponding reference flight path.*

b) The points Q_0, Q_1, Q_n *represent aeroplane positions on the measured flight path at time* t_0, t_1 *and* t_n *respectively. Consider the point* Q_1 *at which the noise was emitted and observed as one-third octave values* $SPL(i)_1$ *at the noise measuring station* K *at time* t_1. *The point* Q_{r1} *represents the corresponding position on the reference flight path for noise observed as* $SPL(i)_{r1}$ *at the measuring station* K_r *at time* t_{r1}. Q_1K *and* $Q_{r1}K_r$ *are respectively the measured and reference noise propagation paths.* Q_{r0} *and* Q_{rn} *are similarly the points on the reference flight path corresponding to* Q_0 *and* Q_n *on the measured flight path.* Q_0 *and* Q_n *are chosen so that between* Q_{r0} *and* Q_{rn} *all values of PNLT (computed and described below) within 10 dB of the peak value are included. In this case* K_r *is only specified as being on a particular lateral line. The position of* K_r *and* Q_{r1} *are found from the assumptions that:*

1) Q_1K *and* $Q_{r1}K_r$ *form the same angle* θ_1 *with their respective flight paths for all times* t_1; *and*

2) the differences between the angles ψ_1 *and* ψ_{r1} *are minimized over the relevant part of the time history by a method approved by the certificating authorities.*

Note 3.— In the particular case of lateral noise measurement, sound propagation is affected not only by "inverse square" and atmospheric attenuation, but also by ground absorption and reflection effects which depend mainly on the angle ψ. *For geometrical reasons it is generally not possible to choose* K_r *so that condition 1) above is fulfilled while at the same time* ψ_1 *and* ψ_{r1} *are kept equal at all times* t_1.

Note 4.— The time t_{r1} *is later (for* $Q_{r1}K_r > Q_1K$*) than* t_1 *by two separate amounts:*

a) the time taken for the aeroplane to travel the distance $Q_{r1}Q_{r0}$ *at a speed* V_r *less the time taken for it to travel* Q_1Q_0 *at* V;

b) the time taken for sound to travel the distance $Q_{r1}K_r - Q_1K$.

Note 5.— Where thrust or power cutback is used there will be test and reference flight paths at full thrust or power and at cutback thrust or power. Where the transient region between these affects the final result an interpolation must be made between them by an approved method such as that given in Chapter 2, 2.2.1, of Doc 9501.

9.4.2.1 The measured values of $SPL(i)_1$, etc., shall be adjusted to the reference values $SPL(i)_{r1}$, etc., for the differences between measured and reference noise path lengths and between measured and reference atmospheric conditions, by the methods of 9.3.2.1 of this appendix. Corresponding values of PNL_{r1} shall be computed.

9.4.2.2 For each value of PNL_{r1} a pure sound correction C_1 shall be determined by analysing the reference values $SPL(i)_r$, etc., by the methods of 4.3 of this appendix, and added to PNL_{r1} to give $PNLT_{r1}$.

9.4.3 Duration correction

The values of $PNLT_r$ corresponding to those of PNLT at each one-half second interval shall be plotted against time ($PNLT_{r1}$ at time t_{r1}, etc.). The duration correction shall then be determined by the method of 4.5.1 of this appendix, to give $EPNL_r$.

9.4.4 Source noise adjustment

Finally, a source noise adjustment Δ_3 shall be determined by the methods of 9.3.4 of this appendix.

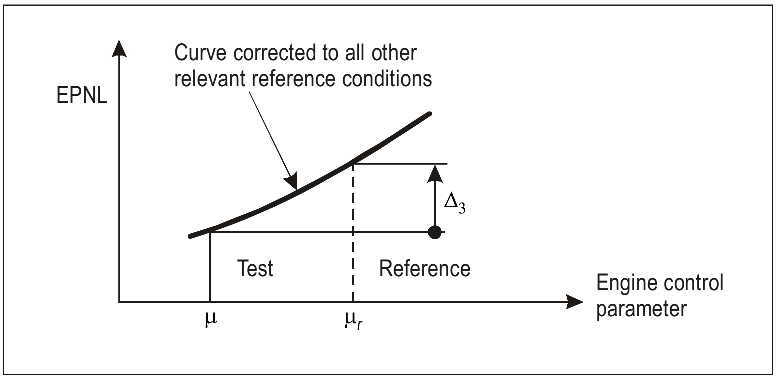


Figure A2-12. Noise thrust correction

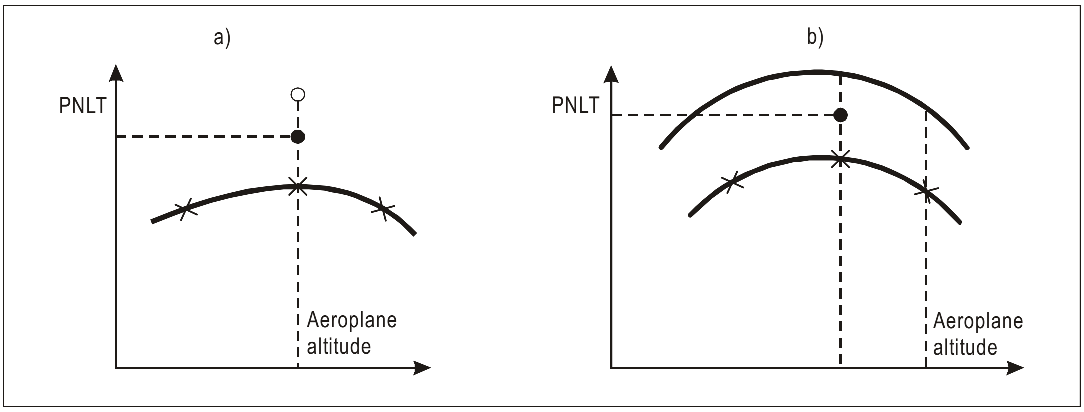


Figure A2-13. Symmetry correction

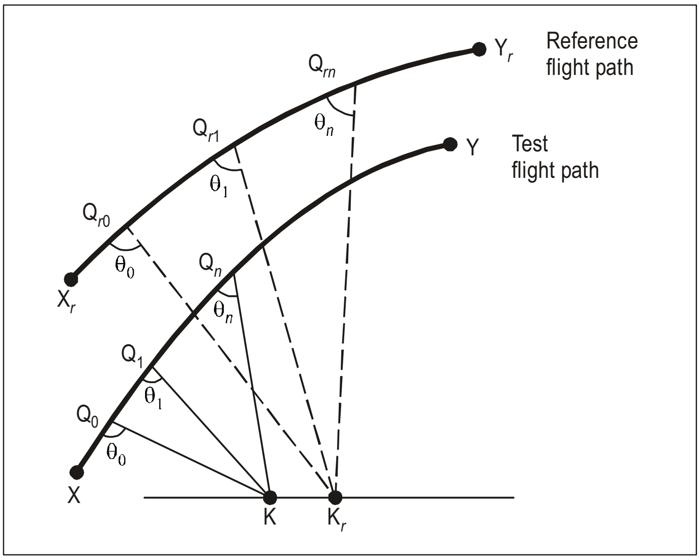


Figure A2-14. Correspondence between measured and reference flight paths for application of correction integrated methods

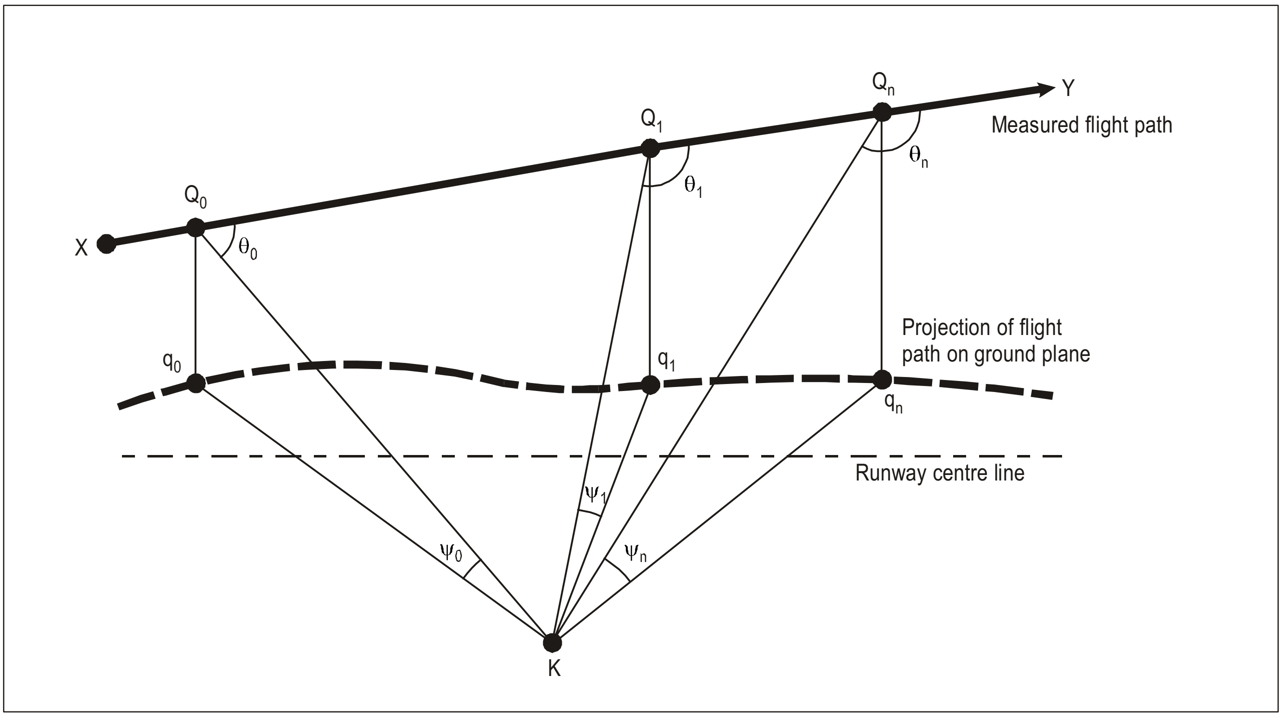


Figure A2-15 a). Measured flight path

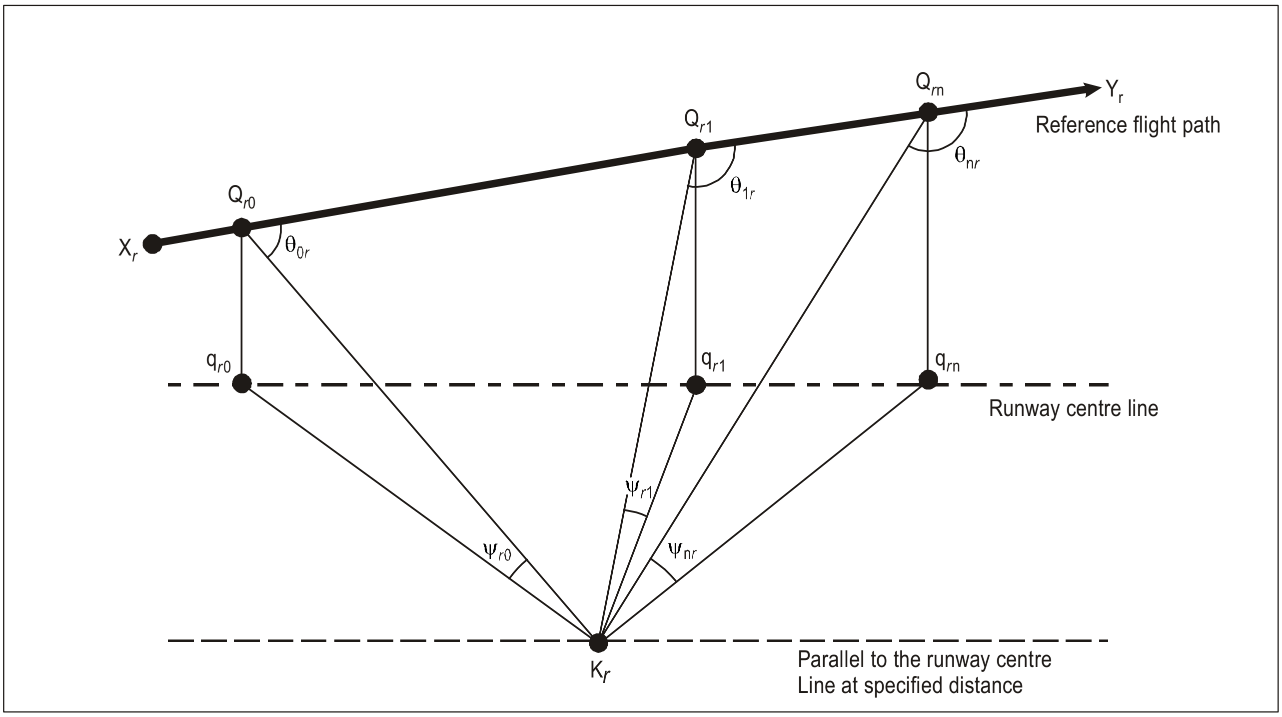


Figure A2-15 b). Reference flight path

9.5 Flight path identification positions

Position	*Description*
A	Start of take-off roll.
B	Lift-off.
C	Start of first constant climb.
D	Start of thrust reduction.
E	Start of second constant climb.
F	End of noise certification take-off flight path.
G	Start of noise certification approach flight path.
H	Position on approach path directly above noise measuring station.
I	Start of level-off.
J	Touchdown.
K	Noise measurement point.
K_r	Reference measurement point.
K_1	Flyover noise measurement point.
K_2	Lateral noise measurement point.
K_3	Approach noise measurement point.
M	End of noise certification take-off flight track.
O	Threshold of approach end of runway.
P	Start of noise certification approach flight track.
Q	Position on measured take-off flight path corresponding to apparent PNLTM at station K. See 9.3.2.
Q_r	Position on reference take-off flight path corresponding to PNLTM at station K. See 9.3.2.
V	Aeroplane test speed.
V_r	Aeroplane reference speed.

9.6 Flight path distances

Distance	*Unit*	*Meaning*
AB	metres	*Length of take-off roll.* The distance along the runway between the start of take-off roll and lift off.
AK	metres	*Take-off measurement distance.* The distance from the start of roll to the take-off noise measurement station along the extended centre line of the runway.
AM	metres	*Take-off flight track distance.* The distance from the start of roll to the take-off flight track position along the extended centre line of the runway for which the position of the aeroplane need no longer be recorded.
QK	metres	*Measured noise path.* The distance from the measured aeroplane position Q to station K.
Q_rK_r	metres	*Reference noise path.* The distance from the reference aeroplane position Q_r to station K_r.
K_3H	metres (feet)	*Aeroplane approach height.* The height of the aeroplane above the approach measuring station.
OK_3	metres	*Approach measurement distance.* The distance from the runway threshold to the approach measurement station along the extended centre line of the runway.
OP	metres	*Approach flight track distance.* The distance from the runway threshold to the approach flight track position along the extended centre line of the runway for which the position of the aeroplane need no longer be recorded.

APPENDIX 3. NOISE EVALUATION METHOD FOR NOISE CERTIFICATION OF PROPELLER-DRIVEN AEROPLANES NOT EXCEEDING 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED BEFORE 17 NOVEMBER 1988

Note.— See Part II, Chapter 6.

1. INTRODUCTION

Note 1.— This noise evaluation method includes:

a) noise certification test and measurement conditions;

b) measurement of aeroplane noise received on the ground; and

c) reporting of data to the certificating authority and correction of measured data.

Note 2.— The instructions and procedures given in the method are clearly delineated to ensure uniformity during compliance tests, and to permit comparison between tests of various types of aeroplanes, conducted in various geographical locations. The method applies only to aeroplanes within the applicability clauses of Part II, Chapter 6.

2. NOISE CERTIFICATION TEST AND MEASUREMENT CONDITIONS

2.1 General

This section prescribes the conditions under which noise certification tests shall be conducted and the measurement procedures that shall be used to measure the noise made by the aeroplane for which the test is conducted.

2.2 General test conditions

2.2.1 Locations for measuring noise from an aeroplane in flight shall be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as might be caused by thick, matted or tall grass, shrubs or wooded areas. No obstructions which significantly influence the sound field from the aeroplane shall exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75° from this axis.

2.2.2 The tests shall be carried out under the following atmospheric conditions:

a) no precipitation;

b) relative humidity not higher than 95 per cent and not lower than 20 per cent and ambient temperature not above 35°C and not below 2°C at 1.2 m (4 ft) above ground except that on a diagram of temperature plotted against relative humidity combinations of temperature and relative humidity which fall below a straight line between 2°C and 60 per cent and 35°C and 20 per cent shall be avoided;

c) at 1.2 m (4 ft) above ground, instantaneous wind speed shall not exceed 19 km/h (10 kt) and instantaneous crosswind speed shall not exceed 9 km/h (5 kt). Flights shall be made in equal numbers with tailwind and headwind components; and

d) no temperature inversions or anomalous wind conditions that would significantly affect the noise level of the aeroplane when the noise is recorded at the measuring points specified by the certificating authority.

2.3 Aeroplane testing procedures

2.3.1 The test procedures and noise measurement procedure shall be acceptable to the airworthiness and noise certificating authorities of the State issuing the certification.

2.3.2 The aeroplane height and lateral position relative to the microphone shall be determined by a method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation, photographic scaling techniques, or other methods to be approved by the certificating authority.

3. MEASUREMENT OF AEROPLANE NOISE RECEIVED ON THE GROUND

3.1 General

3.1.1 All measuring equipment shall be approved by the certificating authority.

3.1.2 Sound pressure level data for noise evaluation purposes shall be obtained with acoustical equipment and measurement practices that conform to the specifications given hereunder in 3.2.

3.2 Measurement system

The acoustical measurement system shall consist of approved equipment equivalent to the following:

a) a microphone system with frequency response compatible with measurement and analysis system accuracy as stated in 3.3;

b) tripods or similar microphone mountings that minimize interference with the sound being measured;

c) recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of 3.3; and

d) acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal shall be described in terms of its average and maximum root-mean-square (rms) value of non-overload signal level.

3.3 Sensing, recording and reproducing equipment

3.3.1 When so specified by the certificating authority, the sound produced by the aeroplane shall be recorded in such a way that the complete information, including time history, is retained. A magnetic tape recorder is acceptable.

3.3.2 The characteristics of the complete system shall comply with the recommendations given in International Electrotechnical Commission (IEC) Publication No. 179[1] with regard to the sections concerning microphone, amplifier and indicating instrument characteristics. The text and specifications of IEC Publication No. 179[1] entitled "Precision Sound Level Meters" are incorporated by reference into this section and are made a part hereof.

Note.— When a tape recorder is used, it forms part of the complete system complying with IEC Recommendation 561.[1]

3.3.3 The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude shall lie within the tolerance limits specified in Table IV and Table V for Type I instruments in IEC Publication No. 179,[1] for weighting curve "A" over the frequency range 45 to 11 200 Hz.

3.3.4 The recorded noise signal shall be read through an "A" filter as defined in IEC Publication No. 179,[1] and with dynamic characteristics designated "slow".

Note.— During tests with high flight speeds, the "fast" dynamic characteristics may be necessary to obtain the true level.

3.3.5 The equipment shall be acoustically calibrated using facilities for acoustic free-field calibration. The overall sensitivity of the measuring system shall be checked before and after the measurement of the noise level for a sequence of aeroplane operations, using an acoustic calibrator generating a known sound pressure level at a known frequency.

Note.— A pistonphone operating at a nominal 124 dB and 250 Hz is generally used for this purpose.

3.3.6 A wind screen shall be employed with the microphone during all measurements of aeroplane noise when the wind speed is in excess of 11 km/h (6 kt). Its characteristics shall be such that when it is used, the complete system including the wind screen will meet the specifications above. Its insertion loss at the frequency of the acoustic calibrator shall also be known and included in the provision of an acoustic reference level for the analysis of the measurements.

3.4 Noise measurement procedures

3.4.1 The microphones shall be oriented in a known direction so that the maximum sound received arrives as nearly as possible in the direction for which the microphones are calibrated. The microphones shall be placed so that their sensing elements are approximately 1.2 m (4 ft) above ground.

3.4.2 Immediately prior to and after each test, a recorded acoustic calibration of the system shall be made in the field with an acoustic calibrator for the two purposes of checking system sensitivity and providing an acoustic reference level for the analysis of the sound level data.

3.4.3 Background noise, including ambient noise and electrical noise of the measurement systems, shall be recorded and determined in the test area with the system gain set at levels which will be used for aeroplane noise measurements. If aeroplane sound pressure levels do not exceed background sound pressure levels by at least 10 dB(A), approved corrections for the contribution of background sound pressure level to the observed sound pressure level shall be applied.

4. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY AND CORRECTION OF MEASURED DATA

4.1 Data reporting

4.1.1 Measured and corrected sound pressure levels obtained with equipment conforming to the specifications described in Section 3 of this appendix shall be reported.

1. As amended. Available from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

4.1.2 The type of equipment used for measurement and analysis of all acoustic aeroplane performance and meteorological data shall be reported.

4.1.3 The following atmospheric environmental data, measured immediately before, after, or during each test at the observation points prescribed in Section 2 of this appendix shall be reported:

a) air temperature and relative humidity; and

b) maximum, minimum and average wind velocities.

4.1.4 Comments on local topography, ground cover, and events that might interfere with sound recordings shall be reported.

4.1.5 The following aeroplane information shall be reported:

a) type, model and serial numbers of aeroplane, engine(s) and propeller(s);

b) any modifications or non-standard equipment likely to affect the noise characteristics of the aeroplane;

c) maximum certificated take-off mass;

d) for each overflight, airspeed and air temperature at the flyover altitude determined by properly calibrated instruments;

e) for each overflight, engine performance as manifold pressure or power, propeller speed in revolutions per minute and other relevant parameters determined by properly calibrated instruments;

f) aeroplane height above ground (see 2.3.2);

g) corresponding manufacturer's data for the reference conditions relevant to 4.1.5 d) and e).

4.2 Data correction

4.2.1 Correction of noise at source

4.2.1.1 When so specified by the certificating authority, corrections for differences between engine power achieved during the tests and the power that would be achieved at settings corresponding to the highest power in the normal operating range by an average engine of the type under reference conditions shall be applied using approved methods.

4.2.1.2 At a propeller helical tip Mach number at or below 0.70 no correction is required if the test helical tip Mach number is within 0.014 of the reference helical tip Mach number. At a propeller helical tip Mach number above 0.70 and at or below 0.80 no correction is required if the test helical tip Mach number is within 0.007 of the reference helical tip Mach number. Above a helical tip Mach number of 0.80 no correction is required if the helical tip Mach number is within 0.005 of the reference helical tip Mach number. If the test power at any helical tip Mach number is within 10 per cent of the reference power, no correction for source noise variation with power is required. No corrections are to be made for power changes for fixed pitch propeller-driven aeroplanes. If test propeller helical tip Mach number and power variations from reference conditions are outside these constraints, corrections based on data developed using the actual test aeroplane or a similar configured aeroplane with the same engine and propeller operating as the aeroplane being certificated shall be used as described in Section 4.1 of the *Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft* (Doc 9501).

4.2.2 Correction of noise received on the ground

The noise measurements made at heights different from 300 m (985 ft) shall be adjusted to 300 m (985 ft) by the inverse square law.

4.2.3 Performance correction

Note.— The performance correction is intended to credit higher performance aeroplanes based on their ability to climb at a steeper angle and to fly the traffic pattern at a lower power setting. Also, this correction penalizes aeroplanes with limited performance capability which results in lower rates of climb and higher power settings in the traffic pattern.

4.2.3.1 A performance correction determined for sea level, 15°C conditions and limited to a maximum of 5 dB(A) shall be applied using the method described in 4.2.3.2 and added algebraically to the measured value.

4.2.3.2 The performance correction shall be calculated by using the following formula:

$$\Delta dB = 49.6 - 20 \log_{10} \left[(3\ 500 - D_{15}) \frac{R/C}{V_y} + 15 \right]$$

where D_{15} = Take-off distance to 15 m at maximum certificated take-off mass and maximum take-off power (paved runway)

R/C = Best rate of climb at maximum certificated take-off mass and maximum take-off power

V_y = Climb speed corresponding to R/C at maximum take-off power and expressed in the same units.

Note.— When take-off distance is not certificated, the figure of 610 m for single-engined aeroplanes and 825 m for multi-engined aeroplanes is used.

4.3 Validity of results

4.3.1 The measuring point shall be overflown at least four times. The test results shall produce an average dB(A) value and its 90 per cent confidence limits, the noise level being the arithmetic average of the corrected acoustical measurements for all valid test runs over the measuring point.

4.3.2 The samples shall be large enough to establish statistically a 90 per cent confidence limit not exceeding ±1.5 dB(A). No test result shall be omitted from the averaging process, unless otherwise specified by the certificating authority.

Note.— Methods for calculating the 90 per cent confidence interval are given in Appendix 1 of Doc 9501.

APPENDIX 4. EVALUATION METHOD FOR NOISE CERTIFICATION OF HELICOPTERS NOT EXCEEDING 3 175 kg MAXIMUM CERTIFICATED TAKE-OFF MASS

Note.— See Part II, Chapter 11.

1. INTRODUCTION

Note 1.— This noise evaluation method includes:

a) noise certification test and measurement conditions;

b) definition of sound exposure level using measured noise data;

c) measurement of helicopter noise received on the ground;

d) adjustment of flight test results; and

e) reporting of data to the certificating authority.

Note 2.— The instructions and procedures given in the method are intended to ensure uniformity during compliance tests of various types of helicopters conducted in various geographical locations. The method applies only to helicopters meeting the applicability clauses of Part II, Chapter 11, of this Annex.

2. NOISE CERTIFICATION TEST AND MEASUREMENT CONDITIONS

2.1 General

This section prescribes the conditions under which noise certification shall be conducted and the meteorological and flight path measurement procedures that shall be used.

2.2 Test environment

2.2.1 The location for measuring noise from the helicopter in flight shall be surrounded by relatively flat terrain having no excessive ground absorption characteristics such as might be caused by thick, matted or tall grass, shrubs or wooded areas. No obstructions which significantly influence the sound field from the helicopter shall exist within a conical space above the test noise measurement position, the cone being defined by an axis normal to the ground and by a half-angle of 80° from this axis.

Note.— Those people carrying out the measurements could themselves constitute such obstructions.

2.2.2 The tests shall be carried out under the following atmospheric conditions:

a) no precipitation;

b) relative humidity not higher than 95 per cent or lower than 20 per cent and ambient temperature not above 35°C and not below 2°C at a height between 1.2 m and 10 m above ground (if the measurement site is within 2 000 m of aerodrome weather measuring equipment, the aerodrome reported temperature, relative humidity and wind speed may be used). Combinations of temperature and humidity which lead to an absorption coefficient in the 8 KHz one-third octave band of greater than 10 dB/100 m shall be avoided. Absorption coefficients as a function of temperature and relative humidity are given in Section 7 of Appendix 2 or SAE ARP 866 A;

c) at a height between 1.2 m (4 ft) and 10 m (33 ft) above ground, average wind speed shall not exceed 19 km/h (10 kt) and the crosswind average wind speed component at right angles to the direction of flight shall not exceed 9 km/h (5 kt) at a height between 1.2 m (4 ft) and 10 m (33 ft) above ground; and

Note.— Average wind speed is defined over a 30-second time period.

d) no other anomalous meteorological conditions that would significantly affect the noise level when recorded at the measuring points specified by the certificating authority.

2.3 Flight path measurement

2.3.1 The helicopter position relative to the flight path reference point shall be determined by a method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation or photographic scaling techniques, approved by the certificating authority.

2.3.2 The helicopter noise shall be measured over a distance sufficient to ensure adequate data during the period that the noise is within 10 dB(A) of the maximum value of dB(A).

2.3.3 Position and performance data required to make the adjustments referred to in Section 5 of this appendix shall be recorded at an approved sampling rate. Measuring equipment shall be approved by the certificating authority.

2.4 Flight test conditions

2.4.1 The helicopter flyover noise test shall be conducted at the airspeed referred to in Part II, Chapter 11, 11.5.2 with such airspeed adjusted as necessary to produce the same advancing blade tip Mach number as associated with the reference conditions.

2.4.2 Advancing blade tip Mach number (Mat) is defined as the ratio of the arithmetic sum of blade tip rotational speed (Vt) and the helicopter true airspeed (Vr) divided by the speed of sound (c) at 25°C such that:

$$\text{Mat} = \frac{(\text{Vt} + \text{Vr})}{\text{c}}$$

3. NOISE UNIT DEFINITION

3.1 The value of sound exposure level L_{AE} is defined as the level, in decibels, of the time integral of squared A-weighted sound pressure (P_A) over a given time period or event, with reference to the square of the standard reference sound pressure (P_0) or 20 micropascals and a reference duration of one second.

3.2 This unit is defined by the expression:

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{t2} \left(\frac{P_A(t)}{P_0}\right)^2 dt$$

where T_0 is the reference integration time of one second and ($t2 - t1$) is the integration time interval.

3.3 The above integral can also be expressed as:

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{t2} 10^{L_A\frac{(t)}{10}} dt$$

where $L_A(t)$ is the time varying A-weighted sound level.

3.4 The integration time ($t2 - t1$) in practice shall not be less than the time interval during which $L_A(t)$ first rises to within 10 dB(A) of its maximum value (L_{Amax}) and last falls below 10 dB(A) of its maximum value.

3.5 The SEL may be approximated by the following expression:

$$L_{AE} = L_{Amax} + \Delta A$$

where ΔA is the duration allowance given by

$$\Delta A = 10 \log_{10}\tau$$

where $\tau = (t2 - t1)/2$.

L_{Amax} is defined as the maximum level, in decibels, of the A-weighted sound pressure (slow response) with reference to the square of the standard reference sound pressure P_0.

4. MEASUREMENT OF HELICOPTER NOISE RECEIVED ON THE GROUND

4.1 General

4.1.1 All measuring equipment shall be approved by the certificating authority.

4.1.2 Sound pressure level data for noise evaluation purposes shall be obtained with acoustical equipment and measurement practices that conform to the specifications given in 4.2.

4.2 Measurement system

The acoustical measurement system shall consist of approved equipment equivalent to the following:

a) a microphone system with frequency response compatible with measurement and analysis system accuracy as stated in 4.3;

b) tripods or similar microphone mountings that minimize interference with the sound being measured;

c) recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of 4.3; and

d) acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal shall be described in terms of its average and maximum root-mean-square (rms) value for non-overload signal level.

4.3 Sensing, recording and reproducing equipment

4.3.1 With the approval of the certificating authority the sound level produced by the helicopter may be stored on a magnetic tape recorder for later evaluation. Alternatively, the A-weighted sound level time history may be written onto a graphic level recorder set at "slow" response from which the SEL value may be determined or the SEL may be directly determined from an integrating sound level meter complying with the Standards of International Electrotechnical Commission (IEC) Publication No. 804[1] for a Type 1 instrument set at "slow" response. The SEL value may also be calculated from one-third octave band data obtained from measurements made in conformity with Section 3 of Appendix 2. In this case each one-third octave band sound pressure level shall be weighted in accordance with the A-weighting values given in IEC Publication No. 651.[1]

4.3.2 The characteristics of the complete system shall comply with the recommendations given in IEC Publication No. 651[1] with regard to the sections concerning microphone, amplifier and indicating instrument characteristics. The text and specifications of IEC Publication No. 651 entitled "Sound Level Meters" are incorporated by reference into this section and are made a part hereof.

4.3.3 If a tape recording is used, the tape recorder shall comply with IEC Recommendation 561.[1]

4.3.4 The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude shall lie within the tolerance limits specified in Table IV and Table V for Type I instruments in IEC Publication No. 651, for weighting curve A over the frequency range 45 to 11 500 Hz.

4.3.5 The overall sensitivity of the measuring system shall be checked before tests start and at intervals during testing using an acoustic calibrator generating a known sound pressure level at a known frequency. The output of the acoustic calibrator shall have been checked by a standardizing laboratory within 6 months of the test series; tolerable changes in output shall be not more than 0.2 dB. The equipment shall be considered satisfactory if the variation over the period immediately prior to and immediately following each test series within a given test day is not greater than 0.5 dB.

Note.— A pistonphone operating at a nominal 124 dB and 250 Hz is generally used for this purpose.

4.3.6 A wind screen should be employed with the microphone during all measurements of helicopter noise. Its characteristics should be such that when it is used, the complete system including the wind screen will meet the specifications above. Its insertion loss at the frequencies of the pistonphone should also be known and included in the acoustic reference level for analysis of the measurements.

4.4 Noise measurement procedures

4.4.1 The microphone shall be of the pressure-sensitive type designed for nearly uniform grazing incidence response.

4.4.2 The microphone shall be mounted with the centre of the sensing element 1.2 m above the local ground surface and shall be oriented for grazing incidence, i.e. with the sensing element substantially in the plane defined by the nominal flight path of the helicopter and the measuring station. The microphone mounting arrangement shall minimize the interference of the supports with the sound to be measured.

4.4.3 If the noise signal is tape-recorded, the frequency response of the electrical system shall be determined, during each test series, at a level within 10 dB of the full-scale reading used during the tests, utilizing random or pseudo-random pink noise. The output of the noise generator shall have been checked by an approved standards laboratory within six months of the test series, and tolerable changes in the relative output at each one-third octave band shall be not more than 0.2 dB. Sufficient determinations shall be made to ensure that the overall calibration of the system is known for each test.

4.4.4 Where a magnetic tape recorder forms part of the measuring chain, each reel of magnetic tape shall carry 30 s of this electrical calibration signal at its beginning and end for this purpose. In addition, data obtained from tape-recorded signals shall be accepted as reliable only if the level difference in the 10 kHz one-third octave band filtered levels of the two signals is not more than 0.75 dB.

4.4.5 Background noise, including ambient noise and electrical noise of the measurement systems, shall be determined in the test area with the system gain set at levels which will be used for helicopter noise measurements. If helicopter sound pressure levels do not exceed background sound pressure levels by at least 15 dB(A), flyovers at an approved lower height may be used and the results adjusted to the reference measurement point by an approved method.

5. ADJUSTMENT TO TEST RESULTS

5.1 When certification test conditions differ from the reference conditions, appropriate adjustments shall be made to the measured noise data by the methods of this section.

5.2 Corrections and adjustments

5.2.1 The adjustments may be limited to the effects of differences in spherical spreading between the helicopter test

1. Available from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

flight path and the reference flight path (and between reference and adjusted reference airspeed). No adjustment for the differences in atmospheric attenuation between the test and reference meteorological conditions and between the helicopter test and reference ground speeds need be applied.

5.2.2 The adjustments for spherical spreading and duration may be approximated from:

$$\Delta_1 = 12.5 \log_{10} (H/150) \text{ dB}$$

where H is the height, in metres, of the test helicopter when directly over the noise measurement point.

5.2.3 The adjustment for the difference between reference airspeed and adjusted reference airspeed is calculated from:

$$\Delta_2 = 10 \log_{10}\left(\frac{Var}{Vr}\right) dB$$

where Δ_2 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference airspeed on the duration of the measured flyover event as perceived at the noise measurement station. Vr is the reference airspeed as prescribed under Part II, Chapter 11, 11.5.2, and Var is the adjusted reference airspeed as prescribed in 2.4.1 of this appendix.

6. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY AND VALIDITY OF RESULTS

6.1 Data reporting

6.1.1 Measured and corrected sound pressure levels obtained with equipment conforming to the specifications described in Section 4 of this appendix shall be reported.

6.1.2 The type of equipment used for measurement and analysis of all acoustic helicopter performance and meteorological data shall be reported.

6.1.3 The following atmospheric environmental data, measured immediately before, after, or during each test at the observation point prescribed in Section 2 of this appendix shall be reported:

a) air temperature and relative humidity;

b) wind speeds and wind directions; and

c) atmospheric pressure.

6.1.4 Comments on local topography, ground cover and events that might interfere with sound recording shall be reported.

6.1.5 The following helicopter information shall be reported:

a) type, model and serial numbers of helicopter, engine(s) and rotor(s);

b) any modifications or nonstandard equipment likely to affect the noise characteristics of the helicopter;

c) maximum certificated take-off and landing mass;

d) indicated airspeed in kilometres per hour (knots) and rotor speed in rpm during each demonstration;

e) engine performance parameters during each demonstration; and

f) helicopter height above the ground during each demonstration.

6.2 Reporting of noise certification reference conditions

Helicopter position and performance data and noise measurements shall be corrected to the noise certification reference conditions specified in Part II, Chapter 11, 11.5. These conditions, including reference parameters, procedures and configurations shall be reported.

6.3 Validity of results

6.3.1 The measuring point shall be overflown at least six times. The test results shall produce an average SEL and its 90 per cent confidence limits, the noise level being the arithmetic average of the corrected acoustical measurements for all valid test runs over the measuring point for the reference procedure.

6.3.2 The sample shall be large enough to establish statistically a 90 per cent confidence limit not exceeding ±1.5 dB(A). No test results shall be omitted from the averaging process unless approved by the certificating authority.

Note.— Methods for calculating the 90 per cent confidence interval are given in Appendix 1 of the Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft *(Doc 9501).*

APPENDIX 5. MONITORING AIRCRAFT NOISE ON AND IN THE VICINITY OF AERODROMES

Note.— See Part III.

1. INTRODUCTION

Note 1.— The introduction of jet aircraft operations, as well as the general increase in air traffic, has resulted in international concern over aircraft noise. To facilitate international collaboration on the solution of aircraft noise problems, it is desirable to recommend a procedure for monitoring aircraft noise on and in the vicinity of aerodromes.

Note 2.— In this appendix monitoring is understood to be the routine measurement of noise levels created by aircraft in the operation of an aerodrome. Monitoring usually involves a large number of measurements per day, from which an immediate indication of the noise level may be required.

Note 3.— This appendix specifies the measuring equipment to be used in order to measure noise levels created by aircraft in the operation of an aerodrome. The noise levels measured according to this appendix are approximations to perceived noise levels PNL, in PNdB, as calculated by the method described in Appendix 1, 4.2.

Monitoring of aircraft noise should be carried out either with mobile equipment, often using only a sound level meter, or with permanently installed equipment incorporating one or more microphones with amplifiers located at different positions in the field with a data transmission system linking the microphones to a central recording installation. This appendix describes primarily the latter method, but specifications given in this appendix should also be followed, to the extent the specifications are relevant, when using mobile equipment.

2. DEFINITION

Monitoring of aircraft noise is defined as the routine measurement of noise levels created by aircraft on and in the vicinity of aerodromes for the purpose of monitoring compliance with and checking the effectiveness of noise abatement requirements.

3. MEASUREMENT EQUIPMENT

3.1 The measurement equipment should consist of either portable recording apparatus capable of direct reading, or apparatus located at one or more fixed positions in the field linked through a radio transmission — or cable system (e.g. telephone line) to a centrally located recording device.

3.2 The characteristics of the field equipment, including the transmission system, should comply with IEC Publication No. 179,[1] "Precision Sound Level Meters", except that frequency weighting equal to the inverse of the 40 noy contour (see Figure A5-1) should apply. An approximation, to the nearest decibel, of the inverse of the 40 noy contour relative to the value at 1 000 Hz, is given in Table A5-1. The relative frequency response of the weighting element of the equipment should be maintained within a tolerance of ±0.5 dB. When such a weighting network is incorporated in a direct reading instrument, the relation between the acoustical input to the microphone and the meter reading should follow the inverse of the 40 noy contour with the same tolerances as those specified for weighting curve C in IEC Publication No. 179.[1] Measurements obtained by means of the instrumentation described above provide, after adding 7 dB, values which are approximations to the perceived noise levels in PNdB.

3.3 An alternative method of determining approximations to the perceived noise levels can be obtained from measuring the noise using a sound-level meter incorporating the A-weighting network[2] and adding a correction K normally between 9 and 14 dB dependent on the frequency spectrum of the noise. The value of K and the method used by the measuring authorities for determination of that value should be specified when reporting results.

3.4 The field installation of microphones for aircraft noise monitoring purposes should provide for suitable protection of the microphones from rain, snow and other adverse weather conditions. Adequate correction for any insertion loss, as a function of frequency and weather conditions, produced by wind screens or other protective enclosures should be applied to the measured data.

1. This publication was first issued in 1965 by the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.
2. The A-weighting network is described in IEC Publication No. 179.

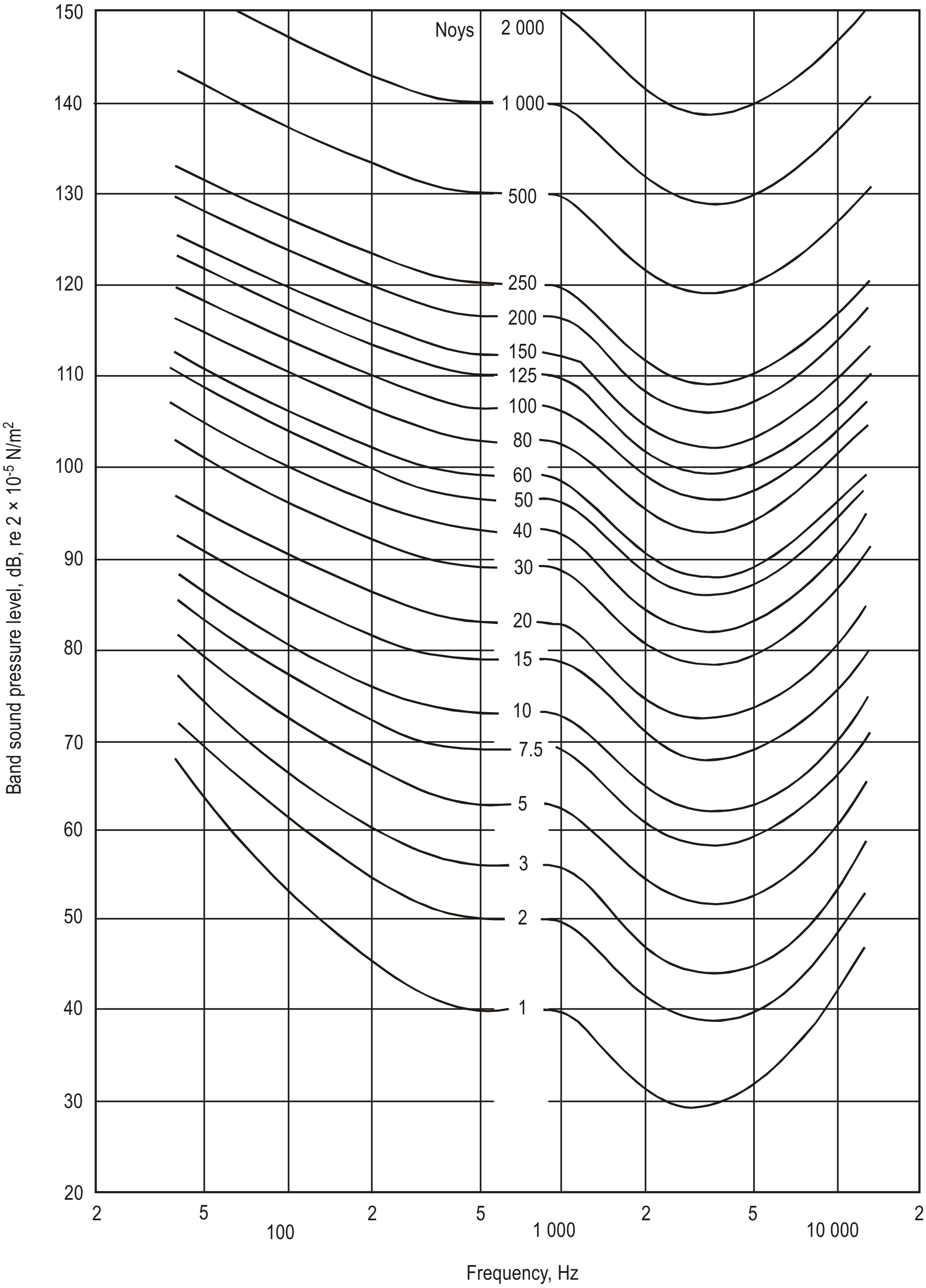


Figure A5-1. Contours of perceived noisiness

Table A5-1. Approximation to the nearest decibel of the inverse of the 40 noy contour relative to the value at 1 000 Hz

Hz	40	50	63	80	100	125	160
dB	–14	–12	–11	–9	–7	–6	–5
Hz	200	250	315	400	500	630	800
dB	–3	–2	–1	0	0	0	0
Hz	1 000	1 250	1 600	2 000	2 500	3 150	4 000
dB	0	+2	+6	+8	+10	+11	+11
Hz	5 000	6 300	8 000	10 000	12 500		
dB	+10	+9	+6	+3	0		

Note.— Where a record of the noise as a function of time is required this can be obtained by recording the noise signal on a magnetic tape, a graphic level recorder or other suitable equipment.

3.5 The recording and indicating equipment should comply with IEC Publication No. 179[3] regarding the dynamic characteristics of the indicating instrument designated as "slow".

Note.— If the anticipated duration of the noise signal is less than 5 s, the dynamic characteristics designated as "fast" may be used.

For the purpose of this note, the duration is described as the length of the significant time history during which the recorded signal, passed through a weighting network having an amplitude characteristic equal to the inverse 40 noy contour, remains within 10 dB of its maximum value.

3.6 The microphone system should have been originally calibrated at a laboratory equipped for free-field calibration and its calibration should be rechecked at least every six months.

3.7 The complete measurement system prior to field installation and at periodic intervals thereafter should be calibrated in a laboratory to ensure that the frequency response and dynamic range requirements of the system comply with the specifications described in this document.

Note.— Direct reading measuring systems that yield approximate values of perceived noise levels other than those defined above are not meant to be excluded from use in monitoring.

3. This publication was first issued in 1965 by the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

4. FIELD EQUIPMENT INSTALLATION

4.1 Microphones used for monitoring noise levels from aircraft operations should be installed at appropriate locations with the axis of maximum sensitivity of each microphone oriented in a direction such that the highest sensitivity to sound waves is achieved. The microphone position should be selected so that no obstruction which influences the sound field produced by an aircraft exists above a horizontal plane passing through the active centre of the microphone.

Note 1.— Monitoring microphones may need to be placed in locations having substantial background noise levels caused by motor vehicle traffic, children playing, etc. In these instances it is often expedient to locate the microphone on a rooftop, telephone pole or other structure rising above the ground. Consequently, it is necessary to determine the background noise level and to carry out a field check, at one or more frequencies, of the overall sensitivity of the measuring system after or before the measurement of the noise level for a sequence of aircraft operations.

Note 2.— If, due to the microphone being placed in a structure above the ground, it is impracticable for operating personnel to calibrate it directly because of its inaccessibility, it can be useful to provide a calibrated sound source at the microphone location. This sound source can be a small loudspeaker, an electrostatic actuator, or similar device.

4.2 Monitoring concerns the noise produced by a single aircraft flight, by a series of flights or by a specified type of aircraft, or by a large number of operations of different aircraft. Such noise levels vary, for a specific monitoring location, with variations in flight procedures or meteorological conditions. In interpretation of the results of a monitoring procedure, consideration should therefore be given to the statistical distribution of the measured noise levels. In describing the results of a monitoring procedure an appropriate description of the distribution of the observed noise levels should be provided.

APPENDIX 6. NOISE EVALUATION METHOD FOR NOISE CERTIFICATION OF PROPELLER-DRIVEN AEROPLANES NOT EXCEEDING 8 618 kg — APPLICATION FOR CERTIFICATE OF AIRWORTHINESS FOR THE PROTOTYPE ACCEPTED ON OR AFTER 17 NOVEMBER 1988

Note.— See Part II, Chapter 10.

1. INTRODUCTION

Note 1.— This noise evaluation method includes:

a) noise certification test and measurement conditions;

b) noise unit;

c) measurement of aeroplane noise received on the ground;

d) adjustments to test data; and

e) reporting of data to the certificating authority and validity of results.

Note 2.— The instructions and procedures given in the method are clearly delineated to ensure uniformity during compliance tests and to permit comparison between tests of various types of aeroplanes, conducted in various geographical locations. The method applies only to aeroplanes within the applicability clauses of Part II, Chapter 10.

2. NOISE CERTIFICATION TEST AND MEASUREMENT CONDITIONS

2.1 General

This section prescribes the conditions under which noise certification tests shall be conducted and the measurement procedures that shall be used to measure the noise made by the aeroplane for which the test is conducted.

2.2 General test conditions

2.2.1 Locations for measuring noise from an aeroplane in flight shall be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as might be caused by thick, matted or tall grass, shrubs or wooded areas. No obstructions which significantly influence the sound field from the aeroplane shall exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75° from this axis.

2.2.2 The tests shall be carried out under the following atmospheric conditions:

a) no precipitation;

b) relative humidity not higher than 95 per cent and not lower than 20 per cent and ambient temperature not above 35°C and not below 2°C;

c) average wind speed shall not exceed 19 km/h (10 kt) and crosswind average wind speed shall not exceed 9 km/h (5 kt);

Note.— Average wind speed is defined over a 30-second time period.

d) no other anomalous meteorological conditions that would significantly affect the noise level of the aeroplane when the noise is recorded at the measuring points specified by the certificating authority; and

e) the meteorological measurements must be made between 1.2 m and 10 m above ground level. If the measurement site is within 2 000 m of an airport meteorological station, measurements from this station may be used.

2.3 Aeroplane testing procedures

2.3.1 The test procedures and noise measurement procedure shall be acceptable to the airworthiness and noise certificating authorities of the State issuing the certification.

2.3.2 The flight test programme shall be initiated at the maximum take-off mass for the aeroplane, and the mass shall be adjusted to maximum take-off mass after each hour of flight time.

2.3.3 The flight test shall be conducted at V_y ± 9 km/h (5 kt) indicated airspeed.

2.3.4 The aeroplane position relative to the flight path reference point shall be determined by a method independent of normal flight instrumentation, such as radar tracking, theodolite triangulation or photographic scaling techniques, approved by the certificating authorities.

2.3.5 The aeroplane height when directly over the microphone shall be measured by an approved technique. The aeroplane shall pass over the microphone within ±10° from the vertical and within ±20 per cent of the reference height (see Figure A6-1).

2.3.6 Aeroplane speed, position and performance data required to make the adjustments referred to in Section 5 of this appendix shall be recorded when the aeroplane is directly over the measurement site. Measuring equipment shall be approved by the certificating authority.

2.3.7 An independent device accurate to within ±1 per cent shall be used for the measurement of propeller rotational speed to avoid orientation and installation errors when the test aeroplane is equipped with mechanical tachometers.

3. NOISE UNIT DEFINITION

The L_{Amax} is defined as the maximum level, in decibels, of the A-weighted sound pressure (slow response) with reference to the square of the standard reference sound pressure (P_0) of 20 micropascals (μPa).

4. MEASUREMENT OF AEROPLANE NOISE RECEIVED ON THE GROUND

4.1 General

4.1.1 All measuring equipment shall be approved by the certificating authority.

4.1.2 Sound pressure level data for noise evaluation purposes shall be obtained with acoustical equipment and measurement practices that conform to the specifications given in 4.2.

4.2 Measurement system

The acoustical measurement system shall consist of approved equipment equivalent to the following:

a) a microphone system with frequency response compatible with measurement and analysis system accuracy as stated in 4.3;

b) tripods or similar microphone mountings that minimize interference with the sound being measured;

c) recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of 4.3; and

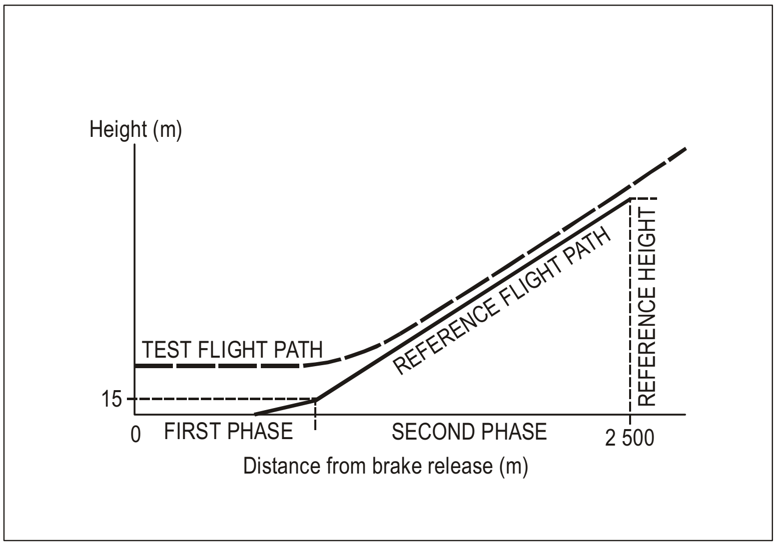


Figure A6-1. Typical test and reference profiles

d) acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal shall be described in terms of its average and maximum root-mean-square (rms) value for non-overload signal level.

4.3 Sensing, recording and reproducing equipment

4.3.1 The sound level produced by the aeroplane shall be recorded. A magnetic tape recorder, graphic level recorder or sound level meter is acceptable at the option of the certificating authority.

4.3.2 The characteristics of the complete system shall comply with the recommendations given in International Electrotechnical Commission (IEC) Publication No. 651[1] with regard to the sections concerning microphone, amplifier and indicating instrument characteristics. The text and specifications of IEC Publication No. 651 entitled "Sound Level Meters" are incorporated by reference into this section and are made a part hereof.

Note.— If a tape recording is required by the certificating authority, the tape recorder shall comply with IEC Recommendation 561.

4.3.3 The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude shall lie within the tolerance limits specified in Table IV and Table V for Type I instruments in IEC Publication No. 651, for weighting curve "A" over the frequency range 45 to 11 500 Hz.

4.3.4 The noise signal shall be passed through an "A" filter as defined in IEC Publication No. 651.

4.3.5 The overall sensitivity of the measuring system shall be checked before tests start and at intervals during testing using an acoustic calibrator generating a known sound pressure level at a known frequency.

Note.— A pistonphone operating at a nominal 124 dB and 250 Hz is generally used for this purpose.

4.3.6 When a tape recording is used, the maximum A-weighted noise level L_{Amax} may be determined using a graphic level recorder or digital equivalent.

Note.— The maximum noise level L_{Amax} *could also be determined using an approved sound level meter.*

1. Available from the Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

4.4 Noise measurement procedures

4.4.1 The microphone shall be a 12.7 mm diameter pressure type, with its protective grid, mounted in an inverted position such that the microphone diaphragm is 7 mm above and parallel to a circular metal plate. This white-painted metal plate shall be 40 cm in diameter and at least 2.5 mm thick and shall be placed horizontally and flush with the surrounding ground surface with no cavities below the plate. The microphone shall be located three-quarters of the distance from the centre to the edge along a radius normal to the line of flight of the test aeroplane.

4.4.2 If the noise signal is tape-recorded, the frequency response of the electrical system shall be determined, during each test series, at a level within 10 dB of the full-scale reading used during the tests, utilizing random or pseudo-random pink noise. The output of the noise generator shall have been checked by an approved standards laboratory within six months of the test series, and tolerable changes in the relative output at each one-third octave band shall be not more than 0.2 dB. Sufficient determinations shall be made to ensure that the overall calibration of the system is known for each test.

4.4.3 Where a magnetic tape recorder forms part of the measuring chain, each reel of magnetic tape shall carry 30 s of this electrical calibration signal at its beginning and end for this purpose. In addition, data obtained from tape-recorded signals shall be accepted as reliable only if the level difference in the 10 kHz one-third octave band filtered levels of the two signals is not more than 0.75 dB.

4.4.4 Background noise, including ambient noise and electrical noise of the measurement systems, shall be determined in the test area with the system gain set at levels which will be used for aeroplane noise measurements. If aeroplane peak sound pressure levels do not exceed background sound pressure levels by at least 10 dB(A), a take-off measurement point nearer to start of roll shall be used and the results adjusted to the reference measurement point by an approved method.

5. ADJUSTMENT TO TEST RESULTS

5.1 When certification test conditions differ from the reference conditions, appropriate adjustments shall be made to the measured noise data by the methods of this section.

5.2 Corrections and adjustments

5.2.1 The adjustments take account of the effects of:

a) differences in atmospheric absorption between meteorological test conditions and reference conditions;

b) differences in the noise path length between the actual aeroplane flight path and the reference flight path;

c) the change in the helical tip Mach number between test and reference conditions; and

d) the change in engine power between test and reference conditions.

5.2.2 The noise level under reference conditions (L_{Amax}) REF is obtained by adding increments for each of the above effects to the test day noise level (L_{Amax}) TEST.

$$(L_{Amax})\ \text{REF} = (L_{Amax})\ \text{TEST} + \Delta(M) + \Delta_1 + \Delta_2 + \Delta_3$$

where

$\Delta(M)$ is the adjustment for the change in atmospheric absorption between test and reference conditions;
Δ_1 is the adjustment for noise path lengths;
Δ_2 is the adjustment for helical tip Mach number; and
Δ_3 is the adjustment for engine power.

a) When the test conditions are within those specified in Figure A6-2, no adjustments for differences in atmospheric absorption need be applied, i.e. $\Delta(M) = 0$. If conditions are outside those specified in Figure A6-2 then adjustments must be applied by an approved procedure or by adding an increment $\Delta(M)$ to the test day noise levels where,

$$\Delta(M) = 0.01\ (H_T\alpha - 0.2\ H_R)$$

and where H_T is the height in metres of the test aeroplane when directly over the noise measurement point, H_R is the reference height of the aeroplane above the noise measurement point, and α is the rate of absorption at 500 Hz specified in Tables A1-5 to A1-16 of Appendix 1.

b) Measured noise levels should be adjusted to the height of the aeroplane over the noise measuring point on a reference day by algebraically adding an increment equal to Δ_1. When test day conditions are within those specified in Figure A6-2:

$$\Delta_1 = 22 \log (H_T/H_R)$$

When test day conditions are outside those specified in Figure A6-2:

$$\Delta_1 = 20 \log (H_T/H_R)$$

where H_T is the height of the aeroplane when directly over the noise measurement point, and H_R is the reference height of the aeroplane over the measurement point.

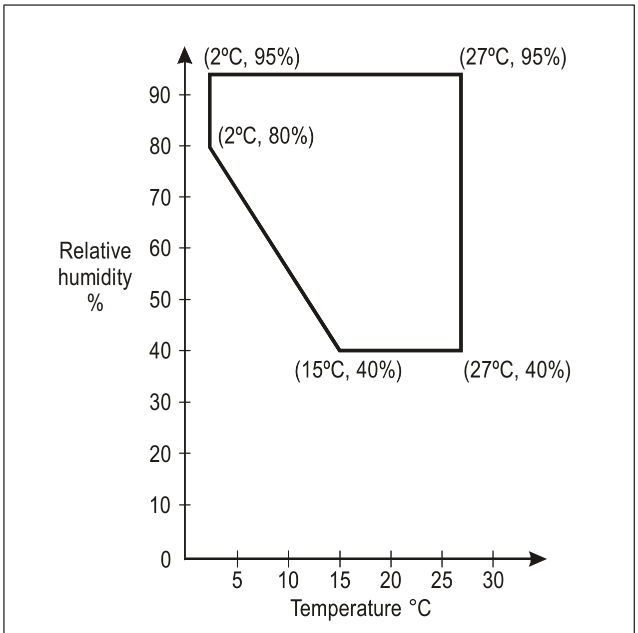


Figure A6-2. Measurement window for no absorption correction

c) No adjustments for helical tip Mach number variations need be made if the propeller helical tip Mach number is:

1) at or below 0.70 and the test helical tip Mach number is within 0.014 of the reference helical tip Mach number;

2) above 0.70 and at or below 0.80 and the test helical tip Mach number is within 0.007 of the reference helical tip Mach number;

3) above 0.80 and the test helical tip Mach number is within 0.005 of the reference helical tip Mach number. For mechanical tachometers, if the helical tip Mach number is above 0.8 and the test helical tip Mach number is within 0.008 of the reference helical tip Mach number.

Outside these limits measured noise levels shall be adjusted for helical tip Mach number by an increment equal to:

$$\Delta_2 = K_2 \log (M_R/M_T)$$

which shall be added algebraically to the measured noise level, where M_T and M_R are the test and reference helical tip Mach numbers respectively. The value of K_2 shall be determined from approved data from the test aeroplane. In the absence of flight test data and at the discretion of the certificating authority a value of K_2 = 150 may be used for M_T less than M_R; however, for M_T greater than or equal to M_R no correction is applied.

Note.— The reference helical tip Mach number M_R *is the one corresponding to the reference conditions above the measurement point:*

where

$$M_R = \frac{\left[\left(\frac{D\pi N}{6}\right)^2 + V_T{}^2\right]^{1/2}}{c}$$

where D *is the propeller diameter in metres.*

V_T *is the true airspeed of the aeroplane in reference conditions in metres per second.*

N *is the propeller speed in reference conditions in rpm. If* N *is not available, its value can be taken as the average of the propeller speeds over nominally identical power conditions during the flight tests.*

c *is the reference day speed of sound at the altitude of the aeroplane in metres per second based on the temperature at the reference height assuming an ISA temperature lapse rate with height.*

d) Measured sound levels shall be adjusted for engine power by algebraically adding an increment equal to:

$$\Delta_3 = K_3 \log (P_R/P_T)$$

where P_T and P_R are the test and reference engine powers respectively obtained from the manifold pressure/torque gauges and engine rpm. The value of K_3 shall be determined from approved data from the test aeroplane. In the absence of flight test data and at the discretion of the certificating authority a value of K_3 = 17 may be used. The reference power P_R shall be that obtained at the reference height pressure and temperature assuming an ISA temperature lapse rate with height.

6. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY AND VALIDITY OF RESULTS

6.1 Data reporting

6.1.1 Measured and corrected sound pressure levels obtained with equipment conforming to the specifications described in Section 4 of this appendix shall be reported.

6.1.2 The type of equipment used for measurement and analysis of all acoustic aeroplane performance and meteorological data shall be reported.

6.1.3 The following atmospheric environmental data, measured immediately before, after, or during each test at the observation points prescribed in Section 2 of this appendix shall be reported:

a) air temperature and relative humidity;

b) wind speeds and wind directions; and

c) atmospheric pressure.

6.1.4 Comments on local topography, ground cover and events that might interfere with sound recordings shall be reported.

6.1.5 The following aeroplane information shall be reported:

a) type, model and serial numbers of aeroplane, engine(s) and propeller(s);

b) any modifications or non-standard equipment likely to affect the noise characteristics of the aeroplane;

c) maximum certificated take-off mass;

d) for each overflight, airspeed and air temperature at the flyover altitude determined by properly calibrated instruments;

e) for each overflight, engine performance as manifold pressure or power, propeller speed in revolutions per minute and other relevant parameters determined by properly calibrated instruments;

f) aeroplane height above the measurement point; and

g) corresponding manufacturer's data for the reference conditions relevant to 6.1.5 d), e) and f).

6.2 Validity of results

6.2.1 The measuring point shall be overflown at least six times. The test results shall produce an average noise level (L_{Amax}) value and its 90 per cent confidence limits, the noise level being the arithmetic average of the corrected acoustical measurements for all valid test runs over the measuring point.

6.2.2 The samples shall be large enough to establish statistically a 90 per cent confidence limit not exceeding ±1.5 dB(A). No test results shall be omitted from the averaging process, unless otherwise specified by the certificating authority.

ATTACHMENTS TO ANNEX 16, VOLUME I

ATTACHMENT A. EQUATIONS FOR THE CALCULATION OF NOISE LEVELS AS A FUNCTION OF TAKE-OFF MASS

Note.— See Part II, 2.4.1, 2.4.2, 3.4.1, 4.4, 5.4, 6.3, 8.4.1, 8.4.2, 10.4, 11.4.1 and 11.4.2.

1. CONDITIONS DESCRIBED IN CHAPTER 2, 2.4.1

<table>
<tr><th>M = Maximum take-off mass in 1 000 kg</th><th>0</th><th>34</th><th>272</th></tr>
<tr><td>Lateral noise level (EPNdB)</td><td>102</td><td>91.83 + 6.64 log M</td><td>108</td></tr>
<tr><td>Approach noise level (EPNdB)</td><td>102</td><td>91.83 + 6.64 log M</td><td>108</td></tr>
<tr><td>Flyover noise level (EPNdB)</td><td>93</td><td>67.56 + 16.61 log M</td><td>108</td></tr>
</table>

2. CONDITIONS DESCRIBED IN CHAPTER 2, 2.4.2

<table>
<tr><th colspan="2">M = Maximum take-off mass in 1 000 kg</th><th>0</th><th>34</th><th>35</th><th>48.3</th><th>66.72</th><th>133.45</th><th>280</th><th>325</th><th>400</th></tr>
<tr><td colspan="2">Lateral noise level (EPNdB)
All aeroplanes</td><td colspan="2">97</td><td colspan="6">83.87 + 8.51 log M</td><td>106</td></tr>
<tr><td colspan="2">Approach noise level (EPNdB)
All aeroplanes</td><td colspan="2">101</td><td colspan="4">89.03 + 7.75 log M</td><td colspan="3">108</td></tr>
<tr><td rowspan="3">Flyover noise levels (EPNdB)</td><td>2 engines</td><td colspan="3">93</td><td colspan="4">70.62 + 13.29 log M</td><td colspan="2">104</td></tr>
<tr><td>3 engines</td><td>93</td><td colspan="3">67.56 + 16.61 log M</td><td colspan="3">73.62 + 13.29 log M</td><td colspan="2">107</td></tr>
<tr><td>4 engines</td><td>93</td><td colspan="4">67.56 + 16.61 log M</td><td colspan="2">74.62 + 13.29 log M</td><td colspan="2">108</td></tr>
</table>

3. CONDITIONS DESCRIBED IN CHAPTER 3, 3.4.1

<table>
<tr><th colspan="2">M = Maximum take-off mass in 1 000 kg</th><th>0</th><th>20.2</th><th>28.6</th><th>35</th><th>48.1</th><th>280</th><th>385</th><th>400</th></tr>
<tr><td colspan="2">Lateral full-power noise level (EPNdB)
All aeroplanes</td><td colspan="3">94</td><td colspan="4">80.87 + 8.51 log M</td><td>103</td></tr>
<tr><td colspan="2">Approach noise level (EPNdB)
All aeroplanes</td><td colspan="3">98</td><td colspan="2">86.03 + 7.75 log M</td><td colspan="3">105</td></tr>
<tr><td rowspan="3">Flyover noise levels (EPNdB)</td><td>2 engines or less</td><td colspan="4">89</td><td colspan="2">66.65 + 13.29 log M</td><td colspan="2">101</td></tr>
<tr><td>3 engines</td><td colspan="2">89</td><td colspan="4">69.65 + 13.29 log M</td><td colspan="2">104</td></tr>
<tr><td>4 engines or more</td><td>89</td><td colspan="5">71.65 + 13.29 log M</td><td colspan="2">106</td></tr>
</table>

4. CONDITIONS DESCRIBED IN CHAPTER 4, 4.4

Each of the following conditions shall apply:

$EPNL_L \leq LIMIT_L$; $EPNL_A \leq LIMIT_A$; and $EPNL_F \leq LIMIT_F$;

$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F)] \geq 10$

$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A)] \geq 2$; $[(LIMIT_L - EPNL_L) + (LIMIT_F - EPNL_F)] \geq 2$; and

$[(LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F)] \geq 2$

where

$EPNL_L$, $EPNL_A$ and $EPNL_F$ are respectively the noise levels at the lateral, approach and flyover reference noise measurement points when determined, to one decimal place, in accordance with the noise evaluation method of Appendix 2; and

$LIMIT_L$, $LIMIT_A$, and $LIMIT_F$ are respectively the maximum permitted noise levels at the lateral, approach and flyover reference noise measurement points determined, to one decimal place, in accordance with the equations for the conditions described in Chapter 3, 3.4.1 (Condition 3).

5. CONDITIONS DESCRIBED IN CHAPTER 5, 5.4

M = Maximum take-off mass in 1 000 kg: 5.7 — 34.0 — 358.9 — 384.7

<table>
<tr><td>Lateral noise level (EPNdB)</td><td>96</td><td colspan="2">85.83 + 6.64 log M</td><td>103</td></tr>
<tr><td>Approach noise level (EPNdB)</td><td>98</td><td colspan="2">87.83 + 6.64 log M</td><td>105</td></tr>
<tr><td>Flyover noise level (EPNdB)</td><td>89</td><td>63.56 + 16.61 log M</td><td colspan="2">106</td></tr>
</table>

6. CONDITIONS DESCRIBED IN CHAPTER 6, 6.3

M = Maximum take-off mass in 1 000 kg: 0 — 0.6 — 1.5 — 8.618

Noise level in dB(A)	68	60 + 13.33 M	80

7. CONDITIONS DESCRIBED IN CHAPTER 8, 8.4.1

M = Maximum take-off mass in 1 000 kg: 0 — 0.788 — 80.0

Take-off noise level (EPNdB)	89	90.03 + 9.97 log M	109
Approach noise level (EPNdB)	90	91.03 + 9.97 log M	110
Overflight noise level (EPNdB)	88	89.03 + 9.97 log M	108

8. CONDITIONS DESCRIBED IN CHAPTER 8, 8.4.2

M = Maximum take-off mass in 1 000 kg: 0 — 0.788 — 80.0

Take-off noise level (EPNdB)	86	87.03 + 9.97 log M	l06
Approach noise level (EPNdB)	89	90.03 + 9.97 log M	109
Overflight noise level (EPNdB)	84	85.03 + 9.97 log M	104

9. CONDITIONS DESCRIBED IN CHAPTER 10, 10.4 a) and 10.4 b)

10.4 a):

M = Maximum take-off mass in 1 000 kg	0		0.6		1.4		8.618
Noise level in dB(A)		76		83.23 + 32.67 log M		88	

10.4 b):

M = Maximum take-off mass in 1 000 kg	0		0.57		1.5		8.618
Noise level in dB(A)		70		78.71 + 35.70 log M		85	

10. CONDITIONS DESCRIBED IN CHAPTER 11, 11.4.1

M = Maximum take-off mass in 1 000 kg	0		0.788		3.175
Noise level in dB SEL		82		83.03 + 9.97 log M	

11. CONDITIONS DESCRIBED IN CHAPTER 11, 11.4.2

M = Maximum take-off mass in 1 000 kg	0		1.417		3.175
Noise level in dB SEL		82		80.49 + 9.97 log M	

ATTACHMENT B. GUIDELINES FOR NOISE CERTIFICATION OF PROPELLER-DRIVEN STOL AEROPLANES

Note.— See Part II, Chapter 7.

Note 1.— For the purpose of these guidelines, STOL aeroplanes are those which, when operating in the short take-off and landing mode, consistent with the relevant airworthiness requirements, require a runway length (with no stopway or clearway) of not more than 610 m at maximum certificated mass for airworthiness.

Note 2.— These guidelines are not applicable to aircraft with vertical take-off and landing capabilities.

1. APPLICABILITY

The following guidelines should be applied to all propeller-driven aeroplanes of over 5 700 kg maximum certificated take-off mass intended for operation in the short take-off and landing (STOL) mode, requiring a runway[1] length, compatible with the relevant take-off and landing distance requirements, of less than 610 m at maximum certificated mass for airworthiness, and for which a certificate of airworthiness for the individual aeroplane was first issued on or after 1 January 1976.

2. NOISE EVALUATION MEASURE

The noise evaluation measure should be the effective perceived noise level in EPNdB as described in Appendix 2 to this Annex.

3. NOISE MEASUREMENT REFERENCE POINTS

The aeroplane, when tested in accordance with the flight test procedure of Section 6, should not exceed the noise levels specified in Section 4 at the following reference points:

a) *lateral noise reference point:* the point on a line parallel to and 300 m from the runway centre line, or extended runway centre line, where the noise level is a maximum during take-off or landing, with the aeroplane operating in the STOL mode;

b) *flyover noise reference point:* the point on the extended centre line of the runway 1 500 m from the start of the take-off roll; and

c) *approach noise reference point:* the point on the extended centre line of the runway 900 m from the runway threshold.

4. MAXIMUM NOISE LEVELS

The maximum noise level at any of the reference points, when determined in accordance with the noise evaluation method of Appendix 2, should not exceed 96 EPNdB in the case of aeroplanes with maximum certificated mass of 17 000 kg or less, this limit increasing linearly with the logarithm of mass at a rate of 2 EPNdB per doubling of mass in the case of aeroplanes having maximum certificated mass in excess of 17 000 kg.

5. TRADE-OFFS

If the maximum noise levels are exceeded at one or two measurement points:

a) the sum of any excesses should not be greater than 4 EPNdB;

b) any excess at any single point should not be greater than 3 EPNdB; and

c) any excesses should be offset by a corresponding reduction at the other point or points.

6. TEST PROCEDURES

6.1 The take-off reference procedure should be as follows:

1. With no stopway or clearway.

a) the aeroplane should be at the maximum take-off mass for which noise certification is requested;

b) the propeller and/or engine speed (rpm) and engine power setting scheduled for STOL take-off should be used; and

c) throughout the take-off noise certification demonstration test, the airspeed, climb gradient, aeroplane attitude and aeroplane configuration should be those specified in the flight manual for take-off in the STOL mode.

6.2 The approach reference procedure should be as follows:

a) the aeroplane should be at the maximum landing mass for which the noise certification is requested;

b) throughout the approach noise certification demonstration test, the propeller and/or engine speed (rpm), engine power setting, airspeed, descent gradient, aeroplane attitude and aeroplane configuration should be those specified in the flight manual for STOL landing; and

c) the use of reverse thrust after landing should be the maximum specified in the flight manual.

7. ADDITIONAL NOISE DATA

Where so specified by the certificating authority, data permitting measured noise levels to be evaluated in terms of the A-weighted overall sound pressure level (dB(A)) should be provided.

ATTACHMENT C. GUIDELINES FOR NOISE CERTIFICATION OF INSTALLED AUXILIARY POWER UNITS (APU) AND ASSOCIATED AIRCRAFT SYSTEMS DURING GROUND OPERATION

Note.— See Part II, Chapter 9.

1. INTRODUCTION

1.1 The following guidance material has been prepared for the information of States establishing noise certification requirements for installed auxiliary power units (APU) and associated aircraft systems used during normal ground operation.

1.2 It should apply to installed APU and associated aircraft systems in all aircraft for which the application for a certificate of airworthiness for the prototype, or another equivalent prescribed procedure, is made on or after 26 November 1981.

1.3 For aircraft of existing type design, for which the application for a change of type design involving the basic APU installation, or another equivalent prescribed procedure, is made on or after 26 November 1981, the noise levels produced by installed APU and associated aircraft systems should not exceed those existing prior to the change, when determined in accordance with the following guidelines.

2. NOISE EVALUATION PROCEDURE

The noise evaluation procedure should be according to the methods specified in Section 4.

3. MAXIMUM NOISE LEVELS

The maximum noise levels, when determined in accordance with the noise evaluation procedure specified in Section 4, should not exceed the following:

a) 85 dB(A) at the points specified in 4.4.2.2 a), b) and c);

b) 90 dB(A) at any point on the perimeter of the rectangle shown in Figure C-2.

4. NOISE EVALUATION PROCEDURES

4.1 General

4.1.1 Test procedures are described for measuring noise at specific locations (passenger and cargo doors, and servicing positions) and for conducting general noise surveys around aircraft.

4.1.2 Requirements are identified with respect to instrumentation, acoustic and atmospheric environment data acquisition, reduction and presentation, and such other information as is needed for reporting the results.

4.1.3 Procedures involve recording data on magnetic tape for subsequent processing. The use of tape-recorder time-integrating analyser systems avoids the need to average by eye the variations associated with manual readings from sound level meters and octave band analysers and therefore yields more accurate results.

4.1.4 No provision is made for predicting APU noise from basic engine characteristics, nor for measuring noise of more than one aircraft operating at the same time.

4.2 General test conditions

4.2.1 Meteorological conditions

Wind: not more than 19 km/h (10 kt).

Temperature: not less than 2°C nor more than 35°C.

Humidity: relative humidity not less than 30 per cent nor more than 90 per cent.

Precipitation: none.

Barometric pressure: not less than 800 hPa nor more than 1 100 hPa.

4.2.2 Test site

The ground between microphone and aircraft should be a smooth, hard surface. No obstructions should be present between aircraft and measurement positions and no reflecting surfaces (except the ground and aircraft) should be near enough to sound paths to significantly influence results. Surface of the ground surrounding the aircraft should be sensibly flat and level at least over an area formed by boundaries parallel to and 60 m beyond the outermost microphone array identified in 4.4.2.2 d).

4.2.3 Ambient noise

Ambient noise of the measurement system and test area (that is, composite of the noise due to environmental background and the electrical noise of the acoustic instrumentation) should be determined.

4.2.4 APU installation

Pertinent APU and associated aircraft systems should be tested for each aircraft model for which acoustic data are required.

4.2.5 Aircraft ground configuration

Aircraft flight control surfaces should be in the "neutral" or "clean" configuration, with gust locks on, or as stated in the aircraft's approved operating manual for aircraft undergoing servicing.

4.3 Instrumentation

4.3.1 Aircraft

Operational data identified in 4.5.4 should be determined from normal aircraft instruments and controls.

4.3.2 Acoustical

4.3.2.1 *General*

Instrumentation and measurement procedures should be consistent with requirements of latest applicable issues of appropriate standards listed in the references (see 4.6). All data samples should be at least 2.5 times the data reduction integration period which in no case should be less than 8 s. All sound pressure levels should be in decibels to a reference pressure of 20 μPa.

4.3.2.2 *Data acquisition systems*

Instrumentation systems for recording and analysis of noise, shown in the block diagram of Figure C-1, should meet the following specifications:

4.3.2.2.1 *Microphone system*

a) Over a frequency range of at least 45 Hz to 11 200 Hz the system should meet the requirements as outlined under microphone system specifications in the latest issue of reference 10 (see 4.6).

b) Microphones should be omnidirectional, vented for pressure equalization if of condenser type, and should have known ambient pressure and temperature coefficients. Microphone amplifier specifications should be compatible with those of the microphone and tape recorder.

c) Microphone wind screens should be employed when wind speed is in excess of 11 km/h (6 kt). Corrections as a function of frequency should be applied to measured data to account for the presence of microphone wind screens.

4.3.2.2.2 *Tape recorder*

The tape recorder may be direct record or FM and should have the following characteristics:

a) dynamic range of 50 dB minimum in the octave or one-third octave bands;

b) tape speed accuracy within ±0.2 per cent of rated speed;

c) wow and flutter (peak to peak) less than 0.5 per cent of tape speed;

d) maximum third harmonic distortion less than 2 per cent.

4.3.2.3 *Calibration*

4.3.2.3.1 *Microphone*

Frequency response calibration should be performed prior to the test series and a subsequent post-calibration should be performed within one month of the pre-calibration, with additional calibrations made when shock or damage is suspected. Response calibration should cover the range of at least 45 Hz to 11 200 Hz. Pressure response characteristics of the microphone should be corrected to obtain random incidence calibration.

4.3.2.3.2 *Recording system*

a) A calibration tape, a recording of broadband noise or a sweep of sinusoidal signals over a minimum frequency range of 45 Hz to 11 200 Hz should be recorded in the field or in the laboratory at the beginning and end of each test. The tape should also include signals at the frequencies employed during sound pressure sensitivity checks as defined below.

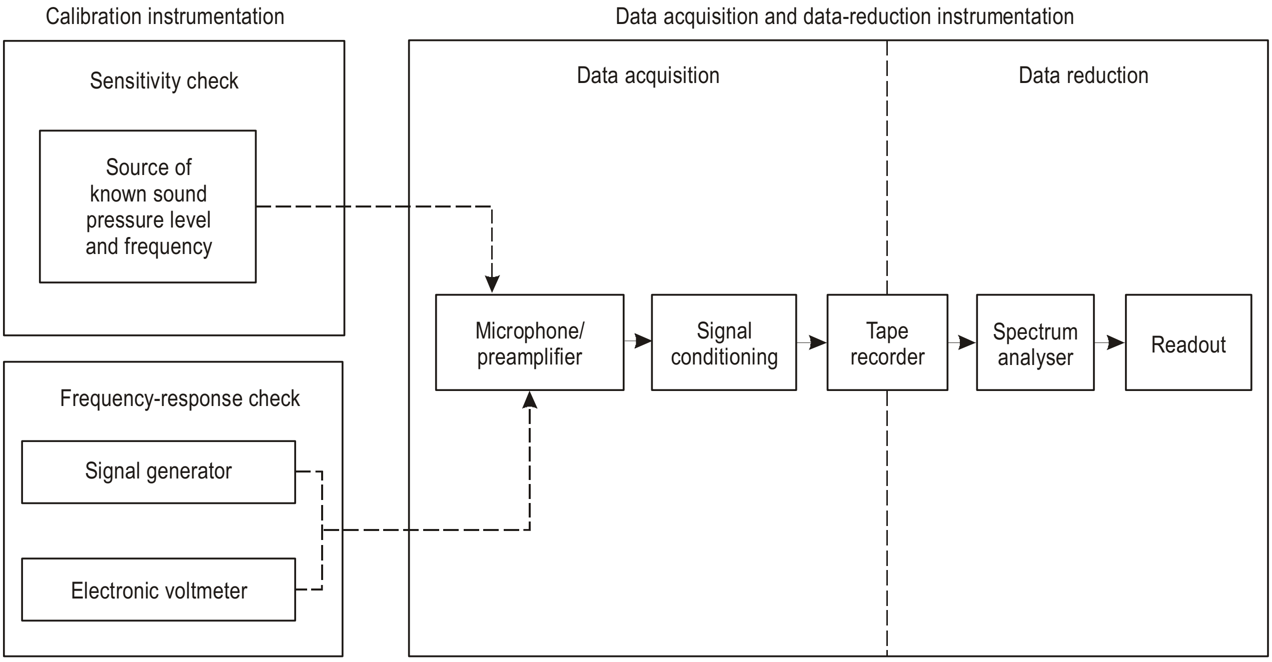


Figure C-1. Noise measurement systems

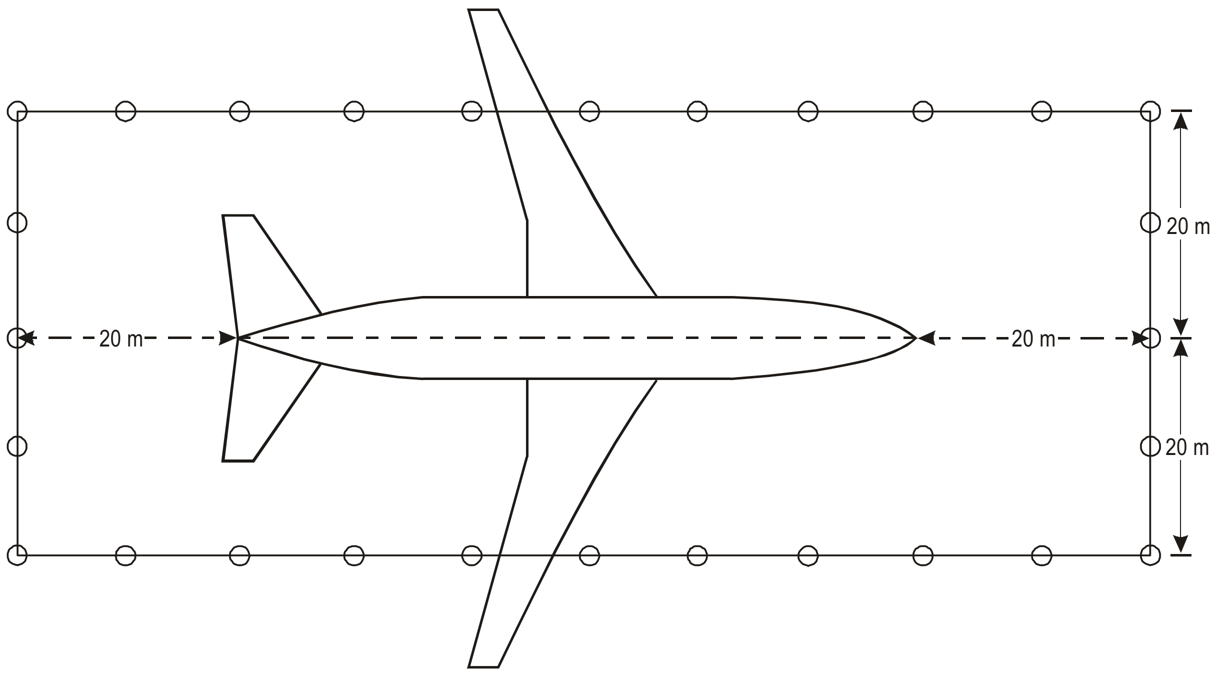


Figure C-2. Rectangle of noise survey measurement positions

b) This calibration signal, an insert voltage, should be applied to the input and should include all signal conditioning preamplifiers, networks and recorder electronics used to record acoustic data. In addition, a “shorted input” (i.e. microphone pressure sensitive element replaced with equivalent electrical impedance) recording of at least 20 s should be made as a check on system dynamic range and noise floor.

c) Sound pressure sensitivity calibrations with the arrangements shown in Figure C-1 should be made in the field for each microphone prior to beginning and after completion of measurements each day. These calibrations should be made using a calibrator producing a known and constant-amplitude sound pressure level at one or more one-third octave band centre frequencies, specified in reference 11 in the frequency range from 45 Hz to 11 200 Hz. A barometric correction should be applied as required. Calibrators employed should be precise at least to within ±0.5 dB and should have a calibration obtained according to references 6 to 9 (see 4.6).

d) Each reel of tape should have comparable response and background noise to the calibration tape. A constant amplitude sine wave should be recorded at the start of each reel of tape, for reel-to-reel sound pressure sensitivity comparisons. The frequency of this sine wave should be within the same frequency range as used for sound pressure sensitivity checks. A separate voltage insert device or an acoustic calibrator may be used for this purpose. If an acoustic calibrator is used, it should be carefully “seated” and corrections for ambient pressure should be made so that effects of pressure on calibrator and microphone response are eliminated.

e) Battery-driven tape recorders should be checked at frequent intervals during a test to ensure good battery condition. Tape recorders should not be moved while recording is in progress unless it has been established that such movements will not change tape recorder characteristics.

4.3.2.3.3 *Data reduction equipment*

Data reduction equipment should be calibrated with electrical signals of known amplitude either at a series of discrete frequencies or with broadband signals covering the frequency range of 45 Hz to 11 200 Hz.

4.3.2.4 *Data reduction*

4.3.2.4.1 The data reduction system of Figure C-1 should provide one-third or one octave band sound pressure levels. Analyser filters should comply with requirements of reference 12 (Class II for octave band filters and Class III for one-third octave band filters). Analyser amplitude resolution should be no worse than 0.5 dB; dynamic range should be a minimum of 50 dB between full scale and the root-mean-square (rms) value of the analyser noise floor in the octave band with the highest noise floor; and amplitude response over the upper 40 dB range should be linear to within ±0.5 dB.

4.3.2.4.2 Mean-square sound pressures should be time averaged by integration of the squared output of frequency band filters over an integration interval that should be no less than 8 s. All data should be processed within the frequency range from 45 Hz to 11 200 Hz. Data should be corrected for all known or predictable errors, such as deviations of system frequency response from a flat response.

4.3.2.5 *Total system*

4.3.2.5.1 In addition to specifications for component systems, frequency response of the combined data acquisition and reduction system should be flat within ±3 dB over the frequency range from 45 Hz to 11 200 Hz. Frequency response gradient anywhere within this range should not exceed 5 dB per octave.

4.3.2.5.2 Amplitude resolution should be at least 1.0 dB. Dynamic range should be a minimum of 45 dB between full scale and the rms value of the system noise floor in the frequency band with the highest noise floor. Amplitude response should be linear within ±0.5 dB over the upper 35 dB in each frequency band.

4.3.3 Meteorological

The wind speed should be measured with a device having a range of at least 0 to 28 km/h (0 to 15 kt) with an accuracy of at least ±2 km/h (±1 kt). Temperature measurements should be made with a device having a range of at least 0°C to 40°C with an accuracy of at least ±0.5°C. Relative humidity should be measured with a device having a range of 0 to 100 per cent with an accuracy of at least ±5 percentage points. Atmospheric pressure should be measured with a device having a range of at least 800 to 1 100 hPa with an accuracy of at least ±3 hPa.

4.4 Test procedure

4.4.1 Test conditions

4.4.1.1 Ambient noise measurements should be made in sufficient number to be representative for all acoustic measurement stations, providing correction data to apply to measured APU noise where necessary (see 4.4.4).

4.4.1.2 The installed APU should meet the noise levels specified in 3.1 at the points specified under typical loads, up to and including those imposed by the electric power generator and air-conditioning units and any other associated systems at their normal maximum continuous ground operation power requirements.

Note.— A measurement of noise from a particular model of auxiliary power unit installed in a specific aircraft type should not be deemed typical of the same equipment installed in other aircraft types nor of other models of APU installed in the same aircraft type.

4.4.2 Acoustical measurement locations

4.4.2.1 Except where specified otherwise, noise measurements should be made with microphones at 1.6 m ± 0.025 m (5.25 ft ± 1.0 in) above the ground or surface where passengers or servicing personnel may stand, with the microphone diaphragm parallel to the ground and facing upwards.

4.4.2.2 Locations for measuring noise should be as follows:

a) *cargo door locations:* measurements should be made at each cargo door location, with the door open, while the aircraft is in a typical ground handling configuration. These measurements should be taken at the centre of the opening, in the plane of the fuselage skin;

b) *passenger door locations:* measurements should be made at each passenger entry door, with the door open, on the vertical centre line of the opening, in the plane of the fuselage skin;

c) *servicing locations:* measurements should be made at all servicing positions where persons are normally working during aircraft ground handling operations, these positions to be determined by reference to the approved aircraft operating and service manuals;

d) *survey locations:* appropriate measurement positions should be chosen along the sides of a rectangle centred on the test aircraft as illustrated in Figure C-2. The distance between measurement positions should not be greater than 10 m for large aircraft. This distance may be reduced to accommodate small aeroplanes or to fulfil special requirements.

4.4.3 Meteorological measurement locations

Meteorological data should be measured at a location at the test site within the microphone array of Figure C-2, but upwind of the aircraft and at a height of 1.6 m (5.25 ft) above ground level.

4.4.4 Data presentation

4.4.4.1 A-weighted sound levels should be calculated by applying frequency weighting corrections derived from the standards for precision sound level meters (reference 10) to one-third or one octave band sound pressure levels. The one octave band sound pressure levels may be determined from a summation of mean-square sound pressures in appropriate one-third octave bands. Overall sound pressure levels should be determined from a summation of mean-square sound pressures in the 24 one-third octave, or 8 one octave, frequency bands included in the frequency range from 45 Hz to 11 200 Hz.

4.4.4.2 Overall sound pressure levels, A-weighted sound levels and one-third or one octave band data should be presented to the nearest decibel (dB) in tabular form, with supplementary graphical presentations as appropriate. Sound pressure levels should be corrected, if necessary, for the presence of high ambient noise. No corrections are needed if a sound pressure level is 10 dB or more above ambient noise. For sound pressure levels between 3 and 10 dB above ambient noise, measured values should be corrected for ambient noise by logarithmic subtraction of levels. If sound pressure levels do not exceed ambient noise by as much as 3 dB, the measured values may be adjusted by means of a method agreed to by the certificating authority.

4.4.4.3 Acoustical data need not be normalized for atmospheric absorption losses. Test results should be reported under the actual test-day meteorological conditions.

4.5 Data reporting

4.5.1 Identification information

a) Test location, date and time of test.

b) Manufacturer and model of the APU and pertinent associated equipment.

c) Aircraft type, manufacturer, model and air registry number.

d) Plan and elevation views, as appropriate, of the aircraft outline showing location of the APU (including inlet and exhaust ports), all associated equipment, and all acoustical measurement stations.

4.5.2 Test site description

a) Type and location of ground surfaces.

b) Location and extent of any above-ground-level reflective surfaces, such as buildings or other aircraft, that might have been present in spite of the precautions noted in 4.2.2.

4.5.3 Meteorological data *(for each test condition)*

a) Wind speed, km/h (kt) and direction, degrees, relative to aircraft centre line (forward 0°).

b) Ambient temperature °C.

c) Relative humidity, per cent.

d) Barometric pressure, hPa.

4.5.4 Operational data *(for each test condition)*

a) Number of air-conditioning packs operated and their locations.

b) APU shaft speed(s), rpm or percentage of normal rated.

c) APU normal rated shaft speed, rpm.

d) APU shaft load (kW), horsepower and/or electric power output, kVA.

e) Pneumatic load, kg/min delivered by APU to all pneumatically operated aircraft systems during the test (calculated as required).

f) Temperature of APU exhaust gas at location specified in aircraft's approved operations manual, °C.

g) Operating mode of environmental control system, cooling or heating.

h) Air conditioning distribution system supply duct temperature, °C.

i) Events occurring during the test which may have influenced the measurements.

4.5.5 Instrumentation

a) A brief description (including manufacturer and type or model numbers) of the acoustical and meteorological measuring instruments.

b) A brief description (including manufacturer and type or model numbers) of the data acquisition and data processing systems.

4.5.6 Acoustical data

a) Ambient noise.

b) Acoustical data specified in 4.4.4 with a description of corresponding microphone locations.

c) List of standards used and description and reason for any deviations.

4.6 References

Related standard for instruments and measurement procedures

1. *International Electrotechnical Vocabulary,* 2nd Edition, IEC-50(08) (1960).

2. *Acoustic Standard Tuning Frequency,* ISO-16.

3. *Expression of the Physical and Subjective Magnitudes of Sound or Noise,* ISO-131 (1959).

4. *Acoustics — Preferred Reference Quantities for Acoustic Levels,* ISO DIS 1638.2.

5. *Guide to the Measurement of Acoustical Noise and Evaluation of its Effects on Man,* ISO-2204 (1973).

6. *Precision Method for Pressure Calibration of One-inch Standard Condenser Microphone by the Reciprocity Technique,* IEC-327 (1971).

7. *Precision Method for Free Field Calibration of One-inch Standard Condenser Microphone by the Reciprocity Technique,* IEC-486 (1974).

8. *Values for the Difference between Free Field and Pressure Sensitivity Levels for One-inch Standard Condenser Microphone,* IEC-655 (1979).

9. *Simplified Method for Pressure Calibration of One-inch Standard Condenser Microphone by the Reciprocity Technique,* IEC-402 (1972).

10. *IEC Recommendations for Sound Level Meters,* International Electrotechnical Commission, IEC 651 (1979).

11. *ISO Recommendations for Preferred Frequencies for Acoustical Measurements,* International Organization for Standardization, ISO/R266-1962(E).

12. *IEC Recommendations for Octave, Half-Octave and Third-Octave Band Filters Intended for the Analysis of Sounds and Vibrations,* International Electrotechnical Commission, IEC 225 (1966).

Note.— The texts and specifications of these publications, as amended, are incorporated by reference into this attachment.

IEC publications may be obtained from:

Central Office of the International
Electrotechnical Commission
3 rue de Varembé
Geneva, Switzerland

ISO publications may be obtained from:

International Organization for Standardization
1 rue de Varembé
Geneva, Switzerland

or from State ISO member bodies.

ATTACHMENT D. GUIDELINES FOR EVALUATING AN ALTERNATIVE METHOD OF MEASURING HELICOPTER NOISE DURING APPROACH

Note.— The approach reference procedure of Part II, Chapter 8, 8.6.4 specifies a single approach path angle. This can coincide with the impulsive noise regime for some helicopters and not for others. In order that alternative methods of establishing compliance may be evaluated, States are encouraged to undertake additional measurements as described below.

1. INTRODUCTION

The following guidance material has been prepared for the use of States when obtaining additional information on which a future revision of the approach test procedures of Chapter 8 may be based.

2. APPROACH NOISE EVALUATION PROCEDURE

When conducting such tests the provisions of Chapter 8 shall be observed except as follows.

2.1 Approach reference noise measurement points

A flight path reference point located on the ground 120 m (394 ft) vertically below the flight paths defined in the approach reference procedure. On level ground this corresponds to the following positions:

a) 2 290 m from the intersection of the 3° approach path with the ground plane;

b) 1 140 m from the intersection of the 6° approach path with the ground plane;

c) 760 m from the intersection of the 9° approach path with the ground plane.

2.2 Maximum noise levels

At the approach flight path reference point: the noise level to be calculated by taking the arithmetical average of the corrected levels for 3°, 6° and 9° approaches.

2.3 Approach reference procedure

The approach reference procedure shall be established as follows:

a) the helicopter shall be stabilized and following approach paths of 3°, 6° and 9°;

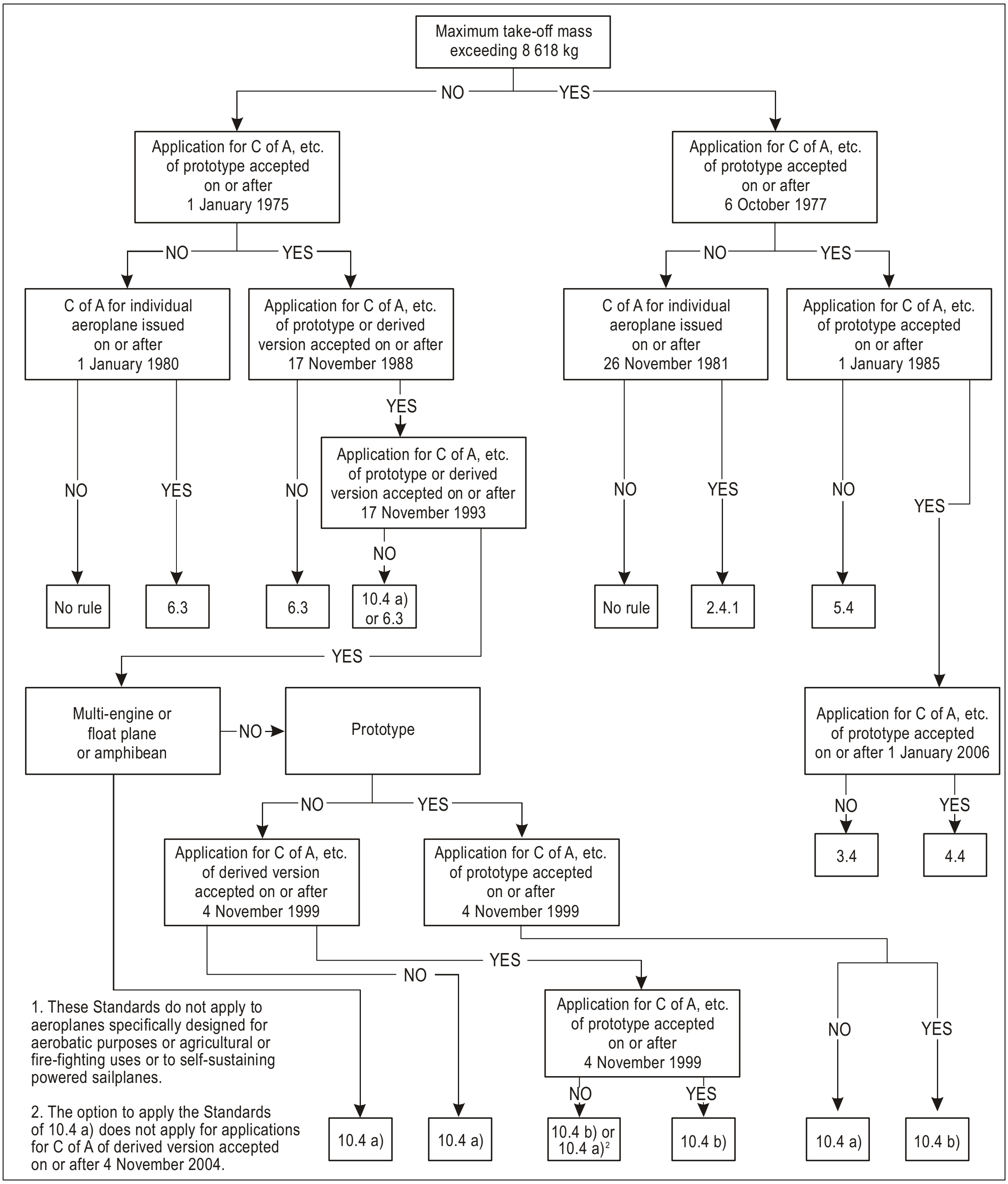
b) the approach shall be made at a stabilized airspeed equal to the best rate of climb speed, V_y, or the lowest approved speed for the approach, whichever is the greater, with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown;

c) the approach shall be made with the rotor speed stabilized at the maximum normal operating rpm certificated for approach;

d) the constant approach configuration used in airworthiness certification tests, with the landing gear extended, shall be maintained throughout the approach reference procedure; and

e) the mass of the helicopter at touchdown shall be the maximum landing mass at which noise certification is requested.

ATTACHMENT E. APPLICABILITY OF ANNEX 16 NOISE CERTIFICATION STANDARDS FOR PROPELLER-DRIVEN AEROPLANES[1]



1. These Standards do not apply to aeroplanes specifically designed for aerobatic purposes or agricultural or fire-fighting uses or to self-sustaining powered sailplanes.

2. The option to apply the Standards of 10.4 a) does not apply for applications for C of A of derived version accepted on or after 4 November 2004.

ATTACHMENT F. GUIDELINES FOR NOISE CERTIFICATION OF TILT-ROTOR AIRCRAFT

Note.— See Part II, Chapter 13.

Note 1.— These guidelines are applicable to heavier-than-air aircraft that can be supported in flight chiefly by the reactions of the air on two or more power-driven rotors on axes which can be changed from substantially vertical to horizontal.

Note 2.— These guidelines are not intended to be used for tilt-rotor aircraft that have one or more configurations that are certificated for airworthiness for STOL only. In such cases, different or additional guidelines would likely be needed.

1. APPLICABILITY

The following guidelines should be applied to all tilt-rotor aircraft, including their derived versions, for which a type certificate of airworthiness was issued on or after 13 May 1998.

Note.— Certification of tilt-rotor aircraft which are capable of carrying external loads or external equipment should be made without such loads or equipment fitted.

2. NOISE EVALUATION MEASURE

The noise evaluation measure should be the effective perceived noise level in EPNdB as described in Appendix 2 of this Annex.

Note.— Additional data in SEL and L_{Amax} *as defined in Appendix 4, and one-third octave SPLs as defined in Appendix 2 corresponding to* L_{Amax} *should be made available to the certificating authority for land-use planning purposes.*

3. NOISE MEASUREMENT REFERENCE POINTS

A tilt-rotor aircraft, when tested in accordance with the reference procedures of Section 6 and the test procedures of Section 7, should not exceed the noise levels specified in Section 4 at the following reference points:

a) *Take-off reference noise measurement points*:

1) a flight path reference point located on the ground vertically below the flight path defined in the take-off reference procedure (see 6.2) and 500 m horizontally in the direction of flight from the point at which transition to climbing flight is initiated in the reference procedure;

2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the take-off reference procedure and lying on a line through the flight path reference point.

b) *Overflight reference noise measurement points*:

1) a flight path reference point located on the ground 150 m (492 ft) vertically below the flight path defined in the overflight reference procedure (see 6.3);

2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the overflight reference procedure and lying on a line through the flight path reference point.

c) *Approach reference noise measurement points*:

1) a flight path reference point located on the ground 120 m (394 ft) vertically below the flight path defined in the approach reference procedure (see 6.4). On level ground, this corresponds to a position 1 140 m from the intersection of the 6.0 degree approach path with the ground plane;

2) two other points on the ground symmetrically disposed at 150 m on both sides of the flight path defined in the approach reference procedure and lying on a line through the flight path reference point.

4. MAXIMUM NOISE LEVELS

For tilt-rotor aircraft specified in Section 1, the maximum noise levels, when determined in accordance with the noise evaluation method of Appendix 2 for helicopters, should not exceed the following:

a) *At the take-off flight path reference point:* 109 EPNdB for tilt-rotor aircraft in VTOL/conversion mode with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor aircraft mass at a rate of 3 EPNdB per halving of mass down to 89 EPNdB after which the limit is constant.

b) *At the overflight path reference point:* 108 EPNdB for tilt-rotor aircraft in VTOL/conversion mode with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor aircraft mass at a rate of 3 EPNdB per halving of mass down to 88 EPNdB after which the limit is constant.

Note 1.— For the tilt-rotor aircraft in aeroplane mode, there is no maximum noise level.

Note 2.— VTOL/conversion mode is all approved configurations and flight modes where the design operating rotor speed is that used for hover operations.

c) *At the approach flight path reference point:* 110 EPNdB for tilt-rotor aircraft in VTOL/conversion mode with maximum certificated take-off mass, at which the noise certification is requested, of 80 000 kg and over and decreasing linearly with the logarithm of the tilt-rotor aircraft mass at a rate of 3 EPNdB per halving of mass down to 90 EPNdB after which the limit is constant.

Note.— The equations for the calculation of noise levels as a function of take-off mass presented in Section 8 of Attachment A, for Conditions Described in Chapter 8, are consistent with the maximum noise levels defined in these guidelines.

5. TRADE-OFFS

If the maximum noise levels are exceeded at one or two measurement points:

a) the sum of excesses should not be greater than 4 EPNdB;

b) any excess at any single point should not be greater than 3 EPNdB; and

c) any excess should be offset by corresponding reductions at the other point or points.

6. NOISE CERTIFICATION REFERENCE PROCEDURES

6.1 General conditions

6.1.1 The reference procedures should comply with the appropriate airworthiness requirements.

6.1.2 The reference procedures and flight paths should be approved by the certificating authority.

6.1.3 Except in conditions specified in 6.1.4, the take-off, overflight and approach reference procedures should be those defined in 6.2, 6.3 and 6.4, respectively.

6.1.4 When it is shown by the applicant that the design characteristics of the tilt-rotor aircraft would prevent a flight from being conducted in accordance with 6.2, 6.3 or 6.4, the reference procedures should:

a) depart from the reference procedures defined in 6.2, 6.3 or 6.4 only to the extent demanded by those design characteristics which make compliance with the reference procedures impossible; and

b) be approved by the certificating authority.

6.1.5 The reference procedures should be established for the following reference atmospheric conditions:

a) sea level atmospheric pressure of 1 013.25 hPa;

b) ambient air temperature of 25°C, i.e. ISA + 10°C;

c) relative humidity of 70 per cent; and

d) zero wind.

6.1.6 In 6.2 d), 6.3 d) and 6.4 c), the maximum normal operating rpm should be taken as the highest rotor speed for each reference procedure corresponding to the airworthiness limit imposed by the manufacturer and approved by the certificating authority. Where a tolerance on the highest rotor speed is specified, the maximum normal operating rotor speed should be taken as the highest rotor speed about which that tolerance is given. If the rotor speed is automatically linked with the flight condition, the maximum normal operating rotor speed corresponding with that flight condition should be used during the noise certification procedure. If the rotor speed can be changed by pilot action, the highest normal rotor speed specified in the flight manual limitation section for power-on conditions should be used during the noise certification procedure for the corresponding flight condition.

6.2 Take-off reference procedure

The take-off reference flight procedure should be established as follows:

a) a constant take-off configuration, including nacelle angle, selected by the applicant should be maintained throughout the take-off reference procedure;

b) the tilt-rotor aircraft should be stabilized at the maximum take-off power corresponding to minimum installed engine(s) specification power available for the reference ambient conditions or gearbox torque limit, whichever is lower, and along a path starting from a point located 500 m prior to the flight path reference point, at 20 m (65 ft) above the ground;

c) the nacelle angle and the corresponding best rate of climb speed, or the lowest approved speed for the climb after take-off, whichever is the greater, should be maintained throughout the take-off reference procedure;

d) the steady climb should be made with the rotor speed stabilized at the maximum normal operating rpm certificated for take-off;

e) the mass of the tilt-rotor aircraft should be the maximum take-off mass at which noise certification is requested; and

f) the reference take-off path is defined as a straight line segment inclined from the starting point (500 m prior to the centre noise measurement point and 20 m (65 ft) above ground level) at an angle defined by best rate of climb (BRC) and the best rate of climb speed corresponding to the selected nacelle angle and for minimum specification engine performance.

6.3 Overflight reference procedure

The overflight reference procedure should be established as follows:

a) the tilt-rotor aircraft should be stabilized in level flight overhead the flight path reference point at a height of 150 m (492 ft);

b) a constant configuration selected by the applicant should be maintained throughout the overflight reference procedures;

c) the mass of the tilt-rotor aircraft should be the maximum take-off mass at which noise certification is requested;

d) in the VTOL/conversion mode, the nacelle angle at the authorized fixed operation point that is closest to the lowest nacelle angle certificated for zero airspeed, a speed of $0.9V_{CON}$ and a rotor speed stabilized at the maximum normal operating rpm certificated for level flight should be maintained throughout the overflight reference procedure;

Note.— For noise certification purposes, V_{CON} is defined as the maximum authorized speed for VTOL/conversion mode at a specific nacelle angle.

e) in the aeroplane mode, the nacelles should be maintained on the down-stop throughout the overflight reference procedure, with:

1) rotor speed stabilized at the rpm associated with the VTOL/conversion mode and a speed of $0.9V_{CON}$; and

2) rotor speed stabilized at the normal cruise rpm associated with the aeroplane mode and at the corresponding $0.9V_{MCP}$ or $0.9V_{MO}$, whichever is lesser, certificated for level flight.

Note 1.— For noise certification purposes, V_{MCP} is defined as the maximum operating limit airspeed for aeroplane mode corresponding to minimum engine installed, maximum continuous power (MCP) available for sea level pressure (1 013.25 hPa), 25° C ambient conditions at the relevant maximum certificated mass; and V_{MO} is the maximum operating (MO) limit airspeed that may not be deliberately exceeded.

Note 2.— The values of V_{CON} and V_{MCP} or V_{MO} used for noise certification should be quoted in the approved flight manual.

6.4 Approach reference procedure

The approach reference procedure should be established as follows:

a) the tilt-rotor aircraft should be stabilized and follow a 6.0 degree approach path;

b) the approach should be in an airworthiness approved configuration in which maximum noise occurs, at a stabilized airspeed equal to the best rate of climb speed corresponding to the nacelle angle, or the lowest approved airspeed for the approach, whichever is the greater, and with power stabilized during the approach and over the flight path reference point, and continued to a normal touchdown;

c) the approach should be made with the rotor speed stabilized at the maximum normal operating rpm certificated for approach;

d) the constant approach configuration used in airworthiness certification tests, with the landing gear extended, should be maintained throughout the approach reference procedure; and

e) the mass of the tilt-rotor aircraft at touchdown should be the maximum landing mass at which noise certification is requested.

7. TEST PROCEDURES

7.1 The test procedures should be acceptable to the airworthiness and noise certificating authority of the State issuing the certificate.

7.2 The test procedures and noise measurements should be conducted and processed in an approved manner to yield the noise evaluation measure designated in Section 2.

7.3 Test conditions and procedures should be similar to reference conditions and procedures or the acoustic data should be adjusted, by the methods outlined in Appendix 2 for helicopters, to the reference conditions and procedures specified in this attachment.

7.4 Adjustments for differences between test and reference flight procedures should not exceed:

a) for take-off 4.0 EPNdB, of which the arithmetic sum of delta 1 and the term –7.5 log (QK/Q_rK_r) from delta 2 should not in total exceed 2.0 EPNdB; and

b) for overflight or approach 2.0 EPNdB.

7.5 During the test the average rotor rpm should not vary from the normal maximum operating rpm by more than ±1.0 per cent during the 10 dB-down time period.

7.6 The tilt-rotor aircraft airspeed should not vary from the reference airspeed appropriate to the flight demonstration by more than ±9 km/h (5 kt) throughout the 10 dB-down time period.

7.7 The number of level overflights made with a headwind component should be equal to the number of level overflights made with a tailwind component.

7.8 The tilt-rotor aircraft should fly within ±10 degrees or ±20 m, whichever is greater, from the vertical above the reference track throughout the 10 dB-down time period (see Figure 8-1 of Part II, Chapter 8).

7.9 The tilt-rotor aircraft height should not vary during overflight from the reference height at the overhead point by more than ±9 m (30 ft).

7.10 During the approach noise demonstration the tilt-rotor aircraft should be established on a stabilized constant speed approach within the airspace contained between approach angles of 5.5 degrees and 6.5 degrees.

7.11 Tests should be conducted at a tilt-rotor aircraft mass not less than 90 per cent of the relevant maximum certificated mass and may be conducted at a mass not exceeding 105 per cent of the relevant maximum certificated mass. For each of the flight conditions, at least one test must be completed at or above this maximum certificated mass.

ATTACHMENT G. GUIDELINES FOR THE ADMINISTRATION OF NOISE CERTIFICATION DOCUMENTATION

Note.— See Part II, Chapter 1.

1. INTRODUCTION

The following information is provided for the benefit of States that wish to have further guidance on the administration of noise certification documentation. These guidelines are not intended to be applied retroactively, but if States wish to apply the proposed formats retroactively they are free to do so.

2. NOISE CERTIFICATION DOCUMENTATION

2.1 Information to be provided

2.1.1 Chapter 1, 1.5, specifies which information shall, as a minimum, be included in the noise certification documentation. The following provides further guidance on these items. Note that all items must be numbered in accordance with 1.5 and 1.6 of Part II, Chapter 1, using Arabic numbers. This is to facilitate access to the information when the noise certification documentation is issued in a language foreign to the user of the information. Some items are relevant to certain chapters only. In these cases the relevant chapters are indicated in the item.

2.1.2 *Item 1. Name of State*

The name of the State issuing the noise certification documentation. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.3 *Item 2. Title of the noise document*

As explained in Section 2.3, several different kinds of documents can be issued depending on the administrative system for implementation of the noise certification documentation. The system chosen will determine the name of the document or documents, for instance “noise certificate”, “noise certification document” or any other title that the State of Registry uses in its administrative system.

2.1.4 *Item 3. Number of the document*

A unique number, issued by the State of Registry, that identifies this particular document in its administration. Such a number will facilitate any enquiries with respect to the document.

2.1.5 *Item 4. Nationality or common mark and registration marks*

The nationality or common mark and registration marks issued by the State of Registry in accordance with Annex 7. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.6 *Item 5. Manufacturer and manufacturer's designation of aircraft*

The type and model of the subject aircraft. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.7 *Item 6. Aircraft serial number*

The aircraft serial number as given by the manufacturer of the aircraft. This item should correspond with the information on the certificate of registration and the certificate of airworthiness.

2.1.8 *Item 7. Engine manufacturer, type and model*

The designation of the installed engine(s) for identification and verification of the aircraft configuration. It should contain the type and model of the subject engine(s). The designation should be in accordance with the type certificate or supplemental type certificate for the subject engine(s).

2.1.9 *Item 8. Propeller type and model for propeller-driven aeroplanes*

The designation of the installed propeller(s) for identification and verification of the aircraft configuration. It should contain the type and model of the subject propeller(s). The designation should be in accordance with the type certificate or supplemental type certificate for the subject propeller(s). This item is included only in the noise certification documentation for propeller-driven aeroplanes.

2.1.10 *Item 9. Maximum take-off mass and unit*

The maximum take-off mass, in kilograms, associated with the certificated noise levels of the aircraft. The unit (kg) should be specified explicitly in order to avoid misunderstanding. If the primary unit of mass of the State of Design of the aircraft is different from kilograms, the conversion factor used should be in accordance with Annex 5.

2.1.11 *Item 10. Maximum landing mass and unit for certificates issued under Chapters 2, 3, 4, 5 and 12*

The maximum landing mass, in kilograms, associated with the certificated noise levels of the aircraft. The unit (kg) should be specified explicitly in order to avoid misunderstanding. If the primary unit of mass of the State of Design of the aircraft is different from kilograms, the conversion factor used should be in accordance with Annex 5. This item is included only in the noise certification documentation for documents issued under Chapters 2, 3, 4, 5 and 12.

2.1.12 *Item 11. The chapter and section of Annex 16, Volume I, according to which the aircraft is certificated*

The chapter of Annex 16, Volume I, to which the subject aircraft is noise certificated. For Chapters 2, 8, 10 and 11, the section specifying the noise limits should also be included.

2.1.13 *Item 12. Additional modifications incorporated for the purpose of compliance with the applicable noise certification Standards*

This item should contain, as a minimum, all additional modifications to the basic aircraft as defined by Items 5, 7 and 8 that are essential in order to meet the requirements of the chapter of Annex 16, Volume I, to which the aircraft is noise certificated as given under Item 11. Other modifications that are not essential to meet the stated chapter but are needed to attain the certificated noise levels as given may also be included at the discretion of the certificating authority. The additional modifications should be given using unambiguous references, such as supplemental type certificate (STC) numbers, unique part numbers or type/model designators given by the manufacturer of the modification.

2.1.14 *Item 13. The lateral/full-power noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5 and 12*

The lateral/full-power noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Chapters 2, 3, 4, 5 and 12.

2.1.15 *Item 14. The approach noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5, 8 and 12*

The approach noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Chapters 2, 3, 4, 5, 8 and 12.

2.1.16 *Item 15. The flyover noise level in the corresponding unit for documents issued under Chapters 2, 3, 4, 5 and 12*

The flyover noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Chapters 2, 3, 4, 5 and 12.

2.1.17 *Item 16. The overflight noise level in the corresponding unit for documents issued under Chapters 6, 8 and 11*

The overflight noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB or dB(A)) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Chapters 6, 8 and 11.

2.1.18 *Item 17. The take-off noise level in the corresponding unit for documents issued under Chapters 8 and 10*

The take-off noise level as defined in the relevant chapter. It should specify the unit (e.g. EPNdB or dB(A)) of the noise level, and the noise level should be stated to the nearest tenth of a dB. This item is included only in the noise certification documentation for aircraft certificated to Chapters 8 and 10.

2.1.19 *Item 18. Statement of compliance, including reference to Annex 16, Volume I*

A statement that the subject aircraft complies with the applicable noise requirements. Reference should be made to Annex 16, Volume I. In addition to this, reference may be made to national noise requirements.

2.1.20 *Item 19. Date of issuance of the noise certification document*

The date on which the noise certification document was issued.

2.1.21 *Item 20. Signature of the officer issuing it*

The signature of the officer issuing the noise certification document. Other items may be added such as a seal or a stamp.

2.2 Additional information

2.2.1 States may decide to add additional information to the noise certification documentation at their own discretion. Caution should be exercised to ensure that the information provided will not be confused with the official noise certification levels. In particular, noise levels taken under conditions other than the noise certification conditions should be clearly marked as supplementary information. The additional information should be placed in a "remarks" box or in separate boxes. These boxes should *not* be numbered in order to avoid non-standardized numbering and to allow for future modifications to the numbering system. The box or boxes should contain an adequate description of what additional information is provided. Examples of possible additional information are provided in 2.2.2 through 2.2.7.

2.2.2 *Logo and name of the issuing authority*

In order to facilitate recognition, the logo or symbol and the name of the issuing authority may be added.

2.2.3 *Noise limits*

If added, noise limits should be given according to the subject noise requirements and should be quoted, to the nearest tenth of a decibel, in the appropriate unit. If national noise requirements use different limits (more or less stringent), this should be clearly marked, and in order to avoid confusion the ICAO limits should also be quoted.

2.2.4 *Language*

States issuing their noise certification documentation in a language other than English should provide an English translation in accordance with Annex 6.

2.2.5 *References to national requirements*

Reference to national requirements can be combined with Item 18 or can be added as a separate item.

2.2.6 *Other aircraft modifications*

Other modifications from the basic aircraft model as specified under Item 5 and and Items 7 through 10 to aid further identification of the noise configuration can be provided at the discretion of the State of Registry. Note that any modifications required to meet the Standards to which any document is issued should be reported under Item 12.

2.2.7 *Date of expiry*

If the State of Registry limits the validity of the noise certification documentation, it should include the date of expiry.

2.3 Formats for noise certification documentation

2.3.1 In view of the wide variety of administrative needs for systems for noise certification documentation, three alternative standardized options are provided:

1) A stand-alone noise certificate in which the mandatory information requirements of Annex 16, Volume I, are contained in a single document.

2) Two complementary documents of which one may be the aeroplane flight manual (AFM) or the aircraft operating manual (AOM).

3) Three complementary documents.

2.3.2 *Option 1. One document*

The first option is an administrative system in which the document attesting noise certification takes the form of a separate noise certificate that contains all the items identified in Part II, Chapter 1, 1.5. A standard format is provided in Figure G-1. States using this format may deviate from this where needed to meet their national requirements and/or to include any additional items. It should however be generally similar to Figure G-1. Note that not all items will be mentioned on every noise certificate. For instance, not all Items 13 through 17 will be mentioned on one noise certificate since they are not all applicable to every chapter. Normally, only one certificate per aircraft serial number should be issued and be valid at the same time. If a noise certificate has lost its validity, it should be suspended or revoked to avoid the situation that more than one noise certificate is current for an aircraft. If multiple documents for this option have been issued, it should be easy to determine which document is applicable at any given time.

2.3.3 *Option 2. Two complementary documents*

2.3.3.1 The second option is an administrative system consisting of two documents in which the first official document attests noise certification but is limited to identification of the aircraft and the statement of compliance, containing only Items 1 through 6 and Items 18 through 20 of 2.1. This can be either in the form of a (limited) noise certificate or in the form of a certificate of airworthiness for those States that include noise requirements in their airworthiness requirements. In the latter case, there is no need for Item 18 (statement of compliance with reference to Annex 16) since compliance is implicit. The numbering of the items in the certificate of airworthiness will be according to the convention in Annex 8. In these cases the remaining items of 2.1 should be transferred to a complementary standardized noise certification document, normally as a page of the AFM or AOM certified by the State of Registry, the format of which can be very similar to that of the noise certificate described under 2.3.2. Therefore the format given in Figure G-1 can equally serve as a standard format for the complementary document, although some items may not be needed.

2.3.3.2 Normally only one set of the two documents should be issued for each aircraft. If a noise certification document has lost its validity, it should be suspended or revoked. If multiple documents have been issued under this option, it should be obvious from the documentation which document is applicable at any given time.

2.3.4 *Option 3. Three complementary documents*

2.3.4.1 The third option is an administrative system consisting of three documents in which the first official document is identical to the first document of Option 2, 2.3.3.1. It attests noise certification and is therefore also limited to identification of the aircraft and the statement of compliance, containing only Items 1 through 6 and Items 18 through 20 of 2.1. This can be either in the form of a noise certificate or in the form of a certificate of airworthiness for those States that include noise requirements in their airworthiness requirements (with the same observation as in the second option). The remaining items of 2.1 should be transferred to the second and third complementary noise certification documents.

2.3.4.2 The second document, normally presented as a page (or set of following pages) in the AFM or AOM, certified by the State of Registry, list(s) all the configurations operated or forecast to be operated by the aircraft fleet from the date of issuance of the page(s). The fleet is composed of all aircraft that are operated with the same flight manual. The format of the information can be very similar to that of the noise certificate described under 2.3.2, all information corresponding to a given configuration comprising Item 5 and Items 7 through 17. Each list of parameters corresponding to a given configuration is identified by a “configuration number”, for example “x”. Therefore the format given in Figure G-1 can equally serve for the items concerned, with the addition of the configuration number.

2.3.4.3 The third document under this option is issued according to a national regulatory process. It states that an aircraft with a given serial number has operated in the configuration number “x” since the date of issuance of this third document. If multiple documents for this option have been issued, it should be obvious from the documentation which document is applicable at any given time.

For use by State of Registry	1. **<State of Registry>**	3. Document number:
2. **NOISE CERTIFICATE**		
4. Nationality and registration marks:	5. Manufacturer and manufacturer's designation of aircraft:	6. Aircraft serial number:

7. Engine:	8. Propeller:*

9. Maximum take-off mass: kg	10. Maximum landing mass:* kg	11. Noise certification Standard:

12. Additional modifications incorporated for the purpose of compliance with the applicable noise certification Standards:

13. Lateral/full-power noise level:*	14. Approach noise level:*	15. Flyover noise level:*	16. Overflight noise level:*	17. Take-off noise level:*

Remarks:

18. This noise certificate is issued pursuant to Volume I of Annex 16 to the Convention on International Civil Aviation, in respect of the above-mentioned aircraft, which is considered to comply with the indicated noise Standard when maintained and operated in accordance with the relevant requirements and operating limitations.

19. Date of issue . . . . 20. Signature . . . .

* These boxes may be omitted depending on the noise certification Standard.

Figure G-1. Noise certificate

ATTACHMENT H. GUIDELINES FOR OBTAINING HELICOPTER NOISE DATA FOR LAND-USE PLANNING PURPOSES

1. INTRODUCTION

The following guidance material has been prepared for the use of States wishing to utilize noise certification data, or optional supplementary test data, for land-use planning purposes. The purpose of this guidance material is to assist in the provision of data suitable for the prediction of helicopter noise exposure contours and to support the development of heliport noise abatement operational procedures.

2. DATA COLLECTION PROCEDURES

2.1 Data suitable for land-use planning purposes may be derived directly from Chapter 8 noise certification data. Chapter 8 applicants may optionally elect to acquire data suitable for land-use planning purposes via alternative take-off, approach and/or flyover procedures defined by the applicant and approved by the certificating authority. Alternative flyover procedures should be performed overhead the flight path reference point at a height of 150 m.

2.2 Chapter 11 noise certification data may be provided for land-use planning purposes. Chapter 11 applicants may optionally elect to provide data acquired via alternative flyover procedures at 150 m above ground level. In acquiring data for land-use planning purposes, Chapter 11 applicants should give consideration to acquiring data from two additional microphones symmetrically disposed at 150 m on each side of the flight path and/or additional take-off and approach procedures defined by the applicant and approved by the certificating authority.

2.3 All data provided for land-use planning purposes should be corrected to the appropriate reference conditions via the approved procedures of Chapter 8 and Chapter 11 or, for alternative flight procedures, by appropriate correction procedures approved by the certificating authority.

3. REPORTING OF DATA

3.1 All data provided for land-use planning purposes should be submitted to the certification authority for approval. The approved data and the corresponding flight procedures should be presented as supplementary information in the helicopter flight manual.

3.2 It is recommended that all data provided for land-use planning purposes be presented in terms of average sound exposure level (L_{AE}), as defined in Appendix 4 of this volume, for left sideline, centre line and right sideline measurement points defined relative to the direction of flight for each test pass. Additional data in other noise metrics may also be provided and should be derived in a manner that is consistent with the prescribed noise certification analysis procedure.

— END —

ICAO TECHNICAL PUBLICATIONS

The following summary gives the status, and also describes in general terms the contents of the various series of technical publications issued by the International Civil Aviation Organization. It does not include specialized publications that do not fall specifically within one of the series, such as the Aeronautical Chart Catalogue *or the* Meteorological Tables for International Air Navigation.

International Standards and Recommended Practices are adopted by the Council in accordance with Articles 54, 37 and 90 of the Convention on International Civil Aviation and are designated, for convenience, as Annexes to the Convention. The uniform application by Contracting States of the specifications contained in the International Standards is recognized as necessary for the safety or regularity of international air navigation while the uniform application of the specifications in the Recommended Practices is regarded as desirable in the interest of safety, regularity or efficiency of international air navigation. Knowledge of any differences between the national regulations or practices of a State and those established by an International Standard is essential to the safety or regularity of international air navigation. In the event of non-compliance with an International Standard, a State has, in fact, an obligation, under Article 38 of the Convention, to notify the Council of any differences. Knowledge of differences from Recommended Practices may also be important for the safety of air navigation and, although the Convention does not impose any obligation with regard thereto, the Council has invited Contracting States to notify such differences in addition to those relating to International Standards.

Procedures for Air Navigation Services (PANS) are approved by the Council for worldwide application. They contain, for the most part, operating procedures regarded as not yet having attained a sufficient degree of maturity for adoption as International Standards and Recommended Practices, as well as material of a more permanent character which is considered too detailed for incorporation in an Annex, or is susceptible to frequent amendment, for which the processes of the Convention would be too cumbersome.

Regional Supplementary Procedures (SUPPS) have a status similar to that of PANS in that they are approved by the Council, but only for application in the respective regions. They are prepared in consolidated form, since certain of the procedures apply to overlapping regions or are common to two or more regions.

The following publications are prepared by authority of the Secretary General in accordance with the principles and policies approved by the Council.

Technical Manuals provide guidance and information in amplification of the International Standards, Recommended Practices and PANS, the implementation of which they are designed to facilitate.

Air Navigation Plans detail requirements for facilities and services for international air navigation in the respective ICAO Air Navigation Regions. They are prepared on the authority of the Secretary General on the basis of recommendations of regional air navigation meetings and of the Council action thereon. The plans are amended periodically to reflect changes in requirements and in the status of implementation of the recommended facilities and services.

ICAO Circulars make available specialized information of interest to Contracting States. This includes studies on technical subjects.

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**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

ENVIRONMENTAL PROTECTION

ANNEX 16

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME II

AIRCRAFT ENGINE EMISSIONS

SECOND EDITION — JULY 1993

This edition incorporates all amendments to Annex 16, adopted by the Council prior to 25 March 1993 and supersedes on 11 November 1993 all previous editions of the Annex.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword and the relevant clauses in each Chapter.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-2	Incorporated in this edition		
3	—	—	ICAO
4	4/11/99	—	ICAO
5	24/11/05	—	ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

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FOREWORD

Historical background

In 1972 the United Nations Conference on the Human Environment was held in Stockholm. The position of ICAO at this Conference was developed in Assembly Resolution A18-11 which contained the following clause among others:

> "2. in fulfilling this role ICAO is conscious of the adverse environmental impact that may be related to aircraft activity and its responsibility and that of its member States to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the human environment;"

The 18th Assembly also adopted Resolution A18-12 relating to the environment which states:

> "THE ASSEMBLY:
>
> 1. REQUESTS the Council, with the assistance and co-operation of other bodies of the Organization and other international organizations to continue with vigour the work related to the development of Standards, Recommended Practices and Procedures and/or guidance material dealing with the quality of the human environment;"

This resolution was followed up by the establishment of an ICAO Action Programme Regarding the Environment. As part of this Action Programme a Study Group was established to assist the Secretariat in certain tasks related to aircraft engine emissions. As a result of the work of this Study Group, an ICAO Circular entitled *Control of Aircraft Engine Emissions* (Circular 134) was published in 1977. This Circular contained guidance material in the form of a certification procedure for the control of vented fuel, smoke and certain gaseous emissions for new turbo-jet and turbofan engines intended for propulsion at subsonic speeds.

It was agreed by the Council that the subject of aircraft engine emissions was not one that was solely confined to objective technical issues but was one that needed consideration by experts in many fields and included the direct views of Member States. A Council committee, known as the Committee on Aircraft Engine Emissions (CAEE) was therefore established in 1977 to pursue a number of aspects of the subject.

At the second meeting of the Committee on Aircraft Engine Emissions, held in May 1980, proposals were made for material to be included in an ICAO Annex. After amendment following the usual consultation with Member States of the Organization, the proposed material was adopted by the Council to form the text of this document. The Council agreed that it was desirable to include all provisions relating to environmental aspects of aviation in one Annex. It therefore renamed Annex 16 as "Environmental Protection", making the existing text of the Annex into "Volume I — Aircraft Noise", the material contained in this document becoming "Volume II — Aircraft Engine Emissions".

Applicability

Part I of Volume II of Annex 16 contains definitions and symbols and Part II contains Standards relating to vented fuel. Part III contains Standards relating to emissions certification applicable to the classes of aircraft engines specified in the individual chapters of the Part, where such engines are fitted to aircraft engaged in international civil aviation.

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Use of the Annex text in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as is practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of international air navigation. Wherever possible, the provisions of this Annex have been written in such a way as to facilitate incorporation, without major textual changes, into national legislation.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated.

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Provisions* governing the applicability of the Standards and Recommended Practices.

d) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in four languages — English, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

It is to be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb “shall” while Recommended Practices employ the operative verb “should”.

In accordance with Annex 5, the International System of Units (SI) is used throughout this document.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Table A. Amendments to Annex 16

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	Special Meeting on Aircraft Noise in the Vicinity of Aerodromes (1969)		2 April 1971 2 August 1971 6 January 1972
1	First Meeting of the Committee on Aircraft Noise	Noise certification of future production and derived versions of subsonic jet aeroplanes and updating of terminology used to describe aircraft weight.	6 December 1972 6 April 1973 16 August 1973
2	Third Meeting of the Committee on Aircraft Noise	Noise certification of light propeller-driven aeroplanes and subsonic jet aeroplanes of 5 700 kg and less maximum certificated take-off weight and guidance on discharge of functions by States in the cases of lease, charter and interchange of aircraft.	3 April 1974 3 August 1974 27 February 1975
3 (2nd Edition)	Fourth Meeting of the Committee on Aircraft Noise	Noise certification standards for future subsonic jet aeroplanes and propeller-driven aeroplanes, other than STOL aeroplanes, and guidelines for noise certification of future supersonic aeroplanes, propeller-driven STOL aeroplanes and installed APU and associated aircraft systems when operating on the ground.	21 June 1976 21 October 1976 6 October 1977
4 (3rd Edition)	Fifth Meeting of the Committee on Aircraft Noise	Introduction of a new parameter, viz. number of engines in the noise certification standards for subsonic jet aeroplanes, improvements in detailed test procedures to ensure that the same level of technology is applied to all types of aircraft, and editorial changes to simplify the language and eliminate inconsistencies.	6 March 1978 6 July 1978 10 August 1978
5 (Annex 16, Volume I — 1st Edition)	Sixth Meeting of the Committee on Aircraft Noise	1. Annex retitled *Environmental Protection* and to be issued in two volumes as follows: Volume I — *Aircraft Noise* (incorporating provisions in the third edition of Annex 16 as amended by Amendment 5) and Volume II — *Aircraft Engine Emissions.* 2. Introduction in Volume I of noise certification Standards for helicopters and for future production of existing SST aeroplanes, updating of guidelines for noise certification of installed APU and associated aircraft systems and editorial amendments including changes to units of measurement to bring the Annex in line with Annex 5 provisions.	11 May 1981 11 September 1981 26 November 1981
6 (Annex 16, Volume II — 1st Edition	Second Meeting of the Committee on Aircraft Engine Emissions	Introduction of Volume II containing Standards relating to the control of fuel venting, smoke and gaseous emissions from newly manufactured turbo-jet and turbofan engines intended for subsonic and supersonic propulsion.	30 June 1981 30 October 1981 18 February 1982
1	First Meeting of the Committee on Aviation Environmental Protection	Changes in test fuel specifications, Appendix 4.	4 March 1988 31 July 1988 17 November 1988
2 (2nd Edition)	Second Meeting of the Committee on Aviation Environmental Protection	a) increased stringency of NO_x emissions limits; b) improvements in the smoke and gaseous emissions certification procedure.	24 March 1993 26 July 1993 11 November 1993
3	Third Meeting of the Committee on Aviation Environmental Protection	Amendment of the criteria on calibration and test gases in Appendices 3 and 5.	20 March 1997 20 March 1997 —

Amendment	*Source(s)*	*Subject(s)*	*Adopted* *Effective* *Applicable*
4	Fourth Meeting of the Committee on Aviation Environmental Protection	Increased stringency of NO_x emissions limits.	26 February 1999 19 July 1999 4 November 1999
5	Sixth Meeting of the Committee on Aviation Environmental Protection	Increase in stringency of the NO_x emissions Standards.	23 February 2005 11 July 2005 24 November 2005

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

PART I. DEFINITIONS AND SYMBOLS

CHAPTER 1. DEFINITIONS

Where the following expressions are used in Volume II of this Annex, they have the meanings ascribed to them below:

Afterburning. A mode of engine operation wherein a combustion system fed (in whole or part) by vitiated air is used.

Approach phase. The operating phase defined by the time during which the engine is operated in the approach operating mode.

Climb phase. The operating phase defined by the time during which the engine is operated in the climb operating mode.

Date of manufacture. The date of issue of the document attesting that the individual aircraft or engine as appropriate conforms to the requirements of the type or the date of an analogous document.

Derivative version. An aircraft gas turbine engine of the same generic family as an originally type-certificated engine and having features which retain the basic core engine and combustor design of the original model and for which other factors, as judged by the certificating authority, have not changed.

Note.— Attention is drawn to the difference between the definition of "derived version of aircraft" in Volume I of Annex 16 and the definition of "derivative version" in this Volume.

Oxides of nitrogen. The sum of the amounts of the nitric oxide and nitrogen dioxide contained in a gas sample calculated as if the nitric oxide were in the form of nitrogen dioxide.

Rated output. For engine emissions purposes, the maximum power/thrust available for take-off under normal operating conditions at ISA sea level static conditions without the use of water injection as approved by the certificating authority. Thrust is expressed in kilonewtons.

Reference pressure ratio. The ratio of the mean total pressure at the last compressor discharge plane of the compressor to the mean total pressure at the compressor entry plane when the engine is developing take-off thrust rating in ISA sea level static conditions.

Note.— Methods of measuring reference pressure ratio are given in Appendix 1.

Smoke. The carbonaceous materials in exhaust emissions which obscure the transmission of light.

Smoke Number. The dimensionless term quantifying smoke emissions (*see* 3 of Appendix 2).

Take-off phase. The operating phase defined by the time during which the engine is operated at the rated output.

Taxi/ground idle. The operating phases involving taxi and idle between the initial starting of the propulsion engine(s) and the initiation of the take-off roll and between the time of runway turn-off and final shutdown of all propulsion engine(s).

Unburned hydrocarbons. The total of hydrocarbon compounds of all classes and molecular weights contained in a gas sample, calculated as if they were in the form of methane.

CHAPTER 2. SYMBOLS

Where the following symbols are used in Volume II of this Annex, they have the meanings ascribed to them below:

CO	Carbon monoxide
D_p	The mass of any gaseous pollutant emitted during the reference emissions landing and take-off cycle
F_n	Thrust in International Standard Atmosphere (ISA), sea level conditions, for the given operating mode
F_{oo}	Rated output (*see* definition)
F^*_{oo}	Rated output with afterburning applied
HC	Unburned hydrocarbons (*see* definition)
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen (*see* definition)
SN	Smoke Number (*see* definition)
π_{oo}	Reference pressure ratio (*see* definition)

PART II. VENTED FUEL

CHAPTER 1. ADMINISTRATION

1.1 The provision of this Part shall apply to all turbine engine powered aircraft intended for operation in international air navigation manufactured after 18 February 1982.

1.2 Certification related to the prevention of intentional fuel venting shall be granted by the certificating authority on the basis of satisfactory evidence that either the aircraft or the aircraft engines comply with requirements of Chapter 2.

Note.— The document attesting certification relating to fuel venting may take the form of a separate fuel venting certificate or a suitable statement contained in another document approved by the certificating authority.

1.3 Contracting States shall recognize as valid a certification relating to fuel venting granted by the certificating authority of another Contracting State provided the requirements under which such certification was granted are not less stringent than the provision of Volume II of this Annex.

CHAPTER 2. PREVENTION OF INTENTIONAL FUEL VENTING

Aircraft shall be so designed and constructed as to prevent the intentional discharge into the atmosphere of liquid fuel from the fuel nozzle manifolds resulting from the process of engine shutdown following normal flight or ground operations.

PART III. EMISSIONS CERTIFICATION

CHAPTER 1. ADMINISTRATION

1.1 The provision of 1.2 to 1.4 shall apply to all engines included in the classifications defined for emission certification purposes in Chapters 2 and 3 where such engines are fitted to aircraft engaged in international air navigation.

1.2 Emissions certification shall be granted by the certificating authority on the basis of satisfactory evidence that the engine complies with requirements which are at least equal to the stringency of the provisions of Volume II of this Annex. Compliance with the emissions levels of Chapters 2 and 3 shall be demonstrated using the procedure described in Appendix 6.

Note.— The document attesting emissions certification may take the form of a separate emissions certificate or a suitable statement contained in another document approved by the certificating authority.

1.3 The document attesting emissions certification for each individual engine shall include at least the following information which is applicable to the engine type:

a) name of certificating authority;

b) manufacturer's type and model designation;

c) statement of any additional modifications incorporated for the purpose of compliance with the applicable emissions certification requirements;

d) rated output;

e) reference pressure ratio;

f) a statement indicating compliance with Smoke Number requirements;

g) a statement indicating compliance with gaseous pollutant requirements.

1.4 Contracting States shall recognize as valid emissions certification granted by the certificating authority of another Contracting State provided that the requirements under which such certification was granted are not less stringent than the provisions of Volume II of this Annex.

CHAPTER 2. TURBO-JET AND TURBOFAN ENGINES INTENDED FOR PROPULSION ONLY AT SUBSONIC SPEEDS

2.1 General

2.1.1 Applicability

2.1.1.1 The provisions of this chapter shall apply to all turbo-jet and turbofan engines, as further specified in 2.2 and 2.3, intended for propulsion only at subsonic speeds, except when certificating authorities make exemptions for:

a) specific engine types and derivative versions of such engines for which the type certificate of the first basic type was issued or other equivalent prescribed procedure was carried out before 1 January 1965; and

b) a limited number of engines beyond the dates of applicability specified in 2.2 and 2.3 for the manufacture of the individual engine.

2.1.1.2 In such cases, an exemption document shall be issued by the certificating authority, the identification plates on the engines shall be marked "EXEMPT," and the grant of exemption shall be noted in the permanent engine record.

2.1.1.3 The provisions of this chapter shall also apply to engines designed for applications that otherwise would have been fulfilled by turbo-jet and turbofan engines.

Note.— In considering exemptions, certificating authorities should take into account the probable numbers of such engines that will be produced and their impact on the environment. When such an exemption is granted, the certificating authority should consider imposing a time limit on the production of such engines for installation on new aircraft or on existing aircraft as spares.

2.1.2 Emissions involved

The following emissions shall be controlled for certification of aircraft engines:

Smoke
Gaseous emissions
 Unburned hydrocarbons (HC);
 Carbon monoxide (CO); and
 Oxides of nitrogen (NO_x).

2.1.3 Units of measurement

2.1.3.1 The smoke emission shall be measured and reported in terms of Smoke Number (SN).

2.1.3.2 The mass (D_p) of the gaseous pollutant HC, CO, or NO_x emitted during the reference emissions landing and take-off (LTO) cycle, defined in 2.1.4.2 and 2.1.4.3, shall be measured and reported in grams.

2.1.4 Reference conditions

2.1.4.1 *Atmospheric conditions*

The reference atmospheric conditions shall be ISA at sea level except that the reference absolute humidity shall be 0.00634 kg water/kg dry air.

2.1.4.2 *Thrust settings*

The engine shall be tested at sufficient power settings to define the gaseous and smoke emissions of the engine so that mass emission rates and Smoke Numbers corrected to the reference ambient conditions can be determined at the following specific percentages of rated output as agreed by the certificating authority:

Operating mode	*Thrust setting*
Take-off	100 per cent F_{oo}
Climb	85 per cent F_{oo}
Approach	30 per cent F_{oo}
Taxi/ground idle	7 per cent F_{oo}

2.1.4.3 *Reference emissions landing and take-off (LTO) cycle*

The reference emissions LTO cycle for the calculation and reporting of gaseous emissions shall be represented by the following time in each operating mode.

Phase	*Time in operating mode, minutes*
Take-off	0.7
Climb	2.2
Approach	4.0
Taxi/ground idle	26.0

2.1.4.4 *Fuel specifications*

The fuel used during tests shall meet the specifications of Appendix 4. Additives used for the purpose of smoke suppression (such as organo-metallic compounds) shall not be present.

2.1.5 Test conditions

2.1.5.1 The tests shall be made with the engine on its test bed.

2.1.5.2 The engine shall be representative of the certificated configuration (*see* Appendix 6); off-take bleeds and accessory loads other than those necessary for the engine's basic operation shall not be simulated.

2.1.6 When test conditions differ from the reference conditions in 2.1.4 the test results shall be corrected to the reference conditions by the methods given in Appendix 3.

2.2 Smoke

2.2.1 Applicability

The provisions of 2.2.2 shall apply to engines whose date of manufacture is on or after 1 January 1983.

2.2.2 Regulatory Smoke Number

The Smoke Number at any thrust setting when measured and computed in accordance with the procedures of Appendix 2 and converted to a characteristic level by the procedures of Appendix 6 shall not exceed the level determined from the following formula:

Regulatory Smoke Number = $83.6\,(F_{oo})^{-0.274}$ or a value of 50, whichever is lower

2.3 Gaseous emissions

2.3.1 Applicability

The provisions of 2.3.2 shall apply to engines whose rated output is greater than 26.7 kN and whose date of manufacture is on or after 1 January 1986 and as further specified for oxides of nitrogen.

2.3.2 Regulatory levels

Gaseous emission levels when measured and computed in accordance with the procedures of Appendix 3 and converted to characteristic levels by the procedures of Appendix 6 shall not exceed the regulatory levels determined from the following formulas:

Hydrocarbons (HC): $D_p/F_{oo} = 19.6$

Carbon monoxide (CO): $D_p/F_{oo} = 118$

Oxides of nitrogen (NO_x):

a) for engines of a type or model for which the date of manufacture of the first individual production model was on or before 31 December 1995 and for which the date of manufacture of the individual engine was on or before 31 December 1999.

$$D_p/F_{oo} = 40 + 2\pi_{oo}$$

b) for engines of a type or model for which the date of manufacture of the first individual production model was after 31 December 1995 or for which the date of manufacture of the individual engine was after 31 December 1999.

$$D_p/F_{oo} = 32 + 1.6\pi_{oo}$$

c) for engines of a type or model for which the date of manufacture of the first individual production model was after 31 December 2003:

1) for engines with a pressure ratio of 30 or less:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$$D_p/F_{oo} = 19 + 1.6\pi_{oo}$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$$D_p/F_{oo} = 37.572 + 1.6\pi_{oo} - 0.2087F_{oo}$$

2) for engines with a pressure ratio of more than 30 but less than 62.5:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$$D_p/F_{oo} = 7 + 2.0\pi_{oo}$$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$$D_p/F_{oo} = 42.71 + 1.4286\pi_{oo} - 0.4013F_{oo} + 0.00642\pi_{oo} \times F_{oo}$$

3) for engines with a pressure ratio of 62.5 or more:

$$D_p/F_{oo} = 32 + 1.6\pi_{oo}$$

d) for engines of a type or model for which the date of manufacture of the first individual production model was after 31 December 2007:

1) for engines with a pressure ratio of 30 or less:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$D_p / F_{oo} = 16.72 + (1.4080 * \pi_{oo})$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$D_p / F_{oo} = 38.5486 + (1.6823 * \pi_{oo}) - (0.2453 * F_{oo}) - (0.00308 * \pi_{oo} * F_{oo})$

2) for engines with a pressure ratio of more than 30 but less than 82.6:

i) for engines with a maximum rated thrust of more than 89.0 kN:

$D_p / F_{oo} = -1.04 + (2.0 * \pi_{oo})$

ii) for engines with a maximum rated thrust of more than 26.7 kN but not more than 89.0 kN:

$D_p / F_{oo} = 46.1600 + (1.4286 * \pi_{oo}) - (0.5303 * F_{oo}) + (0.00642 * \pi_{oo} * F_{oo})$

3) for engines with a pressure ratio of 82.6 or more:

$D_p / F_{oo} = 32 + (1.6 * \pi_{oo})$

Note.— The characteristic level of the Smoke Number or gaseous pollutant emissions is the mean of the values of all the engines tested, measured and corrected to the reference standard engine and reference ambient conditions divided by the coefficient corresponding to the number of engines tested, as shown in Appendix 6.

2.4 Information required

Note.— The information required is divided into three groups: 1) general information to identify the engine characteristics, the fuel used and the method of data analysis; 2) the data obtained from the engine test(s); and 3) the results derived from the test data.

2.4.1 General information

The following information shall be provided for each engine type for which emissions certification is sought:

a) engine identification;

b) rated output (in kilonewtons);

c) reference pressure ratio;

d) fuel specification reference;

e) fuel hydrogen/carbon ratio;

f) the methods of data acquisition;

g) the method of making corrections for ambient conditions; and

h) the method of data analysis.

2.4.2 Test information

The following information shall be provided for each engine tested for certification purposes at each of the thrust settings specified in 2.1.4.2. The information shall be provided after correction to the reference ambient conditions where applicable:

a) fuel flow (kilograms/second);

b) emission index (grams/kilogram) for each gaseous pollutant; and

c) measured Smoke Number.

2.4.3 Derived information

2.4.3.1 The following derived information shall be provided for each engine tested for certification purposes:

a) emission rate, i.e. emission index × fuel flow, (grams/second) for each gaseous pollutant;

b) total gross emission of each gaseous pollutant measured over the LTO cycle (grams);

c) values of D_p / F_{oo} for each gaseous pollutant (grams/kilonewton); and

d) maximum Smoke Number.

2.4.3.2 The characteristic Smoke Number and gaseous pollutant emission levels shall be provided for each engine type for which emissions certification is sought.

Note.— The characteristic level of the Smoke Number or gaseous pollutant emissions is the mean of the values of all the engines tested, measured and corrected to the reference standard engine and reference ambient conditions, divided by the coefficient corresponding to the number of engines tested, as shown in Appendix 6.

CHAPTER 3. TURBO-JET AND TURBOFAN ENGINES INTENDED FOR PROPULSION AT SUPERSONIC SPEEDS

3.1 General

3.1.1 Applicability

The provisions of this chapter shall apply to all turbo-jet and turbofan engines intended for propulsion at supersonic speeds whose date of manufacture is on or after 18 February 1982.

3.1.2 Emissions involved

The following emissions shall be controlled for certification of aircraft engines:

Smoke
Gaseous emissions
Unburned hydrocarbons (HC);
Carbon monoxide (CO); and
Oxides of nitrogen (NO_x).

3.1.3 Units of measurement

3.1.3.1 The smoke emission shall be measured and reported in terms of Smoke Number (SN).

3.1.3.2 The mass (D_p) of the gaseous pollutants HC, CO, or NO_x emitted during the reference emissions landing and take-off (LTO) cycle, defined in 3.1.5.2 and 3.1.5.3 shall be measured and reported in grams.

3.1.4 Nomenclature

Throughout this chapter, where the expression F^*_{oo} is used, it shall be replaced by F_{oo} for engines which do not employ afterburning. For taxi/ground idle thrust setting, F_{oo} shall be used in all cases.

3.1.5 Reference conditions

3.1.5.1 *Atmospheric conditions*

The reference atmospheric conditions shall be ISA at sea level except that the reference absolute humidity shall be 0.00634 kg water/kg dry air.

3.1.5.2 *Thrust settings*

The engine shall be tested at sufficient power settings to define the gaseous and smoke emissions of the engine so that mass emission rates and Smoke Numbers corrected to the reference ambient conditions can be determined at the following specific percentages of rated output as agreed by the certificating authority.

Operating mode	*Thrust setting*
Take-off	100 per cent F^*_{oo}
Climb	65 per cent F^*_{oo}
Descent	15 per cent F^*_{oo}
Approach	34 per cent F^*_{oo}
Taxi/ground idle	5.8 per cent F_{oo}

3.1.5.3 *Reference emissions landing and take-off (LTO) cycle)*

The reference emissions LTO cycle for the calculation and reporting of gaseous emissions shall be represented by the following time in each operating mode.

Phase	*Time in operating mode, minutes*
Take-off	1.2
Climb	2.0
Descent	1.2
Approach	2.3
Taxi/ground idle	26.0

3.1.5.4 *Fuel specifications*

The fuel used during tests shall meet the specifications of Appendix 4. Additives used for the purpose of smoke suppression (such as organo-metallic compounds) shall not be present.

3.1.6 Test conditions

3.1.6.1 The tests shall be made with the engine on its test bed.

3.1.6.2 The engine shall be representative of the certificated configuration (*see* Appendix 6); off-take bleeds and accessory loads other than those necessary for the engine's basic operation shall not be simulated.

3.1.6.3 Measurements made for determination of emission levels at the thrusts specified in 3.1.5.2 shall be made with the afterburner operating at the level normally used, as applicable.

3.1.7 When test conditions differ from the reference conditions in 3.1.5, the test results shall be corrected to the reference conditions by the methods given in Appendix 5.

3.2 Smoke

3.2.1 Regulatory Smoke Number

The Smoke Number at any thrust setting when measured and computed in accordance with the procedures of Appendix 2 and converted to a characteristic level by the procedures of Appendix 6 shall not exceed the regulatory level determined from the following formula:

Regulatory Smoke Number = $83.6\,(F^*_{oo})^{-0.274}$
or a value of 50,
whichever is lower

Note.— Certificating authorities may alternatively accept values determined using afterburning provided that the validity of these data is adequately demonstrated.

3.3 Gaseous emissions

3.3.1 Regulatory levels

Gaseous emission levels when measured and computed in accordance with the procedures of Appendix 3 or Appendix 5, as applicable, and converted to characteristic levels by the procedures of Appendix 6 shall not exceed the regulatory levels determined from the following formulas:

Hydrocarbons (HC): $D_p / F^*_{oo} = 140(0.92)^{\pi_{oo}}$

Carbon monoxide (CO): $D_p / F^*_{oo} = 4\,550(\pi_{oo})^{-1.03}$

Oxides of nitrogen (NO_x): $D_p / F^*_{oo} = 36 + 2.42\pi_{oo}$

Note.— The characteristic level of the Smoke Number or gaseous pollutant emissions is the mean of the values of all the engines tested, measured and corrected to the reference standard engine and reference ambient conditions, divided by the coefficient corresponding to the number of engines tested, as shown in Appendix 6.

3.4 Information required

Note.— The information required is divided into three groups: 1) general information to identify the engine characteristics, the fuel used and the method of data analysis; 2) the data obtained from the engine test(s); and 3) the results derived from the test data.

3.4.1 The following information shall be provided for each engine type for which emissions certification is sought:

a) engine identification;

b) rated output (in kilonewtons);

c) rated output with afterburning applied, if applicable (in kilonewtons);

d) reference pressure ratio;

e) fuel specification reference;

f) fuel hydrogen/carbon ratio;

g) the methods of data acquisition;

h) the method of making corrections for ambient conditions; and

i) the method of data analysis.

3.4.2 Test information

The following information shall be provided for each engine tested for certification purposes at each of the thrust settings specified in 3.1.5.2. The information shall be provided after correction to the reference ambient conditions where applicable:

a) fuel flow (kilograms/second);

b) emission index (grams/kilogram) for each gaseous pollutant;

c) percentage of thrust contributed by afterburning; and

d) measured Smoke Number.

3.4.3 Derived information

3.4.3.1 The following derived information shall be provided for each engine tested for certification purposes:

a) emission rate, i.e. emission index × fuel flow, (grams/second), for each gaseous pollutant;

b) total gross emission of each gaseous pollutant measured over the LTO cycle (grams);

c) values of D_p/F^*_{oo} for each gaseous pollutant (grams/kilonewton); and

d) maximum Smoke Number.

3.4.3.2 The characteristic Smoke Number and gaseous pollutant emission levels shall be provided for each engine type for which emissions certification is sought.

Note.— The characteristic level of the Smoke Number or gaseous pollutant emissions is the mean of the values of all the engines tested, measured and corrected to the reference standard engine and reference ambient conditions, divided by the coefficient corresponding to the number of engines tested, as shown in Appendix 6.

APPENDIX 1. MEASUREMENT OF REFERENCE PRESSURE RATIO

1. GENERAL

1.1 Pressure ratio shall be established using a representative engine.

1.2 Reference pressure ratio shall be derived by correlating measured pressure ratio with engine thrust corrected to standard day ambient pressure and entering this correlation at the standard day rated take-off thrust.

2. MEASUREMENT

2.1 Total pressure shall be measured at the last compressor discharge plane and the first compressor front face by positioning at least four probes so as to divide the air flow area into four equal sectors and taking a mean of the four values obtained.

Note.— Compressor discharge total pressure may be obtained from total or static pressure measured at a position as close as possible to the compressor discharge plane. However, the certificating authority may approve alternative means of estimating the compressor discharge total pressure if the engine is so designed that the provision of the probes referred to above is impractical for the emissions test.

2.2 Necessary correlation factors shall be determined during type certification testing using a minimum of one engine and any associated engine component tests and analysis.

2.3 Procedures shall be acceptable to the certificating authority.

APPENDIX 2. SMOKE EMISSION EVALUATION

1. INTRODUCTION AND DEFINITIONS

Note.— The procedures specified here are concerned with the acquisition of representative exhaust samples and their transmission to, and analysis by, the emissions measuring system.

1.1 Variations in the procedure contained in this Appendix shall only be allowed after prior application to and approval by the certificating authority.

1.2 Where the following expressions and symbols are used in this Appendix, they have the meanings ascribed to them below:

Sampling reference size. The sample mass, 16.2 kg/m^2 of stained filter area, which if passed through the filter material results in a change of reflectance which gives a value of the SN parameter.

Sampling size. A chosen exhaust sample, the magnitude of whose mass (expressed in kilograms per square metre of stained filter surface area) lies in the range prescribed in 2.5.3 h) of this Appendix which, when passed through the filter material, causes a change in reflectance yielding a value for the SN′ parameter.

Sampling volume. The chosen sample volume (expressed in cubic metres) whose equivalent mass, calculated as indicated in 3 of this Appendix, conforms to the above definition of sampling size.

SN. Smoke Number; Dimensionless term quantifying smoke emission level based upon the staining of a filter by the reference mass of exhaust gas sample, and rated on a scale of 0 to 100 (*see* 3 of this Appendix).

SN′. Smoke Number obtained from an individual smoke sample, not necessarily of the reference size, as defined in 3 of this Appendix.

W. Mass of individual exhaust gas smoke sample, in kilograms, calculated from the measurements of sample volume, pressure and temperature (*see* 3 of this Appendix).

2. MEASUREMENT OF SMOKE EMISSIONS

2.1 Sampling probe for smoke emissions

a) The probe shall be made of stainless steel. If a mixing probe is used, all sampling orifices shall be of equal diameter.

b) The probe design shall be such that at least 80 per cent of the pressure drop through the probe assembly is taken at the orifices.

c) The number of sampling orifices shall not be less than 12.

d) The sampling plane shall be as close to the engine exhaust nozzle exit plane as permitted by considerations of engine performance but in any case shall be within 0.5 nozzle diameters of the exit plane.

e) The applicant shall provide evidence to the certificating authority, by means of detailed traverses, that the proposed probe design and position does provide a representative sample for each prescribed power setting.

2.2 Sampling line for smoke emissions

2.2.1 The sample shall be transferred from the probe to the sample collection system via a line of 4.0 to 8.5 mm inside diameter taking the shortest route practicable which shall in no case be greater than 25 m. The line temperature shall be maintained at a temperature between 60°C and 175°C with a stability of ±15°C, except for the distance required to cool the gas from the engine exhaust temperature down to the line control temperature.

2.2.2 Sampling lines shall be as "straight through" as possible. Any necessary bends shall have radii which are greater than 10 times the inside diameter of the lines. The material of the lines shall be such as to discourage build-up of particulate matter or static electricity.

Note.— Stainless steel, copper or carbon-loaded grounded polytetrafluoroethylene (PTFE) meet these requirements.

2.3 Smoke analysis system

Note.— The method prescribed herein is based upon the measurement of the reduction in reflectance of a filter when stained by a given mass flow of exhaust sample.

The arrangement of the various components of the system for acquiring the necessary stained filter samples shall be as shown schematically in Figure 2-1. An optional bypass around the volume meter may be installed to facilitate meter reading. The major elements of the system shall meet the following requirements:

a) *sample size measurement:* a wet or dry positive displacement volume meter shall be used to measure sample volume to an accuracy of ±2 per cent. The pressure and temperature at entry to this meter shall also be measured to accuracies of 0.2 per cent and ±2°C respectively;

b) *sample flow rate measurement:* the sample flow rate shall be maintained at a value of 14 ±0.5 L/min and the flowmeter for this purpose shall be able to make this measurement with an accuracy of ±5 per cent;

c) *filter and holder:* the filter holder shall be constructed in corrosion-resistant material and shall have the flow channel configuration shown in Figure 2-1. The filter material shall be Whatman type No. 4, or any equivalent approved by the certificating authority;

d) *valves:* four valve elements shall be provided as indicated in Figure 2-1:

1) valve A shall be a quick-acting, full-flow, flow diverter enabling the incoming sample to be directed through the measuring filter or around the bypass circuits or shut off;

Note.— Valve A may, if necessary, consist of two valves interlocked to give the requisite function.

2) valves B and C shall be throttling valves used to establish the system flow rate;

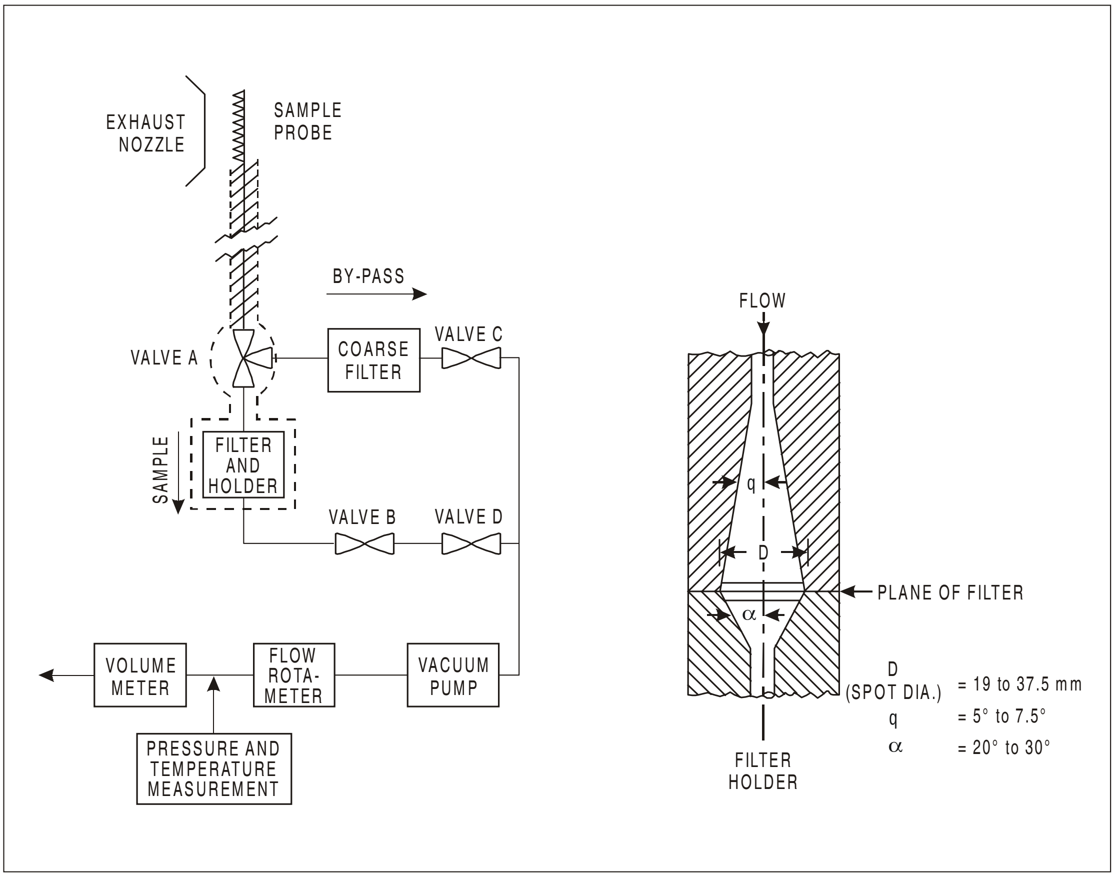

Figure 2-1. Smoke analysis system

3) valve D shall be a shut-off valve to enable the filter holder to be isolated;

all valves shall be made of corrosion-resistant material;

e) *vacuum pump:* this pump shall have a no-flow vacuum capability of –75 kPa with respect to atmospheric pressure; its full-flow rate shall not be less than 28 L/min at normal temperature and pressure;

f) *temperature control:* the incoming sample line through to the filter holder shall be maintained at a temperature between 60°C and 175°C with a stability of ±15°C;

Note.— The objective is to prevent water condensation prior to reaching the filter holder and within it.

g) If it is desired to draw a higher sample flow rate through the probe than through the filter holder, an optional flow splitter may be located between the probe and valve A (Figure 2-1), to dump excess flow. The dump line shall be as close as possible to probe off-take and shall not affect the ability of the sampling system to maintain the required 80 per cent pressure drop across the probe assembly. The dump flow may also be sent to the CO_2 analyser or complete emissions analysis system.

h) If a flow splitter is used, a test shall be conducted to demonstrate that the flow splitter does not change the smoke level passing to the filter holder. This may be accomplished by reversing the outlet lines from the flow splitter and showing that, within the accuracy of the method, the smoke level does not change.

i) *leak performance:* the sub-system shall meet the requirements of the following test:

1) clamp clean filter material into holder,

2) shut off valve A, fully open valves B, C and D.

3) run vacuum pump for one minute to reach equilibrium conditions;

4) continue to pump and measure the volume flow through the meter over a period of five minutes. This volume shall not exceed 5 L (referred to normal temperature and pressure) and the system shall not be used until this standard has been achieved.

j) *reflectometer:* the measurements of the reflectance of the filter material shall be by an instrument conforming to the American National Standards Institute (ANSI) Standard No. PH2.17/1977 for diffuser reflection density. The diameter of the reflectometer light beam on the filter paper shall not exceed D/2 nor be less than D/10 where D is the diameter of filter stained spot as defined in Figure 2-1.

2.4 Fuel specifications

The fuel shall meet the specifications of Appendix 4. Additives used for the purpose of smoke suppression (such as organometallic compounds) shall not be present.

2.5 Smoke measurement procedures

2.5.1 Engine operation

2.5.1.1 The engine shall be operated on a static test facility which is suitable and properly equipped for high accuracy performance testing.

2.5.1.2 The tests shall be made at the power settings approved by the certificating authority. The engine shall be stabilized at each setting.

2.5.2 Leakage and cleanliness checks

No measurements shall be made until all sample transfer lines and valves are warmed up and stable. Prior to a series of tests the system shall be checked for leakage and cleanliness as follows:

a) *leakage check:* isolate probe and close off end of sample line, perform leakage test as specified in 2.3 g) with the exceptions that valve A is opened and set to “bypass”, valve D is closed and that the leakage limit is 2 L. Restore probe and line interconnection;

b) *cleanliness check:*

1) open valves B, C and D;

2) run vacuum pump and alternately set valve A to “bypass” and “sample” to purge the entire system with clean air for five minutes;

3) set valve A to “bypass”;

4) close valve D and clamp clean filter material into holder. Open valve D;

5) set valve A to “sample” and reset back to “bypass” after 50 kg of air per square metre of filter has passed through the filter material;

6) measure resultant filter spot SN′ as described in paragraph 3 of this Appendix.;

7) if this SN′ exceeds 3, the system shall be cleaned (or otherwise rectified) until a value lower than 3 is obtained.

The system shall not be used until the requirements of these leakage and cleanliness checks have been met.

2.5.3 Smoke measurement

Smoke measurement shall be made independently of other measurements unless the smoke values so measured are significantly below the limiting values, or unless it can be demonstrated that the smoke values from simultaneous smoke and gaseous emissions measurements are valid, in which case smoke measurements may be made simultaneously with gaseous emissions measurements. In all cases the bend radius requirements for sampling lines detailed in 2.2.2 shall be strictly observed. The smoke analysis sub-system shall be set up and conform to the specifications of 2.3. Referring to Figure 2-1, the following shall be the major operations in acquiring the stained filter specimens:

a) during engine operation with the probe in position, valve A shall not be placed in the no-flow condition, otherwise particulate buildup in the lines might be encouraged;

b) set valve A to "bypass", close valve D and clamp clean filter into holder. Continue to draw exhaust sample in the bypass setting for at least five minutes while the engine is at or near to the requisite operating mode, valve C being set to give a flow rate of 14 ±0.5 L/min;

c) open valve D and set valve A to "sample", use valve B to set flow rate again to value set in b);

d) set valve A to "bypass" and close valve D, clamp clean filter material into the holder;

e) when the engine is stabilized on condition, allow one minute of sample flow with settings as at d);

f) open valve D, set valve A to "sample", reset flow rate if necessary, and allow chosen sample volume (*see* h)) to pass, before setting valve A back to "bypass" and close valve D;

g) set aside stained filter for analysis, clamp clean filter into holder;

h) the chosen sample sizes shall be such as to be within the range of 12 kg to 21 kg of exhaust gas per square metre of filter, and shall include samples which are either at the value of 16.2 kg of exhaust gas per square metre of filter or lie above and below that value. The number of samples at each engine operating condition shall not be less than 3 and e) to g) shall be repeated as necessary.

3. CALCULATION OF SMOKE NUMBER FROM MEASURED DATA

The stained filter specimens obtained as outlined in 2.5.3 shall be analysed using a reflectometer as specified in 2.3. The backing material used shall be black with an absolute reflectance of less than 3 per cent. The absolute reflectance reading R_S of each stained filter shall be used to calculate the reduction in reflectance by

$$SN' = 100(1 - R_S / R_W)$$

where R_W is the absolute reflectance of clean filter material.

The masses of the various samples shall be calculated by

$$W = 0.348\ PV/T \times 10^{-2} (\mathrm{kg})$$

where P and T are, respectively, the sample pressure in pascals and the temperature in kelvin, measured immediately upstream of the volume meter. V is the measured sample volume in cubic metres.

For each engine condition in the case that the sample sizes range above and below the reference value, the various values of SN′ and W shall be plotted as SN′ versus log W/A, where A is the filter stain area (m^2). Using a least squares straight line fit, the value of SN′ for $W/A = 16.2\ kg/m^2$ shall be estimated and reported as the Smoke Number (SN) for that engine mode. Where sampling at the reference size value only is employed, the reported SN shall be the arithmetic average of the various individual values of SN′.

4. REPORTING OF DATA TO THE CERTIFICATING AUTHORITY

The measured data shall be reported to the certificating authority. In addition the following data shall be reported for each test:

a) sample temperature;

b) sample pressure;

c) actual sample volume at sampling conditions;

d) actual sample flow rate at sampling conditions; and

e) leak and cleanliness checks substantiation (*see* 2.5.2).

APPENDIX 3. INSTRUMENTATION AND MEASUREMENT TECHNIQUES FOR GASEOUS EMISSIONS

1. INTRODUCTION

Note.— The procedures specified in this appendix are concerned with the acquisition of representative exhaust samples and their transmission to, and analysis by, the emissions measuring system. The procedures do not apply to engines employing afterburning. The methods proposed are representative of the best readily available and most established practice.

Variations in the procedure contained in this appendix shall only be allowed after prior application to and approval by the certificating authority.

2. DEFINITIONS

Where the following expressions are used in this appendix, they have the meanings ascribed to them below:

Accuracy. The closeness with which a measurement approaches the true value established independently.

Air/fuel ratio. The mass rate of airflow through the hot section of the engine divided by the mass rate of fuel flow to the engine.

Calibration gas. A high accuracy reference gas to be used for alignment, adjustment and periodic checks of instruments.

Concentration. The volume fraction of the component of interest in the gas mixture — expressed as volume percentage or as parts per million.

Exhaust nozzle. In the exhaust emissions sampling of gas turbine engines where the jet effluxes are not mixed (as in some turbofan engines for example) the nozzle considered is that for the gas generator (core) flow only. Where, however, the jet efflux is mixed the nozzle considered is the total exit nozzle.

Flame ionization detector. A hydrogen-air diffusion flame detector that produces a signal nominally proportional to the mass-flow rate of hydrocarbons entering the flame per unit of time — generally assumed responsive to the number of carbon atoms entering the flame.

Interference. Instrument response due to presence of components other than the gas (or vapour) that is to be measured.

Noise. Random variation in instrument output not associated with characteristics of the sample to which the instrument is responding, and distinguishable from its drift characteristics.

Non-dispersive infra-red analyser. An instrument that by absorption of infra-red energy selectively measures specific components.

Parts per million (ppm). The unit volume concentration of a gas per million unit volume of the gas mixture of which it is a part.

Parts per million carbon (ppmC). The mole fraction of hydrocarbon multiplied by 10^6 measured on a methane-equivalence basis. Thus, 1 ppm of methane is indicated as 1 ppmC. To convert ppm concentration of any hydrocarbon to an equivalent ppmC value, multiply ppm concentration by the number of carbon atoms per molecule of the gas. For example, 1 ppm propane translates as 3 ppmC hydrocarbon; 1 ppm hexane as 6 ppmC hydrocarbon.

Reference gas. A mixture of gases of specified and known composition used as the basis for interpreting instrument response in terms of the concentration of the gas to which the instrument is responding.

Repeatability. The closeness with which a measurement upon a given, invariant sample can be reproduced in short-term repetitions of the measurement with no intervening instrument adjustment.

Resolution. The smallest change in a measurement which can be detected.

Response. The change in instrument output signal that occurs with change in sample concentration. Also the output signal corresponding to a given sample concentration.

Stability. The closeness with which repeated measurements upon a given invariant sample can be maintained over a given period of time.

Zero drift. Time-related deviation of instrument output from zero set point when it is operating on gas free of the component to be measured.

Zero gas. A gas to be used in establishing the zero, or no-response, adjustment of an instrument.

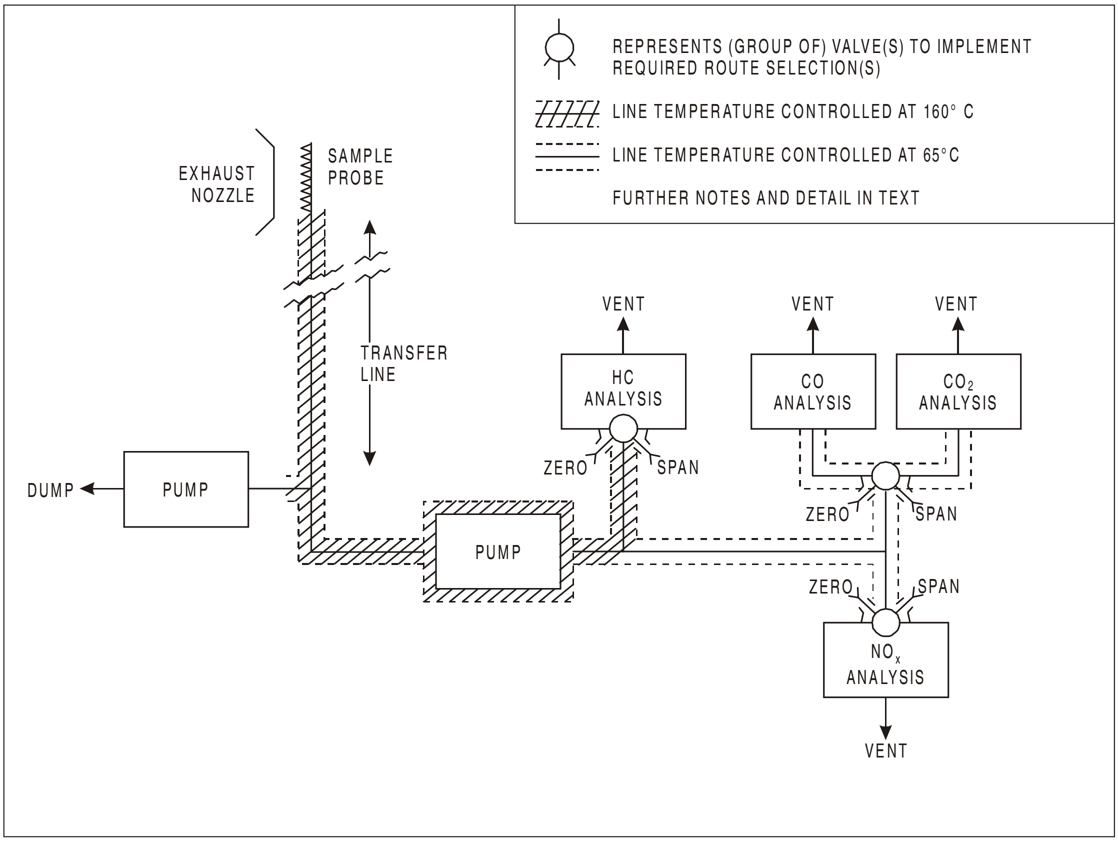

Figure 3-1. Sampling and analysis system, schematic

3. DATA REQUIRED

3.1 Gaseous emissions

Concentrations of the following emissions shall be determined:

a) Hydrocarbons (HC): a combined estimate of all hydrocarbon compounds present in the exhaust gas.

b) Carbon monoxide (CO).

c) Carbon dioxide (CO_2).

Note.— CO_2 is not considered a pollutant but its concentration is required for calculation and check purposes.

d) Oxides of nitrogen (NO_x): an estimate of the sum of the two oxides, nitric oxide (NO) and nitrogen dioxide (NO_2).

e) Nitric oxide (NO).

3.2 Other information

In order to normalize the emissions measurement data and to quantify the engine test characteristics, the following additional information shall be provided:

— inlet temperature;
— inlet humidity;
— atmospheric pressure;
— hydrogen/carbon ratio of fuel;
— other required engine parameters (for example, thrust, rotor speeds, turbine temperatures and gas-generator air flow).

This data shall be obtained either by direct measurement or by calculation, as presented in Attachment F to this appendix.

4. GENERAL ARRANGEMENT OF THE SYSTEM

No desiccants, dryers, water traps or related equipment shall be used to treat the exhaust sample flowing to the oxides of nitrogen and the hydrocarbon analysis instrumentation. Requirements for the various component sub-systems are given in 5, but the following list gives some qualifications and variations:

a) it is assumed that each of the various individual sub-systems includes the necessary flow control, conditioning and measurement facilities;

b) the necessity for a dump and/or a hot-sample pump will depend on ability to meet the sample transfer time and analysis sub-system sample flow rate requirements. This in turn depends on the exhaust sample driving pressure and line losses. It is considered that these pumps usually will be necessary at certain engine running conditions; and

c) the position of the hot pump, relative to the gas analysis sub-systems, may be varied as required. (For example, some HC analysers contain hot pumps and so may be judged capable of being used upstream of the system hot pump.)

Note.— Figure 3-1 is a schematic drawing of the exhaust gas sampling and analytical system and typifies the basic requirements for emissions testing.

5. DESCRIPTION OF COMPONENT PARTS

Note.— A general description and specification of the principal elements in the engine exhaust emissions measurement system follows. Greater detail, where necessary, will be found in Attachments A, B and C to this appendix.

5.1 Sampling system

5.1.1 Sampling probe

a) The probe shall be made of stainless steel. If a mixing probe is used, all sampling orifices shall be of equal diameter;

b) the probe design shall be such that at least 80 per cent of the pressure drop through the probe assembly is taken at the orifices;

c) the number of sampling orifices shall not be less than 12;

d) the sampling plane shall be as close to the engine exhaust nozzle exit plane as permitted by considerations of engine performance but in any case shall be within 0.5 nozzle diameter of the exit plane; and

e) the applicant shall provide evidence to the certificating authority, by means of detailed traverses, that the proposed probe design and position does provide a representative sample for each prescribed power setting.

5.1.2 Sampling lines

The sample shall be transferred from the probe to the analysers via a line of 4.0 to 8.5 mm inside diameter, taking the shortest route practicable and using a flow rate such that the transport time is less than 10 seconds. The line shall be maintained at a temperature of 160°C ±15°C (with a stability of ±10°C), except for a) the distance required to cool the gas from the engine exhaust temperature down to the line control temperature, and b) the branch which supplies samples to the CO, CO_2, and NO_x analysers. This branch line shall be maintained at a temperature of 65°C ± 15°C (with a stability of ±10°C). When sampling to measure HC, CO, CO_2 and NO_x components the line shall be constructed in stainless steel or carbon-loaded grounded PTFE.

5.2 HC analyser

The measurement of total hydrocarbon sample content shall be made by an analyser using the heated flame ionization detector (FID), between the electrodes of which passes an ionization current proportional to the mass rate of hydrocarbon entering a hydrogen flame. The analyser shall be deemed to include components arranged to control temperature and flow rates of sample, sample bypass, fuel and diluent gases, and to enable effective span and zero calibration checks.

Note.— An over-all specification is given in Attachment A to this appendix.

5.3 CO and CO_2 analysers

Non-dispersive infra-red analysers shall be used for the measurements of these components, and shall be of the design which utilizes differential energy absorption in parallel reference and sample gas cells, the cell or group of cells for each of these gas constituents being sensitized appropriately. This analysis sub-system shall include all necessary functions for the control and handling of sample, zero and span gas flows. Temperature control shall be that appropriate to whichever basis of measurement, wet or dry, is chosen.

Note.— An over-all specification is given in Attachment B to this appendix.

5.4 NO_x analyser

The measurement of NO concentration shall be by the chemiluminescent method in which the measure of the radiation intensity emitted during the reaction of the NO in the sample with added O_3 is the measure of the NO concentration. The NO_2 component shall be converted to NO in a converter of the requisite efficiency prior to measurement. The resultant NO_x measurement system shall include all necessary flow, temperature and other controls and provide for routine zero and span calibration as well as for converter efficiency checks.

Note.— An over-all specification is given in Attachment C to this appendix.

6. GENERAL TEST PROCEDURES

6.1 Engine operation

6.1.1 The engine shall be operated on a static test facility which is suitable and properly equipped for high accuracy performance testing.

6.1.2 The emissions tests shall be made at the power settings prescribed by the certificating authority. The engine shall be stabilized at each setting.

6.2 Major instrument calibration

Note.— The general objective of this calibration is to confirm stability and linearity.

6.2.1 The applicant shall satisfy the certificating authority that the calibration of the analytical system is valid at the time of the test.

6.2.2 For the hydrocarbon analyser this calibration shall include checks that the detector oxygen and differential hydrocarbon responses are within the limits specified, as laid down in Attachment A to this appendix. The efficiency of the NO_2/NO converter shall also be checked and verified to meet the requirements in Attachment C to this appendix.

6.2.3 The procedure for checking the performance of each analyser shall be as follows (using the calibration and test gases as specified in Attachment D to this appendix):

a) introduce zero gas and adjust instrument zero, recording setting as appropriate;

b) for each range to be used operationally, introduce calibration gas of (nominally) 90 per cent range full-scale deflection (FSD) concentration; adjust instrument gain accordingly and record its setting;

c) introduce approximately 30 per cent, 60 per cent, and 90 per cent range FSD concentration and record analyser readings;

d) fit a least squares straight line to the zero, 30 per cent, 60 per cent and 90 per cent concentration points. For the CO and/or CO_2 analyser used in their basic form without linearization of output, a least squares curve of appropriate mathematical formulation shall be fitted using additional calibration points if judged necessary. If any point deviates by more than 2 per cent of the full scale value (or ±1 ppm*, whichever is greater) then a calibration curve shall be prepared for operational use.

d) recheck zero and calibration points at the end of the test and also at intervals not greater than 1 hour during tests. If either has changed by more than ±2 per cent of range FSD, the test shall be repeated after restoration of the instrument to within its specification.

6.3 Operation

6.3.1 No measurements shall be made until all instruments and sample transfer lines are warmed up and stable and the following checks have been carried out:

a) leakage check: prior to a series of tests the system shall be checked for leakage by isolating the probe and the analysers, connecting and operating a vacuum pump of equivalent performance to that used in the smoke measurement system to verify that the system leakage flow rate is less than 0.4 L/min referred to normal temperature and pressure;

b) cleanliness check: isolate the gas sampling system from the probe and connect the end of the sampling line to a source of zero gas. Warm the system up to the operational temperature needed to perform hydrocarbon measurements. Operate the sample flow pump and set the flow rate to that used during engine emission testing. Record the hydrocarbon analyser reading. The reading shall not exceed 1 per cent of the engine idle emission level or 1 ppm (both expressed as methane), whichever is the greater.

Note 1.— It is good practice to back-purge the sampling lines during engine running, while the probe is in the engine exhaust but emissions are not being measured, to ensure that no significant contamination occurs.

Note. 2.— It is also good practice to monitor the inlet air quality at the start and end of testing and at least once per hour during a test. If levels are considered significant, then they should be taken into account.

6.3.2 The following procedure shall be adopted for operational measurements:

a) apply appropriate zero gas and make any necessary instrument adjustments;

b) apply appropriate calibration gas at a nominal 90 per cent FSD concentration for the ranges to be used, adjust and record gain settings accordingly;

c) when the engine has been stabilized at the requisite operating mode, continue to run it and observe pollutant concentrations until a stabilized reading is obtained, which shall be recorded;

6.4 Carbon balance check

Each test shall include a check that the air/fuel ratio as estimated from the integrated sample total carbon concentration exclusive of smoke, agrees with the estimate based on engine air/fuel ratio within ±15 per cent for the taxi/ground idle mode, and within 10 per cent for all other modes (*see* 7.1.2).

7. CALCULATIONS

7.1 Gaseous emissions

7.1.1 General

The analytical measurements made shall be the concentrations of the various classes of pollutant, as detected at their respective analysers for the several engine operation modes, and these values shall be reported. In addition, other parameters shall be computed and reported, as follows**.

7.1.2 Basic parameters

$$\text{EI}_p \text{ (emission index for component } p) = \frac{\text{mass of } p \text{ produced in g}}{\text{mass of fuel used in kg}}$$

$$\text{EI(CO)} = \left(\frac{[\text{CO}]}{[\text{CO}_2] + [\text{CO}] + [\text{HC}]}\right)\left(\frac{10^3 M_{\text{CO}}}{M_{\text{C}} + (n/m)M_{\text{H}}}\right)\left(1 + T(\text{P}_0/m)\right)$$

$$\text{EI(HC)} = \left(\frac{[\text{HC}]}{[\text{CO}_2] + [\text{CO}] + [\text{HC}]}\right)\left(\frac{10^3 M_{\text{HC}}}{M_{\text{C}} + (n/m)M_{\text{H}}}\right)\left(1 + T(\text{P}_0/m)\right)$$

$$\text{EI(NO}_x\text{) (as NO}_2\text{)} = \left(\frac{[\text{NO}_x]}{[\text{CO}_2] + [\text{CO}] + [\text{HC}]}\right)\left(\frac{10^3 M_{\text{NO}_2}}{M_{\text{C}} + (n/m)M_{\text{H}}}\right)\left(1 + T(\text{P}_0/m)\right)$$

$$\text{Air/fuel ratio} = (\text{P}_0/m)\left(\frac{M_{\text{AIR}}}{M_{\text{C}} + (n/m)M_{\text{H}}}\right)$$

* Except for the CO_2 analyser, for which the value shall be ±100 ppm.

** A more comprehensive and precise alternative methodology which is acceptable is presented in Attachment E to this appendix.

where

$$P_0/m = \frac{2Z - (n/m)}{4\left(1 + h - |TZ/2|\right)}$$

and

$$Z = \frac{2 - [CO] - \left(|2/x| - |y/2x|\right)\ [HC\} + [NO_2]}{[CO_2] + [CO] + [HC]}$$

M_{AIR}	molecular mass of dry air = 28.966 g or, where appropriate, = (32 R + 28.156 4 S + 44.011 T)g
M_{HC}	molecular mass of exhaust hydrocarbons, taken as CH_4 = 16.043 g
M_{CO}	molecular mass of CO = 28.011 g
M_{NO_2}	molecular mass of NO_2 = 46.008 g
M_C	atomic mass of carbon = 12.011 g
M_H	atomic mass of hydrogen = 1.008 g
R	concentration of O_2 in dry air, by volume = 0.209 5 normally
S	concentration of N_2 + rare gases in dry air, by volume = 0.709 2 normally
T	concentration of CO_2 in dry air, by volume = 0.000 3 normally
[HC]	mean concentration of exhaust hydrocarbons vol/vol, expressed as carbon
[CO]	mean concentration of CO vol/vol, wet
[CO_2]	mean concentration of CO_2 vol/vol, wet
[NO_x]	mean concentration of NO_x vol/vol, wet = [$NO + NO_2$]
[NO]	mean concentration of NO in exhaust sample, vol/vol, wet
[NO_2]	mean concentration of NO_2 in exhaust sample, vol/vol, wet $= \frac{([NO_x]_c - [NO])}{\eta}$
$[NO_x]_c$	mean concentration of NO in exhaust sample after passing through the NO_2/NO converter, vol/vol, wet
η	efficiency of NO_2/NO converter
h	humidity of ambient air, vol water/vol dry air
m	number of C atoms in characteristic fuel molecule
n	number of H atoms in characteristic fuel molecule
x	number of C atoms in characteristic exhaust hydrocarbon molecule
y	number of H atoms in characteristic exhaust hydrocarbon molecule

The value of *n/m*, the ratio of the atomic hydrogen to atomic carbon of the fuel used, is evaluated by fuel type analysis. The ambient air humidity, *h,* shall be measured at each set condition. In the absence of contrary evidence as to the characterization (x,y) of the exhaust hydrocarbons, the values $x = 1$, $y = 4$ are to be used. If dry or semi-dry CO and CO_2 measurements are to be used then these shall first be converted to the equivalent wet concentration as shown in Attachment E to this appendix, which also contains interference correction formulas for use as required.

7.1.3 Correction of emission indices to reference conditions

Corrections shall be made to the measured engine emission indices for all pollutants in all relevant engine operating modes to account for deviations from the reference conditions (ISA at sea level) of the actual test inlet air conditions of temperature and pressure. The reference value for humidity shall be 0.00634 kg water/kg dry air.

Thus, EI corrected = $K \times$ EI measured,

where the generalized expression for K is:

$$K = (P_{Bref}/P_B)^a \times (FAR_{ref}/FAR_B)^b \times \exp\left(|T_{Bref} - T_B|/c\right) \times \exp\left(d|h - 0.00634|\right)$$

P_B	Combustor inlet pressure, measured
T_B	Combustor inlet temperature, measured
FAR_B	Fuel/air ratio in the combustor
h	Ambient air humidity
P_{ref}	ISA sea level pressure
T_{ref}	ISA sea level temperature
P_{Bref}	Pressure at the combustor inlet of the engine tested (or the reference engine if the data is

corrected to a reference engine) associated with T_B under ISA sea level conditions.

$T_{B\text{ref}}$ Temperature at the combustor inlet under ISA sea level conditions for the engine tested (or the reference engine if the data is to be corrected to a reference engine). This temperature is the temperature associated with each thrust level specified for each mode.

FAR_{ref} Fuel/air ratio in the combustor under ISA sea level conditions for the engine tested (or the reference engine if the data is to be corrected to a reference engine).

a,b,c,d Specific constants which may vary for each pollutant and each engine type.

The combustor inlet parameters shall preferably be measured but may be calculated from ambient conditions by appropriate formulas.

7.1.4 Using the recommended curve fitting technique to relate emission indices to combustor inlet temperature effectively eliminates the exp $((T_{B\text{ref}} - T_B)/c)$ term from the generalized equation and for most cases the $(FAR_{\text{ref}} / FAR_B)$ term may be considered unity. For the emissions indices of CO and HC many testing facilities have determined that the humidity term is sufficiently close to unity to be eliminated from the expression and that the exponent of the $(P_{B\text{ref}} / P_B)$ term is close to unity.

Thus,

EI(CO) corrected = EI derived from $(P_B / P_{B\text{ref}}) \cdot$ EI(CO) v. T_B curve

EI(HC) corrected = EI derived from $(P_B / P_{B\text{ref}}) \cdot$ EI(HC) v. T_B curve

EI(NO_x) corrected = EI derived from EI(NO_x) $(P_{B\text{ref}} / P_B)^{0.5}$ exp $(19 \mid h - 0.00634 \mid)$ v. T_B curve

If this recommended method for the CO and HC emissions index correction does not provide a satisfactory correlation, an alternative method using parameters derived from component tests may be used.

Any other methods used for making corrections to CO, HC and NO_x emission indices shall have the approval of the certificating authority.

7.2 Control parameter functions (D_p, F_{oo}, π)

7.2.1 Definitions

D_p The mass of any gaseous pollutant emitted during the reference emissions landing and take-off cycle.

F_{oo} The maximum thrust available for take-off under normal operating conditions at ISA sea level static conditions, without the use of water injection, as approved by the applicable certificating authority.

π The ratio of the mean total pressure at the last compressor discharge plane of the compressor to the mean total pressure at the compressor entry plane when the engine is developing take-off thrust rating at ISA sea level static conditions.

7.2.2 The emission indices (EI) for each pollutant, corrected for pressure and humidity (as appropriate) to the reference ambient atmospheric conditions as indicated in 7.1.4 and if necessary to the reference engine, shall be obtained for the required LTO engine operating mode settings (*n*) of idle, approach, climb-out and take-off, at each of the equivalent corrected thrust conditions. A minimum of three test points shall be required to define the idle mode. The following relationships shall be determined for each pollutant:

a) between EI and T_B ; and

b) between W_f (engine fuel mass flow rate) and T_B ; and

c) between F_n (corrected to ISA sea level conditions) and T_B (corrected to ISA sea level conditions);

Note.— These are illustrated, for example, by Figure 3-2 a), b) and c).

When the engine being tested is not a "reference" engine, the data may be corrected to "reference" engine conditions using the relationships b) and c) obtained from a reference engine. A reference engine is defined as an engine substantially configured to the description of the engine to be certificated and accepted by the certificating authority to be representative of the engine type for which certification is sought.

The manufacturer shall also supply to the certificating authority all of the necessary engine performance data to substantiate these relationships and for ISA sea level ambient conditions:

d) maximum rated thrust (F_{oo}); and

e) engine pressure ratio (π) at maximum rated thrust.

Note.— These are illustrated by Figure 3-2 d).

7.2.3 The estimation of EI for each pollutant at each of the required engine mode settings, corrected to the reference ambient conditions, shall comply with the following general procedure:

a) at each mode ISA thrust condition F_n, determine the equivalent combustor inlet temperature (T_B) (Figure 3-2 c));

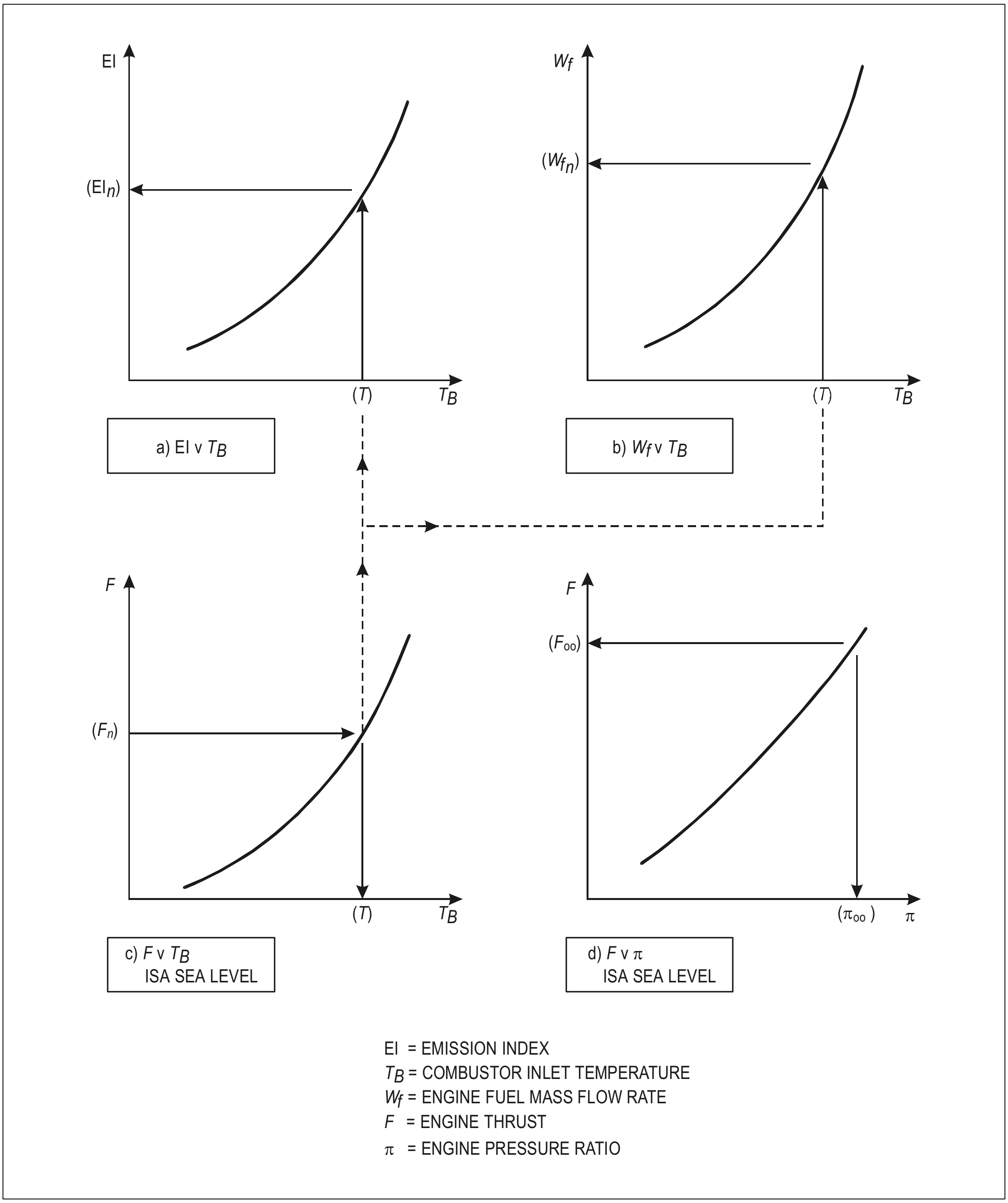

Figure 3-2. Calculation procedure

b) from the EI/T_B characteristic (Figure 3-2 a)), determine the EI_n value corresponding to T_B;

c) from the W_f/T_B characteristic (Figure 3-2 b)), determine the W_{f_n} value corresponding to T_B;

d) note the ISA maximum rated thrust and pressure ratio values. These are F_{oo} and π respectively (Figure 3-2 d));

e) calculate, for each pollutant $D_p = \Sigma\ (EI_n)\ (W_{f_n})\ (t)$ where:

t time in LTO mode (minutes)

W_{f_n} fuel mass flow rate (kg/min)

Σ is the summation for the set of modes comprising the reference LTO cycle.

7.2.4 While the methodology described above is the recommended method, the certificating authority may accept equivalent mathematical procedures which utilize mathematical expressions representing the curves illustrated if the expression have been derived using an accepted curve fitting technique.

7.3 Exceptions to the proposed procedures

In those cases where the configuration of the engine or other extenuating conditions exist which would prohibit the use of this procedure, the certificating authority, after receiving satisfactory technical evidence of equivalent results obtained by an alternative procedure, may approve an alternative procedure.

ATTACHMENT A TO APPENDIX 3. SPECIFICATION FOR HC ANALYSER

Note 1.— As outlined in 5.2 of Appendix 3, the measuring element in this analyser is the flame ionization detector (FID) in which the whole or a representative portion of the sample flow is admitted into a hydrogen-fuelled flame. With suitably positioned electrodes an ionization current can be established which is a function of the mass rate of hydrocarbon entering the flame. It is this current which, referred to an appropriate zero, is amplified and ranged to provide the output response as a measure of the hydrocarbon concentration expressed as ppmC equivalent.

Note 2.— See Attachment D for information on calibration and test gases.

1. GENERAL

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

The instrument to be used shall be such as to maintain the temperature of the detector and sample-handling components at a set point temperature within the range 155°C to 165°C to a stability of ±2°C. The leading specification points shall be as follows, the detector response having been optimized and the instrument generally having stabilized:

a) *Total range:* 0 to 5 000 ppmC in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 0.5 ppmC, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±0.5 ppmC, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±1.0 ppmC, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±0.5 ppmC, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±0.5 ppmC, whichever is greater.

g) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system, to the achievement of 90 per cent of the final reading.

h) *Linearity:* response with propane in air shall be linear for each range within ±2 per cent of full scale, otherwise calibration corrections shall be used.

2. SYNERGISTIC EFFECTS

Note.— In application there are two aspects of performance which can affect the accuracy of measurement:

a) the oxygen effect (whereby differing proportions of oxygen present in the sample give differing indicated hydrocarbon concentration for constant actual HC concentrations); and

b) the relative hydrocarbon response (whereby there is a different response to the same sample hydrocarbon concentrations expressed as equivalent ppmC, dependent on the class or admixture of classes of hydrocarbon compounds).

The magnitude of the effects noted above shall be determined as follows and limited accordingly.

Oxygen response: measure the response with two blends of propane, at approximately 500 ppmC concentration known to a relative accuracy of ±1 per cent, as follows:

1) propane in 10 ± 1 per cent O_2, balance N_2

2) propane in 21 ± 1 per cent O_2, balance N_2

If R_1 and R_2 are the respective normalized responses then $(R_1 - R_2)$ shall be less than 3 per cent of R_1.

Differential hydrocarbon response: measure the response with four blends of different hydrocarbons in air, at concentrations of approximately 500 ppmC, known to a relative accuracy of ±1 per cent, as follows:

a) propane in zero air

b) propylene in zero air

c) toluene in zero air

d) n-hexane in zero air.

If R_a, R_b, R_c and R_d are, respectively, the normalized responses (with respect to propane), then $(R_a - R_b)$, $(R_a - R_c)$ and $(R_a - R_d)$ shall each be less than 5 per cent of R_a.

3. OPTIMIZATION OF DETECTOR RESPONSE AND ALIGNMENT

3.1 The manufacturer's instructions for initial setting up procedures and ancillary services and supplies required shall be implemented, and the instrument allowed to stabilize. All setting adjustments shall involve iterative zero checking, and correction as necessary. Using as sample a mixture of approximately 500 ppmC of propane in air, the response characteristics for variations first in fuel flow and then, near an optimum fuel flow, for variations in dilution air flow to select its optimum shall be determined. The oxygen and differential hydrocarbon responses shall then be determined as indicated above.

3.2 The linearity of each analyser range shall be checked by applying propane in air samples at concentrations of approximately 30, 60 and 90 per cent of full scale. The maximum response deviation of any of these points from a least squares straight line (fitted to the points and zero) shall not exceed ±2 per cent of full scale value. If it does, a calibration curve shall be prepared for operational use.

ATTACHMENT B TO APPENDIX 3. SPECIFICATION FOR CO AND CO_2 ANALYSERS

Note 1.– Paragraph 5.3 of Appendix 3 summarizes the characteristics of the analysis sub-system to be employed for the individual measurements of CO and CO_2 concentrations in the exhaust gas sample. The instruments are based on the principle of non-dispersive absorption of infra-red radiation in parallel reference and sample gas cells. The required ranges of sensitivity are obtained by use of stacked sample cells or changes in electronic circuitry or both. Interferences from gases with overlapping absorption bands may be minimized by gas absorption filters and/or optical filters, preferably the latter.

Note 2.— See Attachment D for information on calibration and test gases.

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

The principal performance specification shall be as follows:

CO Analyser

a) *Total range:* 0 to 2 500 ppm in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 1 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±2 ppm, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±2 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±2 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±1 ppm, whichever is greater.

g) *Interferences:* to be limited with respect to indicated CO concentration as follows:

1) less than 500 ppm/per cent ethylene concentration

2) less than 2 ppm/per cent CO_2 concentration

3) less than 2 ppm/per cent water vapour.*

If the interference limitation(s) for CO_2 and/or water vapour cannot be met, appropriate correction factors shall be determined, reported and applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

CO_2 Analyser

a) *Total range:* 0 to 10 per cent in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 100 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater.

* Need not apply where measurements are on a "dry" basis.

d) *Stability:* better than ±2 per cent of full scale of range used or ±100 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater.

g) The effect of oxygen (O_2) on the CO_2 analyser response shall be checked. For a change from 0 per cent O_2 to 21 per cent O_2, the response of a given CO_2 concentration shall not change by more than 2 per cent of reading. If this limit cannot be met an appropriate correction factor shall be applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

CO and CO_2 Analysers

a) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system, to the achievement of 90 per cent of the final reading.

b) *Sample temperature:* the normal mode of operation is for analysis of the sample in its (untreated) "wet" condition. This requires that the sample cell and all other components in contact with the sample in this sub-system be maintained at a temperature of not less than 50°C, with a stability of ±2°C. The option to measure CO and CO_2 on a dry basis (with suitable water traps) is allowed, in which case unheated analysers are permissible and the interference limits for H_2O vapour removed, and subsequent correction for inlet water vapour and water of combustion is required.

c) *Calibration curves:*

i) Analysers with a linear signal output characteristic shall be checked on all working ranges using calibration gases at known concentrations of approximately 0, 30, 60 and 90 per cent of full scale. The maximum response deviation of any of these points from a least squares straight line, fitted to the points and the zero reading, shall not exceed ±2 per cent of the full scale value. If it does then a calibration curve shall be prepared for operational use.

ii) Analysers with a non-linear signal output characteristic, and those that do not meet the requirements of linearity given above, shall have calibration curves prepared for all working ranges using calibration gases at known concentrations of approximately 0, 30, 60 and 90 per cent of full scale. Additional mixes shall be used, if necessary, to define the curve shape properly.

ATTACHMENT C TO APPENDIX 3. SPECIFICATION FOR NO_x ANALYSER

Note.— See Attachment D for information on calibration and test gases.

1. As indicated in 5.4 of Appendix 3, the measurement of the oxides of nitrogen concentration shall be by the chemiluminescent technique in which radiation emitted by the reaction of NO and O_3 is measured. This method is not sensitive to NO_2 and therefore the sample shall be passed through a converter in which NO_2 is converted to NO before the measurement of total NO_x is made. Both the original NO and the total NO_x concentrations shall be recorded. Thus by difference, a measure of the NO_2 concentration shall be obtained.

2. The instrument to be used shall be complete with all necessary flow control components, such as regulators, valves, flowmeters, etc. Materials in contact with the sample gas shall be restricted to those which are resistant to attack by oxides of nitrogen, such as stainless steel, glass, etc. The temperature of the sample shall everywhere be maintained at values, consistent with the local pressures, which avoid condensation of water.

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

3. The principal performance specification, determined for the instrument operated in an ambient temperature stable to within 2°C, shall be as follows:

a) *Total range:* 0 to 2 500 ppm in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 1 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±1 ppm, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1.0 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 2 hours.

g) *Interference:* suppression for samples containing CO_2 and water vapour, shall be limited as follows:

— less than 0.05 per cent reading/per cent CO_2 concentration;

— less than 0.1 per cent reading/per cent water vapour concentration.

If the interference limitation(s) for CO_2 and/or water vapour cannot be met, appropriate correction factors shall be determined, reported and applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

h) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system to the achievement of 90 per cent of the final reading.

i) *Linearity:* better than ±2 per cent of full scale of range used or ±2 ppm, whichever is greater.

j) *Converter:* this shall be designed and operated in such a matter as to reduce NO_2 present in the sample to NO. The converter shall not affect the NO originally in the sample.

The converter efficiency shall not be less than 90 per cent.

This efficiency value shall be used to correct the measured sample NO_2 value (i.e. $[NO_x]_c$ – [NO]) to that which would have been obtained if the efficiency had not been 100 per cent.

ATTACHMENT D TO APPENDIX 3. CALIBRATION AND TEST GASES

Table of calibration gases

Analyser	*Gas*	*Accuracy**
HC	propane in zero air	±2 per cent or ±0.05 ppm**
CO_2	CO_2 in zero air	±2 per cent or ±100 ppm**
CO	CO in zero air	±2 per cent or ±2 ppm**
NO_x	NO_x in zero nitrogen	±2 per cent or ±1 ppm**

* Taken over the 95 per cent confidence interval.
** Whichever is greater.

The above gases are required to carry out the routine calibration of analysers during normal operational use.

Table of test gases

Analyser	*Gas*	*Accuracy**
HC	propane in 10 ±1 per cent O_2 balance zero nitrogen	±1 per cent
HC	propane in 21 ±1 per cent O_2 balance zero nitrogen	±1 per cent
HC	propylene in zero air	±1 per cent
HC	toluene in zero air	±1 per cent
HC	n-hexane in zero air	±1 per cent
HC	propane in zero air	±1 per cent
CO_2	CO_2 in zero air	±1 per cent
CO_2	CO_2 in zero nitrogen	±1 per cent
CO	CO in zero air	±1 per cent
NO_x	NO in zero nitrogen	±1 per cent

* Taken over the 95 per cent confidence interval.

The above gases are required to carry out the tests of Attachments A, B and C.

Carbon monoxide and carbon dioxide calibration gases may be blended singly or as dual component mixtures. Three component mixtures of carbon monoxide, carbon dioxide and propane in zero air may be used, provided the stability of the mixture is assured.

Zero gas as specified for the CO, CO_2 and HC analysers shall be zero air (which includes “artificial” air with 20 to 22 per cent O_2 blended with N_2). For the NO_x analyser zero nitrogen shall be used as the zero gas. Impurities in both kinds of zero gas shall be restricted to be less than the following concentrations:

1 ppm C
1 ppm CO
100 ppm CO_2
1 ppm NO_x

The applicant shall ensure that commercial gases supplied to him do in fact meet this specification, or are so specified by the vendor.

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ATTACHMENT E TO APPENDIX 3. THE CALCULATION OF THE EMISSIONS PARAMETERS — BASIS, MEASUREMENT CORRECTIONS AND ALTERNATIVE NUMERICAL METHOD

1. SYMBOLS

AFR	air/fuel ratio, the ratio of the mass flow rate of dry air to that of the fuel
EI	emission index; 10^3 × mass flow rate of gaseous emission product in exhaust per unit mass flow rate of fuel
K	ratio of concentration measured wet to that measured dry (after cold trap)
L, L'	analyser interference coefficient for interference by CO_2
M, M'	analyser interference coefficient for interference by H_2O
M_{AIR}	molecular mass of dry air = 28.966 g or, where appropriate, = (32 R + 28.156 4 S + 44.011 T) g
M_{CO}	molecular mass of CO = 28.011 g
M_{HC}	molecular mass of exhaust hydrocarbon, taken as CH_4 = 16.043 g
M_{NO_2}	molecular mass of NO_2 = 46.008 g
M_C	atomic mass of carbon = 12.011 g
M_H	atomic mass of hydrogen = 1.008 g
P_1	number of moles of CO_2 in the exhaust sample per mole of fuel
P_2	number of moles of N_2 in the exhaust sample per mole of fuel
P_3	number of moles of O_2 in the exhaust sample per mole of fuel
P_4	number of moles of H_2O in the exhaust sample per mole of fuel
P_5	number of moles of CO in the exhaust sample per mole of fuel
P_6	number of moles of C_xH_y in the exhaust sample per mole of fuel
P_7	number of moles of NO_2 in the exhaust sample per mole of fuel
P_8	number of moles of NO in the exhaust sample per mole of fuel
P_T	$P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8$
R	concentration of O_2 in dry air, by volume = 0.2095 normally
S	concentration of N_2 + rare gases in dry air, by volume = 0.7902 normally
T	concentration of CO_2 in dry air, by volume = 0.0003 normally
P_0	number of moles of air per mole of fuel in initial air/fuel mixture
Z	symbol used and defined in 3.4
$[CO_2]$	mean concentration of CO_2 in exhaust sample, vol/vol
[CO]	mean concentration of CO in exhaust sample, vol/vol
[HC]	mean concentration of HC in exhaust sample, vol C/vol
[NO]	mean concentration of NO in exhaust sample, vol/vol
$[NO_2]$	mean concentration of NO_2 in exhaust sample, vol/vol
$[NO_x]$	mean concentration of NO and NO_2 in exhaust sample, vol/vol
$[NO_x]_c$	mean concentration of NO in exhaust sample, after passing through the NO_2/NO converter, vol/vol
$[NO_2]$	mean = $\dfrac{([NO_x]_c - [NO])}{\eta}$
$[\ ]_d$	mean concentration in exhaust sample after cold trap, vol/vol
$[\ ]_m$	mean concentration measurement indicated before instrument correction applied, vol/vol

h	humidity of ambient air, vol water/vol dry air
h_d	humidity of exhaust sample leaving “drier” or “cold trap”, vol water/vol dry sample
m	number of C atoms in characteristic fuel molecule
n	number of H atoms in characteristic fuel molecule
x	number of C atoms in characteristic exhaust hydrocarbon molecule
y	number of H atoms in characteristic exhaust hydrocarbon molecule
η	efficiency of NO_2/NO converter

2. BASIS OF CALCULATION OF EI AND AFR PARAMETERS

2.1 It is assumed that the balance between the original fuel and air mixture and the resultant state of the exhaust emissions as sampled can be represented by the following equation:

$$C_mH_n + P_0[R(O_2) + S(N_2) + T(CO_2) + h(H_2O)]$$
$$= P_1(CO_2) + P_2(N_2) + P_3(O_2) + P_4(H_2O)$$
$$+ P_5(CO) + P_6(C_xH_y) + P_7(NO_2) + P_8(NO)$$

from which the required parameters can, by definition, be expressed as

$$\text{EI(CO)} = P_5\left(\frac{10^3 M_{CO}}{mM_C + nM_H}\right)$$

$$\text{EI(HC)} = xP_6\left(\frac{10^3 M_{HC}}{mM_C + nM_H}\right) \text{ expressed as methane equivalent}$$

$$\text{EI(NO}_x) = (P_7 + P_8)\left(\frac{10^3 M_{NO_2}}{mM_C + nM_H}\right) \text{ expressed as NO}_2\text{ equivalent}$$

$$\text{AFR} = P_0\left(\frac{M_{AIR}}{mM_C + nM_H}\right)$$

2.2 Values for fuel hydrocarbon composition (m, n) are assigned by fuel specification or analysis. If only the ratio n/m is so determined, the value m = 12 may be assigned. The mole fractions of the dry air constituents (R, S, T) are normally taken to be the recommended standard values but alternative values may be assigned, subject to the restriction $R + S + T = 1$ and the approval of the certificating authority.

2.3 The ambient air humidity, h, is as measured at each test condition. It is recommended that, in the absence of contrary evidence as to the characterization (x, y) of the exhaust hydrocarbon, values of $x = 1$ and $y = 4$ are assigned.

2.4 Determination of the remaining unknowns requires the solution of the following set of linear simultaneous equations, where (1) to (4) derive from the fundamental atomic conservation relationships and (5) to (9) represent the gaseous product concentration relationships.

$$m + TP_0 = P_1 + P_5 + xP_6 \quad \ldots\ldots (1)$$

$$n + 2hP_0 = 2P_4 + yP_6 \quad \ldots\ldots (2)$$

$$(2R + 2T + h)P_0 = 2P_1 + 2P_3 + P_4 + P_5 + 2P_7 + P_8 \quad \ldots\ldots (3)$$

$$2SP_0 = 2P_2 + P_7 + P_8 \quad \ldots\ldots (4)$$

$$[CO_2]\, P_T = P_1 \quad \ldots\ldots (5)$$

$$[CO]\, P_T = P_5 \quad \ldots\ldots (6)$$

$$[HC]\, P_T = xP_6 \quad \ldots\ldots (7)$$

$$[NO_x]_c P_T = \eta\, P_7 + P_8 \quad \ldots\ldots (8)$$

$$[NO]\, P_T = P_8 \quad \ldots\ldots (9)$$

$$P_T = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8 \quad \ldots\ldots (10)$$

The above set of conditional equations is for the case where all measured concentrations are true ones, that is, not subject to interference effects or to the need to correct for sample drying. In practice, interference effects are usually present to a significant degree in the CO, and NO measurements, and the option to measure CO_2 and CO on a dry or partially dry basis is often used. The necessary modifications to the relevant equations are described in 2.5 and 2.6.

2.5 The interference effects are mainly caused by the presence of CO_2 and H_2O in the sample which can affect the CO and the NO_x analysers in basically different ways. The CO analyser is prone to a zero-shifting effect and the NO_x analyser to a sensitivity change, represented thus:

$$[CO] = [CO]_m + L[CO_2] + M[H_2O]$$

$$\text{and } [NO_x]_c = [NO_x]_{cm}\,(1 + L'[CO_2] + M'[H_2O])$$

which transform into the following alternative equations to (6), (8) and (9), when interference effects require to be corrected,

$$[CO]_m P_T + LP_1 + MP_4 = P_5 \quad \ldots\ldots (6A)$$

$$[NO_x]_{cm} (P_T + L'P_1 + M'P_4) = \eta P_7 + P_8 \quad \ldots\ldots (8A)$$

$$[NO]_m (P_T + L'P_1 + M'P_4) = P_8 \quad \ldots\ldots (9A)$$

2.6 The option to measure CO_2 and CO concentrations on a dry or partially dry sample basis, that is, with a sample humidity reduced to h_d, requires the use of modified conditional equations as follows:

$$[CO_2]_d (P_T - P_4)(1 + h_d) = P_1 \quad \ldots\ldots (5A)$$

and

$$[CO]_d (P_T - P_4)(1 + h_d) = P_5$$

However, the CO analyser may also be subject to interference effects as described in 2.5 above and so the complete alternative CO measurement concentration equation becomes

$$[CO]_{md} (P_T - P_4)(1 + h_d)$$
$$+ LP_1 + Mh_d (P_T - P_4) = P_5 \quad \ldots\ldots (6B)$$

3. ANALYTICAL FORMULATIONS

3.1 General

Equations (1) to (10) can be reduced to yield the analytical formulations for the EI and AFR parameters, as given in 7.1 to this appendix. This reduction is a process of progressive elimination of the roots P_0, P_1 through P_8, P_T, making the assumptions that all concentration measurements are of the "wet" sample and do not require interference corrections or the like. In practice the option is often chosen to make the CO_2 and CO concentrations measurements on a "dry" or "semi-dry" basis; also it is often found necessary to make interference corrections. Formulations for use in these various circumstances are given in 3.2, 3.3 and 3.4 below.

3.2 Equation for conversion of dry concentration measurements to wet basis

Concentration wet = K × concentration dry; that is,

$$[\ \ ] = K [\ \ ]_d$$

The following expression for K applies when CO and CO_2 are determined on a "dry" basis:

$$K = \frac{\left\{4 + (n/m)\,T + (|n/m|\,T - 2h)\left([NO_2] - (2[HC]/x)\right)\right.}{(2 + h)\left\{2 + (n/m)(1 + h_d)\left([CO_2]_d + [CO]_d\right)\right\}}$$

$$\frac{\left. + (2 + h)\left(|y/x| - |n/m|\right)[HC]\right\}(1 + h_d)}{-\left(|n/m|\,T - 2h\right)\left(1 - |1 + h_d|[CO]_d\right)}$$

3.3 Interference corrections

The measurements of CO and/or NO_x and NO may require corrections for interference by the sample CO_2 and water concentrations before use in the above analytical equations. Such corrections can normally be expressed in the following general ways:

$$[CO] = [CO]_m + L[CO_2] + M[H_2O]$$

$$[CO]_d = [CO]_{md} + L[CO_2]_d + M\left(\frac{h_d}{1 + h_d}\right)$$

$$[NO] = [NO]_m \left(1 + L'[CO_2] + M'[H_2O]\right)$$

$$\eta[NO_2] = \left([NO_x]_{cm} - [NO]_m\right)\left(1 + L'[CO_2] + M'[H_2O]\right)$$

3.4 Equation for estimation of sample water content

Water concentration in sample

$$[H_2O] = \frac{\left(|n/2m| + h|P_0/m|\right)\left([CO_2] + [CO] + [HC]\right)}{1 + T(P_0/m)} - (y/2x)[HC]$$

where

$$P_0/m = \frac{2Z - (n/m)}{4\left(1 + h - |TZ/2|\right)}$$

and

$$Z = \frac{2 - [CO] - \left(|2/x| - |y/2x|\right)[HC] + [NO_2]}{[CO_2] + [CO] + [HC]}$$

It should be noted that this estimate is a function of the various analyses concentration readings, which may themselves require water interference correction. For better accuracy an iterative procedure is required in these cases with successive recalculation of the water concentration until the requisite stability is obtained. The use of the alternative, numerical solution methodology (4) avoids this difficulty.

4. ALTERNATIVE METHODOLOGY — NUMERICAL SOLUTION

4.1 As an alternative to the analytical procedures summarized in 3 above, it is possible to obtain readily the emissions indices, fuel/air ratio, corrected wet concentrations, etc., by a numerical solution of equations (1) to (10) for each set of measurements, using a digital computer.

4.2 In the equation set (1) to (10) the actual concentration measurements are substituted using whichever of the alternative equations (5A), (6A), etc. applies for the particular measuring system, to take account of interference corrections and/or dried sample measurements.

4.3 Suitable simple two-dimensional array equation-solving computer programmes are widely available and their use for this purpose is convenient and flexible, allowing ready incorporation and identification of any sample drying options and interference or other corrections.

ATTACHMENT F TO APPENDIX 3. SPECIFICATIONS FOR ADDITIONAL DATA

As required in 3.2 of Appendix 3, in addition to the measured sample constituent concentrations, the following data shall also be provided:

a) inlet temperature: measured as the total temperature at a point within one diameter of the engine intake plane to an accuracy of ±0.5°C;

b) inlet humidity (kg water/kg dry air): measured at a point within 15 m of the intake plane ahead of the engine to an accuracy of ±5 per cent of reading;

c) atmospheric pressure: measured within 1 km of the engine test location and corrected as necessary to the test stand altitude to an accuracy of ±100 Pa;

d) fuel mass flow: by direct measurement to an accuracy of ±2 per cent;

e) fuel H/C ratio: defined as *n/m*, where C_mH_n is the equivalent hydrocarbon representation of the fuel used in the test and evaluated by reference to the engine fuel type analysis;

f) engine parameters:

   1) thrust: by direct measurement to an accuracy of ±1 per cent at take-off power and ±5 per cent at the minimum thrust used in the certification test, with linear variation between these points;

   2) rotation speed(s): by direct measurement to an accuracy of at least ±0.5 per cent;

   3) gas generator airflow: determined to an accuracy of ±2 per cent by reference to engine performance calibration.

The parameters a), b), d) and f) shall be determined at each engine emissions test setting, while c) shall be determined at intervals of not less than 1 hour over a period encompassing that of the emissions tests.

APPENDIX 4. SPECIFICATION FOR FUEL TO BE USED IN AIRCRAFT TURBINE ENGINE EMISSION TESTING

Property	*Allowable range of values*
Density kg/m^3 at 15°C	780 – 820
Distillation temperature, °C	
10% boiling point	155 – 201
Final boiling point	235 – 285
Net heat of combustion, MJ/kg	42.86 – 43.50
Aromatics, volume %	15 – 23
Naphthalenes, volume %	1.0 – 3.5
Smoke point, mm	20 – 28
Hydrogen, mass %	13.4 – 14.3
Sulphur, mass %	less than 0.3%
Kinematic viscosity at –20°C, mm^2/s	2.5 – 6.5

APPENDIX 5. INSTRUMENTATION AND MEASUREMENT TECHNIQUES FOR GASEOUS EMISSIONS FROM AFTERBURNING GAS TURBINE ENGINES

1. INTRODUCTION

Note.— The procedures specified in this appendix are concerned with the acquisition of representative exhaust samples and their transmission to, and analysis by, the emissions measuring system. These procedures only apply when afterburning is employed. The methods proposed are representative of the best readily available and most established modern practice. The need to correct for ambient conditions is recognized and a method will be specified when one becomes available. Meanwhile any correction methods used when afterburning is employed should be approved by the certificating authority.

Variations in the procedure contained in this appendix shall only be allowed after prior application to and approval by the certificating authority.

2. DEFINITIONS

Where the following expressions are used without further explanation in this appendix, they have the meanings ascribed to them below:

Accuracy. The closeness with which a measurement approaches the true value established independently.

Calibration gas. A high accuracy reference gas to be used for alignment, adjustment and periodic checks of instruments.

Concentration. The volume fraction of the component of interest in the gas mixture — expressed as volume percentage or as parts per million.

Flame ionization detector. A hydrogen-air diffusion flame detector that produces a signal nominally proportional to the mass-flow rate of hydrocarbons entering the flame per unit of time — generally assumed responsive to the number of carbon atoms entering the flame.

Interference. Instrument response due to presence of components other than the gas (or vapour) that is to be measured.

Noise. Random variation in instrument output not associated with characteristics of the sample to which the instrument is responding, and distinguishable from its drift characteristics.

Non-dispersive infra-red analyser. An instrument that by absorption of infra-red energy selectively measures specific components.

Parts per million (ppm). The unit volume concentration of a gas per million unit volume of the gas mixture of which it is a part.

Parts per million carbon (ppmC). The mole fraction of hydrocarbon multiplied by 10^6 measured on a methane-equivalence basis. Thus, 1 ppm of methane is indicated as 1 ppmC. To convert ppm concentration of any hydrocarbon to an equivalent ppmC value, multiply ppm concentration by the number of carbon atoms per molecule of the gas. For example, 1 ppm propane translates as 3 ppmC hydrocarbon; 1 ppm hexane as 6 ppmC hydrocarbon.

Plume. Total external engine exhaust flow, including any ambient air with which the exhaust mixes.

Reference gas. A mixture of gases of specified and known composition used as the basis for interpreting instrument response in terms of the concentration of the gas to which the instrument is responding.

Repeatability. The closeness with which a measurement upon a given, invariant sample can be reproduced in short-term repetitions of the measurement with no intervening instrument adjustment.

Resolution. The smallest change in a measurement which can be detected.

Response. The change in instrument output signal that occurs with change in sample concentration. Also the output signal corresponding to a given sample concentration.

Stability. The closeness with which repeated measurements upon a given invariant sample can be maintained over a given period of time.

Zero drift. Time-related deviation of instrument output from zero set point when it is operating on gas free of the component to be measured.

Zero gas. A gas to be used in establishing the zero, or no response, adjustment of an instrument.

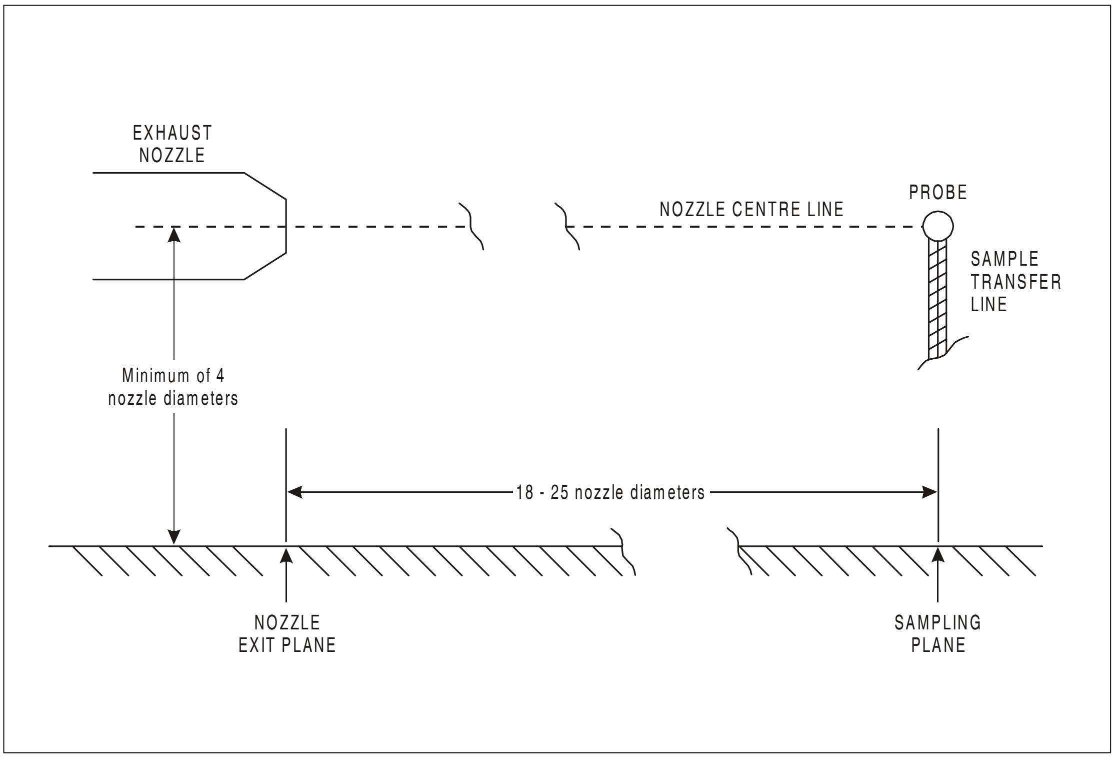

Figure 5-1. Exhaust gas sampling system, schematic

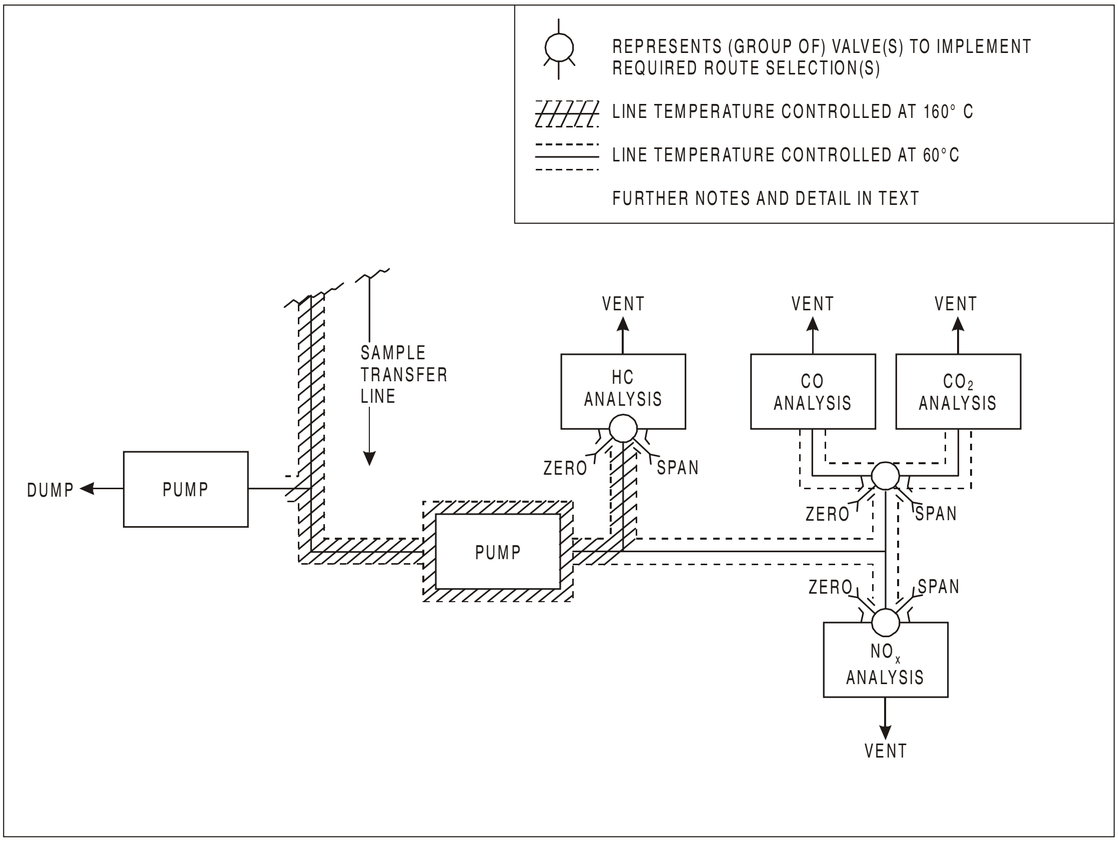

Figure 5-2. Sample transfer and analysis system, schematic

3. DATA REQUIRED

3.1 Gaseous emissions

Concentrations of the following emissions shall be determined:

a) Hydrocarbons (HC): a combined estimate of all hydrocarbon compounds present in the exhaust gas.

b) Carbon monoxide (CO).

c) Carbon dioxide (CO_2).

Note.— CO_2 is not considered a pollutant but its concentration is required for calculation and check purposes.

d) Oxides of nitrogen (NO_x): an estimate of the sum of the two oxides, nitric oxide (NO) and nitrogen dioxide (NO_2).

e) Nitric oxide (NO).

3.2 Other information

In order to normalize the emissions measurement data and to quantify the engine test characteristics, other information in addition to the requirements of Chapter 3, 3.4 shall be provided as follows:

- — inlet temperature;
- — inlet humidity;
- — atmospheric pressure;
- — wind vectors relative to engine exhaust axis;
- — hydrogen/carbon ratio of fuel;
- — engine installation details;
- — other required engine parameters (for example, thrust, rotor speeds, turbine temperatures);
- — pollutant concentration data and statistical validation parameters.

This data shall be obtained either by direct measurement or by calculation, as presented in Attachment F to this appendix.

4. GENERAL ARRANGEMENT OF THE SYSTEM

Owing to the reactive nature of the exhaust plume from engines using afterburning, it is necessary to ensure that the measured emissions do in fact correspond to those actually emitted into the surrounding atmosphere. This is achieved by sampling the plume sufficiently far downstream from the engine that the exhaust gases have cooled to a temperature where reactions have ceased. No desiccants, dryers, water traps or related equipment shall be used to treat the exhaust sample flowing to the oxides of nitrogen and the hydrocarbon analysis instrumentation. Requirements for the various component sub-systems are given in 5, but the following list gives some qualifications and variations:

a) it is assumed that each of the various individual sub-systems includes the necessary flow control, conditioning and measurement facilities;

b) the necessity for a dump and/or a hot-sample pump will depend on the ability to meet the sample transfer time and analysis sub-system sample flow rate requirements. This in turn depends on the exhaust sample-driving pressure and line losses. It is considered that these pumps usually will be necessary at certain engine running conditions; and

c) the position of the hot pump, relative to the gas analysis sub-systems, may be varied as required. (For example, some HC analysers contain hot pumps and so may be judged capable of being used upstream of the system hot pump.)

Note.— Figures 5-1 and 5-2 are schematic drawings of the exhaust gas sampling and analytical system and typify the basic requirements for emissions testing.

5. DESCRIPTION OF COMPONENT PARTS

Note.— A general description and specification of the principal elements in the engine exhaust emissions measurement system follows. Greater detail, where necessary, will be found in Attachments A, B and C to this appendix.

5.1 Sampling system

5.1.1 Sampling probe

a) The probe shall be constructed so that individual samples can be withdrawn at various locations across a diameter of the plume. Mixed samples shall not be permitted.

b) The material with which the sample is in contact shall be stainless steel and its temperature shall be maintained at a value not less than 60°C.

c) The sampling plane shall be perpendicular to the projected engine nozzle centre line, and shall be situated as close as possible to a position 18 nozzle diameters from the nozzle exit plane, consistent with 7.1.2, but in no case greater than 25 nozzle diameters. The nozzle exit diameter shall be for the maximum engine power condition. Between and including exit and sampling planes there shall be an unobstructed region of at least 4 nozzle exit diameters in radial distance about the project engine nozzle centre line.

d) The minimum number of sampling points shall be equal to 11. The measurement plane, located at a distance *X* from the engine shall be divided into three sections demarcated by circles centred around the exhaust stream axis with radii

R1 = 0.05*X*
R2 = 0.09*X*

and a minimum of 3 samples shall be taken from each section. The difference between the number of samples in each section must be less than 3. The sample taken at the most remote distance from the axis shall be from a point located at a radius of between 0.11*X* and 0.16*X*.

5.1.2 Sampling lines

The sample shall be transferred from the probe to the analysers via a line of 4.0 to 8.5 mm inside diameter, taking the shortest route practicable and using a flow rate such that the transport time is less than 10 seconds. The line shall be maintained at a temperature of 160°C ±15°C (with a stability of ±10°C). When sampling to measure HC, CO, CO_2 and NO_x components, the line shall be constructed in stainless steel or carbon-loaded grounded PTFE.

5.2 HC analyser

The measurement of total hydrocarbon sample content shall be made by an analyser using the heated flame ionization detector (FID), between the electrodes of which passes an ionization current proportional to the mass rate of hydrocarbon entering a hydrogen flame. The analyser shall be deemed to include components arranged to control temperature and flow rates of sample, sample bypass, fuel and diluent gases, and to enable effective span and zero calibration checks.

Note.— An over-all specification is given in Attachment A to this appendix.

5.3 CO and CO_2 analysers

Non-dispersive infra-red analysers shall be used for the measurement of these components, and shall be of the design which utilizes differential energy absorption in parallel reference and sample gas cells, the cell or group of cells for each of these gas constituents being sensitized appropriately. This analysis sub-system shall include all necessary functions for the control and handling of sample, zero and span gas flows. Temperature control shall be that appropriate to whichever basis of measurement, wet or dry, is chosen.

Note.— An over-all specification is given in Attachment B to this appendix.

5.4 NO_x analyser

The measurement of NO concentration shall be by the chemiluminescent method in which the measure of the radiation intensity emitted during the reaction of the NO in the sample with added O_3 is the measure of the NO concentration. The NO_2 component shall be converted to NO in a converter of the requisite efficiency prior to measurement. The resultant NO_x measurement system shall include all necessary flow, temperature and other controls and provide for routine zero and span calibration as well as for converter efficiency checks.

Note.— An over-all specification is given in Attachment C to this appendix.

6. GENERAL TEST PROCEDURES

6.1 Engine operation

The engine shall be operated on an open air static test facility which is suitable and properly equipped for high accuracy performance testing, and which conforms to the requirements for sampling probe installation as specified in 5.1. The emissions tests shall be made at the power settings prescribed by the certificating authority. The engine shall be stabilized at each setting.

6.2 Ambient air conditions

6.2.1 A check shall be made on the ambient concentrations of CO, HC, CO_2 and NO_x, with the engine under test running at the test condition. Unusually high concentrations indicate abnormal conditions such as exhaust gas recirculation, fuel spillage or some other source of unwanted emissions in the test area and such situations shall be rectified or avoided as appropriate.

Note.— For guidance, the normal ambient concentration of CO_2 is 0.03 per cent, and ambient concentration levels for CO and HC of 5 ppm and NO_x of 0.5 ppm are unlikely to be exceeded under normal conditions.

6.2.2 Extreme climatic conditions, such a those involving precipitation or excessive wind speed shall also be avoided.

6.3 Major instrument calibration

Note.— The general objective of this calibration is to confirm stability and linearity.

6.3.1 The applicant shall satisfy the certificating authority that the calibration of the analytical system is valid at the time of the test.

6.3.2 For the hydrocarbon analyser this calibration shall include checks that the detector oxygen and differential hydrocarbon responses are within the limits specified in Attachment A to this appendix. The efficiency of the NO_2/NO converter shall also be checked and verified to meet the requirements in Attachment C to this appendix.

6.3.3 The procedure for checking the performance of each analyser shall be as follows (using the calibration and test gases as specified in Attachment D to this appendix):

a) introduce zero gas and adjust instrument zero, recording setting as appropriate;

b) for each range to be used operationally, introduce calibration gas of (nominally) 90 per cent range full-scale deflection (FSD) concentration; adjust instrument gain accordingly and record its setting;

c) introduce approximately 30 per cent, 60 per cent, and 90 per cent range FSD concentrations and record analyser readings;

d) fit a least squares straight line to the zero, 30 per cent, 60 per cent and 90 per cent concentration points. For the CO and/or CO_2 analyser used in its basic form without linearization of output, a least squares curve of appropriate mathematical formulation shall be fitted using additional calibration points if judged necessary. If any point deviates by more than 2 per cent of the full scale value (or ±1 ppm*, whichever is greater) then a calibration curve shall be prepared for operational use.

6.4 Operation

6.4.1 No measurements shall be made until all instruments and sample transfer lines are warmed up and stable and the following checks have been carried out:

a) leakage check: prior to a series of tests the system shall be checked for leakage by isolating the probe and the analysers, connecting and operating a vacuum pump of equivalent performance to that used in the smoke measurement system to verify that the system leakage flow rate is less than 0.4 L/min referred to normal temperature and pressure;

b) cleanliness check: isolate the gas sampling system from the probe and connect the end of the sampling line to a source of zero gas. Warm the system up to the operational temperature needed to perform hydrocarbon measurements. Operate the sample flow pump and set the flow rate to that used during engine emission testing. Record the hydrocarbon analyser reading. The reading shall not exceed 1 per cent of the engine idle emission level or 1 ppm (both expressed as methane), whichever is the greater.

Note 1.— It is good practice to back-purge the sampling lines during engine running, while the probe is in the engine exhaust but emissions are not being measured, to ensure that no significant contamination occurs.

Note. 2.— It is also good practice to monitor the inlet air quality at the start and end of testing and at least once per hour during a test. If levels are considered significant, then they should be taken into account.

6.4.2 The following procedure shall be adopted for operational measurements:

a) apply appropriate zero gas and make any necessary instrument adjustments;

b) apply appropriate calibration gas at a nominal 90 per cent FSD concentration for the ranges to be used, adjust and record gain settings accordingly;

c) when the engine has been stabilized at the requisite operating conditions and sampling location, continue to run it and observe pollutant concentrations until a stabilized reading is obtained, which shall be recorded. At the same engine operating condition repeat the measurement procedure for each of the remaining sampling locations;

d) recheck zero and calibration points at the end of the test and also at intervals not greater than 1 hour during tests. If either has changed by more than ±2 per cent of full scale of range, the test shall be repeated after restoration of the instrument to within its specification.

7. CALCULATIONS

7.1 Gaseous emissions

7.1.1 General

The analytical measurements made shall be the concentrations of the various classes of pollutant, at the relevant afterburning mode(s) of the engine, at the various locations in the sampling plane. In addition to the recording of these basic parameters, other parameters shall be computed and reported, as follows.

* Except for the CO_2 analyser, for which the value shall be ±100 ppm.

7.1.2 Analysis and validation of measurements

a) At each engine setting, the concentrations measured at different probe sampling positions must be averaged as follows:

$$C_{i\ moy} = \sum_{j=1}^{n} C_{i\ j}$$

where

$\sum_{j=1}^{n}$	Summation of the total number n of sampling positions used.
C_{ij}	Concentration of species i measured at the jth sampling position.
$C_{i\ moy}$	average or mean concentration of species i.

All dry concentration measurements shall be converted into real wet concentrations. (*See* Attachment E to this appendix).

b) The quality of the measurements for each pollutant will be determined through a comparison with measurements of CO_2 using the correlation coefficient:

$$r_i = \frac{n \sum_{j=1}^{n} C_{ij}CO_{2\ j} - \sum_{j=1}^{n} C_{ij} \sum_{j=1}^{n} CO_{2j}}{\sqrt{\left(\left\{n \sum_{j=1}^{n} (CO_{2j})^2 - \left(\sum_{j=1}^{n} CO_{2j}\right)^2\right\} \left\{n \sum_{j=1}^{n} C_{ij}2 - \left(\sum_{j=1}^{n} C_{ij}\right)^2\right\}\right)}}$$

Values of r_i which are near to 1 indicate that measurements taken over the entire sampling period are sufficiently stable and that the curves are gaussian. In the event that r_i is less than 0.95, measurements must be repeated in a sampling plane located at a more remote distance from the aircraft engine. The measurement process, per se, is then followed by the same calculations and the same demonstration as previously.

7.1.3 Basic parameters

For the measurements at each engine operating mode the average concentration for each gaseous species is estimated as shown in 7.1.2, any necessary corrections for dry sample measurement and/or interferences having been made as indicated in Attachment E to this appendix. These average concentrations are used to compute the following basic parameters:

$$\text{EI}_p \text{ (emission index for component } p) = \frac{\text{mass of } p \text{ produced in g}}{\text{mass of fuel used in kg}}$$

$$\text{EI(CO)} = \left(\frac{[CO]}{[CO_2] + [CO] + [HC]}\right)\left(\frac{10^3 M_{CO}}{M_C + (n/m)M_H}\right)\left(1 + T(P_0/m)\right)$$

$$\text{EI(HC)} = \left(\frac{[HC]}{[CO_2] + [CO] + [HC]}\right)\left(\frac{10^3 M_{HC}}{M_C + (n/m)M_H}\right)\left(1 + T(P_0/m)\right)$$

$$\text{EI}(NO_x) \text{ (as } NO_2) = \left(\frac{[NO_x]}{[CO_2] + [CO] + [HC]}\right)\left(\frac{10^3 M_{NO_2}}{M_C + (n/m)M_H}\right)\left(1 + T(P_0/m)\right)$$

$$\text{Air/fuel ratio} = \left(P_0/m\right)\left(\frac{M_{AIR}}{M_C + (n/m)M_H}\right)$$

where

$$P_0/m = \frac{2Z - (n/m)}{4\left(1 + h - |TZ/2|\right)}$$

and

$$Z = \frac{2 - [CO] - \left(|2/x| - |y/2x|\right)\ [HC\} + [NO_2]}{[CO_2] + [CO] + [HC]}$$

M_{AIR}	molecular mass of dry air = 28.966 g or, where appropriate, = (32 R + 28.156 4 S + 44.011 T) g
M_{HC}	molecular mass of exhaust hydrocarbons, taken as CH_4 = 16.043 g
M_{CO}	molecular mass of CO = 28.011 g
M_{NO_2}	molecular mass of NO_2 = 46.088 g
M_C	atomic mass of carbon = 12.011 g
M_H	atomic mass of hydrogen = 1.008 g
R	concentration of O_2 in dry air, by volume = 0.209 5 normally
S	concentration of N_2 + rare gases in dry air, by volume = 0.709 2 normally
T	concentration of CO_2 in dry air, by volume = 0.000 3 normally
[HC]	mean concentration of exhaust hydrocarbons vol/vol, wet, expressed as carbon
[CO]	mean concentration of CO vol/vol, wet
[CO_2]	mean concentration of CO_2 vol/vol, wet
[NO_x]	mean concentration of NO_x vol/vol, wet = [NO + NO_2]
[NO]	mean concentration of NO in exhaust sample, vol/vol, wet

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$[NO_2]$ mean concentration of NO_2 in exhaust sample, vol/vol, wet

$$= \frac{[NO_x]_c - [NO]}{\xi}$$

$[NO_x]_c$ mean concentration of NO in exhaust sample after passing through the NO_2/NO converter, vol/vol, wet

ξ efficiency of NO_2/NO converter

h humidity of ambient air, vol water/vol dry air

m number of C atoms in characteristic fuel molecule

n number of H atoms in characteristic fuel molecule

x number of C atoms in characteristic exhaust hydrocarbon molecule

y number of H atoms in characteristic exhaust hydrocarbon molecule

The value of *n/m*, the ratio of the atomic hydrogen to atomic carbon of fuel used, is evaluated by fuel type analysis. The ambient air humidity, *h,* shall be measured at each set condition. In the absence of contrary evidence as to the characterization (*x,y*) of the exhaust hydrocarbons, the values $x = 1$, $y = 4$ are to be used. If dry or semi-dry CO and CO_2 measurements are to be used then these shall first be converted to the equivalent wet concentrations as shown in Attachment E to this appendix, which also contains interference correction formulas for use as required.

Note.— The procedure given in 7.1.4 and 7.2 is only applicable to tests made when afterburning is not used. For tests when afterburning is used, a similar procedure could be used after approval by the certificating authority.

7.1.4 Correction of emission indices to reference conditions

Corrections shall be made to the measured engine emission indices for all pollutants in all relevant engine operating modes to account for deviations from the reference conditions (ISA at sea level) of the actual test inlet air conditions of temperature and pressure. The reference value for humidity shall be 0.00634 kg water/kg dry air.

Thus, EI corrected = $K \times$ EI measured,

where the generalized expression for K is:

$$K = (P_{Bref}/P_B)^a \cdot (FAR_{ref}/FAR_B)^b \cdot \exp(|T_{Bref} - T_B|/c) \cdot \exp(d|h - 0.00634|)$$

P_B Combustor inlet pressure, measured

T_B Combustor inlet temperature, measured

FAR_B Fuel/air ratio in the combustor

h Ambient air humidity

P_{ref} ISA sea level pressure

T_{ref} ISA sea level temperature

P_{Bref} Pressure at the combustor inlet of the engine tested (or the reference engine if the data is corrected to a reference engine) associated with T_B under ISA sea level conditions.

T_{Bref} Temperature at the combustor inlet under ISA sea level conditions for the engine tested (or the reference engine if the data is to be corrected to a reference engine). This temperature is the temperature associated with each thrust level specified for each mode.

FAR_{ref} Fuel/air ratio in the combustor under ISA sea level conditions for the engine tested (or the reference engine if the data is to be corrected to a reference engine).

a,b,c,d Specific constants which may vary for each pollutant and each engine type.

The combustor inlet parameters shall preferably be measured but may be calculated from ambient conditions by appropriate formulas.

7.1.5 Using the recommended curve fitting technique to relate emission indices to combustor inlet temperature effectively eliminates the exp ($|T_{Bref} - T_B|/c$) term from the generalized equation and for most cases the (FAR_{ref}/FAR_B) term may be considered unity. For the emissions indices of CO and HC many testing facilities have determined that the humidity term is sufficiently close to unity to be eliminated from the expression and that the exponent of the (P_{Bref}/P_B) term is close to unity.

Thus,

EI(CO) corrected = EI derived from
(P_B/P_{Bref}) · EI(CO) v. T_B curve

EI(HC) corrected = EI derived from
(P_B/P_{Bref}) · EI(HC) v. T_B curve

$EI(NO_x)$ corrected = EI derived from
$EI(NO_x)$ $(P_{B\text{ref}} / P_B)^{0.5}$ exp $(19 \mid h - 0.00634 \mid)$ v. T_B curve

If this recommended method for the CO and HC emissions index correction does not provide a satisfactory correlation, an alternative method using parameters derived from component tests may be used.

Any other methods used for making corrections to CO, HC and NO_x emissions indices shall have the approval of the certificating authority.

7.2 Control parameter functions (D_p, F_{oo}, ϕ)

7.2.1 Definitions

D_p The mass of any gaseous pollutant emitted during the reference emissions landing and take-off cycle.

F_{oo} The maximum thrust available for take-off under normal operating conditions at ISA sea level static conditions, without the use of water injection, as approved by the applicable certificating authority.

ϕ The ratio of the mean total pressure at the last compressor discharge plane of the compressor to the mean total pressure at the compressor entry plane when the engine is developing take-off thrust rating at ISA sea level static conditions.

7.2.2 The emission indices (EI) for each pollutant, corrected for pressure and humidity (as appropriate) to the reference ambient atmospheric conditions as indicated in 7.1.4 and if necessary to the reference engine, shall be obtained for the required LTO engine operating mode settings (n) of idle, approach, climb-out and take-off, at each of the equivalent corrected thrust conditions. A minimum of three test points shall be required to define the idle mode. The following relationships shall be determined for each pollutant:

a) between EI and T_B ; and

b) between W_f (engine fuel mass flow rate) and T_B ; and

c) between F_n (corrected to ISA sea level conditions) and T_B (corrected to ISA sea level conditions);

Note.— These are illustrated, for example, by Figure 5-3 a), b) and c).

When the engine being tested is not a "reference" engine, the data may be corrected to "reference" engine conditions using the relationships b) and c) obtained from a reference engine. A reference engine is defined as an engine substantially configured to the description of the engine to be certificated and accepted by the certificating authority to be representative of the engine type for which certification is sought.

The manufacturer shall also supply to the certificating authority all of the necessary engine performance data to substantiate these relationships and for ISA sea level ambient conditions:

d) maximum rated thrust (F_{oo}); and

e) engine pressure ratio (ϕ) at maximum rated thrust.

Note.— These are illustrated by Figure 5-3 d).

7.2.3 The estimation of EI for each pollutant at each of the required engine mode settings, corrected to the reference ambient conditions, shall comply with the following general procedure:

a) at each mode ISA thrust condition F_n, determine the equivalent combustor inlet temperature (T_B) (Figure 5-3 c));

b) from the EI/T_B characteristic (Figure 5-3 a)), determine the EI_n value corresponding to T_B;

c) from the W_f /T_B characteristics (Figure 5-3 b)), determine the W_{f_n} value corresponding to TB;

d) note the ISA maximum rated thrust and pressure ratio values. These are F_{oo} and ϕ respectively (Figure 5-3 d));

e) calculate, for each pollutant Dp = O (EI_n) (W_{f_n}) (t) where:

t time in LTO mode (minutes)

W_{f_n} fuel mass flow rate (kg/min)

O is the summation for the set of modes comprising the reference LTO cycle.

7.2.4 While the methodology described above is the recommended method, the certificating authority may accept equivalent mathematical procedures which utilize mathematical expressions representing the curves illustrated if the expressions have been derived using an accepted curve fitting technique.

7.3 Exceptions to the proposed procedures

In those cases where the configuration of the engine or other extenuating conditions exist which would prohibit the use of this procedure, the certificating authority, after receiving satisfactory technical evidence of equivalent results obtained by an alternative procedure, may approve an alternative procedure.

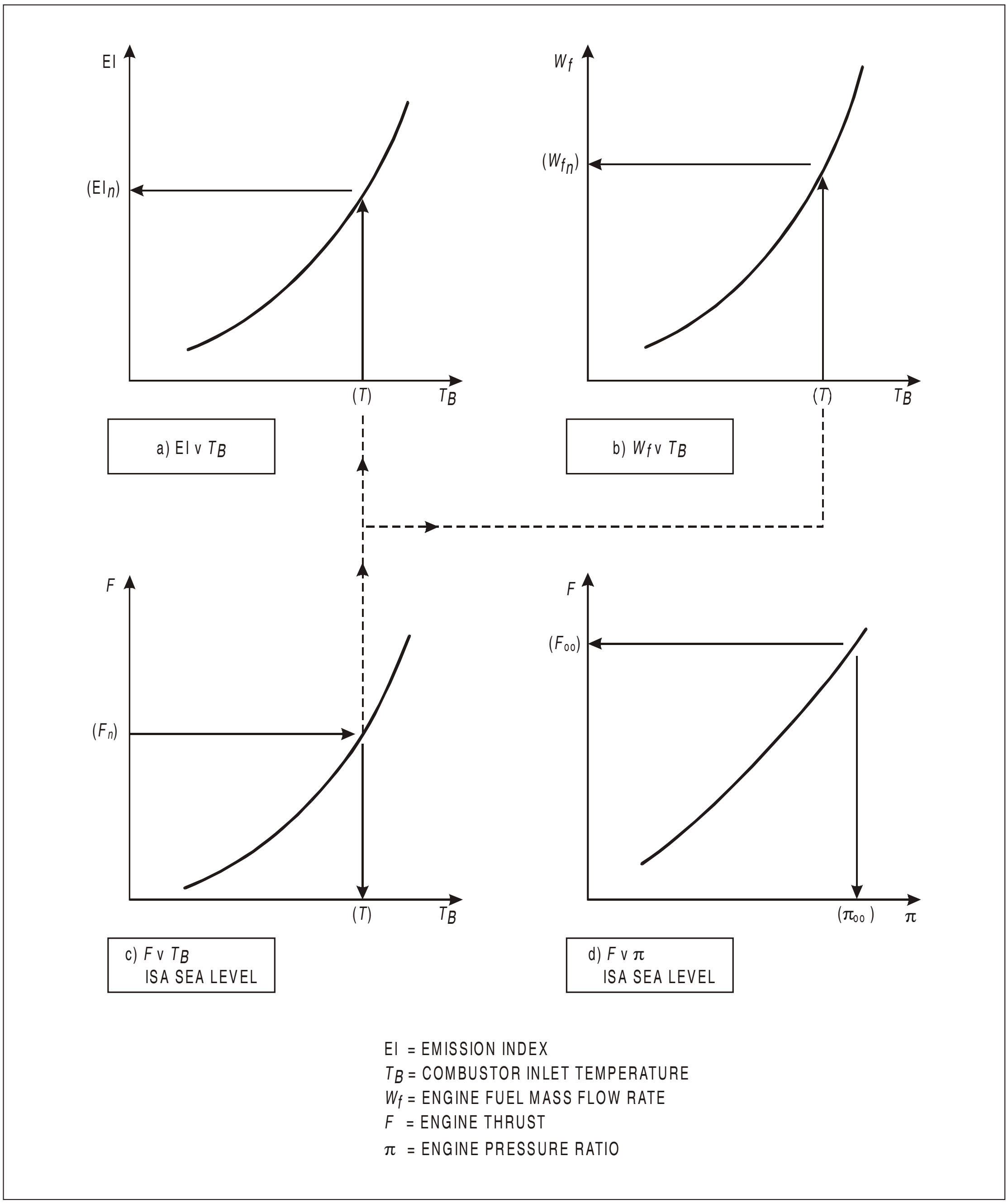

Figure 5-3. Calculation procedure

ATTACHMENT A TO APPENDIX 5. SPECIFICATION FOR HC ANALYSER

Note 1.— As outlined in 5.2 of Appendix 5, the measuring element in this analyser is the flame ionization detector (FID) in which the whole or a representative portion of the sample flow is admitted into a hydrogen-fuelled flame. With suitably positioned electrodes an ionization current can be established which is a function of the mass rate of hydrocarbon entering the flame. It is this current which, referred to an appropriate zero, is amplified and ranged to provide the output response as a measure of the hydrocarbon concentration expressed as ppmC equivalent.

Note 2.— See Attachment D for information on calibration and test gases.

1. GENERAL

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

The instrument to be used shall be such as to maintain the temperature of the detector and sample-handling components at a set point temperature within the range 155°C to 165°C to a stability of ±2°C. The leading specification points shall be as follows, the detector response having been optimized and the instrument generally having stabilized:

a) *Total range:* 0 to 500 ppmC in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 0.5 ppmC, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±0.5 ppmC, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±1 ppmC, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±0.5 ppmC, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±0.5 ppmC, whichever is greater.

g) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system, to the achievement of 90 per cent of the final reading.

h) *Linearity:* response with propane in air shall be linear for each range within ±2 per cent of full scale, otherwise calibration corrections shall be used.

2. SYNERGISTIC EFFECTS

Note.— In application there are two aspects of performance which can affect the accuracy of measurement:

a) the oxygen effect (whereby differing proportions of oxygen present in the sample give differing indicated hydrocarbon concentration for constant actual HC concentrations); and

b) the relative hydrocarbon response (whereby there is a different response to the same sample hydrocarbon concentrations expressed as equivalent ppmC, dependent on the class or admixture of classes of hydrocarbon compounds).

The magnitude of the effects noted above shall be determined as follows and limited accordingly.

Oxygen response: measure the response with two blends of propane, at approximately 500 ppmC concentration known to a relative accuracy of ±1 per cent, as follows:

1) propane in 10 ± 1 per cent O_2, balance N_2

2) propane in 21 ± 1 per cent O_2, balance N_2

If R_1 and R_2 are the respective normalized responses then $(R_1 - R_2)$ shall be less than 3 per cent of R_1.

Differential hydrocarbon response: measure the response with four blends of different hydrocarbons in air, at concentrations of approximately 500 ppmC, known to a relative accuracy of ±1 per cent, as follows:

a) propane in zero air

b) propylene in zero air

c) toluene in zero air

d) n-hexane in zero air.

If R_a, R_b, R_c and R_d are, respectively, the normalized responses (with respect to propane), then ($R_a - R_b$), ($R_a - R_c$) and ($R_a - R_d$) shall each be less than 5 per cent of R_a.

3. OPTIMIZATION OF DETECTOR RESPONSE AND ALIGNMENT

3.1 The manufacturer's instructions for initial setting up procedures and ancillary services and supplies required shall be implemented, and the instrument allowed to stabilize. All setting adjustments shall involve iterative zero checking, and correction as necessary. Using as sample a mixture of approximately 500 ppmC of propane in air, the response characteristics for variations first in fuel flow and then, near an optimum fuel flow, for variations in dilution air flow to select its optimum shall be determined. The oxygen and differential hydrocarbon responses shall then be determined as indicated above.

3.2 The linearity of each analyser range shall be checked by applying propane in air samples at concentrations of approximately 30, 60 and 90 per cent of full scale. The maximum response deviation of any of these points from a least squares straight line (fitted to the points and zero) shall not exceed ±2 per cent of full scale value. If it does, a calibration curve shall be prepared for operational use.

ATTACHMENT B TO APPENDIX 5. SPECIFICATION FOR CO AND CO_2 ANALYSERS

Note 1.– Paragraph 5.3 of Appendix 5 summarizes the characteristics of the analysis sub-system to be employed for the individual measurements of CO and CO_2 *concentrations in the exhaust gas sample. The instruments are based on the principle of non-dispersive absorption of infra-red radiation in parallel reference and sample gas cells. The required ranges of sensitivity are obtained by use of stacked sample cells or changes in electronic circuitry or both. Interferences from gases with overlapping absorption bands may be minimized by gas absorption filters and/or optical filters, preferably the latter.*

Note 2.— See Attachment D for information on calibration and test gases.

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

The principal performance specification shall be as follows:

CO Analyser

a) *Total range:* 0 to 2 500 ppm in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 1 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±2 ppm, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±2 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±2 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±1 ppm, whichever is greater.

g) *Interferences:* to be limited with respect to indicated CO concentration as follows:

1) less than 500 ppm/per cent ethylene concentration

2) less than 2 ppm/per cent CO_2 concentration

3) less than 2 ppm/per cent water vapour.*

If the interference limitation(s) for CO_2 and/or water vapour cannot be met, appropriate correction factors shall be determined, reported and applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

CO_2 Analyser

a) *Total range:* 0 to 10 per cent in appropriate ranges.

* Need not apply where measurements are on a "dry" basis.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 100 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±100 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1 per cent of full scale of range used or ±100 ppm, whichever is greater.

g) The effect of oxygen (O_2) on the CO_2 analyser response shall be checked. For a change from 0 per cent O_2 to 21 per cent O_2 the response of a given CO_2 concentration shall not change by more than 2 per cent of reading. If this limit cannot be met an appropriate correction factor shall be applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

CO and CO_2 Analysers

a) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system, to the achievement of 90 per cent of the final reading.

b) *Sample temperature:* the normal mode of operation is for analysis of the sample in its (untreated) "wet" condition. This requires that the sample cell and all other components in contact with the sample in this subsystem be maintained at a temperature of not less than 50°C, with a stability of ±2°C. The option to measure CO and CO_2 on a dry basis (with suitable water traps) is allowed, in which case unheated analysers are permissible and the interference limits for H_2O vapour removed, and subsequent correction for inlet water vapour and water of combustion is required.

c) *Calibration curves:*

i) Analysers with a linear signal output characteristic shall be checked on all working ranges using calibration gases at known concentrations of approximately 0, 30, 60 and 90 per cent of full scale. The maximum response deviation of any of these points from a least squares straight line, fitted to the points and the zero reading, shall not exceed ±2 per cent of the full scale value. If it does then a calibration curve shall be prepared for operational use.

ii) Analysers with a non-linear signal output characteristic, and those that do not meet the requirements of linearity given above, shall have calibration curves prepared for all working ranges using calibration gases at known concentrations of approximately 0, 30, 60 and 90 per cent of full scale. Additional mixes shall be used, if necessary, to define the curve shape properly.

ATTACHMENT C TO APPENDIX 5. SPECIFICATION FOR NO_x ANALYSER

Note.— See Attachment D for information on calibration and test gases.

1. As indicated in 5.4 of Appendix 5, the measurement of the oxides of nitrogen concentration shall be by the chemiluminescent technique in which radiation emitted by the reaction of NO and O_3 is measured. This method is not sensitive to NO_2 and therefore the sample shall be passed through a converter in which NO_2 is converted to NO before the measurement of total NO_x is made. Both the original NO and the total NO_x concentrations shall be recorded. Thus by difference, a measure of the NO_2 concentration shall be obtained.

2. The instrument to be used shall be complete with all necessary flow control components, such as regulators, valves, flowmeters, etc. Materials in contact with the sample gas shall be restricted to those which are resistant to attack by oxides of nitrogen, such as stainless steel, glass, etc. The temperature of the sample shall everywhere be maintained at values, consistent with the local pressures, which avoid condensation of water.

Precautions: The performance specifications indicated are generally for analyser full scale. Errors at part scale may be a significantly greater percentage of reading. The relevance and importance of such increases shall be considered when preparing to make measurements. If better performance is necessary, then appropriate precautions shall be taken.

3. The principal performance specification, determined for the instrument operated in an ambient temperature stable to within 2°C, shall be as follows:

a) *Total range:* 0 to 2 500 ppm in appropriate ranges.

b) *Resolution:* better than 0.5 per cent of full scale of range used or 1 ppm, whichever is greater.

c) *Repeatability:* better than ±1 per cent of full scale of range used, or ±1 ppm, whichever is greater.

d) *Stability:* better than ±2 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 1 hour.

e) *Zero drift:* less than ±1 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 1 hour.

f) *Noise:* 0.5 Hz and greater, less than ±1.0 per cent of full scale of range used or ±1 ppm, whichever is greater, in a period of 2 hours.

g) *Interference:* suppression for samples containing CO_2 and water vapour, shall be limited as follows:

— less than 0.05 per cent reading/per cent CO_2 concentration;

— less than 0.1 per cent reading/per cent water vapour concentration.

If the interference limitation(s) for CO_2 and/or water vapour cannot be met, appropriate correction factors shall be determined, reported and applied.

Note.— It is recommended as consistent with good practice that such correction procedures be adopted in all cases.

h) *Response time:* shall not exceed 10 seconds from inlet of the sample to the analysis system to the achievement of 90 per cent of the final reading.

i) *Linearity:* better than ±2 per cent of full scale of range used or ±2 ppm, whichever is greater.

j) *Converter:* this shall be designed and operated in such a matter as to reduce NO_2 present in the sample to NO. The converter shall not affect the NO originally in the sample.

The converter efficiency shall not be less than 90 per cent.

This efficiency value shall be used to correct the measured sample NO_2 value (i.e. $[NO_x]_c$ – [NO]) to that which would have been obtained if the efficiency had not been 100 per cent.

ATTACHMENT D TO APPENDIX 5. CALIBRATION AND TEST GASES

Table of calibration gases

Analyser	*Gas*	*Accuracy**
HC	propane in zero air	±2 per cent or ±0.05 ppm**
CO_2	CO_2 in zero air	±2 per cent or ±100 ppm**
CO	CO in zero air	±2 per cent or ±2 ppm**
NO_x	NO_x in zero nitrogen	±2 per cent or ±1 ppm**

* Taken over the 95 per cent confidence interval.
** Whichever is greater.

The above gases are required to carry out the routine calibration of analysers during normal operational use.

Table of test gases

Analyser	*Gas*	*Accuracy**
HC	propane in 10 ±1 per cent O_2 balance zero nitrogen	±1 per cent
HC	propane in 21 ±1 per cent O_2 balance zero nitrogen	±1 per cent
HC	propylene in zero air	±1 per cent
HC	toluene in zero air	±1 per cent
HC	n-hexane in zero air	±1 per cent
HC	propane in zero air	±1 per cent
CO_2	CO_2 in zero air	±1 per cent
CO_2	CO_2 in zero nitrogen	±1 per cent
CO	CO in zero air	±1 per cent
NO_x	NO in zero nitrogen	±1 per cent

* Taken over the 95 per cent confidence interval.

The above gases are required to carry out the tests of Attachments A, B and C.

Carbon monoxide and carbon dioxide calibration gases may be blended singly or as dual component mixtures. Three component mixtures of carbon monoxide, carbon dioxide and propane in zero air may be used, provided the stability of the mixture is assured.

Zero gas as specified for the CO, CO_2 and HC analysers shall be zero air (which includes "artificial" air with 20 to 22 per cent O_2 blended with N_2). For the NO_x analyser zero nitrogen shall be used as the zero gas. Impurities in both kinds of zero gas shall be restricted to be less than the following concentrations:

1 ppm C
1 ppm CO
100 ppm CO_2
1 ppm NO_x

The applicant shall ensure that commercial gases supplied to him do in fact meet this specification, or are so specified by the vendor.

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ATTACHMENT E TO APPENDIX 5. THE CALCULATION OF THE EMISSIONS PARAMETERS — BASIS, MEASUREMENT CORRECTIONS AND ALTERNATIVE NUMERICAL METHOD

1. SYMBOLS

AFR	air/fuel ratio; the ratio of the mass flow rate of dry air to that of the fuel
EI	emission index; 10^3 × mass flow rate of gaseous emission product in exhaust per unit mass flow rate of fuel
K	ratio of concentration measured wet to that measured dry (after cold trap)
L, L'	analyser interference coefficient for interference by CO_2
M, M'	analyser interference coefficient for interference by H_2O
M_{AIR}	molecular mass of dry air = 28.966 g or, where appropriate, = (32 R + 28.156 4 S + 44.011 T) g
M_{CO}	molecular mass of CO = 28.011 g
M_{HC}	molecular mass of exhaust hydrocarbon, taken as CH_4 = 16.043 g
M_{NO_2}	molecular mass of NO_2 = 46.008 g
M_C	atomic mass of carbon = 12.011 g
M_H	atomic mass of hydrogen = 1.008 g
P_1	number of moles of CO_2 in the exhaust sample per mole of fuel
P_2	number of moles of N_2 in the exhaust sample per mole of fuel
P_3	number of moles of O_2 in the exhaust sample per mole of fuel
P_4	number of moles of H_2O in the exhaust sample per mole of fuel
P_5	number of moles of CO in the exhaust sample per mole of fuel
P_6	number of moles of C_xH_y in the exhaust sample per mole of fuel
P_7	number of moles of NO_2 in the exhaust sample per mole of fuel
P_8	number of moles of NO in the exhaust sample per mole of fuel
P_T	$P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8$
R	concentration of O_2 in dry air, by volume = 0.2095 normally
S	concentration of N_2 + rare gases in dry air, by volume = 0.7902 normally
T	concentration of CO_2 in dry air, by volume = 0.0003 normally
P_0	number of moles of air per mole of fuel in initial air/fuel mixture
Z	symbol used and defined in 3.4
$[CO_2]$	mean concentration of CO_2 in exhaust sample, vol/vol
[CO]	mean concentration of CO in exhaust sample, vol/vol
[HC]	mean concentration of HC in exhaust sample, vol/vol
[NO]	mean concentration of NO in exhaust sample, vol/vol
$[NO_2]$	mean concentration of NO_2 in exhaust sample, vol/vol
$[NO_x]$	mean concentration of NO and NO_2 in exhaust sample, vol/vol
$[NO_x]_c$	mean concentration of NO in exhaust sample, after passing through the NO_2/NO converter, vol/vol
$[NO_2]$	mean = $\dfrac{([NO_x]_c - [NO])}{\eta}$
$[\ ]_d$	mean concentration in exhaust sample after cold trap, vol/vol
$[\ ]_m$	mean concentration measurement indicated before instrument correction applied, vol/vol
h	humidity of ambient air, vol water/vol dry air
h_d	humidity of exhaust sample leaving “drier” or “cold trap”, vol water/vol dry sample

m	number of C atoms in characteristic fuel molecule
n	number of H atoms in characteristic fuel molecule
x	number of C atoms in characteristic exhaust hydrocarbon molecule
y	number of H atoms in characteristic exhaust hydrocarbon molecule
η	efficiency of NO_2/NO converter

2. BASIS OF CALCULATION OF EI AND AFR PARAMETERS

2.1 It is assumed that the balance between the original fuel and air mixture and the resultant state of the exhaust emissions as sampled can be represented by the following equation:

$$C_mH_n + P_0[R(O_2) + S(N_2) + T(CO_2) + h(H_2O)]$$
$$= P_1(CO_2) + P_2(N_2) + P_3(O_2) + P_4(H_2O)$$
$$+ P_5(CO) + P_6(C_xH_y) + P_7(NO_2) + P_8(NO)$$

from which the required parameters can, by definition, be expressed as

$$EI(CO) = P_5\left(\frac{10^3 M_{CO}}{mM_C + nM_H}\right)$$

$$EI(HC) = xP_6\left(\frac{10^3 M_{HC}}{mM_C + nM_H}\right) \text{ expressed as methane equivalent}$$

$$EI(NO_x) = (P_7 + P_8)\left(\frac{10^3 M_{NO_2}}{mM_C + nM_H}\right) \text{ expressed as } NO_2 \text{ equivalent}$$

$$AFR = P_0\left(\frac{M_{AIR}}{mM_C + nM_H}\right)$$

2.2 Values for fuel hydrocarbon composition (m, n) are assigned by fuel specification or analysis. If only the ratio n/m is so determined, the value $m = 12$ may be assigned. The mole fractions of the dry air constituents (R, S, T) are normally taken to be the recommended standard values but alternative values may be assigned, subject to the restriction $R + S + T = 1$ and the approval of the certificating authority.

2.3 The ambient air humidity, h, is as measured at each test condition. It is recommended that, in the absence of contrary evidence as to the characterization (x, y) of the exhaust hydrocarbon, values of $x = 1$ and $y = 4$ are assigned.

2.4 Determination of the remaining unknowns requires the solution of the following set of linear simultaneous equations, where (1) to (4) derive from the fundamental atomic conservation relationships and (5) to (9) represent the gaseous product concentration relationships.

$$m + TP_0 = P_1 + P_5 + xP_6 \quad (1)$$

$$n + 2hP_0 = 2P_4 + yP_6 \quad (2)$$

$$(2R + 2T + h)P_0 = 2P_1 + 2P_3 + P_4 + P_5 + 2P_7 + P_8 \quad (3)$$

$$2SP_0 = 2P_2 + P_7 + P_8 \quad (4)$$

$$[CO_2]\, P_T = P_1 \quad (5)$$

$$[CO]\, P_T = P_5 \quad (6)$$

$$[HC]\, P_T = xP_6 \quad (7)$$

$$[NO_x]_c P_T = \eta\, P_7 + P_8 \quad (8)$$

$$[NO]\, P_T = P_8 \quad (9)$$

$$P_T = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8 \quad (10)$$

The above set of conditional equations is for the case where all measured concentrations are true ones, that is, not subject to interference effects or to the need to correct for sample drying. In practice, interference effects are usually present to a significant degree in the CO, NO_x and NO measurements, and the option to measure CO_2 and CO on a dry or partially dry basis is often used. The necessary modifications to the relevant equations are described in 2.5 and 2.6.

2.5 The interference effects are mainly caused by the presence of CO_2 and H_2O in the sample which can affect the CO and NO_x analysers in basically different ways. The CO analyser is prone to a zero-shifting effect and the NO_x analyser to a sensitivity change, represented thus:

$$[CO] = [CP]_m + L[CO_2] + M[H_2O]$$

and

$$[NO_x]_c = [NO_x]_{cm}\,(1 + L'[CO_2] + M'[H_2O])$$

which transform into the following alternative equations to (6), (8) and (9), when interference effects require to be corrected,

$$[CO]_m P_T + LP_1 + MP_4 = P_5 \quad \text{(6A)}$$

$$[NO_x]_{cm} (P_T + L'P_1 + M'P_4) = \eta\, P_7 + P_8 \quad \text{(8A)}$$

$$[NO]_m (P_T + L'P_1 + M'P_4) = P_8 \quad \text{(9A)}$$

2.6 The option to measure CO_2 and CO concentrations on a dry or partially dry sample basis, that is, with a sample humidity reduced to h_d, requires the use of modified conditional equations as follows:

$$[CO_2]_d (P_T - P_4)(1 + h_d) = P_1 \quad \text{(5A)}$$

and

$$[CO]_d (P_T - P_4)(1 + h_d) = P_5$$

However, the CO analyser may also be subject to interference effects as described in 2.5 above and so the complete alternative CO measurement concentration equation becomes

$$[CO]_{md} (P_T - P_4)(1 + h_d) + LP_1 + Mh_d (P_T - P_4) = P_5 \quad \text{(6B)}$$

3. ANALYTICAL FORMULATIONS

3.1 General

Equations (1) to (10) can be reduced to yield the analytical formulations for the EI and AFR parameters, as given in 7.1 to this appendix. This reduction is a process of progressive elimination of the roots P_0, P_1 through P_8, P_T, making the assumptions that all concentration measurements are of the "wet" sample and do not require interference corrections or the like. In practice the option is often chosen to make the CO_2 and CO concentration measurements on a "dry" or "semi-dry" basis; also it is often found necessary to make interference corrections. Formulations for use in these various circumstances are given in 3.2, 3.3 and 3.4 below.

3.2 Equation for conversion of dry concentration measurements to wet basis

Concentration wet = K × concentration dry; that is,

$$[\ ] = K [\ ]_d$$

The following expression for K applies when CO and CO_2 are determined on a "dry" basis:

$$K = \frac{\left\{4 + (n/m)\, T + (|n/m|\, T - 2h)\left([NO_2] - (2[HC]/x)\right)\right.}{(2 + h)\left\{2 + (n/m)(1 + h_d)\left([CO_2]_d + [CO]_d\right)\right\}}$$

$$\frac{\left.+ (2 + h)\left(|y/x| - |n/m|\right)[HC]\right\}(1 + h_d)}{-\left(|n/m|\, T - 2h\right)\left(1 - |1 + h_d|[CO]_d\right)}$$

3.3 Interference corrections

The measurements of CO and/or NO_x and NO may require corrections for interference by the sample CO_2 and water concentrations before use in the above analytical equations. Such corrections can normally be expressed in the following general ways:

$$[CO] = [CO]_m + L[CO_2] + M[H_2O]$$

$$[CO]_d = [CO]_{md} + L[CO_2]_d + M\left(\frac{h_d}{1 + h_d}\right)$$

$$[NO] = [NO]_m \left(1 + L'[CO_2] + M'[H_2O]\right)$$

$$\eta[NO_2] = \left([NO_x]_{cm} - [NO]_m\right)\left(1 + L'[CO_2] + M'[H_2O]\right)$$

3.4 Equation for estimation of sample water content

Water concentration in sample

$$[H_2O] = \frac{\left(|n/2m| + h|P_0/m|\right)\left([CO_2] + [CO] + [HC]\right)}{1 + T(P_0/m)} - (y/2x)\,[HC]$$

where

$$P_0/m = \frac{2Z - (n/m)}{4\left(1 + h - |TZ/2|\right)}$$

and

$$Z = \frac{2 - [CO] - \left(|2/x| - |y/2x|\right)[HC] + [NO_2]}{[CO_2] + [CO] + [HC]}$$

It should be noted that this estimate is a function of the various analyses concentration readings, which may themselves require water interference correction. For better accuracy an iterative procedure is required in these cases with successive recalculation of the water concentration until the requisite stability is obtained. The use of the alternative, numerical solution methodology (4) avoids this difficulty.

4. ALTERNATIVE METHODOLOGY — NUMERICAL SOLUTION

4.1 As an alternative to the analytical procedures summarized in 3 above, it is possible to obtain readily the emissions indices, fuel/air ratio, corrected wet concentrations, etc., by a numerical solution of equations (1) to (10) for each set of measurements, using a digital computer.

4.2 In the equation set (1) to (10) the actual concentration measurements are substituted using whichever of the alternative equations (5A), (6A), etc. applies for the particular measuring system, to take account of interference corrections and/or dried sample measurements.

4.3 Suitable simple two-dimensional array equation-solving computer programmes are widely available and their use for this purpose is convenient and flexible, allowing ready incorporation and identification of any sample drying options and interference or other corrections.

ATTACHMENT F TO APPENDIX 5. SPECIFICATIONS FOR ADDITIONAL DATA

As required in 3.2 of Appendix 5, in addition to the measured sample constituent concentrations, the following data shall also be provided:

a) inlet temperature: measured as the total temperature at a point within one diameter of the engine intake plane to an accuracy of ±0.5°C;

b) inlet humidity (kg water/kg dry air): measured at a point within 15 m of the intake plane ahead of the engine to an accuracy of ±5 per cent of reading;

c) atmospheric pressure: measured within 1 km of the engine test location and corrected as necessary to the test stand altitude to an accuracy of ±100 Pa;

d) fuel mass flow: by direct measurement to an accuracy of ±2 per cent;

e) fuel H/C ratio: defined as *n/m*, where C_mH_n is the equivalent hydrocarbon representation of the fuel used in the test and evaluated by reference to the engine fuel type analysis;

f) engine parameters:

   1) thrust: by direct measurement to an accuracy of ±1 per cent at take-off power and ±5 per cent at the minimum thrust used in the certification test, with linear variation between these points;

   2) rotation speed(s): by direct measurement to an accuracy of at least ±0.5 per cent;

   3) gas generator airflow: determined to an accuracy of ±2 per cent by reference to engine performance calibration.

The parameters a), b), d) and f) shall be determined at each engine emissions test setting, while c) shall be determined at intervals of not less than 1 hour over a period encompassing that of the emissions tests.

APPENDIX 6. COMPLIANCE PROCEDURE FOR GASEOUS EMISSIONS AND SMOKE

1. GENERAL

The following general principles shall be followed for compliance with the regulatory levels set forth in Volume II, Part III, 2.2, 2.3, 3.2 and 3.3 of this Annex:

a) the manufacturer shall be allowed to select for certification testing any number of engines, including a single engine if so desired;

b) all the results obtained during the certification tests shall be taken into account by the certification authority;

c) a total of at least 3 engine tests shall be conducted, so that if a single engine is presented for certification it must be tested at least 3 times;

d) if a given engine is tested several times, the arithmetic mean value of the tests shall be considered to be the mean value for that engine. The certification result (X) is then the mean of the values (X_i) obtained for each engine tested;

e) the manufacturer shall provide to the certificating authority, the information specified in Volume II, Part III, 2.4 or 3.4 of this Annex as appropriate;

f) the engines submitted for testing shall have emissions features representative of the engine type for which certification is sought. However, at least one of the engines shall be substantially configured to the production standard of the engine type and have fully representative operating and performance characteristics. One of these engines shall be declared to be the reference standard engine. The methods for correcting to this reference standard engine from any other engines tested shall have the approval of the national certificating authority. The methods for correcting test results for ambient effects shall be those outlined in 7 of Appendix 3 or 7 of Appendix 5, as applicable.

2. COMPLIANCE PROCEDURES

The certificating authority shall award a certificate of compliance if the mean of the values measured and corrected (to the reference standard engine and reference ambient conditions) for all the engines tested, when converted to a characteristic level using the appropriate factor which is determined by the number of engines tested (i) as shown in the table below, does not exceed the regulatory level.

Note.— The characteristic level of the Smoke Number or gaseous pollutant emissions is the mean of the values of all the engines tested, measured and corrected to the reference standard engine and reference ambient conditions divided by the coefficient corresponding to the number of engines tested, as shown in the table below.

Number of engines tested (i)	CO	HC	NO_x	SN
1	0.814 7	0.649 3	0.862 7	0.776 9
2	0.877 7	0.768 5	0.909 4	0.852 7
3	0.924 6	0.857 2	0.944 1	0.909 1
4	0.934 7	0.876 4	0.951 6	0.921 3
5	0.941 6	0.889 4	0.956 7	0.929 6
6	0.946 7	0.899 0	0.960 5	0.935 8
7	0.950 6	0.906 5	0.963 4	0.940 5
8	0.953 8	0.912 6	0.965 8	0.944 4
9	0.956 5	0.917 6	0.967 7	0.947 6
10	0.958 7	0.921 8	0.969 4	0.950 2
more than 10	$1 - \frac{0.130\,59}{\sqrt{i}}$	$1 - \frac{0.247\,24}{\sqrt{i}}$	$1 - \frac{0.096\,78}{\sqrt{i}}$	$1 - \frac{0.157\,36}{\sqrt{i}}$

3. PROCEDURE IN THE CASE OF FAILURE

Note.— When a certification test fails, it does not necessarily mean that the engine type does not comply with the requirements, but it may mean that the confidence given to the certificating authority in compliance is not sufficiently high, i.e. less than 90 per cent. Consequently, the manufacturer should be allowed to present additional evidence of engine type compliance.

3.1 If an engine type fails a certification test, the certificating authority shall permit the manufacturer, if he so wishes, to conduct additional tests on the certification engines. If the total results available still show that the engine type fails the certification requirements, the manufacturer shall be allowed to test as many additional engines as desired. The resulting test results shall then be considered with all previous data.

3.2 If the result is still failure, the manufacturer shall be allowed to select one or more engines for modification. The results of the tests already made on the selected engine(s) while unmodified shall be inspected, and further testing shall be done so that at least three tests are available. The mean of these tests shall be determined for each engine and described as the “unmodified mean”.

3.3 The engine(s) may then be modified, and at least three tests shall be conducted on the modified engine(s), the mean of which shall be described as the “modified mean” in each case. This “modified mean” shall be compared to the “unmodified mean” to give a proportional improvement which shall then be applied to the previous certification test result to determine if compliance has been achieved. It shall be determined before testing of any modified engine is begun that the modification(s) comply with the appropriate airworthiness requirements.

3.4 This procedure shall be repeated until compliance has been demonstrated or the engine type application is withdrawn.

— END —

International Standards
and Recommended Practices

Annex 17
to the Convention on
International Civil Aviation

Security

**Safeguarding International Civil Aviation
Against Acts of Unlawful Interference**

This edition incorporates all amendments
adopted by the Council prior to 1 December 2005
and supersedes, on 1 July 2006, all previous
editions of Annex 17.

For information regarding the applicability
of the Standards and Recommended Practices,
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International Standards and Recommended Practices

Annex 17
to the Convention on International Civil Aviation

Security

Safeguarding International Civil Aviation Against Acts of Unlawful Interference

This edition incorporates all amendments adopted by the Council prior to 1 December 2005 and supersedes, on 1 July 2006, all previous editions of Annex 17.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword.

Eighth Edition
April 2006

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the *Supplements to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-11	Incorporated in this Edition		

CORRIGENDA			
No.	Date of issue	Date entered	Entered by
1	28/7/06	—	ICAO

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ATTACHMENT TO ANNEX 17

FOREWORD

Historical background

The material included in this Annex was developed by the Council pursuant to the following two resolutions of the Assembly:

Resolution A17-10: Implementation by States of Security Specifications and Practices adopted by this Assembly and further work by ICAO related to such Specifications and Practices

. . . . . .

THE ASSEMBLY:

. . . . . .

(3) REQUESTS the Council, with the assistance of the other constituent bodies of the Organization, to develop and incorporate, as appropriate, the material in the Appendices to this Resolution as Standards, Recommended Practices and Procedures in existing or new Annexes or other regulatory documents or guidance material of the Organization.

Resolution A18-10: Additional Technical Measures for the Protection of the Security of International Civil Air Transport

. . . . . .

THE ASSEMBLY:

(1) REQUESTS the Council to ensure, with respect to the technical aspects of air transportation security, that:

(a) the subject of air transportation security continues to be given adequate attention by the Secretary General, with a priority commensurate with the current threat to the security of air transportation;

. . . . . .

Following the work of the Air Navigation Commission, the Air Transport Committee and the Committee on Unlawful Interference, and as a result of the comments received from Contracting States and interested International Organizations, to whom draft material had been circulated, Standards and Recommended Practices on Security were adopted by the Council on 22 March 1974, pursuant to the provisions of Article 37 of the Convention on International Civil Aviation, and designated as Annex 17 to the Convention with the title "Standards and Recommended Practices — *Security* — Safeguarding International Civil Aviation against Acts of Unlawful Interference".

Table A shows the origin of subsequent amendments together with a list of the principal subjects involved and the dates on which the Annex and the amendments were adopted by the Council, when they became effective and when they became applicable.

Introduction

In order that a comprehensive document may be available to States for implementation of the security measures prescribed by this Annex, an Attachment hereto reproduces extracts from other Annexes, *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284), PANS-ATM and PANS-OPS bearing on the subject of action to be taken by States to prevent unlawful interference with civil aviation, or when such interference has been committed.

Guidance material

The *Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference* (Doc 8973 — Restricted) provides detailed procedures and guidance on aspects of aviation security and is intended to assist States in the implementation of their respective national civil aviation security programmes required by the specifications in the Annexes to the Convention on International Civil Aviation.

Action by Contracting States

Applicability. The provisions of the Standards and Recommended Practices in this document are to be applied by Contracting States.

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention, by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any difference previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

Contracting States are also invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendment thereto, when the notification of such differences is important for the safety of air navigation.

Attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

Promulgation of information. Information relating to the establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations provided according to the Standards and Recommended Practices specified in this Annex should be notified and take effect in accordance with Annex 15.

Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.

General information

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38 of the Convention.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interests of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note*.

Any reference to a portion of this document which is identified by a number includes all subdivisions of that portion.

Table A. Amendments to Annex 17

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
1st Edition	Council action in pursuance of Assembly Resolutions A17-10 and A18-10	—	22 March 1974 22 August 1974 27 February 1975
1	Council action in pursuance of Assembly Resolution A21-23	Change in status of 3.1.2 and 5.1.2 to a Standard; compilation and dissemination of information related to an aircraft being subjected to an act of unlawful interference.	31 March 1976 31 July 1976 30 December 1976
2	Proposals of some States and Council action in pursuance of Assembly Resolution A22-17	Transfer of specifications appearing in Chapter 9 of Annex 9 — *Facilitation* (Seventh Edition) to Annex 17; new provision in Chapter 5 concerning measures to be taken to control transfer and transit passengers and their cabin baggage; and amplification of the note to 5.2.4 (Annex 17, Chapter 5) on measures and procedures to prevent unauthorized access to specified areas on an aerodrome.	15 December 1977 15 April 1978 10 August 1978
3	Proposals of some States and the Secretariat and Council action in pursuance of Assembly Resolution A22-17	Specifications were added on the review of the level of threat by States, the development of training programmes, the isolation of security processed passengers, the inspection of aircraft for concealed weapons or other dangerous devices and the adoption of measures for the safety of passengers and crew of unlawfully diverted aircraft. A number of specifications were amplified and the status of one was changed to a Standard, related to the segregation and special guarding of aircraft liable to attack during stopovers.	13 December 1978 13 April 1979 29 November 1979
4 (2nd Edition)	Proposals of some States and an international organization and Council action in pursuance of Assembly Resolution A22-17	A specification was added on the transportation of persons in custody, and two specifications revised to provide for aircraft which were leased, chartered or interchanged. The status of a specification dealing with the safety of passengers and crew of an aircraft subjected to an act of unlawful interference was changed to a Standard; the provisions of a specification dealing with the prevention of sabotage were amplified and Chapter 1 — Applicability, deleted.	15 June 1981 15 October 1981 26 November 1981
5	Proposals of the Committee on Unlawful Interference and Council action in pursuance of Assembly Resolution A22-17	The note to Chapter 1 — Definitions was deleted. A specification setting out the action required for the transportation of weapons on board aircraft by law enforcement and other duly authorized persons was modified. A specification on the carriage of weapons in all other cases was added and the note to a specification dealing with the safeguarding of unattended aircraft was clarified.	30 November 1984 14 April 1985 21 November 1985
6 (3rd Edition)	Proposals of the Committee on Unlawful Interference with the assistance of an Ad Hoc Group of Experts — Unlawful Interference and Council action in pursuance of Assembly Resolution A22-17	On the instruction of the Council this amendment was undertaken as a matter of urgency by the Committee on Unlawful Interference with the assistance of an Ad Hoc Group of Experts on aviation security which had been appointed on the instruction of the Council. As a consequence 11 new specifications were introduced into the Annex and 19 specifications were adopted as Standards. Special effective and applicable dates for 5.1.4 are shown in the adjacent column. The Council recommended that those States that are able to implement the substance of 5.1.4 do so as soon as it is feasible and practicable before the applicable date.	19 December 1985 19 March 1986 19 May 1986 19 October 1987 19 December 1987

Amendment	*Source(s)*	*Subject(s)*	*Adopted Effective Applicable*
7 (4th Edition)	Proposals of the Committee on Unlawful Interference with the assistance of the Aviation Security Panel and Council action in pursuance of Assembly Resolution A26-7	This amendment includes: a) a reorganization of the chapters of the Annex directed at a rationalization of the sequence of objectives, obligations and necessary actions relating to organization, preventive security measures and management of response; b) the introduction of important new provisions to reflect developments and assist States in confronting new situations which arose from grave acts of unlawful interference against civil aviation, since the last revision of Annex 17 in 1985; and c) the amendment or fine tuning of existing provisions consequential to a) and b), as well as to reflect the experience gained in the implementation of such measures.	22 June 1989 30 October 1989 16 November 1989
8 (5th Edition)	Proposals of the Committee on Unlawful Interference with the assistance of the Aviation Security Panel (AVSECP) and Council action in pursuance of Assembly Resolution A27-7	This amendment includes the introduction of important new provisions in relation to the comprehensive security screening of checked baggage, security control over cargo, courier and express parcels and mail, variations to procedures relating to security programmes, pre-flight checks of international aircraft, and measures relating to the incorporation of security consideration into airport design for the purpose of assisting States in the consistent and uniform implementation of such measures.	11 September 1992 16 December 1992 1 April 1993
9 (6th Edition)	Proposals of the Committee on Unlawful Interference with the assistance of the Aviation Security Panel (AVSECP) and Council action in pursuance of Assembly Resolution A31-4	This amendment includes the introduction of new provisions in relation to the pre-employment checks and capabilities of persons engaged in implementing security controls, baggage accountability and authorization, measures to be applied to catering supplies and operators' stores and supplies, tests for programme effectiveness, and need for notification to the State of known or presumed destination of aircraft under a seized condition.	12 November 1996 31 March 1997 1 August 1997
10 (7th Edition)	Proposals of the Aviation Security Panel (AVSECP) and Council action in pursuance of Assembly Resolution A33-1	This amendment includes the introduction of various definitions and new provisions in relation to the applicability of this Annex to domestic operations, international cooperation relating to threat information, appropriate authority, National Aviation Security Committee, national quality control, access control, passengers and their cabin and hold baggage, in-flight security personnel and protection of the cockpit, code-sharing/collaborative arrangements, Human Factors and management of response to acts of unlawful interference. The status of a number of specifications was changed to Standards.	7 December 2001 15 April 2002 1 July 2002
11 (8th Edition)	Proposals of the Committee on Unlawful Interference with the assistance of the Aviation Security Panel (AVSECP) and Council action in pursuance of Assembly Resolution A35-9	This amendment includes provisions to further clarify the wording of existing Standards and Recommended Practices (SARPs) to facilitate both their common interpretation by Contracting States and their ease of auditing under the ICAO Universal Security Audit Programme (USAP). The amendment addresses the following: applicability of Annex 17; reinforcement of national civil aviation security control programme provisions; in-flight security officers (IFSOs); general aviation and aerial work; one-stop security concept for passengers and baggage; risk assessment concept; security for all-cargo operations; and definitions.	30 November 2005 10 April 2006 1 July 2006

CHAPTER 1. DEFINITIONS

Acts of unlawful interference. These are acts or attempted acts such as to jeopardize the safety of civil aviation and air transport, i.e.:

- unlawful seizure of aircraft in flight,
- unlawful seizure of aircraft on the ground,
- hostage-taking on board aircraft or on aerodromes,
- forcible intrusion on board an aircraft, at an airport or on the premises of an aeronautical facility,
- introduction on board an aircraft or at an airport of a weapon or hazardous device or material intended for criminal purposes,
- communication of false information such as to jeopardize the safety of an aircraft in flight or on the ground, of passengers, crew, ground personnel or the general public, at an airport or on the premises of a civil aviation facility.

Aerial work. An aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying observation and patrol, search and rescue, aerial advertisement, etc.

Aircraft security check. An inspection of the interior of an aircraft to which passengers may have had access and an inspection of the hold for the purposes of discovering suspicious objects, weapons, explosives or other dangerous devices, articles and substances.

Aircraft security search. A thorough inspection of the interior and exterior of the aircraft for the purpose of discovering suspicious objects, weapons, explosives or other dangerous devices, articles or substances.

Airside. The movement area of an airport, adjacent terrain and buildings or portions thereof, access to which is controlled.

Background check. A check of a person's identity and previous experience, including where legally permissible, any criminal history, as part of the assessment of an individual's suitability to implement a security control and/or for unescorted access to a security restricted area.

Cargo. Any property carried on an aircraft other than mail, stores and accompanied or mishandled baggage.

Certification. A formal evaluation and confirmation by or on behalf of the appropriate authority for aviation security that a person possesses the necessary competencies to perform assigned functions to an acceptable level as defined by the appropriate authority.

Commercial air transport operation. An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Corporate aviation. The non-commercial operation or use of aircraft by a company for the carriage of passengers or goods as an aid to the conduct of company business, flown by a professional pilot employed to fly the aircraft. (Note that corporate aviation is a subset of general aviation.)

Disruptive passenger. A passenger who fails to respect the rules of conduct at an airport or on board an aircraft or to follow the instructions of the airport staff or crew members and thereby disturbs the good order and discipline at an airport or on board the aircraft.

General aviation operation. An aircraft operation other than a commercial air transport operation or an aerial work operation.

Human Factors principles. Principles which apply to design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety, security and efficiency of aeronautical operations.

Regulated agent. An agent, freight forwarder or any other entity who conducts business with an operator and provides security controls that are accepted or required by the appropriate authority in respect of cargo or mail.

Screening. The application of technical or other means which are intended to identify and/or detect weapons, explosives or other dangerous devices, articles or substances which may be used to commit an act of unlawful interference.

Note.— Certain dangerous articles or substances are classified as dangerous goods by Annex 18 and the associated Technical Instructions for the Safe Transport of Dangerous Goods by Air *(Doc 9284) and must be transported in* *accordance with those instructions. In addition, the* Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted) provides a list of prohibited items that must never be carried in the cabin of an aircraft.*

Security. Safeguarding civil aviation against acts of unlawful interference. This objective is achieved by a combination of measures and human and material resources.

Security audit. An in-depth compliance examination of all aspects of the implementation of the national civil aviation security programme.

Security control. A means by which the introduction of weapons, explosives or other dangerous devices, articles or substances which may be used to commit an act of unlawful interference can be prevented.

Security inspection. An examination of the implementation of relevant national civil aviation security programme requirements by an airline, airport, or other entity involved in security.

Security restricted area. Those areas of the airside of an airport which are identified as priority risk areas where in addition to access control, other security controls are applied. Such areas will normally include, *inter alia,* all commercial aviation passenger departure areas between the screening checkpoint and the aircraft, the ramp, baggage make-up areas, including those where aircraft are being brought into service and screened baggage and cargo are present, cargo sheds, mail centres, airside catering and aircraft cleaning premises.

Security survey. An evaluation of security needs including the identification of vulnerabilities which could be exploited to carry out an act of unlawful interference, and the recommendation of corrective actions.

Security test. A covert or overt trial of an aviation security measure which simulates an attempt to commit an unlawful act.

Unidentified baggage. Baggage at an airport, with or without a baggage tag, which is not picked up by or identified with a passenger.

CHAPTER 2. GENERAL PRINCIPLES

2.1 Objectives

2.1.1 Each Contracting State shall have as its primary objective the safety of passengers, crew, ground personnel and the general public in all matters related to safeguarding against acts of unlawful interference with civil aviation.

2.1.2 Each Contracting State shall establish an organization and develop and implement regulations, practices and procedures to safeguard civil aviation against acts of unlawful interference taking into account the safety, regularity and efficiency of flights.

2.1.3 Each Contracting State shall ensure that such an organization and such regulations, practices and procedures:

a) protect the safety of passengers, crew, ground personnel and the general public in all matters related to safeguarding against acts of unlawful interference with civil aviation; and

b) are capable of responding rapidly to meet any increased security threat.

2.1.4 **Recommendation.—** *Each Contracting State should ensure appropriate protection of aviation security information.*

Note 1.— Guidance material on achieving civil aviation security objectives through application of the Standards and Recommended Practices in the following chapters is to be found in the Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted).*

Note 2.— The comprehensive aviation security training material to assist States in achieving civil aviation security objectives is contained in the ICAO Training Programme for Aviation Security comprising a series of Aviation Security Training Packages (ASTPs).

2.2 Applicability

2.2.1 Each Contracting State shall apply the Standards and shall endeavour to apply the Recommended Practices contained in Annex 17 to international civil aviation operations.

2.2.2 Each Contracting State shall ensure that measures designed to safeguard against acts of unlawful interference are applied to domestic operations to the extent practicable, based upon a security risk assessment carried out by the relevant national authorities.

2.3 Security and facilitation

Recommendation.— *Each Contracting State should whenever possible arrange for the security controls and procedures to cause a minimum of interference with, or delay to the activities of, civil aviation provided the effectiveness of these controls and procedures is not compromised.*

2.4 International cooperation

2.4.1 Each Contracting State shall ensure that requests from other Contracting States for additional security measures in respect of a specific flight(s) by operators of such other States are met, as far as may be practicable. The requesting State shall give consideration to alternative measures of the other State that are equivalent to those requested.

2.4.2 Each Contracting State shall cooperate with other States in the development and exchange of information concerning national civil aviation security programmes, training programmes and quality control programmes, as necessary.

2.4.3 Each Contracting State shall establish and implement procedures to share with other Contracting States threat information that applies to the aviation security interests of those States, to the extent practicable.

2.4.4 Each Contracting State shall establish and implement suitable protection and handling procedures for security information shared by other Contracting States, or security information that affects the security interests of other Contracting States, in order to ensure that inappropriate use or disclosure of such information is avoided.

2.4.5 **Recommendation.—** *Each Contracting State should share, as appropriate, and consistent with its sovereignty, the results of the audit carried out by ICAO and the corrective actions taken by the audited State if requested by another State.*

2.4.6 **Recommendation.—** *Each Contracting State should include in each of its bilateral agreements on air transport a clause related to aviation security, taking into account the model clause developed by ICAO.*

2.4.7 **Recommendation.—** *Each Contracting State should make available to other Contracting States on request a written version of the appropriate parts of its national civil aviation security programme.*

2.4.8 **Recommendation.—** *Each Contracting State should notify ICAO where it has shared information under 2.4.5.*

2.5 Equipment, research and development

2.5.1 **Recommendation.—** *Each Contracting State should promote research and development of new security equipment, processes and procedures which will better achieve civil aviation security objectives and should cooperate with other Contracting States in this matter.*

2.5.2 **Recommendation.—** *Each Contracting State should ensure that the development of new security equipment takes into consideration Human Factors principles.*

Note.— Guidance material regarding Human Factors principles can be found in the manual on Human Factors in Civil Aviation Security Operations (*Doc 9808) and in Part 1, Chapter 4, of the* Human Factors Training Manual *(Doc 9683).*

CHAPTER 3. ORGANIZATION

3.1 National organization and appropriate authority

3.1.1 Each Contracting State shall establish and implement a written national civil aviation security programme to safeguard civil aviation operations against acts of unlawful interference, through regulations, practices and procedures which take into account the safety, regularity and efficiency of flights.

3.1.2 Each Contracting State shall designate and specify to ICAO an appropriate authority within its administration to be responsible for the development, implementation and maintenance of the national civil aviation security programme.

3.1.3 Each Contracting State shall keep under constant review the level of threat to civil aviation within its territory, and establish and implement policies and procedures to adjust relevant elements of its national civil aviation security programme accordingly, based upon a security risk assessment carried out by the relevant national authorities.

Note.— Guidance material regarding threat assessment and risk management methodologies can be found in the Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted).*

3.1.4 Each Contracting State shall require the appropriate authority to define and allocate tasks and coordinate activities between the departments, agencies and other organizations of the State, airport and aircraft operators and other entities concerned with or responsible for the implementation of various aspects of the national civil aviation security programme.

3.1.5 Each Contracting State shall establish a national aviation security committee or similar arrangements for the purpose of coordinating security activities between the departments, agencies and other organizations of the State, airport and aircraft operators and other entities concerned with or responsible for the implementation of various aspects of the national civil aviation security programme.

3.1.6 Each Contracting State shall require the appropriate authority to ensure the development and implementation of a national training programme for personnel of all entities involved with or responsible for the implementation of various aspects of the national civil aviation security programme. This training programme shall be designed to ensure the effectiveness of the national civil aviation security programme.

3.1.7 **Recommendation.—** *Each Contracting State should ensure that trainers and training programmes meet standards defined by the appropriate authority.*

3.1.8 Each Contracting State shall ensure that the appropriate authority arranges for the supporting resources and facilities required by the aviation security services to be available at each airport serving civil aviation.

3.1.9 Each Contracting State shall make available to its airport and aircraft operators operating in its territory and other entities concerned, a written version of the appropriate parts of its national civil aviation security programme and/or relevant information or guidelines enabling them to meet the requirements of the national civil aviation security programme.

3.2 Airport operations

3.2.1 Each Contracting State shall require each airport serving civil aviation to establish, implement and maintain a written airport security programme appropriate to meet the requirements of the national civil aviation security programme.

3.2.2 Each Contracting State shall ensure that an authority at each airport serving civil aviation is responsible for coordinating the implementation of security controls.

3.2.3 Each Contracting State shall ensure that an airport security committee at each airport serving civil aviation is established to assist the authority mentioned under 3.2.2 in its role of coordinating the implementation of security controls and procedures as specified in the airport security programme.

3.2.4 Each Contracting State shall ensure that airport design requirements, including architectural and infrastructure-related requirements necessary for the implementation of the security measures in the national civil aviation security programme, are integrated into the design and construction of new facilities and alterations to existing facilities at airports.

3.3 Aircraft operators

3.3.1 Each Contracting State shall ensure that commercial air transport operators providing service from that State have established, implemented and maintained a written operator security programme that meets the requirements of the national civil aviation security programme of that State.

3.3.2 **Recommendation**.— *Each Contracting State should ensure that each entity conducting general aviation* *operations, including corporate aviation operations, using aircraft with a maximum take-off mass greater than 5 700 kg, has established, implemented and maintained a written operator security programme that meets the requirements of the national civil aviation security programme of that State.*

3.3.3 **Recommendation**.— *Each Contracting State should ensure that each entity conducting aerial work operations has established, implemented and maintained a written operator security programme that meets the requirements of the national civil aviation security programme of that State. The programme shall contain operations features specific to the type of operations conducted.*

3.3.4 **Recommendation.**— *Each Contracting State should take into account the ICAO model as a basis for operators' or entities' security programmes under 3.3.1, 3.3.2 and 3.3.3.*

3.3.5 **Recommendation.**— *Each Contracting State should require operators providing service from that State and participating in code-sharing or other collaborative arrangements with other operators to notify the appropriate authority of the nature of these arrangements, including the identity of the other operators.*

3.4 Quality control

3.4.1 Each Contracting State shall ensure that the persons implementing security controls are subject to background checks and selection procedures.

3.4.2 Each Contracting State shall ensure that the persons implementing security controls possess all competencies required to perform their duties and are appropriately trained according to the requirements of the national civil aviation security programme and that appropriate records are maintained up to date. Relevant standards of performance shall be established and initial and periodic assessments shall be introduced to maintain those standards.

3.4.3 Each Contracting State shall ensure that the persons carrying out screening operations are certified according to the requirements of the national civil aviation security programme to ensure that performance standards are consistently and reliably achieved.

3.4.4 Each Contracting State shall require the appropriate authority to develop, implement and maintain a national civil aviation security quality control programme to determine compliance with and validate the effectiveness of its national civil aviation security programme.

3.4.5 Each Contracting State shall ensure that the implementation of security measures is regularly subjected to verification of compliance with the national civil aviation security programme. The priorities and frequency of monitoring shall be determined on the basis of risk assessment carried out by the relevant authorities.

3.4.6 Each Contracting State shall arrange for security audits, tests, surveys and inspections to be conducted on a regular basis, to verify compliance with the national civil aviation security programme and to provide for the rapid and effective rectification of any deficiencies.

3.4.7 Each Contracting State shall ensure that the management, setting of priorities and organization of the national civil aviation security quality control programme shall be undertaken independently from the entities and persons responsible for the implementation of the measures taken under the national civil aviation security programme. Each Contracting State shall also:

a) ensure that the personnel carrying out security audits, tests, surveys and inspections are trained to appropriate standards for these tasks in accordance with the national civil aviation security programme;

b) ensure that the personnel carrying out security audits, tests, surveys and inspections are afforded the necessary authority to obtain information to carry out these tasks and to enforce corrective actions;

c) supplement the national civil aviation security quality control programme by establishing a confidential reporting system for analysing security information provided by sources such as passengers, crew and ground personnel; and

d) establish a process to record and analyse the results of the national civil aviation security quality control programme, to contribute to the effective development and implementation of the national civil aviation security programme, including identifying the causes and patterns of non-compliance and verifying that corrective actions have been implemented and sustained.

3.4.8 Each Contracting State concerned with an act of unlawful interference shall require its appropriate authority to re-evaluate security controls and procedures and in a timely fashion take action necessary to remedy weaknesses so as to prevent recurrence. These actions shall be shared with ICAO.

CHAPTER 4. PREVENTIVE SECURITY MEASURES

4.1 Objective

Each Contracting State shall establish measures to prevent weapons, explosives or any other dangerous devices, articles or substances, which may be used to commit an act of unlawful interference, the carriage or bearing of which is not authorized, from being introduced, by any means whatsoever, on board an aircraft engaged in civil aviation.

4.2 Measures relating to access control

4.2.1 Each Contracting State shall ensure that the access to airside areas at airports serving civil aviation is controlled in order to prevent unauthorized entry.

4.2.2 Each Contracting State shall ensure that security restricted areas are established at each airport serving civil aviation designated by the State based upon a security risk assessment carried out by the relevant national authorities.

4.2.3 Each Contracting State shall ensure that identification systems are established in respect of persons and vehicles in order to prevent unauthorized access to airside areas and security restricted areas. Identity shall be verified at designated checkpoints before access is allowed to airside areas and security restricted areas.

4.2.4 Each Contracting State shall ensure that background checks are conducted on persons other than passengers granted unescorted access to security restricted areas of the airport prior to granting access to security restricted areas.

4.2.5 Each Contracting State shall ensure that the movement of persons and vehicles to and from the aircraft is supervised in security restricted areas in order to prevent unauthorized access to aircraft.

4.2.6 Each Contracting State shall ensure that, at a minimum, a proportion of persons other than passengers being granted access to security restricted areas, together with items carried, are screened. The proportion shall be determined in accordance with risk assessment carried out by the relevant national authorities.

4.2.7 **Recommendation.—** *Each Contracting State should ensure that identity documents issued to aircraft crew members provide a harmonized and reliable international basis for recognition and validation of documentation to permit authorized access to airside and security restricted areas by conforming to the relevant specifications set forth in Doc 9303,* Machine Readable Travel Documents.

4.2.8 **Recommendation.—** *Each Contracting State should ensure that checks specified in 4.2.4 be reapplied on a regular basis to all persons granted unescorted access to security restricted areas.*

4.3 Measures relating to aircraft

4.3.1 Each Contracting State shall ensure that aircraft security checks of originating aircraft engaged in commercial air transport movements are performed or an aircraft security search is carried out. The determination of whether it is an aircraft security check or a search that is appropriate shall be based upon a security risk assessment carried out by the relevant national authorities.

4.3.2 Each Contracting State shall ensure that measures are taken to ensure that passengers of commercial flights disembarking from the aircraft at any time do not leave items on board the aircraft.

4.3.3 Each Contracting State shall require its commercial air transport operators to take measures as appropriate to ensure that during flight unauthorized persons are prevented from entering the flight crew compartment.

Note.— Provisions for security of the flight crew compartment of aircraft engaged in commercial air transportation are contained in Annex 6, Part I, Chapter 13, Section 13.2.

4.3.4 Each Contracting State shall ensure that an aircraft subject to 4.3.1 is protected from unauthorized interference from the time the aircraft search or check has commenced until the aircraft departs.

4.3.5 **Recommendation.—** *Each Contracting State should ensure that security controls are established to prevent acts of unlawful interference with aircraft when they are not in security restricted areas.*

4.4 Measures relating to passengers and their cabin baggage

4.4.1 Each Contracting State shall establish measures to ensure that originating passengers of commercial air transport operations and their cabin baggage are screened prior to boarding an aircraft departing from a security restricted area.

4.4.2 Each Contracting State shall ensure that transfer passengers of commercial air transport operations and their cabin baggage are screened prior to boarding an aircraft, unless it has established a validation process and continuously implements procedures, in collaboration with the other Contracting State where appropriate, to ensure that such passengers and their cabin baggage have been screened to an appropriate level at the point of origin and subsequently protected from unauthorized interference from the point of screening at the originating airport to the departing aircraft at the transfer airport.

Note.— See guidance material on this issue in the Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted).*

4.4.3 Each Contracting State shall ensure that passengers and their cabin baggage which have been screened are protected from unauthorized interference from the point of screening until they board their aircraft. If mixing or contact does take place, the passengers concerned and their cabin baggage shall be re-screened before boarding an aircraft.

4.4.4 Each Contracting State shall establish at an airport measures for transit operations to protect transit passengers' cabin baggage from unauthorized interference and protect the integrity of the security of the airport of transit.

4.5 Measures relating to hold baggage

4.5.1 Each Contracting State shall establish measures to ensure that originating hold baggage is screened prior to being loaded onto an aircraft engaged in commercial air transport operations departing from a security restricted area.

4.5.2 Each Contracting State shall ensure that all hold baggage to be carried on a commercial aircraft is protected from unauthorized interference from the point it is screened or accepted into the care of the carrier, whichever is earlier, until departure of the aircraft on which it is to be carried. If the integrity of hold baggage is jeopardized, the hold baggage shall be re-screened before being placed on board an aircraft.

4.5.3 Each Contracting State shall ensure that commercial air transport operators do not transport the baggage of passengers who are not on board the aircraft unless that baggage is identified as unaccompanied and subjected to additional screening.

4.5.4 Each Contracting State shall ensure that transfer hold baggage is screened prior to being loaded onto an aircraft engaged in commercial air transport operations, unless it has established a validation process and continuously implements procedures, in collaboration with the other Contracting State where appropriate, to ensure that such hold baggage has been screened at the point of origin and subsequently protected from unauthorized interference from the originating airport to the departing aircraft at the transfer airport.

Note.— See guidance material on this issue in the Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted).*

4.5.5 Each Contracting State shall ensure that aircraft commercial air transport operators transport only items of hold baggage which have been individually identified as accompanied or unaccompanied, screened to the appropriate standard and accepted for carriage on that flight by the air carrier. All such baggage should be recorded as meeting these criteria and authorized for carriage on that flight.

4.5.6 **Recommendation.—** *Each Contracting State should establish procedures to deal with unidentified baggage in accordance with a security risk assessment carried out by the relevant national authorities.*

4.6 Measures relating to cargo, mail and other goods

4.6.1 Each Contracting State shall ensure that security controls are applied to cargo and mail, prior to their being loaded onto an aircraft engaged in passenger commercial air transport operations.

4.6.2 Each Contracting State shall ensure that cargo and mail to be carried on a passenger commercial aircraft are protected from unauthorized interference from the point security controls are applied until departure of the aircraft.

4.6.3 Each Contracting State shall establish a process for approval of regulated agents, if such agents are involved in implementing security controls.

4.6.4 Each Contracting State shall ensure that operators do not accept cargo or mail for carriage on an aircraft engaged in passenger commercial air transport operations unless the application of security controls is confirmed and accounted for by a regulated agent, or such consignments are subjected to appropriate security controls.

4.6.5 Each Contracting State shall ensure that catering, stores and supplies intended for carriage on passenger commercial flights are subjected to appropriate security controls and thereafter protected until loaded onto the aircraft.

4.6.6 **Recommendation.—** *Each Contracting State should ensure that security controls to be applied to cargo and mail for transportation on all-cargo aircraft are determined on the basis of a security risk assessment carried out by the relevant national authorities.*

4.7 Measures relating to special categories of passengers

4.7.1 Each Contracting State shall develop requirements for air carriers for the carriage of potentially disruptive passengers who are obliged to travel because they have been the subject of judicial or administrative proceedings.

Note.— See guidance material on this issue found in the Security Manual for Safeguarding Civil Aviation Against Acts of Unlawful Interference *(Doc 8973 — Restricted).*

4.7.2 Each Contracting State shall ensure that operators providing service from that State include in their security programmes, measures and procedures to ensure safety on board their aircraft when passengers are to be carried who are obliged to travel because they have been the subject of judicial or administrative proceedings.

4.7.3 Each Contracting State shall ensure that the aircraft operator and the pilot-in-command are informed when passengers are obliged to travel because they have been the subject of judicial or administrative proceedings, in order that appropriate security controls can be applied.

4.7.4 Each Contracting State shall ensure that the carriage of weapons on board aircraft, by law enforcement officers and other authorized persons, acting in the performance of their duties, requires special authorization in accordance with the laws of the States involved.

4.7.5 Each Contracting State shall consider requests by any other State to allow the travel of armed personnel, including in-flight security officers, on board aircraft of operators of the requesting State. Only after agreement by all States involved shall such travel be allowed.

4.7.6 Each Contracting State shall ensure that the carriage of weapons in other cases is allowed only when an authorized and duly qualified person has determined that they are not loaded, if applicable, and then only if stowed in a place inaccessible to any person during flight time.

4.7.7 Each Contracting State that decides to deploy in-flight security officers shall ensure that they are government personnel who are specially selected and trained, taking into account the safety and security aspects on board an aircraft and deployed according to the threat assessment of the competent authority. The deployment of such officers shall be coordinated with concerned States and kept strictly confidential.

4.7.8 Each Contracting State shall ensure that the pilot-in-command is notified as to the number of armed persons and their seat location.

CHAPTER 5. MANAGEMENT OF RESPONSE TO ACTS OF UNLAWFUL INTERFERENCE

5.1 Prevention

5.1.1 Each Contracting State shall establish measures, when reliable information exists that an aircraft may be subjected to an act of unlawful interference, to safeguard the aircraft if it is still on the ground and to provide as much prior notification as possible of the arrival of such aircraft to relevant airport authorities and air traffic services of the States concerned if the aircraft has already departed.

5.1.2 Each Contracting State shall ensure, when reliable information exists that an aircraft may be subjected to an act of unlawful interference, that the aircraft is searched for concealed weapons, explosives or other dangerous devices, articles or substances. Prior notification of the search shall be provided to the operator concerned.

5.1.3 Each Contracting State shall ensure that arrangements are made to investigate, render safe and/or dispose of, if necessary, suspected dangerous devices or other potential hazards at airports.

5.1.4 Each Contracting State shall ensure that contingency plans are developed and resources made available to safeguard civil aviation against acts of unlawful interference. The contingency plans shall be tested on a regular basis.

5.1.5 Each Contracting State shall ensure that authorized and suitably trained personnel are readily available for deployment at its airports serving civil aviation to assist in dealing with suspected, or actual, cases of unlawful interference with civil aviation.

5.2 Response

5.2.1 Each Contracting State shall take appropriate measures for the safety of passengers and crew of an aircraft, which is subjected to an act of unlawful interference, while on the ground in the territory of the Contracting State, until their journey can be continued.

5.2.2 Each Contracting State responsible for providing air traffic services for an aircraft, which is the subject of an act of unlawful interference, shall collect all pertinent information on the flight of that aircraft and transmit that information to all other States responsible for the air traffic services units concerned, including those at the airport of known or presumed destination, so that timely and appropriate safeguarding action may be taken en route and at the aircraft's known, likely or possible destination.

5.2.3 Each Contracting State shall provide assistance to an aircraft subjected to an act of unlawful seizure, including the provision of navigation aids, air traffic services and permission to land as may be necessitated by the circumstances.

5.2.4 Each Contracting State shall take measures, as it may find practicable, to ensure that an aircraft subjected to an act of unlawful seizure which has landed in its territory is detained on the ground unless its departure is necessitated by the overriding duty to protect human life. However, these measures need to recognize the grave hazard attending further flight. States shall also recognize the importance of consul-tations, wherever practicable, between the State where that aircraft has landed and the State of the Operator of the aircraft, and notification by the State where the aircraft has landed to the States of assumed or stated destination.

5.2.5 Each Contracting State in which an aircraft subjected to an act of unlawful interference has landed shall notify by the most expeditious means the State of Registry of the aircraft and the State of the Operator of the landing and shall similarly transmit by the most expeditious means all other relevant information to:

a) the two above-mentioned States;

b) each State whose citizens suffered fatalities or injuries;

c) each State whose citizens were detained as hostages;

d) each State whose citizens are known to be on board the aircraft; and

e) the International Civil Aviation Organization.

5.2.6 **Recommendation.—** *Each Contracting State should ensure that information received as a consequence of action taken in accordance with 5.2.2 is distributed locally to the air traffic services units concerned, the appropriate airport administrations, the operator and others concerned as soon as practicable.*

5.2.7 **Recommendation.—** *Each Contracting State should cooperate with other States for the purpose of providing a joint response in connection with an act of unlawful interference. When taking measures in their territory to free passengers and crew members of an aircraft subjected to an act of unlawful* *interference, each Contracting State should use, as necessary, the experience and capability of the State of the Operator, the State of manufacture and the State of Registry of that aircraft.*

5.3 Exchange of information and reporting

5.3.1 Each Contracting State concerned with an act of unlawful interference shall provide ICAO with all pertinent information concerning the security aspects of the act of unlawful interference as soon as practicable after the act is resolved.

5.3.2 **Recommendation.—** *Each Contracting State should exchange information with other Contracting States as considered appropriate on the management of response to an act of unlawful interference, at the same time supplying such information to ICAO.*

ATTACHMENT TO ANNEX 17

EXTRACTS FROM *ANNEX 2 — RULES OF THE AIR*

CHAPTER 3. GENERAL RULES

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3.7 Unlawful interference

An aircraft which is being subjected to unlawful interference shall endeavour to notify the appropriate ATS unit of this fact, any significant circumstances associated therewith and any deviation from the current flight plan necessitated by the circumstances, in order to enable the ATS unit to give priority to the aircraft and to minimize conflict with other aircraft.

Note 1.— Responsibility of ATS units in situations of unlawful interference is contained in Annex 11.

Note 2.— Guidance material for use when unlawful interference occurs and the aircraft is unable to notify an ATS unit of this fact is contained in Attachment B to this Annex.

Note 3.— Action to be taken by SSR-equipped aircraft which are being subjected to unlawful interference is contained in Annex 11, the PANS-ATM (Doc 4444) and the PANS-OPS (Doc 8168).

Note 4.— Action to be taken by CPDLC-equipped aircraft which are being subjected to unlawful interference is contained in Annex 11, the PANS-ATM (Doc 4444), and guidance material on the subject is contained in the Manual of Air Traffic Services Data Link Applications *(Doc 9694).*

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ATTACHMENT B. UNLAWFUL INTERFERENCE

1. General

The following procedures are intended as guidance for use by aircraft when unlawful interference occurs and the aircraft is unable to notify an ATS unit of this fact.

2. Procedures

2.1 Unless considerations aboard the aircraft dictate otherwise, the pilot-in-command should attempt to continue flying on the assigned track and at the assigned cruising level at least until able to notify an ATS unit or within radar coverage.

2.2 When an aircraft subjected to an act of unlawful interference must depart from its assigned track or its assigned cruising level without being able to make radiotelephony contact with ATS, the pilot-in-command should, whenever possible:

a) attempt to broadcast warnings on the VHF emergency frequency and other appropriate frequencies, unless considerations aboard the aircraft dictate otherwise. Other equipment such as on-board transponders and data links should also be used when it is advantageous to do so and circumstances permit; and

b) proceed in accordance with applicable special procedures for in-flight contingencies, where such procedures have been established and promulgated in the *Regional Supplementary Procedures (*Doc 7030); or

c) if no applicable regional procedures have been established, proceed at a level which differs from the cruising levels normally used for IFR flight by:

   1) 150 m (500 ft) in an area where a vertical separation minimum of 300 m (1 000 ft) is applied; or

   2) 300 m (1 000 ft) in an area where a vertical separation minimum of 600 m (2 000 ft) is applied.

Note.— Action to be taken by an aircraft which is intercepted while being subject to an act of unlawful interference is prescribed in 3.8 of this Annex.

EXTRACTS FROM *ANNEX 6 — OPERATION OF AIRCRAFT*
PART I — *INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES*

CHAPTER 13. SECURITY*

13.1 Domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this Chapter should be applied by all Contracting States also in case of domestic commercial operations (air services).*

13.2 Security of the flight crew compartment

13.2.1 In all aeroplanes which are equipped with a flight crew compartment door, this door shall be capable of being locked, and means shall be provided by which cabin crew can discreetly notify the flight crew in the event of suspicious activity or security breaches in the cabin.

13.2.2 From 1 November 2003, all passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 shall be equipped with an approved flight crew compartment door that is designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorized persons. This door shall be capable of being locked and unlocked from either pilot's station.

13.2.3 In all aeroplanes which are equipped with a flight crew compartment door in accordance with 13.2.2:

a) this door shall be closed and locked from the time all external doors are closed following embarkation until any such door is opened for disembarkation, except when necessary to permit access and egress by authorized persons; and

b) means shall be provided for monitoring from either pilot's station the entire door area outside the flight crew compartment to identify persons requesting entry and to detect suspicious behaviour or potential threat.

13.2.4 **Recommendation.—** *All passenger-carrying aeroplanes should be equipped with an approved flight crew compartment door, where practicable, that is designed to resist penetration by small arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorized persons. This door should be capable of being locked and unlocked from either pilot's station.*

13.2.5 **Recommendation.—** *In all aeroplanes which are equipped with a flight crew compartment door in accordance with 13.2.4:*

a) the door should be closed and locked from the time all external doors are closed following embarkation until any such door is opened for disembarkation, except when necessary to permit access and egress by authorized persons; and

b) means should be provided for monitoring from either pilot's station the entire door area outside the flight crew compartment to identify persons requesting entry and to detect suspicious behaviour or potential threat.

13.3 Aeroplane search procedure checklist

An operator shall ensure that there is on board a checklist of the procedures to be followed in searching for a bomb in case of suspected sabotage and for inspecting aeroplanes for concealed weapons, explosives or other dangerous devices when a well-founded suspicion exists that the aeroplane may be the object of an act of unlawful interference. The checklist shall be supported by guidance on the appropriate course of action to be taken should a bomb or suspicious object be found and information on the least-risk bomb location specific to the aeroplane.

13.4 Training programmes

13.4.1 An operator shall establish and maintain an approved security training programme which ensures crew members act in the most appropriate manner to minimize the consequences of acts of unlawful interference. As a minimum, this programme shall include the following elements:

a) determination of the seriousness of any occurrence;

b) crew communication and coordination;

c) appropriate self-defense responses;

d) use of non-lethal protective devices assigned to crew members whose use is authorized by the State of the Operator;

e) understanding of behaviour of terrorists so as to facilitate the ability of crew members to cope with hijacker behaviour and passenger responses;

f) live situational training exercises regarding various threat conditions;

g) flight deck procedures to protect the aeroplane; and

h) aeroplane search procedures and guidance on least-risk bomb locations where practicable.

13.4.2 An operator shall also establish and maintain a training programme to acquaint appropriate employees with preventive measures and techniques in relation to passengers, baggage, cargo, mail, equipment, stores and supplies intended for carriage on an aeroplane so that they contribute to the prevention of acts of sabotage or other forms of unlawful interference.

13.5 Reporting acts of unlawful interference

Following an act of unlawful interference, the pilot-in-command shall submit, without delay, a report of such an act to the designated local authority.

13.6 Miscellaneous

13.6.1 **Recommendation.—** *Specialized means of attenuating and directing the blast should be provided for use at the least-risk bomb location.*

13.6.2 **Recommendation.—** *Where an operator accepts the carriage of weapons removed from passengers, the aeroplane should have provision for stowing such weapons in a place so that they are inaccessible to any person during flight time.*

* In the context of this Chapter, the word ''security'' is used in the sense of prevention of illicit acts against civil aviation.

EXTRACTS FROM *ANNEX 8 — AIRWORTHINESS OF AIRCRAFT*

CHAPTER 11. SECURITY

11.1 Aeroplanes used for domestic commercial operations

Recommendation.— *International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).*

11.2 Least-risk bomb location

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

11.3 Protection of the flight crew compartment

Recommendation.— *In all aeroplanes, which are required by Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the Type Certificate to include a derivative type design is submitted to the appropriate national authority, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.*

Note.— Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in Annex 6, Part I, Chapter 13.

11.4 Interior design

For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

EXTRACTS FROM *ANNEX 9 — FACILITATION*

CHAPTER 2. ENTRY AND DEPARTURE OF AIRCRAFT

A. General

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2.2 In developing procedures aimed at the efficient clearance of entering or departing aircraft, Contracting States shall take into account the application of aviation security and narcotics control measures, where appropriate.

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CHAPTER 3. ENTRY AND DEPARTURE OF PERSONS AND THEIR BAGGAGE

A. General

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3.2 In developing procedures aimed at the efficient application of border controls on passengers and crew, Contracting States shall take into account the application of aviation security, border integrity, narcotics control and immigration control measures, where appropriate.

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3.4 Contracting States shall not extend the validity of their machine readable travel documents.

Note 1.— Specifications for machine readable travel documents (Doc 9303, Series) do not permit alteration of the expiration date and other data in the machine readable zone.

Note 2. — States whose national legislation or regulations currently allow for the extension of the period of validity should undertake to amend the appropriate text in a reasonable period.

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C. Security of travel documents

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3.7 Contracting States shall regularly update security features in new versions of their travel documents, to guard against their misuse and to facilitate detection of cases where such documents have been unlawfully altered, replicated or issued.

3.8 Contracting States shall establish controls on the creation and issuance of travel documents in order to safeguard against the theft of their stocks and the misappropriation of newly issued travel documents.

3.9 **Recommended Practice.—** *Contracting States should incorporate biometric data in their machine readable passports, visas and other official travel documents, using one or more optional data storage technologies to supplement the machine readable zone, as specified in Doc 9303,* Machine Readable Travel Documents. *The required data stored on the integrated circuit chip is the same as that printed on the data page, that is, the data contained in the machine-readable zone plus the digitized photographic image. Fingerprint image(s) and/or iris image(s) are optional biometrics for Contracting States wishing to supplement the facial image with another biometric in the passport. Contracting States incorporating biometric data in their Machine Readable Passports are to store the data in a contactless integrated circuit chip complying with ISO/IEC 14443 and programmed according to the Logical Data Structure as specified by ICAO.*

D. Travel documents

3.10 Contracting States shall begin issuing only Machine Readable Passports in accordance with the specifications of Doc 9303, Part 1, no later than 1 April 2010.

Note.—This provision does not intend to preclude the issuance of non-machine readable passports or temporary travel documents of limited validity in cases of emergency.

3.10.1 For. passports issued after 24 November 2005 and which are not machine readable, Contracting States shall ensure the expiration date falls before 24 November 2015.

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I. Inspection of travel documents

3.31 Contracting States shall assist aircraft operators in the evaluation of travel documents presented by passengers, in order to deter fraud and abuse.

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3.33 Aircraft operators shall take necessary precautions at the point of embarkation to ensure that passengers are in possession of the documents prescribed by the States of transit and destination for control purposes as described in this chapter.

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K. Entry procedures and responsibilities

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3.46 The public authorities of each Contracting State shall seize fraudulent, falsified or counterfeit travel documents. The public authorities shall also seize the travel documents of a person impersonating the rightful holder of the travel document. Such documents shall be removed from circulation immediately and returned to the appropriate authorities of the State named as issuer or to the resident Diplomatic Mission of that State.

3.47 **Recommended Practice.**— *Where appropriate, Contracting States should introduce a system of advance passenger information which involves the capture of certain passport or visa details prior to departure, the transmission of the details by electronic means to their public authorities, and the analysis of such data for risk management purposes prior to arrival in order to expedite clearance. To minimize handling time during check-in, document reading devices should be used to capture the information in machine readable travel documents.*

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N. Identification and entry of crew and other aircraft operators' personnel

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3.70 Adequate controls shall be placed on the issuance of CMCs and other official crew identity documents to prevent fraud, for example, a background check and certification of employment status of an applicant prior to issuance, controls on blank card stock, and accountability requirements for issuing personnel.

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CHAPTER 4. ENTRY AND DEPARTURE OF CARGO AND OTHER ARTICLES

A. General

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4.6 Where practicable, in order to improve efficiency, modern screening or examination techniques shall be used to facilitate the physical examination of goods to be imported or exported.

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CHAPTER 5. INADMISSIBLE PERSONS AND DEPORTEES

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B. Inadmissible persons

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5.8 Contracting States that have reason to believe that an inadmissible person might offer resistance to his removal shall inform the aircraft operator concerned as far in advance as possible of scheduled departure so that the aircraft operator can take precautions to ensure the security of the flight.

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C. Deportees

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5.18 Contracting States removing deportees from their territories shall assume all obligations, responsibilities and costs associated with the removal.

EXTRACTS FROM *ANNEX 10 — AERONAUTICAL TELECOMMUNICATIONS,* VOLUME IV *(SURVEILLANCE RADAR AND COLLISION AVOIDANCE SYSTEMS)*

CHAPTER 2. GENERAL

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2.1 SECONDARY SURVEILLANCE RADAR (SSR)

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2.1.4 Mode A reply codes (information pulses)

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2.1.4.2.1 Code 7700 to provide recognition of an aircraft in an emergency.

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2.1.4.2.3 Code 7500 to provide recognition of an aircraft which is being subjected to unlawful interference.

2.1.4.3 Appropriate provisions shall be made in ground decoding equipment to ensure immediate recognition of Mode A codes 7500, 7600 and 7700.

EXTRACTS FROM *ANNEX 11 — AIR TRAFFIC SERVICES*

CHAPTER 2. GENERAL

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2.22 Service to aircraft in the event of an emergency

2.22.1 An aircraft known or believed to be in a state of emergency, including being subjected to unlawful interference, shall be given maximum consideration, assistance and priority over other aircraft as may be necessitated by the circumstances.

Note.— To indicate that it is in a state of emergency, an aircraft equipped with an appropriate data link capability and/or an SSR transponder might operate the equipment as follows:

a) on Mode A, Code 7700; or

b) on Mode A, Code 7500, to indicate specifically that it is being subjected to unlawful interference; or

c) activate the appropriate emergency and/or urgency capability of ADS; or

d) transmit the appropriate emergency message via CPDLC.

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2.22.2 When an occurrence of unlawful interference with an aircraft takes place or is suspected, ATS units shall attend promptly to requests by the aircraft. Information pertinent to the safe conduct of the flight shall continue to be transmitted and necessary action shall be taken to expedite the conduct of all phases of the flight, especially the safe landing of the aircraft.

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CHAPTER 5. ALERTING SERVICE

5.1 Application

5.1.1 Alerting service shall be provided:

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c) to any aircraft known or believed to be the subject of unlawful interference.

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5.2 Notification of rescue coordination centres

5.2.1 Without prejudice to any other circumstances that may render such notification advisable, air traffic services units shall, except as prescribed in 5.5.1, notify rescue coordination centres immediately an aircraft is considered to be in a state of emergency in accordance with the following:

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b) *Alert phase* when:

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except when evidence exists that would allay apprehension as to the safety of the aircraft and its occupants, or when

4) an aircraft is known or believed to be the subject of unlawful interference.

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5.5 Information to the operator

5.5.1 When an area control or a flight information centre decides that an aircraft is in the uncertainty or the alert phase, it shall, when practicable, advise the operator prior to notifying the rescue coordination centre.

Note.— If an aircraft is in the distress phase, the rescue coordination centre has to be notified immediately in accordance with 5.2.1.

5.5.2 All information notified to the rescue coordination centre by an area control or flight information centre shall, whenever practicable, also be communicated, without delay, to the operator.

5.6 Information to aircraft operating in the vicinity of an aircraft in a state of emergency

5.6.1 When it has been established by an air traffic services unit that an aircraft is in a state of emergency, other aircraft known to be in the vicinity of the aircraft involved shall, except as provided in 5.6.2, be informed of the nature of the emergency as soon as practicable.

5.6.2 When an air traffic services unit knows or believes that an aircraft is being subjected to unlawful interference, no reference shall be made in ATS air-ground communications to the nature of the emergency unless it has first been referred to in communications from the aircraft involved and it is certain that such reference will not aggravate the situation.

EXTRACTS FROM *ANNEX 13 — AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION*

CHAPTER 5. INVESTIGATION

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ORGANIZATION AND CONDUCT OF THE INVESTIGATION

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RESPONSIBILITY OF THE STATE CONDUCTING THE INVESTIGATION

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Informing aviation security authorities

5.11 If, in the course of an investigation it becomes known, or it is suspected, that an act of unlawful interference was involved, the investigator-in-charge shall immediately initiate action to ensure that the aviation security authorities of the State(s) concerned are so informed.

EXTRACTS FROM *ANNEX 14 — AERODROMES,* VOLUME I — *AERODROME DESIGN AND OPERATIONS*

CHAPTER 3. PHYSICAL CHARACTERISTICS

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3.14 Isolated aircraft parking position

3.14.1 An isolated aircraft parking position shall be designated or the aerodrome control tower shall be advised of an area or areas suitable for the parking of an aircraft which is known or believed to be the subject of unlawful interference, or which for other reasons needs isolation from normal aerodrome activities.

3.14.2 **Recommendation.—** *The isolated aircraft parking position should be located at the maximum distance practicable and in any case never less than 100 m from other parking positions, buildings or public areas, etc. Care should be taken to ensure that the position is not located over underground utilities such as gas and aviation fuel and, to the extent feasible, electrical or communication cables.*

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CHAPTER 5. VISUAL AIDS FOR NAVIGATION

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5.3 Lights

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5.3.23 Apron floodlighting
(see also 5.3.16.1 and 5.3.17.1)

Application

5.3.23.1 **Recommendation.—** *Apron floodlighting should be provided on an apron, on a de-icing/anti-icing facility and on a designated isolated aircraft parking position intended to be used at night.*

Note 1. — Where a de-icing/anti-icing facility is located in close proximity to the runway and permanent floodlighting could be confusing to pilots, other means of illumination of the facility may be required.

Note 2. — The designation of an isolated aircraft parking position is specified in 3.14.

Note 3. — Guidance on apron floodlighting is given in the Aerodrome Design Manual*, Part 4.*

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CHAPTER 8. ELECTRICAL SYSTEMS

8.1 Electric power supply systems for air navigation facilities

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Application

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8.1.10 **Recommendation.—** *The following aerodrome facilities should be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:*

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e) essential security lighting, if provided in accordance with 9.11;

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CHAPTER 9. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

9.1 Aerodrome emergency planning

General

Introductory Note.— Aerodrome emergency planning is the process of preparing an aerodrome to cope with an emergency occurring at the aerodrome or in its vicinity. The objective of aerodrome emergency planning is to minimize the effects of an emergency, particularly in respect of saving lives and maintaining aircraft operations. The aerodrome emergency plan sets forth the procedures for coordinating the response of different aerodrome agencies (or services) and of those agencies in the surrounding community that could be of assistance in responding to the emergency. Guidance material to assist the appropriate authority in establishing aerodrome emergency planning is given in the Airport Services Manual*, Part 7.*

9.1.1 An aerodrome emergency plan shall be established at an aerodrome, commensurate with the aircraft operations and other activities conducted at the aerodrome.

9.1.2 The aerodrome emergency plan shall provide for the coordination of the actions to be taken in an emergency occurring at an aerodrome or in its vicinity.

Note.— Examples of emergencies are: aircraft emergencies, sabotage including bomb threats, unlawfully seized aircraft, dangerous goods occurrences, building fires and natural disasters.

9.1.3 The plan shall coordinate the response or participation of all existing agencies which, in the opinion of the appropriate authority, could be of assistance in responding to an emergency.

Note.— Examples of agencies are:

— on the aerodrome: air traffic control unit, rescue and fire fighting services, aerodrome administration, medical and ambulance services, aircraft operators, security services, and police;

— off the aerodrome: fire departments, police, medical and ambulance services, hospitals, military, and harbour patrol or coast guard.

9.1.4 **Recommendation.—** *The plan should provide for cooperation and coordination with the rescue coordination centre, as necessary.*

9.1.5 **Recommendation.—** *The aerodrome emergency plan document should include at least the following:*

a) types of emergencies planned for;

b) agencies involved in the plan;

c) responsibility and role of each agency, the emergency operations centre and the command post, for each type of emergency;

d) information on names and telephone numbers of offices or people to be contacted in the case of a particular emergency; and

e) a grid map of the aerodrome and its immediate vicinity.

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Emergency operations centre and command post

9.1.7 **Recommendation.—** *A fixed emergency operations centre and a mobile command post should be available for use during an emergency.*

9.1.8 **Recommendation.—** *The emergency operations centre should be a part of the aerodrome facilities and should be responsible for the overall coordination and general direction of the response to an emergency.*

9.1.9 **Recommendation.—** *The command post should be a facility capable of being moved rapidly to the site of an emergency, when required, and should undertake the local coordination of those agencies responding to the emergency.*

9.1.10 **Recommendation.—** *A person should be assigned to assume control of the emergency operations centre and, when appropriate, another person the command post.*

Communication system

9.1.11 **Recommendation.—** *Adequate communication systems linking the command post and the emergency operations centre with each other and with the participating agencies should be provided in accordance with the plan and consistent with the particular requirements of the aerodrome.*

Aerodrome emergency exercise

9.1.12 The plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

Note.— The plan includes all participating agencies and associated equipment.

9.1.13 The plan shall be tested by conducting:

a) a full-scale aerodrome emergency exercise at intervals not exceeding two years; and

b) partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; and

reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

Note.— The purpose of a full-scale exercise is to ensure the adequacy of the plan to cope with different types of emergencies. The purpose of a partial exercise is to ensure the adequacy of the response to individual participating agencies and components of the plan, such as the communications system.

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9.10 Fencing

Application

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9.10.3 **Recommendation.—** *A fence or other suitable barrier should be provided on an aerodrome to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.*

Note 1.— This is intended to include the barring of sewers, ducts, tunnels, etc., where necessary to prevent access.

Note 2.— Special measures may be required to prevent the access of an unauthorized person to runways or taxiways which overpass public roads.

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9.10.5 **Recommendation.—** *Suitable means of protection should be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the aerodrome.*

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Location

9.10.7 **Recommendation.—** *The fence or barrier should be located so as to separate the movement area and other facilities or zones on the aerodrome vital to the safe operation of aircraft from areas open to public access.*

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9.10.9 **Recommendation.—** *When greater security is thought necessary, a cleared area should be provided on both sides of the fence or barrier to facilitate the work of patrols and to make trespassing more difficult. Consideration should be given to the provision of a perimeter road inside the aerodrome fencing for the use of both maintenance personnel and security patrols.*

9.11 Security lighting

Recommendation.— *At an aerodrome where it is deemed desirable for security reasons, a fence or other barrier provided for the protection of international civil aviation and its facilities should be illuminated at a minimum essential level. Consideration should be given to locating lights so that the ground area on both sides of the fence or barrier, particularly at access points, is illuminated.*

EXTRACTS FROM *ANNEX 18 — THE SAFE TRANSPORT OF DANGEROUS GOODS BY AIR*

CHAPTER 2. APPLICABILITY

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2.2 Dangerous Goods Technical Instructions

2.2.1 Each Contracting State shall take the necessary measures to achieve compliance with the detailed provisions contained in the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284), approved and issued periodically in accordance with the procedure established by the ICAO Council. Each Contracting State shall also take the necessary measures to achieve compliance with any amendment to the Technical Instructions which may be published during the specified period of applicability of an edition of the Technical Instructions.

2.2.2 **Recommendation.—** *Each Contracting State should inform ICAO of difficulties encountered in the application of the Technical Instructions and of any amendments which it would be desirable to make to them.*

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CHAPTER 10. ESTABLISHMENT OF TRAINING PROGRAMMES

Dangerous goods training programmes shall be established and updated as provided for in the Technical Instructions.

EXTRACTS FROM DOC 9284 — *TECHNICAL INSTRUCTIONS FOR THE SAFE TRANSPORT OF DANGEROUS GOODS BY AIR*

Part 1. GENERAL

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Chapter 4
TRAINING

Parts of this Chapter are affected by State Variations AE 2, CA 18, HK 1, US 1; see Table A-1

4.1 ESTABLISHMENT OF TRAINING PROGRAMMES

≠ 4.1.1 Initial and recurrent dangerous goods training programmes must be established and maintained by or on behalf of:

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g) agencies engaged in the security screening of passengers and their baggage and/or cargo.

EXTRACTS FROM THE PROCEDURES FOR AIR NAVIGATION SERVICES — *AIR TRAFFIC MANAGEMENT* (DOC 4444)

CHAPTER 5. SEPARATION METHODS AND MINIMA

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5.2 GENERAL PROVISIONS FOR THE SEPARATION OF CONTROLLED TRAFFIC

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5.2.1.2 Larger separations than the specified minima should be applied whenever exceptional circumstances such as unlawful interference or navigational difficulties call for extra precautions. This should be done with due regard to all relevant factors so as to avoid impeding the flow of air traffic by the application of excessive separations.

Note — Unlawful interference with an aircraft constitutes a case of exceptional circumstances which might require the application of separations larger than the specified minima, between the aircraft being subjected to unlawful interference and other aircraft.

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CHAPTER 15. PROCEDURES RELATED TO EMERGENCIES, COMMUNICATION FAILURE AND CONTINGENCIES

15.1 EMERGENCY PROCEDURES

15.1.1 General

15.1.1.1 The various circumstances surrounding each emergency situation preclude the establishment of exact detailed procedures to be followed. The procedures outlined herein are intended as a general guide to air traffic services personnel. Air traffic control units shall maintain full and complete coordination, and personnel shall use their best judgement in handling emergency situations.

Note 1.— Additional radar procedures to be applied in relation to emergencies and contingencies are contained in Chapter 8, 8.8.1.

Note 2.— If the pilot of an aircraft encountering a state of emergency has previously been directed by ATC to operate the transponder on a specific code, that code will normally be maintained unless, in special circumstances, the pilot has decided or has been advised otherwise. Where ATC has not requested a code to be set, the pilot will set the transponder to Mode A Code 7700.

15.1.1.2 When an emergency is declared by an aircraft, the ATS unit should take appropriate and relevant action as follows:

a) unless clearly stated by the flight crew or otherwise known, take all necessary steps to ascertain aircraft identification and type, the type of emergency, the intentions of the flight crew as well as the position and level of the aircraft;

b) decide upon the most appropriate type of assistance which can be rendered;

c) enlist the aid of any other ATS unit or other services which may be able to provide assistance to the aircraft;

d) provide the flight crew with any information requested as well as any additional relevant information, such as details on suitable aerodromes, minimum safe altitudes, weather information;

e) obtain from the operator or the flight crew such of the following information as may be relevant: number of persons on board, amount of fuel remaining, possible presence of hazardous materials and the nature thereof; and

f) notify the appropriate ATS units and authorities as specified in local instructions.

15.1.1.3 Changes of radio frequency and SSR code should be avoided if possible and should normally be made only when or if an improved service can be provided to the aircraft concerned. Manoeuvring instructions to an aircraft experiencing engine failure should be limited to a minimum. When appropriate, other aircraft operating in the vicinity of the aircraft in emergency should be advised of the circumstances.

Note.— Requests to the flight crew for the information contained in 15.1.1.2 e) will be made only if the information is not available from the operator or from other sources and will be limited to essential information.

15.1.2 Priority

An aircraft known or believed to be in a state of emergency, including being subjected to unlawful interference, shall be given priority over other aircraft.

15.1.3 Unlawful interference and aircraft bomb threat

15.1.3.1 Air traffic services personnel shall be prepared to recognize any indication of the occurrence of unlawful interference with an aircraft.

15.1.3.2 Whenever unlawful interference with an aircraft is suspected, and where automatic distinct display of SSR Mode A Code 7500 and Code 7700 is not provided, the radar controller shall attempt to verify any suspicion by setting the SSR decoder to Mode A Code 7500 and thereafter to Code 7700.

Note.— An aircraft equipped with an SSR transponder is expected to operate the transponder on Mode A Code 7500 to indicate specifically that it is the subject of unlawful interference. The aircraft may operate the transponder on Mode A Code 7700, to indicate that it is threatened by grave and imminent danger and requires immediate assistance.

15.1.3.3 Whenever unlawful interference with an aircraft is known or suspected or a bomb threat warning has been received, ATS units shall promptly attend to requests by, or to anticipated needs of, the aircraft, including requests for relevant information relating to air navigation facilities, procedures and services along the route of flight and at any aerodrome of intended landing, and shall take such action as is necessary to expedite the conduct of all phases of the flight.

15.1.3.3.1 ATS units shall also:

a) transmit, and continue to transmit, information pertinent to the safe conduct of the flight, without expecting a reply from the aircraft;

b) monitor and plot the progress of the flight with the means available, and coordinate transfer of control with adjacent ATS units without requiring transmissions or other responses from the aircraft, unless communication with the aircraft remains normal;

c) inform, and continue to keep informed, appropriate ATS units, including those in adjacent FIRs, which may be concerned with the progress of the flight;

Note.— In applying this provision, account must be taken of all the factors which may affect the progress of the flight, including fuel endurance and the possibility of sudden changes in route and destination. The objective is to provide, as far in advance as is practicable in the circumstances, each ATS unit with appropriate information as to the expected or possible penetration of the aircraft into its area of responsibility.

d) notify:

1) the operator or its designated representative;

2) the appropriate rescue coordination centre in accordance with appropriate alerting procedures;

3) the designated security authority;

Note.— It is assumed that the designated security authority and/or the operator will in turn notify other parties concerned in accordance with pre-established procedures.

e) relay appropriate messages, relating to the circumstances associated with the unlawful interference, between the aircraft and designated authorities.

15.1.3.4 The following additional procedures shall apply if a threat is received indicating that a bomb or other explosive device has been placed on board a known aircraft. The ATS unit receiving the threat information shall:

a) if in direct communication with the aircraft, advise the flight crew without delay of the threat and the circumstances surrounding the threat; or

b) if not in direct communication with the aircraft, advise the flight crew by the most expeditious means through other ATS units or other channels.

15.1.3.5 The ATS unit in communication with the aircraft shall ascertain the intentions of the flight crew and report those intentions to other ATS units which may be concerned with the flight.

15.1.3.6 The aircraft shall be handled in the most expeditious manner whilst ensuring, to the extent possible, the safety of other aircraft and that personnel and ground installations are not put at risk.

15.1.3.7 Aircraft in flight shall be given re-clearance to a requested new destination without delay. Any request by the flight crew to climb or descend for the purpose of equalizing or reducing the differential between the outside air pressure and the cabin air pressure shall be approved as soon as possible.

15.1.3.8 An aircraft on the ground should be advised to remain as far away from other aircraft and installations as possible and, if appropriate, to vacate the runway. The aircraft should be instructed to taxi to a designated or isolated parking area in accordance with local instructions. Should the flight crew disembark passengers and crew immediately, other aircraft, vehicles and personnel should be kept at a safe distance from the threatened aircraft.

15.1.3.9 ATS units shall not provide any advice or suggestions concerning action to be taken by the flight crew in relation to an explosive device.

15.1.3.10 An aircraft known or believed to be the subject of unlawful interference or which for other reasons needs isolation from normal aerodrome activities shall be cleared to the designated isolated parking position. Where such an isolated parking position has not been designated, or if the designated position is not available, the aircraft shall be cleared to a position within the area or areas selected by prior agreement with the aerodrome authority. The taxi clearance shall specify the taxi route to be followed to the parking position. This route shall be selected with a view to minimizing any security risks to the public, other aircraft and installations at the aerodrome.

Note.— See Annex 14, Volume I, Chapter 3.

EXTRACTS FROM THE PROCEDURES FOR AIR NAVIGATION SERVICES —
AIRCRAFT OPERATIONS* (DOC 8168), VOLUME I — *FLIGHT PROCEDURES

PART VIII. — SECONDARY SURVEILLANCE RADAR (SSR) TRANSPONDER OPERATING PROCEDURES

Chapter 1

OPERATION OF TRANSPONDERS

. . . . . .

1.4 EMERGENCY PROCEDURES

1.4.1 The pilot of an aircraft encountering a state of emergency shall set the transponder to Mode A Code 7700 except when previously directed by ATC to operate the transponder on a specified code. In the latter case the pilot shall maintain the specified code unless otherwise advised by ATC.

1.4.2 Notwithstanding the procedures at 1.4.1, a pilot may select Mode A Code 7700 whenever there is a specific reason to believe that this would be the best course of action.

. . . . . .

1.6 UNLAWFUL INTERFERENCE WITH AIRCRAFT IN FLIGHT

1.6.1 Should an aircraft in flight be subjected to unlawful interference, the pilot-in-command shall endeavour to set the transponder to Mode A Code 7500 to give indication of the situation unless circumstances warrant the use of Code 7700.

1.6.2 A pilot, having selected Mode A Code 7500 and subsequently requested to confirm this code by ATC in accordance with 1.1.5 shall, according to circumstances, either confirm this or not reply at all.

Note.— The absence of a reply from the pilot will be taken by ATC as an indication that the use of Code 7500 is not due to an inadvertent false code selection.

— END —

ICAO PUBLICATIONS AND RELATED PRODUCTS IN THE AIR TRANSPORT FIELD

The following summarizes the various publications and related products in the air transport field issued by the International Civil Aviation Organization:

- *International Standards and Recommended Practices (SARPs)* adopted by the Council in accordance with Articles 37, 54 and 90 of the Convention on International Civil Aviation and designated, for convenience, as Annexes to the Convention. Annex 9 — *Facilitation* — contains SARPs dealing with customs, quarantine, immigration and health matters concerned with international air navigation. Annex 17 — *Security* — is composed of SARPs on all matters related to safeguarding civil aviation against acts of unlawful interference. Any differences between the national regulations and practices of a State and what is prescribed by an International Standard must be notified to the Council in accordance with Article 38 of the Convention. The Council has also invited Contracting States to notify differences from the provisions of the Recommended Practices.

- *ICAO's policies* on the regulation of international air transport, charges for airports and air navigation services, and taxation in the field of international air transport.

- *Technical specifications* on machine readable travel documents (MRTDs).

- *Tariffs* for airports and air navigation services, including charges applied towards users in more than 180 States.

- *Manuals* providing information or guidance to Contracting States on such issues as regulation of international air transport, financial management of airports and air navigation services, air traffic forecasting methods, and compliance with Annex 17 provisions.

- *Circulars* providing specialized information of interest to Contracting States. They include studies on medium- and long-term trends in the air transport industry at a global and regional level and specialized studies of a worldwide nature covering issues such as the economic and financial aspects of CNS/ATM systems implementation, regional differences in airline operating economics, economic contribution of civil aviation, privatization of airports and air navigation services, and regulatory implications of slot allocation.

- *Aviation Security Training Packages (ASTPs) and courses* on a range of subjects designed to assist security professionals, managers and staff in developing a more comprehensive understanding of SARPs, as well as to offer specialized practical expertise in the implementation and monitoring of measures and provisions in accordance with local programmes. For further information, please contact avsec@icao.int or visit the training page on the ICAO AVSEC website at www.icao.int/avsec.

- *Publications in electronic form*, in database and interactive forms, such as the world's air services agreements and the ICAO template air services agreements. *Civil aviation statistics* can be accessed by purchasing an annual subscription to one or more of the data series distributed by ICAO through its commercial website at www.icaodata.com. Questions regarding ICAO statistics or special orders for statistical data should be sent to sta@icao.int.

- *Reports of meetings in the air transport field,* including reports on the Facilitation and Statistics divisional-type meetings and those related to conferences on aviation security, regulation of international air transport, and economics of airports and air navigation services.

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International Standards
and Recommended Practices

Annex 18
to the Convention on
International Civil Aviation

The Safe Transport of Dangerous Goods by Air

This edition incorporates all amendments adopted by the Council prior to 8 March 2001 and supersedes, on 1 November 2001, all previous editions of Annex 18.

For information regarding the applicability of the Standards and Recommended Practices, *see* Foreword and the relevant clauses in each Chapter.

Third Edition
July 2001

International Civil Aviation Organization

AMENDMENTS

The issue of amendments is announced regularly in the *ICAO Journal* and in the monthly *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS			
No.	Date applicable	Date entered	Entered by
1-6	Incorporated in this edition		
7	27/11/03		ICAO
8	24/11/05		ICAO

CORRIGENDA			
No.	Date of issue	Date entered	Entered by

TABLE OF CONTENTS

FOREWORD

Historical background

The material in this Annex was developed by the Air Navigation Commission in response to a need expressed by Contracting States for an internationally agreed set of provisions governing the safe transport of dangerous goods by air. In order to assist in achieving compatibility with the regulations covering the transport of dangerous goods by other modes of transport, the provisions of this Annex are based on the Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods and the Regulations for the Safe Transport of Radioactive Materials of the International Atomic Energy Agency.

Relationship with the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284)

The provisions of Annex 18 govern the international transport of dangerous goods by air. The broad provisions of this Annex are amplified by the detailed specifications of the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284).

Action by Contracting States

Notification of differences. The attention of Contracting States is drawn to the obligation imposed by Article 38 of the Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. Further, Contracting States are invited to keep the Organization currently informed of any differences which may subsequently occur, or of the withdrawal of any differences previously notified. A specific request for notification of differences will be sent to Contracting States immediately after the adoption of each amendment to this Annex.

The attention of States is also drawn to the provisions of Annex 15 related to the publication of differences between their national regulations and practices and the related ICAO Standards and Recommended Practices through the Aeronautical Information Service, in addition to the obligation of States under Article 38 of the Convention.

In the specific case of 2.2.1 of this Annex, it should be noted that States are expected to file a difference only if they are unable to accept the binding nature of the Technical Instructions. Variations from the detailed provisions of the Technical Instructions are to be reported to ICAO for publication in that document as required by 2.5 of this Annex. Such detailed variations from the Technical Instructions will not be published with any other differences in a Supplement to this Annex and are not expected to be published under the provisions of Annex 15.

Promulgation of information. The establishment and withdrawal of any changes to facilities, services and procedures affecting aircraft operations provided in accordance with the Standards specified in this Annex should be notified and take effect in accordance with the provisions of Annex 15.

Status of Annex components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.— *Material comprising the Annex proper:*

a) *Standards* and *Recommended Practices* adopted by the Council under the provisions of the Convention. They are defined as follows:

Standard: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice: Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which Contracting States will endeavour to conform in accordance with the Convention.

b) *Appendices* comprising material grouped separately for convenience but forming part of the Standards and Recommended Practices adopted by the Council.

c) *Definitions* of terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

d) *Tables* and *Figures* which add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

2.— *Material approved by the Council for publication in association with the Standards and Recommended Practices:*

a) *Forewords* comprising historical and explanatory material based on the action of the Council and including an explanation of the obligations of States with regard to the application of the Standards and Recommended Practices ensuing from the Convention and the Resolution of Adoption.

b) *Introductions* comprising explanatory material introduced at the beginning of parts, chapters or sections of the Annex to assist in the understanding of the application of the text.

c) *Notes* included in the text, where appropriate, to give factual information or references bearing on the Standards or Recommended Practices in question, but not constituting part of the Standards or Recommended Practices.

d) *Attachments* comprising material supplementary to the Standards and Recommended Practices, or included as a guide to their application.

Selection of language

This Annex has been adopted in six languages — English, Arabic, Chinese, French, Russian and Spanish. Each Contracting State is requested to select one of those texts for the purpose of national implementation and for other effects provided for in the Convention, either through direct use or through translation into its own national language, and to notify the Organization accordingly.

Editorial practices

The following practice has been adhered to in order to indicate at a glance the status of each statement: *Standards* have been printed in light face roman; *Recommended Practices* have been printed in light face italics, the status being indicated by the prefix **Recommendation**; *Notes* have been printed in light face italics, the status being indicated by the prefix *Note.*

It will be noted that in the English text the following practice has been adhered to when writing the specifications: Standards employ the operative verb “shall” while Recommended Practices employ the operative verb “should”.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Table A. Amendments to Annex 18

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
1st Edition	Air Navigation Commission Study		26 June 1981 1 January 1983 1 January 1984
1	Sixth Meeting of the Dangerous Goods Panel	Miscellaneous amendments for alignment with Recommendations of the UN Committee of Experts and IAEA.	26 November 1982 26 March 1983 1 January 1984
2	Fifth, Sixth and Seventh Meetings of the Dangerous Goods Panel	Improved definitions for overpack and unit load device. Definitions of package and packaging aligned with Recommendations of the UN Committee of Experts. Addition of a paragraph covering surface transport to or from aerodromes. The requirement to provide information to the pilot-in-command revised to indicate when this information should be given.	1 June 1983 1 October 1983 1 January 1984
3	Eighth Meeting of the Dangerous Goods Panel	Clarification of the circumstances when exemptions may be granted. Clarification of the segregation requirements of poisons or infectious substances from animals or foodstuffs.	25 March 1985 29 July 1985 1 January 1986
4 (2nd Edition)	Eleventh Meeting of the Dangerous Goods Panel	General simplification of the provisions of Annex 18 through the removal of technical detail. Miscellaneous amendments to various provisions.	24 February 1989 23 July 1989 16 November 1989
5	Fourteenth and Sixteenth Meetings of the Dangerous Goods Panel	Clarification of the responsibility of States to achieve compliance with any amendment to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284). Clarification of the exceptions to dangerous goods carried by passengers and crew members.	10 March 1999 19 July 1999 4 November 1999
6 (3rd Edition)	Seventeenth Meeting of the Dangerous Goods Panel and Amendment 25 to Annex 6, Part I	a) revised definitions of dangerous goods, crew member, flight crew member and pilot-in-command; b) revision of the provisions to grant exemptions in special circumstances by the States of Overflight to facilitate the movement of dangerous goods in an aircraft overflying its territory; c) alignment of provisions regarding packaging with the Technical Instructions; d) introduction of provisions to cover the requirement to load and stow dangerous goods in accordance with the Technical Instructions; e) revision of the provisions to place the overall responsibility with States to provide information to passengers; f) revision of the provisions to ensure that emergency response personnel are informed without delay, after an accident or incident, about the dangerous goods carried as cargo on board the aircraft; g) revision of the provisions to enhance cooperation between States in taking action against shippers who wilfully violate the dangerous goods transport regulations; and h) revision of the provisions of the pilot to provide information on dangerous goods on board in the event of an emergency.	7 March 2001 16 July 2001 1 November 2001

Amendment	*Source(s)*	*Subject(s)*	*Adopted/approved Effective Applicable*
7	Eighteenth Meeting of the Dangerous Goods Panel	a) notification to ICAO of appropriate national authorities responsible for dangerous goods; and b) provision of emergency response information regarding dangerous goods.	24 February 2003 14 July 2003 27 November 2003
8	Nineteenth Meeting of the Dangerous Goods Panel	a) a refinement of paragraph 9.6.1 to make it clear that the presence of dangerous goods needs to be reported only in the case of a serious incident in which the dangerous goods were likely to have been involved; and b) introduction of a new Chapter 13 requiring States to establish dangerous goods security measures.	16 February 2005 11 July 2005 24 November 2005

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

CHAPTER 1. DEFINITIONS

When the following terms are used in this Annex, they have the following meanings:

Cargo aircraft. Any aircraft, other than a passenger aircraft, which is carrying goods or property.

Consignment. One or more packages of dangerous goods accepted by an operator from one shipper at one time and at one address, receipted for in one lot and moving to one consignee at one destination address.

Crew member. A person assigned by an operator to duty on an aircraft during a flight duty period.

Dangerous goods. Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Dangerous goods accident. An occurrence associated with and related to the transport of dangerous goods by air which results in fatal or serious injury to a person or major property damage.

Dangerous goods incident. An occurrence, other than a dangerous goods accident, associated with and related to the transport of dangerous goods by air, not necessarily occurring on board an aircraft, which results in injury to a person, property damage, fire, breakage, spillage, leakage of fluid or radiation or other evidence that the integrity of the packaging has not been maintained. Any occurrence relating to the transport of dangerous goods which seriously jeopardizes the aircraft or its occupants is also deemed to constitute a dangerous goods incident.

Exception. A provision in this Annex which excludes a specific item of dangerous goods from the requirements normally applicable to that item.

Exemption. An authorization issued by an appropriate national authority providing relief from the provisions of this Annex.

Flight crew member. A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Incompatible. Describing dangerous goods which, if mixed, would be liable to cause a dangerous evolution of heat or gas or produce a corrosive substance.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Overpack. An enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage.

Note.— A unit load device is not included in this definition.

Package. The complete product of the packing operation consisting of the packaging and its contents prepared for transport.

Packaging. Receptacles and any other components or materials necessary for the receptacle to perform its containment function.

Note.— For radioactive material, see Part 2, paragraph 7.2 of the Technical Instructions.

Passenger aircraft. An aircraft that carries any person other than a crew member, an operator's employee in an official capacity, an authorized representative of an appropriate national authority or a person accompanying a consignment or other cargo.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Serious injury. An injury which is sustained by a person in an accident and which:

a) requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or

b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or

c) involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or

d) involves injury to any internal organ; or

e) involves second or third degree burns, or any burns affecting more than 5 per cent of the body surface; or

f) involves verified exposure to infectious substances or injurious radiation.

State of Origin. The State in the territory of which the cargo was first loaded on an aircraft.

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

UN number. The four-digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods to identify a substance or a particular group of substances.

Unit load device. Any type of freight container, aircraft container, aircraft pallet with a net, or aircraft pallet with a net over an igloo.

Note.— An overpack is not included in this definition.

CHAPTER 2. APPLICABILITY

2.1 General applicability

The Standards and Recommended Practices of this Annex shall be applicable to all international operations of civil aircraft. In cases of extreme urgency or when other forms of transport are inappropriate or full compliance with the prescribed requirements is contrary to the public interest, the States concerned may grant exemptions from these provisions provided that in such cases every effort shall be made to achieve an overall level of safety in transport which is equivalent to the level of safety provided by these provisions. For the State of Overflight, if none of the criteria for granting an exemption are relevant, an exemption may be granted based solely on whether it is believed that an equivalent level of safety in air transport has been achieved.

Note 1.— The States concerned are the States of Origin, transit, overflight and destination of the consignment and the State of the Operator.

Note 2.— Refer to 4.2 for dangerous goods normally forbidden for which States may grant an exemption.

Note 3.— Refer to 4.3 for dangerous goods forbidden for transport by air under any circumstances.

Note 4.— It is not intended that this Annex be interpreted as requiring an operator to transport a particular article or substance or as preventing an operator from adopting special requirements on the transport of a particular article or substance.

2.2 Dangerous Goods Technical Instructions

2.2.1 Each Contracting State shall take the necessary measures to achieve compliance with the detailed provisions contained in the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284), approved and issued periodically in accordance with the procedure established by the ICAO Council. Each Contracting State shall also take the necessary measures to achieve compliance with any amendment to the Technical Instructions which may be published during the specified period of applicability of an edition of the Technical Instructions.

2.2.2 **Recommendation.—** *Each Contracting State should inform ICAO of difficulties encountered in the application of the Technical Instructions and of any amendments which it would be desirable to make to them.*

2.2.3 **Recommendation.—** *Although an amendment to the Technical Instructions with an immediate applicability for reasons of safety may not yet have been implemented in a Contracting State, such State should, nevertheless, facilitate the movement of dangerous goods in its territory which are consigned from another Contracting State in accordance with that amendment, providing the goods comply in total with the revised requirements.*

2.3 Domestic civil aircraft operations

Recommendation.— *In the interests of safety and of minimizing interruptions to the international transport of dangerous goods, Contracting States should also take the necessary measures to achieve compliance with the Annex and the Technical Instructions for domestic civil aircraft operations.*

2.4 Exceptions

2.4.1 Articles and substances which would otherwise be classed as dangerous goods but which are required to be aboard the aircraft in accordance with the pertinent airworthiness requirements and operating regulations, or for those specialized purposes identified in the Technical Instructions, shall be excepted from the provisions of this Annex.

2.4.2 Where articles and substances intended as replacements for those described in 2.4.1 or which have been removed for replacement are carried on an aircraft, they shall be transported in accordance with the provisions of this Annex except as permitted in the Technical Instructions.

2.4.3 Specific articles and substances carried by passengers or crew members shall be excepted from the provisions of this Annex to the extent specified in the Technical Instructions.

2.5 Notification of variations from the Technical Instructions

2.5.1 Where a Contracting State adopts different provisions from those specified in the Technical Instructions, it shall notify ICAO promptly of such State variations for publication in the Technical Instructions.

Note.— Contracting States are expected to notify a difference to the provisions of 2.2.1 under Article 38 of the Convention only if they are unable to accept the binding nature of the Technical Instructions. Where States have adopted different provisions from those specified in the Technical Instructions, they are expected to be reported only under the provisions of 2.5.

2.5.2 **Recommendation.—** *The State of the Operator should take the necessary measures to ensure that when an operator adopts more restrictive requirements than those specified in the Technical Instructions, the notification of such operator variations is made to ICAO for publication in the Technical Instructions.*

2.6 Surface transport

Recommendation.— *States should make provisions to enable dangerous goods intended for air transport and prepared in accordance with the ICAO Technical Instructions to be accepted for surface transport to or from aerodromes.*

2.7 National authority

Each Contracting State shall designate and specify to ICAO an appropriate authority within its administration to be responsible for ensuring compliance with this Annex.

CHAPTER 3. CLASSIFICATION

The classification of an article or substance shall be in accordance with the provisions of the Technical Instructions.

Note.— The detailed definitions of the classes of dangerous goods are contained in the Technical Instructions. These classes identify the potential risks associated with the transport of dangerous goods by air and are those recommended by the United Nations Committee of Experts on the Transport of Dangerous Goods.

CHAPTER 4. LIMITATION ON THE TRANSPORT OF DANGEROUS GOODS BY AIR

4.1 Dangerous goods permitted for transport by air

The transport of dangerous goods by air shall be forbidden except as established in this Annex and the detailed specifications and procedures provided in the Technical Instructions.

4.2 Dangerous goods forbidden for transport by air unless exempted

The dangerous goods described hereunder shall be forbidden on aircraft unless exempted by the States concerned under the provisions of 2.1 or unless the provisions of the Technical Instructions indicate they may be transported under an approval issued by the State of Origin:

a) articles and substances that are identified in the Technical Instructions as being forbidden for transport in normal circumstances; and

b) infected live animals.

4.3 Dangerous goods forbidden for transport by air under any circumstances

Articles and substances that are specifically identified by name or by generic description in the Technical Instructions as being forbidden for transport by air under any circumstances shall not be carried on any aircraft.

CHAPTER 5. PACKING

5.1 General requirements

Dangerous goods shall be packed in accordance with the provisions of this chapter and as provided for in the Technical Instructions.

5.2 Packagings

5.2.1 Packagings used for the transport of dangerous goods by air shall be of good quality and shall be constructed and securely closed so as to prevent leakage which might be caused in normal conditions of transport, by changes in temperature, humidity or pressure, or by vibration.

5.2.2 Packagings shall be suitable for the contents. Packagings in direct contact with dangerous goods shall be resistant to any chemical or other action of such goods.

5.2.3 Packagings shall meet the material and construction specifications in the Technical Instructions.

5.2.4 Packagings shall be tested in accordance with the provisions of the Technical Instructions.

5.2.5 Packagings for which retention of a liquid is a basic function, shall be capable of withstanding, without leaking, the pressure stated in the Technical Instructions.

5.2.6 Inner packagings shall be so packed, secured or cushioned as to prevent their breakage or leakage and to control their movement within the outer packaging(s) during normal conditions of air transport. Cushioning and absorbent materials shall not react dangerously with the contents of the packagings.

5.2.7 No packaging shall be re-used until it has been inspected and found free from corrosion or other damage. Where a packaging is re-used, all necessary measures shall be taken to prevent contamination of subsequent contents.

5.2.8 If, because of the nature of their former contents, uncleaned empty packagings may present a hazard, they shall be tightly closed and treated according to the hazard they constitute.

5.2.9 No harmful quantity of a dangerous substance shall adhere to the outside of packages.

CHAPTER 6. LABELLING AND MARKING

6.1 Labels

Unless otherwise provided for in the Technical Instructions, each package of dangerous goods shall be labelled with the appropriate labels and in accordance with the provisions set forth in those Instructions.

6.2 Markings

6.2.1 Unless otherwise provided for in the Technical Instructions, each package of dangerous goods shall be marked with the proper shipping name of its contents and, when assigned, the UN number and such other markings as may be specified in those Instructions.

6.2.2 *Specification markings on packagings.* Unless otherwise provided for in the Technical Instructions, each packaging manufactured to a specification contained in those Instructions shall be so marked in accordance with the appropriate provisions of those Instructions and no packaging shall be marked with a packaging specification marking unless it meets the appropriate packaging specification contained in those Instructions.

6.3 Languages to be used for markings

Recommendation.— *In addition to the languages required by the State of Origin and pending the development and adoption of a more suitable form of expression for universal use, English should be used for the markings related to dangerous goods.*

CHAPTER 7. SHIPPER'S RESPONSIBILITIES

7.1 General requirements

Before a person offers any package or overpack of dangerous goods for transport by air, that person shall ensure that the dangerous goods are not forbidden for transport by air and are properly classified, packed, marked, labelled and accompanied by a properly executed dangerous goods transport document, as specified in this Annex and the Technical Instructions.

7.2 Dangerous goods transport document

7.2.1 Unless otherwise provided for in the Technical Instructions, the person who offers dangerous goods for transport by air shall complete, sign and provide to the operator a dangerous goods transport document, which shall contain the information required by those Instructions.

7.2.2 The transport document shall bear a declaration signed by the person who offers dangerous goods for transport indicating that the dangerous goods are fully and accurately described by their proper shipping names and that they are classified, packed, marked, labelled, and in proper condition for transport by air in accordance with the relevant regulations.

7.3 Languages to be used

Recommendation.— *In addition to the languages which may be required by the State of Origin and pending the development and adoption of a more suitable form of expression for universal use, English should be used for the dangerous goods transport document.*

CHAPTER 8. OPERATOR'S RESPONSIBILITIES

8.1 Acceptance for transport

An operator shall not accept dangerous goods for transport by air:

a) unless the dangerous goods are accompanied by a completed dangerous goods transport document, except where the Technical Instructions indicate that such a document is not required; and

b) until the package, overpack or freight container containing the dangerous goods has been inspected in accordance with the acceptance procedures contained in the Technical Instructions.

Note 1.— See Chapter 12 concerning the reporting of dangerous goods accidents and incidents.

Note 2.— Special provisions relating to the acceptance of overpacks are contained in the Technical Instructions.

8.2 Acceptance checklist

An operator shall develop and use an acceptance checklist as an aid to compliance with the provisions of 8.1.

8.3 Loading and stowage

Packages and overpacks containing dangerous goods and freight containers containing radioactive materials shall be loaded and stowed on an aircraft in accordance with the provisions of the Technical Instructions.

8.4 Inspection for damage or leakage

8.4.1 Packages and overpacks containing dangerous goods and freight containers containing radioactive materials shall be inspected for evidence of leakage or damage before loading on an aircraft or into a unit load device. Leaking or damaged packages, overpacks or freight containers shall not be loaded on an aircraft.

8.4.2 A unit load device shall not be loaded aboard an aircraft unless the device has been inspected and found free from any evidence of leakage from, or damage to, any dangerous goods contained therein.

8.4.3 Where any package of dangerous goods loaded on an aircraft appears to be damaged or leaking, the operator shall remove such package from the aircraft, or arrange for its removal by an appropriate authority or organization, and thereafter shall ensure that the remainder of the consignment is in a proper condition for transport by air and that no other package has been contaminated.

8.4.4 Packages or overpacks containing dangerous goods and freight containers containing radioactive materials shall be inspected for signs of damage or leakage upon unloading from the aircraft or unit load device. If evidence of damage or leakage is found, the area where the dangerous goods or unit load device were stowed on the aircraft shall be inspected for damage or contamination.

8.5 Loading restrictions in passenger cabin or on flight deck

Dangerous goods shall not be carried in an aircraft cabin occupied by passengers or on the flight deck of an aircraft, except in circumstances permitted by the provisions of the Technical Instructions.

8.6 Removal of contamination

8.6.1 Any hazardous contamination found on an aircraft as a result of leakage or damage to dangerous goods shall be removed without delay.

8.6.2 An aircraft which has been contaminated by radioactive materials shall immediately be taken out of service and not returned to service until the radiation level at any accessible surface and the non-fixed contamination are not more than the values specified in the Technical Instructions.

8.7 Separation and segregation

8.7.1 Packages containing dangerous goods which might react dangerously one with another shall not be stowed on an aircraft next to each other or in a position that would allow interaction between them in the event of leakage.

8.7.2 Packages of toxic and infectious substances shall be stowed on an aircraft in accordance with the provisions of the Technical Instructions.

8.7.3 Packages of radioactive materials shall be stowed on an aircraft so that they are separated from persons, live animals and undeveloped film, in accordance with the provisions in the Technical Instructions.

8.8 Securing of dangerous goods cargo loads

When dangerous goods subject to the provisions contained herein are loaded in an aircraft, the operator shall protect the dangerous goods from being damaged, and shall secure such goods in the aircraft in such a manner that will prevent any movement in flight which would change the orientation of the packages. For packages containing radioactive materials, the securing shall be adequate to ensure that the separation requirements of 8.7.3 are met at all times.

8.9 Loading on cargo aircraft

Except as otherwise provided in the Technical Instructions, packages of dangerous goods bearing the “Cargo aircraft only” label shall be loaded in such a manner that a crew member or other authorized person can see, handle and, where size and weight permit, separate such packages from other cargo in flight.

CHAPTER 9. PROVISION OF INFORMATION

9.1 Information to pilot-in-command

The operator of an aircraft in which dangerous goods are to be carried shall provide the pilot-in-command as early as practicable before departure of the aircraft with written information as specified in the Technical Instructions.

9.2 Information and instructions to flight crew members

The operator shall provide such information in the Operations Manual as will enable the flight crew to carry out its responsibilities with regard to the transport of dangerous goods and shall provide instructions as to the action to be taken in the event of emergencies arising involving dangerous goods.

9.3 Information to passengers

Each Contracting State shall ensure that information is promulgated in such a manner that passengers are warned as to the types of dangerous goods which they are forbidden from transporting aboard an aircraft as provided for in the Technical Instructions.

9.4 Information to other persons

Operators, shippers or other organizations involved in the transport of dangerous goods by air shall provide such information to their personnel as will enable them to carry out their responsibilities with regard to the transport of dangerous goods and shall provide instructions as to the action to be taken in the event of emergencies arising involving dangerous goods.

9.5 Information from pilot-in-command to aerodrome authorities

If an in-flight emergency occurs, the pilot-in-command shall, as soon as the situation permits, inform the appropriate air traffic services unit, for the information of aerodrome authorities, of any dangerous goods on board the aircraft, as provided for in the Technical Instructions.

9.6 Information in the event of an aircraft accident or incident

9.6.1 In the event of:

a) an aircraft accident; or

b) a serious incident where dangerous goods carried as cargo may be involved,

the operator of the aircraft carrying dangerous goods as cargo shall provide information, without delay, to emergency services responding to the accident or serious incident about the dangerous goods on board, as shown on the written information to the pilot-in-command. As soon as possible, the operator shall also provide this information to the appropriate authorities of the State of the Operator and the State in which the accident or serious incident occurred.

9.6.2 In the event of an aircraft incident, the operator of an aircraft carrying dangerous goods as cargo shall, if requested to do so, provide information without delay to emergency services responding to the incident and to the appropriate authority of the State in which the incident occurred, about the dangerous goods on board, as shown on the written information to the pilot-in-command.

Note.— The terms "accident", "serious incident" and "incident" are as defined in Annex 13.

CHAPTER 10. ESTABLISHMENT OF TRAINING PROGRAMMES

Dangerous goods training programmes shall be established and updated as provided for in the Technical Instructions.

CHAPTER 11. COMPLIANCE

11.1 Inspection systems

Each Contracting State shall establish inspection, surveillance and enforcement procedures with a view to achieving compliance with its dangerous goods regulations.

Note.— It is envisaged that these procedures would include provisions for the inspection of both documents and cargo and operators' practices as well as providing a method for the investigation of alleged violations (see 11.3).

11.2 Cooperation between States

Recommendation.— *Each Contracting State should participate in cooperative efforts with other States concerning violations of dangerous goods regulations, with the aim of eliminating such violations. Cooperative efforts could include coordination of investigations and enforcement actions; exchanging information on a regulated party's compliance history; joint inspections and other technical liaisons, exchange of technical staff, and joint meetings and conferences. Appropriate information that could be exchanged include safety alerts, bulletins or dangerous goods advisories; proposed and completed regulatory actions; incident reports; documentary and other evidence developed in the investigation of incidents; proposed and final enforcement actions; and educational/ outreach materials suitable for public dissemination.*

11.3 Penalties

11.3.1 Each Contracting State shall take such measures as it may deem appropriate to achieve compliance with its dangerous goods regulations including the prescription of appropriate penalties for violations.

11.3.2 **Recommendation.—** *Each Contracting State should take appropriate action to achieve compliance with its dangerous goods regulations, including the prescription of appropriate penalties for violations, when information about a violation is received from another Contracting State, such as when a consignment of dangerous goods is found not to comply with the requirements of the Technical Instructions on arrival in a Contracting State and that State reports the matter to the State of Origin.*

11.4 Dangerous goods by mail

Recommendation.— *Each Contracting State should establish procedures with a view to controlling the introduction of dangerous goods into air transport through its postal services.*

Note.— International procedures for controlling the introduction of dangerous goods into air transport through the postal services have been established by the Universal Postal Union.

CHAPTER 12. DANGEROUS GOODS ACCIDENT AND INCIDENT REPORTING

12.1 With the aim of preventing the recurrence of dangerous goods accidents and incidents, each Contracting State shall establish procedures for investigating and compiling information concerning such accidents and incidents which occur in its territory and which involve the transport of dangerous goods originating in or destined for another State. Reports on such accidents and incidents shall be made in accordance with the detailed provisions of the Technical Instructions.

12.2 **Recommendation.—** *With the aim of preventing the recurrence of dangerous goods accidents and incidents, each Contracting State should establish procedures for investigating and compiling information concerning such accidents and incidents which occur in its territory other than those described in 12.1. Reports on such accidents and incidents should be made in accordance with the detailed provisions of the Technical Instructions.*

CHAPTER 13. DANGEROUS GOODS SECURITY PROVISIONS

Each Contracting State shall establish dangerous goods security measures, applicable to shippers, operators and other individuals engaged in the transport of dangerous goods by air, to be taken to minimize theft or misuse of dangerous goods that may endanger persons, property or the environment. These measures should be commensurate with security provisions specified in other Annexes and the Technical Instructions.

— END —

ANNEX 1.
Személyi alkalmasság

10. kiadás – 2006. július
167. módosítással

Ezen kiadás a Tanács által 2006. március 11. előtt elfogadott összes módosítást tartalmazza és az Annex 1 minden korábbi kiadásának helyébe lép 2006. november 23-án.

A Szabványok, és az Ajánlott Eljárások alkalmazhatóságára vonatkozó információkat az Előszó tartalmazza.

Nemzetközi Polgári Repülési Szervezet

MÓDOSÍTÁSOK

A megjelenő módosításokat az ICAO Journal újság, valamint az ICAO Kiadványok és Audio-Vízuális Oktatási Segédletek Katalógusának havonta megjelenő kiegészítő része rendszeresen közzéteszi, melyből ezen kiadvány használói tájékozódhatnak. Az alábbi táblázat rendeltetése az ilyen módosítások nyilvántartása.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK NYILVÁNTARTÁSA

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Sorszám	Életbelépés dátuma	Módosítás dátuma	Módosító neve	Sorszám	Kiadás dátuma	Javítás végre hajtásának dátuma	Javítást végző neve
1–167	23/11/06						

TARTALOMJEGYZÉK

ELŐSZÓ

Történelmi háttér

Az Egyezmény 1. Annex-ének elnevezett, a szakszolgálati engedélyek kiadására vonatkozó szabványokat és ajánlott gyakorlatokat a Tanács a Nemzetközi Polgári Repülési Egyezmény (Chicago, 1944) 37. Cikkelyének megfelelően 1948. április 14-én fogadta el első ízben. Ezek 1948. szeptember 15-én léptek hatályba.

Az „A” táblázat a soron következő módosítások eredetét, az érintett főbb témakörök felsorolását és azokat az időpontokat mutatja, amelyeken a Tanács az Annex-et, illetve módosításait elfogadta, valamint amikor azok érvénybe léptek, és amikor azok alkalmazhatóvá váltak.

A szakszolgálati engedélyezés (PEL) alkalmazása

Az Annex 1 a Nemzetközi Polgári Repülési Szervezet által elfogadott szabványokat és ajánlott gyakorlatokat tartalmazza, melyek a szakszolgálati engedélyezés minimum szabványai.

Az Annex alkalmazható minden egyes szakszolgálati engedélyért folyamodóra és megújítás esetében az itt meghatározott szakszolgálati engedélyek és jogosítások birtokosaira.

A Tanács úgy döntött, hogy alapelvként, az érvényes engedélyezési előírásokat érintő módosításokat valamennyi kérelmezőre kötelező alkalmazni, de az engedélyek régebbi birtokosaira történő alkalmazásuk tekintetében az egyedi engedélyekkel rendelkező személyek tudásának, tapasztalatának és jártasságának – szükség szerinti újravizsgáztatással
történő értékeléséről – a döntést a Szerződő Állam hatáskörébe utalja.

A Szerződő Államok eljárásai

Az eltérések bejelentése. Felhívjuk a Szerződő Államok figyelmét az Egyezmény 38. Cikkelyében foglalt kötelezettségükre, melynek értelmében a Szerződő Állam köteles bejelenteni a Szervezet számára minden olyan eltérést, mely nemzeti előírásai és gyakorlata és ezen Annex-ben, ennek módosításaiban közzétett nemzetközi szabványok között fennáll. A Szerződő Államot felkérjük, hogy ezt a bejelentést ezen Annex-ben és annak bármely módosításában közzétett ajánlott eljárásoktól történő eltérésekre is terjessze ki, ha ezen eltérések bejelentése a léginavigáció biztonságára nézve fontos. Ezen kívül kérjük a Szerződő Államokat, hogy a szervezetet folyamatosan tájékoztassák az esetleg később létrejövő eltérésekről, és a korábban bejelentett eltérés visszavonásáról is. Jelen Annex minden új módosításának elfogadása után a Szerződő

Államnak azonnal külön felkérést küldünk az eltérések bejelentésére.

Az Annex szövegének felhasználása a nemzeti szabályozásban. A Tanács 1948. április 13.-án határozatot fogadott el, melyben felhívta a Szerződő Államok figyelmét arra a kívánatos tényre, hogy, – amennyire csak lehetséges, – saját nemzeti szabályalkotásukban használják fel mindazon ICAO szabványok pontos megfogalmazásait, melyek szabályozó jellegűek és tüntessék fel saját kiegészítő nemzeti előírásaikat is, amelyek fontosak a léginavigáció biztonsága, vagy szabályszerűsége érdekében.

Általános tájékoztató

Jelen Annex teljes terjedelmében az „engedély” kifejezés értelmezése megegyezik az Egyezmény szövegében lévő alábbi kifejezésekkel: „alkalmassági és jogosítási bizonyítvány”, „engedély vagy bizonyítvány” és „engedély”. Hasonlóképpen a „hajózó személyzeti tag” kifejezés megegyező értelmű az Egyezményben szereplő „a légijárművet üzemeltető személyzet tagja”, és az „üzemeltető személyzet” kifejezéssel, míg a „hajózó személyzetbe nem tartozó személyzet” kifejezés azonos értelmű az Egyezményben szereplő „műszaki személyzet” kifejezéssel.

Az Annex alkotóelemeinek jogállása

Egy Annex az alábbi alkotóelemekből épül fel, de nem szükségszerű, hogy minden elem az összes Annex-ben megtalálható legyen. Az egyes alkotóelemek az alábbi jogállással rendelkeznek:

1. Az Annex felépítésének jellemző összetevői:

a) *Szabványok és Ajánlott Gyakorlatok*, melyeket a Tanács az Egyezmény rendelkezései értelmében elfogadott. Ezek meghatározása a következő:

Szabvány: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó minden olyan pontosan körülírt meghatározás, melynek egységes alkalmazása a nemzetközi repülés biztonsága és rendszeressége érdekében szükséges, és a Szerződő Államok alkalmazni fognak az Egyezménynek megfelelően, illetőleg, ha ezek teljesítése nem lehetséges, akkor kötelesek értesíteni erről a Tanácsot a 38. Cikkely értelmében.

Ajánlott gyakorlat: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan pontosan körülírt meghatározás, melynek egységes alkalmazását a nemzetközi repülés biztonsága, rendszeressége és hatékony végrehajtása szempontjából kívánatosnak tartottak, és amelyhez az Egyezmény értelmében a Szerződő Államok alkalmazkodni fognak.

b) *Függelékek:* a felhasználás kényelme érdekében külön csoportosított anyagokat tartalmaznak, de részét képezik a Tanács által elfogadott szabványoknak és ajánlott gyakorlatoknak.

c) *Meghatározások:* A szabványokban és ajánlott gyakorlatokban használt olyan fogalmak meghatározásai, amelyek nem maguktól értetődőek olyan értelemben, hogy elfogadott szótári jelentésük nincs. A meghatározás független jogállással nem rendelkezik, de lényeges része minden olyan szabványnak és ajánlott gyakorlatnak, melyben szerepel, mivel a fogalom értelmének megváltozása hatással lenne az előírásra is.

d) *Táblázatok és ábrák:* valamely szabványhoz vagy ajánlott gyakorlathoz készült kiegészítő, vagy szemléltető anyagok, amelyekre a szabvány vagy az ajánlott eljárás szövege hivatkozik. Részét képezik a kapcsolatos szabványnak vagy ajánlott gyakorlatnak és jogállásuk ezekével megegyező.

Meg kell jegyezni, hogy néhány szabvány ebben az Annex-ben hivatkozásul magába foglal ajánlott gyakorlat jogállású egyéb meghatározásokat is. Ilyen esetben az ajánlott gyakorlat tartalma a szabvány részét képezi.

2. *Szabványokkal és Ajánlott eljárásokkal (SARPS) társított anyagok, melyeket a Tanács kiadásra jóváhagyott:*

a) *Előszó:* A Tanács tevékenységét érintő történeti áttekintést és magyarázó jellegű anyagokat foglal magában, valamint a szabványok és ajánlott gyakorlatok alkalmazásához az államok részére magyarázatul szolgál az Egyezményből, valamint az Elfogadási Határozatból eredő kötelezettségeik megvalósításához.

b) *Bevezetés:* az Annex részeinek, fejezeteinek vagy szakaszainak elején található magyarázó jellegű anyagok, melyek segítséget nyújtanak a szövegalkalmazás megértéséhez.

c) *Megjegyzések:* szükség szerint a szövegbe beépített olyan anyag, mely tárgyi felvilágosítással vagy hivatkozással szolgál az érintett szabványhoz vagy ajánlott gyakorlathoz, de ezeknek részét nem képezi.

d) *Mellékletek:* a szabványokat és az ajánlott eljárásokat, vagy ezek alkalmazását elősegítő kiegészítő anyag.

A nyelv kiválasztása

Jelen Annex-et hat nyelven fogadták el: angol, arab, kínai, francia, orosz és spanyol. Felkérjük a Szerződő Államokat, hogy ezen szövegezések valamelyikéből válasszanak a hazai kivitelezés, és egyéb, az Egyezményben foglalt célokra akár a szövegek közvetlen felhasználásával, akár a nemzeti nyelvre történő lefordítással és a választott megoldásról tájékoztassák a Szervezetet.

Szerkesztési gyakorlat

Annak érdekében, hogy minden egyes szövegrész jogállása első pillanatra szembe tűnő legyen, az alábbi gyakorlatot alkalmazzuk: a Szabványokat vékony álló betűvel, az *Ajánlott Gyakorlatokat* vékony dőlt betűkkel tüntetjük fel. Az Ajánlások jogállását a kövér betűvel nyomtatott **Ajánlás** szó jelzi. A megjegyzések vékony dőlt betűkkel szerepelnek, jogállásukat a *Megjegyzés* címszó jelöli.

Meg kell jegyezni, hogy az angol nyelvű szövegezésben az előírások megfogalmazásában a szerkesztési gyakorlat a következő: a Szabványokban a „shall”, az Ajánlásokban pedig a „should” műveltető ige használatos.
A jelen dokumentumban alkalmazott mértékegységek teljesen megfelelnek a Nemzetközi Polgári Repülés Egyezményének 5. Annex-ében közzétett nemzetközi mértékegység rendszernek, az (SI)-nek. Ahol az 5. Annex lehetőséget ad alternatív, nem-SI mértékegység alkalmazására, ott ezt, az alapegységet követően zárójelben tüntettük fel. Ahol két, különféle mértékegységben közölt adat-pár szerepel, ott nem tételezhető fel, hogy az érték-párok egyenlők és felcserélhetők. Olyan módon viszont értelmezhető, hogy bármelyik mértékegység-pár kizárólagos alkalmazásával megvalósítható az azonos biztonsági szint.

Jelen dokumentum bármely, számmal azonosított részére történő utalás magába foglalja az adott rész alpontjait is.

A. Táblázat. Az Annex 1. módosításai

Módosítás	*Forrás (ok)*	*Tárgy*	*Elfogadva* *Hatályba lép* *Alkalmazandó*
Első kiadás	A PEL Divízió 2. Ülésszaka, 1947. január	A repülőszemélyzet és a léginavigációs szolgálatokért felelős kulcs-személyzet engedélyeinek kiadása	1948. április 14. 1948. szeptember 15. 1949. május 01.
1 – 123 (2. kiadás)	A PEL Divízió 3. Ülésszaka 1948. március	A meglévő Szabványok módosítása	1950. március 22. 1950. szeptember 01. 1951. október 01.
124 – 129	A PEL Divízió 3. Ülésszaka, 1948. március	A meglévő Szabványok módosítása	1950. június 27. 1950. november 01. 1951. október 01.
130 – 151 (3. kiadás)	A PEL Divízió 3. és 4. Ülésszaka 1948. március 1952. február	A meglévő Szabványok módosítása	1952. november 25. 1953. április 01. 1955. április 01.
152	A szakszolgálati engedély kiadásához szükséges hallási és látási követelmények külön ülésszaka 1955.	A szakszolgálati engedélyek kiadásának hallási és látási követelményei	1956. február 22. 1956. július 01. 1956. december 01.
153	Léginavigációs Bizottság	Új EKG (electrocardiogram) követelmények	1957. április 16. 1957. szeptember 01. 1957. december 01.
154 (4. kiadás)	3. Léginavigációs Konferencia , 1956	A SARP-ok (Szabványok és Ajánlott Eljárások) módosítása	1957. június 13. 1957. október 01. 1957. december 01.
155 (5. kiadás)	A PEL/MED ülés ajánlása 1961. május	A SARP-ok módosítása	1962. június 27. 1962. november 01. 1963. szeptember 01.
156 (6. kiadás)	PEL/TRG/MED Divíziótalálkozó 1970. október-november	A SARP-ok módosítása	1972. december 11. 1973. április 11. 1975. január 02. 1978. január 26.
157	Tanács	Az orosz nyelv használata a szakszolgálati engedélyekben	1976. június 28. 1976. október 28. 1977. április 21.

158 (7. kiadás)	Levelezés és Titkárság, 21. Közgyűlés és Tanács	A vizsgáló orvosokra érvényes szabványok módosítása. Új SARPs-előírások az orvosi alkalmasság megállapítására. A „fizikai és szellemi követelmények” Egészségügyi Osztály”-okkal történő felváltása	1982. május 04. 1982. szeptember 04. 1982. november 25.
159 (8. kiadás)	A szakszolgálati engedély kiadásával és a kiképzéssel foglalkozó (PELT) Panel 2., 3., és 4. Ülése 1983. november, 1985. április, 1986. április, 1986. május Léginavigációs Bizottság	A hajózó személyzeti tagok szakszolgálati engedélyezésével foglalkozó SARP-ok módosítása. A senior kereskedelmi pilóta – repülőgép, az ellenőrzött VFR jogosítás, a hajózó fedélzeti rádiós szakszolgálati engedély, és a vitorlázó és ballon repülésoktató jogosítások eltörlése. Az 5700 kg maximális felszálló tömeg határvonal eltörlése és felváltása az engedélyezéshez szükséges személyzeti összetétel szerinti határvonallal. A helikopterekre vonatkozó minden előírás szabvány jogállásúra változtatása. A két-pilótás üzemelésre jogosított repülőgépekre a típusjogosítás kiadási követelményeinek megszigorítása. Minden szakszolgálati engedély és jogosítás kiadási feltételének naprakésszé tétele. Repülésoktatási követelmények felállítása a magán-, a kereskedelmi-, a vitorlázó-, és a szabadon repülő ballon pilótájának szakszolgálati engedélyeihez és a műszeres, illetve a repülés- oktató jogosításokhoz.	1988. március 28. 1988. július 31. 1989. november 16.
160	Léginavigációs Bizottság	A légiforgalmi irányítókra, a légiforgalmi állomásüzemeltetőkre és a repülésüzemi tisztekre vonatkozó SARP-ok módosítása	1993. március 24. 1993. július 26. 1994. november 10.
161	Léginavigációs Bizottság	A repülőgép karbantartó technikus /mérnök/mechanikus személyekre vonatkozó SARP-ok és a szakszolgálati engedélyükre vonatkozó előírások módosítása	1997. március 10. 1997. július 21. 1998. november 05.

162	A különféle szerekkel kapcsolatos munkahelyi visszaélések megakadályozásával foglalkozó munkacsoport (PSAWSG) 1., 2., 3., és 4. találkozója 1993. december 1994. augusztus 1995. január 1995. május Léginavigációs Bizottság	A repülésben foglalkoztatott személyek által használt pszichoaktív anyagokkal kapcsolatos SARP-ok módosítása	1998. február 25. 1998. július 20. 1998. november 05.
163 (9. kiadás)	Repülésbiztonsági és Emberi Tényezőket Vizsgáló Bizottság (FSHFSG) 1995. május Látást és Színérzékelést Vizsgáló Bizottság (VCPSG) 1997. június-1998. május Léginavigációs Bizottság	Az Emberi Tényezők ismeretére vonatkozó követelmények, a látásra és színérzékelésre vonatkozó követelmények, a szakszolgálati engedélyben használatos nyelv, a Melléklet törlése.	2001. február 19. 2001. július 16. 2001. november 01.
164	A Közgyűlés 32. Ülése, valamint a MET Divízió ülése (2002), a Léginavigációs Bizottság ülése	Meghatározások módosítása, a megkívánt nyelvtudásra vonatkozó új előírások a rádiótávbeszélőt használó repülőgépvezetőkre és helikopterpilótákra, valamint a légiforgalmi irányítókra és légiforgalmi állomás üzemeltetőkre vonatkozólag, a légiforgalmi meteorológiai szakszemélyzet minősítésére és kiképzésére vonatkozó előírások Megjegyzés-el való kiegészítése, a légijármű karbantartó mérnökre vonatkozó Emberi Tényezők ismeret követelményeinek módosítása.	2003. március 5. 2003. július 14. 2003. november 27.
165	Léginavigációs Bizottság	Módosító bejegyzés a típusjogosításra vonatkozólag az utazórepülés fázisa jogosításainak korlátozásával	2004. február 25. 2004. július 12 2004. november 25
166	Léginavigációs Bizottság, Orvosi Előírások Munkacsoportja (MPSG), a Szakszolgálati Engedély kiadásával és a kiképzéssel foglalkozó Panel (FCLTP)	Az orvosi előírások módosítása, új előírások a jogosított oktatási/kiképzési szervezetekre vonatkozólag	2005. február 21. 2005. július 11. 2005. november 24.

167 (10. kiadás)	A Léginavigációs Bizottság tanulmányai. A szakszolgálati engedély kiadásával és a kiképzéssel foglalkozó Panel második ülése.	Módosított és új egészségügyi előírások a hajózó személyzet tagjai életkorának felső határára vonatkozólag, léghajókra és motoros szerkezetekre vonatkozó új szakszolgálati engedélyezési követelmények, a többszemélyes személyzet pilóta szakszolgálati engedélyének bevezetése, a jelenleg érvényes hajózó személyzet szakszolgálati engedélyezésére vonatkozó Szabványok részleges módosításai, a repülési szimulátoron történő képzés eszközeinek szerepére vonatkozó rendelkezések módosításai a szakszolgálati engedélyek és jogosítások különböző szintjei által megkívánt szakképzettség megszerzésében vagy fenntartásában.	2006. március 10. 2006. július 17. 2006. november 23.

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

1. FEJEZET

MEGHATÁROZÁSOK ÉS AZ ENGEDÉLYEKRE VONATKOZÓ ÁLTALÁNOS SZABÁLYOK

1. 1. Meghatározások

Ahol a szakszolgálati engedélyezésre vonatkozó Szabványokban és Ajánlott Eljárásokban az alábbi kifejezéseket használtuk, ezek jelentése a következő:

Hiteles orvosi minősítés – (Accredited medical conclusion)
Az engedélyt kiadó Hatóság által elfogadott egy vagy több orvos szakértő által, – a végeredmény elérése céljából, szükség szerint repülési, vagy egyéb szakértők bevonásával – az adott eset tárgyában levont végeredmény.

Repülőgép – (Aeroplane) A levegőnél nehezebb, erőgép meghajtású légijármű, amely repülés közben a felhajtóerőt elsősorban a repülés adott szakaszaiban rögzített helyzetben maradó felületeire ható aerodinamikai reakciók révén nyeri.

Légijármű – (Aircraft) Minden olyan szerkezet, amelynek a levegőben maradását olyan aerodinamikai reakciók biztosítják, amelyek nem azonosak a földfelszínre ható aerodinamikai reakciókkal.

Légijármű repülési elektronika – (Aircraft avionics) Kifejezés, mely az adott légijármű fedélzetén használt bármilyen elektronikus készüléket – beleértve azok elektronikus részeit is, – magában foglal, mint például a rádiót, az automata repülésvezérlési és a műszer rendszereket is.

Légijármű – osztály (Aircraft – category) A légijárművek osztályba sorolása meghatározott alapjellemzők szerint, pl. repülőgép, helikopter, vitorlázó repülőgép, szabadon repülő ballon.

Egy pilótás üzemelésre hitelesített légijármű – (Aircraft certificated for single-pilot operation)
A légijárművek azon típusa, amelyről a lajstromozó állam a légialkalmassági vizsgálatok alapján megállapította, hogy egy pilótás minimum létszámú személyzettel biztonságosan üzemeltethető.

Másodpilótával üzemeltetendő légijármű (Aircraft required to be operated with a co-pilot)
A légijármű olyan típusa, melyet egy másodpilótával kell üzemeltetni a repülési kézikönyvben, vagy az üzemeltetési bizonyítványban előírtak szerint.

A légijármű típusa (Aircraft – type of) Azonos alapkonstrukciójú légijárművek összessége, beleértve azok minden változatát, kivéve, ha olyan módosításokat hajtottak végre, amelynek következtében a légijármű vezetési vagy repülési jellemzői megváltoztak.

Repülési készség (**Airmanship)** A jó ítélőképesség és a megfelelő szintű tudás következetes alkalmazása, készségek és hozzáállás a repülési feladatok végrehajtásához

Léghajó (Airship) A levegőnél könnyebb, erőgép meghajtással rendelkező légijármű.

Jogosított karbantartó szervezet – (Approved maintenance organization) A Szerződő Állam által az Annex 6. I. Részének 8. Fejezete előírásai alapján jogosított, és az illető állam jóváhagyott felügyelete alatt működő szervezet, melynek feladata a légijármű, vagy részeinek karbantartása.

Megjegyzés – Ez a meghatározás nem kívánja kizárni azt a lehetőséget, hogy a szervezetet vagy annak felügyeletét egynél több állam hagyja jóvá.

Jóváhagyott kiképzés – (Approved training) A Szerződő Állam által jóváhagyott speciális tanterv és felügyelet szerint végzett kiképzés, melyet a hajózó személyzeti tagok esetében egy jogosított kiképzési szervezet hajt végre.

Jogosított kiképzési szervezet – (Approved Training Organization) Egy Szerződő Állam által, az Annex 1. 1. 2. 8. 2. pontja és a 2. számú Függelék követelményei szerint jogosított szervezet a hajózó személyzetek kiképzésének és működtetésének végrehajtására ugyanezen Állam felügyelete alatt.

Ballon – (Balloon) A levegőnél könnyebb, erőgép meghajtással nem rendelkező légijármű.

Megjegyzés: Jelen Annex céljára ez a meghatározás a szabadon repülő ballonra vonatkozik.

Légi-alkalmassá nyilvánítás – (Certify as airworthy (to)) Annak igazolása, hogy a légijármű, vagy annak részei a rajtuk elvégzett karbantartást követően az érvényes légialkalmassági előírásoknak megfelelnek.

Közforgalmú légiszállítás (Commercial air transport operation) Egy légijármű üzemeltetése, beleértve utasok, áru, vagy postaküldemények szállítását, díjazás, vagy ellenszolgáltatás céljából.

Alkalmasság (Competency) Készségek, tudás és magatartásformák kombinációja, melyek egy feladatnak az előírt standard szintjén történő végrehajtásához szükségesek.

Alkalmassági alapelem (Competency element) Olyan tevékenység, mely úgy alakít egy feladatot, melynek van egy kiváltó eseménye és egy befejező eseménye, hogy világosan értelmezi annak határait és egy meghatározható végeredményét.

Az alkalmasság egysége (Competency unit) Különálló részekből összetevődő tevékenység, mely számos alkalmassági alapelemet foglal magába.

Másodpilóta – (Co-pilot) Szakszolgálati engedéllyel rendelkező, a légijármű fedélzetén a repülőgép parancsnok feladatain kívül bármely más pilóta-feladatot ellátó pilóta, kivéve azt a személyt, aki a légijármű fedélzetén kizárólag repülésoktatás céljából tartózkodik.

Beszámítható eredmény (Credit) Alternatív módozatok, vagy korábbi minősítés elismerése.

Útvonalrepülés (Cross-country) Egy indulási pont és egy érkezési pont között végrehajtott olyan repülés, melynek során szabvány navigációs eljárások alkalmazásával egy előre megtervezett útvonalat követ.

Kétkormányos képzési idő (Dual instruction time) Az a repülési időtartam, amely alatt a légijármű fedélzetén egy adott személyt megfelelő jogosítással rendelkező pilóta oktatott.

Hiba (Error) A hajózó személyzet részéről végrehajtott olyan tevékenység, vagy annak elmaradása, melynek eltérés a következménye a szervezet, vagy a hajózó személyzet szándékaitól vagy elvárásaitól.

Hiba kezelése (Error management) Az a folyamat, melynek során a hibák felderítése és az ellenintézkedések segítségével rájuk adott válasz olyan, hogy csökkenti, vagy kiküszöböli a hibák következményeit, és csökkenti a további hibák, vagy a nemkívánatos légijármű helyzetek valószínűségét.

Megjegyzés – Lásd a Léginavigációs Szolgálatok Eljárásai Kiképzés című kiadvány 3. Fejezetének C mellékletét (PANS-TRG, Doc 9868), mely tartalmazza a nemkívánatos légijármű helyzetek ismertetését.

Hajózó személyzeti tag – (Flight crew member) Szakszolgálati engedéllyel rendelkező olyan repülőszemélyzeti tag, akit a repülés időtartama alatt a légijármű üzemeltetéséhez nélkülözhetetlen kötelmek elvégzésével bíztak meg.

Repülési terv – (Flight plan) A légiforgalmi szolgálatok egységei számára biztosított meghatározott tartalmú tájékoztatás, mely egy tervezett repülésre, vagy annak egy részére vonatkozik.

Repülési eljárásokat gyakorló berendezés (Flight procedures trainer) Lásd: Repülési szimulátor oktató berendezés.

Repülési szimulátor oktatóberendezés (Flight simulation training device)
Az alábbi három berendezéstípus bármelyike, amelyben a repülési körülményeket a földön leutánozzák (szimulálják):

Repülési szimulátor (Flight simulator), amely egy bizonyos légijármű pilótakabinjának pontos utánzata oly mértékben, hogy a mechanikus, elektromos és elektronikai stb. légijármű rendszerek működtetésének funkciói, a hajózó személyzet normál környezete, valamint az adott légijármű teljesítmény- és repülési jellemzői valósághűen utánozhatók,

Repülési eljárást gyakorló berendezés /Flight procedures trainer)
A berendezés biztosítja a fedélzet valósághű környezetét, és a műszerjelzéseket, a légijármű mechanikus, elektromos, elektronikus, stb. rendszereinek egyszerű vezérlési funkcióit, és az adott osztályba sorolható légijárművek teljesítmény- és repülési jellemzőit valószerűen utánozza,

Műszerrepülést gyakorló alapberendezés (Basic instrument flight trainer)
Olyan berendezés, mely megfelelő műszerekkel van felszerelve, és valósághűen utánozza a légijármű fedélzeti környezetét műszeres repülési körülmények között.

Repülési szimulátor (Flight simulator)
Lásd: Repülési szimultátor oktatóberendezés.

Repülési idő – repülőgép – (Flight Time – aeroplanes) Az a teljes időtartam, mely a repülőgép felszállás céljából történő megmozdulásának első pillanatával kezdődik, és azzal a pillanattal végződik, amikor a repülőgép a repülés befejeződésével végső nyugalomba jut.

Megjegyzés: A fentiekben meghatározott repülési idő megegyezik a „fékoldástól – befékezésig”, vagy a „féktuskó elvételétől a visszahelyezéséig” kifejezésekkel általánosan használt értelemben, és időtartamát attól a pillanattól mérik, amikor a repülőgép felszállás céljából először mozdul meg és tart addig a pillanatig, amikor a repülés befejeződésével a repülőgép véglegesen leáll.

Repülési idő – helikopter (Flight time – Helicopters) Az a teljes időtartam, mely akkor kezdődik, amikor a helikopter rotorlapátjai forogni kezdenek és tart addig a pillanatig, amikor a repülés befejeződésével a helikopter véglegesen megáll, rotorlapátjainak forgása teljesen megszűnik.

Vitorlázó repülőgép – (Glider) Erőgép meghajtással nem rendelkező, a levegőnél nehezebb légijármű, mely repülés közben a felhajtóerőt elsősorban a repülés adott szakaszaiban rögzített helyzetben maradó felületeire ható aerodinamikai reakciók révén nyeri.

Vitorlázó repülési idő – (Glider Flight Time) Attól függetlenül, hogy a vitorlázó repülőgép vontatással, vagy szabadon tartózkodik a levegőben, a repüléssel eltöltött teljes időtartam kezdete az a pillanat, amikor a vitorlázógép felszállás céljából először megmozdul és addig a pillanatig tart, amikor a repülés befejeztével a repülőgép nyugalmi helyzetbe kerül.

Helikopter – (Helicopter) Olyan a levegőnél nehezebb légijármű, melynek levegőben maradását egy általában függőleges tengelyre szerelt egy vagy több motormeghajtású rotorlapáton képződő légreakció biztosítja.

Emberi tényezők – (Human performance) Az emberi képességnek és korlátainak összessége, mely befolyást gyakorol a légiforgalmi tevékenységek biztonságára és hatékonyságára.

Műszeres repülési idő – (Instrument flight time) Az az időtartam, mely alatt a pilóta valamely légijárművet kizárólag a műszerek alapján vezet, külső vizuális támpontok felhasználása nélkül.

Műszeres földi idő – (Instrument ground time) Az az időtartam, amely alatt a pilóta szimulált műszeres repülést gyakorol a földön egy olyan repülési szimulátor oktatóberendezésben, melyet az Engedélyező Hatóság jóváhagyott.

Műszeres idő – (Instrument time) Műszeres repülési idő, vagy műszeres földi idő.

Engedélyező Hatóság – (Licensing Authority) A Szerződő Állam által kijelölt hatóság, amely felelős a szakszemélyzet engedéllyel történő ellátásáért.

Megjegyzés – Jelen Annex előírásaiban feltételeztük, hogy a Szerződő Állam az Engedélyező Hatóságot az alábbi jogkörökkel ruházta fel:

a) engedély vagy jogosítás megszerzéséhez a folyamodó alkalmasságának felmérése,
b) engedélyek és jogosítások kiadása és érvényesítése,
c) jóváhagyott személyek kijelölése és felhatalmazása,
d) kiképző tanfolyamok jóváhagyása,
e) repülési szimulátor oktató-berendezés jóváhagyása, illetve a berendezés használatának engedélyezése a szükséges tapasztalat megszerzése, vagy a jártasság bizonyítása érdekében, melyet az engedély vagy a jogosítás kiadásához előírnak, és
f) más Szerződő Állam által kiadott szakszolgálati engedélyek érvényesítése

Valószínű – (Likely) A 6. Fejezetben szereplő orvosi előírások szövegösszefüggésében a ***valószínű*** az előfordulás valószínűségét jelenti, amely elfogadhatatlan az Egészségügyi Minősítő személy számára.

Karbantartás (Maintenance) A légijármű folyamatos légialkalmasságának fenntartásához szükséges feladatok ellátása, beleértve a külön-külön, vagy bármely kombinációban a nagyjavítást, a javítást, az átvizsgálást, a cserét, a módosítást vagy a hibaelhárítást.

Egészségügyi minősítés (Medical Assessment) A Szerződő Állam által kiadott olyan bizonyítvány, amely szerint a szakszolgálati engedély birtokosa az egészségügyi alkalmasság meghatározott követelményeinek megfelel. Azt követően adják ki, hogy az Engedélyező Hatóság értékelte az engedélyért folyamodó személy vizsgálatát végző kijelölt vizsgálóorvos által benyújtott jelentést.

Egészségügyi Minősítő (Medical Assessor) A gyakorlati repülés-orvostanban tapasztalattal rendelkező és minősített orvos, aki az egészségügyi felülvizsgálók által az Engedélyező Hatósághoz benyújtott orvosi jelentéseket kiértékeli.

Egészségügyi felülvizsgáló (Medical examiner) Olyan orvos, aki a repülő-orvostan témakörében kiképzést kapott, és a repülési környezetet illetően gyakorlati tudással és tapasztalattal rendelkezik, és akit az Engedélyező Hatóság kijelölt olyan szakszolgálati engedélyért vagy jogosításért jelentkezők alkalmasságát megállapító orvosi vizsgálatok végrehajtására, amelyekhez egészségügyi követelményeket írtak elő.

Éjszaka – (Night) Az esti polgári szürkület vége és a hajnali polgári szürkület kezdete között eltelt idő, avagy a napnyugta és a napkelte között eltelt olyan egyéb időtartam, amelyet az illetékes Hatóság állapított meg.

Megjegyzés: Az esti polgári szürkület akkor fejeződik be, amikor a napkorong középpontja 6°-kal a horizont alá süllyedt, a hajnali szürkület pedig reggel akkor kezdődik, amikor a napkorong középpontja 6°-kal a horizont alatt van.

Teljesítmény kritériumok (Performance criteria) Az alkalmassági elemek előírt végeredményének egyszerű, értékelhető megállapításai, és azon kritériumok ismertetése, melyeket annak megítéléséhez alkalmaztak, hogy a teljesítmény előírt szintje teljesült-e.

A légijármű vezetése (Pilot (to)) Valamely légijármű repülési kormányszerveinek működtetése a repülési idő alatt.

Parancsnok-pilóta (Pilot-in-command) Az üzemeltető, vagy kisgépes (általános célú) repülésben a tulajdonos által parancsnokpilótának kijelölt pilóta, akit megbíznak a repülés biztonságos végrehajtásával.

Ellenőrzés alatti parancsnokpilóta (Pilot-in-command under supervision) A parancsnokpilóta ellenőrzése alatt álló másodpilóta, aki végrehajtja a parancsnokpilóta feladatait az Engedélyező Hatóság által elfogadhatónak ítélt ellenőrzési eljárásnak megfelelően.

Motoros szerkezet (Powered lift) A levegőnél nehezebb olyan légijármű, mely képes a függőleges felszállásra, a függőleges leszállásra és a kis sebességgel történő repülésre, és amely elsődlegesen a motormeghajtású emelőszerkezettől, vagy az emeléshez alkalmazott motor tolóerőtől függ ezen repülési tartományokban, valamint az emelésben szerepet nem játszó nem- forgó légijármű- felület (ek) től a vízszintes repülés alatt.

Káros szerek problémát okozó használata (Problematic use of substances)
A repülési szakszemélyzet által fogyasztott olyan egy vagy több pszichoaktív szer, mely:

a) használójára nézve közvetlen veszélyt jelent, vagy mások életét, egészségét, illetve jólétét veszélyezteti, és/vagy
b) foglalkozási, szociális, mentális, fizikai problémát, vagy rendellenességet okoz, illetve azt súlyosbítja.

Pszichoaktív szerek – (Psichoactive substances) Az alkohol, az ópium-rokon-, a cannabis-rokon- anyagok, a nyugtató és hipnotikus anyagok, a kokain, a tudatállapotot befolyásoló egyéb szerek, a hallucinogén anyagok és az illó oldószerek a kávé és a dohány kivételével.

Minőségbiztosítási rendszer (Quality system) A szervezet dokumentált eljárásai és irányelvei, ezen irányelvek és eljárások belső auditjai, a minőség tökéletesítése érdekében hozott ajánlások és felülvizsgálatok kezelése.

Jogosított légiforgalmi irányító – (Rated air traffic controller) Olyan légiforgalmi irányító, aki szakszolgálati engedéllyel és az általa gyakorolt tevékenységre érvényes jogosítással rendelkezik.

Jogosítás – (Rating) A szakszolgálati engedélybe bejegyzett, vagy a szakszolgálati engedélyhez tartozó, annak részét képező felhatalmazás, amely a szakszolgálati engedélyt érintő külön feltételeket, jogosításokat vagy a korlátozásokat rögzíti.

Érvényesség elismerése (szakszolgálati engedély) – (Rendering (a licence) valid) Valamely Szerződő Állam saját szakszolgálati engedély kiadását helyettesítő olyan tevékenység. amellyel más Szerződő Állam által kiadott szakszolgálati engedélyt a saját maga által kiadott szakszolgálati engedéllyel egyenértékűnek ismer el.

Karbantartási nyilatkozat aláírása (Sign a maintenance release (to))
Az Annex 6-ban szereplő karbantartási nyilatkozat kiadásával annak igazolása, hogy a karbantartási munkát a vonatkozó légialkalmassági szabványokkal megegyezően kielégítő módon elvégezték.

Jelentős (Significant) A 6. Fejezetben szereplő egészségügyi előírások szövegösszefüggésében a ***jelentős*** olyan fokú, vagy olyan természetű dolgot jelent, mely valószínűen veszélyt jelent a repülés biztonságára.

Egyedül repülési idő – (Solo flight time) Az az időtartam, amely alatt a növendék pilóta egyedül tartózkodik a légijárműben.

Fenyegetés (Threat) Olyan események vagy hibák, melyek a hajózó személyzet befolyásán kívül fordulnak elő, megnövelik az üzemeltetés bonyolultságát, és amelyeket kezelni kell a biztonság megfelelő szintjének fenntartása érdekében.

Fenyegetés kezelése (Threat management) A fenyegetések felderítése és a rájuk adott válasz ellenintézkedések útján annak érdekében, hogy a fenyegetések következményei csökkenjenek vagy kiküszöbölhetők legyenek, valamint a hibák vagy a nemkívánatos légijármű helyzetek előfordulási valószínűsége csökkenjen.

1. 2. Az engedélyekre vonatkozó általános szabályok

1. Megjegyzés: Annak ellenére, hogy a Nemzetközi Polgári Repülés Egyezménye a Lajstromozó Államot olyan feladatokkal ruházza fel, amelyeket ez az állam – a helyzetnek megfelelően – jogosult, vagy köteles gyakorolni, a Közgyűlés az A23-13 Határozatában elismerte, hogy a lajstromozó állam esetenként képtelen megfelelően eleget tenni kötelezettségének akkor, amikor más állam által üzemeltetett légijárművet – elsősorban hajózó személyzet nélkül- vesz bérbe, szerződésbe vagy cserébe, és elismerte továbbá azt, hogy az Egyezmény esetleg nem megfelelően írja elő az üzemeltető államának ilyen esetekre vonatkozó jogait és kötelezettségeit mindaddig, amíg az Egyezmény függőben lévő 83. Cikkelye érvénybe nem lép. Ezért a Tanács arra ösztönöz,- ha a fenti körülmények között a Lajstromozó Állam képtelennek vagy nem teljes értékűnek ítéli meg a rá vonatkozó előírt feladatok ellátását,- hogy utalja át az üzemeltető államának hatáskörébe (ha ezt az utóbbi elfogadja) a Lajstromozó Állam azon feladatait, amelyeket az üzemeltető állama sokkal megfelelőbben képes gyakorolni. Habár az Egyezmény függőben lévő 83. Cikkelye 1997. június 20.-án életbe lépett mindazon államokra vonatkozólag, amelyek a kapcsolódó Protokol-t (DOC 9318) aláírták, a fentiekben említett lépések elsősorban azokra a Szerződő Államokra vonatkoznak, amelyek a függőben lévő 83. Cikkely hatálya alá eső szerződéses kapcsolattal nem rendelkeznek. Nyilvánvaló, hogy a függőben lévő 83. Cikkely érvénybe lépése után az előzőekben említett tevékenységek a gyakorlati célszerűséget segítik elő, és nem érintik sem a Chicago-i Egyezménynek a lajstromozó állam, sem bármely harmadik állam kötelezettségeket előíró rendelkezéseit. Az Egyezmény 83. Cikkelye ugyan érvénybe lépett 1997. június 20.-án, az ilyen átruházási egyezmények csak azokat a Szerződő Államokat fogják érinteni, amelyek ratifikálták a Protocol-t (DOC 9318) a 83. Cikkelyben foglalt feltételek teljesítését követően

2. Megjegyzés: A nemzetközi szabványokat és ajánlott gyakorlatokat az alábbi szakszolgálati engedélyekre alakították ki:

a) Hajózó személyzet

- *magánpilóta – repülőgép, léghajó, helikopter, vagy motoros szerkezet,*
- *kereskedelmi pilóta – repülőgép, léghajó, helikopter vagy motoros szerkezet,*
- *többszemélyes személyzet pilóta – repülőgép*
- *közforgalmi pilóta – repülőgép, helikopter, vagy motoros szerkezet*
- *vitorlázó repülőgép pilóta,*
- *szabadon repülő ballon pilóta,*
- *hajózó navigátor,*
- *hajózó mérnök*

b*) egyéb személyzet*

- *légijármű szerelő (technikus /mérnök /mechanikus),*
- *légiforgalmi irányító,*
- *repülésüzemi tiszt/diszpécser*
- *légiforgalmi állomásüzemeltető.*

1.2.1. Hajózó személyzeti tagként való ténykedés joga

Valamely személy légijárművön csak abban az esetben tevékenykedhet hajózó személyzet tagjaként, ha rendelkezik a feladatkörének megfelelő és ezen Annex előírásait kielégítő érvényes szakszolgálati engedéllyel. A szakszolgálati engedélyt az adott légijárművet Lajstromozó Államnak kell kiállítania, vagy érvényesítenie kell a más Szerződő Állam által kiadott szakszolgálati engedélyt.

Megjegyzés: A Nemzetközi Polgári Repülési Egyezmény 29. Cikkelye előírja, hogy a hajózó személyzeti tagoknak a megfelelő engedélyeket magukkal kell vinniük a fedélzetre minden olyan légijármű esetében, amely részt vesz a nemzetközi léginavigációban

1. 2. 2. Az engedély érvényességének elismerése

1. Ha egy Szerződő Állam egy másik Állam által kibocsátott szakszolgálati engedélyt érvényesnek ismer el a saját kibocsátású szakszolgálati engedélye alternatívájaként, az érvényességet az előbbi engedéllyel együtt viselendő megfelelő kiterjesztéssel határozza meg, melyben a másik állam szakszolgálati engedélyét a sajátjával egyenértékűnek elismeri. Ha egy Állam bizonyos jogokra korlátozza a kiterjesztést, akkor pontosan meg kell határozni a kiterjesztés jogait, hogy melyeket kell elfogadni egyenértékűnek. A kiterjesztés érvényessége megszűnik, ha az engedélyt, amelyre ezt kibocsátották, visszavonták, vagy felfüggesztették.

2. Megjegyzés: Ez a kitétel nem szándékozik megakadályozni a szakszolgálati engedélyt kibocsátó államot abban, hogy megfelelő bejelentéssel meghosszabbítsa az engedély érvényességi időtartamát anélkül, hogy megkövetelné akár a szakszolgálati engedély.

Megjegyzés: Ez a kitétel nem szándékozik megakadályozni a szakszolgálati engedélyt kibocsátó államot abban, hogy megfelelő bejelentéssel meghosszabbítsa az engedély érvényességi időtartamát anélkül, hogy megkövetelné akár a szakszolgálati engedély fizikai visszaküldését, akár a szakszolgálati engedély tulajdonosának megjelenését az adott állam hatóságai előtt.

1. 2. 2. 2. Ha az 1. 2. 2. 1. pont alatti kiterjesztést közforgalmú légiszállítás tevékenységeiben történő felhasználásra bocsátották ki, az Engedélyező Hatóságnak a másik Szerződő Állam engedélyének érvényességét hitelesítenie kell a kiterjesztés megadása előtt.

1. 2. 2. 3. **Ajánlás** – *A Szerződő Állam által kibocsátott pilóta szakszolgálati engedélyt a többi Szerződő Állam részéről érvényesnek kell elismerni magánrepülések esetére.*

Megjegyzés: A más Szerződő Állam által kiadott szakszolgálati engedélyt magánrepülések céljára hivatalos formaságok nélkül elismerő Szerződő Államot arra ösztönözzük, hogy ezt a lehetőséget saját Légiforgalmi Tájékoztató Kiadványában (AIP) tegye közzé.

1. 2. 3. A szakszolgálati engedély birtokosának jogai

A Szerződő Állam ne engedélyezze, hogy az engedély birtokosa a szakszolgálati engedélyében biztosított jogain kívül egyéb jogokat is gyakorolhasson.

1. 2. 4. Egészségügyi alkalmasság

1. Megjegyzés: Tájékoztató anyagot a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

2. Megjegyzés: A folyamodónak az „Egészségügyi Minősítés”-ben foglalt és három külön osztályba sorolt követelmény közül a megfelelőt kell teljesítenie a különböző típusú szakszolgálati engedélyek egészségügyi feltételeinek kielégítéséhez. Az erre vonatkozó részleteket a 6. 2, 6. 3, 6. 4, és a 6. 5 pontok tartalmazzák. Az 1. 2. 4. 1 pontban leírt követelmények teljesítésének bizonyítékául az Engedélyező Hatóság megadja a folyamodónak a megfelelő (1., 2., illetve 3. osztályú) Egészségügyi Minősítést. Ez többféle módon történhet, mint például: megfelelő megnevezésű külön bizonyítvány kiadásával, a szakszolgálati engedélybe történő bejegyzéssel, állami szabályba foglalással, miszerint az egészségügyi minősítés a szakszolgálati engedély szerves része, stb.

1. 2. 4. 1. Az engedélyért folyamodónak, ahol ez alkalmazható, a 6. Fejezetben részletezett követelményeknek megfelelően kiállított egészségügyi minősítéssel kell rendelkeznie.

1. 2. 4. 2. Az Egészségügyi Minősítés érvényessége időszakaszának azzal a nappal kell kezdődnie, amelyen az egészségügyi minősítést végrehajtották. Az érvényességi periódus időtartamának összhangban kell lennie az 1. 2. 5. 2. pont előírásaival.

1. 2. 4. 2. 1. Az Egészségügyi Minősítés érvényességének időtartamát egészen 45 napig lehet növelni az Engedélyező Hatóság megítélése alapján.

Megjegyzés – Hasznos, ha az Egészségügyi Minősítés lejáratának naptári napját változatlanul hagyjuk évről évre, ezáltal lehetővé válik, hogy az érvényes Egészségügyi Minősítés lejárati napja legyen az új érvényességi periódus kezdőnapja azzal a feltétellel, hogy az egészségügyi felülvizsgálat az érvényes Egészségügyi Minősítés érvényességi időtartama alatt történik meg, de ez nem lehet korábban, mint a lejárat időpontjától visszaszámított 45 nap.

1. 2. 4. 3. A hajózó személyzet tagjai, vagy a légiforgalmi irányítók csak akkor gyakorolhatják a szakszolgálati engedélyükkel együtt járó jogaikat, ha a szakszolgálati engedélyüknek megfelelő, érvényes egészségügyi minősítéssel rendelkeznek, az 1. 2. 5. 2. 4. pontban foglaltak kivételével.

1. 2. 4. 4. A Szerződő Állam jelöljön ki megfelelő képesítéssel és orvosi gyakorlattal rendelkező orvosokat, akik a folyamodó egészségi állapotának orvosi vizsgálatait elvégzik a 2. és a 3. Fejezetben ismertetett szakszolgálati engedélyek vagy jogosítások kiadásához, megújításához, és a 4. Fejezetben szereplő megfelelő engedélyek kiadásához és megújításához.

1. 2. 4. 4. 1. Az egészségügyi felülvizsgálóknak repülés orvostanból kiképzést kell kapniuk és szabályos időközönként felfrissítő képzésben kell részesülniük. A kinevezésüket megelőzően az egészségügyi felülvizsgálóknak bizonyítaniuk kell, hogy megfelelő szaktudással rendelkeznek a repülés orvostanban.

1. 2. 4. 4. 2. Az egészségügyi felülvizsgálóknak gyakorlati ismereteket és tapasztalatokat kell szerezniük azokról a körülményekről, amelyek között a szakszolgálati engedélyek és jogosítások birtokosai a feladatkörüket ellátják.

Megjegyzés – A gyakorlati ismeretek és a tapasztalat megszerezhető repülés közben, szimulátoron, helyszíni tapasztalattal, vagy bármilyen egyéb személyesen megszerzett tapasztalattal, melyről az Engedélyező Hatóság úgy ítéli meg, hogy az kielégíti ezt a követelményt.

1. 2. 4. 5. Ha olyan szakszolgálati engedélyért vagy jogosításért folyamodik valaki, amelyhez előírták az orvosi alkalmasságot, akkor a folyamodó köteles aláírásával ellátott olyan nyilatkozatot eljuttatni egészségügyi felülvizsgálójának, amelyben közli, hogy korábban hasonló vizsgálaton átesett-e, és ha igen, akkor a legutolsó felülvizsgálat dátumát, helyét és eredményét is közölnie kell. Továbbá jeleznie kell a felülvizsgálónak, ha az Egészségügyi Minősítését korábban visszautasították, érvénytelenítették, vagy felfüggesztették, és ha így történt, akkor a visszautasítás, érvénytelenítés vagy a felfüggesztés okát.

1. 2. 4. 5. 1. Ha a szakszolgálati engedélyért vagy jogosításért folyamodó a vizsgáló orvosnak valótlan nyilatkozatot tesz, az orvos ezt jelenteni köteles az állam Engedélyező Hatóságának, hogy az megtehesse a szükségesnek ítélt lépéseket.

1. 2. 4. 6. Amikor a folyamodó 6. Fejezet szerinti egészségügyi felülvizsgálata befejeződött, az egészségügyi felülvizsgálónak koordinálnia kell a vizsgálat eredményeit, és egy aláírásával ellátott jelentést, vagy azzal egyező értékű beszámolót kell benyújtania az Engedélyező Hatóságnak- annak követelményeivel összhangban,- melyben részletezi a vizsgálat eredményeit és ismerteti a folyamodó orvosi alkalmasságára vonatkozó leletek értékelését 1. 2. 5. A szakszolgálati engedélyek érvényessége

1. 2. 4. 6. 1. Ha az egészségügyi jelentést elektronikus formában juttatja el az Engedélyező Hatósághoz, a felülvizsgáló személynek biztosítania kell az azonosítás megfelelőségét.

1. 2. 4. 6. 2. Amennyiben az egészségügyi felülvizsgálatot két vagy több felülvizsgáló végzi, a Szerződő Államoknak közülük ki kell jelölni egyet, aki felelős a vizsgálat eredményeinek koordinálásáért, az egészségügyi alkalmasságra vonatkozó leletek értékeléséért, és a jelentés aláírásáért.

1. 2. 4. 7. A Szerződő Államoknak egészségügyi minősítők szolgálatait kell igénybe venniük azon jelentések értékeléséhez, melyeket az egészségügyi felülvizsgálók az Engedélyező Hatóságnak benyújtottak.

1. 2. 4. 7. 1. Az egészségügyi felülvizsgálóknak kielégítő egészségügyi információt kell benyújtaniuk az Engedélyező Hatósághoz, mely lehetővé teszi, hogy a Hatóság auditálni tudja az Egészségügyi Minősítést.

Megjegyzés: Az ilyen auditálás célja az, hogy biztosított legyen, hogy az egészségügyi felülvizsgálók eleget tesznek a hasznos gyakorlat alkalmazható szabványainak.

1. 2. 4. 8. Ha a 6. Fejezetben foglalt, az adott szakszolgálati engedély kiadásához előírt egészségügyi követelmények valamelyike nem teljesül, akkor a Szerződő Állam egészségügyi minősítést addig nem fog kiadni vagy megújítani, amíg a következő feltételek nem teljesülnek:

a) csatolt orvosi vélemény jelzi, hogy a folyamodó azon hibája, miszerint speciális esetekben valamely követelménynek – akár számszerűségben, akár más módon – nem tesz eleget, ez olyan hiba, mely a kért szakszolgálati engedélyben szereplő jogosítványok gyakorlása során a repülés biztonságára valószínűleg nem jelent veszélyt,

b) a kérelmező adott képességeit, ismereteit és gyakorlottságát, illetve az üzemi körülményeket alaposan mérlegelték, és

c) az engedély bármilyen speciális korlátozással vagy korlátozásokkal látták el, miközben az engedély birtokosának kötelmei biztonságos ellátása függ attól, hogy teljesíti-e ezt a korlátozást vagy ezeket a korlátozásokat.

1. 2. 4. 9. Az egészségügyi anyagok bizalmas voltát mindenkor figyelembe kell venni.

1. 2. 4. 9. 1. Az összes egészségügyi jelentést és feljegyzést biztonságosan kell tárolni és hozzáférést csak a feljogosított személyeknek szabad biztosítani.

1. 2. 4. 9. 2. Ha üzemeltetési megfontolások ezt indokolják, az egészségügyi minősítőnek kell meghatározni, hogy milyen mértékű az a helyénvaló egészségügyi információ, melyet az Engedélyező Hatóság illetékes hivatalainak bemutatnak.

1. 2. 5. A szakszolgálati engedélyek érvényessége

1. 2. 5. 1. Ha a Szerződő Állam szakszolgálati engedélyt adott ki, akkor köteles megbizonyosodni arról, hogy a tulajdonos a szakszolgálati engedélyben, vagy a vele kapcsolatban biztosított jogait csak akkor gyakorolja, ha alkalmasságát fenntartotta és rendelkezik az Állam által előírt előzetes tapasztalatokkal.

1. 2. 5. 1. 1. **Ajánlás –** *A Szerződő Államnak meg kell határoznia az alkalmasság fenntartásának és a megszerzett tapasztalatnak a követelményeit a pilóta szakszolgálati engedélyekre és jogosításokra vonatkozólag, melyek egy szisztematikus baleset-megelőzésen alapulnak, magába kell foglalni egy*

kockázatbecslési folyamatot és az időszerű tevékenységek analízisét, beleértve az adott Állam számára megfelelő, a balesetekről és váratlan eseményekről szóló adatokat.

1. 2. 5. 1. 2. A szakszolgálati engedélyt kiadó Szerződő Államnak biztosítania kell, hogy a többi Szerződő Államnak módjában álljon a szakszolgálati engedély érvényességéről meggyőződni.

1. Megjegyzés – A kereskedelmi légiszállításban részt vevő hajózó személyzeti tagok alkalmasságának meglétéről kielégítő módon lehet meggyőződni az Annex 6 szerint végrehajtott gyakorló repüléseken.

2. Megjegyzés – Az alkalmasság megléte kielégítően dokumentálható az üzemeltető nyilvántartásában, vagy a hajózó személyzet tagjainak személyi repülési naplójában, vagy a szakszolgálati engedélyben.

3. Megjegyzés – A hajózó személyzet tagjai – a Lajstromozó Állam által kívánatosnak tartott mértékig – bizonyíthatják alkalmasságuk folyamatos meglétét a Lajstromozó Állam által jóváhagyott repülési szimulátor oktató-berendezésen is.

4. Megjegyzés – Lásd A Repülési Szimulátor Minősítési Kritériumai Kézikönyvet (DOC 9625).

5. Megjegyzés – A kockázatbecslési folyamat felépítéséhez tájékoztató anyagként használja fel az Állami Szakszolgálati Engedélyezés Rendszere Létrehozásának és Kezelésének Eljárásaira vonatkozó Kézikönyvet (DOC 937).

1. 2. 5. 2. Az 1. 2. 5. 2. 1., 1. 2. 5 2. 2., az 1. 2. 5. 2. 3., 1. 2. 5. 2. 4. 1. 2. 5. 2. 5. és 1. 2. 5. 2. 6. pontokban biztosítottak kivételével az 1. 2. 4. 5. és 1. 2. 4. 6. pontoknak megfelelően kiadott Egészségügyi Minősítésnek érvényesnek kell lennie az egészségügyi vizsgálat napjától az alábbi időtartamoknál nem hosszabb ideig:

60 hónap a magánpilóta szakszolgálati engedély esetében – repülőgép, léghajó, helikopter és motoros szerkezet,

12 hónap a kereskedelmi pilóta szakszolgálati engedély esetében – repülőgép, léghajó, helikopter és motoros szerkezet,

12 hónap a többszemélyes személyzet pilóta szakszolgálati engedély esetében – repülőgép

12 hónap a közforgalmi pilóta szakszolgálati engedély esetében,– repülőgép, helikopter és motoros szerkezet,

60 hónap a vitorlázó repülőgép pilóta szakszolgálati engedély esetében,

60 hónap a szabadon repülő ballon pilóta szakszolgálati engedély esetében,

12 hónap a hajózó navigátor szakszolgálati engedély esetében,

12 hónap a hajózó fedélzeti mérnök szakszolgálati engedély esetében,

48 hónap a légiforgalmi irányító szakszolgálati engedély esetében.

1. Megjegyzés – A fentiekben felsorolt érvényességi periódusok kiterjeszthetők még 45 napig az 1. 2. 4. 2. 1. pontnak megfelelően.

2. Megjegyzés – Ha a számítás az 1. 2. 5. 2. pont és annak alpontjai szerint történik, az érvényesség időtartama a legutolsó számításba vett hónapra magába foglalja azt a napot, melynek ugyanaz a naptári száma, mint amelyik az egészségügyi felülvizsgálat napjáé, vagy ha annak a hónapnak nincs ilyen számú napja, akkor a hónap legutolsó napját.

1. 2. 5. 2. 1. Az Egészségügyi Minősítés érvényességi időtartamát le lehet csökkenteni, ha klinikailag indikált.

1. 2. 5. 2. 2. Ha a közforgalmi pilóta – repülőgép, helikopter és motoros szerkezet szakszolgálati engedély birtokosai, valamint a kereskedelmi pilóta –repülőgép, léghajó, helikopter és motoros szerkezet szakszolgálati engedéllyel rendelkező személy, akit egyszemélyes személyzetként foglalkoztatnak a kereskedelmi légiszállításban, melynek során utasokat szállít, és betöltötte a 40. életévét, akkor a fenti 1. 2. 5. 2. pontban meghatározott időtartamot hat hónapra kell csökkenteni.

1. 2. 5. 2. 3. Ha a közforgalmi pilóta – repülőgép, helikopter és motoros szerkezet szakszolgálati engedély birtokosa, a kereskedelmi pilóta – repülőgép, léghajó, helikopter és motoros szerkezet szakszolgálati engedély birtokosa és a többszemélyes személyzet pilóta – repülőgép szakszolgálati engedély birtokosa, akiket a kereskedelmi légiszállításban foglalkoztatnak, betöltötte a 60. életévét, az 1. 2. 5. 2. pontban meghatározott érvényességi időtartamot 6 (hat) hónapra kell csökkenteni.

1. 2. 5. 2. 4. Ha a magán-pilóta – repülőgép, léghajó, helikopter és motoros szerkezet, szabadon repülő ballon, vitorlázó repülő pilóta és légiforgalmi irányító szakszolgálati engedély birtokosa betöltötte a 40. életévét, az 1. 2. 5. 2. pontban meghatározott érvényességi időtartamot 24 hónapra kell lecsökkenteni.

1. 2. 5. 2. 5. **Ajánlás –** *Ha a magán-pilóta- repülőgép, léghajó, helikopter és motoros szerkezet szakszolgálati engedély birtokosa, valamint a szabadon repülő ballon pilóta, vitorlázó repülő pilóta és a légiforgalmi irányító szakszolgálati engedélyek birtokosai betöltötték az 50. életévüket, az 1. 2. 5. 2. pontban meghatározott érvényességi időtartamot tovább lehet csökkenteni 12 hónapra.*

Megjegyzés – A fentiekben felsorolt érvényességi időtartamokat a folyamodó azon életkorára alapoztuk, amikor ő az orvosi vizsgálatoknak alávetette magát

1. 2. 5. 2. 6. *Az orvosi vizsgálat halaszthatóságának feltételei.* Ha a szakszolgálati engedély birtokosa a kijelölt egészségügyi felülvizsgálat helyszínétől távol tevékenykedik, az Engedélyező Hatóság döntése szerint az előírt újravizsgálat halasztható feltéve, hogy ezt csak kivételesen alkalmazzák, és nem haladja meg az alábbi időtartamot:

a) kereskedelmi légiszállítási tevékenységet nem végző hajózó személyzeti tag esetében egyszeri hat hónapos időtartam,

b) kereskedelmi légiszállítási tevékenységben részt vevő hajózó személyzeti tag esetében két egymást követő három hónapos időtartam, feltéve, hogy mindkét esetben kedvező orvosi jelentést kapott a szóban forgó terület kijelölt vizsgáló orvosánál végrehajtott vizsgálatot követően, vagy olyan esetekben, amikor ilyen személy nem áll rendelkezésre, akkor egy olyan orvos által elvégzett vizsgálat után, aki törvényes minősítéssel rendelkezik orvosi gyakorlat folytatására ezen a területen,

c) magánpilóta esetében egyetlen, de 24 hónapot meg nem haladó időtartam olyan esetben, amikor az orvosi vizsgálatot az azon a területen tevékenykedő, a Szerződő
Állam által az 1. 2. 4. 4. pontban meghatározottak szerint kijelölt vizsgáló orvos végezte el, ahol a kérelmező ideiglenesen tartózkodik. Az orvosi vizsgálat zárójelentését az Engedélyező Hatósághoz kell eljuttatni.

1. 2. 6. Az egészségi állapot romlása

1. 2. 6. 1. Jelen Annex-ben szereplő szakszolgálati engedélyek birtokosai nem gyakorolhatják szakszolgálati engedélyeik és a hozzá kapcsolódó jogosításokból eredő jogaikat, ha tudomásukra jut, hogy egészségi állapotuk bármilyen mértékben romlott, és ennek következtében az engedélyezett feladatkörök biztonságos és megfelelő végzésére esetleg képtelenné válhattak.

1. 2. 6. 1. 1. **Ajánlás –** *A szakszolgálati engedély birtokosainak tájékoztatni kell az Engedélyező Hatóságot arról, ha meggyőződtek terhességükről, vagy egészségügyi alkalmasságuk 20 napon túl tartó csökkenéséről, vagy olyan esetről, amikor orvosi kezelésre szorulnak előírt gyógykezeléssel, vagy amikor kórházi kezelés válik szükségessé.*

1. 2. 6. 1. 2. **Ajánlás –** *Minden egyes Szerződő Államnak a lehető legmesszebbmenően gondoskodnia kell arról, hogy egyetlen szakszolgálati engedély birtokosa se láthasson el a szakszolgálati engedélyben és a hozzá kapcsolódó jogosításban engedélyezett feladatköröket olyan időszakokban, amikor egészségügyi alkalmasságuk bármilyen okból is, de olyan mértékben romlott meg, hogy az az egészségügyi alkalmasságot igazoló minősítés kiadását, vagy megújítását egyébként nem tenné lehetővé.*

1. 2. 7. Pszichoaktív anyagok használata

1. 2. 7. 1. Ezen Annex-ben szereplő szakszolgálati engedélyek birtokosai nem gyakorolhatják szakszolgálati engedélyeik és a hozzá kapcsolódó jogosítványaik biztosította jogokat, ha olyan pszichoaktív szer hatása alatt állnak, melyek esetleg képtelenné tehetik őket jogosításaik biztonságos és megfelelő gyakorlására.

1. 2. 7. 2. Jelen Annex-ben felsorolt szakszolgálati engedélyek birtokosai problémát okozó káros szereket nem használhatnak.

1. 2. 7. 3. **Ajánlás –** *A Szerződő Államnak a legmesszebbmenőkig gondoskodnia kell arról, hogy minden egyes szakszolgálati engedély birtokosa, aki bármilyen problémás káros szert használ, felderítésre és eltávolításra kerüljön a biztonságot veszélyeztető, kritikus funkcióiból. A biztonság szempontjából a kritikus feladatkörbe való visszatérés sikeres kezelés esetén fontolóra vehető, vagy kezelést nem igénylő esetekben, ha a problematikus szerek használatát abbahagyta és megállapítást nyert, hogy feladatköre ellátása során nem valószínű, hogy veszélyezteti a biztonságot.*

Megjegyzés: A Repülési Munkahelyeken Káros Szerek Problémát Okozó Használatának Megelőzési Kézikönyvében (DOC 9654) *útmutató található a felderítés megfelelő módszereiről (amelyek bio-mechanikus ellenőrzést is magukban foglalhatnak, mint például mielőtt egy személy alkalmazására sor kerül, vagy alapos gyanú esetén, balesetet/eseményt követően, időszakosan és véletlenszerűen, továbbá más, megelőzést szolgáló témákról.*

1. 2. 8. Jóváhagyott kiképzés

Megjegyzés – A szakszolgálati engedély megszerzéséhez szükséges képzettség sokkal gyorsabban és könnyebben szerezhető meg, ha a kérelmező egy szigorúan ellenőrzött, szisztematikus és folyamatos kiképzési tanfolyamon vesz részt, mely egy tervezett tantervre és tematikára épült fel. A tapasztalatra vonatkozó követelmények bizonyos fokú csökkentésére már történt előkészület jelen Szabványokban és Ajánlott Eljárásokban ismertetett bizonyos szakszolgálati engedélyek és jogosítások kiadásához, olyan folyamodó esetében, aki már egy jóváhagyott kiképzést sikeresen befejezett.

1. 2. 8. 1. A jóváhagyott kiképzésnek olyan képzettségi szintet kell biztosítania, mely legalább egyenértékű az olyan személyzetre vonatkozó minimális képzettségi követelménnyel, aki ilyen jóváhagyott képzésben nem részesült

1. 2. 8. 2. Egy Állam által biztosított kiképzési szervezet jóváhagyása függ attól, hogy a folyamodó bizonyítja-e, hogy megfelel a 2. számú Függelék követelményeinek.

Megjegyzés – A hajózó személyzet oktatási szervezetének jóváhagyására iránymutatás található a Hajózó Személyzet Oktatási Szervezeteinek Jogosítása Kézikönyvben (Manual on the Approval of Flight Crew Training Organizations) (Doc 9841).

1.2.9 Nyelvtudás

1. 2. 9. 1. A repülőgépen, léghajón, helikopteren és motoros szerkezeten tevékenykedő pilótáknak, valamint azon hajózó navigátoroknak, akiknek használniuk kell a fedélzeti rádiótelefont, bizonyítaniuk kell azt, hogy képesek beszélni és megérteni a rádió-távbeszélő összeköttetésben használatos nyelvet.

Megjegyzés – A Nemzetközi Polgári Repülési Egyezmény 42. Cikkelye értelmében az 1. 2. 9. 1. pont nem alkalmazható azon személyre, akinek szakszolgálati engedélyét eredetileg 2004. március 5. előtt adták ki, de minden esetben vonatkozik azokra a személyzeti tagokra, akiknek szakszolgálati engedélye 2008. március 5. után is érvényben marad.

1. 2. 9. 2. A légiforgalmi irányítóknak és a légiforgalmi állomásüzemeltetőknek bizonyítaniuk kell, hogy képesek beszélni és megérteni a rádió-távbeszélő összeköttetésben használatos nyelvet.

1. 2. 9. 3. **Ajánlás –** *A hajózó mérnököknek, és a vitorlázó repülőgép pilótáinak, vagy szabadon repülő ballonok pilótáinak beszélniük és érteniük kell a rádió-távbeszélő összeköttetésben használatos nyelvet.*

1. 2. 9. 4. 2008. március 5.-től a repülőgép, léghajó, helikopter és motoros szerkezet pilótáinak, a légiforgalmi irányítóknak és a légiforgalmi állomásüzemeltetőknek bizonyítaniuk kell, hogy beszélik és értik a rádió-távbeszélő összeköttetésben használatos nyelvet az 1. Függelékben meghatározott nyelvtudás szinten.

1. 2. 9. 5. **Ajánlás –** *Mindazon repülőgép-vezetőknek, léghajó, helikopter és motoros szerkezet pilótáknak, hajózó navigátoroknak, akiknek használniuk kell a légijármű fedélzeti rádiótelefonját, a légiforgalmi irányítóknak és a légiforgalmi állomásvezetőknek bizonyítaniuk kell, hogy olyan szinten értik és beszélik a rádió-távbeszélő összeköttetésben használatos nyelvet, melyet az 1. Függelék nyelvtudás követelményként meghatároz.*

1. 2. 9. 6. 2008. március 5.-vel kezdődően mindazon repülőgép-vezetők, léghajó, helikopter, és motoros szerkezet pilóták, légiforgalmi irányítók és légiforgalmi állomásüzemeltetők nyelvismeretét, akiknek nyelvtudása nem éri el a Jártasság Szintjét (6 Szint), időszakonként az előírásoknak megfelelően értékelni kell a jártassági szint egyénileg történő bizonyításával.

1. 2. 9. 7. **Ajánlás –** *Mindazon repülőgép-vezetőknek, léghajó, helikopter és motoros szerkezet pilótáknak, hajózó navigátoroknak a nyelvtudását, akiknek használniuk kell a légijármű fedélzeti rádiótelefonját, valamint azon légiforgalmi irányítók és légiforgalmi állomásüzemeltetők nyelvismeretét, akik nem érik el a Jártasság Szintjét (6 Szint), időszakonként az előírásoknak megfelelően értékelni kell a jártassági szint egyénileg történő bizonyításával a következők szerin*t:

a) mindazokat, akiknek bizonyított nyelvtudása eléri az Operatív Szintet (4 Szint).
három évenként legalább egyszer értékelni kell, és

b) mindazokat, akiknek bizonyított nyelvtudása eléri a Bővített Szintet (5 Szint), hat évenként legalább egyszer értékelni kell.

1. Megjegyzés – Előírásszerű értékelés nem szükséges olyan folyamodók esetében, akik bizonyítják magas szintű nyelvtudásukat, például anyanyelvük, és akik magas szinten beszélik, de nem az anyanyelvük, tájszólással vagy olyan hangsúlyozással, amelyet a nemzetközi légiforgalom közössége meg tud érteni.

2. Megjegyzés – Az 1. 2. 9. pont előírásai hivatkoznak az Annex 10 II. Kötet 5. Fejezetére, ahol a rádió-távbeszélő összeköttetésben használt nyelv lehet az a nyelv, amelyet a földi állomás rendszerint használ, vagy az angol nyelv. Ezért a gyakorlatban lesznek olyan helyzetek, ahol a hajózó személyzet tagjainak csak azt a nyelvet szükséges beszélniük, amelyet a földi állomások rendszerint használnak.

2. FEJEZET

PILÓTA SZAKSZOLGÁLATI ENGEDÉLYEK ÉS JOGOSÍTÁSOK

2. 1. A pilóták szakszolgálati engedélyeire és jogosításaira vonatkozó általános szabályok

2. 1. 1. Az engedély kiadásának általános feltételei

2. 1. 1. 1. Egy személy csak akkor tevékenykedhet parancsnokpilótaként vagy másodpilótaként a légijárművek alábbi kategóriáinak bármelyikén, ha ezen személy egy olyan szakszolgálati engedély birtokosa, melyet a jelen fejezet követelményeinek megfelelően állítottak ki:

– Repülőgép
– 4600 m³ feletti térfogattal rendelkező léghajó
– Szabadon repülő ballon
– Vitorlázó repülőgép
– Helikopter
– Motoros szerkezet

2. 1. 1. 2. A légijármű kategóriát magának a szakszolgálati engedély címének is tartalmaznia kell, vagy kategóriajogosításként kell ezt bejegyezni a szakszolgálati engedélybe.

2. 1. 1. 2. 1. Ha egy szakszolgálati engedéllyel már rendelkező pilóta további légijármű kategóriára kíván szakszolgálati engedélyt szerezni, az Engedélyező Hatóságnak az alábbiak egyike szerint kell eljárnia:

a) vagy kibocsát egy újabb szakszolgálati engedélyt a korábbi szakszolgálati engedély birtokosa számára az újabb légijármű kategóriára, vagy
b) az új kategóriajogosítást bejegyzi az eredeti szakszolgálati engedélybe a 2. 1. 2. pont követelményeinek megfelelően.

Megjegyzés: – A kategóriajogosításokra vonatkozó követelmények a pilóták számára előírt engedélyezési feltételek fogalmaiban lettek megadva és olyan szintekben, melyek megfelelnek a szakszolgálati engedély birtokosának adandó jogosítványoknak.

2. 1. 1. 3. A folyamodónak az adott szakszolgálati engedélyhez vagy jogosításhoz előírt követelményeket ki kell elégítenie az életkorra, a szakmai ismeretekre, a tapasztalatra, a repülő kiképzésre, a jártasságra és az egészségi állapotra vonatkozólag, mielőtt bármilyen pilóta szakszolgálati engedélyt vagy jogosítást kiadnának részére.

2. 1. 1. 3. 1. Bármilyen szakszolgálati engedélyért vagy jogosításért folyamodónak az Engedélyező Hatóság által meghatározott módon bizonyítania kell, hogy megfelel mindazon, a szakmai tudásra és jártasságra vonatkozó követelményeknek, melyeket az adott szakszolgálati engedélyhez vagy jogosításhoz előírtak.

2. 1. 1. 4. A *motor szerkezetre való áttérés előírásai (lépései)*
2011. március 10.-ig az Engedélyező Hatóság a motoros szerkezet kategóriájába tartozó légijármű típusjogosítását bejegyezheti a repülőgépre, vagy a helikoptere rendszeresített pilóta szakszolgálati engedélybe. A szakszolgálati engedélybe történő jogosítás bejegyzésének tartalmaznia kell azt, hogy a légijármű a motoros szerkezet kategóriájába tartozik. A motoros szerkezet kategóriájában a típusjogosításhoz a kiképzést egy jóváhagyott képzés tanfolyamán kell elsajátítani, figyelembe kell venni a folyamodó korábbi, repülőgépen, vagy helikopteren megszerzett tapasztalatait, attól függően, hogy melyik alkalmazható, és magába kell foglalni a motoros szerkezet kategóriájába tartozó légijárművek üzemeltetésének összes vonatkozó szempontját.

2. 1. 2. Kategóriajogosítások

2. 1. 2. 1. Ha ilyent bevezettek, a kategóriajogosításoknak a 2. 1. 1. 1. pontban felsorolt légijármű kategóriákkal kell azonosnak lenniük

2. 1. 2. 2. A kategóriajogosítást nem kell bevezetni a szakszolgálati engedélybe akkor, ha magában a szakszolgálati engedély címében szerepel a kategória.

2. 1. 2. 3. Bármely további kategóriajogosításnak, melyet a pilóta szakszolgálati engedélybe bevezettek, utalnia kell azon engedélyezési jogokra, melyeknek megfelelően a kategóriajogosítást megadták.

2. 1. 2. 4. Ha egy szakszolgálati engedéllyel már rendelkező pilóta további kategóriajogosítást kíván szerezni, akkor eleget kell tennie ezen Annex követelményeinek azon jogok tekintetében, amelyre a kategóriajogosítást kérte.

2. 1. 3. Minősítő (osztály) és típusjogosítások

2. 1. 3. 1. A minősítő jogosításokat az egy pilótás üzemeltetésre hitelesített légijárművekre kell meghatározni, és az alábbiakat kell tartalmaznia:
a) egy-motoros /hajtóműves, szárazföldi,
b) egy-motoros /hajtóműves, vízi,
c) több-motoros /hajtóműves, szárazföldi,
d) több-motoros /hajtóműves, vízi

Megjegyzés: Ezen pont előírásai nem zárják ki más minősítő jogosítások létrehozását a fenti alapfelosztás szerkezetén belül.

2. 1. 3. 1. 1. **Ajánlás –** *A Szerződő Államoknak megfontolás tárgyává kell tenniük egy minősítő*

jogosítás létrehozását azon helikopterek és motoros szerkezetek számára, melyeket egy- pilótás személyzettel történő üzemeltetésre engedélyeztek, és amelyeknek kiszolgálása, teljesítménye és egyéb jellemzői hasonlóak.

2. 1. 3. 2. Típusjogosítást kell létrehozni:

a) minden egyes olyan légijárműre, melynek üzemeltetéséhez a minimális személyzet legalább két pilótából áll a hatósági bizonyítványa szerint, és

b) egy pilótás személyzettel üzemeltetett, hatósági bizonyítvánnyal rendelkező helikopterre, és motoros szerkezetekre, kivéve, ha a 2. 1. 3. 1. 1. pontban leírtaknak megfelelő minősítő jogosítást már kiadták számára, és

c) bármilyen típusú légijárműre, amelynél az Engedélyező Hatóság ezt szükségesnek tartja.

1. Megjegyzés – Ahol közös típusjogosítást honosítanak meg, az csak olyan légijárművekre vonatkozhat, amelyeknek az üzemeltetési eljárások, rendszerek és kezelés tekintetében hasonló tulajdonságai vannak.

2. Megjegyzés: A vitorlázó repülőgépekre és a szabadon repülő ballonokra a minősítési és típusjogosítások követelményrendszerét még nem határozták meg.

2. 1. 3. 3. Ha a folyamodó bizonyítja jártasságát és szakismeretét a pilóta szakszolgálati engedély első kiadásához, az adott légijármű típusának és osztályának megfelelő kategóriát és jogosítást a szakszolgálati engedélybe be kell vezetni.

2. 1. 4. Osztály- és típusjogosítást igénylő körülmények

2. 1. 4. 1. A pilóta szakszolgálati engedélyt kiadó Szerződő Állam az ilyen szakszolgálati engedély birtokosának csak akkor engedélyezheti repülőgépen, léghajón, helikopteren, vagy egy motoros szerkezeten parancsnokpilótaként vagy másodpilótaként való tevékenységet, ha a birtokos rendelkezik az alábbi felhatalmazással:

a 2. 1. 3. 1. pontban meghatározott megfelelő osztályjogosítással, vagy

a) típusjogosítással, ha ezt előírták a 2. 1. 3. 2. pontnak megfelelően.

2. 1. 4. 1. 1. Ha a típusjogosítást másodpilótai tevékenység végzésének jogára korlátozva adták ki, vagy a jogait a csak pilóta tevékenységeire korlátozták, akkor ezt a korlátozást a jogosításba be kell jegyezni.

2. 1. 4. 2. Az Engedélyező Hatóság a szakszolgálati engedély birtokosának a 2. 1. 4. 1. pontnak megfelelő osztály-, vagy típusjogosítás helyett írásos külön engedélyt adhat ki gyakorló és próbarepüléshez, vagy meghatározott, különleges célú, bevételt nem eredményező és utasokat nem szállító repülésekre. Az engedély érvényességét az adott repülés végrehajtásához szükséges időtartamra kell korlátozni.

2. 1. 5. Az osztály-, és típusjogosítás kiadásának feltételei

2. 1. 5. 1. *Osztály jogosítás*

A folyamodó a szakszolgálati engedélynek megfelelő szintű jártasságát abba az osztályba tartozó légijárművön köteles demonstrálni, amely osztályra jogosítást kíván szerezni.

2. 1. 5. 2. Típusjogosítás a 2. 1. 3. 2. a) pont szerint

A folyamodónak
a) megfelelő felügyelet mellett tapasztalatot kell szereznie a szóban forgó légijárművön és/vagy repülő szimulátorban, az alábbi eljárásokban:

– a repülés minden fázisának szokványos repülési eljárásai és manőverei,

– a berendezések, mint például a hajtómű, a rendszerek, és a sárkány meghibásodása és helytelen működése esetén követendő nem-szokványos és vészhelyzeti eljárások,

– ha alkalmazható, szokványos, nem-szokványos és vészhelyzeti körülményekre vonatkozó műszerrepülési eljárások, ide sorolva a műszeres megközelítés, a megszakított megközelítés, a leszállás és a szimulált hajtómű meghibásodás eljárásait,

– a hajózó személyzet cselekvőképtelensége eseténi eljárások és a személyzet közötti koordináció, beleértve a pilóták feladatainak kijelölését, a személyzet együttműködését és az ellenőrző jegyzékek (checklists) használatát.

Megjegyzés: – Felhívjuk a figyelmet az oktató pilótákra előírt minősítő követelményekről szóló 2. 1. 8. 1. pontra.

b) az adott légijármű biztonságos üzemeltetéséhez szükséges jártasságot és ismereteket kell demonstrálnia akár a parancsnokpilóta, akár a másodpilóta feladatait tekintve, amelyik alkalmazható, és
c) demonstrálnia kell közforgalmi pilóta szakszolgálati engedély szintjén az Engedélyező Hatóság által meghatározott további ismereteket a 2. 6. 1. 2. pontban szereplő követelmények alapján.

Megjegyzés – *Tájékoztató anyagként* lásd: Kézikönyv Az Állam Szakszolgálati Engedélyezés Rendszere Eljárásainak Létrehozására és Kezelésére (DOC 9379) című kiadványt *a személyzetminősítések és a beszámítható korábbi eredmények általános sajátosságai közötti átjárhatóságra*.

2. 1. 5. 3. *Típusjogosítás a 2. 1. 3. 2. b) és c) pontok szerint*

A folyamodónak demonstrálnia kell az adott légijármű biztonságos üzemeltetéséhez szükséges jártasságát és szakismereteit, tekintettel az engedélyezési követelményekre és a folyamodó pilóta-tevékenységére.

2. 1. 6. Repülési szimulátor oktató-berendezés használata a tapasztalat megszerzéséhez és a jártasság demonstrálásához

Egy repülési szimulátor oktató-berendezés használatát az Engedélyező Hatóságnak kell jóváhagynia a tapasztalat megszerzéséhez, vagy a jártasság demonstrálása alatt szükséges bármely manőver végrehajtásához annak érdekében, hogy szakszolgálati engedélyt vagy jogosítást nyerjen a folyamodó, ezzel biztosítható, hogy a használt repülési szimulátor oktató-berendezés a feladatnak megfelel.

2. 1. 7. Műszeres jogosítást szükségessé tevő körülmények

A Szerződő Állam, amely pilóta szakszolgálati engedélyt adott ki, csak akkor engedélyezheti a szakszolgálati engedély birtokosának, hogy akár parancsnokpilótaként, akár másodpilótaként tevékenykedjen egy légijárműben műszeres repülési szabályok (IFR) szerint, ha az illető személy megfelelő felhatalmazást kapott erre ettől a Szerződő Államtól. A megfelelő felhatalmazásnak magában kell foglalnia a légijármű kategóriának megfelelő műszeres jogosítást.

Megjegyzés: – A műszeres jogosítás része a közforgalmi pilóta – repülőgép szakszolgálati engedélynek, vagy a motoros szerkezet kategóriának, a többszemélyes személyzet pilóta szakszolgálati engedélynek és a kereskedelmi pilóta – léghajó szakszolgálati engedélynek. A 2. 1. 7. pont előírásai nem zárják ki a műszeres jogosítású szakszolgálati engedély kiadását, mivel ez annak integrált része.

2. 1. 8. Repülőoktatás végrehajtásához szükséges felhatalmazás körülményei

2. 1. 8. 1. A Szerződő Állam, amely pilóta szakszolgálati engedélyt adott ki, nem engedi meg az engedély birtokosának, hogy pilóta szakszolgálati engedély vagy jogosítás kiadásához szükséges repülőoktatást végezzen, feltéve, ha az engedély birtokosa megfelelő felhatalmazást kapott erre a Szerződő Államtól. A megfelelő felhatalmazásnak magába kell foglalnia:

a) a szakszolgálati engedély birtokosának repülőoktató jogosítását, vagy

b) az Engedélyező Hatóság által jóváhagyott szervezet alkalmazottjaként felhatalmazást repülésoktatás feladat végrehajtására, vagy

c) az engedélyt kibocsátó Szerződő Állam által kiadott pontosan körülírt felhatalmazást.

2. 1. 8. 2. A Szerződő Állam ne engedélyezze egyetlen személynek se pilóta szakszolgálati engedély vagy jogosítás kiadásához szükséges oktatás végzését repülési szimulátor oktató-berendezésen, feltéve, ha ez a személy megfelelő szakszolgálati engedéllyel rendelkezett, vagy rendelkezik, vagy ha megfelelő repülésoktatói és repülési tapasztalatokkal rendelkezik, és erre a Szerződő Államtól megfelelő felhatalmazást kapott.

2. 1. 9. A repülési idő beszámítása

2. 1. 9. 1. A növendék pilótának, vagy a pilóta szakszolgálati engedély birtokosának joga van teljes egészében beszámítani minden egyedül-repülésének, kétkormányos képzési időtartamának és parancsnokpilótaként végzett repüléseinek időtartamát az összes repült időbe, melyet a pilóta szakszolgálati engedély első kiadásához, vagy az engedély magasabb fokozatának elnyeréséhez előírtak.

2. 1. 9. 2. A pilóta szakszolgálati engedély azon birtokosának, aki másodpilótaként egyszemélyes pilótára jogosított légijármű pilótahelyén foglal helyet, de a Szerződő Állam előírja, hogy a légijárművet másodpilótával üzemeltessék, joga van másodpilótaként szerzett repülési idejének maximum 50 %-át beszámítani a pilóta szakszolgálati engedély magasabb fokozatához előírt összes repült időbe. A Szerződő Állam engedélyezheti a teljes repülési idő beszámítását az előírt összes repült időbe, ha a légijármű úgy van felszerelve, hogy másodpilótával üzemeltethető és a légijármű többszemélyes személyzettel működtethető.

2. 1. 9. 3. A pilóta szakszolgálati engedély birtokosának, ha másodpilótaként másodpilótával történő üzemeltetésre engedélyezett légijárműben a pilótaülésben foglal helyet, joga van ezen tevékenység teljes idejét beszámítani a pilóta szakszolgálati engedély magasabb fokozatához előírt

összes repült időbe.

2. 1. 9. 4. A pilóta szakszolgálati engedély birtokosának, ha parancsnok-pilótaként felügyelet alatt parancsnokpilótai funkciókat és feladatokat lát el, joga van ezen repülési időket teljes egészében beszámítani a magasabb fokozatú pilóta szakszolgálati engedély elnyeréséhez szükséges összes repült időbe.

2. 1. 10. A 60. életévüket betöltött pilóták jogainak korlátozása és a 65. életévüket elérő pilóták jogainak csökkentése

2. 1. 10. 1. A pilóta szakszolgálati engedélyt kiadó Szerződő Állam ne engedélyezze a szakszolgálati engedély birtokosának a parancsnokpilótaként történő ténykedést nemzetközi kereskedelmi légiszállításban részt vevő légijárművön, ha az engedély birtokosa betöltötte a 60. életévét, vagy olyan tevékenységek esetében, amelyben egynél több pilóta vesz részt, és a másik pilóta 60 évnél fiatalabb, valamint a parancsnokpilóta elérte a 65. életévét.

2. 1. 10. 2. **Ajánlás –** *A pilóta szakszolgálati engedélyt kiadó Szerződő Állam ne engedélyezze a szakszolgálati engedély birtokosának a másodpilótaként történő ténykedést nemzetközi kereskedelmi légiszállításban résztvevő légijárműveken, ha az engedély birtokosa elérte a 65. életévét.*

Megjegyzés – Felhívjuk a figyelmet az 1. 2. 5. 2. 3. pontra, mely a kereskedelmi légiszállítás tevékenységeiben részt vevő olyan pilóták Egészségügyi Minősítésének érvényességi időszakára vonatkozik, akik betöltötték a 60. életévüket

2. 2. Növendék pilóta

2. 2. 1. A növendék pilótának ki kell elégítenie az adott Szerződő Állam által előírt követelményeket. Ezen követelmények megalkotása során a Szerződő Államnak biztosítania kell azt, hogy a megadott jogok miatt a növendék pilóta ne jelenthessen veszélyt a léginavigációra.

2. 2. 2. Egy jogosított repülőoktató felügyelete és jóváhagyása nélkül a növendék pilóta nem repülhet egyedül.

2. 2. 2. 1. Nemzetközi repülésben résztvevő légijárműben a növendék pilóta nem repülhet egyedül csak akkor, ha az érintett Szerződő Államok között erre vonatkozólag egy általános, vagy külön megállapodás jött létre.

2. 2. 3. Egészségügyi alkalmasság

A Szerződő Állam csak akkor engedélyezheti a növendék pilóta egyedül repülését, ha az megszerezte a 2. osztályú Egészségügyi Minősítést.

2. 3. Magánpilóta – repülőgép szakszolgálati engedély

2. 3. 1. Az engedély kiadásának feltételei

A repülőgépre, léghajóra, helikopterre és motoros szerkezetre alkalmas szakszolgálati engedélykiadásának általános feltételei

2. 3. 1. 1. *Életkor*

A folyamodó nem lehet 17 évesnél fiatalabb.

2. 3. 1. 2. *Szakismeret*

A folyamodónak bizonyítania kell, hogy rendelkezik azzal a szakismerettel, mely a magánpilóta szakszolgálati engedély birtokosára vonatkozó jogoknak megfelel, valamint a szakszolgálati engedélybe bejegyezni kívánt légijármű kategóriának megfelel minimum az alábbi témakörökben:

Légijog

a) a magán pilóta szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, repülési szabályok, magasságmérő beállítás eljárásai, a légiforgalmi szolgálatok megfelelő gyakorlatai és eljárásai,

Repülőgépekre, léghajókra, helikopterekre és motoros szerkezetekre vonatkozó általános légijármű ismeret

b) a hajtóművek, rendszerek és műszerek működési alapelvei és funkciói,

c) a vonatkozó légijármű kategória és a hajtóművek üzemeltetési korlátai, az erre vonatkozó üzemeltetési információk a repülési kézikönyv vagy más megfelelő dokumentáció alapján,

d) erőátvitel (erőátviteli berendezések) a helikopterek és a motoros szerkezetek esetében, ahol alkalmazható,

e) léghajók esetében a gázok fizikai jellemzői és gyakorlati alkalmazásuk.

Repülési jellemző, repüléstervezés és terhelés

f) a terhelés és a tömeg megoszlás hatásai a repülési jellemzőkre, tömeg és tömegközéppont számítások,

g) a felszállási, leszállási és egyéb teljesítményadatok használata és gyakorlati alkalmazása,

h) a VFR-ben történő magánrepüléseknek megfelelő repülés-előtti és útvonalrepülés alatti tervezés, repülési tervek összeállítása és kitöltése a légiforgalmi szolgálatok számára, a légiforgalmi szolgálatok megfelelő eljárásai, helyzetjelentési eljárások, magasságmérő beállítási eljárások, nagy forgalmú területeken történő üzemelés,

Emberi tényezők

i) a fenyegető jelenségek és a hibakezelés elveit magába foglaló emberi tényezők,

Megjegyzés: – a fenyegető jelenségek és a hibakezelést magába foglaló emberi tényezőkre vonatkozó kiképzési programok tervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

j) alapvető repülés-meteorológia alkalmazása, meteorológiai tájékoztatások beszerzésére és használatára vonatkozó eljárások, magasságmérés, veszélyes időjárási körülmények,

Navigáció

k) a repülési navigáció és a számított hely technikák gyakorlati szempontjai, a légiforgalmi térképek használata,

Üzemeltetési eljárások

l) a fenyegető jelenségek és a hibakezelés alkalmazása az üzemeltetésben,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

m) magasságmérő beállítás eljárásai,

n) légiforgalmi kiadványok használata, mint AIP, NOTAM, légiforgalmi kódok és rövidítések,

o) megfelelő elővigyázatossági és veszélyhelyzeti eljárások, beleértve a veszélyes időjárás, a turbulencia és egyéb, üzemelésre veszélyes jelenségek elkerülése érdekében végzendő tevékenységeket,

p) helikopterek esetében, és ha alkalmazható, motoros felszállások, teljesítmény melletti megülés, földi rezonancia, a hátranyúló forgószárny-lapát átesése, dinamikus hossztengely körüli elfordulás és egyéb üzemeltetési veszélyek, a VMC körülmények közötti repüléshez tartozó biztonsági eljárások.

Repüléselmélet

q) a repülés alapelvei,

Rádió telefónia

r) a VFR repülésre vonatkozó rádiótávbeszélő eljárások és kifejezések, a rádióösszeköttetés megszakadása esetén követendő tevékenységek.

2 3. 1. 3. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes a megfelelő kategóriájú légijárműben parancsnok-pilótaként végrehajtani a 2. 3. 3. 2, vagy a 2. 3. 4. 2. 1, vagy a 2. 3. 5. 2, vagy a 2. 3. 6. 2 pontokban előírt eljárásokat és manővereket olyan fokú alkalmassággal, mely megfelel a magán- pilóta szakszolgálati engedély birtokosának adott jogoknak, és képes:

a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és hibakezelés alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS-TRG, Doc 9868) című kiadvány *3. Fejezet, C Mellékletben,* és az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) *II. Rész 2. Fejezetben található meg.*

b) a légijárművet a határértékeken belül üzemeltetni,

c) minden manővert simán és pontosan végrehajtani,

d) jó ítélőképességet és repülési készséget tanúsítani,

e) légiforgalmi ismereteit alkalmazni, és

f) a légijármű kormányzását mindenkor olymódon fenntartani, hogy az eljárás vagy a manőver sikeres végeredménye biztosított legyen.

2. 3. 1. 4. *Egészségügyi alkalmasság*

A folyamodónak érvényes II. o. Egészségügyi Minősítéssel kell rendelkeznie.

Megjegyzés – Felhívjuk a figyelmet az egészségügyi alkalmasság követelményeinek 2. 7. 1. 3. pontjára olyan magán- pilóta szakszolgálati engedély birtokosai esetében, akik műszeres jogosítást kívánnak szerezni.

2. 3. 2. A szakszolgálati engedély birtokosainak jogai és az ilyen jogok gyakorlásakor figyelembe veendő körülmények

2. 3. 2. 1. Az 1. 2. 5, 1. 2. 6, 1. 2. 7. 1, 1. 2 9 és 2. 1 pontoknak megfelelően a magán-pilóta szakszolgálati engedély birtokosának joga van parancsnok-pilótaként díjazás nélkül, vagy másodpilótaként tevékenykedni a megfelelő légijármű kategórián belül olyan légijárművön, mely nem jövedelemszerző repüléseket hajt végre.

2. 3. 2. 2. A szakszolgálati engedély birtokosának, mielőtt a jogait éjszaka gyakorolná, kétkormányos kiképzésben kell részesülnie olyan légijárművön, mely az éjszakai repüléshez megfelelő légijármű kategórián belül van, beleértve a felszállást, a leszállást és a navigációt.

2. 3. 3. Repülőgép kategória jogosítás kiadásának specifikus követelményei

2. 3. 3. 1. *Tapasztalat*

2. 3. 3. 1. 1. A folyamodónak nem kevesebb, mint 40 óra repülési időt kell olyan repülőgép pilótájaként szereznie, mely megfelelő az elnyerni kívánt osztály-jogosításhoz, vagy 35 órát kell szereznie, ha ezt egy jóváhagyott kiképzés folyamán éri el. Az Engedélyező Hatóságnak meg kell határoznia, hogy egy repülési szimulátor oktató-berendezésben felügyelet alatt tevékenykedő pilóta tapasztalata elfogadható-e a 40 óra, illetve a 35 óra összes repülési idő részeként, attól függően, hogy melyik alkalmazható. Az ilyen tapasztalat vonatkozásában maximum 5 órát lehet jóváírni.

2. 3. 3. 1. 1. 1. Ha a folyamodó más kategóriájú légijárművön szerzett repülési időt pilótaként, az Engedélyező Hatóságnak kell meghatároznia azt, hogy az ilyen tapasztalat elfogadható-e, és, ha igen, akkor a 2. 3. 3. 1. 1 pontban előírt repülési idő követelmény milyen mértékig csökkenthető.

2. 3. 3. 1. 2. A folyamodónak nem kevesebb, mint 10 óra egyedül-repülési idővel kell rendelkeznie a megszerezni kívánt osztály-jogosításnak megfelelő repülőgépeken, egy jogosított repülőoktató felügyelete alatt, beleszámítva 5 óra útvonalrepülésben egyedül végrehajtott repülést, melyből legalább egy útvonalrepülés nem kevesebb, mint 270 km (150 NM) hosszúságú, és melynek folyamán két különböző repülőtéren teljes megállással befejezett leszállást kell végrehajtania.

2. 3. 3. 2. *Repülőoktatás*

A folyamodónak jogosított repülőoktató által kétkormányos kiképzésben kell részesülnie olyan repülőgépeken, amelyek megfelelőek a megszerezni kívánt osztály-jogosításhoz. Az oktatónak gondoskodnia kell arról, hogy a folyamodónak üzemeltetési tapasztalata legyen a magán-pilótára előírt teljesítményszinten legalább az alábbi témakörökben:

a) fenyegető jelenségek és hibák felismerése és kezelése

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a repülőgép szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a repülőgép vezetése külső vizuális támpontok segítségével,

e) kritikusan alacsony repülési sebességgel történő repülés, a kezdeti és a teljes átesés felismerése és abból való visszanyerés,

f) kritikusan nagy repülési sebességgel történő repülés, dugóhúzóba kerülés felismerése és abból való kilépés,

g) felszállások és leszállások szokványos és oldalszélben,

h) felszállások maximális teljesítménnyel (rövid pálya és akadálymentesség), rövid pályán végrehajtott leszállások,

i) egyedül csak a műszerekre hagyatkozó repülés, beleértve egy 180º-os szintbeli forduló végrehajtását,

j) látás melletti útvonalrepülés, számított hely és, ahol rendelkezésre áll, rádiónavigációs berendezések felhasználásával,

k) vészhelyzeti tevékenységek, a repülőgép berendezések szimulált meghibásodásait is beleértve,

l) az ellenőrzött repülőterekre történő berepülés, onnan kirepülés és azok átrepülése a légiforgalmi irányító szolgálatok eljárásaival összhangban, és

m) összeköttetési eljárások és kifejezés gyűjtemény

Megjegyzés – A 2. 3. 3. 2. 1. i) pontban meghatározott műszeres repülés tapasztalat és a 2. 3. 2. 2. pont szerinti kétkormányos éjszakai repülés nem jogosítja fel a magán-pilóta szakszolgálati engedély birtokosát repülőgépek IFR szerinti vezetésére.

2. 3. 4. Helikopter kategória- jogosítás kiadásának specifikus követelményei

2. 3. 4. 1. *Tapasztalat*

2. 3. 4. 1. 1. A folyamodónak helikopter pilótaként nem kevesebb, mint 40 óra repülési időt kell megszereznie, vagy 35 órát, ha ezt egy jóváhagyott kiképzés során gyűjti össze. Az Engedélyező Hatóságnak kell meghatároznia, hogy egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilótaként szerzett tapasztalat elfogadható-e a 40 óra, illetve a 35 óra összes repülési idő részeként, attól függően, hogy melyik eset áll fenn. Az ilyen tapasztalat jóváírását maximum 5 órára kell korlátozni.

2. 3. 4. 1. 1. 1. Ha a folyamodó pilótaként egy másik kategóriájú légijárművön szerezte meg a repülési időt, az Engedélyező Hatóságnak kell meghatározni azt, hogy az ilyen tapasztalat elfogadható-e, és ha igen, azt a mértéket, ameddig a 2. 3. 4. 1. 1. pont repülési idő követelményét le lehet csökkenteni.

2. 3. 4. 1. 2. A folyamodónak jogosított repülőoktató felügyelete alatt helikopterekben nem kevesebb, mint 10 óra egyedül-repülési időt kell megszereznie, beleértve 5 óra útvonal-repülési időt egyedül- repüléssel, melynek során legalább egy olyan útvonalrepülés is végrehajtásra kerül, melynek hossza nem kevesebb, mint 180 km (150 NM), és melynek során két különböző ponton kell leszállást végrehajtania.

2. 3. 4. 2. *Repülésoktatás*

2. 3. 4. 2. 1. A folyamodónak nem kevesebb, mint 20 óra kétkormányos kiképzésben kell részesülnie jogosított repülőoktatótól helikopterekben. Az oktatónak gondoskodnia kell arról, hogy a folyamodónak üzemeltetési tapasztalata legyen a magán-pilótára előírt teljesítményszinten legalább az alábbi témakörökben

a) fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a helikopter szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a helikopter vezetése külső vizuális támpontok segítségével,

e) a teljesítmény melletti megülés kezdeti szakaszából való kivétel, a hajtómű fordulatszám normál tartományán belül az alacsony rotor fordulatszámból történő kivétel technikái,

f) földi manőverezés és nekifutás, lebegés, felszállások és leszállások – normál, szélcsendes és lejtős talajon,

g) minimálisan szükséges teljesítménnyel történő felszállások és leszállások, maximális teljesítmény melletti felszállás és leszállás technikái, szűkre szabott területeken történő üzemelés, gyors megállások,

h) látás melletti útvonalrepülés, számított hely és, ahol rendelkezésre áll, rádiónavigációs berendezések felhasználásával, beleértve egy olyan repülést, melynek időtartama legalább 1 (egy) óra,

i) vészhelyzeti tevékenységek, beleértve a helikopter berendezések szimulált meghibásodásait is, autorotációs megközelítés,

j) az ellenőrzött repülőterekre történő berepülés, onnan kirepülés és azok átrepülése a légiforgalmi irányító szolgálatok eljárásaival összhangban, és

k) összeköttetési eljárások és kifejezés gyűjtemény

2. 3. 4. 2. 1. 1. **Ajánlás –** *A folyamodónak jogosított repülőoktató révén kétkormányos műszeres oktatásban kell részesülnie. Az oktatónak gondoskodnia kell arról, hogy a folyamodó rendelkezzen kizárólagosan a műszerekre támaszkodó repülési tapasztalattal, beleértve egy 180º-os szintbeli forduló végrehajtását, egy megfelelően műszerezett helikopterben.*

Megjegyzés – A 2. 3. 4. 2. 1. 1. pontban meghatározott műszeres repülési tapasztalat és a 2. 3. 2. 2 pontban szereplő kétkormányos éjszakai repülésoktatás nem jogosítja fel a magán-pilóta szakszolgálati engedély birtokosát a helikopter IFR-ben történő vezetésére.

2. 3. 5. Motoros szerkezet kategória jogosítás kiadásának specifikus követelményei

2. 3. 5. 1. *Tapasztalat*

2. 3. 5. 1. 1. **Ajánlás –** *A folyamodónak nem kevesebb, mint 40 óra repülési idővel kell rendelkeznie motoros szerkezet pilótájaként. Az Engedélyező Hatóságnak kell meghatároznia, hogy egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta tapasztalata elfogadható-e a 40 óra összes repülési idő részeként.*

2. 3. 5. 1. 2. **Ajánlás –** *Ha a folyamodó egyéb kategóriájú légijárművön pilótaként szerzett repülési időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalat elfogadható-e, és ha igen, annak mértékét, hogy a 2. 3. 5. 1. 1. pontban előírt repülési idő követelmény emiatt csökkenthető-e.*

2. 3. 5. 1. 3. **Ajánlás –** *A folyamodónak motoros szerkezetekben nem kevesebb, mint 10 óra egyedül-repülési időt kell szereznie egy jogosított repülőoktató felügyelete alatt, beleértve egy 5 óra időtartamú útvonalrepülést egyedül-repüléssel, melyből legalább egy olyan útvonalrepülést, melynek hossza nem kevesebb, mint 270 km (150 NM) és amelynek folyamán teljes megállással végződő leszállást kell két különböző repülőtéren végrehajtania.*

2. 3. 5. 2. *Repülésoktatás*

Ajánlás – *A folyamodónak nem kevesebb, mint 20 óra kétkormányos oktatási idővel kell rendelkeznie motoros szerkezeteken egy jogosított repülőoktatótól. Az oktatónak gondoskodnia kell arról, hogy a folyamodó rendelkezzen üzemeltetési tapasztalattal legalább az alábbi témakörökben a magán-pilótára előírt teljesítményszinten*:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a motor szerkezet szemrevételezését és a kiszolgálást,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a motoros szerkezet vezetése külső vizuális támpontok segítségével,

e) földi manőverezés és nekifutások, lebegés, nekifutásból történő felszállások és emelkedés, lebegés és nekifutásból történő felszállások és leszállások – normál, szélcsendes és lejtős talajon,

f) minimálisan szükséges teljesítménnyel történő felszállások és leszállások, maximális teljesítmény melletti felszállás és leszállás technikái, szűkre szabott területeken történő üzemelés, gyors megállások,

g) kizárólag műszerek alapján végrehajtott repülés, beleértve egy 180º-os szintbeli forduló végrehajtását,

h) a teljesítmény melletti megülés kezdeti szakaszából való kivétel, a hajtómű fordulatszám normál tartományán belül az alacsony rotor fordulatszámból történő kivétel technikái,

i) látás melletti útvonalrepülés, számított hely és, ahol rendelkezésre áll, rádiónavigációs berendezések felhasználásával, beleértve egy olyan repülést, melynek időtartama legalább 1 (egy) óra,

j) veszélyhelyzeti tevékenységek, beleértve a motoros szerkezet berendezéseinek szimulált *meghibásodásait, teljesítmény az autorotációs és az autórotáló megközelítésre történő áttérésre, ahol ez alkalmazható, a transmisszió és az összekötő hajtótengely meghibásodása, ahol ez alkalmazható,*

k) az ellenőrzött repülőterekre történő berepülés, onnan kirepülés és azok átrepülése a légiforgalmi irányító szolgálatok eljárásaival összhangban, és

l) összeköttetési eljárások és kifejezés gyűjtemény.

Megjegyzés – A 2. 3. 5. 2. g) pontban meghatározott műszeres repülési tapasztalat és a 2. 3. 2. 2. pontban meghatározott kétkormányos éjszakai repülésoktatás nem jogosítja fel a magán-pilóta szakszolgálati engedély birtokosát arra, hogy IFR-ben motoros szerkezeteket vezessen.

2. 3. 6. A léghajó kategória jogosítás kiadásának specifikus követelményei

2. 3. 6. 1. Tapasztalat

A folyamodónak nem kevesebb, mint 25 óra repülési időt kell megszereznie egy léghajó pilótájaként, beleértve legalább az alábbiakat:

a) 3 óra időtartamú útvonalrepülés kiképzés léghajóban, ahol egy útvonalrepülés nem kevesebb, mint 45 km (25 NM) hosszúságú,

b) 5 felszállás és 5 leszállás teljes megállással egy repülőtéren, minden egyes leszállásnak magába kell foglalni a repülőtér forgalmi körén történő repülést,

c) 3 óra műszeres időt, és

d) 5 óra pilótaként elfogadva a parancsnok-pilóta kötelmeit, a parancsnok-pilóta felügyelete alatt.

2. 3. 6. 2. Repülésoktatás

A folyamodónak jogosított repülőoktató által kétkormányos oktatásban kell részt vennie léghajóban. Az oktatónak gondoskodnia kell arról, hogy a folyamodó oktatásban részesüljön legalább az alábbi témakörökben:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a léghajó szemrevételezése és kiszolgálása,

c) manőverezés földlátással,

d) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

e) a felszállás technikái és eljárásai, beleértve a megfelelő korlátozásokat, veszélyhelyzeti eljárásokat és alkalmazott jelzéseket,

f) a léghajó vezetése külső vizuális pontok segítségével,

g) felszállások, leszállások és megismételt megközelítések,

h) maximális teljesítmény melletti (akadálymentesség) felszállások,

i) kizárólag műszerek alapján történő repülés, beleértve egy 180º-os szintbeli forduló végrehajtását,

j) navigáció, útvonalrepülés vizuális támpontok, számított hely navigáció és rádiónavigációs berendezések felhasználásával,

k) veszélyhelyzeti tevékenységek (szivárgások felismerése), beleértve a léghajó berendezéseinek szimulált meghibásodásait is, és

l) összeköttetési eljárások és kifejezés gyűjtemény

Megjegyzés – A 2. 3. 6. 2 i) pontban előírt műszeres repülési tapasztalat, valamint a 2. 3. 2. 2. pontban előírt kétkormányos éjszakai repülés oktatás nem jogosítja fel a magán-pilóta szakszolgálati engedély birtokosát a léghajó IFR-ben történő vezetésére.

2. 4. Kereskedelmi pilóta szakszolgálati engedély

2. 4. 1. Repülőgépre, léghajóra, helikopterre és motoros szerkezetre alkalmas szakszolgálati engedély kiadásának általános feltételei

2. 4. 1. 1. *Életkor*

A folyamodó nem lehet 18 évnél fiatalabb.

2. 4. 1. 2. *Szakismeret*

A folyamodónak bizonyítania kell, hogy rendelkezik azzal a szakismerettel, mely a kereskedelmi pilóta szakszolgálati engedély birtokosára vonatkozó jogoknak megfelel, valamint a szakszolgálati engedélybe bejegyezni kívánt légijármű kategóriának megfelel minimum az alábbi témakörökben:

Légijog

a) a kereskedelmi pilóta szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, repülési szabályok, a légiforgalmi szolgálatok megfelelő gyakorlatai és eljárásai,

Repülőgépekre, léghajókra, helikopterekre és motoros szerkezetekre vonatkozó

Általános légijármű ismeret

b) a hajtóművek, rendszerek és műszerek működési alapelvei és funkciói,

c) a vonatkozó légijármű kategória és a hajtóművek üzemeltetési korlátai, az erre vonatkozó üzemeltetési információk a repülési kézikönyv vagy más megfelelő dokumentáció alapján,

d) a megfelelő légijármű berendezéseinek és rendszereinek használata és az üzemképesség ellenőrzése,

e) a megfelelő légijármű sárkányának, rendszereinek és hajtóműveinek karbantartási eljárásai,

f) helikopterek és motoros szerkezetek esetében transzmisszió (erőátviteli berendezések), ahol ez alkalmazható,

g) léghajóknál a gázok fizikai tulajdonságai és gyakorlati felhasználásuk,

Repülési jellemzők, repüléstervezés és terhelés

h) a terhelés és a tömeg megoszlás hatásai a légijármű kiszolgálásban, repülési jellemzők és teljesítmény, tömeg és tömegközéppont számítások,

i) a felszállási, leszállási és egyéb teljesítményadatok használata és gyakorlati alkalmazása,

j) a VFR-ben történő kereskedelmi repüléseknek megfelelő repülés-előtti és útvonalrepülés alatti tervezés, repülési tervek összeállítása és kitöltése a légiforgalmi szolgálatok számára, a légiforgalmi szolgálatok megfelelő eljárásai, magasságmérő beállítási eljárások,

k) léghajók, helikopterek és motoros szerkezetek esetében a külső teher hatásai a kiszolgálásban.

Emberi tényezők

l) a fenyegető jelenségek és a hibakezelés elveit magába foglaló emberi tényezők,

Megjegyzés: – a fenyegető jelenségeket és a hibakezelést magába foglaló emberi tényezőkre vonatkozó kiképzési programok tervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

m) repülés-meteorológiai jelentések, térképek és előrejelzések értelmezése és alkalmazása, meteorológiai tájékoztatások repülés előtti és repülés alatti beszerzésére és használatára vonatkozó eljárások, magasságmérés,

n) repülési meteorológia, a vonatkozó területek éghajlattana tekintetbe véve azokat az elemeket, melyek befolyásolják a repülést, a nyomásrendszerek mozgása, a frontok szerkezete, a felszállás, az útvonalrepülés és a leszállás körülményeit befolyásoló szignifikáns időjárási jelenségek jellemzői és eredetük,

o) a jegesedés okai, felismerése és hatásai, a frontképződési zónába történő belépés eljárásai, veszélyes időjárási jelenségek elkerülése,

Navigáció

p) léginavigáció, beleértve a légiforgalmi térképek, műszerek és navigációs berendezések használatát, az adott navigációs rendszerek jellemzőinek és működési elveinek megértése, a fedélzeti berendezések működtetése,

q) léghajók esetében:

i) a léghajó kormányzásához és navigálásához szükséges műszerek és repülési elektronika használata, korlátozásai és használhatósága

ii) a kirepülés, útvonalrepülés, megközelítés és leszállás fázisaiban használt navigációs rendszerek használata, pontossága és megbízhatósága, a rádiónavigációs berendezések azonosítása,

iii) az önálló és a külső támpontok felhasználásával működtetett navigációs rendszerek jellemzői és alapelvei, a fedélzeti berendezések működtetése,

Üzemeltetési eljárások

r) a fenyegető jelenségek és a hibakezelés alkalmazása az üzemeltetésben,

Megjegyzés –A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet

C. Mllékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

s) légiforgalmi kiadványok használata, mint AIP, NOTAM, légiforgalmi kódok és rövidítések,

t) magasságmérő beállítás eljárásai,

u) megfelelő elővigyázatossági és veszélyhelyzeti eljárások,

v) az áruszállítás üzemeltetési eljárásai, veszélyes árukkal kapcsolatos potenciális veszélyek,

w) az utasoknak adandó biztonsági tájékoztató követelményei és gyakorlata, beleértve a tanúsítandó elővigyázatosságot a légijárműbe történő beszállás, és az abból történő kiszállás folyamán,

x) helikopterek, és amennyiben alkalmazható, motoros szerkezetek esetében teljesítmény melletti megülés, földi rezonancia, a hátranyúló forgószárny-lapát átesése, dinamikus hossztengely körüli elfordulás és egyéb üzemeltetési veszélyek, a VMC körülmények közötti repüléshez tartozó biztonsági eljárások.

Repüléselmélet

y) a repülés alapelvei,

Rádió telefónia

z) a VFR repülésre vonatkozó rádió-távbeszélő eljárások és kifejezések, a

rádió összeköttetés megszakadása esetén követendő tevékenységek.

2. 4. 1. 3. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes a megfelelő kategóriájú légijárműben parancsnok-pilótaként végrehajtani a 2. 4. 3. 2, vagy a 2. 4. 4. 2, vagy a 2. 4. 5. 2, vagy a 2. 4. 6. 2 pontokban előírt eljárásokat és manővereket olyan fokú alkalmassággal, mely megfelel a kereskedelmi pilóta szakszolgálati engedély birtokosának adott jogoknak, és képes:
a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és hibakezelés alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS-TRG, Doc 9868) című kiadvány *3. Fejezet, C Mellékletben,* és az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) *II. Rész 2. Fejezetben található meg.*

b) a légijárművet a határértékeken belül üzemeltetni,

c) minden manővert simán és pontosan végrehajtani,

d) jó ítélőképességet és repülési készséget tanúsítani,

e) légiforgalmi ismereteit alkalmazni, és

f) a légijármű kormányzását mindenkor olymódon fenntartani, hogy az eljárás vagy a manőver sikeres végeredménye biztosított legyen.

2. 4. 1. 4. *Egészségügyi alkalmasság*

A folyamodónak érvényes I. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

2. 4. 2. A szakszolgálati engedély birtokosának jogai és a jogok gyakorlásakor figyelembe veendő körülmények

2. 4. 2. 1. Az 1. 2. 5, 1. 2. 6, 1. 2. 7. 1, 1. 2. 9 és a 2. 1 pontokban meghatározott követelményeknek megfelelően a kereskedelmi pilóta szakszolgálati engedély birtokosa az alábbiakra jogosult:

a) a megfelelő légijármű kategóriában bármelyik légijárműben gyakorolni a magán-pilóta szakszolgálati engedély birtokosának összes jogait,

b) kereskedelmi légiszállításban részt nem vevő, a megfelelő légijármű kategóriába tartozó légijárművön parancsnok-pilótaként tevékenykedni,

c) kereskedelmi légiszállításban részt vevő, a megfelelő légijármű kategóriába tartozó és egy-pilótás üzemeltetésre jogosított légijárművön parancsnok-pilótaként tevékenykedni,

d) másodpilótával üzemeltetendő, a megfelelő légijármű kategóriába tartozó bármelyik légijárművön másodpilótaként tevékenykedni,

e) léghajó kategória esetében, a léghajót IFR körülmények között vezetni.

2. 4. 2. 2. Mielőtt jogait éjszaka gyakorolná, a szakszolgálati engedély birtokosának kétkormányos kiképzésben kell részesülnie éjszakai repülésre alkalmas megfelelő légijármű kategória valamely légijárművén, beleértve a felszállást, a leszállást és a navigációt.

Megjegyzés – A szakszolgálati engedély bizonyos jogait a 2. 1. 10 pont lecsökkenti olyan szakszolgálati engedély birtokosok esetében, akik betöltötték a 60. és 65. életévüket.

2. 4. 3. Repülőgép kategória jogosítás kiadásának specifikus követelményei

2. 4. 3. 1. *Tapasztalat*

2. 4. 3. 1. 1. A folyamodónak nem kevesebb, mint 200 óra repült időt kell megszereznie pilótaként repülőgépen, vagy 150 órát, ha ezt egy jóváhagyott kiképzés folyamán szerzi meg. Az Engedélyező Hatóságnak kell meghatározni, hogy egy repülési szimulátor oktató-berendezésben kiképzés alatt álló pilótaként a repült idejét elismeri-e a 200 óra, vagy a 150 óra összes repült idő részeként, attól függően, hogy melyik eset áll fenn. Az ilyen tapasztalatra történő jóváírást maximum 10 órára kell korlátozni.

2. 4. 3. 1. 1. 1. A folyamodónak repülőgépeken az alábbi repült időket kell megszereznie:

a) 100 órát parancsnok-pilótaként, vagy egy jóváhagyott kiképzés keretében 70 órát parancsnok-pilótaként,

b) 20 órát útvonalrepülésben parancsnok-pilótaként, beleértve egy olyan útvonalrepülést, mely nem kevesebb, mint 540 km (300 NM) hosszúságú, s melynek során teljes megállással végződő leszállást hajt végre két különböző repülőtéren,

c) 10 óra műszeres kiképzési időt, melyből a műszeres földi idő nem lehet több, mint 5 óra, és

d) 5 óra éjszakai repült időt, ha a szakszolgálati engedély jogosítványait éjszaka kell gyakorolni, melybe beletartozik parancsnok-pilótaként végrehajtott 5 felszállás és 5 leszállás.

2. 4. 3. 1. 2. Amennyiben a folyamodó más kategóriába tartozó légijárművön pilótaként szerzett repülési időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot elfogadja-e, és ha igen, azt a mértéket, ameddig a 2. 4. 3. 1. 1 pont követelményei emiatt lecsökkenthetők.

2. 4. 3. 2. *Repülésoktatás*

A folyamodónak kétkormányos oktatásban kell részesülnie a megszerezni kívánt osztály és/vagy típusjogosításnak megfelelő repülőgépeken, jogosított repülőoktatótól. Az oktatónak gondoskodnia kell arról, hogy a folyamodó megszerezze az üzemeltetési tapasztalatot legalább az alábbi témakörökben, a kereskedelmi pilótára előírt teljesítményszinten:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a repülőgép szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a repülőgép vezetése külső vizuális pontok segítségével,

e) kritikusan alacsony repülési sebességekkel repülni, elkerülni a dugóhúzóba kerülést, a kezdődő és a teljes átesés felismerése és abból való visszatérés,

f) többmotoros osztály- vagy típusjogosítás esetében aszimmetrikus teljesítménnyel történő repülés,

g) kritikusan nagy repülési sebességekkel repülni, spirálvonalban történő süllyedés felismerése és abból való kivétel,

h) normál és oldalszélben végrehajtott felszállások és leszállások,

i) maximális teljesítmény melletti (rövid felszálló-terület, és akadálymentesség) felszállások, rövid leszállóterületre történő leszállások,

j) alapvető repülési manőverek, és szokatlan térbeli helyzetek kivédése kizárólag a repülési alapműszerekre támaszkodva,

k) útvonalrepülés végrehajtása külső vizuális támpontok segítségével, számított hely navigáció és rádiónavigációs berendezések felhasználásával, a tervezett útvonalról való letérés eljárásai,

l) nem szokványos és veszélyhelyzeti eljárások és manőverek, beleértve a repülőgép berendezéseinek szimulált meghibásodásait,

m) ellenőrzött repülőterekre, repülőterekről történő üzemelés, ellenőrzött repülőterek átrepülése betartva a légiforgalmi szolgálatok eljárásait, és

n) összeköttetési eljárások és kifejezés gyűjtemény.

Megjegyzés – A 2. 4. 3. 1. 1. 1. c) és 2. 4. 3. 2. j) pontokban előírt műszeres repülési tapasztalat és az éjszakai repülési tapasztalat valamint a 2. 4. 3. 1. 1. 1.d) és a 2. 4. 2. 2 pontokban előírt kétkormányos éjszakai repülés oktatás nem jogosítja fel a kereskedelmi pilóta szakszolgálati engedély birtokosát repülőgép IFR-ben történő vezetésére.

2. 4. 4. Helikopter kategória jogosítás kiadásának specifikus követelményei

2. 4. 4. 1. *Tapasztalat*

2. 4. 4. 1. 1. A folyamodónak pilótaként helikoptereken nem kevesebb, mint 150 óra repült idővel kell megszereznie, vagy 100 órát, ha ezt egy jóváhagyott kiképzés során szerzi meg. Az Engedélyező Hatóságnak kell meghatároznia, hogy egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta tapasztalata elfogadható-e a 150 óra, vagy a 100 óra összes repült idő részeként, attól függően, hogy melyik esetről van szó. Az ilyen tapasztalatra a jóváírást maximum 10 órára kell korlátozni.

2. 4. 4. 1. 1. 1. A folyamodónak helikopterben az alábbiakat kell teljesítenie:

a) nem kevesebb, mint 35 órát parancsnok-pilótaként,

b) 10 óra útvonalrepülést parancsnok-pilótaként, beleértve egy olyan útvonalrepülést, melynek során két különböző ponton leszállást hajt végre,

c) 10 óra műszeres oktatási idő, melyből a műszeres földi idő nem lehet több mint 5 óra, és

d) ha a szakszolgálati engedély jogosításait éjszaka kell gyakorolnia, 5 óra éjszakai repült idő parancsnok-pilótaként, beleértve 5 felszállás és 5 leszállás végrehajtását

2. 4. 4. 1. 2. Ha a folyamodó egyéb kategóriájú légijárművön szerzett pilótaként repült időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot elfogadhatónak tartja-e, és ha igen, azt a mértéket, amelyre a 2. 4. 4. 1. 1. pontban előírt repült idő követelmény emiatt lecsökkenthető.

2. 4. 4. 2. *Repülésoktatás*

A folyamodónak kétkormányos oktatásban kell részesülnie helikopterben jogosított repülőoktatótól. Az oktatónak gondoskodnia kell arról, hogy folyamodó megszerezze az üzemelltetési tapasztalatot legalább az alábbi témakörökben a kereskedelmi pilótára előírt teljesítményszinten:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a helikopter szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a helikopter vezetése külső vizuális pontok segítségével,

e) teljesítmény melletti megülés kezdeti stádiumából való kijövetel, a forgószárny alacsony fordulatszámából való kikerülés technikái a hajtómű fordulatszámának normál tartományán belül,

f) földi manőverezés és nekifutások, lebegés, felszállások és leszállások – normál, szélcsendes körülmények között és lejtős talajról, meredek megközelítések,

g) minimálisa szükséges teljesítménnyel történő felszállások és leszállások, maximális teljesítmény melletti felszállás és leszállás technikái, szűkre szabott helyen történő üzemelés, gyors megállások,

h) a földhatástól mentes lebegés, üzemeltetés külső teherrel, ha alkalmazható, nagy magasságokon történő repülés,

i) alapvető repülési manőverek, és szokatlan térbeli helyzetek kivédése kizárólag a repülési alapműszerekre támaszkodva,

j) útvonalrepülés végrehajtása külső vizuális támpontok segítségével, számított hely navigáció és rádiónavigációs berendezések felhasználásával, a tervezett útvonalról való letérés eljárásai,

k) nem szokványos és veszélyhelyzeti eljárások és manőverek, beleértve a helikopter berendezéseinek szimulált meghibásodásait,

l) ellenőrzött repülőterekre, repülőterekről történő üzemelés, ellenőrzött repülőterek átrepülése betartva a légiforgalmi szolgálatok eljárásait, és

m) összeköttetési eljárások és kifejezés gyűjtemény

Megjegyzés – A 2. 4. 4. 1. 1. 1. c) és a 2. 4. 4. 2.i) pontokban előírt műszeres repülési tapasztalat és az éjszakai repülési tapasztalat, valamint a 2. 4. 4. 1. 1. 1.d) és a 2. 4. 2. 2 pontokban előírt kétkormányos éjszakai repülés oktatás nem jogosítja fel a kereskedelmi pilóta szakszolgálati engedély birtokosát helikopternek IFR-ben történő vezetésére.

2. 4. 5. A motoros szerkezet kategória jogosítás kiadásának specifikus követelményei

2. 4. 5. 1. *Tapasztalat*

2. 4. 5. 1. 1. **Ajánlás –** *A folyamodónak a légijármű pilótájaként nem kevesebb, mint 200 óra repült időt kell megszereznie egy motoros szerkezeten, vagy 150 órát, ha ezt egy jóváhagyott kiképzés folyamán szerzi meg. Az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta esetében elfogadhatónak*

tartja-e a 200 óra, vagy a 150 óra összes repült idő részeként, attól függően, hogy melyik eset áll fenn.

2. 4. 5. 1. 2. **Ajánlás** *– A folyamodónak egy motoros szerkezetben az alábbi időket kell megszereznie, melyek nem lehetnek kevesebbek, mint:*

a) 50 óra parancsnok-pilótaként,

b) 10 óra parancsnok-pilótaként útvonalrepülésben, beleértve egy olyan útvonalrepülést, mely nem kevesebb, mint 540 km (300 NM) hosszúságú, melynek folyamán teljes megállással befejezett leszállásokat kell végrehajtania két különböző repülőtéren,

c) 10 óra műszeres kiképzés, melyből nem több mint 5 óra lehet a műszeres földi idő, és

d) ha a jogosítványokat éjszaka kell gyakorolni, 5 óra éjszakai repülési időt kell teljesítenie parancsnok-pilótaként, beleértve 5 felszállást és 5 leszállást.

2. 4. 5. 1. 3. **Ajánlás** – Ha a folyamodó más kategóriájú légijárművön pilótaként szerzett repülési időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalat elfogadható-e, és ha igen, annak mértékét, hogy a 2. 4. 5. 1. 1 pontban előírt repült idő követelmény emiatt lecsökkenthető-e.

2. 4. 5. 2. *Repülésoktatás*

Ajánlás – A folyamodónak kétkormányos oktatásban kell részesülnie egy jogosított repülőoktatótól. Az oktatónak gondoskodnia kell arról, hogy a folyamodó megszerezze az üzemeltetési tapasztalatot legalább az alábbi témakörökben a kereskedelmi pilótára előírt teljesítményszinten:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a motoros szerkezet szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások,

d) a motoros szerkezet vezetése külső vizuális pontok segítségével, *e) teljesítmény melletti megülés kezdeti stádiumából való kivétel, a forgószárny alacsony fordulatszámából való kikerülés technikái a hajtómű fordulatszámának normál tartományán belül,*

f) földi manőverezés és nekifutások, lebegés, nekifutásból történő felszállások és emelkedés, lebegés, és nekifutásból történő felszállás és leszállások – normál körülmények között, szélcsendben és lejtős talajról, meredek megközelítések,

g) minimálisa szükséges teljesítménnyel történő felszállások és leszállások, maximális teljesítmény melletti felszállás és leszállás technikái, szűkre szabott helyen történő üzemelés, gyors megállások,

h) a földhatástól mentes lebegés, üzemeltetés külső teherrel, ha alkalmazható, nagy magasságokon történő repülés,

i) alapvető repülési manőverek, és szokatlan térbeli helyzetek kivédése kizárólag a repülési alapműszerekre támaszkodva,

j) útvonalrepülés végrehajtása külső vizuális támpontok segítségével, számított hely navigáció, és ahol alkalmazható, rádiónavigációs berendezések felhasználásával, beleértve egy legalább 1 (egy) órás repülést,

k) veszélyhelyzeti üzemeltetés, beleértve a motoros szerkezet berendezéseinek szimulált meghibásodásait, az autorotációra, és az autorotációs megközelítés visszaállítás teljesítménye, ahol alkalmazható, a transmisszió és az összekötő hajtótengely meghibásodása, ahol alkalmazható,

l) ellenőrzött repülőterekre, repülőterekről történő üzemelés, ellenőrzött repülőterek átrepülése betartva a légiforgalmi szolgálatok eljárásait, és

m) összeköttetési eljárások és kifejezés gyűjtemény

Megjegyzés – A 2. 4. 5. 1. 2. c) és a 2. 4. 5. 2. i) pontokban előírt műszeres repülési tapasztalat és az éjszakai repülési tapasztalat, valamint a 2. 4. 5. 1. 2. d) és a 2. 4. 2. 2 pontokban előírt kétkormányos éjszakai repülés oktatás nem jogosítja fel a kereskedelmi pilóta szakszolgálati engedély birtokosát motoros szerkezetek IFR-ben történő vezetésére.

2. 4. 6. Léghajó kategória jogosítás kiadásának specifikus követelményei

2. 4. 6. 1. *Tapasztalat*

2. 4. 6. 1. 1. A folyamodónak nem kevesebb, mint 200 óra repült időt kell szereznie pilótaként.

2. 4. 6. 1. 1. 1. A folyamodónak legalább az alábbi repült időkkel kell rendelkeznie:

a) 50 óra pilótaként, léghajóban,

b) 30 óra parancsnok-pilótaként léghajóban, vagy felügyelet alatt álló parancsnok- pilótaként, mely magába foglal nem kevesebb, mint:

– 10 óra útvonalrepülést, és

– 10 óra éjszakai repülést,

c) 40 óra műszeres időt, melyből 20 óra repülési idő, kell, hogy legyen, és 10 óra repülési időt léghajóban kell megszerezni, és

d) 20 óra repülési kiképzés léghajóban a 2. 4. 6. 2 pontban felsorolt témakörökben.

2. 4. 6. 2. *Repülésoktatás*

A folyamodónak jogosított repülőoktatótól kétkormányos oktatásban kell részesülnie léghajókban. Az oktatónak gondoskodnia kell arról, hogy a folyamodó megszerezze az üzemeltetési tapasztalatot legalább az alábbi témakörökben, a kereskedelmi pilótára előírt teljesítményszinten:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.

b) repülés előtti tevékenységek, beleértve a tömeg és tömegközéppont meghatározását, a léghajó szemrevételezése és kiszolgálása,

c) repülőtéri és forgalmi kör tevékenységek, az összeütközés elkerülésére szolgáló elővigyázatossági intézkedések és eljárások

d) a felszállás technikái és eljárásai, beleértve a vonatkozó korlátozásokat, a veszélyhelyzeti eljárásokat és a használatos jelzéseket,

e) a léghajó vezetése külső vizuális támpontok segítségével,

f) a szivárgás felismerése,

g) szokványos fel-és leszállások,

h) maximális teljesítmény melletti felszállások (rövid felszálló terület és akadálymentesség), rövid leszálló területen történő leszállások,

i) IFR körülmények közötti repülés,

j) vizuális támpontok alkalmazásával végrehajtott útvonalrepülés, számított hely navigáció, és ahol alkalmazható, rádiónavigációs berendezések felhasználásával,

k) veszélyhelyzeti üzemeltetés, beleértve a léghajó berendezéseinek szimulált meghibásodásait,

l) ellenőrzött repülőterekre történő berepülés, onnan való kirepülés és annak átrepülése, a légiforgalmi irányító szolgálatok eljárásainak betartásával, és

m) rádióösszeköttetési eljárások és kifejezés gyűjtemény.

2. 5. A repülőgép kategóriának megfelelő több személyes személyzet pilóta szakszolgálati engedély

2. 5. 1. A szakszolgálati engedély kiadásának feltételei

2. 5. 1. 1. Életkor

A folyamodó nem lehet 18 évnél fiatalabb.

2. 5. 1. 2. *Szakismeret*

A folyamodónak a 2. 6. 1. 2 pontban meghatározott követelményeket kell kielégíteni ahhoz, hogy a repülőgép kategóriának megfelelő közforgalmi pilóta szakszolgálati engedélyt adjanak ki részére, mely tudást egy jóváhagyott kiképzés keretében kell megszereznie.

2. 5. 1. 3. *Jártasság*

2. 5. 1. 3. 1. A 3. Függelékben előírt alkalmassági tényezők kielégítése érdekében a folyamodónak demonstrálnia kell jártasságát olyan pilótaként, aki repüli a repülőgépet, és mint nem-pilótaként olyan szinten, mely szükséges ahhoz, hogy másodpilótaként olyan gázturbinás repülőgépen tevékenykedjen, mely az alkalmassági bizonyítványa szerint minimum személyzetként legalább 2 pilótával üzemeltethető VFR és IFR körülmények között, és jártasnak kell lennie az alábbi témakörökben:

a) a fenyegető jelenségek és hibák felismerése és kezelése,

Megjegyzés – A fenyegető jelenségek és hibák kezelésének alkalmazására tájékoztató anyag a Léginavigációs Szolgálatok – Kiképzés (PANS. TRG, DOC 9868) 3. Fejezet C. Mellékletében, *valamint az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) II. Rész 2. Fejezetben található.*

b) a repülőgép manuális vezetése simán és pontosan a határértékein belül, oly módon, hogy az eljárás vagy manőver sikeres végeredménye biztosított legyen,

c) a repülőgép működtetése a repülési fázisának megfelelő automata üzemmódban, és az automatika aktív üzemmódjának folyamatos figyelemmel kísérése,

d) a szokványos, a nem-szokványos és a veszélyhelyzeti eljárások pontos végrehajtása a repülés összes fázisában, és

e) hatékonyan kommunikálni a hajózó személyzet többi tagjával és demonstrálni azt a képességét, hogy hatékonyan végre tudja hajtani a személyzet cselekvőképtelensége esetére és a személyzet összműködésére vonatkozó eljárásokat, beleértve a pilóta feladatainak kijelölését, a személyzet együttműködését a szabvány üzemeltetési eljárások (SOPs) betartásával, és az ellenőrző jegyzékek (check list) használatát.

2. 5. 1. 3. 2. A 2. 5. 1. 3. 1. pontban meghatározott jártasság megszerzésében való előrehaladást folyamatosan fel kell mérni.

2. 5. 1. 4. *Egészségügyi alkalmasság*

A folyamodónak érvényes I. o. egészségi minősítéssel kell rendelkeznie.

2. 5. 2. A szakszolgálati engedély birtokosának jogai és a jogok gyakorlása során figyelembe veendő körülmények

2. 5. 2. 1. Ha az 1. 2. 5, 1. 2. 6, 1. 2. 7. 1, 1. 2. 9 és 2. 1 pontokban előírt követelményeket teljesíti, a többszemélyes személyzet pilóta szakszolgálati engedély birtokosának meg kell adni az alábbi jogokat:

a) a repülőgép kategóriában a magán-pilóta szakszolgálati engedély birtokosa jogainak gyakorlása feltéve, hogy kielégítette a 2. 3. 3. pontban előírt követelményeket,

b) a többszemélyes személyzettel történő üzemeltetésben a műszeres jogosítás jogainak gyakorlása, és

c) másodpilótaként tevékenykedjen olyan repülőgépen, melyet az előírás szerint másodpilótával kell üzemeltetni.

2. 5. 2. 2. Mielőtt az egy-pilótás üzemeltetés műszeres jogosításait gyakorolná repülőgépeken, a szakszolgálati engedély birtokosának demonstrálnia kell, hogy képes parancsnok-pilótaként tevékenykedni egy-pilótás üzemeltetésben, melyet kizárólag a műszerekre támaszkodva hajt végre, és ki kell elégítenie a 2. 7. 1. 2. pontban előírt, a repülőgép kategóriának megfelelő jártassági követelményeket.

2. 5. 2. 3. Mielőtt a kereskedelmi pilóta szakszolgálati engedély jogait gyakorolná egy-pilótás repülőgép üzemeltetésben, a szakszolgálati engedély birtokosának az alábbi repült időket kell megszereznie:

a) 70 órát repülőgépen, vagy mint parancsnok-pilóta, vagy nem kevesebb, mint 10 órát parancsnok-pilótaként, és a szükséges további repült időt felügyelet alatt tevékenykedő parancsnok-pilótaként

b) 20 órát útvonalrepülésben parancsnok-pilótaként, vagy nem kevesebb, mint 10 órát parancsnok-pilótaként és 10 órát felügyelet alatt tevékenykedő parancsnok-pilótaként, beleértve egy olyan útvonalrepülést, mely nem kevesebb, mint 540 km (300 NM) hosszúságú, s melynek folyamán két különböző repülőtéren kell teljes megállással végződő leszállást végrehajtania, és

c) A 2. 4. 1. 2, a 2. 4. 1. 3, 2. 4. 3. 1. 1 pontokban (a 2. 4. 3. 1. 1. 1 pont kivételével) és a repülőgép kategóriának megfelelően a 2. 4. 3. 2. pontban a kereskedelmi pilóta szakszolgálati engedélyhez előírt követelmények kielégítése.

1. Megjegyzés – Ha a Szerződő Állam megadja az egy-pilótás üzemeltetés jogait a többszemélyes személyzet pilóta szakszolgálati engedély birtokosának, dokumentálhatja a jogokat a többszemélyes személyzet pilóta szakszolgálati engedélybe történő bejegyzéssel, a repülőgép kategóriának megfelelő kereskedelmi pilóta szakszolgálati engedély kiadásával.

2. Megjegyzés – A 2. 1. 10. pont korlátozza a szakszolgálati engedély bizonyos jogait olyan szakszolgálati engedély birtokosok esetében, akik betöltötték a 65. életévüket.

2. 5. 3. Tapasztalat

2. 5. 3. 1. A folyamodónak egy jóváhagyott kiképzés során nem kevesebb, mint 240 óra repült időt kell megszereznie tényleges és szimulált repülésben repülő és nem-repülő pilótaként.

2. 5. 3. 2. A tényleges repülés során szerzett repülési tapasztalatnak magába kell foglalnia legalább a 2. 3. 3. 1. pontban előírt tapasztalatra vonatkozó követelményeket, a visszaállító képzést, az éjszakai repülést és a kizárólag a műszerekre támaszkodva végrehajtott repülést.

2. 5. 3. 3. A 2. 5. 3. 2. pont előírásainak kielégítésén felül, a folyamodónak olyan gázturbinás repülőgépen, melyet az alkalmassági bizonyítvány szerint minimum személyzetként legalább 2 pilótával kell működtetni, vagy egy olyan repülési szimulátor oktató-berendezésben, melyet a 3. számú Függelék 4. pontja szerint az Engedélyező Hatóság erre a célra jóváhagyott, meg kell szereznie a 3. számú Függelékben meghatározott emelt szintű alkalmasság eléréséhez szükséges tapasztalatot.

2. 5. 4. Repülésoktatás

2. 5. 4. 1. A folyamodónak egy olyan jóváhagyott kiképzésben kell részesülnie, mely fedi a 2. 5. 3 pontban előírt tapasztalat követelményeit.

2. 5. 4. 2. A folyamodónak olyan kétkormányos repülésoktatásban kell részesülnie, mely magába foglalja a 3. számú Függelékben meghatározott összes alkalmassági tényezőt a többszemélyes személyzet pilóta szakszolgálati engedély kiadásához előírt szintig, magába foglalva az IFR körülmények között repülő pilóta számára előírt alkalmassági tényezőket.

2. 6. Közforgalmi pilóta szakszolgálati engedély

2. 6. 1. A repülőgépre, helikopterre és motoros szerkezetre megfelelő szakszolgálati engedély kiadásának általános feltételei

2. 6. 1. 1. *Életkor*

A folyamodó nem lehet 21 évnél fiatalabb.

2. 6. 1. 2. *Szakismeret*

2. 6. 1. 2. 1. A folyamodónak olyan szintű szakismeretet kell demonstrálnia, mely megfelel a közforgalmi pilóta szakszolgálati engedély birtokosának adott jogoknak és megfelel a szakszolgálati engedélybe bejegyezni kívánt légijármű kategóriának legalább az alábbi témakörökben:

Légijog

a) a közforgalmi pilóta szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, repülési szabályok, a légiforgalmi szolgálatok megfelelő gyakorlatai és eljárásai,

Repülőgépekre, helikopterekre és motoros szerkezetekre vonatkozó

általános légijármű ismeret

b) elektromos, hidraulikus, túlnyomásos és egyéb légijármű rendszerek, repülésvezérlő rendszerek általános jellemzői és korlátozásai, beleértve a robotpilótát és a stabilitásnövelő berendezést,

c) az üzemeltetés alapelvei, a légijármű hajtóműveinek üzemeltetési korlátai és kiszolgálási eljárásai, légköri viszonyok hatása a hajtómű teljesítményére, az erre vonatkozó üzemeltetési információk a repülési kézikönyv vagy más megfelelő dokumentáció alapján,

d) a vonatkozó légijármű kategória üzemeltetési eljárásai és korlátozásai, a légköri viszonyok hatása a légijármű teljesítményére, a repülési kézikönyvből nyert vonatkozó üzemeltetési információkkal összhangban,

e) a megfelelő légijármű berendezéseinek és rendszereinek használata és az üzemképesség ellenőrzése,

f) repülési műszerek, iránytűk, fordulási és gyorsulási hibák, pörgettyűs műszerek, üzemeltetési határértékek és precessziós hatások, a különböző repülési műszerek és elektronikus kijelző egységek helytelen működése esetén követendő eljárások és gyakorlati teendők,

g) a megfelelő légijármű sárkányának, rendszereinek és hajtóműveinek karbantartási eljárásai,

h) helikopterek és motoros szerkezetek esetében transzmisszió (erőátviteli berendezések), ahol ez alkalmazható,

i) a terhelés és a tömeg megoszlás hatása a légijármű kiszolgálására, repülési jellemzők és teljesítmény, tömeg és tömegközéppont számítások,

j) a felszállási, leszállási és egyéb teljesítményadatok használata és gyakorlati alkalmazása, beleértve az utazószinten történő repülőgép vezetést,

k) repülés előtti és útvonalrepülés alatti repüléstervezés, repülési tervek összeállítása és kitöltése a légiforgalmi szolgálatok számára, a megfelelő légiforgalmi szolgálatok eljárásai, magasságmérő beállítási eljárások,

l) helikopterek és motoros szerkezetek esetében a külső teher hatásai a kiszolgálásban.

Emberi tényezők

m) a fenyegető jelenségek és a hibakezelés elveit magába foglaló emberi tényezők,

Megjegyzés: – a fenyegető jelenségeket és a hibakezelést magába foglaló emberi tényezőkre vonatkozó kiképzési programok tervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

n) repülés-meteorológiai jelentések, térképek és előrejelzések, kódok és rövidítések értelmezése és alkalmazása, meteorológiai tájékoztatások repülés előtti és repülés alatti beszerzésére és használatára vonatkozó eljárások, magasságmérés,

o) repülési meteorológia, a vonatkozó területek éghajlattana tekintetbe véve azokat az elemeket, melyek befolyásolják a repülést, a nyomásrendszerek mozgása, a frontok szerkezete, a felszállás, az útvonalrepülés és a leszállás körülményeit befolyásoló szignifikáns időjárási jelenségek jellemzői és eredetük,

p) a jegesedés okai, felismerése és hatásai, a frontképződési zónába történő belépés eljárásai, veszélyes időjárási jelenségek elkerülése,

q) repülőgépek és motoros szerkezetek esetében magaslégköri gyakorlati meteorológia, beleértve az időjárás-jelentések, térképek és előrejelzések értelmezését és felhasználását, futóáramlások.

Navigáció

r) léginavigáció, beleértve a légiforgalmi térképek, rádiónavigációs berendezések és a területi navigáció rendszereinek használatát, a hosszú- távú repülések speciális navigációs követelményei,

s) a légijármű kormányzásához és navigálásához szükséges műszerek és repülési elektronika használata, korlátozásai és használhatósága,

t) a kirepülés, útvonalrepülés, megközelítés és leszállás fázisaiban felhasznált navigációs rendszerek használata, pontossága és megbízhatósága, a rádiónavigációs berendezések azonosítása,

u) az önálló, és a külső támpontok felhasználásával működtetett navigációs rendszerek jellemzői és alapelvei, a fedélzeti berendezések működtetése,

Üzemeltetési eljárások

v) a fenyegető jelenségek és a hibakezelés alkalmazása az üzemeltetésben,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

w) légiforgalmi kiadványok használata, mint AIP, NOTAM, légiforgalmi kódok és rövidítések,

x) elővigyázatossági és veszélyhelyzeti eljárások, gyakorlati biztonsági teendők,

y) üzemeltetési eljárások az áruszállításra, és a veszélyes áruk szállítására vonatkozólag,

z) az utasoknak adandó biztonsági tájékoztató követelményei és gyakorlata, beleértve a tanúsítandó elővigyázatosságot a légijárműbe történő beszállás, és az abból történő kiszállás folyamán,

aa) helikopterek, és amennyiben alkalmazható, motoros szerkezetek esetében teljesítmény melletti megülés, földi rezonancia, a hátranyúló forgószárny-lapát átesése, dinamikus hossztengely körüli elfordulás és egyéb üzemeltetési veszélyek, a VMC körülmények közötti repüléshez tartozó biztonsági eljárások.

Repüléselmélet

bb) a repülés alapelvei,

Rádió telefónia

cc) rádió-távbeszélő eljárások és kifejezések, a rádióösszeköttetés megszakadása esetén követendő eljárás.

2. 6. 1. 2. 2. A fenti témakörökhöz kiegészítésképpen a repülőgépre és motoros szerkezetekre alkalmas közforgalmi pilóta szakszolgálati engedélyért folyamodónak meg kell szereznie a 2. 7. 1. 1 pontban előírt műszeres jogosítás ismereteit is.

2. 6. 1. 3. *Jártasság*

2. 6. 1. 3. 1. A folyamodónak demonstrálnia kell, hogy képes parancsnok-pilótaként az alábbi eljárásokat és manővereket végrehajtani a megfelelő kategóriába tartozó, másodpilótával üzemeltetendő légijárművön:

a) repülés előtti eljárások, beleértve a részletes útvonalterv (operational flight plan) elkészítését és a repülési terv kitöltését a légiforgalmi szolgálatok számára,

b) szokványos repülési eljárások és manőverek a repülés minden fázisában,

c) nem-szokványos és veszélyhelyzeti eljárások és manőverek, melyeket a berendezések, mint pl. hajtómű, rendszerek és a sárkány meghibásodásai, és helytelen működése esetében kell végrehajtani,

d) a személyzet cselekvőképtelenné válása eseténi eljárások és a személyzet közötti együttműködés eljárásai, beleértve a pilóta feladatok megosztását, a személyzet együttműködését, és az ellenőrző jegyzékek (check lists) használatát, és

e) repülőgépek és motoros szerkezetek esetében a 2. 7. 4. 1. a)-tól d)-ig terjedő pontokban előírt műszerrepülési eljárások és manőverek, beleértve a szimulált hajtómű meghibásodást.

2. 6. 1. 3. 1. 1. Repülőgép esetében a folyamodónak demonstrálnia kell, hogy képes a 2. 6. 1. 3. 1 pontban előírt eljárások és manőverek végrehajtására többhajtóműves repülőgép parancsnok-pilótájaként.

2. 6. 1. 3. 1. 2. A folyamodónak demonstrálnia kell, hogy képes a 2. 6. 1. 3. pontban előírt eljárások és manőverek végrehajtására az alkalmasság olyan szintjén, mely megfelel a közforgalmi pilóta szakszolgálati engedély birtokosának megadott jogosítványoknak és képes:

a) a fenyegető jelenségeket, hibákat felismerni és kezelni,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató *anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.*

b) a légijárművet mindenkor simán és pontosan, manuálisan vezetni annak határértékein belül oly módon, hogy az eljárás, vagy a manőver sikeres végeredménye biztosított legyen,

c) a légijárművet a repülés fázisának megfelelő automatikus üzemmódban működtetni és az automatika aktív üzemmódját folyamatosan figyelemmel kísérni,

d) a szokványos, nem-szokványos és veszélyhelyzeti eljárásokat a repülés minden fázisában pontosan végrehajtani,

e) jó ítélőképességet és repülési készséget tanúsítani, ide értve a megfelelő döntéshozatalt és a helyzethez illő tudatosság fenntartását, és

f) a hajózó személyzet többi tagjával való hatékonyan kommunikálni, és demonstrálni azt, hogy képes hatékonyan végrehajtani a személyzet cselekvőképtelensége eseténi eljárásokat, a személyzet együttműködésének eljárásait, beleértve a pilóta feladatok kijelölését, a személyzet együttműködését, a szabvány üzemeltetési eljárások (SOPs) betartását és az ellenőrző jegyzékek (check lists) használatát.

2. 6. 1. 4. *Egészségügyi alkalmasság*

A folyamodónak érvényes I. o. Egészségügyi Minősítéssel kell rendelkeznie.

2. 6. 2. A szakszolgálati engedély birtokosának jogai és az ilyen jogok gyakorlásakor figyelembe veendő körülmények

2. 6. 2. 1. Az 1. 2. 5, 1. 2. 6, 1. 2. 7. 1, 1. 2. 9, és 2. 1 pontokban meghatározott követelmények betartása mellett a közforgalmi pilóta szakszolgálati engedély birtokosa jogosult:

a) a magán-pilóta és a kereskedelmi pilóta szakszolgálati engedély birtokosának összes jogát gyakorolni a megfelelő légijármű kategóriába tartozó légijárműveken, és ha rendelkezik repülőgépre vagy motoros szerkezet kategóriára kiadott szakszolgálati engedéllyel, valamint műszeres jogosítással, és

b) parancsnok-pilótaként tevékenykedni olyan, a megfelelő kategóriába tartozó légijárművön, mely a kereskedelmi légiszállításban vesz részt és alkalmassági bizonyítványa szerint egynél több pilótával kell működtetni.

2. 6. 2. 2. Ha a közforgalmi pilóta szakszolgálati engedély birtokosa a repülőgép kategóriában korábban csak többszemélyes személyzet pilóta szakszolgálati engedélyt szerzett, a szakszolgálati engedély jogosítványait a többszemélyes személyzettel történő üzemelésre kell korlátozni feltéve, ha a szakszolgálati engedély birtokosa kielégítette a 2. 5. 2. 1 a), a 2. 5. 2. 2 és a 2. 5. 2. 3

pontokban meghatározott követelményeket, attól függően, hogy melyik alkalmazható. A jogosítványok bármilyen korlátozását a szakszolgálati engedélyben fel kell tüntetni.

Megjegyzés – A 2. 1. 10 pont a szakszolgálati engedély bizonyos jogosítványait korlátozza olyan szakszolgálati engedély birtokosok esetében, akik betöltötték a 60. és a 65. életévüket.

2. 6. 3. Repülőgép kategória jogosítás kiadásának specifikus követelményei

2. 6. 3. 1. *Tapasztalat*

2. 6. 3. 1. 1. A folyamodónak nem kevesebb, mint 1500 óra repült időt kell szereznie pilótaként, repülőgépen. Az Engedélyező Hatóságnak kell meghatározni, hogy egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta tapasztalata elfogadható-e az 1500 óra összes repült idő részeként. Az ilyen tapasztalatra maximum 100 óra írható jóvá, melyből nem több mint 25 órát repülési eljárásokat gyakorló berendezésben, vagy műszerrepülést oktató alapberendezésben szerzett meg.

2. 6. 3. 1. 1. 1. A folyamodónak nem lehet kevesebb repült ideje repülőgépben, mint:

a) 500 óra parancsnok-pilótaként felügyelet alatt, vagy 250 óra akár parancsnok-pilótaként, akár nem kevesebb, mint 70 óra parancsnok-pilótaként és a szükséges további repült idő parancsnok-pilótaként felügyelet alatt,

b) 200 óra repült idő útvonalrepülésben, melyből nem kevesebb, mint 100 óra kell, hogy legyen az a repült idő, melyet parancsnok-pilótaként, vagy felügyelet alatt álló parancsnok-pilótaként szerez meg,

c) 75 óra műszeres idő, amelyből nem több mint 30 óra lehet a műszeres földi idő, és

d) 100 óra éjszakai repülésben parancsnok-pilótaként, vagy másodpilótaként.

2. 6. 3. 1. 2. Ha a folyamodó más kategóriába tartozó légijárművön szerzett pilótaként repült időt, az Engedélyező Hatóságnak kell meghatározni, hogy az ilyen tapasztalat elfogadható-e, és ha igen, azt a mértéket, amelyre a 2. 6. 3. 1. 1 pont repült idő követelményei emiatt lecsökkenthetők.

2. 6. 3. 2. *Repülésoktatás*

A kereskedelmi pilóta szakszolgálati engedély kiadásához a folyamodónak a 2. 4. 3. 2 pontban előírt kétkormányos repülésoktatásban, kell részesülnie, valamint a 2. 7. 4. pontban előírt oktatásban a műszeres jogosítás kiadásához, vagy a 2. 5. 4 pontban előírt oktatásban a többszemélyes személyzet pilóta szakszolgálati engedély kiadásához.

2. 6. 4. A helikopter kategória jogosítás kiadásának specifikus követelményei

2. 6. 4. 1. *Tapasztalat*

2. 6. 4. 1. 1. A folyamodónak nem kevesebb, mint 1000 óra repült időt kell megszereznie helikoptereken, pilótaként. Az Engedélyező Hatóságnak kell meghatározni, hogy egy repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta tapasztalata elfogadható-e az 1000 óra összes repült idő részeként. Az ilyen tapasztalatra maximum 100 óra írható jóvá, melyből nem több mint 25 órát repülési eljárásokat gyakorló berendezésben, vagy műszerrepülést oktató alapberendezésben szerzett meg.

2. 6. 4. 1. 1. 1. A folyamodónak helikopterben az alábbinál nem kevesebb repült időt kell megszereznie:

a) 250 órát, akár parancsnok-pilótaként, vagy nem kevesebb, mint 70 órát parancsnok-pilótaként és a szükséges többi repült időt parancsnok-pilótaként ellenőrzés alatt,

b) 200 óra repült időt útvonalrepülésben, melyből nem kevesebb, mint 100 órát parancsnok-pilótaként, vagy ellenőrzés alatt álló parancsnok-pilótaként,

c) 30 óra műszeres időt, melyből nem több mint 10 óra lehet a műszeres földi idő, és

d) 50 órát éjszakai repülésben parancsnok-pilótaként, vagy másodpilótaként.

2. 6. 4. 1. 2. Ha a folyamodó más kategóriájú légijárműben szerzett repült időt pilótaként, az Engedélyező Hatóságnak kell meghatározni, hogy az ilyen tapasztalatot elfogadja-e, és ha igen, azt a mértéket, amelyre a 2. 6. 4. 1. 1. pontban előírt repült idő követelmény lecsökkenthető.

2. 6. 4. 2. *Repülésoktatás*

A folyamodónak repülésoktatásban kell részesülnie a kereskedelmi pilóta szakszolgálati engedély (2. 4. 4. 2. pont) kiadásához.

Megjegyzés – A 2. 6. 4. 1. 1. 1. c) pontban meghatározott műszeres idő és a 2. 6. 4. 1. 1. 1. d) pontban meghatározott éjszakai repült idő nem jogosítja fel a helikopterre kiadott közforgalmi pilóta szakszolgálati engedély birtokosát arra, hogy IFR körülmények között helikoptert vezessen.

2. 6. 5. Motoros szerkezet kategória jogosítás kiadásának
specifikus követelményei

2. 6. 5. 1. *Tapasztalat*

2. 6. 5. 1. 1. **Ajánlás –** *A folyamodónak nem kevesebb, mint 1500 óra repült időt kell megszereznie egy motoros szerkezet pilótájaként. Az Engedélyező Hatóságnak kell meghatározni, hogy egy*

repülési szimulátor oktató-berendezésben oktatás alatt álló pilóta tapasztalata elfogadható-e az 1500 óra összes repült idő részeként.

2. 6. 5. 1. 2. **Ajánlás** – *A folyamodónak motoros szerkezetekben az alábbi repült időket kell megszerezni:*

a) 250 órát, akár parancsnok-pilótaként, vagy nem kevesebb, mint 70 órát parancsnok-pilótaként, és a szükséges többi repült időt parancsnok-pilótaként felügyelet alatt,

b) 100 órát útvonalrepülésben, melyből nem kevesebb, mint 50 órát parancsnok-pilótaként, vagy felügyelet alatt álló parancsnok-pilótaként,

c) 75 óra műszeres időt, amelyből nem több mint 30 óra lehet a műszeres földi idő, és

d) 25 órát éjszakai repülésben, parancsnok-pilótaként, vagy másodpilótaként.

2. 6. 5. 1. 3. **Ajánlás** – *Ha a folyamodó más kategóriájú légijárműben szerzett repült időt pilótaként, az Engedélyező Hatóságnak kell meghatározni, hogy az ilyen tapasztalat elfogadható-e, és ha igen, azt a mértéket, amelyre a 2. 6. 5. 1. 1. pontban előírt repült idő követelmény lecsökkenthető.*

2. 6. 5. 2. *Repülésoktatás*

Ajánlás – A kereskedelmi pilóta szakszolgálati engedély kiadásához a folyamodónak a 2. 4. 5. 2. pontban előírt kétkormányos kiképzésben kell részesülnie és a műszeres jogosítás kiadásához a 2. 7. 4. pontban előírt kiképzésben.

2. 7. Műszeres jogosítás

2. 7. 1. Repülőgépre, léghajóra, helikopterre és motoros szerkezetre vonatkozó jogosítás kiadásának feltételei

2. 7. 1. 1. *Szakismeret*

A folyamodónak olyan szintű szakismeretet kell demonstrálnia, mely megfelel a műszeres jogosítás birtokosának megadott jogoknak, legalább az alábbi témakörökben:

Légijog

a) IFR-ben történő repülésre vonatkozó szabályok és előírások, a légiforgalmi szolgálatok vonatkozó és gyakorlatai és eljárásai, *A kívánt légijármű kategóriára vonatkozó általános légijármű ismeret*

b) az elektronika, az elektromos berendezések és műszerek használata, korlátozásai és használhatósága, melyek IFR és műszeres meteorológiai körülmények között repülő légijármű vezetéséhez és navigálásához szükségesek, a robotpilóta használata és korlátozásai,

c) iránytűk, forduló- és gyorsulási hibák, pörgettyűs műszerek, üzemi határértékek és precessziós hatások, különböző repülési műszerek helytelen működése eseténi eljárások és gyakorlati tennivalók,

A kívánt légijármű kategóriára vonatkozó repülési jellemzők és repüléstervezés

d) az IFR körülmények közötti repülésnek megfelelő repülés előtti előkészületek és ellenőrzések,

e) az útvonalterv elkészítése, IFR repülési terv készítése és kitöltése a légiforgalmi szolgálatok számára, magasságmérő beállítási eljárások,

A kívánt légijármű kategóriára vonatkozó emberi tényezők

f) légijárműben, műszerrepülésre vonatkozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelését,

Megjegyzés – Az emberi tényezők kiképzési program megtervezéséhez, beleértve a fenyegető jelenségek és hibák kezelését, tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (Doc 9683) található.

A kívánt légijármű kategóriára vonatkozó meteorológia

g) a repülési meteorológia alkalmazása, a jelentések, térképek, előrejelzések, kódok és rövidítések értelmezése és használata, a meteorológiai információk beszerzésének eljárásai és azok használata, magasságmérés,

h) a jegesedés okai, felismerése és hatásai, időjárási frontzónába való belépés eljárásai, veszélyes időjárás elkerülése,

i) helikopterek és motoros szerkezetek esetében a forgószárnyon keletkező jegesedés hatásai,

A kívánt légijármű kategóriára vonatkozó navigáció

j) gyakorlati repülési navigáció rádiónavigációs berendezések felhasználásával,

k) a kirepülés, az útvonalrepülés, a megközelítés és a leszállás fázisaiban használt navigációs rendszerek használata, pontossága és megbízhatósága, a rádiónavigációs berendezések azonosítása, *A kívánt légijármű kategóriára vonatkozó üzemeltetési eljárások*

l) a fenyegető jelenségek és hibák kezelésének alkalmazása az üzemeltetésben,

m) a légiforgalmi dokumentációk, mint az AIP és NOTAM, a légiforgalmi kódok és rövidítések, a kirepülés, az útvonalrepülés, a süllyedés és a megközelítés során használatos műszerrepülési eljárások térképeinek értelmezése és használata,

n) elővigyázatossági és veszélyhelyzeti eljárások, gyakorlati biztonsági eljárások IFR szerinti repülés esetében, akadálymentesség kritériumai,

Megjegyzés – Pilóták és repülésüzemi személyzet számára az üzemeltetési eljárásokról és a repülési eljárás paramétereiről információ a Léginavigációs Szolgálatok (PANS-OPS, Doc 8168) I. Kötetben – Repülési Eljárások – található meg. Bizonyos Államokban használatos eljárások eltérhetnek a PANS-OPS-tól, és ezen eltéréseknek az ismerete biztonsági okokból fontos.

Rádiótelefónia

o) IFR szerint üzemelő légijárműre vonatkozó összeköttetési eljárások és kifejezés gyűjtemény, a rádióösszeköttetés megszakadása esetén követendő tevékenység.

2. 7. 1. 2. *Jártasság*

2. 7. 1. 2. 1. A folyamodónak azon kategórián belül lévő légijárműben, melyre a műszeres jogosítást meg kívánja kapni, demonstrálnia kell, hogy képes a 2. 7. 4. 1. pontban előírt eljárások és manőverek végrehajtására az alkalmasság olyan fokán, mely megfelel egy műszeres jogosítás birtokosának megadott jogoknak és képes:

a) a fenyegető jelenségeket és hibákat felismerni és kezelni,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

b) a kívánt kategóriájú légijárművet a határértékeken belül üzemeltetni,

c) az összes manővert simán és pontosan végrehajtani,

d) jó ítélőképességet és repülési készséget tanúsítani,

e) légiforgalmi ismereteit alkalmazni,

f) a légijármű kormányzását állandó jelleggel fenntartani oly módon, hogy az eljárás, vagy a manőver sikeres végeredménye biztosított legyen.

2. 7. 1. 2. 1. 1. A folyamodónak demonstrálnia kell, hogy képes a megfelelő kategórián belül lévő több-hajtóműves légijárművet kizárólag a műszerek alapján működtetni, amikor az egyik hajtómű üzemképtelen, vagy szimuláltan üzemképtelen, ha a műszeres jogosítás jogosítványait ilyen légijárműben kell gyakorolnia.

Megjegyzés – Figyelembe kell venni a 2. 1. 6. pontot, ha a jártasság demonstrálására a repülési szimulátor oktató-berendezést használják.

2. 7. 1. 3. *Egészségügyi alkalmasság*

2. 7. 1. 3. 1. Magán-pilóta szakszolgálati engedéllyel rendelkező folyamodók hallásélességét meg kell állapítani az I. osztályú Egészségügyi Minősítés hallásra vonatkozó követelményeire alapozva ahhoz, hogy I. osztályú Egészségügyi Minősítést adjanak ki.

2. 7. 1. 3. 2. Ajánlás – *A Szerződő Államoknak meg kell fontolniuk, hogy a magán-pilóta szakszolgálati engedély birtokosának előírják-e az I. osztályú Egészségügyi Minősítéshez megkívánt fizikai, mentális és látásképesség követelményt.*

2. 7. 2. A jogosítás birtokosának jogai és

az ilyen jogok gyakorlásában figyelembe veendő körülmények

2. 7. 2. 1. Ha az 1. 2. 5, az 1. 2. 6 és a 2. 1 pontban előírt követelményeknek eleget tett, egy adott légijárműre műszeres jogosítással rendelkező személy jogai közé tartozik, hogy vezetheti IFR-ben azt az adott kategóriájú légijárművet.

2. 7. 2. 2. Mielőtt jogosítványait többhajtóműves légijárművön gyakorolná, a jogosítás birtokosának eleget kell tennie a 2. 7. 1. 2. 1. 1. pontban előírt követelményeknek.

Megjegyzés – A műszeres jogosítás kategória közös jogosítványait egynél több légijármű kategóriában akkor gyakorolhatják, ha kielégítették az egyes kategóriák követelményeit.

2. 7. 3. Tapasztalat

2. 7. 3. 1. A folyamodónak pilóta szakszolgálati engedéllyel kell rendelkeznie a megszerezni kívánt légijármű kategóriára.

2. 7. 3. 2. A folyamodónak az alábbi repült idővel kell rendelkeznie, mely nem lehet kevesebb, mint:

a) 50 óra útvonalrepülésben az Engedélyező Hatóság számára elfogadható légijármű kategóriában parancsnok-pilótaként, melyből nem kevesebb, mint 10 óra kell, hogy legyen a repült idő a megszerezni kívánt légijármű kategóriában, és

b) 40 óra műszeres idő a légijárművön, melyből nem több mint 20 óra lehet a műszeres földi idő, vagy 30 óra, ha repülési szimulátort használnak. A földi időt egy jogosított oktató felügyelet alatt kell megszereznie.

2. 7. 4. Repülésoktatás

2. 7. 4. 1. A folyamodónak nem kevesebb, mint 10 óra műszeres repülési időt kell összegyűjtenie a 2. 7. 3. 2. b) pont előírása szerint, mialatt a kívánt kategóriájú légijárműben kétkormányos műszeres kiképzést kap egy jogosított repülőoktatótól. Az oktatónak biztosítania kell, hogy a folyamodó megszerezze az üzemeltetési tapasztalatot legalább az alábbi témakörökben, a műszeres jogosítás birtokosára előírt teljesítményszinten:

a) repülés előtti eljárások, beleértve a repülési kézikönyv, vagy azzal egyenértékű dokumentáció, valamint a megfelelő légiforgalmi szolgálatok dokumentációinak használatát az IFR repülési terv elkészítésében,

b) repülés előtti szemrevételezés, az ellenőrző jegyzékek (check lists) használata, gurulás és felszállás előtti ellenőrzések,

c) szokványos, nem-szokványos és veszélyhelyzeti körülmények között az IFR repülés eljárásai és manőverei, melyek legalább az alábbiakat fedik:

– felszálláskor áttérés műszerrepülésre,

– szabvány műszeres kirepülések és berepülések,

– IFR eljárások útvonalon,

– várakozási eljárások,

– műszeres megközelítés meghatározott minimum értékig,

– megszakított megközelítési eljárások,

– műszeres megközelítésből végrehajtott leszállások,

d) repülés közbeni manőverek és sajátságos repülési jellemzők.

2. 7. 4. 2. Ha a műszeres jogosítás jogosítványait többhajtóműves légijárművön kell gyakorolnia, a folyamodónak kétkormányos műszeres repülésoktatásban kell részesülnie egy, a megfelelő kategóriába tartozó többhajtóműves légijárművön, egy jogosított repülőoktatótól.

Az oktatónak biztosítani kell, hogy a folyamodó megszerezze kizárólag a műszerekre támaszkodva az üzemeltetési tapasztalatot a megfelelő kategóriába tartozó légijármű működtetésében, ha az egyik hajtómű üzemképtelen, vagy szimuláltan üzemképtelen.

2. 8. A repülőgépekre, léghajókra, helikopterekre és motoros szerkezetekre megfelelő repülőoktató jogosítás

2. 8. 1. A jogosítás kiadásának feltételei

2. 8. 1. 1. *Szakismeret*

A folyamodónak a kereskedelmi pilóta szakszolgálati engedély kiadásához előírt szakismeret követelményeknek kell eleget tennie, azon légijármű kategóriában, amelyet a szakszolgálati engedélybe bejegyeznek. Ezen felül, a folyamodónak demonstrálnia kell, hogy rendelkezik a szakismeret olyan szintjével, mely megfelel a repülőoktató jogosítás birtokosának megadott jogoknak, legalább az alábbi témakörökben:

a) az alkalmazott oktatás technikái,

b) a növendék teljesítményének értékelése azon témakörökben, amelyekben földi oktatást kap,

c) az elsajátítás folyamata,

d) a hatékony tanítás elemei,

e) a növendék értékelése, és tesztelési, kiképzési filozófiák,

f) a kiképzési program felépítése,

g) a feladatok megtervezése,

h) osztálytermi oktatás technikái,

i) kiképzési eszközök használata, beleértve a repülési szimulátor oktató-berendezést, ha alkalmazható,

j) a növendék hibáinak analízise és javítása,

k) a repülésoktatásra vonatkozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelését.

Megjegyzés – A fenyegető jelenségek és hibák kezelését is magába foglaló emberi tényezők oktatásának megtervezéséhez tájékoztató anyag Az Emberi Tényezők Kiképzési Kézikönyvben (Doc 9683) található meg.

l) a légijárműben a rendszer meghibásodások szimulálásával és a helytelen működéssel együtt járó veszélyek

2. 8. 1. 2. *Jártasság*

A folyamodónak demonstrálnia kell abban a légijármű kategóriában és osztályban, amelyre a repülőoktató jogosítást meg kívánja szerezni, hogy képes oktatni azokban a témakörökben, amelyben repülésoktatást kell végeznie, beleértve a repülés előtti, a repülés utáni és földi oktatást is, ahogy ez alkalmazható.

2. 8. 1. 3. *Tapasztalat*

A folyamodónak ki kell elégítenie a 2. 4. 3. 1, 2. 4. 4. 1, 2. 4. 5. 1, és a 2. 4. 6. 1. pontokban meghatározott, a kereskedelmi pilóta szakszolgálati engedély kiadásához előírt tapasztalat követelményeit

2. 8. 1. 4. *Repülésoktatás*

A folyamodónak az Engedélyező Hatóság által erre a célra elfogadott repülőoktató felügyelete alatt:

a) repülésoktatási technikákból oktatásban kell részesülni, beleértve a szemléltetést, a növendék gyakorlati eljárásokat, az általános növendék-hibák felismerését és javítását, és

b) gyakorolnia kell az oktatási technikákat mindazon repülési manőverben és eljárásokban, amelyekben repülésoktatást kíván végrehajtani.

2. 8. 2. A jogosítás birtokosának jogai és az ilyen jogok gyakorlásakor figyelembe veendő körülmények

2. 8. 2. 1. Ha megfelelt az 1. 2. 5 és 2. 1. pontokban meghatározott követelményeknek, a repülőoktató jogosítás birtokosának joga van az alábbiakra:

a) felügyelni a növendék pilóta által végrehajtott egyedül-repülést, és

b) repülésoktatást végrehajtani magán-pilóta, kereskedelmi pilóta szakszolgálati engedély, műszeres jogosítás és repülőoktató jogosítás kiadása céljából,

feltéve, hogy a repülőoktató:

1) rendelkezik legalább azzal a szakszolgálati engedéllyel és jogosítással a megfelelő légijármű kategóriában, amelyre az oktatást végre akarja hajtani,

2) rendelkezik az oktatandó légijármű kategórián parancsnok-pilótaként történő ténykedéshez szükséges szakszolgálati engedéllyel és jogosítással,

3) szakszolgálati engedélyébe bevezették, hogy megszerezte a repülőoktató jogosítványait.

2. 8. 2. 2. Annak érdekében, hogy többszemélyes személyzet pilóta szakszolgálati engedély céljából oktatást hajthasson végre, a folyamodónak ki kell elégítenie az oktató minősítési követelményeit is.

Megjegyzés – Többszemélyes személyzet pilóta szakszolgálati engedély céljából oktatást végző repülőoktatókra vonatkozó speciális előírások a Léginavigációs Szolgálatok – Kiképzés (PANS-TRG, Doc 9868) című kiadvány 4. Fejezetében találhatók meg.

2. 9. Vitorlázó repülő pilóta szakszolgálati engedély

2. 9. 1. A szakszolgálati engedély kiadásának feltételei

2. 9. 1. 1. Életkor

A folyamodó nem lehet 16 évnél fiatalabb.

2. 9. 1. 2. *Szakismeret*

2. 9. 1. 2. 1. A folyamodónak demonstrálni kell, hogy rendelkezik mindazon szakismerettel, mely a vitorlázó repülő szakszolgálati engedély birtokosának megadott jogosítványoknak megfelel, legalább az alábbi témakörökben:

Légijog

a) a vitorlázó repülő szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, repülési szabályok, a megfelelő légiforgalmi szolgálatok gyakorlatai és eljárásai,

Általános légijármű ismeret

b) a vitorlázó repülőgép rendszereinek és műszereinek üzemeltetési elvei,

c) a vitorlázó repülőgép üzemi korlátai, a vonatkozó üzemeltetési információk a repülési kézikönyvből és egyéb, megfelelő dokumentumból,

Repülési jellemzők, repüléstervezés és terhelés

d) a terhelés és a tömeg megoszlásának hatásai a repülési jellemzőkre, tömeg és tömegközéppont megfontolások,

e) a levegőbe emelés (launching), a leszállás és egyéb teljesítményadatok használata és gyakorlati alkalmazása,

f) a VFR körülmények közötti üzemelésnek megfelelő repülés előtti és útvonalon történő útvonalrepülés tervezése, a megfelelő légiforgalmi szolgálatok eljárásai, magasságmérő beállítás eljárásai, nagy-forgalmú légtérben való üzemelés,

Emberi tényezők

g) a vitorlázó repülő pilótára vonatkozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelésének alapelveit,

Megjegyzés – Tájékoztató anyag az emberi tényezők kiképzési program megtervezéséhez, beleértve a fenyegető jelenségek és hibák kezelését is, Az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) című kiadványban található.

Meteorológia

h) alapvető repülés-meteorológia alkalmazása, a meteorológiai információk használata és beszerzésének eljárásai, magasságmérés,

Navigáció

i) a léginavigáció és a számított hely navigáció technikáinak gyakorlati szempontjai, a légiforgalmi térképek használata,

Üzemeltetési eljárások

j) légiforgalmi dokumentációk használata, mint például AIP és NOTAM, légiforgalmi kódok és rövidítések,

k) a levegőbe emelés különböző módszerei és a hozzájuk tartozó eljárások,

l) megfelelő elővigyázatossági és veszélyhelyzeti eljárások, beleértve a veszélyes időjárási jelenségek, a turbulencia, és egyéb üzemeltetési veszélyek elkerülésére teendő tevékenységeket,

Repüléselmélet

m) a vitorlázó-repülőgépre vonatkozó repüléselmélet.

2. 9. 1. 2. 2. **Ajánlás** – *A folyamodónak demonstrálnia kell a vitorlázó-repülőgép pilóta szakszolgálati engedély birtokosának megadandó jogosítványoknak megfelelő tudásszintet, a VFR körülmények közötti üzemelésnek megfelelő rádió-távbeszélő eljárások és kifejezések ismeretét, valamint a rádióösszeköttetés megszakadása esetén teendőket.*

2. 9. 1. 3. *Tapasztalat*

2. 9. 1. 3. 1. A folyamodónak nem kevesebb, mint 6 óra repült időt kell megszereznie vitorlázó-repülőgép pilótájaként, beleértve 2 óra egyedül-repülési időt, melynek során nem kevesebb, mint 20 levegőbe emelkedést és leszállást kell végrehajtani,

2. 9. 1. 3. 1. 1. Ha a folyamodó repülőgépeken pilótaként szerzett repült időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot elfogadja-e, és ha igen, akkor milyen mértékben csökkenthető ennek megfelelően a 2. 9. 1. 3. 1. pontban előírt repült idő követelmény.

2. 9. 1. 3. 2. Megfelelő felügyelet alatt a folyamodónak üzemeltetési tapasztalatot kell szereznie vitorlázó-repülőgépekben, legalább az alábbi témakörökben:

a) repülés előtti tevékenységek, beleértve a vitorlázó-repülőgép összeszerelését és ellenőrzését,

b) a levegőbe emeléshez alkalmazott módszerre vonatkozó technikák és eljárások, beleértve a megfelelő repülési sebesség korlátozásokat, a veszélyhelyzeti eljárásokat és a használatos látjeleket,

c) üzemelés a forgalmi körön, óvintézkedések és eljárások az összeütközés elkerülésére,

d) a vitorlázó-repülőgép vezetése külső vizuális támpontok segítségével,

e) repülés a teljes repülési tartományban,

f) a kezdeti és a teljes átesés, és a spirális süllyedések veszélyének felismerése és helyrehozása,

g) levegőbe emelkedés, megközelítés és leszállás normál és oldalszél viszonyok között,

h) útvonalrepülés vizuális támpontok és számított hely navigáció módszerek felhasználásával,

i) veszélyhelyzeti eljárások.

2. 9. 1. 4. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes egy vitorlázó-repülőgép parancsnok-pilótájaként a 2. 9. 1. 3. 2. pontban előírt eljárásokat és manővereket végrehajtani az alkalmasság olyan szintjén, mely megfelel a vitorlázó- repülőgép pilóta szakszolgálati engedély birtokosának adott jogosítványoknak, és képes:

a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

b) a vitorlázógépet a határértékein belül üzemeltetni,

c) az összes manővert simán és pontosan végrehajtani,

d) jó ítélőképességet és repülési készséget tanúsítani,

e) légiforgalmi ismeretit alkalmazni, és

f) a vitorlázó repülőgép irányítását fenntartani úgy, hogy egy eljárás vagy manőver sikeres végeredménye biztosított legyen.

2. 9. 1. 5. *Egészségügyi alkalmasság*

A folyamodónak érvényes 2. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

2. 9. 2. A szakszolgálati engedély birtokosának jogosítványai és ezek gyakorlásakor figyelembe veendő feltételek.

2. 9. 2. 1. Ha az 1. 2. 5, az 1. 2. 6, az 1. 2. 7. 1, és a 2. 1. pontokban előírt követelményeknek megfelelt, a vitorlázó repülőgép pilóta szakszolgálati engedély birtokosának jogosítványai közé tartozik, hogy bármilyen vitorlázó repülőgépen parancsnok-pilótaként tevékenykedjen feltéve, hogy a szakszolgálati engedély birtokosának van üzemeltetési tapasztalata a levegőbe emelkedés használatos technikáját illetően.

2. 9. 2. 2. **Ajánlás –** *Ha utasokat kell szállítania, a szakszolgálati engedély birtokosának nem kevesebb, mint 10 óra repült idővel kell rendelkeznie vitorlázó repülőgép pilótájaként.*

2. 10. Szabadon repülő ballon pilóta

Megjegyzés – A szabadon repülő ballon pilóta szakszolgálati engedélyre vonatkozó előírások mind a meleg levegővel töltött, mind pedig a gázzal töltött szabadon repülő ballonra vonatkoznak.

2. 10. 1. A szakszolgálati engedély kiadásának feltételei

2. 10. 1. 1. *Életkor*

A folyamodó nem lehet 16 évesnél fiatalabb.

2. 10. 1. 2. *Szakismeret*

2. 10. 1. 2. 1. A folyamodónak demonstrálnia kell, hogy szakismerete megfelel a szabadon repülő ballon pilóta szakszolgálati engedély birtokosának megadott jogosítványoknak legalább az alábbi témakörökben:

Légijog

a) a szabadon repülő ballon pilóta szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, repülési szabályok, megfelelő légiforgalmi szolgálatok eljárásai és gyakorlatai,

Általános légijármű ismeret

b) a szabadon repülő ballon rendszereinek és műszereinek üzemeltetési elvei,

c) a szabadon repülő ballon üzemi határértékei, a repülési kézikönyvből, vagy más megfelelő dokumentációból nyert üzemeltetési információk,

d) a szabadon repülő ballonban használt gázok fizikai alkotóelemei és gyakorlati alkalmazásuk,

Repülési jellemzők, repüléstervezés és terhelés

e) a terhelés hatásai a repülési jellemzőkre, tömegszámítások,

f) a levegőbe emelés, a leszállás és egyéb teljesítményadatok használata és gyakorlati alkalmazása beleértve a hőmérséklet hatását is,

g) a VFR körülményeknek megfelelő repülés előtti és útvonalon történő repüléstervezés, a megfelelő légiforgalmi szolgálatok eljárásai, magasságmérő beállítás eljárásai, nagy-forgalmú légtérben való üzemelés,

Emberi tényezők

h) a szabadon repülő ballon pilótára vonatkozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelésének alapelveit,

Megjegyzés – Tájékoztató anyag az emberi tényezők kiképzési program megtervezéséhez, beleértve a fenyegető jelenségek és hibák kezelését is, Az Emberi Tényezők Kiképzési Kézikönyv (Doc 9683) című kiadványban található.

Meteorológia

i) alapvető repülési meteorológia alkalmazása, a meteorológiai információk használata és beszerzésük eljárásai, magasságmérés,

Navigáció

j) a léginavigáció és a számított hely navigáció technikáinak gyakorlati szempontjai, a légiforgalmi térképek használata,

Üzemeltetési eljárások

k) a légiforgalmi dokumentációk, mint AIP és NOTAM, valamint a légiforgalmi kódok és rövidítések használata,

l) megfelelő elővigyázatossági és veszélyhelyzeti eljárások, beleértve a veszélyes időjárási jelenségek, a turbulencia, és egyéb üzemeltetésre veszélyes időjárási tényező elkerülésére teendő tevékenységeket,

Repüléselmélet

m) a szabadon repülő ballonra vonatkozó repüléselmélet.

2. 10. 1. 2. 2. **Ajánlás** – *A folyamodónak demonstrálnia kell, hogy rendelkezik azzal a szakismeret szinttel, amely a szabadon repülő ballon pilóta szakszolgálati engedély birtokosának megadott jogosítványoknak megfelel, ismeri a VFR szerinti üzemeltetésnek megfelelő rádió-távbeszélő eljárásokat és kifejezéseket, valamint a rádió-összeköttetés megszakadása esetén a teendőket.*

2. 10. 1. 3. *Tapasztalat*

2. 10. 1. 3. 1. A folyamodónak nem kevesebb, mint 16 óra repült idővel kell rendelkeznie egy szabadon repülő ballon pilótájaként, beleértve legalább 8 indítást és emelkedést, melyből az egyiket egyedül kell végrehajtania.

2. 10. 1. 3. 2. Megfelelő felügyelet alatt a folyamodónak tapasztalatot kell szereznie szabadon repülő ballon üzemeltetésében legalább az alábbi témakörökben:

a) repülés előtti tevékenységek, beleértve a ballon összeállítását, a kötélzet elrendezését, a felfújást, a lenyűgözést, és a szemrevételezéssel végzett ellenőrzést,

b) az indítás és emelkedés eljárásai és technikái, beleértve a vonatkozó korlátozásokat, a veszélyhelyzeti eljárásokat és a használatos jelzéseket,

c) elővigyázatossági intézkedések az összeütközés elkerülésére,

d) a szabadon repülő ballon vezetése külső vizuális támpontok segítségével,

e) a gyors süllyedések felismerése és az abból történő kivétel,

f) útvonalrepülés vizuális támpontok és számított hely navigáció segítségével,

g) megközelítések és leszállások, beleértve a földi kiszolgálást,

h) veszélyhelyzeti eljárások.

2. 10. 1. 3. 3. Ha a szakszolgálati engedély jogosítványait éjszaka kell gyakorolni, a folyamodónak megfelelő felügyelet alatt üzemeltetési tapasztalatot kell szereznie a szabadon repülő ballon éjszakai repülésében.

2. 10. 1. 3. 4. **Ajánlás** – *Ha utasokat kell szállítani díjazás, vagy bérleti díj ellenében a szakszolgálati engedély birtokosának nem kevesebb, mint 35 óra repült idővel kell rendelkeznie, beleértve 20 óra repült időt a szabadon repülő ballon pilótájaként.*

2. 10. 1. 4. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes egy szabadon repülő ballon parancsnok-pilótájaként végrehajtani a 2. 10. 1. 3. 2. pontban előírt eljárásokat és manővereket az alkalmasság olyan szintjén, mely megfelel a szabadon repülő ballon pilóta szakszolgálati engedélyben adott jogosítványoknak, és képes:

a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató *anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.*

b) a szabadon repülő ballont a határértékeken belül üzemeltetni,

c) az összes manővert simán és pontosan végrehajtani,

d) jó ítélőképességet és repülési készségeket tanúsítani,

e) légiforgalmi ismereteit alkalmazni, és

f) a szabadon repülő ballon vezetését folytonosan fenntartani oly módon, hogy egy eljárás, vagy manőver sikeres végeredménye biztosított legyen.

2. 10. 1. 5. *Egészségügyi alkalmasság*

A folyamodónak érvényes 2. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

2. 10. 2. A szakszolgálati engedély birtokosának jogosítványai és ezek gyakorlásakor figyelembe veendő feltételek

2. 10. 2. 1. Ha az 1. 2. 5, az 1. 2. 6, az 1. 2. 7. 1, a 2. 1, és a 2. 10. 1. 3. 4. pontokban előírt követelményeknek megfelelt, a szabadon repülő ballon pilóta szakszolgálati engedély birtokosának megadott jogosítványok szerint joga van parancsnok-pilótaként bármely szabadon repülő ballonban tevékenykedni feltéve, hogy a szakszolgálati engedély birtokosa tapasztalattal rendelkezik a meleglevegős, vagy a gázballon üzemeltetésben, ahogy megfelelő.

2. 10. 2. 2. Mielőtt jogosítványait éjszaka gyakorolná, a szakszolgálati engedély birtokosának ki kell elégítenie a 2. 10. 1. 3. 3. pontban előírt követelményeket.

3. FEJEZET

NEM PILÓTA HAJÓZÓ SZEMÉLYZETI TAGOK SZAKSZOLGÁLATI ENGEDÉLYE

3. 1. A hajózó navigátor és a hajózó mérnök szakszolgálati engedélyre vonatkozó általános szabályok

3. 1. 1. Mielőtt a hajózó navigátor vagy a hajózó mérnök szakszolgálati engedélyt részére kiadnák, a folyamodónak meg kell felelnie az életkorra, szakismeretre, tapasztalatra, jártasságra és egészségügyi alkalmasságra vonatkozó azon előírásoknak, amelyeket ezekhez az engedélyekhez előírtak.

3. 1. 1. 1. A hajózó navigátor vagy a hajózó mérnök szakszolgálati engedélyért folyamodónak az Engedélyező Hatóság által meghatározott módon kell demonstrálnia az adott szakszolgálati engedélyhez előírt szakismeret- és jártasságszintet.

3. 2. Hajózó navigátor szakszolgálati engedély

3. 2. 1. A szakszolgálati engedély kiadásának feltételei

3. 2. 1. 1. *Életkor*

A folyamodó nem lehet 18 évesnél fiatalabb.

3. 2. 1. 2. *Szakismeret*

A folyamodónak demonstrálnia kell a hajózó navigátor szakszolgálati engedély birtokosa jogosítványainak megfelelő szakismeretszintet legalább az alábbi témakörökben:

Légijog

a) a hajózó navigátor szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, megfelelő légiforgalmi szolgálatok gyakorlatai és eljárásai,

Repülési jellemzők, repüléstervezés és terhelés

b) a terhelés és a tömeg megoszlás hatásai a légijármű teljesítményére,

c) a felszállási, leszállási és egyéb teljesítményadatok használata, beleértve az utazószint vezérlés eljárásait,

d) repülés előtti és útvonalon történő részletes repülési terv készítése, a légiforgalmi szolgálatok számára repülési terv összeállítása és kitöltése, a megfelelő légiforgalmi szolgálatok eljárásai, magasságmérő beállítás eljárásai, *Emberi tényezők*

e) a hajózó navigátorra vonatkozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelésének eljárásait,

Megjegyzés: – Tájékoztató anyag az emberi tényezők kiképzési program megtervezéséhez, beleértve a fenyegető jelenségek és hibák kezelését, az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

f) a légiforgalmi meteorológiai jelentések, térképek és előrejelzések, a kódok és rövidítések értelmezése és gyakorlati alkalmazása, repülés előtt és repülés közben a meteorológiai információk használata és beszerzésük eljárásai, magasságmérés,

g) repülési meteorológia, az adott területek éghajlattana, tekintetbe véve azokat az elemeket, amelyek hatással vannak a repülésre, a nyomásrendszerek mozgása, a frontok struktúrája, azon szignifikáns időjárási jelenségek helye és jellemzői, melyek befolyásolják a felszállás, az útvonalrepülés és a leszállás körülményeit,

Navigáció

h) számított hely navigáció, izobárikus és csillagászati navigációs eljárások, légiforgalmi térképek, rádiónavigációs berendezések és területi navigációs rendszerek használata, a hosszú távú repülésre vonatkozó speciális követelmények,

i) a légijármű navigációjához szükséges műszerek és elektronika használata, korlátai és használhatósága,

j) a kirepülés, az útvonalrepülés és megközelítés szakaszában alkalmazott navigációs rendszerek használata, pontossága és megbízhatósága, a rádiónavigációs berendezések azonosítása,

k) az autonóm és a működéséhez külső támpontokat felhasználó navigációs rendszerek működési elvei, jellemzői és alkalmazásuk,

l) az éggömb, beleértve az égitestek mozgását, ezek megfigyeléshez történő kiválasztása és azonosítása, az irányzási idő csökkentése, a sextánsok kalibrálása, a navigációs dokumentáció kitöltése,

m) a repülési navigációban használatos fogalmak, mértékegységek és képletek,

n) légiforgalmi dokumentációk, mint az AIP, a NOTAM, a légiforgalmi kódok és rövidítések, valamint a kirepülés, az útvonalrepülés, a süllyedés és a megközelítés műszerrepülési eljárásai térképeinek értelmezése és használata,

Repüléselmélet

o) a repülés elmélete,

Rádiótávbeszélés

p) a rádióösszeköttetés eljárásai és kifejezései,

3. 2. 1. 3. *Tapasztalat*

3. 2. 1. 3. 1. A folyamodónak a hajózó navigátor kötelmek ellátása során nem kevesebb, mint 200 repült órát kell teljesítenie az Engedélyező Hatóság részére elfogadhatóan olyan légijárműben, mely útvonalrepüléseket hajt végre, ezen belül 30 óra éjszakai repült időt kell szereznie.

3. 2. 1. 3. 1. 1. Ha a folyamodó pilótaként szerzett repült időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot elfogadja-e, és ha igen, akkor a

3. 2. 1. 3. 1 pontban előírt repült idő ennek megfelelően milyen mértékben csökkenthető.

3. 2. 1. 3. 2. A folyamodónak bizonyítania kell, hogy repülés közben a repülőgép helyzetét kielégítő módon meg tudta határozni és ezt az információt felhasználta a légijármű navigálásához az alábbiak szerint:

a) éjszaka – nem kevesebb, mint 25 alkalommal, csillagászati megfigyelésekkel, és

b) nappal – nem kevesebb, mint 25 alkalommal, csillagászati megfigyeléssel, amikor ehhez az autonóm, vagy a külső támpontokat használó navigációs rendszert is felhasználja.

3. 2. 1. 4. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes hajózó navigátorként tevékenykedni olyan fokú szakértelemmel, mely megfelel a hajózó navigátor szakszolgálati engedély birtokosának adott jogosítványoknak, és képes:

a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

b) jó ítélőképességet és repülési készségeket tanúsítani,

c) légiforgalmi ismereteit alkalmazni,

d) több tagból álló hajózó személyzet tagjaként az összes kötelmet ellátni, és

e) hatékonyan kommunikálni a hajózó személyzet többi tagjával.

3. 2. 1. 5. *Egészségügyi alkalmasság*

A folyamodónak érvényes 2. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

3. 2. 2. A szakszolgálati engedély birtokosának jogosítványai és ezen jogosítványok gyakorlásakor betartandó feltételek

Ha az 1. 2. 5, és 1. 2. 6, és 1. 2. 7. 1. pontokban előírt követelményeknek megfelelt, a hajózó navigátor szakszolgálati engedély birtokosának joga van bármely légijárműben hajózó navigátorként tevékenykedni. Ha a jogosítványok megkövetelik a rádió-távbeszélő összeköttetést, a szakszolgálati engedély tulajdonosának ki kell elégítenie az 1. 2. 9. 2. pontban meghatározott követelményeket.

3. 3. Hajózó mérnök szakszolgálati engedély

3. 3. 1. A szakszolgálati engedély kiadásának feltételei

3. 3. 1. 1. *Életkor*

A folyamodó nem lehet 18 évesnél fiatalabb.

3. 3. 1. 2. *Szakismeret*

A folyamodónak demonstrálnia kell a hajózó mérnök szakszolgálati engedély birtokosának adott jogosítványoknak megfelelő tudásszintet legalább az alábbi témakörökben:

Légijog

a) a hajózó mérnök szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, a polgári repülésben résztvevő légijármű üzemeltetését meghatározó szabályok és előírások, melyek a hajózó mérnök kötelmeivel kapcsolatosak, *Általános légijármű ismeret*

b) a hajtóművek, gázturbinák és/vagy a dugattyús hajtóművek működési alapelvei, a tüzelőanyag, a tüzelőanyag-rendszerek és a tüzelőanyag vezérlés jellemzői, kenőanyagok és rendszerek, utánégetők és befecskendező rendszerek, a hajtómű gyújtási és indítórendszereinek funkciói és üzemeltetése,

c) a légijármű hajtóműveinek működési alapelve, kiszolgálási eljárásai és üzemi korlátai, a légköri viszonyok hatása a hajtómű teljesítményére,

d) sárkány, kormányok, szerkezeti részek, kerék szerelvények, fékek és blokkolásgátló egységek, korrózió és kifáradási élettartam, a szerkezeti sérülések és meghibásodások azonosítása,

e) jég és csapadékvédelmi rendszerek,

f) túlnyomást biztosító és légkondicionáló rendszerek, oxigénrendszerek,

g) hidraulika rendszer és pneumatika rendszer,

h) az elektromosság elméletének alapjai, elektromos rendszerek (egyenáram és váltóáram), a légijármű elektromos hálózata, bekötések és árnyékolás,

i) a műszerek, az iránytűk, a robotpilóták, a rádióösszeköttetési berendezések, a rádió- és radar-navigációs berendezések, a repülőgép-vezérlő rendszerek, kijelzések és az elektronikai berendezések működésének alapelvei,

j) az adott légijármű korlátozásai,

k) tűzvédelmi, észlelő, lokalizáló és tűzoltó rendszerek,

l) az adott légijármű berendezéseinek és rendszereinek használata és alkalmasságuk ellenőrzése,

Repülési jellemzők, repüléstervezés és terhelés

m) a terhelés és a tömeg megoszlásának hatásai a légijármű kiszolgálásában, repülési jellemzők és teljesítmény, tömeg és tömegközéppont számítások,

n) teljesítmény adatok használata és gyakorlati alkalmazása, beleértve az utazószint vezérlés eljárásait, *Emberi tényezők*

o) a hajózó mérnökre vonatozó emberi tényezők, beleértve a fenyegető jelenségek és hibák kezelésének alapelveit,

Megjegyzés: – az emberi tényezők,- beleértve a fenyegető jelenségek és hibák kezelését,- kiképzési program megtervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Üzemeltetési eljárások

p) a karbantartás elvei, a légialkalmasság fenntartásának eljárásai, hibajelentések, repülés előtti szemrevételezések, tüzelőanyag tankoláskor és külső áramforrás használatakor betartandó óvintézkedések, fedélzeti berendezések és utaskabin rendszerek,

q) szokványos, nem-szokványos és veszélyhelyzeti eljárások,

r) áru és veszélyes anyagok szállításának üzemi eljárásai,

Repüléselmélet

s) az aerodinamika alapjai,

Rádiótávbeszélés

t)rádióösszeköttetési eljárások és kifejezések.

3. 3. 1. 2. 2. Ajánlás – *A folyamodónak demonstrálnia kell a hajózómérnök szakszolgálati engedély birtokosának adott jogosítványoknak megfelelő tudásszintet legalább az alábbi témakörökben:*

a) a navigáció alapjai, az autonóm rendszerek alapelve és működése, és

b) a meteorológia üzemeltetési vonatkozásai.

3. 3. 1. 3. *Tapasztalat*

3. 3. 1. 3. 1. Az Engedélyező Hatóság által erre a célra elfogadott személy felügyelete alatt a folyamodónak nem kevesebb, mint 100 óra repült időt kell szereznie a hajózó mérnök kötelmek ellátásában. Az Engedélyező Hatóságnak meg kell határoznia, hogy a folyamodónak hajózó mérnökként egy jóváhagyott szimulátorban megszerzett repült idejét elfogadja-e a teljes 100 óra részeként. Az így szerzett tapasztalatot maximum 50 óra mértékéig kell beszámítani.

3. 3. 1. 3. 1. 1. Ha a folyamodó pilótaként szerzett repült időt, az Engedélyező Hatóságnak kell meghatároznia, hogy az ilyen tapasztalatot elfogadja-e, és ha igen, akkor azt, hogy a 3. 3. 1. 3. 1 pontban előírt repült idő ennek megfelelően milyen mértékben csökkenthető.

3. 3. 1. 3. 2. Az Engedélyező Hatóság által erre a célra elfogadott hajózó mérnök felügyelete alatt a folyamodónak üzemeltetési tapasztalatot kell szereznie a hajózó mérnök kötelmek ellátásában legalább az alábbi témakörökben:

a) *Szokványos eljárások*

– repülés előtti szemrevételezések,

– tankolási eljárások, tüzelőanyag szabályozás,

– a karbantartási dokumentációk ellenőrzése,

– szokványos fedélzeti eljárások a repülés összes fázisában,

– a hajózó személyzet cselekvőképtelensége esetében követendő személyzet- együttműködés és eljárásai,

– hibajelentés

b) Nem szokványos és alternatív (készenléti) eljárások

– a légijármű rendszerei nem szokványos működésének felismerése,

– a nem szokványos és alternatív (készenléti) eljárások alkalmazása,

c) Veszélyhelyzeti eljárások

– veszélyhelyzeti körülmények felismerése,

– a megfelelő veszélyhelyzeti eljárások alkalmazása

3. 3. 1. 4. *Jártasság*

3. 3. 1. 4. 1. A folyamodónak demonstrálnia kell, hogy képes egy légijármű hajózó mérnökeként végrehajtani a 3. 3. 1. 3. 2 pontban előírt kötelmeket és eljárásokat olyan fokú szakértelemmel, mely megfelel a hajózó mérnök szakszolgálati engedély birtokosának adott jogosítványoknak, és képes:

a) felismerni és kezelni a fenyegető jelenségeket és hibákat,

Megjegyzés – A fenyegető jelenségek és a hibák kezelésének alkalmazására vonatkozó tájékoztató anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) 3. Fejezet C. Mellékletben, valamint az Emberi Tényezők Kiképzési Kézikönyv II. Rész 2. Fejezetben találhatók.

b) a légijármű rendszereit azok adottságain és korlátozásain belül használni,

c) jó ítélőképességet és repülési készségeket tanúsítani,

d) légiforgalmi ismereteit alkalmazni,

e) több tagból álló személyzet részeként képes feladatait olyan módon ellátni, hogy a kivitelezés sikeres végrehajtása biztosított legyen, és

f) hatékonyan kommunikálni a hajózó személyzet többi tagjával.

3. 3. 1. 4. 2. Ha a 3. 3. 1. 4. 1 pontban előírt jártasság demonstrálása során a szükséges eljárások végrehajtásához repülési szimulátor oktató-berendezést használnak, ezt az Engedélyező Hatóságnak jóvá kell hagynia, mivel így biztosítható, hogy az alkalmazott repülési szimulátor oktató-berendezés a feladatra alkalmas.

3. 3. 1. 5. *Egészségügyi alkalmasság*

A folyamodónak érvényes 2. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

3. 3. 2. A szakszolgálati engedély birtokosának jogosítványai és

ezek gyakorlásakor betartandó feltételek

3. 3. 2. 1. Ha az 1. 2. 5, az 1. 2. 6, és az 1. 2. 7. 1. pontokban meghatározott követelményeket kielégíti, a hajózó mérnök szakszolgálati engedély birtokosának joga van bármely olyan típusú légijárművön hajózó mérnökként tevékenykedni, amelyen a birtokos demonstrálta szakismeret- és jártasságszintjét, melyeket az Engedélyező Hatóság a 3. 3. 1. 2 és 3. 3. 1. 4 pontokban meghatározott követelmények alapján állapított meg, és melyek a szóban forgó légijármű típus biztonságos üzemeltetéséhez alkalmazhatók.

3. 3. 2. 2. A légijármű típusait, amelyeken a hajózó mérnök szakszolgálati engedély birtokosa gyakorolhatja a szakszolgálati engedély jogosítványait, vagy a szakszolgálati engedélybe kell bejegyezni, vagy más helyre olymódon, hogy az az Engedélyező Hatóság számára elfogadható legyen.

3. 4. Hajózó rádiós

1. Megjegyzés – Ha a folyamodó szakértelmét és jártasságát kielégítőnek találták a Nemzetközi Távközlési Szabályzat függelékét képező általános rádiószabályokban meghatározott korlátozott rádiótávbeszélő-kezelő bizonyítvány követelményeihez képest, valamint, ha a folyamodó eleget tett a légijármű fedélzeti távbeszélő üzemeltetésére vonatkozó követelményeknek, a Szerződő Állam vagy kiterjesztheti a folyamodó már meglévő szakszolgálati engedélyét (az 5. 1. 1. 2. pont XIII. alpont szerint), vagy egy külön szakszolgálati engedélyt ad ki, ahogy alkalmazható.

2. Megjegyzés – A rádió-távbeszélő eljárásokra és kifejezésekre vonatozó jártasság és szakismeret az összes repülőgép, léghajó, helikopter és motoros szerkezet szakszolgálati engedély integrált része.

4. FEJEZET

A HAJÓZÓ SZEMÉLYZETHEZ NEM TARTOZÓ SZEMÉLYZETEK SZAKSZOLGÁLATI ENGEDÉLYEI ÉS JOGOSÍTÁSAI

4. 1. A hajózó személyzethez nem tartozó személyzetek szakszolgálati engedélyére és jogosításaira vonatkozó általános szabályok

4. 1. 1. Bármely, a hajózó személyzethez nem tartozó személyzet tagjára vonatkozó szakszolgálati engedély vagy jogosítás kiadása előtt a folyamodónak ki kell elégítenie az életkorra, szakértelemre, tapasztalatra és – ahol alkalmazható, – az egészségügyi alkalmasságra, jártasságra vonatkozó követelményeket, úgy, ahogy azokat az adott szakszolgálati engedélyhez vagy jogosításhoz előírták.

4. 1. 2. Ha egy a hajózó személyzethez nem tartozó személyzet tagja bármilyen szakszolgálati engedélyért vagy jogosításért folyamodik, demonstrálnia kell az Engedélyező Hatóság által meghatározott módon az ilyen szakszolgálati engedélyre vagy jogosításra előírt tudást és jártasságot.

4. 2. Légijármű karbantartó (technikus /mérnök /szerelő)

Megjegyzés: – A zárójelben lévő meghatározásokat a szakszolgálati engedély címéhez elfogadható kiegészítésként adtuk meg. Minden egyes Szerződő Állam az általa elfogadhatónak talált kifejezést használja fel saját előírásaiban.

4. 2. 1. A szakszolgálati engedély kiadásának feltételei

4. 2. 1. 1. *Életkor*

A folyamodó nem lehet 18 évesnél fiatalabb.

4. 2. 1. 2. *Szakismeret*

A folyamodónak demonstrálnia kell, hogy tudásszintje megfelel az adandó jogosítványoknak és a légijármű karbantartó szakszolgálati engedély birtokosa felelősségi körének legalább az alábbi témakörökben:

Légijog és légialkalmassági követelmények

a) a légijármű karbantartó szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, beleértve a légi-alkalmassá nyilvánítást és a folyamatos légialkalmasság körét szabályozó előírásokat, illetve a jóváhagyott légijármű karbantartó szervezetet és eljárásokat, *Természettudományi és általános légijármű ismeret*

b) alapfokú matematika, mértékegységek, a fizika és a kémia elmélete és alapelvei, melyek a légijármű karbantartóra vonatkozhatnak,

Légijármű mérnöki ismeretek (engineering)

c) a légijármű építéséhez használt anyagok jellemzői és alkalmazásuk, beleértve az építés alapelveit és a légijármű szerkezetének működését, a rögzítési módszereket, a hajtóműveket és a hozzájuk tartozó rendszereket, a mechanikus, folyadék, elektromos és elektronikus erőforrásokat, légijármű műszereket és kijelző rendszereket, légijármű vezérlési rendszereket, és a fedélzeti navigációs és kommunikációs rendszereket,

Légijármű karbantartás

d) egy légijármű folyamatos légialkalmasságának fenntartásához előírt tevékenységek, beleértve a légijármű szerkezetének, elemeinek és rendszereinek nagyjavítására, javítására, felülvizsgálatára, cserélésére, módosítására, és a hibaelhárításra vonatkozó eljárásokat és módszereket a vonatkozó Karbantartási Kézikönyvben, valamint az alkalmazandó légialkalmassági Szabványokban előírt módszereknek megfelelően, és

Emberi tényezők és korlátozások

e) a légijármű karbantartó szakszolgálati engedély birtokosára vonatkozó emberi tényezők és korlátozások.

Megjegyzés – Az emberi tényezők kiképzési program megtervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (Doc 9683) található meg.

4. 2. 1. 3. *Tapasztalat*

A folyamodónak mind a légijármű, mind pedig alkatrészeinek karbantartásában, szervizelésében, felülvizsgálatában az alábbi tapasztalattal kell rendelkeznie:

a) szakszolgálati engedély kiadásához a légijármű teljes egészére vonatkozó jogosítványokkal legalább:

1.) négy év, vagy

2.) két év, ha a folyamodó kielégítően elvégzett egy jóváhagyott kiképzési tanfolyamot, és

b) a 4. 2. 2. 2. a) 2) vagy 3) pontoknak megfelelő korlátozott jogosítványokkal kiadott szakszolgálati engedélyhez olyan időtartam, mely lehetővé teszi az a) alpontban előírt alkalmasság szintjének elérését feltéve, hogy ez nem rövidebb, mint:

1.) két év, vagy
2.) egy olyan időtartam, melyet az Állam szükségesnek tart ahhoz, hogy a folyamodó egy jóváhagyott kiképzési tanfolyamot elvégzett személlyel azonos szintű gyakorlati tapasztalatot szerezzen.

4. 2. 1. 4. *Kiképzés*

Ajánlás – *A folyamodónak a kért jogosítványoknak megfelelő kiképzési tanfolyamot kell elvégeznie.*

Megjegyzés: – Légijármű karbantartó szakszolgálati engedélyért folyamodók számára a kiképzési tanfolyamra vonatkozó tájékoztató anyagot a Kiképzési Kézikönyv (DOC 7192) D-1 Része tartalmazza.

4. 2. 1. 5. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes ellátni a megadandó jogosítványoknak megfelelő funkciókat.

4. 2. 2. A szakszolgálati engedély birtokosának jogosítványai és ezek gyakorlásakor figyelembe veendő feltételek

4. 2. 2. 1. Ha a 4. 2. 2. 2 és a 4. 2. 2. 3 pontokban előírt követelményeknek megfelel, a légijármű karbantartó szakszolgálati engedély birtokosának joga van a légijármű, vagy részeinek légialkalmasságát igazolni jóváhagyott javítás, módosítás, vagy egy hajtómű, tartozékok, műszer és/vagy berendezés tétel beépítését követően, és aláírni a karbantartási okmányt felülvizsgálat, karbantartási munkák elvégzése és/vagy rutin szervizmunkák elvégzése után.

4. 2. 2. 2. A 4. 2. 2. 1. pontban meghatározott légijármű karbantartó szakszolgálati engedély birtokosának jogosítványai csak akkor gyakorolhatók, ha:

a) ezekre nézve:

1) a szakszolgálati engedélybe teljes egészében be van jegyezve a légijármű akár specifikusan, akár egy átfogó kategóriába sorolva, vagy

2) a szakszolgálati engedélybe akár specifikusan, akár egy átfogó kategóriába sorolva bejegyezték a sárkány és hajtóműveket, a légijármű rendszereket vagy részegységeket, és/vagy

3) a szakszolgálati engedélybe akár specifikusan, akár egy átfogó kategóriába sorolva bejegyezték a légijármű elektronikai rendszereket vagy részegységeket,

b) feltéve, hogy a szakszolgálati engedély birtokosa ismeri az adott légijármű karbantartására és légialkalmasságára vonatkozó összes információt, melyek alapján a szakszolgálati engedély birtokosa aláírja a Karbantartási Okmányt, vagy a sárkányra, hajtóműre, légijármű rendszerre vagy részegységre vonatkozó minden információt, amelyeknek légialkalmasságát a szakszolgálati engedély birtokosa igazolja, és

c) feltéve, hogy a megelőző 24 hónapon belül a szakszolgálati engedély birtokosa tapasztalatot szerzett egy légijármű vagy alkotóelemei felülvizsgálata, szervizelése vagy karbantartása terén, és a kiadott szakszolgálati engedélye jogosítványait nem kevesebb, mint 6 hónapja gyakorolja, vagy eleget tett a szakszolgálati engedély megfelelő jogosítványokkal történő kiadása feltételeinek az Engedélyező Hatóság megelégedésére.

4. 2. 2. 3. A Szerződő Államnak a szakszolgálati engedély birtokosa jogosítványainak körét le kell írnia a feladatok komplexitásának azon fogalmaiban, amelyekre a szakszolgálati engedély kiadása vonatkozik.

4. 2. 2. 3. 1. **Ajánlás –** *A szakszolgálati engedély jogosítványainak részleteit vagy be kell vezetni a szakszolgálati engedélybe, vagy ahhoz kell csatolni akár közvetlenül, akár a Szerződő Állam által kiadott másik dokumentumra történő hivatkozással.*

4. 2. 2. 4. Ha a Szerződő Állam felhatalmaz egy jóváhagyott karbantartó szervezetet szakszolgálati engedéllyel nem rendelkező személyzet kijelölésére a 4. 2. 2 pont jogosítványainak gyakorlására, a kijelölt személynek ki kell elégítenie a 4. 2. 1 pont előírásait.

4. 3. Légiforgalmi irányító szakszolgálati engedély

4. 3. 1 A szakszolgálati engedély kiadásának feltételei

A légiforgalmi irányító szakszolgálati engedély kiadása előtt a Szerződő Államnak meg kell követelnie a folyamodótól, hogy eleget tegyen a 4. 3. 1 pont előírásainak és a 4. 4 pontban leírt jogosítások közül legalább az egyik követelményeinek. Szakszolgálati engedéllyel nem rendelkező állami alkalmazottak csak akkor dolgozhatnak légiforgalmi irányítóként, ha ugyanezen követelményeknek megfelelnek.

4. 3. 1. 1. *Életkor*

A folyamodó nem lehet 21 évesnél fiatalabb.

4. 3 1. 2. *Szakismeret*

A folyamodónak demonstrálnia kell, hogy rendelkezik a légiforgalmi irányító szakszolgálati engedély birtokosára vonatkozó tudásszinttel legalább az alábbi témakörökben:

Légijog

a) a légiforgalmi irányítóra vonatkozó szabályok és előírások,

Légiforgalmi irányítás berendezései

b) a légiforgalmi irányításban használatos berendezések alapelvei, használata és korlátozásai,

Általános ismeretek

c) a repülés alapelvei, a légijármű, a hajtóművek és rendszerek működésének és üzemeltetésének alapelvei, a légijárműnek a légiforgalmi irányításra vonatkozó teljesítmény jellemzői,

Emberi tényezők

d) a légiforgalmi irányítóra vonatkozó emberi tényezők,

Megjegyzés: – Az emberi tényezők kiképzési program megtervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

e) repülési meteorológia, meteorológiai dokumentációk és információk értelmezése és használata, a repülés végrehajtását és biztonságát befolyásoló időjárási jelenségek keletkezési helye és jellemzői, magasságmérés, *Navigáció*

f) a repülési navigáció alapelvei, a navigációs rendszerek és a látás utáni navigáció segédeszközeinek alapelve, pontossága és korlátai, és

Üzemeltetési eljárások

g) a légiforgalmi irányítás, a rádióösszeköttetés, a rádiótávbeszélés és kifejezések eljárásai (szokványos, nem szokványos, veszélyhelyzeti), a vonatkozó légiforgalmi dokumentációk használata, a repüléssel kapcsolatos biztonsági gyakorlati eljárások.

4. 3. 1. 3. *Tapasztalat*

A folyamodónak egy jóváhagyott kiképzési tanfolyamot kell elvégeznie és nem kevesebb, mint 3 hónapig kielégítően kell tevékenykednie a tényleges légiforgalmi irányításban egy megfelelően jogosított légiforgalmi irányító felügyelete alatt. A légiforgalmi irányító jogosításaira a 4. 4. pontban meghatározott tapasztalat- követelményeket a jelen pontban előírt tapasztalat részének lehet tekinteni, és javára jóvá lehet írni.

4. 3. 1. 4. *Egészségügyi alkalmasság*

A folyamodónak érvényes 3. osztályú Egészségügyi Minősítéssel kell rendelkeznie.

4. 4. A légiforgalmi irányító jogosításai

4. 4. 1. A légiforgalmi irányító jogosításainak kategóriái

4. 4. 1. 1. A légiforgalmi irányító jogosításainak a következő kategóriákat kell magába foglalnia:

a) repülőtéri irányító jogosítás,

b) bevezetés irányító jogosítás,

c) radarbevezetés irányító jogosítás,

d) precíziós radarbevezetés irányító jogosítás,

e) távolkörzeti irányító jogosítás, és

f) távolkörzeti radarirányító jogosítás.

Megjegyzés: – A Meteorológiai Világszervezet (WMO) a meteorológiai észleléseket végző személyzetre követelményeket írt elő, melyek az ugyanilyen feladatot ellátó légiforgalmi irányítókra is vonatkoznak.

4. 4. 2. A légiforgalmi irányító jogosítások feltételei

4. 4. 2. 1. *Szakismeret*

A folyamodónak demonstrálnia kell, hogy tudásszintje megfelel a megadandó jogosítványoknak legalább az alábbi témakörökben és olyan mértékig, amennyire ezek érintik a felelősségi körét:

a) repülőtéri irányító jogosításhoz:

1) a repülőtér kialakítása, fizikai jellemzői és vizuális berendezései,

2) a légtér szerkezete,

3) alkalmazandó szabályok, eljárások, és információforrások,

4) léginavigációs berendezések,

5) a légiforgalmi irányítás berendezései és azok használata,

6) domborzati és jellegzetes tereppontok,

7) a légiforgalom jellemzői,

8) időjárási jelenségek, és

9) veszélyhelyzeti, valamint kutatási és mentési tervek,

b) *bevezetés irányító és távolkörzet irányító jogosításokhoz:*

1) a légtér szerkezete,

2) alkalmazandó szabályok, eljárások és információforrás,

3) léginavigációs berendezések,

4) a légiforgalmi irányítás berendezései és használata,

5) domborzati és jellegzetes tereppontok,
6) a légiforgalom és a forgalomáramlás jellemzői,

7) időjárási jelenségek, és

8) veszélyhelyzeti, valamint kutatási és mentési tervek, és

c)*radarbevezetés irányító, precíziós radarbevezetés irányító és távolkörzeti radarirányító jogosításokhoz:* A folyamodónak ki kell elégítenie a b) alpontban előírt követelményeket a felelősségi körét érintő mértékben, és demonstrálnia kell az adandó jogosítványoknak megfelelő tudásszintet legalább az alább felsorolt további témakörökben:

1) a radar és egyéb légtérellenőrző rendszerek, a hozzájuk tartozó berendezések alapelve, használata és korlátai, és

2) a bevezetés, a precíziós bevezetés vagy a távolkörzeti radarirányítás szolgálatok biztosításának eljárásai, – ahogy alkalmazható, – beleértve a domborzattól való megfelelő elkülönítés megvalósításának eljárásait.

4. 4. 2. 2. *Tapasztalat*

4. 4. 2. 2. 1. A folyamodónak:

a) sikeresen el kell végeznie egy jóváhagyott kiképzési tanfolyamot,

b) megfelelően jogosított légiforgalmi irányító felügyelete alatt irányítói szolgálatot kielégítő módon ellátni:

1) *irányító jogosítás esetében:* 90 óránál, vagy egy hónapnál nem rövidebb ideig, attól függően, hogy melyik a hosszabb időtartam, egy repülőtéri irányító szolgálat azon egységénél, amelyre a jogosítását kéri,

2) *bevezetés irányító, radarbevezetés irányító és távolkörzeti radarirányító jogosítás esetében:* nem kevesebb, mint 180 óra, vagy három hónap – attól függően, hogy melyik a hosszabb időtartam, azon irányítási egységnél, amelyre a jogosítását kéri,

3) *precíziós radarbevezetés irányító jogosítás esetében:* nem kevesebb, mint 200 precíziós bevezetést, melyből maximum 100 bevezetést lehet az Engedélyező Hatóság által erre a célra jóváhagyott radar-szimulátorban teljesíteni. Nem kevesebb, mint 50 – et ezekből a precíziós megközelítésekből annál a szolgálati egységnél, és azon az irányítóberendezésen kell teljesítenie, amelyre a jogosítását kéri, és

c) ha a radarbevezetés irányító jogosítás magába foglalja a légtérellenőrző radarbevezetés jogosítványát is, akkor a folyamodónak megfelelően jogosított bevezetés irányító felügyelete alatt nem kevesebb, mint 25 PPI (síkhelyzetkiértékelő) bevezetést kell végrehajtania olyan légtér-ellenőrző berendezés típuson, amelyet annál az egységnél használnak, amelyre a jogosítását kéri.

4. 4. 2. 2. 2. A 4. 4. 2. 2. 1 b) pontban meghatározott tapasztalatot, az alkalmazását közvetlenül megelőző 6 hónapon belül kell megszereznie.

4. 4. 2. 2. 3. Ha a folyamodó már rendelkezik légiforgalmi irányító jogosítással egy másik kategóriában, vagy ugyanazzal a jogosítással egy másik irányító szolgálati egységnél, az Engedélyező Hatóságnak kell meghatároznia, hogy a 4. 4. 2. 2 pontban előírt tapasztalat csökkenthető-e, és ha igen, akkor milyen mértékben.

4. 4. 2. 3. *Jártasság*

A folyamodónak demonstrálnia kell – a megadandó jogosítványoknak megfelelő szinten – az irányítói feladatok biztonságos, rendszeres és gyors ellátásához szükséges jártasságát, ítélőképességét és teljesítőképességét.

4. 4. 2. 4. *Két légiforgalmi irányító jogosítás egyidejű kiadása*

Ha a folyamodó egyidejűleg két légiforgalmi irányító jogosítást kér, az Engedélyező Hatóságnak kell kialakítania az alkalmazható követelményeket az egyes jogosítások megszerzésének feltételei alapján. Az így meghatározott követelmények szintje nem lehet alacsonyabb, mint a magasabb követelményszintű jogosításé.

4. 4. 3. A légiforgalmi irányító jogosítás (ok) birtokosának jogai és ezek gyakorlásakor betartandó feltételek

4. 4. 3. 1. Ha a szakszolgálati engedély birtokosa az 1. 2. 5. az 1. 2. 6, 1. 2. 7. 1. és az 1. 2. 9. pontokban meghatározott követelményeknek eleget tett, és az alábbi jogosításokból egyet vagy többet bejegyeztek a légiforgalmi irányító szakszolgálati engedélyébe, akkor joga van:

a) *repülőtéri irányító jogosítás esetében:* repülőtéri irányító szolgálatot, vagy felügyeletet ellátni azon a repülőtéren, amelyre a jogosítása szól,

b) *bevezetés irányító jogosítás esetében*: bevezetés irányító szolgálatot, vagy felügyeletet ellátni, a bevezetés irányító szolgálat illetékességi területébe vagy annak egy szektorába tartozó repülőtéren, vagy repülőtereken, amelyekre a szakszolgálati engedély birtokosa a jogosítást megszerezte,

c) *radarbevezetés irányító jogosítás esetében*: a bevezetés irányító szolgálat illetékessége alá tartozó, vagy annak meghatározott szektorában lévő repülőtéren, vagy repülőtereken radarral, vagy egyéb légtérellenőrző rendszerrel biztosított bevezetés irányító szolgálatot ellátni és/vagy felügyeletet, amelyekre a szakszolgálati engedély birtokosa a jogosítást megszerezte,

1) ha a 4. 4. 2. 2. 1. c) pont előírásainak megfelelt, a jogosítványoknak magukba kell foglalni a légtérellenőrző radarral történő bevezetéseket is,

d) *precíziós radarbevezetés irányító jogosítás esetében:* precíziós radarbevezetés szolgálatot és/vagy felügyeletet ellátni azon a repülőtéren, amelyre a szakszolgálati engedély birtokosa jogosítást szerzett,

e) távolkörzeti irányító jogosítás esetében: távolkörzeti irányító szolgálatot, és/vagy felügyeletet ellátni azon irányítási körzetben vagy annak egy adott részében, amelyre a szakszolgálati engedély birtokosa jogosítást kapott,

f) távolkörzeti radarirányító jogosítás esetében: az irányítási körzetben, vagy annak egy részében radar használatával irányító szolgálatot, és/vagy felügyeletet ellátni, amelyre a szakszolgálati engedély birtokosa jogosítást szerzett.

4. 4. 3. 2. Mielőtt a 4. 4. 3. 1 pontban jelzett jogosítványait gyakorolná, a szakszolgálati engedély birtokosának meg kell ismernie az összes vonatkozó és érvényben lévő információt.

4. 4. 3. 3. A Szerződő Állam, ha már kiadott egy légiforgalmi irányító szakszolgálati engedélyt, ne engedje meg, hogy a szakszolgálati engedély birtokosa oktatást végezzen üzemi körülmények között feltéve, ha megfelelő felhatalmazást kapott erre a Szerződő Államtól.

4. 4. 3. 4. *A jogosítások érvényessége*

Egy jogosítás akkor válik érvénytelenné, ha egy légiforgalmi irányító az Engedélyező Hatóság által meghatározott időtartam alatt nem gyakorolja jogosítványait. Ez az időtartam nem haladhatja meg a hat hónapot. A jogosítás érvénytelensége addig fennáll, amíg az irányítóról újra meg nem állapítják, hogy képes a jogosítványok gyakorlására.

4. 5. Repülésüzemi tiszt / diszpécser szakszolgálati engedély

4. 5. 1. A szakszolgálati engedély kiadásának feltételei

4. 5. 1. 1. *Életkor*

A folyamodó nem lehet 21 évesnél fiatalabb.

4. 5. 1. 2. *Szakismeret*

A folyamodónak demonstrálnia kell, hogy rendelkezik a repülésüzemi tiszt szakszolgálati engedély birtokosának megadott jogosítványoknak megfelelő tudásszinttel, legalább az alábbi témakörökben:

Légijog

a) a repülésüzemi tiszt szakszolgálati engedély birtokosára vonatkozó szabályok és előírások, megfelelő légiforgalmi szolgálatok gyakorlatai és eljárásai,

Általános légijármű ismeret

b) a repülőgép hajtóműveinek, rendszereinek és műszereinek üzemeltetési alapelvei,

c) a repülőgépek és a hajtóművek üzemi korlátozásai,

d) minimálisan elégséges berendezések jegyzéke,

Repülési jellemzők kiszámítása, a repüléstervezés eljárása és terhelési

e) a terhelés és a tömeg megoszlás hatásai a légijármű teljesítményére és repülési jellemzőire, tömeg és tömegközéppont számítások,

f) a repülés részletes megtervezése, tüzelőanyag fogyasztás és tüzelőanyag- időtartam számítások, kitérő repülőtér kiválasztási eljárásai, utazórepülés szabályozása az útvonalon, kiterjesztett hatótávolságú üzemelés,

g) repülési terv összeállítása és kitöltése a légiforgalmi szolgálatok részére,

h) a számítógépes repüléstervezési rendszerek alapelvei,

Emberi tényezők

i) a diszpécser kötelmekre vonatkozó emberi tényezők,

Megjegyzés: az emberi tényezők kiképzési program megtervezéséhez tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

Meteorológia

j) repülési meteorológia, a nyomásrendszerek mozgása, a frontok szerkezete, szignifikáns időjárási jelenségek keletkezési helye és jellemzői, amelyek befolyásolják a felszállás, az útvonalrepülés és a leszállás körülményeit,

k) a légiforgalmi meteorológiai jelentések, térképek és előrejelzések, a kódok és rövidítések értelmezése és alkalmazása, a meteorológiai információ használata és beszerzésének eljárásai, *Navigáció*

l) a léginavigáció alapelvei, különös tekintettel a műszerrepülésre,

Üzemeltetési eljárások

m) a légiforgalmi dokumentáció használata,

n) áru és veszélyes anyagok szállításának üzemi eljárásai,

o) légijármű balesetekre és repülési eseményekre vonatkozó eljárások, veszélyhelyzeti repülési eljárások,

p) a légijárműben elkövetett jogellenes cselekményekre és szabotázs akcióra vonatkozó eljárások,

Repüléselmélet

q) a megfelelő kategóriájú légijárműre vonatkozó repüléselmélet, és

Rádióösszeköttetés

r) a légijárművel, és a vonatkozó földi állomásokkal történő rádióösszeköttetés eljárásai,

4. 5. 1. 3. *Tapasztalat*

4. 5. 1. 3. 1. A folyamodónak az alábbi tapasztalatot kell megszereznie:

a) két teljes év szolgálati idő az 1)–3) alpontokban (mindkettőt beleértve) meghatározott munkakörök bármelyikében, vagy ezek kombinációjában feltéve, hogy bármilyen kombináció esetében a szolgálati időnek bármelyik munkakörben legalább egy évnek kell lenni az alábbi beosztásokban:

1) közforgalmi repülésben a hajózó személyzet tagja, vagy

2) közforgalmi repülésben légijárművek diszpécser teendőit ellátó szervezetnél meteorológus, vagy

3) légiforgalmi irányító, vagy a repülésüzemi tisztek vagy közforgalmi repülésüzemi rendszerek műszaki felügyelője, vagy

b) legalább 1 évet eltöltött gyakornokként közforgalmi légijárművek diszpécser feladatainak ellátásában, vagy

c) *sikeresen elvégzett egy jóváhagyott kiképzési tanfolyamot*

4. 5. 1. 3. 2. A folyamodónak az alkalmazását közvetlenül megelőzően 6 (hat) hónapon belül legalább 90 munkanapot kell teljesítenie egy repülésüzemi tiszt felügyelete alatt.

4. 5. 1. 4. *Jártasság*

A folyamodónak demonstrálnia kell, hogy képes:

a) a napi időjárási térképekből és jelentésekből pontos és az üzemeltetés szempontjából elfogadható időjárás-analízist készíteni, egy adott útvonal általános környezetében uralkodó időjárási körülményekről üzemeltetési szempontból érvényes tájékoztatást adni, a repülést érintő időjárási tendenciát előrejelezni, különös tekintettel a cél- és kitérő repülőterekre,

b) egy adott járatszakasz optimális repülési útvonalát meghatározni, és kézzel és/vagy számítógéppel pontos repülési útvonaltervet készíteni, és

c) üzemeltetési felügyeletet gyakorolni, és minden egyéb segítséget megadni a tényleges vagy szimulált hátrányos időjárási körülmények között lévő járatnak, ahogy ezt a repülésüzemi tiszt szakszolgálati engedély birtokosának kötelmei szükségessé teszik.

4. 5. 2. A szakszolgálati engedély birtokosának jogosítványai és ezek gyakorlásakor betartandó követelmények

Ha az 1. 2. 5 pontban előírt követelményeknek megfelelt, a repülésüzemi tiszt szakszolgálati engedély birtokosának joga van ebbeli minőségében szolgálatot ellátni bármely olyan körzetre kiterjedő felelősséggel, amelyre nézve a folyamodó eleget tett az Annex 6-ban meghatározott feltételeknek.

4. 6. Légiforgalmi állomásüzemeltető szakszolgálati engedély

Megjegyzés: – Ez a szakszolgálati engedély nem a repülőtéri repüléstájékoztató szolgálat (AFIS) személyzete számára szolgál. Az ilyen személyzetek képesítésére vonatkozó tájékoztató anyag az ICAO 211 számú Körlevelében Repülőtéri Repüléstájékoztató Szolgálat (AFIS) címmel található meg.

4. 6. 1. A szakszolgálati engedély kiadásának feltételei

4. 6. 1. 1. Mielőtt a Szerződő Állam egy légiforgalmi állomásüzemeltető szakszolgálati engedélyt kiadna, meg kell követelnie a folyamodótól, hogy az eleget tegyen a 4. 6. 1 pont követelményeinek. Szakszolgálati engedély nélküli személyek azzal a feltétellel tevékenykedhetnek légiforgalmi állomásüzemeltetőként, hogy az az állam, amelynek területéről üzemelnek biztosítja, hogy ezen személyek megfelelnek ugyanezen követelményeknek.
4. 6. 1. 2. *Életkor*

A folyamodó nem lehet 18 évesnél fiatalabb.

4. 6. 1. 3. Szakismeret

A folyamodónak demonstrálnia kell a légiforgalmi állomásüzemeltető szakszolgálati engedély birtokosára előírt tudásszintet legalább az alábbi témakörökben:

Általános ismeretek

a) az Állam területén belül biztosított légiforgalmi szolgálatok,

Üzemeltetési eljárások

b) rádiótávbeszélő eljárások, kifejezések, távközlési hálózat,

Szabályok és előírások

c) a légiforgalmi állomásüzemeltetőre vonatkozó szabályok és előírások,

Távközlési berendezések

d) a légiforgalmi állomáson lévő távközlési berendezések alapelvei, használata és korlátozásai.

4. 6. 1. 4. *Tapasztalat*

A folyamodónak:

a) sikeresen el kell végeznie egy jóváhagyott kiképzési tanfolyamot, az alkalmazását közvetlenül megelőző 12 hónapos időszak alatt és kielégítően kell tevékenykednie egy minősített légforgalmi állomásüzemeltető mellett nem kevesebb, mint két hónapig, vagy

b) egy minősített légiforgalmi állomásüzemeltető mellett kielégítően kell tevékenykednie nem kevesebb, mint hat hónap időtartamig az alkalmazását közvetlenül megelőző 12 hónapon belül.

4. 6. 1. 5. *Jártasság*

A kérelmezőnek demonstrálnia kell, vagy már előzőleg demonstrálta jártasságát a:

a) a használatos távközlési berendezések üzemeltetésében, és

b) a rádiótelefon üzenetek hatékony és pontos adásában és vételében.

4. 6. 2. 1. A légiforgalmi állomásüzemeltető szakszolgálati engedély birtokosának jogosítványai és ezen jogosítványok gyakorlásakor figyelembe veendő feltételek

Ha az 1. 2. 5 és 1. 2. 9 pontokban előírt követelményeket teljesítette, a légiforgalmi állomásüzemeltető szakszolgálati engedély birtokosának joga van egy légiforgalmi állomáson üzemeltetőként (operátor) tevékenykedni. Mielőtt a szakszolgálati engedélye jogosítványait gyakorolná, a szakszolgálati engedély birtokosának meg kell ismernie a légiforgalmi állomáson használatos berendezéstípusokra és üzemeltetési eljárásokra vonatkozó és érvényes összes információt.

4. 7. Légiforgalmi meteorológiai személyzet

Megjegyzés – Minden légiforgalmi meteorológiai személyzet kiképzési és minősítési követelményeinek meghatározása a Meteorológiai Világszervezet (WMO) felelőssége a Nemzetközi Polgári Repülési Szervezet és a Meteorológiai Világszervezet közötti Működési Megállapodásban foglaltaknak megfelelően (Doc 7475). A követelményeket a WMO 258. Okmányában lehet megtalálni – Irányelvek a meteorológia és az üzemi hidrológia személyzeteinek oktatásához és kiképzéséhez – I. kötet: Meteorológia.

5. FEJEZET

A SZAKSZOLGÁLATI ENGEDÉLYEKRE VONATKOZÓ ELŐÍRÁSOK

5. 1. Jelen Annex vonatkozó rendelkezései alapján a Szerződő Állam által kiadott szakszolgálati engedélyeknek meg kell felelniük az alábbi előírásoknak:

5. 1. 1. Részletes adatok

5. 1. 1. 1. Egy szakszolgálati engedélyeket kiadó Szerződő Államnak biztosítania kell azt, hogy más Szerződő Államok könnyen meg tudják határozni a szakszolgálati engedély jogosítványait és a jogosítások érvényességét.

Megjegyzés – Járatói feljegyzések, vagy a hajózó személyzet tagjainak személyi repülési naplói, melyekben az alkalmasság fenntartása, és a legfrissebb tapasztalat kielégítően szerepelhet, rendes körülmények között nincsenek a nemzetközi járatok fedélzetén.

5. 1. 1. 2. A szakszolgálati engedélybe az alábbi adatokat kell bevezetni:

I) Az állam neve (nagybetűkkel),

II) A szakszolgálati engedély címe (telt kövér nagybetűkkel),

III) A szakszolgálati engedély sorszáma arab számokkal, melyet, a szakszolgálati engedélyt kiadó hatóság ad meg,

IV) A szakszolgálati engedély birtokosának teljes neve (latin betűkkel is, ha a nemzeti nyelv a latintól eltérő írásformát használ),

IV a) Születési idő,

V) Az engedély birtokosának lakcíme, ha ezt az Állam megkívánja,

VI) Az engedély birtokosának nemzetisége,

VII) A szakszolgálati engedély birtokosának aláírása,

VIII) A szakszolgálati engedélyt kiállító hatóság, és, ahol szükséges, azok a feltételek, amelyekre a szakszolgálati engedélyt kiadták,

IX) Az érvényesség igazolása és felhatalmazás a szakszolgálati engedély birtokosa számára az engedélyben foglalt jogosítások gyakorlására,

X) A szakszolgálati engedélyt kiállító személy aláírása és a kiállítás dátuma,

XI) A szakszolgálati engedélyt kiállító hatóság pecsétje vagy bélyegzője,

XII) Jogosítások bejegyzése, például: kategória, osztály, légijármű típus, sárkány, repülőtéri irányítás, stb.

XIII) Megjegyzések, azaz külön bejegyzések a jogosítványokra és a korlátozásokra vonatkozólag, beleértve 2008. március 5.-től a nyelvtudásra vonatkozó bejegyzéseket is, valamint minden egyéb olyan információt, melyet az Egyezmény 39. Cikkelye alapján előírtak.

XIV) A szakszolgálati engedélyt kiállító Állam által szükségesnek tartott bármilyen további részadat.

5. 1. 2. A szakszolgálati engedély anyaga

A szakszolgálati engedély anyagául első osztályú papírt vagy más megfelelő anyagot kell használni, ide értve a plasztik kártyát is, és az 5. 1. 1 2. pontban felsorolt tételeknek ezen tisztán olvashatóaknak kell lenniük.

5. 1. 3. Nyelv

Ha a szakszolgálati engedélyt nem angol nyelven állítják ki, a szakszolgálati engedélynek legalább az alábbi tételeket kell angol fordításban is tartalmaznia: I), II), VI), IX), XII), XIII) és XIV). Ha a szakszolgálati engedélyt nem angol nyelven állítják ki, akkor az 1. 2. 2. 1 pont szerinti jogosításokat angol nyelvű fordításban is fel kell tüntetni, úgymint a kiadó Állam neve, a jogosítás érvényességi határideje és bármilyen korlátozás vagy megkötés, melyet a szakszolgálati engedélybe bejegyezhetnek.

5. 1. 4. A rovatok elrendezése

A rovatok fejlécét a szakszolgálati engedélyben egységesen kell számozni római számokkal, ahogy az 5. 1. 1 pontban fel van tüntetve, és olymódon, hogy bármilyen szakszolgálati engedélyben a számozás bármilyen csoportosítás esetén is ugyanarra a rovatra vonatkozzon.

Megjegyzés: – A rovatok olyan sorrendbe rendezhetők, ahogy az a szakszolgálati engedélyt kiadó Szerződő Állam számára a leginkább megfelelő.

6. FEJEZET

A SZAKSZOLGÁLATI ENGEDÉLY KIBOCSÁTÁSÁNAK EGÉSZSÉGÜGYI FELTÉTELEI

1. Megjegyzés:- A jelen fejezetben közzétett Szabványok és Ajánlott Eljárások önmagukban nem részletezhetik teljes körűen az összes lehetséges egyedi körülményt. Természetszerűen az egészségügyi alkalmasság értékelésére vonatkozólag sok esetben kell a döntést az adott egészségügyi vizsgáló megítélésére hagyni. Ezért az értékelést egy olyan egészségügyi vizsgálatra kell alapozni, mely minden tekintetben az orvosi gyakorlat legmagasabb szintjén hajtották végre.

2. Megjegyzés – Betegségre hajlamosító tényezők ismerete, mint az elhízás és a dohányzás, fontos lehet annak eldöntéséhez, hogy további vizsgálat vagy értékelés szükséges-e az adott egyedi esetben.

3. Megjegyzés – Olyan esetekben, amikor a folyamodó nem elégíti ki teljes egészében az egészségügyi követelményeket, továbbá komplikált, vagy rendkívüli esetek értékelését, és el kell halasztani és végső értékelésre az Engedélyező Hatóság egészségügyi minősítőjéhez kell továbbítani. Ilyen esetekben kellő figyelmet kell fordítani azokra a jogosítványokra, melyeket a folyamodónak adandó, vagy a folyamodó birtokában lévő szakszolgálati engedély biztosít az Egészségügyi Minősítéshez, és azokra a körülményekre, melyek között a szakszolgálati engedély birtokosa jogosításait gyakorolva kijelölt kötelmeit majd ellátja.

4. Megjegyzés – Felhívjuk a figyelmet az 1. 2. 4. 8. pontban szereplő, a hiteles (akkreditált) egészségügyi minősítéssel foglalkozó adminisztratív záradékra.

5. Megjegyzés – Az Engedélyező Hatóságot és a vizsgáló repülőorvost segítő tájékoztató anyagot különállóan a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) tettek közé. Ez a tájékoztató kiadvány tartalmazza a „valószínű” és a „jelentős” fogalmak kifejtését is, ahogy ezeket a fogalmakat a 6. Fejezet egészségügyi előírásai szöveg összefüggéseiben használtuk.

6. 1. Egészségügyi Minősítések – Általános rész

6. 1. 1. Az Egészségügyi Minősítés osztályai

Az Egészségügyi Minősítésnek három osztályát kell kialakítani, melyek a következők:

a) I. osztályú Egészségügyi Minősítés,

mely vonatkozik az alábbi szakszolgálati engedélyek esetében mind a folyamodóra, mind pedig a birtokosára:

– kereskedelmi pilóta szakszolgálati engedélyek – repülőgép, léghajó, helikopter, és teheremelő

– többszemélyes személyzet pilóta szakszolgálati engedély – repülőgép

– közforgalmi pilóta szakszolgálati engedélyek – repülőgép, helikopter, és teheremelő

b) II. osztályú Egészségügyi Minősítés,

mely vonatkozik az alábbi szakszolgálati engedélyek esetében mind a folyamodóra, mind pedig a birtokosára:

– hajózó navigátor,

– hajózó mérnök,

– magánpilóta szakszolgálati engedélyek – repülőgép, léghajó, helikopter, és teheremelő

– vitorlázó repülőgép pilóta szakszolgálati engedélyek,

– szabadon ballon pilóta.

c) III. osztályú Egészségügyi Minősítés,

mely vonatkozik az alábbi szakszolgálati engedély esetében mind a folyamodóra, mind pedig a birtokosára:

– légiforgalmi irányító.

6. 1. 2 A folyamodónak Egészségügyi Minősítés céljából a vizsgáló orvos számára személyesen aláírt nyilatkozatot kell adnia a személyi, a családi és az örökletes kórelőzményekről. A folyamodót figyelmeztetni kell, hogy a tudomása szerinti legteljesebb és legpontosabb nyilatkozatot állítsa ki, és hogy minden valótlan állítás az 1. 2. 4. 5. 1 pontnak megfelelően kell kezelni.

6. 1. 3. A vizsgálatot végző orvos köteles az Engedélyező Hatóságot minden olyan egyedi esetről jelentésben értesíteni, amelynél megítélése szerint a folyamodó valamely követelménynek – legyen az számszerű, vagy egyéb – nem felel meg és mely olyan természetű, hogy a szakszolgálati engedélyért folyamodó, vagy annak birtokosa ezzel a repülésbiztonságot nem valószínű, hogy veszélyeztetné (1. 2. 4. 8. pont).

6. 1. 4. Az Egészségügyi Minősítés megújításának követelményei azonosak az első kibocsátás követelményeivel, kivéve, ha mást írtak elő.

Megjegyzés: – Az Egészségügyi Minősítés megújítása céljából végzett rutin orvosi vizsgálatok közötti időtartamokat az 1. 2. 5. 2 pont tartalmazza.

6. 2. Az Egészségügyi Minősítés követelményei

6. 2. 1. Általános rész

Az 1. 2. 4. 1 pontnak megfelelően kiadott Egészségügyi Minősítés megszerzése érdekében a folyamodónál az alábbi orvosi vizsgálatokat kell végezni:

a) fizikai és mentális vizsgálatok,

b) látás és színlátás vizsgálatok, és

c) hallásvizsgálat.

6. 2. 2. Fizikai és mentális követelmények

Az Egészségügyi Minősítés bármely osztályában a folyamodónál mentesnek nem állhat fenn olyan:

a) veleszületett vagy szerzett rendellenesség, vagy

b) aktív, látens, akut vagy krónikus egészségkárosodás, vagy

c) baleset vagy műtét következménye,

d) gyógykezelés illetve diagnosztikai vagy preventív célból szedett vényköteles vagy vény nélkül kapható gyógyszer hatása vagy mellékhatása,

mely feltehetőleg akadályozza a szakszolgálati feladatok biztonságos ellátását.

Megjegyzés: Növényi kivonatok és más alternatív terápiák használatakor rendkívüli figyelmet kell fordítani a lehetséges mellékhatásokra.

6. 2. 3. A látóélesség mérésének követelményei

6. 2. 3. 1. A látóélesség mérésére szolgáló különféle módszerek valószínűleg eltérő eredményekhez vezetnek. Az egységesség elérése érdekében ezért a Szerződő Államoknak gondoskodnia kell arról, hogy az értékelési módszerek azonosak legyenek.

6. 2. 3. 2. **Ajánlás .** – *A látásélesség mérésére az alábbiakat kell alkalmazni:*

a) A látóélesség méréseket olyan környezetben kell elvégezni, ahol a megvilágítás szintje megfelel az átlagos irodai megvilágításnak
(30-60 cd/m²),

b) A látóélességet Landolt gyűrűkkel vagy hasonló típusú eszközökkel kell mérni, és olyan távolságra kell elhelyezni a vizsgált személytől, mely megfelel az elfogadott mérési módszernek.

6. 2. 4. A színlátás követelményei

6. 2. 4. 1. A Szerződő Államoknak olyan vizsgálati módszereket kell alkalmazni, melyek szavatolják a színlátás megbízható mérését.

6. 2. 4. 2. A folyamodónak bizonyítania kell, hogy képes azonnal felismerni azokat a színeket, melyek szakszolgálati feladatainak biztonságos végrehajtáshoz szükségesek.

6. 2. 4. 3. A folyamodónál mérni kell, hogy képes-e helyesen azonosítani a pseudoisokromatikus táblasorozatot napfényben vagy mesterséges fényben ugyanolyan színhőmérséklet mellett, mint amilyent a C vagy a D65 szabvány fényforrások biztosítanak, a Nemzetközi Megvilágítási Bizottság (CIE) meghatározása szerint.

6. 2. 4. 4. Azt a folyamodót, aki az Engedélyező Hatóság által előírt kielégítő eredményt elérte, alkalmasnak kell nyilvánítani. Ha a folyamodó nem ért el ilyen mérésnél kielégítő eredményt, alkalmatlannak kell minősíteni feltéve, ha képes a légiközlekedésben használatos színek gyors felismerésére és helyesen azonosítja a repülésben alkalmazott színes fény jelzéseket. Az a folyamodó, aki nem tud eleget tenni ezen kritériumoknak, alkalmatlannak minősül, kivéve a II. osztályú minősítést a következő korlátozással: csak nappal érvényes.

Megjegyzés: – A színlátás mérés megfelelő módszereire tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) található.

6. 2. 4. 4. 1. **Ajánlás –** *Amennyiben a szakszolgálati engedély birtokosa jogosításainak gyakorlása közben napszemüveget visel, akkor annak nem-polarizálónak, és semleges halványszürke színűnek kell lennie.*

6. 2. 5. Hallásra vonatkozó követelmények

6. 2. 5. 1. A Szerződő Államoknak olyan vizsgálati módszereket kell alkalmazni, melyek szavatolják a hallás megbízható mérését.

6. 2. 5. 2. A folyamodónak bizonyítania kell, hogy hallásképessége kielégítő a szakszolgálati engedélyében és jogosításában foglaltak biztonságos gyakorlásához.

6. 2. 5. 3. Az I. osztályú Egészségügyi Minősítésért folyamodónál tiszta-hang audiometriát kell végezni a Minősítés első kiadásakor, ezt követően 5 évente a 40. életévig, majd 40. életév felett 2 évente.

6. 2. 5. 3. 1. Többféle vizsgáló módszer is alkalmazható, amennyiben ezek azonos értékű eredményeket biztosítanak.

6. 2. 5. 4. A III. osztályú Egészségügyi Minősítésért folyamodónál tiszta-hang audiometriát kell végezni a Minősítés első kiadásakor, majd 4 évente a 40. életévig, 40 év felett pedig 2 évente.

6. 2. 5. 4. 1. Többféle vizsgáló módszer is alkalmazható, amennyiben ezek azonos értékű eredményeket biztosítanak

6. 2. 5. 5. **Ajánlás** – *A II. osztályú Egészségügyi Minősítésért folyamodónál tiszta-hang audiometriát kell végezni a Minősítés első kiadásakor, majd 50. életév kétévenként.*

6. 2. 5. 6. A 6. 2. 5. 3, a 6. 2. 5. 4, és a 6. 2. 5. 5. pontokban felsoroltaktól eltérő egészségügyi vizsgálatoknál, ahol audiométert nem alkalmaznak, a folyamodó hallását egy csendes szobában kell kipróbálni suttogás és beszédhang próbája során.

1. Megjegyzés – A tiszta-hang audiométerek kalibrálásához a referencia nulla azonos a Nemzetközi Szabványosítási Szervezet (ISO) által kiadott Audiométerrel végzett Vizsgálati Módszerek jelenlegi kiadásának vonatkozó Szabványaival

2. Megjegyzés – A követelményeknek megfelelő hallásvizsgálat céljára csendes szobának azt a szobát tekintjük, amelyben a háttérzaj intenzitása kevesebb, mint 35dB (A).

3. Megjegyzés – A követelményeknek megfelelő hallásvizsgálat céljára egy átlagos beszédhang hangszint értéke a kimeneti ponttól számított egy méterre (a beszélő alsó ajka) kb. 60dB (A), és a suttogásé kb. 45dB (A). A beszélőtől számított két méterre a hangszint 6dB (A) értékkel kevesebb.

4. Megjegyzés – Hallókészülékkel rendelkező folyamodók minősítéséhez tájékoztató anyagot a Polgári Repülés Egészségügyi Kézikönyv tartalmaz (DOC 8984).

5. Megjegyzés – Felhívjuk a figyelmet a 2. 7. 1. 3. 1. pontban foglalt követelményekre, amikor műszeres jogosítást adnak ki olyan folyamodónak, aki rendelkezik magánpilóta szakszolgálati engedéllyel.

6. 3. I. osztályú Egészségügyi Minősítés

6. 3. 1. A minősítés kiadása és megújítása

6. 3. 1. 1. A kereskedelmi pilóta szakszolgálati engedély – repülőgépre, léghajóra, helikopterre, vagy motoros szerkezetre, a többszemélyes személyzet pilóta szakszolgálati engedély- repülőgépre, vagy a közforgalmi pilóta szakszolgálati engedély – repülőgépre, helikopterre, vagy motoros szerkezetre birtokosainak egy kezdeti egészségügyi vizsgálatnak kell alávetni magukat az I. osztályú Egészségügyi Minősítés kiadása céljából.

6. 3. 1. 2. Ha a fejezet mást nem ír elő, a kereskedelmi pilóta szakszolgálati engedély- repülőgép, léghajó, helikopter vagy teheremelő, a többszemélyes személyzet pilóta szakszolgálati engedélyek – repülőgép, vagy a közforgalmi pilóta szakszolgálati engedélyek- repülőgép, helikopter, vagy teheremelő, birtokosainak I. osztályú Egészségügyi Minősítésüket az 1. 2. 5. 2. pontban előírt időszakokat meg nem haladó időtartam után meg kell újítaniuk.

6. 3. 1. 3. Ha az Engedélyező Hatóság meggyőződött arról, hogy ezen fejezet követelményei és a 6. 1. és 6. 2. pontban felsorolt általános előírások megvalósultak, a folyamodónak az I. osztályú Egészségügyi Minősítést ki kell adni.

6. 3. 2. Fizikai és mentális követelmények

6. 3. 2. 1. A folyamodó nem szenvedhet semmiféle olyan betegségben vagy rokkantságban, melynek következtében valószínűleg hirtelen képtelenné válik akár valamely légijármű biztonságos üzemeltetésére, akár a ráruházott feladatok biztonságos elvégzésére.

6. 3. 2. 2. A folyamodó kórelőzményében ne szerepeljen, illetve klinikailag igazoltan ne szenvedjen

az alábbiakban:

a) szervi alapú elmebaj,

b) pszichoaktív anyagok használata okozta szervi vagy magatartási rendellenesség, ez magába foglalja az alkohol vagy más pszichoaktív anyag okozta függőséget is,

c) skizofrénia vagy skizotypiás betegség, érzékcsalódásos zavarok,

d) hangulati (affektív) élet zavarai,

e) neurózis, stress okozta vagy szomatikus zavarok,

f) magatartás zavar, mely pszichológiai zavarokkal vagy testi tünetekkel társul,

g) felnőttkori személyiség- vagy magatartás zavar, különösen, ha nyilvánvaló cselekvések ismétlődésében mutatkozik meg,

h) szellemi elmaradottság,,

i) pszichológiai fejlődési zavar,

j) magatartás vagy az érzelmi élet zavara, mely a gyermekkorban vagy a serdülőkorban jelentkezett először, vagy

k) más módon meg nem határozott elmezavar

mely a folyamodót képtelenné teheti arra, hogy biztonságosan gyakorolja meglévő szakszolgálati engedélye vagy a kért szakszolgálati engedélye jogosítványait.

Megjegyzés – Az elmebeli és magatartásbeli rendellenességek az Egészségügyi Világszervezet klinikai leírásai és diagnosztikai irányelvei szerint vannak meghatározva, úgy, ahogy azokat közzétették a Nemzetközi Statisztikai Betegség Osztályozás és a Kapcsolatos Egészségügyi Problémák című kiadványban, 10. kiadás- Elmebeli és Magatartásbeli zavarok, WHO 1992.
Ez a dokumentum a diagnosztikai követelmények részletes leírását tartalmazza, melyek hasznosak lehetnek az egészségügyi minősítésben történő alkalmazásra.

6. 3. 2. 3. A folyamodó kórelőzményében, illetve klinikai diagnózisában nem szerepelhet egyik sem az alábbiak közül:

a) az idegrendszer kifejlett (progressive) vagy nem-kifejlett (non-progressive) betegsége, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye, vagy jogosítása jogainak biztonságos gyakorlásában,

b) epilepszia, vagy

c) bármilyen tudatzavar, az ok kielégítő orvosi magyarázata nélkül.

6. 3. 2. 4. A folyamodó nem szenvedhet semmilyen fejsérülésben, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye vagy jogosítása jogainak gyakorlásában.

6. 3. 2. 5. A folyamodónak nem lehet semmiféle szív-rendellenessége, se vele született, se szerzett, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye, vagy jogosítása jogainak gyakorlásában.

6. 3. 2. 5. 1. Azt a folyamodót, aki koszorúverőér by-pass műtéten, vagy érplasztikán (angioplastry) (stent felvezetése mellett, vagy anélkül), vagy egyéb szívben végrehajtott beavatkozáson esett át, vagy ha volt szívinfarktus kórelőzménye, vagy aki bármilyen egyéb potenciálisan cselekvőképtelenséget okozó szívbetegségben szenved, azt alkalmatlannak kell minősíteni feltéve, ha a folyamodó szívének állapotát megvizsgálták és értékelték a legjobb orvosi gyakorlat szerint, és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 3. 2. 5. 2. Azt a folyamodót, akinek abnormális a szívritmusa, alkalmatlannak kell tekinteni, feltéve, ha a szabálytalan szívműködést (aritmia) kivizsgálták és értékelték a legjobb orvosi gyakorlatnak megfelelően, és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása biztonságos gyakorlásában.

Megjegyzés – Tájékoztató anyag a szív érrendszerének (cardiovascular) értékeléséhez a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 3. 2. 6. Az EKG vizsgálat (electrocardiography) a szakszolgálati engedély első alkalommal történő kiadásához szükséges szív-vizsgálat része kell, hogy legyen.

6. 3. 2. 6. 1. Az EKG vizsgálatot az ismételt vizsgálatok során is el kell végezni az 50. életévüket betöltött folyamodóknál nem kevesebb, mint éves gyakorisággal.

6. 3. 2. 6. 2. **Ajánlás –** *Mindazon folyamodóknál, akiknek életkora 30 és 50 év közé esik, az EKG vizsgálatot az ismételt vizsgálatok során is el kell végezni nem kevesebb, mint 2 éves gyakorisággal.*

1. Megjegyzés – A rutin EKG vizsgálatot diagnosztikus célra végzik. Ez nem szolgál elegendő bizonyítékul az alkalmatlanság megítéléséhez, további alapos érrendszeri kivizsgálást kell végezni.

2. Megjegyzés – A nyugalmi és a terheléses EKG-ra vonatkozó tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC8984) található

6. 3. 2. 7. A szisztolés és a diaszisztolés vérnyomásnak a normál határokon belül kell lenni.

6. 3. 2. 7. 1. A magas vérnyomás beállítására alkalmazott gyógyszerek használata kizáró ok, kivéve azon gyógyszereket, melyeknek a használata összeegyeztethető a folyamodó szakszolgálati engedélye és jogosítása biztonságos gyakorlásával.

Megjegyzés – Ezen témakörben részletes irányelveket a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

6. 3. 2. 8. Az érrendszernek sem jelentős működésbeli, sem felépítésbeli rendellenessége nem lehet.

6. 3. 2. 9. A tüdőnek nem lehet sem akut elváltozása, sem a tüdő bármely részegységének, a mediasstinumnak vagy a mellhártyának semmilyen aktív betegsége, mely valószínűleg a cselekvőképesség tüneteit eredményezi normál és veszélyhelyzetekben.

6. 3. 2. 9. 1. **Ajánlás –** Az *első vizsgálatnak magába kell foglalnia a mellkas radiográfiát.*

Megjegyzés – Időszakosan ismétlődő radiográfiára rendszerint nincs szükség, de szükségessé válhat olyan esetekben, amikor tünetmentes tüdőbaj valószínűsége fennáll.

6. 3. 2. 10. Krónikus elzáródásos tüdőbajban (obstructive pulmonary disease) szenvedő folyamodót alkalmatlannak kell tekinteni kivéve, ha a folyamodó állapotát kivizsgálták, a lehető legjobb orvosi gyakorlatnak megfelelően értékelték, és olyan minősítést kapott, mely szerint nem valószínű, hogy ez akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása biztonságos gyakorlásában.

6. 3. 2. 11. Azt a folyamodót, akinek asztmája van, mely jelentős tüneteket okoz, vagy valószínű, hogy cselekvőképtelenség tüneteit idézi elő a normál, vagy veszélyhelyzeti üzemelés alatt, alkalmatlannak kell tekinteni.

6. 3. 2. 11. 1. Az asztma kezelésére szolgáló drogok használata kizáró ok, kivéve azokat a gyógyszereket, melyeknek alkalmazása összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítványa biztonságos gyakorlásával.

Megjegyzés – A gyógyszerek és drogok veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.

6. 3. 2. 12. Az aktív tüdőtuberkulózisban szenvedő folyamodót alkalmatlannak kell tekinteni.

6. 3. 2. 12. 1. Azt a folyamodót, kinél nyugvó vagy gyógyult maradványok vannak, melyekről ismert, hogy tuberkulózis okozta, vagy feltehetően ilyen eredetű, alkalmasnak lehet minősíteni.

1. Megjegyzés – A légzőszervi betegségek minősítéséhez irányelveket a Polgári Repülés Egészségügyi Kézikönyv (DOC 8984) tartalmaz.

2. Megjegyzés – A *gyógyszerek és drogok veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.*

6. 3. 2. 13. Azt a folyamodót, akinél jelentős károsodás áll fenn a gyomor és bélrendszer működésében, vagy a hasi szervek működését károsító betegség fordul elő, alkalmatlannak kell minősíteni.

6. 3. 2. 13. 1. A folyamodónak nem lehet olyan sérve, mely a cselekvőképtelenség tüneteihez vezethet.

6. 3. 2. 14. Az emésztőcsatorna, vagy a hasi szervek bármely betegsége, vagy műtét utáni állapota, mely repülés közben valószínűleg cselekvőképtelenséget okoz, különösképpen a szűkület vagy összenyomódás következtében létrejöhető elzáródás esetében, a folyamodót alkalmatlannak kell minősíteni.

6. 3. 2. 14. 1. **Ajánlás –** *Ha a folyamodó emésztőszervi, vagy hasi szervein olyan nagyobb sebészeti műtétet végeztek, melynek során ezen szervek bármelyikét részlegesen vagy teljesen kioperálták, vagy áthelyezték, a folyamodót alkalmatlannak kell minősíteni addig, amíg az egészségügyi minősítő, miután szabad betekintést nyert az adott operáció részletes anyagába, úgy ítéli meg, hogy az operáció hatásai valószínűleg nem vezetnek repülés közbeni cselekvőképtelenséghez.*

6. 3. 2. 15. A folyamodót alkalmatlannak kell minősíteni, ha nála anyagcsere, táplálkozási és hormonális rendellenesség áll fenn, melyek valószínűleg hátrányosan befolyásolják a szakszolgálati engedélyben adott jogosítványok vagy a jogosítása biztonságos gyakorlását.

6. 3. 2. 16. A folyamodót alkalmatlannak kell minősíteni, ha inzulin-kezelés alatt áll cukorbetegsége (diabetes mellitus) miatt.

6. 3. 2. 16. 1. Azt a folyamodót, akinek cukorbetegségét (diabetes mellitus) nem inzulinnal kezelik, alkalmatlannak kell minősíteni feltéve, ha a körülmények azt mutatják, hogy ezt kizárólag diétával kielégítően karban lehet tartani, vagy diéta és szájon át szedhető anti-diabetikus gyógyszer kombinációjával, melynek használata összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásával.

Megjegyzés – Cukorbeteg folyamodók minősítésére vonatkozó irányelveket a Polgári Repülés Egészségügyi Kézikönyv (DOC 8984) tartalmaz.

6. 3. 2. 17. Azokat a folyamodókat, akik a vér- és/vagy a nyirokrendszer betegségeiben szenvednek, alkalmatlannak kell minősíteni feltéve, ha kellően kivizsgálták, és állapotukat olyannak találták, mely nem valószínű, hogy megakadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – A sarlósejt egyéni jellegzetesség, vagy egyéb vörös vérfestékből származó egyéni jellegzetesség rendszerint összeegyeztethető az alkalmas minősítéssel.

6. 3. 2. 18. Vese, vagy húgy- és ivarszervi betegségben szenvedő folyamodókat alkalmatlannak kell minősíteni, feltéve, ha megfelelően kivizsgálták, és állapotukat olyannak találták, melynél nem valószínű, hogy szakszolgálati engedélyük vagy jogosításuk jogainak biztonságos gyakorlásában akadályozva lesznek.

6. 3. 2. 18. 1. A húgyutak vizsgálata része kell, hogy legyen az egészségügyi felülvizsgálatnak és a rendellenességeket megfelelően fel kell deríteni.

Megjegyzés – A húgyutak vizsgálatához és a rendellenességek felderítéséhez irányelvek a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) találhatók.

6. 3. 2. 19. Azokat a folyamodókat, akiknek a veséjében vagy a húgyutakban és ivarszervekben betegség, vagy sebészi beavatkozás fordult elő, különösen, ha szűkület, vagy összenyomódás okozta elzáródás tapasztalható, alkalmatlannak kell minősíteni feltéve, ha a folyamodó állapotát kivizsgálták és a lehető legjobb orvosi gyakorlatnak megfelelően értékelik ki, és úgy minősítik, hogy nem áll fenn a valószínűsége annak, hogy a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában ez akadályozná.

6. 3. 2. 19. 1. Azokat a folyamodókat, akiknek az egyik veséjét eltávolították, alkalmatlannak kell minősíteni, kivéve, ha az állapota jól kompenzált.

6. 3. 2. 20. Azokat a folyamodókat, akik szerzett immunhiányos szindrómában (AIDS) szenvednek, alkalmatlannak kell minősíteni.

6. 3. 2. 20. 1. Azokat a folyamodókat, akik szérum pozitívak az emberi immunhiányos vírusra (HIV), alkalmatlannak kell minősíteni feltéve, ha a teljes kivizsgálás azt bizonyítja, hogy klinikai betegség nyilvánvalóan nem áll fenn.

1. Megjegyzés – Azoknál a folyamodóknál, akik szérum pozitívak az emberi immunhiányos vírusra (HIV), az értékelés során különleges figyelmet kell fordítani az elmebeli állapotra, ideértve a diagnózis lélektani hatásait is.

2. Megjegyzés – Irányelvek azon folyamodók minősítésére, akik szérum pozitívak az emberi immunhiányos vírusra (HIV), a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

6. 3. 2. 21. Azokat a folyamodókat, akik nőgyógyászati rendellenességben szenvednek, melyek valószínűleg akadályozzák szakszolgálati engedélyük vagy jogosításuk jogainak biztonságos gyakorlásában, alkalmatlannak kell minősíteni.

6. 3. 2. 22. Azokat a folyamodókat, akik terhesek, alkalmatlannak kell minősíteni feltéve, ha a szülészeti értékelés és a folyamatos orvosi felülvizsgálat azt mutatja, hogy ez egy alacsony kockázatú komplikációmentes terhesség.

6. 3. 2. 22. 1. **Ajánlás –** *Azon folyamodónál, akinek terhessége alacsony kockázatú komplikációmentes, és a 6. 3. 2. 22. pontnak megfelelően értékelték és felülvizsgálták, alkalmasságának minősítését a terhesség12. hetének végétől a 26. hét végéig terjedő időszakra kell korlátozni.*

6. 3. 2. 23. A terhesség végét, vagy a szülést követően a folyamodónak nem engedélyezett a szakszolgálati engedélye jogainak gyakorlása egészen addig, amíg ismételt orvosi értékelésen át nem esett, melyet a lehető legjobb orvosi gyakorlat szerint hajtottak végre, és meg nem állapították, hogy a folyamodó képes a szakszolgálati engedélye és jogosításai jogainak biztonságos gyakorlására.

6. 3. 2. 24. A folyamodó nem szenvedhet a csontokat, izületeket, izmokat, inakat, vagy a hozzájuk kapcsolódó struktúrákat illetően semmilyen rendellenességben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – Bármely, a csontokat, izületeket, izmokat vagy inakat érintő sérülés következménye, és bizonyos anatómiai fogyatékosságok rendszerint funkcionális minősítést igényelnek az alkalmasság meghatározása céljából.

6. 3. 2. 25. A folyamodó nem szenvedhet semmilyen a füllel, és a hozzá tartozó struktúrákkal kapcsolatos rendellenességben vagy betegségben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 3. 2. 26. Nem lehet:
a) a fültornác működésének semmiféle zavara,

b) Az Eustach kürtök jelentős rendellenes működése, és

c) be nem gyógyult perforáció a dobhártyán.

6. 3. 2. 26. 1. Egyoldali száraz perforáció a dobhártyán nem szükségszerűen jelenti azt, hogy a folyamodó alkalmatlan.

Megjegyzés – A fültornác működésének kipróbálására vonatkozó irányelvek a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) találhatók.

6. 3. 2. 27. Nem lehet:

a) semmiféle elzáródás az orrban, és

b) a szájüregnek, vagy a felső légutaknak semmiféle betegsége vagy deformáltsága,

mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 3. 2. 28. Azt a folyamodót, aki dadog, vagy egyéb beszédhibával rendelkezik, mely eléggé súlyos ahhoz, hogy zavart okozzon a beszéd összeköttetésben, alkalmatlannak kell minősíteni.

6. 3. 3. Látásra vonatkozó követelmények

Az egészségügyi vizsgálatot az alábbi követelményekre kell alapozni:

6. 3. 3. 1. A szem és a védőszerveinek működése legyen normál állapotú. Nem lehetnek ezek aktív kóros állapotban, akut vagy krónikus formában, sem sebészeti beavatkozás, vagy trauma következményei a szemben, vagy annak védőszervein, melyek valószínűleg csökkentik a megfelelő látási funkciót olymértékben, mely már akadályozza a folyamodót abban, hogy szakszolgálati engedélye vagy jogosítása jogait biztonságosan gyakorolja.

6. 3. 3. 2. A folyamodó látásélessége korrekcióval vagy korrekció nélkül legalább 6/9 legyen, vagy ettől több, mindkét szemet külön mérve, és a két szemmel látás élességének 6/6 értékűnek, vagy ettől jobbnak kell lennie. A nem korrigált látásélességre korlátozás nem vonatkozik. Ha ezt a szabvány látásélességet korrigáló lencsékkel (szemüveggel) el lehet érni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha:

a) az ilyen korrigáló szemüveget mindvégig viseli, mialatt szakszolgálati engedélyének jogosítványait és jogosítását gyakorolja, és

b) ezen felül egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

1. Megjegyzés. – Az Annex 6 I. Rész tartalmazza a 6. 3. 3. 2. b) témakörének Szabványait.

2. Megjegyzés – A folyamodót mindaddig úgy tekintik, mint aki eleget tesz ezen előírásoknak, ameddig nincs ok a gyanúra, mely esetben egy szemészeti jelentés szükséges az Engedélyező Hatóság döntéséhez. Mind a korrigált, mind a nem korrigált látásélességet rendszeresen mérik és naplózzák minden egyes újbóli vizsgálatnál. A szemészeti jelentést igénylő körülmények magukba foglalják a nem korrigált látásélesség lényeges romlását, a legoptimálisabban korrigált látásélesség bármilyen romlását, és a szem megbetegedésének esetét, a szemsérülést, vagy a szemműtétet.

6. 3. 3. 2. 1. A folyamodó viselhet kontaktlencsét ezen követelmény betartására feltéve, ha:

a) a szemüveglencse egyfókuszú (monofocal) és nem színezett,

b) a szemüveg viselését jól tolerálja, és

c) egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

Megjegyzés: A folyamodónak, aki kontaktlencsét visel, nem feltétlenül kell korrekció nélküli látásélességet mérni minden egyes újbóli vizsgálatnál feltéve, hogy a kontaktlencse receptje ismert.

6. 3. 3. 2. 2. A nagy fénytörési hibában szenvedő folyamodónak kontaktlencsét, vagy nagy törésű szemüveget kell használnia.

Megjegyzés: Ha szemüveget használ, nagy törésű lencsék szükségesek a periférikus mezőtorzítás minimalizálására.

6. 3. 3. 2. 3. Annak a folyamodónak, akinek korrigálás nélküli távollátás élessége bármelyik szeménél 6/60-nál rosszabb értékű, egy teljes szemészeti bizonyítványt kell beszereznie az első Egészségügyi Minősítés előtt és ezután minden 5. évben.

1. Megjegyzés – Az előírt szemvizsgálat célja (1) a normál látásképességről meggyőződni és (2) bármilyen szignifikáns kóros állapotot azonosítani.

2. Megjegyzés – Az 1. 2. 4. 8 pont előírásainak megfelelően az egy szemmel látó (monocular) folyamodó minősítéséhez tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 3. 3. 3. Ha a folyamodó olyan műtéten esett át, mely befolyásolja a szem törésállapotát, akkor őt alkalmatlannak kell minősíteni egészen addig, amíg mentesek nem lesznek szemei mindazon következményektől, melyek valószínűleg akadályozzák szakszolgálati engedélye jogosítványainak és jogosításának biztonságos gyakorlásában.

6. 3. 3. 4. A folyamodónak képesnek kell lennie arra, hogy elolvassa az N5 táblát vagy ennek megfelelőt – ha korrigálás céljából szemüveget visel,- melyet a 6. 3. 3. 2 pontban írnak elő, – a folyamodó által megválasztott 30-50 cm-es távolságból és képesnek kell lennie arra, hogy elolvassa az N14 táblát, vagy ennek megfelelőt 100 cm távolságból. Ha ennek a követelménynek csak közel-látás korrekcióval tud megfelelni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha ezt hozzáadják a 6. 3. 3. 2. pontnak megfelelően már előírt szemüveg korrekció értékéhez. Ha ilyent nem írtak elő, egy olvasó szemüveget használatra készen mindig magánál kell tartania mindvégig, amíg a szakszolgálati engedély jogosítványait gyakorolja. Ha közel-látás korrekció szükséges, a folyamodónak demonstrálnia kell, hogy egyetlen szemüveg elegendő számára mind a közel-látási, mind a távol-látási követelmények kielégítésére.

1. Megjegyzés – Az N5 és az N14 a használt betűtípust jelöli. További részletek a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

2. Megjegyzés – Azon folyamodónak, akinek közel-látás korrekcióra van szüksége ahhoz, hogy megfeleljen ezen előírásnak, „átnéző”, bifokális vagy talán multifokális szemüvegre van szüksége mind a műszerek jelzéseinek leolvasásához, mind pedig egy térkép vagy könyv olvasásához, melyet a kezében tart, és ahhoz, hogy a szemüveg levétele nélkül az ablakon keresztül a távolba is élesen tudjon látni. A csak egyféle, közel-látás korrekciót biztosító szemüveg (teljes felületén azonos dioptriájú lencse, olvasáshoz való) jelentősen csökkenti a távolbalátás élességét és ezért nem elfogadható.

3. Megjegyzés – Ha korrekciós lencse beszerzésére vagy megújítására van szükség, a folyamodótól *elvárják, hogy a szemüveget készítő optikust tájékoztassa arról, mekkorák az olvasási távolságok a fedélzeti feladatok látással történő végrehajtásához azokon a légijárműveken, amelyeken várhatóan dolgozni fog.*

6. 3. 3. 4. 1. Ha ezen pont előírásai értelmében közel-látás korrekció szükséges, egy második közel-látó szemüveget kell a folyamodónak magánál tartania azonnali használatra készen.

6. 3. 3. 5. A folyamodótól megkövetelik, hogy normál látótérrel rendelkezzen.

6. 3. 3. 6. A folyamodótól megkövetelik, hogy mindkét szemmel való látása normál legyen.

6. 3. 3. 6. 1. Nem feltétlenül kizáró ok a csökkent térhatás (stereopsis), az abnormális konvergencia, mely nem gátolja a közel-látást, valamint a szem eltérése az egytengelyűségtől, ahol a fuzionális tartalékok kielégítőek ahhoz, hogy megakadályozzák az asthenopia-t és a kettős látást.

6. 3. 4. Hallási követelmények

6. 3. 4. 1. A folyamodónak, amikor tiszta-hang audiométerrel vizsgálják, nem lehet külön-külön fülenként nagyobb a hallásvesztesége, mint 35dB az 500, 1000 vagy 2000 frekvenciák bármelyikén, vagy több mint 50dB 3000 Hz frekvencián.

6. 3. 4. 1. 1. Az a folyamodó, akinek a hallásvesztesége nagyobb, mint a fentiekben ismertetett értékek, alkalmasnak minősíthető feltéve, ha a folyamodó hallásteljesítménye normális olyan háttérzaj ellenében, mely hűen visszaadja, vagy utánozza a fedélzeti zaj álcázott jellegét (tulajdonságait) a beszéd vagy a jeladók ellenében.

1. Megjegyzés – Fontos, hogy a háttérzaj tipikus legyen annak a légijármű típusnak a pilótafülkéjében előforduló zajok tekintetében, melyre a folyamodó szakszolgálati engedélye vagy jogosításai érvényesek.

2. Megjegyzés – Megkülönböztetési vizsgálathoz a beszédanyagban rendszerint mind a repülésben használatos kifejezéseket, mind pedig fonetikailag azonos értékű szavakat használnak.

6. 3. 4. 1. 2. Vagylagosan, egy gyakorlati halláspróbát lehet végrehajtani repülés közben annak a légijármű típusnak a fedélzetén, amelyre a folyamodó szakszolgálati engedélye és jogosításai érvényesek.

6. 4. II. osztályú Egészségügyi Minősítés

6. 4. 1. A minősítés kiadása és megújítása

6. 4. 1. 1. A magánpilóta – repülőgép, léghajó, helikopter, vagy motoros szerkezet, a vitorlázó repülőgép pilóta vagy a szabadon repülő ballon pilóta szakszolgálati engedélyért folyamodónak, valamint a hajózómérnök, vagy a hajózó rádiós szakszolgálati engedélyért folyamodónak egy kezdeti orvosi vizsgálaton kell részt venni a II. osztályú Egészségügyi Minősítés kiadása céljából.

6. 4. 1. 2. Ha ebben a fejezetben mást nem írnak elő, a magánpilóta – repülőgép, léghajó, helikopter, vagy motoros szerkezet szakszolgálati engedélyek birtokosa, valamint a vitorlázó repülőgép pilóta, a szabadon repülő ballon pilóta szakszolgálati engedélyek birtokosai, és a hajózó mérnök, a hajózó navigátor szakszolgálati engedély birtokosainak II. osztályú Egészségügyi Minősítéssel kell rendelkezni, melyet az 1. 2. 5. 2 pontban meghatározott időszakokat meg nem haladó gyakorisággal kell megújítani.

6. 4. 1. 3. Ha az Engedélyező Hatóság kielégítőnek találja a jelen fejezet, valamint a 6. 1 és a 6. 2 pontok általános előírásainak teljesítését, akkor ki kell adnia a II. osztályú Egészségügyi Minősítést a folyamodó részére.

6. 4. 2. Fizikai és mentális követelmények

Az orvosi vizsgálatot az alábbi követelményekre kell alapozni:

6. 4. 2. 1. A folyamodó nem szenvedhet semmilyen betegségben vagy rokkantságban, melynek következtében valószínűsíthető, hogy hirtelen képtelenné válik a légijármű biztonságos üzemeltetésére vagy kijelölt feladatainak biztonságos végrehajtására.

6. 4. 2. 2. A folyamodó kórelőzményében, vagy klinikai diagnózisában nem szerepelhetnek az alábbiak:

a) szervi vagy elmebeli rendellenesség,

b) pszichoaktív szerek használata miatt bekövetkezett elmebeli vagy viselkedésbeli rendellenesség, ez magába foglalja a függőség tünetcsoportot, melyet alkohol, vagy egyéb pszichoaktív anyagok idéznek elő,

c) skizofrénia, vagy tudathasadás-jellegű betegség, érzékcsalódás,

d) kedélyállapoti rendellenesség (mániás-depressziós pszichózis)

e) idegrendszeri zavar, stressz okozta, vagy szomatikus zavar

f) magatartással kapcsolatos tünetcsoport, mely pszichológiai zavarokkal, vagy testi tényezőkkel társul,

g) felnőttkori személyiség- vagy magatartás zavar, különösen, ha bűncselekmény kísérletek ismétlődésében mutatkozik meg,

h) szellemi lassultság,

i) pszichológiai fejlődési rendellenesség,
j) magatartásbeli vagy érzelmi zavar, mely a gyermekkorban vagy a serdülőkorban jelentkezett először, vagy
k) más módon meg nem határozott elmezavar

mely a folyamodót képtelenné teheti arra, hogy biztonságosan gyakorolja meglévő szakszolgálati engedélye vagy a kért szakszolgálati engedélye jogait.

Megjegyzés – Az elmebeli és magatartásbeli rendellenességek az Egészségügyi Világszervezet klinikai leírásai és diagnosztikai irányelvei szerint vannak meghatározva, ahogy *azokat közzétették a* Nemzetközi Statisztikai Betegség Osztályozás és a Kapcsolatos Egészségügyi Problémák című kiadványban, 10. kiadás- Elmebeli és Magatartásbeli zavarok, WHO 1992.
Ez a dokumentum a diagnosztikai követelmények részletes leírását tartalmazza, melyek hasznosak lehetnek az egészségügyi minősítésben történő alkalmazásra.

6. 4. 2. 3. A folyamodó kórelőzményében, illetve klinikai diagnózisában nem szerepelhet az alábbiak közül egyik sem:

a) az idegrendszer kifejlett (progressive) vagy nem-kifejlett (non-progressive) betegsége, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában,

b) epilepszia,

c) bármilyen tudatzavar, az ok kielégítő orvosi magyarázata nélkül.

6. 4. 2. 4. A folyamodó nem szenvedhet semmilyen fejsérülésben, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye vagy jogosítása jogainak gyakorlásában.

6. 4. 2. 5. A folyamodónak nem lehet semmiféle szív-rendellenessége, se vele született, se szerzett, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak gyakorlásában.

6. 4. 2. 5. 1. Azt a folyamodót, aki koszorúverőér by-pass műtéten, vagy érplasztikán (angioplastry) (stent felvezetése mellett, vagy anélkül), vagy egyéb szívben végrehajtott beavatkozáson esett át, vagy ha volt szív- infarktus kórelőzménye, vagy aki bármilyen egyéb potenciálisan cselekvőképtelenséget okozó szívbetegségben szenved, azt alkalmatlannak kell minősíteni feltéve, ha a folyamodó szívének állapotát megvizsgálták és értékelték a legjobb orvosi gyakorlat szerint és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 4. 2. 5. 2. Azt a folyamodót, akinek abnormális a szívritmusa, alkalmatlannak kell tekinteni,

feltéve, ha a szabálytalan szívműködést (aritmia) kivizsgálták és értékelték a legjobb orvosi gyakorlatnak megfelelően, és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – Tájékoztató anyag a szív érrendszerének (cardiovascular) értékeléséhez a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 4. 2. 6. Az EKG vizsgálat (electrocardiography) a szakszolgálati engedély első alkalommal történő kiadásához szükséges szívvizsgálat része kell, hogy legyen 40 éves életkor felett.

6. 4. 2. 6. 1. A folyamodó ismételt egészségügyi vizsgálatának része kell, hogy legyen az EKG vizsgálat 50 éves életkor felett, nem kevesebb, mint kétévente.

6. 4. 2. 6. 2. **Ajánlás –** *A szívvizsgálatnak az EKG vizsgálat része kell, hogy legyen az Egészségügyi Minősítés első kiadásakor.*

1. Megjegyzés – A rutin EKG vizsgálatot diagnosztikus célra végzik. Ez nem szolgál elegendő bizonyítékul az alkalmatlanság megítéléséhez, további alapos érrendszeri kivizsgálást kell végezni.

2. Megjegyzés – A nyugalmi és a terheléses EKG-ra vonatkozó tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC8984) található.

6. 4. 2. 7. A szisztolés és a diaszisztolés vérnyomásnak a normál határokon belül kell lenni.

6. 4. 2. 7. 1. A magas vérnyomás beállítására alkalmazott gyógyszerek használata kizáró ok, kivéve azon gyógyszereket, melyeknek a használata összeegyeztethető a folyamodó szakszolgálati engedélye és jogosítása biztonságos gyakorlásával.

Megjegyzés – Ezen témakörben irányelveket a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

6. 4. 2. 8. Az érrendszernek sem jelentős működésbeli, sem felépítésbeli rendellenessége nem lehet.

6. 4. 2. 9. A tüdőnek nem lehet sem akut elváltozása, sem a tüdő bármely részegységének, a mediasstinumnak vagy a mellhártyának semmilyen aktív betegsége, mely valószínűleg a cselekvőképesség tüneteit eredményezi a normál és a veszélyhelyzetekben.

6. 4. 2. 9. 1. ***Ajánlás –*** *Olyan esetekben, amikor tünetmentes tüdőbaj feltételezhető, a mellkas radiográfia- vizsgálata része kell, hogy legyen az első és a további újbóli vizsgálatoknak.*

6. 4. 2. 10. Krónikus elzáródásos tüdőbajban (obstructive pulmonary disease) szenvedő folyamodót alkalmatlannak kell tekinteni kivéve, ha a folyamodó állapotát kivizsgálták és a lehető legjobb orvosi gyakorlatnak megfelelően értékelték, és olyan minősítést kapott, mely szerint nem valószínű, hogy ez akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 4. 2. 11. Azt a folyamodót, akinek asztmája van, mely jelentős tüneteket okoz, vagy valószínű, hogy a cselekvőképtelenség tüneteit idézi elő a normál, vagy veszélyhelyzeti üzemelés alatt, alkalmatlannak kell tekinteni.

6. 4. 2. 11. 1. Az asztma kezelésére szolgáló drogok használata kizáró ok, kivéve azokat a gyógyszereket, melyeknek alkalmazása összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítványa jogainak biztonságos gyakorlásával.

Megjegyzés – A gyógyszerek és drogok veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.

6. 4. 2. 12. Az aktív tüdőtuberkulózisban szenvedő folyamodót alkalmatlannak kell tekinteni.

6. 4. 2. 12. 1. Azt a folyamodót, akinél nyugvó vagy gyógyult maradványok vannak, melyekről ismert, hogy tuberkulózis okozta, vagy feltehetően ilyen eredetű, alkalmasnak lehet minősíteni.

1. Megjegyzés – A légzőszervi betegségek minősítéséhez irányelveket a Polgári Repülés Egészségügyi Kézikönyv (DOC 8984) tartalmaz.

2. Megjegyzés – A *gyógyszerek és drogok veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.*

6. 4. 2. 13. A folyamodónak teljesen mentesnek kell lennie olyan típusú sérvektől, melyek a cselekvőképtelenség tüneteinek előfordulását idézhetik elő.

6. 4. 2. 13. 1. Azokat a folyamodókat, akiknél a gyomor- béltraktusban, vagy annak védőszerveiben jelentős funkciócsökkenés áll fenn, alkalmatlannak kell minősíteni.

6. 4. 2. 14. A folyamodót alkalmatlannak kell minősíteni, ha az emésztőszervek, vagy védőszerveinek bármely része betegség következtében, vagy sebészi beavatkozás következtében valószínűleg cselekvőképtelenséget okoz repülés közben, különösen, ha bármilyen elzáródás alakul ki szűkület vagy összenyomódás által.

6. 4. 2. 14. 1. **Ajánlás –** *Azt a folyamodót, akinél az epevezetékekben, vagy az emésztőszervekben és védőszerveiben nagyobb sebészi beavatkozás történt, melynek során ezen szervek bármelyikét részben vagy egészben eltávolították, vagy elvezették, alkalmatlannak kell minősíteni addig, amíg az egészségügyi minősítő, hozzáférvén az adott operáció részleteihez, úgy ítéli meg, hogy az operáció következményei nem valószínű, hogy cselekvőképtelenséget okoznak repülés közben.*

6. 4. 2. 15. A folyamodót alkalmatlannak kell minősíteni, ha anyagcsere, táplálkozási, vagy belső elválasztású mirigyek zavara áll fenn, melyek valószínűleg gátolják a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 4. 2. 16. Az inzulin-kezelt cukorbeteg (diabetes mellitus) folyamodót alkalmatlannak kell minősíteni.

6. 4. 2. 16. 1. Azt a folyamodót, akinél nem inzulin-kezelt cukorbetegség (diabetes mellitus) áll fenn, alkalmatlannak kell minősíteni feltéve, ha a körülmények azt mutatják, hogy ez csak diétával, vagy diéta és szájon át szedhető olyan anti-diabetikus gyógyszer kombinációjával kielégítően ellenőrzés alatt tartható, mely összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásával.

Megjegyzés – A cukorbeteg folyamodók minősítéséhez irányelveket a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

6. 4. 2. 17. Azokat a folyamodókat, akik a vér- és/vagy a nyirokrendszer betegségeiben szenvednek, alkalmatlannak kell minősíteni feltéve, ha kellően kivizsgálták, és állapotukat olyannak találták, mely nem valószínű, hogy megakadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – A sarlósejt egyéni jellegzetesség, vagy egyéb vörös vérfestékből származó egyéni jellegzetesség rendszerint összeegyeztethető az alkalmas minősítéssel.

6. 4. 2. 18. Vese, vagy húgy- és ivarszervi betegségben szenvedő folyamodókat alkalmatlannak kell minősíteni, feltéve, ha megfelelően kivizsgálták, és állapotukat olyannak találták, melynél nem valószínű, hogy szakszolgálati engedélyük vagy jogosításuk jogainak biztonságos gyakorlását akadályozná.

6. 4. 2. 18. 1. A húgyutak vizsgálata része kell, hogy legyen az egészségügyi felülvizsgálatnak és a rendellenességeket megfelelően fel kell deríteni.

Megjegyzés – A húgyutak vizsgálatához és a rendellenességek felderítéséhez irányelvek a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) találhatók.

6. 4. 2. 19. Azokat a folyamodókat, akiknek a veséjében vagy a húgyutakban és ivarszervekben betegség, vagy sebészi beavatkozás fordult elő, különösen, ha szűkület vagy összenyomódás okozta elzáródás tapasztalható, alkalmatlannak kell minősíteni feltéve, ha a folyamodó állapotát kivizsgálják és a lehető legjobb orvosi gyakorlatnak megfelelően értékelik ki, és úgy minősítik, hogy nem áll fenn a valószínűsége annak, hogy a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában ez akadályozná.

6. 4. 2. 19. 1. Azokat a folyamodókat, akiknek az egyik veséjét eltávolították, alkalmatlannak kell minősíteni, kivéve, ha az állapota jól kompenzált.

6. 4. 2. 20. Azokat a folyamodókat, akik szerzett immunhiányos szindrómában (AIDS) szenvednek, alkalmatlannak kell minősíteni.

6. 4. 2. 20. 1. Azokat a folyamodókat, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), alkalmatlannak kell minősíteni feltéve, ha a teljes kivizsgálás azt bizonyítja, hogy klinikai betegség nyilvánvalóan nem áll fenn.

1. Megjegyzés – Azoknál a folyamodóknál, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), az értékelés során különleges figyelmet kell fordítani az elmebeli állapotra, ideértve a diagnózis lélektani hatásait is.

2. Megjegyzés – Irányelvek azon folyamodók minősítésére, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

6. 4. 2. 21. Azokat a folyamodókat, akik nőgyógyászati rendellenességben szenvednek, melyek valószínűleg akadályozzák szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában, alkalmatlannak kell minősíteni.

6. 4. 2. 22. Azokat a folyamodókat, akik terhesek, alkalmatlannak kell minősíteni feltéve, ha a szülészeti értékelés és a folyamatos orvosi felülvizsgálat azt mutatja, hogy ez egy alacsony kockázatú komplikációmentes terhesség.

6. 4. 2. 22. 1. **Ajánlás** – *Azon folyamodónál, akinek terhessége alacsony kockázatú komplikációmentes, és akit a 6. 4. 2. 22. pontnak megfelelően értékeltek és felülvizsgáltak, alkalmasságának minősítését a terhesség12. hetének végétől a 26. hét végéig terjedő időszakra kell korlátozni.*

6. 4. 2. 23. A terhesség végét, vagy a szülést követően a folyamodónak nem engedélyezett a szakszolgálati engedélye jogainak gyakorlása egészen addig, amíg ismételt orvosi értékelésen át nem esett, melyet a lehető legjobb orvosi gyakorlat szerint hajtottak végre, és meg nem állapították, hogy a folyamodó képes a szakszolgálati engedélye és jogosításai jogainak biztonságos gyakorlására.

6. 4. 2. 24. A folyamodó nem szenvedhet a csontokat, izületeket, izmokat, inakat, vagy a hozzájuk kapcsolódó struktúrákat illetően semmilyen rendellenességben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – Bármely, a csontokat, izületeket, izmokat vagy inakat érintő sérülés következménye és bizonyos anatómiai fogyatékosságok rendszerint funkcionális minősítést igényelnek az alkalmasság meghatározása céljából.

6. 4. 2. 25. A folyamodó nem szenvedhet semmilyen a füllel és a hozzá tartozó struktúrákkal kapcsolatos rendellenességben vagy betegségben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 4. 2. 26. Nem lehet:
a) a fültornác működésének semmiféle zavara,

b) Az Eustach kürtök jelentős rendellenes működése, és

c) be nem gyógyult perforáció a dobhártyán.

6. 4. 2. 26. 1. Egyoldali száraz perforáció a dobhártyán nem szükségszerűen jelenti azt, hogy a folyamodó alkalmatlan.

Megjegyzés – A fültornác működésének kipróbálására vonatkozó irányelvek a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) találhatók.

6. 4. 2. 27. Nem lehet:

a) semmiféle elzáródás az orrban, és

b) a szájüregnek, vagy a felső légutaknak semmiféle betegsége vagy deformáltsága,

mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 4. 2. 28. Azt a folyamodót, aki dadog, vagy egyéb beszédhibával rendelkezik, mely eléggé súlyos ahhoz, hogy zavart okozzon a beszéd összeköttetésben, alkalmatlannak kell minősíteni.

6. 4. 3. Látásra vonatkozó követelmények

Az egészségügyi vizsgálatot az alábbi követelményekre kell alapozni:

6. 4. 3. 1. A szem és a védőszerveinek működése legyen normál állapotú. Nem lehetnek ezek aktív kóros állapotban, akut vagy krónikus formában, sem sebészeti beavatkozás, vagy trauma következményei a szemben vagy annak védőszervein, melyek valószínűleg csökkentik a megfelelő látási funkciót olymértékben, mely már akadályozza a folyamodót abban, hogy szakszolgálati engedélye vagy jogosítása jogait biztonságosan gyakorolja.

6. 4. 3. 2. A folyamodó látásélessége korrekcióval vagy korrekció nélkül legalább 6/9 legyen, vagy ettől több, mindkét szemet külön mérve, és a két szemmel látás élességének 6/6 értékűnek, vagy ettől jobbnak kell lennie. A nem korrigált látásélességre korlátozás nem vonatkozik. Ha ezt a szabvány látásélességet korrigáló lencsékkel (szemüveggel) el lehet érni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha:

a) az ilyen korrigáló szemüveget mindvégig viseli, mialatt szakszolgálati engedélyének jogosítványait és jogosítását gyakorolja, és

b) ezen felül egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

Megjegyzés – A folyamodót mindaddig úgy tekintik, mint aki eleget tesz ezen előírásoknak, ameddig nincs ok a gyanúra, mely esetben egy szemészeti jelentés szükséges az Engedélyező Hatóság döntéséhez. Mind a korrigált, mind a nem korrigált látásélességet rendszeresen mérik és naplózzák minden egyes újbóli vizsgálatnál. A szemészeti jelentést igénylő körülmények magukba foglalják a nem korrigált látásélesség lényeges romlását, a legoptimálisabban korrigált látásélesség bármilyen romlását, és a szem megbetegedésének esetét, a szemsérülést, vagy a szemműtétet.

6. 4. 3. 2. 1. A folyamodó viselhet kontaktlencsét ezen követelmény kielégítésére, feltéve, ha:

a) a szemüveglencse egyfókuszú (monofocal) és nem színezett,

b) a szemüveg viselését jól tolerálja, és

c) egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

Megjegyzés - A folyamodónak, aki kontaktlencsét visel, nem feltétlenül kell korrekció nélküli látásélességet mérni minden egyes újbóli vizsgálatnál feltéve, hogy a kontaktlencse receptje ismert.

6. 4. 3. 2. 2. A nagy fénytörési hibában szenvedő folyamodónak kontaktlencsét, vagy nagy törésű szemüveget kell használnia.

Megjegyzés - Ha szemüveget használ, nagy törésű lencsék szükségesek a periférikus mezőtorzítás minimalizálására.

6. 4. 3. 2. 3. **Ajánlás –** *Annak a folyamodónak, akinek korrigálás nélküli távollátás élessége bármelyik szeménél 6/60-nál rosszabb értékű, egy teljes szemészeti bizonyítványt kell beszereznie az első Egészségügyi Minősítés előtt, és ezután minden 5. évben.*

1. *Megjegyzés – Az előírt szemvizsgálat célja (1) a normál látásképességről meggyőződni, és (2) bármilyen szignifikáns kóros állapotot azonosítani.*

2. Megjegyzés – Az 1. 2. 4. 8 pont előírásainak megfelelően az egy szemmel látó (monocular) folyamodó minősítéséhez tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 4. 3. 3. Ha a folyamodó olyan műtéten esett át, mely befolyásolja a szem törésállapotát, akkor őt alkalmatlannak kell minősíteni egészen addig, amíg mentesek nem lesznek szemei mindazon következményektől, melyek valószínűleg akadályozzák szakszolgálati engedélye jogosítványainak és jogosításának biztonságos gyakorlásában.

6. 4. 3. 4. A folyamodónak képesnek kell lennie arra, hogy elolvassa az N5 táblát vagy ennek megfelelőt – ha korrigálás céljából szemüveget visel, melyet a 6. 4. 3. 2 pontban írnak elő, – a folyamodó által megválasztott 30-50 cm-es távolságból. Ha ennek a követelménynek csak közel-látás korrekcióval tud megfelelni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha ezt a közel-látás korrekciót hozzáadják a 6. 4. 3. 2. pontnak megfelelően már előírt szemüveg korrekció értékéhez. Ha ilyent nem írtak elő, egy olvasó szemüveget használatra készen mindig magánál kell tartania mindvégig, amíg a szakszolgálati engedély jogosítványait gyakorolja. Ha közel-látás korrekció szükséges, a folyamodónak demonstrálnia kell, hogy egyetlen szemüveg elegendő számára mind a közel-látási, mind a távol-látási követelmények kielégítésére.

1. Megjegyzés – Az N5 a használt betűtípust jelöli. További részletek a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

2. Megjegyzés – Azon folyamodónak, akinek közel-látás korrekcióra van szüksége ahhoz, hogy megfeleljen ezen előírásnak, „átnéző", bifokális vagy talán multifokális szemüvegre van szüksége mind a műszerek jelzéseinek leolvasásához, mind pedig egy térkép vagy könyv olvasásához, melyet a kezében tart, és ahhoz, hogy a szemüveg levétele nélkül az ablakon keresztül a távolba is élesen tudjon látni. A csak egyféle, közel-látás korrekciót biztosító szemüveg (teljes felületén azonos dioptriájú lencse, olvasáshoz való) jelentősen csökkenti a távolbalátás élességét és ezért nem elfogadható.

3. Megjegyzés – Ha korrekciós lencse beszerzésére vagy megújítására van szükség, a folyamodótól elvárják, hogy a szemüveget készítő optikust tájékoztassa arról, mekkorák az olvasási távolságok a fedélzeti feladatok látással történő végrehajtásához azokon a légijárműveken, amelyeken várhatóan dolgozni fog.

6. 4. 3. 4. 1. Ha ezen pont előírásai értelmében közel-látás korrekció szükséges, egy második közel-látó szemüveget kell a folyamodónak magánál tartania azonnali használatra készen.

6. 4. 3. 5. A folyamodótól megkövetelik, hogy normál látótérrel rendelkezzen.

6. 4. 3. 6. A folyamodótól megkövetelik, hogy mindkét szemmel való látása normál legyen.

6. 4. 3. 6. 1. Nem feltétlenül kizáró ok a csökkent térhatás (stereopsis), az abnormális konvergencia, mely nem gátolja a közel-látást, valamint a szem eltérése az egytengelyűségtől, ahol a fuzionális tartalékok kielégítőek ahhoz, hogy megakadályozzák az asthenopia-t és a kettős látást.

6. 4. 4. Hallással kapcsolatos követelmények

Megjegyzés - Felhívjuk a figyelmet a 2. 7. 1. 3. 1. pontra a már magánpilóta szakszolgálati engedéllyel rendelkező, műszeres jogosítás kiadását kérő folyamodóval szemben támasztott követelményekre.

6. 4. 4. 1. Azt a folyamodót, aki egy csendes szobában mindkét fülét használva nem képes hallani az átlagos társalgási beszédet, amikor 2 méter távolságra, hátát a vizsgáló személy felé fordítva helyezkedik el, alkalmatlannak kell minősíteni.

6. 4. 4. 2. A folyamodónak, amikor tiszta-hang audiométerrel vizsgálják, nem lehet külön-külön fülenként nagyobb a hallásvesztesége, mint 35dB az 500, 1000 vagy 2000 frekvenciák bármelyikén, vagy több mint 50dB 3000 Hz frekvencián. Ha ettől több, alkalmatlannak kell minősíteni.

6. 4. 4. 3. **Ajánlás –** *Azt a folyamodót, aki nem elégíti ki a 6. 4. 4. 1. vagy a 6. 4. 4. 2. pontok követelményeit, további vizsgálatnak kell alávetni a 6. 3. 4. 1. 1. pontnak megfelelően.*

6. 5. III. osztályú Egészségügyi Minősítés

6. 5. 1. A minősítés kiadása és megújítása

6. 5. 1. 1. A légiforgalmi irányító szakszolgálati engedélyért folyamodónak első alkalommal egészségügyi vizsgálaton kell részt vennie a III. osztályú Egészségügyi Minősítés kiadása céljából.

6. 5. 1. 2. Ha jelen fejezetben egyéb nem szerepel, a légiforgalmi irányító szakszolgálati engedély birtokosának III. osztályú Egészségügyi Minősítését meg kell újítania az 1. 2. 5. 2. pontban feltüntetett időszakokat meg nem haladó intervallumokban.

6. 5. 1. 3. Ha az Engedélyező Hatóság meg van győződve arról, hogy a jelen fejezet követelményei és a 6. 1, valamint a 6. 2. általános előírásai kielégítően teljesültek, a III. osztályú Egészségügyi Minősítést ki kell adnia a folyamodónak.

6. 5. 2. Fizikai és mentális követelmények

6. 5. 2. 1. A folyamodó nem szenvedhet semmilyen betegségben vagy rokkantságban, melynek következtében valószínűsíthető, hogy hirtelen képtelenné válik feladatainak biztonságos végrehajtására.

6. 5. 2. 2. A folyamodó kórelőzményében, vagy klinikai diagnózisában nem szerepelhetnek az alábbiak:

a) szervi vagy elmebeli rendellenesség,

b) pszichoaktív szerek használata miatt bekövetkezett elmebeli vagy viselkedésbeli rendellenesség, ez magába foglalja a függőség tünetcsoportot, melyet alkohol, vagy egyéb pszichoaktív anyagok idéznek elő,

c) skizofrénia, vagy tudathasadás-jellegű betegség, érzékcsalódás,

d) kedélyállapoti rendellenesség (mániás-depressziós pszichózis)

e) idegrendszeri zavar, stressz okozta, vagy szomatikus zavar

f) magatartással kapcsolatos tünetcsoport, mely pszichológiai zavarokkal vagy testi tényezőkkel társul,

g) felnőttkori személyiség- vagy magatartás zavar, különösen, ha ismétlődő bűncselekmény kísérletekben mutatkozik meg,

h) szellemi lassultság,

i) pszichológiai fejlődési rendellenesség,

j) magatartásbeli vagy érzelmi zavar, mely a gyermekkorban vagy a serdülőkorban jelentkezett először, vagy

k) más módon meg nem határozott elmezavar

mely a folyamodót képtelenné teheti arra, hogy biztonságosan gyakorolja meglévő szakszolgálati engedélye vagy a kért szakszolgálati engedélye jogait.

Megjegyzés – Az elmebeli és magatartásbeli rendellenességek az Egészségügyi Világszervezet klinikai leírásai és diagnosztikai irányelvei szerint vannak meghatározva, ahogy *azokat közzétették a* Nemzetközi Statisztikai Betegség Osztályozás és a Kapcsolatos Egészségügyi Problémák című kiadványban, 10. kiadás- Elmebeli és Magatartásbeli zavarok, WHO 1992.
Ez a dokumentum a diagnosztikai követelmények részletes leírását tartalmazza, melyek hasznosak lehetnek az egészségügyi minősítésben történő alkalmazásra.

6. 5. 2. 3. A folyamodó kórelőzményében, illetve klinikai diagnózisában nem szerepelhet az alábbiak közül egyik sem:
a) az idegrendszer kifejlett (progressive) vagy nem-kifejlett (non-progressive) betegsége, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában,

b) epilepszia,

c) bármilyen tudatzavar, az ok kielégítő orvosi magyarázata nélkül.

6. 5. 2. 4. A folyamodó nem szenvedhet semmilyen fejsérülésben, melynek hatásai valószínűleg akadályozzák a folyamodót szakszolgálati engedélye vagy jogosítása jogainak gyakorlásában.

6. 5. 2. 5. A folyamodónak nem lehet semmiféle szív-rendellenessége, se vele született, se szerzett, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak gyakorlásában.

6. 5. 2. 5. 1. Azt a folyamodót, aki koszorúverőér by-pass műtéten, vagy érplasztikán (angioplastry) (stent felvezetése mellett, vagy anélkül), vagy egyéb szívben végrehajtott beavatkozáson esett át, vagy ha volt szív- infarktus kórelőzménye, vagy aki bármilyen egyéb potenciálisan cselekvőképtelenséget okozó szívbetegségben szenved, azt alkalmatlannak kell minősíteni feltéve, ha a folyamodó szívének állapotát megvizsgálták és értékelték a legjobb orvosi gyakorlat szerint és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 5. 2. Azt a folyamodót, akinek abnormális a szívritmusa, alkalmatlannak kell tekinteni, feltéve, ha a szabálytalan szívműködést (aritmia) kivizsgálták és értékelték a legjobb orvosi gyakorlatnak megfelelően, és úgy minősítették, hogy nem valószínű, hogy ez akadályozni fogja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – Tájékoztató anyag a szív érrendszerének (cardiovascular) értékeléséhez a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 5. 2. 6. Az elektrokardiográf (EKG) vizsgálat része kell, hogy legyen a szív-vizsgálatnak az Egészségügyi Minősítés első kiadásához.

6. 5. 2. 6. 1. Az EKG vizsgálatot el kell végezni az ismételt egészségügyi felülvizsgálatok alkalmával is, ha a folyamodó betöltötte az 50. életévét, de nem gyakrabban, mint kétévenként.

1. Megjegyzés – A rutin EKG vizsgálat diagnosztikai célú. További alapos szív- és érrendszeri vizsgálatok nélkül nem jelent kielégítő bizonyítékot az alkalmatlanság megítéléséhez.

2. Megjegyzés – A nyugalmi és a terheléses EKG-ra vonatkozó tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC8984) található

6. 5. 2. 7. A szisztolés és a diasztolés vérnyomásértékeknek a normál határokon belül kell lenniük.

6. 5. 2. 7. 1. A magas vérnyomás beállítására alkalmazott gyógyszerek használata kizáró ok, kivéve azon gyógyszereket, melyeknek alkalmazása összeegyeztethető a folyamodó szakszolgálati engedélye és jogosítása biztonságos gyakorlásával.

Megjegyzés – Ezen témakörben irányelveket a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

6. 5. 2. 8. Az érrendszernek sem jelentős működésbeli, sem felépítésbeli rendellenessége nem lehet.

6. 5. 2. 9. A tüdőnek nem lehet semmilyen betegsége, sem a tüdő bármely részegységének, a mediasstinumnak vagy a mellhártyának semmilyen aktív betegsége, mely valószínűleg a cselekvőképesség tüneteit eredményezi.

Megjegyzés - Mellkas radiográfiára rendszerint nincs szükség, de szükségessé válhat olyan esetekben, amikor tünetmentes tüdőbaj valószínűsége áll fenn.

6. 5. 2. 10. Krónikus elzáródásos tüdőbajban (obstructive pulmonary disease) szenvedő folyamodót alkalmatlannak kell tekinteni kivéve, ha a folyamodó állapotát kivizsgálták és a lehető legjobb orvosi gyakorlatnak megfelelően értékelték és olyan minősítést kapott, mely szerint nem valószínű, hogy ez akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 11. Azt a folyamodót, akinek asztmája van, mely jelentős tüneteket okoz, vagy valószínű, hogy cselekvőképtelenség tüneteit idézi elő a normál, vagy veszélyhelyzeti üzemelés alatt, alkalmatlannak kell tekinteni.

6. 5. 2. 11. 1. Az asztma kezelésére szolgáló drogok használata kizáró ok, kivéve azokat a gyógyszereket, melyeknek alkalmazása összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítványa jogainak biztonságos gyakorlásával.

Megjegyzés – A gyógyszerek veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.

6. 5. 2. 12. Az aktív tüdőtuberkulózisban szenvedő folyamodót alkalmatlannak kell tekinteni.

6. 5. 2. 12. 1. Azt a folyamodót, kinél nyugvó vagy gyógyult maradványok vannak, melyekről ismert, hogy tuberkulózis okozta, vagy feltehetően ilyen eredetű, alkalmasnak lehet minősíteni.

1. Megjegyzés – A légzőszervi betegségek minősítéséhez irányelveket a Polgári Repülés Egészségügyi Kézikönyv (DOC 8984) tartalmaz.

2. Megjegyzés – A *gyógyszerek és drogok veszélyeiről irányelveket a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) lehet megtalálni.*

6. 5. 2. 13. Azt a folyamodót, akinél a gyomor- bélműködésben, vagy védőszerveiben jelentős károsodás áll fenn, alkalmatlannak kell minősíteni.

6. 5. 2. 14. A folyamodót alkalmatlannak kell minősíteni, ha betegség vagy sebészi beavatkozás történt az emésztőszervei bármely részében, vagy annak védőszerveiben, mely valószínűleg cselekvőképtelenséget okoz, különösen bármilyen elzáródás következtében, melyet szűkület vagy összenyomódás okozott.

6. 5. 2. 14. 1. **Ajánlás –** *Azt a folyamodót, akinél az epevezetékekben, vagy az emésztőszervekben és védőszerveiben nagyobb sebészi beavatkozás történt, melynek során ezen szervek bármelyikét részben vagy egészben eltávolították, vagy elvezették, alkalmatlannak kell minősíteni addig, amíg az egészségügyi minősítő, hozzáférvén az adott operáció részleteihez, úgy ítéli meg, hogy az operáció következményei nem valószínű, hogy cselekvőképtelenséget okoznak.*

6. 5. 2. 15. A folyamodót alkalmatlannak kell minősíteni, ha anyagcsere, táplálkozási, vagy belső elválasztású mirigyek zavara áll fenn, melyek valószínűleg gátolják a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 16. Az inzulin-kezelt cukorbeteg (diabetes mellitus) folyamodót alkalmatlannak kell minősíteni.

6. 5. 2. 16. 1. Azt a folyamodót, akinél nem inzulin-kezelt cukorbetegség (diabetes mellitus) áll fenn, alkalmatlannak kell minősíteni feltéve, ha a körülmények azt mutatják, hogy ez a csak diétával, vagy diéta és szájon át szedhető olyan anti-diabetikus gyógyszer kombinációjával kielégítően ellenőrzés alatt tartható, mely összeegyeztethető a folyamodó szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásával.

Megjegyzés – A cukorbeteg folyamodók minősítéséhez irányelveket a Polgári Repülés Egészségügyi Kézikönyve (DOC 8984) tartalmaz.

6. 5. 2. 17. Azokat a folyamodókat, akik a vér- és/vagy a nyirokrendszer betegségeiben szenvednek, alkalmatlannak kell minősíteni feltéve, ha kellően kivizsgálták, és állapotukat olyannak találták, mely nem valószínű, hogy megakadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 18. Vese, vagy húgy- és ivarszervi betegségben szenvedő folyamodókat alkalmatlannak kell minősíteni, feltéve, ha megfelelően kivizsgálták, és állapotukat olyannak találták, melynél nem valószínű, hogy szakszolgálati engedélyük vagy jogosításuk jogainak biztonságos gyakorlásában a folyamodót akadályozná.

6. 3. 2. 18. 1. A húgyutak vizsgálata része kell, hogy legyen az egészségügyi felülvizsgálatnak és a rendellenességeket megfelelően fel kell deríteni.

Megjegyzés – A húgyutak vizsgálatához és a rendellenességek felderítéséhez irányelvek a Polgári Repülés Egészségügyi Kézikönyvben (DOC 8984) találhatók.

6. 5. 2. 19. Azokat a folyamodókat, akiknek a veséjében vagy a húgyutakban és ivarszervekben betegség, vagy sebészi beavatkozás fordult elő, különösen, ha szűkület vagy összenyomódás okozta elzáródás tapasztalható, alkalmatlannak kell minősíteni feltéve, ha a folyamodó állapotát kivizsgálták és a lehető legjobb orvosi gyakorlatnak megfelelően értékelik ki, és úgy minősítik, hogy nem áll fenn a valószínűsége annak, hogy a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában ez akadályozná.

6. 5. 2. 19. 1. Azokat a folyamodókat, akiknek az egyik veséjét eltávolították, alkalmatlannak kell minősíteni, kivéve, ha az állapota jól kompenzált.

6. 5. 2. 20. Azokat a folyamodókat, akik szerzett immunhiányos szindrómában (AIDS) szenvednek, alkalmatlannak kell minősíteni.

6. 5. 2. 20. 1. Azokat a folyamodókat, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), alkalmatlannak kell minősíteni feltéve, ha a teljes kivizsgálás azt bizonyítja, hogy klinikai betegség nyilvánvalóan nem áll fenn.

1. Megjegyzés – Azoknál a folyamodóknál, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), az értékelés során különleges figyelmet kell fordítani az elmebeli állapotra, ideértve a diagnózis lélektani hatásait is.

2. Megjegyzés – Irányelvek azon folyamodók minősítésére, akik szérumpozitívak az emberi immunhiányos vírusra (HIV), a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

6. 5. 2. 21. Azokat a folyamodókat, akiknél nőgyógyászati rendellenesség áll fenn, mely valószínűleg gátolja a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában, alkalmatlannak kell minősíteni.

6. 5. 2. 22. Azokat a folyamodókat, akik terhesek, alkalmatlannak kell minősíteni feltéve, ha a szülészeti értékelés és a folyamatos egészségügyi felülvizsgálat azt mutatja, hogy a folyamodó terhessége alacsony-kockázatú komplikációmentes terhesség.

6. 5. 2. 22. 1. **Ajánlás –** *A terhesség kihordási ideje alatt óvatosságot kell tanúsítani a légiforgalmi irányító kellő időben történő tehermentesítésére a korai munkakezdés, vagy az egyéb komplikációk*

esetében.

6. 5. 2. 22. 2. **Ajánlás** – *Azon folyamodóknál, akiknek terhessége alacsony-kockázatú komplikációmentes, és amelyet a 6. 5. 2. 22. pont szerint értékeltek és felülvizsgáltak, az alkalmasság minősítését a terhesség 34. hetének végéig terjedő időszakra kell korlátozni.*

6. 5. 2. 23. A terhesség végét, vagy a szülést követően a folyamodónak nem engedélyezett szakszolgálati engedélye jogainak gyakorlása addig, amíg egy értékelésen át nem esett, melyet a lehető legjobb orvosi gyakorlat szerint hajtottak végre, és meg nem állapították, hogy a folyamodó képes a szakszolgálati engedélye és jogosításai jogainak biztonságos gyakorlására.

6. 5. 2. 24. A folyamodó nem szenvedhet a csontokat, izületeket, izmokat, inakat, vagy a hozzájuk kapcsolódó struktúrákat illetően semmilyen rendellenességben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

Megjegyzés – Bármely, a csontokat, izületeket, izmokat vagy inakat érintő sérülés következménye, és bizonyos anatómiai fogyatékosságok rendszerint funkcionális minősítést igényelnek az alkalmasság meghatározása céljából.

6. 5. 2. 25. A folyamodó nem szenvedhet semmilyen a füllel, és a hozzá tartozó struktúrákkal kapcsolatos rendellenességben vagy betegségben, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 26. A folyamodó az orr, a szájüreg, vagy a felső légutak semmiféle deformáltságában, vagy betegségében nem szenvedhet, mely valószínűleg akadályozza a folyamodót szakszolgálati engedélye vagy jogosítása jogainak biztonságos gyakorlásában.

6. 5. 2. 27. Alkalmatlannak kell minősíteni azt a folyamodót, aki dadog, vagy egyéb beszédhibával rendelkezik, mely eléggé komoly ahhoz, hogy zavart okozzon a beszéd összeköttetésben.

6. 5. 3. Látással kapcsolatos követelmények

Az egészségügyi vizsgálatot az alábbi követelményekre kell alapozni:

6. 5. 3. 1. A szem és a védőszerveinek működése legyen normál állapotú. Nem lehetnek ezek aktív kóros állapotban, akut vagy krónikus formában, sem sebészeti beavatkozás, vagy trauma következményei a szemben vagy annak védőszervein, melyek valószínűleg csökkentik a megfelelő látási funkciót olymértékben, mely már akadályozza a folyamodót abban, hogy szakszolgálati engedélye vagy jogosítása jogait biztonságosan gyakorolja.

6. 5. 3. 2. A folyamodó látásélessége korrekcióval vagy korrekció nélkül legalább 6/9 legyen, vagy ettől több, mindkét szemet külön mérve, és a két szemmel látás élességének 6/6 értékűnek, vagy ettől jobbnak kell lennie. A nem korrigált látásélességre korlátozás nem vonatkozik. Ha ezt a szabvány látásélességet korrigáló lencsékkel (szemüveggel) el lehet érni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha:

a) az ilyen korrigáló szemüveget mindvégig viseli, mialatt szakszolgálati engedélyének jogosítványait és jogosítását gyakorolja, és

b) ezen felül egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

Megjegyzés – A folyamodót mindaddig úgy tekintik, mint aki eleget tesz ezen előírásoknak, ameddig nincs ok a gyanúra, mely esetben egy szemészeti jelentés szükséges az Engedélyező Hatóság döntéséhez. Mind a korrigált, mind a nem korrigált látásélességet rendszeresen mérik és naplózzák minden egyes újbóli vizsgálatnál. A szemészeti jelentést igénylő körülmények magukba foglalják a nem korrigált látásélesség lényeges romlását, a legoptimálisabban korrigált látásélesség bármilyen romlását, és a szem megbetegedésének esetét, a szemsérülést, vagy a szemműtétet.

6. 5. 3. 2. 1. A folyamodó viselhet kontaktlencsét ezen követelmény kielégítésére feltéve, ha:

a) a szemüveglencse egyfókuszú (monofocal) és nem színezett,

b) a szemüveg viselését jól tolerálja, és

c) egy megfelelő tartalék szemüveget állandóan magánál tart szakszolgálati engedélye jogosítványainak gyakorlása alatt.

Megjegyzés - A folyamodónak, aki kontaktlencsét visel, nem feltétlenül kell korrekció nélküli látásélességet mérni minden egyes újbóli vizsgálatnál feltéve, hogy a kontaktlencse receptje ismert.

6. 5. 3. 2. 2. A nagy fénytörési hibában szenvedő folyamodónak kontaktlencsét, vagy nagy törésű szemüveget kell használnia.

Megjegyzés - Ha szemüveget használ, nagy törésű lencsék szükségesek a periférikus mezőtorzítás *minimalizálására.*

6. 5. 3. 2. 3. Annak a folyamodónak, akinek korrigálás nélküli távollátás élessége bármelyik szeménél 6/60-nál rosszabb értékű, egy teljes szemészeti bizonyítványt kell beszereznie az első Egészségügyi Minősítés előtt és ezután minden 5. évben.

1. Megjegyzés . – Az előírt szemvizsgálat célja (1) meggyőződni a normál látásképességről, és (2) bármilyen szignifikáns kóros állapotot azonosítani.

2. Megjegyzés – Az 1. 2. 4. 8 pont előírásainak megfelelően az egy szemmel látó (monocular) folyamodó minősítéséhez tájékoztató anyag a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) található.

6. 5. 3. 3. Ha a folyamodó olyan műtéten esett át, mely befolyásolja a szem törésállapotát, akkor őt alkalmatlannak kell minősíteni egészen addig, amíg mentesek nem lesznek szemei mindazon következményektől, melyek valószínűleg akadályozzák szakszolgálati engedélye jogosítványainak és jogosításának biztonságos gyakorlásában.

6. 5. 3. 4. A folyamodónak képesnek kell lennie arra, hogy elolvassa az N5 táblát vagy ennek megfelelőt – ha korrigálás céljából szemüveget visel,- melyet a 6. 5. 3. 2 pontban írnak elő, – a folyamodó által megválasztott 30-50 cm-es távolságból és képesnek kell lennie arra, hogy elolvassa az N14 táblát, vagy ennek megfelelőt 100 cm távolságból. Ha ennek a követelménynek csak közel-látás korrekcióval tud megfelelni, a folyamodót alkalmasnak lehet minősíteni feltéve, ha ezt hozzáadják a 6. 5. 3. 2. pontnak megfelelően már előírt szemüveg korrekció értékéhez. Ha ilyent nem írtak elő, egy olvasó szemüveget használatra készen mindig magánál kell tartania mindvégig, amíg a szakszolgálati engedély jogosítványait gyakorolja. Ha közel-látás korrekció szükséges, a folyamodónak demonstrálnia kell, hogy egyetlen szemüveg elegendő számára mind a közel-látási, mind a távol-látási követelmények kielégítésére.

1. Megjegyzés – Az N5 és az N14 a használt betűtípust jelöli. További részletek a Polgári Repülés Egészségügyi Kézikönyvében (DOC 8984) találhatók.

2. Megjegyzés – Azon folyamodónak, akinek közel-látás korrekcióra van szüksége ahhoz, hogy megfeleljen ezen előírásnak, „átnéző”, bifokális vagy talán multifokális szemüvegre van szüksége mind a műszerek jelzéseinek leolvasásához, mind pedig egy térkép vagy könyv olvasásához, melyet a kezében tart, és ahhoz, hogy a szemüveg levétele nélkül az ablakon keresztül a távolba is élesen tudjon látni. A csak egyféle, közel-látás korrekciót biztosító szemüveg (teljes felületén azonos dioptriájú lencse, olvasáshoz való) jelentősen csökkenti a távolbalátás élességét és ezért nem elfogadható.

3. Megjegyzés – Ha korrekciós lencse beszerzésére vagy megújítására van szükség, a folyamodótól elvárják, hogy a szemüveget készítő optikust tájékoztassa arról, mekkorák az olvasási távolságok a fedélzeti feladatok látással történő végrehajtásához azokon a légijárműveken, amelyeken várhatóan dolgozni fog.

6. 5. 3. 4. 1. Ha ezen pont előírásai értelmében közel-látás korrekció szükséges, egy második közel-látó szemüveget kell a folyamodónak magánál tartania azonnali használatra készen.

6. 5. 3. 5. A folyamodótól megkövetelik, hogy normál látótérrel rendelkezzen.

6. 5. 3. 6. A folyamodótól megkövetelik, hogy mindkét szemmel való látása normál legyen.

6. 5. 3. 6. 1. Csökkent stereopsis, abnormális konvergencia, mely akadályozza a közel-látást, és a szemtengelytől való eltérés, ahol a fúzionális tartalékok elegendőek ahhoz, hogy meggátolja az asthenopia-t és a diplopia-t, nem feltétlenül jelentenek alkalmatlansági okot.

6. 5. 4. Hallásra vonatkozó követelmények

6. 5. 4. 1. A folyamodó hallásvesztése, ha tiszta-hang audiometer-rel vizsgálják, mindkét fülét külön-külön vizsgálva, nem lehet több mint 35dB az 500, 1000, vagy 2000 Hz frekvenciáknál, vagy 50dB-nél több 3000 Hz frekvencián.

6. 5. 4. 1. 1. Azt a folyamodót, akinek a hallásvesztése meghaladja a fentieket alkalmasnak lehet minősíteni feltéve, hogy a folyamodó normál halláskészséggel rendelkezik olyan, a légiforgalmi irányítás munkahelyen tipikusan tapasztalt háttérzaj ellenében, melyet felidéznek, vagy szimulálnak.

1. Megjegyzés – A háttérzaj frekvencia- összetétele csak olyan mértékben meghatározott, hogy a 600-tól 4800 Hz-ig (beszéd frekvenciatartomány) terjedő frekvenciasáv megfelelően megjelenítésre kerüljön.

2. Megjegyzés – A megkülönböztetés kipróbálására szolgáló beszédanyagban mind repülési vonatkozású, mind fonetikailag kiegyensúlyozott szavakat kell rendes körülmények között használni.

6. 5. 4. 1. 2. Alternatívaként gyakorlati halláspróbát is végre lehet hajtani egy olyan légiforgalmi irányítás környezetben, mely jól jeleníti meg azt a munkahelyet, amelyre a folyamodó szakszolgálati engedélye és jogosításai érvényesek.

1. számú FÜGGELÉK

A RÁDIÓTÁVBESZÉLŐ ÖSSZEKÖTTETÉSBEN HASZNÁLATOS NYELVEK ISMERETÉNEK SZINTJÉRE VONATKOZÓ KÖVETELMÉNYEK

(Hivatkozással az 1. Fejezet, 1. 2. 9. Pontra)

1. Általános rész

Megjegyzés - Az ICAO nyelvtudásra vonatkozó követelményei magukba foglalják a 2. Szakaszban ismertetett részletező leírásokat és az „A” Mellékletben szereplő, az ICAO Nyelvtudás Szintjét Minősítő Táblázat Operatív Szintjét (4 Szint). A nyelvtudás követelményei mind a kifejezésmódokra, mind pedig az adott nyelven történő beszédre vonatkoznak.

Az 1. Fejezet 1. 2. 9. Szakaszban szereplő nyelvtudás követelmények kielégítéséhez az engedélyért folyamodónak vagy az engedély birtokosának az engedélyező hatóság számára elfogadható módon bizonyítania kell, hogy megfelel a 2. Szakaszban szereplő részletező leírásoknak, valamint az „A” Mellékletben szereplő ICAO Nyelvtudás Szintjét Minősítő Táblázat Operatív Szintjének (4. Szint).

2. Holisztikus (részletező) leírás

A jó nyelvtudással rendelkező személynek:

a) hatékonyan kell tudnia kommunikálni mind a hang-összeköttetésben (telefon/rádiótelefon), mind a személyes beszélgetés helyzeteiben,

b) pontosan és tisztán kell kommunikálnia általános, konkrét és a munkával kapcsolatos témákban,

c) megfelelő kommunikációs stratégiát kell használnia a közleményváltásokban, fel kell tudnia ismerni és megfejteni a félreértéseket (rosszul érthető részeket), (például: ellenőrizni, megerősíteni vagy tisztázni az információkat) az általános, és a munkával kapcsolatos szövegekben,

d) sikeresen és relatív gördülékenységgel kell kezelnie egy komplikáció, vagy váratlan események következtében előforduló nyelvi kihívásokat, melyek előadódhatnak a szokványos munkahelyzetekben, vagy olyan kommunikációs feladatokban, melyeket egyébként jól ismer, és

e) olyan dialektust, vagy hangsúlyozást kell használnia, melyet a légiforgalmi közösség megért.

2. számú FÜGGELÉK

JÓVÁHAGYOTT KIKÉPZÉSI SZERVEZET

(Lásd az 1. Fejezet 1. 2. 8. 2. pontot)

1. A jóváhagyás kiadása

1. 1. Egy kiképzési szervezet számára a jóváhagyás kiadása és a jóváhagyás folyamatos érvényessége attól függ, hogy a kiképzési szervezet fenntartja-e összhangját a jelen Függelék követelményeivel.

1. 2. A jóváhagyási okiratnak legalább az alábbiakat tartalmaznia kell:

a) a szervezet neve és helye,

b) a kiállítás dátuma és az érvényesség időtartama (ahol ez alkalmazható),

c) a jóváhagyás időtartama.

2. Kiképzési és eljárási kézikönyv

2. 1. A kiképzési szervezetnek biztosítania kell egy kiképzési és eljárási kézikönyvet az érdekelt személyzet tájékoztatására és használatára. Ezt a kézikönyvet különálló részekben is ki lehet adni, ennek legalább az alábbi információkat kell tartalmaznia:

a) a kiképzés általános leírása és működési területe, melyet a szervezet jóváhagyásának időtartamára engedélyeztek,

b) a felkínált kiképzési programok tartalma, magába foglalva a tanfolyamféleségeket és a használatos eszközöket,

c) a szervezet minőségbiztosítási rendszerének leírása a 4. pont szerint,

d) a szervezet felszereléseinek leírása,

e) azon személy neve, kötelmei és minősítése, aki felelős a 6. 1. pontban meghatározott jóváhagyási követelményeknek való megfelelésért,

f) azon személyek kötelmeinek és minősítésének leírása, akiket felelősnek jelöltek ki a kiképzés 6. 2. pont szerinti tervezéséért, végrehajtásáért és felügyeletéért,

g) az oktatószemélyzet alkalmasságát megalapozó és fenntartó eljárások leírását, a 6. 3. pontban előírtaknak megfelelően,

h) a 7. pontban előírt kiképzési személyi nyilvántartás végrehajtására és megőrzésére használatos módszerek leírása,

i) ahol alkalmazható, kiegészítő kiképzés leírása, mely szükséges ahhoz, hogy az üzemeltető eljárásainak és követelményeinek való megfelelést biztosítsa, és

j) ha egy Állam felhatalmazott egy jóváhagyott kiképzési szervezetet vizsgák végrehajtására, melyeket a szakszolgálati engedély vagy jogosítás kiadásához követelnek meg a 9. pontban foglaltaknak megfelelően, akkor a felhatalmazott személyek kiválasztásának, feladatainak és kötelmeinek leírása, valamint az Engedélyező Hatóság által megállapított alkalmazható követelmények leírása.

2. 2. A kiképzési szervezetnek gondoskodnia kell arról, hogy a kiképzési és eljárási kézikönyv módosításra kerüljön, amikor szükséges, annak érdekében, hogy a benne foglalt információk naprakészek legyenek.

2. 3. A kiképzési és eljárási kézikönyv módosításainak példányait haladéktalanul el kell juttatni az összes szervezethez, vagy személyhez, akik számára a kézikönyvet kiadták.

3. Kiképzési programok

3. 1. Az Engedélyező Hatóság jóváhagyhat egy magán-pilóta szakszolgálati engedélyre, kereskedelmi pilóta szakszolgálati engedélyre, vagy műszeres jogosításra vonatkozó kiképzési programot, mely a megfelelés egy alternatív módját engedi meg az Annex 1-ben meghatározott tapasztalati követelmények betartása mellett, feltéve, hogy a jóváhagyott kiképzési szervezet az Engedélyező Hatóság megelégedésére demonstrálja, hogy a kiképzés legalább egyenértékű szintű alkalmasságot biztosít ahhoz képest, mint amilyent az ilyen jóváhagyott kiképzésben nem részesülő személyzet minimális tapasztalati követelményei biztosítanak.

3. 2. Ha az Engedélyező Hatóság egy többszemélyes személyzet pilóta szakszolgálati engedély kiképzési programját hagyja jóvá, a jóváhagyott kiképzési szervezetnek demonstrálnia kell az Engedélyező Hatóság megelégedésére, hogy a kiképzés biztosítja a többszemélyes személyzet működésének azon alkalmassági szintjét, mely legalább azonos a kereskedelmi pilóta szakszolgálati engedély, a műszeres jogosítás és a típusjogosítás birtokosainak alkalmassági szintjével, olyan repülőgépen, melyet legalább két pilótából álló minimum személyzet általi üzemeltetésre jogosítottak.

Megjegyzés - A kiképzési programok jóváhagyására tájékoztató anyagot a Hajózó Személyzetek Kiképzési Szervezetei Jóváhagyásának Kézikönyve *(Doc 9841) tartalmaz.*

4. Minőségbiztosítási rendszer

A kiképzési szervezetnek olyan minőségbiztosítási rendszert kell létrehoznia, mely elfogadható a jóváhagyást kiadó Engedélyező Hatóság számára, és amely biztosítja, hogy a kiképzési és oktatási gyakorlat megfelel az összes vonatkozó követelménynek.

5. Felszerelések

5. 1. A felszereléseknek és munkakörnyezetnek megfelelőnek kell lennie a végrehajtandó feladatokhoz, és elfogadhatónak kell lenniük az Engedélyező Hatóság számára.

5. 2. A kiképzési szervezetnek rendelkeznie kell, vagy hozzáféréssel kell rendelkeznie a tanfolyamok végrehajtása érdekében szükséges információkhoz, berendezésekhez és kiképzési eszközökhöz, anyagokhoz, melyre a szervezetet jóváhagyták.

5. 3. A szintetikus kiképző eszközöket (szimulátor) az Állam által lefektetett követelményeknek megfelelően kell minősíteni, és használatukat az Engedélyező Hatóságnak jóvá kell hagynia annak biztosítására, hogy azok megfelelőek a feladathoz.

Megjegyzés - A Repülési Szimulátorok Minőségi Kritériumainak ICAO Kézikönyve (DOC 9625) tartalmaz irányelveket a repülési szimulátorok jóváhagyásához.

6. Alkalmazott személyzet

6. 1. A kiképzési szervezetnek ki kell neveznie azt a személyt, aki felelős annak biztosításáért, hogy ez a szervezet a jóváhagyott szervezetre vonatkozó követelményeknek megfelel.

6. 2. A szervezetnek alkalmaznia kell a szükséges személyzetet, mely a végrehajtandó kiképzést megtervezi, teljesíti és ellenőrzi.

6. 3. A kiképző személyzet alkalmasságának összhangban kell lennie az eljárásokkal, és olyan fokúnak kell lennie, melyet az Engedélyező Hatóság elfogad.

6. 4. A kiképzési szervezetnek biztosítania kell, hogy a kiképző személyzet minden tagja megkapja mindazokat a kezdeti és továbbképző képzéseket, melyek kijelölt feladataikhoz és felelősségeikhez megfelelőek. A kiképzési szervezet által összeállított oktatóprogramnak tartalmaznia kell az emberi teljesítőképességre vonatkozó tudás és jártasság oktatását.

Megjegyzés - Az emberi teljesítőképességre vonatkozó tudás és jártasság kifejlesztésére tervezett kiképzési programokhoz tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

7. Személyi nyilvántartás

7. 1. A kiképzési szervezetnek részletes személyi nyilvántartást kell vezetnie a hallgatókról annak bizonyítására, hogy a kiképző tanfolyam összes követelménye kielégítésre került, az Engedélyező Hatósággal történő megállapodás szerint.

7. 2. Ahol ez megvalósítható, a kiképzési szervezetnek nyilvántartási rendszert kell vezetnie a kiképző és a vizsgáztató személyek minősítéseiről.

7. 3. A 7. 1. pont szerinti személyi nyilvántartásokat minimálisan 2 év időtartamig meg kell őrizni a kiképzés befejezését követően. A 7. 2. pont szerinti személyi nyilvántartásokat minimálisan 2 év időtartamig meg kell őrizni azt követően, hogy az oktató, vagy a vizsgáztató személy befejezte a kiképzési szervezet számára végzett feladatának végrehajtását.

8. Felügyelet

A Szerződő Államoknak a jóváhagyott kiképzési szervezetek felett hatékony felügyeleti programmal kell rendelkezni annak érdekében, hogy biztosítva legyen a folyamatos megfelelőség a jóváhagyott követelményekkel.

9. Értékelés és ellenőrzés

Ha egy Állam felhatalmaz egy jóváhagyott kiképzési szervezetet szakszolgálati engedély vagy jogosítás kibocsátásához előírt vizsgák végrehajtására, a vizsgáztatást végrehajtó személyeket az Engedélyező Hatóságnak kell felhatalmaznia, vagy a kiképzési szervezetnek kell kijelölnie az Engedélyező Hatóság által jóváhagyott kritériumoknak megfelelően.

3. számú FÜGGELÉK

A TÖBBSZEMÉLYES SZEMÉLYZET PILÓTA SZAKSZOLGÁLATI ENGEDÉLY KIADÁSÁNAK KÖVETELMÉNYEI – REPÜLŐGÉPRE

(Hivatkozással a 2. Fejezet 2. 5. szakaszára)

1. Kiképzés

1. 1. Annak érdekében, hogy az adott repülőgép kategóriában a többszemélyes személyzet pilóta szakszolgálati engedély követelményeit kielégítsék, a folyamodónak egy jóváhagyott kiképzési tanfolyamon kell részt vennie. A kiképzésnek alkalmasság-alapúnak kell lennie, és egy többszemélyes személyzet működési környezetében kell azt végrehajtani.

1. 2. A kiképzés alatt a folyamodónak el kell sajátítania mindazt a tudást, jártasságot és magatartásformákat, mely ahhoz szükséges, hogy alapul szolgáljon egy olyan gázturbinás közforgalmi repülőgép másodpilótájaként történő ténykedéshez, melyet bizonyítványa szerint minimum személyzetként legalább 2 pilótával való üzemeltetésre jogosítottak.

2. Az értékelés szintje

Az adott repülőgép kategóriában a többszemélyes személyzet pilóta szakszolgálati engedélyért folyamodónak kielégítően kell demonstrálnia teljesítményét a 3. pontban ismertetett mind a 9 alkalmassági egységben, valamint a B Mellékletben meghatározott emelt szintű alkalmassági szint követelményeiben.

Megjegyzés.- Az adott repülőgép kategóriában a többszemélyes személyzet pilóta szakszolgálati engedélyhez a kiképzési tervet, beleértve az alkalmasság különböző szintjeit, a Léginavigációs Szolgálatok – Kiképzés (PANS-TRG, Doc 9868) című kiadvány tartalmazza.

3. Az alkalmasság egységei

Az a 9 alkalmassági egység, melyet a folyamodónak demonstrálnia kell a 2. Fejezet, 2. 5. 1. 3. pontjának megfelelően, a következő:

1. a fenyegető jelenségek és hibák kezelésének (TEM) alapelveit alkalmazni,
2. a repülőgép földi üzemeltetését végrehajtani,
3. végrehajtani a felszállást,
4. végrehajtani az emelkedést,
5. végrehajtani az utazórepülést,
6. végrehajtani a süllyedést,
7. végrehajtani a megközelítést,
8. végrehajtani a leszállást, és

9. végrehajtani a leszállást követő és a repülőgép repülés utáni teendőit.

1. Megjegyzés - Az alkalmassági egységeket azon lényeges elemek szerint határoltuk el, amelyekre meghatározott teljesítmény kritériumok lettek meghatározva. Az alkalmasság egységeit és a teljesítmény kritériumokat a Léginavigációs Szolgálatok – Kiképzés (PANS-TRG, Doc 9868) című kiadvány tartalmazza.

2. Megjegyzés - A fenyegető jelenségek és hibák kezelésének alkalmazási alapelvei egy sajátságos alkalmassági egységet alkotnak, melyekkel ki kell egészíteni a kiképzési és vizsgáztatási célú összes alkalmassági egység mindegyikét.

4. Repülés szimulátorban

4. 1. A tapasztalat megszerzése céljából használt repülési szimulátor oktató-berendezést, melyet a 2. Fejezet 2. 5. 3. 3. pontban határoztuk meg, az Engedélyező Hatóságnak jóvá kell hagynia.

4. 2. A repülési szimulátor oktató-berendezéseket az alábbiak szerint kell kategorizálni:

a) *I. típusú*. Olyan elektronikus kiképzési és részfeladat oktató berendezés, melyet az Engedélyező Hatóság jóváhagyott, és rendelkezik az alábbi jellemzőkkel:

– az asztali számítógépek normál tartozékai felül egyéb tartozékokat foglal magába, mint például a gázkar állító karok működőképes modellje, a vezérlés-irányító kar, vagy egy FMS billentyűzet, és

– pszicho-motoros tevékenységet foglal magába az erő és a válaszok időmérésének megfelelő alkalmazásával,

b) *II. típusú.*Egy általános turbina-meghajtású repülőgépet megjelenítő repülési szimulátor oktató-berendezés.

Megjegyzés - Ez a követelmény kielégíthető egy olyan repülési szimulátor oktató-berendezéssel, melyet nappali világításban leolvasható optikai rendszerrel szereltek fel, és egyébként minimumként egyenértékűen megfelel az FAA FTD 5. Szint, vagy a JAA FNPT II., MCC specifikációjának.

c) III. típusú. Többhajtóműves turbina-meghajtású repülőgépet megjelenítő repülési szimulátor oktató-berendezés, mely bizonyítványa szerint 2 pilótával üzemeltethető emelt szintű nappali világításban leolvasható optikai rendszerrel, és robotpilótával szereltek fel.

Megjegyzé - Ez a követelmény kielégíthető egy olyan repülési szimulátor oktató-berendezéssel, melyet nappali világításban leolvasható optikai rendszerrel szereltek fel, és egyébként minimumként a módosított JAR STD 1A által meghatározott B szintű szimulátornak megfelelő specifikációval egyenértékű, és a módosított FAA AC 120-40B-vel, beleértve a Megfelelés Alternatív Módjait (AMOC), melyet az AC 120-40B megenged.

Néhány korábban értékelt a szintű teljes repülési szimulátor, melyet az előírt manőverek oktatására és ellenőrzésére hagytak jóvá, használata megengedett.

d) IV. típusú. A D szintű repülési szimulátorral teljesen egyenértékű, vagy a C szintű repülési szimulátorral, ha az emelt szintű nappali világításban leolvasható optikai rendszerrel van felszerelve.

Megjegyzé - Ezt a követelményt ki lehet elégíteni egy olyan repülési szimulátor oktató-berendezéssel, amely minimumként a C vagy a D szintű szimulátor *specifikációjával egyenértékű, a módosított JAR STD 1A szerint meghatározott és a módosított FAA AC 102-40B-vel, beleértve a Megfelelés Alternatív Módjait (AMOC), amelyet az AC 120-40B megenged.*

„A” MELLÉKLET

ICAO NYELVTUDÁS SZINTJÉT MINŐSÍTŐ TÁBLÁZAT

1.1 Jártassági, Bővített és Operatív Szintek

SZINT	KIEJTÉS A légiforgalmi közösség számára érthető dialektust és/vagy hangsúlyozást tételez fel	STRUKTÚRA A feladatnak megfelelő nyelvi formák által meghatározott helytálló nyelvtani szerkezetek és mondatformák	SZÓKÉSZ-LET	GÖRDÜLÉ-KENYSÉG	SZÖVEG ÉRTÉS	KÖLCSÖN-HATÁSOK
Jártasság 6	A kiejtés, a hangsúly, a ritmus és az intonáció szinte soha ne zavarja a megértést, noha előfordulhat, hogy az első nyelv vagy tájnyelvi variáció ezt befolyásolhatják	Mind az alapfokú, mind a komplex nyelvtani szerkezetek és mondatformák következetesen jól irányítottak	Kielégítő szókészlet és pontosság, mely elegendő az ismert és nem ismert témák széles változatainál a hatékony kommuniká-cióhoz. A szókincs nyelvre jellemző, árnyalt és érzékeny a pontos illeszkedésre	Képes hosszabb ideig természetesen, könnyed stílusban beszélni. A stilisztikai hatás elérése érdekében változtatja a beszéd folyamát, például azért, hogy hangsúlyoz-zon egy pontot. Spontán módon használja a beszédfordula tokat és mondatfűzése ket.	A szövegértés egyenletesen pontos csaknem minden szövegössze-függésben és ide értendők a nyelvi és kulturális finom megkülönböz-tetések	Szinte minden helyzetben könnyedén reagál. Érzékeny a szóbeli és nem szavakkal történő utalásokra és megfelelően válaszol rájuk
Bővített 5	A kiejtés, a hangsúly, a ritmus és az intonáció ritkán zavarja a megértést, noha előfordulhat, hogy az első nyelv vagy tájnyelvi variáció ezt befolyásolhatják	Az alapfokú nyelvtani szerkezetek és mondatformák következetesen jól irányítottak. A komplex szerkezetekkel megpróbálko-zik, de hibákkal, mely néha zavarja a megértést.	Kielégítő szókészlet és pontosság, mely elegendő az általános, a konkrét és a munkával kapcsolatos témák hatékony kommuniká-lásához. Következete-sen és sikeresen képes valamely fogalmat más szavakkal körülírni. Szókincse	Képes hosszabb ideig relative gördülékenyen beszélni ismert témákról, de lehet, hogy a beszéd folyamata nem alakul olyan változatosan, mint egy stílusos előadás. Alkalmazni tudja a beszédfordulato kat és mondatfűzéseke t.	A szövegértés pontos az általános, a konkrét és a munkával kapcsolatos témákban és legnagyobb-részt pontos, amikor a beszélő nyelvi vagy helyzeti komplikáció-val, vagy váratlan eseménnyel találja szemben magát. Képes többfajta beszédváltozato t megérteni	Válaszai azonnaliak, megfelelőek és informatívak. A beszélő/hallga tó kapcsolatot hatékonyan kezeli.

SZINT	KIEJTÉS A légiforgalmi közösség számára érthető dialektust és/vagy hangsúlyozást tételez fel	STRUKTÚRA A feladatnak megfelelő nyelvi formák által meghatározott helytálló nyelvtani szerkezetek és mondatformák	SZÓKÉSZ-LET	GÖRDÜLÉ-KENYSÉG	SZÖVEG ÉRTÉS	KÖLCSÖN-HATÁSOK
			néha tájnyelvi		(dialektus és/vagy akcentus), vagy szófűzések.	
Operatív 4	A kiejtést, a hangsúlyt, a ritmust és az intonációt befolyásolja az első nyelv vagy a tájnyelvi variáció, de ez csak néha zavarja a könnyű érthetőséget.	Nyelvtani alapszerkezete-ket és mondatformá-kat kreatív módon használ és azok rendszerint jól irányítottak. Hibák előfordulhatnak különösen szokatlan vagy váratlan körülmények esetén, de ezek ritkán zavarják a megértést.	A szókészlet és a pontosság rendszerint elegendő a hatékony kommuniká-láshoz az általános, a konkrét és a munkával kapcsolatos témákban. Képes gyakran más szavakkal sikeresen körülírni, amikor szokatlan vagy váratlan helyzetekben szóhiánya van	A beszéd folyását megfelelő tempóban tartja. Esetenként előfordulhat, hogy beszéde elveszti gördülékenysé gét olyan esetekben, amikor áttér az előadói vagy szabályos beszédről a spontán mondanivaló-ra, de ez nem akadályozza meg a hatékony kommunikáci ót. Korlátozott mértékben alkalmazni tudja a beszédfordula tokat és mondatfűzése ket. A hézagtöltő szavak nem vonják el a figyelmet.	Az általános, a konkrét és a munkával kapcsolatos témákban a szövegértés majdnem mindig pontos, amikor a használatos akcentus, vagy tájnyelv kielégítően megérthető a felhasználók nemzetközi közössége számára. Ha a beszélő nyelvi vagy szituációs komplikáció-val kerül szembe, vagy egy váratlan eseménnyel, a szövegértés lelassulhat, vagy tisztázó stratégiát igényelhet.	Válaszai rendszerint azonnaliak, megfelelőek és informatívak. Váltást kezdeményez és valósít meg amikor váratlan helyzetben találja magát. Megfelelően kezeli a nyilvánvaló félreértéseket ellenőrzéssel, megerősítés-sel vagy tisztázással

Az 1, 2 és 3 Szintek a következő lapokon találhatók

SZINT	KIEJTÉS A légiforgalmi közösség számára érthető dialektust és/vagy hangsúlyozást tételez fel	STRUKTÚRA A feladatnak megfelelő nyelvi formák által meghatározott helytálló nyelvtani szerkezetek és mondatformák	SZÓKÉSZ-LET	GÖRDÜLÉ-KENYSÉG	SZÖVEG ÉRTÉS	KÖLCSÖN-HATÁSOK
A 4, 5 és 6 Szint az előző lapokon található						
Operatív szint alatti tudás 3	A kiejtést, a hangsúlyt, a ritmust és az intonációt erősen befolyásolja az első nyelv vagy a tájnyelvi variáció és gyakran zavarja a megértést.	Az előre meghatározható szituációkkal együttjáró nyelvtani alapszerkezetek és mondatformák nem mindig illeszkednek jól. A hibák gyakran zavarják a megértést.	Az általános, a konkrét, vagy a munkával kapcsolatos témákban a kommunikáláshoz gyakran elegendő szókészlet és pontosság, de a szókészlet mértéke korlátozott és a szó megválasztás gyakran nem megfelelő. A szókészlet hiánya miatt gyakran nem képes sikeresen körülírni a mondanivalót.	A beszéd folyamatosságát megvalósítja, de a megfogalmazás és a szünettartás gyakran nem megfelelő. A habozás és a lassúság a beszédfolyamatban akadályozhatja a hatékony kommunikációt. A hézagtöltő szavak néha elterelik a figyelmet.	Az általános, a konkrét és a munkával kapcsolatos témák szövegértése gyakran pontos, amikor a használt akcentus vagy tájszólás a felhasználók egy nemzetközi közössége számára kielégítően megérthető. Lehet, hogy a megértés nem valósul meg nyelvi vagy szituációs komplikáció, vagy az események váratlan fordulata esetében.	A válaszok időnként azonnaliak, megfelelőek és informatívak. Képes váltást kezdeményezni és megvalósítani az ismert témák elfogadható megértésével és az előre látható helyzetekben. Általában alkalmatlan a váratlan események kezelésében.
Alapfok 2	A kiejtést, a hangsúlyt, a ritmust és az intonációt erősen befolyásolja az első nyelv vagy a tájnyelvi variáció és rendszerint zavarja a megértést.	Néhány egyszerű megtanult nyelvtani szerkezetet és mondatformát csak korlátozottan használ.	Korlátozott szókészlet, mely csak különálló szavakból és megtanult beszédfordulatból áll.	Igen rövid, különálló, megtanult kifejezést tud megvalósítani gyakori szünetekkel, és a hézagpótló szavak elterelő használatával a kifejezések keresése céljából és a kevésbé ismert szavak tagolt ejtése érdekében.	A szövegértés a különálló, megtanult mondatformákra korlátozódik, ha azokat gondosan és lassan ejtik ki.	A válaszadási idő lassú és gyakran nem megfelelő. A reagálás az egyszerű rutin váltásokra korlátozódik.

SZINT	KIEJTÉS A légiforgalmi közösség számára érthető dialektust és/vagy hangsúlyozást tételez fel	STRUKTÚRA A feladatnak megfelelő nyelvi formák által meghatározott helytálló nyelvtani szerkezetek és mondatformák	SZÓKÉSZ-LET	GÖRDÜLÉ-KENYSÉG	SZÖVEG ÉRTÉS	KÖLCSÖN-HATÁSOK
Alapfok alatti tudás 1	Az Alapfok szintjénél alacsonyabban teljesít	Az Alapfok szintjénél alacsonyabban teljesít	Az Alapfok szintjénél alacsonyab-ban teljesít	Az Alapfok szintjénél alacsonyab-ban teljesít	Az Alapfok szintjénél alacsonyab-ban teljesít	Az Alapfok szintjénél alacsonyab-ban teljesít

Megjegyzés.- A rádiótávbeszélő összeköttetésben a minimális előírt tudásszint az Operatív Szint (4. Szint). Az 1-től 3. Szintig ismerteti az Alapfok alatti, az Alapfokú és az Operatív szint alatti nyelvtudás ismérveit, de ezek egyike sem éri el az ICAO nyelvtudásra vonatkozó követelményének szintjét. Az 5. Szint és a 6. Szint tartalmazza a Bővített és a Jártassági Szintet, olyan tudásszinteket, melyek sokkal magasabb fokon állóak, mint a minimálisan előírt Szabvány. Egészében véve a táblázat szint-jelként szolgál a kiképzéshez és az ellenőrzéshez, valamint segítséget nyújt a jelölteknek az ICAO Operatív Szintje (4. Szint) eléréséhez.

– VÉGE –

„B” MELLÉKLET

TÖBBSZEMÉLYES SZEMÉLYZET PILÓTA SZAKSZOLGÁLATI ENGEDÉLY – REPÜLŐGÉPRE

AZ ALKALMASSÁG SZINTJEI

1. Repülési alap-jártasság

Az alkalmasság azon szintje, melynél a folyamodó eleget tesz a 2. Fejezet 2. 3. pontjában előírt, a magán-pilóta szakszolgálati engedélyre vonatkozó követelményeknek, beleértve az éjszakai repülés követelményét, és, ezen felül, a kiképzés befejezéséhez kapcsolódó összes eljárást és manővert simán és pontosan hajtja végre, és a repülést kizárólag a műszerekre alapozza. A kezdetektől az összes kiképzést egy alkalmasságra alapozott, integrált, többszemélyes személyzetben, és a fenyegető jelenségek és hibák kezelésének (TEM) környezetében végzi. A kezdő kiképzés és az oktatási input szintjei magasak, mivel a repülési alap-jártasságot beillesztették az ab initio (a kezdeti) alkalmazási területbe. A minősítés ezen a szinten azt igazolja, hogy a repülőgép irányítását mindenkor olyan módon tartja fenn, hogy biztosított az eljárás vagy a manőver sikeres végeredménye.

2. 1. Szint (alapfokú)

Az alkalmasság azon szintje, melynél a minősítés azt igazolja, hogy a repülőgép, vagy a szituáció irányítása folyamatosan fenntartott, és olyan módon történik, hogy ha az eljárás, vagy a manőver sikeres végeredménye kétséges, helyesbítő tevékenységet hajt végre. Az általános pilóta-kabin környezetben a teljesítmény még nem következetesen elégíti ki a szaktudás, és az üzemeltetési jártasság Szabványait, és az alapjártasságnál megkövetelt teljesítési szintet. Folyamatos kiképzési ráfordítás szükséges ahhoz, hogy egy elfogadható kezdeti üzemeltetési standard-nak meg tudjon felelni. A teljesítmény tökéletesítésére/egyéni fejlődésre specifikus tervekben kell megegyezni és azokat a személyi kartotéklapra rávezetni. A folyamodóknál a további kiképzésre és minősítésre való alkalmasságot folyamatosan értékelni fogják az egymást követő fázisokban

3. 2. Szint (közepes)

Az alkalmasság azon szintje, melynél a minősítés azt igazolja, hogy a repülőgép, vagy a szituáció irányítása folyamatosan fenntartott, és olyan módon történik, hogy az eljárás, vagy a manőver sikeres végeredménye biztosított. A 2. Szintnél nyújtott kiképzést a műszerrepülési szabályok alkalmazásával kell végrehajtani, de nem kell specifikusnak lennie a repülőgép típusok egyikére sem. A 2. Szint elérése után a folyamodónak demonstrálnia kell szakismeretének és üzemeltetési jártasságának azt a szintjét, mely megfelel abban a környezetben, és el kell érnie az alap standard szintet az alapvető képességekben. Kiképzés biztosítása szükségessé válhat egy specifikus haladási terv szerint annak érdekében, hogy fenntartsa és javítsa a légijármű működtetését, a magatartási teljesítményt a vezetésben, vagy a team irányításában. Tökéletesítés és fejlődés a Szabvány elérése érdekében a teljesítmény kulcsfontosságú célja. Ha az alapvető képességek bármelyikét úgy minősítik, hogy az a kielégítőnél alacsonyabb szintű, akkor ennek a minősítésnek a nyilvánvaló voltát alá kell támasztani és egy korrigáló tervet kell magába foglalni.

4. 3. Szint (Haladó)

Az alkalmasság azon szintje, mely ahhoz szükséges, hogy másodpilótaként üzemeltessen és közreműködjön egy olyan turbina meghajtású repülőgépen, melyet a bizonyítványa szerint minimum személyzetként legalább 2 fő pilótával kell üzemeltetni, látási és műszeres körülmények között. A minősítés azt igazolja, hogy a repülőgép vagy a szituáció irányítása fenntartása folyamatos, és oly módon történik, hogy az eljárás, vagy a manőver sikeres végeredménye biztosított. A folyamodónak következetesen kell demonstrálnia, hogy rendelkezik azzal a szakismerettel, jártassággal és magatartásformákkal, melyek a megfelelő repülőgép típus biztonságos működtetéséhez szükségesek a teljesítmény kritériumokban meghatározottak szerint.

Megjegyzés – A teljesítmény kritériumok kidolgozásához anyag a Léginavigációs Szolgálatok Eljárásai – Kiképzés (PANS-TRG, Doc 9868) című kiadványban található.

ANNEX 2.
Repülési szabályok

10. kiadás – 2005 július
39. módosítással

Jelen kiadvány magában foglalja a Tanács által 2005. február 24-ét megelőzően elfogadott módosításokat, és 2005. november 24-től hatálytalanítja a 2. Annex összes megelőző kiadását.
A nemzetközi szabványok alkalmazhatóságával kapcsolatosan lásd az Előszót.

Nemzetközi Polgári Légi-közlekedési Szervezet

ICAO

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	*kiadás időpontja*	*alkalmazhatóság időpontja*	*bevezette*
1-38. beépített	2005 július 11	2005 november 24	
39. (a Tanács 2006 február 20-án fogadta el)	2006 július 17	2006 november 23.	

Előszó

Történeti háttér

A Repülési és Légiforgalmi Irányítási Szabályok (RAC) munkacsoport első ülésszakán 1945 októberében ajánlásokat tett a légiforgalmi irányító szolgálatok előírásaira és ajánlott gyakorlati eljárásaira. Ezeket az akkor működő Léginavigációs Bizottság áttanulmányozta, a Tanács 1946 február 25-én jóváhagyta. Ezeket az 1946 februárjában kiadott Doc 210 – RAC/104 kiadvány második részében „Előírások és ajánlott gyakorlati Eljárások – *Repülési Szabályok*” címen tették közzé.

A RAC munkacsoport 1946 decembere és 1947 januárja között megtartott második ülésszakán felülvizsgálta a Doc 2010-et és ajánlásokat tett közzé a repülési szabályokat érintő nemzetközi szabványokra és ajánlott gyakorlatokra. Ezt a Tanács a Nemzetközi Polgári Repülési Egyezmény (Chicago 1944.) 37. cikkelye alapján az Egyezmény 2. Függelékeként (a továbbiakban 2. Annex) mint nemzetközi szabványok és ajánlott gyakorlatok elfogadta és a *Nemzetközi Repülési Szabályok* kiadvány 1948 szeptember 15-én hatályba lépett.

A Tanács 1951 november 27-én jóváhagyta a 2. Annex teljesen új szövegezésű változatát, amely a továbbiakban ajánlott gyakorlatokat nem tartalmazott. Az így módosított 2. Annex nemzetközi

előírásai 1952 április 1-én léptek hatályba és 1952 szeptember 1-től voltak alkalmazhatók.
Az egymást követő módosításokat az A. táblázat tartalmazza, jelezve a lényeges témaköröket, valamint a Tanács általi elfogadási, a hatályba lépési és az alkalmazhatósági időpontokat is.

Alkalmazhatóság

A jelen kiadványban található nemzetközi szabványokat és ajánlott gyakorlatokat a 11. Annex rendelkezéseivel együttesen szabályozzák a „Légiközlekedési Szolgálatok Eljárásai – Repülési szabályok és Légiforgalmi szolgálatok” valamint a „Körzeti Kiegészítő Eljárások – Repülési szabályok és Légiforgalmi szolgálatok” alkalmazását, amely utóbbi kiadványban a körzeti alkalmazáshoz szükséges kiegészítő eljárásokat teszik közzé.

Nyílt tenger feletti repülés

Megjegyzendő, hogy a 2. Annex 1948 áprilisában történt elfogadása alkalmával és ennek 1951 novemberi módosításakor a Tanács úgy határozott, hogy az Egyezmény 12. cikkelye értelmében az Annex *A légijármű közlekedés és repülés végrehajtása szabályai* vonatkozásában jogszabálynak minősül és ezért a nyílt vizek felett ezek az előírások kivétel nélkül alkalmazandók.
A nyílt vizek felett üzemelő légijárművek feletti fennhatósággal foglalkozó 14. számú módosítás 1972 november 15-én történt elfogadásakor a Tanács hangsúlyozta, hogy a módosításokat kizárólag azért adja ki, hogy ezzel növeljék a repülés biztonságát és megfelelő légiforgalmi szolgálatot biztosítsanak a nyílt vizek felett üzemelő légijárművek számára. A módosítás semmiféle formában nem érinti a lajstromozó államnak a légijármű feletti törvényes jogait vagy az Egyezmény 12. cikkelye értelmében a szerződő államok repülési szabályok betartására vonatkozó felelősségét.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi szabványok és ajánlott gyakorlatok alapján biztosított – a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését – a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex szövegének alkalmazása az országos előírásokban

A Tanács 1948 április 13-án elfogadta azt a határozatot, amelyben felhívják a szerződő államok figyelmét saját országos, nemzeti előírásaikban a szabályozó jellegű ICAO előírások pontos nyelvezetének lehetőség szerint azonos alkalmazásának kívánatosságára, továbbá hogy az államok jelezzék a nemzetközi szabványoktól és ajánlott gyakorlatoktól való eltéréseket, ismertetve azokat az országos előírásokat, amelyek a légiközlekedés biztonsága és rendszeressége szempontjából fontosak. Ahol ez lehetséges, a jelen Annex előírásait úgy fogalmaztuk meg és tettük közzé, hogy ezzel megkönnyítsük az országos jogszabályokba lényeges szövegi módosítás nélkül történő átvételüket.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annexben.

Az egyes részek jogállása a következő:

1. – Az Annex anyaga:

a) Nemzetközi szabványok és ajánlott gyakorlatok, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlat: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) Függelék: A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi szabványook és ajánlott gyakorlatok szerves részét képezik.

c) Meghatározások: A nemzetközi szabványok és az ajánlott gyakorlatok ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi szabványnak vagy ajánlott gyakorlatnak amelyben előfordul, mert a meghatározás értelmének megváltoztatása a specifikációt befolyásolja.

d) Táblázatok és ábrák: Ezek egy nemzetközi szabványt vagy ajánlott gyakorlatot egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi szabványban vagy ajánlott gyakorlatban utalnak. A táblázatok és az ábrák az adott nemzetközi szabvány vagy ajánlott gyakorlat részét képezik és jogállásuk ezekkel megegyező.

2. – A nemzetközi szabványokkal és az ajánlott gyakorlatokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi szabványra vagy ajánlott gyakorlatra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi szabványt és ajánlott gyakorlatot kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et öt nyelven fogadták el – angolul, arabul, franciául, oroszul és spanyolul. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A szabványokat vékony álló, a *megjegyzéseket dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását *„Megjegyzés”* felirattal is jelezzük. Nincsenek ajámlott gyakorlatok a 2. Annex-ben.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás – akár számmal, akár címmel vagy pedig mindkettővel – vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat
A 2. Annex módosításai

(Tagolási sorrend: Módosítás – Forrás – Tárgy – Elfogadva/ Hatályos/ Alkalmazható)

Első kiadás (1948)

Repülési és Légiforgalmi Irányítási Szabályok (RAC) Munkacsoport 2. ülése (1947)
Nemzetközi szabványok és ajánlott gyakorlatok – Repülési Szabályok
1948. április 15 1948. szeptember 15
–

1) – Második kiadás – Repülési és Légiforgalmi Irányítási Szabályok (RAC) Munkacsoport 4. ülése (1950)
2. Annex teljes felülvizsgálata és átszerkesztése
1951 november 27. 1952 április 1. 1952 szeptember 1.

2) – Európai és Földközi-tengeri körzet RAC munkacsoport 4. rendkívüli értekezlete
Rádióösszeköttetés megszakadása esetén követendő eljárások; repülési terv.
1953 november 17. 1954 április 1. 1954 szeptember 1.
3) – Harmadik kiadás – Második Léginavigációs Konferencia (1955)
Meghatározások és szakkifejezések a látvarepülési szabályok szerint és ellenőrzött légtéren kívül végrehajtott repülésekre; vészhelyzeti és sürgősségi jelzések; repülőtéri forgalom.

1956 május 11. 1956 november 15. 1956 december 1.

4) – Léginavigációs bizottság

Veszélyes, tiltott és korlátozott légterek meghatározása és alkalmazásukhoz kidolgozott útmutató anyag.

1958 november 14. – –

5) – Negyedik kiadás – Repülési és Légiforgalmi Irányítási Szabályok (RAC) valamint a Kutatás és Mentés (SAR) Munkacsoportok ülése (1958) – Léginavigációs bizottság

Meghatározások; éjszakai VFR repülések megtiltása az ellenőrzött légterekben; az összeütközések elkerülése; repülési tervek; VFR és IFR repülési szabályok; SELCAL előírások; forgalmi előtér beállító jelzései.

1958 december 8. 1960 május 1. 1960 augusztus 1.

6) – Negyedik kiadás – Repülési és Légiforgalmi Irányítási Szabályok (RAC) valamint a Kutatás és Mentés (SAR) Munkacsoportok ülése – Légialkalmassági bizottság 4. ülése (1960)

Látvarepülési szabályok szerint végrehajtott repülés; utazómagasság táblázatok; légijármű navigációs fények.

1961 december 8. 1962 november 1. 1962 december 1.

7) – IV. Észak-atlanti körzeti léginavigációs értekezlet

Utazómagasság táblázatok a sarkvidéki területeken.

1962 július 27. 1962 november 1. 1962 december 1.

8) – Repülési szabályok és Légiforgalmi szolgálatok munkacsoport ülése (1963)

Meghatározások; repülési szintek és tengerszint feletti magasságok; repülési terv benyújtása; VFR minimum érték táblázatok; VFR repülése megtiltása éjszaka ellenőrzött légtéren kívül és FL200 feletti repülések esetében; IFR repülések összeköttetései ellenőrzött légtéren kívül; a négy-szektoros utazómagasság táblázat cseréje két-szektoros táblázatra; függőleges elkülönítés FL290 felett.

1965 november 29. 1966 március 29. 1966 augusztus 25.

9) – Léginavigációs bizottság

Tengeri összeütközések megelőzésének nemzetközi szabályaiból készített útmutató anyag.

1965 november 29. – –

10) – ATCAP bizottsági ülés (1966) – Léginavigációs bizottság

Repülési tervek; Tengeri összeütközések megelőzésének nemzetközi szabályaiból készített útmutató anyag és a vonatkozó előírások törlése.

1967 június 7. 1967 október 5. 1968 február 8.

11) – Ötödik Léginavigációs Konferencia (1967)

Légiforgalmi szolgálatok bejelentő irodája és az összeköttetési követelmények; a beállító jelzései.

1969 január 23. 1969 május 23. 1969 szeptember 18.

12) – Hatodik Léginavigációs Konferencia (1969)

Meghatározások; legalacsonyabb repülési magasságok; ellenőrzött VFR repülések; ellenőrzött légtér kijelölése (új szöveg).

1970 május 25. 1970 szeptember 25. 1971 február 4.

13) – RAC/COM korlátozott európai körzeti értekezlet (1969) – Léginavigációs bizottság

Rádióösszeköttetés megszakadása esetén követendő eljárások; működési terület használhatatlanságának jelzései.

1972 március 24. 1972 július 24. 1972 december 7.

14) – Léginavigációs bizottság
Fennhatóság a nyílt vizek felett üzemelő légijármű felett.
1972 november 15. 1973 március 15. 1973 augusztus 7.

15) – ATCAP bizottsági ülés
Ismétlődő repülési tervek.
1972 július 1. 1973 április 13. 1973 augusztus 1.

16) – Hetedik Léginavigációs Konferencia (1972)
Megjegyzés az SSR C-mód alkalmazásán alapuló nyomásmagasság megadására vonatkozóan.
1973 március 2. – 1974 május 23.

17) – A Tanács határozata az A17/10 és A18/10 ajánlások bevezetésére
A jogtalan beavatkozás alatt álló légijárművel kapcsolatos követendő gyakorlati eljárások.
1973 április 7. 1973 december 7. 1974 május 23.

18) – Léginavigációs bizottság
Rádióösszeköttetés megszakadása esetén követendő eljárások; légijármű kölcsönzésére, bérletére és cseréjére vonatkozó megjegyzések.
1974 április 8. 1974 augusztus 8. 1975 február 27.

19) – Hangsebesség feletti légiszállítási munkacsoport (SSTP) 4. ülése (1973) – Léginavigációs Bizottság

Hangsebesség feletti repülések transz-szónikus gyorsítására és lassítására vonatkozó engedélyek; elfogott légijármű által követendő eljárások; tájékoztató anyag az elfogás szükségességének kiküszöböléséhez vagy csökkentéséhez; együttműködés a katonai hatóságok valamint a légiforgalmi szolgálatok között; utazómagasság táblázatok fogalomkörére vonatkozó változások.
1975 június 4. 1975 október 9. 1975. október 9.

20) – Léginavigációs Bizottság
A 7500-as másodlagos radar-kód használata jogtalan beavatkozás esetén; óra-idő pontosság a légiforgalmi szolgálati egységeknél és a légijármű fedélzetén.
1976 április 7. 1976 augusztus 7. 1976 december 30.

21) – IX. Léginavigációs Konferencia

Meghatározások; átkapcsolási pontok és átváltási magasságok; ATS útvonalak középvonalán történő repülésre és az átkapcsolási pontok betartására vonatkozó előírások; utazómagasságok kijelölése; repülési tervek és helyzetjelentések; repülési szintek egyeztetése a 3. Annex és a 10. Annex II. kötetében.
1977 december 7. 1978 április 7. 1978 augusztus 1.

22) – Léginavigációs bizottság

Személyzet nélküli szabad léggömbök; várható érkezési idő.
1981 március 2. 1981 július 2. 1981 november 26.

23) – Hetedik kiadás – Léginavigációs Bizottság
Polgári légijármű elfogása.
1981 április 1. 1981 augusztus 1. 1981 november 26.

24) – Léginavigációs bizottság
Légijármű külső fények.
1982 március 19. 1982 július 19. 1982 november 25.

25) – AGA bizottsági ülés (1981) – Léginavigációs bizottság

Földfelszín feletti magasság; műszeres megközelítési eljárások; mozgási és munkaterület; gurulás és gurulóút meghatározások; a „HIJACK” kifejezés használata a polgári légijármű elfogásánál; a légijármű bérletére; cseréjére és különjárati üzemeltetésére vonatkozó megjegyzés; előírások a légijármű földi mozgására és gurulására; 2. sorozatú jelzések; amelyeket a forgószárnyas légijármű elfogás esetén használ; mértékegységek.
1983 március 21. 1983 július 29. 1983 november 24.

26) – Adatfeldolgozási munkacsoport 1981 évi harmadik ülése – Léginavigációs bizottság

Meghatározások; a légiforgalmi szolgálati egységeknek benyújtott repülési terv tartalma; az ismétlődő repülési tervek; ATS adatcsere; az elfogó légijármű által használt kifejezések kiejtése; rádiótelefon sürgősségi jelzés egyeztetése a 10. Annex II. kötetével; UTC – Egyeztetett Egységes Idő.
1984 június 22. 1984 október 22. 1985 november 21.

27) – Nyolcadik kiadás – Tanács – Léginavigációs Bizottság

Polgári légijármű azonosítása és elfogása.
1986 március 10. 1986 július 27. 1986 november 20.

28) – Léginavigációs Bizottság

A forgalmi előtér meghatározása; különleges eljárások a jogtalan beavatkozás esetére
1987 március 16. 1987 július 27. 1987 november 19.

29) – Kilencedik kiadás – Látvarepülési szabályok szerinti üzemeltetés munkacsoport 1986 évi harmadik ülése – Titkárság – Látás utáni segédeszközök munkacsoport 1987 évi 11. ülése – Léginavigációs Bizottság – A 6. Annex elfogadása miatt szükséges módosítások
Légijármű üzemeltetés VFR/IFR vegyes körülmények között; a légijármű földi mozgása, irányítása és ellenőrzése; a jogtalan beavatkozási eseményei; forgószárnyas légijármű elfogóként történő igénybevétele.
1990 március 12. 1990 július 30. 1991 november 14.

30) – SSR fejlesztési és összeütközés megelőzési rendszerek munkacsoport 1989 évi negyedik ülése
Meghatározások; összeütközés elkerülését biztosító fedélzeti rendszer (ACAS).
1993 február 26. 1993 július 26. 1993 november 11.

31) – Az elkülönítés általános elmélete munkacsoport 1990 évi hetedik ülése – Léginavigációs Bizottság – Automatikus légtérfelderítés munkacsoport 1992 évi második ülése
Meghatározások; légi gurulás; elkülönítés a légijárművek között; polgári légijárművek kötelék repülése ellenőrzött légtérben; automatikus légtérfelderítés.
1994 március 18. 1994 július 25. 1994 november 10.

32) – Léginavigációs Bizottság
Megjegyzés az összeütközés elkerülését biztosító fedélzeti rendszer (ACAS) elhelyezésére és alkalmazására vonatkozó előírásokhoz.
1996 február 19. 1996 február 19. –

33) – Léginavigációs Bizottság
Összeköttetés megszakadása esetén alkalmazott eljárások.
1997 február 26. 1997 július 21. 1997 november 6.

34) – Automatikus légtérfelderítés munkacsoport negyedik ülése (1996), Az elkülönítés általános elméletével foglalkozó munkacsoport kilencedik ülése (1996), az 1. Annex 162. kiegészítésének megfelelő módosítások.
Meghatározások; automatikus légtér-felderítési rendszerek és eljárások; adatcsere az automatizált légiforgalmi szolgálati rendszerek között; a levegő–föld adatösszeköttetés alkalmazása az ATS területén; a szellemi tevékenységet befolyásoló anyagok használatával kapcsolatos kérdések.
1998 március 19. 1998 július 20. 1998 november 5.

35) – Léginavigációs Bizottság – Látás utáni segédeszközök munkacsoport 1997 évi 13. ülése
Légiforgalmi szolgálati légterek osztályozása; VMC időjárási körülmények között kiadott légiforgalmi irányítói engedély; futópálya várakozási hely.
1999 március 10. 1999 július 19. 1999 november 4.

36) – A legutóbbi módosításoknak megfelelő változások: 11. Annex 40.sz. módosítása., – 6. Annex I. rész 23–25. sz. módosítása, – 6. Annex II. rész 20. és III. rész 7. sz. módosítása., – 3. Annex 72. sz. módosítása.
Módosított meghatározások: légiforgalmi irányító egység, bevezető irányító egység, kitérő repülőtér, hajózószemélyzeti tag, légijármű parancsnok, látástávolság; továbbá szerkesztői módosítások.
2001 március 12. 2001 július 16. 2001 november 1.

37) – Elkülönítési és légtér biztonsági munkacsoport (SASP) Repülőgépvezető eljárásai a jogtalan beavatkozás esetén; szerkesztői módosítások.
2003 február 28. – –

38) – Titkársági Meghatározások; beállítói jelzések; rádióösszeköttetés megszakadási eljárások; elfogási manőverek; szerkesztői módosítások
2005.február.23. 2005.július 11. 2005.11november 24.

39) – Titkársági Átszövegezés annak érdekében, hogy nagyobb hangsúlyt kapjon a légi-jármű parancsnok felelőssége az összeütközések elkerülésében..
2006.február.20. 2006.július 17. 2006.11november 23.

1. fejezet

Meghatározások

Megjegyzés: A jelen Annex szövegében a „szolgálat” kifejezés mindvégig a feladatkörök vagy biztosított szolgáltatások megjelölésre vonatkozó elvont fogalom, míg az „egység” kifejezés egy szolgálatot ellátó kollektív testület megjelölésére szolgál.

Amikor a Repülési Szabályokra vonatkozó nemzetközi szabványok szövegében a következő kifejezéseket használjuk, azok jelentése a következő:
Adat összeköttetési távközlés – Data link communications

Olyan távközlési összeköttetés, amelynek célja az adathálózaton keresztül történő közleményváltás.

Anyagok (szellemi tevékenységet befolyásoló) használatából származó veszélyek – Problematic use of substances
Egy vagy több, a szellemi tevékenységet befolyásoló anyag olyan jellegű felhasználása a légiközlekedés személyzete részéről, amely:

a) közvetlen veszélyt jelent az anyagot felhasználó számára vagy veszélyezteti mások életét, egészségét illetve vagyontárgyait; és/vagy

b) foglalkozásbeli, társadalmi, szellemi vagy fizikai nehézséget illetve rendellenességet okoz.

Átkapcsolási pont – Change over point
Az a pont, ahol az ultrarövidhullámú (VHF) körsugárzó VOR berendezéssel kijelölt ATS útvonalszakaszon üzemelő légijárműtől elvárják, hogy a már átrepült berendezés – mint elsődleges navigációs vonatkozási hely – követéséről átáll az előtt levő berendezés követésére.

Megjegyzés: Az átkapcsolási pontokat azért jelölik ki, hogy a jelek erőssége és minősége a legmegfelelőbb egyensúlyban legyen a navigációs berendezések között minden használatos szinten, továbbá hogy azonos berendezéstől származó irányszög vezetést biztosítsanak az azonos útvonalszakaszon üzemelő összes légijármű számára.

Átváltási magasság – Transition altitude
Az a magasság, amelyen vagy amely alatt a légijármű függőleges helyzetét a közepes tengerszint feletti magassághoz viszonyítva ellenőrzik.

Automatikus légtérfelderítés – Automatic dependent surveillance (ADS)
Egy olyan, a légijárműtől származó adatok alapján működő automatikus légtér-felderítési módszer, amely során a légijármű fedélzeti navigációs és helyzet-meghatározó rendszereiből egy adattovábbító összeköttetési rendszer segítségével automatikusan továbbít adatokat, amelyek közé tartozik a légijármű azonosítója, négy-dimenziós helyzete és egyéb, szükséges tájékoztatások.

Automatikus légtérfelderítési egyezmény – ADS agreement
Az automatikus légijármű légtérfelderítési adatok továbbításának terve, amely meghatározza az ADS jelentések megadására vonatkozó előírásokat, azaz a légiforgalmi irányító szolgálati egység által igényelt adatokat és az ADS jelentések gyakoriságát. (Ezekben az ADS szolgáltatás megkezdése előtt kell megállapodni.)

Megjegyzés: Az egyezmény tartalmát a földi rendszer és a légijármű között adat csoport vagy csoportok segítségével továbbítják.

Automatikus légtérfelderítési adat szolgáltatási megállapodás – Automatic dependent surveillance (ADS) contract
Olyan módszer, amelynek alapján az ADS egyezményben szereplő tájékoztatásokat továbbítják a földi rendszer és a légijármű között, meghatározva azokat a körülményeket, amelyek között az ADS jelentéseket kezdeményezik és azokat az adatokat, amelyeket a jelentés tartalmaz.

Megjegyzés: Az „ADS adat szolgáltatási megállapodás” általános megnevezés, amely különböző jelentéseket, mint eseti, kérésre biztosítandó, időszakos vagy vészhelyzeti adat szolgáltatást jelenthet. Az ADS jelentések földi továbbítását a földi rendszerek között végezhetik el.

Benyújtott repülési terv – Filed flight plan
A repülőgépvezető vagy kijelölt képviselője által a légiforgalmi szolgálati egységnek benyújtott repülési terv bármely egyéb, későbbi módosítás nélkül.

Bevezető irányító egység – Approach control office
Egy vagy több repülőtér érkező vagy induló ellenőrzött repülés számára légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Bevezető irányító szolgálat – Approach control service
Az érkező vagy induló ellenőrzött forgalom irányítására létesített légiforgalmi irányító szolgálat.

Biztonsági szempontból fontos személyek – Safety sensitive personnel
A légiközlekedés biztonságát veszélyeztető személyek, amennyiben ezek feladataikat és kötelességeiket nem megfelelő módon látják el. Ezek közé tartoznak, de nem csak ezekre korlátozódnak a hajózószemélyzet tagjai, a légijármű karbantartó személyzet és a légiforgalmi irányítók.

Ellenőrzött légtér – Controlled airspace
Meghatározott kiterjedésű légtér, amelyen belül a légtér osztályozásnak megfelelően az IFR és VFR repülések számára légiforgalmi irányító szolgálatot biztosítanak.

Megjegyzés: Az ellenőrzött légtér olyan gyűjtőfogalom, amelybe a 11. Annex 2.6 pontjában ismertetett A, B, C, D és E osztályú (ATS) légiforgalmi szolgálati légterek tartoznak.

Ellenőrzött repülés – Controlled flight
Bármely repülés, amely légiforgalmi irányítói engedély függvénye.

Ellenőrzött repülőtér – Controlled aerodrome
Olyan repülőtér, amelyen a repülőtéri forgalom számára légiforgalmi irányító szolgálatot biztosítanak.

Megjegyzés: Az „ellenőrzött repülőtér” kifejezés azt jelzi, hogy a repülőtéri forgalom számára légiforgalmi irányító szolgálatot biztosítanak, azonban ez nem jelenti szükségszerűen azt, hogy ott repülőtéri irányítói körzet is van.

Engedélyhatár – Clearance limit
Az a pont, ameddig egy légijármű részére légiforgalmi irányítói engedélyt adtak ki.

Érvényes repülési terv – Current flight plan
A későbbi engedélyekből (ha van ilyen) adódó módosításokat is magába foglaló repülési terv.

Felhőalap – Ceiling
A 6000 méter (20000 láb) alatt, az égbolt több mint felét beborító föld vagy vízfelszín feletti legalacsonyabb felhőréteg alapjának magassága.

Forgalmi előtér – Apron
A szárazföldi repülőtéren kijelölt terület, amely az utasok, posta vagy teherárú küldemények be és kirakodására valamint a légijármű üzemanyaggal történő feltöltésére, parkírozására vagy karbantartására szolgál.

Forgalmi tájékoztatás – Traffic information
A légiforgalmi szolgálati egységtől származó, az adott légijármű közelében vagy annak tervezett útvonalán előforduló ismert vagy észlelt légi forgalomról szóló tájékoztatás annak érdekében, hogy a repülőgépvezetőt figyelmeztessék és ezzel segítséget nyújtsanak számára az összeütközés elkerüléséhez.

Forgalom elkerülésére adott tájékoztatás – Traffic avoidance advice
Repülési műveletek végrehajtására vonatkozó tanács a légiforgalmi szolgálati egységtől annak érdekében, hogy ezzel segítséget nyújtsanak a repülőgépvezető számára az összeütközés elkerüléséhez.

Földi látástávolság – Ground visibility
A repülőtéren kijelölt észlelő által jelentett látástávolság.

Futópálya – Runway
Egy szárazföldi repülőtéren meghatározott derékszögű terület, amelyet a légijármű le és felszállására alakítottak ki.

Futópálya várakozási hely – Runway-holding position
A futópálya, egy akadálykorlátozási felület vagy az ILS/MLS kritikus/érzékeny terület védelmére kijelölt hely, amelynél a guruló légijárműveknek és egyéb járműveknek a repülőtéri irányító torony ettől eltérő engedélyének hiányában meg kell állniuk és várakozniuk kell.

Gurulás – Taxiing
A légijármű mozgása a repülőtér területén saját hajtóművei segítségével, a fel és leszállás eseteit kivéve.

Gurulóút – Taxiway
Egy szárazföldi repülőtéren a légijárművek gurulására kialakított út, amelynek feladata a repülőtér egyes részei közötti összeköttetés biztosítása, beleértve:
a) Légijármű állóhely gurulási nyomvonal – A forgalmi előtér gurulóútként kijelölt része, amelynek kizárólagos feladata a légijármű állóhelyek megközelítésének biztosítása.

b) Forgalmi előtér gurulóút – A gurulóút rendszer forgalmi előtéren átvezető része, amelynek feladata a forgalmi előtéren történő átgurulás biztosítása.

c) Gyors legurulóút – Egy futópályához hegyes szögben csatlakozó gurulóút, amely lehetővé teszi, hogy a leszállt repülőgépek más legurulásra használható gurulóútakkal szemben nagyobb sebességgel hagyják el a futópályát, ily módon csökkentve annak foglaltsági idejét.

Hajózószemélyzeti tag – Flight crew member
Szakszolgálati engedéllyel rendelkező személyzeti tag, aki a repülés időtartama alatt a légijármű üzemeltetéséhez nélkülözhetetlen feladatokkal van megbízva.

IFR – Instrument Flight Rules
A műszerrepülési szabályok jelzésére alkalmazott rövidítés.

IFR repülés – IFR flight
A műszerrepülési szabályok szerint végrehajtott repülés.

Illetékes hatóság – Appropriate authority
a) A nyílt tenger feletti repülés esetén: a lajstromozó állam megfelelő hatósága.

b) A nem nyílt tenger feletti repülés esetén: Az átrepült terület felett fennhatósággal rendelkező állam megfelelő hatósága.

Illetékes légiforgalmi szolgálati hatóság – Appropriate ATS authority
Az adott légtérben a légiforgalmi szolgálatok biztosításáért felelős, az állam által kijelölt megfelelő hatóság.

IMC – Instrument Meteorological Conditions
A műszeres időjárási körülmények jelzésére alkalmazott rövidítés.

Irányítói terület – Control area
A földfelszín felett meghatározott határtól felfelé terjedő ellenőrzött légtér.

Irányítói körzet – Control zone
A földfelszíntől egy meghatározott felső magasság határig terjedő ellenőrzött légtér.

Irányszög – Heading
Az az általában északtól (földrajzi, mágneses, iránytű vagy hálózati) fokokban kifejezett irány, amelyre a légijármű hossztengelye mutat.

Ismétlődő repülési terv – Repetitive flight plan (RPL)
Azonos alapjellemzőkkel rendelkező, rendszeresen üzemeltetett egyedi repülések sorozatára vonatkozó repülési terv, amelyet a járató elfogadásra és ismétlődő felhasználásra nyújt be a légiforgalmi szolgálati egységek számára.
Jel terület – Signal area
A repülőtéren a földi látjelek kihelyezésére használt terület.

Jelentő-pont – Reporting point
Meghatározott földrajzi hely, amelyhez viszonyítva egy légijármű helyzete jelenthető.

Kitérő repülőtér – Alternate aerodrome
Olyan repülőtér, amelyre a légijármű abban az esetben folytathatja az útját, ha a tervezett célállomás repülőtere felé történő repülés folytatása vagy az oda történő leszállás végrehajtása lehetetlenné válik vagy nem tanácsos. A kitérő repülőterek köze tartoznak az alábbiak:

Felszállási kitérő – Take-off alternate
Olyan kitérő repülőtér, amelyen a légijármű leszállhat, ha ez röviddel a felszállás után szükségessé válik és erre az indulási repülőtér nem használható.

Útvonal kitérő – En-route alternate
Olyan kitérő repülőtér, amelyen egy légijármű leszállhat, ha az útvonal-repülés közben a hajózószemélyzet szokásostól eltérő vagy vészhelyzetet tapasztal.

Útvonal kitérő megnövelt hatótávolságú üzemeltetésnél – ETOPS en-route alternate
Olyan alkalmas és megfelelő kitérő repülőtér, amelyen egy légijármű szükség esetén leszállhat, ha a megnövelt hatótávolságú üzemeltetés közben egy hajtómű leáll vagy a hajózószemélyzet egyéb, a szokásostól eltérő vagy vészhelyzetet tapasztal.

Célállomás kitérő – Destination alternate
Olyan kitérő repülőtér, amely felé a légijármű folytathatja az útját, ha a tervezett célállomás repülőterén történő leszállás végrehajtás lehetetlenné válik vagy nem tanácsos.

Megjegyzés: Az a repülőtér, amelyről a járat elindult, az adott járat számára útvonal vagy célállomás kitérőként is megjelölhető.

Korlátozott terület – Restricted area
Egy állam föld területe vagy felségvizei felett elhelyezkedő meghatározott kiterjedésű légtér, amelyen belül a légijármű repülését bizonyos meghatározott körülmények alapján korlátozzák.

Körzeti irányító központ – Area control centre
Az illetékessége alá tartozó irányítói területeken üzemelő ellenőrzött repülések számára légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Körzeti irányító szolgálat – Area control service
Az irányítói körzetekben üzemelő ellenőrzött repülések számára létesített légiforgalmi irányító szolgálat.

Közelkörzet – Terminal control area
Egy vagy több repülőtér közelében, általában a légiforgalmi szolgálati útvonalak találkozási pontjánál létesített irányítói körzet.

Különleges VFR repülés – Special VFR flight
A repülőtéri irányítói körzeten belül, a látás utáni időjárási körülményeknél rosszabb időjárási helyzetben a légiforgalmi irányító szolgálat által engedélyezett VFR repülés.

Látás utáni időjárási körülmények – Visual meteorological conditions (VMC)
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél jobbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 4. fejezet tartalmazza.

Látástávolság – Visibility
A léginavigációs célokra a látás a következők közül a nagyobb:
a) a legnagyobb távolság, amelyen egy megfelelő méretű, a földfelszínhez közel elhelyezkedő fekete tárgy a fényes háttérből látható és felismerhető;

b) a legnagyobb távolság, amelyen a kb. 1000 gyertyafényerejű fények kivilágítatlan háttérből láthatók és azonosíthatók.

Megjegyzés: A két távolság a levegőben egy adott kioltási együttható mellett különböző értékű. A b) pont értéke a háttérvilágítás függvényében változó. Az a) pont értéke jelenti a meteorológiai optikai távolságot (MOR).

Leszállási terület – Landing area
A mozgási terület azon része, amelyet a légijármű le és felszállására kívánnak igénybe venni.

Légi gurulás – Air-taxiing
A forgószárnyas vagy VTOL légijármű mozgása a repülőtér felszíne felett, általában földpárna-hatás mellett és 37 km/h (20 csomó) értéknél kisebb földfelszín feletti sebességgel.

Megjegyzés: A tényleges magasság változhat és bizonyos forgószárnyas légijárművek a földpárna-hatás turbulencia csökkentése valamint a felfüggesztett mozgó teherárú rakományok védelme érdekében 8 méter (25 láb) AGL-nél nagyobb magasságot igényelhetnek.

Légifolyosó – Airway
Folyosó formájában kijelölt irányítói terület vagy ennek egy része.

Légiforgalmi irányító és repülőgépvezető közötti adatcsere – Controller – pilot data link communications (CPDLC)
A légiforgalmi irányító és a repülőgépvezető közötti távközlési módszer, amelyben az légiforgalmi irányítói szolgálati közleményeket adatátviteli összeköttetéssel továbbítják.
Légiforgalmi szolgálat – Air traffic service

Különböző; repüléstájékoztató, riasztó, tanácsadó és légiforgalmi irányító szolgálatokat (körzeti irányító, közel-körzeti irányító vagy repülőtéri irányító szolgálatokat) magába foglaló gyűjtőfogalom.

Légiforgalmi szolgálati útvonal – ATS route
A légiforgalmi szolgálatok biztosítására, a forgalom irányításához szükséges meghatározott repülési útvonal.

1. Megjegyzés: A „légiforgalmi szolgálati (ATS) útvonal" kifejezés általános megnevezés, amely többek között légifolyosót, tanácsadói, ellenőrzött vagy nem ellenőrzött, érkezési vagy indulási útvonalat is jelenthet.

2. Megjegyzés: A légiforgalmi szolgálati (ATS) útvonalat útvonal leírással határozzák meg, amely tartalmazza az ATS útvonal jelzést, a jelentős pontok (útvonal pontok) közötti rárepülési vagy kirepülési irányszöget, a helyzetjelentési előírásokat valamint, az illetékes légiforgalmi szolgálati hatóság által megállapított legalacsonyabb biztonságos tengerszint feletti repülési magasságot.

Légiforgalmi állomás – Aeronautical station
A légiforgalmi mozgó szolgálat földi állomása. Bizonyos esetekben a légiforgalmi állomás hajó fedélzetén vagy vízfelszínen létesített építményen is elhelyezhető.
Légiforgalmi irányító szolgálat – Air traffic control service
A következő célokra létesített szolgálat:
a) összeütközés megelőzése:
- *1)* a légijárművek között; és
- *2)* a mozgási területen üzemelő légijárművek és az akadályok között;

b) a légiforgalom rendszeres és folyamatos áramlásának elősegítése.

Légiforgalmi irányító szolgálati egység – Air traffic control unit
Különböző, körzeti irányító, közelkörzeti irányító vagy repülőtéri irányító egységeket magába foglaló gyűjtőfogalom.

Légiforgalmi irányítói engedély – Air traffic control clearance
Felhatalmazás a légijármű részére ahhoz, hogy valamely légiforgalmi irányító szolgálati egység által meghatározott feltételek szerint üzemeljen.

1. Megjegyzés: A légiforgalmi irányítói engedély kifejezést, megfelelő szövegkörnyezetben gyakran engedélyre rövidítik.

2. Megjegyzés: A rövidített engedély kifejezést gyakran megelőzhetik a következő – „gurulási", „felszállási", „indulási", „útvonal", „megközelítési" vagy „leszállási" – szavak, amelyek a repülés azon szakaszát jelzik, amelyre az engedély vonatkozik.

Légiforgalmi szolgálati egység – Air traffic services unit
Különböző, légiforgalmi irányító egységet, repüléstájékoztató központot vagy légiforgalmi szolgálatok bejelentő irodáját magába foglaló gyűjtőfogalom.

Légiforgalmi szolgálati légterek – Air traffic services airspace
Meghatározott kiterjedésű, az ABC betűivel azonosított légterek, amelyeken belül adott típusú repülések üzemelhetnek és amelyek számára légiforgalmi szolgálatokat jelöltek ki valamint üzemeltetési előírásokat határoztak meg.

Megjegyzés: A légiforgalmi szolgálati légterek az A–G osztályokba tartoznak.

Légiforgalmi szolgálatok bejelentő irodája – Air traffic services reporting office
A légiforgalmi szolgálatokat érintő jelentések valamint az indulás előtt a légiforgalmi szolgálati egységeknek benyújtott repülési tervek átvételére létesített egység.

Megjegyzés: A légiforgalmi szolgálatok bejelentő irodája különálló vagy egy már meglevővel – mint például egy másik légiforgalmi szolgálati egység vagy a légiforgalmi tájékoztató szolgálat irodája – együtt kialakított egység is lehet.

Légiforgalmi tájékoztató Kiadvány – Aeronautical Information Publication (AIP)
a léginavigáció szempontjából fontos és tartós jellegű légiforgalmi tájékoztatásokat tartalmazó kiadvány, amelyet az érintett állam vagy annak megbízott szervezete tesz közzé.

Légiforgalmi tanácsadó szolgálat – Air traffic advisory service
A tanácsadói légtéren belül nyújtott szolgálat, amely az IFR repülési tervek alapján üzemelő légijárművek között a lehetséges mértékben elkülönítést biztosít.

Légiforgalom – Air traffic
A levegőben levő valamint a repülőtér munkaterületén üzemelő légijárművek összessége.

Légijármű – Aircraft
Bármely szerkezet, amelynek levegőben maradása a levegővel kialakuló olyan kölcsönhatásokból származik, amelyek különböznek a föld felszínére ható légköri hatásoktól.
Légijármű parancsnoka – Pilot-in-command
A repülés biztonságos végrehajtásáért felelős, a járató vagy az általános célú légiközlekedés esetében a légijármű tulajdonosa részéről parancsnoknak kijelölt repülőgépvezető.

Levegő – föld irányítási rádióállomás – Air-ground control radio station
Légiforgalmi távközlési állomás, amely elsősorban az adott területen belül üzemelő légijárművek üzemeltetéséhez és irányításához szükséges távközlés lebonyolításáért felelős.

Magasság – Height
Egy pontként vett szint, tárgy vagy pont valamint egy meghatározott vonatkozási alap (alapadat) közötti függőleges távolság.

Mozgási terület – Movement area
Egy repülőtérnek a légijárművek fel és leszállására valamint gurulására használandó része amely a munkaterületet és a forgalmi előtere(ke)t foglalja magába.

Munkaterület – Manoeuvring area
Egy repülőtérnek a légijárművek fel és leszállására valamint gurulására használandó része a forgalmi előterek kivételével.

Műrepülés – Acrobatic flight
A légijárművel szándékosan végrehajtott olyan repülési műveletek sorozata, amely hirtelen repülési helyzet változtatással, a szokásostól eltérő repülési helyzetekkel vagy rendkívüli sebesség változtatással jár.

Műszeres időjárási körülmények – Instrument meteorological conditions (IMC)
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények, amelyek a látás utáni időjárási körülményekre meghatározott minimum értékeknél alacsonyabbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 4. fejezet tartalmazza.

Műszeres megközelítési eljárás – Instrument approach procedure
A repülési műszerek segítségével, az akadályoktól megfelelő biztonsági távolságban végrehajtott, előre meghatározott repülési műveletek sorozata, amely a kezdeti megközelítés navigációs pontjától vagy – ahol ez alkalmazható – egy meghatározott érkezési útvonal kezdetétől addig a pontig tart, amelytől a leszállás végrehajtható, illetve amennyiben a leszállást nem hajtják végre, addig ahonnan a várakozási vagy útvonal akadálymentességi előírásokat alkalmazzák.

Nyomás-magasság – Pressure-altitude
A Nemzetközi Műlégkör[8. Annex alapján*] szerinti nyomás értéknek megfelelő magasság értékben kifejezett légköri nyomás.

Összeütközés elkerülését biztosító fedélzeti rendszer – Airborne collision avoidance system (ACAS)
A másodlagos légtérfelderítő radar berendezés válaszjel-adó egysége jeleinek segítségével működő fedélzeti rendszer, amely a földi berendezésektől függetlenül tájékoztatja a légijármű vezetőjét az SSR válaszjel-adóval felszerelt, összeütközési veszélyt jelentő egyéb légijárművekről.

Rádió-távbeszélés – Radiotelephony
Olyan rádió-távközlési módszer, amelynek során a tájékoztatás csere elsősorban szóbeli közlemény-váltással történik.

Repülés állapota – Flight status
Annak jelzése, hogy egy adott légijármű a légiforgalmi szolgálati egységektől különleges kezelést igényel vagy sem.

Repülési látástávolság – Flight visibility
A repülés közben egy légijármű pilótafülkéjéből előre irányba észlelt látástávolság.

Repülési szint – Flight level
Meghatározott 1013.2 hectopascal (hPa) alap-nyomás értékhez viszonyított állandó atmoszférikus légnyomású felület, amely más ilyen felületektől meghatározott légnyomáskülönbséggel van elválasztva.

1. Megjegyzés: Az egyezményes nemzetközi műlégkörnek megfelelően kalibrált nyomásmagasság-mérő:
a) QNH beállításra állítva tengerszint feletti magasság;
b) QFE beállításra állítva a QFE földfelszín feletti magasság;
c) 1013.2 hectopascal (hPa) beállításra állítva a repülési szint (FL) kijelzésére használható.

2. Megjegyzés: A fenti 1. megjegyzésben használt tengerszint és földfelszín feletti magasság kifejezések inkább barometrikus, azaz nyomásmagasságot, mint geometrikus, azaz földméréssel számított terepmagasságot jelentenek.

Repülési terv – Flight plan
A légiforgalmi szolgálati egységek rendelkezésére bocsátott, a légijármű tervezett repülésére vagy a repülés egy szakaszára vonatkozó meghatározott tájékoztatás.

Repüléstájékoztató körzet – Flight information region
Meghatározott kiterjedésű légtér, amelyen belül repüléstájékoztató és riasztó szolgálatot biztosítanak.

Repüléstájékoztató központ – Flight information centre
Repüléstájékoztató és riasztó szolgálat biztosítására létrehozott egység.

Repüléstájékoztató szolgálat – Flight information service
A repülések biztonságos és eredményes végrehajtásához hasznos tanácsok és tájékoztatások nyújtása céljából biztosított szolgálat.

Repülőgép – Aeroplane
Levegőnél nehezebb, hajtóművel működő légijármű, amely felhajtóerejét repülés közben főként az olyan felületekre ható aerodinamikai reakciókból nyeri, amelyek a repülés adott körülményei között rögzített helyzetben maradnak.

Repülőtér – Aerodrome
Szárazföldön vagy vízfelszínen kijelölt terület (beleértve bármely épületet, létesítményt és berendezést) amely egészében vagy részben a légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Repülőtéri forgalom – Aerodrome traffic
A repülőtér munkaterületén működő összes légijármű és egyéb járművek valamint a repülőtér körzetében repülő összes légijármű forgalma.

Megjegyzés: A repülőtér körzetében repülő légijárművön a repülőtér forgalmi körén működő, az oda besoroló és az onnan kilépő légijármű értendő.

Repülőtéri forgalmi körzet – Aerodrome traffic zone
A repülőtér körül a repülőtéri forgalom védelmére kialakított meghatározott kiterjedésű légtér.

Repülőtéri irányító szolgálat – Aerodrome control service
A repülőtéri forgalom számára létesített légiforgalmi irányító szolgálat.

Repülőtéri irányító torony – Aerodrome control tower
A repülőtéri forgalom számára légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Riasztó szolgálat – Alerting service
A kutatásra és mentésre szoruló légijárművek vonatkozásában a megfelelő szervek értesítésére és szükség esetén az ezekkel történő együttműködésre létesített szolgálat.

Számított érkezési idő – Estimated time of arrival
A műszerrepülési szabályok szerint végrehajtott repülések esetében az az időpont, amikor a légijármű a számítások szerint azon navigációs berendezéssel meghatározott kijelölt pont fölé érkezik, ahonnan a műszeres megközelítési eljárás megkezdődik; vagy amennyiben nincs ilyen a repülőteret kiszolgáló navigációs berendezés, az az időpont, amikor a légijármű a repülőtér fölé érkezik. A látás utáni szabályok szerint végzett repülések esetében az az időpont, amikor a légijármű a repülőtér fölé érkezik.

Számított fékoldási idő – Estimated off-block time
Az a számított időpont, amikor a légijármű megkezdi az indulással összefüggő mozgását.

Szellemi tevékenységet befolyásoló anyagok – Psychoactive substances
Alkohol, ópiumból vagy kenderből készített kábítószer, kokain, nyugtatók és altatók, egyéb izgató, serkentő, élénkítő-szerek, képzeteket keltő erős izgatószerek és illékony oldószerek a kávé és a dohányféleségek kivételével.

Személyzet nélküli szabad léggömb – Unmanned free balloon
Hajtómű és személyzet nélkül szabadon repülő, levegőnél könnyebb légijármű.

Megjegyzés: A személyzet nélküli szabad léggömbök a 4. Függelék előírásai alapján nehéz, közepes és könnyű osztályba tartoznak.

Szint – Level
A levegőben levő légijármű függőleges helyzetére vonatkozó általános kifejezés, amely jelenthet földfelszín feletti vagy tengerszinthez viszonyított magasságot illetve repülési szintet.

Tanácsadói légtér – Advisory airspace
Meghatározott kiterjedésű légtér vagy kijelölt útvonal, amelyen belül légiforgalmi tanácsadói szolgálat áll rendelkezésre.

Tanácsadói útvonal – Advisory route
Kijelölt légi útvonal, amelyen légiforgalmi tanácsadói szolgálat áll rendelkezésre.

Teljes számított repülési idő – Total estimated elapsed time
IFR repülések esetében az a számított időtartam, amely a felszállástól addig szükséges, amíg a légijármű azon navigációs berendezéssel meghatározott kijelölt pont fölé érkezik, ahonnan a műszeres megközelítési eljárás megkezdődik; vagy amennyiben nincs ilyen a rendeltetési repülőteret kiszolgáló navigációs berendezés, az az időtartam, amely alatt a légijármű a rendeltetési repülőtér fölé érkezik. A VFR repülések esetében a felszállástól rendeltetési repülőtér fölé történő érkezésig számított időtartam.

Tengerszint feletti magasság – Altitude
Egy szint, egy pont vagy egy tárgy a közepes tengerszinthez viszonyított függőleges magassága.

Tiltott terület – Prohibited area
Egy állam földfelszíni területe vagy felségvizei felett elhelyezkedő meghatározott kiterjedésű légtér, amelyen belül a légijármű repülése tilos.

Utazó emelkedés – Cruise climb
Olyan repülőgép utazó repülés-végrehajtási módszer, amelynek során az útvonalon a tengerszint feletti repülési magasság a repülőgép tömegének csökkenésével növekszik.

Utazómagasság – Cruising level
Az a repülési szint, amelyet a légijármű a repülés jelentős szakasza során tart.

Útirány – Track
A légijármű repülési útvonalának vetülete a föld felületén, amelynek irányát bármely adott pontban általában északhoz (földrajzi, mágneses vagy földrajzi hálózati) viszonyított fok értékben fejezik ki.

VFR
A látvarepülési szabályok szerint történő üzemeltetés jelzésére használt rövidítés.

VFR repülés – VFR flight
A látvarepülési szabályok szerint végrehajtott repülés.

VMC – Visual Meteorological Conditions
A látás utáni időjárási körülmények jelzésére alkalmazott rövidítés.

Várható bevezetési idő – Expected approach time
Az az időpont, amikor légiforgalmi irányító szolgálat számítása szerint egy késleltetett érkező légijármű a leszálláshoz történő megközelítés végrehajtásához elhagyja a várakozási pontot.

Megjegyzés: A várakozási pont elhagyásának tényleges időpontja a bevezetési engedélytől függ.

Veszélyes légtér – Danger area
Meghatározott méretű légtér, amelyen belül bizonyos kijelölt időpontokban a légijármű repülésére veszélyes tevékenység folyhat.

2. fejezet

A repülési szabályok alkalmazhatósága

2.1 A repülési szabályok területi alkalmazhatósága

2.1.1 A repülési szabályokat egy szerződő állam felség- és lajstromjeleit viselő légijárműre – bárhol is legyen – alkalmazni kell mindaddig, amíg az nem ellentétes az átrepült terület felett jogi illetékességet gyakorló állam közzétett előírásaival.

Megjegyzés: A Nemzetközi Polgári Légiközlekedési Szervezet Tanácsának 1948 április 2-án elfogadott 2. Annex-e és ennek 1951 novemberi 1. módósítása azt a határozatot hozta, hogy az Annex a légijármű repülésére és üzemeltetésére vonatkozóan az Egyezmény 12. cikkelye értelmében tartalmazzon előírásokat. Ezért a nyílt vizek feletti repülésre ezek az előírások kivétel nélkül alkalmazandók.
2.1.2 Amennyiben és ameddig egy szerződő állam a Nemzetközi Polgári Légiközlekedési Szervezetet ennek ellenkezőjéről nem értesítette úgy tekintik, hogy a légijármű lajstromozására vonatkozóan az adott állam hozzájárul az alábbiakhoz:

> Olyan repülés vonatkozásában, amelyet nyílt vizek azon területei felett hajtanak végre, ahol a körzeti légiközlekedési egyezmény alapján egy szerződő állam felelősséget vállalt a légiforgalmi szolgálatok ellátásáért, a jelen Annex-ben jelzett „illetékes légiforgalmi szolgálati hatóság" a szolgálatok biztosításáért felelős állam kijelölt hatósága.

Megjegyzés: A „körzeti légiközlekedési egyezmény" kifejezés általában az ICAO Tanács által a körzeti légiközlekedési tanácskozás javaslatára jóváhagyott megállapodásra vonatkozik.

2.2 A repülési szabályok betartása

A levegőben vagy a repülőtér mozgási területén működő légijármű üzemeltetését az általános szabályok alapján hajtsák végre és ezen felül a repülés közben a légijárművet:
a) látvarepülési szabályok szerint; vagy
b) műszerrepülési szabályok szerint üzemeltessék.

1. Megjegyzés: A hét kijelölt légiforgalmi szolgálati légtér osztályban a látvarepülési valamint a műszerrepülési szabályok szerint üzemeltetett légijármű részére biztosítandó szolgálatokra vonatkozó tájékoztatást a 11. Annex 2.6.1 és 2.6.3 pontja tartalmazza.

2. Megjegyzés: A repülőgépvezető a látás utáni időjárási körülények között is választhatja a műszerrepülési szabályok szerint történő repülés végrehajtást vagy erre az illetékes légiforgalmi szolgálati hatóság felkérheti.

2.3 Felelősség a repülési szabályok betartásáért

2.3.1 A légijármű parancsnokának felelőssége

Egy légijármű parancsnoka felelős a légijármű repülési szabályok szerint történő üzemeltetésért függetlenül attól, hogy azt ténylegesen ő vezeti vagy sem, kivéve hogy a légijármű parancsnoka eltérhet ezen szabályoktól abban az esetben, ha a repülés biztonsága ezt az eltérést feltétlenül szükségessé teszi.

2.3.2 Repülés előtti tevékenység

A repülés megkezdése előtt a légijármű parancsnoka ismerje meg a tervezett repülésre vonatkozó összes rendelkezésre álló tájékoztatást. Egy repülőtér körzetét elhagyó és minden műszerrepülési szabályok szerint végrehajtott repülés esetében a repülés végrehajtása előtti tevékenység tartalmazza a rendelkezésre álló összes érvényes időjárás jelentés és előrejelzés gondos tanulmányozását, figyelembe véve a szükséges tüzelőanyag mennyíséget és megfelelő módosítás kidolgozását arra az esetre, ha a repülést a tervek szerint nem lehet fejezni.

2.4 A légijármű parancsnokának joga

A légijármű parancsokának joga a légijárműre vonatkozó összes felmerülő kérdés végső eldöntése parancsnokságának teljes időtartama alatt.

2.5 A szellemi tevékenységet befolyásoló anyagok használatának veszélyei

Azon személy, akinek tevékenysége a repülésbiztonság szempontjából alapvető fontosságú (légiközlekedés biztonságát veszélyeztető személy) nem végezheti feladatait a szellemi tevékenységet befolyásoló anyagok hatása alatt, mert ezek cselekvőképességét korlátozzák. Ilyen személy számára tilos bármely fenti anyag használata.

3. fejezet
Általános szabályok

3.1 Személy és vagyonvédelem

3.1.1 A légijármű gondatlan vagy felelőtlen üzemeltetése

A légijárművet tilos olyan gondatlan vagy felelőtlen módon üzemeltetni, hogy ez veszélyeztesse mások életét vagy vagyontárgyainak épségét.

3.1.2 Legalacsonyabb magasságok

A fel és leszállás eseteit valamint az illetékes hatóság megfelelő engedélyeit kivéve légi-jármű városok, települések sűrűn lakott területei vagy szabadban tartózkodó ember-csoportok felett csak olyan magasságon repülhet, amelyről kényszerhelyzet esetében a leszállás a földön tartózkodó személyek vagy az ott elhelyezkedő vagyontárgyak indokolatlan veszélyeztetése nélkül végrehajtható.

Megjegyzés – A látva repülési szabályok szerint végrehajtott repülésekre vonatkozó legalacsonyabb magasságokat a 4.6 pont, a műszerrepülési szabályok szerint végrehajtott repülésekre vonatkozó legalacsonyabb magasságokat az 5.1.2 pont tartalmazza.

3.1.3 Utazómagasságok

Az utazómagasságot, amelyen a repülést vagy annak egy részét végrehajtják, az alábbiak szerint határozzák meg:

a) a legalacsonyabb használható repülési szinten vagy felette illetve ahol alkalmazható, az átváltási magasság felett repülési szintekben;

b) a legalacsonyabb használható repülési szint alatt vagy ahol alkalmazható, az átváltási magasság alatt tengerszint feletti magasságban.

Megjegyzés – A repülési szintek rendszerét a Légiforgalmi Szolgálatok Eljárásai – Légi-jármű Üzemeltetés (Doc 8168) *kiadvány előírásai tartalmazzák.*

3.1.4 Tárgyak kidobása vagy anyagok szórása

A légi-járműből repülés közben semmiféle tárgyat ne dobjanak ki, vagy anyagot ne szórjanak ki kivéve, ha erre az illetékes hatóság engedélyében meghatározott feltételek szerint, a vonatkozó tájékoztatásokkal összhangban az illetékes légiforgalmi szolgálati egység tanácsot és/vagy engedélyt ad.

3.1.5 Vontatás

A légi-jármű más légi-járművet vagy egyéb tárgyat csak az illetékes hatóság előírásainak megfelelően, a vonatkozó tájékoztatásokkal összhangban és az illetékes légiforgalmi szolgálati egység tanácsa és/vagy engedélye alapján vontathat.

3.1.6 Ejtőernyős ugrások

A kényszerhelyzetben végrehajtott ejtőernyős ugrások kivételével ejtőernyős ugrást csak az illetékes hatóság előírásainak megfelelően, a vonatkozó tájékoztatásokkal összhangban és az illetékes légiforgalmi szolgálati egység tanácsa és/vagy engedélye alapján végezhetnek.

3.1.7 Műrepülés

Műrepülés csak az illetékes hatóság előírásainak megfelelően, a vonatkozó tájékoztatásokkal összhangban és az illetékes légiforgalmi szolgálati egység tanácsa és/vagy engedélye alapján hajtható végre.

3.1.8 Kötelékrepülés

Légi-járművek nem repülhetnek kötelékben csak abban az esetben, ha a repülésben résztvevő légi-járművek parancsnokai ezt előzetesen megbeszélték. Ellenőrzött légtérben végrehajtandó kötelék-repülés esetén az csak az illetékes légiforgalmi szolgálati hatóság(ok) feltételei szerint hajtható végre. A feltételek közé a következők tartoznak:

a) a kötelék a légi-navigáció és a helyzetjelentés szempontjából egy légi-járműként működik;

b) a repülésben résztvevő légi-járművek közötti elkülönítés a kötelékrepülést vezető és az abban résztvevő más légi-járművek parancsnokainak felelőssége és olyan átmeneti időszakokat is tartalmaz, amikor a légi-járművek a kötelékbe történő csatlakozás illetve kiválás alkalmával repülési műveleteket hajtanak végre a köteléken belüli saját elkülönítés biztosítása érdekében; és

c) minden egyes légi-jármű oldalirányba és hosszirányba 1 km (0.5 tengeri mérföld) valamint függőlegesen 30 métert (100 láb) nem meghaladó távolságot tart a kötelékrepülést vezető légi-járműtől.

3.1.9 Személyzet nélküli szabad léggömbök

A személyzet nélküli szabad léggömböt a 4. Függelék feltételeinek megfelelően és úgy üzemeltessék, hogy az a lehető legkisebb mértékben veszélyeztesse a személyeket, vagyontárgyakat vagy egyéb légi-járműveket.

3.1.10 Tiltott vagy korlátozott légterek

A tiltott vagy korlátozott területen belül, amelynek adatait és jellemzőit megfelelő módon közzétették, légi-járművet csak a korlátozások feltételei szerint vagy azon állam engedélye alapján üzemeltethetnek, amelynek területe felett ezeket a légtereket kijelölték.

3.2 Összeütközések elkerülése

E szabályokban semmi nem mentesíti a légi-jármű parancsnokot annak felelőssége alól, hogy az akadály elkerülésére legjobban szolgáló cselekedetet tegye, beleértve az ACAS berendezés által biztosított megoldási tanácsadáson alapuló összeütközés elkerülési manővereket.

1. Megjegyzés – Fontos, hogy a légi-jármű fedélzetén mind a repülés végrehajtása, mind a repülőtér mozgási területén történő működés közben – a repülés típusától vagy a légi-jármű által használt légtér osztályától függetlenül, a potenciális összeütközési veszély észlelése céljából – éberséget gyakoroljanak.

2. Megjegyzés – A ACAS berendezés felhasználásához szükséges – a légi-jármű parancsnok felelősségét részletező – üzemeltetési eljárásokat, a PANS-OPS (Doc 8168) I. kötet VIII. rész 3. fejezete tartalmazza.

3. Megjegyzés – Az ACAS berendezés szállítására vonatkozó előírásokat a 6. Annex I. rész 6. fejezete és a II. rész 6. fejezete tartalmazza.

3.2.1 Közelség

Légi-járművet tilos a másik légi-járműhez olyan közel üzemeltetni, hogy az összeütközés veszélye álljon elő.

3.2.2 Útirány jog

Az elsőbbséggel rendelkező légi-jármű köteles tartani repülési irányát és sebességét.

3.2.2.1 A következő előírások alapján kitérésre kötelezett légi-jármű kerülje el a másik légi-jármű felett, alatt vagy előtt történő elrepülést kivéve, ha ezt kellő távolságban teszi, és a légi-jármű által keltett turbulencia hatásait figyelembe veszi.

3.2.2.2 *Közeledés szembetartó irányon* – Amikor két légi-jármű szembetartó vagy hozzávetőlegesen ilyen irányon egymás felé közeledve repül és összeütközési veszély áll fenn, mindkettő irányától jobbra fordulva térjen ki.

3.2.2.3 *Közeledés összetartó irányon* – Amikor két légi-jármű összetartó vagy hozzávetőlegesen ilyen irányon egymás felé közeledve repül, az a légi-jármű adjon utat, amelyiknek a másik légi-jármű a jobb oldalán van, kivéve:

a) a levegőnél nehezebb, motoros meghajtású légi-jármű adjon utat a léghajónak, a vitorlázórepülőnek és a léggömbnek;

b) a léghajó adjon utat a vitorlázó repülőnek és léggömbnek;

c) a vitorlázó repülő adjon utat a léggömbnek;

d) a motoros meghajtású légi-jármű adjon utat annak a légi-járműnek, amely láthatóan más légi-járművet vagy tárgyakat vontat.

3.2.2.4 *Előzés* – Az előzést végrehajtó légi-jármű az a légi-jármű, amelyik a másikat hátulról olyan egyenesen közelíti meg, amely az utóbbi légi-jármű hossztengelyével 70 foknál kisebb szöget zár be, azaz a másikhoz képest olyan helyzetben van, hogy éjszaka se a bal, sem pedig a jobb oldali navigációs fényeit nem láthatják. Az előzés alatt álló légi-jármű elsőbbséggel rendelkezik és az előzést végrehajtó légi-jármű emelkedő, süllyedő vagy vízszintes repülés közben jobbra történő kitéréssel biztosítsa a másik légi-jármű útját. A két légi-jármű viszonylagos helyzetében a továbbiakban bekövetkező változás nem mentesíti az előzést végrehajtó légi-járművet ezen kötelezettsége alól mindaddig, amíg azt teljesen meg nem előzte és attól biztonságos távolságra került.

3.2.2.5 *Leszállás*

3.2.2.5.1 A levegőben levő, illetve a földön vagy vízfelszínen üzemelő légi-jármű adjon utat a leszálló vagy a leszálláshoz történő megközelítés utolsó szakaszaiban levő légi-járműnek.

3.2.2.5.2 Amikor két vagy több levegőnél nehezebb légi-jármű közeledik leszállás céljából egy repülőtérhez, a magasabban repülő adjon utat az alacsonyabban repülő légi-járműnek, azonban ez utóbbi ne használja fel ezt a szabályt arra, hogy a leszálláshoz történő megközelítés utolsó szakaszaiban levő légi-jármű elé vágjon vagy ezt megelőzze. Ettől függetlenül a levegőnél nehezebb, motoros meghajtású légi-jármű adjon utat a vitorlázó repülőnek.

3.2.2.5.3 *Kényszerleszállás* – Az a légi-jármű, amelynek tudomására jut, hogy egy másik kényszerleszállást hajt végre, adjon utat ennek a légi-járműnek.

3.2.2.6 *Felszállás* – A repülőtér munkaterületén guruló légi-jármű adjon utat a felszálló vagy felszálláshoz készülő légi-járműnek.

3.2.2.7 *A légi-jármű földfelszíni mozgása*

3.2.2.7.1 A repülőtér munkaterületén guruló két légi-jármű közötti összeütközés veszélye esetén a következő előírások alkalmazandók:
a) amikor két légi-jármű egymással szembetartó vagy közel szembetartó irányon közeledik egymáshoz, mindkettő álljon meg vagy lehetőség szerint a biztonságos oldaltávolság megtartásával jobbra térjen ki egymástól;
b) amikor két légi-jármű összetartó irányon közeledik egymáshoz, az adjon elsőbbséget, amelyikhez a másik jobbról közeledik;
c) egy másik légi-jármű által előzött légi-jármű elsőbbséggel rendelkezik, és az előzést végrehajtó légi-jármű tartson megfelelő biztonságos oldaltávolságot a másiktól.

Megjegyzés – Az előző légi-jármű ismertetését lásd a 3.2.2.4 pontban.

3.2.2.7.2 A munkaterületen guruló légi-jármű álljon meg és várakozzon az összes futópálya várakozási helyen kivéve, ha a repülőtéri irányító toronytól más engedélyt kapott.

Megjegyzés: A futópálya várakozási helyjelzéseket és jeleket a 14. Annex, I. kötet, 5.2.9 és 5.4.2 pontjai tartalmazzák.

3.2.2.7.3 A munkaterületen guruló légi-jármű álljon meg és várakozzon az összes kivilágított megállító kereszt-fénysornál, és csak akkor haladhat tovább, amikor a fényeket kikapcsolták.

3.2.3 Légijárművön alkalmazandó fények

1. Megjegyzés – A 3.2.3 pont repülőgépekre vonatkozó követelményeinek kielégítését célzó fények *jellemzőit a 8. Annex tartalmazza. A repülőgépek navigációs fényeire vonatkozó előírások a 6. Annex I. és II. Részeinek Függelékeiben találhatók. A repülőgép fények részletes műszaki előírásait a Légi-alkalmassági Kézikönyv (Doc 9760) A. Részének 4. fejezete, a forgószárnyas légi-jármű fényekét e dokumentum A. Részének 5. fejezete tartalmazza.*

2. Megjegyzés – A 3.2.3.2 c) és 3.2.3.4 a) pontok esetében egy légi-jármű akkor tekintendő üzemelőnek, amikor az gurul, vagy vontatják, illetve ha a gurulás vagy vontatás alatt ideiglenesen megállítják.

3. Megjegyzés – A vízfelszínen üzemelő légi-jármű esetére lásd a 3.2.6.2 pontot.

3.2.3.1 A 3.2.3.5 pont előírásai kivételével napnyugtától napkeltéig vagy az illetékes hatóság által meghatározott bármely más időszakban az összes légi-jármű repülés közben működtesse az alábbiakat:
a) összeütközés elleni jelző fények, amelyek célja más légi-jármű figyelmének felkeltése; és
b) navigációs fények, amelyek célja a légi-jármű viszonylagos repülési pályájának jelzése a megfigyelő számára, és egyéb olyan fények működtetése tilos, amelyek összetéveszthetősége ezekkel valószínűsíthető.

Megjegyzés – A légi-jármű láthatóságának növelése érdekében a Légi-alkalmassági Kézikönyv II. kötetében (Doc 9760) meghatározott összeütközés elleni jelző fények mellett egyéb célokra felszerelt – mint például leszálló vagy légi-jármű testet megvilágító – fények is használhatók.

3.2.3.2 A 3.2.3.5 pont előírásai kivételével napnyugtától napkeltéig vagy az illetékes hatóság által meghatározott bármely más időszakban:
a) a repülőtér mozgási területein haladó összes légi-jármű működtesse navigációs fényeit, amelyek célja a légi-jármű viszonylagos repülési pályájának jelzése a megfigyelő számára. Egyéb fények nem működtethetők, ha azok a fentiekkel összetéveszthetők;
b) a repülőtér mozgási területein levő összes légi-jármű, az egy helyben álló és más módon megfelelően megvilágítottak kivételével működtesse a sárkányszerkezete szélső pontjainak jelzésére szolgáló fényeit;
c) a repülőtér mozgási területein üzemelő összes légi-jármű működtesse azokat a fényeit, amelyek célja más légi-jármű figyelmének felkeltése; és
d) a repülőtér mozgási területein levő összes légi-jármű, amelyeknek hajtóműve üzemel, működtesse azokat a fényeit, amelyek ezt a tényt jelzik.

Megjegyzés – Amennyiben ezek a légi-járművön megfelelő helyen vannak elhelyezve, a 3.2.3.1 b) pontban jelzett navigációs fények kielégíthetik a 3.2.3.2 b) pont követelményeit is. A 3.2.3.1 a) pont előírása szerint felszerelt vörös színű összeütközés elleni fények kielégíthetik a 3.2.3.2 c) és d) pontok követelményeit is feltéve, hogy ezek a megfigyelőket nem vakítják el.

3.2.3.3 A 3.2.3.5 pont előírásai kivételével a levegőben levő és a 3.2.3.1 a) pont előírásának megfelelő összeütközés elleni jelző fényekkel felszerelt összes légi-jármű a 3.2.3.1 pontban meghatározott időszakon kívül is működtesse ezeket a fényeket.

3.2.3.4 A 3.2.3.5 pont előírásai kivételével az összes légi-jármű:
a) amely a repülőtér mozgási területén üzemel és a 3.2.3.2 c) pont előírásának megfelelő összeütközés elleni jelző fényekkel van felszerelve; vagy
b) amely a repülőtér mozgási területén üzemel és a 3.2.3.2 d) pont előírásának megfelelő fényekkel van felszerelve
a 3.2.3.2 pontban meghatározott időszakon kívül is működtesse ezeket a fényeket.
3.2.3.5 A repülőgép-vezető számára engedélyezzék a 3.2.3.1, 3.2.3.2, 3.2.3.3 vagy 3.2.3.4 pontok előírásainak megfelelően felszerelt bármely villanó fény lekapcsolását vagy intenzitásának csökkentését, ha ezek ténylegesen vagy valószínűen:
a) hátrányosan befolyásolják feladatainak kielégítő végrehajtását; vagy
b) elvakítják a külső megfigyelőt.

3.2.4 Gyakorló műszer-repülések

Légi-járművel gyakorló műszerrepülési feltételek között tilos repülni kivéve, ha:
a) a légi-jármű kifogástalanul működő kettős kormány-berendezéssel van felszerelve; és
b) az ellenőrző ülést képesített repülőgép-vezető foglalja el azzal a céllal, hogy biztonsági repülőgép-vezetőként működjön a gyakorló műszer-repülési feltételek között repülő másik személy számára. A biztonsági repülőgép-vezető előre és a légi-jármű mindkét oldalára megfelelő kilátással rendelkezzen, vagy a légi-járműben alkalmas helyet elfoglaló kompetens olyan megfigyelővel legyen összeköttetésben, aki megfelelően tudja figyelni a biztonsági repülőgép-vezető helyéről be nem látható területet.

3.2.5 Üzemelés a repülőtéren és annak közelében

A repülőtéren vagy annak közelében üzemeltetett légi-jármű, akár a repülőtér forgalmi körzetében van, akár nem:

a) az összeütközés elkerülése érdekében figyelje a repülőtér egyéb forgalmát;

b) igazodjon a többi üzemelő légi-jármű közlekedési pályájához, vagy kerülje el azt;

c) a leszálláshoz történő megközelítés és a felszállás után minden fordulót balra hajtsa végre kivéve, ha más utasítást nem kap;

d) a leszállást és felszállást széllel szemben hajtsa végre kivéve, ha biztonsági, futópálya elrendezési vagy légiforgalmi okok miatt az ettől eltérő irány igénybevétele előnyösebb.

1. Megjegyzés – Lásd 3.6.5.1 pont.

2. Megjegyzés – A repülőtéri forgalmi körzetekben más szabályok is alkalmazhatók.

3.2.6 Üzemeltetés vízfelszínen

Megjegyzés – A jelen Annex 3.2.6.1 pontjának előírásai mellett egyes esetekben a tengeri összeütközések megelőzésének szabályait felülvizsgáló nemzetközi konferencián (1972 – London) kidolgozott „Tengeri Összeütközések Megelőzésének Nemzetközi Előírásai”-ban található szabályok is alkalmazhatók.

3.2.6.1 Amikor két légi-jármű vagy egy légi és egy vízi jármű közeledik egymáshoz és összeütközési veszély következik be, a légi-jármű a fennálló körülményeknek és feltételeknek megfelelő óvatossággal haladjon, figyelembe véve a szóban forgó jármű korlátozott manőverezési képességeit is.

3.2.6.1.1 *Közeledés összetartó irányon* – Az a légi-jármű, amelyiknek a másik légi- vagy vízi jármű a jobb oldalán van, a másiktól megfelelő biztonságos oldaltávolságot tartva adjon utat.

3.2.6.1.2 *Közeledés szembetartó irányon* – Az a légi-jármű, amelyik egy másik légi- vagy vízi járműhez képest szembetartó vagy hozzávetőlegesen ilyen irányon közeledik, irányától jobbra fordulva megfelelő biztonságos oldaltávolságra térjen ki.

3.2.6.1.3 *Előzés* – Az előzés alatt álló légi vagy vízi jármű elsőbbséggel rendelkezik, és az előzést végrehajtó légi-járműnek – elfordulva – megfelelő biztonságos oldaltávolságot kell tartania.

3.2.6.1.4 *Leszállás és felszállás* – A vízfelszínre leszálló vagy az arról felszálló légi-jármű a lehetőségek szerint tartson megfelelő biztonságos oldaltávolságot az összes vízi járműtől, és ne akadályozza azok haladását.

3.2.6.2 *Vízfelszínen üzemelő légi-járművön alkalmazandó fények* – Napnyugtától napkeltéig vagy az illetékes hatóság által napnyugta és napkelte között meghatározott bármely más időszakban a vízfelszínen levő összes légi-jármű a Tengeri Összeütközések Megelőzésének Nemzetközi Előírásai szerint (1972) működtesse fényeit kivéve, ha ez gyakorlati okokból nem lehetséges. Ez utóbbi esetben üzemeltessen olyan fényeket, amelyek jellemzőikben és elhelyezésükben a lehető legjobban megfelelnek a nemzetközi előírásoknak.

1. Megjegyzés – A víz-felszínen üzemelő repülőgépeken alkalmazandó fények előírásai a 6. Annex I. és II. részének Függelékeiben találhatók.

2. Megjegyzés – A Tengeri Összeütközések Megelőzésének Nemzetközi Előírásai meghatározzák, hogy a fényekre vonatkozó szabályok napnyugta és napkelte között alkalmazandók. Ezért a 3.2.6.2 pont alapján megállapított bármely – napnyugta és napkelte közötti rövidebb – időszak nem alkalmazható azokon a területeken, mint például nyílt vízen, amelyeken a Tengeri Összeütközések Megelőzésének Nemzetközi Előírásai érvényesek.

3.3 Repülési tervek

3.3.1 Repülési terv benyújtása

3.3.1.1 A tervezett repülésre vagy repülési szakaszra vonatkozó tájékoztatást a légiforgalmi szolgálati egységeknek repülési terv formájában nyújtsák be.

3.3.1.2 A repülés végrehajtása előtt nyújtsanak be repülési tervet:
a) minden olyan repülésre vagy repülési szakaszra, amelyet légiforgalmi irányító szolgálat igénybevételével hajtanak végre;
b) bármely műszerrepülési szabályok szerint tanácsadói légtérben végrehajtott repülésre;
c) bármely repülésre, amelyet meghatározott légtérben vagy ilyen légtérbe vezetően illetve meghatározott útvonalakon hajtanak végre, amennyiben a repüléstájékoztató, riasztó illetve kutató – mentő szolgálat biztosítása érdekében az illetékes légiforgalmi szolgálati hatóság ezt előírja;
d) bármely repülésre, amelyet meghatározott légtérben vagy ilyen légtérbe vezetően illetve meghatározott útvonalakon hajtanak végre, amennyiben az illetékes légiforgalmi szolgálati hatóság ezt az azonosítás céljából történő elfogás szükségességének elkerülése érdekében a katonai szervekkel vagy a szomszédos állam légiforgalmi szolgálati egységeivel történő együttműködés elősegítése miatt előírja;
e) bármely nemzetközi határokat keresztező repülésre.

Megjegyzés: A repülési terv kifejezés jelenthet teljes repülési tervet, amely tartalmazza az összes tájékoztatást a repülés egész útvonalára, vagy ez lehet korlátozott tájékoztatás, amely abban az esetben szükséges, ha a repülési terv benyújtásának célja a repülés egy rövidebb szakaszára, például egy légiútvonal keresztezésére, ellenőrzött repülőtérről történő felszállásra vagy ilyen repülőtérre történő leszállásra vonatkozó engedély beszerzése.

3.3.1.3 Nyújtsanak be repülési tervet a légiforgalmi szolgálatok bejelentő irodájának az indulás előtt vagy az illetékes légiforgalmi szolgálati egységhez illetve a légiforgalmi irányító szolgálat levegő-föld rádióállomásához a repülés közben, kivéve ha az ismétlődő repülési terv benyújtása céljából megfelelő intézkedéseket foganatosítottak.

3.3.1.4 Amennyiben az illetékes légiforgalmi szolgálati hatóság másként nem írja elő, a légiforgalmi irányító vagy tanácsadó szolgálatot igénybe vevő repülésre vonatkozó repülési tervet az indulás előtt legalább hatvan perccel vagy a repülés közben annyi idővel előbb nyújtsák be, amely biztosítja, hogy azt az illetékes légiforgalmi szolgálati egységek legalább tíz perccel azon időpont előtt megkapják, amikor a légijármű a számítások szerint eléri:
a) az ellenőrzött vagy tanácsadói légtér tervezett belépési pontját; vagy
b) a légiútvonal vagy a tanácsadói útvonal keresztezési pontját.

3.3.2 A repülési terv tartalma

A repülési terv az illetékes légiforgalmi szolgálati hatóság által szükségesnek tekintett módon az alábbi tájékoztatásokat tartalmazza:

• A légijármű azonosítója;
• Repülési szabályok és a repülés típusa;
• Légijárművek száma és típusa valamint a turbulencia kategória;
• Felszerelések;
• Indulási repülőtér (lásd 1. Megjegyzés);
• Számított fékoldási idő (lásd 2. Megjegyzés);
• Utazó sebesség(ek);
• Utazó magasság(ok);
• Követendő útvonal;
• Rendeltetési repülőtér és a teljes számított repülési idő;
• Kitérő repülőtér vagy repülőterek;
• Tüzelőanyag-készlet;
• Fedélzeten tartózkodó személyek teljes létszáma;
• Vészhelyzeti és mentőfelszerelések;
• Egyéb tájékoztatás.

1. Megjegyzés: A repülés közben benyújtott repülési tervek esetében az erre vonatkozó adat azt a helyet jelzi, ahonnan a repülésre vonatkozó kiegészítő tájékoztatások szükség esetén beszerezhetők.

2. Megjegyzés: A repülés közben benyújtott repülési tervek esetében az itt jelzett időpont az lesz, amikor a légijármű átrepüli az első pontot azon az útvonalon, amelyre a repülési terv vonatkozik.

3. Megjegyzés: A repülési tervben alkalmazott „repülőtér” kifejezés olyan, repülőtérnek nem tekinthető helyet is jelenthet, amelyet bizonyos típusú légijárművek – például forgószárnyas légijármű vagy léggömb – használhatnak.

3.3.3 A repülési terv kitöltése

3.3.3.1 A repülési terv, bármely célból nyújtották azt be, a „kitérő repülőtér” megnevezéséig bezárólag tartalmazza azokat a megfelelő adatokat, amelyek a repülés teljes útvonalára vagy annak azon szakaszára vonatkoznak, amelyre a repülési tervet benyújtották.

3.3.3.2 Ezen kívül a repülési terv szükség szerint tartalmazzon minden olyan további adatokat, amelyeket az illetékes légiforgalmi szolgálati hatóság előírt vagy amelyeket a repülési terv benyújtója szükségesnek ítélt.

3.3.4 A repülési terv változtatása

A 3.6.2.2 pont előírásainak megfelelően az IFR repülésre vagy az ellenőrzött VFR repülésre benyújtott repülési terv minden változását a lehető legrövidebb időn belül jelentsék az illetékes légiforgalmi szolgálati egységnek. Egyéb VFR repülések esetében a repülési terv jelentős változásait a lehető legrövidebb időn belül jelentsék az illetékes légiforgalmi szolgálati egységnek.

1. Megjegyzés: Az indulás előtt benyújtott, a tüzelőanyag készletre vagy a fedélzeten tartózkodó személyek számára vonatkozó tájékoztatás, ha ez az indulás időpontjában nem pontos, jelentős változásnak tekintendő és ezért az ilyen változást jelenteni kell.

2. Megjegyzés: Az ismétlődő repülési tervek változásának benyújtására vonatkozó eljárásokat a PANS-ATM (Doc. 4444) tartalmazza.

3.3.5 A repülési terv lezárása

3.3.5.1 Amennyiben az illetékes légiforgalmi szolgálati hatóság másként nem írja elő, bármely repülés, amely vonatkozásában az egész útvonalra vagy a célállomás repülőtérig tartó fennmaradó útvonal szakaszra repülési tervet nyújtottak be, a leszállás követően a lehető legrövidebb időn belül személyesen, rádiótávbeszélőn vagy adathálózati összeköttetés segítségével jelentse leszállását az érkezési repülőtér illetékes légiforgalmi szolgálati egységének.

3.3.5.2 Amennyiben a repülési tervet csak a repülés egy olyan szakaszára nyújtották be, amely nem azonos célállomás repülőtérig tartó fennmaradó útvonal szakasszal, azt az illetékes légiforgalmi szolgálati egységének továbbított megfelelő jelentéssel zárják le abban az esetben, ha ezt előírták vagy kérik.

3.3.5.3 Amennyiben az érkezési repülőtéren nincs légiforgalmi szolgálati egység, az érkezési jelentést kérésre a leszállás után a lehető legrövidebb időn belül és a rendelkezésre álló leggyorsabb módon adják meg a legközelebbi légiforgalmi szolgálati egységnek.

3.3.5.4 Amikor ismert, hogy a távközlési berendezések az érkezési repülőtéren nem kielégítőek és az érkezési jelentés továbbítására a földön egyéb lehetőség nem áll rendelkezésre, a következők szerint járjanak el:

Ha lehetséges és ezt kérik, közvetlenül a leszállás előtt továbbítsanak az érkezési jelentésnek megfelelő közleményt az illetékes légiforgalmi szolgálati egység részére. Általában ezt a jelentést azon repüléstájékoztató körzetért felelős légiforgalmi szolgálati egységet kiszolgáló légiforgalmi állomáson adják le, amelyben a légijármű üzemel.

3.3.5.5 A légijármű érkezési jelentése a következő adatokat tartalmazza:
a) légijármű azonosítója;
b) indulási repülőtér:
c) rendeltetési repülőtér (csak a kitérő repülőtéren történő leszállás esetén);
d) érkezési repülőtér; és
e) érkezés időpontja.

Megjegyzés: Amikor érkezési jelentést írnak elő, ezen fenti előírások nem teljesítése komoly fennakadásokat okozhat a légiforgalmi szolgálatok működésében és jelentős költségekkel jár a szükségtelen kutató és mentő műveletek végrehajtása.

3.4 Jelzések

3.4.1 Az 1. Függelékben ismertetett jelzések észlelése vagy vétele esetén a légijármű hajtsa végre azokat a tevékenységeket, amelyek a Függelékben meghatározott jelzések értelmezése alapján szükségesek.

3.4.2 Az 1. Függelékben ismertetett jelzések felhasználásuk esetén azzal a jelentéssel rendelkeznek, amelyet a Függelék tartalmaz. Ezeket csak az ismertetett célokra lehet igénybe venni és ne használjanak egyéb olyan jelzéseket, amelyek ezekkel összetéveszthetők.

3.5 Idő

3.5.1 Alkalmazzák az éjféllel kezdődő, 24-órás napban számított, órában, percben és szükség szerint másodpercben kifejezett egyeztetett egyetemes időt (UTC).

3.5.2 Az ellenőrzött repülés megkezdése előtt valamint bármikor a repülés során, mikor ez szükséges, végezzenek óra – idő egyeztetést.

Megjegyzés: Az ilyen idő egyeztetést általában a légiforgalmi szolgálati egységgel végzik el, kivéve ha a járató vagy az illetékes légiforgalmi szolgálati hatóság más intézkedéseket foganatosított.

3.5.3 Ahol az idő(mérés)t az adatátviteli összeköttetéseknél is felhasználják, annak pontossága 1 másodperc UTC értéken belül legyen.

3.6 Légiforgalmi irányító szolgálat

3.6.1 Légiforgalmi irányítói engedélyek

3.6.1.1 Minden ellenőrzött repülés vagy ellenőrzött repülésként végrehajtott repülési szakasz megkezdése előtt szerezzenek be légiforgalmi irányítói engedélyt. Az ilyen engedélyt a légiforgalmi irányító szolgálati egységhez benyújtott repülési terv útján kell megkérni.

1. Megjegyzés: A repülési terv szükség szerint tartalmazhatja a repülésnek csak azt a részét, amely a repülésnek azon szakaszát vagy repülési részleteit ismerteti, melyet légiforgalmi irányító szolgálat közreműködésével hajtanak végre. Megengedhető, hogy a légiforgalmi irányítói engedély csak az érvényes repülési terv csak egy részére vonatkozzon, amelyet engedélyhatárral vagy meghatározott repülési műveletek megnevezésével – például gurulás, leszállás vagy felszállás – jeleznek.

2. Megjegyzés: Amennyiben a légiforgalmi irányítói engedély a légijármű parancsnoka számára nem kielégítő, a légijármű parancsnoka módosított engedélyt kérhet és ha ez gyakorlatilag lehetséges, kaphat.

3.6.1.2 Amikor egy légijármű elsőbbségi engedélyt kért, az illetékes légiforgalmi szolgálati egység kérésére az elsőbbségi engedély kérelmét indokolja meg.

3.6.1.3 *A repülés lehetséges tovább-engedélyezése*

Amennyiben az indulás előtt úgy tervezik, hogy a repülés közben a tüzelőanyag készlet függvényében és további engedély alapján a személyzet eldöntheti, hogy a repülést tovább folytatják egy módosított rendeltetési repülőtérre, erről a repülési tervbe illesztett útvonal módosítással (ha ismert) és a módosított rendeltetési repülőtér meghatározásával értesítsék az illetékes légiforgalmi szolgálati egységeket.

Megjegyzés: Ezen előírás célja a repülésnek általában az eredetitől távolabbra eső módosított

3.6.1.4 Az ellenőrzött repülőtéren üzemelő légijármű a munkaterületen nem hajthat végre gurulást a repülőtéri irányító torony engedélye nélkül, és be kell tartania az ezen egység által adott bármely utasítást.

3.6.2 A repülési terv betartása

3.6.2.1 A 3.6.2.2 és 3.6.2.4 pontokban ismertetett előírások kivételével a légijármű tartsa be az ellenőrzött repülésre benyújtott érvényes repülési tervét vagy annak megfelelő részét, kivéve ha valamilyen módosítást kért és erre az illetékes légiforgalmi szolgálati egységtől engedélyt kapott vagy ha olyan kényszerhelyzetbe került, amely azonnali cselekvést követel meg. Ebben az esetben amint azt a kényszer-intézkedés végrehajtása után a körülmények lehetővé teszik, értesítse az illetékes légiforgalmi szolgálati egységet a foganatosított intézkedésről és arról a tényről, hogy azt kényszerítő körülmények hatására hajtották végre.

3.6.2.1.1 Amennyiben az illetékes légiforgalmi irányító egységtől más felhatalmazást vagy utasítást nem kapott, az ellenőrzött repülések amennyire gyakorlatilag lehetséges:

a) kijelölt légiforgalmi szolgálati útvonalon (ATS) történő repülés alkalmával az adott útvonal meghatározott középvonalán; vagy

b) bármely más útvonalon történő repülés alkalmával az útvonalat kijelölő navigációs berendezések és/vagy pontok között közvetlenül haladjanak.

3.6.2.1.2 A 3.6.2.1.1 pontban ismertetett elsődleges fontosságú előírás figyelembevétele mellett egy ultrarövidhullámú VOR berendezéssel kijelölt ATS útvonal szakaszon repülő légijármű a már átrepült berendezés követéséről az úton előtte levő berendezés követésére – ahol ilyet létesítettek – az átkapcsolási ponton vagy üzemeltetési szempontból ahhoz legközelebb álljon át.

3.6.2.1.3 A 3.6.2.1.1 pontban előírtaktól való eltérésről értesítsék az illetékes légiforgalmi szolgálati egységet.

3.6.2.2 *Nem szándékos eltérések* – Amennyiben az ellenőrzött repülés nem szándékosan tér el az érvényes repülési tervétől, a következő intézkedéseket tegye meg:

a) Eltérés az útvonaltól: ha a légijármű letér az útvonalról, haladéktalanul helyesbítse géptengely irányszögét úgy, hogy a lehető legrövidebb időn belül visszatérjen az útvonalra;

b) Tényleges repülési sebesség eltérése esetén: ha a jelentőpontok között az utazómagasságon az átlagos tényleges repülési sebesség a repülési tervben meghatározott repülési sebességhez viszonyítva ± 5 %-kal eltér vagy várhatóan megváltozik, erről tájékoztassák az illetékes légiforgalmi szolgálati egységet;

c) Számított idők eltérése esetén: ha a következő alkalmazható jelentőpontra, repüléstájékoztató körzet határra vagy rendeltetési repülőtérre – amelyik előbb következik – számított idő három percnél többel, vagy az illetékes ATS hatóság által meghatározott illetve a körzeti légiközlekedési egyezményben kijelölt más időtartammal eltér a légiforgalmi szolgálatok számára megadott időtől, a módosított számított időt a lehető legrövidebb időn belül közöljék illetékes légiforgalmi szolgálati egységgel.

3.6.2.2.1 Ezen kívül, amikor ADS egyezmény van érvényben, az adathálózaton keresztül automatikusan tájékoztassák az illetékes légiforgalmi szolgálati egységet (ATSU) a változásról abban az esetben, ha a változás meghaladja az ADS eseti adatszolgáltatási megállapodásban meghatározott határértéket.

3.6.2.3 *Szándékos eltérések* – A repülési terv megváltoztatására irányuló kérések a következőkben ismertetett tájékoztatásokat tartalmazzák:

a) Az utazómagasság megváltoztatása esetén: a légijármű azonosító jele; a kért új utazómagasság és utazósebesség ezen a magasságon; a módosított számított idők – ha alkalmazható – a következő repüléstájékoztató körzet határokra.

b) Az útvonal megváltoztatása esetén:

1) *A rendeltetési hely változatlan:* a légijármű azonosító jele; repülési szabályok; a repülés új útvonalának leírása, beleértve a repülési terv vonatkozó adatait attól a helytől kezdődően, amelynél a kért útvonal változtatás megkezdődik; módosított számított idők; bármely más ide tartozó tájékoztatás.

2) *A rendeltetési hely változik:* a légijármű azonosító jele; repülési szabályok; a repülés új útvonalának leírása a módosított rendeltetési repülőtérre, beleértve a repülési terv vonatkozó adatait attól a helytől kezdődően, amelynél a kért útvonal változtatás megkezdődik; módosított számított idők; kitérő repülőtér (repülőterek); bármely más ide tartozó tájékoztatás.

3.6.2.4 *Időjárás romlás a VMC értékek alá* – Amikor nyilvánvalóvá válik, hogy a repülést az érvényes repülési terv szerint látás utáni időjárási körülmények (VMC) között végrehajtani nem lehet, a látvarepülési szabályok szerint üzemeltetett ellenőrzött repülést végző légijármű:
a) kérjen módosított engedélyt, amely lehetővé teszi, hogy a légijármű repülését VMC körülmények között folytathassa a rendeltetési vagy kitérő repülőtérig vagy elhagyja azt a légteret, amelyben a repülést légiforgalmi irányítói engedély alapján hajthatja végre; vagy
b) amennyiben a fenti *a)* alpontban meghatározott engedély nem szerezhető be, folytassa működését VMC körülmények között és értesítse az illetékes légiforgalmi irányító egységet az érintett légtér elhagyása vagy a legközelebbi alkalmas repülőtéren történő leszállás végrehajtása céljából foganatosított intézkedésről; vagy
c) a repülőtéri irányító körzeten belül történő működés esetén kérjen engedélyt különleges VFR repülésre; vagy
d) kérjen engedélyt a műszerrepülési szabályok szerint történő üzemelésre.

3.6.3 Helyzetjelentések

3.6.3.1 Kivéve, ha az illetékes légiforgalmi szolgálati hatóság vagy ezen hatóság által meghatározott feltételek alapján az illetékes légiforgalmi szolgálati egység ezen kötelezettség alól felmentést nem ad, az ellenőrzött repülés a lehető legrövidebb időn belül jelentse az illetékes légiforgalmi szolgálati egységnek minden egyes kijelölt kötelező jelentőpont átrepülésének időpontját és repülési magasságát valamint bármely más előírt tájékoztatást. Az illetékes légiforgalmi szolgálati egység felkérésére adjon hasonló helyzet jelentéseket bármely más pontnál is. A kijelölt jelentőpontok hiányában az ellenőrzött repülés a helyzet jelentéseket az illetékes légiforgalmi szolgálati hatóság által előírt vagy az illetékes légiforgalmi szolgálati egység által meghatározott időközökben adja meg.

3.6.3.1.1 Az adathálózati összeköttetésen keresztül az illetékes légiforgalmi szolgálati egységnek helyzet tájékoztatást adó légijármű szóbeli helyzetjelentést csak kérésre adjon.

Megjegyzés: Azok a feltételek és körülmények, amelyek között a nyomás-magasság SSR C módban történő adása megfelel a helyzet jelentés magassági tájékoztatásra vonatkozó követelményének, a PANS-ATM (Doc 4444) kiadványban találhatók.

3.6.4 Az irányítás megszűnése

Az ellenőrzött repülés – az ellenőrzött repülőtéren történő leszállás kivételével – a lehető legrövidebb időn belül értesítse az illetékes légiforgalmi irányító egységet, mihelyst megszűnik számára a légiforgalmi irányító szolgáltatás.

3.6.5 Összeköttetések

3.6.5.1 Az ellenőrzött repülést végrehajtó légijármű tartson fenn folyamatos figyelést a megfelelő rádió frekvencián és szükség szerint létesítsen két-oldalú szóbeli rádióösszeköttetést az illetékes légiforgalmi irányító egységgel, kivéve ha az illetékes légiforgalmi szolgálati hatóság az ellenőrzött repülőtér repülőtéri forgalmában résztvevő légijárművek számára mást ír elő.

1. Megjegyzés: A SELCAL vagy más hasonló automatikus jelző készülékek tesznek a folyamatos figyelésre vonatkozó előírásnak.

2. Megjegyzés: A folyamatos rádió figyelésre vonatkozó előírás a légijármű számára érvényben marad azt követően is, hogy légiforgalmi irányító és repülőgépvezető közötti adatcsere összeköttetést létesítettek.

3.6.5.2 *Az összeköttetés megszakadása* – Amennyiben az összeköttetés megszakadása miatt lehetetlen a 3.6.5.1 pont előírásának teljesítése, a légijármű hajtsa végre a 10. Annex II. kötetében található rádióösszeköttetés megszakadására vonatkozó valamint szükség szerint a következőkben ismertetett eljárásokat. Ezeken kívül az ellenőrzött repülőtér repülőtéri forgalmában résztvevő légijármű figyeljen a látjelek útján kiadható utasításokra is.

3.6.5.2.1 Látás utáni időjárási körülmények (VMC) között a légijármű:
a) folytassa repülését látási időjárási körülmények között;
b) szálljon le a legközelebbi alkalmas repülőtéren; és
c) a leggyorsabb módon jelentse érkezését az illetékes légiforgalmi irányító egységnek.

3.6.5.2.2 Műszeres időjárási körülmények (IMC) között vagy olyan esetben, ha a repülés befejezése a 3.6.5.2.1 pont (lásd 1. Megjegyzés) alapján nem látszik lehetségesnek, a légijármű:
a) kivéve ha a helyi körzeti légiközlekedési egyezmény másként nem rendelkezik, tartsa az utoljára kijelölt sebességét és repülési szintjét vagy legalacsonyabb tengerszint feletti repülési magasságát – amelyik a nagyobb érték – húsz percig az után, hogy nem tudta jelenteni helyzetét egy kötelező jelentőpont felett, majd ezt követően repülési szintjét és sebességét a légiforgalmi szolgálati egységeknek benyújtott repülési tervnek megfelelően módosítsa;
b) az érvényes repülési terve szerint repüljön tovább a rendeltetési repülőteret kiszolgáló megfelelő navigációs berendezésig és ha ez az alábbi c) alpontban ismertetettek teljesítése érdekében szükséges, várakozzon ezen navigációs berendezés felett a süllyedés megkezdéséig;
c) kezdje meg a süllyedést a *b)* alpontban ismertetett navigációs berendezésnél az utoljára vett és nyugtázott várható bevezetési vagy ahhoz a lehető legközelebbi időpontban; vagy ha várható bevezetési időt nem kapott és nyugtázott, az érvényes repülési tervében meghatározott számított érkezési vagy ahhoz a lehető legközelebbi időpontban;
d) hajtsa végre a kijelölt navigációs berendezésre előírt szabványos műszermegközelítési eljárást; és
e) szálljon le, ha lehetséges a *c)* alpontban meghatározott számított érkezési idő vagy az utoljára nyugtázott várható bevezetési idő – amelyik a későbbi – utáni harminc percen belül.

1. Megjegyzés: Amint az az ismertetett időjárási körülményekből is nyilvánvaló, a 3.6.5.2.1 pont az összes ellenőrzött repülésre, míg a 3.6.5.2.2 pont csak az IFR repülésekre vonatkozik.

2. Megjegyzés: A légiforgalmi irányító szolgálat intézkedései az érintett légtérben működő többi légijárműre vonatkozóan azon a feltételezésen alapulnak, hogy az összeköttetés megszakadása esetén a légijármű eleget tesz a 3.6.5.2.2 pont előírásainak.
3. Megjegyzés: Lásd még az 5.1.2 pontot is.

3.7 Jogtalan beavatkozás

A jogtalan beavatkozás alatt álló légijármű kísérelje meg értesíteni az illetékes légiforgalmi szolgálati egységet erről a tényről valamint az ezzel kapcsolatos bármely lényeges körülményről és az érvényes repülési tervétől így szükségessé váló bármely eltérésről annak érdekében, hogy az ATS egység biztosítani tudja számára az elsőbbséget és a többi légijárművel való konfliktus lehetőségét a lehető legkisebbre csökkentse.

1. Megjegyzés: A légiforgalmi szolgálati egységek jogtalan beavatkozás helyzeteiben érvényes felelősségét a 11. Annex tartalmazza.

2. Megjegyzés: A jogtalan beavatkozás alatt álló, azonban az ATS egységet erről értesíteni nem tudó légijárművel kapcsolatos intézkedésekre vonatkozó tájékoztató a jelen Annex B. Mellékletében található.

3. Megjegyzés: A másodlagos válaszjeladóval (SSR) felszerelt jogtalan beavatkozás alatt álló légijármű által követendő eljárás a 11. Annex-ben, a PANS-ATM (Doc 4444) és PANS-OPS (Doc 8168) kiadványokban található.

4. Megjegyzés: A légiforgalmi irányító és repülőgépvezető közötti adatcsere kapcsolatot fenntartó, jogtalan beavatkozás alatt álló légijármű által követendő eljárás a 11. Annex-ben, a PANS-ATM (Doc 4444) és a Légiforgalmi szolgálatok adat-összeköttetés alkalmazási kézikönyvében (Doc 9694) kiadványokban található.

3.8 Elfogás

Megjegyzés: Az „elfogás” kifejezés ebben az értelemben nem foglalja magában azt az esetet, amikor a veszélyben levő légijármű számára és kérésére a Nemzetközi Légiközlekedési és Tengerhajózási Kutatási és Mentési Kézikönyv (IAMSAR – Doc 9731) II. és III. kötete alapján biztosítanak légi megközelítést és kíséretet.

3.8.1 A polgári légijármű elfogását a szerződő államok által kiadott megfelelő előírások és adminisztratív irányelvek szerint hajtsák végre, amelyek megfelelnek a Nemzetközi Polgári Légiközlekedési Egyezmény és különösen annak 3 (d) cikkelye rendelkezéseinek, melyek alapján a szerződő államok kötelezettséget vállalnak arra, hogy állami légijárműveikre vonatkozó előírásaik kiadásakor kellő figyelmet fordítanak a polgári légiközlekedésben működő légijárművek biztonságára. Ennek megfelelően a vonatkozó előírások és adminisztratív irányelvek kidolgozása alkalmával kellő figyelmet kell fordítani az 1. Függelék 2. részében és a 2. Függelék 1. részében található előírásokra.

Megjegyzés: Elismerve, hogy a repülésbiztonság érdekében alapvető fontosságú, hogy a csak végső eszközként alkalmazott elfogás esetében használt bármilyen vizuális jelzéseket a polgári és katonai légijárművek az egész világon helyesen alkalmazzák és értelmezzék, a Nemzetközi Polgári Légi-közlekedési Szervezet Tanácsa a jelen Annex 1. Függelékéhez tartozó látjelek elfogadása alkalmával felhívta a szerződő államok figyelmét arra, biztosítsák, hogy azokat állami légijárműveik szigorúan tartsák be. Tekintettel arra, hogy a polgári légijárművek elfogása minden esetben gyakorlati veszélyt jelent, a Tanács különleges ajánlásokat dolgozott ki és nyomatékosan kéri, hogy azokat a szerződő államok egységesen alkalmazzák. Ezeket a különleges ajánlásokat az A. Melléklet tartalmazza.

3.8.2 A polgári légijármű parancsnoka az elfogás alkalmával tegyen eleget a 2. Függelék 2. és 3. részében található nemzetközi előírásoknak és a látjeleket az 1. Függelék 2. részében meghatározottak szerint értelmezze és viszonozza.

Megjegyzés: Lásd még 2.1.1 és 3.4 pontokat.

3.9 VMC minimális látástávolság és felhőzettől való távolság

A látás utáni időjárási körülményekre vonatkozó látástávolság és felhőzettől való távolság minimum értékeket a 3-1. táblázat tartalmazza.

3-1. táblázat *

(lásd 4.1 pont)

<table>
<tr><td>Légtér osztály A***</td><td>B C D E</td><td colspan="2">F G</td></tr>
<tr><td></td><td></td><td>900 m (3000 láb) AMSL vagy
300 m (1000 láb)
terep feletti magasság felett –
amelyik a
nagyobb érték</td><td>900 m (3000 láb) AMSL vagy
300 m (1000 láb)
terep feletti magasságon vagy ez alatt –
amelyik a nagyobb érték</td></tr>
<tr><td>Távolság a felhőtől</td><td colspan="2">vízszintesen 1500 m,
függőlegesen 300 m (1000 láb)</td><td>felhőn kívül és
felszín látással</td></tr>
<tr><td>Repülési látástávolság</td><td colspan="2">3050 m (10000 láb) AMSL magasságon vagy felette 8 km,
3050 m (10000 láb) AMSL magasság alatt 5 km</td><td>5 km **</td></tr>
</table>

* Amikor az átváltási magasság 3050 méter (10000 láb) AMSL értéknél alacsonyabb, a 10000 láb magasság helyett FL 100 használandó.

** Amikor az illetékes légiforgalmi szolgálati hatóság így írja elő:

a) 1500 méterig terjedő alacsonyabb repülési látástávolság engedélyezhető a repülések számára:

1) amelyeket olyan sebességgel hajtanak végre, amely az uralkodó látástávolság mellett lehetővé teszi az egyéb forgalom és bármely akadály időben történő észlelését és az összeütközés elkerülését; vagy

2) ha a körülmények olyanok, hogy az egyéb forgalommal történő találkozás valószínűsége csekély, például olyan területeken, ahol a forgalom kicsi vagy egészen alacsony magasságon végrehajtott munkarepülés esetén.

b) A forgószárnyas légijármű üzemeltetése engedélyezhető *1500 méter repülési látástávolság alatt*, ha az olyan sebességgel repül, amely lehetővé teszi az egyéb forgalom és bármely akadály időben történő észlelését és az összeütközés elkerülését.

*** Az A. osztályú légtér VMC minimum értéke csak útmutatást biztosít a repülőgép-vezetők részére és nem teszi kötelezővé a látvarepülési szabályok szerint történő üzemeltetés elfogadását az „A” légtér osztályban.

4. fejezet
Látvarepülési szabályok

4.1 A különleges VFR repülésként történő üzemelés kivételével a látvarepülési szabályok szerint történő (VFR) repüléseket úgy hajtsák végre, hogy a légijármű a 3-1. táblázatban meghatározott látástávolság és felhőzettől való távolsági értékek vagy azoknál nagyobb értékek mellett repüljön.

4.2 Kivéve ha egy légiforgalmi irányító egység erre engedélyt adott, a látvarepülési szabályok szerint üzemelő (VFR) repülés ne szálljon fel vagy le repülőtéri irányító körzetben levő repülőtéren vagy ne lépjen be a repülőtér forgalmi körzetébe vagy körébe, amikor:
a) a felhőalap 450 méternél (1500 láb) alacsonyabb; vagy
b) a földi látástávolság kevesebb mint 5 km.
4.3 Napkelte és napnyugta között vagy az illetékes légiforgalmi szolgálati hatóság által előírt, ettől eltérő más időszakban látvarepülési szabályok szerint üzemelő (VFR) repüléseket az ilyen hatóság által előírt feltételekkel hajtsák végre.

4.4 Kivéve, ha az illetékes légiforgalmi szolgálati hatóság erre engedélyt adott, a látvarepülési szabályok szerint üzemelő (VFR) repüléseket ne hajtsák végre:
a) FL 200 repülési szint felett;
b) transszonikus és szuperszonikus repülési sebességgel.

4.5 A látvarepülési szabályok szerint üzemelő (VFR) repülések végrehajtását ne engedélyezzék FL 290 felett azokon a területeken, amelyeken FL 290 repülési szint felett 300 méter (1000 láb) csökkentett függőleges elkülönítési minimumot alkalmaznak.

4.6 Kivéve, ha az a fel és leszállás végrehajtásához szükséges vagy az illetékes hatóság erre engedélyt ad, VFR repülés nem hajtható végre:
a) városok, falvak vagy települések sűrűn lakott területei vagy szabadban levő ember-csoportok felett, a légijárműtől mint középponttól számított 600 méter sugarú körben található legmagasabb akadály felett 300 méternél (1000 láb) alacsonyabban;
b) a 4.6 *a)* pontban meghatározottaktól eltérő bármely más föld vagy vízfelszín felett 150 méternél (500 láb) alacsonyabban.

Megjegyzés: Lásd még 3.1.2 pont.

4.7 Kivéve ha a légiforgalmi irányítói engedély másként nem jelzi vagy az illetékes légiforgalmi szolgálati hatóság másként nem rendelkezik, a föld vagy vízfelszín felett 900 méternél (3000 láb) vagy az illetékes légiforgalmi szolgálati hatóság által meghatározott ennél magasabb alapmagasságnál nagyobb magasságon üzemeltetett szinttartó utazó VFR repüléseket a 3. Függelék utazómagasság táblázatában meghatározott, az útiránynak megfelelő repülési szinteken hajtsák végre.

4.8 A látvarepülési szabályok szerint végrehajtott repülés tegyen eleget a 3.6 pont előírásainak, amennyiben azt:
a) B, C, és D osztályú légtérben hajtják végre;
b) az ellenőrzött repülőterek repülőtéri forgalmának részeként hajtják végre; vagy
c) különleges VFR repülésként hajtják végre.

4.9 Az illetékes légiforgalmi szolgálati hatóság által a 3.3.1.2 *c)* vagy *d)* pont alapján kijelölt területeken belül vagy útvonalakon üzemelő illetve azokra belépő VFR légijármű tartson fenn folyamatos figyelést a megfelelő rádió frekvencián és szükség szerint jelentse helyzetét a repülés-tájékoztató szolgálatot ellátó légiforgalmi szolgálati egységnek.

Megjegyzés: Lásd a 3.6.5.1 pontot követő megjegyzéseket.

4.10 Amikor a látvarepülési szabályok szerint üzemeltetett légijármű műszerrepülési szabályok (IFR) szerinti üzemeltetésre kíván áttérni:
a) amennyiben repülés tervet nyújtott be, közölje az érvényes repülési tervét érintő szükséges módosításokat; vagy
b) ha ez a 3.3.1.2 pont alapján szükséges, nyújtson be repülési tervet az illetékes légiforgalmi szolgálati egységeknek és az ellenőrzött légtérben történő IFR repülés megkezdése előtt szerezzen be engedélyt.

5. Fejezet
Műszerrepülési szabályok

5.1 Az összes IFR repülésre alkalmazandó szabályok

5.1.1 Légijármű berendezések

A légijárművel a lerepülendő útvonalnak megfelelő alkalmas műszerekkel és navigációs berendezéssel szereljék fel.

5.1.2 Legalacsonyabb szintek

A fel és leszállás eseteit valamint az illetékes hatóság különleges engedélyeit kivéve a műszerrepülési szabályok szerint üzemeltetett repülést ne hajtsák végre azon állam által megállapított legalacsonyabb tengerszint feletti repülési magasság alatt, amelynek területét átrepülik vagy ha ilyet nem határoztak meg:
a) magasföld vagy hegyvidék felett olyan szinten, amely legalább 600 méterrel (2000 láb) magasabb, mint a légijármű számított helyzetétől mint középponttól mért 8 km-es sugarú körön belül található legmagasabb akadály;
b) a fenti *a)* alpontban ismertetett eseten kívül olyan szinten, amely legalább 300 méterrel (1000 láb) magasabb, mint a légijármű számított helyzetétől mint középponttól mért 8 km-es sugarú körön belül található legmagasabb akadály.

1. Megjegyzés: A légijármű számított helyzeténél vegyék figyelembe az adott útvonal szakaszon a földön és a légijármű fedélzetén rendelkezésre álló navigációs létesítmények és berendezések alapján biztosítható navigációs pontosságot.

2. Megjegyzés: Lásd még a 3.1.2 pontot.

5.1.3 Áttérés IFR repülésről VFR repülésre

5.1.3.1 Amikor a műszerrepülési szabályok szerint üzemeltetett légijármű látvarepülési szabályok szerinti üzemeltetésre kíván áttérni és a repülésre repülés tervet nyújtott be, értesítse az illetékes légiforgalmi szolgálati egységet arról, hogy törli IFR repülési tervét és adja meg az érvényes repülési tervét érintő változásokat.

5.1.3.2 Amikor a műszerrepülési szabályok szerint üzemeltetett légijármű látás utáni időjárási körülmények közé kerül, ne törölje IFR repülési tervét addig, amíg várható és a hajózószemélyzet szándékával megegyező, hogy a repülés huzamosabb ideig zavartalan látási utáni időjárási körülmények között folytatható lesz.

5.2 Az ellenőrzött légtéren belüli IFR repülésekre alkalmazandó szabályok

5.2.1 Az ellenőrzött légtérben üzemelő IFR repülések tegyenek eleget a 3.6 pont előírásainak.

5.2.2 Az ellenőrzött légtérben üzemelő utazó IFR repülést repülési szinten vagy ha utazó emelkedési repülési eljárást alkalmaznak, a következőkből kiválasztott két repülési szint vagy egy repülési szint felett hajtsák végre:
a) a 3. Függelék táblázataiban meghatározott repülési szintek;
b) a 3. Függelék alapján módosított repülési szintek a FL 410 felett végrehajtott repülés esetében. kivéve, ha a légiforgalmi irányítói engedélyben vagy az illetékes ATS hatóság által kiadott Légiforgalmi Tájékoztató Kiadványban meghatározottak szerint nem az útiránynak megfelelő repülési szintet alkalmazzák.

5.3 Az ellenőrzött légtéren kívüli IFR repülésekre alkalmazandó szabályok

5.3.1 Utazómagasságok

Az ellenőrzött légtéren kívül üzemelő szinttartó utazó IFR repülést az útirányának megfelelő, az alábbiakban előírt repülési szinten hajtsák végre:
a) a 3. Függelék táblázataiban meghatározott repülési szintek, kivéve ha az illetékes légiforgalmi szolgálati hatóság a közepes tengerszint feletti 900 méter (3000 láb) magasságon vagy ez alatt végrehajtott repülésre mást ír elő; vagy
b) a 3. Függelék alapján módosított repülési szintek a FL 410 felett végrehajtott repülés esetében.

Megjegyzés: Ez az előírás a hangsebesség feletti repülés esetén nem zárja ki az utazó emelkedési repülési módszer alkalmazását.

5.3.2 Összeköttetések

Az ellenőrzött légtérén kívül, de az illetékes légiforgalmi szolgálati hatóság által a 3.3.1.2 *c)* vagy *d)* alpontok alapján kijelölt légterekbe tartó vagy útvonalak mentén repülést végrehajtó légijármű tartson fenn folyamatos figyelést a megfelelő rádió frekvencián és szükség szerint létesítsen két-oldalú szóbeli rádióösszeköttetést repüléstájékoztató szolgálatot biztosító illetékes légiforgalmi szolgálati egységgel.

Megjegyzés: Lásd a 3.6.5.1 pontot követő megjegyzéseket.

5.3.3 Helyzetjelentések

Az ellenőrzött légtéren kívül üzemelő IFR repülés – amennyiben az illetékes ATS hatóság előírja –, hogy
• nyújtson be repülési tervet,
• tartson fenn folyamatos figyelést a megfelelő rádió frekvencián és szükség szerint létesítsen két-oldalú szóbeli rádióösszeköttetést repüléstájékoztató szolgálatot biztosító illetékes légiforgalmi szolgálati egységgel,
jelentse helyzetét az ellenőrzött repülésekre a 3.6.3 pontban előírtak szerint.

Megjegyzés: A kijelölt tanácsadói légtéren belül üzemelő, légiforgalmi tájékoztató szolgálat igénybevételét választó IFR repüléstől elvárják, hogy eleget tegyen a 3.6 pont előírásainak, kivéve hogy a repülési terv és ennek változásai nem engedély kötelesek, továbbá két-oldalú összeköttetést tart fenn a repüléstájékoztató szolgálatot biztosító egységgel.

1. Függelék
Jelzések

1. Kényszerhelyzeti és sürgősségi jelzések

1. Megjegyzés: Az alábbi előírások egyike sem akadályozhatja meg, hogy egy kényszerhelyzetben levő légijármű bármely rendelkezésre álló eszközt felhasználjon arra, hogy felhívja magára a figyelmet, helyzetét jelezze és segítséget kérjen.

2. Megjegyzés: A kényszerhelyzeti és sürgősségi jelzésekre vonatkozó távközlési előírások részletes ismertetése a 10. Annex II. kötet 5. fejezetében találhatók.

3. Megjegyzés: A kutató és mentő eljárások látjeleinek részletes ismertetése a 12. Annex-ben található.

1.1 Kényszerhelyzeti jelzések

A következő, együttesen vagy külön-külön használt jelzések azt jelentik, hogy a légijárművet súlyos, közvetlen veszély fenyegeti és azonnali segítségre van szüksége:
a) rádiótávírón vagy bármely más jelző eszközzel leadott SOS betűcsoportból (**. . . – – – . . .** Morse kód) álló jelzés;
b) rádiótávbeszélőn leadott szóbeli veszély jelzés „MAYDAY"
c) adathálózaton leadott veszély jelzés „MAYDAY"szó jelentéssel;
d) vörös fényű, egyenként rövid időközönként kilőtt jelző-rakéta vagy lövedék;
e) ejtőernyővel kidobott vörös színű erős jelző-fény.

Megjegyzés: Az ITU rádiószabályzatának 41. cikkelye (lásd 3268, 3270 és 3271 pontok) tartalmazza a rádiótávíró és rádiótávbeszélő automatikus riasztó rendszereinek működtetéséhez szükséges tájékoztatásokat.

3268 A rádiótávíró üzemű riasztó jelzés egy perc alatt továbbított 12 vonásból álló jelzés-sorozat, amelyben az egyes vonások 4 másodpercig, a vonások közötti szünet pedig 1 másodpercig tart. A riasztó jelzés kézzel is leadható, azonban ajánlatos az önműködő berendezéssel történő továbbítás.

3270 A rádiótávbeszélő üzemű riasztó jelzés két váltakozva leadott, alapvetően szinuszos hangfrekvenciás jelből áll. Az egyik jel frekvenciája 2200 Hz a másik jel frekvenciája pedig 1300 Hz. Az egyes hangfrekvenciás jelek időtartama 250 milliszekundum.

3271 Ha a rádiótávbeszélő üzemű riasztó jelzést önműködő berendezés adja, a jelzést legalább 30 másodpercig, de legfeljebb egy percig folyamatosan sugározza; amennyiben a jelzést másként adják le, azt a lehető legfolyamatosabban, megközelítőleg egy perc időtartamon át adják.

1.2 Sürgősségi jelzések

1.2.1 A következő, együttesen vagy külön-külön használt jelzések azt jelentik, hogy a légijármű olyan nehézségeket kíván jelezni, amelyek leszállásra kényszerítik, azonban azonnali segítségre nincs szüksége:
a) a leszálló fények ismételt bekapcsolása és kikapcsolása; vagy
b) a navigációs fények ismételt bekapcsolása és kikapcsolása olyan módon, hogy az a villogó navigációs fényektől megkülönböztethető legyen.

1.2.2 A következő, együttesen vagy külön-külön használt jelzések azt jelentik, hogy a légijárműnek nagyon sürgős közleménye van egy (látókörén belül levő) hajó, légijármű vagy egyéb jármű illetve a fedélzetén tartózkodó személy biztonságával kapcsolatosan:
a) rádiótávírón vagy bármely más jelző eszközzel leadott XXX betűcsoportból álló jelzés;
b) rádiótávbeszélőn leadott szóbeli sürgősségi jelzés „PAN PAN”
c) adathálózaton leadott veszély jelzés „PAN PAN”szó jelentéssel.

2. Elfogás esetén alkalmazandó jelzések

2.1 Az elfogó légijármű által kezdeményezett jelzések és az elfogott légijármű válasz jelzései

Sorozat	Elfogó légijármű jelzései	Jelentés	Elfogott légijármű válaszai	Jelentés
1	NAPPAL vagy ÉJSZAKA – A légijármű billegtetése és a navigációs (és forgószárnyas légijármű esetén a leszálló) fények rendszertelen villogtatása kissé az elfogott légijármű felett és előtt, általában attól balra (vagy jobbra, ha az elfogott légijármű forgószárnyas) majd a nyugtázás után lassú szintrepülésben végrehajtott forduló általában balra (vagy jobbra, ha az elfogott légijármű forgószárnyas) a kívánt irányra. *1. Megjegyzés: Az időjárási körülmények vagy a földfelszín szükségessé teheti, hogy az elfogó légijármű a fenti 1. sorozatban meghatározottakkal ellentétes helyzetet és ellentétes irányú fordulót vegyen fel.* *2. Megjegyzés: Ha az elfogott légijármű nem képes az elfogó légijárművel együtt repülni, az elfogótól elvárják, hogy várakozási köröket repüljön és billegtetéssel jelezzen mindannyiszor, ahányszor az elfogott légijármű mellett elhalad.*	Önt elfogták. Kövessen.	NAPPAL vagy ÉJSZAKA – A légijármű billegtetése, a navigációs fények rendszertelen villogtatása és követés *Megjegyzés: Az elfogott légijármű hajtsa végre a 3. Fejezet 3.8.pontja szerinti kiegészítő tevékenységet.*	Értettem. Végrehajtom.
2	NAPPAL vagy ÉJSZAKA – Az elfogott légijármű útvonalának keresztezése nélkül végrehajtott 90°-os vagy ennél nagyobb mértékű emelkedő fordulóból álló hirtelen elrepülési művelet az elfogott légijárműtől.	Tovább haladhat.	NAPPAL vagy ÉJSZAKA – A légijármű billegtetése.	Értettem. Végrehajtom.

3	NAPPAL vagy ÉJSZAKA – A légijármű futóművének kiengedése (ha ilyen típusú), a leszálló fényszórók folyamatos üzemeltetése és a használatos futópálya átrepülése, vagy ha az elfogott forgószárnyas légijármű, a helikopter leszállóhely átrepülése. A forgószárnyas légijármű esetében az elfogó helikopter végrehajtja a leszálláshoz történő megközelítést és függeszkedést végez a leszállóhely közelében.	Szálljon le ezen a repülőtéren.	NAPPAL vagy ÉJSZAKA – A légijármű futóművének kiengedése (ha ilyen típusú), a leszálló fényszórók folyamatos üzemeltetése, az elfogó légijármű követése és amennyiben a használatos futópálya vagy helikopter leszállóhely átrepülése után a leszállást biztonságosnak ítélik meg, a leszállás végrehajtása.	Értettem. Végrehajtom.

2.2 Az elfogott légijármű által kezdeményezett jelzések és az elfogó légijármű válasz jelzései

Sorozat	Elfogott légijármű jelzései	Jelentés	Elfogott légijármű válaszai	Jelentés
4	NAPPAL vagy ÉJSZAKA – A légijármű futóművének behúzása (ha ilyen típusú) és a leszálló fények villogtatása a használatos futópálya 300 métert meghaladó (1000 láb) de 600 méternél (2000 láb) nem nagyobb földfelszín feletti magasságon vagy a helikopter leszállóhely 50 métert meghaladó (170 láb) de 100 méternél (3300 láb) nem nagyobb földfelszín feletti magasságon végrehajtott átrepülése közben, majd körözés a használatos futópálya vagy helikopter leszállóhely felett. Ha a leszálló fényszórót nem tudja villogtatni, villogtasson bármely más rendelkezésre álló fényt.	Az ön által kijelölt repülőtér nem felel meg.	NAPPAL vagy ÉJSZAKA – Ha azt kívánják, hogy az elfogott légijármű kövesse az elfogó légijárművel egy másik repülőtérre, az elfogó légijármű húzza be futóművét (ha ilyen típusú) és alkalmazza a számára előírt 1. sorozatú jelzéseket. Amennyiben úgy határoznak, hogy elengedik az elfogott légijárművet, az elfogó légijármű alkalmazza a számára előírt 2. sorozatú jelzéseket.	Értettem. Kövessen. Értettem. Továbbhaladhat.
5	NAPPAL vagy ÉJSZAKA – Az összes rendelkezésre álló fény rendszeres be és kikapcsolása, azonban olyan módon, hogy azt a villogó fényektől meg lehessen különböztetni .	Nem tudom végrehajtani.	NAPPAL vagy ÉJSZAKA – Az elfogó légijármű alkalmazza a számára előírt 2. sorozatú jelzéseket.	Értettem.
6	NAPPAL vagy ÉJSZAKA – Valamennyi rendelkezésre álló fény rendszertelen villogtatása.	Veszélyben vagyok.	NAPPAL vagy ÉJSZAKA – Az elfogó légijármű alkalmazza a számára előírt 2. sorozatú jelzéseket.	Értettem.

3. Korlátozott, tiltott vagy veszélyes légtérben felhatalmazás nélkül repülő

vagy oda belépni szándékozó légijármű figyelmeztetésére használt jelzések

NAPPAL vagy ÉJSZAKA – A fölről 10 másodperces időközönként kilőtt világító jelző lövedék sorozat, amely szétrobbanásakor vörös és zöld fényt mutat vagy csillagokat szór; ezzel az illetéktelen légijárműnek azt jelzi, hogy korlátozott, tiltott vagy veszélyes légtérben halad illetve ahhoz közeledik. A jelzéssel felhívják a légijármű figyelmét, hogy haladéktalanul tegye meg a szükséges intézkedéseket.

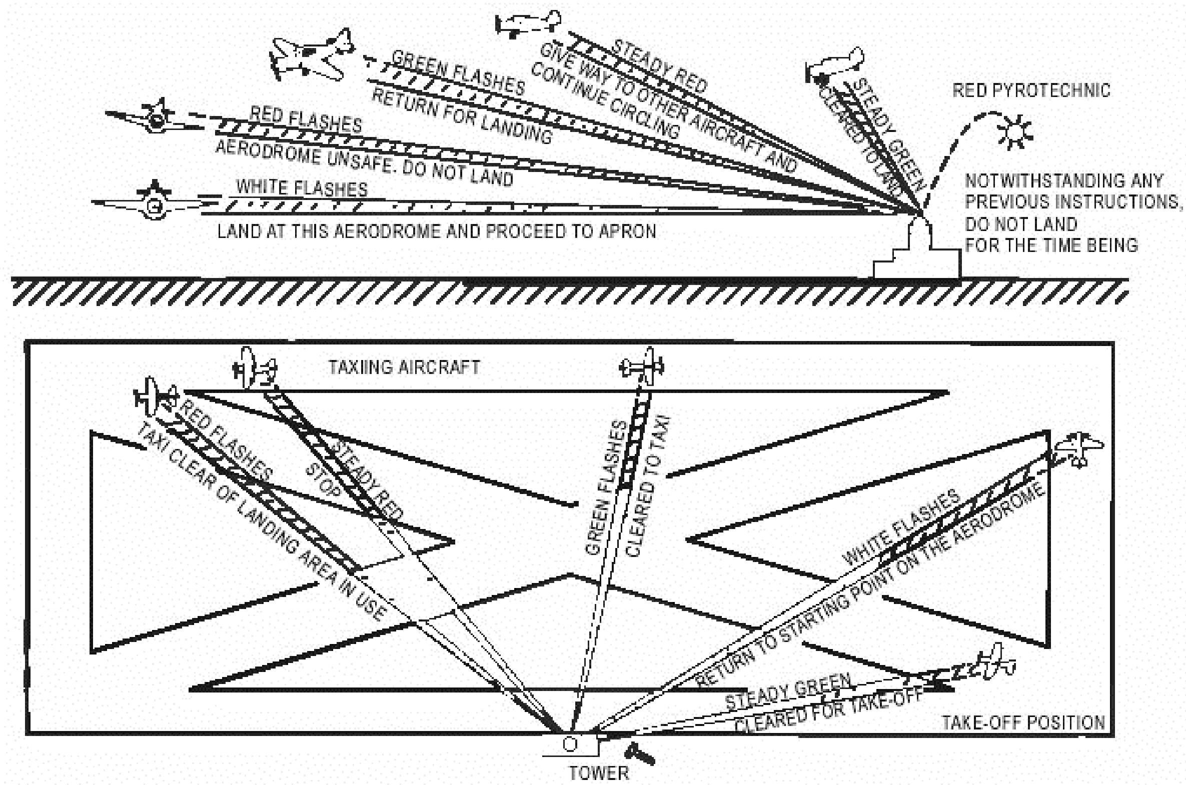
4. Jelzések a repülőtéri forgalomhoz

4.1 Fény és pirotechnikai jelzések

4.1.1 Utasítások (lásd 4-1. ábra)

Fényjelzések	*A repülőtér irányítástól*	
** az érintett légijármű felé irányítva* (lásd az 1.1. ábrát)	*A levegőben levő légijármű részére*	*A földön levő légijármű részére*
folyamatos zöld*	leszállhat	felszállhat
folyamatos vörös*	adjon utat más légijárműnek és folytassa a körözést	Állj !
szaggatott zöld*	forduljon vissza a leszálláshoz **	gurulhat
szaggatott vörös*	a repülőtér nem biztonságos, ne szálljon le	hagyja el a használatos leszállási területet
szaggatott fehér*	szálljon le ezen a repülőtéren és guruljon a forgalmi előtérre **	térjen vissza a repülőtéri kiindulási pontjára
vörös rakéta jelzés	minden eddigi utasítás érvénytelen, egyenlőre nem szálljon le	

Megjegyzés: ** A leszállási valamint gurulási engedélyeket időben megadják.



A1-1. ábra
Fény és pirotechnikai jelzések
lásd 4.1.1 pont

4.1.2 Nyugtázás a légijármű részéről

1) Repülés közben:
a) nappali órákban:
– szárnybillegtetéssel;
Megjegyzés. – Ez a jelzés nem várható a megközelítés alapfalán és a végső egyenesen.

b) éjszakai órákban:
– a leszálló fények kétszeri felvillantása, vagy ha ez nincs felszerelve, a navigációs fények kétszeri bekapcsolása és kikapcsolása.

2) Földön:
a) nappali órákban
– a légijármű csűrő- vagy oldalkormányának mozgatásával;

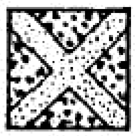
b) éjszakai órákban:
– a leszálló fények kétszeri felvillantása, vagy ha ez nincs felszerelve, a navigációs fények kétszeri bekapcsolása és kikapcsolása.

4.2 Földi látjelek

Megjegyzés. – A földi látjelek részletes leírását lásd az Annex 14-ben.

4.2.1 Leszállási tilalom

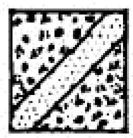
Amikor a jelmezőben sárga átlókkal ellátott vörös négyszöget helyeznek el vízszintesen (1.2. ábra), az azt jelzi, hogy a leszállás tilos és a tilalom tartós jellegű.



1.2. ábra

4.2.2 A megközelítéskor és a leszálláskor különleges óvatosság szükséges.

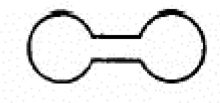
A jelmezőben vízszintesen elhelyezett, egy sárga átlóval ellátott vörös négyszög (1.3. ábra) azt jelenti, hogy a munkaterület rossz állapota, vagy bármely más ok miatt a megközelítés, vagy a leszállás során különleges óvatossággal kell eljárni.



1.3. ábra

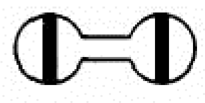
4.2.3 Futópályák és gurulóutak használata

4.2.3.1 A jelmezőben vízszintesen elhelyezett fehér színű súlyzó alakú jel (1.4. ábra) azt jelenti, hogy a légijárműveknek felszállásra, valamint leszállásra csak a futópályát, gurulásra pedig csak a gurulóutakat lehet használni.



1.4. ábra

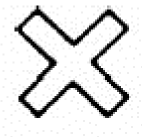
4.2.3.2 A jelmezőben vízszintesen elhelyezett, a 4.2.3.1 pontban leírttal azonos, de a kör alakú részekben a tengelyre merőleges fekete sávokkal ellátott fehér súlyzó alakú jel (1.5. ábra) azt jelenti, hogy csak a felszállásokat és leszállásokat kell a futópályán végrehajtani, egyéb manőverek végrehajtására a futópályák és a gurulóutak használata nem kötelező.



1.5. ábra

4.2.4 Lezárt futópályák és gurulóutak

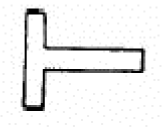
A futópályákon és gurulóutakon, vagy azok részein vízszintesen elhelyezett, feltűnő sárga vagy fehér egyszerű kereszt alakú jelek (1.6. ábra) azt jelentik, hogy az adott terület nem alkalmas a légijárművek mozgására.



1.6. ábra

4.2.5 Leszállási vagy felszállási irányok

4.2.5.1 Vízszintesen elhelyezett fehér, vagy narancs színű "T" alakú leszállójel (1.7. ábra) jelzi a légijárművek számára a leszállás és felszállás irányát, amelyet a "T" tengelyével párhuzamosan, a keresztszár felé kell végrehajtani.
Megjegyzés. – Éjszaka a "T" jelet teljesen, vagy körvonalaiban fehér fénnyel kell kivilágítani.



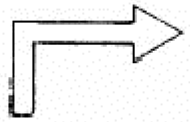
1.7. ábra

4.2.5.2 A repülőtéri irányító tornyon, vagy annak közelében függőlegesen elhelyezett két számjegy (1.8. ábra) jelzi a munkaterületen lévő légijárműveknek a felszállási irányt a mágneses iránytű közelebbi fokához kerekített 10 fokos egységben kifejezve.

1.8. ábra

4.2.6 Jobb forgalmi kör

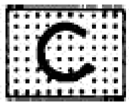
A jelmezőben, vagy a használatos futópálya, illetve a leszállási sáv végénél vízszintesen elhelyezett feltűnő színű, jobbra mutató nyíl (1.9. ábra) azt jelzi, hogy leszállás előtt, valamint felszállás után, a fordulókat jobbra kell végezni.



1.9. ábra

4.2.7 Légiforgalmi szolgálatok bejelentő irodája

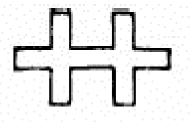
Függőlegesen elhelyezett táblán, sárga alapon, fekete “C” betű (1.10. ábra) a légiforgalmi szolgálatok bejelentő irodáját jelzi.



1.10. ábra

4.2.8 Vitorlázó repülés folyik

A jelmezőben vízszintesen elhelyezett fehér színű kettős kereszt (1.11. ábra) azt jelzi, hogy a repülőteret vitorlázók használják, és hogy vitorlázó repülés folyik.



1.11. ábra

5. Beállító jelzések

5.1 A beállító jelzései a légijármű részére

1. Megjegyzés. – A jelzéseket a légijárművekkel szembefordulva, valamint, hogy a repülőgép-vezető megfigyelését megkönnyítse, szükség szerint megvilágított kezű beállító által történő használatra állapították meg, aki.
a) merevszárnyú légijárműveknél a bal szárnyvég előtt a repülőgép-vezető látókörében áll, és
b) helikoptereknél olyan helyen, ahonnan a helikoptervezető a legjobban látja.

2. Megjegyzés. – A vonatkozó jelzések értelme azonos, akár tárcsával, beállító kézilámpával, vagy rúd alakú lámpával adják le azokat.

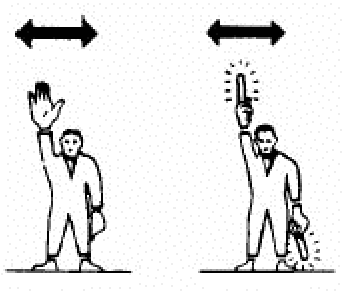
3. Megjegyzés. – A légijármű hajtóművei, a légijárművel szembe álló beállító helyzetéből jobbra-balra számozottak (azaz az 1. sz. hajtómű a légijármű bal oldalán lévő külső hajtómű).

4. Megjegyzés. – A csillaggal megjelölt jelzések lebegő helikopterre vonatkoznak.

5.1.1 Mielőtt a beállító az alábbi jelzéseket használja, meg kell győződnie arról, hogy az a terület, amelyen belül a légijárművet irányítani fogja, mentes olyan tárgyaktól, melyeknek a 3.4.1 pont rendelkezéseit betartva, a légijármű nekiütközne.

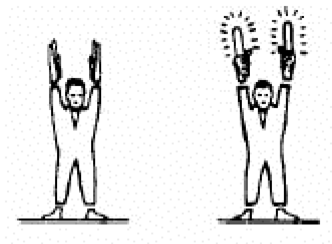
Megjegyzés. – Számos légijármű kialakítása olyan, hogy a szárnyvégek, hajtóművek és más külső részek ívei nem mindig láthatók a pilótafülkéből a légijármű földi manőverei során.

1. – A továbbiakban a beállító jelzései szerint működjön



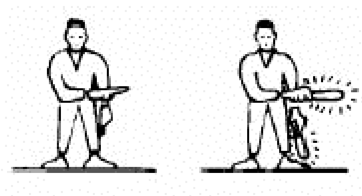
A beállító irányítja a repülőgép-vezetőt, ha a repülőtéri forgalmi viszonyok ezt megkívánják.

2. – Ez parkolóhely



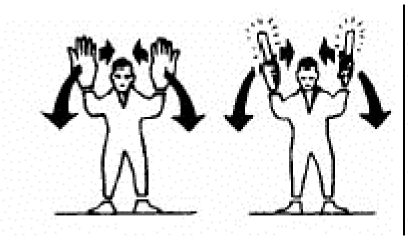
A karok függőlegesen a fej fölött, befelé fordított tenyérrel.

3. – Guruljon a következő beállítóhoz



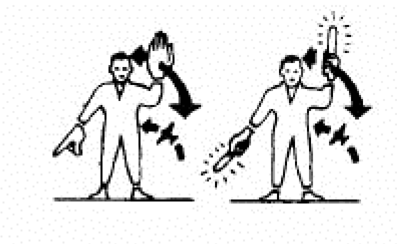
A bal, vagy a jobb kar lefelé, a másik a törzs előtt keresztben és kinyújtva,
a következő beállító irányba mutat.

4. – Guruljon előre

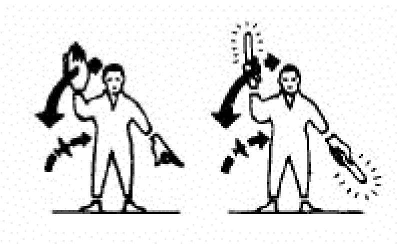


A karok egy kissé oldalt hátrafelé néző tenyérrel, felfelé és lefelé ismétlődő mozgást végezve vállmagasságból.

5. – Forduljon

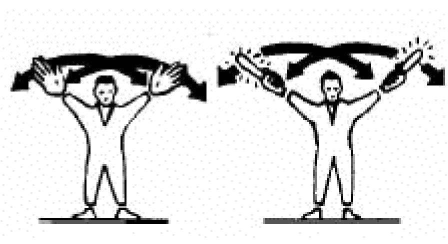


a) saját helyzetétől balra:
jobb kar lefelé, bal kar felfelé és lefelé ismétlődő mozgást végez.
A kar mozgatási sebessége jelzi a forduló mértékét;



b) saját helyzetétől jobbra:
a bal kar lefelé, jobb kar felfelé és lefelé ismétlődő mozgást végez.
A kar mozgási sebessége jelzi a forduló mértékét.

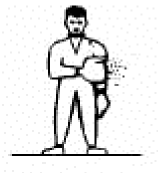
6. – Álljon meg



A karok ismételt keresztezése a fej felett (a karmozgatás sebessége jelezze a megállás sürgősségét, azaz minél gyorsabb a mozgatás, annál sürgősebb a megállás).

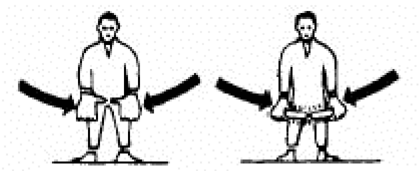
7. – Fékek

a) Fékezzen be:
A test előtt vízszintesen felemelt kéz és kar kinyújtott, majd ökölbe szorított ujjakkal.

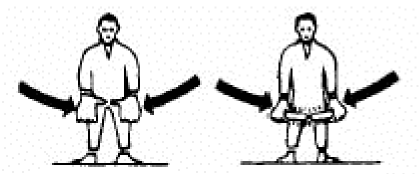


b) Fékezzen ki:
A test előtt vízszintesen felemelt kar, kéz ökölbe szorítva, majd az ujjakat kinyújtva.

8. – Féktustók

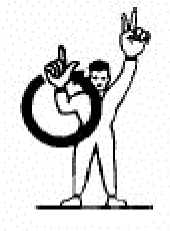


a) Féktuskók behelyezve:
A karok lefelé nyújtva, befelé néző tenyérrel, széttartott helyzetből befelé mozgatva;



b) Féktuskók eltávolítva:
A karok lefelé nyújtva, kifelé néző tenyérrel, kifelé mozgatva.

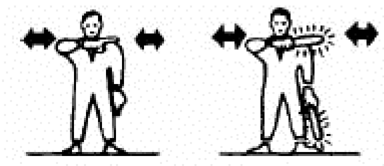
9. – Indítsa el a hajtóművet



A bal kéz a fej felett kinyújtott ujjakkal mutatja a beindítandó hajtómű számát,

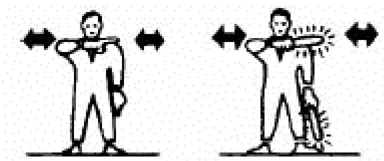
jobb kéz a fej magasságában körözö mozgást végez.

10. – Állítsa le hajtóműveit



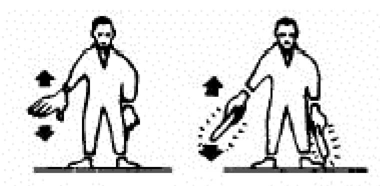
Az egyik kar és kéz vállmagasságban vízszintesen, a kézfej a torok előtt lefelé fordítva, kézmozgatás oldal irányban, behajlított karral.

11. – Lassítson



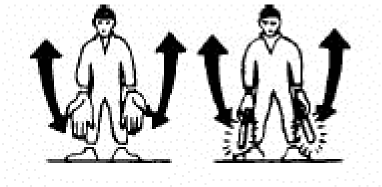
Leengedett karok, lefelé néző tenyérrel, majd többszöri felfelé és lefelé mozgatás.

12. – Csökkentse a jelzett oldalon lévő hajtóművek fordulatszámát



Leengedett karok, lefelé néző tenyérrel. Ezután a jobb, vagy a bal kéz felfelé és lefelé mozgatása jelzi a lassítandó bal, vagy jobb oldali hajtóművet.

13. – Guruljon hátrafelé



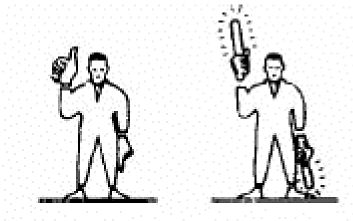
A karok oldalt leengedve, előre néző tenyérrel. Ismételt előre és felfelé mozgatás vállmagasságig.

14. – Forduljon hátrálás közben

a) A légijármű farokrészét jobbra:
A bal kar lefelé mutat, a jobb kar kinyújtva a fej felett. A jobb kart ismételt mozgatása függőlegesből vízszintesen előre mutató helyzetbe.

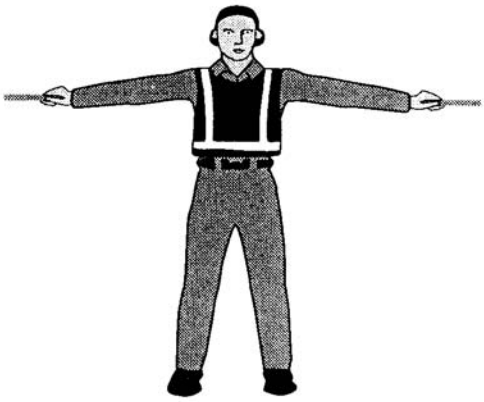
b) A légijármű farokrészét balra:
A jobb kar lefelé mutat, a bal kar kinyújtva a fej felett. A bal kar ismételt mozgatása függőlegesből vízszintesbe, előre mutató helyzetbe.

15. – Minden rendben



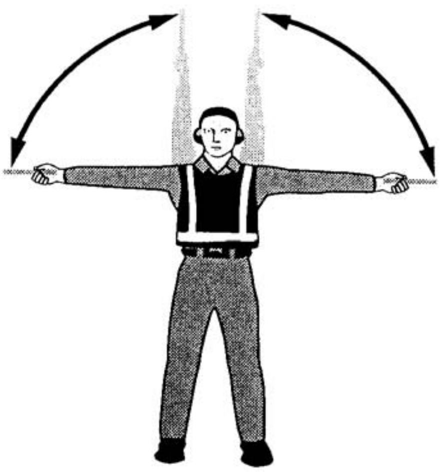
Könyökben behajlított jobb kar felfelé emelve, felfelé mutató hüvelykujjal.

*16. – Lebegjen



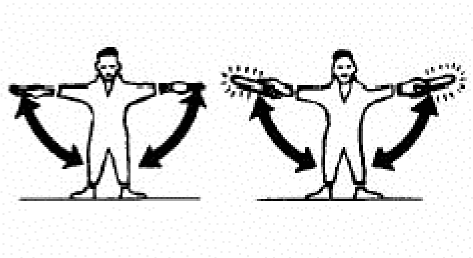
A karok oldalra, vízszintesen kinyújtva.

*17. – Emelkedjen fel



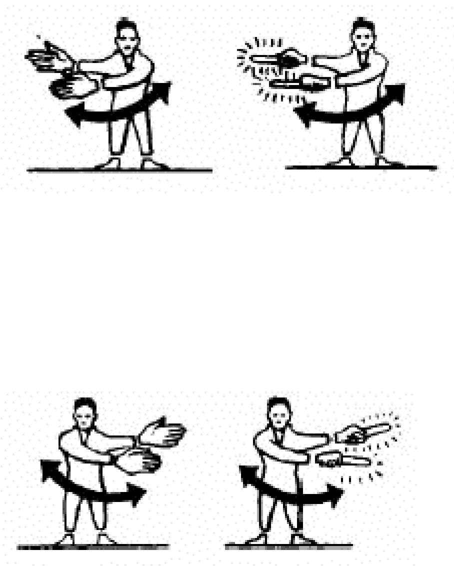
A karok oldalra, vízszintes kinyújtva, felfelé néző tenyérrel. A karok ismételt mozgatása felfelé. A karok mozgatási sebessége határozza meg az emelkedési sebesség mértékét.

*18. – Ereszkedjen le



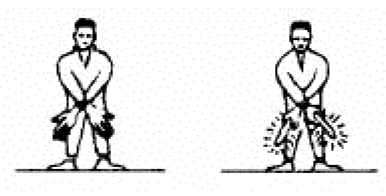
A karok oldalra, vízszintesen kinyújtva, lefelé néző tenyérrel. A karok ismételt mozgatása lefelé. A karok mozgatási sebessége határozza meg a leereszkedési sebesség mértékét.

*19. – Repüljön vízszintesen



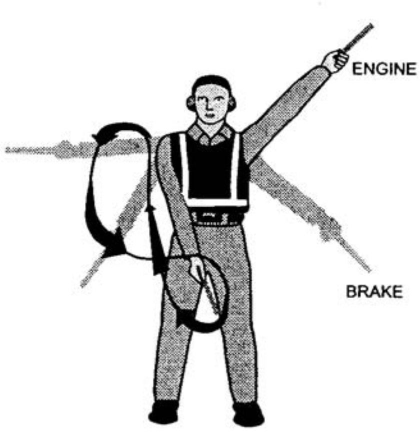
A megfelelő kar oldalra vízszintesen kinyújtva a repülés irányába. A másik kar ismételt mozgatása a test előtt, ugyanazon irányba.

*20. – Szálljon le



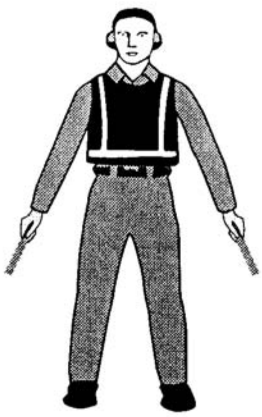
Kinyújtott karok a test előtt lefelé, keresztbe téve.

21. Tűz van



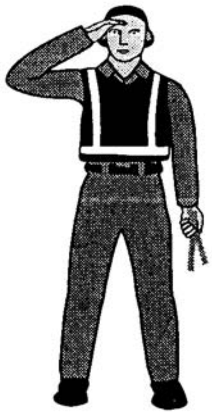
A jobb kezében lévő rudat mozgassa légcsavarszerűen a vállától a térdéig, eközben a jobb kezében tartott rúddal mutasson a tűz irányába.

22. Várakozzon



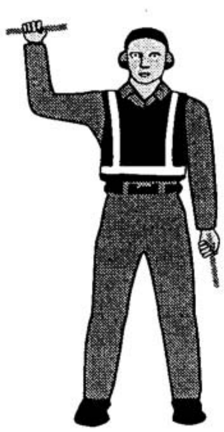
Oldalirányba 45 fokban lefelé nyújtsa ki teljesen karjait. Maradjon ebben a helyzetben mindaddig, amíg a légi-jármű engedélyt kap a következő manőverre.

23. Légi-jármű átadása



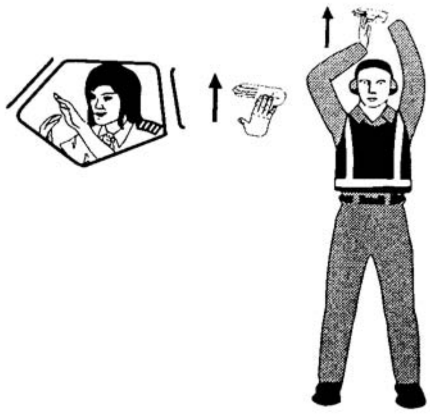
Szabványosan tisztelegjen a jobb kezével és/vagy a rúddal a légi-jármű átadásának jelzésére. A hajózószemélyzettel mindaddig tartsa a szemkontaktot, amíg az meg nem kezdi a gurulást.

24. Ne érjen a kormányszervekhez (műszaki, szolgáltatási kommunikációs jelzés)



Emelje a jobb karját teljesen a feje fölé és zárja be tenyerét vagy tartsa vízszintesen a rudat; a bal karja a térde mellet maradjon.

25. Földi áramforrás felcsatlakoztatva (műszaki, szolgáltatási kommunikációs jelzés)

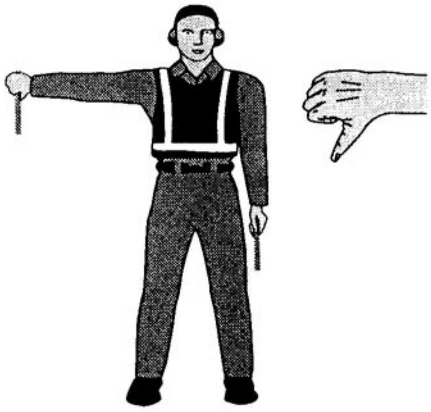


Tartsa karjait teljesen a feje felett; nyissa ki vízszintes irányba a bal kezét és a jobb kezének ujjaival érintse meg bal tenyerét („T” jelet formálva). Éjszaka a fej feletti „T” jelzéshez használhatja a világító rudakat.

26. Földi áramforrás lecsatlakoztatva (műszaki, szolgáltatási kommunikációs jelzés)

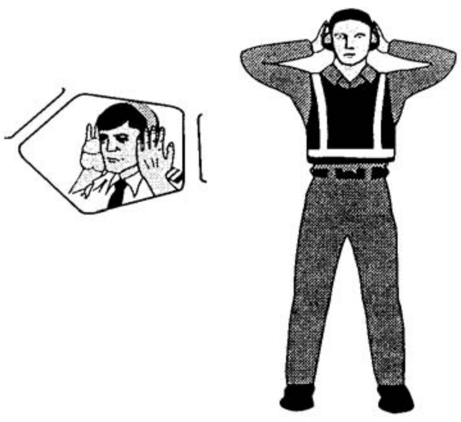
Tartsa karjait teljesen a feje felett úgy, hogy a jobb kezének ujjaival érinti a vízszintesen nyitott bal tenyerét („T” jelet formálva); majd húzza el a jobb kezét a baltól. Tilos az áramforrást lecsatlakoztatni mindaddig, amíg arra a hajózószemélyzet engedélyt nem ad. Éjszaka a fej feletti „T” jelzéshez használhatja a világító rudakat.

27. Nem, azaz „negatív” (mint tagadás)



Tartsa a jobb karját vízszintesen oldalra kinyújtva és mutasson a rúddal a föld felé vagy alkalmazza a „lefelé fordított hüvelykujj” jelzést; a bal kar a térd mellett marad.

28. Vegye fel a kapcsolatot a vezetékes telefonon (műszaki, szolgáltatási kommunikációs jelzés)



Nyújtsa ki derékszögben oldalra karjait, és a kezeivel fedje be füleit.

29. Nyissa/csukja a lépcső(ke)t (műszaki, szolgáltatási kommunikációs jelzés)

Oldalt tartott jobb karral és 45 fokon a fej ölé emelt bal karral a bal vállcsúcsa felé söprő mozdulatot végezzen a jobb karjával.
Megjegyzés – A jelzést főként az elülső beépített lépcsősorral rendelkező légi-járműveket célozza.

5.2 A légijármű vezetőjének jelzései a beállító részére

1. Megjegyzés. – A jelzéseket a pilótakabinban lévő repülőgép-vezető részére állapították meg, aki a jelzéseit a beállító felé jól láthatóan, kézzel, vagy a beállító megfigyelésének megkönnyítése érdekében megvilágított kézzel adja.

2. Megjegyzés. – A légijármű hajtóművei a légijárművel szemben álló beállító helyzetétől jobbra-balra számozottak (azaz az 1. hajtómű a légijármű bal külső hajtóműve).

5.2.1 – Fékek

Megjegyzés. – Az ököl összeszorítása, vagy az ujjak kinyújtása a befékezés vagy a kifékezés pillanatát jelöli.

a) *Befékezés:*
Az arc előtt vízszintesen felemelt kéz és kar, ujjak kinyújtva, majd ökölbe szorítva.

b) *Kifékezés:*
Az arc előtt vízszintesen felemelt kar, ökölbe szorított kéz, majd az ujjak kinyújtva.

5.2.2 – Féktuskók

a) *Helyezze be a féktuskókat:*

Kinyújtott karok kifelé néző tenyérrel, a kezek az arc elé befelé mozognak.

b) *Távolítsa el a féktuskókat:*
Az arc előtt keresztbe lévő kezek kifelé néző tenyérrel, a karok kifelé mozognak.

5.2.3 – Hajtómű(vek) indításra kész(ek)

Az egyik kézen a megfelelő számú ujj felemelése jelzi az indítandó hajtómű számát.

5.3. Műszaki, szolgáltatási kommunikációs jelzések

5.3.1. A műszaki és szolgáltatási kommunikációs jelzések tekintetében a kézi jelzéseket csak akkor kell használni, ha a szóbeli kommunikációra nincs lehetőség.

5.3.2. A műszaki és szolgáltatási kommunikációs jelzéseknél a jelző embernek meg kell bizonyosodnia arról, hogy a hajózószemélyzet nyugtázza azokat.

5.3.3. A műszaki, szolgáltatási kommunikációs jelzések azért kerültek az 1. Függelékbe, hogy a repülőgép földi mozgási folyamataihoz kapcsolódó kiszolgálási vagy kezelési funkciókhoz szabványosítsa a hajózószemélyzetekkel való kommunikációhoz használt kézi jelzéseket.

2. FÜGGELÉK – POLGÁRI LÉGIJÁRMŰVEK ELFOGÁSA

(Lásd az Annex 3. Fejezet 3.8 pontját)

1. Betartandó elvi szempontok az Államok számára

1.1 Abból a célból, hogy egységes szabályozásokat lehessen elérni, mely szükséges a polgári légijárművek biztonságos működése szempontjából, a Szerződő Államoknak kellő figyelmet kell fordítaniuk az alábbi elvi szempontokra, amikor előírásokat és adminisztratív intézkedéseket dolgoznak ki:
a) polgári légijárművek elfogását csak végső eszközként alkalmazzák;
b) amennyiben elfogást hajtanak végre, az elfogást csak a légijármű azonosításra korlátozzák, hacsak nem szükséges a légijármű visszavezetése annak tervezett útvonalára, a légijárműnek az ország légteréből történő kivezetése, tiltott, korlátozott vagy veszélyes légterekből történő elvezetése, vagy nem szükséges a légijárművek kijelölt repülőtérre történő leszállíttatása.
c) polgári légijármű elfogást gyakorlás céljából ne hajtsanak végre;
d) ha rádióösszeköttetés létesíthető, az elfogott légijármű részére a navigációs segítségnyújtást és az ezzel kapcsolatos tájékoztatást rádió-távbeszélőn keresztül adják;
e) abban az esetben, ha egy elfogott légijárműtől megkívánják, hogy leszálljon az átrepült területen, a leszállás céljára kijelölt repülőtér alkalmas legyen az érintett légijármű típus biztonságos leszállására.

Megjegyzés. – Az ICAO tagállamok közgyűlésének 1984. május 10-én tartott 25. (rendkívüli) ülésén egyöntetűen elfogadott Nemzetközi Polgári Repülési Egyezmény 3 (b) cikkelye értelmében a Szerződő Államok elfogadták, hogy "minden államnak tartózkodnia kell a fegyverhasználattól repülést folytató polgári légijárművekkel szemben".

1.2 A Szerződő Államoknak közzé kell tenniük a polgári légijárművet elfogó légijármű szabvány működési eljárását. Az ilyen eljárást úgy kell kidolgozni, hogy az az elfogott légijármű részére ne jelentsen semmiféle veszélyt.

Megjegyzés. – Szabvány működési eljárásra vonatkozó különleges ajánlásokat az „A" melléklet 3. pontja tartalmaz.

1.3 A Szerződő Államoknak biztosítaniuk kell, hogy ahol másodlagos radar áll rendelkezésre, ott azt használják fel polgári légijárművek azonosításához azokon a területeken, ahol elfogás válhat szükségessé.

2. Az elfogott légijármű ténykedése

2.1 Egy másik légijármű által elfogott légijárműnek azonnal:
a) követnie kell az elfogó légijármű utasításait, a látjeleket az „1" függelékben megadott előírások szerint értelmezve és viszonozva.
b) ha lehetséges, értesítse az illetékes légiforgalmi szolgálati egységet;
c) kísérelje meg a rádióösszeköttetés felvételét az elfogó légijárművel, vagy az illetékes, elfogást irányító egységgel, általános hívással a 121,5 MHz kényszerhelyzeti frekvencián, megadva az elfogott légijármű azonosító jelét és a repülés természetét; és ha nem jött létre az összeköttetés és gyakorlatilag lehetséges, ismételje meg ezt a hívást a 243 MHz vészfrekvencián is;
d) ha fel van szerelve SSR transzponderrel, állítsa be az „A" mód 7700 kódot, hacsak más utasítást nem kapott az illetékes légiforgalmi szolgálati egységtől.

2.2 Ha bármely rádión kapott utasítás ellentétes az elfogó légijármű által látjelek útján adott utasítással, az elfogott légijármű kérjen azonnali tisztázást, mialatt továbbra is követi az elfogó légijármű látjelekkel adott utasításait.

2.3 Ha bármely rádión vett utasítás ellentétes az elfogó légijármű által rádión adott utasítással, az elfogott légijármű kérjen azonnali tisztázást, mialatt továbbra is követi az elfogó légijármű rádión adott utasításait.

3. Ráióösszeköttetés az elfogás során

Ha létrejön a rádiókapcsolat, de nincs lehetőség közös nyelven a kommunikációra, az A 2.1 Táblázatban lévő kifejzeéseket és kiejtések haszbálatával és minden egyes kifejezést kétszer ismételve kíséreljék meg az utasítások,

A2.1 táblázat. Az ELFOGÓ légijármű kifejezései

Kifejezés	Kiejtés	Jelentés
CALL SIGN	KOL SZAIN	Mi a hívójele?
FOLLOW	FOL-LO	Kövessen
DESCEND	DI-SZEND	Süllyedjen leszálláshoz
YOU LAND	JU LEEND	Szálljon le ezen a repülőtéren
PROCEED	PRO-SZID	Tovább haladhat

Az ELFOGOTT légijármű kifejezései

Kifejezés	Kiejtés	Jelentés
CALL SIGN	KOL SZAIN	Hívójelem…
WILCO	VILL-KO	Megértettem, végrehajtom
CAN NOT	KANN NOT	Nem tudom teljesíteni
REPEAT	RI-PIIT	Ismételje meg utasítását
AM LOST	EM LOSZT	Eltévedtem
MAYDAY	MÉJDÉJ	Vészhelyzetben vagyok
HIJACK	HÁJDZSEK	Eltérítettek
LAND (…)	LEEND (…)	Kérek leszállást (… helyen)
DESCEND	DI-SZEND	Süllyedést kérek

1. Megjegyzés. – A második oszlopban a hangsúlyozandó szótag alá van húzva.
2. Megjegyzés. – A megadandó hívójel az legyen, melyet a légiforgalmi szolgálati egységekkel tartott rádió-távbeszélő összeköttetés során használnak, és amely megfelel a légijármű repülési tervében szereplő azonosító jelnek.
3. Megjegyzés. – A „HIJACK” kifejezés használatát a körülmények nem mindig teszik lehetővé, illetve kívánatossá.

3. FÜGGELÉK – UTAZÁSI SZINTEK TÁBLÁZATAI

A jelen Annex által megkívánt esetekben betartandó utazási magasságok a következők:

a) azokban a légterekben, amelyekben – körzeti repülési egyezmény alapján, és az egyezményben meghatározott körülményekkel összhangban – 300 méter (1000 láb) függőleges elkülönítési minimum (VSM) alkalmazandó FL 290 és FL 410* (mindkettő szélső érték beleértendő) között, az utazó-magasságok a következők:

ÚTIRÁNY** 000°–179° ***					
FL	IFR repülések magasság		VFR repülések magasság		
méter	láb	méter	láb		
–90			–	–	–
10	300	1000	–	–	–
30	900	3000	35	1050	3500
50	1500	5000	55	1700	5500
70	2150	7000	75	2300	7500
90	2750	9000	95	2900	9500
110	3350	11000	115	3500	11500
130	3950	13000	135	4100	13500
150	4550	15000	155	4700	15500
170	5200	17000	175	5350	17500
190	5800	19000	195	5950	19500
210	6400	2100	215	6550	21500
230	7000	23000	235	7150	23500
250	7600	25000	255	7750	25500
270	8250	27000	275	8400	27500
290	8850	29000			
310	9450	31000			
330	10050	33000			
350	10650	35000			
370	11300	37000			
390	11900	39000			
410	12500	41000			
450	13700	45000			
490	14950	49000			
stb.	stb.	stb.			

ÚTIRÁNY** 180°–359° ***					
FL	IFR repülések magasság		VFR repülések magasság		
méter	láb	méter	láb		
0			–	–	–
20	600	2000	–	–	–
40	1200	4000	45	1350	4500
60	1850	6000	65	2000	6500
80	2450	8000	85	2600	8500
100	3050	10000	105	3200	10500
120	3650	12000	125	3800	12500
140	4250	14000	145	4400	14500
160	4900	16000	165	5050	16500
180	5500	18000	185	5650	18500
200	6100	20000	205	6250	20500
220	6700	22000	225	6850	22500
240	7300	24000	245	7450	24500
260	7900	26000	265	8100	26500
280	8550	28000	285	8700	28500
300	9150	30000			
320	9750	32000			
340	10350	34000			
360	10950	36000			
380	11600	38000			
400	12200	40000			
430	13100	43000			
470	14350	47000			
510	15550	51000			
stb.	stb.	stb.			

* Kivéve, amikor körzeti repülési egyezmény alapján, meghatározott feltételek esetén, a FL 410 felett a légtér kijelölt részeiben működő légijárművek számára a 300 méteres (1000 láb) névleges függőleges elkülönítési minimumra alapozott módosított utazómagasság táblázatot írtak elő használatra.

** Mágneses útirányszög, vagy a sarki területeknél a 70°-os szélességi körnél magasabban, illetve hasonló területek esetén az illetékes ATS hatóságok előírása szerint, hálózati útirány, amelyet a Greenwich-i Meridiánnal párhuzamos vonalaknak egy sztereografikus poláris térképre kivetített hálózata határoz meg, ahol az északi irány a hálózati észak.

*** Kivéve, ahol körzeti repülési egyezmény alapján a meghatározó jellegű forgalom irányai miatt 090–269° és 270–089° között írják elő, és megfelelő átmeneti eljárásokat határoznak meg ezzel összefüggésben.

Megjegyzés. – A függőleges elkülönítésre vonatkozó útmutató anyag a „Kézikönyv a FL 290 és FL 410 (mindkét szélső érték beleértendő) közötti 300 méteres (1000 láb) függőleges elkülönítési minimum teljesítéséhez (Doc 9574)” című dokumentumban található.

b) egyéb légterekben:

ÚTIRÁNY** 000°–179° ***					
FL	IFR repülések magasság		VFR repülések magasság		
méter	láb	méter	láb		
–90			–	–	–
10	300	1000	–	–	–
30	900	3000	35	1050	3500
50	1500	5000	55	1700	5500
70	2150	7000	75	2300	7500
90	2750	9000	95	2900	9500
110	3350	11000	115	3500	11500
130	3950	13000	135	4100	13500
150	4550	15000	155	4700	15500
170	5200	17000	175	5350	17500
190	5800	19000	195	5950	19500
210	6400	2100	215	6550	21500
230	7000	23000	235	7150	23500
250	7600	25000	255	7750	25500
270	8250	27000	275	8400	27500
290	8850	29000	300	9150	3000
330	10050	33000	340	10350	34000
370	11300	37000	380	11600	38000
410	12500	41000	420	12800	42000
450	13700	45000	460	14000	46000
490	14950	49000	500	15250	50000
stb.	stb.	stb.	stb.	stb.	stb.

ÚTIRÁNY**

180°–359° **					
FL	IFR repülések magasság		VFR repülések magasság		
méter	láb	méter	láb		
0			–	–	–
20	600	2000	–	–	–
40	1200	4000	45	1350	4500
60	1850	6000	65	2000	6500
80	2450	8000	85	2600	8500
100	3050	10000	105	3200	10500
120	3650	12000	125	3800	12500
140	4250	14000	145	4400	14500
160	4900	16000	165	5050	16500
180	5500	18000	185	5650	18500
200	6100	20000	205	6250	20500
220	6700	22000	225	6850	22500
240	7300	24000	245	7450	24500
260	7900	26000	265	8100	26500
280	8550	28000	285	8700	28500
310	9450	31000	320	9750	32000
350	10650	35000	360	10950	36000
390	11900	39000	400	12200	40000
430	13100	43000	440	13400	44000
470	14350	47000	480	14650	48000
510	15550	51000	520	15850	52000
stb.	stb.	stb.	stb.	stb.	stb.

* Mágneses útirányszög, vagy a sarki területeknél a 70°-os szélességi körnél magasabban, illetve hasonló területek esetén az illetékes ATS hatóságok előírása szerint, hálózati útirány, amelyet a Greenwich-i Meridiánnal párhuzamos vonalaknak egy sztereografikus poláris térképre kivetített hálózata határoz meg, ahol az északi irány a hálózati észak.

** Kivéve, ahol körzeti repülési egyezmény alapján a meghatározó jellegű forgalom irányai miatt 090–269° és 270–089° között írják elő, és megfelelő átmeneti eljárásokat határoznak meg ezzel összefüggésben.

Megjegyzés. – A függőleges elkülönítésre vonatkozó útmutató anyag a „Kézikönyv a FL 290 és FL 410 (mindkét szélső érték beleértendő) közötti 300 méteres (1000 láb) függőleges elkülönítési minimum teljesítéséhez (Doc 9574)” című dokumentumban található.

4. FÜGGELÉK – SZEMÉLYZET NÉLKÜLI SZABAD BALLONOK

(Megjegyzés. – Lásd a jelen Annex 3. Fejezet, 3.1.9 pontját.)

1. Személyzet nélküli szabad ballonok osztályba sorolása

A személyzet nélküli szabad ballonokat a következőképpen kell osztályozni:
a) könnyű:
az a személyzet nélküli szabad ballon, amely egy vagy több darabból álló terhet szállít, amelynek tömege 4 kg-nál kevesebb, kivéve, ha a ballon az alábbi *c) 2), 3)* vagy *4)* pontoknak megfelelően nehéznek minősül; vagy
b) közepes:
azt a személyzet nélküli szabad ballon, amely egy vagy több darabból álló terhet szállít, amelynek össztömege 4 kg vagy több, de 6 kg-nál kevesebb, kivéve, ha a ballon az alábbi *c) 2), 3)* vagy *4)* pontoknak megfelelően nehéznek minősül; vagy
c) nehéz:
az a személyzet nélküli szabad ballon, amely olyan terhet szállít, amelynek:
1) össztömege 6 kg vagy több; vagy
2) egy darab 3 kg-os vagy nehezebb terhet szállít; vagy
3) egy darab 2 kg-os vagy nehezebb csomagot szállít, amelynek területi sűrűsége nagyobb, mint 13 g/cm^2; vagy
4) a teher felfüggesztésre olyan kötelet vagy egyéb eszközt használnak, amelynél 230 N, vagy ennél nagyobb becsapódási erőre van szükség ahhoz, hogy a terhelés leváljon a ballonról.

1. Megjegyzés. – A c) 3) pontban említett területi sűrűséget úgy kell kiszámítani, hogy a teher grammban kifejezett össztömegét el kell osztani a teher legkisebb felületének négyzetcentiméterben kifejezett nagyságával.

2. Megjegyzés. – Lásd a 4.1 ábrát.

2. Általános üzemeltetési szabályok

2.1 A személyzet nélküli szabad ballon nem üzemeltethető azon állam engedélye nélkül, ahol a felbocsátást végrehajtják.

2.2 A kizárólag meteorológiai célokra használt és az illetékes hatóságok által előírtaknak megfelelően üzemeltetett könnyű ballon kivételével, a személyzet nélküli szabad ballon t más állam területére átrepültetni az érintett állam megfelelő engedélye nélkül tilos.

2.3 Amennyiben a repülés tervezésekor okkal feltételezhető, hogy a ballon egy másik állam légterébe sodródhat, a 2.2 pontban megjelölt engedélyt még a felbocsátás megkezdése előtt be kell szerezni. Ilyen engedély beszerezhető ballon repülési sorozatokra, vagy egy adott típusú ismétlődő repülésre, pl. légkörkutató ballon repülésére.

2.4 A személyzet nélküli szabad ballont a lajstromozó állam, valamint a várhatóan átrepült államok előírásaiban meghatározott feltételeknek megfelelően kell üzemeltetni.

2.5 A személyzet nélküli szabad ballont tilos úgy üzemeltetni, hogy a ballon vagy bármely része – köztük a teher – földnek ütközése a műveletben részt nem vevő személyeket vagy vagyontárgyakat veszélyeztessen.

2.6 Nehéz besorolású személyzet nélküli szabad ballont tilos nyílt tenger felett üzemeltetni a megfelelő ATS hatósággal való előzetes koordináció nélkül.

3. Üzemeltetési korlátozások és a felszereléssel kapcsolatos követelmények

3.1 A személyzet nélküli nehéz besorolású szabad ballon nem üzemeltethető 18000 méter (60000 láb) nyomásmagasságon, vagy ez alatt az illetékes ATS hatóság engedélye nélkül, ha:
a) a felhőzet vagy a sötétítő, homályosító jelenség kiterjedése meghaladja a négy oktát; vagy
b) a vízszintes látástávolság 8 km-nél kevesebb.

3.2 A nehéz vagy a közepes besorolású, személyzet nélküli szabad ballont tilos úgy felbocsátani, hogy az a városok, települések sűrűn lakott területei és a műveletben részt nem vevő, szabadban tartózkodó embercsoportok felett 300 méternél (1000 láb) alacsonyabban repüljön.

3.3 Nehéz besorolású, személyzet nélküli szabad ballont nem szabad üzemeltetni, kivéve, ha
a) a ballon legalább két darab, egymástól függetlenül működő, automatikus vagy távirányítású teherleválasztó berendezéssel vagy rendszerrel van felszerelve.

Megjegyzés. – Ezen berendezések használata a túlnyomásos ballonoknál nem szükséges, mivel azok a teher elengedése után gyorsan felemelkednek és a ballon burkolata így, a kilyukasztásra szolgáló berendezés vagy rendszer nélkül is széthasad. A túlnyomásos ballon itt olyan nem táguló burkolatú ballont jelent, amely ellenáll a belső túlnyomásnak. A ballont úgy töltik fel, hogy az éjszakai kisebb nyomású gáz teljesen kitöltse a ballon belsejét. Az ilyen túlnyomásos ballon gyakorlatilag egészen addig állandó szinten marad, amíg túl sok gáz nem távozik el belőle.

c) a ballon burkolata olyan radarjel visszaverő berendezéssel vagy radarjel visszaverő anyaggal van felszerelve, amely a 200 MHz és 2700 MHz frekvencia tartományok között működő földi radar berendezéseknek visszavert jelet ad és/vagy a ballon olyan egyéb berendezéssel van felszerelve, amely a földi radar berendezés hatótávolságán túl a radar kezelőjének folyamatos célkövetésre ad lehetőséget.

3.4 A nehéz besorolású személyzet nélküli szabad ballont tilos olyanterületen üzemeltetni, ahol földi telepítésű, másodlagos radar berendezést használnak, kiéve, ha a ballon olyan transzponderrel van felszerelve, amely képes kijelölt másodlagos radar kód és repülési magasság folyamatos sugárzására, vagy amelyet a megfigyelő állomásról, szükség szerint be lehet kapcsolni.

3.5 Azt a nehéz besorolású, személyzet nélküli szabad ballont, amely olyan függő antennával van felszerelve, amelynek bármely pontján történő letörléséhez 230 Newtonnál nagyobb erőre van szükség, csak abban az esetben üzemeltethetnek, ha az antennán legalább 15 méterenként színes jelzőzászló vagy jelzőcsík található.

3.6 A nehéz besorolású személyzet nélküli szabad ballon nem üzemeltethető 18000 méter (60000 láb) nyomásmagasság alatt napnyugta és napkelte között, kivéve, ha a ballont, annak tartozékait és a terhet, függetlenül attól, hogy ezek a repülés során a ballonról leválnak-e vagy sem, jelzőfénnyel látják el.

3.7 A nehéz besorolású, személyzet nélküli szabad ballon, amely 15 méternél hosszabb felfüggeszthető szerkezettel (a nagyon feltűnő, színes, nyitott ejtőernyő kivételével) van ellátva, nem üzemeltethető napkelte és napnyugta között 18000 méter (60000 láb) nyomásmagasság alatt, kivéve, ha a függő szerkezetet nagyon feltűnő színes csíkokkal befestik, vagy azt színes jelzőzászlókkal látják el.

4. A repülés szüneteltetése

4.1 A nehéz besorolású, személyzet nélküli szabad ballon üzemeltetője köteles működésben hozni a fenti 3.3 *a)* és *b)* pontban előírt, továbbrepülést megakadályozó berendezést, ha:
a) ismeretessé válik, hogy az időjárási feltételek az üzemeltetésre előírt minimumoknál rosszabbak;
b) meghibásodás, vagy bármely egyéb ok miatt a további üzemeltetés veszélyes lehet a légiforgalomra

vagy a földön lévő személyekre vagy vagyontárgyakra; vagy
c) mielőtt a ballon engedély nélkül berepül egy másik állam légterébe.

5. A repülésre vonatkozó tájékoztatás

5.1 Repülés előtti tájékoztatás

5.1.1 A közepes és a nehéz besorolású, személyzet nélküli szabad ballon tervezett repüléséről a repülés megkezdése előtt legalább hét nappal előzetes tájékoztatást kell küldeni az illetékes légiforgalmi szolgálati egységnek.

5.1.2 A tervezett repüléssel kapcsolatos tájékoztatásnak – az illetékes légiforgalmi szolgálati egység kívánságának megfelelően – az alábbi adatokat, vagy ezek bármelyikét kell tartalmaznia.
a) a ballonrepülés azonosító jele vagy kód neve;
b) a ballon osztálybasorolása és leírása);
c) SSR kód vagy NDB frekvencia (amelyik alkalmazható);
d) az üzemeltető neve és telefonszáma;
e) a felbocsátás helye;
f) a felbocsátás tervezett ideje (vagy több felbocsátás esetén a felbocsátások kezdete és befejezése);
g) több ballon felbocsátása esetén a ballonok száma, valamint a felbocsátások közötti időtartam;
h) a felemelkedés várható iránya;
i) utazómagasság (nyomásmagasság);
j) az a várható időtartam, amely a 18000 méter (60000 láb) nyomásmagasság keresztezéséig, vagy ha az utazómagasság 18000 méter (60000 láb) vagy kevesebb, az utazómagasság eléréséig eltelik, valamint a keresztezés vagy az utazómagasság elérés számított helye;

Megjegyzés. – Ha az üzemeltetés folyamatosan történő ballon felbocsátásokból áll, a feltüntetendő idők azon várható időpontok, amikor az első és az utolsó ballon eléri a megfelelő repülési szintet (például 122136–130330 UTC).

k) a repülés befejezésének várható ideje (nap/óra/perc), valamint a tervezett földetérési (megtalálási) terület. Azon ballonok esetében, melyek repülése hosszú ideig tart és ezért a repülés befejezésének idejét, valamint a tervezett földetérési/megtalálási területet pontosan nem lehet előre megállapítani, a „hosszú időtartam” (long duration) kifejezést kell használni.

Megjegyzés. – Amennyiben egynél több földetérési/megtalálási területet állapítanak meg, minden egyes helyszínt, a megfelelő várható földetérési idővel együtt fel kell tüntetni. Amennyiben sorozatos földetérés várható, a feltüntetendő idők azon várható időpontok legyenek, amikor a sorozat első és utolsó ballonja földet ér (például 070330–072300 UTC).

5.1.3 Az 5.1.2 pont előírásaiban megadott, felbocsátás előtti tájékoztatások bármely változását legalább 6 órával, kritikus időpontú naprendszeri vagy kozmikus zavarok vizsgálata esetén legalább 30 perccel a tervezett felbocsátás előtt be kell jelenteni az érintett légiforgalmi szolgálati egységnek.

5.2 A felbocsátásról szóló tájékoztatás

5.2.1 A közepes vagy nehéz besorolású, személyzet nélküli szabad ballon felbocsátása után az üzemeltetőnek azonnal értesítenie kell az illetékes légiforgalmi szolgálati egységet a következőkről:
a) a ballonrepülés azonosító jele;
b) a felbocsátás helye;
c) a felbocsátás tényleges ideje;
d) a 18000 méter (60000 láb) nyomásmagasság keresztezésének, vagy ha az utazómagasság 18000 méter (60000 láb) vagy kevesebb, az utazómagasság elérésének várható ideje és helye; és
e) a 3.1.2 *g)* és *h)* pontban előírtak szerint az előzetes tájékoztatásban közöltektől való bármely eltérés.

5.3 Tájékoztatás a repülési feladat törléséről

5.3.1 Az üzemeltetőnek azonnal értesítenie kell az illetékes légiforgalmi szolgálati egységet, amint ismertté válik az 5.1 pontban előírtak alapján előzetesen bejelentett közepes vagy nehéz besorolású, személyzet nélküli szabad ballon repülését törlik.

6. A repülési útvonal követése és helyzetjelentés

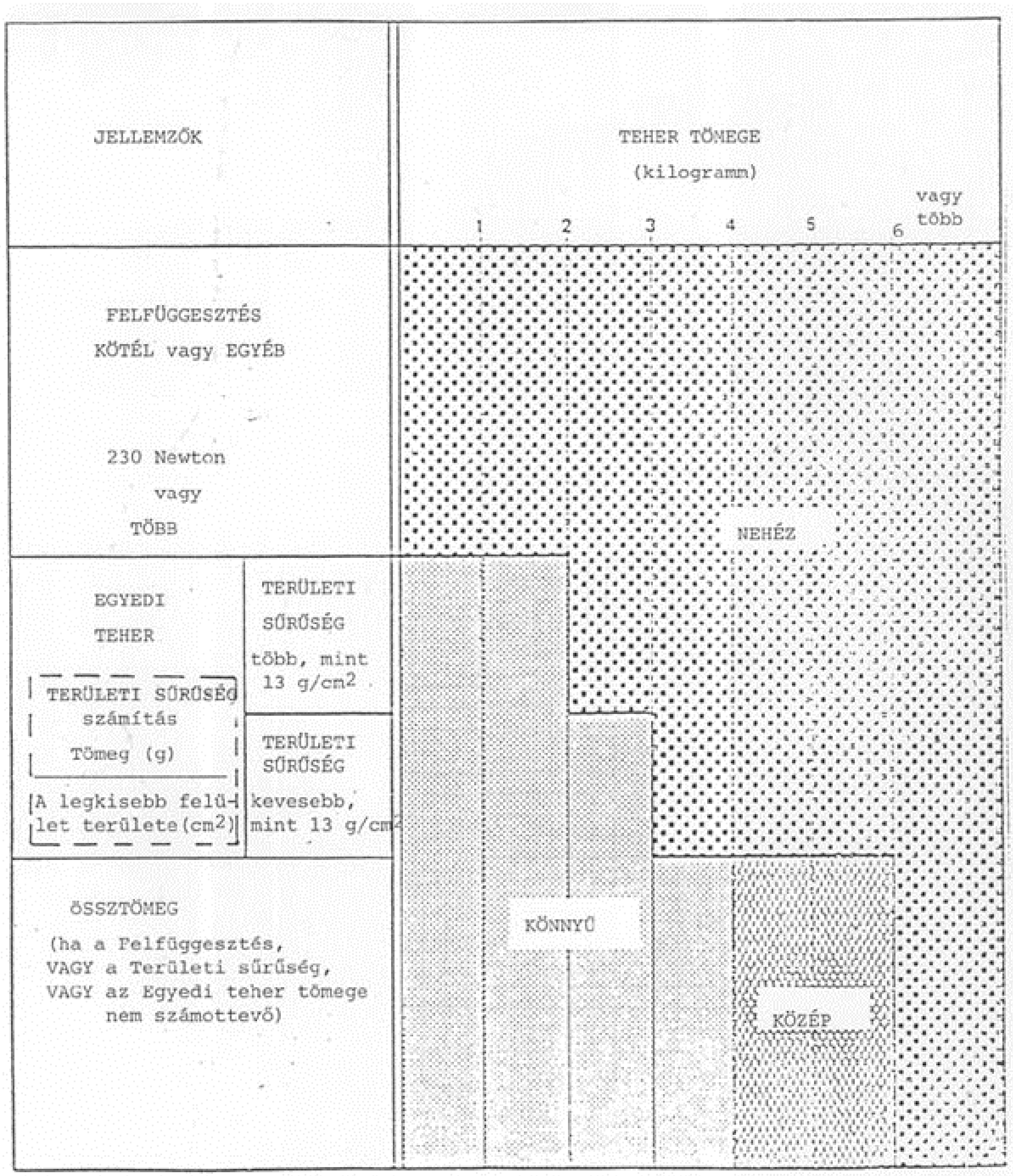
6.1 A 18000 méter (60000 láb) nyomásmagasságon, vagy ez alatt működő nehéz besorolású, személyzet nélküli szabad ballon üzemeltetőjének figyelemmel kell kísérnie a ballon repülési útját és a légiforgalmi szolgálatok kívánságának megfelelően, jelentenie kell a ballon helyzetét. Amennyiben a légiforgalmi szolgálatok gyakoribb helyzetjelentést nem kérnek, az üzemeltetőnek minden két órában jelentenie kell a ballon helyzetét.

6.2 A 18000 méter (60000 láb) nyomásmagasság felett működő nehéz besorolású, személyzet nélküli szabad ballon üzemeltetőjének figyelemmel kell kísérnie a ballon repülési útját és a légiforgalmi szolgálatok kívánságának megfelelően jelentenie kell a ballon helyzetét. Amennyiben a légiforgalmi szolgálatok gyakoribb helyzetjelentéseket nem kérnek, az üzemeltetőnek 24 óránként kell jelenteni a ballon helyzetét.

6.3 Amennyiben a ballon helyzetét a 6.1 és a 6.2 pontokban előírtak szerint nem lehet megállapítani, az üzemeltetőnek erről azonnal értesítenie kell az illetékes légiforgalmi szolgálati egységet. Ennek az értesítésnek tartalmaznia kell a ballon utolsó megállapított helyzetét. Amikor a ballonrepülési útvonalának követését ismét végre tudják hajtani, az illetékes légiforgalmi szolgálati egységet azonnal értesíteni kell.

6.4 A nehéz besorolású, személyzet nélküli szabad ballon tervezett süllyedésének megkezdése előtt egy órával az üzemeltetőnek értesíteni kell az illetékes légiforgalmi szolgálati egységet a ballonnal kapcsolatos következő adatokról.
a) jelenlegei földrajzi helyzet;
b) jelenlegi repülési magasság (nyomásmagasság);
c) amennyiben lehetséges, a 18000 méter (60000 láb) nyomásmagasság keresztezésének időpontja (előre jelzett);
d) a földetérés várható ideje és helye.

6.5 A nehéz vagy közepes besorolású, személyzet nélküli irányítatlan ballon üzemeltetőjének értesítenie kell az illetékes légiforgalmi szolgálati egységet a repülési feladat befejezéséről.



4.1 ábra. Személyzet nélküli szabad ballonok osztályozása

„A” MELLÉKLET
POLGÁRI LÉGIJÁRMŰVEK ELFOGÁSA

(Megjegyzés. – Lásd az Annex 3. fejezet 3.8 pontját és a hozzá tartozó megjegyzést.)

Megjegyzés: A teljesség érdekében az Annex 2. Függelékének előírásait a jelen Mellékletben összefoglaljuk.

1. Bevezető

A Nemzetközi Polgári Légiközlekedési Egyezmény 3 (d) cikkelyének rendelkezése szerint az ICAO szerződő államok „állami légijárműveikre vonatkozó előírásaik kiadásakor kellő figyelmet fordítanak a polgári légiközlekedésben működő légijárművek biztonságára”. Mivel a polgári légijárművek elfogása minden esetben gyakorlati veszélyt jelent, az ICAO Tanács kidolgozta az alábbi különleges ajánlásokat és nyomatékosan kéri, hogy azokat a szerződő államok egységesen alkalmazzák, mert az összes érintett részéről történő egységes alkalmazás alapvető fontosságú a polgári légijárművek és bennük tartózkodó személyek biztonsága érdekében. Ezért az ICAO Tanácsa felhívja a szerződő államok figyelmét, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve az alábbiakban ismertetett különleges ajánlások között van.

2. Általános rész

2.1 A polgári légijármű elfogása elkerülendő, csak végső eszközként alkalmazható. Amennyiben az elfogást alkalmazzák, az a légijármű azonosságának megállapítására korlátozódjon, kivéve ha szükség van a tervezett repülési útvonalra, az ország légtér határain belülre történő visszavezetésére, a tiltott, korlátozott vagy veszélyes légterekből történő kivezetésre illetve a kijelölt repülőtérre történő leszállás végrehajtásának biztosítására. A polgári légijármű gyakorlás céljából történő elfogása tilos.

2.2 A polgári légijármű elfogásának elkerülése vagy az elfogás szükségességének csökkentése érdekében:
a) az elfogást irányító egységek tegyenek meg minden lehetséges intézkedést a légijármű azonosítására, amely polgári légijármű lehet. Az illetékes légiforgalmi szolgálati egységek segítségével adják meg a szükséges utasításokat vagy tanácsokat az ilyen légijármű számára. ennek érdekében alapvető fontosságú, hogy gyors és megbízható összeköttetést alakítsanak ki az elfogást irányító és a légiforgalmi szolgálati egységek között, továbbá a 11. Annex előírásai1 szerint megfelelő egyezményeket dolgozzanak ki az egységek között a polgári légijármű mozgására vonatkozó tájékoztatás biztosítására;
b) az összes polgári repülés számára tiltott valamint olyan területeket, amelyeken a polgári repülést külön állami engedély nélkül nem engedélyezik, a légiforgalmi tájékoztató kiadványban a 15. Annex előírásai szerint pontosan tegyék közzé, szükség szerint jelezve az elfogás lehetőségét az ilyen területre történő belépés esetén. Amikor az ilyen területek a közzétett légiforgalmi szolgálati útvonalak vagy más, gyakran használt útirányok közelében helyezkednek el, az államok vegyék figyelembe a polgári légijárművek által használt navigációs rendszerek jellemzőit és általános pontosságát valamint a légijárművek azon képességét, hogy a kijelölt területet elkerüljék;
c) tekintsék át további kiegészítő navigációs berendezések létesítésének lehetőségét illetve szükségességét, hogy a polgári légijármű biztonságosan elkerülhesse a tiltott vagy szükség szerint a korlátozott területeket.

2.3 A végső lehetőségként alkalmazott elfogásokból származó veszélyek kiküszöbölése vagy csökkentése érdekében minden lehetséges intézkedést tegyenek meg a repülőgépvezető és az érintett földi egységek személyzetének összehangolt tevékenységének elősegítésére. Ennek érdekében alapvető, hogy a szerződő államok biztosítsák az alábbiakat:
a) az összes polgári légijármű repülőgépvezetője pontosan ismerje a végrehajtandó feladatait és az alkalmazott látjeleket, amelyek a jelen Annex 3. fejezetében és az 1. Függelékben kerültek meghatározásra;

b) a polgári légijármű üzemeltetője vagy parancsnoka tegyen eleget a 6. Annex I, II. és III. rész előírásainak, amelyek a légijármű rádió összeköttetés tartási képességére vonatkoznak a 121.5 MHz vészhelyzeti frekvencián valamint a légijármű fedélzetén helyezzék el az elfogás esetén alkalmazandó eljárások és látjelek jegyzékét;
c) a légiforgalmi szolgálatok teljes személyzete pontosan ismerje a 11. Annex 2. fejezet és a PANS-ATM (Doc 4444) előírásai szerint végrehajtandó feladatait;
d) az elfogó légijárművek összes parancsnoka ismerje a polgári légijármű általános teljesítmény korlátozásait és számoljon azzal a lehetőséggel, hogy az elfogott légijármű műszaki nehézségek vagy jogtalan beavatkozás miatt vészhelyzetben lehet;
e) az elfogást irányító egységek valamint a lehetséges elfogó légijárművek parancsnokai számára pontos és egyértelmű utasításokat adjanak az elfogási műveletekről, az elfogott légijármű vezetéséről, az elfogott légijármű részéről várható tevékenységekről és repülési műveletekről, a levegőben alkalmazott látjelekről, az elfogott légijárművel történő rádiólevelezésről és a fegyverhasználattól történő tartózkodás szükségességéről

Megjegyzés: Lásd a 3. – 8. pontokat;

f) az elfogott légijárművel való kapcsolatteremtés érdekében az elfogást irányító egységek és az elfogó légijárművek el legyenek látva az Annex 10 I. kötetében megadott műszaki követelményű rádió-távbeszélő berendezéssel, az elfogott légijárművel a 121,5 MHz kényszerhelyzeti frekvencián történő közleményváltásra;
g) biztosítsanak másodlagos radar berendezéseket a lehetséges mértékben, amely lehetővé teszi az elfogást irányító egységeknek a polgári légijárművek azonosítását azokon a területeken, ahol azok elfogására egyébként sor kerülhet. Az ilyen berendezések tegyék lehetővé az „A” módú diszkrét négyszámjegyű kódok felismerését, beleértve az „A” mód 7500, 7600 és 7700 kódok azonnali felismerését.

3. Elfogási manőverek

3.1 Az elfogott légijárművet érintő veszélyek elkerülése érdekében a polgári légijárművet elfogó légijármű repülési tevékenységére szabvány működési eljárást kell kidolgozni. az eljárás kidolgozásakor kellő mértékben vegyék figyelembe a polgári légijárművek teljesítmény korlátait, azt a követelményt, hogy az elfogó légijármű ne repüljön olyan közel az elfogott légijárműhöz, hogy abból összeütközési veszély származhasson, valamint, hogy az elfogó légijármű ne keresztezze az elfogott légijármű útját, vagy, hogy bármilyen más manővert ne úgy hajtsanak végre, hogy a légijármű keltette turbulencia veszélyt okozhasson, különösen akkor, ha az elfogott légijármű "könnyű" kategóriájú.

3.2 Látással történő azonosítási manőverek

3.2.1 Az alábbi eljárást javasoljuk az elfogó légijármű számára a polgári légijármű látással történő azonosításának végrehajtására:

I. szakasz:

Az elfogó légijármű az elfogott légijárművet a légijármű hátsó része felől közelítse meg. Az elfogó kötelék vezetője, vagy amennyiben egy elfogó légijármű tevékenykedik, az elfogó légijármű az elfogott légijármű baloldalára, kissé az elfogott légijármű felett és előtte helyezkedjen el úgy, hogy az elfogott légijárműtől kezdetben legalább 300 m távolságra, az elfogott légijármű vezetőjének látóterén belül legyen. Bármely más, az elfogásban résztvevő légijármű maradjon biztonságos távolságban, lehetőleg az elfogott légijármű felett és mögött. Amikor az elfogott légijárműhöz viszonyított megfelelő sebességet és repülési helyzetet felvették, az elfogó légijármű szükség szerint hajtsa végre a mások szakaszban előírtakat.

II. szakasz:

Az elfogó kötelék vezetője, vagy az elfogó légijármű azonos szinten repülve kezdje meg az elfogott légijármű óvatos megközelítését. Az elfogó légijármű ne repüljön az elfogott légijárműhöz közelebb, mint ahogy az a szükséges adatok beszerzése céljából feltétlenül szükséges. Az elfogó kötelék vezetője, vagy az elfogó légijármű legyen óvatos, nehogy megijessze az elfogott légijármű személyzetét, vagy utasait. Az elfogó légijármű vezetője mindig vegye figyelembe azt a tényt, hogy azok a manőverek, melyek elfogó légijárművek számára természetesek, veszélyesek lehetnek a polgári légijármű személyzetei, vagy utasai számára. az elfogásban résztvevő bármely más légijármű maradjon az elfogott légijárműtől biztonságos távolságban. Az azonosítás befejezése után az elfogó légijármű a harmadik szakaszban körvonalazottak szerint távolodjon el az elfogott légijármű közeléből.

III. szakasz:

Az elfogó kötelék vezetője, vagy az elfogó légijármű óvatosan, enyhe süllyedő fordulóval repüljön el az elfogott légijárműtől. Az elfogásban résztvevő bármely más légijármű maradjon az elfogott légijárműtől biztonságos távolságban, és csatlakozzon a kötelék vezetőjéhez.

3.3 Navigációs vezetési manőverek

3.3.1 Amennyiben a fenti I. és II. szakaszban leírt azonosítási műveletek végrehajtása után úgy ítélik meg, hogy az elfogott légijármű repülési útvonalának megváltoztatása szükséges, a kötelék vezetőjének, vagy az egyedül elfogó légijárműnek rendszerint az elfogott légijármű bal oldalán, kissé felette és előtte kell elhelyezkednie, hogy annak parancsnoka láthassa a leadott látjeleket.

3.3.2 Nélkülözhetetlenül szükséges, hogy az elfogó légijármű parancsnoka meggyőződjön arról, hogy az elfogott légijármű parancsnoka az elfogást észlelte és nyugtázza a jelzéseket. Ha az 1. függelék II. részében szereplő 1. sorozatú jelzések ismétlésével sem sikerül az elfogott légijármű parancsnokának figyelmét felhívni, más jelzési módszerek is használhatók e célra, beleértve utolsó eszközként az utánégető keltette fényhatást, feltéve, ha ennek használata az elfogott légijárműre nem jelent veszélyt.

3.4 Navigációs vezetési manőverek

3.4.1 Amennyiben a fenti I. és II. szakaszban leírt azonosítási műveletek végrehajtása után úgy ítélik meg, hogy az elfogott légi-jármű repülési útvonalának megváltoztatása szükséges, a kötelék vezetőjének, vagy az egyedül elfogó légi-járműnek rendszerint az elfogott légi-jármű bal oldalán, kissé felette és előtte kell elhelyezkednie, hogy annak parancsnoka láthassa a leadott látjeleket.

3.4.2 Nélkülözhetetlenül szükséges, hogy az elfogó légi-jármű parancsnoka meggyőződjön arról, hogy az elfogott légi-jármű parancsnoka az elfogást észlelte és nyugtázza a jelzéseket. Ha az 1. függelék II. részében szereplő 1. sorozatú jelzések ismétlésével sem sikerül az elfogott légi-jármű parancsnokának figyelmét felhívni, más jelzési módszerek is használhatók e célra, beleértve utolsó eszközként az után-égető keltette fényhatást, feltéve, ha ennek használata az elfogott légi-járműre nem jelent veszélyt.

3.5 Ismeretes, hogy adódnak olyan esetek, amikor az időjárási körülmények, vagy a domborzati viszonyok szükségessé tehetik, hogy a kötelék vezetője, vagy az egyedül elfogó légi-jármű az elfogott légi-jármű jobb oldalán, kissé felette és előtte helyezkedjen el. Ilyen esetben, az elfogó légi-jármű parancsnokának különös figyelmet kell fordítania arra, hogy légi-járművét az elfogott légi-jármű parancsnoka folyamatosan, világosan láthassa.

4. Az elfogott légijármű vezetése

4.1 Amikor az elfogott légijárművel rádióösszeköttetés létesíthető, a navigációs segítség és a szükséges információk rádió-távbeszélőn adandók meg az elfogott légijármű számára.

4.2 Amikor navigációs vezetést adnak egy elfogott légijármű számára, úgy gondoskodni kell arról, hogy az elfogott légijárművet ne vezessék olyan körülmények közé, ahol a látástávolság a repülés látási körülmények közötti lebonyolításához szükséges minimum alá csökkenhet. Vigyázni kell arra is, hogy az elfogott légijárművektől megkövetelt manőverek ne növeljék az elfogott légijárműre háruló, már meglévő veszélyeket abban az esetben, ha a légijármű működési jellemzői korlátozottak.

4.3 Abban a kivételes esetben, ha az elfogott légijárművet az átrepült területen le kell szállítani, vigyázni kell arra is, hogy:
a) a kijelölt repülőtér alkalmas legyen az érintett légijármű típus biztonságos leszállására, különösen akkor, ha a repülőteret rendes körülmények között polgári légiforgalom céljaira nem használják;

b) a repülőteret körülvevő terep alkalmas legyen a körözés, megközelítés, valamint a megszakított megközelítés végrehajtására;
c) az elfogott légijárműnek elegendő üzemanyaga legyen a repülőtér elérésére;
d) amennyiben az elfogott légijármű polgári szállító légijármű, a kijelölt repülőtér olyan futópályával rendelkezzen, melynek hosszúsága megfelel egy közepes tengerszinten lévő, 2500 m hosszú pálya hosszának, és a pálya teherbírása elegendő legyen a légijármű súlyának megtartására; és
e) amikor csak lehetséges, a kijelölt repülőtér olyan legyen, melynek részletes leírása a légiforgalmi tájékoztató kiadványban szerepel.

4.4 Amennyiben polgári légijárművet ismeretlen repülőtéren való leszállásra utasítanak, elegendő időt kell adni arra, hogy a polgári légijármű vezetője előkészülhessen a leszállás végrehajtására, figyelembe véve azt a tényt, hogy egyedül a polgári légijármű parancsnoka tudja megítélni azt, hogy adott időben a futópálya hosszát és a légijármű tömegét figyelembe véve a leszállási manőver biztonságosan végrehajtható-e.

4.5 Különösen fontos, hogy rádió-távbeszélő segítségével adják meg az elfogott légijárműnek a biztonságos megközelítés és leszállás végrehajtásához szükséges összes tájékoztatást.

5. Az elfogott légijármű ténykedése

A 2. függelék II. részében szereplő szabványok az alábbiakat írják elő:
„2.1 Egy másik légijármű által elfogott légijárműnek azonnal:
a) követnie kell az elfogó légijármű utasításait, a látjeleket az 1. függelékben megadott előírások szerint értelmezve és viszonozva;
b) ha lehetséges, értesítse az illetékes légiforgalmi szolgálati egységet;
c) kísérelje meg a rádióösszeköttetés felvételét az elfogó légijárművel, vagy az illetékes, elfogást irányító egységgel, általános hívással a 121,5 MHz kényszerhelyzeti frekvencián, megadva az elfogott légijármű azonosító jelét és a repülés természetét. Ha nem jött létre az összeköttetés, és gyakorlatilag lehetséges, ismételje meg ezt a hívást a 243 MHz vészfrekvencián is;
d) ha fel van szerelve SSR transzponderrel, állítsa be az „A” mód 7700 kódot, hacsak más utasítást nem kapott az illetékes légiforgalmi szolgálati egységtől.

2.2 Ha bármely rádión kapott utasítás ellentétes az elfogó légijármű által látjelek útján adott utasítással, az elfogott légijármű kérjen azonnali tisztázást, mialatt továbbra is követi az elfogó légijármű látjelekkel adott utasításait.

2.3 Ha bármely rádión vett utasítás ellentétes az elfogó légijármű által rádión adott utasítással, az elfogott légijármű kérjen azonnali tisztázást, mialatt továbbra is követi az elfogó légijármű rádión adott utasításait.”

6. Levegőben alkalmazott látjelek

6.1 Az elfogó és az elfogott légijárművek által alkalmazandó látjeleket jelen Annex 1. függeléke tartalmazza. Elengedhetetlenül fontos, hogy az elfogó légijármű pontosan alkalmazza ezeket a látjeleket és helyesen értelmezze a másik légijármű által alkalmazott jelzéseket. Különösen fontos, hogy az elfogó légijármű nagyon figyeljen minden, az elfogott légijármű által adott olyan jelzésre, amely azt jelzi, hogy az elfogott légijármű veszélyben van, vagy segítségre szorul.

7. Rádióösszeköttetés az elfogást irányító egység, vagy az elfogó légijármű és az elfogott légijármű között

7.1 Elfogás végrehajtása során, az elfogást irányító egység és az elfogó légijármű
a) először kíséreljen meg közös nyelven kétoldalú rádióösszeköttetést létesíteni a 121,5 MHz kényszerhelyzeti frekvencián;
A rádióösszeköttetés során a következő hívónevek használandók:
„INTERCEPT CONTROL” (elfogást irányító egység),
„INTERCEPTOR (hívójel)” [elfogó légijármű (hívójel)],
„INTERCEPTED AIRCRAFT” (elfogott légijármű); és
b) ennek sikertelensége esetén kíséreljenek meg kétoldalú rádióösszeköttetést létesíteni az elfogott légijárművel olyan más frekvencián vagy frekvenciákon, amelyeket az illetékes ATS hatóságok előírhattak, vagy létesítsenek összeköttetést a megfelelő ATS egységeken keresztül.

7.2 Ha az elfogás során rádióösszeköttetés jön létre, de a közleményváltás közös nyelven nem lehetséges, meg kell kísérelni az utasítások adását, az utasítások nyugtázását és a leglényegesebb tájékoztatások továbbítását az A-1 táblázatban szereplő kifejezések és kiejtési útmutató használatával, az egyes kifejezéseket kétszer ismételve.

A-1 táblázat

Az ELFOGÓ légijármű által használandó kifejezések:			*Az ELFOGOTT légijármű által használandó kifejezések:*		
Kifejezés	*Kiejtés*[1]	*Jelentése*	*Kifejezés*	*Kiejtés*[1]	*Jelentése*
CALL SIGN	KOL-SZAIN	Mi a hívójele?	CALL SIGN[2] (hívójel)	KOL-SZAIN (hívójel)	Hívójelem…
FOLLOW	FOL-LO	Kövessen	WILCO	VILL-KO	Megértettem, végrehajtom
DESCEND	DI-SZEND	Süllyedjen leszálláshoz	CAN NOT	KAN-NOT	Nem tudom teljesíteni
YOU LAND	JU-LEEND	Szálljon le ezen a repülőtéren	REPEAT	RI-PIT	Ismételje meg utasítását
PROCEED	PRO-SZID	Tovább haladhat	AM LOST	AM-LOSZT	Eltévedtem
			MAYDAY	MÉJDÉJ	Vészhelyzetben vagyok
			HIJACK[3]	HÁJDZSEK	Eltérítettek

			LAND (…)	LEND (…)	Leszállást kérek … helyen
			DESCEND	DI-SZEND	Süllyedést kérek

1. Megjegyzés. – A második oszlopban a hangsúlyozandó szótag alá van húzva.
2. Megjegyzés. – A megadandó hívójel az legyen, melyet a légiforgalmi szolgálati egységekkel tartott rádió-távbeszélő összeköttetés során használnak, és amely megfelel a légijármű repülési tervében szereplő azonosító jelnek.
3. Megjegyzés. – A "HIJACK" kifejezés használatát a körülmények nem mindig teszik lehetővé, illetve kívánatossá.

8. Tartózkodás a fegyverhasználattól

Megjegyzés. – Az ICAO tagállamok közgyűlésének 1984. május 10-én tartott 25. (rendkívüli) ülésén egyöntetűen elfogadott Nemzetközi Polgári Repülési Egyezmény 3 (b) cikkelye értelmében a Szerződő Államok elfogadták, hogy „minden államnak tartózkodnia kell a fegyverhasználattól repülést folytató polgári légijárművekkel szemben".

8.1 Nyomjelzős lövedékek használata figyelem felkeltése céljából veszélyes, és elvárják, hogy intézkedéseket hozzanak ezek használatának kerülésére a célból, hogy a légijármű biztonságát és a fedélzeten lévő utason életét ne veszélyeztessék.

9. Együttműködés az elfogást irányító egységek és a légiforgalmi szolgálati egységek között

9.1 Nélkülözhetetlenül fontos, hogy egy tudottan vagy feltételezhetően polgári lgijármű elfogásának minden szakaszában szoros együttműködést tartsanak fenn az elfogást irányító egység és az illetékes légiforgalmi szolgálatok között abból a célból, hogy a légiforgalmi szolgálati egység folyamatosan tájékoztatva legyen a fejleményekről, valamint az elfogott légijárműtől megkövetelt tevékenységről.

„B” MELLÉKLET

JOGTALAN BEAVATKOZÁS

1. Általános rész

A következő eljárások útmutatóként szolgálnak arra az esetre, amikor a légijármű jogtalan beavatkozás alatt áll, és erről a légiforgalmi szolgálati egységet nem tudja értesíteni.

2. Eljárások

2.1 Amennyiben a légijármű fedélzetén uralkodó körülmények mást nem követelnek, a légijármű parancsnoka kísérelje meg folytatni útját a kijelölt útirányon és repülési szinten legalább addig, amíg nem tud értesíteni egy légiforgalmi szolgálati egységet vagy amíg radar fedésterületre nem érkezik.

2.2 Amikor a jogtalan beavatkozás alatt álló légijármű el kell térjen kijelölt útirányától vagy kijelölt repülési szintjétől és nem képes rádióösszeköttetést létesíteni a légiforgalmi szolgálattal, a légijármű parancsnoka amennyiben ez lehetséges:
a) kíséreljen meg figyelmeztető adást adni az URH vészhelyzeti és más megfelelő frekvencián, kivéve ha a légijármű fedélzetén uralkodó körülmények mást nem követelnek. Amennyiben ez előnyös lehet és a körülmények lehetővé teszik, használjon más berendezéseket is, mint például a fedélzeti válaszjeladó vagy adatátviteli egységet;
b) amennyiben ilyen eljárásokat kidolgoztak és a Helyi Körzeti Egyezmények (Doc 7030) eljárásaiban közzétettek, repüljön tovább a repülés közben kialakult váratlan helyzetekre előírt különleges eljárások szerint; vagy
c) ha alkalmazható körzeti eljárásokat nem dolgoztak ki, repüljön olyan repülési szinten, amely a rendes IFR repülési szintektől a következőkben különbözik:

> *1)* 150 méter (500 láb) olyan területen, ahol az alkalmazott függőleges elkülönítési minimum 300 méter (1000 láb); vagy
>
> *2)* 300 méter (1000 láb) olyan területen, ahol az alkalmazott függőleges elkülönítési minimum 600 méter (2000 láb).

Megjegyzés: A jogtalan beavatkozás alatt álló elfogott légijármű teendői a jelen Annex 3.8 szakaszában vannak leírva.

ANNEX 3.
A nemzetközi légiközlekedés meteorológiai szolgálata

15. kiadás – 2004. július
73. módosítással
I. rész
Szabványok és Ajánlott Eljárások törzsanyaga

II. rész
Függelékek és Mellékletek

Ez a kiadás magában foglalja a Tanács által 2004. február 26. előtt elfogadott összes módosítást, és 2004 november 25-ével érvényteleníti a 3. Annex minden ezt megelőző kiadását.
A Szabványok és Ajánlott Eljárások alkalmazhatóságára vonatkozó információkat illetően lásd az Előszót.
Nemzetközi Polgári Repülési Szervezet

KÍSÉRŐ MEGJEGYZÉS
A NEMZETKÖZI POLGÁRI REPÜLÉSI EGYEZMÉNY FÜGGELÉKÉNEK ÚJ KIADÁSAI
Tudomásunkra jutott, hogy egy Annex új kiadásának megjelenésekor az Annex előző kiadásával együtt az ahhoz tartozó **Kiegészítés** is kidobásra kerültek. Kérjük megjegyezni, hogy az előző kiadáshoz tartozó Kiegészítést meg kell tartani, amíg egy új Kiegészítés kiadásra nem kerül.

MÓDOSÍTÁSOK

A módosítások kiadását rendszeresen közlik az *ICAO Journal*-ban és a havonta megjelenő *Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids*-ben (Kiegészítés az ICAO kiadványok és audio-vizuális képzési segédletek katalógusához), amelyeket jelen kiadvány birtokosainak célszerű áttanulmányozni. Az alábbi hely ezeknek a módosításoknak a bejegyzésére szolgál.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK BEJEGYZÉSE

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Szám	Alkalmaz-hatóság dátuma	Beírás dátuma	Beírta:	Kiadás dátuma	Beírás dátuma	Beírta:	
1-73	Ebbe a kiadásba beépítve			1	04/10/15	04/10/15	ICAO

ELŐSZÓ

Történeti háttér

A meteorológiára vonatkozó Szabványokat és Ajánlott Eljárásokat a Tanács először 1948. Április 16-án fogadta el a Nemzetközi Polgári Repülési Egyezmény (Chicago, 1944) 37. Cikkelyében foglalt előírásoknak megfelelően, és 3. Annex-ként jelölte ki az Egyezményhez, *Szabványok és Ajánlott Eljárások - Meteorológiai Kódok* címen. A Szabványok és Ajánlott Eljárások a Meteorológiai Részleg 1947. szeptemberében tartott különleges ülésszakának ajánlásain alapultak.

Az *A* Táblázat mutatja az egymást követő módosítások eredetét, valamint egy jegyzéket az érintett lényegi kérdésekről és azokról a dátumokról, amelyeken az Annexet és a módosításokat a Tanács elfogadta vagy jóváhagyta, amikor hatályba léptek és amikor alkalmazhatóvá váltak.

A Szerződő Államok tevékenysége

Eltérések bejelentése. A Szerződő Államok figyelmét felhívjuk az Egyezmény 38. Cikkelyében szereplő kötelezettségükre, amely szerint a Szerződő Államok kötelesek tájékoztatni a Szervezetet bármely eltérésről, amely nemzeti szabályozásaik és eljárásaik, és a jelen Annexben és annak bármely módosításában tartalmazott Nemzetközi Szabvány között fennáll. Felhívjuk a Szerződő Államokat, hogy ezt a tájékoztatást terjesszék ki a jelen Annex és annak bármely módosítása által tartalmazott Ajánlott Eljárásoktól való eltérésekre, amennyiben ezek az eltérések a légiközlekedés biztonsága szempontjából fontosak. Továbbá felhívjuk a Szerződő Államokat, hogy folyamatosan tájékoztassák a Szervezetet a későbbiekben előforduló eltérésekről, illetve bármely, korábban bejelentett eltérés megszűnéséről. Az eltérések bejelentésére vonatkozó kérést a Szervezet minden, ezzel az Annexszel kapcsolatos módosítás elfogadása után azonnal elküldi a Szerződő Államoknak.

Felhívjuk a szerződő Államok figyelmét a 15. Annex azon előírásaira is,a melyek a nemzeti szabályok és eljárások és a vonatkozó ICAO Szabványok és Ajánlott Eljárások között fennálló eltéréseknek a Repülési Információs Szolgálaton (AIS) keresztül való közzétételére vonatkoznak, amelyet az Államoknak az Egyezmény 38. Cikkelye szerinti kötelezettségén felül meg kell tenniük.

Információ közlés. A jelen Annexben részletezett Szabványoknak és Ajánlott Eljárásoknak megfelelően biztosított, a légijárművek üzemeltetését befolyásoló berendezések, szolgálatok és eljárások létrehozásáról, megszüntetéséről és változásáról tájékoztatást kell adni, és ezeket a 15. Annex rendelkezései szerint kell életbe léptetni.

Az Annex szövegének felhasználása a nemzeti szabályozásokban. A Tanács 1948. április 13-án elfogadott egy határozatot, amely felhívja a Szerződő Államok figyelmét arra, hogy kívánatos saját nemzeti szabályozásaikban, amennyiben lehetséges, azoknak az ICAO Szabványoknak pontos nyelvezetét használni, amelyek szabályozó jellegűek; továbbá, hogy kívánatos a Szabványoktól való eltérések közlése, beleértve bármely pótlólagos nemzeti szabályozásról adott tájékoztatást, amely fontos a légiközlekedés biztonsága és rendszeressége szempontjából. Ahol csak lehetséges volt, jelen Annex rendelkezései olyan módon íródtak, hogy megkönnyítsék a nemzeti rendelkezésekbe nagyobb szövegváltoztatás nélküli beillesztését.

Az Annex részeinek státusza

Egy Annex a következő alkotórészekből épül fel, amelyek közül azonban nem mindegyik található meg szükségszerűen minden egyes Annexben; ezeknek a következőkben meghatározott státuszuk van:

1. – *Az Annex sajátosságát tartalmazó anyag:*

a) *Szabványok és Ajánlott Eljárások,* amelyeket a Tanács elfogadott az Egyezmény előírásainak megfelelően. Ezek meghatározása a következő:

Szabvány: Fizikai jellemzőkre, elrendezésekre, anyagra, teljesítményre, személyekre vagy eljárásokra vonatkozó bármely előírás, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi repülés biztonsága vagy rendszeressége szempontjából, és amelyhez a Szerződő Államok az Egyezményeknek megfelelően igazodnak; teljesítésének lehetetlensége esetén a 38. Cikkely értelmében a Tanácsot kötelező értesíteni.

Ajánlott Eljárás: Fizikai jellemzőkre, elrendezésekre, anyagra, teljesítményre, személyekre vagy eljárásokra vonatkozó bármely előírás, amelynek egységes alkalmazását kívánatosnak tartják a nemzetközi repülés biztonsága, rendszeressége vagy hatékonysága érdekében és amelyhez a Szerződő Államok az Egyezménynek megfelelően igyekeznek alkalmazkodni.

b) *Függelékek:* a kényelem kedvéért külön csoportosított anyag, de a Tanács által elfogadott Szabványok és Ajánlott Eljárások részét képezik.

c) *Meghatározások:* a Szabványok és Ajánlott Eljárásokban használt azon kifejezések definíciói, amelyek nem maguktól értetődőek, mivel nincs elfogadott szótári jelentésük. A definíciónak nincs független státusza, de lényeges része minden Szabványnak és Ajánlott Eljárásnak, amelyben a kifejezés előfordul, mivel a kifejezés jelentésének megváltoztatása befolyásolná az előírást.

d) *Táblázatok és Ábrák,* amelyek kiegészítik vagy illusztrálják a Szabványokat és Ajánlott Eljárásokat, amelyekben hivatkoznak azokra, részei a velük kapcsolatos Szabványoknak, illetve Ajánlott Eljárásoknak és ugyanazon státuszuk van.

2. – A Tanács által kiadásra jóváhagyott Szabványokkal és Ajánlott Eljárásokkal kapcsolatos anyag:

a) *Előszó:* Tartalmazza a történeti és magyarázó anyagot a Tanács tevékenységéről, és tartalmazza az Államoknak a Szabványok és Ajánlott Eljárások alkalmazására vonatkozó kötelezettségeinek kifejtését, amelyek az Egyezményből és az Elfogadási Határozatból következnek.

b) *Bevezetés* -az Annex részeinek, fejezeteinek vagy alfejezeteinek az elején magyarázó anyagot tartalmaz, amely segít a szöveg alkalmazásnak megértésében.

c) *Megjegyzések,* ahol szükségesek, a szövegben szerepelnek, tényszerű információkat és felvilágosításokat adnak az adott Szabványra és Ajánlott Eljárásra vonatkozóan, de nem alkotják a Szabványok és Ajánlott Eljárások részét.

d) *Mellékletek* olyan anyagokat tartalmaznak, amelyek kiegészítik a Szabványokat és Ajánlott Eljárásokat vagy útmutatást adnak azok alkalmazásához.

Nyelv kiválasztása

Ezt az Annexet öt nyelven fogadták el - angolul, arabul, franciául, oroszul és spanyolul. Minden Szerződő Államot felkérnek, hogy válasszon ezek közül egyet a nemzeti alkalmazás céljaira és az Egyezményben előírt egyéb célokra, akár közvetlen felhasználással, akár saját nemzeti nyelvére lefordítva, és erről a Szervezetet megfelelően értesítse.

Szerkesztési eljárások

A következő szerkesztési gyakorlatot alkalmazták az előírások szövegezésében, hogy az egyes állítások státusza az első pillantásra jelezze: *Szabványok* antikva betűtípussal vannak nyomtatva, míg az *Ajánlott Eljárások* dőlt betükkel , a státuszt az **Ajánlat** előtag jelzi; *Megjegyzés* antikva *betűtípussal* nyomtatva, a státuszt a *Megjegyzés* előtag jelzi..

Alkalmazhatóság

Jelen dokumentumban szereplő Szabványok és Ajánlott Eljárások szabályozzák a *Regionális Kiegészítő Eljárások* (Doc. 703O, 3. Rész - Meteorológia) alkalmazását, amelyben a regionális választású megállapítások szerepelnek, amennyiben ilyen választást jelen Annex megenged.

Felelősség

A 6. Annex II. Rész Előszavának egy hasonló előírásában foglaltaknak megfelelően, a felelősség, amely az üzemeltetőre hárul, a 3. Annex előírásai szerint, a nemzetközi általános célú repülés esetén a légijármű parancsnokot terheli.

A megfelelő WMO kiadványokkal való kapcsolat

A 3. Annexben lévő szabályozó anyag, néhány kisebb szerkesztési eltéréstől eltekintve, azonos a Meteorológiai Világszervezet (WMO) Műszaki Szabályozások (C.3.1 Fejezet) anyagával.

A 3. Annexben hivatkozott repülésmeteorológiai kód formátumokat a Meteorológiai Világszervezet alakította ki az ebben az Annexben található repülési követelmények alapján, illetve a Tanács időről-időre megállapított követelményei alapján. A repülésmeteorológiai kód formátumokat a Meteorológiai Világszervezet No.306 kiadványban - *Kódkézikönyv,* I. kötet tette közzé.

A Táblázat A 3. Annex módosításai

Módosítás(ok)	Forrás(ok)	Tárgy(ak)	Elfogadva/ jóváhagyva Hatályba lép Alkalmazható
1. kiadás	A Meteorológiai Részleg 2. Ülésszaka	Meteorológiai kódok a meteorológiai információk repülési célokból való továbbítására	1948.04.16. 1948.09.01. 1949.01.01.
1 -21 (2. kiadás)	A Meteorológiai Részleg rendkívüli Ülésszaka	A meteorológiai kódok felülvizsgálata és javítása.	1948.09.17. 1948.12.23. 1949.01.01.
22 - 37	A Meteorológiai Részleg 3. Ülésszaka	Köznyelvű szöveg és egyszerűsített kódok alkalmazása a légijelentésekben a repülési körülményekre vonatkozóan	1951.05.28. 1951.10.01. 1952.01.01.
38 (3. kiadás)	Első Léginavigációs Konferencia	A légijelentések rádiótelefonos vagy rádiótávírós AIREP forma bevezetése.	1953.12.15. 1954.08.01. 1954.09.01.
39	Első Léginavigációs Konferencia	A POMAR-kód módosított rádiótávíró formája a légijelentések számára.	1954.05.18. 1954.09.01. 1954.09.01.
40	Meteorológiai Világ Szervezet	Új repülésmeteorológiai számkódok egy mellékletben, amely felváltja a SARP-okban korábban megjelenteket (a POMAR-kódok kivételével).	1954.09.28. 1955.01.01. 1955.01.01.
41	A Meteorológiai Részleg 4. Ülésszaka	Szabványok és Ajánlott Eljárások bevezetése, amelyek szabályozzák a Szerződő Államok kötelezettségeit a meteorológiai szervezet létrehozásában minden egyes Államban, megfelelően kielégítve az Egyezmény 28. és 37. Cikkelyében foglaltakat; a 3. Annex címének ebből adódó megváltozása a következőkre: „Nemzetközi Szabványok és Ajánlott Eljárások - Meteorológia”.	1955.04.01. 1955.08.01. 1956.01.01.
42 (4.kiadás)	Második Léginavigációs Konferencia	A légijelentés AIREP és POMAR formájában a helyzet meghatározás módszeréhez alkalmazott részletes leírás egyszerűsítése	1956.05.08. 1956.09.01. 1956.12.01.
43	Harmadik Léginavigációs Konferencia	A „SIGMET tájékoztatás” kifejezés bevezetése a „tanácsadói közlemény” és a „figyelmeztető közlemény” helyett; a POMAR-kódban a „tenger állapota” (State of Sea) táblázat módosítása.	1957.06.13. 1957.10.01. 1957.12.01.

44	Repülési Szabályok és Légiforgalmi Szolgálatok/Kutatás és Mentés Részlegek	A légijelentések AIREP formájában az 1.rész (helyzetjelentés) alapelemeinek változása - a „Repülési Körülmények” elem törlése és az utolsó elem módosítása ebben a részben a következőkre: „Következő helyzet és eltelt idő”	1960.02.18. 1960.05.01. 1960.08.01.
45	Repülési Szabályok és Légiforgalmi Szolgálatok/Kutatás és Mentés Részlegek	Az AIREP és POMAR típusú légijelentés formanyomtatvány mintájának módosítása, a 44. Módosítás következményeként.	
46	Meteorológiai Világszervezet	Felfrissítés a WMO által 1960. Január 1-jén bevezetett repülés-meteorológiai számkódokkal.	1960.06.08 – 1960.06.08
47 (5. kiadás)	A Meteorológiai Részleg 5. Ülésszaka	Légijárművek időjárás észlelési és jelentési eljárásainak módosítása, megváltoztatva azokat a különleges észlelések tekintetében, és bevezetve az egyéb észlelésekre vonatkozó követelményeket; a légijelentés POMAR formátumának törlése; a repülésmeteorológiai figyelés törlése és az útvonal előrejelző szolgálat bevezetése a területi meteorológiai figyelés kiegészítésére; a kitérő repülőtérhez vezető útvonalon lévő meteorológiai körülményekre vonatkozó előírások módosítása	1960.12.02. 1961.04.01. 1961.07.01..
48	A Meteorológiai Részleg 5. Ülésszaka	A légijelentés AIREP formanyomtatvány mintájának módosítása, hogy tükrözze a légijármű általi meteorológiai észlelésekre és jelentésekre a PANS-RAC módosítása miatt bekövetkező változásokat.	1960.12.02. – 1961.07.01.
49	A Meteorológiai Részleg 5. Ülésszaka	A „D-érték” definíciójának bevezetése	1963.04.08. 1963.08.01. 1963.11.01
50.	Meteorológiai Világszervezet	Felfrissítés az 1964. Január 1-jén a Meteorológiai Világszervezet által bevezetett repülésmeteorológiai számkódokkal.	1964.03.18 – 1964.03.18.
51 (6. kiadás)		Megfigyelés végzése követelményének bevezetése olyan helyekre, ahol ezek arra a területre lesznek jellemzőek, amelyre elősorban megkövetelték. Különleges légijelentések kritériumainak kiterjesztése olyan jelenségekre, amelyek befolyásolhatják a hatékonyságot és a biztonságot, és az „egyéb légijármű általi észlelések” követelményének törlése a regionálisan egyeztetett kritériumok szerint; a légijelentések AIREP formátumából a D-érték, az időjárás és felhőzet, mint állandó tételek törlése; az AIREP formátum módosított mintájának bevezetése; a meteorológiai közlemények formájára vonatkozó és az információk képi formában való cseréjére biztosított eljárások változása; „köznyelv” definíciójának bevezetése.	1965.05.31. 1965.10.01. 1965.03.10.
52	Meteorológiai Világszervezet	Felfrissítés a Meteorológiai Világszervezet által 1966. Március 10-én bevezetett repülésmeteorológiai számkódokkal	1966.12.12 –

53	Meteorológiai és Üzemeltetési részleg ülése.	A regionális léginavigációs egyezmény jóváhagyása a közlemények képi formában való továbbításáról az előrejelzések szétosztásában; a „szimbolikus közleményforma” kifejezés helyettesítése a közlemény formájának specifikusabb leírásával, amelyre ez a kifejezés volt hivatva utalni.	1966.12.12. 1967.04.12. 1967.08.24.
…54	Meteorológiai Világszervezet	Felfrissítés a Meteorológiai Világszervezet által 1968. Január 1-jén bevezetett repülésmeteorológiai számkódokkal.	1967.06.13. 1968.01.01.
55.	Franciaország	A légijelentések változtatásának engedélyezése a föld-föld terjesztésük előtt	1968.12.16. 1969.04. 16. 1969.09.18.
56 (7. kiadás)	Hatodik Léginavigációs Konferencia	A következők bevezetése: területi előrejelző központok részletes leírása; meteorológiai szolgálatok egyszerűsített előírásai, amelyek a növekvő centralizációt tükrözik; a légijelentések tartalmának kiterjesztése rossz időjárási körülményekre, amelyekbe a légijármű a kezdeti emelkedés és a végső megközelítés során kerül; a légijármű általi jelentés inkább egy „adott ponton” uralkodó szélről, mint az „átlag” szélről; a turbulencia erősségéről repülés közben adandó jelentés kritériumainak pontosítása; a „légiforgalmi szolgálatok jelentő irodája” új definíciója és változtatás a „légiforgalmi szolgálati egység” meghatározásában; felfrissítés a Meteorológiai Világszervezet által 1969. Szeptember 18-án bevezetett repülésmeteorológiai kódokkal.	1970.05.15. 1970.09.15. 1971.02.04.
57	A Szuperszónikus Légiközlekedés Repülés Üzemelési Munkacsoport Második Ülése	A „SIGMET információ” meghatározásának módosítása, hogy az SST légijárművek üzemeltetési követelményeit figyelembe vegye; különleges megfigyelések végzésére és rögzítésére vonatkozó előírások bevezetése olyan esetekre, amikor transzonikus vagy szuperszonikus sebességű repülés során mérsékelt turbulencia, jégeső vagy cumulonimbus felhő tapasztalható.	1971.03.19. 1971.09.06. 1972.01.01
58.	Meteorológiai Világszervezet	Felfrissítés a Meteorológiai Világszervezet által 1972. Január 1-jén bevezetett repülésmeteorológiai kódokkal.	1971.03.19. 1972.01.06.
59	Hatodik Léginavigációs Konferencia	A meteorológiai szolgálatok között váltott légijelentések 1. Részéről a „következő helyzet és az odaérkezés ideje” elhagyásának engedélyezése: a légijelentés formátum mintájában és a megszokott adatokban bekövetkező változások bevezetése annak érdekében, hogy azt alkalmassá tegyék a számítógépbe való közvetlen bevitelre.	1972.03.24. 1972.07.24. 1972.12.07.

60.	Hatodik Léginavigációs Konferencia.Nyolcadik Léginavigációs Konferencia. Meteorológiai Részleg Ülése (1974)	A 3. Annex teljes átdolgozása, a PANS-MET beépítése, amelynek előírásait alkalmasnak találták a 3. Annexbe Szabványként és Ajánlott Eljárásként való beillesztésre; az átdolgozás figyelembe vette az elfogadott üzemeltetési követelményeket és azok kielégítésének korszerű módszereit; az üzemeltetők és a hajózószemélyzet tagjai részére adott szolgáltatások, a légiforgalmi szolgálatoknak és a kutató-mentő szolgálatoknak adott meteorológiai információkra vonatkozó új Szabványok és Ajánlott Eljárások bevezetése, beleértve a kommunikációra és azok felhasználására vonatkozó követelményeket is; a 3. Annex címe ennek megfelelően *Meteorológiai Szolgálat a Nemzetközi Repülés számára.*	1975.11.26. 1976.03.26. 1976.08.12.
61.	Kilencedik Léginavigációs Konferencia. Meteorológiai Részleg Ülés (1974))	Új előírások és fennálló rendelkezések módosításai a meteorológiai hivatalok/állomások és a légiforgalmi szolgálati egységek között meglévő koordináció és az utóbbi számára adott meteorológiai informáckkal való ellátottság javítása érdekében; a 14. Annexnek a berendezések és épületek üzemelési területén való olyan elhelyezésére és építésére vonatkozó előírásaira utaló megjegyzés bevezetése, amelynél a légijárművek veszélyeztetettsége mininimumra csökken; a „szuperszónikus szállító légijármű” kifejezés helyettesítése a „szuperszónikus légijármű” kifejezéssel; a 2. Függelék 2. Részének pontosítása; a „nefanalizis” definíciójának módosítása és a „(29.92 inch)” törlése a „repülési szin” definíciójából; a D Melléklet - Repülésmeteorológiai Kódok rész törlése.	1977.12.14. 1978.04.14. 1978.08.10
62	Nyolcadik Léginavigációs Konferencia és az ICAO Tanács	Az 1. Függelékbe a Meteorológiai Világszervezet által a 3. Annexben szereplő üzemeltetési követelmények alapján kifejlesztett minta térképek és formanyomtatványok beiktatása; az adatjelölések és földrajzi jelzések átvitele a 3. Annex 2. Függelékéből a *Repülésmeteorológiai Eljárások Kézikönyvébe* (Doc 8896).	1978.06.26. 1978.10.26. 1979.11.29
63.	MET Részleg Ülés (1974). ICAO Titkárság Üzemi Repüléstájékoztató Szolgálati Panel. Kilencedik Léginavigációs Konferencia (Doc 9328)	Definíció a „meteorológiai bulletin”-re; a légijelentések föld-föld terjesztése hiányosságainak kijavítása; az „aktív zivatar területtel” foglalkozás csökkentése SIGMET közleményekben; a „jelentő vonalakra” való hivatkozás törlése; utalás új RVR Megfigyelési és Jelentési Eljárásaink Kézikönyvére.	1981.03.23. 1981.07.23. 1981.11.26
64	ICAO Titkárság	Új előírások és a meglévő módosítása, hogy megfeleljenek az alacsony szinti szélnyírás megfigyelésére és jelentésére vonatkozó üzemeltetési követelményeknek, beleértve a szélnyírásra való figyelmeztetést is, a repülés kezdeti emelkedési és a megközelítés fázisaiban.	1982.12.06. 1983.04.06. 1983.11.24.

65. (9. kiadás)	Távközlési/Meteorológiai Részleg Együttes Ülése (1982). ADAPT panel harmadik ülése.	Új előírások és a régiek módosítása, amelyek az új világméretű területi előrejelző rendszer bevezetésére vonatkoznak; az üzemelési meteorológiai adatok cseréjének módszerei; az RVR becslési pontosságának javítása és az RVR jelentése	1983.06.10. 1984.10.10. 1984.11.22
66. (10. kiadás)	Távközlési/Meteorológiai Részlet Együttes Ülés (1982). Második Asia/Pacific Regionális léginavágiációsÜlés. Ez Európai Léginavigációs Tervezési Csoport Huszonkettedik és huszonharmadik ülése. Meteorológiai Világszervezet. Az ANC referencia dátum/idő módszere és a mértékegységekre vonatkozó javaslatai ICAO Titkárság	A következők módosítása: a szélnyírás információ repülőtéren kívülre való továbbítására vonatkozó előírás; a kiválasztott különleges jelentések kiadásának kritériumai, a felhő információ belefoglalása a repülőtéri előrejelzésekbe, rövidtávú-repülésekhez biztosítandó repülési dokumentáció a SIGMET közlemény és a meteorológiai bulletin fejrészének formátuma: a „SIGMET információ” definíciójának bevezetése; a 3. Annex és az 5. Annex egyeztetése a mértékegység és a referencia idő tekintetében.	1986.03.24. 1986.07.27. 1986.11.f20.
67	Távközlési/Meteorológiai Részleg Együttes Ülése (1982). Az Európai Léginavigációs Tervező Csoport 22. És 23. Ülése. ICAO Titkárság. Meteorológiai Világszervezet	A következőkre vonatkozó előírások módosítása: RVR mérésnél használt fényintenzitás beállítás; a kiválasztott repülőterek azonosítása és a WAFS térképeken a hőmérsékleti körök követelmény törlése; előrejelzések továbbítási ideje a regionális körzeti előrejelző központokból a felhasználókhoz; a vulkáni hamu figyelmeztetés eredetére és terjesztésére vonatkozó előírások bevezetése; a szélsebesség mértékegységeinek a repülésmeteorológiai számkódok példáiba való beillesztése, a 3. Annex és a PANS-RAC egyeztetése a légijelentések elemeinek tekintetében; a SIGMET közlemény példák szerkesztői módosítása	1987.03.27. 1987.07.27. 1987.11.19.

68.	Távközlési/Meteorológiai Részlet Együttes Ülése (1982). ICAO Titkárság Meteorológiai Világszervezet	Az RVR jelentés helyének azonosítására vonatkozó előírások módosítása; az RVR változásának kiválasztott különleges jelentésekben való közzétételének kritériumai; a repülőtéren túl szétosztandó jelentésekbe foglalandó földetérési zóna RVR értékek, amikor valamennyi futópálya használható leszállásra; repülőtéri dokumentációhoz minta térképek és formátumok; a vulkáni hamuval kapcsolatos SIGMET közlemény kiadása és módosítása, pontos előírások, hogy mikor szükséges a légiforgalmi tájékoztató szolgálati egységeket MET tájékoztatással ellátni; a légiforgalmi állandóhelyű távközlési hálózat és a légiforgalmi mozgószolgálat definíciók 10. Annex szerinti egységesítése, a terminológiai PANS-OPS II. kötet III. rész 6.3.1. pont szerinti egységesítése; a 3.3.7 pont szerkesztői módosítása az egyenértékű nyomásszint törlése; példa a SPECI jelentésre; a 8. Melléklet 3. Rész 1.4.b/ pontjának Hivatkozása; és a „C" melléklet lábjegyzete az RVR és a látástávolság vonatkozásában.	1989.03.21. 1989.07.23. 1989.11.16.
69. (11. kiadás)	Távközlési/Meteorológia/Üzemelések (COM/MET/OPS) Részleg Együttes Ülés (1990). ICAO Titkárság	A WAFS végső fázisára történő átmenettel kapcsolatos előírások módosítása; légiforgalmi meteorológiai kódok, útmutató anyag repülőtéri külön jelentések kritériumairól; légiforgalmi klimatológiai tájékoztatás; SIGMET információk és útmutató anyag SIGMET-ek kiadásához; automatikus időjárás észlelő állomások; meteorológiai információk helikopterek számára; valamint a 6. Annex I. és II. kötetének megfelelően, a kitérő repülőtér definíciója	1992.03.23. 1992.07.27. 1992.11.12. 1993.07.01.

70. (12. kiadás)	Kommunikációs/Meteorológiai/Üzemeltetési Részlet Együttes Ülése (1990). Korlátozott Észak-Atlanti (COM/MET/RAC) Regionális Léginavigációs Ülés (1992). Harmadik Ázsia/Csendes Óceán Regionális Léginavigációs Ülés (1993). Az Európai Léginavigációs Tervezési Csoport harminckettedik ülése. ICAO Titkárság.	Az AIRMET információ definíciója, a kiterjesztett hatótávolságú üzemelés definíciója, a GAMET területi előrejelzés definíciója, az üzemelési irányítás definíciója és a trópusi ciklon definíciója; a vizszintes felbontással és a kód formával foglalkozó rendelkezések módosítása, amelyekben a magaslégköri szél és hőmérséklet rácspont előrejelzéseket a világ-területi előrejelző központoknak kell készíteni; különleges jelentések kiadása a repülőtéri hőmérséklet változásról; repülőtéri meteorológiai információk jelentésére és előrejelzésére vonatkozó rendelkezések, amelyeken az új repülésmeteorológiai kódok alapulnak, és ezek következményeként az A1, A2, TA1, TA2 és SN minták módosítására a felfrissített repülésmeteorológiai kódok figyelembevételéhez; automatizált légi jelentés; a kismagassági repülésre veszélyes időjárás jelenségre vonatkozó információkat érintő rendelkezés, a minimum küszöbérték bevezetése a maximális talajszél sebességre, amelynél trópusi ciklon SIGMET-et kell kiadn; szélnyírás megfigyelés és jelentés a földi szélnyírás megfigyelő berendezéseknél bevezetett új technológia figyelembevételével; METAR-ok és SPECI-k körzetek közötti cseréje a kiterjesztett hatótávolságú üzemelés és a központosított üzemelés irányítás alatt végrehajtott nagyhatótávolságú repülések segítésére; szerkesztési módosítások a „line squall line”-nal (széllökés vonal) történő helyettesítése; az SWL és SN minták szerkesztési módosítása a fagyszint ábrázolás elrendezése érdekében és az A2 minta szerkesztési korrekciói; az SN mintába a „vulkánkitörések”, a „tenger állapota” és a „tengerfelszín hőmérséklete” szimbolumok bevitele; a mérés vagy megfigyelés üzemelés szempontjából kívánatos pontossága és a mérés vagy megfigyelés elérhető pontosságának felfrissítése; bevezetési kritériumok jelentős hegyi hullámok bevitelére a SIGMET információba.	1995.03.17. 1995.07.24. 1996.01.01.

71 (13. kiadás)	Korlátozott Észak-Atlanti COM/MET/RAC) Regionális Léginavigációs Űlés (1992) Harmadik Ázsia/Csendes óceán Regionális Léginavigációs Tervezési Csoport harmincnyolcadik űlése (EANPG/38). Egyesült Államok. ICAO Titkárság	Automatikus függő légtérellenőrzés definíciója, az Emberi Tényező alapelvek definíciója, nemzetközi légiútvonali vulkánikus figyelés definíciója, szint definíciója, trópusi ciklon tanácsadó központ definíciója, vulkánikus hamu tanácsadó központ definíciója, és VOLMET adatkapcsolat szolgálat definíciója;az Államok AIP-jaiban kijelölt meteorológiai hatóság feltüntetéseire vonatkozó előírások módosítása; az Emberi Tényező alapelvek szerepének bevezetése; 6 óra és 36 óra érvényességű WAFS magas-Légköri szél/hőmérséklet előrejelzések beillesztése; vulkánikus hamu tanácsadásokra vonatkozó előírások és új modell bevezetése grafikus formában; vulkánikus hamu tanácsadások felfrissítési gyakoriságának és a VAAC-ok és TCAS-ok speciális szerepének specifikálása; szerkesztési módosítás a kon- zisztencia biztosítására az „RVR” és „RWY” szavak rendjében; az aktuális időjárásra vonatkozó rövidítések módosítása; a „VOLMET” adatkapcsolat szolgáltatásra vonatkozó előírások bevezetése; a légi Automatikus függő légtérellenőrzés definíciója, az Emberi Tényező alapelvek definíciója, nemzetközi légiútvonali vulkánikus figyelés definíciója, szint definíciója, trópusi ciklon tanácsadó központ definíciója, vulkánikus hamu tanácsadó központ definíciója, és VOLMET adatkapcsolat szolgálat definíciója;az Államok AIP-jaiban kijelölt meteorológiai hatóság feltüntetéseire vonatkozó előírások módosítása; az Emberi Tényező alapelvek szerepének bevezetése; 6 óra és 36 óra érvényességű WAFS magas- Légköri szél/hőmérséklet előrejelzések beillesztése; vulkánikus hamu tanácsadásokra vonatkozó előírások és új modell bevezetése grafikus formában; vulkánikus hamu tanácsadások felfrissítési gyakoriságának és a VAAC-ok és TCAS-ok speciális szerepének specifikálása; szerkesztési módosítás a konzisztencia biztosítására az „RVR” és „RWY” szavak rendjében; az aktuális időjárásra vonatkozó rövidítések módosítása; a „VOLMET” adatkapcsolat szolgáltatásra vonatkozó előírások bevezetése; a légi jelentésre vonatkozó szerkesztési módosítások; az „előrejelzési hőmérséklet” beillesztése a repülőtéri előrejelzésekbe; a területi előrejelzések és kismagasságú repülések repülési dokumentációjának szabványosítására vonatkozó előírások és a Füg- gelék – Minta Térképek és Űrlapok ebből adódó módosításainak bevezetése; a nemzeti nyelv SIGMET közleményekkel kapcsolatos használatának törlése; meteorológiai információk automatizált repülés-előtti információs rendszerek általi szolgáltatásaira vonatkozó előírások bevezetése; megnövelt hatótávolságú üzemeltetés központosított repülési tervezéshez történő szolgáltatására vonatkozó előírások bevezetése; a WAFS SIGWX térképeken használt CB felhők és zivatarok mennyiségi definíciói, és az útmutató anyag ebből következő módosításai.	1998.03.11. 1998.07.20. 1998.11.5

72 (14. kiadás)	Korlátozott Közép-Kelet (COM/MET/RAC) RAN Ülés. ASIA/PAC Léginavi-gációs Tervező és Megvalósító Regionális Csoport kilencedik ülése.urópai éginavigációs Tervező Csoport harminchatodi, harminckilencedik és negyvenedik ülése. Nemzetközi Légiközlekedési Egyesület. Titkárság.	A hajózó személyzet tagja, a rácspont adat numerikus formában, repülőgép parancsnok, a regionális területi előrejelző központ és világ területi elörejelző központ definíciójának megváltoztatása; a minimális szektor tengerszint feletti magasság, a minőségbiztosítás, a minőségellenőrzés a minőségirányítás, a minőségrendszer és a látás definíciójának bevezetése, OPMET információk globális cseréjére vonatkozó előírások bevezetése; vulkánikus hamu és trópus ciklon tanácsadási közlemények felfrissített formulája; radioaktív anyagok véletlen elszabadulásáról tudósító információk továbbítására, sugárzás szimbólumának WAFS SIGWX térképekre való felvitelére vonatkozó előírások bevezetése; WAFS magas-légköri szél/hőmérséklet adatok napi négyre növelt kiadási gyakoriságra vonatkozó világ területi előrejelző rendszer (WAFS) előírások; 140-es repülési szint és nedvesség bevitele a GRIB globális adatokba, a BUFR kód bevezetése, „erős talajszelek” és „hegyi homály” szimbólumok beillesztése az alacsonyszinti SIGWX térképeken; szabványosított VOLMET kifejezések, adat/idő csoportok METAR és TAF kód-formákban való egységes felhasználása, GAMET közleményekben kiegészítő felhő magasság referencia szint és fagy szint, a látás javulásai és leromlásai közötti megkülönböztetés, repülőtéri jelentésekben és előrejelzésekben felhőalap és függőleges látás bevezetésére vonatkozó repülési MET kód működési követelmények; helyi meteorológiai jelentés, METAR/SPECI, TAF és SIGMET sablonok bevezetése; algoritmus turbulencia jelentéshez és turbulencia index biztosítása, és a turbulencia index működési értelmezése; automatizált repülés előtti információs rendszerek és harmonizált AIS/MET repülés előtti eligazítás ellátása MET komponensek kel; MET információk minőségbiztosítására és minőségellenőrzésére vonatkozó előírások; SIGMET információk grafikus formában és SIGMET közlemények mennyiségi kritériumai; előre-szórás mérők beillesztése RVR előírásokba; és szerkesztési módosítások	2001.03.07. 2001.07.16. 2001.11.01.

73 (15. kiadás)	Meteorológiai (MET) Részleg Ülése (2002). Titkárság	A 3. Annex átszerkesztése két részbe; új és módosított definíciók; egyes Ajánlott Eljárások előléptetése Szabvánnyá; WAFS T4 térkép előállítások kiadása szükségességének megszüntetése; WAFS előrejelzések integritása fenntartása követelményének bevezetése; ACC, MWO és VAAC Állami vulkán megfigyelő állomások általi értesítése a vulkanikus tevékenységről; Előírások bevezetése, melyek lehetővé teszik SIGMET közlemények kiadását grafikus formában vulkanikus hamu és trópusi vihar jelenségekről WMO BUFR kódforma használatával; sablonok bevezetése különleges légijelentések, (lefelé kapcsolati), vulkanikus hamu és trópusi ciklon tanácsadó közlemények és repülőtéri és szélnyírás figyelmeztetések vonatkozásában; követelmény bevezetése METAR és SPECI információk kiadására a repülőtér újbóli üzemelései előtt, előírások bevezetése, amelyek lehetővé teszik teljesen automatikus megfigyelő rendszerek használatát üzemen kívüli órák során; a dominens látás bevezetése; követelmény bevezetése azoknak a repülőtéri előrejelzéseknek a törlésére, amelyeket nem lehet állandó ellenőrzés alatt tartani; előírás bevezetése a látás mérés átlagos időszakaszára és a közepes szélsebesség változásának mérésére; előírás bevezetése a maximális fényintenzitás használatára az RVR mérésére METAR-hoz és SPECI-hez, A TB minta 2. Példa törlése; új, 3-as és 4-es példa beillesztése az SWH modellhez; az A Melléklet törlése; új C Melléklet bevezetése, amely a WAFC-oknál támogató eljárásokat ír le; és szerkesztői kiegészítések.	2004. 02. 25. 2004.07. 12. 2004. 11. 25

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

I. RÉSZ

SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK TÖRZSANYAGA

1. FEJEZET. DEFINÍCIÓK

Megjegyzés. – Az (RR) jelölés ezekben a definíciókban olyan definíciót jelez, amelyet a Nemzetközi Távközlési Egyesület (ITU) Rádió Szabályzatokból vettünk (lásd Rádiófrekvencia Spektrum Előírások Kézikönyve Polgári Repülés részére, amely jóváhagyott ICAO álláspontokat tartalmaz *(Doc 9718)).*

1.1 Definíciók

Amikor a következő fogalmakat használják a Meteorológiai Szolgálat Nemzetközi Léginavigációhoz Szabványaiban és Ajánlott Eljárásaiban, ezek az alábbi jelentéssel bírnak:

Repülőtér (Aerodrome). Egy meghatározott terület földön vagy vízen (beleértve bármely épületet, építményt és berendezést), amely teljes egészében vagy részben a légijárművek érkezésére, indulására és földi mozgására szolgál.

Repülőtéri éghajlati összefoglaló (Aerodrome climatological summary). Meghatározott meteorológiai elemek tömör összefoglalása egy repülőtérre, statisztikai adatok alapján.

Repülőtéri éghajlati táblázat (Aerodrome climatological table). Olyan táblázat, amely statisztikai adatokat szolgáltat egy vagy több meteorológiai elem megfigyelt előfordulásáról egy adott repülőtéren.

Repülőtéri irányító torony (Aerodrome control tower). A repülőtéri forgalom számára légiforgalmi irányító szolgálat biztosítására létrehozott egység.

Repülőtér tengerszint feletti magassága (Aerodrome elevation). A leszálló terület legmagasabb pontjának tengerszint feletti magassága.

Repülőtéri meteorológiai iroda (Aerodrome meteorological office). A repülőtéren telepített, a nemzetközi repülés számára meteorológiai szolgálat nyújtására kijelölt hivatal.

Repülési állandóhelyű szolgálat (Aeronautical fixed service–AFS). Meghatározott rögzített pontok közötti távközlési szolgálat, amely elsősorban a repülés biztonságát, valamint a légiszolgálatok rendszeres, hatékony és gazdaságos működését szolgálja.

Repülési állandóhelyű távközlési hálózat (Aeronautical fixed telecommunication network (AFTN)). A légiforgalmi állandóhelyű körök világméretű rendszere, amely a repülési állandóhelyű szolgálat részeként az ugyanolyan, vagy kompatíbilis távközlési jellemzőkkel rendelkező repülési állandóhelyű állomások közötti közlemények és/vagy digitális adatok cseréjére szolgál.

Repülésmeteorológiai állomás (Aeronautical meteorological station). A nemzetközi léginavigációban való felhasználásra szolgáló megfigyelések és meteorológiai jelentések készítésére kijelölt állomás.

Repülési mobil szolgáltatás (RR S1.32) (Aeronautical mobile service). Mobil szolgálat repülési állomások és légijármű állomások között, vagy légijármű állomások között, amelyben életmentő állomások is szerepelhetnek; vészhelyzeti helyzetjelző rádió jeladók is részt vehetnek ebben a szolgáltatásban, kijelölt katasztrófa- és vészhelyzeti frekvenciákon.

Repülési távközlési állomás (Aeronautical telecommunication station). A légiforgalmi távközlési szolgálat állomása.

Légijármű (Aircraft). Bármely gép, amely az atmoszférában képes támaszt leszármaztatni a levegő olyan reakcióiból, amelyeket a levegőből nem a földfelszín vált ki.

Légijárműves megfigyelés (Aircraft observation). Repülést végző légijárműtől származó, egy vagy több meteorológiai elem értékelése.

AIRMET információ (AIRMET information). Meteorológiai figyelő iroda által kiadott tájékoztatás, amely meghatározott útvonali időjárás jelenségek előfordulásával vagy várható előfordulásával foglalkozik, amely jelenségek befolyásolhatják a kismagasságú légijármű üzemelések biztonságát, és amely tájékoztatás már nem szerepelt a kismagasságú repülések részére kiadott előrejelzésben az illetékes repülési információs körzetben vagy ennek alkörzetében.

Légijelentés (Air-report). Légijárműről repülés közben adott jelentés, amelyet a helyzet, üzemeltetési és/vagy meteorológiai jelentésre vonatkozó előírásoknak megfelelően készítettek.

Megjegyzés. — Az AIREP formanyomtatványra vonatkozó részleteket a PANS-ATM (Doc 4444) tartalmaz.

Légiforgalmi szolgáltató egység (Air traffic service unit). Gyűjtőnévi kifejezés, amely váltakozva jelenthet légiforgalmi irányító egységet, repülésinformációs központot vagy légiforgalmi szolgálathoz tartozó jelentő irodát.

Kitérő repülőtér (Alternate aerodorome). Az a repülőtér, ahová a légijármű repülhet, ha a rendeltetési repülőtérre történő repülés, vagy az ott történő leszállás nem lehetséges, vagy nem tanácsos. A kitérő repülőterek fajtái az alábbiak:

Felszállási kitérő repülőtér (Departure alternate). Az a kitérő repülőtér, ahol egy légijármű leszállhat, ha ez a felszállást követő rövid időn belül szükségessé válik és az indulási repülőtér erre nem használható.

Útvonali kitérő repülőtér (En-route alternate). Az a kitérő repülőtér, ahol egy útvonalrepülés során rendellenes, vagy vészhelyzeti állapot észlelése után a légijármű leszállni képes.

ETOPS útvonali kitérő repülőtér (ETOPS en-route alternate). Alkalmas és megfelelő kitérő repülőtér, ahol ETOPS útvonal repülés során hajtóműleállás vagy egyéb rendellenes vagy vészhelyzeti állapot észlelése után a repülőgép leszállni képes.

Rendeltetési kitérő repülőtér (Destination alternate). Az a kitérő repülőtér, ahová egy légijármű repülhet, ha a szándékolt repülőtéren a leszállás lehetetlenné, vagy nem tanácsolttá válik.

Megjegyzés. — Az a repülőtér, amelyről a repülés elindult, e repülés számára útvonali vagy rendeltetési kitérő repülőtér is lehet.

Közepes tengerszint feletti magasság (Altitude). Egy szint, egy pont vagy egy pontnak tekintett tárgy közepes tengerszinttől (MSL) mért függőleges távolsága.

Bevezető irányítási egység (Approach control unit). Egy vagy több repülőtérre érkező vagy azokról induló irányított repülések részére légiforgalmi irányítás szolgáltatására létesített egység.

Illetékes ATS hatóság (Appropriate ATS authority). Egy állam által kijelölt illetékes hatóság, amely felelős az érintett légtérben a légiforgalmi szolgálatok ellátásáért.

Körzeti irányító központ (Area control centre). Az irányított repülések számára, az illetékessége alá tartozó irányítás körzetekben légiforgalmi irányító szolgálat ellátására létesített egység.

Automatikus függő légtérellenőrzés (ADS) (Automatic dependent surveillance(ADS)) Légtérellenőrzési eljárás, amelynél a légijárművek automatikusan, egy adatkapcsolaton keresztül fedélzeti navigációs és helyzetrögzítő rendszerekből származtatott adatokat, közöttük légijármű azonosítási, négydimenziós helyzet és szükség szerinti kiegészítő adatokat szolgáltatnak.

Eligazítás (Briefing). Szóbeli ismertetés fennálló és/vagy várható meteorológiai viszonyokról.

Üzemelési jelentőségű felhő (Cloud of operational significance). Felhő 1500 m (5000 láb) vagy a legmagasabb minimális szektormagasság, amelyik a nagyobb, alatti felhőalap magassággal.

Konzultáció (Consultation). A meteorológussal vagy más képesített személlyel a légi üzemeltetésre vonatkozó fennálló és/vagy várható meteorológiai viszonyokról folytatott megbeszélés; a kérdésekre adott válaszokat is magában foglalja.

Irányítási terület (Control area). A földfelszín felett meghatározott határtól felfelé terjedő ellenőrzött légtér.

Utazómagasság (Crusing level). A repülés jelentős szakaszán tartott repülési magasság.

Tengerszint feletti magasság (Elevation). Egy földfelszínen lévő, vagy ahhoz rögzített pontnak vagy szintnek a közepes tengerszinttől mért függőleges távolsága.

Kiterjesztett hatótávolságú üzemelés (Extended range operation). Két-gázturbinás-hajtóműves repülőgép olyan repülése, ahol a repülési idő az egyik hajtómű működőképtelensége esetéhez tartozó utazási repülési sebességnél (Nemzetközi Normál Atmoszféra és szélcsend körülményei között) az útvonal egy pontjától egy alkalmas kitérő repülőtérig nagyobb, mint az Üzemeltető Állam által jóváhagyott küszöbidő.

Hajózószemélyzet tagja (Flight crew member). Szakszolgálati engedéllyel rendelkező személyzeti tag, aki olyan szolgálati feladatokkal van megbízva, amelyek a repülés ideje alatt fontosak a légijármű üzemeltetése szempontjából.

Repülési dokumentáció (Flight documentation). Kézírásos vagy nyomtatott okmányok, közöttük a repüléshez meteorológiai információkat tartalmazó térképek és nyomtatványok.

Repülési információs központ (Flight information centre). Repülési információs és riasztó szolgálat ellátására létesített egység.

Repülési információs régiót (Flight information region). Meghatározott méretű légtér, amelyen belül repülési információs szolgálatot és riasztó szolgálatot biztosítanak.

Repülési szint (Flight level). Egy állandó légköri nyomású felület, amely egy speciális 1013.2 hektopascal (hPa) nyomásértékhez tartozik, és amelyet más ilyen felületektől meghatározott nyomásintervallumok választanak el.

1. Megjegyzés Egy nyomás típusú , a Nemzetközi Normál Atmoszférával összhangban kalibrált magasságmérő:

a) amikor QNH magasságmérő beállításhoz állítják be, tengerszint feletti magasságot mutat;

b) amikor QFE magasságmérő beállításhoz állítják be, a QFE referencia érték feletti magasságot mutat; és

c) amikor 1013,2 hektopascal (hPa) nyomásra állítják be, akkor repülési szintek jelzésére lehet használni.

2. Megjegyzés — A „height" (magasság) és „altitude" (tengerszint feletti magasság), amelyeket a fenti 1. Megjegyzésben használtunk, inkább altimetrikus, mint geometriai magasságokat és tengerszint feletti magasságokat jelölnek.

Előrejelzés (Forecast). Egy meghatározott időpontban vagy időszakban és a légtér egy meghatározott területén vagy részén várható meteorológiai viszonyokra adott közlés.

GAMET körzeti előrejelzés (GAMET area forecast) Körzeti előrejelzés rövidített köznyelven kismagasságú repüléseknél egy repülési információs körzet vagy alterület számára, amelyet az illetékes meteorológiai hatóság által kijelölt meteorológiai iroda készít, és amelyet a szomszédos repülési információs körzetekben működő meteorológiai irodával kicserélnek az illetékes meteorológiai hatóságok közötti megállapodás szerint.

Rácspont adatok alfanumerikus formában (Grid point data in alfanumeric form).
Egy térképen szabályos távolságokban elhelyezkedő pontok egy halmazára feldolgozott meteorológiai adatok olyan kód formában, amely manuális felhasználásra alkalmas.

Rácspont adatok digitális formában (Grid point data in digital form). Egy térképen szabályos távolságokban elhelyezkedő pontok halmazára vonatkozó, számítógéppel feldolgozott meteorológiai adatok egy meteorológiai számítógépből másik számítógépbe való továbbítására, automatikus felhasználásra alkalmas kód formában.

Megjegyzés — Legtöbb esetben az ilyen adatokat közepes vagy nagysebességű távközlési csatornákon továbbítják.

Magasság - (Height). Egy szintnek, egy pontnak vagy egy pontnak tekintett tárgynak meghatározott vonatkozási alaptól mért függőleges távolsága.

Emberi Tényező alapelvek (Human Factors principles). Olyan alapelvek, amelyeket repülési tervezéshez, alkalmasság tanúsításhoz, képzéshez, üzemeltetéshez és karbantartáshoz alkalmaznak, és amelyek biztonságos kapcsolódást keresnek az emberi és más rendszer komponensek között az emberi teljesítőképesség helyes értékelésével.

Nemzetközi légiútvonali vulkán figyelés (IAVW) (International airways volcano watch) (IAVW) Nemzetközi egyezmények az atmoszférában lévő vulkánikus hamu figyeléséről és a légijárművek erre való figyelmeztetéséről.

Megjegyzés. – A IAVW repülési és nem-repülési operatív egységek együttműködésén alapszik, felhasználva az Államok által biztosított megfigyelő forrásokból és hálózatokból származtatott információkat. A figyelést az ICAO, más érdekelt nemzetközi szervezetekkel együttműködve, koordinálja.

Szint (Level) Repülést végző légijármű függőleges helyzetére vonatkozó gyűjtőnévi fogalom, amely váltakozva jelent magasságot, közepes tengerszint feletti magasságot vagy repülési szintet.

Meteorológiai hatóság (Meteorological authority). A Szerződő Állam nevében a nemzetközi repülés részére meteorológiai szolgáltatást nyújtó vagy e szolgáltatás nyújtását elrendelő hatóság.

Meteorológiai bulletin (Meteorological bulletin). Meteorológiai információkat tartalmazó szöveg, amelyet egy megfelelő fejrész előz meg.

Meteorológiai információ (Meteorological information). Meteorológiai jelentés, analízis, előrejelzés és bármilyen egyéb, a fennálló vagy várható meteorológiai viszonyokra vonatkozó közlemény.

Meteorológiai iroda (Meteorological office). A nemzetközi léginavigáció számára meteorológiai szolgáltatásra kijelölt iroda.

Meteorológiai jelentés (Meteorological report). Egy meghatározott időre és helyre vonatkozó, megfigyelt meteorológiai viszonyok közlése.

Meteorológiai mesterséges hold (Meteorological satellite). Föld körül keringő mesterséges hold, amely meteorológiai megfigyeléseket végez és ezeket a földre továbbítja.

Minimális szektor tengerszint feletti magasság (Minimum sector altitude). Az alkalmazható legkisebb tengerszint feletti magasság, amely minimum 3OO m (1000 láb) akadálymentes magasságot szolgáltat egy navigációs rádióberendezés középpontú, 46 km (25 tengeri mérföld) sugarú kör szektoron belüli területen elhelyezkedő összes akadály felett.

Megfigyelés (meteorológiai) (Observation (meteorological)). Egy vagy több meteorológiai elem értékelése.

Üzemelés ellenőrzés (Operational control). Felügyelet gyakorlása egy repülés indítása, folytatása, elterelése vagy befejezése felett a légijármű biztonsága és a repülés rendszeressége és hatékonysága érdekében.

Üzemeltetési repülési terv (Operational flight plan). Az üzemeltető a repülés biztonságos végrehajtására vonatkozó terve a repülőgép teljesítménye, más üzemeltetési korlátok, valamint a lerepülendő légiútvonalon és a repülőtereken várható viszonyokra vonatkozó megfontolások alapján.

Üzemeltetési tervezés (Operational planning). A repülés üzemeltetés üzemeltető általi tervezése.

Üzemeltető (Operator). Személy, szervezet, vagy vállalat, amely légijárműveket üzemeltet, vagy arra ajánlatot tesz.

Légijármű parancsnok (Pilot-in-command). Az üzemeltető, vagy általános célú repülés esetén a tulajdonos, által parancsnokként a légijármű üzemeltetéséért és a repülés biztonságos végrehajtásáért felelősként kijelölt légijárművezető.

Dominens látás (Prevailing visibility). A körhorizontnak legalább a felén belül, vagy a repülőtéri felületnek legalább a felén belül a „látás" definíciójának megfelelően észlelt látási érték. Ezek a területek szomszédos és nem szomszédos szektorokat tartalmazhatnak.

Megjegyzés. – Ezt az értéket emberi megfigyeléssel és/vagy műszerezett rendszerekkel lehet meghatározni. Amikor műszereket szerelnek fel, azokat a dominens látás legjobb meghatározásának nyerésére használják.

Előrejelzési térkép ((Prognostic chart). Meghatározott meteorológiai elem(ek) előrejelzése egy meghatározott időpontra vagy időszakra, és egy meghatározott felületre vagy légtér részre, grafikusan ábrázolva egy térképen.

Minőségbiztosítás (Quality assurance) A minőségi rendszeren belül megvalósított, és szükség esetén demonstrált összes tervezett és rendszeres tevékenység, amely arra irányul, hogy bizonyosságot szolgáltasson arról, hogy egy entitás teljesíti a minőségi követelményeket (ISO 9000:2000[1]*)

Minőségellenőrzés (Quality control) Üzemelési eljárások és tevékenységek, amelyeket a minőségi követelmények kielégítésére használnak (ISO9000:2000[2]*)

Minőség menedzsment (Quality management) Az átfogó menedzsment funkcióhoz tartozó összes tevékenység, amely meghatározza a minőségpolitikát, a célokat és felelősségi köröket és azok megvalósítását olyan eszközökkel, mint például a minőség rendszeren belüli minőségtervezés, minőségellenőrzés, minőségbiztosítás és minőségjavítás (ISO9000:2000[3]*).

Minőség rendszer (Quality system) A minőség menedzsment megvalósításához szükséges szervezeti struktúra, eljárások, folyamatok és források (ISO 9000:2000[4]*)

Regionális léginavigációs egyezmény (Regional air navigation agreement). Az ICAO Tanács által jóváhagyott megegyezés, általában a Regionális Léginavigációs Értekezlet tanácsára.

Regionális területi előrejelző központ (Regional area forecast centre (RAFC). Egy meteorológiai központ, amelyet arra jelöltek ki, hogy területi előrejelzéseket készítsen, illetve biztosítson a szolgálati körzetén belül lévő repülőterekről induló légijárművek számára és rácspont adatokat szolgáltasson digitális formában a világméretű fedéshez.

Jelentőpont (Reporting point). Egy meghatározott földrajzi hely, amelyhez viszonyítva egy légijármű helyzetét jelenteni lehet.

Mentés koordináló központ (Rescue co-ordinating centre). Egy kutató és mentő körzeten belül a kutatási és mentési szolgáltatás hatékony megszervezésének elősegítéséért és a kutatási és mentési műveletek végrehajtásának koordinálásáért felelős egység.

Futópálya (Runway). Szárazföldi repülőtéren a légijárművek le- és felszállására készített téglalap alakú terület.

Futópálya látástávolság (RVR) (Runway visual range (RVR). Az a távolság, amelyről a futópálya középvonalán lévő légijármű vezetője a futópálya felületi jelzéseit, vagy a futópálya szegélyfényeit, illetve a középvonalat jelző fényeket látja.

Kutató és mentő szolgálati egység (Search and rescue service unit). Gyűjtőnévi kifejezés, amely jelenthet mentést koordináló központot, mentő alközpontot, vagy riasztó őrhelyet.

Szolgálati terület (világterületi előrejelző rendszer). (Service area (world area forecast system)). Egy földrajzi terület, amelyen belül egy regionális területi előrejelző központ felelősséggel tartozik területi előrejelzések biztosításáért a meteorológiai hatóságok és más felhasználók részére.

SIGMET információ (SIGMET information). Meteorológiai figyelőiroda által kiadott, az útvonalon a légijárművek üzemeltetésének biztonságát befolyásolható, meghatározott időjárási jelenségek előfordulásáról, vagy várható előfordulásáról szóló információk.

Szabvány izobár felület (Standard isobaric surface). Izobár felület, amelyet világméretű alapon a légköri viszonyok reprezentálására és elemzésére használnak.

Küszöb (Threshold). A futópálya leszállásra használható részének kezdete.

Földetérési zóna (Touchdown zone). A futópálya küszöbén túli rész, ahol a leszállni szándékozó légijárművek először érintik a futópályát.

Trópusi ciklon (Tropical cyclone). Trópusi vagy szubtrópusi vizek felett keletkező, szervezett konvekcióval és határozott ciklonikus felületi szél cirkulációval rendelkező gyűjtőnévi fogalom.

Trópusi ciklon tájékoztató központ (TCAC) (Tropical cyclone advisory centre (TCAC)) Regionális léginavigációs egyezmény által meteorológiai figyelő irodák, világterületi előrejelző központok és nemzetközi OPMET adatbankok részére a trópusi ciklonok helyzetére, előrejelzett mozgásirányára és sebességére, központi nyomására és maximális talajszelére vonatkozó tanácsadó információk szolgáltatására kijelölt meteorológia központ.

Magaslégköri térkép (Upper-air-chart). Az atmoszféra meghatározott felső légköri szintjére vagy rétegére vonatkozó meteorológiai térkép.

Látás (Visibility) A repülési célokra szolgáló látás az alábbiak közül a nagyobbik:

a) az a legnagyobb távolság, amelynél megfelelő méretű, a föld közelében elhelyezett fekete tárgy látható és felismerhető, amikor fényes háttérrel szemben figyelik;

b) az a legnagyobb távolság, amelynél körülbelül 1000 gyertyás fények láthatóak és felismerhetőek kivilágítatlan háttérrel szemben.

Megjegyzés. – A két távolságnak, adott kioltási tényezőjű levegőben, különböző értékei vannak, és az utóbbi b) a háttér megvilágítással változik. Az előbbi a)-t a meteorológiai optikai távolság reprezentálja (MOR).

Vulkanikus hamu tájékoztató központ (VAAC) (Volcanic ash advisori centre (VAAC)). Regionális léginavigációs egyezmény által meteorológiai megfigyelő irodák, körzeti irányító központok, repülési információs központok, világterületi előrejelző központok és nemzetközi OPMET adatbankok részére a vulkánkitörést követően a vulkanikus hamunak az atmoszférában való lateriális és függőleges kiterjedésére, előrejelzett mozgására tanácsadó információkat szolgáltató meteorológiai központ.

VOLMET. (VOLMET) Meteorológiai információ repülést végző légijármű részére.

Adatkapcsolati VOLMET (D-VOLMET) (Data link VOLMET (D-VOLMET)) Aktuális rendszeres repülőtéri időjárás jelentések, (METAR) és repülőtéri különleges meteorológiai jelentések (SPECI) repülőtéri előrejelzések (TAF), SIGMET, SIGMET által nem lefedett különleges légijelentések és, ahol rendelkezésre áll, AIRMET közlemények szolgáltatása adatkapcsolaton keresztül.

VOLMET adás (VOLMET broadcast). Folytonos és ismétlődő rádióadások útján, ahogyan megfelelő, aktuális METAR, SPECI, TAF és SIGMET előrejelzések és SIGMET közlemények szolgáltatása.

Világterületi előrejelző központ (WAFC) (World area forecast centre). Egy meteorológiai központ, amelyet arra jelöltek ki, hogy szignifikáns időjárás előrejelzéseket és magaslégköri előrejelzéseket készítsen és biztosítson digitális és/vagy képi formában, az egész világra kiterjedően, a regionális területi előrejelző központok és közvetlenül az Államok részére, megfelelő eszközökkel, mint a repülési helyhez kötött szolgálat része.

Világterületi előrejelző rendszer (WAFS) (World area forecast system). Egy világméretű rendszer, amelynek segítségével a világ- és regionális körzeti előrejelző központok légiforgalmi meteorológiai útvonal előrejelzéseket biztosítanak egységesített formában.

1.2 Korlátozott jelentéssel használt fogalmak

Ezen Annex céljára a következő kifejezések korlátozott jelentéssel rendelkeznek, az alábbiak szerint:

a) a „szolgálat” (service) szó körüli félreértések elkerülése érdekében a meteorológiai szolgálat, mint adminisztratív egység és az általa nyújtott szolgáltatás megkülönböztetésére „meteorológiai hatóságnak” nevezzük az előbbit és „szolgáltatásnak” az utóbbit;

b) „szolgáltatni” kizárólag szolgáltatással kapcsolatosan használatos;

c) „kiadni” kizárólag azokkal az esetekkel kapcsolatosan használatos, amikor a kötelezettség kifejezetten információknak egy felhasználóhoz való megküldésére terjed ki;

d) „hozzáférhetővé tesz” csak akkor használatos, ha a kötelezettség akkor fejeződik be, amikor az információt egy felhasználó számára hozzáférhetővé tették;

e) „rendelkezésre bocsát” kifejezés csak a c) vagy d) esetekkel kapcsolatban használatos.

2. FEJEZET – ÁLTALÁNOS ELŐÍRÁSOK

1. Bevezető Megjegyzés – Ismeretes, hogy ennek az Annex-nek a meteorológiai információkra vonatkozó rendelkezései annak megértésén alapulnak, hogy a Szerződő Állam kötelessége, az Egyezmény 28. Cikkelye alapján, meteorológiai információk szolgáltatása, és hogy az ilyen információk alkalmazásáért a felhasználó felelős.

2. Bevezető Megjegyzés.– Bár a Nemzetközi Polgári Repülési Egyezmény a lajstromozó államra bizonyos teendőket jelöl ki, amelyeket az állam jogosult vagy köteles végrehajtani, a közgyűlés elismerte az A23-13 sz. Határozatban, hogy a Lajstromozó Állam esetleg képtelen megfelelően teljesíteni kötelezettségeit olyan esetekben, ha a légijárművet egy másik Állam üzemeltetője haszonbérbe veszi, kibérli vagy elcseréli – különösen , ha személyzet nélküli – és, hogy az Egyezmény nem határozhatja meg pontosan az üzemeltető államának jogait és kötelezettségeit ilyen esetekben, amíg az Egyezmény 83. bis Cikkelye életbe nem lép. Ennek megfelelően a Tanács sürgette, hogy ha a fent említett esetben a Lajstromozó Állam képtelennek érezné magát az Egyezmény által ráosztott tevékenység megfelelő végrehajtására, akkor ruházza át azokat a feladatokat az üzemeltető államra, annak hozzájárulásával, amelyeket az jobban el tud látni. Nyilvánvaló, hogy amíg az Egyezmény 83. bis cikkelye életbe lép, az előbb említett intézkedés csupán gyakorlati megegyezés kérdése, és nem befolyásolja a Chicagói Egyezmény rendelkezéseit, amelyek a lajstromozó állam, illetve bármely harmadik állam kötelezettségeit előírja. Azonban, mivel az Egyezmény 83 bis cikkelye 1997. június 20-án életbelépett, ilyen átruházási egyezmények azokra a Szerződő Államokra bírnak érvénnyel, amelyek a vonatkozó Jegyzőkönyvet (Doc 9318) a 83 bis Cikkelyben megállapított feltételek kielégítéséről ratifikálták.

3. Bevezető Megjegyzés. – Nemzetközi üzemelés esetén, amelyet közösen olyan repülőgépekkel végeznek, amelyek nem mindegyike ugyanazon Szerződő Államban van lajstromozva, semmi nincs ebben az Annexben, ami megakadályozná az illető Államokat abban, hogy egyezményt kössenek azon funkciók közös gyakorlására, amelyeket ennek az Annexnek az előírásai a Lajstromozó Államra vonatkozóan lefektetnek

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2.1 A meteorológiai szolgálat célja, meghatározása és a rá vonatkozórendelkezés

2.1.1 A nemzetközi léginavigáció részére nyújtott meteorológiai szolgáltatás célja hozzájárulni a nemzetközi léginavigáció biztonságához, rendszerességéhez és hatékonyságához.

2.1.2 Ezt a célt úgy kell elérni, hogy az üzemeltetőnek, a hajózószemélyzet tagjainak, a légiforgalmi szolgálati egységeknek, kutató és mentőszolgálati egységeknek, repülőtéri igazgatóságoknak és más olyan szervezeteknek, amelyek a nemzetközi légiközlekedés fejlesztésében érdekeltek, biztosítják a saját feladataik ellátásához szükséges meteorológiai információkat.

2.1.3 Minden Szerződő Államnak meg kell határoznia azt a meteorológiai szolgáltatást, amelyet nyújtani fog a nemzetközi léginavigáció igényeinek kielégítésére. Ezt a jelen Annex rendelkezéseinek megfelelően kell végrehajtani, tekintettel a regionális léginavigációs egyezményekre is; ennek tartalmazni kell a nemzetközi vizek és az illető állam területén kívül fekvő területek fölötti léginavigáció számára nyújtott meteorológiai szolgáltatás meghatározását is.

2.1.4 Minden Szerződő Állam jelölje ki a hatóságát, a továbbiakban: meteorológiai hatóság, amely a Szerződő Állam képviseletében ellátja vagy megszervezi a nemzetközi légiközlekedés részére a meteorológiai szolgáltatást. Az így kijelölt meteorológiai hatóságra vonatkozó részleteket az Állam repülési információs kiadványnak kell tartalmaznia a 15. Annex, 1. Függelék, GEN 1.1.

2.1.5 Minden Szerződő Államnak biztosítania kell, hogy a kijelölt meteorológiai hatóság kielégítse a Meteorológiai Világszervezetnek a nemzetközi léginavigáció kiszolgálását végző meteorológiai személyzet képesítésére és szakképzésére vonatkozó követelményeit.

Megjegyzés. – A repülésmeteorológiában alkalmazott meteorológiai személyzet képesítésére és szakképzésére vonatkozó követelmények a WMO 49 sz. kiadványában, Technical Regulations, *Volume I* – General Meteorological Standards and Recommended Practises, *Chapter B.4 (*Műszaki Szabályozások, *I. Kötet* – Általános Meteorológiai Szabványok és Ajánlott Eljárások, *B.4 fejezet – Oktatás és képzés) találhatók*

2.2 Meteorológiai információk szolgáltatása, minőségbiztosítása és felhasználása

2.2.1 Szoros kapcsolatot kell tartani a nemzetközi léginavigáció meteorológiai szolgáltatásait érintő kérdésekre vonatkozó meteorológiai információk szolgáltatásában érdekeltek és a felhasználásában érdekeltek között.

2.2.2 **Ajánlás.** – *Hogy megvalósítsák a nemzetközi léginavigáció meteorológiai szolgálatának célját, a Szerződő Államoknak biztosítaniuk kell, hogy a 2.1.4 pontban hivatkozott kijelölt meteorológiai hatóság létrehozzon és megvalósítson egy jól szervezett minőségi rendszert, amely magában foglalja a 2.1.2 pontban felsorolt felhasználóknak szolgáltatott meteorológiai információk minőség menedzseléséhez szükséges eljárásokat, folyamatokat és forrásokat.*

2.2.3 **Ajánlás.** – *A 2.2.2 pontnak megfelelően létrehozott minőségi rendszer legyen konform a minőségbiztosítási szabványok Nemzetközi Szabványügyi Szervezet (ISO) 9000-es sorozatával, és erről egy megfelelő szervezet által kiadott igazolással rendelkezzen.*

Megjegyzés. – A minőségbiztosítási szabványok Nemzetközi Szabványügyi Szervezet (ISO) 9000-es sorozata alapkeretet szolgáltat egy minőségbiztosítási program kidolgozásához. Egy sikeres program részleteit minden Államnak meg kell fogalmaznia, és a legtöbb esetben ezek az Állam szervezeti sajátjai.

2.2.4 **Ajánlás.** – *A minőségi rendszernek biztosítékot kell nyújtania a felhasználóknak, hogy a szolgáltatott információk kielégítik a megállapított követelményeket a földrajzi és térbeli lefedés, a forma és tartalom, a kiadás időpontja és gyakorisága és az érvényességi időszak, valamint a mérések, megfigyelések és előrejelzések pontossága tekintetében. Amennyiben a minőségi rendszer jelzi, hogy a felhasználók részére szolgáltatott információk nem felelnek meg a megállapított követelményeknek, és az automatikus hibakorrigáló eljárások nem megfelelőek, ezeket az információkat nem szabad a felhasználókhoz eljuttatni, hacsak az információ létrehozója ezeket nem érvényesíti.*

1. Megjegyzés. – A repülési felhasználók részére szolgáltatott meteorológiai információk földrajzi és térbeli lefedésre, tartalmára és formájára, a kiadás időpontjára és gyakoriságára és érvényességi időtartamára vonatkozó követelmények ennek az Annexnek a 3. Fejezete 4., 6., 7., 8.,9. és 10. pontjában és a 2.,3.,5.,.6,.7.,8. és 9. Függelékeiben és a megfelelő regionális léginavigációs tervekben vannak megadva. A mérési és megfigyelési pontossággal, és az előrejelzések pontosságával foglalkozó útmutató jelen Annex A és B Mellékletében található.

2. Megjegyzés – A 2.2.4 pont rendelkezései ellenére provizórikus TAF szükség esetén mégis kiadható, a 8. Függelék 4.4.3 pontjával összhangban.

2.2.5 **Ajánlás.** – *Üzemelési célú meteorológiai információk cseréjére vonatkozóan a minőségi rendszer tartalmazzon igazolási és érvényesítési eljárásokat és forrásokat az egyedi üzenetek, és/vagy bulletinek, melyeknek cseréjét megkövetelik, előírt továbbítási üteme és a továbbítás időpontjai betartásának figyelésére. A minőségi rendszernek képesnek kell lenni a közlemények és bulletinek túlságosan hosszú továbbítási idejének észlelésére.*

Megjegyzés. – Üzemelési meteorológiai információk cseréjére vonatkozó előírások jelen Annex 11. Fejezetében és 10. Függelékében találhatók

2.2.6 **Ajánlás.** – *Az alkalmazott minőségi rendszer megfelelősségének demonstrálását ellenőrző vizsgálattal lehet végezni. Ha a rendszer konformitásának hiányát észlelik, az okot meg kell határozni, és meg kell szüntetni. Minden ellenőrző vizsgálatot tanúsítani és megfelelően dokumentálni kell.*

2.2.7 A 2.1.2 pontban felsorolt felhasználóknak szolgáltatott meteorológiai információknak konzisztenseknek kell lenniük az Emberi Tényező alapelvekkel, és olyan formájúaknak kell lenniük, hogy ezektől a felhasználóktól csak minimális értelmezési munkát igényeljenek, ahogyan az a következő fejezetekben le van írva.

Megjegyzés. – Útmutató anyag az Emberi Tényező alapelveiről az Emberi Tényező Oktatási Kézikönyvben (Human Factors Trainig Manual) *(Doc 9683) található.*

2.3 Az üzemeltetőktől megkövetelt értesítések

2.3.1 Az az üzemeltető, amely a meteorológiai szolgáltatást vagy a fennálló meteorológiai szolgáltatás megváltoztatását kívánja, elegendő idővel előre értesítse a meteorológiai hatóságot, vagy az illetékes meteorológiai irodát. Az előzetes értesítés minimális terjedelme és minimális előretartási ideje a meteorológiai hatóság, vagy a meteorológiai iroda és az üzemeltető közötti megállapodásnak megfelelő legyen.

2.3.2 A szolgáltatást kérő üzemeltetőnek értesítenie kell a meteorológiai hatóságot, ha:

a) új útvonalakat vagy új típusú üzemeltetést tervez;

b) hosszabb időre szóló változtatásokat kíván végrehajtani a menetrendszerű járatokban;

c) egyéb olyan változtatásokat tervez, amelyek befolyásolják a meteorológiai szolgáltatást.

Az ilyen információnak tartalmaznia kell az összes részletet, amelyek a meteorológiai hatóság részére szükségesek a megfelelő intézkedések tervezéséhez.

2.3.3 Az üzemeltető vagy a hajózószemélyzet tagja értesítse a repülőtéri vagy az illetékes meteorológiai irodát:

a) a repülési menetrendről;

b) amikor nem-menetrendszerű járatokat kívánnak üzemeltetni

c) ha a járatok késnek, korábban indulnak, vagy törölték őket.

2.3.4 **Ajánlás. –** *A repülőtéri, vagy az illetékes meteorológiai iroda számára az egyes járatokról adandó értesítésnek az alábbi információkat kell tartalmaznia, kivéve, ha a menetrendszerű járatok esetében ezeket az információkat, vagy azok egy részét a meteorológiai iroda és az üzemeltető közötti megállapodás törölte:*

a) indulási repülőtér és a tervezett indulási idő;

b) rendeltetési hely és tervezett érkezés időpontja;

c) repülendő útvonal és a közbenső repülőtérre (repülőterekre) való érkezés, illetve onnan való indulás becsült időpontja;

d) a repülés végrehajtási terv elkészítéséhez szükséges és a regionális léginavigációs tervezet megfelelő jegyzékében szereplők közül kiválasztott kitérő repülőterek;

e) utazómagasság;

f) szuperszonikus járatoknál az alternatív szubszonikus utazómagasság, a transzonikus gyorsítás, illetve lassítás területei, valamint a szubszonikus emelkedés és a süllyedés pályája;

g) a repülés típusa, hogy az látás szerinti repülési- vagy műszer szerinti repülési szabályok szerint hajtják végre;

h) a hajózószemélyzeti tag részére kért meteorológiai információ típusa: időjárási repülési dokumentáció és/vagy eligazítás vagy konzultáció; és

i) időpont(ok), amelyekre az eligazítás, konzultáció és/vagy repülési dokumentáció szükséges.

3. FEJEZET – VILÁGTERÜLETI ELŐREJELZŐ RENDSZER ÉS METEOROLÓGIAI IRODÁK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 2. Függelék tartalmazza

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3.1 A világ területi előrejelző rendszer feladata

A világ területi előrejelző rendszer feladata ellátni a meteorológiai hatóságokat és más felhasználókat digitális formában globális magassági szél, magaslégköri hőmérséklet és nedvesség; maximális szélirány, sebesség és magaság, tropopauza magasság és hőmérséklet előrejelzésekkel; valamint a szignifikáns időjárás jelenségek előrejelzéseivel. Ezt a feladatot átfogó, integrált, világméretű és, amennyire megvalósítható, egységes rendszerrel és költséghatékony módon, a fejlődő technológia összes előnyének kihasználásával kell megvalósítani.

3.2 Világ területi előrejelző központok

3.2.1 Egy Szerződő Állam, amely magára vállalta egy világterületi előrejelző központ (WAFC) felállításának felelősségét a világterületi előrejelző rendszer keretében, a következőket rendelje el az adott központ számára:

a) globális előrejelzések készítése rácspont adatokhoz digitális formában, valamennyi szükséges magasságra vonatkozóan és szabvány formátumban; az előrejelzéseknek tartalmazniuk kell a magassági szeleket, magaslégköri hőmérsékleteket és nedvességet, tropopauza magasságokat és a maximális szél sebességét, irányát és magasságát;

b) globális előrejelzések készítése szignifikáns időjárási jelenségekről digitális formában;

c) az a) és b) alpontok szerinti előrejelzések kiadása digitális formában a meteorológiai hatóságok és más felhasználók részére, ahogyan a Szerződő Állam a meteorológiai hatóság tanácsára jóváhagyta;

d) módosítások elkészítése és kiadása az előrejelzésekhez;

e) radioaktív anyagok véletlen atmoszférába jutásáról szóló információk fogadása a hozzátartozó WMO regionális, a radiológiai környezeti vészhelyzeti reagáláshoz szolgáló közlekedés modell eredmények szolgáltatására specializált meteorológiai központtól annak érdekében, hogy ezeket az információkat beillesszék a szignifikáns időjárás előrejelzésekbe; és

f) kapcsolatot létesíteni és fenntartani a VAAC-kal a vulkánikus tevékenységről szóló információk cseréjéhez, hogy koordinálják a vulkán kitörésekről szóló információk beillesztését a szignifikáns időjárás előrejelzésekbe.

1. Megjegyzés – Szignifikáns időjárási jelenségekről szóló és magaslégköri előrejelzési térképek készítésére vonatkozó specifikációk a II. Rész 1. Függelékben találhatók.

2. Megjegyzés – A WAFS szolgáltatási területek a regionális léginavigációs tervekben vannak megadva.

3.2.2 Egy WAFC működésének megszakadása esetén feladatait vegye át egy másik WAFC.

Megjegyzés. – Egy WAFC működésének megszakadása esetén alkalmazandó támogató eljárásokat a C Melléklet tartalmazza. A támogató eljárásokon a Világterületi Előrejelző Rendszer Üzemelési Csoport) várhatóan kismértékű revíziókat hajt végre, és az utolsó revízió a WAFSOPSG weboldalán: www.icao.int/anb/wafsopsg *található.*

3.3 Meteorológiai irodák

3.3.1 Minden Szerződő Államnak egy vagy több repülőtéri és/vagy egyéb meteorológiai irodát kell létesítenie, amelyek alkalmasak z üzemeltetési szükségletek kielégítéséhez szükséges meteorológiai szolgáltatások biztosítására.

3.3.2 Egy repülőtéri meteorológiai irodának el kell látnia az alábbiakban felsorolt feladatok mindegyikét vagy egy részét, amelyek szükségesek a repülőtéri repülés-üzemelés szükségleteinek kielégítéséhez:

a) előrejelzések és egyéb fontos információk készítése és/vagy beszerzése azokhoz a járatokhoz, amelyekkel ezek kapcsolatosak; az előrejelzések készítésére vonatkozó kötelezettségeinek ki kell terjednie a más irodáktól kapott útvonal és repülőtéri előrejelzések anyagának helyi hozzáférhetőségére és felhasználására;

b) előrejelzések készítése és/vagy beszerzése a helyi meteorológiai viszonyokról;

c) a meteorológiai viszonyok folyamatos ellenőrzése azokon a repülőtereken, amelyekre előrejelzéseket kell készítenie;

d) eligazítást, konzultációt és repülési dokumentációt kell biztosítania hajózószemélyzeti tagok és/vagy egyéb légi üzemeltetést végző személyek számára;

e) egyéb meteorológiai információk adása repülési felhasználóknak;

f) a rendelkezésre álló meteorológiai információk bemutatása;

g) meteorológiai információk cseréje más meteorológiai irodákkal;

h) kitörés előtti vulkánikus aktivitással, vulkánkitöréssel vagy vulkánikus hamu felhővel kapcsolatban kapott információk szolgáltatása a légiforgalmi szolgálati egységnek, légiforgalmi tájékoztató szolgálati egységnek és meteorológiai figyelő szolgálatnak, ahogy ebben az érintett meteorológiai, légiforgalmi tájékoztató szolgálat és ATS hatóságok megegyeztek.

3.3.3 Azokat a repülőtéri meteorológiai irodákat, amelyektől repülési dokumentációt igényelnek, valamint a lefedendő területeket és/vagy légiútvonalakat a regionális léginavigációs egyezményben, és ha szükséges, a meteorológiai hatóság és az érintett üzemeltető közötti kiegészítő egyezményben kell meghatározni.

3.3.4 Azokat a repülőtereket, amelyekre leszállási előrejelzés szükséges, a regionális léginavigációs egyezményben kell meghatározni.

3.3.5 A meteorológiai irodával nem rendelkező repülőterek számára:

a) az illetékes meteorológiai hatóság jelöljön ki egy vagy több meteorológiai irodát a kívánt meteorológiai információk biztosítására; és

b) az illetékes hatóságok hozzák létre azokat az eszközöket, amelyek segítségével ezek az információk az érintett repülőterek számára eljuttathatók.

3.4 Meteorológiai megfigyelő irodák

3.4.1 Az a Szerződő Állam, amely elfogadta azt a kötelezettséget, hogy egy repüléstájékoztató körzeten vagy irányítási területen belül légiforgalmi szolgálatokat biztosít, egy vagy több megfigyelő irodát tartozik létesíteni, vagy el kell intéznie, hogy ezt egy másik Szerződő Állam megtegye.

3.4.2 A meteorológiai megfigyelő iroda köteles:

a) figyelemmel kísérni azokat a meteorológiai viszonyokat, amelyek a felelősségi területének határain belül lévő légijárművek üzemeltetését befolyásolhatják;

b) SIGMET és egyéb információkat készíteni a felelősségi területére vonatkozóan;

c) SIGMET információkat és szükség esetén egyéb meteorológiai információkat szolgáltatni a kapcsolódó légiforgalmi szolgálati egységeknek;

d) szétosztani a SIGMET tájékoztatást;

e) amikor a regionális léginavigációs egyezmény megköveteli, a 7.2.1-el összhangban;

1) AIRMET információt készíteni a felelősségi területére vonatkozóan;

2) AIRMET információval ellátni a kapcsolódó légiforgalmi szolgálati egységeket; és

3) terjeszteni az AIRMET információt;

f) kitörés előtti vulkanikus aktivitással, vulkánkitöréssel vagy vulkanikus hamu felhővel kapcsolatban kapott információkat továbbítani, amelyre vonatkozóan SIGMET-et még nem adtak ki, a hozzákapcsolt ACC/FIC számára, ahogy abban az érintett meteorológiai és ATS hatóságok megegyeztek, és a hozzákapcsolt VAAC számára, hogyan azt a regionális léginavigációs egyezmény meghatározta; és

g) a radioaktív anyagoknak azon a területen, amelyen figyelést végez, és a szomszédos területeken, véletlen atmoszférába jutásáról szóló, vett információk továbbítása a hozzá tartozó ACC/FIC-hez, az illetékes meteorológiai és ATS hatóságok közötti megállapodás szerint, és a repülési információs szolgálati egységeknek, az illetékes meteorológiai és megfelelő polgári repülési hatóságok közötti megállapodásnak megfelelően. Az információnak tartalmaznia kell a baleset helyét, dátumát és időpontját, és a radioaktív anyagok előrejelzett trajektóriáit.

Megjegyzés. – Az információt a radiológiai környezeti vészhelyzeti reagáláshoz szolgáló transzport modell eredmények szolgáltatására specializált WMO regionális meteorológiai központok (RSMC) által egy Államba delegált hatóság kérésére szolgáltatják. Az információkat az RSMC mindegyik Államban az országos meteorológiai szolgálatának egyetlen csatlakozási pontjára küldi el. Ennek a csatlakozási pontnak a felelőssége az RSMC produktumok újraelosztása az érintett Államon belül.

3.4.3 **Ajánlás** – *Azon terület határainak, amelyre a meteorológiai irodának figyelést kell fenntartania, lehetőség szerint egybe kell esnie egy repülésinformációs körzet, vagy repülésinformációs körzetek és/vagy összevont irányítási területek egy kombinációjának határaival.*

3.4.4 **Ajánlás** – *A meteorológiai figyelést folyamatosan fenn kell tartani, olyan területeken azonban, ahol a forgalom sűrűsége kicsi, a figyelést korlátozni lehet a várható repülés üzemelési időszakra.*

3.5 Vulkanikus hamu tájékoztató központok

3.5.1 Egy Szerződő Államnak, miután egy regionális léginavigációs egyezmény által elfogadta egy VAAC ellátásának kötelezettségét a nemzetközi légiútvonali vulkánikus figyelés keretében, meg kell szerveznie, hogy ez a központ válaszoljon egy vulkán kitöréséről vagy várható kitöréséről szóló értesítésre, vagy ha vulkanikus hamut jelentenek a felelősségébe tartozó területén, megszervezve, hogy ez a központ

a) figyelje a releváns geostacionárius és poláris keringési pályájú műhold adatokat, hogy észlelje vulkanikus hamu meglétét és kiterjedését az atmoszférában a szóbanforgó területen; és

b) aktivizálja a vulkanikus hamu numerikus trajektória/szétoszlás modellt annak érdekében, hogy bármely észlelt vagy jelentett hamu „felhő” mozgását előrejelezzék.

Megjegyzés. – A numerikus modell lehet saját, vagy megegyezéssel egy másik VAAC modellje.

c) adjon ki vulkanikus hamu „felhő” kiterjedésére és előrejelzett mozgására vonatkozó tanácsadási információkat a következő szervezetek részére:

1) meteorológiai megfigyelő irodák, körzeti irányító központok és repülési információs központok, amelyek azokat a felelősségi területén lévő repülési információs körzeteket szolgálják ki, amelyek érintettek lehetnek;

2) más VAAC-ok, amelyek felelősségi területei érintettek lehetnek;

3) világ területi előrejelző központok, releváns regionális területi előrejelző központok, nemzetközi OPMET adatbankok, nemzetközi NOTAM irodák, és a regionális léginavigációs egyezmény által repülési helyhezkötött szolgálati műholdas elosztó rendszerek működtetésére kijelölt központok; és

4) légitársaságok, amelyek a speciálisan erre a célra biztosított AFTN címen keresztül igénylik a tájékoztató információkat;

Megjegyzés. – A VAAC-ok által használt cím a Kézikönyv a Nemzetközi Légiútvonali Vulkán Figyelésről(IAVW) – Üzemelési Eljárások és Kapcsolat Lista *(Doc 9766) kiadványban, és az ICAO web oldalán http:// www.icao.int Navigation Bureau, Meteorology, International Airways Volcano Watch alatt található.*

d) adjon ki felfrissített információkat a meteorológiai figyelő irodáknak, körzeti irányító központoknak és VAAC-oknak, amelyek a c)-ben vannak felsorolva, szükség szerint, de legalább minden hat órában, amíg a vulkánikus hamu „felhő” már nem azonosítható a műholdas adatokból, már nem érkezik több vulkánikus hamu jelentés a területről, nem jelentenek már vulkán kitörést.

3.5.2 A vulkanikus hamu tájékoztató központoknak 24-órás figyelést kell fenntartaniuk.

3.6 Állami vulkán megfigyelő állomások

Azoknak a Szerződő Államoknak, amelyek aktív vulkánok monitorozását végző vulkán megfigyelő állomásokat működtetnek, meg kell szervezniük, hogy kiválasztott Állami vulkán megfigyelő állomások, amelyek regionális léginavigációs szerződésnek megfelelően, a szignifikáns kitörés előtti vulkanikus tevékenységet, vulkánkitörést és/vagy az atmoszférában vulkanikus hamu megfigyeléseket végeznek, ezeket az információkat amilyen gyorsan csak lehet, küldjék meg a hozzájuk tartozó AAC, MWO és VAAC intézményeknek.

Megjegyzés. –Kitörés előtti vulkanikus tevékenység ebben a vonatkozásban szokatlan és/vagy növekvő vulkanikus tevékenységet jelent, amely vulkánkitörés előjele lehet.

3.7 Trópusi ciklon tanácsadó központok

Egy Szerződő Államnak, miután egy regionális léginavigációs egyezmény által elfogadta egy TCAC ellátásának kötelezettségét, meg kell szerveznie, hogy ez a központ:

a) geostacionárius és poláris keringési pályán lévő műholdak adatainak, radar adatok és egyéb meteorológiai információk felhasználásával figyelje trópusi ciklonok kialakulását a felelősségi területén;

b) adjon ki rövidített köznyelven a ciklon központ helyzetére, mozgásának irányára és sebességére, a középpont nyomására és a középpont közelében a talajszélre vonatkozó tájékoztató információkat a következő szervezetek részére:

1) a felelősségi területén lévő meteorológiai figyelő irodák;

2) más TCAC-ok, amelyek felelősségi területei érintettek lehetnek;

3) világ területi előrejelző központok, releváns regionális területi előrejelzö központok, nemzetközi OPMET adatbankok, és a regionális léginavigációs egyezmény által repülési helyhezkötött szolgálati műholdas elosztó rendszerek működtetésére kijelölt központok;

c) adjon ki felfrissített tájékoztató információkat a meteorológiai figyelő irodák részére minden trópusi ciklonra, ahogy szükséges, de legalább minden hat órában.

4. FEJEZET – METEOROLÓGIAI MEGFIGYELÉSEK ÉS JELENTÉSEK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 3. Függelék tartalmazza
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4.1 Repülésmeteorológiai állomások és megfigyelések

4.1.1 Minden Szerződő Állam tartozik a repülőtereken és a nemzetközi léginavigáció számára lényeges egyéb pontokon a felségterületén olyan repülésmeteorológiai állomásokat létesíteni, amelyeket szükségesnek ítél. Egy repülésmeteorológiai állomás lehet különálló, vagy egy szinoptikus állomással kombinált.

4.1.2 **Ajánlás** – *Minden Szerződő Állam létesítsen, vagy gondoskodjon repülésmeteorológiai állomások létesítéséről tengeri építményeken vagy egyéb, a tengeri építményekre irányuló helikopter üzemelések szempontjából fontos helyeken, ha regionális léginavigációs egyezmény ezt megköveteli.*

4.1.3 A repülésmeteorológiai állomásoknak meghatározott időközönként rutin megfigyeléseket kell végezniük. Repülőtereken a rendszeres megfigyeléseket ki kell egészíteni különleges megfigyelésekkel, amikor meghatározott változások fordulnak elő a talajszél, a látás, futópálya látástávolság, aktuális időjárás, felhőzet és/vagy levegő hőmérséklet vonatkozásában.

4.1.4 **Ajánlás** – *Minden Szerződő Állam kellő gyakorisággal ellenőrizze a repülésmeteorológiai állomásait annak biztosítására, hogy a megfigyelések magas színvonalát fenntartsa, a műszerek és az összes jelzőberendezések kifogástalanul működjenek, és ellenőrizze, hogy a műszerek elhelyezése nem változott-e meg jelentősen.*

4.1.5 II. és III. kategóriájú műszeres megközelítési és leszállási műveletek végrehajtására szolgáló futópályákkal rendelkező repülőtereken a talajszél, a futópálya látástávolság és felhőalap magasság, levegő- és harmatpont hőmérséklet és atmoszférikus nyomás mérésére vagy megbecslésére, amelyik megfelelő, és figyelésére és távkijelzésére szolgáló automatizált berendezéseket kell felszerelni. Ezeknek a berendezéseknek integrált automatikus rendszereknek kell lenniük, amelyek a fel- és leszállási műveleteket befolyásoló meteorológiai paraméterek begyűjtését, feldolgozását, szétosztását és valósidejű kijelzését végzik. Az integrált automatikus rendszerek tervezésénél figyelembe kell venni az Emberi Tényezők alapelveket, és támasztó eljárásokat kell tartalmazniuk.

1. Megjegyzés. – A precíziós megközelítési és leszállási műveletek kategóriái a 6. Annex I. Részben vannak definiálva.

2. Megjegyzés. – Az Emberi Tényező alapelvek alkalmazására vonatkozó útmutató anyag az Emberi Tényező Oktatási Kézikönyvben *(Doc.9683) található.*

4.1.6 **Ajánlás.** – *I. kategóriájú műszeres megközelítési és leszállási műveletek végrehajtására szolgáló futópályákkal rendelkező repülőtereken a talajszél, a futópálya látástávolság és felhőalap magasság, levegő és harmatpont hőmérséklet és atmoszférikus nyomás mérésére vagy megbecslésére, amelyik megfelelő, és figyelésére és távkijelzésére szolgáló automatizált berendezéseket kell felszerelni. Ezeknek a berendezéseknek integrált automatikus rendszereknek kell lenniük, amelyek a fel- és leszállási műveleteket befolyásoló meteorológiai paraméterek begyűjtését, feldolgozását, szétosztását és valósidejű kijelzését végzik. Az integrált automatikus rendszerek tervezésénél figyelembe kell venni az Emberi Tényezők alapelveket, és támasztó eljárásokat kell tartalmazniuk.*

4.1.7 **Ajánlás. –** *Ahol integrált automatikus rendszert használnak a meteorológiai információk szétküldésére/kijelzésére, ez legyen alkalmas azon meteorológiai elemek adatai manuális bevitelének elfogadására, amelyek automatikus eszközökkel nem figyelhetők meg.*

4.1.8 A megfigyelések egyaránt alapját képezik azon jelentések elkészítésének, amelyeket amegfigyelést végző repülőtéren terjesztenek, valamint azoknak, amelyeket e repülőtéren kívül terjesztenek.

4.1.9 A meteorológiai elemek térbeli és időbeli változékonysága, az észlelési technika és bizonyos elemek meghatározása által okozott bizonytalanságok miatt, egy jelentésben bármely elemre megadott jellemző értéket a fogadónak úgy kell értelmeznie, hogy az a tényleges viszonyok legjobb megközelítése a megfigyelés idején.

Megjegyzés – A mérések, illetve megfigyelések üzemeltetési szempontból kívánatos és jelenleg elérhető pontosságára vonatkozó tájékoztató anyagot az A Melléklet tartalmaz.

4.2 Légiforgalmi szolgáltató hatóságok és meteorológiai hatóságok közötti egyezmény

Ajánlás. – *A meteorológiai hatóság és az illetékes ATS hatóság között megállapodást kell létrehozni többek között a következőkre kiterjedően:*

a) a légiforgalmi szolgálati egységek ellátása integrált automatikus rendszerekre vonatkozó kijelzőkkel;

b) ezen kijelzők/műszerek hitelesítése és karbantartása;

c) ezeknek a kijelzőknek/műszereknek a légiforgalmi szolgálatok személyzete általi használata;

d) amennyiben és ahol szükséges, pótlólagos vizuális megfigyelések (pl. az emelkedési és megközelítési területeken üzemeltetési jelentőséggel bíró meteorológiai jelenségekről), amennyiben és amikor azt légiforgalmi szolgálatok tagja végezte annak érdekében, hogy a meteorológiai állomás által szolgáltatott információkat aktuálissá tegyék, vagy kiegészítsék;

e) a fel- és leszálló légijárművektől kapott meteorológiai információk (pl. a szélnyírás);

f) ha rendelkezésre áll, földi időjárás radartól származó meteorológiai információkra.

Megjegyzés. — Útmutatót az ATS és repülésmeteorológiai szolgálat közötti koordináció tárgyában a Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorology Services (Kézikönyv Légiforgalmi Szolgálat, Repülés Információs Szolgálat és Repülésmeteorológiai Szolgálat közötti koordinációról) *(Doc 9377).*

4.3 Rendszeres megfigyelések és jelentések

4.3.1 A repülőtereken minden nap 24 órán keresztül kell megfigyeléseket végezni, kivéve, ha a meteorológiai hatóság, az illetékes légiforgalmi szolgálati hatóság és az érintett üzemeltető között másfajta megállapodás született. Az ilyen megfigyeléseket óránként, vagy ha regionális léginavigációs egyezményben úgy határozzák meg, félóránként kell végezni. Más repülésmeteorológiai állomásokon az ilyen megfigyeléseket a meteorológiai hatóság által a légiforgalmi szolgálati egységek és a légijárművek üzemeltetési követelményeinek figyelembevételével meghatározottak szerint kell végezni.

4.3.2 Rendszeres megfigyelések jelentéseit a következők szerint kell kiadni:

a) helyi rendszeres jelentésekként rövidített köznyelven, a 2. Függelékben közölt mintának megfelelően, csak azon a repülőtéren terjesztve, ahol ezeket kiadták (érkező és induló légijárművek számára); és

b) rendszeres jelentésekként a Meteorológiai Világszervezet által előírt METAR kód formában, a 2. Függelékben közölt mintának megfelelően, a származási helyhez tartozó repülőtéren kívül, a többi repülőtereken való terjesztésre (főleg repülés tervezésre, VOLMET rádióadásra és D-VOLMET-re szánva).

Megjegyzés. – ATIS-ban (beszéd-ATIS-ban és D-ATIS-ban) használt meteorológiai információkat a helyi rendszeres jelentésből kell kivenni, a 11. Annex 4.3.6.1 g) pontjával összhangban.

4.3.3 Azoknál a repülőtereknél, amelyek nem 24 órán keresztül üzemelnek, a 4.3.1 ponttal összhangban METAR-t kell kiadni a repülőtér újraüzemelései előtt, a regionális léginavigációs egyezménynek megfelelően.

4.4 Különleges megfigyelések és jelentések

4.4.1 A különleges megfigyelések kritériumainak listáját a meteorológiai hatóságnak a megfelelő ATS hatósággal, az üzemeltetőkkel és más érdekeltekkel konzultálva kell elkészítenie.

4.4.2 Különleges megfigyelések jelentéseit a következők szerint kell kiadni:

a) helyi rendszeres jelentések, csak azon a repülőtéren terjesztve, ahol ezeket kiadták (érkező és induló légijárművek számára); és

b) SPECI, a származási helyhez tartozó repülőtéren kívüli repülőtereken való terjesztésre (főleg repülés tervezésre, VOLMET rádióadásra és D-VOLMET-re szánva).

Megjegyzés. – ATIS-ban (beszéd-ATIS-ban és D-ATIS-ban) használt meteorológiai információkat a helyi különleges jelentésből kell kivenni, a 11. Annex 4.3.6.1 g) pontjával összhangban.

4.4.3 Azoknál a repülőtereknél, amelyek nem 24 órán keresztül üzemelnek, a 4.3.1 ponttal összhangban, METAR ismételt kiadása előtt, ha szükséges, SPECI-t kell kiadni.

4.5 A jelentések tartalma

4.5.1 A helyi rendszeres és különleges és a METAR/SPEC kódformájú rendszeres és különleges jelentéseknek az alábbi információkat kell tartalmazniuk, a megadott sorrendben:

a) a jelentés fajtájának azonosítása;

b) elhelyezkedési jelző;

c) a megfigyelés ideje;

d) automatizált vagy hiányzó jelentés azonosítása, ha alkalmazható;

e) talajszél iránya és sebessége;

f) látás;

g) futópálya látástávolság, ahol alkalmazható;

h) aktuális időjárás;

i) felhő mennyisége, fajtája (csak cumulonimbus és tornyosuló cumulus felhő esetén) és alapjának magassága, vagy, ahol mérik, függőleges látás;

j) levegőhőmérséklet és harmatpont hőmérséklet; és

k) QNH és ahol alkalmazható, QFE értéke (a QFE-t csak a helyileg, a repülőtéren szétosztott jelentésekbe kell belefoglalni).

Megjegyzés. -- A fenti b) pontban említett helységjelzők és jelentésük az ICAO Doc 7910 –Location Indicators (Hely jelölések) *kiadványban találhatók.*

4.5.2 **Ajánlás.** – *A 4.5.1 a) – k) pontok alatt felsorolt elemeken kívül a helyi rendszeres és különleges jelentések és a METAR és SPECI kiegészítő információkat is tartalmaznak, amelyeket a k pont után kell elhelyezni.*

4.5.3 Kiegészítő információk alatt tartalmazott választható elemeket a METAR-nak és SPECI-nek a regionális léginavigációs egyezménynek megfelelően kell tartalmazni

4.6 Meteorológiai elemek megfigyelése és jelentése

4.6.1 Talajszél

4.6.1.1 A talajszél közepes irányát és közepes sebességét mérni kell, ugyanígy a szél irányában és sebességében beálló változásokat, és földrajzi fokokban és kilométer per órában (vagy csomóban) kell jelenteni.

4.6.1.2 **Ajánlás.**– *Amikor helyi rendszeres és különleges jelentéseket induló légijárművekhez használják, az ezekhez a jelentésekhez végzett talajszél megfigyeléseknek a futópálya mentére kell kiterjedniük; amikor helyi rendszeres és különleges jelentéseket érkező légijárművekhez használják, az ezekhez a jelentésekhez végzett talajszél megfigyeléseknek a földetérési zónára kell kiterjedniük.*

4.6.1.3 **Ajánlás.** – *METAR és SPECI esetén a talajszél megfigyeléseknek az egész futópályára kell* *kiterjednie, ha csak egy futópálya van, és a teljes futópálya komplexumra, ahol egynél több futópálya van.*

4.6.2 Látás

4.6.2.1 Az 1. Fejezetben definiált látást méterben vagy kilométerben kell mérni vagy megfigyelni és jelenteni.

Megjegyzés. – A műszeren leolvasott értékek látásra való átszámítására vonatkozó útmutató anyag az E Mellékletben található.

4.6.2.2 **Ajánlás.–** *Amikor helyi rendszeres és különleges jelentéseket induló légijárművekhez használják, az ezekhez a jelentésekhez végzett látás megfigyeléseknek a futópálya mentére kell kiterjedniük; amikor helyi rendszeres és különleges jelentéseket érkező légijárművekhez használják, az ezekhez a jelentésekhez végzett látás megfigyeléseknek a földetérési zónára kell kiterjedniük.*

4.6.2.3 **Ajánlás. –** *METAR és SPECI esetén a talajszél megfigyeléseknek a repülőtérre kell kiterjedniük*
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4.6.3 Futópálya látástávolság

Megjegyzés. – A futópálya látástávolság témakörére vonatkozó útmutató anyag a Futópálya látástávolság észlelési és jelentési gyakorlatának kézikönyvében (Manual of Runway Visual Range Observing and Reporting PRACTICES) *található (Doc.9328).*

4.6.3.1 Az 1. Fejezetben szereplő definíció szerinti futópálya látástávolságot az összes II. és III kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópályára meg kell határozni.

4.6.3.2 **Ajánlás –** *Az 1. Fejezetben szereplő definíció szerinti futópálya látástávolságot az összes olyan futópályára meg kell határozni, amelyet csökkent látási időszakokban is használni kívánnak, közöttük a:*

a) az I. kategóriájú műszeres megközelítési és leszállási üzemelésre szolgáló precíziós megközelítési futópályákra; és

b) felszállásra használt és nagyintenzitású szegélyfényekkel és/vagy középvonalfényekkel rendelkező futópályákra.

Megjegyzés. – A precíziós megközelítési futópályák meghatározása a 14. Annex 1. Kötet, 1. Fejezetében, a „Műszeres futópályák" cím alatt található.

4.6.3.3 A futópálya látástávolságot, a 4.6.3.1 és 4.6.3.2 pontoknak megfelelően megállapítva, méterekben kell jelenteni azokban az időszakokban, amikor vagy a látás, vagy a futópálya látástávolság kisebb, mint 1500 m.

4.6.3.4 A futópálya látástávolság megállapításokat a futópálya alábbi részére kiterjedően kell végezni:
a) nem-precíziós vagy I. kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópálya földetérési zónája;

b) II. kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópálya földetérési zónája és felezőpontja;

c) III. kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópálya földetérési zónája; felezőpontja és megállási végszakasza.

4.6.3.5 Egy repülőtér részére légiforgalmi szolgáltatást és repülési információ szolgáltatást nyújtó egységeknek késedelem nélkül tudomást kell szerezniük a futópálya látástávolság megállapítására használt automatizált berendezések működőképességi állapotában beállt változásokról.

4.6.4 Aktuális időjárás

4.6.4.1 A repülőtéren és/vagy annak környékén uralkodó aktuális időjárást figyelni és szükség esetén jelenteni kell.

4.6.4.2 **Ajánlás**. – *Helyi rendszeres és különleges jelentéseknél az aktuális időjárás információknak a repülőtéri időjárási viszonyokra kell vonatkozniuk.*

4.6.4.3 **Ajánlás. –** *METAR és SPECI esetén az aktuális időjárás információknak a repülőtéri időjárási viszonyokra, és bizonyos meghatározott aktuális időjárási jelenségek esetében, a repülőtér környékére kell kiterjedniük.*

4.6.4.4 **Ajánlás –** *Ahol a megfigyeléseket automatikus megfigyelő rendszerekkel végzik; gondoskodni kell azoknak az aktuális időjárási elemeknek kézi-beviteli lehetőségéről, amelyek ezekkel a berendezésekkel adekvát módon nem határozhatók meg.*

4.6.5 Felhők

4.6.5.1 A felhőmennyiséget, felhőtípust és felhőalap magasságát figyelni és jelenteni kell, szükség esetén ismertetve az üzemeltetés szempontjából jelentőséggel bíró felhőket. Ha az égbolt borult, a felhő mennyiség; felhő típus és felhőalap magasság helyett, ahol mérik, a függőleges látást kell figyelni és jelenteni. A felhőalap magasságát és a függőleges látást méterben (vagy lábban) kell jelenteni.

4.6.5.2 **Ajánlás**. – *Helyi rendszeres és különleges jelentésekhez végzett felhő megfigyeléseknek a megközelítési területre kell kiterjedniük.*

4.6.5.3 **Ajánlás.** – *METAR és SPECI részére végzett felhő megfigyeléseknek a repülőtérre és környékére kell kiterjedniük.*

4.6.5.4 **Ajánlás**. – *Ahol a felhő mennyiség és/vagy felhőalap magasság megfigyeléseket automatikus megfigyelő rendszerek felhasználásával végzik, gondoskodni kell a felhő mennyiség, ahol ez aktuális, a felhő típus, kézi beviteléről azoknak a felhőrétegeknek vagy felhőtömegeknek a magasságával együtt, amelyek ezekkel a berendezésekkel közvetlenül nem mérhetők.*

4.6.6 Levegő hőmérséklet és harmatpont hőmérséklet

4.6.6.1 A levegő hőmérsékleteket és a harmatpont hőmérsékletet Celsius fokban kell mérni és jelenteni.

4.6.6.2 **Ajánlás**. – *Helyi rendszeres és különleges jelentések és METAR és SPECI részére végzett levegő hőmérséklet és harmatpont hőmérséklet megfigyeléseknek a teljes futópálya komplexusra kell kiterjedniük.*

4.6.7 Atmoszférikus nyomás

Az atmoszférikus nyomást mérni kell, és a QNH és QFE értékeket hektopascalban kell számolni és jelenteni.

4.6.8 Kiegészítő információk

4.6.8.1 **Ajánlás**. – *A repülőtereken végzett megfigyeléseknek magukban kell foglalniuk a szignifikáns* *meteorológiai viszonyokra vonatkozó kiegészítő információkat, különös tekintettel azokra, amelyek a megközelítési és emelkedési területekre vonatkoznak. Ahol megvalósítható, az információnak azonosítani kell a meteorológiai körülmények helyét.*

4.6.8.2 **Ajánlás**. – *Ahol a megfigyeléseket automatikus megfigyelő berendezésekkel végzik, biztosítani kell a berendezések által megfelelően meg nem határozható szignifikáns időjárási jelenségekre vonatkozó információk manuális bevitelét.*

4.7 Automatikus megfigyelő rendszertől érkező meteorológiai információk jelentése

Ajánlás. – *Automatikus megfigyelő rendszerektől származó METAR és SPECI csak a repülőtér üzemidején kívüli órákban használhatók. Ezeket a METAR-okat és SPECI-ket az „AUTO” szóval kell azonosítani.*

4.8 Vulkanikus tevékenység megfigyelése és jelentése

Ajánlás. – *A kitörés előtti vulkáni tevékenység, vulkán kitörés és vulkanikus hamu felhő előfordulását késedelem nélkül jelenteni kell a légiforgalmi szolgálati egységnek és a meteorológiai megfigyelő irodának. A jelentést vulkánikus tevékenység jelentés formájában kell elkészíteni, amely tartalmazza az alább felsorolt információkat a megadott sorrendben:*

a) közlemény típusa, VULKANIKUS TEVÉKENYSÉG JELENTÉS (VOLCANIC ACTIVITY REPORT);

b) állomás azonosítója, az állomás elhelyezkedés jelzője vagy neve;

c) a közlemény dátuma/időpontja;

d) a vulkán helye és neve, ha ismert;

e) az esemény tömör leírása, ideértve a vulkánikus tevékenység intenzitásának szintjét, kitörése előfordulását és annak dátumát és időpontját, valamint vulkánikus hamu felhő előfordulását az adott térségben, a hamu felhő mozgásának irányát és magasságát.

Megjegyzés: -- A kitörés előtti vulkanikus tevékenység ebben a szöveg-összefüggésben szokatlan és/vagy erősödő vulkanikus tevékenységet jelent, amely előre jelezheti egy vulkán kitörését.

5. FEJEZET – LÉGIJÁRMŰVES MEGFIGYELÉSEK ÉS JELENTÉSEK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 4. Függelék tartalmazza.

5.1 Az államok kötelezettségei

Minden Szerződő Állam köteles ennek a fejezetnek az előírásaival megegyezően intézkedni a felségjelével lajstromozott, nemzetközi légiútvonalakon üzemeltetett légijárművek által végzendő megfigyelésekről és a megfigyelések rögzítéséről, illetve azok jelentéséről.

5.2 Légijárműves megfigyelések fajtái

A következő légijárműves megfigyeléseket kell végrehajtani:

a) rendszeres légijárműves megfigyelések útvonal repülés és emelkedés során; és

b) speciális és más nem rendszeres légijárműves megfigyelések a repülés bármely fázisában.

5.3 Rendszeres légijárműves megfigyelések – kijelölés

5.3.1 **Ajánlás**. -- *Amikor levegő-föld adatösszeköttetést használnak, és automatikus függő ellenőrzést (ADS) alkalmaznak, az útvonal repülés fázisában minden 15 percben, míg az emelkedés fázisának első 10 perce során 30 másodpercenként automatizált rendszeres megfigyeléseket kell végezni.*

5.3.2 Amikor beszédkommunikációt használnak, rendszeres megfigyeléseket kell végezni az útvonal repülés fázisban a következő légiforgalmi szolgálati jelentő pontokra vagy intervallumokra vonatkozóan:

a) amelyeken az alkalmazandó légiforgalmi szolgálati eljárások rendszeres helyzetjelentést követelnek meg; és

b) amelyek távolsága egyórás repülési időnek megfelelő távolsághoz a legközelebb esik.

5.3.3 **Ajánlás**. -- *Tengeren épült szerkezeteken lévő repülőterekre és repülőterekről történő helikopter üzemeléseknél a helikopterekről az érintett meteorológiai hatóságok és helikopter üzemeltetők között egyeztetett pontokon és időpontokban kell rendszeres észleléseket végezni.*

5.3.4 Nagysűrűségű légiforgalommal rendelkező légiútvonalak (pl. szervezett útvonalak) esetében egyes repülési magasságokon repülő légijárművek közül egyet kijelölnek, közelítőleg órás intervallumokban, rendszeres megfigyelések végzésére az 5.3.1 vagy 5.3.2 pontnak megfelelően, amelyik alkalmazható. A kijelölési eljárások regionális léginavigációs egyezmény tárgyai.

5.3.5 Emelkedési fázisban jelentés leadás iránti követelmény esetén egy légijárművet kell kijelölni, közelítőleg órás intervallumokban, egyes repülőtereknél rendszeres megfigyelés végzésére az 5.3.1 pontnak megfelelően.

5.4 Rendszeres légijárműves megfigyelések – mentesítések

5.4.1 Amikor beszédkommunikációt használnak, egy légijármű akkor mentesül az 5.4.2 pontban leírt rendszeres megfigyelések végzése alól, ha:

a) a légijármű nincs felszerelve RNAV berendezéssel, vagy

b) a repülés időtartama 2 óra vagy kevesebb; vagy

c) a légijármű egy repülési órának megfelelő távolságnál közelebb van a következő tervezett leszállási ponthoz; vagy

d) a repülési magassága 1500 m (5000 láb) alatt van.

5.4.7 **Ajánlás**. -- *Amikor beszédkommunikációt használnak, további felmentéseket írhat elő a regionális léginavigációs egyezmény a nagy légiforgalmú és/vagy megfelelő szinoptikus hálózattal* *rendelkező területeken és útvonalakon repülő járatok részére. Az ilyen eljárások felmentési vagy kijelölési eljárás formáját öltsék, és*

a) tegyék lehetővé valamennyi érdekelt meteorológiai hivatal minimális követelményeinek kielégítését a légijárművek által végzett észlelésekkel kapcsolatban;

b) végrehajtásuk a lehető legegyszerűbb legyen és lehetőleg ne tartalmazzanak egyedi esetekre vonatkozó megfontolásokat.

5.5 Különleges légijárműves megfigyelések

Különleges megfigyeléseket kell végezni minden légijárműnek, ha az alábbi körülményekkel találkozik, vagy ilyent észlel:

a) erős turbulencia; vagy

b) erős jegesedés; vagy

c) erős hegyi hullám; vagy

d) zivatar jégeső nélkül, amely takart, beágyazott, széles kiterjedésű vagy széllökés vonalban lévő; vagy

e) zivatar jégesővel, amely takart, beágyazott, széles kiterjedésű vagy széllökés vonalban lévő;

f) heves porvihar vagy heves homokvihar; vagy

g) vulkanikus hamu felhő; vagy

h) kitörés előtti vulkanikus tevékenység vagy vulkánkitörés.

Megjegyzés. -- A kitörés előtti vulkanikus tevékenység ebben a szöveg-összefüggésben szokatlan és/vagy erősödő vulkánikus tevékenységet jelent, amely előre jelezhet egy vulkán kitörést.

Ezen kívül transszonikus és szuperszonikus repülés esetén:

i) mérsékelt turbulencia; vagy

j) jégeső; vagy

k) cumulonimbus felhők

5.6 Egyéb nem-rendszeres légijárműves megfigyelések

Amikor az 5.5 alatt nem-felsorolt meteorológiai viszonyok, pl. szélnyírás, lépnek fel, és olyanok, amelyek a légijármű parancsnok véleménye szerint más légijárművek biztonságára kihatnak, vagy üzemelési hatékonyságukat jelentősen befolyásolják, a légijármű parancsnok a lehető legrövidebb időn belül tájékoztassa erről a megfelelő légiforgalmi szolgálati egységet.

Megjegyzés. – A jegesedés, turbulencia és főleg a szélnyírás olyan elemek, amelyeket ma még nem lehet kielégítően észlelni a földről, és amelyek jelenlétére vonatkozóan a legtöbb esetben a légijárműves megfigyelések képezik az egyetlen bizonyítékot.

5.7 Légijárműves megfigyelések jelentése repülés során

5.71 A légijárműves megfigyeléseket a levegő-föld adatkapcsolaton keresztül kell jelenteni. Ahol levegő-föld adatösszeköttetés nincs, vagy nem megfelelő, a légijárműves megfigyeléseket beszédkommunikáció útján kell jelenteni.

5.7.2 A légijárműves megfigyeléseket a repülés során a megfigyelés végzésével egyidőben vagy azután, amilyen rövid időn belül lehetséges, kell jelenteni.

5.7.3 Légijárműves megfigyeléseket légijelentésként kell jelenteni.

5.8 Légi-jelentések ATS egységek általi továbbítása

Az illetékes meteorológiai hatóságnak meg kell állapodnia a megfelelő légiforgalmi szolgálati hatósággal, hogy miután a légiforgalmi szolgálati egységek vették az alábbiakat, biztosítsák:

a) rendszeres és különleges légijelentések beszédkommunikációval, az ATS egységek ezeket késedelem nélkül továbbítsák a hozzájuk tartozó meteorológiai megfigyelő irodáknak;

b) rendszeres légijelentések adatkapcsolati kommunikációval, az ATS egységek ezeket késedelem nélkül továbbítsák a WAFC-oknak és;

c) különleges légijelentéseket adatkapcsolati kommunikációval, az ATS egységek ezeket késedelem nélkül továbbítsák a hozzájuk tartozó meteorológiai megfigyelő irodának, és a WAFC-oknak.

5.9 Vulkanikus tevékenység légijárműves megfigyeléseinek rögzítése és repülés utáni jelentése

A kitörés előtti vulkanikus tevékenység, vulkanikus kitörés vagy vulkanikus hamu felhő speciális légijármű megfigyeléseket a vulkanikus tevékenység különleges légijelentés formátumra kell rögzíteni. A formátum egy példányát tartalmaznia kell a repülési dokumentumnak, amelyet olyan útvonalakon üzemelő járatok részére adnak át, amely útvonalakat az illetékes meteorológiai hatóság véleménye szerint vulkanikus hamu felhők zavarhatnak.

6. FEJEZET – ELŐREJELZÉSEK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat az 5. Függelék tartalmazza.

6.1 Az előrejelzések értelmezése és felhasználása

6.1.1 A meteorológiai elemek térbeli és időbeli változása, az előrejelzési módszerek korlátjai, és néhány elem meghatározásában előforduló korlátozások miatt, egy előrejelzésben megadott bármely elemre vonatkozó értéket a fogadó félnek úgy kell értelmeznie, mint azt a legvalószínűbb értéket, amelyet az előrejelzési periódus folyamán az elem felvehet. Hasonlóképpen, ha valamely elem előfordulásának vagy megváltozásának idejét adják meg egy előrejelzésben, ezt az időt a legvalószínűbb időpontnak kell felfogni.

Megjegyzés. – Az előrejelzés üzemeltetés szempontjából kívánatos pontosságára vonatkozó útmutatást a B Melléklet tartalmaz.

6.1.2 Egy meteorológiai iroda által kiadott új előrejelzést, mint például egy rendszeres repülőtéri előrejelzést, úgy kell értelmezni, hogy az automatikusan törli bármely ugyanarra az érvényességi időszakra, vagy annak egy részére, ugyanarra a helyre vonatkozó, ugyanolyan típusú, korábban kiadott előrejelzést.

6.2 Repülőtéri előrejelzések

6.2.1 Repülőtéri előrejelzést az illetékes meteorológiai hatóság által kijelölt meteorológiai irodának kell készítenie.

6.2.2 A repülőtéri előrejelzést meghatározott időpontban kell kiadni, és a repülőtéren egy meghatározott időszak alatt várható meteorológiai viszonyokra vonatkozó tömör megállapításból kell állnia. Magában kell foglalnia a talajszél, látás, időjárás és felhőzet adatokat, valamint az ezen időszak alatt a fenti elemek valamelyikének vagy több elemének várható szignifikáns változásait.

6.2.3 Repülőtéri előrejelzéseket és ezek módosításait TAF-ként kell kiadni, és a következő információkat kell, a jelzett sorrendben, tartalmazniuk:

a) az előrejelzés fajtájának azonosítása;

b) hely jelző;

c) előrejelzés kiadásának időpontja;

d) hiányzó előrejelzés azonosítása, amikor alkalmazható;

e) az előrejelzés érvényességi dátuma és időszaka;

f) törölt előrejelzés azonosítása, amikor alkalmazható;

g) talajszél;

h) látás;

i) időjárás;

j) felhő; és

k) ezen elemek közül egynek vagy többnek az érvényességi időszak alatti várható lényeges változásai.

A TAF-nak választható elemeket a regionális léginavigációs egyezménnyel összhangban kell tartalmazniuk

Megjegyzés. – A TAF-ban szereplő látás az előrejelzési domináns látásra vonatkozik.

6.2.4 A repülőtéri előrejelzéseket készítő meteorológiai irodáknak az előrejelzéseket folyamatosan ellenőrizniük kell és ha szükséges, azonnal módosításokat kell kiadni. Az előrejelzési közlemények hosszát és az előrejelzésekben megjelölt változások számát minimálisra kell korlátozni.

6.2.5 Azt a TAF-t, amely nem tartható folytonos felülvizsgálat alatt, törölni kell.

6.2.6 **Ajánlás.–** *Egy rendszeres TAF érvényességi időszaka nem lehet kevesebb, mint 9 óra, és nem lehet több, mint 24 óra; ezt az időszakot a regionális léginavigációs egyezményben kell meghatározni. 12 óránál rövidebb időszakra érvényes rendszeres TAF-ot minden 3 órában ki kell adni, és azokat, amelyek 12-24 óráig érvényesek, minden 6 órában kell kiadni.*

6.3 Leszállási előrejelzések

6.3.1 Leszállási előrejelzést az illetékes meteorológiai hatóság által kijelölt meteorológiai irodának kell készítenie; az ilyen előrejelzéseknek ki kell elégíteniük a helyi felhasználók és a repülőtértől körülbelül egy órás repülési időre lévő légijárművek igényeit.

6.3.2 A leszállási előrejelzéseket trend típusú előrejelzés formájában kell elkészíteni, ahogyan azt a regionális léginavigációs egyezmény meghatározza.

6.3.3 Egy trend előrejelzés a repülőtéri időjárási viszonyokban várható jelentős változások tömör bejelentéséből áll, amelyet egy helyi rendszeres vagy helyi különleges jelentéshez, vagy egy METAR-hoz, vagy SPECI-hez csatolnak. A trend előrejelzés érvényessége 2 óra annak a jelentésnek az időpontjától számítva, amely a leszállási előrejelzés részét képezi.

6.4 Előrejelzések felszálláshoz

6.4.1 Felszállási előrejelzést az illetékes meteorológiai hatóság által kijelölt meteorológiai irodának kell készítenie.

6.4.2 **Ajánlás**. – *A felszállási előrejelzésnek egy meghatározott időszakra kell vonatkoznia és információkat kell tartalmaznia a futópálya rendszer felett várható viszonyokról, a talajszél irányáról és sebességéről, valamint annak bármilyen megváltozásáról, hőmérsékletről, a nyomásról (QNH), valamint helyi megállapodás alapján, bármely más elemről.*

6.4.3 **Ajánlás**. – *A felszállási előrejelzést az üzemeltetők és a hajózószemélyzet tagjainak kérésére 3 órával az indulás várható időpontja előtt rendelkezésükre kell bocsátani.*

6.4.4 **Ajánlás**. – *A felszálláshoz előrejelzéseket készítő meteorológiai irodáknak az előrejelzéseket állandóan felül kell vizsgálniuk, és ha szükséges, azonnal módosításokat kell kiadni.*

6.5 Nem a világ területi előrejelző rendszer keretén belül kiadott területi és útvonali előrejelzések

Megjegyzés. – A világ területi előrejelző rendszer keretében kiadott előrejelzésekre vonatkozó rendelkezéseket a 3. Fejezet és a 2. Függelék tartalmazza, és a kismagasságú repülések részére szóló területi előrejelzésekkel foglalkozó részek a 6.6 szakasz és az 5. Függelék alatt találhatók.

6.5.1 A területi és útvonal előrejelzéseknek tartalmazniuk kell a magassági szelet, a magaslégköri levegő hőmérsékletet, a szignifikáns útvonal időjárási jelenségeket, és a velük társuló felhőzetet. Kívánság szerint egyéb elemeket is bele lehet foglalni. Ez az információ azokra a légi üzemeltetésekre terjedjen ki, amelyekre időtartam, magasság és földrajzi kiterjedést illetően szánták.

6.5.2 A területi és útvonal előrejelzéseket készítő meteorológiai irodák kötelesek az előrejelzéseket folyamatosan ellenőrizni és szükség esetén módosításokat kibocsátani.

6.6 Területi előrejelzések kismagasságú repülések részére

6.6.1 Ha a 100-as repülési magasságszint alatt (maximálisan 150-es repülési szintig hegyes területen, vagy ennél nagyobb magasságig, ha szükséges) üzemelő forgalom sűrűsége szükségessé teszi az ilyen repülések számára területi előrejelzések rendszeres kiadását és elosztását, akkor az ilyen előrejelzések kiadásának gyakoriságát és érvényességnek pontos időtartamát vagy időszakát a meteorológiai hatóságnak a felhasználókkal folytatott konzultáció alapján kell meghatároznia.

6.6.2 Amikor a 100-as repülési szint alatt üzemelő járatok sűrűsége megkívánja AIRMET információk kiadását a 7.2.1 ponttal összhangban, az ilyen repüléseknek szóló területi előrejelzéseket az illetékes meteorológiai hatóságok közötti megállapodás szerinti formátumban kell elkészíteni. Ha rövidített köznyelvet használnak, az előrejelzést GAMET területi előrejelzésként kell elkészíteni, jóváhagyott ICAO rövidítéseket és számszerű értékeket alkalmazva. A területi előrejelzéseket úgy kell kiadni, hogy lefedjék a talajszint és a 100-as repülési szint (vagy hegyes területen 150-es repülési szint, vagy ha szükséges, magasabb szint) közötti réteget és tartalmaznia kell a kismagasságú jelenségekről szóló információkat az AIRMET információ kiadásának alátámasztására, és a kismagasságú repülések számára szükséges további információkat.

6.6.3 Kismagasságú repülések részére szóló területi előrejelzéseket, amelyeket az AIRMET információk kiadásának elősegítésére a meteorológiai irodák egymás között cserélnek, minden 6 órában ki kell adni egy 6 órás érvényességi időtartamra, és az illetékes meteorológiai irodák részére nem később, mint érvényességi időszakának kezdete előtt egy órával, továbbítani kell.

7. FEJEZET – SIGMET ÉS AIRMET INFORMÁCIÓK, REPÜLŐTÉRI FIGYELMEZTETÉSEK ÉS SZÉLNYÍRÁS FIGYELMEZTETÉSEK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 6. Függelék tartalmazza

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7.1 SIGMET tájékoztatás

7.1.1 A SIGMET tájékoztatást meteorológiai figyelő irodának kell kiadnia, amelynek rövidített köznyelven, tényleges vagy várható előfordulását kell tömören megadnia azoknak a meghatározott útvonali időjárási jelenségeknek, melyek befolyásolhatják a légi üzemelés biztonságát, valamint meg kell adnia ezen jelenségek időbeli és térbeli alakulását

7.1.2 A SIGMET tájékoztatást törölni kell, ha a jelenség már nem fordul elő, vagy előfordulása az adott területen a továbbiakban nem várható.

7.1.3 A SIGMET közlemény érvényességi időtartama nem lehet több 6 óránál, és előnyös, ha 4 óránál nem több.

7.1.4 **Ajánlás**. – *Olyan különleges esetben, ha a SIGMET közlemény vulkanikus hamufelhőre vagy trópusi ciklonokra vonatkozik, a 7.1.3 pontban megadott érvényességi időszakon túl 12 órára vonatkozó kilátásokat kell a közleménybe foglalni, mely a vulkanikus hamufelhő útirányáról, illetve a trópusi ciklon központjának helyzetéről ad tájékoztatást.*

7.1.5 **Ajánlás**. – *A 7.1.4 pontnak megfelelően kiadott vulkanikus hamufelhőre, illetve trópusi ciklonra vonatkozó SIGMET közleményeknek regionális léginavigációs egyezmény szerint kijelölt VAAC-ok, illetve TCAC-ok által szolgáltatott tájékoztató információn kell alapulnia.*

7.1.6 Szoros együttműködést kell fenntartani a meteorológiai figyelő iroda és a hozzátartozó körzeti irányító központ/repülési információs központ között annak biztosítása érdekében, hogy a SIGMET és a NOTAM közleményekben lévő információk a vulkanikus hamuról, konzisztensek legyenek.

7.1.7 A 6. Függelék 1.1.4 pontjában felsorolt időjárás jelenségek, a vulkanikus hamufelhő és trópusi ciklonok kivételével, várható megjelenésére vonatkozó SIGMET közleményt ennek a jelenségnek a várható megjelenési időpontja előtt 6 óránál, de inkább 4 óránál nem többel, kell kiadni.

7.1.8 **Ajánlás**. – *Egy repülési információs régióra várhatóan hatást kifejtő vulkanikus hamu felhőre vagy trópusi ciklonokrra vonatkozó SIGMET közleményeket maximum 12 órával az érvényességi időszak kezdete előtt, vagy amint megvalósítható, kell kiadni, ha ezek a jelenségek fennállására ilyen előzetes figyelmeztetés nincsen. Vulkanikus hamu felhőről és trópusi ciklonokról szóló SIGMET közleményeket legalább hatóránként fel kell frissíteni.*

7.2 AIRMET tájékoztatás

7.2.1 AIRMET tájékoztatást a meteorológiai megfigyelő iroda ad ki a regionális légi-navigációs egyezménynek megfelelően, figyelembe véve a 100-as repülési magasságszint alatti légiforgalmi sűrűséget. AIRMET tájékoztatásnak rövidített köznyelven rövid leírást kell adni meghatározott útvonali időjárás jelenségek előfordulásáról és/vagy várható előfordulásáról, amelyeket nem tartalmaz a kismagasságú repülések részére a 6. Fejezet 6.6 szakaszban leírtakkal összhangban kiadott területi előrejelzés I. szakasza, és amelyek kihatással lehetnek a kismagasságú repülések biztonságára, valamint a szóbanforgó jelenségek időbeli és térbeli alakulásáról.

7.2.2 AIRMET tájékoztatást törölni lehet, ha a jelenségek már nem állnak fenn, vagy megjelenésük már nem várható a területen.

7.2.3 Az AIRMET közlemény érvényességi időszaka nem lehet több 6 óránál, de előnyös, ha nem több mint 4 óra.

7.3 Repülőtéri figyelmeztetések

7.3.1 A repülőtéri figyelmeztetéseket az illetékes meteorológiai hatóság által kijelölt meteorológiai irodának kell kiadnia, és ezeknek tömör információt kell adniuk olyan meteorológiai körülményekről, amelyek károsan befolyásolhatják a földön lévő légijárműveket, beleértve a parkoló légijárműveket is, valamint a repülőtéri létesítményeket és szolgálatokat.

7.3.2 **Ajánlás-** – *Repülőtéri figyelmeztetéseket törölni kell, amikor a repülőtéren a körülmények már nem állnak fenn és/vagy bekövetkezésük már nem várható.*

7.4 Szélnyírás figyelmeztetések

7.4.1 A szélnyírás figyelmeztetéseket az illetékes meteorológiai hatóság által kijelölt meteorológiai hivatalnak kell elkészítenie, és tömör információt kell adnia a megfigyelt vagy várhatóan megjelenő szélnyírásról, amely hátrányosan befolyásolhatja a légijárművet a megközelítési pályán, vagy a felszálló pályán, vagy körös megközelítés alatt a futópálya szint és e szint feletti 500 m-es (1600 láb) szint között, és a futópályán leszállási kigurulás vagy felszállási nekifutás végzése közben. Ahol a helyi terepviszonyok jelentős szélnyírás létesítését mutatják ki 500 m-t (1600 láb) a futópálya szint felett meghaladó magasságokon, ott az 500 m (1600 láb) nem tekinthető korlátozó értéknek.

Megjegyzés. – Útmutatást a szélnyírás tárgyában a Szélnyírás kézikönyv (Manual on Wind Shear) *(Doc 9817, készítés alatt) tartalmaz.*

7.4.2 **Ajánlás**. – *Az érkező és/vagy induló légijárművek számára szóló szélnyírási figyelmeztetést törölni kell, ha légijármű jelentések jelzik, hogy szélnyírás a továbbiakban nem áll fenn, vagy alternatívaként, egy meghatározott idő eltelte után. A szélnyírásról szóló figyelmeztetés megszüntetésének kritériumait minden repülőtérre külön kell megállapitani a meteorológiai hatóság, az illetékes ATS hatóság és az érintett üzemeltetők megállapodásának megfelelően.*

8. FEJEZET. – REPÜLÉSKLIMATOLÓGIAI INFORMÁCIÓK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 7. Függelék tartalmazza.

8.1 Általános előírások

Megjegyzés. – Olyan esetekben, amikor a repülésklimatológiai információs követelményeket nemzeti alapon nem lehetséges kielégíteni, a megfigyelési adatok gyűjtését, feldolgozását és tárolását nemzetközi használatra fenntartott számítógépes eszközökkel is végre lehet hajtani, valamint a megkívánt repülésklimatológiai információ készítésének felelősségét az érintett meteorológiai hatóságok közötti megegyezés alapján át lehet ruházni.

8.1.1 A légi üzemeltetés tervezéséhez igényelt repülésklimatológiai információkat repülőtéri klimatológiai táblázatok és repülőtéri klimatológiai összefoglalók formájában kell elkészíteni. Az ilyen információkat repülési felhasználók részére a meteorológiai hatóság és az érintett felhasználók közötti megállapodás szerint kell megadni.

Megjegyzés. – Repülőtér-tervezési célokra szükséges klimatológiai adatok a 14. Annex I. Kötet, 3.1.3. pontjában és az „A” Mellékletben találhatók.

8.1.2 **Ajánlás**. – *A repülésklimatológiai információknak általában legalább 5 éven keresztül végzett megfigyeléseken kell alapulniuk, és ezt az időszakot meg kell jelölni a szolgáltatott információban.*

8.1.3 **Ajánlás**. – *Új repülőterek létesítésének helyére, valamint meglévő repülőtereken további futópályák kialakítására vonatkozó klimatológiai adatok gyűjtését a repülőterek, illetve futópályák üzembe helyezését megelőzően, a lehető legkorábban kell elkezdeni.*

8.2 Repülőtéri klimatológiai táblázatok

Ajánlás – *Minden Szerződő Állam intézkedjen a szükséges megfigyelési adatok gyűjtéséről és megőrzéséről, továbbá legyen képes:*

a) repülőtéri klimatológiai táblázatok készítésére a területén belül lévő valamennyi, a nemzetközi légiforgalom által rendszeresen és kitérőként használt repülőtérre; és

b) ezeknek a klimatológiai táblázatoknak elérhetővé tételére valamely légiforgalmi felhasználó számára egy olyan időszakon belül, amelyet a meteorológiai hatóság és a felhasználó közötti megállapodás tartalmaz.

8.3 Repülőtéri klimatológiai összefoglalók

Ajánlás. – *A repülőtéri klimatológiai összefoglalókat a Meteorológiai Világszervezet által előírt eljárásoknak megfelelően kell készíteni. Amennyiben az információk tárolására, feldolgozására és visszakeresésére számítógépes eszközök állnak rendelkezésre, az összefoglalókat publikálni kell, vagy kérésükre egyéb módon a repülési felhasználók rendelkezésére kell bocsátani. Ahol ilyen számítógépes eszközök nincsenek, az összefoglalókat a Meteorológiai Világszervezet által meghatározott minták felhasználásával kell elkészíteni, ezeket ki kell adni és szükség szerint naprakészen kell tartani.*

8.4 A meteorológiai megfigyelési adatok példányai

Minden meteorológiai hatóság, kívánságra és a lehetőségekhez mérten, tegye hozzáférhetővé bármely más meteorológiai hatóság, üzemeltető és egyéb, a meteorológiának a nemzetközi légiközlekedésben való felhasználásában érintett részére az eredeti meteorológiai észlelési adatok másolatait, amelyek kutatáshoz, kivizsgáláshoz vagy üzemeltetési analízishez szükségesek.

9. FEJEZET – ÜZEMELTETŐK ÉS HAJÓZÓSZEMÉLYZETI TAGOK RÉSZÉRE NYÚJTOTT SZOLGÁLTATÁSOK

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 8. Függelék tartalmaz
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9.1 Általános előírások

9.1.1 Meteorológiai információkat kell szolgáltatni az üzemeltetők és a hajózószemélyzet részére a következők szerint:

a) az üzemeltetők általi repülés előtti tervezéshez

b) üzemeltetők által, repülésüzemeltetés központosított üzemelés-irányításának felhasználásával végrehajtott, repülés közbeni áttervezéshez;

c) a hajózószemélyzet tagjai általi felhasználásra indulás előtt; és

d) levegőben lévő légijárművek számára.

9.1.2 Az üzemeltető és a hajózószemélyzeti tagok részére szolgáltatott információknak le kell fedniük a repülést idő, magasság és földrajzi kiterjedés szempontjából. Ennek megfelelően, az információnak a megfelelő rögzített időpontokra vagy időszakokra kell vonatkoznia és addig a célrepülőtérig kell terjednie, ahol újabb információkat szolgáltatnak. Kívánságra, vagy ha a körülmények az adott repülőtéren való leszállást kétségessé teszik, akkor további információkat kell adni, amelyek tartalmazzák a célrepülőtér és az üzemeltető által kijelölt kitérő repülőtér közötti terület várható meteorológiai viszonyait. Ezen kívül, ha ilyen megállapodás született a meteorológiai hatóság és az üzemeltető között, egy további repülőtérig is szolgáltathatók információk.

9.1.3 Az üzemeltetők és a hajózószemélyzeti tagok részére szolgáltatott meteorológiai információknak tartalmazniuk kell a magassági szelet, a magaslégköri levegőhőmérsékletet, szignifikáns útvonali időjárási jelenségeket, METAR és SPECI jelentéseket(trend előrejelzéseket is beleértve), TAF előrejelzéseket, felszállási előrejelzéseket, leszállási előrejelzéseket, SIGMET információkat és azokat a speciális légijelentéseket, amelyeket a SIGMET és AIRMET információk nem tartalmaznak és amelyek rendelkezésre állnak a meteorológiai irodánál és amelyek a tervezett légiüzemeltetésnél relevánsak.

9.1.4 Amikor szükséges, az üzemeltetők és a hajózószemélyzeti tagok számára szolgáltatást nyújtó Állam meteorológiai hatósága koordinációt köteles kezdeményezni más Államok meteorológiai hatóságaival, annak érdekében, hogy beszerezze tőlük a szükséges jelentéseket és/vagy előrejelzéseket.

9.1.5 A meteorológiai információkat az üzemeltető és a hajózószemélyzet tagjai számára a meteorológiai hatóság által az üzemeltetőkkel folytatott konzultációk után, meghatározott helyen, a meteorológiai iroda és az érintett üzemeltető közötti megállapodásnak megfelelő időben kell szolgáltatni. A szolgáltatásnak rendes körülmények között az érintett Állam területéről induló járatokra kell korlátozódnia, hacsak nem születik más megállapodás a meteorológiai hatóság és az érintett üzemeltető között. Meteorológiai irodával nem rendelkező repülőtéren a meteorológiai információk nyújtására vonatkozó intézkedések a meteorológiai hatóság és az érdekelt üzemeltető között létrejött megállapodás függvénye.

9.2 Az üzemeltetők részére központosított üzemelés irányítás alatti repülés előtti tervezéshez és repülés közbeni áttervezéshez adott információk

9.2.1 Az üzemeltetők részére repülés előtti tervezéshez és repülés közbeni áttervezéshez adott meteorológiai információnak magába kell foglalnia az alábbi információkat, ahogyan azt a meteorológiai hatóság az illetékes üzemeltetőkkel konzultálva létrehozta:

a) aktuális és előrejelzett magassági szelek, magaslégköri levegő hőmérséklet, tropopauza magassága és maximális szél információk és ezek módosításai;

b) tropopauza magasság és hőmérséklet, és a maximális szél iránya, sebessége és magassága;

c) fennálló és várható szignifikáns útvonali időjárás jelenségek és ezek módosításai;

d) felszállási előrejelzés;

e) METAR formájú jelentések és, ahol rendelkezésre áll, SPECI (beleértve a trend előrejelzéseket) az indulási, felszállási és az útvonali kitérő repülőterekre, a leszállási célrepülőtérre és az érkezési alternatív kitérő repülőterekre, ahogyan a regionális léginavigációs egyezmény meghatározza;

f) TAF és annak módosításai az indulási repülőterekre és leszállási célrepülőterekre és a felszállási, útvonali és érkezési kitérő repülőterekre, ahogyan a regionális léginavigációs egyezmény meghatározza;

g) SIGMET tájékoztatások és megfelelő különleges légijelentések, amelyek relevánsak a teljes aktuális útvonalra.

Megjegyzés – Megfelelő különleges légijelentések azok lesznek, amelyeket nem használtak fel már SIGMET tájékoztatások készítéséhez.

h) AIRMET információk kismagasságú repülések részére, regionális léginavigációs egyezmény szerint.

9.2.2 Ha a magaslégköri információt térkép formájában adják meg, ennek szabvány repülési magasságszintek térképeiből kell állnia.

9.2.3 **Ajánlás** – *Az üzemeltető részére a repülés előtti tervezéshez és repülés közbeni áttervezéshez igényelt információkat a magassági szélről és magaslégköri levegőhőmérsékletről, valamint a szignifikáns útvonal időjárási viszonyokról általában azonnal meg kell adni, mihelyt rendelkezésre állnak, de legalább 3 órával az indulás előtt. Egyéb, az üzemeltető által repülés előtti tervezéshez igényelt meteorológiai információt általában a lehető leghamarabb kell megadni.*

9.3 Eligazítás, konzultáció és kijelzés

Megjegyzés – Automatizált repülés előtti információs rendszerek eligazítás, konzultáció és kijelzés szolgáltatására való felhasználására vonatkozó követelmények a 9.5 szakaszban találhatók.

9.3.1 Kívánságra eligazítást és/vagy konzultációt kell biztosítani a hajózószemélyzet tagjainak és/vagy egyéb légiüzemeltetési személyzetnek. Ennek célja az, hogy megadja a legutóbbi rendelkezésre álló információkat a repülendő légiútvonalon fennálló és várható meteorológiai viszonyokról, valamint a tervezett rendeltetési repülőtérre, kitérő repülőtérre és egyéb érintett repülőterekre vonatkozóan, akár az, hogy magyarázatot és megerősítést adjon a repülési dokumentációban található információkra, akár a meteorológiai hatóság és az üzemeltető megállapodása lapján repülési dokumentáció helyett szerepeljen.

9.3.2 Az eligazításhoz és konzultációhoz szolgáló meteorológiai információknak magukban kell foglalniuk a 9.2.1 pontban felsoroltak közül az egyiket vagy mindegyiket.

9.3.3 Ha a meteorológiai iroda olyan véleményt nyilvánít, hogy valamely repülőtéren a meteorológiai viszonyok alakulása jelentősen eltér a repülési dokumentációban lévő repülőtéri előrejelzéstől, akkor a hajózószemélyzet tagjainak figyelmét fel kell hívni erre az eltérésre. Az eligazításnak az eltéréssel foglalkozó részét az eligazítás idején rögzíteni kell és hozzáférhetővé kell tenni az üzemeltető számára.

9.3.4 Az igényelt eligazítást, konzultációt, bemutatást és/vagy repülési dokumentációt általában az indulási repülőteret kiszolgáló meteorológiai irodának kell biztosítania. Olyan repülőtéren, ahol ezek a szolgáltatások nem biztosíthatók, a hajózószemélyzet kívánságainak teljesítésére irányuló intézkedések a meteorológiai hatóság és az érdekelt üzemeltető közötti megállapodástól függnek. Kivételes körülmények között, mint pl. nagyobb késés, a repülőtérhez tartozó meteorológiai irodának biztosítania kell, vagy ha ez nem lehetséges, akkor intézkednie kell új eligazításról, konzultációról és/vagy repülési dokumentációról, ahogyan szükséges.

9.3.5 **Ajánlás** – *A hajózószemélyzet tagjának vagy egyéb légiüzemeltetési személynek, akinek a részére az eligazítást, konzultációt és/vagy repülési dokumentációt igényelték, fel kell keresnie a meteorológiai irodát, a meteorológiai iroda és az érintett üzemeltető közötti megállapodásban előírt időben. Ha egy repülőtéren a helyi körülmények a személyes eligazítást vagy konzultációt nem teszik lehetővé, a meteorológiai irodának ezeket a szolgáltatásokat telefonon vagy egyéb megfelelő távközlési eszközök segítségével kell biztosítania.*

9.4 Repülési dokumentáció

Megjegyzés. – Automatikus repülés előtti információs rendszerek repülési dokumentációban való felhasználására vonatkozó előírások a 9.5 szakaszban találhatók.

9.4.1 **Ajánlás.** – *Repülésdokumentációnak le kell fednie az egész repülni szándékozott útvonalat és a 9.2.1 a), c) és e)-től h)-ig alatt felsorolt információkból kell állnia. Azonban, regionális léginavigációs egyezménynek megfelelően, vagy ennek hiányában, ha a meteorológiai hatóság és az érdekelt üzemeltető megegyezett, két óra vagy ennél kisebb időtartamú repülések repülési dokumentációját rövid megállás vagy fordulás után az üzemeléshez szükséges információkra kell korlátozni, de a dokumentációnak minden esetben legalább a 9.2.1 e), f), g) és ha megfelelő, h) pontból kell állnia.*

9.4.2 **Ajánlás** – *A meteorológiai irodák, amennyire lehetséges, biztosítsák a világ területi előrejelző rendszer keretében kapott információkat a repülési dokumentáció számára. A repülési dokumentációt térképek, táblázatok vagy rövidített köznyelvű szöveg formájában kell szolgáltatni. A TAF-t az 5. Függelékben közölt mintának megfelelően, vagy rövidített köznyelvű szöveggel kell megadni, táblázatos formát alkalmazva.*

Megjegyzés – Térképmodellek és repülési dokumentáció elkészítése során használatos formanyomtatványok az 1. Függelékben találhatók. Ezeket a mintákat és kitöltési módszereket a Meteorológiai Világszervezet fejlesztette ki a Nemzetközi Polgári Repülési Szervezet által megállapított, vonatkozó üzemeltetési követelmények alapján.

9.4.3 Amikor nyilvánvalóvá válik, hogy a meteorológiai információk, amelyek a repülési dokumentációba kerülnek, lényegesen különbözni fognak, amelyet a repülés előtti tervezéshez és a repülés közbeni újratervezéshez rendelkezésre bocsátottak, az üzemeltetőt haladéktalanul értesíteni kell, és ha megvalósítható, revidiált információval el kell látni, ahogyan az üzemeltető és az illetékes meteorológiai iroda megállapodott.

9.4.4 **Ajánlás** – *Amikor szükséges és lehetséges, a repülési dokumentációt fel kell frissíteni írásban vagy szóban, mielőtt kiadnák a hajózószemélyzet tagjainak. Amikor a módosítás szükségessége a repülési dokumentáció kiadása után merül fel, a légijármű felszállása előtt a meteorológiai irodának, a helyi megállapodásnak megfelelően, ki kell adni a szükséges módosítást vagy a felfrissített információt az üzemeltető számára, vagy a helyi légiforgalmi szolgálati egység részére a légijárműhöz való továbbítás céljából.*

9.4.5 **Ajánlás** – *A repülési dokumentáció nyomtatványait és térképeit angol, francia, orosz vagy spanyol nyelven nyomtassák, ha lehetséges, az üzemeltető által kért, lehetőleg az egyik fenti nyelven kell kitölteni. Ahol alkalmazható, a jóváhagyott rövidítéseket kell használni. Az egyes elemeknél az alkalmazott mértékegységeket jelölni kell, ezeknek az 5. Annexszel összhangban kell lenniük.*

9.4.6 A meteorológiai hatóság őrizze meg a hajózószemélyzet tagjainak szolgáltatott információkat vagy nyomtatott példány, vagy számítógépes fájlok formájában, a kiadás keltétől legalább 30 napig. Az információkat kérésre hozzáférhetővé kell tenni érdeklődés vagy kivizsgálás céljára és ezek befejezéséig azokat meg kell őrizni.

9.5 Automatizált repülés előtti információs rendszerek eligazításhoz, konzultációhoz, repülés tervezéshez és repülési dokumentációhoz

9.5.1 Ahol a meteorológiai hatóság automatizált repülés előtti információs rendszereket használ az üzemeltetők és a repülő személyzeti tagok meteorológiai információkkal való ellátására és ezek kijelzésére eligazítás, repülés tervezés és repülés dokumentáció céljaira, a szolgáltatott és kijelzett információknak eleget kell tenniük a 9.1 - 9.4 szakaszok releváns előírásainak.

9.5.2 **Ajánlás.** *–Az üzemeltetők, repülőszemélyzeti tagok és más repülésben érdekelt személyek részére meteorológiai információkhoz és repülési információs szolgáltatási információkhoz harmonizált, közös pontú hozzáférést biztosító automatikus repülés előtti információs rendszert kell létrehozni a meteorológiai hatóság és az illetékes polgári repülési hatóság, vagy azon hivatal között, amelybe a szolgáltatást végző hatóság delegálva van, a 15. Annex 3.1.1 c) pontjával összhangban.*

Megjegyzés – A szóbanforgó meteorológiai illetve a repülési információs szolgáltatási információkat a 9.1 – 9.4 szakaszok és a 8. Függelék és a 15.Annex 8.1 és 8.2 szakaszai ismertetik.

9.5 3 Ahol üzemeltetők, repülőszemélyzeti tagok és más repülésben érdekelt személyek részére meteorológiai információkhoz és repülési információs szolgáltatási információkhoz harmonizált, közös pontú hozzáférést biztosító automatikus repülés előtti információs rendszert használnak, az ilyen rendszerek által szolgáltatott meteorológiai információk minőségi ellenőrzésének és minőségmenedzselésének az érintett meteorológiai hatóság kötelezettségében kell maradnia, a 2. Fejezet 2.2.2 ponttal összhangban.

Megjegyzés. – A repülési információs szolgálati információkra és az információk minőségbiztosítására vonatkozó kötelezettségeket a 15. Annex 3. Fejezet tartalmazza.

9.6 Információk repülést végző légijárművek részére

9.6.1 A repülést végző légijárművek részére felhasználás céljára adott meteorológiai információkat a meteorológiai irodának a vele kapcsolatban álló légiforgalmi szolgálati egységnek kell továbbítania és D-VOLMET vagy VOLMET adásban sugároznia. A repülést végző légijármű számára az üzemeltető által végzett tervezéshez szolgáló meteorológiai információt kívánságra meg kell adni a meteorológiai hatóság vagy hatóságok és az érintett üzemeltető közötti megállapodásnak megfelelően.

9.6.2 A repülést végző légijármű általi felhasználásra adott meteorológiai információkat a 10. Fejezet előírásainak megfelelően kell eljuttatni a légiforgalmi szolgálati egységhez.

9.6.3 A meteorológiai információkat D-VOLMET vagy VOLMET adás segítségével kell adni, a regionális léginavigációs egyezmény rendelkezéseinek és a 11. Fejezet előírásainak megfelelően.

10. FEJEZET – INFORMÁCIÓK A LÉGIFORGALMI SZOLGÁLATOK, A KUTATÓ ÉS MENTŐ SZOLGÁLATOK, ÉS REPÜLÉSI TÁJÉKOZTATÓ SZOLGÁLATOK RÉSZÉRE

Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 9. Függelék tartalmazza.

10.1 Információk légiforgalmi szolgálati egységek részére

10.1.1 A meteorológiai hatóság jelöljön ki egy meteorológiai irodát, amely az egyes légiforgalmi szolgálati egységekkel kapcsolódik. A kapcsolódó meteorológiai irodának a légiforgalmi szolgálati egységgel való koordináció után, szolgáltatnia kell a legfrissebb meteorológiai információkat az egység részére, vagy intézkednie kell a friss információk biztosításáról, ahogyan az feladatainak ellátásához szükséges.

10.1.2 **Ajánlás** – *Repülőtéri irányító toronyhoz, vagy körzeti irányító egységhez rendelt meteorológiai iroda a repülőtéri meteorológiai iroda legyen.*

10.1.3 Repülési központhoz, vagy területi irányító központhoz rendelt meteorológiai iroda a meteorológiai megfigyelő iroda legyen.

10.1.4 **Ajánlás** – *Ahol helyi körülmények miatt célszerű valamely hozzárendelt meteorológiai iroda feladatait két vagy több meteorológiai iroda között megosztani, a felelősség megosztását a meteorológiai hatóságnak kell meghatároznia, az érintett ATS hatósággal folytatott konzultáció alapján.*

10.1.5 Bármely, a légiforgalmi szolgálati egység által kért meteorológiai információt, amely a légijárművek vészhelyzetével kapcsolatos, olyan gyorsan kell megadni, amennyire az lehetséges.

10.2 Információk a kutató-mentő szolgálati egységek részére

A regionális léginavigációs megállapodásnak megfelelően a meteorológiai hatóság által kijelölt meteorológiai irodák a kutató-mentő szolgálati egységeket ellátják az általuk kért információkkal a kölcsönös megegyezés alapján létrehozott formában. E célból a kijelölt meteorológiai állomásnak kapcsolatot kell tartani a kutató-mentő szolgálati egységgel a kutató-mentő művelet során.

10.3 Információk a repülési információs szolgálati egységek részére

A meteorológiai hatóságnak, az illetékes polgári repülési hatósággal koordinálva, biztosítania kell a releváns repülési információs szolgálati egységek ellátását aktuális meteorológiai információkkal feladataik ellátása érdekében.

11. FEJEZET – A KOMMUNIKÁCIÓVAL ÉS HASZNÁLATÁVAL SZEMBEN TÁMASZTOTT KÖVETELMÉNYEK

1. Megjegyzés. – Erre a fejezetre vonatkozó műszaki specifikációkat és részletes kritériumokat a 10. Függelék tartalmazza.

2. Megjegyzés – Elismert, hogy minden szerződő állam maga dönt a jelen fejezetben szereplő kommunikációs létesítmények megvalósítását illető saját belső szervezeti és kötelezettségi kérdésekben.

11.1 Kommunikációval szembeni követelmények

11.1.1 Megfelelő távközlési eszközöket kell biztosítani annak érdekében, hogy a repülőtéri meteorológiai irodák és szükség szerint a repülésmeteorológiai állomások továbbíthassák a megkívánt meteorológiai információkat az azokon a repülőtereken lévő légiforgalmi szolgálati egységeknek, melyekért ezek a hivatalok, illetve állomások felelősek, különös tekintettel az ezeket a repülőtereket kiszolgáló repülőtéri irányító tornyokra, bevezető irányító egységekre és repülési távközlési állomásokra.

Megjegyzés. – Repülési helyhezkötött szolgálat áramköreit üzemelési meteorológiai információk gyűjtésére és regionális és inter-regionális cseréjére, valamint a nemzetközi üzemelési meteorológiai adatbankokhoz való hozzáféréshez használják. Három, globális lefedést biztosító repülési helyhezkötött szolgálati műholdas elosztó rendszert használnak az üzemelési meteorológiai információk regionális és inter-regionális cseréjének támogatására. A műholdas elosztó rendszerekre vonatkozó előírásokat a 10. Annex, III. Kötet, I. Rész 10.1 és 10.2 pontja tartalmaz.

11.1.2 Megfelelő távközlési eszközöket kell biztosítani annak érdekében, hogy a meteorológiai figyelő irodák továbbíthassák a megkívánt meteorológiai információkat a légiforgalmi és mentő szolgálati egységek számára azon repülési információs régiókra, irányítói területekre, valamint kutatási és mentési régiókra vonatkozóan, melyekért ezek az irodák felelősek, különös tekintettel a repülési információs központokra, valamint a mentést koordináló központokra, és az ezekhez tartozó repülési távközlési állomásokra.

11.1.3 Megfelelő távközlési létesítményeket kell biztosítani annak érdekében, hogy a világ és a regionális területi előrejelző központok továbbíthassák a kívánt világterületi előrejelző rendszer anyagait a meteorológiai irodák, meteorológiai hatóságok és egyéb felhasználók számára.

11.1.4 A meteorológiai irodák, illetve szükség esetén a repülésmeteorológiai állomások és a repülőtéri irányítótornyok, vagy bevezető irányító egységek közötti távközlési eszközöknek lehetővé kell tenniük a közvetlen beszéd kommunikációt, a sebesség, amellyel a kommunikáció létrehozható, olyan legyen, hogy a kívánt pontok között a kapcsolat, rendes körülmények között, körülbelül 15 másodpercen belül létrehozható legyen.

11.1.5 **Ajánlás** –

A meteorológiai irodák és a repülési információs központok, területi irányító központok, mentést koordináló központok és repülési távközlési állomások közötti távközlési eszközök tegyék lehetővé a következőket:

a) a közvetlen beszéd kommunikációt, a sebesség, amellyel a kommunikációt létrehozzák, olyan legyen, hogy a kívánt ponttal való kapcsolat rendes körülmények között, körülbelül 15 másodpercen belül megteremthető legyen; és

b) nyomtatott formájú kommunikációt, ha a fogadó felek a rögzítést megkívánják; a közlemény továbbítási ideje ne haladja meg az 5 percet.

Megjegyzés – A 11.1.4 és a 11.1.5 pontokban szereplő „körülbelül 15 másodperc" a manuális távbeszélő központon keresztüli telefon kommunikációra, az „5 perc" pedig a továbbküldést is magában foglaló, nyomtatott kommunikáció küldésre vonatkozik.

11.1.6 **Ajánlás** – *A 11.1.4 és a 11.1.5 pontoknak megfelelő távközlési eszközöket, ahol és amikor szükséges, ki kell egészíteni vizuális vagy audio kommunikáció egyéb formáival, például zártláncú televízióval vagy külön információ feldolgozó rendszerekkel.*

11.1.7 **Ajánlás** – *A meteorológiai hatóság és az üzemeltetők közötti megállapodás szerint rendelkezni kell arról, hogy lehetővé tegyék az üzemeltetők számára megfelelő távközlési eszközök létesítését, a repülőtéri meteorológiai irodáktól, illetve más megfelelő forrásoktól történő meteorológiai információk beszerzésére.*

11.1.8 Megfelelő távközlési eszközöknek kell rendelkezésre állni ahhoz, hogy a meteorológiai irodák kicserélhessék az üzemeltetési meteorológiai információkat más meteorológiai irodákkal.

11.1.9 **Ajánlás** – *Üzemeltetési meteorológiai információk cseréjére használt távközlési eszköz a repülési állandóhelyű szolgálat legyen.*

11.2 Repülési állandó helyű szolgálati kommunikációk felhasználása – alfanumerikus formátumú meteorológiai bulletinek

A légiforgalmi állandó helyű szolgálaton keresztül továbbított üzemeltetési meteorológiai bulletineket a megfelelő meteorológiai irodának vagy meteorológiai állomásnak kell feladnia.

Megjegyzés. – A légiforgalmi állandó helyű szolgálaton keresztüli továbbításra engedélyezett üzemeltetési meteorológiai infomációkat tartalmazó meteorológiai bulletinek felsorolása a 10. Annex , II. Kötet 4. Fejezetében található a megfelelő prioritással és prioritás jelölővel együtt.

11.3 A repülési helyhezkötött szolgálati kommunikáció felhasználása – a világ területi előrejelző rendszer anyagai

11.3.1 **Ajánlás** – *A világterületi előrejelző rendszer adatait digitális formában bináris adat kommunikációs technika alkalmazásával kell továbbítani. Az anyagok szétosztásának módszere és az erre használt kommunikációs csatornák feleljenek meg a regionális léginavigációs egyezményben meghatározottaknak.*

11.4 A repülési mozgószolgálati kommunikáció felhasználása

A légijárműveknek és a légijárművek által továbbított meteorológiai információk tartalma és formája legyen konzisztens a jelen Annex előírásaival.

11.5 Repülési adatkapcsolat szolgáltatás felhasználása – D-VOLMET tartalma

11.5.1 A D-VOLMET tartalmazzon aktuális METAR-t és SPECI-t trend előrejelzésekkel együtt, ahol rendelkezésre áll, TAF és SIGMET közleményeket, különleges légi-jelentéseket, amelyeket SIGMET nem fed le, és ahol rendelkezésre áll, AIRMET közleményeket.

Megjegyzés – METAR és SPECI kód formájú jelentések szolgáltatásának követelményei kielégíthetők az adatkapcsolati repülési információ szolgáltatás (D-FIS) alkalmazásával, amely az „Adatkapcsolat-repülési rendszeres időjárás jelentés (D-METAR) szolgáltatás" címet viseli; a TAF szolgáltatásának követelménye kielégíthető a D-FIS alkalmazásával, amely az „Adatkapcsolati-repülőtéri előrejelzés (D-TAF) szolgáltatás" címet viseli, és a SIGMET és AIRMET közlemények szolgáltatásának követelménye kielégíthető a D-FIS alkalmazásával, amely az „Adatkapcsolati-SIGMET szolgáltatás" címet viseli. Ezekről az adatkapcsolatokról részletes specifikáció a Manual of Air Traffic Services Data Link Applications (Légiforgalmi szolgálat adatkapcsolat alkalmazási kézikönyv) *(Doc. 9694) kiadványban található.*

11.6 A repülési rádióadási szolgálat felhasználása – VOLMET rádióadások tartalma

11.6.1 Az általában nagyon nagy frekvenciás (VHF), folyamatos VOLMET rádióadásoknak aktuális METAR-t és SPECI-t kell tartalmazniuk, trend előrejelzésekkel együtt, ahol rendelkezésre áll.

11.6.2 Az általában nagyfrekvenciás (HF) sugárzott rendszeres VOLMET adásoknak aktuális METAR-t és SPECI-t kell tartalmazniuk, a rendelkezésre álló trend előrejelzésekkel együtt, ahol rendelkezésre áll, valamint ha a regionális léginavigációs egyezmény előírja, TAF-t és SIGMET-et.

II. RÉSZ

FÜGGELÉKEK ÉS MELLÉKLETEK

1. FÜGGELÉK. REPÜLÉSI DOKUMENTÁCIÓ – TÉRKÉP MINTÁK ÉS FORMAMINTÁK

(lásd jelen Annex 9.Fejezet)

A MODELL	Repülőtéri előrejelzések
	1. példa – Táblázatos forma
	2. példa – TAF
TA MODELL	Útvonali körülmények táblázatos előrejelzése
	1. példa – Alacsony szint
	2. példa – Közepes szint
TB MODELL	Magassági szél és magaslégköri hőmérséklet táblázatos előrejelzése
	Példa – Pont helyzetek
IS MODELL	Magassági szél és hőmérséklet térkép szabvány izobár felületre
	1. példa – Nyilak, tollak és zászlók (Merkátor vetület)
	2. példa – Nyilak, tollak és zászlók (Polár sztereografikus vetület)
SWH MODELL	Szignifikáns időjárási térkép (magas szint)
	1. példa – Merkátor vetület
	2. példa – Polár sztereografikus vetület
	3. példa – Polár sztereografikus vetület, (amely a jet stream függőleges kiterjedését és a keresztező jet stream leképezéseket mutatja)
	Megjegyzés. – A 8. Függelék 4.3.1.1 m) pontjának megfelelően, vulkanikus hamura vonatkozó kiegészítő információkat a térképek oldalán kell elhelyezni.
SWM MODELL	Szignifikáns időjárási térkép (közepes szint)
SWL MODELL	Szignifikáns időjárási térkép (alacsony szint)
	1. példa
	2. példa
VAG MODELL	Vulkanikus hamu tájékoztató információ grafikus formában
SN MODELL	A repülési dokumentációnál használt jelöléseket tartalmazó ív

A modell. Repülőtéri előrejelzések.
1. Példa – Táblázatos forma

KIADTA				METEOROLÓGIAI IRODA				DÁTUM		IDŐ (UTC)
A REPÜLŐTÉR TENGERSZINT FELETTI MAGASSÁGÁTÓL MÉRT MAGASSÁGOK										
Repülőtér	Kiadás dátuma és időpontja	Érvényes-ségi időszak (UTC)	A változás típusa és időpontja	Talajszél átlagos iránya (földrajzi fokokban), átlagos szélsebesség, maximális szélsebesség	Domináns látás	Időjárás	Felhő		Előrejelzett hőmérséklet (Celsius fokokban)	Megjegyzések
							Legalacsonyabb réteg mennyisége, alapjának magassága (láb) és fajtája (ha CB)	Magasabb rétegek mennyisége, alapjának magassága (láb) és fajtája (ha CB)		
MOMBASA	150350	06–06	TEMPO 09–12	150/15 KT VRB/20 KT MAX 30 KT	10 KM 200 M	HVY SHRA	FEW 1500 SCT 1000 CB	BKN 1500	MAX 30 AT 1200Z MIN 20 AT 0400Z	
NAIROBI	142140	03–15	PROB 40 TEMPO 03–05 BECMG 05–06	060/05 KT VRB/03 KT 060/10 KT	2 000 M 500 M 10 KM	FG NSW	OVC 0200 SCT 1500		N/A	Kivonatolva a TAF 00-24-ből
KHARTOUM	150400	12–18	PROB 30 TEMPO 12–15	030/05 KT 030/20 KT	10 KM 100 M	MOD BLSA	SCT 2500		MAX 30 AT 1300 Z	Kivonatolva a TAF 06-06-ból
CAIRO	150345	06–06		060/10 KT		CAVOK			MAX 25 AT 1400 Z MIN 06 AT 0500	
ROME	151120	12–06	FM 1400 FM 1800	270/10 KT 270/10 KT 330/15 KT	2 000 M 5 000 M 10 KM	HVY DZRA MOD RA NSW	BKN 500 BKN 1200 BKN 2500	OVC 1500 OVC 2000	MAX 06 AT 1500 Z MIN MS 02 AT 0400 Z	TAF 06-06 módosítva

A modell. Repülőtéri előrejelzések.

2. Példa – TAF

KIADTA METEOROLÓGIAI IRODA (DÁTUM, IDŐ UTC)

Intenzitás

“-” (gyenge); nincs jelölés (mérsékelt); “+” (heves vagy jól kifejlett por(homok forgatagok és tölcsér felhők esetében) bizonyos jelenségek előrejelzett intenzitásának jelölésére használják.

Deszkriptorok

MI – talajközeli	DR – alacsony fúvás	SH – zápor(ok)	FZ – ónos (túlhűlt)
BC – foltok	BL – fúvás	TS – zivatar	
PR – részbeni			

Előrejelzett időjárás rövidítések

DZ – szitálás	BR – párásság	PO – por/homok forgatag
RA – eső	FG – köd	SQ – szélroham
SN – hó	FU – füst	FC – tölcsér felhő(k)
SG – hódara	VA – vulkánikus hamu	SS – homokvihar
IC – jégkristályok (gyémántpor)	DU – nagykiterjedésű por	DS – porvihar
PL – jégmagok	SA – homok	
GR – jég	HZ – homály	
GS – kis jég és/vagy hódara		

Példák

+ SHRA – heves záporeső	TSSN – mérsékelt zivatar hóval
FZDZ – mérsékelt ónos szitálás	SNRA – mérsékelt havazás és eső
+ TSSNGR – heves zivatar hóval és jéggel	

Kiválasztott ICAO helység-jelölés

CYUL Montreal Intl/Dorval	KJFK New York/John F. Kennedy Intl	RJTT Tokyo Intl
EDDF Frankfurt/Main	LFPG Paris/Charles de Gaulle	SBGL Rio de Janeiro Intl/Galeao
EGLL London/Heathrow	NZAA Auckland Intl	YSSY Sydney/Kingsford Smith Intl
HKNA Nairobi/Jomo Kenyatta Intl	OBBI Bahrain Intl	ZBAA Beijing/Capital

RJTT	122130Z	130024 VRB03KT 4000 SCT025 BECMG 0305 9999 T30/12Z T20/06Z =
EGLL	090845Z	091212 27010KT 9999 SCT020 BKN080 FM2100 30015KT 3000 FZDZ BKN006 OVC060 FM0000 30015KT 0800 +RASN BKN004 OVC060 BECMG 0305 33020KT 5000 NSW SCT020 BKN100 BECMG 0709 9999 =
LFPG	160910Z	161212 10008KT CAVOK FM2000 VRB03KT 8000 SCT012 FM0400 VRB03KT 0800 FG FM0900 10008KT CAVOK =
OBBI	030300Z	030624 03010KT 9999 SCT010 PROB30 TEMPO 0915 03030KT 0500 BLSA FM1800 VRB02KT 8000 SCT020 =
HKNA	280215Z	280624 06010KT 9999 SCT025 TEMPO 1216 3000 SHRA BKN015 PROB40 TEMPO 1416 VRB20G30KT +TSRA SCT010CB BKN015 =

TA modell. Útvonali körülmények táblázatos előrejelzése

1. példa – Alacsony szint

Dátum	**Közepes tengerszint feletti magasságok lábban**	
Útvonal BIGGIN-HILL **-ből** AMSTERDAM **-ba** AIRWAYS **keresztül**		
Érvényes **1500** UTC és **1700** UTC közötti indulásra és **1700** UTC és **2100** UtC közötti érkezésre		
A meteorológiai helyzet különleges jellemzői: Aktív hideg front Humbertől a Csatorna szigetekig 1000 UTC-kor, amely keletre mozog 20 csomóval és észak/dél keresztező nyomvonaláig körülbelül Amszterdamtól 40 mérföldre 1900 UTC-ig		
Zóna	LONDON 02° E AMSTERDAM	
Magassági szelek (Földrajzi fok és csomó) 10000 láb Hőmérsékletek 5000 láb (Celsius fok) 2000 láb	280/30 MS 12 290/25 MS 03 290/20 PS 03	250/45 MS 09 240/35 00 230/30 PS 06
Felhő	SCT CU XXX 1500 BKN SC 5000 2500 BKN AC LYR XXX 800	ISOL EMBD CB XXX 1000 BKN St 800 500 OVC SC AS LYR XXX 2000
Talajmenti látás	1500 M záporokban	4000 M mérsékelt esőben és 1000 M zivatarokban
Szignifikáns időjárás	Mérsékelt OCNL .erős jegesedés 10000 3500	ISOL zivatarok Mérsékelt OCNL erős jegesedés XXX 5000 Mérsékelt OCNL, erős turbulencia a frontális zónában XXX 1000
0°C izoterma magasság	3500	5000
Előrejelzett legalacsonyabb QNH (pHa)	1008	1004

Kiadta: …………………. UTC-kor …………………-én ……………… előrejelző

Megjegyzések:

1. A pozitív és negatív értékeket a “PS” (plusz) és “MS” (mínusz) előtagokkal jelölik.

2 Amikor az előrejelzésben egy olyan egyetlen számszerű értéke van megadva, azt egy értéktartomány legvalószínűbb középértékének kell tekinteni, amelyet az elem az előrejelzés időtartama alatt felvehet. Rövidítések SKC - O okta, FEW - 1-2 okta, SCT - 3-4 okta, BKN - 5-7 okta, OVC - 8 okta, LYR - rétegeződött, LOC - helyi, ISOL - izolált, OCNL - eseti, FRQ - gyakori, EMBD - beágyazódott.

TA modell. Útvonali körülmények táblázatos előrejelzése

2. példa – Közepes/magas szint

Dátum	Magasságok nyomásmagasságban, 100 lábakban	
Útvonal **BIGGIN**-ből **AMSTERDAM**-ba **AIRWAYS** keresztül		
Érvényes **1500** UTC és **1700** UTC közötti indulásra és **1700** UTC és **2100** UTC közötti érkezésre		
A meteorológiai helyzet különleges sajátosságai (felszíni központok és frontok): Aktív hideg front Humbertől a Csatorna szigetekig 1000 UTC-kor, amely keletre mozog 20 csomóval az észak/dél keresztező nyomvonalig, körülbelül Amszterdamtól 40 mérföldre 1900 UTC-ig		
Zóna	LONDON 02° E AMSTERDAM	
Magassági szél (valódi fok és csomó) FL 240 Hőmérséklet FL 180 (Celsius fok) FL 100	 260/40 MS 40 270/35 MS 26 280/30 MS 12	 240/60 MS 36 240/50 MS 24 250/45 MS 09
Szignifikáns időjárás és a hozzátartozó felhő	Mérsékelt turbulencia 180 XXX	ISOL zivatarok mérsékelttől erősig jegesedés és turbulencia 240 XXX
*Tropopauza magassága	–	–
*Jet stream	–	–

*A tervezett utazó magasság felett, ha nincs meghatározva

Kiadta: …………………. UTC-kor …………………-én ……………… előrejelző

Megjegyzések: 1. A nyomásmagasság a standard atmoszférában 1013,2 hPA nyomásnak megfelelő szint felettimagasság lábban kifejezve.

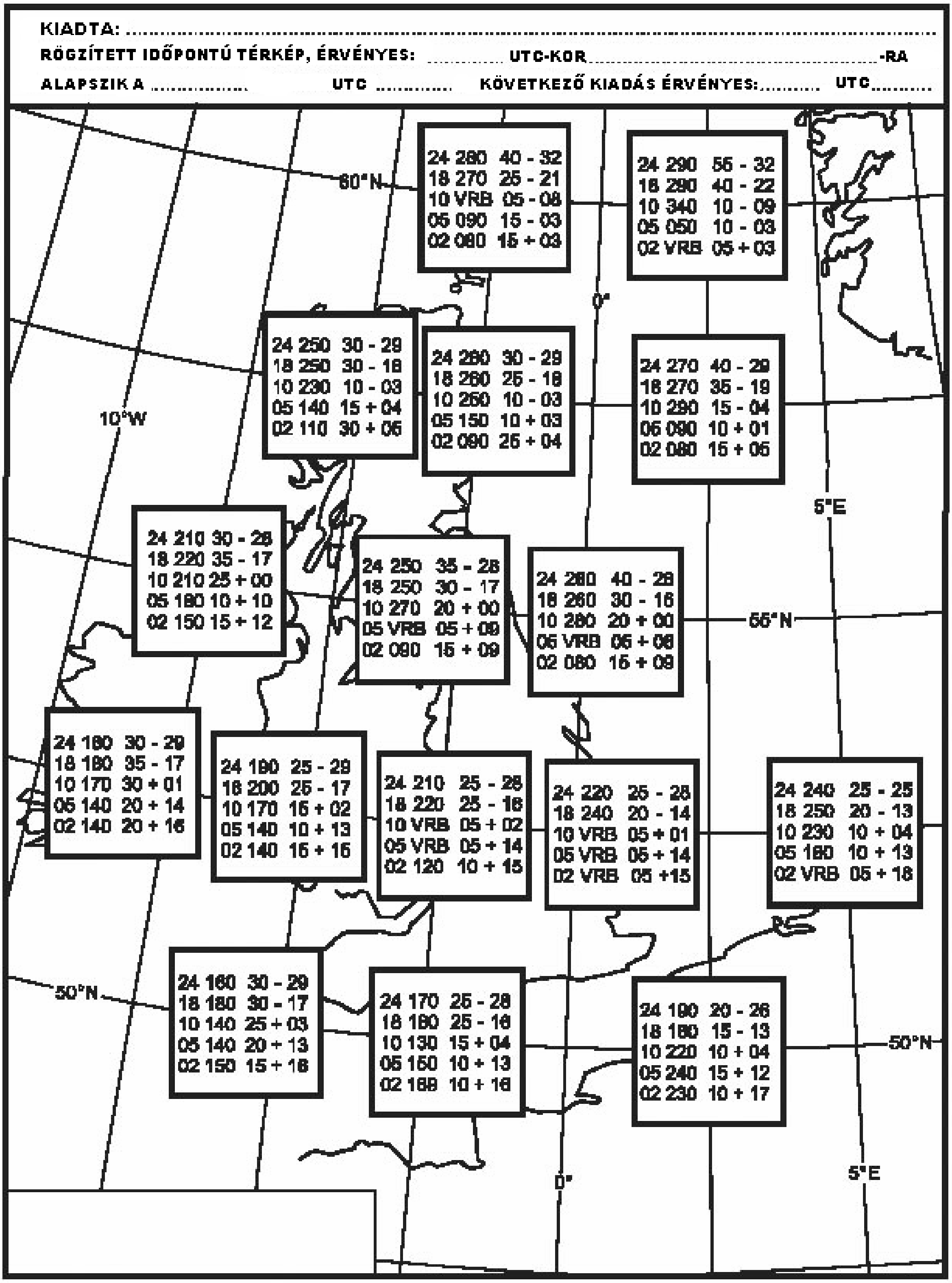
2. Pozitív és negatív értékeket a “PS” (plusz) és “MS” (mínusz) előtagok jelölik.

3. Csak szignifikáns időjáráshoz tartozó felhő van feltüntetve. Alacsony stratusz és köd, amikor várhatók, a terminál területekre a megfelelő repülőtéri előrejelzésekben vannak feltüntetve.

4. Amikor az előrejelzésben egy elem egyetlen számszerű értéke van megadva, azt egy értéktartomány legvalószínűbb középértékének kell tekinteni, amelyet az elem az előrejelzés időtartama alatt felvehet.

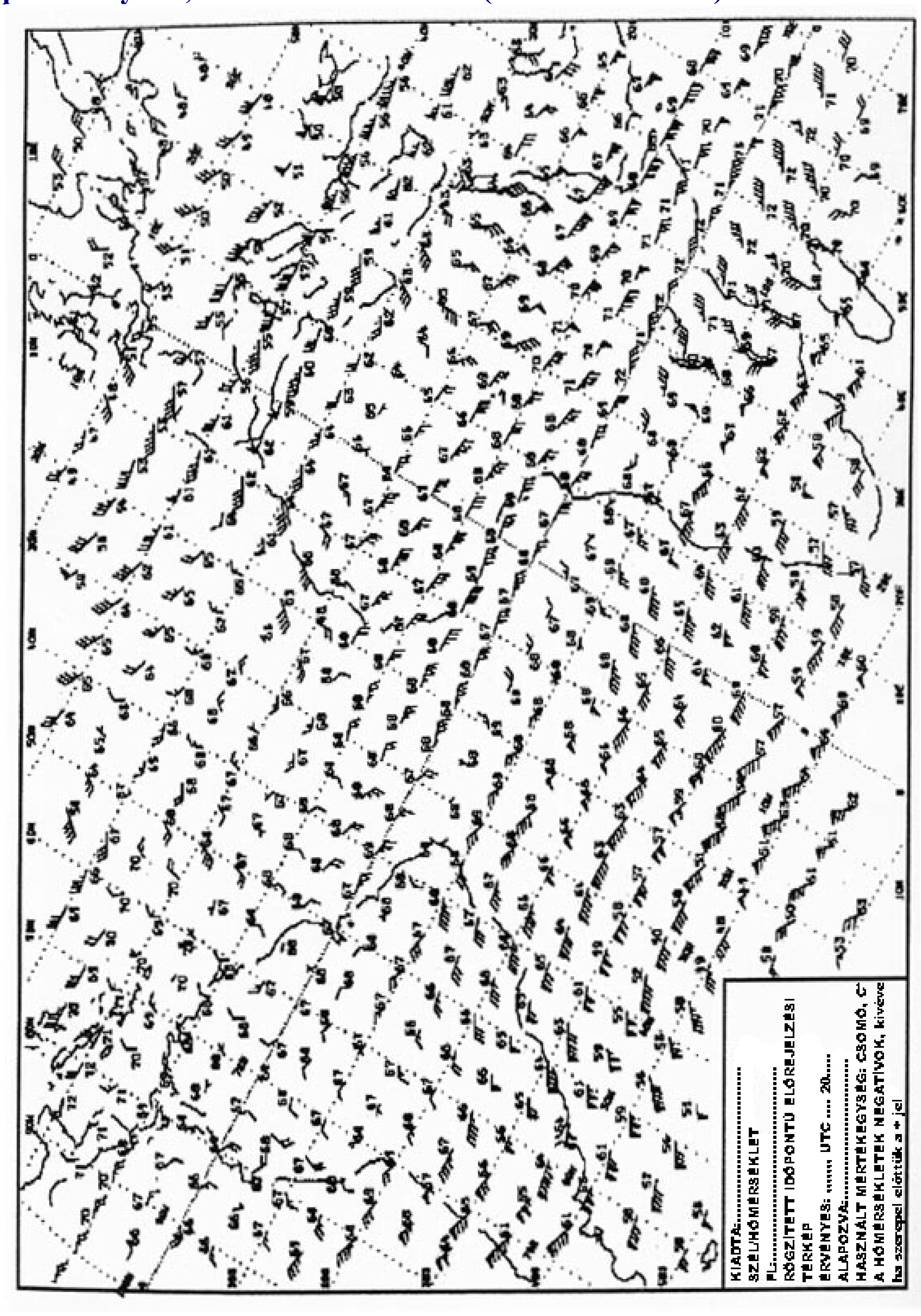
Rövidítések: SKC - O okta, FEW - 1-2 okta, SCT - 3-4 okta, BKN - 5-7 okta, OVC - 8 okta, LYR - rétegeződött, LOC - helyi, ISOL - izolált, OCNL - esetenkénti, FRQ - gyakori, EMBD - beágyazódott.

TB modell. Magassági szél és magaslégköri levegő hőmérséklet. Példa – Pont helyek

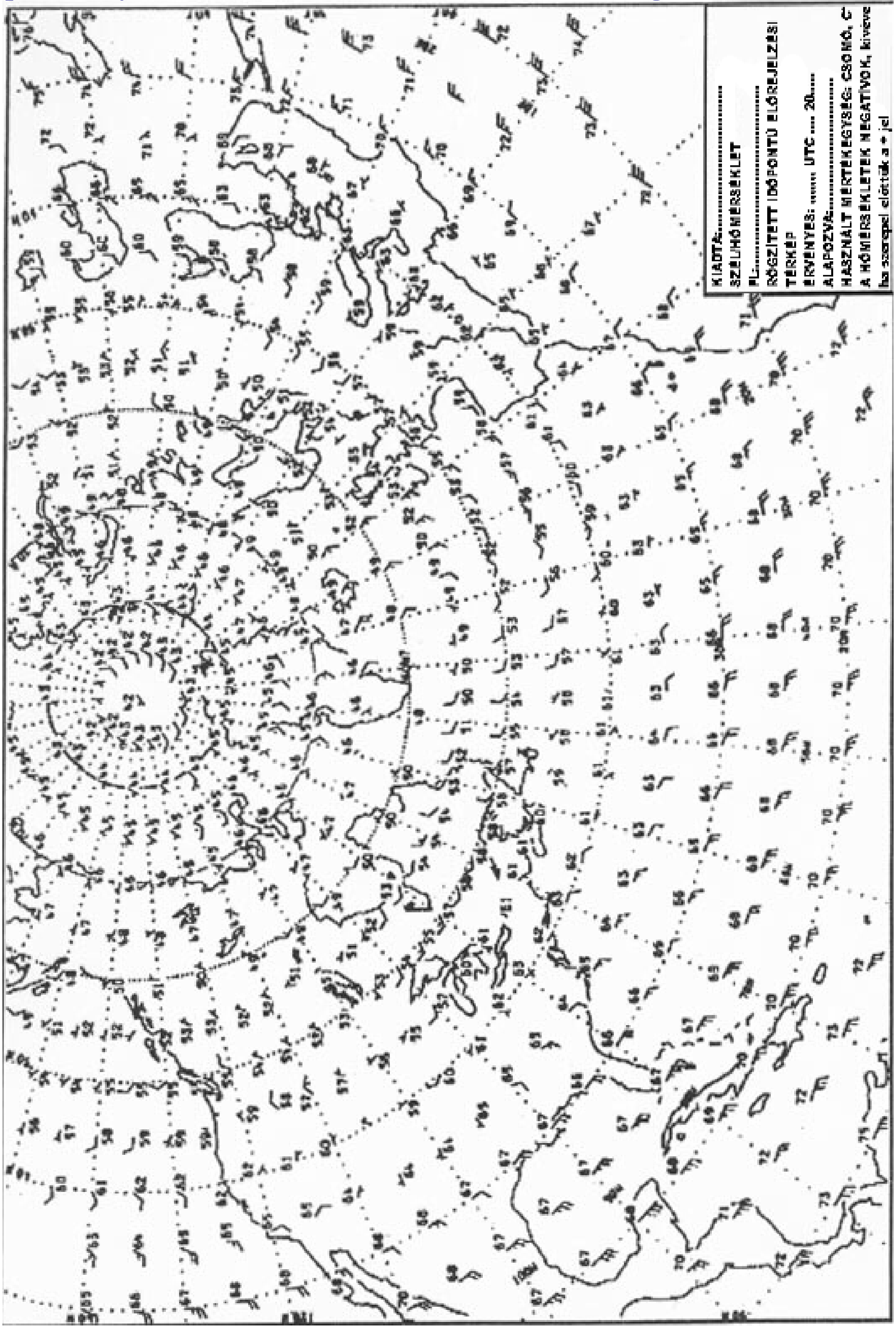


A vastagkeretű négyzetek az általuk takart földrajzi hosszúság/szélesség vonalak metszéspontjainak megfelelő helyekre vonatkozó szél irányának valódi szöge és csomóban kifejezett sebessége; a hőmérsékletek Celsius fokokban, a magasságok a közepes tengerszint felettiek (ezer lábban kifejezve).

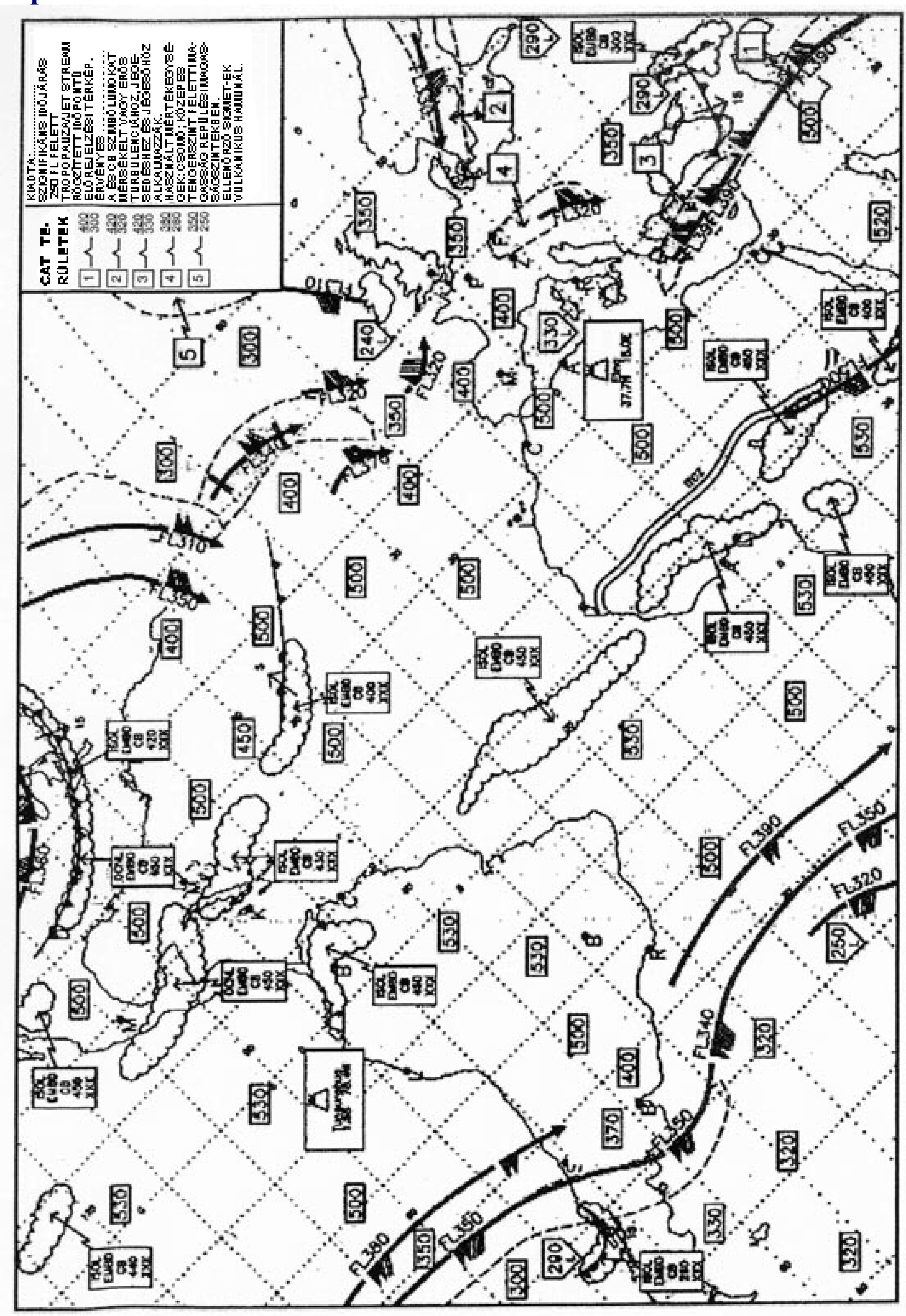
IS modell. Magassági szél és hőmérséklet térkép izobár felületre.
1. példa - Nyilak, tollak és zászlócskák (Merkátor vetület)



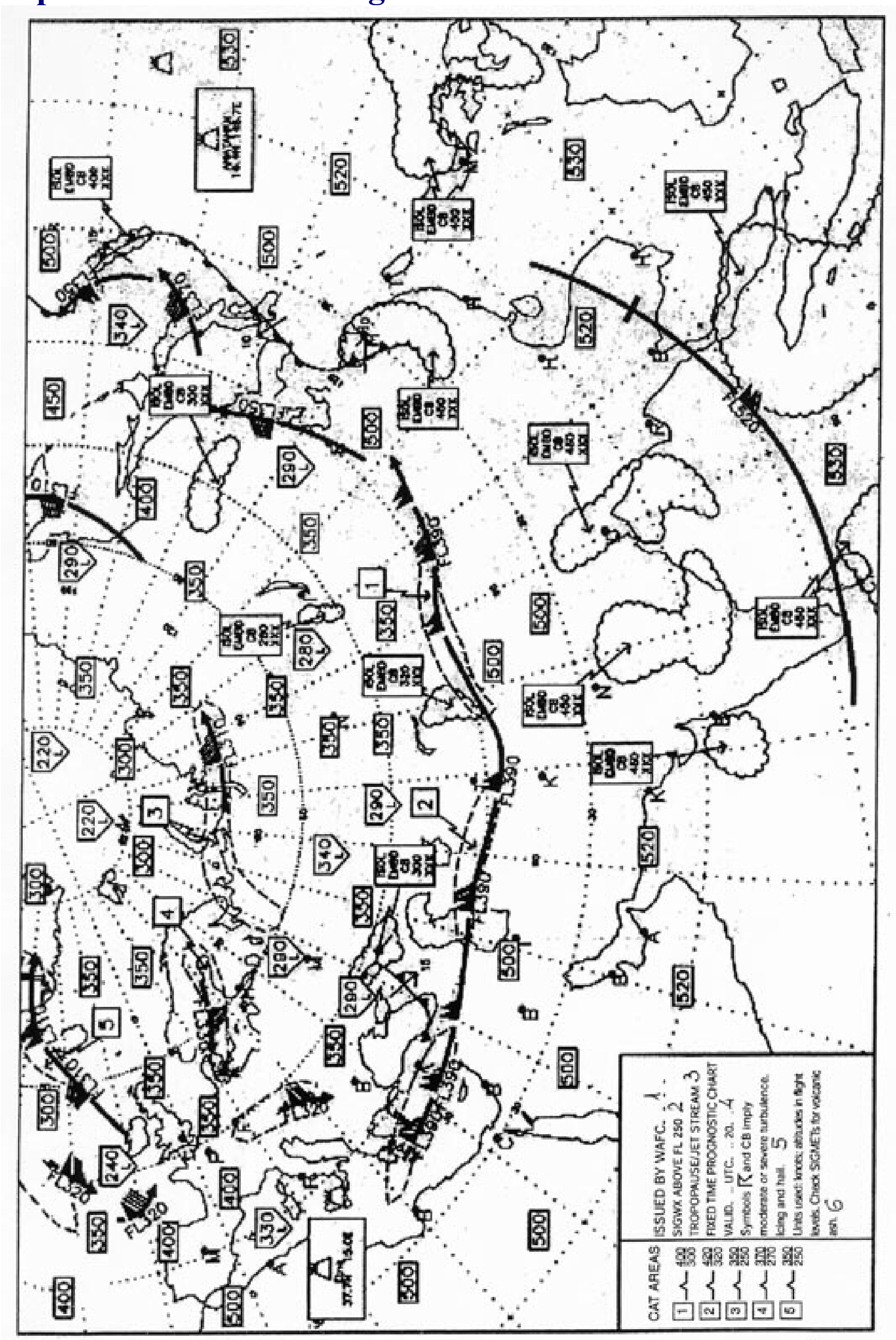
IS modell. Magassági szél és hőmérséklet térkép standard izobár felületre.
2. példa - Nyilak, tollak és zászlócskák (Poláris sztereografikus vetület)



SWH modell. Szignifikáns időjárási térkép (nagy magasság)
1. példa - Merkátor vetület

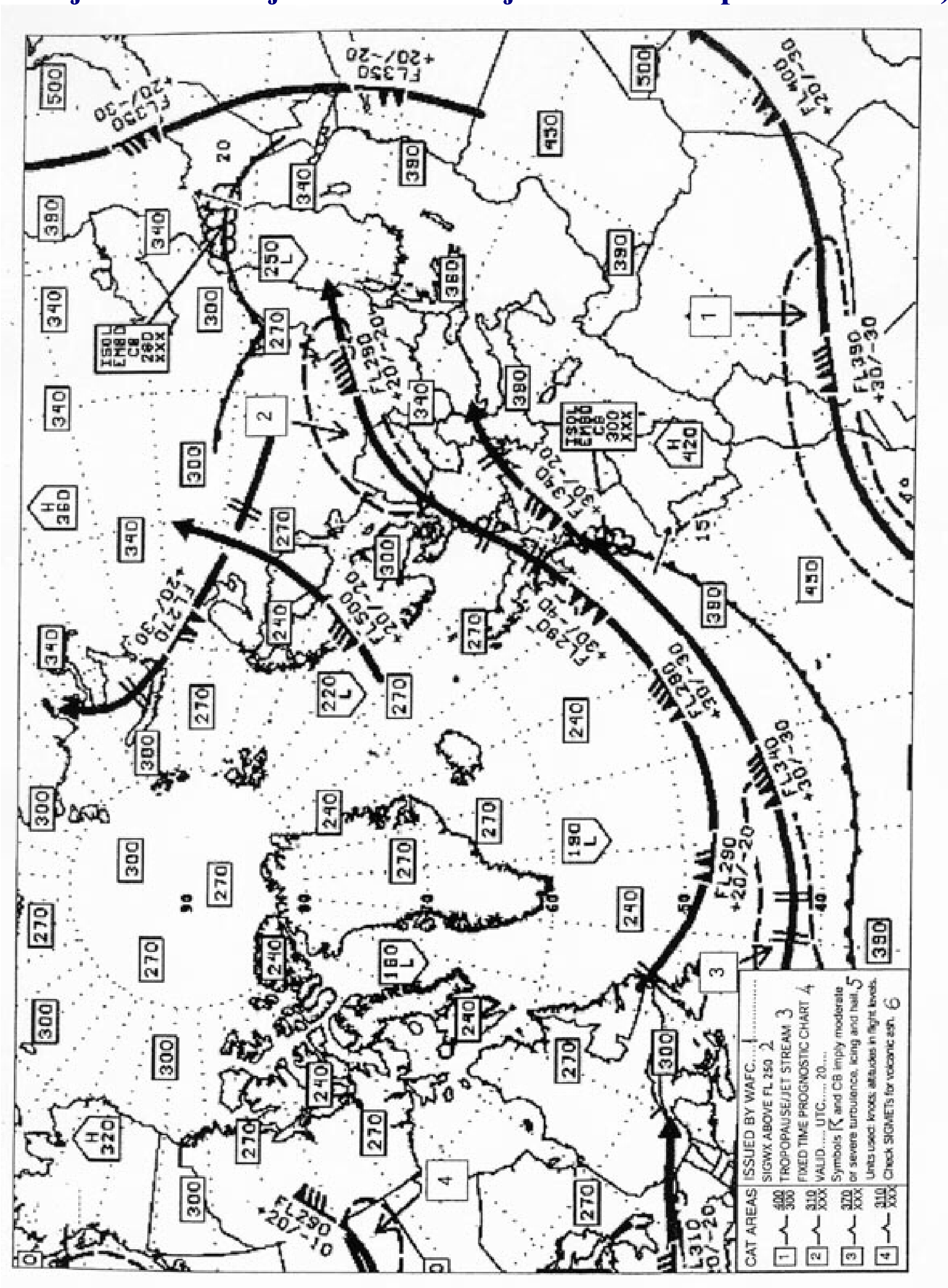


SWH modell. Szignifikáns időjárás térkép (nagy magasság)
2. példa - Poláris sztereografikus vetület



Ábra szövegek
1 Kiadta
2 Szignifikáns időjárás 250-es repülési magasságszint felett
3 Tropopauza/jet-stream
4 Rögzített időpontú előrejelzési térkép. Érvényes …………………….
5 A és CB szimbólumokat mérsékelt vagy erős turbulenciához, jegesedéshez és jégesőhöz alkalmazzák.
6 Használt mértékegységek: csomó; közepes tengerszint feletti magasság repülési magasságszintekben. Ellenőrző SIGMET vulkanikus hamunál.

SWH modell. Szignifikáns időjárás térkép (magas szint). 3. példa. Poláris sztereografikus vetület, (amely a jet stream függőleges kiterjedését mutatja és keresztező jet stream leképzéseket mutat)



Ábra szövegek

1 Kiadta

2 Szignifikáns időjárás 250-es repülési magasságszint felett

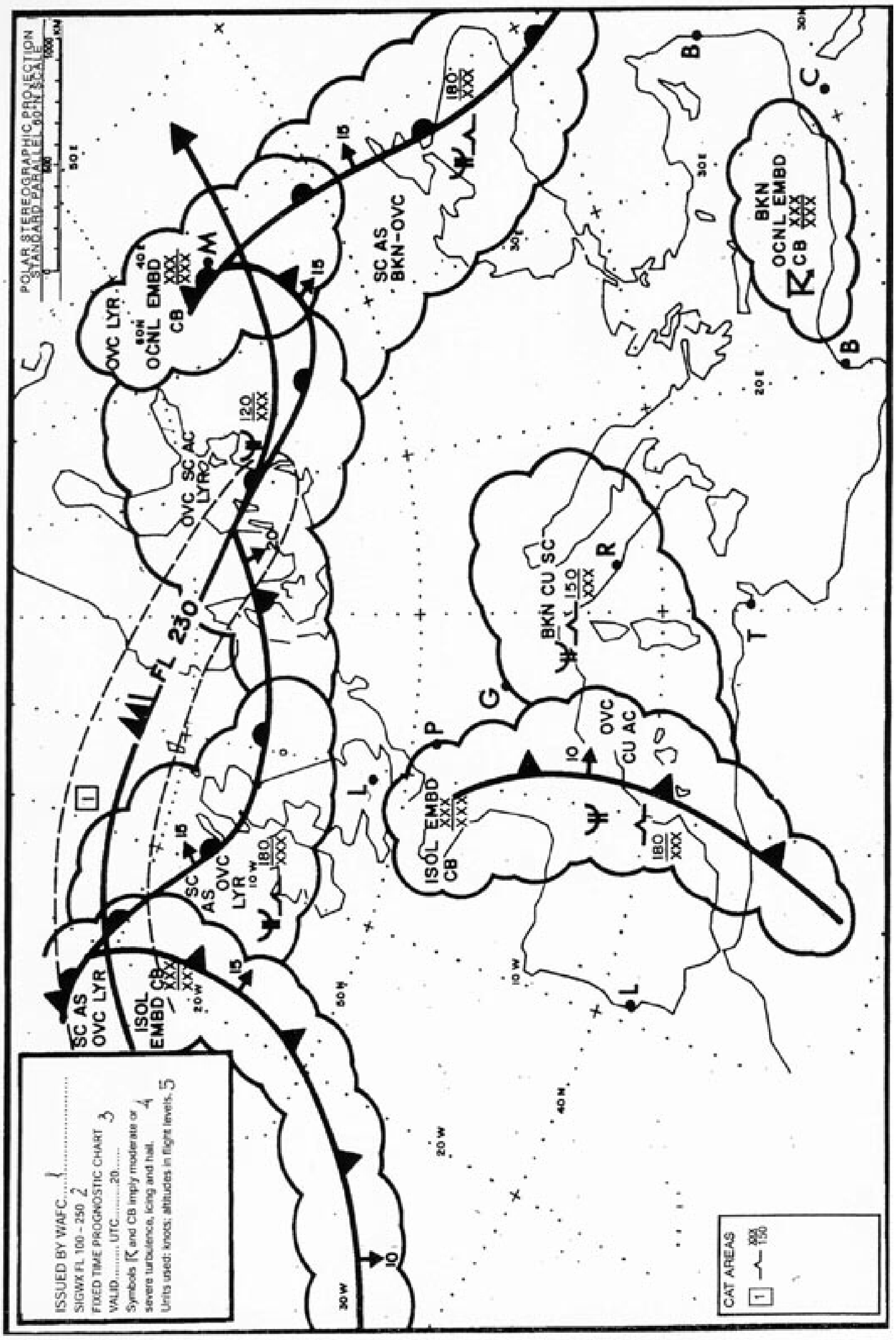
3 Tropopauza/jet-stream

4 Rögzített időpontú előrejelzési térkép. Érvényes …………………….

5 A és CB szimbólumokat mérsékelt vagy erős turbulenciához, jegesedéshez és jégesőhöz alkalmazzák.

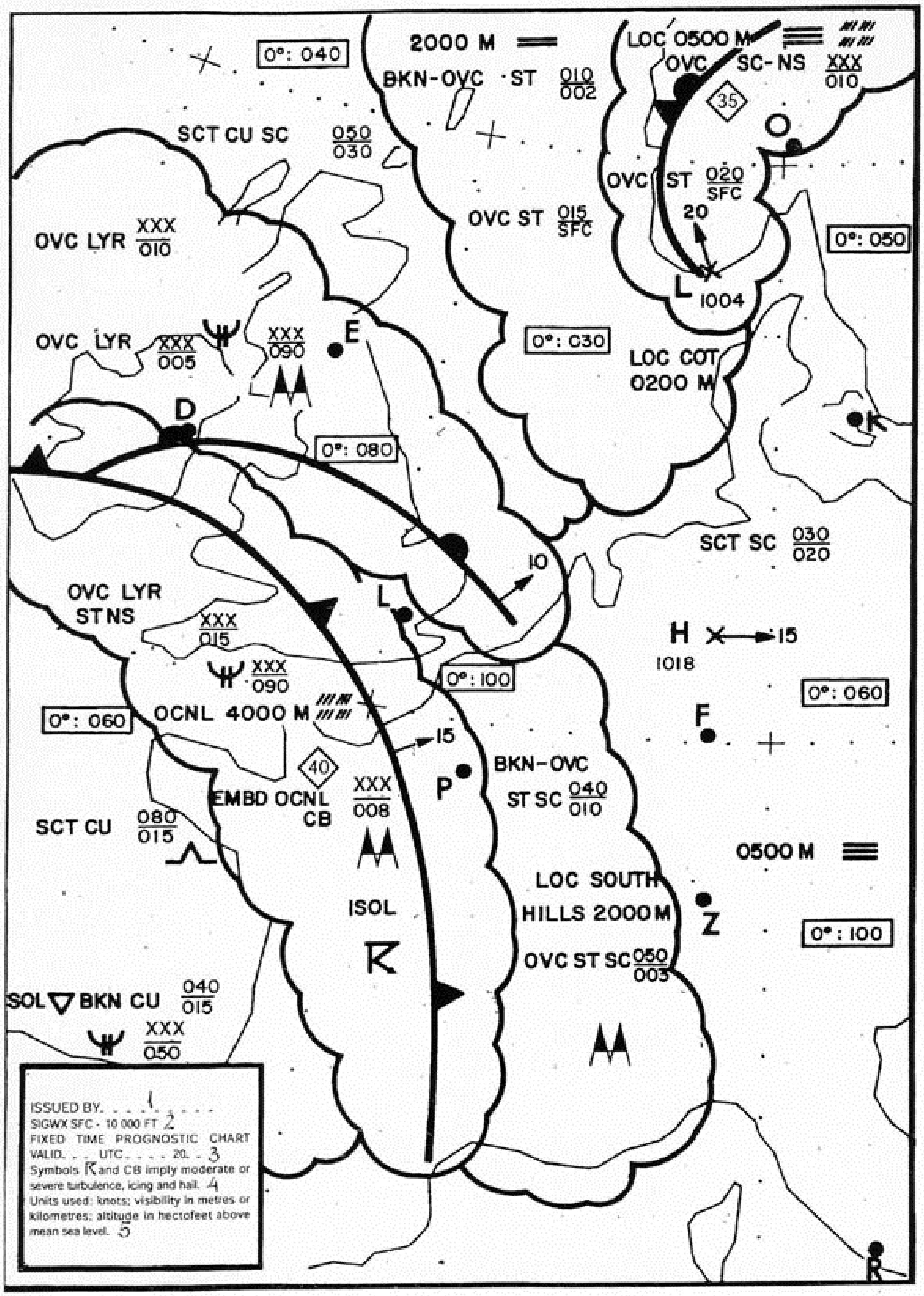
6 Használt mértékegységek: csomó; közepes tengerszint feletti magasság repülési magasságszintekben. Ellenőrző SIGMET vulkanikus hamunál.

SWM modell. Szignifikáns időjárási térkép (közepes magasság)



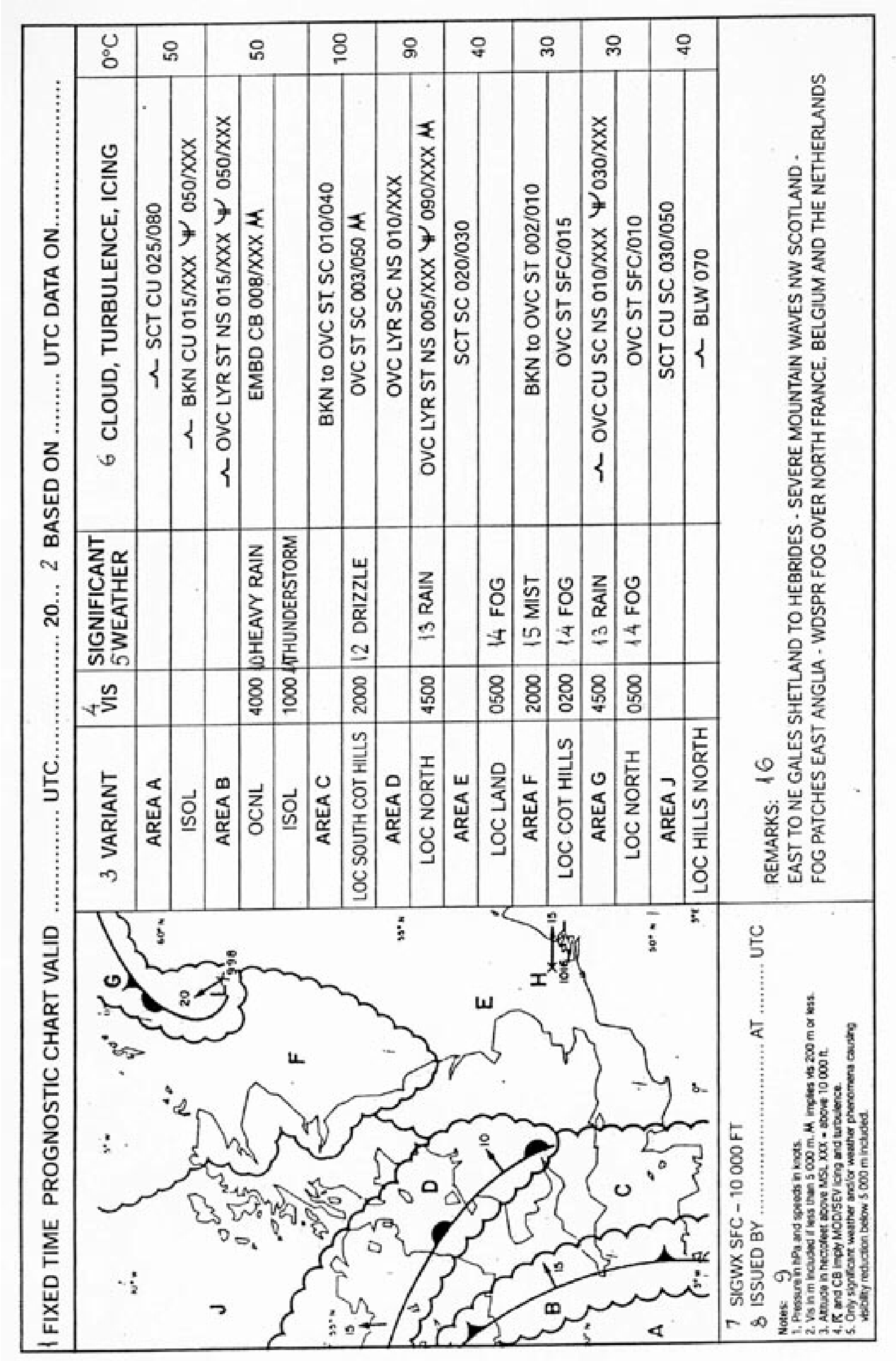
Ábra szövegek
1 Kiadta
2 Szignifikáns időjárás
3 100-250 repülési magasságszintek
4 Rögzített időpontú előrejelzési térkép
5 Érvényes ……………….
6 A és CB szimbólumokat mérsékelt vagy erős turbulenciához, jegesedéshez és jégesőhöz használják. Használt mértékegységek: csomó; közepes tengerszint feletti repülési magasságszintekben.

SWL modell. Szignifikáns időjárási térkép (kismagasság). 1. példa



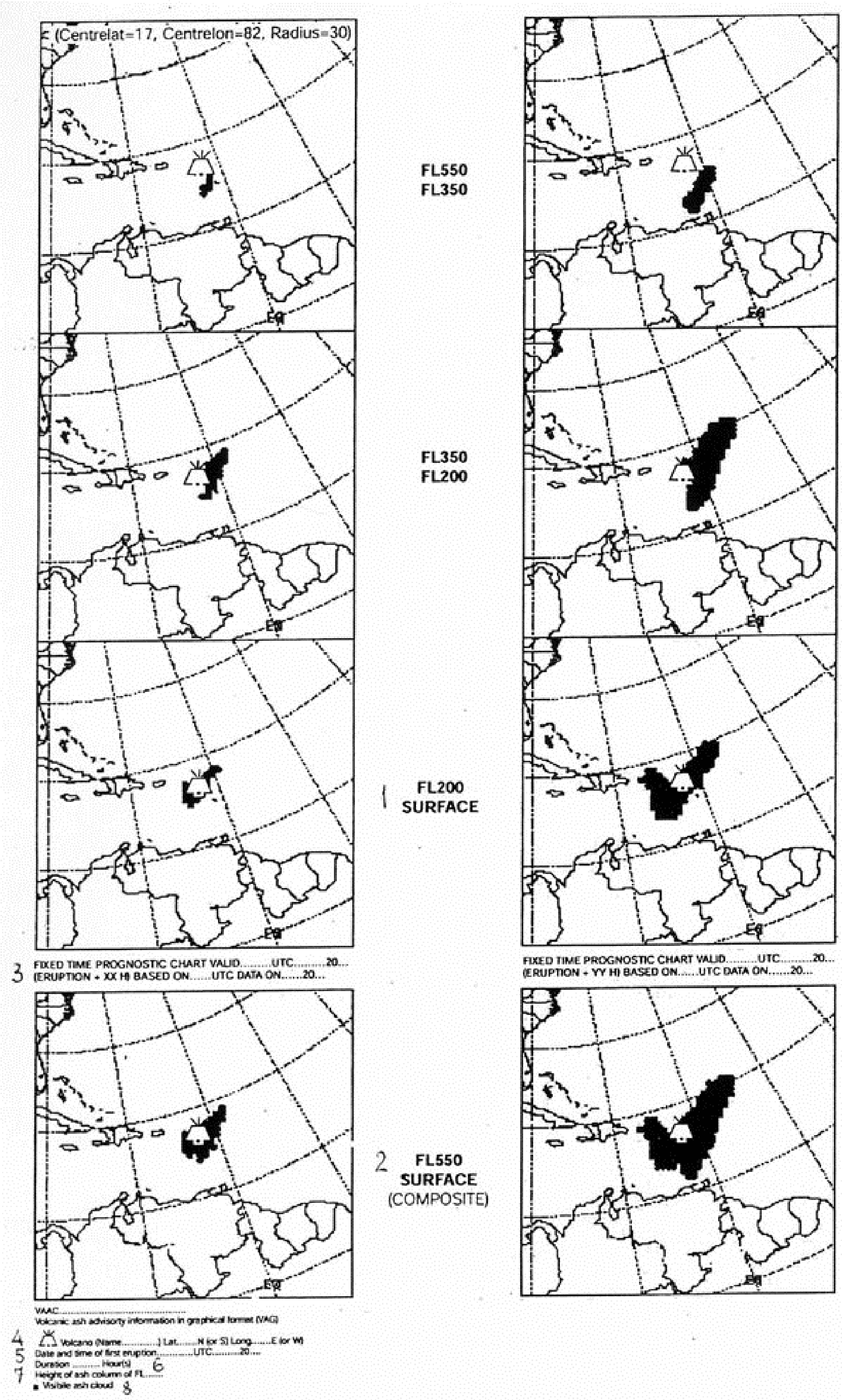
1. példa
Ábra szövegek
1 Kiadta
2 Szignifikáns időjárás
3 Rögzített időpontú előrejelzési térkép. Érvényes ……………..
4 és CB szimbólumokat mérsékelt vagy erős turbulenciához, jegesedéshez és jégesőhöz használják.
5 Használt mértékegységek: csomó; látás méterben vagy kilométerben; magasság hektolábban a közepes tengerszint felett.

SWL modell. Szignifikáns időjárás térkép alacsony szint) 2. példa



Ábra szövegek
1 Rögzített időpontú térkép, érvényes …………………..
2 Alapszik…………… UTC ………………. DÁTUM ………………..
3 Változó
4 Látás
5 Szignifikáns időjárás
6 Felhő, turbulencia, jegesedés
7 Szignifikáns időjárás 10000 láb alatt
8 Kiadta ………………….
9 Megjegyzés:
1. Nyomás hPa-ban és a sebesség csomóban
2. Látás m-ben vagy km-ben. Domb köd hatására a látás 2OO M vagy kevesebb
3. Magasság hektolábban a közepes tengerszint felett. XXX = 10000 láb felett
4. R és CB mérsékelt/erős jegesedésnél és turbulenciánál alkalmazva
5. Csak szignifikáns időjárás és/vagy olyan időjárási jelenséget tartalmaz, amely látás csökkenést okoz 5000 m alatt.
10 Heves eső
11 Zivatar
12 Szemerkélés
13 Eső
14 Köd
15 Homály
16 Megjegyzés: Kelettől ÉK-ig széllökésvonal Shetlandtól a Hebridekig - Erős hegyi hullámok ÉNY Skócia - Ködfoltok Kelet Anglia - WDSPR köd észak Franciaország, Belgium és Hollandia felett.

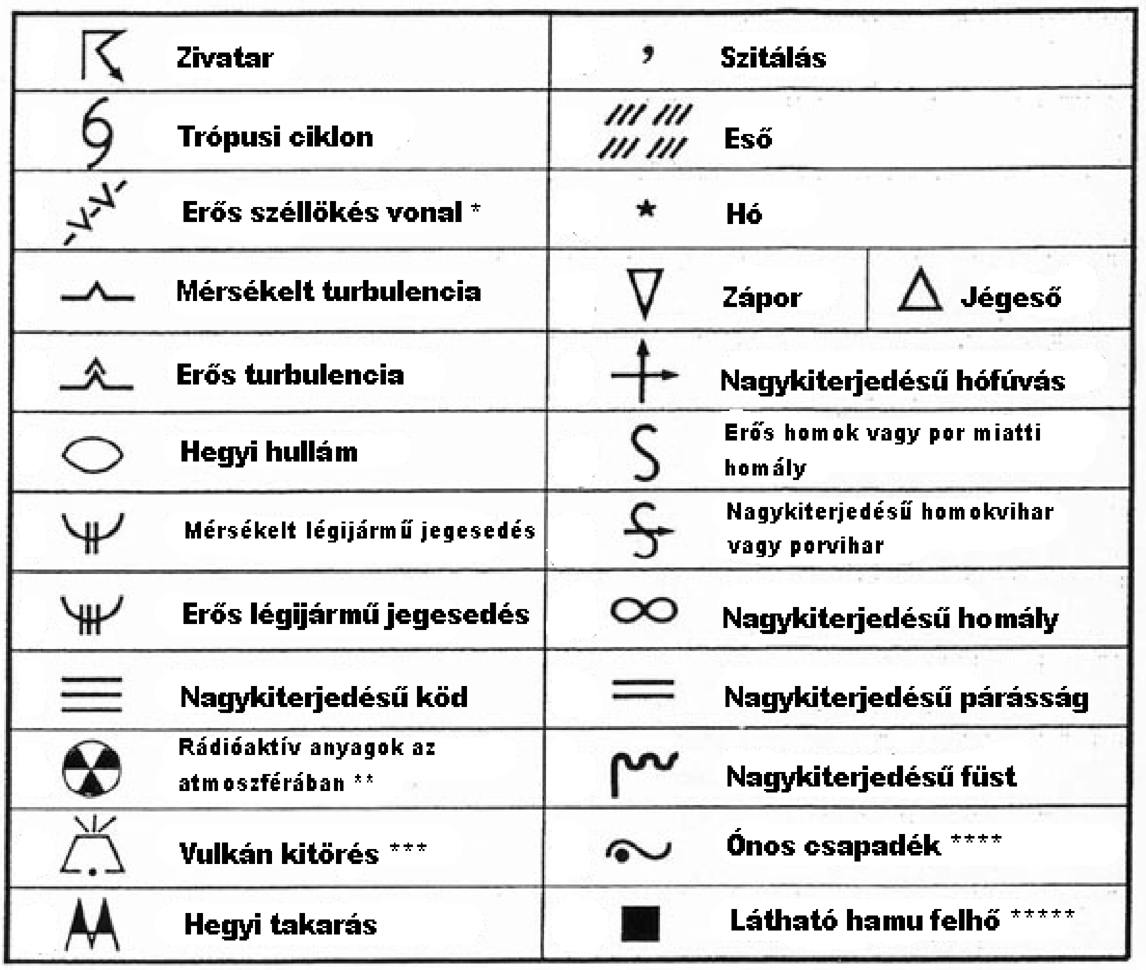
VAG modell. Vulkanikus hamu közlési információ grafikus formátumban



Ábra szövegek
1 200-as repülési szint felület
2 550-as repülési szint felület
3 Rögzített időpontú előrejelzés térkép érvényes ………………..(kitörés +XX óra) Alapszik ………………….. UTC DÁTUM ………………
4 Vulkán (név ……………….) szélesség ………… É(vagy D) hosszúság K (vagy Ny)
5 Első kitörés dátuma és időpontja …………… UTC
6 Időtartam óra
7 Hamuoszlop magassága ………………… repülési szintig
8 Látható hamufelhő

SN modell. Repülési dokumentációban használatos jelölések

1. Szignifikáns időjárás szimbólumok



	Zivatar		Szitálás
	Trópusi ciklon		Eső
	Erős széllökés vonal *		Hó
	Mérsékelt turbulencia		Zápor / Jégeső
	Erős turbulencia		Nagykiterjedésű hófúvás
	Hegyi hullám		Erős homok vagy por miatti homály
	Mérsékelt légijármű jegesedés		Nagykiterjedésű homokvihar vagy porvihar
	Erős légijármű jegesedés		Nagykiterjedésű homály
	Nagykiterjedésű köd		Nagykiterjedésű párásság
	Rádióaktív anyagok az atmoszférában **		Nagykiterjedésű füst
	Vulkán kitörés ***		Ónos csapadék ****
	Hegyi takarás		Látható hamu felhő *****

*A 100-as repülési magasságszintig ez a szimbólum a repülési dokumentációban "széllökés vonal"-ra utal.

**A következő információkat a térkép oldalán kell elhelyezni: radioaktív anyagok szimbóluma; a baleset helyszínének földrajzi szélessége/hosszúsága; a baleset dátuma és időpontja; ellenőrzési NOTAM a következő információnál.

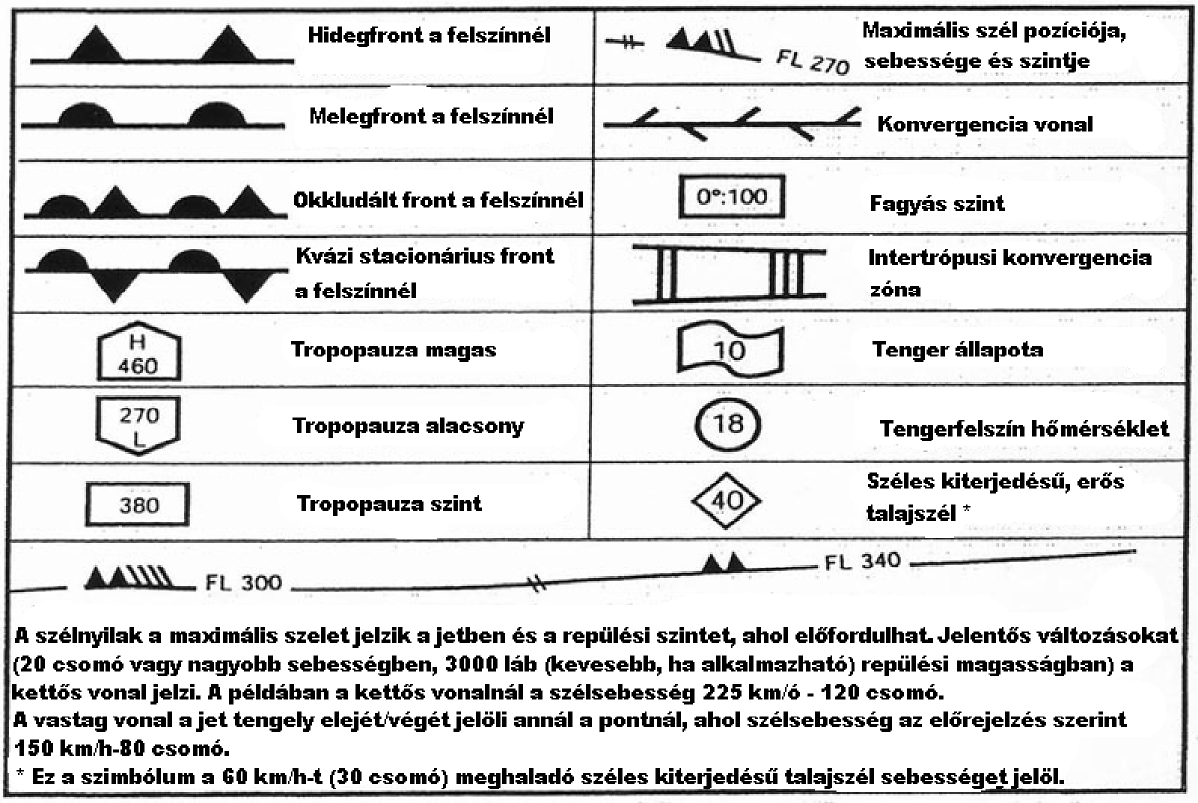
***A következő információk azokra a szimbólumokra vonatkoznak, amelyek a térkép oldalán vannak feltüntetve: vulkán kitörés; a vulkán neve (ha ismert); földrajzi hosszúság/szélesség; az első kitörés dátuma és időpontja (ha ismert); vulkánikus hamura vonatkozó SIGMET-ek és NOTAM vagy ASHTAM ellenőrzése

****Ez a szimbólum nem vonatkozik nagyon alacsony hőmérsékleten repülő légijárművel érintkezésbe kerülő csapadék miatti jegesedésre.

******Látható hamufelhő szimbólum csak a VAG modellre érvényes a SIGWX térképekre nem.

MEGJEGYZÉS: - Magasságjelzések, amely magasságok között a jelenségek várhatók, tető az alap felett, a térkép jelmagyarázata szerint.

2. Frontok és konvergencia zónák és más használt szimbólumok



3. Felhők jellemzésére használt rövidítések

3.1 Felhőfajta

CI = Cirrus
CC = Cirrocumulus
Cs = Cirrostratus
AC = Altocumulus
AS = Altostratus
NS = Nimbostratus
SC = Stratocumulus
ST = Stratus
CU = Cumulus
CB = Cumulonimbus

3.2 Mennyiség

Felhők a CB kivételével
SKC = tiszta égbolt (O/8)
FEW = kevés (1/8-2/8)
SCT = elszórt (3/8-4/8)
BKN = (szakadozott (5/8-7/8)
OVC = borult (8/8)
Csak CB esetén
ISOL = egyedi CB-k (izolált)
OCNL = jól elkülönült CB-k (esetenkénti)
FRQ = CB-k kis elkülönüléssel vagy elkülönülés nélkül
EMBD = más felhőrétegekbe beágyazódott vagy homály által takart CB-k (beágyazódott)

3.3 Magasságok

Az SWH és SWM térképeken a magasságokat repülési magasságszintekkel jelölik, (FL) tető az alap felett. Amikor a XXX-et használnak, a tetők vagy alapok kívül esnek azon az atmoszféra rétegen, amelyre a térképet alkalmazzák.
SWL térképen)
i) a magasságokat közepes tengerszint feletti magasságként jelölik,
ii) az SFC rövidítést a talajszint jelölésére használják.

4. Vonalak és rendszerek ábrázolása specifikus térképeken

4.1 SWH és SWM modellek – Szignifikáns időjárás térképek (nagy és közepes magasság)

Cakkozott vonal	=	Szignifikáns időjárási területek elválasztása
Vastag szaggatott vonal	=	CAT terület körvonala
Vastag folytonos vonal szél-nyíllal és repülési magasságszinttel megszakítva	=	Jet-stream tengely helye, szlirány, szélsebesség csomóban, vagy km/h-ban és magasság repülési magasságszintben jelölésével
Számok a nyilakon	=	Frontrendszer mozgási sebessége csomóban vagy km/h-ban
Repülési magasságszintek kis négyszögeken belül	=	A tropopauza magassága repülés magasságszintben kifejezve adott helyeken, pl. 340. A tropopauza topográfia Alacsony és Magas pontjait L és H betűkkel jelölik egy ötszögbe írt, repülési magasságszintben kifejezett magassággal együtt.

4.2 SWL modell – Szignifikáns időjárás térkép (kismagasság)

X	=	Nyomás középpontok helye hektopascalban megadva
L	=	Kisnyomás középpontja
H	=	Nagynyomás középpontja
Cakkozott vonal	=	Szignifikáns időjárási terület elválasztó körvonala
Szaggatott vonal	=	O°C izoterma magassága lábban (hektolábban) vagy méterben MEGJEGYZÉS: a O°C szintet O°:O6O módon is lehet jelölni, azaz O°C szint 6000 láb magasságban van
Számok nyilakon	=	Front rendszerek, depressziók vagy anticiklonok mozgási sebessége csomóban vagy km/h-ban
Szám a tenger állapota szimbólumon belül	=	Teljes hullám magasság lábban vagy méterben
Szám a tenger felszín hőmérséklet szimbólumon belül	=	Tenger felszín hőmérséklete C^{O}-ban

4.3 Nyilak, tollak és zászlócskák

A nyilak az irányt jelzik. A zászlócskák és/vagy tollak száma a sebességnek felel meg. Például: 270o/115 csomó (ekvivalens 213 km/h-val)
A zászlócskák 50 csomó vagyis 92 km/h sebességnek felelnek meg.
Tollak 10 csomónak vagy 18 km/h-nak felelnek meg.
Féltollak 5 csomónak vagy 9 km/h-nak felelnek meg.

2. FÜGGELÉK A VILÁG TERÜLETI ELŐREJELZŐ RENDSZERRE ÉS METEOROLÓGIAI IRODÁKRA VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 3. Fejezet)

1. VILÁG TERÜLETI ELŐREJELZŐ RENDSZER

1.1 Formátumok és kódok

A WAFC-oknak egységes formátumokat és kódokat kell alkalmazniuk előrejelzések és módosítások szolgáltatásánál.

1.2 Magaslégköri szél, hőmérséklet és nedvesség információk

1.2.1 A magassági szél, magaslégköri hőmérséklet és nedvesség, a maximális szél irány, sebesség és magasság és a tropopauza magasság és hőmérséklet előrejelzések, amelyeket a WAFC naponta négyszer készít, 6, 12, 18, 24, 30 36 óra hosszáig érvényesek a szinoptikus adatok, amelyeken az előrejelzések alapultak, időpontja (0000, 0600, 1200 és1800 UTC) után, és a továbbítás megkezdésére a fenti sorrendben, nem később, mint 6 órával a megfigyelés szabványos időpontja után.

1.2.2 **Ajánlás.–** *A WAFC által készített rácspont előrejelzéseknek a következőkből kell állniuk:*

a) szél és hőmérséklet adatok a következő repülési magasságszintekre: 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) és 450 (150 hPa)

b) tropopauza magasság és hőmérséklet, a maximális szél iránya, sebessége és magassága;

c) nedvesség adatok a következő repülési magasságszinteken: 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) és 180 (500 hPa);

d) szél és hőmérséklet adatok az 530 (100 hPa) és 600 (70 hPa) repülési magasságszintekre amikor és ahol igénylik.

1.2.3 Az előremenő rácspont előrejelzéseket a WAFC-oknak bináris kód formában kell kiadniuk, a WMO által előírt GRIB kód formát használva.

1. Megjegyzés. – A GRIB kód formát a WMO 306 számú kiadványa, Kód kézikönyv (Manual on Codes) *1.2 kötet, B Rész – Bináris kódok tartalmazza.*

2. Megjegyzés. – A WAFC-ok 2005. július 1.-ig folytatják a felsőlégköri szél és hőmérséklet térkép formában való kiadását, a regionális léginavigációs tervekkel összhangban.

1.2.4 Az előremenő rácspont előrejelzéseket a WAFC-nak 140 km-es vízszintes felbontású rögzített rácsban kell készítenie.

Megjegyzés. – 140 km egy körülbelül 1,25°-os távolságot jelent hosszúsági körben.

1.3 Szignifikáns időjárás információk

1.3.1 A WAFC-ok által készített szignifikáns időjárás jelenségeket naponta négyszer 0000, 0600, 1200 és 1800 UTC rögzített érvényességi időpontokra kell kiadni. Mindegyik előrejelzés továbbítását, amint technikailag lehetséges, de érvényességi időpontja előtt legalább 12 órával meg kell valósítani.

1.3.2 Szignifikáns időjárás jelenségek előrejelzéseit bináris kód formában kell kiadni, a WMO által előírt GRIB kód formát használva.

1. Megjegyzés. – A BUFR kód formát a WMO 306 számú kiadványa, Kód kézikönyv (Manual on Codes) *1.2 kötet, B Rész – Bináris kódok tartalmazza.*

2. Megjegyzés. – A WAFC-ok 2005. július 1.-ig folytatják a szignifikáns időjárás előrejelzések térkép formában való kiadását, a regionális léginavigációs tervekkel összhangban.

1.3.3 A szignifikáns időjárás jelenségek előrejelzéseinek tartalmazniuk kell a 8. Függelék 4.3.1.1 pontjában felsorolt tételeket. Az előrejelzéseket a következő repülési magasságszintekre kell kiadni:

a) 250 és 600 repülési magasságszintek között; és

b) 100 és 250 repülési magasságszintek között regionális repülésnavigációs egyezményben meghatározott korlátozott földrajzi területekre. Ha a terület átlagos közepes tengerszint feletti terepmagassága szignifikáns topográfiai hatást gyakorolhatna a 100-s repülési magasságszintre, a térképek alapjául, az illetékes WAFC-al konzultálva, és a regionális léginavigációs egyezménnyel összhangban, magasabb szintet kell megadni.

1.3.4 **Ajánlás.** – *A szignifikáns időjárás jelenségek előrejelzéseinek módosításait a lehetséges minimális késéssel kell kiadni az 1.4 kritériumoknak megfelelően, és módosított BUFR fájlok formájában kell szolgáltatni.*

1.4 WAFS előállítások módosításainak kritériumai

Ajánlás. – *A szignifikáns útvonali időjárás előrejelzések módosításánál a WAFC-oknak a következő kritériumokat kell alkalmazni:*
SWH előrejelzések:
turbulencia, és esetenként gyakori vagy beágyazódott cumulonimbus;
Újonnan várható előfordulás vagy nem-előfordulás
SWM előrejelzések:
légijármű jegesedés, turbulencia, cumulonimbus és homokviharok/porviharok
Újonnan várható előfordulás vagy nem-előfordulás
Vulkán kitörések radioaktív anyagok véletlen elszabadulása az atmoszférába, amely a légijármű üzemelés szempontjából jelentősséggel bír:
Vulkanikus tevékenység szimbólum vagy sugárzás szimbólum bevitele vagy eltávolítása.

2. METEOROLÓGIAI IRODÁK

2.1 WAFS produktumok használata

2.1.1 Annak terjedelmét, hogy melyik repülőtéri meteorológiai iroda készít előrejelzéseket és/vagy használ fel WAFC-októl vagy más forrásokból származó produktumokat, az illetékes meteorológiai hatóságnak kell megállapítania.

2.1.2 **Ajánlás.** – *A repülőtéri meteorológiai irodák repülési dokumentáció készítésénél használják fel a világ területi előrejelző rendszerek kibocsátott produktumait*

2.1.3 A repülési dokumentáció egységességének és szabványosításának érdekében a kapott WAFS GRIB és BUFR adatokat dekódolni kell szabványos WAFS térképekbe ebben az Annexben szereplő előírásokkal összhangban, és a WAFS előrejelzések eredetijének tartalmát és azonosítását nem szabad módosítani.

2.2 Illetékes WAFC értesítése szignifikáns diszkrepenciákról

WAFS GRIB és/vagy BUFR adatokat használó meteorológiai irodáknak azonnal értesíteniük kell az illetékes WAFC-t, ha, az 1.4 szakasszal összhangban, WAFS adatokra és produktumokra vonatkozóan szignifikáns diszkrepenciákat észleltek vagy jelentettek. Az üzenetet vevő WAFC-nak nyugtáznia kell az átvételt a küldőnek, rövid észrevételezéssel együtt a jelentésről és a tett intézkedésekről, ugyanazokat a kommunikációs eszközöket használva, mint amelyeket a küldő alkalmazott. Ha módosítás kiadásának szükségessége merül fel, az összes felhasználónak műholdas közvetítéssel alkalmas ADMIN közleményt kell továbbítani.

1. Megjegyzés. – Nincs követelmény a meteorológiai irodákkal szemben radiológiai vészeseti események jelentése iránt.

2. Megjegyzés. – Szignifikáns diszkrepenciák jelentésére vonatkozó útmutatást a Repülésmeteorológiai gyakorlati kézikönyv (Manual of Aeronautical Meteorological Practice) *tartalmaz.*

3. METEOROLÓGIAI MEGFIGYELŐ IRODÁK

3.1 WAFS produktumok használata

2.1.1 Annak terjedelmét, hogy melyik repülőtéri meteorológiai iroda használ WAFC-tól és más forrásokból származó produktumokat, az illetékes meteorológiai hatóságnak kell megállapítania.

4. VULKANIKUS HAMU TANÁCSADÓ KÖZPONTOK (VAAC)

4.1 Vulkanikus hamu tanácsadó információk

4.1.1 **Ajánlás. –** *A jóváhagyott ICAO rövidítéseket és magától értetődő jellegű numerikus értékeket használva, rövidített köznyelven kiadott vulkanikus hamu tanácsadó információknak összhangban kell lenniük az A2-1 táblázatban bemutatott mintával. Ahol jóváhagyott ICAO rövidítések nem állnak rendelkezésre, angol köznyelvű szöveget kell használni, minimumra törekedve.*

4.1.2 **Ajánlás. –** *Az A2-1 táblázatban felsorolt vulkanikus hamu információknak, amennyiben grafikus formátumban adták ki őket, az 1. Függelékben megadottakkal egyezőnek kell lenniük. Ha bináris formátumban adták ki őket, BUFR kód formát kell használni.*

Megjegyzés. – A BUFR kód formát a WMO 306 számú kiadványa, Kód kézikönyv (Manual on Codes) *1.2 kötet, B Rész – Bináris kódok tartalmazza.*

5. ÁLLAMI VULKÁN MEGFIGYELŐ ÁLLOMÁSOK

5.1 Információk az állami vulkán megfigyelő állomásoktól

Ajánlás. – *Az igényelt információk, amelyeket az állami vulkán megfigyelő állomásoknak a hozzájuk tartozó ACC-k, MWO és VAAC részére meg kell küldeniük, a következőkből áll:*

a) szignifikáns, kitörés előtti vulkanikus tevékenység: a jelentés dátuma/időpontja (UTC); a vulkán neve és, ha ismert, száma; földrajzi hely (szélesség/hosszúság); és a vulkanikus tevékenység leírása; és

b) vulkán kitörés: a jelentés dátuma/időpontja (UTC) és a kitörés időpontja (UTC), ha a jelentés időpontjától különbözik; a vulkán neve és, ha ismert, száma; földrajzi hely (szélesség/hosszúság); és a vulkán kitörés leírása, benne, hogy hamuoszlop kilövellés történt-e, és ha igen, a hamuoszlop becsült magasága, és bármely látható vulkanikus hamufelhő kiterjedése a kitörés alatt, és azt követően.

Megjegyzés. – Kitörés előtti vulkanikus tevékenység ebben a vonatkozásban szokatlan és/vagy növekvő vulkanikus tevékenységet jelent, amely vulkán kitörés előjele lehet.

6. TRÓPUSI CIKLON TANÁCSADÓ KÖZPONTOK (TCAC)

6.1 Trópusi ciklon tanácsadó információk

6.1.1 **Ajánlás. –** *A trópusi ciklonra vonatkozó tanácsadó információknak összhangban kell lenniük az A2-2 táblázatban bemutatott mintával.*

6.1.2 **Ajánlás. –** *Ha trópusi ciklon tanácsadást bináris formátumban adnak ki, BUFR kód formát kell használni.*

Megjegyzés. – A BUFR kód formát a WMO 306 számú kiadványa, Kód kézikönyv (Manual on Codes) *1.2 kötet, B Rész – Bináris kódok tartalmazza.*

A2-1 táblázat. Minta vulkanikus hamu tanácsadó közleményhez
Kulcs: M = kötelező bevitel, minden közlemény kötelező része
O = fakultatív bevitel
= = kettős párhuzamos vonal azt jelzi, hogy az ezt követő szöveget a következő sorban kell elhelyezni

1. Megjegyzés. – A vulkanikus hamu tanácsadó közleményekben szereplő numerikus elemek nagyságrendje és felbontása a 6. Függelék A6-4 táblázatban látható

2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400).*

3. Megjegyzés. – „Kettőspont” beírása minden elem címe után kötelező.

4. Megjegyzés. – Az 1-től 18-ig számok csak az anyag világossá tétele céljából szerepelnek, ezek nem részei a tanácsadó közleménynek, ahogyan az a példában látszik.

	Elem	Részletezett tartalom	Minta (Minták)	Példák
1	A közlemény fajtájának azonosítása (M)	A közlemény fajtája	Vulkanikus hamu tanácsadás	
2	A keletkezés dátuma	Év, hónap, nap, időpont UTC szerint, vagy nap, hónap, év, időpont UTC szerint	KIADTA: nnnnnnn/nnnnnZ *vagy* nnmonth[1]nnnn/nnnnZ	
3	VAAC neve (M)	VAAC neve	VAAC nnnnnnnnnnnnnnn	
4	Vulkán neve (M)	IAVCEI[2] neve, a vulkán száma	VULKÁN: nnnnnnnnnnnnnnn [nnnnnn] *vagy* Ismeretlen *vagy* névtelen	
5	A vulkán földrajzi helye (M)	A vulkán földrajzi helye fokokban és percekben	FŐLDRAJZI HELY Nnnnn *vagy* Snnnnn Wnnnnn *vagy* Ennnnn Ismeretlen *vagy* névtelen	

6	Állam vagy régió (M)	Állam, vagy régió, ha az Állam felett hamut nem jelentettek	TERÜLET: nnnnnnnnnnnnnn	
7	A csúcs közepes tengerszint feletti magassága (M)	A csúcs közepes tengerszint feletti magassága m-ben (vagy lábban)	CSÚCS KÖZEPES nnnnM (*vagy* nnnnnFT) TENGERSZINT FELETTI MAGASSÁGA:	
8	Tanácsadás szám (M)	Tanácsadás szám: évszám teljesen kiírva és közlemény szám (külön sorozat az egyes vulkánokra)	TANÁCSADÁS SZÁM : nnnn/nnnn	
9	Információ forrás (M)	Információ forrás szabad szöveggel leírva	INFORMÁCIÓ FORRÁS: szabad szöveg maximum 32 karakter	
10	Szín kód (O)	Repülési szín kód:	REPÜLÉSI SZÍN KÓD: Vörös *vagy* narancs *vagy* sárga *vagy* zöld , *vagy* nincs megadva, *vagy* semmi	
11	Kitörés részletek (M)	Kitörés részletek (beleértve a kitörés(ek) dátuma/időpontja)	KITÖRÉS RÉSZLETEK: szabad szöveg maximum 64 karakter vagy ismeretlen	
12	Hamu észlelésének időpontja (M)	Vulkanikus hamu észlelésének napja és időpontja (UTC szerint)	OBS ASH DATE/TIME: nn/nnnnZ	

13	Észlelt hamufelhő (M)	Az észlelt hamufelhő vízszintes kiterjedése (fokokban és percekben) és függőleges kiterjedése, vagy, ha az alap ismeretlen, az észlelt hamufelhő teteje; az észlelt hamufelhő mozgása	OBS ASH CLOUD TOP FLnnn *vagy* SFC/FLnnn *vagy* FLnnn/nnn Nnn[nn] *vagy*Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] TOP FLnnn *vagy* SFC/FLnnn *vagy* FLnnn/nnn MOV N nnKMH (*vagy* KT) *vagy* MOV NE nnKMH (*vagy* KT) *vagy* MOV E nnKMH (*vagy* KT) *vagy* MOV SE nnKMH (*vagy* KT) *vagy* MOV S nnKMH (*vagy* KT) *vagy* MOV SW nnKMH (*vagy* KT) *vagy* MOV W nnKMH (*vagy* KT) *vagy* MOV NW nnKMH (*vagy* KT) *vagy* *vagy*[4] ASH NOT IDENTIFIABLE FROM FLnn/nnn nnn/nn[n] SATELLITE DATA WINDS KMH (KT)3	

14	A hamufelhők előrejelzési magassága és pozíciója (+6óra) (M)	Nap és időpont (UTC szerint) (6 óra a 12 tételben megadott „Hamu észlelésének időpontjá”-tól); Előrejelzési magasság és pozíció (fokokban és percekben) minden egyes felhőtömegre erre a rögzített érvényességi időre	FCST ASH CLOUD+6HR nn/nnnnZ SFC *vagy* FLnnn/[FL]nnn Nnn[nn]*vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn]3 *vagy* NO ASH EXP	
15	A hamufelhők előrejelzési magassága és pozíciója (+12 óra) (M)	Nap és időpont (UTC szerint) (12 óra a 12 tételben megadott „Hamu észlelésének időpontjá”-tól); Előrejelzési magasság és pozíció (fokokban és percekben) minden egyes felhőtömegre erre a rögzített érvényességi időre	FCST ASH CLOUD+12HR nn/nnnnZ SFC *vagy* FLnnn/[FL]nnn Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn]3 *vagy* NO ASH EXP	
16	A hamufelhők előrejelzési magassága és pozíciója (+18 óra) (M)	Nap és időpont (UTC szerint) (18 óra a 12 tételben megadott „Hamu észlelésének időpontjá”-tól); Előrejelzési magasság és pozíció (fokokban és percekben) minden egyes felhőtömegre erre a rögzített érvényességi időre	FCST HAMU FELHŐ+18HR nn/nnnnZ SFC *vagy* FLnnn/[FL]nnn Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn] Nnn[nn] *vagy* Snn[nn] Wnn[nn] *vagy* Ennn[nn]3 *vagy* NO ASH EXP	

17	Következő tanácsadás (M)	A következő tanácsadás dátuma: év, hónap, nap és időpont UTC-ben vagy nap, hónap év és időpont UTC-ben	KÖVETKEZŐ TANÁCSADÁS: nnnnnnnn/nnnnZ *vagy* nnmonth[1]nnn/nnnnZ NEM KÉSŐBB MINT nnnnnnnnn/nnnnZ *vagy* nnmonth[1]nnnnZ *vagy* NINCS KÖVETKEZŐ TANÁCSADÁS *vagy* KIADÁSRA KERÜL nnnnnnnnn/nnnnZ -ig *vagy* nnmonth[1]nnnnZ-ig	KÖVETKEZŐ 20000402/1300Z TANÁCSADÁS
18	Megjegyzések (M)	Megjegyzések, szükség szerint	MEGJEGYZÉSEK Szabad szöveg maximum 256 karakter *vagy* NIL	HAMUFELHŐ NEM ÉSZ-LELHETŐ A MŰHOLD FEL-VÉTELEN

Megjegyzés .–
1. Használjuk az év hónapjainak rövidítéseit a PANS-ABC-ből (Doc 8400), például „JAN”.
2. International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI) (A Föld belsejének vulkanológiai és kémiai nemzetközi szövetsége).
3. Maximum 4 kiválasztott réteg.
4. Ha hamut jelentenek (pl. AIREP), de nem azonosítható műholdas adatokból.

*** A2-1 példa Tanácsadási közlemény vulkanikus hamuról**

VOLCANIC ASH ADVISORY	
ISSUED:	20000402/0700Z
VAAC:	TOKYO
VOLCANO:	USUZAN 805-03
LOCATION:	N4230E14048
AREA:	JAPAN
SUMMIT ELEVATION:	732M
ADVISORY NUMBER:	2000/432
INFORMATION SOURCE:	GMS JMA
AVIATION COLOUR CODE:	RED
ERUPTION DETAILS:	ERUPTED 20000402/0614Z ERUPTION OBS ASH TO ABV FL300
OBS ASH DATE/TIME:	02/0645Z
OBS ASH CLD:	FL150/350 N4230E14048-N4300E14030-N4246E14230-N4232E14150-N4230E14048 SFC/FL150 MOV NE 25KT FL150/350 MOV E 30KT
FCST ASH CLD + 6 HR:	02/1245Z SFC/FL200 N4230E14048-N4232 E14150-N4238E14300-N4246 E14230 FL200/350 N4230 E14048-N4232E14150N4238 E14300-N4246E14230 FL350/600 NO ASH EXP
FCST ASH CLD + 12 HR:	02/1845Z SFC/FL300 N4230 E14048-N4232E14150-N4232 E14300-N4246 E14230 FL300/600 NO ASH EXP
FCST ASH CLD + 18 HR:	03/0045Z SFC/FL600 NO ASH EXP
KÖVETKEZŐ	20000402/1300Z
	HAMUFELHŐ MÁR NEM ÉSZLELHETŐ A MŰHOLD KÉPEN

TANÁCSADÁS: MEGJEGYZÉSEK:

A2-2. táblázat. Minta trópusi ciklon tanácsadó közleményhez
Key = = kettős párhuzamos vonal azt jelzi, hogy az ezt követő szöveget a következő sorban kell elhelyezni

1. Megjegyzés. – A trópusi ciklon tanácsadó közleményekben szereplő numerikus elemek nagyságrendje és felbontása a 6. Függelék A6-4 táblázatban látható.

2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400).*

3. Megjegyzés. – Az összes elem kötelező.

4. Megjegyzés. – „Kettőspont” beírása minden elem címe után kötelező.

5. Megjegyzés. – Az 1-től 16-ig számok csak az anyag világossá tétele céljából szerepelnek, ezek nem részei a tanácsadó közleménynek, ahogyan az a példában látszik.

	Elem	Részletezett tartalom	Minta (Minták)	Példák
1	A közlemény fajtájának azonosítása	A közlemény fajtája	TC tanácsadás	
2	8 A keletkezés dátuma	A kiadás éve, hónapja, napja, időpontja UTC szerint	DTG: nnnnnnn/nnnnZ	DTG: 20040925/1600Z
3	A TCAC neve	A TCAC neve (földrajzi hely jelölése vagy teljes név)	TCAC: nnnnnnn/nnnnZ	
4	A trópusi ciklon neve	A trópusi ciklon neve	TC: nnn or nnnnnnn	
5	Tanácsadás szám	Tanácsadás szám („01”-től kezdve mindegyik ciklonra)	NR: nn	
6	A központ helyzete	A trópusi ciklon középpontjának helyzete (fokokban és percekben)	PSN: Nnn[nn] vagy Snn[nn] vagy Wnnn[nn] vagy Ennn[nn]	
7	A mozgás iránya és sebessége	A mozgás iránya és sebessége legalább nyolc iránytű pontban, km/h, vagy stacionárius	MOV: N nnKMH (*vagy* KT *vagy*) NE nnKMH (*vagy* KT *vagy*) E nnKMH (*vagy* KT *vagy*) SE nnKMH (*vagy* KT *vagy*) S nnKMH (*vagy* KT *vagy*) SW nnKMH (*vagy* KT *vagy*) W nnKMH (*vagy* KT *vagy*) NW nnKMH (*vagy* KT *vagy*) STNR	
8	Központi nyomás	Központi nyomás (hPa-ban)	C: nnnHPA	
9	Maximális talajszél	Maximális talajszél a központ közelében (10 percre vonatkozó átlag km/h-ban (vagy	MAX WIND: nn[n]KMH (*vagy* nn[n]KT)	

		csomóban)		
10	Központ helyzet előrejelzés (+12 óra)	Nap és időpont (UTC szerint) (12 órával a 2-es tételben adott „DTG"-től) Trópusi ciklon központ helyzetének előrejelzése (fokokban és percekben	FCST PSN +12 HR: nn/nnnnZ Nnn[nn] *vagy* Snn[nn] *vagy* Wnnn[nn] *vagy* Ennn[nn]	
11	Maximális talajszél előrejelzés (+12 óra)	Maximális talajszél előrejelzés (12 órával a 2-es tételben adott „DTG"-től)	FCST MAX WIND +12 HR: nn[n]KMH (vagy nn[n]KT)	
12	Központ helyzet előrejelzés (+18 óra)	Nap és időpont (UTC szerint) (18 órával a 2-es tételben adott „DTG"-től) Trópusi ciklon központ helyzetének előrejelzése (fokokban és percekben	FCST PSN +18 HR: nn/nnnnZ Nnn[nn] *vagy* Snn[nn] *vagy* Wnnn[nn] *vagy* Ennn[nn]	
13	Maximális talajszél előrejelzés (+18 óra)	Maximális talajszél előrejelzés (18 órával a 2-es tételben adott „DTG"-től)	FCST MAX WIND +18 HR: nn[n]KMH (*vagy* nn[n]KT)	
14	Központ helyzet előrejelzés (+24 óra)	Nap és időpont (UTC szerint) (18 órával a 2-es tételben adott „DTG"-től) Trópusi ciklon központ helyzetének előrejelzése (fokokban és percekben	FCST PSN +24 HR: nn/nnnnZ Nnn[nn] *vagy*nn[nn] *vagy* Wnnn[nn] *vagy* Ennn[nn]	
15	Maximális talajszél előrejelzés (24 órával a 2-es tételben adott „DTG"-től)	Maximális talajszél előrejelzés (18 órával a 2-es tételben adott „DTG"-től)	FCST MAX WIND +24 HR: nn[n]KMH (*vagy* nn[n]KT)	
16	A következő tanácsadás kiadásának várható időpontja	A következő tanácsadás kiadásának várható éve, hónapja, napja és időpontja (UTC szerint)	NXT MSG: [BFR] nnnnnnnn/nnnnZ *vagy* NO MSG EXP	

Megjegyzés

1.Fiktív hely.

A2-2 példa. Tanácsadási közlemény trópusi ciklonokról

TC ADVISORY	
DTG:	19970925/1600Z
TCAC:	YUFO
TC:	GLORIA
NR:	01
PSN:	N2706 W07306
MOV:	NW 20kMH
C:	965HPA
MAX WIND:	90KMH
FCST PSN + 12 HR:	260400 N2830 W07500
FCT MAX WIND + 12 HR:	90KMH
FCST PSN + 18 HR:	261000 N2852 W07500
FCST MAX WIND + 18 HR:	85KMH
FCST PSN + 24 HR:	261600 N2912 W07530
FCST MAX WIND + 24 HR:	80KMH
NXT MSG:	19970925/2000 Z

3. FÜGGELÉK. METEOROLÓGIAI MEGFIGYELÉSEKRE ÉS JELENTÉSEKRE VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 4. Fejezete)

1.METEOROLÓGIAI MEGFIGYELÉSEKRE VONATKOZÓ ÁLTALÁNOS ELŐÍRÁSOK

1.1 **Ajánlás** – *A repülőtéren használt meteorológiai műszereket úgy kell elhelyezni, hogy arra a területre jellemző adatokat szolgáltassanak, amelyekre a méréseket igénylik.*
Megjegyzés. – Az üzemelési területeken telepített berendezések és felszerelések elhelyezésére és konstrukciójára vonatkozó előírások, amelyek a légijárművek veszélyeztetésének a minimumra csökkentését célozzák, a 14. Annex 1.Kötet 8. Fejezetében találhatók.

1.2 **Ajánlás –** *A repülésmeteorológiai állomásokon lévő meteorológiai műszereket a Meteorológiai Világszervezet által közzétett eljárások és előírások szerint kell telepíteni, üzemeltetni és karbantartani.*

1.3 **Ajánlás** – *A repülőtéren a megfigyelőket, amennyire lehetséges, úgy kell elhelyezni, hogy az általuk szolgáltatott adatok jellemezzék a területet, amelyre a megfigyeléseket igénylik*

1.4 **Ajánlás. –***Ahol az automatikus megfigyelő berendezés részét képezi egy integrált fél-automatikus rendszernek, a helyi légiforgalmi szolgálati egységek számára rendelkezésre álló adatkijelzők a helyi meteorológiai szolgálati egység berendezéseinek kiegészítő egységei legyenek, és azokkal párhuzamosan működjenek. Ezeken a kijelzőkön az egyes időjárási elemeknél, ahogyan megfelelő, jelezni kell, hogy az elem melyik észlelési helyre vonatkozik.*

2. METEOROLÓGIAI JELENTÉSEKRE VONATKOZÓ ÁLTALÁNOS KRITÉRIUMOK

2.1 Meteorológiai jelentések formátuma

2.1.1 Helyi rendszeres és különleges jelentéseket rövidített köznyelven kell kiadni, az A3-1 táblázatban bemutatott mintának megfelelően.

2.1.2 METAR-t és SPECI-t az A3-2 táblázatban bemutatott mintával összhangban kell kiadni, és a Világ Meteorológiai Szervezet által előírt METAR és SPECI kód formában kell terjeszteni.
Megjegyzés. – A METAR és SPECI kód formákat a WMO 306 számú kiadványában, Kód kézikönyv (Manual on Codes), *1.1 kötet, A Rész – Alfanumerikus kódok.*

2.2 CAVOK használata

Amikor a megfigyelés idején a következő feltételek szimultán fordulnak elő:

a) látás, 10 km vagy több;

Megjegyzés. –.Helyi rendszeres és különleges jelentésekben a látás azokra az érték(ek)re vonatkozik, amelyeket 4.2.4.2 és 4.2.4.3 pontoknak megfelelően kell jelenteni; METAR-ban és SPECI-ben azokra az értékekre vonatkozik, amelyeket a 4.2.4.4 pontnak megfelelően kell jelenteni.

b) nincs felhő 1500 m (5000 láb), vagy a legmagasabb minimális szektor magasság, mindenkor a nagyobbik érték alatt, és nincs cumulonimbus;

c) nincs olyan időjárás, amely a repülés számára jelentőséggel bír, a 4.4.2.3 és 4.4.2.4 pontok szerint;

akkor a látásra, a futópálya látástávolságra, az aktuális időjárásra és felhőmennyiségre, felhő fajtára és felhő alap magasságra vonatkozó információkat minden meteorológiai jelentésben a „CAVOK” terminussal kell helyettesíteni.

2.3 Helyi különleges jelentések és SPECI kiadásának kritériumai

2.3.1 A helyi különleges jelentések kritériumainak listájában a következőknek kell szerepelniük:

a) azok az értékek, amelyek a legszorosabban kapcsolódnak a repülőteret használó üzemeltetők minimumaihoz;

b) azok az értékek, amelyek kielégítik a légiforgalmi szolgálati egységek és az üzemeltetők más helyi követelményeit;

c) 2 C°-os vagy ennél nagyobb levegő hőmérséklet növekedés a legutolsó jelentésben megadotthoz képest, vagy egy alternatív küszöbérték, a meteorológiai hatóság, a megfelelő légiforgalmi szolgáltatási hatóság és az érintett üzemeltetők közötti megállapodásnak megfelelően;

d) a megközelítési és emelkedési területeken szignifikáns meteorológiai körülmények előfordulásával foglalkozó, rendelkezésre álló kiegészítő információk, az A3-1 táblázatban megadottaknak megfelelően; és

e) azok az értékek, amelyek a SPECI kritériumait alkotják.

2.3.2 **Ajánlás** – *SPECI kód formában különleges jelentéseket kell kiadni, valahányszor a következő kritériumoknak megfelelő változások lépnek fel:*

a) ha a talajszél közepes iránya 60 fokkal, vagy többel megváltozott a legutóbbi jelentésben közölthöz képest, amennyiben az átlagos sebessége a változás előtt és/vagy után 20 km/h (10 csomó), vagy több volt;

b) ha a talajszél közepes sebessége 20 km/h-val (10 csomóval), vagy többel megváltozott a legutóbbi jelentésben közölthöz képest;

c) ha a talajszél közepes sebességtől való eltérés (széllökések) 20 km/h-val (10 csomó), vagy többel nagyobb a legutóbbi jelentésben közölt értéknél, amennyiben a közepes szélsebesség a megváltozás előtt és/vagy után 30 km/h (15 csomó), vagy több volt

d) ha a szélváltozások üzemelési szempontból lényeges értékeket lépnek át. A küszöbértékeket a meteorológiai hatóságnak kell megállapítania az illetékes ATS hatósággal és az érintett üzemeltetővel együttműködve, figyelembe véve azokat a szélváltozásokat, melyek:

1) használatos futópálya (futópályák) változtatást tesznek szükségessé;

2) jelzik, hogy a futópálya hátszél és oldalszél összetevői a repülőtéren üzemelő tipikus légijárművek számára a főbb üzemelési határértékeket meghaladják.

e) ha a látás javul és a változások során az alábbi értékek közül egyet vagy többet elér, vagy túllép, vagy amikor a látás romlik, és az alábbi értékek közül egyet vagy többet átlép:

1) 800, 1500, 3000 méter; és

2) 5000 métert, ahol jelentős számú járatot üzemeltetnek látás szerinti repülési szabályok szerint.

Megjegyzés. – Helyi különleges jelentésekben a látás arra (azokra) az érték(ek)re vonatkozik, amelye(ke)t a 4.2.4.2 és 4.2.4.3 pontoknak megfelelően kell jelenteni, SPECI-ben a látás arra (azokra) az érték(ek)re vonatkozik, amelye(ke)t a 4.24.4 pontnak megfelelően kell jelenteni.

f) ha a futópálya látástávolság javul, és az alábbi értékek közül egyet vagy többet a változás során

elér, vagy átlép, vagy ha a futópálya látástávolság romlik, és az alábbi értékek közül egyet vagy többet átlép:
150, 350, 600 vagy 800 m;

g) ha a következő meteorológiai jelenségek valamelyike, vagy ezek valamilyen kombinációja létrejön, megszűnik, vagy intenzitása megváltozik:

– ónos csapadék

– ónos ködszitálás

– mérsékelt vagy heves csapadék (beleértve a záporokat is)

– porvihar

–homokvihar;

h) ha a következő meteorológiai jelenségek valamelyike, vagy ezek valamilyen kombinációja létrejön vagy megszűnik:

– jégkristályok

– ködszitálás

– talajközeli por-, homok- vagy hófúvás

– por, homok vagy hófúvás (beleértve a hóvihart)

– zivatar (csapadékkal vagy anélkül)

– szélroham

– tölcsérfelhő (tornádó vagy víztölcsér);

i) amikor a BKN vagy OVC felhőtakarás legalacsonyabb felhőrétege alapjának magassága növekszik, és az alábbi értékek közül egyet vagy többet a változás során elér, vagy túllép, vagy amikor a BKN vagy OVC felhőtakarás legalacsonyabb felhőrétege alapjának magasságcsökkenése az alábbi értékek közül egyet vagy többet elér vagy átlép: vagy amikor a BKN vagy OVC felhőtakarás legalacsonyabb felhőrétege alapjának magasságcsökkenése az alábbi értékek közül egyet vagy többet elér vagy átlép:

1) 30, 60, 150, vagy 300 méter (100, 200, 500 vagy 1000 láb); és

2) 450 méter (1500 láb), olyan esetekben, amikor jelentős számú járatot üzemeltetnek látás szerinti repülési szabályok szerint;

j) amikor a 450 méter (1500 láb) alatti felhőréteg mennyisége az alábbiak szerint megváltozik

1) SKC-ről, FEW-ről vagy SCT-ről BKN-re vagy OVC-re; vagy
2) BKN-ről vagy OVC-ről SKC-re, FEW-re vagy SCT-re; és

k) amikor az égbolt borult és a függőleges látás javul, és az alábbi értékek közül egyet vagy többet elér vagy túlhalad, vagy amikor a függőleges látás romlik és az alábbi értékek közül egyen vagy többen áthalad: 30, 60, 150 vagy 300 m (100, 200, 500 vagy1000 láb).

2.3.3 Ha egy időjárási elem romlását egy másik javulása kíséri, akkor egyetlen különleges jelentést kell kiadni SPECI kód formában; ezt romlási jelentésként kell kezelni.

3. METEOROLÓGIAI JELENTÉSEK SZÉTKÜLDÉSE

3.1 METAR és SPECI

3.1.1 A METAR-t és SPECI-t el kell juttatni a nemzetközi OPMET adatbázisokhoz és a regionális léginavigációs egyezmények által repülési álandó helyű műholdas elosztó rendszer működtetésére kijelölt központokhoz, a regionális léginavigációs egyezménynek megfelelően.

3.1.2 METAR-t és SPECI-t a regionális léginavigációs egyezményeknek megfelelően más repülőterekhez is el kell juttatni.

3.1.3 **Ajánlás**. – *A körülmények leromlásáról szóló SPECI-t közvetlenül az észlelés után kell szétküldeni. A körülmények javulásáról szóló SPECI-t a javulás után 10 perc visszatartás után kell szétküldeni, szükség esetén a SPECI-t módosítani kell és jelezni kell az ennek a 10 perces periódusnak a végén uralkodó körülményeket. Egy SPECI-t, amely az egyik időjárás elem leromlását és egy másik elem javulását tartalmazza, az észlelés után azonnal szét kell küldeni.*

3.2 Helyi rutin és különleges jelentés

3.2.1 A helyi rendszeres jelentéseket továbbítani kell a helyi légiforgalmi szolgálati egységeknek, és az üzemeltetők és a repülőtéren más felhasználók részére rendelkezésre kell bocsátani.

3.2.2 A helyi különleges jelentéseket továbbítani kell a helyi légiforgalmi szolgálati egységeknek, mihelyt a specifikált körülmények megjelennek. Azonban a meteorológiai hatóság és a megfelelő légiforgalmi szolgáltatási hatóság közötti egyezmény szerint nem kell kiadni a következők vonatkozásában:

a) bármely elem, amelyre vonatkozóan a helyi légiforgalmi szolgáltató egységnél egy kijelző van, amely megegyezik a meteorológiai állomáson lévővel, és elrendezések vannak érvényben ennek a kijelzőnek a használatát illetően a helyi rendszeres és különleges jelentésekben lévő információk felfrissítésére; és

b) futópálya látástávolságban a használt jelentés mérték szerinti egy vagy több lépcsőnyi összes változás, amelyet a helyi légiforgalmi szolgálati egységnek egy repülőtéren lévő megfigyelő jelent.

Helyi különleges jelentéseket az üzemeltetők és a repülőtéren lévő más felhasználók részére ugyancsak rendelkezésre kell bocsátani.

4. METEOROLÓGIAI ELEMEK MEGFIGYELÉSE ÉS JELENTÉSE

Bevezető Megjegyzés. – A 4.1-től – 4.8-ig szakaszokban hivatkozott meteorológiai információkhoz alkalmazható kiválasztott kritériumok.

4.1 Talajszél

4.1.1 Elhelyezés

4.1.1.1 **Ajánlás**. – *A talajszelet közelítőleg a futópálya(k) felett 10 m (30 láb) magasságban kell megfigyelni.*

4.1.1.2 **Ajánlás**. – *Reprezentatív talajszél megfigyeléseket alkalmasan elhelyezett érzékelők felhasználásával kell nyerni. A helyi rendszeres és különleges jelentésekhez végzett talajszél megfigyeléseket kiszolgáló érzékelőket úgy kell elhelyezni, hogy a lehető legjobb jelzését adja a futópálya menti és a földetérési zónákban uralkodó viszonyoknak. Azokon a repülőtereken, ahol a* *terepviszonyok vagy a domináns időjárási viszonyok jelentős különbségeket okoznak a talajszélben a futópálya különböző szakaszain, további érzékelőket kell alkalmazni.*

Megjegyzés. – Mivel a gyakorlatban a talajszelet nem lehet közvetlenül a futópályán mérni, a felszálláshoz és leszálláshoz végzett talajszél megfigyelések várhatóan a legjobb mutatója a szeleknek, amellyel egy légijármű felszállás és leszállás közben találkozik.

4.1.2 Kijelzők

4.1.2.1 Az egyes érzékelőkkel kapcsolatos kijelzőket a megfelelő légiforgalmi szolgálati egységnél lévő kijelzőkkel kapcsolódó meteorológiai állomáson kell elhelyezni. A meteorológiai állomáson és a légiforgalmi szolgálati egységeknél lévő kijelzőknek ugyanakkor az érzékelőhöz kell tartozniuk, és ahol külön érzékelők szükségesek, ahogyan a 4.1.1.2 pontban specifikálva van, a kijelzőket világosan meg kell jelölni az egyes érzékelők által figyelt futópálya és futópálya szakasz azonosításához.

4.1.2.2 **Ajánlás**. – *A talajszél irány és sebesség közepes értékeit és jelentős változásait automatizált berendezésekkel kell leszármaztatni és kijelezni.*

4.1.3 Átlagolás

4.1.3.1 A talajszél megfigyelések átlagolási időszakainak a következőknek kell lenniük:

a) 2 perc helyi rendszeres és különleges jelentéseknél és szél kijelzőknél légiforgalmi szolgáltató egységeknél; és

b) 10 perc METAR és SPECI esetén, kivéve, ha a 10-perces időszak markáns diszkontinuitást tartalmaz a szélirányban és/vagy sebességben, amikor csak a diszkontinuitást utáni adatokat használják fel a középértékek nyeréséhez, ennek következtében az időintervallumok ilyen körülmények között megfelelően csökkennek.

Megjegyzés – Markáns diszkontnuitás akkor fordul elő, amikor egy megszakítás és a szélirányban 30 fokos vagy ennél nagyobb változás tartósan fennmarad, a változás előtt vagy után 20 km/h (10 csomó) szélsebesség mellett, vagy 20 km/h (10 csomó) vagy nagyobb szélsebesség változásnál, amely legalább 2 percig tart.

4.1.3.2 **Ajánlás. –** *Az átlagolási periódus a közepes szélsebességtől való mért eltéréseknél (széllökések), amelyeket a 4.1.4.2 c) pontnak megfelelően jelentettek, 3 másodperc legyen helyi rendszeres és különleges jelentéseknél és METAR és SPECI esetén és a közepes szélsebességtől való eltérések (széllökések) leképezéséhez használt kijelzőknél, a légiforgalmi szolgálati egységeknél.*

4.1.4 Jelentés

4.1.4.1 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben a talajszél irányt, illetve sebességet 10 földrajzi fokonként, illetve 1 km per óra (vagy 1 csomó). Az olyan észlelt értéket, amelyik nem illeszkedik a használt jelentés skálához, a skála legközelebbi lépcsőjének értékére kell lekerekíteni.

4.1.4.2 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben:

a) a szélsebesség mérésére használt mértékegységeket jelölni kell;

b) a közepes széliránytól az utolsó 10 perc során való eltéréseket a következők szerint kell jelenteni, ha a teljes változás 60^{o} vagy több:

1) ha a teljes változás 60^{o} és 180^{o} között van, és a szélsebesség 6 km/h (3 csomó) vagy ennél nagyobb; az ilyen irányváltozásokat a két szélső irány, amelyek között a talajszél változott, megadásával kell jelenteni;

2) ha a teljes változás 60^{o} és 180^{o} között van, és a szélsebesség kisebb, mint 6 km/h (3 csomó), a szélirányt, mint nem a közepes széliránnyal változót kell jelenteni; vagy

3) ha a teljes változás 180^{o} vagy nagyobb, a szélirányt mint nem közepes széliránnyal változót kell jelenteni;

c) az utolsó 10 perc során a közepes szélsebességtől való eltéréseket (széllökések) akkor kell jelenteni, ha a maximális szélsebesség a közepes szélsebességet 20 km/h-val (10 csomó) vagy többel meghaladja;

d) ha 2 km/h-nál (1 csomó) kisebb szélsebességet jelentenek, ezt nyugalomként kell jelezni;

e) ha 200 km(h (100 csomó) vagy ennél nagyobb szélsebességet jelentenek, ezt több, mint 199 km/h-ként (99 csomó) kell jelölni; és

f) ha a 10 perces időperiódus a szélirány és/vagy szélsebesség markáns diszkontinuitását tartalmazza, csak ezen diszkontinuitás után fellépő, a közepes szeliránytól és közepes szélsebességtől való eltéréseket kell jelenteni.

Megjegyzés. – Lásd a 4.1.3.1 pont alatti megjegyzést

4.1.4.3 A helyi rendszeres és különleges jelentésekben:

a) ha a talajszelet a futópálya mentén egynél több helyen mérték, azokat a helyeket, amelyeket ezek az értékek reprezentálnak, meg kell jelölni;

b) amikor egynél több futópálya van használatban, és a talajszelet ezekre a futópályákra vonatkozóan figyelik, a rendelkezésre álló értékeket az egyes futópályákra kell megadni, és a futópályákat, amelyekre az érték vonatkozik, jelenteni kell;

c) ha a közepes széliránytól való eltéréseket a 4.1.4.2 b) 2) pontnak megfelelően jelentik, a két szélső értéket, amelyek között a talajszél változott, kell jelenteni; és

d) ha a közepes szélsebességtől való eltéréseket (széllökések) a 4.1.4.2c) pontnak megfelelően jelentik, a szélsebesség által elért maximális és minimális értéket kell jelenteni;

4.1.4.4 METAR-ban és SPECI-ben, amikor a közepes szélsebességtől való eltéréseket (széllökések) a

4.1.4.2 c) pontnak megfelelően jelentik, az elért maximális szélsebesség értéket kell jelenteni.

4.2 Látás

4.2.1 Elhelyezés

Ajánlás – *Ha a látás mérésére műszerezett rendszereket használnak, reprezentatív méréseket megfelelően elhelyezett érzékelők használatával kell nyerni. Helyi rendszeres és különleges jelentések részére végzett látás megfigyelésekhez használt érzékelőket úgy kell elhelyezni, hogy a futópálya menti és a földetérési zónában fennálló látás lehető legjobb jelzéseit adja. A látást a futópálya feletti 2,5 m (7,5 láb) magasságban kell mérni.*

4.2.2 Kijelzők

Ajánlás – *Ha látás mérésére műszerezett rendszereket használnak, az egyes érzékelőkhöz tartozó látás kijelzőket a megfelelő légiforgalmi egységeknél lévő kijelzőkkel kapcsolódó meteorológiai állomáson kell elhelyezni. A meteorológiai állomáson és a légiforgalmi szolgálati egységeknél lévő kijelzőknek ugyanazon érzékelőkhöz kell tartozniuk, és ahol külön érzékelők szükségesek, ahogyan a 4.2.1 szakaszban le van írva, a kijelzőket világosan meg kell jelölni az egyes érzékelők által figyelt terület, például futópálya és futópálya szakasz azonosítása érdekében.*

4.2.3 Átlagolás

Ajánlás. – *Ha látás mérésére műszerezett rendszereket használnak, ezek inputjait legalább minden 60 másodpercben fel kell frissíteni, hogy lehetővé tegyék az aktuális reprezentatív értékek szolgáltatását. Az átlagolási időszaknak a következők szerintinek kell lenni:*

a) 1 perc helyi rendszeres és különleges jelentéseknél és légiforgalmi szolgáltató egységeknél lévő látáskijelzőknél; és

b) 10 perc METAR és SPECI esetén, kivéve, ha a megfigyelést közvetlen megelőző 10-perces időszak markáns diszkontinuitást tartalmaz a látásban, amikor csak a diszkontinuitás utáni adatokat használják fel a középértékek nyeréséhez.

Megjegyzés – Markáns diszkontinuitás akkor fordul elő, amikor a látásban egy megszakítás vagy egy legalább 2 percig tartó változás fennmarad, amely eléri vagy meghaladja a 2.3 pontban megadott, SPECI jelentések kiadására vonatkozó kritériumokat.

4.2.4 Jelentés

4.2.4.1 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben, ha a látás 800 m alatt van, azt 50 m-es lépcsőkben kell kifejezni, ha a látás 800 m, vagy több, de kevesebb, mint 5 km, akkor 100 m-es lépcsőket kell használni¸ 5 km felett, de 10 km alatt pedig kilométeres lépcsőkben; és ha 10 km, vagy több, akkor 10 km-ekben kell megadni, kivéve, ha fennállnak a CAVOK használatára vonatkozó feltételek. Ha valamely észlelt érték nem illeszkedik a használt jelentő skálához, akkor a skálán lévő legközelebbi kisebb lépcsőre kell lekerekíteni.

Megjegyzés. – A CAVOK használatára vonatkozó előírásokat a 2.2 szakasz tartalmazza.

4.2.4.2 Helyi rendszeres és különleges jelentésekben a futópálya (futópályák) menti látást a mértékegységekkel együtt kell jelenteni.

4.2.4.3 **Ajánlás** – *Helyi rendszeres és különleges jelentésekben, amikor műszerezett rendszert használnak a látás mérésére:*

a) ha a látást a futópálya mentén egynél több helyen figyelik, ahogyan a 4. Fejezet 4.6.2.2 pontjában le van írva, a földetérési zónát képviselő értékeket kell először jelenteni, amelyet, ha szükséges, a futópálya középponthoz és megállás véghez tartozó értékek követnek, és az ezeket az értékeket képviselő helyeket jelezni kell; és

b) ha egynél több futópálya van használatban, és a látást ezekre a futópályákra vonatkozóan figyelik, az egyes futópályákra vonatkozó látás értékeket jelenteni kell, és a futópályát, amelyre ezek az értékek vonatkoznak, jelezni kell

4.2.4.4 **Ajánlás** – *METAR-ban és SPECI-ben a látást domináns látásként kell jelenteni, ahogyan az 1. Fejezetben definiálva van. Ha a látás nem ugyanaz minden irányban és* *a) ha a legkisebb látás különbözik a domináns látástól és kisebb, mint 1500 m vagy kisebb, mint a domináns látás 50 százaléka, a megfigyelt látást is jelenteni kell és ennek a repülőtérhez viszonyított általános irányát az iránytű nyolc pontjának egyikéhez viszonyítva kell jelezni. Ha a legkisebb látást egynél több irányban észlelik, akkor az üzemeltetés szempontjából legszignifikánsabb irányt kell jelenteni; és*

b) ha a látás gyorsan ingadozik és a domináns látás nem határozható meg, csak a legkisebb látást kell jelenteni az irány megjelölése nélkül.

4.3 Futópálya látástávolság

4.3.1 Elhelyezés

4.3.1.1 **Ajánlás.** – *Futópálya látástávolságot a futópálya felett közelítőleg 2,5 m (7,5 láb) magasságban kell meghatározni.*

4.3.1.2 **Ajánlás.** –*A futópálya látástávolság megfigyeléseket a futópálya középvonalától legfeljebb 120 m oldalirányú távolságban kell végezni. A földetérési zónára jellemző megfigyelések helyének kb. 300 m-re kell lennie a futópálya mentén a küszöbtől számítva. A futópálya középső és harmadik harmadára jellemző megfigyelések helyét a futópálya mentén a küszöbtől számítva 1000 és 1500 méter közötti távolságra kell telepíteni , illetve kb. 300 m-re a futópálya ellentétes végétől. Ezeknek a helyeknek, és ha szükséges, további helyeknek, pontos meghatározásához olyan repülési, meteorológiai és klimatológiai tényezőket kell figyelembe venni, mint pl. hosszú futópályák, ingoványok és más ködösödésre hajlamos területek.*

4.3.2 Műszerezett rendszerek

Megjegyzés. – Mivel a pontosság egyik műszerkivitelezésről a másikra változhat, a teljesítmény jellemzőket a futópálya látástávolság megállapítására szolgáló műszereknél kiválasztás előtt ellenőrizni kell. Az előre-szórás mérő kalibrálásának követhetőnek, és a transzmisszométer szabványhoz verifikálhatónak kell lenni, amelynek pontosságát az előirányzott üzemelési tartomány felett verifikálták. Műszerezett futópálya látástávolság rendszerekben lévő transzmisszométerek és előre-szórás mérők használatára vonatkozó útmutató anyag a Futópálya látástávolság megfigyelési és jelentési eljárások kézikönyve (Manual of Runway Visual Range Observing and Reporting Practices) *(Doc 9328) kiadványban található.*

4.3.2.1 Transzmisszométereken vagy előre-szórás mérőkön alapuló műszerezett rendszereket II. és III. kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópályákon való futópálya látástávolság meghatározására használnak.

4.3.2.2 **Ajánlás.** – *Transzmisszométereken vagy előre-szórás mérőkön alapuló műszerezett rendszereket I. kategóriájú műszeres megközelítési és leszállási műveletekre szánt futópályákon való futópálya látástávolság meghatározására használnak.*

4.3.3 Kijelző

4.3.3.1 Ha a futópálya látástávolság megállapítására műszerezett rendszereket használnak, egy, vagy igény esetén több kijelzőt a megfelelő légiforgalmi egységeknél lévő kijelzőkkel kapcsolódó meteorológiai állomáson kell elhelyezni. A meteorológiai állomáson és a légiforgalmi szolgálati egységeknél lévő kijelzőknek ugyanazon érzékelőkhöz kell tartozniuk, és ahol külön érzékelők szükségesek, ahogyan a 4.3.1.2 pontban le van írva, a kijelzőket világosan meg kell jelölni az egyes érzékelők által figyelt futópálya és futópálya szakasz azonosítása érdekében.

4.3.3.2 **Ajánlás.** – *Ahol a futópálya látástávolságot emberi megfigyelők állapítják meg, a futópálya látástávolságot jelenteni kell a megfelelő helyi légiforgalmi szolgáltató egységeknek, amikor a jelentő* *skálának megfelelően jelentett értékben változás áll be (kivéve, ha a 3.2.2 a) vagy b) érvényes). Az ilyen jelentések továbbítását normál esetben a megfigyelés befejezése után 15 másodpercen belül be kell fejezni.*

4.3.4 Átlagolás

Ahol a futópálya látástávolság meghatározására műszerezett rendszereket használnak, ezek inputjait legalább minden 60 másodpercben fel kell frissíteni, hogy lehetővé tegyék az aktuális reprezentatív értékek szolgáltatását. Az átlagolási időszaknak a következőknek kell lenni:

a) 1 perc helyi rendszeres és különleges jelentéseknél és légiforgalmi szolgáltató egységeknél elhelyezett futópálya látástávolság kijelzőknél; és

b) 10 perc METAR és SPECI esetén, kivéve, ha a megfigyelést közvetlen megelőző 10-perces időszak markáns diszkontinuitást tartalmaz a futópálya látástávolság értékekben, amikor csak a diszkontinuitás utáni adatokat használják fel a középértékek nyeréséhez.

Megjegyzés – Markáns diszkontintinuitás akkor fordul elő, amikor a látásban egy megszakítás, vagy egy legalább 2 percig tartó változás fennmarad, amely eléri vagy meghaladja a 2.3.2 f) pontban megadott, SPECI jelentések kiadására vonatkozó kritériumokat.

4.3.5 Futópálya megvilágítás intenzitása

Ajánlás – *Ha műszerezett rendszereket használnak a futópálya látástávolság megállapítására, számításokat kell végezni külön mindegyik rendelkezésre álló futópályára. A futópálya látástávolságot nem lehet a futópályán rendelkezésre álló maximális fényintenzitás 3 %-ára vagy ennél kevesebbre számítani. Helyi rendszeres és különleges jelentések részére a számításhoz használt fényintenzitásnak a következőnek kell lenni:*

a) bekapcsolt fényekkel rendelkező futópályáknál a fényintenzitás aktuálisan az ezen a futópályán használt lesz; és

b) a kikapcsolt (vagy az üzemelés folytatása alatt a legkisebbre állított) világítású futópályánál az optimális fényintenzitás, amely megfelelne az uralkodó körülményekben üzemelési célra használtnak.

METAR-ban és SPECI-ben a futópálya látástávolságnak a futópályán rendelkezésre álló maximális fényintenzitáson kell alapulnia.

Megjegyzés. – A műszeren leolvasott értékek futópálya látástávolság értékekre való átszámítására vonatkozó útmutató anyag az E Mellékletben található.

4.3.6 Jelentés

4.3.6.1 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben, ha a futópálya látástávolság 400 m alatt van, azt 25 m-es lépcsőkben kell kifejezni, 400 m és 800 m között 50 m-es lépcsőket kell használni, és 100 m-es lépcsőket, ha a futópálya látástávolság nagyobb, mint 800 m. Ha valamely észlelt érték nem illeszkedik a használt jelentő skálához, akkor a skálán lévő legközelebbi kisebb lépcsőre kell lekerekíteni.

4.3.6.2 **Ajánlás** – *A futópálya látástávolság alsó határának 50 métert, a felső határának 2000 métert kell tekinteni. Ezeken a határértékeken kívül eső értékeknél a helyi rendszeres és különleges jelentések és a METAR és SPECI csupán azt kell, hogy jelezze, hogy a futópálya látástávolság kisebb, mint 50 méter, vagy nagyobb, mint 2000 méter.*

4.3.6.3 Helyi rendszeres és speciális jelentésekben és METAR-ban és SPECI-ben:

a) Ha a futópálya látástávolság a használt rendszerrel meghatározható maximális érték fölött van, ezt a „ABV” rövidítés használatával kell jelenteni a helyi rendszeres és különleges jelentésekben, és a „P” rövidítés használatával METAR-ban és SPECI-ben, amelyet a rendszerrel megállapítható maximális érték követ; és

b) ha a futópálya látástávolság a használt rendszerrel meghatározható minimális érték alatt van, azt „BLW” rövidítés használatával kell jelenteni a helyi rendszeres és különleges jelentésekben, és „M” rövidítés használatával METAR-ban és SPECI-ben, amelyet a rendszerrel meghatározó minimális érték követ.

4.3.6.4 Helyi rendszeres és különleges jelentésekben:

a) a használt mértékegységeknek szerepelniük kell;

b) ha futópálya látástávolságot a futópálya mentén csak egy helyen figyelik, azaz a földetérési zónában, annak a hely jelzése nélkül kell szerepelni;

c) ha a futópálya látástávolságot a futópálya mentén egynél több helyen figyelik meg, a földetérési zónát képviselő értéket kell először jelenteni, amelyet a középpontot és a megállási véget képviselő értékek követnek, és azokat a helyeket, amelyeket ezek az értékek képviselnek, jelölni kell; és

d) ha egynél több futópálya van használatban, a rendelkezésre álló futópálya látástávolság értékeket mindegyik futópályára jelenteni kell, és a futópályákat, amelyekre az értékek vonatkoznak, jelölni kell.

4.3.6.5 **Ajánlás** – *METAR-ban és SPECI-ben:*

a) csak a földetérési zónát képviselő értéket kell jelenteni és nem kell a futópályán lévő hely jelzését megadni; és

b) ahol egynél több futópálya áll leszálláshoz rendelkezésre, a földetérési zóna futópálya látástávolság értékeket minden ilyen futópályára, maximálisan négyre, meg kell adni és a futópályákat, amelyekre az értékek vonatkoznak, jelölni kell.

4.3.6.6 **Ajánlás**. – *Ha a futópálya látástávolság megállapításához műszeres rendszereket használnak, a megfigyelést megelőző 10 perc futópálya látástávolság értékek változásait a METAR/SPECI kód formában készült jelentéseknek tartalmazniuk kell a következők szerint:*

4.3.6.7

a) ha a futópálya látástávolság értékek a 10 perces időszak alatt határozott tendenciát mutatnak, pl. az első 5 perc átlaga 100 m-el, vagy többel eltér a második 5 perc átlagától, ezt jelezni kell. Ha a látástávolság értékek növekvő, vagy csökkenő tendenciát mutatnak, ezt az „U”, illetve a „D” rövidítésekkel kell jelezni. Olyan esetekben, amikor a 10 perces időszak alatti értékváltozások határozott tendenciát nem mutatnak, ezt a „N” rövidítéssel kell jelezni. Ha tendenciajelzés nem áll rendelkezésre, a fenti rövidítések nem alkalmazhatók;
b) ha a 10 perces időszak egy perces futópálya látástávolság értékei az átlagértéktől több, mint 50 m-el, vagy az átlagértéktől több mint 20 százalékkal, attól függően, melyik a nagyobb, eltérnek, az 1 perces átlag minimumot és az 1 perces átlag maximumot kell megadni a 10 perces átlagérték helyett. Ha megfigyelést közvetlenül megelőző 10 perces időszak alatt jelentős diszkontinuitás mutatkozik a futópálya látástávolság értékekben, csak a diszkontinuitás utáni értékeket kell használni a változások meghatározásához.

Megjegyzés. – Markáns diszkontinuitásnak a futópálya látástávolság olyan hirtelen bekövetkező és folyamatos – legalább 2 percig tartó – változása minősül, amely eléri vagy meghaladja a SPECI kódformájú különleges jelentések kiadásának 2.3.2 f) pontban megadott kritériumait.

4.4. Aktuális időjárás

4.4.1 Elhelyezés

Ajánlás – *Ha a 4.4.2.3 és 4.4.2.4 pontok alatt felsorolt aktuális időjárás jelenségek megfigyelésére műszerezett rendszereket használnak, reprezentatív információkat megfelelően elhelyezett érzékelők használatával kell nyerni*

4.4.2 Jelentés

4.4.2.1 *A helyi rendszeres és különleges jelentésekben az észlelt aktuális időjárási jelenségeket fajta és jelleg szerint kell megadni, és minősíteni kell azok intenzitását, amelyik a megfelelő.*

4.4.2.2 *METAR-ban és SPECI-ben az észlelt aktuális időjárási jelenségeket fajta- és jelleg szerint kell megadni, valamint minősíteni kell azok intenzitását, illetve távolságát a repülőtértől, amelyik a megfelelő.*

4.4.2.3 **Ajánlás. –** *Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben az aktuális időjárás jelenségek következő fajtáit kell jelenteni, a megfelelő rövidítéseket és releváns kritériumokat, amelyik a megfelelő, használva:*

a) Csapadék	*DZ*
Szitálás	*RA*
Eső	*SN*
Hó	*SG*
Hódara	*PL*
Jéglabdacsok	*IC*
Jégkristályok (nagyon apró jégkristályok lebegésben, gyémántporként is ismert)	
– Csak akkor kell jelenteni, ha a hozzá kapcsolódó látás 5000 m vagy; kevesebb;	*GR*
Jégeső	
– Akkor jelentendő, ha a legnagyobb jégszemek átmérője 5 mm, vagy ennél nagyobb;	
Kisméretű jég és/vagy hódara	
– Akkor jelentendő, ha a legnagyobb szemek átmérője 5 mm-nél kisebb;	*FG*
b) Homályosságok (hidrometeorok)	
Köd	
– Akkor jelentendő, ha a látástávolság 1000 m alatt van, kivéve azokat az eseteket, amikor „MI”, „BC”, „PR”, vagy „VC”-nek van minősítve (lásd 4.4.2.4 és 4. pontokat);	*BR*
Párásság	
– Akkor jelölendő, ha a látástávolság legalább 1000 m, de nem több, mint 5000 m;	
c) Homályosság (litometeorok)	
A következők csak akkor használandók, ha a homályosság	*SA*
túlnyomórészt litometeorokból áll és a látástávolság 5000 m,	*DU*
vagy annál kisebb, kivéve az „SA”-t, ha azt „DR” kvalifikálja	*HZ*
(lásd 4.4.2.4 pont) és a vulkanikus hamu esetét;	*FU*
Homok	*VA*
Por (nagy kiterjedésű)	
Homály	*PO*
Füst	*SQ*
Vulkanikus hamu	*FC*
d) Egyéb jelenségek	*DS*
Por/homok forgatag (dust devils)	*SS*
Szélroham	

Tölcsérfelhő (tornádó vagy víztölcsér)
Porvihar
Homokvihar

4.4.2.4 **Ajánlás. –** *Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben az aktuális időjárás jelenségek következő jellemzőit, ahogyan szükséges, kell jelenteni, a megfelelő rövidítéseiket és releváns kritériumaikat, amelyik alkalmas, használva:*

Zivatar	*TS*
– Szokásos zivatar esővel „TSRA”, hóval „TSSN”, jégdarával „TSPL”, jégesővel „TSGR” vagy kisméretű jég és/vagy hódarával „TSGS” kísért zivatar, vagy ezek kombinációjának jelentésére, pl. „TSRASN”. Ha mennydörgés volt hallható a megfigyelést megelőző 10 perces időszakon belül, a „TS” rövidítést kell használni, minősítés nélkül.	
Zápor	*SH*
– Használatos záporesővel „SHRA”, hóval „SHSN”, jégdarával kísért zápor „SHGS”, vagy ezek kombinációjának jelentésére, pl. „SHRASN”. A repülőtér környezetében észlelt záport (lásd 4.4.2.5. pont) „VCSH”-ként kell jelezni, a csapadék típusának és intenzitásának minősítése nélkül;	
Ónos eső	*FZ*
Túlhűlt vízcseppek, vagy csapadék, csak FG-vel, DZ-vel és RA-val használatos	
Fúvás	*BL*
–Használatos szél által a föld felett 2 m-re, (6 láb) vagy annál magasabbra felkavart DU, SA vagy SN (beleértve a hóvihart) jelentésére; hó esetén ugyancsak használatos egy felhőből hulló hó és a szél által a földről felkavart hó keveredésére.	
Talajközeli fúvás	*DR*
--Használatos szél által a föld feletti 2 m-t (6 láb) el nem érő magasságra emelt SA, DU vagy SN jelentésre	
Sekély	*MI*
--A földfelszínhez képest 2 m-nél (6 láb) alacsonyabb	
Foltok	*BC*
--Ködfoltok, amelyek a repülőteret véletlenszerűen elszórva borítják.	
Részleges	*PR*
--A repülőtér számottevő részét köd borítja, míg a többi rész tiszta.	

4.4.2.5 **Ajánlás.** *– Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben jelentett aktuális időjárási jelenség intenzitásának, illetve ahogy alkalmas, a repülőtérhez való közelségének jelölésére az alábbiak szolgálnak:*

	(helyi rendszeres és különleges jelentések)	*(METAR és SPECI)*
Gyenge	*FBL*	*–*
Közepes	*MOD*	*(nincs jelölés)*
Erős	*HVY*	*+*

Csak DZ, GR, GS, PL, RA, SG és SN (vagy ezeknek az aktuális időjárás jelenségeknek a kombinációival használatos; ebben az esetben az intenzitás a 4.4.2.6 pontnak megfelelő csapadékokra vonatkozik); DS és SS (a DS és SS esetekben csak mérsékelt és heves intenzitásokat kell jelölni).

Környék	*VC*

– Nem a repülőtéren, de nem távolabb, mint közelítőleg 8 km-re a repülőtér peremétől, és csak METAR-ban és SPECI-ben DS, SS, FG, FC, SH, PO, BLDU, BLSA, BLSN és TS esetén használatos; amikor nem

4.4.2.4. pont alatt jelentették.

4.4.2.6 **Ajánlás**. – *Helyi rendszere és különleges jelentésekben egy vagy több, maximum három, a 4.4.2.3 és 4.4.2.4 pontban megadott rövidítést kell szükség szerint használni, és ahol megfelelő, a jelenség jellegének és intenzitásának vagy repülőtéri közelségének jelzésével együtt, úgy, hogy a repülési műveletek számára jelentőséggel bíró aktuális időjárásról komplett leírást adjon. Ennek az információnak a jelentésében az intenzitás jelölése vagy a repülőtéri közelség jelölése kerüljön az első helyre a megkívánt szerint, ezt követi az időjárási jelenség jellege és fajtája. Ha két különböző fajtájú időjárást figyelnek meg, ezt két különálló csoportban kell jelenteni, ahol az intenzitás vagy repülőtér közelség jelölés arra az időjárási jelenségre utal, amelyik a jelölést követi. Az észlelés időpontjában előforduló többféle csapadék fajtát viszont egyetlen csoportban kell jelenteni, a domináns csapadékfajta jelentésével az első helyen, ezt csak egy intenzitásjelző előzi meg, amely a teljes csapadékintenzitást jelöli.*

4.5 Felhők

4.5.1 Elhelyezés

Ajánlás – *Ha a felhő mennyiség és felhőalap magasság mérésére műszerezett rendszert használnak, reprezentatív észleléseket kell nyerni megfelelően elhelyezett érzékelők használatával. Helyi rendszeres és különleges jelentéseknél precíziós megközelítéses futópályákkal rendelkező repülőterek esetén, a felhő mennyiség és felhőalap magasság érzékelőket úgy kell elhelyezni, hogy a felhőalap magasság és felhő mennyiség lehető legjobb jelzését adja a műszeres leszállító rendszer középső markerjánál, vagy olyan repülőtereknél, ahol középső rádió jeladót nem használnak, 900-1200 m (3000-4000 láb) távolságra a leszállási küszöbtől a futópálya megközelítési végénél.*

Megjegyzés. – Műszeres leszállító rendszer középső jeladó helyének specifikációi a 10. Annex 3. Kötet 3. Fejezetben és a C Melléklet C-5 táblázatában vannak meg adva.

4.5.2 Kijelző

Ajánlás. – *Ha a felhőalap mérésére automatizált berendezést használnak, a felhőalap magasság kijelző(ke)t a megfelelő légiforgalmi szolgálati egységeknél lévő kijelző(k)höz kapcsolódó meteorológiai állomáson kell elhelyezni. A meteorológiai állomáson és a légiforgalmi szolgálati egységeknél lévő kijelzőknek ugyanahhoz az érzékelőhöz kell tartozniuk, és ahol különálló érzékelők szükségesek, ahogyan a 4.5.1 pontban le van írva, a kijelzőknek világosan azonosítani kell az egyes érzékelők által figyelt területet.*

4.5.3 Referencia szint

Ajánlás – *A felhőalap magasságot általában a repülőtér közepes tengerszint feletti magassága felettiként kell jelenteni. Ha olyan precíziós megközelítéses futópálya van használatban, amelynek 15 m-el (50 láb) vagy többel a repülőtér közepes tengerszint feletti magassága alatti küszöbmagassága van, helyi megállapodást kell kötni arról, hogy az érkező légijárműveknek jelentett felhőalap a küszöbmagasságra vonatkozzon. Tengeren lévő partközeli szerkezetekről szóló jelentések esetében a felhőalap magasságot a közepes tengerszint felett kell megadni.*

4.5.4 Jelentés

4.5.4.1 **Ajánlás** – *Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben:*

a) felhőmennyiséget a „FEW” (1-től 2 oktáig), „SCT” (3-tól 4 oktáig, „BKN” (5-től 7 oktáig) vagy „OVC” (8 okda) rövidítéseket használva kell jelenteni;

b) cumulonimbus felhőket és tornyosuló cumulonimbus felhőket „CB” és „CU” rövidítésekkel kell jelenteni;

c) a felhőalap magasságot 30 m-es (100 láb) lépcsőkben kell jelenteni 3000 m-ig (10000 láb) és 300 m-es (1000 láb) lépcsőkben 3000 m (10000 láb) felett;

d) a függőleges látást 30 m-es (100 láb) lépcsőkben kell jelenteni 600 m-ig (2000 láb);

e) ha nincs felhő, és nincs korlát a függőleges látásban, és a „CAVOK” rövidítés nem megfelelő, az „SKC” rövidítést kell használni;

f) ha nincs az üzemeltetés szempontjából jelentős felhő, nincs cumulonimbus és nincs korlát a függőleges látásban, és a „CAVOK” és „SKC” nem megfelelő, az „NSC” rövidítést kell használni.

g) ha több, üzemeltetés szempontjából szignifikáns felhőréteget vagy felhőtömeget észleltek, mennyiségüket és felhőalap magasságukat a felhőalap magasság növekvő sorrendjében, és a következő kritériumoknak megfelelően kell jelenteni:

1) mennyiségre való tekintet nélkül, a legalacsonyabb réteg vagy tömeg, melyet megfelelően FEW, SCT, BKN, vagy OVC-ként kell jelenteni;

2) a következő réteg vagy tömeg, amely az égboltnak több mint 2/8 részét borítja, melyet megfelelően SCT, BKN, vagy OVC-ként kell jelteni;

3) a következő magasabb réteg vagy tömeg, amely az égboltnak több, mint 4/8 részét borítja, melyet megfelelően BKN, vagy OVC-ként kell jelteni; és

4) cumulonimbus és/vagy tornyos cumulus felhők, ha észleltek ilyet és nem jelentették azokat a fenti 1-3 pontokban.

h) ha a felhőalap kusza vagy egyenetlen, vagy gyorsan ingadozik a felhőalap minimális magasságát, vagy felhőfoszlányokat kell jelenteni; és

i) ha ega egyedi felhőréteg (felhőtömeg) cumulonimbusszal és tornyosuló cumulus felhőkkel együttvan, a felhőfajtát csak mint cumulonimbust kell jelenteni.

Megjegyzés. – Tornyosuló cumulus nagy függőleges kiterjedésű cumulus congestust jelöl.

4.5.4.2 Helyi rendszeres és különleges jelentésekben:

a) a felhőalap magasság és a függőleges látás vonatkozó mértékegységeit jelölni kell; és

b) ha egynél több futópálya van használatban, és a felhőalap magasságokat ezekre a futópályákra műszerekkel figyelik, a rendelkezésre álló felhőalap magasságokat az egyes futópályákra vonatkozóan kell jelenteni, és afutópályát, amelyre az értékek vonatkoznak, meg kell jelölni.

4.6 Levegő hőmérséklet és harmatpont hőmérséklet

4.6.1 Kijelző

Ajánlás. – *Ha a levegő hőmérséklet és harmatpont hőmérséklet mérésére automatizált berendezést használnak, a levegő hőmérséklet és harmatpont hőmérséklet kijelzőket a megfelelő légiforgalmi szolgálati egységeknél lévő kijelző(k)höz kapcsolódó meteorológiai állomáson kell elhelyezni. A meteorológiai állomáson és a légiforgalmi szolgálati egységeknél lévő kijelzőknek ugyanahhoz az* *érzékelőhöz kell tartozniuk.*

4.6.2 Jelentés

4.6.2.1 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben a levegő hőmérsékletet és a harmatpont hőmérsékletet egész Celsius fok lépcsőkben kell jelenteni. Azokat az észlelt értékeket, amelyek nem illeszkednek a használt jelentő skálához, a legközelebbi egész Celsius fokra kell kerekíteni, ha az észlelt érték 0,5° végződésű, akkor a legközelebbi nagyobb egész Celsius fokra kell kerekíteni.
4.6.2.2 Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben 0°C alatti hőmérsékletet azonosítani kell.

4.7 Atmoszférikus nyomás

4.7.1 Kijelző

Amikor nyomásmérésre automatizált berendezéseket használnak, a barométerrel kapcsolódó QNH és a 4.7.3.2 b)ponttal összhangban igényelt QFE kijelzőket a meteorológiai állomáson kell elhelyezni, összekötve a megfelelő légiforgalmi szolgáltató egységekben lévő kijelzőkkel. Ha a QFE értékek kijelzése egynél több futópályára történik, ahogyan az a 4.7.3.2 d) pontban le van írva, a kijelzőket világosan meg kell jelölni, hogy a futópálya, amelyre a kijelzett QFE érték vonatkozik, azonosítható legyen.

4.7.2 Referencia szint

Ajánlás. – *A QFE kiszámításához a vonatkozási szint a repülőtér tengerszint feletti magassága legyen. Nem-precíziós megközelítésű futópályáknál, amelyek küszöbje 2 méterrel (7 lábbal), vagy többel a repülőtér tengerszint feletti magassága alatt vagy felett van, és a precíziós megközelítésű futópályáknál, a QFE-t, ha szükséges, a megfelelő küszöb tengerszint feletti magasságra vonatkoztatva kell megadni.*

4.7.3 Jelentés

4.7.3.1 Helyi rendszeres és különleges jelentéseknél és METAR-ban és SPECI-ben QNH-t és QFE-t tized hektopascalban kell számolni, és egész hektopascalban kell jelenteni, négy számjegyet használva. Azokat az észlelt értékeket, amelyek nem illeszkednek a használt jelentő skálához, a legközelebbi kisebb egész hektopascalra kell kerekíteni.
4.7.3.2 Helyi rendszeres és különleges jelentésekben:

a) QNH-nak szerepelni kell;

b) QFE-nek szerepelni kell, ha az üzemeltető igényli, vagy ha a légiforgalmi szolgáltatási hatóságok és az érdekelt üzemeltetők között helyileg ilyen megállapodás van, reguláris alapon;

c) a QNH és QFE értékek mérésénél használt mértékegységeknek szerepelni kell; és ha a QFE értékeket egynél több futópályára igénylik, az igényelt QFE értékeket az egyes futópályákra jelenteni kell, és a futópályákat, amelyekre az értékek vonatkoznak, meg kell jelölni.

4.7.3.3 METAR-ban és SPECI-ben csak a QNH értékeket kell szerepeltetni.

4.8 Kiegészítő információk

4.8.1 Jelentés

4.8.1.1 **Ajánlás**. – *Helyi rendszeres és különleges jelentésekben és METAR-ban és SPECI-ben az* *alább felsorolt legutóbbi időjárás jelenségeket, azaz a repülőtéren az utolsó kiadott rendszeres jelentés óta eltelt időszak során, vagy az utolsó egy órában, amelyik a rövidebb, észlelték, de nem a megfigyelés időpontjában, maximálisan három csoportot, a kiegészítő információban jelenteni kell:*

– ónos csapadék	*REFZDZ, REFZRA*
– mérsékelt vagy heves csapadék (beleértve a záport)	*REDZ, RERA, RESN, RESG, REPL, RESHRA, RESHSN,RESHGR,*
RESHGS	
– hófúvás	*REBLSN*
– porvihar vagy homokvihar	*REDS, RESS*
– zivatar	*RETS*
– tölcsér felhő (tornádó vagy víztölcsér)	*REFC*
– vulkanikus hamu	*REVA*

4.8.1.2 **Ajánlás. –** *Helyi rendszeres és különleges jelentésekben a következő szignifikáns meteorológiai viszonyokat, vagy ezek kombinációit kell kiegészítő információként jelenteni:*

– cumulonimbus felhők	*CB*
– zivatar	*TS*
– mérsékelt vagy heves turbulencia	*MOD TURB, SEV TURB*
– szélnyírás	*WS*
– jégeső	*GR*
– heves szélvihar vonal	*SEV SQL*
– mérsékelt vagy erős jegesedés	*MOD ICE, SEV ICE*
– ónos csapadék	*FZDZ, FZRA*
– erős hegyi hullám	*SEV MTW*
– porvihar, homokvihar	*DS, SS*
– hófúvás	*BLSN*
– tölcsérfelhő (tornádó vagy víztölcsér)	*FC.*

A meteorológiai körülmény helyét jelölni kell. Ahol szükséges, kiegészítő információkat kell bevinni, rövidített köznyelvet használva.

4.8.1.3 **Ajánlás. –** *METAR-ban és SPECI-ben, ahol a helyi körülmények így biztosak, szélnyírás információkat kell adni.*

Megjegyzés. – A 4.8.1.3 pontban hivatkozott helyi körülmények, bár nem korlátozódnak szükségszerűen egy nem átmeneti jellegű szélnyírásra, például kapcsolódhatnak alacsonyszinti hőmérséklet inverzióval vagy helyi terepviszonyokkal.

4.8.1.4 **Ajánlás. –** *METAR-ban és SPECI-ben a következő információknak kell szerepelni a kiegészítő információk között, a regionális léginavigációs egyezménynek megfelelően:*

a) tengeren emelt építményeken létesített, támogató léginavigációs meteorológiai állomásoktól származó, a tengerszinti hőmérsékletre és a tenger állapotára vonatkozó információk a helikopteres üzemelések támogatására; és

b) a megfelelő repülőtéri hatóság által szolgáltatott, a futópálya állapotára vonatkozó információk.

1. Megjegyzés. – A tenger állapota a WMO 306 számú kiadványában, Kód kézikönyv (Manual on Codes), *1.1 kötet, A Rész – Alfanumerikus kódok, 3700-es kód táblázat van specifikálva.*

2. Megjegyzés. –A tenger állapota a WMO 306 számú kiadványában, Kód kézikönyv (Manual on Codes), *1.1 kötet, A Rész – Alfanumerikus kódok, 0366, 0519, 0919 és 1079 kód táblázatok.*

4.9 Automatikus megfigyelő rendszerektől származó meteorológiai információk

4.9.1 Jelentés

4.9.1.1 **Ajánlás. –** *Automatizált METAR-ban és SPECI-ben talajszél, futópálya látástávolság, levegőhőmérséklet és harmatpont hőmérséklet és atmoszférikus nyomás értékeket jelenteni kell összhangban a METAR-ral és SPECI-vel releváns előírásokkal, amelyeket a 4.1, 4.3, 4.6 és 4.7 szakaszok tartalmaznak.*

4.9.1.2 **Ajánlás. –** *Automatizált METAR-ban és SPECI-ben a látást értékeket jelenteni kell összhangban a METAR-ral és SPECI-vel releváns előírásokkal, amelyeket a 4.2 szakasz tartalmaz Azonban, amikor látás érzékelőket olyan módon helyezik el, hogy irány változásokat nem lehet megadni, a jelentett látás értéket az „NDV” rövidítésnek kell követni.*

4.9.1.3 **Ajánlás. –** *Automatizált METAR-ban és SPECI-ben a látást értékeket jelenteni kell összhangban a METAR-ral és SPECI-vel releváns előírásokkal, amelyeket a 4.4 szakasz tartalmaz. Azonban a 4.4.2.3 a) pont alatt felsorolt csapadék fajtákon kívül az UP rövidítést kell használni azonosítatlan csapadékoknál, amikor a csapadékot nem lehet automatikus megfigyelő rendszerrel azonosítani.*

4.9.1.4 **Ajánlás. –** *Automatizált METAR-ban és SPECI-ben felhőket és függőleges látást a 4.5 szakasz által tartalmazott METAR-ral és SPECI-vel releváns előírásokkal összhangban kell jelenteni. Azonban:*

a) amikor a felhő fajtát az automatikus megfigyelő rendszerrel nem lehet megfigyelni, a felhő fajtát az egyes felhő csoportokban „///” jellel kell helyettesíteni; és

b) amikor az automatikus megfigyelő rendszerrel nem észlelnek felhőt, ezt az „NCD” rövidítéssel kell jelölni.

4.9.1.5 **Ajánlat. –** *Automatizált METAR-ban és SPECI-ben kiegészítő információkat a 4.8 szakasz által tartalmazott METAR-ral és SPECI-vel releváns előírásokkal összhangban kell jelenteni. Azonban, a*

4.8.1.2 pont alatt felsorolt időjárás jelenségeken kívül a REUP rövidítést kell használni aktuális csapadéknál, amikor a csapadék fajtát nem lehet automatikus megfigyelő rendszerrel azonosítani.

A3-1 táblázat. Minta helyi rendszeres (MET REPORT) és helyi különleges (SPECIAL) jelentésekhez

Kulcs: M = kötelező beszúrás, minden közlemény része
C = feltételes beszúrás meteorológiai körülményektől függ
O = fakultatív beszúrás

1. Megjegyzés. –A helyi rendszeres és különleges jelentésekben szereplő numerikus elemek nagyságrendje és felbontása jelen Függelék A3-4 táblázatban látható

2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400) kiadványban található.*

A 4. Fejezet- ben meghatá- rozottak sze- rinti elem	**Részletes tartalom**	**Minta (Minták)**			**Példák**
A jelentés típusának azonosítása (M)	A jelentés típusa	MET REPORT vagy SPECIAL			MET REPORT SPECIAL
Hely jelzése (M)	ICAO hely jelzés (M)	nnnn			YUDO[1]
A megfigyelés időpontja (M)	A megfigyelés dátuma és aktu- ális időpontja UTC- ben	nnnnnnZ			221630Z
Taljszél (M)	Elem neve(M)	SZÉL			WIND 240/150KH (WIND 240/8KT)
	Futópálya (O)[2]	RWY nn(n)			WIND RWY 18 TDZ 190/22KMH
	Futópálya szekció (O[3])	TDZ			(WIND RWY 18 TDZ 190/11KT)
	Szélirány (M)	nnn	VRB BTN nnn/ÉS nnn/ *vagy* VRB	CALM	WIND VRB4KMH WIND VRB2KT WIND VRB BTN 350 AND 050/4KMH (WIND VRB BTN 350 AND 050/2KT)
	Szélsebesség(M)	ABV] n(n)(n)KMH (*vagy* [ABV]n(n)KT)			WIND 270/ABV 190KMH WIND 270/ABV 99KT
	Szignifikáns sebességváltozások (C)[4]	MAX [ABV] nn (n) MNM n (n)			WIND 120/12KMH MAX35 MNM8 (WIND 120/6KMH MAX18 MNM4)(
	Futópálya szekció (O[3])	VRB BTN nnn/ ÉS nnn/	–		WIND 020/20KMH VRB BTN 350 AND 070/ (WIND 020/10KT VRB BTN 350 AND 070/)
	Futópálya szekció (O[3])	MID			WIND RWY 14R MID 140/22KMH (WIND RWY 14R MID 140/11KT
	Szélirány (O)[3]	nnn	VRB BTN nnn/ÉS nnn/ *vagy* VRB	CALM	
	Szélsebesség (O)[3]	ABV] n(n)(n)KMH (*vagy* [ABV]n(n)KT)			
	Szignifikáns sebességváltozások (C)[4]	MAX [ABV] nn (n) MNM n (n)			
	Szignifikáns irányváltozások (C)[5]	VRB BTN nnn/ ÉS nnn/			

A 4. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)			Példák
	Futópálya szekció (O[3])	END			WIND RWY 27 TDZ 240/32KMH MAX54 MNM20 END 250/28KMH (WIND RWY 27 TDZ 240/16KT MAX27 MNM10 END 250/14KT
	Szélirány (O)[3]	nnn	VRB BTN nnn /ÉS nnn/ *vagy* VRB	CALM	
	Szélsebesség (O)[3]	[ABV] n(n)(n)KMH (*vagy* [ABV] n(n)KT)			
	Szignifikáns sebességváltozások (C)[4]	MAX [ABV] nn (n) MNM n (n)			
	Szignifikáns irányváltozások (C)[5]	VRB BTN nnn/ ÉS nnn/	–		
Látás (M)	Elem neve (M)	VIS		CAVOK	VIS 350M CAVOK VIS 7KM VIS 10KM
	Futópálya (O)[2]	RWY nn(n)			VIS RWY 09 TDZ 800M END 1200M
	Futópálya szekció (O)[3]	TDZ			
	Látás (M)	nn(n][n)M *vagy* (nn]KM			
	Futópálya szekció (O)[3]	MID			VIS RWY 18 TDZ 6KM RWY 27 TDZ 4000M
	Látás (O)[3]	nn(n][n)M *vagy* (nn]KM			
RVR(C)[6]	Elem neve (M)	RVR			RVR RWY 32 400M RVR RWY 20 500M
	Futópálya (C)[7]	RWY nn[n]			
	Futópálya szekció (C)[8]	TDZ			
	RVR (M)	[ABV VAGY BLW] nn(n][n)M			RVR RWY 10 BLW 50M RVR RWY 14 ABV 2000M RVR RWY 10 BLW 150M RVR RWY 14 ABV 1200M
	Futópálya szekció (C)[8]	MID			RVR RWY 12 TDZ 1100M ABV 1400M
	RVR (C)[8]	ABV VAGY BLW] nn(n][n)M			
	Futópálya szekció (C)[8]	END			RVR RWY 16 TDZ 600M MID 500M END 400M
	RVR (C)[8]	ABV VAGY BLW] nn(n][n)M			RVR RWY 26 500M RWY 20 800M
Aktuális időjárás (C)[9,10]	Aktuális időjárás intenzitása (C)[9]	FBL *vagy* MOD *vagy* HVY	–		

A 4. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)			Példák
	Aktuális időjárás jellemzői és Fajtája (C)[9,11]	DZ *vagy* RA *vagy* SN *vagy* SG *vagy* PL *vagy* DS *vagy* SS *vagy* FZDZ *vagy* FZRA *vagy* SHGR *vagy* SHGS *vagy* SHRA *vagy* SHSN *vagy* TSGR *vagy* TSGS *vagy* TSPL *vagy* TSRA *vagy* TSSN	IC *vagy* FG*vagy* BR *vagy* SA *vagy* DU *vagy* HZ *vagy* FU *vagy* VA *vagy* SQ *vagy* PO *vagy* FC *vagy* TS *vagy* BCFG *vagy* BLDU *vagy* BLSA *vagy* BLSN *vagy* DRDU *vagy* DRSA *vagy* DRSN *vagy* FZFG *vagy* MIFG *vagy* PRFG		MOD RA HZ HVY TSRA FG HVY DZ VA FBL SN MIFG HVY TSRA FBL SNRA FBL DZ FG HVY SHSNBLSN
Felhő (M)[12]	Az elem neve (M)	CLD			
	Futópálya (O)[2]	RWY nn(n]			
	Felhőmennyiség vagy függőleges látás (O)[9]	FEW *vagy* SCT *vagy* BKN *vagy* OVC	OBSC	SKC *vagy* NSC	CLD SCT 300M OVC 600M CLD NSC (CLD SCT 1000FT OVC 2000 FT) CLD BKN TCU 270M (CLD BKN TCU 900FT) CLD RWY 08 BKN 60M RWY 26 BKN 90M (CLD RWY 08 BKN 200FT RWY 26 BKN 300FT)
	Felhőfajta (C)[9]	CB *vagy* TCU	--		
	Felhőalap magassága vagy a függőleges látás értéke (C)[9]	nn[n][n]M (*vagy*.nnn[n] FT)	[VER VIS nn[n][n]M (or nnn[n]FT)]		
Levegőhőmérséklet (M)	Az elem neve (M)	T			T17
	Levegőhőmérséklet (M)	[MS]nn			tMS08
Harmatpont hőmérséklet (M)	Az elem neve (M)	DP			DP15
	Harmatpont hőmérséklet (M)	[MS]nn			DPMS18
Nyomásértékek (M)	Az elem neve (M)	QNH			QNH 0995HPA
	QNH (M)	nnnnHPA			QNH 1009HPA
	Az elem neve (O)	QFE			QNH 1022HPA QFE 1001HPA QNH 0987HPA QFE RWY 18 0956HPA
	QFE (O)	[RWY nn(n]] nnnnHPA [RWYnn(n] nnnnHPA]			RWY 24 0955HPA
Kiegészítő információk (C)[9]	Signifikáns meteorológiai jelenségek (C)[9]	CB *vagy* TS *vagy* MOD TURB *vagy* SEV TURB *vagy* WS *vagy* GR *vagy* SEV SOL *vagy* MOD ICE *vagy* SEV ICE *vagy* FZDZ *vagy* FZRA *vagy* SEV MTW *vagy* SS *vagy* DS *vagy* BLSN *vagy* FC[13]			FC IN APCH WS IN APCH 60M-WIND:360/50KMH WS RWY 12
	A jelenség helye (C)[9]	IN APCH [nnnM-WIND nnn/nnKMH] *vagy* IN CLIMB_OUT [nnnM-WIND nnn/nnKMH] (IN APCH [nnnFT-wind nnn/nnKT] *vagy* IN CLIMB-OUT [nnnFT-Wind nnn/nnKT] *vagy* RWY nn[n]			
	Legutóbbi időjárás (C)[9,10]	REFZDZ *vagy* REFZRA *vagy* REDZ *vagy* RE[SH]RA *vagy* RE[SH]SN *vagy* RESG *vagy* RESHGR *vagy* RESHGS *vagy* REBLSN *vagy* RESS *vagy* REDS *vagy* RETSRA *vagy* RETSSN *vagy* RETSPL *vagy* RETSGR *vagy* RETSGS *vagy* REFC *vagy* REPL *vagy* REVA			REFZRA CB IN CLIMB-OUT RETSRA

A 4. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)					Példák
Trend előrejel-zés (O)[14]	Az elem neve (M)	TREND					
	Változás jelző (M)[15]	NOSIG	BECMG *vagy* TEMPO				TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT)
	A változás periodusa (C)[9]		FMnnnn *és/vagy* TLnnnn *vagy* ATnnnn				
	Szél (C)[9]		nnn/ [ABV] n[n][n]KMH [MAX[ABV] nn [n]] (*vagy* nnn/ [ABV] n[n]KT [MAX[ABV] nn])				TREND TEMPO 250/750KMH MAX 100 (TREND TEMPO 250/35KT MAX 50)
	Látás (C)[9]		VIS nn[n][n]M *vagy* VISn[n]KM			CAVOK	TREND BECMG AT1800 VIS 10 NSW TREND BECMG TL1700 VÍS 800M FG TREND BECMG FM1030 TL1130 CAVOK
	Időjárás jelenség: intenzitás (C)[9]		FBL *vagy* MOD *vagy* HVY	_	NSW		TREND TEMPO TL1200 VIS 600M BECMG AT 1230 VIS 8KM NSW NSC
	Időjárás jelenség: jellemzők és fajta (C)[9,10,12]		DZ *v.* RA *v.* SN *v.* SG *v.* PL *v.* DS *v.* SS *v.* FZDZ *v.* FZRA *v.* SHGR *v.* SHGS *v.* SHRA *v.* SHSN *v.* TSGR *v.* TSGS *v.* TSPL *v.* TSRA *v.* TSSN	IC *v.* FG*v.* BR *v.* SA *v.* DU *v.* HZ *v.* FU *v.* VA *v.* SQ *v.* PO *v.* FC *v.* TS *v.* BCFG *v.* BLDU *v.* BLSA *v.* BLSN *v.* DRDU *v.* DRSA *v.* DRSN *v.* FZFG *v.* MIFG *v.* PRFG			TREND TEMPO FM 0300 TL0430 MOD FZRA TREND BECMG FM1900 VIS 500M HVY SNRA TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN
	Az elem neve (C)[9]	CLD					
	Felhő mennyiség és függőleges látás (C)[9]	FEW *vagy* SCT *vagy* BKN *vagy* OVC	OBSC	SKC vagy NSC			TREND BECMG AT1130 CLD OVC 300M (TREND BECMG AT1130 OVC 1000FT)
	Felhőfajta (C)[9]	CB vagy TCU	_				TREND TEMPO TL1530 HVY SHRA CLD BKN CB 360M
	A felhőalap magassága vagy a függőleges látás értéke (C)[9]	nn[n][n]M (*vagy* nnn[n]FT)	[VER VIS nn[n]M (*vagy*) VER VIS nnn[n]FT)]				(TREND TEMPO TL1530 HVY SHRA CLD BKN CB 1200FT)

Megjegyzések.–

1. Fiktív hely.
2. Fakultatív értékek egy vagy több futópályára.C)
3. Fakultatív értékek a futópálya egy vagy két szektorára.
4. Tartalmazni kell a 4.1.4.2 c) pontnak megfelelően.
5. Tartalmazni kell a 4.1.4.2 b) 1) pontnak megfelelően.
6. Tartalmazni kell, ha a látás vagy futópálya látástávolság < 1500m; maximálisan négy futópályára.
7. Tartalmazni kell a 4.3.6.4 d) pontnak megfelelően
8. Tartalmazni kell a 4.3.6.4 c) pontnak megfelelően.
9. Tartalmazni kell, ha odavonatkozik.
10. Egy vagy több, maximum három csoport 4.4.2.6, 4.8.1.1és az 5. Függelék 2.2.4.1 pontjának megfelelően
11. A 4.4.2.3 a) pont alatt felsorolt csapadék fajták kombinálhatók a 4.4.2.6 és az 5. Függelék 2.2.4.1 pontjának megfelelően. Csak. mérsékelt vagy heves csapadékot kell jelezni trend előrejelzésekben az 5. Függelék 2.2 4.1 pontjának megfelelően.
12. Maximálisan négy felhőréteg.
13. .Rövidített köznyelv használható a 4.8.1.2 pontnak megfelelően
14. Tartalmazni kell a 6. Fejezet 6.3.2 pontnak megfelelően
15. A változás jelzők számát minimumon kell tartani; általában három csoportot nem halad meg.

A3-2 táblázat. Minta METAR-ra és SPECI-re
Kulcs: M = kötelező beszúrás, minden közlemény része
C = feltételes beszúrás meteorológiai körülményektől függ
O = fakultatív beszúrás

1. Megjegyzés. – 1. Megjegyzés. – A METAR-ban és SPECI-ben szereplő numerikus elemek nagyságrendje és felbontása jelen Függelék A3-5 táblázatban látható

2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400).*

<table>
<tr><th>A 4. Fejezetben meghatározottak szerinti elem</th><th>Részletes tartalom</th><th colspan="2">Minta (Minták)</th><th>Példák</th></tr>
<tr><td>A jelentés típusának azonosítása (M)</td><td>A jelentés típusa (M)</td><td colspan="2">METAR,METAR COR,SPECI vagy SPECI COR</td><td>METAR
METAR COR
SPECI</td></tr>
<tr><td>Hely jelzése (M)</td><td>ICAO hely jelzés (M)</td><td colspan="2">nnnn</td><td>YUDO[1]</td></tr>
<tr><td>A megfigyelés időpontja (M)</td><td>A megfigyelés dátuma és időpontja UTC szerint</td><td colspan="2">nnnnnnZ</td><td>221630Z</td></tr>
<tr><td>Automatizált vagy hiányzó jelentés azonosítása (C)[2]</td><td>Automatizált vagy hiányzó jelentés azonosítása (C)[2]</td><td colspan="2">AUTO vagy NIL</td><td>AUTO
NIL</td></tr>
<tr><td colspan="5">A METAR vége, ha a jelentés hiányzik</td></tr>
<tr><td></td><td>Szélirány (M)</td><td>nnn</td><td>VRB</td><td rowspan="2">24015KMH VRB4KMH
(24008KT) (VRB2KT)
19000KMH
(19011KT)
00000KMH
(00000KT)
140P199KMH
(140P99KT</td></tr>
<tr><td></td><td>Szélsebesség (M)</td><td colspan="2">[P]nn[n]</td></tr>
<tr><td></td><td>Jelentős sebesség változások (C)[3]</td><td colspan="2">G[P]nn[n]</td><td rowspan="2">12012G35KMH
(12006G18KT)
24032G54KMH
(24016G27KT)</td></tr>
<tr><td></td><td>Mértékegységek (M)</td><td colspan="2">KMH (or KT)</td></tr>
<tr><td></td><td>Jelentős irányváltozások (C)[4]</td><td>nnnVnnn</td><td>–</td><td>02020KHM 350V070
(02010KT 350V070)</td></tr>
<tr><td rowspan="4">Látás (M)</td><td>Domináns vagy minimális látás (M)[5]</td><td>nnn</td><td rowspan="9">CAVOK</td><td>0350 CAVOK
7000NDV
9999</td></tr>
<tr><td>Egyirányú látás (C)[6]</td><td>NDV</td><td>0800</td></tr>
<tr><td>Minimális látás (C)[7]</td><td>nnnn</td><td>2000 1200NW</td></tr>
<tr><td>Minimális látás iránya (C)[7]</td><td>N or NE or E or
SE or S or SW or
W or NW</td><td>6000 2800E</td></tr>
<tr><td rowspan="3">RVR (C)[8]</td><td>Az elem neve (M)</td><td>R</td><td>R32/0400</td></tr>
<tr><td>Futópálya(M)</td><td>Nn[n]/</td><td>R10/M0050
R14L/P2000</td></tr>
<tr><td>RVR(M)</td><td>P vagy M]nnn</td><td>R16L/0650 R16C/0500
R16R/0450 R17L/0450</td></tr>
<tr><td></td><td>RVR változások (C)[9]</td><td>V[P vagy M]nnnn</td><td>R20/0700V1200
R19/0350VP1200</td></tr>
<tr><td></td><td>RVR múlt tendenciái (C)[10]</td><td>U,D vagy N</td><td>R12/1100U
R26/0550N R20/0800D

RVR09/0357v0600U
RVR10/M0150V0500D</td></tr>
</table>

A 4. Fejezetben meghatározottak szerinti elem	**Részletes tartalom**	**Minta (Minták)**				**Példák**
Aktuális időjárás (C)[2,11]	Aktuális időjárás intenzitása vagy közelsége (C)[12]	– *vagy* +	._	**VC**		
	Aktuális időjárás jellemzői és fajtája (M)[13]	DZv.RA v. SNv.SGv PLv.DSv. SSv.. FZDZv. FZRAv. FZUPv. SHGRv. SHGSv. SHPLv. SHRAv. SHSNv. TSGRv. TSGSv. TSPLv. TSRAv. TSSNv. UP6	IC *vagy* FG *vagy* BR *vagy* SA *vagy* DU *vagy* HZ *vagy* FU *vagy* VA *vagy* SQ *vagy* PO *vagy* FC *vagy* TS *vagy* BCFG *vagy* BLDU *vagy* BLSA *vagy* BLSN *vagy* DRDU *vagy* DRSA *vagy* DRSN *vagy* FZFG *vagy* MIFG *vagy* PRFG	FG *vagy* PO *vagy* FC *vagy* DS *vagy* SS *vagy* TS *vagy* SH *vagy* BLSN *vagy* BLSA *vagy* BLDU *vagy* VA		RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS -SN MIFG VCBLSA +TSRASN -SNRA DZ FG +SHSN BLSN UP FZUP
Felhő (M)[14]	Felhő mennyiség és felhőalap magassága vagy függőleges látás (M)	FEWnnn v. SCTnnn Vagy BKNnnn Vagy OVCnnn	VVnnn *vagy* VV///	SKC *vagy* NSC *vagy* NCD[6]		FEW015 VV005 SKC OVC030 VV/// NSC SCT010 OVC020 BKN025///
	Felhőfajta (C)[2]	CB vagy TCU vagy LLL	_.			BKN009TCU NCD SCT008 BKN025CB
Levegő és harmatpont hőmérséklet (M)	Levegő és harmatpont hőmérsékletek (M)	[M]nn/[M]nn				17/10 02M08 M01/M10
Nyomás értékek (M)	Az elem neve (M)	Q				Q0995 Q1009
	QNH (M	nnnn				Q1022 Q0987
Kiegészítő információk (C)	Legutóbbi időjárás (C) 2,11	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSPL *or* RETSGR *or* RETSGS *or* REFC *or* REVA *or* REPL *or* REUP				REFZRA RETSRA

A 4. Fejezetben meghatározottak szerinti elem	**Részletes tartalom**		**Minta (Minták)**			**Példák**
Kiegészítő információk (C)	Szélnyírás (C)[2]		WS RWYnn[n] *or* WS ALL RWY			WS RWY03 WS ALL RWY
	Tengerfelszín hőmérséklet és a tenger állapota (C)[15]		W[M]nnn/Sn			W15/S2
	Futópálya állapota (C)[16]Futópá	Futópálya jelölés (M)	nn		SNOCLO	99421594 SNOCLO 14CLRD//
		Futópálya lerakódások (M)	n *vagy* /	CLRD//		
		Futópálya szennyezés kiterjedése (M)	n *vagy* /			
		A lerakódás mélysége (M)	nn *vagy* //			
		Súrlódási együttható vagy fékezési művelet (M)	nn *vagy* //			

Trend előrejelzés (O)[17]	Változás indikátor (M)[18]	NOSIG	BECMG *vagy* TEMPO				NOSIG BECMG FEW020
	A változás időszaka (C)[2]						TEMPO25070G100KMH
	Szél (C)[2]						(TEMPO 25030G50KT)
	Domináns látás (C)[2]		nnnn			C A V O K	BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA
	Időjárási jelenség: intenzitás (C)[12]		– *vagy* +	–	NSW		
	Időjárási jelenség: jellemzők és fajta (C)[2,11,13]		IC *vagy* FG*rvagy* BR *vagy* SA *orvagy* DU *vagy* HZ *vagy* FU *vagy* VA *vagy* SQ *vagy* PO *vagy* FC *vagy* TS *vagy* BCFG *vagy* BLDU *vagy* BLSA *vagy* BLSN *vagy* DRDU *vagy* DRSA *vagy* DRSN *vagy* FZFG *vagy* MIFG *vagy* PRFG	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSPL *or* TSRA *or* TSSN			
	Felhő mennyiség és felhőalap magassága vagy függőleges látás (C)[2]		FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn Vagy VV///	SKC vagy NSC		TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010 TEMPO TL1530 +SHRA BKN012CB
	Felhő fajta (C)[2]		CB vagy TCU	–			

Megjegyzések. –
1.Fiktív hely.
2. Tartalmazni kell, amikor alkalmazható.
3. Tartalmazni kell a 4.1.4.2 c) pontnak megfelelően.
4. Tartalmazni kell a 4.1.4.2 b) 1) pontnak megfelelően.
5. Tartalmazni kell a 4.2.4.4 b) pontnak megfelelően.
6. Csak automatizált jelentéseknél a 4.9 szakasznak megfelelően.
7. Tartalmazni kell a 4.2.4.4 a) pontnak megfelelően.
8 Tartalmazni kell, ha a látás vagy a futópálya látástávolság<1500 m maximálisan négy futópályára.
9 Tartalmazni kell a 4.3.6.6 b) pontnak megfelelően.
10 Tartalmazni kell a 4.3.6.6 a) pontnak megfelelően
11 Egy vagy több, maximum három csoport a 4.4.2.6, 4.8.1.1 és az 5. Függelék 2.2.4.1 pontjának megfelelően.
12 Tartalmazni kell, amikor alkalmazható; nem minősítő *mérsékelt* intenzitás esetén a 4.4.2.5 pontnak megfelelően.
13 A 4.4.2.3 a) pont alatt felsorolt csapadék fajták kombinálhatók a 4.4.2.6 és az 5. Függelék 2.2.4.1 pontjának megfelelően. Csak. mérsékelt vagy heves csapadékot kell jelezni trend előrejelzésekben az 5. Függelék 2.2 4.1 pontjának megfelelően.
14. Maximálisan négy felhőréteg a 4.5.4.1 g) pontnak megfelelően.
15. Tartalmazni kell a 4.8.1.4 a) pontnak megfelelően.
16. Tartalmazni kell a 4.8.1.4 b) pontnak megfelelően
17. Tartalmazni kell a 6. Fejezet 6.3.2 pontnak megfelelően
18. A csere indikátorok számát minimumon kell tartani az 5. Függelék 2.2.1 pontnak megfelelően; általában nem haladja meg a három csoportot.

A3-3 táblázat. Változás jelzők használata trend előrejelzésekben

Változás indikátor	Idő indikátor és időszak	Jelentés	
NOSIG	–	nincsenek szignifikáns változások előrejelezve	
BECMG	$FMn_1n_1n_1n_1$ $TLn_2n_2n_2n_2$	a változás előrejelzés szerint	kezdődik $n_1n_1n_1n_1$-kor UTC szerint és befejeződik $n_2n_2n_2n_2$-kor UTC szerint
	TLnnnn		kezdődik a trend előrejelzési időszak kezdetén és befejeződik nnnn UTC-ig
	FMnnnn		kezdődik nnnn UTC-kor és befejeződik a trend előrejelzési időszak végén
	ATnnnn		megjelenik nnnn UTC-kor (megadott időpont)
	–		a) kezdődik a trend előrejelzési időszak kezdetén és befejeződik a trend előrejelzési időszak alatt b) az időpont bizonytalan
TEMPO	$FMn_1n_1n_1n_1$ $TLn_2n_2n_2n_2$	átmeneti ingadozás van előrejelezve	kezdődik $n_1n_1n_1n_1$-kor UTC szerint és megszakad $n_2n_2n_2n_2$-ig UTC szerint
	TLnnnn		kezdődik a trend előrejelzési időszak kezdetén és megszakad nnnn UTC-ig
	FMnnnn		kezdődik nnnn UTC-kor és megszakad a trend előrejelzési időszak végén
	–		kezdődik trend előrejelzési időszak kezdetén és megszakad a trend előrejelzési időszak alatt

A3-4 táblázat Tartományok és felbontások a helyi jelentések által tartalmazott numerikus elemeknél

A 4. Fejezet szerint specifikált elem		Intervallum	Felbontás
Futópálya		01–36	1
Szélirány földrajzi fok	°true	010–360	10
Szélsebesség	KMH KT	1–399* 1–199*	1 1
Látás	M M KM	0–800 800–5000 5–10	50 100 1
Futópálya látástávolság	M M M	0–400 400–800 800–2000	25 50 100
Függőleges látás	M FT	0–600 0–2000	30 100
Felhő: alap magassága	M FT	0–1500 0–5000	30 100
Levegő hőmérséklet Harmatpont hőmérséklet	°C	-80–+60	1
QNH; QFE	hPa	0500–1100	1

*Nincs repülési követelmény arra, hogy 200km/h (100 csomó) vagy nagyobb sebességű talajszelet jelentsenek, azonban rendeletet hoztak nem-repülési célokra szolgáló jelentések készítésére 399 km/h (199 csomó) szélsebességig, szükség szerint.

A3-5 táblázat. Tartományok és felbontások a METAR/SPECI által tartalmazott numerikus elemeknél

A 4. Fejezet szerint specifikált elem			Intervallum	Felbontás
Futópálya			01–36	1
Szélirány földrajzi fok		°true	000–360	10
Szélsebesség		KMH KT	00–399* 00–199*	1 1
Látás		M M M M	0000–0800 0800–5000 5000–9000 9000–9999	50 100 1000 999
Futópálya látástávolság		M M M	0000–0400 0400–0800 0800–2000	25 50 100
Függőleges látás		30's M (100's FT)	000–020	1
Felhő: alap magassága		30's M (100's FT)	000–050	1
Levegő hőmérséklet Harmatpont hőmérséklet		°C	-80–+60	1
QNH		hPa	0850–1100	1
Tengerfelület hőmérséklete		°C	-10–+40	1
A tenger állapota		-	0–9	1
A futópálya állapota	Futópálya jelölés	-	01–36; 51–86; 88; 89	1
	Lerakódások a futópályán	-	0–9	1
	A futópálya szennyezés mértéke	-	1; 2; 5; 9	–
	A lerakódás mélysége	-	00–90; 92–99	1
	Súrlódási tényező/fékezés	-	00–95; 99	1

*Nincs repülési követelmény arra, hogy 200km/h (100 csomó) vagy nagyobb sebességű talajszelet, azonban rendeletet hoztak 399 km/h (199 csomó) szélsebességig jelentésre nem-repülési célokra.
22 100 - 200 trend előrejelzésekben.

A3-1. Rendszeres jelentés

a) Helyi rendszeres jelentés (ugyanaz a hely és időjárási körülmények, mint a METAR-nál:
MET REPORT YUDO 22163Z WIND 24015KMH VIS 600M RVR RWY 12 TDZ 1000M FG MOD DZ CLD SCT 300M OVC 600M T17 DP16 QNH 1018 TREND BECMG TL1700 VIS800M FG BECMG AT1800 VIS 10KM NSW

b) METAR YUDO-ra (Donlon Nemzetközi Repülőtér):*
METAR YUDO 221630Z 24015KMH 0600 R12/1000U FG DZ SCT010 OVC020 17/16 Q1018 BECMG TL1700 0800 FG BECMG AT1800 9999 NSW

A két jelentés értelmi jelentése:
Rendszeres jelentés Donlon Nemzetközi Repülőtérről, amelyet a hónap 22-én 1630 UTC-kor adtak ki; talajszél irány 240 fok; szélsebesség 15 kilométer per óra; látás 600 méter; a 12-es futópálya földetérési zónáját reprezentáló futópálya látástávolság 1000 méter és a futópálya látástávolság értékei az előző 10 perc során felfelé irányuló tendenciát mutattak (az EVR tendenciát csak a METAR tartalmazza); köd és mérsékelt szitálás; szétszórt felhőzet 300 méteren; teljes borultság 600 méteren; levegő hőmérséklet 17 fok Celsius; harmatpont hőmérséklet 16 fok Celsius; QNH 1018 hektopascal; trend a következő két óra alatt: a látás 800 méterré válik ködben 1700 UTC-ig; 1800 UTC-kor a látás 10 kilométerre vagy nagyobbra változik és nincs szignifikáns időjárás.*

**Fiktív hely*
Megjegyzés. – Ebben a példában az elsődleges mértékegységeket, a „kilométer per órát” illetve a „métert” használtuk a szélsebesség illetve a felhőalap magasságára vonatkozóan. Az 5. Annex előírásainak megfelelően, helyettük a vonatkozó, nem SI szerinti alternatív mértékegységek, a „csomó” illetve a „láb” használható.

A3-2. példa – Különleges jelentés

a) Helyi különleges jelentés (ugyanaz a hely és időjárási körülmények, mint a SPECI-nél):

SPECIAL YUDO 151115Z WIND 050/25KT MAX37 MNM10 VIS 1200M HVZ TSRA CLD BKN CB 500FT T25 DP22 QNH 1008 HPA TREND TEMPO TL1200 VIS 600M BECMG AT1200 VIS 8KM NSW NSC

b) SPECI YUDO-ra (Donlon Nemzetközi Repülőtér):*

SPECI YUDO 15115Z 05025G37KT 3000 1200NE + TSRA BKN005CB 25/22 Q1008 TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC

A két jelentés értelmi jelentése:

Kiválasztott különleges jelentés Donlon Nemzetközi Repülőtérről*, amelyet a hónap 15-én 1115 UTC-kor adtak ki; talajszél iránya 050 fok; szélsebesség 25 csomó, széllökések 10 és 37 csomó között (a minimális szélsebességet a SPECI-nek nem kell tartalmaznia); a látás 1200 méter (a futópálya (futópályák) mentén a helyi különleges jelentésben); domináns látás 3000 méter (SPECI-ben) 1200 méteres minimális látással észak-kelet felé (az irányváltozásokat csak a SPECI tartalmazza); zivatar heves esővel; szakadozott cumulonimbus felhő 500 lábon; lvegő hőmérséklet 25 fok Celsius; harmatpont hőmérséklet 22 fok Celsius; QNH 1008 hektopascal; a trend a következő két órában: látás (a futópálya (futópályák) mentén a helyi különleges jelentésben; domináns látás SPECI-ben) átmenetileg 600 méter 1115-től 1200-ig, 1200 UTC-kor, látás (a futópálya (futópályák) mentén a helyi különleges jelentésben; domináns látás SPECI-ben) 8 km lesz, a zivatar megszűnik és nincs szignifikáns időjárás és nincs szignifikáns felhő.

*Fiktív hely

Megjegyzés. – Ebben a példában a "csomó" és "láb"nem-SI alternatív mértékegységeket használtuk a sebességre és a felhőalap magasságra. Azonban az 5. Annex előírásainak megfelelően, helyettük a vonatkozó elsődleges mértékegységek, a „kilométer per óra” illetve a „méter” használható..

A3-3. példa – Vulkánikus tevékenység jelentés

VOLCANIC ACTIVITY REPORT YUSB* 231500 MT TROJEEN* VOLCANO N5605 W12652 ERUPTED 231445 LARGE ASH CLOUD EXTENDING TO APPROX 30000 FEET MOVING SW

Jelentése:

Vulkánikus tevékenység jelentés, amelyet a Siby/Bistock meteorológiai állomás adott ki 1500 UTC-kor a hónap 23-án. Az Mt Trojeen vulkán, amelynek helye 56 fok 5 perc északi szélesség és 126 fok 52 perc nyugati hosszúság a hónap 23. napján 1445 UTC-kor kitört; egy nagy hamufelhőt észleltek, amely közelítőleg 30000 lábig terjed, és délnyugati irányban mozog.

*Fiktív hely

4. FÜGGELÉK. LÉGIJÁRMŰVES MEGFIGYELÉSEKRE ÉS JELENTÉSEKRE VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓ

(Lásd jelen Annex 5. Fejezet)

1. LÉGIJELENTÉSEK TARTALMA

1.1 Rendszeres légijelentések levegő-föld adatkapcsolattal

1.1.1 Amikor levegő-föld adatkapcsolatot használnak, és automatikus függő légtérellenőrzés (ADS) van alkalmazásban, a rendszeres légijelentések által tartalmazott elemeknek a következőknek kell lenni:
Közlemény típus jelölő
Légijármű azonosító

1. adatblokk
Földrajzi szélesség
Földrajzi hosszúság
Magasságszint
Idő

2. adatblokk
Szélirány
Szélsebesség
Szélminőség zászló
Hőmérséklet
Turbulencia (ha rendelkezésre áll)
Nedvesség (ha rendelkezésre áll)

Megjegyzés. – Amikor ADS van alkalmazásban, a rendszeres légijelentés követelményei kielégíthetők az alap ADS adatblokk (1. adatblokk) és a meteorológiai információs adatblokk (2. adatblokk) kombinációjával, amely az ADS jelentésekből áll rendelkezésre. Az ADS közlemény formátum ismertetése a PANS-ATM (Doc 4444) II. Rész 14.4 Szakaszban és a 10. Annex, III. Kötet I. Részben – Digitális adatkommunikációs rendszerek (Digital Data Communication Systems) *– került ismertetésre.*
1.1.2 Ha levegő-föld adatkapcsolatot akkor használnak, amikor ADS nincs használatban, a rendszeres jelentések által tartalmazott elemeknek az 1.3 szakasszal kell összhangban lenniük.
Megjegyzés. – Amikor levegő-föld adatkapcsolatot használnak, miközben ADS nincs alkalmazásban, a rendszeres légi-jelentések követelményei kielégíthetők az irányító-légijárművezető adatkapcsolati kommunikáció (CPDLC) alkalmazásával, a „Helyzet jelentés” címzéssel. Ezen adatkapcsolat alkalmazásáról részletes leírás a Légiforgalmi szolgálatok adatkapcsolat alkalmazások kézikönyvben (Manual of Air Trafic Services Data Link Applications) *(Doc4444) és a 10. Annex, III. Kötet, I. Részben található.*

1.2 Különleges légi-jelentések levegő-föld adatkapcsolattal

Amikor levegő-föld adatkapcsolatot használnak, és ADS alkalmazás van folyamatban, a rendszeres légi-jelentések által tartalmazott elemeknek a következőknek kell lenni:
Közlemény típus jelölő
Légijármű azonosító

1. adatblokk
Földrajzi szélesség
Földrajzi hosszúság
Magasságszint
Idő

2. adatblokk
Szélirány
Szélsebesség
Szélminőség zászló
Hőmérséklet
Turbulencia (ha rendelkezésre áll)
Nedvesség (ha rendelkezésre áll)
3. adatblokk
Különleges légijelentés kiadását indokolttá tevő körülmény (egy körülményt az A4-3 táblázatban közölt listáról kell kiválasztani).

1. Megjegyzés. – A különleges légijelentések követelményei kielégíthetők az adatkapcsolati repülés információ szolgáltatás (D-FIS) alkalmazásával, amely „Különleges légijelentés szolgáltatás” címet viseli. Ennek az adatkapcsolatnak az alkalmazásáról részletes specifikáció a Doc 9694 kiadványban található.

2. Megjegyzés. – Kitörés előtti vulkanikus tevékenység, vulkánkitörés vagy vulkanikus hamufelhő különleges légijelentése továbbításának esetében további követelmények a 4.2 szakaszban vannak feltüntetve.

1.3 Rendszeres légijelentések beszédkommunikációval

Amikor beszédkommunikációt használnak, a rendszeres és különleges légi jelentéseknek a következőket kell tartalmazniuk:
Közlemény típus jelölő

1. szekció (Helyzet információ)
Légijármű azonosítás
Helyzet vagy földrajzi szélesség és hosszúság
Időpont
Repülési magasságszint vagy tengerszint feletti magasság
Következő helyzet és időpontja
Következő szignifikáns pont

2. szekció (Üzemelési információk)
Megérkezés várható ideje
Repülési időtartam

3. szekció (Meteorológiai információk)
Levegő hőmérséklet
Szélirány
Szélsebesség
Turbulencia
Légijármű jegesedés
Nedvesség (ha rendelkezésre áll)

1.4 Különleges légi jelentések beszédkommunikációval

Amikor beszédkommunikációt használnak, a különleges légi jelentéseknek a következő elemeket kell tartalmazniuk:

Közlemény típus jelölő

1. szekció (Helyzet információ)
Légijármű azonosítás

Helyzet vagy földrajzi szélesség és hosszúság
Időpont
Repülési magasságszint vagy tengerszint feletti magasság
3. szekció (Meteorológiai információk)
Különleges légi jelentés kiadását indokolttá tevő körülményeket az 5.5 szakaszban közölt listából kell kiválasztani.

1. Megjegyzés. – A légi-jelentés alapértelmezés szerint rendszeres jelentés. A közlemény típus jelző különleges légi jelentés esetére a PANS-ATM (Doc. 4444), I. Függelékben van leírva.

2. Megjegyzés. – Kitörés előtti vulkanikus tevékenység, vulkánkitörés vagy vulkanikus hamu felhő különleges légi jelentése esetében a további követelmények az 4.2 szakaszban vannak feltüntetve.

2. JELENTÉSI KRITÉRIUMOK

2.1 Amikor levegő-föld adatkapcsolatot használnak, a légi-jelentésekben tartalmazott szélirányt, szélsebességet, szélminőség zászlót, hőmérsékletet, turbulenciát és nedvességet kell jelenteni a következő kritériumokkal összhangban.

2.2 Szélirány

A szélirányt földrajzi fokokban kell jelenteni, a legközelebbi egész fokra kerekítve.

2.3 Szélsebesség

A szélsebességet kilométer per órában vagy csomóban kell jelenteni, a legközelebbi 2 km/h-ra (1csomó) kerekítve. A használt mértékegységeket jelölni kell.

2.4 Szélminőség zászló

A szélminőség zászlót 0-nak kell jelenteni, ha a görgés szög kisebb, mint 5 fok, és 1-nek, ha a görgés szög 5 fok vagy ennél nagyobb.

2.5 Hőmérséklet

A hőmérsékletet tized Celsius fokokban kell jelenteni.

2.6 Turbulencia

A turbulenciát örvény disszipáció ráta (EDR) fogalmainak megfelelően kell figyelni.

2.6.1 Rendszeres légi-jelentések

A turbulenciát a repülés útvonal fázisa alatt kell jelenteni, és a megfigyelést közvetlenül megelőző 15 perces időszakra kell vonatkoznia. A turbulenciának mind az átlagos, mind a csúcsértékét, a csúcsérték megjelenési idejét, a legközelebbi perc pontossággal, figyelni kell. Az átlagos és a csúcs értékeket az EDR hét intenzitás szintjéből álló turbulencia index terminusában kell jelenteni, ahogyan azt az A4-1 táblázat mutatja. A csúcsérték megjelenési idejét az A4-2 táblázatban feltüntetett módon kell jelenteni.

2.6.2 A turbulencia index értelmezése

A turbulencia index értelmezése a következők szerinti:

a) heves, ha a turbulencia index 15 és 20 között van (azaz az EDR csúcsérték meghaladja a 0,5-öt);

b) mérsékelt, ha a turbulencia index 6 és 14 között van (azaz az EDR csúcsérték meghaladja a 0,3-at, de nem haladja meg a 0,5-öt);

c) enyhe, ha a turbulencia index 1 és 5 között van (azaz az EDR csúcsérték 0,1és 0,3 között van); és

d) nulla, ha a turbulencia index 0 (azaz az EDR csúcsérték kisebb, mint 0,1).

Megjegyzés. – Az EDR a turbulencia légijármű-független mértéke. Azonban az EDR index és a turbulencia érzékelés közötti kapcsolat a légijármű típus és tömeg, közepes tengerszint feletti magasság, konfiguráció a légijármű levegő szerinti sebességének függvénye.

2.6.3 Különleges légijelentések

Különleges légi-jelentéseket kell készíteni turbulenciáról a repülés bármely fázisában, amikor a csúcsérték meghaladja a 0,5 EDR értéket. A különleges jelentést a megfigyelést közvetlen megelőző 1 perces időszakra vonatkozóan kell készíteni. A turbulenciának mind az átlagos, mind a csúcs értékét figyelni kell. A turbulencia átlagos és csúcs értékét a turbulencia index terminusaiban kell jelenteni, ahogyan az A4-1 táblázat árnyékolt részében fel van tüntetve. Különleges légijelentést minden percben ki kell adni addig az időpontig, amíg a turbulencia csúcsértéke a 0,5 EDR érték alá nem esik.

2.7 Nedvesség

A nedvességet relatív nedvességként kell jelenteni, a legközelebbi egész százalékértékre kerekítve.

Megjegyzés. – A légijelentésekben szereplő meteorológiai elemek intervallumai és felbontásai az A4-4 táblázatban láthatók.

3. LÉGIJELENTÉSEK CSERÉJE

3.1 Meteorológiai figyelő irodák kötelezettségei

3.1.1 A meteorológiai figyelő irodáknak össze kell gyűjteniük a rendszeres légi jelentéseket, amelyek beszédkommunikáció útján érkeztek, és a regionális léginavigációs egyezménnyel összhangban továbbítaniuk kell azokat a WAFC-oknak és más meteorológiai irodáknak.

Megjegyzés. – Egyórás bázisú gyűjtemények cseréje lehet kívánatos, ha nagyon sok a jelentés.

3.1.2 A meteorológiai figyelő irodának késedelem nélkül továbbítania kell a beszédkommunikáció útján a vett különleges légijelentéseket a WAFC-okhoz

3.1.3 A meteorológiai figyelő irodának késedelem nélkül továbbítania kell a kitörés előtti vulkánikus tevékenységről, vulkánkitörésről, vagy vulkánikus hamu felhőről szóló, általa vett különleges légi jelentéseket a hozzátartozó VAAC-okhoz.

3.1.4 Ha különleges légi-jelentés érkezik a meteorológiai figyelő irodához, de az előrejelző úgy gondolja, hogy a jelenség, amely miatt a jelentés íródott, várhatóan nem marad fenn, és így SIGMET kiadására nincs ok, a különleges légi jelentést kell ugyanolyan módon, mint egy SIGMET közleményt szétküldeni a 6. Függelék 1.2.1 pontjának megfelelően, azaz a meteorológiai figyelő irodáknak és más meteorológiai irodáknak, a regionális léginavigációs egyezménynek megfelelően.

3.2 Világ előrejelző központok kötelezettségei

A WAFC-oknál és RAFC-oknál vett légi-jelentéseket meteorológiai alapadatként kell tovább terjeszteni.

Megjegyzés. – A meteorológiai alapadatok terjesztését általában a WMO globális távközlési rendszerén végzik.

3.3 Légijelentések kiegészítő terjesztése

Ajánlás. – *Ahol a légi-jelentések kiegészítő szétosztására van szükség speciális repülési vagy meteorológiai igények kielégítésére, az ilyen terjesztést az illetékes meteorológiai hatóságok között kell lerendezni.*

3.4 Légijelentések formátuma

Légi-jelentéseket olyan formátumban kell cserélni, amilyenben azok érkeztek, kivéve azt, amikor beszéd kommunikációt használnak, ha helyzetet egy légiforgalmi szolgálat jelentő pontjára hivatkozva adnak meg, azt a meteorológiai megfigyelő irodának a megfelelő földrajzi szélességre és hosszúságra kell átalakítania.

4. SZÉLNYÍRÁS ÉS VULKANIKUS HAMU JELENTÉSÉRE VONATKOZÓ SPECIFIKUS ELŐÍRÁSOK

4.1 Szélnyírás jelentése

4.1.1 **Ajánlás**. -- *Emelkedési és megközelítési repülési fázis során előfordult lágijárműves szélnyírás megfigyelésekről szóló jelentéseknek tartalmazniuk kell a légijármű típusát.*

4.1.2 **Ajánlás**. -- *Ha a felszállás utáni emelkedés vagy megközelítés fázisaiban szélnyírást jelentettek vagy előre jeleztek, de nem tapasztaltak, a légijármű parancsnokának ezt, mihelyt lehetséges, jelentenie kell az illetékes légiforgalmi szolgálati egységnek, kivéve, ha tudomása van arról, hogy a megfelelő légiforgalmi szolgálati egységet már tájékoztatta egy korábbi légijármű.*

4.2 Vulkanikus tevékenység repülés utáni jelentése

Megjegyzés. – A vulkánikus tevékenység megfigyelések rögzítésére és jelentésére vonatkozón részletes instrukciók a PANS-ATM (Doc.444) I. Függelékben találhatók.

4.2.1 Egy járat megérkezésekor egy repülőtérre, a vulkánikus tevékenységről szóló elkészített jelentést az üzemeltetőnek vagy a repülő személyzet egy tagjának késedelem nélkül el kell juttatnia a repülőtéri meteorológiai irodához, vagy ha ilyen iroda az érkező járat személyzete számára nem könnyen elérhető, a kész formátumot a meteorológiai hatóság és az üzemeltető közötti helyi megállapodásokkal összhangban kell kezelni.

4.2.2 A meteorológiai iroda által megkapott, vulkánikus tevékenységről szóló kész jelentést késedelem nélkül továbbítani kell azon meteorológiai figyelő iroda részére, amelynek kötelessége meteorológia megfigyelést biztosítani a repülési információhoz abban a régióban, ahol a vulkánikus tevékenységet megfigyelték.

A4-1 Táblázat. A jelentendő turbulencia index mint a turbulencia átlag- és csúcsértékének függvénye (Az erős turbulenciához tartozó osztályok sötétítve vannak)

	A turbulencia csúcsértéke							
A turbulencia átlagértéke	EDR ($m^{2/3}s^{-1}$)							Nulla jelentés
EDR ($m^{2/3}s^{-1}$)	< 0.1	0.1–0.2	0.2–0.3	0.3–0.4	0.4–0.5	0.5–0.8	> 0.8	
< 0.1	0	1	3	6	10	15	21	
0.1–0.2		2	4	7	11	16	22	
0.2–0.3			5	8	12	17	23	
0.3–0.4				9	13	18	24	
0.4–0.5					14	19	25	
0.5–0.8						20	26	
> 0.8							27	
Nulla jelentés								28

A4-2 Táblázat A jelentendő csúcsérték megjelenésének időpontja

A megfigyelést …….perccel megelőző egy-perces időszak alatt előforduló turbulencia csúcsérték	A jelentendő érték
0–1	0
1–2	1
2–3	2
…	…
13–14	13
14–15	14
Idő információnem áll rendelkezésre	15

A4-3 táblázat. Minta a különleges légijelentéshez (lefelé kapcsolat)

Kulcs: M = kötelező, minden közlemény része

C = feltételes tartalmazás, ahol rendelkezésre áll

Megjegyzés. – Pilóta-parancsnok által kezdeményezett közlemény. Jelenleg csaka „SEV TURB” feltétel lehet automatizált (lásd 2.6.3 pont).

Az 5. Fejezet szerint specifikált elem	Részletes tartalom	Minta (Minták)	Példák
Közlemény típusú jelölés (M)	Légijelentés fajtája (M)	ARS	ARS
Légijármű azonosítás (M)	Légijármű rádiótelefon hívójel	nnnn	VA812
1. adatblokk			
Földrajzi szélesség (M)	Földrajzi szélesség fokokban és percekben (M)	Nnnnn *vagy* Snnnn	S4506
Földrajzi hosszúság (M)	Földrajzi hosszúság fokokban és percekben (M)	Wnnnn *vagy* Ennnn	E01056
Magassági szint (M)	Repülési magassági szint (M)	FLnnn	FL330
Időpont (M)	A megjelenés időpontja órákban és percekben (M)	OBS AT nnnnZ	OBS AT 1216Z
2. Adatblokk			
Szélirány (M)	Szélirány földrajzi fokokban(M)	nnn/	262/
Szélsebesség (M)	Szélsebesség kilométer per órában (vagy csomóban) (M)	nnnKMH (*or* nnnKT)	158KMH (079KT)
Szélminőség zászló (M)	Szélminőség zászló (M)	n	1
Hőmérséklet (M)	Levegőhőmérséklet tized Celsius fokokban (M)	T[M]nnn	T127 TM455
Turbulencia (C)	Turbulencia index és a csúcsérték megjelenésének időpontja (C)[1]	EDRnn/nn	EDR16/08
Nedvesség (C)	Relatív nedvesség százalékban (C)	RHnnn	RH054
3. Adatblokk			
Különleges légijelentés kiadását szükségessé tevő feltétel (M)		SEV TURB [EDRnn][2] *vagy* SEV ICE *vagy* SEV MTW *vagy* TS GR[3] *vagy* TS[3] *vagy* HVY SS[4] *vagy* VA CLD [FL nnn/nnn] *vagy* VA[5] [MT nnnnnnnnnnnnnnnnnn]	SEV TURB EDR16; VA CLD FL050/100

Megjegyzés

1. A jelentendő index és megjelenés időpont az A4-1 és A4-2 táblázatnak megfelelően.
2. A jelentendő turbulencia index a 2.6.3 pont és az A4-1 táblázatnak megfelelően.

3. Borult, beágyazott vagy kiterjedt zivatarok vagy zivatarok széllökésvonalakban.
4. Porvihar vagy homokvihar.
5 Kitörés előtti vulkanikus tevékenység vagy vulkánkitörés.

A4-4. Légijelentésekben lévő meteorológiai elemek intervallumai és felbontásai

Az 5. Fejezet szerint specifikált elem		IntervallumFelbontás
Szélirány		000–3601
Szélsebesség		00–500 00–2502 1
Szélminőség zászló	(index)*	0–11
Hőmérséklet		-80–+600.1
Turbulencia: rendszeres légijelentés	(index)* (a megjelenés időpontja)	0–28 0–151 1
Turbulencia: különleges légijelentés		15–271
Nedvesség		0–1001
*Dimenzió nélküli		

5. FÜGGELÉK ELŐREJELZÉDEKRE VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 6. Fejezet)

1. TAF-RA VONATKOZÓ KRITÉRIUMOK

1.1 TAF formátum

A TAF-t az A5-1 táblázatban bemutatott mintának megfelelően kell kiadni, és a Meteorológiai Világ Szervezet által előírt TAF kód formában kell terjeszteni.
A TAF kód forma ismertetését a WMO 306 számú kiadványa Kód kézikönyv (Manual on Codes) *I.1 Kötet, A Rész – Alfanumerikus kódok (Alphanumeric Codes) tartalmazza.*

1.2 Meteorológiai elemek bevitele TAF-ba

Megjegyzés. – Előrejelzések üzemelés szempontjából megkívánt pontosságáról útmutatást a B Melléklet tartalmaz.

1.2.1 Talajszél

Ajánlás. – *Szél előrejelzésben a várható domináns irányt kell megadni. Ha a domináns talajszél irányt a várható változása miatt nem lehet előrejelezni, például enyhe szél (kevesebb, mint 6 km/h (1csomó)), vagy zivatarok alatt, a szélirányt „VRB" alkalmazásával változóként kell jelölni. Ha a szelet 2 km/h-nál (1 csomó) kisebbre előrejelzik, a szélsebességnek nyugalom jelzést kell kapnia. Ha az előrejelzett maximális sebesség (széllökés) 20 km/h-val (10 csomó) vagy többel meghaladja az előrejelzett közepes szélsebességet, az előrejelzett maximális szélsebességet kell jelenteni. Ha az előrejelzés 200 km/h (100 csomó) vagy ennél nagyobb szélsebességet jósol, ezt nagyobb, mint 199 km/h (99 csomó)sebességként kell jelezni.*

1.2.2 Látás

Ajánlás. – *Ha a látást 800 m-nél kisebbre előrejelzik, ezt 50 m-es lépcsőkben kell kifejezni; ha az előrejelzett látás 800 m vagy nagyobb, de kisebb, mint 5 km, 100 m-es lépcsőkben; ha 5 km vagy nagyobb, de kisebb, mint 10 km, akkor kilométeres lépcsőkben; ha 10 km vagy ennél nagyobb, akkor 10 km-ként kell előrejelezni, kivéve ha CAVOK körülmények előrejelzése történt. Ha az előrejelzett* *látás különböző irányokban változó, és a domináns látás nem előrejelezhető, a legkisebb előrejelzett látást kell megadni.*

1.2.3 Időjárás jelenségek

Ajánlás. – *Az alábbi időjárási jelenségek vagy azok kombinációi közül egynek vagy többnek, de maximum háromnak, jellemzőivel és, ahol lehet, intenzitásával együtt előrejelzését kell megadni:*

- ónos csapadék

- ónos köd

- mérsékelt vagy heves csapadék (beleértve a záport)

- talajközeli por, homok vagy hófúvás

- por, homok vagy hófúvás

- porvihar

- homokvihar

- zivatar (csapadékkal vagy anélkül)

- szélroham

- tölcsérfelhő (tornádó vagy víztölcsér).

- egyéb, a 3. Függelék 4.4.2.3 pontjában megadott időjárás jelenségek csak akkor, ha azok várhatóan a látás lényeges megváltozását okozzák.

A fenti jelenségek várható megszűnését a „NSW" rövidítéssel kell jelezni.

1.2.4 Felhő

Ajánlás. – *A felhőzet mennyiségét szükség szerint a „FEW, „SCT", „BKN" vagy az „OVC" rövidítések használatával kell előrejelezni, ahogyan szükséges. Ha felhőzet előfordulás az előrejelzés szerint nem várható, és a „CAVOK" rövidítés nem megfelelő, az „SKC"-t kell használni. Ha várható, hogy az égbolt homályos marad, vagy azzá válik, és felhőzetet nem lehet előrejelezni, ugyanakkor a függőleges látásra vonatkozó információ a repülőtéren rendelkezésre áll, a függőleges látást kell előre jelezni a következő formában: "VV", melyet a függőleges látás előrejelzett értéke követ. Ha több felhőréteg vagy felhőtömeg várható, mennyiségüket és alapjuk magasságát az alábbi sorrendben kell előrejelezni:*

a) mennyiségtől függetlenül, a legalacsonyabb réteget vagy tömeget FEW, SCT, BKN, illetőleg OVC , ahogy megfelelő, jelzésekkel kell előrejelezni;

b) a következő réteget vagy tömeget, amely az égboltnak több mint 2/8 részét borítja, SCT, BKN, illetőleg OVC jelzésekkel kell előrejelezni, ahogy megfelelő;

c) a következő magasabb réteget vagy tömeget, amely az égboltnak több mint 4/8 részét borítja, BKN illetőleg OVC jelzésekkel kell előrejelezni, ahogyan megfelelő; és

d) cumulonimbus felhők, ha várhatók, és a fenti a)-c) pontokban még nem szerepeltek.

A felhő információkat az üzemeltetés szempontjából jelentőséggel bíró felhőzetre kell korlátozni, azaz 1500 méter (5000 láb) alatti felhőre, vagy a legnagyobb minimum szektormagasságra, amelyik a nagyobb, és cumulonimbusra, ha ez előrejelzett. Ezen korlátozás alkalmazása esetén, ha nincs előrejelezve cumulonimbus, és felhő 1500 méter (5000 láb) alatt, vagy a legnagyobb minimum szektor magasság alatt, amelyik a nagyobb, és a „CAVOK” vagy az „SKC” rövidítések nem megfelelőek, akkor az „NSC” rövidítés használandó.

1.2.5 Hőmérséklet

Ajánlás. – *Amikor regionális léginavigációs egyezménnyel összhangban, előrejelzett hőmérsékleteket visznek be, a TAF érvényességi időszaka alatt várhatóan fellépő maximális és minimális hőmérsékleteket, a megjelenésük időpontjával együtt, meg kell adni.*

1.3 Változás csoportok használata

1.3.1 **Ajánlás**. – *A változás csoportoknak a TAF való beillesztésénél, vagy a TAF módosításánál használt kritériumoknak az alábbiakon kell alapulniuk:*

a) ha a talajszél az előrejelzés szerint üzemelési szempontból szignifikáns értéket lép át, a küszöbértékeket a meteorológiai hatóságnak kell megállapítania, konzultálva az illetékes ATS hatósággal, valamint az érintett üzemeltetőkkel, figyelembe véve azokat a szél változásokat, amelyek:

1) használatos futópálya(k) megváltoztatást tesznek szükségessé; és

2) jelzik, hogy a futópálya hátszél és oldalszél összetevői a repülőtéren üzemelő tipikus légijármű számára a főbb üzemelési határértékeket meghaladják;

b) ha a látás az előrejelzés szerint javul és az alábbi értékek közül egyet vagy többet elér vagy meghalad, vagy amikor az előrejelzés szerint a látás romlik és az alábbi értékek közül egyet vagy többet átlép:

1) 150, 350, 600, 800, 1500, vagy 3000 m

2) 5000 m azokban az esetekben, ha jelentős számú repülést tvégeznek látvarepülési szabályok szerint;

c) ha az alábbiakban felsorolt időjárási jelenségek közül bármelyik, vagy ezek valamilyen kombinációjának beindulása vagy megszűnése előrejelzés szerint elkezdődik, vagy befejeződik:

– ónos csapadék

– mérsékelt vagy heves csapadék (beleértve a záporokat is)

– porvihar

– homokvihar

– a 3.Függelék 4.4.2.3 pontjában felsorolt egyéb időjárási jelenségek, csak akkor, ha várhatóan jelentős változást okoz a látásban;

d) ha az alábbiakban felsorolt időjárási jelenségek közül bármelyik, vagy ezek valamilyen kombinációja előrejelzés szerint elkezdődik, vagy befejeződik, vagy intenzitása megváltozik:

– jégkristályok

– zúzmarás köd

– talajközeli por-, homok- vagy hófúvás;

– por-, homok- vagy hófúvás

– zivatar (csapadékkal vagy csapadék nélkül);

– szélroham;

– tölcsérfelhő (tornádó vagy víztölcsér);

e) ha a legalacsonyabb BKN vagy OVC mennyiségű felhőréteg, vagy felhőtömeg alapjának magassága az előrejelzés szerint emelkedik, és az alábbi értékek közül egyet vagy többet elér, vagy meghalad, vagy amikor a legalacsonyabb BKN vagy OVC mennyiségű felhőréteg vagy felhőtömeg alapjának magassága az előrejelzés szerint csökken és az alábbi értékek közül egyet vagy többet átlép:

1) 30, 60, 150, vagy 300 m (100, 200, 500 vagy 1000 láb)¸vagy

2) 450 m (1500 láb) azokban az esetekben, ha jelentős számú repülést végeznek látás szerinti repülési szabályok szerint;

f) ha 450 m (1500 láb) alatti felhőréteg vagy felhőtömeg mennyisége várhatóan az alábbiak szerint változik;

1) SKC-ról, FEW-ról vagy SCT-ról BKN-re vagy OVC-re; vagy

2) BKN-ről vagy OVC-ről SKC-re, FEW-re vagy SCT-re;

g) ha előrejelzés szerint cumulonimbus felhők fognak kifejlődni, vagy szétoszlani;

h) ha a függőleges látás az előrejelzés szerint javul, és az alábbi értékek közül egyet, vagy többet elér, vagy meghalad, vagy amikor a függőleges látás az előrejelzés szerint romlik, és az alábbi értékek közül egyet vagy többet átlép: 30, 60, 150 vagy 300 m (100, 200, 500 vagy 1000 láb);

i) bármely egyéb, a meteorológiai hatóság és az üzemeltetők által közösen megállapított, helyi repülőtéri minimumokon alapuló kritérium.

1.3.2 **Ajánlás**. *– Ha a 6. Fejezet 6.23 pontjában megadott elemek valamelyikében beálló változást az*

1.3.1 pontban szereplő kritériumoknak megfelelően jelezni kell, a „BECMG” vagy „TEMPO” változás jelzőket kell használni és ezt követően meg kell adni azt az időszakot, amely alatt a változás várhatóan végbemegy. Az időszakot, annak kerek UTC órában kifejezett kezdeti és befejezési időpontjával kell jelölni. A változásjelzést követően csak azokat az elemeket kell megadni, melyek várhatóan szignifikánsan megváltoznak. Felhőzetre vonatkozó szignifikáns változások esetében azonban valamennyi felhőcsoportot, beleértve azokat a felhőrétegeket és tömegeket, amelyeknek változása nem várható, meg kell adni.

1.3.3 **Ajánlás. –** *A „BECMG” változás jelzőt és a hozzátartozó időcsoportot olyan változások leírására kell használni, ahol a meteorológiai körülmények egy megadott küszöbértéket szabályos vagy szabálytalan mértékben, és az időperiódus alatt egy nem meghatározott időpontban, várhatóan elérnek vagy meghaladnak. Az időperiodus normál körülmények között nem haladhatja meg a két órát, de semmi esetre sem haladhatja meg a 4 órát.*

1.3.4 **Ajánlás** *– A „TEMPO” változásjelzőt és az ehhez kapcsolódó időcsoportot olyan, várhatóan gyakori vagy nem gyakori átmeneti meteorológiai körülmény-ingadozások leírására kell használni,* *melyek meghatározott küszöbértékeket érnek el, vagy meghaladnak, és minden esetben egy óránál rövidebb időszakon keresztül tartanak, és az ingadozások együttesen előreláthatólag az előrejelzési időszak felénél rövidebb időtartam alatt fognak fennállni. Ha az átmeneti ingadozás várhatóan egy órán keresztül, vagy hosszabb ideig marad fenn, az 1.3.3 pont szerinti „BECMG" változás jelző csoportot kell használni, vagy az érvényességi időszakot az 1.3.5 pontnak megfelelően fel kell osztani.*

1.3.5 **Ajánlás. –** *Ahol az uralkodó időjárási feltételek egy együttesének jelentős változása, többé-kevésbé teljes mértékben egy eltérő együttesbe való átmenete várható, az érvényességi időszakot két különálló időszakra kell osztani az „FM" rövidítést használva, amelyet közvetlenül követ egy négyszámjegyű időcsoport UTC szerinti egész órákban és percekben, jelezve azt a várható időpontot, amikor a változás várhatóan fellép. Az „FM" rövidítést követő felosztott időszaknak különállónak kell lennie, és a rövidítés előtt adott minden előrejelzett körülményt hatálytalanítanak a rövidítést követő előrejelzett körülmények.*

1.4 Valószínűségi csoportok használata

Ajánlás. – *Valamely előrejelzett időjárási elem, vagy elemek alternatív értékének előfordulási valószínűségét szükség szerint a „PROB" rövidítés használatával kell jelezni, melyet a 10 százalékos egységségekben kifejezett valószínűségi érték, és annak az időperiódusnak a jelölése követ, amely alatt az alternatív érték(ek) várhatóan érvényesek. A valószínűség információt az előrejelzett elem vagy elemeket követően kell elhelyezni, és ezt követően kell megadni az elem, vagy elemek alternatív értékét. A meteorológiai viszonyok várható időnkénti változásainak valószínűségét szükség szerint, a „PROB" rövidítés használatával kell jelezni, melyet a valószínűség 10 százalékos egységekben kifejezett értékének jelölése követ. Ezt a „TEMPO" változásjelző és a hozzá kapcsolódó időcsoport elé kell elhelyezni. Valamely alternatív érték vagy változás 30 százaléknál kisebb valószínűsége nem tekintendő olyan jelentősnek, hogy fel kelljen tüntetni. Valamely alternatív érték vagy változás 50 százalékos, vagy azt meghaladó valószínűségét repülési célokra nem valószínűségként kell tekinteni, hanem szükség szerint a „BECMG" vagy „TEMPO" változásjelzők használatával, vagy az érvényességi időszak „FM" rövidítés használatával történő felosztásával kell jelezni. A valószínűségi csoportot nem használják sem a „BECMG" változás-jelző, sem az „FM" időjelző minősítésére.*

1.5 Változási és valószínűségi csoportok száma

Ajánlás. – *A változási és valószínűségi csoportok számát minimumon kell tartani és ez általában nem haladhatja meg az öt csoportot.*

1.6 TAF terjesztése

A TAF-t és módosításait el kell juttatni a nemzetközi OPMET adatbázisokhoz, a regionális léginavigációs egyezmény által kijelölt központokhoz, a repülési állandó helyű szolgálati elosztó rendszerek működtetéséhez, a regionális léginavigációs egyezménnyel összhangban.

2. TREND ELŐREJELZÉSEKRE VONATKOZÓ KRITÉRIUMOK

2.1 Trend előrejelzések formátuma

Trend előrejelzéseket a 3. Függelék A3-1 és A3-2 táblázatban bemutatott mintának megfelelően kell kiadni. A trend előrejelzésben használt egységeknek és méretarányoknak ugyanazoknak kell lenni, mint amiket a jelentés használ, amelyhez az előrejelzés tartozik.
Megjegyzés. – Trend előrejelzésekre példákat a 3. Függelék tartalmaz.

2.2 Meteorológiai elemek bevitele trend előrejelzésekbe

2.2.1 Általános előírások

A trend előrejelzéseknek jelezniük kell egy vagy több elem: talajszél, látás, időjárás és felhők vonatkozásában végbemenő jelentős változásokat. Csak azokat az elemeket kell tartalmazniuk, amelyeknek jelentős változása várható. Azonban felhőre vonatkozó jelentős változás esetén, minden felhőcsoportra, beleértve azokat a felhő rétegeket és tömegeket is, amelyeknél változás nem várható, meg kell jelölni. A látás jelentős változása esetén a látás csökkenését okozó jelenséget is meg kell jelölni. Ha változás bekövetkezése nem várható, ezt a „NOSIG” terminussal kell jelölni.

2.2.2 Talajszél

A trend típusú leszállási előrejelzés trend részének jeleznie kell a talajszélben bekövetkező alábbi változásokat:

a) a közepes szélirány 60 fokos vagy nagyobb változása, amikor a közepes szélsebesség a változás előtt és/vagy után 2O km/h (10 csomó) vagy

b) a közepes szélsebesség 20 km/h (10 csomó) értékű vagy ennél nagyobb változása;

c) üzemelési szempontból lényeges értékeket meghaladó szélváltozások. A küszöb értékeket a meteorológiai hatóságnak kell megállapítania, az illetékes ATS hatósággal és az érintett üzemeltetőkkel együttműködve, figyelembe véve azokat a szélváltozásokat, melyek:

1) használatos futópálya(k) megváltoztatását teszik szükségessé; és

2) jelzik, hogy a futópálya hátszél és keresztszél összetevői a repülőtéren üzemelő tipikus légijármű számára a főbb üzemelési határértéket meghaladják.

2.2.3 Látás

Ha a látás várhatóan javul és a 150, 350, 600, 800, 1500 vagy 3000 m értékek közül egyet vagy többet elér, vagy túllép, vagy ha a látás várhatóan romlik és ezen értékek közül egyet vagy többet átlép, a trend típusú leszállási előrejelzésekben jelezni kell a változást: , . Ha jelentős számú járat a látás szerinti repülési szabályok szerint repül, akkor az előrejelzésnek ezen felül jeleznie kell az 5000 m-es értékre való változást vagy ennek átlépését.

Megjegyzés. – Helyi rendszeres és különleges jelentésekhez tartozó trend előrejelzésekben a látás a futópálya (futópályák) menti látás előrejelzésre vonatkozik; METAR-hoz és SPECI-hez tartozó trend előrejelzésekben az előrejelzett domináns látásra vonatkozik.

2.2.4 Időjárás jelenségek

2.2.4.1 A trend előrejelzésnek az alábbi időjárási jelenségek vagy azok kombinációi közül egynek vagy többnek, de maximum háromnak, a várható kialakulását, megszűnését vagy intenzitás változását kell jeleznie:

– ónos csapadék

– mérsékelt vagy heves csapadék (beleértve a záporokat is)

– porvihar

– homokvihar

– a 3.Függelék 4.4.2.3 pontjában felsorolt egyéb időjárási jelenségek, csak akkor, ha várhatóan jelentős változást okoznak a látásban;

2.2.4.2 A trend előrejelzésnek az alábbi időjárási jelenségek vagy azok kombinációi közül egynek vagy többnek, de maximum háromnak, a várható kialakulását, megszűnését kell jeleznie:

2.2.4.3 A fenti jelenségek várható megszűnését a „NSW” rövidítéssel kell jelezni.

– jégkristályok

– ónos köd

--talajközeli por-, homok- vagy hófúvás

– por-, homok- vagy hófúvás

– zivatar (csapadékkal vagy csapadék nélkül)

– széllökés

– tölcsérfelhő (tornádó vagy víztölcsér)

2.2.5 Felhők

Ha egy BKN vagy OVC mennyiségű felhőréteg alapjának magassága várhatóan növekszik, és az alábbi értékek közül egyet vagy többet elér, vagy túllép, vagy egy BKN vagy OVC mennyiségű felhőréteg alapjának magassága várhatóan csökken, és ezen értékek közül egyet vagy többet átlép, a trend típusú leszállási előrejelzés trend részében a változást jelezni kell: 30, 60, 150, 300 és 450 m (100, 200, 500, 1000 és 1500 láb). Ha a felhőréteg alapjának magassága 450 m (1500 láb) alatt van, várhatóan az alá süllyed, vagy a fölé emelkedik, akkor a trend típusú leszállási előrejelzések trend részének jelezni kell a felhőzet SKC, FEW vagy SCT-ről BKN-re, vagy OVC-re növekedését, illetve BKN vagy OVC-ről SKC, FEW vagy SC-re csökkenését. Ha nincsen cumulonimbus és nincs felhő 1500 m (5000 láb) alatt, vagy a legmagasabb minimum szektor alatt, amelyik a nagyobb, előrejelezve és a „CAVOK” és „SKC” nem megfelelő, az „NSC” rövidítést kell alkalmazni.

2.2.6 Függőleges látás

Ha várható, hogy az égbolt takart marad, vagy azzá változik, és a repülőtéren a függőleges látás megfigyelések rendelkezésre állnak, és a függőleges látás javulását jelezték előre, és ez eléri, vagy meghaladja a 0, 60, 150 vagy 300 m (100, 200, 500 vagy 1000 láb). értékek egyikét, vagy közülük többet, vagy ha a függőleges látás romlása van előrejelezve, és ez ezen értékek közül egyet vagy többet átlép, a trend típusú leszállási előrejelzés trend részének jeleznie kell a változást: 3

2.2.7 Kiegészítő kritériumok

A 2.2.2 - 2.2.6 pontokban megadottakon kívül helyi repülőtéri üzemelési minimumokon alapuló változás jelzési kritériumokat a meteorológiai hatóság és az érintett üzemeltető(k) megállapodásának megfelelően kell alkalmazni.

2.3 Változás jelzők használata

2.3.1 Ha változás bekövetkezése várható, a trend előrejelzésnek a „BECMG” vagy „TEMPO” jelzések egyikével kell kezdődnie.

2.3.2 A „BECMG” változásjelzőt kell használni olyan változások előrejelzésének leírásához, ahol az időjárási körülmények szabályos vagy szabálytalan ütemben várhatóan elérnek, vagy átlépnek meghatározott értékeket. Azt az időszakot, vagy azt az időpontot, ami alatt, vagy amikor a változás bekövetkezését előrejelzik, az „FM”, „TL” vagy AT” rövidítések megfelelő használatával, valamint ezeket követően egy órákból és percekből álló időcsoporttal jelezni kell. Ha a változás az előrejelzés szerint trend előrejelzés kezdete és vége közötti időszakban teljes mértékben végbemegy, a változás kezdetét és végét az „FM”, illetőleg „TL” rövidítésekkel és ezeket kiegészítő időcsoportokkal kell jelezni. Ha a változás az előrejelzés szerint a trend előrejelzés kezdeti időpontjában kezdődik el, de még annak vége előtt befejeződik, az „FM” rövidítést és a hozzá kapcsolódó időcsoportot ki kell hagyni és csak a „TL”-t és a hozzá kapcsolódó időcsoportot kell használni. Ha a változás az előrejelzés szerint a trend előrejelzés érvényességi időszakában kezdődik meg és ezen időszak végének időpontjában fejeződik be, a „TL” rövidítést és a hozzá kapcsolódó időcsoportot ki kell hagyni és csak az „FM”-t és a hozzá kapcsolódó időcsoportot kell használni. Ha a változás az előrejelzés szerint a trend előrejelzés érvényességi időszaka alatti valamely időpontban történik, az „AT” rövidítést és a hozzá kapcsolódó időcsoportot kell használni, például: „BECMG AT 1100” (METAR kód formában és rövidített köznyelven egyaránt). Ha a változás az előrejelzés szerint a trend előrejelzés időszakának kezdetekor kezdődik és az időszak végén fejeződik be, vagy ha a változás az előrejelzés szerint a trend előrejelzés időtartama alatt megtörténik, de az időpont bizonytalan, az „FM”, „TL” vagy „AT” rövidítéseket és az ezekhez kapcsolódó időcsoportokat ki kell hagyni és egyedül a „BECMG” változásjelzőt kell használni.

2.3.3 A „TEMPO” változásjelzőt kell használni olyan átmeneti időjárás ingadozások előrejelzésének leírásához, melyeknél az egyes változások meghatározott értékeket egy óránál rövidebb időtartamon keresztül érnek el, vagy lépnek át és az ingadozások összességükben az előrejelzés szerint az előrejelzési időszak felénél rövidebb időszakot fednek le. Azt az időszakot, amely alatt az átmeneti ingadozások az előrejelzés szerint fennállnak, az „FM” és/vagy „TL” rövidítések megfelelő használatával, valamint ezeket követően egy órákból és percekből álló időcsoporttal kell jelezni. Ha az átmeneti időjárás változások az előrejelzés szerint a trend előrejelzés kezdete és vége közötti időpontok között teljes mértékben végbemegy, az átmeneti ingadozások kezdetét és végét az „FM”, illetőleg a „TL” rövidítésekkel és ezeket kiegészítő időcsoportokkal kell jelezni. Ha az átmeneti ingadozások időszaka az előrejelzés szerint a trend előrejelzés kezdeti időpontjában kezdődik el, de befejeződik még annak vége előtt, az „FM” rövidítést és a hozzá kapcsolódó időcsoportot ki kell hagyni és csak a „TL”-t és a hozzá kapcsolódó időcsoportot kell használni. Ha az átmeneti ingadozások időszaka az előrejelzés szerint a trend előrejelzés érvényességi időszakában kezdődik és ezen időszak végének időpontjában befejeződik, a „TL” rövidítést és a hozzá kapcsolódó időcsoportot ki kell hagyni és csak az FM-t és a hozzá kapcsolódó időcsoportot kell használni. Ha az átmeneti ingadozások időszaka az előrejelzés szerint a trend előrejelzés időszakának kezdetekor kezdődik és az időszak végén fejeződik be, az „FM” és „TL” rövidítéseket és a hozzájuk kapcsolódó időcsoportokat ki kell hagyni és egyedül a „TEMPO” változásjelzőt kell használni.

2.4 Valószínűségi jelző használata

A „PROB” jelző nem alkalmazható trend típusú leszállási előrejelzésekben.

3. FELSZÁLLÁSI ELŐREJELZÉSEKRE VONATKOZÓ KRITÉRIUMOK

3.1 Felszállási előrejelzések formátuma

Ajánlás. – *Az előrejelzés formátumának a meteorológiai hatóság és az érintett üzemeltető közötti megállapodás szerintinek kell lennie. A felszállási előrejelzésekben használt időjárási elemek sorrendje, a terminológia, a mértékegységek és a skálák legyenek azonosak az ugyanazon repülőtérről készült jelentésekben használtakkal.*

3.2 Felszállási előrejelzések módosításai

Ajánlás. –. *A felszálláshoz a talajszél irányról és sebességről, a hőmérsékletről és nyomásról és más helyileg megállapított elemekről szóló előrejelzések módosításának kiadási kritériumairól a meteorológiai hatóság és az érintett üzemeltetők között kell megállapodni. A kritériumoknak konzisztensnek kell lenniük a hozzájuk tartozó repülőtéri különleges jelentésekre megállapított kritériumokkal, a 3. Függelék 2.3.1 pontjával összhangban.*

4. NEM A VILÁG TERÜLETI ELŐREJELZŐ RENDSZER KERETÉBEN KIADOTT TERÜLETI ÉS ÚTVONALI ELŐREJELZÉSEKRE VONATKOZÓ KRITÉRIUMOK

4.1 Területi és útvonali előrejelzések formátuma

4.1.1 A területi és útvonal előrejelzések és módosításaik helyi elosztása az ilyen információknak a meteorológiai irodák közötti cseréjére előírt egyik formában vagy más helyi megállapodásoknak megfelelő formában történjen.

4.1.2 A Meteorológiai Világ Szervezet által előírt kód formában a meteorológiai irodák között cserére kerülő területi és útvonal előrejelzések és módosításaik ROFOR kód formájúak legyenek.

Megjegyzés. – A ROFOR kód formák a Meteorológiai Világszervezet 306. számú kiadványában – Kód kézikönyv (Manual on Codes*) I.1. kötet, A Rész – Alfanumerikus kódok (Alphanumeric Codes) találhatók.*

4.1.3 **Ajánlás.** – *A rövidített köznyelvű területi és útvonali előrejelzésekben (vagy azok módosításaiban) az elemek sorrendje általában a megfelelő közlemény kódolt formájának sorrendjét kövesse. Az alkalmazott terminológia és mértékegységek egyezzenek meg a repülőtéri jelentésekben és előrejelzésekben használtakkal. Az alkalmazott azonosító „AREA FCST”, illetve „ROUTE FCST” legyen, amelyet módosítás esetén „AMD” előz meg. A repülőtéri előrejelzésekben alkalmazott CAVOK eljárás a körzeti és útvonal előrejelzésekben nem használható.*

4.2 Területi és útvonali előrejelzések módosításai

4.2.1 A meteorológiai hatóságnak, az üzemeltetőkkel és más érdekelt felhasználókkal konzultálva, létre kell hoznia a területi és útvonali előrejelzések módosításához használt kritériumok jegyzékét.

4.2.2 Területi és útvonali előrejelzésekhez módosításokat a 2. Függelék 1.4 szakaszában közölt kritériumoknak megfelelően kell kiadni.

5. KISMAGASSÁGÚ REPÜLÉSEK RÉSZÉRE KIADOTT TERÜLETI ELŐREJELZÉSEKRE VONATKOZÓ KRITÉRIUMOK

5.1 GAMET területi előrejelzések formátuma és tartalma

Ha GAMET formátumban készülnek, két szakaszt kell tartalmazniuk: az I. Szakasz a kismagasságú repülésekre veszélyes útvonali időjárás jelenségekről szóló információkra vonatkozik, amelyek AIRMET információk kiadásának alátámasztására készülnek, és a II. Szakasz, amely a kismagasságú repülések által igényelt további információkra vonatkozik. A területi előrejelzéseknek, amikor GAMET formátumban készülnek, szükség szerint a következő információkat kell tartalmazniuk, a feltüntetett sorrendben. A II. Szakaszba további elemeket a regionális léginavigációs egyezménnyel összhangban kell bevinni:

a) légiforgalmi szolgálati egység elhelyezkedés jelzője, amely szolgálati egység azt a repülési információs régiót (régiókat) szolgálja ki, amelyre a kismagasságú repülések számára készített területi előrejelzés vonatkozik; például „YUCC”;

b) közlemény azonosító a „GAMET” rövidítést használva;

c) dátum-időpont csoportok, amelyek az érvényesség időszakát mutatják UTC-ben; például „VALID 220600/221200”;

d) a közleményt kiadó meteorológiai iroda helyének jelzése, amelyet egy kötőjel követ, hogy a bevezetést a szövegtől elválassza; például „YUDO”;

e) a következő sorban a repülési információs régió, vagy ennek alterülete, amelynek részére a kismagasságú repüléseknek szóló területi előrejelzést kiadták; például „AMSWELL FIR/2 BLW FL120”;

f) a következő sorban a területi előrejelzés első szakasza kezdetének jelzése, a „SECN I” rövidítést használva;

g) nagykiterjedésű közepes talajszél sebesség, amely meghaladja a 60 km/h-t (30 csomó); például „SFC WSPD: 10/12 65 KMH”;

h) kiterjedt felszíni területen a látás 5000 m alatt, beleértve a látás csökkenését okozó időjárás jelenséget; például „SFC FIS: 06/08N 3000 M BRN OF N51”;

i) szignifikáns időjárási körülmények, amelyek zivatarokat és heves homok- és porvihart foglalnak magukban (kivéve azokat a jelenségeket, amelyekre már kiadtak egy SIGMET közleményt); például „SIGWX: 11/12 ISOL TS”;

j) hegyi elsötétülés; például „MT OBSC: MT PASSES S OF N48”;

k) szakadozott vagy összefüggő felhőzet kiterjedt területei, melynek alapja kisebb, mint 300 m (1000 láb) a föld felett (AGL) és/vagy a közepes tengerszint felett (AMSL) és/vagy cumulonimbus (CB) vagy tornyos cumulonimbus (TCU) bármilyen jelenléte, megadva alapjaik és tetőik magasságát; például „SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL”;

l) jegesedés (kivéve, amikor konvektív felhőkben fordul elő, és az erős jegesedést, amelyre már SIGMET közleményt adtak ki); például „ICE: MOD FL050/080”;

m) turbulencia (kivéve, amikor konvektív felhőkben fordul elő és erős turbulencia, amelyre már SIGMET közleményt adtak ki); például „TURB: MOD ABV FL090”;

n) hegyi hullám (kivéve az erős hegyi hullámot, amelyre már SIGMET közleményt adtak ki); például „MTW: MOD ABV FL080 E OF N63”;

o) SIGMET közlemények, amelyek az illetékes repülési információs régiónál vagy alterületén alkalmazhatók, amelyekre a területi előrejelzés érvényes; például „SIGMET APPLICABLE: 3,5”.

p) a következő sorban a területi előrejelzés második szakasza kezdetének jelzése, amelyre a „SECN II” rövidítés használatos;

q) nyomás középpontok és frontok és várható mozgásaik és alakulásuk; például „PSYS: 06 L 1004 HPA 51.30 E01000 MOV NE 25 KT WKN”;

r) magassági szelek és magaslégköri levegő hőmérsékletek legalább a következő magasságokra: 600, 1500 és 3000 m (2000, 5000 és10000 láb); például „WIND/T: 2000 FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11”;

s) a k) alatt nem szereplő felhő információk, amelyek megadják a felhő mennyiséget fajtát és a felhőalap és tető föld feletti (AGL) és közepes tengerszint feletti (AMSL) magasságát; például „CLD: BKN SC 2500/8000 FT AGL”;

t) a 0º C szint(ek) föld feletti (AGL) vagy közepes tengerszint feletti (AMSL) magasságának jelzése, ha alacsonyabb, mint annak a légtérnek a teteje, amelyre az előrejelzést szolgáltatják; például „FZLVL: 3000 FT AGL”;

u) az érvényességi időszak alatti legalacsonyabb előrejelzett QNH; például „MNM QNH: 1004 HPA”;

v) a tenger felszín hőmérséklete és a tenger állapota, ha a regionális léginavigációs egyezmény megköveteli; például „SEA: T15 HGT 5 M”; és

w) a légijárművek üzemeltetésére jelentőséggel bíró hamu felhőket létrehozó vulkánkitörések helye, a vulkán neve és az első kitörés időpontja, ha ismert; például „VA: MT. HOKKAIDO KOMAGATAKE PSN N4255 E14040 ERUPTED VA CLD TOP 4900 FT MOV SE”.

A g)-től o)-ig és q)-tól w)-ig minden egyes tételt, ha alkalmazható, a GAMET területi előrejelzésnek tartalmaznia kell, új sorban kezdve, és tartalmaznia kell a hely jelzését (hivatkozva, ahol lehet, földrajzi szélességre és hosszúságra, vagy/és nemzetközileg jól ismert földrajzi nevezetességekre), és azt a szintet, amelyre vonatkozik. A g)-től o)-ig tételeket, amelyeknél veszélyes jelenség előfordulása nem várható, vagy amelyeket már egy SIGMET üzenet lefed, a területi előrejelzésből ki kell hagyni. Amikor a kismagasságú repülésre veszélyes időjárás jelenségek nem fordulnak elő, és SIGMET információ nem alkalmazható, a „HAZARDOUS WX NIL” terminussal kell helyettesíteni a g)-től o)-ig pontok alatt felsorolt összes tételt.

5.2 GAMET területi előrejelzések módosításai

Ha a kismagasságú repülésekre veszélyes jelenség szerepelt a GAMET területi előrejelzésben, és az előre jelzett jelenség nem fordul elő, vagy már nincs előre jelezve, egy GAMET AMD kerüljön kiadásra, amely csak a szóbanforgó időjárás elemet módosítja.
Megjegyzés. – A kismagasságú repülésekre veszélyes időjárás jelenségekre vonatkozó területi előrejelzést módosító AIRMET információ kiadását érintő előírások a 6. Függelékben találhatók.

5.3 Kismagasságú repülések részére készített területi előrejelzések cseréje

Kismagasságú repülések részére szóló területi előrejelzéseket, amelyeket az AIRMET információk kiadásának elősegítésére készítenek, az illetékes repülési információs körzetekben végzett kismagasságú repülések részére kiadásáért felelős meteorológiai irodáknak egymás között cserélniük kell.

A5-1 táblázat Minta TAF-ra
Kulcs: M = kötelező beszúrás, minden közlemény része
C = feltételes beszúrás meteorológiai körülményektől függ
O = fakultatív beszúrás
1. Megjegyzés. – A TAF kód formájú repülőtéri előrejelzésekben szereplő numerikus elemek tartományait és felbontásait ennek a függeléknek az A5-3 táblázata mutatja be.
2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400).*

A 6. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)		Példák
Az előrejelzéstípusának azonosítása) (M	Az előrejelzés típusa(M)	TAF *vagy* TAF AMD *vagy* TAF COR		TAF TAF AMD
Hely jelzés (M)	ICAO hely jelzés (M)	nnnn		YUDO[1]
Az előrejelzés kiadásának időpontja (M)	Az előrejelzés kiadásának dátuma és időpontja UTC-ben (M)	nnnnnnZ		160000Z
Hiányzó előrejelzés azonosítása (C)	Hiányzó előrejelzés azonosító (C)	NIL		NIL
A TAF vége, ha az előrejelzés hiányzik				
Az előrejelzés érvényességének napja és időszaka (M)	Az előrejelzés érvényességének napja és időszaka UTC szerint (M)	nnnnnn		160624 080918
Törölt előrejelzés azonosítása (C)	Törölt előrejelzés azonosító (C)	CNL		CNL
A TAF vége, ha az előrejelzést törölték				
Talajszél (M)	Szélirány (M)	nnn *vagy* VRB[2]		24015KMH; VRB04KMH (24008KT); (VRB02KT) 19022KMH (19011KT)
	Szélsebesség (M)	[P]nn[n]		00000KMH (00000KT) 140P199KMH (140P99KT)
	Jelentős sebesség változások (C)[3]	G[P]nn[n]		12012G35KMH (12006G18KT)
	Mértékegységek(M)	KMH (*vagy* KT)		24032G54KMH (24016G27KT)
	Domináns látás (M)	nnnn	C A V O K	0350 CAVOK 7000 9000 9999
Időjárás (C)[4, 5]	Az időjárás jelenség intenzitása (C)[6]	- *vagy* +		

A 6. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)				Példák
Időjárás (C)[4, 5]	Az időjárás jelenségek jellemzői és típusa (M)[7]	DZ *vagy* RA *vagy* SN *vagy* SG *vagy* PL *vagy* DS *vagy* SS *vagy* FZDZ *vagy* FZRA *vagy* SHGR *vagy* SHGS *vagy* SHPL *vagy* SHRA *vagy* SHSN *vagy* TSGR *vagy* TSGS *vagy* TSPL *vagy* TSRA *vagy* TSSN		IC *vagy* FG *vagy* BR *vagy* SA *vagy* DU *vagy* HZ *vagy* FU *vagy* VA *vagy* SQ *vagy* PO *vagy* FC *vagy* TS *vagy* BCFG *vagy* BLDU *vagy* BLSA *vagy* BLSN *vagy* DRDU *vagy* DRSA *vagy* DRSN *vagy* FZFG *vagy* MIFG *vagy* PRFG	CAVOK	RA HZ +TSRA FG -FZDZ PRFG TSRASN SNRA FG
Felhő (M)[8]	Felhőmennyiség és az alap magasága vagy függőleges látás (M)	FEWnnn *vagy* SCTnnn *vagy* BKNnnn *vagy* OVCnnn	VVnnn *vagy* VV ///	SKC *vagy* NSC		FEW010 VV005 SKC OVC020 VV/// NSC SCT005 BKN012 SCT008 BKN025CB
	Felhő fajta (C)[4]	CB	–			
Hőmérséklet (O)[9]	A elem neve (M)	TX				TX25/13Z TN09/05Z TX05/12Z TNM02/03Z
	Maximális hőmérséklet (M)	[M]nn/				
	A maximális hőmérséklet fellépésének időpontja(M)	nnZ				
	A elem neve (M)	TN				
	Minimális hőmérséklet (M)	[M]nn/				
	A minimális hőmérséklet fellépésének időpontja(M)	nnZ				
A fenti elemek közül egynek vagy többnek az érvényességi időszak alatti várható lényeges változásai (C)[4, 10]	Változási vagy valószínűség jelző (M)	PROB30 [TEMPO] *vagy* PROB40 [TEMPO] *vagy* BECMG *vagy* TEMPO *vagy* FM				
	A változás vagy megjelenés időszaka (C)[4]	nnnn				
	Szél (C)[4]	nn[P]nn[n][G[P]nn[n]]KMH *vagy* VRBnnKMH (*vagy* nnn[P]nn[G[P]nn]KT *vagy* VRBnnKT)				TEMPO 1518 25070G100KMH (TEMPO 1518 25035 G50KT) TEMPO 1214 17025G50KMH 1000 TSRA SCT010CB BKN020 TEMPO 1214 17012G25KT 1000 TSRA SCT010CB BKN020)

A 6. Fejezetben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)				Példák
	Domináns látás (C)[4]	nnnn			C A V O K	BECMG 1011 00000KMH 2400 OVC010 (BECMG 1011 00000KT 2400 OVC010)
	Időjárás jelenség: intenzitás (C)[6]	- *vagy* +	–	NSW		PROB30 1214 0800 FG BECMG 1214 RA TEMPO 0304 FZRA TEMPO 1215 BLSN PROB40 TEMPO 0608 0500 FG
	Időjárás jelenség: jellem- zők és típus (C)[4, 7]	DZ *vagy* RA *vagy* SN *vagy* SG *vagy* PL *vagy* DS *vagy* SS *vagy* FZDZ *vagy* FZRA *vagy* SHGR *vagy* SHGS *vagy* SHPL *vagy* SHRA *vagy* SHSN *vagy* TSGR *vagy* TSGS *vagy* TSPL *vagy* TSRA *vagy* TSSN	IC *vagy* FG *vagy* BR *vagy* SA *vagy* DU *vagy* HZ *vagy* FU *vagy* VA *vagy* SQ *vagy* PO *vagy* FC *vagy* TS *vagy* BCFG *vagy* BLDU *vagy* BLSA *vagy* BLSN *vagy* DRDU *vagy* DRSA *vagy* DRSN *vagy* FZFG *vagy* MIFG *vagy* PRFG			
	Felhő mennyiség és felhőalap magasság vagy függőleges látás (C)[4]	FEWnnn *vagy* SCTnnn *vagy* BKNnnn *vagy* OVCnnn	VVnnn *vagy* VV///	SKC *vagy* NSC		FM1230 15015KMH 9999 BKN020 (FM1230 15008KT 9999 BKN020) BECMG 1820 8000 NSW NSC
	Felhő fajta (C)[4]	CB	–			BECMG 0608 SCT015CB BKN020

Megjegyzések:
1. Fiktív hely.
2. Az 1.2.1 pontnak megfelelően kell használni.
3. Az 1.2.1 pontnak megfelelően kell tartalmazni.
4. Akkor kell tartalmazni, ha odavonatkozik.
5. Egy vagy több, maximum három csoport, 1.2.3 pontnak megfelelően.
6. Akkor kell tartalmazni, ha odavonatkozik, az 1.2.3 pontnak megfelelően. Nincs minősítő *mérsékelt* intenzitásnál.
7. 1.2.3 pontnak megfelelő időjárás jelenségeket kell szerepeltetni.
8 Maximálisan négy felhőréteg, az 1.2.4 pontnak megfelelően.
9. Az 1.2.1 pontnak megfelelően kell tartalmazni.
10. Az 1.3, 1.4 és 1.5 pontoknak megfelelően kell tartalmazni.

A5-2 táblázat Változás és idő jelzők használata TAF-ban

Változás és idő jelző		Időszak	Jelentés	
FM		$n_hn_hn_mn_m$	több időjárás elemben, n_hn_h óra n_mn_m perckor (UTC szerint) fellépő jelentős változás jelölésére használják; az összes „FM” előtt megadott elemet tartalmaznia kell az „FM” után következőknek (azaz ezeket a rövidítést követők hatálytalanítják	
BECMG		$n_1n_1n_2n_2$	a változás kezdetét n_1n_1 órára (UTC), és végbemenetelét n_2n_2 órára (UTC) előrejelzik; csak azokat az elemeket kell a „BECMG” után megadni, amelyek változását előrejelzik; az $n_1n_1n_2n_2$ időszakasznak általában kisebbnek kell lenni, mint 2 óra és semmi esetre sem haladhatja meg a 4 órát	
TEMPO		$n_1n_1n_2n_2$	előrejelzik átmeneti ingadozások elkezdődését n_1n_1 órára (UTC), megszűnését n_2n_2 órára (UTC); csak azokat az elemeket kell a „TEMPO” után megadni, amelyek ingadozását előrejelzik; az ingadozási időszak nem tarthat tovább egy óránál az egyes esetekben, és összességében az $n_1n_1n_2n_2$ időszakasznak kevesebb, mint a felét fedhetik le.	
PROBnn	–	$n_1n_1n_2n_2$	az előrejelzett elem vagy elemek egy relatív értékének előfordulási valószínűsége (%-ban); csak nn=30 vagy nn=40; a megfelelő elem(ek) után elhelyezve	–
	TEMPO	$n_1n_1n_2n_2$		átmeneti ingadozás fellépésének valószínűsége

A5-3 Táblázat. Tartományok és felbontások TAF által tartalmazott numerikus elemekhez

A 6. Fejezetben meghatározottak szerinti elem			Tartomány	Felbontás
Szélirány	földrajzi fok	°	000–360	10
Szélsebesség		KMH	00–399*	1
		KT	00–199*	1
Látás		M	0000–0800	50
		M	0800–5000	100
		M	5000–9000	1000
		M	9000–9999	999
Függőleges látás		30's M (100's FT)	000–020	1
Felhőalap magassága		30's M (100's FT)	000–050	1
Levegő hőmérséklet (maximum és minimum)		°C	-80–+60	1

*Nincs repülési követelmény arra, hogy 200km/h (100 csomó) vagy nagyobb sebességű talajszelet jelentsenek, azonban rendeletet hoztak nem-repülési célokra szolgáló jelentések készítésére 399 km/h (199 csomó) szélsebességig, szükség szerint.

A5-1 példa. TAF

*TAF YUDO-ra (Donlon Nemzetközi Repülőtér)**

TAF YUDO 160000Z 160624 13018KMH 9000 BKN020 BECMG 0608 SCT015CB BKN020 TEMPO 0812 17025G40KMH 1000TSRA SCT010CB BKN020 FM1230 15015KMH 9999 BKN020 BKN100

Az előrejelzés értelmi jelentése:

Repülőtéri előrejelzés Donlon Nemzetközi Repülőtérre*, amelyet a hónap 16-án 0000 UTC-kor adtak ki, érvényes a hónap 16-án 0600 UTC-től 2400 UTC-ig; talajszél iránya 130 fok; szélsebesség 18 km/óra; látás 9 kilométer, szakadozott felhő 600 méteren; 0600 UTC és 0800 UTC között, szétszórt cumulonimbus 450 méteren és szakadozott felhő 600 méteren; 0800 UTC és 1200 UTC között időnként a talajszél iránya 170 fok; szélsebesség 25 km/óra 40 km/órás lökésekkel; látás 1000 méter esővel kísért mérsékelt zivatarban; szétszórt cumulonimbus 300 méteren és szakadozott felhő 600 méteren; 1200 UTC-től talajszél iránya 150 fok; szélsebesség 15 km/óra; látás 10 kilométer vagy több; a szignifikáns időjárás megszűnik; szakadozott felhő 600 méteren és szakadozott felhő 3000 méteren.

*Fiktív hely

Megjegyzés. – Ebben a példában az elsődleges mértékegységeket, a „kilométer per órát” illetve a „métert” használtuk a szélsebesség illetve a felhöalap magasságára vonatkozóan. Az 5. Annex előírásainak megfelelően, helyettük a vonatkozó, nem-SI szerinti alternatív mértékegységek, a „csomó” illetve a „láb” használható.

A5-2 példa. TAF törlése

*TAF törlése Zudo-ra (Donlon/International)**

TAF AMD YUDO 161500Z 160624 CNL

Az előrejelzés jelentése:

Módosított TAF Donlon/Internationalra* a hó 16.-án 1500 UTC-kor kiadva, amely törli az előzőleg kiadott, a hó 16.-án 0600 UTC-től 2400 UTC-ig érvényes TAF-t

*Fiktív hely

A5-3 példa. GAMET területi előrejelzésre

YUCC GAMET VALID 220600/221200 YUDO-
AMSWELL FIR/2 BLW FL100
SECN 1
SFC WSPD: 10/12 65 KMH
SFC VIS: 06/08 3000 M BR N OF N51
SIGWX: 11/12 ISOL TS
SIG CLD: 06/09 OVC 800/1100 FT AGL N OF N51 10/12 ISOL TCU 1200/8000 FT AGL
ICE: MOD FL050/080
TURB: MOD ABV FL090
SIGMETS APPLICABLE: 3,5
SECN II
PSYS: 06 L 1004 HPA N51.5 E10.0 MOV NE 25 KT WKN
WIND/T: FT 270/70 KMH PS03 5000 FT 250/80 KMH MS02 10000 FT 240/85 KMH MS11
CLD: BKN SC 2500/8000 FT AGL
MNM QNH: 1004 HPA
SEA: T15 HGT 5M
VA: NIL

Jelentése: területi előrejelzés kismagasságú repülések részére (GAMET), a Donlon/International* meteorológiai iroda (YUDO) adott ki az Amswell* repülési információs régió 2. sz. alterülete (YUCC Amswell területi irányító központ által azonosított) számára;

I. Szakasz:
talajszél sebesség: 1000 UTC és 200 UTC között 65 kilométer per óra;
talajmenti látás: 0600 UTC és 800 UTC között 3000 méter az 51-es északi szélességi körtől északra; (párásság miatt);
szignifikáns időjárás jelenségek:: 1100 UTC és 1200 UTC között izolált zivatarok jégeső nélkül;

szignifikáns felhők: 0600 UTC és 0900 UTC között összefüggő felhő alap 800, tető 1100 láb föld feletti magasság szinten 51-es északi szélességi körtől északra; 1000 UTC és 1200 között izolált tornyosuló cumulus alap 1200, tető 8000 láb föld feletti magasság szinten;

jegesedés: mérsékelt 050 és 080 repülési szint között;
turbulencia: mérsékelt a 090-es repülési szint felett (legalább a 100-as repülési szintig);
SIGMET közlemények: 3 és 5 alkalmazható az érvényességi időszakra és az érintett al-területre;

II. Szakasz:
nyomás rendszerek: 0600 UTC-kor 1004 hektopascal alacsony nyomás északi 51,5 foknál, keleti 10,0 foknál, várható mozgás észak-kelet felé 25 csomó sebességgel és gyengül;
szelek és hőmérsékletek: 2000 láb föld feletti magasság szinten a szélirány 270 fok; szélsebesség 70 kilométer per óra, hőmérséklet plusz 3 fok Celsius; 5000 láb föld feletti magasság szinten a szélirány 250 fok; szélsebesség 80 kilométer per óra, hőmérséklet mínusz 2 fok Celsius; 10000 láb föld feletti magasság szinten a szélirány 240 fok; szélsebesség 85 kilométer per óra, hőmérséklet mínusz 11 fok Celsius;
felhők: szakadozott stratocumulus, alap 2500 láb, tető 800 láb föld feletti magasság szinten;
fagyás szint: 3000 láb föld feletti magasság szinten;
minimum QNH: 1004 hektopascal;
tenger: felület hőmérséklete: 15 fok Celsius; és tenger állapot 5 méter;
vulkanikus hamu: nincs.

*Fiktív helyek

6. FÜGGELÉK. SIGMET ÉS AIRMET TÁJÉKOZTATÁSRA, REPÜLŐTÉRI FIGYELMEZTETÉSEKRE ÉS SZÉLNYÍRÁSRA VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 7. Fejezet)

Megjegyzés. – A SIGMET, AIRMET, trópusi ciklon és vulkánikus hamu tájékoztató közlemények rövidített címeiben használt adattípus jelölések a WMO 386 számú kiadványában, Globális távközlési rendszer kézikönyv (Manual on Global Telecommunication System) *vannak megadva.*

1. SIGMET TÁJÉKOZTATÁSRA VONATKOZÓ SPECIFIKÁCIÓK

1.1 SIGMET közlemények formátuma

1.1.1 A SIGMET közlemény tartalmának és elemei sorrendjének az A6-1. táblázatban bemutatott mintával kell összhangban lennie.

1.1.2 A szubszonikus légijárművek számára adott SIGMET információkat tartalmazó közleményeket „SIGMET”, a transzszonikus vagy szuperszonikus repülést végző szuperszonikus légijárművek számára szóló SIGMET információkat tartalmazó közleményeket pedig „SIGMET SST” jelöléssel kell azonosítani.

1.1.3 Az A6-1 táblázatban lévő mintában hivatkozott sorszámnak meg kell egyeznie azoknak a SIGMET közleményeknek a számával, amelyet az adott napon 0001 UTC óta a repülési információs régió számára kiadtak. A „SIGMET" és „SIGMET SST” közleményeket külön kell sorszámozni. A meteorológiai megfigyelő irodák, amelyeknek felelősségi területébe egynél több FIR és/vagy CTA tartozik, mindegyik, a felelősségi területébe tartozó FIR és/vagy CTA részére külön SIGMET közleményt kell kiadni.

1.1.4 Az A6-1 táblázatban lévő mintának megfelelően, a SIGMET közleménynek a következő jelenségeknek csak egyikét kell tartalmaznia, az alább bemutatott rövidítéseket használva: a) szubszonikus utazó magasságokon:

zivatar	
– takart	OBSC TS
– beágyazott	EMBD TS
– gyakori	FRQ TS
– széllökés vonali	SQL TS
– takart jégesővel	OBSC TS HVYGR
– beágyazott jégesővel	EMBD TS HVYGR
– gyakori jégesővel	FRQ TS HVYGR
– széllökés-vonali jégesővel	SQL TS HVYGR
trópusi ciklon	
– trópusi ciklon	TC (+ciklon neve)
– 10 perces 63 km/h	
– (34 csomó) vagy nagyobb közepes talajszél-sebesség	
turbulencia	
– erős turbulencia	SEV TURB
jegesedés	
– erős jegesedés	SEV ICE
– erős jegesedés ónos eső miatt	SEV ICE (FZRA)
hegyi hullám	
– erős hegyi hullám	SEV MTW
porvihar	
– erős porvihar	HVY DS
homokvihar	
– erős homokvihar	HVY SS
vulkánikus hamu	
– vulkánikus hamu (magasságra való tekintet nélkül)	VA (+ vulkán neve, ha ismert)

b) transzonikus magasságokon és szuperszonikus utazó magasságokon:

turbulencia	
– mérsékelt turbulencia	MOD TURB
– erős turbulencia	SEV TURB
cumulonimbus	
– izolált cumulonimbus	ISOL CB
– esetenkénti cumulonimbus	OCNL CB
– gyakori cumulonimbus	FRQ B
jégeső	
–jégeső	GR
vulkánikus hamu	
– vulkánikus hamu (magasságra való tekintet nélkül)	VA (+vulkán neve, ha ismert)

1.1.5 A SIGMET tájékoztatás nem tartalmazhat szükségtelen leíró részeket. A SIGMET kiadását előidéző időjárási jelenség leírása a 1.1.4 pontban megadottakon túlmenő leíró anyagot nem tartalmazhat. Zivatarokra és trópusi ciklonokra vonatkozó SIGMET tájékoztatások nem tartalmazhatnak hivatkozást velük társult turbulenciára és jegesedésre.

1.1.6 **Ajánlás.** – *Az erre alkalmas pozícióban lévő meteorológiai megfigyelő irodáknak SIGMET tájékoztatást kell kiadniuk vulkánikus hamu felhőről és trópusi ciklonokról grafikus formában, a WMO BUFR kód formát használva, még ugyanezen SIGMET tájékoztatásnak a 1.1.1 pontnak megfelelő*

rövidített köznyelven való kiadásán felül.
Megjegyzés. – A BUFR kód formát a WMO 306 sz. kiadványa, Kód kézikönyv (Manual on Codes) *I.1. Kötet B Rész – Bináris kódok, tartalmazza.*

1.2 SIGMET közlemények terjesztése

1.2.1 A SIGMET közleményeket a meteorológiai figyelő irodák, WAFC-k és más meteorológiai irodák részére a regionális léginavigációs egyezményeknek megfelelően kell szétküldeni. A vulkánikus hamura vonatkozó SIGMET közleményeket a VAAC-oknak is el kell küldeni.

1.2.2 A SIGMET tájékoztatásokat továbbítani kell a nemzetközi OPMET adatbankokba és a regionális léginavigációs egyezmény által repülési helyhezkötött szolgálati műholdas elosztó rendszerek működtetésére kijelölt központokhoz, a regionális léginavigációs egyezményekkel összhangban.

2. AIRMET INFORMÁCIÓKRA VONATKOZÓ SPECIFIKÁCIÓK

2.1 AIRMET közlemények formátuma

2.1.1 Az AIRMET közlemény tartalmának és elemei sorrendjének az A6-1 táblázatban bemutatott mintával kell összhangban lennie.

2.1.2 Az A6-1 táblázatban lévő mintában hivatkozott sorszámnak meg kell egyeznie azoknak az AIRMET közleményeknek a számával, amelyet az adott napon 0001 UTC óta a repülési információs régió számára kiadtak. A meteorológiai megfigyelő irodáknak, amelyeknek felelősségi területébe egynél több FIR és/vagy CTA tartozik, mindegyik, a felelősségi területébe tartozó FIR és/vagy CTA részére külön AIRMET közleményt kell kiadni.
2.1.3 A repülési információs régiót, ha szükséges, alterületekre lehet osztani.
2.1.4 Az A6-1 táblázatban lévő mintának megfelelően, az AIRMET közleménynek a következő jelenségeknek csak egyikét kell tartalmaznia, az alább bemutatott rövidítéseket használva:
A 100-as repülési magasságszint alatti (vagy a 150-es repülési magasságszint alatti hegyes területen vagy ha szükséges, ennél is magasabb szint alatti) utazó magasságokon:

– talajszél sebesség	
– nagykiterjedésű közepes talajszél sebesség	SFC WSPD
60 km/h (30 csomó) felett	(+szélsebesség és egységei)
– felszíni látás	
– a látásnak 5000 m-nél kisebbre csökkenése	SFC VIS
által befolyásolt nagykiterjedésű területek,	(+látás)
amelyek magukbafoglalják a látás csökkenését	(+a következő időjárási
jelenségek, illetve	
okozó időjárás jelenséget	ezek kombinációinak,
valamelyike:	
BR, DS, DU, DZ, FC	
FG, FU, GR, GS, HZ	
IC, PL, PQ, RA, SA, SG,	
	SN, SQ, SS, vagy VA)
-- zivatarok	
– izolált zivatarok jégeső nélkül	ISOL TS
–- esetenkénti zivatarok jégeső nélkül	OCNL TS
– izolált zivatarok jégesővel	ISOL TSGR
– esetenkénti zivatarok jégesővel	OCNL TSGR
– hegytakarás	
–eltakart hegyek	MT OBSC
– felhő	

–kisebb, mint 300 m (1000 láb) föld feletti felhőalap magassággal rendelkező szakadozott vagy összefüggő felhőzet kiterjedt területei	
–szakadozott	BKN CLD (+felhőalap és tető magasság + egységek)
–összefüggő felhőtakaró	OVC CLD (+felhőalap és tető magasság és egységek)
– cumulonimus felhők, amelyek:	
– izolált	ISOL CB
– esetenkénti	OCNL CB
– gyakori	FRQ CB
– tornyosuló cumulus felhők, amelyek:	
– izolált	ISOL TCU
– esetenként	OCNL TCU
– gyakori	FRQ TCU
– jegesedés	
– mérsékelt jegesedés (kivéve a jegesedést konvektív felhőkben)	MOD ICE
– turbulencia	
– mérsékelt turbulencia (kivéve a turbulenciát konvektív felhőkben)	MOD TURB
– hegyi hullám	
– mérsékelt hegyi hullám	MOD MTW

2.1.5 AIRMET információ szükségtelen leíró anyagot nem tartalmazhat. Az időjárás jelenségek, amelyre az AIRMET-et kiadják, leírásában nem lehet a 7.3.1-ben megadottakhoz kiegészítő leírás. Zivatarokkal, vagy cumulonimbus felhőkkel foglalkozó AIRMET információ nem tartalmazhat kísérő turbulenciára és jegesedésre vonatkozó utalást. Viszont jégesőnek zivatarokkal való előfordulását jelezni kell.

Megjegyzés. – Specifikációkat a SIGMET közleményekről, amelyek kismagasságú repülésekre is használhatók, az 1.1.4 pont tartalmaz.

2.2 SIGMET közlemények terjesztése

2.2.1 **Ajánlás** – *Az AIRMET közleményeket a szomszédos repülési információs régiókban lévő meteorológiai irodák és más meteorológiai irodák részére kell szétosztani, ahogyan az illetékes meteorológiai hatóságok megállapodtak.*

2.2.2 **Ajánlás. –** *Az AIRMET tájékoztatásokat továbbítani kell a nemzetközi üzemelési meteorológiai adatbankokba, és a regionális léginavigációs egyezmény által a repülési helyhezkötött szolgálati műholdas elosztó rendszerek működtetésére kijelölt központokhoz, a regionális léginavigációs egyezményekkel összhangban.*

3. KÜLÖNLEGES LÉGIJELENTÉSEKRE VONATKOZÓ SPECIFIKÁCIÓK

Megjegyzés. – Ez a függelék különleges légijelentések felfelé kapcsolatával foglalkozik. A különleges légijelentésekre vonatkozó általános leírások a 4. Függelékben találhatók.

3.1 **Ajánlás. –** *Különleges légijelentéseket kiadásuk utáni 60 perc során kell felküldeni.*

3.2 **Ajánlás. –** *Az automatizált különleges légi-jelentésekben lévő szél és hőmérséklet információkat nem kell felküldeni más, repülést végző légijárműveknek.*

4. SIGMET ÉS AIRMET KÖZLEMÉNYEKRE ÉS KÜLÖNLEGES LÉGIJELENTÉSEKRE (FELFELÉ KAPCSOLAT) VONATKOZÓ RÉSZLETES KRITÉRIUMOK

4.1 Repülési információs régió azonosítása

Ajánlás. – *Azokban az esetekben, amikor a légtér repülési információs régióra (FIR) és magassági repülési információs régióra (UIR) van felosztva, a SIGMET-et a FIR-t kiszolgáló légiforgalmi irányítási szolgálati egység hely jelzőjével kell azonosítani.*

Megjegyzés. – A SIGMET közlemény a FIR laterális határain belül a teljes légtérre érvényes, azaz a FIR-re és az UIR-re. A SIGMET kiadását szükségessé tevő időjárási jelenségek által befolyásolt részterületek és/vagy repülési magasságszintek a közlemény szövegében meg vannak adva.

4.2 A SIGMET és AIRMET közleményekben és különleges légijelentésekben tartalmazott jelenségekre vonatkozókritériumok

4.2.1 **Ajánlás** – *Zivatarok és cumulonimbus felhők területei lehetnek:*

a) takart (OBSC), ha homály vagy füst borítja, vagy sötétség miatt nem látszik felismerhetően;

b) beágyazott (EMBD), ha felhőrétegek közé van beágyazódva és nem ismerhető fel világosan;

c) izolált (ISOL), ha egyedekből áll, amelyek ténylegesen hatással vannak, vagy előrejelzés szerint hatással lesznek egy területre, amelynek térbeli beborítottsága kisebb, mint az érintett terület 50 százaléka (egy rögzített időpontban vagy egy érvényességi időszak alatt); és

d) eseti (OCNL), ha jól elkülönült egyedekből áll, amelyek ténylegesen hatással vannak, vagy előrejelzés szerint hatással lesznek egy területre, amelynek maximális térbeli beborítottsága az érintett terület 50 és 75 százaléka között van (egy rögzített időpontban vagy egy érvényességi időszak alatt).

4.2.2 **Ajánlás.** – *Zivatarok egy területét gyakorinak (FRQ) tekintik, ha ezen a területen belül a szomszédos zivatartól kis elválasztódások vannak, vagy ilyenek egyáltalán nincsenek, amelynek maximális térbeli beborítottsága az érintett, vagy az előrejelzés szerint érintetté váló terület 75 százalékánál nagyobb (egy rögzített időpontban vagy egy érvényességi időszak alatt).*

4.2.3 **Ajánlás.** – *Szélroham vonal (SQL) zivatart jelöl, amely egy vonal mentén egyedi felhők között kis közökkel rendelkezik, vagy ilyenek egyáltalán nincsenek.*

4.2.4 **Ajánlás.** – *Jégesőt (GR) a zivatar további leírásaként kell használni, ha szükséges.*

4.2.5 **Ajánlás.** – *Heves és mérsékelt turbulencia (TURB) csak a következőkre vonatkozhat: alacsonyszinti turbulencia, amely erős talajszéllel kapcsolódik; rotor áramlás; turbulencia vagy felhővel, vagy felhő nélkül (CAT). Konvektív felhőkkel kapcsolatosan turbulenciát nem használnak.*

4.2.6 Turbulencia lehet:

a) erős, amikor a turbulencia index 15 és 20 között van(azaz az örvény disszipációs ráta (EDR) csúcsértéke nem haladja meg a 0,5-őt); és

b) mérsékelt, amikor a turbulencia index 6 és 14 között van (azaz az örvény disszipációs ráta (EDR) csúcsértéke meghaladja a 0,3-at, de nem haladja meg a 0,5-őt).

4.2.7 **Ajánlás.** – *Erős és mérsékelt jegesedés (ICE) nem-konvektív felhőben való jegesedésre* *vonatkozhat. Ónos eső (FZRA) ónos eső által okozott erős jegesedési körülményekre vonatkozhat.*

4.2.8 **Ajánlás. –** *Hegyi hullám (MTW) lehet:*

a) erős, amikor 3,0 m/s (600 láb/perc) vagy ennél nagyobb kísérő leáramlás és/vagy erős turbulencia ténylegesen fennáll, vagy előrejelezve van; és

b) mérsékelt, , amikor 1,75 – 3,0 m/s (350-600 láb/perc) kísérő leáramlás és/vagy mérsékelt turbulencia ténylegesen fennáll, vagy előrejelezve van.

4.2.9 **Ajánlás. –** *Vulkanikus hamura vonatkozó SIGMET közlemények maximálisan négy réteget vagy szintet tartalmazhat.*

5. REPÜLŐTÉRI FIGYELMEZTETÉSEKRE VONATKOZÓ SPECIFIKÁCIÓK

5.1 Repülőtéri figyelmeztetések formátuma és terjesztése

5.1.1 A repülőtéri figyelmeztetéseket az A6-2 táblázatban közölt mintának megfelelően kell kiadni, ahol az üzemeltetők vagy repülőtéri szolgáltatók igénylik és az azokra vonatkozó helyi megállapodásnak megfelelően kell szétosztani.

5.1.2 **Ajánlás** – *Az A6-2 táblázatban közölt mintának megfelelően, repülőtéri figyelmeztetéseket az alábbi jelenségek közül valamelyiknek vagy többnek a megjelenésével, vagy várható megjelenésével kapcsolatban kell kiadni.*

– trópusi ciklon (akkor, ha a repülőtéren a 10 perces közepes talajszél sebesség 63 km/h-ra vagy ennél nagyobbra várható)

– zivatar

– jégeső

– hó (beleértve a várható vagy észlelt hó felgyülemlést)

– ónos csapadék

– dér vagy zúzmara

– homokvihar

– porvihar

– felkavart homok vagy por

– erős talajszél és széllökések

– szélroham

– fagy

– vulkanikus hamu

– egyéb jelenségek helyi megállapodás szerint.

5.1.3 **Ajánlás. –** *Az A6-2 táblázatban lévő mintában felsorolt rövidítéseket kiegészítő szöveg használatát minimálisra kell korlátozni. A kiegészítő szöveget rövidített köznyelven kell kiadni, ICAO* *által jóváhagyott rövidítéseket, valamint numerikus értékeket kell használni. Ha ICAO által jóváhagyott rövidítések nem állnak rendelkezésre, angol köznyelvű szöveget kell használni.*

5.2 Mennyiségi kritériumok repülőtéri figyelmeztetésekhez

Ajánlás – *Ha mennyiségi kritériumok szükségesek repülőtéri figyelmeztetések kibocsátásához, például a várható maximális szélsebesség vagy a várható lehulló teljes hómennyiség, a kritériumokat a meteorológiai iroda és a figyelmeztetések felhasználói közötti megállapodásban kell rögzíteni.*

6. SZÉLNYÍRÁS FIGYELMEZTETÉSEKRE VONATKOZÓ SPECIFIKÁCIÓK

6.1 Szélnyírás észlelése

Ajánlás. – *Szélnyírás létezésének bizonyítékát a következőkből kell származtatni:*

a) földi szélnyírás távérzékelő berendezés, például Doppler radar;
b) földi szélnyírás észlelő berendezések, például talajszél és/vagy nyomás érzékelők, amelyek úgy vannak elhelyezve, hogy adott futópályát vagy futópályákat és a hozzájuk tartozó megközelítési és indulási pályákat figyelnek;
c) légijármű megfigyelések emelkedési vagy megközelítési repülési fázisban, amelyeket az 5. Fejezetnek megfelelően kell végezni; vagy
d) más meteorológiai információk, például a repülőtér szomszédságában vagy magasföldek közelében lévő póznákon vagy tornyokon elhelyezett megfelelő érzékelőktől származó információk.

Megjegyzés. – A szélnyírási körülmények rendszerint a következő jelenségekkel járnak együtt:
– zivatarok, mikroburstök, tölcsérfelhő (tornádó vagy víztölcsér), és széllökés front;
– front felületek;
– helyi terepviszonyokkal kapcsolatos erős talajszél;
– tengeri szélfrontok;
– hegyi hullámok; (beleértve az alacsonyszinti rotorokat a terminál területen)
– alacsonyszinti hőmérséklet inverziók.

6.2 Szélnyírás figyelmeztetések formátuma és terjesztése

Megjegyzés. – A helyi rendszeres és különleges jelentéseknek és METAR-nak és SPECI-nek kiegészítő információként a szélnyírás információkat is tartalmazniuk kell az A3-1 és A3-2 táblázatokban lévő mintáknak megfelelően.

6.2.1 A szélnyírás figyelmeztetéseket rövidített köznyelven kell készíteni az A6-3 táblázatban lévő mintának megfelelően, és azoknak a repülőtereknek kell eljuttatni, ahol a szélnyírás tényezőnek számít, a megfelelő ATS hatósággal és az illetékes üzemeltetőkkel és a repülőtér kiszolgálására kijelölt meteorológiai irodával kötött helyi megállapodásnak megfelelően, vagy ezeket közvetlenül az automatizált földi telepítésű szélnyírás távérzékelőtől vagy a 6.1 a) és b) pontokban hivatkozott észlelő berendezésektől osztják el.

6.2.2 **Ajánlás.** – *Ahol mikroburstöt észlelnek, pilóták jelentenek, vagy földi szélnyírás észlelő vagy távérzékelő érzékel, a szélnyírás figyelmeztetésnek tartalmaznia kell egy speciális utalást a mikroburstre.*

6.2.3 **Ajánlás.** – *Ahol földi szélnyírás észlelő vagy távérzékelő berendezésektől nyerik a szélnyírás figyelmeztetés készítéséhez használt információkat, a figyelmeztetés, amennyiben megvalósítható, a futópálya egy bizonyos szakaszára, és a megközelítési pálya vagy felszállási pálya mentén bizonyos távolságra vonatkozzon, a meteorológiai hatóság, a megfelelő ATS hatóság és az érdekelt üzemeltetők közötti megállapodásnak megfelelően.*

6.2.4 **Ajánlás**. – *Ha egy légijármű jelentése alapján készítenek szélnyírásról szóló figyelmeztetést,* *vagy megerősítik az előzőleg kiadott figyelmeztetést, akkor a légijármű jelentését, a légijármű típusával együtt, változatlan formában kell megadni a figyelmeztetésben.*

1. *Megjegyzés. – Ha egy érkező és egy induló légijármű is jelentett szélnyírást, akkor két szélnyírásról szóló figyelmeztetés is létezhet, egy az induló, egy az érkező légijárművek számára.*

2. Megjegyzés. – A szélnyírás intenzitásának jelentésére vonatkozó részletek kidolgozása folyamatban van. Elfogadott azonban, hogy a pilóták a szélnyírás jelentésekor használhatják a „mérsékelt" (moderate), „erős" (strong) és „heves" (severe) minőségjelző kifejezéseket, a tapasztalt szélnyírás intenzitásának megítélését nagymértékben a pilóták szubjektív becslésére alapozva. A.6.2.4 ponttal összhangban ezeket a jelentéseket változatlan formában kell belevenni a szélnyírásról szóló figyelmeztetésekbe.

6.2.5 **Ajánlás.** – *Az A6-3 táblázatban lévő mintában felsorolt rövidítéseket kiegészítő szövegek használatát minimálisra kell korlátozni. A kiegészítő szöveget rövidített köznyelven kell kiadni, ICAO által jóváhagyott rövidítéseket, és numerikus értékeket kell használni. Ha ICAO által jóváhagyott rövidítések nem állnak rendelkezésre, angol köznyelvű szöveget kell használni.*

6.1 Táblázat. Minta SIGMET és AIRMET közleményekre és különleges légi-jelentésekre

Kulcs: M = kötelező beszúrás, minden közlemény része

C = feltételes beszúrás meteorológiai körülményektől függ

= = kettős vonal azt jelzi, hogy az ezt követő szöveget a következő sorban kell elhelyezni.

Megjegyzés. – A SIGMET/AIRMET közleményekben és különleges légijelentésekben szereplő numerikus elemek tartományait és felbontásait ennek a függeléknek az A6-4 táblázata mutatja be.

Az 5. Fejezetben és a 6. Függelékben meghatározottak szerinti elem	Részletes tartalom	Minta (Minták)				Példák
		SIGMET	*SIGMET SST*[1]	*AIRMET*	Különleges légijelentés[2]	
FIR/CTA hely jelző (M)[3]	Azt a FIR-t vagy CTA-t kiszolgáló ATS egység ICAO hely jelzője, amelyre a SIGMET/AIRMET vonatkozik	nnnn			–	YUCC[4] YUDD[4]
Azonosítás (M)	Közlemény azonosítás és sorozatszám[5] (M)	SIGMET [nn]n	SIGMET SST [nn]n	AIRMET [nn]n	ARS	SIGMET 5 SIGMET A3 SIGMET SST 1 AIRMET 2 ARS
Érvényességi időtartam (M)	Az érvényességi időtartamot UTC-ben jelölő dátum-időpont csoport (M)	ÉRVÉNYES nnnnnn/nnnnnn			_6	ÉRVÉNYES 221215/221600 ÉRVÉNYES 101520/101800 ÉRVÉNYES 251600/252200
Az MWO hely jele (M)	Az MWO, ahonnan a közlemény származik, a hely jele elválasztó kötőjellel (M)	nnnn–				YUDO–[4] YUDO–[4]

Az 5. Fejezetben és a 6. Függelékben meghatározottak szerinti elem	**Részletes tartalom**	**Minta (Minták)**				**Példák**
		SIGMET	*SIGMET SST*[1]	*AIRMET*	Különleges légijelentés[2]	
A FIR/CTA neve, vagy légijármű azonosítás (M)	A FIR/CTA[7] neve, amelynek részére a SIGMET/ARMET-et kiadják, vagy a légijármű rádiótelefon hívójele (M)	nnnn nnnnnnnnnn FIR[/UIR] *vagy* nnnn nnnnnnnnnn CTA		nnnn nnnnnnnnnn FIR[/n]	nnnnnn	YUCC AMSWELL FIR[4] YUDD SHANLON FIR/UIR[4] YUCC AMSWELL FIR/2[4] YUDD SHANLON FIR[4] VA812
Ha a SIGMET-et törölni kell, erre vonatkozóan lásd a minta végénél						
Jelenség (M)[8]	SIGMET/AIRMET kiadását kiváltó jelenség leírása (C)	OBSC[9] TS [GR[10]] EMBD[12] TS [GR] FRQ[13] TS [GR] SQL[14] TS [GR] TC nnnnnnnnnn SEV TURB[11] SEV ICE[19] SEV ICE (FZRA)[20] SEV MTW[21] HVY DS HVY SS VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] *vagy* Snn[nn] Ennn[nn] *vagy* Wnnn[nn]] VA CLD	MOD TURB[11] SEV TURB ISOL[15] CB[16] OCNL[18] CB FRQ[13] CB GR VA[ERUPTION] [MT nnnnnnnnnn] [LOC Nnn[nn] *vagy* Snn[nn] Ennn[nn] *vagy* Wnnn[nn]] VA CLD	SFC WSPD nn[n]KMH (*vagy* SFC WSPD nn[n]KT) SFC VIS nnnnM (nn)[17] ISOL[15] TS[GR][10] OCNL[18] TS[GR] MT OSC BKN CLD nnn/[ABV]nnnnM (*vagy* BKN CLD nnn/[ABV]nnnnFT) OVC CLD nnn/[ABV]nnnnM (*vagy* OVC CLD nnn/[ABV]nnnnFT) ISOL[15] CB[16] OCNL[18] CB FRQ[13] CB ISOL[15] TCU[16] OCNL[18] TCU[16] FRQ[13] TCU MOD TURB[11] MOD ICE[19] MOD MTW[21]	TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/nnn] VA [MT nnnnnnnnnn] MOD TURB[11] GR[10] CB[16]	SEV TURB FRQ TS OBSC TSGR EMBD TSGR TC GLORIA VA ERUPTION MT ASHVAL LOC S15 E073 VA CLD MOD TURB MOD MTW ISOL CB BKN CLD 120/900M (BKN CLD 400/3000FT) OVC CLD 270/ABV3000M (OVC CLD 900/ABV10000FT) SEV ICE
Megfigyelt vagy előrejelzett jelenség (M)	Annak jelölése, hogy az információ megfigyelt és folytatódása várható, vagy pedig előrejelzett-e (M)	OBS [AT nnnnZ] FCST OBS [AT nnnnZ] AND FCST			OBS AT nnnnZ	OBS AT 1210Z OBS OBS AND FCST

Az 5. Fejezetben és a 6. Függelékben meghatározottak szerinti elem	**Részletes tartalom**	**Minta (Minták)**				**Példák**
		SIGMET	*SIGMET SST*[1]	*AIRMET*	Különleges légijelentés[2]	
Hely (C)	Hely (földrajzi szélességben és hosszúságban (fokokban és percekben) megadva, vagy nemzetközileg jól ismert helyek vagy földrajzi jellegzetességek)	*vagy* N OF Nnn[nn] *vagy* S OF Nnn[nn] *vagy* N OF Snn[nn] *vagy* S OF Snn[nn] *vagy* [AND] W OF Wnnn[nn] *vagy* E OF Wnnn[nn] *vagy* W OF Ennn[nn] *vagy* E OF Ennn[nn] *vagy* [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] nnnnnnnnnnn *vagy* WI Nnn[nn] *vagy* Snn[nn] Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy*Snn[nn] Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn] Wnnn[nn] *vagy* Ennn[nn] – [Nnn[nn] *vagy* Snn[nn] Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn] Wnnn[nn] *vagy* Ennn[nn]]			Nnn[nn] Wnnn[nn]*rvagy* Nnn[nn] Ennn[nn] *vagy* Snn[nn] Wnnn[nn] *vagy* Snn[nn] Ennn[nn]	S OF N54 N OF N50 N2020 W07005 YUSB[4] N2706 W07306 N48 E010 N OF N1515 AND W OF E13530 W OF E1554 WI N6030 E02550 - N6055 E02500 - N6050 E02630
Szint (C)	Repülési szint és terjedtség[22] (C)	FLnnn *vagy* FLnnn/nnn *vagy* TOP FLnnn *vagy* [TOP] ABV FLnnn *vagy* [TOP] BLW FLnnn *vagy* BLW nnnnM (*vagy* BLW nnnnFT) *vagy*[23] CB TOP [ABV] FLnnn WI nnnKM OF CENTRE (*or* CB TOB [ABV] FLnnn WI nnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnKM OF CENTRE (or CB TOP [BLW] FLnnn WI nnnNM OF CENTRE) *vagy*[24] FLnnn/nnn [APRX nnnKM BY nnnKM] [Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]]] (*vagy* FLnnn/nnn [APRX nnnNM BY nnnNM] [Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]]])			FLnnn	FL180 FL050/080 TOP FL390 BLW FL200 TOB ABV FL100 FL310/450 CB TOP FL500 WI 270KM OF CENTRE (CB TOP FL500 WI 150NM OF CENTRE) FL310/350 APRX 220KM BY 35KM FL390
Mozgás vagy várható mozgás (C)	Mozgás vagy várható mozgás az iránytű nyolc pontjának egyikére hivatkozással, vagy mozdulatlanság (C)	MOV N [nnKMH] *vagy* MOV NE [nnKMH] *vagy* MOV E [nnKMH] *vagy* MOV SE [nnKMH] *vagy* MOV S [nnKMH] *vagy* MOV SW [nnKMH] *vagy* MOV W [nnKMH] *vagy* MOV NW [nnKMH] *vagy* MOV N [nnKT] *vagy* MOV NE [nnKT] *vagy* MOV E [nnKT] *vagy* MOV SE [nnKT] *vagy* MOV S [nnKT] *vagy* MOV SW [nnKT] *vagy* MOV W [nnKT] *vagy* MOV NW [nnKT]) *vagy* STNR			–	MOV E 40KMH (MOV E 20KT) MOV SE STNR
Intenzitás változások (C)	Az intenzitás várható változásai (C)	INTSF or WKN or NC			–	WKN

Az 5. Fejezetben és a 6. Függelékben meghatározottak szerinti elem	**Részletes tartalom**	**Minta (Minták)**				**Példák**
		SIGMET	*SIGMET SST*[1]	*AIRMET*	Különleges légijelentés[2]	
Intenzitás változások(C)	Intenzitás várható változásai(C)	INTFS vagy WKN vagy NC			–	WKN
Előrejelzett pozíció (C)[22]	Vulkánikus hamu felhő vagy a TC központjának előrejelzett helyzete a SIGMET közlemény érvényességi időszakának végén (C)	FCST nnnnZ TC CENTRE Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] *vagy* FCST nnnnZ VA CLD APRX Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]]		–	–	FCST 2200Z TC CENTRE N2740 W07345 FCST 1700Z VA CLD APRX S15 E075 – S15 E081 – S17 E083 – S18 E079 – S15 E075
Kilátások (C)[22]	, amelyek információt nyújtanak az érvényességi időszak utánra a vulkánikus felhő trajektóriáiról és a trópusi ciklon helyzeteiről (C)	OTLK nnnnnn TC CENTRE Nnnnn *vagy* SnnnnWnnnnn *vagy* Ennnnn nnnnnn TC CENTRE Nnnnn *vagy* SnnnnWnnnnn *vagy* Ennnnn *vagy* OTLK nnnnn VA CLD APRX [FLnnnn/nnnn][25] Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] nnnnnn VA CLD APRX Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn] – Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[Kilátások[22] (C)nn] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]] [– Nnn[nn] *vagy* Snn[nn]Wnnn[nn] *vagy* Ennn[nn]]		–		OTLK260400 TC CENTRE N28030 W07430 261000 TC CENTRE N3100 W07600 OTLK212300 VA CLD APRX S16 E078- S17 E084 S18 E089 S16 E078- S17 E084 S18 E089 S19 E081- S16 E078 220300 VA CLD APRX S17 E081 S18 E086 S20 E092- S17 E081

VAGY

35 (C) SIGMET/AIRMET törlése[26]	SIGMET/AIRMET törlése azonosítására hivatkozva	CNL SIGMET [nn]n nnnnnn/nnnnnn *vagy* CNL SIGMET [nn]n nnnnnn/nnnnnn [VA MOV TO nnnn FIR][24]	CNL SIGMET SST [nn]n nnnnnn/nnnnnn	CNL AIRMET [nn]n nnnnnn/nnnnnn	–	CNL SIGMET 2 101200/101600[26] CNL SIGMET 3 251030/251430 VA MOV TO YUDO FIR[26] CNL SIGMET SST 1 212330/220130[26] CNL AIRMET 151520/151800[26]

Megjegyzések.–
1. 1.1.2 pontnak megfelelően.
2. a szél és hőmérséklet, amelyeket nem szükséges feljuttatni a repülést végző többi légijárműhöz.
3. Lásd 4.1 pont.
4. Fiktív hely.
5. 1.1.3 és 2.1.2 pontnak megfelelően.
6. Lásd 3.1 pont.
7. Lásd 2.1.3 pont.
8. 1.1.4 és 2.1.4 pontnak megfelelően.
9. 4.2.1 a) pontnak megfelelően.
10. 4.2.4 pontnak megfelelően.
11. 4.2.5 pontnak megfelelően.
12. 4.2.1 b) pontnak megfelelően.
13. 4.2.2 pontnak megfelelően.
14. 4.2.3 pontnak megfelelően.
15. 4.2.1 c) pontnak megfelelően.
16. Cumulonimbus, CB használata szuperszonikus utasszállító repülőgép transszonikus és szuperszonikus utazórepülés alatti repülésére vonatkozó AIRMET-ekre és SIGMET-ekre korlátozódik; a tornyosuló cumulus, TCU használata AIRMET-ekre korlátozódik az 1.1.4 és 2.1.4 ponttal összhangban.
17. 2.1.4 pontnak megfelelően.
18. 4.2.1 d) pontnak megfelelően.
19. 4.2.7 pontnak megfelelően.
20. 4.2.7 pontnak megfelelően.
21. 4.2.8 pontnak megfelelően.
22 Csak vulkánikus hamu felhőre vagy trópusi ciklonokra vonatkozó SIGMET közleményeknél.
23 Csak trópusi ciklonokra vonatkozó SIGMET közleményeknél.
24 Csak vulkánikus hamu felhőre vonatkozó SIGMET közleményeknél.
25 Maximum négy réteget (vagy szintet) kell tartalmaznia a vulkánikus hamura vonatkozó SIGMET kilátásoknak.
26 A közlemény vége (ahogy a SIGMET/AIRMET közlemény törölve van)
38 *Megjegyzés.* – Zivatarokkal, cumulonimbus felhőkkel vagy trópusi ciklonokkal kapcsolódó erős vagy mérsékelt jegesedést, és erős vagy mérsékelt turbulenciát (SEV ICE, MOD ICE, SEV TURB, MOD TURB) nem tartalmazhat.

A6-2 táblázat. Minta repülőtéri figyelmeztetésekre
Kulcs: M = kötelező beszúrás, minden közlemény része
C = feltételes beszúrás meteorológiai körülményektől függ
1. Megjegyzés. –A helyi rendszeres és különleges jelentésekben szereplő numerikus elemek nagyságrendje és felbontása jelen Függelék A6-4 táblázatban látható
2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400) kiadványban található.*

Elem	Részletes tartalom	Minta	Példa
A repülőtér hely jelzője(M)	A repülőtér hely jelzője	nnnn	YUCC[1]
A közlemény fajtájának azonosítása (M)	A közlemény fajtája és sorszáma	AD WRNG n	AD WRNG 2
Érvényességi időszak (M)	Az érvényességi időszak napja és időpontja UTC szerint	ÉRVÉNYES nnnnnn/nnnnnn	ÉRVÉNYES 211230/211530
Ha a repülőtéri figyelmeztetést törölni kell, a részleteket lásd a minta végén.			

Jelenség (M)[2]	A repülőtéri figyelmeztetés kiadását szükségessé tevő jelenség leírása	TC[3] nnnnnnnnnn or [HVY] TS *vagy* GR *vagy* [HVY] SN [nnCM][3] *vagy* [HVY] FZRA *vagy* [HVY] FZDZ *vagy* RIME[4] *vagy* [HVY] SS *vagy* [HVY] DS *vagy* SA *vagy* DU *vagy* SFC WSPD nn[n]KMH MAX nn[n] (SFC WSPD nn[n]KT MAX nn[n]) *vagy* SQ *vagy* FROST *vagy* VA *vagy* szöveg 32 karakterig[5]	TC ANDREW HVY SN 25CM SFC WSPD 80KMH MAX 120 VA
Észlelt vagy előrejelzett jelenség (M)	Jelzés, hogy az információt észlelték-e és folytatódása várható-e vagy előrejelezték	OBS [AT nnnnZ] *vagy* FCST *vagy* OBS [AT nnnnZ] AND FCST	OBS AT 1200Z OBS OBS AT 1220Z AND FCST
Intenzitás változások (C)	Várható intenzitás változások	INTSF *vagy* WKN *vagy* NC	WKN
Vagy			
Repülőtéri figyelmeztetés törlése[6]	Repülőtéri figyelmeztetés törlése, azonosítására hivatkozva	CNL AD WRNG n nnnnnn/nnnnnn	CNL AD WRNG 2 211230/211530[6]

Megjegyzés. –
1. Fiktív hely.
2. Egyik jelenség, vagy ezeknek egy kombinációja, az 5.1.2 pontnak megfelelően
3. 5.1.2 pontnak megfelelően
4. Zúzmarás fagy vagy zúzmara, 5.1.2 pontnak megfelelően.
5. 5.1.3 pontnak megfelelően
6. Közlemény vége (mivel a repülőtéri figyelmeztetést törlik).

A6-3 táblázat. Minta szélnyírás figyelmeztetésre

Kulcs: M = kötelező beszúrás, minden közlemény része

C = feltételes beszúrás meteorológiai körülményektől függ

1. Megjegyzés. –A helyi rendszeres és különleges jelentésekben szereplő numerikus elemek nagyságrendje és felbontása jelen Függelék A6-4 táblázatban látható

2. Megjegyzés. – A rövidítések magyarázata a Procedures for Air Navigation Services – ICAO Abbreviations and Codes (Léginavigációs szolgálati eljárások – ICAO rövidítések és kódok) *(PANS-ABC, Doc 8400) kiadványban található.*

Elem	Részletes tartalom	Minta	Példa
A repülőtér hely indikátora (M)	A repülőtér hely indikátora	nnnn	YUCC
A közlemény fajtájának azonosítása (M)	A közlemény fajtája és sorszáma	WS WRNG	WS WRNG 01
Érvényességi időszak (M)	Az érvényességi időszak napja és időpontja UTC szerint	nnnnnn [VALID TL nnnnnn] *vagy* [VALID nnnnnn/nnnnnn]	211230 VALID TL 211330 221200 VALID 221215/221315
Ha a szélnyírás figyelmeztetést törölni kell, a részleteket lásd a minta végén.			

Jelenség (M)[2]	A jelenség és helyének azonosítása	[MOD] *vagy* [SEV] WS IN APCH *vagy* [MOD] *vagy* [SEV] WS [APCH] RWYnnn *vagy* [MOD] *vagy* [SEV] WS IN CLIMB-OUT *vagy* [MOD] *vagy* [SEV] WS CLIMB-OUT RWYnnn *vagy* MBST IN APCH *vagy* MBST [APCH] RWYnnn *vagy* MBST IN CLIMB-OUT *vagy* MBST CLIMB-OUT RWYnnn	WS APCH RWY 12 MOD WS RWY34 WS IN CLIMB-OUT MBST APCH RWY26 MBST IN CLIMB-OUT
Észlelt, jelentett, vagy előrejelzett jelenség (M)	Azonosítás, hogy az információt észlelték-e és folytatódása várható-e vagy előrejelezték	REP AT nnnn nnnnnnnn *vagy* OBS [AT nnnn] *vagy* FCST	REP AT 1510 B747 OBS AT 1205 FCST
A jelenség részletei (C)	A szélnyírás figyelmeztetés kiadását szükségessé tevő jelenség leírása	SFC WIND: nnn/nnKMH (or nnn/nnKT) nnnM (nnnFT)-WIND: nnn/nnKMH (or nnn/nnKT) *vagy* nnKMH (*vagy* nnKT) ASPEEDL nnKM (*vagy* nnNM) FNA RWYnn *vagy* nnKMH (or nnKT) ASPEEDG nnKM (or nnNM) FNA RWYnn	SFC WIND: 320/20KMH 60M-WIND: 360/50KMH (SFC WIND: 320/10KT 200FT-WIND: 360/25KT) 60KMH ASPEEDL 4KM FNA RWY13 (30KT ASPEEDL 2NM FNA RWY13)
VAGY			
Szélnyírás figyelmeztetés törlése[6]20	Szélnyírás figyelmeztetés törlése, azonosítására hivatkozva	CNL WS WRNG n nnnnnn/nnnnnn	CNL WS WRNG 1211230/211330[3]

Megjegyzés. –
1. Fiktív hely.
2. További előírások a 6.2.5 pontban.
3. Közlemény vége (mivel a repülőtéri figyelmeztetést törlik).

A6-4 táblázat. Vulkanikus hamu és trópusi ciklon tanácsadó közleményekben, SIGMET/AIRMET közleményekben és repülőtéri és szélnyírás figyelmeztetésekben tartalmazott numerikus elemek tartományai és felbontásai

A 2. és 3. Függelékben ismertetett elem		Tartomány	Felbontás
Csúcsmagasság	M FT	000–8100 000–27000	1 1
Tanácsadói szám	for VA (index)* for TC (index)*	000–2000 00–99	1 1
Maximális talajszél	KMH KT	00–399 00–199	1 1
Központi nyomás	hPa	850–1050	1
Talajszél sebesség	KMH KT	60–199 30–99	1 1
Talajmenti látás	M M	0000–0800 0800–5000	50 100

Felhőalap magassága	M FT	000–300 000–1000	30 100
Felhőtető magasság	M M FT FT	000–3000 3000–20000 000–10000 10000–60000	30 300 100 1000
Földrajzi szélesség	°(fokok) ’(percek)	00–90 00–60	1 1
Földrajzi hosszúság	°(fokok) ’(percek)	000–180 00–60	1 1
Repülési magasságszint		000–650	10
Mozgás	KMH KT	0–300 0–150	10 5
*Dimenzió nélküli			

A6-1 példa SIGMET és AIRMET közlemény és törlésük

SIGMET	SIGMET törlése
YUDD SIGMET 2 VALID 101200/101600 YUSO-YOUD SHANLON FIR/UIR OBSC TS FCST S OF N54 TOP FL390 MOV E WKN	YUDD SIGMET 3 VALID101345/101600 YUSO-YUDD SHANLON FIR/UIR CNL SIGMET 2 101200/101600
AIRMET	**AIRMET törlése**
YUDD AIRMET 1 VALID 151520/151800 YUSO-YUDD SHANLON FIR ISOL TS OBS N OF S50 TOP ABV FL100 STNR WKN	YUDD AIRMET 2 VALID 151650/151800 YUSO-YUDD SHANLON FIR CNL AIRMET 151520/151800

A6-2 példa. SIGMET közlemények trópusi ciklonnál

YUCC SIGMET 3 VALID 251600/252200 YUDO-YUCC AMSWELL FIR TC GLORIA OBS AT 1600Z N2706 W07306 CB TOP FL500 WI 150NM OF CENTRE MOV NW 10KT NC FCST 22007 TC CENTRE N2740 W07345
OTLK TC CENTRE 260400N1830 W07430 261000 N2912 W07530

Jelentése:

Az AMSWELL* repülési információs régió részére a Donlon/International* meteorológiai megfigyelő iroda (YUDO) által 0001 UTC óta kiadott (a YUCC Amswell területi ellenőrző központ által azonosított) harmadik SIGMET közlemény; a közlemény e hó 25-e 1600 UTC-től 2200 UTC-ig érvényes; a Glória trópusi ciklont 27 fok 06 perc észak és 73 fok 6 perc nyugat helyen észlelték 1600 UTC-kor, cumulonimbus tetővel az 500-as repülési magasságszinten a központtól 150 tengeri mérföldön belül; a trópusi ciklon várhatóan észak-nyugati irányban fog mozogni 10 csomós sebességgel és intenzitása nem változik; a trópusi ciklon központjának előrejelzett helyzete 2200 UTC-kor várhatóan 27 fok 40 perc észak és 73 fok 45 perc nyugat.

Kilátások:

A trópusi ciklon középpontja e hó 26-án 0400 UTC-kor és 1000 UTC-kor várhatóan 28 fok 30 perc észak és 74 fok 30 perc nyugat, és 29 fok 12 perc észak és 75 fok 30 perc nyugat pozícióban lesz.

*Fiktív helyek

A6-3. Példa. SIGMET közlemény vulkanikus hamunál

YUDD SIGMET 2 VALID 211100/211700 YUSO-YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL LOC S1500 E07348 VA CLD OBS AT 1100Z FL310/450 APRX 220KM BY 35 KM S1500 E07348 – S1530 E07642 MOV ESE 65KMH FCST 1700Z VA CLD APRX S1506 E07500 – S1518 E08112 – S1712 E08330 – S1824 E07836 OTLK 212300Z VA CLD APRX S1600 E07806 – S1642 E08412 – S1824 E08900 – S1906 E08100 220500Z VA CLD APRX S1700 E08100 – S1812 E08636 – S2000 E09224 – S2130 E08418

Jelentése:

A Shanlon/International* meteorológiai megfigyelő iroda (YUSO) által 0001 UTC óta az SHANLON* repülés információs régió részére kiadott (a YUDD Shanlon területi ellenőrző központ által azonosított) második SIGMET közlemény; a közlemény e hó 21-e 1100 UTC-től 1700 UTC-ig érvényes; a Mount Ashval* vulkanikus hamu kitörése, amely 15 fok dél és 73 fok 48 perc kelet elhelyezkedésű; vulkanikus hamufelhőt észleltek 1100 UTC-kor a 310-es és 450-es repülési magasságszint között egy közelítőleg 220 km x 35 km nagyságú területen 15 fok dél és 73 fok 48 perc kelet, és 15 fok 30 perc dél és 76 fok 42 perc kelet között; a vulkanikus hamufelhő várhatóan kelet-délkelet irányban fog mozogni 65 km per óra sebességgel;1700 UTC-kor a vulkanikus hamufelhő előrejelzés szerint közelítőleg a következő pontok által határolt területen lesz: 15 fok 6 perc dél és 75 fok kelet, 15 fok 18 perc dél és 81 fok 12 perc dél, 17 fok 12 perc dél és 83 fok 30 perc kelet, és 18 fok 24 perc dél és 78 fok 36 perc kelet.

Kilátások:

A vulkanikus hamufelhő a hó 21-én 2300 UTC-kor várhatóan közelítőleg a következő pontok által határolt területen fog elhelyezkedni: 16 fok dél és 78 fok 6 perc kelet, 16 fok 42 perc dél és 84 fok 12 perc kelet, 18 fok 24 perc dél és 89 fok kelet, és 19 fok 6 perc dél, és 81 fok kelet; a vulkanikus hamufelhő a hó 22-én 0500 UTC-kor várhatóan közelítőleg a következő pontok által határok területen fog elhelyezkedni: 17 fok dél és 81 fok kelet, 18 fok 12 perc dél és 86 fok 36 perc kelet, 20 fok dél és 92 fok 24 perc kelet, és 21 fok 30 perc dél és 84 fok 18 perc kelet.

*Fiktív helyek

A6-4 példa SIGMET közlemény erős turbulenciánál

YUCC SIGMET 5 VALID 221215/221600 YUDO-YUCC AMSWELL FIR SEV TURB OBS AT 1210Z YUSB FL250 MOV E 40KMH WKN

Jelentése:

A Donlon/International* meteorológiai megfigyelő iroda (YUDO) által 0001 UTC óta az AMSWELL* repülés információs régió részére kiadott (a YUCC Amswell területi ellenőrző központ által azonosított) ötödik SIGMET közlemény; a közlemény e hó 22-e 1215 UTC-től 1600 UTC-ig érvényes; erős turbulenciát észleltek 1210 UTC-kor a Siby/Bistock* repülőtér (YUSB) felett a 250-es repülési magasságszinten; a turbulencia várhatóan kelet felé mozog 40 km per óra sebességgel és intenzitása gyengülni fog.

*Fiktív helyek

A6-5 példa AIRMET közlemény mérsékelt hegyi hullámnál

YUCC AIRMET 2 VALID 221215/221600 YUDO-YUCC AMSWELL FIR MOD MTW OBS AT 12057 AND FCST N48 E10 FL080 STNR NC *Jelentése:* A Donlon/International* meteorológiai megfigyelő iroda (YUDO) által 0001 UTC óta az AMSWELL* repülés információs régió részére kiadott (a YUCC Amswell területi ellenőrző központ által azonosított) második AIRMET közlemény; a közlemény e hó 22-e 1215 UTC-től 1600 UTC-ig érvényes; mérsékelt hegyi hullámot észleltek 1205 UTC-kor 48 fok észak és 10 fok kelet pontban a 080-as repülési magasságszinten; a hegyi hullám várhatóan stacionárus marad és intenzitásában nem változik. *Fiktív helyek

7. FÜGGELÉK. REPÜLÉSI KLIMATOLÓGIAI INFORMÁCIÓKRA VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(*Lásd jelen Annex 8. Fejezetet*)

1. REPÜLÉS-KLIMATOLÓGIAI INFORÁCIÓK FELDOLGOZÁSA

Ajánlás. – *A reguláris és kitérő repülőtéri megfigyeléseket a repülőtéri klimatológiai információk készítéséhez illeszkedő formában kell összegyűjteni, feldolgozni és tárolni.*

2. REPÜLÉS-KLIMATOLÓGIAI INFORMÁCIÓK CSERÉJE

Ajánlás. – *Repülés-klimatológiai információkat kérésre a meteorológiai hatóságok között cserélni kell. Üzemeltetőknek és más repülési felhasználóknak, akik ilyen információkat igényelnek, általában ezek készítéséért felelős meteorológiai hatóságokhoz kell folyamodniuk.*

3. REPÜLÉS-KLIMATOLÓGIAI INFORMÁCIÓK TARTALMA

3.1 Repülőtéri klimatológiai táblázatok

3.1 1 **Ajánlás. –** *A repülőtéri klimatológia táblázatnak alkalmazhatóként az alábbiakat kell megadni:*

a) középértéket meteorológiai elemek és az attól való eltérések, tartalmazva a maximum és minimum értékeket (például levegőhőmérséklet); és/vagy

b) a repülőtéren a repülésüzemeltetésre ható aktuális időjárás jelenségek (például homokvihar) előfordulási gyakorisága; és/vagy

c) egy, vagy két, vagy több elem kombinációja (például alacsony látás és alacsony felhő kombinációja) megadott értékének megjelenési gyakorisága.

3.1.2 **Ajánlás** – *A repülőtéri klimatológiai táblázatoknak tartalmazniuk kell a repülőtéri klimatológiai összegezések 3.2 pontnak megfelelő elkészítésének követelményeire vonatkozó információkat.*

3.2 Repülőtéri klimatológiai összegezései

Ajánlás – *Repülőtéri klimatológiai összegezéseknek le kell fedniük az alábbiakat:*

a) futópálya látástávolság/látás és/vagy meghatározott időpontokban meghatározott értékek alá nyúló BKN vagy OVC legalsó felhő réteg felhőalap magasság előfordulási gyakorisága;

b) meghatározott időpontokban meghatározott értékek alatti látás gyakoriság;

c) meghatározott időpontokban meghatározott értékek alá nyúló BKN vagy OVC legalsó felhőréteg felhőalap magasságának gyakorisága;

d) párhuzamosan megjelenő szél irány és sebesség előfordulása gyakorisága meghatározott intervallumokon belül;

e) talajmenti hőmérséklet gyakorisága az 5°C meghatározott intervallumaiban, meghatározott időpontokban;

f) üzemelés tervezési célokból, beleértve a felszállási teljesítményszámításokat is, szükséges meteorológiai elemek középértékei, és az ettől való eltéréseket, a maximális és minimális értékeket.

Megjegyzés. – Az a)-tól e)-ig pontokra vonatkozó klimatológiai összegezési modelleket a WMO Publication No.49, Technical Regulations (Műszaki szabályozások), *II. kötet C.3.2 fejezet tartalmazza.*

8. FÜGGELÉK. ÜZEMELTETŐK ÉS REPÜLŐ SZEMÉLYZET KISZOLGÁLÁSÁRA VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 9. Fejezet)

Megjegyzés. – A repülés dokumentációra (beleértve a minta térképeket és formátumokat) vonatkozó specifikációkat az 1. Függelék tartalmazza.

1. METEOROLÓGIAI INFORMÁCIÓK SZOLGÁLTATÁSI ESZKÖZEI ÉS FORMÁTUMA

1.1 Üzemeltetőket és repülőszemélyzeti tagokat az alábbiak közül az egyik vagy többféle módon kell meteorológiai információkkal ellátni a meteorológiai hatóság és az illetékes üzemeltető közötti megállapodás szerint:

a) írt vagy nyomtatott anyag, közötte specifikált térképek, és formanyomtatványok;

b) adatok digitális formában;

c) eligazítás;

d) konzultáció;

e) kijelzés; vagy

f) a)-tól e)-ig pontok helyett öneligazítást szolgáltató automatizált repülés előtti információs rendszer és repülésdokumentációs eszközök, fenntartva az üzemeltetők és repülőszemélyzet konzultálási lehetőségét, szükség szerint, a meteorológia irodával, az 5.1 pontnak megfelelően.

1.2 A meteorológiai irodának az üzemeltetővel való konzultációjánál az alábbiakat kell meghatároznia:

a) a szolgáltatásra kerülő meteorológiai információk típusát és formátumát; és

b) ezen információk szolgáltatásának módszereit és eszközeit.

1.3 **Ajánlás**. – *Az üzemeltető kérésére a repülési tervhez szolgáltatott információknak adatokat kell tartalmazniuk a legalsó használható repülési magasság meghatározásához.*

2. REPÜLÉS ELŐTTI TERVEZÉSHEZ ÉS REPÜLÉS KÖZBENI ÁTTERVEZÉSHEZ SZOLGÁLÓ INFORMÁCIÓKRA VONATKOZÓ SPECIFIKÁCIÓK

2-1 Magaslégköri információ formátuma

A WAPC-ok által repülés előtti tervezéshez és repülés közbeni áttervezéshez szolgáltatott magaslégköri információknak GRIB kód formájúaknak kell lenniük.

Megjegyzés. – A BUFR kód formát a WMO 306 számú kiadványa (Kód kézikönyv (Manual on Codes) *1.2 Kötet B Rész – Bináris kódok (Binary Codes), tartalmazza.*

2.2 Szignifikáns időjárási információk formátuma

A WAFC-ok által repülés előtti tervezéshez és repülés közbeni áttervezéshez szolgáltatott információknak BUFR kódformát kell ölteniük.

Megjegyzés. – A BUFR kódformát a WMD 306 számú kiadványa (Kód kézikönyv (Manual on Codes), *1.2 Kötet B Rész – Bináris kódok (Binary Codes) tartalmazza.*

2.3 Szuperszonikus repülőgépek speciális igényei

Ajánlás. – *Üzemeltetők által végzett, repülés előtti tervezéshez és repülés közbeni áttervezéshez szolgáltatott meteorológiai információknak szuperszonikus repülőgépek esetén, a szubszonikus repüléshez használt magasságszintekre vonatkozó adatokkal együtt tartalmazniuk kell a transszonikus és szuperszonikus repülésnél használt magasságszintekre vonatkozó adatokat is. Különös figyelmet kell fordítani cumulonimbus felhők, turbulencia és csapadék előfordulására, várható megjelenésére, helyére és függőleges kiterjedésére.*

2.4 Helikopter üzemeltetés speciális igényei

Ajánlás – T*engeri partközeli szerkezetekre repülő helikoptereket üzemeltetők által végzett, repülés előtti tervezéshez és repülés közbeni áttervezéshez szolgáló meteorológiai információknak a tengerszinttől a 100-as repülési magassági szintig terjedő magasságokra vonatkozó adatokat is tartalmazniuk kell. Különös figyelmet kell fordítani a várható felszíni látásra, a 100-as repülési magassági szint alatti felhő mennyiségére, fajtájára (ahol rendelkezésre áll), alapjára és tetejére, a tenger állapotára és tenger felszín hőmérsékletére, a közepes tengerszinti nyomásra, és turbulencia és jegesedés előfordulására és várható megjelenésére, ahogyan a regionális léginavigációs egyezmény meghatározza.*

3. ELIGAZÍTÁSRA ÉS KONZULTÁCIÓRA VONATKOZÓ SPECIFIKÁCIÓK

3.1 Szuperszonikus repülőgépek speciális igényei

Ajánlás. – *Szuperszonikus repülőgép repülőszemélyzeti tagjainak tartandó eligazításnak és konzultációnak le kell fednie a transszonikus és szuperszonikus repülés magasságszintjeit. Különös figyelmet kell fordítani cumulonimbus felhők, turbulencia és csapadék előfordulására, és várható megjelenésére, helyére és függőleges kiterjedésére.*

3.2 Kismagasságú repülések speciális igényei

Ajánlás – *Kismagasságú repülésekhez, beleértve a látás szerinti repülési szabályok szerinti repüléseket, tartozó eligazításnak és/vagy konzultációnak meteorológiai információkat kell tartalmazniuk, amelyek lefedik a 100-as repülési magasságszintig (150-es repülési magasságszintig hegyes területeken, vagy nagyobb magasságig, ha szükséges) terjedő magasságokat. Különös figyelmet kell fordítani azoknak a jelenségeknek az előfordulására és várható megjelenésére, amelyek* *széles kiterjedésűen a látás 5000 méter alá csökkenését okozzák, valamint olyan felhők előfordulására vagy várható megjelenésére, amelyek a repülésre hatást gyakorolhatnak.*

3.3 Kijelzést igénylő információk

3.3.1 A repülőszemélyzeti tagok és más, a repülés előkészítésében érintettek segítésére, és eligazításnál és konzultációnál való felhasználáshoz a meteorológiai irodának ki kell jelezni az alábbiak rendelkezésre álló legfrissebb változatát:
a) METAR és SPECI;
b) TAF és trend előrejelzések;
c) helyi repülőtérre vonatkozó repülőtéri figyelmeztetések;
d) felszállási előrejelzések;
e) SIGMET és AIRMET tájékoztatások és a SIGMET által nem tartalmazott speciális légijelentések;
g) meteorológiai műholdas képek vagy mozaikok és/vagy nefanalízisek
h) földi telepítésű meteorológiai radar információk.
3.3 2 **Ajánlás** – *A kijelzett anyagnak olvashatóan hozzáférhetővé kell lennie a repülőszemélyzet tagjai és más érdekelt repülésüzemeltető személyzet számára. A meteorológiai hatóság és a felhasználó közötti megegyezéssel a kijelzés felhasználható eligazítás és/vagy konzultáció helyett.*

4. REPÜLÉSI DOKUMENTÁCIÓRA VONATKOZÓ SPECIFIKÁCIÓK

4.1 Általános

4.1.1 Repülési dokumentáció prezentálása

4.1.1.1 **Ajánlás** – *A repülés dokumentáció által tartalmazott térképeknek világosnak és jól olvashatónak kell lenniük és a következő fizikai jellemzőkkel kell rendelkezniük:*

a) a kényelem kedvéért a térképek legnagyobb méretének körülbelül 42 x 30 cm-nek (szabványos A3 méret), és a legkisebb méretnek 21 x 30 cm-nek (szabványos A4 méret) kell lennie. Ezen méretek közötti választás az útvonal hossztól függ, a térképeken megadni szükséges részletek mennyisége a meteorológiai hatóságok és a felhasználók közötti megállapodás tárgya.;

b) nagyobb földrajzi egységeket, mint például tengerpartokat, nagyobb folyókat és tavakat olyan módon kell ábrázolni, hogy azok könnyen felismerhetők legyenek;

c) számítógéppel készített térképeknél a meteorológiai adatok preferenciát élveznek az alap térkép információkkal szemben, az előbbi törli az utóbbit, ahol ezek fedik egymást;

d) nagyobb repülőtereket pontként kell ábrázolni, és annak a városnak az első betűjével azonosítani, amelyet a repülőtér kiszolgál, ahogyan a regionális léginavigációs terv AOP táblázatában meg van adva;

e) a földrajzi hálózatot minden 10^{o} szélességnél és hosszúságnál pontozott vonalakkal húzott meridiánok és párhuzamosak képviselik; a pontokat egymástól egy fok távolságra kell elhelyezni;

f) a szélességi és hosszúsági értékeket a térképeken több különböző ponton kell jelölni (azaz nemcsak a széleken);

g) a címkéknek a repülési dokumentációs térképeken világosnak és egyszerűnek kell lenniük, és egyértelmű módon fel kell tüntetni rajtuk a világ területi előrejelző központ nevét, vagy nem-WAFS előállítások esetén az eredeti központ nevét, a térkép típusát, a dátumot és az érvényesség idejét, és szükség esetén a használt egységek fajtáit.

4.1.1.2 **Ajánlás**. – *A repülési dokumentációban szereplő meteorológiai információkat a következők reprezentálják:*

a) a szeleket a térképeken tollakkal és árnyékolt zászlócskákkal ellátott nyilakkal kell ábrázolni, elegendően sűrű rácson;

b) a hőmérsékleteket számokkal kell ábrázolni, elegendően sűrű rácson;

c) egy világ területi előrejelző központtól kapott adatkészletből kiválasztott szél és hőmérséklet adatokat elegendően sűrű szélesség/hosszúság rácsban kell ábrázolni; és

d) szélnyilaknak előtérbe kell kerülniük a hőmérsékletekkel szemben és mindkettőnek előtérbe kell kerülniük a térkép háttérrel szemben.

4.1.1.3 **Ajánlás** – *Rövid hatótávolságú repülésekhez korlátozott területeket lefedő térképeket kell készíteni, 1:15x10^{6} méretarányban, ahogy megkövetelik és ahogy a regionális léginavigációs egyezményben szerepel.*

4.1.2 A szolgáltatandó térkép készlet

4.1.2.1 **Ajánlás** – *A 250-es repülési magasságszint és a 630-as repülési magasságszint közötti repülésekhez szolgáltatandó térképek minimális száma között kell lenni egy nagy magassági szignifikáns időjárás térképnek (250-es repülési magasságszinttől 630-as repülési magasságszintig) és egy előrejelzési 250 hPa-os szél és hőmérséklet térképnek. A repülés előtti és repülés közbeni áttervezéshez és a repülési dokumentációhoz szolgáló aktuális térképek együttesének összetételét a meteorológiai hatóságok és a szolgálati területen belüli más felhasználók közötti megállapodás határozza meg.*

4.1.2.2 **Ajánlás**. – *A 250-es repülési magasságszint alatti repüléshez a világ területi előrejelző rendszer alatt szolgáltatandó térkép készlet összetétele a felhasználó Államok és más felhasználók közötti megállapodás szerinti.*

4.1.3 Magasság jelölések

Ajánlás – *Repülési dokumentációban a magasság jelöléseket a következőképpen kell végezni:*

a) az útvonali meteorológiai viszonyokra való minden hivatkozást, mint például magassági szelek, turbulencia, vagy felhőalap és felhőtető magasságjelölések, lehetőség szerint repülési magasságszintekben kell kifejezni; ezek kifejezhetők még nyomásban, közepes tengerszint feletti magasságban, vagy, kismagasságú repüléseknél, föld feletti magassággal; és

b) a repülőtéri meteorológiai viszonyokra való minden hivatkozást, mint például a felhőalap magasság jelölések, a repülőtér közepes tengerszint feletti magassága feletti magassággal kell kifejezni.

4.2 A magassági szél és magaslégköri hőmérséklet információkra vonatkozó specifikációk

4.2.1 Térkép formában

4.2.1.1 Ahol indulás előtt a repülőszemélyzetet térképformájú magassági szél és magas-légköri hőmérséklet információval látják el, a térképeknek rögzített idejű, szabványos repülési magasságszintekre vonatkozó előrejelzés térképeknek kell lenniük. Trópusi területeken, vagy rövid repülések esetén előrejelzés térképek helyett aktuális térképek adhatók; ezekben az esetekben az ábrázolt szinteknek a szabványos izobár szinteknek kell lenniük.

4.2.1.2 Magassági szél és magaslégköri hőmérséklet térképeket kismagasságú repülések részére nem több, mint 500 km (300 NM) közökkel elválasztott pontokra és legalább a következő magasságokra kell szolgáltatni: 600, 1500 és 3000 m (2000, 5000 és 10000 láb).

4.2.2 Táblázatos formában

Ajánlás. – *Ahol magassági szél és magaslégköri hőmérséklet információt táblázatos formában szolgáltatnak, ennek ugyanazokra a repülési magasságszintekre vonatkozó adatokat kell tartalmazniuk, mint a magaslégköri térképeknek. Ezeket az információkat egy szabályos rácson lévő, kitűzött helyekre kell megadni.*

Megjegyzés. – Magassági szél és magaslégköri hőmérséklet táblázatos előrejelzések prezentációs formájára példákat az 1 Függelék tartalmaz.

4.3 Szignifikáns időjárási információkra vonatkozó specifikációk

4.3.1 Térkép formában

4.3.1.1 Ahol a szignifikáns útvonal időjárási jelenségekre vonatkozó információkat térkép formájában adják a hajózószemélyzet tagjainak indulás előtt, a térképeknek meghatározott rögzített időtartamra érvényes szignifikáns időjárási térképeknek kell lenniük. Ezeknek a térképeknek mutatniuk kell a következőket, aszerint, hogy a járathoz mi szükséges:

a) zivatarok;

b) trópusi ciklon;

c) erős széllökés vonalak;

d) mérsékelt vagy erős turbulencia (felhőben vagy felhő nélküli);

e) mérsékelt vagy erős jegesedés;

f) kiterjedt homokvihar/porvihar;

g) a 100-as repülési szinttől a 250-es repülési szintig a fenti a)-tól f)-ig terjedő alpontokban felsoroltakhoz társuló felhők;

h) a 250-es repülési szint fölött a fenti a)-tól f)-ig terjedő alpontokban felsoroltakhoz társuló cumulonimbus felhők;

i) jól meghatározható konvergencia zónák elhelyezkedése a felszínen;

j) frontrendszerek mozgásának sebessége, iránya és elhelyezkedése a felszínen, amikor ezek szignifikáns útvonali időjárás jelenségekkel társulnak;

k) tropopauza magasságok;

l) jet-streamek;

m) olyan vulkánkitörések helyéről és idejéről szóló információk, melyek a légijárművek üzemeltetése szempontjából jelentőséggel bíró hamufelhőt okoznak, beleértve azokat is, amelyek csak gőzt hoznak létre, ezek a következőkből állnak: vulkán kitörés szimbóluma a vulkán helyén, és a térkép oldalán a vulkán kitörés szimbóluma, a vulkán neve, nemzetközi száma, földrajzi szélesség/hosszúság, az első kitörés dátuma és időpontja, ha ismert, és egy emlékeztető a felhasználók számára, hogy hivatkozni kell az érintett területre kiadott SIGMET-ekre és NOTAM-ra vagy ASHTAM-ra; és

n) radioaktív anyagoknak a légijármű üzemeltetésre lényeges hatást gyakorló, véletlen kijutásának helyére vonatkozó információ a következőkből áll: a radioaktivitás szimbóluma a véletlen kijutás helyén, és a térkép oldalán a radioaktivitás szimbóluma, a véletlen kijutás helyének földrajzi szélessége/hosszúsága, a véletlen kijutás dátuma és időpontja, és egy emlékeztető a felhasználók számára a területre vonatkozó NOTAM ellenőrzésére.

1. Megjegyzés – A 250-es repülési szint fölött üzemelő légijárművek számára az a)-tól f)-ig terjedő pontokban felsorolt tételek csak akkor szükségesek, ha várhatóan az említett repülési szint fölött fordulnak elő, és az a) tétel esetében csak azok a zivatarok szerepelnek, amelyek SIGMET kiadását indokolttá teszik, ahogyan az a 6. Függelékben le van írva. Az „FRQ TS” fogalom használatára a 6. Függelékben található útmutatás.

2. Megjegyzés – A „CB” rövidítésnek csak akkor kell szerepelni, ha nagykiterjedésű cumulonimbus felhők tényleges vagy várható előfordulására, vagy olyan cumulonimbusra vonatkozik, mely egy vonal mentén helyezkedik el és az egyedi felhők között nincs, vagy csak kis távolság van, illetve a cumulonimbus felhőréteg közé ágyazódott, vagy amelyet légköri homály eltakar. Nem vonatkozik ez izolált, vagy felhőrétegekbe be nem ágyazódott vagy légtéri homály által nem takart szétszórt cumulonimbusra.

3. Megjegyzés. – Amikor vulkán kitörés vagy radioaktív anyagok véletlen folytán atmoszférába kerülése indokolja a vulkánikus tevékenység szimbólum, vagy a radioaktivitás szimbólum bevitelét a szignifikáns időjárás térképbe, akkor a szimbólumoknak az összes ilyen térképen (alacsony, közepes és magasszinti) rajta kell lennie tekintet nélkül arra a magasságra, amelyet a hamu oszlop vagy radioaktív anyag jelentés szerint elért, vagy várhatóan elér.

4. Megjegyzés. – A nemzetközi vulkán számokat a Nemzetközi Vulkanológiai és Föld-belső Kémiai Társaság (Internatinal Association of Volcanology and Chemistry of the Earth's Interior) (IAVCEI) osztja ki és listázza a Vulkánikus hamu, radioaktív anyag és mérgező kémiai felhők kézikönyve (Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds) *(Doc 9691) kiadványban.*

4.3.1.2 **Ajánlás** – *A szignifikáns időjárási térképeken a „CB” vagy a zivatar szimbólumok feltüntetését úgy kell értelmezni, hogy az magában foglal minden olyan időjárási jelenséget, amely rendes körülmények között cumulonimbusszal vagy zivatarral társulhat, nevezetesen mérsékelt vagy erős jegesedés, mérsékelt vagy erős turbulencia, jégeső.*

4.3.1.3 **Ajánlás** – *A kismagasságú repülések, beleértve a 100-as repülési szintig (150-es repülési szintig hegyes területeken, vagy nagyobb magasságig, ha szükséges, terjedő, látás szerinti repülési szabályok szerint üzemelő repüléseket is, számára készített időjárás képek, az adott repülésnek megfelelően, a következőket tartalmazzák:*

a) azokat a jelenségeket, amelyek SIGMET kiadását teszik indokolttá, ahogyan a 6. Függelékben meg van adva, és amely várhatóan befolyásolja a kismagasságú repüléseket; és

b) a kismagasságú repülés részére készült területi előrejelzésekben szereplő elemeket, ahogyan az 5.Függelékben meg van adva, kivéve a r) illetve u) elemeket, amelyek magassági szelekre és magaslégköri levegőhőmérsékletekre, illetve előrejelzett legalacsonyabb QNH-ra vonatkoznak.

1. Megjegyzés – A szignifikáns időjárási térképek prezentálásának formájára vonatkozó példák az 1. Függelékben találhatók.

2. Megjegyzés – Az „ISOL”, „OCNL” és „FRQ”, cumulonimbus felhőkre és zivatarokra vonatkozó útmutatás a 6. Függelékben található.

4.3.2 Egyéb formák

Ajánlás. – *Ahol szignifikáns útvonali időjárási viszonyokat tartalmazó repülési dokumentációt nem szolgáltatnak térkép formában, ott táblázatos formában és/vagy rövidített köznyelvű szövegként kell prezentálni.*

Megjegyzés –Táblázatos előrejelzés prezentálási formájára vonatkozó példák az 1. Függelékben találhatók.

4.4 TAF-ra vonatkozó specifikációk

4.4.1 TAF iránti igények

4.4.1.1 A repülési dokumentáció minden esetben foglalja magába az indulási és a tervezett leszállási repülőterek repülőtéri előrejelzéseit. A repülési dokumentáció még tartalmazzon egy vagy több olyan megfelelő kitérő repülőtérre vonatkozó TAF-t, amennyiben ez szükséges az üzemelési repülési terv kiegészítéséhez, amelyeket a meteorológiai hatóság és az üzemeltetők között létrejött megállapodás alapján, a megfelelő regionális léginavigációs tervezetben szereplő repülőtér jegyzékből választottak ki.

4.4.1.2 Más meteorológiai irodáktól kapott TAF-t lényegi változtatás nélkül kell a repülési dokumentációba felvenni.

4.4.1.3 **Ajánlás** – *A meteorológiai hatóság és az üzemeltető megállapodása alapján, a repülési dokumentáció foglaljon magában korlátozott számú kitérő repülőtérre és tervezett közbenső leszállási repülőtérre vonatkozó TAF-t..*

4.4.2 TAF prezentálása

Ajánlás. – *A TAF-t az 5. Függelékben közölt minta szerint kell prezentálni; ezek táblázatos formában, vagy rövidített köznyelvű szöveg formájában is prezentálhatók. A használt hely jelzőket és a rövidítéseket a repülés dokumentációban meg kell magyarázni. Több TAF esetén ezeket olyan módon kell prezentálni, amely lehetővé teszi az egyes előrejelzések kezdetének és végének gyors azonosítását.*

Megjegyzés –TAF prezentálási formájára vonatkozó példák az 1. Függelékben találhatók.

4.4.3 Ideiglenes TAF kiadása

Ajánlás – *Ha a TAF-t időben nem kapják meg, akkor az indulási repülőtérhez tartozó meteorológiai iroda tegyen meg minden gyakorlatilag lehetséges erőfeszítést, hogy beszerezze az előrejelzést, de ha ez nem szerezhető be, akkor az iroda, ha lehetséges, készítsen ideiglenes előrejelzést. A meteorológiai iroda értesítse a hajózószemélyzet tagjait, hogy az előrejelzés ideiglenes és eredetét be kell jegyeznie a repülési dokumentációba.*

4.5 Kismagasságú repülésekre vonatkozó specifikációk

4.5.1 Térkép formában

Ajánlás – *Ahol az előrejelzéseket térkép formájában szolgáltatják, a repülési dokumentációnak kismagasságú repülésekhez, beleértve azokat is, amelyek a látás szerinti repülés szabályai szerint* *folynak, amely repüléseket maximum a 100-as szinten hajtják végre (vagy hegyes területen maximum a 150-es repülési szinten, vagy nagyobb magasságokban, ahol szükséges) a következőket kell tartalmazniuk, ahogyan a repülésnek megfelel:*

a) információk a releváns SIGMET és AIRMET közleményekből;

b magassági szél és magaslégköri hőmérséklet térképek, ahogyan a 4.2.1.2 pontban meg van adva; és

c) szignifikáns időjárás térképek, ahogy a 4.2.1.3 pontban meg van adva.

4.5.2 Rövidített köznyelven

Ajánlás – *Ahol az előrejelzéseket térkép formájában szolgáltatják, a repülési dokumentációnak kismagasságú repülésekhez, beleértve azokat is, amelyek a látás szerinti repülés szabályai szerint folynak, amely repüléseket maximum a 100-as szinten hajtják végre (vagy hegyes területen maximum a 150-es repülési szinten, vagy nagyobb magasságokban, ahol szükséges) a következőket kell tartalmazniuk, ahogyan a repülésnek megfelel:*

a) SIGMET és AIRMET tájékoztatások; és

b) információk, amelyeket a kismagasságú repülések számára készült területi előrejelzések tartalmaznak, ahogyan az 5. Függelékben meg van adva, vagy ahol az előrejelzéseket rövidített köznyelvű szöveg formájában adják ki, a GAMET területi előrejelzések.

Megjegyzés – a GAMET területi előrejelzésre példát az 5. Függelék tartalmaz.

5. ELIGAZÍTÁSHOZ, KONZULTÁCIÓHOZ, REPÜLÉSTERVEZÉSHEZ ÉS REPÜLÉSI DOKUMENTÁCIÓHOZ SZOLGÁLÓ, AUTOMATIZÁLT REPÜLÉS ELŐTTI INFORMÁCIÓS RENDSZEREKRE VONATKOZÓ SPECIFIKÁCIÓK

5.1 Hozzáférés a rendszerekhez

Az automatizált repülés előtti információs rendszereknek, amelyek ön-eligazítási eszközöket szolgáltatnak, biztosítaniuk kell az üzemeltetők és a repülőszemélyzet tagjai számára a hozzáférést a konzultációhoz, ha szükséges, egy meteorológiai irodával telefonon vagy más alkalmas távközlési eszköz igénybevételével.

5.2 A rendszerek részletes specifikációja

Ajánlás – *Az automatizált repülés előtti információs rendszerek öneligazításhoz, repülés előtti tervezéshez és repülési dokumentációhoz szolgáló meteorológiai információk szolgáltatásának a következőknek kell eleget tennie:*

a) biztosítsa a rendszer adatbázis folyamatos felfrissítését és a tárolt meteorológiai információk érvényességének és integritásának figyelését;

b) tegye lehetővé az üzemeltetők és repülőszemélyzeti tagok, és egyéb repülési felhasználók számára is a rendszerhez alkalmas távközlési eszközökön keresztüli hozzáférést;

c) használjon rövidített köznyelven alapuló hozzáférési és lekérdezési eljárásokat és, megfelelés szerint, ICAO hely jelöléseket, és a WMO által előírt repülésmeteorológiai kód adattípusú jelöléseket, vagy, egy menü meghajtású felhasználói interfészt vagy egyéb alkalmas mechanizmust, a meteorológiai hatóság és az érintett üzemeltető közötti megállapodás szerint; és

d) biztosítson gyors választ a felhasználó információ iránti kérésére.

Megjegyzés – ICAO rövidítések és kódok, illetve hely jelölések a (PANS-ABC, Doc 8400) és Hely jelölések (Location Indicators) *(Doc.7910) kiadványokban találhatók. Repülésmeteorológiai kód adat-típusú jelöléseket a WMO 386 számú kiadványa,* Világméretű távközlési rendszer kézikönyv (Manual on the Global Telecommunication System) *tartalmaz.*

6 REPÜLÉST VÉGZŐ LÉGIJÁRMŰVEKNEK SZOLGÁLTATOTT INFORMÁCIÓKRA VONATKOZÓ SPECIFIKÁCIÓK

6.1 Repülést végző légijármű által igényelt információk szolgáltatása

Ajánlás – *Ha egy levegőben lévő légijármű meteorológiai információt kér, a kérést vevő meteorológiai irodának intézkednie kell az információ megadását illetően, szükség esetén más meteorológiai iroda közreműködését is igénybe véve.*

6.2 Információk repülés közben üzemeltető általi tervezéshez

Ajánlás – *A repülést végző légijármű számára az üzemeltető által végzendő tervezéshez adott meteorológiai információkat a repülés ideje alatt kell továbbítani, és rendes körülmények között az alábbiak egyikét vagy mindegyikét kell tartalmaznia.*

a) meteorológiai jelentések, TAF és leszállási előrejelzések;

b) SIGMET és AIRMET információk és különleges légijelentések, amelyek a repüléshez relevánsak, hacsak az utóbbiak nem szerepeltek már SIGMET közleményben; és

c) magassági szél és magaslégköri hőmérséklet információk.

6.3 Információk szuperszonikus repülésekhez

Ajánlás – *Repülést végző szuperszonikus légijármű számára a szándékolt leszállási repülőteret kiszolgáló meteorológiai iroda biztosítson, az üzemeltető kérésére, a transszonikus sebességcsökkentés és a szubszonikus süllyedési fázisokra érvényes előrejelzést. Ezt az előrejelzést az illetékes területi irányító központhoz vagy repülési információs központhoz kell továbbítani az érkezés előtti 2 órán belül. Az üzemeltető időben közölje a meteorológiai irodával a süllyedési pálya helyét és a süllyedés megkezdésének várható idejét.*

9. FÜGGELÉK. LÉGIFORGALMI SZOLGÁLATOK, KUTATÓ-MENTŐ SZOLGÁLATOK ÉS REPÜLÉSI INFORMÁCIÓS SZOLGÁLATOK RÉSZÉRE NYÚJTOTT INFORMÁCIÓKRA VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 10. Fejezete)

1 LÉGIFORGALMI SZOLGÁLATI EGYSÉGEK SZÁMÁRA SZOGÁLTATANDÓ INFORMÁCIÓK

1.1 Repülőtéri irányító tornyoknak szóló információk jegyzéke

A következő meteorológiai információkat kell szükség esetén a repülőtéri irányító torony részére a hozzárendelt repülőtéri meteorológiai irodának biztosítani:

a) rendszeres és különleges jelentések, METAR és SPECI, TAF és trend előrejelzések és ezek módosításai az érintett repülőtérre vonatkozóan;

b) SIGMET és AIRMET tájékoztatások, szélnyírás figyelmeztetések és repülőtéri figyelmeztetések;

c) helyileg egyeztetett, bármely pótlólagos meteorológiai információ, mint például felszállási jelentések vagy a talajszélre vonatkozó előrejelzések, a lehetséges futópálya változtatás meghatározásához; és

d) vulkanikus hamu felhőről kapott tájékoztatás, amelyre vonatkozóan még nem adtak ki SIGMET-et, ahogy abban az érintett meteorológiai és ATS hatóságok megegyeztek.

1.2 Bevezetés irányító irodának szóló információk jegyzéke

A bevezető irányító egység részére a hozzárendelt repülőtéri meteorológiai irodának szükség esetén a következő meteorológiai információkat kell biztosítania:

a) helyi rendszeres és különleges jelentések, rendszeres jelentések METAR, és SPECI, amelyek az aktuális nyomás adatokat, repülőtéri és leszállási adatokat, repülőtéri és leszállási előrejelzéseket és ezek módosításait tartalmazzák arra (azokra) a repülőtérre (repülőterekre) vonatkozóan, amelye(ke)n a bevezető irányító egység illetékes.

b) arra a légtérre vonatkozó SIGMET és AIRMET tájékoztatások, szélnyírás figyelmeztetések és megfelelő különleges légijelentések, amelyben a bevezető irányító egység illetékes, és repülőtéri figyelmeztetések;

c) bármely további meteorológiai információ, amelyben helyileg megegyeztek;

d) vulkanikus hamu felhőről kapott információ, amelyre vonatkozóan még nem adtak ki SIGMET-et, az érintett meteorológiai és ATS hatóságok megegyezésének megfelelően.

1.3 Repülés információs központnak szóló információk jegyzéke

A repülési információs központ vagy a területi irányító központ részére, szükség szerint, a hozzárendelt meteorológiai megfigyelő irodának ,a következő meteorológiai információkat kell biztosítania:

a) METAR és SPECI, amelyek tartalmazzák a repülőterek és egyéb helyek aktuális légnyomás adatait, TAF és trend előrejelzéseket, és ezek módosításait, amelyek a repülési információs területet vagy az irányító területet érintik, és ha a repülési információs központ vagy a körzeti irányító központ kívánja, a szomszédos repülési információs területen lévő repülőterekre vonatkozókat is, a regionális léginavigációs egyezményben meghatározottaknak megfelelően;

b) a magassági szelekre és magaslégköri levegő hőmérsékletre, szignifikáns útvonal időjárási jelenségekre vonatkozó előrejelzések és ezek módosításai, különös tekintettel azokra, melyek lehetetlenné teszik a látás szerinti repülési szabályok szerinti üzemelést, SIGMET és AIRMET tájékoztatások és megfelelő különleges légi-jelentések, amelyek a repülési információs régióra, illetve irányítói körzetre vonatkoznak, valamint, ha a regionális léginavigációs egyezmény úgy határozza meg, és a körzeti irányító központ úgy kívánja, a szomszédos repülési információs területekre vonatkozókat is;

c) bármely egyéb, a repülési információs központ, illetve a körzeti irányító központ által a repülést végző légijárművek kéréseinek kielégítéséhez igényelt meteorológiai információk; ha az igényelt információ nem áll rendelkezésre a hozzárendelt meteorológiai figyelő irodánál, akkor ennek más meteorológiai iroda segítségét kell kérnie ezen információk biztosításához;

d) vulkanikus hamu felhőről kapott információ, amelyre vonatkozóan még nem adtak ki SIGMET közleményt, ahogy abban az érintett meteorológiai és ATS hatóságok megegyeztek; és

e) radioaktív anyagok véletlen atmoszférába jutásáról szóló vett információ, az érintett meteorológiai és ATS hatóság közötti megállapodás szerint.

1.4 Vulkanikus hamu és vulkánkitörés információk szolgáltatására vonatkozó különleges előírások

1.4.1 Egy VAAC által kiadott vulkanikus hamu tájékoztató információkat el kell juttatni az érintett területért felelős körzeti irányító központhoz és repülési információs központhoz.

1.4.2 Kitörés előtti vulkanikus tevékenységgel és/vagy vulkán kitöréssel kapcsolatban vett tájékoztatást, ahogy szükséges, a megfelelő hozzárendelt meteorológiai irodának meg kell adnia az ATS egység részére, ahogy abban az érintett meteorológiai és ATS hatóságok megegyeztek.

1.5 Szuperszonikus légijárművek részére szóló információk szolgáltatására vonatkozó különleges előírások

Ajánlás – *A szuperszonikus légijárművekre vonatkozó, a repülési információs központoknak és körzeti irányító központoknak adott információ a transzszonikus és szuperszonikus repülésekhez használt szintekre vonatkozzon, és foglalja magába a repülési információs területen belül lévő repülőterekhez vezető, szubszonikus süllyedési pályákra vonatkozó előrejelzéseket.*

1.6 Repülési távközlési központok információ ellátása

Ahol repülési információs célokra szükséges, az érvényes meteorológiai jelentéseket és előrejelzéseket biztosítani kell kijelölt légiforgalmi távközlési állomások részére. Ha szükséges, az információk egy példányát továbbítani kell a repülési információs központnak vagy a körzeti irányító központnak.

1.7 Információ formátum

1.7.1 **Ajánlás** – *A légiforgalmi szolgálati egységeket helyi rendszeres és különleges jelentésekkel, METAR-ral, SPECI-vel, repülőtéri és leszállási előrejelzéssel, SIGMET és AIRMET tájékoztatással, magassági szél és magaslégköri hőmérséklet előrejelzésekkel és ezek módosításaival kell ellátni, abban a formában, amelyben ezek készültek, a többi meteorológiai irodáknak szétosztásra kerültek vagy más meteorológiai irodáktól érkeztek, hacsak helyileg nem másképpen állapodtak meg.*

1.7.2 **Ajánlás** – *Ha rácspontokra vonatkozó, számítógép által feldolgozott magaslégköri adatokat digitális formában továbbítják a légiforgalmi szolgálati egységnek a légiforgalmi szolgálatok számítógépein történő felhasználásra, a formátum és a továbbítás módja a meteorológiai hatóság és az illetékes ATS hatóság közötti megállapodás szerinti legyen. Az adatokat rendes körülmények között, az előrejelzések feldolgozásának befejezése után, a lehető leggyorsabban meg kell adni*

2. KUTATÁS-MENTÉS SZOLGÁLATI EGYSÉGEK RÉSZÉRE SZOLGÁLTATANDÓ INFORMÁCIÓK

2.1 Információk jegyzéke

A mentő koordinációs központoknak juttatott információknak tartalmazniuk kell a meteorológiai körülményeket, amelyek a keresett repülőgép utolsó ismert helyzeténél és ennek a légijárműnek a szándékolt útvonala mentén fennálltak, különös tekintettel a következőkre:

a) szignifikáns útvonali időjárás jelenségek;

b) felhő mennyiség és fajta, különösen a cumulonimbus, a felhőalap- és tető magasság jelzések;

c) látás és a látást csökkentő jelenségek;

d) talajszél és magassági szél;

e) a talaj állapota, különösen hótakaró vagy vízelöntés;

f) tengerfelület hőmérséklet, a tenger állapota, jégborítás (ha van) és óceáni áramlatok, ha relevánsak a kutatás területén;

g) tengerszinti nyomás adatok.

2.2 Kérésre szolgáltatandó információk

2.2.1 **Ajánlás** – *A mentést koordináló központ kérésére a kijelölt meteorológiai irodának intézkednie kell azon repülési dokumentáció részleteinek beszerzéséről, amelyet az eltűnt légijárműnek adtak, bármely előrejelzésre vonatkozó módosítással együtt, melyet a repülést végző légijárműnek továbbítottak.*

2.2.2 **Ajánlás** – *A kutatási és mentési munkálatok elősegítése érdekében a kijelölt meteorológiai iroda kérésre biztosítson:*

a) teljes és részletes információkat a jelenlegi és várható meteorológiai viszonyokról a kutatási területre vonatkozóan; és

b) a jelenlegi és előrejelzett viszonyokat azokon az útvonalakon, amelyeken a kutató légijárművek a kutatás kiindulási repülőterétől és az oda való visszatérésük alatt berepülnek.

2.2.3 **Ajánlás** – *A mentést koordináló központ kérésére a kijelölt meteorológiai iroda szolgáltassa a kutató és mentő tevékenységet végző hajók által igényelt meteorológiai információkat vagy intézkedjen annak biztosítására.*

3. REPÜLÉSI INFORMÁCIÓS SZOLGÁLTATÓ EGYSÉGEK RÉSZÉRE BIZTOSÍTANDÓ INFORMÁCIÓK

3.1 Információk jegyzéke

Egy légiforgalmi információs szolgálati egység részére szükség szerint az alábbi információkat kell biztosítani:

a) információ a nemzetközi léginavigáció meteorológiai szolgálatáról, amelyet repülési információs kiadvány(ok)ban szándékoznak közzétenni.

Megjegyzés: – Az erre vonatkozó tájékoztatás részleteit lásd a 15. Annex, 1. Függelék 1. Rész 3.5 és a 3. Rész 2.2, 2.11, 3.2 és 3.11 pontjai alatt.

b) NOTAM vagy ASHTAM elkészítéséhez szükséges információk, amelyek különösen az alábbiakra vonatkozó információkat tartalmazzák:

1) repülésmeteorológiai szolgálatok létesítése, megszüntetése és működésükben beálló jelentős változások. Ezt a tájékoztatást a repülési információs szolgálati egység részére a hatályba lépés időpontja előtt megfelelő idővel biztosítani kell, hogy lehetőség legyen NOTAM kiadására a 15. Annex 5.1.1 és 5.1.1.1 pontjának megfelelően.

2) vulkanikus tevékenység előfordulása; és

Megjegyzés – A kívánt speciális információkat 3. Fejezet 3.3.2 és a 4. Fejezet 4.8 pontjai tartalmazzák.

3) radioaktív anyagok véletlen atmoszférába kerülése, ahogyan az érintett meteorológiai és a megfelelő polgári repülési hatóság megállapodott; és

Megjegyzés. – A megkövetelt különleges információk a 3. Fejezet 3.4.2 g) pontban vannak megadva.

c) a repülési információs körlevelek elkészítéséhez szükséges információk, különösen az alábbi információk:

1) a repülésmeteorológiai eljárások, szolgálatok és eszközök várható jelentős változása; és

2) bizonyos időjárási jelenségek hatása a légijárművek üzemelésére.

10. FÜGGELÉK. KOMMUNIKÁCIÓVAL ÉS HASZNÁLATÁVAL SZEMBENI KÖVETELMÉNYEKRE VONATKOZÓ MŰSZAKI SPECIFIKÁCIÓK

(Lásd jelen Annex 11. Fejezet)

1. KOMMUNIKÁCIÓVAL SZEMBENI SPECIÁLIS KÖVETELMÉNYEK

1.1 Meteorológiai információk megkövetelt átviteli idői

Ajánlás – *Hacsak a regionális léginavigációs egyezményben máshogy nem rendelkeztek, az üzemeltetési meteorológiai információkat tartalmazó AFTN közlemények és bulletinek továbbítási idejének a következőkben meghatározottaknál rövidebbnek kell lenni:*

SIGMET és AIRMET közlemények, vulkánikus hamu és trópusi ciklon tájékoztató információk és különleges légijelentések		*5 perc*
Szignifikáns időjárásra és magas-légköri előrejelzésekre vonatkozó rövidített köznyelvű módosítások		*5 perc*
Módosított TAF és TAF korrekciók		*5 perc*
METAR *Trend előrejelzések* *TAF* *SPECI*	*0-900 km (500 NM)*	*5 perc*
	több mint 900 km (500NM)	*10 perc*

1.2 Rácspont adatok ATS és üzemeltetők részére

1.2.1 **Ajánlás.** –*Amikor a légiforgalmi szolgálatok számítógépein való felhasználásra a rácspontokra vonatkozó magaslégköri adatokat digitális formában bocsátják rendelkezésre, a továbbításra vonatkozó előírások feleljenek meg a meteorológiai hatóság és az illetékes ATS hatóság közötti megállapodásnak.*

1.2.2 **Ajánlás.** – *Amikor számítógépes repüléstervezés céljából az üzemeltetők részére a rácspontokra vonatkozó magaslégköri adatokat digitális formában bocsátják rendelkezésre, a továbbításra vonatkozó rendelkezések feleljenek meg az érintett világterületi vagy regionális területi előrejelző központ, a meteorológiai hatóság és az üzemeltetők közötti megállapodásnak.*

2. REPÜLÉSI ÁLLANDÓ HELYŰ SZOLGÁLATI KOMMUNIKÁCIÓ HASZNÁLATA

2.1 Meteorológiai bulletinek alfanumerikus formátumban

2.1.1 Bulletinek összeállítása

Ajánlás – *Ahol lehetséges, az üzemeltetési meteorológiai információk cseréjét a meteorológiai jelentések ugyanazon típusainak összevonásával, bulletinek formájában kell végezni*

2.1.2 Bulletinek összeállítási időpontjai

Ajánlás – *Ütemezetten továbbítandó meteorológiai bulletineket rendszeresen, meghatározott időpontban kell összeállítani. A METAR kód formájában készült jelentéseket továbbítás céljából nem később, mint 5 perccel a megfigyelés tényleges ideje után össze kell állítani. A repülőtéri előrejelzéseket továbbítás céljából legalább 1 órával az érvényességi időtartamuk kezdete előtt össze kell állítani, hacsak a regionális léginavigációs egyezmény másképp nem határozza meg.*

2.1.3 Bulletinek fejrészei

A repülési állandóhelyű szolgálatok eszközein keresztül való továbbításra szánt üzemeltetési meteorológiai információkat tartalmazó meteorológiai bulletinek az alábbiakból álló fejrésszel rendelkeznek:

a) négy betűből és két számjegyből álló azonosító;

b) a meteorológiai bulletint kibocsátó vagy összeállító meteorológiai iroda földrajzi helyére vonatkozó négybetűs ICAO helységjelölés;

c) dátum-idő csoport; és

d) szükség esetén egy hárombetűs jelölés.

1. *Megjegyzés – A fejrész formájára és tartalmára vonatkozó részletes előírások a WMO* Globális Távközlési Rendszer Kézikönyv (Manual on the Telecommunication System*) I. kötetében találhatók és a* Repülésmeteorológiai Eljárások Kézikönyvben (Manual of Aeronautical Meteorological Practice) *(Doc. 8896) reprodukálva vannak.*

2. *Megjegyzés – Az ICAO helységjelölések* Helységjelölések (Location Indicators) *(Doc 7910) című kiadványban vannak felsorolva.*

2.1.4 Bulletinek szerkezete

Az AFTN-en keresztül továbbítandó üzemeltetési meteorológiai információkat tartalmazó meteorológiai bulletineket az AFTN közlemény formátum szöveg részébe kell belefoglalni.

2.2. Világ területi előrejelző rendszer produktumai

2.2.1 Távközlés WAFS produktumok szolgáltatásának részére

Ajánlás. – *A világ területi előrejelzési rendszer előállítások szolgáltatására használt eszközök a repülési állandó helyű szolgálatok.*

2.2.2 Térképek minőségi követelményei

Ajánlás – *Ahol a világterületi előrejelző rendszer anyagait térkép formában osztják szét, a kapott térképek minősége olyan legyen, amely megfelelően olvasható másolatok készítését teszi lehetővé repüléstervezési és dokumentációs célokra. A megkapott térképek az ábrázolt területnek több mint 95 százalékában legyenek olvashatók.*

2.2.3 Átvitelek minőségi követelményei

Ajánlás – *Az átvitelek olyanok legyenek, melyek biztosítják, hogy bármely 6 órás időtartam alatt a megszakadásuk nem haladja meg a 10 percet.*

2.2.4 WAFS produktumokat tartalmazó bulletinek fejrésze

A repülési állandó helyű szolgálat eszközein digitális formában továbbítandó, WAFS anyagokat tartalmazó meteorológiai bulletineket a 2.1.3 pontban megadott fejrésszel kell ellátni.

3. REPÜLÉSI MOZGÓ SZOLGÁLATI KOMMUNIKÁCIÓ HASZNÁLATA

3.1 Meteorológiai közlemények tartalma és formátuma

3.1.1 A légijárműveknek továbbított jelentések, előrejelzések és SIGMET tájékoztatások tartalma és formája legyen azonos a jelen Annex 4., 6. és 7. Fejezeteiben előírtakkal.

3.1.2 A légijárművek által továbbított légijelentések tartalma és formája egyezzen meg a jelen Annex 5. Fejezetének, és a (PANS-ATM, Doc. 4444) 1. Függelékének *előírásaival.*

3.2 Meteorológiai bulletinek tartalma és formátuma

A légiforgalmi mobil szolgálaton keresztül továbbított meteorológiai bulletin lényege maradjon változatlan ahhoz képest, amelyet a bulletin a kibocsátásakor tartalmazott.

4. REPÜLÉSI ADATKAPCSOLATI SZOGÁLAT –D-VOLMET – HASZNÁLATA

4.1 D-VOLMET részére rendelkezésre álló meteorológiai információk részletes tartalma

4.1.1 **Ajánlás** – *Azokat a repülőtereket, amelyekre jelentéseknek, előrejelzéseknek kell rendelkezésre állni felfelé kapcsolatnál a repülést végző légijárműhöz, regionális léginavigációs egyezménnyel kell meghatározni.*

4.1.2 **Ajánlás** – *A repülési információs körzeteket, amelyekre SIGMET és AIRMET közleményeknek kell rendelkezésre állni felfelé kapcsolatnál a repülést végző légijárműhöz, regionális léginavigációs egyezménnyel kell meghatározni.*

4.2 A D-VOLMET részére rendelkezésre álló meteorológiai információkra vonatkozó kritériumok

4.2.1 **Ajánlás –** *A legfrissebb rendelkezésre álló METAR és SPECI kód formájú jelentéseket, előrejelzéseket és SIGMET és AIRMET közleményeket kell a repülést végző légijárműhöz való felfelé kapcsolathoz használni.*

4.2.2 **Ajánlás** – *A D-VOLMET által tartalmazott repülőtéri előrejelzéseket módosítani kell, ha ahhoz szükséges, hogy biztosítsák, hogy egy előrejelzés, amikor a repülést végző légijárműhöz való felfelé kapcsolatnál rendelkezésre bocsátják, az illetékes meteorológiai iroda legfrissebb véleményét tükrözze.*

4.2.3 **Ajánlás** – *Ha SIGMET közlemény nem áll rendelkezésre egy repülési információs régió számára, „NIL SIGMET" közlemény jelzésnek benne kell lenni a D-VOLMET-ben.*

4.3 A D-VOLMET részére rendelkezésre álló meteorológiai információk formátuma

A VOLMET adásokban szereplő jelentések, előrejelzések és SIGMET és AIRMET tájékoztatások tartalma és formája feleljen meg jelen Annex 4., 6. és 7. Fejezeteiben szereplő előírásoknak.

5. REPÜLÉSI RÁDIÓADÁS SZOLGÁLAT —HASZNÁLATA— VOLMET RÁDIÓADÁSOK

5.1 VOLMET rádióadásokban tartalmazott meteorológiai információk részletes tartalma

5.1.1 **Ajánlás** – *Azokat a repülőtereket, amelyekre vonatkozó METAR-t, SPECI-t és TAF-t a VOLMET adásoknak tartalmazniuk kell, ezek továbbítási sorrendjét és az adás idejét regionális léginavigációs egyezménynek kell meghatároznia.*

5.1.2 **Ajánlás. –** *Azokat a repülési információs régiókat*, *amelyek részére az időütemezett VOLMET rádióadásoknak SIGMET közleményeket kell tartalmazniuk, regionális léginavigációs egyezménnyel kell meghatározni. Ahol ez történik, a SIGMET közleményt, vagy egy „NINCS SIGMET" jelölést kell továbbítani az adás elején, vagy egy ötperces idő-blokk elején.*

5.2 VOLMET rádióadásokban tartalmazott információkra vonatkozó kritériumok

5.2.1 **Ajánlás** – *Ha egy jelentés valamely repülőtérről nem érkezett meg időben az adáshoz, a legutóbbi rendelkezésre álló jelentést kell felvenni az adásba, az észlelés idejének megjelölésével.*

5.2.2 **Ajánlás** – *Rendszeres időközökben sugárzott VOLMET adásokban szereplő TAF elő érvényességi periódusa 9 óra legyen; ezeket 3 óránként kell kiadni és a rendszeres adások között szükség esetén módosítani kell azokat annak érdekében, hogy az előrejelzés a továbbítás idején az érintett meteorológiai iroda legutolsó véleményét tükrözze.*

5.3 VOLMET rádióadásokban tartalmazott meteorológiai információk formátuma

5.3.1 **Ajánlás** – *A VOLMET adásokban szereplő jelentések, előrejelzések és SIGMET tájékoztatás tartalma és formája feleljen meg jelen Annex 4., 6. és 7. Fejezeteiben, az eredeti repülőtéren kívülre szétküldésre kerülő bulletinekre alkalmazandó előírásoknak.*

5.3.2 **Ajánlás.** – *VOLMET rádióadásoknak szabványos rádiótelefon frazeológiákat kell használni.*

Megjegyzés. – VOLMET rádióadásokban használt szabványos rádiótelefon frazeológiákról útmutatást a Kézikönyv a Légiforgalmi Szolgálatok, a Repülési Információs Szolgálatok és a Repülésmeteorológiai Szolgálatok közötti koordinációról (Manual on Coordination between Air Traffic Services, Aeronautical Meteorological Services) *(Doc 9377), A. Függelék ad*

A MELLÉKLET. MÉRÉSEK VAGY MEGFIGYELÉSEK ÜZEMELÉSI SZEMPONTBÓL KÍVÁNATOS ÉS JELENLEG ELÉRHETŐ PONTOSSÁGA

Megjegyzés – A jelen táblázatba foglalt útmutatás a 4. Fejezetre – Meteorológiai megfigyelések és jelentések – különösen a 4.1.9 pontra vonatkozik.

Észlelendő elem	*A mérések vagy megfigyelések üzemelés szempontjából kívánatos pontossága**	*A mérések vagy megfigyelések elérhető pontossága**(1994)*
Átlagos talaj-szél	Irány: ±10 fok Sebesség: ±2 km/h (1 csomó) 19 km/h-ig (10 csomó) ±10% 19 km/h (10 csomó) felett;	Irány: ±5 fok Sebesség: 2 km/h (1 csomó) 37 km/h-ig (20 csomó) ±5% 37 km/h (20 csomó) felett;
Eltérések az átlagos talajszéltől	±4km/h (2 csomó), hosszanti és oldalirányú komponensekben kifejezve;	mint fent
Látás	±50 m 600 m-ig ±10% 600 és 1500 m között ±20% 1500 m felett;	±50 m 500 m-ig ±10% 500 és 2000 m között ±20% 200m és 10 km között
Futópálya látás-távolság	±10 m 400 m-ig ±25 m 400 és 800 m között ±10% 800m felett	±25 m 100 m-ig ±50 m 150 és 500 m között ±10% 1000 és 2000 m között
Felhőmennyiség	±1 okta	Nappal a megfigyelő a megfigyelési pontról ±1 okta pontosságot érhet el. Sötétben, és ha légköri jelenség korlátozza az alacsony felhőzet megfigyelését, ilyen pontosság elérése nehéz.
Felhőmagasság	±10 m -től (33 láb) 100 m-ig (330 láb) ±10% 100 m (330 láb) felett	±10 m (33 láb) 1000 m-ig (3300 láb) ±30 m (100 láb) 1000 m felett 3000 m-ig (10000 láb)
Levegő hőmérséklet és harmatpont hőmérséklet	±1ºC	±0,2º C
Nyomásérték (QNH, QFE)	±0,5 hPa	±0,3 hPa

* Az üzemelés szempontjából kívánatos pontosságot nem üzemelési előírásnak szánják; ezt az üzemeltetők által kifejezett célként kell tekinteni.
**A közölt pontosság a műszerek becsült pontossága (kivéve a felhő mennyiség esetét); ez általában nem érhető el műszerek alkalmazása nélkül végzett megfigyeléseknél.

B MELLÉKLET. ELŐREJELZÉSEK ÜZEMELTETÉSI SZEMPONTBÓL KÍVÁNATOS PONTOSSÁGA

1. Megjegyzés. – Az ebben a táblázatban lévő útmutató a 6. Fejezet – Előrejelzésekre különösen a 6.1.1 pontra vonatkozik

2. Megjegyzés. – Ha az előrejelzések pontossága a második oszlopban bemutatott, üzemelési szempontból kívánatos tartományon belül marad az eseteknek a harmadik oszlopban jelölt százalékánál, akkor az előrejelzés hibáinak hatása nem tekinthető lényegesnek a navigációs hibák és más üzemelési bizonytalanságok hatásaihoz képest.

Előrejelzendő elemek	*Előrejelzések üzemeltetési szempontból kívánatos pontossága*	*A tartományon belüli esetek minimális százaléka*
	TAF	
Szélirány	±30	az esetek 80%-a
Szélsebesség	±9 km/h (5csomó) 46 km/h-ig (25 csomó)	az esetek 80%-a
	±20% 46 km/h (25 csomó) felett	
Látás	±200 m 700 m-ig	az esetek 80%-a
	±30% 700 m és 10 km között	
Csapadék	Előfordulás vagy elmaradás	az esetek 80%-a
Felhő mennyiség	±2 okta	az esetek 70%-a
Felhő magasság	±30 m (100 láb) 120 m-ig (400 láb)	az esetek 70%-a
	±30% 120 m (400 láb) és 3000 m (10000 láb) között	
Levegő hőmérséklet	±1ºC	az esetek 70%-a
	TREND ELŐREJELZÉS	
Szélirány	±30º	az esetek 90%-a
Szélsebesség	±9 km/h (5 csomó) 46 km/h-ig (25 csomó)	az esetek 90%-a
	±20% 46 km/h (25 csomó) felett	
Látás	±200 m 700 m-ig	az esetek 90%-a
	±30% 700 m és 10 km között	
Csapadék	Előfordulás vagy elmaradás	az esetek 90%-a
Felhő mennyiség	±2 okta	az esetek 90%-a

Felhő magasság	±30 m (100 láb) 120 m-ig (400 láb) ±30% 120 m (400 láb) és 3000 m (10000 láb) között	az esetek 90%-a
	FELSZÁLLÁSI ELŐREJELZÉS	
Szélirány	±30	az esetek 90%-a
Szélsebesség	±9 km/h (5csomó) 46 km/h-ig (25 csomó) ±20% 46 km/h (25 csomó) felett	az esetek 90%-a
Levegő hőmérséklet	±1ºC	az esetek 90%-a
Nyomásérték (QNH)	±1 hPa	az esetek 90%-a
	TERÜLETI, REPÜLÉSI ÉS ÚTVONALI ELŐREJELZÉSEK	
Magaslégköri hőmérséklet	±3º C (Közepes 900km/500NM-re)	az esetek 90%-a
Magassági szél	±28 km/h (15 csomó) a 250-es repülési magasságszintig ±37 km /h (20 csomó) a 250-es repülési magasságszint felett (Vektorkülönbség modulusza 900 km/500NM-re)	az esetek 90%-a
Szignifikáns útvonali időjárás jelenség és felhő	Előfordulás vagy elmaradás	az esetek 80%-a
	Hely: ±100 km/60NM	az esetek 70%-a
	Függőleges kiterjedés:±600 m/2000láb	az esetek 70%-a

C MELLÉKLET. TÁMOGATÓ ELJÁRÁSOK A VILÁG TERÜLETI ELŐREJELZŐ KÖZPONTOKBAN

(Lásd jelen Annex 3. Fejezet 3.2.2 pont)

1. BEVEZETÉS

A WAFC szükség szerint valamelyik vagy mindegyik WAFS szolgáltatást nyújtja, ha a másik WAFC üzemelésének megszakadása következik be. A WAFC London és WAFC Washington számos szolgáltatás megszakadást és üzemzavar lefolyást tanulmányozott, átnézve a két WAFC közötti jelenlegi kommunikációs kapcsolatokat, és megállapodtak a megfelelő válaszokban a szolgáltatásban bekövetkező ilyen megszakadásokra.

2. MEGSZAKADÁSOK A NUMERIKUS IDŐJÁRÁS ELŐREJELZÉSBEN (NWP) VAGY A SZIGNIFIKÁNS IDŐJÁRÁS (SIGWX) ELŐREJELZÉS ELŐÁLLÍTÁSBAN

2.1 WAF London megszakadások

2.1.1 Egy globális rácspont NWP modell fut Exeterben. Az ebből az NWP modellből jövő output képezi a bázisát a rácsozott bináris (Gridded Binary) (GRIB) kód formában írt szél- és hőmérséklet előrejelzéseknek. Két, nagymértékben identikus szuperszámítógépet helyeztek el különálló számítógép termekben, lehetővé téve, hogy a modell bármelyik gépen fusson. Ennek következtében rendszeres, vagy nem rendszeres karbantartást lehet végezni az egyik szuperszámítógépen anélkül, hogy a WAFC London működőképességét befolyásolnák. Abban a ritka esetben, amikor a modell egyik szuperszámítógépen sem tud futni, a következő intézkedéseket kell tenni. Amikor az első modell futása jelentősen késik, vagy nem áll rendelkezésre, döntést kell hozni az előző modell futásból származó output használatára, amelyet a megfelelő óraszám megnövel. Abban az esetben, amikor az output egy második rákövetkező futásból nem elérhető, a WAFC Londonnak fel kell dolgozni azokat a GRIB adatokat, amelyeket rendszeresen kap a WAFC Washingtontól, hogy előállítsa az igényelt WAFS előrejelzéseket. Ha a WAFC Washington adatokat nem lehet feldolgozni, a WAFC Washingtont értesíteni lehet a támogató SIGWX előrejelzések létrehozásának megkezdéséről. Ezeket az előrejelzéseket, más WAFS adatokkal együtt, azután megküldik a WAFC London közlemény-kapcsoló központnak normál szétosztásra.

2.1.2 Az elsődleges üzemelési munkahelyen bekövetkezett meghibásodás esetén az előrejelzőnek az előrejelzési szinten, vagy a támogató üzemelési központban elhelyezett támogató munkahelyek egyikét kell használnia. Ha a WAFC Londonnál komoly meghibásodás áll fenn, a tennivalókat az ötödik paragrafus „Egy WAFC teljes kiesése” cím alatt ismerteti.

2.2 WAFC Washington megszakadások

2.2.1 Egy globális spektrális modell fut a National Centres for Environmental Prediction-nál (környezeti előrejelzési országos központok) (NCEP), és a WAFC Washington NWP outputot állítja elő. Ez képezi az alapját a GRIB kódformában írott szél és hőmérséklet előrejelzéseknek. Az elsődleges rendszer meghibásodása esetén az NCEP-nek megmarad a képessége globális modell futtatására a redundens rendszereken. Ha az elsődleges vagy másodlagos számítógép rendszer meghibásodása miatt az NWP jelentősen késik vagy hiányzik, döntést hoznak a Londontól rendszeresen kapott NWP adatoknak a National Weather Service Telecommunications Gateway (NWSTG)-nél lévő WAFC általi használatáról, a megfelelő óraszám növeléssel, a WAFC előrejelzések létrehozása érdekében.

2.2.2 Ha az elsődleges üzemelési munkahely kiesik, az előrejelzőnek az előrejelzési szinten elhelyezett támogató munkahelyet kell használnia. Ha a WAFC Washington SIGWX előállító központ üzemen kívül van, a WAFC Londont kérik fel az összes WAFC Washington SIGWX előrejelzés elkészítésére. Ezeket az előrejelzéseket azután visszakapcsolják az NWSTG-hez, a rendszeres WAFC London SIGWX előrejelzésekkel együtt, a nemzetközi műholdas kommunikációs rendszer (International Satellite Communications System) (ISCS)keresztüli elosztásra. Ha a WAFC

Washingtonnál súlyos meghibásodás következik be, a tennivalókat az 5. paragrafus írja le „Egy WAFC teljes kiesése” cím alatt.

3. MEGSZAKADÁSOK A KÖZLEMÉNY KAPCSOLÁSBAN

3.1 WAFC London megszakadások

A WAFC Londonnál két közlemény kapcsoló van. Az elsődleges kapcsoló meghibásodásának ritka esetében a támogató kapcsolót kell használni adatok küldésére és fogadására. A támogató közleménykapcsoló közvetlenül össze van kötve a washingtoni és toulousei WMO globális távközlési rendszer (GTS) útvonalakkal, és permanensen kapcsolódik a léginavigációra vonatkozó információk műholdas elosztó rendszerével (SADIS) az elsődleges kapcsoló meghibásodásának esetén. Abban a szélsőségesen valószínűtlen esetben, amikor a WAFC London nem kapcsolható a GTS-hez, egy Silver Spring és Exeter közötti integrált szolgáltatási digitális hálózati áramkört használnak az adatok küldésére és fogadására. Ez az áramkör egy fizikai támasza annak a kapcsolatnak, amely általában a helyén van és csak akkor használják, ha nagyon komoly hiba fordul elő.

3.2 WAFC Washington megszakadásai

Integrált szolgáltatási digitális hálózati (ISDN) áramkört tartanak fenn WAFC London és az ISCS felfelé kapcsolati hely között. Abban a ritka esetben, amikor a közleménykapcsoló az NWSTG-nél nem működik, a WAFC Londont értesíteni kell, hogy kezdje meg a WAFS előállítások küldését az ISDN áramkörön keresztül, közvetlenül az ISCS felsőkapcsolati helynek. Az ISCS műholdak ekkor ezeket az előállításokat normál módon közvetítik. Egy támogató közleménykapcsoló van előirányozva, de ez 2004. év előtt nem fog megvalósulni.

4. MEGSZAKADÁSOK A MŰHOLDAS FELFELÉKAPCSOLATI ÉS A MŰHOLDAS ELOSZTÓ RENDSZEREKBEN.

A WAFS adatok SADIS és ISCS rádióadások szolgáltatására használt műholdas kommunikációs rendszerek működése a két WAFC ellenőrzésén kívül esik. Ezeknek a szolgáltatásoknak a megbízhatóságát és rendelkezésre állását a kereskedelmi üzemeltetők garantálják, és nem a két WAFC.

5. EGY WAFC TELJES KIESÉSE

5.1 WAFC London kiesése

Teljesen valószínűtlennek tekintik azt, hogy a WAFC London valamikor teljesen kiessen. Legkorszerűbb infrastruktúra biztosítja, hogy mindkét számítógép egymástól teljesen függetlenül tudjon működni. Külön elsődleges és támogató energiaellátása van mindegyik számítógépnek. A támogató eljárásokat a kiesés jellegétől függően hajtják végre. A legrosszabb esetben, amikor az elsődleges szuperszámítógép működésképtelenné válik, és a WAFC Washington–WAFC London kapcsolatot nem lehet visszaállítani, a 4. paragrafusban leírt ISDN áramkört kell használni a Washingtonból jövő adatok küldésére és fogadására. Így az elsődleges szuperszámítógép meghibásodása nem befolyásolja a WAFC London képességét a WAFS előállítások terjesztésére a SADIS rádióadásokon keresztül, vagy abban, hogy elküldjék azokat Washingtonba az ISCS-en való rádióadáshoz. Abban az esetben, amikor a WAFC Londonnál lévő előrejelzési iroda válik működésképtelenné, a WAFC Washington kapcsolatba léphet a WAFC London által rendszeresen előállított összes magasszinti és középszinti SIGWX előrejelzések támogató előállításainak kezdeményezésére. Meg kell jegyezni, hogy egy támogató előrejelző iroda a WAFC Londonnál az épület különálló szárnyában van elhelyezve. Így nagyon valószínűtlen, hogy a WAFC London teljesen képtelen lesz a WAFS SIGWX előrejelzéseinek előállítására. A SIGWX előrejelzések a SADIS felfelé kapcsolat részére még rendelkezésre állnak bármely előrejelző irodától is olyan esetben, amikor feltételezhető, hogy valamelyik számítógép rendelkezésre áll.

5.2 WAFS Washington kiesése

A WAFS előállításokat létrehozó eszközök több helyen el vannak helyezve. Így a WAFS Washington soha nem lehet teljesen üzemen kívül. A végrehajtott támogató eljárások az érintett eszköztől függnek, és a fentiekben már ismertetésre kerültek. Két egymástól független adat útvonal létezik a közleménykapcsoló központtól. Így egy kábel átvágás nem szakítja meg a kommunikációt a kapcsolótól vagy kapcsolóhoz. De egy olyan esetben is, amikor a Washington közleménykapcsoló teljesen kiesik, az előállítások szétosztása a WAFC Londonhoz és az ISC-hez szintén megoldott. Egy különálló elhelyezést terveznek a támogató közleménykapcsolónak, de ez nem valósul meg 2004-ig.

6. RENDSZERES ÉS TÁMOGATÓ SZIGNIFIKÁNS IDŐJÁRÁS ELŐREJELZÉSEK

A C-1 táblázat összegezi az ICAO területeket, amelyeket a WAFC Washington és London használ mind a rendszeres, mind a támogató SIGWX előrejelzésekhez.

C-1 táblázat. Rendszeres és támogató SIGWX területek WMO fejrészekkel

SWH terület	*Elsődleges WAFC*	*WMO fejrész*
A	Washington	PGEE07 KKCI
B	London	PGSE06 EGRR
B1	Washington	PGIE07 KKCI
C	London	PGRE06 EGRR
D	London	PGZE06 EGRR
E	London	PGGE06 EGRR
F	Washington	PGGE07 KKCI
G	London	PGCE06 EGRR
H	London	PGAE06 EGRR
	Washington	PGAE07 KKCI
I	Washington	PGBE07 KKCI
J	Washington	PGJE07 KKCI
K	London	PGKE06 EGRR
M	Washington	PGDE30 KKCI
NAT	Washington	PGNE40 KKCI
EUR	London	PGDE15 EGRR
MID	London	PGCE15 EGRR
S ASIA	London	PGZE15 EGRR

D MELLÉKLET. REPÜLŐTÉRI JELENTÉSEKHEZ ALKALMAZHATÓ SZELEKTÁLT KRITÉRIUMOK

(Ebben a táblázatban lévő útmutatás a 4. Fejezetre és a 3. Függelékre vonatkozik.)

D MELLÉKLET. REPÜLŐTÉRI JELENTÉSEKHEZ ALKALMAZHATÓ SZELEKTÁLT KRITÉRIUMOK

(Ebben a táblázatban lévő útmutatás a 4. Fejezetre és a 3. Függelékre vonatkozik.)

D MELLÉKLET. REPÜLŐTÉRI JELENTÉSEKHEZ ALKALMAZHATÓ SZELEKTÁLT KRITÉRIUMOK

(Ebben a táblázatban lévő útmutatás a 4. Fejezetre és a 3. Függelékre vonatkozik.)

	Talajszél	Látás (VIS)	RVR[1]	(Megfigyelés időpontja)	Aktuális időjárás	Felhő	Hőmérséklet	Nyomás (QNH, QFE)	Kiegészítő információk							
A	B	C	Mennyiség	Fajta[2]												
-10	-5 (Idő, perc)		Borultság esetén jelentendő rétegek	Azonosítás												
Specifikációk	Irányváltozások[3]		Sebesség változások[3]	Irányváltozások[4]	Elmúlt tendencia[5]	Változások	Nincsenek általános kritériumok, amelyek minden időjárási jelenséghez alkalmazhatók (speciális kritériumokat lásd: 4.8.4-4.8.7 pontokban).	Legalsó réteg	Következő réteg>	Következő magasabb réteg>	CB vagy TCU		Nincsenek kritériumok	Jelentett paraméterek	Felfrissített, ha a változások nagyobbak egy megállapodás szerinti mennyiségnél	Paraméterek, amelyeknek szerepelni kell
$\geq$60 és <180	$\geq$180°	Az átlagsebességet több mint 20 km/h-val (10 csomó) meghaladó	Általános szabály	Speciális esetek minimális VIS? domináns VIS	$\lvert R_{5(AB)} - R_{5(BC)} \rvert$	$\lvert R_1 - R_{10} \rvert$ > MAX [50 m or 20 % × R_{10}]	Mindig	2/8	4/8	Mindig	CB TCU	QNH QFE[9]	Igen	Mind[10]		
Átlagsebesség	Minimális VIS < 1500 m vagy < 0,5 x domináns VIS	VIS ingadozó és domináns VIS nem határozható meg	< 100 m	>= 100 m												
<6km/h (3kt)	>6km/h (3kt)															
Helyi rendszeres és különleges jelentés	VRB + 2 két szélsőséges irány	mean + 2 két szélsőséges irány	VRB (nincsenek szélsőségek)	Minimális és maximális sebesség	VIS a futópálya (futópályák) mentén	N/A	N/A	N/A[8]	Mindig	2/8	4/8	Mindig	CB TCU	QNH	Nem	Üzemeltetés szempontjából szignifikáns legutóbbi időjárás és szélnyírás[12]
METAR/SPECI	VRB (nincsenek szélsőségek)	mean + 2 két szélsőséges irány	VRB (nincsenek szélsőségek)	Maximális sebesség	Domináns VIS	Domináns VIS és minimális VIS + irány	Minimális VIS	Nincs megfigyelt tendencia („N”)	Felfelé („U”) vagy lefelé („D”)	Minimum és maximum (10 perces átlag helyett)						
Releváns jelentő skálák az összes közleménynél	Irány három számjeggyel a legközelebbi 10 fokra kerekítve =1-4 fok lefelé, 5-9 fok felfelé	Sebesség 1 km/h vagy 1 csomó léptékben Sebesség < 2 km/h (1 csomó) esetén CALM jelölés alkalmazandó	Ha Alkalmazható lépésköz VIS < 800 m : 50 m 800 $\leq$ VIS < 5000 m : 100 m 5000 m $\leq$ VIS < 10 km : 1 km VIS $\geq$ 10 km : nincs, 10 km-ként vagy CAVOK-ként megadva	Ha Alkalmazható lépésköz RVR < 400 m : 25 m 400 <= RVR <= 800 m : 50 m 800 < RVR < 2000 m : 100 m[13]	N/A	Ha Alkalmazható lépésköz Alap $\leq$ 1500 m (5000 láb) : 30 m (100 láb) (Vonatkozási magasságszint: Repülőtér tengerszint feletti magassága, vagy közepes tengerszint tengeren emelt építmények esetén)	Egész fokokra lekerekítve: 5 tizedig	Egész hPa-ban 1-9 tizedes jegyeknél lefelé kerekítve	N/A							

Megjegyzés–

1. Az elmúlt 10 percet figyelembe véve (kivéve: ha a 10 perces időtartam alatt jelentős változás áll be (pl. az RVR eléri vagy meghaladja a 150, 350, 600 vagy 800 métert és ez 2 percig, vagy annál tovább tart), ez esetben a változás utáni adatokat kell használni). Egyszerű diagram mutatja az RVR kritériumokra vonatkozó megfigyelés előtti 10 perces időtartamot, pl. AB, BC és AC.

2. CB és TCU-ból álló azonos felhőalapú réteg esetén, a felhőt „CB"-vel kell jelölni.

3. Az elmúlt 10 percet figyelembe véve (kivéve ha a 10 perces időtartam alatt jelentős változás áll be (pl. az irány 30 fokkal vagy annál nagyobb mértékben megváltozik és a szélsebesség 10 km/h vagy ennél nagyobb; vagy a szélsebesség 20 km/h-val vagy annál nagyobb mértékben megváltozik és ez 2 percig vagy annál hosszabb ideig tart), ez esetben a változás utáni adatokat kell használni.

4. Különböző irányok esetén az üzemeltetési szempontból legfontosabb irány használandó.

5. R_1 = az AC időtartam alatt bármely 1 perc átlag RVR értéke;

R_{10} = az AC időtartam alatti átlag RVR érték;

$R_{5(AB)}$= az AB időtartam alatti RVR érték 5 perces átlaga; és

$R_{5(BC)}$ = a BC időtartam alatti RVR érték 5 perces átlaga

6. CB (cumulonimbus) és TCU (tornyosuló cumulus = nagy függőleges kiterjedésű cumulus congestus), ha a többi rétegben még nem szerepel.

7. Időátlagolás, ha alkalmazható, a bal felső sarokban jelezve.

8. N/A = nem alkalmazható.

9. Külön kérésre a QFE-t bele kell foglalni. A QFE referencia magassága a repülőtér közepes tengerszint feletti magassága, kivéve a precíziós megközelítéses futópályákat, és azokat a nem-precíziós megközelítéses futópályákat, melyeknek küszöbe ?2 m-el (7 láb) a repülőtér tengerszint feletti magassága alatt vagy felett van, amikor a referencia szint a releváns küszöb közepes tengerszint feletti magassága.

10. Ahogyan a 3. Függelék 4.8 pontban fel van sorolva.

11. A WMO Kódok Kézikönyve (WMO – No.306) 15.4.5 pontja szerint „ajánlatos, hogy a szélmérő rendszerek olyanok legyenek, hogy a csúcs széllökések 3 másodperces átlag értékeket jelezzenek".

12. Beleértve a tenger felszíni hőmérsékletet és tengerállapotot, tengeren emelt építményen történő megfigyelés esetén. a regionális léginavigációs egyezménynek megfelelően.

13. Akkor jelezze, ha az RVR és/vagy a látás kisebb, mint 1500 méter, értékhatárok 50 és 2000 méter.

14. Azokon a repülőtereken, ahol a küszöbmagasság 15 méterrel, vagy annál többel a repülőtér tengerszint feletti magassága alatt van, és a leszállópálya precíziós megközelítésű, a *küszöb magasságot* kell referenciaként használni.

15. 0,1 hPa pontossággal mérendő.

E MELLÉKLET – A MŰSZER LEOLVASÁSI ÉRTÉKEINEK ÁTALAKÍTÁSA FUTÓPÁLYA LÁTÁSTÁVOLSÁG ÉRTÉKEKRE

(Lásd jelen Annex 4.7.10 pontját)

1. A műszer leolvasási értékeinek futópálya látástávolság értékekre történő átalakítása a Koschmieder-törvényen vagy az Allard-törvényen alapul, attól függően, hogy a pilóta a vizuális irányítás túlnyomó részét a futópályától és annak jelöléseitől, vagy pedig a futópálya-fényektől várhatja. A futópálya látástávolság becslésének szabványosítása érdekében ezen melléklet útmutatást ad a fő átszámítási tényezők használatára és alkalmazására vonatkozóan.

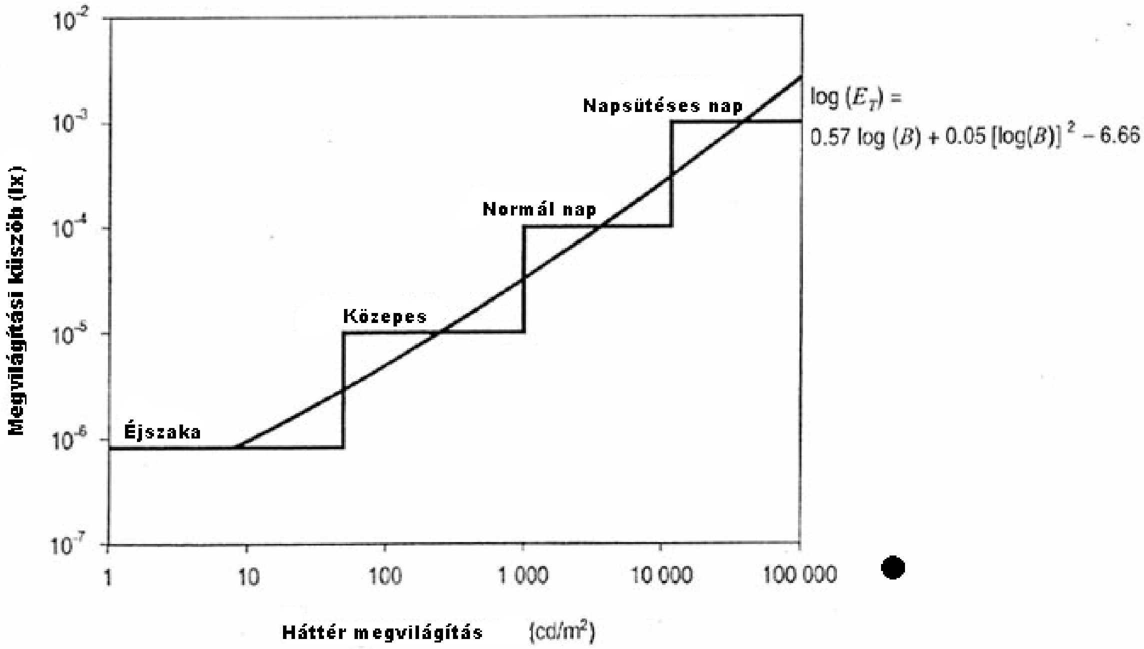
2. A Koschmieder-törvényben az egyik számításba veendő tényező a pilóta szemének kontrasztérzékenységi küszöbe. Megállapodás szerint ehhez a 0,05 állandót használják (dimenzió nélküli).

3. Az Allard-törvényben a megfelelő tényező a megvilágítási küszöb. Ez nem egy állandó, hanem a háttérmegvilágítás folytonos függvénye. A megállapított összefüggést, amelyet olyan műszerezett rendszerben kell használni, melyben a megvilágítási küszöböt a háttér megvilágítás érzékelője folyamatosan állítja, a E1. ábra görbéje mutatja. Egy folytonos függvény használata, amely a lépcsős függvényt közelíti, ahogyan a E-1 ábra mutatja, a 4. paragrafusban leírt lépcsős összefüggéshez képesti nagyobb pontossága miatt előnyben részesül.

4. Olyan műszerezett rendszerekben, amelyek nem rendelkeznek folyamatos megvilágítási küszöbbe állítással, négy egyenlő térközű megvilágítási küszöbérték használata megállapított megfelelő háttér megvilágítási tartományokkal, kényelmes, de a pontosságot csökkenti. A négy értéket a E-1 ábra lépcsőzetesen ábrázolja, valamint a E-1 táblázat is tartalmazza, a könnyebb érthetőség kedvéért.

1. Megjegyzés. – A futópálya látástávolság pályafényeken alapuló becsléséhez információ és útmutató anyag a Futópálya látástávolság észlelési és jelentési eljárásainak kézikönyve (Manual of Runway Visual Range Observing and Reporting Practices) *(Doc 9328) kiadványban található.*

2. Megjegyzés. – A látás repülési célokra alkotott definíciójával összhangban, a látás becsléséhez használt megvilágítás intenzitás 1000 cd környékén van.



E-1 ábra. Összefüggés az E_T(lx) megvilágítás küszöb és a B (cd/m^2) háttér fényerősség között

E-1 táblázat. Megvilágítási küszöb lépcsők

Feltétel	Megvilágítási küszöb (lx)	háttér megvilágítás (cd/m2)
Éjszaka	$8x10^{-7}$	≤50
Közbenső	10^{-5}	51-999
Normál nappal	10^{-4}	1000-12000
Fényes nappal (napfényes köd)	10^{-3}	>12000

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[1]ISO 9000:2000 Szabvány – *Minőség menedzsment és Minőségbiztosítás – Szótár. Második kiadás*
[2]ISO 9000:2000 Szabvány – *Minőség menedzsment és Minőségbiztosítás – Szótár. Második kiadás*
[3]ISO 9000:2000 Szabvány – *Minőség menedzsment és Minőségbiztosítás – Szótár. Második kiadás*
[4]ISO 9000:2000 Szabvány – *Minőség menedzsment és Minőségbiztosítás – Szótár. Második kiadás*

- VÉGE -

ANNEX 4.
Légiforgalmi térképek

10. kiadás – 2001. július
53. módosítással
Ez a kiadás magában foglal a Tanács által 2001 március 8. előtt elfogadott minden módosítást és 2001 november 9-től a 4. Annex minden korábbi kiadásának helyébe lép.
A szabványok és az ajánlott gyakorlatok alkalmazási eljárásaira vonatkozó tájékoztatás az 1. Fejezetben és az Előszóban olvasható.
Nemzetközi Polgári Repülési Szervezet

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK JEGYZÉKE

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Sorszám	Alkalmazás dátuma	Beépítés dátuma	Beépítette	Sor szám	Kiadás dátuma	Beépítés dátuma	Beépítette
1-52	E kiadásba bedolgozva						
53	2004 nov. 25	-	ICAO				

ELŐSZÓ

Történeti háttér

A légiforgalmi térképekre vonatkozó szabványokat és ajánlott gyakorlatokat legelőször 1948. április 16-án fogadott el az ICAO Tanácsa a Nemzetközi Polgári Repülésről szóló Egyezmény (Chicago 1944) 37. cikkelye rendelkezésének folyományaként, és ezeket az Egyezmény 4. Annexének nevezték el. Ezek 1949 március 1-től váltak alkalmazandóvá.

Az "A" táblázatban található a soron következő módosítások felsorolása, a módosítások eredete az érintett főbb témakörökkel, és azokkal a dátumokkal együtt, amikor az Annex-et és módosításait a Tanács elfogadta, amikor azok hatályba léptek, és amikor alkalmazandóvá váltak.

A Szerződő Államok Ténykedése

Az eltérések bejelentése. Felhívjuk a Szerződő Államok figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségükre, mely értelmében a Szerződő Államtól megkövetelt, hogy a szervezet számára bejelentsenek minden olyan eltérést, amelyek nemzeti előírásai és gyakorlatai, valamint a jelen Annex-ben és annak bármely módosításában található nemzetközi szabványok között fennáll. Felkérjük a Szerződő Államot, hogy ezt a bejelentést a jelen Annex-ben és annak bármely módosításában található ajánlott gyakorlatoktól történő eltérésekre is terjessze ki, ha az ilyen eltérések bejelentése a repülés biztonságra nézve fontos. Felkérjük továbbá a Szerződő Államot, hogy folyamatosan tájékoztassa a szervezetet az esetleg később keletkező eltérésekről, illetve a korábban bejelentett eltérés visszavonásáról is. A jelen Annex minden egyes módosításának elfogadása után azonnal külön felkérést küldünk a Szerződő Államnak az eltérések bejelentése céljából.

Felhívjuk az államok figyelmét a 15. Annex rendelkezéseire is, amely az államoknak az Egyezmény

38. cikkelyéből fakadó kötelezettségén kívül előírja, hogy a nemzeti előírások és gyakorlatok, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket a légiforgalmi tájékoztató szolgálat útján közzé kell tenni.

A tájékoztatás közzététele. A légijármű üzemeltetést érintő és az ebben az Annexben előírt szabványoknak és ajánlott gyakorlatoknak, továbbá eljárásoknak megfelelően biztosított légi-forgalmi térképek rendelkezésre állásáról és módosításáról szóló tájékoztatást a 15. Annex előírásainak megfelelően kell közzétenni és érvénybe léptetni.

Az Annex alkotóelemeinek jogállása

Egy Annex az alábbi alkotóelemekből áll, habár nem minden elem található meg szükségképpen minden Annex-ben. Az egyes alkotóelemek az alábbiakban feltüntetett jogállással rendelkeznek:

1. - A szoros értelemben vett Annex-et alkotó anyag:

a) Szabványok és ajánlott gyakorlatok, amelyeket a Tanács az Egyezmény rendelkezései értelmében elfogadott. Ezek meghatározása a következő:

Szabvány: fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága és rendszeressége szempontjából szükségesnek ismerték el és, amelyhez a Szerződő Államok az Egyezmény szerint alkalmazkodni fognak, illetőleg amelyek teljesítésének lehetetlensége esetén a Tanács értesítése a 38. cikkely értelmében kötelező

Ajánlott gyakorlat: fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága, rendszeressége és hatékony lebonyolítása szempontjából kívánatosnak ismerték el és, amelyhez alkalmazkodni a Szerződő Államok az Egyezmény értelmében törekedni fognak.

b) *Függelékek:* ezek kényelmi szempontból külön csoportosított anyagot tartalmaznak, de a Tanács által elfogadott szabványok és ajánlott gyakorlatok részét képezik.

c) *Meghatározások:* A szabványokban és ajánlott gyakorlatokban használt olyan kifejezések meghatározásai, amelyek nem maguktól értetődők abban az értelemben, hogy elfogadott szótári jelentéssel nem rendelkeznek. A meghatározás független jogállással nem rendelkezik, de minden olyan szabványnak és ajánlott gyakorlatnak, amelyben a kifejezést használják, lényeges részei, mivel a kifejezés értelmének megváltoztatása hatással volna az előírásra is.

d) *Táblázatok* és *ábrák:* amelyek kiegészítik, vagy szemléltetik az adott szabványt, vagy ajánlott gyakorlatot és amelyekre a szabványban, vagy ajánlott gyakorlatban hivatkozás történik, azok a kapcsolatos szabvány, vagy ajánlott gyakorlat részét képezik és ugyanolyan jogállással rendelkeznek.

2. - A Tanács által a szabványokkal és ajánlott gyakorlatokkal együttes közzétételre jóváhagyott anyag:

a) *Előszó:* a Tanács tevékenységén alapuló történeti áttekintést és magyarázó jellegű anyagot tartalmaz, valamint a szabványok és ajánlott gyakorlatok alkalmazására vonatkozóan az államok részére magyarázattal szolgál az Egyezményből és az elfogadási határozatból eredő kötelezettségeikhez.

b) *Bevezető rész:* magyarázó jellegű anyagot tartalmaz, amely azért szerepel az Annex részeinek, fejezeteinek, vagy szakaszainak elején, hogy elősegítse a szöveg alkalmazásának megértését.

c) *Megjegyzések:* ahol szükséges, a szövegbe beépített anyag, amely az érintett szabvánnyal és ajánlott gyakorlattal kapcsolatban tárgyi felvilágosítással, vagy hivatkozással szolgál, de a szabvány és az ajánlott gyakorlat részét nem képezi.

d) *Mellékletek:* a szabványokat és az ajánlott gyakorlatokat kiegészítő anyag, vagy ezek alkalmazásához útmutatóul szolgáló anyag.

A nyelv kiválasztása

Ezt az Annex-et hat nyelven, angolul, arabul, kínaiul, franciául, spanyolul és oroszul fogadták el. Minden Szerződő Államra vonatkozó felkérés, hogy a hazai bevezetés céljára, illetve az Egyezményben meghatározott egyéb célokra az említett hat szöveg közül egyet válasszon ki és közvetlenül, vagy saját nyelvre lefordítva használja azt, és az ICAO-t erről tájékoztassa.

Szerkesztési gyakorlat

Annak érdekében, hogy minden alkotórész jogállása első pillantásra szembetűnjön, az alábbi gyakorlatot alkalmaztuk: a szabványokat vékony álló betűkkel nyomtattuk, az ajánlott gyakorlatokat vékony dőlt betűkkel nyomtattuk. Az ajánlás esetében a jogállást vastag álló betűvel szedett **Ajánlás** szó jelzi. A megjegyzéseket vékony dőlt betűvel szedtük, jogállásukat a dőlt betűvel szedett Megjegyzés címszó jelzi.

Az angol nyelvű rendelkezések szövegében az alábbi szerkesztési gyakorlatot követték: a szabványok szövegében a "kell", "köteles" szó (az angol nyelvű eredetiben "shall"), az ajánlott gyakorlatok szövegében a szükséges (az angol nyelvű eredeti szövegben "should") kifejezést alkalmazták.

E dokumentumban a mértékegységek metrikus rendszerben szerepelnek, amelyeket a láb-font rendszerben közölt mértékegységek zárójelben követnek.

A jelen dokumentum bármely számmal és/vagy címmel azonosított részére történő utalás magában foglalja az adott rész alpontjait is.

"A" Táblázat - a 4. Annex módosításai

Módosítás	*Forrás(ok)*	*Tárgy*	*Elfogadva* *Hatályba lépés* *Alkalmazandó*
1. kiadás	Légiforgalmi térképek szekció 1. ülés (1945 nov), 2. ülés (1946 ápr.), 3. ülés (1947jan.)	ICAO (WAC) 1:1000000 Légiforgalmi világtérkép; műszeres megközelítési és leszálló térképek; 1:500000 Légiforgalmi térképek; 1: 250000 Légiforgalmi térképek; Légiforgalmi tartózkodási hely követő térképek; Légiforgalmi útvonal térképek; Légiforgalmi tervező térképek	1948. ápr. 16 1948. nov. 1. 1949. márc.1
Az 1. Kiadásba beépített 1. módosítás	Légiforgalmi térképek szekció, 4.ülés (1948.március)	Az ICAO WAC 1:1000000 vetülete	1948. dec. 6 1949. márc. 15 1949. márc. 15

A 2. - 22. Módosításokat magába foglaló 2. kiadás	Légiforgalmi térképek szekció, 4. ülés (1948.március)	Meghatározások; ICAO WAC 1:1000000; ICAO 1:500000 Légiforgalmi térképek; 1: 250000 Légiforgalmi térképek; ICAO műszeres megközelítési térképek; ICAO Műszeres leszálló térképek; Rádió-navigációs berendezések térképei.	1949. nov. 15. 1950. jún 1 1950. szep 1
23. -28.	A Tanács egyéb tevékenysége	Rövidítések; Térképjelek; Meghatározások.	1951. jún. 25 1951. nov 1 1952. jan 1
29.	Légiforgalmi térképek szekció 5. ülés (1951. október)	Meghatározások; ICAO WAC 1:1000000; ICAO 1:500000 Légiforgalmi térképek; ICAO 1: 250000 Légiforgalmi térképek; ICAO Megközelítési térképek; ICAO Leszálló térképek; ICAO Légiforgalmi tartózkodási hely követő térképek; Rádió navigációs berendezések térképei; ICAO Térképjelölések; ICAO Repülőtéri akadályok felülnézeti és metszeti rajza.	1952. jún. 19 1952. dec 1 1953. ápr 1
30.	A Légi-navigációs Bizottság tevékenysége az államokkal folytatott konzultációt követően.	A 4. és a 15. Annex között fennálló ellentmondások megszüntetése.	1956. feb 22 1956. júl 1 1956. dec 1
31., 32.	Harmadik Légi-navigációs Konferencia (1956 október) A Légi-navigációs Bizottság ajánlása	Repülőtéri akadály térképek; Szerkesztői módosítások; ICAO térkép jelölések.	1957. jún 13 1957. okt 1 1957. dec 1
33.	A Légi-navigációs Bizottság tevékenysége az államokkal folytatott konzultációt követően.	A Veszélyes légtér, a korlátozott légtér és a tiltott légtér meghatározások alkalmazása (Útmutató anyag).	1958. nov 14 - -

34.	A Légiforgalmi Tájékoztató Szolgálatok Szekció és a Légiforgalmi Térképek Szekció (AIS/MAP Szekció) ülés (1959 április - május)	Meghatározások; Általános előírások; ICAO A és B típusú Repülőtéri akadály térkép; ICAO Tartózkodási hely követő térképek; ICAO Rádió-navigációs Térképek; ICAO Közel körzeti térkép; ICAO Műszeres megközelítési térkép; ICAO (WAC) 1:1000000 Légiforgalmi világtérkép; ICAO 1:500000 Légiforgalmi térkép; ICAO Látás szerinti megközelítési térkép; ICAO Leszálló térkép; ICAO Repülőtér térkép; ICAO 1 : 2 000 000 Légiforgalmi navigációs térkép; Lap elrendezés az ICAO WAC 1 : 1 000000 szelvényekhez; ICAO térkép jelölések; Szín útmutató; Magasság szerinti színárnyalási útmutató; Az ICAO WAC 1:1000000 formátuma; A legkisebb szektor magasság meghatározására vonatkozó előírások; Mellékletek.	1960. jún 20 1960. okt 1 1961. júl 1
35.	AIS/MAP szekció ülés (1959 április-május)	ICAO 'A' típusú Repülőtéri Akadály térkép	1961. dec 8 1962. ápr 1 1962. júl 1
36.	AIS/MAP szekció ülés (1959 április-május); nem hivatalos EUM/MAP ülés (1961 május).	Legkisebb szektor magasságok; Az ICAO WAC 1:1000000 szelvény határai.	1962. dec 14 1963. ápr 1 1963. nov 1
37.	Kanada; Svájc; ENSZ műszaki konferencia a Nemzetközi világtérképről.	Térképjelek.	1963. dec 11 1964. jún 1 1964. nov 1
38.	Az AGA Szekció 7. ülése; PANS-ICAO rövidítések és Kódok (Doc 8400)	Meghatározások; Általános előírások; ICAO A és B típusú repülőtéri akadály térkép minták .	1964. már 25 1964. aug 1 1964. nov 1
39.	RAC/OPS ülés (1963)	Meghatározások; Magyarázó jegyzetek a veszélyes légtér, tiltott légtér és a korlátozott légtér meghatározások alkalmazására.	1965. dec 10 1966. ápr 10 1966. aug 25

40.	AIS/MAP Szekció ülés	Szintvonalak és a domborzat ábrázolása, magasság szerinti színárnyalás, térképjelek, ICAO WAC 1:1000000; ICAO kisméretarányú Légiforgalmi térkép; az akadályok magasságának vonatkoztatási alapja; meghatározások; mellékletek.	1967. jún 13 1967. okt 8 1968. feb 8
41.	5. Légi-navigációs Konferencia; Akadálymentességi Szakcsoport (első ülés). Különféle időjárási feltételek közötti üzemelési szakcsoport (harmadik ülés)	Meghatározások; ICAO 'A' típusú Repülőtéri Akadály Térkép; ICAO Leszálló térkép; ICAO Repülőtér térkép; ICAO térképjelek.	1969. jan 23 1969. máj 23 1969. szep 18
42	Hatodik Légi-navigációs Konferencia (1969)	ICAO Rádió-navigációs Térkép; ICAO Közel körzeti Térkép	1970.máj.15 1970.szept.15 1971.febr.04
43	5. Észak-Atlanti Körzeti Légi-navigációs Értekezlet (1970), 17/5 a) ajánlás	ICAO Repülőtér Térkép	1971.nov.29 1972.márc.29 1972.dec.07
44	Különféle időjárási körülmények közötti üzemelési szakcsoport harmadik ülése, 8/1 ajánlás	ICAO Precíziós Megközelítés domborzati Térkép	1972.nov.27 1973.márc.27 1973.aug.16
45	A RAN ülés világméretben alkalmazható ajánlásairól hozott Légi-navigációs Bizottsági döntés. Hatodik EUM RAN értekezlet (16/24 számú ajánlás). Kilencedik Légi-navigációs Konferencia.	Meghatározások; ICAO A és B típusú Repülőtéri Akadály Térkép; ICAO Rádió-navigációs Térkép; ICAO Közel körzeti Térkép; ICAO Műszeres Megközelítési Térkép; ICAO 1 : 1 000 000 Légiforgalmi Világ Térkép; ICAO 1 : 500 000 Légiforgalmi Világ Térkép; Látás szerinti Megközelítési Térkép; ICAO Leszálló térkép; ICAO Repülőtér Térkép; ICAO kis méretarányú Légiforgalmi Navigációs Térkép; ICAO Precíziós Megközelítési domborzati Térkép; ICAO térképjelölések	1977.dec.9 1978.ápr.9 1978.aug.10
46	Tanulmány a pilótakabinban használt térképekről; Az akadálymentességi szakcsoport hatodik ülésének 4/2 számú ajánlása és az AGA szekció ülés (1981) 10/1számú ajánlása	Meghatározások; Általános Előírások; ICAO Műszeres Megközelítési Térkép	1984.febr.27 1984.júl.30 1984.nov.22

47	Tanulmány a pilótakabinban használt térképekről. Az akadálymentességi szakcsoport hetedik ülésének 3/1 számú ajánlása és az AGA szekció ülés (1981) 8/2 számú ajánlása	Meghatározások; Általános előírások; ICAO A és B típusú Repülőtéri Akadály Térkép; ICAO Tartózkodási hely követő Térkép; ICAO Útvonal Térkép; ICAO Körzeti Térkép; ICAO Műszeres megközelítési térkép; ICAO 1:1000000 Légiforgalmi Világ Térkép; ICAO 1:500000 Légiforgalmi Térkép; ICAO Látás szerinti Megközelítési Térkép; ICAO Repülőtér Térkép; ICAO kis méretarányú Légiforgalmi Navigációs Térkép; ICAO Precíziós Megközelítés domborzati Térkép; ICAO térképjelölések; Színezési útmutató; A következő térképek bevezetése: ICAO Repülőtéri Földi Mozgások Térképe; ICAO Légijármű állóhely/beállító Térkép; ICAO Műszeres Szabvány Kirepülési Eljárás Térkép (SID); ICAO Műszeres Szabvány Érkezési Eljárás Térkép (STAR); ICAO C Típusú Repülőtéri Akadály Térkép.	1985.márc.18 1985.júl.29 1985.nov.21

48	A 6. Annex 18. módosítása; a 14. Annex 33. módosítása; a Látási Segédeszközök Testület (11 értekezletének) 2/2 számú ajánlása és Titkársági észrevételek	ICAO A, B és C típusú Repülőtéri Akadály Térkép; ICAO Precíziós Megközelítés domborzati Térkép; ICAO Műszeres Szabvány Indulási Eljárás Térkép (SID); ICAO Műszeres Szabvány Érkezési Eljárás Térkép (STAR); ICAO Műszeres Megközelítési Térkép; ICAO Látás szerinti Megközelítési Térkép; ICAO Repülőtér Térkép; ICAO Repülőtéri Földi Mozgások Térképe; ICAO Légijármű állóhely/beállító Térkép; ICAO 1:1000000 Légiforgalmi Világtérkép; ICAO 1:500000 Légi-forgalmi Térkép; ICAO kis méretarányú Légiforgalmi Navigációs Térkép; ICAO Tartózkodási hely követő térkép; ICAO térképjelek;	1989.febr.24 1989.júl.31 1989.nov.16
49	A 11. Annex 33. módosítása; A 14. Annex 39. módosítása; A 14. Annex II. Kötetének bevezetése; A Doc 8168 PANS-OPS I. és II. Kötetének 5., illetve 6. Módosítása	Meghatározások; Általános előírások; ICAO Útvonal Térkép; ICAO Körzeti Térkép; ICAO Műszeres Megközelítési Térkép; ICAO Látás szerinti Megközelítési Térkép; ICAO Repülőtéri Térkép; ICAO 1:1000000 Légiforgalmi Világ Térkép; ICAO 1 : 500 000 Légiforgalmi Térkép; ICAO térképjelek;	1992.febr.28 1992.júl.27 1992.nov.12
50	A WGS-84 Tanács általi elfogadása, mint a nemzetközi légi-közlekedés szabvány geodéziai vonatkoztatási rendszere; WAFS tervezés és bevezetés; PANS-OPS bevezetési problémák; az All Weather Operation kézikönyv felülvizsgálata; a helikopter forgalom és a hagyományos repülőgép forgalom integrálása; az RGCSP/8 és a Titkárság javaslata	Meghatározások; új rendelkezések bevezetése a WGS84 koordináták 1998 január 1-el történő közzétételével kapcsolatban; a vízszintes gyorsítási magasság közzétételére vonatkozó rendelkezés megszüntetése; az RNP típus bevezetése; a közeli akadályokról szóló megjegyzések SID térképeken történő feltüntetése; új térkép szimbólum bevezetése az aktív tűzhányó jelzésére.	1995 márc 1 1995 július 24 1995 nov 9 1998 január 1

51	Az Akadály mentességi panel és a Légi-navigációs Bizottság 10. és 11. Találkozója	Meghatározások; repülési adatbázisok; a geodéziai világrendszer (WGS-84) függőleges eleme; emberi tényező; az RNAV eljárások azonosítása; a befejező megközelítés gradiensének biztosítása; meredek siklópályájú megközelítések; és térképjelek az átrepülési útvonal pont és a rátartásos útvonal pont céljára.	1998. márc. 20 1998. július 20 1998. nov. 5
52	Az optikai berendezések panel (VAP); az akadály mentességi panel (OCP); a kormányzott földnek ütközés (CFIT) közös ICAO - iparági munkacsoport; a légiforgalmi tájékoztató szolgálatok/légiforgalmi térképek (AIS/MAP) divízió találkozójának (1998); és a titkárság ajánlásai	Meghatározások; futópálya várópontok; légvédelmi azonosító körzet (ADIZ); a domborzat és a legkisebb repülési magasságok ábrázolása; futópálya menti látástávolság (RVR) mérő helyek; légtér osztályozás; területi navigációs (RNAV) berendezésekre alapuló repülési eljárások és akadály mentességi kritériumok; térkép jelek a futópálya váró-pont, az ADIZ, az elektronikus légiforgalmi térképek, a légtér kategória, az atomerőmű és útvonalpont céljára, valamint 2002 november 28-tól új rendelkezések bevezetése az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő - céljára.	2001 márc 7 2001 júl 16 2001 nov 1 2002 nov 28

53	Az Akadály Mentességi Panel tizedik és tizenegyedik találkozója; a Légi-Navigációs Bizottság; és a Titkárság	A meghatározásokkal kapcsolatos új rendelkezések; függőleges és időpont vonatkoztatási rendszerek; közel-forgalmi érkezési magasság; ICAO Legkisebb Radar Magasság Térkép; és térképjelek a magasságok/repülési szintek és a befejező megközelítés kezdőpontja céljára. A geodéziai világrendszer - 1984 (WGS-84) érvényben lévő rendelkezéseinek naprakésszé tétele; akadályok; az ICAO Műszeres Megközelítési Térkép azonosítása, a rajta lévő repülőtér üzemeltetési minimum és kiegészítő információk; valamint légi-forgalmi adat minőségi követelmények.	2004 feb. 23 2004 júl. 12 2004 nov. 25

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

1. FEJEZET - MEGHATÁROZÁSOK, ALKALMAZÁSI ELŐÍRÁSOK ÉS HOZZÁFÉRHETŐSÉG

1.1 Meghatározások

Ha a légiforgalmi térképekre vonatkozó Szabványokban és Ajánlott Eljárásokban a következő fogalmakat alkalmazzák, akkor azok a következő jelentéssel rendelkeznek:

Repülőtér (Aerodrome) - Szárazföldön vagy vízen kijelölt terület (beleértve minden épületét, felszerelését és berendezését is), mely egészében, vagy részben a légijárművek érkezésére, indulására és földfelszíni mozgására szolgál.

Repülőtér Tengerszint feletti magassága (Aerodrome elevation) - A leszállási terület legmagasabb pontjának tengerszinthez viszonyított magassága.

Repülőtér üzemeltetési minimum (Aerodrome operating minima) - Egy repülőtér használhatóságának határértéke a következőkre:

a) felszállásra, látástávolság és/vagy futópálya látástávolság és, ha szükséges, felhőviszonyok fogalmával kifejezve;

b) leszálláshoz precíziós megközelítéssel és leszállási üzemre, látástávolság és/vagy futópálya látástávolság és elhatározási QNH/QFE magasság (DA/H) fogalmakkal kifejezve, az üzemelési kategóriának megfelelően;

c) leszálláshoz megközelítési és leszállási üzemhez függőleges menti vezetés biztosítása mellett, látástávolság és/vagy futópálya látástávolság és elhatározási QNH/QFE magasság (DA/H) fogalmakkal kifejezve; és

d) leszálláshoz nem-precíziós megközelítési és leszállási üzemhez, látástávolság és/vagy futópálya látástávolság, minimum süllyedési magasság (MDA/H) és, ha szükséges, felhőviszonyok fogalmával kifejezve;

Repülőtér vonatkoztatási pont (Aerodrome reference point) - A repülőtér kijelölt földrajzi helyzete (helyzetpontja)

Légiforgalmi térkép (Aeronautical chart) - A földfelszín egy részének ábrázolása az adott kultúr környezetet és domborzatot kifejezetten a légi-navigációs követelményeknek megfelelően feltüntetve.

Légijármű állóhely (Aircraft stand) - Az előtér légijármű parkolásra szánt kijelölt része.

Légvédelmi azonosító körzet (Air defense identification zone) - Meghatározott kiterjedésű különleges céllal kijelölt légtér rész, amelyen belül a légijárműtől elvárt, hogy a légiforgalmi szolgálatok (ATS) biztosításához kapcsolódó eljárások mellett eleget tegyen a különleges azonosítási és/vagy jelentési eljárásoknak

Légi gurulóút (Air taxiway) - Helikopterek lebegésben végzett gurulása céljából a talaj felszínen kijelölt pálya.

Légiforgalmi szogálat (Air traffic service) - Gyűjtőfogalom, mely jelenthet repüléstájékoztató szolgálatot, riasztó szolgálatot, légiforgalmi tanácsadó szolgálatot, légiforgalmi irányító szolgálatot, (körzeti irányító szolgálatot, bevezető irányító szolgálatot, vagy repülőtéri irányító szolgálatot).

Légi tranzitút (Air transit route) - Helikopterek légi áthaladásához a talajfelszínen kijelölt pálya.

Légifolyosó (Airway) - folyosó formájában kialakított irányítói körzet, vagy annak egy része.

Tengerszint feletti magasság (Altitude) - Adott szintnek, pontnak, vagy pontként értelmezett tárgynak a közepes tengerszinthez (MSL) viszonyított függőleges távolsága.

Előtér (Apron) - Szárazföldi repülőtéren a légijárművek kiszolgálására, utasok ki és beszállítására, posta, vagy áru ki és berakására, üzemanyag felvételre, parkolásra, vagy karbantartásra kijelölt terület.

Legkisebb területi magasság (Area minimum altitude AMA) - Műszeres meteorológiai körülmények (IMC) esetén használatos, a legközelebbi magasabb 30 m-es (100 láb) értékre felkerekített legalacsonyabb tengerszint feletti magasság, amely legalább 300 m (1000 láb), de hegyvidéknek minősített terepviszonyok esetén 600 m (2000 láb) akadály mentességet biztosít a meghatározott területen belül lévő összes akadály felett.

Érkezési útvonal (Arrival routes) - A műszeres megközelítési eljárásban az a kijelölt útvonal, amelyet követve a légijármű a repülés utazószakaszáról a kezdeti megközelítés pontjára érkezik.

ATS útvonal (ATS route) - A légiforgalmi szolgálatok biztosításához szükség szerint, a légi-forgalom irányított áramlására kijelölt útvonal.

1. Megjegyzés: Az ATS útvonal kifejezés légifolyosó, tanácsadói útvonal, ellenőrzött, vagy nem-ellenőrzött útvonal, érkezési, vagy indulási útvonal, stb., jelentéssel használatos.

2. Megjegyzés: az ATS útvonalat útvonal jellemzőkkel azonosítják, e jellemzők közé tartozik egy ATS útvonal elnevezés, a jellemző pontokhoz (útvonal pontokhoz), vagy azoktól elvezető irány, a jellemző pontok közötti távolság, a jelentési előírások és, a megfelelő ATS hatóság által kijelölt legalacsonyabb biztonságos magasság.

Puszta Föld (Bare Earth) - A Föld felszíne, beleértve a vízfelületeket, az állandó jég és hó mezőket, de kizárva minden vegetációt és ember alkotta tárgyat.

Naptár (Calendar) - Egyértelmű időpont vonatkoztatási rendszer, amely az időpont egy napos nagysűgrendű meghatározásához szolgáltat alapot (ISO 19108[i]*).

Burok (Canopy) - A puszta Föld felszín kiegészítve a vegetáció magasságával.

Átkapcsolási pont (Change-over point) - VHF körsugárzó rádió irányszög-adó (VOR) berendezésektől vett rádió-navigációs jelekkel kijelölt ATS útvonalon az a pont, amelynél a légijármű navigációs helymeghatározásának elsődleges viszonyítási alapjaként a mögötte lévő navigációs berendezésről az előtte lévő következő berendezésre várhatóan átkapcsol.

Megjegyzés: Átkapcsolási pontokat azért jelölnek ki, hogy a navigációs berendezések között kiegyenlített jel erősséget és minőséget biztosítsanak az összes használt repülési szinten, továbbá, hogy az azonos útvonal szakaszon repülő légijárművek mindegyike számára ugyanattól a berendezéstől származó irányszög vezetést biztosítsanak.

Akadálymentes sáv (Clearway) - Az illetékes hatóság ellenőrzése alatt álló, alkalmasként kijelölt, vagy alkalmassá tett téglalap alakú szárazföldi, vagy vízi terület, amely felett a légijármű kezdeti emelkedésének egy részét az előírt magasság elérése érdekében végrehajthatja.

Szintvonal (Contour line) - térképen lévő, egyenlő magasságokat összekötő vonal.

Kultúr környezet (Culture) - A föld felszínén található, emberek által létrehozott minden olyan terepjellegzetesség, mint például a városok, vasútvonalak, csatornák, stb.

Ciklikus redundancia ellenőrzés (Cyclic Redundancy Check) - az adat vesztéssel, vagy módosulással szemben egy adott szinten biztosítékot nyújtó, az adat digitális kifejezéséhez alkalmazott matematikai algoritmus.

Veszélyes légtér (Danger area) - Meghatározott kiterjedésű légtér, amelyen belül meghatározott időben a légijárművek repülésére veszélyes tevékenység folyhat.

Adat minőség (Data Quality) - Megbízhatósági szint, vagy fok, miszerint a szolgáltatott adat teljesíti az adat-felhasználó pontosság, felbontás és egységesség értelmében kifejezett követelményeit.

Alapadat (Datum) - Bármely mennyiség, vagy mennyiségek együttese, amely (amelyek) kiindulási, vagy viszonyítási alapul szolgálhatnak más mennyiségek kiszámításához (ISO 19104[ii]*).

Beljebb helyezett küszöb (Displaced threshold) - Nem a futópálya végénél kijelölt küszöb.

Elektronikus légiforgalmi térkép megjelenítő (Electronic aeronautical chart display) - Elektronikus készülék, amely a repülő személyzetnek az előírt információk megjelenítésével kényelmes és időbeni útvonaltervezés, útvonal ellenőrzés és navigálás elvégzését teszi lehetővé.

Tengerszint feletti magasság (Elevation) - A föld felszínén lévő, vagy ahhoz rögzített pontnak, vagy szintnek a közepes tengerszinttől mért függőleges távolsága.

Elliptikus magasság (Geodéziai magasság) (Ellipsoid height) (Geodetic height) - Az ellipszoid kérdéses ponton keresztül haladó külső merőlegese mentén mért és a viszonyítási alapul vett ellipszishez vonatkoztatott magasság.

Jellegzetesség (Feature) - A valós világ absztrakt jellemzői (ISO 19101[iii]*).

Befejező megközelítés (Final Approach) - A műszeres megközelítési eljárásnak egy meghatározott befejező megközelítési navigációs berendezésnél, vagy pontnál kezdődő része, vagy ahol ilyen berendezés, vagy pont nincs kijelölve,

a) az utolsó eljárási forduló, alapforduló, vagy lóversenypálya alakú eljárás rárepülési fordulója, ha azt kijelölték; vagy

b) a megközelítési eljárásban meghatározott utolsó útirányra való ráállás pontjánál: és a repülőtér közelében lévő azon pontig tartó szakasz, ahonnan:

1) a leszállás végrehajtható; vagy

2) megszakított megközelítési eljárást kell kezdeni.

Befejező megközelítési és felszállási légtér (Final approach and take-off area) (FATO). Meghatározott légtér, amely felett a megközelítési manőver befejező szakasza a függeszkedéshez, vagy leszálláshoz befejeződik és, amelyről a felszállás manőverét megkezdik. Abban az esetben, ha a FATO-t az 1. teljesítmény osztályba tartozó helikopterek használják, ez a légtér magába foglalja a megszakított felszálláshoz rendelkezésre álló légteret is.

A befejező megközelítés navigációs berendezése, vagy pontja (Final approach fix or point) - A műszeres megközelítési eljárásban az a navigációs berendezés vagy pont, amelynél a befejező megközelítési szakasz kezdődik.

Befejező megközelítési szakasz (Final approach segment) - A műszeres megközelítési eljárásnak az a szakasza, amelyen a befejező egyenesre való ráállást és a leszálláshoz való süllyedést végrehajtják.

Repüléstájékoztató körzet (Flight information region) - Meghatározott kiterjedésű légtér, amelyben repüléstájékoztató és riasztó szolgálat biztosított.

Repülési szint (Flight level) - Meghatározott alaphoz, az 1013 hektopaszkálhoz (hPa) viszonyított, állandó légnyomású felület, amelyet a többi ugyanilyen felületektől meghatározott nagyságú légnyomáskülönbség értékek választanak el.

1. Megjegyzés. - A Nemzetközi Műlégkörnek megfelelően kalibrált barometrikus magasságmérő az, amelyik:
a) ha QNH nyomásértékre van beállítva, a tengerszint feletti magasságot mutatja;

b) ha QFE nyomásértékre van beállítva, a QFE vonatkoztatási alap feletti magasságot mutatja;

c) ha az 1013,2 hPa nyomásértékre van beállítva, a repülési szintek jelzésére használható.

2. Megjegyzés. - A fenti 1. Megjegyzésben használt magasság és tengerszint feletti magasság kifejezések barometrikus magasságot, nem pedig geometrikus magasságot és geometrikus tengerszint *feletti magasságot jelentenek.*

Geodéziai távolság (Geodetic distance) - Matematikailag meghatározott ellipsziod felületen bármely két pont közötti legrövidebb távolság.

Geodéziai alapadat (Geodetic datum) - a viszonyítási világrendszerhez képest a helyi viszonyítási rendszer helyének és tájolásának meghatározásához szükséges minimum mennyiségű adat együttes.

Geoid (Geoid) – egyenlő gravitációs potenciájú felület a Föld gravitációs mezőjében, amely egybe esik a kontinenseken át folyamatosan kiterjesztett és zavarmentes közepes tengerszinttel (MSL).

Megjegyzés.- A helyi gravitációs zavarok eredményeképp (szél által keltett ár, sótartalom, áramlat stb.) a Geoid szabálytalan alakú és a gravitáció iránya minden ponton a geoidra merőleges.

Geoid egyenetlenség (Geoid undulation) - A geoid távolsága a matematikai viszonyítási ellipszoid alatt (negatív), vagy felett (pozitív).

Megjegyzés. - A Geodéziai Világrendszer - 1984 (WGS-84) által meghatározott ellipszoid tekintetében a WGS-84 ellipszoid magasság és az orthometrikus magasság közötti különbség adja a WGS-84 geoid egyenetlenségét.

Siklópálya (Glide path) - A befejező megközelítés közbeni függőleges menti vezetéshez kijelölt süllyedési pálya.

Gergely naptár (Gregorian calendar) - Általánosan használt naptár; először 1582-ben vezették be az év meghatározásához, amely a György (Julian) naptárnál sokkal pontosabban követi a tropikus évet (ISO 19108[iv]*).

Megjegyzés. - A Gergely naptárban az egymást követő tizenkét hónapra osztott szokványos évek 365 napból állnak, míg a szökő év 366 napból áll.

Magasság (Height) - Egy szintnek, egy pontnak, vagy egy pontként értelmezett tárgynak meghatározott vonatkozási alaptól mért függőleges távolsága.

Helikopter állóhely (Helicopter stand) - Helikopter parkolását biztosító légijármű állóhely és, ahol légi gurulás végezhető ott lehetőséget biztosít a helikopter földet éréséhez, illetve elemelkedéséhez.

Helikopter repülőtér (Heliport) - Helikopterek érkezésére, indulására és felszíni mozgására részben, vagy teljes egészében használatos repülőtér vagy építményen kijelölt terület.

Várakozási eljárás (Holding Procedure) - Előre kijelölt manőver, amely a további engedélyre várakozó légijárművet az előírt légtéren belül tartja.

Emberi tényező alapelvek (Human Factors principles) - A repülés terén a tervezésben/kialakításban, jogosításban, kiképzésben, üzemeltetésben és karbantartásban alkalmazandó elvek, melyek az emberi teljesítőképességet figyelembe véve keresnek biztonságos összekapcsolódási megoldásokat az ember és a rendszer más alkotó elemei között.

Magassági szín árnyékolás (Hypsometric tints) - Tengerszinthez viszonyított magassági szintközök ábrázolására használt árnyékolási vagy színárnyalási fokozatok.

Kezdeti megközelítési szakasz (Initial approach segment) - A műszeres megközelítési eljárásnak a kezdeti megközelítési navigációs berendezés/pont és a közbenső megközelítési navigációs berendezés/pont, vagy ahol alkalmazható, a befejező megközelítési berendezés, vagy pont közötti szakasza.

Műszeres megközelítési eljárás (Instrument approach procedure) - Repülés műszerek alapján végrehajtott, előre meghatározott manőverek sorozata, az akadályoktól való meghatározott védettséggel, a kezdeti megközelítés navigációs berendezésétől/pontjától, vagy ahol alkalmazható, a meghatározott érkezési útvonal kezdetétől egy olyan pontig, ahonnan a leszállás végrehajtható és azt követően, ha a leszállás nem történt meg, egy olyan helyzetig, ahol a várakozásra, vagy az útvonal szakaszra előírt akadálymentességi követelményeket alkalmazzák.

Közbenső megközelítési szakasz (Intermediate approach segment) - A műszeres megközelítési eljárásnak az a szakasza, amely, vagy a közbeeső megközelítési navigációs berendezéstől/ponttól a befejező megközelítés navigációs berendezéséig/pontjáig tart, vagy az irányváltásos, a lóversenypálya alakú, vagy a számított helyzet navigációs eljárás vége és a befejező megközelítés navigációs berendezése, vagy pontja között helyezkedik el, amelyik alkalmazható.

Izogonal (Isogonal) - Térképen, vagy egy térképlapon feltüntetett azon vonal, amelynek minden pontjában azonos értékű a mágneses elhajlás egy meghatározott időszakon belül.

Izogriv (Isogriv) - Egy térképen, vagy térképlapon feltüntetett azon vonal, amely a navigációs hálózati észak és a mágneses észak közötti azonos fokeltérésű pontokat köti össze.

Leszállási terület (Landing area) - A mozgási terület légijárművek leszállására, vagy felszállására használatos része.

Leszállási irányjelző (Landing direction indicator) - A le- és felszállásra kijelölt aktuális irány lát jelzésére szolgáló eszköz.

Szint (Level) - A levegőben lévő légijármű függőleges helyzetére vonatkozó általános kifejezés, mely jelenthet magasságot, tengerszint feletti magasságot, vagy repülési szintet.

Mágneses eltérés (Magnetic variation) - A földrajzi Észak és a mágneses Észak közötti különbség, fokokban kifejezve.

Megjegyzés: A megadott érték megjelöli azt is, hogy a fokbeli eltérés keleti, vagy nyugati a földrajzi Északhoz viszonyítva.

Munkaterület (Manoeuvring area) - Az előtér kivételével, a repülőtérnek légijárművek fel- és leszállására valamint gurulására használatos része.

Jelölés (Marking) - A mozgásterület felületén, légiforgalmi tájékoztatás közlése céljából elhelyezett jel, vagy jelek csoportja.

Meta adat (Metadata) - Adat az adatról (ISO 19115[v]*).

Megjegyzés. - Az adatot leíró és dokumentáló adat.

Legkisebb szektor magasság (Minimum sector altitude) - Az a használható legalacsonyabb tengerszint feletti magasság, amely a rádió-navigációs berendezés körüli 46 km (25 NM) sugarú kör egy adott szektora által határolt területen belül található összes akadály felett legkevesebb 300 m

(1000 láb) akadálymentességet biztosít.

A megszakított megközelítés pontja (Missed approach point) (MAPt) - A műszeres megközelítési eljárás azon pontja, amelynél vagy, amely előtt az előírt megszakított megközelítési eljárást annak biztosítása érdekében meg kell kezdeni, hogy a légijármű az akadálymentességi minimumot ne sértse meg.

Megszakított megközelítési eljárás (Missed approach procedure) - Abban az esetben követendő eljárás, ha a megközelítés nem folytatható tovább.

Mozgási terület (Movement area) - A repülőtérnek az a része, amely a légijárművek le- és felszállására, valamint gurulására használatos és, amely magába foglalja a munkaterületet és az előter(ek)et.

Akadály (Obstacle) - A repülésben lévő légijármű védelmét szolgáló meghatározott felület fölé nyúló, vagy a légijármű földi mozgására szánt területen belül található minden rögzített (akár időleges, akár állandó), vagy mozgó tárgy, vagy annak része.

Megjegyzés. - Jelen Annexben az "akadály" kifejezés kizárólag a térképre viendő olyan tárgyakra vonatkozik, amely tárgyak valós veszélyt jelentenek azon üzemelési fajta szerint működő légijármű biztonságos áthaladására, amely üzemeltetési fajtára az illető térképlapot kialakították.

Akadálymentes QNH magasság, vagy Akadálymentes QFE magasság - Obstacle clearance altitude (OCA) or Obstacle clearance height (OCH) - A vonatkozó futópálya küszöb szintje, vagy alternatívaképp a repülőtér szintje feletti - amelyik alkalmazandó- az a legkisebb tengerszinthez viszonyított QNH magasság (OCA), vagy QFE magaság (OCH), amelyet a vonatkozó akadálymentességi követelmények teljesítésének megállapításához használnak.

1. Megjegyzés. - Az akadálymentes magasságot (altitude) a közepes tengerszinthez viszonyítják, míg az akadálymentes magasságot (height) a küszöb magasságához, illetve nem-precíziós megközelítések esetében a repülőtér szintmagasságához, avagy a küszöb magasságához, ha ez több mint 2 m-el (7 ft) alacsonyabb a repülőtér szintmagasságánál. A körözésből végzett megközelítés akadálymentes magasságát a repülőtér szintmagasságához viszonyítják.

2. Megjegyzés. - Kényelmi okok miatt, amikor mindkét kifejezést alkalmazzák, ezt a következő formában is írhatják: akadálymentes magasság/tengerszint feletti magasság (altitude/height), rövidítése OCA/H.

3. Megjegyzés. - E meghatározás jellemző alkalmazásáról lásd a Légi-navigációs Szolgálatok Eljárásai - Légijármű üzemeltetés (Procedures for Air Navigation Services - Aircraft Operations) (Doc 8168) I. Kötet, III. Rész 1.5 és II. Kötet III. Rész 6.4 pontját.

Akadálymentes terület (Obstacle free zone) (OFZ) - A belső megközelítési, a belső átmeneti és az elvétett leszállási felületek feletti, valamint az ezen felületek által határolt földsáv azon része feletti légtér, amelybe kizárólag a légi-navigáció számára szükséges kistömegű és törhetően épített rögzített akadály nyúlik bele.

Ortometrikus magasság (Orthometric Height) - Egy adott pont általában MSL magasságban kifejezett geoidhoz vonatkoztatott magassága.

Pontfény (Point light) - Érzékelhető hosszúság nélkülinek látszó világító jel.

Helyzet (földrajzi) (Position - Geographical) - A matematikai ellipszoidhoz viszonyított és a föld felszínén lévő adott pont helyzetét meghatározó koordináta együttes (szélesség, hosszúság).

Precíziós megközelítési eljárás (Precision approach procedure) - ILS, vagy PAR berendezés révén biztosított iránysáv és siklópálya információkat alkalmazó műszeres megközelítési eljárás.

Eljárási QNH/QFE magasság (Procedure altitude/height) - A minimum QNH/QFE magasságon, vagy felette kijelölt és üzemszerűen alkalmazott QNH/QFE magasság, amely célja a közbeeső/befejező megközelítési szakaszon előírt süllyedési mértékű/szögű stabilizált süllyedések számára teret biztosítani.

Eljárási forduló (Procedure turn) - Manőver, amely során először a kijelölt repülési útirány elhagyására kell fordulót végezni, ezt egy ellentétes irányú forduló követi, amely a légijárműnek lehetővé teszi a kijelölt repülési útiránnyal ellentétes irány felvételét és az azon való továbbrepülést.

1. Megjegyzés. - Az eljárási fordulót "bal", vagy "jobb" fordulós néven nevezik meg, az első forduló irányának meg felelően.

2. Megjegyzés. - Az eljárási forduló kijelölhető akár szinttartással, akár süllyedésben történő végrehajtásra, az egyes műszeres megközelítési eljárások által támasztott követelmények függvényében.

Tiltott légtér (Prohibited area) - Az állam területe, vagy felségvize felett kijelölt meghatározott kiterjedésű légtér, amelyen belül légijárművek repülése tiltott.

Radar irányvezetés (Radar vectoring) - Radarberendezés használatára alapozott, navigációs irányvezetés biztosítása légijárművek számára meghatározott irányok formájában.

Domborzat (Relief) - A föld felszínének a tengerszinthez viszonyított magasságaiban lévő egyenetlenségek, melyeket a légiforgalmi térképeken szintvonalakkal, színárnyalással, árnyékolással, vagy a pontok tengerszinthez viszonyított magasságainak megadásával jelölnek.

Jelentőpont (Reporting point) - Meghatározott földrajzi hely, amelyhez viszonyítva a légijármű helyzetét jelenteni lehet.

Teljesítendő Navigációs Pontosság (Required Navigation Performance - RNP) - Kijelölt légtérben történő üzemeléshez a navigációs képesség pontosságára vonatkozó közlemény.

Megjegyzés. - A navigációs teljesítőképességet és követelményeket adott RNP típusra és/vagy alkalmazásra határoznak meg.

Felbontás (Resolution) - Mérési egységek, vagy számjegyek szám értéke, amelyben adott mért, vagy számított értéket kifejeznek, illetve használnak.

Korlátozott légtér (Restricted area) - Az állam területe, vagy felségvize felett kijelölt, meghatározott kiterjedésű légtér, amelyen belül a légijárművek repülése bizonyos előírt feltételeknek megfelelően korlátozott.

Irányváltásos eljárás (Reversal procedure) - A műszeres megközelítési eljárás kezdeti megközelítési szakasza folyamán a légijárművek számára az ellentétes irányba fordulás lehetővé tételéhez kijelölt eljárás. A szakasz magába foglalhat eljárási fordulókat, vagy alapfordulókat.

RNP típus (RNP type) - Tengeri mérföld távolság értékben kifejezett és a szándék szerinti tartózkodási helytől számított"belül tartózkodás" értéke, amelyen a repülőgép a teljes repülési idő legalább 95 %-ában belül marad.

Például. - Az RNP 4, plusz, vagy mínusz 7,4 km (4 tengeri mérföld) navigációs pontosságot jelent 95 százalékos "belül tartózkodási" alapon.

Futópálya (Runway) - A szárazföldi repülőtéren kijelölt derékszögű, a légijárművek leszállására és felszállására előkészített terület.

Futópálya várópont (Runway-Holding Position) - A futópálya, az akadály korlátozó felület, vagy az ILS/MLS kritikus/érzékeny területek védelmére kijelölt földi helyzetpont, amelynél a földi mozgást végző légijárműnek, vagy járműveknek meg kell állni és várakozni kell, amíg a repülőtéri torony irányító eltérő engedélyt nem ad.

Futópálya sáv (Runway strip) - A futópályát, és ha ilyet létesítettek-a végbiztonsági sávot is magába foglaló, az alábbiak céljára szolgáló kijelölt terület:

a) a futópályáról lefutó légijárművek sérülési kockázatának csökkentésére; és

b) a felszállás, vagy leszállás művelete közben a felette átrepülő légijárművek védelmére.

Futópálya látástávolság (Runway visual range) (RVR) - Az a távolság, amely távolságig a futópálya középvonalán lévő légijármű vezetője látja a futópálya felületének jelzéseit, illetve a futópályát szegélyező, vagy annak középvonalát azonosító fényeket.

Padka (Shoulder) - Egy, a szilárd burkolatú felület széléhez csatlakozó és olymódon kiképzett terület, hogy az átmenetet biztosítson a szilárd burkolat és a szomszédos talajfelület között.

Fontos/mérvadó pont (Significant point) - Meghatározott földrajzi hely, melyet valamely ATS útvonal, vagy egy légijármű repülési útvonalának meghatározásához, valamint egyéb navigációs és ATS célokra használnak.

Végbiztonsági sáv (Stopway) - A rendelkezésre álló nekifutási úthossz végénél kezdődő kijelölt derékszögű terület, amelyet megfelelően előkészítettek arra a célra, hogy rajta, megszakított felszállás esetén, a légijármű megállítható legyen.

Gurulás (Taxiing) - A fel- és leszállások kivételével a légijármű saját erőből történő mozgása a repülőtér talaján.

Gurulóút (Taxiway) - A szárazföldi repülőtéren a légijárművek gurulásra kijelölt és kialakított út, amelyet arra a célra terveztek, hogy a repülőtér egy meghatározott részét egy másik részével összekösse, beleértve az alábbiakat:

a) *Légijármű állóhely guruló útvonal (Aircraft stand taxilane)* - Az előtérnek gurulósávként kijelölt azon része, amely kizárólagos célja a légijármű állóhely elérésének lehetővé tétele.

b) *Előtéri gurulóút (Apron taxiway)* - A gurulóút rendszer előtéren elhelyezkedő része, amelynek rendeltetése, hogy az előtéren keresztül történő átguruláshoz útvonalat biztosítson.

c) *Gyors leguruló út (Rapid exit taxiway)* - A futópályához hegyesszögben csatlakozó gurulóút, amelynek célja, hogy a leszálló légijárművek a futópályát attól nagyobb sebességgel lefordulva hagyhassák el, mint amekkora sebességet más gurulóút típusok tesznek lehetővé, ezáltal csökkentve a futópálya foglaltsági idejét.

Közel-forgalmi érkezési magasság (Terminal arrival altitude - TAA) - Az a használható legalacsonyabb tengerszint feletti magasság, amely a megközelítés kezdőpontja (IAF), vagy ha nincs IAF kijelölve, akkor a közbenső megközelítés pontja (IF) körüli 46 km (25 NM) sugarú kör egy adott íve által határolt területen belül található összes akadály felett legkevesebb 300 m (1000 láb) akadálymentességet biztosít, amely ív széleit az IF-el összekötő egyenesek határolják. Egy adott megközelítési eljáráshoz tartozó TAA-k együttese az IF körül 360 fok-os fedettséget biztosítsanak.

Terep (Terrain) - A Föld felszíne, amely az akadályokon kívül magában foglal minden olyan természetes jellegzetességet, mint például a hegyek, dombok, szakadékok, völgyek, vízfelületek, állandó jég- és hómezők.

Megjegyzés. - Gyakorlatilag - az adatgyűjtés módjától függően - a terep felöleli a puszta föld folytonos felületét, a (vegetációs) burok tetejét, vagy ami közöttük esetleg van - ez "első visszaverő felület" néven is ismert.

Küszöb (Threshold) - A futópálya leszállásra használható részének kezdete.

Földet érési és elemelkedési terület (Touchdown and lift-off area) (TLOF) - Teherviselésre képes terület, amelyről, illetve amelyre a helikopter elemelkedhet, illetve földet érhet.

Földet érési zóna (Touchdown zone) - A futópályának a küszöbön belül lévő azon része, amelyben a leszállni szándékozó légijármű a futópályát először érinti.

Útirány (Track) - A légijármű útvonalának földfelszíni vetülete, amelynek irányát annak minden pontjában általában (földrajzi, mágneses, vagy hálózati) Északtól mért fokokban fejezik ki.

Átváltási magasság (Transition altitude) - Az a tengerszint feletti magasság, amelyen, vagy amely alatt a légijármű függőleges helyzetét a közepes tengerszint feletti magassághoz viszonyítva vezérlik.

Látás szerinti megközelítési eljárás (Visual approach procedure) - Látási támpontokra alapozott előre meghatározott manőverek sorozata a megközelítés kezdőpontjától, vagy ahol alkalmazható, a meghatározott érkezési útvonal kezdetétől egy olyan pontig, ahonnan a leszállás végrehajtható, és azt követően, ha a leszállás nem történt meg, egy olyan helyzetig, ahonnan az ismételt megközelítés kezdőpontjához vezető eljárás végrehajtható.

Útvonal pont (Waypoint) - Adott területi navigációs út vonalvezetésének, vagy egy területi navigációt alkalmazó légijármű repülési útvonalának kijelöléséhez használt meghatározott földrajzi hely. Az útvonal pont elnevezése lehet:

Rátartásos útvonal pont (Fly-by way-point) - Útvonal pont, mely esetében a fordulót a forduló ívének beszámításával a pont elérése előtt kell kezdeményezni, hogy az adott útvonal következő szakaszára fel-, vagy egy eljárásba becsatlakozás a forduló ív érintője mentén történjen meg.

Átrepülendő útvonal pont (Flyover way-point) - Útvonal pont, melynél fordulót annak érdekében kezdeményeznek, hogy valamely útvonal következő szakaszára fel-, vagy egy eljárásba becsatlakozzanak.

1.2 Alkalmazási előírások

1.2.1 Ezen Annex előírásait 2001. november 1-ével kezdődően kell alkalmazni.

Megjegyzés: a 20. Fejezet - ICAO Elektronikus Légiforgalmi térkép megjelenítő, 2002. November 28-án és azután alkalmazandó.

1.2.2 Az ezen Annex hatáskörébe tartozó és 2001. november 1-i, vagy azt követő légiforgalmi információ érvényességi dátumú összes térképnek teljesítenie kell az adott térképre vonatkozó Szabványokat.

1.2.2.1 **Ajánlás**. - *Továbbá, minden ilyen térképnek teljesítenie kell a rá vonatkozó Ajánlott Gyakorlatokat is.*

1.3. Hozzáférhetőség

1.3.1 *Tájékoztatás*. A másik szerződő állam kérésére és részére a szerződő állam bocsássa rendelkezésre a saját területére vonatkozó és a jelen Annex szabványainak teljesítését lehetővé tévő minden tájékoztatást.

1.3.2 *Térképek*. Ha az előírt, a térkép, vagy térképsorozat egyedi térképlapjára vonatkozó megfelelő alábbi módok valamelyike révén a szerződő állam köteles biztosítani a térképeihez való hozzáférést.

1.3.2.1 A szerződő állam a teljes egészében azon területén belülre vonatkozó bármely térkép, vagy térképsorozat egyedi lapja esetében, amely terület fölött a szerződő állam hatáskörrel rendelkezik, köteles:

1) vagy maga elkészíteni a térképet, illetve térkép lapot; vagy

2) intézkedni azoknak egy másik szerződő állam, illetve ügynökség általi elkészítéséről; vagy

3) a térkép elkészítéséhez szükséges adatokat egy olyan szerződő állam rendelkezésére bocsátani, amely hajlandó kötelezettséget vállalni a térkép, vagy térképlap elkészítésére.

1.3.2.2. Két, vagy több szerződő állam területét magába foglaló térképekre, vagy térképsorozat egyedi térképlapjára vonatkozóan, azon államoknak kell meghatározniuk a módot, amelynek megfelelően a térkép, vagy térképlap hozzáférhetőségét biztosítják, amelyek fennhatósági területét a térkép magába foglalja. A döntést úgy kell meghozni, hogy az megfelelően figyelembe vegye a körzeti légi-navigációs egyezményeket és az ICAO Tanács által kialakított minden térkép-szelvényezési programot.

Megjegyzés. - A "körzeti légi-navigációs egyezmények" kifejezés az ICAO Tanácsa által, általában a körzeti légi-navigációs értekezletek javaslatai alapján, jóváhagyott egyezményeket jelenti.

1.3.3 A szerződő állam köteles minden ésszerű intézkedést megtenni annak érdekében, hogy az általa szolgáltatott tájékoztatások és az általa biztosított térképek a szükséges kívánalmaknak megfelelőek és pontosak legyenek és, hogy azokat megfelelő helyesbítő szolgálattal naprakész állapotban tartsa.

1.3.4 **Ajánlás.** - *Hogy az új térképészeti technikáról és az előállítási eljárásokról a tájékoztatások világméretű terjesztése javuljon, a szerződő államok által készített megfelelő térképeket, kérésre és kölcsönösségi alapon, a többi szerződő államnak ingyenesen kell rendelkezésre bocsátani.*

Megjegyzés. - A légiforgalmi térképek elkészítéséről, beleértve azok mintáit is, a Légiforgalmi Térképek Kézikönyve (Doc 8697) tartalmaz útmutató segédanyagot.

2. FEJEZET – ÁLTALÁNOS ELŐÍRÁSOK

Megjegyzés. - Kivéve, ha az illető térképre vonatkozó előírások erről eltérően rendelkeznek, az e fejezetben tartalmazott szabványok és ajánlott gyakorlatok alkalmazandók mindegyik ICAO légiforgalmi térképre.

2.1 Az üzemeltetés térkép igényei

Megjegyzés. - Ezen Annex céljaira, a repülés szakaszai a következők:

1. Szakasz - Gurulás a légijármű állóhelytől a felszállás megkezdésének pontjáig

2. Szakasz - Felszállás és emelkedés az utazás ATS útvonal szerkezet eléréséig

3. Szakasz - Utazás az ATS útvonal szerkezet mentén

4. Szakasz - Süllyedés a megközelítéshez

5. Szakasz - Megközelítés leszálláshoz és átstartolás

6. Leszállás és a légijármű állóhelyre gurulás.

2.1.1 Mindegyik térkép fajta biztosítsa a térkép rendeltetésének megfelelő tájékoztatást és kialakítása vegye figyelembe az optimális használatot elősegítő emberi tényező szempontokat.

Megjegyzés. - Az Emberi Tényező szempontok alkalmazásáról szóló útmutató az Emberi Tényező Kiképzési Kézikönyvben (Human Factors Training Manual) (Doc 9683) található.

2.1.2 Mindegyik térkép fajta hordozza a repülési szakasznak megfelelő információkat a légijármű biztonságos és akadályoztatás mentes üzemelésének biztosítása érdekében.

2.1.3 Az információk pontosan, torzítás mentesen és zsúfoltság mentesen legyenek feltüntetve, továbbá a szokványos üzemeltetési körülmények között téveszthetetlenek és értelmezhetők legyenek.

2.1.4 Az alkalmazott színek, vagy szín árnyalatok és betű méretek a pilóta számára a természetes és mesterséges megvilágítás változó körülményei között tegyék lehetővé a térkép könnyű olvashatóságát és értelmezhetőségét.

2.1.5 A tájékoztatás közlése olyan formában történjen, amely a pilóta részéről történő megértésüket az üzemeltetési körülményekkel és a munkateherrel egyeztethető ésszerű időn belül lehetővé teszi.

2.1.6 Az egyes térkép fajtákon biztosított tájékoztatás megjelenési formája az egyik térképről a repülés szakaszának megfelelő másik térképre történő probléma mentes átállást biztosítson.

2.1.7 **Ajánlás. -** *A térképek földrajzi Északra legyenek tájolva.*

2.1.8 **Ajánlás. -** *A térképlapok alapmérete 210 × 148 mm (8,27 × 5,82 hüvelyk) (A5) legyen.*

2.2 Térkép címek

Az ebben az Annexben közzétett előírásoknak megfelelően készített és a vonatkozó fejezet bevezető rész megjegyzésében említett rendeltetési cél kielégítésére szánt térkép, vagy térképsorozat címfelirata egyezzen meg a vonatkozó fejezet címsorának az e kiadványban tartalmazott bármely szabvány alkalmazása által megkívánt módosított formájával, de a címfelirat az 'ICAO' jelzést csak abban az esetben tartalmazza, ha a térkép megfelel eme 2. Fejezetben előírt minden szabványnak és az adott térképre előírt minden külön rendelkezésnek.

2.3 Egyéb információk

2.3.1 Kivéve, ha az adott térképre más előírás vonatkozik, a széljegyzeteket az 1. Függelékben közöltek szerint kell elrendezni.

2.3.2 Kivéve, ha az adott térképre más előírás vonatkozik, a következő tájékoztatást minden térkép előlapján fel kell tüntetni:

1) A térképsorozat megnevezése vagy címe;

Megjegyzés. - A cím rövidíthető

2) A szelvény neve és azonosítója;

3) Mindegyik lapszélen a csatlakozó térképszelvény jelzése (ha van csatlakozó szelvény).

2.3.3 Az alkalmazott jelek és rövidítések magyarázatát biztosítani kell. A jelmagyarázat, vagy a térkép előlapján, vagy hátoldalán szerepeljen kivéve, ha ez terjedelmi okok miatt megoldhatatlan, ilyen esetekben a jelmagyarázat külön is közölhető.

2.3.4 A térképet készítő ügynökség nevét és pontos címét a térkép szélén fel kell tüntetni, kivéve, ha a térkép valamely légiforgalmi kiadvány részeként jelentetik meg, amikor is ez a tájékoztatás a kiadvány elején is elhelyezhető

2.4 Térkép jelek

Az alkalmazott térképjelek egyezzenek a 2. Függelék - ICAO Térképjelek alatt szereplő jelekkel, kivéve, ha a légiforgalmi térképen, a polgári repülés számára fontossággal bíró olyan terep jellegzetességet, vagy részleteket akarnak ábrázolni, amelyre jelenleg nincs megfelelő ICAO jelölés. Ilyen esetben a célra bármely megfelelő jelölés használható, feltéve, hogy az már meglévő másik ICAO jelöléssel összetévesztést nem idéz elő, illetve a térkép értelmezhetőségét nem csökkenti.

Megjegyzés. - A jelölések mérete és kiemelése, valamint a vonalak vastagsága és térközeik nagysága a térkép léptékének és funkciójának megfelelően változtatható, de kellő figyelmet kell fordítani az általuk hordozott információ fontosságára.

2.5 Mértékegységek

2.5.1 A távolságokat geodéziai távolságokból kell származtatni.

2.5.2 A távolságokat, vagy kilométerben, vagy tengeri mérföldben vagy, mindkettőben kifejezve kell feltüntetni, feltéve, hogy a mértékegységek megkülönböztetése egyértelmű.

2.5.3 A tengerszint, terepszint feletti magasságokat, vagy méterben, vagy lábban, vagy mindkettőben kifejezve kell feltüntetni, feltéve, hogy a mértékegységek megkülönböztetése egyértelmű.

2.5.4 A repülőtereken belüli távolságok, illetve a rövidebb távolságok hosszméreteit méterben kell kifejezni.

2.5.5 A távolságok, tengerszint feletti magasságok, tengerszintre vonatkoztatott magasságok és a terep feletti magasságok, illetve a méretek kifejezésére használt mértékegységek nagyságrendje (felbontása) egyezzen az illető térképhez előírtakkal.

2.5.6 A távolságok, tengerszint feletti magasságok, tengerszintre vonatkoztatott magasságok és a terep feletti magasságok, illetve a méretek kifejezésére használt mértékegységeket a térkép előlapján szembetűnően kell feltüntetni.

2.5.7 Távolságot, tengerszint feletti magasságot, tengerszintre vonatkoztatott magasságot feltüntető minden térképen (kilométer/tengeri mérföld, méter/láb) átszámító mérővonalat kell biztosítani. Az átszámító mérővonalat minden térkép esetében az előlapon kell elhelyezni.

2.6 Méretarány és vetület

2.6.1 A nagyobb kiterjedésű területeket ábrázoló térképek esetében a vetület megnevezését, alapvető adatait és a méretarányát fel kell tüntetni.

2.6.2 A kisebb területeket ábrázoló térképek esetében csak egy hossz-mérővonalat kell feltüntetni.

2.7 A légiforgalmi információk érvényességi dátuma

A légiforgalmi információ érvényességi dátumát minden térkép előlapján egyértelműen fel kell tüntetni.

2.8 A földrajzi nevek helyesírása

2.8.1 Minden írott szövegben a latin ABC írásjeleit kell alkalmazni.

2.8.2 A latin ABC írásjel változatait hivatalosan használó országokban lévő helyneveket és földrajzi jellegzetességek neveit hivatalos betűzésük szerint kell elfogadni, beleértve a vonatkozó ABC-ben használt ékezeteket és hangsúlyjeleket is.

2.8.3 Ha valamely adott térképen az olyan földrajzi fogalmakat, mint például "fok", "pont", "öböl", "folyó" rövidített formában közlik, azt a szót - mindegyik fajta legfontosabb példájára - a kiadó ügynökség által használt nyelven teljes egészében ki kell írni. Magán a térképen, rövidítéseknél kipontozás írásjel nem használható.

2.8.4 Ajánlás. - Olyan területeken, ahol latin betűs átiratú neveket hivatalosan nem alkottak, vagy nem fogadtak el, valamint a szerződő államok területén kívüli területeken, a neveket a nem-latin formáról a térkép készítő ügynökség által általában használt módszer szerint kell átírni.

2.9 Rövidítések

2.9.1 A légiforgalmi térképeken minden esetben rövidítést kell alkalmazni, ha az megfelelő.

2.9.2 **Ajánlás**. - *Ahol alkalmazható, a rövidítéseket a Légi-navigációs Szolgálatok Eljárásai - ICAO Rövidítések és Kódok (Doc 8400)-ból kell kiválasztani.*

2.10 Politikai határok

2.10.1 A nemzetközi határokat fel kell tüntetni, de a határvonalak megszakíthatók, ha az a térkép használhatósága szempontjából sokkal fontosabb adatot takarna el.

2.10.2 Ha egynél több állam területe szerepel a térképen, akkor az országokat azonosító neveket fel kell tüntetni.

Megjegyzés. - Függőségi terület esetében a felségjoggal bíró állam neve zárójelben feltüntethető

2.11 Színek

Ajánlás. - *A térképen alkalmazott színek feleljenek meg a 3. Függelék - Szín kódok -ban szereplőknek.*

2.12 Domborzat

2.12.1 A domborzat, ha ábrázolt, a felhasználó alábbi igényeit kielégítő módon kell feltüntetni:
a) tájolás és azonosítás;

b) biztonságos terep feletti elkülönítés;

c) a légiforgalmi információk hitelessége (amikor azokat feltüntetik)

d) tervezés.

Megjegyzés. - A domborzatot általában szintvonalak, magasság szerinti színárnyalás, a pontok tengerszint feletti magasságának feltüntetése és domborzati árnyékolás kombinációjával ábrázolják, az alkalmazott módszer kiválasztását a térkép jellege, méretaránya, valamint tervezett felhasználási köre befolyásolja.

2.12.2 **Ajánlás.** - Ha a domborzatot magassági színárnyalással ábrázolják, az alkalmazott színárnyalás alapjául a 4. Függelékben lévő Magassági szint színárnyalási útmutatóban feltüntetetteket kell venni.

2.12.3 Ha a magassági pontok tengerszint feletti magasságának feltüntetését alkalmazzák, akkor azokat kiválasztott kritikus pontokra kell feltüntetni.

2.12.3.1 A megbízhatatlan pontosságú magaslati pontok tengerszinthez viszonyított magassági értéke mögött ± jelet kell feltüntetni.

2.13 Tiltott, korlátozott és veszélyes légterek

Ha tiltott, korlátozott, vagy veszélyes légtereket tüntetnek fel, akkor a hivatkozási, vagy egyéb azonosító jelölést is fel kell tüntetni, kivéve, hogy a nemzeti azonosító betűk elhagyhatók.

Megjegyzés. - A nemzetiségi azonosító betűk azok, amelyeket a "Doc 7910 - Helységjelölések" tartalmaz.

2.14 Légiforgalmi szolgálati légterek

2.14.1 Ha a térképen ATS légteret tüntetnek fel, akkor kötelező feltüntetni a légtér osztályt, típust, nevet, vagy hívójelet, a függőleges határokat és a használandó rádió frekvenciá(ka)t, a vízszintes határokat pedig a 2. Függelék - ICAO Térkép Jelekkel egyezésben kell feltüntetni.

2.14.2 **Ajánlás.** - *A látás szerinti repüléshez használatos térképek mindegyikének fedő-, vagy hátoldalán fel kell tüntetni a 11. Annex ATS Légtér Osztályozási táblázatának azon részeit, amelyek a térkép által ábrázolt légtér osztályokra vonatkoznak.*

2.15 Mágneses eltérés

2.15.1 A földrajzi Északot és a mágneses eltérést fel kell tüntetni. A mágneses eltérés nagyságrendje (felbontása) az illető térképhez előírtaknak feleljen meg.

2.15.2 **Ajánlás.** - *Ha a térképen szerepeltetik a mágneses eltérést, akkor a feltüntetett érték a kiadás évéhez eső legközelebbi öttel osztható évszámnak megfelelő érték legyen, azaz 1980., 1985., stb. Kivételes esetekben, ha az éves változást kiszámítva a pillanatnyi érték egy foknál nagyobb eltérést mutat, akkor közbenső dátumot és értéket kell megadni.*

Megjegyzés. - A dátum és az éves változás értéke feltüntethető.

2.16 Betűtípusok

Megjegyzés. - A légiforgalmi térképeken alkalmazásra megfelelő betűtípus mintákat a Légiforgalmi Térkép Kézikönyv (Doc 8697) tartalmazza.

2.17 Légiforgalmi adatok

2.17.1 A szerződő állam tegyen meg minden szükséges intézkedést megfelelően szervezett minőség biztosító rendszer bevezetésére. E minőség biztosító rendszer, a 15. Annex 3.1.7. pontjában körvonalazottak szerint, minden funkcionális szakaszban a minőség kézben tartásának megvalósításához szükséges eljárásokat és erőforrásokat foglaljon magába. Ha szükséges, a minőség kézbentartásának menete mindegyik funkcionális szakaszra legyen bemutatható. Továbbá, a szerződő állam gondoskodjon róla, hogy kialakított eljárás legyen a légiforgalmi adatnak a forrásig visszamenő nyomon követhetőségére bármely adott pillanatban, oly módon, hogy a gyártás/karbantartás szakaszában, avagy az üzemi használat során az adat rendellenesség, vagy hiba egyaránt észlelhető és korrigálható legyen.

Megjegyzés. - A minőség biztosító rendszert szabályozó előírásokat a 15. Annex 3. Fejezete tartalmazza.

2.17.2 Az állam gondoskodjon róla, hogy a légiforgalmi adat térképi felbontásának nagyságrendje az illető térképre előírt és a 6. Függelékben táblázatos formában közzétettek szerinti legyen.

2.17.3 A szerződő állam biztosítsa a légiforgalmi adat integritásának megtartását az adat feldolgozás folyamatában kezdve az adat felméréstől/származtatástól egészen a szándék szerinti következő felhasználóig. Az adat integritási követelményeket az adat megbízhatatlanságból fakadó lehetséges veszélyekre, illetve a felhasználás fajtára kell alapozni, azaz, hogy az illető adat tételt milyen használat céljára teszik közzé. Következésképp, a következő osztályozást és adat integritási szintet kell alkalmazni:

a) kritikus adat, integritási szint 1 x 10-8: megbízhatatlan kritikus adat használatával nagyon valószínű, hogy a légijármű további biztonságos repülését és leszállását katasztrófa lehetőségét magában hordozó súlyos veszélyeztetésnek tennék ki;

b) fontos adat, integritási szint 1 x 10-5: megbízhatatlan fontos adatot használatával kicsi a valószínűsége, hogy a légijármű további biztonságos repülését és leszállását katasztrófa lehetőségét magában hordozó súlyos veszélyeztetésnek tennék ki; és

c) szokványos adat, integritási szint 1 x 10-3: megbízhatatlan szokványos adatot használatával nagyon kicsi a valószínűsége, hogy a légijármű további biztonságos repülését és leszállását katasztrófa lehetőségét magában hordozó súlyos veszélyeztetésnek tennék ki;

2.17.4 Az integritáshoz és az adat osztályozáshoz kötődő légiforgalmi adat minőségi követelmények a 6. Függelék 1 - 5 Táblázatában foglaltak szerintiek legyenek.

2.17.5 Az elektronikus formájú légiforgalmi adat védelmét tárolás és átvitel folyamán teljes egészében ciklikus redundancia ellenőrzéssel (cyclic redundancy check - CRC) kell felügyelni. A fenti 2.17.3 szerint osztályozott kritikus és a fontos légiforgalmi adatok integritási szintjének védelméhez 32-, vagy 24-bit CRC algoritmust kell alkalmazni (a sorrendnek megfelelően).

2.17.6 **Ajánlás.** - *A fenti 2.17.3 szerint osztályozott szokványos légiforgalmi adatok integritási szintjének védelméhez 16-bit CRC algoritmust kell alkalmazni.*

Megjegyzés. - A légiforgalmi adat minőségi követelményeiről (pontosság, felbontás, integritás, védelem és nyomon követhetőség) útmutató anyag a Geodéziai Világ Rendszer - 1984 (WGS-84) Kézikönyvben (Doc 9674) található. A 6. Függelék közzétételével összefüggő, a térkép felbontáshoz és a légiforgalmi adat integritáshoz kapcsolódó megalapozó anyag az RTCA DO-201A dokumentumában és az European Organization for Civil Aviation Equipment (EUROCAE) ED-77 - Légiforgalmi Információk Ipari Követelményei dokumentumában található.

2.18. Közös viszonyítási rendszer

2.18.1 Vízszintes vonatkoztatási rendszer

2.18.1 A vízszintes irányú (geodéziai) vonatkoztatási rendszerként a Geodéziai Világrendszer - 1984 (WGS-84)-et kell alkalmazni. A közzétett légiforgalmi geodéziai (földrajzi szélességet és hosszúságot jelző) koordinátákat a WGS-84 geodéziai vonatkoztatási alap szerint kell kifejezni.

Megjegyzés. - A WGS-84-el kapcsolatos átfogó útmutató anyag a Geodéziai Világrendszer - 1984 (WGS-84) Kézikönyvben (Doc 9674) található.

2.18.1.2 Csillag megjelöléssel kell ellátni azokat a WGS-84 koordinátákká átalakított földrajzi koordinátákat, amelyek esetében az eredeti terepfelmérés pontossága nem teljesíti a 11. Annex 2. Fejezetében és a 14. Annex I. és II. Kötetének 2. Fejezetében szereplő követelményeket.

2.18.1.3 A térkép földrajzi koordináta felbontási mértéke feleljen meg az illető térképfajtára előírtaknak és legyen egyezésben a 6. Függelék 1. Táblázatában közöltekkel.

Megjegyzés. - A WGS-84 rendszerrel kapcsolatos és a légiforgalmi szolgálatok által kijelölt földrajzi pontok légiforgalmi koordinátáinak meghatározását és jelentését (a terepmunka pontosságát és az adat integritását) szabályozó előírások a 11. Annex 2. Fejezetében és 5. Függelékének 1. Táblázatában, a repülőterekkel/helikopter repülőterekkel kapcsolatos helyzetpontokra vonatkozóan pedig a 14. Annex I. és II. Kötetének 2. Fejezetében, valamint az 5. Függelék 1. Táblázatában szerepelnek a sorrendnek megfelelően.

2.18.2 Függőleges viszonyítási rendszer

2.18.2.1 Függőleges vonatkoztatási rendszerként a gravitáció függvényű magasságnak (elevation) a geoidként ismert felülettel való összefüggését adó közepes tengerszint (MSL) alapadatot kell alkalmazni .

1. Megjegyzés. - Világméreteket nézve a geoid leginkább az MSL-hez közelít. Meghatározása szerint a geoid a Föld gravitációs mezejében azonos potenciájú felület, amely egybeesik a kontinensekre folytatólagosan kiterjesztett zavarmentes MSL-el.

2. Megjegyzés. - A gravitáció függvényű magasságokat (elevation) orthometric magasságoknak is nevezik, míg az ellipszoid feletti pontok távolságát ellipszoidikus magasságoknak mondják.

2.18.2.2 Az egyedileg felmért földi helyzetpontok MSL-hez viszonyított szintmagasságának (elevation) közzétételén felül, közzé kell tenni az e pontokhoz tartozó (WGS-84 ellipszoidhoz viszonyított) geoid egyenetlenséget is, az adott térképre előírtak szerint.

Megjegyzés. - Repülőterek/helikopter repülőterek kijelölt helyzetpontjainál a szintmagasság (elevation) és a geoid egyenetlenség meghatározását és jelentését (a terepmunka pontosságát és az adat integritását) szabályozó előírások a 14. Annex I. és II. Kötetének 2. Fejezetében, valamint az 5. és az 1. Függelék 2. Táblázatában szerepelnek a sorrendnek megfelelően.

2.18.2.3 A szintmagasságok és a geoid egyenetlenség felbontása az adott térképre előírtnak megfelelő és a 6. Függelék 2. Táblázatával egyező legyen.

2.18.3 Időpont vonatkoztatási rendszer

2.18.3.1 Időpont vonatkoztatási rendszerként a Gergely naptárt és a koordinált világ időt (UTC) kell alkalmazni.

2.18.3.2 Ha térképezéshez eltérő időpont viszonyítási rendszert alkalmaznak, akkor e tényt a Légiforgalmi Tájékoztató Kiadvány (AIP) GEN 2.1.2 pontjában jelezni kötelező.

3. FEJEZET - ICAO A TÍPUSÚ REPÜLŐTÉRI AKADÁLY TÉRKÉP - (ÜZEMELTETÉSI KORLÁTOZÁSOK)

3.1 Rendeltetése

3.1.1 Ez a térkép a C típusú Repülőtéri Akadály Térképpel, vagy az AIP-ben közzétett információkkal együttesen biztosítsa az üzemeltetők számára a 6. Annex I. és II. Részének 5. Fejezetében, továbbá a III. Rész 3. Fejezetében leírt üzemeltetési korlátozások teljesítéséhez szükséges adatokat.

3.2 Alkalmazási előírások

Az ICAO A típusú Repülőtéri Akadály Térképet (Üzemeltetési Korlátozások) a nemzetközi polgári repülés által rendszeresen használt minden repülőtérről az 1.3.2 pontban előírt módon rendelkezésre kell bocsátani, kivéve azokat a Repülőtereket, ahol a felszállás pályája mentén nincsenek akadályok.

3.2.2 Ha ez a térkép nem szükséges, mert a felszállás pályája mentén nincsenek akadályok, akkor ilyen értelmű tájékoztatást kell közzétenni.

3.3 Mértékegységek

3.3.1 A tengerszinthez viszonyított magasságokat a legközelebbi fél méter, vagy legközelebbi egész láb értéknek megfelelő pontossággal kell feltüntetni.

3.3.2 A hossz-méreteket a legközelebbi fél méter értéknek megfelelő pontossággal kell feltüntetni.

3.4 Fedésterület és méretarány

3.4.1 Mindegyik felülnézeti térképrajz méretének elegendő nagyságúnak kell lennie ahhoz, hogy az összes lényeges akadályt magába foglalja.

Megjegyzés. - Az olyan egyedül álló távoli mérvadó akadályokat, amelyek a térkép méretét szükségtelenül növelnék, jelezhetők mindössze a megfelelő térképjellel és egy nyíllal is, azzal a feltétellel, hogy az akadálynak legtávolabbi futópálya végétől mért távolságát és irányát eltávolítják, az akadály tengerszinthez viszonyított magasságát közlik.

3.4.2 A vízszintes méretarány 1:10 000-től 1:15 000-ig terjedő tartományba essen.

3.4.3 **Ajánlás**. - A vízszintes méretarány 1:10 000 legyen.

Megjegyzés. - Ha a térkép előállítása ezzel megkönnyíthető az 1 : 20 000 méretarány is alkalmazható.

3.4.4 A függőleges méretarány a vízszintes méretarány tízszerese legyen.
3.4.5 Hossz-mértékvonalak. A térképeken fel kell tüntetni a méter és láb beosztású vízszintes- és függőleges mértékvonalat.

3.5 Formátum

3.5.1 A térképeken felülnézeti és metszetrajzban ábrázolni kell minden futópályát és a hozzájuk tartozó minden végbiztonsági és akadálymentes sávot, a felszállás pályájának területét és az akadályokat.

3.5.2 A metszetrajzon - a megegyező felülnézeti rajz felett - fel kell tüntetni az egyes futópályákat, végbiztonsági és akadálymentes sávokat, valamint a felszállás pályájának területén lévő akadályokat. Az alternatív felszállási pálya terület oldalnézeti metszete foglalja magába a teljes felszálló pályát és olymódon kell a megfelelő felülnézeti rajza fölé helyezni, amely a tájékoztatás azonnali megértését a legmegfelelőbben szolgálja.

3.5.3 A futópálya kivételével a teljes metszetre, metszet méret hálót kell fektetni. A függőleges vonalháló kiindulási pontja a közepes tengerszint legyen. A vízszintes vonalháló kiindulási pontja a vonatkozó felszállás pályája alatti terület kezdetétől távolabb lévő futópályavég legyen. A beosztási térközöket jelző osztóvonalakat a méretarány alap vonalán és a függőleges határvonalakon végig (azok teljes hosszában) fel kell tüntetni.

3.5.3.1 **Ajánlás**.- *A függőleges méret hálót 30 m-es (100 láb), a vízszintes méret hálót 300 m-es (1000 láb) térközökkel kell ábrázolni.*

3.5.4 A térkép tartalmazzon:

a) A 3.8.3 pontban megadott üzemi adatok rögzítésére szolgáló ablakot;

b) A módosítások és azok dátumainak bejegyzésére szolgáló ablakot.

3.6 Azonosítás

A térképet a következő nevekkel kell azonosítani: az ország neve, amelyben a repülőtér elhelyezkedik, annak a városnak, vagy körzetnek a neve, amelyet a repülőtér kiszolgál, továbbá a repülőtér neve és a futópálya(ák) azonosítói.

3.7 Mágneses eltérés

A térképen a legközelebbi fokra kerekített mágneses eltérést, valamint az adatok felmérési dátumát fel kell tüntetni.

3.8 Légiforgalmi adatok

3.8.1 Akadályok

3.8.1.1 Akadálynak kell tekinteni és fel kell tüntetni a felszállás pályája alatti területen lévő, a felszállás pályájának kezdőpontjától induló, 1,2%-os lejtésű síkon túlnyúló akadályokat, kivéve azokat az akadályokat, amelyek a 3.8.1.2 pontban meghatározottak szerint teljes egészében más akadályok árnyékában fekszenek. Az olyan mozgó akadályokat, mint például hajók, vonatok, teherautók, stb., amelyek az 1,2%-os síkon túlnyúlnak, akadályoknak kell tekinteni, de ezeket nem lehet úgy venni, hogy azok képesek az árnyékhatás létrehozására.

3.8.1.2 Egy akadály árnyékát olyan sík felületként kell kezelni, amely az akadály tetején keresztül és a felszállási pálya területére merőlegesen húzott vízszintes vonalnál kezdődik. Ez a sík a felszállás nyomvonalának teljes szélességét fedi és vagy a 3.8.1.1 pontban meghatározott síkig, vagy a legközelebbi magasabb akadályig tart, amelyik előbb helyezkedik el. A felszállás nyomvonalának első 300 m-én (1000 láb) az árnyék síkok vízszintesek, ezen a ponton túl a síkok felfelé 1,2%-os meredekséggel emelkednek.

3.8.1.3 Ha az árnyékhatást létrehozó akadályt várhatóan eltávolítják, akkor a térképen fel kell tüntetni azokat az tárgyakat, amelyek az előző akadály eltávolítása után akadályokká válnak.

3.8.2 A felszállási pálya nyomvonal területe

3.8.2.1 A felszállás pályája alatti terület a föld felszínén közvetlenül a felszállás pályája alatt kijelölt, annak két oldalán szimmetrikusan elhelyezkedő, négy oldallal rendelkező terület. Ez a terület a következő jellemzőkel rendelkezik:

a) a felszállásra alkalmasként közzétett terület végénél kezdődik (azaz, a futópálya, vagy az akadálymentes sáv végénél - amelyik alkalmazandó);

b) szélessége a kiinduló pontnál 180 m (600 láb) és ez 0,25D értékkel növekszik 1800 m (6000 láb) legnagyobb szélességig, ahol is "D" egyenlő a kiindulási ponttól mért távolsággal;

c) addig a pontig terjed, amelyen túl nincsenek akadályok, vagy 10 km (5,4 tengeri mérföld) távolságig, amelyik a kisebb.

3.8.2.2 Az olyan légijárműveket kiszolgáló futópályák esetében, amely légijárművek üzemelési korlátjai miatt 1,2 %-nál kisebb meredekségű emelkedési gradiens alkalmazása nincs kizárva, a felszállás pályája alatti terület 3.8.2.1 c) pontban meghatározott hosszát legalább 12 km-re (6,5 tengeri mérföld) meg kell növelni és a síknak a 3.8.1.1 pontban, illetve a 3.8.1.2 pontban meghatározott emelkedését 1 %-ra, vagy ennél kisebbre kell csökkenteni.

Megjegyzés. - Ha az 1,0 százalékos felmérő sík akadályt nem érint, akkor hajlásszöge addig *csökkenthető, amíg a sík valamely akadállyal érintkezik.*

3.8.3 Közzétett úthosszak

3.8.3.1 Minden futópálya mindkét irányára a következő tájékoztatást kell feltüntetni az e célra biztosított helyen:

a) rendelkezésre álló nekifutási úthossz;

b) rendelkezésre álló gyorsítás-fékezési úthossz

c) rendelkezésre álló felszálló úthossz;

d) rendelkezésre álló leszálló úthossz;

Megjegyzés. - - A 14. Annex I. Kötet, A Mellékletének 3. szakaszában útmutatás található a közzétett úthosszakról.

3.8.3.2 **Ajánlás.** - *Ha valamelyik úthosszat nem teszik közzé, mert a futópálya csak egy irányból használható, akkor a futópályát "felszállásra, leszállásra, vagy mindkettőre nem használható"-ként kell azonosítani.*

3.8.4 Felülnézeti és oldalnézeti ábrázolások

3.8.4.1 A felülnézeti ábrán:

a) a futópályák körvonalát folyamatos vonallal kell ábrázolni, beleértve hosszukat és szélességüket, a legközelebbi fokra kerekített mágneses irányukat és a futópálya számát;

b) az akadálymentes területet szaggatott vonallal kell jelölni, beleértve a hosszát és ilyen területként való azonosítását;

c) a felszállást követő repülés nyomvonalának területeit szaggatott vonallal és középvonalát hosszú/rövid vonalakból álló vékony szaggatott vonallal kell jelölni;

d) a felszállást követő repülés alternatív nyomvonal területeket. Ha a futópálya meghosszabbított középvonalára nem központos felszállást követő repülési alternatív nyomvonal területeket ábrázolnak, akkor egy, az ilyen területek jelentőségét magyarázó megjegyzést kell biztosítani.

e) az akadályokat, beleértve:

1) az egyes akadályok pontos helyét, az akadály fajtáját mutató jel feltüntetésével együtt;

2) az egyes akadályok tengerszinthez viszonyított magasságát és azonosítását;

3) a nagy kiterjedésű akadályok túlnyúlásának határértékeit megkülönböztető módon kell feltüntetni és a jelmagyarázatban azonosítani.

Megjegyzés. - Ez nem zárja ki a felszállást követő repülési nyomvonal területén belül lévő kritikus magassági pontok jelzésének szükségességét.

3.8.4.1.1 **Ajánlás.** - *A futópálya és végbiztonsági sáv felületek fajtáját fel kell tüntetni.*

3.8.4.1.2 **Ajánlás.** - *A végbiztonsági területeket, mint olyanokat azonosítani kell és szaggatott vonallal kell jelezni.*

3.8.4.1.3 Ha a végbiztonsági területeket ábrázolják, akkor az egyes végbiztonsági területek hosszát meg kell adni.

3.8.4.2 Az oldalnézeti rajzokon fel kell tüntetni:

a) a futópálya középvonalának metszetrajzát folyamatos vonallal és az egyes kapcsolódó végbiztonsági sávok és akadálymentes területek középvonalának metszetrajzát szaggatott vonallal;

b) a futópálya középvonalának tengerszinthez viszonyított magasságát, a futópálya mindkét végénél, a végbiztonsági sávoknál, az egyes felszállási repülési nyomvonal területek kezdeténél valamint a futópálya és a végbiztonsági sáv lejtésének minden jelentős változásánál;

c) az akadályokat, beleértve:

1) az egyes akadályokat olyan folyamatos vonallal, amely egy tetszés szerinti megfelelő hálózati vonaltól legalább még egy hálózati vonalon keresztül az akadály tetejének tengerszinthez viszonyított magasságáig terjed;

2) az egyes akadályok azonosítását;

3) a nagy kiterjedésű akadályok túlnyúlási határait megkülönböztető módon és a jelmagyarázatban azonosítva.

Megjegyzés. - Az akadály profil is feltüntethető, amely az egyes mérvadó akadályok tetejét összekötő vonal és, amely az egymás után következő mérvadó akadályok általi árnyékhatást képviseli.

3.9 Pontosság

3.9.1 Az elért pontosság mértékét a térképen fel kell tüntetni.

3.9.2 **Ajánlás.** - *A futópálya, a végbiztonsági sáv és az akadálymentes terület térképén feltüntetendő vízszintes kiterjedését és tengerszinthez viszonyított magasságát a legközelebbi 0,5 m-re (1 láb) kell meghatározni.*

3.9.3 **Ajánlás.** - *A terepen végzett felmérő munka és a térkép elkészítésének pontossági fokának olyannak kell lennie, hogy a térképen végezhető mérések pontossága a felszállást követő repülési nyomvonal területén a következő legnagyobb eltérésen belül legyen.*

1) *vízszintes távolságokra: 5 m (15 láb) a kezdőpontnál és azt követően 1/500-as nagyságrenddel növekvő eltéréssel;*

2) *függőleges méretekre: 0,5 m (1,5 láb) az első 300 méteren (1000 láb) és azt követően 1/1000-es nagyságrenddel növekvő eltéréssel;*

3.9.4 Magasság viszonyítási alap. Ha nincs pontos magasság viszonyítási alap, akkor az alkalmazott magasság viszonyítási alap pontjának tengerszinthez viszonyított magasságát kell megállapítani és, 'feltételezett érték' megjelöléssel kell ellátni.

4. FEJEZET -

ICAO B TÍPUSÚ REPÜLŐTÉRI AKADÁLY TÉRKÉP

4.1 Rendeltetése

A térképnek az alábbi feladatok teljesítéséhez kell információt biztosítania:

a) a minimális biztonságos tengerszinthez viszonyított magasságok megállapításához, beleértve a körözési eljárásokra vonatkozókat is.

b) a felszállás, vagy a leszállás során bekövetkező kényszerhelyzet esetén alkalmazandó eljárások megállapításához;

c) az akadály elkerülési és jelölési követelmények alkalmazásához;

d) forrás adatanyag biztosítására légiforgalmi térképekhez.

4.2 Alkalmazási rendelkezések

4.2.1 **Ajánlás.** - Az ICAO B Típusú Repülőtéri Akadály Térképet a nemzetközi polgári repülés által rendszeresen használt minden repülőtérről az 1.3.2 pontban előírt módon rendelkezésre kell bocsátani.

4.2.2 Ha a 3. és a 4. fejezet előírásait egyesítő térképet tesznek közzé, akkor azt "ICAO (összevont) Repülőtéri Akadály Térkép" névvel kell ellátni.

4.3 Mértékegységek

4.3.1 A tengerszinthez viszonyított magasságokat a legközelebbi fél méter, vagy legközelebbi egész láb értéknek megfelelő pontossággal kell feltüntetni.

4.3.2 A hossz-méreteket a legközelebbi fél méter értéknek megfelelő pontossággal kell feltüntetni.

4.4 Fedésterület és méretarány

4.4.1 Minden egyes felülnézeti térképrajz méretének elegendő nagyságúnak kell lennie ahhoz, hogy az összes akadályt magába foglalja.

Megjegyzés. - Az olyan egyedül álló távoli akadályok, amelyek a térkép méretét szükségtelenül növelnék, jelezhetők mindössze a megfelelő térképjellel és egy nyíllal is, azzal a feltétellel, hogy az akadálynak a repülőtér vonatkoztatási pontjától mért távolságát és irányát, továbbá az akadály tengerszinthez viszonyított magasságát is közlik.

4.4.2 A vízszintes méretarány 1:10 000-től 1:20 000-ig terjedő tartományba essen.

4.4.3 A térképeken fel kell tüntetni egy vízszintes mérővonal skálát, amely a méter és láb értékeket egyaránt tartalmazza. Ha szükséges, a hossz értékeket kilométerben is és tengeri mérföldben is mutató mérővonalat is fel kell tüntetni.

4.5 Formátum

A térképeken ábrázolni kell:

a) az alkalmazott vetület minden szükséges magyarázatát;

b) az alkalmazott hálózat minden szükséges magyarázatát;

c) annak jelölését, hogy a feltüntetett akadályok azok az akadályok, amelyek a 14. Annex, I. Kötet, 4. Fejezetében meghatározott felületeken túlnyúlnak;

d) egy, a módosítások és azok időpontjainak bejegyzésére alkalmas rovatot;

e) a térkép határoló vonalán kívül, a földrajzi szélesség és hosszúság minden egyes fokának és fokpercének jelölését.

Megjegyzés. - A szélességi és hosszúsági körök vonalait a térképen végighúzva is fel lehet tüntetni.

4.6 Azonosítás

A térképet a következő nevekkel kell azonosítani: az ország neve, amelyben a repülőtér elhelyezkedik, annak a városnak, vagy körzetnek a neve, amelyet a repülőtér kiszolgál, továbbá a repülőtér neve.

4.7 Kultúr környezet és tereprajz

4.7.1 A vízelvezetési és vízrajzi részleteket a minimumra kell szorítani.

4.7.2 A repülőtérhez kapcsolódó épületeket és egyéb jellemző jellegzetességeket fel kell tüntetni. Ahol lehetséges, ezeket mérethelyesen kell ábrázolni.

4.7.3 A térképen fel kell tüntetni minden olyan mesterséges és természetes akadályt, amely a 4.9 pontban meghatározott felszállási és megközelítési felületeken, vagy a 14. Annex, I. Kötet, 4. Fejezetében meghatározott akadály elkülönítési és akadály jelölő felületeken túlnyúlik.

4.7.4 A térképen ábrázolni kell azokat az utakat és vasutakat, amelyek a felszállási és a megközelítési területen belül, a futópályától vagy a futópálya meghosszabbítástól kevesebb, mint 600 méter (2000 láb) távolságban fekszenek.

Megjegyzés. - A terepjellegzetességek neve, ha ezek jelentőséggel bírnak, feltüntethetők.

4.8 Mágneses eltérés

A térképen el kell helyezni egy, a földrajzi Északra tájolt iránytűrózsát, vagy egy Észak pontot és fel kell tüntetni a legközelebbi fokra kerekített mágneses eltérést az adat felmérési dátumával és az évenkénti változással egyetemben.

4.9 Légiforgalmi adatok

4.9.1 A térképen fel kell tüntetni:

a) a repülőtér vonatkoztatási pontját és annak földrajzi koordinátáit fokban, fokpercben és fokmásodpercben;

b) a futópályák körvonalát folyamatos vonallal;

c) a futópályák hosszát és szélességét;

d) a futópályák legközelebbi fokra kerekített mágneses irányát és a futópálya számát;

e) a futópálya középvonalának tengerszinthez viszonyított magasságát a futópálya mindkét végénél, a végbiztonsági sávoknál, az egyes felszállást követő repülési nyomvonal és megközelítési repülés nyomvonal területek kezdeténél, valamint a futópálya és a végbiztonsági sáv lejtésének minden jelentős változásánál;

f) a guruló utakat, az előtereket és az állóhely területeket ilyenként azonosítva, körvonalaikat folyamatos vonallal ábrázolva;

g) a végbiztonsági területet szaggatott vonallal és ilyen területként való azonosítását;

h) az egyes végbiztonsági sávok hosszát;

i) az akadálymentes területeket szaggatott vonallal és ilyen területként azonosításukat;

j) az egyes akadálymentes területek hosszát;

k) a felszállási és megközelítési felületeket ilyenekként azonosítva és szaggatott vonallal ábrázolva;

l) a felszállási és megközelítési területeket;

Megjegyzés. - A felszállási terület leírását a 3.8.2.1 pont tartalmazza. A megközelítési terület a 14. Annex, I. Kötet, 4. Fejezetében meghatározottak szerinti közvetlenül a megközelítési felület alatt fekvő földfelszíni terület.

m) az akadályokat pontos helyükön, beleértve:

1) az akadály fajtájára utaló jelölést;

2) a tengerszinthez viszonyított magasságot

3) azonosítását;

4)) a nagymérvű túlnyúlások határértékeit a jelmagyarázatban azonosított megkülönböztető módon és;

Megjegyzés. - Ez nem zárja ki a felszállást követő repülési nyomvonal területén belül lévő kritikus magassági pontok jelzésének szükségességét.

n) minden olyan további, a 3.8.1.1 pont szerint meghatározott akadályt, beleértve az akadályok árnyékában lévő akadályokat is, amelyeket egyébként nem kellene feltüntetni.

Megjegyzés. - A 14. Annex, I. Kötet, 4. Fejezetében meghatározott követelmények minimum követelmények. Ha az illetékes hatóság alacsonyabb felületeket alakított ki, ott ezek alkalmazhatók az akadályok kijelölésére.

4.9.1.1 **Ajánlás.** - *A futópálya és végbiztonsági sáv felületek fajtáját meg kell nevezni.*

4.9.1.2 **Ajánlás.** - *Ha megvalósítható, a térképen szembeötlően kell feltüntetni a repülőtér vonatkoztatási pontjától mért 5000 m-es (15 000 láb) sugarú körön belül lévő, a kapcsolódó megközelítési területek közötti legmagasabb tárgyat, vagy akadályt.*

4.9.1.3 **Ajánlás.** - *A részben akadályt képező fás területek és domborzati jellemzők kiterjedését* *ábrázolni kell.*

4.10 Pontosság

4.10.1 Az elért pontosság mértékét a térképen fel kell tüntetni.

4.10.2 Ajánlás. - A térképen feltüntetett mozgási területek, végbiztonsági sávok és akadálymentes területek vízszintes kiterjedtségét és a tengerszinthez viszonyított magasságát a legközelebbi 0,5 m-re (1 láb) kerekítve kell ábrázolni.

4.10.3 **Ajánlás.** - *A terepen végzett felmérő munka pontossági fokának és a térkép elkészítési pontosságának olyannak kell lennie, hogy a térképen végezhető mérések pontossága a következő legnagyobb eltérésen belül legyen:*

a) felszállási és megközelítési területek:

1) vízszintes távolságokra: 5 m (15 láb) a kezdőpontnál és azt követően 1/500-as nagyságrenddel növekvő eltéréssel;

2) függőleges méretekre: 0,5 m (1,5 láb) az első 300 méteren (1000 láb) és azt követően 1/1000-es nagyságrenddel növekvő eltéréssel;

b) egyéb területek:

1) vízszintes távolságokra: 5 m (15 láb) a repülőtér vonatkoztatási pontjától mért 5000 m-en (15 000 láb) belül és 12 m (40 láb) e területen kívül;

2) függőleges méretekre: 1 m (3 láb) a repülőtér vonatkoztatási pontjától mért 1500 m-en (5 000 láb) távolságon belül és azt követően 1/1000-es nagyságrenddel növekvő eltéréssel;

4.10.4 Magasság viszonyítási alap. Ha nincs pontos magasság viszonyítási alap, akkor az alkalmazott magasság viszonyítási alap pontjának tengerszinthez viszonyított magasságáról kell nyilatkozni és, mint feltételezett értéket kell jelölni.

5. FEJEZET - ICAO C TÍPUSÚ REPÜLŐTÉRI AKADÁLY TÉRKÉP

5.1 Rendeltetése

Előállítása esetén, e térképnek kell biztosítania az üzemeltetők számára a 6. Annex I. és II. Részének 5. Fejezetében, továbbá a III. Rész 3. Fejezetében leírt üzemeltetési korlátozásoknak eleget tévő eljárások kidolgozásához szükséges akadály adatokat, különös tekintettel a megengedett legnagyobb felszálló tömeget korlátozó akadályokról történő tájékoztatásra, valamint:

a) a minimális biztonságos tengerszinthez viszonyított magasságok megállapításához, beleértve a körözési eljárásokra vonatkozókat is;

b) a felszállás, vagy a leszállás során bekövetkező vészhelyzet esetén használatos eljárások meghatározásához;

c) forrás adatanyag biztosítását a légiforgalmi térképekhez és légiforgalmi adatbázisokhoz.

Megjegyzés. - E térkép szándék szerinti céljáról és használatáról a Légiforgalmi Térkép Kézikönyv (Doc 8697) tartalmaz magyarázatot.

5.2 Alkalmazási rendelkezések

Ez a térkép nem szükséges, ha:

a) az 5.1 pontban meghatározott akadályok adatait a Légiforgalmi Tájékoztató Kiadványban (AIP) közzétették; vagy

b) nincsenek akadályok és erről a tényről a Légiforgalmi Tájékoztató Kiadványban tájékoztatást tettek közzé.

5.3 Fedésterület és méretarány

5.3.1 Az egyes térképlapok mérete legyen elegendő ahhoz, hogy:

a) magába foglalja a felszállás pályája alatti területen lévő összes olyan akadályt, beleértve az akadály árnyékában lévő akadályokat is, amelyik a felszállás pályájának kezdőpontjától induló, 1,2%-os lejtésű síkon túlnyúlik. Figyelembe kell venni az 1,2%-os síkon esetleg túlnyúló olyan mozgó akadályokat is, mint például hajók, vonatok, teherautók, stb.;

b) fedje az összes olyan akadályt, amely 120 méterrel (400 láb), vagy ettől jobban túlnyúlik a futópályá(ko)n található legalacsonyabb tengerszinthez viszonyított magasságon és, amely befolyásolhatja a megengedhető maximum felszálló tömeget, vagy a légijármű repülési profiljának megválasztását, mind az egyenes vonalú felszállások területén, és minden olyan területen, amely felett fordulóval végzett felszállásra kerülhet sor;

c) nyújtson tereprajzi tájékoztatást a repülőtér vonatkoztatási pontjától mért hozzávetőleg 45 km-es (24 tengeri mérföld) távolságon belüli területről.

5.3.2 A vízszintes méretarány 1:20 000-től 1:100 000-ig terjedő tartományba essen.

Megjegyzés. - A javasolt méretarány 1:50 000.

5.4 Formátum

A térképeken ábrázolni kell:

a) az alkalmazott vetület minden szükséges magyarázatát;

b) az alkalmazott hálózat minden szükséges azonosítását;

c) egy, a módosítások és azok időpontjainak bejegyzésére alkalmas rovatot;

d) az 5.8.2 pontban meghatározott, közzétett úthosszak beírására alkalmas rovatot;

e) a térkép határoló vonalán kívül, a földrajzi szélesség és hosszúság fokbeosztási jelöléseket egyenletes távközönként, legalább a földrajzi szélesség és hosszúság minden 10 percét fokokban és fokpercekben feltüntetve.

1. Megjegyzés. - A szélességi és hosszúsági körök vonalai a térképen végighúzva is feltüntethetők.

2. Megjegyzés. - Az ICAO "C" Típusú Repülőtéri Akadály Térkép bármilyen alkalmas, rendelkezésre álló tereprajzot tartalmazó térkép, vagy térképsorozat lehet, amelyen a szükséges légiforgalmi adatokat megkülönböztető színnel felülnyomják.

5.5 Azonosítás

A térképet a következő nevekkel kell azonosítani: az ország neve, amelyben a repülőtér elhelyezkedik, annak a nagyvárosnak, vagy városnak a neve, amelyet a repülőtér kiszolgál, továbbá a repülőtér neve.

5.6 Mágneses eltérés

Ajánlás. - A térképen szerepelnie kell a legközelebbi fokra kerekített mágneses eltérésnek az adat felmérés dátumával és az évenkénti változás értékével egyetemben.

5.7 Mértékegységek

5.7.1 A tengerszinthez viszonyított magasságokat a legközelebbi méterre, vagy legközelebbi egész lábra kerekített érték pontossággal kell feltüntetni.

5.7.2 A hossz-méreteket a legközelebbi méterre kerekített érték pontossággal kell feltüntetni.

5.8 Légiforgalmi adatok

5.8.1 A térképen fel kell tüntetni:

a) a repülőtér vonatkoztatási pontját és annak földrajzi koordinátáját fokokban, fokpercekben és fokmásodpercekben;

b) a futópályákat és a futópályák meghosszabbított középvonalait;

c) az akadályokat az 5.3.1 a) és b) pontban szereplők szerint; az egyes felülnézeti térképrajzok mérete olyan legyen, hogy fedje az összes akadályt kivéve, hogy a térképlap méreteit szükségtelenül növelő, egyedülálló távoli akadályok jelölhetők egyetlen nyíllal is, azzal a feltétellel, hogy az ilyen akadálynak egy vonatkoztatási ponttól mért távolságát és irányát, továbbá az akadály tengerszinthez viszonyított magasságát és földrajzi koordinátáját fokokban, fokpercekben, fokmásodpercekben és tized fokmásodpercekben is közlik.

d) szimbólummal jelölve az egyes akadályok pontos helyét és földrajzi koordinátáját fokokban, fokpercekben, fokmásodpercekben és tized fokmásodpercekben;

e) minden akadály tengerszinthez viszonyított magasságát;

f) az egyes akadályok fajtájának jelölését;

Megjegyzés. - Az akadályok fajtája szöveges formában is megadható, illetve olyan területeken, ahol ez túlzott zsúfoltságot okozna, ott az akadály a térképen belül számmal jelölhető és a számok/akadályfajták a térkép szélén vagy külön lapon táblázatos formában közölhetők.
g) a nagyméretű akadályok túlnyúlási határait megkülönböztető módon és a jelmagyarázatban azonosítva;

Megjegyzés. - Ez nem mentesít az adott területen belül lévő kritikus magassági pontok jelzésének és pontos helyének és földrajzi koordinátájának fokokban, fokpercekben, fokmásodpercekben és tized *fokmásodpercekben való feltüntetésének szükségessége alól.*

h) az összes rádió-navigációs berendezés helyét.

5.8.2 Közzétett úthosszak

5.8.2.1 Minden futópálya mindkét irányára a következő tájékoztatást kell feltüntetni az e célra biztosított helyen:

a) rendelkezésre álló nekifutási úthossz;

b) rendelkezésre álló gyorsítás-fékezési úthossz

c) rendelkezésre álló felszálló úthossz;

d) rendelkezésre álló leszálló úthossz;

Megjegyzés. - A 14. Annex I. Kötet, A Mellékletében található útmutatás a közzétett úthosszakról.

5.8.2.2 **Ajánlás.** - *Ha valamelyik úthosszat nem teszik közzé, mert a futópálya csak egy irányból használható felszállásra, leszállásra, vagy egyikre sem használható, akkor a futópályát "nem használható" szavakkal vagy az "NU" rövidítés beírásával kell azonosítani.*

5.9 Pontosság

Az elért pontosság mértékét a térképen fel kell tüntetni.

6. FEJEZET - ICAO PRECIZIÓS MEGKÖZELÍTÉSI TEREP TÉRKÉP

6.1 Rendeltetése

A térkép rendeltetése, hogy a befejező megközelítés egy meghatározott részéről részletes terepmetszeti tájékoztatást nyújtson a légijármű üzemeltetők részére a rádió-magasságmérő használat céljaira megállapítandó elhatározási magasságra a terepviszonyok által gyakorolt hatás felméréséhez.

6.2 Alkalmazási rendelkezések

6.2.1 Az "ICAO Precíziós Megközelítési Terep Térkép"-et a nemzetközi polgári légi-közlekedés által használt minden repülőtér minden II. és III. kategóriájú precíziós megközelítéssel rendelkező futópályájára el kell készíteni.

6.2.2 Az "ICAO Precíziós Megközelítési Terep Térkép"-et minden esetben módosítani kell, amikor bármiféle jelentősebb változás történik.

6.3 Méretarányok

6.3.1 **Ajánlás.** - *A vízszintes méretarány 1:2 500, a függőleges 1:500 méretarány legyen.*

6.3.2 **Ajánlás.** - *Ha a térkép a futópálya küszöbtől 900 m-nél (3000 láb) távolabb lévő terület terep metszetrajzát tartalmazza, akkor a vízszintes méretarány 1:5 000 legyen.*

6.4 Azonosítás

A térképet a következő nevekkel kell azonosítani: az ország neve, amelyben a repülőtér elhelyezkedik, annak a körzetnek, vagy városnak a neve, amelyet a repülőtér kiszolgál, a repülőtér neve és a futópálya azonosítója.

6.5 Felülnézeti és metszet információk

6.5.1 A térképnek tartalmaznia kell:

1) felülnézeti ábrázolást a metszetrajzon szereplőkkel egyező távolságig, a szintvonalakat a futópálya meghosszabbított középvonala mentén és annak mindkét oldalán 60-60 méteren (200 láb) belüli területen 1 m (3 láb) térközönként tüntetve fel, a szintvonalakat a küszöbhöz kell viszonyítani;

2) annak jelzését, hogy a terep vagy a terepen lévő bármilyen akadály a fenti 1) pontban meghatározott felülnézeti rajzon (3 méterrel (10 láb) eltér a középvonal metszésvonalának magasságától és valószínű, hogy a rádió-magasságmérőt befolyásolja;

3) a terep metszetrajzát a futópálya meghosszabbított középvonala mentén a futópálya küszöbtől 900 m (3000 láb) távolságig.

6.5.2 **Ajánlás**. - *Ha a futópálya küszöbétől mért 900 m (3000 láb) távolságon túl lévő terep hegyekkel tűzdelt, vagy a térkép használója számára egyéb szempontból lényeges, akkor a terepmetszetet a futópálya küszöbtől mért 2000 métert (6500 láb) meg nem haladó távolságig szükséges ábrázolni.*

6.5.3 **Ajánlás.** - *Az ILS vonatkoztatási pont magasságát a térképen a legközelebbi fél méter, vagy láb pontossággal tüntessék fel.*

7. FEJEZET - ICAO ÚTVONAL TÉRKÉP

7.1 Rendeltetése

E térképen kell közölni a légjármű személyzetek részére az ATS útvonalakon a légiforgalmi szolgálatok eljárásainak betartásához megfelelő navigációs tevékenységet megkönnyítő információkat.
Megjegyzés. - E térképek egyszerűsített változatai alkalmasak arra, hogy a rádióösszeköttetési és rádió-navigációs táblázatok kiegészítéseként a Légiforgalmi Tájékoztató Kiadványba bekerüljenek.

7.2 Alkalmazási eljárások

7.2.1 Az ICAO Útvonal Térkép-et az 1.3.2 pontban előírt módon el kell készíteni minden olyan területről, ahol repülés tájékoztató körzetet létrehoztak.

Megjegyzés. - Bizonyos körülmények között szükségessé válhat az ICAO Körzeti Térkép elkészítése (lásd a 8. Fejezetet).

7.2.2 Különálló térképet kell biztosítani, ha a légiforgalmi szolgálati útvonalak, a helyzetjelentési követelmények, a repülés tájékoztató körzetek, vagy irányítói körzet területi határvonalak kijelölése a légtérben különféle magassági rétegződés szerint történt és kielégítő átláthatósággal ezek egyetlen térképen nem ábrázolhatók.

7.3 Fedésterület és méretarány

1. Megjegyzés. - Az ilyen típusú térképekre egységes méretarány, a különféle területek változó mértékű adatsűrűsége miatt nem határozható meg.

2. Megjegyzés. - A térkép átlagos méretarányán alapuló vízszintes mérővonal feltüntethető

7.3.1 **Ajánlás.** - *A térképlapok fedésterületének határvonalait az ATS útvonal szerkezet sűrűsége és szerkezeti felépítése alapján szükséges meghatározni.*

7.3.2 A folyamatos útvonal rendszert ábrázoló egymással szomszédos térképek között kerülni kell a nagy méretaránybeli különbségeket.

7.3.3 A navigáció folyamatosságának biztosítása érdekében a térképlapokon megfelelő nagyságú átfedést kell kialakítani.

7.4 Vetület

7.4.1 **Ajánlás.** - *Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.*

7.4.2 A szélességi és hosszúsági köröket megfelelő térközönként kell feltüntetni.

7.4.3 A fokbeosztás jelzéseit azonos térközönként kell kiválasztott szélességi és hosszúsági körök vonala mentén elhelyezni.

7.5 Azonosítás

Az egyes térképlapokat a térképsorozat megnevezésével és számmal kell azonosítani.

7.6 Kultúr környezet és terepszint

7.6.1 Az összes nyílt vízfelületet, a nagy tavak és folyók elnagyolt partvonalát fel kell tüntetni kivéve akkor, ha az a térkép rendeltetésével szorosabban összefüggő adatokkal ütközne.

7.6.2 A 7.6.3 pontban előírtak kivételével, az egyes szélességi és hosszúsági körök által alkotott négyzetekben fel kell tüntetni a Terület legkisebb magasságát.

7.6.3 **Ajánlás.** - *A magasabb földrajzi szélességeken fekvő olyan területek esetében, amelyekről az illetékes hatóság úgy határozott, hogy a térkép földrajzi északhoz tájolása nem használható, ott a terület tengerszinthez viszonyított legkisebb biztonságos magasságát a használatos hálózati vonalak által alkotott négyzetekbe kell beírni.*

7.6.4 Ha a térkép nem a földrajzi északhoz tájolt, akkor ezt a tényt és az alkalmazott tájolást egyértelműen kötelező jelezni.

7.7 Mágneses eltérés

Ajánlás. - *Az azonos mértékű mágneses eltérések pontjait összekötő vonalakat (isogon) valamint az információ beszerzésének időpontját fel kell tüntetni.*

7.8 Irányok, útirányok és radiálok

7.8.1 A 7.8.2 pontban előírtak kivételével, az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük.

7.8.2 **Ajánlás.** - *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság úgy határoz, hogy a mágneses Északra való iránymeghatározás nem megfelelő, akkor más alkalmas* *vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

7.8.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz vagy hálózati Északhoz viszonyítják, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

7.9 Légiforgalmi adatok

7.9.1 Repülőterek

A nemzetközi polgári repülés által használt minden olyan repülőteret fel kell tüntetni, amelyre műszeres megközelítés végrehajtható.

Megjegyzés. - Az egyéb repülőterek is ábrázolhatók.

7.9.2 Tiltott, korlátozott és veszélyes légterek

Az adott légtérréteget érintő tiltott, korlátozott és veszélyes légtereket, azonosító jelükkel és függőleges határértékeikkel együtt fel kell tüntetni.

7.9.3 Légiforgalmi szolgálatok rendszere

7.9.3.1 Ahol alkalmazható, ott fel kell tüntetni az adott területen kialakított légiforgalmi szolgálati rendszer összetevő elemeit.

7.9.3.1.1 Az alkotóelemek a következőket foglalják magukba:

1) a légiforgalmi szolgálati rendszerhez kapcsolódó rádió-navigációs berendezéseket, neveikkel, azonosítójukkal, frekvenciájukkal és fokokban, fokpercekben, fokmásodpercekben megadott földrajzi koordinátáikkal együtt;

2) DME berendezések vonatkozásában, kiegészítőleg, a DME adó antenna legközelebbi 30 méterre (100 láb) kerekített tengerszinthez viszonyított magasságát;

3) az összes kijelölt légtér feltüntetése, beleértve oldal és magassági határait és a megfelelő légtér-osztály azonosítókat;

4) útvonal repülés céljára biztosított minden ATS útvonalat és útvonal elnevezést, az előírt navigációs teljesítőképesség fajtáját (RNP), az útvonal minden egyes szakaszán mindkét irányban a legközelebbi fokra kerekített útirányt és, ahol alkalmazható, a forgalom áramlási irányát;

5) az ATS útvonalat meghatározó, rádió berendezés nélkül kijelölt minden mérvadó pontot és névkódjaikat, fokokban, fokpercekben, fokmásodpercekben megadott földrajzi koordinátáikkal együtt;

6) a VOR/DME berendezésekkel meghatározott területi navigációs útvonalakat kijelölő útvonal pontok esetében kiegészítésképp:

a) az útvonalat kijelölő VOR/DME berendezés azonosító jelét és rádió frekvenciáját;

b) a legközelebbi tized fokra kerekített irányt és a legközelebbi kéttized kilométerre (egytized tengeri mérföldre) kerekített távolságot az útvonalat kijelölő VOR/DME berendezéstől, ha az útvonal pont nem esik egybe a berendezés telepítési helyével;

7) az összes kötelező és nem-kötelező jelentőpont és az ATS-MET jelentőpont jelölését;

8) a fordulópontként, vagy jelentőpontként szolgáló mérvadó pontok közötti távolságot a legközelebbi tized kilométerre, vagy tengeri mérföldre kerekítve;

Megjegyzés. - A rádió berendezések közötti össz távolság is feltüntethető.

9) VOR berendezésekkel kijelölt útvonalszakaszokon az átkapcsolási pontokat, a navigációs berendezéstől mért és a legközelebbi kilométerre, vagy tengeri mérföldre kerekített távolságot is feltüntetve;

Megjegyzés. - Két rádió-navigációs berendezés között félúton, vagy két radiál metszésénél kialakított minden átkapcsolási pontot minden olyan útvonal szakasz esetében felesleges feltüntetni, amely útvonal iránya a két berendezés között változik, abban az esetben, ha ezen átkapcsolási pontok létezéséről általános nyilatkozatot tesznek közzé.

10) az ATS útvonalak igénybe vehető legalacsonyabb repülési magasságait a legközelebbi magasabb 50 méterre, vagy 100 lábra felkerekítve (Lásd a 11. Annex 2.21);

11) a rádióösszeköttetési berendezések felsorolását a frekvenciáikkal együtt.

12) a légvédelmi azonosító körzeteket (ADIZ) megfelelően azonosítva.

Megjegyzés: Az ADIZ eljárás a térkép jelmagyarázatában leírható.

7.9.4 Kiegészítő tájékoztatások

7.9.4.1 A közel körzeten belüli érkezési és kirepülési eljárások útvonalát és a kapcsolódó várakozási eljárásokat fel kell tüntetni kivéve, ha ezeket az ICAO Körzeti Térképen, az ICAO Műszeres Szabvány Kirepülési Eljárás Térképen (SID), vagy az ICAO Műszeres Szabvány Érkezési Eljárás Térképen (STAR) megadják.

1. Megjegyzés. - Lásd a 8., 9. és 10. Fejezetet az ezen térképekre vonatkozó előírásokat illetően.

2. Megjegyzés. - A kirepülési útvonalak rendszerint a futópálya végénél kezdődnek, míg az érkezési útvonalak rendszerint annál a pontnál végződnek, ahol a műszeres megközelítési eljárás kezdődik.

7.9.4.2 Ahol ilyent létrehoznak, a magasságmérő beállítási körzeteket fel kell tüntetni és azokat azonosítani kell.

8. FEJEZET - ICAO KÖRZETI TÉRKÉP

8.1 Rendeltetése

E térképen kell közölni a légjármű személyzetek részére a műszeres repülés következő szakaszainak végrehajtását megkönnyítő információkat:

a) az utazó repülési szakasz és a repülőtér megközelítési szakasz közötti átmenet;

b) a felszállás/megszakított megközelítés és az utazó repülési szakasz közötti átmenet; és

c) a bonyolult ATS útvonalakkal, vagy légtérszerkezettel rendelkező területeken áthaladó repülési szakasz.

Megjegyzés. - A 8.1 c) pontban leírt rendeltetési cél kielégíthető különálló térképpel, vagy egy, az ICAO Útvonal Térképen beszúrt betét térképpel is.

8.2 Alkalmazási előírások

8.2.1 Az ICAO Körzeti Térkép-et az 1.3.2 pontban előírt módon kell elkészíteni ott, ahol a légiforgalmi szolgálati útvonalak, vagy a helyzetjelentési követelmények bonyolultak és ez az ICAO Útvonal Térkép-en kielégítő módon nem ábrázolható.

8.2.2 Ha a légiforgalmi szolgálati útvonalak, vagy a helyzetjelentési követelmények az érkezésekre és a kirepülésekre eltérőek és az kielégítő láthatósággal egyetlen térképen nem ábrázolható, ott különálló térképet kell biztosítani.

Megjegyzés. - Bizonyos körülmények között szükségessé válhat ICAO Műszeres Szabvány Indulási Eljárási Térképet (SID) és ICAO Műszeres Szabvány Érkezési Térképet (STAR) biztosítani (lásd 9. és 10. Fejezetet).

8.3 Fedésterület és méretarány

8.3.1 Az egyes térképek fedésterülete legyen olyan, hogy a térkép ténylegesen ábrázolja az érkezési és indulási útvonalakat.

8.3.2 A térképet méretarányosan kell rajzolni, feltüntetve a mérő vonalat is.

8.4 Vetület

8.4.1 **Ajánlás.** - *Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.*

8.4.2 A szélességi és hosszúsági köröket megfelelő térközönként fel kell tüntetni.
8.4.3 A fokbeosztás jelzéseit azonos térközönként kell a térkép határvonalán elhelyezni.

8.5 Azonosítás

Minden egyes térképlapot az ábrázolt légtérhez kapcsolódó értelmező névvel kell azonosítani.

Megjegyzés. - Ez a név lehet a légiforgalmi szolgálati központ neve, egy, a térkép fedésterületén belül elhelyezkedő város, vagy nagyváros neve, vagy annak a városnak a neve, amelyet a repülőtér kiszolgál. Ha a várost több repülőtér szolgálja ki, akkor annak a repülőtérnek a nevét is hozzá kell tenni, amelyre az eljárások felépülnek.

8.6 Kultúr környezet és terepszint

8.6.1 Az összes nyílt vízfelületet, a nagy tavak és folyók elnagyolt partvonalát fel kell tüntetni kivéve akkor, ha az a térkép rendeltetésével szorosabban összefüggő adatokkal ütközne.

8.6.2 **Ajánlás.** - *A jelentős domborzati sajátossággal rendelkező területeken a tartózkodási hely tudat fokozása céljából az elsődleges repülőtér szintjétől 300 m-el (1000 láb) magasabb domborzatot halvány szintvonallal, szintvonal értékekkel és a szintkülönbségeket barna színárnyalattal kell feltüntetni. A megfelelő magassági pontokat, beleértve az egyes szintvonal csoportokon belüli legmagasabb pont magasságát fekete színnel nyomtatva kell feltüntetni. A mérvadó akadályokat ugyancsak fel kell tüntetni.*

1. Megjegyzés - - A színárnyalás kezdődhet az alap topográfiai térképen az elsődleges repülőtér *szintjétől számított 300 m-t (1000 láb) meghaladó következő magasabb alkalmas szintvonal színárnyalásával.*

2. Megjegyzés - A szintvonalak és domborzati jellemzők céljára 3. Függelék - Szín Útmutató-ban szerepel az előírt barna szín, amelyet a féltónusú szint árnyaláshoz alapul kell venni.

3. Megjegyzés - A megfelelő magasság pontok és mérvadó akadályok azok, amelyeket az eljárás specialisták biztosítanak.

8.7 Mágneses eltérés

A térkép fedésterületére vonatkozó átlagos mágneses eltéréseket a legközelebbi fokra kerekítve meg kell adni.

8.8 Irányok, útirányok és radiálok

8.8.1 A 8.8.2 pontban előírtakat kivételével, az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük.

8.8.2 **Ajánlás. -** *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság úgy határoz, hogy a mágneses Északra való iránymeghatározás nem megfelelő, akkor más alkalmas vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

8.8.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz vagy hálózati Északhoz viszonyítják, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

8.9 Légiforgalmi adatok

8.9.1 Repülőterek

A közel körzeti útvonal vezetést befolyásoló összes repülőteret fel kell tüntetni. Ha szükséges, akkor fel kell tüntetni a futópályák elhelyezkedési rajzát is.

8.9.2 Tiltott, korlátozott és veszélyes légterek

A tiltott, korlátozott és veszélyes légtereket fel kell tüntetni, azonosító jelükkel és függőleges kiterjedtségi határaikkal együtt.

8.9.3 Területi legkisebb repülési magasságok

A szélességi és hosszúsági körök által alkotott négyzetekben fel kell tüntetni a terület tengerszinthez viszonyított legalacsonyabb repülési magasságát.

Megjegyzés. - A térkép választott méretarányának függvényében, a szélességi és hosszúsági körök által alkotott négyzetek rendszerint egész hosszúsági, illetve szélességi fokoknak feleljenek meg.

8.9.4 Légiforgalmi szolgálatok rendszere

8.9.4.1 Az adott területet érintő kialakított légiforgalmi szolgálati rendszer összetevő elemeit fel kell tüntetni.

8.9.4.1.1 Az alkotóelemek a következőket foglalják magukba

1) a légiforgalmi szolgálati rendszerhez kapcsolódó rádió-navigációs berendezéseket, neveikkel,

azonosítójukkal, frekvenciájukkal és fokokban, fokpercekben és fok másodpercekben kifejezett földrajzi koordinátáikkal együtt;

2) DME berendezések vonatkozásában, kiegészítésképp, a DME adó antenna tengerszint feletti magasságát a legközelebbi 30 méterre (100 láb) kerekítve;

3) azokat a közel körzeti rádió-navigációs berendezéseket, amelyek az induló és az érkező forgalom számára és a várakozási eljárásokhoz szükségesek;

4) az összes kijelölt légtér oldal és magassági határait és a megfelelő légtér-osztály azonosítókat;

5) a várakozási eljárásokat és a közel körzeti útvonal rendszert az útvonal elnevezésekkel együtt, valamint az előírt légifolyosók és közel körzeti útvonalak egyes szakaszainak legközelebbi fokra kerekített útirányát;

6) a közel körzeti útvonalakat kijelölő rádió-navigációs berendezéssel nem jelölt összes mérvadó pontot névkódjukkal és fokokban, fokpercekben és fokmásodpercekben kifejezett földrajzi koordinátáikkal együtt;

7) a VOR/DME berendezésekkel meghatározott területi navigációs útvonalakat kijelölő útvonal pontok esetében kiegészítésképp:

a) a viszonyítás alapját adó VOR/DME berendezés azonosító jelét és rádió frekvenciáját;

b) a legközelebbi tized fokra kerekített irányt és a legközelebbi kéttized kilométerre (egytized tengeri mérföldre) kerekített távolságot a viszonyítási alapul szolgáló VOR/DME berendezéstől, ha az útvonal pont nem esik egybe a berendezés telepítési helyével;

8) az összes kötelező és nem-kötelező jelentőpontot;

9) a fordulópontként, vagy jelentőpontként szolgáló mérvadó pontok közötti, legközelebbi kilométerre, vagy tengeri mérföldre kerekített távolságot;

Megjegyzés. - A rádió berendezések közötti össz távolság is feltüntethető

10) VOR berendezésekkel kijelölt útvonalszakaszokon az átkapcsolási pontokat, a navigációs berendezésektől mért legközelebbi kilométerre, vagy tengeri mérföldre kerekített távolsággal együtt;

Megjegyzés. - Két rádió-navigációs berendezés között félúton, vagy két radiál metszésénél kialakított minden átkapcsolási pontot minden olyan útvonal szakasz esetében felesleges feltüntetni, amely útvonal iránya a két berendezés között változik, abban az esetben, ha ezen átkapcsolási pontok létezéséről általános nyilatkozatot tesznek közzé.

11) az ATS útvonalak legalacsonyabb repülési magasságait a legközelebbi magasabb 50 méterre, vagy 100 lábra kerekítve (lásd a 11. Annex 2.21 pontját).

12) a megállapított legkisebb radar repülési magasságokat a legközelebbi magasabb 50 méterre, vagy 100 lábra kerekítve és egyértelműen azonosítva;

1. Megjegyzés. - Ha a közzétett szabvány érkezési, vagy indulási útvonalakon a légijárművek mérvadó pontokra/ról való rá-, illetve elvezetésére, avagy megközelítés folyamán a legkisebb szektormagasság alá süllyedéshez az engedély kiadásra radar eljárást alkalmaznak, akkor a radar eljárás az ICAO Körzeti Térkép-re rajzolhatók feltéve, hogy ez túlzott zsúfoltságot nem okoz.

2. Megjegyzés. - Ha túlzott zsúfoltság keletkezne, akkor Legkisebb Radar Magasság Térkép adható ki (lásd a 21. Fejezetben), amely esetben a 8.9.4.1.1, 12) pontban említett elemeket nem kell az ICAO Körzeti Térkép-en megismételni.

13) a területen alkalmazandó sebesség és repülési szint/tengerszint feletti magasság korlátozásokat, ahol ilyent meghatároztak;

14) a rádióösszeköttetési berendezéseket frekvenciájukkal együtt felsorolva.

9. FEJEZET - ICAO MŰSZERES SZABVÁNY INDULÁSI ELJÁRÁS TÉRKÉP (SID)

9.1 Rendeltetése

E térképen kell közölni a légjármű személyzetek részére azokat az információkat, amelyek alapján követni tudják a szabvány műszeres indulási útvonalakat a felszállás szakaszától az utazó repülési szakaszig.

1. Megjegyzés. - A szabvány indulási útvonalak azonosítására vonatkozó előírásokat a 11. Annex 3. Függeléke; az ilyen útvonalak kialakítására vonatkozó útmutató anyagot a Légiforgalmi Szolgálatok Tervezési Kézikönyve (Doc 9426) tartalmazza.

2. Megjegyzés. - Az akadálymentességi követelményeket és a közzéteendő legszükségesebb információkkal kapcsolatos részleteket meghatározó előírásokat a PANS-OPS II. Kötet II. Rész (Doc 8168) tartalmazza.

9.2 Alkalmazás

Az ICAO Műszeres Szabvány Indulási Eljárás Térképet (SID) mindig ki kell adni, ha szabvány műszeres indulási eljárásokat alakítottak ki és ezek kielégítő láthatósággal az ICAO Körzeti Térkép-en nem ábrázolhatók.

9.3 Fedésterület és méretarány

9.3.1 Az egyes térképek fedésterülete legyen olyan, hogy a térkép ténylegesen ábrázolja azt a pontot, ahol az indulási útvonal kezdődik és azt a kijelölt pontot is, ahol egy kijelölt légiforgalmi szolgálati útvonalon az utazó repülés szakasza megkezdhető.

Megjegyzés. - Az indulási útvonal rendszerint a futópálya végénél kezdődik.

9.3.2 **Ajánlás.** - *A térkép legyen méretarányos.*

9.3.3 Ha a térkép méretarányosan készül, akkor a lépték vonalat is fel kell tüntetni.

9.3.4 Ha a térkép nem méretarányosan készül, rajta "NEM MÉRETARÁNYOS" feliratot kell elhelyezni és a méretarány váltási jelzést kell alkalmazni az útvonalakon és a térkép egyéb olyan részletein, amelyek túl nagyok ahhoz, hogy méretarányosan legyenek ábrázolhatók.

9.4 Vetület

9.4.1 **Ajánlás.** - Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.

9.4.2 **Ajánlás.**- *Ha a térkép méretarányosan készül, akkor a szélességi és hosszúsági köröket megfelelő térközönként fel kell tüntetni.*

9.4.3 A fokbeosztás jelzéseit azonos térközönként kell a térkép szélvonalai mentén elhelyezni.

9.5 Azonosítás

A térkép azonosítása a következőkből álljon: a repülőtér által kiszolgált városnak, vagy körzetnek a neve, a repülőtér nevével egyetemben és a Légi-navigációs Szolgálatok Eljárásai - Légi-jármű Üzemelés (PANS-OPS, Doc 8168) II. Kötet II. Rész 5. Fejezetével egyezésben kialakított műszeres szabvány indulási útvonal(ak) megnevezése.

Megjegyzés. - A műszeres szabvány indulási útvonal(ak) nevét az eljárás specialisták adják.

9.6 Kultúr környezet és domborzat

9.6.1 A méretarányosan rajzolt térkép esetében az összes nyílt vízfelületet, a nagy tavak és folyók elnagyolt partvonalát fel kell tüntetni kivéve akkor, ha az a térkép rendeltetésével szorosabban összefüggő adatokkal ütközne.

9.6.2 **Ajánlás.** - *A jelentős domborzati sajátossággal rendelkező területeken a tartózkodási hely tudat fokozása céljából a térképet méretarányosan kell készíteni és a repülőtér szintjétől 300 m-el (1000 láb) magasabb domborzatot halvány szintvonallal, szintvonal értékekkel és a szintkülönbségeket barna színárnyalattal kell feltüntetni. A megfelelő magassági pontokat, beleértve az egyes szintvonal csoportokon belüli legmagasabb pont magasságát fekete színnel nyomtatva kell feltüntetni. Az akadályokat ugyancsak fel kell tüntetni.*

1. Megjegyzés - Az alap topográfiai térképen a színárnyalás kezdhető a repülőtér szintjétől számított 300 m-t (1000 láb) meghaladó következő magasabb alkalmas szintvonal színárnyalásával.

2. Megjegyzés - A szintvonalak és domborzati jellemzők céljára 3. Függelék - Szín Útmutató-ban szerepel az az előírt barna szín, amelyet a féltónusú szint árnyaláshoz alapul kell venni.

3. Melléklet - A megfelelő magasság pontok és mérvadó akadályok azok, amelyeket az eljárás specialisták biztosítanak.

9.7 Mágneses eltérés

A mágneses irányok, útirányok és radiálok meghatározásához alkalmazandó legközelebbi fokra kerekített mágneses eltérést fel kell tüntetni.

9.8 Irányok, útirányok és radiálok

9.8.1 Az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük, kivéve a 9.8.2 pontban előírtakat.

Megjegyzés. - A térképen feltüntethető egy erre utaló megjegyzés.

9.8.2 **Ajánlás.** - *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság döntése szerint a mágneses Északhoz viszonyított iránymeghatározás nem megfelelő, más alkalmas vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

9.8.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz, vagy hálózati Északhoz viszonyítva teszik közzé, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

9.9 Légiforgalmi adatok

9.9.1 Repülőterek

9.9.1.1 Az indulási repülőteret futópályáinak elhelyezkedését szemléltető jelzésekkel kell ábrázolni.

9.9.1.2 Minden egyes olyan repülőteret fel kell tüntetni és azonosítani kell, amelyek a kijelölt szabvány műszeres indulási eljárások útvonalait befolyásolják. Ahol alkalmazható, ott a futópályák elhelyezkedését szemléltető jelzéseket kell alkalmazni.

9.9.2 Tiltott, korlátozott és veszélyes légterek

Az összes olyan tiltott, korlátozott és veszélyes légteret, amely befolyásolhatja az eljárások végrehajtását, fel kell tüntetni, azonosítójukkal és magassági határaikkal együtt.

9.9.3 Legkisebb szektor magasság

9.9.3.1 Fel kell tüntetni az eljárással kapcsolatos navigációs berendezésre alapozott, legalacsonyabb megállapított szektor magasságot, világosan jelezve, hogy az melyik szektorra vonatkozik.

9.9.3.2 Ha a legkisebb szektor magasságot nem határozták meg, akkor a térképet méretarányosan kell megrajzolni és a hosszúsági és szélességi körök által határolt négyzetekben fel kell tüntetni a területi legkisebb magasságokat. A területi legkisebb magasságokat a térkép azon részein ugyancsak fel kell tüntetni, amely területeket a legkisebb szektor magasságok nem fednek le.

Megjegyzés. - A térkép választott méretarányának függvényében, a szélességi és hosszúsági körök által alkotott négyzetek rendszerint fél hosszúsági, illetve szélességi fokoknak feleljenek meg.

9.9.4 Légiforgalmi szolgálatok rendszere

9.9.4.1 A vonatkozó légiforgalmi szolgálati rendszer összetevő elemeit fel kell tüntetni.

9.9.4.1.1 Ezek az összetevő elemek foglalják magukba a következőket:

1) minden szabvány műszeres indulási útvonal grafikus ábrázolása, beleértve a:

a) az útvonal elnevezését;

b) az útvonalat kijelölő fontos pontokat;

c) az útvonalak egyes szakaszain a legközelebbi fokra kerekített útirányokat, vagy radiálokat;

d) a fontos pontok közötti legközelebbi egész kilométer, vagy tengeri mérföld értékre kerekített távolságokat;

e) az útvonalak, vagy az útvonal szakaszok a legközelebbi magasabb 50 méterre, vagy 100 lábra kerekített tengerszint feletti legkisebb repülési magasságait, az eljárás által előírt magasságokat, illetve a repülési szint korlátozásokat, ahol ilyen létezik;

f) ha a térkép méretarányos és az indulás során radar irányvezetés biztosított, a legközelebbi magasabb

50 méterre, vagy 100 lábra kerekített, egyértelműen azonosított, közzétett legkisebb radar magasságot;

Megjegyzés. - Ha a közzétett szabvány indulási útvonalon a légijárművek mérvadó pontokra/ról való rá-, illetve elvezetésére radar eljárást alkalmaznak, akkor a radar eljárás az ICAO Szabvány Műszeres Indulási Eljárás Térkép-re rajzolható, feltéve, hogy ez túlzott zsúfoltságot nem okoz.

2. Megjegyzés. - Ha túlzott zsúfoltság keletkezne, akkor Legkisebb Radar Magasság Térkép adható ki (lásd a 21. Fejezetben), amely esetben a 9.9.4.1.1, 1) f) pontban említett elemeket nem kell az ICAO Szabvány Műszeres Indulási Eljárás Térkép-en megismételni.

2) az útvonalakhoz kapcsolódó rádió-navigációs berendezéseket, beleértve:

a) nyílt nyelvű nevüket;

b) azonosító jeleiket;

c) frekvenciájukat;

d) fokokban, fokpercekben és fokmásodpercekben kifejezett földrajzi koordinátáikat;

e) DME berendezésnél a csatorna számot és a DME berendezés adó antennájának tengerszinthez viszonyított magasságát a legközelebbi 30 méterre (100 láb) kerekítve;

3) rádió berendezés telepítési helyével ki-nem-jelölt minden mérvadó pontot névkódjával és fokokban, fokpercekben és fok másodpercekben kifejezett földrajzi koordinátáival egyetemben, továbbá a legközelebbi tized fokra kerekített irányát és a legközelebbi kéttized kilométerre (egytized tengeri mérföldre) kerekített távolságát a viszonyítási alapul szolgáló rádió berendezéstől;

4) az alkalmazható várakozási eljárásokat;

5) a legközelebbi magasabb 300 méterre, vagy 1000 lábra kerekített átváltási magasságot/tengerszint feletti magasságot;

6) az akadály felmérő síkon (OIS) túlnyúló közeli akadályok helyzetét és magasságát. Minden esetben egy kiegészítő megjegyzést kell közzétenni, ha a közeli akadályok túlnyúlnak az akadály felmérő síkon (OIS), amelyeket azonban a közzétett eljárás tervezési gradiensénél nem vettek figyelembe;

Megjegyzés. A PANS-OPS II. Kötetével egyezésben, a közeli akadályokra vonatkozó adatokat az eljárás specialisták adják meg.

7) a területi sebesség korlátozásokat, ahol ilyent meghatároztak;

8) az összes kötelező és kérésre alkalmazandó jelentőpontot;

9) a rádióösszeköttetési eljárásokat, beleértve:

a) az ATS egységek hívójeleit;

b) frekvenciáját;

c) a válasz jeladó kód beállítást, ahol szükséges.

9.9.4.2 **Ajánlás.** - *A műszeres szabvány indulási útvonal (SID) szöveges leírását és a radarirányításhoz kapcsolódó rádióösszeköttetés megszakadása esetén alkalmazandó eljárások leírását meg kell adni és amikor csak lehetséges, ezeket a térképen, vagy a térképet magába foglaló oldalon kell feltüntetni.*

10. FEJEZET - ICAO MŰSZERES SZABVÁNY ÉRKEZÉSI ELJÁRÁS TÉRKÉP (STAR)

10.1 Rendeltetése

E térképen kell közölni a légjármű személyzetek részére azokat az információkat, amelyek alapján követni tudják a szabvány műszeres érkezési útvonalakat az útvonal repülési szakasztól a megközelítési szakaszig.

1. Megjegyzés. - A "szabvány műszeres érkezési útvonal" fogalom értelme magában foglalja a "süllyedés profil" és a "folyamatos süllyedéssel végzett megközelítés" valamint egyéb, nem szabványos eljárás leírásokat is. Szabvány süllyedési profil esetében az oldalnézeti ábrázolás nem szükséges.

2. Megjegyzés. - A szabvány érkezési útvonalak azonosítására vonatkozó előírásokat a 11. Annex 3. Függeléke; míg az ilyen útvonalak kialakítására vonatkozó útmutató anyagot a Légiforgalmi Szolgálatok Tervezési Kézikönyve (Doc 9426) tartalmazza

10.2 Alkalmazási rendelkezések

Az ICAO Műszeres Szabvány Érkezési Eljárás Térkép-et (STAR) mindig ki kell adni, ha szabvány műszeres megközelítési eljárásokat alakítottak ki és ezek kielégítő láthatósággal az ICAO Körzeti Térkép-en nem ábrázolhatók.

10.3 Fedésterület és méretarány

10.3.1 Az egyes térképek fedésterülete legyen olyan, hogy a térkép tartalmazza azokat a pontokat, amelyeknél az utazó szakasz végződik és azokat, amelyeknél a megközelítés szakasza kezdődik.

10.3.2 **Ajánlás**. - *A térkép legyen méretarányos.*

10.3.3 Ha a térkép méretarányosan készül, akkor a lépték vonalat is fel kell tüntetni.

10.3.4 Ha a térkép nem méretarányosan készül, rajta "NEM MÉRETARÁNYOS" feliratot kell elhelyezni és a méretarány váltási jelzést kell alkalmazni az útvonalakon és a térkép egyéb olyan részletein, amelyek túl nagyok ahhoz, hogy méretarányosan legyenek ábrázolhatók.

10.4 Vetület

10.4.1 **Ajánlás.** - Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.

10.4.2 **Ajánlás. -** Ha a térkép méretarányosan készül, akkor a szélességi és hosszúsági köröket megfelelő térközönként fel kell tüntetni.

10.4.3 A fokbeosztás jelzéseit azonos térközönként kell a térkép oldalvonalán elhelyezni.

10.5 Azonosítás

A térkép azonosítása a következőkből álljon: a repülőtér által kiszolgált városnak, vagy körzetnek a neve, a repülőtér nevével egyetemben és a Légi-navigációs Szolgálatok Eljárásai - Légi-jármű Üzemelés (PANS-OPS, Doc 8168) II. Kötet III. Rész 3. Fejezetével egyezésben kialakított műszeres szabvány érkezési útvonal(ak) megnevezése.

Megjegyzés. - A műszeres szabvány érkezési útvonal(ak) nevét az eljárás specialisták adják.

10.6 Kultúr környezet és tereprajz

10.6.1 Ha a térképet méretarányosan rajzolták, akkor az összes nyílt vízfelületet, a nagy tavak és folyók elnagyolt partvonalát fel kell tüntetni kivéve akkor, ha az a térkép rendeltetésével szorosabban összefüggő adatokkal ütközne.

10.6.2 **Ajánlás**. - *A jelentős domborzati sajátossággal rendelkező területeken a tartózkodási hely tudat fokozása céljából a térképet méretarányosan kell készíteni és a repülőtér szintjétől 300 m-el (1000 láb) magasabb domborzatot halvány szintvonallal, szintvonal értékekkel és a szintkülönbségeket barna színárnyalattal kell feltüntetni. A megfelelő magassági pontokat, beleértve az egyes szintvonal csoportokon belüli legmagasabb pont magasságát fekete színnel nyomtatva kell feltüntetni. Az akadályokat ugyancsak fel kell tüntetni.*

1. Megjegyzés - - Az alap topográfiai térképen a színárnyalás kezdődhet a repülőtér szintjétől számított 300 m-t (1000 láb) meghaladó következő magasabb alkalmas szintvonal színárnyalásával.

2. Megjegyzés - A szintvonalak és domborzati jellemzők céljára 3. Függelék - Szín Útmutató-ban szerepel az az előírt barna szín, amelyet a féltónusú szint árnyaláshoz alapul kell venni.

3. Melléklet - - A megfelelő magasság pontok és mérvadó akadályok azok, amelyeket az eljárás specialisták biztosítanak

10.7 Mágneses eltérés

A mágneses irányok, útirányok és radiálok meghatározásához alkalmazandó legközelebbi fokra kerekített mágneses eltérést fel kell tüntetni.

10.8 Irányok, útirányok és radiálok

10.8.1 Az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük, kivéve a 10.8.2 pontban előírtakat.
Megjegyzés. - A térképen feltüntethető egy erre utaló megjegyzés.

10.8.2 **Ajánlás.** - *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság döntése szerint a mágneses Északhoz viszonyított iránymeghatározás nem megfelelő, más alkalmas vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

10.8.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz, vagy hálózati Északhoz viszonyítva teszik közzé, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

10.9 Légiforgalmi adatok

10.9.1 Repülőterek

10.9.1.1 A leszállás repülőterét futópályáinak elhelyezkedését szemléltető jelzésekkel kell ábrázolni.

10.9.1.2 A kijelölt szabvány műszeres érkezési eljárások útvonalait befolyásoló minden egyes repülőteret fel kell tüntetni és azonosítani kell. Ahol alkalmazható, ott a futópályák elhelyezkedését szemléltető jelzéseket kell alkalmazni.

10.9.2 Tiltott, korlátozott és veszélyes légterek

Az összes olyan tiltott, korlátozott és veszélyes légteret, amely befolyásolhatja az eljárások végrehajtását, fel kell tüntetni, azonosítójukkal és magassági határaikkal együtt.

10.9.3 Legkisebb szektor magasság

10.9.3.1 A szektor megállapított legkisebb magasságot -ha meghatározták-, fel kell tüntetni, világosan jelezve, hogy melyik szektorra vonatkozik.

10.9.3.2 Ha a ledkisebb szektor magasságot nem határozták meg, akkor a térképet méretarányosan kell megrajzolni és a hosszúsági és szélességi körök által határolt négyzetekben fel kell tüntetni a területi legkisebb magasságokat. A területi legkisebb repülési magasságokat a térkép azon részein ugyancsak fel kell tüntetni, amelyeket a legkisebb szektorok magasságok nem fednek le.

Megjegyzés. - A térkép választott méretarányának függvényében, a szélességi és hosszúsági körök által alkotott négyzetek rendszerint fél hosszúsági, illetve szélességi fokoknak feleljenek meg.

10.9.4 Légiforgalmi szolgálatok rendszere

10.9.4.1 A vonatkozó légiforgalmi szolgálati rendszer összetevő elemeit fel kell tüntetni.

10.9.4.1.1 Ezek az összetevő elemek foglalják magukba a következőket:

1) minden szabvány műszeres érkezési útvonal grafikus ábrázolása, beleértve:

a) az útvonal elnevezését;

b) az útvonalat kijelölő fontos pontokat;

c) az útvonal szakaszainak legközelebbi egész fokértékre kerekített útirányait, vagy radiáljait;

d) a fontos pontok közötti legközelebbi egész kilométer érékre, vagy tengeri mérföldre kerekített távolságokat;

e) az útvonalak, vagy az útvonal szakaszok legközelebbi magasabb 50 méterre, vagy 100 lábra kerekített tengerszint feletti legkisebb repülési magasságait, az eljárás által előírt magasságokat, illetve a repülési szintkorlátozásokat, ahol ilyen létezik;

f) ha a térkép méretarányos és az érkezés során radar irányvezetés biztosított, a legközelebbi magasabb 50 méterre, vagy 100 lábra kerekített, egyértelműen azonosított, közzétett legkisebb radar magasságot;

1. Megjegyzés. - Ha a közzétett szabvány érkezési útvonalon a légijárművek mérvadó pontokra/ról *való rá-, illetve elvezetésére, vagy az érkezés során a legkisebb szektor magasság alá süllyedés engedélyének kiadásához radar eljárást alkalmaznak, akkor a radar eljárás az ICAO Szabvány Műszeres Érkezési Eljárás Térkép-re rajzolható, feltéve, hogy ez túlzott zsúfoltságot nem okoz.*

2. Megjegyzés. - Ha túlzott zsúfoltság keletkezne, akkor Legkisebb Radar Magasság Térkép adható ki (lásd a 21. Fejezetben), amely esetben a 10.9.4.1.1, 1) f) pontban említett elemeket nem kell az ICAO Szabvány Műszeres Érkezési Eljárás Térkép-en megismételni.

2) az útvonalakhoz kapcsolódó rádió-navigációs berendezéseket, beleértve:

a) nyílt nyelvű elnevezéseiket;

b) azonosító jeleiket;

c) frekvenciájukat;

d) földrajzi fokokban, fokpercekben és fokmásodpercben kifejezett koordinátáikat;

e) DME berendezésnél a csatorna számot és a DME berendezés adó antennájának tengerszinthez viszonyított magasságát a legközelebbi 30 méterre (100 láb) kerekítve;

3) rádió berendezés telepítési helyével ki-nem-jelölt minden mérvadó pontot névkódjával és fokokban, fokpercekben és fok másodpercekben kifejezett földrajzi koordinátáival egyetemben, továbbá a legközelebbi tized fokra kerekített irányát és a legközelebbi kéttized kilométerre (egytized tengeri mérföldre) kerekített távolságát a viszonyítási alapul szolgáló rádió berendezéstől;

4) az alkalmazható várakozási eljárásokat;

5) a legközelebbi magasabb 300 méterre, vagy 1000 lábra kerekített átváltási magasságot/tengerszint feletti magasságot;

6) a területi sebesség korlátozásokat, ahol ilyent meghatároztak;
7) az összes kötelező és a kérésre alkalmazandó jelentőpontot;

8) a rádióösszeköttetési eljárásokat, beleértve:

a) az ATS egységek hívójeleit;

b) frekvenciáját;

c) a válasz jeladó kód beállítást, ahol szükséges.

10.9.4.2 **Ajánlás.** - *A szabvány műszeres érkezési útvonalak (STAR) szöveges leírását és a radarirányításhoz kapcsolódó, rádióösszeköttetés megszakadása esetén alkalmazandó eljárások leírását meg kell adni és amikor csak lehetséges, ezt a térképen, vagy a térképet magába foglaló oldalon kell feltüntetni.*

11. FEJEZET
ICAO MŰSZERES MEGKÖZELÍTÉSI TÉRKÉP

11.1 Rendeltetése

E térképen kell közölni a légjármű személyzetek részére azokat az információkat, amelyek lehetővé teszik számukra valamely jóváhagyott műszeres megközelítési eljárás végrehajtását arra a futópályára, amelyre a leszállást végre kívánják hajtani, beleértve a megszakított megközelítési eljárás végrehajtását és, ahol alkalmazható, a kapcsolódó várakozási eljárásokat is.

Megjegyzés. - A műszeres megközelítési eljárások kialakítására és a kapcsolódó tengerszint/terep szint feletti magasságok felbontási nagyságrendjére vonatkozó részletes előírásokat a Légi-navigációs Szolgálatok Eljárásai - Légijármű üzemeltetés (PANS-OPS, Doc 8168) tartalmazza.

11.2 Alkalmazási rendelkezések

11.2.1 Az ICAO Műszeres Megközelítési Térkép-et, a nemzetközi polgári repülés által használt minden olyan repülőtérről ki kell adni, amelyre az illető állam műszeres megközelítési eljárásokat alakított ki.

11.2.2 Az állam által kialakított minden precíziós műszeres megközelítési eljárásra általában különálló műszeres megközelítési térképet kell biztosítani.

11.2.3 Általában külön műszeres megközelítési térképet kell biztosítani az állam által kialakított minden nem-precíziós műszeres megközelítési eljárásra.

Megjegyzés. - Egyetlen lapra nyomtatott precíziós, vagy nem-precíziós megközelítési térkép is kiadható olyan esetben, amikor több olyan megközelítési eljárást tüntetnek fel, amelyek közbeeső megközelítési, befejező megközelítési és a megszakított megközelítési eljárási szakaszaik azonosak.

11.2.4 Több térképlapot kell készíteni akkor, ha a műszeres megközelítési eljárás befejező szakaszán kívül, a különféle légijármű kategóriákra vonatkozó útirányok, az idő, vagy a tengerszint feletti magasság értékek eltérőek és ezek egyetlen térképlapon való felsorolása zavart, vagy tévesztést idézhet elő.

Megjegyzés. - A légijármű kategóriákat illetően lásd a Légi-navigációs Szolgálatok Eljárásai - Légijármű üzemeltetés (PANS-OPS, Doc 8168), II. Kötet, III. Rész, 1. Fejezetét.

11.2.5 Az "ICAO Műszeres Megközelítési Térkép"-et minden olyan esetben helyesbíteni kell, amikor a biztonságos üzemeltetéshez szükséges nélkülözhetetlen adatok elavulttá válnak.

11.3 Fedésterület és méretarány

11.3.1 Az egyes térképek fedésterülete kellően nagy legyen, hogy a műszeres megközelítési eljárás minden szakasza és az olyan kiegészítő területek ábrázolhatók legyenek, amelyek a tervezett megközelítési fajta esetében szükségesek lehetnek.

11.3.2 A választott méretarány optimális olvashatóságot biztosítson:

1) a térképen ábrázolt eljárás; és

2) a lapméret figyelembevételével.

11.3.3 Méretarány jelzést biztosítani kell.

11.3.3.1 Ha megvalósítható, a térképen egy 20 km (10 tengeri mérföld) sugarú kört kell ábrázolni, amelynek középpontja vagy a repülőtéren, vagy annak szomszédságában telepített DME berendezés, vagy -ha alkalmas DME berendezés nem áll rendelkezésre- a repülőtér vonatkoztatási pontja; a sugár méretét a köríven ki kell írni.

11.3.3.2 **Ajánlás.** - *Közvetlenül a metszeti ábrázolás alatt, távolság mérővonal feltüntetése szükséges.*

11.4 Formátum

Ajánlás. - *A lapméret 210 × 148 mm (8,27 × 5,82 hüvelyk) legyen.*

11.5 Vetület

11.5.1 Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.

11.5.2 **Ajánlás.** - *A fokbeosztás jelzéseit azonos térközönként kell a térkép oldalvonalán elhelyezni.*

11.6 Azonosítás

11.6.1 A térkép azonosítása a következőkből álljon: a repülőtér által kiszolgált városnak, vagy körzetnek a neve, a repülőtér neve és a Légi-navigációs Szolgálatok Eljárásai – Légijármű Üzemelés (PANS-OPS, Doc 8168) II. Kötet III. Rész 1. Fejezetével egyezésben kialakított műszeres megközelítési eljárás megnevezése.

Megjegyzés. – A műszeres megközelítési eljárás nevét az eljárás specialisták adják.

11.7 Kultúr környezet és domborzat

11.7.1 A szabvány műszeres megközelítési eljárás biztonságos végrehajtásához tartozó nélkülözhetetlen összes topográfiai információt fel kell tüntetni, ideértve a megszakított megközelítési eljárásokat, a kapcsolódó várakozási eljárásokat és a látással végzett manőverezést (körözést) is, ahol ilyent kialakítottak. Az ilyen terepjellegzetességeket csak akkor kell elnevezésükkel megjelölni, ha az eljárások érthetőségének növeléséhez ez szükséges. Legalább a nagyobb földterületeket valamint lényegesebb folyók és tavak körvonalát kell jelezni.

11.7.2 A domborzatot a terület sajátos magassági jellegzetességeinek legjobban megfelelő módon kell ábrázolni. Olyan térségekben, ahol a térkép fedésterületén belül a repülőtér szintjétől számított domborzat magassága 1200 m-nél (4000 láb) magasabb, vagy a repülőtér vonatkozási pontjától mért 11 km-en (6 tengeri mérföld) belül 600 m-nél (2000 láb) magasabb, avagy ha a befejező megközelítés, vagy a megszakított megközelítés gradiense az optimumnál meredekebb a domborzatnak betudhatóan, akkor a repülőtér szintjétől 150 m-el (500 láb) magasabb minden domborzatot halvány szintvonallal, szintvonal értékekkel és a szintkülönbségeket barna színárnyalattal kell feltüntetni. A megfelelő magassági pontokat, beleértve az egyes szintvonal csoportokon belüli legmagasabb pont magasságát fekete színnel nyomtatva kell feltüntetni.

1. Megjegyzés - A színárnyalás kezdődhet az alap topográfiai térképen feltüntetett és a repülőtér szintjétől számított 150 m-t (500 láb) meghaladó következő magasabb alkalmas szintvonal színárnyalásával.

2. Megjegyzés - A szintvonalak és domborzati jellemzők céljára a 3. Függelék - Szín Útmutató-ban szerepel az az előírt barna szín, amelyet a féltónusú szint árnyaláshoz alapul kell venni.

3. Megjegyzés - A megfelelő magasság pontok és mérvadó akadályok azok, amelyeket az eljárás specialisták biztosítanak.

11.7.3 **Ajánlás.** - *Az olyan területeken, ahol a domborzat alacsonyabb a 11.7.2-ben meghatározottaktól, ott a repülőtér szintjétől 150 m-el (500 láb) magasabb minden domborzatot halvány szintvonallal, szintvonal értékekkel és a szintkülönbségeket barna színárnyalattal kell feltüntetni. A megfelelő magassági pontokat, beleértve az egyes szintvonal csoportokon belüli legmagasabb pont magasságát fekete színnel nyomtatva kell feltüntetni.*

1. Megjegyzés - A színárnyalás kezdődhet az alap topográfiai térképen feltüntetett és a repülőtér szintjétől számított 150 m-t (500 láb) meghaladó következő magasabb alkalmas szintvonal színárnyalásával.

2. Megjegyzés - A szintvonalak és domborzati jellemzők céljára 3. Függelék - Szín Útmutató-ban szerepel az az előírt barna szín, amelyet a féltónusú szint árnyaláshoz alapul kell venni.

3. Megjegyzés - A megfelelő magasság pontok és mérvadó akadályok azok, amelyeket az eljárás specialisták biztosítanak.

11.8 Mágneses eltérés

11.8.1 **Ajánlás.** - *A mágneses eltérést fel kell tüntetni.*

11.8.2 Ha a legközelebbi egész fokra kerekített mágneses eltérést feltüntetik, akkor annak értéke egyezzen meg a mágneses irányok, útirányok és radiálok meghatározásához alkalmazott értékével.

11.9 Irányok, útirányok és radiálok

11.9.1 Az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük, kivéve a 11.9.2 pontban előírtakat.

Megjegyzés. - A térképen feltüntethető egy erre utaló megjegyzés.

11.9.2 **Ajánlás.** - *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság döntése szerint a mágneses Északhoz viszonyított iránymeghatározás nem megfelelő más alkalmas vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

11.9.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz, vagy hálózati Északhoz viszonyítva teszik közzé, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

11.10 Légiforgalmi adatok

11.10.1 Repülőterek

11.10.1.1 A levegőből jellegzetes rajzolatot mutató minden egyes repülőteret megfelelő jelöléssel kell feltüntetni a térképen. Az üzemen kívül helyezett repülőtereket "üzemen kívül"- ként kell megjelölni.

11.10.1.2 A futópályák elhelyezkedését a repülőtér egyértelmű szemléltetéséhez elégséges nagyságú méretben kell feltüntetni:

1) arra a repülőtérre, amelyre az eljárás alapszik;

2) az olyan repülőterekre, amelyek érintik a forgalmi kört, vagy úgy helyezkednek el, hogy kedvezőtlen időjárási körülmények esetén összetéveszthetők a tervezett leszállás repülőterével.

11.10.1.3 A repülőtér legközelebbi méterre, vagy lábra kerekített tengerszint feletti magasságát a térképen szembeötlő helyen kell feltüntetni.

11.10.1.4 A térképen fel kell tüntetni a küszöb tengerszinthez viszonyított legközelebbi méterre, vagy lábra kerekített magasságát, vagy ahol alkalmazható, a földetérési zóna legmagasabb pontjának legközelebbi méterre, vagy lábra kerekített tengerszint feletti magasságát.

11.10.2 Akadályok

11.10.2.1 Az akadályokat a repülőtér felülnézeti ábrázolásán fel kell tüntetni.

Megjegyzés. - A megfelelő akadályok azok, amelyeket az eljárás specialisták adnak meg.

11.10.2.2 **Ajánlás.** - *Ha valamely akadálymentességi/tengerszint feletti magasság meghatározó tényezője egy, vagy több akadály, akkor ezeket az akadályokat azonosítani kell.*

11.10.2.3 Az akadályok tetejének tengerszinthez viszonyított magasságát a legközelebbi (magasabb) méterre, vagy lábra kerekítve kell közzétenni.

11.10.2.4 **Ajánlás.** - *Az akadályok magasságát a közepes tengerszinttől eltérő alapszinttől mérten is fel kell tüntetni (lásd 11.10.2.3). Ha ilyen magasságokat is feltüntetnek, akkor ezeket zárójelbe téve kell a térképen ábrázolni.*

11.10.2.5 Ha az akadályok magasságát a közepes tengerszinttől eltérő egyéb vonatkoztatási alaphoz viszonyítva tüntetik fel, akkor e vonatkoztatás alapja a repülőtér tengerszinthez viszonyított magassága legyen, kivéve az olyan repülőterek esetében, amelyek műszeres futópályája (vagy pályái) küszöbének tengerszinthez viszonyított magassága több, mint 2 méterrel (7 láb) alacsonyabb, mint a repülőtér tengerszinthez viszonyított magassága, mert ilyen esetben a térkép vonatkoztatási alapja annak a küszöbnek a tengerszinthez viszonyított magassága legyen, amelyre a műszeres megközelítés vonatkozik.

11.10.2.6 Ha nem a közepes tengerszintet használják vonatkoztatási alapul, akkor ezt a térképen szembetűnő helyen közzé kell tenni.

11.10.2.7 Ha az I. kategóriás precíziós megközelítési futópályára akadály mentes zónát nem hoztak létre, ott ezt jelezni kell.

11.10.3 Tiltott, korlátozott és veszélyes légterek

Az eljárások végrehajtását befolyásoló tiltott, korlátozott és veszélyes légtereket azonosítójukkal és magassági határaikkal együtt fel kell tüntetni.

11.10.4 Rádióösszeköttetési berendezések és navigációs eszközök

11.10.4.1 Az eljárásokhoz szükséges rádió-navigációs eszközöket frekvenciájukkal, azonosítójukkal és útirány meghatározó jellemzőikkel - ha vannak ilyenek - kell feltüntetni. Olyan eljárások esetében, amelyeknél a befejező megközelítés pályáján egynél több berendezés található, ott a befejező megközelítésben irányköveteshez alkalmazott berendezést egyértelműen kell azonosítani. Továbbá, fontolóra kell venni, hogy a megközelítési térképen lehetőleg ne tüntessék fel az eljárás folyamán nem alkalmazott berendezéseket.

11.10.4.2 A befejező megközelítés fixét (vagy ILS megközelítési eljárás esetén a befejező megközelítési pontot) és minden egyéb, az eljárásban foglalt és ahhoz nélkülözhetetlen fixet és pontot fel kell tüntetni és azonosítani kell azokat.

11.10.4.3 **Ajánlás.** - *A befejező megközelítés fixét (vagy ILS megközelítési eljárás esetén a befejező megközelítési pontot) fokokban, fokpercekben és fokmásodpercekben megadott földrajzi koordinátáival kell azonosítani.*

11.10.4.4 Az alternatív eljárásoknál használható rádió-navigációs berendezéseket, azok útirány meghatározó jellemzőikkel, ha van ilyen, fel kell tüntetni, vagy jelezni kell a térképen.

11.10.4.5 Az eljárás végrehajtásához szükségesek rádióösszeköttetési frekvenciákat, beleértve a hívójeleket is, fel kell tüntetni.

11.10.4.6 A befejező megközelítési szakasz által érintett minden rádió-navigációs berendezés repülőtértől mért, legközelebbi egész kilométerre, vagy tengeri mérföldre kerekített távolságát kötelező feltüntetni, ha az az eljáráshoz szükséges. Ha nincs útirányt meghatározó olyan berendezés, amely a repülőtérre vezető irányt megadja, az irányt a legközelebbi egész fokra kerekítve kell feltüntetni.

11.10.5 Legkisebb szektor magasság, vagy közel-forgalmi érkezési magasság

Az illetékes hatóság által megállapított legalacsonyabb szektormagasságot, vagy közel-forgalmi érkezési magasságot a vonatkozó szektor egyértelmű jelölésével együtt kell feltüntetni.

11.10.6 Az eljárások útirányainak ábrázolása

11.10.6.1 A felülnézeti rajznak a következő információkat kell ábrázolnia, az alábbiakban megadott módon:

a) a megközelítési eljárás útirányát nyilazott folyamatos vonallal, ahol a nyilak a repülés irányát jelzik;

b) a megszakított megközelítés útirányát nyilazott szaggatott vonallal;

c) nyilazott pontozott vonallal minden egyéb, az a), vagy a b) pontban megadottaktól eltérő kiegészítő eljárás útirányát;

d) az eljáráshoz szükséges legközelebbi egész fokra kerekített irányokat, útirányokat, radiálokat és a legközelebbi kéttized kilométerre, vagy tized tengeri mérföldre kerekített távolságokat, vagy az eljáráshoz előírt időtartamokat;

e) ha az útirány meghatározásához navigációs berendezés nem áll rendelkezésre, a befejező megközelítési szakasz által érintett navigációs berendezéstől a repülőtérre vezető, legközelebbi egész fokra kerekített mágneses irányt;

f) minden olyan szektor határvonalát, amelyben a látásos manőverezés (körözés) tiltott;

g) ahol kijelölték, ott a megközelítéshez és a megszakított megközelítéshez kapcsolódó várakozási eljárást és a várakozás legalacsonyabb tengerszint feletti magasságát/magasságait;

h) ahol szükséges, a térkép előlapján szembetűnő helyen feltüntetett figyelmeztető megjegyzéseket.

11.10.6.2 **Ajánlás.** - *A felülnézeti rajzon fel kell tüntetni a befejező megközelítési szakasz által érintett minden navigációs berendezésnek a repülőtértől mért távolságát.*

11.10.6.3 Rendszerint a felülnézeti rajz alatt, a következő adatokat feltüntető metszetrajzot kell biztosítani:

a) a repülőteret tömör négyszöggel ábrázolva, a repülőtér tengerszinthez viszonyított magasságánál;

b) a megközelítési eljárás oldalnézeti nyomvonalát nyilazott folyamatos vonallal, ahol a nyilak a repülés irányát jelzik.

c) a megszakított megközelítés oldalnézeti nyomvonalát nyilazott szaggatott vonallal és az eljárás leírásával;

d) nyilazott pontozott vonallal minden egyéb kiegészítő, a b) és c) pontban leírtaktól eltérő eljárás oldalnézeti nyomvonalát;

e) az eljáráshoz szükséges legközelebbi egész fokra kerekített irányokat, útirányokat, radiálokat és a legközelebbi kéttized kilométerre, vagy tized tengeri mérföldre kerekített távolságokat, vagy az eljáráshoz előírt időtartamokat;

f) az eljáráshoz szükséges tengerszint/terepszint feletti magasságokat, beleértve az átváltási magasságot is és az eljárásban előírt magasságokat, ahol ilyet kijelöltek;

g) az eljárási forduló legközelebbi egész kilométerre, vagy tengeri mérföldre kerekített határoló távolságát, ha ilyet meghatároztak;

h) a közbenső megközelítés fixét, vagy pontját az olyan eljárásokban, ahol irányváltás nincs engedélyezve;

i) a térkép széléig kiterjesztett, a repülőtér magasságát, vagy a küszöb magasságát - amelyik megfelelő- jelképező vonalat a futópálya küszöbnél kezdődő távolság léptékkel együtt.

11.10.6.4 **Ajánlás.** - *Az eljáráshoz szükséges magasságokat (height) zárójelben kell feltüntetni, a 11.10.2.5 pontban előírt magassági viszonyítási alapot használva.*

11.10.6.5. **Ajánlás.** – *Az oldalnézet tartalmazza a talaj metszetvonalát, vagy a minimum QNH/QFE magasság ábrázolását a következők szerint:*

a) a talaj metszetvonalát folyamatos vonallal tüntetve fel, amely ábrázolja a befejező megközelítés elsődleges területén belül előforduló legmagasabb domborzat legmagasabb pontjainak tengerszint feletti magasságát. A befejező megközelítés másodlagos területén belül előforduló legmagasabb terep alakulatok legmagasabb pontjainak tengerszint feletti magasságait a metszet rajzon szaggatott vonallal tüntetve fel; vagy

b) a közbenső és a befejező megközelítési szakaszra vonatkozó minimum QNH/QFE magasságokat körülhatárolt árnyékolt keretekben.

1. Megjegyzés. - A talaj oldalnézeti ábrázolásához a befejező megközelítési szakasz elsődleges és másodlagos területeinek aktuális mintáit a kartográfusok részére az eljárás specialisták biztosítják

2. Megjegyzés. - A minimum QNH/QFE magasság ábrázolás célja, hogy azt a nem-precíziós megközelítéseket befejező megközelítési fix-el ábrázoló térképeken használják.

11.10.7 Repülőtér üzemeltetési minimumok

11.10.7.1 Ha az állam repülőtér üzemeltetési minimumokat meghatározott, akkor azokat fel kell tüntetni.

11.10.7.2 Az akadálymentességi tengerszint feletti magasságot/terep feletti magasságot azon légijármű kategóriákra fel kell tüntetni, amely kategóriákra az eljárást kialakították; precíziós megközelítési eljárásokhoz, a Cat D_L légijárművek (szárny fesztávolság 65 m és 80 méter között és/vagy a kerekek, illetve a a siklópálya vevő antenna repülési pályája közötti függőleges távolság 7 m és 8 m között van) számára kiegészítő OCA/H-t kell közzétenni, ha az szükséges.

11.10.8 Kiegészítő tájékoztatások

11.10.8.1 Ha a megszakított megközelítési pont az alábbiak révén kijelölt:

- a befejező megközelítési ponttól mért távolsággal, vagy

- navigációs berendezéssel, vagy ponttal és a befejező megközelítés pontjától mért vonatkozó távolsággal,

akkor meg kell adni a befejező megközelítés pontjától a megszakított megközelítés pontjáig adott és a legközelebbi kéttized kilométerre, vagy tized tengeri mérföldre kerekített távolságot, illetve a vonatkozó földfeletti sebességet és időtartamokat tartalmazó táblázatot.

11.10.8.2 Ha a befejező megközelítési szakaszon DME berendezés használata szükséges, akkor fel kell tüntetni egy olyan táblázatot, amely a tengerszint feletti magasságokat/terep feletti magasságokat, vagy 2 km-enként, vagy tengeri mérföldenként tartalmazza - amelyik a megfelelő. A táblázatban nem szerepelhetnek az OCA/H alatti magasságokhoz/tengerszint feletti magasságokhoz tartozó távolság adatok.

11.10.8.3 **Ajánlás.** - *Olyan eljárások esetén, amelyek befejező megközelítési szakaszában a DME berendezés használata nem szükséges, de ahol egy megfelelően telepített DME berendezés rendelkezésre áll, hogy tájékoztató süllyedési profil információt biztosítson, akkor a térképen legyen feltüntetve a tengerszint feletti magasság/terep feletti magasság táblázat.*

11.10.8.4 **Ajánlás.** - *A süllyedés mértékét megadó táblázat feltüntetése szükséges.*

11.10.8.5 A befejező megközelítési fix-el rendelkező nem precíziós eljárások esetében befejező megközelítési süllyedési gradienst és zárójelben a legközelebbi tized fokra kerekített süllyedési szöget kell feltüntetni.

11.10.8.6 Az ILS/MLS és LNAV/VNAV megközelítési eljárásokat ábrázoló térképen meg kell adni az ILS/MLS és az LNAV/VNAV vonatkozási pontjának legközelebbi fél méterre, vagy lábra kerekített magasságát és a siklópálya/tengerszint feletti magasság/függőleges pálya szögének fokértékét. Ha az ILS/MLS siklópálya/szintmagasság szög a 3,5 fokot meghaladja, az eljárással kapcsolatos légijármű és repülő személyzeti megfelelő minősítési követelményekre utaló megjegyzést kell feltüntetni. Ha ILS-hez befejező megközelítési fix-et jelöltek ki a befejező megközelítés pontjánál, akkor egyértelműen jelezni kell, hogy az vajon az ILS-re, az adott ILS csak iránysávos eljárására, avagy mindkettőre alkalmazandó. MLS esetében egyértelműen jelezni kell, ha FAF-ot jelöltek ki a befejező megközelítés pontjánál.

Megjegyzés. - ha a siklópálya szöge 3,5-nál meredekebb, a vonatkozó kiegészítő követelményeket lásd a Légi-navigációs Szolgálatok Eljárásai - Légijármű üzemeltetés (PANS-OPS, Doc 8168) II. Kötetében.

11.10.8.7 A függőleges menti információt biztosító precíziós eljárások befejező megközelítési süllyedési szögét a legközelebbi tized fokra kerekítve kell feltüntetni.

11.10.9 Légiforgalmi adatbázis követelmények

A következő adatokat táblázatos formában kell közölni a térkép hátulján, vagy egy különálló, de megfelelő hivatkozásokkal ellátott lapon:

a) befejező megközelítési fixek/pontok és a műszeres megközelítési eljárást alkotó más lényeges fixek/pontok, földrajzi fokokban, fokpercekben fokmásodpercekben és tized másodpercekben kifejezett koordinátáikkal azonosítva;

b) műszeres megközelítési eljárási fix-et kijelölő szög a legközelebbi századfokra kerekítve; és

c) műszeres megközelítési eljárási fix-et kijelölő távolság a legközelebbi század tengeri mérföldre kerekítve.

d) nem precíziós megközelítés esetében, a befejező megközelítés süllyedési szögét a legközelebbi századfokra kerekítve.

12. FEJEZET- ICAO LÁTÁS SZERINTI MEGKÖZELÍTÉSI TÉRKÉP

12.1 Rendeltetése

E térképnek kell a légijármű személyzet részére biztosítani azokat az információkat, amelyek lehetővé teszik, hogy a repülés utazó/süllyedési szakaszáról látás szerint tájékozódva tudjanak áttérni a leszállás tervezett futópályájára végzett megközelítésre.

12.2 Alkalmazási előírások

Az ICAO Látás szerinti Megközelítési Térkép-et az 1.3.2 pontban meghatározott módon közzé kell tenni a nemzetközi polgári repülés által használt minden olyan repülőtérre, ahol:

1) navigációs berendezések csak korlátozottan állnak rendelkezésre; vagy

2) rádióösszeköttetési berendezések nem állnak rendelkezésre; vagy

3) 1:500 000, vagy nagyobb részletességű megfelelő légi-forgalmi térkép a repülőtérről és annak környezetéről nem áll rendelkezésre; vagy

4) látva repülési megközelítési eljárásokat alakítottak ki.

12.3 Méretarány

12.3.1 A méretarány legyen megfelelő ahhoz, hogy a térkép ábrázolja a lényeges terepjellegzetességeket és a repülőtér helyszínrajzát.

12.3.2 **Ajánlás.** - *A méretarány 1:500 000-nél kisebb nem lehet.*
Megjegyzés. - Ajánlott méretarány az 1:250 000, vagy 1:200 000.

12.3.3 **Ajánlás.** - *Ha az adott repülőtérről ICAO Műszeres Megközelítési Térkép rendelkezésre áll, akkor a Látás szerinti Megközelítési Térképet azzal azonos méretarányban kell elkészíteni.*

12.4 Formátum

Ajánlás. - *A térképlap mérete 210 x 148 mm (8.27 x 5.82 hüvelyk) legyen.*

Megjegyzés. - Előnyös, ha a térképet több színnel nyomják, a színeket úgy megválasztva, hogy a térkép a lehető legjobb olvashatóságot biztosítsa a változó fényerő és fényfajták között.

12.5 Vetület

12.5.1 Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal megközelítőleg azonos egy nagykörrel.

12.5.2 **Ajánlás.** - *A térképlap vonalhálóján egyenlő térközönként fokbeosztási vonalakat kell elhelyezni.*

12.6 Azonosítás

A térképet a repülőtér által kiszolgált városnak, vagy nagyvárosnak a nevével és a repülőtér nevével kell azonosítani.

12.7 Kultúr környezet és tereprajz

12.7.1 A természetes és kultúr környezeti terepjellegzetességeket kell feltüntetni (például sziklaszirteket, parti sziklafalakat, homokdűnéket, városokat, nagyvárosokat, utakat, vasutakat, egyedül álló világítótornyokat, stb.).

12.7.1.1 **Ajánlás.** - *A földrajzi helységneveket csak akkor kell megadni, amikor azok az összetévesztés elkerülése, vagy a bizonytalanság megakadályozása végett szükségesek.*

12.7.2 A partvonalakat, tavakat, folyókat és patakokat fel kell tüntetni.

12.7.3 A domborzatot a térképen ábrázolt terület magassági és akadályjellemzőnek legjobban megfelelő módon kell ábrázolni.

12.7.4 **Ajánlás.** - *Ha a magassági pontokat feltüntetnek, akkor azokat gondosan meg kell válogatni.*
Megjegyzés. - Bizonyos kiemelkedő pontok magassága/tengerszinthez viszonyított magassága megadható mind a repülőtér szintjéhez viszonyítva mind, a közepes tengerszinthez viszonyítva is.

12.7.5 A különböző vonatkozási alaphoz viszonyított magasságok számértékeit jól megkülönböztethető módon kell feltüntetni.

12.8 Mágneses eltérés

A mágneses eltérést fel kell tüntetni.

12.9 Irányok, útirányok és radiálok

12.9.1 A 12.9.2 pontban előírtak kivételével, az irányoknak, útirányoknak és a radiáloknak mágneses irányoknak kell lenniük.

12.9.2 **Ajánlás.** - *A magasabb földrajzi szélességű területek esetében, ha az illetékes hatóság döntése szerint a mágneses Északhoz viszonyított iránymeghatározás nem megfelelő, más alkalmas vonatkoztatási alap, például földrajzi Észak, vagy hálózati Észak használható.*

12.9.3 Ha az irányok, útirányok, vagy a radiálok földrajzi Északhoz, vagy hálózati Északhoz viszonyítva szerepelnek, akkor ezt világosan jelezni kell. Ha hálózati Északot alkalmaznak, akkor ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

12.10 Légiforgalmi adatok

12.10.1 Repülőterek

12.10.1.1 Az összes repülőteret a futópálya elrendezés ábrázolásával kell feltüntetni. Ha bármelyik leszállási irány használata korlátozva lenne, azt jelölni kell. Ahol két szomszédos repülőtér viszonylatában fennáll az összetéveszthetőség lehetősége, ezt jelezni kell. Az üzemen kívül helyezett repülőtereket "üzemen kívül"-iként kötelező azonosítani.

12.10.1.2 A repülőtér tengerszinthez viszonyított magasságát a térképen szembetűnő helyen fel kell tüntetni.

12.10.2 Akadályok

12.10.2.1 Az akadályok feltüntetése és azonosítása kötelező.

12.10.2.2 Az akadályok magasságát a tetejük tengerszinthez viszonyított magasságának a legközelebbi (magasabb) méterre, vagy lábra felkerekítésével kell megadni.

12.10.2.3 **Ajánlás.** - *Az akadályok repülőtér tengerszintjéhez viszonyított magasságát fel kell tüntetni.*

12.10.2.3.1 Ha az akadályok terepszint feletti magasságát szerepeltetik, akkor a vonatkoztatási alapot a térképen szembetűnő helyen fel kell tüntetni, továbbá a magasságokat zárójelben kell megadni a térképen.

12.10.3 Tiltott, korlátozott és veszélyes légterek

A tiltott légtereket, korlátozott légtereket és veszélyes légtereket azonosítójukkal és magassági határaikkal együtt kötelező feltüntetni.

12.10.4 Kijelölt légterek

Ahol alkalmazható, a repülőtéri irányítói körzeteket és a repülőtéri forgalmi körzeteket magassági határaikkal együtt és a légtér megfelelő osztály jelével együtt kell feltüntetni.

12.10.5 Tájékoztatás látás szerinti megközelítéshez

12.10.5.1 A látás szerinti megközelítési eljárásokat - ahol ez alkalmazható - a térképen fel kell tüntetni.

12.10.5.2 A navigáció látási támpont segédeszközeit fel kell tüntetni, ahogy megfelelő.

12.10.5.3 Az optikai siklópálya rendszer helyét és típusát, valamint a névleges megközelítési siklószöget és a névleges "siklópályán" jelnek megfelelő küszöb feletti minimum szemmagasságot fel kell tüntetni. Továbbá ott, ahol a rendszer tengelye nem párhuzamos a futópálya középvonalával fel kell tüntetni az irányeltérés szögét és irányát, úgy, mint jobbra vagy balra.

12.10.6 Kiegészítő tájékoztatások

12.10.6.1 A rádió-navigációs berendezéseket, frekvenciájukkal és azonosítójukkal együtt fel kell tüntetni, ahogy megfelelő.

12.10.6.2 A rádióösszeköttetési berendezéseket frekvenciájukkal együtt fel kell tüntetni, ahogy megfelelő.

13. FEJEZET - ICAO REPÜLŐTÉR/HELIKOPTER REPÜLŐTÉR TÉRKÉP

13.1 Rendeltetése

E térképnek kell a légijármű személyzet számára biztosítania a légijárművek földi mozgását megkönnyítő információkat:

a) a légijármű állóhelyéről a futópályáig; és

b) a futópályától a légijármű állóhelyig;

valamint a helikopterek mozgását megkönnyítő információkat:

a) a helikopter állóhelyéről a földet érési és elemelkedési területig és a befejező megközelítési és felszállási területig;

b) a befejező megközelítési és felszállási területről a földet érési és elemelkedési területig és a helikopter állóhelyig;

c) a helikopter földi és légi guruló utak mentén; és

d) a légi tranzit utak mentén;

továbbá, alapvető repülőtéri/helikopter repülőtéri üzemeltetési tájékoztatásokat is biztosítania kell.

13.2 Alkalmazási előírások

13.2.1 Az ICAO Repülőtér/helikopter repülőtér térkép-et a nemzetközi polgári repülés által rendszeresen használt összes repülőtérre/helikopter repülőtérre az 1.3.2 pontban leírt módon el kell készíteni.

13.2.2 **Ajánlás.** - *Az ICAO Repülőtér/helikopter repülőtér Térkép-et az 1.3.2. pontban előírt módon el kell készíteni a nemzetközi polgári repülés használatára rendelkezésre álló összes egyéb repülőtérről/helikopter repülőtérről is.*

Megjegyzés. - Bizonyos körülmények esetén szükségessé válhat az ICAO Repülőtéri Földi Mozgások Térkép és az ICAO Légijármű Állóhely/Beállító Térkép elkészítése (lásd a 14. és a 15. Fejezetben), amely esetben az ezeken a kiegészítő térképeken feltüntetett részleteket nem kell az ICAO Repülőtér/Helikopter repülőtér Térkép-en megismételni.

13.3 Fedésterület és méretarány

13.3.1 A fedésterület és a méretarány legyen elegendően nagy ahhoz, hogy a térkép a 13.6.1 pontban felsorolt valamennyi alkotóelemet világosan ábrázolja.

13.3.2 A térképen lineáris mérővonalat kell feltüntetni.

13.4 Azonosítás

A térképet a repülőtér/helikopter repülőtér által kiszolgált nagy város, város, vagy körzet nevével, valamint a repülőtér/helikopter repülőtér nevével kell azonosítani.

13.5 Mágneses eltérés

A földrajzi és a mágneses Észak irányjelző nyilakat, a legközelebbi fokra kerekített mágneses eltérést és a mágneses eltérés éves változtatását fel kell tüntetni.

13.6 Repülőtéri/helikopter repülőtéri adatok

13.6.1 E térkép ábrázolja:

a) a repülőtér/helikopter repülőtér vonatkoztatási pontjának földrajzi koordinátáit fokokban, fokpercekben és fokmásodpercekben;

b) a legközelebbi egész méterre, vagy lábra kerekítve, a repülőtér/helikopter repülőtér, a nem precíziós megközelítési futópálya küszöbök és az előtér pontjainak (repülés előtti magasságmérő ellenőrzési helyek), ha alkalmazható, tengerszinthez viszonyított magasságát; és a nem-precíziós megközelítésekhez a futópálya küszöbök, valamint a földetérési és elemelkedési terület geometriai középpontjának tengerszinthez viszonyított magasságát és geoid egyenetlenségét;

c) a legközelebbi fél méterre, vagy lábra kerekítve, a futópálya küszöbök, a földetérési és elemelkedési terület geometriai középpontjának, valamint a precíziós megközelítési futópálya földetérési zónája legmagasabb pontjának tengerszinthez viszonyított magasságát és geoid egyenetlenségét;

d) az összes futópályát beleértve az építés alatt állókat is, a futópályák azonosítóját, a legközelebbi méterre kerekített hosszukat, szélességüket, teherbírásukat, a beljebb helyezett küszöböket a végbiztonsági és az akadálymentes sávokat, a futópályák irányát a legközelebbi mágneses fokra kerekítve, a burkolat fajtáját és a futópálya burkolatának jeleit;

Megjegyzés. - A teherbírás megadható táblázatos formában a térkép előlapján, vagy a hátoldalán.

e) az összes előteret a légijármű/helikopter állóhelyekkel, a világítási rendszert, a jelöléseket és egyéb vizuális útmutató és irányító eszközöket, ahol alkalmazható, beleértve a vizuális beállító útmutató rendszerek típusát és elhelyezkedését, a helikopter repülőtér felületének típusát és teherbírását, vagy a légjármű korlátozás fajtáját ott, ahol a teherbírás kisebb, mint a kapcsolódó futópályák teherbírása;

Megjegyzés. - A teherbíró képesség, vagy a légijármű típus szerinti korlátozás táblázatos formában is megadható, a térkép előlapján, vagy a hátoldalán.

f) a küszöbök, a földet érési és elemelkedési terület geometriai középpontjának és/vagy a befejező megközelítés és felszállási terület küszöbjeinek földrajzi koordinátáit fokokban, fokpercekben és fokmásodpercekben (ahol alkalmazható);

g) az összes guruló utat, helikopter légi- és földi guruló utat a felület típusával együtt, a helikopter légi tranzit utakat, elnevezésükkel, szélességükkel, fénytechnikai rendszereikkel, burkolati jelzéseikkel, beleértve a gurulási várópontokat és a megállító kereszt fénysorokat, az egyéb vizuális útmutató és irányító eszközöket, a teherbíró képességet, vagy a légijármű típus szerinti korlátozásokat ott, ahol a teherbíró képesség kisebb, mint a kapcsolódó futópálya teherbíró képessége;

Megjegyzés. - A teherbíró képesség, vagy a légijármű típus szerinti korlátozás feltüntethető táblázatos formában a térkép előlapján, vagy hátoldalán.

h) megfelelő gurulóút középvonal pontok és légijármű állóhelyek földrajzi koordinátáit fokokban, fokpercekben és fokmásodpercekben;

i) ahol ilyet a guruló légijárművek része kialakítottak, a szabvány útvonalakat, elnevezésükkel együtt;

j) a légiforgalmi irányító szolgálat területi határát;

k) a futópálya látástávolság (RVR) mérőberendezések helyét;

l) a bevezető és a futópálya fényeket;

m) az optikai siklópálya rendszer helyét és típusát, a névleges megközelítési siklószöget, valamint a névleges "siklópályán" jelhez tartozó küszöb feletti minimum szemmagasságot fel kell tüntetni. Továbbá ott, ahol a rendszer tengelye nem párhuzamos a futópálya középvonalával, fel kell tüntetni az irányeltérés szögét és irányát, úgy, mint jobbra, vagy balra.

n) a rádióösszeköttetési berendezéseket;

o) a gurulási akadályokat;

p) a légijármű kiszolgáló területeket és az üzemeltetés szempontjából fontos épületeket;

q) a VOR ellenőrzési pontot és az adott berendezés frekvenciáját;

r) az ábrázolt mozgási terület bármely olyan részét, mely tartósan alkalmatlan a légijárművek részére, ilyenként egyértelműen azonosítva azt.

13.6.2 A 13.6.1-ben a helikopter repülőterekre vonatkozó tételek kiegészítéseképp a térképen fel kell tüntetni:

a) a helikopter repülőtér típusát;

Megjegyzés. - A helikopter repülőtér típusokat a 14. Annex II. Kötete, talajszinti, építményen kialakított, vagy hajófedélzeti helikopter repülőtérként azonosítja.

b) a földet érési és elemelkedési területet, beleértve a legközelebbi méterre kerekített méreteit, lejtését, a felület fajtáját és teherbírását tonnában kifejezve;

c) a befejező megközelítési és felszállás területet, beleértve típusát, földrajzi irányát a legközelebbi egész fokra kerekítve, (ahol megfelelő) azonosító számát, hosszát és szélességét a legközelebbi méterre kerekítve, lejtését és a felület fajtáját;

d) a biztonsági területet, beleértve hosszát, szélességét és a felület fajtáját;

e) a helikopter akadálymentes sávot, beleértve hosszát és talajának profilját;

f) az akadályokat, beleértve fajtájukat, tetejüknek a következő magasabb méter, vagy láb értékre kerekített szintmagasságát;

g) a megközelítési eljáráshoz tartozó látási segédeszközöket, a befejező megközelítési és felszállási terület valamint a földet érési és elemelkedési terület jelöléseit és fénytechnikai berendezéseit;

h) a helikopter repülőtér rendelkezésre állóként közzétett, legközelebbi méterre kerekített úthossz értékeit, ahol alkalmazható, beleértve:

1) a rendelkezésre álló felszálló úthosszat;

2) a rendelkezésre álló megszakított felszálló úthosszat;

3) a rendelkezésre álló leszálló úthosszat.

14. FEJEZET
ICAO REPÜLŐTÉRI FÖLDI MOZGÁSOK TÉRKÉPE

14.1 Rendeltetése

E kiegészítő térképnek kell a légijármű személyzet számára biztosítani azt a részletes tájékoztatást, amely megkönnyíti a légijárműveknek a légijármű állóhelyekre/ről való földi mozgását és a légijárművek parkolását/beállását.

14.2 Alkalmazási előírások

Ajánlás. - *Az ICAO Repülőtéri Földi Mozgások Térképe-t az 1.3.2 pontban leírt módon biztosítani kötelező olyan esetekben, ha az információk zsúfoltsága miatt a légijárműveknek a guruló utakon az állóhelyekre/ről való földi mozgásához szükséges részletes tájékoztatás nem tüntethető fel kielégítő láthatósággal az ICAO Repülőtér/Helikopter repülőtér Térkép-en.*

14.3 Fedésterület és méretarány

14.3.1 A térkép fedésterülete és méretaránya legyen elegendő nagyságú ahhoz, hogy a 14.6 pontban felsorolt összes alkotóelemet tisztán ábrázolja.

14.3.2 **Ajánlás**. - *A térképen lineáris mérővonalat kötelező feltüntetni.*

14.4 Azonosítás

A térképet a repülőtér által kiszolgált város, vagy nagyváros nevével valamint a repülőtér nevével kell azonosítani.

14.5 Mágneses eltérés

14.5.1 A térképen a földrajzi Északot jelző nyilat kötelező feltüntetni.

14.5.2 **Ajánlás.** - *A legközelebbi egész fokra kerekített mágneses eltérést és az évenkénti változását fel kell tüntetni.*

Megjegyzés. - E térképet nem szükséges a földrajzi Északra tájolni.

14.6 Repülőtéri adatok

E térképen a Repülőtér/Helikopter repülőtér Térképen megadott és azokkal megegyező módon szerepelnie kell az ábrázolt területre vonatkozó összes információnak, beleértve:

a) az előtér legközelebbi méterre, vagy lábra kerekített tengerszinthez viszonyított magasságát;

b) az előtereket a légijármű állóhelyekkel, a teherbíró képességet, vagy a légijármű típus szerinti korlátozást, térvilágítást, a burkolati jeleket és egyéb vizuális útmutató és irányító eszközöket, ahol alkalmazható, beleértve a vizuális beállási útmutató rendszerek helyét és típusát is;

c) a légijármű állóhelyek földrajzi koordinátáit fokokban, fokpercekben és század fokmásodpercekben;

d) a guruló utakat elnevezésükkel, legközelebbi méterre kerekített szélességüket, teherbírásukat, vagy a légijármű típus szerinti korlátozásokat, ahol alkalmazható, a fényeket, a burkolati jeleket, beleértve a gurulási várópontokat és a megállító kereszt fénysorokat, valamint az egyéb vizuális útmutató és irányító eszközöket;

e) a guruló légijárművek részére szolgáló szabvány útvonalakat, elnevezésükkel, ahol ilyet kialakítottak;

f) megfelelő guruló út középvonal pontok földrajzi koordinátáit fokokban, fokpercekben, fokmásodpercekben és század fokmásodpercekben;

g) a légiforgalmi irányító szolgálat területi határát;

h) a megfelelő rádióösszeköttetési berendezéseket frekvenciáik felsorolásával;

i) a gurulási akadályokat;

j) a légijármű kiszolgáló területeket és az üzemeltetés szempontjából fontos épületeket;

k) a VOR ellenőrzési pontot és az adott berendezés rádió frekvenciáját;

l) az ábrázolt mozgási terület bármely olyan részét, amely tartósan alkalmatlan a légijárművek részére és azokat ilyenként világosan azonosítva.

15. FEJEZET - ICAO LÉGIJÁRMŰ ÁLLÓHELY/BEÁLLÍTÓ TÉRKÉP

15.1 Rendeltetése

A légijármű személyzet részére e kiegészítő térképnek kell részletes tájékoztatást biztosítani azokról a részletekről, amelyek megkönnyítik a légijárműveknek a guruló utak és a légijármű állóhelyek közötti mozgását, illetve a légijárművek parkolását/beállását.

15.2 Alkalmazási előírások

Ajánlás. - *Az ICAO Légijármű Állóhely/Beállító Térkép-et, az 1.3.2 pontban leírt módon el kell készíteni ott, ahol a forgalmi létesítmények rendszerének bonyolultsága miatt kielégítő áttekinthetőséggel a tájékoztatás nem adható meg az ICAO Repülőtér/Helikopter repülőtér Térkép-en, vagy az ICAO Repülőtér Földi Mozgások Térképe-n.*

15.3 Fedésterület és méretarány

15.3.1 A fedésterület és méretarány elegendően nagy legyen ahhoz, hogy a 15.6 pontban felsorolt összes alkotóelem világosan feltüntethető legyen.

15.3.2 **Ajánlás.** - *A térképen lineáris mérővonalat kötelező feltüntetni.*

15.4 Azonosítás

A térképet a repülőtér által kiszolgált város, vagy nagyváros, vagy térség nevével, valamint a repülőtér nevével kell azonosítani.

15.5 Mágneses eltérés

15.5.1 A térképen a földrajzi Északot jelző nyilat kötelező feltüntetni.

15.5.2 **Ajánlás.** - *A legközelebbi egész fokra kerekített mágneses eltérést és az évenkénti változását fel kell tüntetni.*

Megjegyzés. - E térképet nem szükséges a földrajzi Északra tájolni.

15.6 Repülőtéri adatok

E térképen, az ICAO Repülőtér/Helikopter repülőtér Térkép-en és az ICAO Földi Mozgások Térképe-n megadott és azokkal megegyező módon kell szerepelnie az ábrázolt területre vonatkozó minden információnak, beleértve:

a) az előtér legközelebbi méterre, vagy lábra kerekített tengerszinthez viszonyított magasságát;

b) az előtereket a légijármű állóhelyekkel, a teherbíró képességet, vagy a légijármű típus szerinti korlátozást, fényjelzéseket, a burkolati jeleket és egyéb vizuális útmutató és irányító eszközöket, ahol alkalmazható, beleértve a vizuális dokkolás irányító rendszerek helyét és típusát is;

c) a légijármű állóhelyek földrajzi koordinátáit fokokban, fokpercekben, fokmásodpercekben és század fokmásodpercekben;

d) a guruló út belépőpontokat elnevezéseikkel, beleértve a gurulási várópontokat és a megállító kereszt fénysorokat;

e) a megfelelő guruló út középvonal pontok földrajzi koordinátáit fokokban, fokpercekben, fokmásodpercekben és század fokmásodpercekben;

f) a légiforgalmi irányító szolgálat területi határát;

g) a megfelelő rádióösszeköttetési berendezéseket frekvenciáik felsorolásával;

h) a gurulási akadályokat;

i) a légijármű kiszolgáló területeket és az üzemeltetés szempontjából fontos épületeket;

j) a VOR ellenőrzési pontot és az adott berendezés rádió frekvenciáját;

k) az ábrázolt mozgási terület bármely olyan részét, amely tartósan alkalmatlan a légijárművek részére és azokat ilyenként világosan azonosítva.

16. FEJEZET – ICAO 1 : 1 000 000 LÉGIFORGALMI VILÁG TÉRKÉP

16.1 Rendeltetése

A térkép célja, hogy információkat biztosítson a látás szerinti repülés légi-navigációs igényeinek kielégítésére.

Megjegyzés. - Ez a térkép még szolgálhat:

1) alap légiforgalmi térképként:

a) olyan esetekben, amikor a látás szerinti tájékoztatás tekintetében hiányos, erősen specializált térképek lényeges adatokkal nem szolgálnak;

b) hogy biztosítva legyen a Föld teljes térképi fedettsége azonos méretaránnyal és a szükséges adatok egységes ábrázolásával;

c) a nemzetközi polgári repülés által igényelt egyéb légiforgalmi térképek előállításánál;

2) repülés előtti felkészülési térképként.

16.2 Alkalmazási előírások

16.2.1 Az ICAO 1 : 1 000 000 Légiforgalmi Világ Térképet az 5. Függelékben meghatározott minden területről az 1.3.2 pontban előírt módon el kell készíteni.

Megjegyzés. - Ha üzemeltetési, vagy térképkészítési megfontolások azt mutatják, hogy az üzemeltetési igények hatékonyan kielégíthetők az ICAO 1 : 500 000-es Légiforgalmi Térképpel, vagy az ICAO Kis Méretarányú Légiforgalmi Navigációs Térképpel, akkor ezek bármelyike rendelkezésre bocsátható az alap 1 : 1 000 000 méretarányú térkép helyett.

16.2.2 **Ajánlás.** - *Az összes szárazföldi terület teljes ábrázolásának biztosítása, és valamely koordinált sorozat kellő folyamatosságának biztosítása érdekében az 1 : 1 000 000-tól eltérő méretarányú térképek méretarányának megválasztását körzeti egyezményben kell meghatározni.*

16.3 Méretarány

16.3.1 A kilométer és tengeri mérföld mérővonalakat a következők szerint kell elrendezni:

- kilométer,

- tengeri mérföld,

egyazon “O” pontból induló függőleges vonal mentén, a térképlap szélén feltüntetve.

16.3.1.1 **Ajánlás.** - *A lineáris mérővonal legalább 200 km (110 tengeri mérföld) hossznak megfelelő méretű legyen.*

16.3.2 A térképlap szélén egy (méter/láb) átváltási mérővonalat is fel kell tüntetni.

16.4 Formátum

16.4.1 **Ajánlás.** - *A címfeliratokat és a széljegyzeteket az ICAO valamelyik munkanyelven kell a térképre nyomtatni.*

Megjegyzés. - Az ICAO munkanyelvét kiegészítve, a kiadó ország nyelve is alkalmazható.

16.4.2 A csatlakozó lapok számozására, valamint a tengerszinthez viszonyított magasságok kifejezésére alkalmazott mértékegységre vonatkozó tájékoztatást úgy kell a térképlapon elhelyezni, hogy az a térkép összehajtogatott formájában is jól látható legyen.

16.4.**3 Ajánlás.** - *A térképlap összehajtogatásának módja a következő legyen:*

A térképet hossztengelye mentén, a felező szélességi kör mellett hajtsa össze, úgy, hogy a térkép előlapja kívül és felül legyen; fordítsa a térképet alsó felével felfelé, a középső hosszúsági kör mentén hajtsa félbe befelé irányban,majd mindkét fél részt harmonikaszerűen hajtsa vissza.

16.4.4 **Ajánlás.** - *Amikor csak lehetséges, a térképlap határvonalainak meg kell egyezni az 5. Függelékben megadottakkal.*

1. Megjegyzés. - Adott cél teljesítése érdekében a lap által fedett terület a megadott vonalaktól eltérhet.

2. Megjegyzés. - Elismerten hasznos, hogy az ICAO 1 : 1 000 000 térképek és a Nemzetközi Világtérkép (IMW) megegyező lapjai számára azonos határvonalakat fogadnak el, feltéve, hogy ez nem sérti a légiforgalmi követelményeket.

16.4.5 Az alkalmazott lap-határvonalakról -az információ ICAO Légiforgalmi Térkép Katalógus-ában (Doc 7101) történő közzététele érdekében- az ICAO-t értesíteni kell.

16.4.6 **Ajánlás. -** *A térkép fedésterületének -lap felső, és a jobb oldali részének- a jegyzékben megadott területen kívülre történő kiszélesítésével átfedést kell biztosítani. Ennek az átfedő területnek is tartalmaznia kell az összes légiforgalmi, tereprajzi, vízrajzi és kultúr környezeti információt. Az átfedésnek a határvonalon túl 28 km-re (15 tengeri mérföld) kell kiterjednie, ha lehetséges, de minden esetben ki kell terjeszteni az egyes térképek határoló szélességi és hosszúsági köreitől a térkép lapszél-vonaláig.*

16.5 Vetület

16.5.1 A vetületek a következők legyenek:

1) az Egyenlítő és a 80 fok szélességi kör között: Lambert-féle szögtartó kúpvetület az egyes térképsávokra külön tartománnyal. A szabvány szélességi köröknek minden 4 foknyi tartományban 40 fokperccel a legészakabbi szélességi körtől délre, és 40 fokperccel a legdélebbi szélességi körtől északra kell lenniük;

2) a 80 fok és 90 fok szélességi kör között poláris sztereografikus vetület, amely méretaránya a 80 fok szélességi körnél megegyezik a Lambert féle szögtartó kúpvetületével, kivéve, hogy az északi féltekén a Lambert-féle szögtartó kúpvetület használható a 80 fok és 84 fok szélességi kör között is, illetve a 84 fok északi szélességnél egyező méretarányú poláris sztereografikus vetület alkalmazható a 84 fok és 90 fok szélességi kör között.

16.5.2 A fokhálózatokat és a fokbeosztási vonalakat az alábbiak szerint kell ábrázolni:

1) Szélességi körök esetében:

Földrajzi szélesség	A szélességi körök közötti távolság	Fokbeosztási vonalak a szélességi körökön
0 fok-72 fok	30'	1'
72 fok -84 fok	30'	5'
84 fok-89 fok	30'	1 fok
89 fok-90 fok	30'	5 fok (Csak a 72 fok - 89 fokig terjedő egészfokos szélességi körökön.)

2) Hosszúsági körök esetében:

Földrajzi szélesség	A szélességi körök közötti távolság	Fokbeosztási vonalak a szélességi körökön
0 fok-52 fok 52 fok-72 fok	30' 30'	1' 1' (Csak a páros hosszúsági körökön.)
72 fok-84 fok 84 fok-89 fok 89 fok-90 fok	1 fok 5 fok 15 fok	1' 1' 1' (Csak minden negyedik hosszúsági körön)

16.5.3 A fokbeosztási jelöléseket 1 és 5 fokpercenként kell a Greenwich-i hosszúsági körtől és az Egyenlítőtől kiindulóan feltüntetni. A 10 fokperces térközöket olyan jelöléssel kell ellátni, amely a vonal mindkét oldalára kiterjed.

16.5.3.1 **Ajánlás.** - *A fokbeosztási vonalkák hosszának hozzávetőleg 1,3 mm-nek (0,05 hüvelyk) kell lennie az 1 fokpercek jelölésénél, 2 mm-nek (0,08 hüvelyk) az 5 fokpercek jelölésénél és 2 mm-nek (0,08 hüvelyk) a10 fokperceknek a fokhálózati vonal mindkét oldalára kiterjedő jelölésénél.*

16.5.4 Az összes feltüntetett hosszúsági és szélességi kört be kell számozni a térkép határvonalán. Ezenkívül minden szélességi kört a térképen belül is be kell számozni oly módon, hogy azok könnyen azonosíthatóak legyenek a térkép összehajtott állapotában is.

Megjegyzés. - A hosszúsági körök is beszámozhatók a térképen belül.

16.5.5 A térkép szélén meg kell adni a vetület fajta nevét és alapvető jellemzőit.

16.6 Azonosítás

A lapszámozás az 5. Függelékben megadott index-el legyen egyezésben.

Megjegyzés. - A Nemzetközi Világtérkép (IMW) vonatkozó lapszáma is feltüntethető.

16.7 Kultúr környezet és tereprajz

16.7.1 Beépített területek

16.7.1.1 A nagyvárosokat, városokat és falvakat a látás szerinti navigálás szempontjai szerinti fontosságuknak megfelelően kell megválogatni és feltüntetni a térképen.

16.7.1.2 **Ajánlás.** - *A megfelelően nagyméretű nagyvárosokat és városokat a beépített területek határvonalával, és nem kijelölt határaikkal kell jelezni.*

16.7.2 Vasútvonalak

16.7.2.1 A tájékozódási támpont jelleggel bíró minden vasútvonalat fel kell tüntetni.

1. Megjegyzés. - A zsúfoltabb területeknél az áttekinthetőség érdekében egyes vasútvonalak feltüntetésétől el lehet tekinteni.

2. Megjegyzés. - Ha a rendelkezésre álló hely módot ad rá, ott a vasútvonalak neve megadható.

16.7.2.2 **Ajánlás.** - *A fontos alagutakat fel kell tüntetni.*

Megjegyzés. - Ismertető megjegyzéssel kiegészíthető

16.7.3 Főútvonalak és utak

16.7.3.1 Az úthálózatot olyan részletességgel kell feltüntetni, hogy rajzolatuk lényegi részei a levegőből szemlélve felismerhetők legyenek.

16.7.3.2 **Ajánlás.** - *A beépített területeken lévő utat nem kell ábrázolni, kivéve, ha a levegőből nézve, mint határozott terepjellegzetességek, felismerhetők.*
Megjegyzés. - A fontos főútvonalak neve, vagy száma feltüntethető.

16.7.4 Tájékozódási támpontok

Ajánlás. - *Ha a látás szerinti navigálás szempontjából fontosnak tartják, akkor a természet és a kultúr környezet olyan tájékozódási támpontjait fel kell tüntetni, mint például a hidak, nagy távvezetékek, állandó telepítésű drótkötélpályák, bányaszerkezetek, erődök, romok, gátak/töltések, csővezetékek valamint sziklák, hegyfokok, kőszirtek, homokdűnék, különálló világítótornyok, világító hajók stb.*
Megjegyzés. - Ismertető megjegyzésekkel kiegészíthetők.

16.7.5 Politikai határok

A nemzetközi határokat kötelező feltüntetni. A kijelöletlen és meghatározatlan határokat magyarázó megjegyzéssel kell megkülönböztetni.

16.7.6 Vízrajz

16.7.6.1 A térkép méretarányával egyeztethető minden vízrajzi jellegzetességet fel kell tüntetni, ideértve a partvonalakat, tavakat, folyókat és patakokat (a nem állandó jellegűeket is), sós tavakat, gleccsereket és jégsapkákat.

16.7.6.2 **Ajánlás.** - *A nagykiterjedésű nyílt vízfelületeket egészen világos színárnyalattal kell jelölni.*

Megjegyzés. - A partvonal kiemelése céljából a partvonalak mentén keskeny, sötétebb tónusú zóna alkalmazható.

16.7.6.3 **Ajánlás.** - *Ha lényeges tájékozódási jelleggel bírnak, akkor a zátonyok és homokpadok, az egyedül álló sziklák, a homokos, kavicsos, köves és egyéb hasonló jellegű területek a megfelelő térképjellel feltüntethetők.*

Megjegyzés. - A sziklacsoportok, az adott területre berajzolt néhány szikla-térképjellel ábrázolhatók.

16.7.7 Szintvonalak

16.7.7.1 A szintvonalakat fel kell tüntetni. A szintvonalak közötti térköz megválasztása teljesítse azt a kívánalmat, hogy a légi-navigációhoz szükséges domborzati viszonyok egyértelműen legyenek ábrázolva.

16.7.7.2 Az alkalmazott szintvonalak értékét fel kell tüntetni.

16.7.8 Magasság szerinti színárnyalás

16.7.8.1 A térképen alkalmazott magassági színárnyalás magassági tartományait fel kel tüntetni.

16.7.8.1 A magasság szerinti színárnyalás skáláját a térkép lapszélén fel kell tüntetni.

16.7.9 Magassági pontok

16.7.9.1 A kiválasztott kritikus pontoknál fel kell tüntetni a magassági pont tengerszinthez viszonyított magasságát. A kiválasztott magassági pontok a közvetlen környezet legmagasabb pontjai legyenek, általában egy hegycsúcsot, vagy hegygerinc tetejét kell jelezniük. A repülés szempontjából különös fontossággal bíró völgyek, vagy tavak felszínének tengerszinthez viszonyított magasságát fel kell tüntetni. A kiválasztott magassági pontok helyét egy ponttal kell jelezni.

16.7.9.2 A térkép szélén kötelező megadni a térképen ábrázolt legmagasabb pont tengerszinthez viszonyított magasságát (lábban, vagy méterben) és annak legközelebbi 5 fokpercre kerekített földrajzi helyét.

16.7.9.3 **Ajánlás.** - *A térképlapon a legmagasabb pont tengerszinthez viszonyított magasságának értékeit jelző számjegyek körül a színárnyalást törölni kell.*

16.7.10 Hiányos, vagy megbízhatatlan domborzati információk

16.7.10.1 "A domborzati adatok hiányosak" megjegyzést kell feltüntetni az olyan területek esetében, amelyek szintvonalas ábrázolásához a felmérések még nem történtek meg.

16.7.10.2 A légiforgalmi információk feltüntetésére alkalmazott színnel figyelmeztető megjegyzést kell nyomtatni azon térképek előlapjára, amely térképeknél a magassági pontok tengerszinthez viszonyított magasság értékei általában megbízhatatlanok; a figyelmeztetés szövege a következő legyen:

"Figyelem - E térképen a domborzati információk megbízhatatlanok, ezért a tengerszinthez viszonyított magasság értékek figyelembevételekor körültekintően kell eljárni."

16.7.11 Szakadékok

Ajánlás. - *A szakadékokat fel kell tüntetni, ha azok szembeötlő terep jellegzetességek vagy, ha a kultúr környezet nagyon szórványos.*

16.7.12 Fás területek

16.7.12.1 **Ajánlás.** - *A fás területeket tüntessék fel.*

Megjegyzés. - A magasabb földrajzi szélességen fekvő területek térképein az erdőhatár hozzávetőleges legészakibb, illetve legdélebbi vonala feltüntethető

16.7.12.2 Ha az erdőhatár hozzávetőleges legészakibb, illetve legdélebbi vonalát ábrázolják, akkor azt, megfelelő felirattal kiegészített szaggatott fekete vonallal kell jelölni.

16.7.13. A tereprajzi információk kelte

A térkép szélén közölni kell a feltüntetett tereprajzi információk legutolsó felmérésének időpontját.

16.8 Mágneses eltérés

16.8.1 Az izogon vonalakat fel kell tüntetni.

16.8.2 Az izogon információk felmérésének dátumát meg kell adni a térképlap szélén.

16.9 Légiforgalmi adatok

16.9.1 A feltüntetett légiforgalmi adatok mennyiségét - a térképnek a látás szerinti navigációhoz való felhasználásával összhangba hozva és az adatok módosítási ciklusát (lásd a 16.9.6 pontot) figyelembe véve - a lehető legalacsonyabb szinten kell tartani.

16.9.2 Repülőterek

16.9.2.1 A nagyobb légiforgalmi jelentőségű repülőtereknek elsőbbséget adva, a szárazföldi és vízi repülőtereket, valamint a helikopter repülőtereket nevükkel együtt fel kell tüntetni, oly mértékig, hogy a térképen ne okozzanak felesleges zsúfoltságot.

16.9.2.2 A repülőtér tengerszinthez viszonyított magasságát, a rendelkezésre álló fénytechnikai rendszert, a futópálya felület fajtáját és a leghosszabb futópálya, vagy csatorna hosszát, a 2. Függelékben bemutatott példának megfelelően rövidített formában kell megadni az egyes repülőterekre, feltéve, hogy ez a térképen nem okoz zsúfoltságot.

16.9.2.3 Az üzemen kívül helyezett repülőtereket, melyek a levegőből repülőtérként még felismerhetők, fel kell tüntetni és "üzemen kívüli" jelöléssel kell ellátni azokat.

16.9.3 Akadályok

16.9.3.1 Az akadályokat fel kell tüntetni.

Megjegyzés. - Akadálynak általában azokat az akadályokat tartják, amelyek földszinttől mért magassága 100 méter (300 láb) vagy attól magasabb.

16.9.3.2 Ha a látás szerinti repülés szempontjából fontosnak ítélik, az akadályt képező nagy távvezetékeket és állandó drótkötélpályákat fel kell tüntetni a térképen.

16.9.4 Tiltott, korlátozott és veszélyes légterek

A tiltott, korlátozott és veszélyes légtereket fel kell tüntetni.

16.9.5 A légiforgalmi szolgálatok rendszere

16.9.5.1 A légiforgalmi szolgálatok rendszerének lényeges elemeit beleértve, ahol megvalósítható a repülőtéri irányító körzeteket, a repülőtéri forgalmi körzeteket, ellenőrzött légtereket, a repüléstájékoztató körzetek határait és az egyéb olyan légtereket, amelyekben VFR repülések üzemelnek, a megfelelő légtér-osztállyal együtt fel kell tüntetni.

16.9.5.2 Ahol alkalmazható, ott a légvédelmi azonosító körzetet (ADIZ) fel kell tüntetni és megfelelően kell azonosítani.

Megjegyzés.- Az ADIZ eljárás a térkép jelmagyarázatában leírható.

16.9.6 Rádió-navigációs berendezések

A rádió-navigációs berendezéseket fel kell tüntetni a megfelelő térképjellel és a nevükkel, de a frekvenciájukat, kódjelüket, üzemidejüket és egyéb jellemzőiket nem, kivéve, ha biztosítható, hogy az adatok bármely olyan része, vagy egésze, ami feltüntetésre került, naprakészen tartható marad a térkép újbóli kiadásaival.

16.9.7 Kiegészítő tájékoztatások

16.9.7.1 A légiforgalmi földi fényeket jellemzőikkel, vagy azonosítójukkal együtt, vagy mindkettővel kell feltüntetni.

16.9.7.2 A külső kiemelkedő tengerparton, vagy egyedülálló terepjellegzetességeken elhelyezkedő és 28 km-nél (15 tengeri mérföld) nagyobb távolságból látható tengerhajózási fényeket fel kell tüntetni ott, ahol:

1) ezek nem kevésbé megkülönböztethetőek a körzetben lévő többi, erősebb tengerhajózási fénytől;

2) ezek világosan megkülönböztethetők más tengerhajózási, vagy egyéb fényektől, a beépített tengerpart környezetében;

3) csak ezek az egyedül rendelkezésre álló, jelentőséggel bíró fények.

17. FEJEZET - ICAO 1 : 500 000 LÉGIFORGALMI TÉRKÉP

17.1 Rendeltetése

A térkép célja, hogy információkat biztosítson a látás szerinti repülés légi-navigációs követelményeinek kielégítésére a kis sebességű rövid, vagy közepes hatótávolságú légi-üzemeléshez, alacsony és közepes tengerszint feletti magasságokon.

1. Megjegyzés. - Ez a térkép használható még:

a) alap légiforgalmi térképként;

b) megfelelő eszközként a légijárművezető alap és navigációs képzéshez;

c) hogy kiegészítse az erősen specializált, de a lényeges vizuális információkat nem biztosító térképeket;

d) a repülés előtti felkészülésre.

2. Megjegyzés. - A szándék az, hogy ilyen térkép készüljön azokról a szárazföldi területekről, amelyek esetében a légi-navigáció egyéb formáitól független, vagy azokat kiegészítő látás szerinti légi-navigációt alkalmazó polgári repülési üzem ilyen méretarányú térképet igényel.

3. Megjegyzés. - Amikor az állam e térkép fajtát saját felségterületéről elkészíti, az egész ábrázolt területet általában körzeti alapon kezelje.

17.2 Alkalmazási előírások

Ajánlás. - *Az ICAO 1 : 500 000 Légiforgalmi Térkép-et az 5. Függelékben meghatározott területekről, az 1.3.2 pontban előírt módon kell elkészíteni.*

Megjegyzés. - Az ICAO 1 : 1 000 000 Légiforgalmi Világ Térkép helyett e méretarány választásának feltételeit a 16.2.1 és 16.2.2 pont tartalmazza.

17.3 Méretarány

17.3.1 A kilométer és tengeri mérföld mérővonalakat a következők szerint kell elrendezni:

- kilométer,

- tengeri mérföld,

egyazon "O" pontból induló függőleges vonal mentén, a térképlap szélén feltüntetve.

17.3.1.1 **Ajánlás.** - *A lineáris mérővonal hossza legalább 200 mm (8 hüvelyk) legyen*.

17.3.2 A térképlap szélén átváltási (méter/láb) mérővonal feltüntetése kötelező

17.4 Formátum

17.4.1 A címfeliratokat és a széljegyzeteket az ICAO valamelyik munkanyelvén kell a térképre nyomtatni.

Megjegyzés. - Az ICAO munkanyelvét kiegészítve a kiadó ország nyelve, vagy bármely más állam nyelve is használható.

17.4.2 A csatlakozó lapok számozására és a tengerszinthez viszonyított magasságok kifejezésére alkalmazott mértékegységekre vonatkozó tájékoztatást úgy kell a térképlapon elhelyezni, hogy az a térkép összehajtogatott formájában is jól látható legyen.

17.4.3 **Ajánlás.** - *A térképlap összehajtogatásának módja a következő legyen:*

Hajtsa össze a térképet hossztengelye mentén a felező szélességi kör közelében, hogy a térkép kívül legyen, alsó része pedig felül legyen; a középső hosszúsági kör mentén befelé irányban hajtsa félbe, és mindkét fél-részt harmonikaszerűen hajtsa vissza.

17.4.4 **Ajánlás.** - *Amikor csak lehetséges, a térképlapoknak az ICAO 1 : 1 000 000 Légiforgalmi Világ Térkép térképlap egynegyedének kell lenniük. A két térképsorozat közötti összefüggést megadó, a szomszédos térképlapokra utaló mutató-számot a térképlap előlapján vagy a hátoldalán kell elhelyezni.*

Megjegyzés. - A térképlapok határvonala, valamely speciális követelmény kielégítése érdekében, megváltoztatható.

17.4.5 **Ajánlás.** - *Átfedéseket kell biztosítani a térkép fedésterület lap felső- és jobb oldali részének a jegyzékben megadott területen túlra történő kiszélesítésével. Ennek az átfedő területnek is tartalmaznia kell minden légiforgalmi, tereprajzi, vízrajzi és kultúr környezeti információt. Ha lehetséges, az átfedés 15 km-re (8 tengeri mérföldre) terjedjen ki, de mindenképpen ki kell terjednie az egyes térképlapok* *határoló szélességi és hosszúsági köreitől a térkép lapszél vonaláig.*

17.5 Vetület

17.5.1 Szögtartó (orthomorfikus) vetületet kell alkalmazni.

17.5.2 **Ajánlás.** - *Az ICAO 1:1 000 000 Légiforgalmi Világ Térkép vetületét kell alkalmazni.*

17.5.3 A szélességi köröket 30 fokperces térközökkel kell feltüntetni.

17.5.3.1 A hosszúsági köröket általában 30 fokperces térközökkel kell megadni.

Megjegyzés. - Magasabb földrajzi szélességű területek térképein ez a térköz megnövelhető.

17.5.4 A fokbeosztási jelöléseket a Greenwich-i hosszúsági körtől és az Egyenlítőtől kiindulva 1 fokpercenként kell feltüntetni minden egész fokszámú hosszúsági és szélességi körön. A 10 fokperces értékeket a vonal mindkét oldalára kiterjedő szálkával kell jelölni.

17.5.4.1 **Ajánlás.** - *A fokbeosztási szálkák hosszának hozzávetőleg 1,3 mm-nek (0,05 hüvelyk) kell lennie az 1 fokpercek jelölésénél, 2 mm-nek (0,08 hüvelyk) az 5 fokpercek jelölésénél és a fokhálózati vonal mindkét oldalára átnyúló 2 mm-nek (0,08 hüvelyk) a 10 fokpercek jelölésénél.*

17.5.5 Az összes feltüntetett hosszúsági és szélességi kört be kell számozni a térkép határvonalán.

17.5.5.1 **Ajánlás.** - *A térképen belül számértékkel kell jelölni minden szélességi és hosszúsági kört, ha ezek az adatok az üzemeltetéshez szükségesek.*

17.5.6 A térkép szélén meg kell adni a vetület fajta nevét és alapvető jellemzőit.

17.6 Azonosítás

17.6.1 Minden lapot, a lapon található legfontosabb város, vagy földrajzi jellegzetesség nevével kell azonosítani.

17.6.1.1 **Ajánlás.** - *Ahol alkalmazható, a térkép azonosítása tartalmazza az ICAO 1:1 000 000 Légiforgalmi Világtérkép vonatkozási számát is, a számot egy, vagy több betűvel kiegészítve, amely betűk a következők szerint jelölnek negyedet, vagy negyedeket:*

Betű	Térkép-negyed
A	Észak-nyugat
B	Észak-kelet
C	Dél-kelet
D	Dél-nyugat

17.7 Kultúr környezet és tereprajz

17.7.1 Beépített területek

17.7.1.1 A nagyvárosokat, városokat és falvakat a látás szerinti navigáció szempontjai szerinti fontosságuknak megfelelően kell megválogatni és feltüntetni a térképen.

17.7.1.2 **Ajánlás.** - *A megfelelően nagyméretű nagyvárosokat és városokat a beépített területek határvonalával, és nem kijelölt határaikkal kell jelezni.*

17.7.2 Vasútvonalak

17.7.2.1 Minden olyan vasútvonalat, amely tájékozódási támpont jelleggel bír, fel kell tüntetni.

1. Megjegyzés. - A zsúfoltabb területeknél az áttekinthetőség érdekében egyes vasútvonalak feltüntetésétől el lehet tekinteni.

2. Megjegyzés. - A vasútvonalak neve megadható.

3. Megjegyzés. - A vasútállomások feltüntethetők.

17.7.2.2 Az alagutakat fel kell tüntetni, ha azok szembetűnő terep jellegzetességek.

Megjegyzés. - Ismertető megjegyzéssel kiegészíthető a jellegzetesség kiemelése érdekében.

17.7.3 Főútvonalak és utak

17.7.3.1 Az úthálózatot olyan részletességgel kell feltüntetni, hogy rajzolatuk lényegi részei a levegőből szemlélve felismerhetők legyenek.

Megjegyzés. - Az építés alatt álló utak feltüntethetők.

17.7.3.2 **Ajánlás**. - *A beépített területeken lévő utakat nem kell ábrázolni, kivéve, ha a levegőből nézve, mint határozott terepjellegzetességek, felismerhetők.*

Megjegyzés. - A fontos főútvonalak neve és száma feltüntethető

17.7.4 Tájékozódási támpontok

Ajánlás. - *Ha a látás szerinti navigálás szempontjából fontosnak tartják, akkor a természeti és a kultúr környezeti olyan tájékozódási támpontjait fel kell tüntetni, mint például a hidak, bányaszerkezetek, kilátó tornyok, erődök, romok, gátak/töltések, csővezetékek, távvezetékek, állandó telepítésű drótkötél pályák, valamint sziklák, hegyfokok, kőszirtek, homokdűnék, különálló világítótornyok, világító hajók stb.*

Megjegyzés. - Ismertető megjegyzésekkel kiegészíthetők.

17.7.5 Politikai határok

A nemzetközi határokat kötelező feltüntetni. A kijelöletlen és meghatározatlan határokat magyarázó megjegyzéssel kell megkülönböztetni.

Megjegyzés. - Egyéb határok is feltüntethetők.

17.7.6 Vízrajz

17.7.6.1 A térkép méretarányával egyeztethető minden vízrajzi jellegzetességet fel kell tüntetni, ideértve a partvonalakat, tavakat, folyókat és patakokat (a nem állandó jellegűeket is), sós tavakat, gleccsereket és jégsapkákat.

17.7.6.2 **Ajánlás.** - *A nagykiterjedésű nyílt vízfelületeket egészen világos színárnyalattal kell jelölni.*

Megjegyzés. - A partvonal kiemelése céljából a partvonalak mentén keskeny, sötétebb tónusú zóna alkalmazható.
17.7.6.3 **Ajánlás.** - *Ha lényeges tájékozódási jelleggel bírnak, akkor a zátonyok és homokpadok, az egyedül álló sziklák, a homokos, kavicsos, köves és egyéb hasonló jellegű területek feltüntetése szükséges, a megfelelő térképjelet alkalmazva.*

Megjegyzés. - A sziklacsoportok, az adott területre berajzolt néhány szikla-térképjellel ábrázolhatók.

17.7.7 Szintvonalak

17.7.7.1 A szintvonalakat fel kell tüntetni. A szintvonalak közötti térköz megválasztása teljesítse azt a kívánalmat, hogy a légi-navigációhoz szükséges domborzati viszonyok egyértelműen legyenek ábrázolva.

17.7.7.2 Az alkalmazott szintvonalak értékét fel kell tüntetni.

17.7.8 Magasság szerinti színárnyalás

17.7.8.1 Ha a magasság szerinti színárnyalást alkalmaznak, akkor a színárnyalathoz tartozó tengerszinthez viszonyított magasság-tartományt fel kell tüntetni.

17.7.8.2 Az alkalmazott magassági színárnyalás magassági tartományait a térkép szélén fel kel tüntetni.

17.7.9 Magassági pontok

17.7.9.1 A kiválasztott kritikus pontoknál fel kell tüntetni a magassági pont tengerszinthez viszonyított magasságát. A kiválasztott magassági pontok a közvetlen környezet legmagasabb pontjai legyenek, általában egy hegycsúcsot vagy hegygerinc tetejét kell jelezniük. A repülés szempontjából különös fontossággal bíró völgyek, vagy tavak felszínének tengerszinthez viszonyított magasságát fel kell tüntetni. A kiválasztott magassági pontok helyét egy ponttal kell jelezni.

17.7.9.2 A térkép szélén kötelező megadni a térképen ábrázolt legmagasabb pont tengerszinthez viszonyított magasságát (lábban, vagy méterben) és annak legközelebbi 5 fokpercre kerekített földrajzi helyét.

17.7.9.3 **Ajánlás.** - *A térképlapon a legmagasabb pont tengerszinthez viszonyított magasságának értékeit jelző számjegyek körül a színárnyalást törölni kell.*

17.7.10 Hiányos, vagy megbízhatatlan domborzati információk

17.7.10.1 "A domborzati adatok hiányosak" megjegyzést kell feltüntetni az olyan területek esetében, amelyek szintvonalas ábrázolásához a felmérések még nem történtek meg.

17.7.10.2 A légiforgalmi információk feltüntetésére alkalmazott színnel figyelmeztető megjegyzést kell nyomtatni azon térképek előlapjára, amely térképeknél a magassági pontok tengerszinthez viszonyított magasság értékei általában megbízhatatlanok; a figyelmeztetés szövege a következő legyen:

"Figyelem - E térképen a domborzati információk megbízhatatlanok, ezért a tengerszinthez viszonyított magasság értékek figyelembevételekor körültekintően kell eljárni."

17.7.11 Szakadékok

Ajánlás. - *A szakadékokat fel kell tüntetni, ha azok szembeötlő terep jellegzetességek vagy, ha a kultúr környezet nagyon szórványos.*

17.7.12 Fás területek

17.7.12.1 **Ajánlás.** - *A fás területek feltüntetendők.*

Megjegyzés. - A magasabb földrajzi szélességen fekvő területek térképein az erdőhatár hozzávetőleges legészakibb, illetve legdélebbi vonala feltüntethető

17.7.12.2 Ha az erdőhatár hozzávetőleges legészakibb, illetve legdélebbi vonalát ábrázolják, akkor azt, megfelelő felirattal kiegészített szaggatott fekete vonallal kell jelölni.

17.7.13 A tereprajzi információk kelte

A térkép szélén közölni kell a feltüntetett tereprajzi információk legutolsó felmérésének időpontját.

17.8 Mágneses eltérés

17.8.1 Az izogon vonalakat fel kell tüntetni.

17.8.2 Az izogon információk felmérésének dátumát a térképlap szélén meg kell adni.

17.9 Légiforgalmi adatok

17.9.1 A légiforgalmi adatokat a térkép használatával összhangban és az adatok módosítási ciklusát figyelembe véve kell feltüntetni.

17.9.2 Repülőterek

17.9.2.1 A nagyobb légiforgalmi jelentőségű repülőtereknek elsőbbséget adva, a szárazföldi és vízi repülőtereket, valamint a helikopter repülőtereket nevükkel együtt kell feltüntetni, oly mértékig, hogy a térképen az ne okozzon felesleges zsúfoltságot.

17.9.2.2 Feltéve, hogy a térképen ez nem okoz zsúfoltságot, minden repülőtérre vonatkozóan fel kell tüntetni a repülőtér tengerszinthez viszonyított magasságát, a rendelkezésre álló fénytechnikai rendszert, a futópálya felület fajtáját és a leghosszabb futópálya, vagy csatorna hosszát, a 2. Függelékben bemutatott példának megfelelően rövidített formában.

17.9.2.3 Az üzemen kívül helyezett repülőtereket, melyek a levegőből repülőtérként még felismerhetők, fel kell tüntetni és "üzemen kívüli" jelöléssel kell ellátni azokat.

17.9.3 Akadályok

17.9.3.1 Az akadályokat fel kell tüntetni.

Megjegyzés. - Akadályoknak általában a földfelszíntől számított 100 méter (300 láb), vagy magasabb akadályokat tekintik.

17.9.3.2 Amennyiben a látás szerinti repülés szempontjából fontosnak ítélik, az akadályt képező nagy távvezetékeket és az állandó drótkötélpályákat a térképen fel kell tüntetni.

17.9.4 Tiltott, korlátozott és veszélyes légterek

A tiltott, korlátozott és veszélyes légtereket fel kell tüntetni.

17.9.5 A Légiforgalmi szolgálatok rendszere

17.9.5.1 A légiforgalmi szolgálatok rendszerének lényeges elemeit, beleértve, ahol megvalósítható, a repülőtéri irányítói körzeteket, a repülőterek forgalmi körzeteit, az irányítói körzeteket, a repüléstájékoztató körzetek határait és az egyéb olyan légtereket, amelyekben VFR repülés üzemel, a megfelelő légtér-osztállyal együtt fel kell tüntetni.

17.9.5.2 Ahol alkalmazható, ott a légvédelmi azonosító körzetet (ADIZ) fel kell tüntetni és megfelelően kell azonosítani.

Megjegyzés. - Az ADIZ eljárás a térkép jelmagyarázatában leírható.

17.9.6 Rádió-navigációs berendezések

A rádió-navigációs berendezéseket fel kell tüntetni a megfelelő térképjellel és a nevükkel, de a frekvenciájukat, kódjelüket, üzemidejüket és egyéb jellemzőket nem, kivéve, ha biztosítható, hogy az adatok bármely olyan része, vagy egésze, ami feltüntetésre kerül, naprakészen tartható marad a térkép újbóli kiadásaival.

17.9.7 Kiegészítő tájékoztatások

17.9.7.1 A légiforgalmi földi fényeket jellemzőikkel, vagy azonosítójukkal együtt, vagy mindkettővel, kell feltüntetni.

17.9.7.2 A külső kiemelkedő tengerpartokon, vagy egyedül álló képződményeken elhelyezkedő legalább 28 km (15 tengeri mérföld) távolságból látható tengerhajózási fényeket fel kell tüntetni ott, ahol:

1) ezek legalább annyira megkülönböztethetőek, mint a környezetükben lévő erősebb tengerhajózási fények.

2) ezek a beépített tengerparti környezetben világosan megkülönböztethetőek más tengerhajózási, vagy egyéb fényektől;

3) ezek az egyedüli rendelkezésre álló és jelentőséggel bíró fények.

18. FEJEZET - ICAO KIS MÉRETARÁNYÚ LÉGIFORGALMI NAVIGÁCIÓS TÉRKÉP

18.1 Rendeltetése

E térkép célja:

1) hogy légi-navigációs segédeszközként szolgáljon a nagytávolságú repüléseket nagy magasságban végrehajtó légijárművek személyzetei számára.

2) hogy a légijármű helyzetének látás melletti ellenőrzéséhez szükséges szelektív ellenőrző pontokat biztosítson nagy távolságokon keresztül nagy magasságban és nagy sebességgel végzett repülésekhez;
3) hogy folyamatos vizuális eligazodási alapot biztosítson a földfelszín vonatkozásában a nagytávolságú repülések során, olyan területek felett, ahol a rádió, vagy más elektronikus navigációs berendezések hiányoznak, vagy olyan területek felett, ahol a látásszerinti navigációt részesítik előnyben, vagy az szükségessé válik;

4) hogy általános rendeltetésű térképsorozatot biztosítson a nagytávolságú repülések tervezéséhez és a helymeghatározáshoz.

18.2 Alkalmazási előírások

Ajánlás. - *Az ICAO Kis Méretarányú Légiforgalmi Navigációs Térkép-et az 1.3.2. pontban előírt módon, az 5. Függelékben meghatározott területekről kell elkészíteni.*

Megjegyzés. - E méretaránynak az ICAO 1 : 1 000 000 Légiforgalmi Világ Térkép alternatívájaként történő választási feltételeit a 16.2.1 és 16.2.2 pont tartalmazza.

18.3 Fedésterület és méretarány

18.3.1 **Ajánlás.** - *Az ICAO Kis Méretarányú Légiforgalmi Navigációs Térkép-nek minimálisan a Föld nagy szárazföldi területeire kell teljes fedést biztosítani.*

1. Megjegyzés. - Ennek a térképsorozatnak egy lehetséges lapelrendezését a Légiforgalmi Térképek Kézikönyve (Doc 8697) tartalmazza.

2. Megjegyzés. - A lap mérete esetleg a térkép előállító rendelkezésére álló legnagyobb nyomdai méretét jelentheti.

18.3.2 A méretarány az 1 : 2 000 000-tól az 1 : 5 000 000-ig terjedő tartományban legyen.

18.3.3 Ennek a térképnek a méretarány megjelölését a címfeliratban a "kis méretarányú" felirat helyére kell beírni.

18.3.4 A térképen a léptékvonalat kilométerben és tengeri mérföldben, 0 pontjukkal azonos függőleges vonalba esően kell feltüntetni az alábbiak szerint:

- kilométer,

- tengeri mérföld.

18.3.5 **Ajánlás.** - *A léptékvonal hossza legalább 200 mm (8 hüvelyk) legyen.*

18.3.6 A térképlap szélén átváltási (méter/láb) mérővonal feltüntetése kötelező

18.4 Formátum

18.4.1 A címfeliratokat és a széljegyzeteket az ICAO valamelyik munkanyelvén kell a térképre nyomtatni.

Megjegyzés. - Az ICAO munkanyelvét kiegészítően a kiadó ország nyelve, vagy bármely más nyelv is használható.

18.4.2 A csatlakozó lapok számozására és a tengerszinthez viszonyított magasságok jelzésére alkalmazott mértékegységekre vonatkozó tájékoztatást úgy kell a térképlapon elhelyezni, hogy az a térkép összehajtogatott formájában is jól látható legyen.

Megjegyzés. - A lapszámozásra nincs nemzetközi megállapodás.

18.5 Vetület

18.5.1 Szögtartó (orthomorfikus) vetületet kell alkalmazni.

18.5.1.1 A vetület megnevezését és alapvető jellemzőit a térképlap szélén meg kell adni.

18.5.2 A szélességi köröket 1 fokos térközökkel kell feltüntetni.

18.5.2.1 A szélességi körökön a fokbeosztási vonalakat olyan szűk térközökkel kell feltüntetni, amely a térképen lévő szélességi körrel és a térkép méretarányával összeegyeztethető.

18.5.3 A hosszúsági köröket a térképen lévő szélességi kör és a térkép méretarányával összeegyeztethető térközökkel kell feltüntetni.

18.5.3.1 A hosszúsági körökön a fokbeosztási vonalakat 5 fokpercet meg nem haladó térközökkel kell feltüntetni.

18.5.4 A fokbeosztási jelöléseket a Greenwich-i hosszúsági körtől és az Egyenlítőtől kiindulóan kell feltüntetni.

18.5.5 Az összes feltüntetett hosszúsági és szélességi kört be kell számozni a térkép határvonalán. Ezen kívül, ha szükséges, minden szélességi és hosszúsági kört a térképen belül is be kell számozni oly módon, hogy azok könnyen azonosíthatóak legyenek a térkép összehajtott állapotában is.

18.6 Kultúr környezet és tereprajz

18.6.1 Beépített területek

18.6.1.1 A nagyvárosokat, városokat és falvakat a látás szerinti navigáció szempontjai szerinti fontosságuknak megfelelően kell megválogatni és feltüntetni a térképen.

18.6.1.2 **Ajánlás.** - *A megfelelően nagyméretű nagyvárosokat és városokat a beépített területek határvonalával, és nem kijelölt határaikkal kell jelezni.*

18.6.2 Vasútvonalak

18.6.2.1 Minden olyan vasútvonalat, amely tájékozódási támpont jelleggel bír, fel kell tüntetni.

Megjegyzés. - A zsúfoltabb területeknél az áttekinthetőség érdekében egyes vasútvonalak feltüntetésétől el lehet tekinteni.

18.6.2.2 **Ajánlás.** - *A fontos alagutak feltüntetendők.*

Megjegyzés. - Ismertető megjegyzéssel kiegészíthető

18.6.3 Főútvonalak és utak

18.6.3.1 Az úthálózatot olyan részletességgel kell feltüntetni, hogy rajzolatuk lényegi részei a levegőből szemlélve felismerhetők legyenek.

18.6.3.2 **Ajánlás.** - *A beépített területeken lévő utakat nem kell ábrázolni, kivéve, ha a levegőből nézve, mint határozott terepjellegzetességek, felismerhetők.*

18.6.4 Tájékozódási támpontok

Ajánlás. - *Ha a látás szerinti navigálás szempontjából fontosnak tartják, akkor a természeti és a kúltúr környezeti olyan tájékozódási támpontjait fel kell tüntetni, mint például a hidak, bányaszerkezetek, kilátó tornyok, erődök, romok, gátak/töltések, csővezetékek, távvezetékek, állandó telepítésű drótkötél pályák, valamint sziklák, hegyfokok, kőszirtek, homokdűnék, különálló világítótornyok, világító hajók stb.*

Megjegyzés. - Ismertető megjegyzésekkel kiegészíthetők.

18.6.5 Politikai határok

A nemzetközi határokat kötelező feltüntetni. A kijelöletlen és meghatározatlan határokat magyarázó megjegyzéssel kell megkülönböztetni.

18.6.6 Vízrajz

18.6.6.1 A térkép méretarányával egyeztethető minden vízrajzi jellegzetességet fel kell tüntetni, ideértve a partvonalakat, tavakat, folyókat és patakokat (a nem állandó jellegűeket is), sós tavakat, gleccsereket és jégsapkákat.

18.6.6.2 **Ajánlás.** - *A nagykiterjedésű nyílt vízfelületeket egészen világos színárnyalattal kell jelölni.*

Megjegyzés. - A partvonal kiemelése céljából a partvonalak mentén keskeny, sötétebb tónusú zóna alkalmazható.

18.6.6.3 **Ajánlás.** - *A lényeges tájékozódási jelleggel bíró zátonyok és homokpadok, az egyedül álló sziklák, a homokos, kavicsos, köves és egyéb hasonló jellegű területek feltüntetése megfelelő térképjel alkalmazásával kötelező*

18.6.7 Szintvonalak

18.6.7.1 A szintvonalakat fel kell tüntetni. A szintvonalak közötti térköz megválasztása teljesítse azt a kívánalmat, hogy a légi-navigációhoz szükséges domborzati viszonyok egyértelműen legyenek ábrázolva.

18.6.7.2 Az alkalmazott szintvonalak értékét fel kell tüntetni.

18.6.8 Magasság szerinti színárnyalás

18.6.8.1 Ha a magasság szerinti színárnyalást alkalmaznak, akkor az adott színárnyalatokhoz tartozó tengerszinthez viszonyított magasságok értékeit fel kell tüntetni.

18.6.8.2 Az alkalmazott magassági színárnyalás/magassági tartományokat a térkép szélén fel kel tüntetni.

18.6.9 Magassági pontok

18.6.9.1 A kiválasztott kritikus pontoknál fel kell tüntetni a magassági pont tengerszinthez viszonyított magasságát. A kiválasztott magassági pontok a közvetlen környezet legmagasabb pontjai legyenek, általában egy hegycsúcsot, vagy hegygerinc tetejét kell jelezniük. A látás szerinti repülés szempontjából különös fontossággal bíró völgyek vagy tavak felszínének tengerszinthez viszonyított magasságát fel kell tüntetni. A kiválasztott magassági pontok helyét egy ponttal kell jelezni.

18.6.9.2 A térkép szélén kötelező megadni a térképen ábrázolt legmagasabb pont tengerszinthez viszonyított magasságát (lábban, vagy méterben) és annak legközelebbi 5 fokpercre kerekített földrajzi helyét.

18.6.9.3 **Ajánlás.** - *A térképlapon a legmagasabb pont tengerszinthez viszonyított magasságának értékeit jelző számjegyek körül a színárnyalást törölni kell.*

18.6.10 Hiányos, vagy megbízhatatlan domborzati információk

18.6.10.1 "A domborzati adatok hiányosak" megjegyzést kell feltüntetni az olyan területek esetében, amelyek szintvonalas ábrázolásához a felmérések még nem történtek meg.

18.6.10.2 A légiforgalmi információk feltüntetésére alkalmazott színnel figyelmeztető megjegyzést kell nyomtatni azon térképek előlapjára, amely térképeknél a magassági pontok tengerszinthez viszonyított magasság értékei általában megbízhatatlanok; a figyelmeztetés szövege a következő legyen:

"Figyelem - E térképen a domborzati információk megbízhatatlanok, ezért a tengerszinthez viszonyított magasság értékek figyelembevételekor körültekintően kell eljárni."

18.6.11 Szakadékok

Ajánlás. - *A szakadékokat fel kell tüntetni, ha azok szembeötlő terep jellegzetességek vagy, ha a kultúr környezet nagyon szórványos.*

18.6.12 Fás területek

Ajánlás. - *A nagy kiterjedésű fás területek feltüntetendők.*

18.6.13. A tereprajzi információk kelte

A tereprajzi alapon szereplő legutolsó információ dátumát kell a térképlap szélén közölni.

18.6.14 Színek

18.6.14.1 **Ajánlás.** - *A térkép alapszínezéséhez halvány színeket kell alkalmazni a manuális (pozíció) berajzolás elősegítése érdekében.*

18.6.14.2 **Ajánlás.** - *A látással végzett navigáció szempontjából lényeges terepjellegzetességek kiemelése érdekében jó színkontraszt hatást kell biztosítani.*

18.7 Mágneses eltérés

18.7.1 Az izogon vonalakat fel kell tüntetni.

18.7.2 Az izogon információk felmérésének dátumát a térképlap szélén meg kell adni.

18.8 Légiforgalmi adatok

18.8.1 Repülőterek

A nagyobb légiforgalmi jelentőségű repülőtereknek elsőbbséget adva, a szárazföldi és vízi repülőtereket, valamint a helikopter repülőtereket nevükkel együtt kell feltüntetni, olymértékben, hogy a térképen az ne okozzon nemkívánatos zsúfoltságot.

18.8.2 Akadályok

Az akadályokat fel kell tüntetni.

18.8.3 Tiltott, korlátozott és veszélyes légterek

Ajánlás. - *Ha megítélés szerint, a légi-navigáció szempontjából jelentőséggel bírnak, akkor a tiltott, korlátozott és veszélyes légtereket fel kell tüntetni.*

18.8.4 A Légiforgalmi szolgálatok rendszer

18.8.4.1 **Ajánlás.** - *A légiforgalmi szolgálatok rendszerének lényeges elemeit fel kell tüntetni, ha megítélés szerint ez a légi-navigáció szempontjából jelentőséggel bír.*

18.8.4.2 **Ajánlás. -** *Ahol alkalmazható, ott a légvédelmi azonosító körzetet (ADIZ) fel kell tüntetni és megfelelően kell azonosítani.*

Megjegyzés. - Az ADIZ eljárás a térkép jelmagyarázatában leírható.

18.8.5 Rádió-navigációs berendezések

Megjegyzés. - A rádió-navigációs berendezések, a megfelelő térképjeleikkel és nevükkel feltüntethetők.

19. FEJEZET - ICAO TARTÓZKODÁSI HELYZET KÖVETŐ TÉRKÉP

19.1 Rendeltetése

A térkép rendeltetése a tervezett útvonal tartásának érdekében eszközül szolgálni a légijármű repülés közbeni tartózkodási helyének különféle helymeghatározási mód és a számított helyzet-navigáció révén történő folyamatos rögzítéséhez.

19.2 Alkalmazási rendelkezések

Ajánlás. - *A térkép, az 1.3.2 pontban leírt módon, kiadható a nemzetközi polgári repülés által használt óceánok feletti illetve a kis település-sűrűségű területek felett haladó fő légi-útvonalakról.*

Megjegyzés. - A Tartózkodási Helyzet Követő Térképet nem szükséges elkészíteni az olyan területekről, amelyekről az "ICAO Útvonal Térkép" rendelkezésre áll.

19.3 Fedésterület és méretarány

19.3.1 **Ajánlás.** - *Ha megoldható, akkor egyetlen térképlap tartalmazza az adott körzet főbb légi-útvonalait és a kapcsolódó közel körzeteket.*

19.3.2 **Ajánlás.** - *A méretarányt az ábrázolandó terület nagysága szabja meg.*

Megjegyzés. - A méretarány általában az 1 : 3 000 000-tól, az 1 : 7 500 000-ig terjedő tartományban legyen.

19.4 Formátum

Ajánlás. - *A térképlap olyan méretű legyen, hogy a navigátor asztalán használható legyen.*

19.5 Vetület

19.5.1 **Ajánlás.** - *Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal megközelítőleg azonos a nagykörrel.*

19.5.2 A szélességi és hosszúsági köröket fel kell feltüntetni.

19.5.2.1 **Ajánlás.** - *A fokhálózati térközök megválasztása a tartózkodási hely rövid időn belüli és könnyen elvégezhető pontos felrajzolását tegye lehetővé.*

19.5.2.2 A fokbeosztás vonalait elegendő számú szélességi/hosszúsági kör mentén egyenlő térközökkel kell feltüntetni. A térköz megválasztása -a méret aránytól függetlenül- olyan legyen, hogy a pontos helymeghatározáshoz szükséges interpolálást a lehető legkevesebbszer kelljen végezni.

19.5.2.3 **Ajánlás.** - *A szélességi és hosszúsági köröket úgy kell számozni, hogy egy szám legalább 15 cm-enként (6 hüvelyk) egyszer szerepeljen a térképen.*

19.5.2.4 Ha a magasabb szélességi körökön fekvő területeket ábrázoló térképen navigációs rácshálót tüntetnek fel, akkor a hálózatnak a Greenwich-i meridiánnal, vagy anti meridiánnal párhuzamos vonalakat kell tartalmaznia.

19.6 Azonosítás

Minden térképlapot a térképsorozat nevével és egy számmal kell ellátni.

19.7 Kultúr környezet és tereprajz

19.7.1 A térképen minden vízfelület, nagyobb tó és folyó elnagyolt partvonalát ábrázolni kell.

19.7.2 A légi-navigáció számára veszélyes, kiválasztott terepjellegzetességek magasságát fel kell tüntetni.

19.7.3 **Ajánlás.** - *A különösen veszélyes, vagy feltűnő domborzati jellegzetességeket ki kell hangsúlyozni.*

Megjegyzés. - A nagyvárosok és városok feltüntethetők.

19.8 Mágneses eltérés

19.8.1 Az izogon vonalakat, illetve a magasabb szélességi körökön fekvő területek esetében az izogriv vonalakat, vagy mindkettőt, a térkép teljes egészén azonos térközökkel kell feltüntetni. A fokhálózati térközök megválasztása -a méretaránytól függetlenül- az interpolálás szükségességét csökkentse a minimumra.

19.8.2 Az izogon információ dátumát meg kell adni.

19.9 Légiforgalmi adatok

19.9.1 A következő légiforgalmi adatokat kell feltüntetni:

1) a nemzetközi kereskedelmi légi-szállítás által rendszeresen használt repülőterek és nevük;

2) a helymeghatározást elősegítő kiválasztott rádió-navigációs berendezések és neveik, azonosítóik;

3) a nagy távolságú navigáció elektronikus berendezéseinek hálózata, szükség szerint;

4) repülés tájékoztató körzetek, irányítói és repülőtér irányítói körzet határok, amelyek a térkép céljának megfelelően szükségesek;

5) a térkép rendeltetési céljához kijelölt jelentőpontok;

6) óceáni állomás-hajók.

Megjegyzés. - Egyéb légiforgalmi adatok is feltüntethetők, feltéve, hogy azok nem rontják az elengedhetetlenül szükséges információk olvashatóságát.

19.9.2 **Ajánlás.** - *Ahol egyéb navigációs berendezések nincsenek, ott a légi-navigáció számára hasznos légiforgalmi földi és tengerhajózási fényeket a térképen fel kell tüntetni.*

20. FEJEZET - ICAO ELEKTRONIKUS LÉGIFORGALMI TÉRKÉP MEGJELENÍTŐ

20.1 Célja

Az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő, megfelelő biztonsági tartalékoltsággal és a 6. Annex térképekre vonatkozó követelményeivel egyezésben, a szükséges információk megjelenítésével tegye lehetővé a repülő személyzet számára, hogy útvonal tervezést, útvonal figyelemmel kisérést és navigálást kényelmesen és időben elvégezhessen általa.

20.2 Megjelenítéshez rendelkezésre álló információk

20.2.1 Az ICAO Elektronikus Légiforgalmi Térkép megjelenítő legyen képes kijelezni a 4. Annex 5. és 7.-től 19. tartó Fejezeteiben előírt minden légiforgalmi, kultúr környezeti és domborzati adatot.

20.2.2 **Ajánlás**. - *Az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő legyen képes kijelezni a 4. Annex 5. és 7.-től 19. tartó Fejezeteiben ajánlott minden légiforgalmi, kultúr környezeti és domborzati adatot.*

Megjegyzés. - Az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő az egyenértékesnek tekintett papír alapú térképen ábrázoltak mellett egyéb, a navigáció biztonsága szempontjából hasznosnak tartott kiegészítő adatokat is megjeleníthet.

20.3 Megjelenítési követelmények

20.3.1 Megjelenítési kategóriák

20.3.1.1 A megjelenítéshez rendelkezésre álló adatokat a következő kategóriák szerint kell osztályozni:

a) kijelzési alap információk, amelyek a képernyőn állandóan láthatók és a repülés biztonságos végrehajtásához legalapvetőbb lényeges információkból tevődnek össze; és

b) egyéb kijelzett információk, amelyek a képernyőről eltávolíthatók, avagy igény szerint egyedileg megjeleníthetők és a repülés biztonságos végrehajtásához nem lényeges információkból tevődnek össze.

20.3.1.2 Legyen egyszerű valamely kijelzési adat megjelenítése, avagy eltávolítása, azonban az alap kijelzéshez tartozó adatokat ne lehessen eltávolítani a képernyőről.

20.3.2 Kijelzési mód és a környező terület ábrázolása

20.3.2.1 Az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő legyen képes folyamatosan és valós mozgás szerint térképezni a légijármű haladását, miközben a környező terület törlése és újra előállítása automatikus módon megy végbe.

Megjegyzés. - rendelkezésre állhatnak egyéb üzemmódok is, mint például a térkép kimerevítés.

20.3.2.2 Legyen lehetséges kézzel szabályozni a térkép fedésterületét és a légijárműnek a kijelző széleihez viszonyított helyzetét.

20.3.3 Méretarány

Legyen lehetséges a térkép megjelenítési méretarányát változtatni.

20.3.4 Térkép jelek

Az alkalmazott térképjelek egyezzenek az elektronikus térképekre a 2. Függelék – ICAO térkép jelek-ben előírtakkal, kivéve, ha olyan tételek megjelenítése kívánatos, amelyre nincs kialakított ICAO térképjel. Ilyen esetekben olyan elektronikus térképjelet kell választani, amely:

a) a lehető legkevesebb vonalból, körívből áll és minél kisebb területet tölt ki

b) ne legyen összetéveszthető a meglévő légiforgalmi térképjelekkel

c) a kijelző áttekinthetőségét hátrányosan ne befolyásolja.

Megjegyzés. - Mindegyik térképjel kiegészíthető további részletekkel a kijelző eszköz felbontó képességének függvényében, azonban semmiféle kiegészítő részlet nem változtathatja meg az illető jel alapvető felismerhetőségét.

20.3.5 Kijelző készülék

20.3.5.1 A megjelenített térkép valós mérete túlzott mértékű “lapozgatás” nélkül legyen elegendő a 20.2-ben előírt információk kijelzéséhez.

20.3.5.2 A kijelző legyen képes pontosan megjeleníteni a 2. Függelék – ICAO térképjelek-ben előírt elemeket.

20.3.5.3 Az ábrázolási mód biztosítsa, hogy a kijelzett információ a szemlélő számára tisztán látható legyen a pilótakabin természetes és mesterséges fényviszonyai között.

20.3.5.4 A kijelző fényereje a repülő személyzet által legyen szabályozható.

20.4 Adat biztosítás és frissítés

20.4.1 A kijelző által alkalmazott adatok biztosítása és frissítése legyen egyezésben a légiforgalmi adat minőségbiztosítási rendszer követelményeivel.

Megjegyzés. - a légiforgalmi adat minőségbiztosítási rendszer követelményeit illetően lásd a 2. Fejezet 2.17 pontját és a 15. Annex 3. Fejezetének 3.2 pontját.

20.4.2 A rendszer legyen képes automatikusan elfogadni a meglévő adatok engedélyezett frissítéseit. Olyan eszközt kell biztosítani, amely garantálja, hogy az engedélyezett adatok és ezen adatok minden vonatkozó frissítése megfelelő módon töltődjön be a kijelzőbe.

20.4.3 A meglévő adatok manuálisan bevitt engedélyezett frissítéseit a rendszer az adatok végső elfogadását megelőző egyszerű hitelesítő eszközökkel legyen képes elfogadni. A képernyőn legyen megkülönböztethető a manuálisan bevitt frissítés az engedélyezett adattól és az engedélyezett frissítésektől és az a kijelző áttekinthetőségét ne rontsa.

20.4.4 Nyilvántartást kell vezetni minden frissítésről, beleértve az alkalmazás dátumát és időpontját is.

20.4.5 A rendszer tegye lehetővé a repülő személyzet számára a frissítések kijelzését oly módon, hogy a személyzet áttekinthesse a frissítés tartalmát és meghatározhassa, hogy azokat a rendszer befogadta.

20.5 Teljesítmény ellenőrzések, működési rendellenesség riasztások, jelzések

20.5.1 Eszközt kell biztosítani a főbb funkciók fedélzeti ellenőrzésének végrehajtásához. Hiba esetén az ellenőrzés eredményeképp arról szóló tájékoztatónak kell megjelennie, hogy a rendszer mely része hibás.

20.5.2 A rendszer meghibásodás esetére megfelelő riasztást, vagy jelzést kell biztosítani.

20.6 Tartalékoltsági megoldások

Az ICAO Elektronikus Légiforgalmi Térkép Megjelenítő meghibásodásának esetén a biztonságos navigálás érdekében a megfelelő tartalékoltsági megoldásnak magában kell foglalnia a következőket:

a) a kijelző funkciók biztonságos átvételét lehetővé tévő megoldások annak érdekében, hogy a meghibásodás ne okozhasson kritikus helyzetet; és

b) a repülés hátralévő részében a biztonságos navigálás eszközéül szolgáló biztonsági tartalék megoldások.

Megjegyzés. - A megfelelő biztonsági tartalék megoldások közé tartozhat a papír alapú térképek rendszeresítése.

21. FEJEZET – ICAO LEGKISEBB RADAR MAGASSÁG TÉRKÉP

21.1 Rendeltetése

21.1.1 E kiegészítő térképen kell közölni a légjármű személyzetek részére azokat az információkat, amelyek radar irányítás során lehetővé teszik számukra a kijelölt magasság figyelemmel kísérését és keresztellenőrzését.

Megjegyzés. - A 11. Annex meghatározása szerint a légiforgalmi irányító szolgálat feladatai közé nem tartozik a földnek ütközés megelőzése. Ezért a repülőgép vezető mindig felelős meggyőződni róla, hogy a légiforgalmi irányító egység által kiadott bármely engedély e tekintetben biztonságos, kivéve, ha az IFR szerint repülő gépet radar vektorok adásával irányítják. Lásd a Légi-navigációs Szolgálatok Eljárásai – Légi-forgalom Igazgatás *(PANS-ATM, Doc 4444) 8. Fejezet 8.6.5.2.*

21.1.2 A térkép előlapján szembetűnő módon megjegyzést kell elhelyezni, miszerint a térkép csakis a kijelölt magasság keresztellenőrzésére használható radar irányítás során.

21.2 Alkalmazási rendelkezések

Ajánlás. - *Az ICAO Legkisebb Radar Magasság Térkép-et az 1.3.2 pontban leírt módon biztosítani kötelező olyan esetekben, amikor radar irányvezetési eljárást alakítottak ki és a legkisebb radar magasságok megfelelő módon nem tüntethetők fel az ICAO Körzeti Térkép-en, az ICAO Szabvány Műszeres Indulási Eljárás Térképen (SID), vagy az ICAO Szabvány Műszeres Érkezési Eljárás Térképen (STAR).*

21.3 Fedésterület és méretarány

21.3.1 A térkép fedésterülete kellően nagy legyen, hogy rajta feltüntethető legyen a radar irányvezetési eljárással kapcsolatos minden információ.

21.3.2 A térkép legyen méretarányos.

21.3.3 **Ajánlás.** - *A térkép ugyan olyan méretaránnyal készüljön, mint a kapcsolatos ICAO Körzeti Térkép.*

21.4 Vetület

21.4.1 **Ajánlás.** - *Szögtartó vetületet kell alkalmazni, amelyen az egyenes vonal hozzávetőleg a nagykörrel azonos.*

21.4.2 **Ajánlás.** - *A fokbeosztás jelzéseit azonos térközönként kell a térkép oldalvonalán elhelyezni.*

21.5 Azonosítás

21.5.1 A térkép azonosítása a következőkből álljon: a repülőtér neve, amelyre a radar irányadási eljárást felépítették, vagy, ha az eljárás több repülőtérre vonatkozik, akkor az ábrázolt légtérhez kapcsolódó név.

Megjegyzés. – Ez a név lehet a repülőtér által kiszolgált városnak a neve, vagy ha a várost több repülőtér szolgálja ki, akkor a légiforgalmi szolgálati központ neve, avagy, a térkép fedésterületén belül elhelyezkedő legnagyobb város, vagy nagyváros neve.

21.6 Kultúr környezet és domborzat

21.6.1 Az összes nyílt vízfelületet, a nagy tavak és folyók elnagyolt partvonalát fel kell tüntetni kivéve akkor, ha az a térkép rendeltetésével szorosabban összefüggő adatokkal ütközne.

21.6.2 A megfelelő magasság pontokat és az akadályokat fel kell tüntetni.

Megjegyzés. - A megfelelő magasság pontok és akadályok azok, amelyeket az eljárás specialisták biztosítanak.

21.7 Mágneses eltérés

A térkép által fedett térség átlagos mágneses eltérést a legközelebbi egész fokra kerekítve fel kell tüntetni.

21.8 Irányok, útirányok és radiálok

21.8.1 Az irányoknak, útirányoknak és radiáloknak mágneses irányoknak kell lenniük, kivéve a 21.8.2 pontban előírtakat.

21.8.2 **Ajánlás.** - *Ha a magasabb földrajzi szélességű területek esetében az illetékes hatóság döntése szerint a mágneses Északhoz viszonyított iránymeghatározás nem megfelelő más alkalmas vonatkozatási alapot, például földrajzi Északot, vagy hálózati Északot kell alkalmazni.*

21.8.3 Ha az irányokat, útirányokat és radiálokat földrajzi Északhoz, vagy hálózati Északhoz viszonyítva teszik közzé, ott ezt világosan jelezni kell. Ahol hálózati Északot alkalmaznak, ott ennek a hálózati vonatkoztatási hosszúsági körét azonosítani kell.

21.9 Légiforgalmi adatok

21.9.1 Repülőterek

21.9.1.1 A közel-körzeti útvonalvezetést befolyásoló minden repülőteret fel kell feltüntetni a térképen. Ahol kivitelezhető, ott a futópályák elhelyezkedését mutató jelölést kell alkalmazni.

21.9.1.2 Fel kell tüntetni az elsődleges repülőtér tengerszinthez viszonyított és a legközelebbi méterre, vagy láb értékre felkerekített magasságát.

21.9.2 Tiltott, korlátozott és veszélyes légterek

A tiltott, korlátozott és veszélyes légtereket azonosítójukkal együtt kell feltüntetni.

21.9.3 Légiforgalmi Szolgálati Rendszer

21.9.3.1 A térképen fel kell tüntetni a kialakított légiforgalmi szolgálati rendszer alábbi összetevőit:

1) a vonatkozó rádió navigációs berendezéseket azonosítóikkal egyetemben;

2) a vonatkozó, kijelölt légterek oldal határait;

3) a szabvány műszeres indulási és érkezési eljárásokhoz kapcsolódó vonatkozó mérvadó pontokat;

Megjegyzés. – A légijárművek vektor irányítása során használatos, a mérvadó pontokhoz, illetve azoktól elvezető útvonalak feltüntethetők.

4) átváltási magasságot, ha kijelölték;

5) a radarvektor irányítással összefüggő információkat, beleértve:

a) egyértelműen azonosított módon, a legközelebbi magasabb 50 m-re, vagy 100 láb-ra kerekített legkisebb radar magasságot;

b) a legkisebb radar magasság szektorok oldalhatárait rendszerint rádió navigációs berendezéshez viszonyított iránnyal és távolsággal, vagy, ha ez nem oldható meg, akkor fokokban, fokpercekben és másodpercekben kifejezett földrajzi koordinátákkal és vastag vonalakkal rajzolva oly módon, hogy a kialakított különféle radar szektorok egyértelműen megkülönböztethetők legyenek;

Megjegyzés. – Az áttekinthetőség érdekében, a zsúfolt térségekben a földrajzi koordináták elhagyhatók.

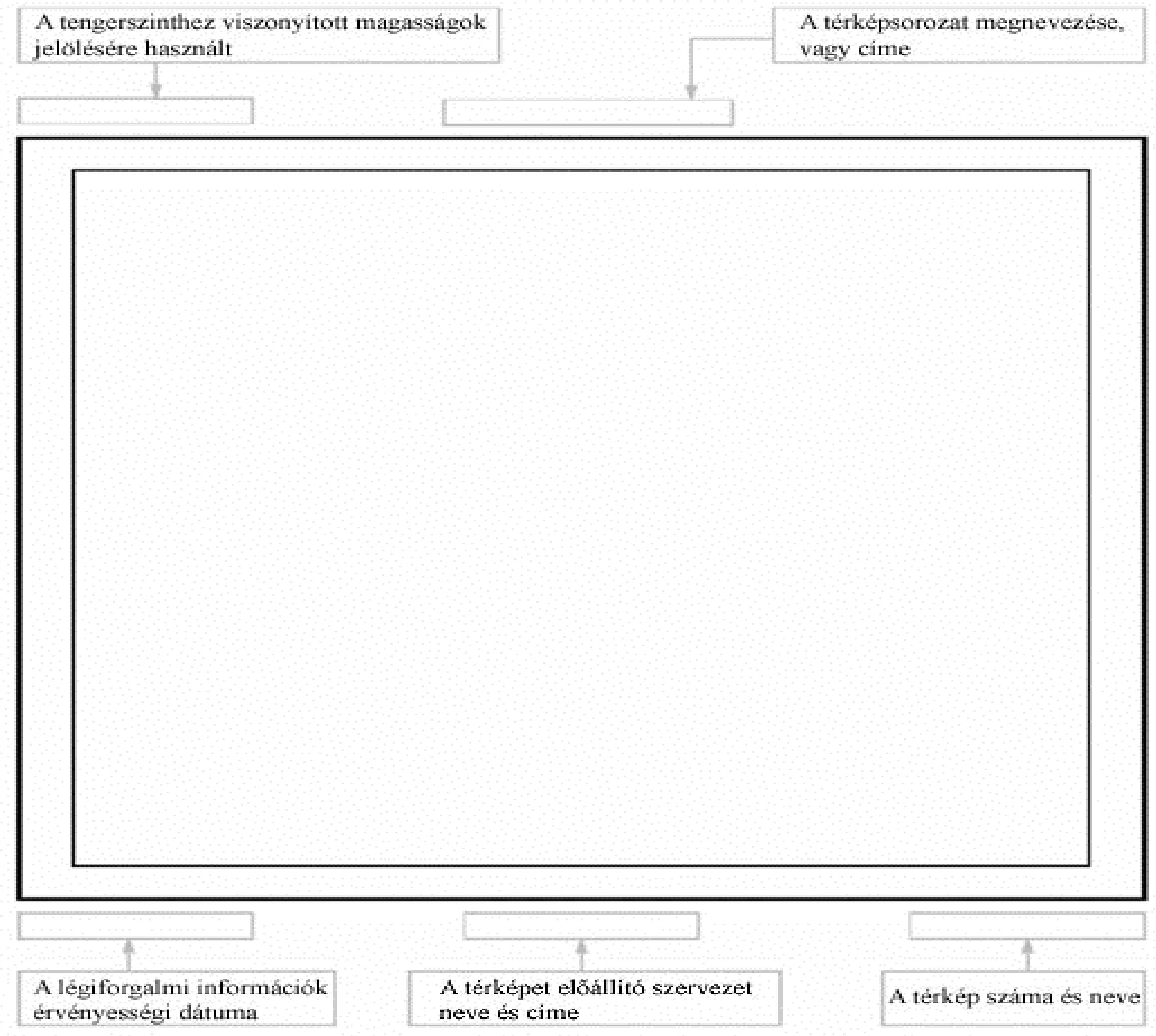
c) a megnevezett repülőtér fő VOR rádió navigációs berendezését, vagy ha ilyen nincs, akkor a repülőtér/helikopter repülőtér vonatkoztatási pontját véve központul, vastag szaggatott vonalakkal rajzolt távolság jelző koncentrikus köröket 20 km, vagy 10 tengeri mérföld térközökkel, vagy, ha lehetséges 10 km, vagy 5 tangeri mérföld térközökkel, a körívek mentén feltüntetve a kör sugarának méretét;

d) az alacsony hőmérséklet hatásainak helyesbítéseivel összefüggő megjegyzések, ha alkalmazandók;

6) rádió összeköttetési eljárásokat, beleértve az approach/radar egység(ek) hívójelé(ei)t és frekvenciáját (frekvenciáit).

21.9.3.2 **Ajánlás.** - *A radarirányítással kapcsolatos rádió összeköttetés megszakadási eljárás szöveges leírását biztosítani kell és – amikor lehetséges – vagy a térképen kell feltüntetni, vagy ugyanazon az oldalon, amely a térképet tartalmazza.*

1. FÜGGELÉK - A SZÉLJEGYZETEK ELRENDEZÉSE



2. FÜGGELÉK - ICAO TÉRKÉPJELEK

ATS/MET jelentőpont – MRP (kötelező, kérésre)	123
Alapvető rádió navigációs berendezés	99
Szirt	4
Határok (nemzetközi)	63
Határok, egyéb	64
Épület (a Repülőtéri Akadály Térképen)	161
Épületek	50
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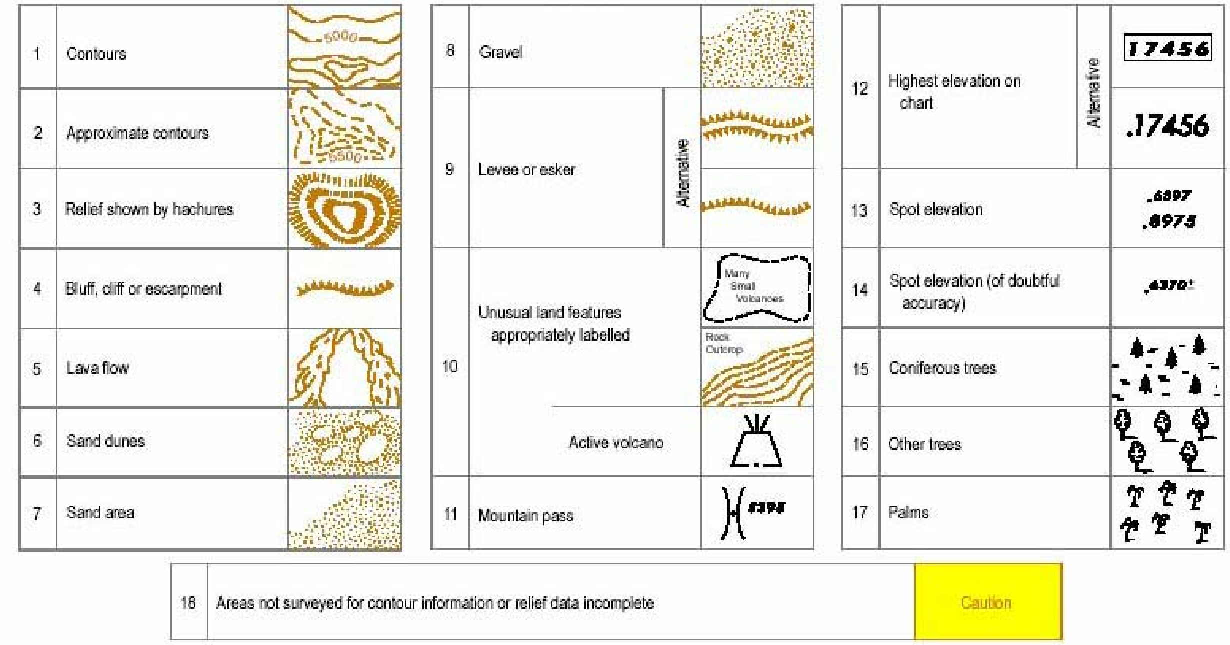

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2 Közelítőleges szintvonalak
3 Vonalkázással jelzett domborzat
4 Szirt sziklafal vagy szakadék
5 Lávafolyam
6 Homokdűnék
7 Homokos terület
8 Kavics
9 Töltés vagy glaciális eredetű homokfal (alternatív jelölés)
10 Rendkívüli terep jellegzetességek, megfelelő felirattal
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11 Hágó
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15 Tűlevelű fák
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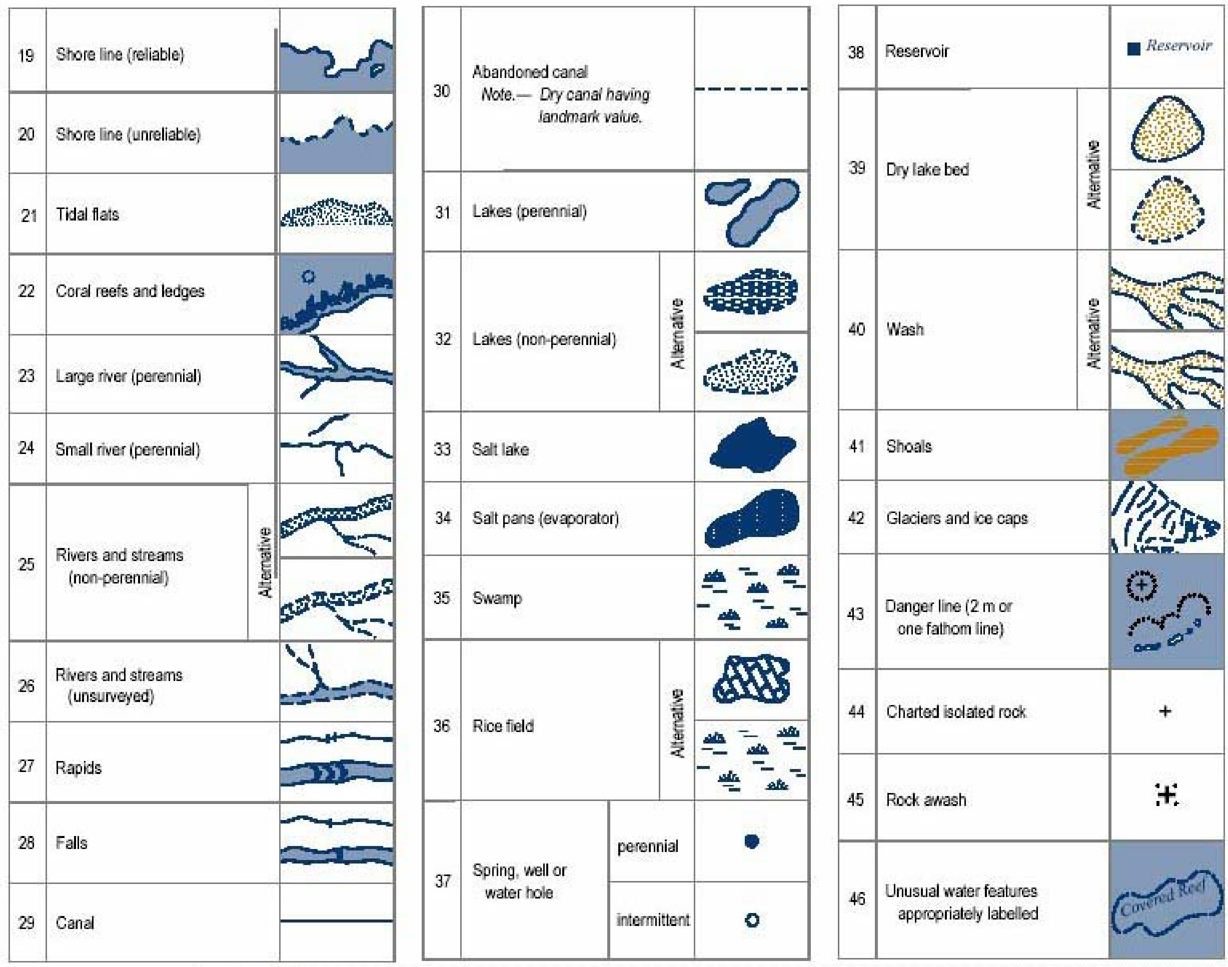
17 Pálmák
18 Figyelem - A terület nincs felmérve szintvonalas ábrázoláshoz, vagy a domborzati adatok megbízhatatlanok



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19 Partvonal (megbízható)
20 Partvonal (nem megbízható)
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26 Folyók és patakok (felméretlenek)
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39 Száraz tómeder - alternatív
40 Vízhordalék - alternatív
41 Homokpad
42 Gleccserek és jégsapkák
43 Veszély vonal (2 méter vagy 1 fathom vonal)
44 Feltérképezett magányos szikla
45 Sziklazátony
46 Rendkívüli vízi jellegzetességek, megfelelő felirattal

47	City or large town	
48	Town	
49	Village	
50	Buildings	

RAILROADS

51	Railroad (single track)	
52	Railroad (two or more tracks)	
53	Railroad (under construction)	
54	Railroad bridge	
55	Railroad tunnel	
56	Railroad station	

57	Dual highway	
58	Primary road	
59	Secondary road	
60	Trail	
61	Road bridge	
62	Road tunnel	

MISCELLANEOUS

63	Boundaries (international)	
64	Outer boundaries	
65	Fence	X—X—X
66	Telegraph or telephone line (when a landmark)	—T—T—
67	Dam	
68	Ferry	

69	Pipeline	Pipeline
70	Oil or gas field	
71	Tank farms	
72	Nuclear power station	
73	Coast guard station	
74	Lookout tower	
75	Mine	
76	Forest ranger station	
77	Race track or stadium	
78	Ruins	
79	Fort	
80	Church	
81	Mosque	
82	Pagoda	
83	Temple	

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47 Nagyváros vagy nagyobb város
48 Város
49 Falu
50 Épületek
Vasútvonalak
51 Vasútvonal (egy sínpár)
52 Vasútvonal (kettő vagy több sínpár)
53 Vasútvonal (építés alatt)
54 Vasúti híd
55 Vasúti alagút
56 Vasútállomás
Főutak és utak
57 Kétpályás főút
58 Elsőrendű főút
59 Másodrendű főút
60 Ösvény
61 Közúti híd
62 Közúti alagút

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63 Határok (nemzetközi)
64 Egyéb határok
65 Kerítés
66 Távíró vagy távbeszélő légvezeték (ha tájékozódási pont)
67 Gát
68 Komp
69 Csővezeték
70 Olaj vagy gázmező
71 Tartálytelep
72 Atomerőmű
73 Parti őrség állomás
74 Kilátótorony
75 Bánya
76 Erdő őrség állomása
77 Lóversenypálya vagy stadion
78 Romok
79 Erőd
80 Templom
81 Mecset
82 Pagoda
83 Templom

84	Civil	Land	
85	Civil	Water	
86	Military	Land	
87	Military	Water	
88	Joint civil and military	Land	
89	Joint civil and military	Water	
90	Emergency aerodrome or aerodrome with no facilities		
91	Abandoned or closed aerodrome		
92	Sheltered anchorage		
93	Aerodrome for use on charts on which aerodrome classification is not required e.g. Enroute Charts		
94	Heliport *Note.— Aerodrome for the exclusive use of helicopters*		
95	*Note.— Where required by the function of the chart, the runway pattern of the aerodrome may be shown in lieu of the aerodrome symbol, for example:*		

REPÜLŐTEREK

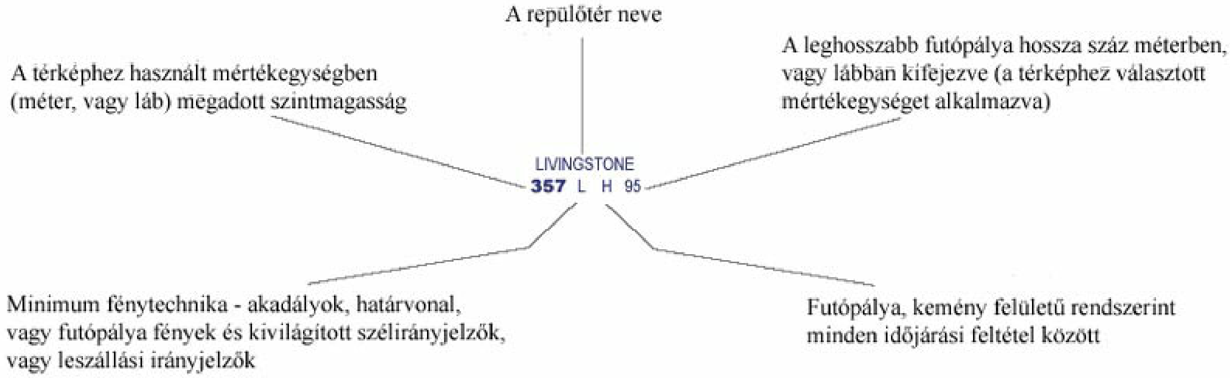
84 Polgári, szárazföldi
85 Polgári, vízi
86 Katonai szárazföldi
87 Katonai vízi
88 Közös katonai és polgári, szárazföldi
89 Közös katonai és polgári, vízi
90 Szükség repülőtér vagy berendezések nélküli repülőtér
91 Elhagyott, vagy bezárt repülőtér
92 Védett horgonyzóhely
93 Repülőtérjel az olyan térképekre, amelyeken a repülőtér osztályba sorolása nem szükséges, például az útvonal térképeken
94 Helikopter repülőtér

Megjegyzés. - Repülőtér helikopterek kizárólagos használatára

95 *Megjegyzés. - Ha a térkép rendeltetéséhez szükséges, akkor a repülőtér jele helyett feltüntethető a futópályák elrendezését mutató ábra.*

A REPÜLÕTÉR JELÖLÉSEKKEL EGYÜTT ALKALMAZHATÓ RÖVIDÍTETT FORMÁJÚ REPÜLŐTÉRI ADATOK

(Hivatkozási pont: 16.9.2.2 és 17.9.2.2)



Megjegyzés. - Kötőjelet (-) kell kitenni, ha az L, vagy a H nem alkalmazandó

A MEGKÖZELÍTÉSI TÉRKÉPEN ALKALMAZOTT TÉRKÉPJELEK

97	Aerodromes affecting the traffic pattern on the aerodrome on which the procedure is based	
98	The aerodrome on which the procedure is based	

97 Repülőterek, amelyek befolyásolják annak a repülőtérnek a forgalmi eljárását, amelyre az eljárás alapul
98 A repülőtér, amelyre az eljárás alapul

RÁDIÓ-NAVIGÁCIÓS BERENDEZÉSEK*

99	Basic radio navigation aid symbol *Note.— This symbol may be used with or without a box to enclose the data.*			
100	Non-directional radio beacon	NDB		Electronic
101	VHF omnidirectional radio range	VOR		
102	Distance measuring equipment	DME		
103	Collocated VOR and DME radio navigation aids	VOR/DME		
104	DME distance	Distance in kilometres (nautical miles) to DME → 15 km; Identification of radio navigation aid → KAV		
105	VOR radial	Radial bearing from, and identification of, VOR	R 090 KAV	
106	UHF tactical air navigation aid	TACAN		

107	Collocated VOR and TACAN radio navigation aids	VORTAC		Electronic
108	Instrument landing system	ILS	PLAN VIEW	B Y
			Electronic	FRONT COURSE, BACK COURSE
			PROFILE	
			Electronic	GLIDE PATH
109	Radio marker beacon		Elliptical	
			Bone Shape	
	Note.— Marker beacon may be shown by outline, or stipple, or both.			

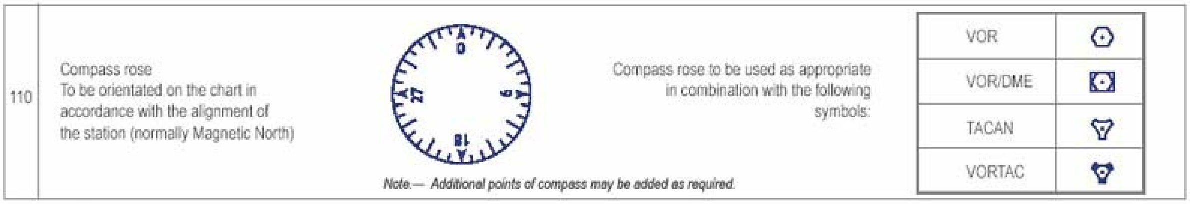
99 Alap rádió-navigációs berendezések és jelölésük

Megjegyzés. - E jel alkalmazható az adatokat keretbe foglaló kerettel, vagy az nélkül

100 Irányítatlan körsugárzó rádió adó NDB
101 Irányszög körsugárzó VHF rádió adó VOR
102 Távolságmérő berendezés DME
103 Együtt telepített VOR és DME rádió berendezések VOR/DME
104 DME távolság adat
A DME berendezés távolsága kilométerben (tengeri mérföldben)→ 15 km
A rádió-navigációs berendezés azonosítója→ KAV
105 VOR radiál A radiál iránya a berendezéstől és a VOR azonosító jele R 090 KAV→
106 UHF, taktikai légi-navigációs rádió berendezés TACAN

107 Együtt telepített VOR és TACAN rádió-navigációs berendezés VORTAC
108 Műszeres leszállító rendszer ILS
Felülnézet
Elektronikus
Mellső iránysáv
Hátsó iránysáv
Oldalnézet
Elektronikus
Siklópálya
109 Rádió marker adóberendezés Ellipszis
Piskóta formájú

Megjegyzés. - A marker adók feltüntethetők körvonalakkal, pontozottan, vagy mindkettővel



110 Iránytűrózsa

Tájolása a térképen feleljen meg a berendezés tájolásával (rendszerint mágneses Észak)

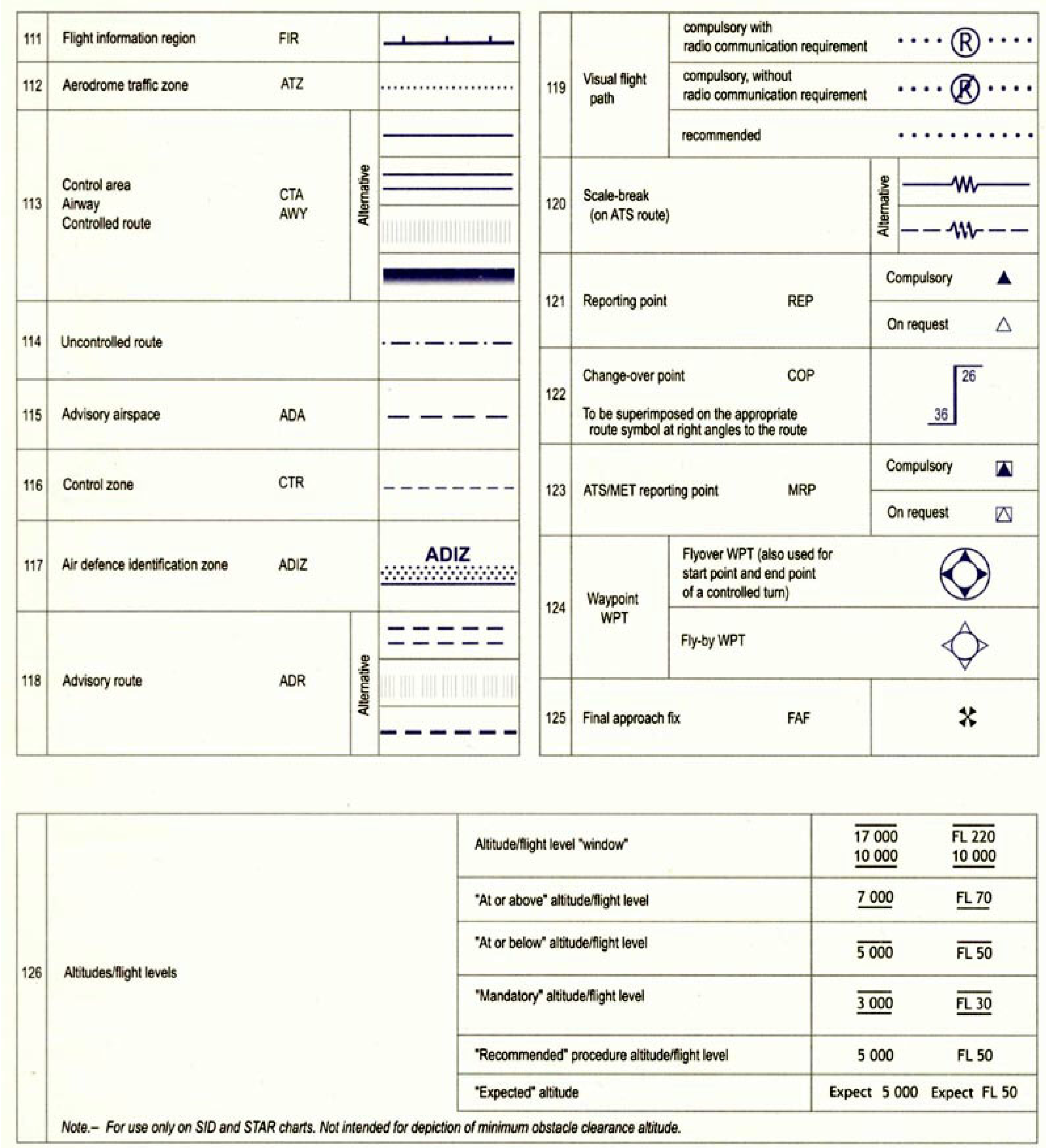
Az iránytűrózsa, a helyzetnek megfelelően, az alábbi jelölésekkel együtt alkalmazandó

VOR
VOR/DME
TACAN
VORTAC

Megjegyzés. - Szükség szerint további iránytűpontok is feltüntethetők

**Megjegyzés. - A rádió-navigációs berendezési adatok megjelenítéséről útmutató anyagot a Légiforgalmi Térkép Kézikönyv (Doc 8697) tartalmaz.*

LÉGIFORGALMI SZOLGÁLATOK



111 Repüléstájékoztató körzet FIR
112 Repülőtér forgalmi körzet ATZ
113 Ellenőrzött légtér CTA
Légifolyosó AWY alternatíva
Ellenőrzött útvonal
114 Nem-ellenőrzött útvonal
115 Tanácsadói légtér ADA
116 Repülőtéri irányítói körzet CTR
117 Légvédelmi azonosító körzet ADIZ
118 Tanácsadói útvonal ADR alternatíva
119 Látás szerinti repülési pálya
kötelező, rádiókommunikációs követelményekkel
kötelező, rádiókommunikációs követelmények nélkül
ajánlott
120 Méretarány változás (ATS útvonalon) alternatíva
121 Jelentőpont REP

Kötelező

Kérésre

122 Átkapcsolási pont COP

Az útvonal tengelyre merőlegesen és a megfelelő útvonaljelre felülnyomtatandó

123 ATS/MET jelentőpont MRP

Kötelező

Kérésre

124 Útvonal pont WPT

Átrepülendő WPT (az ellenőrzött fordulók kezdő és befejező pontjához is használatos)

Rátartásos WPT

125 Befejező megközelítési fix FAF

126 Magasságok/repülési szintek

Magasság/repülési szint "tatomány" -------- --------

17000 FL220

10000 10000

Az adott magasságon/repülési szinten, vagy felette:

7000 FL 70

Az adott magasságon/repülési szinten, vagy alatta:____ _____

5000 FL 50

Kötelező magasság/repülési szint: ____ _____

3000 FL 30

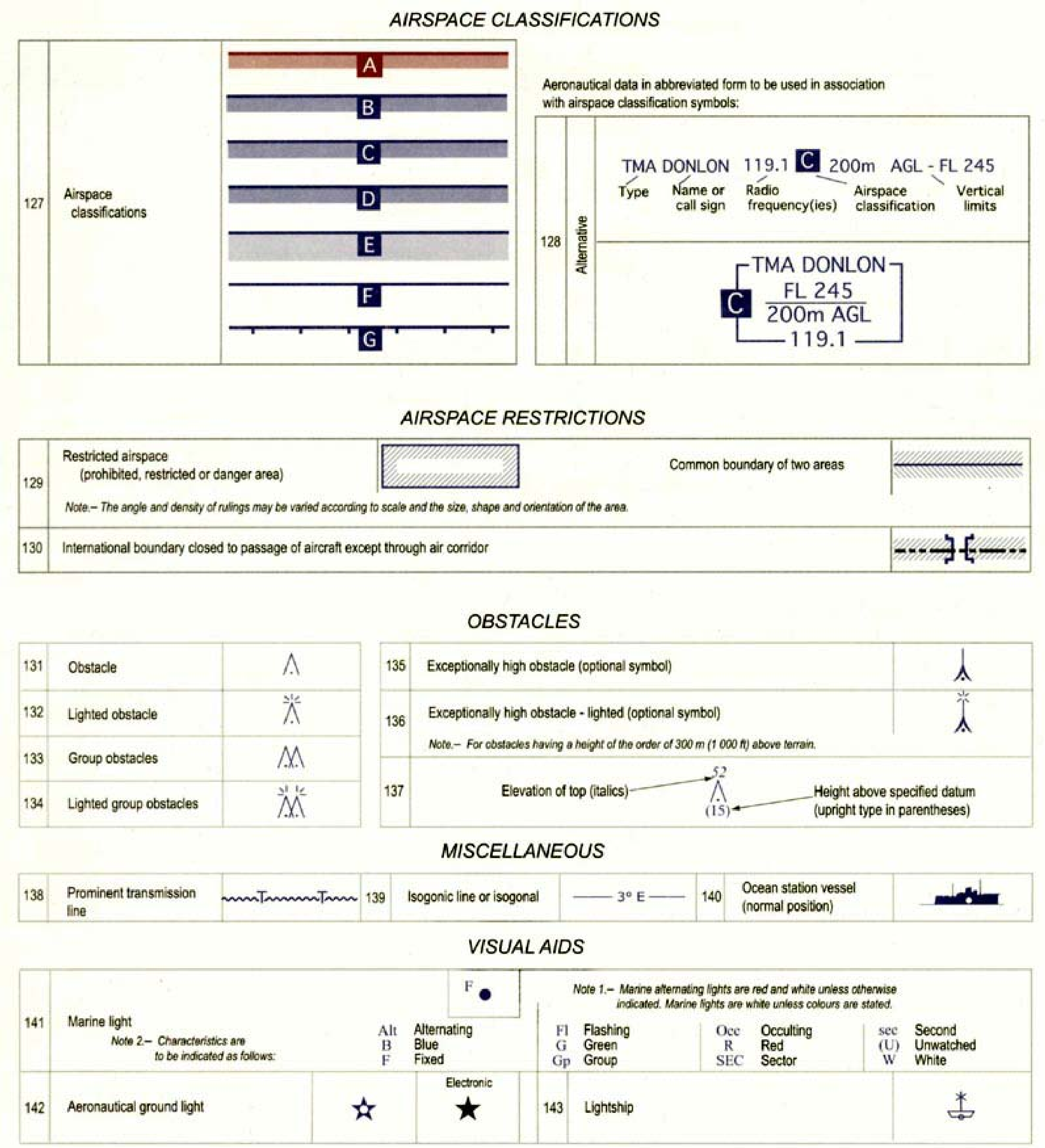
Az eljárás javasolt magassága/repülési szintje:

5000 FL 50

"Várható" magasság Expect 5000 Expect FL 50

Megjegyzés. – Csak SID és STAR térképeken való használatra. Nem cél, hogy a legalacsonyabb akadálymentességi magasságot így jelezzék.

LÉGTÉR OSZTÁLY



127 Légtér osztályok

A légtér osztály jelekkel együtt használatos rövidített formátumú légiforgalmi adatok:

128 Alternatíva Típus Név, vagy hívójel Rádiófrekvencia(k) Légtér osztály Függőleges határok

LÉGTÉR KORLÁTOZÁSOK

129 Korlátozott légtér (tiltott, korlátozott, vagy veszélyes légtér)

Két légtér közös határa

Megjegyzés. - A szálkák sűrűsége és szöge a légtér méretaránya és mérete, alakja és tájolása függvényében változtatható.

130 Nemzetközi határ, amelyet légi-járművek csak a légifolyosókon keresztezhetnek

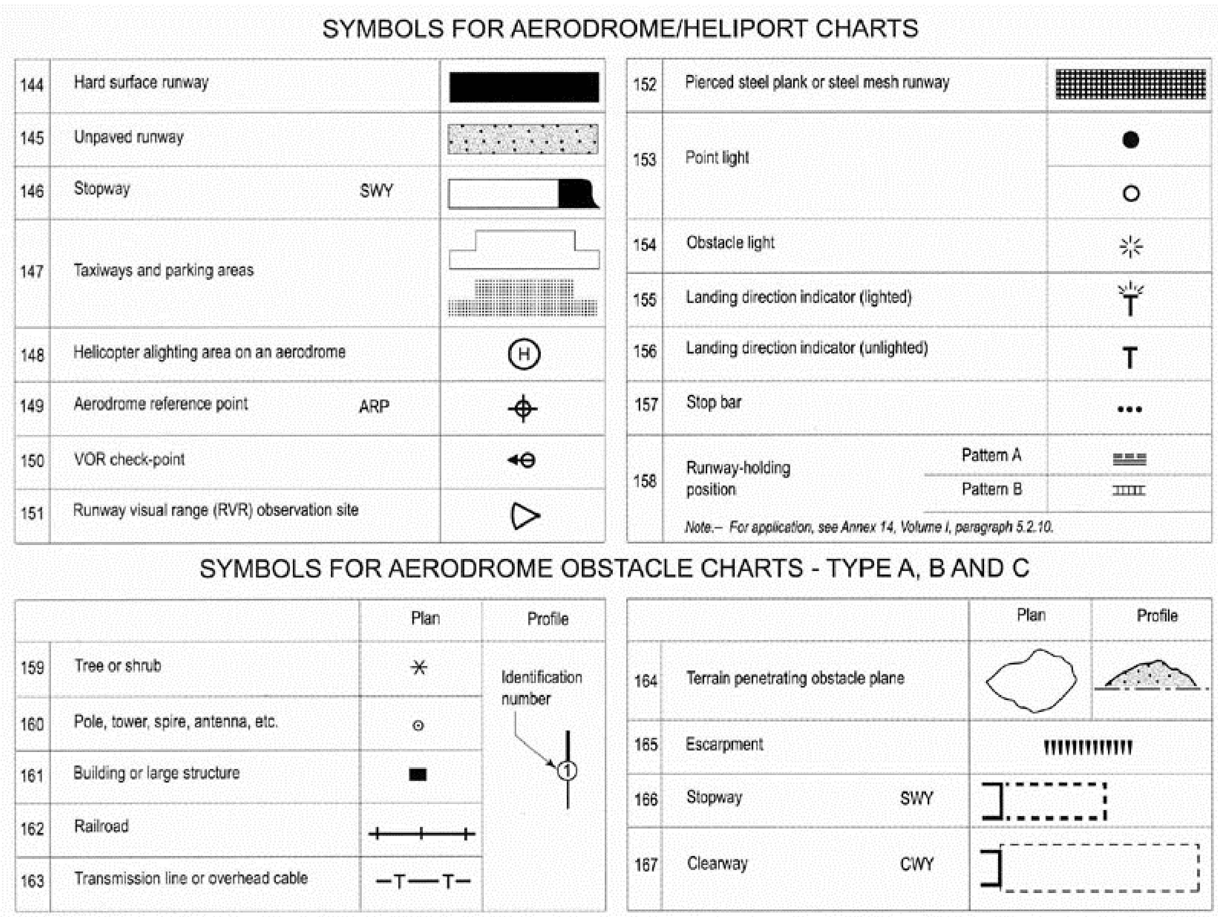
AKADÁLYOK

131 Akadály

132 Kivilágított akadály

133 Akadály csoport
134 Kivilágított akadály csoport
135 Különösen magas akadály (választás szerint alkalmazható jel)
136 Különösen magas akadály - kivilágított (választás szerint alkalmazható jel)
Megjegyzés. - A terepszintnél legalább 300 m-el (1000 láb) magasabb akadályok céljaira
137 Az akadály tetejének magassága (dőlt számok)
Megadott viszonyítási alaphoz mért magasság (zárójelben lévő álló számok)
KÜLÖNFÉLE JELÖLÉSEK
138 Szembeötlő távvezeték
139 Izogon vonal vagy izogon
140 Óceáni állomáshajó (normál tartózkodási hely)
VIZUÁLIS ESZKÖZÖK
141 Tengerhajózási fény
1. Megjegyzés. - A tengerhajózási váltakozó fények vörös és fehér színűek, kivéve, ha másképp van jelezve.
A tengerhajózási fények fehérek, kivéve, ha eltérő színt neveznek meg.
2. Megjegyzés. - Jellemzőik a következőképp jelölendők:
Alt - Váltakozó FL - villogó Occ - pulzáló sec - Másodperc
B - Kék G - Zöld R - Vörös (U) - Nem ellenőrzött
F - Rögzítet Gp - Csoport SEC - Szektor W - Fehér
142 Légiforgalmi földi fény Elektronikus
143 Világítóhajó

JELÖLÉSEK REPÜLŐTÉR/HELIKOPTER REPÜLŐTÉR TÉRKÉPEK CÉLJAIRA



144 Szilárd burkolatú futópálya
145 Burkolat nélküli futópálya
146 Végbiztonsági sáv SWY
147 Guruló utak és parkolási területek

148 Helikopter le/felszállóhelyek a repülőtéren
149 A repülőtér vonatkoztatási pontja ARP
150 VOR ellenőrzési pont
151 Futópálya menti látástávolság (RVR) mérőhely
152 Lyuggatott acéllap, vagy acélháló futópálya
153 Pont fény
154 Akadály fény
155 Leszállási irányjelző (kivilágított)
156 Leszállási irányjelző (kivilágítatlan)
157 Megállító kereszt fénysor
158 Gurulóút várópont
"A" jelölési forma
"B" jelölési forma

Megjegyzés. - Alkalmazásáról lásd a 14. Annex I. Kötet 5.2.10 pontját

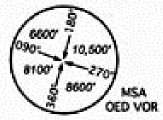
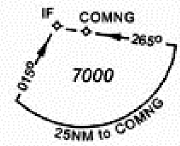
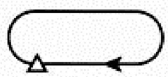
AZ A, B ÉS C TÍPUSÚ REPÜLŐTÉRI AKADÁLYTÉRKÉPEKEN ALKALMAZANDÓ JELÖLÉSEK

FELÜLNÉZET OLDALNÉZET

159 Fa, vagy bokor
160 Oszlop, torony, templomtorony, antenna, stb. azonosító szám
161 Épület, vagy nagyobb szerkezet
162 Vasútvonal
163 Távvezeték, vagy légvezeték
164 Az akadálysíkon átnyúló terep
165 Szakadék
166 Végbiztonsági sáv SWY
167 Akadálymentes terület CWY

ELEKTRONIKUS TÉRKÉPEKEN HASZNÁLHATÓ TOVÁBBI JELEK

PLAN VIEW

168	Minimum sector altitude *Note.– This symbol may be modified to reflect particular sector shapes.*	MSA	
169	Terminal arrival altitude *Note.– This symbol may be modified to reflect particular TAA shapes.*	TAA	
170	Holding pattern		
171	Missed approach track		

PROFILE

172	Runway	
173	Radio navigation aid (type of aid and its use in the procedure to be annotated on top of the symbol)	
174	Radio marker beacon (type of beacon to be annotated on top of the symbol)	
175	Collocated radio navigation aid and marker beacon (type of aid to be annotated on top of the symbol)	
176	DME fix (distance from DME and the fix use in the procedure to be annotated on top of the symbol)	
177	Collocated DME fix and marker beacon (distance from DME and the type of beacon to be annotated on top of the symbol)	

FELÜLNÉZET

168 Biztonságos szektor magasság MSA

Megjegyzés. - E jelölés módosítható, hogy tükrözze az egyes szektorok alakját

169 Közel-forgalmi érkezési magasság TAA

Megjegyzés. - E jelölés módosítható, hogy tükrözze az illető TAA formáját

170 Várakozási eljárás

171 Megszakított megközelítési irány

OLDALNÉZET

172 Futópálya

173 Rádió navigációs berendezés

(a jel tetején a berendezés típusa és az eljárásbeli alkalmazása szerepeljen)

174 Rádió marker adó
(a jel tetején az adó típusa szerepeljen)
175 Együtt telepített rádió navigációs berendezés és marker adó
(a jel tetején a berendezés típusa és az eljárásbeli alkalmazása szerepeljen)
176 DME fix
(a DME-től mért távolság és a fix eljárásbeli alkalmazása szerepeljen a jel tetején)
177 Azonos helyű DME fix és marker adó
(a DME-től mért távolság és az adó típusa megadható a jel tetején)

3. FÜGGELÉK - SZÍN ÚTMUTATÓ

(Hívatkozás 2.11.1)

TÉRKÉPJELEK

Kultúrkörnyezet, a főútvonalak és utak kivételével; nagyvárosok körvonalai; rács és		FEKETE
Városok beépített területei		FEKETE, pontozott
Főutak és utak	Választható színek:	FEKETE, fél tónus
		VÖRÖS
Városok beépített területei (alternatíva a fekete pontozás helyett)		SÁRGA
Szintvonalak és tereprajzi jellegzetességek: a 2. Függelék 1 - 10 jelei.		BARNA
Partvonalak, csatornák, folyók, tavak, mélységjelző színárnyalás és más vízrajzi		KÉK
Nyíltvízi területek		KÉK, fél tónus
Sós tavak és só lepárló medencék		KÉK, pontozott
Nagyméretű, nem állandó folyók és tavak		KÉK, pontozott
Légiforgalmi adatok, az Útvonal Térkép és a Körzeti Térkép -ICAO kivételével, ahol más színekre lehet szükség. Egyazon térképlapon mindkét szín alkalmazható, de ha csak egyetlen színt alkalmaznak, akkor a sötétkéket kell előnyben részesíteni	Választható színek	BARNA (magenta)
		SÖTÉTKÉK
Erdők		ZÖLD
Területek, melyek a szintvonalas tájékoztatás biztosításához nincsenek	Választható színek	ARANYSÁRGA FEHÉR

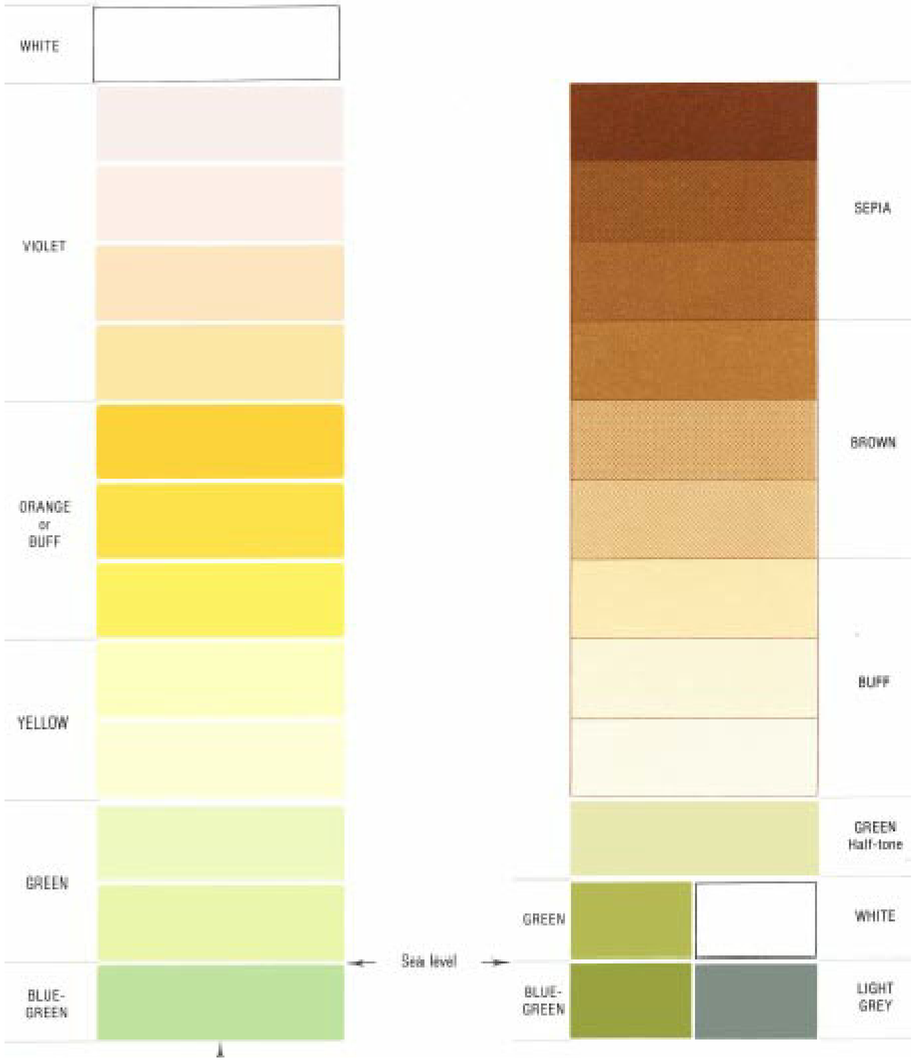
MAGASSÁG SZERINTI SZÍNÁRNYALÁS

Fehér Lila (világos)	Tengerszinthez viszonyított nagyon nagy magasságok színárnyalata		Mély barna (szépia)
Narancs, vagy okker	Tengerszinthez viszonyított nagyobb magasságok		Barna
Sárga	Tengerszinthez viszonyítva közepes magasságok		Karamel
Zöld	Tengerszinthez viszonyítva kisebb magasságok	Választható szín	Zöld Fehér
Kékeszöld	Tengerszint alatti területek	Választható szín	Kékeszöld Világos-szürke

Megjegyzés.-
Az alap színárnyalás azonos a Nemzetközi Világtérkép részére meghatározottakkal.

4. FÜGGELÉK - MAGASSÁGI SZÍNÁRNYALÁSI ÚTMUTATÓ

(Alternatív rendszer, hivatkozás 2.12.2)



Fehér

Világos lila Sötét barna

Barna

Narancs, vagy okker Karamel

Sárga

Zöld fél tónus

Zöld

Zöld Fehér

Tengerszint

Kékeszöld Kékeszöld Világosszürke

1. Megjegyzés.- Az alap színárnyalás azonos a Nemzetközi Világtérkép részére meghatározottakkal.

2. Megjegyzés.- A tengerszinthez viszonyított magasságok nem kötődnek egyik rendszer árnyalataihoz sem, annak érdekében, hogy ez rugalmasságot biztosítson megválasztásukra.

5. FÜGGELÉK - LAPELRENDEZÉS AZ ICAO 1 : 1 000 000 LÉGIFORGALMI VILÁG TÉRKÉPHEZ

Megjegyzés.- A szerződő államok részéről az ICAO 1:1 000 000 méretarányú Légiforgalmi Világ Térképnél ténylegesen alkalmazott lapvonalak az ICAO Légiforgalmi Térképek Katalógusában (Doc 7101-MAP/565) megadottak legyenek.

Az e térképen jelzett államhatárok nem jelentik azok ICAO általi hivatalos jóváhagyásukat, vagy elfogadásukat.

6. FÜGGELÉK
LÉGIFORGALMI ADAT MINŐSÉGI KÖVETELMÉNYEK

1. Táblázat - Földrajzi szélesség és hosszúság Térkép felbontás Integritási osztály

Repülés tájékoztató körzet határpontok	berajzolás szerint	1 x 10-3 szokványos
Korlátozott, tiltott és veszélyes légtér határpontok (CTA/CTZ határokon kívül)	berajzolás szerint	1 x 10-3 szokványos
Korlátozott, tiltott és veszélyes légtér határpontok (CTA/CTZ határokon belül)	berajzolás szerint	1 x 10-5 fontos
CTA/CTZ határpontok	berajzolás szerint	1 x 10-5 fontos
Útvonal menti nav. berendezések és fixek, várakozási, SID/STAR pontok	1 másodperc	1 x 10-5 fontos
Akadályok az 1. Területen (az állam teljes területén)	berajzolás szerint	1 x 10-3 szokványos
Repülőtér/helikopter repülőtér Vonatkoztatási pont	1 másodperc	1 x 10-3 szokványos
Repülőtéren/helikopter repülőtéren telepített nav. berendezések	berajzolás szerint	1 x 10-5 fontos
Akadályok a 3. Területen	1/10 másodperc	1 x 10-5 fontos
Akadályok a 2. Területen	1/10 másodperc	1 x 10-5 fontos
Befejező megközelítési fixek/pontok és a műszeres megközelítési eljárást alkotó egyéb lényeges fixek/pontok	1 másodperc	1 x 10-5 fontos
Futópálya küszöbök	1 másodperc	1 x 10-8 kritikus
Guruló út középvonal/parkolási útmutató vonal pontok	1/100 másodperc	1 x 10-5 fontos
Futópálya vég (repülési pálya igazodási pont)	1 másodperc	1 x 10-8 kritikus
Futópálya várópont	1 másodperc	1 x 10-8 kritikus
Gurulóút csatlakozás jelölő vonal	1 másodperc	1 x 10-5 fontos
Elhagyás útmutató vonal	1 másodperc	1 x 10-5 fontos
Előtér határok (poligon)	1 másodperc	1 x 10-3 szokványos
Jégtelenítő/jegesedésgátló létesítmény (poligon)	1 másodperc	1 x 10-3 szokványos
Légi-jármű állóhely/INS ellenőrző pontok	1/100 másodperc	1 x 10-3 szokványos
TLOF, vagy FATO küszöbök, helikopter repülőterek geometriai közepe	1 másodperc	1 x 10-8 kritikus

Megjegyzés. – Lásd a 15. Annex 8. Függelékét a meghatározott területeken belül lévő akadályok azonosításához használt kritériumok és az akadály adat gyűjtő felületek grafikus ábrázolása tekintetében.

2. Táblázat - Magasságok (elevation/height/altitude)

Magasságok (elevation/height/altitude)	Térkép felbontás	Integritási osztály
Repülőtér/helikopter repülőtér szintmagasság	1 m, vagy 1 láb	1 x 10-5 fontos
WGS-84 geoid egyenetlenség a repülőtér/helikopter repülőtér szintmagassági pontoknál	1 m, vagy 1 láb	1 x 10-5 fontos
Futópálya, vagy FATO küszöbök, nem-precíziós megközelítések	1 m, vagy 1 láb	1 x 10-5 fontos
WGS-84 geoid egyenetlenség a futópálya, vagy FATO küszöböknél, a TLOF geometriai közepénél, nem-precíziós megközelítések	1 m, vagy 1 láb	1 x 10-5 fontos
Futópálya, vagy FATO küszöbök, precíziós megközelítések	0,5 m, vagy 1 láb	1 x 10-8 kritikus
WGS-84 geoid egyenetlenség a futópálya, vagy FATO küszöböknél, a TLOF geometriai közepénél, precíziós megközelítések	0,5 m, vagy 1 láb	1 x 10-8 kritikus
Küszöb átrepülési magasság, precíziós megközelítés	0,5 m, vagy 1 láb	1 x 10-8 kritikus
Akadály elkülönítési magaság (altitude/height) (OCA/H)	a PANS-OPS (Doc 8168)-ban	1 x 10-5 fontos

	meghatározottak szerint	
Akadályok az 1. Területen (az állam teljes területén)	3 m (10 láb)	1 x 10-3 szokványos
A kadályok a 2. Területen	1 m, vagy 1 láb	1 x 10-5 fontos
Akadályok a 3. Területen	1 m, vagy 1 láb	1 x 10-5 fontos
Távolság mérő berendezés (DME)	30 m (100 láb)	1 x 10-5 fontos
Műszeres megközelítései eljárás magasságai	a PANS-OPS (Doc 8168)-ban meghatározottak szerint	1 x 10-5 fontos
Minimum magasságok	50 m, vagy 100 láb	1 x 10-3 szokványos

Megjegyzés. – Lásd a 15. Annex 8. Függelékét a meghatározott területeken belül lévő akadályok azonosításához használt kritériumok és az akadály adat gyűjtő felületek grafikus ábrázolása tekintetében.

3. Táblázat - Mágneses eltérés

Mágneses eltérés	Térkép felbontás	Integritási osztály
Repülőtér/helikopter repülőtér mágneses eltérése	1 fok	1 x 10-5 fontos

4. Táblázat - Irányok

Irányok	Térkép felbontás	Integritási osztály
Útvonal szakasz	1 fok	1 x 10-3 szokványos
Útvonal és közel körzeti fix kialakítás	1/10 fok	1 x 10-3 szokványos
Közel körzeti érkezési/indulási útvonal szakasz	1 fok	1 x 10-3 szokványos
Műszeres megközelítési eljárás fix Kialakítás	1/10 fok	1 x 10-5 fontos
ILS iránysáv fekvés	1 fok	1 x 10-5 fontos
MLS zéró azimut fekvés	1 fok	1 x 10-5 fontos
Futópálya és FATO irány	1 fok	1 x 10-3 szokványos

5. Táblázat - Hosszúság/távolság/kiterjedés

Hosszúság / távolság / kiterjedés	Térkép felbontás	Integritási osztály
Útvonal szakasz hossza	1 km, vagy 1 NM	1 x 10-3 szokványos
Útvonal fix kialakítás távolsága	2/10 km (1/10 NM)	1 x 10-3 szokványos
Közel körzeti érkezési/indulási útvonal szakasz hossza	1 km, vagy 1 NM	1 x 10-5 fontos
Közel körzeti és műszeres megközelítési eljárás fix kialakítás távolsága	2/10 km (1/10 NM)	1 x 10-5 fontos
Futópálya és FATO hossza, TLOF kiterjedés	1 m	1 x 10-8 kritikus
Futópálya szélesség	1 m	1 x 10-5 fontos
Végbiztonsági sáv hossza és szélessége	1 m	1 x 10-8 kritikus
Rendelkezésre álló leszálló úthossz	1 m	1 x 10-8 kritikus
Rendelkezésre álló nekifutási úthossz	1 m	1 x 10-8 kritikus
Rendelkezésre álló felszálló úthossz	1 m	1 x 10-8 kritikus
Rendelkezésre álló gyorsítás-fékezési úthossz	1 m	1 x 10-8 kritikus
ILS iránysáv antenna-futópálya vég, távolság	a berajzolás szerint	1 x 10-3 szokványos
ILS siklópálya antenna-küszöb, a középvonalon mért távolság	a berajzolás szerint	1 x 10-3 szokványos
ILS marker-küszöb távolság	2/10 km (1/10 NM)	1 x 10-5 fontos
ILS DME antenna-küszöb, a középvonalon mért távolság	a berajzolás szerint	1 x 10-5 fontos
MLS azimut antenna-futópálya vég távolsága	a berajzolás szerint	1 x 10-3 szokványos
MLS magasság adó antenna-küszöb, a középvonalon mért távolság	a berajzolás szerint	1 x 10-3 szokványos
MLS DME/P antenna-küszöb, a középvonalon mért távolság	a berajzolás szerint	1 x 10-5 fontos

Kisérő jegyzetek
17/11/03
1. MÓDOSÍTÁS
A 4. ANNEX - LÉGIFORGALMI TÉRKÉPEK
(Tizedik Kiadás)
KIEGÉSZÍTÉSÉHEZ

A Kiegészítés 1. módosításának bedolgozásához:
1. a meglévő (iii) - (x) lapokat cserélje ki a 03/11/17 dátumot viselő új lapokkal; és
2. Szüntesse meg Ausztrália, Kanada, Kína (Hong Kong SAR), Németország és Urugváj jelenlegi, 02/3/28 dátumú lapjait.
3. Fűzze be a 03/11/17 dátumot viselő alábbi új, illetve cserelapokat:
Australia
Belarus
Canada
Chile
China (Hong Kong SAR)
Cook Islands
Germany
Switzerland
United Kingdom
Uruguay
Uzbekistan
4. a Kiegészétő (ii) lapján jegyezze be a jelen módosítás bevezetését.

1. Az eltérésekről az ICAO-t értesítő szerződő államok
Az álább felsorolt államok értesítették az ICAO-t a saját nemzeti előírásaik és gyakorlatuk illetve a 4. Annex és módosításait a 10. módosításáig bezárólag felölelő (10. Kiadás kiadásában szereplő nemzetközi szabványok és ajánlott eljárások között fennálló eltérésekről, illetve amelyek a bevezetéskor azt véleményezték.

Az illető állam neve mellett feltüntetett lapszám és az adott lapszám kiadási dátum e Kiegészítés adott aktuális lapjáéval azonos.

Állam	Értesítési dátum	Lapok a Kiegészítésben	Értesítési dátum
Argentina	28/9/01	1-4	28/3/02
Australia	2/6/03	1-4	17/11/03
Belarus	27/9/01	1-4	17/11/03
Canada	31 / 1/03	1-3	17/11/03
Chile	20/8/03	1-2	17/11/03
China (Hong Kong, SAR)	23/10/02	1	17/11/03
Cook Islands	13/10/03	1-3	17/11/03
Cuba	30/7/01	1-2	28/3/02
Denmark	24/9/01	1	28/3/02
Ecuador	21/6/01	1	28/3/02
France	5/10/01	1-6	28/3/02
Germany	29/10/02	1-3	17/11/03
India	3/9/01	1	28/3/02
Lithuania	6/6/01	1	28/3/02
Mauritius	18/1/02	1	28/3/02
New Zealand	13/3/02	1-3	28/3/02
Norway	1/10/01	1-2	28/3/02
Panama	9/7/01	1	28/3/02

Slovakia	26/9/01	1	28/3/02
Sweden	21/9/01	1	28/3/02
Switzerland	10/7/02	1-3	17/11/03
Uganda	25/5/01	1	28/3/02
United Kingdom	16/9/02	1-5	17/11/03
Uruguay	10/2/03	1	17/11/03
Uzbekistan	28/9/01	1-2	17/11/03

2. Szerződő államok akik az ICAO-t értesítették, hogy nincs eltérés

Állam	Értesítési dátum	Állam	Értesítési dátum
Bahrain	14/7/01	Pakistan	26/9/01
Barbados	9/5/01	Paraguay	24/8/01
Egypt	14/7/01	Portugal	12/10/01
El Salvador	9/7/01	Romania	5/10/01
Eritrea	14/5/01	Sri Lanka	12/2/01
Finland	11/9/01	The former Yugoslav Republic of Macedonia	29/6/01
Ghana	12/6/01	Togo	1/7/01
Jordan	1 / 10/01	United Arab Emirates	9/9/01
Kuwait	10/6/01	United Republic of Tanzania	21/6/01
Netherlands	22/10/01	Zimbabwe	17/9/01
17/11/03			

3. Szerződő Államok akiktől értesítés nem érkezett

Afghanistan
Albania
Algeria
Andorra
Angola
Antigua and Barbuda
Armenia
Austria
Azerbaijan
Bahamas
Bangladesh
Belgium
Belize
Benin
Bhutan
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Burundi
C6te d'Ivoire
Cambodia
Cameroon
Cape Verde
Central African Republic
Chad
China
Colombia

Comoros
Congo
Costa Rica
Croatia
Cyprus
Czech Republic
Democratic People's Republic of Korea
Democratic Republic of the Congo
Djibouti
Dominican Republic
Equatorial Guinea
Estonia
Ethiopia
Fiji
Gabon
Gambia
Georgia
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
Indonesia
Iran (Islamic Republic of)
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Kazakhstan
Kenya
Kiribati
Kyrgyzstan
Lao People's Democratic Republic
Latvia
Lebanon
Lesotho
Liberia
Libyan Arab Jamahiriya
Luxembourg
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mexico

Micronesia (Federated States of)
Monaco
Mongolia
Morocco
Mozambique
Myanmar
Namibia
Nauru
Nepal
Nicaragua
Niger
Nigeria
Oman
Palau
Papua New Guinea
Peru
Philippines
Poland
Qatar
Republic of Korea
Republic of Moldova
Russian Federation
Rwanda
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia and Montenegro
Seychelles
Sierra Leone
Singapore
Slovenia
Solomon Islands
Somalia
South Africa
Spain
Sudan
Suriname
Swaziland
Syrian Arab Republic
Tajikistan
Thailand
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Ukraine
United States
Vanuatu
Venezuela

Viet Nam
Yemen
Zambia
17/11/03
4. Pontszámok, amelyekhez eltérést jelentettek be

Pont szám	Eltérést jelentett
1.1	Belarus
	Chile
	France
1.2.2	United Kingdom
1.2.2.1	United Kingdom
1.3.1	Uzbekistan
2.1.8	Belarus
	United Kingdom
2.2	Argentina
	Australia
	Canada
	United Kingdom
2.3.1	Argentina
2.3.2	Argentina
2.4	Argentina
2.5.4	Canada
2.5.7	Australia
	Canada
	Germany
2.6.1	Belarus
	Uzbekistan
2.10.1	Switzerland
2.11	Australia
2.12.3.1	Argentina
	Australia
2.13	Canada
2.14.1	Belarus
	Denmark
	France
	Germany
2.17.1	Sweden
2.17.3	Germany
2.17.5	Chile
2.18	Switzerland
2.18.1	Canada
2.18.2	Belarus
	Australia
	Belarus
Pont szám	Eltérést jelentett
	Chile
	Cook Islands
	Ecuador
	New Zealand
	United Kingdom
2.18.3	Chile
2.18.4	Australia
3.2.1	Australia

	Uruguay
3.3.2	Canada
3.4.2	United Kingdom
3.5.4	Switzerland
3.7	United Kingdom
3.8.1.1	United Kingdom
3.8.1.2	United Kingdom
3.8.2	France
3.8.2.1	United Kingdom
3.8.2.2	Canada
	United Kingdom
3.8.4	France
3.9.1	Argentina
	Chile
	United Kingdom
4.2	Lithuania
4.2.1	Australia
	Belarus
	Canada
	Cook Islands
	Cuba
	Ecuador
	France
	Germany
	New Zealand
	Switzerland
	Uganda
	United Kingdom
	Uruguay

17/11/03

Pont szám	Eltérést jelentett
	Uzbekistan
4.4.3	Argentina
4.5	Argentina
4.7.3	Argentina
4.8	Argentina
4.9.1	Argentina
4.10.1	Argentina
5.1	Chile
5.2	Australia
	Belarus
	Canada
	Cook Islands
	Cuba
	Ecuador
	France
	India
	Lithuania
	New Zealand
	Norway
	Switzerland
	United Kingdom
	Uruguay

	Uzbekistan
6.2	Australia
	Canada
	Cuba
	Uganda
7.2.1	United Kingdom
7.6.2	Belarus
	Canada
	Cook Islands
	Cuba
	Germany
	New Zealand
	Norway
7.9.1	Argentina
7.9.2	Canada
	Uzbekistan
7.9.3.1.1	Argentina
	Australia
	Belarus
	Cook Islands
	Ecuador
	France
	New Zealand
	Norway
Pont szám	Eltérést jelentett
	Sweden
	Uruguay
	Uzbekistan
7.9.4.2	Cook Islands
	New Zealand
8.2	Switzerland
8.2.1	Germany
	United Kingdom
8.3.2	France
8.4.2	Belarus
8.4.3	Belarus
8.6.1	Norway
8.6.2	Australia
	Cook Islands
	France
	New Zealand
	Norway
8.9.1	Argentina
	Uzbekistan
8.9.2	Canada
	Uzbekistan
8.9.3	Belarus
	Canada
	Cook Islands
	France
	New Zealand
	Sweden

8.9.4.1.1 Argentina
Australia
Belarus
Canada
Cook Islands
France
New Zealand
Norway
Sweden

9.3.2 Australia
Canada
China (Hong Kong SAR)
United Kingdom
9.3.3 France
United Kingdom
9.4 China (Hong Kong SAR)
9.4.2 Belarus
Cook Islands
United Kingdom
9.4.3 Belarus

17/11/03
Pont szám Eltérést jelentett
Cook Islands
New Zealand
Switzerland
United Kingdom
9.5.4 France
9.6.1 Sweden
Switzerland
United Kingdom
9.6.2 Cook Islands
Cuba
France
Germany
India
New Zealand
United Kingdom
9.7 United Kingdom
9.9 China (Hong Kong SAR)
9.9.1.2 Uzbekistan
9.9.2 Canada
Chile
United Kingdom
Uzbekistan
9.9.3 Belarus
Chile
9.9.3.1 Canada
9.9.3.2 Canada
France
Germany
Norway
9.9.4.1.1 Australia
Belarus

	Cook Islands
	France
	Germany
	New Zealand
	Sweden
	Switzerland
	United Kingdom
9.9.4.2	United Kingdom
10.3.2	Canada
	China (Hong Kong SAR)
	United Kingdom
10.3.3	France
	United Kingdom
10.4	China (Hong Kong SAR)
10.4.1	United Kingdom
10.4.2	Belarus
	Cook Islands
Pont szám	Eltérést jelentett
	New Zealand
	United Kingdom
10.4.3	Belarus
	Switzerland
10.5.2	Australia
10.5.4	France
10.6.1	Sweden
	Switzerland
10.6.2	Australia
	Cook Islands
	Cuba
	France
	Germany
	India
	New Zealand
	United Kingdom
10.7	United Kingdom
10.9	China (Hong Kong, SAR)
10.9.1.2	Uzbekistan
10.9.2	Canada
	Chile
	United Kingdom
	Uzbekistan
10.9.3	Belarus
	Chile
10.9.3.1	Sweden
	Canada
10.9.3.2	France
	Canada
	Germany
	Norway
10.9.4.1.1	Australia
	Belarus
	Cook Islands
	France
	Germany

	New Zealand
	Sweden
	Switzerland
	United Kingdom
10.9.4.2	United Kingdom
11.2.2	France
11.2.3	France
11.2.4	United Kingdom
11.3.3	Cook Islands
	France
	New Zealand
11.3.3.1	Belarus

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Pont szám	Eltérést jelentett
	France
	Sweden
	United Kingdom
11.3.3.2	United Kingdom
11.4	United Kingdom
I1.5.2	Belarus
	Cook Islands
	New Zealand
11.6.1	France
11.6.2	Cook Islands
	New Zealand
	United Kingdom
11.6.3	Switzerland
11.6.4	Switzerland
11.6.5	France
	Switzerland
I1.7	China (Hong Kong SAR)
11.7.1	Argentina
	Switzerland
11.7.2	Argentina
	Canada
	Chile
	Cook Islands
	France
	Germany
	India
	New Zealand
	Panama
	Switzerland
	Uganda
	United Kingdom
11.7.3	Australia
11.8.2	United Kingdom
11.10.1.1	Cuba
	United Kingdom
	Uzbekistan
11.10.1.3	France
11.10.1.4	France
11.10.2.2	United Kingdom

11.10.2.4 New Zealand
United Kingdom
11.10.2.5 Cook Islands
France
11.10.2.6 Belarus
11.10.2.7 United Kingdom
11.10.3 Canada
Uzbekistan
11.10.4.1 France
11.10.4.3 Australia
Pont szám Eltérést jelentett
Belarus
Cook Islands
France
New Zealand
Norway
Switzerland
United Kingdom
11.10.4.4 France
11.10.4.5 United Kingdom
11.10.6.1 Canada
France
11.10.6.3 Argentina
France
United Kingdom
11.10.6.4 Australia
11.10.6.5 Australia
Cook Islands
France
New Zealand
United Kingdom
11.10.7.1 United Kingdom
11.10.8.1 Cook Islands
New Zealand
11.10.8.5 Argentina
Cook Islands
France
New Zealand
11.10.8.6 France
Uzbekistan
11.10.9 Australia
Cook Islands
France
New Zealand
Panama
United Kingdom

12.2 Australia
Belarus
France
United Kingdom
12.6 France
12.10.1.1 Cuba
12.10.2.3 Cook Islands
New Zealand

12.10.2.3.1 Switzerland
12.10.3 Canada
France
12.10.4 France
12.10.5.3 Cook Islands

17/11/03
Pont szám Eltérést jelentett
Germany
New Zealand
Switzerland

13.1 Australia
13.2.1 Norway
13.5 Belarus
Cook Islands
France
Germany
New Zealand
United Kingdom
13.6.1 Australia
Belarus
Canada
Chile
Cook Islands
Ecuador
France
Germany
New Zealand
Norway
Switzerland
United Kingdom
13.6.2 Chile
Cook Islands
New Zealand
United Kingdom

14.2 Australia
Cuba
United Kingdom
14.3.2 Belarus
Cook Islands
New Zealand
14.5.2 Belarus
Cook Islands
France
Germany
New Zealand
14.6 Belarus
Canada
Cook Islands
France
Germany
New Zealand
Norway

	Switzerland
	Uzbekistan
Pont szám	Eltérést jelentett
15.3.2	Belarus
15.5.2	Australia
	Belarus
	France
	Germany
	United Kingdom
15.6	Belarus
	Canada
	France
	Germany
	Norway
	Switzerland
	United Kingdom
	Uzbekistan
16. Fejezet	Panama
	Uruguay
16.2	Lithuania
16.2.1	Argentina
	Belarus
	Chile
	France
	Germany
	Norway
	Switzerland
	United Kingdom
	Uzbekistan
16.4.6	Australia
16.5.1	Canada
	Cuba
16.5.2	Argentina
	Cuba
16.6	Argentina
	Canada
16.7.5	Australia
16.7.9.3	Australia
	Cuba
16.9.2	France
16.9.2.2	Australia
16.9.2.3	Cuba
16.9.3.1	Australia
	Argentina
16.9.4	Australia
	Canada
16.9.5	Argentina
	Australia
	France
17. Fejezet	Uruguay

17/11/03

Pont szám	Eltérést jelentett

17.2	Argentina
	Belarus
	Chile
	Cuba
	Mauritius
	Uganda
	Uzbekistan
17.3.2	United Kingdom
17.4.3	United Kingdom
17.4.4	Australia
	United Kingdom
17.4.5	Australia
17.6	Argentina
17.7.4	Germany
17.7.7.1	Germany
17.7.9.2	France
	Germany
17.7.9.3	Australia
17.7.11	United Kingdom
17.9.2	France
17.9.2.2	Argentina
	Australia
	France
	Germany
	United Kingdom
17.9.3.1	Argentina
17.9.4	Canada
17.9.5	Argentina
	Canada
	France
17.9.5.2	United Kingdom
18.2	Australia
	Belarus

Pont szám	Eltérést jelentett
	Canada
	Cuba
	France
	Germany
	Lithuania
	Switzerland
	United Kingdom
19.2	Australia
	Belarus
	Cuba
	Ecuador
	France
	Lithuania
	Slovakia
	Switzerland
	United Kingdom
	Uzbekistan

20. Fejezet Australia
Cuba
India
Uruguay
20.1 Chile
20.2.1 Argentina
United Kingdom

2. Függelék Argentina
France
Germany

6. Függelék Germany

AUSTRALIA 1

2. Fejezet

2.2 Az Ausztrál térképek céljukat mutató címet viselnek. A térképe címek nem mindegyike ICAO szerinti.
2.5.7 A látási célú térképek mindegyikén szerepel a magasság szerinti színárnyalás színfokozat átszámító skála.
A látási célú térképek mindegyikén szerepel a kilométer/tengeri mmérföld skála. A méter/láb skála folyamatosan felkerül mindegyik látás szerinti navigációs térképre (Visual Navigation Charts (VNC) és midegyik látás szerinti közelfogalmi térképre Visual Terminal Charts (VTC).
2.11* Minden térkép szín megfelelő, kivéve a szárazföldi vízek színét, amely kék helyett zöld.
2.12.3.1 A nem megbízható pontosságú magassági pontok jelenleg zárójelben szerepelnek. A "±" követelménnyel az egyezés megvalósítása elindult mindegyik térkép esetében alkalmi alapon, a soronkövetkező felülvizsgálatkor valósul meg.
2.18.2 A geoid egyenetlenség nincs közölve.
2.18.4 A koordináták felbotási mértéke az előrtaknak megfelelő (adatbázis arhívum); azonban a geoid egyentelneségek nincsene bevezetve

3. Fejezet
3.2.1 A repülőtér üzemeltető biztosítja e térképeket akkor és úgy, ahogy szükségesek.

4. Fejezet
4.2.1* A repülőtér üzemeltető biztosítja e térképeket akkor és úgy, ahogy szükségesek.

5. Fejezet
5.2 A repülőtér üzemeltető biztosítja e térképeket akkor és úgy, ahogy szükségesek.

6. Fejezet
6.2 Megjegyzés: e térképre nincs mert az ausztrál repülőtérek legfeljebb ILS CAT I.-ig üzemelnek.

7. Fejezet
7.9.3.1.1, 2) A DME adó antenna magasságát az Ausztrál Útvonal Melléklet Létesítmények (Enroute Supplement Australia Facilities (ERSA FAC)) része tartalmazza.
9) Ausztrália esetére az útvonalszakasz átváltási pontok nem értelmezhetőek.
11) A rádiókommunikációs létesítmények felsorolása frekvenciáikkal együtt az alacsony légtér útvonal térképeken (Enroute Chart Low (ERC L)) megvalósul, de a magaslégtéri útvonal térképek és a közelforgalmi légtér térképek (Enroute Chart High (ERC H) és Terminal Area Chart (TAC)) esetében azonban a frekvencia nem szerepel a térképen, azt az Ausztrál Útvonal Melléklet Létesítmények

(Enroute Supplement Australia Facilities (ERSA FAC)) része tartalmazza

* Ajánlott gyakorlat

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AUSTRALIA 2

8. Fejezet
8.6.2* Ezt az ajánlást Ausztráliában nagyon kevés alkalomal alkalmaznák, következésképp megvalósítása sürgősséggel nem indokolt. A legjobb esetben is csak négy ausztrál repülőtér esetére vonatkozna és csak "éépen hogy" alapon. A biztonság azonos szintű garantálására alternatív megoldások szolgálnak.
8.9.4.1.1, 2) A DME adó antenna magasságát az Ausztrál ERSA része tartalmazza.

9. Fejezet
9.3.2* Az Ausztrál SID-ek nem mértarányosak .
9.9.4.1.1, 1) e) A SID útvonalakon, vagy szakaszokon a legkisebb repülési magasság nincs feltüntetve.
2) d) A földrajzi koordinátákat az ERSA FAC tartalmazza
2) e) A DME magasság adatait az ERSA FAC tartalmazza.
5) Az átváltási magasság a SID-eken nem szerepel..

10. Fejezet
10.5.2 Ausztráliában nincs VOR/DME RNAV eljárás.
10.6.2* Ezt az ajánlást Ausztráliában nagyon kevés alkalomal alkalmaznák, következésképp megvalósítása sürgősséggel nem indokolt. A legjobb esetben is csak négy ausztrál repülőtér esetére vonatkozna és csak "éépen hogy" alapon. A biztonság azonos szintű garantálására alternatív megoldások szolgálnak.
10.9.4.1.1, 2) a) A nyílt nyelvű név a címben szerepel.
2) d) A földrajzi koordinátákat az ERSA FAC tartalmazza Földrajzi koordináta are contained in ERSA FAC.
2) e) A DME adatokat az ERSA FAC tartalmazza.
5) Az átváltási magasság az ausztrál STAR-okon nem szerepel..

11. Fejezet
11.7.3* Ezt az ajánlást Ausztráliában nagyon kevés alkalomal alkalmaznák, következésképp megvalósítása sürgősséggel nem indokolt. A legjobb esetben is csak négy ausztrál repülőtér esetére vonatkozna és csak "éépen hogy" alapon. A biztonság azonos szintű garantálására alternatív megoldások szolgálnak.
11.10.4.3* Ha feltüntetik, a földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel. Ausztrália nem tünteti fel a befejező megközelítési fix földrajzi koordinátáit.
11.10.6.4* A műszeres megközelítési és a leszálló térkép (Instrument Approach and Landing Chart (IAL)) az eljárás által megkövetelt magasságokat aláhúzással jelöli a zárójelek helyett.

* Ajánlott gyakorlat

17/11/03

AUSTRALIA 3

11.10.6.5* Ezt az ajánlást Ausztráliában nagyon kevés alkalomal alkalmaznák, következésképp megvalósítása sürgősséggel nem indokolt. A biztonság azonos-, vagy magasabb szintű eléréséhez alternatív megoldások bevezetése folyik.
11.10.9 Az adatot elektronikus adatbázisban őrzik, a tréképen nincs feltüntetve.

12. Fejezet

12.2 Megjegyzés: a látás szerinti megközelítési térképekre Ausztrália követelményeket nem ír elő.

13. Fejezet
13.1 a) to d) A helikopter mozgással kapcsolatos ausztrál követelményeket minden nemzetközi repülőtérre az ERSA FAC tartalmazza.
13.6.1 a) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
c) Csak a futópálya vég magassága szerepel.
a) A burkolat fajta, a teherbírás, a beljebb helyezett küszöb és a futópálya felfestés az ERSA-ban szerepel.
J) A légiforgalmi irányítói körzethatárok nincsenek feltüntetve.

14. Fejezet
14.2* Ausztrália nem állít elő ilyen térképet.

15. Fejezet
15.5.2* A legközelebbi fokra kerekített mágneses elhajlás szerepel, de az éves változás nem.
15.6 b) A vizuális beállási útmutató rendszerek nincsnek feltüntve.
c) Minden földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
f) A légiforgalmi irányítói körzethatárok nincsenek feltüntetve.
g) A repülőtéri indulási és megközelítési eljárás térképeken (Departure and Approach Procedures (DAP) AD) a rádiókommunikációs létesítmények nem szereplenek.

16. Fejezet
16.4.6* Az ausztrál világtérképek a kritikus körzetekben követik az átfedési kötelmeket, de a térképek fedésterülete általában a lapszél vonalánál véget ér.

* Ajánlott gyakorlat

17/11/03

AUSTRALIA 4
16.7.5 A világtérképekre folyamatosan felkerülenek a nemzetközi határok.
16.7.9.3* A legmagasabb tereppontok körül a magasság szerinti színárnyalás nincs eltüntetve.
16.9.2.2 A repülőtér lényeges adatai az ERSA FAC-ban találhatók. A térképen csak a repülőtér fajtájának megfelelő szimbólum és a repülőtér neve szerepel.
16.9.3.1 Az Ausztrál Repülőtéri szabályok és Eljárások 10. Fejezet - légtéri akadályok 6.1. cikkelyében a következő követelmény szerepel: "A Polgári Repülési Előírások (CAR) 1988, 89Y rendelkezése értelmében a talajszinttől számított 110 magasságú akadályt felállítani szándékozó értsítse a Polgári Repülésbiztonsági Hatóságot (CASA), hogy az ilyen akadály légijármű tevékenységre gyakorolt hatása megítélhető legyen").
16.9.4 A tiltott, korlátozott és veszélyes légtérek a világtérképeken nincsenek feltüntetve..
16.9.5 A világtérképek nem ábrázolják az ausztrál légiforgalmi szolgálati rendszer elemeit.

17. Fejezet
17.4.4* A látás szerinti navigációs térképek (VNC) megközelítőleg negyedei, de nem pont negyedei az azonos területre vonatkozó világtérkép lapjainak. A VTC-k szükséges fedésterületei miatt ez az ajánlás nem tartható be..
17.4.5* Az ausztrál fedésterület esetében az ajánlott átfedés megoldhatatlan.
17.7.9.3* A legmagasabb tereppontok körül a magasság szerinti színárnyalás nincs eltüntetve.
17.9.2.2 A repülőtér lényeges adatai az ERSA FAC-ban találhatók. A térképen csak a repülőtér fajtájának megfelelő szimbólum és a repülőtér neve szerepel.

18. Fejezet
18.2. Ausztrália nem állít elő ilyen térképet.

19. Fejezet
19.2* Ausztrália nem állít elő ilyen térképet.

20. Fejezet Ausztrália nem állít elő ilyen térképet. A 20 Fejezet rendelkezése lényegében az FMS berendezés gyártókra és adat szolgáltatókra vonatkozik. E rendelkezések ezért kívül esnek az ilyen iparral nem rendelkező állam közvetlen felügyelete alól. Ausztrália ezen államok közil az egyik.

* Ajánlott gyakorlat

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BELARUS 1

1. Fejezet
1.1 A "terület legkisebb magassága (AMA)" fogalom helyett a "legkisebb biztonságos magasság (MSA)" használt.

Műszer szerinti repülések céljára mindegyik repülőtérre megállapították az MSA-t, amely a megközelítési eljárás korlátait átlépő vészhelyzeti körülmények közötti süllyedésben alkalmazható. Az MSA a repülőtér vonatkoztatási pontjától (ARP) számított 50 km-es területen belül legkevesebb 300 m függőleges elkülönítést biztosít a legmagasabb domborzati pont, illetve mesterséges akadály tetejétől számítva..
Ha a domborzati pontok, beleértve a mesterséges akadályokét is, magasságai 100 m-nél nagyobb mértékben nem térnek el, akkor az MSA a közelforgalmi terület egészére azonos. Ha a magasságok között az eltérés nagyobb, a közelforgalmi területet szektorokra osztják és minden szektorra külön MSA értéket határoznak meg.

A domborzat, illetve a mesterséges akadályok legmagasabb pontjainak szintmagasságát a megközelítési irány szerinti futópálya küszöbének szintmagasságához viszonyítva és a legközelebbi egész 10 m-re felkerekítve adják meg.

2. Fejezet
2.1.8* A térképlap alapmérete 210 x 297 mm.
2.6.1 A vetület nevét és alapjellemzőit nem teszik közzé.
2.14.1 Az ATS légtér osztály nincs jelezve.
2.18.1 A földrajzi szélességet és hosszúságot azonosító koordinátákat az 1942-es koordináta rendszer szerint fejezik ki.
2.18.2 A geoid egyenetlenségről információ nincs közzétéve.

4. Fejezet
4.2.1* Az ICAO B típusú Repülőtéri Akadály Térkép nincs kiadva.

5. Fejezet
5.2 Az ICAO C típusú Repülőtéri Akadály Térkép nincs kiadva.

7. Fejezet
7.6.2 A terület legkisebb magasságai nincsenek feltüntetve.
7.9.3.1.1, 1) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
2) A DME adó antenna magassága nincs feltüntetve.

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BELARUS 2

3) Az ATS légtér osztály nincs jelezve.

4) Az RNP típus nincs jelezve.
5) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
6) A VOR/DME területi navigációs útvonalakat kijelölő útvonal pontok nincsenek feltüntetve.
9) Az átváltási pontok a térképeken nem szerepelnek.

8. Fejezet
8.4.2 A szélességi körök és a meridiánok nem szerepelnek.
8.4.3 Fokbeosztási jelek nincsenek.
8.9.3 A terület legkisebb magasságai nincsenek feltüntetve.
8.9.4.1.1, 1) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
2) A DME adó antenna magassága nincs feltüntetve.
4) Az ATS légtér osztály nincs jelezve.
6) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
7) A VOR/DME területi navigációs útvonalakat kijelölő útvonal pontok nincsenek feltüntetve.
10) Az átváltási pontok a térképeken nem szerepelnek.

9. Fejezet
9.4.2* A szélességi körök és a meridiánok nem szerepelnek.
9.4.3 Fokbeosztási jelek nincsenek.
9.9.3 A terület legkisebb magasságai nincsenek feltüntetve.
9.9.4.1.1, 2) d) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
2) e) A DME adó antenna magassága nincs feltüntetve.
3) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel. A referencia rádióállomástól jelzett irány egy fok pontosságú.

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BELARUS 3
10. Fejezet
10.4.2* A szélességi körök és a meridiánok nem szerepelnek.
10.4.3 Fokbeosztási jelek nincsenek.
10.9.3 A terület legkisebb magasságai nincsenek feltüntetve.
10.9.4.1.1, 2) d)A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel
2) e) A DME adó antenna magassága nincs feltüntetve.
3) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel. A referencia rádióállomástól jelzett irány egy fok pontosságú.
11. Fejezet
11.3.3.1 A DME-től, vagy az ARP-től mért 20 km sugarú kör van felvíve. egy fok pontosságú.
11.5.2* Fokbeosztási jelek nincsenek.
11.10.2.6 Az alap magassági adat nincs közölve.
11.10.4.3* A befejező megközelítési fix (vagy befejező megközelítési pont) földrajzi koordinátája nincs jelezve.
12. Fejezet
12.2 Az ICAO Látás szerinti Megközelítési Térkép nincs kiadva.
13. Fejezet
13.5 A mágneses eltérés éves változása nincs jelezve.
13.6.1 a) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
c) A geoid egyenetlenségről információ nincs közzétéve.
f) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel..
h) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
A légijármű állóhelyek földrajzi koordinátái fokokban, fokpercekben és tized fokpercekben szerepelnek.
A gurulóút középvonal pontok földrajzi koordinátái nincsenek megadva.

J) A légiforgalmi irányító szolgálat határai nincsenek jelezve.

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BELARUS 4

14. Fejezet
14.3.2* A mérővonal nincs feltüntetve.
14.5.2* A mágneses eltérés éves változása nincs jelezve.
14.6 a) Az előtér szintmagassága nincs jelezve.
c) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
f) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
A gurulóút középvonal pontok földrajzi koordinátái nem szerepelnek.
g) A légiforgalmi irányító szolgálat határai nincsenek feltüntetve..

15. Fejezet
15.3.2* Mérővonal nincs.
15.5.2* A mágneses eltérés éves változása nincs jelezve.
15.6 a) Az előtér szintmagassága nincs jelezve.
c) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
e) A földrajzi koordináta fokokban, fokpercekben és tized fok percekben szerepel.
A gurulóút középvonal pontok földrajzi koordinátái nincsenek megadva.
f) A légiforgalmi irányító szolgálat határai nincs jelezve.

16. Fejezet
16.2.1 Az ICAO 1:1 000 000 Légiforgalmi Világtérképnincs kiadva.

17. Fejezet
17.2* Az ICAO 1:500 000 Légiforgalmi Világtérképnincs kiadva.

18. Fejezet
18.2* Az ICAO kisméraranyú Légiforgalmi Navigációs Térkép nincs kiadva.

19. Fejezet
19.2* Az ICAO Tartózkodási Helyzet Követő Térkép nincs kiadva.

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CANADA 1

2. Fejezet
2.2 A Körzeti Térkép (Annex 4, 8. Fejezet) neve Közelkörzeti Légtér Térkép (Terminal Area Chart). A Repülőtéri Földi Mozgások Térképe (Annex 4, 14. Fejezet) neve Guruló térkép (TAXI Chart). A Légijármű Állóhely/Beállási Térkép (Annex 4, 15. Fejezet) neve Parkoló Területek (Parking Areas).
2.5.4 A rövid távolságok hosszmértékegysége láb.
2.5.7 Méter/láb átszámító mérővonal nem minden olyan térképen szerepel, amelyen talaj/tengerszint feletti magasságok szerepelnek.
2.13 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.
2.18 Megjegyzés: Kanada az Észak-Amerikai Alap-viszonyítási magasságot (North American Datum 1983 (NAD 83)) alkalmazza geodéziai viszonyítási alapként. A NAD 83 egyenértékű az 1984-es Geodéziai Világrendszerrel (WGS-84) a légiforgalmi célokat illetően

3. Fejezet
3.3.2 A rövid távolságok hosszmértékegysége láb, de nincs méterre átszámító vonal.
3.8.2.2 Jelenleg nem javasolt eme információ térképre vitele. Az információ iránt a jövőben előálló üzemeltetési igény esetén, bevezetését a kiadást megelőzően jelenteni fogjuk .

4. Fejezet
4.2.1* ICAO B típusú Repülőtéri Akadály Térképet nem készítünk.

5. Fejezet
5.2 ICAO C típusú Repülőtéri Akadály Térképet nem készítünk.

6. Fejezet
6.2 ICAO Precíziós Megközelítési Terep Térképet nem készítünk. A CAT II és CAT III Műszeres Megközelítési Térképek azonban "oldalnézeti terep térkép" kiegészítővel készülnek.

7. Fejezet
7.6.2 A területi legkisebb magasság nincs közölve, viszont földrajzi körzeti biztonságos magasság (geographic area safe altitude (GASA)) használatos, amely a földrajzi körzet határain belül található minden ismert akadály, vagy tereppont felett a legközelebbi magasabb 100 lábra felkerekített 2000 láb elkülönítést biztosít. Az AMA bevezetése 2002 április 18-tól várható.
7.9.2 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.

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CANADA 2

8. Fejezet
8.9.2 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.
8.9.3 A területi legkisebb magasság nincs közölve, viszont földrajzi körzeti biztonságos magasság (geographic area safe altitude (GASA)) használatos, amely a földrajzi körzet határain belül található minden ismert akadály, vagy tereppont felett a legközelebbi magasabb 100 lábra felkerekített 2000 láb elkülönítést biztosít. Az AMA bevezetése 2002 április 18-tól várható.
8.9.4.1.1, 2) Nincs feltüntve.
4) A függőleges és oldalirányú határok nem szerepelnek a Közelforgalmi Légtér térképeken; azonban a lap magyarázat részében megtalálhatók.
13) Nincs feltüntve.

9. Fejezet
9.3.2* E térkép nem méretarányosan készül
9.9.2 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.
9.9.3.1 A szektor legkisebb magassága nem szerepel a szabvány indulási térképen. A szektor legkisebb magassága a műszeres megközelítési térképen szerepel.
9.9.3.2 A területi legkisebb magasság nincs feltüntetve a szabvány indulási térképen.

10. Fejezet
10.3.2* E térkép nem méretarányosan készül.
10.9.2 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.
10.9.3.1 A szektor legkisebb magassága nincsfeltüntetve a Szabvány érkezési térképen. A szektor legkisebb magassága a műszeres megközelítési térképen szerepel.
10.9.3.2 A területi legkisebb magasság nem szerepel a szabvány érkezési térképen.

11. Fejezet
11.7.2 A térkép fedés területén belül lévő és a repülőtér szintjétől számított 4000 lábat meghaladó, illetve a repülőtér vonatkoztatási pontjától számított 6 tengeri mérföldön belül található és 2000 lábat

meghaladó magasságú szintvonalak és jellegzetességek közzététele 2002 április 18-tól várható.
11.10.3 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.

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CANADA 3

11.10.6.1 d) A tiltott manőverezési területeket a térképen a körözési minimum mellett szereplő csillag jel jelzi egy magyarázat kiséretében, miszerint a körözést a futópálya meghosszabbított középvonalától északra, délre, nyugatra, vagy keletre (amelyik megfelelő) kell végrehajtani.

12. Fejezet
12.10.3 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.

13. Fejezet
13.6.1 d) A teherbíró képesség nincs megadva.
J) A légiforgalmi irányító szolgálat határait a repülőtér térképek nem mutatják.
l) Nem szerepel a repülőtér térképen. A megközelítési térkép ábrázolja.
m)

14. Fejezet
14.6 d) A teherbíró képesség nincs megadva.
g) A légiforgalmi irányító szolgálati határok nincsenek feltüntve.

15. Fejezet
15.6 a) Apron elevation Nincs feltüntve.
f) A légiforgalmi irányító szolgálati határok nincsenek feltüntve.

16. Fejezet
16.5.1, 1) A szabvány szélességek minden 8°-nyi tartományban: 1° 20"-re délre a legészakibb szélességtől és 1° 20"-re északra a legdélebbi szélességtől.
16.6 Az 5. Függelékben lévő listátban szereplőtől eltérő lapszámozás alkalmazott.
16.9.4 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.

17. Fejezet
17.9.4 Kanadában korlátozott, veszélyes és tanácsadói légtereket alkalmaznak.

18. Fejezet
18.2* ICAO kisméretarányú Légiforgalmi Navigációs Térképet nem adnak ki.

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CHILE 1

1. Fejezet
1.1 Futópálya várópont. Csíle ezt a futópályára csatlakozási várópontnak nevezi az ICAO-éval egyező értelemben.

2. Fejezet
2.17.3 A használatos besorolás és adat integritási szint nem felel meg a kialakított szintnek, amely messze több, mint ami a mi követelményeinket teljesíti.
2.18.2 Csíle nem teszi közzé a geoid egyenetlenséget sem, de a földrajzi koordináta felbontási nagyságrendjét sem..

2.18.3

3. Fejezet
3.9.1 Az elért pontosság mértékét a térkép nem mutatja.

5. Fejezet
5.1 Csíle nem készít ICAO C típusú Repülőtéri Akadály Térképet.
Nincs feltüntve.

9. Fejezet
9.9.2 Nincs feltüntve.
9.9.3 Megjegyzés.- A tiltott, korlátozott és veszélyes légtér és a szektor legkisebb magassága az IAC-on szerepel.

10. Fejezet
10.9.2 Nincs feltüntve.
10.9.3 Nincs feltüntve. Megjegyzés.- A tiltott, korlátozott és veszélyes légtér és a szektor legkisebb magassága az IAC-on szerepel..

11. Fejezet
11.7.2 A műszeres megközelítési térképen nincs feltüntetve.

13. Fejezet
13.6.1 A repülőtér/helikopter repülőtérképen az előírt információk közül nem mindegyik szerepel.
13.6.2

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CHILE 2

16. Fejezet
16.2.1 Csíle nem alkalmazza az 5. Függelékben szereplő terület kiosztást.

17. Fejezet
17.2* Csíle nem alkalmazza az 5. Függelékben szereplő terület kiosztást.

20. Fejezet
20.1 Légiforgalmi térkép elektronikus megjelenítőt Csíle nem alkalmaz.

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CHINA (HONG KONG SAR)

9. Fejezet
9.3.2* A térkép nem méretarányosan készül. A teljes egyezést megvalósító munkálatok folyamatban vannak.
9.4 A térkép formailag egy vázlatos ábrázolás.. A teljes egyezést megvalósító munkálatok folyamatban vannak.
9.9 Néhány légiforgalmi adat a térképen nem szerepel. Információ szöveg formájában áll rendelkezésre. A teljes egyezést megvalósító munkálatok folyamatban vannak.

10. Fejezet
10.3.2* A térkép nem méretarányosan készül. A teljes egyezést megvalósító munkálatok folyamatban vannak.
10.4 A térkép formailag egy vázlatos ábrázolás. A teljes egyezést megvalósító munkálatok folyamatban vannak

10.9 Néhány légiforgalmi adat a térképen nem szerepel. Információ szöveg formájában áll rendelkezésre. A teljes egyezést megvalósító munkálatok folyamatban vannak.

11. Fejezet
11.7 A terep jellegzetességeket nem halvány tónusú szintvonalak ábrázolják. A domborzatot a területi legkisebb magassági tartományával ábrázolják. A teljes egyezést megvalósító munkálatok folyamatban vannak

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COOK ISLANDS 1

2. Fejezet
2.18.2 Geoid egyenetlenség nincs kiadva.

4. Fejezet
4.2.1* Nincs bevezetve.

5. Fejezet
5.2 Nincs bevezetve.

7. Fejezet
7.6.2 A területi legkisebb magasság nincs feltüntve.
7.9.3.1.1, 2) A térképen DME magasságok nem szerepelnek.
4) Megjegyzés: Ha van, az RNP légtér ábrázolt.
7.9.4.2 Nincs bevezetve.

8. Fejezet
8.6.2* Nincs bevezetve.
8.9.3 Nincs bevezetve.
8.9.4.1.1, 2) Nincs bevezetve.

9. Fejezet
9.4.2* A szélességi körök és a meridiánok nem szerepelnek. A térkép a földrajzi északra tájolt és mind a mágneses, mind a földrajzi irány szerepel rajta..
9.4.3 Fokbeosztási jelek nincsenek. Földrajzi koordináta minden navigációs berendezésre és jelentőpontra meg van adva.
9.6.2* Nincs bevezetve.
9.9.4.1.1, 2) e) A térképen DME magasságok nem szerepelnek.
5) A SID térképen átváltási magasság nem szerepel. Minden közzétett indulási eljárás jelzi a magasságokat. Minden jelzett magasság az átváltási magasság alatti magasság.

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COOK ISLANDS 2

6) Nincs bevezetve.
9) c) Megjegyzés: A SID eljárásokhoz nincs transzponder kód kijelölés. Nincs radar szolgáltatás.

10. Fejezet
10.4.2* A szélességi körök és a meridiánok nem szerepelnek. A térkép a földrajzi északra tájolt és mind a mágneses, mind a földrajzi észak szerepel rajta.
10.6.2* Nincs bevezetve.

10.9.4.1.1, 2) e) A térképen DME magasságok nem szerepelnek.
5) STAR térképen nem szerepel az átváltási magasság. Minden közzétett érkezési eljárás mutatja a magasságokat. Minden feltüntetett magasság az átváltási szint (FL 130) alatti magasság.
8) c) Megjegyzés: Nincs transzponder kód kijelölés. Nincs radar szolgáltatás.

11. Fejezet
11.3.3 A térkép méretaránya nincs feltüntve.
11.5.2* Fokbeosztás csak a bal és a felső lapszél vonalakon látható.
11.6.2 A térkép felső részén középen láthatók a légijármű kategóriák, amelyekre az eljárást engedélyezték.
11.7.2 Nincs bevezetve.
11.10.2.5 Megjegyzés: Minden akadály magasság a közepes tengerszintre vonatkozik.
11.10.4.3* A befejező megközelítési fix földrajzi koordinátája nincs feltüntve.
11.10.6.5* Nincs bevezetve.
11.10.8.1 A table of ground speeds and times from the befejező megközelítési fixtől a megközelítés megszakításának pontjáig a földfeletti sebesség és idők táblázata nincs közzétéve.
11.10.8.5 A süllyedési szög százalékban van kifejezve.
11.10.9 Nincs bevezetve.

12. Fejezet
12.10.2.3* Az akadályok magassága nincs feltüntve.
12.10.5.3 Nincs bevezetve.

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COOK ISLANDS 3
13. Fejezet
13.5 A mágneses elhajlás éves változásának mértéke nincs feltüntve.
13.6.1 A helikopter üzemre jelenleg nincs kialakított megoldás.
c) Geoid egyenetlenség nincs megadva.
f) Nincs bevezetve.
13.6.2 A helikopter üzemre jelenleg nincs kialakított megoldás.

14. Fejezet
14.3.2* A mérővonal nincs feltüntve.
14.5.2* A mágneses elhajlás éves változásának mértéke nincs feltüntve.
14.6 a) Az előtér magassága nincs feltüntve.
f) A gurulóút középvonal pontok koordinátái nincsenek feltüntve.

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GERMANY 1
2. Fejezet
2.5.7 Átváltási mérővonal azokon a térképeken szerepel, ahol az megfelelő.
2.14.1 A német térképek az ATS légtér oldalirányú határait különféle színű (piros, zöld, kék) vonalak jelzik és nem ugyanazon szín különféle árnyalatai, amint az a B és F közötti légtérosztályokra vonatkozóan elvárható.

4. Fejezet
4.2.1* Az ICAO B típusú Repülőtéri Akadály Térkép nincs kiadva.

7. Fejezet
7.6.2 A területi legkisebb magasság (AMA) nincs feltüntetve.

8. Fejezet
8.2.1 A Körzeti Térkép -- ICAO nincs kiadva.

9. Fejezet
9.6.2* A domborzat nem ábrázolt.
9.9.3.2 A területi legkisebb magasság nincs feltüntve.
9.9.4.1.1, 2) e) A DME adóantenna magassága nincs feltüntve.
3) Bearings are shown to the nearest degree. Distances are shown to the nearest nautical mile.

10. Fejezet
10.6.2* A domborzat nem ábrázolt.
10.9.3.2 A területi legkisebb magasság nincs feltüntve.
10.9.4.1.1, 2) e) A DME adóantenna magassága nincs feltüntve.
3) A szögek a legközelebbi egész fokokban szerepelnek. A távolságok a legközelebbi egész mérföld értékben lettek megadva.
11. Fejezet
11.7.2 A domborzat nem ábrázolt.

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12. Fejezet
12.10.5.3 A névleges siklópálya szöge(i) és a minimum szemmagasság(ok) részben nincsenek feltüntve.

13. Fejezet
13.5 A mágneses eltérés éves változása nincs feltüntve.

14. Fejezet
14.5.2* A mágneses eltérés éves változása nincs feltüntve.
14.6 d) A gurulóút teherbírás nincs feltüntve.

15. Fejezet
15.5.2* A mágneses eltérés éves változása nincs feltüntve.
15.6 a) Az előtér magassága nincs feltüntve.
b) Az előtér teherbírása nincs feltüntve.

16. Fejezet
16.2.1 ICAO 1:1 000 000 Légiforgalmi Világtérképnincs kiadva.

17. Fejezet
17.7.4* A szembeötlő távvezetékek nincsenek feltüntve.
17.7.7.1 A kontúrok nincsenek feltüntve.
17.9.2.2 A repülőtér adatok egy módosított változata használatos a repülőtér nevével közösen.

18. Fejezet
18.2* ICAO kisméretarányú Légiforgalmi Navigációs Térképnincs kiadva.

2. Függelék
125. Jelölés A német térképek az ATS légtér oldalirányú határait különféle színű (piros, zöld, kék) vonalak jelzik és nem ugyanazon szín különféle árnyalatai, amint az a B és F közötti légtérosztályokra

vonatkozóan elvárható.

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126. Jelölés Ezt a jelet nem fogjuk használni. Az információ keret túl nagyméretű és sokkal lényegesebb adatokat takarhat el.

6. Függelék

1. Táblázat A gurulóút középvonal pontok és a légijármű állóhelyek pontjainak az előírt felbontási szintű közzététle jelenleg nem lehetséges.

2. Táblázat A WGS-84 geoid egyenetlenség a repülőtér/helikopter repülőtér szintmagasság elhelyezkedésére vonatkozóan nincs közzétéve.

4. Táblázat Az útvonal és közelkörzeti pontok kijelöléséhez, illetve a műszeres megközelítési eljárás pontjainak kijelöléséhez a térkép felbontása 1 fok az 1/10 fok helyett.

5. Táblázat Az útvonal és közelkörzeti pontok kijelöléséhez, illetve a műszeres megközelítési eljárás pontjainak kijelöléséhez a térkép felbontása 1 fok az 1/10 fok helyett.

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2. Fejezet

2.10.1 A nemzetközi határok nincsenek feltüntetve az IAC, SID/STAR és a repülőtér térképeken.

2.17.5 Az elektronikus adatok cilikus redundancia ellenőrzéssel (CRC) történő védelmének teljes bevezetése várhatóan 2003 végén valósul meg az Európai AIS adatbázis (EAD) létrejöttével.

3. Fejezet

3.5.4 b) A módosítások és a dátum bejegyzéséhez rovat nem áll rendelkezésre.

4. Fejezet

4.2.1* ICAO B típusú Repülőtéri Akadály Térkép nincs kiadva.

5. Fejezet

5.2 ICAO C típusú Repülőtéri Akadály Térkép nem készül.

8. Fejezet

8.2 ICAO Körzeti Térkép nincs kiadva.

9. Fejezet

9.4.3 Fokbeosztási jelek nincsenek.

9.6.1 Az elnagyolt partvonalak nincsenek feltüntve.

9.9.4.1.1, 2) b) Azonosítójuk nincs feltüntve.

2) d) A földrajzi koordináták nincsenek megadva.

3) A jelentős pontok név kódja, földrajzi koordinátája és a vonatkozó navigációs beendezéshez viszonyított iránya nincs feltüntve.

6) Az akadály kijelölő síkon (OIS) túlnyúló közeli akadályok helye és magassága nincs feltüntve.

9) A rádió kommunikációs eljárások nincsenek feltüntve.

10. Fejezet

10.4.3 Fokbeosztási jelek nincsenek.

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SWITZERLAND 2

10.6.1 Az elnagyolt partvonalak nincsenek feltüntve.

10.9.4.1.1, 2) b)Azonosítójuk nincs feltüntve.

2) d) A földrajzi koordináták nincsenek megadva.

3) A jelentős pontok név kódja, földrajzi koordinátája és a vonatkozó navigációs beendezéshez viszonyított iránya nincs feltüntve..

8) A rádió kommunikációs eljárások nincsenek feltüntve.

11. Fejezet

11.6.3 A kiegészítő "RNAV" rövidítés nincs feltüntetve.

11.6.4 A kiegészítő "RNAV", illetve "RNAV (VOR/DME) " rövidítés nincs feltüntetve.

11.6.5 Az "RNP" rövidítés nincs feltüntetve.

11.7.1 A kultúr- és a domborzati információ nincs feltüntve.

11.7.2 A terep jellegzetesség nincs feltüntve.

11.10.4.3* A befejező megközelítési fix földrajzi koordinátáival nincs azonosítva.

12. Fejezet

12.10.2.3.1 A térképen az akadályok magasságát nem zárójelekben szerepeltetik.

12.10.5.3 Az optikai siklópálya jelző rendszer helyét, típusát és névleges siklópályáját (pályáit), a siklópályán tartózodás jel küszöb feletti minimum szemmagasságát (magasságait) a térkép nem tartalmazza, ezek az AD INFO lapokon találhatóak.

13. Fejezet

13.6.1 a) Földrajzi koordinátákat a térkép nem tartalmaz, ezek az AD INFO lapokon találhatóak.

k) Az RVR mérőhelyek nincsenek feltüntve.

m) Az optikai siklópálya jelző rendszer helyét, típusát és névleges siklópályáját (pályáit), a siklópályán tartózodás jel küszöb feletti minimum szemmagasságát (magasságait) a térkép nem tartalmazza, ezek az AD INFO lapokon találhatóak.

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14. Fejezet

14.6 b) A vizuális beállási útmutató rendszerek helye és típusa nincs feltüntve.

c) A légijármű állóhelyek földrajzi koordinátáit a térkép nem tartalmazza, de megtalálhatók az AD 2 § 2.8.-ben.

f) A gurulóút középvonal pontok földrajzi koordinátái nincsenek feltüntetve.

h) A rádió kommunikációs létesítmények frekvenciái nincsenek feltüntve.

k) A VOR ellenőrző pont és a rádió frekvencia nincs feltüntve.

15. Fejezet

15.6 b) A vizuális beállási útmutató rendszerek helye és típusa nincs feltüntve.

c) A légijármű állóhelyek földrajzi koordinátáit a térkép nem tartalmazza, de megtalálhatók az AD 2 § 2.8.-ben.

e) A gurulóút középvonal pontok földrajzi koordinátái nincsenek feltüntetve.

g) A rádió kommunikációs létesítmények frekvenciái nincsenek feltüntve.

j) A VOR ellenőrző pont és a rádió frekvencia nincs feltüntve.

16. Fejezet

16.2.1 ICAO 1:1 000 000 Légiforgalmi Világtérkép nem készül..

18. Fejezet
18.2* ICAO kisméretarányú Légiforgalmi Navigációs Térkép nem készül.

19. Fejezet
19.2* ICAO Tartózkodási Helyzet Követő Térkép nem készül.

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UNITED KINGDOM 1
1. Fejezet
1.2.2 A kiadott térképek némelyike nem felel meg minden vonatkozó szabványnak. Lehetelen minden szabványt a közzétett formájában teljesíteni.
1.2.2.1* A kiadott térképek némelyike nem felel meg minden vonatkozó ajánlásoknak. Lehetelen minden ajánlást a közzétett formájában teljesíteni.

2. Fejezet
2.1.8* Az alapméret 279 mm x 210 mm. Ez, az információ közzétételéhez bővebb teret biztosít.
2.2 A térképek nem teljesítenek minden szabványt és a címben szerepel az ICAO. Számtalan ok létezik ami miatt nincs mindig igazodás e szabványokhoz.
2.18.2 A geiod egyenetlenség nincs feltüntve. Ez kellő időben szerepelni fog a térképen.

3. Fejezet
3.4.2 1:20 000 méretarány használatos időnként. A 3.4.3.-ben adott ennek lehetősége.
3.8.1.1 1.2 százalék helyett 1 százalékos lejtő használatos. A kiinduló ponttól számított 9 000 m-re a felület síkja 1 százalékról vízszintesre vált. Az alkalmazott szabvány lényegesen szigorúbb.
3.8.1.2 A felszállási repülési pálya első 900 m-es szakaszán az árnyék sík vízszintes és e pont után 9000 m-ig az illető sík egy százalékos emelkedésű. 9 000 m-nél az árnyék sík vizszíntesre vált ismét. További biztonsági tényező alkalmazása történik. A felszállási pálya területének külső 25 méteres körzetében lévő akadályok csak az illető 25 m-es zónán belüli akadályokat "szüntetik" meg. Az alkalmazott szabványok lényegesen szigorúbbak.
3.8.2.1b) A kiinduló pontban a szélesség 180 m, ez 0,25 D értékkel növekszik 3930 m maximum szélességig, ahol D a kiinduló ponttól mért távolság. Az alkalmazott szabványok lényegesen szigorúbbak.
3.8.2.2 A 3.8.2.1 c)-ben meghatározott felszállási pálya terület 15 km marad.
A sik meredekségének a 3.8.1.1-ben, illetve a 3.2.8.1.2-ben meghatározott mértékűnek kell lennie.. Az alkalmazott szabványok lényegesen szigorúbbak.
3.9.1 A megvalósított pontosság nincs feltüntetve, hacsak nem túlzott.

4. Fejezet
4.2.1* Megjegyzés: A térképet nem állítják elő. Gyártására nincs kötelezettség. Az információt az AIP teszi közzé.

5. Fejezet
5.2 Megjegyzés: A térképet nem állítják elő. Gyártására nincs kötelezettség. Az információt az AIP teszi közzé.

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UNITED KINGDOM 2
7. Fejezet

7.2.1 A térképet nem állítják elő. Az információt az AIP teszi közzé.
A követelmény teljesítésére megfelelőnek tartott katonai és kereskedelmi előállítású térképek állnak rendelkezésre.

8. Fejezet
8.2.1 A térképet nem állítják elő. Az információt az AIP teszi közzé.

9. Fejezet
9.3.2* A térkép nem méretarányosan készül. Lehetelenség olyan méretarányt alkalmazni, amely az áttekinthetőséget is biztosítja.
9.3.3 Léptékvonal nincs feltüntetve. A térkép nem méretarányosan készül.
9.4.2* Nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül.
9.4.3 Nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül.
9.6.1 A tereprajz és a kultúr környezet nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül.
9.6.2* A tereprajz és a kultúr környezet nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül.
9.7 A mágneses elhajlás nincs feltüntve. Amikor lehetséges, bevezetik.
9.9.2 A tiltott, korlátozott és veszélyes légtér nincs feltüntve. A zsúfoltság csökkentése érdekében.
9.9.4.1.1, 1) e) Az útvonal menti, illetve az útvonal szakaszok legkisebb repülési magasságai nincsenek feltüntve. A zsúfoltság csökkentése érdekében.
2) e) A DME magassága és csatorna száma nincs feltüntve. Ezeket nem tartják szükségesnek . A DME frekvencia látható.
3) A szögek a legközelebbi egész fokra, a távolság a legközelebbi mérföldre kerekítve szerepelnek Az áttekinthetőség fokozása érdekében.
6) A tereprajzi információ nincs feltüntetve. A zsúfoltság csökkentése érdekében.
9.9.4.2* Az összeköttetés megszakadása esetén követendő eljárás nincs feltüntetve. A zsúfoltság csökkentése érdekében.

10. Fejezet
10.3.2* A térkép nem méretarányosan készül. Lehetetlen alkalmas méretarányt alkalmazni ami a láthatóságot is biztosítja.
10.3.3 Nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül..
10.4.1* A vetület fajtása nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül..
10.4.2* A szélességek és hosszúságok nincsenek feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül.

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10.6.2* A domborzat és a kultúr környezet nincs feltüntve. Nem alkalmazható, a térkép nem méretarányosan készül. A tereprajzi információ nincs feltüntetve. A zsúfoltság csökkentése érdekében.
10.7 A mágneses elhajlás nincs feltüntve. Alkalmas időpontban bevezetik.
10.9.2 Tiltott, korlátozott és veszélyes légtérare Nincs feltüntve. A zsúfoltság csökkentése érdekében.
10.9.4.1.1, 2) e) A DME magassága és csatorna száma nincs feltüntve. Ezeket nem tartják szükségesnek. A DME frekvencia látható.
3) A szögek a legközelebbi egész fokra, a távolság a legközelebbi mérföldre kerekítve szerepelnek Az áttekinthetőség fokozása érdekében.
10.9.4.2* Az összeköttetés megszakadása esetén követendő eljárás nincs feltüntetve. A zsúfoltság csökkentése érdekében.

11. Fejezet
11.2.4 A térkép légijármű kategóriák szerint nincs elkülönítve. Nem szükséges, mert a jelenlegi

térképek sem zsúfoltságot, sem tévesztést nem okoznak
11.3.3.1 A repülőtér vonatkoztatási pontjától 10 tengeri mérföld sugárral rajzolt kör. Bevezetését nem tartjuk ésszerűnek.
11.3.3.2* A hosszmérték mérővonalat csak azokon a térképeken tüntetjük fel, amelyeken az eljáráshoz nem társul DME. Nincs követelmény.
11.4* Az alapméret 297 mm x 210 mm. Ez, az eljárás bemutatásához bővebb teret biztosít.
11.6.2 Az eljárások korlátozásának jelzésére a légijármű kategóriák nem zárójelben szerepelnek. Az engedélyezett légijárművek jelzéséhez eltérő forma szolgál.
11.7.2 A térkép a szintvonalakat 300 láb osztással mutatja, az elős osztás a repülőtér szintje feletti 300 láb-nál kezdődik a legközelebbi 50 lábra lekerekítve. Az Egyesült Királyság területére a legjobban ez felel meg.
11.8.2 A mágneses elhajlást csak a nem-VOR eljárásokhoz tüntetjük fel. A VOR telepítési értéke eltérhet a helyi mágneses elhajlás értékétől.
11.10.1.1 A térképen csak az eljárást befolyásolónak tekinthető repülőterek szerepelnek. A zsúfoltság csökkentése érdekében.
11.10.2.2* Az akadály mentes tengerszint/terepszint feletti magasságot meghatározó akadályok nincsenek azonosítva. A bevezetés lehetőségét vizsgáljuk.
11.10.2.4* Az akadálynak csak a közepes tengerszint feletti magassága jelzett. A zsúfoltság csökkentése érdekében.
11.10.2.7 Akadálymentes zóna nincs kijelölve. A bevezetés lehetőségét vizsgáljuk.
11.10.4.3* A FAF/FAP földrajzi koordináta nincs feltüntve. A bevezetés lehetőségét vizsgáljuk.
11.10.4.5 Csak a rádió kommunikációs frekvenciák szerpelnek, a hívójelek nem. A zsúfoltság csökkentése érdekében.
11.10.6.3 f) Az átváltási magasság a felülnézeti ábrázolás felett kapott helyet és nem az oldalnézeti területen. A zsúfoltság csökkentése érdekében.

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11.10.6.5* A talaj oldalnézeti metszet a futópálya meghosszabbított középvonala mentén előforduló legnagyobb terep magasságot mutatja. A bevezetés lehetőségét vizsgáljuk.
11.10.7.1 A repülőtér üzemeltetési minimumot nem minden repülőtérre adják meg.A kisebb repülőterekre nincs minimum.
11.10.9 A kapcsolódó műszeres megközelítési eljárás adatai nincsenek feltüntetve. A bevezetés lehetőségét vizsgáljuk.

12. Fejezet
12.2 Megjegyzés: Nem állítják elő. Nem kötelező. Lásd Doc 8697 - Légiforgalmi térkép kézikönyv (Aeronautical Chart Manual) 2. Fejezet 2.5.1.

13. Fejezet
13.5 A mágneses elhajlás éves változásának mértéke nincs feltüntve. A térképet rendszerese napra késszé teszik a mágneses elhajlás változásaival egyetemben.
13.6.1 c) A geoid egyenetlenség és a precíziós megközelítési eljárás földetérési zónájának legmagasabb szintje nincs feltüntve. A bevezetés lehetőségét vizsgáljuk.
d) A futópálya teherbírás nincs feltüntve. Az akadálymentes terület és a futópálya jelölések nincsenek feltüntve. Az információt az AIP teszi közzé.
e) Nincs feltüntetve az előtér világítás, a jelölések és egyéb vizuális útmutató és irányító segédletek, beleértve a beállító rendszereket és a teherbírási adatokat. Részletek az AIP-ben..
f) Földrajzi koordináta nincs feltüntve. Részletek az AIP-ben..
g) A gurulóút felület, a szélesség és a teherbírás nincs feltüntve. Részletek az AIP-ben..
i) A guruló légijárműveknek szolgáló útvonalak és nevük nincs feltüntve.
13.6.2 a) A helikopter repülőtér típusa nincs feltüntve. A bevezetés lehetőségét vizsgáljuk.

b) A TLOF lejtése és teherbírása nincs feltüntve. A bevezetés lehetőségét vizsgáljuk.
c) Földrajzi irány nincs feltüntetve, a mágneses irány a legközelebbi egész fokra kerekítve látható. A lejtés nincs feltüntetve. A bevezetés lehetőségét vizsgáljuk.
d) Az akadálymentes sáv nincs feltüntve. A bevezetés lehetőségét vizsgáljuk.
h) A közzétett úthosszak nincsenek feltüntve. A bevezetés lehetőségét vizsgáljuk.

14. Fejezet
14.2* Megjegyzés: A térképet az Egyesült Királyság nem állítja elő. Az információ a repülőtér térképen található.

*Ajánlott gyakorlat

17/11/03

UNITED KINGDOM 5
15. Fejezet
15.5.2* A mágneses elhajlás éves változásának mértéke nincs feltüntve. A térképet rendszerese újra kiadják, így a mágneses változás feltüntetésére nincs szükség.
15.6 b) Nincs feltüntetve az előtér világítás, a jelölések és egyéb vizuális útmutató és irányító segédletek, beleértve a beállító rendszereket és a teherbírási adatokat. Részletek az AIP-ben.
c) Földrajzi koordináta nincs feltüntve. Az AIP-ben látható.
e)

16. Fejezet
16.2.1 Az Egyesült Királyság nem készít ilyent. A méretarány túl kicsi, hogy használható legyen az Egyesült Királyságban.

17. Fejezet
17.3.2 Átváltási skála nincs feltüntve. Helyhiány miatt eltávolítva, de egy külön magyarázó szelvényen szerepel.
17.4.3* Minden térkép hajtogatlan állapotban kerül piacra. Vásárlói igény.
17.4.4* Az 1:1 000 000 térképet nem gyártjuk. Nem alkalmazható.
17.7.11* A szakadékok nincsenek feltüntve. Információ nem áll rendelkezésre.
17.9.2.2 A repülőtéri fényadón kívül egyéb rendelkezésre álló világítás nincs feltüntetve. A leghosszabb futópálya felülete és hossza nincs feltüntve. Zsúfoltság csökkentés.
17.9.5.2 ADIZ nincs az Egyesült Királyságban. Nincs igény.

18. Fejezet
18.2* Nem készítik. Nincs üzemeltetési igény rá.

19. Fejezet
19.2* Nem készítik. Nincs üzemeltetési igény rá.

20. Fejezet
20.2.1 A térképet az Egyesült Királyság nem gyártja. Jelenleg nics rá igény.

* Ajánlott gyakorlat

17/11/03

URUGUAY 1
3. Fejezet
3.2.1 Az A, B és C típusú Repülőtéri Akadály Térképek átütemezése továbbra is érvényes az ez évben végzett utolsó akadály felmérések miatt és az összes módosítás mindegyikében tapasztalható számtalan változtatás miatt. Ezeket 2003 végére ütemezték át.

4. Fejezet
4.2.1* Az A, B és C típusú Repülőtéri Akadály Térképek átütemezése továbbra is érvényes az ez évben végzett utolsó akadály felmérések miatt és az összes módosítás mindegyikében tapasztalható számtalan változtatás miatt. Ezeket 2003 végére ütemezték át.

5. Fejezet
5.2 Az A, B és C típusú Repülőtéri Akadály Térképek átütemezése továbbra is érvényes az ez évben végzett utolsó akadály felmérések miatt és az összes módosítás mindegyikében tapasztalható számtalan változtatás miatt. Ezeket 2003 végére ütemezték át.

7. Fejezet
7.9.3.1.1, 12) Légvédelmi azonosító körzet (ADIZ) még nincs kijelölve.

16. Fejezet Nincs egyezés a térkép fedésterületére az 5. Függelékben előrtakkal.
17. Fejezet Ilyen méretarányú térképet nem teszünk közzé.

20. Fejezet E kérdéssel a Légiforgalmi Térképek Munkabizottsága foglalkozik és a megjelenítendő térkép fájljának formátum meghatározását végzik. Szempontjainak véglegesítése még nem történt meg, hiszen ezekről a felhasználókkal kell egyezségre jutni. Minden esetre, e téma megoldása előtt nagyon fontos a térkép szimbólumok kialakítása.

*Ajánlott gyakorlat

17/11/03

UZBEKISTAN 1
I. Fejezet
1.3.1 Csak a repülés biztonság okán szükséges információ biztosított az üzbég felségterületek feletti átrepüléshez.

2. Fejezet
2.6.1 A vetület neve és alapjellemzői nincsenek feltüntetve.

4. Fejezet
4.2.1* Az ICAO B típusú Repülőtéri Akadály Térkép nincs kiadva.

5. Fejezet
5.2 Az ICAO C típusú Repülőtéri Akadály Térkép nincs kiadva.

7. Fejezet
7.9.2 Tiltott, korlátozott és veszélyes légtérek nincsenek feltüntetve az ICAO útvonal térképen.
7.9.3.1.1, 6) A VOR/DME területi navigációs útvonalakat kijelölő útvonal potok nincsenek közölve.

8. Fejezet
8.9.1 Az üzbég AIP-ben közzétett repülőterek az ICAO körzeti térképeken szerepelnek.
8.9.2 Tiltott, korlátozott és veszélyes légtér nem szerepel az ICAO Körzeti Térképen.

9. Fejezet
9.9.1.2 Az üzbég AIP-ben közzétett repülőterek szerepelnek az ICAO Szabvány műszeres indulási térképen (SID).
9.9.2 Tiltott, korlátozott és veszélyes légtér nem szerepel az ICAO Szabvány műszeres indulási térképen (SID).

10. Fejezet
10.9.1.2 Az üzbég AIP-ben közzétett repülőterek szerepelnek az ICAO Szabvány műszeres érkezési térképen (STAR).
10.9.2 Tiltott, korlátozott és veszélyes légtér nem szerepel az ICAO Szabvány műszeres érkezési térképen (STAR).

* Ajánlott gyakorlat
17/11/03

UZBEKISTAN 2
I1. Fejezet
II.I0.I.I Az üzbég AIP-ben közzétett repülőterek szerepelnek az ICAO műszeres érkezési térképen.
11.10.3 Tiltott, korlátozott és veszélyes légtér nem szerepel az ICAO műszeres megközelítési térképen.
11.10.8.6 Az ILS vonatkoztatási pont magassága nincs jelezve az ICAO műszeres megközelítési térképen.

14. Fejezet
14.6 c) A légijármű állóhelyek földrajzi koordinátáit rendszerint nem teszik közzé az ICAO Repülőtéri Földi Mozgások Térképén.

15. Fejezet
15.6 c) A légijármű állóhelyek földrajzi koordinátáit rendszerint nem teszik közzé az ICAO Légijármű Állóhely/Beállási térképen.

16. Fejezet
16.2.1 Az ICAO 1:1 000 000 Légiforgalmi Világtérkép nincs kiadva.

17. Fejezet
17.2* Az ICAO 1:500 000 Légiforgalmi Világtérkép nincs kiadva.

19. Fejezet
19.2* Az ICAO Tartózkodási Helyzet Követő Térkép nincs kiadva.

* Ajánlott gyakorlat

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[i]* ISO szabvány
19108, Földrajzi információ - Idő rendszer
[ii]* ISO szabvány
19104, Földrajzi információ - Szakkifejezések
[iii]* ISO szabvány
19104, Földrajzi információ - Szakkifejezések
[iv]* ISO szabvány
19108, Földrajzi információ - Idő rendszer
[v]* ISO szabvány
19115, Földrajzi információ - Meta adat

ANNEX 5.
Mértékegységek használata a légi és a földi üzemeltetésben

4. kiadás – 1979
16. módosítással
Nemzetközi szabványok és ajánlott gyakorlatok
5. Annex
Mértékegységek használata a légi és földi üzemeltetésben
Negyedik kiadás – 1979 július
16. módosítással
A jelen kiadvány magába foglalja az 5. Annex-nek a Tanács részéről 1979. március 24-e előtt elfogadott összes módosítását és 1981. november 26-tól hatálytalanítja az 5. Annex összes korábbi kiadásait.
Nemzetközi Polgári Légiközlekedési Szervezet
ICAO

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális képzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	kiadás időpontja	alkalmazás időpontja	bevezette
Negyedik kiadás Tartalmazza a Tanács által 1979. március 24. előtt elfogadott összes módosítást	1979. július 23.	1981. november 26	
14. módosítás (a Tanács 1984. február 27-én fogadta el)	1984. július 30.	1984. november 22.	
15. módosítás (a Tanács 1986. november 24-én fogadta el)	1987. április 19.	1987. november 19.	
16. módosítás (a Tanács 2000. február 21-én fogadta el)	2000. július 17.	2000. november 2.	

Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

Tartalomjegyzék

Az ANNEX 5. MELLÉKLETEI
A. MELLÉKLET A Nemzetközi Mértékegység (SI) Rendszer fejlesztése
B. MELLÉKLET. Útmutató az SI alkalmazásához
C. MELLÉKLET Átváltási tényezők
D. MELLÉKLET Egyeztetett Egyetemes Idő
E. MELLÉKLET Dátum és időjelzés számjegyes fromában

Előszó

Történeti háttér

A levegő – föld összeköttetéseknél alkalmazandó mértékegységekre vonatkozó nemzetközi szabványokat és ajánlott gyakorlatokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944.) 37. Cikkelyének rendelkezései alapján 1948. április 16-án fogadta el és foglalta az 5. számú Annex-be. Az előírások 1948. szeptember 15-én léptek hatályba és 1949. január 1-től alkalmazhatók.
Az A. táblázat a vonatkozó tárgy és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. Cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos szabványai és gyakorlata, illetve a jelen Annex nemzetközi szabványai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlatokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesen. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről, valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.
Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. Cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi szabványok és ajánlott gyakorlatok alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását, illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész minden egyes Annex-ben megtalálható legyen.
Az egyes részek jogállása a következő:

1. – Az Annex anyaga:

a) Nemzetközi szabványok és ajánlott gyakorlatok, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében, valamint amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlatok: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) Függelék: A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi szabványok és ajánlott gyakorlatok szerves részét képezik.

c) Meghatározások: A nemzetközi szabványok és az ajánlott gyakorlatok ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi szabványnak vagy ajánlott gyakorlatnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása a specfikációt befolyásolja.

d) Táblázatok és ábrák: Nemzetközi szabványt vagy ajánlott gyakorlatot egészítenek ki vagy szemléltetnek, és amelyekben adott nemzetközi szabványra vagy ajánlott gyakorlatra hivatkoznak, ezáltal a nemzetközi szabvány vagy ajánlott gyakorlat részét képezik és jogállásuk azokkal egyező.

2.- A nemzetközi szabványokkal és az ajánlott gyakorlatokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit, illetve az ezekre vonatkozó magyarázatokat a nemzetközi szabványok és gyakorlatok alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez, illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóbanforgó nemzetközi szabványra, vagy ajánlott gyakorlatra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi szabványt és ajánlott gyakorlatot kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et hat nyelven – angolul, arabul, franciául, kínaiul, oroszul és spanyolul fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előírt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Kérjük, erről értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: *A nemzetközi szabványokat* vékony álló, az *ajánlott gyakorlati* *eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását **„Ajánlás”** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a *„Megjegyzés:”* felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat „shall – kell/köteles” kifejezéssel és az ajánlott gyakorlati eljárásokat „should – szükséges/kívánatos” kifejezéssel jelezzük. (Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.)
A jelen kiadvány bármelyik részére történő hivatkozás – akár számmal, akár címmel vagy pedig mindkettővel – vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat – Az 5. Annex módosításai
(tagolás sorrendben: Módosítás – Forrás – Tárgya – Elfogadás/Hatályba lépés/Alkalmazhatóság időpontja)

Első kiadás
A Tanács tevékenysége az A1-35 Közgyűlési Határozat alapján
1948. április 16. 1948. szeptember 15. 1949. január 1.

1–11) Második kiadás – Léginavigációs Bizottság
A mértékegység táblázatok számának ötről kettőre történő csökkentése
1951. december 11 1952. május 1. 1952. szeptember 1..

12) Harmadik kiadás – Léginavigációs Bizottság
Azonos mértékegységek alkalmazása az ICAO és a Kék Táblázatokban, kivéve a tengerszint vagy földfelszín feletti magasságok, általános magasság és függőleges sebesség mérésére használt mértékegységeket.
1961. december 8. 1962. április 1. 1964. július 1.

13) Negyedik kiadás – A Tanács tevékenysége az A22-18 Határozat F. Függelék alapján
Az Annex címének megváltoztatása és a témakörök kibővítése a légi és földi üzemeltetés összes területére, szabványos mértékegység rendszer bevezetése az SI[i]1 alapján, a nemzetközi polgári légiközlekedésben használatra engedélyezett nem-SI mértékegységek meghatározása; bizonyos nem-SI mértékegységek megszüntetése.
1979. március 23. 1979. július 23. 1981. november 26.

14) – Léginavigációs Bizottság tanulmánya
A „bar” mértékegység megszüntetési időpontjának pontos kijelölése és útmutató anyag bevezetése az Egyeztetett Egységes Idő (UTC) vonatkozásában; tájékoztató a dátum és idő jelzésére,
1984. február 27. 1984. július 30. 1987. november 22.

15) – Léginavigációs Bizottság
A „méter” új meghatározása; a különleges „sievert” név bevezetése; a továbbiakban már nem használatos ideiglenes nem-SI mértékegységekre való hivatkozás törlése.
1986. november 24. 1987. április 19. 1987. november 19.

16) – Az 1. Annex 162. Módosítása
Az emberi tényezők alapelveire vonatkozó új előírások bevezetése.
2000. február 21. 2000. július 17. 2000. november 2.

1. fejezet
Meghatározások

A nemzetközi polgári légiközlekedés légi és földi üzemeltetésénél használt mértékegységekre vonatkozó nemzetközi szabványok és ajánlott gyakorlatok esetére alkalmazott egyedi kifejezések jelentése az alábbiakban található.

Amper (A) – Ampere Az amper olyan állandó elektromos áram erőssége, amely két párhuzamos, egyenes, végtelen hosszúságú, elhanyagolhatóan kicsiny keresztmetszetű és vákuumban egymástól egy méter távolságra levő vezetőben áramoltatva a két vezető között méterenként 2×10^{-7} newton (tér) erőt hoz létre.

Becquerel (Bq) Olyan radioaktív sugárforrás hatóereje, amelyben egy másodperc időtartam alatt egy spontán nukleáris lebomlás következik be.

Candela – Gyertyafényerő (cd) 1/600 000 négyzetméter felületű, a platina dermedési hőmérsékletével azonos hőmérsékletű fekete test függőleges irányú fényereje[ii] 1 101 325 Newton/m^2 nyomáson.

Celsius fok (°C) -Degree Celsius A kelvin egység speciális neve ahhoz, hogy a Celsius hőmérséklet értékeit megállapítsuk.

Celsius hőmérséklet (t°C) – Celsius temperature A Celsius hőmérséklet értéke, amely egyenlő **t°C** = $T - T_0$ különbséggel két termodinamikus hőmérséklet $T - T_0$ között, ahol a T_0 értéke 273.15 kelvin.

Coulomb (C) 1 amper áramerősség által egy másodperc alatt szállított elektromosság mennyisége.

Csomó – Knots (kt) Óránként egy tengeri mérfölddel egyenlő sebesség.

Emberi teljesítmény/teljesítőképesség – Human performance Az egyéni emberi képességek és korlátozó tényezők, amelyek hatással vannak a légiközlekedési üzemeltetés biztonságára és hatékonyságára.

Farad (F) Két fémlemez közötti kondenzátor kapacitása, amelyek között 1 coulomb töltés hatására ténylegesen 1 volt feszültség különbség tapasztalható.

Gray (G) 1 joule/kg tömegre ható ion-sugárzás által leadott energia mennyisége.

Henry (H) Olyan zárt áramkör indukciója, amelyben 1 volt elektromos erő keletkezik, amikor az áramkörben az elektromos áram 1 amper/másodperc arányban változik.

Hertz (Hz) Egy másodperc periódusú periodikus jelenség frekvenciája.

Joule (J) 1 newton erő előre, az erő irányába mutató egy méter távolságra történő áthelyezése során keletkező munkamennyiség.

Kelvin (K) Termodinamikai hőmérséklet egység, amely a víz hármaspontja hőmérsékletének 1/273.16 része.

Kilogramm (kg) A kilogramm súly nemzetközi prototípusának tömegével megegyező tömeg mértékegysége.

Láb – Foot (ft) Pontosan 0.3048 méter távolságnak megfelelő hosszúság.

Liter (L) A folyadékok és gázok mérésére korlátozott térfogat egység, amely egyenlő 1 köbdeciméterrel.

Lumen (lm) 1 steradian térszögben egy candela egységes intenzitású fényforrás pont által sugárzott fényáram[iii][2] mennyiség.

Lux (lx) 1 négyzetméter felületen egységesen eloszló 1 lumen fényáram mennyiséggel létrehozott fényhatás.

Másodperc – Second (s) A cézium–133 atom alapállapotának két hiper-finom szintje közötti átmenetnek megfelelően sugárzás 9 192 631 770 periódusának időtartama.

Méter -Metre (m) A fény vákumban megtett útja a másodperc 1/299792458-ad része alatt

Mole (mol) Egy rendszer anyagának olyan mennyisége, amely annyi elemi részecskét tartalmaz, mint amennyi a szén-12 0.012 kilogrammjában levő atomok száma.

Megjegyzés: Amikor a mole-t használják, meg kell határozni az elemi részecskéket, amelyek atomok, molekulák, ionok, elektronok vagy egyéb részecskék illetve részecske csoportok lehetnek.

Newton (N) 1 kilogramm tömegre ható erő mennyisége, amely ezzel az adott tömeggel 1 méter/négyzet-másodperc gyorsulást hoz létre.

Ohm (Ω) Egy vezető két pontja között tapasztalható elektromos ellenállás, amikor a két pont közötti 1 volt állandó feszültség különbség a vezetőben 1 amper áramerősséget hoz létre és ez a vezető elektromotoros erőnek nem forrása.

Pascal (Pa) 1 newton/négyzetméter (N/m^2) nyomás vagy fizikai igénybevétel.

Radián – Radian (rad) Két kör sugara közötti síkszög, amely a kör kerületén a sugárral egyenlő hosszúságú ívet zár be.

Siemens (Sv) 1 joule/kilogramm értéknek megfelelő sugárzási mennyiség egysége.

Steradian (sr) Az a térszög, amelynek csúcs a gömb közepén helyezkedik el és a gömb felületén olyan területet jelöl ki, amely azzal a négyzettel egyenlő, aminek oldalhosszai azonosak a gömb sugarával.

Tengeri mérföld (tmf) – Nautical Mile (NM) Pontosan 1852 méternek megfelelő hosszúság.

Tesla (T) 1 weber/négyzetméter mágneses térerősség által keltett mágneses fluxus-sűrűség.

Tonna (t) – Tonne 1000 kilogrammal egyenlő tömeg.

Volt (V) Az elektromos feszültség különbség és az elektromos erő egysége, az 1 amper állandó áramot szállító vezető két pontja közötti elektromos feszültség különbség, amikor a két pont között megoszló teljesítmény értéke 1 (W) watt.

Watt (W) Olyan teljesítmény, amelynek során az energiatermelés növekedés 1 joule/másodperc.

Weber (Wb) Az a mágneses térerő, amely az egy menetből álló vezetőben 1 volt elektromotoros erőt létesít, amint 1 másodperc alatt egyenletesen nullára csökkentik.

2.Fejezet
Alkalmazhatóság

Bevezető megjegyzés: A jelen Annex a nemzetközi polgári légiközlekedés légi és földi üzemeletetésénél alkalmazott szabványos mértékegység rendszer használatára vonatkozó specifikációkat tartalmzza. Ez a szabványos mértékegység rendszer a Nemzetközi Mértékegységrendszeren (SI) és egyes nem-SI mértékegységeken alapszik, amely utóbbiak a nemzetközi polgári légiközlekedés sajátos követelményeinek kielégítéséhez szükségesek.Lásd az A. Függeléket az SI fejlődése részleteinek megismeréséhez.

2.1.Alkalmazhatóság

A jelen Annex-ben meghatározott nemzetközi szabványok és ajánlott gyakorlatok a nemzetközi polgári légiközlekedés légi és földi üzemeltetésének minden területén alkalmazandók.

3. Fejezet
A mértékegységek szabványos alkalmazása

3.1. SI mértékegységek

3.1.1. A 3.2. és 3.3. előírások alapján a nemzetközi polgári légiközlekedés légi és földi üzemeltetésének minden területén szabványos mértékegység rendszerként alkalmazandó a Nemzetközi Mértékegység (SI) Rendszer, amelyet az Általános Súly és Mértékügyi Konferencia[iv][3] (CGPM) dolgozott ki és vizsgál felül.

3.1.2. Előtagok[v][4]

Az SI mértékegységek tízszeres többszöröseinek illetve tizedes törtrészeinek jelzésére a 3-1. Táblázatban felsorolt előtagokat és szimbólumokat használják.

1. Megjegyzés: Az SI mértékegységek kifejezés itt magában foglalja az alapegységeket, az ezekből számolt (levezetett) egységeket, valamint azok többszöröseit és törtrészeit is.

2. Megjegyzés: Az előtagok általános alkalmazására vonatkozó útmutatás a B. Mellékletben található.

3-1. táblázat SI mértékegység előtagok

1 Szorzó tényező			*Előtag*	*Szimbólum*
1 000 000 000 000 000 000	=	10^{18}	exa	E
1 000 000 000 000 000	=	10^{15}	peta	P
1 000 000 000 000	=	10^{12}	tera	T
1 000 000 000	=	10^{9}	giga	G

1 Szorzó tényező			***Előtag***	***Szimbólum***
1 000 000	=	10^{6}	mega	M
1 000	=	10^{3}	kilo	k
100	=	10^{2}	hecto	h
10	=	10^{1}	deca	da
0.1	=	10^{-1}	deci	d
0.01	=	10^{-2}	centi	c
0.001	=	10^{-3}	milli	m
0.000 001	=	10^{-6}	micro	μ
0.000 000 001	=	10^{-9}	nano	n
0.000 000 000 001	=	10^{-12}	pico	p
0.000 000 000 000 001	=	10^{-15}	femto	f
0.000 000 000 000 000 001	=	10^{-18}	atto	a

3-2. táblázat Nemzetközi Mértékegység Rendszerrel (SI) együttesen használt nem-SI mértékegységek

A 3-4. Táblázatban jelzett egyedi mennyiségek	**A mértékegység neve**	**A mértékegység jele**	**A mértékegység meghatározása SI mértékegységben**
tömeg	tonna	t	$1\ t = 10^{3}\ kg$
sík szög	fok	o	$1^{o} = (\pi/180) rad$
	perc	’	$1' = (1/60)^{o} = (\pi/10\ 800$ rad)
	másodperc	”	$1 = (1/60)^{o} = (\pi/648\ 000$ rad)
hőmérséklet	Celsius fok	^{o}C	$1\ ^{o}C$ = 1 egység K [a)]
idő	perc	min	1 min = 60 másodperc
	óra	h	1 h = 60 min = 3600 másodperc
	nap	d	1 d = 24 h = 86 400 másodperc
	hét,hónap,év	–	–
térfogat	liter	L	$1\ L = 1\ dm^{3} = 10^{-3}\ m^{-3}$

Megjegyzés: a) = Lásd C. Melléklet, C-2. átváltási táblázat

3.2. Nem-SI mértékegységek

3.2.1. A Nemzetközi Mértékegység (SI) Rendszertől eltérő állandó használatra engedélyezett mértékegységek
A 3-2. táblázatban felsorolt nem-SI mértékegységeket elsődleges mértékegységként az SI mértékegységek helyett vagy mellett, azonban kizárólag a 3-4. táblázatban előírtak szerint használják.

3.2.2. A Nemzetközi Mértékegység (SI) Rendszertől eltérő ideiglenes használatra engedélyezett mértékegységek. A 3-3. táblázatban felsorolt nem-SI mértékegységeket választható mértékegységként az SI mértékegységek helyett, azonban kizárólag a 3-4. táblázatban előírtak szerint ideiglenesen használják.

Megjegyzés:- Célkitűzés az, hogy a 3-3. táblázatban felsorolt és a 3-4. táblázat szerint alkalmazott alternatív nem-SI mértékegységek használatát a Tanács által meghatározott egyedi megszüntetési időponttal befejezzék. Az egyedi megszüntetési időpontokat meghatározásuk után a 4. fejezetben tesszük közzé.

3.3. Az egyedi mértékegységek alkalmazása

3.3.1. A nemzetközi polgári légiközlekedés légi és földi üzemeltetésénél használt mértékegységek mennyiségeit a 3-4. táblázatnak megfelelően alkalmazzák.

Megjegyzés: A 3-4. táblázat célja a légi és földi üzemeltetésnél általánosan használt mennyiségek (beleértve az előtagokat is) szabványosítását. Az Annex alapvető előírásai azokra a mértékegységekre is vonatkoznak, amelyek mennyiségét a kiadványban nem jeleztük.

3.3.2**.** ***Ajánlás*** *– Dolgozzanak ki és vezessenek be megfelelő tervezési, eljárási és kiképzési módszereket a szabványos, valamint a nem-SI alternatív mértékegységek alkalmazásával történő üzemeltetésre, a különböző mértékegységeket használó szervezeti egységek közötti összhang kialakítására és a megfelelő átmenetre. A tevékenységek során vegyék figyelembe az emberi teljesítőképességre vonatkozó alapelveket.*

*Megjegyzés: Az Emberi Tényezők Alapelveivel kapcsolatos tájékoztatót a következő Körlevelek tartalmazzák:*Emberi Tényezők Kiképzési Kézikönyv (*Doc 9683*) – Alapvető Emberi Tényező Elméletek; *238. Körlevél* – (Emberi Tényezők 6. kiadvány – Ergonómia).

3-3. táblázat Nemzetközi Mértékegység Rendszernél (SI) ideiglenes használatra engedélyezett alternatív nem-SI mértékegységek

A 3-4. táblázatban jelzett egyedi mennyiségek	A mértékegység neve	A mértékegység jele	A mértékegység meghatározása SI mértékegységben
hossztávolság	tengeri mérföld	NM (tmf)	1 NM = 1852 méter
Távolság (függőleges[a])	láb	ft	1 ft = 0.3048 méter
sebesség	csomó	kt	1 kt = 0.514 444 m/s

Megjegyzés: a) = közepes tengerszint vagy földfelszín (tereppont) feletti magasság, függőleges sebesség

3-4. táblázat A mértékegységek szabványos alkalmazása a nemzetközi polgári légiközlekedésben

Hiv.szám	Mennyiség	SI mérték jele	nem-SI m.jele
1.	Irány / Tér / Idő		
1.1	közepes tengerszing feletti magasság	m	ft
1.2	terület	m2	
1.3	hossztávolság	km	NM (tmf)
1.4	távolság (rövid)	m	
1.5	tengerszinthez viszonyított magasság	m	ft
1.6	időtartam	h és min	
1.7	magasság	m	ft
1.8	földrajzi szélesség	o/ ’ / ”	
1.9	hosszúság	m	
1.10	földrajzi hosszúság	o/ ’ / ”	
1.11	sík szög (szükség szerint a fok érték	o	
	tizedesei)		
1.12	futópálya hosszúság	m	
1.13	futópálya látástávolság	m	
1.14	légijármű tüzelőanyagtartály kapacitás	L	
1.15	idő (másodperc, perc, óra,nap)	s/min/h/d	
	(hét,hónap, év)	week/month/year	
1.16	(körkőrös) látástávolság	km	
1.17	űrtartalom	m^3	
1.18	szélirány (le- és felszálláshoz mágneses fokban, ezeken kívül földrajzi fokokban kifejezendők)	o	

2. Tömeg mértékegység

2.1.	légsűrűség	kg/m^3
2.2.	terület egységre jutó tömeg	kg/m^2
2.3.	áru rakomány befogadóképesség	kg
2.4.	áru rakomány sűrűség	kg/m^3
2.5.	(tömeg) sűrűség	kg/m^3
2.6.	tüzelőanyag befogadóképesség (súlymérés)	kg
2.7.	gáz (tömeg) sűrűség	kg/m^3
2.8.	összsúly vagy teljes terhelés	kg/t
2.9.	emelési (csőrlési) képesség	kg
2.10.	hosszegységre számított tömeg	kg/m
2.11.	folyadék sűrűség	kg/m^3
2.12.	tömeg	Kg
2.13.	tehetetlenségi nyomaték	$kgxm^2$

2.14.	impulzus nyomaték (mozgásmennyiség)	$kgxm^2/s$
2.15.	mozgásmennyiség	$kgxm^2/s$

3. Erő meghatározására szolgáló egységek

3.1.	(általános) légnyomás	kPa
3.2.	nyomásmagasságmérő beállítás	hPa
3.3.	légköri (atmoszférikus) nyomás	hPa
3.4.	hajlító nyomaték	kNxm
3.5.	erő	N
3.6.	tüzelőanyag betáplálási rendszer nyomása	kPa
3.7.	hidraulika nyomás	kPa
3.8.	rugalmassági tényező	Mpa
3.9.	nyomás	kPa
3.10.	mechanikai feszültség terhelés	Mpa
3.11.	felületi feszültség	mN/m
3.12.	tolóerő	kN
3.13.	nyomaték	Nxm
3.14.	vákuum	Pa

4. Mechanikai egységek

4.1.	levegőhöz viszonyított repülési sebesség	km/h	kt
4.2.	szöggyorsulás	rad/s	
4.3.	szögsebesség	rad/s	
4.4.	energia vagy munka	J	
4.5.	egyenértékű tengely teljesítmény	kW0	
4.6.	frekvencia	Hz	
4.7.	földhöz viszonyított repülési sebesség	km/h	kt
4.8.	érintési energia, becsapódás	j/m^2	
4.9.	a fékek által felvett mozgási energia	MJ	
4.10.	lineáris gyorsulás	m/s^2	
4.11.	teljesítmény	kW	
4.12.	trimmelési arányérték	o/s	
4.15.	függőleges sebesség	m/s	ft/min
4.16.	szélsebesség	km/h	kt

5. *Áramlástani egységek*

5.1.	hajtóművön áthaladó levegő mennyiség	kg/s
5.2.	hajtóművön áthaladó víz mennyiség	kg/h
5.3.	fajlagos tüzelőanyag fogyasztás dugattyús motorok légcsavaros gázturbina hajtóművek gázturbina sugárhajtóművek	 kg/(kWxh) kg/(kWxh) kg/(kWxh)
5.4.	tüzelőanyag áramlás mennyisége	kg/h
5.5.	tüzelőanyagtartály feltöltési sebesség	kg/min
5.6.	gázáramlás	kg/s

5.7.	folyadékáramlás (súly mérési)	g/s
5.8.	folyadékáramlás (tömeg mérési)	L/S
5.9.	tömeg áramlás	kg/s

5.10.	olajfogyasztás gázturbina hajtóművek dugattyús motorok	 kg/h g/(kWxh)
5.11.	átáramló olajmennyiség	g/s
5.12.	szivattyú szállító-teljesítmény	l/min
5.13.	átáramló levegőmennyiség	g/s
5.14.	dinamikus viszkozitás	Paxs
5.15.	kinematikus viszkozitás	m^2/s

6. *Termodinamikai egységek*

6.1.	hőátadási együttható	$W/(m^2xK)$
6.2.	fajlagos hőáramlás	J/m^2
6.3.	hőáram érték	W
6.4.	(abszolút) páratartalom	g/kg
6.5.	hőtágulási együttható (lineáris)	°C-1
6.6.	hőmennyiség	J
6.7.	hőmérséklet	°C

7. Elektromos és mágneses egységek

7.1.	elektromos kapacitás	F
7.2.	elektromos vezetés	S
7.3.	fajlagos vezetés	S/m
7.4.	áramsűrűség	A/m
7.5.	elektromos áramerősség	A
7.6.	elektromos térerő	C/m^2
7.7.	elektromos feszültség	V
7.8.	elektromos erő	V
7.9.	mágneses térerő	A/m
7.10.	mágneses fluxus	Wb
7.11.	mágneses indukció	T
7.12.	elektromos teljesítmény	W
7.13.	elektromos töltés	C
7.14.	elektromos ellenállás	W

8. *Fénytani és kapcsolatos elektromágneses sugárzás egységek*

8.1.	megvilágítás	lx
8.2.	fényerősség	cd/m^2
8.3.	fajlagos kisugárzott fényáram	lm/m^2
8.4.	fényáram5	lm
8.5.	fényerősség6	cd
8.6.	fényenergia mennyiség	lmxs
8.7.	kisugárzott energia	J
8.8.	hullámhossz	m

9. Hangtani (akusztikus) egységek

9.1.	frekvencia	Hz
9.2.	tömeg sűrűség	kg/m^3
9.4.	rezgésidő, periódus idő	dB e)
9.5.	hang intenzitás	W/m^2
9.6.	hangerő	W
9.7.	hangnyomás	Pa
9.8.	hangerő szint	dB e)
9.9.	pillanatnyi statikus nyomás	Pa
9.10.	hangsebesség	m/s
9.11.	pillanatnyi (hangtömeg) hangsebesség	M^3/s
9.12.	hullámhossz	m

10. Magfizikai és ionizálós sugárzás egységek

10.1.	elnyelt sugárdózis	Gy
10.2.	elnyelt sugárdózis teljesítmény arányérték	Gy/s
10.3.	radioaktív sugárforrás aktivitása	Bq
10.4.	sugárdózis egyenérték	Sv
10.5.	besugárzási dózis mennyisége	C/kg
10.6.	besugárzási teljesítmény	C/kgxs

Megjegyzések:
a) Léginavigációhoz történő felhasználásnál, általában 4000 méter magasság felett.
b) Mint például légijármű tüzelőanyag, hidraulika folyadék, víz, olaj, nagy nyomású oxigén tartályok.
c) Az 5 kilométernél kisebb látástávolságot méterben is megadhatják.
d) A repülés végrehajtás alkalmával a levegőhöz viszonyított repülési sebességet időnként MACH szám arányértékben jelentik.
e) A decibel (dB) a hangnyomásszint és a hangteljesítményszint meghatározására használható mértékegység. Alkalmazásához referencia szintet kell megállapítani.

4.fejezet
A Nemzetközi Mértékegység (SI) Rendszertől eltérő mértékegységek használatának megszüntetése

Bevezető Megjegyzés: – A 3-3. táblázatban felsorolt nem-SI mértékegységek széles körben elterjedt alkalmazásuk miatt alternatív lehetőségként ideiglenes használatban maradnak, hogy ezzel elkerüljük ezen mértékegységek alkalmazásának átfogó nemzetközi egyeztetés nélkül történő megszüntetéséből származó tényleges repülésbiztonsági nehézségeket. Ha a Tanács kidolgozza a megszüntetési időpontokat, ezeket a jelen fejezetben nemzetközi szabványként tesszük közzé. Várható, hogy a megszüntetés időpontjainak kiadása jóval megelőzi majd a megszüntetés tényleges időpontját. Bármely egyedi mértékegység használatának megszüntetését célzó különleges eljárást körlevél formájában a jelen Annex-től külön fogjuk az összes szerződő állam számára közzétenni.

4.1. A 3-3. táblázatban meghatározott, a Nemzetközi Mértékegység Rendszerrel (SI) együttesen ideiglenes használatra engedélyezett nem-SI mértékegységek használatát a nemzetközi polgári légiközlekedésben a 4-1. táblázatban található időpontoktól megszüntetjük.

4-1. táblázat A nem-SI mértékegységek megszüntetési időpontjai

alternatív nem-SI mértékegységek	megszüntetési időpont
csomó (kt) – tengeri mérföld (NM)	nincs meghatározva *a)*
láb (ft)	nincs meghatározva *b)*

Megjegyzés:
a) A tengeri mérföld és a csomó mértékegységek használatának megszüntetésére időpont még nincs meghatározva
b) A láb hosszmérték mértékegységek használatának megszüntetésére időpont még nincs meghatározva.

Az 5. Annex mellékletei

A. MELLÉKLET
A Nemzetközi Mértékegység (SI) Rendszer kialakulása

1. Történelmi háttér

1.1 Az SI megnevezés a „Systeme International d'Unités" francia kifejezésből származik. A rendszer hossz és tömeg (méter illetve kilogramm) mértékegységekből keletkezett, amelyeket a PárizsiTudományos Akadémia dolgozott ki és az iparban, valamint a kereskedelemben alkalmazott mérésekhez a Francia Nemzetgyűlés 1975-ben fogadott el. Az eredeti rendszer mint „metrikus rendszer" vált ismertté. A fizikai tudományok szakemberei felismerték a rendszer előnyeit és azt tudományos, valamint műszaki körökben is hamarosan elfogadták.

1.2 A nemzetközi szabványosítás megvalósítása 15 állam Párizsban, 1870-ben megtartott találkozójával kezdődött meg. Ennek eredményeképpen 1875-ben létrejött a Nemzetközi Méterrendszer Megállapodás és megalakították a Súlyok és Mértékek Állandó Nemzetközi Irodáját. A méterrendszer összes nemzetközi ügyeinek intézése érdekében létrehozták a Súlyok és Mértékek Általános Konferenciáját (CGPM) is. Ennek első, 1889-ben megtartott értekezletén a hosszúság és a tömeg mérésének nemzetközi szabványos egységeként jóváhagyták a méter és kilogramm régi prototípusát. Az ezt követő üléseken egyéb mértékegységeket is elfogadtak, majd a CGPM tizedik, 1954. évi értekezletén ésszerű és átfogó, egységes rendszert dolgoztak ki. Ennek a rendszernek alapja a korábban kifejlesztett méter/kilogramm/másodperc/amper (MKSA) rendszer, valamint a hőmérséklet mérésére jóváhagyott kelvin és a fényerősség mértékeként elfogadott candela lett.
A 36 résztvevővel 1960-ban megtartott 11. CGPM ülés elfogadta a Nemzetközi Mértékegység (SI) Rendszer elnevezést, kialakította a jelzések, származtatott és kiegészítő egységek és egyéb kérdések alapszabályait, ezzel lefektetve a mérések nemzetközi egységeinek átfogó specifikációit.
1964-ben a 12. CGPM ülés bizonyos finomításokat végzett a rendszeren, majd az 1967-es 13. ülés újra meghatározta a másodpercet, megnevezte a hőmérséklet mérésére használt kelvint (K) és felülvizsgálta a candela (ca) meghatározását. A 14. ülés felvett egy hetedik alapegységet, a „mole-t" (mol), és jóváhagyta a pascal (Pa) mint a nyomás vagy igénybevétel, a newton/négyzetméter (N/m^2), valamint a siemens (S) mint az áramvezetés mérésére szolgáló SI mértékegységeket. A CGPM 1975 ben elfogadta a becquerel (Bq) egységet a rádionuklidok Azonos rendszámú és tömegű atomok7 , valamint a gray-t (Gy) az elnyelt sugárdózis mértékegységeként.

2. Súlyok és Mértékek Állandó Nemzetközi Irodája

2.1. A Súlyok és Mértékek Állandó Nemzetközi Irodája (BIPM)[vi][8] az 1875. május 20-án Párizsban 17 ország részéről a Nemzetközi Méter Konferencia utolsó napján aláírt Méter Egyezmény keretében alakult meg. Az Egyezményt 1921-ben módosították. Az Iroda Párizs közelében működik és fenntartását a Méter Egyezmény tagállamai fedezik. A BIPM feladata a fizikai mértékegységek nemzetközi egységesítésének biztosítása és felelős az alábbiakért:

• az alapvető fizikai mennyiségek méréséhez szükséges alap szabványok és mérőeszközök kialakításáért, valamint a nemzetközi prototípusok őrzéséért;

• a nemzeti és nemzetközi szabványok összevetéséért;

• az egyes mérési módszerek egyeztetéséért;

• az alapvető fizikai állandókra vonatkozó meghatározások kidolgozásáért és egyeztetéséért.

2.2. A BIPM a Súlyok és Mértékek Általános Konferenciája fennhatósága alá tartozó Nemzetközi Súly és Mérték Bizottság[vii][9] kizárólagos felügyelete alatt működik. A Nemzetközi Bizottság az egyes különböző tagállamokból delegált 18 tagból áll és legalább kétévenként egyszer ülésezik. A bizottság tisztviselői Éves Jelentést adnak ki a BIPM adminisztratív és pénzügyi helyzetéről, amelyet megküldenek a Méter Egyezmény tagállamainak kormányai számára.

2.3. A BIPM tevékenysége – amely kezdetben a hossz- és tömeg mérésekre, valamint ezen mennyiségekkel kapcsolatos mértékismereti tanulmányokra korlátozódott – később kiterjedt az elektromosság (1927), a fényerősség mérés (1937), valamint az ionizáló sugárzás (1960) mérésének szabványaira is. Ennek érdekében az 1876. és 1878. között épített eredeti laboratóriumokat 1929-ben megnagyobbították, és 1963-64-ben két új épületet építettek az ionizáló sugárzás tanulmányozására. A BIPM laboratóriumaiban mintegy 30 fizikus vagy más műszaki szakértő dolgozik, akik mértékismereti kutatással foglalkoznak, valamint a fent említett mértékegységek (anyag) szabványainak mérését és hitelesítését végzik.

2.4. A Súlyok és Mértékek Állandó Nemzetközi Irodájára bízott feladatok megnövekedése következtében a CIPM[viii][10] 1827-től Tanácsadó Bizottság elnevezéssel különböző testületeket hoz létre azzal a céllal, hogy a számukra tanulmányozásra és tanácsadásra átadott anyagokról szakvéleményt adjanak. Ezek a Tanácsadó Bizottságok, amelyek egyes kérdések vizsgálatára ideiglenes vagy állandó munkacsoportot alkothatnak, felelősek a területükön végzett nemzetközi munka egyeztetéséért, valamint a mértékegységek meghatározására és értékeire vonatkozó ajánlások kidolgozásáért. A mértékegységek világméretű egységességének biztosítása érdekében a Nemzetközi Bizottság közvetlenül működik és ajánlásait közvetlenül a Súlyok és Mértékek Általános Konferenciájának nyújtja be.

2.5. A Tanácsadó Bizottságok működési szabályzatai[ix][11] egységesek. Mindenegyes bizottság, amelynek elnöke általában a CIPM tagja, az egyes jelentős mérésügyi laboratóriumok és szakintézetek különféle szakértőiből áll. A laboratóriumok és szakintézetek kiválasztását a CIPM végzi. A bizottságok nem rendszeres időközökben tartják üléseiket. Jelenleg 7 ilyen bizottság van, az alábbiak szerint:

1. Elektromossággal foglalkozó Tanácsadó Bizottság (CCE) – alapítás 1927;
2. Fényerősség és Sugárzás mérési Tanácsadó Bizottság (CCPR),amely az 1933-ban alapított Fényerősség mérési Tanácsadó Bizottság[x][12] 1971-ben kapott új elnevezése;
3. Hőtani Tanácsadó Bizottság (CCT) – alapítás 1937;
4. Méter Meghatározási Tanácsadó Bizottság (CCDM) – alapítás 1952;
5. Másodperc Meghatározási Tanácsadó Bizottság (CCDS) – alapítás 1956;

6. Ionizáló Sugárzás Mérések Szabványosítási Tanácsadó Bizottság (CCEMRI) – alapítás 1958; A bizottság 1969 óta négy részlegből áll: I. részleg (röntgen és gamma sugárzás mérés); II. részleg (rádionuklida mérés); III. részleg (neutron mérés); IV. részleg (alfa energia szabványok);

7. Mértékegységek Tanácsadó Bizottsága – alapítás 1964.

A Súlyok és Mértékek Általános Konferenciája, a Nemzetközi Súly és Mérték Bizottság, a Tanácsadó Bizottságok és a Súlyok és Mértékek Állandó Nemzetközi Irodája tevékenységéről az utóbbi védnöksége alatt a következő sorozat kiadványok jelentek meg:

• Comptes rendus des séances de la Conférence Générale des Poids et Mesures;

• Procés-Verbaux des séances de Comité International des Poids et Measures;

• Sessions des Comités Consultatifs;

• Recueil de Travaux de Bureau International des Poids et Measures; (az összeállítás tartalmazza a tudományos és szakmai könyvekben valamint folyóiratokban megjelent cikkeket és bizonyos sokszorosított jelentésekben közölt munkákat).

2.6. A Súlyok és Mértékek Állandó Nemzetközi Irodája időről-időre jelentést ad ki a méterrendszer az egész világot átfogó fejlődéséről. A Travaux et Memories du Bureau International des Poids et Measures című kiadvány (1881. és 1966. között kiadott 22 kötet) a CIPM határozata alapján 1966-ban megszűnt. A Metrologia című nemzetközi folyóirat a CIPM kiadásában 1965. óta cikkeket közöl a tudományos mértékismerettel kapcsolatosan világszerte megjelent fontosabb munkákról, a mérési módszerek, szabványok, egységek stb. fejlődéséről valamint jelentéseket ad ki a Méter Egyezmény keretében létrehozott különféle testületek tevékenységéről, határozatairól és ajánlásairól.

3. Nemzetközi Szabványosítási Szervezet (ISO)

A Nemzetközi Szabványosítási Szervezet az országos szabványügyi intézetek világszövetsége, amely bár nem része a Súlyok és Mértékek Állandó Nemzetközi Irodájának, ajánlásokat ad az SI és bizonyos más mértékegységek használatára. A légiközlekedésben használt SI mértékegységek szabványos alkalmazása érdekében az ICAO rendszeres kapcsolatot tart fenn az ISO-val. Az SI mértékegységek alkalmazásáról részletes tájékoztatást biztosítanak a következő kiadványok: ISO Document 1000 valamint ISO Recommendation R131.

B. MELLÉKLET

Útmutató az SI alkalmazásához

1. Bevezető

1.1. Nemzetközi Mértékegység (SI) Rendszer teljes és átfogó rendszer, amely három mértékegység csoportot tartalmaz:

a) alap mértékegységek;

b) kiegészítő mértékegységek; és

c) származtatott mértékegységek.

1.2. Az SI a dimenzió szempontjából független hét egység alapján került kidolgozásra és alkalmazásra, amelyek a következő B-1. táblázatban találhatók.

1.3. Az SI kiegészítő egységeit a B-2. táblázat tartalmazza, amelyek alapegységek vagy származtatott egységek is egyaránt lehetnek.

1.4. Az SI származtatott egységei az alap, kiegészítő és más származtatott egységek kombinációjából, a megfelelő mennyiségeket összekapcsoló algebrai összefüggés alapján kerülnek meghatározásra. A származtatott egységek jelét a szorzás, osztás és a hatvány-kitevők matematikai jelölésének felhasználásával kapjuk meg. A külön névvel és jellel rendelkező származtatott egységek felsorolása a B-3. táblázatban található.

Megjegyzés: A B-3. táblázatban felsorolt származtatott valamint a nemzetközi polgári légiközlekedésben használatos egyéb mértékegységek felhasználása a 3-4. táblázatban található.

B-1. táblázat
SI alapegységek

Mennyiség	***(Mérték) egység***	***Jel***
egy anyag mennyisége	mole	mol
elektromos áram	amper	A
hosszúság	méter	m
fényerő	kandela	cd
tömeg (súly)	kilogramm	kg
termodinamikai hőmérséklet	kelvin	K
idő	másodperc	s

B-2. táblázat
SI kiegészítő egységek

Mennyiség	**(Mérték)egység**	**Jel**
síkszög	radián	rad
térszög	szteradián	sr

B-3. táblázat
SI egységből származtatott különleges elnevezésű mértékegységek

Mennyiség	**Egység**	**Jel**	**Származtatás**
elnyelt sugárzás dózis	gray	Gy	J/kg
rádió-nuklidok aktivitása	becguerel	Bq	I/s
elektromos kapacitás	farad	F	C/V
elektromos vezetőképesség	siemens	S	A/V
sugár-dózis egyenérték	sievert	Sv	J/kg
elektromos feszültség, feszültség különbség, elektromotors erő	volt	V	W/A
elektromos ellenállás	ohm	Ω	V/A
energia,munka,hőmennyiség	joule	J	N_xM
erő	newton	N	Kg_xm/s^2
periodikus jelenség frekvenciája	hertz	Hz	Is
megvilágítás	lux	lx	lm/m^2
induktivitás	henry	H	Wb/A
fényerő	lumen	lm	cd_xsr
mágneses fluxus	weber	Wb	V_xs
mágneses fluxus sűrűség	tesla	T	Wb/m^2

teljesítmény,sugárzási fluxus	watt	W	J/s
nyomás,fizikai igénybevétel	pascal	Pa	N/m^2
elektromos(villamos töltés)mennyiség	coulomb	C	A x s
elektromos töltés	coulomb	C	A x s

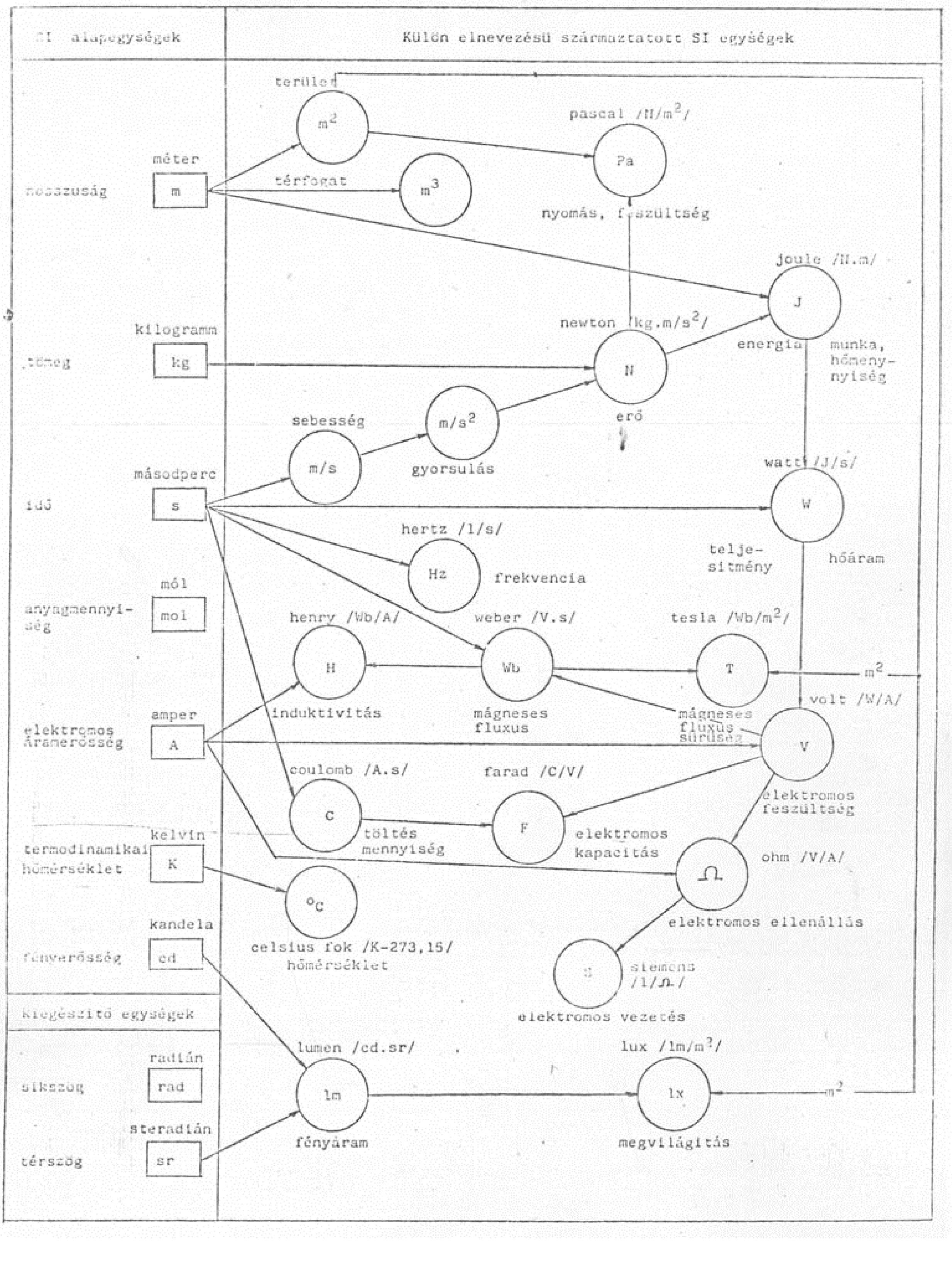
1.5. Az SI a méterrendszer egységeinek olyan racionalizált kiválogatása, ami magában véve nem új. Az SI nagy előnye, hogy minden egyes fizikai mennyiségre csak egy egység van – a hosszúságra a méter, a tömegre a kilogramm /gramm helyett/, az időre a másodperc stb. Ezekből az elemi vagy alapegységekből származtatják az egyéb mechanikai egységeket. Ezeket a származtatott egységeket egyszerű összefüggések alapján határozzák meg, így pl. a sebesség a távolság változásának arányával egyenlő, a gyorsulás egyenlő a sebesség arányának változásával, az erő a tömeg és a gyorsulás eredménye, a teljesítmény egységnyi idő alatt végzett munka stb. Néhány ilyen egységnek csak általános neve van, pl. a sebességnek méter/másodperc; néhánynak pedig külön neve van, így pl. erőre a newton /N/, az energiára a joule /J/, a teljesítményre a Watt /W/. Az erő, az energia és a teljesítmény SI egységei ugyanazok mechanikai, elektromos, kémiai vagy nukleáris folyamat esetén is. 1 newton erő,1 méter távolságból 1 joule hőt hoz létre, ami azonos azzal, amit 1 Watt villamosenergia 1 másodperc alatt hoz létre.

1.6. Az SI azon előnye mellett, hogy minden egyes fizikai mennyiségre külön egység használatos, előnyös a jelek és rövidítések egyedi és jól meghatározott rendszerének használata is. Ezek a jelek és rövidítések kizárják az összetévesztés lehetőségét, melyek a különböző tudományágak jelenlegi gyakorlatából eredhetnek, mint pld. a „b” jel használata a bar-ra /nyomásegység/ és a barn-ra /területegység/.

1.7. Az SI másik előnye, hogy a fizikai mennyiségek alapegységeinek többszörösei és osztói közötti decimális viszonyt fenntartja. Többszörös és osztó egységek jelölésére prefixumokat /jelzéseket/ hoztak létre „exa”-tól /10^{18}/ egészen „atto”-ig /10^{-18}/, az írás és a kiejtés megkönnyítése céljából.

1.8. Az SI további fő előnye annak összefüggősége. Bármelyik egységet választhatjuk, de ha az összehasonlítható mennyiségek egyes csoportjaihoz független egységet választunk, akkor különböző kiegészítő numerikus tényezők jelennek meg a számértékek egyenletében. Azonban lehetséges, és a gyakorlatban sokkal egyszerűbb, ha az egységek rendszerét úgy választjuk meg, hogy a számértékek – ideértve a numerikus tényezőket is – között ugyanolyan formájú egyenlőség van, mint a megfelelő mennyiségek között. Az így meghatározott egységrendszert összefüggőnek nevezzük, a mértékek rendszerére és a szóbanforgó egyenlőségekre való tekintettel. Összefüggő egységrendszer egységei közötti egyenletek numerikus tényezőként csak az 1-es számot tartalmazzák. Egy összefüggő rendszerben két egység szorzata vagy hányadosa az eredő mennyiség egysége. Pl. bármelyik összefüggő rendszerben egységterület jön ki, ha az egységhosszat egységhosszal szorozzuk és egységsebességet kapunk, ha egységidővel osztunk egységhosszat, egységerőt, ha egységtömeget egységgyorsulással szorzunk.
Megjegyzés. – A B-1. ábra mutatja az SI egységek összefüggését.

SI EGYSÉGEK ÖSSZEFÜGGÉSE



2. Tömeg, erő és súly

2.1.Az SI alapkiindulása a metrikus egységek gravimetrikai rendszeréből a tömeg és erő kifejezetten elhatárolható egységeinek használata. SI-ben a kilogramm elnevezés a tömeg egységére korlátozódik, és a kilogramm-erő /amelyből az „erő” toldalékot a gyakorlatban többször hibásan elhagyják/ nem használandó. Ehelyett az SI erő egysége, a Newton használatos. Hasonlóképpen az erőt magukban foglaló származtatott egységeknél is inkább a newtonból indul ki, mint a kg-erőből, pl. a nyomás vagy igénybevétel /N/m^2=Pa/, energia /N˙m=J/ és teljesítmény /N˙m/s=W/.

2.2.Nagy zavar van a súlykifejezés erő vagy tömeg mértékeként történő használatánál. Köz-használatban a súly majdnem mindig tömeget jelent, így amikor valaki egy személy súlyáról beszél, a kapott mennyiség tömegként jön szóba. A tudományban és technikában a test súlyának kifejezése általában azt az erőt jelenti, amit ha a testre gyakorolnak, annak olyan gyorsulást ad, ami egyenlő a szabadesés helyi gyorsulásával. A „helyi” jelző a „szabadesés helyi gyorsulása” kifejezésben általában a föld felszínén levő helyet jelenti; ebben az értelemben a „szabadesés helyi gyorsulásának” a jele g /néha úgy említik „gravitációs gyorsulás”/, a föld felszínén különböző pontokon a 'g' értékek több mint 0,5 % eltérést mutatnak, és ahogy a földtől való távolság nő, a 'g' értékek úgy csökkennek. Igy, mivel a súly erő = tömeg x gravitációs gyorsulás, egy személy súlya attól függ, hogy hol tartózkodik, de a tömege nem. Egy 70 kg tömegű személy a földön 686 N /kb. 155 lbf/ erőt /súlyt/ ad, a holdon csak 113 N erőt /megközelítőleg 22 lbf/. A mennyiségként használt súly kettős használata következtében a súly kifejezést a műszaki gyakorlatban el kell kerülni, hacsak annak jelentése nem teljesen tisztázott. Amikor a kifejezést használják, szükséges annak ismerete, hogy tömegről vagy erőről van-e szó és ismerni kell az SI egységek helyes használatát, vagyis tömegre kg-ot és erőre newtont kell használni.

2.3. A tömeg mérleggel történő meghatározásánál a gravitáció szerepet játszik. Amikor egy szabványtömeget használunk, a mért tömeg méréséhez a gravitáció a két tömegre kiegyenlítődik, de a közvetett hatás a levegő vagy más folyadék felhajtó erején keresztül általában nem egyenlítődik ki. Ha rugós mérleget használunk, a tömeg mérése indirekt történik, mivel a műszer reagál a gravitációs erőre. Igy a mérlegeket tömegegységben hitelesíteni akkor lehet, ha a gravitáció és a felhajtóerő korrekciókban levő különbségek használatuknál nem jelentősek.

3. Energia és forgatónyomaték

3.1. Az erő és a nyomatéki kar vektoriális szorzatát általában newton méterrel határozzák meg. A hajlító nyomaték vagy torziós nyomaték ezen egysége összekeverhető az energia egységével, ami szintén newton-méter. Ha a torziós nyomatékot newton-méter/radianban fejezik ki, az energiával való összefüggés világos, mivel a torziós nyomaték és a szögelfordulás szorzata az energia: /N • m/rad/ • rad = N • m

3.2. Ha vektorok szerepelnek, az energia és a forgatónyomaték közötti megkülönböztetés világos, mivel az erő és a hossz orientációja más a két esetben. Az energia és a torziós nyomaték használatánál ennek a különbségnek az ismerete fontos, s a joule-t sosem szabad torziós nyomatékhoz használni.

4. – SI prefixumok /jelzések/

4.1. – Jelzések kiválasztása

4.1.1 Az SI jelzéseket azért használják általában, hogy nagyságrendet jelöljenek velük, igy a nem jelentős számjegyeket kiküszöbölik és a nullákat tizedestörtre hozzák, megfelelő változatot kialakítva a tizes számrendszerű hatvány számításokhoz. Pl.

12 300 mm	12.3 m	lesz
$12{,}3 \times 10^3$ m	12.3 km	lesz

0,00123 μ A 1.23 nA lesz.

4.1.2 Amikor egy mennyiséget számértékkel és egységgel fejezünk ki, a jelzéseket mindenekelőtt úgy kell megválasztani, hogy a számérték 0,1 és 1000 között legyen. A különféleség csökkentése érdekében az 1000 hatványait mutató jelek használata ajánlatos, azonban a következő esetekben a fent említettől való eltérés jelölhető:

a) terület és térfogat kifejezésekor a hekto, deka és centi lehet szükséges, pl. négyzethektométer, köbcentiméter;

b) ugyanazon mennyiség értékeinek táblázatában vagy adott összefüggésen belül ilyen értékek megvitatásakor általában célszerű ugyanazt az egységtöbbszöröst használni végig és

c) egyedi alkalmazásoknál bizonyos mennyiségekre egy külön sorozatot használnak általában. Pl. magasságbeállításoknál hectopascalt használnak és műszaki rajzok hosszirányú méreteihez millimétert használnak még akkor is, ha az értékek kívül esnek a 0,1 – 1000 értéktartományon.

4.2 – Jelzések összetett egységeknél[xi1]

Ajánlatos, hogy egy összetett egység többszörösének kifejezésére csak egy jelzést használjunk. A jelzés általában egy egységnél a számlálóban szerepel. Kivétel, ha az egyik egység a kilogramm. Pl.: V/m, nem mV/mm; MJ/kg, nem kJ/g

4.3. – Összetett jelzések

ét vagy több SI jelzés egymás mellé helyezésével keletkező összetett jelzések nem használatosak. Pl.

1 nm nem 1 mμ m; 1 pF nem 1 μμF

Ha a jelzések által kifejezhető tartományon kívüli értékekre van szükség, akkor azokat az alapegységből 10 hatványaival képezzük.

4.4 – Egységek hatványai

Ha egy jelzést tartalmazó kifejezésnél hatványkitevő van, akkor az egység többszöröse vagy osztója /a jelzéssel ellátott egység/ a kitevő által kifejezett hatványra kerül.

Pl.:

1 cm^3	=	$/10^{-2}$ m$/^3$	= 10^{-6} m^3
1 ns^{-1}	=	$/10^{-9}$ s$/^{-1}$	= 10^9 s^{-1}
1 mm^2/s	=	$/10^{-3}$m$/^2$/s	= $10^{-6}$$m^2$/s

5. – Stílus és használat

5.1 – Egységjelek írásának szabályai

5.1.1 Az egységjeleket antikva /álló/ betűkkel kell írni, attól függetlenül, hogy a szövet milyen típusú betűkkel íródott.

5.1.2 Az egységjelek többesszámban változatlanok.

5.1.3 Az egységjelek után nem áll pont, csak ha a jel a mondat végére kerül.

5.1.4 A betűjeleket kisbetűvel írjuk, ha a jel nem tulajdonnévből ered, amikor is a jel első betűje nagy

/W, Pa/. A jelzések és egységjelek megtartják előírt formájukat a környező betűszedéstől függetlenül.
5.1.5 Egy mennyiség leírásakor közt kell hagyni a számérték és az egységjel között. Például 35 mm-t írunk és nem 35mm-t, 237 lm-et és nem 237lm-et. Amikor a mennyiséget jelzői értelemben használjuk, kötőjelet teszünk, pl. 35 mm-es film.

Kivétel: Nem hagyunk közt a számérték és a jel között síkszög fok, perc és másodpercnél, valamint Celsius foknál.

5.1.6 A jelzés és a jel között nem hagyunk helyet.

5.1.7 Jeleket és nem rövidítéseket használunk az egységeknél. Pl. ampernél írjunk A-t és nem amp-ot.

5.2 – Egységnevek írásának szabályai

5.2.1 A kiejtett egységnevek az angolban köznévként kezelendők. Igy az egységek első betűjét csak akkor írjuk nagybetűvel, ha mondatot kezdünk vele, vagy nagybetűs anyagot írunk, pl. címet, még akkor sem írjuk nagybetűvel, ha az egység neve tulajdonnévből származik és jelként nagybetűvel szerepel /lásd 5.1.4./ pl. azt írjuk newton és nem Newton, még akkor is, ha a jel N.

5.2.2 Többesszámot akkor használunk, ha a nyelvtani szabályok azt megkívánják és azt a szabályoknak megfelelően képezzük, pl. henries a henry többesszáma. A következő rendhagyó többesszámokra hívjuk fel a figyelmet:

Egyesszám	Többesszám
lux	lux
hertz	hertz
siemens	siemens

5.2.3 A jelzés és az egységnév között nincs köz vagy kötőjel.

5.3 – Szorzással és osztással képzett egységek

5.3.1 Egységnevekkel:

Közt /gyakoribb/ vagy kötőjelet használunk szorzatnál:

newton méter vagy newton-méter

A watt óra esetében a köz elhagyható, így:

wattóra

Hányadosnál a per szót és nem per-jelet használunk:

méter per másodperc és nem méter/másodperc

Hatványnál az egység neve után tesszük a négyzeten vagy köbön szót:

méter per másodperc a négyzeten

Terület vagy térfogat esetén ezt az egység neve elé is tehetjük:

négyzetmilliméter, köbméter

Ez a kivétel származtatott terület vagy térfogategységekre is vonatkozik:

watt per négyzetméter

Megjegyzés – Bonyolult kifejezéseknél a félreértés elkerülése érdekében jeleket és nem szavakat használunk.

5.3.2 Egységjelekkel:

Szorzat a következető módok mindegyikén kifejezhető:

Nm vagy N • m newton-méter esetén

Megjegyzés. – Amikor prefixumként olyan jelet használunk, amely az egység nevének jelével megegyezik, különös figyelmet kell fordítani a félreértés elkerülésére. A torziós nyomatékra a newton méter egységet Nm vagy N • m formában írjuk, hogy ne keverjük össze az mN-nel, a millinewtonnal.

Ennél a gyakorlatnál kivételt képeznek a számítógépes, automata írógéppel készülő munkák, stb., ahol a félsorral megemelt pont nem lehetséges és ezért a pont a sor alján használandó.

Hányadosnál a következő formák valamelyikét használjuk:

m/s vagy $m \cdot s^{-1}$ vagy $\frac{m}{s}$

Ugyanabban a kifejezésben egynél több per-jel nem használható, hacsak a félreértések elkerülése végett zárójelet nem kell használni. Pl.:

J/ /mol • K/ vagy $J \cdot mol^{-1} \cdot K^{-1}$
vagy /J/mol/K
de nem J/mol/K

5.3.3 Jelek és egységnevek nem keverendők össze ugyanabban a kifejezésben:
vagy azt írjuk, hogy

joule per kilogramm

vagy J/kg ill. $J \cdot kg^{-1}$

de nem joule/kilogramm vagy joule/kg v. $joule \cdot kg^{-1}$

5.4 – Számok

5.4.1 A használatos tizedesjelző a pont a vonalon; azonban a vessző is elfogadott. Amikor egynél kisebb számokat írunk, a zérót oda kell írni a tizedespont elé.

5.4.2 Számjegyek elkülönítésére vesszőt nem használunk. Ehelyett a számjegyeket hármas csoportokban írjuk a tizedesponttól számítva balra és jobbra és kis közt hagyva a csoportokat elkülönítjük. Pl.:

73 655 7 281 2.567 321 0.133 47

5.4.3 A számok szorzásának jele egy kereszt /x/ vagy egy fél sorral megemelt pont. Azonban ha a fél sorral megemelt pontot használjuk szorzójelként, akkor ugyanabban a kifejezésben nem használhatunk vonalon levő pontot a tizedes jelölésére.

5.4.4 Helytelen, ha egy egységjelhez betűt teszünk a mennyiség természetének megmagyarázása céljából. Igy Mwe „megawatt elektromos /teljesítmény”, Vac „volt ac” és kJt „kilojoules” hő „energia” jelölések nem elfogadhatóak. Ezért nem kell arra kísérletet tenni, hogy a „psia” és „psig” rövidítéseknek SI megfelelőt alkossunk, amit gyakran használunk az abszolút és manometrikus nyomás megkülönböztetésére. Ha a szövegből nem derül ki, hogy melyikről van szó, akkor a nyomás szót kell helyesen meghatározni, pl.

„….13 kPa túlnyomásnál”

vagy „….13 kPa abszolút nyomásnál”

C MELLÉKLET – ÁTVÁLTÁSI TÉNYEZŐK

1. – Általános rész

1.1. Az ebben a Kiegészítésben szereplő átváltási tényezők arra szolgálnak, hogy a mennyiségek különböző egységeinek meghatározását az SI egységek szám többszöröseként fejezzék ki.

1.2. Az átváltási tényezők úgy szerepelnek, hogy azok komputeres leolvasásra és elektronikus adat-továbbításra alkalmasak. A tényezők 1-nél nagyobb és 10-nél kisebb számként szerepelnek 6 vagy annál kevesebb tizedessel. Ezt a számot követi az E betű /kitevőt jelöl/ egy plusz vagy mínusz jel és 2 számjegy, amely 10 azon hatványát jelöli, amivel a számot meg kell szorozni ahhoz, hogy a helyes értéket megkapjuk, pl.:

3.523 907 E – 02 az $3.523\ 907 \times 10^{-2}$ vagy 0.035 239 07

hasonlóképpen,

3.386 389 E + 03 az $3.386\ 389 \times 10^{3}$ vagy 3 386.389

1.3. A 6. tizedes hely után levő csillag /*/ azt jelöli, hogy az átváltási tényező pontos és a hátrelevő számjegyek nullák. Ahol 6 tizedesnél kevesebb van, ott nagyobb pontosság nem szükséges.

1.4. További példák a táblázatok használatához:

Átváltás

	-ról	-ra	szorzással
	font-erő per négyzetláb	Pa	4.788 026 E + 01
	hüvelyk	m	2.540 000*E – 02
így:	$1\ lbf/ft^2$	= 47.880 26 Pa	
	1 inch	= 0.025 4 m /pontosan	

2. – Nem felsorolt tényezők

2.1. Az összetett egységeknél használatos átváltási tényezők, amelyeket itt nem sorolunk fel, könnyen megkaphatók, a listában megadott számokból, ha az átváltott egységeket a következőképpen behelyettesítjük.

Pl.: az lb ˙ ft/s /font x láb/másodperc / átváltása

kg • m/s – ra:

először átváltjuk a

fontot kg-ra: 1 font = 0.453 592 4 kg

lábot m-re: 1 láb = 0.304 8 m

azután behelyettesítjük:
/0.453 592 4 kg/ x /0.304 8 m/ /s =

0.138 255 kg · m/s
így a tényező: 1.382 55 E – 01

C-1. Táblázat. Átszámítási tényezők SI-egységekre
/Az SI-egységek jelei zárójelben vannak feltüntetve/

Az angol írásmóddal megadott mértékegységről	SI-egységre	Szorzótényezővel
abampere	amper (A)	1,000 000*E+01
abcoulomb	coulomb (C)	1,000 000*E+01
abfarad	farad (F)	1,000 000*E+09
abhenry	henry (H)	1,000 000*E-09
abmho	siemens (S)	1,000 000*E+09
abohm	ohm (W)	1,000 000*E-09
abvolt	volt (V)	1,000 000*E-08
acre (U.S. survey)	négyzetméter (m^2)	4,046 873 E-03
ampere hour	coulomb (C)	3,600 000 *E+03
are	négyzetméter (m^2)	1,000 000*E+02
atmosphere (standard)	pascal (Pa)	1,013 250*E+05
atmosphere (technical=1kgf/cm^2)	pascal (Pa)	9,806 650*E+04
bar	pascal (Pa)	1,000 000*E+05
barrel (for petroleum, 42 U.S. liquid gal)	köbméter (m^3)	1,589 873 E-01
British thermal unit (International Table)	joule (J)	1,055 056 E+03
British thermal unit (mean)	joule (J)	1,055 87 E+03
British thermal unit (thermochemical)	joule (J)	1,054 350 E+03
British thermal unit (39^{0}F)	joule (J)	1,059 67 E+03
British thermal unit (59^{0}F)	joule (J)	1,054 80 E+03
British thermal unit (60^{0}F)	joule (J)	1,054 68 E+03
Btu (International Table) . ft/h. ft^2 . oF (k, thermal conductivity)	watt per méterkelvin(W/m . K)	1,730 735 E+00
Btu (thermochemical) . ft/h.ft^2 . ^{0}F (k, thermal conductivity)	watt per méterkelvin(W/m . K)	1,729 577 E+00
Btu (International Table) . in/h. ft^2 . ^{0}F (k, thermal conductivity)	watt per méterkelvin (W/m . K)	1,442 279 E-01
Btu (thermochemical) . in/h . ft^2 . ^{0}F (k, thermal conductivity)	watt per méterkelvin (W/m . K)	1,441 314 E-01
Btu (International Table) . in/s . ft^2 . ^{0}F (k, thermal conductivity)	watt per méterkelvin (W/m . K)	5,192 204 E+02
Btu (International Table)/h (k, thermal conductivity)	watt per méterkelvin (W/m . K)	5,188 732 E+02
Btu (International Table) /h	watt (W)	2,930 711 E-01
Btu (thermochemical) /h	watt (W)	2,928 751 E-01
Btu (thermochemical) /s	watt (W)	1,757 250 E+01
Btu (thermochemical)/s	watt (W)	1,054 350 E+03
Btu (International Table)/ ft^2	joule per négyzetméter (J/m2)	1,135 653 E+04
Btu (thermochemical)/ ft^2	joule per négyzetméter (J/m^2)	1.134 893 E+04
Btu (thermochemical)/ ft^2 . h	watt per négyzetméter (W/m^2)	3.152 481 E+00

Az angol írásmóddal megadott mértékegységről	SI-egységre	Szorzótényezővel
Btu (thermochemical)/ ft^2 . min	watt per négyzetméter (W/m^2)	1.891 489 E+02
Btu (thermochemical)/ ft^2 . s	watt per négyzetméter (W/m^2)	1.134 893 E+04
Btu (thermochemical)/ft2 . s	watt per négyzetméter (W/m^2)	1.634 246 E+06
Btu (International Table) /h . ft^2 . ^0F (C, thermal conductance)	watt per négyzetméterkelvin (W/m^2 . K)	5.678 263 E+00
Btu (thermochemical)/h . ft^2 . oF (C, thermal conductance)	watt per négyzetméterkelvin (W/m^2 . K)	5.674 466 E+00
Btu (International Table) /s . ft^2 . ^0F	watt per négyzetméterkelvin (W/m^2 . K)	2,044 175 E+04
Btu (thermochemical) / s . ft^2 . ^0F	watt per négyzetméterkelvin (W/m^2 . K)	2,042 808 E+04
Btu (International Table)/lb	joule per kilogramm (J/kg)	2,326 000*E+03
Btu (thermochemical)/lb	joule per kilogramm (J/kg . K)	2.324 444 E+03
Btu (International Table)/lb . ^0F (C, heat capacity)	joule per kilogrammkelvin (J/kg . K)	4,186 800*E+03
calibre (inch)	méter (m)	2,540 000*E-02
calorie (International Table)	joule (J)	4,186 800*E+00
calorie (mean)	joule (J)	4,190 02 E+00
calorie (thermochemical)	joule (J)	4,184 000*E+00
calorie (15 ^0C)	joule (J)	4,185 80 E+00
calorie (20 ^0C)	joule (J)	4,181 90 E+00
calorie (kilogram, International Table)	joule (J)	4,186 800*E+03
calorie (kilogram, mean)	joule (J)	4,190 02 E+03
calorie (kilogram, thermochemical)	joule (J)	4,184 000*E+03
cal (thermochemical)/cm^2	joule per négyzetméter (J/m^2)	4,184 000*E+04
cal (International Table) /g	joule per kilogramm (J/kg)	4,186 800*E+03
cal (thermochemical) /g	joule per kilogramm (J/kg)	4,184 000*E+03
cal (International Table) /g	joule per kilogramm (J/kg)	4,186 800*E+03
cal (thermochemical) /g	joule per kilogramm (J/kg)	4,184 000*E+03
cal (International Table) /g . ^0C	joule per kilogrammkelvin (J/kg . K)	4,186 800*E+03
cal (thermochemival) / g . oC	joule per kilogrammkelvin (J/kg . K)	4,184 000*E+03
cal (thermochemical) /min	watt (W)	6,973 333 E-02
cal (thermochemical) /s	watt (W)	4,184 000*E+00
cal (thermochemical) /cm^2 . min	watt per négyzetméter (W/m^2)	6,973 333 E+02
cal (thermochemical) /cm^2 . s	watt per négyzetméter (W/m^2)	4,184 000*E+04
cal (thermochemical) /cm . s . °C	watt per méterkelvin (W/m . K)	4,184 000*E+02
centimetre of mercury (0 °C)	pascal (Pa)	1,333 22 E+03
centimetre of water (4 °C)	pascal (Pa)	9,806 38 E+01
centipoise	pascal másodperc (Pa . s)	1,000 000*E-03
centistokes	négyzetméter per másodperc(m^2/s)	1,000 000*E-06
circular mil	négyzetméter (m^2)	5,067 075 E-10
clo	kelvin-négyzetméter per watt (K . m^2/W)	2,003 712 E-01
cup	köbméter (m^3)	2,365 882 E-04
curie	becquerel (Bq)	3,700 000*E+10
day (mean solar)	másodperc (s)	8,640 000 E+04
day (sidereal)	másodperc (s)	8,616 409 E+04
degree (angle)	radian (rad)	1,745 329 E-02
^0F . h . ft^2 /Btu (International Table) (R, thermal resistance)	kelvin-négyzetméter per watt (K . m^2/W)	1,761 102 E-01
^0F . h . ft^2 /Btu (thermochemical) (R, thermal resistance)	kelvin-négyzetméter per watt (K . m^2/W)	1,762 280 E-01
dyne	newton (N)	1,000 000*E-05

Az angol írásmóddal megadott mértékegységről	SI-egységre	Szorzótényezővel
dyne . cm	newtonméter (N . m)	1,000 000*E-07
dyne/cm^2	pascal (Pa)	1,000 000*E-01
electonvolt	joule (J)	1,602 19 E-19
EMU of capacitance	farad (F)	1,000 000 E+09
EMU of current	amper (A)	1,000 000*E+01
EMU of electric potential	volt (V)	1,000 000*E-08
EMU of inductance	henry (H)	1,000 000*E-09
EMU of resistance	ohm (W)	1,000 000*E-09
erg	joule (J)	1,000 000*E-07
erg/cm^2 . s	watt per négyzetméter (W/m^2)	1,000 000*E-03
erg/s	watt (W)	1,000 000*E-07
ESU of capacitance	farad (F)	1,112 650 E-12
ESU of current	amper (A)	3,335 6 E-10
ESU of electric potential	volt (V)	2,997 9 E+02
ESU of inductance	henry (H)	8,987 554 E+11
ESU of resistance	ohm (Ω)	8,987 554 E+11
faraday (based on carbon-12)	coulomb (C)	9,648 70 E+04
faraday (chemical)	coulomb (C)	9,649 57 E+04
faraday (physical)	coulomb (C)	9,652 19 E+04
fathom	méter (m)	1,828 8 E+00
fermi (femtometre)	méter (m)	1,000 000*E-15
fluid ounce (U.S.)	köbméter (m^3)	2,957 353 E-05
foot	méter (m)	3,048 000*E-01
foot (U.S. survey)	méter (m)	3,048 006 E-01
foot of water (39,2 ^{0}F)	pascal (Pa)	2,988 98 E+03
ft^2	négyzetméter (m^2)	9,290 304*E-02
ft^2/h (thermal diffusivity)	négyzetméter per másodperc (m^2/s)	2,580 640*E-05
ft^2/s	négyzetméter per másodperc (m^2/s)	9,290 304*E+02
ft^3 (volume;section modulus)	köbméter (m^3)	2,831 685 E-02
ft^3/min	köbméter per másodperc (m^3/s)	4,719 474 E-04
ft^3/s	köbméter per másodperc (m^3/s)	2,831 685 E-02
ft^4 (moment of section)	méter a negyedik hatványon (m^4)	8,630 975 E-03
ft . lbf	joule (J)	1,355 818 E+00
ft . lbf/h	watt (W)	3,766 161 E-04
ft . lbf/min	watt (W)	2,259 697 E-02
ft . lbf/s	watt (W)	1,355 818 E+00
ft . poundal	joule (J)	4,214 011 E-02
free, fall, standard (g)	méter per másodperc a négyzeten (m/s^2)	9,806 650*E+00
ft/h	méter per másodperc (m/s)	8,466 667 E-05
ft/min	méter per másodperc (m/s)	5,080 000*E-03
ft/s	méter per másodperc (m/s)	3,048 000*E-01
ft/s^2	méter per másodperc a négyzeten (m/s^2)	3,048 000*E-01
footcandle	lux (lx)	1,076 390 E+01
footlambert	candela per négyzetméter (cd/m^2)	3,426 259 E+00
gal	méter per másodperc a négyzeten (m/s^2)	1,000 000*E-02
gallon(Canadian liquid)	köbméter (m^3)	4,546 090 E-03
gallon (U.K. liquid)	köbméter (m^3)	4,546 092 E-02
gallon (U.S. dry)	köbméter (m^3)	4,404 884 E-03
gallon (U.S. liquid)	köbméter (m^3)	3,785 412 E-03
gal (U.S. liquid) day	köbméter per másodperc (m^3/s)	4,381 264 E-08

Az angol írásmóddal megadott mértékegységről	SI-egységre	Szorzótényezővel
gal (U.S. liquid) min	köbméter per másodperc (m^3/s)	6,309 020 E-05
gal (U.S. liquid) hp.h	köbméter per joule	1,410 089 E-09
(SFC, specific fuel consumption)	(m^3/J)	
gamma	tesla (T)	1,000 000*E-09
gauss	tesla (T)	1,000 000*E-04
gilbert	amper (A)	7,957 747 E-01
grad	fok (síkszög)	9,000 000*E-01
grad	radian (rad)	1,570 796 E-02
gram	kilogramm (kg)	1,000 000*E-02
g/cm^3	kilogramm per köbméter (kg/m^3)	1,000 000*E-03
gram-force/cm^2	pascal (Pa)	9,806 650*E-01
hectare	négyzetméter (m^2)	1,000 000*E+04
horsepower (550 ft.lbf/s)	watt (W)	7,456 999 E+02
horsepower (electric)	watt (W)	7,460 000*E+02
horsepower (metric)	watt (W)	7,354 99 E+02
horsepower (water)	watt (W)	7,460 43 E+02
horsepower (U.K.)	watt (W)	7,457 0 E+02
hour (mean solar)	másodperc (s)	3,600 000 E+03
hour (sidereal)	kilogramm (kg)	5,080 235 E+01
hundredweight (short)	kilogramm (kg)	4,535 924 E+01
inch	méter (m)	2,540 000*E-02
inch of mercury (32 ^{0}F)	pascal (Pa)	3,386 38 E-03
inch of mercury (60 ^{0}F)	pascal (Pa)	3,376 85 E+03
inch of water (39,2 ^{0}F)	pascal (Pa)	2,490 82 E+02
inch of water (60 ^{0}F)	pascal (Pa)	2,488 4 E+02
in^2	négyzetméter (m^2)	6,451 600*E-04
in^3 (volume; section modulus)	köbméter (m^3)	1,638 706 E-05
in^3 /min	köbméter per másodperc (m^3/s)	2,731 177 E-07
in^4 (moment of section)	méter a negyedik hatványon (m^4)	4,162 314 E-07
in/s	méter per másodperc (m/s)	2,540 000*E-02
in/s^2	méter per másodperc a négyzeten (m/s^2)	2,540 000*E-02
kilocalorie (International Table)	joule (J)	4,186 800*E+03
kilocalorie (mean)	joule (J)	4,190 02 E+03
kilocalorie (thermochemical)	joule (J)	4,184 000*E+03
kilocalorie (thermochemical)	watt (W)	6,973 333 E+01
kilocalorie (thermochemical) /s	watt (W)	4,184 000*E+03
kilogram-force (kgf)	newton (N)	9,806 650*E+00
kgf . m	newton méter (N . m)	9,806 650*E+00
kgf . m	newton méter (N . m)	9,806 650*E+00
kgf/cm^2	pascal (Pa)	9,806 650*E+04
kgf/m^2	pascal (Pa)	9,806 650*E+00
kgf/m^2	pascal (Pa)	9,806 650*E+00
kgf/mm^2	pascal (Pa)	9,806 650*E+06
km/h	méter per másodperc (m/s)	2,777 778 E-01
kilopond	newton (N)	9,806 650*E+00
kW.h	joule (J)	3,600 000*E+06
kip (1 000 lbf)	newton (N)	4,448 222 E+03
kip/in^2 (ksi)	pascal (Pa)	6,894 747 E+06
knot (international)	méter per másodperc (m/s)	5,144 444 E-01
lambert	candela per négyzetméter (cd/m^2)	*E+04

Az angol írásmóddal megadott mértékegységről	**SI-egységre**	**Szorzótényezővel**
lambert	candela per négyzetméter (cd/m^2)	3,183 099 E+03
langley	joule per négyzetméter (J/m^2)	4,184 000*E+04
$lb.ft^2$ (moment of inertia)	kilogramm per négyzetméter ($kg.m^2$)	4,214 011 E-02
$lb.in^2$ (moment of inertia)	kilogramm négyzetméter ($kg.m^2$)	2,926 397 E-04
lb/ft.h	pascalmásodperc (Pa.s)	4,133 789 E-04
lb/ft.s	pascalmásodperc (Pa.s)	1,488 164 E+00
lb/ft^2	kilogramm per négyzetméter (kg/m^2)	4,882 428 E+00
lb/ft^3	kilogramm per köbméter (kg/m^3)	1,601 846 E+01
lb/gal (U.K. liquid)	kilogramm per köbméter (kg/m^3)	9,977 633 E+01
lb/gal (U.S. liquid)	kilogramm per köbméter (kg/m^3)	1,198 264 E+02
lb/h	kilogramm per másodperc (kg/s)	1,259 979 E-04
lb/hp.h (SFC, specific fuel consumption)	kilogramm per joule (kg/J)	1,689 659 E-07
lb/in^3	kilogramm per köbméter (kg/m^3)	2,767 990 E+04
lb/min	kilogramm (kg/s)	7,559 873 E-03
lb/s	kilogramm per másodperc (kg/s)	4,535 924 E-01
lb/yd^3	kilogramm per köbméter (kg/m^3)	5,932 764 E-01
lbf.ft	newtonméter (N.m)	1,355 818 E+00
lbf.ft/in	newtonméter per méter (N.m/m)	5,337 866 E+01
lbf.in	newtonméter (N.m)	1,129 848 E-01
lbf.in/in	newtonméter per méter (N.m/m)	4,448 222 E+00
$lbf.s/ft^2$	pascalmásodper (Pa.s)	4,788 026 E+01
lbf/ft	newton per méter (N/m)	1,459 390 E+01
lbf/ft^2	pascal (Pa)	4,788 026 E+01
lbf/in	newton per méter (N/m)	1,751 268 E+02
lbf/in^2 (psi)	pascal (Pa)	6,894 757 E+03
lbf/lb (thrust/weight (mass) ratio)	newton per kilogramm (N/kg)	9,806 650 E+00
light year	méter (m)	9,460 55 E+15
litre	köbméter (m^3)	1,000 000*E-03
maxwell	weber (Wb)	1,000 000*E-08
mho	siemens (S)	1,000 000*E+00
microinch	méter (m)	2,540 000*E-08
micron	méter (m)	1,000 000*E-06
mil	méter (m)	2,540 000*E-05
mile (international)	méter (m)	1,609 344*E+03
mile (statute)	méter (m)	1,609 3 E+03
mile (U.S. survey)	méter (m)	1,609 347 E+03
mile (international nautical)	méter (m)	1,852 000*E+03
mile (U.K. nautical)	méter (m)	1,853 184*E+03
mile (U.S. nautical)	méter (m)	1,852 000*E+03
mi^2 (international)	négyzetméter (m^2)	2,589 988 E+06
mi^2 (U.S. survey)	négyzetméter (m^2)	2,589 998 E+06
mi/h (international)	méter per másodperc (m/s)	4,470 400*E-01
mi/h (international)	kilométer per óra (km/h)	1,609 344*E+00
mi/min (international)	méter per másodperc (m/s)	2,682 240*E+01
mi/s (international)	méter per másodperc (m/s)	1,609 344*E+03
Millibar	pascal (Pa)	1,000 000*E+02
Millimetre of mercury (0^0C)	pascal (Pa)	1,333 22 E+02
Minute (angle)	radian (rad)	2,908 882 E-02
Minute (mean solar)	másodperc (s)	6,000 000 E+01

Az angol írásmóddal megadott mértékegységről	SI-egységre	Szorzótényezővel
Minute (sidereal)	másodperc (s)	5,983 617 E+01
Month (mean calendar)	másodperc (s)	2,628 000 E+06
Oersted	amper per méter (A/m)	7,957 747 E+01
Ohm centimetre	ohmméter (W .m)	1,000 000*E+02
Ohm circular-mil per ft	ohm-négyzetmilliméter per méter (W .mm^2/m)	1,662 426 E-02
Ounce (avoirdupois)	kilogramm (kg)	2,834 952 E-02
Ounce (troy or apothecary)	kilogramm (kg)	3,110 348 E-02
Ounce (U.K. fluid)	köbméter (m^3)	2,841 307 E-05
Ounce (U.S. fluid)	köbméter (m^3)	2,957 353 E-05
Ounce-force	newton (N)	2,780 139 E-01
Ozf.in	newtonméter (N.m)	7,061 552 E-03
oz (avoirdupois)/gal (U.K. liquid)	kilogramm per köbméter (kg/m^3)	6,236 021 E+00
oz (avoirdupois)/gal (U.S. liquid)	kilogramm per köbméter (kg/m^3)	7,489 152 E+00
oz (avoirdupois) /in^3	kilogramm per köbméter (kg/m^3)	1,729 994 E+03
oz (avoirdupois)/ft^2	kilogramm per négyzetméter (kg/m^2)	3,051 517 E-01
oz (avoirdupous) /yd^2	kilogramm per négyzetméter (kg/m^2)	3,390 575 E-02
Parsec	méter (m)	3,085 678 E+16
Pennyweight	kilogramm (kg)	1,555 174 E-03
perm (0 ^{0}C)	kilogramm per pascalmásodpercnégyzetméter (kg/Pa.s.m^2)	5,721 35 E-11
perm (23 ^{0}C)	kilogramm per pascalmásodpercnégyzetméter (kg/Pa.s.m^2)	5,745 25 E-11
perm . in (0 ^{0}C)	kilogramm per pascalmásodpercméter (kg/Pa.s.m)	1,453 22 E-12
perm.in (23 ^{0}C)	kilogramm per pascalmásodpercméter (kg/Pa.s.m)	1,459 29 E-12
phot	lumen per négyzetméter (lm/m^2)	1,000 000*E+04
pint (U.S. dry)	köbméter (m^3)	5,506 105 E-04
pint (U.S. liquid)	köbméter (m^3)	4,731 765 E-04
poise (absolute viscosity)	pascalmásodperc (Pa.s)	1,000 000*E-01
pound (lb avoirdupois)	kilogramm (kg)	4,535 924 E-01
pound (troy or apothecary)	kilogramm (kg)	3, 732 417 E-01
poundal	newton (N)	1,382 550 E-01
poundal /ft^2	pascal (Pa)	1,488 164 E+00
poundal.s/ft^2	pascalmásodperc (Pa.s)	1,488 164 E+00
pound-force (lbf)	newton (N)	4,488 222 E+
quart (U.S. liquid)	köbméter (m^3)	9,463 529 E-04
rad (radiation dose absorbed)	gray (Gy)	1,000 000*E-02
rem	sievert (Sv)	1,000 000*E-02
rhe	1 per pascalmásodperc (1/Pa.s)	1,000 000*E+01
roentgen	coulomb per kilogramm (C/kg)	2,58 E-04
second (angle)	radian (rad)	4,848 137 E-06
second (sideral)	másodperc (s)	9,972 696 E-01
slug	kilogramm (kg)	1,459 390 E+01
slug/ft.s	pascalmásodperc (Pa.s)	4,788 026 E+01
slug/ft^3	kilogramm per köbméter (kg/m^3)	5,153 788 E+02
statampere	amper (A)	3,335 640 E-10
statcoulomb	coulomb (C)	3,335 640 E+10
statfarad	farad (F)	1,112 650 E-12
stathenry	henry (H)	8,987 554 E+11

Az angol írásmóddal megadott mértékegységről	**SI-egységre**	**Szorzótényezővel**
statmho	siemens (S)	1,112 650 E-12
statohm	ohm (W)	8,987 554 E+11
statvolt	volt (V)	2,997 925 E+02
stere	köbméter (m^3)	1,000 000*E+00
stilb	candela per négyzetméter (cd/m^2)	1,000 000*E+04
stokes (kinematic viscosity)	négyzetméter per másodperc (m^2/s)	1,000 000*E-04
therm	joule (J)	1,055 056 E+08
ton (assay)	kilogramm (kg)	2,916 667 E-02
ton (long, 2 240 lb)	kilogramm (kg)	1,016 047 E+03
ton (metric)	kilogramm (kg)	1,000 000*E+03
ton (nuclear equvalent of TNT)	joule (J)	4,184 E+09
ton (refrigeration)	watt (W)	3,516 800 E+03
ton (register)	köbméter (m^3)	2,831 685 E+00
ton (short, 2 000 lb)	kilogramm (kg)	9,071 847 E+02
ton (long) yd^3	kilogramm per köbméter (kg/m^3)	1,329 939 E+03
ton (short)/h	kilogramm per másodperc (kg/s)	2,519 958 E-01
ton-force (2 000 lbf)	newton (N)	8,896 444 E+03
tonne	kilogramm (kg)	1,000 000*E+03
torr (mm hg, 0 ^{0}C)	pascal (Pa)	1,333 22 E+02
unit pole	weber (Wb)	1,256 637 E-07
W.h	joule (J)	3,600 000*E+03
w.s	joule (J)	1,000 000*E+00
W/cm^2	watt (W/m^2)	1,000 000*E+04
W/in^2	watt per négyzetméter (W/m^2)	1,550 003 E+03
yard	méter (m)	9,144 000*E-01
yd^2	négyzetméter (m^2)	8,361 274 E-01
yd^3	köbméter (m^3)	7,645 549 E-01
yd^3/min	köbméter per másodperc (m^3/s)	1,274 258 E-02
year (calendar)	másodperc (s)	3,153 600 E+07
year (sideral)	másodperc (s)	3,155 815 E+07
year (tropical)	másodperc (s)	3,155 693 E+07

C-2. Táblázat Hőmérséklet-átszámítási egyenletek

Az angol írásmóddal megadott mértékegységről	**SI-egységre**	**Átszámítási egyenlet**
Celsius temperature (t ^{0}C)	Kelvin temperature (^{t}K)	^{t}K = t ^{0}C +273.15
Fahrenheit temperature (t ^{0}F)	Celsius temperature (t ^{0}C)	toC = (t ^{0}F- 32)/1.8
Fahrenheit temperature (t ^{0}F)	Kelvin temperature (^{t}K)	tK = (t ^{0}F + 459.67)/1.8
Kelvin temperature (^{t}K)	Celsius temperature (t ^{0}C)	toC = ^{t}K – 273.15
Rankine temperature (t ^{0}R)	Kelvin temperature (^{t}K)	tK = t ^{0}R/1.8

*A hatodik decimális számjegy utáni csillag azt jelzi, hogy a tényező pontos érték, és az utána következő minden többi számjegy nulla.

Ahol hat tizedes számjegynél kevesebb szerepel, ott nincs szükség nagyobb pontosságra.

D MELLÉKLET – EGYEZTETETT EGYETEMES IDŐ

1. Egyeztetett Egyetemes Idő (UTC) váltotta fel a Greenwich-i középidő-t (GMT) az óraidő nemzetközi szabványaként. Ez szolgál sok államban a polgári időszámítás alapjául és ezt használják a repülésben világszerte használatos pontos időt sugárzó adásoknál is. Az UTC használatát olyan szervek javasolják, mint a Súlyok és Mértékek Általános Konferenciája (CGPM), a Nemzetközi rádió Konzultatív Tanács (CCIR) és a Rádió Világkonferencia (WARC).

2. Valamennyi óraidő alapjául a Nap látszólagos forgása szolgál. Ez azonban változó, mely többek között függ attól, hogy a Föld melyik pontján mérik. Ennek az időnek a középértékét, amely a Föld számos pontján végzett méréseken alapul, Egyetemes Időnek nevezik. Egy másfajta időskála, mely a másodperc meghatározásán alapul, a Nemzetközi Atomidő (TAI). Ennek a két időskálának a kombinációja eredményezi az Egyeztetett Egyetemes Időt. Ez a TAI-ból áll, melyet szükség szerint módosítanak szökőmásodpercekkel az Egyetemes Időhöz való szoros igazodás (max. 0,5 mp eltérés) érdekében.

E MELLÉKLET – DÁTUM ÉS IDŐJELZÉS SZÁMJEGYES FORMÁKBAN

1. Bevezetés

A Nemzetközi Szabványosítási Szervezet (ISO) 2014 és 3307 szabványai meghatározzák a dátumok és időpontok számjegyes formában történő kifejezésének módját és az ICAO ezeket az eljárásokat fogja a jövőben alkalmazni azokban a kiadványaiban, ahol ezek szükségesek.

2. Dátumjelölés

Ahol a dátumot számjegyes formában fejezik ki, az ISO 2014 úgy írja elő, hogy az év-hónap-nap sorrend használandó. A dátum elemei az alábbiak legyenek:
– négy számjegy, mely az évet fejezi ki, de lehetőség van az évszázadot jelölő számjegyek elhagyására, ha ez az elhagyás nem okozhat zavart. Érdemes az új formátum megszokásáig használni az évszázadot jelölő számjegyeket, abból a célból, hogy világosan kitűnjön az új sorrend alkalmazása;
– két számjegy a hónap jelölésére;
– két számjegy a nap megjelölésére.

Amikor a könnyebb érthetőség érdekében ajánlatos az elemek szétválasztása, az elemek szétválasztására csak egy szóközt, vagy egy kötőjelet használjanak. Pl. 1983. augusztus 25-e a következőképpen írható:

19830825 vagy 830825, vagy
1983-08-25 vagy 83-08-25, vagy
1983 08 25 vagy 83 08 25.

Hangsúlyoznunk kell azonban, hogy az ISO sorrend csak akkor használható, ha teljes egészében számjegyekkel kívánják a dátumot kifejezni. Számjegyek és szavak kombinációja szükség esetén továbbra is alkalmazható (pl. 1983 augusztus 25).

3. Óraidő jelölése

3.1 Amennyiben az óraidőt számjegyekkel jelölik, az ISO 3307 szerint az óra-perc-másodperc sorrend alkalmazandó.
3.2 Az órák jelölésére két számjegy használható 00-tól 23-ig a 24 órás időalapú rendszerben, ezt vagy az óra decimális törtértéke, vagy percek és másodpercek követik. Ha az óra decimális törtértékét alkalmazzák, a normális tizedesponttal történő elválasztás után adják meg a kívánt pontossághoz szükséges számjegyeket. (a ford. megj.: az angol nyelvben tizedesvessző helyett tizedespontot használnak).

3.3 A perceket a fentiekhez hasonlóan két számjeggyel fejezzék ki 00 és 59 között, melyet a másodperc decimális értéke követ, ha erre szükség van.

3.4 A másodperceket a fentiekhez hasonlóan két számjeggyel fejezzék ki 00 és 59 között, melyet a másodperc decimális értéke követ, ha erre szükség van

3.5 Amennyiben a könnyebb érthetőség érdekében szükséges, az órákat és perceket, valamint a perceket és másodperceket kettősponttal válasszák el egymástól.

Pl. du. 3 óra 20 perc 18 másodperc a következőképpen írható:
152018 vagy 15:20:18 órákban, percekben és másodpercekben, **vagy**, 1520.3 vagy 15:20.3 órákban, percekben és a perc decimális törtértékekben, **vagy,** 15.338 órákban és az óra decimális törtértékében.

4. Dátum és óraidő csoportok kombinációja

Ez a megjelenítési forma lehetővé teszi a dátum és időpont egybeírásának egységesítését. Ilyen esetben az év-hónap-nap-óra-perc-másodperc elemsorrend használandó. Megjegyzésre érdemes, hogy nem szükséges minden esetben valamennyi elemet feltüntetni, egyes esetekben pl. csak a nap-óra-perc is használható.

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[i]Az 5. Annex esetenként lehetővé lehetővé teszi a nem-SI, alternatív mértékegységek alkalmazását. Itt az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol a kiadványokban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlők és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

ii Egységnyi fényerő térszög egységenként (gyertyafényerő ~ cd)

iii A kisugárzási fényből számított mennyiségi érték a kisugárzás időtartama alapján szabványos CIE fénymérési értékben megállapítva.

iv General Conference of Weights and Measures

v Prefixumok

vi Bureau International des Poids et Mesures

vii CIPM

viii Nemzetközi Súly és Mérték Bizottság

ix Procés-Verbaux CIPM, 1963, 31, 97

x 1930 – 1933 között a CCE fényerősség-méréstani kérdésekkel foglalkozó részlege

xi Összetett egység olyan egység, amely két vagy több egységgel van kifejezve, azaz nincs saját külön neve

ANNEX 6/I.
A légijármű üzemeltetése: Nemzetközi kereskedelmi légiszállítás – Repülőgépek

I. kötet 8. kiadás – 2001. július
30. módosítással

A jelen kiadvány magába foglalja a 6. Annex I. részének 2001 március 10-e előtt elfogadott összes módosításait és 2001 november 1-től hatálytalanítja 6. Annex I. kötetének összes korábbi kiadásait.

A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót.

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette
1. – 26.	2001 július 16.	2001 november 1.	
27. módosítás (A Tanács 2002 március 15-én fogadta el)	2002 július 15.	2002 november 28	
28. módosítás (A Tanács 2003 március 13-án fogadta el)	2003 július 14.	2003 november 27.	
29. módosítás (A Tanács 2005 március 9-én fogadta el)	2005 július 11	2005 november 24	
30. módosítás (A Tanács 2006 március 14-én fogadta el) A következő oldalak cseréje: (iii)–(v), (vi), (viii), (xxi), (1-2)–(1-5), (3-1)–(3-2), (4-1)–(4-9), (6-1)–(6-11), (8-1)–(8-4), (9-1)–(9-4), 10-1, APP 2-1, (APP 5-1)–(APP 5-2), (ATT F1)–(ATT F-5)	2006 július 17	2006 november 23	

Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

A 6. Annex I. részében alkalmazott rövidítések és jelzések

Rövidítések és jelzés

AC	váltóáram
ACAS	Összeütközés elkerülését biztosító fedélzeti rendszer
ADREP	Légijármű baleset vagy esemény jelentés
ADS	Automatikus légtérfelderítés
AFCS	Automatikus repülésvezérlő rendszer
AGA	Repülőterek, légútvonalak és földi berendezések
AIG	Légijármű baleset kivizsgálás és megelőzés
AOC	Repülésvégrehajtás irányítása
AOC	Légijármű járatói engedély
APU	Segédhajtómű
ASDA	Rendelkezésre álló gyorsításból történő megállási távolság
ASE	Magasságmérő rendszer hiba
ASIA/PACIFIC	Ázsia és Csendes Óceáni területek
ATC	Légiforgalmi irányító szolgálat
ATM	Légiforgalom szervezés
ATS	Légiforgalmi szolgálatok
CAS	Műszer szerint szabályozott helyesbített sebesség
CAT I	I. kategória
CAT II	II. kategória
CAT IIIA	IIIA. kategória
CAT IIIB	IIIB. kategória
CAT IIIC	IIIC. kategória
Cm	centiméter
CDL	Repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek jegyzéke
CFIT	Földnek ütközés vezetett repülés során (szabályszerűen üzemelő légijárművel)
CPDLC	Légiforgalmi irányító és repülőgépvezető közötti adatátviteli összeköttetés
CVR	Pilótakabin hangrögzítő berendezés
DA	Tengerszint feletti elhatározási magasság
DA/H	Elhatározási magasság
DC	Berendezés vezérlés
D-FIS	Adatátvitelt alkalmazó repüléstájékoztatás
DH	Talajszint feletti elhatározási magasság
DME	Távolságmérő berendezés
DSTRK	Kívánatos repülési irány
ECAM	Központi elektronikus légijármű képernyő
EFIS	Elektronikus repülésvezérlő műszer rendszer
EGT	Kilépő gázhőmérséklet

EICAS	Hajtómű kijelző és hajózószemélyzet riasztó rendszer
ELT	Vészhelyzeti helyjeladó berendezés
ELT(AD)	Automatikusan kibocsátható vészhelyzeti helyjeladó berendezés
ELT(AF)	Automatikus állandó vészhelyzeti helyjeladó berendezés
ELT(AP)	Automatikus hordozható vészhelyzeti helyjeladó berendezés
EPR	Hajtómű nyomásviszony
ETOPS	Gázsugár hajtóműves repülőgép megnövelt hatótávolságú üzemeltetése
EUROCAE	Európai Polgári Légiközlekedési Elektronikai Szervezet
FDAU	Repülési adatgyűjtő egység
FDR	Légijármű repülési adatrögzítő
FL	Repülési szint
FM	Frekvencia moduláció
ft	láb
ft/min	láb/perc
g	Általános gyorsulás
GCAS	Földnek ütközés elkerülését biztosító fedélzeti rendszer
GNSS	Műholdas navigációs világ rendszer
GPWS	Földközelség jelző és riasztó rendszer
hPa	Hektopascal
IFR	Műszerrepülési szabályok
ILS	Műszeres leszállító rendszer
IMC	Műszeres időjárási körülmények
INS	Inerciális navigációs rendszer
ISA	Nemzetközi műlégkör
kg	kilogramm
kg/m^2	kilogramm/négyzetméter
km	kilométer
km/h	kilométer/óra
kt/s	csomó/másodperc
Lb	font (súlymérték)
LDA	Rendelkezésre álló leszállási távolság
M	méter
MDA	Legalacsonyabb tengerszint feletti süllyedési magasság
MDA/H	Legalacsonyabb süllyedési magasság tengerszint/földfelszín felett
MDH	Legalacsonyabb földfelszín feletti süllyedési magasság
MEL	Minimális berendezések jegyzéke
MHz	Megahertz
MLS	Mikrohullámú leszállító rendszer
MMEL	Gyártó minimális felszerelési jegyzéke
MNPS	Minimális navigációs teljesítmény előírás

MOPS	Minimális üzemi teljesítmény előírás
m/s	méter/másodperc
m/s^2	méter/másodperc négyzet
N	Newton (erő)
N_1	Nagynyomású gázturbina forgási sebesség
N_2	Ventilátor forgási sebesség
N_3	Kompresszor forgási sebesség
NAV	Navigáció
NM	Tengeri mérföld
OCA	Akadálymentes tengerszint feletti magasság
OCA/H	Akadálymentes tengerszint/földfelszín feletti magasság
OCH	Akadálymentes földfelszín feletti magasság
PANS	Légiforgalmi szolgálatok eljárásai
RNP	Előírt navigációs teljesítmény
RVR	Futópályamenti látástávolság érték
RVSM	Csökkentett függőleges elkülönítési minimum
SICASP	Másodlagos légtérfelderítő radar fejlesztési és összeütközés elkerülési rendszereket kidolgozó munkacsoport
SOP	Szabványos üzemeltetési eljárások
SST	Hangsebesség feletti szállítás
STOL	Rövid fel és leszállás
TAS	Tényleges repülési sebesség
TAWS	Földfelszín közelség figyelmeztető rendszer
TCAS	Forgalmi riasztást és összeütközés elkerülést biztosító rendszer
TLA	Tolóerő szabályzó kar állásszöge
TLS	Megcélzott biztonsági szint
TODA	Rendelkezésre álló felszállási távolság
TORA	Rendelkezésre álló felszállási nekifutási távolság
TVE	Összegzett függőleges hiba
UTC	Egyeztetett világidő
VFR	Látvarepülési szabályok
V_D	Tervezési süllyedési sebesség
VMC	Látás utáni időjárási körülmények
V_{MC}	Legalacsonyabb sebesség, amelyen a légijármű üzemképtelen fő hajtómű mellett még kormányozható
VOR	Ultrarövidhullámú körsugárzó adóberendezés
V_{S_0}	Átesési sebesség, azaz a legalacsonyabb állandó sebesség a repülésvezérlő szerkezetek leszálláshoz történő beállítása mellett
V_{S_1}	Átesési sebesség, azaz a legalacsonyabb állandó sebesség a repülésvezérlő szerkezetek meghatározott beállítása mellett
VTOL	Függőleges fel és leszállás

WXR	Időjárás
Szimbólumok	
°C	Celsius fok
%	Százalék

A jelen Annex előírásaival kapcsolatos kiadványok

Egyezmény a Nemzetközi Polgári Légiközlekedésről (Doc 7300)
Európai Polgári Légiközlekedési Elektronikai Szervezet (EUROCAE) ED55A és ED56A jelzésű kiadványai
Nemzetközi előírások a nyílt tengeren történő összeütközés megelőzésére
A Nemzetközi Légiszállítás Szabályzásának Előírásai és Útmutatói (Doc 9587)
Jegyzőkönyv a nemzetközi polgári légiközlekedésről szóló Egyezmény (83. b cikkely) módosításáról (Doc 9318)

A Nemzetközi Polgári Légiközlekedési Egyezmény jelen kiadványban felhasznált **Annex**-ei

1. Annex	*Személyi jogosítás*
2. Annex	*Repülési szabályok*
3. Annex	*A nemzetközi légiközlekedés meteorológiai szolgálata*
4. Annex	*Léginavigációs térképek*
5. Annex	*A légi és földi üzemeltetésnél alkalmazott mértékegységek*
6. Annex	*Légijárművek üzemeltetése* *II. rész – Általános célú nemzetközi légiközlekedés – Repülőgépek* *III. rész – Nemzetközi üzemeltetés – Forgószárnyas légijárművek*
7. Annex	*Légijármű nemzetisége és lajstromozása*
8. Annex	*Légijármű légialkalmassága*
9. Annex	*Egyszerűsítések*
10. Annex	*Légiforgalmi távközlés III. kötet* *I. rész – Digitális adatátviteli rendszerek* *II. rész – Rádiótávbeszélő rendszerek*
	Légiforgalmi távközlés IV. kötet
11. Annex	Légiforgalmi szolgálatok
12. Annex	Kutatás és mentés
13. Annex	Légijármű baleset kivizsgálás
14. Annex	Repülőterek I. kötet – Repülőtér tervezés és üzemeltetés
15. Annex	Légiforgalmi tájékoztató szolgálat
16. Annex	Környezetvédelem I. kötet – Légijármű zaj
18. Annex	Veszélyes árúk légi szállítása

A Légiforgalmi Szolgálatok Eljárásai

ATM – Légiforgalmi Áramlásszervezés (Doc 4444)
PANS-OPS – Légijármű Üzemeltetés (Doc 8168)
I. kötet – Repülési eljárások
II. kötet – A látvarepülési (VFR) és műszerrepülési (IFR) szabályok kidolgozása
PANS-ATM – Légiforgalom Szabályzása és Légiforgalmi Irányító Szolgálatok Szabályai (DOC 4444)
Körzeti Kiegészítő Eljárások (Doc 7030)

Kézikönyvek

ADREP Légijármű Baleset és Repesemény Jelentése (Doc 9156)
Folyamatos Légialkalmassági Kézikönyv (Doc 9642)
Légijármű baleset megelőzési kézikönyv (Doc 9422)
Repülőtér Szolgálati Kézikönyv (Doc 9137)
1. rész – Tűzoltó és mentő szolgálatok
8. rész – Repülőtér üzemeltető szolgálatok
Légijármű Légialkalmassági Kézikönyv (Doc 9760)
Emberi Tényezők Kiképzési Kézikönyv (Doc 9683)
A Földi Jégtelenítés Végrehajtási Kézikönyve (Doc 9640)

Időjárástól Független Légijármű Üzemeltetés Kézikönyve (Doc 9365)

A Repülési Szimulátorok Minősítési Kézikönyve (Doc 9625)

Üzemeltetés Felügyeleti, Jogosítási és Folyamatos Ellenőrzési Eljárások Kézikönyve (Doc 8335)

A 300 Méter (1000 Láb) Csökkentett Függőleges Elkülönítési Minimum FL290 és FL410 Közötti Bevezetésének Kézikönyve (Doc 9574)

Az Előírt Navigációs Teljesítmény (RNP) Kézikönyve (Doc 9613)

Üzemeltetési Kézikönyv Elkészítése (Doc 9376)

Körlevelek

126. szám Útmutató a hangsebesség feletti szállító légijármű üzemeltetéséhez
126. szám Útmutató a hangsebesség feletti szállító légijármű üzemeltetéséhez

Előszó

Történeti háttér

A nemzetközi kereskedelmi légiszállításban üzemeltetett légijárművekre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (1944. Chicago) 37. cikkelyének rendelkezései alapján 1948 december 10-én fogadta el és foglalta a 6. számú Annex-be. Az előírások 1949 július 15-én léptek hatályba. A nemzetközi előírások és ajánlott gyakorlati eljárások az Üzemeltetési Bizottság 1946 áprilisi első és 1947 februári második ülése javaslatai alapján kerültek kidolgozásra.

Az Annex módosításait, amelyek új nemzetközi előírásokat és ajánlott gyakorlati eljárásokat valamint a meglevő előírások módosításait tartalmazták, az Üzemeltetési Bizottság 1949 február-márciusi harmadik és 1951 március-áprilisi negyedik, ülésének javaslatai alapján dolgozták ki, a Tanács az alábbiak szerint fogadta el és vezette be; 1950 december 5 (1–127. módosítás, hatályos 1951 június 1); 1951 december 4 (128–131. módosítás, hatályos 1952 május 1); 1952 november 28 (132–133. módosítás, hatályos 1953 április 1); 1952 december 2 (134. módosítás, hatályos 1953 május 1); 1953 október 20 (135. módosítás, hatályos 1954 március 1); 1956 február 23 (136. módosítás, hatályos 1956 július 1); 1956 május 8 (137. módosítás, hatályos 1956 szeptember 1) és 1956 május 15 (138. módosítás, hatályos 1956 szeptember 15).
A harmadik Léginavigációs Konferencia (1956 szeptember-október, Montreal) többek között felülvizsgálta az Annex teljes 5. fejezetét. A módosítási javaslatokat megküldték az összes szerződő államnak és ezt követően a Léginavigációs Bizottság felülvizsgálta a beérkezett válaszokat és javaslatokat. Az ajánlások eredményeképpen a Tanács 1957 június 13-án 139. módosításként elfogadta az 5. fejezet teljes új szövegét és az 1957 október 1-én hatályba lépett.

A Tanács továbbá 1957 június 13-án elfogadta a 140. módosítást, amely 6. fejezetben a légijármű törzsének átvágható részei jelölésével valamint a navigációs fényekkel, a 8. fejezetben a légijármű légialkalmassági bizonyítványának kiadásáért felelős személyek képesítésével, a 9. fejezetben a repülőgépvezető útvonal és repülőtéri minősítésével és a 10. fejezetben a repülés üzemi tisztek szakszolgálati követelményeivel foglalkozott. A módosítás 1957 október 1-én lépett hatályba. Az ötödik kiadás után a Tanács 1958 május 12-én elfogadta a 141. módosítást, amely 1958 december 1-én lépett hatályba. A Tanács 1959 december 8-án elfogadta a 142. módosítást, amely a 6. fejezetben a hordozható vészrádió adókészülék rendszeresítésével foglalkozott, ez 1960 május 1-én lépett hatályba és 1960 augusztus 1-től alkalmazható. 1960 december 2-án a Tanács elfogadta a 143. módosítást, amely a 4. fejezetben az üzemeltetési tájékoztatásokkal, köztük a légiforgalmi irányító szolgálatnak benyújtott repülési tervek változásával foglalkozott, ez 1961 április 1-én lépett hatályba és 1961 július 1-től alkalmazható. 1961 március 24-én a Tanács elfogadta a 144. módosítást, amely a hajózószemélyzet repülési szolgálati idejének korlátozásával és pihenőidejének biztosításával foglalkozott és az Annex mellékletében útmutatót készített a szolgálati és pihenő időre vonatkozóan; ez 1961 augusztus 1-én lépett hatályba és 1961 október 1-től alkalmazható. A Tanács 1961 március 24-én elfogadta a 145. és 1961 december 13-án a 146–148. módosításokat. Ezek elsősorban az oxigén rendszer használatával, a nagy-intenzitású összeütközés elleni fények bevezetésével valamint egyéb, szerkesztési kérdésekkel foglalkoztak. A módosítások 1962 április 1-én léptek hatályba és 1962 július 1-től alkalmazhatók. A Tanács 1963 április 8-án elfogadta a 149. módosítást, amely meghatározta, hogy a vízfelszín felett végrehajtott hosszú-távú repülések esetében milyen vészhelyzeti és túlélő felszerelések szállítása szükséges. A módosítás 1963 augusztus 1-én lépett hatályba és 1963 november 1-től alkalmazható.

Az Annex hatodik kiadását a 150. módosítás elfogadását követően adták ki, amelyet annak átfogó természete tett szükségessé. Az ajánlásokat a negyedik Léginavigációs Konferencián (1965 november-december, Montreal) dolgozták ki elsősorban azzal a céllal, hogy az Annex megfeleljen a nagy teljesítményű, gázsugár hajtóműves légijárművek támasztotta üzemeltetési követelményeknek. Azonkívül a Konferencia ajánlása alapján az Annex alkalmazhatóságát a nemzetközi menetrendszerű és nem-menetrendszerű kereskedelmi légiszállításban üzemeltetett „repülőgépek”-re korlátozták. Korábban ez a korlátozás csak a nem-menetrendszerű nemzetközi légiszállításra vonatkozott. A 150. módosítást a Tanács 1966 december 14-én fogadta el, ez 1967 április 14-én lépett hatályba és 1967 augusztus 24-től alkalmazható.

A Tanács 1967 november 8-án elfogadta a 151. módosítást, amely a 7. Annex 2. módosítása alapján új meghatározást adott a „légijármű” kifejezésnek, továbbá kiegészítette az 5.2.7.2.2 pontot, felvéve ebbe a három hajtóműves repülőgépeket. A módosítás 1968 március 8-án lépett hatályba és 1968 augusztus 22-től alkalmazható.

A Tanács 1969 január 23-án elfogadta a 152. módosítást. Ebben a 4, 7. és 8. fejezetek egyes részeinek pontosítását célzó módosítások mellett a 4. fejezetet olyan előírással egészítették ki, amely megtiltja a repülőgép repülési jellemzőit befolyásoló vészhelyzeti gyakorlást repülés közben abban az esetben, ha a fedélzeten utasok tartózkodnak. Ez adott alkalmat arra is, hogy módosításokat eszközöljenek a Tanács által elfogadott – *Nemzetközi előírások és ajánlott gyakorlati eljárások – Légijármű üzemeltetés* – 6. Annex II. rész – *Nemzetközi általános célú légiközlekedés* című társ-dokumentumban. A módosítást alapján az eddig 6. Annex-ként jelzett dokumentum új megnevezése „6. Annex I. rész I. kiadás” lett. A 152. módosítás 1969 május 23-án lépett hatályba és 1969 szeptember 18-tól alkalmazható. A 6. Annex új, *Nemzetközi üzemeltetés – Forgószárnyas légijárművek* című III. részének elfogadása után az I. rész címét módosították, jelezve, hogy az csak repülőgépekre alkalmazható.

Az A. táblázat a vonatkozó fontosabb témakörök felsorolásával és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

Alkalmazhatóság

A 6. Annex I. részének jelen kiadása a Nemzetközi Polgári Légiközlekedési Szervezet által elfogadott nemzetközi előírásokat és ajánlott gyakorlati eljárásokat tartalmazza, amelyek a nemzetközi kereskedelmi légiszállításban történő részvételre jogosított járatók által üzemeltetett repülőgépekre minimális előírásként vonatkoznak és alkalmazandók. A nemzetközi kereskedelmi légiszállítás tevékenységi körébe tartoznak a pénzbeli ellenszolgáltatásért vagy bérleti díjért végzett nemzetközi menetrendszerű és nem-menetrendszerű légi szállítási tevékenységek.

A fenti két üzemeltetési típus így magába foglal minden térítés vagy bérleti díj ellenében repülőgéppel végzett nemzetközi légi szállítási tevékenységet. A kettő közötti megkülönböztetés lényege abban rejlik, hogy az Egyezmény az általános nemzetközi légi szállítással szemben kifejezetten a menetrendszerű nemzetközi légi szolgáltatásokról rendelkezett és sürgősen szükségessé vált a pénzbeli ellenszolgáltatásért vagy bérleti díjért végzett nem-menetrendszerű nemzetközi légi szállítási tevékenységre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások kidolgozása. A továbbiakban tehát nem tekintették szükségesnek, hogy különbséget tegyenek a két típus, a menetrendszerű nemzetközi légi szolgáltatásra valamint a nemzetközi légiszállító tevékenységre vonatkozó előírások között.

A 6. Annex I. részének célja az, hogy a biztonságos üzemeltetésre vonatkozó gyakorlati követelmények meghatározásával hozzájáruljon a nemzetközi légiközlekedés biztonságához továbbá felszólítva az államokat arra, hogy területük felett biztosítsák az ilyen előírások alapján a nemzetközi kereskedelmi légi szállításban tevékenykedő üzemeltetők repülőgépeinek átrepülését, segítse a nemzetközi légiforgalom hatékony, gazdaságos és rendszeres működését.

5. fejezet

A biztonságos üzemeltetés egyik fontos eleme a légijármű saját biztonsága, azaz légialkalmassági színvonala. Mindazonáltal a légijármű légialkalmassági szintje a 8. Annex légialkalmassági előírásának alkalmazásával maradéktalanul nem teljesíthető és ezért szükség van a jelen Annex előírásainak alkalmazására is, amelyek kiegészítik az előbbieket.

Az eredetileg elfogadott, valamint az 1–138. módosításokkal kiegészített Annex-ben volt egy „Repülőgép üzemeltetési korlátozások” című fejezet, amely általános rendelkezéseket tartalmazott az Annex hatálya alá eső összes repülőgép üzemeltetésére vonatkozóan. Ezen felül tartalmazott egy részt vagy részeket az akkor létező 8. Annex-el összhangban levő ICAO kategóriák szerint minősített valamint a nem ennek megfelelően minősített repülőgépek vonatkozásában is.
Az Üzemeltetési Bizottság negyedik ülésszakán a Légialkalmassági Bizottság együttműködésével a 128–133. módosítások mellett ajánlásokat tett közzé, amelyek a teljesítmény jellemző kódokra vonatkoztak. Ez az ICAO A. kategóriás repülőgépek számára előírtak alternatívájaként bizonyos alapvető emelkedési értékeket jelzett és ezek ajánlott gyakorlati eljárás jogállásúak voltak. A Légialkalmassági Bizottság további ajánlásokat tett az ICAO kategóriák szerint történő jogosítás bizonyos kérdéseivel kapcsolatban és ezek alapján a Tanács 1952 december 2-án elfogadta az 1953 május 1-től hatályos 134. módosítást. A módosítás szerint az Annex A. Mellékleteként alternatív teljesítmény jellemző meghatározás került felvételre, de a Tanács kifejezte azt az álláspontját, hogy mivel a teljesítménnyel kapcsolatos előírások tekintetében még nincs megegyezés, nincs reális alapja az ICAO A. kategória szerinti minősítésnek. Felszólította a szerződő államokat, hogy a teljesítmény jellemzőkre vonatkozó előírások hatálybalépésétől függően vagy addig, amíg a Tanács megfelelő légialkalmassági alapelveket dolgoz ki, tartózkodjanak az ilyen minősítéstől. A Közgyűlés 1953 júniusi hetedik ülésszaka jóváhagyta a Tanács és a Léginavigációs Bizottság eddigi intézkedéseit a légialkalmasság nemzetközi alapelveinek kidolgozására és felszólította a Tanácsot az ilyen irányú feladatok lehető leggyorsabb elvégzésére.

A légialkalmassági alapelvek kidolgozását célzó tanulmányok elvégzésében a Léginavigációs Bizottság segítségére volt egy „Légialkalmassági Munkacsoport” elnevezésű nemzetközi szakértő testület, amely hozzájárult a harmadik Léginavigációs Konferencia munkájának előkészítéséhez.

A fentiek eredményeképpen új nemzetközi légialkalmassági alapelveket dolgoztak ki, amelyeket a Tanács 1956-ban elfogadott. Ebben elvetették az ICAO kategóriák szerint történő minősítés alapelvét és helyettük a 8. Annex-be átfogó előírásokat dolgoztak ki. Az előírások meghatározták a légialkalmassági bizonyítványok elfogadásának általános minimális követelményrendszerét, amelyet az érintett államok illetékes hatóságai más államok légijárműveinek saját területük feletti repülésére illetve az ott történő leszállás végrehajtására alkalmazhatnak. Ezek célja többek között a más légijárművek, harmadik felek és vagyontárgyak védelme volt és úgy gondolták, hogy a védelem a nemzetközi légialkalmassági előírások az Egyezmény 37. cikkely előírásai szerint történő elfogadásával biztosítható lesz.

Felismerték, hogy az ICAO légialkalmassági előírásai nem helyettesíthetik a nemzeti illetve országos szabályokat és egy légijármű légiüzemeltetésre alkalmassá történő nyilvánításához szükség van a mindenre kiterjedő és átfogó, részletes állami légialkalmassági szabályokra illetve az ezeket tartalmazó törvényekre. Minden állam hozza létre a légialkalmasság átfogó és részletes törvényi szabályozását saját feltételei és igényei alapján vagy más szerződő államok hasonló rendelkezéseinek átvétele segítségével. A törvényben meghatározott légialkalmasság szintjét az előírások és ha szükséges, a vonatkozó kiegészítések jelzik.

Az előbbi elvek alapján felülvizsgált szöveg került a 6. Annex 5. fejezetébe. A szöveg átfogó előírásokat tartalmaz, amelyek kiegészítik a 8. Annex repülőgép teljesítményre vonatkozó rendelkezéseit (a) továbbá meghatároz két „elfogadható teljesítési módszer”-t, amelyek példákkal mutatják be az előírások szerinti teljesítmény szintet. Olyan törvény elfogadása, amely lényegesen alacsonyabb teljesítmény szintet ír elő, mint amit az „elfogadható teljesítési módszer”-ek tartalmaznak, a jelen Annex 5. fejezetének megsértését jelenti.

A nemzetközi légialkalmasság jelenlegi alapelvei

A kiegészítő légialkalmassági előírásoknak „elfogadható teljesítési módszer” formájában történő kidolgozásának lassú fejlődése bizonyos aggályokat támasztott az érintettek között és megállapították, hogy a 6. és 8. Annex-ekben szereplő módszerek, amelyeket 1957-ben dolgoztak ki, csak azokra a repülőgép típusokra voltak alkalmazhatók, amelyek abban az időben üzemeltek. Semmit sem tettek az „elfogadható teljesítési módszer”-ek előírásainak felülvizsgálatára, sem pedig az ideiglenes módszerek átértékelésére, noha ez utóbbiakat azért dolgozták ki, hogy gyakorlati alapként szolgáljanak az átfogó módszerek továbbfejlesztéséhez. Ezért a Léginavigációs Bizottság felkérte a Légialkalmassági Bizottságot saját tevékenységének illetve a munka fejlődésének áttekintésére, különös tekintettel arra a kérdésre, hogy elérték-e a kívánt eredményeket és tettek-e megfelelő módosítási javaslatokat a részletes légialkalmassági előírások korszerűsítése és javítása érdekében.

A Légialkalmassági Bizottság 1970 november-decemberi kilencedik ülésszakán Montrealban részletesen megvizsgálta a nehézségeket és javaslatot tett arra, hogy a légialkalmassági követelmények kidolgozásánál vessék el az „elfogadható teljesítési módszer” és az „ideiglenes teljesítési módszer” elveket, ez után pedig az ICAO dolgozzon ki és tegyen közzé olyan útmutató anyagot, amely célja a szerződő államok országos légialkalmassági alapelveinek és jogosítási módszereinek kidolgozása és ezek egységesítése. A tájékoztató anyag címe a „Légialkalmassági Műszaki Kézikönyv” legyen.

A Léginavigációs Bizottság a Tanács 1956-ban elfogadott légialkalmassági alapelveinek fejlődése fényében áttekintette a Légialkalmassági Bizottság ajánlásait és arra a megállapításra jutott, hogy az ICAO alapvető légialkalmassági célkitűzései és elvei helyesek, azok jelentős módosításra nem szorulnak. Azt is megállapították, hogy a légialkalmassági előírások lassú fejlődésének egyik fő oka a teljesítés módszereinek kötelező érvénye volt, amelyet a 6. és 8. Annex bevezetője az alábbiak szerint tartalmazott:
„Olyan törvény elfogadása, amely a teljesítés elfogadható módszereinél jóval alacsonyabb légialkalmassági szintet követel meg, az előírás megsértésének tekintendő”.

A nehézségek leküzdése érdekében a Léginavigációs Bizottság számos megközelítési módszert vizsgált meg és végül arra a megállapításra jutott, hogy a légialkalmassági előírások „teljesítés elfogadható módszerei” és a „teljesítés ideiglenes elfogadható módszerei” formájában történő kidolgozását elveti. Az ICAO jelentse ki, hogy az államok eleget tesznek az Egyezmény 33. cikkelyében található kötelezettségüknek akkor, ha elfogadják a 8. Annex általános nemzetközi előírásait és azt szükség szerint légialkalmassági műszaki útmutató anyaggal egészítik ki, kerülve mindennemű kötelező érvényű rendelkezést vagy szabályzást. Ugyanakkor maradjon hatályban az az előírás, mely szerint minden állam alakítsa ki a légialkalmasság átfogó és részletes törvényi szabályozását saját feltételei és igényei alapján vagy más szerződő államok hasonló rendelkezéseinek átvétele segítségével.

A Tanács 1972 március 15-én elfogadta a fenti elméletet, amely az ICAO légialkalmassággal kapcsolatos tevékenységének alapjait jelenti. A Tanács jóváhagyta a légialkalmassági útmutató anyag kiadását is „Légialkalmassági Műszaki Kézikönyv” címen. Egyetértésre jutottak abban, hogy az útmutató tényleges jogállással ne rendelkezzen és fő célja a szerződő államok tájékoztatása a 8. Annex II. rész 2.2 szakaszában jelzett részletes országos légialkalmassági előírásainak illetve vonatkozó törvényeinek kidolgozásához.

A 6. Annex I. rész vonatkozásában megállapodtak abban, hogy a repülőgép teljesítmény korlátozásokat tartalmazó „elfogadható teljesítési módszerek”-et az Annex-ben hagyják, de melléklet formájában (zöld oldalak) adják ki.

A 8. Annex teljesítmény előírásai

A 8. Annex IIIA. rész, 2. fejezetének és a IIIB. rész, B alrészének repülőgép teljesítmény előírásai kiegészítik a jelen Annex 5. fejezetében található előírásokat. Mindkettő átfogó célkitűzéseket tartalmaz. A Tanács felhívta a szerződő államok figyelmét arra, hogy ne támasszanak a 41. cikkely alapján felmentésben nem részesülő érkező idegen repülőgépekkel szemben egyéb üzemeltetési követelményeket, csak olyanokat, amelyek a lajstromozó államban érvényben vannak, feltéve hogy ezek biztosítják a jelen Annex 5. fejezetében található előírásoknak valamint a 8. Annex IIIA. rész, 2. fejezetében és a IIIB. rész, B alrészében található kiegészítő előírásoknak megfelelő teljesítmény szint fenntartását.

A 41. cikkely alapján felmentésben részesülő légijármű vonatkozásában a jelen Annex 5. fejezete olyan ajánlott gyakorlati eljárást tartalmaz, amelynek alapján a lajstromozó állam biztosítja, hogy a nem felmentett repülőgépekre vonatkozó, az 5.2 szakaszban meghatározott teljesítmény szintet az érintett repülőgépek a lehetőségek szerint teljesítik. A Tanács felhívta a szerződő államok figyelmét arra, hogy ne támasszanak a 41. cikkely alapján felmentésben nem részesülő érkező idegen repülőgépekkel szemben egyéb üzemeltetési követelményeket, csak olyanokat, amelyek a lajstromozó államban érvényben vannak, feltéve ha biztosítják, hogy az előírások kidolgozása alkalmával a lajstromozó állam az ajánlott gyakorlati eljárásokban meghatározottaknak eleget tett. Ezek az ajánlások kiegészítik a Tanács vonatkozó javaslatát, mely szerint a 41. cikkely alapján felmentésben részesülő légijármű esetén a szerződő államok lehetőség szerint alkalmazzák azokat a 8. Annex IIIA. és IIIB. részei alapján a nemzetközi légiközlekedésben utas, teherárú vagy postaküldemények szállításra igénybe venni kívánt 5700 kg-nál nehezebb repülőgép esetében.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.
Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben.
Az egyes részek jogállása a következő:

1. – Az Annex anyaga:

a) Nemzetközi előírások és ajánlott gyakorlati eljárások, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:
Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.
Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) Függelék: A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) Meghatározások: A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) Táblázatok és ábrák: Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

Megjegyzendő, hogy a jelen Annex egyes előírásai olyan követelményeket is tartalmaznak, melyek jogállása ajánlott gyakorlati eljárás. Az ilyen esetekben ezek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

2. – A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et hat nyelven – angol, arab, francia, kínai, orosz és spanyol nyelven fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***„Ajánlás”*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a *„Megjegyzés:”* felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat „shall – kell” kifejezéssel, míg az ajánlott gyakorlati eljárásokat „should – szükséges” kifejezéssel jelezzük. (Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk. Ford.)

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel – vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat – A 6. Annex I. kötetének módosításai

(módosítás – forrás – tárgy – elfogadva/ hatályos/ alkalmazható)

Első kiadás
A 6. Annex hatodik kiadása alapján, a 152. módosítás felhasználásával
1969 január 23. 1969 május 23. 1969 szeptember 18.

1) – Második kiadás – Hatodik Léginavigációs Konferencia

a) A legalacsonyabb útvonalmagasság meghatározására vonatkozó felelősség átruházása a járatóról az átrepülendő állam illetékes hatósága számára;

b) a repülőgépben felszerelendő további műszerekre vonatkozó előírások az ellenőrzött VFR repülések útvonalszakaszán; és különös hangsúllyal;

c) a repülőgépek részére engedélyezi, hogy amennyiben azokat földi tájékozódási pontok alapján látás után nem lehet irányítani (vezetni), olyan egyéb, nem rádiónavigációs berendezések segítségével legyenek irányíthatók, mint például a saját fedélzeti navigációs eszközei, feltéve hogy ezek eleget tesznek bizonyos teljesítmény előírásoknak és ezzel szükségtelenné válik a rádiónavigációs berendezések felszerelésére és szállítására vonatkozó bármely előírás.
1970 május 25. 1970 szeptember 25. 1971 február 4.

2) – A repülőtér környékén fellépő légijármű zajjal foglalkozó külön értekezlet (1969) és a Hangsebesség feletti szállítási munkacsoport második ülése

a) A repülőgép súlya a felszállás megkezdésekor vagy a leszállás várható időpontjában bizonyos külön ismertetett körülmények kivételével ne haladja meg az alkalmazható zajszint előírásokban meghatározott legnagyobb súly értékeket;

b) a zajbizonyítványt tartalmazó okmány elhelyezése és szállítása a repülőgépen;

c) a 49 000 láb (15 000 méter) repülési magasság felett üzemeltetni kívánt minden repülőgép legyen felszerelve olyan berendezéssel, amely folyamatosan méri és kijelzi a teljes kozmikus sugárzás értékét.
1971 április 2. 1971 augusztus 2. 1972 január 6.

3) – A Tanács intézkedése az A17-10 Közgyűlési Határozat alapján
Az Annex ajánlott gyakorlati eljárásai közé felvették, hogy minden utasszállító repülőgép pilótafülke ajtaja belülről zárható legyen.
1971 december 10. 1972 április 10. 1972 december 7.

4) – Harmadik kiadás – Léginavigációs Bizottság felülvizsgálata

a) A 2. fejezetből törölték azt a rész, amely bizonyos körülmények között lehetővé tette, hogy egyes nemzetközi eljárások ajánlott gyakorlati előírás jogállást kapjanak;

b) a „repülőtéri időjárási minimum” helyett „repülőtér üzemeltetési minimum” kifejezés bevezetése;

c) az „elhatározási magasság”, „műszeres időjárási körülmények”, „futópályamenti látástávolság érték” és „látás utáni időjárási körülmények” kifejezések bevezetése;

d) előírás bevezetése, melynek értelmében a járató Üzemeltetési Kézikönyvét bizonyos meghatározott anyagokkal kötelezően kiegészítve nyújtsa be a lajstromozó államnak;

e) a légijármű fedélzetén szállított elsősegély készletek tartalmának naprakész felsorolását tartalmazó jegyzék elhelyezése;

f) az 5700 kg. tömeg megfelelő értékének módosítása 12 500 fontról 12 566 fontra;
g) előírás arra vonatkozóan, hogy egyes meghatározott repülőgép típusokat Mach-szám mérő és kijelző berendezéssel szereljenek fel;

h) előírás arra vonatkozóan, hogy a légi utaskísérők egyes meghatározott repülési szakaszok során ülőhelyeiken bekötve tartózkodjanak.
1972 június 27. 1972 október 27. 1973 március 1.

5) – Hetedik Léginavigációs Konferencia

A „repülési adatrögzítő” és a „legnagyobb (légijármű) tömeg” kifejezések bevezetése valamint a légijármű repülési adatrögzítő rendszeresítésére, üzemeltetésére és a rögzítendő adatokra vonatkozó előírások módosítása.
1973 május 29. 1973 október 1. 1974 május 23.

6) – A Tanács intézkedése az A18-16 Közgyűlési Határozat alapján a nemzetközi légialkalmassági előírások új alapelveinek figyelembevételével

A repülőgép teljesítmény üzemeltetési korlátozásokra vonatkozó elfogadható teljesítési módszerek felcserélése az Annex-et kiegészítő útmutató Melléklettel, és a repülőgép repülési helyzetét jelző műszereknek a teljes elektromos generátor rendszer meghibásodása esetén vészhelyzeti tápfeszültséggel (tartalék áramforrással) történő ellátásra vonatkozó előírás felvétele. A módosítás elkészítése és közzététele miatt módosult az Annex 3. fejezetének Bevezető Megjegyzése is. A módosítás rámutat az államok feladatainak megosztására és egyes feladatok átruházására vonatkozó gyakorlati módszerekre a nemzetközi légiforgalomban üzemeltetett légijármű bérbeadása, szerződéses üzemeltetése és cseréje esetében.
1973 október 30. 1974 február 28. 1974 május 23.

7) – A Tanács intézkedése az A17-10 és A18-16 Közgyűlési Határozatok alapján

A jogtalan beavatkozás alatt álló légijármű esetén követendő eljárások bevezetése.
1973 december 7. 1974 április 7. 1974 május 23.

8) – Léginavigációs Bizottság tanulmánya alapján

A jogtalan beavatkozás alatt álló légijármű veszélyeztetésének csökkentésére foganatosítandó intézkedések bevezetése.
1975 február 4. 1975 június 4. 1975 október 9.

9) – Baleset kivizsgálási és megelőzési munkacsoport 1974 évi ülése – Hangsebesség feletti szállítási munkacsoport ötödik ülése – A 3. és 14. Annex-ek módosítása alapján végzett változtatások

Előírások bevezetése a balesetben vagy repeseményben érintett repülőgép repülési adatrögzítő berendezésének védelmére és őrzésére vonatkozóan, a hajózószemélyzet biztonsági öv és vállheveder rendszerének létrehozásával kapcsolatban, és a repülés végrehajtása során túlzott mértékű kozmikus sugárzás hatásával kapcsolatos intézkedésekre valamint a hajózószemélyzet tagjainak teljes sugárszennyezettségéről szóló feljegyzések készítésére vonatkozóan.

A módosítás kiterjed az IFR és ellenőrzött VFR repülések időmérő szerkezetének típusára és pontosságára vonatkozó előírások követelményeinek szigorítására és az SST repülőgép üzemanyagkészletéről szóló tájékoztatás és ellenőrzés biztosítására. A módosítás célja továbbá a 3. és 14. Annex módosításai miatt szükséges részek felülvizsgálatának és a társ-dokumentumok módosításának bemutatása. Ezek a változtatások a PANS-MET-re történő hivatkozás megszüntetését és több kifejezés (Repülőtér, Futópályamenti látástávolság érték, Rendelkezésre álló felszállási nekifutási távolság, Rendelkezésre álló leszállási távolság) módosítását tartalmazzák.
1976 április 7. 1976 augusztus 7. 1976 december 30.

10) – ASIA/PAC körzeti Léginavigációs Konferencia 1973

A vészrádió berendezés szállítására vonatkozó előírást olyan területek felett, ahol a kutatás és mentés különösen nagy nehézségekbe ütközik nem a körzeti léginavigációs egyezmény, hanem az érintett államok határozzák meg.
1976 június 16. 1976 október 16. 1977 október 6.

11) – Hetedik Léginavigációs Konferencia – Léginavigációs Bizottság tanulmánya

Előírás a járató számára, hogy olyan üzemeltetési eljárásokat dolgozzon ki, amelyek biztosítják, hogy a repülőgép a precíziós megközelítés végrehajtása során a futópálya küszöböt biztonságos magasságon repüli át.
1977 június 23. 1977 október 23. 1978 február 23.

12) – Léginavigációs Bizottság tanulmánya

Előírás bevezetése, hogy bizonyos meghatározott repülőgépeken földközelség figyelmeztető és riasztó rendszert helyezzenek el.
1977 december 15. 1978 április 15. l978 augusztus 10.

13) —Léginavigációs Bizottság tanulmánya

A vészhelyzeti kiürítés végrehajtása során feladatra kijelölt légi utaskísérők üléseinek vállhevederekkel ellátott biztonsági övvel történő felszerelése vonatkozó előírás bevezetése.
1978 december 13. 1979 április 13. 1979 november 29.

14) – Léginavigációs Bizottság tanulmánya

A repülésüzemi irányítás kifejezés, és a minimális navigációs teljesítmény előírásnak megfelelő navigációs berendezésekre vonatkozó előírások (MNPS) bevezetése.
1980 április 2. 1980 augusztus 2. 1980 november 27.

15) – Léginavigációs Bizottság tanulmánya

A külső fényekre vonatkozó előírások felülvizsgálata, hogy azok megegyezzenek a 2. és 8. Annex új előírásaival, és előírás bevezetése, hogy az Üzemeltetési Kézikönyv tartalmazza a vészhelyzeti és biztonsági berendezések felsorolását, ellenőrző listáját valamint használati utasítását.
1982 március 22. 1982 július 22. 1982 november 25.

16) – AGA Üzemeltetési munkacsoport harmadik és negyedik ülése (1981) – a 18. Annex elfogadása – Léginavigációs tanulmány

Zajcsökkentett légijármű üzemeltetési eljárásokra vonatkozó valamint a műszerrepülési szabályok bevezetése, valamint a repülőgéppel végzett földi gurulásra és az utasok fedélzeten tartózkodása melleti üzemanyagtöltésre vonatkozó jogosítás és képzettség meghatározása.

A 18. Annex elfogadása alapján módosításokat vezettek be a veszélyes árucikkek szállításával valamint ezek kereskedelmi repülőgépen történő szállításhoz szükséges hajózószemélyzeti kiképzéssel kapcsolatosan.

A követelményrendszer pontosítása érdekében módosították a repülőtér üzemeltetési minimumot és felvették a futópályamenti látástávolság érték tájékoztatás biztosítására vonatkozó előírást.
Az alkalmazott mértékegységeket az 5. Annex előírásaival összhangba hozták és felülvizsgálták illetve módosították a 3. fejezet bérlettel, szerződéses üzemeltetéssel és cserével kapcsolatos megjegyzését.
1983 március 29. 1983 július 29. 1983 november 24.

17) – Baleset kivizsgálási és megelőzési munkacsoport 1979 évi ülése

A légijármű repülési adatrögzítőkkel kapcsolatos előírások felülvizsgálata és a tájékoztató anyag mellékletben történő ismertetése.
1985 március 6. 1985 július 29. 1985 november 21

18) – Akadálymentesség kérdésével foglalkozó munkacsoport hetedik ülése – Léginavigációs Bizottság vizsgálatai – Tagállam javaslata

Emelkedési teljesítmény adat biztosítása minden hajtómű működésének esetére;
Két hajtóműves repülőgépek hosszú távú (megnövelt hatótávolságú) üzemeltetése;
Akadály adatok biztosítása és a futópályára történő kifordulás és beállás útvesztesége.
1986 március 25. 1986 július 27. 1986 november 20.

19) – Ötödik kiadás – Léginavigációs Bizottság Annex felülvizsgálata – VFR Üzemeltetési munkacsoport harmadik ülése – Léginavigációs Bizottság tanulmánya

a) Új meghatározások bevezetése a kereskedelmi légiszállítások üzemeltetésére, a légijármű üzembentartási engedélyére, a gyártó minimális felszerelési jegyzékére és a minimális felszerelési jegyzékre. Módosított meghatározások bevezetése a 6. Annex I. részében a munkarepülés és az általános célú légiközlekedés fogalmakra. A kitérő repülőtér meghatározás felülvizsgálata, felszállási, útvonal és célállomás kitérő repülőtér fogalmak bevezetése;

b) a menetrendszerű és nem-menetrendszerű üzemeltetés előírásai közötti különbségek megszüntetése;

c) a 6. Annex I. rész alkalmazhatóságának kiterjesztése a nemzetközi kereskedelmi légi szállítási tevékenységre jogosított járatók repülőgépeire;

d) légijármű üzembentartási engedély kiadására vonatkozó előírások és útmutató anyag elkészítése;

e) a minimális felszerelési jegyzékre vonatkozó előírások és útmutató anyag elkészítése;

f) a kitérő repülőterekre vonatkozó tájékoztatások közzététele;

g) légijármű üzemeltetési kézikönyv kidolgozására és alkalmazására vonatkozó előírás;

h) előírás arra, hogy a járató dolgozzon ki baleset megelőzési és repülésbiztonsági programot valamint a kézipoggyászra vonatkozó megfelelő előírásokat;

i) a 6. Annex I. rész tartalmában különbségtétel az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési tervek között;

j) új előírás arra vonatkozóan, hogy a légijármű parancsnoka szükség szerint számoljon be a nagytávolságú navigációval kapcsolatos ismereteiről;

k) az „ellenőrzött VFR repülés” kifejezés törlése és annak elismerése, hogy bármely VFR repülés ellenőrzött repülés lehet.

l) a 13. fejezet – Biztonság módosítása; ajánlás, hogy nemcsak az utasszállító, de az összes repülőgép pilótakabin ajtaja zárható legyen; a repülőgép átkutatási eljárásokhoz ellenőrző lista formájában biztosítsanak útmutató anyagot; előírás, hogy a járató dolgozzon ki és vezessen be megfelelő személyzeti kiképzési programot a szabotázs vagy jogtalan beavatkozás eseményeinek megelőzésére és kezelésére;

m) tájékoztató anyag kidolgozása az elektronikus megjelenítő ernyőkkel felszerelt repülőgép fontos üzemeltetési adatainak repülési adatrögzítővel történő rögzítésére;

n) az Üzemeltetési Kézikönyv tartalmára vonatkozó előírások felülvizsgálata;

o) a kézipoggyásszal kapcsolatos előírások kidolgozása;

p) a „repülési ellenőrző rendszer” kifejezés felcserélése „ellenőrző lista” kifejezésre.

1990 március 19. 1990 július 30. 1990 november 15.

20) – Üzemeltetési munkacsoport ötödik ülése – az Elkülönítési munkacsoport általános elméletének módosítását célzó hetedik és nyolcadik ülés – Baleset kivizsgálási munkacsoport 1992 évi ülése – Folyamatos légialkalmassági munkacsoport harmadik ülése – Léginavigációs Bizottság tanulmányai *a)* Repülőtér üzemeltetési minimum, elhatározási magasság, legalacsonyabb süllyedési magasság és akadálymentességi magasság kifejezések módosítása;

b) vészhelyzeti helyjel adó és előírt navigációs teljesítmény illetve típus új meghatározások bevezetése;

c) a műszeres megközelítés és leszállás osztályozásának bevezetése;

d) a *Folyamatos légialkalmassági kézikönyv* hivatkozás kidolgozása és bevezetése;

e) a repülési adatrögzítőkben alkalmazott fém-szalagok használatára vonatkozó előírás módosítása;

f) a vészhelyzeti helyjel adó berendezés szállítására vonatkozó előírás bevezetése a vészrádió berendezés és helyjel adó helyett;

g) előírás, melynek alapján a repülőgépen elhelyezett navigációs berendezés segítségével a repülőgép előírt navigációs teljesítménye alapján repüljön tervezett útvonalán vagy területeken; előírás a csökkentett 1000 láb (300 m) függőleges elkülönítési minimum egységes bevezetéséhez FL 290 felett; hivatkozás az üzemeltetési kézikönyvben az RNP légtérben történő repülésvégrehajtási követelményekre;

h) a karbantartási ellenőrzésre, műszaki módosításokra, javításokra valamint folyamatos légialkalmassági tájékoztatásokra vonatkozó előírások felülvizsgálata.
1994 március 21. 1994 július 25. 1994 november 10.

21) – Hatodik kiadás – Léginavigációs Bizottság tanulmányai – Veszélyes árúk munkacsoport tizennegyedik ülése – Szerkesztői módosítások – Szöveg egyeztetése a 6. Annex II. és/vagy III. részével és a szükséges módosítások

a) Új és módosított meghatározások bevezetése: légi utaskísérők, repülésvégrehajtási kézikönyv, nagy és kis repülőgép, üzemeltetési kézikönyv;

b) előírások módosítása az üzemeltetési létesítményekkel, repülés előkészítéssel, repülési idővel, a hajózószemélyzet repülési szolgálati és kötelező pihenőidejével, az oxigén rendszerrel valamint a megnövelt (ETOPS) hatótávolságú üzemeltetéssel kapcsolatosan;

c) új előírások a rendelkezésre álló futópálya hossz meghatározáshoz;

d) új és módosított előírások a földközelség jelző és riasztó rendszerrel (GPWS), orvosi és mentőfelszereléssel valamint a nagy repülési magasságon üzemelő repülőgépek oxigénkészletével kapcsolatosan;

e) a műszerrepülési szabályok szerint üzemeltetett repülőgépekre vonatkozó előírások módosítása;

f) hivatkozás az *ICAO Repülési szimulátorok minősítési követelményei kézikönyv* -re valamint a hajózószemélyzet új kiképzési programjának előírásaira különös tekintettel az emberi teljesítőképességre és ennek korlátaira;

g) a repülésüzemi tiszt meghatározás egyeztetése az 1. Annex előírásaival;

h) az üzemeltetési kézikönyv tartalmának felülvizsgálata és új előírások a repülőtér üzemeltetési minimum, oxigén tartalék rendszer, repülési szolgálati idő korlátozások, időzített indulási eljárások, tömeg és súlypont számítási eljárások, földnek történő ütközés (CFIT) elhárítására alkalmazott rendszerek ismertetése és használatára történő kiképzés valamint a földközelség jelző és riasztó rendszer (GPWS) alkalmazásának alapelvei vonatkozásában;

i) új előírások a repülési idő, légi utaskísérők repülési szolgálati és kötelező pihenőideje vonatkozásában, a kiképzést érintő előírások felülvizsgálata és módosítása; és

j) új és módosított előírások a légijármű tervezés biztonsági kérdéseivel kapcsolatban.
1995 március 8. 1995 július 24. 1995 november 9.

22) – A Másodlagos radarberendezések továbbfejlesztésével valamint az Összeütközés elkerülését biztosító rendszerekkel foglalkozó munkacsoportok negyedik és ötödik ülése (SICASP/4 és 5)

A barometrikus repülési magasságot (nyomásmagasságot) továbbító másodlagos válaszjeladókra vonatkozó valamint az összeütközés elkerülő fedélzeti rendszerekkel kapcsolatos előírások felvétele (ACAS).
1996 február 19. 1996 július 15. 1996 november 7.

23) – Hetedik kiadás – Repülési adatrögzítéssel foglalkozó munkacsoport első ülése – Folyamatos légialkalmassági munkacsoport negyedik ülése – Léginavigációs Bizottság tanulmányai – Az ICAO és az ipari CFIT munkabizottságok vizsgálatai – 1. Annex 162. módosítása és a 11. Annex 38. módosítása – Szerkesztői módosítások

a) A légijármű üzemeltetési kézikönyv új és módosított meghatározásai, repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek felsorolása, kitérő repülőtér a megnövelt hatótávolságú üzemeltetés (ETOPS) útvonalán, emberi tényezők alapelvei, emberi teljesítőképesség és teljesítmény, minimális berendezések alap-felsorolása, karbantartás, szellemi tevékenységet befolyásoló anyagok és előírt navigációs teljesítmény;

b) a kölcsönbérlet és csere vonatkozó megjegyzéseinek módosítása;

c) a repülési adatrögzítőkkel kapcsolatos új és módosított előírások;

d) a szellemi tevékenységet befolyásoló anyagok használatára vonatkozó új megjegyzés bevezetése;

e) a repülés irányába előre érzékelő fedélzeti szélnyírás jelző rendszerekre vonatkozó új előírások;
f) a folyamatos légialkalmasságra vonatkozó új és módosított előírások, amelyek figyelembe veszik a jóváhagyott karbantartó szervezetek igénybevételét és tisztázzák a járató valamint a karbantartó szervezet felelősségét;

g) új és módosított előírások a függelékbe áthelyezett üzemeltetési kézikönyv tartalmára vonatkozóan valamint új ajánlott gyakorlati eljárás a földközelség jelző rendszer felszerelésére és szállítására a dugattyús motorral felszerelt repülőgépeken;

h) az államok felelősségét érintő új előírások a légijármű üzembentartási engedély alapján végzett tevékenység felügyeletére, az üzemeltetési kézikönyv jóváhagyására valamint a járatói jogosítási és folyamatos ellenőrzési rendszer kialakítására;

i) új előírások a légijármű földi jégtelenítésére, a repülőgép üzemeltetési teljesítmény korlátozásokra, tömeg korlátozásokra, érzékeny nyomásmagasság mérőműszerekre valamint az első tiszt legutóbbi folyamatos gyakorlati tapasztalatára vonatkozóan;

j) új előírások az összeütközés elkerülését biztosító fedélzeti rendszer (ACAS) valamint a nyomásmagasságot továbbító válaszjeladók szállítására; és

k) új előírások az emberi tényezők figyelembevétele alapján.
1998 március 19. 1998 július 20. 1998 november 5.

24) – Repülési adatrögzítéssel foglalkozó munkacsoport második ülése – A Közgyülés 32. ülése – Léginavigációs Bizottság tanulmányai

a) A „légiutaskísérő” kifejezés módosítása „utaskabin személyzet” kifejezésre;

b) meghatározások módosítása;

c) új előírások a 406 MHz és 121,5 MHz frekvencián üzemelő vészhelyzeti helyjeladó (ELT) berendezések kötelező szállítására; földközelség jelző és riasztó rendszer (GPWS) kiegészítő veszélyes felszín közelség megelőző riasztási funkcióval történő ellátására vonatkozóan; a digitális összeköttetések rögzítésére vonatkozó határidő kijelölése.
1999 március 15. 1999 július 19. 1999 november 4.

25) – Léginavigációs Bizottság tanulmányai

a) A meghatározások módosítása;

b) új előírások a futópályamenti látástávolság érték biztosítására; a műszeres megközelítések követelményei; a légijármű parancsnok feladatainak módosítása.
2000 március 15. 2000 július 17. 2000 november 2.

26) – Nyolcadik kiadás – Repülési adatrögzítéssel foglalkozó munkacsoport második ülése – Baleset kivizsgálási munkacsoport 1999 évi ülése – Az egész világot átfogó műholdas navigációs rendszerrel foglalkozó munkacsoport harmadik ülése – Folyamatos légialkalmassági munkacsoport ötödik ülése – Léginavigációs Bizottság tanulmányai

a) A repülési adatrögzítőkre vonatkozó előírások módosítása, amelyek tartalmazzák a digitális távközlési adatok rögzítését; az új légijármű repülési adatrögzítőjére (FDR) vonatkozó előírások; rögzítendő jellemzők új felsorolása; a pilótakabin hangrögzítők (CVR) két órás felvételi időtartamának előírása;

b) új előírások a repülési adatok kiértékelő programjaira vonatkozóan;

c) a műszeres megközelítés és leszállás osztályozásának módosítása;

d) új előírások a függőleges irányvezetéssel (APV) végrehajtott megközelítésre vonatkozóan;

e) új meghatározások és a karbantartással kapcsolatos előírások módosítására vonatkozóan; és

f) a zajbizonyítvány angol nyelvre történő lefordítása.
2001 március 9. 2001 július 16. 2001 november 1.

27) —Léginavigációs Bizottság tanulmányai

a) A földközelség jelző és riasztó rendszerre (GPWS) és az előre irányuló veszélyes földfelszín közelség megelőző riasztó feladatra vonatkozó előírások módosítása;

b) a légijármű szerkezeti tervezésénél és fizikai kialakításában alkalmazott biztonsági elemekre vonatkozó új és módosított előírások.
2002 március 15. 2002 július 15. 2002 november 28.

28) – Elkülönítési és Légtérbiztonsági munkacsoport valamint a Léginavigációs Bizottság tanulmányai

a) Az (idegen) nyelvismeretre vonatkozó új előírások;

b) a járató repülésbiztonsági dokumentáció rendszerére vonatkozó új meghatározások és előírások;

c) a földi kiszolgálás biztonsági tényezőire vonatkozó új meghatározások és előírások;

d) a járató államának jogosítása a RNP légtérben történő üzemeltetésre;

e) légijármű összeütközés elkerülő fedélzeti rendszerek (ACAS) üzemeltetési kézikönyvének tartalmára vonatkozó új előírások.
2003 március 13. 2003 július 14. 2003 november 27.
29) —Az Üzemeltetői munkacsoport és az Elkülönítési és Légtérbiztonsági munkacsoport hatodik ülése:

a) új meghatározás a csökkentett függőleges elkülönítési magasság (RVSM) szerinti üzemeltetésre és az útvonal repülést megkönnyítő repülőgépvezetőre vonatkozóan;

b) a 4.9.1 és 4.9.2 pontok alatt új előírások bevezetése a műszer szerinti repülési szabályok (IFR) vagy éjszakai feltételek közötti, egy repülőgépvezetővel történő üzemeltetésre;

c) kivétel a jóváhagyott, egy gázturbinás hajtóművel felszerelt repülőgépek 5.1.2 pont szerinti üzemeltetési korlátozásaihoz;

d) az 5.4.1 és 5.4.2 pontok alatt új előírások bevezetése az egy gázturbinás hajtóművel felszerelt repülőgépek műszeres meteorológiai feltételek (IMC) és éjszakai körülmények közötti kereskedelmi üzemeltetésének jóváhagyásához szükséges követelmények meghatározására;

e) a 6.22 pont alatt új előírás bevezetése a műszeres repülési szabályok (IFR) szerint, vagy éjszaka egy repülőgépvezetővel végrehajtott üzemeltetéshez szükséges repülőgép felszerelésekre vonatkozó követelmények meghatározására;

f) a csökkentett függőleges elkülönítési minimumhoz (RVSM) tartozó repülési magasságokra vonatkozó 7.2.4 pont módosítása, valamint a 7.2.5, 7.2.6 és 7.2.7 pontok alatt új előírások bevezetése az illetékes állam hatóságára vonatkozó felelősség meghatározására azonnali és megfelelő intézkedések meghozatalához, amennyiben az ellenőrzések eredményei azt mutatják, hogy egy adott repülőgép vagy egy meghatározott repülőgép típushoz tartozó több repülőgép magasságtartási tulajdonságai meghaladják az előírt korlátozásokat;

g) a 7.4.1 és 7.4.2 pont alatt új előírás bevezetése az elektronikus navigációs adat termékek járató általi kezeléséhez;

h) a 9.4.1 és 9.4.2 pontokhoz tartozó előírások módosítása a repülőgép parancsnok, a másodpilóta és az útvonalrepülést megkönnyítő repülőgépvezető folyamatos gyakorlatban tartásával kapcsolatban;

i) a 9.4.3.5 és a 9.4.3.6 pontokhoz tartozó előírások módosítása a repülőgép parancsnok körzeti-, útvonal- és repülőtéri jogosításával kapcsolatban;

j) a 9.4.5.1 pont alatt új előírás bevezetése, amely megköveteli az államtól az egy repülőgépvezetővel a műszeres repülési szabályok szerint, vagy éjszaka végrehajtott üzemeltetésre vonatkozó követelmények meghatározását;

k) a 9.4.5.2 pont alatt egy új ajánlott eljárás bevezetése, amely meghatározza az egy repülőgépvezetővel történő műszeres repülési szabályok szerinti, vagy éjszakai feltételek közötti üzemeltetésre vonatkozó repülőgép parancsnoki jártasságot és képzési követelményeket;

l) a 2. Függelék módosítása az üzemeltetési kézikönyv tartalmára vonatkozóan, a repülőgép parancsnok körzet, útvonal és repülőtér jogosításához valamint az oldalszél és hátszél alatti üzemeltetés korlátozásaihoz kapcsolódóan; és

m) egy új, 3. számú Függelék bevezetése, amely meghatározza az egy gázturbinás hajtóművel felszerelt repülőgép éjszaka és/vagy IMC feltételek közötti jóváhagyott üzemeltetésének kiegészítő feltételeit, valamint egy új, 4. számú Függelék bevezetése a magasságtartási tulajdonságokra vonatkozó követelményekhez kapcsolódóan, az RVSM légtérben végrehajtott üzemeltetés során.
2005 március 09. 2005 július 11. 2005 november 24.

30) – Felügyeleti és a Konfliktusmegoldási Rendszerek munkacsoport első ülése, Hajózó személyzetek Szakszolgálati Engedélyeinek kiadásával és Képzésével foglalkozó munkacsoport második ülése, Akadálymentesség kérdésével foglalkozó munkacsoport tizennegyedik ülése, Egyesült Államok által benyújtott javaslat, Tanácsi kérés, A35-17 Közgyűlési Határozat, a Közgyülés 35. ülése és a Tizenegyedik Léginavigációs Konferencia:

a) nagyobb felbontóképességű magasság kódolók szállítása;

b) repülőgépvezetők folyamatos gyakorlatban tartási és szakmai jártassági ellenőrzésének követelményei, a személyzet kereszt jogosítása és a gyakorlati jártasság keresztirányú beszámítása, az alkalmasság értékelése, fenyegetés és hiba kezelés valamint a repülőgépvezetők félévenkénti szakmai jártasság ellenőrzése;

c) a repülőgépvezetők ismerete az eljárások tartalmi felépítése által meghatározott üzemeltetési követelményekről;

d) a Repülés-üzemi tisztek / szolgálatvezetők jogosítása és az állami szabályozó rendszer kritikus elemei;

e) a légijármű üzembentartási engedély másolatának szállítása a légijármű fedélzetén;

f) a biztonsági adatokat gyűjtő és feldolgozó rendszerből származó információk védelmére vonatkozó jogi útmutatások; és

g) a biztonság elfogadható szintjére vonatkozó új útmutató anyagokhoz kapcsolódó biztonság kezelési ajánlások és hivatkozások.
2006 március 14. 2006 július 17. 2006 november 23.

1. fejezet
Meghatározások

Amennyiben a nemzetközi kereskedelmi légiszállításban üzemeltetett légijárművekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások során a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Aerial Work – Munkarepülés
A légijármű olyan különleges szolgáltatások nyújtásához történő üzemeltetése, mint például mezőgazdasági, építési, légi-fényképezési, megfigyelési, felderítési, ellenőrzési, kutató és mentő feladatok valamint hirdetési szolgáltatások.

Aerodrome – Repülőtér
Szárazföldön vagy vízfelszínen kijelölt terület (beleértve bármilyen épületet, létesítményt vagy szerkezetet), amelyet részben vagy teljes egészében légijárművek érkezésére, indulására valamint földi mozgására kívánnak felhasználni.

Aerodrome operating minima – Repülőtér üzemeltetési minimum
Egy repülőtér igénybevételének korlátozásai a következő repülési feladatok vonatkozásában:
a) Felszállás – futópályamenti látástávolság (RVR) és/vagy látástávolság értékben és ha szükséges, felhőzet jellemzőkben kifejezve;
b) Precíziós megközelítés és leszállás – az üzemeltetés kategóriájának megfelelően látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;
c) Függőleges irányvezetéssel végrehajtott megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;
d) Nem-precíziós megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint legalacsonyabb süllyedési magasság értékben (MDA/H) és ha szükséges, felhőzet jellemzőkben kifejezve.

Aeroplane – Repülőgép
Levegőnél nehezebb, hajtóművel működő légijármű, amely felhajtóerejét repülés közben főként az olyan felületekre ható aerodinamikai reakciókból nyeri, amelyek a repülés adott körülmények között rögzített helyzetben maradnak.

Aircraft – Légijármű
Minden olyan szerkezet, amelynek levegőben maradását olyan aerodinamikai reakcióerők biztosítják, amelyek nem azonosak a földfelszínre ható aerodinamikai reakcióerőkkel.

Aircraft operating manual – Légijármű üzemeltetési kézikönyv
A járató állama által elfogadható kézikönyv, amely tartalmazza az általános, különleges és vészhelyzeti eljárásokat, ellenőrző listákat, korlátozásokat, teljesítmény tájékoztatásokat, a légijármű rendszereinek részletezését valamint minden egyéb, a légijármű üzemeltetéséhez szükséges tájékoztató anyagot. *Megjegyzés: A légijármű üzemeltetési kézikönyv az üzemeltetési kézikönyvek közé tartozik.*

Air operator certificate (AOC) – Légijármű üzembentartási engedély
A járatót meghatározott kereskedelmi légiszállítási tevékenység végrehajtására jogosító engedély.

Alternate aerodrome – Kitérő repülőtér
Olyan repülőtér, amelyre a légijármű abban az esetben folytathatja az útját, ha a tervezett célállomás repülőtere felé történő repülés folytatása vagy az oda történő leszállás végrehajtása lehetetlenné válik vagy nem tanácsos. A kitérő repülőterek közé tartoznak az alábbiak:

Felszállási kitérő – Take-off alternate
Olyan kitérő repülőtér, amelyen a légijármű leszállhat, ha ez röviddel a felszállás után szükségessé válik és erre az indulási repülőtér nem használható.

Útvonal kitérő – En-route alternate
Olyan kitérő repülőtér, amelyen egy légijármű leszállhat, ha az útvonal-repülés közben a hajózószemélyzet szokásostól eltérő vagy vészhelyzetet tapasztal.

Megnövelt hatótávolságú üzemeltetés útvonal kitérő – ETOPS en-route alternate
Olyan alkalmas és megfelelő kitérő repülőtér, amelyen egy légijármű le-szállhat, ha a megnövelt hatótávolságú üzemeltetés közben egy hajtómű le-áll vagy a hajózószemélyzet egyéb, a szokásostól eltérő vagy vészhelyzetet tapasztal.

Célállomás kitérő – Destination alternate
Olyan kitérő repülőtér, amely felé a légijármű folytathatja az útját, ha a tervezett célállomás repülőterén történő leszállás végrehajtás lehetetlenné válik vagy nem tanácsos.
Megjegyzés: Az a repülőtér, amelyről a járat elindult, az adott járat számára útvonal vagy célállomás kitérőként is megjelölhető.

Approach and landing operations using instrument approach procedures -Műszeres megközelítési eljárásokat alkalmazó megközelítés és leszállás
A műszeres megközelítési és leszállási eljárások osztályozása a következő:

Nem-precíziós megközelítés és leszállás – Non-precision approach and landing operations
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú irányvezetést alkalmaznak, azonban függőleges irányvezetést nem vesznek igénybe.

Megközelítés és leszállás függőleges irányvezetéssel – Approach and landing operations with vertical guidance
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú és függőleges irányvezetést alkalmaznak, azonban az a precíziós megközelítésre és leszállásra vonatkozó üzemeltetési előírásoknak nem tesz eleget.

Precíziós megközelítés és leszállás -Precision approach and landing operations
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során precíziós oldalirányú és függőleges irányvezetést alkalmaznak az alábbiakban meghatározott üzemeltetési minimumok figyelembevételével:

Megjegyzés: Az oldalirányú és függőleges irányvezetés a következő berendezések egyikének segítségével nyújtott iránysáv és siklópálya tájékoztatás:

a) földi telepítésű navigációs berendezés; vagy

b) számítógéppel biztosított navigációs adatok.

Precíziós megközelítés és leszállás kategóriái – Categories of precision approach and landing operations:
I. kategória (I. kat) – Category I (CAT I) operations
Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága nem kevesebb mint 60 méter (200 láb) valamint a látástávolság értéke nem kevesebb mint 800 méter vagy a futópályamenti látástávolság értéke nem kevesebb mint 550 méter.

II. kategória (II. kat) – Category II (CAT II) operations
Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága kevesebb mint 60 méter (200 láb) de nem kevesebb mint 30 méter (100 láb) valamint a futópályamenti látástávolság értéke nem kevesebb mint 350 méter.

III/A. kategória (III/A. kat) – Category IIIA (CAT IIIA) operations
Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 30 méter (100 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke nem kevesebb mint 200 méter.

III/B. kategória (III/B. kat) – Category IIIB (CAT IIIB) operations
Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 15 méter (50 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke kevesebb mint 200 méter, de nem kevesebb mint 50 méter.

III/C. kategória (III/C. kat) – Category IIIC (CAT IIIC) operations
Olyan műszeres megközelítés és leszállás, amelyhez elhatározási magasság és futópályamenti látástávolság érték korlátozást nem határoztak meg.

Megjegyzés: Ahol az elhatározási magasság és futópályamenti látástávolság érték korlátozások különböző üzemeltetési kategóriákba esnek, a műszeres megközelítés és leszállás az igényesebb kategória alapján határozandó meg, azaz ott, ahol az elhatározási magasság érték a III/A. kategóriába, míg a futópályamenti látástávolság érték a III/B. kategóriába tartozik, a megközelítés és leszállás III/B. kategóriás lesz. Ugyanígy, amennyiben az elhatározási magasság érték II. kategóriás és a futópályamenti látástávolság érték az I. kategóriába tartozik, a megközelítés és leszállás II. kategóriásnak tekintendő.

Basic instrument flight trainer – Alap műszerrepülési gyakorló berendezés
Olyan megfelelő műszerekkel ellátott berendezés, amely mesterségesen biztosítja a légijármű műszerfal környezetét műszerrepülési körülmények között.

Cabin crew member – Utaskabin személyzeti tag
Személyzeti tag , aki a járató vagy a légijármű parancsnoka kijelölése alapján az utasok biztonsága érdekében szükséges feladatokat végez, azonban nem a hajózószemélyzet tagja.

Commercial air transport operation – Kereskedelmi légiszállítási tevékenység
Pénzbeli ellenszolgáltatásért vagy bérleti díjért végzett utas, teherárú vagy postaküldemény szállító légijármű üzemeltetések.

Configuration deviation list (CDL) – Repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek jegyzéke
A típus tervezéséért felelős szervezet által kidolgozott és a tervezés állama által jóváhagyott lista, amely meghatározza a légijármű típus bármely olyan külső alkatrészét, amely a repülés megkezdésekor hiányozhat, továbbá szükség szerint tartalmazza az összes vonatkozó üzemeltetési korlátozást valamint repülési teljesítmény korrekciós tájékoztatást.

Crew member – Személyzeti tag
A járató által a légijárművön a repülési idő alatt szolgálattételre kijelölt személy.

Cruising level – Utazómagasság
Az a repülési szint, amelyet a légijármű a repülés jelentős szakasza során tart.

Dangerous goods – Veszélyes áruk
Olyan tárgyak vagy anyagok, amelyek az egészségre, biztonságra vagy az anyagi javakra (tulajdonra) nagy kockázatot jelentenek és amelyek a Műszaki Utasításokban a veszélyes áruk felsorolásában találhatók vagy az Utasítások ilyennek minősítik.

Megjegyzés: A veszélyes árukat a 18. Annex 3. fejezete osztályozza.

Decision altitude (DA) / Decision height (DH) – Elhatározási magasság
A precíziós vagy a függőleges irányvezetéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amelyen megszakított megközelítés eljárást kell kezdeményezni, ha a megközelítés folytatásához szükséges látás utáni tájékozódás feltételei nem jöttek létre.

1. Megjegyzés: A DA elhatározási magasság a közepes tengerszinthez, a DH elhatározási magasság pedig a futópálya küszöb magasságához viszonyított érték.

2. Megjegyzés: A szükséges látás utáni tájékozódás feltételei a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. III. kategóriás üzemelés során, amennyiben elhatározási magasságot jelölnek ki, a szükséges látási feltételek az adott eljárásra vagy üzemelésre vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok „QNH/QFE elhatározási magasság"-ként rövidítve pedig DA/H-ként írhatók le.

Emergency locator transmitter – Vészhelyzeti helyjeladó berendezés (ELT)
Olyan berendezés leírására szolgáló általános kifejezés, amely a kijelölt hullámhosszakon egyedi megkülönböztethető (rádió)jeleket sugároz és alkalmazásától függően a baleset alkalmával automatikusan működésbe léphet vagy kézzel üzembe helyezhető. A vészhelyzeti helyjeladó berendezés az alábbi típusú lehet:

Automatikus rögzített – Automatic fixed ELT (ELT/AF)
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön állandóan rögzítve helyezkedik el.

Automatikus hordozható – Automatic portable ELT (ELT/AP)
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után a légijármű fedélzetéről könnyen eltávolítható.

Automatikusan leváló – Automatically deployable ELT (ELT/AD)
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után, annak hatására automatikusan leválik a légijárműről. Szükség esetén lehetséges annak kézi eltávolítása is.

Túlélési – Survival (ELT/S)
Olyan vészhelyzeti helyjeladó berendezés, amely eltávolítható légijárműről és a légijárművön úgy tárolják, hogy azt vészhelyzet esetén a túlélők egyszerűen üzembe helyezhetik és használhatják.

Flight crew member – Hajózószemélyzeti tag
Szakszolgálati engedéllyel rendelkező személyzeti tag, akinek munkája a repülési szolgálati idő tartam alatt nélkülözhetetlen a légijármű üzemeltetéséhez.

Flight Data Analysis – Repülési adat elemzés
A rögzített repülési adatok elemzésének eljárása a légijármű üzemeltetés biztonságának fokozása érdekében.

Flight duty period – Repülési szolgálati időtartam
Azon teljes időtartam, amely akkor kezdődik, amikor a hajózószemélyzeti tag pihenőidejét követően a repülés vagy repülési sorozat előtt szolgálatba lép és addig az időpontig tart, amikor a hajózószemélyzeti tag a repülés vagy repülési sorozat befejezése után mentesül összes szolgálati feladata alól.

Flight manual – Repülésvégrehajtási kézikönyv
A légialkalmassági bizonyítvánnyal összhangban kidolgozott és kiadott kézikönyv, amely tartalmazza azokat a korlátozásokat, amelyek mellett a légijármű repülésre alkalmasnak nyilvánítható, valamint azokat az utasításokat és tájékoztatásokat, amelyek a hajózószemélyzet tagjai számára a légijármű biztonságos üzemeltetéséhez szükségesek.

Flight operations officer/flight dispatcher – repülés-üzemi tiszt/szolgálatvezető
A járató által a légiüzemeltetés irányításába és felügyeletébe szakszolgálati engedéllyel vagy anélkül bevont, az 1. Annex előírásainak megfelelően jogosított személy, aki a légijármű parancsnokát támogatja, eligazítja és/vagy kiszolgálja a repülés biztonságos lefolytatása érdekében.

Flight plan – Repülési terv
A légiforgalmi szolgálati egységek rendelkezésére bocsátott, a légijármű tervezett repülésére vagy a repülés egy szakaszára vonatkozó meghatározott tájékoztatás.

Flight recorder – Repülési adatrögzítő
A légijárművön felszerelt bármely típusú adatrögzítő, amelynek célja a tájékoztatások biztosítása a légijármű baleset vagy repesemény kivizsgáláshoz.

Flight safety documents system – Repülésbiztonsági dokumentációs rendszer
A járató által létrehozott egymással kölcsönös kapcsolatban lévő dokumentációs rendszer, amely összerendezi és szervezetté teszi a repülések és a földi üzemeltetés végrehajtásához szükséges információkat, és minimum a repülésvégrehajtási kézikönyvből és az üzemeltető karbantartás irányítási kézikönyvéből áll.

Flight simulation training device – Mesterséges repülés-gyakorló berendezés
Az alábbi három berendezés közül bármelyik, amely a repülési körülmények földi gyakorlati megjelenítésére, pontos utánzására alkalmas:

Flight simulator – Repülési szimulátor
Egy adott légijármű típus pilótakabinjának pontos utánzata olyan mértékben, hogy a mechanikus, elektromos továbbá elektronikus légijármű rendszerek működése és ezek hatása, a légijármű hajózószemélyzetének általános munkakörnyezete valamint az adott légijármű teljesítmény és repülési jellemzői a valósághoz hűen utánozhatók;

Flightprocedures trainer – Repülési eljárás gyakorló berendezés
Olyan berendezés, amely valóságos pilótafülke környezetet biztosít és mesterségesen ábrázolja a műszerek működését valamint reakcióit, megjeleníti a műszaki, mechanikus, elektromos és elektronikus rendszerek működését valamint az adott osztályba tartozó légijárművek teljesítmény és repülési jellemzőit;

Flight recorder – Repülési adatrögzítő
A légijárművön felszerelt bármely típusú adatrögzítő, amelynek célja a tájékoztatások biztosítása a légijármű baleset vagy repesemény kivizsgálásához.

Flight time – Aeroplanes – Repülési idő – Repülőgép
Az a teljes időtartam, amely akkor kezdődik, amikor a repülőgép a felszállás céljából először megindul és akkor fejeződik be, amikor a repülőgép a repülés után megáll.

Megjegyzés: Az itt meghatározott repülési idő azonos az általánosan használt "blokk-idővel" vagy a "féktuskó elvételétől annak visszahelyezéséig" tartó időtartammal, amelyet attól az időponttól mérnek, amikor a repülőgép a felszállás céljából először elindul és akkor fejeződik be, mikor a repülőgép a repülés után megáll.

Flight recorder – Repülési adatrögzítő
A légijárművön felszerelt bármely típusú adatrögzítő, amelynek célja a tájékoztatások biztosítása a légijármű baleset vagy repesemény kivizsgálásához.

Flight safety documents system – Repülésbiztonsági dokumentációs rendszer
A járató által létrehozott egymással kölcsönös kapcsolatban lévő dokumentációs rendszer, amely összerendezi és szervezetté teszi a repülések és a földi üzemeltetés végrehajtásához szükséges információkat, és minimum a repülésvégrehajtási kézikönyvből és az üzemeltető karbantartás irányítási kézikönyvéből áll.

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General aviation operation – Általános célú légiközlekedés
A kereskedelmi légiszállító tevékenységtől valamint a munkarepüléstől eltérő légijármű üzemeltetés.

Ground handling – Földi kiszolgálás
A légijármű érkezése után és indulása előtt a repülőtéren szükséges kiszolgálási feladatok, amelyeket nem a légiforgalmi szolgálatok végeznek el.

Human Factors principles – Emberi tényezők alapelvei
A légiközlekedés tervezés, jogosítás, kiképzés, üzemeltetés és karbantartás vonatkozó alapelvei, amelyek célja az emberi teljesítmény és teljesítőképesség tényezőinek átfogó és teljes mértékű figyelembevételével biztonságos kapcsolat kialakítása a személyek és a rendszer egyes elemei között.

Human performance – Emberi teljesítmény és teljesítőképesség
Az egyéni emberi képességek és korlátozó tényezők, amelyek hatással vannak a légiközlekedési üzemeltetés biztonságára és hatékonyságára.

Instrument meteorological conditions (IMC) – Műszeres időjárási körülmények
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal # kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél alacsonyabbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

Large aeroplane – Nagy(méretű) repülőgép
Olyan repülőgép, amelynek engedélyezett felszállósúlya (tömege) több mint 5700 kg.

Maintenance – Karbantartás
A légijármű folyamatos légialkalmasságának biztosításához előírt feladatok, beleértve a következők bármelyikét vagy ezek kombinációját; ellenőrzés, átvizsgálás, javítás, csere, módosítás vagy a meghibásodás elhárítása.

Maintenance organization's procedures manual – Karbantartó szervezet eljárási kézikönyve
A karbantartó szervezet vezetője által jóváhagyott dokumentum, amely részletezi a karbantartó szervezet felépítését, a vezetői felelősségi rendszert, az elvégzendő munkafeladatokat, ismerteti a létesítményeket, a karbantartási eljárásokat valamint a minőségbiztosítási vagy felügyeleti illetve ellenőrzési rendszert.

Maintenance programme – Karbantartási program
Az előírt tervszerű karbantartási feladatok felsorolását tartalmazó kiadvány, amely jelzi a feladatok végrehajtásának időrendi tervét és rendjét. Ilyen kiadvány lehet a légijármű üzemi megbízhatósági programja, amely azon légijármű biztonságos üzemeltetéshez szükséges, amelyre az vonatkozik.

Maintenance release – Karbantartási nyilatkozat
Olyan igazolást tartalmazó dokumentum, amely megerősíti, hogy a megfelelő karbantartási feladatokat a karbantartást végző szervezet eljárási kézikönyve vagy más egyenértékű rendszer alapján az elfogadott jellemzők figyelembevételével kielégítően elvégezték.

Master minimum equipment list (MMEL) – Gyártó minimális felszerelési jegyzéke
Az adott légijármű típusra vonatkozóan a gyártó által kidolgozott és a gyártó állama által jóváhagyott felszerelési jegyzék, amely azokat a felszereléseket és egységeket tartalmazza, amelyek közül egy vagy több a repülés megkezdése előtt üzemképtelen lehet. A jegyzékhez (MMEL) különleges üzemeltetési feltételek, korlátozások vagy eljárások határozhatók meg.

Maximum mass – Legnagyobb tömeg
Legnagyobb engedélyezett felszállósúly.

Minimum descent altitude (MDA) / Minimum descent height (MDH) – Legalacsonyabb süllyedési magasság
A nem-precíziós megközelítési vagy a körözéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amely alá az előírt látási feltételek létrejöttének hiányában süllyedni tilos.

1. Megjegyzés: A legalacsonyabb QNH süllyedési magasság a közepes tengerszinthez, a legalacsonyabb QFE süllyedési magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott legalacsonyabb süllyedési magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A szükséges látási feltételek a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. A körözéssel végrehajtott megközelítés esetében a szükséges látási feltételek a futópálya környezetére vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok „QNH/QFE legalacsonyabb süllyedési magasság”-ként rövidítve pedig MDA/H-ként írhatók le.

Minimum equipment list (MEL) – Minimális felszerelési jegyzék
A légijármű üzemeletetéséhez rendelkezésre álló felszerelések jegyzéke, amely meghatározott feltételek alapján tartalmazza azokat a berendezéseket és egységeket, amelyek üzemképtelenek lehetnek. A jegyzéket a járató az adott légijármű vonatkozásában a MMEL vagy ennél szigorúbb feltételek alapján készíti el.

Night – Éjszaka
Az esti polgári szürkület vége és a hajnali polgári szürkület kezdete között eltelt idő vagy olyan más, napnyugat és napkelte között eltelt időszak, amelyet az illetékes hatóság határoz meg.

Megjegyzés: Az esti polgári szürkület akkor fejeződik be, amikor a napkorong középpontja 6 fokkal a horizont alá süllyed és a hajnali polgári szürkület akkor kezdődik, amikor a napkorong középpontja 6 fokkal a horizont fölé emelkedik.

Obstacle clearance altitude (OCA) or Obstacle clearance height (OCH) – Akadálymentes tengerszint feletti magasság (OCA) vagy akadálymentes földfelszín feletti magasság (OCH)
A legalacsonyabb közepes tengerszinthez viszonyított magasság vagy a megfelelő futópálya küszöb illetve a repülőtér magassága feletti magasság – amelyik alkalmazható – amelyet az akadályoktól történő megfelelő függőleges elkülönítés biztosítása érdekében az akadálymentességi előírá-sokkal összhangban határoznak meg.

1. Megjegyzés: Az akadálymentes tengerszint feletti magasság a közepes tengerszinthez, az akadálymentes földfelszín feletti magasság a futópálya küszöb magasságához viszonyított érték. A nem-precíziós megközelítés esetében az akadálymentes földfelszín feletti magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott akadálymentes földfelszín feletti magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok „QNH/QFE akadálymentes magasság”-ként rövidítve pedig OCA/H-ként írhatók le.

Operational control – Repülésüzemi irányítás
Felügyelet gyakorlása valamely repülési feladat megkezdésére, folytatására, befejezésére vagy kitérő repülőtérre történő irányítására a légijármű biztonsága valamint a repülés menetrendszerű és gazdaságos lebonyolítása érdekében.

Operational flight plan – Üzemeltetői repülési terv
A járató terve a repülési feladat biztonságos végrehajtására a repülőgép teljesítményének, üzemeltetési korlátozásainak valamint a követendő útvonalon és az érintett repülőtereken várható repülésvégrehajtási körülmények figyelembevételével.

Operations Manual – Üzemeltetési kézikönyv
A légijárművet üzemeltető személyzet számára feladataik elvégzéséhez kiadott eljárásokat, utasításokat és tájékoztatásokat tartalmazó kézikönyv.

Operator – Járató
Valamely személy, szervezet vagy vállalat, amely légijárműveket üzemeltet vagy ilyen tevékenység végzésére ajánlkozik.

Operator's maintenance control manual – Járató karbantartás irányítási kézikönyve
A járató azon eljárásait ismertető dokumentum, amely biztosítja az összes tervezett és igény szerint végrehajtandó karbantartási feladat megfelelő időben, és szabályozott valamint kielégítő módon történő végrehajtását a járató légijárművén.

Pilot-in-command – Légijármű parancsnoka
A repülés biztonságos végrehajtásáért felelős, a járató vagy az általános célú légiközlekedés esetében a légijármű tulajdonosa részéről parancsnoknak kijelölt repülőgépvezető.

Pressure-altitude – Nyomásmagasság
Magasság fogalmakban kifejezett légköri nyomás érték, mely megfelel a nemzetközi Egyezményes Légkör adott nyomásértékének (a 8. Annex alapján).

Psychoactive substances – Szellemi tevékenységet befolyásoló anyagok
Alkohol, ópiumból vagy kenderből készített kábítószer, kokain, nyugtatók és altatók, egyéb izgató, serkentő, élénkítőszerek, képzeteket keltő erős izgatószerek és illékony oldószerek a kávé és a dohányféleségek kivételével.

Repair – Javítás
A légijármű bármely üzemi alkatrészének sérülést vagy üzemszerű kopást követő repülésre alkalmas állapotba történő helyreállítása annak biztosítása érdekében, hogy az továbbra is megfeleljen a vonatkozó légialkalmassági előírásoknak, amelyeket az adott légijármű típus bizonyítványának kiadásakor figyelembe vettek.

Required navigation performance (RNP) – Előírt navigációs pontosság
Egy meghatározott légtérben történő repülés-végrehajtáshoz szükséges navigációs teljesítmény, azaz pontosság.

Megjegyzés: A navigációs teljesítményt és előírásokat az adott RNP típusra és/vagy alkalmazásra határozzák meg.

Rest period – Pihenőidő
A földön eltöltött bármely időtartam, amely alatt a járató a hajózószemélyzet tagját mentesíti összes feladata alól.

RNP type – Előírt navigációs pontosság típus
A repülőgép tervezett repülési helyzetéhez viszonyított, tengeri mérföldben kifejezett távolsággal meghatározott pontossági érték. A repülés végrehajtása során a repülési idő legalább 95 %-ában ezen a határértéken belül kell a repülőgépnek tartózkodnia.

Például: – Az RNP 4 olyan navigációs pontosság határértéket jelent, amelynek alapján az adott repülőgép repülési idejének legalább 95 százalékában mindenkori tervezett repülési helyzetéhez viszonyítva plusz/minusz 4 tengeri mérföld (7.4 km) távolságon belül repül.

Runway visual range – Futópályamenti látástávolság érték (RVR*)*
Az a távolság, ameddig a futópálya középvonalán álló légijármű vezetője látja a futópálya felületi jelzéseket vagy a futópálya szélét kijelölő illetve a középvonalát azonosító fényeket.

Safe forced landing – Biztonságos kényszerleszállás
Elkerülhetetlen kényszerleszállás talajra vagy vízfelszínre, melynek során nagy valószínűséggel várható, hogy a légijármű fedélzetén valamint a földön tartózkodó személyek nem sérülnek meg.

Safety management system – Biztonság irányítási rendszer
A biztonság irányításának rendszerezett megközelítése, amely magában foglalja a szükséges szervezeti felépítést, felelősségi köröket, irányelveket és eljárásokat.

Safety programme – Biztonsági program
Előírások és tevékenységek egységes rendszere, amely a biztonság növelésére irányul.

Small aeroplane – Kis repülőgép
Olyan repülőgép, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg vagy kevesebb.

State of Registry – Lajstromozó állam
Azon állam, amelynek lajstromába a légijárművet bevezették.

Megjegyzés: A nem nemzeti alapon működő nemzetközi üzemeltető vállalkozás vagy szervezet légijárművének lajstromozása esetében az abban érintett államokra együttesen és külön-külön is vonatkozik az a kötelezettség, amely a Chicagó-i Egyezmény értelmében a lajstromozó államot illeti. Erre vonatkozóan lásd a Tanács 1967 december 14-i Határozatát a Nemzetközi Üzemeltető Szervezetek Által Üzemeltetett Légijárművek Nemzeti Hovatartozása és Lajstromozása címmel, amely megtalálható a Nemzetközi Légiszállítás Gazdasági Szabályzására vonatkozó Útmutatóban (Doc 9587).

State of the Operator – Járató állama
Az az állam, amelynek területén a járató legfőbb üzleti telephelye található. Ennek hiányában az az állam, amelyben a járató állandó tartózkodási helye (címe) van.

Target level of safety (TLS) – Megcélzott biztonsági szint (TLS)
Adott körülmények között elfogadhatónak ítélt kockázati szintet kifejező általános fogalom.

Total vertical error (TVE) – Összegzett magassági hiba (TVE)
A légijármű aktuális repülési nyomás magassága és a részére meghatározott nyomás magasság (repülési szint) közötti függőleges geometriai különbség.

Visual meteorological conditions (VMC) – Látás utáni időjárási körülmények
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények (a 2. Annex alapján), ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél jobbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

2. fejezet
Alkalmazhatóság

A 6. Annex I. részében található nemzetközi előírások és ajánlott gyakorlati eljárások a nemzetközi kereskedelmi légiszállítás tevékenység végzésére jogosított járatók repülőgépeinek üzemeltetésére alkalmazhatók.

1. Megjegyzés: A nemzetközi általános célú légiközlekedésben üzemeltetett repülőgépekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex II. részében találhatók.

2. Megjegyzés: A nemzetközi kereskedelmi légiszállításban valamint a nemzetközi általános célú légiközlekedésben üzemeltetett forgószárnyas légijárművekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex III. részében találhatók.

3. fejezet
Általános rész

1. Megjegyzés: Bár a Nemzetközi Polgári Légiközlekedési Egyezmény a lajstromozó államra bizonyos feladatokat ír elő, amelyek végrehajtására az állam jogosult vagy kötelezett, a Közgyűlés A23-13 számú határozatában elismerte azt a tényt, hogy a lajstromozó állam bizonyos körülmények között képtelen megfelelő módon eleget tenni a fenti kötelezettségének, amikor a légijárművet más állam járatója – elsősorban hajózószemélyzet nélkül – bérbe veszi, szerződés vagy csere megállapodás alapján üzemelteti valamint azt is, hogy amíg az Egyezmény 83/b. cikkelye életbe nem lép, az Egyezmény nem megfelelően határozza meg a járató államára ilyen esetekben vonatkozó jogokat és kötelezettségeket. Ezért a Tanács felhívta a figyelmet arra, hogy ha a fenti esetekben a lajstromozó állam megállapítja, hogy képtelen az Egyezményben előírt kötelezettségei teljesítésére, azokat a feladatokat, amelyeket a járató állama jobban el tud végezni és amennyiben ez a feladatok végrehajtását elvállalja, járató államára utalhatja át. Tudomásul vették, hogy a 83/b. cikkely hatályba lépéséig a fentiek csak gyakorlati szempontból lesznek célszerűek és nem érintik a Chicagó-i Egyezménynek a lajstromozó államra vagy harmadik államra háruló kötelezettségeit. Mindazonáltal, mivel a 83/b. cikkely 1997 június 20-án hatályba lépett, a vonatkozó kiegészítést (Doc 9318) aláíró államok kötelesek az ilyen átadási megállapodásokban foglaltak teljesítésére.

2. Megjegyzés: A közös nemzetközi légi üzemeltetés esetében, amelyet olyan repülőgépekkel bonyolítanak le, amelyek nem mindegyike van azonos szerződő államban lajstromozva, a jelen rész előírásai közül semmi sem *akadályozza meg az érintett államokat abban, hogy szerződés alapján közösen végezzék el azokat a feladatokat, amelyek végrehajtására a vonatkozó Annex-ek a lajstromozó államot jelölik ki.*

3.1 A törvények, előírások és eljárások betartása

3.1.1 A járató biztosítsa, hogy minden külföldön tartózkodó alkalmazottja tudatában legyen annak, hogy eleget kell tenniük azon államok jogszabályainak, előírásainak és közzétett eljárásainak, amelyekben az üzemeltetést végrehajtják.

3.1.2 A járató biztosítsa, hogy összes repülőgépvezetője ismerje a feladataik teljesítéséhez szükséges törvényeket, jogszabályokat, előírásokat és eljárásokat, amelyeket az átrepülendő területre, az igénybe vett repülőterekre és léginavigációs létesítményekre megállapítottak. A járató biztosítsa, hogy a hajózószemélyzet többi tagja is ismerje a repülőgép üzemeltetésével kapcsolatos feladataik teljesítéséhez szükséges ilyen jogszabályokat, előírásokat és eljárásokat.

Megjegyzés: A repülőgépvezetőknek és a légiüzemeltetéssel foglalkozó személyeknek szóló azon információkat, amelyek a repülési eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülési eljárásokfelépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.

3.1.3 A repülésüzemi irányításért a járató vagy kijelölt képviselője felelős.

Megjegyzés: Ez az előírás nem érinti az állam jogait és kötelezettségeit azon repülőgépek üzemeltetésére vonatkozóan, amelyeket abban az államban vettek lajstromba.

3.1.4 A repülésüzemi irányításért viselt felelősséggel csak a légijármű parancsnoka és a repülés-üzemi tiszt / szolgálatvezető hatalmazható fel, amennyiben a járató jóváhagyott módszere a légiüzemeltetés irányítására és felügyeletére megköveteli a repülés-üzemi tiszt / szolgálatvezető alkalmazását.

Megjegyzés: A repülésüzem irányításának megszervezésére vonatkozó útmutató és a repülés-üzemi tiszt / szolgálatvezető szerepének leírása az Üzemeltetés Felügyeleti, Jogosítási és Folyamatos Ellenőrzési Eljárások Kézikönyvében (Doc 8335) *található. A repülés-üzemi tiszt / szolgálatvezető felhatalmazására, kötelességeire, és felelősségi körére vonatkozó részletes útmutatót a* Repülésüzemi Kézikönyv Előkészítése (Doc 9376) *című anyagban található. A szakszolgálati engedéllyel rendelkező repülés-üzemi tiszt / szolgálatvezető korára, képzettségére, tudására és gyakorlati jártasságára vonatkozó követelmények az 1. Annexben találhatók.*

3.1.5 Amennyiben a repülőgép vagy az utasok biztonságát fenyegető vészhelyzetről először a repülés-üzemi tiszt / szolgálatvezető szerez tudomást, akkor annak a személynek a 4.6.2 bekezdés szerinti tevékenysége, ahol az lehetséges, tartalmazza a kialakult helyzet természetéről a megfelelő hatóságok késedelem nélküli értesítését, és a segítségre vonatkozó kérést, amennyiben szükséges.

3.1.6 Amennyiben a repülőgép vagy az utasok biztonságát fenyegető vészhelyzet esetében olyan tevékenységre van szükség, amellyel megsértik a helyi előírásokat vagy eljárásokat, erről a légijármű parancsnoka késedelem nélkül értesítse az illetékes helyi hatóságot. Ha az állam, amelynek felségterületén az esemény bekövetkezik így rendelkezik, a légijármű parancsnoka bármely ilyen előírás megsértéséről nyújtson be jelentést ezen állam illetékes hatósága számára; ebben az esetben a jelentés másolatát nyújtsa be továbbá a járató állama számára is. Az ilyen jelentéseket a lehető legrövidebb időn, általában 10 napon belül nyújtsák be.

3.1.7 A járató biztosítsa, hogy a repülőgép fedélzetén a légijármű parancsnokának rendelkezésére álljon az átrepült területen működő kutató és mentő szolgálatokra vonatkozó összes alapvető tájékoztatás.

Megjegyzés: Ezt a tájékoztatást a repülőgépvezető számára az üzemeltetési kézikönyv vagy más hasonló, alkalmasnak tekintető tájékoztató anyag is tartalmazhatja.

3.1.8 A járató biztosítsa, hogy a hajózószemélyzet tagjai az 1. Annex előírásai szerint bizonyítsák képességüket a légiforgalmi rádiótávbeszélő összeköttetések során alkalmazott nyelv szóbeli használatára és megértésére.

3.2 A biztonság irányítása

3.2.1 Az állam dolgozzon ki egy biztonsági programot, hogy a repülőgépek üzemeltetése során elfogadható biztonsági szintet lehessen elérni.

3.2.2 A célul kitűzött elfogadható biztonsági szintet az érintett állam(ok) határozza(ák) meg.
Megjegyzés – a biztonsági programra és az elfogadható biztonsági szint meghatározására vonatkozó útmutatót a 11. Annex E. melléklete és a Biztonság Irányítási Kézikönyv (SMM) *(Doc 9859) tartalmazza.*

3.2.3 ***Ajánlás*** *– az államok követeljék meg, hogy a biztonsági programjuk részeként egy járató vezessen be a járató államának elfogadható biztonság irányítási rendszert, amely minimum:*

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható biztonsági szint kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és

d) törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

3.2.4 2009 január 01-től az államok a biztonsági programjuk részeként követeljék meg, hogy egy járató vezessen be a járató államának elfogadható biztonság irányítási rendszert, amely minimum:

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható biztonsági szint kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és

d) törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

3.2.5 A biztonság irányítási rendszer világosan határozza meg a biztonságért viselt felelősség függelmi viszonyait a járató teljes szervezetén belül, beleértve a felső vezetés biztonságért viselt közvetlen felelősségét.

Megjegyzés: A biztonság irányítási rendszerre vonatkozó útmutató a Biztonság Irányítási Kézikönyv*-ben* (SMM) *(Doc 9859) található.*

3.2.6 **Ajánlás** *– 2002 január 1-től a 20000 kg-nál nagyobb engedélyezett felszállósúllyal (tömeg) rendelkező repülőgép járatója biztonság irányítási rendszere részeként dolgozzon ki és vezessen be repülési adat elemző programot.*

3.2.7 A 27000 kg-nál nagyobb engedélyezett felszállósúllyal (tömeg) rendelkező repülőgép járatója biztonság irányítási rendszere részeként dolgozzon ki és vezessen be repülési adat elemző programot.

Megjegyzés: A járató a repülési adat elemző program végrehajtásával megbízhat más szervezetet, azonban az ilyen programmal kapcsolatos általános felelősség a járatót terheli.

3.2.8 A repülési adat elemző program nem lehet szankcionáló jellegű és megfelelő intézkedéseket tartalmazzon az adatforrások védelmére.

1. megjegyzés: A repülési adat elemző programokra vonatkozó útmutató a Biztonság Irányítási Kézikönyv*-ben* (SMM) *(Doc 9859) található.*

2. megjegyzés: A biztonsági adatgyűjtő és feldolgozó rendszerektől származó információk jogi útmutatóit a 13. Annex, E. melléklete *tartalmazza.*

3.2.9 A járató, biztonság irányítási rendszere részeként, az üzemeltető személyzet részére, felhasználásra és útmutatásra repülésbiztonsági dokumentációs rendszert dolgozzon ki.

Megjegyzés: A repülésbiztonsági dokumentációs rendszer kidolgozására és elrendelésére vonatkozó útmutató a H. mellékletben található.

3.3 Veszélyes áruk

1. Megjegyzés: A veszélyes árukra vonatkozó előírások a 18. Annex-ben találhatók.

2. Megjegyzés: Az Egyezmény 35. cikkelye bizonyos teheráru korlátozási osztályokra vonatkozik.

3.4 Szellemi tevékenységet befolyásoló anyagok használata

Megjegyzés: A szellemi tevékenységet befolyásoló anyagok használatára vonatkozó előírások az 1. Annex 1.2.7 és a 2. Annex 2.5 pontjaiban találhatók.

4. fejezet
Repülésvégrehajtás

4.1 Az üzemeltetés létesítményei

4.1.1 A járató biztosítsa, hogy a repülés végrehajtása ne kezdődjön meg az előtt, hogy minden rendelkezésre álló lehetséges és ésszerű eszközzel meggyőződtek arról, hogy azok a rendelkezésre álló földi és/vagy vízfelszíni létesítmények, amelyek a repülőgép biztonságos üzemeltetése valamint az utasok védelme érdekében közvetlenül szükségesek megfelelnek annak az üzemeltetés típusnak, amelynek alapján a repülést végre fogják hajtani és azokat a fenti célnak megfelelő módon üzemeltetik.

Megjegyzés: A jelen előírásban alkalmazott "lehetséges és ésszerű eszköz" kifejezés a járató részére az indulási helyen, a légiforgalmi tájékoztató szolgálatok kiadott hivatalos információiból vagy más forrásokból származó rendelkezésre álló tájékoztatásokat jelenti.

4.1.2 A járató biztosítsa, hogy az üzemeltetés során tapasztalt bármilyen működési rendellenességet indokolatlan késedelem nélkül jelentsék be a létesítmény üzemeltetéséért felelős hatóságnak.

4.1.3 A repülőtereket és azok létesítményeit a kiadott igénybevételi feltételek alapján, a közzétett üzemidőben az időjárási körülményektől függetlenül, folyamatosan bocsássák a repülési üzem rendelkezésére.

4.2 Üzemeltetési engedélyek és ellenőrzés

4.2.1 Légijármű üzembentartási engedély

4.2.1.1 A járató kereskedelmi légiszállítási tevékenységet csak akkor végezhet, ha érvényes légijármű üzembentartási engedéllyel rendelkezik, amelyet a járató állama bocsátott ki.

4.2.1.2 A légijármű üzembentartási engedély a meghatározott feltételek és korlátozások betartása mellett feljogosítja a járatót a kereskedelmi légiszállítási tevékenység végzésére.

Megjegyzés – a légijármű üzembentartási engedélyre vonatkozó útmutatót és a kapcsolódó felhatalmazásokat, feltételeket és korlátozásokat, melyeket az üzemeltetői specifikáció tartalmazhat, a Repülésüzem Ellenőrzésére, Tanúsítására és Folyamatos Felülvizsgálatára vonatkozó Eljárások Kézikönye *(Doc 8335) tartalmazza.*

4.2.1.3 A szerződő államok egy másik szerződő állam által kiadott légijármű üzembentartási engedélyt érvényesnek fogadhatnak el, feltételezve azt, hogy az engedély kiadásául szolgáló követelmények legalább azonosak a jelen Annexben meghatározott vonatkozó előírásokkal.

4.2.1.4 A légijármű üzembentartási engedély vagy más ezzel egyenértékű dokumentum kibocsátása a járató állam részéről annak függvénye, hogy a járató a meghatározott üzemeltetés természetétől és nagyságrendjétől függően és figyelembevételével bizonyságot tesz a repülési tevékenység megfelelő szervezéséről, ellenőrzési módszereiről és átfogó irányításáról valamint a kiképzési és karbantartási programjairól.

Megjegyzés: A légijármű üzembentartási engedély kiadásával kapcsolatos tájékoztatás az F. Függelékben található.

4.2.1.5 A légijármű üzembentartási engedély folyamatos érvényessége attól függ, hogy a járató a járató államának ellenőrzése alatt eleget tesz a 4.2.1.4 pont előírásának.

4.2.1.6 A légijármű üzembentartási engedély legalább a következőket tartalmazza:

a) a járató megnevezése (cégnév, székhelye);

b) a kiadás időpontja és az érvényesség időtartama;

c) az engedélyezett tevékenység típusok ismertetése;

d) a használatra engedélyezett légijármű típus(ok); és

e) üzemeltetésre engedélyezett területek vagy repülési útvonalak.

4.2.1.7 A járató állama az 5. Függelékkel öszhangban, dolgozzon ki és alkalmazzon járató üzemeltetés engedélyezési és folyamatos minőség ellenőrzési rendszert mellyel biztosítja a 4.2 pontban található, a légijármű üzemeltetés színvonalára vonatkozó előírások betartását.

4.2.2 Üzemeltetési kézikönyv

4.2.2.1 A járató az érintett üzemeltető személyzet részére felhasználásra és tájékoztatásra a 2. Függelék előírásaival összhangban biztosítson üzemeltetési kézikönyvet, amelyet szükség szerint módosítsanak és egészítsenek ki, hogy az mindig naprakész legyen. Minden ilyen kiegészítést és módosítást adjanak ki a kézikönyv használatára kötelezett összes személynek.

4.2.2.2 A járató állama írja elő a járató számára, hogy az üzemeltetési kézikönyvének egy példányát és az összes kiegészítést és/vagy módosítást adja át a járató államának felülvizsgálatra, elfogadásra és ahol szükséges jóváhagyásra. A járató üzemeltetési kézikönyvébe vegye fel az összes további kötelező anyagot, amelyeket a járató állama igényelhet.

1. Megjegyzés: Az üzemeltetési kézikönyv tartalmára és szerkezetére vonatkozó előírásokat a 2. Függelék tartalmazza.

2. Megjegyzés: Az üzemeltetési kézikönyvben szereplő egyes tételekhez a 4.2.7, 6.1.3, 9.3.1, 12.4 és 13.4.1 pontok előírásai alapján a járató államának jóváhagyása szükséges.

4.2.3 Üzemeltetési utasítások – Általános rész

4.2.3.1 A járató biztosítsa, hogy az üzemeltetésben résztvevő valamennyi személy saját feladatairól, felelősségéről valamint a feladatainak a járató tevékenységében elfoglalt helyéről megfelelő oktatásban részesüljön.

4.2.3.2 A repülőtér mozgási területén a repülőgép nem végezhet gurulást, kivéve ha a kormányánál helyet foglaló személy:

a) a járató vagy megbízott képviselőjétől megfelelő felhatalmazással rendelkezik ;

b) teljes mértékben jogosult a repülőgép gurulásának végrehajtására;

c) jogosult a rádió-távbeszélő berendezés használatára; és

d) erre jogosított személytől megfelelő kiképzést kapott a repülőtér elrendezése, útvonalai, jelzései, jelölései, fényei, a légiforgalmi irányítás utasításai, jelzései, kifejezései és eljárásai vonatkozásában továbbá képes a repülőgépnek a repülőtér területén történő biztonságos mozgatásához szükséges üzemeltetési előírások betartására.

4.2.3.3 **Ajánlás** – *A járató adjon ki üzemeltetési utasításokat és biztosítson tájékoztatásokat a repülőgép összes működő hajtóművel történő emelkedési képességéről, hogy ezzel a légijármű parancsnoka a meglevő felszállási körülmények és a tervezett felszállási módszer (repülés-technika) alapján meghatározhassa az indulási szakasz kezdeti emelkedés mértékét. Ezt a tájékoztatást vegyék fel az üzemeltetési kézikönyvbe.*

A járató biztosítsa, hogy vészhelyzeti vagy a rendes üzemeléstől eltérő gyakorlást illetve szimulációt ne végezzenek a repülés közben abban az esetben, ha a fedélzeten utasok tartózkodnak vagy teherárút szállítanak.

4.2.5 Ellenőrző jegyzékek

A hajózószemélyzet a repülőgép üzemeltetésének minden szakasza előtt, alatt és után továbbá vészhelyzetben alkalmazza a 6.1.4 pont előírása alapján elkészített és kiadott ellenőrző jegyzékeket annak biztosítására, hogy végrehajtották a légijármű üzemeltetési kézikönyvében, repülés-végrehajtási kézikönyvében vagy más, a légialkalmassági bizonyítvánnyal kapcsolatos egyéb dokumentumban valamint üzemeltetési tájékoztató kiadványokban található üzemeltetési előírásokat. Az ellenőrző jegyzékek összeállítása és felhasználása alkalmával vegyék figyelembe az emberi tényezők alapelveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében *(Doc 9683) található.*

4.2.6 Legalacsonyabb repülési magasságok

4.2.6.1 A járató jogosult arra, hogy kijelölje a legalacsonyabb repülési magasságokat azokon a repülési útvonalakon, amelyekre az átrepült útvonal állama vagy az útvonalért felelős állam is kijelölt ilyen magasságokat, feltéve hogy ezek nem alacsonyabbak, mint amelyeket az állam határozott meg.

4.2.6.2 A járató határozza meg és az üzemeltetési kézikönyvben tegye közzé azt a módszert, amely szerint meghatározni kívánja a legalacsonyabb repülési magasságokat azokra a repülési útvonalakra, amelyekre az átrepült útvonal állama vagy az útvonalért felelős állam ilyen magasságokat nem jelölt ki. A fenti módszer alapján meghatározott legalacsonyabb repülési magasságok ne legyenek alacsonyabbak, mint a 2. Annex-ben meghatározott értékek.

4.2.6.3 **Ajánlás** – *A legalacsonyabb repülési magasságok meghatározásának módszerét a járató állama hagyja jóvá.*

4.2.6.4 **Ajánlás** – *A járató állama ezeket a legalacsonyabb repülési magasságokat kellő megfontolás után, a következő tényezőknek az üzemeltetés biztonságát valószínűleg befolyásoló hatásai figyelembevételével hagyja jóvá:*

a) a pontosság és megbízhatóság, amellyel a repülőgép helyzete meghatározható;

b) a felhasznált magasságmérő berendezések jelzéseinek pontatlansága;

c) a földfelszín jellemzői (például a magasság hirtelen változásai);

d) kedvezőtlen időjárási körülmények előfordulásának valószínűsége (például erős turbulencia vagy leszálló légáramlatok);

e) a léginavigációs térképek lehetséges pontatlanságai; és

f) légtér korlátozások.

4.2.7 Repülőtér üzemeltetési minimum

4.2.7.1 A járató állama írja elő, hogy a járató minden egyes olyan repülőtérre határozzon meg repülőtér üzemeltetési minimumot, amelyet használni kíván. Az ilyen minimum meghatározásának módszerét a járató állama hagyja jóvá. A minimum ne legyen alacsonyabb, mint amelyet a repülőtérre azon állam ír elő, amelyben a repülőtér elhelyezkedik, kivéve ha erre az érintett állam külön engedélyt ad.

Megjegyzés: Ez az előírás nem követeli meg attól az államtól, amelyben a repülőtér elhelyezkedik, hogy repülőtér üzemeltetési minimumot határozzon meg.

4.2.7.2 A járató állama írja elő, hogy a repülőtér üzemeltetési minimum meghatározásánál bármely üzemeltetési mód esetében a következőket teljes mértékben vegyék figyelembe:

a) a repülőgép típusa, teljesítménye, kezelése és kiszolgálási jellemzői;

b) a hajózószemélyzet összetétele, szakmai alkalmassága és tapasztalata;

c) az igénybevételre kiválasztható futópályák méretei és jellemzői;

d) a rendelkezésre álló látás utáni és nem-látás utáni földi segédeszközök pontossága és jellemzői;

e) a repülőgépen rendelkezésre álló berendezések, amelyek a navigációhoz és/vagy a leszálláshoz történő megközelítéshez valamint a megszakított megközelítés repülési pályájának irányításához szükségesek;

f) a megközelítési és a megszakított megközelítési területeken elhelyezkedő akadályok valamint a műszeres megközelítési eljárásokhoz meghatározott akadálymentes tengerszint és földfelszín feletti magasságok;

g) az időjárási körülmények felderítésére, meghatározására és jelentésére alkalmazott módszerek; és

h) a kezdeti emelkedési területeken levő akadályok és a szükséges biztonsági elkülönítés értékei.

Megjegyzés: A repülőtér üzemeltetési minimum meghatározásával kapcsolatos útmutató az Időjárástól Független Üzemeltetés Kézikönyv-ében *(Doc 9365) található.*

4.2.7.3 A II. és III. kategóriás műszeres megközelítés és leszállás csak akkor engedélyezhető, amennyiben a futópályamenti látástávolság értékről (RVR) szóló tájékoztatás rendelkezésre áll.

4.2.7.4 **Ajánlás** – *A műszeres megközelítés és leszállás végrehajtására 800 méter látástávolság alatti repülőtéri üzemeltetési minimumot csak akkor lehet engedélyezni, ha a futópályamenti látástávolság értékről (RVR) szóló tájékoztatás rendelkezésre áll.*

4.2.8 Futópálya küszöb átrepülési magasság a precíziós megközelítések esetében

A járató dolgozzon ki üzemeltetési eljárásokat annak biztosítása érdekében, hogy a precíziós megközelítésekhez használt repülőgép repülésvezérlő szerkezeteinek leszállási beállítása mellett és ilyen repülési helyzetben a futópálya küszöböt biztonságos magasságon repülje át.

4.2.9 Tüzelőanyag és olaj jegyzékek

4.2.9.1 A járató tartson fenn tüzelőanyag és olaj jegyzékeket annak lehetővé tétele érdekében, hogy a járató állama megbizonyosodjon arról, hogy a 4.3.6 pont előírásainak minden egyes repülés esetében eleget tettek.

4.2.9.2 A tüzelőanyag és olaj jegyzékeket a járató három hónap időtartamig őrizze meg.

4.2.10 Hajózószemélyzet

4.2.10.1 *Légijármű parancsnok* – A járató minden egyes járatra jelöljön ki egy repülőgépvezetőt a parancsnoki feladatok ellátására.

4.2.10.2 *Repülési idő, repülési szolgálati időtartam és pihenőidő* – A járató dolgozzon ki szabályokat és előírásokat a repülési idő és a repülési szolgálati időtartam korlátozására továbbá a megfelelő pihenőidő biztosítására a személyzet minden tagja számára. Ezeket a szabályokat a járató állama által meghatározott vagy jóváhagyott előírásokkal összhangban dolgozzák ki és vegyék fel az üzemeltetési kézikönyvbe.

4.2.10.3 A járató rendszeresen tartsa nyilván a személyzet minden tagjának repülési idejét, repülési szolgálati valamint pihenő idejét is.

Megjegyzés: A korlátozások kidolgozásával kapcsolatos útmutató az A. Mellékletben található.

4.2.10.4 Minden egyes olyan repülés vonatkozásában, amelynek során a légijármű 15000 méter (49 000 láb) magasság felett repül, a járató az egymást követő 12 hónap alatt a személyzet minden egyes tagját ért teljes kozmikus sugárzás értékének meghatározhatósága érdekében rendszeresen tartsa nyilván a szükséges adatokat.

Megjegyzés: A teljes kozmikus sugárzás értékének nyilvántartására vonatkozó útmutató a 126 számú körlevélben – SST Légijármű Üzemeltetési Tájékoztató – *található.*

4.2.11 Utasok

4.2.11.1 A járató biztosítsa, hogy az utasokkal megismertessék a következő eszközök elhelyezkedését és használatát:

a) biztonsági övek;

b) vészkijáratok;

c) mentőmellények, ha ezek szállítását előírták;

d) oxigén légzőkészülék, amennyiben az utasok részére oxigén szállítását előírták; és

e) más, egyéni használatra rendszeresített mentőfelszerelések, beleértve az utastájékoztató kiadványokat is.

4.2.11.2 A járató tájékoztassa az utasokat a közös használatra rendszeresített alapvető mentőfelszerelések elhelyezkedéséről és általános használatáról.

4.2.11.3 A repülés során bekövetkező vészhelyzetekben az utasokat a körülményeknek megfelelő vészhelyzeti tevékenységre utasítsák.

4.2.11.4 A járató biztosítsa, hogy a fel és leszállás során valamint bármikor, amikor a repülés alkalmával turbulencia vagy bármely vészhelyzet következik be és ezt az óvintézkedést szükségesnek ítélik, a repülőgép fedélzetén tartózkodó valamennyi utas a rendelkezésre álló biztonsági övvel vagy hevederrel az ülésbe legyen bekötve.

4.3 Repülés előkészítés

4.3.1 A repülési feladat végrehajtása addig ne kezdődjön meg, amíg a repülés előkészítési nyomtatványokat nem töltötték ki annak bizonyítására, hogy a légijármű parancsnoka meggyőződött a következőkről:

a) a a repülőgép repülésre alkalmas;

b) a 6. fejezetben előírt műszerek és berendezések az adott repülési feladat típus végrehajtására felszerelésre kerültek, megfelelőek és üzemképesek;

c) a repülőgép karbantartás kibocsátó jegyzőkönyvét a 8.8 pontban előírtak szerint kiállították;

d) a repülőgép tömege valamint súlypont-helyzete a várható repülési körülmények figyelembevételével olyan, hogy a repülési feladat biztonságosan végrehajtható;

e) bármely szállítmányt megfelelő módon elhelyeztek és biztonságosan rögzítettek;

f) ellenőrizték, hogy az 5. fejezetben található üzemeltetési korlátozások az adott repülés vonatkozásában betarthatók illetve teljesíthetők; és *g)* eleget tettek a 4.3.3 pontban található üzemeltetési repülés tervezés előírásnak.

4.3.2 A kitöltött repülés előkészítési nyomtatványokat a járató három hónapig őrizze meg.

4.3.3 Üzemeltetési repülés tervezés

4.3.3.1 Minden tervezett repüléshez készítsenek üzemeltetési repülési tervet. Az üzemeltetési repülési tervet a légijármű parancsnoka és ahol ilyen van, a repülés-üzemi tiszt vagy szolgálatvezető fogadja el és írja alá. A terv egy példányát továbbítsák a járatónak vagy kijelölt képviselőjének illetve ha ezek végrehajtása nem lehetséges, az üzemeltetési repülési tervet hagyják a repülőtéri hatóságnál vagy az indulási állomáson más, alkalmas helyen.

Megjegyzés: A repülés-üzemi tiszt vagy szolgálatvezető feladatait a 4.6 szakasz tartalmazza.

4.3.3.2 Az üzemeltetési kézikönyvben ismertetni kell az üzemeltetési repülési terv tartalmát és használatát.

4.3.4 Kitérő repülőterek

4.3.4.1 Felszállási kitérő repülőtér

4.3.4.1.1 Válasszanak ki és az üzemeltetési repülési tervben határozzanak meg felszállási kitérő repülőteret, ha az indulási repülőtéren az időjárási körülmények az alkalmazható repülőtér üzemeltetési minimum értékén vagy az alatt vannak illetve ha bármely más okból az indulási repülőtérre történő visszatérés nem lehetséges.

4.3.4.1.2 A felszállási kitérő repülőtér az indulási repülőtértől számított alábbi távolságokon belül helyezkedjen el:

a) Két hajtóműves repülőgépek esetében – nem több mint egy órányi repülésnek megfelelő távolság egy (működő) hajtóműves utazósebessége mellett;

b) Három vagy több hajtóműves repülőgépek esetében – nem több mint két órányi repülésnek megfelelő távolság egy üzemképtelen hajtóművel történő repülés utazósebessége mellett.

4.3.4.1.3 A felszállási kitérő repülőtérként kiválasztandó repülőtérről rendelkezésre álló tájékoztatások jelezzék, hogy az igénybevétel várható időpontjában a repülőtér (időjárási) körülményei adott üzemeltetésre vonatkozó repülőtér üzemeltetési minimumnak megfelelőek vagy annál jobbak lesznek.

4.3.4.2 Útvonal kitérő repülőtér

A két sugárhajtóművel felszerelt repülőgép megnövelt hatótávolságú üzemeltetése esetében, a 4.7 pont alapján válasszanak ki és az üzemeltetési valamint a légiforgalmi szolgálatoknak benyújtott repülési tervekben határozzanak meg útvonal kitérő repülőtereket.

4.3.4.3 Célállomás kitérő repülőtér

A műszerrepülési szabályok szerint végrehajtott repülések esetében válasszanak ki és az üzemeltetési valamint a légiforgalmi szolgálatoknak benyújtott repülési tervekben határozzanak meg legalább egy célállomás kitérő repülőteret, kivéve ha:

a) a repülés időtartama és az uralkodó időjárási körülmények olyanok, hogy nagy valószínűséggel feltételezhető, hogy a tervezett leszállási repülőtéren az érkezés számított időpontjában valamint az ezt megelőző és az ezt követő ésszerű idő-határokon belül a megközelítés és a leszállás látás utáni időjárási körülmények között végrehajtható lesz; és
b) a tervezett leszállási repülőtér elszigetelt fekvésű és nincs alkalmas célállomás kitérő repülőtér.

4.3.5 Időjárási körülmények

4.3.5.1 A látvarepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha az érvényes időjárás-jelentések vagy az érvényes időjárás-jelentések és előrejelzések kombinációja azt jelzik, hogy az útvonalon vagy annak látvarepülési szabályok szerint tervezett repülési szakaszán a megfelelő időben az uralkodó időjárási körülmények olyanok lesznek, hogy a Látás után történő repülésvégrehajtás szabályai (VFR) betarthatók lesznek.

4.3.5.2 A műszerrepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha a rendelkezésre álló tájékoztatások szerint az érkezés várható időpontjában a tervezett leszállási repülőtéren vagy ahol célállomás kitérő repülőtér meghatározása is szükséges, legalább egy ilyen repülőtéren az uralkodó (időjárási) körülmények repülőtér üzemeltetési minimumnak megfelelőek vagy annál jobbak lesznek.

Megjegyzés: Néhány állam gyakorlata szerint a repülés tervezési célokra magasabb minimumokat jelölnek meg arra az esetre, ha a repülőteret célállomás kitérőként választják szemben azzal, ha a repülőtér a tervezett leszállás helye.

4.3.5.3 Ismert vagy várható jegesedés körülményei között a repülést ne kezdjék meg, csak akkor, ha a repülőgép ilyen körülmények között történő üzemelésre van jogosítva és felszerelve.

4.3.5.4 Ismert vagy várható földi jegesedés körülményei között történő üzemelésre tervezett járat nem szállhat fel mindaddig, amíg a repülőgépet jegesedés szempontjából nem vizsgálták felül és nem végezték el a megfelelő jégtelenítést illetve jégmentesítést. A jeget vagy más természetes szennyező anyagot úgy távolítsák el a repülőgépről, hogy az közvetlenül a felszállás előtt is repülésre alkalmas állapotban legyen.

Megjegyzés: A fentiekre vonatkozó tájékoztatót a Légijármű Földi Jégtelenítés Végrehajtása Kézikönyv *(Doc 9640) tartalmazza.*

4.3.6 Tüzelőanyag (üzemanyag) és olajkészlet

Megjegyzés: A hangsebesség felett repülő repülőgépek tüzelőanyag és olajkészletének meghatározása különleges körülmények figyelembevételét teszi szükségessé az ilyen repülőgép típus egyedi üzemeltetési jellemzői miatt. A hangsebesség feletti repülőgépek tüzelőanyag-készletével kapcsolatos útmutató a 126 számú körlevélben – SST Légijármű Üzemeltetési Tájékoztató – *található.*

4.3.6.1 *Minden repülőgép esetében* – A repülés végrehajtását ne kezdjék meg csak akkor, ha az időjárási körülmények valamint a repülés során várható bármely késés figyelembevételével a repülőgép elegendő tüzelőanyagot és olajat szállít ahhoz, hogy a repülést biztonságosan be tudja fejezni. Ezen kívül az előre nem látható eseményekre való tekintettel szállítsanak tartalékot is.

4.3.6.2 *Légcsavaros repülőgép esetében* – A 4.3.6.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a légcsavaros repülőgép esetében legalább annyi legyen, ami lehetővé teszi, hogy a repülőgép:

4.3.6.2.1 Ha célállomás kitérő repülőtér kijelölése szükséges:

a) elrepüljön arra a repülőtérre, amelyre a repülést tervezték és onnan tovább repüljön az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési terveiben meghatározott (tüzelőanyag-fogyasztás szempontjából) legkritikusabb kitérő repülőtérre majd ezután további 45 percig; vagy

b) egy bármely előre meghatározott ponton át elrepüljön a kitérő repülőtérre majd ezután további 45 percig, feltéve hogy ez nem kevesebb, mint az a mennyiség, amely a tervezett repülőtérre történő repüléshez és ezt követően;

1) további 45 perc repüléshez valamint az utazómagasságon tervezett repülési idő 15 %-a lerepüléséhez ; vagy

2) két órai repüléshez – amelyik a kevesebb – szükséges.

4.3.6.2.2 Ha célállomás kitérő repülőtér kijelölése nem szükséges:

a) a 4.3.4.3 *a)* alapján elrepüljön arra a repülőtérre, amelyre a repülést tervezték és ez után további 45 percig; vagy

b) a 4.3.4.3 *b)* alapján elrepüljön arra a repülőtérre, amelyre a repülést tervezték és ezt követően;

1) további 45 perc repüléshez valamint az utazómagasságon tervezett repülési idő 15 %-a lerepüléséhez; vagy

2) két óra időtartamig – amelyik a kevesebb – repüljön.

4.3.6.3 G*ázsugár hajtóműves repülőgép esetében* – A 4.3.6.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a gázsugár hajtóműves repülőgép esetében legalább annyi legyen, ami lehetővé teszi, hogy a repülőgép:

4.3.6.3.1 Ha célállomás kitérő repülőtér kijelölése szükséges:

a) elrepüljön arra a repülőtérre amelyre a repülést tervezték és ott egy megközelítést és egy megszakított megközelítést hajtson végre majd ezek után;

1) tovább repüljön az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési terveiben meghatározott kitérő repülőtérre; és ezt követően;

2) a kitérő repülőtér felett 1500 láb (450 méter) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön valamint megközelítést és leszállást hajtson végre; és

3) ezen felül a repülőgép rendelkezzen annyi tüzelőanyaggal, amely fedezi a járató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét; vagy

b) egy bármely előre meghatározott ponton át elrepüljön a kitérő repülőtérre majd ott 1500 láb (450 méter) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön továbbá ezen felül a repülőgép rendelkezzen annyi tüzelő-anyaggal, amely fedezi a járató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét, feltéve hogy ez a teljes mennyiség nem kevesebb, mint a célrepülőtérig történő és ezen felül további két órányi, általános utazósebességgel történő repüléshez szükséges teljes tüzelőanyag-készlet.

4.3.6.3.2 Ha célállomás kitérő repülőtér kijelölése nem szükséges:

a) a 4.3.4.3 *a)* alapján elrepüljön arra a repülőtérre, amelyre a repülést tervezték és ezt követően:

1) a repülőtér felett 1500 láb (450 méter) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön; és

2) ezen felül a repülőgép rendelkezzen annyi tüzelőanyaggal, amely fedezi a járató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét; és

b) a 4.3.4.3 *b)* alapján elrepüljön arra a repülőtérre, amelyre a repülést tervezték és ezt követően rendes utazósebességnek megfelelő tüzelőanyag-fogyasztással további két óra időtartamig repüljön.

4.3.6.4 A 4.3.6.1 pont előírása alapján szükséges tüzelőanyag és olaj készlet mennyiségének kiszámításánál legalább a következő tényezőket vegyék figyelembe:

a) előrejelzett időjárási körülmények;

b) várható légiforgalmi irányítói engedélyek és útvonalak valamint forgalmi késések;

c) a műszerrepülési szabályok szerint (IFR) végrehajtott repülés esetében egy műszeres megközelítés végrehajtása a célállomás repülőtéren, beleértve egy megszakított megközelítést is;

d) az üzemeltetési kézikönyvben a repülés végrehajtása alatt (útközben) a túlnyomásos kabin dehermetizálódás – amennyiben alkalmazható – valamint egy hajtómű meghibásodása esetére előírt eljárások; és

e) minden egyéb olyan körülmény, amely a repülőgép leszállását késleltetheti vagy a tüzelőanyag és/vagy olajfogyasztást növelheti.

Megjegyzés: A 4.3.6 pontban ismertetett tényezők nem korlátozzák a repülési terv repülés közben történő módosításának lehetőségét és a repülés áttervezését egy másik repülőtérre, feltéve hogy a 4.3.6 pont előírásai teljesíthetők attól a ponttól kezdődően is, ahol a repülés áttervezése megtörtént.

4.3.7 Tüzelőanyag-feltöltés utasokkal a fedélzeten

4.3.7.1 A repülőgépen ne végezzenek tüzelőanyag feltöltést akkor, amikor az utasok beszállnak, kiszállnak vagy a repülőgép fedélzetén tartózkodnak, kivéve ha elegendő számú kiképzett személyzet áll készenlétben a repülőgép leggyorsabb és legcélszerűbb módszerekkel történő kiürítésének megkezdésére és a kiürítés irányítására.

4.3.7.2 Az utasok beszállása, kiszállása vagy a repülőgép fedélzetén történő tartózkodása alatt végzett tüzelőanyag feltöltés alatt a repülőgép belső távbeszélő berendezése vagy más alkalmas eszköz segítségével tartsanak fenn két-oldalú összeköttetést a tüzelőanyag feltöltést ellenőrző földi személyzet és a repülőgép fedélzetén tartózkodó kiképzett személyzet között.

1. Megjegyzés: A 4.3.7.1 pont előírása a tüzelőanyag-feltöltés előfeltételeként nem teszi alapvetően szükségessé a repülőgép saját beépített lépcsőjének kibocsátását vagy a vészkijáratok kinyitását.

2. Megjegyzés: A légijármű tüzelőanyag feltöltésére vonatkozó előírások a 14. Annex-ben és a biztonságos tüzelőanyag feltöltési módszerekkel kapcsolatos útmutató a Repülőtér Szolgálati Kézikönyv *(Doc 9137) 1. valamint 8. részében található.*

3. Megjegyzés: Amikor a repülőgép tüzelőanyaggal történő feltöltését nem kerozinnal végzik, a feltöltés alkalmával a kerozin más gázturbina hajtóanyagokkal keveredik, vagy nyílt töltővezetéket alkalmaznak, további elővigyázatossági rendszabályokra van szükség.

4.3.8 Oxigén készlet

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, az egyezményes légkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	***magasság – méter***	***magasság – láb***
700 hPa	3000	10 000
620 hPa	4000	13 000
376 hPa	7600	25 000

4.3.8.1 Olyan repülési magasságon végrehajtandó repülés esetén, amelyen a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb, a repülést ne kezdjék meg csak akkor, ha elegendő mennyiségű belégzésre alkalmas oxigént biztosítottak, amely ellátja:

a) a személyzet minden tagját valamint az utasok 10 %-át 30 percet meghaladó bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa és 620 hPa érték között van; és

b) a személyzet tagjait valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 620 hPa értéknél alacsonyabb.

4.3.8.2 A túlnyomásos kabinnal rendelkező repülőgép esetében a repülés végrehajtását ne kezdjék meg csak akkor, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely a túlnyomás megszűnése esetén, a repülés körülményeinek megfelelően ellátja a személyzet összes tagját valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa értéknél alacsonyabb. Ezen kívül, ha a repülőgépet olyan repülési magasságon üzemeltetik, amelyen az atmoszférikus légnyomás értéke 376 hPa-nál alacsonyabb vagy amelyen az atmoszférikus légnyomás értéke 376 hPa-nál magasabb, de a repülőgéppel négy percen belül nem lehet biztonságosan olyan magasságra süllyedni, amelyen az atmoszférikus légnyomás értéke 620 hPa-nak felel meg, az utaskabinban tartózkodó személyek részére legalább tíz percre elegendő oxigén készletet biztosítsanak.

4.4 Repülési eljárások

4.4.1 Repülőtér üzemeltetési minimum

4.4.1.1 A repülést ne folytassák a tervezett leszállási repülőtér felé csak abban az esetben, ha a rendelkezésre álló legújabb tájékoztatások azt jelzik, hogy az érkezés várható időpontjában az adott vagy legalább egy célállomás kitérő repülőtéren a leszállás a 4.2.7.1 pont előírásaiban meghatározott üzemeltetési minimum érték alapján végrehajtható.

4.4.1.2 A precíziós megközelítés esetében a műszeres megközelítést ne folytassák a külső marker adó (OM) navigációs ponton túl vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alatt, kivéve ha a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték (RVR) a megállapított minimum felett van.

4.4.1.3 Amennyiben precíziós megközelítés esetében a külső marker adó (OM) navigációs pont átrepülése után vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alá történő süllyedésnél a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték a megállapított minimum alá csökken, a megközelítés az elhatározási vagy a legalacsonyabb süllyedési magasságig folytatható. A repülőgép semmi esetre se folytassa a leszálláshoz történő megközelítését bármely repülőtérre azon a meghatározott ponton túl, amely után a repülőtérre megállapított repülőtér üzemeltetési minimum értéket megsértené.

Megjegyzés: A meghatározó futópályamenti látástávolság érték az egy vagy több mérési helyről (földetérési terület, futópálya középpont, megállási terület) jelentett RVR értékeket jelenti, amelyeket az üzemeltetési minimum érték teljesítésének megállapítására használnak. Ahol RVR értéket alkalmaznak, a meghatározó futópályamenti látástávolság érték a földetérési területre vonatkozó RVR, kivéve ha a helyi előírások mást nem határoznak meg.

4.4.2 Időjárási megfigyelések

Megjegyzés: A repülés végrehajtása során a légijármű fedélzetén történő időjárás megfigyelés, észlelés, feljegyzés valamint jelentés megfelelő eljárásait a 3. Annex, a PANS-ATM (Doc 4444) és a vonatkozó Körzeti Kiegészítő Eljárások *(Doc 7030) tartalmazzák.*

4.4.3 Repülésre veszélyes körülmények

A repülésre veszélyes, az időjárási viszonyokkal kapcsolatostól eltérő, a repülés végrehajtása során tapasztalt egyéb körülményeket a lehető legrövidebb időn belül jelentsék az illetékes légiforgalmi állomásnak. A jelentések tartalmazzák a más légijárművek biztonságával kapcsolatos vagy kapcsolatba hozható részleteket is.

4.4.4 A hajózószemélyzet tagjai munkahelyeiken

4.4.4.1 *Fel és leszállás* – A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén.

4.4.4.2 *Útvonalon* – A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén, kivéve ha távolléte a repülőgép üzemeltetésével kapcsolatos feladatok elvégzése vagy fiziológiai okok miatt szükséges.

4.4.4.3 *Biztonsági övek* – A hajózószemélyzet valamennyi tagja szolgálati helyén tartsa biztonsági övét becsatolva.

4.4.4.4 *Vállhevederekkel ellátott biztonsági övek* – A fel és leszállási szakaszokban a hajózószemélyzet valamennyi repülőgépvezető ülést elfoglaló tagja vállhevederrel ellátott biztonsági övét tartsa becsatolva; a hajózószemélyzet többi tagja a fel és leszállási szakaszokban vállhevederrel ellátott biztonsági övét tartsa becsatolva, kivéve ha a vállhevederek akadályozzák őket feladataik végrehajtásában, amely esetben a vállhevedereket kikapcsolhatják, azonban a biztonsági öveket bekapcsolva kell tartaniuk.

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

4.4.5 Oxigén használat

4.4.5.1 A repülőgép repülési közben történő biztonságos üzemeltetéséhez nélkülözhetetlen feladatokat ellátó összes hajózószemélyzeti tagja folyamatosan használja az oxigén légzőkészüléket, amikor ezt az uralkodó körülmények a 4.3.8.1 vagy 4.3.8.2 pontok előírásai alapján szükségessé teszik.

4.4.5.2 Olyan túlnyomásos kabinnal ellátott repülőgép esetében, amely azon tengerszint feletti magasság felett üzemel, amelyben az atmoszférikus nyomás 376 hPa értéknél alacsonyabb, az összes hajózószemélyzeti tag szolgálati helyén álljon rendelkezésre gyorsan igénybe vehető, zárt oxigén álarc (légzőmaszk), amely szükség esetén azonnal belégzésre alkalmas oxigént biztosít.

4.4.6 A túlnyomásos kabinnal felszerelt repülőgép utaskabin személyzeti tagjainak és utasainak védelme dehermetizáció – a túlnyomás megszűnése – esetén

Ajánlás – *Az utaskabin személyzeti tagok biztonságát úgy védjék, hogy azok az esetleges túlnyomás megszűnése esetében szükségessé váló vészsüllyedés alkalmával eszméletüket nagy valószínűséggel ne veszítsék el továbbá képesek maradjanak arra, hogy a vészhelyzetet követő stabilizált repülés folyamán az utasokat elsősegélyben részesítsék. Az utasok biztonságát olyan eszközökkel, berendezésekkel vagy üzemeltetési eljárásokkal védjék, amelyek nagy valószínűséggel biztosítják, hogy az utasok túlélik a túlnyomás megszűnése miatt fellépő oxigénhiány hatásait.*

Megjegyzés: Nem lehet előre megállapítani vagy feltételezni, hogy az utaskabin személyzet a túlnyomás megszűnése esetén szükségessé váló vészsüllyedés alkalmával mindig képes lesz segítséget nyújtani az utasoknak.

4.4.7 Repülés végrehajtása során alkalmazandó üzemeltetési utasítások

A légiforgalmi szolgálati egységeknek benyújtott repülési terv megváltoztatását magába foglaló járatói üzemeltetési utasításokat, ha lehetséges még a repülőgépre történő továbbítás előtt egyeztessék az illetékes légiforgalmi szolgálati egységgel.

Megjegyzés: Amennyiben a fent jelzett egyeztetés nem lehetséges, a kapott üzemeltetési utasítás nem mentesíti a repülőgépvezetőt az illetékes légiforgalmi szolgálati egység megfelelő engedélyének beszerzésével kapcsolatos felelőssége alól a repülési terv megváltoztatása előtt.

4.4.8 Műszerrepülési eljárások

4.4.8.1 A műszeres megközelítési és leszállási kategóriák alapján minden egyes műszeres futópályára vagy műszerrepülési szabályok szerint történő üzemeltetésre használt repülőtérre dolgozzanak ki egy vagy több műszeres megközelítési eljárást, amelyet az az állam hagyjon jóvá és tegyen közzé, amelynek területén a repülőtér elhelyezkedik.

4.4.8.2 A műszerrepülési szabályok szerint üzemelő összes repülőgép tartsa be azokat a műszerrepülési eljárásokat, amelyeket az az állam hagyott jóvá, amelynek területén a repülőtér elhelyezkedik.

1. Megjegyzés: A műszeres megközelítés és leszállás kategóriáit illetve az osztályozást az I. fejezet tartalmazza.

2. Megjegyzés: A műszerrepülési eljárásokban érintett személyek részére ajánlott üzemeltetési eljárások a PANS OPS (Doc 8168) I. kötetében találhatók.

3. Megjegyzés: A műszerrepülési eljárások kidolgozásában érintett szakértők részére ajánlott tájékoztató anyag a PANS-OPS (Doc 8168) II. kötetében található.

4.4.9 Repülőgép zajcsökkentő eljárások

4.4.9.1 **Ajánlás** – *A zajcsökkentés érdekében kidolgozott repülőgép üzemeltetési eljárások feleljenek meg a PANS-OPS I. kötet V. rész (Doc 8168) előírásainak.*

4.4.9.2 ***Ajánlás*** – *A járató által egy repülőgép típus vonatkozásában kidolgozott zajcsökkentési eljárás minden repülőtérre azonos legyen.*

4.5 A légijármű parancsnok kötelmei

4.5.1 Az ajtók bezárása után a légijármű parancsnoka felelős a fedélzeten tartózkodó összes személyzeti tag, utas és az elhelyezett teherárú biztonságáért. A parancsnok felelős továbbá a repülőgép üzemeltetéséért és biztonságáért attól a pillanattól kezdve, amikor a repülőgép a felszállás céljából történő indulásra készen áll addig, mikor az a repülés után végleg megáll és az elsődleges hajtómű egységeket leállítják.

4.5.2 A légijármű parancsnoka biztosítsa, hogy pontosan és részletesen betartsák a repülési ellenőrző jegyzékekre vonatkozó 4.2.5 pontban ismertetett előírást.

4.5.3 A légijármű parancsnoka felelős a legközelebbi illetékes hatóság lehető leggyorsabb értesítéséért a repülőgépet érintő bármely olyan balesetről, amelynek következménye bármely személy súlyos vagy halálos sérülése illetve a repülőgép vagy más anyagi javak jelentős károsodása.
Megjegyzés: A „súlyos sérülés” kifejezés meghatározása a 13. Annex-ben található.

4.5.4 A légijármű parancsnoka felelős az összes, a repülőgépen tapasztalt vagy feltételezett meghibásodás jelentéséért a járató felé a repülés befejezését követően.

4.5.5 A légijármű parancsnoka felelős a 11.4.1 pontban ismertetett tájékoztatásokat tartalmazó útinaplóért vagy általános nyilatkozatért.

Megjegyzés: A Közgyűlés 1956 június-július hónapjaiban, Caracasban tartott tizedik ülésszakán elfogadott A10-36 számú határozata értelmében a 9. Annex-ben ismertetett "Általános Nyilatkozat" (General Declaration) – amennyiben tartalmazza az Egyezmény 34. cikkelyében előírt tájékoztatásokat – a szerződő államok részéről az "Útinapló" (Journey Log Book) megfelelő változataként fogadható el.

4.6 A repülés-üzemi tiszt vagy szolgálatvezető kötelmei

4.6.1 A repülés-üzemi tiszt/szolgálatvezető – amikor a 4.2.1 pont előírásainak megfelelően repülés-felügyeleti feladatok ellátásával van megbízva – hajtsa végre a következőket:

a) segítse a légijármű parancsnokát a repülés előkészítésében és adjon meg számára minden szükséges tájékoztatást;

b) segítse a légijármű parancsnokát az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési tervek elkészítésében valamint amennyiben erre szükség van, írja alá a dokumentumokat és nyújtsa be a megfelelő repülési tervet az illetékes légiforgalmi szolgálati egységnek;

c) repülés közben a rendelkezésre álló eszközök segítségével adja meg a légijármű parancsnoka számára azokat a tájékoztatásokat, amelyek a repülés biztonságos végrehajtásához szükségesek lehetnek; és *d)* vészhelyzet esetén kezdeményezze az üzemeltetési kézikönyvben található vészhelyzetre vonatkozó eljárásokat.

4.6.2 A repülés-üzemi tiszt/szolgálatvezető feladatainak végrehajtása során kerüljön el minden olyan ténykedést, amellyel ellentétbe kerülne a következő szervezetek által kidolgozott eljárásokkal:

a) légiforgalmi irányítás;

b) meteorológiai szolgálatok; és

c) távközlési szolgálatok.

4.7 Két gázturbinás sugárhajtóművel felszerelt repülőgépek megnövelt hatótávolságú üzemeltetésére (ETOPS) vonatkozó kiegészítő előírások

4.7.1 A két gázturbinás sugárhajtóművel felszerelt repülőgépet a 4.7.4 pont ajánlásában foglaltak kivételével, a járató államának külön engedélye nélkül ne üzemeltessenek olyan útvonalon, amelyen az alkalmas útvonal kitérő repülőtérig tartó egy hajtóműves utazósebességgel történő repülés ideje meghaladja az állam által ilyen üzemeltetésre meghatározott legnagyobb időtartamot, azaz küszöb-időt.

1. Megjegyzés: A küszöb-idő értékével kapcsolatos útmutató az E. Mellékletben található.

2. Megjegyzés: Az üzemeltetés engedélyezésére vonatkozóan, amelynek alapján eleget tehetnek az 5.2.11 pont előírásának, a megfelelő és alkalmas kitérő repülőterekkel kapcsolatos útmutató az E. Mellékletben található.

4.7.2 A járató állama az üzemeltetés engedélyezésekor biztosítsa, hogy:

a) a repülőgép típus légialkalmassági bizonyítványa;

b) a hajtómű rendszer megbízhatósága; és

c) a járató karbantartási programjai, üzemeltetési eljárásai és gyakorlata, repülés felügyeleti módszerei és eljárásai valamint hajózószemélyzet kiképzési programjai;

alapján teljes mértékben teljesítik a 6. és 8. Annex-ekben meghatározott átfogó repülésbiztonsági szintet. Ennek felmérésekor vegyék figyelembe a lerepülendő útvonalat, a várható repülési körülményeket valamint az alkalmas útvonal kitérő repülőterek elhelyezkedését is.

1. Megjegyzés: A fenti követelmények teljesítésére vonatkozó útmutató az E. Mellékletben található.

2. Megjegyzés: A repülőgép rendszereinek a 4.7.2 pontban jelzett teljesítmény és megbízhatóság szintjére illetve folyamatos légialkalmasság tényezőire és jellemzőire vonatkozó útmutató a Légialkalmassági Kézikönyv-ben *(Doc 9760) található.*

4.7.3 A 4.7.1 pont előírása alapján végrehajtandó repülést ne kezdjék meg csak akkor, ha az érkezés lehetséges időszakában a kijelölt útvonal kitérő repülőtér illetve repülőterek rendelkezésre áll(nak) és a tájékoztatások azt jelzik, hogy a fenti repülőterek körülményei az adott üzemeltetéshez elfogadott repülőtér üzemeltetési minimum értékeknek megfelelőek vagy azoknál jobbak lesznek.

4.7.4 **Ajánlás** – *A két gázturbinás sugárhajtóművel felszerelt repülőgép típus járatójának állama, amely az ilyen repülőgép részére 1986 március 25. előtt adott ki üzemeltetési engedélyt olyan útvonalra, ahol az egy hajtóműves utazósebességgel történő repülés időtartama az alkalmas útvonal kitérő repülőtérig meghaladja a 4.7.1 pontban az ilyen üzemeltetésre megállapított küszöb-időt, vizsgálja meg, hogy a jelzett időpont után az adott útvonalon az ilyen üzemeltetés folytatását tovább engedélyezi.*

4.8 Kézipoggyász

A járató biztosítsa, hogy a repülőgépre felvitt és az utaskabinban elhelyezett összes poggyászt megfelelő módon és biztonságosan tárolják (szállítsák).

4.9 Kiegészítő követelmények a műszerrepülési szabályok szerint (IFR) vagy éjszaka, egy pilótával végrehajtott repülések esetére

4.9.1 IFR körülmények között, vagy éjszaka a légijármű nem üzemeltethető egy pilótával, kivéve, ha a járató állama jóvá nem hagyja.

4.9.2 A légijármű IFR feltételek között, vagy éjszaka nem üzemeltethető egy pilótával, kivéve, ha:

a) a repülésvégrehajtási kézikönyv nem írja elő az egynél több főből álló hajózó személyzetet;

b) a légijármű légcsavar meghajtású;

c) a jóváhagyott utasülések száma nem haladja meg a kilencet;

d) a maximálisan engedélyezett felszálló tömeg nem lépi túl az 5700 kg értéket;

e) a légijármű felszerelése megfelel a 6.22 fejezetben leírtaknak; és

f) a repülőgép parancsnok képesítése, gyakorlata, ellenőrzöttsége és naprakészsége megfelel a 9.4.5 fejezetben leírtaknak.

5. fejezet
Repülőgép teljesítmény üzemeltetési korlátozások

5.1 Általános rész

5.1.1 A repülőgépeket a lajstromozó állam részéről a jelen fejezet alkalmazható nemzetközi előírásaival összhangban kidolgozott és közzétett, részletes és átfogó teljesítmény előírás betartásával üzemeltessék.

5.1.2 Az egy hajtóművel felszerelt repülőgépeket csak olyan időjárási és fényviszonyok között valamint olyan útvonalak és (kitérő) területek felett üzemeltessék, amelyek a hajtómű meghibásodása esetén lehetővé teszik a biztonságos kényszerleszállás végrehajtást.

5.1.3 **Ajánlás** – *Olyan repülőgépek esetében, amelyekre a 8. Annex IIIA és IIIB része az Egyezmény 41. cikkelyének előírásában található felmentés miatt nem alkalmazható, a lajstromozó állam biztosítsa, hogy az 5.2 pontban meghatározott teljesítmény szintet a lehető legnagyobb mértékben kielégítsék.*

5.2 A 8. Annex IIIA és IIIB részei alapján jogosított repülőgépek

5.2.1 Az 5.2.2 – 5.2.11 pontokban ismertetett előírások azokra a repülőgépekre vonatkoznak, amelyekre 8. Annex IIIA és IIIB részek előírásai alkalmazhatók.

Megjegyzés: A következő nemzetközi előírások nem tartalmaznak az országos légialkalmassági előírásokban található rendelkezésekkel összevethető érték (mennyiség) előírásokat. Ezeket az 5.1.1 pont alapján a szerződő államok kiegészítésképpen saját előírásaiban határozzák meg.

5.2.2 Az 5.1.1 pontban jelzett, az 5.2.1 pontban kijelölt repülőgépekre vonatkozó átfogó és részletes országos előírásokban meghatározott teljesítmény szintek legalább lényegükben feleljenek meg a jelen fejezet előírásaiban megfogalmazott általános színvonalnak.

Megjegyzés: A C. Melléklet útmutató anyagot tartalmaz, amely példák segítségével mutatja be a jelen fejezet nemzetközi előírásaiban és ajánlott gyakorlati eljárásaiban biztosítani kívánt teljesítmény szintet.

5.2.3 A repülőgépet a légialkalmassági bizonyítványban megállapított feltételek alapján, a repülésvégrehajtási kézikönyvében található elfogadott teljesítmény korlátozások betartásával üzemeltessék.

5.2.4 A lajstromozó állam az ésszerűség határain belül foganatosítson olyan elővigyázatossági intézkedéseket, amelyek lehetővé teszik az elvárható általános biztonsági szint fenntartását minden várható – még a jelen fejezetben tételesen nem jelzett – üzemeltetési körülmények között.

5.2.5 A repülés végrehajtását ne kezdjék meg csak akkor, ha a repülésvégrehajtási kézikönyvben található teljesítmény tájékoztatások azt jelzik, hogy a tervezett repülés során be tudják tartani az 5.2.6 – 5.2.11 pontok előírásait.

5.2.6 A jelen fejezet előírásainak alkalmazásakor vegyék figyelembe a repülőgép teljesítményét jelentősen befolyásoló összes tényezőt (mint például a tömeg, üzemeltetési eljárások, a repülőtér magasságának megfelelő nyomás-magasság, hőmérséklet, szélviszonyok, futópálya lejtése és állapota azaz a felületen található latyak, víz és/vagy hó a szárazföldi valamint a vízfelszín állapota a vízi repülőgépek vonatkozásában). Ezeket a tényezőket közvetlenül üzemeltetési jellemzőként vagy közvetetten tűrési illetve határértékként vegyék figyelembe, amelyek azon teljesítmény adatok részletes ismertetésével vagy átfogó teljesítmény előírással adhatók meg, amelyek alapján a repülőgépet üzemeltetik.

5.2.7 Tömeg korlátozások

a) A felszállás végrehajtásának megkezdésekor a repülőgép tömege ne haladja meg az 5.2.8 pont alapján meghatározott, sem pedig a repülés előrehaladása folyamán vagy az üzemanyag-kibocsátás miatt bekövetkező súlycsökkenést figyelembe vevő 5.2.9 – 5.2.11 pontok alapján meghatározott értékeket úgy, ahogy az az 5.2.9 és 5.2.10 pontok alkalmazása során, a kitérő repülőterek vonatkozásában az 5.2.7 c) pontban valamint az 5.2.11 pontban szerepel.

b) A felszállás végrehajtásának megkezdésekor a repülőgép tömege semmi esetre se haladja meg a repülőgép repülésvégrehajtási kézikönyvében a repülőtér magasságának megfelelő nyomás-magasságra meghatározott legnagyobb felszálló-súly értéket továbbá ha a legnagyobb felszálló-súly meghatározására más jellemzőket is felhasználnak, bármely más helyi környezeti jellemzővel meghatározott értéket.

c) A tervezett leszállási vagy bármely kijelölt célállomás kitérő repülőtéren az érkezés várható időpontjában a repülőgép számított tömege semmi esetre se haladja meg a repülőgép repülésvégrehajtási kézikönyvében a repülőtér magasságának megfelelő nyomás-magasságra meghatározott legnagyobb leszálló-súly értéket továbbá ha a legnagyobb leszálló-súly meghatározására más jellemzőket is felhasználnak, bármely más helyi környezeti jellemzővel meghatározott értéket.

d) A felszállás végrehajtásának megkezdésekor vagy a tervezett leszállási illetve bármely kijelölt célállomás kitérő repülőtéren az érkezés várható időpontjában a repülőgép számított tömege semmi esetre se haladja meg a legnagyobb engedélyezett tömeget, amely megfelel a 16. Annex I. kötet zajszint minősítési előírásainak, kivéve ha különleges körülmények között, bizonyos repülőtéren vagy futópályán, ahol zajszint probléma nem jelentkezik, erre az érintett állam illetékes hatósága, amelyben a repülőtér elhelyezkedik, külön engedélyt ad.

5.2.8 *Felszállás* – A repülőgép a felszállás során bármely időpontban bekövetkező kritikus hajtómű meghibásodás esetén képes legyen a felszállás megszakítására valamint a rendelkezésre álló gyorsításból történő megállási távolságon belül történő megállásra vagy a felszállás folytatására és a repülési pályán levő összes akadály feletti biztonságos elkülönítés tartására addig, amíg olyan helyzetbe kerül, hogy eleget tud tenni az 5.2.9 pont előírásának.

Megjegyzés: A fenti pontban jelzett „biztonságos elkülönítés"-t a C. Mellékletben található példákkal mutatjuk be.

5.2.8.1 A rendelkezésre álló futópálya hossz meghatározásánál vegyék figyelembe azt a távolság csökkenést – ha van ilyen – ami a felszállási helyzetbe történő kigurulás miatt következhet be.

5.2.9 *Útvonalon – Egy hajtómű üzemképtelen* – A repülőgép az útvonalrepülés vagy tervezett kitérés során bármely időpontban bekövetkező kritikus hajtómű meghibásodás esetén a repülési útvonal legalacsonyabb repülési magassága alá történő süllyedés nélkül képes legyen a repülés folytatására egy olyan repülőtérig, amelyen az 5.2.11 pont előírásának eleget tudnak tenni.

5.2.10 *Útvonalon – Kettő hajtómű üzemképtelen* – A három vagy több hajtóművel felszerelt repülőgép az útvonalrepülés bármely részén, ahol az útvonal kitérő repülőterek elhelyezkedése és a repülés teljes időtartama olyan, hogy egy második hajtómű meghibásodás valószínűségét a jelen fejezet előírásaiba foglalt általános repülésbiztonsági szint fenntartása érdekében figyelembe kell venni, bármely két hajtómű meghibásodása esetén képes legyen az útvonal kitérő repülőtérig történő repülés folytatására és ott a leszállás végrehajtására.

5.2.11 *Leszállás* – A repülőgép a tervezett leszállási vagy bármely kitérő repülőtéren a megközelítési repülési útvonalon levő összes akadály felett biztonságos elkülönítést tartva képes legyen a leszállás végrehajtására valamint a rendelkezésre álló leszállási távolságon belül a leszállás utáni kigurulás végén megállásra vagy vízi-repülőgép esetében megfelelő sebességre történő lelassulásra. Vegyenek figyelembe megfelelő tűréshatárokat a várható megközelítési és leszállási módszerek illetve repüléstechnikai eljárások alapján, amennyiben ezeket a teljesítmény adatok meghatározásánál figyelmen kívül hagyták.

5.3 Akadály adatok

5.3.1 Tegyék közzé az akadályokra vonatkozó adatokat annak érdekében, hogy a járató kidolgozhassa az 5.2.8 pont előírásának megfelelő eljárásait.

Megjegyzés: Bizonyos akadály adatok közzétételének módszerei a 4. és 15. Annex-ekben találhatók.
5.3.2 A járató az 5.2.8 pont előírásának teljesítése alkalmával vegye figyelembe a térképek pontosságát.

5.4 Az egy gázsugár hajtóműves repülőgépek éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti üzemeltetésére vonatkozó kiegészítő követelmények

5.4.1 Az egy gázsugár hajtóműves repülőgépek éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti üzemeltetésének jóváhagyásakor a járató államának meg kell győződnie arról, hogy a légijármű légialkalmassági bizonyítványa megfelelő-e, valamint a 6. és 8. Annex-ben előírt teljeskörű repülésbiztonsági szintek teljesítését az alábbiak biztosítják-e:

a) A gázsugár hajtómű megbízhatósága;

b) A járató karbantartási eljárásai, légiüzemeltetési gyakorlata, repülés előkészítési eljárásai és a hajózó személyzet képzési programjai; és

c) A felszerelések és a 3. függelékkel összhangban előírt követelmények teljesítése.

5.4.2 Éjszaka és/vagy műszeres időjárási körülmények (IMC) között üzemeltetett, egy gázsugár hajtóművel felszerelt összes repülőgépnek rendelkeznie kell a hajtómű üzemi állapot változását figyelő rendszerrel, és azon légijárműveknek, melyek egyedi légialkalmassági bizonyítványát első alkalommal 2005 január 01-én, vagy azt követően állítják ki, automatikus hajtómű üzemi állapotváltozást figyelő rendszerrel kell rendelkezniük.

6. fejezet
Repülőgép műszerek, felszerelések és repülési okmányok

Megjegyzés: A repülőgép távközlési és navigációs berendezésekkel történő felszerelésére vonatkozó előírásokat a 7. fejezet tartalmazza.

6.1 Általános rész

6.1.1 A légialkalmassági bizonyítvány kiadásához szükséges alapvető felszereléseken kívül a felhasznált repülőgép típustól valamint a repülés végrehajtásának körülményeitől függően a következő pontokban előírt műszereket, felszereléseket és repülési okmányokat helyezzék el vagy szállítsák a repülőgépen. Az előírt műszereket és berendezéseket, beleértve azok felszerelését is a lajstromozó állam hagyja jóvá vagy fogadja el.

6.1.2 A repülőgép szállítson egy tanúsított hiteles másolatot a 4.2.1 fejezetben meghatározott légijármű üzembentartási engedélyből, és egy másolatot a repülőgép típusra érvényes felhatalmazásokból, feltételekből és korlátozásokból, melyek a tanúsítással összefüggésben kerültek kiadásra. Amikor a tanúsítás és a hozzá kapcsolódó felhatalmazások, feltételek és korlátozások a járató állama részéről az angoltól eltérő nyelven kerül kiadásra, akkor mellékeljék az angol nyelvű forditásokat is..

Megjegyzés – a légijármű üzembentartási engedélyére és az ahhoz kapcsolódó azon, az üzemeltetési specifikációban esetleg megadott felhatalmazásokra, feltételekre és korlátozásokra vonatkozó útmutatót az Üzemeltetés Felügyeleti, Jogosítási és Folyamatos Ellenőrzési Eljárások Kézikönyve *(Doc 8335) tartalmazza.*

6.1.3 A járató az üzemeltetési kézikönyvben helyezze el a járató állama által jóváhagyott minimális felszerelési jegyzéket (MEL), amelynek segítségével a légijármű parancsnoka eldöntheti, hogy a repülés végrehajtása megkezdhető vagy egy közbenső állomástól folytatható abban az esetben, ha bármely műszer, felszerelés vagy rendszer üzemképtelenné válik. Ahol a járató állama nem azonos a lajstromozó állammal, a járató állama biztosítsa, hogy a minimális felszerelési jegyzék az adott repülőgép esetében ne befolyásolja a lajstromozó állam vonatkozó légialkalmassági előírásainak teljesítését.

Megjegyzés: A minimális felszerelési jegyzék (MEL) tájékoztatót a G. Melléklet tartalmazza

6.1.4 A járató az üzemeltetési, valamint a hajózószemélyzet részére, minden egyes üzemeltetett légijármű típushoz biztosítson légijármű üzemeltetési kézikönyvet, amely tartalmazza az adott légijármű típus üzemeltetéséhez szükséges általános, rendellenes és vészhelyzeti üzemeltetési eljárásokat. A kézikönyvben továbbá részletezzék a légijármű rendszereit és a felhasználandó ellenőrzési jegyzékeket is. A kézikönyvet az emberi tényezők figyelembevételével készítsék el.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

6.2 Az összes repülőgép összes repülése

6.2.1 A repülőgépet szereljék fel azokkal a műszerekkel, amelyek a hajózószemélyzet számára lehetővé teszik a repülőgép repülési pályájának irányítását és ellenőrzését, bármely előírt eljárás művelet végrehajtását valamint a repülőgép üzemeltetési korlátozásainak a várható üzemeltetési körülmények között történő megfigyelését.

6.2.2 A repülőgépet szereljék fel:

a) hozzáférhető és a repülőgépen szállításra engedélyezett utasok számának megfelelő egészségügyi felszereléssel;

Ajánlás – *Az egészségügyi felszerelés a következőket tartalmazza;*

1) általános használatra összeállított egy vagy több elsősegélynyújtó készlet; és

2) a több mint 250 utas szállítására jogosított repülőgép esetében orvosok és repülőgépen repülés közben bekövetkező orvosi (egészségügyi) kényszerhelyzetek megoldására kiképzett és képesített más személyek részére összeállított egészségügyi készlet.

Megjegyzés: Az egészségügyi készletek típusára, számára, elhelyezésére és tartalmára vonatkozó útmutató a B. Mellékletben található.

b) olyan típusú hordozható tűzoltó készülék(ek)kel, amelynek tűzoltó anyaga igénybevétel után nem szennyezi veszélyesen a repülőgép belső terének levegőjét.

Legalább egy ilyen tűzoltó készüléket helyezzenek el;

1) a repülőgép pilótafülkéjében; és

2) minden egyes olyan utaskabinban, amely a pilótakabintól el van választva és amelyet a hajózószemélyzet nem tud azonnal megközelíteni.

Megjegyzés: Előírásosnak minősül bármely olyan hordozható tűzoltó készülék, amely a repülőgép légialkalmassági bizonyítványában előírtak szerint került elhelyezésre.

c) 1) egy – a járató állama által meghatározott életkor feletti minden egyes személy részére – megfelelő ülő vagy fekvőhellyel;

2) minden üléshez egy biztonsági övvel valamint minden fekvőhelyhez egy bekötő biztonsági hevederrel; és

3) minden egyes hajózószemélyzeti tag üléshez egy vállhevederekkel ellátott biztonsági övvel. A biztonsági vállhevederekhez tartozzon egy olyan szerkezet is, amely a hirtelen lassulás esetében automatikusan visszatartja az ülésben helyet foglaló személy testét.

Ajánlás – *A repülőgépvezetői üléseken felszerelt, vállhevederekkel ellátott biztonsági övhöz tartozzon egy olyan szerkezet is, amely megakadályozza, hogy a hirtelen cselekvőképtelenné vált repülőgépvezető gátolja a kormányszervek működését.*

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

d) az utasok felé a következő tájékoztatások és utasítások továbbítására szolgáló eszközökkel;

1) mikor kapcsolják be a biztonsági öveket;

2) amennyiben oxigén szállítása van előírva, mikor és hogyan kell használni az oxigén-ellátó berendezést;

3) dohányzás korlátozása;

4) a mentőmellények, vagy egyéb megfelelő egyéni úszóeszközök elhelyezkedése és használata, amennyiben ezek szállítása van előírva; és

5) a vészkijáratok elhelyezkedése és nyitása;

e) megfelelő értékű elektromos biztosítékokkal tartalékként a repülés közben hozzáférhető biztosítékok cseréjéhez.

6.2.3 A repülőgép szállítson;

a) a 4.2.2 pontban előírt üzemeltetési kézikönyvet vagy annak azon részeit, amelyek a repülés végrehajtására vonatkoznak;

b) az adott repülőgép repülésvégrehajtási kézikönyvét vagy más olyan dokumentumot, amely tartalmazza az 5. fejezet alkalmazásához szükséges teljesítmény adatokat valamint bármely más olyan tájékoztatást, amelyre a repülőgép üzemeltetéséhez – a légialkalmassági bizonyítványban meghatározott értékeken belül – szükség van, kivéve ha ezek az adatok az üzemeltetési kézikönyvben megtalálhatók; és

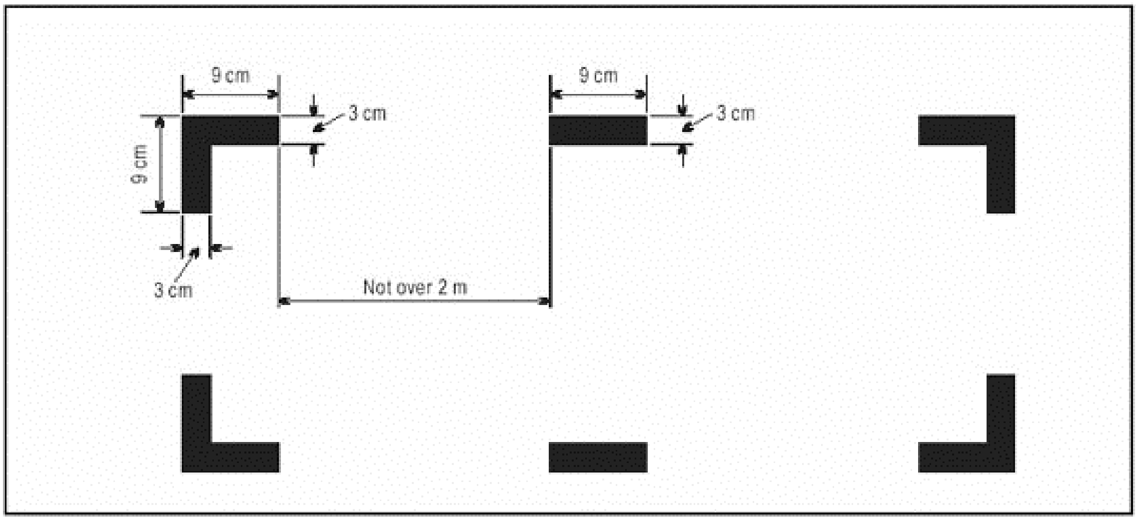
c) érvényes és alkalmas térképeket, amelyek fedik a tervezett repülés útvonalát valamint bármely olyan egyéb útvonalat, amelyről joggal feltételezhető, hogy arra a repülés átirányítható.

6.2.4 Az átvágható felületek jelzése

6.2.4.1 Amennyiben a repülőgépen a mentőszemélyzet részére jelzik a kényszerhelyzet esetén a törzsön átvágható felületeket, azokat az alábbi ábrának megfelelő módon jelöljék meg. A jelölések színe vörös vagy sárga legyen és ha erre a háttértől történő megkülönböztethetőség érdekében szükség van, azokat fehér színű alapozásra készítsék el.

6.2.4.2 Amennyiben a sarkok jelölése egymástól több mint 2 méter távolságra vannak, fessenek fel 9 x 3 cm-es vonalakat olyan módon, hogy az egymás mellett levő vonalak közötti távolság 2 méternél nagyobb ne legyen.

Megjegyzés: Ez az előírás nem teszi szükségessé azt, hogy bármely repülőgép sárkányszerkezetén átvágható felületek legyenek.



A légijármű törzsén levő átvágható felületek, azaz behatolási pontok jelzése a mentőszemélyzet számára ***(lásd 6.2.4)***

6.3 Repülési adatrögzítők

1. Megjegyzés: A repülési adatrögzítők két rendszerből illetve berendezésből, a repülési adatrögzítőből (FDR) valamint a pilótakabin hangrögzítőből (CVR) állnak.

2. Megjegyzés: Az összetett repülési adat és pilótakabín hangrögzítő berendezések csak a jelen Annex-ben külön ismertetett repülési adatrögzítő berendezés előírások teljesítésére használhatók.

3. Megjegyzés: A repülési adatrögzítőkre vonatkozó részletes útmutató a D. Mellékletben található.

6.3.1 Repülési adatrögzítők – típusok

6.3.1.1 Az I. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek.

6.3.1.2 A II. és IIA. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének valamint a magassági és áramlásrontó (fékező) szerkezetei beállításának pontos meghatározásához szükségesek.

6.3.1.3 1995 január 1. után ne használjanak fémszalaggal üzemelő repülési adatrögzítő berendezést.

6.3.1.4 **Ajánlás** – *1998 november 5. után ne használják a frekvencia modulációt (FM) alkalmazó analóg adatrögzítőket.*

6.3.1.4.1 2003 január 1. után ne használják a fényképészeti filmmel működő repülési adatrögzítőket.

6.3.1.5 Az összes olyan digitális adathálózati összeköttetést alkalmazó repülőgép, amelynek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki, valamint pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett, az összes adathálózati digitális közleményváltást a repülési adatrögzítő berendezésén rögzítse. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a pilótakabinban rögzített hangfelvétellel.

6.3.1.5.1 2007 január 1. után az összes digitális adathálózati összeköttetést alkalmazó repülőgép, amely pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett, az összes adathálózati digitális közleményváltást a repülési adatrögzítő berendezésén rögzítse. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és összevethető legyen a pilótakabinban rögzített hangfelvétellel.

6.3.1.5.2 Az adathálózati digitális közleményváltás tartalmának megismeréséhez szükség tájékoztatást és ahol ez lehetséges a közlemény megjelenítésének vagy a hajózószemélyzet által történt lehívásának időpontját rögzítsék.

Megjegyzés: Az adathálózati összeköttetések közé tartoznak, azonban nem csak ezekre korlátozódnak a következők:

ADS – automatikus függőségen alapuló légtérfelderítés
CPDLC – légiforgalmi irányító és repülőgépvezető közötti adathálózati összeköttetések
D-FIS – adathálózati és repüléstájékoztató szolgálati összeköttetések
AOC – légiközlekedési üzemi irányítási közlemények.

6.3.1.6 **Ajánlás** – *Minden olyan 5700 kg. legnagyobb engedélyezett felszálló-súlynál nagyobb tömegű repülőgépet, amely repülési adatrögzítő és pilótakabin hangrögzítő berendezések szállítására kötelezett, alternatív megoldásként kettő összetett repülési adat és pilótakabin hangrögzítő berendezéssel is (FDR/CVR) felszerelhetnek.*

6.3.1.7 ***Ajánlás*** *– Minden olyan több gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszálló-súlya 5700 kg. vagy kevesebb és amely repülési adatrögzítő és/vagy pilótakabin hangrögzítő berendezések szállítására kötelezett, alternatív megoldásként egy összetett repülési adat és pilótakabin hangrögzítő berendezéssel is (FDR/CVR) felszerelhetnek.*

6.3.1.8 Az I.A típusú repülési adatrögzítő rögzítse azokat a jellemző adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek. A következő pontokban ismertetjük azokat a jellemzőket, amelyek kielégítik az I.A típusú repülési adatrögzítőre vonatkozó előírásokat. A jelölés (*) nélküli jellemzők rögzítése kötelező. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a repülőgép rendszerei vagy a hajózószemélyzet a jellemzőt illetve adatot a repülőgép üzemeltetéshez használja fel.

6.3.1.8.1 A repülőgép repülési pályájára és sebességére vonatkozó előírásokat kielégítő jellemzők:
• nyomás-magasság
• műszer szerinti vagy kalibrált repülési sebesség
• levegő – föld viszonyítási helyzet és minden egyes futóműhöz tartozó levegő-föld érzékelő, szükség szerint
• külső levegő hőmérséklete vagy össz-hőmérséklet
• géptengely irányszög (a hajózószemélyzet elsődleges műszerei alapján)
• függőleges gyorsulás
• oldalirányú gyorsulás
• hosszirányú gyorsulás (törzs tengely)
• idő vagy relatív idő számítás
• navigációs adatok*: széleltérítés sodródási szög, szélsebesség, szélirány, szélességi és hosszúsági fok adatok
• földi feletti sebesség*
• rádió magasságmérő jelzett magassága*

6.3.1.8.2 A repülési helyzetre vonatkozó előírásokat kielégítő jellemzők:
• bólintási helyzet, azaz repülőgép kereszt-tengely körüli mozgása
• bedöntési helyzet, azaz a repülőgép hossztengely körüli elfordulása
• legyezőmozgás helyzet, azaz a repülőgép függőleges tengelye körüli elfordulás*
• állásszög*

6.3.1.8.3 A hajtóműre vonatkozó előírásokat kielégítő jellemzők:
• hajtómű tolóerő illetve teljesítmény: minden egyes hajtómű tolóereje, pilótakabin tolóerő szabályzó kar(ok) helyzete
• sugárfordító helyzete*
• hajtómű teljesítmény vezérlés és jeladó helyzete*
• hajtómű levegő elvételi szelep helyzete*
• további hajtómű jellemzők: kiáramló gáznyomás arányérték, hajtómű rezgési szint jelzett értékek, tüzelőanyag áramlási értékek, tüzelőanyag áramlás lekapcsoló kar helyzete, N_1, N_2, EGT, TLA, N_3

6.3.1.8.4 A repülésvezérlő szerkezetek helyzetére vonatkozó előírásokat kielégítő jellemzők:
• bólintás trimm kiegyenlítő lap(ok) helyzete
• fékszárnyak*: belépőél helyzete, pilótakabin fékszárny szabályzó kar választás
• orrsegédszárnyak*: orrsegédszárny belépőél helyzete, pilótakabin szabályzó kar választás
• futómű*: futómű egységek helyzete, választó kar helyzete
• legyezőmozgás trimm kiegyenlítő lap helyzete*
• bedöntés trimm (hossztengely körüli elfordulás) kiegyenlítő lap helyzete*
• pilótakabin trimm szabályzók helyzete (vezérlés)*: bólintás, bedöntés, legyezőmozgás
• földi áramlásrontó aerodinamikai fék és repülési interceptor*: spoiler helyzet, választó kapcsoló beállítások
• jégmentesítő és/vagy jégtelenítő berendezések választása és működése*
• hidraulika nyomás (minden egyes rendszer)*
• tüzelőanyag-mennyiség*
• AC és DC elektromos táplálások helyzete*
• segédhajtómű csapoló-szelep helyzete*
• számított súlyponthelyzet*

6.3.1.8.5 Az üzemeltetésre vonatkozó előírásokat kielégítő jellemzők:
• riasztások
• elsődleges repülés vezérlő szerkezetek helyzete és a kezelő egységek beállítása: bólintási, bedöntési és elfordulási tengelyek
• irányadó átrepülése
• minden egyes navigációs vevőberendezés frekvencia kiválasztása
• kézi rádió adógomb helyzete és CVR/FDR szinkron jel
• automatikus repülésvezérlés, hajtómű teljesítmény automatikus szabályzás, AFCS üzemmód és kapcsolók állása*
• választott barometrikus nyomás beállítás*: légijármű parancsok és első tiszt
• választott nyomásmagasság, repülési sebesség, emelkedési és süllyedési sebesség, MACH szám, géptengely irányszög, repülési irányszög, korrigált repülési pálya, megközelítési siklópálya szög (repülőgépvezető részéről állítható értékek)*
• választott elhatározási magasság*
• az elektronikus repülési műszerrendszer (EFIS) választott megjelenítési beállítása*: légijármű parancsok és első tiszt
• több funkciós hajtómű teljesítmény és állapot riasztás megjelenítési beállítása*

• GPWS/TAWS/GCAS helyzet*: földfelszín megjelenítési mód választás, figyelmeztető jelzések és riasztások, riasztási állapot, tanácsadó rendszer állapot, üzemi kapcsolók helyzete
• alacsony nyomás riasztás*: hidraulika és pneumatika rendszerek
• számítógép meghibásodás riasztás*
• veszélyes kabinnyomás csökkenés riasztás*
• összeütközés elkerülését biztosító fedélzeti riasztó rendszerek helyzete és jelzései (TCAS/ACAS)*
• jegesedés jelzőrendszer*
• veszélyes hajtómű rezgés riasztás minden egyes hajtóműnél*
• veszélyes hajtómű túlmelegedés riasztás minden egyes hajtóműnél*
• veszélyes alacsony olajnyomás riasztás minden egyes hajtóműnél*
• veszélyes hajtómű fordulatszám túllépés riasztás minden egyes hajtóműnél*
• szélnyírás riasztás*
• repülés közben működő átesés elleni védelem, jelzőrendszer és automatika[1]6 helyzete és működése*
• a pilótakabinban található összes repülésvezérlő egység bemeneti erőhatásai*: botkormány, kormányoszlop, pedálok, karok erőértékek
• függőleges eltérések*: ILS siklópálya, MLS magasság irányvezetés, GNSS megközelítési pálya
• vízszintes eltérések*: ILS iránysáv, MLS oldalszög irányvezetés, GNSS megközelítési pálya
• távolságmérő jelzőműszerek jelzett távolság értékei (1 és 2 DME készletek)*
• elsődleges navigációs rendszerek*: GNSS, INS, VOR/DME, MLS, ILS, Loran C
• fékberendezések*: bal és jobb oldali féknyomások, bal és jobb oldali fékpedál helyzete
• időpont*
• események jelzése*
• a homlokĂĽvegre való kivetítés (HUD) használatban*
• az oldalsó kivetítő képernyő bekapcsolva*

1. Megjegyzés: Az előírt jellemzők, közöttük a tartományok, a mintavételi pontosság és felbontás megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezetének repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

2. Megjegyzés: A rögzítendő jellemzők száma a repülőgép típustól, annak összetettségétől függ, azonban a csillag (*) jelölés nélküli jellemzőket ettől függetlenül rögzíteni kell. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a repülőgép rendszerei vagy a hajózószemélyzet a jellemzőt illetve adatot a repülőgép üzemeltetéshez használja fel.

6.3.2 Repülési adatrögzítők – felvételi időtartam

Minden repülési adatrögzítő képes legyen a működése legalább utolsó 25 órájában rögzített tájékoztatások tárolására, kivéve a IIA. típusú repülési adatrögzítőt, amely képes legyen a működése legalább utolsó 30 percében rögzített tájékoztatások tárolására.

6.3.3 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1989 január 1-én, vagy ezt követően adták ki

6.3.3.1 Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. I. típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.3.3.2 Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg-tól 27 000 kg-ig terjed, II. típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.3.3.3 **Ajánlás** – *Az összes olyan több hajtóműves, gázturbinás sugárhajtóműves repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg. vagy kevesebb és egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, szereljenek fel IIA. típusú repülési adatrögzítő berendezéssel.*

6.3.4 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1-én, vagy ezt követően, azonban 1989 január 1. előtt adták ki

6.3.4.1 Minden olyan gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. – a 6.3.4.3 pontban jelzettek kivételével – szereljenek fel olyan repülési adatrögzítővel, amely rögzíti az időt, a repülési magasságot, a repülési sebességet, a függőleges irányú gyorsulást valamint a repülési irányszöget.

6.3.4.2 **Ajánlás** – *Minden olyan gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. – a 6.3.4.3 pontban jelzettek kivételével – szereljenek fel olyan repülési adatrögzítővel, amely rögzíti az időt, a repülési magasságot, a repülési sebességet, a függőleges irányú gyorsulást, a repülési irányszöget valamint azokat a további jellemző adatokat, amelyek a repülőgép függőleges és hossztengelyhez viszonyított helyzetének (bólintás és bedöntés), beállított rádiófrekvenciáinak valamint minden egyes hajtóműve teljesítményének meghatározásához szükségesek.*

6.3.4.3 Minden olyan gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. és olyan típuscsaládba tartozik, amelynek prototípusát az illetékes országos hatóság 1969 szeptember 30. után látta el egyedi légialkalmassági bizonyítvánnyal, II. típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.3.5 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1. előtt adták ki

6.3.5.1 Minden olyan gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. szereljenek fel olyan repülési adatrögzítővel, amely rögzíti az időt, a repülési magasságot, a repülési sebességet, a függőleges irányú gyorsulást valamint a repülési irányszöget.

6.3.5.2 **Ajánlás** – *Minden olyan gázturbinás sugárhajtóművel felszerelt repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. és olyan típuscsaládba tartozik, amelynek prototípusát az illetékes országos hatóság 1969 szeptember 30. után látta el légialkalmassági bizonyítvánnyal, szereljenek fel olyan repülési adatrögzítővel, amely az idő, a repülési magasság, a repülési sebesség, a függőleges irányú gyorsulás és a repülési irányszög mellett rögzíti azokat a további jellemző adatokat, amelyek az alábbiak meghatározásához szükségesek:*
a) a repülőgép repülési helyzete a repülési pályájának eléréséhez; és
b) az elért repülési pályán a repülőgépre ható alapvető erők, valamint ezek eredetének megállapítása.

6.3.6 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki

Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. IA típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.3.7 Pilótakabin hangrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1-én, vagy ezt követően adták ki

6.3.7.1 Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.

6.3.7.2 **Ajánlás** – *Minden olyan több hajtóműves, gázturbinás repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg. vagy kevesebb és egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.*

6.3.8 Pilótakabin hangrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1. előtt adták ki

Megjegyzés: A pilótakabin hangrögzítő berendezések teljesítmény előírásai megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezetének repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

6.3.8.1 Minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. és olyan típuscsaládba tartozik, amelynek prototípusát az illetékes országos hatóság 1969 szeptember 30. után látta el légialkalmassági bizonyítvánnyal, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.

6.3.8.2 **Ajánlás** – *Minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg-tól 27 000 kg-ig terjed és olyan típuscsaládba tartozik, amelynek prototípusát az illetékes országos hatóság 1969 szeptember 30. után látta el légialkalmassági bizonyítvánnyal, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.*

6.3.9 Pilótakabin hangrögzítők – felvételi időtartam

6.3.9.1 A pilótakabin hangrögzítő berendezés képes legyen a működése legalább utolsó 30 percében rögzített tájékoztatások tárolására.

6.3.9.2 **Ajánlás** – *Az a pilótakabin hangrögzítő berendezés, amelyet olyan repülőgépbe szereltek fel, melynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg és egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.*

6.3.9.3 Az a pilótakabin hangrögzítő berendezés, amelyet olyan repülőgépbe szereltek fel, melynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg és egyedi légialkalmassági bizonyítványát először 2003 január 1. után adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.

6.3.10 Repülési adatrögzítők – szerkezet és beszerelés

A repülési adatrögzítőket úgy készítsék el és helyezzék el illetve szereljék be a repülőgépbe, hogy biztosítsák a rögzített adatok gyakorlatilag lehetséges legnagyobb védelmét annak érdekében, hogy a rögzített tájékoztatások megőrizhetők, leolvashatók és feldolgozhatók legyenek. A repülési adatrögzítők feleljenek meg a baleseti törési ellenálló képességre és tűzvédelemre vonatkozó ipari előírásoknak.

Megjegyzés: A baleseti törési ellenálló képesség és tűzvédelem ipari előírásai megtalálhatók a Polgári Légiközlekedési Berendezések Európai Szervezete (EUROCAE) ED55 és ED56A jelű és hasonló kiadványokban.

6.3.11 Repülési adatrögzítők – működés

6.3.11.1 A repülési adatrögzítőt a repülés alatt ne kapcsolják ki.

6.3.11.2 A repülési adatrögzítővel rögzített tájékoztatások megőrzése érdekében a berendezést egy baleset vagy repesemény utáni repülés befejezését követően kapcsolják ki és azt a tájékoztatásokat tartalmazó adathordozónak a 13. Annex előírásaival összhangban végrehajtott eltávolítása előtt ne kapcsolják ismét be.

1. Megjegyzés: A repülési adatrögzítővel rögzített tájékoztatások légijárműből történő eltávolításának szükségességét a vizsgálatot végző állam vizsgáló hatósága határozza meg az esemény súlyossága és körülményei alapján, beleértve az eseménynek a repülési üzemre gyakorolt hatását is.

2. Megjegyzés: A járatónak a repülési adatrögzítővel rögzített tájékoztatások tárolására vonatkozó felelősségét a 11.6 pont tartalmazza.

6.3.12 Repülési adatrögzítők – folyamatos működőképesség

Végezzék el a repülési adat (FDR) és pilótakabin hangrögzítő (CVR) rendszerek felvételeinek üzemi ellenőrzését és értékelését annak érdekében, hogy a rögzítő berendezések folyamatos működőképességét biztosíthassák.

Megjegyzés: A repülési adat (FDR) és pilótakabin hangrögzítő rendszerek (CVR) ellenőrzésének eljárásait a D. Melléklet tartalmazza.

6.4 Az összes, látvarepülési szabályok szerint üzemeltetett repülőgép

6.4.1 Az összes, látvarepülési szabályok (VFR) szerint üzemeltetett repülőgépet szereljenek fel a következőkkel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) érzékeny nyomás-magasság mérőműszerrel;

d) repülési sebesség mérőműszerrel; és

e) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

6.4.2 A látvarepülési szabályok szerint (VFR), ellenőrzött repülésként üzemeltetett repülőgépet a 6.9 pont előírásainak megfelelően szereljék fel.

6.5 Az összes, vízfelszín felett üzemeltetett repülőgép

6.5.1 Vízi-repülőgépek

Minden vízi-repülőgépet szereljenek fel:

a) a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel;

b) a tengeri összeütközések megelőzésére vonatkozó nemzetközi szabályokban előírt – ahol ez alkalmazható – hangjelzést előállító berendezéssel; és

c) egy darab horgonnyal.

Megjegyzés: A vízi repülőgépek közé tartoznak a vízi repülőgépként üzemeltetett un. "kétéltű" repülőgépek is.

6.5.2 Szárazföldi repülőgépek

6.5.2.1 A szárazföldi repülőgépeket szereljék fel a 6.5.2.2 pontban előírtakkal, amennyiben:

a) az 5.2.9 és 5.2.10 pontoknak megfelelően üzemeltetett szárazföldi repülőgép vízfelszín felett repül és a parttól több mint 93 km (50 tengeri mérföld) távolságra eltávolodik;

b) bármely egyéb szárazföldi repülőgép a parttól olyan távolságra repül a vízfelszín felett, amely nagyobb mint a hajtómű nélküli siklás távolsága; és

c) olyan repülőtéren száll fel vagy le, ahol a járató államának véleménye szerint a felszállási vagy leszállási útvonal olyan hosszan vezet vízfelszín felett, hogy az esetleges rendellenes üzemelés vagy repesemény alkalmával vízreszállás valószínű.

6.5.2.2 A fenti 6.5.2.1 pontban jelzett felszerelés a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellény vagy egyéb megfelelő egyéni úszóeszköz.

Megjegyzés: A szárazföldi repülőgépek közé tartoznak a szárazföldi repülőgépként üzemeltetett un. „kétéltű” repülőgépek is.

6.5.3 Az összes, vízfelszín felett hosszú távú repülést végrehajtó repülőgép

6.5.3.1 A 6.5.1 vagy 6.5.2 pontokban – amelyik alkalmazható – előírt felszerelés mellett minden olyan repülőgépet, amelyet olyan útvonalon használnak, ahol az 5.2.9 vagy 5.2.10 pontok előírásai szerint üzemeltetett repülőgép az utazósebességet figyelembe véve 120 perces repülésnek megfelelő vagy 740 km (400 tengeri mérföld) távolságnál nagyobb mértékben – amelyik a kisebb érték – valamint minden más repülőgép 30 perces repülésnek megfelelő vagy 185 km (100 tengeri mérföld) távolságnál nagyobb mértékben – amelyik a kisebb érték – eltávolodhat a kényszerleszállás végrehajtására alkalmas szárazföldtől szereljenek fel a következőkkel:

a) elegendő számú mentő-tutaj a fedélzeten tartózkodó összes személy elhelyezésére, amelyeket úgy tárolnak, hogy azok a vészhelyzet esetén gyorsan üzembe helyezhetők és az útvonal sajátosságainak megfelelő életmentő eszközökkel vannak ellátva, beleértve a létfenntartási eszközöket is; és

b) a 2. Annex-ben ismertetett pirotechnikai vészjelzések előállítására szolgáló felszerelés.

6.5.3.2 Minden egyes mentőmellényt és egyéb megfelelő egyéni úszóeszközt, amelyet a 6.5.1 a), 6.5.2.1 és 6.5.2.2 pontok előírásai alapján szállítanak, a felhasználó személy feltalálásának megkönnyítése érdekében lássanak el elektromos világítással, kivéve ha a 6.5.2.1 *c)* pont előírását a mentőmellénytől eltérő más egyéni úszóeszköz segítségével teljesítik.

6.6 Az összes, kijelölt szárazföld felett üzemeltetett repülőgép

Amennyiben a repülőgépet azon szárazföldi területek felett üzemeltetik, amelyeket az érintett államok olyan területként jelölnek meg, ahol a kutatás és mentés különös nehézségekbe ütközik, a repülőgépet szereljék fel olyan jeladó berendezéssel és életmentő felszereléssel, beleértve a létfenntartási eszközöket is, amelyek nagy valószínűséggel megfelelnek az átrepülendő terület sajátosságainak.

6.7 Az összes, nagy repülési magasságon üzemeltetett repülőgép

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, az egyezményes légkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	***magasság – méter***	***magasság – láb***
700 hPa	3000	10 000
620 hPa	4000	13 000
376 hPa	7600	25 000

6.7.1 Azt a repülőgépet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb, szereljenek fel olyan oxigén tároló és adagoló berendezéssel, amely lehetővé teszi a 4.3.8.1 pontban előírt oxigén készlet tárolását és szükség szerinti adagolását.

6.7.2 Azt a repülőgépet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken az atmoszférikus légnyomás 700 hPa értéknél alacsonyabb, azonban a repülőgép személyek részére rendszeresített kabinjá(i)ban megfelelő módszerekkel 700 hPa értéknél nagyobb nyomást biztosítanak, szereljenek fel olyan oxigén tároló és adagoló berendezéssel, amely lehetővé teszi a 4.3.8.2 pontban előírt oxigén készlet tárolását és szükség szerinti adagolását.

6.7.3 Az 1962 július 1-én vagy ezt követően üzembe állított új, túlnyomásos kabinnal rendelkező repülőgépeket, amelyeket olyan repülési magasságokon kívánnak üzemeltetni, ahol az atmoszférikus nyomás 376 hPa értéknél alacsonyabb, szereljék fel olyan berendezéssel, amely a kabin légnyomás bármely veszélyes csökkenése esetén egyértelmű figyelmeztető jelzést ad a repülőgépvezető számára.

6.7.4 **Ajánlás** – *Az 1962 július 1. előtt üzembe állított túlnyomásos kabinnal rendelkező repülőgépeket, amelyeket olyan repülési magasságokon kívánnak üzemeltetni, ahol az atmoszférikus nyomás 376 hPa értéknél alacsonyabb, szereljék fel olyan berendezéssel, amely a kabin légnyomás bármely veszélyes csökkenése esetén egyértelmű figyelmeztető jelzést ad a repülőgépvezető számára.*

6.7.5 Azt a repülőgépet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken az atmoszférikus légnyomás 376 hPa értéknél alacsonyabb vagy amelyet olyan repülési magasságokon üzemeltetnek, ahol az atmoszférikus légnyomás több mint 376 hPa, azonban a repülőgép négy percen belül nem tud olyan biztonságosan olyan repülési magasságra süllyedni, ahol az atmoszférikus légnyomás értéke 620 hPa és amelynek egyedi légialkalmassági bizonyítványát először 1998 november 9-én vagy ezt követően adták ki, szereljék fel a 4.3.8.2 pont előírásának megfelelő automatikusan működésbe lépő oxigén berendezéssel. Az oxigén adagoló eszközök teljes száma legalább 10 %-kal több legyen, mint az utasok és utaskabin személyzeti tagok üléseinek száma.

6.7.6 **Ajánlás** —*Azt a repülőgépet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, ahol az atmoszférikus légnyomás 376 hPa értéknél alacsonyabb vagy amelyet olyan repülési magasságokon üzemeltetnek, ahol az atmoszférikus légnyomás több mint 376 hPa, azonban a repülőgép négy percen belül nem tud biztonságosan olyan repülési magasságra süllyedni, ahol az atmoszférikus légnyomás értéke 620 hPa és amelynek egyedi légialkalmassági bizonyítványát először 1998 november 9. előtt adták ki, szereljék fel a 4.3.8.2 pont előírásának megfelelő automatikusan működésbe lépő oxigén berendezéssel. Az oxigén adagoló eszközök teljes száma legalább 10 %-kal több legyen, mint az utasok és utaskabin személyzeti tagok üléseinek száma.*

6.8 Az összes, jegesedési körülmények között üzemeltetett repülőgép

Minden olyan repülőgépet, amelyet ténylegesen jelentett vagy várható jegesedési időjárási körülmények között üzemeltetnek, alkalmas jégtelenítő és/vagy jégmentesítő rendszerrel szereljenek fel.

6.9 Az összes, műszerrepülési szabályok szerint üzemeltetett repülőgép

6.9.1 Az összes, műszerrepülési szabály szerint (IFR) üzemeltetett repülőgépet, továbbá azokat, amelyek üzemeltetésük során egy vagy több műszer segítsége nélkül nem tarthatók a kívánt repülési helyzetben, szereljék fel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) kettő darab érzékeny, kiegyenlített dob-mutatós vagy hasonló megjelenítést biztosító nyomás-magasság mérőműszerrel;

Megjegyzés: A három mutatós valamint a dob-mutatós magasságmérők nem elégítik ki a fenti c) alpont előírását.

d) repülési sebesség mérőműszerrel, amely olyan berendezéssel van ellátva, amely megakadályozza a vízpára lecsapódás vagy jegesedés következtében lehetséges helytelen működést;

e) elfordulás és dőlés jelzőműszerrel;

f) repülési helyzetjelző műszerrel (műhorizont);

g) irányjelző műszerrel (géptengely irány-jelző pörgettyűs – giroszkópikus – műszer):

Megjegyzés: a 6.9.1 e), f) és g) pontok előírásainak műszerek együttesével vagy integrált repülés vezérlési rendszerrel is eleget lehet tenni, feltéve, hogy a rendszer a három külön műszer egységen belül és együttesen is védve van a teljes meghibásodás ellen.

h) a pörgettyűs műszerek kielégítő elektromos táplálásának jelzésére szolgáló eszközzel;

i) a külső levegő hőmérsékletét jelző, a pilótakabinban felszerelt műszerrel;

j) emelkedési és süllyedési sebesség mérőműszerrel; és

k) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

6.9.2 Az összes 5700 kg. tömegnél nehezebb repülőgép – Elektromos üzemeltetésű repülési helyzetjelző műszerek vésztáplálása

6.9.2.1 Minden 1975 január 1. után üzembe állított új repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg, szereljenek fel az elektromos energiát biztosító fő rendszertől független vészhelyzeti áramforrással, amelynek az a feladata, hogy a légijármű parancsnoka számára legalább 30 percig működtesse és tisztán láthatóan megvilágítsa a repülőgép repülési helyzetjelző műszerét (műhorizont). A vészhelyzeti áramforrás az elektromos energiát biztosító fő rendszer teljes meghibásodását követően automatikusan lépjen működésbe és a műszerfalon jelenjen meg egyértelmű jelzés arra vonatkozóan, hogy a repülőgép repülési helyzetjelző műszerét vagy műszereit a vészhelyzeti áramforrás üzemelteti.

6.9.2.2 Bármely repülőgépvezető által használt repülési helyzetjelző műszereket úgy helyezzék és rendezzék el, hogy azok jelzései a repülőgépvezető üléséből jól láthatók legyenek anélkül, hogy a repülőgépvezető rendes testhelyzetét és – általában a repülési pálya irányába előretekintő – tekintetének irányát lényegesen megváltoztatná.

6.10 Az összes, éjszaka üzemeltetett repülőgép

Az összes, éjszaka üzemeltetett repülőgépet szereljenek fel:

a) a 6.9 pontban előírt valamennyi berendezéssel;

b) a repülés közben levő valamint a repülőtér mozgási területein üzemelő légijármű számára a 2. Annex-ben előírt (navigációs) fényekkel;

Megjegyzés: A 2. Annex előírásainak megfelelő navigációs fényeket az 1. Függelékben ismertetjük. A fények általános jellemzőit a 8. Annex-ben határoztuk meg. A repülés közben lévő valamint a repülőtér mozgási területein üzemelő légijárművek fényeire vonatkozó, 2. Annex előírásainak megfelelő fények jellemzőit a Légialkalmassági Kézikönyv *-ben (Doc 9760) részletezzük.*

c) két leszálló fényszóróval;

Megjegyzés: Az egy darab leszálló fényszóróval felszerelt, nem a 8. Annex előírásai alapján jogosított repülőgépek, amelyeknek a leszálló fényszórójában két külön, egymástól függetlenül táplált izzószál helyezkedik el, a 6.10 c) pont előírását teljesítőnek tekinthetők.

d) a repülőgép biztonságos üzemeltetése szempontjából alapvető fontosságú, a hajózószemélyzet által használt valamennyi műszer és berendezés (meg)világításával;

e) világítással valamennyi utastérben; és

f) elektromos kézilámpával minden egyes hajózószemélyzeti szolgálati helyen.

6.11 Túlnyomásos repülőgépek, amikor utasokat szállítanak – időjárás-felderítő radarberendezés

Ajánlás – *A túlnyomásos kabinnal ellátott repülőgépeket, amikor azok utasokat szállítanak és ezeket olyan területeken üzemeltetik, ahol éjszaka vagy műszeres időjárási körülmények között az időjárás-felderítő radarberendezéssel várhatóan idejében felderíthető zivatarok és más gyakorlatilag veszélyt jelentő időjárási jelenségek fordulhatnak elő, üzemképes időjárás-felderítő radarberendezéssel szereljék fel*

.

6.12 Az összes, 15 000 méter (49 000 láb) repülési magasság felett üzemeltetett repülőgép – sugárzásérzékelő és jelző berendezés

Minden olyan repülőgépet, amelyet 15 000 méter (49 000 láb) repülési magasság felett kívánnak üzemeltetni, szereljenek fel sugárzásmérő és jelző rendszerrel, amely folyamatosan méri és jelzi a teljes kozmikus sugárzás (azaz a galaktikus és szoláris eredetű ion és neutron sugárzás) kapott és a repülés során összegzett mennyiségét. A berendezés kijelző egysége egy hajózószemélyzeti tag számára közvetlenül látható legyen.

Megjegyzés: A berendezést az illetékes országos hatóság által elfogadhatónak tartott értékek alapján szabályozzák be (kalibrálják).

6.13 Az összes olyan repülőgép, amely megfelel a 16. Annex I. kötet zajbizonyítvány előírásoknak

A repülőgép szállítson olyan dokumentumot, amely megfelel a repülőgép zajbizonyítványának. Amikor ez az okmány vagy a lajstromozó állam részéről jóváhagyott más, egyéb dokumentumban található zajszint minősítést tartalmazó megfelelő nyilatkozat nem angol nyelvű, mellékeljék annak hiteles angol nyelvű fordítását is.

Megjegyzés: A zajszint minősítést bármely olyan dokumentum tartalmazhatja, amelyet a lajstromozó állam elfogad és a fedélzeten szállítanak.

6.14 MACH-szám jelzőműszer

Minden olyan repülőgépet, amelynek üzemeltetési sebesség korlátozásait Mach-szám érték(ek)ben fejezik ki, Mach-szám jelzőműszerrel szereljenek fel.

Megjegyzés: Ez az előírás nem zárja ki a repülési sebesség mérőműszer igénybevételét a légiforgalmi szolgálatok céljaira megadott Mach-szám érték kiszámításához.

6.15 Repülőgépek, amelyeket földközelség jelző és riasztó rendszerrel (GPWS) kell felszerelni

6.15.1 Minden olyan gázsugár hajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb vagy amely több mint 9 utas szállítására jogosított, földközelség jelző és riasztó rendszerrel szereljenek fel.

6.15.2 Minden olyan gázsugár hajtóműves repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2001 január 1-én vagy ezt követően adják ki, engedélyezett legnagyobb felszállósúlya (tömege) 15000 kg-nál nagyobb vagy amely több mint 30 utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, ami előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.15.3 Minden olyan gázsugár hajtóműves repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2004 január 1-én vagy ezt követően adják ki, és engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb vagy amely több mint 9 utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, ami előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.15.4 2007 január 1-től minden olyan gázsugár hajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb vagy amely több mint 9 utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, ami előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.15.5 ***Ajánlás –*** *Minden olyan gázsugár hajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg vagy kevesebb és ötnél több, de kilencnél kevesebb utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, amely biztosítja a 6.15.8 a) valamint c) alpontokban előírt riasztást, a nem biztonságos földfelszín feletti magasság figyelmeztetést és előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.*

6.15.6 2007 január 1-től minden olyan dugattyús motorral felszerelt repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb vagy amely több mint 9 utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, amely biztosítja a 6.15.8 a) valamint c) alpontokban előírt riasztást, a nem biztonságos földfelszín feletti magasság figyelmeztetést és előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.15.7 A földközelség jelző és riasztó rendszer képes legyen a hajózószemélyzet részére önműködően, időben és jól megkülönböztethető módon figyelmeztető jelzést adni abban az esetben, ha a repülőgép a föld felszínét gyakorlati szempontból veszélyes mértékben megközelíti.

6.15.8 A földközelség jelző és riasztó rendszer legalább a következő körülmények között adjon figyelmeztető jelzést:

a) túlzott mértékű süllyedés;

b) túlzott mértékű közeledés a föld felszínéhez;

c) felszállást, vagy átstartolást követő túlzott mértékű magasságvesztés;

d) a földfelszín nem biztonságos megközelítése abban az esetben, amikor a repülőgép repülésvezérlő berendezései nem leszállási elrendezésben vannak;

   a) a futómű nincs kiengedett és rögzített helyzetben;

   b) fékszárnyak nincsenek leszállási helyzetben;

e) túlzott mértékű süllyedés a műszeres siklópálya alá.

6.16 Utasszállító repülőgépek – utaskabin személyzet ülései

6.16.1 Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1981 január 1-én, vagy ezt követően adták ki

Minden repülőgépet szereljenek fel a repülőgép hossztengelyéhez viszonyított 15° tartományon belül előre vagy hátrafelé néző, vállhevederekkel ellátott biztonsági övvel rendelkező üléssel minden utaskabin személyzeti tag részére, akikre a repülőgép vészkiürítésénél a 12.1 pont előírása céljából szükség van.

6.16.2 Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1981 január 1. előtt adták ki

Ajánlás – *Minden repülőgépet szereljenek fel a repülőgép hossztengelyéhez viszonyított 15° tartományon belül előre vagy hátrafelé néző, vállhevederekkel ellátott biztonsági övvel rendelkező üléssel minden utaskabin személyzeti tag részére, akikre a repülőgép vészkiürítésénél a 12.1 pont előírása céljából szükség van.*

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

6.16.3 A 6.16.1 és 6.16.2 pontok előírásai szerint biztosított utaskabin személyzeti tag üléseket úgy helyezzék el, hogy azok a padlószinten és egyéb helyeken található vészkijáratok közelében legyenek, ahogy azt a lajstromozó állam a vészhelyzeti kiürítésre vonatkozó előírásaiban meghatározta.

6.17 Vészhelyzeti helyjeladó berendezés (ELT)

6.17.1 A 6.17.2 pont előírása kivételével 2005 január 1-ig minden, a 6.5.3 pont szerint vízfelszín felett hosszú távú repülést végrehajtó repülőgépet legalább kettő darab vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel.

6.17.2 Minden olyan, a 6.5.3 pont szerint vízfelszín felett hosszú távú repülést végrehajtó repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adták ki, legalább kettő darab vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel, amelyek közül az egyik automatikus működésű legyen.

6.17.3 2005 január 1-től minden, a 6.5.3 pont szerint vízfelszín felett hosszú távú repülést végrehajtó repülőgépet legalább kettő darab vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel, amelyek közül az egyik automatikus működésű legyen.

6.17.4 A 6.17.5 pont előírása kivételével a 6.6 pont szerint kijelölt szárazföldi terület felett repülést végrehajtó repülőgépet 2005 január 1-ig legalább egy darab vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljék fel.

6.17.5 Minden olyan, a 6.6 pont szerint kijelölt szárazföldi terület felett repülést végrehajtó repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adták ki, legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

6.17.6 A 6.6 pont szerint kijelölt szárazföldi terület felett repülést végrehajtó repülőgépet 2005 január 1-től legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

6.17.7 **Ajánlás** – *Minden repülőgép szállítson egy automatikus működésű vészhelyzeti helyjeladó (ELT) berendezést.*

6.17.8 A fenti 6.17.1 – 6.17.7 pontok alapján felszerelt és szállított vészhelyzeti helyjeladó (ELT) berendezés a 10. Annex III. kötet vonatkozó előírásainak megfelelően üzemeljen.

6.18 Repülőgépek, amelyeket összeütközést elkerülő fedélzeti rendszerrel (ACAS II) kell felszerelni

6.18.1 2003 január 1-től minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 15000 kg-nál nagyobb, vagy amely több mint 30 utas szállítására jogosított, szereljenek fel összeütközést elkerülő fedélzeti rendszerrel (ACAS II).

6.18.2 2005 január 1-től minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb, vagy amely több mint 19 utas szállítására jogosított, szereljenek fel összeütközést elkerülő fedélzeti rendszerrel (ACAS II).

6.18.3 **Ajánlás** – *Minden repülőgépet szereljenek fel összeütközést elkerülő fedélzeti rendszerrel (ACAS II).*

6.18.4 Az összeütközést elkerülő fedélzeti rendszer a 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemeljen.

6.19 Repülőgépek, amelyeket nyomásmagasság-adó másodlagos radar válaszjeladóval kell felszerelni

A 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemelő minden repülőgépet szereljenek fel nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel.

Megjegyzés: Ennek az előírásnak célja a légiforgalmi szolgálatok valamint az összeütközést elkerülő fedélzeti rendszerek hatékony működésének továbbfejlesztése.

6.20 Mikrofonok

A pilótakabinban szolgálati feladatot ellátó összes hajózószemélyzeti tag az átváltási szint/magasság alatt közleményváltásaihoz kézi vagy fejhallgatóhoz erősített mikrofont használjon.

6.21 Sugárhajtóműves légijárművek – a repülés irányába előre irányuló (vizsgáló) fedélzeti szélnyírás jelző rendszer

6.21.1 **Ajánlás** – *Minden olyan sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg-nál nagyobb vagy amely több mint 19 utas szállítására jogosított, a repülés irányába előre vizsgáló fedélzeti szélnyírás jelző rendszerrel szereljenek fel.*

6.21.2 **Ajánlás** – *A repülés irányába előre vizsgáló fedélzeti szélnyírás jelző rendszer képes legyen időben hang és látjelzés útján figyelmeztetést adni a repülőgépvezető számára a légijármű előtt levő szélnyírásról, megfelelő tájékoztatást nyújtani annak elősegítésére, hogy szükség esetén biztonságosan megszakított megközelítést, átstartolást vagy egyéb elkerülő repülési műveletet kezdjen és hajtson végre. A rendszer továbbá az önműködő leszállító berendezés alkalmazása esetében jelezze a repülőgépvezető számára, ha a szélnyírás a berendezésre engedélyezett határértékeket megközelíti.*

6.22 Minden repülőgép, amelyet a műszerrepülési szabályok szerint (IFR), vagy éjszaka egy pilóta üzemeltet

A 4.9.1 fejezettel összhangban történő jóváhagyás megszerzése céljából, minden olyan repülőgépet, amelyet a műszerrepülési szabályok szerint (IFR), vagy éjszaka egy pilóta üzemeltet, fel kell szerelni az alábbiakkal:

a) működőképessé tehető (javítható) robotpilótával, amelyik legalább magasságtartási, valamint repülési irány kiválasztási üzemmóddal rendelkezik;

b) fejhallgatós mikrofonnal, vagy azzal megegyezővel; és

c) térképet megjelenítő eszközzel, amelyik biztosítja a térkép olvashatóságát minden környezeti megvilágítási feltétel között.

7. fejezet
Repülőgép távközlési és navigációs berendezések

7.1 Távközlési berendezés

7.1.1 A repülőgépet szereljék fel olyan rádió távközlésre alkalmas berendezéssel, amely képes:
a) a repülőtéri irányítás céljainak megfelelő kétoldalú összeköttetés fenntartására;
b) a repülés végrehajtása során bármikor alkalmas az időjárási tájékoztatások vételére; és
c) a repülés végrehajtása során bármikor alkalmas a kétoldalú rádióösszeköttetés fenntartására legalább egy légiforgalmi állomással valamint más olyan légiforgalmi állomásokkal és olyan hullámhosszokon, amelyeket az illetékes hatóság előírt.

Megjegyzés: A 7.1.1 pont előírásai teljesítettnek tekinthetők, ha az útvonalon szokásos hullámterjedési viszonyok között a repülőgép képes az itt meghatározott távközlési összeköttetések fenntartására.

7.1.2 A 7.1.1 pont alapján előírt rádió berendezés képes legyen rádió összeköttetés fenntartására a 121.5 MHz-es légiközlekedési vészfrekvencián.

7.2 Navigációs berendezés

7.2.1 A repülőgépet szereljék fel olyan navigációs berendezéssel, amelynek segítségével az képes:

a) az üzemeltetői repülési tervében meghatározott útvonal követésére; és

b) a légiforgalmi szolgálatok előírásainak megfelelő repülés végrehajtására;

kivéve, – amennyiben az illetékes hatóság ezt nem tiltja meg – amikor a látvarepülési szabályok szerint végrehajtott repülés során a navigációt a földi tájékozódási pontok látás utáni azonosításával hajtja vége.

7.2.2 A légtér meghatározott szakaszaiban, vagy olyan útvonalakon történő repülés esetében, amelyekre vonatkozóan RNP típust írtak elő, a repülőgép a 7.2.1 pontban ismertetett előírások mellett:

a) legyen felszerelve olyan navigációs berendezésekkel, amelyek lehetővé teszik az előírt RNP típus(ok) szerinti üzemeltetést;

b) a járató állama részéről rendelkezzen jogosítással az ilyen légtérben történő üzemeléshez.

Megjegyzés: Az előírt navigációs pontosságra (RNP), az ezzel összefüggő eljárásokra valamint a jogosítási folyamatra vonatkozó tájékoztatásokat az RNP Kézikönyv (Doc 9613) tartalmazza. A kiadvány átfogóan felsorolja azokat a dokumentumokat és egyéb anyagokat, amelyeket az államok és a nemzetközi szervezetek a navigációs rendszerekre valamint az előírt navigációs teljesítményre vonatkozóan készítettek el.

7.2.3 A Körzeti Léginavigációs Egyezmény alapján kijelölt olyan légterekben végrehajtott repülések esetében, amelyekre vonatkozóan minimális navigációs teljesítmény előírást (MNPS) írtak elő, a repülőgépet szereljék fel olyan navigációs berendezéssel:

a) amely a kijelölt repülési útvonal bármely pontján a hajózószemélyzet részére az előírt pontossággal és folyamatosan jelzi az útvonal-tartást vagy az ettől való eltérést; és

b) amelyet a járató állama az érintett MNPS üzemeltetésre engedélyezett.

Megjegyzés: Az előírt minimális navigációs teljesítményre vonatkozó értékek és alkalmazási eljárások a Körzeti Kiegészítő Eljárások *című kiadványban (Doc 7030) találhatók.*

7.2.4 A légtér azon meghatározott szakaszaiban történő repüléseknél, ahol a helyi Körzeti Léginavigációs Egyezmény értelmében FL 290 felett 300 méter (1000 láb) függőleges elkülönítési minimumot (RVSM) alkalmaznak, a repülőgépet szereljék fel:

a) olyan berendezéssel, amely képes:

1) a tartott repülési szintet (FL) a hajózószemélyzet részére jelezni;

2) a kiválasztott repülési szintet automatikusan tartani;

3) a hajózószemélyzet részére riasztó jelzést adni, ha a kiválasztott repülési szinttől eltérnek – az eltérés riasztó jelzés határértéke ne haladja meg a ±90 métert (300 láb); és

4) a nyomás-magasságot automatikusan jelezni; és

b) a repülőgépet a járató állama az ilyen légtérben történő üzemeltetésre engedélyezze.

7.2.5 A 7.2.4 b) szerinti RVSM jóváhagyás kiadása előtt, az Állam győződjön meg arról, hogy:

a) a légijármű függőleges navigációt biztosító felszereléseinek képességei kielégítik a 4. Függelék követelményeit;

b) a járató megfelelő eljárásokat vezet be a folyamatos légialkalmassághoz (karbantatás és javítás) kapcsolódó gyakorlati tevékenységek és programok vonatkozásában; és

c) a járató megfelelő hajózó személyzeti eljárásokat vezet be az RVSM szerinti légtérben való üzemeltetéshez.

Megjegyzés: Az RVSM szerinti jóváhagyás globálisan érvényes annak figyelembe vételével, hogy egy adott régióra érvényes bármely üzemeltetési eljárást tartalmazni fogja az üzemeltetési kézikönyv vagy a megfelelő személyzeti útmutató.

7.2.6 A járató állama, amennyiben szükséges a lajstromozó állammal konzultálva, a 7.2.4 fejezetben említett légijárművek vonatkozásában biztosítja, hogy megfelelő lépések történjenek:

a) amikor a 11. Függelék, 3.3.4.1 alfejezetével összhangban létrehozott ellenőrző szervezettől jelentés érkezik a magasság tartás körülményeiről;

b) helyesbítő intézkedések bevezetésére az előbbiek szerinti jelentésben szereplő egyedi repülőgép, vagy repülőgép típusba tartozó csoportra vonatkozóan, amennyiben eltérést tapasztalnak az RVSM szerinti légtérben való üzemeltetésre vonatkozó követelmények betartásában, ha az alkalmazásra került.

7.2.7 Mindegyik állam, amelyik felelős azon légterekért, ahol az RVSM alkalmazásra került, vagy a járatóknak RVSM jóváhagyást adott ki a saját államán belül, olyan intézkedéseket és eljárásokat vezet be, amelyek biztosítják a megfelelő lépések megtételét az RVSM légteret, RVSM jóváhagyás nélkül használó repülőgépek vagy járatók ellen.

Megjegyzés: ezeket az intézkedéseket és eljárásokat mindkét olyan esetben alkalmazn szükségesi, amikor a kérdéses repülőgép üzemeltetése jóváhagyás nélkül történik az állam légterében, vagy amikor az állam rendszeres felügyeleti felelősségébe tartozó járató a szükséges jóváhagyás nélkül üzemeltet egy másik állam légterében.

7.2.8 A repülőgépet szereljék fel olyan navigációs berendezéssel, amely biztosítja, hogy a repülés végrehajtásának bármely szakaszában bekövetkező, az egyik rendszert érintő meghibásodás esetében a repülőgépet a 7.2.1, valamint ahol ez alkalmazható, a 7.2.2, 7.2.3 és 7.2.4 pontok előírásainak megfelelően tovább lehessen irányítani (navigálni).

Megjegyzés: A FL 290 felett 300 méter (1000 láb) függőleges elkülönítési minimum alkalmazására kijelölt légtérben szükséges légijármű berendezésekre vonatkozó útmutató a 300 méter (1000 láb) Függőleges Elkülönítési Minimum Bevezetése FL 290 és FL 410 Repülési Szintek Között (Doc 9574) kézikönyvben található.

7.2.9 A műszeres időjárási körülmények között végrehajtott leszállással tervezett repülések esetében a repülőgépet szereljék fel olyan rádió berendezéssel, amely alkalmas az irányvezetést biztosító rádiójelek vételére egy olyan pontig, ahonnan a leszállás látással végrehajtható. Ez a rádió berendezés képes legyen az irányvezetés biztosítására minden olyan tervezett leszállási valamint bármely kijelölt kitérő repülőtéren, ahol műszeres időjárási körülmények között történő leszállás végrehajtását tervezik.

7.3 Felszerelés

A berendezéseket úgy szereljék fel, hogy bármely egyedi egység meghibásodása – amely akár rádió távközlési összeköttetési, akár navigációs illetve mindkét célra szükséges – ne okozza a távközlési összeköttetési vagy navigációs célokból szükséges másik egység meghibásodását.

8. fejezet
Repülőgép karbantartás

1. Megjegyzés: A jelen fejezetben történő alkalmazás során a repülőgép kifejezésbe tartoznak a hajtóművek, légcsavarok, alkatrészek, műszerek, szerkezeti egységek és felszerelések, beleértve a vészhelyzeti felszereléseket is.

2. Megjegyzés: A jelen fejezetben megadott előírások a lajstromozó állam előírásait jelentik. Amennyiben a járató állama nem azonos a lajstromozó állammal, szükséges lehet a járató állama bármely további előírásainak figyelembevétele is.

3. Megjegyzés: A folyamatos légialkalmasság követelményeire vonatkozó útmutató a Légialkalmassági Kézikönyv-ben *(Doc 9760) található*
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8.1 A járató karbantartási felelőssége

8.1.1 A járató biztosítsa, hogy a lajstromozó állam részéről elfogadható eljárásokkal összhangban:
a) minden üzemeltetett repülőgépe repülésre alkalmas állapotban legyen;
b) a tervezett repüléshez szükséges üzemeltetési és vészhelyzeti berendezések működőképesek legyenek;
c) minden egyes üzemeltetett repülőgép Légialkalmassági Bizonyítványa érvényes legyen.

8.1.2 A járató ne üzemeltesse a repülőgépet csak abban az esetben, ha azt a lajstromozó állam részéről elfogadható, a 8.7 pont alapján jóváhagyott szervezet vagy ennek megfelelő (műszaki) rendszer karbantartja és szolgálatra átadja.

8.1.3 Amikor a lajstromozó állam elfogadja a fenti megfelelő (műszaki) rendszert, a kkarbantartási nyilatkozatot aláíró személy az 1. Annex előírásainak megfelelő szakszolgálati jogosítással rendelkezzen.

8.1.4 A járató alkalmazzon egy személyt vagy munkacsoportot annak biztosítására, hogy az összes karbantartási feladatot a karbantartás irányítási kézikönyvnek megfelelően végzik el.

8.1.5 A járató biztosítsa, hogy repülőgépeinek karbantartását a karbantartási programnak megfelelően végzik el.

8.2 A járató karbantartás irányítási kézikönyve

8.2.1 A járató a karbantartást végző szervezetek és személyek tájékoztatására és használatára a 11.2 szakasz előírásaival összhangban, a lajstromozó állam által elfogadható karbantartás irányítási kézikönyvet biztosítson.
A kézikönyv tartalmi kialakítása kövesse az emberi tényezők elveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

8.2.2 A járató biztosítsa, hogy a karbantartás irányítási kézikönyvet szükség szerint módosítsák és egészítsék ki annak érdekében, hogy az abban található tájékoztatások mindig naprakészek legyenek.

8.2.3 A járató karbantartás irányítási kézikönyve kiadott összes módosításának megfelelő példányait haladéktalanul juttassák el minden olyan szervezetnek vagy személynek, amelynek a kézikönyv eredeti példányát átadták.

8.2.4 A járató adja át a járatói karbantartás irányítási kézikönyv egy-egy példányát a lajstromozó és a járató államainak az összes módosítással és/vagy kiegészítéssel továbbá az összes olyan anyaggal együtt, amelyeket ezek kötelezően előírnak.

8.3 Karbantartási program

8.3.1 A járató a karbantartást végző szervezetek és személyek tájékoztatására és használatára a 11.3 szakaszban meghatározott tájékoztatásokat tartalmazó, a lajstromozó állam részéről jóváhagyott karbantartási programot adjon ki. A járató karbantartási programjának kidolgozása és felhasználása alkalmával vegyék figyelembe az emberi tényezők alapelveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében *(Doc 9683) található.*

8.3.2 A karbantartási program összes módosításának megfelelő példányait haladéktalanul juttassák el minden olyan szervezetnek vagy személynek, amelynek a karbantartási programot átadták.

8.4 Karbantartások nyilvántartása

8.4.1 A járató biztosítsa a karbantartásokra vonatkozó alábbi nyilvántartások megőrzését a 8.4.2 pontban jelzett időtartamig:

a) a repülőgép és az összes korlátozott ideig üzemeltethető alkatrészének teljes üzemideje (szükség szerint órában, naptári időszakban és repülési ciklusokban meghatározva);

b) a repülőgép állapota az összes kötelező folyamatos légialkalmassági előírás és tájékoztatás teljesítése vonatkozásában;

c) a repülőgép és főbb szerkezeti elemeinek, alkatrészeinek módosítása és javítása valamint ennek részletezése;

d) a repülőgép vagy meghatározott kötelező karbantartási időszakkal vagy ciklussal rendelkező részeinek teljes üzemideje az utolsó (nagy)javítás óta (szükség szerint órában, naptári időszakban és/vagy repülési ciklusokban meghatározva);

e) a repülőgép karbantartási programhoz viszonyított jelenlegi felülvizsgálati – ellenőrzési – helyzete a feladatok végrehajtása alapján; és

f) részletes karbantartási jegyzőkönyvek, amelyekből megállapítható, hogy teljesítették a karbantartási kézikönyvben található, a karbantartási nyilatkozatra vonatkozó összes előírást.

8.4.2 A 8.4.1 *a)–e)* alpontokban ismertetett nyilvántartásokat azon egység üzemi élettartamának lejáratát és üzemeltetésből történő végleges kivonását követő legalább 90 napig őrizzék meg, amely egységre a nyilvántartás vonatkozik. A 8.4.1 *f)* alpontban ismertetett karbantartási nyilatkozatot az aláírást követő egy évig őrizzék meg.

8.4.3 Amennyiben a repülőgép járatója ideiglenesen megváltozik, a nyilvántartást bocsássák az új járató rendelkezésére. Ha a járató véglegesen megváltozik, a nyilvántartást adják át az új járatónak.

Megjegyzés: A 8.4.3 pont vonatkozásában a lajstromozó állam feladata annak megítélése, hogy mi tekintendő a járató ideiglenes megváltozásának. A lajstromozó állam ezt a nyilvántartások feletti felügyelet, azaz a nyilvántartások elkészítése, tárolása és hozzáférhetősége alapján határozhatja meg.

8.5 Folyamatos légialkalmassági tájékoztatás

8.5.1 Az 5700 kg. engedélyezett legnagyobb felszállósúlynál (tömeg) nehezebb repülőgép járatója a folyamatos légialkalmasság szempontjából kövesse figyelemmel és értékelje a repülőgép üzemeltetését és karbantartását, biztosítsa a lajtromozó állam részéről előírt tájékoztatásokat, valamint azokat a 8. Annex II. rész 4.3.5 és 4.3.8 pontok előírásaiban meghatározott rendszerben jelentse.

8.5.2 Az 5700 kg. engedélyezett legnagyobb felszállósúlynál (tömeg) nehezebb repülőgép járatója a repülőgép típus tervezéséért felelős szervezettől szerezze be és értékelje ki a rendelkezésre álló folyamatos légialkalmassági tájékoztatásokat és ajánlásokat továbbá ezek alapján szükség szerint, a lajstromozó állam által elfogadható eljárásokkal összhangban vezessen be megfelelő intézkedéseket.

Megjegyzés: A repülőgép típus tervezéséért felelős szervezet kifejezés értelmezésére vonatkozó útmutatót a Légialkalmassági Kézikönyv *(Doc 9760) tartalmazza.*

8.6 Módosítások és javítások

Az összes módosítást és javítást a lajstromozó állam által elfogadható légialkalmassági előírásoknak megfelelően végezzék el. Dolgozzanak ki eljárásokat annak biztosítására, hogy a légialkalmassági követelményeknek való megfelelőséget alátámasztó adatok, a létrehozást követően megőrzésre kerüljenek.

8.7 Engedélyezett karbantartó szervezet

8.7.1 Az engedély kiadása

8.7.1.1 A karbantartó szervezet engedélyének az állam részéről történő kiadása attól függ, hogy a jelölt szervezet bizonyítja az ilyen szervezetekre vonatkozó, a 8.7 szakaszban található előírások teljesítését.

8.7.1.2 Az engedélyezési okmány legalább a következőket tartalmazza:

a) a szervezet neve és székhelye;

b) a kiadás időpontja és érvényessége;

c) a engedélyezés feltételei.

8.7.1.3 Az engedély folyamatos érvényessége attól függ, hogy a szervezet továbbra is eleget tesz a jóváhagyott karbantartó szervezetre vonatkozó, a 8.7 szakaszban található előírásoknak.

8.7.2 Karbantartó szervezet eljárási kézikönyve

8.7.2.1 A karbantartó szervezet biztosítsa, hogy a karbantartást végző személyek tájékoztatására és használatára külön kötetekben is kiadható, a következő tájékoztatásokat tartalmazó eljárási kézikönyv álljon rendelkezésre:

a) a szervezet engedélyezési feltételei alapján jóváhagyott munkafeladatok általános ismertetése;

b) a 8.7.4 szakasz előírásai alapján a szervezet eljárásainak valamint minőségügyi vagy ellenőrzési rendszerének ismertetése;

c) a szervezet létesítményeinek általános ismertetése;

d) a 8.7.6.1 pontban előírt személy vagy személyek neve és beosztása;

e) a karbantartó személyzet szakmai jártasságának ellenőrzésére alkalmazott eljárások ismertetése a 8.7.6.3 pont előírása alapján;

f) a karbantartásra vonatkozó nyilvántartások elkészítésének és megőrzésének módszerei a 8.7.7 szakasz előírásai alapján;

g) a karbantartási nyilatkozat elkészítésénél alkalmazott eljárás, és a jegyzőkönyv aláírási körülményeinek meghatározása;

h) a karbantartási nyilatkozat aláírására kijelölt személyek és jogosítási körük;

i) a járató további karbantartási eljárásai és az ezekkel kapcsolatos előírások teljesítésére vonatkozó eljárások szükség szerinti ismertetése;

j) a 8. Annex II. rész 4.3.5 és 4.3.8 pontjaiban előírt, a szolgálati tájékoztatások jelentésére vonatkozó követelmények teljesítésének eljárásai; és

k) a légialkalmasságot befolyásoló összes szükséges adatnak a típus-bizonyítvány tulajdonosától vagy a típust tervező szervezettől történő beszerzésének, értékelésének, módosításának és szétosztásának eljárásai a karbantartó szervezeten belül.

8.7.2.2 A karbantartó szervezet biztosítsa, hogy az eljárási kézikönyvet szükség szerint módosítsák és egészítsék ki abból a célból, hogy az abban található tájékoztatások mindig naprakészek legyenek.

8.7.2.3 Az eljárási kézikönyv összes módosításának megfelelő példányait haladéktalanul juttassák el minden olyan szervezetnek vagy személynek, amelynek a kézikönyv eredeti példányát átadták.

8.7.3 A biztonság irányítása

8.7.3.1 Az államok dolgozzanak ki biztonsági programot annak érdekében, hogy a légijárművek karbantartásánál elfogadható biztonsági szintet érjenek el.

8.7.3.2 A célul kitűzött elfogadható biztonsági szintet az érintett állam(ok) határozza(ák) meg.

Megjegyzés – a biztonsági programra és az elfogadható biztonsági szint meghatározására vonatkozó útmutatót a 11. Annex E. melléklete és a Biztonság Irányítási Kézikönyv (SMM) *(Doc 9859) tartalmazza.*

8.7.3.3 ***Ajánlás*** – az államok követeljék meg, hogy a biztonsági programjuk részeként egy karbantartó szervezet vezessen be az államnak elfogadható biztonság irányítási rendszert, amely minimum:

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható biztonsági szint kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és *d)* törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

8.7.3.4 2009 január 01-től az államok a biztonsági programjuk részeként követeljék meg, hogy egy karbantató szervezet vezessen be az állam számára elfogadható biztonság irányítási rendszert, amely minimum:

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható biztonsági szint kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és

d) törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

8.7.3.5 A biztonság irányítási rendszer világosan határozza meg a biztonságért viselt felelősség függelmi viszonyait egy karbantartó szervezeten belül, beleértve a felső vezetés biztonságért viselt közvetlen felelősségét.

Megjegyzés: A biztonság irányítási rendszerre vonatkozó útmutató a Biztonság Irányítási Kézikönyv-ben (SMM) (Doc 9859) található.

8.7.4 Karbantartási eljárások és minőség biztosítási rendszer

8.7.4.1 A karbantartó szervezet dolgozzon ki és vezessen be az engedélyt kiadó állam részéről elfogadható eljárásokat, amelyek biztosítják a karbantartás megfelelő és szakszerű elvégzését továbbá összhangban vannak a jelen fejezet összes vonatkozó előírásával.

8.7.4.2 A karbantartó szervezet biztosítsa a 8.7.4.1 pont előírásának teljesítését egy független minőség biztosítási rendszer létrehozásával, amely figyelemmel kíséri és felülvizsgálja az alkalmazott eljárások helyességét vagy olyan ellenőrzési rendszer kialakításával, amely biztosítja az összes karbantartási feladat megfelelő előírás-szerű elvégzését.

8.7.5 Létesítmények

8.7.5.1 A létesítmények és a munkakörülmények az elvégzendő feladatra alkalmasak legyenek.

8.7.5.2 A karbantartó szervezet rendelkezzen azon munka elvégzéséhez szükséges műszaki adatokkal, berendezésekkel, felszerelésekkel, szerszámokkal és anyagokkal, amelyre engedéllyel illetve jóváhagyással rendelkezik.

8.7.5.3 Alakítsanak ki megfelelő raktár területet az alkatrészek, berendezések, szerszámok és anyagok tárolására. Hozzanak létre biztonságos raktározási körülményeket valamint akadályozzák meg a raktározott egységek károsodását és sérülését.

8.7.6 Személyzet

8.7.6.1 A karbantartó szervezet jelöljön ki egy személyt vagy munkacsoportot, akik felelősek annak biztosításáért, hogy a szervezet megfelel az engedélyezett karbantartó szervezetre vonatkozó, a 8.7 szakaszban található előírásoknak.

8.7.6.2 A karbantartó szervezet alkalmazza a szükséges személyeket, akik az elvégzendő munkát megtervezik, végrehajtják, felügyelik, ellenőrzik és kibocsátják.

8.7.6.3 A karbantartó személyzet szakmai jártassága a feladattal (eljárással) legyen összhangban és az engedélyező állam részére elfogadható szintű legyen. A karbantartási munka megfelelő elvégzésének igazolására készített karbantartási nyilatkozatot az erre az 1. Annex alapján jogosított személy írja alá.

8.7.6.4 A karbantartó szervezet biztosítsa, hogy a karbantartásban résztvevő összes személy feladatának és felelősségének megfelelő alapkiképzésben és folyamatos továbbképzésben részesüljön. A karbantartó szervezet által kidolgozott és alkalmazott kiképzési program tartalmazzon emberi tevékenységet és teljesítményt fejlesztő elméleti és gyakorlati képzést, beleértve a többi karbantartó személlyel és a hajózószemélyzettel történő együttműködést is.

Megjegyzés: Az emberi teljesítmény fejlesztését célzó kiképzési programok tervezéséhez útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében (Doc 9683) található.

8.7.7 Jegyzőkönyvek

8.7.7.1 A karbantartó szervezet készítsen részletes karbantartási jegyzőkönyvet annak bizonyítására, hogy a karbantartási nyilatkozat aláírásához szükséges összes előírásnak és feltételnek eleget tettek.

8.7.7.2 A 8.7.7.1 pontban előírt karbantartási jegyzőkönyveket a karbantartási nyilatkozat aláírását követően legalább egy évig őrizzék meg.

8.8 Karbantartási nyilatkozat

8.8.1 A karbantartási munka megfelelő, a karbantartó szervezet eljárási kézikönyvében ismertetett eljárásoknak és a jóváhagyott feltételeknek megfelelően történő sikeres elvégzésének igazolására készítsenek el és írjanak alá karbantartási nyilatkozatot.

8.8.2 A karbantartási nyilatkozat tartalmazzon igazolást az alábbiakról:

a) az elvégzett karbantartási munka alapvető részletei, beleértve a felhasznált engedélyezési illetve jóváhagyási feltételek részletezését;

b) a karbantartás befejezésének időpontja;

c) az engedélyezett karbantartó szervezet azonosítója; és

d) a karbantartási nyilatkozatot aláíró személy vagy személyek neve.

9. fejezet
A repülőgép hajózószemélyzete

9.1 A hajózószemélyzet összetétele

9.1.1 A hajózószemélyzet tagjainak száma és összetétele az üzemeltetési kézikönyvben előírtnál ne legyen kevesebb. A repülésvégrehajtási kézikönyvben vagy a légijármű légialkalmassági bizonyítványával összefüggésben levő más egyéb dokumentumban meghatározott minimális létszámon felül a hajózószemélyzetet egészítsék ki további hajózószemélyzeti tagokkal abban az esetben, ha ezt a repülőgép vagy az adott üzemeltetés típusa valamint a hajózószemélyzet váltási pontok közötti repülés időtartama ezt szükségessé teszi.

9.1.2 Rádió berendezés kezelője

A hajózószemélyzetben legyen legalább egy olyan tag, aki az alkalmazott rádió-távbeszélő berendezés üzemeltetésére jogosító, a lajstromozó állam által kiadott vagy elfogadott érvényes rádiótávbeszélő kezelői engedéllyel rendelkezik.

9.1.3 Fedélzeti mérnök

Amennyiben a repülőgép típuson külön fedélzeti mérnök munkahelyet alakítottak ki, a hajózószemélyzetben legyen legalább egy fedélzeti mérnök, akit külön ezen munkahely feladatainak ellátására jelöltek ki, kivéve ha ezek kielégítő ellátására saját feladatainak megfelelő elvégzése mellett a hajózószemélyzet más olyan tagja képes, aki fedélzeti mérnöki szakszolgálati engedéllyel rendelkezik.

9.1.4 Hajózó navigátor

Minden olyan üzemeltetés esetében, amelynél a járató államának előírása szerint a repülés biztonságos végrehajtásához szükséges navigációs feladatokat a légijármű vezetők a repülőgépvezetői munkahelyről nem tudják megfelelő módon ellátni, a hajózószemélyzetben legyen legalább egy olyan tag, aki hajózó navigátor szakszolgálati engedéllyel rendelkezik.

9.2 A hajózószemélyzeti tag vészhelyzeti kötelességei

A járató minden egyes repülőgép típusra jelölje ki és határozza meg a hajózószemélyzet minden tagjának vészhelyzetben vagy a repülőgép vészkiürítése esetében elvégzendő egyéni feladatait. A járató kiképzési programja tartalmazza ezen vészhelyzeti feladatok éves gyakorlását, beleértve az összes előírás szerint szállított vészhelyzeti és életmentő berendezés használatát valamint a repülőgép vészkiürítésének gyakorlását is.

9.3 A hajózószemélyzeti tag kiképző programok

9.3.1 A járató dolgozzon ki és folyamatosan tartson fenn a járató állama részéről elfogadott és jóváhagyott földi és repülési kiképzési programot, amely biztosítja, hogy a hajózószemélyzet minden tagja kijelölt feladatainak ellátására megfelelő kiképzésben részesüljön. A kiképzési program:

a) tartalmazzon a járató állama által meghatározott földi és repülési kiképző létesítményeket továbbá jól képzett és jogosított oktatókat;

b) földi és repülési kiképzésből álljon minden olyan repülőgép típuson, amelyen a hajózószemélyzeti tag szolgálatot teljesít;

c) terjedjen ki a hajózószemélyzet tagjai közötti együttműködésre továbbá az összes olyan vészhelyzet vagy rendellenes üzemelés esetén szükséges eljárás gyakorlására, amely a hajtómű, sárkányszerkezet, repülési rendszerek meghibásodás, tűz vagy más rendellenesség esetében következhet be;

d) tartalmazzon olyan elméleti és gyakorlati képzést, amely a betervezett üzemeltetési területekre érvényes látás szerinti és műszeres repülési eljárásokra, a fenyegetések és hibák kezelését is magába foglaló emberi teljesítőképesség fejlesztésre, valamint a veszélyes áruk szállítására tér ki;

e) biztosítsa hogy a hajózószemélyzet minden egyes tagja ismerje azokat a feladatokat, amelyek végrehajtásáért személyesen felelős továbbá ezen feladatok kapcsolatát a hajózószemélyzet többi tagjának feladataival, különös tekintettel a vészhelyzeti vagy rendellenes üzemelés esetében szükséges eljárásokra, és

f) a járató államának előírásai alapján rendszeres időközönként kerüljön megismétlésre, melynek alkalmával az érintettek jártasságukról tegyenek vizsgát.

1. Megjegyzés: A 4.2.4 pont tiltja, hogy vészhelyzeti vagy a rendes üzemeléstől eltérő gyakorlást illetve szimulációt végezzenek a repülés közben abban az esetben, ha a fedélzeten utasok tartózkodnak vagy teherárut szállítanak.

2. Megjegyzés: A repülési kiképzést a járató állama által megfelelőnek tartott mértékben a járató állama részéről erre a célra engedélyezett szintetikus repülési gyakorló berendezésen is végre lehet hajtani.

3. Megjegyzés: A 9.2 és 9.3 pontokban előírt ismétlődő képzés terjedelme változtatható és annak nem kell olyan alaposnak lennie, mint az adott repülőgép típus vonatkozásában lebonyolított első (alap) kiképzés.

4. Megjegyzés: Az időszakos földi kiképzés követelményeinek biztosítására a já-rató állama által megfelelőnek tartott mértékben levelező tanfolyamokat, írásbeli vizsgáztatást vagy más, elfogadott módszereket is alkalmazhatnak.

5. Megjegyzés: A veszélyes áruk szállításával kapcsolatos kiképzésre vonatkozó előírásokat a 18. Annex tartalmazza.

6. Megjegyzés: Az emberi teljesítmény és gyakorlati ismeretek fejlesztését célzó kiképzési programok tervezésére vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében (Doc 9683) található.

7. Megjegyzés: A repülőgépvezetőknek és a légiüzemeltetéssel foglalkozó személyeknek szóló azon információkat, amelyek a repülési eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülési eljárások felépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak *használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.*

8. Megjegyzés: A hajózószemélyzetek kiképzési programjainak tartalmi összeállítására vonatkozó útmutató anyag a Repülésüzemi Kézikönyv Előkészítése (Doc 9376) című anyagban található.

9. Megjegyzés: az alkalmasság megállapítására használatos különböző eszközökre vonatkozó útmutató A Légiforgalmi Szolgálatok Eljárásai – Képzés (PANS-TRG, Doc 9868) című anyag 2. fejezetének mellékletében található.

9.3.2 Az időszakos ismétlődő repülési képzés követelményei az adott repülőgép típus vonatkozásában teljesítettnek tekinthetők, amennyiben:

a) a járató állama által jóváhagyott mértékben olyan repülőgép szintetikus repülési gyakorló berendezést használnak, amelyet az állam erre a célra jóváhagyott; vagy

b) a megfelelő időszakon belül elvégzik a 9.4.4 pontban az adott repülőgép típusra előírt repüléstechnikai ellenőrzést.

9.4 Jogosítások

Megjegyzés: A személyzet kereszt jogosításának, az eltérő típusokon való repülésnek és a képzettség beszámításának általános tulajdonságaira vonatkozó útmutatót lásd az Egyéni szakszolgálati engedélyek kiadását biztosító állami rendszer létrehozására vonatkozó eljárások kézikönyvében (Doc 9379).

9.4.1 Folyamatos gyakorlatban tartás – légijármű parancsnok és másodpilóta

9.4.1.1 A járató a repülés-vezérlő rendszerek fel és leszállás végrehajtása közben történő kezelésére csak olyan légijármű parancsnokot vagy másodpilótát jelöljön ki, aki megelőző kilencven nap folyamán az adott repülőgép típuson, vagy annak változatán, illetve erre a célra elfogadott repülési szimulátoron legalább három fel és leszállás alkalmával ilyen feladatot teljesített.

9.4.1.2 Amikor egy repülőgép parancsnok vagy egy másodpilóta azonos típusú repülőgép különböző változatait, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró de eltérő típusú repülőgépeket vezeti az állam döntse el, hogy a 9.4.1.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra vagy minden egyes repülőgép típusra vonatkozóan.

9.4.2 Folyamatos gyakorlatban tartás – útvonalrepülést megkönnyítő repülőgépvezető

9.4.2.1 A járató csak olyan repülőgépvezetőt jelöljön ki útvonalrepülést megkönnyítő repülőgépvezető beosztásba egy repülőgép típuson, vagy egy repülőgép típus eltérő változatain, aki a megelőző kilencven nap folyamán:

a) az adott repülőgép típuson légijármű parancsnokként, másodpilótaként, vagy útvonalrepülést megkönnyítő repülőgépvezetőként tevékenykedett; vagy

b) repülőgépvezetői képességeket frissítő képzésen vett részt, amely magába foglalja az útvonal repülésre vonatkozó normál, rendellenes és vészhelyzeti eljárások gyakorlását az adott légijármű típuson vagy erre a célra elfogadott repülési szimulátoron, és gyakorolta megközelítési és leszállási eljárásokat, ahol a megközelítési és leszállási eljárások gyakorlásának végrehajtása során a repülőgép tényleges vezetésében nem feltétlenül kell részt vennie.

9.4.2.2 Amikor egy útvonalrepülést megkönnyítő repülőgépvezető azonos típusú repülőgép különböző változatait, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró de eltérő típusú repülőgépeket vezeti az állam döntse el, hogy a 9.4.2.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra vagy minden egyes repülőgép típusra vonatkozóan.

9.4.3 Légijármű parancsnok körzet, útvonal és repülőtér jogosítása

9.4.3.1 A járató a repülőgépvezetőt légijármű parancsnokként mindaddig ne jelölje ki olyan útvonalra vagy útvonal szakaszra, amelyre az érintett repülőgép-vezetőnek nincs érvényes jogosítása, amíg ez a személy nem tesz eleget a 9.4.3.2 és 9.4.3.3 pontok előírásainak.

9.4.3.2 Valamennyi érintett repülőgépvezető bizonyítsa a járató számára, hogy megfelelő mértékben ismeri a következőket:

a) a lerepülendő útvonalat valamint az igénybe vett repülőtereket a következő jellemzők vonatkozásában;

1) domborzati viszonyok és legalacsonyabb biztonságos repülési magasságok;

2) az évszaknak megfelelő időjárási körülmények;

3) a meteorológiai, távközlési és légiforgalmi irányítási létesítmények, szolgálatok valamint eljárások;

4) a kutató és mentő szolgálati eljárások; és

5) a tervezett repülési útvonal teljes hosszán található navigációs létesítmények és eljárások, beleértve bármely nagy távolságú navigációs eljárást is; és

b) a sűrűn lakott területek felett valamint a nagy forgalmú légtereken keresztül vezető repülési útvonalak eljárásai, akadályai, fizikai jellemzői, megközelítési segédeszközei, érkezési, indulási, várakozási és műszeres megközelítési eljárásai továbbá az alkalmazható üzemeltetési minimumok.

Megjegyzés: Az érkezési, indulási, várakozási és műszeres megközelítési eljárások ismeretét az erre a célra alkalmas kiképzési segédeszköz igénybevételével is bizonyítani lehet.

9.4.3.3 A légijármű parancsnoka hajtson végre egy tényleges megközelítést az útvonalon elhelyezkedő összes leszállási repülőtérre olyan repülőgépvezető megfigyelése mellett, aki az adott repülőtérre jogosítással rendelkezik és hajózószemélyzeti tagként vagy megfigyelőként a fedélzeten tartózkodik, kivéve ha:

a) a repülőtér megközelítése nem nehéz terep felett történik és a műszeres megközelítési eljárások valamint az ehhez rendelkezésre álló segédeszközök hasonlóak azokhoz, amelyeket a repülőgépvezető jól ismer, továbbá az általános üzemeltetési minimumokat a járató állama által jóváhagyott biztonsági tűrésekkel megnövelték vagy a megközelítés és leszállás nagy valószínűséggel látás utáni időjárási körülmények között hajtható végre; vagy

b) a kezdeti megközelítési magasságról történő süllyedés nappal és látás utáni időjárási körülmények között hajtható végre; vagy

c) a járató a légijármű parancsnokát megfelelő vizuális segédeszközök segítségével felkészíti és jogosítja az adott repülőtéren történő leszállás végrehajtására; vagy *d)* az adott repülőtér olyan repülőtér mellett helyezkedik el, amelyre a légijármű parancsnoka érvényes leszállási jogosítással rendelkezik.

9.4.3.4 A járató vezessen megfelelő nyilvántartást, amellyel a járató állama részére kielégítően bizonyítja a repülőgépvezető jogosítását valamint a jogosítás megszerzésének módját.

9.4.3.5 A járató egy repülőgépvezetőt egy útvonalon, vagy a járató által kijelölt és a járató állama által jóváhagyott körzeten belül légijármű parancsnokként csak akkor foglalkoztasson tovább, ha az érintett a megelőző 12 hónapon belül hajózószemélyzeti tagként, ellenőrző repülőgépvezetőként vagy a pilótakabinban megfigyelőként legalább egy utat megtett:

a) A kijelölt körzeten belül; és

b) Amennyiben szükséges bármilyen útvonalon, ahol az útvonallal vagy fel- és leszállásra használni kívánt repülőterekkel kapcsolatos eljárások speciális tudás vagy képességek alkalmazását követelik meg.

9.4.3.6 Amennyiben több mint 12 hónap telt el azóta, hogy a repülőgépvezető nem repült az útvonal közvetlen közelében és hasonló adottságú terep felett az ilyen kijelölt körzet, útvonal vagy repülőtér határárain belül, és nem gyakorolta a vonatkozó eljárásokat az adott célra alkalmas gyakorló berendezéseken, akkor az adott körzeten belül, vagy útvonalon légijármű parancsnokként történő foglalkoztatása előtt az adott repülőgépvezetőnek meg kell erősítenie a jogosítását a 9.4.3.2 és 9.4.3.3 pontok előírásai alapján.

9.4.4 A repülőgépvezető szakmai jártasságának ellenőrzése

9.4.4.1 A járató biztosítsa a repülőgépvezető repüléstechnikai felkészültségének és a vészhelyzeti eljárások megfelelő végrehajtásának ellenőrzését oly módon, amelyből egyértelműen kiderül a repülőgépvezető szakmai jártassága minden egyes repülőgép típuson vagy egy repülőgép típus változatain. Amennyiben az üzemeltetés műszerrepülési szabályok között is végrehajtható, a járató biztosítsa, hogy a repülőgépvezető az ilyen szabályok alapján történő megfelelő tevékenységét, szakmai jártasságát a járató ellenőrző repülőgépvezetője vagy a járató államának képviselője előtt bizonyítsa. Az ilyen ellenőrzéseket egy éven belül két alkalommal végezzék el, azonban négy egymást követő hónapon belül kétszer végrehajtott hasonló jellegű ellenőrzés a fenti követelményt önmagában nem elégíti ki.

1. *Megjegyzés: Az ellenőrzések olyan részleteinek végrehajtására felhasználhatók a járató állama részéről elfogadott repülési szimulátorok, amelyekre ezek külön jogosítással rendelkeznek.*

2. Megjegyzés: Lásd az ICAO Repülési Szimulátorok Jogosítási Kézikönyv-ét (Doc 9625).

9.4.4.2 Amikor egy járató a repülőgép személyzetet azonos típusú repülőgép különböző változataira, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró de eltérő típusú repülőgépekre osztja be, az állam döntse el, hogy a 9.4.4.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra vagy minden egyes repülőgép típusra vonatkozóan.

9.4.5. Egy repülőgépvezetővel történő üzemeltetés műszer szerinti (IFR), vagy éjszakai feltételek közötti repülés esetén

9.4.5.1 A járató állama határozza meg a műszer szerinti repülés (IFR) vagy az éjszakai repülés feltételei közötti, egy repülőgépvezetővel végrehajtott üzemeltetés jártassági, folyamatos gyakorlatban tartási és képzési követelményeit.

9.4.5.2 **Ajánlás** – *a légijármű parancsnoka*:

a) a műszer szerinti (IFR), vagy az éjszakai feltételek közötti repüléshez gyűjtsön össze legalább 50 óra repülési időt az adott osztályba tartozó légijárművön, amelyből legalább 10 órát légijármű parancsnokként teljesítsen;

b) a műszer szerinti (IFR) repüléshez gyűjtsön össze legkevesebb 25 óra IFR feltételek között repülési időt az adott osztályba tartozó légijárművön, amely részét képezheti az a) alpont szerinti 50 repült órának;

c) éjszakai feltételek közötti repüléshez gyűjtsön össze legkevesebb 15 óra éjszakai feltételek közötti repült időt, amely részét képezheti az a) alpont szerinti 50 repült órának;

d) az IFR feltételei szerinti repülésekhez mutasson fel folyamatos gyakorlatban tartást az egy repülőgépvezetővel, IFR feltételei között végrehajtott repülésekből, ahol:

i. a megelőző 90 nap során hajtson végre legalább öt IFR szerinti repülést, benne három műszer szerinti megközelítést az adott osztályba tartozó repülőgépen, egy repülőgépvezetős feltételek mellett; vagy

ii. a megelőző 90 nap során hajtson végre ellenőrző repülést az adott osztályba tartozó repülőgépen, IFR feltételeknek megfelelő megközelítés során;

e) az éjszakai feltételek szerinti repülésekhez, a megelőző 90 napon belül hajtson végre legalább három éjszakai le- és felszállást az adott osztályba tartozó repülőgépen, egy repülőgépvezetős feltételek mellett; és

f) sikeresen hajtsa végre a képzési programot, amelynek a 9.3 alfejezetben leírt követelmények mellett tartalmaznia kell az utasok repülőgép vészelhagyására vonatkozó tájékoztatását, a robotpilóta kezelését, és az egyszerűsített repülés-közbeni dokumentáció használatát.

9.4.5.3 A 9.3.1 és a 9.4.4 alfejezetekben feltüntetett alap- és megújító repülési képzést, valamint szakmai jártasság ellenőrzést a légijármű parancsnoka egy repülőgépvezetős beosztásban hajtsa végre az adott osztályba tartozó repülőgépen, az üzemeltetést reprezentáló feltételek mellett.

9.5. A hajózószemélyzet felszerelése

A hajózószemélyzet tagja rendelkezzen könnyen hozzáférhető, megfelelő tartalék szemüveggel abban az esetben, ha szakszolgálati tevékenységének végzésére csak megfelelő korrekciós szemüveg viselése mellett jogosult.

9.6 Repülési idő, repülési szolgálati idő és pihenőidő

A járató állama dolgozzon ki előírásokat a hajózószemélyzet tagjainak repülési idejének valamint repülési szolgálati idejének korlátozására. Ezek az előírások biztosítsák a megfelelő pihenőidőt és olyanok legyenek, hogy a repülés vagy repülési sorozat végrehajtása során illetve bizonyos időszak alatt ezen feladatok és más események miatt felhalmozódott fáradtság ne veszélyeztesse a repülés biztonságát.

Megjegyzés: A korlátozások kidolgozásával kapcsolatos útmutató az A. Mellékletben található.

10. fejezet
Repülés-üzemi tiszt / szolgálatvezető

10.1 Amennyiben a járató állama megköveteli, hogy a légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerén belül alkalmazott repülés-üzemi tiszt/szolgálatvezető rendelkezzen szakszolgálati engedéllyel, akkor az érintett repülés-üzemi tisztet/szolgálatvezetőt az 1. Annex előírásainak megfelelő szakszolgálati engedéllyel lássák el.

10.2 Amennyiben a repülés-üzemi tiszt/szolgálatvezető szakszolgálati engedélytől eltérő más jogosítási módszert fogadnak el, akkor a légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével összefüggésben, a járató állama követelje meg, hogy az ilyen személyek minimum feleljenek meg az 1. Annexben a repülés-üzemi tisztre/szolgálatvezetőre meghatározott követelményeknek.

10.3 A légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével szolgálatra csak azt követően osztható be, hogy:

a) megfelelően elvégezte a járatóra meghatározott tanfolyamot, amely tartalmazza a 4.2.1.4 bekezdésben a járató légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével összefüggő sajátságos összetevőket;

Megjegyzés: az ilyen tananyag összeállítására vonatkozó útmutató a Kiképzési Kézikönyv (Doc 7192), repülés-üzemi tiszt/szolgálatvezető című D-3 részében található

.

b) a megelőző 12 hónapon belül legalább egy alkalommal egy egy-irányú útvonal jogosító repülésen vett részt a repülőgép pilótakabinjában bármely olyan terület felett, amelyre repülésfelügyeleti jogosítással rendelkezik. A repülés gyakorlati szempontból lehető legtöbb leszállást is foglaljon magába;

Megjegyzés: A jogosító repülés céljainak megfelelően a repülés-üzemi tiszt/szolgálatvezető legyen képes ellenőrizni a hajózó személyzet egymás közötti kommunikációját biztosító rendszert és a rádió kommunikációt, és legyen képes megfigyelni a hajózó személyzet tevékenységét.

c) a járatónak bizonyította, hogy kielégítő mértékben ismeri:

1) a 2. Függelékben ismertetett üzemeltetési kézikönyv tartalmát;

2) az igénybe vett repülőgép rádió berendezését; és

3) az igénybe vett repülőgép navigációs berendezéseit;

d) bizonyította a járatónak, hogy ismeri azon feladatok következő részleteit, amelyekért felelős valamint azokat a területeket, amelyeken az érintett repülés-üzemi tiszt/szolgálatvezető repülés-felügyelet gyakorlására jogosult;

1) az évszaknak megfelelő időjárási körülmények és a meteorológiai tájékoztatások beszerzési forrásai;

2) az időjárási körülmények hatásai az igénybe vett repülőgépek rádió berendezéseinek vételi tulajdonságaira;

3) az üzemeltetés során használt egyes rádiónavigációs rendszerek jellegzetességei és üzemeltetési korlátozásai; és

4) a repülőgép terhelési utasítása;

e) bizonyította a járatónak, hogy rendelkezik az emberi teljesítőképességgel összefüggő olyan ismeretekkel és jártassággal, amelyek a szolgálatvezetői tevékenységgel állnak kapcsolatban; és

f) bizonyította a járatónak, hogy képes a 4.6 pontban kijelölt feladatainak ellátására.

10.4 **Ajánlás** – *A szolgálatra kijelölt repülés-üzemi tiszt/szolgálatvezető teljes mértékben ismerje a feladatkörét érintő üzemeltetés összes jellemzőit, beleértve az emberi teljesítőképességgel kapcsolatos elméleti és gyakorlati ismereteket.*

Megjegyzés: Az emberi teljesítmény és gyakorlati ismeretek fejlesztését célzó kiképzési programok tervezéséhez útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében (Doc 9683) található

.

10.5 ***Ajánlás*** *– A repülés-üzemi tisztet/szolgálatvezetőt ne jelöljék ki szolgálatra abban az esetben, ha egymást követő 12 hónapon keresztül ilyen szolgálatot nem látott el, kivéve, ha a 10.2 pont előírásainak eleget tesz.*

11. fejezet
Kézikönyvek, naplók és nyilvántartások

Megjegyzés: A következő kiegészítő kézikönyvek, nyilvántartások és jegyzőkönyvek a jelen Annex anyagával kapcsolatban vannak, azonban ezeket a fejezet nem tartalmazza:

tüzelőanyag és olaj jegyzőkönyvek	lásd 4.2.9
karbantartási nyilvántartás	lásd 8.4
repülési idő jegyzőkönyvek	lásd 4.2.10.3
repülés előkészítési formanyomtatványok	lásd 4.3
üzemeltetői repülési terv	lásd 4.3.3.1
légijármű parancsnok útvonal és repülőtér jogosítások nyilvántartásai	lásd 9.4.3.4

11.1 Repülésvégrehajtási kézikönyv

Megjegyzés: A repülésvégrehajtási kézikönyv a 8. Annex-ben meghatározott tájékoztatásokat tartalmazza
.
A repülésvégrehajtási kézikönyvet a lajstromozó állam előírásai alapján kötelező érvényű változások behelyezésével tartsák naprakészen.

11.2 Járató karbantartás irányítási kézikönyve

A járató 8.2 szakasz előírásai alapján biztosított karbantartás irányítási kézikönyve, amelyet több részben is kiadhat, a következő tájékoztatásokat tartalmazza:

a) a 8.1.1 pont alapján előírt eljárások ismertetése, szükség szerint:

1) a járató és az engedélyezett karbantartó szervezet közötti adminisztratív megállapodások;

2) a karbantartás végrehajtási eljárások valamint a karbantartási nyilatkozat elkészítési és aláírási eljárások, amikor a karbantartást olyan rendszerben hajtják végre, amely nem azonos az engedélyezett karbantartó szervezet eljárásaival;

b) a 8.1.4 pontban előírt személy vagy személyek neve és feladatai;

c) hivatkozás a 8.3.1 pontban előírt karbantartási programra;

d) a járató karbantartási jegyzőkönyveinek elkészítési és megőrzési módszerei a 8.4 szakasz előírásai alapján;

e) a 8.5.1 pontban előírt karbantartás és üzemeltetés felügyeleti, értékelési és jegyzőkönyvezési eljárások ismertetése;

f) a 8. Annex II. rész 4.2.5 és 4.2.8 pontjaiban előírt, a szolgálati tájékoztatások jelentésére vonatkozó követelmények teljesítésének eljárásai;

g) a 8.5.2 pontban előírt folyamatos légialkalmassági tájékoztatások értékelésének és ezek alapján végrehajtott bármely tevékenység elvégzésének eljárásai;

h) a kötelező folyamatos légialkalmassági tájékoztatás alapján szükséges intézkedések végrehajtásának eljárásai;

i) az ellenőrzési és elemzési rendszer kialakításának és fenntartásának ismertetése valamint a karbantartási program teljesítményének és hatékonyságának folyamatos felügyelete, melynek célja a program bármely hiányosságának kiküszöbölése;

j) az légijármű típusok és típusváltozatok ismertetése, amelyekre a kézikönyv alkalmazható;

k) azon eljárások ismertetése, amelyek biztosítják a légialkalmasságot befolyásoló meghibásodások valamint hiányosságok jegyzőkönyvezését és kijavítását; és

l) azon eljárások ismertetése, amelyekkel a lajstromozó államot értesítik a repülés végrehajtás során bekövetkezett jelentősebb rendellenességekről.

11.3 Karbantartási program

11.3.1 Minden egyes repülőgép karbantartási programja a 8.3 szakasz előírásai alapján a következőket tartalmazza:
a) a karbantartási feladatok és ezek elvégzésének időszakai a repülőgép várható és tervezett igénybevételének figyelembevételével;
b) a repülőgép szerkezeti épségének folyamatos ellenőrzése – amikor ez a karbantartási feladat alkalmazható;
c) a fenti *a)* és *b)* alpontok előírásaitól való eltérés vagy azok megváltozatása céljából alkalmazott eljárások; és
d) a légijármű rendszereinek, alkatrészeinek és hajtóműveinek állapotát és megbízhatóságát felülvizsgáló programok szükség szerinti ismertetése.

11.3.2 A légijármű típusra kötelezőnek kijelölt karbantartási feladatokat és ezek elvégzésének időszakait ennek megfelelően azonosítsák.

11.3.3 **Ajánlás** – *A karbantartási programot a tervezés állama vagy a típus tervezéséért felelős szervezet által rendelkezésre bocsátott tájékoztatások valamint bármely más megfelelő gyakorlati tapasztalatok alapján dolgozzák ki.*

11.4 Útinapló

11.4.1 **Ajánlás** – *A repülőgép útinaplója a következő tételeket és a megfelelő római számokat tartalmazza:*

I _ A repülőgép nemzeti hovatartozása és lajstromjele.

II _ A repülés időpontja.

III _ A személyzeti tagok névsora.

IV _ A személyzet tagjainak kijelölt feladatai.

V _ Az indulási helye.

VI _ Az érkezés helye.

VII _ Az indulás időpontja.

VIII _ Az érkezés időpontja.

IX _ A repülés időtartama.

X _ A repülési feladat pontos meghatározása (magáncélú, munkarepülés, menetrendszerű vagy nem-menetrendszerű repülés).

XI _ Események és megfigyelések – ha van.

XII _ A felelős személy aláírása.

11.4.2 **Ajánlás** – *A repülőgép útinaplót naprakészen vezessék, a bejegyzéseket tollal vagy kitörölhetetlen ceruzával írják be.*

11.4.3 **Ajánlás** – *A kitöltött útinaplót őrizzék meg, hogy a repülőgép üzemeltetésének utolsó hat hónapjáról folyamatos feljegyzés álljon rendelkezésre*
.

11.5 A fedélzeten szállított vészhelyzeti és túlélési felszerelések jegyzéke

A járató mindig rendelkezzen a mentést koordináló központnak azonnal továbbítható jegyzékkel, amely tartalmazza a nemzetközi légiforgalomban üzemeltetett bármely repülőgépén szállított vészhelyzeti és túlélési felszerelések felsorolását. A tájékoztató szükség szerint tartalmazza a mentőtutajok számát, színét és típusát, a rendelkezésre álló pirotechnikai eszközök ismertetését, a vészhelyzeti egészségügyi készletek részletezését, a vízkészletek meghatározását valamint a hordozható vészhelyzeti rádióberendezések típusát és frekvenciáit.

11.6 Repülési adatrögzítő felvételei

A járató a lehetőségek határain belül biztosítsa, hogy amennyiben egyik légijárműve balesetet szenvedett vagy repeseményben érintett, az összes vonatkozó repülési adatrögzítő felvételt és ha szükséges, a repülési adatrögzítő berendezéseket is megőrizze és azokat a 13. Annex előírásaival összhangban biztonságos őrizet alatt tárolja.

12. fejezet
Utaskabin személyzeti tagok

12.1 Vészhelyzeti feladatok kijelölése

A járató a járató államának egyetértésével minden egyes repülőgép típusához az ülésszám, vagy a szállított utasok száma alapján határozza meg a szükséges utaskabin személyzeti tagok legkisebb számát annak érdekében, hogy vészhelyzetben, vagy olyan esetben, amikor a repülőgép vészkiürítése válik szükségessé, a fentiekre előírt feladatokat, valamint a repülőgép biztonságos és gyors elhagyását végrehajtsák. Ezeket a feladatokat a járató minden egyes repülőgép típusára határozza meg.

12.2 Utaskabin személyzeti tagok vészkiürítési szolgálati helyeiken

A fel és leszállás végrehajtása alkalmával továbbá minden olyan esetben, amikor a légijármű parancsnoka erre utasítást ad, a vészhelyzeti feladatokkal megbízott minden utaskabin személyzeti tag tartózkodjon a 6.16 pont előírásai alapján részére kijelölt ülésen.

12.3 Utaskabin személyzeti tagok védelme a repülés alatt

A fel és leszállás végrehajtása alkalmával továbbá minden olyan esetben, amikor a légijármű parancsnoka erre utasítást ad, minden utaskabin személyzeti tag foglaljon helyet és biztonsági övét vagy ha ilyet biztosítottak, váll-hevederekkel ellátott biztonsági övét csatolja be.

12.4 Kiképzés

A járató a járató államának jóváhagyásával dolgozzon ki és bonyolítson le kiképzési programot, amelyen az utaskabin személyzeti tagnak történő kijelölése előtt minden érintett személynek részt kell vennie. Az utaskabin személyzeti tagok ezt követően évente vegyenek részt ismétlődő képzési programon. Ezek a kiképzési programok biztosítsák, hogy minden érintett személy:

a) gyakorlottan végre tudja hajtani azokat a biztonsági feladatokat és kötelezettségeket, amelyek elvégzésére a repülés során bekövetkező vészhelyzet vagy vészkiürítést igénylő helyzet esetében az utaskabin személyzeti tagot kijelölték;

b) megfelelő gyakorlati tapasztalatokkal rendelkezzen a repülőgép fedélzetén történő szállításra előírt vészhelyzeti és életmentő felszerelések használatában és képes ezen eszközök, mint például mentő-mellények, mentőtutajok, vészcsúszdák, vészkijáratok, hordozható tűzoltó készülékek, oxigén berendezések és elsősegély-nyújtó készletek használatára;

c) amennyiben 3000 méter (10 000 láb) repülési magasság felett üzemeltetett repülőgépen teljesít szolgálatot, ismerje az oxigén hiány hatásait valamint a túlnyomásos kabinnal rendelkező repülőgép esetében a hirtelen nyomásvesztést azaz dehermetizációt kísérő fiziológiai tüneteket;

d) olyan mértékben ismerje a személyzet többi tagjának vészhelyzet esetére kijelölt feladatait, amennyire az saját feladatainak ellátásához szükséges;

e) ismerje a repülőgép utaskabinjában szállítható illetve nem szállítható veszélyes árukat és végezze el a veszélyes áruk szállítására vonatkozó, a 18. Annex-ben előírt kiképzési programot; és *f)* ismerje az utaskabinban végrehajtandó biztonsági feladatokat érintő emberi tevékenységet és teljesítményt, beleértve az utaskabin személyzet és a hajózószemélyzet közötti együttműködést is.

Megjegyzés: Az emberi teljesítmény ismeretének fejlesztését célzó kiképzési programokra vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében *(Doc 9683) található.*

12.5 Repülési idő, repülési szolgálati idő és pihenőidő

A járató állama dolgozzon ki előírásokat az utaskabin személyzeti tagok repülési idejének és repülési szolgálati idejének korlátozására valamint a megfelelő pihenőidő biztosítására.

Megjegyzés: A korlátozások kidolgozásával kapcsolatos útmutató az A. Mellékletben található.

13. fejezet
Védelem*

13.1. Belföldi kereskedelmi üzemeltetés

Ajánlás – *A jelen fejezetben előírt nemzetközi előírásokat és ajánlott gyakorlati eljárásokat az összes szerződő állam alkalmazza a belföldi kereskedelmi (légi-szállítási) üzemeltetésre.*

13.2 A hajózószemélyzet kabinjának védelme

13.2.1 Minden olyan repülőgépen, amely pilótakabin ajtóval van felszerelve, ez az ajtó belülről zárható legyen. Biztosítsanak megfelelő lehetőséget arra, hogy az utaskabin személyzet bizalmasan és feltűnés nélkül értesíthesse a hajózó-személyzetet az utaskabinban tapasztalható gyanús tevékenységről vagy a biztonság szintjének csökkenéséről.

13.2.2 2003 november 1-től minden olyan utasszállító repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 45000 kg vagy amely több mint 60 utas szállítására jogosított, szereljenek fel olyan jóváhagyott pilótakabin ajtóval, amelyet úgy terveztek és alakítottak ki, hogy megakadályozza a kézifegyver tűzzel és a kézigránát szilánkkal történő kinyílását valamint ellenáll a jogtalan személyek erőszakos behatolási kísérleteinek. Ez az ajtó bármely repülőgépvezető üléséből nyitható és zárható legyen.

13.2.3 Az összes olyan repülőgépen, amelyet a 13.2.2 pont alapján szereltek fel pilótakabin ajtóval:

a) ezt az ajtót csukják be és tartsák bezárva attól az időponttól kezdődően, amikor a légijármű összes külső ajtaját a beszállítást követően bezárják, addig az időpontig, amíg bármely ilyen ajtót a kiszállítás céljából kinyitják. Kivételt képez, az erre jogosított személyek szükségszerű be és kilépésének lehetővé tétele; és

b) tegyék lehetővé, hogy bármely repülőgépvezető üléséből megfigyelhessék a pilótakabin ajtó előtti teljes területet annak érdekében, hogy a belépést kérő személyeket azonosíthassák, valamint a gyanús viselkedést felfedezzék vagy a tényleges veszélyhelyzetet felismerjék.

13.2.4 **Ajánlás –** *Minden olyan utasszállító repülőgépet a lehetőségek szerint szereljenek fel olyan jóváhagyott pilótakabin ajtóval, amelyet úgy terveztek és alakítottak ki, hogy megakadályozza a kézifegyver tűzzel és a kézigránát szilánkkal történő kinyílását valamint ellenálljon a jogtalan személyek erőszakos behatolási kísérleteinek. Ez az ajtó bármely repülőgépvezető üléséből nyitható és zárható legyen.*

13.2.5 **Ajánlás –** *Az összes olyan repülőgépen, amelyet a 13.2.4 pont alapján szereltek fel pilótakabin ajtóval:*

a) ezt az ajtót csukják be és tartsák bezárva attól az időponttól kezdődően, amikor a légijármű összes külső ajtaját a beszállítást követően bezárják, addig az időpontig, amíg bármely ilyen ajtót a kiszállítás céljából kinyitják. Kivételt képez, az erre jogosított személyek szükségszerű be és kilépésének lehetővé tétele; és

b) tegyék lehetővé, hogy bármely repülőgépvezető üléséből megfigyelhessék a pilótakabin ajtó előtti teljes területet annak érdekében, hogy a belépést kérő személyeket azonosíthassák, valamint a gyanús viselkedést felfedezzék vagy a tényleges veszélyhelyzetet felismerjék.

13.3 Repülőgép átkutatás ellenőrző jegyzéke

A járató biztosítsa, hogy a repülőgép fedélzetén ellenőrző jegyzéket helyezzenek el, amely tartalmazza azokat az eljárásokat, amelyek alapján a feltételezett szabotázs esetén a robbanószerkezet felkutatása érdekében, valamint ha megalapozott gyanú áll fenn, hogy a repülőgép jogtalan beavatkozás tárgya lehet, végre tudják hajtani a repülőgép átvizsgálását az elrejtett fegyverek, robbanóanyagok vagy más veszélyes eszközök feltalálása céljából. Az ellenőrző jegyzék mellett biztosítsanak útmutatást azokról a feladatokról és tevékenységekről, amelyeket abban az esetben szükséges végrehajtani, ha robbanószerkezetet vagy gyanús tárgyat találnak. Adjanak továbbá tájékoztatást az adott repülőgép azon részéről, ahol a robbanószerkezet elhelyezése a legkevésbé veszélyes.

13.4 Kiképzési programok

13.4.1 A járató dolgozzon ki és bonyolítson le kiképzési programot, amely lehetővé teszi, hogy a személyzet minden tagja a helyzetnek leginkább megfelelő módon tevékenykedjen, a lehető legkisebbre csökkentve ezzel a jogtalan beavatkozás következményeit. A kiképzési program legalább az alábbiakra terjedjen ki:

a) bármely esemény súlyosságának megállapítása;

b) kapcsolattartás és egyeztetés a hajózószemélyzet tagjai között;

c) megfelelő önvédelmi tevékenységek;

d) a személyzeti tagok számára kiadott a halálos sérülést nem okozó védelmi eszközök használata, amelyek alkalmazását az üzemeltető állama jóváhagyta;

e) a terroristák viselkedésmódjának megismerése és megértése, ami a személyzet tagjainak segítséget ad a repülőgép eltérítői magatartás és az utasok válaszreakcióinak kezelése során;

f) a különféle fenyegetések körülményei közötti élő szituációs gyakorlatok;

g) a repülőgép védelmében szükséges eljárások a pilótakabinban; és

h) repülőgép átkutatási eljárások és szükség szerint útmutató a repülőgép azon részéről, ahol a robbanószerkezet elhelyezése a legkevésbé veszélyes.

13.4.2 A járató továbbá dolgozzon ki és bonyolítson le kiképzési programot, amelynek során az érintett alkalmazottai megismerik azokat a megelőző intézkedéseket és a szükséges módszereket, amelyek az utasok, poggyász, teherárú, postaküldemények, felszerelések és kellékek repülőgépen történő szállítására vonatkoznak, hozzájárulva ezzel a szabotázs vagy más jogtalan beavatkozás megelőzéséhez.

13.5 A jogtalan beavatkozás jelentése

A jogtalan beavatkozást követően a légijármű parancsnoka a kijelölt helyi hatóságnak késedelem nélkül tegyen jelentést erről az eseményről.

13.6 Egyebek

13.6.1 **Ajánlás** – *A bomba fenyegetés céljából a legkisebb kockázatot jelentő térségnél történő használatra, speciális eszközt kell biztosítani, amellyel a léglökés terjedése és iránya irányítható.*

13.6.2 ***Ajánlás*** – *Ahol a járató elfogadja szállításra az utasoktól átvett fegyvereket, a repülőgépen legyen alkalmas hely az ilyen fegyverek olyan módon történő tárolására, hogy azok a repülés közben senki számára ne legyenek elérhetők.*

* Az ebben a fejezetben használt „védelem” szót a polgári légiközlekedés elleni jogtalan cselekmények megelőzése értelmében használják.

1. Függelék

A repülőgépeken rendszeresítendő fények

(Megjegyzés: Lásd a 6. fejezet 6.10 szakaszt)

1. A kifejezések magyarázata

Ahol a jelen Függelékben a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Fedési szögek – Angles of coverage
a) Az „A" fedési szög két egymást metsző függőleges sík között elhelyezkedő, a hossztengely mentén hátrafelé néző, a középvonaltól jobbra és balra 70°-ot bezáró körszeletekből áll, amelyek a hossztengelyt függőleges síkban metszik.

b) Az „F" fedési szög két egymást metsző függőleges sík között elhelyezkedő, a hossztengely mentén előre néző, a középvonaltól jobbra és balra 110°-ot bezáró körszeletekből áll, amelyek a hossztengelyt függőleges síkban metszik.

c) Az „L" fedési szög két egymást metsző függőleges sík között elhelyezkedő körszeletből áll, az egyik sík párhuzamos a repülőgép hossztengelyével és a másik attól balra elhelyezkedve 110°-os körszeletet alkot, amely a hossztengely mentén előre néz.

d) Az „R" fedési szög két egymást metsző függőleges sík között elhelyezkedő körszeletből áll, az egyik sík párhuzamos a repülőgép hossztengelyével és a másik attól jobbra elhelyezkedve 110°-os körszeletet alkot, amely a hossztengely mentén előre néz.

Vízszintes sík – Horizontal plane
A repülőgép hossztengelyét magába foglaló és a repülőgép szimmetria síkjára merőleges sík.

Repülőgép hossztengelye – Longitudinal axis of aeroplane
Az általános utazósebességen a repülés irányával párhuzamos kiválasztott tengely, amely keresztülhalad a repülőgép súlypontján.

Haladás – Making way
A repülőgép akkor halad a víz felszínén, ha az mozgásban van és a vízhez viszonyított sebessége magasabb.

Irányítás alatt – Under command
A repülőgép a víz felszínén akkor van irányítás alatt azaz mozgása akkor tekinthető irányítottnak, amikor azzal végre lehet hajtani az egyéb vizijárművek kikerülésére kidolgozott, a Tengeri Összeütközések Megelőzésére Vonatkozó Nemzetközi Előírások-ban meghatározott műveleteket.

Sodródás – Under way
A vízfelszínen levő repülőgép akkor sodródik, ha az nincs a szárazföldön, vagy ahhoz horgonyozva illetve nincs a szárazföldhöz rögzített, vagy a vízfelszínen levő bármely rögzített tárgyhoz horgonyozva.

Függőleges síkok – Vertical planes
A vízszintes síkra merőleges síkok.

Látható – Visible
Sötét éjszaka tiszta légköri viszonyok mellett látható.

2. A levegőben levő repülőgépen rendszeresítendő navigációs fények

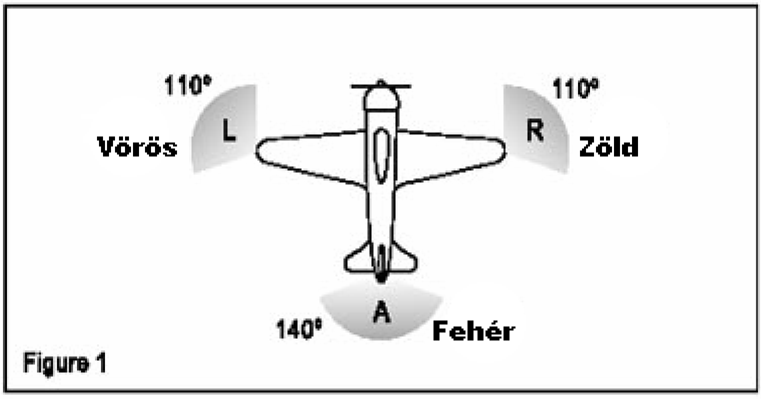
Megjegyzés: Az itt meghatározott fények célja a 2. Annex navigációs fényekre vonatkozó előírásainak teljesítése.

A repülőgépen az 1- ábrának megfelelően a következő navigációs fények takarásmentesen láthatók legyenek:

a) a vízszintes sík alá és fölé az „L” fedési szög területén vörös színű fény;

b) a vízszintes sík alá és fölé az „R” fedési szög területén zöld színű fény;

c) a vízszintes sík alá és fölé az „A” fedési szög területén hátrafelé fehér színű fény.



1. ábra
A repülőgépen rendszeresítendő navigációs fények

3. A vízen levő repülőgépen rendszeresítendő fények

3.1 Általános

Megjegyzés: Az itt meghatározott fények célja a 2. Annex vízfelületen levő repülőgépeken elhelyezett fényekre vonatkozó előírásainak teljesítése.

Tengeri Összeütközések Megelőzésére Vonatkozó Nemzetközi Előírások alapján különböző fényeket helyezzenek el a következő körülmények között:

a) amikor a repülőgép sodródik;

b) amikor a repülőgép másik vizijárművet vagy repülőgépet vontat;

c) amikor a repülőgépet vontatják;

d) amikor a repülőgép nincs irányítás alatt és nem halad;

e) amikor a repülőgép halad de nincs irányítás alatt;

f) amikor a repülőgép le van horgonyozva;

g) amikor a repülőgép szárazföldön van.

Az alábbiakban ismertetjük az egyes esetekre előírt fényeket.

3.2 Amikor a repülőgép sodródik

A repülőgépen a 2. ábrának megfelelően a következő állandó fények takarásmentesen láthatók legyenek:

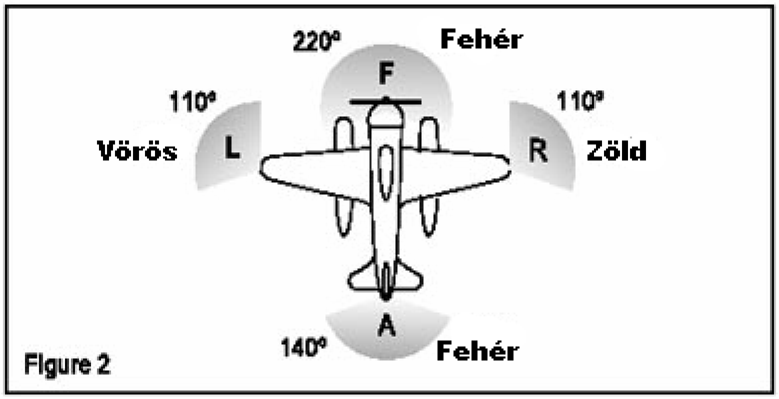
a) a vízszintes sík alá és fölé az „L” fedési szög területén vörös színű fény;

b) a vízszintes sík alá és fölé az „R” fedési szög területén zöld színű fény;

c) a vízszintes sík alá és fölé az „A” fedési szög területén hátrafelé fehér színű fény; és

d) az „F” fedési szög területén előre fehér színű fény.

A 3.2 *a), b)* és *c)* pontokban ismertetett fények legalább 3.7 km (2 NM) távolságból, a 3.2 *d)* pontban ismertetett fény – amennyiben 20 méter hosszú vagy ennél hosszabb repülőgépen van elhelyezve – legalább 9.3 km (5 NM) távolságból vagy ha 20 méternél rövidebb repülőgépen van elhelyezve legalább 5.6 km (3 NM) távolságból legyenek láthatók.



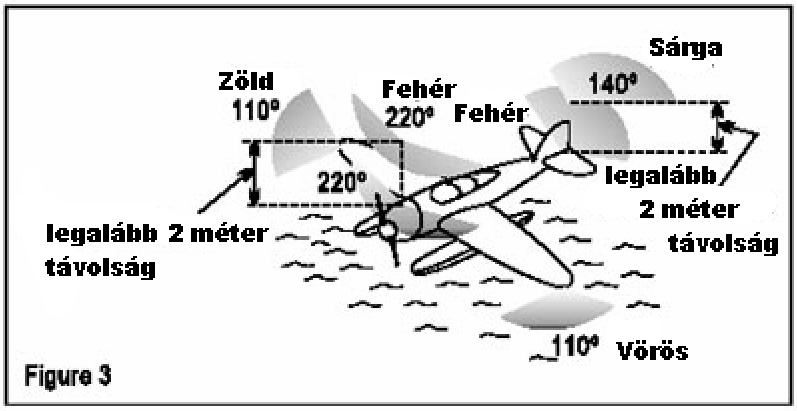
2. ábra
Amikor a repülőgép sodródik

3.3 Amikor a repülőgép másik vizijárművet vagy repülőgépet vontat

A repülőgépen a 3. ábrának megfelelően a következő állandó fények takarásmentesen láthatók legyenek:

a) a fenti 3.2 pontban ismertetett fények;

b) a 3.2 *d)* pontban ismertetettel azonos jellemzőkkel rendelkező második fény, amely függőleges síkban legalább 2 méterrel az első fény felett vagy alatt helyezkedik el; és *c)* a 3.2 *c)* pontban ismertetettel egyébként azonos jellemzőkkel rendelkező sárga színű fény, amely függőleges síkban legalább 2 méterrel az első fény felett helyezkedik el.



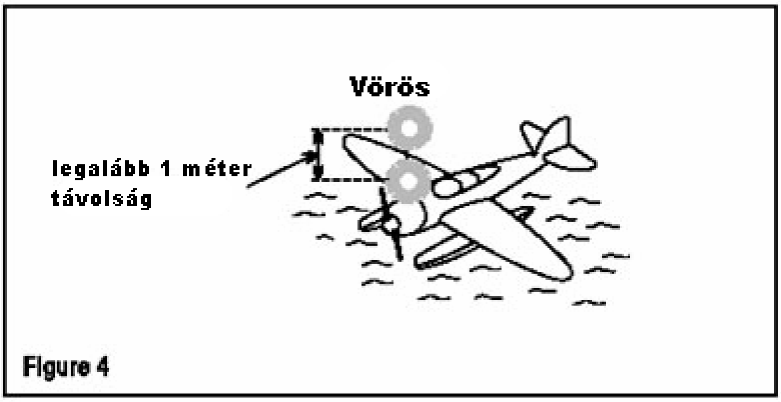
3. ábra
Amikor a repülőgép másik vizijárművet, vagy repülőgépet vontat

3.4 Amikor a repülőgépet vontatják

A repülőgépen a 3.2 *a), b)* és *c)* pontban ismertetett állandó, takarásmentes fények legyenek láthatók.

3.5 Amikor a repülőgép nincs irányítás alatt és nem halad

A repülőgépen a 4. ábrának megfelelően két állandó vörös színű fény legyen ott elhelyezve, ahol azok a legjobban láthatók. Az egyik fény a másik fölött nem kevesebb mint 1 méter távolságban legyen és a fények olyan jellemzőkkel rendelkezzenek, hogy azok a horizonton legalább 3.7 km (2 NM.) távolságból minden irányból láthatók legyenek.

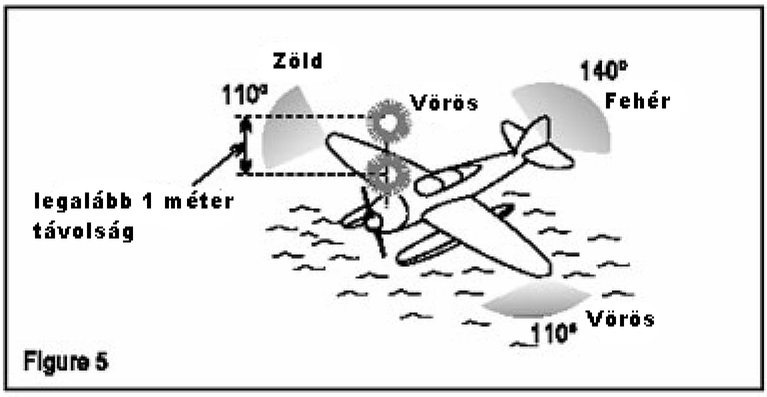


4. ábra
Amikor a repülőgép nincs irányítás alatt és nem halad

3.6 Amikor a repülőgép halad de nincs irányítás alatt

A repülőgépen az 5. ábrának megfelelően a 3.5 pontban valamint a 3.2 a), b) és c) pontokban ismertetett fények legyenek láthatók.

Megjegyzés: A fenti 3.5 és 3.6 pontokban meghatározott fényeket a másik repülőgép tekintse az első repülőgép olyan jelzésének, hogy az nem áll irányítás alatt és ezért nem képes a másik elől kitérni. Ezek nem a vészhelyzetben levő és segélyt kérő repülőgép jelzései.

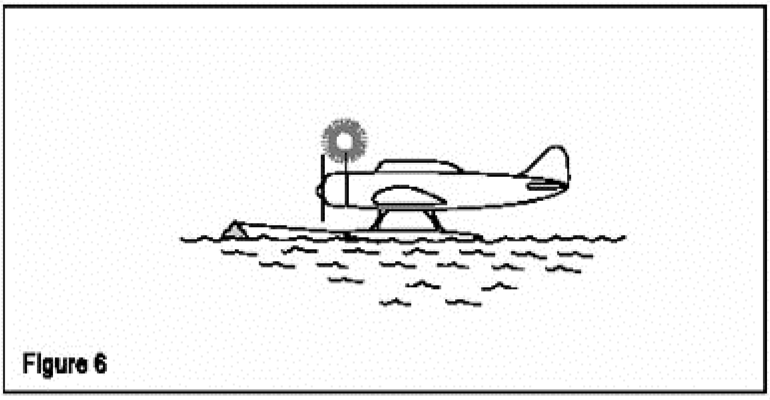


5. ábra
Amikor a repülőgép halad, de nincs irányítás alatt

3.7 Amikor a repülőgép le van horgonyozva

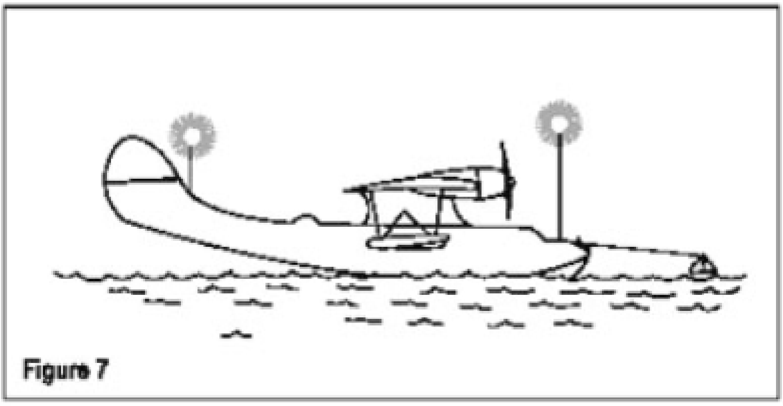
A repülőgépen az alábbi fények legyenek láthatók;

a) Amennyiben a repülőgép hosszúsága kevesebb mint 50 méter, a legjobban látható helyen elhelyezett állandó fehér színű fény (6. ábra), amely a horizonton legalább 3.7 km (2 NM) távolságból minden irányból látható legyen;



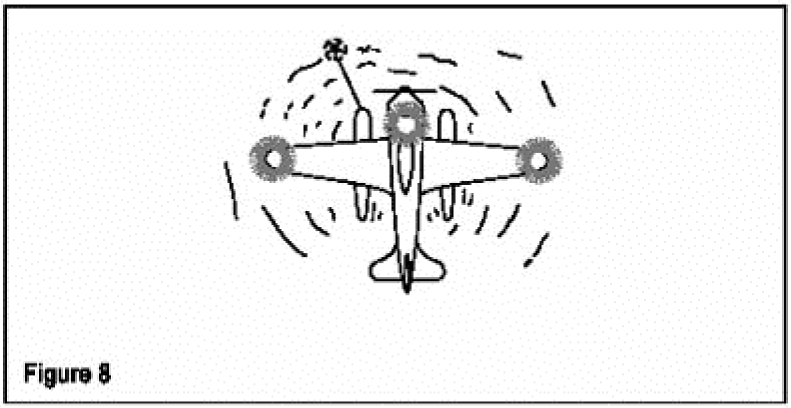
6. ábra
Amikor az 50 méternél rövidebb repülőgép le van horgonyozva

b) Amennyiben a repülőgép hosszúsága 50 méter vagy több, a legjobban látható helyen elhelyezett állandó fehér színű első és hátsó fények (7. ábra), amelyek a horizonton legalább 5.6 km (3 NM) távolságból minden irányból láthatók legyenek;

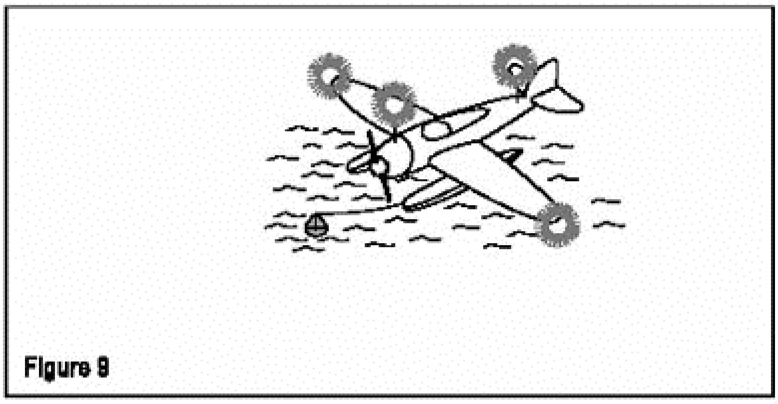


7. ábra
Amikor az 50 méternél hosszabb repülőgép le van horgonyozva

c) Amennyiben a repülőgép fesztávja 50 méter vagy több, mindkét oldalon a lehető legjobban látható helyen elhelyezett állandó fehér színű fények), amelyek jelzik a legnagyobb fesztávot és lehetőség szerint a horizonton legalább 1.9 km (1 NM) távolságból minden irányból láthatók legyenek.



8. ábra
Amikor az 50 méternél rövidebb, de 50 méter vagy nagyobb fesztávú repülőgép le van horgonyozva



9. ábra
Amikor az 50 méter vagy hosszabb és 50 méter vagy nagyobb fesztávú repülőgép le van horgonyozva

3.8 Amikor a repülőgép szárazföldön van

A repülőgépen a 3.7 pontban ismertetett, továbbá két állandó, függőlegesen egymástól legalább 1 méter távolságra elhelyezett vörös színű fények a horizonton minden irányból legyenek láthatók.

2. Függelék
Az üzemeltetési kézikönyv szerkezete és tartalma

(Lásd 4. fejezet 4.2.2.1 pont)

1. Szerkezet

1.1 **Ajánlás –** *A 4. fejezet 4.2.2.1 pont előírásai alapján kiadott üzemeltetési kézikönyvet, amely a különböző üzemeltetési területek szerint esetleg külön részekből is állhat, a következő összeállítás szerint készítsék el:*

a) általános rész;

b) légijármű üzemeltetési tájékoztatások;

c) útvonalak és repülőterek;   és

d) kiképzés.

1.2 2006.január 1-től a 4. fejezet 4.2.2.1 pont előírásai alapján kiadott üzemeltetési kézikönyvet, amely a különböző üzemeltetési területek szerint esetleg külön részekből is állhat, a következő összeállítás szerint készítsék el:

a) általános rész;

b) légijármű üzemeltetési tájékoztatások;

c) útvonalak és repülőterek; és

d) kiképzés.

2. Tartalom

Az 1.1 és az 1.2 bekezdések előírásainak megfelelő üzemeltetési kézikönyvek legalább az alábbiakat tatalmazzák:

2.1 Általános rész

2.1.1 A repülési üzemeltetés végrehajtásához szükséges üzemeltető személyzet felelősségi körének ismertetése.

2.1.2 A hajózószemélyzeti tagok és az utaskabin személyzeti tagok repülési idejének és repülési szolgálati idejének korlátozására továbbá megfelelő pihenőidejének biztosítására vonatkozó, a 4. fejezet 4.2.10.2 pontja előírásának megfelelő szabályok.

2.1.3 A szállítandó navigációs berendezések felsorolása, beleértve az RNP légtérben történő üzemeltetésre vonatkozó bármely előírást.

2.1.4 Ahol ez az üzemeltetés szempontjából szükséges, a hosszú távú navigációs eljárások, a két gázsugár hajtóműves repülőgépek megnövelt hatótávolságú üzemeltetésére (ETOPS) vonatkozó hajtómű meghibásodási valamint a kitérő repülőterek kijelölésére és használatára vonatkozó eljárások.

2.1.5 Azon körülmények ismertetése, amelyek között rádiófigyelést kell tartani.

2.1.6 A legalacsonyabb repülési magasság meghatározásának módszere.

2.1.7 A repülőtér üzemeltetési minimum meghatározásának módszere.
2.1.8 Biztonsági elővigyázatossági intézkedések az olyan tüzelő-anyag feltöltés esetére, amikor az utasok a fedélzeten tartózkodnak.

2.1.9 A földi kiszolgálás rendszere és eljárásai.

2.1.10 A balesetet észlelő légijármű parancsnok számára a 12. Annex-ben előírt eljárások.

2.1.11 Minden egyes típusú üzemeltetéshez meghatározott hajózószemélyzet, beleértve a parancsnokság sorrendjének megállapítását is.

2.1.12 Egyedi utasítások az útvonalra szükséges tüzelőanyag és olaj mennyiségének kiszámításához az üzemeltetés valamennyi körülményének figyelembevételével, beleértve a túlnyomás elvesztésének és az útvonalon bekövetkező egy vagy több hajtómű meghibásodás lehetőségét is.

2.1.13 Azon körülmények, amelyek között oxigén használatra van szükség továbbá a 4. fejezet 4.3.8.2 pont alapján meghatározott oxigén-készlet mennyisége.

2.1.14 Tömeg és súlypont (egyensúly) számítási utasítások.

2.1.15 A földi jégtelenítés illetve jégmentesítés végrehajtására és ellenőrzésére vonatkozó utasítások.

2.1.16 Az üzemeltetési repülési tervre vonatkozó előírások.

2.1.17 Előírt szabványos üzemeltetési eljárások (SOP) a repülés minden egyes szakaszára.

2.1.18 A rendes körülmények között használt ellenőrző jegyzékek használatára és a használat időpontjára vonatkozó előírások.

2.1.19 Az indulási korlátozásokra vonatkozó eljárások.

2.1.20 A repülési magasság folyamatos tartásának figyelésére és az automatikus vagy hajózószemélyzet által előidézett magasság változásra figyelmeztető jelző rendszer használatára vonatkozó utasítások.

2.1.21 A robotpilóta és az önműködő hajtómű teljesítmény szabályzás használatára vonatkozó utasítások műszeres időjárási körülmények (IMC) között.

2.1.22 A légiforgalmi irányítói engedélyek tisztázására és elfogadására vonatkozó utasítások különösen abban az esetben, ha azok földfelszín feletti biztonságos magassággal is kapcsolatosak.

2.1.23 Indulási és megközelítési tájékoztatások.

2.1.24 Útvonal és célállomás repülési körülmények ismertetése.

2.1.25 Stabilizált megközelítési eljárás.

2.1.26 Nagy mértékű süllyedésre vonatkozó korlátozások a földfelszín közelében.

2.1.27 A műszeres megközelítés megkezdéséhez vagy folytatásához szükséges feltételek.

2.1.28 A precíziós és nem-precíziós műszeres megközelítési eljárások végrehajtására vonatkozó utasítások.

2.1.29 A hajózószemélyzet feladatainak kiosztása valamint a tagok munkaterhelése helyes elosztásának eljárásai az éjszakai repülés valamint a műszeres időjárási körülmények között végrehajtott megközelítés és leszállás során.

2.1.30 A kormányzott földnek ütközés (CFIT) megakadályozására illetve megelőzésére vonatkozó utasítások és kiképzési követelmények továbbá a földközelség jelző és riasztó (GPWS) rendszer[2]1 használatának módszerei.

2.1.31 Az összeütközés elkerülésére valamint az összeütközés elkerülését biztosító fedélzeti riasztó rendszer (ACAS) használatára vonatkozó utasítások, eljárások, üzemeltetői stratégia és kiképzési eljárások.

Megjegyzés: Az összeütközés elkerülését biztosító fedélzeti (ACAS) rendszer üzemeltetésére vonatkozó eljárásokat a PANS-OPS (Doc 8168) I. kötet, VIII. rész 3. fejezete és a PANS-ATM (Doc 4444) 12. és 15. fejezete tartalmazza.

2.1.32 A polgári légijármű elfogásával kapcsolatos tájékoztatások és utasítások, beleértve;

a) az elfogott légijármű parancsnoka számára a 2. Annex-ben előírt eljárások;

b) az elfogó és az elfogott légijárművek által használandó, a 2. Annex-ben előírt látjelek.

2.1.33 A 15 000 méter (49 000 láb) repülési magasság felett üzemeltetni szándékozott repülőgépek esetében;

a) tájékoztatás, amely a repülőgépvezető számára lehetővé teszi a legmegfelelőbb intézkedések végrehajtását abban az esetben, ha a repülőgépet kozmikus sugárzás éri; és

b) eljárások arra az esetre, amikor süllyedés végrehajtását határozták el és ekkor;

i) szükséges az illetékes légiforgalmi szolgálati egység értesítése illetve riasztása, tájékoztatást adva a helyzetről és előzetesen engedélyt kérve a süllyedésre;

ii) intézkedések arra az esetre, ha az illetékes légiforgalmi szolgálati egységgel nem tudnak összeköttetést teremteni vagy az összeköttetés megszakadt.

Megjegyzés: A biztosítandó tájékoztatásokra vonatkozó útmutató a 126 számú Körlevélben – SST Légijármű Üzemeltetési Tájékoztató – található.

2.1.34 A 3. fejezet 3.2 szakasz előírásai szerint biztosítandó baleset-megelőzési és repülésbiztonsági program részletezése, beleértve az alkalmazott biztonsági rendszert és személyi felelősséget.

2.1.35 Veszélyes árúk szállítására vonatkozó tájékoztatások és utasítások, beleértve a vészhelyzet esetén végrehajtandó intézkedéseket is.

Megjegyzés: Veszélyes árúk szállítása során a légijármű fedélzetén bekövetkező váratlan események kezelését érintő módszerek és eljárások kidolgozására valamint végrehajtására vonatkozó útmutató a Veszélyes áruk szállítása során a légijármű fedélzetén bekövetkező eseményekre hozott vészintézkedések *(Doc 9481) kiadványban található.*

2.1.36 Védelmi utasítások és útmutatók.

2.1.37 A 13. fejezet 13.3 pont előírása szerint biztosítandó repülőgép átkutatási ellenőrző jegyzék.

2.2 Légijármű üzemeltetési tájékoztatások

2.2.1 Légialkalmasság jogosítási és üzemeltetési korlátozások.

2.2.2 A 6. fejezet 6.1.3 pont alapján előírt általános, különleges és vészhelyzeti eljárások a hajózószemélyzet részére, az ezekre vonatkozó ellenőrző jegyzékek.

2.2.3 Az emelkedési teljesítményre vonatkozó üzemeltetési utasítások és tájékoztatások minden hajtómű működése mellett – amennyiben ezt a 4. fejezet 4.2.3.3 pont alapján biztosították.

2.2.4 Repülés tervezési adatok a repülés előtti és repülés közbeni tervezéshez, különböző hajtómű teljesítmény beállítások és repülési sebességek mellett.

2.2.5 Tömeg és súlypont (egyensúly) számítási utasítások.

2.2.6 Légijármű rakodási és teher rögzítési utasítások.

2.2.7 Légijármű rendszerek, vezérlő szervek és a megfelelő használati utasítások a 6. fejezet 6.1.3 pont előírása szerint.

2.2.8 Az üzemeltetett repülőgép típusra és az engedélyezett különleges üzemeltetésre vonatkozó gyártó(i) minimális felszerelési jegyzék valamint a repülésvezérlő szerkezetek alaphelyzettől történő engedélyezett eltéréseinek jegyzéke, beleértve az előírt navigációs teljesítmény (RNP) alapján kijelölt légtérben történő üzemeltetésre vonatkozó bármely előírást.

2.2.9 A vészhelyzeti és biztonsági berendezések ellenőrző jegyzéke valamint ezek használati utasítása.

2.2.10 A vészkiürítési eljárások, beleértve az adott légijármű típust érintő eljárásokat, a hajózószemélyzet közötti együttműködés szervezését, a hajózószemélyzet minden egyes tagjának vészhelyzeti helyét és kijelölt vészhelyzeti feladatait.

2.2.11 Az utaskabin személyzet részéről alkalmazott általános, különleges és vészhelyzeti eljárások, az ezekre vonatkozó ellenőrző jegyzékek valamint légijármű rendszer tájékoztatások, beleértve a szükséges együttműködési eljárásokat a hajózószemélyzet és az utaskabin személyzet között.

2.2.12 A különböző repülési útvonalakon szállított vészhelyzeti és túlélési felszerelések valamint azok helyes működésének felszállás előtt történő ellenőrzésének eljárásai, beleértve a szükséges oxigén mennyiség megállapításának és rendelkezésre álló mennyiségének meghatározását.

2.2.13 A túlélők részére a 12. Annex-ben meghatározott, alkalmazandó föld-levegő látjelek.

2.3 Útvonalak és repülőterek

2.3.1 Az útvonalra vonatkozó tájékoztatások, amelyek biztosítják, hogy a hajózószemélyzet minden egyes repülés vonatkozásában részletes tájékoztatást kapjon a távközlési létesítményekről, navigációs berendezésekről, repülőterekről, az üzemeltetéshez igénybe vehető műszeres megközelítésekről, érkezési és indulási eljárásokról valamint minden más olyan tényezőről, amelyet a járató a szabályszerű repülésvégrehajtás érdekében szükségesnek ítél.

2.3.2 Minden egyes lerepülendő útvonalszakasz legalacsonyabb repülési magassága.

2.3.3 Minden egyes olyan repülőtér üzemeltetési minimuma, amelyet tervezett leszállási vagy kitérő repülőtérként valószínűleg igénybe vehetnek.

2.3.4 A megközelítési vagy a repülőtéri létesítmény használhatóságának csökkenése esetére megnövelt repülőtér üzemeltetési minimum.

2.3.5 Az előírásokban szereplő összes repülési művelet és repülésvezérlő szerkezet beállítás teljesítéséhez szükséges tájékoztatások, beleértve, de nem csak ezekre korlátozva az alábbiakat:

a) futópálya felszállási távolságok száraz, nedves és szennyezett körülmények között, beleértve azon rendszer meghibásodások eseteit, amelyek a szükséges távolságot befolyásolhatják;

b) felszállási emelkedési korlátozások;

c) útvonal emelkedési korlátozások;

d) megközelítési és leszállási emelkedési korlátozások;

e) futópálya leszállási távolságok száraz, nedves és szennyezett körülmények között, beleértve azon rendszer meghibásodások eseteit, amelyek a szükséges távolságot befolyásolhatják;

f) egyéb kiegészítő tájékoztatások, mint például gumiabroncs sebesség korlátozások.

2.4 Kiképzés

2.4.1 A hajózószemélyzet kiképzési program a 9. fejezet 9.3 szakasz előírásai alapján..

2.4.2 Az utaskabin személyzet kiképzési program a 12. fejezet 12.4 szakasz előírásai alapján.

2.4.3 A repülésüzemi tiszt kiképző program, ha azt a 4. fejezet 4.2.1 pont alapján repülés felügyelettel összefüggésben alkalmazzák.

Megjegyzés: A repülésüzemi tiszt kiképző program részletezését a 10. fejezet 10.2 szakasza tartalmazza.

3. FÜGGELÉK

Az egy gázsugár hajtóműves repülőgépek jóváhagyott üzemeltetésére vonatkozó kiegészítő követelmények éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti repülések esetére

(Lásd 5. fejezet 5.4.1)

Az 5. fejezet, 5.4.1 alpontjában előírt légialkalmassági és üzemeltetési követelmények betartása az alábbiakkal biztosítható:

1. Gázturbinás hajtómű megbizhatósága

1.1 A gázturbinás hajtómű megbízhatósági mutatója olyan értéket érjen el, hogy a teljesítmény elvesztésének mértéke egynél kevesebb legyen 100 000 hajtómű órára vetítve.

Megjegyzés: A teljesítmény elvesztését ebben az esetben a hajtómű vagy hajtómű komponens – beleértve a tüzelőanyag segédberendezéseket vagy a hajtómű vezérlő rendszereket is – hibás tervezésére vagy beépítésére visszavezethető ok miatt bekövetkező bármely teljesítményvesztéssel lehet értelmezni (lásd: I melléklet).

1.2 A járató felel a hajtómű üzemállapot változásának figyeléséért.

1.3 A repülésközbeni hajtómű meghibásodás valószínűségének csökkentése érdekében a hajtóművet fel kell szerelni:

a) Egy olyan gyújtási rendszerrel, amely automatikusan működésbe lép, vagy manuálisan is működtethető a felszállás és leszállás során vagy repülés közben, látható nedvesség mellett;

b) Egy mágneses részecske érzékelő vagy ahhoz hasonló rendszerrel, amely figyeli a hajtómű, a segédberendezéseket meghajtó ház és az áttétel ház állapotát, és amely magába foglalja a műszerfalra figyelmeztető jelzést kiadó rendszert is; és

c) Egy vész hajtómű teljesítmény szabályozó berendezéssel, amely biztosítja a hajtómű folyamatos üzemeltetését egy megfelelő teljesítmény tartományon keresztül, amellyel biztonságosan befejezhető a repülés a tüzelőanyag szabályozó egység ésszerű keretek között bekövetkező valószínű meghibásodása esetén.

2. Rendszerek és felszerelések

Az egy gázsugár hajtóművel felszerelt repülőgépek, amelyek megkapták a jóváhagyást az éjszakai és / vagy IMC feltételek közötti repülésre legyenek ellátva az összes megengedett üzemeltetési feltételek mellett, egy hajtómű meghibásodás bekövetkezését követően, a folyamatos biztonságos repülés fenntartását és a biztonságos kényszerleszállás végrehajtását támogató alábbi rendszerekkel és felszerelésekkel:

a) Két, egymástól elválasztott, elektromos energiát előállító rendszerrel, melyek mindegyike alkalmas az éjszaka és/vagy IMC feltételek közötti folyamatos repülésekhez előírt műszerek, felszerelések és rendszerek elektromos terhelésének összes valószínűsíthető kombinációjában való táplálásához;

b) Egy rádió magasságmérővel;

c) Megfelelő kapacitással és tartóssággal rendelkező vész elektromos tápláló rendszerrel, amely az összes fejlesztett energia elvesztése után, minimum az alábbiakat teszi lehetővé:

1) Az összes olyan repülőgépvezetési műszer, kommunikációs és navigációs rendszer működését, amelyek a maximálisan engedélyezett magasságról, siklási konfigurációban a leszállás végrehajtásához szükségesek;

2) Fékszárnyak és futóművek kibocsátását, amennyiben szükségesek;

3) Egy olyan pitot cső fűtéséhez szükséges energia biztosítását, amely a repülőgépvezető számára világosan látható légsebességmérő műszer táplálását látja el;

4) A 2 j) alpontban meghatározott leszálló fény működtetését;

5) Egy hajtómű újraindítását, amennyiben szükséges; és

6) A rádiómagasság mérő működtetését.

d) Két darab magasságmérővel, amelyek önálló tápforrással rendelkeznek;

e) Olyan eszközzel, amely legalább egy kísérletet lehetővé tesz a hajtómű újraindítására;

f) Fedélzeti időjárás radarral;

g) Tanúsított, körzeti navigációs rendszerrel, amely alkalmas a repülőterek és a biztonságos vészleszálló helyek pozícióinak beprogramozására, valamint azok helyzetét meghatározó távolság és útvonal azonnali megjelenítésére;

h) Utas-szállításhoz utasülésekkel és rögzítési csomópontokkal, amelyek kielégítik a dinamikusan vizsgált teljesítőképességre vonatkozó szabványokat, és minden egyes utasüléshez vállhevederrel vagy átlósan elhelyezett vállszíjjal kiegészített biztonsági övvel rendelkeznek;

i) Túlnyomásos repülőgépen, az ott tartózkodó összes személy részére a maximális siklási teljesítménnyel végrehajtott süllyedés időtartamára megfelelő tartalék oxigénnel, amely a hajtómű meghibásodását követően a maximálisan engedélyezett repülési magasságról azon biztonságos magasság eléréséhez szükséges, ahol a továbbiakban már nincs szükség a kiegészítő oxigén ellátásra;

j) A futóműtől független leszálló fényre, amely alkalmas a földetérés körzetének megfelelő megvilágítására, az éjszakai vészleszállás során; és

k) Egy hajtómű tűzjelző rendszerre.

3. Minimális felszerelések jegyzéke

A járató állama követelje meg a jóváhagyott járatótól az 5. fejezet, 5.4 alpontja szerinti minimális felszerelés jegyzéket, amelyben meghatározza azokat a felszereléseket, amelyek éjszaka és/vagy IMC feltételek közötti repülésekhez, vagy nappal/VMC feltételek (vizuális időjárási körülmények) közötti repülésekhez szükségesek.

4. A repülésvégrehajtási kézikönyv információi

A repülésvégrehajtási kézikönyvnek tartalmaznia kell azokat a korlátozásokat, eljárásokat, jóváhagyási állapotokat és egyéb információkat, amelyek az egy hajtóművel felszerelt repülőgépek éjszakai és/vagy IMC feltételek közötti repüléseihez szükségesek.

5. Események jelentése

5.1 Az egy gázturbinás hajtóművel felszerelt repülőgépek éjszakai és/vagy IMC feltételek közötti üzemeltetésére jóváhagyott járató jelentse az összes lényeges meghibásodást, rendellenességet vagy hibás működést a járató államának és az másfelől a tervező államának.

5.2 A járató állam vizsgálja felül a repülésbiztonsági adatokat és kövesse figyelemmel a megbízhatósági információkat, hogy képes legyen a szükséges intézkedéseket megtenni a kívánt repülésbiztonsági szint elérése érdekében. A járató állama tájékoztatást ad a jelentős eseményekről vagy egyedi problémákról az érintett tipusalkalmassági bizonyítvány tulajdonosnak vagy a tervező államának.

6. A járató tervezése

6.1 A járató útvonal tervezése vegye figyelembe a tervezett útvonal vagy üzemeltetési körzet felülvizsgálata során az összes kapcsolódó információt, a következőket is beleértve:

a) A repült útvonal alatt található felszín tulajdonságait, beleértve a biztonságos kényszerleszállás végrehajtásához szükséges lehetőségeket egy hajtómű meghibásodás vagy jelentős rendellenesség esetére;

b) A repülésre hatást gyakorolható időjárási információkat, beleértve a szezonális és más kedvezőtlen meteorológiai hatásokat; és

c) Más jellemzőket és korlátozásokat a járató államának meghatározásai szerint.

6.2 A járató határozza meg a hajtómű meghibásodásának esetére alkalmazható repülőtereket és kényszerleszállási körzeteket, és azok helyzetét programozza be a körzeti navigációs rendszerbe

Megjegyzés 1. – A „biztonságos” kényszerleszállás ebben az összefüggésben egy olyan körzetben való leszállást jelenti, amelynél ésszerűen várható, hogy nem fog komoly sérüléseket vagy életek elvesztését okozni, még akkor sem, ha a repülőgép jelentős károsodást szenvedne el.

Megjegyzés 2 – Hajtómű meghibásodás esetén az 5. fejezet, 5.1.2 alpontjában meghatározottak szerinti biztonságos kényszerleszállást megengedő útvonalakon és időjárási feltételek közötti üzemeltetés nem követelmény a 3. Függelék 6.1 és 6.2 alpontjai szerint, az 5. fejezet, 5.4 alpontja szerint jóváhagyott repülőgépek esetében. Ezen repülőgépekre nem kell minden pontra megvizsgálni a kényszerleszállási körzetek rendelkezésre állását, a hajtóművek nagyfokú megbizhatósága, kiegészítő rendszerek és működőképes felszerelések megléte valamint a jelen Függelékben meghatározott eljárások és kiképzési követelmények miatt.

7. A hajózószemélyzet jártassága, képzése és ellenőrzése

7.1 A járató állama írja elő a hajózó személyzet minimális jártasságát, ami az egy gázturbinás hajtóművel felszerelt repülőgép éjszakai/IMC feltételek közötti üzemeltetéséhez szükségesek.

7.2 A járató rendelkezzen megfelelő képzéssel és ellenőrzéssel az egy gázturbinás hajtóművel felszerelt repülőgépek éjszaka és/vagy IMC feltételek közötti üzemeltetését végző hajózó személyzetek számára, amely lefedi a normál, rendellenes és vészhelyzetekre vonatkozó eljárásokat, és különösen a hajtómű meghibásodások esetét, beleértve a kényszerleszálláshoz való süllyedést éjszaka és/vagy IMC feltételei között.

8. Víz feletti útvonalak korlátozása

A járató alkalmazzon útvonal korlátozási követelményeket az egy gázturbinás hajtóművel felszerelt repülőgépek éjszakai és/vagy IMC feltételek közötti víz feletti üzemeltetésére, amennyiben a biztonságos kényszerleszállásra / vízreszállásra alkalmas helyhez viszonyított siklási távolságon kívül a repülőgép jellemzőin túlmenően még figyelembe kell venni a szezonális időjárási körülményeket, mint a tenger állapotát és hőmérsékletét, valamit a kutató-mentő szolgálatok lehetőségét.

9. A járató tanúsítása vagy megerősítése

A járató állama által meghatározott tanúsítási és jóváhagyási folyamattal a járatónak bizonyítania kell a képességét az egy gázturbinával felszerelt repülőgépekkel történő éjszakai és/vagy IMC feltételek közötti repülések végrehajtására.

Megjegyzés – a légialkalmassági és üzemeltetési követelményekre vonatkozó útmutatót az I Melléklet tartalmazza.

4. FÜGGELÉK

Magasságmérő rendszerek RVSM légtérben való üzemeltetéséhez szükséges teljesítmény követelmények

(lásd: 7. fejezet, 7.2.5)

1. A magasságtartási jellemzők pontosságát befolyásolni képes összes alkatrész vonatkozásában, névleg teljesen azonos tervezésű és építésű repülőgépek csoportjában, a magasságtartási tulajdonságokra vonatkozó képességek olyanok legyenek, hogy repülőgépek csoportjára nézve a teljes függőleges hiba (TVE) középértéke 25 m (80 ft) nagyságú értéket ne haladja meg, és a szabványos eltérés ne legyen nagyobb, mint $28 - 0.013z^2$ a $0 \leq z \leq 25$ értéktartományra nézve, ahol a „z” az átlagos TVE méterben kifejezett értéke, vagy ne legyen nagyobb mint $92 - 0.0004z^2$ a $0 \leq z \leq 80$ értéktartományra nézve, ahol a „z” értékét feet-ben kell számolni. Kiegészítésűl, a TVE összetevői a következő jellemzőkkel rendelkezzenek:

a) Az általános magasságmérő rendszer hiba (ASE) a csoportra vetítve ne haladja meg a 25 m (80 ft) értéket;

b) Az átlagos ASE abszolút értékeinek összege három szabványos ASE eltérésből számolva ne haladja meg a 75 m (245 ft) értéket; és

c) A beállított repülési magasság és a tényleges repülési magassághoz tartozó kijelzett nyomásmagasság különbsége szimmetrikus legyen a 0 középértékhez viszonyítva, ahol a szabványos eltérés ne haladja meg a 13.3 m (43.7 ft) értéket, és kiegészítésül a különbség frekvenciájának csökkenése exponenciális legyen, amikor a különbség mértéke növekedik.

2. Azon repülőgépek vonatkozásában, amelyek sárkányszerkezetének jellemzői és magasságmérő rendszerének megfelelősége egyedi sajátosságokkal bír, és nem sorolható be az 1. bekezdés szerint meghatározott repülőgépek csoportjába, a magasságtartás képessége olyan legyen, amelynél a repülőgép TVE összetevői a következő jellemzőknek felelnek meg:

a) A repülőgép ASE értéke ne haladja meg a 60 m (200 ft) értéket, az összes repülési feltétel között; és

b) A beállított repülési magasság és a tényleges repülési magassághoz tartozó kijelzett nyomásmagasság különbsége szimmetrikus legyen a 0 középértékhez viszonyítva, ahol a szabványos eltérés ne haladja meg a 13.3 m (43.7 ft) értéket, és kiegészítésül a különbség frekvenciájának csökkenése exponenciális legyen, amikor a különbség mértéke növekedik.

5. FÜGGELÉK

A járatók biztonsági felülvizsgálata

(lásd: 4. fejezet, 4.2.1.7)

1. Elsődleges légiközlekedési törvényhozás

1.1 A járató állama léptessen érvénybe és alkalmazzon olyan törvényt, amely képessé teszi az államot a polgári légiközlekedés szabályozására a Polgári Légiközlekedési Hatóság (CAA), vagy erre a célra létrehozott azonos szervezet bevonásával. A törvény jogosítsa fel a Hatóságot az állam felülvizsgálati tevékenységének végrehajtására. A törvény tegye lehetővé előírások kiadását, a járatók tanúsítását és folyamatos felügyeletét, és határozat meghozatalát a Hatóság által megállapított biztonsági ügyekben.

Megjegyzés: A jelen Függelékben használatos Hatóság kifejezés megfelel a Polgári Légiközlekedési Hatóságnak, valamint a felügyelőket és az állományt magába foglaló azonos szervezeteknek.

1.2 A járató állama biztosítsa, hogy az állam törvényei írják elő a járatók számára azt a követelményt, hogy a Hatóság hozzáférhessen a járatók személyi állományához, légijárműveihez, üzemeltetéséhez és létesítményeihez valamint a nyilvántartásokhoz a a tanúsítások és a folyamatos felülvizsgálatok céljából.

Megjegyzés: Azon rendszer kritikus elemeire vonatkozó útmutató, amely képessé teszi az államot az üzemeltetés ellenőzésében, tanúsításában és folyamatos felülvizsgálatában viselt felelősségének gyakorlására, a Biztonsági Felülvizsgálati Kézikönyvnek *(Doc 9734)* az Állami Biztonsági Felülvizsgálati Rendszer Létrehozása és Irányítása című A. részében, a Repülésüzem Ellenőrzésére, Tanúsítására és Folyamatos Felülvizsgálatára vonatkozó Eljárások Kézikönyvében *(Doc 8335)* és a Légialkalmassági Kézikönyvben *(Doc 9760) található.*

2. Különleges üzemeltetési előírások

2.1 A járató állama olyan előírásokat fogadjon el a légijárművek üzemeltetésének folyamatos felügyeletére és tanúsítására valamint a légijárművek karbantartására, amelyek biztosítják a Nemzetközi Polgári Légiközlekedési Egyezmény Annexeivel való összhangot.

2.2 A járató állama biztosítsa, hogy a technológia és az üzemeltetési környezet változásainak tekintetében az állam előírásai eléggé átfogóak, részletezettek és naprakészek legyenek, amelyek garantálják, hogy az előírásokhoz való alkalmazkodás az adott üzemeltetés elfogadható biztonsági szintjét eredményezi.

3. A Polgári Légiközlekedési Hatóság felépítése és a biztonsági felülvizsgálati feladatok

3.1 Az állami felelősség hatékony vállalása érdekében a járató állama biztosítsa, hogy a Hatóság legyen felelős a légiüzemeltetés biztonsági felülvizsgálatáért, valamint a Hatóság rendelkezzen az állam fennhatósága alá tartozó polgári légiközlekedés összetettségének és méretének megfelelő erőforrásokkal.

3.2 A járató állama biztosítsa, hogy a hatósági ellenőrök rendelkezzenek megfelelő támogatással, felhatalmazással és szállítóeszközzel annak érdekében, hogy függetlenül láthassák el a tanúsítási és folyamatos felügyeleti tevékenységüket.

4. Műszaki útmutatók

4.1 A járató állama biztosítsa, hogy a hatósági ellenőrök a járatók tanúsításához és folyamatos felülvizsgálatához szükséges irányelveket, eljárásokat és szabványokat tartalmazó műszaki útmutató kézikönyvekkel rendelkezzenek.

4.2 A járató állama biztosítsa, hogy a hatósági ellenőrök a biztonsági kérdésekkel összefüggő és a hatályba léptetést is magukba foglaló döntésekhez szükséges irányelveket, eljárásokat és szabványokat tartalmazó műszaki útmutató kézikönyvekkel rendelkezzenek.

4.3 A járató állama biztosítsa, hogy a hatósági ellenőrök a hivatalos kötelezettségek teljesítésekor követendő erkölcsre, személyes viselkedésre valamint a valós vagy vélt érdek ütközések elkerülésére irányuló műszaki útmutató kézikönyvekkel rendelkezzenek.

5. Jogosított műszaki személyzet

5.1 A járató állama használjon módszertant az ellenőri állományára vonatkozó követelmények meghatározására, az adott állam polgári légiközlekedésének összetettségéhez és méretéhez igazodva.

5.2 **Ajánlás –** az *5.1 bekezdés módszertanát dokumentálják.*

5.3 A járató állama határozzon meg jogosítási követelményeket anak biztosítása érdekében, hogy az ellenőrző személyzetük rendelkezzen a tanúsításhoz és ellenőrzéshez szükséges tevékenységükkel összhangban álló üzemeltetési és műszaki végrehajtási tapasztalattal és képzettséggel.

Megjegyzés: az ellenőrök gyakorlati jártasságára és képzésére vonatkozó útmutatót a Repülésüzem Ellenőrzésére, Tanúsítására és Folyamatos Felülvizsgálatára vonatkozó Eljárások Kézikönyve *(Doc 8335), Fejezet 9, 9.4.*

5.4 A járató állama követelje meg, hogy a tanúsítási és a folyamatos felügyeleti feladataik hatékony ellátásához, a hatósági ellenőrök részesüljenek alap- és ismétlő képzésben a vonatkozó műszaki témakörökből (beleértve a légijármű specifikus témaköröket) és gyakorlati ismeretekből.

5.5 **Ajánlás** – *a járató állama hozzon megfelelő intézkedéseket az alkalmazási feltételek és a javadalmazás terén, hogy biztosítani lehessen felkészült ellenőrök jelentkezését és megtartását.*

6. Igazolási és tanúsítási kötelezettségek

6.1 A járató állama alkalmazzon dokumentált eljárást a járatók tanúsításához, amely magába foglalja a 6. Annex, I. Részében meghatározott eljárások, dokumentációk és üzemeltetések elfogadáshoz vagy jóváhagyásához vezető átfogó műszaki értékeléseket is.

6.2 A járató állama követelje meg, hogy új kereskedelmi légiszállítási tevékenység megkezdése előtt a járatók bizonyítsák be, hogy a beterjesztett üzemeltetést biztonságosan tudják elvégezni.

Megjegyzés: Az F melléklet további információkat tartalmaz ezzel kapcsolatban

7. Folytatólagos felügyeleti kötelezettségek

7.1 A járató állama alkalmazzon dokumentált eljárást a járatók folyamatos felügyeletéhez, amellyel igazolni lehet a járatók részére a Hatóság által kiadott légijármű üzembentartási engedélyek folyamatos érvényességét.

7.2 A járató állama alkalmazzon egy használatban lévő felügyeleti tervet annak alátámasztására, hogy a járatók változatlanul megfelelnek az alaptanúsításra megállapított követelményeknek és, hogy az összes járató megfelelőképpen működik.

8. Biztonsági kérdésekről hozott döntések

8.1 A felismert biztonsági problémák megoldása érdekében, a járató állama alkalmazzon dokumentált eljárást a végrehajtást is magába foglaló megfelelő helyesbítő intézkedések meghozatalához.

8.2 A járató által a felismert biztonsági problémák megoldására hozott intézkedéseket is magába foglaló fejlődést nyomonkövető és nyilvántartó rendszer segítségével, a járató állama győződjön meg arról, hogy a felismert biztonsági problémák a megfelelő időben megoldásra kerültek.

A. Melléklet
Repülési idő és repülési szolgálati idő korlátozások
Kiegészítés a 4. fejezet 4.2.10.3 ponthoz

1. Cél és tárgykör

1.1 A repülési idő és a repülési szolgálati idő korlátozásának egyedüli célja, hogy csökkenjen annak valószínűsége, hogy a hajózószemélyzet tagjának fáradtsága a repülésbiztonságot hátrányosan befolyásolja.

1.2 A fenti lehetőség kiküszöbölése érdekében kétféle fáradtságot, nevezetesen az átmeneti és a hosszabb időn át felgyülemlett fáradtságot kell figyelembe venni. Az átmeneti fáradtság úgy irható le, mint amely az egészséges személynél munkával, feszültséggel vagy erőkifejtéssel járó időszakot követően alakul ki és amit rendszerint megfelelő időtartamú alvással ki lehet pihenni. Másrészt a felgyülemlett fáradtság az átmeneti fáradtság nem időben vagy nem teljes mértékben történő kipihenése esetében vagy nagyobb mértékű munkavégzés, különösen nagy fokú izgalom vagy erőkifejtés hatásaként jöhet létre, amelyet az érintett személy nem tudott megfelelően kipihenni.

1.3 A jelen rész előírásai alapján kidolgozott korlátozások védelmet biztosítanak mindkét típusú fáradtsággal szemben, mert figyelembe veszik a következőket:

1.3.1 A repülési idő korlátozása szükséges olyan módon, hogy ezzel védelmet biztosítsanak mindkét fajta fáradtsággal szemben.

1.3.2 A földön, a repülést közvetlenül megelőzően vagy a repülési feladat illetve sorozat közbenső pontjain elsősorban az átmeneti fáradtsággal szembeni védelem érdekében szükséges szolgálati idő korlátozása.

1.3.3 Szükséges, hogy a hajózószemélyzet tagjai számára megfelelő lehetőséget biztosítsanak a fáradtság kipihenésére.

1.3.4 Elsősorban a felgyülemlett fáradtság hatásaival szemben történő védelem érdekében szükséges, hogy figyelembe vegyék a hajózószemélyzet tagjának más előírt feladatait is.

2. Meghatározások

2.1 Repülési idő

A repülési idő meghatározás szükségszerűen nagyon általános, de a hajózószemélyzet tagjaira korlátozások vonatkozásában természetesen a "hajózószemélyzeti tag" meghatározás szerint alkalmazandó. Ennek megfelelően az utasként utazó, szakszolgálati engedéllyel rendelkező személyzeti tagok nem tekinthetők hajózószemélyzeti tagnak, bár az utazási idejüket a pihenőidő megállapításánál figyelembe vehetik.

2.2 Repülési szolgálati idő

2.2.1 A repülési szolgálati idő meghatározás célja egy olyan folyamatos szolgálati időtartam megnevezése, amely mindig egy repülésre vagy repülési sorozatra vonatkozik. Tartalmazza a hajózószemélyzet tagjának minden olyan feladatát, amelyeknek elvégzésére a repülés napján szolgálati helyen történő jelentkezéstől a repülés vagy repülési sorozat befejezését követően a szolgálatból történő felmentéséig utasítható. Álláspontunk szerint ezen időtartam korlátozása szükséges, mert a hajózószemélyzet tagjának ezen időtartamon belül történő tevékenysége a repülésbiztonságot veszélyeztető átmeneti vagy felgyülemlett fáradtságot eredményez. Másrészt viszont (a repülésbiztonság szempontjából) egyéb olyan időszakokat illetően, amelyek során a hajózószemélyzet tagja a járató által számára kijelölt más feladatokat végez, nincs elegendő nyomós indok a korlátozás bevezetésére. Az ilyen feladatokat ezért csak a pihenőidővel kapcsolatos rendelkezéseknél és csak a fáradtság kialakulásához vezető számos tényező egyikeként vegyék figyelembe.

2.2.2 A repülési szolgálati idő meghatározásánál nem tekintjük szükségesnek egyéb olyan időtartamok beszámítását, mint például azon időszakot, amely alatt a hajózószemélyzet tagja otthonából a munkahelyére utazik.

2.2.3 Fontos elővigyázatossági intézkedés valósítható meg, amennyiben az államok és a járatók elismerik a személyzeti tag jogát a további repülési szolgálat elutasítására, ha az olyan természetű fáradtságot érez, amely hátrányosan befolyásolja a repülésbiztonságot.

2.3 Pihenő idő

A pihenőidő meghatározás szolgálattól való távollétet jelent, amelynek célja a fáradtság kipihenése; a pihenés módját az érintett személy önmaga határozza meg.

3. A korlátozások módjai

3.1 A korlátozások az időtartam tekintetében nagyon különbözőek; például az ICAO-nak erről tájékoztatást nyújtó államok többsége napi, havi és éves repülési idő korlátozásokat ír elő valamint igen sokan negyedévi korlátozást is alkalmaznak. Valószínűleg elegendő a napi repülési szolgálati időszakok korlátozása, mindazonáltal tudomásul kell venni, hogy ezek a korlátozások az egyedi helyzetek különbségei miatt jelentős mértékben eltérőek egymástól.

3.2 A repülési idő korlátozását szabályozó előírások vagy utasítások kidolgozásánál vegyék figyelembe a személyzet összetételét valamint azt is, hogy a különböző feladatok milyen mértékben oszthatók fel a személyzet tagjai között. Abban az esetben, ha a légijárművön megfelelő pihenésre alkalmas helyet biztosítanak arra, hogy a személyzet tagja ott elkülönítetten és vízszintes (fekvő) testhelyzetben pihenjen, a repülési szolgálati idő meghosszabbítható. A földön, ahol a személyzet tagjai a pihenőidőt töltik, megfelelő pihenőhelyek kialakítása szükséges. Az államok vagy járatók továbbá vegyék figyelembe a következő tényezőket is: a forgalom sűrűsége, a rendelkezésre álló navigációs és távközlési létesítmények, a munka és alvásidő ciklusa illetve ritmusa, a fel és leszállások száma, a légijármű kezelés, kiszolgálás valamint teljesítmény jellemzők és az időjárási körülmények.

B. Melléklet
Elsősegélynyújtó egészségügyi készletek
Kiegészítés a 6. fejezet 6.2.2 a) ponthoz
Egészségügyi Készletek Típusa, Száma, Elhelyezése és Tartalma

1. Típus

Két típusú egészségügyi készletet biztosítsanak a következők szerint:

Minden repülőgép fedélzetén szállítandó elsősegélynyújtó egészségügyi készlet(ek); és
amennyiben a repülőgép több mint 250 utas szállítására engedélyezett, egy orvosi egészségügyi készlet.

2. Az elsősegélynyújtó egészségügyi készletek száma

Az elsősegélynyújtó egészségügyi készletek mennyisége az alábbiak szerint feleljen meg a repülőgép fedélzetén szállításra engedélyezett utasok számának:

Utasok száma	*Készletek száma*
0 – 50	1
51 – 150	2
151 – 250	3
több mint 250	4

3. Elhelyezés

3.1 Alapvetően szükséges, hogy az előírt elsősegélynyújtó egészségügyi készleteket az utaskabinban lehetőleg egyenletesen elosztva helyezzék el. Ezekhez az utaskabin személyzet könnyen hozzáférjen és a vészhelyzet esetén esetlegesen a repülőgépen kívül történő segítségnyújtásra történő felhasználás figyelembevétele érdekében a készleteket a légijármű kijárata közelében helyezzék el.

3.2 A szállított orvosi egészségügyi készletet megfelelő biztos helyen tárolják.

4. Tartalom

4.1 Az elsősegélynyújtó és orvosi egészségügyi készletek tartalmának meghatározásakor különböző tényezőket kell figyelembe venni. Az alábbiakban a repülőgép fedélzetén szállítandó elsősegélynyújtó és orvosi egészségügyi készlet(ek) általános tartalmát ismertetjük.

4.1.1 Elsősegélynyújtó készlet

– elsősegély-nyújtási kézikönyv
– „Túlélők által használt föld–levegő látjelek” a 12. Annex alapján
– sérülések ellátására szolgáló egészségügyi anyagok
– szemcseppek
– orrváladék oldó permet(szóró)k
– rovarirtó illetve riasztó szerek
– szemkenőcs
– égési sérülések kezelésére szolgáló kenőcs

– vízzel keverhető fertőtlenítő és bőrtisztító anyag
– kiterjedt égési sérülések kezelésére szolgáló anyagok
– szájon át bevehető tabletták a következők szerint:
  érzéstelenítő, görcsoldó, a központi idegrendszert élénkítő, keringést serkentő, koszorú-ér tágító, egyensúlyi zavarok
  valamint hasmenés elleni orvosságok
– műanyagcső a mesterséges lélegeztetéshez
– műanyag csonttörés rögzítő.

4.1.2 Orvosi egészségügyi készlet

Gyógyászati felszerelések
– egy pár steril sebészeti kesztyű
– vérnyomásmérő
– sztetoszkóp (mellkas hallgató)
– steril ollók
– ércsipeszek
– érkötő és szorító kötések
– steril sebvarró felszerelés
– egyszer használható fecskendő és orvosi tű
– egyszer használható sebészeti szike (nyél és penge)

Gyógyszerek
– koszorúér tágítók
– fájdalomcsillapítók
– hasmenés elleni és bélfertőtlenítők
– allergia elleni gyógyszerek
– nyugtatók
– görcsoldók
– keringés serkentők
– kábító gyógyszer injekció formájában
  (ahol ez az illetékes hatóság előírásaival összhangban van)
– lélegzés serkentő tüdőtágító injekció formájában

Megjegyzés: Az Egyesült Nemzetek Szervezete Kábítószerekről tartott 1961 márciusi konferenciáján határozatot fogadtak el, amelynek 32. cikkelye külön előírásokat tartalmaz a nemzetközi légiforgalomban üzemeltetett légijármű fedélzetén szállított orvosi egészségügyi készletek kábító gyógyszereiről.

C. Melléklet
Repülőgép teljesítmény üzemeltetési korlátozások – 1. példa

Cél és tárgykör

A következő példa célja az 5. fejezet előírásainak megfelelő teljesítmény szintek alkalmazásának bemutatása az alábbiakban ismertetett repülőgép típusok esetében. A 6. Annex 1949 július 14-én hatályba lépett nemzetközi előírásai és ajánlott gyakorlati eljárásai hasonló meghatározásokat tartalmaztak, mint amelyeket egyes szerződő államok saját országos teljesítmény előírásaikban alkalmaztak. A polgári szállító repülőgépek döntő többségét ezen előírásoknak megfelelően gyártották és üzemeltetik. Ezek a repülőgépek dugattyús, közöttük turbó-feltöltéses motorokkal rendelkeznek. Közéjük tartoznak a kettő és négy motoros repülőgépek, amelyek tömege körülbelül 4200 kg-tól 70 000 kg-ig terjed, átesési sebesség tartományuk 100–175 km/h (55–95 csomó) között és szárny felület terhelésük hozzávetőlegesen 120–360 kg/m^2 között van. Utazósebességük több mint 555 km/h (300 csomó). Ezeket a repülőgépeket igen különböző repülési magasságokon, levegő hőmérsékleti és páratartalom körülmények között üzemeltetik. A későbbiek folyamán ezt a teljesítmény előírást alkalmazták illetve használták fel az un. első generációs gázturbinás légcsavaros és sugárhajtóműves repülőgépek minősítésének kidolgozásához.

Bár csak a múlt tapasztalatai igazolhatják azt a tényt, hogy a jelen példa érzékelteti az 5. fejezetben található nemzetközi előírások és ajánlott gyakorlati eljárások alapján szükséges teljesítmény szintet, a példa alkalmazhatónak látszik nagyon különféle repülőgép jellemzők és légköri körülmények esetében. Mindazonáltal a példát a magas külső légköri hőmérséklet körülményei között fenntartással kezeljék. Bizonyos különleges esetekben főként az akadályok miatt korlátozott felszállási repülési pálya vonatkozásában kívánatosnak találták a további hőmérséklet és/vagy páratartalom jellemzők figyelembevételét.

A jelen példának nem célja a rövid felszállópályát igénylő (STOL) vagy függőlegesen felszálló (VTOL) repülőgépekre történő alkalmazás.

A példa időjárástól független meteorológiai körülmények között történő alkalmazhatóságának megállapítására nem készült részletes vizsgálat és ezért ennek helyességét nem bizonyították olyan üzemeltetési körülmények között, amikor alacsony elhatározási magasságokat valamint ezzel együtt alacsony repülőtér üzemeltetési minimumhoz szükséges módszereket és eljárásokat alkalmaznak.

1. Meghatározások

Műszer szerint szabályozott helyesbített sebesség (CAS) – Calibrated airspeed
A műszer szerint helyesbített repülési sebesség megfelel a sebességmérő műszerről leolvasott, a beépítési és műszerhibával helyesbített értékkel.
(A sebességmérő műszer skálája a tengerszintre meghatározott adiabatikus áramlási nyomáshibával helyesbítve van és ezért a műszer szerint szabályozott helyesbített sebesség tengerszinten, az Egyezményes Légkörnek megfelelő nyomáson megegyezik a tényleges repülési sebességgel).

Kijelölt távolságok – Declared distances

a) Rendelkezésre álló felszállási nekifutási távolság (TORA) – A futópálya azon hosszúsága, amelyet a felszálló repülőgép földi nekifutására alkalmasnak és igénybevehetőnek nyilvánítanak.

b) Rendelkezésre álló felszállási távolság (TODA) – A rendelkezésre álló felszállás nekifutási távolság valamint ha ilyet kijelöltek, a biztonsági terület együttes hossza.

c) Rendelkezésre álló megállási távolság (ASDA) – A rendelkezésre álló felszállás nekifutási távolság valamint ha ilyet kijelöltek, a biztonsági megállási terület együttes hossza.

d) Rendelkezésre álló leszállási távolság (LDA) – A futópálya azon hosszúsága, amelyet a leszálló repülőgép leszállását követő földi kigurulására alkalmasnak és igénybevehetőnek nyilvánítanak.

Megjegyzés: A kijelölt távolságok kiszámítása a 14. Annex, I. kötet, A. mellékletében található.

Magasság – Height
Egy szintnek, egy pontnak vagy egy pontnak tekintett tárgynak meghatározott vonatkozási alaptól mért függőleges távolsága.

Megjegyzés: A jelen példa esetében a fentiek alapján jelzett pont a repülőgép legalacsonyabb része és a meghatározott vonatkozási alap a felszállási vagy leszállási felület.

Leszállási felület – Landing surface
A repülőtér felületének az a része, amelyet a repülőtéri hatóság a repülőgép egy adott irányba történő leszállása utáni földi kigurulására vagy vízfelületen lassuló siklására alkalmasnak és igénybevehetőnek nyilvánít.

Felszállási felület – Take-off surface
A repülőtér felületének az a része, amelyet a repülőtéri hatóság a repülőgép egy adott irányba történő felszállása alatti földi vagy vízfelületi nekifutására alkalmasnak és igénybevehetőnek nyilvánít.

V_{S_0} – Átesési leszálló sebesség – Stalling speed
Átesési vagy legalacsonyabb állandósult repülési sebesség a repülésvezérlő szerkezetek leszállási beállítása mellett *(lásd 2.4 pont).*

V_{S_1} – Átesési sebesség – Stalling speed
Átesési vagy legalacsonyabb állandósult repülési sebesség *(lásd 2.5 pont).*

Megjegyzés: A többi meghatározást lásd 1. fejezet, valamint Annex 8 és 14, I. kötet)

2. Átesési sebesség – legalacsonyabb állandó(sult) repülési sebesség

2.1 A jelen példa esetében az átesési sebesség az a repülési sebesség, amelynél az állásszög nagyobb annál, mint amelynél a legnagyobb felhajtóerő jön létre vagy ha az utóbbi nagyobb, az a repülési sebesség, amelynél a 2.3 pontban ismertetett repülési művelet végrehajtása esetén nem azonnal kormányozható erőteljes hosszirányú vagy oldalirányú mozgás (hosszdőlés azaz bólintás és elfordulás) tapasztalható.

Megjegyzés: Meg kell jegyezni, hogy az átesés előtti remegéssel társuló gyenge hosszirányú mozgás (bólintás) nem szükségszerűen jelenti az átesési sebesség elérését.

2.2 A legalacsonyabb állandó repülési sebesség az a sebesség, amely akkor alakul ki és állandósul, amikor a 2.3 pontban ismertetett manőver végrehajtásánál a magassági kormányt a lehetséges leghátsó helyzetben tartják. Ez a sebesség nem alkalmazható, ha a 2.1 pontban meghatározott átesési sebesség azt megelőzően jön létre, hogy a magassági kormány legvégső kitérítését eléri.

2.3 Az átesési sebesség meghatározása – Legalacsonyabb állandó repülési sebesség

2.3.1 A repülőgépet körülbelül 1.4 V_{S_1} repülési sebességhez kitrimmelték. A repülési sebességet egyenes vonalú repülés során jóval az állandó és folyamatos sebesség csökkenést biztosító átesési sebesség feletti értékről, 0.5 m/s^2 (egy csomó/mp) értéket nem meghaladó arányban lecsökkentik a 2.1 és 2.2 pontokban meghatározott átesési vagy a legalacsonyabb állandó repülési sebesség eléréséig.

2.3.2 Az átesési vagy a legalacsonyabb állandó repülési sebesség méréséhez alkalmazott műszerek olyanok legyenek, amelyeknél a valószínű mérési hiba értéke ismert.

2.4 V_{S_0}

A V_{S_0} az átesési sebesség értéke, ha azt a 2.3 pont alapján végzett repülési ellenőrzéssel határozták meg, vagy más esetben a legalacsonyabb állandó repülési sebesség (CAS), ha azt a 2.2 pont alapján az alábbiak szerint határozták meg:

a) a hajtóművek teljesítménye nem nagyobb, mint ami a 0 tolóerőhöz szükséges az átesési sebesség 110 %-ánál nem magasabb sebességnél;

b) a légcsavarszög beállítás a felszálláshoz ajánlott általános helyzetben van;

c) a futómű kibocsátott helyzetben van;

d) a fékszárny leszálló helyzetben van;

e) a hajtómű burkoló áramlás-szabályzó lapok és hűtözsaluk zárt vagy közel zárt helyzetben vannak;

f) a repülőgép súlypontja a leszálláshoz meghatározott határértékeken belül olyan helyen van, amelynél a maximális átesési vagy legalacsonyabb állandó repülési sebesség alakul ki;

g) a repülőgép tömege megfelel a megállapítandó jellemzőhöz tartozó értéknek.

2.5 V_{S_1}

A V_{S_1} az átesési sebesség értéke, ha azt a 2.3 pont alapján végzett repülési ellenőrzéssel határozták meg, vagy más esetben a legalacsonyabb állandó repülési sebesség (CAS), ha azt a 2.2 pont alapján az alábbiak szerint határozták meg:

a) a hajtóművek teljesítménye nem nagyobb, mint ami a 0 tolóerőhöz szükséges az átesési sebesség 110 %-ánál nem magasabb sebességnél;

b) a légcsavarszög beállítás a felszálláshoz ajánlott általános helyzetben van;

c) a repülőgép összes többi repülésvezérlő szerkezetei olyan beállításban vannak és a repülőgép tömege olyan, mint amit a megállapítandó jellemzőhöz előírtak.

3. Felszállás

3.1 Tömeg

A felszállásnál a repülőgép tömege ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott, és arra a tengerszint feletti magasságra vonatkozó legnagyobb engedélyezett felszállósúly értéket, amelyen a felszállást végrehajtják.

3.2 Teljesítmény

A repülőgép teljesítményét a repülésvégrehajtási kézikönyv adatai alapján határozzák meg úgy, hogy:

a) a szükséges gyorsításból történő megállási távolság ne haladja meg a rendelkezésre álló gyorsításból történő megállási távolságot;

b) a szükséges felszállási távolság ne haladja meg a rendelkezésre álló felszállási távolságot;

c) a felszállás repülési pálya biztosítson **D** = 500 méter (1500 láb) távolságig nem kevesebb mint 15.2 méter (50 láb) függőleges elkülönítést majd ezt követően 15.2 + 0.01{**D** – 500} méter (50 + 0.01 {**D**-1500} láb) függőleges elkülönítést minden akadály felett, amely 60 méter valamint a repülőgép fesztávjának fele és 0.125 **D** oldaltávolságon belül található a repülési pálya mindkét oldalán, kivéve azokat az akadályokat, amelyek a repülési pálya bármely oldalán 1500 méter távolságon túl helyezkednek el, mert ezeknél a fenti elkülönítés nem szükséges.

A **D** távolság az a vízszintes távolság, amelyet a repülőgép a rendelkezésre álló felszállási távolság vége után megtett.

Megjegyzés: Ezt a távolságot nem szükséges azon a ponton túl figyelembe venni, amelyen a repülőgép képes lenne további emelkedés nélkül a felszállási repülőtéren történő leszállás végrehajtásának megkezdésére vagy eléri a másik repülőtérre történő repülés megkezdéséhez szükséges legalacsonyabb biztonságos repülési magasságot.

Mindazonáltal az akadályoktól számított oldalirányú elkülönítés a fenti meghatározott értékek alá csökkenthető akkor és olyan mértékben, ahogy a repülőgépvezető segítséget kap a tervezett repülési pályától történő véletlen eltérés elkerülésére. Például különösen kedvezőtlen időjárási körülmények között egy pontos rádiónavigációs berendezés segítheti a repülőgépvezetőt a tervezett repülési pálya tartásában. Ehhez hasonlóan, ha a felszállást elég jó időjárási körülmények között hajtják vége, egyes esetekben lehetséges a jól látható, azonban a 3.2 c) pontban meghatározott oldalirányú határokon belül levő akadályok elkerülése.

1. Megjegyzés: A szükséges gyorsításból történő megállási távolság, a szükséges felszállási távolság és a felszállási repülési pálya meghatározásához használt eljárások a példához tartozó függelékben találhatók.

2. Megjegyzés: A példánkhoz hasonló egyes országos előírásokban alkalmazott felszálló teljesítményre vonatkozó előírások olyanok, hogy a rendelkezésre álló gyorsításból történő megállási távolság és a rendelkezésre álló felszállási távolság nem növelhető az 1. részben meghatározott rendelkezésre álló felszállási nekifutási távolságnál nagyobbra. Ezek az előírások 15.2 méter (50 láb) függőleges elkülönítést határoznak meg a repülőtér határain belül, a repülési pálya mindkét oldalán 60 méter távolságon belül, azon túl pedig a repülési pálya mindkét oldalán 90 méter távolságon belül elhelyezkedő összes akadály felett. Megjegyzendő, hogy ezek az előírások a repülési pálya elemeinek meghatározásához nem biztosítanak választási lehetőséget (lásd a jelen példa függelékét). Véleményünk szerint ezek az előírások egybeesnek a jelen példa általános elveivel.

3.3 Feltételek

A 3.1 és 3.2 pontok vonatkozásában a teljesítmény az alábbiaknak megfelelő:

a) a repülőgép tömege a felszállás megkezdésekor;

b) a magasság megfelel a repülőtér tengerszint feletti magasságának;
továbbá a 3.2 pont vonatkozásában;

c) csak a 3.2 *a)* és *b)* esetére a környezeti hőmérséklet a felszállás időpontjában;

d) a futópálya lejtése a felszállás irányába (szárazföldi repülőgép);

e) a jelentett szélsebesség összetevők nem több mint 50 %-a a felszállás irányával szemben és nem kevesebb mint 150 %-a a felszállás irányába. A vízi repülőgépek üzemeltetésének egyes eseteiben a felszállás irányába eső általános jelentett szélsebesség összetevőket is figyelembe kell venni.

3.4 Kritikus pont

A 3.2 pont alkalmazásánál a 3.2 a) pont teljesítésének vizsgálata esetében a kiválasztott kritikus pont ne legyen a kezdőponthoz közelebb, mint amit a 3.2 b) és 3.2 c) pontok esetében alkalmaztak.

3.5 Fordulók

Amennyiben a repülési pálya 15 fokosnál nagyobb bedöntést igénylő fordulókat is tartalmaz, a 3.2 c) pontban előírt biztonsági távolságokat a forduló során megfelelő mértékben növeljék meg és a **D** távolságot a tervezett repülési pálya mentén mérjék.

4. Útvonalon

4.1 Egy hajtómű nem működik

4.1.1 A repülési útvonal vagy az attól történő tervezett kitérés bármely pontján a repülőgép képes legyen az útvonalon meghatározott legalacsonyabb repülési magasságról egy üzemképtelen hajtóművel történő állandó értékű emelkedésre a repülésvégrehajtási kézikönyv meghatározásai alapján legalább:

1. $K\left(\frac{V_{S_0}}{185.2}\right)^2$ m/s, ahol a V_{S_0} km/h-ban van kifejezve;

2. $K\left(\frac{V_{S_0}}{100}\right)^2$ m/s, ahol a V_{S_0} csomóban van kifejezve;

3. $K\left(\frac{V_{S_0}}{100}\right)^2$ láb/perc, ahol a V_{S_0} csomóban van kifejezve;

és a K értéke a következő:

$K = 4.04 - \frac{5.40}{N}$ az 1) és 2) alpont esetében;

$K = 797 - \frac{1060}{N}$ a 3) alpont esetében;
amelyeknél az N a felszerelt hajtóművek száma.

Megjegyzendő, hogy a legalacsonyabb repülési magasság általában nem kevesebb, mint a repülési pálya mentén és mellett levő földfelszín felett 1000 láb (300 méter) magasság.

4.1.2 A 4.1.1 pont egyik választható változata az, hogy a repülőgépet minden hajtóműve működése mellett olyan repülési magasságon üzemeltetik, amelyről egy hajtómű meghibásodása esetén lehetséges a repülés folytatása addig a repülőtérig, amelyen a leszállás az 5.3 pont alapján végrehajtható és a repülés során a repülőgép a tervezett repülési útvonala mentén annak középvonalától mindkét oldalra számított 8 km (4.3 NM) távolságon belül levő minden tereppont és akadály fölött legalább 600 méter (2000 láb) magasságon repül. Ezeken felül ha ilyen eljárást alkalmaznak, a következő előírásokat is teljesítsék:

a) a repülésvégrehajtási kézikönyvből a repülési pálya kiszámításánál felhasznált, a repülőgép tömege és a magasság alapján meghatározott emelkedés mértékét az alábbiakkal csökkentik:

1. $K\left(\frac{V_{S_0}}{185.2}\right)^2$ m/s, ahol a V_{S_0} km/h-ban van kifejezve;

2. $K\left(\frac{V_{S_0}}{100}\right)^2$ m/s, ahol a V_{S_0} csomóban van kifejezve;

3. $K\left(\frac{V_{S_0}}{100}\right)^2$ láb/perc, ahol a V_{S_0} csomóban van kifejezve;

és a K értéke a következő:

$K = 4.04 - \frac{5.40}{N}$ az 1) és 2) alpont esetében;

$K = 797 - \frac{1060}{N}$ a 3) alpont esetében;
amelyeknél az N a felszerelt hajtóművek száma;

b) a repülőgép képes tartani a kitérőként kijelölt repülőtér magassága felett a 4.1.1 pontban meghatározott 300 méter (1000 láb) legalacsonyabb repülési magasságot;

c) a hajtómű meghibásodása észlelését követően figyelembe veszik a repülési pályán uralkodó szél összetevők és hőmérsékleti értékek hatásait;

d) azt veszik alapul, hogy a tervezett repülési pályán történő előrehaladás során a repülőgép tömege az általános tüzelőanyag és olajfogyasztás értékének megfelelő mennyiséggel csökken;

e) általában azt feltétezik, hogy a repülőgép tüzelőanyag kibocsátása illetve felhasználása megfelelő a kérdéses repülőtér eléréséhez.

4.2 Két hajtómű nem működik (csak négy hajtóműves repülőgép esetében alkalmazható)

Két hajtómű meghibásodásának lehetőségét akkor vegyék figyelembe, ha a repülőgép minden hajtóművének működése melletti utazósebességgel több mint 90 perc repülési távolságra távolodik el az útvonal kitérő repülőtértől. Ennek oka, hogy bármely olyan ponttól, amelyen ez a kettős hajtómű meghibásodás bekövetkezhet, a repülőgép a repülésvégrehajtási kézikönyvben meghatározott repülési helyzetben és hajtómű teljesítmény mellett a legalacsonyabb biztonságos repülési magasság alá történő süllyedés nélkül elérheti a kitérő repülőteret. Általánosan azt feltétezik, hogy a repülőgép tüzelőanyag kibocsátása illetve felhasználása megfelelő a kérdéses repülőtér eléréséhez.

5. Leszállás

5.1 Tömeg

A repülőgép számított tömege a tervezett leszállási vagy bármely célállomás kitérő repülőtéren történő leszállás várható időpontjában ne haladja meg a repülésvégrehajtási kézikönyvben a repülőtér tengerszint feletti magasságára meghatározott legnagyobb értéket.

5.2 Leszállási távolságok

5.2.1 A tervezett leszállási repülőtér

A repülésvégrehajtási kézikönyv alapján meghatározott leszállási távolság a tervezett leszállási repülőtéren ne haladja meg a rendelkezésre álló leszállási távolság 60 %-át:

a) a legkedvezőbb leszállási felületen szélcsendben végrehajtott leszállás esetében és ha az sokkal kedvezőtlenebb,

b) bármely más leszállási felület esetében, amelyen az érkezés időpontjában várható szélviszonyok miatt szükséges a leszállást végrehajtani.

5.2.2 Kitérő repülőterek

A repülésvégrehajtási kézikönyv alapján meghatározott leszállási távolság bármely kitérő repülőtéren ne haladja meg a rendelkezésre álló leszállási távolság 70 %-át:

a) a legkedvezőbb leszállási felületen szélcsendben végrehajtott leszállás esetében és ha az sokkal kedvezőtlenebb,

b) bármely más leszállási felület esetében, amelyen az érkezés időpontjában várható szélviszonyok miatt szükséges a leszállást végrehajtani.

Megjegyzés: A leszállási távolság meghatározásához használt eljárást a példa függelékében ismertetjük.

5.3 Feltételek

Az 5.2 pontban megállapított célok esetében a leszállási távolság ne haladja meg a következőknek megfelelő távolságokat:

a) a repülőgép számított tömege a leszállás várható időpontjában;

b) a repülőtér tengerszint feletti magasságának megfelelő magasság;

c) az 5.2.1 a) és 5.2.2 a) pontok valamint szélcsend vonatkozásában;

d) az 5.2.1 b) és 5.2.2 b) pontok vonatkozásában a várható szélsebesség összetevők nem több mint 50 %-a a leszállás iránya mentén valamint a leszállás irányával szemben és nem kevesebb mint 150 %-a a leszállás irányába.

1. példa függeléke

Repülőgép teljesítmény üzemeltetési korlátozások – Felszállási és leszállási teljesítmény meghatározásának eljárásai

1. Általános rész

1.1 Amennyiben erről más előírás nem rendelkezik, Egyezményes Légkört és szélcsend időjárási körülményeket vegyenek figyelembe.

1.2 A hajtómű teljesítmények a 80 %-os relatív nedvességtartalmú általános légköri viszonyok között tapasztalható vízpára-nyomás alapján kerültek meghatározásra. Amennyiben a teljesítményt a szabványosnál magasabb hőmérsékletre számítják ki, az adott tengerszint feletti magasságra vonatkozó vízpára-nyomást az egyezményes légköri viszonyokra meghatározottak szerint vegyék figyelembe.

1.3 Az adott repülési helyzetre vonatkozó összes teljesítmény adatot úgy határozzák meg, hogy a hajtómű segédberendezései felveszik az adott repülési helyzetnek megfelelő hajtómű teljesítményt.

1.4 Válasszanak ki különböző fékszárny helyzeteket úgy, hogy ezek az elfogadott üzemeltetési módszerek és eljárások alapján a tömeg, a tengerszint feletti magasság valamint a hőmérséklet szerint változtathatók legyenek.

1.5 A súlypont helyzetet megengedett tartományon belül úgy válasszák meg, hogy az ilyen elrendezéssel és hajtómű teljesítménnyel elérhető repülőgép üzemeltetési teljesítmény az adott helyzetben minimumnak tekintendő.

1.6 A repülőgép üzemeltetési teljesítményét úgy határozzák meg, hogy a hajtóműre elfogadott korlátozásokat semmiféle körülmények között ne lépjék túl.

1.7 A meghatározott teljesítményt úgy tervezzék meg, hogy az a repülőgép üzemeltetési korlátozásainak teljesítéséhez közvetlenül felhasználható legyen.

2. Felszállás

2.1 Általános rész

2.1.1 Határozzák meg a felszállási teljesítmény adatokat:

a) a következő körülményekre:

1) tengerszint;

2) a repülőgép tömege a tengerszinten engedélyezett legnagyobb felszállósúllyal egyenlő;

3) a felszálló felület sík, sima, száraz és kemény (szárazföldi repülőgép);

4) hullámzástól mentes – sima, meghatározott és közzétett sűrűségű vízfelület (vízi repülőgép);

b) a következő változó jellemzők kiválasztott tartományaira:

1) légköri viszonyok, nevezetesen a tengerszint feletti magasság valamint a nyomás-magasság és hőmérséklet;

2) a repülőgép tömege;

3) a felszállás irányával párhuzamos állandó szélsebesség érték;

4) a felszállás irányával merőleges állandó szélsebesség érték (vízi repülőgép);

5) a felszálló felület egységes lejtése (szárazföldi repülőgép);

6) a felszálló felület típusa (szárazföldi repülőgép);

7) a vízfelület állapota (vízi repülőgép);

8) a víz sűrűsége (vízi repülőgép);

9) az áramlások erőssége (vízi repülőgép).

2.1.2 A teljesítmény adatok kedvezőtlen légköri körülményeknek megfelelő módosításának módszerei tartalmazzanak tűrés értékeket a sebesség növelésére valamint az ilyen körülmények között a hajtómű hőmérséklet előírt szinten történő megtartása érdekében szükséges hajtómű burkoló lapok és a hűtőzsaluk helyzetének megfelelő szabályzására.

2.1.3 A vízi repülőgépek esetében a futómű és egyéb hasonló kifejezések, amennyiben alkalmazásra kerülnek, a bevonható úszótalpakra értendők.

2.2 Biztonságos felszálló sebesség

2.2.1 A biztonságos felszálló sebesség az a kiválasztott műszer szerint szabályozott repülési sebesség (CAS), amely nem alacsonyabb, mint:

a) két hajtóműves repülőgépek esetében 1.20 V_{S_1};

b) a kettőnél több hajtóműves repülőgépek esetében 1.15 V_{S_1};

c) a 2.3 pont előírásai alapján megállapított legalacsonyabb ellenőrzött repülési sebesség 1.10-szerese, azaz 1.10 V_{MC};
ahol a V_{S_1} a repülésvezérlő szerkezetek 2.3.1 b), c) és d) pontok alapján történő beállításának megfelelő.

2.3 Legalacsonyabb ellenőrzött repülési sebesség

2.31 A legalacsonyabb ellenőrzött repülési sebesség V_{MC} (amelynél a repülőgép kormányozható) az a sebesség, amely nem haladja meg az 1.2 V_{S_1} értéket, ahol a V_{S_1} a legnagyobb engedélyezett felszállósúlynak megfelelő, ha:

a) minden hajtómű legnagyobb felszálló teljesítményen üzemel;

b) a futómű behúzott helyzetben van;

c) a fékszárnyak felszállási helyzetben vannak;

d) a hajtómű burkoló lapok és a hűtőzsaluk beállítása rendes felszálláshoz ajánlott általános helyzetben van;

e) a repülőgép felszállás végrehajtásához kitrimmelt helyzetben van;

f) a repülőgép a levegőben van és a föld (párna) hatás elhanyagolható.

2.3.2 A legalacsonyabb ellenőrzött repülési sebesség az a sebesség, amelynél a repülőgép bármely hajtóművének leállítása esetén lehetséges a repülőgép irányíthatóságának helyreállítása olyan körülmények között, amikor annak egy hajtóműve továbbra sem működik továbbá ennél a sebességnél legyezőmozgás vagy 5 fokot meghaladó bedöntés nélkül lehetséges a repülőgép egyenes vonalú repülésének fenntartása.

2.3.3 A hajtómű leállításának időpontjától a repülőgép irányíthatóságának helyreállításáig a magasságvesztés megakadályozása nem igényel különleges szakmai jártasságot és tapasztalatot, figyelmet vagy fizikai erőt a repülőgépvezetőtől, csak amennyit a teljesítmény csökkenés vagy 20 fokosnál nagyobb irányváltozás igényel továbbá a repülőgép nem került veszélyes repülési helyzetbe sem.

2.3.4 A tapasztalatok bizonyították, hogy a repülőgép irányíthatóságának helyreállítása után és a megfelelő kitrimmelés előtt a repülőgép állandó, egyenes vonalú repülési helyzetben történő megtartásához ezen a sebességen nem szükséges az oldalkormányok 800 N-nál nagyobb erővel történő működtetése és nem szükséges a többi működő hajtómű teljesítményének csökkentése sem.

2.4 Kritikus pont

2.4.1 A kritikus pont az a kiválasztott pont, amelyen a feltételezés szerint a gyorsításból történő megállási távolság és a felszállási útvonal meghatározása céljából figyelembe vett kritikus hajtómű meghibásodás bekövetkezik. A repülőgépvezető számára a kritikus pont elérésének megállapítására egyértelmű és megbízható módszer álljon rendelkezésre.

2.4.2 Ha a kritikus pont úgy helyezkedik el, hogy az ott tapasztalható repülési sebesség a biztonságos felszálló sebességnél alacsonyabb, a repülőgép a tapasztalatok szerint a kritikus hajtómű meghibásodás minden esetében megfelelő módon irányítható és a felszállás az általános repülésvégrehajtási eljárásokkal és repüléstechnikával a többi hajtómű teljesítményének csökkenése nélkül biztonságosan folytatható, még akkor is, ha az a kritikus pontnak megfelelő legalacsonyabb sebességnél következik be.

2.5 Szükséges gyorsításból történő megállási távolság

2.5.1 A szükséges gyorsításból történő megállási távolság az az úthossz, amely az álló-helyzetből történő indulástól a kritikus pont eléréséig, továbbá feltételezve, hogy a kritikus hajtómű meghibásodás hirtelen ezen a ponton következik be, a szárazföldi repülőgép megállításához vagy a vízi repülőgép körülbelül 6 km/h (3 csomó) sebességre történő lelassításához szükséges.

2.5.2 A távolság meghatározása alkalmával a futómű fékek mellett vagy helyett más megbízható eszköz illetve módszer alkalmazása is figyelembe vehető, feltéve, hogy ezek működése megbízható és alkalmazásuk módja olyan, hogy általános üzemeltetési körülmények esetén hasonló eredmények várhatók továbbá használatuk során a repülőgép irányítása nem igényel különleges jártasságot.

2.5.3 A futómű ezen távolság megtétele alatt kibocsátott helyzetben van.

2.6 Felszállási útvonal

2.6.1 Általános rész

2.6.1.1 A felszállási útvonalat azaz repülési pályát a 2.6.2 pont alapján szakaszos vagy a 2.6.3 pont alapján folyamatos módszerrel vagy ezek kombinációjával határozzák meg.

2.6.1.2 A 2.6.2.1 c) 1) és 2.6.3.1 c) pontok előírásainak módosítása megengedhető akkor, ha a felszállási repülési pályát bólintás vezérlő automata használata befolyásolja, feltéve hogy a teljesítményszint biztonságát a 2.6 pont szerint gyakorlatban bizonyítják.

2.6.2 Szakaszos módszer

2.6.2.1 A felszállási útvonal kijelölése céljából a következő szakaszokat határozzák meg:

a) Az a távolság, amely a repülőgép álló helyzetből történő elindulásától addig a pontig tartó felgyorsításáig szükséges, amelynél a repülőgép a következő feltételek mellett először éri el a biztonságos felszálló sebességet:

1) a kritikus hajtóművet a kritikus ponton leállítják;

2) a repülőgép a földön vagy a föld közelében marad;

3) a futómű kiengedett helyzetben marad.

b) A biztonságos felszálló sebességgel megtett vízszintes távolság valamint a repülőgép elért magassága azon időtartam alatt, amíg a repülőgép a 2.6.2.1 a) alpontban jelzett pontot követően megkezdi és végrehajtja a futómű behúzását úgy, hogy:

1) a kritikus hajtómű nem működik, a légcsavarja vitorla helyzetben áll valamint a légcsavar állásszög szabályozás általános ajánlott felszállási helyzetben van, kivéve, ha a futómű behúzás befejezése később következik be, mint a 2.6.2.1 c) 1) alpont szerint megkezdett légcsavar leállítás, mert ekkor feltételezhető, hogy a légcsavar a futómű behúzásához szükséges idő alatt áll le;

2) a futómű kiengedett helyzetben van.

c) Amikor a futómű behúzás befejezése a légcsavar leállása előtt következik be, a repülőgép által megtett vízszintes távolság és elért magasság a 2.6.2.1 b) szakasz végétől addig az időpontig, amikor a nem működő légcsavar megáll, ha:

1) a légcsavar megállítási műveletet nem kezdik meg az előtt, hogy a repülőgép eléri és átrepüli a felszállási felület feletti 15.2 méter (50 láb) magasságot;

2) a repülőgép sebessége azonos a biztonságos felszálló sebességgel;

3) a futóművet behúzzák;

4) a nem működő légcsavar vitorla állásban és a légcsavar állásszög szabályozás ajánlott általános felszállási helyzetben van.

d) a repülőgép által megtett vízszintes távolság és elért magasság a 2.6.2.1 c) szakasz végétől addig az időpontig, amíg a elérik a felszálló teljesítmény alkalmazás korlátozásának határát biztonságos felszálló sebességgel repülve, ha:

1) a nem működő légcsavart megállították;

2) a futómű behúzott helyzetben van.

A felszállás kezdete óta eltelt időtartamot összesen öt percnél többre növelni nem szükséges.

e) A 2.6.2.1 d) pontban ismertetett módon elrendezett repülésvezérlő szerkezetek mellett valamint a többi működő hajtóművek legnagyobb folyamatos működési korlátozási értéken belül történő üzemeltetése mellett a repülőgép repülési pályájának emelkedése abban az esetben, amikor a felszálló teljesítmény alkalmazása 5 percnél rövidebb időtartamra van korlátozva.

2.6.2.2 A repülési szakaszok meghatározása alkalmával – amennyiben erre vonatkozóan kielégítő adatok állnak rendelkezésre – figyelembe lehet venni a légcsavar légellenállását a vitorlába állítás valamint a futómű légellenállását a behúzás végrehajtása alatt.
2.6.2.3 A felszállás és az ezt követő, fenti szakaszokkal meghatározott emelkedés során a fékszárny beállítás változatlan marad kivéve, hogy a kritikus pont elérése előtt és a kritikus pont után nem kevesebb mint 1 perccel változtatások végrehajthatók; ebben az esetben bizonyítást nyert, hogy a feladatok végrehajtása nem igényel szokatlan mértékű gyakorlati jártasságot, összpontosítást vagy erőfeszítést a repülőgépvezető részéről.

2.6.3 Folyamatos módszer

2.6.3.1 A felszállási útvonalat a tényleges felszállási repülési pálya alapján határozzák meg, amelynek során:

a) a kritikus hajtóművet a kritikus ponton leállítják;

b) az elemelkedést nem kezdik meg, amíg nem érik el a biztonságos felszálló sebességet és az elemelkedést követő emelkedés során a repülési sebesség nem csökken ezen érték alá;

c) a futómű behúzását nem kezdik meg, amíg nem érik el a biztonságos felszálló sebességet;

d) a fékszárny beállítás változatlan marad kivéve, hogy a kritikus pont elérése előtt és a kritikus pont után nem kevesebb mint 1 perccel változtatások végrehajthatók; ebben az esetben bizonyítást nyert, hogy a feladatok végrehajtása nem igényel szokatlan mértékű gyakorlati jártasságot, összpontosítást vagy erőfeszítést a repülőgépvezető részéről;

e) a légcsavar megállítási műveletet nem kezdik meg az előtt, hogy a repülőgép eléri és átrepüli a felszállási felület feletti 15.2 méter (50 láb) magasságot

2.6.3.2 A felszállás során esetleg tapasztalható bármely szélsebesség függőleges gradiens figyelembevételére valamint a megfelelő módosítások elvégzésére alkalmas módszerek állnak rendelkezésre.

2.7 Szükséges felszállási távolság

A szükséges felszállási távolság az a felszállási útvonal mentén meghatározott vízszintes távolság, amely a felszállás megkezdésétől addig a pontig tart, ahol a repülőgép eléri és átrepüli a felszállási felület feletti 15.2 méter (50 láb) magasságot.

2.8 A környezeti hőmérséklet figyelembevétele

A felszállósúly (tömeg) és felszállási úthossz kiszámításhoz az Egyezményes Légkör hőmérséklet alatti és feletti értékek figyelembevételéhez korrekciós tényezőket dolgoztak ki. Ezek megállapítása az alábbiak szerint történik:

a) Bármely meghatározott repülőgép típus vonatkozásában az átlagos teljes hőmérsékleti helyesbítést tömeg és tengerszint feletti magasság tartományokra valamint az üzemeltetés során várható hőmérsékleti értékhatárokra számítják ki. Figyelembe veszik a hőmérsékleti tényező hatását úgy a repülőgép aerodinamikai jellemzőire mint a hajtóművek teljesítményére. A teljes hőmérsékleti helyesbítést hőmérséklet fokonként felszállósúly (tömeg) és felszállási távolság (úthossz) korrekciós értékben valamint ha van, a kritikus pont helyzetének módosításában fejezik ki.

b) Ahol a felszállási útvonal meghatározását a 2.6.2 pont szerint végzik, a repülőgép felszállósúly (tömeg) és felszállási távolság üzemeltetési módosító tényezői legalább a teljes hőmérsékleti helyesbítő értékek felét tegyék ki. Ahol a felszállási útvonal meghatározását a 2.6.3 pont szerint végzik, a repülőgép felszállósúly (tömeg) és felszállási távolság üzemeltetési módosító tényezői azonosak a teljes hőmérsékleti helyesbítő értékekkel. Mindkét módszer esetében a kritikus pont helyzetét tovább módosítsák azzal az átlagos értékkel, amely szükséges annak biztosításához, hogy a repülőgép az adott környezeti hőmérsékleten meg tudjon állni a futópályán, azonban a repülőgép sebessége a kritikus ponton ne legyen alacsonyabb, mint az a legkisebb sebesség, amelynél a repülőgép a kritikus hajtómű üzemképtelensége esetén még irányítható marad.

3. Leszállás

3.1 Általános rész

Határozzák meg a leszállási teljesítményt:

a) a következő körülményekre:

1) tengerszint;

2) a repülőgép tömege egyenlő a tengerszinten engedélyezett legnagyobb leszállósúllyal;

3) a leszálló felület sík, sima, száraz és kemény (szárazföldi repülőgép);

4) hullámzástól mentes – sima, meghatározott és közzétett sűrűségű vízfelület (vízi repülőgép);

b) a következő változó jellemzők kiválasztott tartományaira:

1) légköri viszonyok, nevezetesen a tengerszint feletti magasság valamint a nyomás-magasság és hőmérséklet;

2) a repülőgép tömege;

3) a leszállás irányával párhuzamos állandó szélsebesség érték;

4) a leszálló felület egységes lejtése (szárazföldi repülőgép);

5) a leszálló felület típusa (szárazföldi repülőgép);

6) a vízfelület állapota (vízi repülőgép);

7) a víz sűrűsége (vízi repülőgép);

8) az áramlások erőssége (vízi repülőgép).

3.2 Leszállási távolság

3.2.1 A leszállási távolság az a vízszintes távolság, amely a leszálló felületen levő azon pontban kezdődik, amely felett a repülőgép 15.2 méter (50 láb) magasságon átrepül és addig a pontig tart, amelyen a szárazföldi repülőgép teljesen megáll vagy a vízi repülőgép körülbelül 6 km/h (3 csomó) sebességre lelassul.

3.3 Leszállási módszer

3.3.1 A leszállási távolság meghatározásánál:

a) közvetlenül a 15.2 méter (50 láb) magasság elérése előtt a megközelítés állandósult (stabilizált) repülési helyzetben van, a futóművet teljesen kibocsátották és a repülési sebesség nem kevesebb mint 1.3 V_{S_0};

b) a 15.2 méter (50 láb) magasság elérése után a repülőgép orrát a repülés közben nem nyomják lefelé és a tolóerőt a hajtómű teljesítmény változtatásával nem növelik;

c) a fékszárny leszálló helyzetbe van állítva és a végső megközelítés, kilebegtetés és földetérés során így is marad addig, amíg a repülési sebesség 0.9 V_{S_0} felett van. Ha a repülőgép a leszálló felületen van és a sebessége 0.9 V_{S_0}.alá csökkent, a fékszárny állás változtatható;

d) a leszállást olyan módon hajtják végre, hogy nincs túlzott mértékű függőleges gyorsulás, nem lép fel túlságosan nagy földetérés utáni elpattanás vagy ilyen tendencia, nem tapasztalható kormányzási nehézség vagy más nem kívánatos földetérési (vízfelület elérési) jellemző továbbá annak megismétlése a repülőgépvezető részéről nem igényel túlzottan nagy szakmai jártasságot és különlegesen kedvező körülményeket;

e) a futómű fékeket nem használják olyan módon, hogy azok túlzott mértékben megterheljék a fék szerkezeteket vagy a gumiabroncsokat és nem lépik túl az engedélyezett üzemi fékrendszer nyomás értékeket.

3.3.2 A leszállási távolság meghatározása alkalmával a futómű fékek mellett vagy helyett más megbízható eszköz illetve módszer alkalmazása is figyelembe vehető, feltéve hogy ezek megbízhatóak és alkalmazásuk módja olyan, hogy általános üzemeltetési körülmények esetén hasonló eredmények várhatók továbbá használatuk alatt a repülőgép irányítása nem igényel különleges jártasságot.
3.3.3 Az állandósult (stabilizált) megközelítés süllyedési értékét illetve a leszállási távolság meghatározásához használt módszert valamint a kritikus hajtómű meghibásodással végrehajtott leszállásra vonatkozó ajánlásokat és bármely más, a leszállási távolságot megváltoztató elfogadható jellemzőt vezessék be a repülésvégrehajtási kézikönyvbe.

Repülőgép teljesítmény üzemeltetési korlátozások – 2. példa

Cél és tárgykör

A következő példa célja az 5. fejezet előírásainak megfelelő teljesítmény szintek alkalmazásának bemutatása az alábbiakban ismertetett repülőgép típusok esetében. Ezt az anyagot már tartalmazta a 6. Annex most módosított és hatályát vesztett kiadása, amely 1953 május 1-én lépett hatályba. Az anyagot a Teljesítmény jellemzőkkel foglalkozó Állandó Bizottság[1] által kidolgozott követelmények alapján készítették el és az anyag számos részletet is tartalmazott annak érdekében, hogy az egyes országok sajátosságait minél jobban bemutathassák.

1 – *A Teljesítmény jellemzőkkel foglalkozó Bizottságot a Légialkalmassági és Üzemeltetési Osztály negyedik ülésszakán, 1951 évben hozták létre és az 1951 – 1953 között négy ülést tartott.*

A polgári szállító repülőgépek döntő többségét ezen előírásoknak megfelelően gyártották és üzemeltetik. Ezek a repülőgépek dugattyús, közöttük turbó-feltöltéses motorokkal, légcsavaros gázturbinával és sugárhajtóművel rendelkeznek. Közéjük tartoznak a kettő és négy motoros repülőgépek, amelyek tömege körülbelül 5500 kg-tól 70 000 kg-ig terjed, átesési sebesség tartományuk (V_{S0}) 110 – 170 km/h (60 – 90 csomó) között és szárny felület terhelésük hozzávetőlegesen 120 – 350 km/m^2 között van. Utazósebességük egészen 740 km/h-ig (400 csomó) terjed. Ezeket a repülőgépeket igen különböző repülési magasságokon, levegő hőmérsékleti és páratartalom körülmények között üzemeltetik.

Bár csak a múlt tapasztalatai igazolhatják azt a tényt, hogy a jelen példánk bemutatja azt a teljesítmény szintet, amelyet az 5. fejezet nemzetközi előírásai és ajánlott gyakorlati eljárásai határoznak meg, a példa alkalmasnak látszik a teljesítmény szintek ismertetésére, azonban egyes részleteket az egyedi esetekhez kell módosítani. Mindazonáltal ezen tételt illetően éljenek fenntartással. A jelen példa leszállási távolság meghatározását nem ugyanazon módszerekből vezették le, mint a többi előírást és ezért azok csak a melléklet 1. példájában megjelöltekre érvényesek.

A jelen példának nem célja a rövid felszállópályát igénylő (STOL) vagy függőlegesen felszálló (VTOL) repülőgépekre történő alkalmazás.

A példa időjárástól független meteorológiai körülmények között történő alkalmazhatóságának megállapítására nem készült részletes vizsgálat és ezért ennek helyességét nem bizonyították olyan üzemeltetési körülmények között, amikor alacsony elhatározási magasságokat valamint ezzel együtt alacsony repülőtér üzemeltetési minimumhoz szükséges módszereket és eljárásokat alkalmaznak.

1. Meghatározások

Kijelölt távolságok – Declared distances

a) Rendelkezésre álló felszállási nekifutási távolság (TORA) – A futópálya azon hosszúsága, amelyet a felszálló repülőgép földi nekifutására alkalmasnak és igénybevehetőnek nyilvánítanak.

b) Rendelkezésre álló felszállási távolság (TODA) – A rendelkezésre álló felszállás nekifutási távolság valamint ha ilyet kijelöltek, a biztonsági terület együttes hossza.

c) Rendelkezésre álló megállási távolság (ASDA) – A rendelkezésre álló felszállás nekifutási távolság valamint ha ilyet kijelöltek, a biztonsági megállási terület együttes hossza.

d) Rendelkezésre álló leszállási távolság (LDA) – A futópálya azon hosszúsága, amelyet a leszálló repülőgép leszállását követő földi kigurulására alkalmasnak és igénybevehetőnek nyilvánítanak.

Megjegyzés: A kijelölt távolságok kiszámítása a 14. Annex, I. kötet, A. mellékletében található

Kijelölt hőmérséklet – Declared temperature
Olyan módon meghatározott hőmérsékleti érték, hogy amikor azt a teljesítmény megállapítási célokra egy üzemeltetési sorozatban használják, a biztonság átlagos szintje nem alacsonyabb, mint ami a hivatalos előrejelzett hőmérsékleti értékek alkalmazásával elérhető.

Várható – Expected
A teljesítmény különböző elemeivel kapcsolatosan használt kifejezés (például emelkedés mértéke vagy foka), amely a típus szabványos, az adott körülmények (például tömeg, magasság és hőmérséklet) közötti teljesítmény értékét jelenti.

Magasság – Height
Egy szintnek, egy pontnak vagy egy pontnak tekintett tárgynak meghatározott vonatkozási alaptól mért függőleges távolsága.

Megjegyzés: A jelen példa esetében a fentiek alapján jelzett pont a repülőgép legalacsonyabb része, míg a meghatározott vonatkozási alap a felszállási vagy leszállási felület.

Leszállási felület – Landing surface
A repülőtér felületének az a része, amelyet a repülőtéri hatóság a repülőgép egy adott irányba történő leszállása utáni földi kigurulására vagy vízfelületen lassuló siklására alkalmasnak és igénybevehetőnek nyilvánít.

Teljes mértékű emelkedés – Net gradient
A teljes mértékű emelkedés értéke az emelkedés várható, az üzemeltetési feladathoz szükséges teljesítménnyel (azaz a manőverhez szükséges teljesítmény-többlet biztosításához végrehajtott emelkedés mértéke) és a tűrési határértékkel (az az emelkedési mérték, amely az előre nem látható teljesítmény ingadozások miatt szükséges) csökkentett mértéke.

Referencia páratartalom – Reference humidity
A hőmérséklet és a referencia páratartalom közötti kapcsolatot az alábbiak szerint határozzuk meg:

1. az Egyezményes Légkör hőmérsékletén és ez alatt 80 %-os relatív páratartalom;
2. az Egyezményes Légkör + 28 °C hőmérsékleten és e felett 34 %-os relatív páratartalom;
3. az Egyezményes Légkör és az Egyezményes Légkör + 28 °C közötti hőmérsékleten a relatív páratartalom lineárisan változik az adott hőmérséklethez tartozó páratartalom szerint.

Felszállási felület – Take-off surface
A repülőtér felületének az a része, amelyet a repülőtéri hatóság a repülőgép egy adott irányba történő felszállása alatti földi vagy vízfelületi nekifutására alkalmasnak és igénybevehetőnek nyilvánít.

Tényleges repülési sebesség – levegőhöz viszonyított – TAS – True airspeed
A repülőgép sebessége a mozdulatlan levegőhöz viszonyítva.

2. Felszállás

2.1 Tömeg

A repülőgép tömege ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb engedélyezett felszállósúly értéket arra a magasságra és hőmérsékletre vonatkozóan, amelyen a felszállást végrehajtják.

2.2 Teljesítmény

A repülőgép teljesítményét a repülésvégrehajtási kézikönyv adatai alapján határozzák meg úgy, hogy:

a) a szükséges gyorsításból történő megállási távolság ne haladja meg a rendelkezésre álló gyorsításból történő megállási távolságot;

b) a szükséges felszállási nekifutási távolság ne haladja meg a rendelkezésre álló felszállási nekifutási távolságot;

c) a szükséges felszállási távolság ne haladja meg a rendelkezésre álló felszállási távolságot;

d) a szükséges felszállási távolság végén, a talaj felett 10.7 méter (35 láb) magasságban kezdődő teljes felszállás repülési pálya biztosítson nem kevesebb mint 6 méter (20 láb) valamint 0.005 **D** függőleges elkülönítést minden akadály felett, amely 60 méter valamint a repülőgép fesztávjának fele és 0.125 **D** oldaltávolságon belül található a repülési pálya mindkét oldalán addig a pontig, ahol elérik az üzemeltetési kézikönyvben meghatározott útvonal repülési magasságot, kivéve azokat az akadályokat, amelyek a repülési pálya bármely oldalán 1500 méter távolságon túl helyezkednek el, mert ezeknél a fenti elkülönítés nem szükséges.

A **D** távolság az a vízszintes távolság, amelyet a repülőgép a rendelkezésre álló felszállási távolság vége után megtett.

Megjegyzés: Ezt a távolságot nem szükséges azon a ponton túl figyelembe venni, amelynél a repülőgép képes lenne további emelkedés nélkül a felszállási repülőtéren történő leszállás végrehajtásának megkezdésére vagy eléri a másik repülőtérre történő repülés megkezdéséhez szükséges legalacsonyabb biztonságos repülési magasságot.

Mindazonáltal az akadályoktól számított oldalirányú elkülönítés a fenti meghatározott értékek alá csökkenthető akkor és olyan mértékben, ahogy a repülőgépvezető segítséget kap a tervezett repülési pályától történő véletlen eltérés elkerülésére. Például különösen kedvezőtlen időjárási körülmények között egy pontos rádiónavigációs berendezés segítheti a repülőgépvezetőt a tervezett repülési pálya tartásában. Ehhez hasonlóan, ha a felszállást elég jó időjárási körülmények között hajtják vége, egyes esetekben lehetséges a jól látható, azonban a 2.2 d) pontban meghatározott oldalirányú határokon belül levő akadályok elkerülése.

Megjegyzés: A szükséges gyorsításból történő megállási távolság, a szükséges felszállási távolság és a felszállási repülési pálya meghatározásához használt eljárások a példához tartozó függelékben találhatók.

2.3 Feltételek

A 2.1 és 2.2 pontok vonatkozásában a teljesítmény az alábbiaknak megfelelő:
a) a repülőgép tömege a felszállás megkezdésekor;

b) a magasság egyenlő a repülőtér tengerszint feletti magasságával;

c) a környezeti hőmérséklet a felszállás időpontjában vagy egy meghatározott hőmérséklet érték, amely megfelelő átlagos teljesítmény szinthez tartozik; és a 2.2 alpont vonatkozásában;

d) a futópálya lejtése a felszállás irányába (szárazföldi repülőgép);

e) a jelentett szélsebesség összetevők nem több mint 50%-a a felszállás irányával szemben és nem kevesebb mint 150%-a a felszállás irányába. A vízi repülőgépek üzemeltetésének egyes eseteiben a felszállás irányára merőlegesen jelentett szélsebesség összetevőket is figyelembe kell venni.

2.4 Hajtómű meghibásodási pont

A 2.2 pont alkalmazásánál a 2.2 *a)* előírás teljesítéséhez kiválasztott hajtómű meghibásodási pont ne legyen közelebb az indulási ponthoz, mint amit a 2.2 *b)* valamint 2.2 *c)* előírásokhoz figyelembe vettek.

2.5 Fordulók

A teljes felszállási repülési pálya magába foglalhat fordulókat is, feltéve hogy;

a) az állandósult forduló számított sugara nem kisebb, mint amit a repülőgép repülésvégrehajtási kézikönyve erre előírt;

b) ha a felszállási repülési pálya tervezett irányváltozása meghaladja a 15 fokot, a felszállási repülési pálya biztonsági magassága az akadályok felett legalább 30 méter (100 láb) legyen a forduló végrehajtása alatt és után, továbbá vegyék figyelembe a repülésvégrehajtási kézikönyvben a forduló végrehajtása alatti meghatározott emelkedési mérték csökkenés tűréshatárait is;

c) a **D** távolságot a tervezett útvonal mentén mérjék.

3. Útvonalon

3.1 Minden hajtómű működik

A repülési útvonalon vagy az attól tervezett kitérés bármely pontján a repülőgép minden hajtóművének működése esetén a repülőgép tömegének – figyelembe véve a várhatóan elfogyasztott tüzelőanyag és olaj mennyiségét – megfelelő legnagyobb repülési magasság az adott ponton ne legyen alacsonyabb, mint a legalacsonyabb biztonságos magasság (lásd a 4. fejezet 4.2.6 pontját) vagy ha ez utóbbi a nagyobb érték, a repülőgép minden hajtóművének működése esetén a 3.2 és 3.3 pontok előírásainak teljesítésére tervezett magasság.

3.2 Egy hajtómű nem működik

A repülési útvonalon vagy az attól tervezett kitérés bármely pontján egy hajtómű meghibásodása esetén lehetséges a repülés folytatása egy útvonal kitérő repülőtérig, amelyen a leszállás a 4.2 pont alapján végrehajtható és a repülőtérre történő érkezéskor az emelkedés teljes mértéke a repülőtér tengerszint feletti magassága felett 450 méter (1500 láb) magasságon nem lesz nullánál kevesebb.

3.3 Két hajtómű nem működik (csak négy hajtóműves repülőgépek esetében)

A repülési útvonalon vagy az attól tervezett kitérés bármely pontján, ahol a repülőgép minden hajtóművének működése melletti utazósebességgel több mint 90 perc repülési időre van az útvonal kitérő repülőtértől, két hajtómű meghibásodása esetén a tiszta repülési pálya olyan legyen, hogy az ilyen repülőtérre történő érkezésig legalább 300 méter (1000 láb) magasságot tarthassanak a földfelszín felett.

Megjegyzés: A teljes repülési pálya meghatározható a várható emelkedési vagy süllyedési érték 0.2 %-al történő csökkentésével.

3.4 Feltételek

A 3.1, 3.2 és 3.3 pontok előírásainak teljesíthetőségét a következők alapján határozzák meg:

a) az előrejelzett hőmérsékletek vagy az azonos átlagos teljesítmény szintet meghatározó közzétett hőmérsékleti érték alapján;

b) az előrejelzett magassági szélsebesség adat az egész repülési tervre és hely alapján megállapítva;

c) a 3.2 és 3.3 pont esetében a hajtómű meghibásodás után számított emelkedés vagy süllyedés mértéke, az egyes számításban vett pontokra vonatkozó tömeg és magasság alapján;

d) azon feltételezés alapján, hogy ha a repülőgép a hajtómű meghibásodás után bármely ponton várhatóan képes az emelkedésre, kielégítő pozitív emelkedési mérték biztosítható;

e) a 3.2 pont esetében azon feltételezés alapján, hogy a hajtómű meghibásodás helye és a tervezett leszállási repülőtér között a repülőgép az egyes pontoknak megfelelő legalacsonyabb biztonságos magasság (lásd a 4.

fejezet 4.2.6 pontját) felett képes repülni;

f) a 3.2 pont esetében bármely ponton történő hajtómű meghibásodás alkalmára a navigációs hiba és a döntési nehézségek lehetőségére ésszerű mértékű tartalék magasság áll rendelkezésre.

4. Leszállás

4.1 Tömeg

A repülőgép számított tömege a tervezett leszállási vagy bármely célállomás kitérő repülőtéren történő leszállás várható időpontjában ne haladja meg a repülésvégrehajtási kézikönyvben a repülőtér magasságára meghatározott legnagyobb értéket.

4.2 Szükséges leszállási távolság

A tervezett leszállási vagy bármely célállomás kitérő repülőtéren a repülésvégrehajtási kézikönyv alapján meghatározott szükséges leszállási távolság ne legyen több, mint:
a) a legalkalmasabb leszállási felületen szélcsendben történő leszálláshoz rendelkezésre álló leszállási távolság; és ha ez utóbbi a nagyobb,
b) az érkezés időpontjában várható szélviszonyok miatt bármely más leszállási felületen történő leszálláshoz rendelkezésre álló leszállási távolság.

4.3 Feltételek

A 4.2 pont alapján szükséges leszállási távolság feleljen meg a következőknek:

a) a repülőgép számított tömege a leszállás várható időpontjában;

b) a magasság egyenlő a repülőtér tengerszint feletti magasságával;

c) a leszállás végrehajtásának időpontjában várható hőmérséklet vagy az azonos átlagos teljesítmény szintet meghatározó közzétett hőmérsékleti érték;

d) a felület lejtése a leszállás irányába;

e) a 4.2 *a)* pont vonatkozásában szélcsend;

f) a 4.2 *b)* pont vonatkozásában a várható szélsebesség összetevők nem több mint 50 %-a a leszállás iránya mentén valamint a leszállás irányával szemben és nem kevesebb mint 150 %-a a leszállás irányába.

2. példa függeléke

Repülőgép teljesítmény üzemeltetési korlátozások – Felszállási és leszállási teljesítmény meghatározásának eljárásai

1. Általános rész

1.1 Amennyiben erről más előírás nem rendelkezik, a referencia páratartalmat (nedvesség) és szélcsend körülményeket vegyék figyelembe.

1.2 A repülőgép teljesítményét úgy határozzák meg, hogy ne lépjék túl a repülőgép és rendszereinek elfogadott légialkalmassági korlátozásait.

1.3 A fékszárny beállítása feleljen meg a kiválasztott teljesítmény előírásoknak.

Megjegyzés: Amennyiben kívánatos, határozzanak meg alternatív fékszárny beállításokat is olyan módon, hogy azok egyszerű üzemeltetési módszerekkel alkalmazhatók legyenek.

1.4 A súlypont helyzetet megengedett tartományon belül úgy válasszák meg, hogy az ilyen elrendezéssel és hajtómű teljesítménnyel elérhető repülőgép üzemeltetési teljesítmény az adott helyzetben minimumnak tekintendő.

1.5 A repülőgép üzemeltetési teljesítményét úgy határozzák meg, hogy a hajtóműre elfogadott korlátozásokat semmiféle körülmények között ne lépjék túl.

1.6 Bár a legnagyobb várható hőmérséklet alapján bizonyos hűtőzsalu beállításokat meghatározhatnak, más beállítások is alkalmazhatók, amennyiben ezzel a biztonság szintjét tartani lehet.

1.7 A meghatározott teljesítményt úgy tegyék közzé, hogy az a repülőgép üzemeltetési korlátozásainak teljesítéséhez közvetlenül felhasználható legyen.

2. Felszállás

2.1 Általános rész

2.1.1 A következő felszállási adatokat határozzák meg az Egyezményes Légkör szerinti tengerszintre számított nyomásra, hőmérsékletre és referencia nedvességtartalomra, a sík, sima, száraz és kemény (szárazföldi repülőgép) felszálló felületnek és sima, meghatározott és közzétett sűrűségű (vízi repülőgép) vízfelületnek megfelelő legnagyobb felszállósúlyra (tömegre);

a) biztonságos felszálló és bármely egyéb vonatkozó sebességek;

b) hajtómű meghibásodási pont {*d), e), és f) tételekkel együtt*};

c) hajtómű meghibásodási pont jelzői, például repülési sebesség értéke {*d), e), és f) tételekkel együtt*};

d) szükséges gyorsításból történő megállási távolság;

e) szükséges felszállási nekifutási távolság;

f) szükséges felszállási távolság;

g) teljes felszállási repülési pálya;

h) állandó, 1. fokozatú (180° percenként) bedöntésű, a teljes felszállási repülési pálya meghatározásához alkalmazott sebességgel végrehajtott forduló sugara valamint a megfelelő emelkedési mérték csökkenés a 2.9 pont feltételei szerint.

2.1.2 Határozzák meg továbbá az adatokat a következő változó jellemzők kiválasztott tartományaira:

a) a repülőgép tömege;

b) a felszállási felület nyomás-magassága;

c) külső levegő hőmérséklete;

d) a felszállás irányával párhuzamos állandó szélsebesség érték;

e) a felszállás irányára merőleges állandó szélsebesség érték (vízi repülőgép);

f) a felszálló felület lejtése a szükséges felszállási távolság mentén (szárazföldi repülőgép);

g) a vízfelület állapota (vízi repülőgép);

h) a víz sűrűsége (vízi repülőgép);

i) az áramlások erőssége (vízi repülőgép).

j) hajtómű meghibásodási pont (a 2.4.3 pont előírásai alapján).

2.1.3 A vízi repülőgépek esetében a futómű és egyéb hasonló kifejezések, amenyiben alkalmazzák, a bevonható úszótalpakra értendők.

2.2 Biztonságos felszálló sebesség

2.2.1 A biztonságos felszálló sebesség az a kiválasztott műszer szerint szabályozott repülési sebesség (CAS), amely nem alacsonyabb, mint:

a) két hajtóműves repülőgépek esetében 1.20 V_{S_1};

b) több mint két hajtóműves repülőgépek esetében 1.15 V_{S_1};

c) elért legalacsonyabb ellenőrzött repülési sebesség 1.10-szerese, azaz
1.10 V_{MC} a 2.3 pont előírásai alapján;

d) a 2.9.7.6 pontban előírt legalacsonyabb sebesség;

ahol a V_{S1} a repülésvezérlő szerkezetek felszálláshoz történő beállításának megfelelő.

Megjegyzés: A V_{S_1} meghatározása az 1. példában található.

2.3 Legalacsonyabb ellenőrzött repülési sebesség

2.3.1 A legalacsonyabb ellenőrzött repülési sebesség az a sebesség, amelynél a repülőgép bármely hajtóművének leállítása esetén lehetséges a repülőgép irányíthatóságának helyreállítása abban az esetben, ha a repülőgép egy hajtóműve nem működik továbbá a repülőgép egyenes vonalú repülésének fenntartása legyezőmozgás[2] , vagy 5 fokot meghaladó bedöntés nélkül lehetséges.

[2] -A légijármű függőleges tengely körüli mozgása (elfordulás)

2.3.2 A hajtómű leállításának időpontjától a repülőgép irányíthatóságának helyreállításáig a magasságvesztés megakadályozása a repülőgépvezetőtől nem követel különleges szakmai jártasságot és tapasztalatot, figyelmet vagy fizikai erőt, csak amennyit a teljesítmény csökkenés vagy 20 fokosnál nagyobb irányváltozás igényel továbbá a repülőgép nem került veszélyes repülési helyzetbe sem.

2.3.3 A tapasztalatok bizonyították, hogy a repülőgép irányíthatóságának helyreállítása után és a megfelelő kitrimmelés előtt a repülőgép ezen a sebességen állandó, egyenes vonalú emelkedő repülési helyzetben történő megtartásához nem szükséges az oldalkormány 800 N-nál nagyobb erővel történő működtetése és nincs szükség a többi működő hajtómű teljesítményének csökkentésére sem.

2.4 Hajtómű meghibásodási pont

2.4.1 A hajtómű meghibásodási pont az a pont, ahol a vizsgált esetre vonatkozó kritikus teljesítmény tényező mellett feltételezik, hogy a hajtómű teljesítménye hirtelen és teljes mértékben elvész. A tapasztalatok azt mutatták, hogy ha az ehhez a ponthoz tartozó repülési sebesség alacsonyabb, mint a biztonságos felszálló sebesség, a hajtómű meghibásodási ponthoz tartozó legalacsonyabb sebességig minden repülési sebességen bekövetkező hirtelen kritikus hajtómű meghibásodás esetén a repülőgép kielégítően irányítható és kormányozható marad és a felszállás általános repülőgép vezető szakmai ismeretekkel biztonságosan folytatható:

a) a többi működő hajtómű tolóerejének csökkentése nélkül; és

b) olyan jellemzők fellépése nélkül, amelyek a nedves futópálya felületen a repülőgép nem megfelelő kormányozhatóságát okozzák.

2.4.2 Ha a kritikus hajtómű a repülésvezérlő szerkezetek beállítása szerint változik és ez a változás jelentős hatással van a teljesítményre, a kritikus hajtóműre vonatkozó minden egyes elemet kell külön-külön megvizsgálni vagy pedig azt kell bemutatni, hogy a meghatározott teljesítmény jellemzők minden hajtómű meghibásodás esetére alkalmazhatók.

2.4.3 Válasszanak ki hajtómű meghibásodási pontot minden egyes szükséges felszállási, felszállás alatti nekifutási és gyorsításból történő megállási távolsághoz. A repülőgépvezető számára biztosítsanak gyors és megbízható módszert (eszközt) az alkalmazható hajtómű meghibásodási pont elérésének meghatározására.

2.5 Szükséges gyorsításból történő megállási távolság

2.5.1 A szükséges gyorsításból történő megállási távolság az az úthossz, amely az álló-helyzetből történő indulástól a hajtómű meghibásodási pont eléréséig, továbbá feltételezve, hogy a kritikus hajtómű meghibásodás hirtelen ezen a ponton következik be, a szárazföldi repülőgép megállításához vagy a vízi repülőgép körülbelül 9 km/h (5 csomó) sebességre történő lelassításához szükséges.

2.5.2 A távolság meghatározása alkalmával a futómű fékek mellett vagy helyett más megbízható eszköz illetve módszer alkalmazása is figyelembe vehető, feltéve hogy ezek megbízhatóak és alkalmazásuk módja olyan, hogy általános üzemeltetési körülmények esetén hasonló eredmények várhatók továbbá használatuk alatt a repülőgép irányítása nem igényel különleges jártasságot.

2.6 Szükséges felszállási nekifutási távolság

A szükséges felszállási nekifutási távolság az alábbiak közül a nagyobbik érték:

1. azon távolság értékének **1.15** -szöröse, amely minden hajtómű működése esetén az álló helyzetből a biztonságos felszálló sebesség eléréséig tartó gyorsításhoz szükséges;

2. azon távolság értékének **1.00** -szerese, amely az álló helyzetből a biztonságos felszálló sebesség eléréséig tartó gyorsításhoz szükséges – feltételezve, hogy a kritikus hajtómű a hajtómű meghibásodási ponton üzemképtelenné válik.

2.7 Szükséges felszállási távolság

2.7.1 A szükséges felszállási távolság a felszállási felület feletti alábbi magasságok eléréséig szükséges távolság, miközben a kritikus hajtómű meghibásodás a hajtómű meghibásodási ponton következik be:

10.7 méter (35 láb) két hajtóműves repülőgépek esetében;

15.2 méter (50 láb) négy hajtóműves repülőgépek esetében.

2.7.2 A fent megadott magasságok azok a magasságok, amelyeket a repülőgép egyenes irányú repülési pályán, bedöntés nélkül, kiengedett futóművekkel éppen átrepült.

Megjegyzés: A 2.8 pont és a vonatkozó üzemeltetési előírások, amelyek a teljes felszállási repülési pálya kezdőpontját 10.7 méter (35 láb) magasságnál határozzák meg, biztosítják a megfelelő biztonsági elkülönítés elérését.

2.8 Teljes felszállási repülési pálya

2.8.1 A teljes felszállási repülési pálya azon egy üzemképtelen hajtóművel repült útvonal szakasz, amely a szükséges felszállási távolság végén 10.7 méter (35 láb) magasságon kezdődik és a 2.9 pont feltételeinek megfelelően legalább 450 méter (1500 láb) magasságig tart és ahol az emelkedés várható mértéke minden ponton az alábbi értékkel csökken:

0.5 % a két hajtóműves repülőgépek esetében;

0.8 % a négy hajtóműves repülőgépek esetében.

2.8.2 A repülőgép várható teljesítménye, amelyet a felszállási helyzetbe állított fékszárnyak és felszálló teljesítmény mellett feltételeznek, a kiválasztott biztonságos felszálló sebességen és 9 km/h-val (5 csomó) ezen sebesség alatt is biztosítható legyen.

2.8.3 A jelentős fordulók végrehajtásából származó hatásokat is vegyék figyelembe az alábbiak szerint:
Fordulósugár

Tegyék közzé az állandó, 1. fokozatú (180° percenként) bedöntésű, szélcsendben és különböző, a 450 méter (1500 láb) alatti teljes felszállási repülési pálya meghatározására alkalmazott egyes fékszárny beállításokhoz tartozó biztonságos felszálló sebességeknek megfelelő tényleges repülési sebességgel végrehajtott forduló sugarát.

Teljesítményváltozás
A fenti fordulók miatt bekövetkező, az alábbiaknak megfelelő teljesítmény csökkenés értékét tegyék közzé:

$\left[0.5\left(\frac{V}{185.2}\right)^2\right]$ %, ahol V a tényleges repülési sebesség km/h értékben; és

$\left[0.5\left(\frac{V}{100}\right)^2\right]$ %, ahol V a tényleges repülési sebesség csomó értékben.

2.9 Feltételek

2.9.1 Repülési sebesség

2.9.1.1 A szükséges felszállási távolság meghatározásánál a repülőgép a kiválasztott biztonságos felszálló sebességet a szükséges felszállási távolság vége előtt eléri.

2.9.1.2 A 120 méter (400 láb) magasság alatti teljes felszállási repülési pálya meghatározásánál a repülőgép tartja a kiválasztott biztonságos felszálló sebességet, azaz a fenti magasság elérése előtt gyorsulást nem vesznek figyelembe.

2.9.1.3 A 120 méter (400 láb) magasság feletti teljes felszállási repülési pálya meghatározásánál a repülési sebesség nem alacsonyabb a kiválasztott biztonságos felszálló sebességnél. Ha a repülőgépet a 120 méter (400 láb) magasság elérése után, azonban a 450 méter (1500 láb) magasság elérése előtt gyorsítják, akkor abból indulunk ki, hogy a gyorsítás szintrepülésben történik és mértéke megfelel a lehetséges tényleges gyorsulás 2.8.1 pont szerinti emelkedési mértékkel csökkentett értékének.

2.9.1.4 A teljes felszállási repülési pályához tartozik az útvonalrepülés kezdeti szakaszán alkalmazott repülésvezérlő szerkezet beállításra és repülési sebességre történő átmenet is. Az összes átmeneti szakasznál vegyék figyelembe a gyorsításra vonatkozó fenti utasításokat.

2.9.2 Fékszárnyak

2.9.2.1 A repülőgép fékszárnyai végig azonos (felszálló) helyzetben maradnak, kivéve:

a) 120 méter (400 láb) magasság elérése után a fékszárnyakat állíthatják, feltéve hogy a 2.9.1 pontban ismertetett repülési sebességeket megtartják és a következő szakaszokhoz tartozó biztonságos felszálló sebesség az új fékszárny beállításnak megfelelő;

b) a fékszárnyak állíthatók a legkorábbi hajtómű meghibásodási pont elérése előtt, amennyiben ezt általános üzemeltetési eljárásként határozzák meg.

2.9.3 Futómű

2.9.3.1 A szükséges gyorsításból történő megállási valamint a felszállási nekifutási távolságok meghatározásánál a futómű végig kibocsátott helyzetben van.

2.9.3.2 A szükséges felszállási távolság meghatározásánál a kiválasztott biztonságos felszálló sebesség elérése előtt a futómű behúzását nem kezdik meg, kivéve ha a kiválasztott biztonságos felszálló sebesség a 2.2 pontban előírt értéknél nagyobb, mert ekkor a futómű behúzását a 2.2 pontban előírt legalacsonyabb sebesség elérése után megkezdhetik.

2.9.3.3 A teljes felszállási repülési pálya meghatározásánál abból indulnak ki, hogy a futómű behúzását a 2.9.3.2 pontban előírtak előtt nem kezdik meg.

2.9.4 Hűtés

A teljes felszállási repülési pálya 120 méteres (400 láb) magassági pontja előtt és minden egyes átmeneti szakaszon, amely ezen magassági pontnál kezdődik, a motor burkoló hűtő-lapok helyzete olyan legyen, hogy az engedélyezett legnagyobb hőmérsékleten megkezdett felszállásnál és a várható legmagasabb környezeti hőmérséklet mellett sem lépik túl a vonatkozó maximális hőmérséklet korlátozás értékét. A teljes felszállási repülési pálya további szakaszain a motor burkoló hűtő-lapok helyzete olyan legyen, hogy az állandósult repülés alatt a várható legmagasabb környezeti hőmérséklet mellett sem lépik túl a vonatkozó maximális hőmérséklet korlátozás értékét. A felszállás megkezdésekor minden egyes hajtómű hűtő-lapjai a fentieknek megfelelő helyzetben legyenek és az üzemképtelen hajtómű hűtő-lapjai a szükséges felszállási távolság végének elérésekor zárva lehetnek.

2.9.5 A hajtómű egység állapotok

2.9.5.1 Az indulási ponttól a hajtómű meghibásodási pontig az összes hajtómű a legnagyobb felszálló teljesítménnyel működhet. A működő hajtóművek ne üzemeljenek a felszálló teljesítmény felső határán hosszabb ideig annál, mint ami az ilyen üzemeltetésre engedélyezve van.

2.9.5.2 A felszálló teljesítmény alkalmazhatóságának maximális időtartama után ne lépjék túl a legnagyobb folyamatos teljesítmény határértéket. A legnagyobb felszálló teljesítmény alkalmazásának időtartama általában a felszálláshoz történő nekifutás megkezdésekor kezdődik.

2.9.6 Légcsavar állapotok

Az indulási ponton minden egyes légcsavart a felszálláshoz ajánlott helyzetbe állítanak be. A légcsavar vitorla helyzetbe vagy (nagyobb) állásszögre történő állítását ne kezdjék meg a szükséges felszállási távolság vége előtt, kivéve ha ez önműködő vagy automata kiválasztó módszerrel történik.

2.9.7 Repüléstechnika

2.9.7.1 A teljes felszállási repülési pálya 120 méteres (400 láb) magassági pontja előtti részén a repülésvezérlő szerkezetek beállítását vagy a hajtómű teljesítményt ne változtassák abban az esetben, ha ennek eredménye az emelkedés mértékének csökkenése.

2.9.7.2 A repülőgépet ne vezessék úgy, hogy az a teljes felszállási repülési pálya bármely szakaszán negatív emelkedést, azaz süllyedést okozzon vagy ez elméletben lehetővé váljon.

2.9.7.3 Az állandósult repülési pálya azon részeihez kiválasztott repüléstechnikai módszerek esetében, amelyekre számszerű emelkedési érték nincs előírva, az emelkedés teljes mértéke 0.5 %-nál kevesebb ne legyen.

2.9.7.4 Határozzák meg és tegyék közzé az összes olyan tájékoztatást, amelyre a repülőgépvezetőnek a tervezett teljesítménynek megfelelő repülés-végrehajtáshoz szüksége lehet.

2.9.7.5 A repülőgépet tartsák a földön vagy a föld közelében addig a pontig, amíg a futómű behúzásának megkezdése engedélyezhető.

2.9.7.6 Ne tegyenek kísérletet a földfelszín elhagyására addig, amíg legalább a következő sebességeket elérik:

– összes működő hajtómű mellett a legalacsonyabb lehetséges elemelkedési sebességnél 15 %-kal magasabb sebesség;

– ha a kritikus hajtómű nem működik, a legalacsonyabb lehetséges elemelkedési sebességnél 7 %-kal magasabb sebesség;
ezek az elemelkedési sebesség határok azonban 10 % és 5 % értékre csökkenthetők, ha a korlátozás a futómű elrendezés és nem a földi átesési jellemzők miatt szükséges.

Megjegyzés: A fenti előírás teljesítését meghatározza az a cél, hogy a földfelszín elhagyását, vagyis az elemelkedést fokozatosan alacsonyabb sebességgel kíséreljék meg addig, amíg a földfelszín elhagyása és az emelkedés folytatása a fenti előírásoknak megfelelő sebességgel még lehetséges. A műveletnél a repülésvezérlő szerkezeteket általános módszerrel működtessék, de a magassági kormányt korábban és az általános mértéknél nagyobb kitérítéssel alkalmazhatják. Vegyék figyelembe, hogy a kísérleti manőver során az általános repüléstechnikai módszereknek és várható teljesítményeknek megfelelő repülőgép vezetési határértékek nem állnak rendelkezésre.

2.10 Számítási módszerek

2.10.1 Általános rész

A szükséges felszállási út hosszát a tényleges felszállások és földi nekifutások mért hosszúságából határozzák meg. A teljes felszállási repülési pályát az egyes szakaszok külön-külön, az állandósult repülés teljesítmény adatainak alapján számítják ki.

2.10.2 Teljes felszállási repülési pálya

A repülésvezérlő szerkezetek beállításának változtatását nem veszik figyelembe addig, amíg az be nem fejeződött, kivéve ha pontosabb adatok állnak rendelkezésre a jelentős mértékben pontatlanabb becslés alátámasztására. A földhatást figyelmen kívül hagyják.

2.10.3 Szükséges felszállási távolság

Elvégzik a szélsebesség függőleges értékének megfelelő korrekciókat.

3. Leszállás

3.1 Általános rész

3.1.1 A szükséges leszállási távolságot meghatározzák:

a) a következő körülményekre:

1) tengerszint;

2) a repülőgép tömege egyenlő a tengerszinten engedélyezett legnagyobb leszállósúllyal;

3) a leszálló felület sík, sima, száraz és kemény (szárazföldi repülőgép);

4) hullámzástól mentes – sima, meghatározott és közzétett sűrűségű vízfelület (vízi repülőgép);

b) a következő változó jellemzők kiválasztott tartományaira:

1) légköri viszonyok, nevezetesen a tengerszint feletti magasság vagy a nyomás-magasság és hőmérséklet;

2) a repülőgép tömege;

3) a leszállás irányával párhuzamos állandó szélsebesség érték;

4) a leszálló felület egységes lejtése (szárazföldi repülőgép);

5) a leszálló felület típusa (szárazföldi repülőgép);

6) a vízfelület állapota (vízi repülőgép);

7) a víz sűrűsége (vízi repülőgép);

8) az áramlások erőssége (vízi repülőgép).

3.2 Szükséges leszállási távolság

A szükséges leszállási távolság annak a vízszintes távolságnak 1/0.7 tényezővel való szorzata, amely a leszálló felületen levő azon pontban kezdődik, amely felett a repülőgép 15.2 méter (50 láb) magasságon átrepül és addig a pontig tart, amelyen a szárazföldi repülőgép teljesen megáll vagy a vízi repülőgép körülbelül 9 km/h (5 csomó) sebességre lelassul.

Megjegyzés: Egyes államokban az 1/0.7 helyett az 1/0.6 tényező használatát találták szükségesnek.

3.3 Leszállási módszer

3.3.1 A mért leszállási távolság meghatározásánál:

a) közvetlenül a 15.2 méter (50 láb) magasság elérése előtt a megközelítés állandósult (stabilizált) repülési helyzetben van, a futóművet teljesen kibocsátották és a repülési sebesség legalább 1.3 V_{S0};
Megjegyzés: A V_{S0} meghatározása az 1. példában található.

b) a 15.2 méter (50 láb) magasság elérése után a repülőgép orrát a repülés közben nem nyomják lefelé és nem növelik a tolóerőt a hajtómű teljesítmény változtatásával;

c) a teljesítményt nem csökkentik olyan módon, hogy bármely ponton egészen a földetérésig a megszakított leszállás emelkedési előírásainak megfelelő teljesítményt ne tudnák öt másodpercen belül elérni;

d) a jelen módszerrel történő leszállási távolság valamint útvonal hossz meghatározás alkalmával sugárfordító vagy negatív légcsavarszög beállítást nem használnak. Földi, kis mértékű légcsavarszög állítást alkalmaznak, ha a leszállási távolság légi szakaszán a tényleges ellenállás/súly arány nem kevésbé kielégítő, mint a hagyományos, dugattyús hajtóművel felszerelt repülőgép esetében;

Megjegyzés: Ez nem jelenti azt, hogy a sugárfordító vagy negatív légcsavarszög beállítás illetve a kis mértékű földi légcsavarszög állítás tilos.

e) a fékszárny leszálló helyzetbe van állítva és így is marad, amíg a repülési sebesség 0.9 V_{S0} felett van a végső megközelítés, kilebegtetés és földetérés során. Ha a repülőgép a leszálló felületen van és a sebessége 0.9 V_{S0} alá csökkent, a fékszárny állás változtatható;

f) a leszállást olyan módon hajtják végre, hogy nincs túlzott mértékű függőleges gyorsulás, nem lép fel túlságosan nagy földetérés utáni elpattanás vagy ilyen tendencia, nem tapasztalható kormányzási nehézség vagy más nem kívánatos földetérési (vízfelület elérési) jellemző továbbá annak megismétlése a repülőgépvezető részéről nem igényel túlzottan nagy szakmai jártasságot és különlegesen kedvező körülményeket;

g) a futómű fékeket nem használják olyan módon, hogy azok túlzott mértékben megterheljék a fék szerkezeteket vagy a gumiabroncsokat és nem lépik túl az engedélyezett üzemi fékrendszer nyomás értékeket.

3.3.2 Az állandósult megközelítés süllyedési értéket valamint a leszállási távolság meghatározásához használt módszer részleteit, továbbá a kritikus hajtómű üzemképtelensége mellett végrehajtott leszállásra vonatkozó ajánlott repüléstechnikai módszert, a hozzátartozó jellemzőket és az ezekből adódó változásokat a repülésvégrehajtási kézikönyvben tegyék közzé.

Repülőgép teljesítmény üzemeltetési korlátozások – 3. példa

Cél és tárgykör

Az alábbi példa célja az 5. fejezet előírásainak megfelelő teljesítmény szintek alkalmazásának bemutatása az 5700 kg legnagyobb engedélyezett felszállósúly (tömeg) feletti, kettő vagy több sugárhajtóműves, hangsebesség alatt üzemelő szállító repülőgépek vonatkozásában. Mindazonáltal ahol ez lehetséges és megfelelő, a példa alkalmazható az összes kettő, három vagy négy gázturbinás sugárhajtóművel vagy dugattyús hajtóművel felszerelt hangsebesség alatt üzemelő repülőgépekhez is. Ez a példa megfelelőnek mutatkozott az 1969-ben érvénybe lépett alapvető országos légialkalmassági előírások vonatkozásában is.
Nem végeztünk tanulmányokat a jelen anyagnak az olyan sugárhajtóműves, hangsebesség alatt üzemelő repülőgépekre történő alkalmazhatóságáról, amelyek jellemzői mások, mint az 1969-ig üzembe állított sugárhajtóműves repülőgépeké. Ennek a példának nem célja a rövid felszállópályát igénylő (STOL) vagy függőlegesen felszálló (VTOL) repülőgépekre történő alkalmazás.
A példa időjárástól független meteorológiai körülmények között történő alkalmazhatóságának megállapítására nem készült részletes vizsgálat és ezért ennek helyességét nem bizonyították olyan üzemeltetési körülmények között, amikor alacsony elhatározási magasságokat valamint ezzel együtt alacsony repülőtér üzemeltetési minimumhoz szükséges módszereket és eljárásokat alkalmaznak.

1. Általános rész

1.1 Teljesítsék az 1 – 5 pontok előírásait, kivéve ha az ezektől való eltéréseket a lajstromozó állam azon az alapon külön engedélyezi, hogy az adott eset különleges körülményei az előírások figyelembevételét a repülésbiztonság szempontjából szükségtelenné teszik.

1.2 Az 1 – 5 pontok előírásainak teljesítése a repülésvégrehajtási kézikönyv teljesítmény adatai alapján és más alkalmazható üzemeltetési előírásoknak megfelelő történjen. A repülésvégrehajtási kézikönyv korlátozásait semmilyen esetben nem léphetik túl. Mindazonáltal amennyiben a repülésvégrehajtási kézikönyvben nem található üzemeltetési körülmények alakulnak ki, további korlátozásokat is alkalmazhatnak.

1.3 Kövessék a repülésvégrehajtási kézikönyvben található eljárásokat, kivéve ha az üzemeltetési körülmények a kívánt biztonsági szint fenntartása érdekében más, módosított eljárások végrehajtását teszik szükségessé.

Megjegyzés: A vonatkozó légialkalmassági teljesítményekkel kapcsolatos útmutató a Légialkalmassági Kézikönyvben *(Doc 9760) található*
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2. Repülőgép felszálló teljesítmény korlátozások

2.1 A repülőgép nem szállhat fel olyan tömeggel, amely meghaladja a repülésvégrehajtási kézikönyvben a repülőtér tengerszint feletti magasságára valamint a felszállás időpontjában uralkodó külső levegő hőmérsékletre meghatározott felszállósúlyt (tömeget).

2.2 A repülőgép nem szállhat fel olyan tömeggel, amely a célállomásig vagy a célállomás kitérő repülőtérig való repülése során normál esetben elfogyasztott tüzelőanyag és olaj mennyiség figyelembevételével meghaladja a repülésvégrehajtási kézikönyvben az összes érintett repülőtér tengerszint feletti magasságára valamint a leszállás várható időpontjában uralkodó külső levegő hőmérsékletre meghatározott leszállósúlyt (tömeget).

2.3 A repülőgép nem szállhat fel olyan tömeggel, amely meghaladja azt az értéket, ami megfelel a repülésvégrehajtási kézikönyvben található legalacsonyabb felszálló távolságoknak. Ezek a 2.3.1 – 2.3.3 pontokban jelzett távolságok megfelelnek az igénybe vett repülőtér, futópálya, biztonsági és végbiztonsági területek tengerszint feletti magasságának, a futópálya és a biztonsági terület lejtviszonyainak, a végbiztonsági terület síkja lejtésének valamint a felszállás időpontjában uralkodó külső hőmérsékleti és szélviszonyoknak.

2.3.1 A szükséges felszállási nekifutási távolság ne haladja meg a futópálya hosszát.

2.3.2 A szükséges gyorsításból történő megállási távolság ne haladja meg a futópálya és ahol van, a végbiztonsági megállási terület együttes hosszát.

2.3.3 A szükséges felszállási távolság ne haladja meg a futópálya és ahol van a biztonsági terület együttes hosszát, kivéve hogy a futópálya és a biztonsági terület hosszának összegét semmi esetre sem vehetik többnek, mint a futópálya hosszának másfélszerese.

2.4 Ne vegyék figyelembe a végbiztonsági megállási vagy a biztonsági terület hosszát, amennyiben azok nem felelnek meg a 14. Annex I. kötet vonatkozó előírásainak.

Megjegyzés: A rendelkezésre álló futópálya hossz meghatározásakor vegyék figyelembe a futópálya igénybe vehető hosszának a repülőgép kigurulása miatt bekövetkező csökkenését, ha van ilyen.

3. Felszállási akadálymentességi korlátozások

3.1 A repülőgép nem szállhat fel olyan tömeggel, amely meghaladja a repülésvégrehajtási kézikönyvben meghatározott, teljes felszállási repülési pályának megfelelő felszállósúlyt (tömeget), amely lehetővé teszi az összes akadály függőlegesen legalább 10.7 méter (35 láb) magassággal vagy oldalirányba legalább 90 méter és 0.125 **D** távolsággal történő biztonságos átrepülését. A **D** az a vízszintes távolság, amelyet a repülőgép a 3.1.1 – 3.1.3 pontokban meghatározottak kivételével a rendelkezésre álló felszállási távolság vége után megtesz. A teljes felszállási repülési pályától történő engedélyezett eltérés meghatározása alkalmával, melynek célja, hogy az akadályokat legalább a meghatározott távolságokkal elkerüljék, abból indulnak ki, hogy a repülőgépet nem döntik be (nem kezdenek fordulóba) mielőtt a teljes felszállási repülési pálya biztonsági távolsága legalább 15.2 méter (50 láb) az akadályok felett, továbbá a bedöntés mértéke ez után sem haladja meg a 15°-ot. A figyelembe vett teljes felszállási repülési pálya a repülőtér tengerszint feletti magassága valamint a felszállás időpontjában uralkodó külső hőmérsékleti és szélviszonyoknak megfelelő.

3.1.1 Ahol a tervezett repülési pálya 15°-osnál nagyobb irányváltozásokat nem tartalmaz; és;

a) a repülést nappal és látvarepülési körülmények között; vagy

b) olyan navigációs berendezések segítségével hajtják végre, amelyekkel a repülőgépvezető a repülőgépet a 3.1.1. a) alpontnak megfelelő pontossággal tudja a tervezett repülési pályán tartani, a tervezett repülési pálya két oldalán 300 méternél nagyobb oldaltávolságra levő akadályokat nem szükséges figyelembe venni.

3.1.2 Ahol a tervezett repülési pálya nem tartalmaz 15°-osnál nagyobb irányváltozásokat és a repülést műszerrepülési vagy éjszaka látvarepülési körülmények között hajtják végre, a 3.1.1 b) kivételével; valamint ahol a tervezett repülési pálya 15°-osnál nagyobb irányváltozásokat tartalmaz és repülést nappal és látvarepülési körülmények között hajtják végre, a tervezett repülési pálya két oldalán 600 méternél nagyobb oldaltávolságra levő akadályokat nem szükséges figyelembe venni.

3.1.3 Ahol a tervezett repülési pálya 15°-osnál nagyobb irányváltozásokat tartalmaz és a repülést műszerrepülési vagy éjszaka látvarepülési körülmények között hajtják végre, a tervezett repülési pálya két oldalán 900 méternél nagyobb oldaltávolságra levő akadályokat nem szükséges figyelembe venni.

4. Korlátozások az útvonalon

4.1 Általános rész

4.1.1 A három vagy több hajtóművel felszerelt repülőgép tervezett repülési útvonal egyetlen pontján sem lehet minden hajtóművének működése melletti rendes utazósebességgel több mint 90 perc repülési időre attól a repülőtértől, amelyre az 5.2 pontban a kitérő repülőterekre meghatározott távolság előírások alkalmazhatók és ahol, kivéve a 4.3.1.1 pont előírásainak teljesítését, biztonságos leszállás végrehajtható.

Megjegyzés: A két hajtóműves repülőgépek megnövelt hatótávolságú üzemeltetésének engedélyezése a jelen rész 4.7 szakaszában található.

4.2 Egy hajtómű nem működik

4.2.1 A repülőgép nem szállhat fel olyan tömeggel, amely meghaladja a repülésvégrehajtási kézikönyvben meghatározott, egy üzemképtelen hajtómű mellett a teljes útvonal repülési pályának megfelelő felszállósúlyt (tömeget), amely lehetővé teszi az útvonal minden pontján a 4.2.1.1 vagy 4.2.1.2 pontok előírásainak teljesítését. A teljes repülési pálya azon repülőtér feletti 450 méter (1500 láb) magasságán, ahol a leszállást a hajtómű meghibásodás után tervezik, pozitív lejtésszöggel rendelkezzen. A teljes repülési pálya meghatározásánál vegyék figyelembe az útvonalon várható hőmérsékleti értékeket. Olyan időjárási körülmények között, ahol a jegesedés elleni védő rendszerek működése szükséges lehet, ezek használatának hatásait is vegyék figyelembe.

4.2.1.1 A teljes repülési pálya a tervezett útvonal mentén annak középvonalától mindkét oldalra számított 9.3 km (5 NM) távolságon belül minden tereppont és akadály felett legalább 300 méter (1000 láb) magasságú pozitív lejtésszöggel rendelkezzen.

4.2.1.2 A teljes repülési pálya biztosítsa, hogy a repülőgép utazómagasságáról folytathassa repülését egy repülőtérig, ahol a leszállás az 5.2 pont alapján végrehajtható. A teljes repülési pálya a tervezett útvonal mentén annak középvonalától mindkét oldalra számított 9.3 km (5 NM) távolságon belül minden tereppont és akadály felett legalább 600 méter (2000 láb) elkülönítést biztosítson. Alkalmazzák továbbá a 4.2.1.2.1–4.2.1.2.5 pontok előírásait is.

4.2.1.2.1 Feltételezzük, hogy a hajtómű meghibásodás az útvonal leginkább kritikus pontján következik be továbbá a navigációs hiba és a döntési nehézségek lehetőségére ésszerű mértékű tartalék magasság áll rendelkezésre.

4.2.1.2.2 Figyelembe vesszük a szél hatásait a repülési pályára.

4.2.1.2.3 Amennyiben biztonságos eljárást alkalmaznak, a tüzelőanyag-kibocsátás olyan mértékben engedélyezhető, amely elegendő tartalékkal biztosítja a repülőtér elérését.

4.2.1.2.4 Az üzemeltetési repülési tervben határozzák meg azt a repülőteret, amelyen a repülőgép a hajtómű meghibásodás után várhatóan leszáll és az feleljen meg a vonatkozó repülőtér üzemeltetési minimumnak.

4.2.1.2.5 A hajtómű meghibásodása után a tüzelőanyag és olaj fogyasztás olyan legyen, mint amit a repülésvégrehajtási kézikönyvben a teljes repülési pályára meghatároztak.

4.3 Két hajtómű nem működik

4.3.1 Azok a repülőgépek, amelyek nem teljesítik a 4.1 pont előírását, tegyenek eleget a 4.3.1.1 pont előírásainak.

4.3.1.1 A repülőgép nem szállhat fel olyan tömeggel, amely meghaladja a repülésvégrehajtási kézikönyvben meghatározott, kettő üzemképtelen hajtómű mellett a teljes útvonal repülési pályának megfelelő felszállósúlyt (tömeget), amely lehetővé teszi a repülés folytatását attól a ponttól, ahol a két hajtómű egyidejűleg meghibásodik egy repülőtérig, ahol leszállási távolságok megfelelnek a kitérő repülőterekre vonatkozó előírásoknak (lásd 5.2) és ahol várható, hogy a leszállás biztonságosan végrehajtható. A teljes repülési pálya a tervezett útvonal mentén annak középvonalától mindkét oldalra számított 9.3 km (5 NM) távolságon belül minden tereppont és akadály felett legalább 600 méter (2000 láb) elkülönítést biztosítson. A teljes repülési pálya meghatározásánál vegyék figyelembe az útvonalon várható hőmérsékleti értékeket. Olyan időjárási körülmények között, ahol a jegesedés elleni védő rendszerek működése szükséges lehet, ezek használatának hatásait is vegyék figyelembe. Alkalmazzák továbbá a 4.3.1.1.1–4.3.1.1.5 pontok előírásait is.

4.3.1.1.1 Azt feltételezik, hogy a két hajtómű meghibásodása az útvonal leginkább kritikus pontján következik be, ahol a repülőgép normál utazósebességgel több mint 90 perc repülési időre van attól a repülőtértől, amelyre az 5.2 pontban a kitérő repülőterekre meghatározott leszállási távolság előírások alkalmazhatók és ahol várható, hogy a leszállás biztonságosan végrehajtható.

4.3.1.1.2 A teljes repülési pálya azon repülőtér felett, ahol a leszállást a két hajtómű meghibásodása után tervezik, 450 méter (1500 láb) magasságon pozitív lejtésszöggel rendelkezzen.

4.3.1.1.3 Amennyiben biztonságos eljárást alkalmaznak, a tüzelőanyag-kibocsátás a 4.3.1.1.4 pontnak megfelelő mértékben engedélyezhető.

4.3.1.1.4 Abból indulunk ki, hogy a repülőgép tömege azon a ponton, ahol a két hajtómű a feltételezés szerint meghibásodik, nem kevesebb, mint azon tüzelőanyag mennyiséggel megnövelt tömeg, amely tüzelőanyag lehetővé teszi a repülés folytatását és a repülőtér elérését közvetlenül a leszálló terület felett legalább 450 méter (1500 láb) magasságon és ezt követően utazó teljesítménnyel további 15 perc repülést.

4.3.1.1.5 A hajtóművek meghibásodása után a tüzelőanyag és olaj fogyasztás olyan legyen, mint amit a repülésvégrehajtási kézikönyvben a teljes repülési pályára meghatároztak.

5. Leszállási korlátozások

5.1 Célállomás repülőtér

5.1.1 A repülőgép nem szállhat le olyan tömeggel, amely meghaladja a repülésvégrehajtási kézikönyvben előírt, a tervezett célállomás repülőterének tengerszint feletti magassága alapján meghatározott leszállási távolságoknak megfelelő értéket. A repülőgép tömege tegye lehetővé a repülőgép teljes lefékezését a tervezett leszállási repülőtéren rendelkezésre álló tényleges futópálya teljes hosszán belül, amely távolságot a repülőtéri hatóságok a megközelítési terület akadályai alapján tesznek közzé. Feltételezzük, hogy a repülőgép tömege a tervezett célállomás repülőtérre történő repülés során elfogyasztott tüzelőanyag és olaj mennyiséggel (ennek súlyával) csökken. Vegyék figyelembe az 5.1.1.3 és az 5.1.1.4 vagy 5.1.1.5 pontokat.

5.1.1.1 Alapfeltételezés, hogy a futópálya lejtése nulla, kivéve ha a futópályát csak egy irányba használják.

5.1.1.2 A futópálya felület állapota nem kedvezőbb annál (nedves vagy száraz), mint amit figyelembe vettek.

Megjegyzés: Az országos hatóságok részéről olyan alkalmas módszerek kidolgozása szükséges, amelyek révén figyelembe vehetik a futópálya felületének állapotát (nedves vagy száraz).

5.1.1.3 Alapfeltételezés, hogy a repülőgép szélcsendben a legkedvezőbb futópályán és a legkedvezőbb irányba száll le.

5.1.1.4 Alapfeltételezés, hogy a repülőgép azon a futópályán száll le, amelyik a leszállás időpontjában a

várható szélviszonyok figyelembevételével a legalkalmasabb. Ennek elbírálása során figyelembe veszik a szél irányát és sebességét, a repülőgép földi kiszolgálási jellemzőit valamint más tényezőket (például leszálláshoz rendelkezésre álló segédeszközök, földfelszín, stb.) is.
5.1.1.5 Amennyiben az 5.1.1.4 pont teljesítése nem bizonyított, a repülőgép felszállhat, ha a kijelölt célállomás kitérő repülőtér megfelel az 5.2 pont előírásának.

5.2 Célállomás kitérő repülőtér

Egy repülőtér célállomás kitérő repülőtérként csak akkor jelölhető ki, ha a repülőgép tömege az ilyen repülőtérre történő érkezés várható időpontjában a repülésvégrehajtási kézikönyvben a kitérő repülőtér tengerszint feletti magasságára meghatározott szükséges leszállási távolsággal valamint a kitérő repülőtérre vonatkozó más alkalmazható üzemeltetési utasításokkal összhangban megfelel az 5.1 pont előírásainak.

D. Melléklet
Repülési adatrögzítők
Kiegészítés a 6. fejezet 6.3 szakaszhoz

Bevezető

A jelen mellékletben található anyag a nemzetközi légiközlekedésben üzemeltetni kívánt repülőgépeken felszerelni kívánt repülési adatrögzítő berendezésekkel foglalkozik. A repülési adatrögzítők két rendszerből, a repülőgép repülési adatrögzítőből valamint a pilótakabin hangrögzítőből állnak. A repülőgép repülési adatrögzítők a rögzítendő adatok mennyiségétől, azaz a jellemző adatok számától valamint a rögzített tájékoztatások időtartamától függően I. típus, II. típus és IIA. típus csoportba tartoznak.

1. Repülési adatrögzítő (FDR)

1.1 Általános követelmények

1.1.1 A repülési adatrögzítő a repülési idő alatt folyamatosan rögzítse az adatokat.

1.1.2 A repülési adatrögzítő burkolata:

a) feltűnő narancs-sárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot; és

c) rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzet-jelző berendezéssel.

1.1.3 A repülési adatrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentsék a rögzített adatok sérülésének lehetőségét. Ennek érdekében a berendezést a repülőgép fedélzetén a lehető leghátrább tegyék; a túlnyomásos kabinnal ellátott repülőgép esetében a berendezést a hátsó nyomásálló válaszfal közelében helyezzék el;

b) a berendezés elektromos táplálását olyan áramkörről kapja, amely a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát; és

c) hallás vagy látás utáni lehetőség legyen az adatrögzítő megfelelő működésének repülés előtt történő ellenőrzésére.

1.2 Rögzítendő adatok és jellemző értékek

1.2.1 Az *I. típusú repülési adatrögzítő*

Ez a repülési adatrögzítő a repülőgépnek megfelelően képes legyen legalább a D-1. táblázatban található 32 féle repülési adat rögzítésére. A repülőgép típusának és a rögzítő berendezés jellemzőinek figyelembe-vételével azonban a felsoroltaktól eltérő más adatok is rögzíthetők.
1.2.1 A *II. és IIA. típusú repülési adatrögzítő*

Ez a repülési adatrögzítő a repülőgépnek megfelelően képes legyen legalább a D-1. táblázatban található első 15 féle repülési adat rögzítésére. A repülőgép típusának és a rögzítő berendezés jellemzőinek figyelembevételével azonban a felsoroltaktól eltérő más adatok is rögzíthetők.

1.3 Kiegészítő tájékoztatások

1.3.1 A IIA. típusú repülési adatrögzítő a 30 perces felvételi idő mellett kalibrálási célokból rögzítsen megfelelő mennyiségű tájékoztatást a felszállást megelőző időszakból is.

1.3.2 A felszerelt berendezés mérési tartományát, rögzítési időközeit, a repülési adatok és jellemzők pontosságát általában a légialkalmassági bizonyítványt kiadó illetékes hatóság módszerei alapján jogosítják.

1.3.3 A repülési adatrögzítőre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások;

b) a repülési adatok és jellemzők eredetét vagy forrását valamint a megfelelő mértékegységre történő átszámítás módozatait; és

c) a gyártó ellenőrző felülvizsgálatának eredményét.

1.3.4 A rögzített adatok jellemzőire, az átváltási számításokra, időszakos kalibrálásokra, valamint egyéb karbantartási és/vagy üzemeltetési tájékoztatásokra vonatkozó dokumentációt a járató tartsa naprakész állapotban. Ez a dokumentáció alkalmas kell legyen arra, hogy a baleset kivizsgáló hatóságok beszerezhessék a szükséges tájékoztatásokat a rögzített adatok megfelelő létesítményekben történő feldolgozásához.

2. Pilótakabin hangrögzítő berendezés (CVR)

2.1 Általános követelmények

2.1.1 A hangrögzítő berendezést úgy tervezzék meg, hogy az legalább a következőket rögzítse:

a) a repülőgép fedélzetén vett és leadott szóbeli rádió közlemények;

b) a repülőgép pilótakabinjának belső hangkörnyezete;

c) a hajózószemélyzet tagjainak szóbeli közleményei, amelyhez a repülőgép belső távközlési rendszerét használják;

d) a navigációs vagy megközelítési berendezéseket azonosító szó vagy hangjelek, amelyek a fejhallgatóban vagy a külső hangszóróban hallhatók;

e) a hajózószemélyzet tagjainak az utastájékoztató rendszer – amennyiben ilyen felszereltek – segítségével adott szóbeli tájékoztatása ; és

f) a légiforgalmi szolgálatokkal folytatott digitális adatcsere, kivéve ha ezt a repülési adatrögzítő veszi fel.

2.1.2 A hangrögzítő burkolata:

a) feltűnő narancs-sárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot; és *c)* rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzet-jelző berendezéssel.

2.1.3 A beszéd és a hangok megkülönbözetésének megkönnyítése érdekében a mikrofonokat a pilótakabinban a felvétel szempontjából legalkalmasabb helyekre helyezzék el, hogy azok a legjobb minőségben vegyék a légijármű vezetője és a másodpilóta munkahelyéről származó valamint a pilótakabinban más hajózószemélyzeti tagoktól az előbbieknek szánt közleményeket és szóbeli tájékoztatásokat. Ez az igény legjobban a külön felvételi csatornákon folyamatosan rögzítő irányított mikrofonok segítségével teljesíthető.

2.1.4 A pilótakabin hangrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentsék a felvétel sérülésének lehetőségét. Ennek érdekében a berendezést a repülőgép fedélzetén a lehető leghátrább tegyék; a túlnyomásos kabinnal ellátott repülőgép esetében a berendezést a hátsó nyomásálló válaszfal közelében helyezzék el;

b) a berendezés elektromos táplálását olyan áramkörről kapja, amely a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát; és

c) hallás vagy látás utáni lehetőség legyen az adatrögzítő megfelelő működésének repülés előtt történő ellenőrzésére; és

d) amennyiben a hangrögzítő berendezés gyors-törlő egységgel rendelkezik, a felszerelést úgy tervezzék meg, hogy megakadályozzák a gyors-törlőnek a repülés időtartama alatti vagy egy becsapódástól származó ütés következtében történő működésbe lépését.

2.2 Teljesítmény követelmények

2.2.1 A hangrögzítő berendezés a 6. fejezet 6.3.7.2 pontjában jelzett kivételével képes legyen legalább négy felvételi sáv egyidejű rögzítésére. A sávok közötti pontos idő összefüggés biztosítása érdekében a hangrögzítő berendezés soros *(in-line)* rendszerben működjön. Amennyiben két felvételi irányt (oda-vissza játszó) alkalmaznak, mindkét irányba biztosítsák a soros működést és a helyes csatorna elosztást.

2.2.2 A legkívánatosabb sáv elosztás a következő:

1. sáv – másodpilóta fejhallgatója és élő hangot közvetítő szerelt mikrofonja

2. sáv – légijármű parancsnok fejhallgatója és élő hangot közvetítő szerelt mikrofonja

3. sáv – pilótakabin belső mikrofonja

4. sáv – idő referencia jel valamint a hajózószemélyzet harmadik és negyedik tagjának (ha van) fejhallgatója és egyéni mikrofonja

1. Megjegyzés: Az 1. sáv a felvevő-fej aljához legközelebb levő sáv legyen.

2. Megjegyzés: A kívánatos sáv kiosztás vonatkozásában feltételezzük a jelenleg leggyakrabban alkalmazott hagyományos mágnes-szalag továbbító szerkezet használatát és a kiosztás oka az, hogy a szalag külső szélei sérülékenyebbek a szalag középső részénél. Nem zárjuk ki az egyéb, ettől eltérő hangrögzítő berendezés alkalmazását, amelynél a fenti korlátozó tényezők esetleg nem állnak fenn.

2.2.3 Amikor a hangrögzítő berendezést az illetékes légialkalmasságot elbíráló hatóság elfogadott módszereivel ellenőrzik, mutassák be és bizonyítsák, hogy a berendezés képes olyan szélsőséges körülmények között működni, amelyek között történő üzemelésre azt tervezték.

2.2.4 Megfelelő módszert alkalmazzanak a repülőgép repülési adatrögzítő valamint a pilótakabin hangrögzítő berendezések közötti pontos-idő kapcsolat fenntartására.

Megjegyzés: Ennek egyik módszere a repülőgép repülési adatrögzítő idő-jelének átvitele a pilótakabin hangrögzítő berendezésre.

2.3 További tájékoztatások

2.3.1 A pilótakabin hangrögzítő berendezésre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások; és

b) a gyártó ellenőrző felülvizsgálatának eredményét.

3. A repülési adatrögzítő és a pilótakabin hangrögzítő rendszerek ellenőrzése

3.1 Az adott nap első repülési feladatának megkezdése előtt vizsgálják meg a repülési adatrögzítő (FDR), a pilótakabin hangrögzítő (CVR) rendszerek valamint – ha ilyeneket felszereltek – a repülési adatgyűjtő berendezés (FDAU) pilótakabinban levő beépített ellenőrző egységeit.

3.2 Az éves felülvizsgálatot a következők szerint hajtsák végre:

a) a repülési adatrögzítő és pilótakabin hangrögzítő (FDR és CVR) berendezések felvett adatainak visszajátszása biztosítsa, hogy a rögzítő berendezések a névleges felvételi időtartamon belül megfelelően működnek;

b) a repülési adatrögzítő adatainak elemzésével értékeljék a rögzített adatok minőségét annak meghatározása érdekében, hogy a bit-hiba arány elfogadható értékek között van továbbá, hogy a hibák természete és eloszlása milyen képet mutat;

c) a repülési adatrögzítő rendszer működését ellenőrző szervezetnél az összes rögzített jellemző érvényességének vizsgálata érdekében egy teljes repülés adatait elemezzék ki. Különösen nagy figyelmet szenteljenek a repülési adatrögzítőnek közvetlen adatot biztosító érzékelőktől származó jellemzőknek. A légijármű elektromos hálózati rendszerétől származó jellemzőket nem szükséges ellenőrizni abban az esetben, ha annak működőképességét a légijármű más rendszerei segítségével ellenőrizni lehet;

d) a repülési adatrögzítő ellenőrző szervezet rendelkezzen a rögzített értékek pontos leolvasásához és átalakításához valamint az egyes jelek pontos megkülönböztethetőségéhez szükséges software csomagokkal;

e) pilótakabin hangrögzítő felvett adatainak éves vizsgálatát a felvétel visszajátszásával végezzék el. Amikor a berendezést a légijármű fedélzetén felszerelik, a CVR vegyen fel az ellenőrző jeleket minden egyes belső fedélzeti és a megfelelő külső forrásokból annak biztosítása érdekében, hogy az összes felvétel megfelel az érthetőségre vonatkozó előírásoknak; és

f) ahol ez gyakorlatilag lehetséges, az éves ellenőrzés során vizsgálják meg a pilótakabin hangrögzítő repülés közbeni felvételeinek egy részét annak biztosítása érdekében, hogy a jelek érthetősége elfogadható legyen.

3.3 A repülési adatrögzítő rendszerek működésképtelennek tekintendők, ha az adatok jelentősebb ideig rossz minőségűek, érthetetlenek vagy a kötelezően rögzítendő jellemzők közül egy vagy több pontatlanul illetve nem helyesen kerül rögzítésre.

3.4 Az éves ellenőrzésről készített jegyzőkönyvet kérésre bocsássák az állam felügyeleti hatósága rendelkezésére.

3.5 A repülési adatrögzítő rendszer kalibrálása:

a) a repülési adatrögzítő rendszert legalább öt-évente kalibrálják újra a kötelező jellemzők műszaki rögzítés átalakítási módszereinek helyességét érintő bármely hiányosságok megállapítása érdekében és annak biztosítása céljából, hogy a jellemzőket a kalibrálási tűrési határ-értéken belül rögzíti; és

b) amikor a repülési magasság és sebesség jellemzők a repülési adatrögzítő rendszernek közvetlen adatot biztosító érzékelőktől származnak, ezeket az érzékelőket a gyártó szervezet ajánlásai alapján vagy legalább két-évente kalibrálják újra.

D-1. táblázat
A repülési adatrögzítővel rögzítendő adatok és jellemzők

No	*Jellemző*	*Mérési tartomány*	*Rögzítés időköz (mp)*	*Mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)*
1	idő (UTC ha rendelkezésre áll vagy eltelt repülési idő)	24 óra	4	± 0.125 % óránként
2	nyomás-magasság	-300 m (- 1000 láb) -tól a légijármű engedélyezett legnagyobb repülési magassága felett +1500 m (+ 5000 láb) -ig	1	±30 méter – ±200 méter (± 100 láb – ± 700 láb)
3	műszer szerinti repülési sebesség	95 km/h (50 csomó) -tól maximum. V_{S_0} –ig *(1. Megjegyzés)*	1	± 5 %
		V_{S_0} -tól 1.2 V_D -ig *(2. Megjegyzés)*	°1	± 3 %
4	géptengely irányszög	360°	1	± 2°
5	függőleges gyorsulás	-3 g-től +6 g-ig	0.125	maximális tartomány ± 1 % -a, az 5 % adathiba kivételével
6	bólintási helyzet	± 75°	1	± 2°
7	dőlési helyzet	± 180°	1	± 2°
8	rádióadás kapcsoló	be/ki kapcsolva: az egyik parancsjel	1	
9	az egyes hajtóművek teljesítménye *(3. Megjegyzés)*	teljes tartomány (hajtóművenként)	1	± 2 %
10	kilépőél fékszárny helyzet vagy vezérlő kapcsoló állás	teljes tartomány vagy minden egyes parancsjel helyzet	2	± 5 % vagy repülőgépvezető jelzése szerint
11	orrsegédszárny helyzet	teljes tartomány vagy	2	± 5 % vagy

No	***Jellemző***	***Mérési tartomány***	***Rögzítés időköz (mp)***	***Mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)***
	vagy vezérlő kapcsoló állás	minden egyes parancsjel helyzet		repülőgépvezető jelzése szerint
12	sugárfordító helyzet	alaphelyzet, átállás alatt, átállt helyzet (hajtóművenként)	1	
13	földi aerodinamikai fék vagy repülési sebesség csökkentő (interceptor) választás	teljes tartomány vagy minden egyes parancs helyzet	1	± 2 %, kivéve ha nagyobb pontosságot írnak elő
14	külső levegő hőmérséklete	a mérőműszer érzékelési tartománya	2	±2° C
15	robotpilóta / tolóerő automata / automatikus repülésvezérlő rendszer üzemmód és működési helyzet	az egyszeri parancsjelek megfelelő kombinációja	1	
16	hosszirányú gyorsulás	± 1 g	0.25	maximális tartomány ± 1.5 % -a, a ± 5 % adathiba kivételével
17	oldalirányú gyorsulás	± 1 g	0.25	maximális tartomány ± 1.5 % -a, a ± 5 % adathiba kivételével
18	a repülőgép elsődleges vezérlő szerkezeteinek kezelése és/vagy a kormány felületek helyzete *(4. Megjegyzés)*	teljes tartomány	1	± 2 ^{0}, kivéve ha nagyobb pontosságot írnak elő
19	bólintás trimm helyzet	teljes tartomány	1	± 3 %, kivéve ha egyedi helyzetben nagyobb pontosságot írnak elő
20	rádió magasságmérő	- 6 m – 750 m között (- 20 láb – 2500 láb között)	1	150 m (500 láb) alatt ± 0.6 m (± 2 láb) vagy 3% – amelyik a nagyobb érték 150 m (500 láb) felett ± 5 %
21	eltérés a siklópályától	jeltartomány	1	± 3 %
22	eltérés az iránysávtól	jeltartomány	1	± 3 %
23	helyzetjelző adók átrepülése (marker)	egyszeri parancsjel	1	
24	központi riasztó jelzés	egyszeri parancsjel	1	
25	1. és 2. navigációs készlet frekvencia beállítás *(5. Megjegyzés)*	teljes tartomány	4	felszerelés szerint
26	1. és 2. DME távolságok *(5. és 6. Megjegyzés)*	0 – 370 km	4	felszerelés szerint
27	futómű kibocsátó	egyszeri parancsjel	1	

No	*Jellemző*	*Mérési tartomány*	*Rögzítés időköz (mp)*	*Mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)*
	kapcsoló helyzete			
28	GPWS földközelség riasztó rendszer	egyszeri parancsjel	1	
29	állásszög	teljes tartomány	0.5	felszerelés szerint
30	alacsony nyomású hidraulika rendszer (egyenként)	egyszeri parancsjel	2	
31	navigációs adatok (szélesség / hosszúság, föld feletti sebesség, széleltérítési szög) *(7. Megjegyzés)*	felszerelés szerint	1	felszerelés szerint
32	futómű vagy futómű választó helyzet	egyszeri parancsjel	4	felszerelés szerint

Az első **15** jellemző megfelel a II. típusú repülőgép repülési adatrögzítőre vonatkozó követelményeknek.

*A fenti **32** jellemző megfelel az I. típusú repülőgép repülési adatrögzítőre vonatkozó követelményeknek.*

Megjegyzések:

1. *V_{S_0} az átesési vagy legalacsonyabb állandósult repülési sebesség a repülésvezérlő szerkezetek leszállási beállítása mellett.*

2. *V_D tervezési süllyedési sebesség (sikló sebesség).*

3. *A teljesítmény meghatározásához szükséges megfelelő mértékű bemenőjel rögzítése.*

4. *A hagyományos repülésvezérlő (bólintás, dőlés, elfordulás) szerkezetekkel felszerelt repülőgépek esetében a „vagy” szó alkalmazandó. A nem mechanikus repülésvezérlő szerkezetekkel felszerelt repülőgépek esetében az „és” szó alkalmazandó. A réselt felületekkel felszerelt repülőgépek esetében az egyes elemek adatai helyett elfogadható a műveletek megfelelő kombinációjának rögzítése.*

5. *Amennyiben a jel digitális formában áll rendelkezésre.*

6. *Javasolt választási lehetőség a területi navigációs, az inerciális vagy más navigációs rendszerek meghatározásából kapott földrajzi szélességi és hosszúsági adatok rögzítése.*

7. *Ha az ilyen jelek könnyen beszerezhetők.*

Amennyiben további rögzítési kapacitás áll rendelkezésre, javasoljuk a következő kiegészítő adatok és tájékoztatások rögzítését:

a) Az elektronikus megjelenítő rendszerek segítségével rendelkezésre álló üzemeltetési tájékoztatások. Az ilyen rendszerek közé tartoznak az alábbiak:

1. EFIS elektronikus repülési műszerrendszer

2. ECAM központi elektronikus légijármű képernyő

3. EICAS hajtómű ellenőrző és hajózószemélyzet riasztó rendszer

A következő fontossági sorrendet alkalmazzák:

1. a kívánatos repülési pályára vonatkozó adatok és jellemzők a hajózószemélyzet kiválasztása alapján, például: barometrikus nyomásmagasság-mérő beállítás, kiválasztott repülési magasság és sebesség, elhatározási magasság, automatikus repülésvezérlő rendszer bekapcsolása és üzemmód jelzése, ha azt más forrásból nem rögzítik;

2. a megjelenítő rendszer kiválasztása és beállítása, mint például: SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, stb.;

3. figyelmeztetések és riasztások;

4. a vészhelyzeti eljárások és ellenőrző listák megjelenített oldalainak oldalszám alapján történő azonosítása.

b) lassításra vonatkozó tájékoztatások, beleértve a fékek alkalmazását is a leszállás utáni túlfutással járó vagy a megszakított felszállás eseteinek vizsgálatához;
c) további hajtómű adatok és működési jellemzők, például: EPR, N_1, EGT, tüzelőanyag fogyasztás illetve áramlás, stb.

E. Melléklet
Két gázturbinás sugárhajtóművel felszerelt repülőgépek megnövelt hatótávolságú üzemeltetése
Kiegészítés a 4. fejezet 4.7 szakaszhoz

1. Cél és tárgykör

1.1 Bevezető

A jelen melléklet célja azon küszöb-idő értékével kapcsolatos útmutató biztosítása, amelyet a 4. fejezet 4.7.1 pontja alapján határoznak meg. Útmutatást kívánunk továbbá adni a 4. fejezet 4.7.2 pontjában ismertetett előírt biztonsági szintre vonatkozóan is azokban az esetekben, amikor a megállapított küszöb-időn túli üzemeltetést engedélyezik.

1.2 Küszöb-idő

Vegyék figyelembe, hogy a 4. fejezet 4.7.1 pontja alapján meghatározott küszöb-idő nem üzemeltetési határérték, hanem egy megfelelő útvonal kitérő repülőtértől számított repülési idő, amelyen túl a járató államának az engedélyezés előtt különös mértékben kell megvizsgálnia az adott repülőgép típust és üzemeltetést. A két hajtóműves kereskedelmi szállító repülőgép ilyen üzemeltetésére vonatkozó további adatok beszerzésétől függően és a 4. fejezet 4.7.2 pontban jelzett előírt biztonsági szint figyelembevételével javasoljuk, hogy ez a küszöb-idő 60 perc legyen.

1.3 Alapvető elmélet

Az előírt biztonsági szint fenntartása érdekében olyan útvonalakon, ahol a két hajtóműves repülőgép üzemeltetését a küszöb-időn túl engedélyezik, szükséges hogy:

a) a repülőgép rendszereinek tervezése és a működési megbízhatósága figyelembevételével a repülőgép típus légialkalmassági bizonyítványában kifejezetten engedélyezzék a küszöb-időn túli üzemeltetést;

b) a hajtómű rendszer megbízhatósága olyan legyen, hogy az egymástól független okok miatt bekövetkező kettős hajtómű meghibásodás lehetősége nagyon ritkán forduljon elő;

c) teljesítsék az összes szükséges karbantartási követelményt;

d) teljesítsék a különleges és egyedi repülés-előkészítési követelményeket;

e) meghatározzák és alkalmazzák a szükséges repülés közbeni üzemeltetési eljárásokat; és

f) a járató állama megadja a különleges üzemeltetési engedélyt.

2. Meghatározások

Amennyiben a jelen mellékletben a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Megfelelő kitérő repülőtér – Adequate alternate aerodrome
Megfelelő kitérő repülőtér az a repülőtér, ahol a leszállási teljesítmény előírások teljesíthetők és az szükség szerint várhatóan rendelkezésre áll. A repülőtér rendelkezik a szükséges létesítményekkel és szolgálatokkal, mint a légiforgalmi irányítás, meteorológiai szolgálat, távközlési, fénytechnikai, navigációs berendezések illetve eszközök, tűzoltó és mentő szolgálat valamint legalább egy alkalmas műszeres megközelítési eljárás.

Repülőgép rendszer – Aeroplane system
A repülőgép rendszer magába foglalja a rendszer minden olyan elemét, amely egy meghatározott fő repülési feladat vezérléséhez és teljesítéséhez szükséges. Ida tartoznak a kérdéses feladat végrehajtásához külön rendszeresített berendezések valamint más, a repülőgép alapfelszereléséhez tartozó egységek is, mint például a berendezések üzemeltetéséhez szükséges tápfeszültség. Ebben az értelemben a hajtómű nem tartozik a repülőgép rendszeréhez.

Megnövelt hatótávolságú üzemeltetés – Extended range operations
Kettő gázturbinás sugárhajtóművel felszerelt repülőgép bármely repülése, ahol a repülési idő az útvonal egy pontjától a megfelelő kitérő repülőtérig egy hajtómű üzemképtelensége melletti utazósebességgel (Egyezményes Légkörben és szélcsendben) meghaladja a járató állama által elfogadott küszöb-időt.

Hajtómű egység – Power unit
A hajtóműből és arra a repülőgépbe történő beépítése előtt felszerelt összes kiegészítő egységből és alkatrészből álló rendszer, amely a hajtóerő/tolóerő biztosítására és a repülőgép rendszereinek táplálására valamint az ilyen hajtóerők vezérlésére szolgál. Nem tartoznak ide a független, rövid ideig tolóerőt biztosító szerkezetek.

Meghajtó rendszer – Propulsion system
A hajtómű egységből és minden olyan egyéb berendezésből álló rendszer, amelyeket bármely hajtómű egység által biztosított hajtóerő/tolóerő fenntartására, ellenőrzésére és vezérlésre szükséges feladatok ellátása céljából a hajtómű felszerelése után a sárkányszerkezetbe beépítettek.

Alkalmas kitérő repülőtér – Suitable alternate aerodrome
Alkalmas kitérő repülőtér az a repülőtér, ahol az igénybevétel várható időpontjában az időjárás jelentések vagy előrejelzések illetve ezek együttese azt jelzi, hogy az időjárási körülmények az előírt repülőtér üzemeltetési minimumon vagy annál jobbak lesznek továbbá a futópálya felületi állapotáról szóló jelentések szerint lehetséges a biztonságos leszállás végrehajtása.

3. Légialkalmassági követelmények a megnövelt hatótávolságú üzemeltetéshez

A megnövelt hatótávolságú üzemeltetésre tervezett repülőgép típus légialkalmassági jogosítása során különösen ügyeljenek az előírt biztonsági szint fenntartására olyan körülmények között, amelyek az ilyen repülés végrehajtása során bekövetkezhetnek. Ezek közé tartozik a hosszú ideig tartó repülés egy hajtómű és/vagy az alapvető repülési rendszerek meghibásodása után. Dolgozzák ki és vegyék fel a repülőgép repülésvégrehajtási kézikönyvébe, karbantartási kézikönyvébe vagy más megfelelő okmányába a megnövelt hatótávolságú üzemeltetéssel kapcsolatos különleges tájékoztatásokat és eljárásokat.

Megjegyzés: A repülőgép rendszereinek teljesítményére valamint megbízhatóságára vonatkozó követelményeket a megnövelt hatótávolságú üzemeltetés esetére a Légialkalmassági Kézikönyv (*Doc 9760) tartalmazza*

.

4. A meghajtó rendszer fejlettsége és megbízhatósága

4.1 A megnövelt hatótávolságú üzemeltetés engedélyezése alkalmával elsősorban a meghajtó rendszer fejlettségét és megbízhatóságát vegyék figyelembe. Ezek olyanok legyenek, hogy az egymástól független okok miatt bekövetkező teljes hajtóerő elvesztés kockázata különösen alacsony legyen.

4.2 A meghajtó rendszer fejlettségének és működése megbízhatóságának felmérésére szolgáló egyetlen lehetőség a hajtóművel kapcsolatos, az egész világra kiterjedő tapasztalatok figyelembevételével kialakított műszaki megítélés.

4.3 Azon meghajtó rendszer vonatkozásában, amelynek megbízhatóságát már megállapították, minden egyes országos hatóságnak – megvizsgálva a járató közel hasonló típusokkal kapcsolatos megbízhatósági jellemzőit és statisztikáit – értékelnie kell a járató képességét a megbízhatósági szint fenntartására.

5. Légialkalmassági módosítások és karbantartási program előírások

Minden járató karbantartási programja biztosítsa, hogy:

a) a repülőgép rendszereinek a megnövelt hatótávolságú üzemeltetésre történő jogosítása érdekében végrehajtott minden egyes légialkalmassági módosítását, kiegészítését és változtatását közöljék a lajstromozó állammal és ahol szükséges, a járató államával is;

b) a megnövelt hatótávolságú üzemeltetésre történő jogosítás érdekében bevezetett karbantartási és kiképzési eljárások, gyakorlatok vagy korlátozások bármely változását annak elfogadása és hatályba lépése előtt nyújtsák be a járató államának és ahol szükséges, a lajtromozó államnak is;

c) a jogosítás előtt dolgozzanak ki és vezessenek be megbízhatósági jelentési programot és azt a jogosítás után folyamatosan alkalmazzák;

d) a meghajtó rendszer megbízhatóságát befolyásoló szükséges módosításokat és ellenőrzéseket pontosan végezzék el;

e) dolgozzanak ki eljárásokat annak megelőzésére, hogy az előző repülési feladat teljesítése során hajtómű leállítással vagy elsődleges rendszer hibával üzemelő repülőgépet megnövelt hatótávolságú üzemeltetésre jelöljék ki addig, amíg a fenti meghibásodás okát pontosan meghatározták és a szükséges javításokat elvégezték. Bizonyos esetekben a megnövelt hatótávolságú üzemeltetésre történő kijelölés előtt az ilyen szükséges javítás elvégzésének megerősítéséhez egy általános repülési feladat sikeres teljesítése szükséges; és *f)* dolgozzanak ki eljárást annak biztosítására, hogy a fedélzeti berendezések a megnövelt hatótávolságú üzemeltetésnek megfelelő teljesítmény szinten és megbízhatósággal üzemeljenek.

6. Repülés előkészítési követelmények

A 4. fejezet általános repülés előkészítési előírásainak alkalmazása során külön figyelmet szenteljenek azoknak a körülményeknek, amelyek a megnövelt hatótávolságú üzemeltetés során tapasztalhatók. Ezek közé tartozik a hosszantartó repülés egy üzemképtelen hajtóművel, alapvető rendszer működőképességének csökkenése, csökkentett repülési magasságon történő repülés és így tovább. A 4. fejezet 4.7.3 pontja előírásai mellett vegyék figyelembe legalább a következő tényezőket:

a) a rendszer repülés előtti üzemképessége;

b) a távközlési és navigációs létesítmények és ezek teljesítőképessége;

c) a tüzelőanyag szükséglet; és

d) a vonatkozó teljesítmény tájékoztatások beszerzésének lehetőségei.

7. Az üzemeltetés alapelvei

A megnövelt hatótávolságú üzemeltetésre felhasznált repülőgép általában:

a) egy hajtómű leállása esetében képes legyen elrepülni a legközelebbi (legkevesebb repülési időt igénylő) leszállásra alkalmas repülőtérig és ott leszállást végrehajtani;

b) az elsődleges repülőgép rendszerek egyedi vagy többszörös meghibásodása esetén képes legyen elrepülni a legközelebbi alkalmas repülőtérig és ott leszállást végrehajtani, kivéve ha bizonyították, hogy a meghibásodásnak a repülés végrehajtását érintő következményei valamint a további meghibásodások valószínűsége és következményei a tervezett repülés folytatása során nem csökkentik jelentős mértékben a repülés biztonságát; és

c) a minimális felszerelési jegyzékbe tartozó berendezések, a távközlési és navigációs létesítmények, a tüzelőanyag és olaj tartalék, az útvonal kitérő repülőterek vagy a repülőgép teljesítménye meghatározott állapotának változását eredményező események után megfelelő változásokat hajtanak végre a repülési tervben.

8. Az üzemeltetés engedélyezése

A két gázturbinás sugárhajtóművel felszerelt repülőgépnek a 4. fejezet 4.7.2 pontja alapján megnövelt hatótávolságú útvonalon történő üzemeltetésére történő engedélyezése során a járató állama a jelen mellékletben korábbiakban meghatározott előírások mellett győződjön meg arról, hogy:

a) a járató múltbeli szakmai tapasztalatai és az előírások betartásáról szóló jelentései (jegyzőkönyvei) kielégítőek;

b) a járató bebizonyította, hogy az alábbiakban ismertetett várható csökkent működésképesség mellett a repülés folytatható a biztonságos leszállás végrehajtásáig;

1) egy hajtómű tolóerejének teljes elvesztése; vagy

2) a hajtómű segítségével biztosított elektromos tápfeszültség teljes elvesztése; vagy

3) bármely olyan más körülmény, amelyet a járató állama a légialkalmasság vagy teljesítmény kockázat szempontjából lényegesnek ítél;

c) a járató személyzetének kiképzési programja a javasolt üzemeltetésnek megfelelő; és

d) az engedélyezéssel kapcsolatos dokumentumok tartalmazzák az összes szükséges tényezőt és jellemzőt.

F. Melléklet
Légijármű üzembentartási engedély vagy más ezzel egyenértékű dokumentum

Kiegészítés a 4. fejezet, 4.2.1 ponthoz

1. Cél és tárgykör

1.1 Bevezetés

A jelen melléklet célja, hogy az államok által a járatók 4. fejezet, 4.2.1 pont szerinti tanúsítási követelményeivel kapcsolatban előírt tevékenységekkel, különös tekintettel ezen tevékenységek végrehajtásához és nyilvántartásához szükséges eszközökkel kapcsolatban útmutatót adjon.

1.2 A tanúsítást megelőző követelmények

A 4.2.1.4 alpontban előírtaknak megfelelően a légijármű üzembentartási engedély (AOC) kibocsátása a járató állama részéről annak függvénye, hogy a járató a meghatározott üzemeltetés természetétől és nagyságrendjétől függően valamint figyelembevételével bizonyságot tesz a repülési tevékenység megfelelő ellenőrzéséről és szervezéséről, kiképzési programjairól, földi kiszolgálásáról és karbantartási intézkedéseiről. A tanúsítási folyamat magába foglalja az összes járatónak az állam részéről történő értékelését, vagy későbbi engedélyek hozzáadását az AOC-hez, valamint annak a meghatározását, hogy az AOC első kibocsátását megelőzően a járató képes a biztonságos üzemeltetés lefolytatására,.

1.3 Szabványos tanúsítási gyakorlatok

A 4.2.1.7 alpont előírja, hogy a járató állama hozzon létre egy tanúsítási rendszert az üzemeltetés hatályába tartozó típusra vonatkozó előírások betartásának igazolására,. Számos állam az iparág lehetőségeinek megfelelően alakította ki a saját politikáját és eljárásait, hogy ezen tanúsítási követelményeknek megfeleljen. Noha ezek az államok egymással való koordináció nélkül alakították ki saját gyakorlatukat, ezen gyakorlati megoldások szerfelett hasonlítanak egymásra és összhangban állnak saját követelményeik tekintetében. Ezen gyakorlati megoldások hatékonysága az évek során igazolást nyert, a járatók számára javuló biztonsági nyilvántartásokat eredményezve a világ minden részén. Ezen gyakorlati megoldások jelentős része hivatkozásként bépítésre került az ICAO ajánlásokba.

2. Előírt műszaki biztonsági értékelések

2.1 Jóváhagyási és elfogadási tevékenységek

2.1.1 A járatók tanúsítása és folyamatos ellenőrzése magába foglalja az államnak, az általa történő felülvizsgálatra benyújtott tárgykörben tett vizsgálatait. Az államnak, az általa történő felülvizsgálatra benyújtott tárgykörben tett válaszainak jellegétől függően a tevékenységeket jóváhagyási vagy elfogadási kategóriába lehet sorolni.

2.1.2 Egy jóváhagyás az állam által adott aktív válasz a felülvizsgálat céljából hozzá benyújtott tárgykörben. Egy jóváhagyás a megfelelő előírásnak való megfelelés meghatározását vagy tényét állapítja meg. Egy jóváhagyás bizonyosságát a jóváhagyó hivatalos személy aláírása, egy dokumentum vagy tanúsítvány kibocsátása, vagy az állam által hozott egyéb formális tevékenység igazolja.

2.1.3 Egy elfogadás nem feltétlenül igényli az állam aktív válaszát a felülvizsgálat céljából hozzá benyújtott tárgykörben. Egy állam a hozzá felülvizsgálat céljából benyújtott anyagot elfogadhatja mint a megfelelő előírással megegyezőt, ha az állam kifejezetten nem utasítja el a felülvizsgálat alá tartozó anyag egészét vagy egy részét, általában a benyújtást követő meghatározott időtartam után.

2.1.4 Az „Állam által jóváhagyva" kifejezés, vagy a „jóváhagyva" szót alkalmazó hasonló kifejezések gyakran fordulnak elő a 6. Annex, I. részében. Az állam részéről jóváhagyást vagy legalább „elfogadást" igénylő felülvizsgálatot jelző intézkedések fordulnak még elő gyakran a 6. Annex, I. részében. Ezen sajátos kifejezéseken felül, a 6. Annex, I. része számos hivatkozást tartalmaz olyan követelményekre, amelyek minimum legalább az állam által végrehajtandó műszaki felülvizsgálat igényét fogalmazzák meg. Az államok általi használat megkönnyítése céljából ez a melléklet csoportokba szedi és összefoglalja ezeket a sajátos előírásokat és ajánlott gyakorlati eljárásokat.

2.1.5 A jóváhagyás vagy az elfogadás kibocsátása előtt az állam hajtson végre vagy készítsen elő műszaki biztonsági értékelést. Az értékelést:

a) olyan személy hajtsa végre, aki különleges jogosítással rendelkezik az ilyen műszaki értékelések végrehajtására;

b) leírt, szabványos módszer szerint hajtsák végre; és

c) gyakorlati bemutató bevonásával hajtsák végre, amennyiben a biztonság érdekében szükséges a járató valós képességeinek vizsgálata az ilyen üzemeltetések végrehajtásához.

2.2 Szemléltetés néhány jóváhagyás kibocsátása előtt

2.2.1 A 4.2.1.4 alpontban leírtak kötelezik a járató államát arra, hogy a járató tanúsítását megelőzően követeljen meg a járatótól egy olyan szemléltetést, amely alapján az állam el tudja dönteni, hogy a járató szervezete, a repülési tevékenység, a földi kiszolgálás valamint a karbantartási programok irányítására és felügyeletére használt módszerei megfelelőek-e. Ezek a szemléltetések a kézikönyvek, nyilvántartások, létesítmények és eszközök értékelésén és ellenőrzésén felül kerülnek alkalmazásra. A 6. Annex, I. részében megkövetelt egyes jóváhagyások, mint például a III. kategória szerinti üzemeltetés jóváhagyása, érzékelhető biztonsági kihatással rendelkeznek, így szemléltetés alapján kerülnek elbírálásra mielőtt az állam jóváhagyná az ilyen üzemeltetést.

2.2.2 Habár az előírt szemléltetések és értekelések mértéke és sajátos módszerei eltérőek az államok között, mégis azon államok esetében, ahol a járatók jó biztonsági adatokkal rendelkeznek, a tanúsítási folyamatok általában összhangban vannak. Ezekben az államokban, az AOC kibocsátása vagy az AOC kiegészítéseinek jóváhagyása előtt, a műszakilag felkészített ellenőrök egy reprezentatív mintát vizsgálnak a tényleges képzés, karbantartás és üzemeltetés területéről.

2.3 A tanúsítási tevékenységek jegyzőkönyvezése

2.3.1 Nagyon fontos, hogy az államok tanúsítási, jóváhagyási és elfogadási tevékenysége megfelelően legyen dokumentálva. A tevékenységek hivatalos feljegyzéseként az állam adjon ki egy okiratot, mint például egy levelet vagy egy hivatalos dokumentumot. Ezt az okiratot mindaddig meg kell őrizni, amíg a járató gyakorolja a felhatalmazása szerinti tevékenységet, amelyre a jóváhagyási vagy elfogadási műveleteket lefolytatták. Ezen okirat a járató felhatalmazásának egyértelmű tanúbizonysága, és bizonyítékként szolgál abban az esetben ha az állam és a járató eltérő véleménnyel van arról az üzemeltetésről, amelynek folytatására a járatót felhatalmazták.

2.3.2 Egyes államok egy okmánygyűjtőben összesítik a tanúsítással kapcsolatos adatokat, mint az ellenőrzés, a szemléltetés, a jóváhagyás és az elfogadás iratait, és mindaddig megőrzik, míg a járató aktív. Más államok ezeket az adatokat a végrehajtott tanúsítási tevékenységnek megfelelő gyűjtőben tárolják, és a gyűjtőt a jóváhagyási vagy az elfogadási okmány naprakészségének megfelelően módosítják. Az alkalmazott módszertől függetlenül, ezek a tanúsítási adatok meggyőző tanúbizonyságul szolgálnak, hogy az államok eleget tesznek a járató tanúsításával kapcsolatos ICAO kötelezettségeiknek.

2.4 Az üzemeltetés és a légialkalmasság értékelésének összehangolása

A 6. Annex, I. részének a jóváhagyásra vagy az elfogadásra vonatkozó egyes hivatkozásai megkövetelik a járatók értékelését és a légialkalmasság értékelését. Az alacsony minimumokra voantkozó jóváhagyás, amely a II kategóriájú és a III kategóriájú alacsony feltételek szerinti ILS megközelítések végrehajtásához szükségesek, például az üzemeltetési és a légialkalmassági szakemberek összehangolt előzetes értékelését igényli. A légiüzemeltetési szakemberek értékeljék az üzemeltetési eljárásokat, képzéseket és jogosításokat. A légialkalmassági szakemberek értékeljék a légijármű és a berendezések megbízhatóságát és a karbantartási eljárásokat. Ezen értékeléseket önállóan is el lehet végezni, de a biztonsághoz szükséges összes tényező figyelembevételének biztosítása érdekében, a jóváhagyás kibocsátása előtt az értékeléseket össze kell hangolni.

2.5 A járató államának és a lajstromozó államnak a felelőssége

2.5.1 A 6. Annex, I. része a járató államának felelősségébe utalja az alap tanúsítást, az AOC kibocsátását és a járató működés alatti felügyeletét. A 6. Annex, I. része megköveteli a járató államától azt is, hogy vegye figyelembe a lajstromozó állam által kiadott különböző jóváhagyásokat és elfogadásokat, vagy cselekedjen azok szerint. Ezen kérésekre tekintettel, a járató állama biztosítsa, hogy az intézkedései összhangban állnak a lajstromozó állam jóváhagyásaival és elfogadásaival, és azt is, hogy a járató megfelel a lajstromozó állam követelményeinek.

2.5.2 Jelentős fontosságú, hogy a járató állama kapja meg mindazon intézkedéseket, különösen a karbantartásra és a hajózó személyzetek képzésére vonatkozókat, melyek alapján a légi üzemeltetői használják egy másik állam lajstromába tartozó légijárművet. Az ilyen intézkedéseket a lajstromozó állammal összhangban tekintse át a járató állama. Ahol helyénvaló, a Nemzetközi Polgári Légiközlekedési Egyezmény 83 bis cikkelye értelmében egy olyan egyezményt kell előkészíteni, amelyik a lajstromozó állam felülvizsgálati felülvizsgálati felelősségét átruházza a járató államára, hogy ki lehessen zárni bármely arra vonatkozó félreértést, hogy melyik állam felelős a különös felülvizsgálati felelősségért.

Megjegyzés: a bérbevétel, a különjárati és a közös üzemeltetéssel összefüggésben a járató államának és a lajstromozó államnak a felelősségére vonatkozó útmutatót a Repülésüzem Ellenőrzésére, Tanúsítására és Folyamatos Felülvizsgálatára vonatkozó Eljárások Kézikönyve *(Doc 8335) tartalmazza. A lajstromozó állam felelősségének a járató államára való átruházására vonatkozó útmutató, amikor a felelősség átruházása a 83. bis cikkely értelmében valósul meg,* a Nemzetközi Polgári Légiközlekedési Egyezmény 83 bis cikkelyének alkalmazási útmutatójában *(Cir 295) található meg.*

3. Jóváhagyási intézkedések

3.1 Jóváhagyások

A „jóváhagyás” fogalom sokkal több hivatalos tevékenységre utal a tanusítás tárgyára vonatkozó állami szerepvállalásban, mint azt az „elfogadás” fogalom teszi. Egyes államok megkövetelik, hogy a Polgári Légiközlekedési Hatóság (CAA) igazgatója, vagy egy kijelölt alacsonyabb beosztású CAA hivatalnok bocsásson ki egy hivatalos okmányt minden egyes elvégzett „jóváhagyási” tevékenységre. Egyes államok megengedik különféle okiratok kibocsátását a jóváhagyás bizonyítékaként. A jóváhagyó okirat és az abban meghivatkozott tárgy a hivatalnokra ruházott hatáskörtől fog függeni. Az ilyen államokban a rutin jóváhagyások aláírásának jogát, mint például a járató minimális berendezéseinek jegyzéke egy meghatározott légijárműre, a műszaki ellenőrökre bízzák. Normál esetben az összetettebb vagy jelentős jóváhagyások kibocsátása magasabb színtű hivatalos személyek feladata.

3.2 Légijármű üzembentartási engedély (AOC)

3.2.1 A 6. Annex, I. rész, 4.2.1 alpontja által előírtak szerint az AOC egy hivatalos okmány, amely a 4.2.1.6 alpont követelményeinek megfelelően legalább a következőket tartalmazza:

a) a járató megnevezése (cégnév vagy azonosító, székhelye);

b) a kiadás időpontja és az érvényesség időtartama;

c) az engedélyezett üzemeltetés típusok ismertetése;

d) a használatra engedélyezett légijármű típus(ok); és

e) üzemeltetésre engedélyezett területek vagy repülési útvonalak.

3.2.2 Egyes államok az AOC-t és a kapcsolódó okiratokat, mint például az üzemeltetések részletezését a 6. Annex, I. rész által előírt egyéb engedélyek alátámasztására alkalmazzák.

3.3 Jóváhagyást igénylő intézkedések

Az alábbi intézkedések megkövetelik, vagy támogatják a meghatározott államok által történő jóváhagyást. A járató államának jóváhagyása szükséges az alább felsorolt minden olyan tanúsítás esetén, amelyet nem előz meg egy vagy több csillagjel. Az alább felsorolt tanúsítási esetek közül, amelyeket egy vagy több csillagjel előz meg, vagy a lajstromozó állam (egy csillag, vagy ”*”), vagy a tervező állam (kettős csillag, vagy ”**”) jóváhagyása szükséges. Ennek ellenére a járató állama tegyen meg minden szükséges lépést annak biztosítása érdekében, hogy a felelősségi körébe tartozó járatók, az ő követelményein felül, feleljenek meg minden szükséges, a lajstromozó állam és/vagy a tervező állam által kiadott jóváhagyásnak.

a) **Repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek jegyzéke (CDL) (Meghatározások);

b) **Gyártó minimális felszerelési jegyzéke (MMEL) (Meghatározások);

c) A legalacsonyabb repülési magasságok meghatározásának módszere (4.2.6.3);

d) A repülőtér üzemeltetési minimum meghatározásának módszere (4.2.7.1);

e) Kiegészítő követelmények a műszerrepülési szabályok szerint (IFR) éjszaka, egy pilótával végrehajtott repülések esetére (4.9.1);

f) Repülési idő, repülési szolgálati időtartam és pihenőidő (4.2.10.2);

g) Sajátos megnövelt hatótávolságú üzemeltetés (4.7.1);

h) Az egy gázsugár hajtóműves repülőgépek éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti üzemeltetésére vonatkozó kiegészítő követelmények (5.4.1);

i) Légijármű-specifikus minimális felszerelési jegyzék (MEL) (6.1.3);

j) RNP üzemeltetések (7.2.2 b));

k) MNPS üzemeltetések (7.2.3 b));

l) RVSM üzemeltetések (7.2.4 b));

m) Elektronikus navigációs adatok kezelései (7.4.1);

n) *Légijármű-specifikus karbantartási program (8.3.1);

o) *Engedélyezett karbantartó szervezet (8.7.1.1);

p) *Karbantartás minőségügyi felülvizsgálatának módszerei 88.7.4.1);

q) Hajózószemélyzeti tag kiképző programok (9.3.1);

r) Veszélyes áruk szállítására vonatkozó képzés (9.3.1, 5. Megjegyzés);

s) Repülőtéri kiegészítő biztonsági szegélyek (9.4.3.3 a));

t) A repülőgép parancsnok körzet, útvonal és repülőtér jogosítása (9.4.3.5);

u) Szintetikus repülési gyakorló berendezés használata (9.3.1, 2. Megjegyzés, és 9.4.4, 1. Megjegyzés);

v) A repülési üzem irányításának és felügyeletének módszere (4.2.1.4 és 10.1);

w) **Kötelező karbantartási feladatok és ezek elvégzésének időszakai (11.3.2);

x) Utaskabin személyzeti tagok képzési programjai (12.4).

3.4 Műszaki értékelést igénylő intézkedések

A 6. Annex, I. részében található egyéb intézkedések igénylik, hogy az államok műszaki értékelést hajtsanak végre. Ezek az intézkedések olyan kifejezéseket tartalmaznak, mint „az állam számára elfogadható”, „az állam számára megfelelő”, „az állam által meghatározva”, „az állam által elfogadhatónak itélve” és az „állam által előírva”. Miközben nem feltételenül várják el az állam által történő jóváhagyást, ezek az előírások megkövetelik az államtól, hogy legalább fogadja el a szóbanforgó ügyet, miután hajtson végre egy sajátos felülvizsgálatot vagy értékelést. Ezek az intézkedéseka következők:

a) a légijármű-specifikus ellenőrző lista részletei (Meghatározás: légijármű üzemeltetési kézikönyv és 6.1.4);

b) a légijármű specifikus rendszerek részletei (Meghatározás: légijármű üzemeltetési kézikönyv és 6.1.4);

c) kötelező anyag az üzemeltetési kézikönyv számára (4.2.2.2 / 2. Függelék);

d) hajtómű állapotfigyelő rendszerek (5.4.2);

e) egy pilóta által a műszerrepülési szabályok szerint (IFR) vagy éjszaka üzemeltetett repülőgép berendezései (6.22);

f) az RVSM légtérben való üzemeltetés jóváhagyásának követelményei (7.2.5);

g) az RVSM légtérben való üzemeltetésre jóváhagyott repülőgépek magasságtartási képességeinek figyelése (7.2.6);

h) az elektronikus navigációs adatok légijárművön való beillesztésének és elosztásának eljárásai (7.4.2);

i) *a járató légijármű-specifikus karbantartási felelősségei (8.1.1);

j) *a karbantartás és az üzemképessé nyilvánítás módszere (8.1.2);

k) *karbantartás irányítási kézikönyv (8.2.1);

l) *kötelező anyag a karbantartás irányítási kézikönyv számára (8.2.4);

m) *a karbantartási gyakorlatra vonatkozó információk jelentése (8.5.1);

n) *a karbantartás szükséges helyesbítő intézkedéseinek bevezetése (8.5.2);

o) *módosítási és javítási követelmények (8.6);

p) *a karbantartó személyek minimális képességi szintje (8.7.6.3);

q) a hajózó navigátorra vonatkozó követelmények (9.1.4);

r) oktatási létesítmények (9.3.1);

s) az oktatók jogosítása (9.3.1);

t) ismeretfelújító képzése szükségessége (9.3.1);

u) levelező tanfolyamok és írásbeli vizsgáztatás alkalmazása (9.3.1, 4. melléklet;

v) szintetikus repülési gyakorló berendezés alkalmazása (9.3.2);

w) a hajózó személyzetek jogosításainak nyilvántartása (9.4.3.4);

x) a járató államának kijelölt képviselője (9.4.4);

y) a műszer szerinti repülés (IFR) vagy az éjszakai repülés feltételei közötti, egy repülőgépvezetővel végrehajtott üzemeltetés jártassági, folyamatos gyakorlatban tartási és képzési követelményei (9.4.5.1 és 9.4.5.2);

z) *a repülésvégrehajtási kézikönyv változásai (11.1);

aa) meghatározott légijárművekre kijelölt légiutaskisérők minimális száma (12.1);

bb) magasságmérő rendszerek RVSM légtérben való üzemeltetéséhez szükséges teljesítmény követelmények (4. Függelék, 1 és 2);

Egyhajtóműves üzemeltetés

cc) a gázturbinás hajtómű megbízhatósága az egy gázsugár hajtóműves repülőgépek jóváhagyott üzemeltetése esetén, éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti repüléseknél (3. Függelék, 1.1);

dd) rendszerek és berendezések (3. Függelék, 2);

ee) a minimális felszerelések jegyzéke (3. Függelék, 3);

ff) a repülésvégrehajtási kézikönyv információi (3. Függelék, 4);

gg) események jelentése (3. Függelék, 5);

hh) a járató tervezése (3. Függelék, 6);

ii) A hajózószemélyzet jártassága, képzése és ellenőrzése (3. Függelék, 7);

jj) víz feletti útvonalak korlátozása (3. Függelék, 8); és

kk) a járató tanúsítása vagy megerősítése (3. Függelék, 9).

4. Elfogadási tevékenységek

4.1 Elfogadás

4.1.1 A járató meghatározott légiüzemeltetés végrehajtásához való felkészültségének ellenőrzésénél, az állam által végrehajtott műszaki értékelés valós terjedelme legyen sokkal átfogóbb, mint az az előírás, amelyik megköveteli vagy maga után vonja a jóváhagyást. A járató nemzetközi kereskedelmi légiszállítási feladatainak megkezdése előtt, az állam győződjön meg a tanúsítás során arról, hogy a járató megfelel a 6. Annex, I, rész összes követelményének.

4.1.2 Egyes államok az „elfogadás" fogalmát hivatalos módszerként használják, amikor meg akarnak győződni arról, hogy az AOC hivatalos kibocsátását megelőzően, a járató tanúsításának összes kritikus elemét megvizsgálta az állam. Az előbbi fogalom használatával, ezek az államok érvényesítik azon előjogukat, hogy rendelkeznek a műszaki ellenőröknek a járatók üzemeltetési biztonságot befolyásoló politikájáról és eljárásairól szóló beszámolóival. Ezen elfogadást tükröző okmány tényleges kiadásával (feltételezve, hogy egy ilyen dokumentum kibocsátásra kerül) a tanúsítás végrehajtására kijelölt műszaki ellenőrt is meg lehet bízni.

4.2 Megfelelőségi jelentés

Egyes államok a megfelelőségi jelentést konkrét járatóra vonatkozó elfogadás okmányolására használják. Ez egy olyan, a járató által beterjesztett dokumentum, amelyben a járató az üzemeltetési vagy a karbantartási kézikönyv megfelelő részeire való hivatkozással azt részletezi, hogy miként fog megfelelni az állam összes alkalmazható követelményének. Ezt a fajta dokumentumot a Doc 8335, 3.3.2 e) része és a Légialkalmassági Kézikönyv (Doc 9760), I. kötet, 6.2.1 c) 4) része hivatkozza meg. A tanúsítás során az ilyen megfelelőségi jelentést aktívan kell alkalmazni és szükség szerint módosítani, a járató politikájában és eljárásaiban az állam igényei alapján végrehajtott változtatások bemutatása érdekében. Ezt követően a végleges megfelelőségi jelentést elhelyezik az állam tanúsítási nyilvántartásában, más egyéb tanúsítási jelentésekkel együtt. A megfelelőségi jelentés egy kiváló módszer annak bemutatására, hogy a járató tanúsítása az összes, alkalmazandó hatósági előírás szerint megfelelően lett végrehajtva.

4.3 Üzemeltetési és karbantartási kézikönyvek

4.3.1 Az üzemeltetési és a karbantartási kézikönyveket, valamint az összes további módosításukat terjesszék be az államnak (4.2.2.2, 8.1.1, 8.2.4, 8.3.2 és 8.7.2.3). Továbbá, az állam meghatározza ezen kézikönyvek minimális tartalmát (11.2, 11.3, 11.4 és 2. Függelék). Az állam műszaki kézikönyvében határozzák meg a járató kézikönyveinek (például, az üzemeltetési politika kézikönyve, üzemeltetési kézikönyv, utaskabin személyzet kézikönyve, útvonal ismertető és képzési kézikönyv) értékelésre szolgáló adagját. Egyes államok hivatalos okmányt adnak ki az összes kézikönyv és minden további módosítás elfogadásáról.

4.3.2 Az állam műszaki értékelése, az előírt tartalom meglétének ellenőrzésén kívül, téren ki arra is, hogy a sajátosan jellemző politika és eljárások az elvárt eredményt hozzák-e. Például az üzemeltetési repülési tervre (2. Függelék, 2.1.16) vonatkozó részletes leírás, az említett tervek tartalmára és megőrzésére vonatkozó 4.3 alfejezet előírásainak teljesítése érdekében, határozzon meg egy lépésenkénti kitöltési útmutatót.

4.3.3 A kipróbált iparági alkalmazásokat hivatkozás céljából, mint például a hajózó személyzetek és a szolgálatvezetők által ténylegesen kitöltött üzemeltetési repülési tervet (habár nem egy szabványosat), a tanúsítás során az állam műszaki felülvizsgálója elkérheti. A műszaki értékelés ezen részét az üzemeltetés tanúsításában gyakorlott ellenőr végezze. A kipróbált iparági gyakorlat értékelésének alkalmazásával kapcsolatos legfőbb megfontolás tárgyát képezi, hogy ez a módszer légijármű-specifikus, berendezés-specifikus, vagy korlátozottan állnak rendelkezésre olyan értékelő személyek, akik naprakész jogosítással rendelkeznek az értékelendő alkalmazás vonatkozásában.

5. Egyéb jóváhagyási vagy elfogadási megfontolások

Jóváhagyás vagy elfogadás céljából egyes államok bekérnek bizonyos, a 6. Annex I. részében meghatározott kritikus dokumentumokat, feljegyzéseket vagy eljárásokat, noha a 6. Annexben található vonatkozó előírás nem követeli meg a járató állama általi jóváhagyást vagy elfogadást. Néhány erre vonatkozó példa látható az alábbiakban:

a) biztonsági program (3.2.1);

b) repülési adat elemző program (3.2.7);

c) légiközlekedési adatok beszerzésének módja (4.1.1);

d) a tüzelőanyag és olaj jegyzékek megfelelősége (4.2.9);

e) a repülési időre, a repülési szolgálati időtartamra és a pihenőidőre vonatkozó adatok megfelelősége (4.2.10.3, 9.6 és 12.5);

f) a légijármű karbantartási naplójának megfelelősége (4.3.1 a), b) és c));

g) a terhelési nyilatkozat megfelelősége (4.3.1 d), e) és f));

h) a repülési terv megfelelősége (4.3.1 g));

i) az időjárási adatok beszerzési módja (4.3.5.1 és 4.3.5.2);

j) a kézi poggyász megfelelő elhelyezésének módja (4.8);

k) repülőgép teljesítmény üzemeltetési korlátozások (5.2.4);

l) repülőtéri akadály adatok beszerzésének és felhasználásának módja (5.3);

m) az utastájékoztató kártyák megfelelősége (6.2.2 d));

n) a hosszútávú navigáció eljárásai (7.2.1 b));

o) az útinapló tartalma (11.4.1); és

p) a repülésvédelmi képzésre vonatkozó program tartalma (13.4).

6. Az üzemeltetési előírások érvényesítése

A 4.2.1.5 alpont előírása meghatározza, hogy a légijármű üzembentartási engedély (AOC) folyamatos érvényessége attól függ, hogy a járató a járató államának ellenőrzése alatt rendszeresen eleget tesz az eredeti tanúsítási előírásnak (4.2.1.4). Ez az ellenőrzés megköveteli egy olyan folyamatos minőség ellenőrzési rendszer létrehozását, amellyel biztosítani lehet a 4.2.1.7 alpontban található, a légijármű üzemeltetés színvonalára vonatkozó előírások betartását. Megfelelő kiindulási pont egy ilyen rendszer létrehozásában, ha éves vagy féléves ellenőrzéseket, megfigyeléseket vagy vizsgálatokat követelnek meg, az igényelt tanusítás jóváhagyási és elfogadási tevékenységek érvényesítéséhez.

7. A légijármű üzembentartási engedély módosítása

A járató tanúsítása egy folyamatos tevékenység. Kevés járató fog egy idő elteltével megfelelni a légijármű üzembentartási engedélyével megszerzett kezdeti felhatalmazásának. A piaci lehetőségek kibontakozása arra készteti a járatót, hogy változtasson légijármű modellt és kérjen jóváhagyást egyéb járulékos feltételeket igénylő üzemeltetési területekre. Az eredeti légijármű üzembentartói engedély bármely változását és egyéb felhatalmazását jóváhagyó hivatalos okmány kiadása előtt az állam hajtson végre kiegészítő műszaki értékelést. Ahol lehetséges, minden kérést az eredeti felhatalmazásra támaszkodva vizsgáljanak meg, hogy a hivatalos okmány kiadása előtt meg lehessen határozni az állam előtt álló értékelési feladat mértékét.

G. Melléklet
Minimális felszerelési jegyzék (MEL)
Kiegészítés a 6. fejezet 6.1.2 ponthoz

1. Ha az állami előírásoktól való eltéréseket a légijármű jogosítása alkalmával nem engedélyezték, a légijármű csak akkor üzemeltethető a levegőben, ha minden rendszere és berendezése üzemképes. A tapasztalatok szerint rövid távon bizonyos egységek üzemképtelensége elfogadható, ha a többi üzemeltetési rendszer és berendezés biztosítja az üzemeltetés biztonságos folytatását.

2. A minimális felszerelési jegyzék elfogadásával az állam jelezze azokat a rendszereket és felszerelési tárgyakat, amelyek bizonyos repülési körülmények között üzemképtelenek lehetnek – azzal a céllal, hogy a meghatározottakon kívül más üzemképtelen rendszerrel vagy berendezéssel a repülés ne legyen végrehajtható.

3. Ezért minden légijármű részére szükséges a légijármű típushoz a típus megtervezéséért felelős szervezet részéről, a tervezés államának jóváhagyásával kidolgozott gyártói minimális felszerelési jegyzék alapján meghatározott és a járató állama által elfogadott minimális felszerelési jegyzék.

4. A járató állama kérje fel a járatót a minimális felszerelési jegyzék elkészítésére annak érdekében, hogy lehetővé tegyék a légijármű üzemeltetését bizonyos rendszerek vagy berendezések üzemképtelensége mellett, feltéve hogy a biztonság elfogadható szintjét fenntartják.

5. A minimális felszerelési jegyzéknek nem célja, hogy korlátlan ideig biztosítsa a légijármű nem működő illetve üzemképtelen rendszerekkel vagy berendezésekkel történő üzemeltetését. A minimális felszerelési jegyzék alapvető célja a légijármű üzemképtelen rendszerekkel vagy berendezésekkel történő biztonságos üzemeltetésének meghatározott valamint ellenőrzött karbantartási és alkatrész csere program kereteken belül történő tartása.

6. A járató biztosítsa, hogy a repülés végrehajtását ne kezdjék meg a minimális felszerelési jegyzékbe tartozó több tétel működésképtelensége mellett annak megállapítása előtt, hogy az üzemképtelen rendszerek vagy alkatrészek közötti kapcsolat nem okozza a biztonság elfogadhatatlan szint alá csökkenését és/vagy a hajózószemélyzet munkaterhelésének szükségtelen mértékű növekedését.

7. Az elfogadható biztonsági szint fenntarthatóságának megállapítása alkalmával figyelembe kell venni az üzemképtelen rendszerekkel vagy berendezésekkel történő üzemeltetés folytatása során bekövetkező további meghibásodások lehetőségét is. A minimális felszerelési jegyzék nem térhet el a repülésvégrehajtási kézikönyv korlátozásaitól, a vészhelyzeti eljárásoktól vagy a járató vagy a lajstromozó állam más légialkalmassági előírásaitól, kivéve, ha az illetékes légialkalmassági hatóság vagy a repülésvégrehajtási kézikönyv másként rendelkezik.

8. Egy repülés során üzemképtelennek elfogadott rendszereket vagy berendezéseket szükség szerint lássák el feliratokkal vagy jelzésekkel valamint az összes ilyen tételt vezessék be a repülőgép műszaki jegyzékébe (naplójába), hogy a hajózó és a karbantartó személyzetet tájékoztassák az üzemképtelen rendszerekről vagy berendezésekről.

9. Egy adott üzemképtelennek elfogadott rendszer vagy berendezés esetében a repülés megkezdése előtt szükséges lehet a karbantartási eljárás meghatározása annak érdekében, hogy az üzemképtelen rendszert vagy berendezést lekapcsolják vagy elkülönítsék. Ehhez hasonlóan szükség lehet a megfelelő hajózószemélyzeti üzemeltetési eljárás kidolgozására is.

10. A légijármű parancsnokának felelősségét a minimális felszerelési jegyzéknek megfelelő hiányosságokkal rendelkező repülőgép üzemeltetésre történő elfogadására a 4. fejezet 4.3.1 pontja határozza meg.

H. Melléklet
Repülésbiztonsági dokumentációs rendszer
Kiegészítés a 3. fejezet 3.3 ponthoz

1. Bevezető

1.1 A következő anyagban útmutatót biztosítunk a járató repülésbiztonsági dokumentum rendszerének kidolgozásához és megszervezéséhez. Vegyék figyelembe, hogy a dokumentációs rendszer kidolgozása összetett feladat és ezért a rendszer részét képező minden egyes dokumentum módosítása hatással lehet az egész rendszerre. Az üzemeltetési dokumentumok elkészítésére vonatkozó irányelveket az állami, kormány és ipari szervek dolgozták ki és ezek a járatók rendelkezésére állnak. Mindazonáltal a járatók számára nehézséget jelenthet ezek átfogó felhasználása, mivel az irányelvek csak több különböző kiadványból szerezhetők be.

1.2 Az üzemeltetési dokumentumok kidolgozásához alkalmazható útmutató elsősorban a kiadvány szerkesztésére vonatkozik, csak ritkán terjed ki az üzemeltetési dokumentum teljes körű elkészítésére. Nagyon fontos, hogy az egyes anyagok egymással összhangban, az előírásokkal, a gyártói rendelkezésekkel és az emberi tényezők alapelveivel egybehangzók legyenek. Fontos továbbá a szervezeti és alkalmazási egység biztosítása. Ezért a hangsúly az átfogó kidolgozáson van, az üzemeltetési dokumentumok közös rendszerként alkalmazandók.

1.3 A jelen melléklet anyaga a járató repülésbiztonsági dokumentum rendszerének kidolgozási eljárásával foglalkozik annak érdekében, hogy az a 3. fejezet 3.3 pontnak megfelelő legyen. Az útmutató nemcsak a tudományos kutatásokon alapszik, hanem támaszkodik a legutóbbi ipari gyakorlatokra isl, különös hangsúllyal a magas szintű gyakorlati felhasználhatóságra.

2. Összeállítás és tartalom

2.1 A repülésbiztonsági dokumentum rendszert úgy dolgozzák ki és szerkesszék meg, hogy az biztosítsa a repülési és földi üzemeltetéshez szükséges tájékoztatások egyszerű megtalálását a biztonsági rendszert alkotó különböző dokumentumokban és megkönnyítse ezek szétosztását illetve a módosítások után történő kiadását is.

2.2 A repülésbiztonsági dokumentum rendszerbe tartozó tájékoztatásokat azok fontossága és felhasználási módja szerint, a következők alapján csoportosítsák:

a) idő szempontjából alapvető fontosságú tájékoztatások, mint például azok a tájékoztatások, amelyek azonnal elérhetőség hiányában veszélyeztethetik az üzemeltetés biztonságát;

b) idő szempontjából lényeges tájékoztatások, amelyek gyors elérhetőség hiányában befolyásolhatják az üzemeltetés biztonságának szintjét vagy késleltethetik az üzemeltetést;

c) gyakran használt tájékoztatások;

d) hivatkozások, például olyan tájékoztatások, amelyek az üzemeltetéshez szükségesek, azonban nem tartoznak a fenti *b)* vagy *c)* alpontok hatálya alá;

e) olyan tájékoztatások, amelyek az üzemeltetés szakaszai szerint csoportosíthatók.

2.3 Az idő szempontjából alapvető tájékoztatásokat idejekorán és figyelemfelkeltő módon helyezzék el a repülésbiztonsági dokumentum rendszerben.

2.4 Az idő szempontjából alapvető és lényeges, továbbá a gyakran felhasznált tájékoztatásokat cserelapokra és gyorsan alkalmazható ellenőrző jegyzékekre készítsék el.

3. Érvényesség

A repülésbiztonsági dokumentum rendszert a bevezetés előtt, valós körülmények között vizsgálják felül és az alkalmazáshoz szükséges érvényesítést csak ez után adják ki. Az érvényesítés illetve engedélyezési eljárás a hatékonyság igazolása érdekében terjedjen ki a felhasználás fontos tényezőire, továbbá vizsgálják meg a különböző szakmai csoportok közötti együttműködés kérdéseit is.

4. Tartalmi kialakítás

4.1 A repülésbiztonsági dokumentum rendszer szak-kifejezései egymással összhangban legyenek, a közös témakörök, egységek és feladatok leírására szabványos meghatározásokat használjanak.

4.2 Az üzemeltetési dokumentumok tartalmazzák a meghatározások, kifejezések és rövidítések gyűjteményes magyarázatát, amelyet a műszaki fejlődés alapján rendszeresen és folyamatosan vizsgáljanak felül, illetve naprakészen módosítsanak. A repülésvégrehajtási dokumentumokban található összes fontos meghatározás, kifejezés és rövidítés ismertetését a kiadványban tegyék közzé.

4.3 A repülésbiztonsági dokumentum rendszer elkészítése során biztosítsák az egységes dokumentum típus alkalmazást, beleértve a szöveg stílust, a kifejezéseket, a táblázatokat és rajzokat valamint a nyomdai kialakítást is. Egyes meghatározott tájékoztatások mindig állandó helyen szerepeljenek, az alkalmazott mértékegységek és kódok mindig azonosak, egymásnak megfelelők legyenek.

4.4 A repülésbiztonsági dokumentum rendszer tartalmazzon az alkalmazási időpont szerint összeállított lényegi tartalomjegyzéket, amelynek célja az egynél több üzemeltetési dokumentumban található tájékoztatások egyszerű megtalálása.

Megjegyzés: Ezt a fő tartalomjegyzéket minden egyes dokumentum elején kell elhelyezni. A tartalomjegyzék háromnál több szintet nem tartalmazhat. A különleges és vészhelyzeti tájékoztatásokat a közvetlen kiválaszthatóság érdekében fülekkel kell ellátni.

4.5 A repülésbiztonsági dokumentum rendszer feleljen meg a járató minőségbiztosítási rendszere előírásainak, amennyiben ilyet meghatároztak.

5. Terjesztés

A járató kísérje figyelemmel a repülésbiztonsági dokumentum rendszer terjesztését, biztosítva ezzel a dokumentumok helyes és időszerű alkalmazását az üzemeltetési környezet jellemzői alapján valamint olyan módon, amely üzemeltetési szempontból megbízható és hasznos a felhasználók számára. Ide tartozik a járató részéről fenntartott információs rendszer, amelynek segítségével az üzemeltető személyzettől visszajelzéseket szerez be.

6. Módosítás

6.1 A járató dolgozzon ki tájékoztatás gyűjtési, felülvizsgálati, szétosztási és ellenőrzési rendszert az üzemeltett típusnak megfelelő összes forrásból beszerzendő tájékoztatások és adatok feldolgozására, beleértve, de nem csak ezekre korlátozva a járató, a lajstromozó és a tervezés államait, a gyártókat és a berendezések kereskedőit.

Megjegyzés: A gyártók egy adott légijármű üzemeltetéséhez olyan tájékoztatásokat nyújtanak, amelyek a légijármű rendszerekre és eljárásokra vonatkoznak olyan általános üzemeltetési körülmények között, amelyek nem mindig egyeznek meg teljes mértékben a járató igényeivel. A járatók biztosítsák, hogy a beszerzett tájékoztatások feleljenek meg egyedi igényeknek és a helyi hatóságok elvárásainak.

6.2 A járató dolgozzon ki tájékoztatás összegyűjtési, felülvizsgálati, szétosztási és ellenőrzési rendszert az üzemeltetésből származó vagy az üzemeltetés során bekövetkező változások feldolgozására, beleértve:

a) egy új berendezés felszereléséből származó változások;

b) az üzemeltetés gyakorlati tapasztalatai miatt bekövetkező változások;

c) a járató tevékenységének, céljainak, és eljárásainak változásai;

d) a járató jogosításainak változása;

e) a légiflotta állomány egységesítésének igénye érdekében bekövetkező változások.

Megjegyzés: A járató biztosítsa, hogy a személyzetek koordinálásának módszertana, irányelvei és eljárásai feleljenek meg az üzemeltetés sajátosságainak.

6.3 A repülésbiztonsági dokumentum rendszer vizsgálják felül;

a) rendszeresen (legalább évente egyszer);

b) jelentősebb eseményeket követően (egyesülés, bővítés, a vállalat gyors növekedése vagy csökkenése, stb.);

c) technológiai változások után (új berendezések és felszerelések felszerelése és használata); és

d) a biztonsági szabályok változásai után.

6.4 A járatók dolgozzanak ki módszereket az új tájékoztatások szétosztására, mely módszerek feleljenek meg a tájékoztatások közzététele sürgősségének és fontosságának.

Megjegyzés: Tekintettel arra, hogy a gyakori változások csökkentik az új vagy módosított eljárások fontosságát, a repülésbiztonsági dokumentum rendszer változásainak legalacsonyabb szinten tartása kívánatos.

6.5 Az új tájékoztatást a teljes repülésbiztonsági dokumentum rendszerre gyakorolt hatásai alapján vizsgálják felül és hitelesítsék.

6.6 Az új tájékoztatás közzétételét olyan módszerrel egészítsék ki, amelynek segítségével az üzemeltető személyzet nyomon követheti a tájékoztatás hitelességét, érvényességét valamint annak tényleges igazolását, hogy a közzétett tájékoztatások naprakészek. Az ellenőrző rendszer tartalmazzon eljárást annak igazolására, hogy az üzemeltető személyzet minden esetben megkapja a legutóbbi módosításokat.

I. MELLÉKLET

Kiegészítő útmutató az egy gázsugár hajtóműves repülőgépek éjszaka és/vagy műszeres időjárási körülmények (IMC) közötti jóváhagyott üzemeltetésére

Kiegészítés az 5. fejezet, 5.4 alfejezetéhez és a 3. Függelékhez

1. Cél és tárgykör

A jelen melléklet azt a célt szolgálja, hogy kiegészítő útmutatót adjon az 5. fejezet 5.4 alfejezetében és a 3. Függelékben leírt légialkalmassági és üzemeltetési követelményekhez, melyeket az egy gázsugár hajtóműves repülőgépek éjszakai és/vagy IMC feltételek közötti jóváhagyott üzemeltetéséhez szükséges teljes körű biztonsági szint létrehozására fogalmaztak meg.

2. Gázturbinás hajtómű megbízhatósága

2.1 Az 5. fejezet, 5.4.1 alfejezetében és a 3. Függelékben előírtaknak megfelelően a tolóerő megszűnésének arányát úgy kell meghatározni, hogy amennyiben lehetséges az feleljen meg a kereskedelmi üzemeltetésből nyert adatoknak, kiegészítve azokat a magán forgalomból hasonló körülmények között szerzett üzemeltetési adatokkal. Az értékelés megalapozásához az aktuális repülőgép/hajtómű kombinációra vonatkoztatva legalább 20 000 órát magába foglaló gyakorlati tapasztalat szükséges, kivéve, ha a rendelkezésre álló hajtóművel kiegészítő vizsgálatot vagy kísérletet hajtottak végre teljesen azonos kialakítás mellett.

2.2 A gázturbinás hajtómű megbízhatóságának vizsgálata során a bizonyítékokat a világszerte használatos teljes flotta adatbázisából kell meríteni, hogy az üzemeltetést jellemző minél nagyobb számú minta álljon rendelkezésre, melyeket a gyártóknak kell összesíteniük és a tervező, valamint a járató államainak kell felülvizsgálniuk. Mivel a járatók által használatos típusok nem mindegyikére kötelező a repült órák jelentése, ezért megfelelő statisztikai becslésekre lehet támaszkodni a hajtómű megbízhatósági adatok kimunkálása során. Az ilyen üzemeltetésre jóváhagyott egyedi járatók által létrehozott adatokat, beleértve az állapotváltozás figyelését és az események jelentését, a járatók államainak kell figyelnie és felülvizsgálnia annak igazolása érdekében, hogy a járatók által betartott gyakorlat megfelelő.

2.2.1 A hajtómű állapotváltozásának figyelése a következőket tartalmazza:

a) Egy, a gyártó javaslatain alapuló, olajfogyasztást ellenőrző programot; és
b) Egy, a hajtómű állapotát ellenőrző programot, meghatározva az ellenőrzésre kijelölt paramétereket, az adatok összegyűjtésének módját és a helyesbítő műveletekre vonatkozó eljárásokat. Mindezeknek a gyártók javaslatain kell alapulniuk. Az ellenőrzésnek az a célja, hogy minél korábbi szakaszban meg lehessen állapítani a gázturbinás hajtómű állapot romlását, és helyesbítő intézkedést lehessen tenni, mielőtt a biztonságos üzemeltetés feltételei megváltoznának.

2.2.2 A megbízhatósági program fedje le a hajtóművet és kapcsolódó rendszereit is. A hajtómű program tartalmazza a vizsgált időszakra vonatkozó repülésközbeni üzemórák számát és az okokra vetített repülésközbeni hajtómű leállások értékét valamint a nem tervezett hajtómű leépítések számát. Mindkét értéket 12 hónapos gördülő adatbázison kell számolni. Az események jelentési rendszere fedje le az éjszakai és/vagy IMC feltételek közötti repülések biztonságos végrehajthatóságát befolyásoló összes eseményt. Az adatok legyenek elérhetők a járató, a típusbizonyítvány tulajdonos és az állam számára annak megállapítása érdekében, hogy a kitűzött megbízhatósági szint elérésre került-e. Bármely folyamatosan fennálló kedvezőtlen állapotváltozás esetén, a járató haladéktalanul végezzen értékelést, amelybe vonja be az államot és a gyártót, hogy meg lehessen határozni a kitűzött megbízhatósági szint megtartására vonatkozó intézkedéseket. A gyártó támogatásával együtt a járató dolgozzon ki egy alkatrész kezelési programot, amely biztosítja, hogy megfelelő alkatrészek és összeállítások kerüljenek felhasználásra az ilyen üzemeltetésekre jóváhagyott egy gázturbinás hajtóművel felszerelt repülőgépeken. A program magába foglalja azon vizsgálatokat is, melyek igazolják, hogy azok az alkatrészek kerülnek felépítésre a jóváhagyott, egy gázturbinás hajtóművel felszerelt repülőgépekre az alkatrészek kölcsönbeadási vagy közös készletből való felhasználási egyezményének időtartama alatt, továbbá azok az alkatrészek kerültek felhasználásra a javítást vagy nagyjavítást követően, amelyek biztosítják az 5. fejezet, 5.4 alfejezete szerint jóváhagyott üzemeltetésre alkalmas repülőgépek megfelelő készletezettségét.

2.3 A tolóerő megszűnésének arányát egy meghatározott időszakot meghaladó gördülő átlaggal kell jellemezni (pl. 12 hónapos gördülő átlaggal, ha a reprezentatív minta magas). A tolóerő megszűnésének aránya kerül inkább alkalmazásra, mint a repülés közbeni hajtómű leállási arány, mivel ez sokkal kifejezőbb az egy hajtóművel felszerelt repülőgépek esetén. Ha egy több hajtóműves repülőgépen olyan hiba keletkezik, amely jelentős, de nem teljes mértékű tolóerő csökkenést eredményez, akkor ez hajtómű leállással egyenértékűnek számít a működőképesen maradt hajtóművek miatt. Azonban az egy hajtóművel felszerelt repülőgépeknél még további segítséget jelenthet a maradék tolóerő felhasználása a siklási távolság megnövelésére.

2.4 A kiválasztott aktuális időszaknak tükröznie kell a világméretű felhasználás és a figyelembe vett tapasztalati eredmény kapcsolatát (például egy korai adat alkalmatlan lehet, az adat felvételét követően végrehajtott kötelező módosítás miatt, amely befolyásolhatja a tolóerő csökkenésének arányát). Egy új hajtómű változat bevezetését követően, és amíg a világméretű felhasználás viszonylag alacsony, az összes rendelkezésre álló gyakorlati eredményt hasznosítani kell a statisztikailag értékelhető átlag elérése érdekében.

3. Üzemeltetési kézikönyv

Az üzemeltetési kézikönyvnek tartalmaznia kell mindazon tudnivalókat, melyek az egy gázturbinás hajtóművel felszerelt repülőgépek éjszakai és/vagy IMC feltételek közötti üzemeltetésével összefüggésben szükségesek. Ennek magába kell foglalnia az összes kiegészítő felszerelést, és az ilyen üzemeltetéshez szükséges eljárást és képzést, az üzemeltetés útvonalát és/vagy körzetét, valamint a repülőterekre vonatkozó ismereteket (beleértve a tervezési és üzemeltetési minimumokat is).

4. A járató tanúsítása, vagy megerősítése

A járató állama által meghatározott tanúsítási vagy megerősítési folyamatnak igazolnia kell a járató eljárásainak alkalmasságát a normál, rendellenes és vészhelyzetekre vonatkozóan, beleértve hajtómű, a rendszerek és felszerelések meghibásodását követő műveleteket is. A járató tanúsítására vagy megerősítésére vonatkozó általános követelményeken felül, a következő előírásokat is figyelembe kell venni az egy gázturbinás hajtóművel felszerelt repülőgépek üzemeltetésével kapcsolatban:

a) a hajtómű elért megbízhatóságának igazolását az adott hajtómű-repülőgép összeállításban (lásd: 3. Függelék, 1. szakasz);

b) a sajátos és a megfelelő képzésre valamint az ellenőrzésre vonatkozó eljárásokat, amelyek magukba foglalják a földön, a felszállást követően és az útvonalon bekövetkező hajtómű meghibásodásokat/rendellenességeket, valamint a normál utazó magasságról a kényszerleszálláshoz való süllyedést;

c) a karbantartási programot, amely kiterjesztésre került a 3. függelék, 2. szakaszában meghatározott felszerelésekre és rendszerekre;

d) a MEL-t, amely módosításra került az éjszakai és/vagy IMC feltételek közötti repülésekhez szükséges felszerelésekre és rendszerekre;

e) az éjszakai és/vagy IMC feltételek közötti üzemeltetéshez tartozó tervezési és üzemeltetési minimumokat;

f) az indulási és érkezési eljárásokat, valamint az útvonal korlátozásokat;

g) a repülőgépvezetők jogosítását és jártasságát; és

h) az üzemeltetési kézikönyvet, amely tartalmazza a korlátozásokat, a vész eljárásokat, az üzemeltetéshez jóváhagyott útvonalakat és körzeteket, a MEL-t és a 3. függelék, 2. szakaszában meghatározott felszerelésekre vonatkozó normál eljárásokat.

5. Üzemeltetői és karbantartási program előírások

5.1 Az egy gázturbinás hajtóművel felszerelt repülőgépek éjszakai és/vagy IMC feltételek közötti üzemeltetésre, a légiüzemeltetői engedélyben vagy azzal megegyező dokumentumban való jóváhagyása magába kell, hogy foglalja az adott sárkány/hajtómű összeállítást, beleértve az ilyen üzemeltetésre vonatkozó naprakész típustervezési előírásokat, a jóváhagyott különös repülőgépet, és az ilyen üzemeltetésekhez tartozó útvonalakat vagy körzeteket.

5.2 A járató karbantartás irányítási kézikönyve magába kell hogy foglalja a szükséges kiegészítő felszerelések tanúsítására vonatkozó nyilatkozatot, és a hajtóművet is beleértve az ilyen felszerelés karbantartási és megbízhatósági programját.

6. A víz feletti repülés útvonalak korlátozásai

6.1 Az egy gázturbinás hajtóművel felszerelt repülőgépek járatói, akik éjszakai és/vagy IMC feltételek közötti üzemeltetést végeznek hajtsák végre a víz feletti útvonalak korlátozására vonatkozó értékelést. A repülőgép szárazföldhöz viszonyított üzemeltetési távolságát a biztonságos kényszerleszálláshoz szükséges feltételek befolyásolják. Ez megegyezik a hajtómű meghibásodását követően az utazó magasságról a biztonságos kényszerleszállás helyéig szükséges siklási távolsággal, nyugodt légköri viszonyokat feltételezve. Az államok ehhez még kiegészítő távolságokat adhatnak hozzá, a valószínüsíthetően bekövetkező állapotok és az üzemeltetett típus figyelembe vételével. Ehhez számításba kell venni a tenger várható állapotát, a szállított túlélő felszerelést, az elért hajtómű megbízhatóságot, és a rendelkezésre álló kutató- mentő szolgálatokat.

6.2 A siklási távolságot meghaladó bármely kiegészítő távolság ne lépje túl a repülőgép normál utazó sebessége mellett, 15 perc alatt megtehető távolságot.

ANNEX 6/II.
A légijármű üzemeltetése: Általános célú nemzetközi repülés – Repülőgépek

II. rész hatodik kiadása – 1998 július
25. módosítással

A jelen kiadvány magába foglalja a 6. Annex II. részének 2000 március 15-e előtt elfogadott összes módosításait és 1998 november 5-től hatálytalanítja a 6. Annex II. kötetének összes korábbi kiadásait.

A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót.

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	*kiadás időpontja*	*alkalmazhatóság időpontja*	*bevezette*
Hatodik kiadás 1–18. módosításokkal	1998 július 20.	1998 november 5.	
19. módosítás (a Tanács 1999 március 15-én fogadta el)	1999 július 19.	1999 november 4.	
20. módosítás (a Tanács 2000 március 15-én fogadta el)	2000 július 17.	2000 november 2.	
21. módosítás (a Tanács 2001 március 9-én fogadta el)	2001 július 16.	2001 november 1.	
22. módosítás (a Tanács 2002 március 15-én fogadta el)	2002 július 15.	2002 november 28.	
23. módosítás (a Tanács 2003 március 13-án fogadta el)	2003 július 14.	2003 november 27.	
24. módosítás (a Tanács 2005 február 28-án fogadta el)	2005 július 11.	2005 november 24.	
25. módosítás (a Tanács 2006. március 06-án fogadta el) A (x)-(xiii), 5,6,9,20 oldalak cseréje	–	–	

Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

Tartalomjegyzék

A 6. Annex II. részében alkalmazott rövidítések és jelzések

Rövidítések és jelzés

ACAS	Fedélzeti összeütközést megelőző rendszer
ADREP	Légijármű baleset vagy esemény jelentés
AFCS	Automatikus repülésvezérlő rendszer
AGA	Repülőterek, légútvonalak és földi berendezések
AIG	Légijármű baleset kivizsgálás és megelőzés
ASIA/PACIFIC	Ázsia és Csendes Óceáni területek
ASE	Magasságmérő rendszer hiba
ATC	Légiforgalmi irányító szolgálat
ATS	Légiforgalmi szolgálatok
CAT I	I. kategória
CAT II	II. kategória
CAT III	III. kategória
CAT IIIIA	IIIA. kategória
CAT IIIB	IIIB. kategória
CAT IIIC	IIIC. kategória
CFIT	Földnek ütközés szabályszerűen üzemelő és vezetett légijárművel a repülés során
Cm	centiméter
CVR	Pilótakabin hangrögzítő berendezés
DA	Tengerszint feletti elhatározási magasság
DA/H	Elhatározási magasság
DH	Talajszint feletti elhatározási magasság
DME	Távolságmérő berendezés
ECAM	Központi elektronikus légijármű képernyő
EFIS	Elektronikus repülésvezérlő műszer rendszer
EGT	Kilépő gázhőmérséklet
EICAS	Hajtómű működés kijelző és hajózószemélyzet riasztó rendszer

ELT	Vészhelyzeti helyjeladó berendezés
ELT(AF)	Automatikus állandó vészhelyzeti helyjeladó berendezés
ELT(AP)	Automatikus hordozható vészhelyzeti helyjeladó berendezés
ELT(AD)	Automatikusan kibocsátható vészhelyzeti helyjeladó berendezés
ELT(S)	Túlélési vészhelyzeti helyjeladó berendezés
EPR	Hajtómű nyomásviszony
EUROCAE	Európai Polgári Légiközlekedési Elektronikai Szervezet
FDAU	Repülési adat beszerző egység
FDR	Légijármű repülési adatrögzítő
FL	Repülési szint
FM	Frekvencia moduláció
Ft	láb
ft	láb
g	Általános gyorsulás
GPWS	Földközelség jelző és riasztó rendszer
hPa	Hektopascal
IFR	Műszerrepülési szabályok
IMC	Műszeres időjárási körülmények
INS	Inerciális navigációs rendszer
Kg	kilogramm
Km	kilométer
km/h	kilométer/óra
kt	csomó
m	méter
MDA	Legalacsonyabb tengerszint feletti süllyedési magasság
MDA/H	Legalacsonyabb süllyedési magasság
MDH	Legalacsonyabb földfelszín feletti süllyedési magasság
Mhz	Megahertz
MNPS	Minimális navigációs teljesítmény előírás

NAV	Navigáció
NM	Tengeri mérföld
N_1	Nagynyomású gázturbina forgási sebesség
OCA	Akadálymentes tengerszint feletti magasság
OCA/H	Akadálymentességi magasság
OCH	Akadálymentes földfelszín feletti magasság
RNP	Előírt navigációs teljesítmény
RVR	Futópályamenti látástávolság érték
RVSM	Csökkentett függőleges elkülönítési minimum
SI	Nemzetközi mértékegység rendszer
SICASP	Másodlagos légtérfelderítő radar fejlesztési és összeütközés elkerülési rendszereket kidolgozó munkacsoport
TLS	Megcélzott biztonsági szint
TVE	Összegzett függőleges hiba
UTC	Egyeztetett világidő
V_D	Tervezési süllyedési sebesség
VFR	Látvarepülési szabályok
VMC	Látás utáni időjárási körülmények

V_{S_0}	Átesési sebesség, azaz a legalacsonyabb állandó sebesség a repülésvezérlő szerkezetek leszálláshoz történő beállítása mellett
WXR	Időjárás
Szimbólumok	
°C	Celsius fok
%	százalék

A jelen Annex előírásaival kapcsolatos kiadványok

Egyezmény a nemzetközi polgári légiközlekedésről (Doc 7300)

Nemzetközi előírások a nyílt tengeren történő összeütközés megelőzésére

Európai Polgári Légiközlekedési Elektronikai Szervezet ED55A és ED56A jelzésű kiadványai

A Nemzetközi légiszállítás szabályzásának előírásai és útmutatói (Doc 9587)

A Nemzetközi Polgári Légiközlekedési Egyezmény **Annex**-ei

1. Annex	*Személyi jogosítás*
2. Annex	*Repülési szabályok*
3. Annex	*A nemzetközi légiközlekedés meteorológiai szolgálata*
5. Annex	*A légi és földi üzemeltetésnél alkalmazott mértékegységek*
6. Annex	*Légijármű üzemeltetés*
	I. rész – Nemzetközi kereskedelmi légiszállítás – Repülőgépek
	II. rész – Általános célú nemzetközi légiközlekedés – Repülőgépek
	III. rész – Nemzetközi üzemeltetés – Forgószárnyas légijárművek
8. Annex	*Légijármű légialkalmassága*

10. Annex	*Légiforgalmi távközlés*
	III. kötet
	I. rész – Digitális adattovábbítási rendszerek
	II. rész – Rádiótávbeszélő rendszerek
	IV. kötet - Légtérfelderítő radar és összeütközés elkerülését biztosító rendszerek
11. Annex	*Légiforgalmi szolgálatok*
12. Annex	*Kutatás és mentés*
13. Annex	*Légijármű baleset kivizsgálás*
14. Annex	*Repülőterek*
	I. kötet – Repülőtér tervezés és üzemeltetés
15. Annex	*Légiforgalmi tájékoztató szolgálat*
16. Annex	*Környezetvédelem*
	I. kötet – Légijármű zaj
18. Annex	*Veszélyes árúk légi szállítása*

A Légiforgalmi Szolgálatok Eljárásai (PANS)

OPS – Légijármű Üzemeltetés (Doc 8168)
I. kötet – Repülési eljárások
II. kötet – A látvarepülési (VFR) és műszerrepülési (IFR) szabályok kidolgozása

ATM – Légiforgalmi Áramlásszervezés (Doc 4444)

A nemzetközi polgári légiközlekedésről szóló Egyezmény 83/b. cikkelyének kiegészítő jegyzőkönyve (Doc 9318)

Körzeti Kiegészítő Eljárások (Doc 7030)

Kézikönyvek
ADREP Légijármű baleset és repesemény jelentése (Doc 9156)

Repülőtér szolgálati kézikönyv (Doc 9137)
1. rész – Tűzoltó és mentő szolgálatok
8. rész – Repülőtér üzemeltető szolgálatok

Légialkalmassági kézikönyv (Doc 9760)
A polgári légiközlekedés orvostana (Doc 8984)

A 300 méter (1000 láb) függőleges elkülönítési minimum FL290 és FL410 közötti bevezetésének kézikönyve – RVSM kézikönyv (Doc 9574)

Az előírt navigációs teljesítmény (RNP) kézikönyve (Doc 9613)

Előszó

Történeti háttér

Az általános célú nemzetközi légiközlekedésben üzemeltetett légijárművekre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944) 37. cikkelyének rendelkezései alapján 1968 december 2-án fogadta el és ekkor foglalta be a 6. számú Annex II. részébe. Az előírások 1969 április 2-án léptek hatályba és 1969 szeptember 18-tól alkalmazhatók.

A 6. Annex II. részét a következő módon dolgozták ki:

A Közgyűlés 1965 június és július hónapokban tartott 15. ülésén elfogadta az A15-15 számú határozatot „Az ICAO műszaki tevékenységével kapcsolatos igények az általános célú nemzetközi légiközlekedés vonatkozásában” címmel. Ezt követően a Negyedik léginavigációs konferencia (1965 november és december – Montreal) számos olyan tényezőt ajánlott, amelyeket véleményük szerint a fenti A15 -15 közgyűlési határozat irányelveivel összhangban a 6. Annex-nek az általános célú nemzetközi légiközlekedésre történő kiterjesztése alkalmával figyelembe kell venni.

A Negyedik léginavigációs konferencia javasolta, hogy az általános célú nemzetközi légiközlekedésre kidolgozott nemzetközi előírások és ajánlott gyakorlati eljárások ne vonatkozzanak a munkarepülésre. Mindazonáltal a konferencia egyértelmű álláspontja az volt, hogy az Annex-et úgy állítsák össze, hogy az megkönnyítse a munkarepülés későbbi időpontban történő felvételét, amennyiben ez kívánatossá válik.

A fenti meggondolások alapján a Léginavigációs Bizottság kidolgozta az általános célú nemzetközi légiközlekedésben résztvevő légijárművekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások tervezetét és a tagállamokkal történő konzultációk után azt a Tanács elfogadta. Így az elfogadott Előszóval együtt az a jelen Annex szövege lett. Az anyag kidolgozása alkalmával a Léginavigációs Bizottságot az alábbi szempontok vezérelték:

Alaki és tartalmi egyezés a 6. Annex I. részével

Az Annex a lehetőségek határain belül témakörében és tartalmában azonos legyen a 6. Annex-el, amely jelenleg a 6. Annex I. része.

Alkalmazhatóság

Bár ebben az Annex-ben az eredetileg használt általános célú légiközlekedés kifejezés a munkarepülést is magába foglalta, azt a módosított 2. fejezet – *Alkalmazhatóság* – előírásával szándékosan kizárták a jelen Annex-ből.

A biztonság szintje

Az Annex biztosítson elfogadható biztonsági szintet a harmadik személyek számára, akik ebben az esetben a földön tartózkodó illetve a levegőben levő másik légijármű fedélzetén helyet foglaló személyeket jelentik. Továbbá, mivel az általános célú nemzetközi légiközlekedés egyes repüléseit;

a) kevésbé tapasztalt és gyakorlott hajózószemélyzettel;

b) kevésbé megbízható berendezésekkel;

c) kevésbé szigorú előírások alapján; és *d)* nagyobb cselekvési szabadsággal hajtják végre, mint ami a kereskedelmi légiszállításban lehetséges;

el kell fogadni azt a tényt, hogy az általános célú nemzetközi légiközlekedésben résztvevő légijármű utasa nem élvezi szükségszerűen ugyanazt a biztonsági szintet, mint a kereskedelmi légiszállítás fizető utasa. Mindazonáltal elismerték, hogy a harmadik személyek megfelelő biztonsági szintjének fenntartásával a hajózószemélyzet és az utasok is elfogadható biztonsági szintet élveznek.

Cselekvési szabadság

Az elfogadható biztonsági szint fenntartása mellett az általános célú nemzetközi légiközlekedés számára a lehető legnagyobb cselekvési szabadságot biztosítsák.

Felelősség

A járató felé a 6. Annex I. részében meghatározott felelősség az Annex II. részében a légijármű parancsnokát terheli. Az erre vonatkozó további rendelkezéseket a 2. Annex tartalmazza.

A 6. Annex III. részének elfogadását követően – *Nemzetközi légiközlekedés – Forgószárnyas légijárművek* – a jelen rész címét kiegészítették annak jelzésére, hogy ez csak a repülőgépekre vonatkozik.

A Léginavigációs Bizottság áttekintette a 6. Annex II. részét és arra a következtetésre jutott, hogy az általános célú nemzetközi légiközlekedés meghatározását módosítani szükséges, kizárva ebből a munkarepülést. Ezzel jelzik, hogy a munkarepülés a polgári légiközlekedés külön része és erre a 6. Annex II. rész előírásai nem alkalmazhatók. Ahogy a Negyedik léginavigációs konferencia 1965-ben, úgy a Léginavigációs Bizottság sem tudott bármilyen olyan nagyságrendű nemzetközi munkarepülésről, amely szükségessé tette volna a nemzetközi előírások és ajánlott gyakorlati eljárások kidolgozását. Az általános célú légiközlekedés és a munkarepülés módosított meghatározásokat a szokásos módon benyújtották a tagállamoknak és ezeket a Tanács 1990 márciusában elfogadta.

A Léginavigációs Bizottság 1986-ban megkezdte a 6. Annex II. részének felülvizsgálatát és eközben arra a megállapításra jutott, hogy az általános célú nemzetközi légiközlekedés meghatározást módosítani szükséges, kizárva ebből a munkarepülést. Ezzel elismerte, hogy az a polgári légiközlekedés különleges eleme, amelyre a 6. Annex II. része nem vonatkozik. Ahogy 1965-ben a Negyedik Léginavigációs Konferencia, ugyanígy a Léginavigációs Bizottság sem ismert olyan nemzetközi munkarepülést, amely szükségessé tenné a nemzetközi előírások és ajánlott gyakorlati eljárások kidolgozását. Az általános célú nemzetközi légiközlekedés és munkarepülés módosított meghatározásait és a fejezet alkalmazhatóságának megfelelő módosítását az államok részére a szokásos módon benyujtották majd ezt követően a Tanács 1990 márciusában elfogadta azokat.

Az A. táblázat a vonatkozó fontosabb témakörök felsorolásával és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

Alkalmazhatóság

A 6. Annex II. részének jelen kiadása a Nemzetközi Polgári Légiközlekedési Szervezet által elfogadott és az általános célú nemzetközi légiforgalomban üzemeltetett repülőgépekre alkalmazandó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat tartalmazza.

A jelen nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex I. részével – Légijárművek üzemeltetése – Nemzetközi Kereskedelmi Légiszállítás – Repülőgépek – együttesen a nemzetközi kereskedelmi légiszállításban résztvevő összes repülőgép üzemeltetésére – a munkarepülés kivételével – minimális előírásként vonatkoznak és alkalmazandók.

Megjegyzendő, hogy a 6. Annex II. részében található nemzetközi előírások és ajánlott gyakorlati eljárások a nagy repülőgépekre történő alkalmazásuk során kevésbé szigorúak, mint a kereskedelmi légiszállításban üzemeltetett ugyanilyen vagy hasonló méretű repülőgépekre vonatkozó, a 6. Annex I. részében levő előírások. Ezzel együtt úgy gondoljuk, hogy az 1. és 8. Annex-ek és a jelen II. rész meglevő előírásai megfelelő biztonsági szintet adnak a kérdéses nagy méretű repülőgépek üzemeltetéséhez. Ebben az összefüggésben felhívjuk a figyelmet arra, hogy a 8. Annex összes teljesítmény előírása vonatkozik a nemzetközi légiközlekedésben utasok, teherárú vagy postaküldemény szállítására használt minden olyan, 5700 kg. tömegűnél nagyobb repülőgépre, amely prototípusára először 1964 december 13-án vagy ezt követően kértek légialkalmassági bizonyítványt. Ezen kívül az 1. Annex előírása alapján a magán repülőgépvezető szakszolgálati engedély birtokosának, aki 5700 kg. tömegűnél nagyobb légijárművet vezet – kivéve ha abban egyedül foglal helyet – szakszolgálati engedélyében típus jogosítással is rendelkeznie kell. Mivel a kérdéses típusú repülőgépek légialkalmassági bizonyítványához előzetes, az összes általános körülmények között végrehajtandó egyedül-repülés szükséges, a fenti típus jogosítási kötelezettség elfogadható.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben.

Az egyes részek jogállása a következő:

1.– Az Annex anyaga :

a) Nemzetközi előírások és ajánlott gyakorlati eljárások, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) Függelék: A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) Meghatározások: A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) Táblázatok és ábrák: Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

Megjegyzendő, hogy a jelen Annex egyes előírásai olyan követelményeket is tartalmaznak, melyek jogállása ajánlott gyakorlati eljárás. Az ilyen esetekben ezek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

2.– A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et hat nyelven – angol, arab, francia, kínai, orosz és spanyol nyelven fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előírt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***„Ajánlás”*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a „*Megjegyzés:*” felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat „shall – kell” kifejezéssel és az ajánlott gyakorlati eljárásokat „should – szükséges” kifejezéssel jelezzük. (Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk. – fordító).

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlők és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel – vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat – A 6. Annex II. részének módosításai

(módosítás – forrás – tárgy – elfogadva / hatályos / alkalmazható)

Első kiadás

A Közgyűlés 15. ülésszakának A15-15 határozata valamint a Negyedik Léginavigációs Konferencia alapján.

1968 december 2. 1969 április 2. 1969 szeptember 18.

1) – Hatodik Léginavigációs Konferencia

a) a repülőgépben felszerelendő további műszerekre vonatkozó előírások az ellenőrzött VFR repülések útvonalszakaszán; és;
b) a repülőgépek részére engedélyezi, hogy amennyiben azokat földi tájékozódási pontok alapján látás után nem lehet irányítani (vezetni), olyan egyéb, nem rádiónavigációs berendezések segítségével legyenek irányíthatók, mint például a saját fedélzeti navigációs eszközei, feltéve hogy ezek eleget tesznek bizonyos teljesítmény előírásoknak és ezzel szükségtelenné válik a rádiónavigációs berendezések felszerelésére és szállítására vonatkozó bármely előírás.

1970 június 1 1970 október 1. 1971 február 4.

2) – Második kiadás – A repülőtér környékén fellépő légijármű zajjal foglalkozó külön értekezlet

Az alkalmazható zajszint előírások tömeg korlátozásainak megfelelően üzemeltetett repülőgépek felvétele az előírások tartalmába; külön kivételektől eltekintve továbbá a zajbizonyítványt tartalmazó dokumentum szállítása.

1971 április 2. 1971 augusztus 2. 1972 január 6.

3) – Hetedik Léginavigációs Konferencia

A vészhelyzeti helyjeladó berendezés tervezésére, szállítására valamint felszerelésére vonatkozó ajánlott gyakorlati eljárás felvétele azon repülőgépekre és járatokra vonatkozóan, amelyekre ezt az illetékes hatóság előírja.

1973 május 29. 1973 október 1. 1974 május 23.

4) – A 12. Annex módosítása, a Léginavigációs Bizottság tanulmánya a polgári légijárművek elfogásával kapcsolatosan valamint az A18-19 Közgyűlési Határozat

a) A behatolási pontok jelzése a légijármű sárkányszerkezeten;

b) A jogtalan beavatkozás alatt álló légijármű veszélyeztetésének csökkentésére foganatosítandó intézkedések;

c) Az Annex 3. fejezet bevezető megjegyzésének módosítása. A módosítás az államok feladatainak megosztására és egyes feladatok átruházására vonatkozó útmutatás a nemzetközi légiforgalomban üzemeltetett légijármű bérbeadása, szerződéses üzemeltetése és cseréje esetében.

1975 február 4. 1975 június 4. 1975 október 9.

5) – A 3. Annex 60. számú és a 14. Annex 30. számú módosítása valamint a Léginavigációs Bizottság tanulmánya

A hajózószemélyzet vállhevederekkel ellátott biztonsági öveinek felszerelésére és használatára vonatkozó előírás; az IFR és ellenőrzött VFR repülések esetében pontos időmérő eszköz biztosítására vonatkozó előírás megerősítése; A repülőtéri és meteorológiai tájékoztatások meghatározásának módosítása.

1976 április 7. 1976 augusztus 7. 1976 december 30.

6) – ASIA/PAC Körzeti Léginavigációs Értekezlet

A vészrádió berendezés szállítására vonatkozó előírást olyan területek felett, ahol a kutatás és mentés különösen nagy nehézségekbe ütközik nem a körzeti léginavigációs egyezmény, hanem az érintett államok határozzák meg.
1976 június 16. 1976 október 16. 1977 október 6.

7) – Léginavigációs Bizottság tanulmánya

Ajánlás bevezetése, hogy bizonyos meghatározott repülőgépeken földközelség figyelmeztető és riasztó rendszert helyezzenek el.

1977 december 15. 1978 április 15. l978 augusztus 10.

8) – Léginavigációs Bizottság tanulmánya

A minimális navigációs teljesítmény előírásnak (MNPS) megfelelő navigációs berendezésekre vonatkozó előírások bevezetése.

1980 április 2. 1980 augusztus 2. 1980 november 27.

9) – Léginavigációs Bizottság tanulmánya

A külső fényekre vonatkozó előírások felülvizsgálata, hogy azok megegyezzenek a 2. és 8. Annex új előírásaival;

1982 március 22. 1982 július 22. 1982 november 25.

10) – Harmadik kiadás – Az Akadálymentesség kérdésével foglalkozó munkacsoport hetedik ülése, az AGA Üzemeltetési munkacsoport harmadik és negyedik ülése (1981) valamint az 5. és 18. Annex elfogadása miatt szükséges módosítások

A műszeres megközelítési eljárások kidolgozására és használatára valamint a repülőgéppel végrehajtott földi gurulás jogosítására és a szükséges képzettségre vonatkozó előírások bevezetése; a veszélyes árucikkek szállításával kapcsolatos előírások módosítása a 18. Annex elfogadása alapján; az alkalmazott mértékegységeket az 5. Annex előírásaival összhangba hozták és felülvizsgálták illetve módosították a 3. fejezet bérlettel, szerződéses üzemeltetéssel és cserével kapcsolatos megjegyzését; a „repülőtéri időjárási minimum” helyett „repülőtér üzemeltetési minimum” kifejezés bevezetése; az „elhatározási magasság” és a „legalacsonyabb süllyedési magasság” kifejezések bevezetése az 1. fejezetbe.

1983 május 20. 1983 szeptember 20. 1983 november 24.

11) – Baleset kivizsgálási és megelőzési munkacsoport 1979 évi ülése

A repülési adatrögzítőkkel kapcsolatos előírások felülvizsgálata és a tájékoztató anyag mellékletben történő ismertetése.

1985 március 8. 1985 július 29. 1985 november 21

12) – Léginavigációs Bizottság

Tájékoztatások szállítása a légijármű fedélzetén; 121.5 Mhz frekvencián működő távközlési berendezés.

1986 március 14. 1986 július 27. 1986 november 20.

13) – Akadálymentesség kérdésével foglalkozó munkacsoport hetedik ülése – Léginavigációs Bizottság tanulmánya

Oxigén rendszer biztosítása és használata; túlnyomás meghibásodás figyelmeztető jelzés; tüzelőanyag feltöltés utasokkal a fedélzeten; emelkedési teljesítmény adat biztosítása minden hajtómű működése esetére.

1986 március 14. 1986 július 27. 1986 november 20.

14) – Negyedik kiadás – Léginavigációs Bizottság Annex felülvizsgálata – VFR Üzemeltetési munkacsoport harmadik ülése – Léginavigációs Bizottság tanulmánya

a) Új meghatározások bevezetése a munkarepülésre, az általános célú légiközlekedésre, a kereskedelmi légiszállítási üzemeltetésre, kitérő repülőtér meghatározás felülvizsgálata, felszállási, útvonal és célállomás kitérő repülőtér fogalmak bevezetése; valamint a repülési terv és repülési adatrögzítő meghatározások felvétele;

b) a munkarepülés törlése az alkalmazhatóság részből;

c) a 6. Annex I. rész előírásaival történő egyeztetés, különös tekintettel a repülési adatrögzítők felvételeire egy baleset vagy repesemény után; Mach szám jelző műszer felszerelése;

d) az „ellenőrzött VFR repülés” kifejezés törlése;

e) tájékoztató anyag kidolgozása az elektronikus megjelenítő ernyőkkel felszerelt repülőgép fontos üzemeltetési adatainak repülési adatrögzítővel történő rögzítésére.

1980 március 19. 1990 július 30. 1990 november 15.

15) – Üzemeltetési munkacsoport ötödik ülése – az Elkülönítési munkacsoport általános elméletének módosítását célzó hetedik és nyolcadik ülés – Baleset kivizsgálási munkacsoport 1992 évi ülése – Folyamatos légialkalmassági munkacsoport harmadik ülése – Léginavigációs Bizottság tanulmányai

a) Repülőtér üzemeltetési minimum, elhatározási magasság, legalacsonyabb süllyedési magasság és akadálymentességi magasság kifejezések módosítása;

b) vészhelyzeti helyjel adó és előírt navigációs teljesítmény illetve típus új meghatározások bevezetése;

c) a műszeres megközelítés és leszállás osztályozásának bevezetése;

d) a repülési adatrögzítőkben alkalmazott fém-szalagok használatára vonatkozó előírás módosítása;

e) a vészhelyzeti helyjel adó berendezés (ELTs) szállítására vonatkozó előírás bevezetése a vészrádió berendezés és helyjel adó – ELBA – helyett;

f) előírás, melynek alapján a repülőgépen elhelyezett navigációs berendezés segítségével a repülőgép előírt navigációs teljesítménye alapján repüljön tervezett útvonalán vagy területeken; előírás a csökkentett 1000 láb (300 m) függőleges elkülönítési minimum VSM egységes bevezetéséhez FL 290 felett; hivatkozás az üzemeltetési kézikönyvben az RNP légtérben történő repülésvégrehajtás követelményekre;

1994 március 21. 1994 július 25. 1994 november 10.

16) – Ötödik kiadás – Léginavigációs Bizottság tanulmányai – Veszélyes árúk munkacsoport tizennegyedik ülése – Szerkesztői módosítások – szöveg egyeztetése a 6. Annex I. és/vagy III. részével és a szükséges módosítások

a) új és módosított meghatározások bevezetése:

b) az Egyezmény 35. cikkelyére vonatkozó utalás felvétele;

c) előírások módosítása az üzemeltetési létesítményekkel, repülés előkészítéssel, a repülőgép légialkalmasságával, a biztonsági intézkedésekkel, a célállomás kitérő repülőterekkel, az időjárás miatt szükséges korlátozásokkal, az oxigén rendszerrel valamint a vállhevederekkel ellátott biztonsági övekkel kapcsolatosan;

d) új előírások minden repülőgép minden repülésével, az összes látvarepülési szabályok szerint üzemeltetett repülőgéppel és a földközelség jelző és riasztó rendszerrel kapcsolatosan;

e) a hajózószemélyzet összetételére vonatkozó előírások módosítása;

f) a műszerrepülési szabályok (IFR) szerint üzemeltetett repülőgépekre vonatkozó előírások módosítása; és

g) az oxigén rendszer biztosítására és használatára vonatkozó előírások módosítása.

1995 március 10. 1995 július 24. 1995 november 9.

17) – A másodlagos radarberendezések továbbfejlesztésével valamint az összeütközés elkerülését biztosító rendszerekkel foglalkozó munkacsoportok negyedik ülése (SICASP/4)

A repülőgépek nyomásmagasság-adó másodlagos radar válaszjeladóval történő felszerelésére vonatkozó előírások felvétele (ACAS).

1996 február 19. 1996 július 15. 1996 november 7.

18) – Hatodik kiadás – Repülési adatrögzítés munkacsoport első ülése – Léginavigációs Bizottság tanulmányai – Az ipari és ICAO CFIT munkabizottságok vizsgálatai – 1. Annex 162. módosítása és a 11. Annex 38. módosítása – Szerkesztői módosítások

a) új és módosított meghatározások a szellemi tevékenységet befolyásoló anyagokra és az előírt navigációs teljesítményre vonatkozóan;

b) a kölcsönbérlet és csere vonatkozó megjegyzéseinek módosítása;

c) a szellemi tevékenységet befolyásoló (pszichoaktív) anyagok használatára vonatkozó új megjegyzés bevezetése;

d) új és módosított előírások a földközelség jelző és riasztó rendszer, a repülési adatrögzítők valamint a nyomásmagasság adó válaszjeladók szállítására.

1998 március 20. 1998 július 20. 1998 november 5.

19) – Repülési adatrögzítés munkacsoport második ülése – Léginavigációs Bizottság tanulmányai

a) meghatározások módosítása;

b) új előírások a 406 MHz és 121,5 MHz frekvencián üzemelő vészhelyzeti helyjeladó berendezések kötelező szállítására; földközelség jelző és riasztó rendszer (GPWS) kiegészítő veszélyes földfelszín közelség megelőző riasztási funkcióval történő ellátására vonatkozóan; a digitális összeköttetések rögzítésére vonatkozó határidő kijelölése.

1999 március 15. 1999 július 19. 1999 november 4.

20) – Léginavigációs Bizottság tanulmányai

a) meghatározások módosítása;

b) a műszeres megközelítések követelményeinek bevezetése; a légijármű parancsnok feladatainak módosítása.

2000 március 15. 2000 július 17. 2000 november 2.

21) – Repülési adatrögzítés munkacsoport második ülése – Az egész világot átfogó műholdas navigációs rendszerrel foglalkozó munkacsoport harmadik ülése – Folyamatos légialkalmassági munkacsoport ötödik ülése

a) a repülési adatrögzítőkre vonatkozó előírások módosítása, amelyek tartalmazzák a digitális távközlési adatok rögzítését; az új légijármű repülési adatrögzítőjére (FDR) vonatkozó előírások; rögzítendő jellemzők új felsorolása; a pilótakabin hangrögzítők (CVR) két órás felvételi időtartamának előírása;

b) a műszeres megközelítés és leszállás osztályozásának módosítása;

c) új előírások a függőleges irányvezetéssel (APV) végrehajtott megközelítésre vonatkozóan; és

d) új meghatározások és a karbantartással kapcsolatos előírások módosítása.

2001 március 9. 2001 július 16. 2001 november 1.

22) –Léginavigációs Bizottság tanulmányai
A földközelség jelző és riasztó rendszerre (GPWS) és az előre irányuló veszélyes földfelszín közelség megelőző riasztó feladatra vonatkozó előírások módosítása;

2002 március 15. 2002 július 15. 2002 november 28.

23) – Elkülönítési és Légtérbiztonsági munkacsoport
A RNP légtérben történő repülésvégrehajtás engedélyezése a lajstromozó állam részéről.

2003 március 13. 2003 július 14. 2003 november 27.

24) – Elkülönítési és Légtérbiztonsági munkacsoport és Léginavigációs Bizottság tanulmányai
a) Új meghatározások és intézkedések a magasságtartási teljesítőképesség és magasság ellenőrzési követelményekre vonatkozóan a csökkentett függőleges elkülönítési minimum (RVSM) szerinti üzemeltetéssel összefüggésben; és
b) Új követelmények az összeütközést elkerülő fedélzeti rendszer (ACAS II) kisgépes légiközlekedéshez tartozó repülőgépekre való felépítésével kapcsolatban, és ezzel összefüggő képzési követelmények a repülőgépvezetők számára.

2005 február 28. 2005 július 11. 2005 november 24.

25) – Az Akadály védelmi Munkabizottság tizennegyedik ülése (OCP/14)
A repülőgépvezetők tudomása az eljárás felépítése alapján meghatározott üzemeltetési követelményekről.

2006 március 06. – –

Nemzetközi előírások és ajánlott gyakorlati eljárások

1. fejezet
Meghatározások

Amennyiben az általános célú nemzetközi kereskedelmi légiközlekedésben üzemeltetett légijárművekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások során a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Aerial Work – Munkarepülés

A légijármű olyan különleges szolgáltatások nyújtásához történő üzemeltetése, mint például mezőgazdasági, építési, légi-fényképezési, megfigyelési, felderítési, ellenőrzési, kutató és mentő feladatok valamint hirdetési szolgáltatások.

Aerodrome – Repülőtér

Szárazföldön vagy vízfelszínen kijelölt terület (beleértve bármilyen épületet, létesítményt, amelyet részben vagy teljes egészében légijárművek érkezésére, indulására valamint földi mozgására kívánnak felhasználni.

Aerodrome operating minima – Repülőtér üzemeltetési minimum

Egy repülőtér igénybevételének korlátozásai a következő repülési feladatok vonatkozásában:

a) Felszállás – futópályamenti látástávolság (RVR) és/vagy látástávolság értékben valamint ha szükséges, felhőzet jellemzőkben kifejezve;

b) Precíziós megközelítés és leszállás – az üzemeltetés kategóriájának megfelelően látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;

c) Függőleges irányvezetéssel végrehajtott megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;

d) Nem-precíziós megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint legalacsonyabb süllyedési magasság értékben (MDA/H) és ha szükséges, felhőzet jellemzőkben kifejezve.

Aeroplane – Repülőgép

Levegőnél nehezebb, hajtóművel működő légijármű, amely felhajtóerejét repülés közben főként az olyan felületekre ható aerodinamikai reakciókból nyeri, amelyek a repülés adott körülmények között rögzített helyzetben maradnak.

Aircraft – Légijármű –

Minden olyan szerkezet, amelynek levegőben maradását olyan aerodinamikai reakcióerők biztosítják, amelyek nem azonosak a földfelszínre ható aerodinamikai reakcióerőkkel.

Alternate aerodrome – Kitérő repülőtér

Olyan repülőtér, amelyre a légijármű abban az esetben folytathatja az útját, ha a tervezett célállomás repülőtere felé történő repülés folytatása vagy az oda történő leszállás végrehajtása lehetetlenné válik vagy nem tanácsos. A kitérő repülőterek közé tartoznak az alábbiak:

Felszállási kitérő – Take-off alternate

Olyan kitérő repülőtér, amelyen a légijármű leszállhat, ha ez röviddel a felszállás után szükségessé válik és erre az indulási repülőtér nem használható.

Útvonal kitérő – En-route alternate

Olyan kitérő repülőtér, amelyen egy légijármű leszállhatna, ha az útvonal-repülés közben a hajózószemélyzet szokásostól eltérő vagy vészhelyzetet tapasztal.

Célállomás kitérő – Destination alternate

Olyan kitérő repülőtér, amely felé a légijármű folytathatja az útját, ha a tervezett célállomás repülőterén történő leszállás végrehajtás lehetetlenné válik vagy nem tanácsos.

Megjegyzés: Az a repülőtér, amelyről a járat elindult, az adott járat számára útvonal vagy célállomás kitérőként is megjelölhető.

Altimetry system error (ASE) – Magasságmérő rendszer hiba (ASE)

A magasságmérő számlapján kijelzett magasság – helyes barometrikus magasság beállítást feltételezve – és a zavarmentes környezeti nyomásnak megfelelő nyomásmagasság különbsége.

Approach and landing operations using instrument approach procedures – Műszeres megközelítési eljárásokat alkalmazó megközelítés és leszállás

A műszeres megközelítési és leszállási eljárások osztályozása a következő:

Nem-precíziós megközelítés és leszállás – Non-precision approach and landing operations

Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú irányvezetést alkalmaznak, azonban függőleges irányvezetést nem vesznek igénybe.

Megközelítés és leszállás függőleges irányvezetéssel – Approach and landing operations with vertical guidance

Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú és függőleges irányvezetést alkalmaznak, azonban a precíziós megközelítésre és leszállásra vonatkozó üzemeltetési előírásoknak nem tesznek eleget.

Precíziós megközelítés és leszállás –Precision approach and landing operations

Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során precíziós oldalirányú és függőleges irányvezetést alkalmaznak az alábbiakban meghatározott üzemeltetési minimumok figyelembevételével:

Megjegyzés: Az oldalirányú és függőleges irányvezetés a következő berendezések egyikének segítségével nyújtott iránysáv és siklópálya tájékoztatás:

a) földi telepítésű navigációs berendezés; vagy

b) számítógéppel biztosított navigációs adatok.

Precíziós megközelítés és leszállás kategóriái – Categories of precision approach and landing operations:

I. kategória (I. kat) – Category I (CAT I) operations

Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága nem kevesebb mint 60 méter (200 láb) valamint a látástávolság értéke nem kevesebb mint 800 méter vagy a futópályamenti látástávolság értéke nem kevesebb mint 550 méter.

II. kategória (II. kat) – Category II (CAT II) operations

Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága kevesebb mint 60 méter (200 láb) de nem kevesebb mint 30 méter (100 láb) valamint a futópályamenti látástávolság értéke nem kevesebb mint 350 méter.

III/A. kategória (III/A. kat) – Category IIIA (CAT IIIA) operations

Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 30 méter (100 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke nem kevesebb mint 200 méter.

III/B. kategória (III/B. kat) – Category IIIB (CAT IIIB) operations

Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 15 méter (50 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke kevesebb mint 200 méter, de nem kevesebb mint 50 méter.

III/C. kategória (III/C. kat) – Category IIIC (CAT IIIC) operations

Olyan műszeres megközelítés és leszállás, amelyhez elhatározási magasság és futópályamenti látástávolság érték korlátozást nem határoztak meg.

Megjegyzés: Ahol az elhatározási magasság és futópályamenti látástávolság érték korlátozások különböző üzemeltetési kategóriákba esnek, a műszeres megközelítés és leszállás az igényesebb kategória alapján határozandó meg, azaz ott, ahol az elhatározási magasság érték a III/A. kategóriába, míg a futópályamenti látástávolság érték a III/B. kategóriába tartozik, a megközelítés és leszállás III/B. kategóriás lesz. Ugyanígy, amennyiben az elhatározási magasság érték II. kategóriás és a futópályamenti látástávolság érték az I. kategóriába tartozik, a megközelítés és leszállás II. kategóriásnak tekintendő.

Commercial air transport operation – Kereskedelmi légiszállítási tevékenység

Pénzbeli ellenszolgáltatásért vagy bérleti díjért végzett utas, teherárú vagy postaküldemény szállító légijármű üzemeltetések.

Dangerous goods – Veszélyes áruk

Olyan tárgyak vagy anyagok, amelyek a légijárművön történő szállítás során az egészségre, biztonságra vagy az anyagi javakra (tulajdonra) nagy kockázatot jelentenek.

Megjegyzés: A veszélyes árukat a 18. Annex 3. fejezete osztályozza.

Decision altitude (DA) / Decision height (DH) – Elhatározási magasság

A precíziós vagy a függőleges irányvezetéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amelyen megszakított megközelítés eljárást kell kezdeményezni, ha a megközelítés folytatásához szükséges látás utáni tájékozódás feltételei nem jöttek létre.

1. Megjegyzés: A DA elhatározási magasság a közepes tengerszinthez, a DH elhatározási magasság pedig a futópálya küszöb magasságához viszonyított érték.

2. Megjegyzés: A szükséges látás utáni tájékozódás feltételei a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. III. kategóriás üzemelés során, amennyiben elhatározási magasságot jelölnek ki, a szükséges látási feltételek az adott eljárásra vagy üzemelésre vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok "QNH/OFE elhatározási magasság"-ként rövidítve pedig DA/H-ként írhatók le.

Emergency locator transmitter (ELT) – Vészhelyzeti helyjeladó berendezés –

Olyan berendezés leírására szolgáló általános kifejezés, amely megkülönböztetett (rádió)jeleket sugároz a kijelölt hullámhosszakon és alkalmazásától függően a baleset alkalmával automatikusan működésbe léphet vagy kézzel üzembe helyezhető. A vészhelyzeti helyjeladó berendezés az alábbi típusú lehet:

Automatikus rögzített – Automatic fixed ELT (ELT/AF)

Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön állandóan rögzítve helyezkedik el.

Automatikus hordozható – Automatic portable ELT (ELT/AP)

Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után a légijármű fedélzetéről könnyen eltávolítható.

Automatikusan leváló – Automatically deployable ELT (ELT/AD)

Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után, annak hatására továbbá egyes esetekben hidrosztatikus érzékelők működésének útján automatikusan leválik a légijárműről. Szükség esetén lehetséges annak kézi eltávolítása is.

Túlélési – Survival (ELT/S)

Olyan vészhelyzeti helyjeladó berendezés, amely eltávolítható légijárműről és a légijárművön úgy tárolják, hogy azt vészhelyzet esetén a túlélők egyszerűen üzembe helyezhetik és használhatják.

Flight crew member – Hajózószemélyzeti tag

Szakszolgálati engedéllyel rendelkező személyzeti tag, akinek munkája a repülés időtartama alatt nélkülözhetetlen a légijármű üzemeltetéséhez.

Flight manual – Repülésvégrehajtási kézikönyv

A légialkalmassági bizonyítvánnyal összhangban kidolgozott és kiadott kézikönyv, amely tartalmazza azokat a korlátozásokat, amelyek mellett a légijármű repülésre alkalmasnak nyilvánítható, valamint azokat az utasításokat és tájékoztatásokat, amelyek a hajózószemélyzet tagjai számára a légijármű biztonságos üzemeltetéséhez szükségesek.

Flight plan – Repülési terv

A légiforgalmi szolgálati egységek rendelkezésére bocsátott, a légijármű tervezett repülésére vagy a repülés egy szakaszára vonatkozó meghatározott tájékoztatás.

Flight recorder – Repülési adatrögzítő

A légijárművön felszerelt bármely típusú adatrögzítő, amelynek célja a tájékoztatások biztosítása a légijármű baleset vagy repesemény kivizsgáláshoz.

Flight time – Aeroplanes – Repülési idő – Repülőgép

Az a teljes időtartam, amely akkor kezdődik, amikor a repülőgép a felszállás céljából először megindul és akkor fejeződik be, amikor a repülőgép a repülés után megáll.

Megjegyzés: Az itt meghatározott repülési idő azonos az általánosan használt „blokk-idővel" vagy a „féktuskó elvételétől annak visszahelyezéséig" tartó időtartammal, amelyet attól az időponttól mérnek, amikor a repülőgép a felszállás céljából először megindul és akkor fejeződik be, mikor a repülőgép a repülés után megáll.

General aviation operation – Általános célú légiközlekedés

A kereskedelmi légiszállító tevékenységtől valamint a munkarepüléstől eltérő légijármű üzemeltetés.

Instrument meteorological conditions (IMC) – Műszeres időjárási körülmények

Látástávolsággal, felhőzettől mért távolsággal és felhőalappal[*] kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél alacsonyabbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

Maintenance – Karbantartás

A légijármű folyamatos légialkalmasságának biztosításához előírt feladatok, beleértve a következők bármelyikét vagy ezek kombinációját; ellenőrzés, átvizsgálás, javítás, csere, módosítás vagy a meghibásodás elhárítása.

Maintenance programme – Karbantartási program

Az előírt tervszerű karbantartási feladatok felsorolását tartalmazó kiadvány, amely jelzi feladatok végrehajtásának időrendi tervét és rendjét. Ilyen kiadvány lehet a légijármű üzemi megbízhatósági programja, amely azon légijármű biztonságos üzemeltetéshez szükséges, amelyre az vonatkozik.

Maintenance release – Karbantartási kibocsátás

Olyan igazolást tartalmazó dokumentum, amely megerősíti, hogy a megfelelő karbantartási feladatokat a karbantartást végző szervezet eljárási kézikönyve vagy más egyenértékű rendszer alapján az elfogadott jellemzők figyelembevételével kielégítően elvégezték.

Meteorological information – Időjárás tájékoztatás

A jelenlegi vagy várható időjárási körülményekre vonatkozó időjárás jelentés, elemzés, előrejelzés vagy bármely más kiadott közlemény.

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[*] A 2. Annex szerint.

Minimum descent altitude (MDA) / Minimum descent height (MDH) – Legalacsonyabb süllyedési magasság

A nem-precíziós megközelítési vagy a körözéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amely alá az előírt látási feltételek létrejöttének hiányában süllyedni tilos.

1. Megjegyzés: A legalacsonyabb QNH süllyedési magasság a közepes tengerszinthez, a legalacsonyabb QFE süllyedési magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott legalacsonyabb süllyedési magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A szükséges látási feltételek a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. A körözéssel végrehajtott megközelítés esetében a szükséges látási feltételek a futópálya környezetére vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok „QNH/OFE legalacsonyabb süllyedési magasság”-ként rövidítve pedig MDA/H-ként írhatók le.

Night – Éjszaka

Az esti polgári szürkület vége és a hajnali polgári szürkület kezdete között eltelt idő vagy olyan más, napnyugat és napkelte között eltelt időszak, amelyet az illetékes hatóság határoz meg.

Megjegyzés: Az esti polgári szürkület akkor fejeződik be, amikor a napkorong középpontja 6 °-al a horizont alá süllyed és a hajnali polgári szürkület akkor kezdődik, amikor a napkorong középpontja 6 °-al a horizont fölé emelkedik.

Obstacle clearance altitude (OCA) or Obstacle clearance height (OCH) – Akadálymentes tengerszint feletti magasság (OCA) vagy akadálymentes földfelszín feletti magasság (OCH)

A legalacsonyabb közepes tengerszinthez viszonyított magasság vagy a megfelelő futópálya küszöb illetve a repülőtér magassága feletti magasság – amelyik alkalmazható – amelyet az akadályoktól történő megfelelő függőleges elkülönítés biztosítása érdekében az akadálymentességi előírásokkal összhangban határoznak meg.

1. Megjegyzés: Az akadálymentes tengerszint feletti magasság a közepes tengerszinthez, az akadálymentes földfelszín feletti magasság a futópálya küszöb magasságához viszonyított érték. A nem-precíziós megközelítés esetében az akadálymentes földfelszín feletti magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott akadálymentes földfelszín feletti magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok „QNH/OFE akadálymentes magasság”-ként rövidítve pedig OCA/H-ként írhatók le.

Pilot-in-command – Légijármű parancsnoka

A repülés biztonságos végrehajtásáért felelős, a járató részéről parancsnoknak kijelölt repülőgépvezető vagy az általános célú légiközlekedés esetében a légijármű tulajdonosa.

Psychoactive substances – Szellemi tevékenységet befolyásoló anyagok

Alkohol, ópiumból vagy kenderből készített kábítószer, kokain, nyugtatók és altatók, egyéb izgató, serkentő, élénkítő-szerek, képzeteket keltő erős izgatószerek és illékony oldószerek a kávé és a dohányféleségek kivételével.

Repair – Javítás

A légijármű bármely üzemi alkatrészének sérülést vagy üzemszerű kopást követő repülésre alkalmas állapotba történő helyreállítása annak biztosítása érdekében, hogy az továbbra is megfelel a vonatkozó légialkalmassági előírásoknak, amelyeket az adott légijármű típus bizonyítványának kiadásakor figyelembe vettek.

Required navigation performance (RNP) – Előírt navigációs pontosság

Egy meghatározott légtérben történő repülés-végrehajtáshoz szükséges navigációs teljesítmény azaz pontosság.

Megjegyzés: A navigációs teljesítményt és előírásokat az adott RNP típusra és/vagy alkalmazásra határozzák meg.

Required navigation performance type (RNP type) – Előírt navigációs pontosság típus

Tengeri mérföldben kifejezett távolság érték, azaz pontossági határérték. A repülésvégrehajtás során a repülőgép tervezett repülési helyzetéhez viszonyítva a repülési idő legalább 95 %-ában ezen határértéken belül repüljön.

Például: – az RNP 4 olyan navigációs pontosság határértéket jelent, amelynek alapján az adott repülőgép repülési idejének legalább 95 százalékában mindenkori tervezett repülési helyzetéhez viszonyítva plusz/minusz 7.4 km (4 tmf) távolságon belül repül.

Runway visual range – Futópályamenti látástávolság érték (RVR)

Az a távolság, ameddig a futópálya középvonalán álló légijármű vezetője látja a futópálya felületi jelzéseket vagy a futópálya szélét kijelölő illetve a középvonalát azonosító fényeket.

State of Registry – Lajstromozó állam

Azon állam, amelynek lajstromába a légijárművet bevezették.

Megjegyzés: A nem nemzeti alapon működő nemzetközi üzemeltető vállalkozás vagy szervezet légijárművének lajstromozás esetében az abban érintett államokra együttesen és külön-külön is vonatkozik az a kötelezettség, amely a Chicagó-i Egyezmény értelmében a lajstromozó államot illeti. Erre vonatkozóan lásd a Tanács 1967 december 17-i Határozatát a Nemzetközi üzemeltető szervezetek által üzemeltetett légijárművek nemzeti hovatartozása és lajstromozása (Doc 8722) címmel.

Target level of safety – Megcélzott biztonsági szint (TLS)

Adott körülmények között elfogadhatónak itélt kockázati szintet kifejező általános fogalom.

Total vertical error (TVE) – Összegzett magassági hiba (TVE)

A légijármű aktuális repülési nyomás magassága és a részére meghatározott nyomás magasság (repülési szint) közötti függőleges geometriai különbség.

Visual meteorological conditions (VMC)- Látás utáni időjárási körülmények

Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél jobbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

2. fejezet Alkalmazhatóság

A 6. Annex II. részében található nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatók az általános célú nemzetközi légiközlekedésben résztvevő repülőgépek üzemeltetésére.

1. Megjegyzés: A nemzetközi kereskedelmi légiszállításban üzemeltetett repülőgépekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex I. részében találhatók.

2. Megjegyzés: A nemzetközi kereskedelmi légiszállításban valamint az általános célú nemzetközi légiközlekedésben üzemeltetett forgószárnyas légijárművekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex III. részében találhatók.

3. fejezet Általános rész

1. Megjegyzés: Bár a Nemzetközi Polgári Légiközlekedési Egyezmény a lajstromozó államra bizonyos feladatokat ír elő, amelyek végrehajtására az állam jogosult vagy kötelezett, a Közgyűlés A23-13 számú határozatában elismerte azt a tényt, hogy a lajstromozó állam bizonyos körülmények között képtelen megfelelő módon eleget tenni a fenti kötelezettségének, amikor a légijárművet más állam járatója – elsősorban hajózószemélyzet nélkül – bérbe veszi, szerződés vagy csere megállapodás alapján üzemelteti valamint azt is, hogy amíg az Egyezmény 83/b. cikkelye életbe nem lép, az Egyezmény nem megfelelően határozza meg a járató államára ilyen esetekben vonatkozó jogokat és kötelezettségeket. Ezért a Tanács felhívta a figyelmet arra, hogy ha a fenti esetekben a lajstromozó állam megállapítja, hogy képtelen az Egyezményben előírt kötelezettségei teljesítésére, azokat a feladatokat, amelyeket a járató állama jobban el tud végezni és amennyiben ez a feladatok végrehajtását elvállalja, járató államára utalhatja át. Tudomásul vették, hogy a 83/b. cikkely hatályba lépéséig a fentiek csak gyakorlati szempontból lesznek célszerűek és nem érintik a Chicagó-i Egyezménynek a lajstromozó államra vagy egy harmadik államra háruló kötelezettségeit. Mindazonáltal, mivel a 83/b. cikkely 1997 június 20-án hatályba lépett, a vonatkozó kiegészítő jegyzőkönyvet (Doc 9318) aláíró államok kötelesek az ilyen átadási megállapodásokban foglaltak teljesítésére.

2. Megjegyzés: A nemzetközi légi üzemeltetés esetében, amelyet közösen olyan repülőgépekkel bonyolítanak le, amelyek nem mindegyike van azonos szerződő államban lajstromozva, a jelen rész előírásai közül semmi sem akadályozza meg az érintett államokat abban, hogy szerződés alapján *együttesen végezzék el azokat a feladatokat, amelyek végrehajtására a vonatkozó Annex-ek a lajstromozó államot jelölik ki.*

3.1 A légijármű parancsnoka tegyen eleget azon állam jogszabályainak, előírásainak és közzétett eljárásainak, amelyben a repülőgépet üzemeltetik.

1. Megjegyzés: A lajstromozó állam a 3.1 pont előírásával nem ellentétes, fokozottan korlátozó intézkedéseket is előírhat.

2. Megjegyzés: A nyílt vizek feletti repülés szabályait a 2. Annex tartalmazza.

3. Megjegyzés: A repülési eljárások paramétereiben és az üzemeltetési eljárásokban érintett pilóták részére vonatkozó információk a PANS OPS I. kötetében találhatók. A látás utáni és a műszer szerinti repülési eljárások kidolgozására vonatkozó követelmények a PANS OPS II. kötetében találhatók. Bizonyos Államok által használatos akadályvédelmi követelmények és eljárások eltérhetnek a PANS-OPS-től, és biztonsági okokból fontos ezen különbségek ismerete.

3.2 Az ajtók bezárása után a légijármű parancsnoka felelős a fedélzeten tartózkodó összes hajózószemélyzeti tag, utas és az elhelyezett teherárú biztonságáért. A parancsnok felelős továbbá a repülőgép üzemeltetéséért és biztonságáért attól a pillanattól kezdve, amikor a repülőgép a felszállás céljából történő indulásra készen áll addig, mikor az a repülés után végleg megáll és az elsődleges hajtómű egységeket leállítják.

3.3 Amennyiben a repülőgép vagy az utasok biztonságát fenyegető vészhelyzet esetében olyan tevékenységre van szükség, amellyel megsértik a helyi előírásokat vagy eljárásokat, a légijármű parancsnoka késedelem nélkül értesítse erről az illetékes helyi hatóságot. Ha az állam, amelynek felségterületén az esemény bekövetkezik így rendelkezik, a légijármű parancsnoka bármely ilyen előírás megsértéséről nyújtson be jelentést az állam illetékes hatósága számára; ebben az esetben a jelentés másolatát nyújtsa be továbbá a lajstromozó állama számára is. Az ilyen jelentéseket a lehető legrövidebb időn, általában 10 napon belül nyújtsák be.

3.4 A légijármű parancsnoka felelős a legközelebbi illetékes hatóság lehető leggyorsabb értesítéséért a repülőgépet érintő minden olyan balesetről, amelynek következménye bármely személy súlyos vagy halálos sérülése illetve a repülőgép vagy más anyagi javak jelentős károsodása.

Megjegyzés: A „súlyos sérülés” kifejezés meghatározása a 13. Annex-ben, a „jelentős károsodás” kifejezés magyarázata a Baleset/repesemény Jelentési Kézikönyvben – ADREP Manual – *(Doc 9156) található.*

3.5 **Ajánlás** – A légijármű parancsnokának a repülőgép fedélzetén álljon rendelkezésére az átrepült területen működő kutató és mentő szolgálatokra vonatkozó összes alapvető tájékoztatás.

3.6 Veszélyes árúk

1. Megjegyzés: A veszélyes árúkra vonatkozó előírások a 18. Annex-ben találhatók.

2. Megjegyzés: Az Egyezmény 35. cikkelye bizonyos teherárú korlátozási osztályokra vonatkozik.

3.7 Szellemi tevékenységet befolyásoló anyagok használata

Megjegyzés: A szellemi tevékenységet befolyásoló anyagok használatára vonatkozó előírások az 1. Annex 1.2.7 és a 2. Annex 2.5 pontjaiban találhatók.

4. fejezet
Repülés előkészítés és repülésvégrehajtás

4.1 Az üzemeltetés létesítményeinek alkalmassága

A légijármű parancsnoka a repülést ne kezdje meg az előtt, hogy minden lehetséges és ésszerű eszközzel meggyőződött arról, hogy megfelelőek azok a rendelkezésre álló földi és/vagy vízfelszíni területek valamint létesítmények, beleértve a távközlési és navigációs berendezéseket is, amelyek az ilyen repülés végrehajtásához valamint a repülőgép biztonságos üzemeltetéséhez közvetlenül szükségesek.

Megjegyzés: A jelen előírásban alkalmazott „lehetséges és ésszerű eszköz" kifejezés a légijármű parancsnoka részéről az indulási helyen a légiforgalmi tájékoztató szolgálatok által kiadott hivatalos közlemények vagy más forrásokból származó egyéb közvetlen tájékoztatások felhasználását jelenti.

4.2 Repülőtér üzemeltetési minimum

A légijármű parancsnoka ne hajtson végre repülést olyan repülőtéren ahol a repülőtér üzemeltetési minimum alacsonyabb, mint amit a repülőtér vonatkozásában azon állam határozott meg, amelyben a repülőtér elhelyezkedik, kivéve ha erre az adott állam külön engedélyt ad.

Megjegyzés: Néhány állam gyakorlata szerint a repülés tervezési célokra magasabb minimumokat jelölnek meg arra az esetre, ha a repülőteret kitérőként választják szemben azzal, ha a repülőtér a tervezett leszállás helye.

4.3 Repülés előtti tájékoztatás

4.3.1 A légijármű parancsnoka biztosítsa, hogy az utasok szóbeli tájékoztatás vagy más módszer segítségével megismerjék a következő eszközök elhelyezkedését és használatát:

a) biztonsági övek; és szükség szerint,

b) vészkijáratok;

c) mentőmellények;

d) oxigén légzőkészülék; és

e) más, egyéni használatra rendszeresített mentőfelszerelések, beleértve a vészhelyzeti utas-tájékoztató kiadványokat is.

4.3.2 A légijármű parancsnoka biztosítsa, hogy a fedélzeten tartózkodó összes személy ismerje a közös használatra rendszeresített alapvető mentőfelszerelések elhelyezkedését és általános használatát.

4.4 A repülőgép légialkalmassága és biztonsági intézkedések

4.4.1 A repülést ne kezdjék meg azelőtt, hogy a légijármű parancsnoka meggyőződött arról, hogy:

a) a repülőgép repülésre alkalmas, előírásszerűen lajstromozták és az erre vonatkozó okmányok a repülőgép fedélzetén vannak;

b) a repülőgépen felszerelt műszerek és berendezések a várható repülési körülményeknek megfelelőek és üzemképesek;

c) a 8. fejezet előírásai alapján az összes szükséges karbantartási eljárást elvégezték;

d) a repülőgép tömege valamint súlypont-helyzete a várható repülési körülmények figyelembe-vételével olyan, hogy a repülési feladat biztonságosan végrehajtható;

e) a terhelést megfelelő módon elhelyezték és biztonságosan rögzítették; és

f) a repülésvégrehajtási kézikönyvben vagy más ezzel egyenértékű dokumentumban meghatározott repülőgép üzemeltetési korlátozásokat betartják azaz nem lépik túl.

4.4.2 **Ajánlás** – *A légijármű parancsnoka rendelkezzen megfelelő tájékoztatással a repülőgép összes működő hajtóművel történő emelkedési képességéről, hogy ezzel a meglevő felszállási körülmények és a tervezett felszállási módszer (repülés-technika) alapján meghatározhassa a kezdeti emelkedés mértékét*

.

4.5 Időjárás jelentések és előrejelzések

A repülés megkezdése előtt a légijármű parancsnoka ismerje meg a tervezett repüléshez rendelkezésre álló összes időjárás tájékoztatást. Az indulási helytől eltávolodó és minden müszerrepülési szabályok szerint végrehajtott repülés előkészítéséhez tartozzanak a következők:

1) a rendelkezésre álló érvényes időjárás-jelentések és előrejelzések tanulmányozása; és

2) kitérő tevékenység megtervezése, amely lehetővé teszi a repülés folytatását abban az esetben, ha azt az időjárási körülmények miatt a tervek szerint nem lehet végrehajtani.

Megjegyzés: A repülési tervekre vonatkozó előírásokat a 2. Annex (Repülési Szabályok) *és a PANS-ATM Doc 4444* (Repülési és Légiforgalmi Szolgálatok Szabályai) *tartalmazza.*

4.6 Az időjárási körülmények miatt szükséges korlátozások

4.6.1 Látvarepülési szabályok szerint végrehajtott repülés

A kizárólag helyi, látás utáni időjárási körülmények között végrehajtott repülés kivételével a látvarepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha az érvényes időjárás-jelentések vagy az érvényes időjárás-jelentések és előrejelzések azt jelzik, hogy a megfelelő időben az útvonalon vagy annak látvarepülési szabályok szerint tervezett repülési szakaszán az uralkodó időjárási körülmények olyanok lesznek, hogy az ilyen (VFR) szabályok betarthatók.

4.6.2 Műszerrepülési szabályok szerint végrehajtott repülés

4.6.2.1 *Ha célállomás kitérő repülőtér kijelölése szükséges:*
A műszerrepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha a rendelkezésre álló tájékoztatások szerint az érkezés várható időpontjában a tervezett leszállási és legalább egy célállomás kitérő repülőtéren az uralkodó (időjárási) körülmények repülőtér üzemeltetési minimumnak megfelelőek vagy annál jobbak lesznek.

4.6.2.2 *Ha célállomás kitérő repülőtér kijelölése nem szükséges:*
Amennyiben kitérő repülőtér nem szükséges, a műszerrepülési szabályok szerint tervezett repülés

végrehajtását egy repülőtérre ne kezdjék meg csak akkor, ha:

a) a tervezett leszállási repülőtérre szabványos műszermegközelítési eljárást dolgoztak ki és írtak elő; és
b) a rendelkezésre álló érvényes időjárás tájékoztatások azt jelzik, hogy az érkezés számított időpontja előtt és után két – két órával a következő időjárási körülmények állnak fenn:

1) a felhőalap legalább 300 méterrel (1000 láb) magasabb, mint a műszeres megközelítési eljáráshoz előírt minimum érték; és

2) a látástávolság legalább 5.5 km vagy 4 km-el több, mint az eljáráshoz tartozó legalacsonyabb érték.

4.6.3 Repülőtér üzemeltetési minimum

4.6.3.1 A repülést ne folytassák a tervezett leszállási repülőtér felé csak abban az esetben, ha a rendelkezésre álló legújabb tájékoztatások azt jelzik, hogy az érkezés várható időpontjában az adott vagy legalább egy célállomás kitérő repülőtéren az időjárási körülmények a meghatározott repülőtér üzemeltetési minimum értéknek megfelelőek vagy ennél jobbak lesznek.

4.6.3.2 A precíziós megközelítés esetében a műszeres megközelítést ne folytassák a külső marker adó (OM) navigációs ponton túl vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alatt, kivéve ha a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték (RVR) a megállapított minimum felett van.

4.6.3.3 Amennyiben precíziós megközelítés esetében a külső marker adó (OM) navigációs pont átrepülése után vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alá történő süllyedésnél a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték a megállapított minimum alá csökken, a megközelítés az elhatározási vagy a legalacsonyabb süllyedési[2] elhatározási magasság DA/H – sűllyedési magasság MDA/H 2 magasságig folytatható. A repülőgép semmi esetre se folytassa a leszálláshoz történő megközelítését bármely repülőtérre azon a meghatározott ponton túl, amely után a repülőtérre megállapított repülőtér üzemeltetési minimum értéket megsértené.

Megjegyzés: A meghatározó futópályamenti látástávolság érték az egy vagy több mérési helyről (földetérési terület, futópálya középpont, megállási terület) jelentett RVR értékeket jelenti, amelyeket az üzemeltetési minimum érték teljesítésének megállapítására használnak. Ahol RVR értéket alkalmaznak, a meghatározó futópályamenti látástávolság érték a földetérési területre vonatkozó RVR, kivéve ha a helyi előírások mást nem határoznak meg.

4.6.4 Repülés jegesedés körülményei között

Ismert vagy várható jegesedés körülményei között a repülést ne kezdjék meg csak abban az esetben, ha a repülőgép ilyen körülmények közötti üzemelésre van jogosítva és felszerelve.

4.7 Célállomás kitérő repülőterek

A műszerrepülési szabályok szerint tervezett repülés esetében válasszanak ki és a repülési terven határozzanak meg legalább egy célállomás kitérő repülőteret, kivéve ha:
a) a repülés időtartama és az uralkodó időjárási körülmények olyanok, hogy joggal feltételezhető, hogy a tervezett leszállási repülőtéren a leszállás számított időpontjában valamint megfelelő időtartammal ez előtt illetve ezen túl a megközelítés és a leszállás látás utáni időjárási körülmények között végrehajtható lesz; vagy

b) a tervezett leszállási repülőtér elszigetelt fekvésű és nincs alkalmas célállomás kitérő repülőtér.

4.8 Tüzelőanyag és olajkészlet

4.8.1 A repülés végrehajtását ne kezdjék meg csak akkor, ha az időjárási körülmények valamint a repülés során várható bármely késés figyelembevételével a repülőgép elegendő tüzelőanyagot és olajat szállít ahhoz, hogy a repülést biztonságosan be tudja fejezni és szükség szerint eleget tudjon tenni a következő különleges előírásoknak:

4.8.1.1 Műszerrepülési szabályok szerint végrehajtott repülés

A repülőgép szállítson elegendő mennyiségű tüzelőanyagot és olajat, amely lehetővé teszi, hogy:

a) amennyiben a 4.6.2.2 pont előírásával összhangban célállomás kitérő repülőtér kijelölése nem szükséges:
elrepüljön addig a repülőtérig, amelyre a repülést tervezték és ezt követően további 45 percig repüljön; vagy

b) amennyiben célállomás kitérő repülőtér kijelölése szükséges:
elrepüljön addig a repülőtérig, amelyre a repülést tervezték majd ezt követően a kitérő repülőtérig és további 45 percig repüljön.

Megjegyzés: A 4.8 pont előírásai egyáltalán nem zárják ki a repülési terv repülés közben történő módosításának lehetőségét abból a célból, hogy a repülést másik repülőtérre tervezzék át, feltéve hogy a 4.8 pont előírásai teljesíthetők attól a ponttól, ahol a repülést áttervezték.

4.9 Oxigén készlet

A légijármű parancsnoka biztosítsa, hogy elegendő mennyiségű belélegzésre alkalmas oxigén álljon rendelkezésre a személyzeti tagok és az utasok számára minden olyan repülési magasságon végrehajtott repülés alkalmával, amelyen az oxigénhiány a személyzet tagjainak teljesítőképességét korlátozhatja vagy káros hatásokkal lehet az utasokra.

Megjegyzés: Az oxigén szállításával és használatával kapcsolatos útmutató a B. Mellékletben található.

4.10 Oxigén használat

A repülőgép repülése alatt, annak biztonságos üzemeltetéséhez nélkülözhetetlen feladatokat ellátó összes hajózószemélyzeti tagja folyamatosan használja az oxigén légzőkészüléket, amikor ezt az uralkodó körülmények a 4.9 pont előírásai alapján szükségessé teszik.

4.11 Repülés közbeni vészhelyzeti utasítások

A repülés közben bekövetkező vészhelyzetben a légijármű parancsnoka biztosítsa, hogy a fedélzeten tartózkodó valamennyi személy a körülményeknek megfelelő vészhelyzeti utasításokat és tájékoztatásokat kapjon.

4.12 Repülőgépvezetői időjárás jelentés

Ajánlás – *Amennyiben olyan időjárási körülményeket észlelnek, amelyek valószínűleg más légijárművek biztonságát is befolyásolják, ezeket a lehető legrövidebb időn belül jelentsék*
.

4.13 Repülésre veszélyes körülmények

Ajánlás – *A repülésre veszélyes, az időjárási viszonyokkal kapcsolatostól eltérő, a repülés végrehajtása során tapasztalt egyéb körülményeket a lehető legrövidebb időn belül jelentsék. A jelentések tartalmazzák a más légijárművek biztonságával kapcsolatos vagy kapcsolatba hozható részleteket is*
.

4.14 A hajózószemélyzet tagjainak fizikai állapota

A légijármű parancsnoka felelős annak biztosításáért, hogy a repülést:
a) ne kezdjék meg, ha a hajózószemélyzet bármely tagja bármely okból képtelen előírt feladatainak teljesítésére. Ilyen okok közé tartozhat a sérülés, betegség, fáradtság, gyógyszeres vagy alkoholos befolyásoltság; és
b) ne folytassák a legközelebbi alkalmas repülőtéren túl, ha a hajózószemélyzet bármely tagjának teljesítőképessége valamely ok, mint például fáradtság, betegség vagy oxigén hiány miatt jelentős mértékben csökken.

4.15 A hajózószemélyzet tagjai munkahelyeiken

4.15.1 *Fel és leszállás* – A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén.

4.15.2 *Útvonalon* – A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén, kivéve ha távolléte a repülőgép üzemeltetésével kapcsolatos feladatok elvégzése vagy fiziológiai okok miatt szükséges.
4.15.3 *Biztonsági övek* – A hajózószemélyzet valamennyi tagja szolgálati helyén tartsa biztonsági övét becsatolva.

4.15.4 *Vállhevederekkel ellátott biztonsági övek* – **Ajánlás** – *Amennyiben ilyen biztonsági övet biztosítottak, a fel és leszállási szakaszokban a hajózószemélyzet bármely repülőgépvezetői ülést elfoglaló tagja vállhevederrel ellátott biztonsági övét tartsa becsatolva; a hajózószemélyzet többi tagja a fel és leszállási szakaszokban vállhevederrel ellátott biztonsági övét tartsa becsatolva, kivéve ha a vállhevederek akadályozzák őket feladataik végrehajtásában, amely esetben a vállhevedereket kikapcsolhatják, azonban a biztonsági öveket bekapcsolva kell tartaniuk.*

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

4.16 Műszerrepülési eljárások

4.16.1 A műszeres megközelítés és leszállás kategóriák figyelembevételével minden egyes műszeres futópályára vagy műszerrepülési szabályok szerint üzemelő repülőtérre dolgozzanak ki egy vagy több műszeres megközelítési eljárást és az az állam, amelyben a repülőtér elhelyezkedik, hagyja jóvá valamint tegye közzé ezeket az eljárásokat.

4.16.2 A műszerrepülési szabályok szerint üzemelő összes repülőgép tartsa be azokat a műszerrepülési eljárásokat, amelyeket az az állam hagyott jóvá, amelynek területén a repülőtér elhelyezkedik.

1. Megjegyzés: A műszeres megközelítés és leszállás kategóriáit illetve az osztályozást az I. fejezet tartalmazza.

2. Megjegyzés: A műszerrepülési eljárásokban érintett személyek részére ajánlott üzemeltetési eljárások a PANS OPS I. kötetében (Doc 8168) találhatók.

3. Megjegyzés: A műszerrepülési eljárások kidolgozásában érintett szakértők részére ajánlott tájékoztató anyag a PANS-OPS II. kötetében (Doc 8168) található.

4.17 Általános utasítások

A repülőtér mozgási területén a repülőgép nem gurulhat, kivéve ha a kormányánál helyet foglaló személy:

a) a tulajdonostól illetve bérelt repülőgép esetében a bérlőtől vagy kijelölt képviselőjétől megfelelő felhatalmazással rendelkezik ;

b) teljes mértékben jogosult a repülőgép gurulásának végrehajtására;

c) jogosult a rádió-távbeszélő berendezés használatára, ha rádió összeköttetés fenntartása szükséges; és

d) erre jogosított személytől megfelelő kiképzést kapott a repülőtér elrendezése, útvonalai, jelzései, jelölései, fényei, a légiforgalmi irányítás utasításai, jelzései, kifejezései és eljárásai vonatkozásában továbbá képes a repülőgépnek a repülőtér területén történő biztonságos mozgatásához szükséges üzemeltetési előírások betartására.

4.18 Tüzelőanyag-feltöltés utasokkal a fedélzeten

4.18.1 **Ajánlás** – *A repülőgépen ne végezzenek tüzelőanyag feltöltést akkor, amikor az utasok beszállnak, kiszállnak vagy a repülőgép fedélzetén tartózkodnak, kivéve ha a légijármű parancsnok vagy más kiképzett személyzet áll készenlétben a repülőgép leggyorsabb és legcélszerűbb módszerekkel történő kiürítésének megkezdésére és a kiürítés irányítására.*

4.18.2 **Ajánlás** – *Az utasok beszállása, kiszállása vagy a repülőgép fedélzetén történő tartózkodása alatt végzett tüzelőanyag feltöltés alatt a repülőgép belső beszédüzemű összeköttetési berendezése vagy más alkalmas eszköz segítségével tartsanak fenn két-oldalú összeköttetést a tüzelőanyag feltöltést ellenőrző földi személyzet és a légijármű parancsnoka vagy a 4.18.1 pontban előírt más kiképzett személyzet között.*

1. Megjegyzés: A 4.18.1 pont előírása a tüzelőanyag-feltöltés előfeltételeként nem teszi alapvetően szükségessé a repülőgép saját beépített lépcsőjének kibocsátását vagy a vészkijáratok kinyitását.

2. Megjegyzés: A légijármű tüzelőanyag feltöltésére vonatkozó előírások a 14. Annex-ben és a biztonságos tüzelőanyag feltöltési módszerekkel kapcsolatos útmutató a Repülőtér Szolgálati Kézikönyv *(Doc 9137) 1. és 8. részében található.*

3. Megjegyzés: Amikor a repülőgép tüzelőanyaggal történő feltöltését nem kerozinnal végzik, a feltöltés alkalmával a kerozin más gázturbina hajtóanyagokkal keveredik, vagy nyílt töltővezetéket alkalmaznak, további elővigyázatossági rendszabályokra van szükség.

5. fejezet
Repülőgép teljesítmény üzemeltetési korlátozások

5.1 A repülőgépet a következők szerint üzemeltessék:

a) légialkalmassági bizonyítvánnyal vagy más egyenértékű elfogadott okmánnyal összhangban;

b) a lajstromozó állam légialkalmasságot jogosító hatósága által előírt üzemeltetési korlátozások betartásával; és

c) a 16. Annex I. kötet zajszint minősítési előírásaiban meghatározott tömeg korlátozásoknak megfelelően, kivéve ha különleges körülmények között, bizonyos repülőtéren vagy futópályán, ahol zajszint probléma nem jelentkezik, erre az érintett állam illetékes hatósága – amelyben a repülőtér elhelyezkedik – külön engedélyt ad.

5.2 A repülőgépen táblákkal, felsorolásokkal, jegyzékekkel, műszer jelölésekkel vagy ezek együttesével tüntessék fel azokat az üzemeltetési korlátozásokat, amelyeket a lajstromozó állam légialkalmasságot jogosító hatósága előírt.

Megjegyzés: A 8. Annex – Légijárművek légialkalmassága (III. A valamint III. B részek) nemzetközi előírásai és ajánlott gyakorlati eljárásai *a nemzetközi légiközlekedésben utas, teheráru vagy postaküldemény szállítására felhasználni kívánt minden olyan repülőgépre vonatkoznak, amelynek legnagyobb engedélyezett felszállósúlya több mint 5700 kg.*

6. fejezet
Repülőgép műszerek, felszerelések

Megjegyzés: A repülőgép távközlési és navigációs felszerelésére vonatkozó előírásokat a 7. fejezet tartalmazza.

6.1 Az összes repülőgép összes repülése

6.1.1 Általános rész

A légialkalmassági bizonyítvány kiadásához szükséges minimális felszerelés mellett a repülőgépet az igénybevett repülőgép típus és a repülésvégrehajtás körülményeinek figyelembevételével szereljék fel vagy azon szállítsák a következő pontokban előírt műszereket, felszereléseket és repülési okmányokat. Az előírt műszereket és felszereléseket, beleértve azok elhelyezését is, a lajstromozó állam hagyja jóvá vagy fogadja el.

6.1.2 Műszerek

A repülőgépet szereljék fel azokkal a műszerekkel, amelyek a hajózószemélyzet számára lehetővé teszik a repülőgép repülési pályájának irányítását és ellenőrzését, bármely előírt eljárás művelet végrehajtását valamint a repülőgép üzemeltetési korlátozásainak a várható üzemeltetési körülmények között történő megfigyelését.

6.1.3 Felszerelések

6.1.3.1 Minden repülőgép minden repülése

6.1.3.1.1 Minden repülőgépet minden repülés alkalmával szereljék fel:

a) egy hozzáférhető elsősegélynyújtó készlettel;

b) olyan típusú hordozható tűzoltó készülékkel, amelynek tűzoltó anyaga igénybevétel után nem szennyezi veszélyesen a repülőgép belső terének levegőjét. Legalább egy ilyen tűzoltó készüléket helyezzenek el;

1) a repülőgép pilótafülkéjében; és

2) minden egyes olyan utaskabinban, amely a pilótakabintól el van választva és amelyet a légijármű parancsnoka vagy első tisztje nem tud azonnal megközelíteni.

c) *1)* egy – a lajstromozó állam által meghatározott életkor feletti minden egyes személy részére – megfelelő ülő vagy fekvőhellyel; és

2) minden üléshez egy biztonsági övvel valamint minden fekvőhelyhez egy bekötő biztonsági hevederrel;

d) a következő kézikönyvekkel, térképekkel és tájékoztatásokkal:

1) az adott repülőgép repülésvégrehajtási kézikönyve vagy más olyan dokumentum illetve tájékoztató, amely tartalmazza az 5. fejezet alkalmazásához szükséges, a lajstromozó állam légialkalmasságot jogosító hatósága által a repülőgépre előírt bármely üzemeltetési korlátozást;

2) érvényes és alkalmas térképek, amelyek fedik a tervezett repülés útvonalát valamint bármely olyan egyéb útvonalat, amelyről joggal feltételezhető, hogy arra a repülés átirányítható;

3) az elfogott légijármű parancsnok számára a 2. Annex-ben előírt eljárások; és

4) az elfogó és az elfogott légijárművek által használandó, a 2. Annex-ben előírt látjelek; és

e) megfelelő értékű elektromos biztosítékok tartalékként a repülés közben hozzáférhető biztosítékok cseréjéhez.

6.1.3.1.2 **Ajánlás** – *Minden repülőgép minden repülésén legyen felszerelve a kutatás és mentés céljait szolgáló föld-levegő látjelekkel.*

6.1.3.1.3 **Ajánlás** – *Minden repülőgép minden repülésén az összes hajózószemélyzeti tag ülése legyen felszerelve vállhevederekkel ellátott biztonsági övvel.*

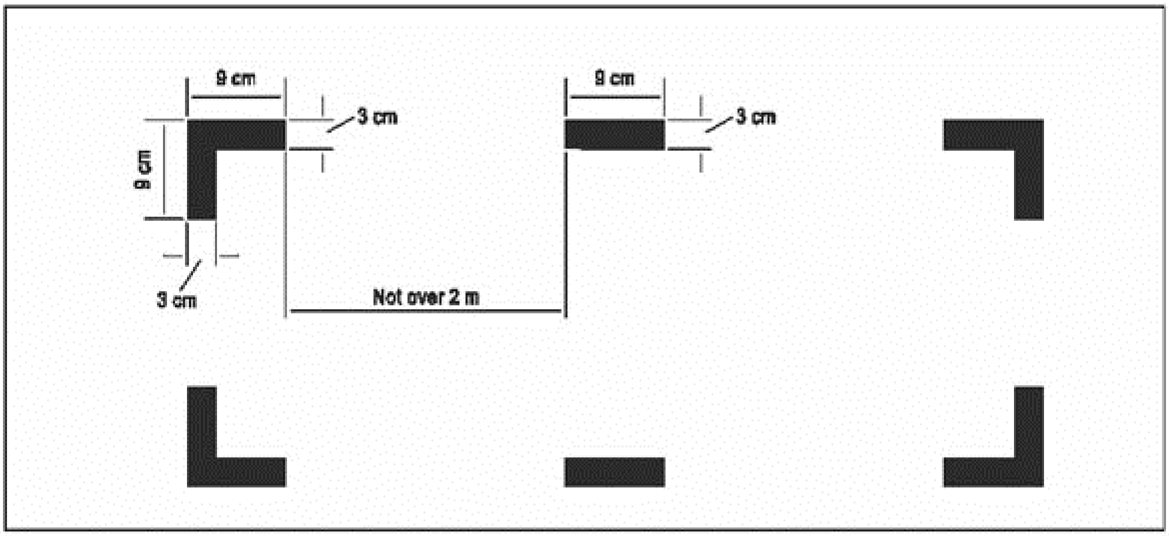
Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

6.1.4 Az átvágható felületek jelzése

6.1.4.1 Amennyiben a repülőgépen a mentőszemélyzet részére jelzik a kényszerhelyzet esetén a törzsön átvágható felületeket, azokat a következő ábrának megfelelő módon jelöljék meg. A jelölések színe vörös vagy sárga legyen és ha erre a háttértől történő megkülönböztethetőség érdekében szükség van, azokat fehér színű alapozásra készítsék el.

6.1.4.2 Amennyiben a sarkok jelölése egymástól több mint 2 méter távolságra vannak, fessenek fel 9 x 3 cm-es vonalakat olyan módon, hogy az egymás mellett levő vonalak közötti távolság 2 méternél nagyobb ne legyen.

Megjegyzés: Ez az előírás nem teszi szükségessé azt, hogy bármely repülőgép sárkányszerkezetén átvágható felületek legyenek.



A légijármű törzsén levő átvágható felületek, azaz behatolási pontok jelzése

6.2 Az összes, látvarepülési szabályok szerint üzemeltetett repülőgép

6.2.1 Az összes látvarepülési szabályok (VFR) szerint üzemeltetett repülőgépet szereljenek fel a következőkkel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) érzékeny nyomás-magasság mérőműszerrel;

d) repülési sebesség mérőműszerrel; és

e) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

6.2.2 **Ajánlás** – A látvarepülési szabályok szerint (VFR) ellenőrzött repülésként üzemeltetett repülőgépet a 6.6 pont előírásainak megfelelően szereljék fel.

6.3 Az összes, vízfelszín felett üzemeltetett repülőgép

6.3.1 Vízi-repülőgépek

Minden vízi-repülőgépet szereljenek fel:

a) a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel;

b) ahol ez alkalmazható, a tengeri összeütközések megelőzésére vonatkozó nemzetközi szabályokban előírt hangjelzést előállító berendezéssel;

c) egy darab horgonnyal; és

d) egy darab tengeri horgonnyal, ha ez a manőverezéshez szükséges.

Megjegyzés: A vízi repülőgépek közé tartoznak a vízi repülőgépként üzemeltetett un. „kétéltű” repülőgépek is.

6.3.2 Szárazföldi repülőgépek

6.3.2.1 Egy-motoros repülőgépek

Ajánlás – *Minden szárazföldi repülőgépet, amennyiben az a vízfelszín felett olyan útvonalon repül, amely nagyobb mint a hajtómű nélküli siklás távolsága, szereljenek fel a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel.*

Megjegyzés: A szárazföldi repülőgépek közé tartoznak a szárazföldi repülőgépként üzemeltetett un. "kétéltű" repülőgépek is.

6.3.3 Az összes, repülőgép hosszú távú repülése vízfelszín felett

Az összes, vízfelszín felett hosszú távú repülést végrehajtó repülőgépet szereljenek fel a következőkkel:

a) amikor a repülőgép 93 km-nél (50 NM) nagyobb távolságra repül a vízfelszín felett a kényszerleszállás végrehajtására alkalmas szárazföldtől:
– a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel;

b) amikor az egy-motoros repülőgép 185 km-nél (100 NM) nagyobb távolságra illetve a több-hajtóműves/motoros repülőgép, amely egy hajtómű leállása esetén folytatni tudja repülését, 370 km-nél (200 NM) nagyobb távolságra repül a vízfelszín felett a kényszerleszállás végrehajtására alkalmas szárazföldtől:

> *1)* elegendő számú mentő-tutaj a fedélzeten tartózkodó összes személy elhelyezésére, amelyeket úgy tárolnak, hogy azok a vészhelyzet esetén gyorsan üzembe helyezhetők és az útvonal sajátosságainak megfelelő életmentő eszközökkel vannak ellátva, beleértve a létfenntartási eszközöket is; és
>
> *2)* a 2. Annex-ben ismertetett pirotechnikai vészjelzések előállítására szolgáló felszerelés.

6.4 Az összes, kijelölt szárazföld felett üzemeltetett repülőgép

Amennyiben a repülőgépet azon szárazföldi területek felett üzemeltetik, amelyeket az érintett államok olyan területként jelölnek meg, ahol a kutatás és mentés különös nehézségekbe ütközik, a repülőgépet szereljék fel olyan jeladó berendezéssel és életmentő felszereléssel, beleértve a létfenntartási eszközöket is, amelyek nagy valószínűséggel megfelelnek az átrepülendő terület sajátosságainak.

6.5 Az összes, nagy repülési magasságon üzemeltetett repülőgép

6.5.1 Minden olyan repülőgépet, amelyet nagy repülési magasságon kívánnak üzemeltetni, szereljenek fel oxigén tároló és adagoló készülékkel, amely biztosítja a 4.9 pontban előírt oxigén készlet tartalékot.

6.5.2 Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki

A túlnyomásos kabinnal ellátott repülőgépeket, amelyeket olyan repülési magasságon kívánnak üzemeltetni, amelyen az atmoszférikus nyomás értéke kevesebb mint 376 hPa, szereljenek fel olyan berendezéssel, amely a kabin légnyomás veszélyes csökkenése esetén egyértelmű figyelmeztető jelzést ad a hajózószemélyzet részére.

6.5.3 Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1990 január 1. előtt adták ki

Ajánlás – *A túlnyomásos kabinnal ellátott repülőgépeket, amelyeket olyan repülési magasságon kívánnak üzemeltetni, amelyen az atmoszférikus nyomás értéke kevesebb mint 376 hPa, szereljenek fel olyan berendezéssel, amely a kabin légnyomás veszélyes csökkenése esetén egyértelmű figyelmeztető jelzést ad a hajózószemélyzet részére.*

6.6 Az összes, műszerrepülési szabályok szerint üzemeltetett repülőgép

Az összes, műszerrepülési szabály szerint (IFR) üzemeltetett repülőgépet, továbbá azokat, amelyek üzemeltetésük során egy vagy több műszer segítsége nélkül nem tarthatók a kívánt repülési helyzetben, szereljenek fel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) érzékeny nyomás-magasság mérőműszerrel;

Megjegyzés: A már hosszabb ideje tapasztalható pontatlan mérések miatt a dob-mutatós magasságmérő használata nem javasolt.

d) repülési sebesség jelző rendszerrel, amely olyan berendezéssel van ellátva, amely megakadályozza a kicsapódás vagy jegesedés következtében lehetséges helytelen működést;

e) elfordulás és csúszás jelzőműszerrel;

f) repülési helyzetjelző műszerrel (műhorizont);

g) irányjelző műszerrel (géptengely irány-jelző pörgettyűs műszer – giroszkóp):

Megjegyzés: a fenti e), f) és g) pontok előírásainak műszerek együttesével vagy integrált repülés vezérlési rendszerrel is eleget lehet tenni, feltéve hogy a rendszer a három külön műszer egységen belül és együttesen is védve van a teljes meghibásodás ellen.

h) a pörgettyűs műszerek kielégítő elektromos táplálásának jelzésére szolgáló eszközzel;

i) a pilótakabinban felszerelt, a külső levegő hőmérsékletét jelző műszerrel;

j) emelkedési és süllyedési sebesség mérőműszerrel; és

k) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

6.7 Az összes, éjszaka üzemeltetett repülőgép

Az összes, éjszaka üzemeltetett repülőgépet szereljenek fel:

a) a 6.6 pontban előírt valamennyi berendezéssel;

b) a repülés közben levő valamint a repülőtér mozgási területein üzemelő légijármű számára a 2. Annex-ben előírt (navigációs) fényekkel;

Megjegyzés: A 2. Annex előírásainak megfelelő navigációs fényeket a Függelékben ismertetjük. A fények általános jellemzőit a 8. Annex-ben határoztuk meg. A repülés közben levő valamint a repülőtér mozgási területein üzemelő légijárművek fényeire vonatkozó, 2. Annex előírásainak megfelelő fények jellemzőit a Légialkalmassági Kézikönyv *-ben (Doc 9760) részletezzük.*

c) egy leszálló fényszóróval;

d) a repülőgép biztonságos üzemeltetése szempontjából alapvető fontosságú, a hajózószemélyzet által használt valamennyi műszer és berendezés (meg)világításával;

e) világítással valamennyi utastérben; és

f) elektromos kézilámpával minden egyes hajózószemélyzeti szolgálati helyen.

6.8 Az összes repülőgép, amely eleget tesz a 16. Annex I. kötet zajbizonyítvány előírásainak

A zajbizonyítványt helyezzék el és szállítsák a repülőgép fedélzetén.

Megjegyzés: A zajbizonyítványt bármely olyan okmány tartalmazhatja, amelyet a lajstromozó állam elfogad és a repülőgép fedélzetén szállítanak.

6.9 Repülőgépek, amelyeket földközelség jelző és riasztó rendszerrel (GPWS) kell felszerelni

6.9.1 Minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2004 január 1-én vagy ezt követően adják ki, engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg vagy amely több mint kilenc utas szállítására jogosított, szereljenek fel földközelség jelző és riasztó rendszerrel, amely előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.9.2 2007 január 1-től minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg vagy amely több mint 9 utas szállítására jogosított, szereljenek fel földközelség jelző és riasztó rendszerrel, amely előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.

6.9.3 **Ajánlás** – *Minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) 5700 kg vagy kevesebb és ötnél több, de tíznél kevesebb utas szállítására jogosított, szereljenek fel földközelség jelző és riasztó rendszerrel, amely előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.*

6.9.4 **Ajánlás** – *Minden olyan dugattyús motoros repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg vagy amely több mint 9 utas szállítására jogosított, szereljenek fel földközelség jelző és riasztó rendszerrel, amely előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.*

6.9.5 A földközelség jelző és riasztó rendszer képes legyen a hajózószemélyzet részére automatikusan, időben és jól megkülönböztethető módon figyelmeztető jelzést adni abban az esetben, ha a repülőgép a föld felszínét gyakorlati szempontból veszélyes mértékben megközelíti.

6.9.6 A földközelség jelző és riasztó rendszer legalább a következő körülmények között adjon figyelmeztető jelzést:

a) túlzott mértékű süllyedés;

b) felszállást vagy átstartolást követő túlzott mértékű magasságvesztés; és

c) a földfelszín nem biztonságos megközelítése.

6.9.7 **Ajánlás** – *Minden olyan gázturbinás sugárhajtóműves repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg vagy amely több mint 9 utas szállítására jogosított, szereljenek fel olyan földközelség jelző és riasztó rendszerrel, amely előre irányuló veszélyes földfelszín közelség megelőző riasztási feladatra is képes.*

6.10 Repülési adatrögzítők

1. Megjegyzés: A repülési adatrögzítők két rendszerből illetve berendezésből, a repülési adatrögzítőből valamint a pilótakabin hangrögzítőből állnak.

2. Megjegyzés: Az összetett repülési adat és pilótakabin hangrögzítő berendezések csak a jelen Annex-ben külön ismertetett repülési adatrögzítő berendezés előírások teljesítésére használhatók.

3. Megjegyzés: A repülési adatrögzítőkkel kapcsolatos részletes útmutató az A. Mellékletben található.

6.10.1 Repülési adatrögzítők – típusok

6.10.1.1 Az I. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek.

6.10.1.2 A II. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének valamint a magassági és áramlásrontó (fékező) szerkezetek beállításának pontos meghatározásához szükségesek.

6.10.1.3 A repülési adatrögzítő berendezésekben 1995 január 1. után ne használjanak fémszalagot.

6.10.1.4 **Ajánlás** – *1998 november 5. után ne használják a frekvencia modulációt (FM) alkalmazó analóg adatrögzítőket.*

6.10.1.4.1 2003 január 1. után ne használják a fényképészeti filmmel működő repülési adatrögzítőket.

6.10.1.5 Az összes olyan digitális adathálózati összeköttetést alkalmazó repülőgép, amelynek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki, valamint pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett, repülési adatrögzítő berendezésén rögzítse az összes, beérkező és kimenő digitális adathálózati közleményt. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a rögzített hangfelvétellel.

6.10.1.5.1 2007 január 1.-től az összes digitális adathálózati összeköttetést alkalmazó repülőgép, amely pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett, repülési adatrögzítő berendezésén rögzítse az összes, beérkező és kimenő digitális adathálózati közleményt. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a rögzített hangfelvétellel.

6.10.1.5.2 Az adathálózati digitális közleményváltás tartalmának megismeréséhez szükség tájékoztatást és ahol ez lehetséges, a közlemény megjelenítésének vagy a hajózószemélyzet által történt lehívásának időpontját is rögzítsék.

Megjegyzés: Az adathálózati összeköttetések közé tartoznak, azonban nem csak ezekre korlátozódnak a következők:

ADS – automatikus légtérfelderítés

CPDLC – légiforgalmi irányító és repülőgépvezető közötti adathálózati összeköttetések

D-FIS – adathálózati és repüléstájékoztató szolgálati összeköttetések

AOC – légiközlekedési üzemi irányítási közlemények.

6.10.1.6 **Ajánlás** – *Minden olyan repülőgépet, amelynek engedélyezett legnagyobb felszállósúlya (tömege) több mint 5700 kg és repülési adatrögzítő és pilótakabin hangrögzítő berendezések szállítására kötelezett, alternatív megoldásként kettős (összetett) repülési adat és pilótakabin hangrögzítő berendezéssel is (FDR/CVR) felszerelhetnek.*

6.10.1.7 Az I.A típusú repülési adatrögzítő rögzítse azokat a jellemző adatokat, amelyek a repülőgép repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek. A következő pontokban ismertetjük azokat a jellemzőket, amelyek kielégítik az I.A típusú repülési adatrögzítőre vonatkozó előírásokat. A jelölés (*) nélkül jellemzők rögzítése kötelező. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a repülőgép rendszerei vagy a hajózószemélyzet a jellemzőt illetve adatot a repülőgép üzemeltetéshez használja fel.

6.10.1.7.1 A repülőgép repülési pályájára és sebességére vonatkozó előírásokat kielégítő jellemzők:
• nyomás-magasság
• műszer szerinti vagy kalibrált repülési sebesség
• levegő – föld viszonyítási helyzet és minden egyes futómű szerkezet helyzete; szükség szerint
• külső levegő hőmérséklete vagy össz-hőmérséklet
• géptengely irányszög (a hajózószemélyzet elsődleges műszerei alapján)
• függőleges gyorsulás

• oldalirányú gyorsulás
• hosszirányú gyorsulás (törzs tengely)
• idő vagy relatív idő számítás
• navigációs adatok*: széleltérítés sodródási szög, szélsebesség, szélirány, szélességi és hosszúsági fok adatok
• földi feletti sebesség*
• rádió magasságmérő jelzett magassága*

6.10.1.7.2 A repülési helyzetre vonatkozó előírásokat kielégítő jellemzők:
• bólintási helyzet, azaz repülőgép kereszt-tengely körüli mozgása
• bedöntési helyzet, azaz hossztengely körüli elfordulása
• legyezőmozgás helyzet, azaz a repülőgép függőleges tengelye körüli elfordulás*
• állásszög*

6.10.1.7.3 A hajtóműre vonatkozó előírásokat kielégítő jellemzők:
• hajtómű tolóerő illetve teljesítmény: minden egyes hajtómű tolóereje, pilótakabin tolóerő szabályzó kar(ok) helyzete
• sugárfordító helyzete*
• hajtómű teljesítmény vezérlés és jeladó helyzete*
• hajtómű levegőelvételi-szelep helyzete*
• további hajtómű jellemzők: hajtómű nyomásviszony, kijelzett hajtómű rezgési szint értékek, tüzelőanyag áramlási értékek, gázkar helyzete, N_1, N_2, EGT, TLA, N_3

6.10.1.7.4 A repülésvezérlő szerkezetek helyzetére vonatkozó előírásokat kielégítő jellemzők:
• bólintás trimm lap(ok) helyzete
• fékszárnyak*: belépőél helyzete, pilótakabin fékszárny vezérlőkar választás
• orrsegédszárnyak*: orrsegédszárny belépőél helyzete, pilótakabin orrsegédszárny vezérlőkar helyzete
• futómű*: futómű egységek helyzete, futó vezérlőkar helyzete
• legyezőmozgás trimm lap helyzete*
• csűrő trimm (hossztengely körüli elfordulás) lap helyzete*
• pilótakabin trimm vezérlő szervek helyzete *: bólintás, bedöntés, legyezőmozgás
• földi áramlásrontó és aerodinamikai fék*: földi áramlásrontó helyzet, földi áramlásrontó vezérlőkar helyzet, aerodinamikai fék helyzet, aerodinamikai vék vezérlőkar helyzet
• jégmentesítő és/vagy jégtelenítő berendezések kiválasztása*
• hidraulika nyomás (minden egyes rendszer)*
• tüzelőanyag-mennyiség*
• AC és DC elektromos táplálások helyzete*
• segédhajtómű levegőelvételi-szelep helyzete*
• számított súlyponthelyzet*

6.10.1.7.5 Az üzemeltetésre vonatkozó előírásokat kielégítő jellemzők:
• riasztások
• elsődleges repülés vezérlő szerkezetek helyzete és a kezelő egységek beállítása: bólintási, bedöntési és elfordulási tengelyek
• marker adó átrepülése
• minden egyes navigációs vevőberendezés frekvencia kiválasztása
• kézi rádió adógomb helyzete és CVR/FDR szinkron jel
• robotpilóta, tolóerő automata, automatikus repülésvezérlés üzemmód és bekapcsolt állapot helyzete*
• választott barometrikus nyomás beállítás*: légijármű parancsok és első tiszt

• választott nyomásmagasság, repülési sebesség, emelkedési és süllyedési sebesség, MACH szám, géptengely irányszög, repülési irányszög, korrigált repülési pálya, megközelítési siklópálya szög (repülőgépvezető részéről állítható összes üzemmód)*
• választott elhatározási magasság*
• az elektronikus repülési műszerrendszer (EFIS) választott megjelenítési beállítása*: légijármű parancsok és első tiszt
• több funkciós hajtómű teljesítmény és állapot riasztás megjelenítési beállítása*
• GWPS/TAWS/GCAS helyzet*: földfelszín megjelenítési mód választás, beleértve a következőket: figyelmeztető jelzések és riasztások, riasztási állapot, tanácsadó rendszer állapot, üzemi kapcsolók helyzete
• alacsony nyomás riasztások*: hidraulika és pneumatika rendszerek
• számítógép meghibásodás*
• veszélyes kabinnyomás csökkenés riasztás*
• összeütközés elkerülését biztosító fedélzeti riasztó rendszerek (forgalmi riasztó és elkerülő rendszerek) helyzete és jelzései (TCAS/ACAS)*
• jegesedés jelzőrendszer*
• veszélyes hajtómű rezgés riasztás minden egyes hajtóműnél*
• veszélyes hajtómű túlmelegedés riasztás minden egyes hajtóműnél*
• veszélyes alacsony olajnyomás riasztás minden egyes hajtóműnél*
• veszélyes hajtómű fordulatszám (sebesség) túllépés riasztás minden egyes hajtóműnél*
• szélnyírás riasztás*
• repülés közben működő átesés elleni védelem, jelzőrendszer és automatika[i]3 helyzete és működése*
• a pilótakabinban található összes repülésvezérlő egység erőhatásai*: botkormány, kormányoszlop, pedálok, karok erőértékek
• függőleges eltérések*: ILS siklópálya, MLS magasság irányvezetés, GNSS megközelítési pálya
• vízszintes eltérések*: ILS iránysáv, MLS oldalszög irányvezetés, GNSS megközelítési pálya
• távolságmérő jelzőműszerek által jelzett távolság értékek (1 és 2 DME készletek)*
• elsődleges navigációs rendszerek*: GNSS, INS, VOR/DME, MLS, ILS, Loran C
• fékberendezések*: bal és jobb oldali féknyomások, bal és jobb oldali fékpedál helyzete
• időpont*
• események jelzése*
• paravizuális megjelenítő egységek bekapcsolása*
• pilótakabin üvegre vetített megjelenítő rendszer bekapcsolása*

1. Megjegyzés: Az előírt jellemzők, közöttük a tartományok, a mintavételi pontosság és felbontás megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

2. Megjegyzés: A rögzítendő jellemzők száma a repülőgép típustól, annak összetettségétől függ, azonban a csillag (*) jelölés nélküli jellemzőket ettől függetlenül rögzíteni kell. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a repülőgép rendszerei vagy a hajózószemélyzet a jellemzőt illetve adatot a repülőgép üzemeltetéshez használja fel.

6.10.2 Repülési adatrögzítők – felvételi időtartam

Az I. és II. típusú repülési adatrögzítő képes legyen a működése legalább utolsó 25 órájában rögzített tájékoztatások tárolására.

6.10.3 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1989 január 1-én vagy ezt követően adták ki

6.10.3.1 Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. I. típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.10.3.2 **Ajánlás** – *Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg-tól 27 000 kg-ig terjed, II. típusú repülési adatrögzítő berendezéssel szereljenek fel.*

6.10.4 Repülési adatrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki

Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. I.A típusú repülési adatrögzítő berendezéssel szereljenek fel.

6.10.5 Pilótakabin hangrögzítők – Repülőgépek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1-én vagy ezt követően adták ki

Megjegyzés: A pilótakabin hangrögzítő berendezések teljesítmény előírásai megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

6.10.5.1 Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 27 000 kg. pilótakabin hangrögzítő berendezéssel szereljenek fel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.

6.10.5.2 **Ajánlás** – *Minden olyan repülőgépet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 5700 kg-tól 27 000 kg-ig terjed, pilótakabin hangrögzítő berendezéssel szereljenek fel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt.*

6.10.6 Pilótakabin hangrögzítők – felvételi időtartam

6.10.6.1 A pilótakabin hangrögzítő berendezés képes legyen a működése legalább utolsó 30 percében rögzített tájékoztatások tárolására.

6.10.6.2 **Ajánlás** –*Az a pilótakabin hangrögzítő berendezés, amelyet olyan repülőgépbe szereltek fel, melynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. és egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.*

6.10.6.3 Az a pilótakabin hangrögzítő berendezés, amelyet olyan repülőgépbe szereltek fel, melynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 5700 kg. és egyedi légialkalmassági bizonyítványát először 2003 január 1. után adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.

6.10.7 Repülési adatrögzítők – szerkezet és beszerelés

A repülési adatrögzítőket úgy készítsék el és helyezzék el illetve szereljék be a repülőgépbe, hogy biztosítsák a rögzített adatok gyakorlatilag lehetséges legnagyobb védelmét annak érdekében, hogy a rögzített tájékoztatások megőrizhetők, leolvashatók és feldolgozhatók legyenek.

Megjegyzés: A baleseti törési ellenálló képesség és tűzvédelem ipari előírásai megtalálhatók a Polgári Légiközlekedési Berendezések Európai Szervezete (EUROCAE) ED55 és ED56A jelű és hasonló kiadványokban.

6.10.8 Repülési adatrögzítők – működés

6.10.8.1 A repülési adatrögzítőt a repülési idő alatt ne kapcsolják ki.

6.10.8.2 A repülési adatrögzítővel rögzített tájékoztatások megőrzése érdekében a berendezést egy baleset vagy repesemény utáni repülés befejezését követően kapcsolják ki és azt a 13. Annex előírásaival összhangban, a tájékoztatásokat tartalmazó adathordozó eltávolítása előtt ne kapcsolják ismét be.

1. Megjegyzés: A repülési adatrögzítővel rögzített tájékoztatások légijárműből történő eltávolításának szükségességét a vizsgálatot végző állam vizsgáló hatósága határozza meg az esemény súlyossága és körülményei alapján, beleértve az eseménynek a repülési üzemre gyakorolt hatását is.

2. Megjegyzés: A légijármű parancsnoknak a repülési adatrögzítővel rögzített tájékoztatások tárolására vonatkozó felelősségét a 6.10.9 pont tartalmazza.

6.10.9 Repülési adatrögzítő felvételei

A légijármű parancsnoka a lehetőségek határain belül biztosítsa, hogy amennyiben a repülőgép balesetet szenvedett vagy repeseményben érintett, az összes vonatkozó repülési adatrögzítő felvételt és ha szükséges, az alkalmazott repülési adatrögzítő berendezéseket is megőrizze, továbbá azokat a 13. Annex előírásaival összhangban biztonságos őrizet alatt tárolja.

6.10.10 Repülési adatrögzítők – folyamatos működőképesség

Végezzék el a repülési adat és pilótakabin hangrögzítő rendszerek felvételeinek üzemi ellenőrzését és értékelését annak érdekében, hogy a rögzítő berendezések folyamatos működőképességét biztosíthassák.

Megjegyzés: A repülési adat és pilótakabin hangrögzítő rendszerek ellenőrzésének eljárásait az A. Melléklet tartalmazza.

6.11 MACH-szám jelzőműszer

Minden olyan repülőgépet, amelynek üzemeltetési sebesség korlátozásait Mach-szám érték(ek)ben fejezik ki, szereljenek fel Mach-szám jelzőműszerrel.

Megjegyzés: Ez az előírás nem zárja ki a repülési sebesség mérőműszer igénybevételét a légiforgalmi szolgálatok céljaira megadott Mach-szám érték kiszámításához.

6.12 Vészhelyzeti helyjeladó berendezés (ELT)

6.12.1 A 6.12.2 pont előírása kivételével 2005 január 1-ig minden, a 6.3.3 b) pont szerint vízfelszín felett hosszú távú és a 6.4 pont szerint kijelölt szárazföld felett repülést végrehajtó repülőgépet egy darab vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

6.12.2 Minden olyan, a 6.3.3 b) pont szerint vízfelszín felett hosszú távú és a 6.4 pont szerint kijelölt szárazföld felett repülést végrehajtó repülőgépet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adták ki, egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

6.12.3 2005 január 1-től minden, a 6.3.3 b) pont szerint vízfelszín felett hosszú távú és a 6.4 pont szerint kijelölt szárazföld felett repülést végrehajtó repülőgépet egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

6.12.4 **Ajánlás** – *Minden repülőgépet szereljenek fel automatikusan működésbe lépő vészhelyzeti helyjeladó (ELT) berendezéssel.*

6.12.5 A fenti 6.12.1 – 6.12.4 pontok alapján felszerelt vészhelyzeti helyjeladó (ELT) berendezés a 10. Annex III. kötet vonatkozó előírásai szerint üzemeljen.

6.13 Repülőgépek, amelyeket nyomásmagasság-adó másodlagos radar válaszjeladóval kell felszerelni

6.13.1 2003 január 1. után az illetékes hatóság felmentésének kivételével minden repülőgépet szereljenek fel a 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemelő nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel.

6.13.2 ***Ajánlás*** *– Minden repülőgépet szereljenek fel a 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemelő nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel.*

Megjegyzés: A 6.13.1 és 6.13.2 pontok előírásainak célja a légiforgalmi szolgálatok valamint az összeütközést elkerülő fedélzeti rendszerek hatékony működésének fejlesztése. Az ACAS rendszer felszerelésére és szállítására vonatkozó hatálybalépési időpontokat a 6. Annex I. rész 6.18.1 és 6.18.2 pontjai tartalmazzák. Az előírás célja továbbá az is, hogy a nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel fel nem szerelt légijármű ne üzemeljen közös légtérben olyan légijárművel, amely összeütközést elkerülő fedélzeti rendszerrel van felszerelve. Ezért a nyomásmagasság-adó másodlagos radar válaszjeladó berendezés szállítása alól történő felmentéseket olyan légtér kijelölése mellett adják ki, amelyben az ilyen berendezés szállítása nem kötelező.

6.14 Repülőgépek, amelyeket összeütközést elkerülő fedélzeti rendszerrel (ACAS II) kell felszerelni

6.14.1 **Ajánlás** – Az összes gázturbinás hajtóművel ellátott repülőgépet amelynek igazolt, maximális felszálló tömege meghaladja a 15 000 kg értéket, vagy 30-nál több utas szállítására kapott feljogosítást, és amelynek az egyedi légialkalmassági bizonyítványát első alkalommal 2005 november 24 után adták ki, szereljenek fel összeütközést elkerülő fedélzeti rendszerrel (ACAS II).

6.14.2 Az összes gázturbinás hajtóművel ellátott repülőgépet amelynek igazolt, maximális felszálló tömege meghaladja a 15 000 kg értéket, vagy 30-nál több utas szállítására kapott feljogosítást, és amelynek az egyedi légialkalmassági bizonyítványát első alkalommal 2007 január 01 után adták ki, fel kell szerelni az összeütközést elkerülő fedélzeti rendszerrel (ACAS II).

6.14.3 **Ajánlás** – Az összes gázturbinás hajtóművel ellátott repülőgépet amelynek igazolt, maximális felszálló tömege meghaladja az 5700 kg értéket, de nem lépi túl a 15 000 kg értéket, vagy 19-nél több utas szállítására kapott feljogosítást, és amelynek az egyedi légialkalmassági bizonyítványát első alkalommal 2008 január 01 után adták ki, szereljenek fel összeütközést elkerülő fedélzeti rendszerrel (ACAS II).

6.15 Mikrofonok

Ajánlás – A pilótakabinban szolgálati feladat ellátására kijelölt minden hajózószemélyzeti tag közleményváltásaihoz az átváltási szint/magasság alatt kézi vagy fejhallgatóhoz erősített mikrofont használjon.

7. fejezet
Repülőgép távközlési és navigációs berendezések

7.1 Távközlési berendezés

7.1.1 A műszerrepülési szabályok szerint vagy éjszaka üzemeltetett repülőgépet szereljék fel rádió-berendezéssel. Ez a berendezés a meghatározott frekvenciákon alkalmas legyen kétoldalú rádióösszeköttetés fenntartására az illetékes hatóság által előírt légiforgalmi állomásokkal.

Megjegyzés: A 7.1.1 pont előírásai teljesítettnek tekinthetők, ha az útvonalon szokásos hullámterjedési viszonyok között a repülőgép képes az itt meghatározott távközlési összeköttetések fenntartására.

7.1.2 Amikor a 7.1.1 előírásának teljesítése érdekében egynél több berendezést szerelnek fel, azok egymástól függetlenül működjenek úgy, hogy az egyik berendezés meghibásodása ne okozza bármely másik berendezés meghibásodását.

7.1.3 A látvarepülési szabályok szerint, de ellenőrzött repülésként üzemeltetett repülőgépet az illetékes hatóság mentesítő engedélyének hiányában szereljenek fel rádió-berendezéssel, amely a repülés végrehajtása alatt a meghatározott frekvenciákon bármikor alkalmas kétoldalú rádió-összeköttetés fenntartására az illetékes hatóság által kijelölt légiforgalmi állomásokkal.

7.1.4 Azt a repülőgépet, amelyet olyan repülés végrehajtására vesznek igénybe, amelyre a 6.3.3 vagy 6.4 pontok előírásai vonatkoznak, hacsak az illetékes hatóság nem ad mentesítő engedélyt, szereljenek fel rádió-berendezéssel, amely a repülés végrehajtása alatt a meghatározott frekvenciákon bármikor alkalmas kétoldalú rádió-összeköttetés fenntartására az illetékes hatóság által kijelölt légiforgalmi állomásokkal.

7.1.5 A 7.1.1–7.1.4 pontok alapján előírt rádió berendezés képes legyen rádió összeköttetés fenntartására a 121.5 Mhz-es légiközlekedési vészfrekvencián.

7.2 Navigációs berendezés

7.2.1 A repülőgépet szereljék fel olyan navigációs berendezéssel, amelynek segítségével az képes:
a) a repülési tervében meghatározott útvonal követésére; és
b) a légiforgalmi szolgálatok előírásai szerint történő repülésre;
kivéve, ha ezt az illetékes hatóság nem tiltja meg, a látvarepülési szabályok szerint végrehajtott repülés során a navigációt az útvonal mentén egymástól legfeljebb 110 km (60 NM) távolságra levő földi tájékozódási pontok látás utáni azonosításával hajtja vége.

7.2.2 A légtér meghatározott szakaszaiban vagy olyan útvonalakon történő repülés esetében, amelyekre vonatkozóan RNP típust írtak elő, a repülőgép a 7.2.1 pontban ismertetett előírások mellett:

a) legyen felszerelve olyan navigációs berendezésekkel, amelyek lehetővé teszik az előírt RNP típus(ok) szerinti üzemeltetést; és

b) rendelkezzen jogosítással a lajtromozó állam részéről az ilyen légtérben történő üzemeléshez.

Megjegyzés: Az előírt navigációs pontosságra (RNP), az ezzel összefüggő eljárásokra valamint a jogosítási folyamatra vonatkozó tájékoztatásokat az RNP Kézikönyv (Doc 9613) tartalmazza. A kiadvány átfogóan felsorolja azokat a dokumentumokat és egyéb anyagokat, amelyeket az államok és a nemzetközi szervezetek a navigációs rendszerekre valamint az előírt navigációs teljesítményre vonatkozóan készítettek el.

7.2.3 A Körzeti Léginavigációs Egyezmény alapján kijelölt olyan légterekben végrehajtott repülések esetében, amelyekre vonatkozóan minimális navigációs teljesítmény előírást (MNPS) határoztak meg, a repülőgépet szereljék fel olyan navigációs berendezéssel, amely:

a) a hajózószemélyzet részére az előírt pontossággal és folyamatosan jelzi az útvonal-tartást vagy az ettől való eltérést a kijelölt repülési útvonal bármely pontján; és

b) amelyet a lajstromozó állam az érintett MNPS üzemeltetésre engedé-lyezett.

Megjegyzés: Az előírt minimális navigációs teljesítményre vonatkozó előírások és alkalmazási eljárások a Helyi Kiegészítő Eljárások című kiadványban (Doc 7030) találhatók.

7.2.4 Azon légtér meghatározott szakaszaiban történő repüléseknél, ahol a helyi Körzeti Léginavigációs Egyezmény értelmében FL 290 és FL 410 között 300 méter (1000 láb) csökkentett függőleges elkülönítési minimumot alkalmaznak, a repülőgépet szereljék fel:

a) olyan berendezéssel, amely képes:

1) a tartott repülési szintet (FL) a hajózószemélyzet részére jelezni;

2) a kiválasztott repülési szintet automatikusan tartani;

3) a hajózószemélyzet részére riasztó jelzést adni, ha a kiválasztott repülési szinttől eltérnek – a riasztó jelzés vonatkozó határértéke +/- 90 méter (300 láb) legyen; és

4) automatikusan jelezni a nyomás-magasságot.

b) A lajstromozó állam a repülőgépet engedélyezze az ilyen légtérben történő üzemeltetésre.

7.2.5 A 7.2.4 b) szerinti RVSM jóváhagyás kiadása előtt, az Állam győződjön meg arról, hogy:

a) a légijármű függőleges navigációt biztosító felszereléseinek képességei kielégítik a 2. Függelék követelményeit;

b) a járató megfelelő eljárásokat vezet be a folyamatos légialkalmassághoz (karbantatás és javítás) kapcsolódó gyakorlati tevékenységek és programok vonatkozásában; és

c) a járató megfelelő hajózó személyzeti eljárásokat vezet be az RVSM szerinti légtérben való üzemeltetéshez.

Megjegyzés: Az RVSM szerinti jóváhagyás globálisan érvényes annak figyelembe vételével, hogy egy adott régióra érvényes bármely üzemeltetési eljárást tartalmazni fogja az üzemeltetési kézikönyv vagy a megfelelő személyzeti útmutató.

7.2.6 A járató állama, amennyiben szükséges a lajstromozó állammal konzultálva, a 7.2.4 fejezetben említett légijárművek vonatkozásában biztosítja, hogy megfelelő lépések történjenek:

a) amikor a 11. Függelék, 3.3.4.1 alfejezetével összhangban létrehozott ellenőrző szervezettől jelentés érkezik a magasság tartás körülményeiről; és

b) helyesbítő intézkedések bevezetésére az előbbiek szerinti jelentésben szereplő egyedi repülőgép, vagy repülőgép típusba tartozó csoportra vonatkozóan, amennyiben eltérést tapasztalnak az RVSM szerinti légtérben való üzemeltetésre vonatkozó követelmények betartásában, ha az alkalmazásra került.

7.2.7 Mindegyik állam, amelyik felelős azon légterekért, ahol az RVSM alkalmazásra került, vagy a járatóknak RVSM jóváhagyást adott ki a saját államán belül, olyan intézkedéseket és eljárásokat vezet be, amelyek biztosítják a megfelelő lépések megtételét az RVSM légteret, RVSM jóváhagyás nélkül használó repülőgépek vagy járatók ellen.

1. Megjegyzés: ezeket az intézkedéseket és eljárásokat mindkét olyan esetben alkalmazni szükséges, amikor a kérdéses repülőgép üzemeltetése jóváhagyás nélkül történik az állam légterében, vagy amikor az állam rendszeres felügyeleti felelősségébe tartozó járató a szükséges jóváhagyás nélkül üzemeltet egy másik állam légterében.

2. Megjegyzés: Az RVSM légtérben történő üzemeltetés jóváhagyásához kapcsolódó útmutató a 300 méter (1000 láb) Függőleges Elkülönítési Minimum Bevezetése FL 290 és FL 410 Repülési Szintek Között (Doc 9574) kézikönyvben található.

7.2.8 A repülőgépet szereljék fel olyan navigációs berendezéssel, amely biztosítja, hogy a repülés végrehajtásának bármely szakaszában bekövetkező, az egyik rendszert érintő meghibásodás esetében a repülőgépet a 7.2.1 valamint ahol ez alkalmazható, a 7.2.2, 7.2.3 és 7.2.4 pontok előírásainak megfelelően tovább lehessen irányítani (navigálni).

1. Megjegyzés: Ezt az előírást a berendezések megkettőzésén kívül más módszerekkel is teljesíthetik.

2. Megjegyzés: A FL 290 és FL 410 között 300 méter (1000 láb) csökkentett függőleges elkülönítési minimum alkalmazására kijelölt légtérben szükséges légijármű berendezésekre vonatkozó útmutatás a következő kézikönyvben található: 300 méter (1000 láb) függőleges elkülönítési minimum (VSM) bevezetése FL 290 és FL 410 repülési szintek között (Doc 9574).

7.2.9 A műszeres időjárási körülmények között végrehajtott leszállással tervezett repülések esetében a repülőgépet olyan rádió berendezéssel szereljék fel, amely alkalmas az irányvezetést biztosító rádiójelek vételére egy olyan pontig, ahonnan a leszállás látással végrehajtható. Ez a rádió berendezés képes legyen az irányvezetés biztosítására minden olyan tervezett leszállási valamint bármely kijelölt kitérő repülőtéren, ahol műszeres időjárási körülmények között történő leszállás végrehajtását tervezik.

8. fejezet
Repülőgép karbantartás

1. Megjegyzés: A jelen fejezetben történő alkalmazás során a repülőgép kifejezésbe tartoznak a hajtóművek, légcsavarok, alkatrészek, műszerek, szerkezeti egységek és felszerelések, beleértve a vészhelyzeti felszereléseket is.

2. Megjegyzés: A folyamatos légialkalmasság előírásaira vonatkozó útmutatást a Légialkalmassági Kézikönyv *(Doc 9760) tartalmazza.*

8.1 Felelősség

8.1.1 A repülőgép tulajdonosa vagy bérlet esetén annak bérlője biztosítsa, hogy:

a) a repülőgép repülésre alkalmas állapotban van;

b) a tervezett repüléshez szükséges üzemeltetési és vészhelyzeti felszerelések üzemképesek;

c) a repülőgép légialkalmassági bizonyítványa érvényes; és

d) a repülőgép karbantartását a lajstromozó állam által elfogadott karbantartási program szerint elvégezték.

8.1.2 A repülőgépet csak abban az esetben üzemeltessék, ha annak karbantartását a lajstromozó állam által elfogadott karbantartási rendszer alapján elvégezték és azt légiüzemeltetésre kibocsátották.

8.1.3 Ha a karbantartási nyilatkozatot nem a 6. Annex I. rész 8.7 pontjában meghatározott jogosított karbantartó szervezet adja ki, a jegyzőkönyvet aláíró személy rendelkezzen az 1. Annexben megállapított szakszolgálati jogosítással.

8.2 Karbantartások nyilvántartása

8.2.1 A repülőgép tulajdonosa biztosítsa a következő nyilvántartási adatok tárolását a 8.2.2 pontban jelzett időtartamig:

a) a repülőgép és az élettartam korláttal rendelkező összes komponens teljes üzemideje (óra, naptári időtartam, repülési ciklus meghatározásban szükség szerint);

b) a valós állapot az összes kötelező folyamatos légialkalmassági előírás és tájékoztatás teljesítése vonatkozásában;

c) a módosítások és javítások megfelelő részletezése;

d) a repülőgép vagy a kötelező nagyjavítási időkorlátokkal rendelkező komponenseinek az utolsó nagyjavítástól számított üzemideje (óra, naptári időtartam, repülési ciklus meghatározásban szükség szerint);

e) a repülőgép valós állapota a karbantartási programnak való megfelelés szempontjából; és *f)* részletes karbantartási jegyzőkönyvek annak bizonyítására, hogy a karbantartási nyilatkozat aláírásához az összes feltételt teljesítették.

8.2.2 A 8.2.1 *a)–e)* pontokban ismertetett nyilvántartási adatokat legalább 90 napig őrizzék meg, miután azt az egységet amelyre a nyilvántartási adatok vonatkoznak az üzemeltetésből teljesen kivonták.
A 8.2.1 *f)* pont esetében a nyilvántartási adatokat a karbantartásra vonatkozó üzembehelyezési igazolás aláírását követően, legalább egy évig őrizzék meg.

8.2.3 A repülőgép bérlője a bérleti időtartam alatt szükség szerint teljesítse a 8.2.1 és 8.2.2 pontok előírásait.

Megjegyzés: A nemzetközi repülések esetében a repülőgép fedélzetén csak az érvényes légialkalmassági bizonyítványt kell elhelyezni, a karbantartások nyilvántartásának és ezzel kapcsolatos egyéb okmányoknak a szállítására nincs szükség.

8.3 Folyamatos légialkalmassági tájékoztatás

Az 5700 kg. engedélyezett legnagyobb felszállósúlynál (tömegnél) nehezebb repülőgép tulajdonosa vagy bérlet esetén annak bérlője a lajtromozó állam előírásai szerint biztosítsa, hogy a folyamatos légialkalmasság szempontjából szükséges karbantartási és üzemeltetési tájékoztatásokat az Annex II. rész 4.3.5 és 4.3.8 pontok előírásainak megfelelő továbbítsák.

8.4 Módosítások és javítások

Az összes módosítást és javítást a lajstromozó állam által elfogadható légialkalmassági előírásoknak megfelelően végezzék el. Dolgozzanak ki eljárásokat annak biztosítására, hogy elegendő mennyiségű adatot gyűjtsenek össze és tároljanak a légialkalmassági követelmények teljesítéséről.

8.5 Karbantartási nyilatkozat

8.5.1 A lajstromozó állam előírásai szerint a karbantartási munka kielégítő elvégzéséről és annak igazolására készítsenek és írjanak alá karbantartási nyilatkozatot jegyzőkönyvet.

8.5.2 A karbantartási nyilatkozat tartalmazzon igazolást az alábbiakról:

a) az elvégzett karbantartási munka alapvető részletei;

b) a karbantartás befejezésének időpontja;

c) amennyiben alkalmazható, a jóváhagyott karbantartó szervezet azonosítója; és

d) a karbantartási nyilatkozatot aláíró személy vagy személyek neve.

9. fejezet
A repülőgép hajózószemélyzete

9.1 Jogosítások

9.1.1 A légijármű parancsnoka biztosítsa, hogy a hajózószemélyzet minden egyes tagja rendelkezzen a lajstromozó állam által kiadott vagy érvényesített szakszolgálati engedéllyel és jogosításuk megfelelő, továbbá bizonyosodjon meg arról, hogy a hajózószemélyzet tagjai rendelkeznek a szükséges szakmai jártassággal.

Megjegyzés: A repülési eljárások paramétereiben és az üzemeltetési eljárásokban érintett pilóták részére vonatkozó információk a PANS-OPS I. kötetében találhatók. A látás utáni és a műszer szerinti repülési eljárások kidolgozására vonatkozó követelmények a PANS-OPS II. kötetében találhatók. Bizonyos Államok által használatos akadályvédelmi követelmények és eljárások eltérhetnek a PANS-OPS-tól, és biztonsági okokból fontos ezen különbségek ismerete.

9.1.2 Az összeütközés elkerülését biztosító fedélzeti rendszerrel (ACAS II) felszerelt légijármű parancsnoka biztosítsa, hogy a hajózószemélyzet minden egyes tagja, a szakmai jártasságnak megfelelő módon ki legyen képezve az ACAS II rendszer használatára és az összeütközés elkerülésére vonatkozóan.

Megjegyzés 1: Az összeütközés elkerülését biztosító fedélzeti (ACAS II) rendszer üzemeltetésére vonatkozó eljárásokat a PANS-OPS, I. kötet tartalmazza. A repülőgépvezetők ACAS II kiképzési útmutatóit a PANS-OPS, I. kötet, VIII. részének, A. melléklete tartalmazza.

Megjegyzés 2: Az állam számára elfogadható, az ACAS II rendszer használatára és az összeütközés elkerülésére vonatkozó szakmai jártasság megszerzését célzó kiképzés megfelelőségének igazolása, például a következő módon történhet:

a) Az ACAS II rendszerrel felszerelt légijárműre vonatkozó típusjogosítás megléte, ahol az ACAS II használata és üzemeltetése a típusjogosítás megszerzéséhez szükséges képzési tananyag részét képezi; vagy

b) Az állam által, a repülőgépevezetők ACAS II rendszer használatára vonatkozó képzésre jóváhagyott tanintézet vagy személy által kiadott olyan dokumentum megléte, amely igazolja, hogy a dokumentum tulajdonosa ki lett képezve az 1. megjegyzésben feltüntetett útmutatók szerint; vagy

c) Olyan repülőgépvezető által megfelelő módon megtartott repülés-előtti eligazítás, aki az 1. megjegyzésben feltüntetett útmutatóknak megfelelő kiképzésben részesült az ACAS II használatát illetően.

9.2 A hajózószemélyzet összetétele

A hajózószemélyzet tagjainak száma és összetétele a repülésvégrehajtási kézikönyvben vagy a légijármű légialkalmassági bizonyítványával összefüggésben levő más egyéb dokumentumban meghatározott minimális létszámnál alacsonyabb ne legyen.

Függelék 1.
A repülőgépeken rendszeresítendő fények

1. A kifejezések magyarázata

Ahol a jelen Függelékben következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Fedési szögek – Angles of coverage

a) Az „A" fedési szög két egymást metsző függőleges sík között elhelyezkedő, a hossztengely mentén hátrafelé néző, a középvonaltól jobbra és balra 70°-ot bezáró körszeletekből áll, amelyek a hossztengelyt függőleges síkban metszik.

b) Az „F" fedési szög két egymást metsző függőleges sík között elhelyezkedő, a hossztengely mentén előre néző, a középvonaltól jobbra és balra 110°-ot bezáró körszeletekből áll, amelyek a hossztengelyt függőleges síkban metszik.

c) Az „L" fedési szög két egymást metsző függőleges sík között elhelyezkedő körszeletből áll, az egyik sík párhuzamos a repülőgép hossztengelyével és a másik attól balra elhelyezkedve 110°-os körszeletet alkot, amely a hossztengely mentén előre néz.

d) Az „R" fedési szög két egymást metsző függőleges sík között elhelyezkedő körszeletből áll, az egyik sík párhuzamos a repülőgép hossztengelyével és a másik attól jobbra elhelyezkedve 110°-os körszeletet alkot, amely a hossztengely mentén előre néz.

Vízszintes sík – Horizontal plane
A repülőgép hossztengelyét magába foglaló és a repülőgép szimmetria síkjára merőleges sík.

Repülőgép hossztengelye – Longitudinal axis of aeroplane
Az általános utazósebességen a repülés irányával párhuzamos kiválasztott tengely, amely keresztülhalad a repülőgép súlypontján.

Haladás – Making way
A repülőgép akkor halad a víz felszínén, ha az mozgásban van és a vízhez viszonyított sebessége magasabb.

Irányítás alatt – Under command
A repülőgép a víz felszínén akkor van irányítás alatt azaz mozgása akkor tekinthető irányítottnak, amikor azzal végre lehet hajtani az egyéb vizijárművek kikerülésére kidolgozott, a Tengeri Összeütközések Megelőzésére Vonatkozó Nemzetközi Előírások-ban meghatározott manővereket.

Sodródás – Under way
A vízfelszínen levő repülőgép akkor sodródik, ha az nincs a szárazföldön vagy ahhoz horgonyozva illetve nincs a szárazföldhöz rögzített vagy a vízfelszínen levő bármely rögzített tárgyhoz horgonyozva.

Függőleges síkok – Vertical planes
A vízszintes síkra merőleges síkok.

Látható – Visible
Sötét éjszaka tiszta légköri viszonyok mellett látható.

2. A levegőben levő repülőgépen rendszeresítendő navigációs fények

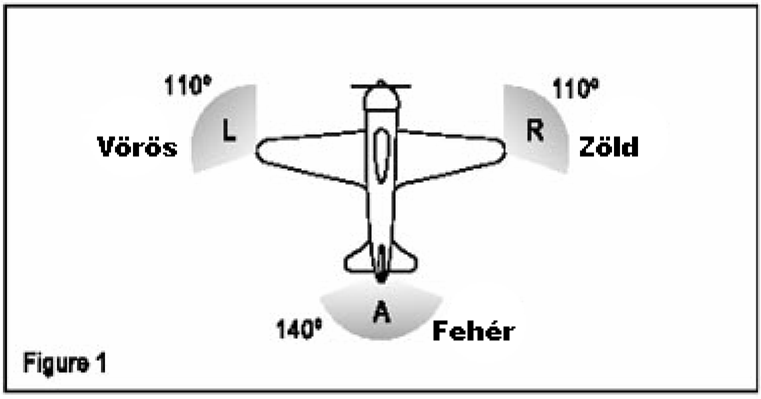
Megjegyzés: Az itt meghatározott fények célja a 2. Annex navigációs fényekre vonatkozó előírásainak teljesítése.

Amint az az 1. ábrán látható, a repülőgépen a következő navigációs fények legyenek takarásmentesen láthatók:

a) a vízszintes sík alá és fölé az „L” fedési szög területén vörös színű fény;

b) a vízszintes sík alá és fölé az „R” fedési szög területén zöld színű fény;

c) a vízszintes sík alá és fölé az „A” fedési szög területén hátrafelé fehér színű fény.



1. ábra
A repülőgépen rendszeresítendő navigációs fények

Red – vörös	White – fehér	Green – zöld
L – bal oldal	A – hátsó	R – jobb oldal

3. A vízen levő repülőgépen rendszeresítendő fények

3.1 Általános rész

Megjegyzés: Az itt meghatározott fények célja a 2. Annex vízfelületen levő repülőgépeken elhelyezett fényekre vonatkozó előírásainak teljesítése.

Tengeri Összeütközések Megelőzésére Vonatkozó Nemzetközi Előírások alapján különböző fényeket helyezzenek el minden egyes alábbi körülmények között:

a) amikor a repülőgép sodródik;

b) amikor a repülőgép másik vizijárművet vagy repülőgépet vontat;

c) amikor a repülőgépet vontatják;

d) amikor a repülőgép nincs irányítás alatt és nem halad;

e) amikor a repülőgép halad de nincs irányítás alatt;

f) amikor a repülőgép le van horgonyozva;

g) amikor a repülőgép szárazföldön van.

Az egyes esetekre előírt fényeket az alábbi pontok tartalmazzák.

3.2 Amikor a repülőgép sodródik:

Amint az a 2. ábrán látható, a repülőgépen a következő állandó fények legyenek takarásmentesen láthatók:

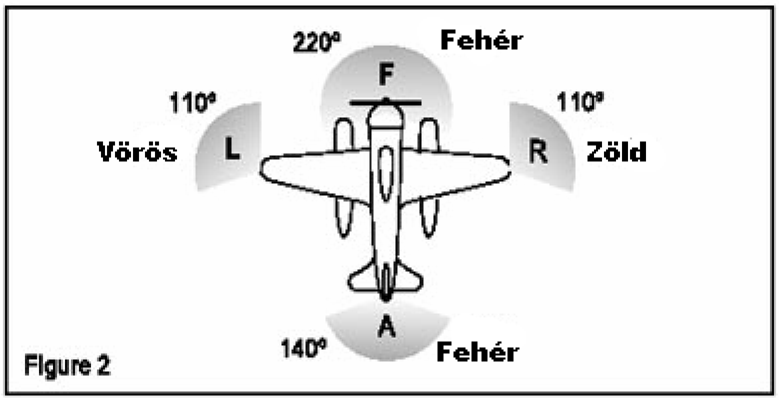
a) a vízszintes sík alá és fölé az „L" fedési szög területén vörös színű fény;

b) a vízszintes sík alá és fölé az „R" fedési szög területén zöld színű fény;

c) a vízszintes sík alá és fölé az „A" fedési szög területén hátrafelé fehér színű fény; és

d) az „F" fedési szög területén előre fehér színű fény.

Az *a), b)* és *c)* pontokban ismertetett fények legalább 3.7 km (2 NM) távolságból, a *d)* pontban ismertetett fény – amennyiben 20 méter hosszú vagy ennél hosszabb repülőgépen van elhelyezve – legalább 9.3 km (5 NM) távolságból vagy ha 20 méternél rövidebb repülőgépen van elhelyezve legalább 5.6 km (3 NM) távolságból legyenek láthatók.



2. ábra
Amikor a repülőgép sodródik

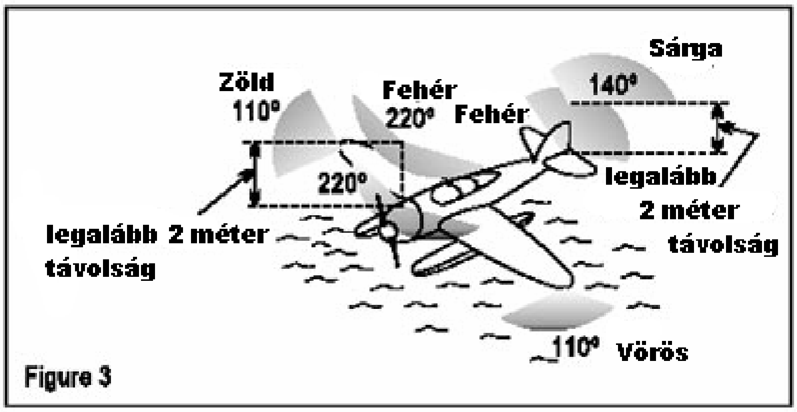
3.3 Amikor a repülőgép másik vizijárművet vagy repülőgépet vontat:

Amint az a 3. ábrán látható, a repülőgépen a következő állandó fények legyenek takarásmentesen láthatók:

a) a fenti 3.2 pontban ismertetett fények;

b) a 3.2 *d)* pontban ismertetettel azonos jellemzőkkel rendelkező második fény, amely függőleges síkban legalább 2 méterrel az első fény felett vagy alatt helyezkedik el; és

c) a 3.2 *c)* pontban ismertetettel egyébként azonos jellemzőkkel rendelkező sárga színű fény, amely függőleges síkban legalább 2 méterrel az első fény felett helyezkedik el.



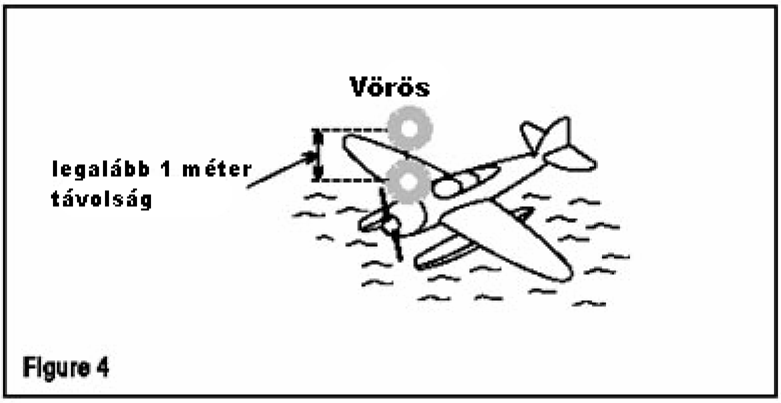
3. ábra
Amikor a repülőgép másik vizijárművet vagy repülőgépet vontat

3.4 Amikor a repülőgépet vontatják:

A repülőgépen 3.2 *a), b)* és *c)* pontban ismertetett állandó, takarásmentes fények legyenek láthatók.

3.5 Amikor a repülőgép nincs irányítás alatt és nem halad:

Amint az a 4. ábrán látható, a repülőgépen két állandó vörös színű fény legyen ott elhelyezve, ahol azok a legjobban láthatók. Az egyik fény a másik fölött nem kevesebb mint 1 méter távolságban legyen és a fények olyan jellemzőkkel rendelkezzenek, hogy azok a horizonton legalább 3.7 km (2 NM) távolságból minden irányból legyenek láthatók.

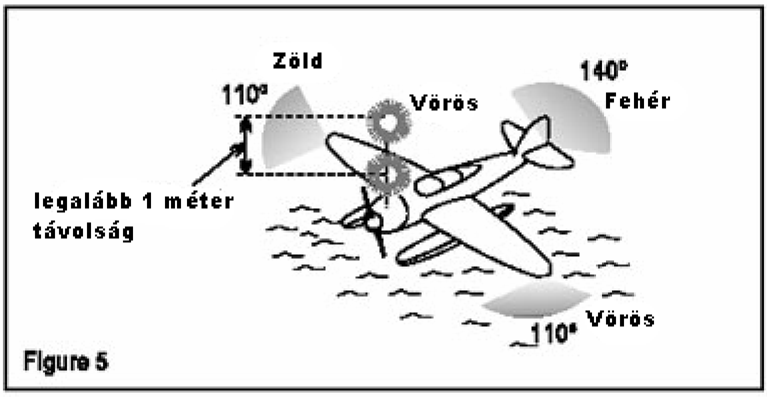


4. ábra
Amikor a repülőgép nincs irányítás alatt és nem halad

3.6 Amikor a repülőgép halad de nincs irányítás alatt:

Amint az az 5. ábrán látható, a repülőgépen a 3.5 pontban valamint a 3.2 *a), b)* és *c)* pontokban ismertetett fények legyenek láthatók.

Megjegyzés: A fenti 3.5 és 3.6 pontokban meghatározott fényeket a másik repülőgép tekintse az első repülőgép olyan jelzésének, hogy az nem áll irányítás alatt és ezért nem képes a másik elől kitérni. Ezek nem a vészhelyzetben levő és segélyt kérő repülőgép jelzései.



5. ábra
Amikor a repülőgép halad, de nincs irányítás alatt

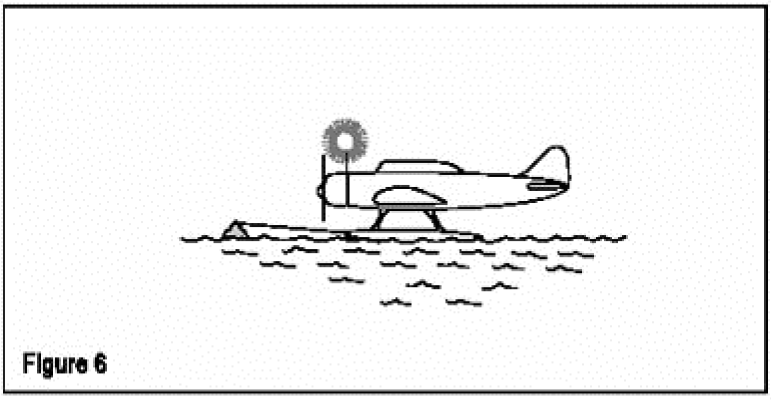
3.7 Amikor a repülőgép le van horgonyozva:

A repülőgépen az alábbi fények legyenek láthatók;

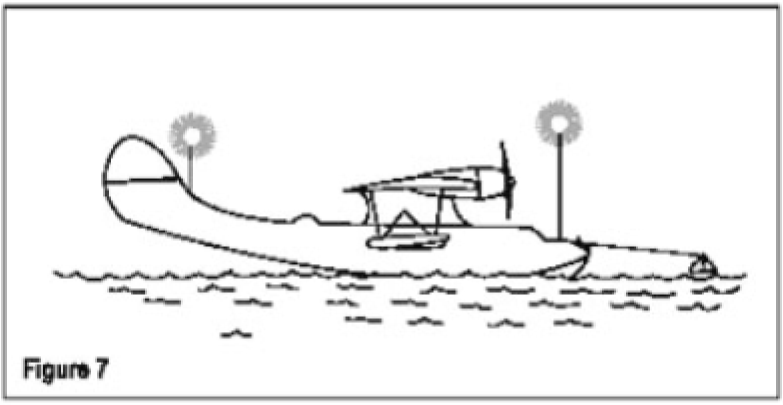
a) Amennyiben a repülőgép hosszúsága kevesebb mint 50 méter, a legjobban látható helyen elhelyezett állandó fehér színű fény (6. ábra), amely a horizonton legalább 3.7 km (2 NM) távolságból minden irányból látható legyen;

b) Amennyiben a repülőgép hosszúsága 50 méter vagy több, a legjobban látható helyen elhelyezett állandó fehér színű első és hátsó fények (7. ábra), amelyek a horizonton legalább 5.6 km (3 NM) távolságból minden irányból láthatók legyenek;

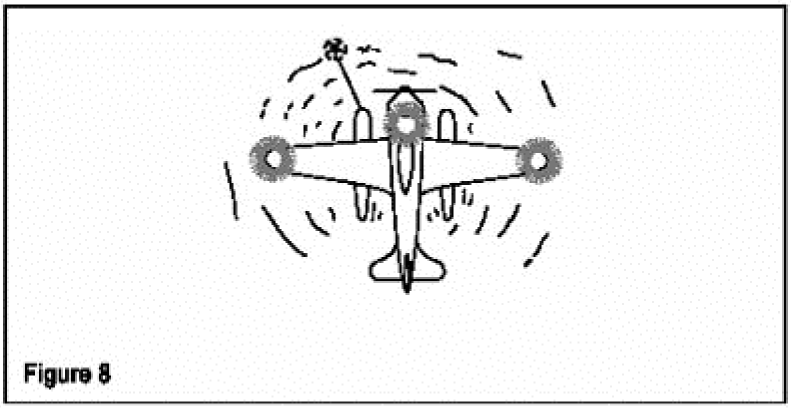
c) Amennyiben a repülőgép fesztávja 50 méter vagy több, mindkét oldalon a lehető legjobban látható helyen elhelyezett állandó fehér színű fények (8. ábra – repülőgép hossza kevesebb mint 50 méter, fesztávja 50 méter vagy több, 9. ábra – repülőgép hossza és fesztávja 50 méter vagy több), amelyek jelzik a legnagyobb fesztávot és lehetőség szerint a horizonton legalább 1.9 km (1 NM) távolságból minden irányból láthatók legyenek.



6. ábra
Amikor az 50 méternél rövidebb repülőgép le van horgonyozva



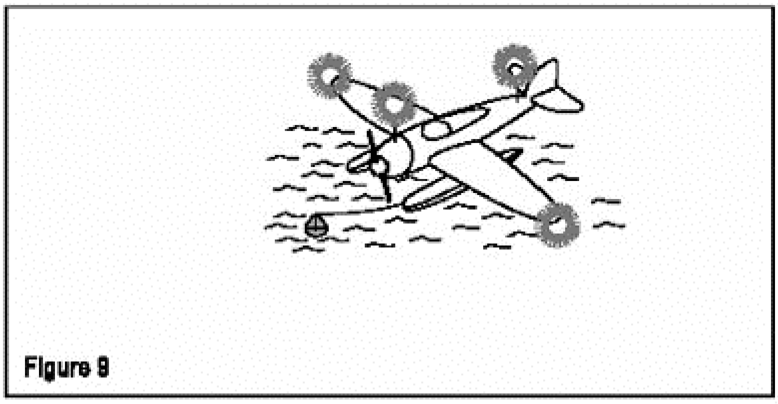
7. ábra
Amikor az 50 méternél hosszabb repülőgép le van horgonyozva



8. ábra
Amikor a repülőgép le van horgonyozva

3.8 Amikor a repülőgép szárazföldön van:

A repülőgépen a 3.7 pontban ismertetett, továbbá két állandó, függőlegesen egymástól legalább 1 méter távolságra elhelyezett vörös színű fények a horizonton minden irányból legyenek láthatók.



9. ábra
Amikor a repülőgép le van horgonyozva

Függelék 2.

Magasságmérő rendszerek RVSM légtérben való üzemeltetéséhez szükséges teljesítmény követelmények

(Megjegyzés – lásd 7. fejezet, 7.2.5)

1. A magasságtartási jellemzők pontosságát befolyásolni képes összes alkatrész vonatkozásában, névleg teljesen azonos tervezésű és építésű repülőgépek csoportjában, a magasságtartási tulajdonságokra vonatkozó képességek olyanok legyenek, hogy repülőgépek csoportjára nézve a teljes függőleges hiba (TVE) középértéke 25 m (80 ft) nagyságú értéket ne haladja meg, és a szabványos eltérés ne legyen nagyobb, mint $28 – 0.013z^2$ a $0 \leq z \leq 25$ értéktartományra nézve, ahol a „z” az átlagos TVE méterben kifejezett értéke, vagy ne legyen nagyobb mint $92 – 0.0004z^2$ a $0 \leq z \leq 80$ értéktartományra nézve, ahol a „z” értékét feet-ben kell számolni. Kiegészítésűl, a TVE összetevői a következő jellemzőkkel rendelkezzenek:

a) Az általános magasságmérő rendszer hiba (ASE) a csoportra vetítve ne haladja meg a 25 m (80 ft) értéket;

b) Az átlagos ASE abszolút értékeinek összege három szabványos ASE eltérésből számolva ne haladja meg a 75 m (245 ft) értéket; és

c) A beállított repülési magasság és a tényleges repülési magassághoz tartozó kijelzett nyomásmagasság különbsége szimmetrikus legyen a 0 középértékhez viszonyítva, ahol a szabványos eltérés ne haladja meg a 13.3 m (43.7 ft) értéket, és kiegészítésül a különbség frekvenciájának csökkenése exponenciális legyen, amikor a különbség mértéke növekedik.

2. Azon repülőgépek vonatkozásában, amelyek sárkányszerkezetének jellemzői és magasságmérő rendszerének megfelelősége egyedi sajátosságokkal bír, és nem sorolható be az 1. bekezdés szerint meghatározott repülőgépek csoportjába, a magasságtartás képessége olyan legyen, amelynél a repülőgép TVE összetevői a következő jellemzőknek felelnek meg:

a) A repülőgép ASE értéke ne haladja meg a 60 m (200 ft) értéket, az összes repülési feltétel között; és

b) A beállított repülési magasság és a tényleges repülési magassághoz tartozó kijelzett nyomásmagasság különbsége szimmetrikus legyen a 0 középértékhez viszonyítva, ahol a szabványos eltérés ne haladja meg a 13.3 m (43.7 ft) értéket, és kiegészítésül a különbség frekvenciájának csökkenése exponenciális legyen, amikor a különbség mértéke növekedik.

A. melléklet
Repülési adatrögzítők

Kiegészítés a 6.10 ponthoz

Bevezető

A jelen mellékletben található anyag az általános célú nemzetközi légiközlekedésben történő üzemeltetésre tervezett repülőgépeken felszerelni kívánt repülési adatrögzítő berendezésekkel foglalkozik. A repülési adatrögzítők két rendszerből, a repülési adatrögzítőből valamint a pilótakabin hangrögzítőből állnak. A repülési adatrögzítők a rögzítendő adatok mennyiségétől, azaz a jellemző adatok számától valamint a rögzített tájékoztatások időtartamától függően I. típus és II. típus csoportba tartoznak.

1. Repülési adatrögzítő (FDR)

1.1 Általános követelmények

1.1.1 A repülési adatrögzítő a repülési idő alatt folyamatosan rögzítse az adatokat.

1.1.2 A repülési adatrögzítő burkolata:

a) feltűnő narancs-sárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot;

c) rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzet-jelző berendezéssel.

1.1.3 A repülési adatrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentésék a berendezés sérülésének lehetőségét. Ennek érdekében a berendezést a repülőgép fedélzetén a lehető leghátrább helyezzék el; a túlnyomásos kabinnal ellátott repülőgép esetében a berendezést a hátsó nyomásálló válaszfal közelében helyezzék el;

b) a berendezés elektromos táplálását olyan áramkörről kapja, amely biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül; és

c) legyen hallás vagy látás utáni lehetőség az adatrögzítő megfelelő működésének repülés előtt történő ellenőrzésére.

1.2 Rögzítendő adatok és jellemző értékek

1.2.1 Az *I. típusú repülési adatrögzítő*

Ez a repülési adatrögzítő képes legyen a repülőgépnek megfelelő, legalább az A-1. táblázatban található 32 féle repülési adat rögzítésére. Mindazonáltal a repülőgép típusának és a rögzítő berendezés jellemzőinek figyelembevételével a felsoroltaktól eltérő más adatok is rögzíthetők.

1.2.2 A *II. típusú repülési adatrögzítő*

Ez a repülési adatrögzítő legyen képes a repülőgépnek megfelelő, legalább a A-1. táblázatban található első 15 féle repülési adat rögzítésére. Mindazonáltal a repülőgép típusának és a rögzítő berendezés jellemzőinek figyelembevételével a felsoroltaktól eltérő más adatok is rögzíthetők.

1.3 Kiegészítő tájékoztatások

1.3.1 A felszerelt berendezés mérési tartományát, rögzítési időközeit, a repülési adatok és jellemzők pontosságát általában a légialkalmassági bizonyítványt kiadó hatóság módszerei alapján jogosítják.

1.3.2 A repülési adatrögzítőre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások;

b) a repülési adatok és jellemzők eredetét vagy forrását valamint a megfelelő mértékegységre történő átszámítás módozatait; és

c) a gyártó ellenőrző felülvizsgálatának eredményeit.

1.3.3 A járató gyűjtse össze és tárolja a mérési jellemzők kiválasztására, az átszámítási eljárásokra, az időszakos kalibrálásra és felülvizsgálatra, valamint egyéb üzemeltetési illetve karbantartási eljárásokra vonatkozó dokumentációját. Ezeknek elegendőnek kell lenniük ahhoz, hogy a repülésbiztonsági hatóságok a kivizsgálás során megfelelő műszaki módszerekkel hozzájuthassanak a szükséges adatokhoz.

2. Pilótakabin hangrögzítő berendezés (CVR)

2.1 Általános követelmények

2.1.1 A hangrögzítő berendezést úgy tervezzék meg, hogy az legalább a következőket rögzítse:

a) a repülőgép fedélzetén elhelyezett rádió-berendezéssel vett és adott szóbeli közlemények;

b) a repülőgép pilótakabinjának belső hangkörnyezete;

c) a hajózószemélyzet tagjainak szóbeli közleményei, amelyhez a repülőgép belső távközlési rendszerét használják;

d) a navigációs vagy megközelítési berendezéseket azonosító szó vagy hangjelek, amelyek a fejhallgatóban vagy a külső hangszóróban hallhatók;

e) az utas-tájékoztató rendszer – amennyiben ilyet felszereltek – segítségével adott szóbeli tájékoztatások a hajózószemélyzet tagjaitól; és

f) a légiforgalmi szolgálatokkal (ATS) folytatott digitális adatcsere, kivéve ha ezt a repülési adatrögzítő veszi fel.

2.1.2 A hangrögzítő burkolata:

a) feltűnő narancs-sárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot; és

c) rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzet-jelző berendezéssel.

2.1.3 A beszéd és a hangok megkülönbözetésének megkönnyítése érdekében a mikrofonokat a pilótakabinban a felvétel szempontjából legalkalmasabb helyekre helyezzék el, hogy azok a legjobb minőségben vegyék a légijármű vezetője és a másodpilóta munkahelyéről származó valamint a pilótakabinban más hajózószemélyzeti tagoktól az előbbieknek szánt közleményeket és szóbeli tájékoztatásokat. Ez az igény legjobban a külön felvételi csatornákon folyamatosan rögzítő irányított mikrofonok segítségével teljesíthető.

2.1.4 A pilótakabin hangrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentsék a berendezés sérülésének lehetőségét. Ennek érdekében a berendezést a repülőgép fedélzetén a lehető leghátrább helyezzék el; a túlnyomásos kabinnal ellátott repülőgép esetében a berendezést a hátsó nyomásálló válaszfal közelében helyezzék el;

b) a berendezés elektromos táplálását olyan áramkörről kapja, amely biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül;

c) hallás vagy látás utáni lehetőség legyen az adatrögzítő megfelelő működésének repülés előtt történő ellenőrzésére; és

d) amennyiben a hangrögzítő berendezés gyors-törlő egységgel rendelkezik, a felszerelést úgy tervezzék meg, hogy megakadályozzák a gyors-törlőnek a repülés időtartama alatti vagy egy becsapódástól származó ütés következtében történő működésbe lépését.

2.2 Teljesítmény követelmények

2.2.1 A hangrögzítő berendezés képes legyen legalább négy felvételi sáv egyidejű rögzítésére. A sávok közötti pontos idő összefüggés biztosítása érdekében a hangrögzítő berendezés soros *(in-line)* rendszerben működjön. Amennyiben két felvételi irányt (oda-vissza játszó) alkalmaznak, a soros működést és a helyes csatorna elosztást mindkét irányba biztosítsák.

2.2.2 A legkívánatosabb sáv elosztás a következő:

1. sáv – a másodpilóta fejhallgatója és ahhoz erősített élő beszédet közvetítő mikrofonja

2. sáv – a légijármű vezető fejhallgatója és ahhoz erősített élő beszédet közvetítő mikrofonja

3. sáv – pilótakabin belső mikrofonja

4. sáv – idő referencia jel valamint a hajózószemélyzet harmadik és negyedik tagjának (ha van) fejhallgatója és ahhoz erősített élő beszédet közvetítő mikrofonja.

1. Megjegyzés: Az 1. sáv a felvevő-fej aljához legközelebb levő sáv legyen.

2. Megjegyzés: A kívánatos sávkiosztás vonatkozásában feltételezzük a jelenleg leggyakrabban alkalmazott hagyományos mágnes-szalag továbbító szerkezet használatát és a kiosztás oka az, hogy a szalag külső szélei sérülékenyebbek a szalag középső részénél. Nem zárható ki az egyéb, ettől eltérő hangrögzítő berendezés alkalmazását, amelynél a fenti korlátozó tényezők esetleg nem állnak fenn.

2.2.3 Amikor a hangrögzítő berendezést az illetékes légialkalmasságot elbíráló hatóság elfogadott módszereivel ellenőrzik, mutassák be és bizonyítsák, hogy a berendezés képes olyan szélsőséges körülmények között működni, amelyek között történő üzemelésre azt tervezték.

2.2.4 Megfelelő módszert alkalmazzanak a repülési adatrögzítő valamint a pilótakabin hangrögzítő berendezések közötti pontos idő-kapcsolat fenntartására.

Megjegyzés: Ennek egyik módszere a repülési adatrögzítő idő-jelének átvitele a pilótakabin hangrögzítő berendezésre.

2.3 További tájékoztatások

2.3.1 A pilótakabin hangrögzítőre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások; és

b) a gyártó ellenőrző felülvizsgálatának eredményét.

3. A repülési adatrögzítő és a pilótakabín hangrögzítő rendszerek ellenőrzése

3.1 Az adott nap első repülési feladatának megkezdése előtt vizsgálják meg a repülési adatrögzítő (FDR), a pilótakabín hangrögzítő (CVR) rendszerek és a repülési adatgyűjtő egység (FDAU) – ha ilyeneket felszereltek –pilótakabinban levő beépített ellenőrző egységeit.

3.2 Az éves felülvizsgálatot a következők szerint hajtsák végre:

a) a repülési adatrögzítő és pilótakabín hangrögzítő (FDR és CVR) berendezések felvett adatainak visszajátszása biztosítsa, hogy a rögzítő berendezések a névleges felvételi időtartamon belül megfelelően működnek;

b) a repülési adatrögzítő adatainak elemzésével értékeljék a rögzített adatok minőségét annak meghatározása érdekében, hogy a bit-hiba arány elfogadható értékek között van továbbá, hogy a hibák természete és eloszlása milyen képet mutat;

c) a repülési adatrögzítő rendszer működését ellenőrző szervezetnél az összes rögzített jellemző érvényességének vizsgálata érdekében egy teljes repülés adatait elemezzék ki. Különösen nagy figyelmet szenteljenek a repülési adatrögzítőnek közvetlen adatot biztosító érzékelőktől származó jellemzőknek. A légijármű elektromos hálózatától származó jellemzőket nem szükséges ellenőrizni abban az esetben, ha annak működőképességét a légijármű más rendszerei segítségével ellenőrizni lehet;

d) a repülési adatrögzítő ellenőrző szervezet rendelkezzen a rögzített értékek pontos leolvasásához és átalakításához valamint az egyes jelek pontos megkülönböztethetőségéhez szükséges software csomagokkal;

e) pilótakabín hangrögzítő felvett adatainak éves vizsgálatát a felvétel visszajátszásával végezzék el. Amikor a berendezést a légijármű fedélzetén felszerelik, a CVR vegye fel az ellenőrző jeleket minden egyes belső fedélzeti és a megfelelő külső forrásokból annak biztosítása érdekében, hogy az összes felvétel megfeleljen az érthetőségre vonatkozó előírásoknak; és

f) ahol ez gyakorlatilag lehetséges, az éves ellenőrzés során vizsgálják meg a pilótakabin hangrögzítő repülés közbeni felvételeinek egy részét annak biztosítása érdekében, hogy a jelek érthetősége elfogadható legyen.

3.3 A repülési adatrögzítő rendszerek működésképtelennek tekintendők, ha az adatok jelentősebb ideig rossz minőségűek, érthetetlenek vagy a kötelezően rögzítendő jellemzők közül egy vagy több pontatlanul illetve nem helyesen kerül rögzítésre.

3.4 Az éves ellenőrzésről készített jegyzőkönyvet kérésre bocsátsák az állam felügyeleti hatóságának rendelkezésére.

3.5 A repülési adatrögzítő rendszer kalibrálása:

a) a repülési adatrögzítő rendszert legalább öt-évente kalibrálják újra a kötelező jellemzők műszaki rögzítés átalakítási módszereinek helyességét érintő bármely hiányosságok megállapítása érdekében és annak biztosítása céljából, hogy a jellemzőket a kalibrálási tűrési határ-értéken belül rögzíti; és

b) amikor a repülési magasság és sebesség jellemzők a repülési adatrögzítő rendszernek közvetlen adatat biztosító érzékelőktől származnak, ezeket az érzékelők gyártó szervezet ajánlásai alapján vagy legalább két-évente kalibrálják újra.

A-1. táblázat

A repülőgép repülési adatrögzítővel rögzítendő adatok és jellemzők

No	jellemző	mérési tartomány	rögzítés időköz (mp)	mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)
1	idő (UTC vagy eltelt repülési idő)	24 óra	4	± 0.125 % óránként
2	nyomás-magasság	-300 m (- 1000 láb) -tól a légijármű engedélyezett legnagyobb repülési magasságáig +1500 m (+ 5000 láb)	1	±30 méter – ±200 méter (± 100 láb – ± 700 láb)
3	műszer szerinti repülési sebesség	95 km/h (50 csomó) -tól max. V_{S_0} -ig *(1. Megjegyzés)*	1	± 5 %
		V_{S_0} -tól 1.2 V_D -ig *(2. Megjegyzés)*	°1	± 3 %
4	géptengely irányszög	360°	1	± 2°
5	függőleges gyorsulás	-3 g-től +6 g-ig	0.125	maximális tartomány ± 1 % -a, az 5 % adathiba kivételével
6	bólintási helyzet	± 75°	1	± 2°
7	dőlési helyzet	± 180°	1	± 2°

No	jellemző	mérési tartomány	rögzítés időköz (mp)	mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)
8	rádióadás kapcsoló	be/ki kapcsolva: az egyik tetszés szerint	1	
9	az egyes hajtóművek teljesítmények *(3. Megjegyzés)*	teljes tartomány	1 (hm*)	± 2 %
10	fékszárny helyzet vagy vezérlő kapcsoló állás	teljes tartomány vagy minden egyes parancsjel helyzet	2	± 5 % vagy repülőgépvezető kijelzése
11	orrsegédszárny helyzet vagy vezérlő kapcsoló állás	teljes tartomány vagy minden egyes parancsjel helyzet	2	± 5 % vagy repülőgépvezető kijelzése
12	sugárfordító helyzet	alaphelyzet, átállás alatt, átállt helyzet	1 (hm*)	
13	földi aerodinamikai fék vagy repülési interceptor helyzet	teljes tartomány vagy minden egyes parancsjel helyzet	1	± 2 %, kivéve ha nagyobb pontosságot írnak elő
14	külső levegő hőmérséklete	a mérőműszer érzékelési tartománya	2	±2° C
15	robotpilóta/ tolóerő automata / automatikus repülésvezérlő rendszer üzemmód és működési helyzet	az egyszeri parancsjelek megfelelő kombinációja	1	
16	hosszirányú gyorsulás	± 1 g	0.25	maximális tartomány ± 1.5 % -a, az 5 % adathiba kivételével
17	oldalirányú gyorsulás	± 1 g	0.25	maximális tartomány ± 1.5 % -a, az 5 % adathiba kivételével
18	a repülőgép elsődleges repülés vezérlő szerkezeteinek kezelése és/vagy a kormány felületek helyzete *(4. Megjegyzés)*	teljes tartomány	1	± 2^0, kivéve ha nagyobb pontosságot írnak elő
19	bólintás trimm helyzet	teljes tartomány	1	± 3 %, kivéve ha külön nagyobb pontosságot írnak elő
20	rádió magasságmérő	- 6 m – 750 m között (- 20 láb és 2500 láb között)	1	150 m (500 láb) alatt ± 0.6 m (± 2 láb) vagy ±3% – amelyik a nagyobb, és 150 m (500 láb) felett ± 5 %
21	eltérés a siklópályától	jeltartomány	1	± 3 %
22	eltérés az iránysávtól	jeltartomány	1	± 3 %
23	marker adók átrepülése	egyszeri parancsjel	1	
24	központi riasztó jelzés	egyszeri parancsjel	1	
25	1. és 2. navigációs készlet frekvencia beállítás *(5. Megjegyzés)*	teljes tartomány	4	felszerelés szerint

No	jellemző	mérési tartomány	rögzítés időköz (mp)	mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)
26	1. és 2. DME távolságok *(5. és 6. Megjegyzés)*	0 – 370 km	4	felszerelés szerint
27	futómű kibocsátva és berugózott állásban kapcsoló helyzete	egyszeri parancsjel	1	
28	GWPS földközelség jelző és riasztó rendszer	egyszeri parancsjel	1	
29	állásszög	teljes tartomány	0.5	felszerelés szerint
30	minden egyes hidraulika rendszer (alacsony nyomás)	egyszeri parancsjel	2	
31	navigációs adatok {szélesség és hosszúság, föld feletti sebesség, széleltérítési szög} *(7. Megjegyzés)*	felszerelés szerint	1	felszerelés szerint
32	futómű vagy futómű kapcsoló helyzet	egyszeri parancsjel	4	felszerelés szerint

Magyarázatok:
** = hajtóművenként ...*

*Az első **15** jellemző megfelel a II. típusú repülőgép repülési adatrögzítőre vonatkozó követelményeknek.*
*A fenti **32** jellemző megfelel az I. típusú repülőgép repülési adatrögzítőre vonatkozó követelményeknek.*

Megjegyzések :

1. V_{S_0} az átesési vagy legalacsonyabb állandósult repülési sebesség a repülésvezérlő szerkezetek leszállási beállítása mellett.

2. V_D tervezési süllyedési sebesség (sikló sebesség).

3. A teljesítmény meghatározásához szükséges megfelelő mértékű bemenőjel rögzítése.

4. A hagyományos repülésvezérlő szerkezetekkel felszerelt repülőgépek esetében a „vagy” szó alkalmazandó. A nem mechanikus repülésvezérlő szerkezetekkel felszerelt repülőgépek esetében az „és” szó alkalmazandó. A réselt felületekkel felszerelt repülőgépek esetében az egyes elemek adatai helyett elfogadható a műveletek megfelelő kombinációjának rögzítése.

5. Amennyiben a jel digitális formában áll rendelkezésre.

6. Javasolt választási lehetőség az inerciális vagy más navigációs rendszerek meghatározásából kapott földrajzi szélességi és hosszúsági adatok rögzítése.

7. Ha az ilyen jelek könnyen beszerezhetők.

Amennyiben további rögzítési kapacitás áll rendelkezésre, javasoljuk a következő kiegészítő adatok és tájékoztatások rögzítését:

a) Az elektronikus megjelenítő rendszerek segítségével rendelkezésre álló üzemeltetési tájékoztatások.

A ilyen rendszerek közé tartoznak az alábbiak:
• EFIS elektronikus repülési műszerrendszer
• ECAM központi elektronikus légijármű képernyő
• EICAS hajtómű ellenőrző és hajózószemélyzet riasztó rendszer

A következő fontossági sorrendet alkalmazzák:

1. a kívánatos repülési pályára vonatkozó adatok és jellemzők a hajózószemélyzet kiválasztása alapján, például: barometrikus nyomásmagasság-mérő beállítás, kiválasztott repülési magasság és sebesség, elhatározási magasság, robotpilóta rendszer bekapcsolása és üzemmód jelzése, ha azt más forrásból nem rögzítik;

2. a megjelenítő rendszer kiválasztása és beállítása, mint például: SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, stb.;

3. figyelmeztetések és riasztások;

4. a vészhelyzeti eljárások és ellenőrző listák megjelenített oldalainak oldalszám alapján történő azonosítása.

b) lassításra vonatkozó tájékoztatások, beleértve a fékek alkalmazását is a leszállás utáni túlfutással járó vagy a megszakított felszállás eseteinek vizsgálatához;

c) további hajtómű adatok és működési jellemzők, például: EPR, N1, EGT, tüzelőanyag fogyasztás illetve áramlás, stb.

B. Melléklet
Oxigén készlet szállítása és használata

Kiegészítés a 4.9 ponthoz

Bevezető

A hajózószemélyzet teljesítőképessége és/vagy az utasok jó közérzete olyan repülési magasságon, amelyen az oxigénhiány jelentős személyi képesség csökkenést eredményezhet, igen nagy fontosságú tényező. A magassági kamrákban vagy hegyvidéki nagy magasságon történő tevékenység vizsgálatok azt jelezték, hogy az emberi tűrőképesség a magassággal és az ilyen magasságon töltött időtartammal van összefüggésben. A tárgyat a *Polgári Légiközlekedés Orvostana Kézikönyv* (Doc 8984) részletesen tárgyalja. A fentiek alapján és annak érdekében, hogy további útmutatást nyújtsunk a légijármű parancsnoka részére a 4.9 pontban előírt oxigén készlettel kapcsolatosan, az alábbiakban ismertetünk néhány, a 6. Annex I. részében található de itt is érvényesnek tekinthető részletet.

1. Oxigén készlet

1.1 Olyan repülési magasságon végrehajtandó repülés esetén, amelyen a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb lesz, a repülés végrehajtását csak akkor kezdjék meg, ha elegendő mennyiségű belégzésre alkalmas oxigént biztosítottak, amely ellátja:

a) a személyzet minden tagját valamint az utasok legalább 10 %-át harminc percet meghaladó bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa és 620 hPa érték között van; és

b) a személyzet tagjait valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 620 hPa értéknél alacsonyabb.
1.2 A túlnyomásos kabinnal rendelkező repülőgép esetében a repülés végrehajtását csak akkor kezdjék meg, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely a túlnyomás megszűnése esetén, a repülés körülményeinek megfelelően ellátja a személyzet összes tagját valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa értéknél alacsonyabb. Ezen kívül, ha a repülőgépet olyan repülési magasságon üzemeltetik, amelyen az atmoszférikus légnyomás értéke 376 hPa-nál alacsonyabb vagy amelyen az atmoszférikus légnyomás értéke 376 hPa-nál magasabb, de a repülőgéppel négy percen belül nem lehet biztonságosan olyan magasságra süllyedni, amelyen az atmoszférikus légnyomás értéke 620 hPa-nak felel meg, az utaskabinban tartózkodó személyek részére legalább tíz percre elegendő oxigén készletet biztosítsanak.

2. Oxigén használata

2.1 A repülőgép repülési közbeni biztonságos üzemeltetéséhez nélkülözhetetlen feladatokat ellátó összes hajózószemélyzeti tagja folyamatosan használja az oxigén légzőkészüléket, amikor ezt az uralkodó körülmények az 1.1 vagy 1.2 pontok előírásai alapján szükségessé teszik.

2.2 Olyan túlnyomásos kabinnal ellátott repülőgép esetében, amely olyan magasság felett üzemel, amelyben az atmoszférikus nyomás 376 hPa értéknél alacsonyabb, álljon az összes hajózószemélyzeti tag rendelkezésére szolgálati helyén gyorsan igénybe vehető (felvehető) , zárt oxigén álarc (légzőmaszk), amely szükség esetén azonnal belégzésre alkalmas oxigént biztosít.

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, az Egyezményes Légkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	*magasság – méter*	*magasság – láb*
700 hPa	*3000*	*10 000*
620 hPa	*4000*	*13 000*
376 hPa	*7600*	*25 000*

ANNEX 6/III.
A légijármű üzemeltetése: Nemzetközi üzemeltetés – Helikopterek

III. kötet 5. kiadás – 2001 július
11. módosítással
A jelen kiadvány magába foglalja a 6. Annex III. részének 2001 március 13-a előtt elfogadott összes módosításait és 2001 november 1-től hatálytalanítja a 6. Annex III. kötetének összes korábbi kiadásait.

A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságára vonatkozóan lásd az Előszót.

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	*kiadás időpontja*	*alkalmazhatóság időpontja*	*bevezette*
1. – 8.	2001 július 16.	2001 november 1.	
9. módosítás (A Tanács 2003 március 13-án fogadta el)	2003 július 14.	2003 november 27.	
10. módosítás (A Tanács 2005 március 09-(fogadta el)	2005 július 11	2005 nov. 24	
11. módosítás (A Tanács 2006 március 14-(fogadta el) A következő oldalak cseréje: (iii)-(vii), (xiii), (xiv), I-1-3 – 1-6, II-1-1, II-1-2, II-2-1 – II-8, II-4-1 – II-4-8, II-6-1, II-6- II-7-1 – II-7-3, II-8-1, III-1-1, III-1-2, III-2-2, III-2-3, III-4- III-4-5, III-7-1, Függelékek elválasztó lap, APP 1-1 – AP 1-3, APP 2-1, APP 2-2, ATT 1 – ATT F-5	2006 július 17	2006 nov. 23	

Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

Tartalomjegyzék

válaszjeladóval kell felszerelni
4.16 Mikrofonok

5. fejezet
Forgószárnyas légijármű távközlési és navigációs berendezések
5.1 Távközlési berendezés
5.2 Navigációs berendezés
5.3 Felszerelés
6. fejezet
Forgószárnyas légijármű karbantartás
6.1 A járató karbantartási felelőssége
6.2 A járató karbantartási ellenőrző kézikönyve
6.3 Karbantartási program
6.4 Karbantartási nyilvántartás
6.5 Folyamatos légialkalmassági tájékoztatás
6.6 Módosítások és javítások
6.7 Karbantartási kibocsátás
6.8 Nyilvántartások
7. fejezet
A forgószárnyas légijármű hajózószemélyzete
7.1 A hajózószemélyzet összetétele
7.2 A hajózószemélyzeti tag vészhelyzeti kötelességei
7.3 A hajózószemélyzeti tag kiképző programok
7.4 Jogosítások
7.5 A hajózószemélyzet felszerelése
7.6 Repülési idő, repülési szolgálati idő és pihenőidő
8. fejezet
Repülés-üzemi tiszt / szolgálatvezető
9. fejezet
Kézikönyvek, naplók és nyilvántartások
9.1 Repülésvégrehajtási kézikönyv
9.2 Járató karbantartás ellenőrzési kézikönyv
9.3 Karbantatási program
9.4 Útinapló
9.5 A fedélzeten szállított vészhelyzeti vészhelyzeti és túlélési felszrelések jegyzéke
9.6 Repülési adatrögzítő felvételei
10. fejezet
Utaskabin személyzet
10.1 Vészhelyzeti feladatok kijelölése
10.2 Az utaskabin személyzet védelme a repülés alatt
10.3 Kiképzés
10.4 Repülési idő, repülési szolgálati idő és pihenőidő
11. fejezet
Biztonság
11.1 Forgószárnyas légijármű átkutatás ellenőrző jegyzéke
11.2 Kiképzési programok
11.3 A jogtalan beavatkozás jelentése

III. szakasz
Általános célú nemzetközi légiközlekedés
1. fejezet
Általános rész
1.1 A jogszabályok, előírások és eljárások betartása
1.2 Veszélyes áruk
1.3 Szellemi tevékenységet befolyásoló anyagok használata
2. fejezet
Repülésvégrehajtás
2.1 Az üzemeltetés létesítményeinek alkalmassága
2.2 Helikopter repülőtér üzemeltetési minimum
2.3 Repülés előtti tájékoztatás
2.4 Forgószárnyas légijármű légialkalmassága és biztonsági intézkedések
2.5 Időjárás jelentésekés előrejelzések
2.6 Időjárási körülmények miatt szükséges korlátozások
2.7 Kitérő helikopter repülőterek
2.8 Tüzelőanyag (üzemanyag) és olajkészlet
2.9 Oxigéán készlet
2.10 Oxigén használat
2.11 Vészhelyzeti utasítások a repülés alatt
2.12 Légijármű vezetők időjárás jelentése
2.13 Repülésre veszélyes körülmények
2.14 A hajózószemélyzet tagjainak fizikai állapota
2.15 A hajózószemélyzet tagjai szolgálati helyeiken
2.16 Műszerrepülési eljárások
2.17 Utasítások – Általános
2.18 Tüzelőanyag-feltöltés utasokkal a fedélzeten vagy a forgószárny(ak) mozgása közben
2.19 Vízfelszín feletti repülések
3. fejezet
Forgószárnyas légijármű teljesítmény üzemeltetési korlátozások
4. fejezet
Forgószárnyas légijármű műszerek, felszerelések és repülési okmányok
4.1 Minden fotrgószárnyas légijármű minden repülése
4.2 Minden látvarepülési szabályok szerint üzemeltetett fogószárnyas légijármű
4.3 Minden vízfelszín felett üzemeltetett forgószárnyas légijármű
4.4 Minden kijelölt szárazföld felett üzemeltetett forgószárnyas légijármű
4.5 Minden nagy repülési magasságon üzemeltetett forgószárnyas légijármű
4.6 Minden műszerrepülési szabályok szerint üzemeltetett forgószárnyas légijármű
4.7 Minden éjszaka üzemeltetett forgószárnyas légijármű
4.8 Minden forgószárnyas légijármű, amelynek meg kell felelnie a 16. Annex I. kötet zajbizonyítvány előírásoknak
4.9 Repülési adatrögzítők
4.10 Vészhelyzeti helyjeladó berendezés (ELT)
4.11 Forgószárnyas légijárművek, amelyeket nyomásmagasság-adó másodlagos radra válaszjeladóval kell felszerelni
4.12 Mikrofonok
5. fejezet
Forgószárnyas légijármű távközlési és navigációs berendezések
5.1 Távközlési berendezés
5.2 Navigációs berendezés

6. fejezet
Forgószárnyas légijármű karbantartás
6.1 Felelősség
6.2 Karbantartás nyilvántartás
6.3 Folyamatos légialkalmassági tájékoztatás
6.4 Módosítások és javítások
6.5 Karbantartási kibocsátás
7. fejezet
A forgószárnyas légijármű hajózószemélyzete
7.1 Jogosítások
7.2 A hajózószemélyzet összetétele
Függelék
Az üzemeltetési kézikönyv tartalma
1. Üzemeltetési adminisztráció és felügyelet
2. Baleset-megelőzési és repülésbiztonsági program
3. Személyi kiképzés
4. Fáradtság és repülési szolgálati idő korlátozások
5. Repülésvégrehajtás
6. Útvonal tájékoztatók és térképek
7. A legalacsonyabb repülési magasság
8. Helikopter repülőtér üzemeltetési minimum
9. Kutatás és mentés
10. Veszélyes áruk
11. Navigáció
12. Távközlés
13. Biztonság
14. Emberi tényezők
A. Melléklet
Forgószárnyas légijármű teljesítmény és üzemeltetési korlátozások
Cél és tárgykör
1. Meghatározások
2. Általános rész
3. Üzemeltetési terület
4. Teljesítménytől függő korlátozások
B. Melléklet
Repülési adatrögzítők
Bevezető
1. Forgószárnyas légijármű repülési adatrögzítő (FDR)
2. Pilótakabin hangrögzítő berendezés (CVR)
3. A repülési adatrögzítő és a pilótakabin hangrögzítő rendszerek ellenőrzése
C. Melléklet
Repülési idő és repülési szolgálati idő korlátozások
1. Cél és tárgykör
2. Általános rész
3. Meghatározások
4. Megjegyzések a meghatározásokhoz
5. A korlátozások módjai
6. Repülési idő táblázat

6. Annex – III. rész – Forgószárnyas légijárművek

A 6. Annex III. részében alkalmazott rövidítések és jelzések

Rövidítések és jelzések	
ADREP	Légijármű baleset vagy esemény jelentés
ADS	Automatikus légtérfelderítés
AFCS	Automatikus repülésvezérlő rendszer
AIG	Légijármű baleset kivizsgálás és megelőzés
AOC	Légijármű üzembentartási engedély
AOC	Légiforgalmi üzemeltetési irányítás
ATC	Légiforgalmi irányító szolgálat
ATM	Légiforgalom szervezés
ATS	Légiforgalmi szolgálatok
CAT I	I. kategória
CAT II	II. kategória
CAT III	III. kategória
CAT IIIA	IIIA. kategória
CAT IIIB	IIIB. kategória
CAT IIIC	IIIC. kategória
CDL	Repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek jegyzéke
CFIT	Földnek ütközés vezetett repülés során (szabályszerűen üzemelő légijárművel)
cm	centiméter
CPDLC	Légiforgalmi irányító és repülőgépvezető közötti adat-átviteli összeköttetés
CVR	Pilótakabin hangrögzítő berendezés
DA	Tengerszint feletti elhatározási magasság
DA/H	Elhatározási magasság
D-FIS	Adatátvitelt alkalmazó repüléstájékoztatás
DH	Talajszint feletti elhatározási magasság
DME	Távolságmérő berendezés
Distance DR	Az a vízszintes távolság, amelyet a forgószárnyas légijármű a rendelkezésre álló felszállási távolság végétől megtett
ECAM	Központi elektronikus légijármű képernyő
EFIS	Elektronikus repülési műszerrendszer
EGT	Kilépő gázhőmérséklet
EICAS	Hajtómű ellenőrző és hajózószemélyzet riasztó rendszer
ELT	Vészhelyzeti helyjeladó berendezés
ELT(AD)	Automatikusan kibocsátható vészhelyzeti helyjeladó berendezés
ELT(AF)	Automatikus állandó vészhelyzeti helyjeladó berendezés
ELT(AP)	Automatikus hordozható vészhelyzeti helyjeladó berendezés
ELT(S)	Túlélési vészhelyzeti helyjeladó berendezés
EUROCAE	Európai Polgári Légiközlekedési Elektronikai Szervezet
EPR	Hajtómű nyomásviszony
FATO	Végső megközelítési és felszállási terület
FDAU	Repülési adatgyűjtő egység
FDR	Repülési adatrögzítő
FM	Frekvencia moduláció
ft	láb

g	Függőleges gyorsulás
GNSS	Műholdas navigációs világ rendszer
hPa	Hektopascal
HUMS	Egészség és alkalmazás figyelő rendszer
IFR	Műszerrepülési szabályok
ILS	Műszeres leszállító rendszer
IMC	Műszeres időjárási körülmények
INS	Inerciális navigációs rendszer
kg	kilogramm
km	kilométer
LDAH	Rendelkezésre álló leszállási távolság
LDP	Leszállási elhatározási pont
LDRH	Szükséges leszállási távolság
m	méter
MDA	Legalacsonyabb tengerszint feletti süllyedési magasság
MDA/H	Legalacsonyabb süllyedési magasság tengerszint/földfelszín felett
MDH	Legalacsonyabb földfelszín feletti süllyedési magasság
MEL	Minimális berendezések jegyzéke
MHz	Megahertz
MLS	Mikrohullámú leszállító rendszer
MMEL	Gyártó minimális felszerelési jegyzéke
MOPS	Minimális üzemi teljesítmény előírás
NAV	Navigáció
N_1	Nagynyomású gázturbina fordulatszáma
N_f	Gázturbina terhelés nélküli fordulatszáma
N_g	Hajtómű turbina fordulatszáma
NM	Tengeri mérföld
OCA	Akadálymentes tengerszint feletti magasság
OCA/H	Akadálymentes tengerszint/földfelszín feletti magasság
OCH	Akadálymentes földfelszín feletti magasság
PANS	Légiforgalmi szolgálatok eljárásai
PNR	Az a pont, amelyen túl a visszafordulás nem lehetséges
R	Forgószárny sugár
RNP	Előírt navigációs teljesítmény
RTODR	Szükséges megszakított felszállási távolság
RVR	Futópályamenti látástávolság érték
SAR	Kutatás és mentés
SI	Nemzetközi mértékegység rendszer
SICASP	Másodlagos légtérfelderítő radar fejlesztési és összeütközés elkerülési rendszereket kidolgozó munkacsoport
SOP	Szabványos üzemeltetési eljárások
T_4	Hajtómű kiáramló gázhőmérséklet
TDP	Felszállási elhatározási pont
TIT	Gázturbina belépő hőmérséklet
TLOF	Földetérési és elemelkedési terület
TODAH	Rendelkezésre álló felszállási távolság
TODRH	Szükséges felszállási távolság

UTC	Egyeztetett világidő
VFR	Látvarepülési szabályok
VMC	Látás utáni időjárási körülmények
V_{TOSS}	Legalacsonyabb sebesség, amelyen üzemképtelen fő hajtómű továbbá a többi hajtómű üzemeltetési határértékeken belül történő működése mellett még emelkedés érhető el
V_y	Legjobb emelkedési sebesség
WXR	Időjárás
°C	Celsius fok
%	Százalék

A jelen Annex előírásaira vonatkozó kiadványok

Egyezmény a nemzetközi polgári légi közlekedésről (Doc 7300)

Európai Polgári Légiközlekedési Elektronikai Szervezet (EUROCAE) ED55A és ED56A jelzésű kiadványai

A Nemzetközi Légiszállítás Gazdasági Szabályzásának Előírásai és Útmutatója (Doc 9587)

Jegyzőkönyv a nemzetközi polgári légiközlekedésről szóló Egyezmény (83. b cikkely) módosításáról (Doc 9318)

A Nemzetközi Polgári Légiközlekedési Egyezmény Annex-ei

1. Annex	*Személyi jogosítás*
2. Annex	*Repülési szabályok*
3. Annex	*A nemzetközi légiközlekedés meteorológiai szolgálata*
4. Annex	*Léginavigációs térképek*
5. Annex	*A légi és földi üzemeltetésnél alkalmazott mértékegységek*
6. Annex	*Légijármű üzemeltetés* *I. rész – Nemzetközi kereskedelmi légiszállítás – Repülőgépek* *II. rész – Általános célú nemzetközi légiközlekedés – Repülőgépek*
8. Annex	*Légijármű légialkalmassága*
9. Annex	*Egyszerűsítések*
10. Annex	*Légiforgalmi távközlés* *III. kötet* *I. rész – Digitális adattovábbítási rendszerek* *II. rész – Rádiótávbeszélő rendszerek* *IV. kötet* *Légtérfelderítő radar és összeütközés elkerülését biztosító rendszerek*
11. Annex	*Légiforgalmi szolgálatok*
12. Annex	*Kutatás és mentés*
13. Annex	*Légijármű baleset kivizsgálás*
14. Annex	*Repülőterek* *I. kötet – Repülőtér tervezés és üzemeltetés* *II. kötet – Forgószárnyas légijármű repülőterek*
15. Annex	*Légiforgalmi tájékoztató szolgálat*
16. Annex	*Környezetvédelem* *I. kötet – Légijármű zaj*
18. Annex	*Veszélyes árúk légi szállítása*

A Légiforgalmi Szolgálatok Eljárásai (PANS)
OPS – Légijármű Üzemeltetés (Doc 8168)
I. kötet – Repülési eljárások
II. kötet – A látvarepülési (VFR) és műszerrepülési (IFR) szabályok kidolgozása
ATM – Légiforgalom Szervezése (DOC 4444)
TRG – Képzés
Körzeti Kiegészítő Eljárások (Doc 7030)
Kézikönyvek
Légijármű baleset megelőzési kézikönyv (Doc 9422)

Repülőtér Szolgálati Kézikönyv (Doc 9137)
1. rész – Tűzoltó és mentő szolgálatok
8. rész – Repülőtér üzemeltető szolgálatok
Légijármű Légialkalmassági Kézikönyv (Doc 9760)
Emberi Tényezők Kiképzési Kézikönyv (Doc 9683)
A Földi Jégtelenítés Végrehajtási Kézikönyve (Doc 9640)
Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve (Doc 8335)
Egyéni szakszolgálati engedélyek kiadását biztosító állami rendszer létrehozására vonatkozó eljárások kézikönyve (Doc 9379)
Előírt Navigációs Teljesítmény Kézikönyv (Doc 9613)
Üzemeltetési Kézikönyv Elkészítése (Doc 9376)
Biztonság Irányítási Kézikönyv (SMM)(Doc 9859)
Biztonsági Felülvizsgálat Kézikönyve (Doc 9734)
A rész – Az államon belüli biztonság felülvizsgálati rendszer irányításának létrehozása
Képzési Kézikönyv (Doc 7192)
D-3 rész: A repülés-üzemi tiszt vagy szolgálatvezető
Körlevelek
A Nemzetközi Polgári Légiközlekedési Egyezmény 83. bis Cikkelyének bevezetésére vonatkozó Útmutató (Cir 295)

Nemzetközi üzemeltetés – Forgószárnyas légijárművek

Előszó

Történeti háttér

A légijármű üzemeltetésre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944) 37. cikkelyének rendelkezései alapján először 1948 december 10-én a nemzetközi kereskedelmi légiszállításra, ezt követően 1968 december 2-án az általános célú légiközlekedésre vonatkozóan fogadta el és foglalta a 6. számú Annex-be. Ezek a nemzetközi előírások és ajánlott gyakorlati eljárások jelenleg a 6. Annex I. és II. részében találhatók; általánosságban ez a két rész a repülőgép üzemeltetéssel foglalkozik és egyértelműen egyik rész sem alkalmazható a helikopterekre, azaz a forgószárnyas légijárművekre.

Ezért a forgószárnyas légijárművek üzemeltetésére tekintettel kidolgoztuk a 6. Annex III. részét is. A forgószárnyas légijárművek részére kifejlesztett repülési adatrögzítőkkel és pilótakabin hangrögzítőkkel először a Balesetmegelőzési Munkacsoport 1979 évi 10/1 ajánlása alapján a Léginavigációs Bizottság foglalkozott. A kidolgozott előírásokat a Tanács 1986 március 14-én fogadta el, 1986 július 27-én léptek érvénybe és 1986 november 20-án váltak alkalmazhatóvá. Ezt követően a forgószárnyas légijárművek üzemeltetésének más területeire vonatkozó átfogó nemzetközi előírások és ajánlott gyakorlati eljárások kerületek kidolgozásra a Helikopter Üzemeltetési Munkacsoport segítségével; ezek az előírások az 1. Módosításba kerültek be, amelyet a Tanács 1990 március 21-én fogadott el. A módosítás 1990 július 30-án lépett érvénybe és 1990 november 15-én vált alkalmazhatóvá.

Az A. táblázat a vonatkozó fontosabb témakörök felsorolásával és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

Alkalmazhatóság

A 6. Annex I. és II. részeiben található nemzetközi előírások és ajánlott gyakorlati eljárások – Légijármű üzemeltetés – az egyedileg meghatározottak kivételével a nemzetközi polgári légiközlekedésben üzemeltetett minden repülőgépre vonatkoznak. Ehhez hasonlóan a 6. Annex III. része azokat a nemzetközi előírásokat és ajánlott gyakorlati eljárásokat tartalmazza, amelyek a nemzetközi kereskedelmi légiszállításban valamint az általános célú nemzetközi légiközlekedésben üzemeltetett forgószárnyas légijárművekre vonatkoznak és alkalmazandók.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

A szerződő államok figyelmét felhívjuk a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben.

Az egyes részek jogállása a következő:
1. – Az Annex anyaga:

a) Nemzetközi előírások és ajánlott gyakorlati eljárások, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) Függelék: A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) Meghatározások: A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) Táblázatok és ábrák: Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek, és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

Megjegyzendő, hogy a jelen Annex egyes előírásai olyan követelményeket is tartalmaznak, melyek jogállása ajánlott gyakorlati eljárás. Az ilyen esetekben ezek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

2. – A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit, illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et az alábbi hat nyelven fogadták el – angol, arab, francia, kínai, orosz és spanyol. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását **"Ajánlás"** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a "*Megjegyzés:* " felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall – kell" kifejezéssel és az ajánlott gyakorlati eljárásokat “should – szükséges" kifejezéssel jelezzük. Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően összhangban állnak a nemzetközi mértékegység rendszerrel /SI/. Ahol az 5. Annex lehetővé teszi az alternatív (nem SI) mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlők és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel – vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat – A 6. Annex III. részének módosításai

(módosítás – forrás – tárgy – elfogadva/ hatályos/ alkalmazható)

Első kiadás

Baleset-megelőzési és Kivizsgálási Munkacsoport 1979 évi körzeti ülésszaka

Repülési adatrögzítők elhelyezése a forgószárnyas légijárműben.
1986 március 14.   1986 július 27.   1986 november 20.

1) – Második kiadás – Helikopter Üzemeltetési Munkacsoport negyedik ülése a 6. Annex I. és II. részeinek 1990 évi módosítása alapján – Léginavigációs Bizottság tanulmányai

a) a forgószárnyas légijárművek üzemeltetésére vonatkozó, a 6. Annex I. és II. részeiben a repülőgépekkel kapcsolatos rendelkezésekhez hasonló előírások bevezetése; ezek a már korábban bevezetett repülési adatrögzítő berendezések felszerelésére vonatkozó előírásokkal (6. Annex III. rész első kiadás) együtt alkották a forgószárnyas légijárművek üzemeltetésre kidolgozott nemzetközi előírások és ajánlott gyakorlati eljárások első teljes anyagát;

b) meghatározások bevezetése a légijármű üzembentartási engedélyre, a minimális felszerelési jegyzékre, az üzemeltetési kézikönyvre valamint néhány új kifejezésre; ezekkel biztosították a 6. Annex három részének egybeesését illetve összhangját;

c) az elektronikus megjelenítő ernyőkel felszerelt forgószárnyas légijárművek üzemeltetési adatainak repülési adatrögzítő berendezéssel történő rögzítésével kapcsolatos útmutató bevezetése.

1990 március 21. 1990 július 30. 1990 november 15.

2) – Üzemeltetési munkacsoport ötödik ülése – az Elkülönítési munkacsoport általános elméletének módosítását célzó nyolcadik ülés – Baleset kivizsgálási munkacsoport 1992 évi ülése – Léginavigációs Bizottság tanulmányai

a) helikopter repülőtér üzemeltetési minimum, elhatározási magasság, legalacsonyabb süllyedési magasság kifejezések módosítása és akadálymentességi magasság kifejezés bevezetése;

b) vészhelyzeti helyjel adó (ELT) és előírt navigációs teljesítmény (RNP) illetve típus új meghatározások bevezetése;

c) a repülési adatrögzítőkben alkalmazott fém-szalagok használatára vonatkozó előírás módosítása;

d) a vészhelyzeti helyjel adó berendezés szállítására vonatkozó előírás bevezetése a vészrádió berendezés és helyjel adó helyett;

e) előírás, melynek alapján a légijárművön elhelyezett navigációs berendezés segítségével a légijármű előírt navigációs teljesítménye alapján repüljön tervezett útvonalán vagy területeken.

1994 március 21. 1994 július 25. 1994 november 10.

3) – Harmadik kiadás – Léginavigációs Bizottság tanulmányai – Veszélyes árúk munkacsoport tizennegyedik ülése – Szerkesztői módosítások – szöveg egyeztetése a 6. Annex II. és/vagy III. részével és a szükséges módosítások

a) új és módosított meghatározások bevezetése;

b) új előírások bevezetése a baleset megelőzéssel és a repülésbiztonsági programokkal kapcsolatosan;

c) az üzemeltetési létesítményekkel, a repülés közbeni történő vészhelyzeti gyakorlással, a legalacsonyabb repülési magasságokkal, a repülés előkészítéssel, a repülési idővel, a hajózószemélyzet repülési szolgálati és kötelező pihenőidejével, a hajózószemélyzet tagjai szolgálati helyeiken, az oxigén rendszerrel, a repülés-üzemi tiszt feladataival kapcsolatos előírások módosítása valamint új előírás a kézipoggyászra;

d) a tömeg korlátozással és az egészségügyi készletekkel kapcsolatos előírások módosítása;

e) új előírások az oxigén berendezéssel kapcsolatosan, a látvarepülési szabályok szerint és műszerrepülési szabályok szerint üzemeltetett forgószárnyas légijárműre vonatkozó előírások módosítása;

f) a hajózószemélyzet új kiképzési programjának előírásai különös tekintettel az emberi teljesítőképességre és ennek korlátaira;

g) a repülés-üzemi tiszt meghatározás egyeztetése az 1. Annex előírásaival;

h) üzemeltetési kézikönyv tartalmának felülvizsgálata és új előírások a helikopter repülőtér üzemeltetési minimum, oxigén tartalék rendszer, repülési szolgálati idő korlátozások, a hajózószemélyzet eljárásai és ellenőrző jegyzékei, az üzemeltetői repülési terv, a hajózószemélyzet kiképzési program, a légi-utaskísérők kiképzési programja, a biztonsági utasítások és útmutatók, a baleset megelőzési és repülésbiztonsági program, időzített indulási eljárások, tömeg és súlypont számítási eljárások vonatkozásában;

i) új előírások a repülési idő, légi-utaskísérők repülési szolgálati és kötelező pihenőideje vonatkozásában, a kiképzést érintő előírások felülvizsgálata és módosítása; és

j) módosított előírások az elsősegély készletekre vonatkozóan; és

k) új előírások a minimális felszerelési jegyzékre (MEL) vonatkozóan.

1995 március 10. 1995 július 24. 1995 november 9.

4) – A Másodlagos radarberendezések továbbfejlesztésével valamint az Összeütközés elkerülését biztosító rendszerekkel foglalkozó munkacsoportok negyedik ülése (SICASP/4)

A forgószárnyas légijárművek nyomásmagasság-adó másodlagos válaszjeladóval történő felszerelésére vonatkozó előírások felvétele (ACAS).

1996 február 19. 1996 július 15. 1996 november 7.

5) – Negyedik kiadás – Repülési adatrögzítés munkacsoport első ülése – Léginavigációs Bizottság tanulmányai – Az ICAO és ipari CFIT munkabizottságok vizsgálatai – 1. Annex 162. módosítása és a 11. Annex 38. módosítása – Szerkesztői módosítások

a) A légijármű üzemeltetési kézikönyv új és módosított meghatározásai, repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek felsorolása, emberi tényezők alapelvei, emberi teljesítőképesség és teljesítmény, gyártók minimális felszerelési jegyzéke, karbantartás, szellemi tevékenységet befolyásoló anyagok és előírt navigációs teljesítmény;

b) a kölcsönbérlet és csere vonatkozó megjegyzéseinek módosítása;

c) a pszichoaktív anyagok használatára vonatkozó új megjegyzés bevezetése;

d) a repülési adatrögzítőkkel kapcsolatos új és módosított előírások;

e) új és módosított előírások a függelékbe áthelyezett üzemeltetési kézikönyv tartalmára vonatkozóan;

f) az államok felelősségét érintő új előírások a légi szállítói engedély alapján végzett tevékenység felügyeletére, az üzemeltetési kézikönyv jóváhagyására valamint a járatói jogosítási és folyamatos ellenőrzési rendszer kialakítására;

g) új előírások a földi légijármű jégtelenítésre, a légijármű üzemeltetési teljesítmény korlátozásokra, tömeg korlátozásokra, érzékeny nyomásmagasság mérőműszerekre valamint az első tiszt meglévő gyakorlati tapasztalatára vonatkozóan;

h) módosított előírások a nyomásmagasság adó válaszjeladók szállítására; és

i) új előírások az emberi tényezők figyelembevétele alapján.

1998 március 20. 1998 július 20. 1998 november 5.

6) – Repülési adatrögzítés munkacsoport második ülése – A Közgyülés 32. ülése – Léginavigációs Bizottság tanulmányai

a) „légiutaskísérő” kifejezés módosítása „utaskabin személyzet” kifejezésre;

b) meghatározások módosítása;

c) új előírások a 406 MHz és 121,5 MHz frekvencián üzemelő vészhelyzeti helyjeladó berendezések kötelező szállítására; nyomásmagasság-adó másodlagos válaszjeladók; a digitális összeköttetések rögzítésére vonatkozó határidő kijelölése.

1999 március 15. 1999 július 19. 1999 november 4.

7) —Léginavigációs Bizottság tanulmányai
a) A műszeres megközelítés és leszállás osztályozásának bevezetése és a meghatározások módosítása;
b) új előírások a futópályamenti látástávolság érték biztosítására; a műszeres megközelítések követelményei; a parancsnok pilóta feladatainak módosítása.

2000 március 15. 2000 július 17. 2000 november 2.

8) – Ötödik kiadás – Repülési adatrögzítés munkacsoport második ülése – Az egész világot átfogó műholdas navigációs rendszerrel foglalkozó munkacsoport harmadik ülése – Folyamatos légialkalmassági munkacsoport ötödik ülése – Léginavigációs Bizottság tanulmányai

a) a repülési adatrögzítőkre vonatkozó előírások módosítása, amelyek tartalmazzák a digitális távközlési adatok rögzítését; az új légijármű repülési adatrögzítőjére vonatkozó előírások; rögzítendő jellemzők új felsorolása; a pilótakabin hangrögzítők két órás felvételi időtartamának előírása;

b) a műszeres megközelítés és leszállás osztályozásának módosítása;

c) új előírások a függőleges irányvezetéssel végrehajtott megközelítésre vonatkozóan;

d) új meghatározások és a karbantartással kapcsolatos előírások módosítása; és

e) a zajbizonyítvány angol nyelvre történő lefordítása.

2001 március 12. 2001 július 16. 2001 november 1.

9) – Elkülönítési és Légtérbiztonsági munkacsoport valamint a Léginavigációs Bizottság tanulmányai

a) (idegen) nyelvismeretre vonatkozó új előírások;

b) a járató repülésbiztonsági dokumentáció rendszerére vonatkozó új meghatározások és előírások;

c) a földi kiszolgálás biztonsági tényezőire vonatkozó új meghatározások és előírások;

d) a járató államának jogosítása a RNP légtérben történő üzemeltetésre;

e) légijármű összeütközés elkerülő fedélzeti rendszerek (ACAS) üzemeltetési kézikönyvének tartalmára vonatkozó új előírások.

2003 március 13. 2003 július 14. 2003 november 27.

10) – A légiközlekedési környezetvédelmi bizottság hatodik ülése
Új javaslatok a zajbizonyítványok hivatkozásaira vonatkozóan

2005 március 09. 2005 július 11. 2005 november 24.

11) – A hajózó személyzetek szakszolgálati engedélyeinek kiadásával és a képzéssel foglalkozó munkacsoport második ülése – Az akadálymentességi munkacsoport tizennegyedik ülése – Az Egyesült Államok javaslata – Tanácsi kérés – A Közgyűlés 35. ülése – A Léginavigációs Konferencia tizenegyedik ülése

a) repülőgépvezetők folyamatos gyakorlatban tartási és szakmai jártassági ellenőrzésének követelményei, a személyzet kereszt jogosítása és a gyakorlati jártasság keresztirányú beszámítása, az alkalmasság értékelése, fenyegetés és hiba kezelés valamint a repülőgépvezetők félévenkénti szakmai jártasság ellenőrzése;

b) a repülőgépvezetők ismerete az eljárások tartalmi felépítése által meghatározott üzemeltetési követelményekről;

c) a repülés-üzemi tisztek / szolgálatvezetők jogosítása és az állami szabályozó rendszer kritikus elemei;

d) a légijármű üzembentartási engedély másolatának szállítása a légijármű fedélzetén;

e) biztonság irányítási intézkedések és hivatkozások az elfogadható biztonsági szint elképzeléseinek új útmutató anyagaira.

2006 március 14. 2006 július 17. 2006 november 23.

I. szakasz
Általános rész
Nemzetközi előírások és ajánlott gyakorlati eljárások

1. fejezet
Meghatározások

Amennyiben a nemzetközi légiforgalomban üzemeltetett forgószárnyas légijár-művekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások során a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Aerial Work – Munkarepülés
A légijármű olyan különleges szolgáltatások nyújtásához történő üzemeltetése, mint például mezőgazdasági, építési, légi-fényképezési, megfigyelési, felderítési, ellenőrzési, kutató és mentő feladatok valamint hirdetési szolgáltatások.

Aircraft – Légijármű
Minden olyan szerkezet, amelynek levegőben maradását olyan aerodinamikai reakcióerők biztosítják, amelyek nem azonosak a földfelszínre ható aerodinamikai reakcióerőkkel.

Aircraft operating manual – Légijármű üzemeltetési kézikönyv
A járató állama által elfogadható kézikönyv, amely tartalmazza az általános, különleges és vészhelyzeti eljárásokat, ellenőrző listákat, korlátozásokat, teljesítmény tájékoztatásokat, a légijármű rendszereinek részletezését valamint minden egyéb, a légijármű üzemeltetéséhez szükséges tájékoztató anyagot.

Megjegyzés: A légijármű üzemeltetési kézikönyv az üzemeltetési kézikönyvek közé tartozik.

Air operator certificate (AOC) —Légijármű üzembentartási engedély
A járatót meghatározott kereskedelmi légiszállítási tevékenység végrehajtására jogosító engedély.

Alternate heliport – Kitérő helikopter repülőtér
A repülési tervben meghatározott olyan helikopter repülőtér, amelyre a repülést folytatni lehet, ha a tervezett célállomás helikopter repülőtéren a leszállás végrehajtása nem tanácsos.
Megjegyzés: A kitérő helikopter repülőtér lehet az indulási helikopter repülőtér is.

Approach and landing operations using instrument approach procedures – Műszeres megközelítési eljárásokat alkalmazó megközelítés és leszállás
A műszeres megközelítési és leszállási eljárások osztályozása a következő:
Nem-precíziós megközelítés és leszállás (Non-precision approach and landing operations)
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú irányvezetést alkalmaznak, azonban függőleges irányvezetést nem vesznek igénybe.

Megközelítés és leszállás függőleges irányvezetéssel (Approach and landing operations with vertical guidance)
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során oldalirányú és függőleges irányvezetést alkalmaznak, azonban az a precíziós megközelítésre és leszállásra vonatkozó üzemeltetési előírásoknak nem tesz eleget.

Precíziós megközelítés és leszállás (Precision approach and landing operations)
Olyan műszeres megközelítés és leszállás, amelynek végrehajtása során precíziós oldalirányú és függőleges irányvezetést alkalmaznak az alábbiakban meghatározott üzemeltetési minimumok

figyelembevételével:

Megjegyzés: Az oldalirányú és függőleges irányvezetés a következő berendezések egyikének segítségével nyújtott iránysáv és siklópálya tájékoztatás:

a) földi telepítésű navigációs berendezés; vagy

b) számítógéppel biztosított navigációs adatok.

Precíziós megközelítés és leszállás kategóriái (Categories of precision approach and landing operations):
I. kategória (I. kat) (Category I (CAT I) operations)
Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága nem kevesebb mint 60 méter (200 láb) valamint a látástávolság értéke nem kevesebb mint 800 méter vagy a futópályamenti látástávolság értéke nem kevesebb mint 550 méter.

II. kategória (II. kat) (Category II (CAT II) operations)
Olyan műszeres megközelítés és leszállás, amelynek elhatározási magassága kevesebb mint 60 méter (200 láb) de nem kevesebb mint 30 méter (100 láb) valamint a futópályamenti látástávolság értéke nem kevesebb mint 350 méter.

III/A. kategória (III/A. kat) (Category IIIA (CAT IIIA) operations)
Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 30 méter (100 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke kevesebb mint 200 méter, de nem kevesebb mint 50 méter.

III/B. kategória (III/B. kat) (Category IIIB (CAT IIIB) operations)
Olyan műszeres megközelítés és leszállás, amelynek:

a) elhatározási magassága kevesebb mint 15 méter (50 láb) vagy ilyen elhatározási magasságot nem határoztak meg; és

b) a futópályamenti látástávolság értéke kevesebb mint 200 méter, de nem kevesebb mint 50 méter.

III/C. kategória (III/C. kat) (Category IIIC (CAT IIIC) operations)
Olyan műszeres megközelítés és leszállás, amelyhez elhatározási magasság és futópályamenti látástávolság érték korlátozást nem határoztak meg.

Megjegyzés: Ahol az elhatározási magasság (DH) és futópályamenti látástávolság érték (RVR) különböző üzemeltetési kategóriákba esnek, a műszeres megközelítés és leszállás az igényesebb kategória alapján határozandó meg, azaz ott, ahol az elhatározási magasság érték a III/A. kategóriába, míg a futópályamenti látástávolság érték a III/B. kategóriába tartozik, a megközelítés és leszállás III/B. kategóriás lesz. Ugyanígy, amennyiben az elhatározási magasság érték II. kategóriás és a futópályamenti látástávolság érték az I. kategóriába tartozik, a megközelítés és leszállás II. kategóriásnak tekintendő.

Approach and landing phase – Helicopter – Megközelítési és leszállási szakasz – forgószárnyas légijármű
A repülési feladatnak azon része, amely a végső megközelítési és felszállási terület1 tengerszint feletti magassága feletti 300 méteren (1000 láb) kezdődik, ha a repülés tervezett magassága ennél nagyobb. Más esetekben a szakasz a süllyedés megkezdésével kezdődik és a leszállás végrehajtásáig vagy a megszakított leszállás pontjáig tart.

Cabin crew member – Utaskabin személyzeti tag
Személyzeti tag2, aki a járató vagy a légijármű parancsnoka kijelölése alapján az utasok biztonsága érdekében szükséges feladatokat végzi, azonban nem a hajózószemélyzet tagja.

Commercial air transport operation – Kereskedelmi légiszállítási tevékenység
Pénzbeli ellenszolgáltatásért vagy bérleti díjért végzett utas, teheráru vagy postaküldemény légijármű üzemeltetés.

Configuration deviation list (CDL) – Repülésvezérlő szerkezetek alapállapottól történő eltéréseinek jegyzéke
A típus tervezéséért felelős szervezet által kidolgozott és a tervezés állama által jóváhagyott lista, amely meghatározza a légijármű típus bármely olyan külső alkatrészét, amely a repülés megkezdésekor hiányozhat, továbbá szükség szerint tartalmazza az összes vonatkozó üzemeltetési korlátozást valamint repülési teljesítmény korrekciós tájékoztatást.

Congested area – Zsúfolt terület
Város, falu vagy település közelében levő bármely olyan terület, amelyet elsősorban lakó, kereskedelmi vagy üdülési célokra vesznek igénybe.

Crew member – Személyzeti tag
A járató által a repülési időtartam alatt a légijárművön szolgálattételre kijelölt személy.

Dangerous goods – Veszélyes áruk
Olyan tárgyak vagy anyagok, amelyek az egészségre, a biztonságra vagy az anyagi javakra (tulajdonra) nagy kockázatot jelentenek és amelyek a Műszaki Utasításokban a veszélyes áruk felsorolásában találhatók vagy az Utasítások ilyennek minősítik.

Megjegyzés: A veszélyes árukat a 18. Annex 3. fejezete osztályozza.

Decision altitude (DA) / Decision height (DH) – Elhatározási magasság
A precíziós vagy a függőleges irányvezetéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amelyen megszakított megközelítési eljárást kell kezdeményezni, ha a megközelítés folytatásához szükséges látás utáni tájékozódás feltételei nem jöttek létre.

1. Megjegyzés: A DA elhatározási magasság a közepes tengerszinthez, a DH elhatározási magasság pedig a futópálya küszöb magasságához viszonyított érték.

2. Megjegyzés: A szükséges látás utáni tájékozódás feltételei a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. III. kategóriás üzemelés során, amennyiben elhatározási magasságot jelölnek ki, a szükséges látási feltételek az adott eljárásra vagy üzemelésre vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok "QNH/QFE elhatározási magasság"-ként rövidítve pedig DA/H-ként írhatók le.

Defined point after take-off – Meghatározott pont a felszállás után
A felszállási és kezdeti emelkedési szakaszon belül az a pont, amely előtt a forgószárnyas légijármű repülésének biztonságos folytatása egy működésképtelen hajtóművel nincs biztosítva és kényszerleszállásra lehet szükség.

Defined point before landing – Meghatározott pont a leszállás előtt
A megközelítési és leszállási szakaszon belül az a pont, amely után a forgószárnyas légijármű

repülésének biztonságos folytatása egy működésképtelen hajtóművel nincs biztosítva és kényszerleszállásra lehet szükség.

Megjegyzés: A fenti meghatározott pontok csak a 2. teljesítmény osztályú helikopterekre vonatkoznak.

Elevated heliport – Emelt szinten létesített helikopter leszállóhely
Szárazföldön, talajszint felett levő emelt szerkezeten kialakított forgószárnyas légijármű leszállóhely.

Emergency locator transmitter (ELT) – Vészhelyzeti helyjeladó berendezés
Olyan berendezés leírására szolgáló általános kifejezés, amely megkülönböztetett (rádió)jeleket sugároz a kijelölt hullámhosszokon és alkalmazásától függően a baleset alkalmával3 automatikusan működésbe léphet vagy kézzel üzembe helyezhető. A vészhelyzeti helyjeladó berendezés az alábbi típusú lehet:

Automatikus rögzített (Automatic fixed ELT (ELT/AF))
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön állandóan rögzítve helyezkedik el.

Automatikus hordozható (Automatic portable ELT (ELT/AP))
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után a légijármű fedélzetéről könnyen eltávolítható.

Automatikusan leváló (Automatically deployable ELT (ELT/AD))
Olyan vészhelyzeti helyjeladó berendezés, amely a légijárművön rögzítve helyezkedik el, azonban a baleset után, annak hatására automatikusan leválik a légijárműről. Szükség esetén lehetséges annak kézi eltávolítása is.

Túlélési (Survival (ELT/S))
Olyan vészhelyzeti helyjeladó berendezés, amely eltávolítható légijárműről és a légijárművön úgy tárolják, hogy azt vészhelyzet esetén a túlélők egyszerűen üzembe helyezhetik és használhatják. A berendezés automatikus kapcsolószerkezettel is felszerelhető, azaz szükség esetén automatikusan is működésbe léphet.

En-route phase – Útvonal repülési szakasz
A repülésnek azon része, amely a felszállási és kezdeti emelkedési szakasz végétől a megközelítési és leszállási szakasz kezdetéig tart.

Megjegyzés: Amennyiben látás után végrehajtott repüléssel nem lehet megfelelő akadálymentességet biztosítani, a repülést úgy tervezzék meg, hogy az az akadályokat elegendő távolsággal elkerülje. Kritikus hajtómű egység meghibásodás esetében szükségessé válhat, hogy az üzemeltetők egyéb, helyettesítő eljárásokat alkalmazzanak.

Final approach and take-off area (FATO) – Végső megközelítési és felszállási terület
Meghatározott terület, amely felett végrehajtják a függeszkedés megkezdéséig vagy a teljes leszállásig tartó végső megközelítést és amelyen a felszállási műveletet megkezdik. Ahol a végső megközelítési és felszállási területet 1. teljesítmény osztályú forgószárnyas légijárművek veszik igénybe, a rendelkezésre álló megszakított felszállási terület is ehhez a meghatározott területhez tartozik.

Flight crew member – Hajózószemélyzeti tag
Szakszolgálati engedéllyel rendelkező személyzeti tag, akinek munkája a repülési szolgálati idő tartama alatt nélkülözhetetlen a légijármű üzemeltetéséhez.

Flight duty period – Repülési szolgálati munkaidő
Azon teljes időtartam, amely akkor kezdődik, amikor a hajózószemélyzeti tag pihenőidejét követően a repülés vagy repülési sorozat előtt szolgálatba lép és addig az időpontig tart, amikor a hajózószemélyzeti tag a repülés vagy repülési sorozat befejezése után összes szolgálati feladata alól

mentesül.

Flight manual – Repülésvégrehajtási kézikönyv
A légialkalmassági bizonyítvánnyal összhangban kidolgozott és kiadott kézikönyv, amely tartalmazza azokat a korlátozásokat, amelyek mellett a légijármű repülésre alkalmasnak nyilvánítható, valamint azokat az utasításokat és tájékoztatásokat, amelyek a hajózószemélyzet tagjai számára a légijármű biztonságos üzemeltetéséhez szükségesek.

Flight operations officer/flight dispatcher – repülés-üzemi tiszt/szolgálatvezető
A járató által a légiüzemeltetés irányításába és felügyeletébe szakszolgálati engedéllyel vagy anélkül bevont, az 1. Annex előírásainak megfelelően jogosított személy, aki a légijármű parancsnokát támogatja, eligazítja és/vagy kiszolgálja a repülés biztonságos lefolytatása érdekében.

Flight plan – Repülési terv
A légiforgalmi szolgálati egységek rendelkezésére bocsátott, a légijármű tervezett repülésére vagy a repülés egy szakaszára vonatkozó meghatározott tájékoztatás.

Flight recorder – Repülési adatrögzítő
A légijárművön felszerelt bármely típusú adatrögzítő, amelynek célja a tájékoztatások biztosítása a légijármű baleset vagy repesemény kivizsgáláshoz.

Flight safety documents system – Repülésbiztonsági dokumentációs rendszer
A járató által kidolgozott és fenntartott, egymással összefüggő dokumentumok, amelyek rendezett formában tartalmazzák a légi- és földi üzemeltetéshez szükséges tájékoztatásokat. A rendszer legalább a repülés-végrehajtási kézikönyvből valamint a járató karbantartási ellenőrző kézikönyvéből álljon.

Flight simulation training device – Mesterséges repülés-gyakorló berendezés
Az alábbi három berendezés közül bármelyik, amely a repülési körülmények földi gyakorlati megjelenítésére, pontos utánzására alkalmas:

Repülési szimulátor – Flight simulator
Egy adott légijármű típus pilótakabinjának pontos utánzata olyan mértékben, hogy a mechanikus, elektromos továbbá elektronikus légijármű rendszerek működése és ezek hatása, a légijármű hajózószemélyzetének általános munkakörnyezete valamint az adott légijármű teljesítmény és repülési jellemzői a valósághoz hűen utánozhatók;

Repülési eljárás gyakorló berendezés – Flight procedures trainer
Olyan berendezés, amely valóságos pilótafülke környezetet biztosít és mesterségesen ábrázolja a műszerek működését valamint reakcióit, megjeleníti a műszaki, mechanikus, elektromos és elektronikus rendszerek működését valamint az adott osztályba tartozó légijárművek teljesítmény és repülési jellemzőit;

Alap műszerrepülési gyakorló berendezés – Basic instrument flight trainer
Olyan megfelelő műszerekkel ellátott berendezés, amely mesterségesen biztosítja a légijármű műszerfal környezetét műszerrepülési körülmények között.

Flight time – Helicopters – Repülési idő – Forgószárnyas légijármű
Az a teljes időtartam, amely akkor kezdődik, amikor a légijármű forgó-szárnyai elindulnak és akkor fejeződik be, amikor a légijármű a repülés végén megáll és forgószárnyai leállnak.

General aviation operation – Általános célú légiközlekedés
A kereskedelmi légiszállító tevékenységtől valamint a munkarepüléstől eltérő légijármű üzemeltetés.

Ground handling – Földi kiszolgálás
A légijármű érkezése után és indulása előtt a repülőtéren szükséges kiszolgálási feladatok, amelyeket nem a légiforgalmi szolgálatok végeznek el.

Helicopter – Forgószárnyas légijármű
Levegőnél nehezebb légijármű, amelynek levegőben maradását elsősorban a függőleges tengelyre felszerelt, egy vagy több hajtóművel meghajtott forgószárny levegővel szemben ható aerodinamikai reakció-erői biztosítják.

Helideck – Helikopter leszállási hely
Úszó vagy rögzített vízi szerkezeten a forgószárnyas légijárművek üzemeltetésére létesített leszállóhely.

Heliport – Helikopter repülőtér
Repülőtér vagy egy építmény meghatározott területén kialakított leszállóhely, amelyet teljes egészében vagy részben forgószárnyas légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Heliport operating minima – Helikopter repülőtér üzemeltetési minimum
Egy helikopter repülőtér igénybevételének a következő repülési feladatok végrehajtását érintő korlátozásai:

a) Felszállás – futópályamenti látástávolság (RVR) és/vagy látástávolság értékben és ha szükséges, felhőzet jellemzőkben kifejezve;

b) Precíziós megközelítés és leszállás – az üzemeltetés kategóriájának megfelelően látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;

c) Függőleges irányvezetéssel végrehajtott megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint elhatározási magasság értékben (DA/H) kifejezve;

d) Nem-precíziós megközelítés és leszállás – látástávolság és/vagy futópályamenti látástávolság értékben (RVR) valamint legalacsonyabb süllyedési magasság értékben (MDA/H) és ha szükséges, felhőzet jellemzőkben kifejezve.

Human Factors principles – Emberi tényezők alapelvei
A légiközlekedési tervezés, jogosítás, kiképzés, üzemeltetés és karbantartás vonatkozó alapelvei, amelyek célja az emberi teljesítmény és teljesítő-képesség tényezőinek tökéletes figyelembevételével biztonságos kapcsolat kialakítása a személyek és a rendszer egyes (műszaki) elemei között.

Human performance – Emberi teljesítmény és teljesítőképesség
Az egyéni emberi képességek és korlátozó tényezők, amelyek hatással vannak a légiközlekedési üzemeltetés biztonságára és hatékonyságára.

Instrument meteorological conditions (IMC) – Műszeres időjárási körülmények
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal* kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél alacsonyabbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

Landing decision point (LDP) – Leszállási elhatározási pont
A leszállási teljesítmény meghatározásánál alkalmazott pont, ahonnan hajtómű meghibásodás esetén a leszállási művelet biztonságosan folytatható vagy a leszállás megszakítása kezdeményezhető.

Megjegyzés: A leszállási elhatározási pont az I. teljesítmény osztályú forgószárnyas légijárműre vonatkozik.

Maintenance – Karbantartás
A légijármű folyamatos légialkalmasságának biztosításához előírt feladatok elvégzése, beleértve a következők bármelyikét vagy ezek kombinációját; ellenőrzés, átvizsgálás, javítás, csere, módosítás vagy a meghibásodás elhárítása.

Maintenance organization's procedures manual – Karbantartó szervezet eljárási kézikönyve
A karbantartó szervezet vezetője által jóváhagyott dokumentum, amely részletezi a karbantartó szervezet felépítését, a vezetői felelősségi rendszert, az elvégzendő munkafeladatokat, ismerteti a létesítményeket, a karbantartási eljárásokat valamint a minőségbiztosítási vagy felügyeleti illetve ellenőrzési rendszert.

Maintenance programme – Karbantartási program
Az előírt tervszerű karbantartási feladatok felsorolását tartalmazó kiadvány, amely a feladatok végrehajtásának időrendi tervét és rendjét jelzi. Ilyen kiadvány lehet a légijármű üzemi megbízhatósági programja, amely azon légijármű biztonságos üzemeltetéshez szükséges, amelyre az vonatkozik.

Maintenance release – Karbantartási nyilatkozat
Olyan igazolást tartalmazó dokumentum, amely megerősíti, hogy a megfelelő karbantartási feladatokat a karbantartást végző szervezet eljárási kézikönyve vagy más egyenértékű rendszer alapján az elfogadott jellemzők figyelembevételével kielégítően elvégezték.

Master minimum equipment list (MMEL) – Gyártó minimális felszerelési jegyzéke
Az adott légijármű típusra vonatkozóan a gyártó által kidolgozott és a gyártó állama által jóváhagyott felszerelési jegyzék, amely azokat a felszereléseket és egységeket tartalmazza, amelyek közül egy vagy több a repülés megkezdése előtt üzemképtelen lehet. A jegyzékhez (MMEL) különleges üzemeltetési feltételek, korlátozások vagy eljárások határozhatók meg.

Maximum mass – Legnagyobb tömeg
Legnagyobb engedélyezett felszállósúly.

Minimum descent altitude (MDA) / Minimum descent height (MDH) – Legalacsonyabb süllyedési magasság
A nem-precíziós megközelítési vagy a körözéssel végrehajtott megközelítési eljárásra előírt meghatározott tengerszint vagy földfelszín feletti magasság, amely alá az előírt látási feltételek létrejöttének hiányában süllyedni tilos.

1. Megjegyzés: A legalacsonyabb QNH süllyedési magasság a közepes tengerszinthez, a legalacsonyabb QFE süllyedési magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott legalacsonyabb süllyedési magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A szükséges látási feltételek a fénytechnikai eszközök vagy a megközelítési terület azon elemeinek illetve részeinek látását jelentik, amelyeket a repülőgépvezetőnek elegendő ideig látnia kell ahhoz, hogy a légijármű helyzetét és a szükséges helyzetváltoztatás mértékét a kívánatos repülési pályához viszonyítva értékelhesse. A körözéssel végrehajtott megközelítés esetében a szükséges látási feltételek a futópálya környezetére vonatkoznak.

3. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok "QNH/QFE legalacsonyabb süllyedési magasság"-ként rövidítve pedig MDA/H-ként írhatók le.

Minimum equipment list (MEL) – Minimális felszerelési jegyzék
A légijármű üzemeletetéséhez rendelkezésre álló felszerelések jegyzéke, amely meghatározott feltételek alapján tartalmazza azokat a berendezéseket és egységeket, amelyek üzemképtelenek lehetnek. A jegyzéket a járató az adott légijármű vonatkozásában a MMEL alapján vagy ennél szigorúbb feltételek szerint dolgozza ki.

Éjszaka – Night
Az esti polgári szürkület vége és a hajnali polgári szürkület kezdete között eltelt idő vagy olyan más, napnyugat és napkelte között eltelt időszak, amelyet az illetékes hatóság határoz meg.

Megjegyzés: Az esti polgári szürkület akkor fejeződik be, amikor a napkorong középpontja 6 fokkal a horizont alá süllyed és a hajnali polgári szürkület akkor kezdődik, amikor a napkorong középpontja 6 fokkal a horizont fölé emelkedik.

Obstacle clearance altitude (OCA) or Obstacle clearance height (OCH) – Akadálymentes tengerszint feletti magasság (OCA) vagy akadálymentes földfelszín feletti magasság (OCH)
A legalacsonyabb közepes tengerszinthez viszonyított magasság vagy a megfelelő futópálya küszöb illetve a repülőtér magassága feletti magasság – amelyik alkalmazható – amelyet az akadályoktól történő megfelelő függőleges elkülönítés biztosítása érdekében az akadálymentességi előírásokkal összhangban határoznak meg.

1. Megjegyzés: Az akadálymentes tengerszint feletti magasság a közepes tengerszinthez, az akadálymentes földfelszín feletti magasság a futópálya küszöb magasságához viszonyított érték. A nem-precíziós megközelítés esetében az akadálymentes földfelszín feletti magasság a repülőtér magasságához vagy a futópálya küszöb magasságához viszonyított érték. Ez utóbbit akkor alkalmazzák, ha a futópálya küszöb magassága több mint 2 méterrel (7 láb) a repülőtér magassága alatt van. A megközelítéshez történő körözéshez meghatározott akadálymentes földfelszín feletti magasság a repülőtér magasságához viszonyított érték.

2. Megjegyzés: A gyakorlati alkalmazás megkönnyítése érdekében ott, ahol mindkét kifejezést használják, azok "QNH/QFE akadálymentes magasság"-ként rövidítve pedig OCA/H-ként írhatók le.

Operational control – Repülésüzemi irányítás
Felügyelet gyakorlása valamely repülési feladat megkezdésére, folytatására, befejezésére vagy kitérő repülőtérre történő irányítására a légijármű biztonsága valamint a repülés menetrendszerű és gazdaságos lebonyolítása érdekében.

Operational flight plan – Üzemeltetői repülési terv
A járató terve a repülési feladat biztonságos végrehajtására a forgószárnyas légijármű teljesítményének, üzemeltetési korlátozásainak valamint az útvonalon és az érintett repülőtereken várható repülésvégrehajtási körülmények figyelembevételével.

Operations Manual – Üzemeltetési kézikönyv
Az üzemeltetéssel megbízott személyzet számára feladataik elvégzéséhez kiadott eljárásokat, utasításokat és tájékoztatásokat tartalmazó kézikönyv.

Operator – Járató
Valamely személy, szervezet vagy vállalat, amely légijárműveket üzemeltet vagy ilyen tevékenység végzésére ajánlkozik.

Operator's maintenance control manual – Járató karbantartás irányítási kézkönyve
A járató eljárásait ismertető dokumentum, amely segítségével a járató biztosítja, hogy légijárművén az összes tervezett és szükség szerint végrehajtandó karbantartási feladat az előírt időben valamint ellenőrzött és kielégítő módon elvégzésre kerül.

Performance Class 1 helicopter – 1. teljesítmény osztályú forgószárnyas légijármű
Olyan teljesítményű forgószárnyas légijármű, amely kritikus hajtómű meghibásodás esetén képes a megszakított felszállási területen belül a leszállást végrehajtani vagy alkalmas leszállási területig biztonságosan elrepülni attól függően, hogy a meghibásodás mikor következik be.

Performance Class 2 helicopter – 2. teljesítmény osztályú forgószárnyas légijármű
Olyan teljesítményű forgószárnyas légijármű, amely kritikus hajtómű meghibásodás esetén képes a repülés biztonságos folytatására, kivéve ha a meghibásodás a felszállás utáni meghatározott pont előtt vagy a leszállás előtti meghatározott pont után következik be, mert ebben az esetben kényszerleszállás végrehajtása válhat szükségessé.

Performance Class 3 helicopter —3. teljesítmény osztályú forgószárnyas légijármű
Olyan teljesítményű forgószárnyas légijármű, amellyel a repülési bármely szakaszán bekövetkező hajtómű meghibásodás esetén kényszerleszállást kell végrehajtani.

Pilot-in-command – Légijármű parancsnoka
A repülés biztonságos végrehajtásáért felelős, a járató vagy az általános célú légiközlekedés esetében a légijármű tulajdonosa részéről parancsnoknak kijelölt repülőgépvezető.

Psychoactive substances – Szellemi tevékenységet befolyásoló anyagok
Alkohol, ópiumból vagy kenderből készített kábítószer, kokain, nyugtatók és altatók, egyéb izgató, serkentő, élénkítő-szerek, képzeteket keltő erős izgatószerek és illékony oldószerek a kávé és a dohányféleségek kivételével.

Repair – Javítás
A légijármű bármely repülésüzemi alkatrészének sérülést vagy üzemszerű kopást követő repülésre alkalmas állapotba történő helyreállítása annak biztosítása érdekében, hogy az továbbra is megfelel a vonatkozó légialkalmassági előírásoknak, amelyeket az adott légijármű típus bizonyítványának kiadásakor figyelembe vettek.

Required navigation performance (RNP) – Előírt navigációs pontosság
Egy meghatározott légtérben történő repülés-végrehajtáshoz szükséges navigációs teljesítmény azaz pontosság.

Megjegyzés: A navigációs teljesítményt és előírásokat egy adott RNP típusra és/vagy alkalmazásra határozzák meg.

Rest period – Pihenőidő
A földön eltöltött bármely időtartam, amely alatt a járató a hajózószemélyzet tagját összes feladata alól mentesíti.

RNP type (Required navigation performance type) – Előírt navigációs pontosság típus
Tengeri mérföldben kifejezett távolság, azaz pontossági határérték. A légijármű a repülésvégrehajtás során a repülési idő legalább 95 %-ában a tervezett repülési helyzetéhez viszonyítva ezen határértéken belül repüljön.

Például: – RNP 4 olyan navigációs pontosság határértéket jelent, amelynek alapján a légijármű repülési idejének legalább 95 százalékában mindenkori tervezett repülési helyzetéhez viszonyítva plusz/minusz 4 tengeri mérföld távolságon belül repül.

Runway visual range (RVR) – Futópályamenti látástávolság érték
Az a távolság, ameddig a futópálya középvonalán álló légijármű-vezetője látja a futópálya felületi jelzéseket vagy a futópálya szélét kijelölő illetve a középvonalát azonosító fényeket.

Safe forced landing – Biztonságos kényszerleszállás
Elkerülhetetlen kényszerleszállás talajra vagy vízfelszínre, melynek során nagy valószínűséggel várható, hogy a légijármű fedélzetén valamint a földön tartózkodó személyek nem sérülnek meg.

Safety management system – Biztonsági irányítási rendszer
A biztonság irányításának rendszerezett megközelítése, amely magában foglalja a szükséges szervezeti felépítést, felelősségi köröket, irányelveket és eljárásokat.

Safety programme – Biztonsági program
Előírások és tevékenységek egységes rendszere, amely a biztonság növelésére irányul.

State of Registry – Lajstromozó állam
Azon állam, amelynek lajstromába a légijárművet bevezették.

Megjegyzés: A nem nemzeti alapon működő nemzetközi üzemeltető vállalkozás vagy szervezet légijárművének lajstromozás esetében az abban érintett államokra együttesen és külön-külön is vonatkozik az a kötelezettség, amely a Chicagó-i Egyezmény értelmében a lajstromozó államot illeti. Erre vonatkozóan lásd a Tanács 1967 december 17-i Határozatát a Nemzetközi Légiszállítás Gazdasági Szabályzásának Előírásai és Útmutatója (Doc 9587) címmel.

State of the Operator – Járató állama
Az az állam, amelynek területén a járató legfőbb üzleti telephelye található. Ennek hiányában az az állam, amelyben a járató állandó tartózkodási helye (címe) van.

Take-off and initial climb phase – Felszállási és kezdeti emelkedési szakasz
A repülésnek az a szakasza, amely a felszállástól a végső megközelítési és felszállási terület magassága felett 300 méter (1000 láb) magasságig tart abban az esetben, ha a repülés tervezett magassága ennél nagyobb. A szakasz más esetekben az emelkedés befejezéséig tart.

Take-off decision point (TDP) – Felszállási elhatározási pont
A felszállási teljesítmény meghatározásánál alkalmazott pont, ahonnan hajtómű meghibásodás esetén a felszállás megszakítható vagy a felszállási művelet biztonságosan folytatható.

Megjegyzés: A felszállási elhatározási pont az I. teljesítmény osztályú forgószárnyas légijárműre vonatkozik.

Visual meteorological conditions (VMC) – Látás utáni időjárási körülmények
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal* kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékekkel azonosak vagy ezeknél jobbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex 4. fejezete tartalmazza.

* A 2. Annex meghatározása szerint

V_{TOSS}
Az a legalacsonyabb sebesség, amelynél üzemképtelen kritikus hajtóművel emelkedés érhető el úgy, hogy a többi hajtómű engedélyezett üzemeltetési határértékein belül működik.

Megjegyzés: A fent említett sebesség a légijármű műszerein vagy más, a repülés-végrehajtási kézikönyvben meghatározott eljárás segítségével mérhető.

2. fejezet
Alkalmazhatóság

A 6. Annex III. részében található nemzetközi előírások és ajánlott gyakorlati eljárások a nemzetközi kereskedelmi légiszállításban vagy az általános célú nemzetközi légiközlekedésben üzemeltetett forgószárnyas légijárművek működésére alkalmazandók, azonban ezek a nemzetközi előírások és ajánlott gyakorlati eljárások a munkarepülésben használt forgószárnyas légijárművekre nem vonatkoznak.

1. Megjegyzés: A nemzetközi kereskedelmi légiszállítási tevékenységre jogosított járatók repülőgépeinek üzemeltetésre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex I. részében találhatók.

2. Megjegyzés: Az általános célú nemzetközi légiközlekedésben üzemeltetett repülőgépekre vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások a 6. Annex II. részében találhatók.

II. szakasz
Nemzetközi kereskedelmi légiszállítás

1. fejezet
Általános rész

1. Megjegyzés: Bár a Nemzetközi Polgári Légiközlekedési Egyezmény a lajstromozó államra bizonyos feladatokat ír elő, amelyek végrehajtására az állam a helyzetnek megfelelően jogosult vagy kötelezett, a Közgyűlés A23-13 számú határozatában elismerte azt a tényt, hogy a lajstromozó állam bizonyos körülmények között képtelen megfelelő módon eleget tenni a fenti kötelezettségének, amikor a légijárművet más állam járatója – elsősorban hajózószemélyzet nélkül – bérbe veszi, szerződés vagy csere megállapodás alapján üzemelteti valamint azt is, hogy amíg az Egyezmény 83/b. cikkelye hatályba nem lép, az Egyezmény nem határozza meg megfelelően a járató államára ilyen esetekben vonatkozó jogokat és kötelezettségeket. Ezért a Tanács felhívta a figyelmet arra, hogy ha a fenti esetekben a lajstromozó állam megállapítja, hogy az Egyezményben előírt kötelezettségei teljesítésére képtelen, azokat a feladatokat, amelyeket a járató állama jobban el tud végezni és ezen feladatok végrehajtását elvállalja, járató államára utalhatja át. Tudomásul vették, hogy a 83/b. cikkely hatályba lépéséig a fentiek csak gyakorlati szempontból lesznek célszerűek és nem érintik a Chicagó-i Egyezménynek a lajstromozó államra vagy bármely harmadik államra háruló kötelezettségeit. Mindazonáltal, mivel a 83/b. cikkely 1997 június 20-án hatályba lépett, a vonatkozó kiegészítést (Doc 9318) aláíró államok kötelesek az ilyen átadási megállapodásokban foglaltak teljesítésére.

2. Megjegyzés: A nemzetközi légi üzemeltetés esetében, amelyet olyan forgószárnyas légijárművekkel bonyolítanak le, amelyek nem mindegyike van azonos szerződő államban lajstromozva, a jelen rész előírásai közül semmi sem akadályozza meg az érintett államokat abban, hogy szerződés alapján *közösen végezzék el azokat a feladatokat, amelyek végrehajtására a jelen részben a lajstromozó államot jelöltük ki.*

1.1 A jogszabályok, előírások és eljárások betartása

1.1.1 A járató biztosítsa, hogy minden külföldön tartózkodó alkalmazottja tudatában legyen annak, hogy eleget kell tenniük azon állam jogszabályainak, előírásainak és közzétett eljárásainak, amelyben forgószárnyas légijárműveiket üzemeltetik.

1.1.2 A járató biztosítsa, hogy összes forgószárnyas légijármű-vezetője ismerje a feladataik teljesítéséhez szükséges jogszabályokat, előírásokat és eljárásokat, amelyeket az átrepülendő területekre, az igénybe vett helikopter repülőterekre és léginavigációs létesítményekre előírtak. A járató biztosítsa, hogy a hajózószemélyzet többi tagja is ismerje a forgószárnyas légijármű üzemeltetésével kapcsolatos egyéni feladataik teljesítéséhez szükséges jogszabályokat, előírásokat és eljárásokat.

Megjegyzés: A repülőgépvezetőknek és a légiüzemeltetéssel foglalkozó személyeknek szóló azon információkat, amelyek a repülési eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülési eljárások felépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.

1.1.3 A járató biztosítsa, hogy a hajózószemélyzet tagjai az 1. Annex előírásai szerint bizonyítsák képességüket a légiforgalmi rádiótávbeszélő összeköttetések során alkalmazott nyelv szóbeli használatára és megértésére.

1.1.4 A repülésüzemi irányításért a járató vagy kijelölt képviselője felelős.

Megjegyzés: Ez az előírás nem érinti az állam jogait és kötelezettségeit azon forgószárnyas légijárművek üzemeltetésére vonatkozóan, amelyeket abban az államban vettek lajstromba.

1.1.5 A repülésüzemi irányításért viselt felelősséggel csak a légijármű parancsnoka és a repülés-üzemi tiszt / szolgálatvezető hatalmazható fel, amennyiben a járató jóváhagyott módszere a légiüzemeltetés irányítására és felügyeletére megköveteli a repülés-üzemi tiszt / szolgálatvezető alkalmazását.

Megjegyzés: A repülésüzem irányításának megszervezésére vonatkozó útmutató és a repülés-üzemi tiszt / szolgálatvezető szerepének leírása az Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyv-ben *(Doc 8335) található. A repülés-üzemi tiszt / szolgálatvezető felhatalmazására, kötelességeire, és felelősségi körére vonatkozó részletes útmutatót a* Repülésüzemi Kézikönyv Előkészítése (Doc 9376) *című anyagban található. A szakszolgálati engedéllyel rendelkező repülés-üzemi tiszt / szolgálatvezető korára, képzettségére, tudására és gyakorlati jártasságára vonatkozó követelmények az 1. Annexben találhatók.*

1.1.6 Amennyiben a forgószárnyas légijármű vagy az utasok biztonságát fenyegető vészhelyzetről először a repülés-üzemi tiszt / szolgálatvezető szerez tudomást, akkor annak a személynek a 2.6.1 bekezdés szerinti tevékenysége, ahol az lehetséges, tartalmazza a kialakult helyzet természetéről a megfelelő hatóságok késedelem nélküli értesítését, és a segítségre vonatkozó kérést, amennyiben szükséges.

1.1.7 Amennyiben a forgószárnyas légijármű vagy az utasok biztonságát fenyegető vészhelyzet esetében olyan tevékenységre van szükség, amellyel megsértik a helyi előírásokat vagy eljárásokat, a légijármű parancsnoka erről késedelem nélkül értesítse az illetékes helyi hatóságot. Ha az állam, amelynek felségterületén az esemény bekövetkezik így rendelkezik, a légijármű parancsnoka bármely ilyen előírás megsértéséről nyújtson be jelentést az állam illetékes hatósága számára; ebben az esetben a parancsnok a jelentés másolatát nyújtsa be a járató állama számára is. Az ilyen jelentéseket a lehető legrövidebb időn, általában tíz napon belül nyújtsák be.

1.1.8 A járató biztosítsa, hogy a forgószárnyas légijármű fedélzetén a légijármű parancsnokának rendelkezésére álljon az átrepült területen működő kutató és mentő szolgálatokra vonatkozó összes alapvető tájékoztatás.

Megjegyzés: Ezt a tájékoztatást a légijármű-vezető számára az üzemeltetési kézikönyv vagy más hasonló, alkalmasnak tekintető tájékoztató anyag is tartalmazhatja.

1.1.9 A járató dolgozzon ki és vezessen be baleset megelőzési és repülésbiztonsági programot.

Megjegyzés: A baleset megelőzéssel kapcsolatos útmutató a Baleset Megelőzési Kézikönyv-*ben (Doc 9422) valamint az* Üzemeltetési Kézikönyv Elkészítése *(Doc 9376) című kiadványokban található.*

1.1.10 A járató az üzemeltető személyzet részére, felhasználás és útmutatás céljából dolgozzon ki egy repülésbiztonsági dokumentációs rendszert.

Megjegyzés: A repülésbiztonsági dokumentációs rendszer kidolgozására és elrendezésére vonatkozó útmutató a G. mellékletben található.

1.2 A biztonság irányítása

1.2.1 Az államok dolgozzanak ki egy biztonsági programot, hogy a légijárművek üzemeltetése során el lehessen érni az elfogadható szintű biztonságot.

1.2.2 Az elérendő, elfogadható szintű biztonságot az érintett állam(ok) teremtse (teremtsék) meg.

Megjegyzés: A biztonsági programra vonatkozó útmutató a Biztonság Irányítási Kézikönyv-*ben* (SMM) *(Doc 9859), míg az elfogadható szintű biztonság meghatározása a 11. Annex E. mellékletében található.*

1.2.3 ***Ajánlás*** *– az államok, mint a biztonsági programjuk részeként követeljék meg, hogy egy járató vezessen be a járató államának elfogadható biztonság irányítási rendszert, amely minimum:*

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható szintű biztonság kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és

d) törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

1.2.4 2009 január 01-től az államok, mint a biztonsági programjuk részeként követeljék meg, hogy egy járató vezessen be a járató államának elfogadható biztonság irányítási rendszert, amely minimum:

a) megnevezi a biztonsági veszélyeket;

b) biztosítja, hogy egy elfogadható szintű biztonság kialakításához szükséges megelőző intézkedések alkalmazásra kerülnek;

c) gondoskodik a folyamatos figyelésről és az elért biztonsági szint rendszeres felülvizsgálatáról; és

d) törekedik a teljeskörű biztonsági szint folyamatos tökéletesítésére.

1.2.5 A biztonság irányítási rendszer világosan határozza meg a biztonságért viselt felelősség függelmi viszonyait a járató teljes szervezetén belül, beleértve a felső vezetés biztonságért viselt közvetlen felelősségét.

Megjegyzés: A biztonság irányítási rendszerre vonatkozó útmutató a Biztonság Irányítási Kézikönyv*ben* (SMM) *(Doc 9859) található.*

1.2.6 A járató, biztonság irányítási rendszere részeként, az üzemeltető személyzet részére, felhasználás és útmutatás céljából dolgozzon ki egy repülésbiztonsági dokumentációs rendszert. Megjegyzés: A repülésbiztonsági dokumentációs rendszer kidolgozására és elrendelésére vonatkozó útmutató a G. mellékletben található.

1.3 Veszélyes áruk

1. Megjegyzés: A veszélyes áruk szállítására vonatkozó előírások a 18. Annex-ben találhatók.

2. Megjegyzés: Az Egyezmény 35. cikkelye bizonyos teheráru korlátozási osztályokra vonatkozik.

1.4 Szellemi tevékenységet befolyásoló anyagok használata

Megjegyzés: A szellemi tevékenységet befolyásoló anyagok használatára vonatkozó előírások az 1. Annex 1.2.7 és a 2. Annex 2.5 pontjaiban találhatók.

1.2 Veszélyes áruk

1. Megjegyzés: A veszélyes áruk szállítására vonatkozó előírások a 18. Annex-ben találhatók.

2. Megjegyzés: Az Egyezmény 35. cikkelye bizonyos teheráru korlátozási osztályokra vonatkozik.

1.3 Szellemi tevékenységet befolyásoló anyagok használata

Megjegyzés: A szellemi tevékenységet befolyásoló anyagok 1 használatára vonatkozó előírások az 1. Annex 1.2.7 és a 2. Annex 2.5 pontjaiban találhatók.

2. fejezet
Repülésvégrehajtás

2.1 Az üzemeltetés létesítményeinek alkalmassága

2.1.1 A járató biztosítsa, hogy a repülés végrehajtása ne kezdődjön meg az előtt, hogy minden rendelkezésre álló lehetséges és ésszerű eszközzel meggyőződtek arról, hogy azok a rendelkezésre álló földi és/vagy vízfelszíni létesítmények, amelyek a forgószárnyas légijármű biztonságos üzemeltetése valamint az utasok védelme érdekében közvetlenül szükségesek, megfelelnek annak az üzemeltetési típusnak, amelyben a repülést végre fogják hajtani, továbbá azokat a fenti célnak megfelelő módon üzemeltetik.

Megjegyzés: A jelen előírásban alkalmazott „lehetséges és ésszerű eszköz" kifejezés a járató részére az indulási helyen rendelkezésre álló tájékoztatások felhasználását jelenti, amelyek a légiforgalmi tájékoztató szolgálatok által kiadott hivatalos közleményekből vagy más forrásokból származnak.

2.1.2 A járató biztosítsa, hogy az üzemeltetés során tapasztalt bármilyen működési rendellenességet indokolatlan késedelem nélkül jelentsék be a létesítmény üzemeltetéséért felelős hatóságnak.

2.1.3 A helikopter repülőtereket és azok létesítményeit a kiadott igénybevételi feltételek alapján, az időjárási viszonyoktól függetlenül, a közzétett üzemidőben folyamatosan bocsássák a repülési üzem rendelkezésére.

2.2 Üzemeltetési engedélyek és ellenőrzés

2.2.1 Légijármű üzembentartási engedély

2.2.1.1 A járató kereskedelmi légiszállítási tevékenységet csak akkor végezhet, ha érvényes légijármű üzembentartási engedély van a birtokában, amelyet a járató állama bocsátott ki.

2.2.1.2 A légijármű üzembentartási engedély a meghatározott feltételek és korlátozások betartása mellett feljogosítja a járatót a kereskedelmi légiszállítási tevékenység végzésére.

Megjegyzés – a légijármű üzembentartási engedélyre vonatkozó útmutatót és a kapcsolódó felhatalmazásokat, feltételeket és korlátozásokat, melyeket az üzemeltetői specifikáció tartalmazhat, az Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve (Doc 8335) tartalmazza.

2.2.1.3 A szerződő államok egy másik szerződő állam által kiadott légijármű üzembentartási engedélyt érvényesnek fogadhatnak el, feltételezve azt, hogy az engedély kiadásául szolgáló követelmények legalább azonosak a jelen Annexben meghatározott vonatkozó előírásokkal.

2.2.1.4 A légijármű üzembentartási engedély kibocsátása a járató állama részéről annak függvénye, hogy a járató a meghatározott üzemeltetés természetétől és nagyságrendjétől függően és figyelembevételével bizonyságot tesz a repülési tevékenység megfelelő szervezéséről, ellenőrzési módszereiről és átfogó irányításáról valamint a kiképzési és karbantartási programjairól.

Megjegyzés: A légijármű üzembentartási engedély kiadásával kapcsolatos tájékoztatás a 6. Annex I. rész F. Függelékben található.

2.2.1.5 A légijármű üzembentartási engedély vagy más ezzel egyenértékű dokumentum folyamatos érvényessége attól függ, hogy a járató a járató államának ellenőrzése alatt eleget tesz a 2.2.1.4 pont előírásának.

2.2.1.6 A légijármű üzembentartási engedély vagy más ezzel egyenértékű dokumentum legalább a következőket tartalmazza:

a) a járató megnevezése (cégnév vagy azonosító, székhelye);

b) a kiadás időpontja és az érvényesség időtartama;

c) az engedélyezett tevékenység típusok ismertetése;

d) a használatra engedélyezett légijármű típus(ok); és

e) üzemeltetésre engedélyezett területek vagy repülési útvonalak.

2.2.1.7 A járató állama az 2. Függelékkel öszhangban, dolgozzon ki és alkalmazzon járató üzemeltetés engedélyezési és folyamatos minőség ellenőrzési rendszert mellyel biztosítja a 2.2 pontban található, a légijármű üzemeltetés színvonalára vonatkozó előírások betartását.

2.2.2 Üzemeltetési kézikönyv

2.2.2.1 A járató a Függelék előírásaival összhangban, az érintett üzemeltető személyzet részére felhasználásra valamint tájékoztatásra biztosítson üzemeltetési kézikönyvet, amelyet szükség szerint módosítsanak és egészítsenek ki, hogy az mindig napra-kész legyen. Minden ilyen kiegészítést és módosítást adjanak ki a kézikönyv használatára kötelezett összes személynek.

2.2.2.2 A járató állama írja elő, hogy az üzemeltetési kézikönyv egy példányát és az összes kiegészítést és/vagy módosítást ellenőrzésre, felülvizsgálatra, valamint amikor szükséges jóváhagyásra adja át a járató államának. A járató az üzemeltetési kézikönyvbe vegye fel azokat a további kötelező anyagokat, amelyeket a járató állama erre előírhat.

1. Megjegyzés: Az üzemeltetési kézikönyv tartalmára vonatkozó előírásokat az 1. Függelék tartalmazza.

2. Megjegyzés: Az üzemeltetési kézikönyvben szereplő egyes meghatározott tételekhez a II. szakasz 2.2.7, 4.1.3, 7.3.1 és 10.3 pontok előírásai alapján a járató államának jóváhagyása szükséges.

2.2.3 Üzemeltetési utasítások – Általános rész

2.2.3.1 A járató biztosítsa, hogy az üzemeltetésben résztvevő valamennyi dolgozója saját feladatairól, felelősségéről valamint a feladatainak a járató egész tevékenységében elfoglalt helyéről megfelelő oktatásban részesüljön.

2.2.3.2 A forgószárnyas légijármű forgószárnyát hajtómű segítségével csak akkor szabad megforgatni, ha a kormányoknál szakszolgálati engedéllyel rendelkező légijármű-vezető foglal helyet.

2.2.3.3 ***Ajánlás** – A járató adjon ki üzemeltetési utasításokat és biztosítson tájékoztatásokat a forgószárnyas légijármű összes működő hajtóművel történő emelkedési képességéről, hogy ezzel a légijármű parancsnoka a meglevő felszállási körülmények és a tervezett felszállási módszer (repülés-technika) alapján meghatározhassa a felszállási és kezdeti emelkedési szakaszban elérhető emelkedés mértékét. Ezt a tájékoztatást vegyék fel az üzemeltetési kézikönyvbe.*

2.2.4 Vészhelyzet repülés közben történő gyakorlása

A járató biztosítsa, hogy amikor utasokat vagy teherárut szállítanak, a repülés közben vészhelyzeti vagy a rendes üzemeléstől eltérő gyakorlást illetve szimulációt ne végezzenek.

2.2.5 Ellenőrző jegyzékek

A hajózószemélyzet a forgószárnyas légijármű üzemeltetésének minden szakasza előtt, alatt és után továbbá vészhelyzetben alkalmazza a 4.1.4 pont előírása alapján elkészített és kiadott ellenőrző jegyzékeket annak biztosítására, hogy végrehajtották a légijármű üzemeltetési kézikönyvében, repülés-végrehajtási kézikönyvében vagy más, a légialkalmassági bizonyítvánnyal kapcsolatos egyéb dokumentumban valamint üzemeltetési tájékoztató kiadványokban található üzemeltetési eljárásokat. Az ellenőrző jegyzékek összeállítása és felhasználása alkalmával vegyék figyelembe az emberi tényezők alapelveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv*-ében (Doc 9683) található.*

2.2.6 Legalacsonyabb repülési magasságok

2.2.6.1 Az járató jogosult arra, hogy kijelölje a legalacsonyabb repülési magasságokat azokon a repülési útvonalakon, amelyekre az átrepült útvonal állama vagy az útvonalért felelős állam is kijelölt ilyen magasságokat, feltéve, hogy ezek nem alacsonyabbak, mint amelyeket az állam határozott meg. A fentieknél alacsonyabb magasság esetében külön eseti jóváhagyás szükséges.

2.2.6.2 A járató határozza meg és az üzemeltetési kézikönyvben tegye közzé azt a módszert, amely szerint meghatározni kívánja a legalacsonyabb repülési magasságokat azokra a repülési útvonalakra, amelyekre az átrepült útvonal állama vagy az útvonalért felelős állam nem jelölt ki ilyen magasságokat. A fenti módszer alapján megállapított legalacsonyabb repülési magasságok ne legyenek alacsonyabbak, mint a 2. Annex-ben meghatározott értékek.

2.2.6.3 ***Ajánlás** – A legalacsonyabb repülési magasságok meghatározásának módszerét a járató állama hagyja jóvá.*

2.2.6.4 ***Ajánlás** – A járató állama ezeket a legalacsonyabb repülési magasságokat kellő megfontolás után, a következő tényezők az üzemeltetés biztonságát valószínűleg befolyásoló hatásainak figyelembevételével hagyja jóvá:*

a) a pontosság és megbízhatóság, amellyel a forgószárnyas légijármű helyzete meghatározható;

b) a felhasznált magasságmérő berendezések jelzéseinek pontatlansága;

c) a földfelszín jellemzői (például a tengerszint feletti magasság hirtelen megváltozásai);

d) kedvezőtlen időjárási körülmények előfordulásainak valószínűsége (például erős turbulencia és leszálló légáramlatok);

e) a léginavigációs térképek lehetséges pontatlanságai; és

f) légtér korlátozások.

2.2.7 Helikopter repülőtér üzemeltetési minimum

2.2.7.1 A járató állama írja elő, hogy a járató határozzon meg helikopter repülőtér üzemeltetési minimumot minden olyan egyes helikopter repülőtérre, amelyet használni kíván, és a minimum meghatározásának módszerét a járató állama hagyja jóvá. Az ilyen minimum ne legyen alacsonyabb, mint amelyet a helikopter repülőtérre azon állam ír elő, amelyben a helikopter repülőtér elhelyezkedik, kivéve ha erre az érintett állam külön engedélyt ad.

Megjegyzés: Ez az előírás nem követeli meg attól az államtól, amelyben a helikopter repülőtér elhelyezkedik, hogy helikopter repülőtér üzemeltetési minimumot határozzon meg.

2.2.7.2 A járató állama írja elő, hogy a bármely üzemeltetési módra vonatkozó helikopter repülőtér üzemeltetési minimum meghatározásánál a következőket teljes mértékben vegyék figyelembe:

a) a forgószárnyas légijármű típusa, teljesítménye és kiszolgálási jellemzői;

b) a hajózószemélyzet összetétele, szakmai alkalmassága és tapasztalata;

c) a meghatározott és közzétett távolságok;

d) a rendelkezésre álló látás utáni és nem-látás utáni földi segédeszközök pontossága és jellemzői;

e) a forgószárnyas légijárművön a navigációhoz és/vagy a leszálláshoz történő megközelítés és a megszakított megközelítés repülési pályájának irányításához rendelkezésre álló berendezések;

f) a megközelítési és a megszakított megközelítési területeken elhelyezkedő akadályok, valamint a műszeres megközelítési eljárásokhoz meghatározott akadálymentes tengerszint és földfelszín feletti magasságok;

g) az időjárási körülmények felderítésére, meghatározására és jelentésére alkalmazott módszerek; és

h) a kezdeti emelkedési területeken levő akadályok és a szükséges biztonsági elkülönítés értékei.

2.2.7.3 II. és III. kategóriás műszeres megközelítést és leszállást csak akkor engedélyezzenek, ha futópályamenti látástávolság érték (RVR) tájékoztatás áll rendelkezésre.

2.2.7.4 Ajánlás – A műszeres megközelítés és leszállás végrehajtására 800 méter látástávolság alatti helikopter repülőtéri üzemeltetési minimumot csak akkor engedélyezzenek, ha futópályamenti látástávolság érték (RVR) tájékoztatás, vagy pontosan mért illetve észlelt látástávolság érték áll rendelkezésre.

2.2.8 Tüzelőanyag és olaj nyilvántartás

2.2.8.1 A járató vezessen tüzelőanyag és olaj nyilvántartást annak érdekében, hogy a járató állama számára bizonyíthassa, hogy minden egyes repülés esetében eleget tettek a 2.3.6 pont előírásainak.

2.2.8.2 A tüzelőanyag és olaj nyilvántartást a járató három hónapig őrizze meg.

2.2.9 Személyzet

2.2.9.1 *Légijármű parancsnok* – A járató minden egyes járatra jelöljön ki egy légijármű-vezetőt, aki a parancsnoki feladatokat látja el.

2.2.9.2 *Repülési idő, repülési szolgálati időtartam és pihenőidő* – A járató dolgozzon ki szabályokat és előírásokat a repülési idő és a repülési szolgálati időtartam korlátozására, továbbá a megfelelő pihenőidő biztosítására a személyzet minden tagja számára. Ezeket a szabályokat a járató állama által meghatározott, vagy jóváhagyott előírásokkal összhangban dolgozzák ki és vegyék fel az üzemeltetési kézikönyvbe.

2.2.9.3 A járató rendszeresen tartsa nyilván a személyzet minden tagjának repülési idejét, repülési szolgálati, valamint pihenő idejét is.

Megjegyzés: A korlátozások kidolgozásával kapcsolatos útmutató a C. Mellékletben található.

2.2.10 Utasok

2.2.10.1 A járató biztosítsa, hogy az utasokkal megismertessék a következő eszközök elhelyezkedését és használatát:

a) biztonsági övek;

b) vészkijáratok;

c) mentőmellények, amennyiben ezek szállítását előírták;

d) oxigén légzőkészülék, amennyiben az utasok részére az oxigén szállítását előírták; és

e) más, egyéni használatra rendszeresített mentőfelszerelések, beleértve az utastájékoztató kiadványokat is.

2.2.10.2 A járató tájékoztassa az utasokat a közös használatra rendszeresített alapvető mentőfelszerelések elhelyezkedéséről és általános használatáról.

2.2.10.3 A repülés során bekövetkező vészhelyzetekben az utasokat a körülményeknek megfelelő vészhelyzeti tevékenységre utasítsák.

2.2.10.4 A járató biztosítsa, hogy a fel és leszállás során valamint bármikor, amikor a repülés alkalmával turbulencia, vagy bármely vészhelyzet következik be és ezt az óvintézkedést szükségesnek ítélik, a forgószárnyas légijármű fedélzetén tartózkodó valamennyi utas a rendelkezésre álló biztonsági övvel, vagy hevederrel az ülésbe legyen kötve.

2.2.11 Vízfelszín feletti repülések

A 4.5.1 pont előírásai alapján a vízfelület felett repülést végrehajtó összes forgószárnyas légijármű jogosítva legyen a vízfelszínre történő kényszerleszállásra, azaz vízreszállásra. A vonatkozó tájékoztatás szerves részét képezze a vízfelszín (tenger) jellemzőinek ismertetése.

2.3 Repülés előkészítés

2.3.1 A repülési feladat végrehajtását ne kezdjék meg mindaddig, amíg nem töltötték ki a repülés előkészítési nyomtatványokat annak bizonyítására, hogy a légijármű parancsnoka meggyőződött az alábbiakról:

a) a forgószárnyas légijármű repülésre alkalmas;

b) a 4. fejezetben az adott repülési feladat végrehajtására előírt műszerek és berendezések felszerelésre kerültek, megfelelőek és üzemképesek;

c) a forgószárnyas légijármű karbantartási kibocsátó jegyzőkönyvét a 6.7 pontban előírtak szerint kiállították;

d) a forgószárnyas légijármű tömege, valamint súlypont-helyzete a várható repülési körülmények figyelembevételével olyan, hogy a repülési feladat biztonságosan végrehajtható;

e) bármely szállítmányt megfelelő módon elhelyeztek és biztonságosan rögzítettek;

f) ellenőrízték, hogy a 3. fejezetben található üzemeltetési korlátozások az adott repülés vonatkozásában betarthatók; és

g) eleget tettek a 2.3.3 szakaszban található üzemeltetési repülés tervezési előírásoknak.

2.3.2 A kitöltött repülés előkészítési nyomtatványokat a járató három hónapig őrízze meg.

2.3.3 Üzemeltetési repülés tervezés

2.3.3.1 Minden tervezett repüléshez készítsenek üzemeltetési repülési tervet. Az üzemeltetési repülési tervet a légijármű parancsnoka, továbbá ahol ilyen van, a repülés-üzemi tiszt, vagy szolgálatvezető fogadja el és írja alá. A terv egy példányát továbbítsák a járatónak, vagy kijelölt képviselőjének, illetve ha ennek végrehajtása nem lehetséges, az üzemeltetési repülési tervet hagyják az indulási hely helikopter repülőtéri hatóságnál, vagy más alkalmas helyen.

Megjegyzés: A repülés-üzemi tiszt/szolgálatvezető feladatait a 2.6 pont tartalmazza.

2.3.3.2 Az üzemeltetési kézikönyvben ismertetni kell az üzemeltetési repülési terv tartalmát és használatát.

2.3.4 Kitérő helikopter repülőterek

2.3.4.1 A műszerrepülési szabályok szerint tervezett repülés esetében az üzemeltetési valamint a légiforgalmi szolgálatoknak benyújtott repülési tervekben határozzanak meg legalább egy alkalmas kitérő helikopter repülőteret vagy leszállási helyet, kivéve ha:

a) a repülés időtartama és az uralkodó időjárási körülmények olyanok, hogy nagy valószínűséggel feltételezhető, hogy a tervezett leszállási helikopter repülőtéren az érkezés számított időpontjában valamint ezt megelőzően és ezt követően ésszerű idő-határokon belül a megközelítés és a leszállás a jártató állama előírása alapján látás utáni időjárási körülmények között végrehajtható lesz; vagy

b) a tervezett leszállási helikopter repülőtér elszigetelt fekvésű és alkalmas kitérő nem áll rendelkezésre. Határozzák meg azt a pontot (PNR), amelyen túl a visszafordulás már nem lehetséges.

2.3.4.2 Az alkalmas parttól, azaz szárazföldtől távoli vízfelszíni kitérő helikopter repülőtereket vagy leszállási helyeket a következők alapján határozhatják meg:

a) a vízfelszíni (parttól távoli) kitérőket csak azon pont átrepülése után használják, amely után a visszafordulás nem lehetséges (PNR). Ezen pont előtt a szárazföldi kitérőket vegyék igénybe;

b) a kitérő meghatározásánál vizsgálják meg és vegyék figyelembe a kritikus repülésvezérlő rendszerek valamint egyéb lényeges részegységek (mechanikai) műszaki megbízhatóságát;

c) a kitérőre történő érkezés előtt határozzák meg és vegyék figyelembe a forgószárnyas légijármű egy működésképtelen hajtóművel történő üzemi teljesítményét;

d) a leszállási hely biztosan rendelkezésre áll;

e) az időjárási tájékoztatások minden körülmények között pontosak és megbízhatóak legyenek.

Megjegyzés: A repülésvégrehajtási kézikönyvben a repülésvezérlő rendszerek meghibásodása esetére meghatározott leszállási módszerek kizárhatják egyes leszállási helyek kitérőként történő igénybevételét.

2.3.4.3 ***Ajánlás*** *– Amennyiben a szárazföldi kitérő helikopter repülőtér vagy leszállási hely eléréséhez szükséges tüzelőanyag mennyiség szállítása lehetséges, vízfelszíni (parttól távoli) kitérőket ne vegyenek igénybe. Az ilyen körülmények csak kivételesen alkalmazandók és a kedvezőtlen időjárási körülmények közötti terhelés növelés nem tartozik ezek közé.*

2.3.5 Időjárási körülmények

2.3.5.1 A látvarepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha az érvényes időjárás-jelentések és/vagy előre.

2.3.5.2 A műszerrepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha a rendelkezésre álló tájékoztatások szerint az érkezés várható időpontjában a tervezett leszállási helikopter repülőtéren vagy ahol kitérő meghatározása is szükséges, legalább egy ilyen helikopter repülőtéren az uralkodó (időjárási) körülmények helikopter repülőtér üzemeltetési minimumnak megfelelőek vagy annál jobbak lesznek.

Megjegyzés: Néhány állam gyakorlata szerint a repülés tervezési célokra magasabb minimumokat jelölnek meg arra az esetre, ha a helikopter repülőteret kitérőként választják szemben azzal, ha a helikopter repülőtér a tervezett leszállás helye.

2.3.5.3 Ismert vagy várható jegesedés körülményei között a repülést ne kezdjék meg, csak akkor, ha a forgószárnyas légijármű ilyen körülmények közötti üzemelésre van jogosítva és felszerelve.

2.3.5.4 Ismert vagy várható földi jegesedés körülményei között történő üzemelésre tervezett repülés ne szálljon fel mindaddig, amíg a forgószárnyas légijárművet jegesedés szempontjából nem vizsgálták felül és nem végezték el a megfelelő jégtelenítést vagy jégmentesítést. A jeget vagy más természetes szennyező anyagot úgy távolítsák el a forgószárnyas légijárműről, hogy az még közvetlenül a felszállás előtt is repülésre alkalmas állapotban legyen.

Megjegyzés: A fentiekre vonatkozó tájékoztatót a Légijármű földi jégtelenítés végrehajtása kézikönyv

(Doc 9640) tartalmazza.

2.3.6 Tüzelőanyag (üzemanyag) és olajkészlet

2.3.6.1 *Minden forgószárnyas légijármű esetében* — A repülés végrehajtását ne kezdjék meg csak akkor, ha az időjárási körülmények valamint a repülés során várható bármely késés figyelembevételével a forgószárnyas légijármű elegendő tüzelőanyagot és olajt szállít ahhoz, hogy a repülést biztonságosan be tudja fejezni. Ezen kívül az előre nem látható eseményekre való tekintettel szállítsanak tüzelőanyag és olaj tartalékot is.

2.3.6.2 *Látvarepülési szabályok szerinti (VFR) üzemeltetés* — A 2.3.6.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a látvarepülési szabályok szerint történő üzemeltetés esetében legalább annyi legyen, ami lehetővé teszi, hogy a forgószárnyas légijármű:

a) elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték;

b) ezt követően a legoptimálisabb utazósebességgel 20 percig valamint a tervezett repülési idő további 10 %-áig repüljön; és

c) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi a árató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.3.6.3 *Műszerrepülési szabályok szerinti (IFR) üzemeltetés* — A 2.3.6.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a műszerrepülési szabályok szerint történő üzemeltetés esetében legalább annyi legyen, ami lehetővé teszi, hogy a forgószárnyas légijármű:

2.3.6.3.1 Ha a 2.3.4.1 a) előírása alapján kitérő kijelölése nem szükséges, elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték és ezt követően;

a) a célállomás helikopter repülőtér felett 450 méter (1500 láb) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön valamint megközelítést és leszállást hajtson végre; és

b) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi a járató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.3.6.3.2 Ha kitérő kijelölése szükséges, elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték, ott megközelítést és egy megszakított megközelítést hajtson végre majd ezt követően;

a) elrepüljön a repülési tervben meghatározott kitérő helikopter repülőtérre vagy leszállási helyre; és ott

b) a kitérő felett 450 méter (1500 láb) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön valamint megközelítést és leszállást hajtson végre; és

c) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi a járató által meghatározott és a járató állama által jóváhagyott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.3.6.3.3 Ha a 2.3.4.1 b) előírása alapján alkalmas kitérő nem áll rendelkezésre, elrepüljön a tervezett célállomás helikopter repülőtérre és ezt követően a várakozáshoz meghatározott sebességgel további két órát repüljön.

2.3.6.4 A 2.3.6.1 pontban előírt szükséges tüzelőanyag és olaj készlet mennyiségének kiszámításánál a legalább következő tényezőket vegyék figyelembe:

a) előrejelzett időjárási körülmények;

b) várható légiforgalmi irányítói engedélyek és útvonalak valamint forgalmi késések;

c) a műszerrepülési szabályok (IFR) szerint végrehajtott repülés esetében egy műszeres megközelítés végrehajtása a célállomás helikopter repülőtéren, beleértve egy megszakított megközelítést is;

d) az üzemeltetési kézikönyvben a repülés végrehajtása alatt bekövetkező egy hajtómű meghibásodása valamint — amennyiben alkalmazható — a túlnyomásos kabin dehermetizálódás esetére előírt eljárások; és

e) minden egyéb olyan körülmény, amely a forgószárnyas légijármű leszállását késleltetheti vagy a tüzelőanyag és/vagy olajfogyasztást növelheti.

Megjegyzés: A 2.3.6 pontban ismertetett tényezők nem korlátozzák a repülési terv repülés közben történő módosításának lehetőségét és a repülés áttervezését egy másik helikopter repülőtérre, feltéve hogy a 2.3.6 pont előírásai teljesíthetők attól a ponttól kezdődően is, ahol a repülés áttervezése megtörtént.

2.3.7 Tüzelőanyag-feltöltés utasokkal a fedélzeten, vagy a forgószárny mozgatása közben

Ajánlás *— A forgószárnyas légijárművön ne végezzenek tüzelőanyag feltöltést akkor, amikor az utasok beszállnak, kiszállnak vagy a forgószárnyas légijármű fedélzetén tartózkodnak illetve ha a forgószárny mozgásban van, kivéve ha a járató a járató állama részéről megfelelő egyedi engedéllyel rendelkezik, amelyben meghatározzák azokat a feltételeket, amelyek betartásával a tüzelőanyag feltöltés ilyen esetekben is elvégezhető.*

1. Megjegyzés: A légijármű tüzelőanyag feltöltésére vonatkozó előírások a 14. Annex I. Kötetében, a biztonságos tüzelőanyag feltöltési módszerekkel kapcsolatos útmutató pedig a Repülőtér Szolgálati Kézikönyv (Doc 9137) 1. illetve 8. Részeiben található.

2. Megjegyzés: Amikor a forgószárnyas légijármű tüzelőanyaggal történő feltöltését nem kerozinnal végzik, a feltöltés alkalmával a kerozin más gázturbina hajtóanyagokkal keveredik, vagy nyílt töltővezetéket alkalmaznak, további elővigyázatossági rendszabályokra van szükség.

2.3.8 Oxigén készlet

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, a nemzetközi műlégkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	magasság — méter	magasság — láb
700 hPa	3000	10 000
620 hPa	4000	13 000
376 hPa	7600	25 000

2.3.8.1 Olyan repülési magasságon végrehajtandó repülés esetén, amelyen a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb lesz, a repülést ne kezdjék meg csak akkor, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely ellátja:

a) a személyzet minden tagját valamint az utasok 10 %-át 30 percet meghaladó bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa és 620 hPa érték között van; és

b) a személyzet tagjait valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 620 hPa értéknél alacsonyabb.

2.3.8.2 A túlnyomásos kabinnal rendelkező forgószárnyas légijármű esetében a repülés végrehajtását ne kezdjék meg csak akkor, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely a túlnyomás megszűnése esetén, a repülés körülményeinek megfelelően ellátja a személyzet összes tagját valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa értéknél alacsonyabb. Ezen kívül, ha a forgószárnyas légijárművet olyan repülési magasságon üzemeltetik, amelyen az atmoszférikus légnyomás értéke 376 hPa-nál alacsonyabb és a forgószárnyas légijárművel négy percen belül nem lehet biztonságosan olyan magasságra süllyedni, amelyen az atmoszférikus légnyomás értéke 620 hPa-nak felel meg, az utaskabinban tartózkodó személyek részére legalább tíz percre elegendő oxigén készletet biztosítsanak.

2.4 Repülés végrehajtási eljárások – repülés közben

2.4.1 Helikopter repülőtér üzemeltetési minimum

2.4.1.1 A repülést ne folytassák a tervezett leszállási helikopter repülőtér felé csak abban az esetben, ha a rendelkezésre álló legújabb tájékoztatások azt jelzik, hogy az érkezés várható időpontjában az adott vagy legalább egy kitérő helikopter repülőtéren a leszállás a 2.2.7.1 pont előírásai szerint meghatározott üzemeltetési minimum mellett végrehajtható.

2.4.1.2 A műszeres megközelítést precíziós megközelítés esetében ne folytassák a külső jeladó (OM) navigációs ponton túl vagy nem precíziós megközelítés esetében a helikopter repülőtér feletti 300 méter (1000 láb) magasság alatt kivéve, ha a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték (RVR) a megállapított minimum felett van.

2.4.1.3 Amennyiben precíziós megközelítés esetében a külső jeladó (OM) navigációs pont átrepülése után vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alá történő süllyedésnél a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték a megállapított minimum alá csökken, a megközelítés az elhatározási vagy a legalacsonyabb süllyedési magasságig folytatható. A forgószárnyas légijármű semmi esetre se folytassa a leszálláshoz történő megközelítését bármely helikopter repülőtérre azon a meghatározott ponton túl, amely után az arra megállapított helikopter repülőtér üzemeltetési minimum értéket megsértené.

2.4.2 Időjárási megfigyelések

Megjegyzés: A repülés végrehajtása során a forgószárnyas légijármű fedélzetén történő időjárás megfigyelés, észlelés, feljegyzés valamint jelentés eljárásait a 3. Annex, a PANS-ATM (Doc 4444) és a megfelelő Körzeti Kiegészítő Eljárások (Doc 7030) tartalmazzák.

2.4.3 Repülésre veszélyes körülmények

A repülésre veszélyes, az időjárási viszonyokkal kapcsolatostól eltérő, a repülés végrehajtása során tapasztalt egyéb körülményeket a lehető legrövidebb időn belül jelentsék az illetékes légiforgalmi állomásnak. A jelentések tartalmazzák a más légijárművek biztonságával kapcsolatos vagy kapcsolatba hozható részleteket is.

2.4.4 A hajózószemélyzet tagjai szolgálati helyeiken

2.4.4.1 *Fel és leszállás* — A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén.

2.4.4.2 *Útvonalon* — A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén, kivéve, ha távolléte a forgószárnyas légijármű üzemeltetésével kapcsolatos feladatok elvégzése vagy fiziológiai okok miatt szükséges.

2.4.4.3 *Biztonsági övek* — A hajózószemélyzet valamennyi tagja szolgálati helyén tartsa biztonsági övét becsatolva.

2.4.4.4 *Vállhevederekkel ellátott biztonsági övek* — A fel és leszállási szakaszokban a hajózószemélyzet valamennyi légijármű-vezetői ülést elfoglaló tagja vállhevederrel ellátott biztonsági övét tartsa becsatolva; a hajózószemélyzet többi tagja a fel és leszállási szakaszokban vállhevederrel ellátott biztonsági övét tartsa becsatolva, kivéve, ha a vállhevederek akadályozzák őket feladataik végrehajtásában, amely esetben a vállhevedereket kikapcsolhatják, azonban a biztonsági öveket bekapcsolva kell tartaniuk.

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

2.4.5 Oxigén használat

A forgószárnyas légijármű repülése alatt, annak biztonságos üzemeltetéséhez nélkülözhetetlen feladatokat ellátó összes hajózószemélyzeti tagja folyamatosan használja az oxigén légzőkészüléket, amikor ezt az uralkodó körülmények a 2.3.8.1 vagy 2.3.8.2 pontok előírásai alapján szükségessé teszik.

2.4.6 A túlnyomásos kabinnal felszerelt forgószárnyas légijármű utaskabin személyzetének és utasainak védelme dehermetizáció – a túlnyomás megszűnése - esetén

***Ajánlás** — Az utaskabin személyzeti tagok biztonságát úgy védelmezzék, hogy azok az esetleges túlnyomás megszűnése esetében szükségessé váló vészsüllyedés alkalmával eszméletüket nagy valószínűséggel ne veszítsék el továbbá képesek maradjanak arra, hogy a vészhelyzetet követő stabilizált repülés folyamán az utasokat elsősegélyben részesítsék. Az utasok biztonságát olyan eszközökkel, berendezésekkel vagy üzemeltetési eljárásokkal védelmezzék, amelyek nagy valószínűséggel biztosítják, hogy a túlnyomás megszűnése miatt fellépő oxigénhiány hatásait túlélik.*

Megjegyzés: Nem lehet előre meghatározni vagy feltételezni, hogy az utaskabin személyzet a túlnyomás megszűnése esetén szükségessé váló vészsüllyedés alkalmával mindig képes lesz segítséget nyújtani az utasoknak.

2.4.7 Repülés végrehajtása során alkalmazandó üzemeltetési utasítások

A légiforgalmi szolgálati egységeknek benyújtott repülési terv megváltoztatását magába foglaló járatói üzemeltetési utasításokat, ha lehetséges még a forgószárnyas légijárműnek történő továbbítás előtt egyeztessék az illetékes légiforgalmi szolgálati egységgel.

Megjegyzés: Amennyiben a fent jelzett egyeztetés nem lehetséges, a kapott üzemeltetési utasítás nem mentesíti a légijármű-vezetőt az illetékes légiforgalmi szolgálati egység megfelelő engedélyének beszerzésével kapcsolatos felelőssége alól a repülési terv megváltoztatása előtt.

2.4.8 Műszerrepülési eljárások

2.4.8.1 Az az állam, amelynek területén a helikopter repülőtér elhelyezkedik, vagy ha egy állam területén kívül levő helikopter repülőtérről van szó, az az állam, amely a létesítményért felelős, a műszerrepülési szabályok szerint igénybe vett minden egyes végső megközelítési és felszállási területre vagy helikopter repülőtérre hagyjon jóvá és tegyen közzé egy vagy több műszeres megközelítési eljárást.

2.4.8.2 A műszerrepülési szabályok szerint üzemelő összes forgószárnyas légijármű hajtsa végre azokat a műszeres megközelítési eljárásokat, amelyeket az az állam hagyott jóvá, amelynek területén a helikopter repülőtér elhelyezkedik vagy ha egy állam területén kívül levő helikopter repülőtérről van szó az, amely a létesítményért felelős.

1. Megjegyzés: A műszerrepülési eljárásokban érintett személyek részére ajánlott üzemeltetési eljárások a PANS OPS (Doc 8168) I. kötetében találhatók.

2. Megjegyzés: A műszerrepülési eljárások követelményeire vonatkozó útmutatás az eljárások kidolgozásában résztvevő szakértők részére a PANS-OPS (Doc 8168) II. kötetében található.

2.4.9 Forgószárnyas légijármű zajcsökkentő eljárások

***Ajánlás** — A járató által kidolgozott zajcsökkentési eljárás bármely adott forgószárnyas légijármű típus vonatkozásában minden helikopter repülőtérre azonos legyen.*

2.5 A légijármű parancsnok kötelmei

2.5.1 A légijármű parancsnoka felelős a forgószárnyas légijármű fedélzeten tartózkodó összes személyzeti tag, utas és az elhelyezett teheráru biztonságáért. A parancsnok felelős továbbá a forgószárnyas légijármű üzemeltetéséért és biztonságáért attól a pillanattól kezdve, amikor a hajtóműve(ke)t beindítják addig, mikor a forgószárnyas légijármű a repülés után végleg megáll, a hajtómű egysége(ke)t leállítják és a forgószárny megáll.

2.5.2 A légijármű parancsnoka biztosítsa, hogy pontosan és részletesen betartsák a repülési ellenőrző jegyzékekre vonatkozó, a 2.2.5 pontban ismertetett előírást.

2.5.3 A légijármű parancsnoka felelős a legközelebbi illetékes hatóság lehető leggyorsabb értesítéséért a forgószárnyas légijárművet érintő bármely olyan balesetről, amelynek következménye bármely személy súlyos vagy halálos sérülése illetve a forgószárnyas légijármű vagy más anyagi javak jelentős károsodása.

Megjegyzés: A "súlyos sérülés" kifejezés meghatározása a 13. Annex-ben található

.

2.5.4 A légijármű parancsnoka felelős a forgószárnyas légijárművön tapasztalt vagy feltételezett meghibásodások jelentéséért a repülés befejezését követően a járató felé.

2.5.5 A légijármű parancsnoka felelős a 9.4.1 pontban ismertetett tájékoztatásokat tartalmazó útinaplóért vagy általános nyilatkozatért.

Megjegyzés: A Közgyűlés 1956. június-július hónapjaiban, Caracasban tartott tizedik ülésszakán elfogadott A10-36 számú határozata értelmében a 9. Annex-ben ismertetett "Általános Nyilatkozat" (General Declaration) – amennyiben tartalmazza az Egyezmény 34. cikkelyében előírt tájékoztatásokat – a szerződő államok részéről az "Útinapló" (Journey Log Book) megfelelő változataként fogadható el.

2.6 A repülés-üzemi tiszt, vagy szolgálatvezető kötelmei

2.6.1 A repülés-üzemi tiszt/szolgálatvezető – ha a 2.2.1.4 pont előírásainak megfelelően repülés-felügyeleti feladatok ellátásával van megbízva – hajtsa végre a következőket:

a) segítse a légijármű parancsnokát a repülés előkészítésében és adjon meg számára minden szükséges tájékoztatást;
b) segítse a légijármű parancsnokát az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési tervek elkészítésében, amennyiben erre szükség van, írja alá a dokumentumokat és nyújtsa be a megfelelő repülési tervet az illetékes légiforgalmi szolgálati egységnek; és
c) a rendelkezésre álló eszközök segítségével a repülés közben adja meg a légijármű parancsnokának azokat a tájékoztatásokat, amelyek szükségesek lehetnek a repülés biztonságos végrehajtásához.

2.6.2 Vészhelyzet esetén a repülés-üzemi tiszt/szolgálatvezető:
a) kezdeményezze az üzemeltetési kézikönyvben található eljárásokat, mialatt kerüljön el minden olyan ténykedést, amellyel ellentétbe kerülne a légiforgalmi irányítás eljárásaival; és
b) továbbítsa a légijármű parancsnoka felé a repülés biztonságos végrehajtásához szükséges biztonsággal kapcsolatos információkat, beleértve a repülési terv összes módosításával kapcsolatos információkat is, melyek a repülés végrehajtása során váltak szükségessé.

Megjegyzés – azonos módon fontos, hogy repülés végrehajtása során a légijármű parancsnoka szintén továbbítson hasonló információkat a repülés-üzemi tiszt/szolgálatvezető felé, különösen a veszélyhelyzettel összefüggőket.

2.7 Kézipoggyász

A járató biztosítsa, hogy a forgószárnyas légijárműre felvitt és az utas-kabinban elhelyezett összes poggyászt megfelelő módon és biztonságosan tárolják (szállítsák).

3. fejezet
Forgószárnyas légijármű teljesítmény üzemeltetési korlátozások

3.1 Általános rész

3.1.1 A forgószárnyas légijárműveket a lajstromozó állam által a jelen fejezet alkalmazható előírásaival összhangban kidolgozott és közzétett, részletes és átfogó teljesítmény előírás betartásával üzemeltessék.

3.1.2 A 3. teljesítmény osztályú forgószárnyas légijárműveket csak olyan időjárási és fényviszonyok között valamint olyan útvonalak és (kitérő) területek felett üzemeltessék, amelyek a hajtómű meghibásodása esetén lehetővé teszik a biztonságos kényszerleszállás végrehajtását. A jelen pont előírása a 2. teljesítmény osztályú forgószárnyas légijárművekre is vonatkozik a felszállás után meghatározott pont előtt valamint a leszállás előtt meghatározott pont után.

3.1.3 **Ajánlás** – *Olyan forgószárnyas légijárművek esetében, amelyekre a 8. Annex IV. része az Egyezmény 41. cikkelyének előírásában található kivétel miatt nem alkalmazható, a lajstromozó állam biztosítsa, hogy az 3.2 szakaszban meghatározott teljesítmény szintet a lehető legnagyobb mértékben betartsák.*

3.1.4 A zsúfolt (sűrűn beépített) területeken emelt szinten létesített helikopter repülőtereken csak az 1. teljesítmény osztályú forgószárnyas légijárművek üzemeltetése engedélyezhető.

3.1.5 **Ajánlás** – *Az emelt szinten létesített helikopter repülőtereken vagy helikopter leszállási helyeken a 3. teljesítmény osztályú forgószárnyas légijárművek üzemeltetését ne engedélyezzék.*

3.2 A 8. Annex IV. rész előírásaival összhangban jogosított forgószárnyas légijárművek

3.2.1 A 3.2.2 – 3.2.7 pontokban ismertetett előírások azokra a forgószárnyas légijárművekre alkalmazandók, amelyekre 8. Annex IV. része vonatkozik.

Megjegyzés: A következő nemzetközi előírások nem tartalmaznak az országos légialkalmassági előírásokban található rendelkezésekkel összevethető érték (mennyiség) előírásokat. Ezeket a 3.1.1 pont alapján a szerződő államok saját előírásaikban határozzák meg.

3.2.2 A 3.1.1 pontban jelzett, a 3.2.1 pontban kijelölt forgószárnyas légijárművekre vonatkozó átfogó és részletes országos (nemzeti) előírásokban meghatározott teljesítmény szintek legalább lényegükben feleljenek meg a jelen fejezetben megfogalmazott általános színvonalnak.

Megjegyzés: Az A. Melléklet útmutató anyagot tartalmaz, amely példák segítségével mutatja be a jelen fejezet nemzetközi előírásaiban és ajánlott gyakorlati eljárásaiban biztosítani kívánt teljesítmény szintet.

3.2.3 A forgószárnyas légijárművet a légialkalmassági bizonyítványában található feltételek alapján, a repülésvégrehajtási kézikönyvben meghatározott, jóváhagyott teljesítmény korlátozások betartásával üzemeltessék.

3.2.4 A lajstromozó állam az ésszerűség határain belül foganatosítson olyan elővigyázatossági intézkedéseket, amelyek lehetővé teszik az elvárható általános biztonsági szint fenntartását minden várható – még a jelen fejezetben tételesen nem jelzett – üzemeltetési körülmények között.

3.2.5 A repülés végrehajtását csak akkor kezdjék meg, ha a repülésvégrehajtási kézikönyvben található teljesítmény tájékoztatások azt jelzik, hogy a tervezett repülés során a 3.2.6 és 3.2.7 pontok előírásait be tudják tartani.

3.2.6 A jelen fejezet előírásainak alkalmazásakor vegyék figyelembe a forgószárnyas légijármű teljesítményét jelentősen befolyásoló összes tényezőt (mint például a tömeg, magasság, az üzemeltetési hely magasságának megfelelő nyomás-magasság, hőmérséklet, szélviszonyok, a talaj felület állapota). Ezeket a tényezőket közvetlenül üzemeltetési jellemzőként vagy közvetetten tűrési illetve határértékként vegyék figyelembe, amelyek azon teljesítmény adatok részletes ismertetésével vagy átfogó teljesítmény előírással adhatók meg, amelyek alapján a forgószárnyas légijárművet üzemeltetik.

3.2.7 Tömeg (súly) korlátozások

a) A felszállás végrehajtásának megkezdésekor a forgószárnyas légijármű tömege ne haladja meg a 3.2.7.1 pont alapján meghatározott, sem pedig a repülés előrehaladása folyamán vagy az üzemanyag-kibocsátás miatt bekövetkező súlycsökkenést figyelembe vevő 3.2.7.2 és 3.2.7.3 pontok alapján meghatározott értékeket úgy, ahogy az a 3.2.7.2 pont alkalmazása során, a kitérők vonatkozásában a 3.2.7 c) pontban valamint a 3.2.7.3 pontban szerepel.

b) A felszállás végrehajtásának megkezdésekor a forgószárnyas légijármű tömege semmi esetre se haladja meg a forgószárnyas légijármű repülésvégrehajtási kézikönyvében az üzemeltetési hely magasságának megfelelő nyomás-magasságra valamint hőmérsékletére meghatározott legnagyobb felszállósúly értéket továbbá ha a legnagyobb felszállósúly meghatározására más jellemzőket is felhasználnak, bármely más helyi környezeti jellemzővel meghatározott értéket.

c) A tervezett leszállási vagy bármely kijelölt kitérő helikopter repülőtéren az érkezés várható időpontjában a forgószárnyas légijármű számított tömege semmi esetre se haladja meg a forgószárnyas légijármű repülésvégrehajtási kézikönyvében az üzemeltetési hely(ek) magasságának megfelelő nyomás-magasságra valamint hőmérsékletre meghatározott legnagyobb leszállósúly értéket továbbá ha a legnagyobb leszállósúly meghatározására más jellemzőket is felhasználnak, bármely más helyi környezeti jellemzővel meghatározott értéket.

d) A felszállás végrehajtásának megkezdésekor vagy a leszállási illetve bármely kijelölt kitérő helikopter repülőtéren az érkezés várható időpontjában a forgószárnyas légijármű számított tömege semmi esetre se haladja meg a legnagyobb engedélyezett tömeget, amely megfelel a 16. Annex I. kötet zajszint minősítési előírásainak kivéve, ha különleges körülmények között, bizonyos üzemeltetési helyeken, ahol zajszint probléma nem jelentkezik, erre az érintett állam illetékes hatósága – amelyben az üzemeltetési hely elhelyezkedik – külön engedélyt ad.

3.2.7.1 Felszállási és kezdeti emelkedési szakasz

3.2.7.1.1 Az *1. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű a felszállási elhatározási ponton vagy ez előtt bekövetkező kritikus hajtómű meghibásodás esetén képes legyen a felszállás megszakítására valamint a megállásra a rendelkezésre álló megszakított felszállási területen belül. Amennyiben a meghibásodás a felszállási elhatározási ponton vagy ez után következik be, a forgószárnyas légijármű képes legyen a felszállás folytatására és a repülési pályán levő összes akadály feletti biztonságos magasságra történő emelkedésre addig, amíg olyan helyzetbe kerül, hogy eleget tud tenni a 3.2.7.2.1 pont előírásának.

3.2.7.1.2 A *2. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű összes működő hajtóművével képes legyen a repülési pályán levő összes akadály felett megfelelő elkülönítés tartására egészen addig, amíg olyan helyzetbe kerül, hogy eleget tud tenni a 3.2.7.2.1 pont előírásának. Amennyiben a felszállás után meghatározott pont elérését követően bármely időpontban kritikus hajtómű meghibásodás következik be, a forgószárnyas légijármű képes legyen a felszállás folytatására és a repülési pályán levő összes akadály feletti biztonságos magasságra történő emelkedésre addig, amíg olyan helyzetbe kerül, hogy eleget tud tenni a 3.2.7.2.1 pont előírásának. A felszállás után meghatározott pont elérése előtt bekövetkező hajtómű meghibásodás esetén a forgószárnyas légijármű kényszerleszállás végrehajtására kényszerülhet és ezért erre az esetre a 3.1.2 pont előírása alkalmazandó.

3.2.7.1.3 A *3. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű összes működő hajtóművével képes legyen a repülési pályán levő összes akadály felett megfelelő elkülönítés tartására egészen addig, amíg olyan helyzetbe kerül, hogy eleget tud tenni a 3.2.7.2.2 pont előírásának. A repülési pálya bármely pontján bekövetkező hajtómű meghibásodás esetén a forgószárnyas légijármű kényszerleszállás végrehajtására kényszerülhet és ezért erre az esetre a 3.1.2 pont előírása alkalmazandó.

3.2.7.2 Útvonalon

3.2.7.2.1 Az *1. és 2. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű az útvonalrepülés bármely pontján bekövetkező kritikus hajtómű meghibásodás esetén képes legyen a repülés folytatására a repülési útvonal legalacsonyabb tengerszint feletti repülési magassága alá történő süllyedés nélkül olyan üzemeltetési helyig, amelyen eleget tudnak tenni a 3.2.7.3.1 (1. teljesítmény osztály) vagy a 3.2.7.3.2 (2. teljesítmény osztály) pontok előírásának. Amennyiben a forgószárnyas légijármű három vagy több hajtóművel rendelkezik, az útvonal bármely részén, ahol az alkalmas közbenső üzemeltetési hely elhelyezkedése és a repülés teljes időtartama olyan, hogy egy második hajtómű meghibásodás valószínűségét a jelen fejezet előírásaiba foglalt általános repülésbiztonsági szint fenntartása érdekében figyelembe kell venni, a forgószárnyas légijármű bármely két hajtómű meghibásodása esetén képes legyen a repülés folytatására egy alkalmas üzemeltetési helyig és ott a leszállás végrehajtására.

3.2.7.2.2 *A 3. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű összes működő hajtóművével képes legyen a repülés folytatására tervezett útvonalán vagy meghatározott kitérő repülési útján az útvonal legalacsonyabb tengerszint feletti repülési magassága alá történő süllyedés nélkül. A repülési pálya bármely pontján bekövetkező hajtómű meghibásodás esetén a forgószárnyas légijármű kényszerleszállás végrehajtására kényszerülhet és ezért erre az esetre a 3.1.2 pont előírása alkalmazandó.

3.2.7.3 Megközelítési és leszállási szakasz

3.2.7.3.1 Az 1. teljesítmény osztályú forgószárnyas légijármű – A megközelítési és leszállási szakasz bármely pontján a leszállási elhatározási pont előtt bekövetkező kritikus hajtómű meghibásodás esetén a forgószárnyas légijármű a repülési útvonalon levő összes akadály biztonságos elkülönítési magasságon történő átrepülése után képes legyen a célállomáson és bármely kitérőn leszállni valamint a rendelkezésre álló leszállási távolságon belül megállni, vagy megszakított megközelítést végrehajtani és a 3.2.7.1.1 pont előírásának megfelelően a repülési útvonalon levő összes akadály felett biztonságos elkülönítés tartásával repülni. Amennyiben a hajtómű meghibásodás a leszállási elhatározási pont után következik be, a forgószárnyas légijármű képes legyen leszállni és a rendelkezésre álló leszállási távolságon belül megállni.

3.2.7.3.2 A *2. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű összes működő hajtóművével a repülési útvonalon levő összes akadály biztonságos elkülönítési magasságon történő átrepülése után képes legyen a célállomáson és bármely kitérőn leszállni valamint a rendelkezésre álló leszállási távolságon belül megállni, vagy megszakított megközelítést végrehajtani és a 3.2.7.1.2 pont előírásának megfelelően a repülési útvonalon levő összes akadály felett biztonságos elkülönítés tartásával repülni. Ha a kritikus hajtómű meghibásodás a leszállás előtt meghatározott pont elérése előtt következik be, ugyancsak a fentiek alkalmazandók. A meghatározott pont elérése után bekövetkező hajtómű meghibásodás esetén a forgószárnyas légijármű kényszerleszállás végrehajtására kényszerülhet és ezért erre az esetre a 3.1.2 pont előírása alkalmazandó.

3.2.7.3.3 A *3. teljesítmény osztályú forgószárnyas légijármű* – A forgószárnyas légijármű összes működő hajtóművével a repülési útvonalon levő összes akadály biztonságos elkülönítési magasságon történő átrepülése után képes legyen a célállomáson és bármely kitérőn leszállni valamint a rendelkezésre álló leszállási távolságon belül megállni, vagy megszakított megközelítést végrehajtani és a 3.2.7.1.3 pont előírásának megfelelően a repülési útvonalon levő összes akadály felett biztonságos elkülönítés tartásával repülni. A repülési pálya bármely pontján bekövetkező hajtómű meghibásodás esetén a forgószárnyas légijármű kényszerleszállás végrehajtására kényszerülhet és ezért erre az esetre a 3.1.2 pont előírása alkalmazandó.

Megjegyzés: A fenti előírásokban jelzett és az összes forgószárnyas légijármű teljesítmény osztályhoz alkalmazható "biztonságos elkülönítés"-t az A. Mellékletben található példákkal mutatjuk be.

3.3 Akadály adatok

3.3.1 Tegyék közzé az akadályokra vonatkozó adatokat, hogy a járató kidolgozhassa 3.2.7.1 és 3.2.7.3 pontok előírásainak megfelelő eljárásait.

Megjegyzés: Bizonyos akadály adatok közzétételének módszerei a 4. és 15. Annex-ekben találhatók.

3.3.2 A járató a 3.2.7.1 és 3.2.7.3 pontok előírásainak teljesítése alkalmával vegye figyelembe a térképek pontosságát.

4. fejezet
Forgószárnyas légijármű műszerek, felszerelések és repülési okmányok

Megjegyzés: A forgószárnyas légijármű távközlési és navigációs felszerelésére vonatkozó előírásokat az 5. fejezet tartalmazza.

4.1 Általános rész

4.1.1 A légialkalmassági bizonyítvány kiadásához szükséges alapvető felszereléseken kívül a felhasznált forgószárnyas légijármű típustól valamint a repülés végrehajtásának körülményeitől függően a következő pontokban előírt műszereket, felszereléseket és repülési okmányokat helyezzék el vagy szállítsák a forgószárnyas légijárművön. Az előírt műszereket és berendezéseket, beleértve azok felszerelését is a lajstromozó állam hagyja jóvá vagy fogadja el.

4.1.2 A forgószárnyas légijármű szállítson egy tanúsított hiteles másolatot a 2.2.1 fejezetben meghatározott légijármű üzembentartási engedélyből, és egy másolatot a forgószárnyas légijármű típusra érvényes felhatalmazásokból, feltételekből és korlátozásokból, melyek a tanúsítással összefüggésben kerültek kiadásra. Amikor a tanúsítás és a hozzá kapcsolódó felhatalmazások, feltételek és korlátozások a járató állama részéről az angoltól eltérő nyelven kerül kiadásra, akkor mellékeljék az angol nyelvű forditásokat is.

Megjegyzés – a légijármű üzembentartási engedélyére és az ahhoz kapcsolódó azon, az üzemeltetési specifikációban esetleg megadott felhatalmazásokra, feltételekre és korlátozásokra vonatkozó útmutatót az Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve *(Doc 8335) tartalmazza.*

4.1.3 A járató az üzemeltetési kézikönyvben helyezze el a járató állama által jóváhagyott minimális felszerelési jegyzéket (MEL), amelynek segítségével a légijármű parancsnoka eldöntheti, hogy a repülés végrehajtása megkezdhető vagy egy közbenső állomástól folytatható abban az esetben, ha bármely műszer, felszerelés vagy rendszer üzemképtelenné válik. Ahol a járató állama nem azonos a lajstromozó állammal, a járató állama biztosítsa, hogy a minimális felszerelési jegyzék az adott forgószárnyas légijármű esetében ne befolyásolja a lajstromozó állam vonatkozó légialkalmassági előírásainak teljesítését.

Megjegyzés: A minimális felszerelési jegyzék (MEL) tájékoztatót az E. Melléklet tartalmazza.

4.1.4 A járató az üzemeltetési valamint a hajózószemélyzet részére, minden egyes üzemeltetett légijármű típushoz biztosítson légijármű üzemeltetési kézikönyvet, amely tartalmazza az adott légijármű típus üzemeltetéséhez szükséges általános, rendellenes és vészhelyzeti üzemeltetési eljárásokat. A kézikönyvben továbbá részletezzék a légijármű rendszereit és a felhasználandó ellenőrzési jegyzékeket is. A kézikönyvben továbbá részletezzék a légijármű rendszereit és a felhasználandó ellenőrzési jegyzékeket is. A kézikönyvet az emberi tényezők alapelveinek figyelembevételével készítsék el.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

4.2 Az összes forgószárnyas légijármű összes repülése

4.2.1 A forgószárnyas légijárművet szereljék fel azokkal a műszerekkel, amelyek a hajózószemélyzet számára lehetővé teszik a forgószárnyas légijármű repülési pályájának irányítását és ellenőrzését, bármely előírt eljárás művelet végrehajtását valamint a forgószárnyas légijármű üzemeltetési korlátozásainak a várható üzemeltetési körülmények között történő megfigyelését.

4.2.2 A forgószárnyas légijárművet szereljék fel:

a) hozzáférhető és a forgószárnyas légijárművön szállításra engedélyezett utasok számának megfelelő egy vagy több elsősegély-nyújtó készlettel;

Megjegyzés: Az elsősegély-nyújtó készletek tartalmára vonatkozó útmutató a D. Mellékletben található.

b) olyan típusú hordozható tűzoltó készülék(ek)kel, amelynek tűzoltó anyaga igénybevétel után nem szennyezi veszélyesen a forgószárnyas légijármű belső terének levegőjét. Legalább egy ilyen tűzoltó készüléket helyezzenek el;

1) a forgószárnyas légijármű pilótafülkéjében; és

2) minden egyes olyan utaskabinban, amely a pilótakabintól el van választva és amelyet a hajózószemélyzet nem tud azonnal megközelíteni.

Megjegyzés: Előírásosnak minősül bármely olyan hordozható tűzoltó készülék, amely a forgószárnyas légijármű légialkalmassági bizonyítványában előírtak szerint került elhelyezésre.

c) 1) a járató állama által meghatározott életkor felett minden egyes személy részére egy megfelelő ülő vagy fekvőhellyel;

2) minden üléshez egy biztonsági övvel valamint minden fekvőhelyhez egy bekötő biztonsági hevederrel; és

3) minden egyes hajózószemélyzeti tag üléshez egy vállhevederekkel ellátott biztonsági övvel. A biztonsági vállhevederekhez tartozzon egy olyan szerkezet is, amely a hirtelen lassulás esetében automatikusan visszatartja az ülésben helyet foglaló személy testét.

Ajánlás – A forgószárnyas légijármű-vezetőüléseken felszerelt, vállhevederekkel ellátott biztonsági övhöz tartozzon egy olyan szerkezet is, amely megakadályozza, hogy a hirtelen cselekvőképtelenné vált légijármű-vezető gátolja a kormányszervek működését.

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

d) az utasok felé a következő tájékoztatások és utasítások továbbítására szolgáló eszközökkel;

1) mikor kapcsolják be a biztonsági öveket;

2) amennyiben oxigén szállítása van előírva, mikor és hogyan kell használni az oxigén-ellátó berendezést;

3) dohányzás korlátozása;

4) a mentőmellények vagy egyéb megfelelő egyéni úszóeszközök elhelyezkedése és használata, amennyiben ezek szállítása van előírva; és

5) a vészkijáratok elhelyezkedése és nyitása;

e) megfelelő értékű elektromos biztosítékok tartalékként a repülés közben hozzáférhető biztosítékok cseréjéhez.

4.2.3 A forgószárnyas légijármű szállítson;

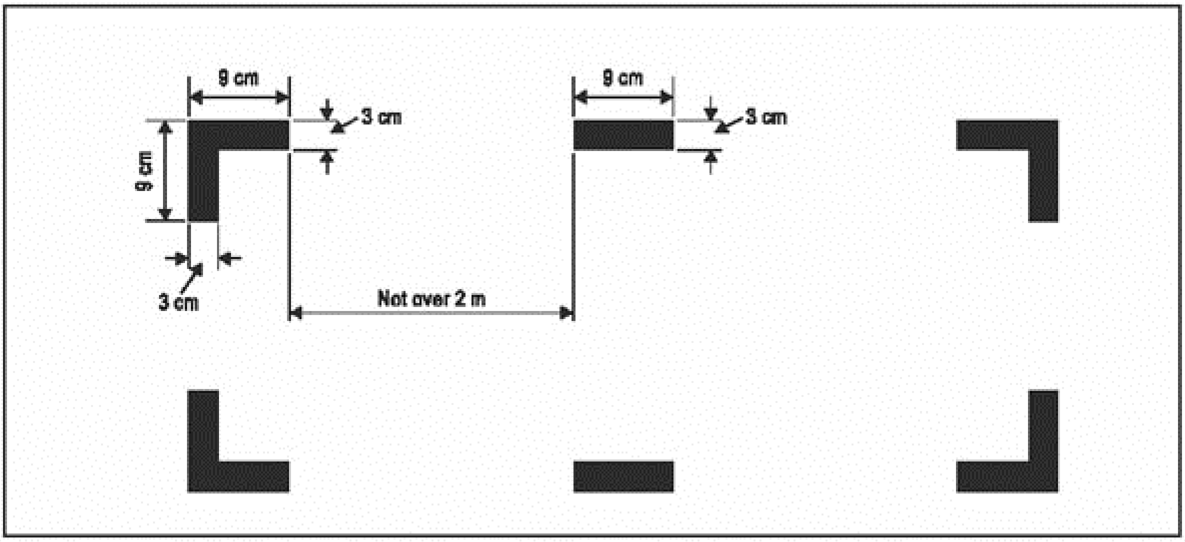
a) a 2.2.2 pont előírásának megfelelő üzemeltetési kézikönyvet vagy annak azon részeit, amelyek a repülés végrehajtására vonatkoznak;

b) az adott forgószárnyas légijármű repülésvégrehajtási kézikönyvét vagy más olyan dokumentumot, amely tartalmazza a 3. fejezet alkalmazásához szükséges teljesítmény adatokat valamint bármely más olyan tájékoztatást, amelyre a forgószárnyas légijármű üzemeltetéséhez – a légialkalmassági bizonyítványban meghatározott jellemzőkön belül – szükség van, kivéve ha ezek az adatok az üzemeltetési kézikönyvben megtalálhatók; és

c) érvényes és alkalmas térképeket, amelyek fedik a tervezett repülés útvonalát, valamint bármely olyan egyéb útvonalat, amelyről joggal feltételezhető, hogy arra a repülés átirányítható.

4.2.4 Az átvágható felületek jelzése

4.2.4.1 Amennyiben a forgószárnyas légijárművön a mentőszemélyzet részére jelzik a kényszerhelyzet esetén a törzsön átvágható felületeket, azokat a következő ábrának megfelelő módon jelöljék meg. A jelölések színe vörös vagy sárga legyen és ha erre a háttértől történő megkülönböztethetőség érdekében szükség van, azokat fehér színű alapozásra készítsék el.



A légijármű törzsén levő átvágható felületek, azaz behatolási pontok

Jelölések közötti távolság nem több mint 2 méter

4.2.4.2 Amennyiben a sarkok jelölései egymástól több mint 2 méter távolságra vannak, fessenek fel 9 x 3 cm-es vonalakat olyan módon, hogy az egymás mellett levő vonalak közötti távolság 2 méternél nagyobb ne legyen.

Megjegyzés: Ez az előírás nem teszi szükségessé azt, hogy bármely forgószárnyas légijármű sárkányszerkezetén átvágható felületek legyenek.

4.3 Repülési adatrögzítők

1. *Megjegyzés: A repülési adatrögzítők két rendszerből illetve berendezésből, a repülési adatrögzítőből (FDR) valamint a pilótakabin hangrögzítőből (CVR) állnak.*

2. *Megjegyzés: Az összetett FDR/CVR berendezés csak a jelen Annex-ben külön ismertetett repülési adatrögzítő berendezés előírások teljesítésére használhatók.*

3. *Megjegyzés: A repülési adatrögzítőkkel kapcsolatos részletes útmutató a B. Mellékletben található.*

4.3.1 Repülési adatrögzítők – típusok

4.3.1.1 A IV. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, repülésvezérlő szerkezetei beállításának, hajtómű teljesítményének és működésének pontos meghatározásához szükségesek.

4.3.1.2 Az V. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, repülésvezérlő szerkezetei beállításának és hajtómű teljesítményének pontos meghatározásához szükségesek.

4.3.1.3 A repülési adatrögzítő berendezésekben 1995 január 1. után ne használjanak fémszalagot.

4.3.1.4 ***Ajánlás*** *– 1998 november 5. után ne használják a frekvencia modulációt (FM) alkalmazó analóg adatrögzítőket.*

4.3.1.4.1 2003 január 1. után ne használják a fényképészeti filmmel működő repülési adatrögzítőket.

4.3.1.5 Az összes olyan digitális adathálózati összeköttetést alkalmazó valamint pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett forgószárnyas légijármű, amelynek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki, az összes adathálózati digitális közleményváltást a repülési adatrögzítő berendezésén rögzítse. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a pilótakabinban rögzített hangfelvétellel.

4.3.1.5.1 2007 január 1-től az összes, digitális adathálózati összeköttetést alkalmazó valamint pilótakabin hangrögzítő berendezés szállítására kötelezett forgószárnyas légijármű rögzítse a légiforgalmi szolgálattal történt digitális közleményváltásait a pilótakabin hangrögzítő vagy repülési adatrögzítő berendezésén. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a pilótakabinban rögzített hangfelvétellel.

4.3.1.5.2 Rögzítsék az adathálózati digitális közleményváltás tartalmának megismeréséhez szükség tájékoztatást és ahol ez lehetséges a közlemény megjelenítésének vagy a hajózószemélyzet által történt lehívásának időpontját is.

Megjegyzés: Az adathálózati összeköttetések közé tartoznak, azonban nem csak ezekre korlátozódnak a következők:

ADS – automatikus légtérfelderítés
CPDLC – légiforgalmi irányító és repülőgépvezető közötti adathálózati összeköttetések
D-FIS – adathálózati és repüléstájékoztató szolgálati összeköttetések
AOC – légiközlekedési üzemi irányítási közlemények.

4.3.1.6 **Ajánlás** – *Minden olyan 2700 kg. legnagyobb engedélyezett felszállósúlynál nagyobb tömegű forgószárnyas légijárművet, amely repülési adatrögzítő és pilótakabin hangrögzítő berendezések szállítására kötelezett, alternatív megoldásként kettő összetett repülési adat és pilótakabin hangrögzítő berendezéssel is (FDR/CVR) felszerelhetnek.*

4.3.1.7 A IV.A típusú repülési adatrögzítő rögzítse azokat a jellemző adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek. A következő pontokban ismertetjük azokat a jellemzőket, amelyek kielégítik a IV.A típusú repülési adatrögzítőre vonatkozó előírásokat. A jelölés (*) nélkül jellemzők rögzítése kötelező. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a jellemzőt illetve adatot a forgószárnyas légijármű rendszerei vagy a hajózószemélyzet a forgószárnyas légijármű üzemeltetéshez használja fel.

4.3.1.7.1 A forgószárnyas légijármű repülési pályájára és sebességére vonatkozó előírásokat kielégítő jellemzők:

• nyomás-magasság
• műszer szerinti repülési sebesség
• külső levegő hőmérséklete
• géptengely irányszög
• függőleges gyorsulás
• oldalirányú gyorsulás
• hosszirányú gyorsulás (törzs tengely)
• idő vagy relatív idő számítás
• navigációs adatok*: széleltérítés sodródási szög, szélsebesség, szélirány, szélességi és hosszúsági fok adatok
• rádió magasságmérő jelzett magassága*

4.3.1.7.2 A repülési helyzetre vonatkozó előírásokat kielégítő jellemzők:
• bólintási helyzet, azaz kereszt-tengely körüli mozgása
• bedöntési helyzet, azaz hossztengely körüli elfordulása
• legyezőmozgás szögsebessége

4.3.1.7.3 A hajtóműre vonatkozó előírásokat kielégítő jellemzők:
• minden egyes hajtómű teljesítménye: gázturbina terhelés nélküli sebesség (N_f), hajtómű nyomaték, hajtómű turbina fodulatszám (N_g), hajtómű tolóerő szabályzó kar(ok) helyzete a pilótakabinban
• forgószárny: fő forgószárny sebessége, forgószárny fékezés helyzete
• fő áttételház olajnyomás*
• áttételház olajhőmérséklet*: fő áttételház olajhőmérséklet, csatlakozó áttételház olajhőmérséklet, farok légcsavar áttételház olajhőmérséklet
• hajtómű kilépő gáz hőmérséklet (T_4)*
• gázturbina belépő hőmérséklet (TIT)*

4.3.1.7.4 A repülésvezérlő szerkezetek helyzetére vonatkozó előírásokat kielégítő jellemzők:
• futómű helyzete, vagy futókibocsátó kar helyzete*
• tüzelőanyag-mennyiség*
• jégérzékelő folyékony víz tartalma*

4.3.1.7.5 Az üzemeltetésre vonatkozó előírásokat kielégítő jellemzők:
• hidraulika rendszer alacsony nyomás

• riasztások
• elsődleges repülés vezérlő szerkezetek helyzete és a kezelő egységek beállítása: összetett, hossziráyú és oldalirányú bólintás illetve bedöntés, farok légcsavar pedál, vezérelhető stabilizátor, hidraulika kiválasztás
• irányadó átrepülése
• minden egyes navigációs vevőberendezés frekvencia kiválasztása
• automatikus repülésvezérlés, AFCS üzemmód és kapcsolók állása*
• stabilitás rásegítő rendszer működése*
• jelzett függeszkedési terhelés*
• függőleges eltérések*: ILS siklópálya, MLS magasság irányvezetés, GNSS megközelítési pálya
• vízszintes eltérések*: ILS iránysáv, MLS oldalszög irányvezetés, GNSS megközelítési pálya
• távolságmérő jelzőműszerek jelzett távolság értékei (1 és 2 DME készletek)*
• magasság változás sebessége*
• jégérzékelő folyékony víz tartalma*
• forgószárnyas légijármű állapotjelző rendszer (HUMS)*: hajtómű adatok, érzékelők állapota, felvételi sávidőzítés, határérték túllépések, általános szélessávú hajtóműrezgés

1 Megjegyzés: Az előírt jellemzők, közöttük a tartományok, a mintavételi pontosság és felbontás megtalálhatók az EUROCAE Polgári Légiközlekedési Be rendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

2. Megjegyzés: A rögzítendő jellemzők száma a forgószárnyas légijármű típustól, annak összetettségétől függ, azonban a csillag (*) jelölés nélküli jellemzőket ettől függetlenül rögzíteni kell. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a jellemzőt illetve adatot a forgószárnyas légijármű rendszerei vagy a hajózószemélyzet a forgószárnyas légijármű üzemeltetéséhez használja fel.

4.3.2 Repülési adatrögzítők – felvételi időtartam

A IV. és V. típusú repülési adatrögzítő képes legyen a működése legalább utolsó tíz órájában rögzített tájékoztatások tárolására.

4.3.3 Repülési adatrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 1989 január 1. után adják ki

4.3.3.1 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 7000 kg, szereljenek fel IV. típusú repülési adatrögzítő berendezéssel.

4.3.3.2 ***Ajánlás*** *- Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 2730 kg, egészen és beleértve 7000 kg-ig, szereljenek fel V. típusú repülési adatrögzítő berendezéssel.*

4.3.4 Repülési adatrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki

4.3.4.1 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 3180 kg, szereljenek fel IV.A típusú repülési adatrögzítő berendezéssel, melynek felvételi időtartama legalább 10 óra.

Megjegyzés: Elfogadható az önálló (FDR) vagy az összetett (CVR/FDR) repülési adatrögzítő is.

4.3.5 Pilótakabin hangrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1-én vagy ezt követően adták ki

4.3.5.1 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 7000 kg, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt. A repülési adatrögzítővel nem rendelkező forgószárnyas légijárművön a pilótakabin hangrögzítő berendezés egyik felvételi sávján rögzítsék legalább a fő forgószárny sebességét.

4.3.5.2 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 3180 kg-tól 7000 kg-ig terjed, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt. A repülési adatrögzítővel nem rendelkező forgószárnyas légijárművön a pilótakabin hangrögzítő berendezés egyik felvételi sávján rögzítsék legalább a fő forgószárny sebességét.

4.3.6 Pilótakabin hangrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1. előtt adták ki

Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 7000 kg, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt. A repülési adatrögzítővel nem rendelkező forgószárnyas légijárművön a pilótakabin hangrögzítő berendezés egyik felvételi sávján rögzítsék legalább a fő forgószárny sebességét.

Megjegyzés: A pilótakabin hangrögzítő berendezésre előírt műszaki követelmények megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

4.3.7 Pilótakabin hangrögzítők – felvételi időtartam

4.3.7.1 A pilótakabin hangrögzítő berendezés képes legyen a működése legalább utolsó 30 percében rögzített tájékoztatások tárolására.

4.3.7.2 **Ajánlás** —*Az a pilótakabin hangrögzítő berendezés, amelyet olyan forgószárnyas légijárműbe szereltek be, amelynek egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.*

4.3.7.3 Az a pilótakabin hangrögzítő berendezés, amelyet olyan forgószárnyas légijárműbe szerelnek be, amelynek egyedi légialkalmassági bizonyítványát először 2003 január 1. után adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.

4.3.8 Repülési adatrögzítők – szerkezet és beszerelés

A repülési adatrögzítőket úgy készítsék el és helyezzék el illetve szereljék be a légijárműbe, hogy biztosítsák a rögzített adatok gyakorlatilag lehetséges legnagyobb védelmét annak érdekében, hogy a rögzített tájékoztatások megőrizhetők, leolvashatók és feldolgozhatók legyenek. A repülési adatrögzítők tegyenek eleget a baleseti törési ellenálló-képesség és tűzvédelemi előírásoknak.

Megjegyzés: A baleseti törési ellenálló-képesség és tűzvédelem ipari előírásai megtalálhatók az Európai Polgári Légiközlekedési Elektronikai Szervezet (EUROCAE) ED55 és ED56A jelű és hasonló kiadványokban.

4.3.9 Repülési adatrögzítők – üzemeltetés

4.3.9.1 A repülési adatrögzítőt a repülés alatt ne kapcsolják ki.

4.3.9.2 A repülési adatrögzítővel rögzített tájékoztatások megőrzése érdekében a berendezést egy baleset vagy repesemény utáni repülés befejezését követően kapcsolják ki és azt a 13. Annex előírásaiban meghatározottakkal összhangban a tájékoztatásokat tartalmazó adathordozó eltávolítása előtt ne kapcsolják ismét be.

1. Megjegyzés: A repülési adatrögzítővel rögzített tájékoztatások légijárműből történő eltávolításának szükségességét a vizsgálatot végző állam vizsgáló hatósága határozza meg az esemény súlyossága és körülményei alapján, beleértve az eseménynek a repülési üzemre gyakorolt hatását is.

2. Megjegyzés: A járatónak a repülési adatrögzítővel rögzített tájékoztatások tárolására vonatkozó felelősségét a 9.6 pont tartalmazza.

4.3.10 Repülési adatrögzítők – folyamatos működőképesség

Végezzék el a repülési adat és pilótakabin hangrögzítő rendszerek felvételeinek üzemi ellenőrzését és értékelését annak érdekében, hogy a rögzítő berendezések folyamatos működőképességét biztosíthassák.

Megjegyzés: A repülési adat és pilótakabin hangrögzítő rendszerek ellenőrzésének eljárásait a B. Melléklet tartalmazza
.

4.4 Az összes, látvarepülési szabályok szerint üzemeltetett forgószárnyas légijármű

4.4.1 Az összes látvarepülési szabályok (VFR) szerint üzemeltetett forgószárnyas légijárművet szereljék fel a következőkkel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) érzékeny nyomás-magasság mérőműszerrel;

d) repülési sebesség mérőműszerrel; és

e) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

4.4.2 A ellenőrzött repülésként a látvarepülési szabályok szerint (VFR) üzemeltetett forgószárnyas légijárművet a 4.10 pont előírásainak megfelelően szereljék fel.

4.5 Az összes, vízfelszín felett üzemeltetett forgószárnyas légijármű

4.5.1 Úszóeszközök

Minden olyan forgószárnyas légijárművet, amelyet vízfelszín felett kívánnak üzemeltetni, állandó vagy gyorsan kibocsátható (üzembe helyezhető) úszóeszközzel szereljenek fel, amely biztosítja a forgószárnyas légijármű biztonságos vízreszállását, amennyiben:

a) az 1. vagy 2. teljesítmény osztályú forgószárnyas légijármű a szárazföldtől olyan távolságra repül vízfelszín felett, amely tíz percnél hosszabb időtartamú (normál) utazósebességgel végrehajtott repülésnek felel meg; vagy

b) a 3. teljesítmény osztályú forgószárnyas légijármű a szárazföldtől olyan távolságra repül vízfelszín felett, amely nagyobb, mint az autórotációs vagy biztonságos kényszerleszállási távolság.

4.5.2 Vészhelyzeti felszerelések

4.5.2.1 A 4.5.1 pont előírása alapján üzemeltetett 1. vagy 2. teljesítmény osztályú forgószárnyas légijárművet szereljék fel;

a) a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel;

b) elegendő számú mentő-tutajjal a fedélzeten tartózkodó összes személy elhelyezésére, amelyeket úgy tárolnak, hogy azok a vészhelyzet esetén gyorsan üzembe helyezhetők és a repülési útvonal sajátosságainak megfelelő életmentő eszközökkel vannak ellátva, beleértve a létfenntartási eszközöket is; és

c) a 2. Annex-ben ismertetett pirotechnikai vészjelzések előállítására szolgáló eszközökkel.

4.5.2.2 A szárazföldtől az autórotációs távolságon kívül, azonban a felelős állam illetékes hatósága által megállapított távolságon belül üzemelő 3. teljesítmény osztályú forgószárnyas légijárművet szereljék fel a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel.

Megjegyzés: A 4.5.2.2 pontban ismertetett szárazföldtől számított távolság meghatározása alkalmával vegyék figyelembe a környezeti körülményeket, valamint a kutató és mentő szolgálat (SAR) igénybevételének lehetőségeit.

4.5.2.3 A 4.5.2.2 pontban meghatározott távolságon túl üzemelő 3. teljesítmény osztályú forgószárnyas légijárművet szereljék fel a 4.5.2.1 pont előírása alapján szükséges vészhelyzeti felszereléssel.

4.5.2.4 A 2. és 3. teljesítmény osztályú forgószárnyas légijármű esetében, amennyiben az olyan helikopter repülőtéren száll fel vagy le, ahol a járató államának véleménye szerint a felszállási vagy leszállási útvonal olyan hosszan vezet vízfelszín felett, hogy az esetleges rendellenes üzemelés vagy repesemény alkalmával vízreszállás valószínű, a forgószárnyas légijárművet szereljék fel legalább a 4.5.2.1 a) alpont előírása alapján szükséges felszereléssel.

4.5.2.5 Minden egyes mentőmellényt és egyéb megfelelő egyéni úszóeszközt, amelyet a jelen 4.5 szakasz előírásai alapján szállítanak, a felhasználó személy feltalálásának megkönnyítése érdekében lássanak el elektromos világítással.

4.5.2.6 **Ajánlás** – *Bármely olyan forgószárnyas légijárművön, amelynek egyedi légialkalmassági bizonyítványát először 1991 január 1-én vagy ezt követően adták ki, a 4.5.2 pont előírása alapján szállított mentőtutajok legalább 50 %-a távirányítással legyen kibocsátható.*

4.5.2.7 **Ajánlás** – *A távirányítással nem kibocsátható és 40 kg-nál nehezebb mentőtutajok a kibocsátás megkönnyítése érdekében valamilyen mechanikus kibocsátó szerkezettel legyenek felszerelve.*

4.5.2.8 **Ajánlás** – *Bármely olyan forgószárnyas légijármű esetében, amelynek egyedi légialkalmassági bizonyítványát először 1991 január 1. előtt adták ki, 1992 december 31. előtt teljesítendők a 4.5.2.6 és 4.5.2.7 pontok előírásai.*

4.6 A kijelölt szárazföld felett üzemeltetett összes forgószárnyas légijármű

Amennyiben a forgószárnyas légijárművet olyan szárazföldi területek felett üzemeltetik, amelyeket az érintett államok olyan területként jelölnek meg, ahol a kutatás és mentés különös nehézségekbe ütközik, a forgószárnyas légijárművet szereljék fel olyan jeladó berendezéssel és életmentő felszereléssel, beleértve a létfenntartási eszközöket is, amelyek nagy valószínűséggel megfelelnek az átrepülendő terület sajátosságainak.

4.7 Vészhelyzeti helyjeladó berendezés (ELT)

4.7.1 A 4.7.2 pont előírása kivételével 2005 január 1-ig minden, a 4.5.1 a) alpont alapján vízfelszín felett üzemeltetett 1. és 2. teljesítmény osztályú és a 4.5.1 b) alpont alapján üzemeltetett 3. teljesítmény osztályú forgószárnyas légijárművet mentőtutajonként legalább egy darab (ELT/S) berendezéssel szereljenek fel, azonban összesen több mint kettő darab vészhelyzeti helyjeladó (ELT) szállítása nem szükséges.

4.7.2 A 4.5.1 a) alpont alapján a vízfelszín felett üzemeltetett összes 1. és 2. teljesítmény osztályú és a 4.5.1 b) alpont alapján üzemeltetett 3. teljesítmény osztályú forgószárnyas légijárművet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adják ki, mentőtutajonként legalább egy darab automatikus valamint legalább egy vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel.

4.7.3 2005 január 1-től a 4.5.1 a) alpont alapján vízfelszín felett üzemeltetett összes 1. és 2. teljesítmény osztályú és a 4.5.1 b) alpont alapján üzemeltetett összes 3. teljesítmény osztályú forgószárnyas légijárművet mentőtutajonként legalább egy darab automatikus valamint legalább egy vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel.

4.7.4 A 4.7.2 pont előírása kivételével 2005 január 1-ig a 4.6 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó összes forgószárnyas légijárművet legalább egy darab vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.7.5 A 4.6 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó minden forgószárnyas légijárművet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adják ki, legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.7.6 2005 január 1-től a 4.6 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó minden forgószárnyas légijárművet legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.7.7 **Ajánlás** – *Az összes forgószárnyas légijárművet szereljék fel automatikusan működésbe lépő vészhelyzeti helyjeladó (ELT) berendezéssel.*

4.7.8 A fenti 4.7.1 – 4.7.7 pontok alapján felszerelt vészhelyzeti helyjeladó (ELT) berendezés a 10. Annex III. kötet vonatkozó előírásai szerint üzemeljen.

4.8 A nagy repülési magasságon üzemeltetett összes forgószárnyas légijármű

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, a nemzetközi műlégkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	*magasság – méter*	*magasság – láb*
700 hPa	3000	10 000
620 hPa	4000	13 000
376 hPa	7600	25 000

4.8.1 Azt a forgószárnyas légijárművet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb lesz, szereljenek fel oxigén tároló és adagoló berendezéssel, amely lehetővé teszi a 2.3.8.1 pontban előírt oxigén készlet tárolását és szükség szerinti adagolását.

4.8.2 Azt a forgószárnyas légijárművet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken az atmoszférikus légnyomás 700 hPa értéknél alacsonyabb lesz, azonban a forgószárnyas légijármű személyek részére rendszeresített kabinjá(i)ban megfelelő módszerekkel 700 hPa értéknél nagyobb nyomást biztosítanak, szereljenek fel oxigén tároló és adagoló berendezéssel, amely lehetővé teszi a 2.3.8.2 pontban előírt oxigén készlet tárolását és szükség szerinti adagolását.

4.8.3 Azt a forgószárnyas légijárművet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken az atmoszférikus légnyomás 376 hPa értéknél magasabb, azonban a forgószárnyas légijármű négy percen belül nem tud olyan biztonságosan olyan repülési magasságra süllyedni, amelyen az atmoszférikus légnyomás értéke 620 hPa és amelynek egyedi légialkalmassági bizonyítványát 1998 november 9-én vagy ezt követően adták ki, a 2.3.8.2 pont előírásának megfelelő automatikusan működésbe lépő oxigén berendezéssel szereljenek fel. Az oxigén adagoló eszközök teljes száma legalább 10 %-al több legyen, mint az utasok és utaskabin személyzet üléseinek száma.

4.8.4 **Ajánlás** – *Azt a forgószárnyas légijárművet, amelyet olyan repülési magasságokon kívánnak üzemeltetni, amelyeken az atmoszférikus légnyomás 376 hPa értéknél magasabb, azonban a forgószárnyas légijármű négy percen belül nem tud olyan biztonságosan olyan repülési magasságra süllyedni, amelyen az atmoszférikus légnyomás értéke 620 hPa és amelynek egyedi légialkalmassági bizonyítványát 1998 november 9. előtt adták ki a 2.3.8.2 pont előírásának megfelelő automatikusan működésbe lépő oxigén berendezéssel, szereljenek fel. Az oxigén adagoló eszközök teljes száma legalább 10 %-al több legyen, mint az utasok és utaskabin személyzet üléseinek száma.*

4.9 Jegesedési körülmények között üzemeltetett összes forgószárnyas légijármű

Az összes olyan forgószárnyas légijárművet, amely ténylegesen jelentett vagy várható jegesedési időjárási körülmények között üzemeltetnek, alkalmas jegesedést gátló és/vagy jégtelenítő rendszerrel szereljenek fel.

4.10 Műszerrepülési szabályok szerint üzemeltetett összes forgószárnyas légijármű

4.10.1 A műszerrepülési szabályok szerint (IFR) üzemeltetett összes forgószárnyas légijárművet vagy azokat, amelyek üzemeltetésük során egy vagy több műszer segítsége nélkül nem tarthatók a kívánt repülési helyzetben, szereljék fel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) kettő érzékeny, ellensúlyos dob-mutatóval vagy hasonló módon kijelző nyomás-magasság mérőműszerrel;

Megjegyzés: Sem a három mutatós, sem pedig a dob-mutatós magasságmérő nem tesz eleget a fenti c) alpont követelményének.

d) repülési sebesség mérőműszerrel, amely olyan berendezéssel van ellátva, amely megakadályozza a kicsapódás vagy jegesedés következtében lehetséges helytelen működést;

e) csúszás jelzőműszerrel;

f) három darab repülési helyzetjelző műszerrel (műhorizont) amelyek közül egy elfordulás jelzőműszer is lehet;

g) irányjelző műszerrel (géptengely irány-jelző pörgettyűs – giroszkópikus – műszer):

Megjegyzés: A fenti e), f) és g) alpontok előírásainak műszerek együttesével vagy integrált repülés vezérlési rendszerrel is eleget lehet tenni feltéve, hogy a rendszer a három külön műszer egységen belül és együttesen is védve van a teljes meghibásodás ellen.

h) a pörgettyűs műszerek kielégítő elektromos táplálásának jelzésére szolgáló eszközzel;

i) a pilótakabinban felszerelt, a külső levegő hőmérsékletét jelző műszerrel;

j) emelkedési és süllyedési sebesség mérőműszerrel;

k) stabilizációs rendszerrel kivéve, ha a légialkalmasságot elbíráló illetékes hatóság számára kielégítően bizonyították, hogy a forgószárnyas légijármű tervezési sajátosságainál fogva ilyen berendezés vagy rendszer nélkül is képes a megfelelő stabilizált repülési helyzet fenntartására; és

l) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

4.10.2 A műszerrepülési szabályok szerint üzemeltetett összes 1. vagy 2. teljesítmény osztályú forgószárnyas légijárművet szereljék fel az elektromos energiát biztosító fő rendszertől független vészhelyzeti áramforrással, amelynek az a feladata, hogy a légijármű parancsnoka számára legalább 30 percig működtesse és tisztán láthatóan megvilágítsa a forgószárnyas légijármű repülési helyzetjelző műszerét (műhorizont). A vészhelyzeti áramforrás az elektromos energiát biztosító fő rendszer teljes meghibásodását követően automatikusan lépjen működésbe és a műszerfalon jelenjen meg egyértelmű jelzés arra vonatkozóan, hogy a forgószárnyas légijármű repülési helyzetjelző műszerét vagy műszereit vészhelyzeti áramforrás üzemelteti.

4.11 Éjszaka üzemeltetett összes forgószárnyas légijármű

4.11.1 Éjszaka üzemeltetett összes forgószárnyas légijárművet szereljék fel:

a) a 4.10 szakaszban előírt valamennyi berendezéssel;

b) a repülés közben levő valamint a helikopter repülőtér mozgási területein üzemelő légijármű számára a 2. Annex-ben előírt (navigációs) fényekkel;

Megjegyzés: A fények általános jellemzőit a 8. Annex határozza meg. A repülés közben levő valamint a helikopter repülőtér mozgási területein üzemelő légijárművek fényeire vonatkozó, 2. Annex előírásainak megfelelő fények jellemzőit a Légialkalmassági Kézikönyv *-ben (Doc 9760) részletezi.*

c) két leszálló fényszóróval;

d) a forgószárnyas légijármű biztonságos üzemeltetése szempontjából alapvető fontosságú, a hajózószemélyzet által használt valamennyi műszer és berendezés (meg)világításával;

e) világítással valamennyi utastérben; és

f) elektromos kézilámpával minden egyes személyzet tag szolgálati helyen.

4.11.2 **Ajánlás** – *Az egyik leszálló fényszóró legalább függőleges síkban elfordítható legyen.*

4.12 Forgószárnyas légijárművek amikor utasokat szállítanak – időjárás-felderítő radarberendezés

***Ajánlás** – A forgószárnyas légijárműveket, amikor azok utasokat szállítanak és ezeket olyan területeken üzemeltetik, amelyeken éjszaka vagy műszeres időjárási körülmények között az időjárás-felderítő radarberendezéssel várhatóan idejében felderíthető zivatarok és más gyakorlatilag veszélyt jelentő időjárási jelenségek fordulhatnak elő, üzemképes időjárás-felderítő radarberendezéssel vagy más szignifikáns időjárási jelenség jelzőkészülékkel szereljék fel.*

4.13 Minden olyan forgószárnyas légijármű, amely megfelel a 16. Annex I. kötet zajbizonyítvány előírásoknak

Minden forgószárnyas légijármű, amelynek meg kell felelnie a 16. Annex, I. kötet zajbizonyítvány előírásoknak, hordozza a forgószárnyas légijármű zajbizonyítványát. Amikor ez az okmány vagy a lajstromozó állam részéről jóváhagyott más dokumentumban található zajbizonyítványt tartalmazó megfelelő nyilatkozat nem angol nyelvű, mellékeljék annak hiteles angol nyelvű fordítását is.

1. Megjegyzés: A kötelezettségvállalást a fedélzeten tartott bármilyen dokumentum tartalmazhatja, amelyet a lajstromozó állam a 16. Annex, I. kötet rendelkezéseivel összhangban jóváhagyott.

2. Megjegyzés: A 16. Annex, I. kötetben közölt, és a forgószárnyas légijárműveknél alkalmazható, különböző zajbizonyítvány előírásokat a típusalkalmassági megkérésének dátumával, vagy az igazolást kiadó hatóság által meghatározott egyenértékű eljárás szerint benyújtott kérelem elfogadási dátumával lehet meghatározni. Néhány forgószárnyas légijárműnél nem követelmény, hogy megfeleljen bármelyik zajbizonyítvány előírásnak. Részletesebben lásd a 16. Annex, I. kötet, II. rész, 8 és 11 fejezeteit.

4.14 Utasszállító forgószárnyas légijárművek – utaskabin személyzet ülései

4.14.1 Minden forgószárnyas légijárművet szereljenek fel a forgószárnyas légijármű hossztengelyéhez viszonyított 15° értéken belül előre vagy hátrafelé néző, vállhevederekkel ellátott biztonsági övvel rendelkező üléssel minden egyes utaskabin személyzeti tag részére, akikre a 10.1 szakasz előírása alapján a forgószárnyas légijármű vészkiürítésénél szükség van.

1. Megjegyzés: A 4.2.2 c) 1) alpont előírásai alapján minden egyes további utaskabin személyzeti tag számára biztosítsanak biztonsági övvel ellátott ülőhelyet.

2. Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

4.14.2 Az utaskabin személyzet üléseit úgy helyezzék el, hogy azok a padlószinten és egyéb helyeken található vészkijáratok közelében legyenek, ahogy azt a lajstromozó állam a vészhelyzeti kiürítésre vonatkozó előírásaiban meghatározta.

4.15 Forgószárnyas légijárművek, amelyeket nyomásmagasság-adó másodlagos radar válaszjeladóval kell felszerelni

Minden forgószárnyas légijárművet szereljenek fel a 10. Annex IV. kötetének előírásai szerint üzemelő nyomásmagasság-adó másodlagos radar válaszjeladóval.

Megjegyzés: Ennek az előírásnak célja a légiforgalmi szolgálatok valamint az összeütközést elkerülő fedélzeti rendszerek hatásos működésének fejlesztése.

4.16 Mikrofonok

A pilótakabinban szolgálati feladatot ellátó összes hajózószemélyzeti tag közleményváltásaihoz az átváltási szint/magasság alatt kézi vagy fejhallgatóhoz erősített mikrofont használjon.

5. fejezet
Forgószárnyas légijármű távközlési és navigációs berendezések

5.1 Távközlési berendezés

5.1.1 A forgószárnyas légijárművet olyan rádió távközlésre alkalmas berendezéssel szereljék fel, amely képes:

a) a helikopter repülőtéri irányítás céljainak megfelelő kétoldalú összeköttetés fenntartására;

b) a repülés végrehajtása során bármikor az időjárási tájékoztatások vételére; és

c) a repülés végrehajtása során bármikor kétoldalú rádióösszeköttetés fenntartására legalább egy légiforgalmi állomással valamint más olyan légiforgalmi állomásokkal és olyan hullámhosszokon, amelyeket az illetékes hatóság előírt.

Megjegyzés: A 5.1.1 pont előírásai teljesítettnek tekinthetők, ha a forgószárnyas légijármű az útvonalon szokásos hullámterjedési viszonyok között képes az itt meghatározott távközlési összeköttetések fenntartására.

5.1.2 A 5.1.1 pont alapján előírt rádió berendezés alkalmas legyen rádió összeköttetés fenntartására a 121.5 Mhz-es légiközlekedési vészfrekvencián.

5.2 Navigációs berendezés

5.2.1 A forgószárnyas légijárművet szereljék fel olyan navigációs berendezéssel, amelynek segítségével az képes:

a) az üzemeltetői repülési tervében meghatározott útvonal követésére; és

b) a légiforgalmi szolgálatok előírásainak megfelelő repülés végrehajtására;

kivéve, – amennyiben ezt az illetékes hatóság nem tiltja meg – amikor a látvarepülési szabályok szerint végrehajtott repülés során a navigációt a földi tájékozódási pontok látás utáni azonosításával hajtják vége.

5.2.2 A légtér meghatározott szakaszaiban vagy olyan útvonalakon történő repülés esetében, amelyekre vonatkozóan RNP típust írtak elő, a forgószárnyas légijármű az 5.2.1 pontban ismertetett előírások mellett:

a) legyen felszerelve olyan navigációs berendezésekkel, amelyek lehetővé teszik az előírt RNP típus(ok) szerinti üzemeltetést; és

b) a járató állama részéről rendelkezzen jogosítással az ilyen légtérben történő üzemeléshez.

Megjegyzés: Az előírt navigációs pontosságra (RNP), az ezzel összefüggő eljárásokra valamint a jogosítási folyamatra vonatkozó tájékoztatásokat az RNP Kézikönyv *(Doc 9613) tartalmazza. A kiadvány átfogóan felsorolja azokat a dokumentumokat és egyéb anyagokat, amelyeket az államok és a nemzetközi szervezetek a navigációs rendszerekre valamint az előírt navigációs teljesítményre vonatkozóan készítettek el.*

5.2.3 A forgószárnyas légijárművet olyan navigációs berendezéssel szereljék fel, amely biztosítja, hogy a repülés végrehajtásának bármely szakaszában bekövetkező, az egyik rendszert érintő meghibásodás esetében a forgószárnyas légijárművet a másik rendszerrel az 5.2.1 pont valamint ahol ez alkalmazható, az 5.2.2 pont előírásainak megfelelően tovább lehessen irányítani (navigálni).

5.2.4 A műszeres időjárási körülmények között végrehajtott leszállással tervezett repülések esetében a forgószárnyas légijárművet szereljék fel olyan rádió berendezéssel, amely alkalmas az irányvezetést biztosító rádiójelek vételére addig a pontig, ahonnan a leszállás látással végrehajtható. Ez a rádió berendezés képes legyen az iránxvezetés biztosítására minden olyan tervezett leszállási, valamint bármely kijelölt kitérő helikopter repülőtéren, ahol műszeres időjárási körülmények között történő leszállás végrehajtását tervezik.

5.3 Felszerelés

A berendezéseket úgy szereljék fel, hogy bármelyik egyedi egység meghibásodása amely akár rádió távközlés összeköttetési, akár navigációs illetve mindkét célra szükséges – ne okozza a távközlési összeköttetés vagy navigációs célra szükséges másik egység meghibásodását.

6. fejezet
Forgószárnyas légijármű karbantartás

1. Megjegyzés: A jelen fejezetben történő alkalmazás során a forgószárnyas légijármű kifejezésbe tartoznak a hajtóművek, meghajtás áttételek, forgószárnyak, légcsavarok, alkatrészek, műszerek, szerkezeti egységek és felszerelések, beleértve a vészhelyzeti felszereléseket is.

2. Megjegyzés: A jelen fejezetben megadott előírások a lajstromozó állam előírásait jelentik. Amennyiben a járató állama nem azonos a lajstromozó állammal, szükséges lehet a járató állama bármely további előírásainak figyelembevétele is.

3. Megjegyzés: A folyamatos légialkalmasság követelményeire vonatkozó útmutató a Légialkalmassági Kézikönyv-*ben (Doc 9760) található.*

6.1 A járató karbantartási felelőssége

6.1.1 A járató biztosítsa, hogy a lajstromozó állam részéről elfogadható eljárásokkal összhangban:

a) minden üzemeltetett forgószárnyas légijárműve repülésre alkalmas állapotban legyen;

b) a tervezett repüléshez szükséges üzemeltetési és vészhelyzeti berendezések működőképesek legyenek;

c) minden egyes üzemeltetett forgószárnyas légijárműve Légialkalmassági Bizonyítványa érvényes legyen.

6.1.2 A járató csak abban az esetben üzemeltesse a forgószárnyas légijárművet, ha azt a lajstromozó állam részéről elfogadható, a 6. Annex I. rész 8.7 szakasza alapján jóváhagyott szervezet vagy ennek megfelelő (műszaki) rendszer karbantartja, és szolgálatra átadja.

6.1.3 Amikor a lajstromozó állam elfogadja a fenti megfelelő (műszaki) rendszert, a karbantartási kibocsátó jegyzőkönyvet aláíró személy az 1. Annex előírásainak megfelelő szakszolgálati jogosítással rendelkezzen.

6.1.4 A járató alkalmazzon egy személyt vagy munkacsoportot annak biztosítására, hogy az összes karbantartási feladatot a karbantartási ellenőrző kézikönyvnek megfelelően végzik el.

6.1.5 A járató biztosítsa, hogy forgószárnyas légijárműveinek karbantartását a karbantartási programnak megfelelően végzik el.

6.2 A járató karbantartási ellenőrző kézikönyve

6.2.1 A járató a karbantartást végző szervezetek és személyek tájékoztatására és használatára a 9.2 szakasz előírásaival összhangban, a lajstromozó állam által elfogadható karbantartási ellenőrző kézikönyvet biztosítson. A kézikönyv tartalmi kialakítása vegye tekintetbe az emberi tényezők alapelveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

6.2.2 A járató biztosítsa, hogy a karbantartási ellenőrző kézikönyvet szükség szerint módosítsák és egészítsék ki annak érdekében, hogy az abban található tájékoztatások mindig naprakészek legyenek.

6.2.3 A járató karbantartás irányítási kézikönyve összes módosításának megfelelő példányait haladéktalanul juttassák el minden olyan szervezetnek vagy személynek, amelynek a kézikönyv eredeti példányát átadták.

6.2.4 A járató adja át a járatói karbantartás irányítási kézikönyv egy-egy példányát a lajstromozó és a járató államainak az összes módosítással és/vagy kiegészítéssel továbbá az összes olyan anyaggal együtt, amelyeket ezek kötelezően előírnak.

6.3 Karbantartási program

6.3.1 A járató a karbantartást végző szervezetek és személyek tájékoztatására és használatára a 9.3 szakaszban meghatározott tájékoztatásokat tartalmazó, a lajstromozó állam részéről jóváhagyott karbantartási programot adjon ki. A járató karbantartási programjának kidolgozása és felhasználása alkalmával vegyék figyelembe az emberi tényezők alapelveit.

Megjegyzés: Az Emberi Tényezők alapelveinek alkalmazására vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

6.3.2 A karbantartási program összes módosításának megfelelő példányait haladéktalanul juttassák el minden olyan szervezetnek vagy személynek, amelynek a karbantartási programot átadták.

6.4 Karbantartások nyilvántartása

6.4.1 A járató biztosítsa a következő karbantartási adatok megőrzését a 6.4.2 pontban jelzett időtartamig:

a) a forgószárnyas légijármű és az összes korlátozott ideig üzemeltethető alkatrészének teljes üzemideje (szükség szerint órában, naptári időszakban és repülési ciklusokban meghatározva);

b) a forgószárnyas légijármű állapota az összes kötelező folyamatos légialkalmassági előírás és tájékoztatás teljesítése vonatkozásában;

c) a forgószárnyas légijármű és főbb szerkezeti elemeinek, alkatrészeinek módosítása és javítása valamint ennek részletezése;

d) a forgószárnyas légijármű vagy meghatározott kötelező karbantartási időszakkal vagy ciklussal rendelkező részeinek teljes üzemideje az utolsó (nagy)javítás óta (szükség szerint órában, naptári időszakban és/vagy repülési ciklusokban meghatározva);

e) a forgószárnyas légijármű karbantartási programhoz viszonyított jelenlegi felülvizsgálati – ellenőrzési – helyzete a feladatok végrehajtása alapján; és

f) részletes karbantartási jegyzőkönyvek, amelyekből megállapítható, hogy teljesítették a karbantartási kézikönyvben található, a karbantartási nyilatkozathoz szükséges összes előírást.

6.4.2 A 6.4.1 *a)–e)* alpontokban ismertetett nyilvántartásokat azon egység üzemi élettartamának lejáratát és üzemeltetésből történő végleges kivonását követő legalább 90 napig őrizzék meg, amely egységre a nyilvántartás vonatkozik. A 6.4.1 *f)* alpontban ismertetett jegyzőkönyvet a karbantartási nyilatkozat aláírását követő egy évig őrizzék meg.

6.4.3 Amennyiben a forgószárnyas légijármű járatója ideiglenesen megváltozik, a nyilvántartást bocsássák az új járató rendelkezésére. Ha a járató véglegesen megváltozik, a nyilvántartást adják át az új járatónak.

6.5 Folyamatos légialkalmassági tájékoztatás

6.5.1 A 3180 kg. legnagyobb engedélyezett felszállósúlynál (tömeg) nehezebb forgószárnyas légijármű járatója a folyamatos légialkalmasság szempontjából kövesse figyelemmel és értékelje a forgószárnyas légijármű üzemeltetését és karbantartását, biztosítsa a lajtromozó állam részéről előírt tájékoztatásokat és azokat a 8. Annex II. rész 4.3.5 valamint 4.3.8 pontok előírásaiban meghatározott rendszerben jelentse.

6.5.2 A 3180 kg. legnagyobb engedélyezett felszállósúlynál (tömeg) nehezebb forgószárnyas légijármű járatója a forgószárnyas légijármű típus tervezéséért felelős szervezettől szerezze be és értékelje ki a rendelkezésre álló folyamatos légialkalmassági tájékoztatásokat és ajánlásokat, továbbá ezek alapján a lajstromozó állam által elfogadható eljárásokkal összhangban szükség szerint vezessen be megfelelő intézkedéseket.

Megjegyzés: A forgószárnyas légijármű típus tervezéséért felelős szervezet kifejezés értelmezésére vonatkozó útmutatót a Légialkalmassági Kézikönyv *(Doc 9760) tartalmazza.*

6.6 Módosítások és javítások

Az összes módosítást és javítást a lajstromozó állam által elfogadható légialkalmassági előírásoknak megfelelően végezzék el. Dolgozzanak ki eljárásokat annak biztosítására, hogy elegendő mennyiségű adatot gyűjtsenek össze és őrizzenek meg annak bizonyítására, hogy a légialkalmasságra vonatkozó követelményeknek eleget tettek.

6.7 Karbantartási nyilatkozat

6.7.1 A karbantartási munka kielégítő, a karbantartó szervezet működési kézikönyvében ismertetett eljárásoknak és a jóváhagyott feltételeknek megfelelően történő sikeres elvégzésének igazolására készítsenek el és írjanak alá karbantartási nyilatkozatot.

6.7.2 A karbantartási nyilatkozat tartalmazzon igazolást az alábbiakról:

a) az elvégzett karbantartási munka alapvető részletei, beleértve a felhasznált engedélyezési illetve jóváhagyási feltételek részletezését;

b) a karbantartás befejezésének időpontja;

c) az engedélyezett karbantartó szervezet azonosítója – amennyiben ez alkalmazható; és

d) a karbantartási nyilatkozatot aláíró személy vagy személyek neve.

6.8 Nyilvántartások

6.8.1 A járató biztosítsa a következő nyilvántartások vezetését:

a) a forgószárnyas légijármű teljes egésze vonatkozásában – a teljes üzemidő;

b) a forgószárnyas légijármű összes fő alkatrésze vonatkozásában:

1) teljes üzemidő;

2) az utolsó nagyjavítás időpontja;

3) az utolsó felülvizsgálat időpontja;

c) az összes korlátozott ideig üzemeltethető műszer és berendezés vonatkozásában;

1) az üzemképesség meghatározásához vagy az üzemi élettartam kiszámításához szükséges üzemidő nyilvántartás;

2) az utolsó felülvizsgálat időpontja.

6.8.2 Ezeket a nyilvántartásokat azon egység üzemi élettartamának lejáratát követő 90 napig őrizzék meg, amely egységre a nyilvántartás vonatkozik.

7. fejezet
A forgószárnyas légijármű hajózószemélyzete

7.1 A hajózószemélyzet összetétele

7.1.1 A hajózószemélyzet tagjainak száma és összetétele az üzemeltetési kézikönyv előírásaiban megállapítottnál ne legyen alacsonyabb. A repülésvégrehajtási kézikönyvben vagy a légijármű légialkalmassági bizonyítványával összefüggésben levő más egyéb dokumentumban meghatározott minimális létszámon felül a hajózószemélyzetet egészítsék ki további hajózószemélyzeti tagokkal abban az esetben, ha ezt a forgószárnyas légijármű vagy az adott üzemeltetés típusa valamint a hajózószemélyzet váltási pontok közötti repülés időtartama szükségessé teszi.

7.1.2 A hajózószemélyzetben legalább egy olyan tag legyen, aki az alkalmazott rádiótávbeszélő berendezés üzemeltetésére jogosító, a lajstromozó állam által kiadott vagy elfogadott érvényes rádiótávbeszélő kezelői engedéllyel rendelkezik.

7.2 A hajózószemélyzeti tag vészhelyzeti kötelességei

A járató minden egyes forgószárnyas légijármű típusra jelölje ki és határozza meg a hajózószemélyzet minden tagjának vészhelyzetben vagy a forgószárnyas légijármű vészkiürítése esetében elvégzendő egyéni feladatait. A járató kiképzési programja tartalmazza ezen vészhelyzeti feladatok éves gyakorlását, beleértve az összes vészhelyzeti és előírás szerint szállított életmentő berendezés használatát valamint a forgószárnyas légijármű kiürítésének gyakorlását is.

7.3 A hajózószemélyzeti tag kiképző programok

7.3.1 A járató dolgozzon ki és folyamatosan tartson fenn a járató állama által elfogadott és jóváhagyott földi és repülési kiképzési programot, amely biztosítja, hogy kijelölt feladatainak ellátására a hajózószemélyzet minden tagja megfelelő kiképzésben részesüljön.
A kiképzési program:

a) Tartalmazzon a járató állama által meghatározott földi és repülési kiképző létesítményeket, továbbá jól képzett és jogosított oktatókat is;

b) Földi és repülési kiképzésből álljon minden olyan forgószárnyas légijármű típuson, amelyen a hajózószemélyzeti tag szolgálatot teljesít;
c) terjedjen ki a hajózószemélyzet tagjai közötti együttműködésre, továbbá az összes olyan vészhelyzet vagy rendellenes üzemelés esetén szükséges eljárás gyakorlására, amely a hajtómű, áttételi rendszer, forgószárny, sárkányszerkezet, repülési rendszerek meghibásodása, tűz vagy más rendellenesség esetében következhet be;
d) tartalmazzon olyan elméleti és gyakorlati képzést, amely a betervezett üzemeltetési területekre érvényes látás szerinti és műszeres repülési eljárásokra, a fenyegetések és hibák kezelését is magába foglaló emberi teljesítőképesség fejlesztésére, valamint a veszélyes áruk szállítására tér ki;
e) biztosítsa, hogy a hajózószemélyzet minden egyes tagja ismerje azokat a feladatokat, amelyek végrehajtásáért személyesen felelős, továbbá ezen feladatok kapcsolatát a hajózószemélyzet többi tagjának feladataival, különös tekintettel a vészhelyzeti, vagy rendellenes üzemelés esetében szükséges eljárásokra; és
f) a járató államának előírásai alapján rendszeres időközönként kerüljön megismétlésre, melynek alkalmával az érintettek jártasságukról tegyenek vizsgát.

1. Megjegyzés: A 2.2.4 pont tiltja, hogy vészhelyzeti vagy a rendes üzemeléstől eltérő gyakorlást illetve szimulációt végezzenek a repülés közben abban az esetben, ha a fedélzeten utasok tartózkodnak vagy *teherárut szállítanak.*

2. Megjegyzés: A repülési kiképzést a járató állama által megfelelőnek tartott mértékben a járató állama által erre a célra engedélyezett szintetikus repülési gyakorló berendezésen is végre lehet hajtani.

3. Megjegyzés: A 7.2 és 7.3 szakaszokban előírt ismétlődő kiképzés terjedelme változtatható és annak nem kell olyan alaposnak lennie, mint az adott forgószárnyas légijármű típus vonatkozásában lebonyolított első (alap) kiképzés.

4. Megjegyzés: Az időszakos földi kiképzés követelményeinek biztosítására a járató állama által megfelelőnek tartott mértékben levelező tanfolyamokat, írásbeli vizsgáztatást vagy más, elfogadott módszereket is alkalmazhatnak.

5. Megjegyzés: A veszélyes áruk szállításával kapcsolatos kiképzésre vonatkozó előírásokat a 18. Annex tartalmazza.

6. Megjegyzés: Az emberi teljesítmény és gyakorlati ismeretek fejlesztését célzó kiképzési programok tervezésére vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv*-ében (Doc 9683) található.*

7. Megjegyzés: A repülőgépvezetőknek és a légiüzemeltetéssel foglalkozó személyeknek szóló azon információkat, amelyek a repülősi eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülősi eljárások felépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.

8. Megjegyzés: A hajózószemélyzetek kiképzési programjainak tartalmi összeállítására vonatkozó útmutató anyag a Repülésüzemi Kézikönyv Előkészítése *(Doc 9376) című anyagban található.*

9. Megjegyzés: az alkalmasság megállapítására használatos különböző eszközökre vonatkozó útmutató A Légiforgalmi Szolgálatok Eljárásai – Képzés *(PANS-TRG, Doc 9868) című anyag 2. fejezetének mellékletében található.*

7.3.2 Az időszakos ismétlődő repülési képzés követelményei az adott forgószárnyas légijármű típus vonatkozásában teljesítettnek tekinthetők, amennyiben:

a) a járató állama által elfogadott mértékben olyan forgószárnyas légijármű szintetikus repülési gyakorló berendezést használnak, amelyet az érintett állam erre a célra elfogadott; vagy

b) az adott forgószárnyas légijármű típusra a 7.4.4 pontban előírt repüléstechnikai ellenőrzést megfelelő időszakon belül elvégzik.

7.4 Jogosítások

Megjegyzés: A személyzet kereszt jogosításának az eltérő típusokon való repülésnek és a képzettség beszámításának általános tulajdonságaira vonatkozó útmutatót lásd az Egyéni szakszolgálati engedélyek kiadását biztosító állami rendszer létrehozására vonatkozó eljárások kézikönyvében *(Doc 9379).*

7.4.1 Folyamatos gyakorlatban tartás – légijármű parancsnok

7.4.1.1 A járató a forgószárnyas légijárművön légijármű parancsnoknak csak olyan légijármű-vezetőt jelöljön ki, aki megelőző kilencven nap folyamán az adott forgószárnyas légijármű típussal, vagy annak típus változatával legalább három fel és leszállást hajtott végre.

7.4.1.2 Amikor egy repülőgép parancsnok azonos típusú forgószárnyas légijármű különböző változatait, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró, de eltérő típusú forgószárnyas légijárműveket vezeti, az állam döntse el, hogy a 7.4.1.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra, vagy minden egyes forgószárnyas légijármű típusra vonatkozóan.

7.4.2 Folyamatos gyakorlatban tartás – másodpilóta

7.4.2.1 A járató a repülési rendszerek fel és leszállás végrehajtása közben történő kezelésére csak olyan másodpilótát jelöljön ki, aki a megelőző kilencven nap folyamán az adott forgószárnyas légijármű típuson légijármű parancsnokként, vagy másodpilótaként szolgálatot teljesített és a légijárművet ilyen minőségében vezette, vagy az erre a célra elfogadott mesterséges repülés gyakorló berendezésen bizonyította alkalmasságát a másodpilóta feladatainak ellátására.

7.4.2.2 Amikor egy másodpilóta azonos típusú forgószárnyas légijármű különböző változatait, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró, de eltérő típusú forgószárnyas légijárműveket vezeti, az állam döntse el, hogy a 7.4.2.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra, vagy minden egyes forgószárnyas légijármű típusra vonatkozóan.

7.4.3 Légijármű parancsnok útvonal és helikopter repülőtér jogosítása

7.4.3.1 A járató a légijármű-vezetőt forgószárnyas légijármű parancsnokként mindaddig ne jelölje ki olyan útvonalra, vagy útvonal szakaszra, amelyre az érintett légijármű-vezetőnek nincs érvényes jogosítása, amíg az érintett légijármű-vezető eleget nem tesz a 7.4.3.2 és 7.4.3.3 pontok előírásainak.

7.4.3.2 Valamennyi érintett légijármű-vezető a járató számára bizonyítsa, hogy megfelelő mértékben ismeri a következőket:

a) a lerepülendő útvonalat valamint az igénybe vett helikopter repülőtereket a következő jellemzők vonatkozásában;

1) domborzati viszonyok és legalacsonyabb biztonságos repülési magasságok;

2) az évszaknak megfelelő időjárási körülmények;

3) a meteorológiai, távközlési és légiforgalmi irányítási létesítmények, szolgálatok valamint eljárások;

4) a kutató és mentő szolgálati eljárások; és

5) a tervezett repülési útvonal teljes hosszán található navigációs létesítmények és eljárások.

b) a sűrűn lakott területek felett valamint a nagy-forgalmú légtereken átvezető repülési útvonalak eljárásai, akadályai, fizikai jellemzői, megközelítési segédeszközei, érkezési, indulási, várakozási és műszeres megközelítési eljárásai továbbá az alkalmazható üzemeltetési minimumok.

Megjegyzés: Az érkezési, indulási, várakozási és műszeres megközelítési eljárások ismeretét az erre a célra alkalmas kiképzési segédeszköz igénybevételével is bizonyítani lehet.

7.4.3.3 A légijármű parancsnoka hajtson végre egy tényleges megközelítést az útvonalon elhelyezkedő összes leszállási helikopter repülőtérre olyan légijármű-vezető megfigyelése mellett, aki az adott helikopter repülőtérre rendelkezik jogosítással és hajózószemélyzeti tagként vagy megfigyelőként a fedélzeten tartózkodik, kivéve ha:

a) a helikopter repülőtér megközelítése nem nehéz terep felett történik és a műszeres megközelítési eljárások valamint az ehhez rendelkezésre álló segédeszközök hasonlóak azokhoz, amelyeket a légijármű-vezető jól ismer, továbbá az általános üzemeltetési minimumokat a járató állama által elfogadott biztonsági tűrésekkel megnövelték vagy a megközelítés és leszállás nagy valószínűséggel látás utáni időjárási körülmények között hajtható végre; vagy

b) a kezdeti megközelítési magasságról történő süllyedés nappal és látás utáni időjárási körülmények között hajtható végre; vagy

c) a járató a légijármű parancsnokát megfelelő képes segédeszközök segítségével felkészíti és jogosítja az adott helikopter repülőtéren történő leszállás végrehajtására.

7.4.3.4 A járató vezessen megfelelő nyilvántartást, amellyel a járató állama részére kielégítően bizonyítja a légijármű-vezető jogosítását, valamint a jogosítás megszerzésének módját.

7.4.3.5 A járató egy légijármű-vezetőt egy útvonalon légijármű parancsnokként csak akkor foglalkoztasson tovább, ha az érintett a megelőző 12 hónapon belül hajózószemélyzeti tagként, ellenőrző légijármű-vezetőként vagy a pilótakabinban megfigyelőként legalább egy utat megtett az útvonal két végpontja között. Amennyiben több mint 12 hónap telt el azóta, hogy a légijármű-vezető nem repült az útvonal közvetlen közelében és hasonló adottságú terep felett, az adott útvonalon légijármű parancsnokként történő foglalkoztatása előtt a 7.4.3.2 és 7.4.3.3 pontok előírásai alapján ismételt útvonal-jogosítást kell szereznie.

7.4.4 A légijármű-vezető szakmai jártasságának ellenőrzése

7.4.4.1 A járató biztosítsa a légijármű-vezető repüléstechnikai felkészültségének és a vészhelyzeti eljárások megfelelő végrehajtásának ellenőrzését oly módon, amelyből egyértelműen kiderül a légijármű-vezető szakmai jártassága. Amennyiben az üzemeltetés műszerrepülési szabályok között is végrehajtható, a járató biztosítsa, hogy a forgószárnyas légijármű-vezető az ilyen (IFR) szabályok alapján történő megfelelő tevékenységét, szakmai jártasságát a járató ellenőrző légijármű-vezetője vagy a járató államának képviselője számára bizonyítsa. Az ilyen ellenőrzéseket egy éven belül két alkalommal végezzék el, azonban négy egymást követő hónapon belül kétszer végrehajtott hasonló jellegű ellenőrzés a fenti követelményt nem elégíti ki.

Megjegyzés: Az ellenőrzések olyan részleteinek végrehajtására felhasználhatók a járató állama által erre elfogadott mesterséges repülés gyakorló berendezés, amelyekre ezek külön jogosítással rendelkeznek.

7.4.4.2 Amikor egy járató a hajózó személyzetet azonos típusú forgószárnyas légijármű különböző változataira, vagy a légiüzemeltetési eljárások, a rendszerek és a kiszolgálás tekintetében hasonló jellemzőkkel bíró de eltérő típusú forgószárnyas légijárművekre osztja be, az állam döntse el, hogy a 7.4.4.1 bekezdés követelményeit milyen feltételekkel lehet összekapcsolni minden egyes változatra vagy minden egyes repülőgép típusra vonatkozóan.

7.5. A hajózószemélyzet felszerelése

A hajózószemélyzet tagja rendelkezzen könnyen hozzáférhető, megfelelő tartalék szemüveggel abban az esetben, ha szakszolgálati tevékenységének végzésére csak megfelelő korrekciós szemüveg viselése mellett jogosult.

7.6 Repülési idő, repülési szolgálati idő és pihenőidő

A járató állama dolgozzon ki előírásokat a hajózószemélyzet tagjainak repülési idejének valamint repülési szolgálati idejének korlátozására. Ezek az előírások biztosítsák a megfelelő pihenőidőt és olyanok legyenek, hogy a repülés vagy repülési sorozat végrehajtása során illetve bizonyos időszak alatt ezen feladatok és más események miatt felhalmozódott fáradtság ne veszélyeztesse a repülés biztonságát.

Megjegyzés: A korlátozások kidolgozására vonatkozó útmutató az A. Mellékletben található.

8. fejezet
Repülés-üzemi tiszt / szolgálatvezető

8.1 Amennyiben a járató állama megköveteli, hogy a légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerén belül alkalmazott repülés-üzemi tiszt/szolgálatvezető rendelkezzen szakszolgálati engedéllyel, akkor az érintett repülés-üzemi tisztet/szolgálatvezetőt az 1. Annex előírásainak megfelelő szakszolgálati engedéllyel lássák el.

8.2 Amennyiben a repülés-üzemi tiszt/szolgálatvezető szakszolgálati engedélytől eltérő más jogosítási módszert fogadnak el, akkor a légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével összefüggésben, a járató állama követelje meg, hogy az ilyen személyek minimum feleljenek meg az 1. Annexben a repülés-üzemi tisztre/szolgálatvezetőre meghatározott követelményeknek.

8.3 A légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével szolgálatra csak azt követően osztható be, hogy:

a) megfelelően elvégezte a járatóra meghatározott tanfolyamot, amely tartalmazza a 2.2.1.4 bekezdésben a járató légiüzemeltetés irányításának és felügyeletének jóváhagyott rendszerével összefüggő sajátságos összetevőket;

Megjegyzés: az ilyen tananyag összeállítására vonatkozó útmutató a Kiképzési Kézikönyv *(Doc 7192),* Repülés-üzemi tiszt/szolgálatvezető *című D-3 részében található.*

b) a megelőző 12 hónapon belül legalább egy alkalommal egy egy-irányú útvonal jogosító repülésen vett részt a forgószárnyas légijármű pilótakabinjában bármely olyan terület felett, amelyre repülésfelügyeleti jogosítással rendelkezik. A repülés gyakorlati szempontból a lehető legtöbb forgószárnyas légijármű leszállóhelyre való leszállást is foglaljon magába;

Megjegyzés: A jogosító repülés céljainak megfelelően a repülés-üzemi tiszt/szolgálatvezető legyen képes ellenőrizni a hajózó személyzet egymás közötti kommunikációját biztosító rendszert és a rádió kommunikációt, és legyen képes megfigyelni a hajózó személyzet tevékenységét.

c) a járatónak bizonyította, hogy kielégítő mértékben ismeri:

1) az 1. Függelékben ismertetett üzemeltetési kézikönyv tartalmát;

2) az alkalmazott forgószárnyas légijárművek rádió berendezéseit; és

3) az alkalmazott forgószárnyas légijárművek navigációs berendezéseit;

d) bizonyította a járatónak, hogy ismeri azon feladatok következő részleteit, amelyekért felelős valamint azokat a területeket, amelyeken az érintett repülés-üzemi tiszt/szolgálatvezető repülés-felügyelet gyakorlására jogosult;

1) az évszaknak megfelelő időjárási körülmények és a meteorológiai tájékoztatások beszerzési forrásai;

2) az időjárási körülmények hatásai az alkalmazott forgószárnyas légijárművek rádió berendezéseinek vételi tulajdonságaira;

3) az üzemeltetés során használt egyes rádiónavigációs rendszerek jellegzetességei és üzemeltetési korlátozásai; és

4) a repülőgép terhelési utasítása;

e) bizonyította a járatónak, hogy rendelkezik az emberi teljesítőképességgel összefüggő olyan ismeretekkel és jártassággal, amelyek a szolgálatvezetői tevékenységgel állnak kapcsolatban; és

f) bizonyította a járatónak, hogy képes a 2.6 pontban kijelölt feladatainak ellátására.

8.4 ***Ajánlás*** *– A szolgálatra kijelölt repülés-üzemi tiszt/szolgálatvezető teljes mértékben ismerje a feladatkörét érintő üzemeltetés összes jellemzőit, beleértve az emberi teljesítőképességgel kapcsolatos elméleti és gyakorlati ismereteket.*

Megjegyzés: Az emberi teljesítmény és gyakorlati ismeretek fejlesztését célzó kiképzési programok tervezéséhez útmutató az Emberi Tényezők Kiképzési Kézikönyv-ében (Doc 9683) található.

8.5 ***Ajánlás*** *– A repülés-üzemi tisztet/szolgálatvezetőt ne jelöljék ki szolgálatra abban az esetben, ha egymást követő 12 hónapon keresztül ilyen szolgálatot nem látott el, kivéve, ha a 8.3 pont előírásainak eleget tesz.*

9. fejezet
Kézikönyvek, naplók és nyilvántartások

Megjegyzés: A következő kiegészítő kézikönyvek, nyilvántartások és jegyzőkönyvek a jelen Annex anyagához kapcsolódnak, azonban ezeket a fejezet nem tartalmazza:

tüzelőanyag és olaj jegyzőkönyvek	lásd 2.2.8
karbantartások nyilvántartása	lásd 6.8
repülési idő jegyzőkönyvek	lásd 2.2.9.3
repülés előkészítési formanyomtatványok	lásd 2.3
üzemeltetői repülési terv	lásd 2.3.3
légijármű parancsnok útvonal és repülőtér jogosításainak nyilvántartásai	lásd 7.4.3.4

9.1 Repülésvégrehajtási kézikönyv

Megjegyzés: A repülésvégrehajtási kézikönyv a 8. Annex-ben meghatározott tájékoztatásokat tartalmazza.

A repülésvégrehajtási kézikönyvet a lajstromozó állam előírásai alapján kötelező érvényű változások behelyezésével tartsák naprakészen.

9.2 Járató karbantartás irányítási kézikönyve

A járató 6.2 szakasz előírásai alapján biztosított karbantartás irányítási kézikönyve, amelyet több részben is kiadhat, a következő tájékoztatásokat tartalmazza:

a) a 6.1.1 pont alapján előírt eljárások ismertetése, szükség szerint:

1) a járató és az engedélyezett karbantartó szervezet közötti adminisztratív megállapodások;

2) a karbantartás végrehajtási eljárások valamint a karbantartási nyilatkozat elkészítési és aláírási eljárások, amikor a karbantartást olyan rendszerben hajtják végre, amely nem azonos az engedélyezett karbantartó szervezet eljárásaival;

b) a 6.1.4 pontban előírt személy vagy személyek neve és feladatai;

c) hivatkozás a 6.3.1 pontban előírt karbantartási programra;

d) a járató karbantartási jegyzőkönyveinek elkészítési és megőrzési módszerei a 6.4 szakasz előírásai alapján;

e) a 6.5.1 pontban előírt karbantartás és üzemeltetés felügyeleti, értékelési és jegyzőkönyvezési eljárások ismertetése;

f) a 8. Annex II. rész 4.3.5 és 4.3.8 pontjaiban előírt, a szolgálati tájékoztatások jelentésére vonatkozó követelmények teljesítésének eljárásai;

g) a 6.5.2 pontban előírt folyamatos légialkalmassági tájékoztatások értékelésének és az ennek alapján végrehajtott bármely tevékenység elvégzésének eljárásai;

h) a kötelező folyamatos légialkalmassági tájékoztatás alapján szükséges intézkedések végrehajtásának eljárásai;

i) az ellenőrzési és elemzési rendszer kialakításának és fenntartásának ismertetése valamint a karbantartási program teljesítményének és hatékonyságának folyamatos felügyelete, melynek célja a program bármely hiányosságának kiküszöbölése;

j) az légijármű típusok és típusváltozatok ismertetése, amelyekre a kézikönyv alkalmazható;

k) azon eljárások ismertetése, amelyek biztosítják a légialkalmasságot befolyásoló meghibásodások, valamint hiányosságok jegyzőkönyvezését és kijavítását; és

l) azon eljárások ismertetése, amelyekkel a lajstromozó államot értesítik a repülés végrehajtás során bekövetkezett jelentősebb rendellenességekről.

m) a légijármű és a hozzá tartozó szerkezeti elemek bérletének ellenőrzésére vonatkozó eljárások ismertetése; és

n) a Karbantartás Irányítási Kézkönyv módosítási eljárásainak ismertetése.

9.3 Karbantartási program

9.3.1 Minden egyes forgószárnyas légijármű karbantartási programja a 6.3 szakasz előírásai alapján a következőket tartalmazza:

a) a karbantartási feladatok és ezek elvégzésének időszakai a forgószárnyas légijármű várható és tervezett igénybevételének figyelembevételével;

b) a forgószárnyas légijármű szerkezeti épségének folyamatos ellenőrzése – amikor ez a karbantartási feladat alkalmazható;

c) a fenti a) és b) alpontok előírásaitól való eltérés vagy azok megváltozatása céljából alkalmazott eljárások; és

d) a forgószárnyas légijármű rendszereinek, alkatrészeinek, meghajtás áttételeinek, forgószárnyainak valamint hajtóműveinek állapotát és megbízhatóságát felülvizsgáló programok szükség szerinti ismertetése.

9.3.2 A forgószárnyas légijármű típusra kötelezőnek kijelölt karbantartási feladatokat és ezek elvégzésének időszakait ennek megfelelően azonosítsák.

9.3.3 **Ajánlás** – *A karbantartási programot a tervezés állama vagy a típus tervezéséért felelős szervezet által rendelkezésre bocsátott tájékoztatások valamint bármely más megfelelő gyakorlati tapasztalatok alapján dolgozzák ki.*

9.4 Útinapló

9.4.1 **Ajánlás** – *A forgószárnyas légijármű útinaplója a következő tételeket és a vonatkozó római számokat tartalmazza:*

I - A forgószárnyas légijármű nemzeti hovatartozása és lajstromjele.
II - A repülés időpontja.
III - A személyzeti tagok névsora.
IV - A személyzet tagjainak kijelölt feladatai.
V - Az indulás helye.
VI - Az érkezés helye.

VII - Az indulás időpontja.
VIII - Az érkezés időpontja.
IX - A repülés időtartama.
X - A repülési feladat pontos meghatározása (magáncélú, menetrendszerű vagy nem-menetrendszerű repülés).
XI - Események és megfigyelések – ha van.
XII - A felelős személy aláírása.

9.4.2 **Ajánlás** – *A forgószárnyas légijármű útinaplót naprakészen vezessék, a bejegyzéseket tollal vagy kitörölhetetlen ceruzával írják be.*

9.4.3 **Ajánlás** – *A kitöltött útinaplót őrizzék meg, hogy a forgószárnyas légijármű üzemeltetésének utolsó hat hónapjáról folyamatos feljegyzés álljon rendelkezésre.*

9.5 A fedélzeten szállított vészhelyzeti és túlélési felszerelések jegyzéke

A járató mindig rendelkezzen a mentést koordináló központnak azonnal továbbítható jegyzékkel, amely tartalmazza a nemzetközi légiközlekedésben üzemeltetett bármely forgószárnyas légijárművének fedélzetén szállított vészhelyzeti és túlélési felszerelések felsorolását. A tájékoztató szükség szerint tartalmazza a mentőtutajok számát, színét és típusát, a rendelkezésre álló pirotechnikai eszközök ismertetését, a vészhelyzeti egészségügyi készletek részletezését, a vízkészletek meghatározását valamint a hordozható vészhelyzeti rádióberendezések típusát és frekvenciáit.

9.6 Repülési adatrögzítő felvételei

A járató a lehetőségek határain belül biztosítsa, hogy amennyiben egyik forgószárnyas légijárműve balesetet szenvedett vagy repeseményben érintett, az összes vonatkozó repülési adatrögzítő felvételt és ha szükséges, a repülési adatrögzítő berendezéseket is megőrizze és azokat a 13. Annex előírásaival összhangban biztonságos őrizet alatt tárolja.

10. fejezet
Utaskabin személyzet

10.1 Vészhelyzeti feladatok kijelölése

A járató a járató államának egyetértésével minden egyes forgószárnyas légijármű típusához az ülésszám vagy a szállított utasok száma alapján határozza meg az utaskabin személyzet legkisebb számát annak érdekében, hogy vészhelyzetben vagy olyan esetben, amikor a forgószárnyas légijármű vészkiürítése válik szükségessé, a fentiekre előírt feladatokat valamint a forgószárnyas légijármű biztonságos és gyors elhagyását végrehajtsák. Ezeket a feladatokat a járató minden egyes forgószárnyas légijármű típusára határozza meg.

10.2 Az utaskabin személyzet védelme a repülés alatt

A fel és leszállás végrehajtása alkalmával továbbá minden olyan esetben, amikor a légijármű parancsnoka erre utasítást ad, minden egyes utaskabin személyzeti tag foglaljon helyet és biztonsági övét vagy ha ilyet biztosítottak, vállhevederekkel ellátott biztonsági övét csatolja be.

Megjegyzés: Az előbbiek nem zárják ki, hogy a légijármű parancsnoka a fel és leszállás végrehajtásának kivételével bármely más alkalommal csak a biztonsági övek becsatolását rendelje el.

10.3 Kiképzés

A járató a járató államának jóváhagyásával dolgozzon ki és bonyolítson le kiképzési programot, amelyen utaskabin személyzeti tagnak történő kijelölése előtt minden érintett személynek részt kell vennie. Az utaskabin személyzet ezt követően évente vegyen részt ismétlődő képzési programon. Ezek a kiképzési programok biztosítsák, hogy minden érintett személy:

a) gyakorlottan végre tudja hajtani azokat a biztonsági feladatokat és kötelezettségeket, amelyek elvégzésére a repülés során bekövetkező vészhelyzet vagy vészkiürítést igénylő helyzet esetében az utaskabin személyzeti tagot kijelölték;

b) megfelelő gyakorlati tapasztalatokkal rendelkezzen a forgószárnyas légijármű fedélzetén történő szállításra előírt vészhelyzeti és életmentő felszerelések használatában és képes legyen ezen eszközök, mint például mentőmellények, mentőtutajok, vészcsúszdák, vészkijáratok, hordozható tűzoltó készülékek, oxigén berendezések és elsősegély-nyújtó készletek használatára;

c) amennyiben 3000 méter (10 000 láb) repülési magasság felett üzemeltetett forgószárnyas légijárművön teljesít szolgálatot, ismerje az oxigén hiány hatásait, valamint a túlnyomásos kabinnal rendelkező forgószárnyas légijármű esetében a hirtelen nyomásvesztést, azaz dehermetizációt kísérő fiziológiai tüneteket;

d) olyan mértékben ismerje a személyzet többi tagjának vészhelyzet esetére kijelölt feladatait, amennyire ez saját feladatainak ellátásához szükséges; és

e) ismerje a forgószárnyas légijármű utaskabinjában szállítható illetve nem szállítható veszélyes árukat és végezze el a veszélyes áruk szállítására vonatkozó, a 18. Annex-ben előírt kiképzési programot; és

f) ismerje az utaskabinban végrehajtandó biztonsági feladatokat érintő emberi tevékenységet és teljesítményt, beleértve az utaskabin személyzet és a hajózószemélyzet közötti együttműködést is.

Megjegyzés: Az emberi teljesítmény ismeretének fejlesztését célzó kiképzési programok tervezésére vonatkozó útmutató az Emberi Tényezők Kiképzési Kézikönyv-*ében (Doc 9683) található.*

10.4 Repülési idő, repülési szolgálati idő és pihenőidő

A járató állama dolgozzon ki előírásokat az utaskabin személyzet repülési idejének és repülési szolgálati idejének korlátozására valamint a megfelelő pihenőidő biztosítására.

Megjegyzés: A korlátozások kidolgozásával kapcsolatos útmutató az A. Mellékletben található.

11. fejezet
Védelem

Megjegyzés: A jelen fejezetben a "védelem" kifejezés a polgári légiközlekedéssel szemben végrehajtott jogellenes (törvénytelen) cselekedetek megakadályozását jelenti.

11.1 Forgószárnyas légijármű átkutatás ellenőrző jegyzéke

A járató biztosítsa, hogy a forgószárnyas légijármű fedélzetén helyezzenek el ellenőrző jegyzéket, amely tartalmazza azokat az eljárásokat, amelyek alapján a feltételezett szabotázs esetében a robbanószerkezet felkutatása érdekében végrehajtják a forgószárnyas légijármű átvizsgálását. Az ellenőrző jegyzék mellett biztosítsanak útmutatást azokról a feladatokról és tevékenységekről, amelyeket abban az esetben szükséges végrehajtani, ha robbanószerkezetet vagy gyanús tárgyat találnak.

11.2 Kiképzési programok

11.2.1 A járató dolgozzon ki és bonyolítson le kiképzési programot, amely biztosítja, hogy a személyzet minden tagja a helyzetnek leginkább megfelelő módon tevékenykedjen, a lehető legkisebbre csökkentve ezzel a jogellenes beavatkozás következményeit.

11.2.2 A járató dolgozzon ki és bonyolítson le további kiképzési programot, amelynek során az érintett alkalmazottai megismerik azokat a megelőző intézkedéseket és a szükséges módszereket, amelyek az utasok, poggyász, teheráru, postaküldemények, felszerelések és kellékek forgószárnyas légijárművön történő szállítására vonatkoznak, hozzájárulva ezzel a szabotázs vagy más jogellenes beavatkozás megelőzéséhez.

11.3 A jogellenes beavatkozás jelentése

A jogellenes beavatkozást követően a légijármű parancsnoka a kijelölt helyi hatóságnak késedelem nélkül tegyen jelentést erről az eseményről.

III. szakasz
Általános célú nemzetközi légiközlekedés

1. fejezet
Általános rész

1. Megjegyzés: Bár a Nemzetközi Polgári Légiközlekedési Egyezmény a lajstromozó államra bizonyos feladatokat ír elő, amelyek végrehajtására az állam jogosult vagy kötelezett, a Közgyűlés A23-13 számú határozatában elismerte azt a tényt, hogy a lajstromozó állam bizonyos körülmények között képtelen megfelelő módon eleget tenni a fenti kötelezettségének, amikor a légijárművet más állam járatója – elsősorban hajózószemélyzet nélkül – bérbe veszi, szerződés vagy csere megállapodás alapján üzemelteti valamint azt is, hogy amíg az Egyezmény 83/b. cikkelye életbe nem lép, az Egyezmény nem megfelelően határozza meg a járató államára ilyen esetekben vonatkozó jogokat és kötelezettségeket. Ezért a Tanács felhívja a figyelmet arra, hogy ha a fenti esetekben a lajstromozó állam megállapítja, hogy képtelen az Egyezményben előírt kötelezettségei teljesítésére, azokat a feladatokat, amelyeket a járató állama jobban el tud végezni és amennyiben ez a feladatok végrehajtását elvállalja, járató államára utalhatja át. Tudomásul vették, hogy a 83/b. cikkely hatályba lépéséig a fentiek csak gyakorlati szempontból lesznek célszerűek és nem érintik a Chicagó-i Egyezménynek a lajstromozó államra vagy egy harmadik államra háruló kötelezettségeit. Mindazonáltal, mivel a 83/b. cikkely 1997 június 20-án hatályba lépett, a vonatkozó kiegészítő jegyzőkönyvet (Doc 9318) aláíró államok kötelesek az ilyen átadási megállapodásokban foglaltak teljesítésére.

2. Megjegyzés: A nemzetközi légi üzemeltetés esetében, amelyet olyan forgószárnyas légijárművekkel bonyolítanak le, amelyek nem mindegyike van azonos szerződő államban lajstromozva, a jelen rész előírásai közül semmi sem akadályozza meg az érintett államokat abban, hogy szerződés alapján közösen végezzék el azokat a feladatokat, amelyek végrehajtására a vonatkozó Annex-ek a lajstromozó államot jelölik ki.

1.1 A jogszabályok, előírások és eljárások betartása

1.1.1 A légijármű parancsnoka tegyen eleget azon államok megfelelő törvényeinek, előírásainak és eljárásainak, amelyekben a forgószárnyas légijárművet üzemeltetik.

1. Megjegyzés: A lajstromozó állam az 1.1.1 pont előírásával nem ellentétes, fokozottan korlátozó intézkedéseket is előírhat.

2. Megjegyzés: A nyílt vizek feletti repülési feladatok végrehajtására vonatkozó előírásokat a 2. Annex tartalmazza.

3. Megjegyzés: A repülőgépvezetőknek szóló azon információkat, amelyek a repülési eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülési eljárások felépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.

1.1.2 A légijármű parancsnoka felelős a forgószárnyas légijármű fedélzeten tartózkodó összes hajózószemélyzeti tag, utas és az elhelyezett teheráru biztonságáért. A parancsnok felelős továbbá a forgószárnyas légijármű üzemeltetéséért és biztonságáért attól a pillanattól kezdve, amikor a hajtóműve(ke)t beindítják addig, mikor a forgószárnyas légijármű a repülés után végleg megáll, a hajtómű egysége(ke)t leállítják és a forgószárny megáll.

1.1.3 Amennyiben a forgószárnyas légijármű vagy az utasok biztonságát fenyegető vészhelyzet esetében olyan tevékenységre van szükség, amellyel megsértik a helyi előírásokat vagy eljárásokat, erről a légijármű parancsnoka késedelem nélkül értesítse az illetékes helyi hatóságot. Ha az állam, amelynek felségterületén az esemény bekövetkezik így rendelkezik, a légijármű parancsnoka bármely ilyen előírás megsértéséről nyújtson be jelentést az állam illetékes hatósága számára; ebben az esetben a jelentés másolatát nyújtsa be továbbá a járató állama számára is. Az ilyen jelentéseket a lehető legrövidebb időn, általában tíz napon belül nyújtsák be.

1.1.4 A légijármű parancsnoka felelős a legközelebbi illetékes hatóság lehető leggyorsabb értesítéséért a forgószárnyas légijárművet érintő bármely olyan balesetről, amelynek következménye bármely személy súlyos vagy halálos sérülése illetve a forgószárnyas légijármű vagy más anyagi javak jelentős károsodása.

Megjegyzés: A "súlyos sérülés" kifejezés meghatározása a 13. Annex-ben található.

1.1.5 ***Ajánlás*** *– A forgószárnyas légijármű fedélzetén álljon a légijármű parancsnokának rendelkezésére az átrepült területen működő kutató és mentő szolgálatokra vonatkozó összes alapvető tájékoztatás.*

1.2 Veszélyes árúk

1. Megjegyzés: A veszélyes árúkra vonatkozó előírások a 18. Annex-ben találhatók.

2. Megjegyzés: Az Egyezmény 35. cikkelye bizonyos teheráru korlátozási osztályokra vonatkozik.

1.3 Szellemi tevékenységet befolyásoló anyagok használata

Megjegyzés: A szellemi tevékenységet befolyásoló anyagok használatára vonatkozó előírások az 1. Annex 1.2.7 és a 2. Annex 2.5 pontjaiban találhatók.

2. fejezet
Repülésvégrehajtás

2.1 Az üzemeltetés létesítményeinek alkalmassága

A légijármű parancsnoka ne kezdje meg a repülés végrehajtását az előtt, hogy minden rendelkezésre álló lehetséges és ésszerű eszközzel meggyőződött arról, hogy azok a rendelkezésre álló földi és/vagy vízfelszíni létesítmények, amelyek a forgószárnyas légijármű biztonságos üzemeltetése valamint az utasok védelme érdekében közvetlenül szükségesek, megfelelnek annak az üzemeltetési típusnak, amelyben a repülést végre fogják hajtani és azokat a fenti célnak megfelelő módon üzemeltetik.

Megjegyzés: A jelen előírásban alkalmazott "lehetséges és ésszerű eszköz" kifejezés a parancsnok részére az indulási helyen rendelkezésre álló tájékoztatások felhasználását jelenti, amelyek a légiforgalmi tájékoztató szolgálatok által kiadott hivatalos közleményekből vagy más forrásokból származnak.

2.2 Helikopter repülőtér üzemeltetési minimum

A légijármű parancsnoka ne hajtson végre repülési feladatot olyan helikopter repülőtérre vagy repülőtérről, amelyen az üzemeltetési minimum értéke alacsonyabb, mint amit az az állam határozott meg, ahol az adott helikopter repülőtér elhelyezkedik, kivéve ha erre az adott állam külön engedélyt ad.

Megjegyzés: Néhány állam gyakorlata szerint a repülés tervezési célokra magasabb minimumokat jelölnek meg arra az esetre, ha a helikopter repülőteret kitérőként választják szemben azzal, ha ez a helikopter repülőtér a tervezett leszállás helye.

2.3 Repülés előtti tájékoztatás

2.3.1 A légijármű parancsnoka biztosítsa, hogy a személyzet tagjai valamint az utasok szóbeli tájékoztatás útján vagy más módszerrel megismerjék a következő eszközök elhelyezkedését és használatát:

a) biztonsági övek;

b) vészkijáratok;

c) mentőmellények;

d) oxigén ellátó berendezések; és

e) más, egyéni használatra rendszeresített mentőfelszerelések, beleértve az utastájékoztató kiadványokat is.

2.3.2 A légijármű parancsnoka biztosítsa, hogy a fedélzeten tartózkodó összes személy ismerje a közös használatra rendszeresített alapvető mentőfelszerelések elhelyezkedését és általános használatát.

2.4 Forgószárnyas légijármű légialkalmassága és biztonsági intézkedések

A repülési feladat végrehajtását ne kezdjék meg mindaddig, amíg a légijármű parancsnoka meggyőződött arról, hogy:

a) a forgószárnyas légijármű repülésre alkalmas, azt előírásszerűen lajstromozták és az erre vonatkozó okmányok a forgószárnyas légijármű fedélzetén vannak;

b) a forgószárnyas légijárművön felszerelt műszerek és berendezések a várható repülési körülmények figyelembevételével az adott repülési feladat végrehajtására megfelelőek;

c) a 6. fejezet előírása szerint elvégezték az összes szükséges karbantartási munkát;

d) a forgószárnyas légijármű tömege valamint súlypont-helyzete a várható repülési körülmények figyelembevételével olyan, hogy a repülési feladat biztonságosan végrehajtható;

e) valamennyi szállítmányt megfelelő módon elhelyeztek és biztonságosan rögzítettek; és

f) a forgószárnyas légijármű üzemeltetési kézikönyvében vagy az ezzel egyenértékű dokumentumban meghatározott üzemeltetési korlátozásokat nem lépik túl.

2.5 Időjárás jelentések és előrejelzések

A repülés megkezdése előtt a légijármű parancsnoka ismerje meg a tervezett repüléshez rendelkezésre álló összes időjárási tájékoztatást. Az indulási hely közeléből eltávolodó és a műszerrepülési szabályok szerint végrehajtott összes repülés előkészítéséhez a következők tartozzanak:

1) a rendelkezésre álló érvényes időjárás-jelentések és előrejelzések tanulmányozása; valamint

2) kitérő tevékenység megtervezése, amely lehetővé teszi a repülés folytatását abban az esetben, ha az időjárási körülmények miatt azt nem lehet a tervek szerint végrehajtani.

Megjegyzés: A repülési tervekre vonatkozó követelményeket a 2. Annex (Repülési Szabályok) és a PANS-ATM Doc 4444 (Légiforgalmi Szolgálatok Szabályai) tartalmazza.

2.6 Időjárási körülmények miatt szükséges korlátozások

2.6.1 Látvarepülési szabályok szerint végrehajtott repülés

A kizárólag helyi, látás utáni időjárási körülmények között végrehajtott repülés kivételével a látvarepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha az érvényes időjárás-jelentések vagy az érvényes időjárás-jelentések és előrejelzések azt jelzik, hogy a megfelelő időben, az útvonalon vagy annak látvarepülési szabályok szerint tervezett repülési szakaszán az uralkodó időjárási körülmények olyanok lesznek, hogy az ilyen (VFR) szabályok betartása lehetséges.

2.6.2 Műszerrepülési szabályok szerint végrehajtott repülés

2.6.2.1 *Ha kitérő helikopter repülőtér kijelölése szükséges*

A műszerrepülési szabályok szerint tervezett repülés végrehajtását ne kezdjék meg csak akkor, ha a rendelkezésre álló tájékoztatások szerint az érkezés várható időpontjában a tervezett leszállási és legalább egy kitérő helikopter repülőtéren az uralkodó (időjárási) körülmények helikopter repülőtér üzemeltetési minimumnak megfelelőek vagy annál jobbak lesznek.
Megjegyzés: Néhány állam gyakorlata szerint a repülés tervezési célokra magasabb minimumokat jelölnek meg arra az esetre, ha a helikopter repülőteret kitérőként választják szemben azzal, ha ugyanez a helikopter repülőtér a tervezett leszállás helye.

2.6.2.2 *Ha kitérő helikopter repülőtér kijelölése nem szükséges*

Amennyiben kitérő helikopter repülőtér nem szükséges, a műszerrepülési szabályok szerint tervezett repülés végrehajtását egy helikopter repülőtérre ne kezdjék meg csak akkor, ha a rendelkezésre álló érvényes időjárás tájékoztatások azt jelzik, hogy az érkezés számított időpontja előtt valamint ez után két – két órával vagy az indulási időpontjától az érkezés számított időpontja után két óráig – amelyik a rövidebb időtartam – a következő időjárási körülmények állnak fenn:

a) a felhőalap a műszeres megközelítési eljáráshoz előírt minimum értéknél legalább 120 méterrel (400 láb) magasabb; és

b) a látástávolság legalább 1.5 km-el több mint az eljáráshoz előírt minimum érték.

Megjegyzés: A fentieket minimum értékként akkor fogadják el, ha megbízható és folyamatos (helyi) időjárás megfigyelést tartanak fenn. Ha csak úgynevezett területi előrejelzés van, a fenti értékeket ennek megfelelő mértékben növeljék meg.

2.6.3 Helikopter repülőtér üzemeltetési minimum

2.6.3.1 A repülést ne folytassák a tervezett leszállási helikopter repülőtér felé csak abban az esetben, ha a rendelkezésre álló legújabb tájékoztatások azt jelzik, hogy az érkezés várható időpontjában ezen a leszállási vagy legalább egy kitérő helikopter repülőtéren az időjárási körülmények a meghatározott helikopter repülőtér üzemeltetési minimum értéknek megfelelőek vagy ennél jobbak lesznek.

2.6.3.2 A precíziós megközelítés esetében a műszeres megközelítést ne folytassák a külső marker adó (OM) navigációs ponton túl vagy nem precíziós megközelítés esetében a helikopter repülőtér feletti 300 méter (1000 láb) magasság alatt, kivéve ha a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték (RVR) a megállapított minimum felett van.

2.6.3.3 Amennyiben precíziós megközelítés esetében a külső marker adó (OM) navigációs pont átrepülése után vagy nem precíziós megközelítés esetében a repülőtér feletti 300 méter (1000 láb) magasság alá történő süllyedésnél a jelentett látástávolság vagy a meghatározó futópályamenti látástávolság érték a megállapított minimum alá csökken, a megközelítés az elhatározási vagy a legalacsonyabb süllyedési magasságig folytatható. A forgószárnyas légijármű semmi esetre se folytassa a leszálláshoz történő megközelítését bármely helikopter repülőtérre azon a meghatározott ponton túl, amely után az arra megállapított helikopter repülőtér üzemeltetési minimum értéket megsértené.

2.6.4 Repülés jegesedés körülményei között

Ismert vagy várható jegesedés körülményei között a repülést ne kezdjék meg, csak akkor, ha a forgószárnyas légijármű ilyen körülmények közötti üzemelésre van jogosítva és felszerelve.

2.7 Kitérő helikopter repülőterek

2.7.1 A műszerrepülési szabályok szerint tervezett repülés esetében az üzemeltetési és a légiforgalmi szolgálati egységeknek benyújtott repülési tervekben határozzanak meg legalább egy alkalmas kitérő helikopter repülőteret vagy leszállási helyet, kivéve ha:

a) az uralkodó időjárási körülmények megfelelnek a 2.6.2.2 pontnak; vagy

b) 1) a tervezett leszállási helikopter repülőtér elszigetelt fekvésű és alkalmas kitérő nem áll rendelkezésre; és

2) az elszigetelt fekvésű tervezett leszállási repülőtéren műszeres megközelítési eljárást írnak elő; és

3) a vízfelszíni célállomás esetében olyan pontot határoznak meg, ahonnan a visszafordulás (PNR) már nem lehetséges.

2.7.2 Az alkalmas parttól, azaz szárazföldtől távoli vízfelszíni kitérő helikopter repülőtereket vagy leszállási helyeket a következők alapján határozhatják meg:

a) a vízfelszíni (parttól távoli) kitérőket csak azon pont átrepülése után használják, amely után a visszafordulás nem lehetséges (PNR). Ezen pont előtt a szárazföldi kitérőket vegyék igénybe;

b) a kitérő alkalmasságának meghatározásánál vizsgálják meg és vegyék figyelembe a kritikus repülésvezérlő rendszerek valamint egyéb lényeges részegységek (mechanikai) műszaki megbízhatóságát;

c) a kitérőre történő érkezés előtt határozzák meg és vegyék figyelembe a forgószárnyas légijármű egy működésképtelen hajtóművel történő üzemi teljesítményét;

d) a leszállási hely biztosan rendelkezésre áll; és

e) az időjárási tájékoztatások minden körülmények között pontosak és megbízhatóak legyenek.

Megjegyzés: A repülésvégrehajtási kézikönyvben a repülésvezérlő rendszerek meghibásodása esetére meghatározott leszállási módszerek kizárhatják egyes leszállási helyek kitérőként történő igénybevételét.

2.7.3 **Ajánlás** – *Amennyiben a szárazföldi kitérő helikopter repülőtér vagy leszállási hely eléréséhez szükséges tüzelőanyag mennyiség szállítása lehetséges, ne vegyenek igénybe parttól távoli (vízfelszíni) kitérőket. Ezek a körülmények kivételesek és a kedvezőtlen időjárási körülmények közötti terhelés növelés nem tartozik ezek közé.*

2.8 Tüzelőanyag (üzemanyag) és olajkészlet

2.8.1 *Minden forgószárnyas légijármű esetében* – A repülés végrehajtását ne kezdjék meg csak akkor, ha az időjárási körülmények valamint a repülés során várható bármely késés figyelembevételével a forgószárnyas légijármű elegendő tüzelőanyagot és olajat szállít ahhoz, hogy a repülést biztonságosan be tudja fejezni. Ezen kívül az előre nem látható eseményekre való tekintettel szállítsanak tartalékot is.

2.8.2 *Látvarepülési szabályok szerinti (VFR) üzemeltetés* – A 2.8.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a látvarepülési szabályok szerint történő üzemeltetés esetében legalább annyi legyen, ami lehetővé teszi, hogy a forgószárnyas légijármű:

a) elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték:

b) ezt követően a legoptimálisabb utazósebességgel 20 percig valamint a tervezett repülési idő további 10 %-áig repüljön; és

c) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi az általános célú légiközlekedést szabályzó előírásokban az állam által meghatározott, előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.8.3 *Műszerrepülési szabályok szerinti (IFR) üzemeltetés* – A 2.8.1 pont előírásának megfelelően szállított tüzelőanyag és olaj mennyisége a műszerrepülési szabályok szerint történő üzemeltetés esetében legalább annyi legyen, ami lehetővé teszi, hogy a forgószárnyas légijármű:

2.8.3.1 Amennyiben a 2.6.2.2 előírása alapján kitérő kijelölése nem szükséges, elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték és ezt követően;

a) a célállomás helikopter repülőtér felett 450 méter (1500 láb) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön valamint egy megközelítést és leszállást hajtson végre; és

b) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi az előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.8.3.2 Amennyiben a 2.6.2.1 pont előírása alapján kitérő kijelölése szükséges, elrepüljön arra a helikopter repülőtérre, amelyre a repülést tervezték, ott egy megközelítést és egy megszakított megközelítést hajtson végre és ezt követően;

a) elrepüljön a repülési tervben meghatározott kitérőre; majd

b) a kitérő felett 450 méter (1500 láb) magasságon, szabványos hőmérsékleti viszonyok között, a várakozásra előírt sebességgel 30 percet repüljön valamint megközelítést és leszállást hajtson végre; és
c) a forgószárnyas légijármű ezen felül rendelkezzen annyi tüzelőanyaggal, amely fedezi az előre nem látható esetekben bekövetkező fogyasztás növekedés mennyiségét.

2.8.3.3 Amennyiben a 2.7.1 b) alpont alapján alkalmas kitérő nem áll rendelkezésre, elrepüljön a tervezett célállomás helikopter repülőtérre és ezt követően a várakozáshoz meghatározott sebességgel további két órát repüljön.

2.8.4 A 2.8.1 pont előírása alapján szükséges tüzelőanyag és olaj készlet mennyiségének kiszámításánál a legalább következő tényezőket vegyék figyelembe:

a) előrejelzett időjárási körülmények;

b) várható légiforgalmi irányítói engedélyek és útvonalak valamint forgalmi késések;

c) a műszerrepülési szabályok szerint végrehajtott repülés esetében egy műszeres megközelítés végrehajtása a célállomás helikopter repülőtéren, beleértve egy megszakított megközelítést is;

d) a repülés végrehajtása alatt bekövetkező egy hajtómű meghibásodás vagy – amennyiben alkalmazható – a túlnyomásos kabin dehermetizálódás esetére előírt eljárások; és

e) minden egyéb olyan körülmény, amely a forgószárnyas légijármű leszállását késleltetheti vagy a tüzelőanyag és/vagy olajfogyasztást növelheti.

Megjegyzés: A 2.8 szakaszban ismertetett tényezők nem korlátozzák a repülési terv repülés közben történő módosításának lehetőségét és a repülés áttervezését egy másik helikopter repülőtérre, feltéve hogy a 2.8 pont előírásai teljesíthetők attól a ponttól kezdődően is, ahol a repülés áttervezése megtörtént.

2.9 Oxigén készlet

Megjegyzés: A szövegben alkalmazott abszolút légnyomás értékeknek megfelelő, az Egyezményes Légkör alapján meghatározott megközelítő magasságok a következők:

Abszolút légnyomás	***magasság – méter***	***magasság – láb***
700 hPa	3000	10 000
620 hPa	4000	13 000

2.9.1 Olyan repülési magasságon végrehajtandó repülés esetében, amelyen a személyek részére rendszeresített kabin(ok)ban a légnyomás 700 hPa értéknél alacsonyabb lesz, a repülést ne kezdjék meg csak akkor, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely ellátja:

a) a személyzet minden tagját valamint az utasok 10 %-át 30 percet meghaladó bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa és 620 hPa érték között van; és

b) a személyzet tagjait valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 620 hPa értéknél alacsonyabb.

2.9.2 A túlnyomásos kabinnal rendelkező forgószárnyas légijármű esetében a repülés végrehajtását ne kezdjék meg csak akkor, ha elegendő mennyiségű belélegzésre alkalmas oxigént biztosítottak, amely a túlnyomás megszűnése esetében, a repülés körülményeinek megfelelően ellátja a személyzet összes tagját valamint az utasokat bármely olyan időtartamra, amely alatt az általuk elfoglalt kabinban a légnyomás 700 hPa értéknél alacsonyabb.

2.10 Oxigén használat

A forgószárnyas légijármű repülése alatt, annak biztonságos üzemeltetéséhez nélkülözhetetlen feladatokat ellátó összes hajózószemélyzeti tagja folyamatosan használja az oxigén légzőkészüléket, amikor ezt az uralkodó körülmények a 2.9.1 vagy 2.9.2 pontok előírásai szerint szükségessé teszik.

2.11 Vészhelyzeti utasítások a repülés alatt

A repülés közben bekövetkező vészhelyzetben a légijármű parancsnoka biztosítsa, hogy a fedélzeten tartózkodó valamennyi személy a körülményeknek megfelelő vészhelyzeti utasításokat és tájékoztatásokat kapjon.

2.12 Légijármű vezetők időjárás jelentése

Ajánlás – *Amennyiben olyan időjárási körülményeket észlelnek, amelyek valószínűleg más légijárművek biztonságát is befolyásolják, ezeket a lehető legrövidebb időn belül jelentsék.*

2.13 Repülésre veszélyes körülmények

Ajánlás – *A repülésre veszélyes, az időjárási viszonyokkal kapcsolatostól eltérő, a repülés végrehajtása során tapasztalt egyéb körülményeket a lehető legrövidebb időn belül jelentsék. Az ilyen leadott jelentések tartalmazzák a más légijárművek biztonságával összefüggő vagy kapcsolatba hozható részleteket is.*

2.14 A hajózószemélyzet tagjainak fizikai állapota

A légijármű parancsnoka felelős annak biztosításáért, hogy a repülést:

a) ne kezdjék meg, ha a hajózószemélyzet bármely tagja valamely okból képtelen előírt feladatainak teljesítésére; Ilyen okok közé tartozhat a testi sérülés, betegség, fáradtság, gyógyszeres vagy alkoholos befolyásoltság; és

b) ne folytassák a legközelebbi alkalmas helikopter repülőtéren túl, ha a hajózószemélyzet bármely tagjának teljesítőképessége valamely ok, mint például fáradtság, betegség vagy oxigén hiány miatt jelentős mértékben csökken.

2.15 A hajózószemélyzet tagjai szolgálati helyeiken

2.15.1 Fel és leszállás

A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén.

2.15.2 Útvonalon

A pilótakabinban szolgálatra kijelölt valamennyi hajózószemélyzeti tag tartózkodjon szolgálati helyén kivéve, ha távolléte a forgószárnyas légijármű üzemeltetésével kapcsolatos feladatok elvégzése vagy fiziológiai okok miatt szükséges.

2.15.3 Biztonsági övek

A hajózószemélyzet valamennyi tagja szolgálati helyén biztonsági övét tartsa becsatolva.

2.15.4 Vállhevederekkel ellátott biztonsági övek

Ajánlás – *Amennyiben ilyen biztonsági övet biztosítottak, a fel és leszállási szakaszokban a hajózószemélyzet bármely légijármű vezetői ülést elfoglaló tagja vállhevederrel ellátott biztonsági övét tartsa becsatolva; a hajózószemélyzet többi tagja a fel és leszállási szakaszokban vállhevederrel ellátott biztonsági övét tartsa becsatolva kivéve, ha a vállhevederek akadályozzák őket feladataik végrehajtásában, amely esetben a vállhevedereket kikapcsolhatják, azonban a biztonsági öveket bekapcsolva kell tartaniuk.*

Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

2.16 Műszerrepülési eljárások

2.16.1 Az az állam, amelynek területén a helikopter repülőtér elhelyezkedik, vagy az az állam amelyik felelős egy állam területén kívül levő helikopter repülőtérért hagyjon jóvá és tegyen közzé egy vagy több műszeres megközelítési eljárást a műszerrepülési szabályok szerint igénybe vett minden egyes helikopter repülőtérre vagy végső megközelítési és felszállási területre.

2.16.2 A műszerrepülési szabályok szerint üzemelő összes forgószárnyas légijármű tartsa be azokat a műszerrepülési eljárásokat, amelyeket az az állam hagyott jóvá, amelynek területén a helikopter repülőtér elhelyezkedik, vagy az az állam hagyott jóvá, amelyik felelős gy állam területén kívül levő helikopter repülőtérért.

1. Megjegyzés: A műszerrepülési eljárásokban érintett személyek részére ajánlott üzemeltetési eljárások a PANS OPS (Doc 8168) I. kötetében találhatók.

2. Megjegyzés: A műszerrepülési eljárások követelményeire vonatkozó útmutatás az eljárások kidolgozásában résztvevő szakértők részére a PANS-OPS (Doc 8168) II. kötetében található.

2.17 Utasítások – Általános

A forgószárnyas légijármű forgószárnyát hajtómű segítségével csak akkor szabad megforgatni, ha a kormányoknál szakszolgálati engedéllyel rendelkező légijármű vezető foglal helyet.

2.18 Tüzelőanyag-feltöltés utasokkal a fedélzeten vagy a forgószárny(ak) mozgása közben

2.18.1 **Ajánlás** – *A forgószárnyas légijárművön ne végezzenek tüzelőanyag feltöltést akkor, amikor az utasok beszállnak, kiszállnak vagy a fedélzeten tartózkodnak illetve a forgószárny mozgása közben, kivéve ha a légijármű parancsnok vagy más kiképzett személyzet áll készenlétben a forgószárnyas légijármű leggyorsabb és legcélszerűbb módszerekkel történő kiürítésének megkezdésére és a kiürítés irányítására.*

2.18.2 **Ajánlás** – *Az utasok beszállása, kiszállása vagy a forgószárnyas légijármű fedélzetén történő tartózkodása alatt végzett tüzelőanyag feltöltés közben a belső távközlési berendezés vagy más alkalmas eszköz segítségével tartsanak fenn kétoldalú beszédüzemű összeköttetést a tüzelőanyag feltöltést ellenőrző földi személyzet és a légijármű parancsnoka vagy a 2.18.1 pontban előírt más kiképzett személyzet között.*

1. *Megjegyzés: A légijármű tüzelőanyag feltöltésére vonatkozó előírások a 14. Annex-ben és a biztonságos tüzelőanyag feltöltési módszerekkel kapcsolatos útmutató a* Repülőtér Szolgálati Kézikönyv *(Doc 9137) 1. és 8. részeiben található.*

2. Megjegyzés: Amikor a forgószárnyas légijármű tüzelőanyaggal történő feltöltését nem kerozinnal végzik, a feltöltés alkalmával a kerozin más gázturbina hajtóanyagokkal keveredik, vagy nyílt töltővezetéket alkalmaznak, további elővigyázatossági rendszabályokra van szükség.

2.19 Vízfelszín feletti repülések

A 4.3.1 pont előírása alapján vízfelszín feletti repülést végrehajtó összes forgószárnyas légijármű jogosítva legyen a vízreszállásra. A vízreszállási tájékoztatások tartalmazzák a vízfelszínre (tengerre) vonatkozó összes információt.

3. fejezet
Forgószárnyas légijármű teljesítmény üzemeltetési korlátozások

3.1 A forgószárnyas légijárművet a következők szerint üzemeltessék:

a) légialkalmassági bizonyítvánnyal vagy más egyenértékű okmánnyal összhangban;

b) a lajstromozó állam légialkalmasságot jogosító hatóságának teljesítmény korlátozások betartásával; és

c) a 16. Annex I. kötet zajszint minősítési előírásaiban meghatározott tömeg korlátozásoknak megfelelően kivéve, ha különleges körülmények között, bizonyos helikopter repülőtéren, ahol zajszint probléma nem jelentkezik, erre az érintett állam illetékes hatósága – amelyben a helikopter repülőtér elhelyezkedik – külön engedélyt ad.

3.2 A forgószárnyas légijárművön táblákkal, felsorolásokkal, jegyzékekkel, műszer jelölésekkel vagy ezek együttesével tüntessék fel azokat az üzemeltetési korlátozásokat, amelyeket a lajstromozó állam légialkalmasságot jogosító hatósága előírt.

Megjegyzés: A 8. Annex – Légijárművek légialkalmassága *(IV. rész) nemzetközi előírásai és ajánlott gyakorlati eljárásai vonatkoznak a nemzetközi légiközlekedésben utas, teheráru vagy postaküldemény szállítására felhasználni kívánt minden forgószárnyas légijárműre.*

3.3 A zsúfolt területeken emelt szinten létesített helikopter repülőterekről csak 1. teljesítmény osztályú forgószárnyas légijármű üzemeltetése engedélyezhető.

3.4 **Ajánlás** – *Emelt szinten létesített helikopter repülőtérről vagy leszállási helyről 3. teljesítmény osztályú forgószárnyas légijármű üzemeltetését ne engedélyezzék.*

4. fejezet
Forgószárnyas légijármű műszerek, felszerelések és repülési okmányok

Megjegyzés: A forgószárnyas légijármű távközlési és navigációs felszerelésére vonatkozó előírásokat a 5. fejezet tartalmazza.

4.1 Az összes forgószárnyas légijármű összes repülése

4.1.1 Általános rész

A légialkalmassági bizonyítvány kiadásához szükséges alapvető felszereléseken kívül a felhasznált forgószárnyas légijármű típustól valamint a repülés végrehajtásának körülményeitől függően a következő pontokban előírt műszereket, felszereléseket és repülési okmányokat helyezzék el vagy szállítsák a forgószárnyas légijárművön. Az előírt műszereket és berendezéseket, beleértve azok felszerelését is a lajstromozó állam hagyja jóvá vagy fogadja el.

4.1.2 Műszerek

A forgószárnyas légijárművet szereljék fel azokkal a műszerekkel, amelyek a hajózószemélyzet számára lehetővé teszik a forgószárnyas légijármű repülési pályájának irányítását és ellenőrzését, bármely előírt eljárás művelet végrehajtását valamint a forgószárnyas légijármű üzemeltetési korlátozásainak a várható üzemeltetési körülmények között történő megfigyelését.

4.1.3 Felszerelések

4.1.3.1 Minden forgószárnyas légijárművet minden repülésén szereljék fel:

a) egy hozzáférhető elsősegélynyújtó készlettel;

b) olyan típusú hordozható tűzoltó készülékkel, amelynek tűzoltó anyaga igénybevétel után nem szennyezi veszélyesen a forgószárnyas légijármű belső terének levegőjét. Legalább egy ilyen tűzoltó készüléket helyezzenek el;

1) a forgószárnyas légijármű pilótafülkéjében; és

2) minden egyes olyan utaskabinban, amely a pilótakabintól el van választva és amelyet a légijármű parancsnoka vagy másodpilótája nem tud azonnal megközelíteni.

c) 1) a lajstromozó állam által meghatározott életkor felett minden egyes személy részére egy megfelelő ülő vagy fekvőhellyel;

2) minden üléshez egy biztonsági övvel valamint minden fekvőhelyhez egy bekötő biztonsági hevederrel;

d) a következő kézikönyvekkel, térképekkel és tájékoztatásokkal:

1) az adott forgószárnyas légijármű repülésvégrehajtási kézikönyve vagy más olyan kiadvány illetve tájékoztató, amely tartalmazza a 3. fejezet alkalmazásához szükséges, a lajstromozó állam légialkalmasságot jogosító hatósága által a forgószárnyas légijárműre előírt bármely üzemeltetési korlátozást;

2) érvényes és alkalmas térképek, amelyek fedik a tervezett repülés útvonalát, valamint bármely

olyan egyéb útvonalat, amelyről joggal feltételezhető, hogy arra a repülés átirányítható;

3) az elfogott légijármű parancsnok számára a 2. Annex-ben előírt eljárások; és

4) az elfogó és az elfogott légijárművek által használandó, a 2. Annex-ben előírt látjelek; és

e) megfelelő értékű elektromos biztosítékok tartalékként a repülés közben hozzáférhető biztosítékok cseréjéhez.

4.1.3.2 **Ajánlás** – *Minden forgószárnyas légijármű minden repülésén legyen felszerelve a kutatás és mentés céljait szolgáló föld-levegő látjelekkel.*

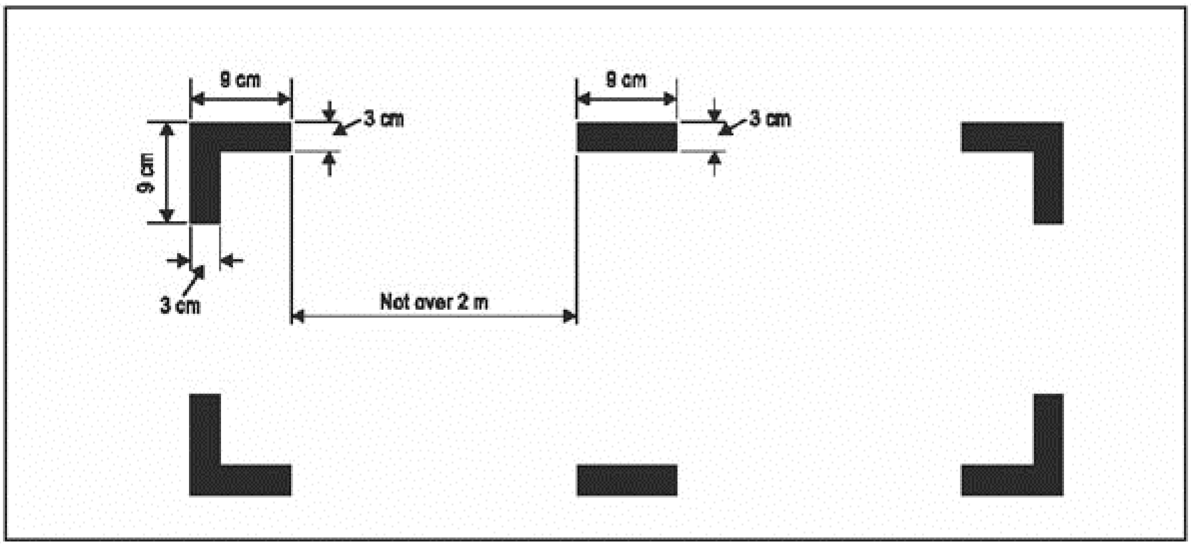
4.1.3.3 **Ajánlás** – *Minden forgószárnyas légijármű minden repülésén az összes hajózószemélyzeti tag ülése legyen felszerelve vállhevederekkel ellátott biztonsági övvel.*
Megjegyzés: A vállhevederekkel ellátott biztonsági öv egymástól függetlenül használható vállhevederekből és biztonsági övből áll.

4.1.4 Az átvágható felületek jelzése

4.1.4.1 Amennyiben a forgószárnyas légijárművön a mentőszemélyzet részére jelzik a kényszerhelyzet esetében a törzsön átvágható felületeket, azokat az alábbi ábrának megfelelő módon jelöljék meg. A jelölések színe vörös vagy sárga legyen és ha erre a háttértől történő megkülönböztethetőség érdekében szükség van, azokat fehér színű alapozásra készítsék el.

4.1.4.2 Amennyiben a sarkok jelölése egymástól több mint 2 méter távolságra van, fessenek fel 9 x 3 cm-es vonalakat olyan módon, hogy az egymás mellett levő vonalak közötti távolság 2 méternél nagyobb ne legyen.

Megjegyzés: Ez az előírás nem teszi szükségessé azt, hogy bármely forgószárnyas légijármű sárkányszerkezetén átvágható felületek legyenek.



A légijármű törzsén levő átvágható felületek azaz behatolási pontok jelzése
a mentőszemélyzet számára
Jelölések közötti távolság nem több mint 2 méter

4.2 Az összes, látvarepülési szabályok szerint üzemeltetett forgószárnyas légijármű

4.2.1 A látvarepülési szabályok (VFR) szerint üzemeltetett összes forgószárnyas légijárművet szereljék fel a következőkkel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) érzékeny nyomás-magasság mérőműszerrel;

d) repülési sebesség mérőműszerrel; és

e) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

4.2.2 **Ajánlás** – *Az ellenőrzött repülésként látvarepülési szabályok szerint (VFR) üzemeltetett forgószárnyas légijárművet a 4.6 pont előírásainak megfelelően szereljék fel.*

4.3 Az összes, vízfelszín felett üzemeltetett forgószárnyas légijármű

4.3.1 Úszóeszközök

Minden olyan forgószárnyas légijárművet, amelyet vízfelszín felett kívánnak üzemeltetni, szereljenek fel állandó vagy gyorsan kibocsátható (üzembe helyezhető) úszóeszközzel, amely biztosítja a forgószárnyas légijármű biztonságos vízreszállását, ha:

a) az 1. vagy 2. teljesítmény osztályú forgószárnyas légijármű a szárazföldtől olyan távolságra repül vízfelszín felett, amely tíz percnél hosszabb időtartamú (normál) utazósebességű repülésnek felel meg; vagy

b) a 3. teljesítmény osztályú forgószárnyas légijármű a szárazföldtől olyan távolságra repül vízfelszín felett, amely nagyobb, mint az autórotációs vagy biztonságos kényszerleszállási távolság.

4.3.2 Vészhelyzeti felszerelések

4.3.2.1 A 4.3.1 pont előírása alapján üzemeltetett 1. vagy 2. teljesítmény osztályú forgószárnyas légijárművet szereljék fel;

a) a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel;

b) elegendő számú mentő-tutajjal a fedélzeten tartózkodó összes személy elhelyezésére, amelyeket úgy tárolnak, hogy azok a vészhelyzet esetében gyorsan üzembe helyezhetők és a repülési útvonal sajátosságainak megfelelő életmentő eszközökkel vannak ellátva, beleértve a létfenntartási eszközöket is; és

c) a 2. Annex-ben ismertetett pirotechnikai vészjelzések előállítására szolgáló eszközökkel.

4.3.2.2 A szárazföldtől az autórotációs távolságon kívül, azonban a felelős állam illetékes hatósága által megállapított távolságon belül üzemelő 3. teljesítmény osztályú forgószárnyas légijárművet szereljék fel a fedélzeten tartózkodó minden személy részére ülőhelyéről vagy fekvőhelyéről azonnal hozzáférhető helyen tárolt mentőmellénnyel vagy egyéb megfelelő egyéni úszóeszközzel.

Megjegyzés: A 4.3.2.2 pontban ismertetett szárazföldtől számított távolság meghatározása alkalmával vegyék figyelembe a környezeti körülményeket, valamint a kutató és mentő szolgálat (SAR) igénybevételének lehetőségeit.

4.3.2.3 A 4.3.2.2 pontban meghatározott távolságon túl üzemelő 3. teljesítmény osztályú forgószárnyas légijárművet szereljék fel a 4.3.2.1 pont előírása alapján szükséges vészhelyzeti felszereléssel.

4.3.2.4 A 2. és 3. teljesítmény osztályú forgószárnyas légijármű esetében, ha az olyan helikopter repülőtéren száll fel vagy le, ahol a járató államának véleménye szerint a felszállási vagy leszállási útvonal olyan hosszan vezet vízfelszín felett, hogy az esetleges rendellenes üzemelés vagy repesemény alkalmával vízreszállás valószínű, a forgószárnyas légijárművet szereljék fel legalább a 4.3.2.1 a) pont előírása alapján szükséges vészhelyzeti felszereléssel.

4.3.2.5 Minden egyes mentőmellényt és egyéb megfelelő egyéni úszóeszközt, amelyet a jelen 4.3 szakasz előírásai alapján szállítanak, a felhasználó személy feltalálásának megkönnyítése érdekében lássanak el elektromos világítással.

4.3.2.6 **Ajánlás** – *Bármely forgószárnyas légijárművön, amelynek egyedi légialkalmassági bizonyítványát először 1991 január 1-én vagy ezt követően adták ki, a 4.3.2 pont előírása alapján szállított mentőtutajok legalább 50 %-a távirányítással legyen kibocsátható.*

4.3.2.7 **Ajánlás** – *A távirányítással nem kibocsátható és 40 kg-nál nehezebb mentőtutajok a kibocsátás megkönnyítése érdekében valamilyen mechanikus kibocsátó szerkezettel legyenek felszerelve.*

4.3.2.8 **Ajánlás** – *Bármely forgószárnyas légijármű esetében, amelynek egyedi légialkalmassági bizonyítványát először 1991 január 1. előtt adták ki, 1992 december 31. előtt teljesítsék a 4.3.2.6 és 4.3.2.7 pontok előírásait.*

4.4 Az összes, kijelölt szárazföld felett üzemeltetett forgószárnyas légijármű

Amennyiben a forgószárnyas légijárművet olyan szárazföldi területek felett üzemeltetik, amelyeket az érintett államok olyan területként jelölnek meg, ahol a kutatás és mentés különös nehézségekbe ütközik, a forgószárnyas légijárművet szereljék fel olyan jeladó berendezéssel és életmentő felszereléssel, beleértve a létfenntartási eszközöket is, amelyek nagy valószínűséggel megfelelnek az átrepülendő terület sajátosságainak.

4.5 Az összes, nagy repülési magasságon üzemeltetett forgószárnyas légijármű

4.5.1 Túlnyomásos kabin nélküli forgószárnyas légijármű

Amennyiben a túlnyomásos kabinnal nem rendelkező forgószárnyas légijárművet nagy repülési magasságon kívánják üzemeltetni, azt szereljék fel a 2.9.1 pontban előírt oxigén tároló és adagoló berendezéssel.

4.5.2 Túlnyomásos kabinnal rendelkező forgószárnyas légijármű

Ajánlás – *Amennyiben a túlnyomásos kabinnal rendelkező forgószárnyas légijárművet nagy repülési magasságon kívánják üzemeltetni, azt szereljék fel a 2.9.2 pontban előírt belélegzésre alkalmas oxigén készlet tárolására megfelelő vészhelyzeti oxigén tároló és adagoló berendezéssel.*

4.6 Az összes, műszerrepülési szabályok szerint üzemeltetett forgószárnyas légijármű

A műszerrepülési szabályok szerint (IFR) üzemeltetett összes forgószárnyas légijárművet, vagy azokat, amelyek üzemeltetésük során egy vagy több műszer segítsége nélkül nem tarthatók a kívánt repülési helyzetben, szereljék fel:

a) egy mágneses iránytűvel;

b) egy pontos időmérő berendezéssel, amely az időt órában, percben és másodpercben jelzi;

c) egy érzékeny nyomás-magasság mérőműszerrel;

Megjegyzés: A már hosszabb ideje tapasztalható pontatlan mérések miatt a dob-mutatós magasságmérő használatát nem javasoljuk.

d) repülési sebesség mérőműszerrel, amely olyan berendezéssel van ellátva, amely megakadályozza a kicsapódás vagy jegesedés következtében lehetséges helytelen működést;

e) csúszást jelző műszerrel;

f) kettő darab repülési helyzetjelző műszerrel (műhorizont) amelyek közül egy elfordulás jelzőműszer is lehet;

g) irányjelző műszerrel (géptengely irány-jelző pörgettyűs – giroszkópikus – műszer):

Megjegyzés: A fenti e), f) és g) pontok előírásainak műszerek együttesével vagy integrált repülés vezérlési rendszerrel is eleget lehet tenni feltéve, hogy a rendszer a három külön műszer egységen belül és együttesen is védve van a teljes meghibásodás ellen.

h) a pörgettyűs műszerek kielégítő elektromos táplálásának jelzésére szolgáló eszközzel;

i) a pilótakabinban felszerelt, a külső levegő hőmérsékletét jelző műszerrel;

j) emelkedési és süllyedési sebesség mérőműszerrel; és

k) olyan további műszerekkel vagy berendezésekkel, amelyeket az illetékes hatóság előírt.

4.7 Az összes, éjszaka üzemeltetett forgószárnyas légijármű

4.7.1 Az összes, éjszaka üzemeltetett forgószárnyas légijárművet szereljék fel:

a) a 4.6 pontban előírt valamennyi berendezéssel;

b) a repülés közben levő valamint a helikopter repülőtér mozgási területein üzemelő légijármű számára a 2. Annex-ben előírt (navigációs) fényekkel;

Megjegyzés: A fények általános jellemzőit a 8. Annex határozza meg. A repülés közben levő valamint a helikopter repülőtér mozgási területein üzemelő légijárművek fényeire vonatkozó, 2. Annex előírásainak megfelelő fények jellemzőit a Légialkalmassági Kézikönyv *(Doc 9760) tartalmazza.*

c) leszálló fényszóróval;

d) a forgószárnyas légijármű biztonságos üzemeltetése szempontjából alapvető fontosságú, a hajózószemélyzet által használt valamennyi műszer és berendezés (meg)világításával;

e) világítással valamennyi utastérben; és

f) elektromos kézilámpával minden egyes személyzeti szolgálati helyen.

4.7.2 **Ajánlás –** *A leszálló fényszóró legalább függőleges síkban elfordítható legyen.*

4.8 Minden forgószárnyas légijármű, amelynek meg kell felelnie a 16. Annex I. kötet zajbizonyítvány előírásoknak

Minden forgószárnyas légijármű, amelynek meg kell felelnie a 16. Annex, I. kötet zajbizonyítvány előírásoknak, hordozza a zajbizonyítványt igazoló okmányt. Amikor ez az okmány vagy a lajstromozó állam részéről jóváhagyott más dokumentumban található zajbizonyítványt tartalmazó megfelelő nyilatkozat nem angol nyelvű, mellékeljék annak hiteles angol nyelvű fordítását is.

1. Megjegyzés: – A kötelezettségvállalást a fedélzeten tartott bármilyen dokumentum tartalmazhatja, amelyet a lajstromozó állam a 16. Annex, I. kötet rendelkezéseivel összhangban jóváhagyott.

2. Megjegyzés: – A 16. Annex, I. kötetben közölt, és a forgószárnyas légijárműveknél alkalmazható, különböző zajbizonyítvány előírásokat a típusalkalmassági megkérésének dátumával, vagy az igazolást kiadó hatóság által meghatározott egyenértékű eljárás szerint benyújtott kérelem elfogadási dátumával lehet meghatározni. Néhány forgószárnyas légijárműnél nem követelmény, hogy megfeleljen bármelyik zajbizonyítvány előírásnak. Részletesebben lásd a 16. Annex, I. kötet, II. rész, 8 és 11 fejezeteit.

4.9 Repülési adatrögzítők

1. Megjegyzés: A repülési adatrögzítők két rendszerből illetve berendezésből, a repülési adatrögzítőből valamint a pilótakabin hangrögzítőből állnak.

2. Megjegyzés: Az összetett[i] repülési adat és pilótakabin hangrögzítő berendezések csak a jelen Annex-ben külön ismertetett repülési adatrögzítő berendezés előírások teljesítésére használhatók.
3. Megjegyzés: A repülési adatrögzítőkkel kapcsolatos részletes útmutató a B. Mellékletben található.

4.9.1 Repülési adatrögzítők – típusok

4.9.1.1 A IV. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, repülésvezérlő szerkezetei beállításának, hajtómű teljesítményének és működésének pontos meghatározásához szükségesek.

4.9.1.2 Az V. típusú repülési adatrögzítő rögzítse azokat az adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, repülésvezérlő szerkezetei beállításának és hajtómű teljesítményének pontos meghatározásához szükségesek.

4.9.1.3 A repülési adatrögzítő berendezésekben 1995 január 1. után ne használjanak fémszalagot.

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[i] FDR/CVR berendezés

4.9.1.4 **Ajánlás** – *1998 november 5. után ne használják a frekvencia modulációt (FM) alkalmazó analóg adatrögzítőket.*

4.9.1.4.1 2003 január 1. után ne használják a fényképészeti filmmel működő repülési adatrögzítőket.

4.9.1.5 Az összes olyan digitális adathálózati összeköttetést alkalmazó, valamint pilótakabin hangrögzítő berendezés (CVR) szállítására kötelezett forgószárnyas légijármű, amelynek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki, az összes adathálózati digitális közleményváltást a repülési adatrögzítő berendezésén rögzítse. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a pilótakabinban rögzített hangfelvétellel.

4.9.1.5.1 2007 január 1-től az összes, digitális adathálózati összeköttetést alkalmazó valamint pilótakabin hangrögzítő berendezés szállítására kötelezett forgószárnyas légijármű rögzítse a légiforgalmi szolgálattal történt digitális közleményváltásait a pilótakabin hangrögzítő vagy repülési adatrögzítő berendezésén. A legkisebb felvételi időtartam azonos legyen a pilótakabin hangrögzítő berendezés felvételi időtartamával és a felvétel összevethető legyen a pilótakabinban rögzített hangfelvétellel.

4.9.1.5.2 Rögzítsék az adathálózati digitális közleményváltás tartalmának megismeréséhez szükség tájékoztatást és ahol ez lehetséges a közlemény megjelenítésének vagy a hajózószemélyzet által történt lehívásának időpontját is.

Megjegyzés: Az adathálózati összeköttetések közé tartoznak, azonban nem csak ezekre korlátozódnak a következők:
ADS – automatikus légtérfelderítés
CPDLC – légiforgalmi irányító és repülőgépvezető közötti adathálózati összeköttetések
D-FIS – adathálózati és repüléstájékoztató szolgálati összeköttetések
AOC – légiközlekedési üzemi irányítási közlemények.

4.9.1.6 **Ajánlás** – *Minden olyan 2700 kg. legnagyobb engedélyezett felszállósúlynál nagyobb tömegű forgószárnyas légijárművet, amely repülési adatrögzítő és pilótakabin hangrögzítő berendezések szállítására kötelezett, alternatív megoldásként egy összetett repülési adat és pilótakabin hangrögzítő berendezéssel is (FDR/CVR) felszerelhetnek.*

4.9.1.7 A IV.A típusú repülési adatrögzítő rögzítse azokat a jellemző adatokat, amelyek a forgószárnyas légijármű repülési pályájának, sebességének, helyzetének, hajtómű teljesítményének és működésének valamint a repülésvezérlő szerkezetek beállításának és működésének pontos meghatározásához szükségesek. A következő pontokban ismertetjük azokat a jellemzőket, amelyek kielégítik a IV.A típusú repülési adatrögzítőre vonatkozó előírásokat. A jelölés (*) nélkül jellemzők rögzítése kötelező. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a jellemzőt illetve adatot a forgószárnyas légijármű rendszerei vagy a hajózószemélyzet a forgószárnyas légijármű üzemeltetéshez használja fel.

4.9.1.7.1 A forgószárnyas légijármű repülési pályájára és sebességére vonatkozó előírásokat kielégítő jellemzők:

• nyomás-magasság
• műszer szerinti repülési sebesség
• külső levegő hőmérséklete
• géptengely irányszög
• függőleges gyorsulás
• oldalirányú gyorsulás
• hosszirányú gyorsulás (törzs tengely)

• idő vagy relatív idő számítás
• navigációs adatok*: széleltérítés sodródási szög, szélsebesség, szélirány, szélességi és hosszúsági fok adatok
• rádió magasságmérő jelzett magassága*

4.9.1.7.2 A repülési helyzetre vonatkozó előírásokat kielégítő jellemzők:
• bólintási helyzet, azaz kereszt-tengely körüli mozgása
• bedöntési helyzet, azaz hossztengely körüli elfordulása
• legyezőmozgás, azaz a függőleges tengely körüli elfordulás szögsebessége

4.9.1.7.3 A hajtóműre vonatkozó előírásokat kielégítő jellemzők:
• minden egyes hajtómű teljesítménye: gázturbina terhelés nélküli fordulatszáma (N_f), hajtómű nyomaték, hajtómű turbina fordulatszám (N_g), hajtómű tolóerő szabályzó kar(ok) helyzete a pilótakabinban
• forgószárny: fő forgószárny fordulatszáma, forgószárny fékezés helyzete
• fő meghajtás áttételház olajnyomás*
• áttételház olajhőmérséklet*: fő áttételház olajhőmérséklet, csatlakozó áttételház olajhőmérséklet, farok légcsavar áttételház olajhőmérséklet
• hajtómű kilépő gáz hőmérséklet (T_4)*
• gázturbina belépő hőmérséklet (TIT)*

4.9.1.7.4 A repülésvezérlő szerkezetek helyzetére vonatkozó előírásokat kielégítő jellemzők:
• futómű helyzete, vagy futóvezérlő kar helyzete*
• tüzelőanyag-mennyiség*
• jégérzékelő folyadék víztartalma*

4.9.1.7.5 Az üzemeltetésre vonatkozó előírásokat kielégítő jellemzők:
• hidraulika rendszer alacsony nyomás
• riasztások
• elsődleges repülés vezérlő szerkezetek helyzete és a kezelő egységek beállítása: kollektív állásszög, hosszirányú ciklikus állásszög, oldalirányú ciklikus állásszög, farok légcsavar pedál, vezérelhető stabilizátor, hidraulika kiválasztás
• markeradó átrepülése
• minden egyes navigációs vevőberendezés frekvencia kiválasztása
• automatikus repülésvezérlés üzemmód, és kapcsolók állása*
• stabilitás rásegítő rendszer működése*
• jelzett függeszkedési terhelés*
• függőleges eltérések*: ILS siklópálya, MLS magasság irányvezetés, GNSS megközelítési pálya
• vízszintes eltérések*: ILS iránysáv, MLS oldalszög irányvezetés, GNSS megközelítési pálya
• távolságmérő jelzőműszerek jelzett távolság értékei (1 és 2 DME készletek)*
• magasságváltozás sebessége*
• jégérzékelő folyadék víztartalma*
• forgószárnyas légijármű állapotjelző rendszer (HUMS)*: hajtómű adatok, érzékelők állapota, felvételi sávidőzítés, határérték túllépések, általános széles-sávú hajtóműrezgés

1 Megjegyzés: Az előírt jellemzők, közöttük a tartományok, a mintavételi pontosság és felbontás megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

2. Megjegyzés: A rögzítendő jellemzők száma a forgószárnyas légijármű típustól, annak összetettségétől függ, azonban a csillag (*) jelölés nélküli jellemzőket ettől függetlenül rögzíteni kell. A jelöléssel ellátott (*) jellemzők akkor rögzítendők, ha a jellemzőt illetve adatot a forgószárnyas *légijármű rendszerei vagy a hajózószemélyzet a forgószárnyas légijármű üzemeltetéséhez használja fel.*

4.9.2 Repülési adatrögzítők – felvételi időtartam

A IV. és V. típusú repülési adatrögzítő legyen képes a működésének legalább utolsó tíz órájában rögzített tájékoztatások tárolására.

4.9.3 Repülési adatrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 1989 január 1-én vagy ezt követően adták ki

4.9.3.1 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 7000 kg, szereljenek fel IV. típusú repülési adatrögzítő berendezéssel.

4.9.3.2 ***Ajánlás*** *– Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 2730 kg-tól 7000 kg-ig terjed, szereljenek fel V. típusú repülési adatrögzítő berendezéssel.*

4.9.4 Repülési adatrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 2005 január 1. után adják ki

Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 3180 kg, szereljenek fel IV.A típusú repülési adatrögzítő berendezéssel, melynek felvételi időtartama legalább 10 óra.

Megjegyzés: Elfogadható az önálló (FDR) vagy az összetett (CVR/FDR) repülési adatrögzítő is.

4.9.5 Pilótakabin hangrögzítők – Forgószárnyas légijárművek, amelyek egyedi légialkalmassági bizonyítványát először 1987 január 1-én vagy ezt követően adták ki

Megjegyzés: A pilótakabin hangrögzítő berendezésre előírt műszaki követelmények megtalálhatók az EUROCAE Polgári Légiközlekedési Berendezések Európai Szervezete repülési adatrögzítő rendszerekre kidolgozott MOPS (minimális üzemi teljesítmény előírások) kiadványában vagy más egyenértékű dokumentumban.

4.9.5.1 Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) több mint 7000 kg, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt. A repülési adatrögzítővel nem rendelkező forgószárnyas légijárművön a pilótakabin hangrögzítő berendezés egyik felvételi sávján rögzítsék legalább a fő forgószárny fordulatszámát.

4.9.5.2 ***Ajánlás*** *– Minden olyan forgószárnyas légijárművet, amelynek legnagyobb engedélyezett felszállósúlya (tömege) 3180 kg-tól 7000 kg-ig terjed, szereljenek fel pilótakabin hangrögzítő berendezéssel, amelynek célja a pilótakabin belső hangkörnyezetének rögzítése a repülés időtartama alatt. A repülési adatrögzítővel nem rendelkező forgószárnyas légijárművön a pilótakabin hangrögzítő berendezés egyik felvételi sávján rögzítsék legalább a fő forgószárny fordulatszámát.*

4.9.6 Pilótakabin hangrögzítők – felvételi időtartam

4.9.6.1 A pilótakabin hangrögzítő berendezés képes legyen a működése legalább utolsó 30 percében rögzített tájékoztatások tárolására.

4.9.6.2 **Ajánlás** —*Az a pilótakabin hangrögzítő berendezés, amelyet olyan forgószárnyas légijárműbe szereltek be, amelynek egyedi légialkalmassági bizonyítványát először 1990 január 1-én vagy ezt követően adták ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.*

4.9.6.3 Az a pilótakabin hangrögzítő berendezés, amelyet olyan forgószárnyas légijárműbe szereltek be, amelynek egyedi légialkalmassági bizonyítványát először 2003 január 1. után adják ki, képes legyen a működése legalább utolsó két órájában rögzített tájékoztatások tárolására.

4.9.7 Repülési adatrögzítők – szerkezet és beszerelés

A repülési adatrögzítőket úgy készítsék el és helyezzék el illetve szereljék be a repülőgépbe, hogy biztosítsák a rögzített adatok gyakorlatilag lehetséges legnagyobb védelmét annak érdekében, hogy a rögzített tájékoztatások megőrizhetők, leolvashatók és feldolgozhatók legyenek.

4.9.8 Repülési adatrögzítők – működés

4.9.8.1 A repülési adatrögzítőt a repülés alatt ne kapcsolják ki.

4.9.8.2 A repülési adatrögzítővel rögzített tájékoztatások megőrzése érdekében a berendezést egy baleset vagy repesemény utáni repülés befejezését követően kapcsolják ki és azt a 13. Annex előírásaival összhangban a tájékoztatásokat tartalmazó adathordozó eltávolítása előtt ne kapcsolják ismét be.

1. Megjegyzés: A repülési adatrögzítővel rögzített tájékoztatások légijárműből történő eltávolításának szükségességét a vizsgálatot végző állam vizsgáló hatósága határozza meg az esemény súlyossága és körülményei alapján, beleértve az eseménynek a repülési üzemre gyakorolt hatását is.

2. Megjegyzés: A járatónak a repülési adatrögzítővel rögzített tájékoztatások tárolására vonatkozó felelősségét a 9.6 pont tartalmazza.

4.9.9 Repülési adatrögzítők – folyamatos működőképesség

Végezzék el a repülési adat és pilótakabin hangrögzítő rendszerek felvételeinek üzemi ellenőrzését és értékelését annak érdekében, hogy a rögzítő berendezések folyamatos működőképességét biztosíthassák.

Megjegyzés: A repülési adat és pilótakabin hangrögzítő rendszerek ellenőrzésének eljárásait a B. Melléklet tartalmazza.

4.10 Vészhelyzeti helyjeladó berendezés (ELT)

4.10.1 A 4.10.2 pont előírása kivételével 2005 január 1-ig az összes olyan, a 4.3.1 a) alpont alapján vízfelszín felett üzemeltetett 1. és 2. teljesítmény osztályú és a 4.3.1 b) alpont alapján üzemeltetett 3. teljesítmény osztályú forgószárnyas légijárművet mentőtutajonként legalább egy darab (ELT/S) berendezéssel szereljenek fel, azonban összesen kettő darabnál több vészhelyzeti helyjeladó (ELT) berendezés nincs előírva.

4.10.2 Minden olyan a 4.3.1 a) alpont alapján vízfelszín felett üzemeltetett 1. és 2. teljesítmény osztályú és a 4.3.1 b) alpont alapján üzemeltetett 3. teljesítmény osztályú forgószárnyas légijárművet amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1. után adják ki, mentőtutajonként legalább egy darab automatikus valamint legalább egy vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel.

4.10.3 2005 január 1-től minden a 4.3.1 a) alpont alapján vízfelszín felett üzemeltetett 1. és 2. teljesítmény osztályú és a 4.3.1 b) alpont alapján üzemeltetett 3. teljesítmény osztályú forgószárnyas légijárművet mentőtutajonként legalább egy darab automatikus valamint legalább egy vészhelyzeti helyjeladó (ELT/S) berendezéssel szereljenek fel.

4.10.4 A 4.10.5 pont előírása kivételével 2005 január 1-ig az összes olyan, a 4.4 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó forgószárnyas légijárművet legalább egy darab vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.10.5 Az összes olyan, a 4.4 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó forgószárnyas légijárművet, amelynek egyedi légialkalmassági bizonyítványát először 2002 január 1-én vagy ezt követően adják ki legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.10.6 2005 január 1-től az összes olyan, a 4.4 szakasz alapján kijelölt szárazföldi területek felett repülést végrehajtó forgószárnyas légijárművet legalább egy darab automatikus vészhelyzeti helyjeladó (ELT) berendezéssel szereljenek fel.

4.10.7 **Ajánlás** – *Minden forgószárnyas légijárművet szereljenek fel automatikusan működésbe lépő vészhelyzeti helyjeladó (ELT) berendezéssel.*

4.10.8 A fenti 4.10.1 – 4.10.7 pontok alapján felszerelt vészhelyzeti helyjeladó (ELT) berendezés a 10. Annex III. kötet vonatkozó előírásai szerint üzemeljen.

4.11 Forgószárnyas légijárművek, amelyeket nyomásmagasság-adó másodlagos radar válaszjeladóval kell felszerelni

4.11.1 2003 január 1-től az illetékes hatóság felmentésének kivételével minden forgószárnyas légijárművet szereljenek fel a 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemelő nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel.

4.11.2 **Ajánlás** – *Minden forgószárnyas légijárművet szereljenek fel a 10. Annex IV. kötet vonatkozó előírásainak megfelelően üzemelő nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel.*

Megjegyzés: A 4.11.1 és 4.11.2 pontok előírásainak célja a légiforgalmi szolgálatok valamint az összeütközést elkerülő fedélzeti rendszerek hatékony működésének fejlesztése. Az ACAS rendszer felszerelésére és szállítására vonatkozó hatálybalépési időpontokat a 6. Annex I. rész 6.18.1 és 6.18.2 pontjai tartalmazzák. Az előírás célja továbbá az is, hogy a nyomásmagasság-adó másodlagos radar válaszjeladó berendezéssel fel nem szerelt légijármű ne üzemeljen közös légtérben olyan légijárművel, amely összeütközést elkerülő fedélzeti rendszerrel (ACAS) van felszerelve. Ennek érdekében a nyomásmagasság-adó másodlagos radar válaszjel adó berendezés szállítása alól történő felmentéseket olyan légtér kijelölése mellett adják ki, amelyben az ilyen berendezés szállítása nem kötelező.

4.12 Mikrofonok

Ajánlás – *A pilótakabinban szolgálati feladatot ellátó összes hajózószemélyzeti tag közleményváltásaihoz az átváltási szint/magasság alatt gégemikrofont vagy fejhallgatóhoz erősített mikrofont használjon.*

5. fejezet
Forgószárnyas légijármű távközlési és navigációs berendezések

5.1 Távközlési berendezés

5.1.1 A műszerrepülési szabályok szerint vagy éjszaka üzemeltetett forgószárnyas légijárművet szereljék fel rádió távközlési berendezéssel. Az ilyen berendezés a meghatározott frekvenciákon alkalmas legyen kétoldalú rádióösszeköttetés fenntartására az illetékes hatóság által előírt légiforgalmi állomásokkal.

Megjegyzés: A 5.1.1 pont előírásai teljesítettnek tekinthetők, ha az útvonalon szokásos hullámterjedési viszonyok között a forgószárnyas légijármű képes az itt meghatározott távközlési összeköttetések fenntartására.

5.1.2 Amikor a 5.1.1 előírásának teljesítése érdekében egynél több berendezés felszerelése szükséges, azok egymástól függetlenül működjenek úgy, hogy az egyik berendezés meghibásodása ne okozza bármely másik berendezés meghibásodását.

5.1.3 A látvarepülési szabályok szerint, de ellenőrzött repülésként üzemeltetett forgószárnyas légijárművet az illetékes hatóság mentesítő engedélyének hiányában szereljenek fel rádió távközlési berendezéssel, amely a repülés végrehajtása alatt bármikor alkalmas az illetékes hatóság által meghatározott frekvenciákon és kijelölt légiforgalmi állomásokkal a kétoldalú rádió-összeköttetés fenntartására.

5.1.4 Azt a forgószárnyas légijárművet, amelyet olyan repülés végrehajtására használnak fel, amelyre a 4.3 vagy 4.4 szakaszok előírásai vonatkoznak, az illetékes hatóság mentesítő engedélyének hiányában szereljenek fel rádió távközlési berendezéssel, amely a repülés végrehajtása alatt bármikor alkalmas az illetékes hatóság által meghatározott frekvenciákon és kijelölt légiforgalmi állomásokkal a kétoldalú rádió-összeköttetés fenntartására.

5.1.5 **Ajánlás** – *Az 5.1.1 – 5.1.4 pontok alapján előírt rádió berendezés alkalmas legyen rádió összeköttetés fenntartására a 121.5 Mhz-es légiközlekedési vészfrekvencián.*

5.2 Navigációs berendezés

5.2.1 A forgószárnyas légijárművet olyan navigációs berendezéssel szereljék fel, amelynek segítségével az képes:

a) az üzemeltetői repülési tervében meghatározott útvonal követésére; és

b) a légiforgalmi szolgálatok előírásainak megfelelő repülés végrehajtására; kivéve, ha ezt az illetékes hatóság nem tiltja meg, a látvarepülési szabályok szerint végrehajtott repülés során a navigációt a földi tájékozódási pontok látás utáni azonosításával hajtja vége. Az általános célú nemzetközi légiközlekedés esetében a földi vonatkozási pontok (tereptárgyak illetve jellegzetes tájolási pontok) közötti legnagyobb távolság 110 km (60 NM) lehet.

5.2.2 A légtér meghatározott szakaszaiban vagy olyan útvonalakon történő repülés esetében, amelyekre vonatkozóan RNP típust írtak elő, a forgószárnyas légijármű az 5.2.1 pontban ismertetett előírások mellett:

a) legyen felszerelve olyan navigációs berendezésekkel, amelyek lehetővé teszik az előírt RNP típus(ok) szerinti üzemeltetést; és

b) a lajstromozó állam részéről rendelkezzen jogosítással az ilyen légtérben történő üzemeléshez.

Megjegyzés: Az előírt navigációs pontosságra (RNP), az ezzel összefüggő eljárásokra valamint a jogosítási folyamatra vonatkozó tájékoztatásokat az RNP Kézikönyv *(Doc 9613) tartalmazza. A kiadvány átfogóan felsorolja azokat a dokumentumokat és egyéb anyagokat, amelyeket az államok és a nemzetközi szervezetek a navigációs rendszerekre valamint az előírt navigációs teljesítményre vonatkozóan készítettek el.*

5.2.3 A forgószárnyas légijárművet olyan navigációs berendezéssel szereljék fel, amely biztosítja, hogy a repülés végrehajtásának bármely szakaszában bekövetkező, az egyik rendszert érintő meghibásodás esetében a forgószárnyas légijárművet a 5.2.1 pont valamint ahol ez alkalmazható, az 5.2.2 pont előírásainak megfelelően tovább lehessen irányítani (navigálni).

Megjegyzés: Az általános célú nemzetközi légiközlekedés vonatkozásában ezt az előírást a berendezések megkettőzésén kívül más módszerekkel is teljesíthetik.

5.2.4 A műszeres időjárási körülmények között végrehajtott leszállással tervezett repülések esetében a forgószárnyas légijárművet szereljék fel olyan rádió berendezéssel, amely alkalmas az irányvezetést biztosító rádiójelek vételére addig a pontig, ahonnan a leszállás látással végrehajtható. Ez a rádió berendezés alkalmas legyen az irányvezetés biztosítására minden olyan tervezett leszállási valamint bármely kijelölt kitérő helikopter repülőtéren, ahol műszeres időjárási körülmények között történő leszállás végrehajtását tervezik.

6. fejezet
Forgószárnyas légijármű karbantartás

1. Megjegyzés: A jelen fejezetben történő alkalmazás során a forgószárnyas légijármű kifejezésbe tartoznak a hajtóművek, meghajtás áttételek, forgószárnyak, légcsavarok, alkatrészek, műszerek, szerkezeti egységek és felszerelések, beleértve a vészhelyzeti felszereléseket is.

2. Megjegyzés: A folyamatos légialkalmasság követelményeire vonatkozó útmutató a Légialkalmassági Kézikönyv*-ben (Doc 9760) található*
.

6.1 Felelősség

6.1.1 A forgószárnyas légijármű tulajdonosa vagy bérlet esetében annak bérlője biztosítsa, hogy:

a) minden üzemeltetett forgószárnyas légijárműve repülésre alkalmas állapotban legyen;

b) a tervezett repüléshez szükséges üzemeltetési és vészhelyzeti berendezések működőképesek legyenek;

c) minden egyes üzemeltetett forgószárnyas légijárművének Légialkalmassági Bizonyítványa érvényes legyen;

d) a forgószárnyas légijármű karbantartását a lajstromozó állam részéről elfogadható program szerint elvégezték.

6.1.2 A forgószárnyas légijárművet csak akkor üzemeltessék, ha azt a lajstromozó állam részéről elfogadható rendszerben tartják karban és helyezik üzembe.

6.1.3 Amikor a karbantartási nyilatkozatot nem a 6. Annex I. rész 8.7 szakasza alapján jóváhagyott szervezet adja ki, a karbantartási nyilatkozatot aláíró személy az 1. Annex előírásainak megfelelő szakszolgálati jogosítással rendelkezzen.

6.2 Karbantartások nyilvántartása

6.2.1 A tulajdonos biztosítsa a karbantartásokra vonatkozó következő nyilvántartások megőrzését a 6.2.2 pontban jelzett időtartamig:

a) a forgószárnyas légijármű és az összes korlátozott ideig üzemeltethető alkatrészének teljes üzemideje (szükség szerint órában, naptári időszakban és repülési ciklusokban meghatározva);

b) a forgószárnyas légijármű állapota az összes kötelező folyamatos légialkalmassági előírás és tájékoztatás teljesítése vonatkozásában;

c) a forgószárnyas légijármű és főbb szerkezeti elemeinek, alkatrészeinek módosítása és javítása valamint ennek részletezése;

d) a forgószárnyas légijármű vagy meghatározott kötelező karbantartási időszakkal vagy ciklussal rendelkező részeinek teljes üzemideje az utolsó (nagy)javítás óta (szükség szerint órában, naptári időszakban és/vagy repülési ciklusokban meghatározva);

e) a forgószárnyas légijármű karbantartási programhoz viszonyított jelenlegi felülvizsgálati – ellenőrzési – helyzete a feladatok végrehajtása alapján; és

f) részletes karbantartási jegyzőkönyvek, amelyekből megállapítható, hogy teljesítették a karbantartási nyilatkozat kiadásához szükséges összes előírást.

6.2.2 A 6.2.1 a)–e) alpontokban ismertetett nyilvántartásokat azon egység üzemi élettartamának lejáratát és üzemeltetésből történő végleges kivonását követő legalább 90 napig őrizzék meg, amely egységre a nyilvántartás vonatkozik. A 6.2.1 f) alpontban ismertetett jegyzőkönyvet a karbantartási nyilatkozat aláírását követő egy évig őrizzék meg.

6.2.3 A forgószárnyas légijármű bérlője a bérleti időtartam alatt szükség szerint teljesítse a 6.2.1 és 6.2.2 pontok előírásait.

6.3 Folyamatos légialkalmassági tájékoztatás

A 3180 kg. legnagyobb engedélyezett felszállósúlynál (tömeg) nehezebb forgószárnyas légijármű tulajdonosa vagy bérlet esetében annak bérlője a lajstromozó állam előírásai szerint biztosítsa, hogy a folyamatos légialkalmasságra vonatkozó tájékoztatásokat és gyakorlati tapasztalatokat a 8. Annex II. rész 4.3.5 valamint 4.3.8 pontok előírásaiban meghatározott rendszer alapján továbbítsák.

6.4 Módosítások és javítások

Az összes módosítást és javítást a lajstromozó állam által elfogadható légialkalmassági előírásoknak megfelelően végezzék el. Dolgozzanak ki eljárásokat annak biztosítására, hogy a légialkalmasságra vonatkozó követelmények teljesítésének bizonyítására elegendő mennyiségű adatot őriznek meg.

6.5 Karbantartási nyilatkozat

6.5.1 A lajtromozó állam előírásai szerint a karbantartási munka kielégítő és sikeres elvégzésének igazolására készítsenek el és írjanak alá karbantartási nyilatkozatot.

6.5.2 A karbantartási nyilatkozat tartalmazzon igazolást az alábbiakról:
a) az elvégzett karbantartási munka alapvető részletei;
b) a karbantartás befejezésének időpontja;
c) az engedélyezett karbantartó szervezet azonosítója – amennyiben ez alkalmazható; és
d) a karbantartási nyilatkozatot aláíró személy vagy személyek neve.

7. fejezet
A forgószárnyas légijármű hajózószemélyzete

7.1 Jogosítások

A légijármű parancsnoka biztosítsa, hogy a hajózószemélyzet minden egyes tagja rendelkezzen a lajstromozó állam által kiadott vagy érvényesített szakszolgálati engedéllyel és jogosításuk megfelelő, továbbá bizonyosodjon meg arról, hogy a hajózószemélyzet tagjai rendelkeznek a szükséges szakmai jártassággal.
Megjegyzés: A repülőgépvezetőknek szóló azon információkat, amelyek a repülési eljárások paramétereire és az üzemeltetési eljárásokra vonatkoznak, a PANS-OPS I. kötete tartalmazza. A látás utáni és a műszeres repülési eljárások felépítésére vonatkozó követelményeket a PANS-OPS II. kötete tartalmazza. Az akadály mentesség követelményeinek és eljárásainak használata egyes államokban eltérhetnek a PANS-OPS előírásaitól, és biztonsági okokból fontos ezen különbségek ismerete.
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7.2 A hajózószemélyzet összetétele

A hajózószemélyzet tagjainak száma és összetétele a repülésvégrehajtási kézikönyvben vagy a légijármű légialkalmassági bizonyítványával összefüggésben levő más egyéb dokumentumban meghatározott minimális létszámnál alacsonyabb ne legyen.

6. Annex – III. rész

Függelékek

1. Szerkezet

Ajánlás – A 2. fejezet 2.2.2.1 pont előírásai alapján kiadott üzemeltetési kézikönyvet, amely a különböző üzemeltetési területek szerint esetleg külön részekből is állhat, a következő összeállítás szerint készítsék el:

a) általános rész;

b) légijármű üzemeltetési tájékoztatások;

c) útvonalak és repülőterek; és

d) kiképzés.

1.2 2006 január 1-től a 2. fejezet 2.2.2.1 pont előírásai alapján kiadott üzemeltetési kézikönyvet, amely a különböző üzemeltetési területek szerint esetleg külön részekből is állhat, a következő összeállítás szerint készítsék el:

a) általános rész;

b) légijármű üzemeltetési tájékoztatások;

c) útvonalak és repülőterek; és

d) kiképzés.

2. Tartalom

A fenti 1.1 és 1.2 pontokban jelzett üzemeltetési kézikönyv legalább az alábbiakat tartalmazza:

2.1 Általános rész

2.1.1 A repülési üzemeltetés végrehajtásához szükséges üzemeltető személyzet felelősségi körének ismertetése.

2.1.2 A hajózószemélyzeti tagok és az utaskabin személyzeti tagok repülési idő és a repülési szolgálati idő korlátozására továbbá a megfelelő pihenőidő biztosítására vonatkozó előírások.

2.1.3 A szállítandó navigációs berendezések felsorolása.

2.1.4 Azon körülmények ismertetése, amelyek között rádiófigyelést kell tartani.

2.1.5 A legalacsonyabb repülési magasság meghatározásának módszere.

2.1.6 A helikopter repülőtér üzemeltetési minimum meghatározásának módszere.

2.1.7 Biztonsági elővigyázatossági intézkedések az olyan tüzelőanyag feltöltés esetére, amikor az utasok a fedélzeten tartózkodnak.

2.1.8 A földi kiszolgálás rendszere és eljárásai.

2.1.9 A balesetet észlelő légijármű parancsnok számára a 12. Annex-ben előírt eljárások.

2.1.10 Minden egyes típusú üzemeltetéshez meghatározott hajózószemélyzet, beleértve a parancsnokság sorrendjének megállapítását is.

2.1.11 Egyedi utasítások az útvonalra szükséges tüzelőanyag és olaj mennyiségének kiszámításához az üzemeltetés valamennyi körülményének figyelembevételével, beleértve beleértve a túlnyomás elvesztésének és az útvonalon bekövetkező egy vagy több hajtómű meghibásodás lehetőségét is.

2.1.12 Azon körülmények, amelyek között oxigén használatra van szükség, továbbá a II. rész 2. fejezet 2.3.8.2 pont alapján meghatározott oxigén-készlet mennyisége.

2.1.13 Tömeg és súlypont (egyensúly) számítási utasítások.

2.1.14 A földi jégtelenítés illetve jégmentesítés végrehajtására és ellenőrzésére vonatkozó utasítások.

2.1.15 Az üzemeltetési repülési tervre vonatkozó előírások.

2.1.16 Előírt szabványos üzemeltetési eljárások (SOP) a repülés minden egyes szakaszára.

2.1.17 A rendes körülmények között használt ellenőrző jegyzékek használatára és a használat időpontjára vonatkozó előírások.

2.1.18 Az indulási korlátozásokra vonatkozó eljárások.

2.1.19 A repülési magasság folyamatos tartásának figyelésére vonatkozó utasítások.

2.1.20 A légiforgalmi irányítói engedélyek tisztázására és elfogadására vonatkozó utasítások különösen abban az esetben, ha azok földfelszín feletti biztonságos magassággal is kapcsolatosak.

2.1.21 Indulási és megközelítési tájékoztatások.

2.1.22 Útvonal és célállomás repülési körülmények ismertetése.

2.1.23 A műszeres megközelítés megkezdéséhez vagy folytatásához szükséges feltételek.

2.1.24 A precíziós és nem-precíziós műszeres megközelítési eljárások végrehajtására vonatkozó utasítások.

2.1.25 A hajózószemélyzet feladatainak kiosztása valamint a tagok munkaterhelése helyes elosztásának eljárásai az éjszakai repülés valamint a műszeres időjárási körülmények között végrehajtott megközelítés és leszállás során.

2.1.26 A polgári légijármű elfogásával kapcsolatos tájékoztatások és utasítások, beleértve;

a) az elfogott légijármű parancsnoka számára a 2. Annex-ben előírt eljárások;

b) az elfogó és az elfogott légijárművek által használandó, a 2. Annex-ben előírt látjelek.

2.1.27 A II. rész 1. fejezet 1.1.7 pont előírásai alapján biztosítandó baleset-megelőzési és repülésbiztonsági program részletezése, beleértve az alkalmazott biztonsági rendszert és személyi felelősséget.

2.1.28 Veszélyes árúk szállítására vonatkozó tájékoztatások és utasítások, beleértve a vészhelyzet esetén végrehajtandó intézkedéseket is.

Megjegyzés: Veszélyes árúk szállítása alkalmával a légijármű fedélzetén bekövetkező váratlan események kezelését érintő módszerek és eljárások kidolgozására valamint végrehajtására vonatkozó útmutató a Veszélyes áruk szállítása során a légijármű fedélzetén bekövetkező események megoldása céljából foganatosítandó intézkedések *(Doc 9481) kiadványban található.*

2.1.29 Biztonsági utasítások és útmutatók.

2.1.30 A II. rész 11. fejezet 11.1 pont előírása szerint biztosítandó repülőgép átkutatási ellenőrző jegyzék.

2.2 Légijármű üzemeltetési tájékoztatások

2.2.1 Légialkalmasság jogosítási és üzemeltetési korlátozások.

2.2.2 A II. rész 4. fejezet 4.1.3 pont alapján előírt általános, különleges és vészhelyzeti eljárások a hajózószemélyzet részére valamint az ezekre vonatkozó ellenőrző jegyzékek.

2.2.3 Repülés tervezési adatok a repülés előtti és repülés közbeni tervezéshez, különböző hajtómű teljesítmény beállítások és repülési sebességek mellett.

2.2.4 Tömeg és súlypont (egyensúly) számítási utasítások.

2.2.5 Légijármű rakodási és teher-rögzítési utasítások.

2.2.6 Légijármű rendszerek, vezérlő szervek és a megfelelő használati utasítások a II. rész 4. fejezet 4.1.3 pont előírása szerint.

2.2.7 Az üzemeltetett forgószárnyas légijármű típusra és az engedélyezett üzemeltetésre vonatkozó gyártó(i) minimális felszerelési jegyzék.

2.2.8 A vészhelyzeti és biztonsági berendezések ellenőrző jegyzéke valamint ezek használati utasítása.

2.2.9 A vészkiürítési eljárások, beleértve az adott légijármű típust érintő eljárásokat, a hajózószemélyzet közötti együttműködés szervezését, a hajózószemélyzet minden egyes tagjának vészhelyzeti helyét és kijelölt vészhelyzeti feladatait.

2.2.10 Az utaskabin személyzet részéről alkalmazott általános, különleges és vészhelyzeti eljárások, az ezekre vonatkozó ellenőrző jegyzékek valamint légijármű rendszer tájékoztatások, beleértve a szükséges együttműködési eljárásokat a hajózószemélyzet és az utaskabin személyzet között.

2.2.11 A különböző repülési útvonalakon szállított vészhelyzeti és túlélési felszerelések valamint azok helyes működésének felszállás előtt történő ellenőrzésének eljárásai, beleértve a szükséges oxigén mennyiség megállapításának és rendelkezésre álló mennyiségének meghatározását.

2.2.12 A túlélők részére a 12. Annex-ben meghatározott, alkalmazandó föld-levegő látjelek.

2.3 Útvonalak és repülőterek

2.3.1 Az útvonalra vonatkozó tájékoztatások, amelyek biztosítják, hogy a hajózószemélyzet minden egyes repülés vonatkozásában részletes tájékoztatást kapjon a távközlési létesítményekről, navigációs berendezésekről, repülőterekről, az üzemeltetéshez igénybe vehető műszeres megközelítésekről, érkezési és indulási eljárásokról valamint minden más olyan tényezőről, amelyet a járató vagy az üzemeltető a szabályszerű repülés-végrehajtás érdekében szükségesnek ítél.

2.3.2 Minden egyes lerepülendő útvonalszakasz legalacsonyabb repülési magassága.

2.3.3 Minden egyes olyan helikopter repülőtér üzemeltetési minimuma, amelyet tervezett leszállási vagy kitérő helikopter repülőtérként valószínűleg igénybe vehetnek.

2.3.4 A megközelítési vagy a helikopter repülőtéri létesítmény használhatóságának csökkenése esetére megnövelt üzemeltetési minimum.

2.4 Kiképzés

2.4.1 A hajózószemélyzet kiképzési program a II. rész 7. fejezet 7.3 szakasz előírásai alapján..

2.4.2 Az utaskabin személyzet kiképzési program a II. rész 10. fejezet 10.3 szakasz előírásai alapján.

2.4.3 A repülésüzemi tiszt / szolgálatvezető kiképző program, ha azt a II. rész 2. fejezet 2.2 szakasz alapján repülés felügyelettel összefüggésben alkalmazzák.

Megjegyzés: A repülésüzemi tiszt / szolgálatvezető kiképző program részletezését a II. rész 8. fejezet 8.2 szakasza tartalmazza.

2. Függelék

A járatók biztonsági felülvizsgálata

(lásd: 2. fejezet, 2.2.1.7)

1. Elsődleges légiközlekedési törvényhozás

1.1 A járató állama léptessen érvénybe és alkalmazzon olyan törvényt, amely képessé teszi az államot a polgári légiközlekedés szabályozására a Polgári Légiközlekedési Hatóság (CAA), vagy erre a célra létrehozott azonos szervezet bevonásával. A törvény jogosítsa fel a Hatóságot az állam felülvizsgálati tevékenységének végrehajtására. A törvény tegye lehetővé előírások kiadását, a járatók tanúsítását és folyamatos felügyeletét, és határozat meghozatalát a Hatóság által megállapított biztonsági ügyekben.

Megjegyzés: A jelen Függelékben használatos Hatóság kifejezés megfelel a Polgári Légiközlekedési Hatóságnak, valamint a felügyelőket és az állományt magába foglaló azonos szervezeteknek.

1.2 A járató állama biztosítsa, hogy az állam törvényei írják elő a járatók számára azt a követelményt, hogy a Hatóság hozzáférhessen a járatók személyi állományához, légijárműveihez, üzemeltetéséhez és létesítményeihez valamint a nyilvántartásokhoz a a tanúsítások és a folyamatos felülvizsgálatok céljából.

Megjegyzés: Azon rendszer kritikus elemeire vonatkozó útmutató, amely képessé teszi az államot az üzemeltetés ellenőzésében, tanúsításában és folyamatos felülvizsgálatában viselt felelősségének gyakorlására, a Biztonsági Felülvizsgálati Kézikönyvnek *(Doc 9734)* az Állami Biztonsági Felülvizsgálati Rendszer Létrehozása és Irányítása *című* A. részében, *az* Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve *(Doc 8335) című anyagban,* és a Légialkalmassági Kézikönyvben *(Doc 9760) található.*

2. Különleges üzemeltetési előírások

2.1 A járató állama olyan előírásokat fogadjon el a légijárművek üzemeltetésének folyamatos felügyeletére és tanúsítására valamint a légijárművek karbantartására, amelyek biztosítják a Nemzetközi Polgári Légiközlekedési Egyezmény Annexeivel való összhangot.

2.2 A járató állama biztosítsa, hogy a technológia és az üzemeltetési környezet változásainak tekintetében az állam előírásai eléggé átfogóak, részletezettek és naprakészek legyenek, amelyek garantálják, hogy az előírásokhoz való alkalmazkodás az adott üzemeltetés elfogadható biztonsági szintjét eredményezi.

3. A Polgári Légiközlekedési Hatóság felépítése és a biztonsági felülvizsgálati feladatok

3.1 Az állami felelősség hatékony vállalása érdekében a járató állama biztosítsa, hogy a Hatóság legyen felelős a légiüzemeltetés biztonsági felülvizsgálatáért, valamint a Hatóság rendelkezzen az állam fennhatósága alá tartozó polgári légiközlekedés összetettségének és méretének megfelelő erőforrásokkal.

3.2 A járató állama biztosítsa, hogy a hatósági ellenőrök rendelkezzenek megfelelő támogatással, felhatalmazással és szállítóeszközzel annak érdekében, hogy függetlenül láthassák el a tanúsítási és folyamatos felügyeleti tevékenységüket.

4. Műszaki útmutatók

4.1 A járató állama biztosítsa, hogy a hatósági ellenőrök a járatók tanúsításához és folyamatos felülvizsgálatához szükséges irányelveket, eljárásokat és szabványokat tartalmazó műszaki útmutató kézikönyvekkel rendelkezzenek.

4.2 A járató állama biztosítsa, hogy a hatósági ellenőrök a biztonsági kérdésekkel összefüggő és a hatályba léptetést is magukba foglaló döntésekhez szükséges irányelveket, eljárásokat és szabványokat tartalmazó műszaki útmutató kézikönyvekkel rendelkezzenek.

4.3 A járató állama biztosítsa, hogy a hatósági ellenőrök a hivatalos kötelezettségek teljesítésekor követendő erkölcsre, személyes viselkedésre valamint a valós vagy vélt érdek ütközések elkerülésére irányuló műszaki útmutató kézikönyvekkel rendelkezzenek.

5. Jogosított műszaki személyzet

5.1 A járató állama használjon módszertant az ellenőri állományára vonatkozó követelmények meghatározására, az adott állam polgári légiközlekedésének összetettségéhez és méretéhez igazodva.

5.2 **Ajánlás –** az 5.1 bekezdés módszertanát dokumentálják.

5.3 A járató állama határozzon meg jogosítási követelményeket anak biztosítása érdekében, hogy az ellenőrző személyzetük rendelkezzen a tanúsításhoz és ellenőrzéshez szükséges tevékenységükkel összhangban álló üzemeltetési és műszaki végrehajtási tapasztalattal és képzettséggel.

Megjegyzés: az ellenőrök gyakorlati jártasságára és képzésére vonatkozó útmutatót az Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve *(Doc 8335) című anyag, Fejezet 9, 9.4 része tartalmazza.*

5.4 A járató állama követelje meg, hogy a tanúsítási és a folyamatos felügyeleti feladataik hatékony ellátásához, a hatósági ellenőrök részesüljenek alap- és ismétlő képzésben a vonatkozó műszaki témakörökből (beleértve a légijármű specifikus témaköröket) és gyakorlati ismeretekből.

5.5 **Ajánlás** – *a járató állama hozzon megfelelő intézkedéseket az alkalmazási feltételek és a javadalmazás terén, hogy biztosítani lehessen felkészült ellenőrök jelentkezését és megtartását.*

6. Igazolási és tanúsítási kötelezettségek

6.1 A járató állama alkalmazzon dokumentált eljárást a járatók tanúsításához, amely magába foglalja a III. Rész, II. fejezetében meghatározott eljárások, dokumentációk és üzemeltetések elfogadásához vagy jóváhagyásához vezető átfogó műszaki értékeléseket is.

6.2 A járató állama követelje meg, hogy új kereskedelmi légiszállítási tevékenység megkezdése előtt a járatók bizonyítsák be, hogy a beterjesztett üzemeltetést biztonságosan tudják elvégezni.

7. Folytatólagos felügyeleti kötelezettségek

7.1 A járató állama alkalmazzon dokumentált eljárást a járatók folyamatos felügyeletéhez, amellyel igazolni lehet a járatók részére a Hatóság által kiadott légijármű üzembentartási engedélyek folyamatos érvényességét.

7.2 A járató állama alkalmazzon egy használatban lévő felügyeleti tervet annak alátámasztására, hogy a járatók változatlanul megfelelnek az alaptanúsításra megállapított követelményeknek és, hogy az összes járató megfelelőképpen működik.

8. Biztonsági kérdésekről hozott döntések

8.1 A felismert biztonsági problémák megoldása érdekében, a járató állama alkalmazzon dokumentált eljárást a végrehajtást is magába foglaló megfelelő helyesbítő intézkedések meghozatalához.

8.2 A járató által a felismert biztonsági problémák megoldására hozott intézkedéseket is magába foglaló fejlődést nyomonkövető és nyilvántartó rendszer segítségével, a járató állama győzödjön meg arról, hogy a felismert biztonsági problémák a megfelelő időben megoldásra kerültek.

Mellékletek

A. Melléklet
Forgószárnyas légijármű teljesítmény és üzemeltetési korlátozások

Cél és tárgykör

A következő példa célja azon teljesítmény szint bemutatása, amelyet a 6. Annex III. rész II. szakasz 3. fejezet és III. szakasz 3. fejezet előírásaival kívánunk biztosítani.

1. Meghatározások

1.1 Csak 1. teljesítmény osztályú forgószárnyas légijárművekre alkalmazandó

Szükséges leszállási távolság (LDRH) – Landing distance required
A leszállási felület felett 10.7 méter (35 láb) magasságról történő leszálláshoz és teljes megálláshoz szükséges vízszintes távolság.

Szükséges megszakított felszállási távolság (RTODR) – Rejected take-off distance required
A felszállás megkezdésétől a forgószárnyas légijármű teljes megállásáig szükséges vízszintes távolság a hajtómű meghibásodás és a felszállási elhatározási ponton végrehajtott felszállás megszakítás után.

Szükséges felszállási távolság (TODRH) – Take-off distance required
A felszállás megkezdésétől addig a pontig szükséges vízszintes távolság, ahol a felszállási elhatározási ponton (TDP) bekövetkező kritikus hajtómű meghibásodás után a felszállási felület felett 10.7 méter (35 láb) magasságban V_{TOSS} valamint pozitív emelkedés következik be, miközben a többi hajtómű egység engedélyezett üzemi határértékein belül működik.

1.2 Minden teljesítmény osztályú forgószárnyas légijárműre alkalmazandó

DR Távolság – Distance DR
Az a vízszintes távolság, amelyet a forgószárnyas légijármű a rendelkezésre álló felszállási távolság végétől megtett.

Rendelkezésre álló leszállási távolság (LDAH) – Landing distance available
A rendelkezésre álló végső megközelítési és felszállási terület valamint bármely más terület együttes hossza, amelyet a forgószárnyas légijárművek egy meghatározott magasságból történő leszállásának végrehajtására alkalmasnak nyilvánítottak.

Rendelkezésre álló felszállási távolság (TODAH) – Take-off distance available
A rendelkezésre álló végső megközelítési és felszállási terület valamint ha ilyet meghatároztak, a helikopter biztonsági terület együttes hossza, amelyet a forgószárnyas légijárművek felszállásának végrehajtására alkalmasnak nyilvánítottak.

Földetérési és elemelkedési terület (TLOF) – Touchdown and lift-off area
Olyan teherviselő felület, amelyre a forgószárnyas légijármű leszállhat vagy amelyről elemelkedhet.

V_y
Legjobb emelkedési sebesség.

2. Általános rész

2.1 Jelentős tényezők

A forgószárnyas légijármű teljesítményének meghatározásához legalább a következő tényezőket vegyük figyelembe:

a) a forgószárnyas légijármű tömege;

b) a tengerszint feletti magasság vagy nyomás-magasság valamint a hőmérséklet;

c) szél: fel és leszállásnál bármely jelentett állandó 5 csomós vagy nagyobb szembeszél esetében a szél nem több mint 50 %-át, amennyiben a repülésvégrehajtási kézikönyvben engedélyezik a hátszélben történő fel és leszállás végrehajtását, bármely jelentett hátszél érték nem kevesebb mint 150 %-át vegyük figyelembe. Ahol pontos szélsebesség mérő berendezés a felszállási és leszállási ponton lehetővé teszi a szél sebességének pontos mérését, ezek az értékek változhatnak; és

d) légijármű üzemeltetési módszerek.

2.2 Ahol a repülés bármely szakaszában bekövetkező hajtómű meghibásodás a 2. és 3. teljesítmény osztályú forgószárnyas légijárművek kényszerleszállását okozhatja:

a) a járatónak a forgószárnyas légijármű jellemzőinek figyelembevételével legalacsonyabb látástávolság értéket kell meghatároznia, azonban ez soha nem lehet alacsonyabb mint 2. teljesítmény osztályú forgószárnyas légijármű esetében 1000 méter és 3. teljesítmény osztályú forgószárnyas légijármű esetében 1500 méter;

b) a járató köteles igazolni, hogy a tervezett repülési pálya alatti felület lehetővé teszi, hogy a légijármű vezető kényszerleszállást hajtson végre; ezen felül a vízfelszín feletti repülés esetében a járató azt is köteles igazolni, hogy a forgószárnyas légijármű vízreszállásra is jogosított;

A fentieken túlmenően 3. teljesítmény osztályú üzemeltetés nem végezhető:

c) felszínlátás nélkül; vagy

d) éjszaka; vagy

e) ha a felhőalap 180 méternél (600 láb) alacsonyabb.

3. Üzemeltetési terület

3.1 Földetérési és elemelkedési terület

A talajszinten létesített helikopter repülőtéren a forgószárnyas légijármű futóművének szélessége vagy hossza – amelyik a nagyobb érték – ne haladja meg a földetérési és elemelkedési területet meghatározó kör átmérőjének 2/3-át. Az emelt szinten létesített helikopter repülőtér vagy leszállási hely esetében a végső megközelítési és felszállási terület egybeesik.

3.2 Végső megközelítési és felszállási terület

A forgószárnyas légijármű teljes hossza vagy szélessége – amelyik a nagyobb érték – a vízen létesített helikopter repülőtér kivételével ne haladja meg a végső megközelítési és felszállási terület legkisebb méretének 2/3-át. Ebben az esetben a fenti méret ne haladja meg a FATO szélességének 1/2-ét. Amennyiben a végső megközelítési és felszállási területbe vízfelszín is tartozik, a forgószárnyas légijármű repülésvégrehajtási kézikönyvében külön jogosítással rendelkezzen a vízfelszín feletti általános üzemeltetésre, beleértve a felszállás vízfelületre történő megszakítását is. Az 1. teljesítmény osztályú forgószárnyas légijármű esetében a végső megközelítési és felszállási terület méretei ne legyenek kisebbek, mint amelyek a légijármű repülés-végrehajtási kézikönyvében találhatók.

3.3 Helikopter biztonsági terület

A forgószárnyas légijármű teljes hossza vagy szélessége – amelyik a nagyobb érték – a szárazföldi helikopter repülőtér esetében ne haladja meg a helikopter biztonsági terület szélességének 2/3-át, vízi helikopter repülőtér esetében pedig annak felét.

4. Teljesítménytől függő korlátozások

4.1 Az 1. teljesítmény osztályú forgószárnyas légijármű

4.1.1 *Felszállás*

4.1.1.1 Ne hajtsanak végre felszállást olyan forgószárnyas légijárművel, amelynek tömege nagyobb, mint a repülésvégrehajtási kézikönyvben a helikopter repülőtér tengerszint-feletti magasságára és a felszállás időpontjában uralkodó külső hőmérsékletre meghatározott legnagyobb felszállósúly.

4.1.1.2 Felszállás felszíni helikopter repülőtérről (A-1. ábra)

A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy:

a) a szükséges megszakított felszállási távolság ne legyen több, mint a rendelkezésre álló megszakított felszállási távolság;

b) a szükséges felszállási távolság ne legyen több, mint a rendelkezésre álló felszállási távolság; vagy

Más megoldásként *(A-2. ábra)* a szükséges felszállási távolság figyelmen kívül hagyható feltéve, hogy a felszállási elhatározási ponton bekövetkező kritikus hajtómű meghibásodás esetében a forgószárnyas légijármű felszállását folytatva a rendelkezésre álló felszállási távolság végétől addig a pontig, ahol emelkedése V_{TOSS} sebességgel, 10.7 méter (35 láb) magasságon (függőleges határérték) vagy e felett stabilizálódik, biztonságos magasságon átrepül az összes akadály felett. A forgószárnyas légijármű útjában akadálynak tekintendő az a tárgy, amelynek távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű legnagyobb méretének másfélszerese (1.5x) – amelyik a nagyobb érték.

4.1.1.3 Felszállás emelt szinten létesített helikopter repülőtérről vagy leszállóhelyről (A-3. ábra)

A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy:

a) a felszállási elhatározási pont előtt bekövetkező kritikus hajtómű meghibásodás esetében lehetséges legyen a felszállás megszakítása és a leszállás a végső megközelítési és felszállási területen;

b) amennyiben a kritikus hajtómű meghibásodás a felszállási elhatározási ponton vagy ez után következik be, lehetséges legyen a repülés folytatása – ebben az esetben a forgószárnyas légijármű repülési pályája a V_{TOSS} elérése érdekében a végső megközelítési és felszállási terület magassága alá süllyedő is lehet, ha eleget tesznek a következő feltételeknek:

1) Biztonsági határértéket állapítanak meg az emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre illetve az összes ott található összes akadályra – a

legtöbb forgószárnyas légijármű vonatkozásában a 4.5 méter (15 láb) értéket általánosságban megfelelőnek találták;

2) Az emelt szinten létesített helikopter repülőtér vagy leszállóhely területén kívül levő összes akadály felett a függőleges biztonsági távolság legalább 10.7 méter (35 láb). Akadálynak tekintendő az a tárgy, amelynek távolsága a repülési pályától kevesebb mint 30 méter vagy a forgószárnyas légijármű legnagyobb méretének másfélszerese (1.5x) – amelyik a nagyobb érték.

4.1.2 *Kezdeti emelkedés*

4.1.2.1 A forgószárnyas légijármű felszállósúlya (tömege)olyan legyen, hogy a felszállási elhatározási ponton (TDP) bekövetkező kritikus hajtómű meghibásodás esetében az emelkedési pálya VFR üzemeltetés esetében legalább 10.7 méter (35 láb), IFR üzemeltetés esetében pedig 10.7 méter (35 láb) és ezen felül (+) 0.01 DR függőleges biztonsági távolságot biztosít az emelkedési pályán levő összes akadály felett.

4.1.2.2 Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül a következő érték:

0.10 DR	nappali VFR üzemeltetés
0.15 DR	éjszakai VFR üzemeltetés
0.30 DR	elektronikus irányvezetéssel nem rendelkező IFR üzemeltetés
0.15 DR	elektronikus irányvezetéssel rendelkező IFR üzemeltetés
0.10 DR	ILS vagy MLS rendszerrel működő IFR üzemeltetés esetében.

Kivételt képeznek azok az akadályok, amelyek a következő távolság értéken kívül helyezkednek el:

a) 7 $R^{\#}$ nappali üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető (# R – a forgószárny sugara).;

b) 10 $R^{\#}$ éjszakai üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető;

c) 300 méter, ha navigációs berendezésekkel pontos navigáció végezhető; és

d) 900 méter egyéb esetekben.

4.1.2.3 Ahol több mint 15°-os irányváltoztatást hajtanak végre, az akadályokra vonatkozó biztonsági távolság értékeket a forduló megkezdésének pontja előtt 5 méterrel (15 láb) növeljék meg. Ennek a fordulónak végrehajtását ne kezdjék meg a felszállási felület feletti 30 méter (100 láb) magasság elérése előtt.

4.1.3 *Útvonal*

A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy a teljes repülési pálya bármely pontján bekövetkező kritikus hajtómű meghibásodás esetében lehetséges legyen a repülés folytatása a megfelelő leszállási helyig és a forgószárnyas légijármű elérje a lerepülendő útvonalnak megfelelő legalacsonyabb repülési magasságot.

4.1.4 *Megközelítés – leszállás – megszakított leszállás* (A-7. és A-8. ábra)

4.1.4.1 A forgószárnyas légijármű számított leszálló súlya a célállomáson vagy a kitérőn olyan legyen, hogy az:

a) a 2.1 pontban ismertetett jellemzők figyelembevételével ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb leszálló súly értéket;

b) a szükséges leszállási távolság ne legyen több mint a rendelkezésre álló leszállási távolság;

c) a leszállási elhatározási pont után bárhol bekövetkező kritikus hajtómű meghibásodás esetében lehetséges legyen a leszállás és a megállás a végső megközelítési és felszállási területen belül;

d) amennyiben a kritikus hajtómű meghibásodás a leszállási elhatározási pont (LDP) előtt következik be, lehetséges legyen a leszállás és megállás a végső megközelítési és felszállási területen belül vagy a megszakított leszállás (átstartolás) végrehajtása és a repülési pályán levő összes akadály felett VFR üzemeltetés esetében 10.7 méter (35 láb) valamint ezen felül IFR üzemeltetés esetében további 0.01 DR függőleges biztonsági távolság tartása.

Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül a következő érték:

0.10 DR	nappali VFR üzemeltetés
0.15 DR	éjszakai VFR üzemeltetés
0.30 DR	elektronikus irányvezetéssel nem rendelkező IFR üzemeltetés
0.15 DR	elektronikus irányvezetéssel rendelkező IFR üzemeltetés
0.10 DR	ILS vagy MLS rendszerrel működő IFR üzemeltetés esetében.

Kivételt képeznek azok az akadályok, amelyek a következő távolság értéken kívül helyezkednek el:

e) 7 $R^{\#}$ nappali üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető (# R – a forgószárny sugara);

f) 10 $R^{\#}$ éjszakai üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető;

g) 300 méter, ha navigációs berendezésekkel pontos navigáció végezhető; és

h) 900 méter egyéb esetekben.

4.1.4.2 Az emelt szinten létesített helikopter repülőtéren vagy leszállóhelyen történő leszállás esetében a forgószárnyas légijármű repülési pályája a V_{TOSS} elérése érdekében a leszálló felület magassága alá süllyedő is lehet, ha a következő feltételeknek eleget tesznek:

a) Biztonsági határértéket állapítanak meg az emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre illetve az összes ott található akadályra —a legtöbb forgószárnyas légijármű vonatkozásában a 4.5 méter (15 láb) értéket általánosságban megfelelőnek találták;

b) Az emelt szinten létesített helikopter repülőtér vagy leszállóhely területén kívül levő összes akadály felett a függőleges biztonsági távolság legalább megfelel a 4.1.4.1 pontban előírt értékeknek.

4.2 A 2. teljesítmény osztályú forgószárnyas légijármű

4.2.1 *Felszállás* (A-4. és A-5. ábra)

4.2.1.1 A forgószárnyas légijármű felszállósúlya (tömege) a 2.1 pontban ismertetett jellemzők figyelembevételével ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb felszállósúly értéket.

4.2.1.2 A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy a felszállás utáni meghatározott pont elérése előtt bekövetkező kritikus hajtómű meghibásodás esetében biztonságos kényszerleszállás legyen végrehajtható.

4.2.1.3 Az emelt szinten létesített helikopter repülőtérről vagy leszállóhelyről végrehajtott felszállás alkalmával a V_y elérése előtt bekövetkező kritikus hajtómű meghibásodás esetében, a repülési pálya a V_y elérése érdekében süllyedő is lehet, ha a következő feltételeknek eleget tesznek:

a) Biztonsági határértéket állapítanak meg az emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre illetve az összes ott található akadályra – a legtöbb forgószárnyas légijármű vonatkozásában a 15 láb (4.5 méter) értéket általánosságban megfelelőnek találták;

b) Az emelt szinten létesített helikopter repülőtér vagy leszállóhely területén kívül levő összes akadály felett a függőleges biztonsági távolság legalább 10.7 méter (35 láb). Akadálynak tekintendő az a tárgy, amelynek távolsága a repülési pályától kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték.

4.2.2 *Kezdeti emelkedés*

4.2.2.1 A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy a felszállás utáni meghatározott ponton bekövetkező kritikus hajtómű meghibásodás esetében az emelkedési pálya VFR üzemeltetés esetében legalább 10.7 méter (35 láb), IFR üzemeltetés esetében pedig 10.7 méter (35 láb) és ezen felül (+) 0.01 DR függőleges biztonsági távolságot biztosít az emelkedési pályán levő összes akadály felett.

4.2.2.2 Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül a következő érték:

0.10 DR	nappali VFR üzemeltetés
0.15 DR	éjszakai VFR üzemeltetés
0.30 DR	elektronikus irányvezetéssel nem rendelkező IFR üzemeltetés
0.15 DR	elektronikus irányvezetéssel rendelkező IFR üzemeltetés
0.10 DR	ILS vagy MLS rendszerrel működő IFR üzemeltetés esetében.

Kivételt képeznek azok az akadályok, amelyek a következő távolság értéken kívül helyezkednek el:

a) 7 R# nappali üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető (# R = a forgószárny sugara);

b) 10 R# éjszakai üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető;

c) 300 méter, ha navigációs berendezésekkel pontos navigáció végezhető; és

d) 900 méter egyéb esetekben.

4.2.3 *Útvonal*

A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy a teljes repülési pálya bármely pontján bekövetkező kritikus hajtómű meghibásodás esetében lehetséges legyen a repülés folytatása a megfelelő leszállási helyig és a forgószárnyas légijármű elérje a lerepülendő útvonalnak megfelelő legalacsonyabb repülési magasságot.

4.2.4 *Megközelítés – leszállás – megszakított leszállás* (A-9. és A-10. ábra)

4.2.4.1 A forgószárnyas légijármű számított leszálló súlya a célállomáson vagy a kitérőn olyan legyen, hogy:

a) a 2.1 pontban ismertetett jellemzők figyelembevételével ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb leszálló súly értéket;

b) a leszállás előtti meghatározott pont elérése után bekövetkező kritikus hajtómű meghibásodás esetében biztonságos kényszerleszállás legyen végrehajtható;

c) az összes hajtómű működése mellett a repülési pálya bármely pontján megszakított leszállás végrehajtása lehetséges és a forgószárnyas légijármű a repülési pályán levő összes akadály felett az alábbiaknál nem kevesebb függőleges biztonsági távolságot tart:

10.7 méter (35 láb) VFR üzemeltetés esetében; és
10.7 méter (35 láb) és ezen felül (+) 0.01 DR IFR üzemeltetés esetében;

d) amennyiben a kritikus hajtómű meghibásodás a leszállás előtti meghatározott pont előtt következik be, lehetséges legyen a leszállás és a megállás a végső megközelítési és felszállási területen belül vagy a megszakított leszállás (átstartolás) végrehajtása és a repülési pályán levő összes akadály felett 10.7 méter (35 láb) függőleges biztonsági távolság tartása.

Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül a következő érték:

0.10 DR	nappali VFR üzemeltetés
0.15 DR	éjszakai VFR üzemeltetés
0.30 DR	elektronikus irányvezetéssel nem rendelkező IFR üzemeltetés
0.15 DR	elektronikus irányvezetéssel rendelkező IFR üzemeltetés
0.10 DR	ILS vagy MLS rendszerrel működő IFR üzemeltetés esetében.

Kivételt képeznek azok az akadályok, amelyek a következő távolság értéken kívül helyezkednek el:

e) 7 $R^{\#}$ nappali üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető (# R = a forgószárny sugara.;

f) 10 $R^{\#}$ éjszakai üzemeltetés esetében, ha biztosítják, hogy az emelkedés során alkalmas látás utáni segédeszközökkel pontos navigáció végezhető;

g) 300 méter, ha navigációs berendezésekkel pontos navigáció végezhető; és

h) 900 méter egyéb esetekben.

4.2.4.2 Az emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre végrehajtott leszállás alkalmával a V_y elérése érdekében a repülési pálya a végső megközelítési és felszállási terület magassága alá süllyedő is lehet, ha a következő feltételeknek eleget tesznek:

a) Biztonsági határértéket állapítanak meg az emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre illetve az összes ott található akadályra – a legtöbb forgószárnyas légijármű vonatkozásában a 4.5 méter (15 láb) értéket általánosságban megfelelőnek találták;

b) Az emelt szinten létesített helikopter repülőtér vagy leszállóhely területén kívül levő összes akadály felett a függőleges biztonsági távolság legalább megfelel a 4.2.4.1 pontban meghatározott értékeknek.

4.3 A 3. teljesítmény osztályú forgószárnyas légijármű

4.3.1 *Felszállás* (A-6. ábra)

4.3.1.1 A forgószárnyas légijármű felszállósúlya (tömege) a 2.1 pontban ismertetett jellemzők figyelembevételével ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb felszállósúly értéket.

4.3.1.2 A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy a kritikus hajtómű meghibásodás esetében biztonságos kényszerleszállás legyen végrehajtható.

4.3.2 *Kezdeti emelkedés*

4.3.2.1 A forgószárnyas légijármű felszállósúlya (tömege)olyan legyen, hogy az emelkedési pálya minden hajtómű működése mellett legalább 10.7 méter (35 láb) függőleges biztonsági távolságot biztosít az emelkedési pályán levő összes akadály felett.

4.3.2.2 Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül 0.10 DR érték, kivéve hogy a 7 $R^{\#}$ távolságon túl levő akadályok figyelmen kívül hagyhatók.

4.3.3 *Útvonal*

A forgószárnyas légijármű felszállósúlya (tömege) olyan legyen, hogy minden hajtómű működése mellett a forgószárnyas légijármű elérje a lerepülendő útvonalnak megfelelő legalacsonyabb repülési magasságot.

4.3.4 *Megközelítés – leszállás – megszakított leszállás* (A-11. ábra)

4.3.4.1 A forgószárnyas légijármű számított leszálló súlya a célállomáson vagy a kitérőn olyan legyen, hogy:

a) a 2.1 pontban ismertetett jellemzők figyelembevételével ne haladja meg a repülésvégrehajtási kézikönyvben meghatározott legnagyobb leszálló súly értéket;

b) a kritikus hajtómű meghibásodás esetében biztonságos kényszerleszállás legyen végrehajtható;

c) az összes hajtómű működése mellett a repülési pálya bármely pontján megszakított leszállás végrehajtása lehetséges és a forgószárnyas légijármű a repülési pályán levő összes akadály felett 10.7 méter (35 láb) függőleges biztonsági távolságot tart.

Akadálynak tekintendő az a tárgy, amelynek oldalirányú távolsága a tervezett repülési pálya alatt a felszínen levő legközelebbi ponttól kevesebb mint 30 méter vagy a forgószárnyas légijármű teljes hosszának másfélszerese (1.5x) – amelyik a nagyobb érték – és ezen felül (+) 0.10 DR érték, kivéve hogy a 7 $R^{\#}$ távolságon túl levő akadályok figyelmen kívül hagyhatók.

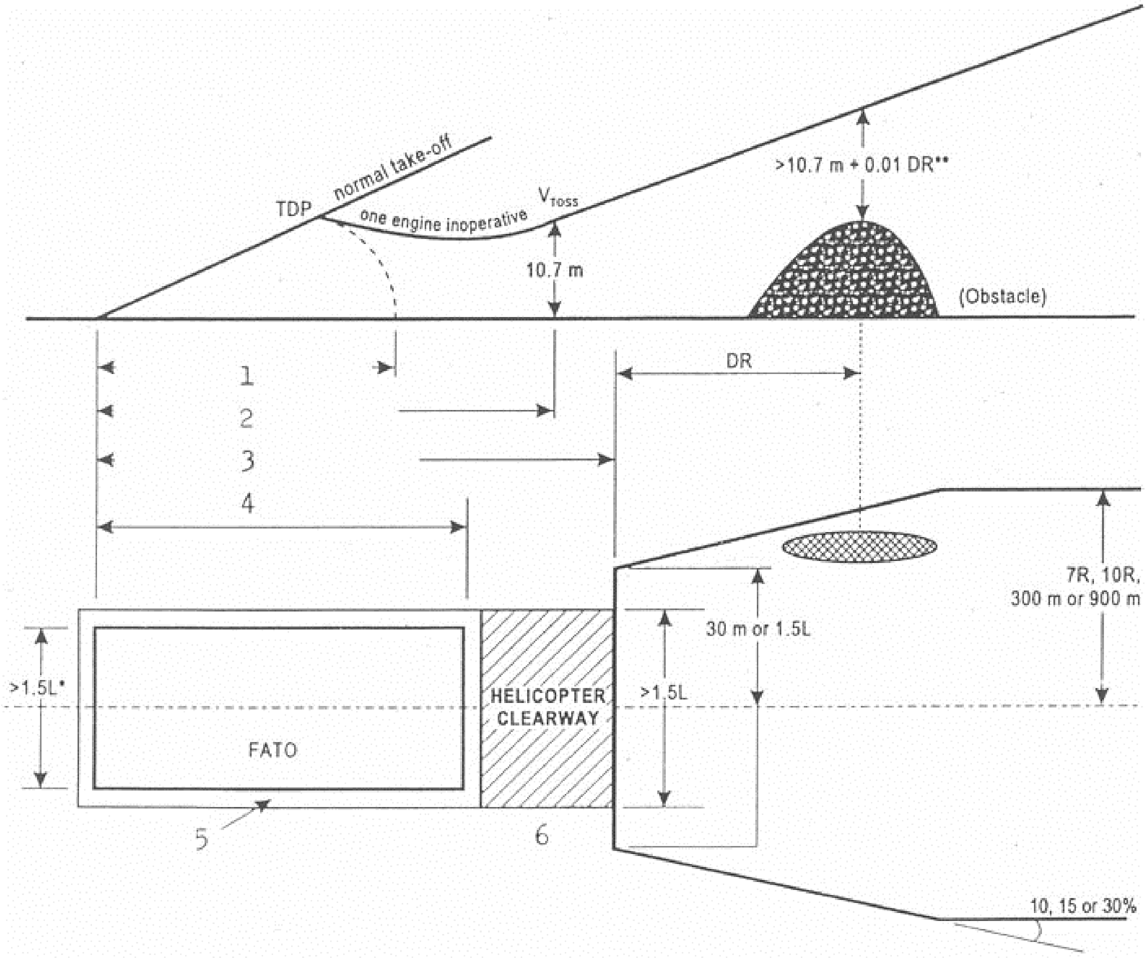
Megjegyzések és magyarázat az A-1. – A-11. ábrákhoz

{egyedi ábra szöveg esetében az ábra számát a megfelelő (1) oszlopban jelezzük}

ábra	*ábra szövege*	*ábra szöveg magyar nyelvű fordítása*
A-1	(1) rejected take-off distance reqiured	szükséges megszakított felszállási távolság
A-2	(2) take-off distance required	szükséges felszállási távolság
A-1	(3) take-off distance available	rendelkezésre álló felszállási távolság
A-2	(4) rejected take-off distance available	rendelkezésre álló megszakított felszállási távolság
A-1	(5) safety area	biztonsági terület
A-2	FATO	végső megközelítési és felszállási terület
	(6) helicopter clearway	forgószárnyas légijármű biztonsági terület
	normal take-off	normál üzemű felszállás
	one engine inoperative	egy hajtómű üzemképtelen
	obstacle	akadály
A-3	TDP	felszállási elhatározási pont
A-4	(7) defined point after take-off	meghatározott pont felszállás után
A-5	(8) area permitting safe forced landing	biztonságos kényszerleszállást lehetővé tevő terület
A-4	(9) VMC required	csak látvarepülési körülmények között
A-7	LDP	leszállási elhatározási pont
A-7	(10) balked landing one engine inoperative	megszakított leszállás – egy hajtómű nem működik
	(AT) suitable area	alkalmas terület
A-8	(11) balked landing all engines operating	megszakított leszállás – minden hajtómű működik
A-8	(12) landing distance required	szükséges leszállási távolság
A-9	(13) landing distance available	rendelkezésre álló leszállási távolság
A-9 A-10	(14) balked landing …{V_y}	megszakított leszállás – minden hajtómű működik vagy a kritikus hajtómű meghibásodás a leszállás előtt meghatározott pont előtt következik be
A-9	(15) defined point before landing	leszállás előtt meghatározott pont
A-10	normal landing	normál üzemű leszállás
A-10	*10.7 méter (35 láb), ha a hajtómű meghibásodás a leszállás előtt meghatározott pontot megelőzően következik be, és VFR üzemelés esetében ha minden hajtómű működik	
A-1, A-4, A-6.	A-2,2L= vízfelszínen létesített helikopter repülőtér vagy leszállóhely esetében	

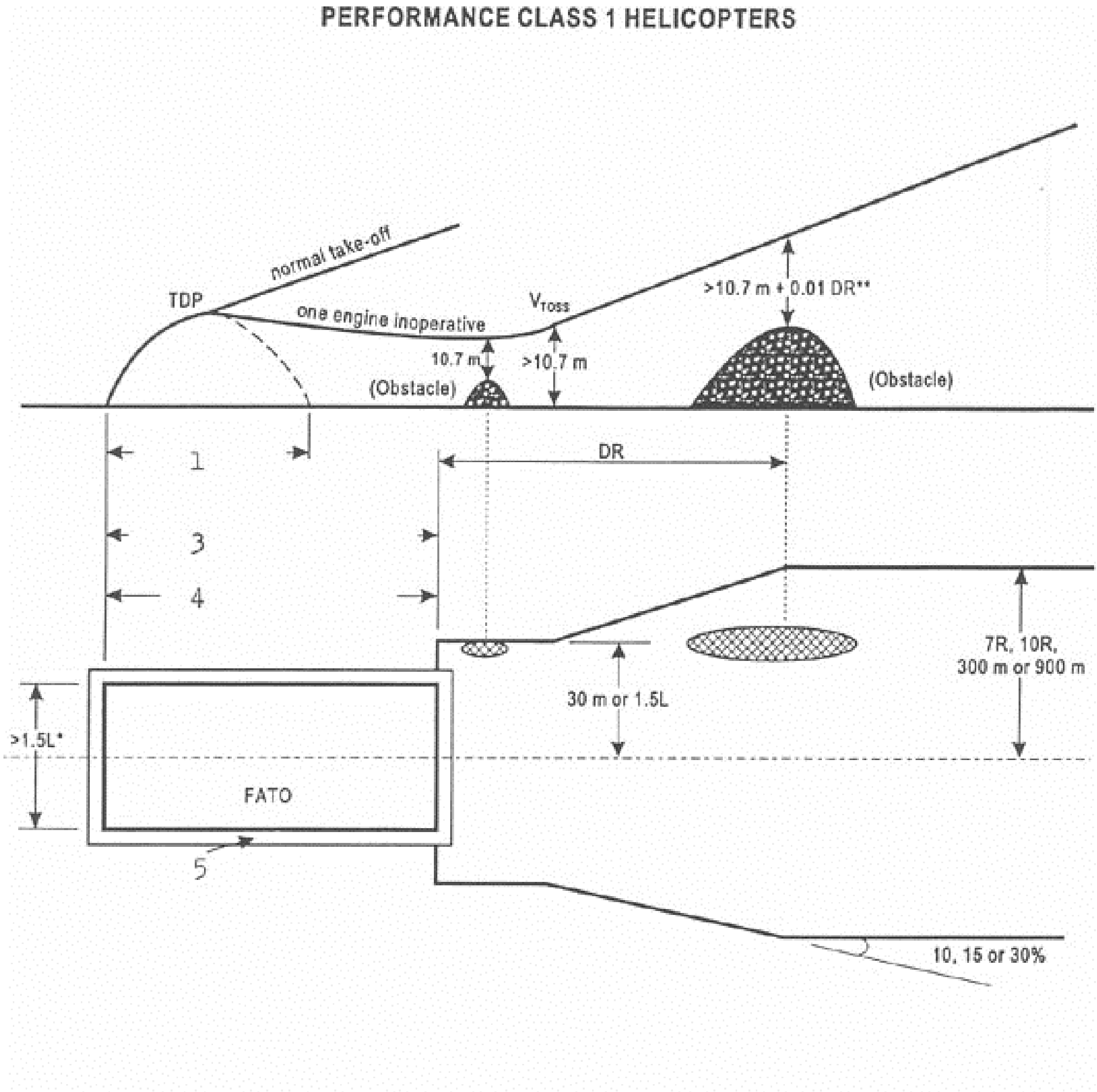
= A műszerrepülési szabályok szerint történő üzemeltetéshez a biztonsági terület az ábrázoltnál nagyobb lesz. A részletek a 14. Annex-ben találhatók.

*= 10.7 méter (35 láb) VFR üzemeltetés esetében
10.7 méter (35 láb) + 0.01 **DR** IFR üzemeltetés esetében



A-1. ábra 1. teljesítmény osztályú forgószárnyas légijármű felszállása felszíni helikopter repülőtérről (#)

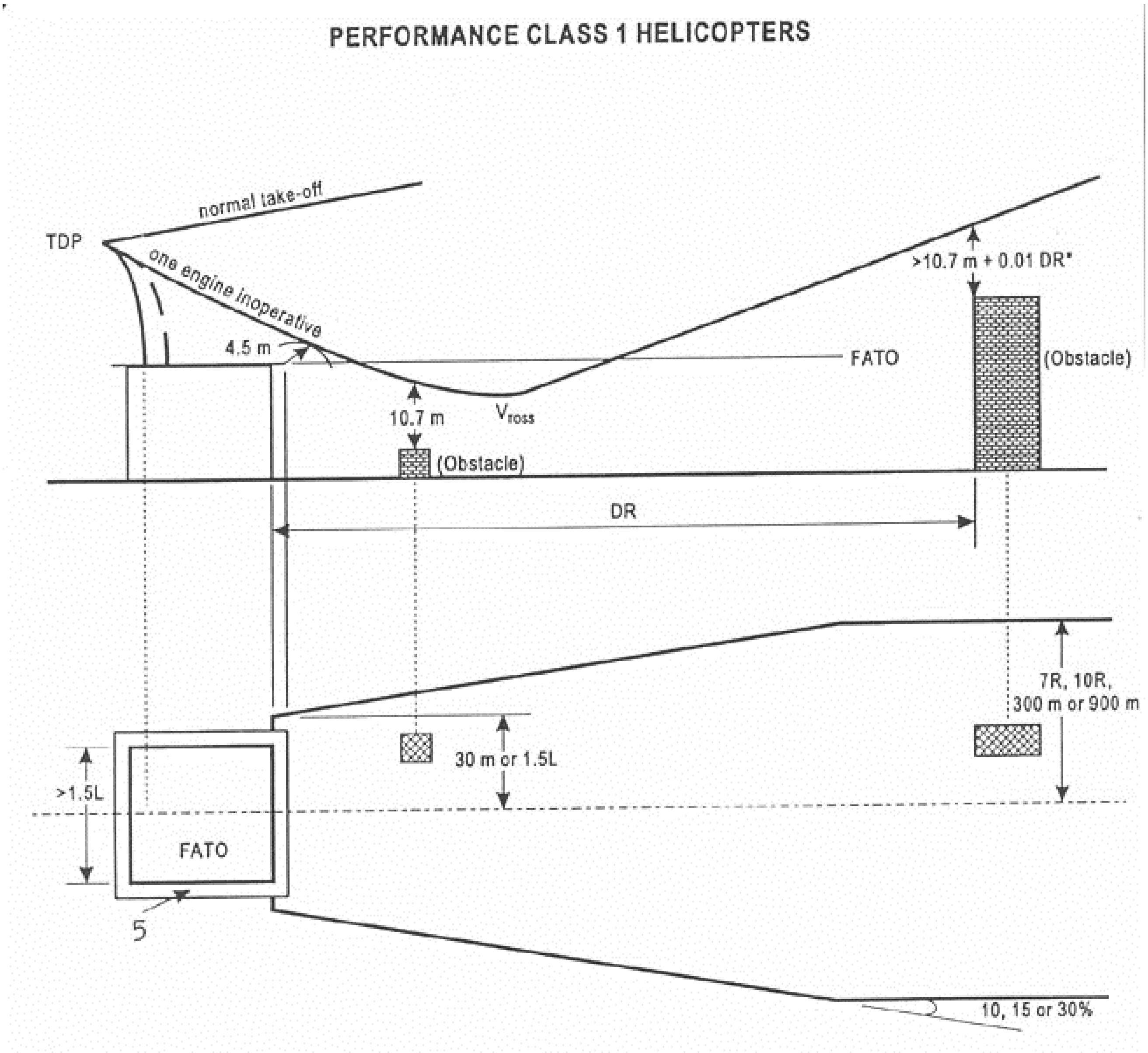
1	Szükséges megszakított felszállás távolság
2	Szükséges felszállási távolság
3	Rendelkezésre álló felszállási távolság
4	Rendelkezésre álló megszakított felszállás távolság
5	Biztonsági terület
6	Forgószárnyas légijármű biztonsági terület



A-2. ábra Az 1. teljesítmény osztályú forgószárnyas légijármű felszállása felszíni helikopter repülőtérről (#) (Lásd 4.1.1.2 b)

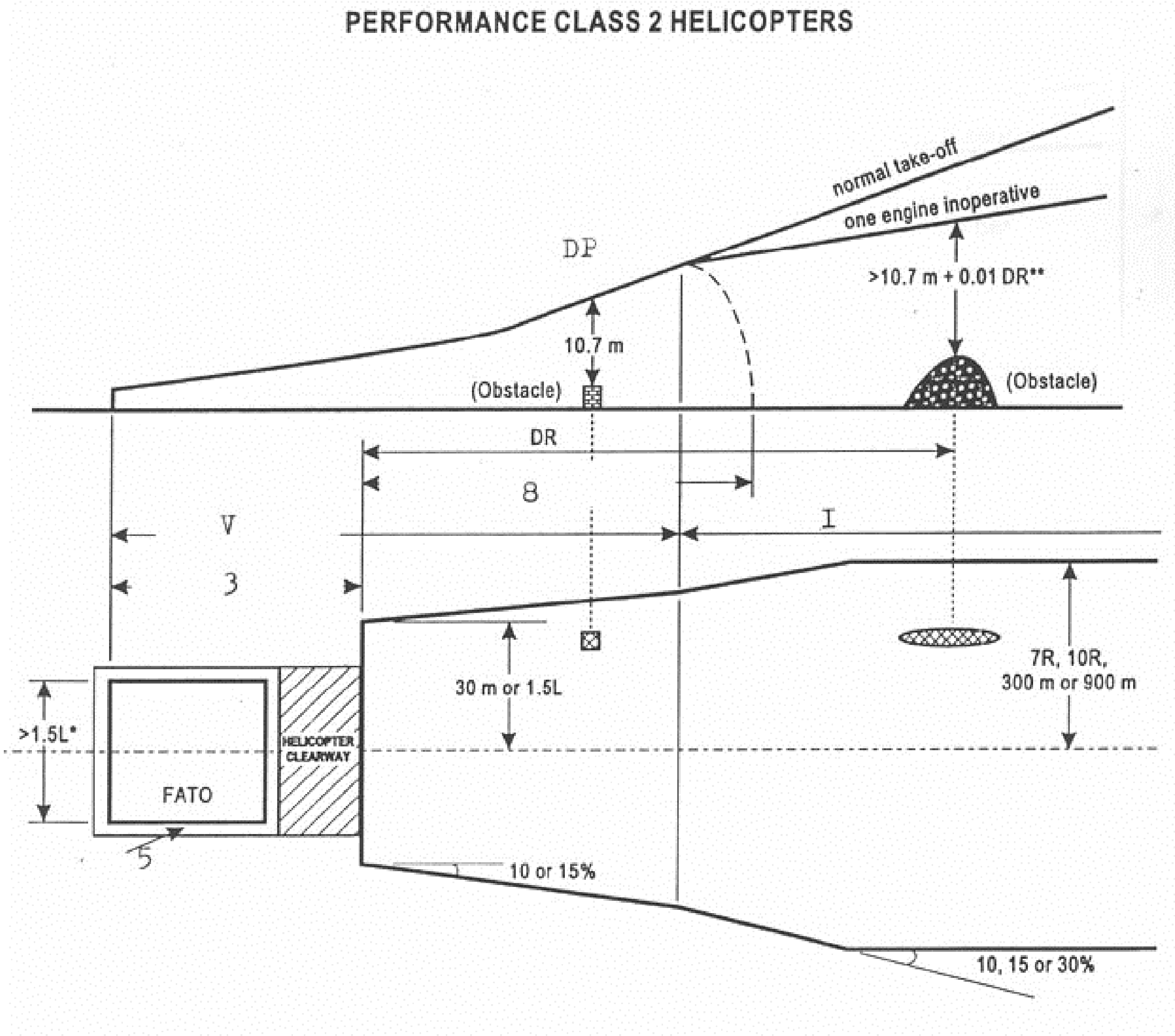
1 Szükséges megszakított felszállás távolság
3 Rendelkezésre álló felszállási távolság
4 Rendelkezésre álló megszakított felszállás távolság
5 Biztonsági terület

* 2L a vízfelszínen telepített helikopter repülőtérnél.
**10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében
L= a forgószárnyas légijármű legnagyobb mérete
Megjegyzés: IFR üzemeltetés esetén a biztonsági terület nagyobb lesz a leírtnál. A részletekért lásd 14 Annex, II kötet.



A-3. ábra Az 1. teljesítmény osztályú forgószárnyas légijármű felszállása emelt szinten létesített helikopter repülőtérről vagy leszállóhelyről

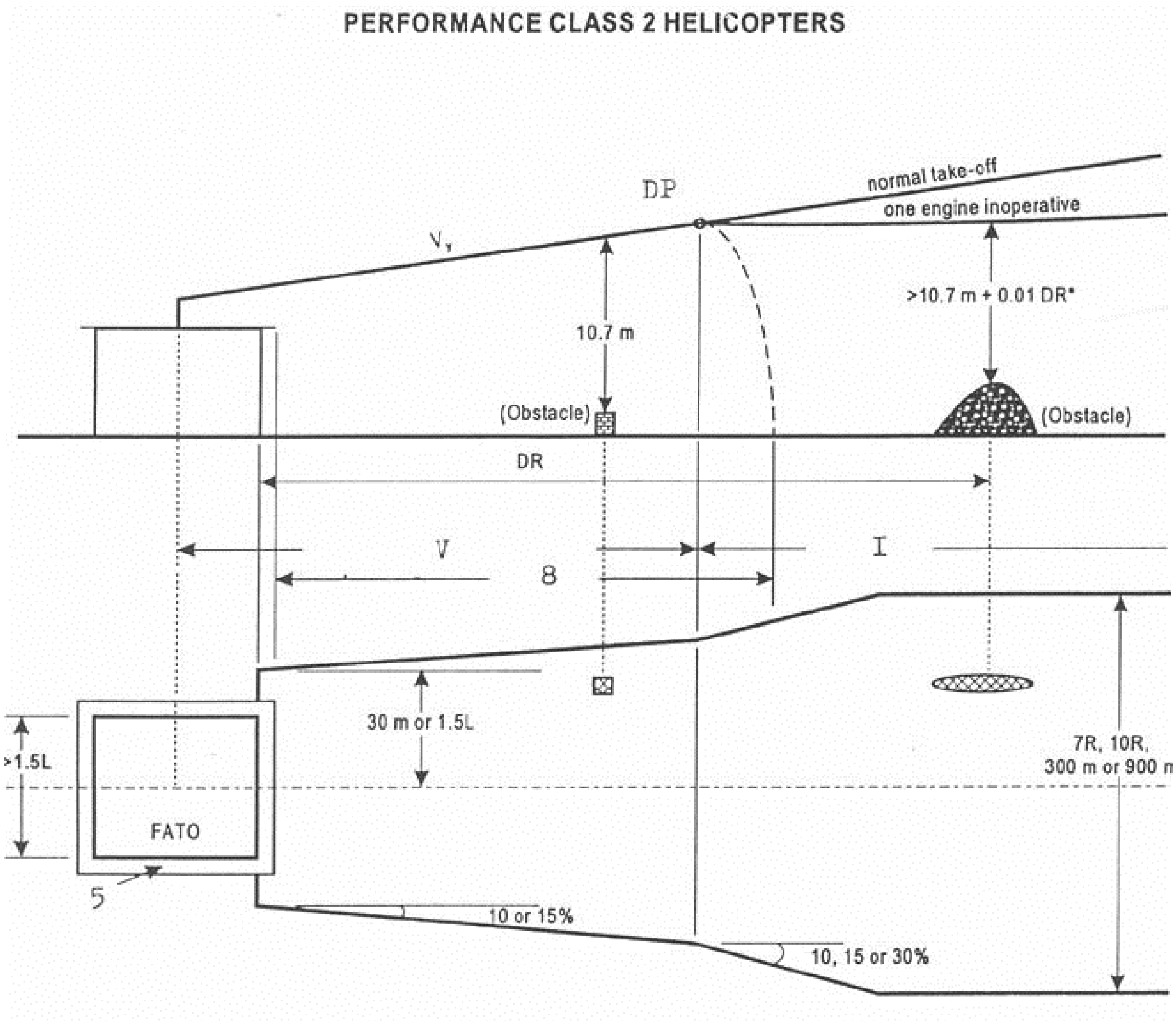
5 Biztonsági terület
TDP Felszállási elhatározási pont
10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében
L= a forgószárnyas légijármű legnagyobb mérete



A-4. ábra A 2. teljesítmény osztályú forgószárnyas légijármű felszállása felszíni helikopter repülőtérről (#)

8	Biztonságos kényszerleszállást lehetővé tevő terület
V	VMC szükséges
I	IMC lehetséges
D	Meghatározott pont a felszállás után
3	Rendelkezésre álló felszállási távolság
5	Biztonsági terület

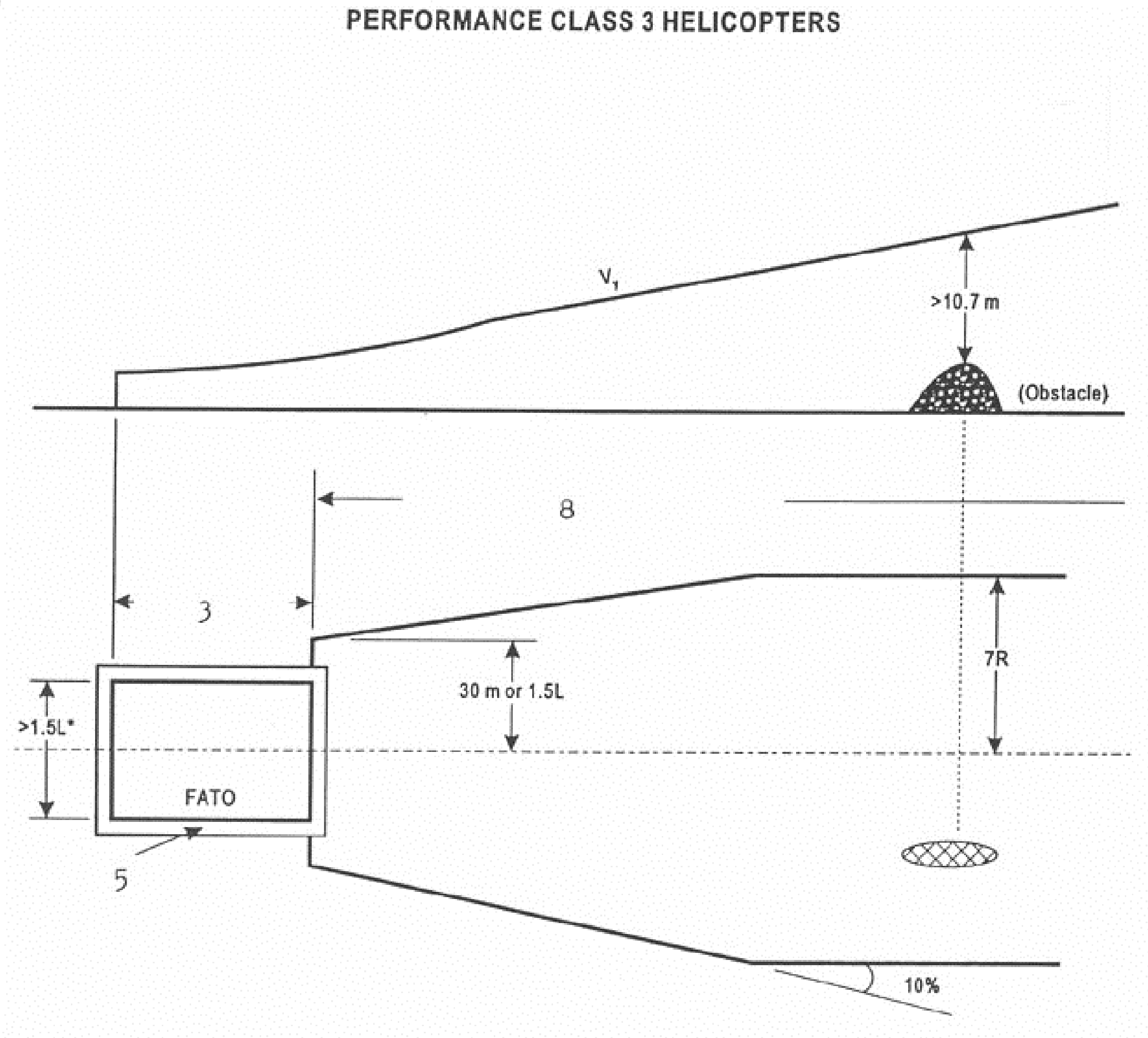
* 2L a vízfelszínen telepített helikopter repülőtérnél.
**10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében
L= a forgószárnyas légijármű legnagyobb mérete
Megjegyzés: IFR üzemeltetés esetén a biztonsági terület nagyobb lesz a leírtnál. A részletekért lásd 14 Annex, II kötet.



A-5. ábra A 2. teljesítmény osztályú forgószárnyas légijármű felszállása emelt szinten létesített helikopter repülőtérről vagy leszállóhelyről

8 Biztonságos kényszerleszállást lehetővé tevő terület
V VMC szükséges
I IMC lehetséges
DP Meghatározott pont a felszállás után
5 Biztonsági terület

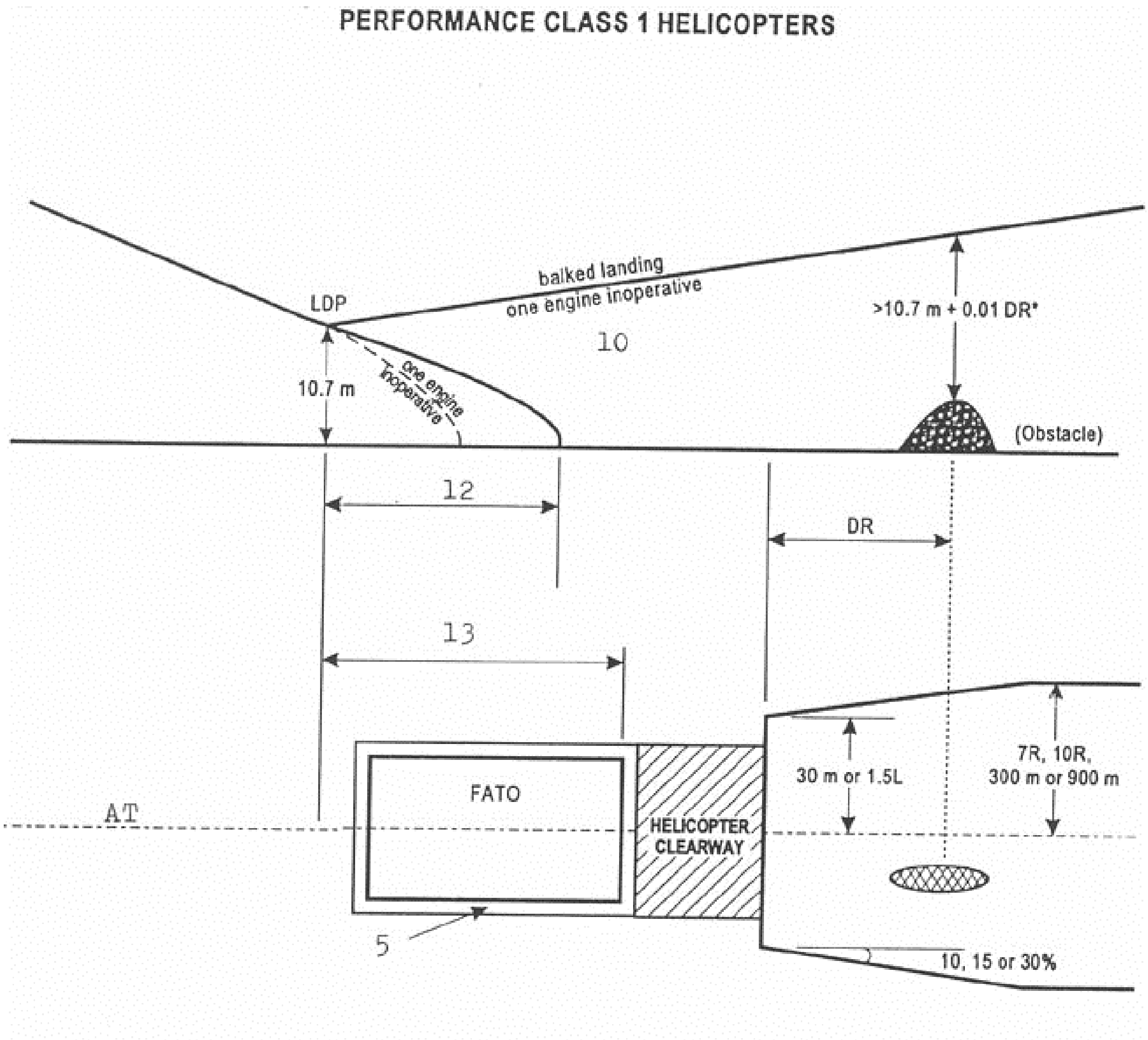
*10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében
L= a forgószárnyas légijármű legnagyobb mérete



A-6. ábra A 3. teljesítmény osztályú forgószárnyas légijármű felszállása felszíni helikopter repülőtérről

8 Biztonságos kényszerleszállást lehetővé tevő terület
3 Rendelkezésre álló felszállási távolság
5 Biztonsági terület

* 2L vízfelszínre telepített helikopter repülőtér esetén
L= a forgószárnyas légijármű legnagyobb mérete



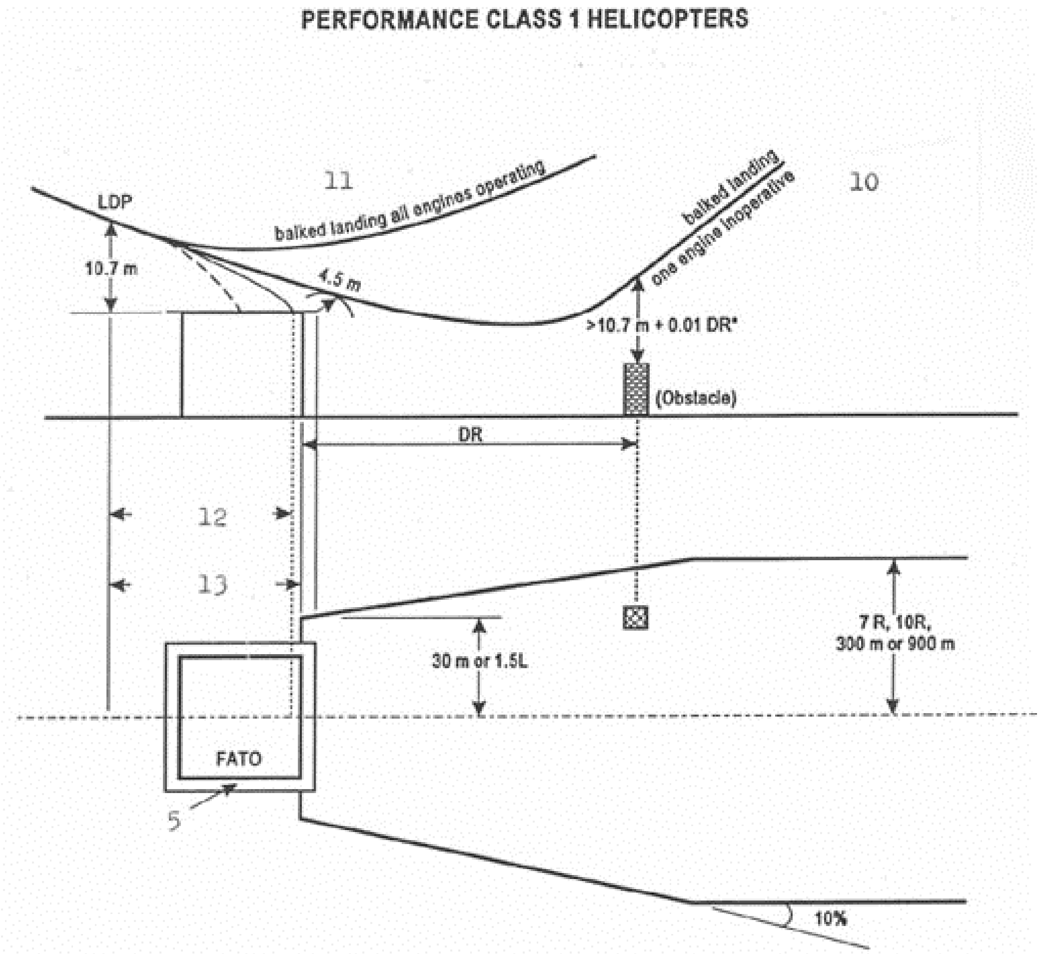
A-7. ábra Az 1. teljesítmény osztályú forgószárnyas légijármű leszállása felszíni helikopter repülőtérre (#)

LDP	Leszállási elhatározási pont
12	Szükséges leszállási távolság
13	Rendelkezésre álló leszállási távolság
AT	Alkalmas terület

*10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében

L= a forgószárnyas légijármű legnagyobb mérete

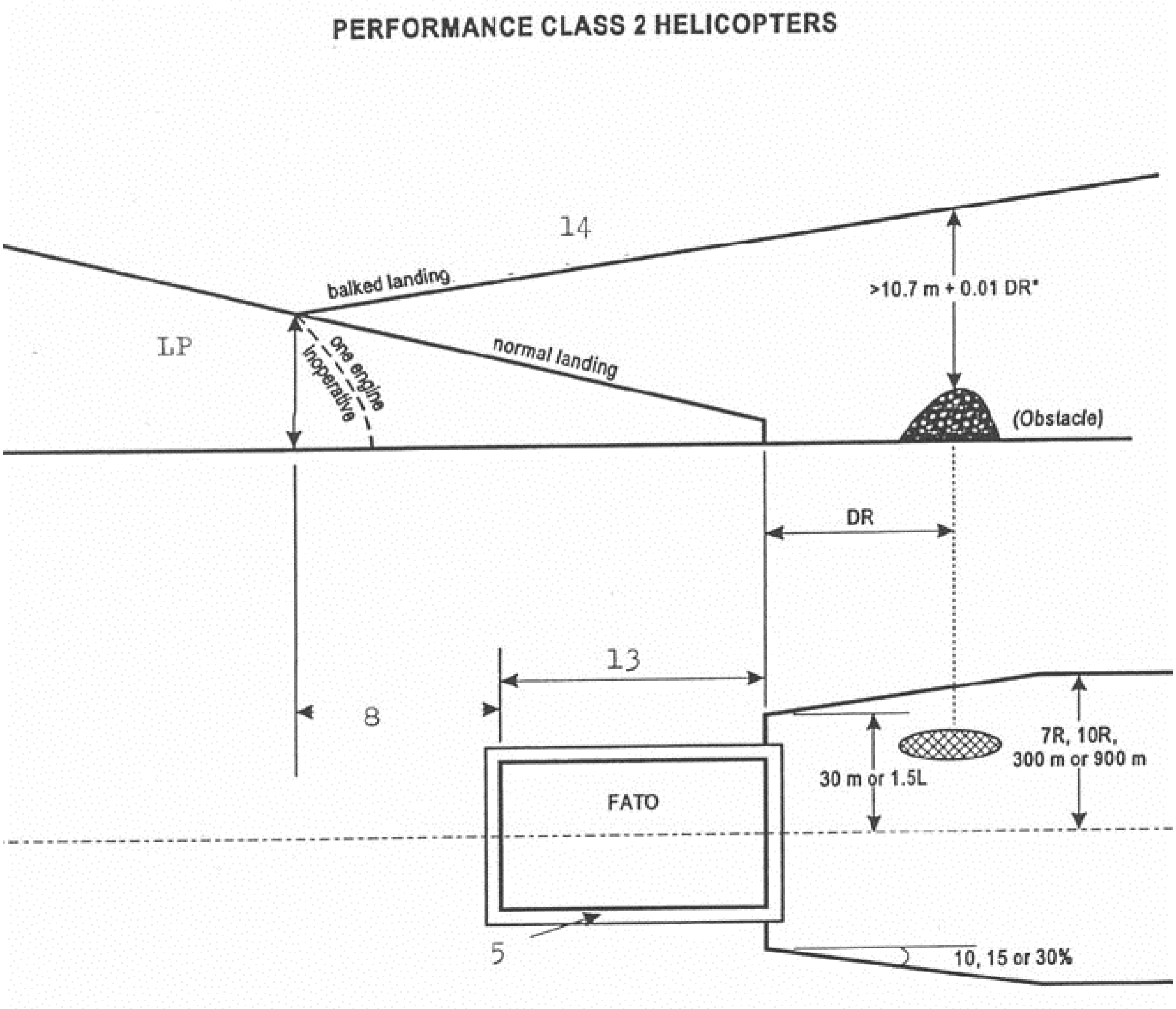
Megjegyzés: IFR üzemeltetés esetén a biztonsági terület nagyobb lesz a leírtnál. A részletekért lásd 14 Annex, II kötet.



A-8. ábra Az 1. teljesítmény osztályú forgószárnyas légijármű leszállása emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre

10 Megszakított leszállás egy hajtómű üzemképtelen
11 Megszakított leszállás minden hajtómű működik
LDP Leszállási elhatározási pont
13 Rendelkezésre álló leszállási távolság
12 Szükséges leszállási távolság
5 Biztonsági terület

*10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében
L= a forgószárnyas légijármű legnagyobb mérete



A-9. ábra A 2. teljesítmény osztályú forgószárnyas légijármű leszállása felszíni helikopter repülőtérre (#)

LP Meghatározott pont leszállás előtt **13** Rendelkezésre álló leszállási távolság

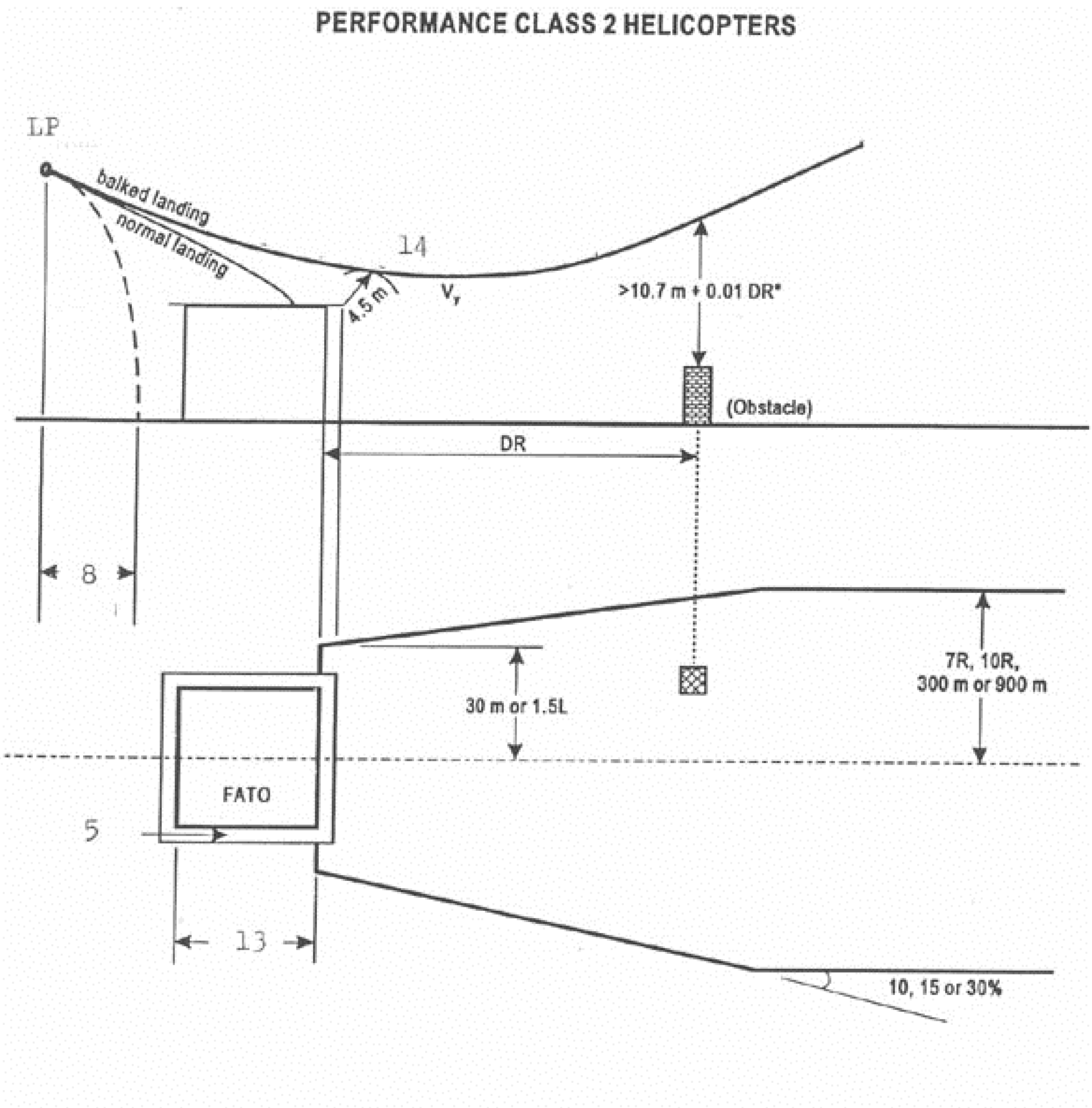
8 Biztonságos kényszerleszállást lehetővé tevő terület

14 megszakított leszállás – minden hajtómű működik vagy a kritikus hajtómű meghibásodás a leszállás előtt meghatározott pont előtt következik be

*10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében

L= a forgószárnyas légijármű legnagyobb mérete

Megjegyzés: IFR üzemeltetés esetén a biztonsági terület nagyobb lesz a leírtnál. A részletekért lásd 14 Annex, II kötet.

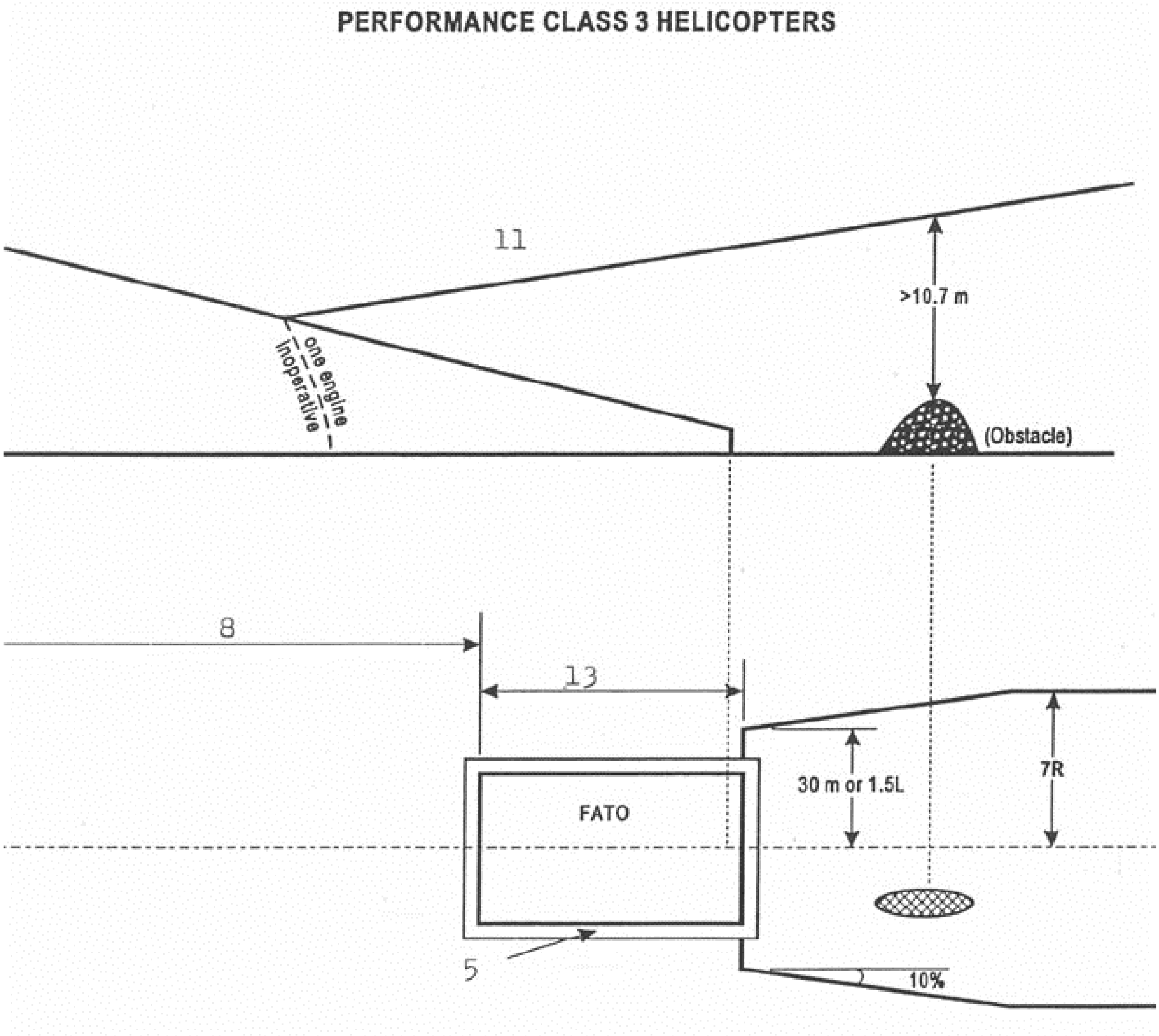


A-10. ábra A 2. teljesítmény osztályú forgószárnyas légijármű leszállása emelt szinten létesített helikopter repülőtérre vagy leszállóhelyre

LP Meghatározott pont leszállás előtt
13 Rendelkezésre álló leszállási távolság
8 Biztonságos kényszerleszállást lehetővé tevő terület
14 megszakított leszállás – minden hajtómű működik vagy a kritikus hajtómű meghibásodás a leszállás előtt meghatározott pont előtt következik be

*10.7 m (VFR) és 10.7 m + 0.01 DR (IFR) repülés esetében

L= a forgószárnyas légijármű legnagyobb mérete



A-11. ábra A 3. teljesítmény osztályú forgószárnyas légijármű leszállása felszíni helikopter repülőtérre

8 Biztonságos kényszerleszállást lehetővé tevő terület
11 Megszakított leszállás – minden hajtómű működik
13 Rendelkezésre álló leszállási távolság
5 Biztonsági terület
L= a forgószárnyas légijármű legnagyobb mérete

B. melléklet
Repülési adatrögzítők

Kiegészítés a II. szakasz 4. fejezet 4.3 és III. szakasz 4. fejezet 4.9 pontokhoz

Bevezető

A jelen mellékletben található anyag a nemzetközi légiközlekedésben üzemeltetett forgószárnyas légijárműveken felszerelni kívánt repülési adatrögzítő berendezésekkel foglalkozik. A repülési adatrögzítők két rendszerből, a forgószárnyas légijármű repülési adatrögzítőből valamint a pilótakabin hangrögzítőből állnak. A forgószárnyas légijármű repülési adatrögzítők a rögzítendő adatok mennyiségétől függően IV. típus és V. típus csoportba tartoznak.

1. Repülési adatrögzítő (FDR)

1.1 Általános követelmények

1.1.1 A repülési adatrögzítő a repülési idő alatt folyamatosan rögzítse az adatokat.

1.1.2 A repülési adatrögzítő burkolata:

a) feltűnő narancssárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot; és

c) rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzetjelző berendezéssel.

1.1.3 A repülési adatrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentésék a berendezés sérülésének lehetőségét;

b) a berendezés elektromos táplálását olyan áramkörről kapja, amely biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül; és

c) hallás vagy látás utáni lehetőség legyen az adatrögzítő megfelelő működésének repülés előtt történő ellenőrzésére.

1.2 Rögzítendő adatok és jellemző értékek

1.2.1 A IV. típusú repülési adatrögzítő
Ez a repülési adatrögzítő képes legyen a forgószárnyas légijárműnek megfelelő, legalább a B-1. táblázatban található harminc féle repülési adat rögzítésére. Mindazonáltal a forgószárnyas légijármű típusának és a rögzítő berendezés jellemzőinek figyelembevételével a felsoroltaktól eltérő más adatok is rögzíthetők.

1.2.2 Az V. típusú repülési adatrögzítő
Ez a repülési adatrögzítő képes legyen a forgószárnyas légijárműnek megfelelő, legalább a B-1. táblázatban található első tizenöt repülési adat rögzítésére. Mindazonáltal a forgószárnyas légijármű típusának és a rögzítő berendezés jellemzőinek figyelembevételével a felsoroltaktól eltérő más adatok is rögzíthetők.

1.3 Kiegészítő tájékoztatások

1.3.1 A felszerelt berendezés mérési tartományát, rögzítési időközeit, a repülési adatok és jellemzők pontosságát általában a légialkalmassági bizonyítványt kiadó hatóság módszerei alapján jogosítják.

1.3.2 A repülési adatrögzítőre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások;

b) a repülési adatok és jellemzők eredetét vagy forrását valamint a megfelelő mértékegységre történő átszámítás módozatait; és

c) a gyártó ellenőrző felülvizsgálatának eredményét.

1.3.3 A rögzített adatok jellemzőire, az átváltási számításokra, időszakos kalibrálásokra, valamint egyéb karbantartási és/vagy üzemeltetési tájékoztatásokra vonatkozó dokumentációt a járató tartsa naprakész állapotban. Ez a dokumentáció alkalmas kell legyen arra, hogy a baleset kivizsgáló hatóságok a rögzített adatok megfelelő létesítményekben történő feldolgozásához beszerezhessék a szükséges tájékoztatásokat.

2. Pilótakabin hangrögzítő berendezés (CVR)

2.1 Általános követelmények

2.1.1 A hangrögzítő berendezést úgy tervezzék meg, hogy az legalább a következőket rögzítse:

a) a forgószárnyas légijármű fedélzetén elhelyezett rádióberendezéssel vett és adott szóbeli közlemények;

b) a forgószárnyas légijármű pilótakabinjának belső hangkörnyezete;

c) a hajózószemélyzet tagjainak szóbeli közleményei, amelyhez a forgószárnyas légijármű belső távközlési rendszerét használják;

d) a navigációs vagy megközelítési berendezéseket azonosító szó vagy hangjelek, amelyek a fejhallgatóban vagy a külső hangszóróban hallhatók;

e) az utastájékoztató rendszer segítségével adott szóbeli tájékoztatások a hajózószemélyzet tagjaitól – amennyiben ilyen felszereltek és

f) a légiforgalmi szolgálatokkal folytatott digitális adatcsere kivéve, ha ezt a repülési adatrögzítő veszi fel.

2.1.2 A hangrögzítő burkolata:

a) feltűnő narancssárga vagy sárga színű legyen;

b) feltalálásának megkönnyítése érdekében helyezzenek el rajta tükröződést biztosító anyagot; és

c) rendelkezzen biztonságosan rögzített és automatikusan működésbe lépő víz alatti helyzetjelző berendezéssel.

2.1.3 A beszéd és a hangok megkülönbözetésének megkönnyítése érdekében a mikrofonokat a pilótakabinban a felvétel szempontjából legalkalmasabb helyekre helyezzék el, hogy azok a legjobb minőségben vegyék a légijármű vezetője és a másodpilóta munkahelyéről származó valamint a pilótakabinban más hajózószemélyzeti tagoktól az előbbieknek szánt közleményeket és szóbeli tájékoztatásokat. Ez az igény legjobban irányított mikrofonok segítségével teljesíthető, amelyek a hangfelvételeket folyamatosan, külön felvételi csatornákon rögzítik.

2.1.4 A pilótakabin hangrögzítőt úgy szereljék be, hogy:

a) a lehető legkisebbre csökkentésék a hangfelvételek sérülésének lehetőségét;

b) a hangrögzítő berendezés elektromos táplálását olyan áramkörről kapja, amely biztosítja az üzemeltetés legnagyobb fokú megbízhatóságát a nélkülözhetetlen, alapvető vagy vészhelyzeti fogyasztók ellátásának veszélyeztetése nélkül; és

c) hallás vagy látás utáni lehetőség legyen a hangrögzítő berendezés megfelelő működésének repülés előtt történő ellenőrzésére; és

d) amennyiben a hangrögzítő berendezés gyorstörlő egységgel rendelkezik, a felszerelést úgy tervezzék meg, hogy megakadályozzák a gyorstörlőnek a repülés időtartama alatti vagy egy becsapódástól származó ütés következtében történő működésbe lépését.

2.2 Teljesítmény követelmények

2.2.1 A hangrögzítő berendezés képes legyen legalább négy felvételi sáv egyidejű rögzítésére. A sávok közötti pontos idő összefüggés biztosítása érdekében a hangrögzítő berendezés soros *(in-line)* rendszerben működjön. Amennyiben két felvételi irányt (oda-vissza játszó) alkalmaznak, a soros működést és a csatorna elosztást mindkét irányba biztosítsák.

2.2.2 A legkívánatosabb sáv elosztás a következő:

1. sáv – a másodpilóta fejhallgatója és élő hangot közvetítő szerelt mikrofonja

2. sáv – a légijármű vezető fejhallgatója és élő hangot közvetítő szerelt mikrofonja

3. sáv – pilótakabin belső mikrofonja

4. sáv – idő referencia jel valamint a hajózószemélyzet harmadik és negyedik tagjának (ha van) fejhallgatója és élő hangot közvetítő szerelt mikrofonja

1. Megjegyzés: Az 1. sáv a felvevőfej aljához legközelebb levő sáv legyen.

2. Megjegyzés: Az ajánlott felvételi sáv kijelölés a jelenleg általánosan alkalmazott mágnes-szalag továbbító mechanizmus használatát feltételezi. A kijelölés oka az, hogy a sérülés veszélye a mágnes-szalag szélein nagyobb, mint annak középső (belső) részén. Nem kívánjuk más hangrögzítő berendezés használatát kizárni, amelyek esetében a fenti korlátozások nem szükségesek.

2.2.3 Amikor a hangrögzítő berendezést az illetékes légialkalmasságot elbíráló hatóság elfogadott módszereivel ellenőrzik, mutassák be, hogy a berendezés képes olyan szélsőséges körülmények között működni, amelyek között történő üzemelésre azt tervezték.

2.2.4 Megfelelő módszert alkalmazzanak a repülési adatrögzítő valamint a pilótakabin hangrögzítő berendezések közötti pontos-idő kapcsolat fenntartására.

Megjegyzés: Ennek egyik módszere a repülési adatrögzítő idő-jelének átvétele a pilótakabin hangrögzítő 4. sávjára.

2.3 További tájékoztatások

A pilótakabin hangrögzítőre vonatkozóan a gyártó általában a következő tájékoztatásokat adja meg az országos engedélyező hatóságnak:

a) a gyártó üzemeltetési utasításai, a berendezés korlátozásai valamint a felszerelési eljárások; és

b) a gyártó ellenőrző felülvizsgálatának eredményét.

3. A repülési adatrögzítő és a pilótakabin hangrögzítő rendszerek ellenőrzése

3.1 Az adott nap első repülési feladatának megkezdése előtt vizsgálják felül a repülési adatrögzítő (FDR), a pilótakabin hangrögzítő (CVR) rendszerek és a repülési adatgyűjtő egység (FDAU) – ha ilyeneket felszereltek – pilótakabinban levő beépített ellenőrző egységeit.

3.2 Az éves ellenőrző vizsgálatot a következők szerint hajtsák végre:

a) a repülési adatrögzítő és pilótakabin hangrögzítő (FDR és CVR) berendezések felvett adatainak visszajátszásával biztosítsák, hogy a rögzítő berendezések a névleges felvételi időtartamon belül megfelelően működnek;

b) a repülési adatrögzítő adatainak elemzésével értékeljék a rögzített adatok minőségét annak meghatározása érdekében, hogy a bit-hiba arány elfogadható értékek között van továbbá, hogy a hibák természete és eloszlása milyen képet mutat;

c) a repülési adatrögzítő rendszer működését ellenőrző műszaki szervezetnél az összes rögzített jellemző érvényességének vizsgálata érdekében elemezzék ki egy teljes repülés adatait. Különösen nagy figyelmet szenteljenek a repülési adatrögzítőnek közvetlen adatot biztosító érzékelőktől származó jellemzőknek. A légijármű elektromos hálózatától származó jellemzőket nem szükséges felülvizsgálni abban az esetben, ha annak működőképességét a légijármű más rendszerei segítségével ellenőrizni lehet;

d) a repülési adatrögzítő ellenőrző szervezet rendelkezzen a rögzített értékek pontos leolvasásához és átalakításához valamint az egyes jelek pontos megkülönböztethetőségéhez szükséges software csomagokkal;

e) pilótakabin hangrögzítő berendezés felvett adatainak éves vizsgálatát a felvétel visszajátszásával végezzék el. Amikor a berendezést a légijármű fedélzetén felszerelik, a pilótakabin hangrögzítő berendezés (CVR) vegye fel az ellenőrző jeleket minden egyes belső fedélzeti és a megfelelő külső forrásokból annak biztosítása érdekében, hogy az összes felvétel megfelel-e az érthetőségre vonatkozó előírásoknak; és

f) ahol ez gyakorlatilag lehetséges, az éves ellenőrzés során vizsgálják meg a pilótakabin hangrögzítő repülés közbeni felvételeinek egy részét annak biztosítása érdekében, hogy a jelek érthetősége elfogadható-e.

3.3 A repülési adatrögzítő rendszerek működésképtelennek tekintendők, ha az adatok jelentősebb ideig rossz minőségűek, érthetetlenek vagy a kötelezően rögzítendő jellemzők közül egy vagy több pontatlanul illetve nem helyesen kerül rögzítésre.

3.4 Az éves ellenőrzésről készített jegyzőkönyvet kérésre bocsátsák az állam felügyeleti hatósága rendelkezésére.

3.5 A repülési adatrögzítő rendszer kalibrálása:

a) a repülési adatrögzítő rendszert a kötelező jellemzők műszaki rögzítés átalakítási módszereinek helyességét érintő bármely hiányosságok megállapítása érdekében és annak biztosítása céljából, hogy a jellemzőket a kalibrálási tűrési határ-értéken belül rögzíti, legalább öt-évente kalibrálják újra; és

b) amikor a repülési magasság és sebesség jellemzők a repülési adatrögzítő rendszernek közvetlen adatat biztosító érzékelőktől származnak, ezeket az érzékelők gyártó szervezet ajánlásai alapján vagy legalább két-évente kalibrálják újra.

B-1. táblázat

A forgószárnyas légijármű repülési adatrögzítővel rögzítendő adatok és jellemzők

No	*jellemző*	*mérési tartomány*	*rögzítés időköz (mp)*	*mérési pontosság (érzékelő bemenő jel és FDR leolvasás összevetése)*
1	idő (UTC vagy eltelt repülési idő)	24 óra	4	±0.125% óránként
2	nyomás-magasság	-300 m (- 1000 láb) -tól a légijármű legnagyobb engedélyezett repülési magassága +1500 m (5000 láb) -ig	1	±30 méter – ±200 méter (±100 láb – ±700 láb)
3	műszer szerinti repülési sebesség	a mérőrendszer kijelzése szerint	1	±3%
4	géptengely irányszög	360°	1	±2°
5	függőleges gyorsulás	-3 g-től +6 g-ig	0.125	±1%
6	bólintási helyzet	±75°	0.5	±2°
7	dőlési helyzet	±180°	0.5	±2°
8	rádióadás kapcsoló	be/ki kapcsolva: az egyik parancsjel	1	
9	az egyes hajtóművek teljesítménye *(1. Megjegyzés)*	teljes tartomány	1 (hm*)	±2%
10	fő forgószárny fordulatszáma	50 – 130%	0.5	±2%

11	a forgószárnyas légijármű elsődleges repülésvezérlő szerkezeteinek működtetése a légijármű vezető által és/vagy a kormányfelületek helyzete (kollektív állásszög, hosszirányú ciklikus állásszög, oldalirányú ciklikus állásszög, farok légcsavar pedál) *(2. Megjegyzés)*	teljes tartomány	1	±2% kivéve, ha nagyobb pontosságot írnak elő
12	alacsony nyomású hidraulika rendszer (egyenként)	egyszeri parancsjel	2	
13	külső levegő hőmérséklete	a mérőműszer érzékelési tartománya	2	±2°C
14	robotpilóta/ tolóerő automata / automatikus repülésvezérlő (AFCS) rendszer üzemmód és működési helyzet	egyszeri parancsjelek megfelelő kombinációja	1	
15	stabilizáló rendszer igénybevétele	egyszeri parancsjel	1	
16	fő áttételház olajnyomás	felszerelés szerint	1	felszerelés szerint
17	fő áttételház olajhőmérséklet	felszerelés szerint	2	felszerelés szerint
18	legyező mozgás gyorsulása (vagy szögsebessége)	±1g	0.25	maximális tartomány ±1.5%-a, a ±5% adathiba kivételével
19	függeszkedési (emelőerő) terhelés	az engedélyezett terhelés 0 – 200%-a	0.5	maximális tartomány ±3%-a
20	hosszirányú gyorsulás	±1g	0.25	maximális tartomány ±1.5%-a, a ±5% adathiba kivételével
21	oldalirányú gyorsulás	±1g	0.25	maximális tartomány ±1.5%-a, a ±5% adathiba kivételével
22	rádió magasságmérő	-6 m és 750 m között (- 20 láb és 2500 láb között)	1	150 m (500 láb) alatt ±0.6 m (±2 láb) vagy 3% – amelyik a nagyobb, és 150 m (500 láb) felett ±5%
23	eltérés a siklópályától	jeltartomány	1	±3%
24	eltérés az iránysávtól	jeltartomány	1	±3%
25	marker adók átrepülése	egyszeri parancsjel	1	
26	központi riasztó jelzés	egyszeri parancsjel	1	

27	1. és 2. navigációs készlet frekvencia beállítás *(3. Megjegyzés)*	teljes tartomány	4	felszerelés szerint
28	1. és 2. DME távolságok *(3. és 4. Megjegyzés)*	0 – 370 km	4	felszerelés szerint
29	navigációs adatok {szélesség és hosszúság, föld feletti sebesség} *(5. Megjegyzés)*	felszerelés szerint	2	felszerelés szerint
30	futómű vagy futókibocsátó kar helyzete	egyszeri parancsjel	4	felszerelés szerint

Magyarázatok:
** = hajtóművenként*
*Az első **15** jellemző megfelel az V. típusú repülési adatrögzítőre vonatkozó követelményeknek.*
*A fenti **30** jellemző megfelel a IV. típusú repülési adatrögzítőre vonatkozó követelményeknek.*

Megjegyzések:

1. A teljesítmény meghatározásához szükséges megfelelő mértékű bemenőjel rögzítése.

2. A hagyományos repülésvezérlő szerkezetekkel felszerelt forgószárnyas légijárművek esetében a "vagy" szó alkalmazandó. A nem mechanikus repülésvezérlő szerkezetekkel felszerelt forgószárnyas légijárművek esetében az "és" szó alkalmazandó.

3. Amennyiben a jel digitális formában áll rendelkezésre.

4. Előnyben részesítendő választási lehetőség az inerciális vagy más navigációs rendszerek meghatározásából kapott földrajzi szélességi és hosszúsági adatok rögzítése.

5. Amennyiben ilyen jelek könnyen beszerezhetők.

Amennyiben további rögzítési kapacitás áll rendelkezésre, javasoljuk a következő kiegészítő adatok és tájékoztatások rögzítését:
a) Az elektronikus megjelenítő rendszerek segítségével rendelkezésre álló üzemeltetési tájékoztatások. A ilyen rendszerek közé tartoznak az alábbiak:
• EFIS elektronikus repülési műszerrendszer
• ECAM központi elektronikus légijármű képernyő
• EICAS hajtómű ellenőrző és hajózószemélyzet riasztó rendszer

A következő fontossági sorrendet alkalmazzák:

1. a kívánatos repülési pályára vonatkozó adatok és jellemzők a hajózószemélyzet kiválasztása alapján, például: barometrikus nyomásmagasság-mérő beállítás, kiválasztott repülési magasság és sebesség, elhatározási magasság, robotpilóta rendszer bekapcsolása és üzemmód jelzése, ha azt más forrásból nem rögzítik;

2. megjelenítő rendszer kiválasztás és állás, például: SECTOR PLAN ROSE, NAV, WXR COMPOSITE, COPY stb.;

3. figyelmeztetések és riasztások; és

4. a vészhelyzeti eljárások és ellenőrző listák megjelenített oldalainak oldalszám alapján történő azonosítása.

b) további hajtómű adatok és működési jellemzők, például: EPR, N1, EGT valamint tüzelőanyag fogyasztás illetve áramlás, stb.

C. Melléklet
Repülési idő és repülési szolgálati idő korlátozások

Kiegészítés a II. szakasz 2. fejezet 2.2.9.3 ponthoz

1. Cél és tárgykör

1.1 A repülési idő és a repülési szolgálati idő korlátozásának egyedüli célja, hogy csökkenjen annak valószínűsége, hogy a hajózószemélyzet tagjának fáradtsága a repülésbiztonságot hátrányosan befolyásolja.

1.2 A fenti lehetőség kiküszöbölése érdekében kétféle fáradtságot, nevezetesen az átmeneti és a hosszabb időn át felgyülemlett fáradtságot kell figyelembe venni. Az átmeneti fáradtság úgy irható le, mint ami az egészséges személynél munkával, feszültséggel vagy erőkifejtéssel járó időszakot követően alakul ki és amit általában egyszeri, megfelelő időtartamú alvással ki lehet pihenni. A felgyülemlett fáradtság ezzel szemben az átmeneti fáradtság nem időben vagy nem teljes mértékben történő kipihenése esetében vagy nagyobb mértékű munkavégzés, különösen nagy fokú izgalom vagy erőkifejtés utóhatásaként jöhet létre, amelyet az érintett személy nem tudott kipihenni.

1.3 A jelen rész előírásai alapján kidolgozott korlátozások védelmet biztosítanak mindkét típusú fáradtsággal szemben, mert figyelembe veszik a következőket:

1.3.1 A repülési idő korlátozása szükséges olyan módon, hogy ezzel védelmet biztosítsanak mindkét fajta fáradtsággal szemben.

1.3.2 A földön, a repülést közvetlenül megelőző vagy a közbenső pontokon a repülési sorozatok között eltöltött szolgálati idő korlátozása szükséges elsősorban az átmeneti fáradtsággal szembeni védelem érdekében.

1.3.3 Szükség van arra, hogy a hajózószemélyzet tagjai számára megfelelő lehetőséget biztosítsanak a fáradtság kipihenésére.

1.3.4 Elsősorban a felgyülemlett fáradtság hatásaival szemben történő védelem érdekében szükséges, hogy a hajózószemélyzet tagjának más előírt feladatait is figyelembe vegyék.

2. Általános rész

2.1 A légijármű vezető felelős azért, hogy szakszolgálati engedélyével és jogosításaival összefüggő jogait ne gyakorolja abban az esetben, ha tudatában van annak, hogy egészségi állapota, beleértve a fáradtsággal összefüggésben levő fizikai állapot szint csökkenést is, képtelenné teheti ezen jogok biztonságos gyakorlására.

2.2 A következő pontokban ismertetett korlátozások minimális követelményként tekintendők és a járató felelős azért, hogy azokat az alábbiakban jelzett tényezők figyelembevétel az egyes esetekre alkalmazza. A korlátozásoknál a következő egyedi tényezőket vegyék figyelembe:

a) a légijármű hajózószemélyzetének összetétele;

b) az üzemeltetés során előforduló késések valószínűsége;

c) a légijármű típusa és a lerepülendő útvonal nehézségi foka, amelyet a következő tényezők befolyásolnak: a forgalom sűrűsége, a navigációs berendezések, a szállított berendezések minősége és fajtái; a távközlési nehézségek, nagy magasságon történő repülés túlnyomás nélküli vagy magas értékű utaskabin nyomás-magasság mellett üzemelő túlnyomással ellátott légijárművel;

d) a repülési feladat során teljesített éjszakai repülések részaránya;

e) az útvonal megszakítás pihenő helyén a személyzetnek biztosított elhelyezés, amennyiben az megfelelő pihenést tesz lehetővé;

f) a fel és leszállások száma;

g) a rendszeres menetrendi tervezés rendszerének szükségessége, amely nagy fokú rendszerességet biztosít (ehhez lényeges tényező a megfelelő tartalék személyzet biztosítása);

h) az általános alvási és ébrenléti ciklusok megszakításából származó egyedi alváskárosodás, azaz pihenési nehézségek; és

i) a légijármű pilótakabin belső környezete.

2.3 A járató repülésbiztonsági okokból felelős annak biztosításáért, hogy ha a hajózószemélyzet tagjai a munkaadó részére végzendő, nem repülési szolgálati feladatokkal foglalkoznak, a repülési szolgálat felvétele előtt legalább a minimális előírt időt pihenéssel töltsék el.

3. Meghatározások

Kitelepült személyzet – Deadheading crew
A járató által légi vagy szárazföldi úton előre küldött személyzeti tag.

Szolgálati idő – Duty period
Az az időtartam, amely alatt a hajózószemélyzet tagja munkaadójának részére, annak utasítására adott feladatot elvégez.

Repülési szolgálati munkaidő – Flight duty period
Azon teljes időtartam, amely akkor kezdődik, amikor a hajózószemélyzeti tag pihenőidejét követően a repülés vagy repülési sorozat előtt szolgálatba lép és addig az időpontig tart, amikor a hajózószemélyzeti tag a repülés vagy repülési sorozat befejezése után mentesül összes szolgálati feladata alól.

Repülési szakasz – Flight sector
Egy repülés vagy repülések sorozatának egyike, amely a légijármű állóhelyén kezdődik és a légijármű megérkezése után annak állóhelyén végződik.

A repülési szakasz a következő részekből áll:

– repülés előkészítés

– repülési idő (tényleges)

– repülés utáni idő, a repülési szakasz vagy a repülési szakaszok sorozatának végrehajtása után.

Repülési idő – Forgószárnyas légijárművek – Flight time – Helicopters
Az a teljes időtartam, amely akkor kezdődik, amikor a légijármű forgószárnyai elindulnak és akkor fejeződik be, amikor a légijármű a repülés végén megáll és forgószárnyai leállnak.

Pihenőidő – Rest period
A földön eltöltött bármely időtartam, amely alatt a járató a hajózószemélyzet tagját mentesíti összes feladata alól.

Repülések sorozata – Series of flights
Két pihenő időszak között teljesített két vagy több repülési szakasz.

Tartalék – Standby
Olyan meghatározott időtartam, amely alatt a személyzet tagja azonnali szolgálattételre hívható be.

Fordulóidő – Turnaround time
Két repülési szakasz között a repülési szolgálati munkaidőn belül a földön töltött időtartam.

4. Megjegyzések a meghatározásokhoz

4.1 Repülési idő

A repülési idő meghatározás szükségszerűen nagyon általános, de a hajózószemélyzet tagjaira korlátozások vonatkozásában természetesen a "hajózószemélyzeti tag" meghatározás szerint alkalmazandó. Ennek megfelelően az utasként utazó, szakszolgálati engedéllyel rendelkező személyzeti tagok nem tekinthetők hajózószemélyzeti tagnak, bár az utazási idejüket a pihenőidő megállapításánál figyelembe vehetik.

4.2 Repülési szolgálati idő

4.2.1 A repülési szolgálati idő meghatározás célja egy olyan folyamatos szolgálati időtartam megnevezése, amely mindig egy repülésre vagy repülési sorozatra vonatkozik. Tartalmazza a hajózószemélyzet tagjának minden olyan feladatát, amelyeknek elvégzésére a repülés napján szolgálati helyen történő jelentkezéstől a repülés vagy repülési sorozat befejezését követően a szolgálatból történő felmentéséig utasítható. Álláspontunk szerint szükséges ezen időtartam korlátozása, mert a hajózószemélyzet tagjának ezen időtartamon belül történő tevékenysége átmeneti vagy felgyülemlett fáradtságot eredményez, amely a repülésbiztonságot veszélyezteti. Másrészt viszont (a repülésbiztonság szempontjából) egyéb olyan időszakokat illetően, amelyek során a hajózószemélyzet tagja a járató által számára kijelölt más feladatokat végez, nincs elegendő nyomós indok a korlátozás bevezetésére. Az ilyen feladatokat ezért csak a pihenőidővel kapcsolatos rendelkezéseknél és csak a fáradtság kialakulásához vezető számos tényező egyikeként vegyék figyelembe.

4.2.2 A repülési szolgálati idő meghatározásánál nem tekintjük szükségesnek egyéb olyan időtartamok beszámítását, mint például azt, amely alatt a hajózószemélyzet tagja otthonából a munkahelyére utazik.

4.2.3 Fontos elővigyázatossági intézkedés valósítható meg, amennyiben az államok és a járatók elismerik a személyzeti tag jogát a további repülési szolgálat elutasítására, ha az olyan természetű fáradtságot érez, amely hátrányosan befolyásolja a repülésbiztonságot.

4.3 Pihenőidő

A pihenőidő meghatározás szolgálattól való távollétet jelent, amelynek célja a fáradtság kipihenése; a pihenés módját az érintett személy önmaga határozza meg.

5. A korlátozások módjai

5.1 A korlátozások az időtartam tekintetében nagyon különbözőek; például az ICAO-nak erről tájékoztatást nyújtó államok többsége napi, havi és éves repülési idő korlátozásokat ír elő valamint igen sokan negyedévi korlátozást is alkalmaznak. Valószínűlege elegendő a napi repülési szolgálati időszakok korlátozása, mindazonáltal meg kell érteni, hogy ezek a korlátozások az egyedi helyzetek különbségei miatt jelentős mértékben eltérőek egymástól.

5.2 A repülési idő korlátozását szabályozó előírások vagy utasítások kidolgozásánál vegyék figyelembe a személyzet összetételét valamint azt is, hogy a különböző feladatok milyen mértékben oszthatók fel a személyzet tagjai között. Abban az esetben, ha a légijárművön megfelelő pihenésre alkalmas helyet biztosítanak arra, hogy a személyzet tagja ott elkülönítetten és vízszintes (fekvő) testhelyzetben pihenjen, a repülési szolgálati idő meghosszabbítható. A földön, ahol a személyzet tagjai a pihenőidőt töltik, megfelelő pihenőhelyek kialakítása szükséges. Az államok vagy járatók továbbá a következő tényezőket is vegyék figyelembe: a forgalom sűrűsége, a rendelkezésre álló navigációs és távközlési létesítmények, a munka és alvásidő ciklusa illetve ritmusa, a fel és leszállások száma, a légijármű kezelés, kiszolgálás valamint teljesítmény jellemzők és az időjárási körülmények.

6. Repülési idő táblázat

A sok lehetséges változat közül az alábbiakban bemutatjuk azt a nyilvántartó táblázatot, amelyben a szolgálati idő 6. Annex III. rész II. szakasz 2.2.9.3 pontjának megfelelően vezethető.

<table>
<tr><th rowspan="2">Hajózó személyzet</th><th rowspan="2">Leghosszabb repülési szolgálati idő 24 óra alatt</th><th colspan="4">Leghosszabb repülési időtartam (óra)</th><th colspan="2">Pihenőidő</th></tr>
<tr><th>napi 24 óra</th><th>havi</th><th>negyedévi</th><th>évi</th><th>napi</th><th>heti</th></tr>
<tr><td>Légijármű parancsnok</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Első tiszt</td></tr>
</table>

D. Melléklet
Elsősegélynyújtó egészségügyi készletek

Kiegészítés a II. szakasz 4. fejezet 4.2.2.1 a) alponthoz

A következőkben ismertetjük a forgószárnyas légijármű fedélzetén szállítandó általános Elsősegélynyújtó készlet tartalmát:

∗ elsősegély-nyújtási kézikönyv
∗ ”Túlélők által használt föld – levegő látjelek” a 12. Annex alapján
∗ sérülések ellátására szolgáló egészségügyi anyagok
∗ szemcseppek
∗ orrváladék oldó permet(szóró)k
∗ rovarirtó illetve riasztó szerek
∗ lágyító/puhító szemkenőcs
∗ napsugárzásból származó égési sérülések kezelésére szolgáló kenőcs
∗ vízzel keverhető fertőtlenítő és bőrtisztító anyag
∗ kiterjedt égési sérülések kezelésére szolgáló anyagok
∗ szájon át bevehető tabletták a következők szerint:
érzéstelenítő, görcsoldó, a központi idegrendszert élénkítő, keringést serkentő, koszorú-ér tágító, hasmenés valamint egyensúlyi zavarok elleni orvosságok
∗ műanyagcső a mesterséges lélegeztetéshez
∗ műanyag csonttörés rögzítő.

E. Melléklet
Minimális felszerelési jegyzék (MEL)

Kiegészítés a II. szakasz 4. fejezet 4.1.2 ponthoz

1. Ha az állami előírásoktól való eltéréseket a légijármű jogosítása alkalmával nem engedélyezték, a légijármű csak akkor üzemeltethető a levegőben, ha minden rendszere és berendezése üzemképes. A tapasztalatok szerint rövidtávon bizonyos egységek üzemképtelensége elfogadható, ha a többi üzemeltetési rendszer és berendezés biztosítja az üzemeltetés biztonságos folytatását.

2. A minimális felszerelési jegyzék elfogadásával az állam jelezze azokat a rendszereket és felszerelési tárgyakat, amelyek bizonyos repülési körülmények között üzemképtelenek lehetnek – azzal a céllal, hogy a meghatározottakon felül más üzemképtelen rendszerrel vagy berendezéssel a repülés nem hajtható végre.

3. Ezért a légijármű típushoz a típus megtervezéséért felelős szervezet által, a tervezés államának jóváhagyásával kidolgozott gyártói minimális felszerelési jegyzéknek megfelelően meghatározott és a járató állama által elfogadott minimális felszerelési jegyzék minden légijármű részére szükséges.

4. A járató állama kérje fel a járatót a minimális felszerelési jegyzék elkészítésére annak érdekében, hogy lehetővé tegyék a légijármű üzemeltetését bizonyos rendszerek vagy berendezések üzemképtelensége mellett feltéve, hogy a biztonság elfogadható szintjét fenntartják.

5. A minimális felszerelési jegyzéknek nem célja, hogy a légijármű nem működő rendszerekkel vagy berendezésekkel történő üzemeltetését korlátlan ideig biztosítsa. A minimális felszerelési jegyzék alapvető célja a légijármű egyes nem működő rendszerekkel vagy berendezésekkel történő biztonságos üzemeltetésének meghatározott és ellenőrzött karbantartási valamint alkatrész csere program kereteken belül történő tartása.

6. A járató biztosítsa, hogy a repülés végrehajtását ne kezdjék meg a minimális felszerelési jegyzékbe tartozó több tétel működésképtelensége mellett annak megállapítása előtt, hogy az üzemképtelen rendszerek vagy alkatrészek közötti kapcsolat nem okozza a biztonság elfogadhatatlan szint alá csökkenését és/vagy a hajózószemélyzet munkaterhelésének szükségtelen mértékű növekedését.

7. Az elfogadható biztonsági szint meghatározása alkalmával figyelembe kell venni az üzemképtelen rendszerekkel vagy berendezésekkel történő üzemeltetés folytatása során bekövetkező további meghibásodások lehetőségét is. A minimális felszerelési jegyzék nem térhet el a repülésvégrehajtási kézikönyv korlátozásaitól, a vészhelyzeti eljárásoktól vagy más, a járató vagy a lajstromozó állam légialkalmassági előírásaitól kivéve, ha az illetékes légialkalmassági hatóság vagy a repülésvégrehajtási kézikönyv másként rendelkezik.

8. Egy repülés során üzemképtelennek elfogadott rendszereket vagy berendezéseket szükség szerint lássák el feliratokkal vagy jelzésekkel és az összes ilyen tételt vezessék be a repülőgép műszaki jegyzékébe (naplójába), hogy a hajózó és a karbantartó személyzetet tájékoztassák az üzemképtelen rendszerekről vagy berendezésekről.

9. Egy adott üzemképtelennek elfogadott rendszer vagy berendezés esetében a repülés megkezdése előtt szükség lehet egy karbantartási eljárás megállapítására annak érdekében, hogy az üzemképtelen rendszert vagy berendezést lekapcsolják vagy elkülönítsék. Ehhez hasonlóan szükség lehet a megfelelő hajózószemélyzeti üzemeltetési eljárás kidolgozására is.

10. A légijármű parancsnokának felelősségét a minimális felszerelési jegyzéknek megfelelő hiányosságokkal rendelkező forgószárnyas légijármű üzemeltetésre történő elfogadására a II. szakasz 2. fejezet 2.3.1 pont határozza meg.

F. Melléklet

Légi üzemeltetői (járatói) engedély vagy más ezzel egyenértékű dokumentum

Kiegészítés a II alrész. 2. fejezet, 2.2.1 ponthoz

1. Cél és tárgykör

1.1 Bevezetés

A jelen melléklet célja, hogy az államok által a járatók 2. fejezet, 2.2.1 pont szerinti tanúsítási követelményeivel kapcsolatban előírt tevékenységekkel, különös tekintettel ezen tevékenységek végrehajtásához és nyilvántartásához szükséges eszközökkel kapcsolatban útmutatót adjon.

1.2 A tanúsítást megelőző követelmények

A 2.2.1.4 alpontban előírtaknak megfelelően a légijármű üzembentartási engedély (AOC) kibocsátása a járató állama részéről annak függvénye, hogy a járató a meghatározott üzemeltetés természetétől és nagyságrendjétől függően valamint figyelembevételével bizonyságot tesz a repülési tevékenység megfelelő ellenőrzéséről és szervezéséről, kiképzési programjairól, földi kiszolgálásáról és karbantartási intézkedéseiről. A tanúsítási folyamat magába foglalja az összes járatónak az állam részéről történő értékelését, vagy későbbi engedélyek hozzáadását az AOC-hez, valamint annak a meghatározását, hogy az AOC első kibocsátását megelőzően a járató képes a biztonságos üzemeltetés lefolytatására,.

1.3 Szabványos tanúsítási gyakorlatok

A 2.2.1.7 alpont előírja, hogy a járató állama hozzon létre egy tanúsítási rendszert az üzemeltetés hatályába tartozó típusra vonatkozó előírások betartásának igazolására,. Számos állam az iparág lehetőségeinek megfelelően alakította ki a saját politikáját és eljárásait, hogy ezen tanúsítási követelményeknek megfeleljen. Noha ezek az államok egymással való koordináció nélkül alakították ki saját gyakorlatukat, ezen gyakorlati megoldások szerfelett hasonlítanak egymásra és összhangban állnak saját követelményeik tekintetében. Ezen gyakorlati megoldások hatékonysága az évek során igazolást nyert, a járatók számára javuló biztonsági nyilvántartásokat eredményezve a világ minden részén. Ezen gyakorlati megoldások jelentős része hivatkozásként bépítésre került az ICAO ajánlásokba.

2. Előírt műszaki biztonsági értékelések

2.1 Jóváhagyási és elfogadási tevékenységek

2.1.1 A járatók tanúsítása és folyamatos ellenőrzése magába foglalja az államnak, az általa történő felülvizsgálatra benyújtott tárgykörben tett vizsgálatait. Az államnak, az általa történő felülvizsgálatra benyújtott tárgykörben tett válaszainak jellegétől függően a tevékenységeket jóváhagyási vagy elfogadási kategóriába lehet sorolni.

2.1.2 Egy jóváhagyás az állam által adott aktív válasz a felülvizsgálat céljából hozzá benyújtott tárgykörben. Egy jóváhagyás a megfelelő előírásnak való megfelelés meghatározását vagy tényét állapítja meg. Egy jóváhagyás bizonyosságát a jóváhagyó hivatalos személy aláírása, egy dokumentum vagy tanúsítvány kibocsátása, vagy az állam által hozott egyéb formális tevékenység igazolja.

2.1.3 Egy elfogadás nem feltétlenül igényli az állam aktív válaszát a felülvizsgálat céljából hozzá benyújtott tárgykörben. Egy állam a hozzá felülvizsgálat céljából benyújtott anyagot elfogadhatja mint a megfelelő előírással megegyezőt, ha az állam kifejezetten nem utasítja el a felülvizsgálat alá tartozó anyag egészét vagy egy részét, általában a benyújtást követő meghatározott időtartam után.

2.1.4 Az „Állam által jóváhagyva” kifejezés, vagy a „jóváhagyva” szót alkalmazó hasonló kifejezések gyakran fordulnak elő a III. rész, II. alrészében. Az állam részéről jóváhagyást vagy legalább „elfogadást” igénylő felülvizsgálatot jelző intézkedések fordulnak még elő gyakran a III. rész, II. alrészében. Ezen sajátos kifejezéseken felül, a III. rész, II. alrésze számos hivatkozást tartalmaz olyan követelményekre, amelyek minimum legalább az állam által végrehajtandó műszaki felülvizsgálat igényét fogalmazzák meg. Az államok általi használat megkönnyítése céljából ez a melléklet csoportokba szedi és összefoglalja ezeket a sajátos előírásokat és ajánlott gyakorlati eljárásokat.

2.1.5 A jóváhagyás vagy az elfogadás kibocsátása előtt az állam hajtson végre vagy készítsen elő műszaki biztonsági értékelést. Az értékelést:

a) olyan személy hajtsa végre, aki különleges jogosítással rendelkezik az ilyen műszaki értékelések végrehajtására;

b) leírt, szabványos módszer szerint hajtsák végre; és

c) gyakorlati bemutató bevonásával hajtsák végre, amennyiben a biztonság érdekében szükséges a járató valós képességeinek vizsgálata az ilyen üzemeltetések végrehajtásához.

2.2 Szemléltetés néhány jóváhagyás kibocsátása előtt

2.2.1 A 2.2.1.4 alpontban leírtak kötelezik a járató államát arra, hogy a járató tanúsítását megelőzően követeljen meg a járatótól egy olyan szemléltetést, amely alapján az állam el tudja dönteni, hogy a járató szervezete, a repülési tevékenység, a földi kiszolgálás valamint a karbantartási programok irányítására és felügyeletére használt módszerei megfelelőek-e. Ezek a szemléltetések a kézikönyvek, nyilvántartások, létesítmények és eszközök értékelésén és ellenőrzésén felül kerülnek alkalmazásra. Ezen részben megkövetelt egyes jóváhagyások, mint például a III. kategória szerinti üzemeltetés jóváhagyása, érzékelhető biztonsági kihatással rendelkeznek, így szemléltetés alapján kerülnek elbírálásra mielőtt az állam jóváhagyná az ilyen üzemeltetést.

2.2.2 Habár az előírt szemléltetések és értekelések mértéke és sajátos módszerei eltérőek az államok között, mégis azon államok esetében, ahol a járatók jó biztonsági adatokkal rendelkeznek, a tanúsítási folyamatok általában összhangban vannak. Ezekben az államokban, az AOC kibocsátása vagy az AOC kiegészítéseinek jóváhagyása előtt, a műszakilag felkészített ellenőrök egy reprezentatív mintát vizsgálnak a tényleges képzés, karbantartás és üzemeltetés területéről.

2.3 A tanúsítási tevékenységek jegyzőkönyvezése

2.3.1 Nagyon fontos, hogy az államok tanúsítási, jóváhagyási és elfogadási tevékenysége megfelelően legyen dokumentálva. A tevékenységek hivatalos feljegyzéseként az állam adjon ki egy okiratot, mint például egy levelet vagy egy hivatalos dokumentumot. Ezt az okiratot mindaddig meg kell őrizni, amíg a járató gyakorolja a felhatalmazása szerinti tevékenységet, amelyre a jóváhagyási vagy elfogadási műveleteket lefolytatták. Ezen okirat a járató felhatalmazásának egyértelmű tanúbizonysága, és bizonyítékként szolgál abban az esetben ha az állam és a járató eltérő véleménnyel van arról az üzemeltetésről, amelynek folytatására a járatót felhatalmazták.

2.3.2 Egyes államok egy okmánygyűjtőben összesítik a tanúsítással kapcsolatos adatokat, mint az ellenőrzés, a szemléltetés, a jóváhagyás és az elfogadás iratait, és mindaddig megőrzik, míg a járató aktív. Más államok ezeket az adatokat a végrehajtott tanúsítási tevékenységnek megfelelő gyűjtőben tárolják, és a gyűjtőt a jóváhagyási vagy az elfogadási okmány naprakészségének megfelelően módosítják. Az alkalmazott módszertől függetlenül, ezek a tanúsítási adatok meggyőző tanúbizonyságul szolgálnak, hogy az államok eleget tesznek a járató tanúsításával kapcsolatos ICAO kötelezettségeiknek.

2.4 Az üzemeltetés és a légialkalmasság értékelésének összehangolása

A III. rész, II. alrészének a jóváhagyásra vagy az elfogadásra vonatkozó egyes hivatkozásai megkövetelik a járatók értékelését és a légialkalmasság értékelését. Az alacsony minimumokra voantkozó jóváhagyás, amely a II kategóriájú és a III kategóriájú alacsony feltételek szerinti ILS megközelítések végrehajtásához szükségesek, például az üzemeltetési és a légialkalmassági szakemberek összehangolt előzetes értékelését igényli. A légiüzemeltetési szakemberek értékeljék az üzemeltetési eljárásokat, képzéseket és jogosításokat. A légialkalmassági szakemberek értékeljék a légijármű és a berendezések megbízhatóságát és a karbantartási eljárásokat. Ezen értékeléseket önállóan is el lehet végezni, de a biztonsághoz szükséges összes tényező figyelembevételének biztosítása érdekében, a jóváhagyás kibocsátása előtt az értékeléseket össze kell hangolni.

2.5 A járató államának és a lajstromozó államnak a felelőssége

2.5.1 A III. rész, II. alrésze a járató államának felelősségébe utalja az alap tanúsítást, az AOC kibocsátását és a járató működés alatti felügyeletét. A III. rész, II. alrésze megköveteli a járató államától azt is, hogy vegye figyelembe a lajstromozó állam által kiadott különböző jóváhagyásokat és elfogadásokat, vagy cselekedjen azok szerint. Ezen kérésekre tekintettel, a járató állama biztosítsa, hogy az intézkedései összhangban állnak a lajstromozó állam jóváhagyásaival és elfogadásaival, és azt is, hogy a járató megfelel a lajstromozó állam követelményeinek.

2.5.2 Jelentős fontosságú, hogy a járató állama kapja meg mindazon intézkedéseket, különösen a karbantartásra és a hajózó személyzetek képzésére vonatkozókat, melyek alapján a légi üzemeltetői használják egy másik állam lajstromába tartozó légijárművet. Az ilyen intézkedéseket a lajstromozó állammal összhangban tekintse át a járató állama. Ahol helyénvaló, a Nemzetközi Polgári Légiközlekedési Egyezmény 83 bis cikkelye értelmében egy olyan egyezményt kell előkészíteni, amelyik a lajstromozó állam felülvizsgálati felülvizsgálati felelősségét átruházza a járató államára, hogy ki lehessen zárni bármely arra vonatkozó félreértést, hogy melyik állam felelős a különös felülvizsgálati felelősségért.

Megjegyzés: a bérbevétel, a különjárati és a közös üzemeltetéssel összefüggésben a járató államának és a lajstromozó államnak a felelősségére vonatkozó útmutatót az Üzemeltetési Ellenőrzés, Jogosítás és Folyamatos Felülvizsgálat Kézikönyve *(Doc 8335) tartalmazza. A lajstromozó állam felelősségének a járató államára való átruházására vonatkozó útmutató, amikor a felelősség átruházása a 83. bis cikkely értelmében valósul meg,* a Nemzetközi Polgári Légiközlekedési Egyezmény 83 bis cikkelyének alkalmazási útmutatójában *(Cir 295) található meg.*

3. Jóváhagyási intézkedések

3.1 Jóváhagyások

A „jóváhagyás” fogalom sokkal több hivatalos tevékenységre utal a tanusítás tárgyára vonatkozó állami szerepvállalásban, mint azt az „elfogadás” fogalom teszi. Egyes államok megkövetelik, hogy a Polgári Légiközlekedési Hatóság (CAA) igazgatója, vagy egy kijelölt alacsonyabb beosztású CAA hivatalnok bocsásson ki egy hivatalos okmányt minden egyes elvégzett „jóváhagyási” tevékenységre. Egyes államok megengedik különféle okiratok kibocsátását a jóváhagyás bizonyítékaként. A jóváhagyó okirat és az abban meghivatkozott tárgy a hivatalnokra ruházott hatáskörtől fog függeni. Az ilyen államokban a rutin jóváhagyások aláírásának jogát, mint például a járató minimális berendezéseinek jegyzéke egy meghatározott légijárműre, a műszaki ellenőrökre bízzák. Normál esetben az összetettebb vagy jelentős jóváhagyások kibocsátása magasabb színtű hivatalos személyek feladata.

3.2 Légijármű üzembentartási engedély (AOC)

3.2.1 A 6. Annex, III. rész, 2.2.1 alpontja által előírtak szerint az AOC egy hivatalos okmány, amely a 2.2.1.6 alpont követelményeinek megfelelően legalább a következőket tartalmazza:

a) a járató megnevezése (cégnév vagy azonosító, székhelye);

b) a kiadás időpontja és az érvényesség időtartama;

c) az engedélyezett üzemeltetés típusok ismertetése;

d) a használatra engedélyezett légijármű típus(ok); és

e) üzemeltetésre engedélyezett területek vagy repülési útvonalak.

3.2.2 Egyes államok az AOC-t és a kapcsolódó okiratokat, mint például az üzemeltetések részletezését a III. rész, II. alrésze által előírt egyéb engedélyek alátámasztására alkalmazzák.

3.3 Jóváhagyást igénylő intézkedések

Az alábbi intézkedések megkövetelik, vagy támogatják a meghatározott államok által történő jóváhagyást. A járató államának jóváhagyása szükséges az alább felsorolt minden olyan tanúsítás esetén, amelyet nem előz meg egy vagy több csillagjel. Az alább felsorolt tanúsítási esetek közül, amelyeket egy vagy több csillagjel előz meg, vagy a lajstromozó állam (egy csillag, vagy ”*”), vagy a tervező állam (kettős csillag, vagy ”**”) jóváhagyása szükséges. Ennek ellenére a járató állama tegyen meg minden szükséges lépést annak biztosítása érdekében, hogy a felelősségi körébe tartozó járatók, az ő követelményein felül, feleljenek meg minden szükséges, a lajstromozó állam és/vagy a tervező állam által kiadott jóváhagyásnak.

a) **Repülésvezérlő szerkezetek alaphelyzettől történő eltéréseinek jegyzéke (CDL) (Meghatározások);

b) **Gyártó minimális felszerelési jegyzéke (MMEL) (Meghatározások);

c) A legalacsonyabb repülési magasságok meghatározásának módszere (2.2.6.3);

d) A helikopter repülőtér üzemeltetési minimum meghatározásának módszere (2.2.7.1);

e) Repülési idő, repülési szolgálati időtartam és pihenőidő (2.2.9.2);

f) Helikopter-specifikus minimális felszerelési jegyzék (MEL) (4.1.3);

g) RNP üzemeltetések (5.2.2 b));

h) *Engedélyezett karbantartó szervezet (6.1.2);

i) *Helikopter-specifikus karbantartási program (6.3.1);

j) Hajózószemélyzeti tag kiképző programok (7.3.1);

k) Veszélyes áruk szállítására vonatkozó képzés (7.3.1, 5. Megjegyzés);

l) Szintetikus repülési gyakorló berendezés használata (7.3.2 a), 7.4.2. és 7.4.4, Megjegyzés);

m) Repülőtéri kiegészítő biztonsági szegélyek (7.4.3.3 a));

n) A repülési üzem irányításának és felügyeletének módszere (2.2.1.4 és 8.1);

o) **Kötelező karbantartási feladatok és ezek elvégzésének időszakai (9.3.2); és

p) Utaskabin személyzeti tagok képzési programjai (10.4).

3.4 Műszaki értékelést igénylő intézkedések

A jelen részben található egyéb intézkedések igénylik, hogy az államok műszaki értékelést hajtsanak végre. Ezek az intézkedések olyan kifejezéseket tartalmaznak, mint „az állam számára elfogadható”, „az állam számára megfelelő”, „az állam által meghatározva”, „az állam által elfogadhatónak itélve” és az „állam által előírva”. Miközben nem feltételenül várják el az állam által történő jóváhagyást, ezek az előírások megkövetelik az államtól, hogy legalább fogadja el a szóbanforgó ügyet, miután hajtson végre egy sajátos felülvizsgálatot vagy értékelést. Ezek az intézkedéseka következők:

a) a helikopter-specifikus ellenőrző lista részletei (Meghatározás: légijármű üzemeltetési kézikönyv és 4.1.4);a légijármű specifikus rendszerek részletei (Meghatározás: légijármű üzemeltetési kézikönyv és 4.1.4);

b) kötelező anyag az üzemeltetési kézikönyv számára (2.2.2.2 és 1. Függelék);

c) *a járató légijármű-specifikus karbantartási felelősségei (6.1.1);

d) *a karbantartás és az üzemképessé nyilvánítás módszere (6.1.2);

e) *karbantartás irányítási kézikönyv (6.2.1);

f) *kötelező anyag a karbantartás irányítási kézikönyv számára (6.2.4);

g) *a karbantartási gyakorlatra vonatkozó információk jelentése (6.5.1);

h) *a karbantartás szükséges helyesbítő intézkedéseinek bevezetése (6.5.2);

i) *módosítási és javítási követelmények (6.6);

j) oktatási létesítmények (7.3.1);

k) az oktatók jogosítása (7.3.1);

l) ismeretfelújító képzése szükségessége (7.3.1);

m) levelező tanfolyamok és írásbeli vizsgáztatás alkalmazása (7.3.1, 4. melléklet);

n) szintetikus repülési gyakorló berendezés alkalmazása (7.3.2);

o) a hajózó személyzetek jogosításainak nyilvántartása (7.4.3.4);

p) a járató államának kijelölt képviselője (7.4.4);

q) *a repülésvégrehajtási kézikönyv változásai (9.1); és

r) meghatározott légijárművekre kijelölt légiutaskisérők minimális száma (12.1).

4. Elfogadási tevékenységek

4.1 Elfogadás

4.1.1 A járató meghatározott légiüzemeltetés végrehajtásához való felkészültségének ellenőrzésénél, az állam által végrehajtott műszaki értékelés valós terjedelme legyen sokkal átfogóbb, mint az az előírás, amelyik megköveteli vagy maga után vonja a jóváhagyást. A járató nemzetközi kereskedelmi légiszállítási feladatainak megkezdése előtt, az állam győződjön meg a tanúsítás során arról, hogy a járató megfelel a III. rész, II. alrész összes követelményének.

4.1.2 Egyes államok az „elfogadás” fogalmát hivatalos módszerként használják, amikor meg akarnak győződni arról, hogy az AOC hivatalos kibocsátását megelőzően, a járató tanúsításának összes kritikus elemét megvizsgálta az állam. Az előbbi fogalom használatával, ezek az államok érvényesítik azon előjogukat, hogy rendelkeznek a műszaki ellenőröknek a járatók üzemeltetési biztonságot befolyásoló politikájáról és eljárásairól szóló beszámolóival. Ezen elfogadást tükröző okmány tényleges kiadásával (feltételezve, hogy egy ilyen dokumentum kibocsátásra kerül) a tanúsítás végrehajtására kijelölt műszaki ellenőrt is meg lehet bízni.

4.1.3 Az „elfogadás”-i tevékenység egy meghatározott jóváhagyás kiadásához kapcsolódó kiegészítésnek tekinthető. Például, az üzemeltetési utasítás egy adott részét el lehet „fogadni” egy hivatalos okmány kiadásával, míg más részeit, mint például a légijármű-specifikus minimális felszerelési jegyzéket, egy önálló hivatalos okmány kiadásával „jóváhagyják”.

4.2 Megfelelőségi jelentés

Egyes államok a megfelelőségi jelentést konkrét járatóra vonatkozó elfogadás okmányolására használják. Ez egy olyan, a járató által beterjesztett dokumentum, amelyben a járató az üzemeltetési vagy a karbantartási kézikönyv megfelelő részeire való hivatkozással azt részletezi, hogy miként fog megfelelni az állam összes alkalmazható követelményének. Ezt a fajta dokumentumot a Doc 8335, 3.3.2 e) része és a Légialkalmassági Kézikönyv (Doc 9760), I. kötet, 6.2.1 c) 4) része hivatkozza meg. A tanúsítás során az ilyen megfelelőségi jelentést aktívan kell alkalmazni és szükség szerint módosítani, a járató politikájában és eljárásaiban az állam igényei alapján végrehajtott változtatások bemutatása érdekében. Ezt követően a végleges megfelelőségi jelentést elhelyezik az állam tanúsítási nyilvántartásában, más egyéb tanúsítási jelentésekkel együtt. A megfelelőségi jelentés egy kiváló módszer annak bemutatására, hogy a járató tanúsítása az összes, alkalmazandó hatósági előírás szerint megfelelően lett végrehajtva.

4.3 Üzemeltetési és karbantartási kézikönyvek

4.3.1 Az üzemeltetési és a karbantartási kézikönyveket, valamint az összes további módosításukat terjesszék be az államnak (2.2.2.2, 6.1.1, 6.2.4, 6.3.2). Továbbá, az állam meghatározza ezen kézikönyvek minimális tartalmát (9.2, 9.3, 9.4 és 1. Függelék). Az állam műszaki kézikönyvében határozzák meg a járató kézikönyveinek (például, az üzemeltetési politika kézikönyve, üzemeltetési kézikönyv, utaskabin személyzet kézikönyve, útvonal ismertető és képzési kéziköny) értékelésre szolgáló adagját. Egyes államok hivatalos okmányt adnak ki az összes kézikönyv és minden további módosítás elfogadásáról.

4.3.2 Az állam műszaki értékelése, az előírt tartalom meglétének ellenőrzésén kívül, téren ki arra is, hogy a sajátosan jellemző politika és eljárások az elvárt eredményt hozzák-e. Például az üzemeltetési repülési tervre (1. Függelék, 2.1.15) vonatkozó részletes leírás, az említett tervek tartalmára és megőrzésére vonatkozó 2.3 alfejezet előírásainak teljesítése érdekében, határozzon meg egy lépésenkénti kitöltési útmutatót.

4.3.3 A kipróbált iparági alkalmazásokat hivatkozás céljából, mint például a hajózó személyzetek és a szolgálatvezetők által ténylegesen kitöltött üzemeltetési repülési tervet (habár nem egy szabványosat), a tanúsítás során az állam műszaki felülvizsgálója elkérheti. A műszaki értékelés ezen részét az üzemeltetés tanúsításában gyakorlott ellenőr végezze. A kipróbált iparági gyakorlat értékelésének alkalmazásával kapcsolatos legfőbb megfontolás tárgyát képezi, hogy ez a módszer légijármű-specifikus, berendezés-specifikus, vagy korlátozottan állnak rendelkezésre olyan értékelő személyek, akik naprakész jogosítással rendelkeznek az értékelendő alkalmazás vonatkozásában.

5. Egyéb jóváhagyási vagy elfogadási megfontolások

Jóváhagyás vagy elfogadás céljából egyes államok bekérnek bizonyos, a jelen részben meghatározott kritikus dokumentumokat, feljegyzéseket vagy eljárásokat, noha a 6. Annexben található vonatkozó előírás nem követeli meg a járató állama általi jóváhagyást vagy elfogadást. Néhány erre vonatkozó példa látható az alábbiakban:

a) biztonsági program (1.1.9);

b) légiközlekedési adatok beszerzésének módja (2.1.1);

c) a tüzelőanyag és olaj jegyzékek megfelelősége (2.2.8);

d) a repülési időre, a repülési szolgálati időtartamra és a pihenőidőre vonatkozó adatok megfelelősége (2.2.9.3, 7.6 és 10.4);

e) a légijármű karbantartási naplójának megfelelősége (2.3.1 a), b) és c));

f) a terhelési nyilatkozat megfelelősége (2.3.1 d), e) és f));

g) a repülési terv megfelelősége (2.3.1 g));

h) az időjárási adatok beszerzési módja (2.3.5.1 és 2.3.5.2);

i) a kézi poggyász megfelelő elhelyezésének módja (2.7);

j) forgószárnyas légijármű teljesítmény üzemeltetési korlátozások (3.2.4);

k) helikopter repülőtéri akadály adatok beszerzésének és felhasználásának módja (3.3);

l) az utastájékoztató kártyák megfelelősége (4.2.2 d));

m) a hosszútávú navigáció eljárásai (5.2.1 b));

n) az útinapló tartalma (9.4); és

o) a repülésvédelmi képzésre vonatkozó program tartalma (11.2).

6. Az üzemeltetési előírások érvényesítése

A 2.2.1.5 alpont előírása meghatározza, hogy a légijármű üzembentartási engedély (AOC) folyamatos érvényessége attól függ, hogy a járató a járató államának ellenőrzése alatt rendszeresen eleget tesz az eredeti tanúsítási előírásnak (2.2.1.4). Ez az ellenőrzés megköveteli egy olyan folyamatos minőség ellenőrzési rendszer létrehozását, amellyel biztosítani lehet a 2.2.1.7 alpontban található, a légijármű üzemeltetés színvonalára vonatkozó előírások betartását. Megfelelő kiindulási pont egy ilyen rendszer létrehozásában, ha éves vagy féléves ellenőrzéseket, megfigyeléseket vagy vizsgálatokat követelnek meg, az igényelt tanusítás jóváhagyási és elfogadási tevékenységek érvényesítéséhez.

7. A légijármű üzembentartási engedély módosítása

A járató tanúsítása egy folyamatos tevékenység. Kevés járató fog egy idő elteltével megfelelni a légijármű üzembentartási engedélyével megszerzett kezdeti felhatalmazásának. A piaci lehetőségek kibontakozása arra készteti a járatót, hogy változtasson légijármű modellt és kérjen jóváhagyást egyéb járulékos feltételeket igénylő üzemeltetési területekre. Az eredeti légijármű üzembentartói engedély bármely változását és egyéb felhatalmazását jóváhagyó hivatalos okmány kiadása előtt az állam hajtson végre kiegészítő műszaki értékelést. Ahol lehetséges, minden kérést az eredeti felhatalmazásra támaszkodva vizsgáljanak meg, hogy a hivatalos okmány kiadása előtt meg lehessen határozni az állam előtt álló értékelési feladat mértékét.

G. Melléklet
Repülésbiztonsági dokumentációs rendszer

Kiegészítés a II. rész 1. fejezet 1.1.8 ponthoz

1. Bevezető

1.1 A következő anyag útmutatót biztosít a járató repülésbiztonsági dokumentum rendszerének kidolgozásához és megszervezéséhez. Vegyék figyelembe, hogy a dokumentációs rendszer kidolgozása összetett feladat és ezért a rendszer részét képező minden egyes dokumentum módosítása hatással lehet az egész rendszerre. Az üzemeltetési dokumentumok elkészítésére vonatkozó irányelveket az állami, kormány és ipari szervek dolgozták ki és ezek a járatók rendelkezésére állnak. Mindazonáltal a járatók számára nehézséget jelenthet ezek átfogó felhasználása, mivel az irányelvek csak több különböző kiadványból szerezhetők be.

1.2 Az üzemeltetési dokumentumok kidolgozásához alkalmazható útmutató elsősorban a kiadvány szerkesztésére vonatkozik, csak ritkán terjed ki az üzemeltetési dokumentum teljes körű elkészítésére. Nagyon fontos, hogy az egyes anyagok egymással összhangban, az előírásokkal, a gyártói rendelkezésekkel és az emberi tényezők alapelveivel egybehangzók legyenek. Fontos továbbá a szervezeti és alkalmazási egység biztosítása. Ezért a hangsúly az átfogó kidolgozáson van, az üzemeltetési dokumentumok közös rendszerként alkalmazandók.

1.3 A jelen melléklet anyaga a járató (üzemeltető) repülésbiztonsági dokumentum rendszerének kidolgozási eljárásával foglalkozik annak érdekében, hogy az a II. szakasz 1. fejezet 1.1.8 pontnak megfelelő legyen. Az útmutató nemcsak a tudományos kutatás, hanem a legutóbbi ipari gyakorlatok felhasználásával, különös hangsúllyal a magas szintű gyakorlati felhasználhatóságra készült.

2. Összeállítás és tartalom

2.1 A repülésbiztonsági dokumentum rendszert úgy dolgozzák ki és szerkesszék meg, hogy az biztosítsa a légi- és földi üzemeltetéshez szükséges tájékoztatások egyszerű megtalálását a biztonsági rendszert alkotó különböző dokumentumokban és megkönnyítse ezek szétosztását illetve a módosítások után történő kiadását is.

2.2 A repülésbiztonsági dokumentum rendszerbe tartozó tájékoztatásokat azok fontossága és felhasználási módja szerint, a következők alapján csoportosítsák:

a) idő szempontjából alapvető fontosságú tájékoztatások, mint például azok a tájékoztatások, amelyek azonnal elérhetőség hiányában veszélyeztethetik az üzemeltetés biztonságát;

b) idő szempontjából lényeges tájékoztatások, amelyek gyors elérhetőség hiányában befolyásolhatják az üzemeltetés biztonságának szintjét vagy késleltethetik az üzemeltetést;

c) gyakran használt tájékoztatások;

d) hivatkozások, például olyan tájékoztatások, amelyek az üzemelte-téshez szükségesek, azonban nem tartoznak a fenti b) vagy c) alpontok hatálya alá;

e) olyan tájékoztatások, amelyek az üzemeltetés szakaszai szerint csoportosíthatók.

2.3 Az idő szempontjából alapvető tájékoztatásokat idejekorán és figyelemfelkeltő módon helyezzék el a repülésbiztonsági dokumentum rendszerben.

2.4 Az idő szempontjából alapvető és lényeges, továbbá a gyakran felhasznált tájékoztatásokat cserelapokra és gyorsan alkalmazható ellenőrző jegyzékekre készítsék el.

3. Érvényesség

A repülésbiztonsági dokumentum rendszert a bevezetés előtt, valós körülmények között vizsgálják felül és az alkalmazáshoz szükséges érvényesítést csak ez után adják ki. Az érvényesítés illetve engedélyezési eljárás a hatékonyság igazolása érdekében terjedjen ki a felhasználás fontos tényezőire, továbbá vizsgálják meg a különböző szakmai csoportok közötti együttműködés kérdéseit is.

4. Tartalmi kialakítás

4.1 A repülésbiztonsági dokumentum rendszer szakkifejezései egymással összhangban legyenek, a közös témakörök, egységek és feladatok leírására szabványos meghatározásokat használjanak.

4.2 Az üzemeltetési dokumentumok tartalmazzák a meghatározások, kifejezések és rövidítések gyűjteményes magyarázatát, amelyet a műszaki fejlődés alapján rendszeresen és folyamatosan vizsgáljanak felül, illetve naprakészen módosítsanak. A repülésvégrehajtási dokumentumokban található összes fontos meghatározás, kifejezés és rövidítés ismertetését a kiadványban tegyék közzé.

4.3 A repülésbiztonsági dokumentum rendszer elkészítése során biztosítsák az egységes dokumentum típus alkalmazást, beleértve a szöveg stílust, a kifejezéseket, a táblázatokat és rajzokat valamint a nyomdai kialakítást is. Egyes meghatározott tájékoztatások mindig állandó helyen szerepeljenek, az alkalmazott mértékegységek és kódok mindig azonosak, egymásnak megfelelők legyenek.

4.4 A repülésbiztonsági dokumentum rendszer tartalmazzon az alkalmazási időpont szerint összeállított lényegi (fő) tartalomjegyzéket, amelynek célja az egynél több üzemeltetési dokumentumban található tájékoztatások egyszerű megtalálása.

Megjegyzés: Ezt a fő tartalomjegyzéket minden egyes dokumentum elején kell elhelyezni. A tartalomjegyzék háromnál több szintet nem tartalmazhat. A különleges és vészhelyzeti tájékoztatásokat a közvetlen kiválaszthatóság érdekében fülekkel kell ellátni.

4.5 A repülésbiztonsági dokumentum rendszer feleljen meg a járató minőségbiztosítási rendszere előírásainak, amennyiben ilyet meghatároztak.

5. Terjesztés

A járató kísérje figyelemmel a repülésbiztonsági dokumentum rendszer terjesztését, biztosítva ezzel a dokumentumok helyes és időszerű alkalmazását az üzemeltetési környezet jellemzői alapján valamint olyan módon, amely üzemeltetési szempontból megbízható és hasznos a felhasználók számára. Ide tartozik a járató részéről fenntartott információs rendszer, amelynek segítségével az üzemeltető személyzettől visszajelzéseket szerez be.

6. Módosítás

6.1 A járató dolgozzon ki tájékoztatás gyűjtési, felülvizsgálati, szétosztási és ellenőrzési rendszert az üzemeltett típusnak megfelelő összes forrásból beszerzendő tájékoztatások és adatok feldolgozására, beleértve, de nem csak ezekre korlátozva a járató, a lajstromozó és a tervezés államait, a gyártókat és a berendezések kereskedőit.

Megjegyzés: A gyártók egy adott légijármű üzemeltetéséhez olyan tájékoztatásokat nyújtanak, amelyek a légijármű rendszerekre és eljárásokra vonatkoznak olyan általános üzemeltetési körülmények között, amelyek nem mindig egyeznek meg teljes mértékben a járató igényeivel. A járatók biztosítsák, hogy a *beszerzett tájékoztatások feleljenek meg egyedi igényeknek és a helyi hatóságok elvárásainak.*

6.2 A járató dolgozzon ki tájékoztatás összegyűjtési, felülvizsgálati, szétosztási és ellenőrzési rendszert az üzemeltetésből származó vagy az üzemeltetés során bekövetkező változások feldolgozására, beleértve:

a) egy új berendezés felszereléséből származó változások;

b) az üzemeltetés gyakorlati tapasztalatai miatt bekövetkező változások;

c) a járató tevékenységének, céljainak, és eljárásainak változásai;

d) a járató jogosításainak változása;

e) a légiflotta állomány egységesítésének igénye érdekében bekövetkező változások.

Megjegyzés: A járató biztosítsa, hogy személyzeti politikája, szakmai egyeztetési tevékenysége és személyi erőforrás módszerei megfeleljenek az üzemeltetési típusának.

6.3 A repülésbiztonsági dokumentum rendszer vizsgálják felül;

a) rendszeresen (legalább évente egyszer);

b) jelentősebb eseményeket követően (egyesülés, bővítés, a vállalat gyors növekedése vagy csökkenése, stb.);

c) technológiai változások után (új berendezések és felszerelések felszerelése és használata); és

d) a biztonsági szabályok változásai után.

6.4 A járatók dolgozzanak ki módszereket az új tájékoztatások szétosztására, amely módszerek feleljenek meg a tájékoztatások közzététele sürgősségének és fontosságának.

Megjegyzés: Tekintettel arra, hogy a gyakori változások csökkentik az új vagy módosított eljárások fontosságát, kívánatos a repülésbiztonsági dokumentum rendszer változásainak legalacsonyabb szinten tartása.

6.5 Az új tájékoztatást a teljes repülésbiztonsági dokumentum rendszerre gyakorolt hatásai alapján vizsgálják felül és hitelesítsék.

6.6 Az új tájékoztatás közzétételét olyan módszerrel egészítsék ki, amelynek segítségével az üzemeltető személyzet nyomon követheti a tájékoztatás hitelességét, érvényességét valamint annak tényleges igazolását, hogy a közzétett tájékoztatások naprakészek. Az ellenőrző rendszer tartalmazzon eljárást annak igazolására, hogy az üzemeltető személyzet minden esetben megkapja a legutóbbi módosításokat.

ANNEX 7.
A légijármű felség- és lajstromjele

5. Kiadás – 2003. július
5. módosítással
Nemzetközi Szabványok
7. ANNEX
A NEMZETKÖZI POLGÁRI REPÜLÉSI EGYEZMÉNYHEZ
5. KIADÁS – 2003. JÚLIUS
Ez a kiadás magában foglalja az összes 2003 február 18. előtt a Tanács által elfogadott módosítást és 2003 november 27-i hatállyal az Annex 7 összes korábbi kiadása érvényét veszti.
A Szabványok alkalmazhatóságára vonatkozó információkat az Előszó tartalmazza.
NEMZETKÖZI POLGÁRI REPÜLÉSI SZERVEZET

MÓDOSÍTÁSOK

A megjelenő módosításokat az ICAO Journal újság, valamint az ICAO Kiadványok és Audio-Vízuális Oktatási Segédletek Katalógusának havonta megjelenő kiegészítő része rendszeresen közzéteszi, melyből ezen kiadvány használói tájékozódhatnak. Az alábbi táblázat rendeltetése az ilyen módosítások nyilvántartása.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK NYILVÁNTARTÁSA

MÓDOSÍTÁSOK				HELYESBÍTÉSEK			
sor-szám	Alkalmaz-hatósá g kelte	Bevezetés kelte	Beve-zette	sor-szám	A kiadás kelte	Bevezetés kelte	Beve-zette
1–5							

ELŐSZÓ

Történelmi háttér

Az ANNEX 7 a Nemzetközi Polgári Repülési Szervezet által elfogadott Szabványokat tartalmazza, melyeket minimum szabványoknak kell tekinteni azon jelölések feltüntetésénél, amelyek jelzik a megfelelő nemzetiséget és lajstromozást, és amelyeket az Egyezmény 20. Cikkelyével összhangban határoztak meg. A Légijármű Felség- és Lajstromjeleire vonatkozó Szabványokat a Tanács először 1949. február 8-án fogadta el a Nemzetközi Polgári Repülési Szervezet Egyezményének (1944. Chicago) 37. Cikkelye előírásainak megfelelően és 7. Függelékként (Annex 7) jelölte meg az Egyezményhez. Ezek a szabványok 1949. július 1.-én léptek hatályba. A Szabványokat a Légialkalmassági Divízió első és második ülésének ajánlásaira alapozták, melyeket 1946 márciusában, illetve 1947. februárban tartottak meg.

Az A Táblázat az egymást követő módosítások keletkezését mutatja a bennük foglalt fő témák felsorolásával, és tartalmazza az Annex és módosításainak a Tanács által elfogadott dátumait, hatálybalépésük és az alkalmazhatóságuk kezdetének időpontjait.

A Szerződő Államok feladatai

Eltérések bejelentése:
Felhívjuk a Szerződő Államok figyelmét az Egyezmény 38. Cikkelye által előírt kötelezettségre, melynek értelmében a Szerződő Államok értesíteni tartoznak a Szervezetet bármilyen eltérésről, amely a saját nemzeti szabályaik és gyakorlatuk és ezen Annex-ben és a hozzá tartozó bármelyik

módosításban foglalt Nemzetközi Szabványok között fennáll. Ezen kívül felkérjük a Szerződő Államokat, hogy a Szervezetet folyamatosan tájékoztassák a jövőben esetleg bekövetkező eltérésekről, vagy egy korábbi eltérésre vonatkozó bejelentés visszavonásáról. Az eltérések bejelentésére vonatkozó külön felkérést a Szerződő Államoknak azonnal elküldjük, amint a jelen Annex egyes módosításai elfogadást nyertek.
Az Államok figyelmét felhívjuk arra, hogy az Annex 15 előírásaiban is szerepel a nemzeti szabályok és gyakorlati eljárások valamint az ICAO Szabványok és Ajánlott Eljárások közötti eltérések bejelentésének kötelezettsége a Légiforgalmi Tájékoztató Szolgálaton keresztül az Egyezmény 38. Cikkelyében megfogalmazott kötelezettségen felül.

Az információk közzététele
A légijárművek üzemeltetését érintő eljárások, szolgáltatások, berendezések változásait, ezen Annex-ben meghatározott Szabványokkal összhangban biztosított információk létrehozását és visszavonását közzé kell tenni és az Annex 15 előírásai szerint hatályba kell helyezni.

Az Annex részeinek jogi helyzete

Egy Annex a következő részekből épül fel, és jogi helyzetük az alábbi, ámbár nem mindegyik található meg szükségszerűen minden egyes Annex-ben:

1.- *Az Annex jellemző részei:*
a) *Szabványok és Ajánlott Eljárások,* melyeket az Egyezmény előírásainak megfelelően a Tanács fogad el. Meghatározásuk az alábbi:

Szabvány: bármely előírás, mely fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozik, melynek egységes alkalmazása a nemzetközi léginavigáció szabályszerűsége és biztonsága érdekében szükséges, és melyre a Szerződő Államok az Egyezmény értelmében törekedni fognak, ha pedig nem tudnak megfelelni az előírásnak, akkor ezt a 38. Cikkely értelmében kötelesek a Tanács tudomására hozni.

Ajánlott Eljárás: bármely előírás, mely fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozik, melynek egységes alkalmazása a nemzetközi léginavigáció biztonsága, szabályossága és hatékonysága érdekében kívánatos, és melyre a Szerződő Államok törekedni fognak hogy megfeleljenek az Egyezménynek.

b) *Függelékek:* a jobb áttekinthetőség érdekében külön csoportosított anyagok, melyek azonban részét képezik a Tanács által elfogadott Szabványoknak és Ajánlott Eljárásoknak.
c) *Meghatározások:* a Szabványokban és Ajánlott Eljárásokban használt fogalmak meghatározásai, melyek nem magától értetődőek olyan értelemben, hogy nincs elfogadott szótári jelentésük. Egy meghatározásnak nincs önálló jogi helyzete, de minden egyes olyan Szabványnak és Ajánlott Eljárásnak, – melyben a fogalmat használják,- lényeges részét képezi, mivel a fogalom jelentésváltozása kihatással lenne a pontos specifikációra.
d) *Táblázatok és ábrák:* a Szabványokat vagy Ajánlott Eljárásokat kiegészítő, vagy szemléltető anyagok, – melyekre a Szabványokban és Ajánlott Eljárásokban hivatkozás is történik, – melyek részét képezik a vonatkozó Szabványnak vagy Ajánlott Eljárásnak, és jogi helyzetük velük azonos.

2. *A Szabványokhoz és Ajánlott Eljárásokhoz kapcsolódó olyan lényeges szövegrészek, melyeket a Tanács közzétételre jóváhagyott:*
a) *Előszó:* a Tanács tevékenységére alapozott történelmi áttekintő és magyarázó anyagok, beleértve az Államok kötelezettségeinek kifejtését a Szabványok és Ajánlott Eljárások alkalmazására vonatkozólag, mely az Egyezményből és a Határozati Javaslat elfogadásából fakad.
b) *Bevezetés:* az Annex részeinek, fejezeteinek vagy pontjainak elején található magyarázó anyag, mely segíti a szöveg alkalmazásának megértését.

c) *Megjegyzések:* ahol megfelelő, a szövegben szerepelnek annak érdekében, hogy konkrét adatokra, vagy a kérdéses Szabványokra és Ajánlott Eljárásokra hivatkozásul szolgáljanak, de nem képezik részét a Szabványoknak, vagy az Ajánlott Eljárásoknak.
d) *Mellékletek:* a Szabványok és Ajánlott Eljárások kiegészítő anyagát képezik, vagy azok alkalmazásához szolgálnak útmutatásként.

A nyelv kiválasztása

Jelen Annex 6 (hat) nyelven került elfogadásra – angol, arab, kínai, francia, orosz és spanyol nyelven. Minden egyes Szerződő Államot felkérünk arra, hogy a szövegekből válaszon ki egyet, melyet a nemzeti szabályozásban és az Egyezményben felsorolt egyéb feladatok céljára kíván felhasználni, akár a szöveg közvetlen átvételével, akár a választott szöveg saját nemzeti nyelvre történő lefordításával, és erről megfelelően tájékoztassa a Szervezetet.

Szerkesztési gyakorlat

A következő gyakorlatot követjük annak érdekében, hogy első pillantásra nyilvánvaló legyen az egyes megállapítások jogi helyzete: a *Szabványok* normál betűtípussal, a *Megjegyzések* dőlt normál betűtípussal kerültek nyomtatásra, melyeknek jogi helyzetét a szöveg előtti *Note* előtag jelöli. A 7. Annex nem tartalmaz Ajánlott Eljárásokat.

Bármely hivatkozás ezen dokumentum valamely részére, amelyet szám, és/vagy cím azonosít, magába foglalja az adott rész valamennyi alpontját is.

A.Táblázat. – Az Annex 7 Módosításai

Módosítás (Amendment)	*Forrása/i/*	*Tárgy*	*Jóváhagyva Hatályba lép Alkalmazható*
(1. kiadás)	A Légialkalmassági Divízió első /1946/ és második /1947/ ülése		1949. február 8. 1949. július 1. 1949. november 1.
1. (2. kiadás)	A Légialkalmassági Bizottság ötödik értekezlete /1962/	A légijármű felség-, és lajstromjeleinek mérete és elhelyezése	1963. november 12. 1964. április 1. 1964. augusztus 1.
2	Léginavigációs Bizottság Tanulmánya /1967/	A „légijármű” fogalmának újbóli meghatározása, amelynek következtében az összes légpárnás jármű, úgymint légpárnás jármű és földi jármű, nem osztályozható légijárműként.	1967. november 8. 1968. március 8. 1968. július 8.
3 (3. kiadás)	A Tanács tanulmánya /1969./	A módosításban bevezetésre került a „ közös jel”, a „közös jelet lajstromozó hatóság” és a „nemzetközi üzemeltető szervezet” kifejezések meghatározása, valamint megfelelő előírásokat tartalmaz annak érdekében, hogy az Egyezmény 77. cikkelye értelmében lehetővé válion nemzetközi üzemeltető	1969. január 23. 1969. május 23. 1969. szeptember 18.

Módosítás (Amendment)	*Forrása/i/*	*Tárgy*	*Jóváhagyva Hatályba lép Alkalmazható*
		szervezet légijárműveinek egy más, nem nemzeti alapon történő lajstromozása.	
4. (4. kiadás)	Léginavigációs Bizottság tanulmánya /1980./, Légijármű-Zaj- Bizottság ülése /1979./	Személyzet nélküli szabad léggömb. A „helikopter" definiciójának változtatása	1981. március 30. 1981. július 30. 1981. november 26.
5. (5. kiadás)	A Léginavigációs Bizottság tanulmánya	A légijármű lajstromozási bizonyítványának fordítása	2003. február 17. 2003. július 14. 2003. november 27.

NEMZETKÖZI SZABVÁNYOK

1. MEGHATÁROZÁSOK

A Légijármű Felség- és Lajstromjeleire vonatkozó Szabványokban szereplő alábbi fogalmak jelentése a következő:

Repülőgép (Aeroplane) A levegőnél nehezebb, erőgép meghajtású légijármű, amely repülés közben a felhajtóerőt elsősorban a repülés adott szakaszaiban rögzített helyzetben maradó felületeire ható aerodinamikai reakciók révén nyeri.

Légijármű (Aircraft) Minden olyan szerkezet, amelynek a levegőben maradását olyan aerodinamikai reakciók biztosítják, melyek nem azonosak a levegőnek a földfelszínnel szembeni reakcióival. (Lásd 1.számú Táblázatot, A légijárművek osztályozása).

Léghajó /Airship) A levegőnél könnyebb, erőgép-meghajtású légijármű.

Ballon (Balloon) A levegőnél könnyebb, erőgép meghajtással nem rendelkező légijármű.

Közös jel (Common mark) A Nemzetközi Polgári Repülési Szervezet által a közös jelet nyilvántartó hatóság számára kijelölt jelölés, amely nem nemzeti alapon veszi lajstromba egy nemzetközi üzemeltető szervezet légijárműveit.
Megjegyzés.- Egy nemzetközi üzemeltető szervezet minden légijárműve, melyet nem nemzeti alapon vettek lajstromba, ugyanazt a közös jelet fogja viselni.

Közös jelet lajstromozó hatóság (Common mark registering authority) Az a hatóság, amely a nem-nemzeti nyilvántartást vezeti, vagy – ahol ez alkalmazható – annak azon részét, amelynél egy nemzetközi üzemeltető szervezet légijárműveit lajstromba veszik.

Tűzálló anyag (Fireproof material) Olyan anyag, amelynek hőállósága legalább azonos az acéllal, vagy ettől jobb, ha mérete mindkét esetben megfelel a meghatározott célnak.

Vitorlázó repülőgép (Glider) Erőgép meghajtással nem rendelkező, a levegőnél nehezebb légijármű, mely repülés közben a felhajtóerőt elsősorban a repülés adott szakaszaiban rögzített helyzetben maradó felületeire ható aerodinamikai reakciók révén nyeri.

Autogiro (Gyroplane) A levegőnél nehezebb légijármű, melyet repülés közben egy vagy több rotoron keletkező felhajtóerő tart a levegőben, mely rotorok szabadon forognak egy lényegében függőleges tengely körül.

Levegőnél nehezebb légijármű (Heavier-than-air aircraft) Bármilyen olyan légijármű, mely a felhajtóerőt repülés közben elsősorban aerodinamikai erőkből nyeri.

Helikopter (Helicopter) Olyan a levegőnél nehezebb légijármű, melynek levegőben maradását egy általában függőeleges tengelyre szerelt egy, vagy több erőgép meghajtású rotorlapáton képződő felhajtóerő biztosítja.

Nemzetközi üzemeltető szervezet (International operating agency) Az Egyezmény 77. Cikkelye által szándékolt képviseleti forma.

Levegőnél könnyebb légijármű (Lighter-than-air aircraft) Minden olyan légijármű, melyet a levegő felhajtóereje tart a levegőben.

Csapkodószárnyú repülőgép (Ornithopter) A levegőnél nehezebb légijármű, amelynek repülését a csapkodó mozgást végző szárnyakra ható felhajtóerő teszi lehetővé.

Forgószárnyas repülőgép (Rotorcraft) Erőgép-meghajtású, a levegőnél nehezebb légijármű, amely levegőben maradását az egy vagy több rotorlapáton képződő felhajtóerőnek köszönheti.

Lajstromozó Állam (State of Registry) Az az állam, amelynek lajstromába a légijárművet bevezették.

2. HASZNÁLANDÓ FELSÉGJELEK, KÖZÖS JEL ÉS LAJSTROMJELEK

2.1. A felségjel, vagy a közös jel, valamint a lajstromjel betűcsoportból áll.

2.2. A felségjel, vagy a közös jel megelőzi a lajstromjelet. Ha a lajstromjel első karaktere egy betű, ezt egy kötőjelnek kell megelőznie.

2.3. A felségjelet a Nemzetközi Távközlési Unió által a Lajstromozó Állam számára kiutalt rádió hívójeleket tartalmazó nemzeti jelsorozatból kell kiválasztani. A felségjelet be kell jelenteni a Nemzetközi Polgári Repülési Szervezetnek.

2.4. A közös jelet a Nemzetközi Távközlési Unió által a Nemzetközi Polgári Repülési Szervezet számára kiutalt rádió hívójelekben szereplő nemzeti jelsorozatból kell kiválasztani.
Megjegyzés – A Nemzetközi Polgári Repülési Szervezet végzi a közös jel kiosztását a közös jelet lajstromozó hatóságnak.

2.5. A lajstromjelnek betűkből, számokból, vagy betűk és számok kombinációjából kell állnia, melyet a Lajstromozó Államnak, vagy a közös jelet lajstromozó államnak kell kijelölni.

2.6. Amikor betűket használnak lajstromjelként, akkor olyan betűkombinációkat nem szabad használni, amelyek összetéveszthetők a Nemzetközi Jelkód II. Részében lévő ötbetűs kombinációkkal, a Q-kódban használt Q betűvel kezdődő hárombetűs kombinációkkal, az SOS vészjelzéssel, vagy más hasonló sürgősségi jellel, mint például: XXX, PAN és TTT.

Megjegyzés – Ezen kódjelekre vonatkozó információként lásd a jelenleg hatályos Nemzetközi Távközlési Szabályzatot.

3. A FELSÉGJEL, A KÖZÖS JEL ÉS A LAJSTROMJEL ELHELYEZÉSE

3.1. Általános rész

A felségjelet, vagy a közös jelet, és a lajstromjelet rá kell festeni a légijárműre, vagy valamely más módon kell rögzíteni a légijárművön oly módon, hogy ennek tartóssága hasonló fokú legyen, mint a festésé. A jeleket mindenkor tisztán és láthatóan kell tartani.

3.2. Levegőnél könnyebb légijárművek

3.2.1. *Léghajók:* A léghajó jeleit vagy a törzsburkolaton, vagy a vezérsíkon kell feltüntetni. Ha a jeleket a törzsön tüntetik fel, akkor a törzs mindkét oldalán hosszirányban és a felső felületén is szimmetrikusan kell elhelyezni. Ha a jeleket a vezérsíkon helyezik el, akkor azokat mind a vízszintes, mind a függőleges vezérsíkon fel kell tüntetni, a vízszintes vezérsíkon a jeleket a felület jobb felső részén és a bal alsó részén kell elhelyezni úgy, hogy a betűk és a számok felső éle a belépőél felé mutasson, a függőleges vezérsíkon a jeleket a vezérsík alsó felén mindkét oldalon vízszintesen írt számokkal és betűkkel kell feltüntetni.

3.2.2. *Gömb-alakú ballonok (nem azonosak a személyzet nélküli szabadon repülő ballonokkal)* A jeleket két helyen, egymással ellenkező oldalon kell megjeleníteni. A jeleket a ballon legnagyobb vízszintes kerülete mentén kell elhelyezni.

3.2.3. *Nem-gömbalakú ballonok (nem azonosak a személyzet nélküli szabadon repülő ballonokkal)* A jeleknek minden egyes oldalon meg kell jelenniük. Úgy kell elhelyezni, hogy a ballon maximális keresztmetszete közelében kerüljenek feltüntetésre, közvetlenül akár a teherelosztó kötélzet felett, vagy a kosár felfüggesztő kábelek csatlakozási pontjai felett.

3.2.4. *Levegőnél könnyebb légijármű (nem azonos a személyzet nélküli szabadon repülő ballonokkal)* Az oldalán lévő jeleknek mind oldalról, mind pedig a földről nézve jól láthatóaknak kell lenni.

3.2.5. *Személyzet nélküli szabadon repülő ballonok* A jeleket az azonosító felületen(lapon) kell elhelyezni (lásd 8. Pontot).

3.3. Levegőnél nehezebb légijárművek

3.3.1.*Szárnyak.* A levegőnél nehezebb légijárműveken a jelzéseket egyszer kell feltüntetni a szárnyszerkezet alsó részén. A szárnyszerkezet alsó felületének bal felén kell a jelzéseket elhelyezni, hacsak ez nem nyúlik túl a szárnyszerkezet egész alsó felületén. Amennyire csak lehetséges, a jelzéseket a szárny belépő és kilépő élétől azonos távolságra kell elhelyezni. A betűk és a számok tetejének a szárny belépőéle felé kell esni.

3.3.2.*A törzs (vagy ezzel egyenértékű szerkezet) és a függőleges vezérsík felületek.* A levegőnél nehezebb légijárműveken a jelzéseket vagy a légijármű törzsének mindkét oldalán (vagy ezzel egyenértékű szerkezeten) a szárnyak és a vezérsík között, vagy a függőleges vezérsík felületek felső felében kell elhelyezni. Amikor az egyetlen függőleges vezérsíkon helyezik el a jelzéseket, akkor azoknak mindkét oldalán látszaniuk kell. Osztott függőleges vezérsík esetén a jelzéseket a szélső vezérsíkok külső oldalán kell elhelyezni.

3.3.3.*Különleges esetek.* Ha egy levegőnél nehezebb légijárműnek nincsenek olyan alkotóelemei, melyek megfelelnek a 3.3.1. és 3.3.2. pontokban ismertetetteknek, akkor a jelzéseket oly módon kell feltüntetni, hogy azok könnyen azonosíthatók legyenek.

4. A FELSÉGJEL, A KÖZÖS JEL ÉS A LAJSTROMJEL MÉRETE.

Minden egyes különálló jelcsoport betűinek és számainak azonos magasságúaknak kell lenniük.

4.1. Levegőnél könnyebb légijárművek

4.1.1. A levegőnél könnyebb légijárműveken, a személyzet nélküli szabadon repülő ballonok kivételével, a jelzések magassága legalább 50 centiméter legyen.

4.1.2.A személyzet nélküli szabadon repülő ballonokon a jelzések méretét a Lajstromozó Államnak kell meghatározni figyelembe véve a hasznos teher méretét, amelyre az azonosító lapot erősítik.

4.2.Levegőnél nehezebb légijárművek

4.2.1. *Szárnyak.* A levegőnél nehezebb légijárművek szárnyain a jelzések magassága legalább 50 centiméter legyen.

4.2.2.*A törzs (vagy ezzel egyenértékű szerkezet) és a függőleges vezérsík felületei*. A jelzések magasságának a törzsön (vagy ezzel egyenértékű szerkezeten), valamint a levegőnél nehezebb légijármű függőleges fvezérsík felületein legalább 30 centiméteres magasságúnak kell lenni.

4.2.3.*Különleges esetek.* Ha egy levegőnél nehezebb légijárműnek nincsenek olyan alkotóelemei, melyek megfelelnek a 4.2.1. és 4.2.2. pontokban ismertetetteknek, akkor a jelzések méretének olyannak kell lennie, hogy a légijármű könnyen azonosítható legyen

5. A FELSÉGJEL, A KÖZÖS JEL ÉS A LAJSTROMJEL ÍRÁSJELEINEK TÍPUSA

5.1.A betűknek díszítés nélküli latin nagybetűknek kell lenni. A számoknak díszítés nélküli arab számoknak kell lenni.

5.2.Az egyes írásjelek szélessége (kivéve az l betűt és az 1-es számot), valamint a kötőjelek hossza a írásjel magasságának kétharmada legyen.

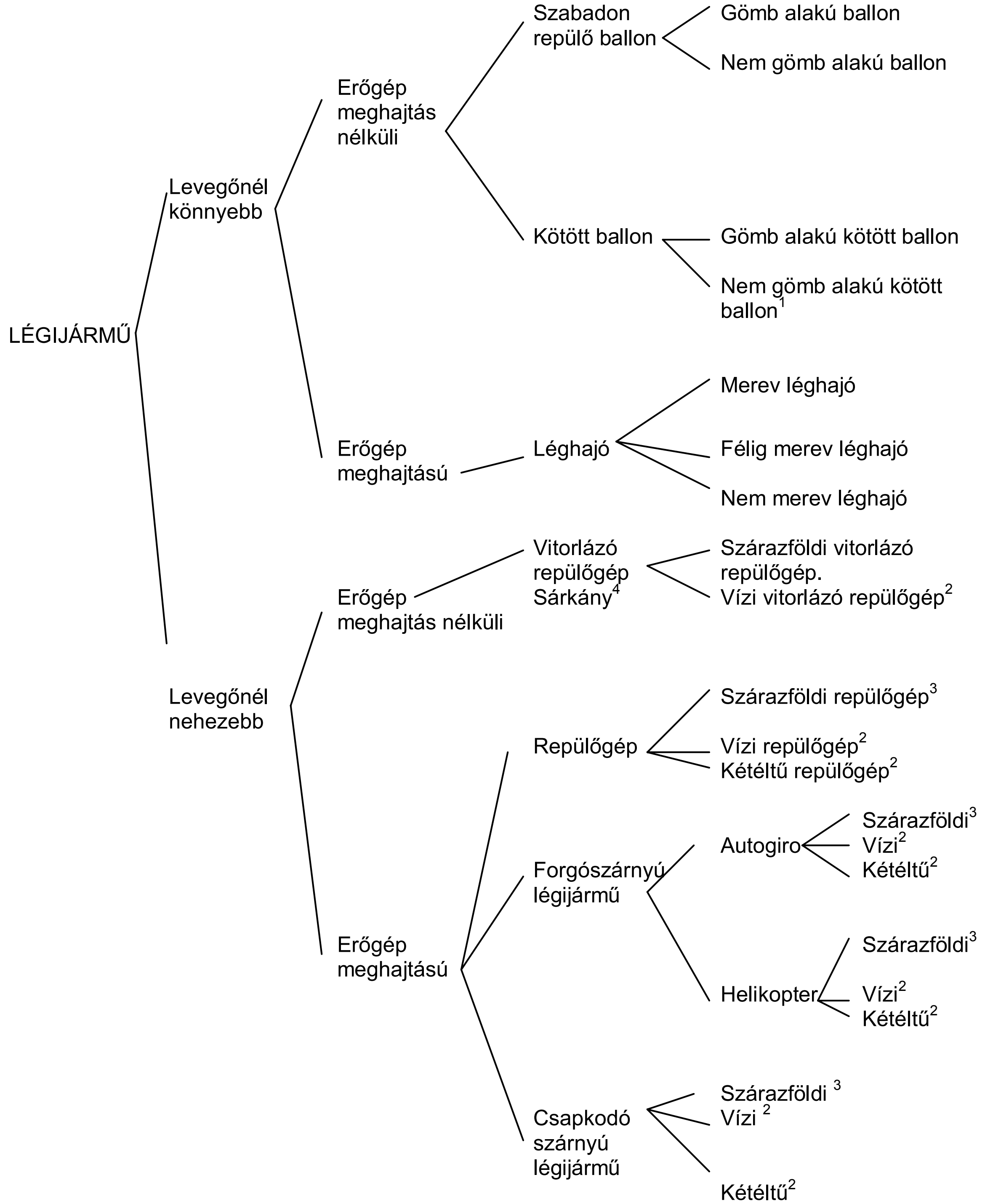
5.3.Az írásjeleket és a kötőjeleket folyamatos vonallal kell képezni, és olyan színnel kell feltüntetni, mely a háttértől jól láthatóan elüt. A vonalak vastagsága az írásjel magasságának egyhatoda kell, hogy legyen.

5.4.Az egyes írásjeleket az őt közvetlenül megelőzőtől, vagy az őt követőtől egy olyan térközzel kell elválasztani, mely nem kisebb, mint az írásjel szélességének egynegyede. Ebből a szempontból a kötőjelet írásjelnek kell tekinteni.

6. A FELSÉGJEL, A KÖZÖS JEL ÉS LAJSTROMJELEK LAJSTROMOZÁSA

Minden egyes Szerződő Állam, vagy közös jelet regisztráló hatóság köteles érvényes nyilvántartást vezetni, melyben szerepel az adott Állam által, vagy a közös jelet regisztráló hatóság által lajstromba vett minden egyes légijármű, és a lajstromozási bizonyítványba bejegyzett adatok (lásd a 7. Pontot). A személyzet nélküli szabadon repülő ballon lajstromozásának tartalmaznia kell a kiadás dátumát, idejét és helyét, a ballon típusát és az üzemeltető nevét.

1. számú táblázat: A légijárművek osztályozása



1- Általános megjelölése "kötött ballon"
2- “Úszótalpas” vagy “csónakos” megjelölés kapcsolható hozzá szükség szerint
3- Magába foglalja a sítalpas futóművel felszerelt légijárművet (a szárazföldi megnevezés helyett használja a sítalpas megnevezést)
4- Csak a teljesség kedvéért.

7. LAJSTROMOZÁSI BIZONYÍTVÁNY

7.1.A lajstromozási bizonyítványnak szövegezésben és elrendezésben az 1. számú ábrán szereplő bizonyítványmintával kell megegyeznie.

Megjegyzés.- A nyomtatvány méretét a Lajstromozó Állam, vagy a közös jelet kiadó hatóság dönti el.

7.2.Ha a lajstromozási bizonyítványokat nem angol nyelven adják ki, akkor az angol nyelvű fordításnak is szerepelnie kell benne.

Megjegyzés.- A Nemzetközi Polgári Repülési Szervezet Egyezményének 29. Cikkelye előírja, hogy a lajstromozási bizonyítványt a nemzetközi léginavigációban résztvevő minden egyes légijármű köteles a fedélzetén tartani.

8. AZONOSÍTÁSI LAP

A légijárművön el kell helyezni egy azonosítási lapot, melyen legalább a felségjel, vagy a közös jel és a lajstromjel fel van tüntetve. A lapot tűzbiztos fémből, vagy más, megfelelő fizikai jellemzőkkel rendelkező anyagból kell készíteni és a légijármű fő bejárata közelében feltűnő helyen kell a légijárműben felerősíteni, vagy személyzet nélküli szabadon repülő ballon esetében a hasznos teher külső részén feltűnő helyen kell rögzíteni.

9. ÁLTALÁNOS RÉSZ

A jelen Annex előírásai nem vonatkoznak a kizárólag meteorológiai célra használt meteorológiai szélmérő ballonokra, és a teher nélküli, személyzet nélküli szabadon repülő ballonokra .

1. számú ábra: Lajstromozási Bizonyítvány

<table>
<tr><td>*</td><td></td><td>*</td></tr>
<tr><td colspan="3">ÁLLAM vagy
KÖZÖS JELET NYILVÁNTARTÓ HATÓSÁG
MINISZTÉRIUM
MINISZTÉRIUMI FŐOSZTÁLY VAGY SZOLGÁLAT
Lajstromozási Bizonyítvány</td></tr>
<tr><td>1. Felségjel vagy közös jel és Lajstromjel
……………………………………</td><td>2.Gyártó és. a légijármű gyártójának típus megnevezése
………………………………………
……………………………………...</td><td>3.A légijármű gyártási száma
………………………………
………………………………</td></tr>
<tr><td colspan="3">4. A légijármű tulajdonosa …………………………………………………..

5. A tulajdonos címe ……………………………………………………………</td></tr>
<tr><td colspan="3">6. Igazoljuk, hogy a fenti légijárművet a ………………………………………. ……………………………………Lajstromába bevezették, összhangban /a nyilvántartó megnevezése/ az 1944. december 7. Nemzetközi Polgári Repülési Egyezménnyel és a / + / ………………………………………………………………………….</td></tr>
<tr><td colspan="3">/Aláírás/ ……………………………………….

A kibocsátás dátuma ……………………………

/ + / Beírni a hivatkozást az alkalmazható szabályozásokra.</td></tr>
<tr><td>*</td><td></td><td></td></tr>
</table>

* A Lajstromozó Állam vagy a közös jelet lajstromozó hatóság tölti ki.

ANNEX 8.
A légijármű légialkalmassága

9. kiadás – 2001. július
99. módosítással

Ez a kiadás a Tanács által, 2001. március 3.-ig elfogadott összes módosítást tartalmazza, és 2004. március 2.-án az Annex 8 összes korábbi kiadásainak helyébe lép.
A Szabványok alkalmazására vonatkozó információkat a II. Rész 1.1, 2.1, 3.1, és 4.1 pontjai, valamint a IIIA Rész 1.1 pontja a IIIB. Rész A.1.1. pontja és az Előszó tartalmazzák.

Nemzetközi Polgári Repülési Szervezet

FONTOS MEGJEGYZÉS AZ ANNEX 8. KILENCEDIK ÉS TIZEDIK KIADÁSAIHOZ

Az Annex 8 *kilencedik kiadása* azokat a Nemzetközi Szabványokat és Ajánlott Gyakorlati Eljárásokat tartalmazza, melyek *2006. május 20.-án* válnak alkalmazhatóvá.
A Az Annex 8 *tizedik kiadása* azokat a Nemzetközi Szabványokat és Ajánlott Eljárásokat tartalmazza, melyek *2007. december 13.-tól* alkalmazhatók.

Ezért a felhasználóknak az Annex 8 Kilencedikés Tizedik Kiadását együtt kell megőrizni.

MÓDOSÍTÁSOK

A megjelenő módosításokat az ICAO Journal újság, valamint az ICAO Kiadványok és Audio-Vízuális Oktatási Segédletek Katalógusának havonta megjelenő kiegészítő része rendszeresen közzéteszi, melyből ezen kiadvány használói tájékozódhatnak. Az alábbi táblázat rendeltetése az ilyen módosítások nyilvántartása.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK NYILVÁNTARTÁSA

MÓDOSÍTÁSOK				*JAVÍTÁSOK*			
Sorszám	*Életbelépés dátuma*	*Módosítás dátuma*	*Módosító neve*	*Sorszám*	*Kiadás dátuma*	*Javítás végrehajtásának dátuma*	*Javítást végző neve*
1–98							
99. sz. Módosítás (A Tanács 2003. május 20.-án fogadta el) Módosított oldalak: Előlap, Kísérő jegyzékben részletezve	2003. október 13.	2006. május 20.					

ELŐSZÓ

Történelmi háttér

A légijárművek légialkalmassága tárgyában a Szabványokat és Ajánlott Eljárásokat az ICAO Tanácsa 1949. március 1.-én fogadta el a Nemzetközi Polgári Repülési Egyezmény (Chicago, 1944) 37. Cikkelyében foglalt rendelkezések értelmében és az Egyezmény 8. Függelékeként (Annex) jelölte meg.

Az Annex II. Részében foglalt általános légialkalmassági eljárásokat minden légijárműre alkalmazni kell, míg a III. Részben azon minimális légialkalmassági jellemzők találhatók, melyek olyan repülőgépekre vonatkoznak, amelyeket valamely meghatározott ICAO kategória szerinti légialkalmassági bizonyítvánnyal láttak el, vagy ezzel kell ellátni. A meghatározásokat az I. Rész tartalmazza.

A 4. Ülésén a Légialkalmassági Divízió- együttműködve az Üzemeltetési Divízióval- ajánlásokat fogalmazott meg egy teljesítmény kód használatára, mely alternatívaként szolgál az Annex-ben található kód mellett, ahol az emelkedési értékek alkotják az Ajánlott Eljárások alapját. Ezen túlmenően, a Légialkalmassági Divízió ajánlásokat tett az ICAO kategóriák felülvizsgálatának bizonyos szempontjaira. Ezen ajánlások eredményeként a Tanács jóváhagyta az alternatív teljesítménykód beépítését az Annex-be A mellékletként, de leszögezte, hogy mivel a teljesítményre vonatkozó Szabványokban ez még nem jelent meg, így nincs alap az ICAO A kategória szerinti minősítésre. Arra ösztönzi a Szerződő Államokat, hogy tartózkodjanak a később életbe lépő teljesítményre vonatkozó Szabványok szerinti minősítéstől, vagy várjanak addig az időpontig, amikor a Tanács dönt a légialkalmasság alapelveiről.

A Közgyűlés a 7. Ülésén (1953. június) jóváhagyta a Tanács és a Léginavigációs Bizottság által addig végzett tevékenységet, miszerint kezdeményezni kell a légialkalmasság feltételeire vonatkozó ICAO irányelvek alapvető áttanulmányozását és utasította a Tanácsot arra, hogy a lehető leghamarabb fejezze be ezt a munkát.

Ezen tanulmány elkészítésében a Léginavigációs Bizottságot egy szakértőkből álló nemzetközi csoport, az u.n. Légialkalmassági Munkacsoport (Airworthiness Panel) segítette, mely hozzájárult a Harmadik Léginavigációs Konferencia munkájának előkészítéséhez.

Ezen tanulmányok eredményeként kidolgozták a légialkalmasság új, nemzetközi irányelveit, melyeket a Tanács 1956-ban jóváhagyott. Ezen irányelveknek megfelelően, megszüntették az ICAO kategória szerinti minősítés elvét. Helyette az Annex 8-ba átfogó Szabványokat dolgoztak be, melyek meghatározták az Államok számára a teljes körű minimális nemzetközi elismerési alapokat, melyeket az illetékes nemzeti hatóságok alkalmazni tudnak olyan esetben, amikor más Államok légijárműve hajt végre az ő területére történő berepülést, vagy annak átrepülését. Így elérhetővé válik – más célok mellett, – a többi légijármű, a harmadik személyek vagy a vagyontárgyak védelme. Úgy ítélték meg, hogy az ICAO ezzel eleget tett az Egyezmény 37. Cikkelyében foglalt kötelezettségének a légialkalmasság Nemzetközi Szabványainak bevezetésére.

Elismerték, hogy a légialkalmasságra vonatkozó ICAO Szabványok nem helyettesíthetik a nemzeti szabályozást és azt is, hogy egyes Államok szükségesnek ítélik a légialkalmasság teljes körű és részletezett nemzeti kódjait, melyek ahhoz szükségesek, hogy alapul szolgáljanak egy egyedi légijármű minősítéséhez. Minden egyes Államnak meg kell alkotnia a saját átfogó és részletes, a légialkalmasságra vonatkozó előírásait, vagy választania kell más Államok által kidolgozott átfogó és részletes kód közül egyet saját alkalmazásra. Ezzel a kóddal meghatározott légialkalmasság szintjét megjelölhetik Szabványokkal, és ha szükséges, kiegészíthetik a "Megfelelés Elfogadható Módjai"-val (Acceptable Means of Compliance).

A fenti elveknek megfelelően az Annex-et úgy kell tekinteni, mint a 33. Cikkely által meghatározott célok megvalósítására szolgáló minimum szabványokat. Tudatában voltak azonban annak, hogy az Annex, elfogadása időpontjában, lehet, hogy már nem tartalmazza a légijárművek összes osztályára, vagy az összes repülőgépre vonatkozó technikai Szabványt, ha a Tanács úgy ítéli meg, hogy a 33. Cikkely hatályba léptetésének időpontjában technikai Szabványokra nincs szükség. Ezen felül, a 33. Cikkely célkitűzéseinek szempontjából teljesnek nyilvánított Annex jóváhagyásával, vagy módosításával az ICAO munkája a légialkalmasság területén nem ért véget, mivel a nemzetközi együttműködés folytatására továbbra is szükség lesz.

Az Annex 8 módosított szövege összhangban van a fenti célkitűzésekkel, melyeket a Harmadik Léginavigációs Konferencia (Montreal, 1956. szeptember-október) ajánlásai alapján készítettek el. Az Annex III. Része azokra az átfogó Szabványokra korlátozódik, melyek inkább a tárgyi feladatokat határozzák meg, mint ezek megvalósításának módszereit. Annak érdekében, hogy a széleskörű Szabvány némelyike által megkívánt légialkalmassági szintet példákkal mutassák be, a "Megfelelés Elfogadható Módjai" cím alatt sokkal részletesebb és számszerűbb előírásokat építettek be. Ezen előírások célja, hogy segítséget nyújtsanak a Szerződő Államoknak a részletes és átfogó nemzeti légialkalmassági kódjaik megalkotásához és alkalmazásához.

A Megfelelés Elfogadható Módjai-ban megadott kódnál észrevehetően alacsonyabb kód elfogadását úgy kell tekinteni, mint a Megfelelés Elfogadható Módjaival kiegészített Szabvány megsértését.
Az Annex 8 módosított szövege a 4. kiadásban lett közzétéve, mely hatálytalanította az első, a második és a harmadik kiadást.

A Harmadik Léginavigációs Konferencia egy másik ajánlására a Tanács 1957-ben létrehozta a Légialkalmassági Bizottságot, melynek tagjait a közreműködni szándékozó Szerződő Államok és nemzetközi szervezetek nagy légialkalmassági tapasztalatokkal rendelkező szakértőiből választották ki.

A nemzetközi légialkalmasság jelenlegi politikája. Nyugtalanítónak találták,, hogy a Megfelelés Elfogadható Módjai formájában megfogalmazott kiegészítő légialkalmassági előírások tekintetében a fejlődés igen lassú volt az eltelt évek alatt. Megjegyzendő, hogy az Annex 6-ban és az Annex 8-ban közzétett Megfelelés Elfogadható Módjai többsége 1957-ben lett kidolgozva, ebből adódóan csak azokra a repülőgéptípusokra voltak alkalmazhatók, amelyek ebben az időben üzemeltek. Ezen Megfelelés Elfogadható Módjaiban szereplő előírások naprakésszé tételére eddig semmilyen erőfeszítés nem történt, sem a Légialkalmassági Bizottság részéről nem készültek ajánlások a Megfelelés Elfogadható Módjainak ideiglenes kiadásában szereplő bármelyik eljárás korszerűsítésére, melyet azzal a céllal dolgoztak ki, hogy potenciális anyagként szolgáljon a teljes értékű Megfelelés Elfogadható Módjai-hoz. A Léginavigációs Bizottság ezért felkérte a Légialkalmassági Bizottságot, hogy tekintse át a létrejötte óta végbement fejlődést olyan szempontból, hogy elérték-e a kívánt eredményt, vagy sem, és hogy a részletes légialkalmassági előírások kidolgozásának elősegítésére ajánlásokat tegyen.

A Légialkalmassági Bizottság a 9. Ülésén (Montreal, 1970 november/december) a problémákat részleteiben áttekintette és azt az ajánlást fogalmazta meg, hogy a légialkalmassági előírások kidolgozásának azzal a koncepciójával fel kell hagyni, melyet a Megfelelés Elfogadható Módjai, valamint az Ideiglenes Megfelelés Elfogadható Módjai képviselnek, és az ICAO-nak ki kell dolgozni és közzé kell tenni egy légialkalmassági technikai kézikönyvet, melyben összefoglalják azokat az irányelveket, amelyek a Szerződő Államok légialkalmassági kódjainak fejlesztését és egységesítését megkönnyítik.

A Léginavigációs Bizottság a Tanács által 1956-ban jóváhagyott légialkalmasság politika fejlődéstörténete fényében áttekintette a Légialkalmasság Bizottság ajánlásait. Arra a következtetésre jutott, hogy az ICAO légialkalmasság politikájának alapvető elvei és célkitűzései helyesek és jelentős változtatásokra nincs szükség. Azt is megállapították, hogy a Megfelelés Elfogadott Módjai és az Ideiglenes Megfelelés Elfodható Módjai formájában közzétett légialkalmassági előírások kidolgozásában tapasztalt lassú fejlődés fő oka az előbbi kötelező státusának mértéke volt, melyet az Annex 8 negyedik és ötödik kiadásának előszavában az alábbi megállapítás tartalmazott:

„A »Megfelelés Elfogadott Módjai«-ban megadott légialkalmassági szintnél érzékelhetően alacsonyabb szint elfogadása a Megfelelés Elfogadott Módjai-val kiegészített Szabvány megsértését jelenti.”

A Léginavigációs Bizottság számos megközelítési módot megvizsgált annak érdekében, hogy kiküszöbölje ezt a nehézséget. Végül arra a következtetésre jutott, hogy a légialkalmasság előírásai kidolgozásának gondolatát a Megfelelés Elfogadható Módjai és az Ideiglenes Megfelelés Elfogadható Módjai formájában el kell vetni és az ICAO-nak deklarálnia kell, hogy az Egyezmény 33. Cikkelyében foglaltak megvalósításához az Államok kötelezettsége, hogy eleget tegyenek az Annex 8 széleskörű Szabványainak, mely, ha szükséges, kiegészül a légialkalmasság technikai tájékoztató anyagával, és el kell kerülni minden kötelező jellegre történő utalást vagy kötelezettséget. Ugyanakkor fenn kell tartani azt a követelményt, hogy minden egyes Szerződő Államnak ki kell dolgoznia saját átfogó és részletes légialkalmasságra vonatkozó kódjait, vagy el kell fogadnia egy másik Állam által átfogóan és részletesen kidolgozott kódot.

A Tanács 1972. március 15.-én jóváhagyta, hogy a fenti megközelítés legyen az ICAO jelenlegi politikájának az alapja a légialkalmasság területén. Ezen politikának megfelelően:

a) a nemzetközi légialkalmasság Szabványainak célja az, hogy meghatározza a légialkalmasság minimális szintjét, melyet az illetékes nemzeti hatóságok alkalmaznak, megteremtve ezzel a nemzetközi alapot az Egyezmény 33. Cikkelye alapján az Államok részéről arra, hogy elismerjék a légialkalmassági bizonyítványokat olyan repülések esetében, amikor egy másik Állam légijárműve repül be az ő területére vagy átrepüli azt, ezzel elérve, – többek között, – a többi légijármű, a harmadik fél és a vagyontárgyak védelmét.

b) A fenti a) pontban meghatározottak kielégítésére kidolgozott Szabványokat a Tanács úgy tekinti, mint amelyek a szükséges területen és mértékben kielégítik a Szervezetnek az Egyezmény 37. Cikkelyében foglalt kötelezettségét a légialkalmasság Nemzetközi Szabványai elfogadására.

c) A Tanács által elfogadott légialkalmassági Szabványokat teljes körű nemzetközi kódnak kell tekinteni, amelyek az Egyezmény 33. Cikkelyéből eredő jogok és kötelezettségek hatályba léptetéséhez szükségesek, és ahhoz, hogy érvényt szerezzenek azoknak.

d) Az Annex 8 műszaki légialkalmassági Szabványait úgy kell közzétenni, hogy azok sokkal inkább a célokat meghatározó átfogó előírások, mintsem a végrehajtás módját meghatározó előírások legyenek. Az ICAO elismeri az egyes Államok elvárását arra, hogy a légialkalmasság nemzeti kódjai, melyek teljes körűek és az összes részletet tartalmazzák, szolgáljanak az egyedi Állam által minden egyes légijárműre a légialkalmasság bizonyításának alapjául.

e) Annak érdekében, hogy az Annex 8 Szabványainak alkalmazásában segítséget nyújtsunk az Államoknak abban, hogy kidolgozzák saját teljes körű nemzeti kódjaikat egységes formában, részletes tájékoztató anyagot fog a Szervezet hamarosan kidolgozni és az ICAO munkanyelveken közzétenni.

A Tanács jóváhagyta a légialkalmasságra vonatkozó tájékoztató anyag kiadását is Légialkalmassági Műszaki Kézikönyv címmel. Megegyeztek abban, hogy ennek kiadása előtt a tájékoztató anyagot a Léginavigációs Bizottság megvizsgálja. Formális jogállással azonban nem fog rendelkezni, és fő célja az, hogy a Szerződő Államoknak tájékoztató anyagként szolgáljon az Annex II. Rész 2. 2. pontjában szereplő részletes nemzeti légialkalmassági kódok kidolgozásához.

A nemzetközi légialkalmasság politikájával megegyező Annex 8 szövegét a Léginavigációs Bizottság dolgozta ki, melyet a Tanács 1972. március 15.-én hagyott jóvá.

Az „A” Táblázat a módosítások keletkezését tartalmazza, a bennük szereplő fő témák felsorolásával, valamint azokat a dátumokat, amikor az Annex-et és módosításait a Tanács elfogadta, továbbá azok hatályba léptetésének és alkalmazhatóságának idejét.

2000. június 6.-án a Léginavigációs Bizottság áttekintette a Folyamatos Légialkalmasság Divízió és a Légialkalmassági Tanulmánykidolgozó Csoport ajánlását a típusalkalmasság bizonyítása folyamat bevezetésének és a Típusalkalmassági Bizonyítvány koncepció bevezetésének fényében. Arra a megállapításra jutottak, hogy a nemzetközileg használt és ismert bizonyítványt már bevezették a Légialkalmasság Műszaki Kézikönyvében (DOC 9051) és annak bevezetési kiegészítése a típusalkalmasság bizonyításának folyamata, így kerül összhangba az Annex 8 szövege a légialkalmasság nemzetközi használatával.

Továbbiakban megállapították, hogy a Lajstromozó Állam, amely meg van bízva az Egyezmény 31. Cikkelye értelmében a Légialkalmassági Bizonyítványok kiadásával és érvényesítésével, valamint a Tervező Állam két különböző Állam is lehet, elkülönülő feladatokkal és kötelmekkel és egymástól független felelősségekkel. Ennek megfelelően, az Annex 8 alkalmazható előírásai szerinti Típusalkalmassági Bizonyítványok kiadását szabályozó követelmények nem képezik részét a „minimális szabványok”-nak, melyek a Légialkalmassági Bizonyítvány kiadását és érvényesítését szabályozzák és az Egyezmény 33. Cikkelyének megfelelően az érvényességük elismeréséhez vezetnek.

Alkalmazhatóság

A Szabványok alkalmazhatóságát a II. Rész 1. 1, 2. 1, 3. 1, és 4. 1 pontjai, a III. Rész 1. 1 pontja és a IIIB Rész A. 1. 1 pontja tartalmazzák. Az alkalmazhatóság dátuma az Egyezmény 41. Cikkelye előírásainak figyelembevételével lett meghatározva. A Tanács azonban azt javasolta, hogy,- amennyiben megvalósítható,- korábbi dátumokat alkalmazzanak.

Az Annex 6 I. Rész kapcsolódó Szabványai. Az Annex 6. I. Rész 5. Fejezete, mely a repülőgépek teljesítményének üzemeltetési korlátozásaival foglalkozik, tartalmaz Szabványokat, melyek kiegészítésül szolgálnak az Annex 8 légialkalmassági Szabványaihoz. Mindkettő átfogó célkitűzéseket határoz meg. Az Annex 6. I. Rész 5. Fejezetének Szabványait kiegészítették tájékoztató anyaggal zöld színű lapokon mellékletként közzétéve, melyben példákkal mutatják be a Szabványok által szándékolt teljesítményszintet.

A Tanács arra ösztönzi a Szerződő Államokat, hogy a hozzájuk látogató repülőgépekkel szemben ne támasszanak más üzemeltetési követelményeket, mint amilyeneket a Lajstromozó Állam megállapított, feltéve, hogy azok nem alacsonyabbak, mint az Annex 6. I. Rész 5. Fejezetének Szabványai, melyet a jelen kiadású Annex 8 2. számú Módosításával tettek naprakésszé a IIIA Rész 2. 2. pontjával és a IIIB Rész B.2. pontjával.

A Szerződő Államok tennivalói

Az eltérések bejelentése. A Szerződő Államok figyelmét felhívjuk arra a kötelezettségre, melyet az Egyezmény 38. Cikkelye ír elő, amelyben a Szerződő Államoktól megkívánják, hogy a Nemzetközi Szabványok, melyeket ez az Annex és módosításai tartalmaznak, és saját nemzeti szabályozásaik és gyakorlataik közötti bármilyen eltérést bejelentsenek a Szervezetnek. A Szerződő Államokat felkérik arra, hogy folyamatosan informálják a Szervezetet bármilyen eltérésről, mely később előfordulhat, vagy egy korábban bejelentett bármilyen eltérés visszavonásáról. A jelen Annex minden egyes Módosításának elfogadása után azonnal egy külön eltérésekre vonatkozó értesítés kérését juttatjuk el a Szerződő Államokhoz.

Az Annex szövegének felhasználása a nemzeti szabályozásban. 1948. április 13.-án a Tanács határozatot fogadott el, melyben felhívták a Szerződő Államok figyelmét arra a kívánatos tényre, hogy a Szerződő Államok használják saját nemzeti előírásaikban, amennyire csak megvalósítható, azoknak az ICAO Szabványoknak a precíz nyelvezetét, melyek szabályozó jellegűek és a Szabványoktól való eltérésekről küldjenek értesítést, beleértve minden olyan kiegészítő szabályozást, mely a léginavigáció szabályosságának és biztonságának szempontjából fontos. Ahol ez lehetséges, a jelen Annex II. Részének előírásait oly módon fogalmazták meg, hogy megkönnyítsék azok nagyobb szöveges változtatás nélküli beépítését a nemzeti előírásokba. A jelen Annex IIIA és IIIB Részeinek előírásait, másrészről, a nemzeti kódok útján kell a repülőgépekre alkalmazni, melyek sokkal átfogóbbak és részletesebbek, mint a Szabványok, így a Tanács 1948. április 13.-i Határozata nem vonatkozik a IIIA és IIIB Részekre.

Az Annex-nek való megfelelést megvalósító nemzeti előírásokra vonatkozó információk.
Az államokat felkérjük arra, hogy akár a II. Rész 3. 2. 2 pontjában említett átfogó és részletes nemzeti kódok kiválasztásáról, akár létrehozásáról küldjenek értesítést a Szervezetnek. Mindazon Államokat kérjük, amelyek ilyen kódokat megalkottak, hogy küldjenek ezekből egy példányt, majd ezek módosításaiból is és bármilyen, rájuk vonatkozó megfelelő értelmező anyagból is egy példányt. Azokat az Államokat, amelyek más Szerződő Államok kódjaiból választanak annak érdekében, hogy megfeleljenek a II. Rész 3. 2. 2 pontjának, felkérjük, hogy küldjenek értesítést az általuk igénybe venni szándékozott kódokról.

A Légialkalmassági Kézikönyvben (DOC 9760) lévő tájékoztató anyag felhasználása. Felhívjuk a Szerződő Államok figyelmét, hogy a Légialkalmassági Kézikönyvben szereplő tájékoztató anyagnak az a célja, hogy segítséget nyújtson átfogó és részletes nemzeti kódjaik kidolgozásában, a nemzeti kódok egységesítése megvalósításában. Az anyag nem kötelező jellegű és a Szerződő Államok teljesen szabadon eltérhetnek ettől akár részletekben, akár módszerekben. Azt sem kívánjuk meg az Államoktól, hogy értesítsenek bármilyen eltérésről, mely előfordulhat a saját részletes nemzeti szabályozásuk és gyakorlatuk, valamint a Légialkalmassági Kézikönyv vonatkozó anyaga között.

Az Annex alkotóelemeinek jogállása

Egy Annex az alábbi alkotóelemekből épül fel, melyeknek nem mindegyike található meg minden egyes Annex-ben, és ezek jogállása az alábbi:

1. *Az Annex jellegzetességeit összefoglaló anyag*

a) Szabványok és Ajánlott Eljárások, melyeket a Tanács az Egyezmény előírásai szerint fogadott el. Ezeket az alábbiakkal határozzuk meg:

Szabvány: Bármilyen olyan előírás a fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozólag, amelynek egységes alkalmazását szükségesnek ítélték a nemzetközi léginavigáció biztonsága és szabályossága érdekében, és amelynek meg kell felelni az Egyezmény szerint, ha ez a megfelelés nem lehetséges, akkor a Tanács értesítése kötelező a 38. Cikkely előírásainak megfelelően.

Ajánlott eljárás: Bármely olyan előírás a fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozólag, amelyeknek egységes alkalmazását kívánatosnak ismerték el a nemzetközi léginavigáció biztonsága, szabályossága és hatékonysága érdekében, és amelyekre a Szerződő Államoknak törekedniük kell annak érdekében, hogy megfeleljenek az Egyezménynek.

b) Függelékek. A Tanács által elfogadott, a Szabványok és Ajánlott Eljárások részét képező, de a célszerűség érdekében külön csoportosítva közzétett anyagok.

c) Meghatározások. A Szabványokban és az Ajánlott Eljárásokban szereplő olyan fogalmak, melyek nem önmaguktól értetődőek és nincs elfogadott szótári jelentésük. Egy meghatározásnak nincs független státusza, de lényeges részét képezi minden egyes olyan Szabványnak és Ajánlott Eljárásnak, amelyben ezt a fogalmat használják, mivel a fogalom jelentésének változása befolyásolhatja a pontos specifikációt.

d) Táblázatok és ábrák. A Szabványokhoz és Ajánlott Eljárásokhoz hozzátett, vagy azokat illusztráló táblázatok és ábrák,- amelyekre az adott helyen hivatkozás történik,- részét képezik az adott Szabványnak vagy Ajánlott Eljárásnak és státuszuk ezekkel megegyező.

2. *A Szabványokhoz és az Ajánlott Eljárásokhoz tartozó anyagok, melyeket a Tanács kiadásra jóváhagyott:*

a) Előszó A Tanács tevékenységét ismertető történeti és magyarázó anyag, magába foglalva az Államok kötelezettségeit a Szabványok és az Ajánlott Eljárások alkalmazására nézve, mely az Egyezményből és az Elfogadási Határozatból következik.

b) Bevezetés. Az Annex részeinek, fejezeteinek, vagy al-részeinek elején található magyarázó anyag, mely a szöveg alkalmazásának megértését segíti elő.

c) Megjegyzések. A szóban forgó Szabványokra és az Ajánlott Eljárásokra vonatkozó, a szövegben szereplő anyag, – ahol ez megfelelő, – mely adatszerű információkat és hivatkozásokat biztosít, de nem képezi részét a Szabványoknak és az Ajánlott Eljárásoknak.

d) Mellékletek. A Szabványok és az Ajánlott Eljárások kiegészítésére szolgáló anyagok, vagy azok alkalmazásához iránymutatóul szolgálnak.

Nyelv kiválasztása

Ezt az Annex-et hat nyelven – angol, arab, kínai, francia, orosz és spanyol, – fogadták el. Felkérik az egyes Szerződő Államokat, hogy nemzeti alkalmazásra és az Egyezményben előírt egyéb célok megvalósítása érdekében válasszanak egyet ezen nyelveken jóváhagyott anyagokból akár közvetlen felhasználásra, akár saját nemzeti nyelvükre történő fordítás útján, és erről küldjenek értesítést a Szervezetnek.

Szerkesztési gyakorlat

Annak érdekében, hogy az egyes megállapítások státusza az első pillantásra meghatározható legyen, a következő szerkesztési gyakorlatot követtük: A *Szabványokat* vékony álló betűkkel szedtük, a *Megjegyzéseket* vékony dőlt betűkkel tüntettük fel, melyeknek státuszát a *Megjegyzés* előtag jelöli. Az Annex 8 *Ajánlott Eljárásokat* nem tartalmaz.

Az előírások szövegezésében az alábbi szerkesztési gyakorlatot követtük: Szabványok esetében alkalmazott fontos ige a „kell”, az Ajánlott Eljárások esetében a „kívánatos”.

Ebben a kiadványban az Annex 5-ben meghatározott Nemzetközi Mértékegység Rendszernek (SI) megfelelő mértékegységeket használtuk. Ahol az Annex 5 megengedi az alternatív, nem SI mértékegység használatát, ezeket zárójelben tüntettük fel az alap mértékegység után. Ahol kétfajta mértékegység szerepel, ott nem szabad feltételezni, hogy az értékpárok egymással azonosak és felcserélhetők. Mindazonáltal arra lehet következtetni, hogy azonos szintű biztonság érhető el akkor, ha csak az egyik mértékegység párt használjuk.

Ezen dokumentum bármely részére történő hivatkozás, melyet számmal és/vagy címmel azonosítottunk, magába foglalja annak a résznek az alrészeit is.

A. Táblázat. Az Annex 8 módosításai

Módosítás(ok))	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
1. kiadás	A Légialkalmassági Divizió első és második ülése (1946 és 1947)	-	1949. március. 1. 1949 augusztus 1. 1949. szeptember 1.
1- től 63-ig (2. kiadás)	A Légialkalmassági Divizió harmadik és negyedik ülése (1949 és 1951)	-	1950. január. 26. 1951. január. 1. 1951. február. 1.
64- től 83-ig	A Légialkalmassági Divizió harmadik és negyedik ülése (1949 és 1951)	-	1951. november. 13. 1952. április. 15. 1952. május. 15.

Módosítás(ok))	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
84 (3. kiadás)	A Légialkalmassági Divizió negyedik ülése (1951)	Alternatív teljesítmény kód mellékletként történő bedolgozása	1952. december. 2. 1953. május. 1. 1953. június. 1.
85 (4. kiadás)	Harmadik Léginavigációs Konferencia (1956)	A Közgyűlés által jóváhagyott nemzetközi légialkalmasság új politikájával egyező módosított szöveg, az Annex 8 III. Része a széleskörű Szabványokra lett limitálva, a légialkalmasság szintjére vonatkozó sokkal részletesebb példákkal, azon célból, hogy “a megfelelés elfogadható módjai” anyagrészként kerüljenek bedolgozásra.	1957. június. 13. 1957. október. 1. 1957. december. 1. Vagy 1960. június. 13. a repülőgép légialkalmassági bizonyítvánnyal való ellátásának alkalmazási napjától függően.
86 (5. kiadás)	A Légialkalmassági Bizottság negyedik ülése	A repülőgép navigációs fényeire vonatkozó Szabványok módosítása és az összeütközést megelőző villogófényekre vonatkozó követelmények	1961. december. 13. 1962. április. 1. 1964. december. 13.
87	Az Egyesült Államok Bizottságának javaslata az Egyezményes Légkör kiterjesztéséről	Az egyezményes légkör újrafogalmazása	1963. november. 12. 1964. április. 1. 1966. november. 12.
88	Az Annex 7. 2.számú Módosításának következménye	A légijármű meghatározásának változása, a III. Rész 2.2.3.2.b) pontjának módosítása a 3-hajtóműves repülőgépek bedolgozásása	1967. november 8. 1968. március 8. 1968. augusztus 22.
89	Az Annex 16 elfogadásának következménye	Hivatkozás beépítése az Annex 6 és Annex 16 zajbizonyítvány Szabványaira	1971. április 2. 1971. augusztus 2. 1972. január 6.
90	A Légialkalmassági Bizottság kilencedik ülése (1970)	Az 5. kiadásból a Megfelelőség Elfogadható Módjai közül kettőnek a törlése a repülőgép teljesítményre vonatkozólag	1971. december 10. 1972. április 10. 1972. december 7.
91 (6. kiadás)	A Közgyűlés tevékenysége a Kilencedik Légialkalmassági Bizottság ülése után	A légialkalmasság módosított politikájának megfelelő új szövegezés, A Megfelelés Elfogadható Módjai-nak törlése, ebből eredően a Légialkalmassági Műszaki Kézikönyvben tájékoztató anyag megjelentetése	1973. március 16. 1973. július 30. 1974. május 23.
92	A Légialkalmassági Bizottság tizedik ülése	A folyamatos légialkalmasság információinak továbbadására vonatkozó előírások megjelentetése, megjegyzés közzététele a légijárművek kibérléséről, bérbevételéről és cseréjéről.	1974. április 3. 1974. augusztus 3. 1975. február 27.
93	A Léginavigációs Bizottság Tanulmánya	Külső fényekre vonatkozó előírások módosítása, hogy összhangban legyenek az Annex 2 és Annex 6 új előírásaival.	1982. március 22. 1982. július 22. 1985. március 22.

Módosítás(ok))	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
94 (7. kiadás)	A Légialkalmassági Bizottság tizennegyedik ülése (1981)	Meghibásodások, hibák, hiányosságok és egyéb előfordulásokra vonatkozó új előírás közzététele és az Annex 5 előírásaival megegyezően az SI mértékegység bedolgozása	1982. december 6. 1983. április 6. 1983. november 24.
95 (8. kiadás)	Az Államok javaslata, a Közgyűlés és a Léginavigációs Bizottság tanulmányai, a HELIOPS Munkabizottság harmadik ülése	Az egyezményes légkör kiterjesztése, a kényszerleszállást követő mentésre és tűzvédelemre vonatkozó megerősített előírások, légialkalmassági követelmények a helikopterekre vonatkozólag	1988. március 22. 1988. július 31. 1991. március 22.
96	A Folyamatos Légialkalmasság Munkabizottsága (CAP/3) harmadik ülése	A Tervező Állam felelősségének és az ehhez tartozó meghatározásoknak a közzététele, a folyamatos légialkalmasságra vonatkozó információ-átadásban érintett felek felelősségeinek módosítása, a karbantartási információk előírásaira vonatkozó új követelmények.	1994. március 22. 1994. július 25. 1994. november 10.
97	Titkársági tanulmány, az ISAD munkacsoport közreműködésével	Tervezési jellemzők változásai, legkisebb kockázattal járó bombahely meghatározása, új 11. Fejezet beillesztése, mely a biztonsági előírásokat tartalmazza.	1997. március 12. 1997. július 21. 1997. november 6. 2000. március 12.
98 (9. kiadás)	A Folyamatos Légialkalmasság Munkacsoport(CAP/5) ötödik ülése, a Léginavigációs Bizottság tanulmányai	a) Az Emberi Tényezők alapelveinek, valamint az emberi teljesítőképesség, a karbantartás, a javítás és a Típusjogosítás új meghatározásai, b) A II. Rész beszerkesztése négy fejezetbe: Típusjogosítás, Gyártás, Légialkalmassági Bizonyítvány és Folyamatos Légialkalmasság c) A II. Rész előírásainak módosítása, hogy lehetővé váljon a típusjogosítás fogalom és a gyártásellenőrzés bevezetése, d) A III. Rész átszerkesztése az IIIA. Részbe (ugyanazok az előírások, mint amelyek az Annex 8, (nyolcadik kiadás) jelenlegi III. Részében találhatók beleértve a 97. számú helyesbítést is, kivéve az alkalmazhatóságra vonatkozókat és a kereszthivatkozásokat), és a III. B. fejezetet (új) e) A III.B. Rész (régi nevén III. Rész) előírásainak módosítása a teljesítményre, stabilitásra, vezethetőségre, és a rakterek tűzvédelmére vonatkozólag, valamint új előírások a kabinkörnyezetre, elektromos testelésre, kényszerleszállásra, elektromágneses interferenciára, jegesedés	2001. március 2. 2001. július 16. 2004. március 2.

Módosítás(ok))	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
		elleni védelemre és rendszer szoftverre. f) a Légialkalmassági Bizonyítványok angolra fordításának előírásai, és g) Az Emberi Tényezőkre vonatkozó új előírások.	
99.	Léginavigációs Bizottság tanulmányai	a) a IIIA Rész címének módosítása, b) az alkalmazhatóság elő-írásainak módosítása az Annex 8-ban az Ajánlott Eljárások bevezetésére történő reflektálás céljából, a IIIA és a IIIB alkalmazhatóságának változtatása, hogy lehetővé váljon néhány előírás alkalmazásának lehetősége az olyan nagy repülőgépekre, melyek meghatározott maximális légialkalmassági bizonyítvány szerinti felszállótömeggel és utas ülés kapacitással rendelkeznek. c) az Annex 8 IIIA és IIIB részében a tervezési, a gyártási és a biztonsági előírások módosítása azon repülőgépek vonatkozólag, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszállótömege meghaladja a 45500 kg-ot, vagy utas ülés kapacitása több, mint 60, és amelyekre a jogosítás iránti kérelmet 2000. március 12.-én, illetőleg 2004. március 2.-án, vagy ezt követően nyújtottak be, valamint a légialkalmassági bizonyítvány szerinti 5700 kg és 45500 kg közötti maximális felszálló tömegű légijárművekre az Ajánlott Eljárások bevezetése. d) a belföldi kereskedelmi üzemelésben résztvevő repülőgépekre a biztonsági előírásokat illetően Ajánlott Eljárások bevezetése, e) azon repülőgépekre biztonsági előírások bevezetése, melyekre az Annex 6 előírja, hogy jóváhagyott pilótakabin ajtóval rendelkezzenek kiegészítő védelemként , és előírja a válaszfalak, a padlózatok és mennyezetek további védelmét is, és f) az üzemeltetési információk és eljárások kiegészítő előírásai a IIIB Részben a legkisebb kockázatú bombahely azonosításának igényéről.	2003. május 20. 2003. október 13. 2006. május 20.

NEMZETKÖZI SZABVÁNYOK

I. RÉSZ. MEGHATÁROZÁSOK

Ahol a Légijárművek Légialkalmassági Szabványaiban az alábbi fogalmak szerepelnek, azok jelentése a következő

Repülőgép (Aeroplane) Erőgép meghajtású, a levegőnél nehezebb légijármű, mely a felhajtóerőt elsősorban azon felületeire ható aerodinamikai reakciók révén nyeri, mely felületek a repülés adott körülményei között rögzített helyzetben maradnak.

Légijármű (aircraft) Bármely szerkezet, mely nem a földfelszínre ható levegő reakciójából nyeri a felhajtóerőt.

Várható üzemeltetési körülmények (Anticipated operating conditions) Mindazon körülmények, melyeket tapasztalatból ismerünk, vagy melyek reális valószínűséggel bekövetkezhetnek az adott légijármű üzemeltetési élettartama alatt, figyelembe véve a légijármű üzemeltetési fajtáját, és azok a körülmények, melyeket úgy ítélünk meg, hogy kapcsolatban állnak a légkör meteorológiai állapotával, a domborzat alakzataival, a légijármű működésével, a személyzet hatékonyságával és minden egyéb olyan tényezővel, mely a repülés biztonságát érinti. A várható üzemeltetési körülmények nem foglalják magukba az alábbiakat:

a) olyan szélsőséges viszonyokat, melyek hatékonyan elkerülhetők az üzemeltetési eljárások betartásával, és

b) az olyan nagyon ritkán előforduló szélsőséges viszonyokat, melyekre a tapasztalat alapján a szükségesnek és célszerűek tekintett körülményekre kidolgozott Szabványokat nem lehet vonatkoztatni, ezek magasabb légialkalmassági színvonalat kívánnának meg.

Megfelelő légialkalmassági követelmények (Appropriate airworthiness requirements)- A Szerződő Állam által a légijárművek, a hajtómű és a légcsavar osztályba sorolására létrehozott, vagy elfogadott, vagy más forrásból átvett részletes és átfogó légialkalmassági kódok gyűjteménye (lásd jelen Annex II. Részének 3. 2. 2. pontját).

Jóváhagyott (Approved) A Szerződő Állam a konkrét célra alkalmasnak, megfelelőnek elfogadta.

Konfiguráció (a repülőgépekre vonatkozóan) (Configuration)(as applied to the aeroplane)
A repülőgép aerodinamikai tulajdonságait befolyásoló változtatható helyzetű szerkezeti elemek sajátos kombinációja, mint például a fékszárnyak és a futómű stb.

Kritikus hajtómű egység (ek) (Critical power-unit (s) Az a hajtómű (azok a hajtóművek), melynek meghibásodása a leghátrányosabb befolyást idézi elő a légijármű jellemző értékeiben a szempontként tekintetbe vett esethez viszonyítva.

Tervezési leszálló tömeg (Design landing mass) a légijármű azon maximális tömege, amelyről a szerkezeti tervezés céljából feltételezték, hogy a légijármű ezzel a tömeggel száll le.

Tervezési felszálló tömeg (Design take-off mass) a légijármű azon maximális tömege, amelyről szerkezeti tervezés céljából feltételezték, hogy a felszálláshoz történő nekifutás megkezdésekor a légijármű rendelkezni fog.

Tervezési gurulási tömeg (Design taxiing mass) a légijármű azon maximális tömege, amelyet a légijármű szilárdsági méretezésénél figyelembe vettek, hogy a légijármű elviselje a felszállás megkezdése előtti földi mozgása közben valószínűleg fellépő terheléseket.

Biztonsági tényező (Factor of safety) Tervezési tényező, melyet a feltételezettnél nagyobb, esetlegesen előforduló terhelések, valamint a tervezésben és a gyártásban előforduló bizonytalanságok ellensúlyozására használnak.

Befejező megközelítési és felszállási terület (Final approach and take-off area) (FATO) Az a körbehatárolt terület, amely felett a megközelítési manőver befejező szakasza a kilebegtetéshez, vagy a leszálláshoz véget ér, és amelytől a felszállás manővere kezdődik. Ha az 1. teljesítményosztályba tartozó helikopterek a FATO-t használják, a körbehatárolt terület magába foglalja a megszakított felszálláshoz rendelkezésre álló területet is.

Helikopter (Helicopter) A levegőnél nehezebb olyan légijármű, melyet repülés közben lényegében a közel függőleges tengelyhez rögzített erőgép meghajtású egy vagy több forgószárnyra ható levegő reakcióereje tart fenn.

Emberi tényező elvei (Human Factors principles) Mindazon irányelvek, amelyeket a légiforgalmi tervezésben, hitelesítésben, a kiképzésben, valamint az üzemeltetés és karbantartás során alkalmaznak, és amely biztonságos csatlakozási felületet keres az ember és a rendszer egyéb alkotóelemei között, figyelembe véve az emberi teljesítőképességet.

Az emberi teljesítőképesség (Human performance) Azon emberi képességek és azok korlátai, amelyek kihatással vannak a légiforgalmi üzemeltetés biztonságára és hatékonyságára.

Leszállási terület (Landing surface) A repülőtér felületének azon része, melyet a repülőtéri hatóság a légjárműveknek egy megadott irányba történő normál nekifutására szárazföldön, vagy vízen igénybe vehetőnek nyilvánított.

Határterhelések (Limit loads) A várható üzemeltetési viszonyok között feltételezhetően előforduló legnagyobb terhelések.

Terhelési tényező (Load factor) A repülőgép súlya és egy adott terhelés viszonyszáma, az előbbit aerodinamikai erő, tehetetlenségi erő vagy földi hatások fogalmakban fejezik ki.

Karbantartás (Maintenance) Mindazon feladatok végrehajtása, melyek szükségesek a légijármű folyamatos légialkalmasságának fenntartásához, beleértve az alábbiak bármelyikét vagy kombinációját: nagyjavítás, felülvizsgálat, alkatrészcsere, hibajavítás, és egy módosítás, vagy javítás végrehajtása.

1. Teljesítményosztályú helikopter (Performance Class 1 helicopter) Olyan teljesítménnyel rendelkező helikopter, amely hajtómű meghibásodás esetén képes leszállni a megszakított felszállásra kijelölt területen, vagy biztonságosan tudja folytatni repülését egy megfelelő leszálló területre.

2. Teljesítményosztályú helikopter (Performance Class 2 helicopter) Olyan teljesítménnyel rendelkező helikopter, amely hajtómű meghibásodás esetén képes biztonságosan folytatni a repülését kivéve, ha a meghibásodás a felszállás utáni egy meghatározott pont előtt fordul elő, vagy a leszállás előtt egy meghatározott pont után, mely esetekben kényszerleszállás válhat szükségessé.

3. Teljesítményosztályú helikopter (Performance Class 3 helicopter) Olyan teljesítménnyel rendelkező helikopter, melynek, ha a repülési profil bármely pontján hajtómű meghibásodás fordul elő, kényszerleszállást kell végrehajtania.

Hajtómű egység (Power unit) Egy vagy több hajtómű és a kiegészítő berendezéseiből álló rendszer, mely együttesen biztosítja a tolóerőt, függetlenül bármely egyéb hajtómű(vek) folyamatos működésétől, de nem tartalmazza a rövid idejű tolóerőt biztosító mechanizmusokat.

Nyomásmagasság (Pressure altitude) Magasság fogalmakban kifejezett légköri nyomás érték, mely megfelel a nemzetközi Egyezményes Légkör adott nyomásértékének.

Érvényesség elismerése (Légialkalmassági bizonyítvány) (Rendering /a Certificate of Airworthiness/ valid) A Szerződő Állam olyan tevékenysége, melyet a Légialkalmassági Bizonyítvány saját kiadása mellett alkalmazhat, ennek során más Szerződő Állam által kiadott Légialkalmassági Bizonyítványt a sajátjaként ismer el.

Javítás (Repair) A légijármű szerkezeti részének,, – ha megsérült vagy elhasználódott, - légialkalmassági állapotra történő helyreállítása, mellyel azt biztosítják, hogy a légijármű továbbra is megfeleljen az adott légijármű-típus Típusbizonyítványára vonatkozó megfelelő légialkalmassági követelmények tervezési szempontjainak.

Egyezményes Légkör (Standard atmosphere) Olyan légkör, mely az alábbi jellemzőkkel határozható meg:

a) a levegő tökéletesen száraz gáz,

b) a fizikai állandók a következők:

- tengerszinten mért közepes molekulasúly:
  $M_O = 28.964420 \times 10^{-3}$ kg mol^{-1}
- légköri nyomás a tengerszinten:
  $P^O = 1013.250$ hPa
- tengerszinten a hőmérséklet:
  $t_O = 15\ {}^0C$
  $T_O = 288.15$ K
- tengerszinten a légsűrűség:
  $\rho_O = 1.2250$ kg m^{-3}
- fagyáspont hőmérséklete:
  $T_i = 273.15$ K
- univerzális gázállandó:
  $R^* = 8.31432\ JK^{-1}\ mol^{-1}$

c) A hőmérsékleti gradiensek a következők:

Geopotenciális magasság (km)		*Hőmérsékleti gradiens (Kelvin/szabvány geopotenciális kilométer)*
-tól	*- ig*	
-5. 0	11. 0	-6. 5
11. 0	20. 0	0. 0
20. 0	32. 0	+1. 0
32. 0	47. 0	+2. 8
47. 0	51. 0	0. 0
51. 0	71. 0	-2. 8
71. 0	80. 0	-2. 0

1. sz. Megjegyzés. – A szabvány geopotenciális méter értéke 9. 80665 $m^2 s^{-2}$.

2. sz. Megjegyzés. – a változók közötti összefüggéseket, valamint a hőmérséklet, a nyomás, a sűrűség és a geopotenciális értékek táblázatait a DOC 7488 kiadvány tartalmazza.

3. sz. Megjegyzés. – a DOC 7488 kiadvány ugyancsak tartalmazza a fajsúly, a dinamikai viszkozitási tényező, a kinematikai viszkozitási tényező és a hangsebesség értékeit különböző magasságokra.

Tervező Állam (State of Design) A típustervezésért felelős szervezet felett álló, fennhatóságot gyakorló Állam.

Gyártó Állam (State of Manufacture) A légijármű végső összeépítéséért felelős szervezet felett álló, fennhatóságot gyakorló Állam.

Lajstromozó Állam (State of Registry) Az az Állam, amelyiknek lajstromába a légijárművet bevezették.
Megjegyzés. – Abban az esetben, ha egy légijárművet lajstromba vevő nemzetközi üzemeltetési szervezet nem azonos a nemzeti alapszervezettel, akkor a szervezetet létrehozó Állam együttesen és egyetemlegesen felelős magára vállalni mindazon kötelezettségeket, melyek a Chicago-i Egyezmény értelmében a Lajstromozó Államra vonatkoznak. Ilyen tekintetben lásd a Tanács 1967.december 14-i Határozatát a Nemzetközi Üzemeltetési Szervezetek által működtetett légijárművek lajstromozása és felségjellel való ellátása című anyagban, mely a DOC 9587 számú kiadványban (A Nemzetközi Légiközlekedés Gazdasági Szabályozására vonatkozó Irányelvek és Tájékoztató Anyagok) található meg.

Felszállási felület (Take-off surface) A repülőtér felületének azon része, melyről a repülőtéri hatóság kinyilvánította, hogy egy adott irányba felszálló légijármű számára igénybe vehető normál szárazföldi vagy vízen történő nekifutásra.

Típusbizonyítvány (Type Certificate) Egy Szerződő Állam által kibocsátott azon dokumentum, mely pontosan meghatározza a légijármű-típus konstrukcióját és bizonyítja, hogy ez a konstrukció kielégíti az Állam megfelelő légialkalmassági tervezési követelményeit.

Mértékadó végső terhelés (Ultimate load) A terhelési határérték és a megfelelő biztonsági tényező szorzata.

II. RÉSZ. A LÉGIALKALMASSÁG MEGADÁSA ÉS A FOLYAMATOS LÉGIALKALMASSÁG ELJÁRÁSAI

Megjegyzés – Annak ellenére, hogy a Nemzetközi Polgári Repülésről szóló Egyezmény a lajstromozó államok számára bizonyos funkciók ellátását meghatározta, melyeket ezek az Államok jogosultak vagy kötelesek gyakorolni, az esettől függően, a Közgyűlés A23-13 számú Határozatában azonban elismerte, hogy előfordulhat, hogy a lajstromozó Állam esetleg képtelen lesz kötelességeit megfelelően teljesíteni olyan esetekben, amikor egy másik Állam üzemeltetője a légijárművet bérli, haszonbérbe veszi vagy egymás között cseréli – különösen, ha ezt személyzet nélkül teszi. Elismerte továbbá azt, hogy az Egyezmény nem megfelelően határozza meg az Üzemeltető Államának jogait és kötelességeit mindaddig, amíg az Egyezmény 83. Cikkelye életbe nem lép. Ennek megfelelően a Tanács hangsúlyozza, hogy ha a fent említett esetekben a Lajstromozó Állam az Egyezmény által ráruházott összes funkció teljesítésére nem képes, akkor azokat a funkciókat, amelyeket az Üzemeltető Állama sokkal kielégítőbben tud teljesíteni, ruházza át az Üzemeltető Államára feltéve, hogy az utóbbi ezt elfogadja. Megállapodtak abban, hogy az Egyezmény 38. Cikkelyének érvénybe lépésétől függően a további lépések megtétele csupán a gyakorlati könnyítések tárgyát fogja képezni, és nem lesz hatással a Chicago-i Egyezmény azon előírásaira, melyek a Lajstromozó Állam, vagy bármely harmadik Állam kötelmeire vonatkoznak. Dacára annak, hogy 83. Cikkely 1997. június 20.-án életbe lépett, az ilyen átruházási egyezmények hatással lesznek azon Szerződő Államokra, amelyek ratifikálták a vonatkozó Protocol-t (DOC 9318), miután teljesítették a 83. Cikkelyben meghatározott feltételeket

1. FEJEZET. A TÍPUSALKALMASSÁG BIZONYITÁSA

1.1. Alkalmazhatóság

Ezen fejezet Szabványait minden olyan légijármű típusra alkalmazni kell, amelyre minősítési kérelmet nyújtottak be a Szerződő Államhoz 1960. június 13.-án, vagy azt követően, kivéve, hogy ezen fejezet 1.4 pontjának előírásait csak arra a légijármű típusra kell alkalmazni, amelyre a Típusalkalmassági Bizonyítvány iránti kérelmet már benyújtották a Tervező Államhoz 2004. március 2.-án, vagy ezt követően.

Megjegyzés.- Ha a légijárművet szériagyártásba kívánják venni, a tipusalkalmassági bizonyítvány iránti kérelmet rendszerint a légijármű gyártója nyújtja be.

1.2. A megfelelő légialkalmassági követelmények tervezési szempontjai

1.2.1. A megfelelő légialkalmassági követelmények tervezési szempontjainak, – melyeket a Szerződő Állam a légijármű osztályára vonatkozólag a típusalkalmassági bizonyítvány kiállításában, vagy a típusalkalmassági bizonyítványban történő bármilyen változtatáskor felhasznál, – olyanoknak kell lenniük, hogy azok egyezzenek ezen Annex II. Részében foglalt Szabványokkal, és, ahol lehetséges, ezen Annex IIIA, IIIB és IV. fejezeteinek Szabványaival is.

1.2.2. A tervezésnek nem lehetnek olyan jellemzői, vagy sajátosságai, melyek a biztonság rovására mennének a várható üzemeltetési feltételek között.

1.2.3. Ha egy speciális légijármű tervezési sajátosságai eltérnek a megfelelő légialkalmassági követelmények tervezési szempontjaitól, vagy a IIIA, a IIIB vagy a IV. fejezet Szabványai nem alkalmazhatóak, a Szerződő Államnak olyan adekvát követelményeket kell alkalmazni, melyek legalább azonos biztonsági szintet nyújtanak.

1.2.4. .Ha egy speciális légijármű tervezési sajátosságai eltérnek a megfelelő légialkalmassági követelmények tervezési szempontjaitól, vagy a IIIA, a IIIB vagy a IV. fejezet Szabványai nem kielégítők, további technikai követelményeket kell a Szerződő Államnak tekintetbe venni ahhoz, hogy legalább az azonos biztonsági szint elérhető legyen.

Megjegyzés.- Az ICAO kiadta a Légialkalmassági Kézikönyvet (DOC9760), mely tartalmazza a tájékoztató anyagot.

1.3. Igazolás a megfelelő légialkalmassági követelmények tervezési szempontjainak teljesítéséről.

1.3.1. Kell lennie egy jóváhagyott tervnek, mely tartalmazza mindazon rajzokat, specifikációkat, jegyzőkönyveket és bizonyítéki anyagokat, melyek szükségesek a légijármű tervezésének pontos megismertetéséhez és annak bizonyításához, hogy a megfelelő légialkalmassági követelmények tervezési szempontjaival egyeznek.

Megjegyzés.- A tervezés jóváhagyását néhány Államban megkönnyítik azáltal, hogy a tervező szervezetet hagyják jóvá.

1.3.2. A légijárművet olyan mértékű felülvizsgálatoknak, földi és légi ellenőrzéseknek kell alávetni, melyeket az Állam szükségesnek tart annak bizonyítására, hogy a megfelelő légialkalmassági követelmények tervezési szempontjainak a légijármű megfelel.

1.3.3. Azon felül, hogy megállapítják egy légijárműről, hogy a vonatkozó légialkalmassági követelmények tervezési szempontjait kielégíti, a Szerződő Államnak további, általa szükségesnek tartott lépéseket is meg kell tennie annak biztosítására, hogy a tervezés jóváhagyását mindaddig visszatartsák, amíg a légijárműről feltételezhető, vagy gyanítható, hogy vannak veszélyes tulajdonságai, melyek nem kifejezetten felelnek meg a követelményeknek.

1. 3. 4. A Szerződő Államnak, amely módosítás,, javítás vagy alkatrészcsere tervezésére ad ki engedélyt, úgy kell eljárnia kielégítő bizonyítékok alapján, hogy a légijármű továbbra is folyamatosan megfeleljen az adott légijármű típusalkalmassági bizonyítványához, vagy módosított Típusalkalmassági Bizonyítványához alkalmazott vonatkozó légialkalmassági követelmények tervezési szempontjainak.

Megjegyzés.- Egy légijármű módosításának tervezése bizonyos Államokban jelentőséggel bír, ezért ilyen esetekben kiegészítő Típusalkalmassági Bizonyítványt, vagy módosított Típusalkalmassági Bizonyítványt bocsátanak ki.

1. 4. Típusalkalmassági Bizonyítvány

1. 4. 1. A Tervező Államnak, miután kielégítő bizonyosságot szerzett arról, hogy a légijármű típus a vonatkozó légialkalmassági követelmények tervezési szempontjait kielégíti, Típusalkalmassági Bizonyítványt kell kiadnia, melyben rögzíti a légijármű típus tervezését és a tervezés jóváhagyását.

1. 4. 2. Ha egy Szerződő Állam, amely nem azonos a Tervező Állammal, egy légijármű típusra Típusalkalmassági Bizonyítványt bocsát ki, ennek során úgy kell eljárnia kielégítő bizonyítékok alapján, hogy a légijármű típus megfeleljen a vonatkozó légialkalmassági követelmények tervezési szempontjainak.

2. FEJEZET. GYÁRTÁS

2. 1. Alkalmazhatóság

Jelen fejezetben ismertetett Szabványokat minden légijárműre alkalmazni kell.

2. 2. Gyártás

2. 2. 1. Légijármű gyártás

A Gyártó Államnak biztosítania kell azt, hogy minden egyes légijármű, beleértve az alvállalkozók által gyártott alkatrészeket is, megfelel a jóváhagyott tervezésnek.

2. 2. 2. Alkatrészgyártás

A Szerződő Államnak, felelősséget vállalva a II. Rész 1. 3. 4. pontjában hivatkozott tervezési jóváhagyás alatt gyártott alkatrészek legyártásáért, biztosítania kell, hogy az alkatrészek megfelelnek a jóváhagyott tervezésnek.

2. 2. 3. Gyártás ellenőrzés

Amikor egy légijármű, vagy légijármű alkatrész gyártását jóváhagyják, a Szerződő Államnak biztosítania kell, hogy ez ellenőrzött módon történjen, beleértve a minőségügyi rendszer felhasználását olymódon, hogy az építés és az összeszerelés kielégítő legyen.

Megjegyzés.- A gyártás felügyeletét bizonyos Államokban megkönnyítik azáltal, hogy a gyártó szervezetet hagyják jóvá.

2. 2. 4. Nyomonkövethetőség

Az okmányolást oly módon kell megvalósítani, hogy a légijármű és alkatrészeinek azonosítása a jóváhagyott tervezés alapján, valamint a gyártás során megvalósítható legyen.

3. FEJEZET. LÉGIALKALMASSÁGI BIZONYÍTVÁNY

Megjegyzés.- Ezen Szabványokban szereplő Légialkalmassági Bizonyítvány azonos az Egyezmény 31. Cikkelyében említett Légialkalmassági Bizonyítvánnyal.

3. 1. Alkalmazhatóság

Jelen fejezet Szabványait az összes légijárműre alkalmazni kell, kivéve a 3. 3 és a 3. 4 pontokat, melyek nem alkalmazandóak az összes légijárműre, csak azokra a típusokra, melyeknek prototípusát az illetékes nemzeti hatósághoz minősítés céljából 1960. június 13. előtt nyújtották be.

3. 2. A Légialkalmassági Bizonyítvány kiadása és megújítása

3. 2. 1. A Légialkalmassági Bizonyítványt a Szerződő Államnak kell kiadnia kielégítő bizonyítékok alapján arra vonatkozólag, hogy a légijármű a megfelelő légialkalmassági követelmények tervezési szempontjait kielégíti.

3. 2. 2. A Szerződő Állam ne bocsásson ki, és ne fogadjon el érvényesnek olyan Légialkalmassági Bizonyítványt, amelyet a Nemzetközi Polgári Repülésről szóló Egyezmény 33. Cikkelye alapján

szándékoznak elismertetni csak akkor, ha a légijármű bizonyítottan megfelel ezen Annex alkalmazható Szabványainak a megfelelő légialkalmassági követelmények teljesítésével.

3. 2. 3. A Légialkalmassági Bizonyítványt meg kell újítani, vagy érvényesnek kell tekinteni, a Lajstromozó Állam törvényeinek megfelelően, feltéve, ha a Lajstromozó Állam előírja, hogy a légialkalmasság folyamatossága fenntartását a légijármű meghatározott időszakonként ismétlődő felülvizsgálatai során állapítsák meg tekintetbe véve az eltelt időt, az üzemelés típusát, vagy pedig olyan ellenőrzési rendszer útján, melyet az Állam jóváhagyott, és amely legalább azonos eredményre vezet.

3. 2. 4. Ha egy Szerződő Állam által kibocsátott érvényes Légialkalmassági Bizonyítvánnyal rendelkező légijárművet lajstromba vesz egy másik Szerződő Állam, az új Lajstromozó Állam, amikor másik Légialkalmassági Bizonyítványt bocsát ki, vagy az eredeti bizonyítványt érvényesnek ismeri el, megfontolhatja a Szerződő Állam által kiadott Légialkalmassági Bizonyítvány előzetes kiadását részben vagy egészben kielégítő bizonyítékként a légijármű légialkalmasságáról és arról, hogy a légijármű a vonatkozó légialkalmassági követelményeket kielégíti. A hatósági jogosítás érvényessége nem lehet hosszabb idejű, mint a Légialkalmassági Bizonyítvány érvényességi ideje.

Megjegyzés.- Ez vonatkozik arra az esetre, amikor a légijárművet első alkalommal veszik lajstromba és arra az esetre is, amikor a légijármű nemzetisége megváltozik.

3. 3. A Légialkalmassági Bizonyítvány szabvány formája

3. 3. 1. A Légialkalmassági Bizonyítványnak tartalmaznia kell az 1. sz. ábrában szereplő összes információt és általában ehhez hasonlónak kell lennie.

3. 3. 2. Ha a Légialkalmassági Bizonyítványokat az angoltól eltérő nyelven állítják ki, akkor ezeknek az angol nyelvű fordítását is tartalmazniuk kell.

Megjegyzés.- A Nemzetközi Polgári Repülésről szóló Egyezmény 29. Cikkelye előírja, hogy a Légialkalmassági Bizonyítványnak minden egyes olyan légijármű fedélzetén ott kell lennie, amely részt vesz a nemzetközi légiforgalomban.

3. 4. A légijármű korlátai és információk

Minden egyes légijárművet el kell látni repülési kézikönyvvel, feliratokkal, vagy egyéb dokumentációval, melyben közzéteszik a jóváhagyott korlátokat, melyeken belül a légijárművet a vonatkozó légialkalmassági követelmények szerint légialkalmasnak tekintik és további olyan utasításokkal és információval is, melyek szükségesek a légijármű biztonságos üzemeltetéséhez.

3. 5. A légialkalmasság ideiglenes megszűnése

Ha a légijármű légialkalmasságának fenntartásában bármilyen olyan hiba fordul elő, melyet a vonatkozó légialkalmassági követelményekben körülhatároltak, a légijárművet üzemeltetésre alkalmatlannak kell tekinteni mindaddig, amíg a légialkalmassági feltételeket helyre nem állították.

3. 6. A légijármű meghibásodása

3. 6. 1. Ha egy légijármű meghibásodást szenved, a Lajstromozó Államnak kell döntést hozni arról, hogy a sérülés olyan természetű-e, hogy a légijármű a vonatkozó légialkalmassági követelményekben leírtak szerint a továbbiakban nem légialkalmas.

3. 6. 2. Ha meghibásodás gyanúja merül fel, vagy ilyenről meggyőződtek olyan esetben, amikor a légijármű egy másik Szerződő Állam területén tartózkodik, a másik Szerződő Állam hatóságait fel kell hatalmazni a légijármű repülése folytatásának megakadályozására azzal a feltétellel, hogy azonnal értesítik a Lajstromozó Államot, részletesen megadva számára az összes információt, hogy az a 3. 6. 1. pont szerinti döntését ki tudja alakítani.

3. 6. 3. Ha a Lajstromozó Állam úgy ítéli meg, hogy az elszenvedett meghibásodás olyan természetű, hogy a légijármű a továbbiakban nem légialkalmas, meg kell tiltani a légijárműnek repülése folytatását addig, amíg a légialkalmasság feltételeit helyre nem állították. Ámbár a Lajstromozó Állam, kivételes körülmények között, előírhat speciális korlátozó feltételeket, melyek alapján a légijárműnek engedélyezik a repülést fizető utasok nélkül egy olyan repülőtérre, ahol vissza fogják állítani a légijármű légialkalmasságát és a Szerződő Állam, amely a 3. 6. 2. pont szerint eredetileg megakadályozta a légijárművet repülése folytatásában, mégis engedélyezi az ilyen repülést.

3. 6. 4. Ha a Lajstromozó Állam úgy ítéli meg, hogy a meghibásodás természete miatt a légijármű légialkalmassága még mindig fennáll, a légijárműnek engedélyezni fogják repülése folytatását

1. sz. ábra

<table>
<tr><td></td><td>.Lajstromozó Állam
Kibocsátó Hatóság
LÉGIALKALMASSÁGI BIZONYÍTVÁNY</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>1. A légijármű felség- és lajstromjele
....
.......</td><td>2. A gyártó cég neve és a légijármű gyári típusjelzése**
....</td><td>3. A légijármű gyártási sorszáma
....
................</td></tr>
<tr><td colspan="3">4. A légijármű kategóriája……………………..
....</td></tr>
<tr><td colspan="3">5. Ezt a Légialkalmassági Bizonyítványt a Nemzetközi Polgári Repülésről szóló 1944.évi december 7-i Egyezmény és a + ……………..rendelkezései szerint a fenti légijármű részére bocsátottuk ki, amely légijárművet légialkalmasnak kell tekinteni, ha az előzőekben említett és a vonatkozó üzemeltetési korlátozásokkal összhangban üzemeltetik és tartják karban. Kiadás dátuma:……………… Aláírás:……………………….
+ = tüntesse fel a hivatkozást a megfelelő légialkalmassági kódra.</td></tr>
<tr><td colspan="3">6. ***</td></tr>
</table>

- * A Lajstromozó Állam tölti ki
- ** A légijármű gyári típusjelzésének tartalmaznia kell a légijármű típusát és modelljét.
- *** Ezt a rovatot vagy az érvényesség időszakos megújítására kell felhasználni (megadva az érvényesség lejártának a határidejét), vagy azon nyilatkozat céljára, hogy a légijárművet folyamatos felülvizsgálati rendszer keretében tartják karban.

4. FEJEZET. A LÉGIJÁRMŰ FOLYAMATOS LÉGIALKALMASSÁGA

4. 1. Alkalmazhatóság

Jelen fejezet Szabványait minden légijárműre alkalmazni kell.

4. 2. A folyamatos légialkalmasság meghatározása

4. 2. 1. A Lajstromozó Állam köteles követelményeket kidolgozni, vagy adoptálni annak érdekében, hogy biztosítsa a légijármű folyamatos légialkalmasságát annak teljes szolgálati élettartama alatt, beleértve azon követelményeket is, amelyekkel biztosítható, hogy:

a) a légijármű módosítás, javítás vagy cserealkatrész felépítése után folyamatosan kielégíti a vonatkozó légialkalmassági követelményeket,

b) a légijárművet légialkalmas állapotban tartja és eleget tesz az Annex 6 szerinti karbantartási követelményeknek és, ahol alkalmazható, ezen Annex IIIA, IIIB és IV. fejezetében foglaltaknak.

4. 2. 2. Egy légijármű folyamatos légialkalmasságát a Lajstromozó Államnak kell megállapítania az adott légijárműre érvényben lévő, vonatkozó légialkalmassági követelményekkel összhangban.

Megjegyzés – A folyamatos légialkalmasság követelményeire tájékoztató anyag a Légialkalmassági Kézikönyv II. kötetének B. Részében található (DOC 9760).

4. 3. A légijármű folyamatos légialkalmasságára vonatkozó információk

4. 3. 1. Ha a Szerződő Állam először vesz lajstromába egy bizonyos típusú légijárművet, amelynek nem ő a Tervező Állama és erre Légialkalmassági Bizonyítványt bocsát ki, vagy érvényesnek ismer el jelen fejezet 3. 2. 2. pontjával összhangban, akkor értesítenie kell a Tervező Államot arról, hogy ezen légijármű bevezetése a saját lajstromába megtörtént.

4. 3. 2. A légijármű Tervező Államának bármilyen általánosan felhasználható információt közölnie kell, melyet a légijármű folyamatos légialkalmaságához és a légijármű biztonságos üzemeltetéséhez szükségesnek találtak (a továbbiakban: a folyamatos légialkalmasság kötelező információi) az alábbiak szerint:

a) minden olyan Szerződő Államnak, amely a 4. 3. 1 pontnak megfelelően tájékoztatta a Tervező Államot arról, hogy a légijárművet saját lajstromába vette, és

b) kérésre minden más Szerződő Államnak.

1. *sz. Megjegyzés.- A 4. 3 pontban a "folyamatos légialkalmasság kötelező információi" fogalom szándék szerint magába foglalja a módosításra, alkatrészcserére, vagy a légijármű felülvizsgálatára és az üzemeltetés korlátozásaira és eljárásokra vonatkozó kötelező követelményeket. Az információk között ez olyan jellegű, melyet a Szerződő Államnak légialkalmassági irányelvek formájában kell kiadnia.*

2.sz. Megjegyzés – A 95 számú Körlevél, melynek tárgya az Üzemeltetésben Lévő Légijárművek Folyamatos Légialkalmassága, biztosítja a szükséges információkat, ezzel segítve a Szerződő Államokat abban, hogy kapcsolatot létesítsenek más Szerződő Államok illetékes hatóságaival az üzemeltetésben lévő légijárművek folyamatos légialkalmasságának fenntartása céljából.

4. 3. 3. A Lajstromozó Államnak, ha megkapta a Tervező Államtól a folyamatos légialkalmasság kötelező információit, adoptálnia kell a kötelező információkat akár közvetlenül, akár értékelve azokat,és végre kell hajtania a megfelelő szabályozási műveleteket.

4. 3. 4. Bármely Szerződő Államnak, amely saját lajstromába vett egy olyan légijárművet, melynél a Tervező Állam nem azonos a Szerződő Állammal, és jelen fejezet 3. 2 pontjának megfelelően

Légialkalmassági Bizonyítványt bocsát ki, vagy érvényesnek fogad el a légijárműre, biztosítania kell, hogy a Tervező Állam a folyamatos légialkalmasság összes kötelező információját megkapja, melyek Lajstromozó Államként nála keletkeztek erről a légijárműről.

4. 3. 5. A Lajstromozó Államnak biztosítania kell, hogy az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépekre és 3180 kg feletti maximális felszálló tömegű helikopterekre vonatkozólag rendelkezzen egy olyan rendszerrel, ahol információk találhatók a meghibásodásokról, a működési zavarokról, hibákról és egyéb olyan előfordulásokról, melyek káros hatást gyakorolnak vagy gyakorolhatnak a légijármű folyamatos légialkalmasságára és ezen információk közlésre kerüljenek a légijármű-típust tervező felelős szervezet felé.

Megjegyzés – A „Típustervezésért felelős szervezet" értelmezéséhez tájékoztató anyag a Légialkalmassági Kézikönyv (DOC 9760) II. kötetének A Részében található.

4. 3. 6. A Tervező Államnak gondoskodni kell arról, hogy az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépekre és 3180 kg feletti maximális felszálló tömegű helikopterekre vonatkozólag legyen egy olyan rendszer, melyben:

a) megkapja a 4. 3. 5 pontnak megfelelő beérkezett információkat,

b) eldönti, hogy szükséges-e, és mikor a légialkalmasságra vonatkozó szabályozási művelet,

c) kidolgozza a légialkalmasságra vonatkozó szükséges szabályozási műveleteket, és

d) kiadja a 4. 3. 2 pontban előírt információkat a fenti szabályozási műveletekről.

4. 3. 7. A Tervező Államnak gondoskodnia kell arról, hogy az 5700 kg maximális felszálló tömeg feletti tömegre jogosított repülőgépek tekintetében legyen egy folyamatos szerkezeti teljesség program, mely biztosítja a repülőgép légialkalmasságát. A programnak magába kell foglalnia a korrózióvédelemre és ellenőrzésre vonatkozó speciális információkat.

4. 3. 8. Minden egyes Szerződő Államnak az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépek esetében, és a 3180 kg feletti maximális felszálló tömegre jogosított helikopterek esetében ki kell dolgoznia azokat a szolgálati tájékoztató közleményfajtákat, melyekkel az üzemeltetők, a típus tervezéséért felelős szervezetek és a karbantartó szervezetek jelentést küldenek a saját légügyi hatóságuk részére. Az ilyen tájékoztatások jelentési eljárásait is ki kell dolgozni.

4. 3. 9. Ha a légijármű Gyártó Állama nem azonos a Tervező Állammal, akkor mindkét állam részéről elfogadható egyezményt kell kötni annak biztosítására, hogy a gyártó szervezet együttműködjön a típus tervezéséért felelős szervezettel a légijármű üzemeltetési tapasztalataiból nyert információk értékelésében.

III. RÉSZ NAGY REPÜLŐGÉPEK

IIIA. RÉSZ. 5700 KG FELETTI REPÜLŐGÉPEK, AMELYEKRE A JOGOSÍTÁSI KÉRELMET 1960. JÚNIUS 13.-ÁN VAGY EZT KÖVETŐEN, DE 2004. MÁRCIUS 2.-A ELŐTT NYÚJTOTTÁK BE

Megjegyzés – A IIIA Rész előírásai megegyeznek az Annex 8 III. Részében leírtakkal (8. Kiadás, beleértve a 97. számú Módosítást is) kivéve a módosított alkalmazhatósági megkötéseket és a kereszthivatkozásokat.

1. FEJEZET. ÁLTALÁNOS RÉSZ

1.1. Alkalmazhatóság

1. 1. 1. A 8.4. pontban foglaltak kivételével a IIIA Rész Szabványait kell alkalmazni az 1.1.3. pontban szereplő összes olyan repülőgéptípusra , melynek prototípusát a légialkalmasság megállapítása céljából a megfelelő nemzeti hatóságokhoz 1960. június 13.-án vagy ezt követően, de 2004. március 2.-a előtt nyújtották be.

1. 1. 2. A IIIA Rész 8.4. pontjában meghatározott Szabványok alkalmazhatók az 1.1.3. pontban meghatározott összes olyan repülőgéptípusra, amelynek prototípusát a megfelelő nemzeti hatóságokhoz légialkalmasság megállapítása céljából 1985. március 22.-én vagy ezt követően, de 2004. március 2.-a előtt nyújtották be.

1. 1. 3. Azokat a Szabványokat és Ajánlott Eljárásokat kivéve, amelyek egy eltérő alkalmazhatóságot határoznak meg, a IIIA Rész Szabványait és Ajánlott Eljárásait kell alkalmazni a légialkalmassági bizonyítvány szerinti 5700 kg maximális felszálló tömegnél nehezebb mindazon repülőgépekre, melyeket a nemzetközi légi forgalomban utasok, vagy áru, vagy posta szállítására terveznek használni.

Megjegyzés.- Az alábbi Szabványok nem tartalmaznak számszerű meghatározásokat, melyek a nemzeti légialkalmassági kódokban található értékekkel összehasonlíthatók lennének. A II. Rész 3. 2. 2. pontjának megfelelően ezeket ki kell egészíteni a Szerződő Államok által összeállított nemzeti követelményekkel.

1. 1. 4. Az 1.1.3. pontban hivatkozott repülőgépek esetében a II. Rész 3.2.2. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő részei által meghatározott légialkalmasság szintjének lényegében legalább azonosnak kell lennie a IIIA Rész átfogó Szabványai által megkívánt teljes szinttel.

1. 1. 5. Ha ezt külön nem jelölik, akkor a Szabványok a teljes repülőgépre vonatkoznak, beleértve a hajtóműveket, a rendszereket és a berendezéseket is.

1.2. Hajtómű egységek száma

A repülőgépnek legalább két hajtóműve kell, hogy legyen.

1.3. Üzemeltetési korlátozások

1.3.1. A repülőgépre, annak hajtóműveire és berendezéseire korlátozásokat kell megállapítani (lásd a 9. 2. pontot). A IIIA Rész Szabványainak való megfelelést meg kell állapítani, feltételezve, hogy a repülőgépet a megadott korlátozásokon belül üzemeltetik. A repülőgép biztonságát hátrányosan befolyásoló bármely körülmény(ek) esetében a korlátozásokat lényegében meg kell szüntetni, hogy az ezekből eredő balesetek valószínűsége a legmesszebbmenőkig csekély legyen.

1. 3. 2. Meg kell állapítani a repülőgép tömegének, súlypont helyzetének, terhelés elosztásának, sebességének és magasságának vagy nyomásmagasságának azokat a korlátozó értékeit, amelyeken belül a repülőgép a IIIA Rész összes vonatkozó Szabványait kielégíti, kivéve azon feltétel-kombinációkat, melyeknek elérése alapvetően nem lehetséges, ezeket nem szükséges figyelembe venni.

1. számú Megjegyzés.- A maximális üzemeltetési tömeg és a súlypont határértékei változhatnak például a magassággal és egyes üzemeltetési körülmények között, mint például: felszállás, utazórepülés, leszállás.

2. számú Megjegyzés.- A repülőgép alapvető korlátozásai közé tartoznak például az alábbiak:
• *engedélyezett maximális felszálló tömeg*
• *engedélyezett maximális gurulási tömeg*
• *engedélyezett maximális leszálló tömeg*
• *engedélyezett maximális tüzelőanyag nélküli tömeg*
• *A mellső és a hátsó súlyponthelyzetek szélső értékei különböző konfigurációkban (felszállás, utazórepülés, leszállás).*

3. számú Megjegyzés: A maximális üzemeltetési tömeg értékét korlátozhatja a Zajminősítési Szabványok alkalmazása (lásd Annex 16, I. Kötet, és Annex 6 I. és II. Részek).

1 .4. Veszélyes tulajdonságok és jellemzők

A repülőgép nem rendelkezhet olyan tulajdonságokkal, vagy jellemzőkkel, melyek veszélyeztetetté tehetik.

1. 5. A megfelelőség bizonyítása

1. 5. 1. A vonatkozó légialkalmassági követelményeknek való megfelelőség megítélését azon bizonyítékokra kell alapozni, melyeket akár tesztek, számítások eredményeiből, vagy a tesztek alapján elvégzett számításokból nyertek feltéve, hogy minden egyes esetben az elért pontosság biztosítani fogja a légialkalmasság azon szintjét, mely azonos értékű a közvetlen tesztek elvégzése során elérhető szinttel.

1. 5. 2. Az 1. 5. 1. pontban szereplő teszteknek olyanoknak kell lenniük, hogy elfogadható garanciát nyújtsanak arra, hogy a repülőgép, annak berendezései és alkotóelemei megbízhatóak és megfelelően működnek a várható üzemeltetési körülmények között.

2. FEJEZET. REPÜLÉS

2. 1. Általános rész

2. 1. 1. A 2.Fejezetben szereplő Szabványoknak való megfelelést repüléssel vagy egyéb tesztekkel kell megállapítani, melyeket olyan repülőgépen, vagy repülőgéptípuson hajtottak végre, melyre Légialkalmassági Bizonyítványt kértek, vagy olyan számítások alapján, melyeket az ilyen tesztekre alapoztak, feltéve, hogy a számításokkal nyert eredmények pontosságukban azonosak a direkt teszt eredményeivel, vagy határozottan ezt fejezik ki.

2. 1. 2. A Szabványnak való megfelelést a repülőgép tömeg és súlyponthelyzetének összes alkalmazható kombinációjára meg kell állapítani azon terhelési határértékeken belül, amelyre a légialkalmassági bizonyítványt kérték.

2. 1. 3. Ahol szükséges, megfelelő repülőgép konfigurációkat kell létrehozni a teljesítmény meghatározása céljából a repülés különböző szakaszaiban , valamint a repülőgép

repülőtulajdonságainak tanulmányozásához.

2. 2. Teljesítmény

2. 2. 1. Általános rész

2. 2. 1. 1. A repülőgép teljesítményéről kielégítő mennyiségű adatot kell meghatározni és ezeket a repülőgép repülési kézikönyvében közzétenni annak érdekében, hogy a szükséges információk a repülőgép teljes repülési tömegének ezen értékek alapján történő meghatározásához az üzemeltetők rendelkezésére álljanak, speciálisan a tervezett repüléshez, valamint a vonatkozó üzemeltetési paraméterek meghatározásához annak érdekében, hogy a repülés nagyfokú garanciával legyen végrehajtható, a biztonságos minimális teljesítmény rendelkezésre álljon.

2. 2. 1. 2. A repülőgép teljesítményadatainak megadásakor figyelembe kell venni az emberi teljesítőképességet, különösen pedig azt kell szem előtt tartani, hogy ne igényeljen kivételes jártasságot vagy elővigyázatosságot a hajózó személyzet részéről.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) található meg.

2. 2. 1. 3. A repülőgép teljesítményadatait úgy kell megadni, hogy azok egyezzenek az 1. 3. 1 ponttal, valamint a repülőgép azon rendszereinek és berendezéseinek logikus működési kombinációival is, melyek a repülőgép teljesítményére befolyást gyakorolhatnak.

2. 2. 2. Minimális teljesítmény

A repülőgépnek képesnek kell lennie a 2.2.2.1 illetve a 2.2.2.2 pontokban meghatározott minimális sebességértékek teljesítésére a felszállásra és a leszállásra közzétett maximális tömegnél (lásd a 2.2.3 pontot), mivel ez függ a repülőtér szintmagasságától vagy a nyomásmagasságtól akár az Egyezményes Légkörben, akár adott szélcsendes légköri viszonyok között, és vízi repülőgépek esetében adott sima vízfelületen, az akadályok, vagy a futópályán, vagy a vízfelületen történő nekifutás hosszának figyelmen kívül hagyása mellett.

Megjegyzés.- Ez a Szabvány lehetőséget ad arra, hogy a maximális felszálló tömeget és a maximális leszálló tömeget közzétegyék a repülőgép repülési kézikönyvében, például az alábbi viszonyok függvényében:

• *repülőtér szintmagassága, vagy*

• *a repülőtér szintjén mért nyomásmagasság, vagy*

• *a repülőtér szintjén mért nyomásmagasság és légköri hőmérséklet, oly módon, hogy ezek felhasználásra készen rendelkezésre álljanak a repülőgép teljesítményadataival kapcsolatos üzemeltetési korlátozásokra vonatkozó nemzeti előírások alkalmazásakor.*

2. 2. 2. 1. *Felszállás*

a) a repülőgépnek képesnek kell lenni a kritikus hajtómű meghibásodása (lásd 2.2.3 pontot) eseténi felszállásra oly módon, hogy a többi hajtómű egység a felszálló teljesítmény határain belül üzemel,

b) azon időtartam lejárta után, amely alatt a felszálló teljesítmény használható, a repülőgépnek képesnek kell lennie az emelkedésre, egy olyan magasságra, melyet tartani tud, és amelynél a repülőtér felett körbe tud repülni, miközben a kritikus hajtómű üzemképtelen és a többi hajtómű folyamatosan a megengedett maximális teljesítménnyel üzemel,

c) a felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lennie ahhoz, hogy az idealizált körülményektől, amelyre az adatokat közzétették (2. 2. 3 pont) enyhén eltérő üzemeltetési feltételek között a közzétett értékekhez képest az eltérés ne legyen aránytalan.

2. 2. 2. 2. *Leszállás*

a) a megközelítési konfiguráció kezdetétől, ha a kritikus hajtóműegység üzemképtelen, a repülőgépnek képesnek kell lennie megszakított megközelítés esetében a repülés folytatására egy olyan pontig, ahonnan a megközelítést ismételten meg tudja kezdeni,

b) a leszállási konfiguráció kezdetétől a repülőgépnek képesnek kell lennie akadályozott leszállás esetében arra, hogy felemelkedjen az összes hajtómű működése mellett.

2. 2. 3. A teljesítmény adatok közzététele

A teljesítményadatokat úgy kell meghatározni és a repülőgép repülési kézikönyvében közzétenni, hogy azok alkalmazása biztonságos összefüggést biztosítson az Annex 6 I. Rész 5. 2 pontjában előírt üzemeltetési szabályok szerint működtetett repülőgép teljesítménye és az üzemeltetésre alkalmas útvonalak és repülőterek között A teljesítmény adatokat a következő szakaszokra és értékhatárok között kell meghatározni és megadni: tömeg, szintmagasság vagy nyomásmagasság, szélsebesség, a felszállási és a leszállási felület lejtése szárazföldi repülőgépek esetében, a vízfelület viszonyai, a vízsűrűség és a vízáramlás erőssége vízi repülőgépek esetében, valamint bármilyen egyéb olyan üzemeltetési változót, amelyre a repülőgép légialkalmasságának megállapítását kérik.

2. 2. 3. 1. *Felszállás.* A felszállás teljesítményadatainak magukba kell foglalniuk a gyorsítás-fékezési úthosszt és a felszállási úthosszt is.

2. 2. 3. 1. 1. *Gyorsítás-fékezési úthossz.* Feltételezve, hogy a kritikus hajtómű váratlanul meghibásodik egy olyan pontnál, amely nincs közelebb, mint a felszállás számításba vett kezdőpontja, amelyre a felszállási úthosszt meghatározták (lásd 2. 2. 3. 1. 2 pontot), a gyorsítás-fékezési úthossz az a távolság, amelyen a repülőgép fel tud gyorsulni és meg is tud állni, vagy vízi repülőgép esetében fel tud gyorsulni és egy kielégítően alacsony sebességre le tud lassulni.

2. 2. 3. 1. 2. *Felszállási úthossz.* A felszállás úthosszának magába kell foglalnia a földön vagy vízen történő nekifutást, a kezdeti emelkedést és a biztonságos magasságra történő emelkedéshez szükséges távolságot feltételezve, hogy a kritikus hajtómű egység felszállás közben váratlanul meghibásodik (lásd 2. 2. 3. 1. 1 pontot). A felszállási úthosszt olyan magasságig kell kidolgozni, amelyet a repülőgép tartani tud, és amelyen a repülőtéri forgalmi kört végig tudja repülni. A biztonságos magasságra történő emelkedést olyan sebességgel kell végrehajtani, mely nem kevesebb, mint a 2. 3. 1. 3 pontnak megfelelően meghatározott biztonságos felszállási sebesség.

2. 2. 3. 2. *Utazórepülés.* Az útvonalon történő emelkedés teljesítménye meg kell, hogy egyezzen az emelkedési (süllyedési) teljesítményértékkel, amikor a repülőgép utazórepülés konfigurációban van, és:

a) a kritikus hajtómű nem üzemel, és

b) három vagy több hajtóműves repülőgép esetében két kritikus hajtómű nem üzemel.
A működő hajtóművek nem léphetik túl a maximális folyamatos teljesítmény értékét.

2. 2. 3. 3. *Leszállás.* Leszálló úthossznak azt a vízszintes távolságot kell tekinteni, melyet a repülőgép megtesz a megközelítés pályáján haladva egy bizonyos magasság átrepülésétől a leszállási felület felett a leszállási felület egy bizonyos pontjáig, ahol a repülőgép teljesen megáll, vagy vízi repülőgép esetében, kielégítően alacsony sebességet ér el. A megközelítési pályán választott pont magasságának és a megközelítés sebességének megfelelően összhangban kell lennie az üzemeltetési gyakorlattal. Ez az úthossz kiegészíthető biztonsági ráhagyás értékével, ha szükséges. Amennyiben szükséges, a leszállási felület feletti kiválasztott pontot, a megközelítési sebességét és a biztonsági ráhagyás távolságát megfelelő összefüggésbe kell hozni egymással, és előírásokat kell alkotni a normál üzemeltetési gyakorlatokra, és az ezektől való észszerű mértékű eltérésekre.

Megjegyzés – Ha a leszálló úthossz magába foglalja ezen Szabványban meghatározott biztonsági ráhagyás távolságát, akkor nem szükséges, hogy az Annex 6 I. Részének 5. 2. 11 pontjának alkalmazásával engedményeket tegyenek a megközelítési és leszállási technikáknál a várható eltérésekre.

2. 3. Repülési tulajdonságok

A 2. 3 pont Szabványainak előírásait a várható maximális magasságig bezárólag minden magasságon a speciális igényekre vonatkozólag és a szóba jöhető magasságokra vonatkozó összes hőmérsékleti körülmény között a repülőgépnek ki kell elégítenie, amelyre a repülőgépet jóváhagyták.

2. 3. 1. Kormányozhatóság

A repülőgépnek valamennyi várható üzemeltetési feltétel között irányíthatónak és vezethetőnek kell maradnia, és képesnek kell lennie arra, hogy egyik repülési helyzetből a másikba (például: fordulók, oldalra csúszás, a hajtómű teljesítményének változtatása, a repülőgép konfigurációjának változtatása) sima átmenettel tudjon áttérni, ne igényeljen a pilótától különleges ügyességet, elővigyázatosságot vagy erőkifejtést még akkor sem, ha bármelyik hajtómű-egység meghibásodik. A repülőgép biztonságos vezetésének technikáját a repülés minden szakaszára és minden olyan repülőgép konfigurációra ki kell dolgozni, amelyre teljesítmény adatokat közzétettek.

Megjegyzés – Ezen Szabvány célja, többek között, hogy alkalmazható legyen olyan körülmények közötti üzemeltetésre, amikor nincs érzékelhető turbulencia és biztosítsa azt is, hogy turbulens levegőben a repülési tulajdonságok indokolatlan romlása ne következzen be.

2. 3. 1. 1. *Kormányozhatóság a földön (vagy vízen)* A repülőgépnek kormányozhatónak kell lennie a földön (vagy a vízen) gurulás, felszállás és leszállás alatt a várható üzemeltetési körülmények között.

2. 3. 1. 2. *Kormányozhatóság felszállás közben.* A repülőgépnek kormányozhatónak kell lennie olyan esetben is, amikor a kritikus hajtómű-egység váratlanul meghibásodik a felszállás bármely pontjánál, amikor a repülőgépet a felszállási úthossz és a gyorsítás-fékezési úthossz közzétett adatai figyelembevételével vezetik.

2. 3. 1. 3. *A felszállás biztonságos sebessége*. A felszállás biztonságos sebességeinek meglétét akkor tételezhetjük fel, amikor a repülőgép teljesítménye (miután elhagyta a földfelszínt vagy a vízfelületet) a felszállás alatt pontosan determinált, olymódon, hogy megfelelő biztonsági ráhagyást foglal magába az átesési érték fölött és azon minimális sebességérték fölött, amelynél a repülőgép kormányozható marad a kritikus hajtómű-egység váratlan meghibásodása után.

2. 3. 2. Kiegyenlítés (trimmelés)

A repülőgép rendelkezzen olyan trimmeléssel és egyéb tulajdonságokkal, hogy a kívánt repülési helyzet megtartása céljából ne legyen szükség a pilóta túlzott figyelmére és túlzott képességeire. Ennek elbírálásakor figyelembe kell venni a repülés azon szakaszait, melyeknél ez előfordulhat és azt is, hogy milyen hosszú ideig tarthat.Ezt nemcsak a normál üzemeltetésre, hanem olyan körülmények közötti üzemelésre is alkalmazni kell, amikor egy vagy több olyan hajtómű-egység hibásodik meg, amely (ek) re a teljesítmény jellemzőket megállapították.

2. 3. 3. Stabilitás

A repülőgépnek olyan stabilitással kell rendelkeznie, összefüggésben az egyéb repülési jellemzőkkel, a teljesítménnyel, a szerkezeti szilárdsággal és a legvalószínűbb üzemeltetési körülményekkel (például: repülőgép konfigurációk és sebességtartományok), hogy a pilóta részéről túlságos koncentrálást ne igényeljen a repülőgép vezetése, számításba véve azt is, hogy az adott helyzet a repülés melyik szakaszában fordul elő és mennyi ideig tart. A repülőgép stabilitása nem lehet olyan szintű, amely a pilótától túlzott mértékű erőkifejtést igényel, vagy hogy a repülőgép manőverező képességét veszélyhelyzetben hátrányosan befolyásolja.

2. 3. 4. Átesés

2. 3. 4. 1. *Figyelmeztetés az átesésre*

Amikor a repülőgép akár egyenesből történő megközelítést, akár fordulóból történő repülést hajt végre miközben az összes hajtómű működik, vagy ha egy hajtómű-egysége üzemképtelen és az átesésshez közeledik, a pilótának világos és jellegzetes figyelmeztetést kell kapnia, melynek nyilvánvalónak kell lennie az összes lehetséges konfigurációban és teljesítmény mellett, kivéve azokat, amelyeket nem kell lényegesnek tekinteni a biztonságos repüléshez. Az átesésre történő figyelmeztetésnek és a repülőgép egyéb jellemzőinek olyanoknak kell lenniük, hogy a pilóta az átesés-jelzés kezdete után a repülőgép teljes kormányozhatóságának fenntartásához képes legyen az átesés bekövetkezését megakadályozni anélkül, hogy a hajtómű teljesítményét változtatná.

2. 3. 4. 2. *A repülőgép viselkedése az átesést követően*

Bármely konfigurációban és teljesítménynél, melyről úgy vélik, hogy lényeges az átesésből történő kivétel lehetősége szempontjából, a repülőgép viselkedése nem lehet annyira szélsőséges, hogy megnehezítse az átesésből való azonnali kivételt a repülőgép sebességkorlátozásainak, vagy szilárdsági korlátozásainak túllépése nélkül. Elfogadhatónak kell tekinteni a működő hajtómű-egységek teljesítményének csökkentését a repülőgép átesésből történő kivétele alatt.

2. 3. 4. 3. *Átesési sebességek.*

A repülés minden egyes szakaszára (például: felszállás, utazórepülés, leszállás) megfelelő konfigurációkban meg kell határozni az átesési sebességeket és a minimum állandósult sebességértékeket. Az átesési sebességértékek meghatározásakor számításba vett hajtómű teljesítmények közül egyetlen érték sem lehet nagyobb annál, mint amely közvetlenül az átesés fölötti sebességértéknél nulla tolóerőt ad.

2. 3. 5. Flatter és vibráció

Megfelelő kísérletekkel bizonyítani kell, hogy a repülőgép minden egyes része az üzemeltetési korlátozásokon belül lévő összes repülőgép konfigurációban és sebességnél mentes a flattertől és veszélyes rezgéstől (lásd 1. 3. 2 pontot). A repülőgép vibrációja nem lehet olyan erős, hogy a repülőgép vezetését zavarja, vagy szerkezeti károsodást okozzon, vagy a hajózó személyzetnek túlzott fáradtságot okozzon.

Megjegyzés.- A vibráció, mint átesésre való figyelmeztetés kívánatos, és ennek kiküszöbölésére bátorítani nem áll szándékunkban.

3. FEJEZET. SZERKEZETEK

3. 1. Általános rész

A 3. Fejezet Szabványai a repülőgép minden olyan alkotóelemére vonatkoznak, melyeknek meghibásodása a repülőgép biztonságát súlyosan veszélyeztetheti.

3. 1. 1. Tömeg és tömegeloszlás

Ha ezt másképpen nem jelzik, a szerkezetre vonatkozó összes Szabványnak olyan körülmények között kell eleget tenni, amikor a tömeget az alkalmazható tartományon felül változtatták és eloszlása a lehető legkedvezőtlenebb azokon az üzemeltetési korlátozásokon belül, amelyre a bizonyítványt kérték.

3. 1. 2. Terhelési határértékek

Ha erre nézve más előírás nincs, a 3. 3, a 3. 4, és a 3. 5 pontokban megadott különböző terhelési feltételekre a külső terhelés és a megfelelő inercia-terhelések vagy a belső erők terhelési értékeit terhelési határértékeknek kell tekinteni.

3. 1. 3. Szilárdság és deformáció

A 3. 3, a 3. 4 és a 3. 5 pontokban ismertetett különböző terhelési feltételek között semmilyen terhelési értéknél, beleértve a terhelési határértéket is, a repülőgép szerkezet egyetlen része sem szenvedhet el ártalmas alakváltozást, a repülőgép szerkezetének el kell viselnie a (végső) tűrőterhelést is.

3. 2. Repülősebességek

3. 2. 1. Tervezési repülősebességek

Meg kell határozni azokat a repülősebességeket, amelyekre a repülőgép szerkezetét tervezték annak érdekében, hogy a repülőgép szerkezete ellenálljon a 3. 3 pont szerinti manőverezési és széllökéseknek. A tervezési repülősebességek megállapításakor az alábbi sebességeket kell figyelembe venni:
a) V_A tervezési manőverezési sebesség,
b) V_B az a sebesség, amelynél a 3. 3. 2 pont szerinti feltételezett legnagyobb függőleges széllökésnek a repülőgép ellen tud állni,
c) V_C az a sebesség, amelyet a repülőgép normál utazórepülés során várhatóan nem fog túllépni, figyelembe véve a széllökésekből eredő lehetséges hatásokat is turbulens viszonyok közötti repülés esetében,
d) V_D maximális merülősebesség, mely kielégítően nagyobb értékű, mint a c.) alpontban ismertetett sebesség, és amely valószínűtlenné teszi, hogy az ilyen tervezési sebességet túl lehessen lépni a várható üzemeltetési körülmények között véletlen sebességnövekedés eredményeképpen, tekintetbe véve a repülőgép repülési tulajdonságait és egyéb jellemzőit.
e) V_{E1} –től V_{En} azon maximális sebességek, amelyeken a fékszárny, illetve a futómű kibocsátható, vagy egyéb konfigurációváltoztatás végrehajtható.

Az a), a b) és c) és e) pontokban felsorolt V_A, V_B, V_C és V_E sebességeknek a repülőgép átesési sebességénél kielégítően nagyobb értékűeknek kell lenniük annak érdekében, hogy a repülőgép kormányozhatósága még turbulens levegőben is biztosított legyen.

3. 2. 2. Repülési sebesség határértékek

A vonatkozó biztonsági ráhagyásértékkel megnövelt tervezési repülősebességekre alapozott repülősebesség határértékeket, ahol ez megfelelő, az 1. 3. 1 pont értelmében fel kell tüntetni a repülőgép repülési kézikönyvében az üzemeltetési korlátozások részeként (lásd 9. 2. 2 pontot).

3. 3. Terhelések repülés közben

A 3. 3. 1, 3. 3. 2 és 3. 5 pontokban szereplő repülés közbeni terhelési viszonyokat a 3. 1. 1 pont előírásai szerinti tömegek és tömegeloszlás, valamint a 3. 2. 1 pont előírásai szerint megválasztott sebességértékek függvényében kell számításba venni. Figyelembe kell venni az aszimmetrikus, és a szimmetrikus terheléseket is. Egy adott terhelési viszonyból eredő légellenállást, tehetetlenséget és más terheléseket olymódon kell elosztani, hogy azok a tényleges viszonyoknak megfeleljenek, vagy szigorúan közelítsenek ezekhez.

3. 3. 1. Manőverezési terhelések

Az üzemeltetési feltételek által megengedett manővereknek megfelelő terhelési tényezők alapján kell a manőverezési terheléseket kiszámítani. Ezek nem lehetnek kisebbek, mint a várható üzemeltetési feltételekhez tartozó tapasztalatok által nyert értékek.

3. 3. 2. Széllökésből eredő terhelések

A széllökésből eredő terheléseket azokra a függőleges és vízszintes széllökés sebességekre és gradiensekre kell statisztikai úton, vagy egyéb bizonyítékok alapján kiszámítani, amelyek a várható üzemeltetési feltételek között elegendőnek mutatkoznak.

3. 4. Fölfelszíntől és vízfelszíntől eredő terhelések

A repülőgép szerkezetének el kell viselnie a gurulás, a felszállás, és a leszállás alatt valószínűen fellépő földfelszíntől és a vízfelülettől eredő terheléseket.

3. 4. 1. Leszállási körülmények

A leszállási körülményeknek a tervezett felszálló tömegnél és a tervezett leszálló tömegnél magukba kell foglalniuk a talajfogás, vagy a vízetérés szimmetrikus és asszimetrikus repülőgéphelyzeteit, a süllyedés ilyen sebességértékeit és minden olyan tényezőt, mely a repülőgép szerkezetére ható terheléseket befolyásolja, és amelyek a várható üzemeltetési körülmények között előfordulhatnak.

3. 5. Egyéb terhelések

A manőverezésből és a széllökésből, a talajfogásból, vagy a vízetérésből eredő terheléseken felül és azokkal összefüggésben más egyéb terheléseket is figyelembe kell venni (repülőgép kormányterhelések, kabinnyomások, a hajtómű üzemeltetésének hatásai, a repülési konfiguráció változtatása következtében fellépő terhelések, stb.), melyek a várható üzemeltetési körülmények között nagy valószínűséggel előfordulnak.

3. 6. Flatter, divergencia és vibráció

A repülőgép szerkezetét úgy kell megtervezni, hogy az mentes legyen a flattertől, a szerkezeti divergenciától (azaz az aerodinamikai terhelésekből származó egyenetlen szerkezeti deformációtól) és a kormányozhatóság ebből eredő elvesztésétől olyan sebességeknél, amelyek az üzemeltetési korlátozásokon belül és kielégítően felette vannak, az 1. 3. 1 pont előírásait kielégítve. A szerkezetnek megfelelően szilárdnak kell lennie, hogy biztosított legyen ellenállóképessége a várható üzemeltetési körülmények között esetleg keletkező vibrációval és berezgéssel szemben.

3. 7. Kifáradásból eredő törés

A repülőgép szilárdságának és szerkezeti felépítésének olyannak kell lenni, hogy a várható üzemeltetési viszonyok között a repülőgép szerkezetét érő ismétlődő terhelések és vibráció okozta terhelések következtében előforduló végzetes kifáradási törés valószínűsége elhanyagolhatóan kicsi legyen.

4. FEJEZET. TERVEZÉS ÉS GYÁRTÁS

4. 1. Általános rész

A tervezés és a gyártás minden részlete olyan legyen, hogy észszerű garanciát nyújtson arra vonatkozólag, hogy a repülőgép összes alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. Ezeket olyan gyakorlati eredményekre kell alapozni, melyek a tapasztalat során kielégítőnek bizonyultak, vagy amelyeket speciális tesztekkel, vagy egyéb megfelelő vizsgálatokkal, vagy a két utóbbi összességével igazoltak. Ezeknél az Emberi Tényezők irányelveit is figyelembe kell venni.

Megjegyzés – Az Emberi Tényezőkre vonatkozó irányelvekre tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

4.1.1. Igazoló tesztek

A repülőgép biztonságos üzemeltetéséhez alapvetően fontos összes mozgó alkatrész működését alkalmas teszteknek kell alávetni annak érdekében, hogy bizonyítva legyen az illető alkotórészről, hogy a várható üzemeltetési körülmények között megfelelően fog működni.

4.1.2. Anyagok

A repülőgép biztonságos üzemeltetéséhez elsődlegesen fontos alkatrészek anyagainak ki kell elégíteniük a jóváhagyott előírásokat. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az anyagok, amelyeket az előírásoknak megfelelően elfogadnak, rendelkezzenek a tervezéskor feltételezett tulajdonságokkal.

4.1.3. Gyártási módszerek

A gyártási és összeszerelési módszereknek olyanoknak kell lenniük, melyekkel egy egyenletesen hibátlan szerkezetet hoznak létre és ez a használat során megbízhatóan megőrzi szilárdságát.

4.1.4. Felületvédelem

Annak érdekében, hogy időjárási okok, korrózió, kopás következtében, vagy más, esetleg észrevétlenül maradó ok miatt a repülőgép szerkezete ne veszítse el szilárdságát, vagy ne károsodjon, a repülőgép szerkezetét védelemmel kell ellátni figyelembe véve, hogy milyen karbantartást fognak számára biztosítani.

4.1.5. Előírások felülvizsgálatok biztosítására

Megfelelő előírásokat kell alkotni, melyek lehetővé tesznek akár periodikusan ismétlődve, akár rendkívül nehéz üzemelési körülményeket követően, bármilyen szükséges vizsgálatot, cserét vagy a repülőgép olyan alkotórészeinek felújítását, melyek ilyen gondozást kívánnak.

4.1.6. Tervezési jellemzők

Különös figyelmet kell fordítani azokra a tervezési jellemzőkre, amelyek a repülőgép kormányozhatósága fenntartásában a hajózó személyzetek képességeire hatással vannak. Ezen jellemzők közé minimálisan beletartoznak az alábbiak:
a) Kormányok és kormányrendszerek. A kormányokat és kormányrendszereket úgy kell megtervezni, hogy a megszorulás, a véletlen működtetés, és a kormányfelületeket rögzítő eszközök nem szándékos bekapcsolódásának lehetősége minimális legyen.
b) A rendszer életképessége.
1) Minden olyan repülőgépnél, – melynek a légiakalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy amelynek az utasülés kapacitása több mint 60, és amelynek a jogosítás iránti kérelmét 2000. március 12.-én vagy ezt követően nyújtották be, – a repülőgép rendszereit úgy kell megtervezni, elrendezni, és fizikailag elkülöníteni, hogy ezzel maximálisan kihasználják a biztonságos repülés és leszállás folytatásának lehetőségeit bármely olyan esemény megtörténte után, melynek során a repülőgép szerkezete vagy rendszerei kárt szenvedtek.
2) **Ajánlás**.- *Minden olyan repülőgépnél, – melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot és amelyre a*

jogosítás iránti kérelmet 2000. március 12.-én, vagy ezt követen nyújtották be,- a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni, hogy ezzel maximálisan kihasználják a biztonságos repülés és leszállás folytatásának lehetőségeit bármely olyan esemény megtörténte után, melynek során a repülőgép szerkezete vagy rendszerei kárt szenvedtek.

c) A személyzet környezete. A pilótakabint úgy kell kialakítani, hogy minimálisra csökkenjen a kormányok helytelen vagy korlátozott működtetése a hajózó személyzet fáradtsága, tévesztése vagy akadályoztatása miatt. Minimálisan az alábbiakat kell figyelembe venni: a kormányok és a műszerek elrendezése és azonosíthatósága, a veszélyhelyzetek gyors azonosíthatósága, a kormányok érzékenysége, szellőzés, fűtés és zaj.

d) Kilátás a pilótakabinból. A pilótakabint úgy kell kialakítani, hogy biztosítva legyen a pilóta számára a tiszta, torzításmentes kilátás a repülőgép biztonságos vezetéséhez, a pilóta látását zavaró csillogás és tükrözés nélkül. A pilótakabin szélvédője tervezési jellemzőinek biztosítania kell azt, hogy csapadékos körülmények között is kielégítő látása legyen a pilótának a repülőgép normál vezetéséhez, valamint a megközelítések és leszállások végrehajtásához.

e) Felkészülés veszélyhelyzetekre. Biztosítani kell olyan módozatokat, amelyekkel automatikusan megelőzhetők a veszélyhelyzetek, vagy amelyekkel a hajózó személyzet kezelni tudja azon berendezések és rendszerek előrelátható meghibásodásaiból származó veszélyhelyzeteket, mely berendezések, és rendszerek hibája veszélyeztetné a repülőgépet. Észszerű megoldásokat kell kidolgozni a hajtómű-egység vagy a rendszerek meghibásodását követő nélkülözhetetlen szolgáltatások olyan mértékű fenntartására, amilyen mértékben ezekre a meghibásodásokra a jelen Annex és az Annex 6 I. és II. Részében foglalt teljesítmény és üzemeltetési korlátozások Szabványai ezt előírják.

f) Tűzvédelem. A repülőgép tervezése és gyártása során a kabin belső bútorzata anyagainak, melyeket nagyobb javítások, vagy a bútorzatcsere során felhasználnak, olyanoknak kell lenniük, hogy minimálisra csökkentsék a tűz keletkezésének lehetőségét repülés közben, vagy a földön, valamint tűz kialakulásakor a füst és a mérgező gázok kifejlődését. Az ilyen tüzek észlelésére, lokalizálására, és eloltására olyan módozatokat kell kidolgozni, hogy ezek a repülőgépre további veszélyt ne jelentsenek.

g) A tűz eloltása. Olyan repülőgépeknél, amelyekre a jogosítási kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, úgy kell megtervezni a rakodótér tűzoltó rendszereit, beleértve a bennük lévő tűzoltó anyagokat, hogy figyelembe vesznek olyan hirtelen keletkező és nagykiterjedésű tüzet is, amely robbanóanyagból vagy gyújtóanyagból keletkezhet.

h) A fedélzeten lévő személyek cselekvőképtelensége.

1) Olyan repülőgépeknél, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy az utasülés kapacitása több mint 60, és amelyekre a jogosítási kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, a tervezésbe óvintézkedéseket kell beépíteni, hogy védelmet nyújtsanak az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, beleértve mindazokat, amelyeket robbanóanyag vagy gyújtóanyag okozott, melyek a repülőgép fedélzetén tartózkodó személyeket cselekvőképtelenné tehetik.

2) **Ajánlás.-** *Minden olyan repülőgépnél, – melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot és amelyre a jogosítás iránti kérelmet 2000. március 12.-én, vagy ezt követen nyújtották be,- a tervezésbe óvintézkedéseket kell beépíteni, hogy védelmet nyújtsanak az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, beleértve mindazokat, amelyeket robbanóanyag vagy gyújtóanyag okozott, melyek a repülőgép fedélzetén tartózkodó személyeket cselekvőképtelenné tehetik.*

i) A pilótakabin védelme a füst és a gőzök ellen.

1) Minden olyan repülőgépnél, – melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, és amelyre a jogosítás iránti kérelmet 2000. március 12.-én, vagy ezt követően nyújtották be, olyan módozatokat kell kidolgozni, amellyel minimálisra csökkenthető a füst, a gőzök és a repülőgépen keletkező tűz, vagy a robbanóanyag által keletkező káros kigőzölgések bejutása a pilótafülkébe.

2) **Ajánlás.-** *Minden olyan repülőgépnél, – melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, és amelyre a*

jogosítás iránti kérelmet 2000. március 12.-én, vagy ezt követen nyújtották be, olyan módozatokat kell kidolgozni, amellyel minimálisra csökkenthető a füst, a gőzök és a repülőgépen keletkező tűz , vagy a robbanóanyag által keletkező káros kigőzölgések bejutása a pilótafülkébe.

4.1.7. Kényszerleszállásra vonatkozó előírások

4. 1. 7. 1. A tervezés során gondoskodni kell arról, hogy a fedélzeten tartózkodó személyek egy kényszerleszállás esetén védettek legyenek a tűztől és a sebességcsökkenés közvetlen hatásaitól, valamint az olyan sérülésektől, melyeket a repülőgép belső berendezéseire ható sebességcsökkenés idéz elő.

4. 1. 7. 2. Eszközöket kell biztosítani a repülőgép gyors elhagyásához egy kényszerleszállás utáni várhatóan előforduló körülmények esetére. Ezeknek az eszközöknek a repülőgép utaslétszámával és a személyzet kapacitásával összhangban kell lenniük.

4. 1. 7. 3. A kabin belső kialakításának és a vészkijáratok helyének és számának, – beleértve a menekülő útvonal és a kijáratok elhelyezkedését és kivilágítását is,- olyannak kell lennie, hogy elősegítse a repülőgép gyors kiürítését a kényszerleszállást követő várhatóan előforduló körülmények között.

4. 1. 7. 4. Vízen történő kényszerleszállásra jóváhagyott repülőgépeken, a tervezés során olyan előírásokat kell megalkotni, amelyek maximálisan megvalósítható garanciát jelentenek arra, hogy vízen történő kényszerleszállás esetében a repülőgép fedélzetén lévő utasok, és a személyzet biztonságosan kimenekíthető legyen.

4.1.8. Földi kiszolgálás

A tervezésnél megfelelő előírásokat kell alkotni az olyan kockázatok minimalizálására, melyek a földi üzemeltetés (például: vontatás, felemelés) során sérüléseket, esetleg észrevétlenül, a repülőgép biztonságos üzemeltetése szempontjából lényeges részein okozhatnak. Ehhez az összes korlátozás és utasítás, mely a védelmet szolgálja, figyelembe vehető.

5. FEJEZET. HAJTÓMŰVEK

5. 1. Alkalmazási terület

Az 5. Fejezet Szabványait az összes hajtóműtípusra alkalmazni kell, amelyeket repülőgépen, mint elsődleges meghajtóegységet használnak.

5. 2. Tervezés, gyártás, és működés

Az egész hajtóművet segédberendezéseivel együtt úgy kell megtervezni és legyártani, hogy az az üzemeltetési határértékeken belül a várható üzemeltetési körülmények között megbízhatóan működjön, ha megfelelően, a 7. Fejezet előírásainak figyelembe vételével építették fel a repülőgépre, és ha ez alkalmazható, alkalmas légcsavarral látták el.

5. 3. Közzétett jogosítások, feltételek és korlátozások

A hajtómű jogosításait, és azokat a légköri viszonyokat, amelyek között a hajtóművet üzemeltetni szándékoznak, közzé kell tenni, valamint az összes üzemeltetési feltételt és a korlátozásokat.

5. 4. Tesztek

A hajtómű típus adott példányán mindazokat a teszteket sikeresen végre kell hajtani, amelyek szükségesek a közzétett osztályozások, feltételek és korlátozások érvényességének bizonyításához, valamint annak biztosításához, hogy a hajtómű kielégítően és megbízhatóan fog működni. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) Hajtómű bemérés. A hajtómű teljesítmény- vagy tolóerő jellemzőinek megállapítására teszteket kell végrehajtani annak új állapotában és a b) és a c) pontokban foglalt tesztek elvégzése után is. Az összes előírt teszt megtörténte után a végeredmény nem hozhat jelentős teljesítménycsökkenést.

b) Működés. Teszteket kell végrehajtani annak igazolására, hogy a hajtómű indítási, alapjárati, gyorsulási, rezgési, túlgyorsulási és egyéb jellemzői kielégítőek, valamint annak bizonyítására, hogy megfelelő szabadságfokú biztonsági ráhagyással rendelkezik a robbanás, instabilitás, vagy egyéb veszélyes viszonyokhoz képest, attól függően, hogy melyik alkalmazható az adott típusú hajtóműre.

c) Élettartam. Az elégséges élettartamra vonatkozó teszteket el kell végezni olyan teljesítménnyel, tolóerővel, sebességekkel, és egyéb üzemeltetési feltételek mellett, melyek a hajtómű megbízhatóságát és élettartamát bizonyítják. A hajtóművet tesztnek kell alávetni a közzétett határértékeket olyan mértékben meghaladó körülmények között üzemeltetve, mint amilyenek a tényleges működtetés során is előfordulhatnak a határértékeket meghaladóan.

6. FEJEZET. LÉGCSAVAROK

6. 1. Alkalmazási terület

Jelen Fejezet Szabványait minden légcsavartípusra alkalmazni kell

6. 2. Tervezés, gyártás és működés.

A tartozékokkal összeállított komplett légcsavart úgy kell megtervezni és legyártani, hogy a várható üzemeltetési körülmények között saját üzemeltetési korlátozásain belül megbízhatóan működjön, amennyiben megfelelően illesztették a hajtóműhöz és a hajtóművet a 7. Fejezetben foglaltaknak megfelelően építették fel a repülőgépre.

6. 3. Közzétett jogosítások, feltételek és korlátozások

A hajtómű jogosításait, és az összes üzemeltetési feltételeket és korlátozásokat közzé kell tenni, melyek között a légcsavart üzemeltetni szándékoznak.

6. 4. Tesztek

A légcsavartípus adott példányán mindazokat a teszteket megfelelően végre kell hajtani, amelyek szükségesek annak bizonyítására, hogy a légcsavar a közzétett jogosítások, feltételek és korlátozások mellett kielégítően és megbízhatóan fog működni. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) Működés. Tesztekkel kell meggyőződni arról, hogy a légcsavar szilárdsági vibráció, és túlpörgési jellemzői kielégítőek, valamint annak bizonyítására, hogy az bólintás szabályozó és a vezérlő mechanizmusok megfelelően és megbízhatóan üzemelnek.

b) Élettartam. Szükséges időtartamban olyan teljesítménnyel, sebességekkel és egyéb üzemeltetési feltételekkel kell a teszteket végrehajtani, melyek ahhoz szükségesek, hogy a légcsavar megbízhatósága és élettartama bizonyítható legyen.

7. FEJEZET. A HAJTÓMŰ FELÉPÍTÉSE

7. 1. Általános rész.

7. 1. 1. Alkalmazható Szabványok

A hajtómű felépítésének ki kell elégítenie a 4. Fejezet, és a jelen Fejezet Szabványait.

7. 1. 2. A hajtómű és a légcsavar korlátozásainak figyelembevétele

A hajtómű felépítését úgy kell megtervezni, hogy a hajtóművek és a légcsavarok (ha alkalmazható) használhatóak legyenek a várható üzemeltetési körülmények között. A repülési kézikönyvben meghatározott körülmények között a repülőgépnek képesnek kell lennie arra, hogy az 5, 6, és 7 Fejezetekben a hajtóművekre és a légcsavarokra meghatározott korlátozások túllépése nélkül üzemeltethetőek legyenek.

7. 1. 3. A hajtómű fordulatszám vezérlése

Olyan felépítéseknél, ahol a meghibásodott hajtómű folyamatos továbbforgása növelné a tűz, vagy a szerkezet súlyos sérülésének kockázatát, a hajózó személyzet részére megoldásokat kell kidolgozni a hajtómű forgásának megállítására repülés közben, vagy hogy le tudja azt csökkenteni egy biztonságos szintre.

7. 1. 4. A hajtómű újraindítása

Megoldásokat kell kidolgozni a hajtóművek repülés közbeni újraindításának biztosítására a közzétett maximális magasságig bezárólag minden magasságra.

7. 2. Elrendezés és működés

7. 2. 1. A hajtóművek függetlensége

A hajtóművet úgy kell elrendezni és felépíteni, hogy az egyes hajtómű-egységek a hozzájuk csatlakozó rendszerekkel együtt alkalmasak legyenek az önálló vezérlésre és a többi hajtóműtől függetlenül lehessen őket működtetni, valamint olymódon, hogy a hajtómű és a rendszerek között legyen legalább egy olyan elrendezésű, amelyikben bármilyen meghibásodás, még ha az előfordulás valószínűsége kiemelkedően csekély is, nem jár nagyobb teljesítményveszteséggel, mint amekkorát a kritikus hajtómű-egység teljes üzemképtelensége okoz.

7. 2. 2. Légcsavar vibráció

A légcsavar vibráció okozta feszültségeket meg kell határozni, melynek értékei nem haladhatják meg a repülőgépre meghatározott üzemeltetési korlátozások között a biztonságos üzemeltetésre megállapított értékeket.

7. 2. 3. Hűtés

A hűtőrendszernek képesnek kell lennie a hajtómű hőmérsékletét a megállapított határok között tartani (lásd 7. 1. 2 pontot) a repülőgép tervezett üzemeltetésének megfelelő maximális külső levegőhőmérséket értékéig bezárólag. A repülőgép repülési kézikönyvében közzé kell tenni azt a maximum-, és ha szükséges, azt a minimum levegő hőmérsékletet, melyre tekintettel a hajtómű alkalmasságát megállapították.

7. 2. 4. Csatlakozó rendszerek

A tüzelőanyag-, az olaj-, és a légfelvevő rendszereknek, melyek csatlakoznak a hajtóműhöz, képesnek kell lenniük a hajtóműveket egyenként táplálni a számukra megszabott követelményeknek megfelelően az összes olyan körülmény között, mely befolyásolja a rendszer működését (például: hajtómű, a repülőgép térbeli helyzete és gyorsulásai, légköri viszonyok, folyadékhőmérsékletek).

7. 2. 5. Tűzvédelem

A hajtómű térségében, ahol a szikraforrások és az éghető anyagok egymáshoz való közelsége miatt a tűz lehetősége különösen nagyfokú, a 4. 1. 6 e) pontban meghatározott általános Szabvány betartása mellett a következőket kell alkalmazni:
a) Elszigetelés. Az ilyen térségeket tűzálló anyaggal kell elszigetelni a hajtómű többi olyan térségétől, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását, tekintetbe véve a tűz terjedésének valószínű keletkezési helyét és haladási pályáját.
b) Gyúlékony folyadékok. Az ilyen térségekben elhelyezett gyúlékony folyadékokat tartalmazó rendszerelemeknek képesnek kell lenniük arra, hogy tűz esetén magukban tartsák a folyadékot. Megoldásokat kell kidolgozni a hajózó személyzet részére, amelyekkel a gyúlékony folyadékok beáramlását az ilyen térségekbe le tudja zárni, ha tűz keletkezik.
c) Tűzjelzés. Elegendő számú, megfelelően elhelyezett tűzérzékelőt kell elhelyezni az ilyen térségekben esetleg előforduló tűz gyors észlelésére.
d) Tűzoltás. Az ilyen térségeket olyan tűzoltó rendszerrel kell ellátni, mely képes eloltani az itt esetleg keletkezett tűzet feltéve, hogy az elszigetelés mértéke, a gyúlékony anyagok mennyisége, a szerkezet tűzálló képessége, és egyéb tényezők megfelelőek ahhoz, hogy a valószínűen elforduló tűz ebben a térségben nem veszélyezteti a repülőgép biztonságát.

8. FEJEZET. MŰSZEREK ÉS BERENDEZÉSEK

8. 1. Szükséges műszerek és berendezések

A repülőgépet fel kell szerelni mindazokkal a jóváhagyott műszerekkel és berendezésekkel, melyek a repülőgép biztonságos üzemeltetéséhez szükségesek a várható üzemeltetési körülmények között. Ezeknek magukba kell foglalniuk mindazon műszereket és berendezéseket, melyek szükségesek ahhoz, hogy a hajózó személyzet az üzemeltetési korlátozásokon belül működtetni tudja a repülőgépet.

1. számú Megjegyzés.- Egy Légialkalmassági Bizonyítvány kiadásához szükséges minimális műszereken és berendezéseken kívül bizonyos körülményekre, vagy bizonyos útvonalféleségekre szükséges műszereket és berendezéseket az Annex 6 I. és II. Részei írják elő.

2. számú Megjegyzés.- A műszerek és berendezések tervezésekor figyelembe kell venni az Emberi Tényezőket is.

3. számú Megjegyzés.- Az Emberi Tényezők irányelveit tartalmazó tájékoztató anyag Az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) és Az Emberi Tényezők Irányelvei a Légiforgalom Kezelésére Szolgáló Rendszerhez (ATM) (DOC 9758) című kiadványokban találhatók meg.

8. 2. Felépítés

A műszerek és berendezések felépítésekor a 4. Fejezet Szabványainak kell megfelelni.

8. 3. Biztonsági és mentőberendezések

Az előírt biztonsági és mentőberendezéseknek, melyeket a hajózó személyzet vagy az utasok várhatóan használni, vagy működtetni fognak veszélyhelyzet esetében, megbízhatónak, azonnal hozzáférhetőnek és könnyen azonosíthatónak kell lenniük, és a működtetés módját félreérthetetlenül jelezni kell rajtuk.

8. 4. Navigációs fények és az összeütközés elkerülésére szolgáló villogófények[1]*

8. 4. 1. Az Annex 2 előírásai szerinti fényforrásoknak – melyeknek égniük kell repülés közben, vagy egy repülőtér mozgási területén történő üzemeléskor, – olyan intenzitással, színnel, fedésterülettel, és egyéb jellemzőkkel kell rendelkezniük, hogy ezek egy másik repülőgép pilótájának, vagy a földi személyzetnek a lehető legtöbb időt biztosítsák az észleléshez, vagy az észlelést követően az összeütközés elkerülése érdekében végzendő manőver végrehajtásához. Az ilyen fényforrások tervezésénél kellően figyelembe kell venni azokat a körülményeket, amelyek között ezeket rendeltetésszerűen leginkább használni kell.

1. számú Megjegyzés.- Várható, hogy a fényforrásokat sokféle háttér-megvilágítás ellenében kell észlelni, ilyenek például a jellegzetes városi fények, a tiszta, csillagos ég, a holdsütötte vízfelület és az alacsony háttér-megvilágítást nyújtó nappali viszonyok. Ezen felül, az összeütközési veszély előfordulásának helyzetei leginkább a repülőterek közelforgalmi körzeteiben a legvalószínűbbek, ahol a légijárművek közel azonos sebességekkel, de valószínűen 900 km/ó (500 kt) értéket meg nem haladó sebességekkel manővereznek közepes és alacsony repülési szinteken.

2. számú Megjegyzés.- A repülőgépek külső fényforrásainak részletes műszaki előírásait lásd a Légialkalmassági Kézikönyvben (DOC 9760, II. Kötet, A Rész).

8. 4. 2. A fényforrásokat úgy kell felépíteni a repülőgépre, hogy minimálisra csökkenjen az alábbiak valószínűsége:

a) A hajózó személyzetet kötelmeinek kielégítő ellátásában hátrányosan befolyásolja,

b) egy külső szemlélőt károsan elvakít.

Megjegyzés.- Ahhoz, hogy a 8. 4. 2 pontban leírt hatásokat el lehessen kerülni, bizonyos esetekben olyan megoldásokat szükséges biztosítani, amelyekkel a pilóta kikapcsolhatja, vagy csökkentheti a villanófények intenzitását.

* Vegye figyelembe ezen rész 1. 1. 2 pontját.

9. FEJEZET. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS TÁJÉKOZTATÁSOK

9. 1. Általános rész

Azon üzemeltetési korlátozásokat, amelyeken belül meghatározták a repülőgépnek a jelen Annex Szabványaival való egyezését, továbbá a repülőgépek biztonságos üzemeltetéséhez szükséges egyéb tájékoztatásokat, jelöléseket és elhelyezett feliratos táblákat, vagy más módozatokat, melyek hatékonyan szolgálják a célt, a repülőgép repülési kézikönyvében kell közzétenni. A korlátozásoknak és tájékoztatásoknak minimálisan tartalmazniuk kell a 9. 2, a 9. 3 és a 9. 4 pontban foglaltakat.

9. 2. Üzemeltetési korlátozások

Azok a korlátozások, amelyek túllépésének veszélye fennáll repülés közben, és amelyeket mennyiségileg, megfelelő mértékegységgel fejeztek ki és szükség esetén módosítottak méréshibák esetében oly módon, hogy a hajózó személyzet a rendelkezésére álló műszerekre támaszkodva könnyen meg tudja állapítani, hogy elérte a korlátozó értékeket.

9. 2. 1. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes tömegre, súlypont helyzetekre, tömegeloszlásra és a padlóterhelésre vonatkozó korlátozásokat (lásd 1. 3. 2 pontot).

9. 2. 2. Repülősebesség korlátozások

A repülősebesség korlátozásoknak magukba kell foglalniuk az összes olyan sebességet (lásd 3. 2 pontot), amelyik korlátozást jelent a szerkezet teljességének, vagy a repülőgép repülési tulajdonságainak, vagy bármilyen egyéb megfontolásnak köszönhetően. Ezeket a sebességeket a repülőgép megfelelő konfigurációinak, és egyéb ide tartozó tényezőnek a figyelembevételével kell meghatározni.

9. 2. 3. A hajtómű korlátozásai

A hajtómű korlátozásainak magukba kell foglalniuk az összes olyan korlátozást, melyeket a repülőgépre felépített hajtómű különböző alkotóelemeire meghatároztak (lásd 7. 1. 2 és 7. 2. 3 pontokat).

9. 2. 4. Berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk az összes olyan korlátozást, amelyet a repülőgépre felépített különböző berendezésekre és rendszerekre meghatároztak.

9. 2. 5. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalni minden olyan korlátozást, amelyet bármilyen, a repülőgép biztonságára hátrányosnak ítélt körülményre tekintettel határoztak meg (lásd 1. 3. 1 pontot).

9. 2. 6. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgép üzemeltetéséhez szükséges minimum létszámot, tekintettel többek között arra, hogy a megfelelő hajózó személyzeti tagok hozzáférjenek a szükséges kormányszervekhez és műszerekhez, és hogy a veszélyhelyzet esetére előírt eljárásokat végre tudják hajtani.

Megjegyzés.- Lásd Annex 6 – A repülőgép üzemeltetése, I. és II. Részt az olyan esetekre, amikor a jelen Fejezet előírásai szerinti minimális hajózó személyzet létszámát további személyzeti tagokkal kell kiegészíteni.

9. 2. 7. Repülési idő korlátozások a rendszer vagy a hajtómű-egység meghibásodása után

A rendszerek korlátozásainak magukba kell foglalniuk azt a maximális repülési időt, amelyre a rendszer megbízhatóságát megállapították az Annex 6 I. Részének 4. 7 pontja szerint megállapított küszöbidőn túli üzemeltetés jóváhagyásával összefüggésben olyan repülőgépeknél, melyek két gázturbinás hajtóművel rendelkeznek.

Megjegyzés.- Az Annex 6 I. Részének 4. 7 pontja szerint megállapított maximális idő egy bizonyos útvonalra kevesebb lehet, mint a 9. 2. 7 pont szerinti meghatározott érték, a benne foglalt üzemeltetési meggondolások miatt.

9. 3. Üzemeltetési információk és eljárások

9. 3. 1. A üzemeltetés megfelelő típusai

Fel kell sorolni részletesen az üzemeltetés mindazon típusait, amelyekre a repülőgépet megfelelőnek találták az előírt légialkalmassági követelményekkel való egyezés alapján az Annex 6 I. és II. Részének megfelelően, vagy ahogy általánosságban elfogadható.

9. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a repülőgép üres súlyát és a súlymérés időpontjában a repülőgép állapotát, a megfelelő súlypont helyzetet, valamint a vonatkoztatási pontokat és az adatvonalakat, amelyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- Az üres tömegbe rendszerint nem számít bele a személyzet és a hasznos terhelés tömege, a kifogyasztható tüzelőanyag és a leengedhető olaj tömege, viszont tartalmazza az állandóra beépített ballasztot, a kifogyaszthatatlan tüzelőanyag és le nem engedhető olaj tömegét, valamint a hajtóművek hűtőfolyadékának és hidraulikafolyadékának teljes mennyiségét.

9. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzet üzemeltetési eljárásait, melyek jellemzőek az adott repülőgépre, és amelyek a biztonságos üzemeltetéshez szükségesek. Ezeknek magukba kell foglalniuk az egy vagy több hajtómű meghibásodása esetén követendő eljárásokat.

9. 3. 4. Információk megadása

A repülőgép jellemzőire vonatkozó összes lényeges, vagy rendkívüli tulajdonságról kielégítő mennyiségű információt kell adni. Közzé kell tenni a 2. 3. 4. 3 pontban foglaltaknak megfelelően az előírt átesési vagy a minimális állandósult repülősebesség értékeket.

9. 3. 5. Bombának a legkisebb kockázattal járó elhelyezése

Mindazon repülőgépeken, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy amelyeknek utasülés kapacitása több mint 60, és amelyekre a jogosítás iránti kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, ki kell jelölni egy olyan helyet, ahol a legkisebb kockázat mellett lehet bombát, vagy egyéb robbanó szerkezetet elhelyezni úgy, hogy minimálisra csökkenjen ezek repülőgépre gyakorolt hatása robbanás esetén.

9. 4. Teljesítményre vonatkozó információk

A repülőgépre vonatkozó teljesítményadatokat a 2. 2 pont szerint kell megadni. Ebben szerepelnie kell a repülőgép különböző konfigurációira és a hozzájuk tartozó teljesítményekre, valamint a vonatkozó sebességekre szóló információknak mindazon tájékoztatásokkal együtt, melyek segíthetik a hajózó személyzetet a közzétett teljesítmények elérésében.

9. 5. A repülőgép repülési kézikönyve

A repülőgép repülési kézikönyvének rendelkezésre kell állnia. Egyértelműen kell tartalmaznia, hogy melyik repülőgépre, vagy milyen sorozatú repülőgépekre vonatkozik. A repülőgép repülési kézikönyvének minimálisan tartalmaznia kell a jelen Fejezetben előírt korlátozásokat, információkat és eljárásokat.

9. 6. Jelzések és feliratok (táblák)

9. 6. 1. A műszereken, berendezéseken, vezérlőszerveken elhelyezett jelzéseknek, feliratoknak minden olyan korlátozást, vagy információt tartalmazniuk kell, amelyekre a hajózó személyzetnek repülés közben elsődlegesen szükséges figyelni.

9. 6. 2. Jelzéseket, táblákat vagy utasításokat kell biztosítani, melyek bármilyen, a földi személyzet részére fontos információt megadnak annak érdekében, hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (például vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat és veszélyeztetheti a repülőgép biztonságát a következő repülések során.

10. FEJEZET. FOLYAMATOS LÉGIALKALMASSÁG – KARBANTARTÁSI INFORMÁCIÓK

10. 1. Általános rész

A repülőgép légialkalmassági állapotban tartására kidolgozandó eljárásokhoz felhasznált információkat közzé kell tenni. Az információknak tartalmazni kell a 10. 2, 10. 3 és 10. 4 pontokban leírtakat.

10. 2. Karbantartási információk

A karbantartási információknak tartalmazniuk kell a repülőgép leírását, és a karbantartási feladatok végrehajtásához ajánlott módszereket. Ezen információknak magukba kell foglalniuk a hiba-meghatározásra vonatkozó tájékoztatásokat.

10. 3. Karbantartási program információi

A karbantartási program információinak magukba kell foglalniuk a karbantartási feladatokat, és a javasolt időközöket, amikor ezeket a feladatokat végre kell hajtani.

10. 4. A típus tervezés jóváhagyásából eredő karbantartási információk

A Tervező Állam által kötelező jellegűnek előírt karbantartási feladatokat és gyakoriságukat ilyen felosztásban kell meghatározni a típus tervezés jóváhagyásakor.

11. FEJEZET. BIZTONSÁG

11. 1. Belföldi kereskedelmi üzemelésben használatos repülőgépek

Ajánlás.- *Ebben a fejezetben közzétett Nemzetközi Szabványokat és Ajánlott Eljárásokat az összes olyan Szerződő Államnak alkalmaznia kell, amelynek repülőgépei belföldi kereskedelmi üzemelésben (légi szolgáltatásban) vesznek részt.*

11. 2. Legkisebb kockázatú bombahely

Minden olyan repülőgépnél, amelynek a maximális légialkalmassági bizonyítvány szerinti felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, és amelyre a jogosítás iránti kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, a repülőgép tervezése során figyelmet kell fordítani arra az előírásra, hogy legyen egy olyan hely kialakítva a repülőgépen, ahol a legkisebb kockázattal lehet bombát szállítani oly módon, hogy minimálisra csökkenjenek a bomba hatásai a repülőgépre és a benne lévő személyekre.

11. 3. A hajózó személyzet kabinjának védelme

Ajánlás.- *Mindazon repülőgépeknél, melyeknek az Annex 6 I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre az illetékes nemzeti hatósághoz kérelmet nyújtottak be a típusbizonyítvány módosítására annak érdekében, hogy az magába foglaljon egy másodlagos típustervet, figyelmet fordítva a pilótakabin válaszfalainak, padlózatának és mennyezetének megerősítésére olymódon, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátsrapnel áthatolásának, valamint erőszakos behatolásokkal szemben is ellenállók legyenek, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.*

Megjegyzés.- Az összes kereskedelmi utasszállító repülőgépen a pilótakabin ajtó követelményeire vonatkozó Szabványok és Ajánlott Eljárások megtalálhatók az Annex 6 I. Rész, 13. Fejezetben.

11. 4. Belső tér tervezése

Minden olyan repülőgépnél, amelynek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, és amelyre a jogosítás iránti kérelmet 2000. március 12. én vagy ezt követően nyújtották be, figyelmet kell fordítani azon tervezési jellemzőkre, melyekkel megakadályozható fegyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetősége a fedélzeten, ezzel megkönnyítve az ilyen tárgyak utáni kutatást.

IIIB. RÉSZ.
5700 KILOGRAM FELETTI REPÜLŐGÉPEK, MELYEKRE A BIZONYÍTVÁNY IRÁNTI KÉRELMET 2004. MÁRCIUS 2.-ÁN VAGY EZT KÖVETŐEN NYÚJTJÁK BE.

„A” ALRÉSZ. ÁLTALÁNOS RÉSZ

A.1 Alkalmazhatóság

A.1.1 Az A. 1. 2 pontban megjelölt összes olyan repülőgépre vonatkoztatni kell a IIIB Rész Szabványait, amelyre a típusbizonyítvány kiadása iránti kérelmet 2004. március 2.-án vagy ezt követően nyújtják be a megfelelő nemzeti hatóságokhoz.

A 1.2 Azon Szabványok és Ajánlott Eljárások kivételével, amelyek különböző alkalmazhatóságot határoznak meg, a IIIB. Rész Szabványait és Ajánlott Eljárásait kell alkalmazni mindazon repülőgépekre, melyeknek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, és melyekkel utasokat, vagy árut, vagy postaküldeményeket akarnak szállítani a nemzetközi légi forgalomban.

1.számú Megjegyzés.- Az A. 1. 2. pontban leírt repülőgépeket bizonyos Államokban szállító repülőgépekként ismerik.

2.számú Megjegyzés.- Az alábbi Szabványok nem tartalmaznak mennyiségi specifikációkat, melyeket össze lehetne hasonlítani a nemzeti légialkalmassági kódokban szereplőkkel. A II. Rész 3. 2. 2. pontjának megfelelően ezeket ki kell egészíteni a Szerződő Államok által összeállítandó nemzeti követelményekkel.

A.1.3 A széleskörű és részletes nemzeti kód megfelelő részei által körülhatárolt légialkalmasság szintjének, – melyre a II. Rész 3. 2. 2 pontjában hivatkoztunk az A1. 2. pontban meghatározott repülőgépekre vonatkozóan,- lényegében azonosnak kell lennie a IIIB Rész általános Szabványai által elérni kívánt átfogó szintnek.

A.1.4 Ha másként nem jelöltük, a Szabványokat a repülőgép teljes egészére kell alkalmazni beleértve a hajtómű egységeket, a rendszereket és a berendezéseket.

A.2 Üzemeltetési korlátozások

A.2.1. Korlátozó feltételeket kell megállapítani a repülőgépre, a hajtómű egységekre és a berendezésekre (lásd G. 2. pontot). A IIIB Szabványainak való megfelelést meg kell valósítani feltételezve, hogy a repülőgépet a megadott korlátozásokon belül üzemeltetik. A korlátozásoknak biztonsági ráhagyást kell tartalmazniuk, megteremtve ezzel a korlátozásokból eredő balesetek különlegesen alacsony szintű valószínűségét.

Megjegyzés – A „különlegesen alacsony szint” kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyv (DOC 9760) II. Kötetének „A” Részében található meg.

A.2.2. A tömegre, a súlypont helyzetre, a terhelés eloszlására, a sebességekre, a külső levegőhőmérsékletre és szintmagasságra, vagy a nyomásmagasságra vonatkozó korlátozások tartományait meg kell határozni, amelyeken belül a IIIB Rész összes vonatkozó Szabványainak való megfelelést feltüntetik.

1.számú Megjegyzés – A maximális üzemeltetési tömeg és a súlypont határok változhatnak például a szintmagassággal és minden egyes különálló üzemeltetési körülménnyel, mint például: felszállás, útvonalrepülés, leszállás.

2. számú Megjegyzés – A maximális üzemeltetési tömeget korlátozhatja a Zaj Bizonyítvány Szabványainak alkalmazása (lásd az Annex 16, I. Kötetben és az Annex 6, I. és II. Részeiben foglaltakat).

A.3 Veszélyes jellemzők és sajátosságok

Az összes várható üzemeltetési körülmény között a repülőgépnek nem lehet egyetlen olyan jellemzője vagy sajátossága sem, mely a repülőgépet veszélyessé teszi.

A.4 A megfelelés bizonyítása

A megadott légialkalmassági követelményeknek való megfelelés megállapítását bizonyítékokra kell alapozni, melyeket tesztekből, számításokból vagy ezek elfogadható kombinációjából nyertek feltéve, hogy minden egyes esetben az elért pontosság olyan szintű, mely elfogadható biztosítékul szolgál arra, hogy a repülőgép, alkotórészei és berendezései megfelelnek a követelményeknek, megbízhatóak és kifogástalanul működnek a várható üzemeltetési körülmények között.

„B” ALRÉSZ. REPÜLÉS

B.1 Általános rész

B.1. 1. A „B” Alrészben előírt Szabványoknak való megfelelést repüléssel vagy egyéb, olyan repülőgépen, vagy repülőgéptípusokon végrehajtott tesztekkel kell megállapítani, melyekre Típus-bizonyítványt kértek, vagy az ilyen tesztekre alapozott számítások segítségével, feltéve, hogy a számításokból nyert eredmények pontosságukat tekintve azonosak a közvetlen tesztek eredményeivel, vagy megalapozottan kifejezik azt.

B.1. 2. Minden egyes Szabvánnyal való egyezést meg kell állapítani a repülőgéptömeg és a súlyponthelyzet összes alkalmazható kombinációjára a terhelési viszonyok olyan tartományain belül, amelyekre a tanúsítást kérik.
B.1. 3. Ha szükséges, megfelelő repülőgép konfigurációkat kell meghatározni a repülés különböző szakaszaiban a teljesítmények megállapítása céljára, és a repülőgép repülési tulajdonságainak vizsgálata céljára.

B.2. Teljesítményre vonatkozó tervezési paraméterek

B.2. 1. A repülőgép teljesítményeiről kielégítő mennyiségű adatot kell meghatározni és közzétenni a repülési kézikönyvben annak érdekében, hogy az üzemeltetőt el tudják látni mindazon szükséges információval, melynek alapján a repülőgép teljes tömegét meghatározhassa, különös tekintettel a tervezett repülésre, továbbá képes legyen meghatározni a vonatkozó üzemeltetési paramétereket annak érdekében, hogy az adott repülés során ezek elfogadható garanciát jelentsenek a minimális biztonságos teljesítmény elérésére.

B.2. 2. A repülőgépre közzétett teljesítményértékek megvalósításakor figyelemmel kell lenni az emberi teljesítőképességre, és nem igényelhet a hajózó személyzet részéről kivételes jártasságot vagy elővigyázatosságot.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) található meg.

B.2. 3. A repülőgép közzétett teljesítményértékeinek meg kell felelniük az A.2. 1 pontban foglaltaknak, valamint a repülőgép rendszerei és berendezései közül azoknak a logikai kombinációiban történő működésének, melyeknek működése befolyással lehet a teljesítményre.

B2. 4 Minimális teljesítmény

A felszállásra és a leszállásra közzétett maximális tömegnél (lásd a B2.7 pontot),- mivel függvényei a repülőtér szintmagasságának vagy a nyomásmagasságnak akár az egyezményes légkörben, akár meghatározott szélcsendes légköri viszonyok között, és vízi repülőgépek esetében meghatározott hullámzásmentes vízfelület viszonyai között, – a repülőgépnek képesnek kell lennie a minimális teljesítményértékek elérésére, melyeket a B.2.5 és a B.2.6 pontokban előírtak, figyelmen kívül hagyva az akadályokat, vagy a futópálya, vagy a vízen történő nekifutás hosszát.

Megjegyzés – Ez a Szabvány megengedi, hogy a maximális felszállótömeget és a maximális leszállótömeget úgy tegyék közzé a repülőgép repülési kézikönyvében, hogy viszonyítják például:
– a repülőtér szintmagasságához, vagy
– a repülőtér szintjén lévő nyomásmagassághoz, vagy
– a repülőtér szintjén a nyomásmagassághoz és a levegő hőmérsékletéhez ,
olymódon, hogy felhasználásra készen álljon rendelkezésre, amikor a repülőtér teljesítményének üzemeltetési korlátozásaihoz a nemzeti kódot alkalmazzák

B2. 5. Felszállás
a) A repülőgépnek képesnek kell lennie arra, hogy felszálljon, feltételezve a kritikus hajtómű egység meghibásodását (lásd B2.7 pontot), a többi működő hajtómű egységek felszálló teljesítményen, vagy tolóerő teljesítményeik határértékein belül működnek.
b) Annak az időtartamnak a végén, amely alatt a felszálló teljesítményt, vagy a tolóerőt alkalmazni lehet, a repülőgépnek képesnek kell lennie az emelkedés folytatására a kritikus hajtómű egység üzemképtelensége mellett és a többi működő hajtómű egységet a maximális folyamatos teljesítmény vagy tolóerő korlátozások között üzemeltetve egészen addig a magasságig, amelyet már meg tud tartani, és amelynél már folytatni tudja biztonságos repülését és a leszállást.
c) A felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lennie ahhoz, hogy biztosítsa, hogy a táblázatban feltüntetett ideális körülményektől (lásd B2.7)

kismértékben eltérő üzemeltetési viszonyok esetében a közzétett értékektől való eltérés nem lesz aránytalanul nagy.

B2.6. Leszállás

a) A megközelítési konfigurációt megkezdve, a kritikus hajtómű egység üzemképtelensége mellett a repülőgépnek képesnek kell lennie megszakított megközelítés esetében a repülés folytatására egy olyan pontig, amelytől a megközelítést megismételheti.

b) A leszállási konfigurációt megkezdve a repülőgépnek képesnek kell lennie akadályozott leszállás esetén újra felemelkedni, ha minden hajtómű egysége működik.

B2.7. Teljesítményadatok közzététele

A teljesítményadatokat úgy kell meghatározni, és a repülési kézikönyvben közzétenni, hogy alkalmazásuk az Annex 6 I. Részének megfelelően üzemeltetendő repülőgépre vonatkozó üzemeltetési szabályok szerinti működtetése során egy biztonságos összefüggést tegyen lehetővé a repülőgép teljesítménye és azon útvonalak és repülőterek között, melyeken képes üzemelni. A teljesítményadatokat meg kell határozni, és közzé kell tenni az alábbi tartományokra: tömeg, szintmagasság, vagy nyomásmagasság, szélsebesség, felszállási gradiens és szárazföldi repülőgépek esetében a leszállási felület, valamint a vízfelület viszonyai, a víz sűrűsége és a hullámzás erőssége vízi repülőgépeknél, és bármely egyéb változóra, amelyre a repülőgépnek légialkalmassági bizonyítványt akarnak szerezni.

a) Felszállás A felszállási teljesítményadatoknak magukba kell foglalniuk a gyorsítás-fékezési úthosszt és a felszállási pálya úthosszát.

b) Gyorsítás-fékezési úthossz. A gyorsítás-fékezési úthossz az a távolság, amely a repülőgép felgyorsításához és megállásához szükséges, vagy vízi repülőgépek esetében a felgyorsításhoz és a kielégítően alacsony sebességre való lelassuláshoz, feltételezve, hogy a kritikus hajtómű hirtelen meghibásodása a felszállás megkezdésének pontjától számítva nem közelebb történik meg, mint azt a felszállási pálya úthosszának megállapításakor feltételezték (lásd B2. 7 c.) pontot). Szárazföldi epülőgépek esetében elkopott fékekkel történő üzemelésekre kell alapozni a távolság meghatározását.

c) Felszállási pálya úthossza. A felszállási pálya úthosszának magába kell foglalnia a földön vagy vízen történő nekifutás,a kezdeti emelkedés és a biztonságos magasságra történő emelkedéshez szükséges távolságot, feltételezve, hogy a kritikus hajtómű hirtelen meghibásodik a felszállás folyamán (lásd a B2. 7 b) pontot). A felszállási pálya úthosszának értékeit közzé kell tenni egészen addig a magasságig bezárólag, ahonnan a repülőgép biztonságosan folytatni tudja repülését, vagy le tud szállni. A biztonságos magasságra történő emelkedést olyan sebességértékkel kell végrehajtani, mely nem kisebb, mint a B.3. 2. 4 pontnak megfelelően meghatározott biztonságos felszálló sebesség.

d) Útvonalrepülés. Az útvonalon történő emelkedés teljesítményének azonosnak kell lennie az útvonal-konfigurációban lévő repülőgép emelkedési (vagy süllyedési) teljesítményértékével, ha:

1) a kritikus hajtómű egység üzemképtelen, és

2) három, és többhajtóműves repülőgépek esetében két kritikus hajtómű egység üzemképtelen. A működő hajtóműveket nem szabad a maximális folyamatos teljesítménynél vagy tolóerőnél nagyobb teljesítménnyel működtetni.

e) Leszállás. A leszállási úthossz az a vízszintes távolság, mely a leszállási felület felett a megközelítési pályán kijelölt magasságban lévő ponttól, melyet a repülőgép átrepül, a leszállási felület azon pontjáig tart, ahol a repülőgép teljesen megáll, vagy vízi repülőgépek esetében kielégítően alacsony sebességre lelassul. A leszállási felület feletti kiválasztott magasságot és a megközelítés sebességét az üzemeltetési gyakorlatra alapozva kell meghatározni. Ez a távolság megnövelhető egy olyan biztonsági ráhagyás értékével, amennyit szükségesnek talál, és ha ez történik, a leszállási felület felett kiválasztott magasságot, a megközelítés sebességét és a távolsági ráhagyást megfelelően kell egymáshoz rendelni, és biztosítani kell előírást mind a normál üzemeltetési gyakorlatra, mind pedig az ettől való elfogadható eltérésekre. Szárazföldi repülőgépek esetében ezt a távolságot elkopott fékekkel történő üzemeltetés esetére kell megállapítani.

Megjegyzés.- Ha a leszállási távolság magába foglalja az ebben a Szabványban meghatározott *biztonsági ráhagyás értékét, akkor nem szükséges engedményeket tenni az Annex 6 I. Rész 5. 2. 11 pontja szerinti megközelítési és leszállási technikák alkalmazásakor várható eltérésekre.*

B.3. Repülési tulajdonságok

B.3. 1. A repülőgépnek ki kell elégítenie a B.3 Szabványait a maximális előre számított magasságig bezárólag minden magasságon, és a szóban forgó magasságokhoz tartozó minden hőmérsékleti körülményre, amelyre a repülőgépet minősítették.

B.3. 2 Kormányozhatóság

B.3.2.1 Minden előre várható üzemeltetési körülmény között a repülőgépnek irányíthatónak és vezethetőnek kell maradnia, és képesnek kell lennie arra, hogy simán áttérjen egyik repülési helyzetből a másikba (például: fordulók, oldlirányú csúszás, a hajtómű teljesítményének vagy a tolóerőnek a változtatása, a repülőgép konfigurációjának változása) anélkül, hogy a pilótától kivételes ügyességet, figyelmet vagy erőkifejtést igényelne, még abban az esetben sem, ha bármelyik hajtómű-egység meghibásodik. A repülőgép biztonságos vezetésének technikáját a repülés minden fázisára, minden repülési helyzetre és az összes repülőgép konfigurációra meg kell határozni, amelyekre a teljesítményadatokat közzétették.

Megjegyzés.- A jelen Szabvány célja, többek között, hogy vonatkozzon a nem észlelhető légköri turbulencia körülményei közötti üzemelésre is, és biztosítsa, hogy turbulens levegőben a repülési tulajdonságok túlzott romlása ne forduljon elő.

B.3. 2. 2 *Kormányozhatóság a földön (vagy vízen*). A repülőgépnek kormányozhatónak kell lennie a földön (vagy a vízen) gurulás, felszállás és leszállás alatt a várható üzemeltetési körülmények között.

B.3. 2. 3 *Kormányozhatóság felszállás alatt*. A repülőgépnek kormányozhatónak kell maradnia akkor is, amikor a felszállás bármely pontján a kritikus hajtómű-egység váratlanul meghibásodik, ha a közzétett felszállási pályáknak és a gyorsítás-fékezési úthosszaknak megfelelően vezetik a repülőgépet.

B.3. 2. 4 *Biztonságos felszállási sebesség*. Az alkalmazott biztonságos felszállási sebességértékeknek, – amikor a repülőgép teljesítménye (a talaj vagy a vízfelszín elhagyása után) megszabott a felszállás alatt, – elegendő nagyságú többletsebességet kell biztosítaniuk az átesés felett, és azon minimális sebességérték felett, amelynél a repülőgép kormányozható marad akkor is, ha a kritikus hajtómű-egység váratlanul meghibásodik.

B.3. 3 Trim

A repülőgépnek olyan trimmel és egyéb jellemzőkkel kell rendelkeznie, melyek biztosítják, hogy a pilóta túlzott figyelmére vagy ügyességére ne legyen szükség a kívánt repülési helyzet megtartása érdekében. Figyelembe kell venni azt, hogy az illető repülési helyzet a repülés melyik szakaszában fordul elő, és a körülmények mennyi ideig tartanak. Ezt mind a normál üzemeltetésre, mind pedig azon körülményekre is alkalmazni kell, amikor egy vagy több olyan hajtómű-egység hibásodik meg, amelyekre a teljesítményértékeket megállapították.

B.4 Stabilitás és vezethetőség.

B.4. 1 Stabilitás

A repülőgépnek olyan stabilitással kell rendelkeznie, melynél figyelembe vették a repülőgép többi repülőtulajdonságát is, a teljesítményt, a szerkezeti szilárdságot és a legvalószínűbb üzemeltetési körülményeket (például: a repülőgép konfigurációit és sebességtartományait). Ezen felül a stabilitásnak biztosítania kell azt is, hogy a repülőgép vezetése a pilóta részéről túlzott figyelemösszpontosítást ne igényeljen, számításba véve azt is, hogy az adott repülési helyzet a repülés melyik szakaszában fordul elő és mennyi ideig tart. A stabilitás azonban nem lehet olyan szintű, hogy a pilótától a repülőgép vezetéséhez túl nagy erőkifejtést igényeljen, vagy hogy a repülőgép biztonságát veszélyeztesse a repülőgép manőverező képességének hiánya veszélyhelyzetekben. A stabilitást természetes és mesterséges úton, vagy ezek kombinációjával lehet elérni. Azokban az esetekben, amikor mesterséges stabilitás válik szükségessé, hogy megfeleljenek jelen rész Szabványainak, bizonyítani kell, hogy minden olyan meghibásodás vagy körülmény, mely a pilótától túlzott erőkifejtést vagy ügyességet kívánna a repülőgép stabilitásának helyreállításához, a legkevésbé lesz valószínű.

Megjegyzés – A „legkevésbé valószínű" kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyv II. Kötet „A" Részében (DOC 9760) található meg.

B.4. 2 Átesés

B.4. 2. 1 *Figyelmeztetés az átesésre*. Világos és egyértelmű figyelmeztetést kell kapnia a pilótának, ha a repülőgép vízszintes repülésben vagy fordulóban közel van az áteséshez, akkor is, ha minden hajtómű egysége működik, és akkor is, ha egy hajtómű egysége nem működik, bármely megengedhető konfigurációban, teljesítménynél, vagy tolóerőnél, kivéve azokat a konfigurációkat, amelyeket a biztonságos repülés szempontjából nem kell lényegesnek tekinteni. Az átesésre történő figyelmeztetés jelzésének és a repülőgép egyéb jellemzőinek olyanoknak kell lenniük, hogy az átesésre figyelmeztető jelzés után a pilóta képes legyen megakadályozni az átesés bekövetkezését a hajtómű teljesítményének vagy tolóerejének változtatása nélkül, és képes legyen fenntartani a repülőgép teljes kormányozhatóságát.

B.4. 2. 2 *Magatartás az átesést követően*. Minden olyan konfigurációban és hajtómű teljesítménynél, amely az átesésből való kivétel szempontjából lényeges, a repülőgép átesés utáni tulajdonságai nem lehetnek annyira szélsőségesek, hogy a sebességkorlátok és a szilárdsági korlátok túllépése nélkül az átesésből történő azonnali kivétel nehézséget okozzon. Az átesésből történő kivétel során a működő hajtómű egységek teljesítményének csökkentését elfogadhatónak kell tekinteni.

B4. 2. 3 *Átesési sebességek*. Meg kell határozni a repülés egyes fázisaihoz (például: felszállás, útvonalrepülés, leszállás) megfelelő konfigurációkra az átesési sebességeket és a minimális állandósult repülősebességeket. Az átesési sebességek meghatározásához használt teljesítmény vagy tolóerő értékek egyike sem lehet nagyobb, mint amennyi ahhoz szükséges, hogy nulla legyen a tolóerő közvetlenül az átesés feletti sebességnél.

B.4. 3 Flatter és vibráció

B.4. 3. 1 Alkalmas tesztekkel, analízisekkel vagy ezek bármilyen elfogadható kombinációjával bizonyítani kell, hogy a repülőgép minden egyes része mentes a flattertől és a túlzott vibrációtól bármilyen repülési konfigurációban és a repülőgép üzemeltetési határértékein belül az összes sebességértéknél. (lásd az A. 2. 2 pontot). Nem fordulhat elő olyan mértékű vibráció vagy berezgés, mely elegendő ahhoz, hogy szerkezeti károsodást okozzon.

B.4. 3. 2 Nem lehet olyan mértékű vibráció vagy berezgés, mely elegendő ahhoz, hogy zavarja a repülőgép kormányozhatóságát, vagy hogy a hajózó személyzet túlzott elfáradását idézze elő.

Megjegyzés – A berezgést ajánlatos átesésre figyelmeztetésként tekinteni és nem ajánlott az ilyen típusú berezgés figyelmen kívül hagyása.

C. ALRÉSZ. SZERKEZET

C. 1 Általános rész

A repülőgép szerkezetét úgy kell megtervezni, legyártani és a karbantartáára, valamint a javítására vonatkozólag olyan utasításokkal kell ellátni, melyeknek célja, hogy katasztrofális károsodás elkerülhető legyen a repülőgép teljes élettartama alatt.

C. 2. Tömeg és tömegeloszlás

Ha másként nem rendelkeznek, az összes, szerkezetre vonatkozó Szabványt ki kell elégíteni minden esetben, amikor a tömeg változik az alkalmazható tartományon belül és eloszlása a lehető legkedvezőtlenebb módon valósul meg az üzemeltetési határértékeken belül, attól függően, hogy milyen alkalmassági bizonyítványt kértek a repülőgépre.

C. 3. Határterhelés

A C. 6 pontban felsorolt különböző terhelési viszonyok között a külső teherbírás értékeket, és a megfelelő inercia terheléseket, vagy az ellenállás terheléseket, melyeket a C.6 pontban felsorolt különböző terhelési viszonyokra adtak meg, határterhelésnek kell tekinteni, ha erre nézve nincs más előírás.

C. 4. Deformáció és törőszilárdság

A C. 6 pontban leírt különböző terhelések esetében a repülőgép egyetlen részén sem keletkezhet káros deformáció semmilyen terhelésnél egészen a határértékig bezárólag, és a repülőgépnek a törőterhelést is el kell viselnie.

C. 5. Repülési sebességek

C. 5. 1. Tervezési repülési sebességek

A repülőgép tervezésekor meg kell határozni azokat a repülési sebesség értékeket, amelyekre a repülőgép szerkezetét megtervezik, hogy az ellenálljon a megfelelő manőverezési, és széllökés okozta terheléseknek. Az erős feláramlások vagy a légkör változásai miatt bekövetkező véletlenszerű, kiugró hatások elkerülése érdekében tervezéskor a repülési sebességeket kielégítő sebességtöbblettel kell meghatározni a gyakorlati üzemeltetés repülési sebesség határértékeinek megállapításához. Ezen felül, a tervezéskori repülési sebességeknek lényegesen nagyobbaknak kell lenniük, mint a repülőgép átesési sebessége, ezzel garanciát nyújtva arra, hogy a kormányozhatóság nem szűnik meg turbulens légköri viszonyok között. Figyelmet kell fordítani a tervezési manőverezési sebességre, a tervezési utazósebességre, a tervezési zuhanósebességre és bármilyen egyéb tervezési repülési sebességre, melyek szükségesek a felhajtóerőt növelő szerkezettel, vagy egyéb speciális szerkezettel együttjáró konfigurációkhoz.

C5. 2. Repülési sebesség határértékek

A repülési sebesség határértékeket,- melyek a megfelelő biztonsági többletsebességgel növelt tervezési repülési sebesség értékeken alapulnak, ahol ez alkalmazható, – az A. 2. 1. pontnak megfelelően fel kell tüntetni a repülési kézikönyvben az üzemeltetési korlátozások részeként (lásd G. 2.).

C. 6. Szilárdság

C. 6. 1. Az összes szerkezeti elemet úgy kell megtervezni, hogy az ellenálljon a várható üzemi terheléseknek károsodás, maradandó alakváltozás, vagy a funkcionalitás elvesztése nélkül. A várható üzemi terhelések megállapításakor számításba kell venni:

a) a repülőgép várható üzemi élettartamát,

b) a várható függőleges és vízszintes széllökés környezetet, tekintetbe véve a felhasználási profilban, az üzemeltetés helyszíneiben és a terhelési konfigurációkban várható különbözőségeket,

c) a valószínű manőverezési spektrumot, számításba véve a felhasználási profilban, a terhelési onfigurációkban és a pilóta képességeiben előforduló valószínű különbözőségeket,

d) az aszimmetrikus és a szimmetrikus terhelést,

e) a valószínű föld- és vízfelszíntől származó terheléseket, beleértve a gurulás, a leszállás és felszállás során fellépő terheléseket és a földön/vízen történő mozgás terheléseit,

f) a repülőgép valószínű sebesség tartományát, figyelembe véve a repülőgép jellemzőit, a közzétett üzemeltetési korlátozásokat és a pilóta képességeinek ingadozásait,

g) vibráció és berezgés okozta terheléseket, melyek várhatóan előfordulnak,

h) a valószínű korróziót és egyéb elhasználódást, az előírt karbantartás végrehajtása mellett, és a különböző üzemeltetési környezeteket, és

i) bármilyen egyéb terhelést, melyek az üzemeltetés során valószínűleg előfordulnak, mint például a kormányra ható terhelések, az utaskabin túlnyomás terhelései, a hajtómű terhelései, vagy a dinamikus terhelések, melyek az állandósult állapot konfigurációban bekövetkező változások miatt fordulnak elő.

C. 6. 2. A különböző terhelési körülményekből eredő levegő, inerciális és egyéb terheléseket úgy kell elosztani, hogy az nagyon közel legyen a tényleges viszonyokhoz, vagy azokat széleskörűen reprezentálja.

C. 7. Túlélőképesség

A repülőgépet úgy kell megtervezni, hogy a fedélzeten lévőknek maximális megvalósítható védelmet nyújtson a szerkezet meghibásodása esetén, vagy a földfelszínbe, a vízbe vagy egy tárgyba ütközés miatt bekövetkezett károsodás esetében. Minimum az alábbiakat kell figyelembe venni:

a) madárral történő valószínű ütközés,

b) a sárkány, a repülőgép ülések és a fékezések energia elnyelése,

c) a repülőgép valószínű viselkedése vízre történő kényszerleszálláskor, és

d) a kijutás lehetővé tétele a megvalósítható legrövidebb idő alatt.

C. 8. Szerkezeti élettartam

A repülőgépet úgy kell megtervezni és megépíteni, ahol ez megvalósítható, hogy megfeleljen a károsodástűrés elveinek, és olyannak kell lennie, hogy biztosítsa a katasztrofális megrongálódás valószínűségének kifejezetten alacsony voltát az üzemi élettartama alatt, számításba véve:

a) a várható környezeti viszonyokat,

b) az üzemeltetés során várható ismétlődő terheléseket,

c) az aerodinamikai kölcsönhatásból, vagy a belső forrásokból eredő várható vibrációkat,

d) a hőtani körfolyamatokat,

e) a valószínű korróziót vagy egyéb károsodást,

f) az előírt karbantartást, és

g) a valószínű szerkezeti javításokat.

Megjegyzés – A „kifejezetten alacsony volta” kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyv (DOC 9760) II. Kötet „A” Részében található meg.

C. 9. Villámcsapás elleni védelem

A repülőgépet meg kell védeni a villámcsapás okozta katasztrofális hatásoktól. Kellő figyelmet kell fordítani a repülőgép szerkezetéhez felhasznált anyagokra.

D. ALRÉSZ. TERVEZÉS ÉS GYÁRTÁS

D. 1. Általános rész

D. 1. 1. A tervezés és gyártás részleteinek olyanoknak kell lenniük, hogy észszerű garanciát nyújtsanak a repülőgép összes alkotórésze hatékony és megbízható működésére a várható üzemeltetési körülmények között. A tervezést és a gyártást a gyakorlati tapasztalatokra kell alapozni, amelynek során bizonyítást nyert ennek kielégítő volta, vagy speciális tesztekkel kell ezt igazolni, vagy más, megfelelő vizsgálatokkal, vagy mindkettővel. Az Emberi Tényezők alapelveit is figyelembe kell venni.

Megjegyzés – Az Emberi Tényezők alapelveire vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

D. 1. 2. Igazoló tesztek

Alkalmas tesztekkel kell bizonyítani az összes olyan mozgó alkatrész működőképességét, mely lényeges a repülőgép biztonságos üzemeltetése szempontjából, annak érdekében, hogy biztosított legyen azok kifogástalan működése a rájuk vonatkozó összes üzemeltetési körülmény között.

D. 1. 3. Anyagok

A repülőgép biztonságos üzemeléséhez lényeges repülőgép alkatrészekben felhasznált összes anyag meg kell, hogy feleljen a jóváhagyott előírásoknak. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az előírásokat kielégítő elfogadott anyagok valóban rendelkezzenek mindazokkal a lényeges tulajdonságokkal, melyeket a tervezéskor feltételeztek. Az anyagok hatásait figyelembe kell venni, melyeket a fedélzeten lévő személyekre, és a földön lévő más személyekre, valamint a környezetre általában gyakorolnak mind a normál üzemeltetés során, mind pedig veszélyhelyzetekben.

D. 1. 4. Gyártási módszerek

A gyártás és összeszerelés módszereinek olyanoknak kell lenni, hogy egyenletesen hibátlan szerkezetet hozzanak létre, mely szilárdságát megbízhatóan megtartja az üzemeltetés során.

D. 1. 5. Védelem

A szerkezetet védeni kell az állapotromlás, vagy az üzemeltetés során szilárdságának elvesztése ellen, melyet időjárás, korrózió, kopás, vagy egyéb ok idéz elő, és mely észrevétlen maradhat, ezeket figyelembe kell venni a karbantartásnál, amelyet a repülőgépen el fognak végezni.

D. 1. 6. Felülvizsgálatra vonatkozó előírások

Megfelelő előírásokat kell létrehozni annak érdekében, hogy lehetővé váljon bármilyen szükséges vizsgálat, csere, vagy a repülőgép mindazon alkatrészeinek felújítása, melyek ilyen ápolást igényelnek, akár időszakosan, akár egy rendkívül nehéz üzemelés után.

D. 2. Rendszerek tervezési jellemzői

Külön figyelmet kell fordítani azokra a tervezési jellemzőkre, melyek a hajózó személyzet képességét befolyásolják a kormányozhatóság fenntartásában. Ezeknek minimum az alábbiakat kell magukba foglalniuk:
a) kormányok és kormányrendszerek. A kormányokat, és kormányrendszereket úgy kell megtervezni, hogy minimális legyen a megszorulás, a véletlen működtetés lehetősége, beleértve a hibás összeszerelés elleni védelmet és a kormányfelület rögzítő eszközeinek nem szándékolt

összekapcsolódását.

b) A rendszerek életképessége

1) Mindazon repülőgépeknél, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni egymástól, hogy maximálisan fennálljon a folytatott biztonságos repülés és leszállás lehetősége bármilyen olyan esemény után, melynek során a repülőgép szerkezete vagy rendszerei meghibásodnak.

2) **Ajánlás.-** *Azoknál a repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 7500 kg-ot, de nem éri el a 45500 kg-ot, a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni egymástól, hogy maximálisan fennálljon a folytatott biztonságos repülés és leszállás lehetősége bármilyen olyan esemény után, melynek során a repülőgép szerkezete vagy rendszerei meghibásodnak.*

c) A személyzet környezete. A pilótafülkét úgy kell megtervezni, hogy a lehető legkisebb lehetőség legyen arra, hogy a hajózó személyzet a kormányokat helytelenül, vagy korlátozottan működteti fáradtság, tévedés, vagy zavaró hatások miatt. Figyelmet kell fordítani legalább az alábbiakra: a kormányok és a műszerek elrendezése és azonosítása, a veszélyhelyzetek gyors azonosítása, a kormányok érzékenysége, a szellőzés, a fűtés és a zaj.

d) Kilátás a pilótakabinból. A pilótafülkét úgy kell kialakítani, hogy eléggé nagyfelületű, tiszta és torzításmentes kilátást biztosítson a repülőgép biztonságos üzemeltetése érdekében, és hogy megakadályozza a csillogást és visszaverődéseket, melyek zavarják a pilótát a látásban. Az ablak tervezési jellemzőinek lehetővé kell tenni a kielégítő látást csapadékos körülmények között a repülés normál vezetéséhez, valamint a megközelítések és a leszállások végrehajtásához.

e) Veszélyhelyzetekre vonatkozó előírások. Olyan megoldásokat kell biztosítani, melyek vagy automatikusan megelőzik, vagy lehetővé teszik a hajózó személyzetnek, hogy kezelni tudja azokat a veszélyhelyzeteket, melyek a berendezések vagy rendszerek előre látható meghibásodásaiból keletkeznek, és amelyeknek a meghibásodása veszélyeztetheti a repülőgépet.

Észszerűen gondoskodni kell arról, hogy az alapvető szolgáltatások biztosítva legyenek, melyek a hajtómű egység vagy a rendszerek meghibásodása után tovább működnek oly mértékig, hogy az megfeleljen az ilyen meghibásodásokra vonatkozó teljesítmény és üzemeltetési korlátozásoknak, melyeket jelen Annex Szabványai és az Annex 6 I. és II. Részei előírnak.

f) Tűzvédelem. A repülőgépet úgy kell megtervezni és a gyártás során olyan anyagokat kell felhasználni, hogy minimálisra csökkenjen a tűz lehetősége mind repülés közben, mind a földön, és minimális legyen a füst és a mérgező gázok keletkezésének lehetősége a tűz kialakulása után és késleltesse a kisülés előfordulását a kabinban. Az ilyenfajta tüzek lokalizálására, észlelésére vagy eloltására olyan megoldásokat kell biztosítani, melyek a repülőgépre nézve további veszélyt nem jelentenek. A repülőgép mosdóiban füstérzékelő rendszereket kell elhelyezni és beépített tűzoltórendszert minden egyes szemétgyűjtő tartályhoz, melyben az elhasznált törölközőket, papírt vagy hulladékot tárolják.

g) A rakterek védelme.

1) minden egyes rakteret, melyet a hajózó személyzet utasszállító repülőgépen meg tud közelíteni, fel kell szerelni tűzlefojtó rendszerrel,

2) az olyan raktereket, melyeket a hajózó személyzet nem tud megközelíteni, beépített tűzérzékelő rendszerrel és beépített tűzlefojtó vagy a tűz terjedését gátló rendszerrel, és

3) a rakterek tűzlefojtó rendszereit, beleértve a tűzoltó anyagokat is, úgy kell megtervezni, hogy számításba vesznek olyan hirtelen, és kiterjedt tűzet is, melyet robbanóanyag, vagy gyújtószerkezet, vagy veszélyes áruk idézhetnek elő.

h) A fedélzeten tartózkodók cselekvőképtelensége.

1) Azoknál a repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a tervezés során figyelmet kell fordítani arra, hogy védelmetbiztosítsanak a kabin dehermetizálódás lehetséges esetei ellen, valamint füst és mérgező gázok jelenléte ellen, beleértve azokat is, amelyeket robbanóanyag, gyújtószerkezet, vagy veszélyes áruk okoztak, mivel mindezek a repülőgép fedélzetén tartózkodók cselekvőképtelenségét idézhetik elő.

2) **Ajánlás**.- *Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, a tervezés során figyelmet kell fordítani arra, hogy védelmetbiztosítsanak a kabin dehermetizálódás lehetséges esetei ellen, valamint füst és mérgező gázok jelenléte ellen, beleértve azokat is, amelyeket robbanóanyag, gyújtószerkezet, vagy veszélyes áruk okoztak, mivel mindezek a repülőgép fedélzetén tartózkodók cselekvőképtelenségét idézhetik elő.*

i) A pilótakabin védelme füst és gőzök ellen.

1) Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, módozatokat kell kidolgozni arra, hogy a repülőgép fedélzetén kialakult tűz vagy robbanás által keletkezett füst, gőzök, és ártalmas kipárolgások bejutása a pilótakabinba minimális mértékű lehessen.

2) **Ajánlás.**- *Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, módozatokat kell kidolgozni arra, hogy a repülőgép fedélzetén kialakult tűz vagy robbanás által keletkezett füst, gőzök, és ártalmas kipárolgások bejutása a pilótakabinba minimális mértékű lehessen*

D. 3. Aeroelaszticitás

A repülőgépet úgy kell megtervezni, hogy mentes legyen szerkezeti deformáció miatt bekövetkező flattertől, szerkezetváltozástól, és a kormányozhatóság elvesztésétől, az A. 2. 1. pontban előírt tervezési burkológörbe összes sebességértékénél és még jóval azon túl is.

Számításba kell venni a repülőgép jellemzőit, valamint a pilóták közötti eltéréseket a szakértelem és teljesítőképesség terén. Az aerodinamikai kormányfelületekre megengedhető határértékeket kell előírni, valamint azt, hogy ezen határértékeket milyen módon kell figyelni annak biztosítása érdekében, hogy a repülőgép aeroelasztikus problémáktól mentes maradjon teljes élettartama alatt.

D. 4. A fedélzeten tartózkodók elhelyezésének jellemzői

D. 4. 1. Ülések és bekötőhevederek

A fedélzeten tartózkodók számára megfelelő ülést és bekötési lehetőségeket kell biztosítani, figyelembe véve a repülés, vagy kényszerleszállás során fellépő terhelések valószínűségét, melyekkel számolni kell. Figyelmet kell fordítani arra, hogy a fedélzeten tartózkodók sérülései minimálisak legyenek, amikor a repülőgép működése alatt a körülöttük lévő szerkezetnek ütődnek.

D. 4. 2. Utaskabin környezet

A szellőztetést, a fűtést és, ahol ez megvalósítható, a hermetizálás rendszereit úgy kell megtervezni, hogy azok megfelelő környezetet teremtsenek az utaskabinban a várható repülés ideje alatt, valamint a földi vagy a vízi üzemeltetés viszonyai között. A rendszerek megtervezésekor számításba kell venni a veszélyhelyzeti körülményeket is.

D. 5. Elektromos testelés.

Az elektromos testelésnek, és a villámcsapás és statikus elektromosság elleni védelemnek olyannak kell lennie, hogy:

a) megvédje a repülőgépet, annak rendszereit, a fedélzeten tartózkodó személyeket és azokat, kik a földön vagy vízen kapcsolatba kerülnek a repülőgéppel mindazoktól a veszélyes hatásoktól, amelyeket villámkisülés, és áramütés okoz, és

b) védelmet nyújtson az elektrosztatikus töltés felhalmozódása okozta veszélyekkel szemben.

D. 6. Kényszerleszállásra vonatkozó rendelkezések

D. 6. 1. A repülőgép tervezésekor gondoskodni kell a fedélzeten tartózkodók védelméről kényszerleszállás esetére, hogy megvédjék őket a tűztől és a sebességcsökkenés közvetlen hatásaitól, valamint azoktól a sérülésektől, melyeket a repülőgép belső berendezési tárgyai okozhatnak a sebességcsökkenés bekövetkezése miatt.

D. 6. 2. Eszközöket kell biztosítani a repülőgép gyors kiürítéséhez olyan körülményekre, melyek valószínűleg fennállnak egy kényszerleszállást követően. Ezeket az eszközöket a repülőgép utasainak és a személyzet kapacitásának összhangba hozásával kell meghatározni, és alkalmasnak kell lenniük a kívánt cél eléréséhez.

D. 6. 3. Az utaskabin belső kialakításának, a vészkijáratok helyének és számának, – beleértve a menekülő útvonalakat és a kijáratok megvilágításának módját és azok elhelyezkedését,- olyannak kell lenni, hogy elősegítsék a repülőgép gyors kiürítését olyan valószínűen előforduló körülmények között, melyek egy kényszerleszállást követően állnak elő.

D. 6. 4. Olyan repülőgépeknél, melyeket vízre történő kényszerleszállásra alkalmasnak nyilvánítottak, a tervezésénél maximális megvalósítható mértékben kell gondoskodni arról, hogy kényszerleszállás után a repülőgép utasai és személyzete a lehető legbiztonságosabb módon tudja elhagyni a repülőgépet.

D. 7. Földi kiszolgálás

A tervezés során megfelelően kell gondoskodni arról, hogy a földi kiszolgálás tevékenységei alatt (például: vontatás, repülőgépre csatlakozás) minimális legyen a veszély, hogy a repülőgép biztonságos üzemeltetés szempontjából lényeges részei károsodnak, és amely esetleg észrevétlen maradhat. A védekezésnek olyan fajtái, mint például utasítások és korlátozások, számításba vehetők.

„E” ALRÉSZ. HAJTÓMŰVEK

E. 1. Hajtóművek

Minden hajtóműtípust a légialkalmassági követelményeknek megfelelő bizonyítvánnyal kell ellátni.

E. 2. Légcsavarok

Minden légcsavartípust a légialkalmassági követelményeknek megfelelő bizonyítvánnyal kell ellátni.

E. 3. A hajtómű felépítése

E. 3. 1. Megfelelés a hajtóműre és légcsavarra vonatkozó korlátozásoknak.

A hajtóművet úgy kell megtervezni, hogy a hajtóművek és légcsavarok (ha alkalmazható) alkalmasak legyenek a használatra a várható üzemeltetési körülmények között. A repülési kézikönyvben feltüntetett körülmények között a repülőgép a hajtóművekre és légcsavarokra meghatározott korlátozások túllépése nélkül legyen képes működni ezen alfejezetnek megfelelően.

E. 3. 2. A hajtómű fordulatszámának szabályozása

Olyan felépítéseknél, ahol egy meghibásodott hajtómű továbbműködése megnövelheti a tűz, vagy egy súlyos szerkezeti meghibásodás veszélyét, olyan megoldásokat kell a hajózó személyzet részére biztosítani, mellyel a személyzet leállíthatja a hajtómű működését repülés közben, vagy egy biztonságos szintre le tudja azt csökkenteni.

E. 3. 3. Gázturbinás hajtómű

Egy gázturbinás hajtómű felépítése esetén:

a) a tervezés során minimálisra kell csökkenteni a hajtómű forgó részeinek meghibásodásából, vagy hajtóműtűzből eredő veszélyt, mely áthatol a hajtómű gondolán, és

b) a hajtóművet segédberendezéseivel, rendszereivel és műszereivel együtt úgy kell megtervezni, hogy észszerű garanciát nyújtson arra, hogy azokat a hajtómű üzemeltetési korlátozásokat, amelyek hátrányosan befolyásolják a forgó részek szerkezeti teljességét, ne lépjék túl a használat során.

E. 3. 4. A hajtómű újraindítása

Megoldásokat kell biztosítani arra, hogy a közzétett maximális magasságig bezárólag minden magasságon a hajtóművet a levegőben újra lehessen indítani.

E. 3. 5. Elrendezés és működés

E. 3. 5. 1. *A hajtómű-egységek függetlensége*

A hajtóművet úgy kell kialakítani és felépíteni, hogy minden egyes hajtómű-egység a hozzá tartozó rendszerekkel alkalmas legyen a többi egységektől független vezérlésre és működésre, valamint oly módon, hogy legalább egy olyan hajtómű és hozzá tartozó rendszer legyen, amelyben bármilyen meghibásodás, hacsak a valószínűség ennek előfordulására különösen alacsony mértékű is, ne okozhasson nagyobb teljesítményvesztést, mint amekkora a kritikus hajtómű-egység teljes meghibásodásából ered.

E. 3. 5. 2. *Légcsavar vibráció*

A légcsavar vibráció okozta igénybevételeket meg kell állapítani, és ezek nem léphetik túl azokat az értékeket, melyeket biztonságosnak ítéltek a működtetéshez a repülőgépre meghatározott üzemeltetési korlátozásokon belül.

E. 3. 5. 3. *Hűtés*

A hűtőrendszernek olyannak kell lennie, hogy a hajtómű hőmérsékleteket a megállapított határértékeken belül tartsa fenn (lásd E. 3. 1. pontot) olyan külső hőmérsékletek mellett egészen a maximális értékig, amely megfelel a repülőgép tervezett üzemeltetésének. A repülési kézikönyvben közzé kell tenni azt a maximális, és ha szükséges, azt a minimális külső levegő hőmérsékletet, melynél a hajtóműről megállapították, hogy üzemelése megfelelő.

E3. 5. 4. *Kapcsolódó rendszerek*

A hajtómű-egységhez tartozó tüzelőanyag-, olaj,- levegő felvételi rendszereknek képesnek kell lenniük arra, hogy az egyes hajtóműveket táplálják az arra meghatározott követelményeknek megfelelően minden olyan körülmény között, amely a rendszerek működését befolyásolja a várható üzemeltetési körülmények között (például: hajtómű teljesítmény, vagy tolóerő, repülőgéphelyzetek, és gyorsulások, légköri viszonyok, folyadékhőmérsékletek).

E. 3. 5. 5. *Tűzvédelem*

A hajtómű olyan részeire, ahol a tűz potenciális veszélye különösen súlyos a gyúlékony anyagokhoz közel lévő gyulladási források miatt, a következőket kell alkalmazni a D. 2. e) pontban előírt általános Szabványon felül:

a) Izoláció

Az ilyen részeket tűzbiztos anyagokkal kell elkülöníteni a repülőgép többi részétől, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását, számításba véve a keletkezés valószínű pontjait és a tűz terjedésének valószínű útvonalát.

b) Tűzveszélyes folyadékok

Az ilyen zónákban lévő tűzveszélyes folyadék rendszere alkotórészeinek képesnek kell lenniük arra, hogy megtartsák a folyadékot tűz esetén. Minden egyes zónában levezetést kell biztosítani, hogy minimálisra csökkenjen a veszély, mely a gyúlékony folyadékokat tartalmazó bármelyik rész meghibásodásából ered. Megoldásokat kell biztosítani arra, hogy a hajózó személyzet tűz esetén meg tudja állítani a tűzveszélyes folyadék áramlását az ilyen zónákba.

c) A tűz észlelése

Kielégítő mennyiségű tűzérzékelőt kell biztosítani és elhelyezni oly módon, hogy az ilyen zónákban esetlegesen előforduló tűz gyors észlelését lehetővé tegye.

d) Tűzoltás.

Az ilyen zónákat olyan tűzoltórendszerrel kell ellátni, mely képes az itt valószínűen keletkező bármilyen tüzet eloltani, feltéve, hogy az izolálás foka, a gyúlékony anyagok mennyisége, a szerkezet tűzállósága és egyéb tényezők olyanok, hogy az ilyen zónákban valószínűleg keletkező tűz ne veszélyeztethesse a repülőgép biztonságát.

„F” ALRÉSZ. RENDSZEREK ÉS BERENDEZÉSEK.

F. 1. Általános rész

F. 1. 1. A repülőgépet fel kell szerelni mindazon jóváhagyott műszerekkel, berendezésekkel és rendszerekkel, beleértve a tájékozódáshoz szükséges műszereket, és a fedélzeti vezérlő rendszereket, melyek a várható üzemeltetési körülmények között a repülőgép biztonságos üzemeltetéséhez szükségesek. Olyan műszereknek és berendezéseknek kell lenniük, melyek szükségesek ahhoz, hogy a hajózó személyzet képes legyen üzemeltetni a repülőgépet működési korlátain belül. A műszerek és berendezések tervezésekor az Emberi Tényezők irányelveit figyelembe kell venni.

1. számú Megjegyzés.-A Légialkalmassági Bizonyítvány kiadásához minimálisan szükséges berendezéseken és műszereken kívül, további műszerekre és berendezésekre lehet igény sajátos körülmények esetében, vagy sajátos útvonalfajták esetében, melyeket az Annex 6 I. és II. Része ír elő.

2. számú Megjegyzés.-A rendszerek szoftvereire vonatkozó értékeléseket lásd a “H” Alrészben.

3. számú Megjegyzés.-Az Emberi Tényezőkre vonatkozó tájékoztató anyagot az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683), valamint az Emberi Tényezők Irányelvei a Légiforgalmi Szolgáltatás Szervezési (ATM) Rendszerekhez (DOC 9758) található meg.

F. 1. 2. Az F. 1. 1. pontban előírt műszerek, rendszerek és berendezések tervezésének és felépítésének olyannak kell lennie, hogy:

a) fordított összefüggést biztosítson a meghibásodási körülmény valószínűsége és hatásának súlyossága között a repülőgépre és a fedélzeten tartózkodókra nézve, ahogy azt a rendszer biztonsága értékelésének folyamatában előírták,

b) rendeltetésszerűen működjön az összes előre várható körülmény között, és

c) minimális legyen az elektromágneses interferencia közöttük.

F. 1. 3. Olyan megoldásokat kell biztosítani, melyek a hajózó személyzetet figyelmeztetik, ha a rendszer működése nem biztonságos, és lehetővé teszik számára a helyesbítő intézkedések megtételét.

F. 1. 4. Az elektromos energiaellátó rendszer tervezésének olyannak kell lennie, hogy képes legyen biztosítani az elektromos áramot a repülőgép normál üzemeltetése alatt, és a lényeges áramterheléseket is ki tudja szolgálni az elektromos áramtermelő rendszert érintő meghibásodás után, a várható környezeti viszonyok között.

F. 2. Felépítés

A műszerek és berendezések felépítésének meg kell felelnie a “D” Alrészben foglalt Szabványoknak.

F. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági és mentőfelszereléseknek, – melyeket a hajózó személyzet, vagy az utasok várhatóan használni, vagy működtetni fognak veszélyhelyzetben – megbízhatónak, azonnali használatra késznek és könnyen azonosíthatónak kell lenniük, és működtetési módszerüket világosan kell jelölni.

F. 4. Navigációs fények és az összeütközés elkerülésére szolgáló fények

F. 4. 1. Az Annex 2-ben előírt fényeknek, melyeket a repülőgépen repülés közben, vagy egy repülőtér forgalmi területén történő üzemelés alatt működtetni kell, olyan intenzitásúnak, színűnek, fedésterületűnek kell lenniük, valamint olyan egyéb jellemzőkkel kell rendelkezniük, melyekkel biztosítva van egy másik légijármű pilótája, vagy a földi személyzet számára, hogy a lehető legtöbb idő álljon rendelkezésre az észlelésre és az összeütközés elkerülése érdekében szükséges manőver végrehajtására. Az ilyen fényforrások megtervezésekor kellő figyelmet kell fordítani azokra a viszonyokra, amelyek között észszerűen elvárható, hogy funkcióiknak megfeleljenek.

1. számú Megjegyzés.-Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, ilyenek például a tipikus városi megvilágítás fényei, a tiszta csillagos égbolt, a holdfényes vízfelület és az alacsony háttér- megvilágítású nappali időszak viszonyai. Ezen felül az összeütközési veszély körülményeinek előfordulása sokkal valószínűbb a közelforgalmi körzetekben, ahol a légijárművek közepes és alacsony repülési szinteken üzemelnek közel azonos sebességgel, mely nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

2.számú Megjegyzés.- A repülőgépek külső fényeire vonatkozó részletes műszaki előírásokat lásd a Légialkalmassági Kézikönyv (DOC 9760) II. kötet, “A” Rész, 4. Fejezetében.

F4. 2. A fényeket úgy kell elhelyezni a repülőgépen, hogy minimális legyen a valószínűsége az alábbiaknak:
a) károsan befolyásolja a hajózó személyzetet kötelmeinek kielégítő ellátásában,
b) a repülőgépen kívül lévő személyt veszélyesen elvakítja.

Megjegyzés – Az F. 4. 2. pontban felsorolt hatások elkerülése érdekében néhány esetben szükségessé válik olyan megoldás biztosítása, hogy a pilóta kikapcsolhassa a villanófényeket, vagy csökkenthesse azok intenzitását.

F. 5. Elektromágneses interferencia elleni védelem

A repülőgép elektromos rendszereit, különösen a repülés szempontjából kritikus és lényeges rendszereket meg kell védeni az elektromágneses interferenciától, melyek akár külső, akár belső forrásból származhatnak.

F. 6. Jegesedés elleni védelem

Ha jegesedési körülmények közötti repülésre kérnek jogosítást, a repülőgépről bizonyítani kell, hogy képes biztonságosan üzemelni olyan jegesedési viszonyok között, melyekkel az összes várható üzemeltetési környezetben számolni kell.

„G” ALRÉSZ. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK.

G. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványaival való egyezést meghatározták, valamint minden olyan egyéb információt, mely a repülőgép biztonságos üzemeltetéséhez szükséges, közzé kell tenni a repülési kézikönyvben, valamint jelölések és feliratok formájában és minden olyan módon, mely a célnak hatékonyan megfelel. A korlátozásoknak és információknak minimum azokat tartalmazniuk kell, melyeket ebben az Alrészben ismertetünk.

G. 2. Üzemeltetési korlátozások

G. 2. 1. Azokat a korlátozásokat, amelyeknél ezek repülés közbeni túllépésének veszélye fennáll, és amelyeket számszerűen határoztak meg, alkalmas egységekben kell kifejezni és szükség esetén helyesbíteni kell a műszerhibák miatt oly módon, hogy a hajózó személyzet a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani, hogy mikor éri el a korlátozó értékeket.

G. 2. 2. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes tömegre, súlypont helyzetekre, tömegelosztásra és padlóterhelésre vonatkozó korlátozó értéket (lásd A. 2. 2. pontot).

G. 2. 3. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk minden olyan sebességértéket (lásd C. 5. pontot), melyek korlátozó jellegűek a szerkezeti épség, vagy a repülőgép repülési tulajdonságai, vagy egyéb megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő repülőgép konfigurációkra és egyéb odaillő tényezőkre vonatkoztatva kell megadni.

G. 2. 4. Hajtómű korlátozások

A hajtómű korlátozásainak magukba kell foglalni mindazokat a korlátozásokat, melyeket a repülőgépre felépített hajtómű különböző alkotóelemeire meghatároztak (lásd E. 3. 1. és E. 3. 5. 3. pontokat).

G. 2. 5. A berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgépre felépített különböző berendezések és rendszerek összes korlátozását.

G. 2. 6. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalniuk a repülőgép biztonsága szempontjából veszélyesnek ítélt körülmény figyelembevételével meghatározott szükséges korlátozást. (lásd A. 2. 1. pontot)

G. 2. 7. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgép üzemeltetéséhez szükséges minimális hajózó személyzeti létszámot, és egyebek mellett tekintetbe kell venni a megfelelő hajózó személyzeti tag hozzáférési lehetőségét az összes szükséges vezérlőszervhez és a műszerekhez, valamint a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 – Légijármű Üzemeltetés, I. és II. Részeit az olyan körülményekre vonatkozólag, amikor az ezen Annex-ben meghatározott minimális hajózó személyzeti létszámon felül további hajózó személyzeti tag válik szükségessé.

G. 2. 8. Repülési idő korlátozás rendszer-, vagy hajtómű meghibásodás után

A rendszer korlátozásainak magukba kell foglalniuk azt a maximális repülési időt, amelyre a rendszer megbízhatóságát megállapították, tekintetbe véve az üzemeltetés jóváhagyását olyan repülőgépeknél, melyeknek két gázturbina hajtóműve az Annex 6. I. Rész 4. 7. pontjának megfelelően megállapított küszöb időn túl van.

Megjegyzés.- Az Annex 6. I. Rész 4. 7. pontjának megfelelően megállapított maximális repülési idő egy adott útvonalra kevesebb is lehet, mint a G. 2. 8. pont szerint meghatározott érték az adott esetet érintő üzemeltetési megfontolások miatt.

G. 3. Üzemeltetésre vonatkozó tájékoztatások és eljárások

G. 3. 1. Megfelelő (választható) üzemeltetés típusok

Fel kell sorolni mindazon üzemeltetés típusokat, amelyekre a repülőgép tulajdonságai révén alkalmasnak mutatkozott a vonatkozó légialkalmassági követelményeknek való megfelelés során.

G. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a repülőgép üres tömegét a repülőgép súlymérése körülményeinek meghatározásával együtt, a vonatkozó súlyponthelyzetet, a referencia pontokat és az alapvonalakat, melyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- A repülőgép üres tömege rendszerint nem foglalja magába a személyzet és a hasznos terhelés tömegét, a kifogyasztható tüzelőanyagot és a leereszthető olaj tömegét, de magába foglalja az összes beépített ballasztt, a kifogyaszthatatlan tüzelőanyag, a le nem ereszthető olaj tömegét, valamint a hajtómű hűtő- és hidraulikafolyadékának teljes mennyiségét.

G. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott repülőgépre jellemzőek és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek tartalmazniuk kell az egy vagy több hajtóműegység meghibásodása esetén követendő eljárásokat.

G. 3. 4. Kezelési információk

A repülőgép jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról kielégítő információt kell biztosítani. Közzé kell tenni azokat az átesési sebességeket, vagy minimális repülősebesség értékeket, melyeket a B. 4. 2. 3. pont szerint kell meghatározni.

G. 3. 5. Legkisebb kockázatú bombahely

Mindazon repülőgépekben, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, ki kell jelölni egy területet, ahol a legkisebb kockázattal lehet egy bombát vagy egyéb robbanóeszközt elhelyezni annak érdekében, hogy ezek hatása robbanás esetén minimális legyen a repülőgépre.

G. 4. Teljesítményre vonatkozó információk

A repülőgép teljesítményét a B. 2. pont szerint kell közzétenni. Magába kell foglalnia a különböző repülőgép konfigurációkra vonatkozó információkat, a teljesítmény és tolóerő értékeket és a hozzájuk tartozó sebesség értékeket, valamint mindazon információkat, amelyek segíthetik a hajózó személyzetet a betervezett teljesítmény elérésében.

G. 5. Repülési kézikönyv

Repülési kézikönyv meglétét biztosítani kell. Világosan meg kell jelölni, hogy mely adott repülőgépre, vagy repülőgép-szériára vonatkozik. A repülési kézikönyvnek minimálisan ezen Alrészben előírt korlátozásokat, információkat és eljárásokat kell tartalmaznia a G. 7. pontban meghatározottak kivételével.

G. 6. Jelölések és feliratok

G. 6. 1. A műszereken, a berendezéseken, a kormányokon lévő jelöléseknek és feliratoknak tartalmazniuk kell mindazon korlátozásokat, vagy információkat, melyeket a hajózó személyzetnek elsődlegesen figyelembe kell venni a repülés alatt.

G. 6. 2. Jelöléseket, feliratokat, utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadják, és hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (például vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat és veszélyeztetheti a repülőgép biztonságát a következő repülések során.

G. 7. Folyamatos légialkalmasság

G. 7. 1. Általános rész

A repülőgép légialkalmas állapotban tartására kidolgozandó eljárásokban felhasznált információkat közzé kell tenni. Az információknak tartalmazni kell a G. 7. 2., a G. 7. 3., és a G. 7. 4. pontokban előírtakat.

G. 7. 2. Karbantartásra vonatkozó információk

A karbantartásra vonatkozó információknak magukba kell foglalniuk a repülőgép leírását és a karbantartási feladatok teljesítésének javasolt módszereit. Ezen információknak útmutatást kell tartalmazni a hiba-meghatározáshoz.

G. 7. 3. A karbantartási programra vonatkozó információk

A karbantartási programra vonatkozó információknak magukba kell foglalniuk a karbantartási feladatokat, és azokat a javasolt időintervallumokat, amikor ezeket végre kell hajtani.

G. 7. 4. A típustervezés jóváhagyásából származó karbantartási információk

A karbantartási feladatokat és azok gyakoriságát, melyeket a Tervező Állam kötelezőnek határozott meg a típus tervezésének jóváhagyásakor, ennek megfelelően kell azonosítani.

„H” ALRÉSZ. RENDSZER SZOFTVEREK

Az összes rendszer szoftvert úgy kell megtervezni és jóváhagyni, hogy biztosítsák, hogy azok a rendszerek, amelyekben használják őket, megfelelnek a tervezett funkcióknak olyan biztonsági szinten, mely kielégíti a IIIB. Rész követelményeit, főleg az F. 1. 2. a) és az F. 1. 3. pontokban foglaltakat.

Megjegyzés – A rendszer szoftverek tervezésére és tesztelésére néhány Állam elfogadja a nemzeti/nemzetközi ipari szabványokat, mint például az RTCA/DO-178-t, vagy az EUROCADE ED12-t.

I. ALRÉSZ. TÖRÉSBIZTOSSÁG ÉS UTASKABIN BIZTONSÁG

1.1. Általános rész

A törésbiztosság témájában történt fejlesztéseket figyelembe kell venni a repülőgépek tervezésénél a fedélzeten tartózkodók túlélési valószínűségének javítása érdekében.

1.2. Kényszerleszálláskor előforduló terhelések tervezése

Kényszerleszállás (katasztrófa) eseténi terheléseket minden repülőgép kategóriára meg kell határozni annak érdekében, hogy a repülőgép belső berendezései, a bútorzat, a hordszerkezetek és a biztonsági berendezések úgy legyenek megtervezhetők, hogy a fedélzeten tartózkodók túlélési lehetősége maximális legyen. Az alábbi tényezőket kell figyelembe venni:

a) dinamikus hatások,

b) azon egységekre vonatkozó korlátozó követelmények, melyek veszélyt idézhetnek elő,

c) a vészkijáratok körzetében a törzs deformálódása,

d) tüzelőanyag cella integritása és helye, és

e) az elektromos rendszer integritása, hogy elkerülhető legyen a gyulladás – források kialakulása.

1.3. Az utaskabin tűzvédelme

Az utaskabint úgy kell megtervezni, hogy védelmet nyújtson a tűz ellen a fedélzeten tartózkodók számára olyan esetekben, amikor a fedélzeti rendszer meghibásodik, vagy egy kényszerleszállási helyzetben. Az alábbi tényezőket kell figyelembe venni:

a) az utaskabin-belső anyagainak éghetősége,

b) tűzállóság és a füst és mérgező gőzök képződése,

c) gondoskodás biztonsági felszerelésekről, melyek lehetővé teszik a repülőgép biztonságos kiürítését, és

d) tűzérzékelő és tűzoltó berendezések.

1.4. A repülőgép kiürítése

A repülőgépet kielégítő számú vészkijárattal kell ellátni, hogy lehetőség legyen az utaskabin kiürítésére megfelelő időegység alatt. Az alábbi tényezőket kell figyelembe venni:

a) ülések száma és az utasülések elrendezése,

b) a kijáratok száma, helye és mérete,

c) a kijáratok jelölése és a használati utasítás elhelyezése,

d) a kijáratok valószínű boltozódásai,

e) a kijáratok működése, és

f) a kiürítésre szolgáló felszerelések súlya és elhelyezése, például: csúszdák és mentőcsónakok.

1.5. Világítás és jelölések

Vészvilágítást kell biztosítani, mely az alábbi jellemzőket foglalja magába:
a) függetlenség a fő elektromos ellátó rendszertől,
b) automatikusan lépjen működésbe a normál elektromos teljesítmény megszűnésekor, vagy ütközéskor,
c) a vészkijáratokhoz vezető útvonal vizuális jelzése füsttel teli kabinkörülmények között,
d) a repülőgép külső és belső megvilágítása a repülőgép kiürítése alatt, és
e) ne forduljon elő további kockázat a tüzelőanyag szétömlése esetében.

1.6. Mentő felszerelések

A repülőgépet úgy kell felszerelni, hogy maximális lehetőséget biztosítson a személyzetnek, és a fedélzeten tartózkodóknak a túlélésre a várható külső környezetben egy észszerű időtartamig. Figyelembe kell venni az alábbi tényezőket:
a) mentőtutajok / mentőmellények száma,
b) mentőfelszerelések elhelyezése az alkalmas (valószínű) környezetben,
c) vészrádiók és pirotechnikai vészjelző felszerelések, és
d) automatikus vészrádióadók.

„J” ALRÉSZ. ÜZEMELTETÉSI KÖRNYEZET ÉS EMBERI TÉNYEZŐK

J. 1. Általános rész

A repülőgépet úgy kell megtervezni, hogy lehetővé tegyék a biztonságos üzemelést az utasok teljesítőképességének határain belül és azokéin, akik működtetik, karbantartják és kiszolgálják azt.

Megjegyzés – Az ember/gép érintkező felület gyakran a gyenge láncszem egy üzemeltetési környezetben, és ezért szükséges biztosítani, hogy a repülőgép a repülés minden fázisában (beleértve meghibásodások okozta csökkenést) irányítható maradjon, és hogy sem a személyzetnek, sem az utasoknak ne okozhasson kárt az a környezet, amelyben tartózkodnak a repülés időtartama alatt.

J. 2. Hajózó személyzet

J. 2. 1. A repülőgépet olyan módon kell megtervezni, hogy lehetővé tegye a hajózó személyzetnek a biztonságos és hatékony repülőgép-vezetést. A tervezésnél tekintettel kell lenni a hajózó személyzet készségeinek és fiziológiai adottságainak különbözőségeire a hajózó személyzet szakszolgálati engedély határain belül. Számításba kell venni a repülőgép különböző várható üzemeltetési körülményeit a környezetében, beleértve a meghibásodások okozta csökkent működést.

1. 2. 2. A repülőgép megtervezéséből eredő, a hajózó személyzetre jutó munkaterhelésnek észszerűnek kell lennie a repülés minden fázisában. A munkaterhelést tekinthetjük mind tudás, mind fiziológiai jellegűnek. Speciális figyelmet kell fordítani a repülés kritikus fázisaira és a kritikus eseményekre, melyek észszerűen várható, hogy előfordulnak a repülőgép élettartama alatt, olyan, mint egy kisebb fokú hajtómű meghibásodás, vagy szélnyírásba kerülés.

J. 3. Ergonómia

A repülőgép tervezése során figyelembe kell venni az ergonómiai tényezőket, beleértve:
a) a kényelmes használatot, és véletlenül bekövetkező helytelen használat megelőzését,
b) a kényelmes hozzáférést,
c) a munkakörnyezetet,

d) a szabványosítást és emberközeliséget,
e) a fenntarthatóságot.

J. 4. Az üzemeltetés környezeti tényezői

A repülőgép tervezésekor figyelembe kell venni a hajózó személyzet működési környezetét, beleértve:
a) a repülő-orvosi tényezők hatását, mint az oxigénszint, hőmérséklet, páratartalom, zaj és vibráció,
b) a fizikai erők hatását a normál repülés alatt,
c) a hosszan tartó üzemelés hatását nagy magasságon, és
d) a testi kényelmet.

„K" ALRÉSZ. BIZTONSÁG

K. 1. Belföldi kereskedelmi üzemeltetésben használatos repülőgépek

Ajánlás.- *Ebben a fejezetben közzétett Nemzetközi Szabványokat és Ajánlott Eljárásokat az összes Szerződő Államnak alkalmaznia kell azon repülőgépekre, melyeket belföldi kereskedelmi üzemelésben (légi szolgáltatásban) használ.*

K. 2. Legkisebb kockázatú bombahely

Mindazoknál a repülőgépeknél, melyeknek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a repülőgép tervezése során figyelembe kell venni azt az előírást, mely szerint ki kell jelölni egy legkisebb kockázattal járó bombahelyet a repülőgépen, oly módon, hogy a bomba hatásai minimálisak legyenek mind a repülőgépre, mind a benne tartózkodó személyekre nézve.

K. 3. A hajózó személyzet kabinjának védelme

K. 3. 1. Mindazon repülőgépeknél, melyeknek az Annex 6. I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre 2006. május 20.-án, vagy ezt követően nyújtanak be kérelmet az első típusbizonyítvány kiadására az illetékes nemzeti hatósághoz, a pilótakabin válaszfalait, padlózatát és mennyezetét úgy kell megtervezni, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátrepesz áthatolásának, valamint erőszakos behatolásoknak is ellenálljanak, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.

K. 3. 2. **Ajánlás.-** *Mindazon repülőgépeknél, melyeknek az Annex 6 I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre az illetékes nemzeti hatósághoz 2006. május 20.-án vagy ezt követően kérelmet nyújtanak be a típusbizonyítvány módosítására annak érdekében, hogy az magába foglaljon egy másodlagos típustervet, figyelmet kell fordítani a pilótakabin válaszfalainak, padlózatának és mennyezetének megerősítésére olymódon, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátrepesz áthatolásának, valamint erőszakos behatolásokkal szemben is ellenállók legyenek, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.*

Megjegyzés – Az összes kereskedelmi utasszállító repülőgépen a pilótakabin ajtó követelményeire vonatkozó Szabványok és Ajánlott Eljárások megtalálhatók az Annex 6 I. Rész, 13. Fejezetben.
egyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetősége a fedélzeten, és ez meg fogja könnyíteni az ilyen tárgyak utáni kutatást is.

K. 4. A belső tér tervezése

Minden olyan repülőgépnél, amelynek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, figyelmet kell fordítani azon tervezési jellemzőkre, melyekkel megakadályozható fegyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetősége a fedélzeten, megkönnyítve ezzel az ilyen tárgyak utáni kutatási eljárásokat.

IV. RÉSZ. HELIKOPTEREK

1. FEJEZET. ÁLTALÁNOS RÉSZ

1.1. Alkalmazhatóság

1.1.1. A IV. Rész Szabványait az 1. 1. 2 pontban felsorolt minden helikopterre alkalmazni kell, amelynek prototípusát légialkalmassági bizonyítvány megszerzése érdekében 1991. március 22.-én vagy azt követően nyújtották be a nemzeti hatósághoz.

Megjegyzés – A Tanács tudatában van annak, hogy a tűzvédelemre, a kényszerleszállás utáni túlélésre, és a veszélyhelyzetekre vonatkozó rendelkezésekkel kapcsolatos Szabványok a biztonság szempontjából nagyon fontosak, és sürgeti, hogy ezen Szabványok lényegi részét amilyen hamar lehet és megvalósítható, vezessék be az alkalmazásra előírt időpont előtt.

1.1.2. A IV. Rész Szabványait a nemzetközi repülésben utas-, áru-, vagy posta szállításában résztvevő helikopterekre kell alkalmazni.

Megjegyzés – Az alábbi Szabványokban nincs mennyiségi specifikáció ellentétben azokkal a Szabványokkal, melyek a nemzeti légialkalmassági kódokban találhatók. A II. Rész 3. 2. 2. pontjának megfelelően ezeket ki kell egészíteni a Szerződő Államok által összeállított nemzeti követelményekkel.

1.1.3. A II. Rész 3. 2. 2. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő része által meghatározott légialkalmassági szintnek az 1. 1. 2. pontban megjelölt helikopterekre lényegében legalább azonosnak kell lenni a IV. Rész széleskörű Szabványai által megcélzott általános szinttel.

1.1.4. Ha mást nem írtak elő, a Szabványokat a komplett helikopterre kell alkalmazni, beleértve a hajtóműveket, rendszereket és berendezéseket.

1.2. Korlátozások

1.2.1. Korlátozó körülményeket kell meghatározni a helikopterre, annak hajtóműveire és berendezéseire (lásd 9. 2. pontot). A IV. Rész Szabványainak való megfelelést meg kell állapítani feltételezve, hogy a helikoptert a megadott korlátozásokon belül üzemeltetik. A korlátozásoknak a helikopter biztonságára veszélyt jelentő bármiféle körülménytől mentesnek kell lenni, úgy, hogy az ilyen körülményből eredő baleset veszélye elhanyagolhatóan kicsiny legyen.

1. 2. 2. A tömeg, a súlyponthelyzet, a terhelés elosztás, a sebességek és a környezeti viszonyok korlátozó tartományait meg kell határozni, melyeken belül a IV. Rész oda illő Szabványaival való egyezés bizonyított, kivéve azokat a körülmény kombinációkat, melyeknek elérése alapvetően lehetetlen.

1. számú Megjegyzés.-A maximális üzemeltetési tömeg és a súlypont határértékei változhatnak az egyes magasságokkal és az egyes eltérő üzemeltetési körülmények között, például: felszállás, utvonalrepülés, leszállás.

2. számú Megjegyzés.-Példaként alapvető helikopterkorlátozásoknak lehet tekintetni az alábbi tételeket:
– maximális engedélyezett felszálló tömeg (beleértve a helikopter földtől való elemelkedését),
– engedélyezett maximális gurulási tömeg,
– maximális engedélyezett leszállási tömeg,

– a mellső, a hátsó és az oldalsó súlypont helyzetek különböző konfigurációkban,

– engedélyezett maximális függesztett rakomány tömeg.

3. számú Megjegyzés – A maximális üzemeltetési tömeget korlátozhatja a Zajminősítési Szabványok alkalmazása (lásd Annex 16, I. Kötet, és Annex 6, III. Rész).

1.3. Veszélyes tulajdonságok és jellemzők

A helikopter nem rendelkezhet olyan tulajdonsággal, vagy jellemzővel, mely a várható üzemeltetési körülmények között a helikopterre veszélyessé válhat.

1.4. A megfelelőség bizonyítása

1.4.1. Az adott légialkalmassági követelményeknek való megfelelést olyan evidenciákra kell alapozni, melyeket akár tesztekből, akár számításokból, vagy a teszteken alapuló számításokból nyertek, vagy más módszerekkel, feltéve, hogy minden egyes esetben az elért pontosság biztosítani fogja, hogy a légialkalmasság szintje azonos azzal a szinttel, amelyet közvetlen tesztek végrehajtásával elértek volna.

1. 4. 2. Az 1. 4. 1. pontban szereplő teszteknek olyanoknak kell lenniük, hogy észszerű biztosítékot szolgáltassanak arra, hogy a helikopter, annak alkotórészei és berendezései megbízhatóak és helyesen működnek a várható üzemeltetési körülmények között.

2. FEJEZET. REPÜLÉS.

2. 1. Általános rész

2. 1. 1. A 2. Fejezetben szereplő Szabványoknak való megfelelést repüléssel, vagy egyéb, egy helikopteren, vagy olyan típusú helikoptereken végrehajtott tesztekkel kell megállapítani, amelyekre Légialkalmassági Bizonyítványt kértek, vagy az ilyen tesztekre alapozott számításokkal (vagy egyéb módszerekkel), feltéve, hogy a számításokból (vagy egyéb módszerekkel) nyert eredmények pontosságban azonosak, vagy szigorú alapossággal reprezentálják a közvetlen tesztek eredményeit.

2. 1. 2. A helikopter tömegének és súlypont helyzeteinek összes alkalmazható kombinációira meg kell állapítani az egyes Szabványoknak való megfelelést azon terhelési határokon belül, amelyekre a légialkalmassági bizonyítványt kérték.

2. 1. 3. Ahol szükséges, megfelelő helikopter konfigurációkat kell létrehozni a teljesítmény megállapításához a repülés különböző fázisaiban, valamint a helikopter repülési tulajdonságainak vizsgálatához.

2. 2. Teljesítmény

2. 1. 1. Általános rész

2. 2. 1. 1. A helikopter teljesítményéről kellő mennyiségű adatot kell meghatározni, és a repülési kézikönyvben közzétenni annak érdekében, hogy az üzemeltetőt ellássák a szükséges információkkal ahhoz, hogy meg tudja határozni a helikopter maximális tömegét azon értékek alapján, melyek sajátosan jellemzik a tervezett repülést, a vonatkozó üzemeltetési paramétereket annak érdekében, hogy a repülés végrehajtható legyen észszerű biztonsággal, és hogy a repülés során a biztonságos minimális teljesítmény elérhető legyen.

2. 2. 1. 2. A helikopterre közzétett teljesítmény adatoknál figyelembe kell venni az emberi teljesítőképességet, és különösen nem követelhet kivételes ügyességet vagy elővigyázatosságot a pilóta részéről.
Megjegyzés – Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

2. 2. 1. 3. A helikopter közzétett teljesítménye meg kell, hogy egyezzen az 1. 2. 1. pontban előírtakkal, és a helikopter rendszerek és berendezések közül azok logikai kombinációjában történő üzemeltetéssel, amelynek működése befolyásolhatja a teljesítményt.

2. 2. 2. Minimális teljesítmény

A felszállásra és leszállásra közzétett maximális tömegnél (lásd 2.2.3. pontot) – a fel- vagy leszállás helyének szintmagassága, vagy nyomásmagassága akár az egyezményes légkörben, akár meghatározott szélcsendes légköri viszonyok között, és vízről történő üzemelés esetében meghatározott sima víztükörnél, – a helikopternek képesnek kell lennie a 2.2.2.1. és a 2.2.2.2. pont szerinti minimális teljesítményre, figyelmen kívül hagyva az akadályokat, vagy a végső megközelítés és a felszálló terület hosszát.

Megjegyzés – Ez a Szabvány lehetőséget nyújt arra, hogy a helikopter repülési kézikönyvében a maximális felszálló tömeget és a maximális leszálló tömeget közzétegyék, viszonyítva például a felszállás vagy a leszállás helyének:
– szintmagasságára, vagy
– nyomásmagasságára, vagy
– nyomásmagasságára és a légköri hőmérsékletre,

o*lymódon, hogy ez azonnali használatra kész adatként felhasználható legyen a helikopter teljesítményének üzemeltetési korlátozásainál a nemzeti kód alkalmazásában.*

2. 2. 2. 1. *Felszállás*

a) Abban az esetben, ha a kritikus hajtómű egység meghibásodik a felszállás elhatározási pontjánál vagy ezt követően (1. teljesítmény osztály), vagy a felszállás utáni meghatározott pontnál (2. teljesítmény osztály), az 1. és a 2. teljesítmény osztályba tartozó helikoptereknek képesnek kell lenniük a repülés biztonságos folytatására úgy, hogy a többi hajtómű egységet a jóváhagyott határértékeken belül üzemeltetik.
b) A felszállás és az emelkedés minden fázisában a minimális teljesítménynek elegendőnek kell lenni ahhoz, hogy biztosítsa az ideális körülményekre meghatározott viszonyoktól (2. 2. 3 pont) kissé eltérő üzemeltetési körülmények esetén azt, hogy a közzétett értékektől való eltérés ne legyen aránytalan.

2. 2. 2. 2. *Leszállás*

a) A megközelítési konfigurációt megkezdve abban az esetben, ha a kritikus hajtómű egység meghibásodása a leszállás elhatározási pontjánál, vagy ezt megelőzően fordul elő (1. Teljesítmény osztály), vagy a leszállás előtti meghatározott pontnál (2. Teljesítmény osztály), a helikopternek képesnek kell lennie a repülés biztonságos folytatására, a többi üzemképes hajtómű egységet a jóváhagyott határértékeken belül üzemeltetve.
b) A leszállási konfigurációt megkezdve a helikopternek képesnek kell lennie akadályozott leszállás esetén az emelkedésre az összes hajtómű egység működése mellett.

2. 2. 3. Teljesítményadatok közzététele

A teljesítményadatokat meg kell határozni, és a helikopter repülési kézikönyvében oly módon kell közzétenni, hogy az Annex 6 III. Rész 5. 1. 2 pontjának megfelelően üzemeltetendő helikopterre vonatkozó üzemeltetési szabályok között alkalmazásuk biztonságos kapcsolatot biztosítson a helikopter teljesítménye és a repülőterek, helikopter leszállóhelyek és útvonalak között, amelyeken a helikoptert működtetni kívánják. A teljesítmény adatokat meg kell határozni, és közzé kell tenni az alább felsorolt repülési fázisokra, és a tömeg, a szintmagasság, vagy a nyomásmagasság, a szélsebesség és egyéb környezeti tényező tartományokra, valamint bármilyen egyéb üzemeltetési változóra, amelyre a helikoptert jogosíttatni kívánják, és ezen felül a kétéltű (amfíbia) helikopterek esetében a vízfelszín viszonyaira és a hullámzás erősségére.

2. 2. 3. 1. *Felszállás.* A felszállás teljesítmény adatainak magukba kell foglalniuk a szükséges felszállási távolságot és a felszállás pályáját. Az 1. Teljesítményosztályú helikopterek esetében tartalmazni kell a megszakított felszálláshoz szükséges úthosszat is.

2. 2. 3. 1. 1. *A felszállás elhatározási pontja* (csak az 1. Teljesítményosztályú helikopterekre)

A felszállás elhatározási pontja a felszállás pályájában lévő, és a felszálló teljesítmény meghatározásához alkalmazott pont, ahol a kritikus hajtómű egység meghibásodása esetén a felszállás vagy megszakítható, vagy biztonságosan folytatható.

2. 2. 3. 1. 2. *Szükséges felszálló úthossz* (Csak az 1. Teljesítményosztályú helikopterekre) A szükséges felszálló úthossz az a vízszintes távolság, amely a felszállás megkezdésének pontjától a felszálló felület felett kiválasztott olyan pontig tart, ahol a helikopter eléri a V_{TOSS} sebességet a felszállási terület egy meghatározott magasságánál és pozitív emelkedési gradienst ér el, miután a kritikus hajtómű egység meghibásodott a felszállás elhatározási pontjánál, de az üzemképes hajtómű egységek a jóváhagyott üzemeltetési határértékeken belül működnek.

2. 2. 3. 1. 3. *Megszakított felszállás szükséges hossza* (csak az 1. Teljesítményosztályú helikopterekre) A megszakított felszállás szükséges úthossza az a vízszintes távolság, amely a felszállás kezdőpontjától egy olyan pontig tart, ahol a helikopter teljesen megáll a felszállás elhatározási pontjánál bekövetkezett hajtómű meghibásodást és a felszállás megszakítását követően.

2. 2. 3. 1. 4. *Szükséges felszálló úthossz* (csak a 2. és 3. Teljesítményosztályú helikopterekre)

A szükséges felszálló úthossz az a vízszintes távolság, amely a helikopter felszállásának kezdőpontjától addig a pontig tart, ahol a legjobb emelkedési sebességet (V_Y) éri el, vagy a legkedvezőbb szögű emelkedéshez tartozó sebességet (V_X), vagy egy kiválasztott közbeeső sebességet (feltéve, hogy ez a sebesség nem teszi szükségessé a magasság-sebesség diagram elkerülendő tartományaiban történő repülést) elér, és a felszállási felület egy kiválasztott magasságának eléréséig tart, miközben összes hajtóműve a jóváhagyott felszálló teljesítményen üzemel.

2. 2. 3. 2. *Útvonalrepülés.* Az útvonalrepüléshez tartoznak az emelkedési, a vízszintes repülési, vagy süllyedési teljesítmény adatok az alábbi feltételekkel:

a) a kritikus hajtómű egység nem üzemel,

b) két kritikus hajtómű egység nem üzemel olyan helikopterek esetében, amelyeknek három, vagy több hajtómű egysége van, és

c) az üzemelő hajtómű egység(ek) nem lépi(k) túl azt a teljesítményt, amelyre azt jogosították.

2. 2. 3. 3. *Leszállás*. A leszállás teljesítmény adatainak magukba kell foglalniuk a szükséges leszálló úthosszt, és az 1. Teljesítményosztályú helikopterek esetében a leszállás elhatározási pontját.

2. 2. 3. 3. 1. *A leszállás elhatározási pontja.* (csak az 1. Teljesítményosztályú helikopterekre) A leszállás elhatározási pontja a megközelítés fázisában az a legkésőbbi pont, melytől akár a leszállást végre lehet hajtani, akár a megszakított leszállást biztonságosan lehet megkezdeni (ismételt megközelítés), miközben a kritikus hajtómű üzemképtelen.

2. 2. 3. 3. 2. *Szükséges leszálló úthossz*. A szükséges leszálló úthossz az a vízszintes távolság, amely a megközelítési pályának a leszálló felület feletti egy kiválasztott pontjánál kezdődik és addig a pontig tart, ahol a helikopter a leszállást követően teljesen megáll.

2. 3. Repülési tulajdonságok.

A helikopternek ki kell elégíteni a 2. 3. pont Szabványait minden magasságon a várható maximális magasságig bezárólag, és a magassághoz tartozó összes hőmérsékleti körülmény között, amelyre a helikoptert jogosították.

2. 3. 1. Kormányozhatóság

A helikopternek kormányozhatónak és manőverezhetőnek kell lennie az összes várható üzemeltetési körülmény között, és képesnek kell lennie arra, hogy simán térjen át egyik repülési körülményből a másikba (például: fordulók, oldalirányú csúszás, a hajtómű teljesítményének változása, a helikopter konfigurációinak változása) anélkül, hogy kivételes képességet, figyelmet vagy erőkifejtést kívánna a pilótától, még abban az esetben is, ha bármelyik hajtómű egysége meghibásodik. A repülés minden fázisára ki kell dolgozni a helikopter biztonságos kormányozhatóságának technikáját, valamint azokra a helikopter konfigurációkra, amelyekre teljesítményértéket határoztak meg.

Megjegyzés.- Ezen Szabványnak többek között az a célja, hogy olyan üzemeltetésre is vonatkozzon, amikor a nem észlelhető légköri turbulencia körülményei állnak fenn, és az is, hogy biztosítsa, hogy a repülési tulajdonságok indokolatlan torzulása nem fog bekövetkezni a turbulens levegőben.

2. 3. 1. 1. *Kormányozhatóság a földön (vízen).* A helikopternek kormányozhatónak kell lennie a földön (vagy a vízen) gurulás, felszállás vagy a leszállás alatt, a várható üzemeltetési körülmények között.

2. 3. 1. 2. *Kormányozhatóság felszállás alatt.* A helikopternek kormányozhatónak kell lennie abban az esetben is, ha a kritikus hajtómű egység hirtelen meghibásodik a felszállás bármely pontjánál, amikor a helikoptert a közzétett felszállási adatoknak megfelelő módon üzemeltetik.

2. 3. 2. A repülési kormányok jellemzői

A helikopternek olyan kiegyenlítéssel és kezelési jellemzőkkel kell rendelkeznie, hogy ne legyen szükség a kívánt repülési körülmény fenntartásához a pilóta túlzott figyelmére, ügyességére, ennek elbírálásához tekintetbe kell venni azt is, hogy az adott repülési helyzet a repülés melyik szakaszában fordul elő és a körülmények mennyi ideig állnak fenn. A kormányokhoz kapcsolódó rendszer – meghibásodás esetén nem fordulhat elő jelentős romlás a kormányozhatóság jellemzőiben.

2. 3. 3. Stabilitás

A helikopternek olyan stabilitással kell rendelkeznie a többi repülési jellemzőre, a teljesítményre, szerkezeti szilárdságra és a legvalószínűbb üzemeltetési viszonyokra (például a helikopter konfigurációi és sebesség tartományok) vonatkozólag, mely biztosítja, hogy a pilóta túlzott figyelemösszpontosítására ne legyen szükség, amikor a repülés adott fázisában ezek az igények felmerülnek, számításba véve fennállásuk időtartamát is. A helikopter stabilitása azonban nem lehet olyan, hogy a pilótától túlzott erőkifejtést igényeljen, vagy hogy a helikopter biztonságát veszélyhelyzetben a manőverezhetőség hiánya veszélyeztesse.

2. 3. 4. Autorotáció

2. 3. 4. 1. *A forgószárny fordulatszámának szabályozása* A helikopter autorotációs jellemzőinek olyanoknak kell lenniük, hogy a pilóta számára lehetővé tegye a forgószárny fordulatának az előírt értéken belüli szabályozását és a helikopter teljes kormányozhatóságának fenntartását.

2. 3. 4. 2. *A helikopter viselkedése a forgószárny meghajtásának elveszése után*

A forgószárny meghajtásának elvesztését követően a helikopter viselkedése nem lehet olyan szélsőséges, hogy megnehezítse a forgószárny sebességének azonnali visszaállítását anélkül, hogy a repülési sebességre vagy a szilárdságra vonatkozó korlátozásokat túllépnék.
2. 3. 4. 3. *Autorotációs repülési sebesség* A maximális hatótávra ajánlott autorotációs repülési sebességet, és a minimális süllyedési sebesség értékét közzé kell tenni.

2. 3. 5. Flatter és vibráció

Megfelelő tesztekkel kell bizonyítani, hogy a helikopter minden alkotórésze mentes a flattertől és a túlzott vibrációtól az összes helikopter konfigurációban és az összes sebességérték mellett a helikopter üzemeltetési határértékein belül (lásd az 1. 2. 2. pontot).

A vibráció nem lehet olyan mértékű, hogy zavarja a helikopter vezetését, vagy szerkezeti károsodás következzen be, vagy a személyzetnek túlzott fáradtságot okozzon.

3. FEJEZET. SZERKEZETEK

3. 1. Általános rész

A 3. Fejezet Szabványai a helikopter szerkezetének mindazon alkotórészére vonatkoznak, amelynek meghibásodása súlyosan veszélyeztetné a helikopter biztonságát.

3. 1. 1. Tömeg és tömegeloszlás

Ha másként nem írják elő, a szerkezetre vonatkozó valamennyi Szabványnak olyan körülmények között kell megfelelni, amikor a tömeg változik az alkalmazható határértékeken belül és eloszlása a lehető legkedvezőtlenebb azokon az üzemeltetési korlátozásokon belül, amelyre a jogosítást megkérték.

3. 1. 2. Határterhelések

Ha másként nem minősítették, a 3. 4, 3. 5, és 3. 6 pontokban előírt különböző terhelési viszonyokra kapott külső terhelést és a megfelelő inercia terhelést, vagy ellenállás terhelést kell határterhelés értéknek tekinteni.

3. 1. 3. Szilárdság és deformáció

A 3. 4, 3. 5 és a 3. 6 pontokban leírt különböző terhelési körülmények között a helikopter egyetlen szerkezeti részén sem következhet be veszélyes deformáció bármilyen terhelésnél egészen a határterhelés értékéig, azt is beleértve, és a helikopter szerkezetének képesnek kell lennie elviselni a törőterhelést is.

3. 2. Repülési sebességek

3. 2. 1. Tervezési repülési sebességek

Meg kell határozni azokat a repülési sebesség értékeket, amelyekre a helikopter szerkezetét megtervezik, hogy ellenálljon a megfelelő manőverezési és széllökés terheléseknek, a 3.4. pontnak megfelelően.

3. 2. 2. Repülési sebesség határértékek

A repülési sebesség határértékeit, melyeket a vonatkozó repülési sebesség biztonsági sebességtöbblettel megnövelt értékére alapoztak, ahol megfelelő, az 1. 2. 1. pontnak szerint, fel kell tüntetni a helikopter repülési kézikönyvében az üzemeltetési korlátozások részeként (lásd a 9. 2. 2. pontot). Ha a repülési sebesség korlátozás a tömeg, a tömegeloszlás, a szintmagasság, a forgószárny fordulatszáma, a teljesítmény vagy egyéb tényezők függvénye, a repülési sebesség határértékeket ezen tényezők kritikus kombinációjára kell meghatározni.

3. 3. A fő forgószárny (ak) forgási sebesség korlátozásai

A fő forgószárny(ak) sebességtartományát úgy kell meghatározni, hogy:

a) a teljesítmény ráadásakor biztosítson megfelelő sebességtöbbletet a forgószárny sebességének változásaira, mely előfordul bármely megfelelő manőver során és megegyezik az alkalmazott vezérlőrendszer, vagy szinkronizációs rendszer fajtáival, és

b) a teljesítmény elvételekor tegye lehetővé a megfelelő autorotációs manőver végrehajtását a repülési sebesség tartományban bármely értéknél és olyan tömeg értéknél, amelyre a jogosítást kérték.

3. 4. Terhelések repülés közben

A 3. 4. 1, a 3. 4. 2, és a 3. 6 pontokban szereplő terhelési viszonyokat kell tekintetbe venni a tömeg és tömegeloszlás tartományára a 3. 1. 1 pontban előírtak szerint, és olyan repülési sebességeknél, melyeket a 3. 2. 1 pontnak megfelelően határoztak meg. Számításba kell venni a szimmetrikus és az aszimmetrikus terheléseket is.

Az adott terhelési viszonyokból eredő légellenállást, tehetetlenségi és egyéb terheléseket úgy kell elosztani, hogy az szorosan megközelítse a tényleges viszonyokat, vagy nagy biztonsággal reprezentálja azt.

3. 4. 1. Manőverezési terhelések

Az üzemeltetési korlátozások által megengedett manővereknek megfelelő manőverezési terhelés tényezők alapján kell kiszámítani a manőverezési terheléseket. Ezek nem lehetnek kisebb értékűek, mint a várható üzemeltetési viszonyok között a gyakorlat által megfelelőnek mutatkozó értékek.

3. 4. 2. Széllökésből eredő terhelések

A széllökésből eredő terheléseket olyan függőleges és vízszintes irányú széllökés erőkre kell kiszámítani, amelyeket statisztikai, vagy egyéb, rendelkezésre álló adatok szerint megfelelőnek találnak a várható üzemeltetési körülményekre.

3. 5. A földfelszín és a víz okozta terhelések

A helikopter szerkezete legyen képes ellenállni a földfelszín vagy a vízfelület reakcióiból eredő minden terhelésnek, ahogy alkalmazható, melyek várhatóan előfordulnak beindításkor, gurulás közben a földön vagy a vízen, a földtől való elemelkedéskor, a földetéréskor, vagy a forgószárny fékezése során.

3. 5. 1. Leszállási viszonyok

A tervezési felszálló tömegnél és a tervezési leszállótömegnél a leszállási viszonyoknak magukba kell foglalniuk a helikopter olyan szimmetrikus és aszimmetrikus helyzeteit talaj- vagy vízet éréskor, olyan süllyedési sebességeket és minden olyan tényezőt, amely a szerkezetre ható terheléseket érinti, melyek a várható üzemeltetési körülmények között jelen vannak.

3. 6. Egyéb terhelések

A manőverezésből, a széllökésből, valamint a vízfelszíntől és a földtől eredő terheléseken felül, vagy ezekkel összefüggésben figyelembe kell venni olyan egyéb terheléseket is (a kormányra ható terhelések, utaskabin nyomásértékek, a hajtómű működtetésének hatásai, a konfigurációváltoztatás következtében fellépő terhelések, a külső teher okozta terhelések, stb.), melyek valószínűleg előfordulnak a várható üzemeltetési körülmények között.

3. 7. Flatter, divergencia és vibráció

A helikopter minden alkotórészének mentesnek kell lennie a túlzott vibrációtól, vagy rezgéstől (oszcilláció) (földi rezonanciától, flattertől, stb.) a megfelelő sebesség és teljesítményviszony bármelyike esetében.

3. 8. Kifáradási szilárdság

A helikopter szilárdságának és szerkezeti felépítésének olyannak kell lenni, hogy a várható üzemeltetési viszonyok között megismétlődő terhelésekből és a rezgési terhelésekből eredő veszélyes kifáradási törés előfordulásának valószínűsége rendkívül csekély legyen.

Megjegyzés – Ezen Szabványnak eleget lehet tenni azáltal, hogy megállapítják a szerkezet „biztonságos élettartam”, vagy „meghibásodás-mentesség” jellemzőit, tekintetbe véve a megengedett terhelés várható nagyságát és gyakoriságát a várható üzemeltetési körülmények között, valamint a felülvizsgálat eljárásait. A szerkezet bizonyos részeire szükségessé válhat mind a „meghibásodás-mentesség”, mind pedig a „biztonságos élettartam” jellemzőinek meghatározása.

4. FEJEZET. TERVEZÉS ÉS GYÁRTÁS

4. 1. Általános rész

A tervezés és gyártás minden részletének olyannak kell lennie, hogy észszerű garanciát nyújtson arra, hogy a helikopter minden alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. A tervezést és gyártást a gyakorlatra kell alapozni, hogy a tapasztalat bizonyítsa megfelelőségüket, vagy speciális tesztek igazolják, vagy egyéb megfelelő vizsgálatok, vagy mindkettő. Figyelembe kell venni az Emberi Tényezők irányelveit is.

Megjegyzés.- Az Emberi Tényezők irányelveire tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található.

4. 1. 1. Bizonyító tesztek

A helikopter biztonságos üzemelése szempontjából lényeges összes mozgó alkotórész működését megfelelő tesztekkel kell bizonyítani annak érdekében, hogy biztosított legyen, hogy ezen alkotórészek hibátlanul fognak működni a rájuk vonatkozó összes üzemeltetési körülmény között.

4. 1. 2. Anyagok

A helikopter biztonságos üzemelése szempontjából lényeges alkotórészek minden anyagának ki kell elégítenie a jóváhagyott előírásokat. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az elfogadott anyagok, melyek megfelelnek az előírásoknak, ténylegesen rendelkezzenek a tervezés során feltételezett tulajdonságokkal.

4. 1. 3. Gyártási eljárások

A gyártási és az összeszerelési eljárásoknak olyanoknak kell lenniük, amelyeknek eredményeképpen egy állandóan szilárd szerkezet jön létre, mely a használat során megbízhatóan megőrzi ezt a tulajdonságát.

4. 1. 4. Védelem

A szerkezetet üzemeltetése közben meg kell védeni a károsodástól és szilárdságának csökkenésétől, melyek időjárási okok, korrózió, kopás, vagy egyéb okok miatt következhetnek be, és amelyek esetleg észrevétlenek maradhatnak, tekintetbe véve azt a karbantartást, melyet a helikopter részére biztosítanak.

4. 1. 5. Felülvizsgálati előírások

Megfelelő előírásokat kell biztosítani annak érdekében, hogy lehetőség legyen a helikopter azon alkotórészeinek felülvizsgálatára, cseréjére, vagy felújítására, melyekre akár időszakosan, akár rendkívül nehéz üzemeltetési körülményeket követően figyelmet kell fordítani.

4. 1. 6. Tervezési jellemzők

A tervezési jellemzőkre különös figyelmet kell fordítani, melyek befolyásolják a hajózó személyzet képességét az ellenőrzött repülés fenntartásában. A tervezési jellemzőknek magukba kell foglalniuk legalább az alábbiakat:
a) Kormányok és kormányrendszerek. A kormányok és kormányrendszerek tervezésének olyannak kell lennie, hogy minimális legyen a megszorulás, a nem szándékos működtetés és a kormányfelület rögzítő mechanizmus véletlen működésbe lépésének valószínűsége.
i) Minden egyes kormánynak és kormányrendszernek könnyen kezelhetőnek, simán és hatékonyan működőnek kell lennie rendeltetésének megfelelően, és
ii) minden egyes kormányrendszer mindegyik elemét úgy kell megtervezni, hogy minimálisra csökkenjen bármilyen téves összeszerelés valószínűsége, mely a rendszer hibás működését idézheti elő.
b) A hajózó személyzet környezete. A pilótafülke tervezésének olyannak kell lenni, hogy minimális legyen a hajózó személyzet részéről a kormányok téves és korlátozott működtetésének lehetősége fáradtság, tévesztés vagy zavaró hatások következtében. Legalább az alábbiakat kell figyelembe venni: a kormányok és műszerek elrendezése és felismerhetősége, a veszélyhelyzetek gyors felismerése, a kormányok érzékenysége, szellőztetés, fűtés és zaj.
c) Kilátás a pilótakabinból. A pilótakabin elrendezésének olyannak kell lennie, hogy kellően nagy kiterjedésű, tiszta és torzításmentes látómezőt biztosítson a helikopter biztonságos üzemeltetéséhez, és mentes legyen a csillogástól és tükröződésektől, mely zavarhatja a pilóta látását. A pilótakabin ablaktervezési jellemzőinek lehetővé kell tenni, hogy csapadékos viszonyok között kielégítő látás legyen biztosított a repülés normál végrehajtásához, valamint a megközelítések és leszállások végrehajtásához.
d) Felkészülés veszélyhelyzetekre. Olyan megoldásokat kell biztosítani, melyek vagy automatikusan megelőzik, vagy a hajózó személyzet számára lehetővé teszik a berendezések és rendszerek előrelátható meghibásodásaiból eredő veszélyhelyzetek kezelését, olyan meghibásodást, mely veszélyt jelenhet a helikopterre. Észszerű megoldásokat kell találni a lényeges működés folyamatosságának fennmaradására egy hajtóműegység vagy a rendszerek meghibásodását követően oly mértékig, hogy az ilyen meghibásodás során fennálljanak ezen Annex Szabványaiban és az Annex 6 III. Részében előírt üzemeltetési korlátozások és teljesítmény.
e) Tűzvédelem. A helikopter tervezésekor és a gyártás során felhasznált anyagoknak, beleértve az utaskabin belső berendezésének anyagait, -melyeket egy nagyobb ismételt rendbehozás során cserélnek, -olyanoknak kell lenni, hogy minimális legyen a repülés közbeni tűz és a földi tüzek valószínűsége, és minimális legyen a füst és a mérgező gázok kifejlődése is tűz kialakulása esetén. Ahol lehetséges, megoldásokat kell biztosítani az összes hozzáférhető tűz oly módon történő gátlására,

vagy észlelésére és eloltására, melyek előfordulhatnak, hogy a helikopterre további veszélyt ne jelentsenek.

f) A fedélzeten tartózkodók cselekvőképtelensége. Óvintézkedéseket kell tenni a tervezés során annak érdekében, hogy védelmet nyújtsanak a kabin dehermetizálódásának lehetséges előfordulása ellen és a füst, vagy egyéb mérgező gázok jelenléte ellen, mely a helikopter fedélzetén tartózkodók cselekvőképtelenségét idézheti elő.

4. 1. 7. Felkészülés kényszerleszállás esetére

A helikopter tervezése során gondoskodni kell arról, hogy kényszerleszállás esetén a tűztől és a lassulási erőktől származó sérülésektől a fedélzeten tartózkodók védve legyenek. Felszereléseket kell biztosítani a kényszerleszállást követően várhatóan előforduló körülmények esetében a helikopter gyors kiürítéséhez. Az ilyen felszereléseknek meg kell felelniük az utasszámnak és a helikopter személyzete kapacitásának. Olyan helikoptereken, amelyeket vízreszállásra jogosítanak, a tervezés során gondoskodni kell arról is, hogy maximális elérhető garancia legyen a helikopter utasainak és személyzetének biztonságos kimenekítése végrehajtására vízreszállás esetében.

4. 1. 8. Földi kiszolgálás

A helikopter tervezése során megfelelően kell gondoskodni arról, hogy a földi kiszolgálás során előforduló kockázat minimális legyen (például: vontatás, felemelés), mely sérülést okozhat a helikopter azon alkotórészeiben, amelyek lényegesek annak biztonságos üzemeltetéséhez és esetleg észrevétlen maradhat. Számításba lehet venni a tevékenységre vonatkozó utasítást, és bármilyen korlátozást, mely védelmet nyújthat.

5. FEJEZET. HAJTÓMŰVEK

5. 1. Alkalmazási terület

Az 5. Fejezet Szabványai minden helikoptertípus hajtóműveire vonatkoznak, amelyeket elsősorban meghajtó egységként alkalmaznak.

5. 2. Tervezés, gyártás és működés

A teljes hajtóművet segédberendezéseivel együtt úgy kell megtervezni, hogy megbízhatóan működjön üzemeltetési korlátozásain belül a várható üzemeltetési körülmények között, ha a 6. Fejezetnek megfelelően pontosan építették fel a helikopterre, alkalmas forgószárnnyal és erőátviteli rendszerrel.

5. 3. Közzétett teljesítmény osztályok, viszonyok és korlátozások

Közzé kell tenni a hajtómű teljesítmény osztályát, a hozzá tartozó légköri viszonyokat és az összes üzemeltetési körülményt és korlátozást, melyre a hajtómű üzemelését megtervezték.

5. 4. Tesztek

Az adott hajtóműtípus egy példányán sikeresen végre kell hajtani mindazokat a teszteket, amelyek ahhoz szükségesek, hogy bizonyítsák a közzétett teljesítmény osztályok, körülménynek és korlátozások érvényességét, és garanciát jelentsenek arra, hogy a hajtómű kielégítően és megbízhatóan fog üzemelni. A teszteknek legalább az alábbiakat kell magukba foglalni:

a) T*eljesítményhitelesítés*. A hajtómű teljesítmény jellemzőinek megállapítására teszteket kell végrehajtani nemcsak akkor, amikor a hajtómű új, hanem a b) és c) pontban előírt tesztek végrehajtása után is. Az összes előírt teszt végrehajtása utáni végeredmény nem mutathatja azt, hogy a hajtómű teljesítménye jelentősen csökkent.

b) Üzemelés. Teszteket kell végrehajtani annak igazolására, hogy a hajtómű indítása, alapjárata, gyorsulása, vibrációja és túlpörgése, valamint egyéb jellemzői kielégítők, és bizonyítani kell, hogy megfelelő szabadságfok többlettel rendelkezik ahhoz, hogy ne forduljon elő robbanás, befulladás vagy egyéb veszedelmes körülmény, mely járuléka lehet bizonyos hajtóműtípusnak.

c) Tartósság. Kielégítően hosszú ideig kell a teszteket végezni olyan teljesítménnyel, hajtómű és forgószárny sebességekkel, és egyéb üzemeltetési körülmények között, melyek a hajtómű megbízhatóságának és tartósságának bizonyításához szükségesek. Ezeknek a teszteknek magukba kell foglalniuk olyan üzemeltetést is, amikor a viszonyok olymértékben haladják meg a közzétett határértékeket, mint amilyen mértékben a tényleges üzemi használat során túlléphetik ezeket a határértékeket.

6. FEJEZET. FORGÓSZÁRNY ÉS ERŐÁTVITELI RENDSZEREK, A HAJTÓMŰ FELÉPÍTÉSE

6. 1. Általános rész

A hajtómű felépítésének, beleértve a forgószárnyat és az erőátviteli rendszert is, ki kell elégítenie a 4. Fejezet és a jelen Fejezet Szabványait.

6. 2. Tervezés, gyártás és működés

A forgószárnyat és az erőátviteli rendszereket tartozékaikkal együtt úgy kell megtervezni és megépíteni, hogy megbízhatóan működjenek az üzemeltetési határértékeken belül a várható üzemeltetési körülmények között, ha pontosan illesztették a hajtóműhöz és építették fel a helikopterre a jelen fejezetnek megfelelően.

6. 3. Közzétett teljesítmény osztályok, viszonyok és korlátozások

Közzé kell tenni a hajtómű teljesítmény osztályait és az összes üzemeltetési körülményeket, valamint korlátozásokat, melyekre a forgószárnyat és az erőátviteli rendszereket megtervezték.

6. 3. 1. A forgószárny maximum és minimum fordulatszámának korlátai

Meg kell határozni a forgószárnyak maximum és minimum fordulatszámát mind meghajtott, mind meghajtás nélküli állapotra. Közzé kell tenni minden olyan üzemeltetési körülményt (például: repülési sebesség), mely befolyásolja ezen maximum és minimum értékeket.

6. 3. 2. Figyelmeztetés a forgószárny alacsony, illetve magas fordulatszámaira

A pilótának egyértelmű és jellegzetes figyelmeztetést kell kapnia, amikor a helikopter a forgószárny sebességhatáraihoz közelít akkor is, ha hajtómű egységei üzemelnek, és akkor is, ha valamelyik üzemképtelen. A figyelmeztetésnek és az előálló helyzet kezdeti jellemzőinek olyanoknak kell lenni, hogy lehetővé tegyék a pilóta számára a kialakult helyzet további kezelését a figyelmeztető jelzés megtörténte után, és hogy a forgószárny fordulatszámát vissza tudja állítani az előírt normál határok közé, és fenn tudja tartani a helikopter teljes kormányozhatóságát.

6. 4. Tesztek

A forgószárnyon és az erőátviteli rendszereken kielégítő eredménnyel kell elvégezni azokat a teszteket, melyek szükségesek annak biztosításához, hogy azok megfelelően és megbízhatóan fognak működni a közzétett teljesítmény osztály, az üzemi körülmények és a korlátozások határértékein belül.

A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) Üzemeltetés. Tesztekkel kell bizonyítani, hogy a szilárd rezgés és a túlpörgés jellemzői kielégítőek, és igazolni azt, hogy az állásszögszabályozó és vezérlő mechanizmusok, valamint a szabadonpörgést biztosító mechanizmus szabályszerűen és megbízhatóan működik.

b) Tartósság. Kielégítő időtartamú teszteket kell végrehajtani olyan teljesítmény, hajtómű és forgószárny sebességeknél, valamint egyéb üzemeltetési körülményeknél, melyek annak bizonyításához szükségesek, hogy a forgószárny és az erőátviteli rendszerek megbízhatóak és tartósságuk megfelelő.

6. 5. A hajtómű, a forgószárny és az erőátviteli rendszerek korlátozásainak való megfelelés

A hajtómű rendszer felépítését úgy kell megtervezni, hogy a hajtóművek, a forgószárny, és az erőátviteli rendszerek használhatóak legyenek a várható üzemeltetési viszonyok között. A helikopter repülési kézikönyvében meghatározott körülmények között a helikopternek képesnek kell lennie arra, hogy a hajtóművekre, a forgószárnyra és az erőátviteli rendszerekre megállapított határértékek túllépése nélkül üzemeljen az 5. és a 6. Fejezeteknek megfelelően.

6. 6. A hajtómű rotáció vezérlése

Olyan hajtómű típusoknál, ahol a meghibásodott hajtómű további rotációja megnövelheti a tűz és komoly szerkezeti károsodás veszélyét, megoldásokat kell biztosítani a személyzetnek arra, hogy leállíthassa a hajtómű rotációját repülés közben, vagy hogy egy biztonságos szintre csökkenthesse azt.

6. 7. A hajtómű újraindítása

Megoldást kell biztosítani a hajtómű újraindítására minden magasságon, a közzétett maximális magasságig bezárólag.

6. 8. Kialakítás és működés

6. 8. 1. A hajtómű egységek függetlensége

Az 1. és a 2. osztályú helikopterek teljesítményének eléréséhez a hajtóművet úgy kell kialakítani, hogy minden egyes hajtóműegységet a hozzá tartozó rendszerekkel együtt a többitől függetlenül lehessen vezérelni és működtetni , és oly módon, hogy közöttük legyen legalább egy hajtóműegység a hozzá tartozó rendszerekkel együtt, amelynek meghibásodása, – bármilyen kicsi is ennek előfordulási valószínűsége, – nem jelent nagyobb teljesítmény vesztést, mint amekkorát a kritikus hajtómű teljes meghibásodása okoz.

6. 8. 2. A forgószárny és az erőátviteli rendszer vibrációja

A forgószárnyban és az erőátviteli rendszerekben a vibráció okozta feszültségeket meg kell határozni, melyek nem lehetlek nagyobbak, mint a helikopterre megállapított üzemeltetési korlátozásokon belül a működtetésre biztonságosnak ítélt értékek.

6. 8. 3. Hűtés

A hűtőrendszernek képesnek kell lennie arra, hogy a hajtómű és az erőátviteli rendszerek hőmérsékletét a meghatározott határértékeken belül tartsa (lásd 6. 5. pontot) a helikopter üzemeltetésére jóváhagyott külső levegő hőmérsékletek mellett. A helikopter repülési kézikönyvében közzé kell tenni azokat a maximum és minimum hőmérsékleteket, amelyek között a hajtómű és az erőátviteli rendszerek alkalmasságát megállapították.

6. 8. 4. Csatlakozó (másodlagos) rendszerek

Minden egyes hajtómű egységhez, erőátviteli rendszer egységhez és minden egyes forgószárnyhoz tartozó tüzelőanyag, levegőbetáplálás és egyéb rendszereknek képesnek kell lenniük arra, hogy kiszolgálják a megfelelő egységet az előírt követelményeknek megfelelően, és minden olyan körülmény fennállása esetén, mely a rendszerek működését befolyásolja (például: hajtómű teljesítményszabályozás, a helikopter térbeli helyzete és gyorsulások, légköri viszonyok, folyadékhőmérsékletek) a várható üzemeltetési körülmények között.

6. 8. 5. Tűzvédelem

A megjelölt tűztérségekben, ahol a potenciális tűzveszély különösen súlyos a gyúlékony anyagokra nézve a begyulladás forrásainak közelsége miatt, a következőket kell alkalmazni a 4. 1. 6 e) pontban szereplő általános Szabványokon felül:
a) Szigetelés. Az olyan zónákat, ahol a tűz jelenléte veszélyeztetheti a folyamatos repülést, tűzálló anyagokkal kell elszigetelni a helikopter többi részétől, számításba véve a tűz keletkezésének valószínű pontjait és a tűz terjedésének valószínű útvonalát.
b) Gyúlékony folyadékok. Az ilyen zónákban elhelyezett gyúlékony folyadék- rendszer alkotóelemeinek képesnek kell lenniük a folyadék megtartására a tűz kialakulásának körülményei között. Megoldásokat kell a személyzet részére biztosítani a gyúlékony anyagok veszélyes mennyiségének az ilyen zónákba történő bejutása meggátolására, ha tűz keletkezett.
c) Tűzvédelem. Elegendő számú tűzjelzőről kell gondoskodni, és úgy kell elhelyezni azokat, hogy bármilyen tűz gyors észlelése biztosított legyen, mely az ilyen zónákban előfordulhat.
d) Tűzoltás. Az ilyen zónákat olyan tűzoltó rendszerrel kell ellátni, mely képes az itt valószínűleg előforduló tűz eloltására feltéve, hogy a szigetelés, a gyúlékony anyagok mennyisége, a szerkezet tűzállósága és egyéb jellemzők olyan fokúak, hogy az ezekben a zónákban valószínűen elforduló bármilyen tűz nem veszélyeztetheti a helikopter biztonságát.

7. FEJEZET. MŰSZEREK ÉS BERENDEZÉSEK

7. 1. Szükséges műszerek és berendezések

A helikoptert el kell látni mindazokkal az engedélyezett műszerekkel és berendezésekkel, melyek a helikopter biztonságos üzemeltetéséhez szükségesek a várható üzemeltetési körülmények között. Ezek között szerepelni kell azoknak a berendezéseknek és műszereknek, amelyekkel a személyzet a helikoptert működtetni képes az üzemeltetési határértékeken belül. A műszerek és a berendezések tervezésekor figyelembe kell venni az Emberi Tényezők alapelveit.

1. számú Megjegyzés.-A Légialkalmassági Bizonyítvány kiadásához szükséges minimumon felüli műszerek és berendezések felsorolását az Annex 6 III. Részben lehet megtalálni, melyeket a különleges körülményekre, vagy a különleges útvonalfajtákra írtak elő.

2. *számú Megjegyzés.-Az Emberi Tényezők alapelveire vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683), valamint a Légiforgalmi Szolgáltatás Szervezés (ATM) Rendszerei (DOC 9758) anyagokban található meg.*

7. 2. Felépítés

A műszerek és berendezések felépítésének ki kell elégítenie a 4. Fejezet Szabványait.

7. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági és mentőfelszereléseknek, melyeket a személyzet vagy az utasok várhatóan használnak egy kényszerleszállás alkalmával, megbízhatónak, azonnali hozzáférésre késznek, és könnyen felismerhetőnek kell lenniük, valamint működtetésük módját egyértelműen kell jelölni.

7. 4. Navigációs és összeütközés elleni fények

7. 4. 1. Az Annex 2-ben előírt fényeknek, melyeket a helikopteren repülés közben működtetni kell, vagy akkor, amikor a helikopter egy repülőtér vagy helikopter repülőtér földi mozgásterületén üzemel, olyan intenzitásúnak, színűnek, fedésterületűnek és egyéb jellemezőkkel rendelkezőnek kell lenniük, hogy elegendő idő álljon rendelkezésére egy másik légijármű pilótájának, vagy a földön tartózkodó személyzetnek a helyzet értelmezésére és az ezt követő manőver végrehajtására, mely az összeütközés elkerüléséhez szükséges. Az ilyen fényforrások tervezésekor kellően számításba kell venni azokat a körülményeket, melyek között észszerűen elvárható, hogy a fényforrások betöltsék funkcióikat.

1. számú Megjegyzés.-Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, mint például a tipikus városi megvilágítás fényei, tiszta csillagos égbolt, holdsütötte vízfelület, és olyan nappali megvilágítási viszonyok mellett, amikor a háttér megvilágítás alacsony mértékű. Ezen túlmenően, az összeütközési veszélyt jelentő helyzetek legvalószínűbben olyan közelforgalmi körzetekben fordulnak elő, amelyekben a légijárművek közbenső vagy alacsony repülési szinteken, közel azonos sebességgel üzemelnek, mely nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

2. számú Megjegyzés.-A helikopterek külső fényeinek műszaki specifikációját lásd a Légialkalmassági Kézikönyv (DOC 9760) II. Kötet, "A" Részében.

7. 4. 2. A helikoptereken a fényeket úgy kell elhelyezni, hogy az alábbi esetek lehetősége minimális legyen:
a) a hajózó személyzet kötelmeinek kielégítő ellátását hátrányosan befolyásolják, vagy
b) külső szemlélőt ártalmasan elvakítanak.

Megjegyzés – A 7. 4. 2. pontban felsorolt hatások elkerülése érdekében bizonyos esetekben szükséges lehet olyan megoldások biztosítása a személyzet számára, amellyel a pilóta ki tudja kapcsolni a villogófényeket, vagy csökkenteni tudja azok intenzitását.

8. FEJEZET. ELEKTROMOS RENDSZEREK

Az elektromos rendszert úgy kell megtervezni, és felépíteni, hogy bármilyen előre látható üzemeltetési körülmény között a tervezett funkciónak megfeleljen.

9. FEJEZET.
ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK

9. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványainak való megfelelést meghatározták, továbbá minden egyéb olyan információt, mely a helikopter biztonságos üzemeltetéséhez szükséges, közzé kell tenni a helikopter repülési kézikönyvében, vagy jelölésekkel, feliratokkal kell közölni, vagy olyan egyéb módon, mely hatékonyan segíti elő a cél elérését. A korlátozásoknak és az információknak legalább a 9. 2, 9. 3 és 9. 4 pontokban előírtakat magukba kell foglalniuk.

9. 2. Üzemeltetési korlátozások

Azokat a korlátozásokat, – melyek repülés közbeni túllépésének veszélye fennáll, és amelyek számszerűen lettek meghatározva, – alkalmas egységekben kell kifejezni, és szükség esetén helyesbíteni kell a méréshibák miatt oly módon, hogy a hajózó személyzet a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani, hogy mikor éri el a korlátozások értékeit.

9. 2. 1. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes, tömegre, súlyponthelyzetre, tömegeloszlásra és padlóterhelésre vonatkozó korlátozó értéket (lásd 1. 2. 2. pontot).

9. 2. 2. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk minden olyan sebességértéket (lásd 3. 2. pontot), melyek korlátozó jellegűek a szerkezeti épség, vagy a helikopter repülési tulajdonságai, vagy más megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő helikopter konfigurációkra és egyéb, odaillő tényezőre vonatkoztatva kell megadni.

9. 2. 3. Hajtómű és erőátvitel korlátozások

A hajtómű (erőforrás) korlátozásainak magukba kell foglalni mindazokat a korlátozásokat, melyeket a helikopterre felépített különböző hajtómű, és átviteli alkotóelemre meghatároztak (lásd a jelen rész 6. 5. és a 6. 6. pontjait).

9. 2. 4. A forgószárnyra vonatkozó korlátozások

A forgószárny sebességkorlátozásainak magukba kell foglalniuk a maximális és a minimális forgószárny sebességeket mind a meghajtás nélküli (autorotáció), mind a meghajtott állapotra vonatkozólag.

9. 2. 5. A berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk a helikopterre felépített különböző berendezésekre és rendszerekre meghatározott összes korlátozást.

9. 2. 6. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalniuk minden olyan szükséges korlátozást, melyek a helikopter biztonsága szempontjából veszélyesnek ítélt körülmény figyelembe vételével határoztak meg (lásd az 1. 2. 1. pontot).

9. 2. 7. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a helikopter üzemeltetéséhez szükséges minimális hajózó személyzeti létszámot, figyelembe véve más egyéb mellett, a megfelelő hajózó személyzeti tag hozzáférését az összes szükséges vezérlőszervhez és a műszerekhez, valamint a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 – Légijármű Üzemeltetés, III. Részét az olyan körülményekre vonatkozólag, amikor jelen Annex-ben meghatározott minimális hajózó személyzeti létszámon felül további hajózó személyzeti tag válik szükségessé.

9. 3. Üzemeltetésre vonatkozó tájékoztatások és eljárások

9. 3. 1. Alkalmas üzemeltetés típusok

Felsorolást kell készíteni mindazokról az üzemeltetés típusokról, hasonlóan az Annex 6 III. Részében meghatározottakhoz, vagy általánosságban ismertekhez, amelyekre a helikopter tulajdonságai révén alkalmasnak mutatkozik a megfelelő légialkalmassági követelményeknek való megfeleltetés során.

9. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a helikopter üres tömegét a helikopter súlymérése körülményeinek meghatározásával együtt, a vonatkozó súlyponthelyzetet, a referencia pontokat és az alapvonalakat, melyre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés – A helikopter üres tömege rendszerint nem foglalja magába a személyzet és a hasznos terhelés tömegét, a kifogyasztható tüzelőanyagot és a leereszthető olaj tömegét, de magába foglalja az összes beépített ballasztot, a kifogyaszthatatlan tüzelőanyag, a le nem ereszthető olaj tömegét, valamint a hajtómű hűtőfolyadéka és a hidraulikafolyadék teljes mennyiségét.

9. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott helikopterre jellemzőek és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek tartalmazniuk kell az egy vagy több hajtóműegység meghibásodása esetén követendő eljárásokat.

9. 3. 4. Kezelési információk

A helikopter jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról kielégítő információt kell biztosítani.

9. 4. Teljesítményre vonatkozó információk

A helikopter teljesítményét a 2. 2. pont szerint kell közzétenni. Ennek magába kell foglalnia a különböző helikopterkonfigurációkra és a vele összefüggő teljesítmény és a vonatkozó sebesség információkat, melyek segítséget nyújthatnak a hajózó személyzetnek a betervezett teljesítmény eléréséhez.

9. 5. Helikopter repülési kézikönyv

A helikopter repülési kézikönyvének meglétét biztosítani kell. Világosan meg kell jelölni, hogy mely adott helikopterre, vagy helikopter szériára vonatkozik. A helikopter repülési kézikönyvnek minimálisan tartalmaznia kell az ebben a fejezetben szereplő korlátozásokat, információkat és eljárásokat.

9. 6. Jelölések és feliratok

9. 6. 1. A műszereken, berendezéseken, a kormányokon lévő jelöléseknek és feliratoknak tartalmazniuk kell mindazon korlátozásokat, vagy információt, melyeket a hajózó személyzetnek repülés alatt elsődlegesen figyelembe kell vennie.

9. 6. 2. Jelelöléseket, feliratokat, utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadjuk, és hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (azaz vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat, és veszélyeztetheti a helikopter biztonságát a következő repülés során.

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[1]**Lásd még jelen Fejezet 1. 1. 2 pontját is.**

ANNEX 8.
A légijármű légialkalmassága

10. kiadás – 2005. április
100. módosítással

Ez a kiadás a Tanács által 2004.december 14.-e előtt elfogadott összes módosítást tartalmazza és 2007 december 13-án az Annex 8 összes korábbi kiadásának helyébe lép.
A Szabványok és Ajánlott Gyakorlati Eljárások alkalmazhatóságára vonatkozó információkat a II. Rész 1.1., 2.1, 3.1. és 4.1. pontjai, a IIIA és IVA Részek 1. 1. pontjai, a IIIB és IVB Részek A1.pontjai, valamint az V., VI., VII. Részek és az Előszó tartalmazzák.
Nemzetközi Polgári Repülési Szervezet

FONTOS MEGJEGYZÉS AZ ANNEX 8. KILENCEDIK ÉS TIZEDIK KIADÁSAIHOZ

Az Annex 8 *kilencedik kiadása* azokat a Nemzetközi Szabványokat és Ajánlott Gyakorlati Eljárásokat tartalmazza, melyek *2006. május 20.-án* válnak alkalmazhatóvá.
A Az Annex 8 *tizedik kiadása* azokat a Nemzetközi Szabványokat és Ajánlott Eljárásokat tartalmazza, melyek *2007. december 13.-tól* alkalmazhatók.

Ezért a felhasználóknak az Annex 8 Kilencedikés Tizedik Kiadását együtt kell megőrizni.

MÓDOSÍTÁSOK

A megjelenő módosításokat az ICAO Journal újság, valamint az ICAO Kiadványok és Audio-Vízuális Oktatási Segédletek Katalógusának havonta megjelenő kiegészítő része rendszeresen közzéteszi, melyből ezen kiadvány használói tájékozódhatnak. Az alábbi táblázat rendeltetése az ilyen módosítások nyilvántartása.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK NYILVÁNTARTÁSA

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Sorszám	Életbelépés dátuma	Módosítás dátuma	Módosító neve	Sor-szám	Kiadás dátuma	Javítás végre-hajtásának dátuma	Javítást végző neve
1-100	2007. december 13						

ELŐSZÓ

A légijárművek légialkalmassága tárgyában a Szabványokat és Ajánlott Gyakorlati eljárásokat az ICAO Tanácsa 1949. március 1.-én fogadta el a Nemzetközi Polgári Repülési Egyezmény (Chicago, 1944) 37. Cikkelyében foglalt rendelkezések értelmében és az Egyezmény 8. Függelékeként (Annex) jelölte meg.

Az Annex II. Részében foglalt általános légialkalmassági eljárásokat minden légijárműre alkalmazni kell, míg a III. Részben azon minimális légialkalmassági jellemzők találhatók, melyek olyan repülőgépekre vonatkoznak, amelyeket valamely meghatározott ICAO kategória szerinti légialkalmassági bizonyítvánnyal láttak el, vagy ezzel kell ellátni.

A 4. Ülésen a Légialkalmassági Divízió együttműködve a z Üzemeltetési Divízióval, ajánlásokat fogalmazott meg egy teljesítmény kód használatára, mely alternatívaként szolgál az Annex-ben található kód mellett, ahol az emelkedési értékek alkotják az Ajánlott Gyakorlati Eljárások alapját. Ezen túlmenően, a Légialkalmassági Divízió ajánlásokat tett az ICAO kategóriák felülvizsgálatának bizonyos szempontjaira. Ezen ajánlások eredményeként a Tanács jóváhagyta az alternatív teljesítménykód beépítését az Annex-be A-mellékletként, de leszögezte, hogy mivel a teljesítményre vonatkozó Szabványokban ez még nem jelent meg, így nincs alap az ICAO A-kategória szerinti minősítésre. Arra ösztönzi a Szerződő Államokat, hogy tartózkodjanak a később életbe lépő, teljesítményre vonatkozó Szabványok szerinti minősítéstől, vagy várjanak addig az időpontig, amikor a Tanács dönt a légialkalmasság alapelveiről.

A Közgyűlés a 7. Ülésén (1953. június) jóváhagyta a Tanács és a Léginavigációs Bizottság által addig végzett tevékenységet, miszerint kezdeményezni kell a légialkalmasság feltételeire vonatkozó ICAO irányelvek alapvető áttanulmányozását és utasította a Tanácsot arra, hogy a lehető leghamarabb fejezze be ezt a munkát.

Ezen tanulmány elkészítésében a Léginavigációs Bizottságot egy szakértőkből álló nemzetközi csoport, az u.n. Légialkalmassági Munkacsoport (Airworthiness Panel) segítette, mely hozzájárult a Harmadik Léginavigációs Konferencia munkájának előkészítéséhez.

A tanulmányok eredményeként kidolgozták a légialkalmasság új, nemzetközi irányelveit, melyeket a Tanács 1956-ban jóváhagyott. Ezen irányelveknek megfelelően, megszüntették az ICAO kategória szerinti minősítés elvét. Helyette az Annex 8-ba jól körbehatárolt Szabványokat dolgoztak be, melyek meghatározták az Államok szánára a teljes körű minimális nemzetközi elismerési alapokat, melyeket az illetékes nemzeti hatóságok alkalmazni tudnak olyan esetben, amikor más Államok légijárműve hajt végre az ő területére berepülést, vagy területének átrepülését. Így elérhetővé válik – más célok mellett, - a többi légijármű, a harmadik személyek, vagy a vagyontárgyak védelme. Úgy ítélték meg, hogy az ICAO ezzel eleget tett az Egyezmény 37. Cikkelyében foglalt kötelezettségének a légialkalmasság Nemzetközi Szabványainak kidolgozására.

Elismerték, hogy a légialkalmasságra vonatkozó ICAO Szabványok nem helyettesíthetik a nemzeti szabályozást és az egyes Államok szükségesnek ítélik a légialkalmasság teljes körű és részletezett nemzeti kódjait, melyek ahhoz szükségesek, hogy alapul szolgáljanak egy egyedi légijármű minősítéséhez. Minden egyes Államnak meg kell alkotnia a saját átfogó, és részletes, a légialkalmasságra vonatkozó előírásait, vagy választania kell más Államok által kidolgozott átfogó és részletes kód közül egyet saját alkalmazásra. Ezzel a kóddal meghatározott légialkalmasság szintjét megjelölhetik Szabványokkal, és ha szükséges, kiegészíthetik a „Megfelelés Elfogadható Módjai"-val (Acceptable Means of Compliance).

A fenti elveknek megfelelően az Annex-et úgy kell tekinteni, mint a 33. Cikkely által meghatározott célok megvalósítására szolgáló minimum szabványokat. Tudatában voltak azonban annak, hogy az Annex, elfogadása időpontjában, lehet, hogy már nem tartalmazza a légijárművek összes osztályára, vagy az összes repülőgépre vonatkozó technikai Szabványt, ha a Tanács majd úgy ítéli meg, hogy a 33. Cikkely hatályba léptetésének időpontjában technikai Szabványokra nincs szükség. Ezen felül, a 33. Cikkely célkitűzéseinek szempontjából teljesnek nyilvánított Annex jóváhagyásával, vagy módosításával az ICAO munkája a légialkalmasság területén nem ért véget, mivel a nemzetközi együttműködés folytatására továbbra is szükség lesz.

Az Annex 8 módosított szövege összhangban van a fenti célkitűzésekkel, melyet a Harmadik Léginavigációs Konferencia (Montreal, 1956. szeptember-október) ajánlásai alapján készítettek el. Az Annex III. Része azokra az átfogó Szabványokra korlátozódik, melyek inkább a tárgyi feladatokat határozzák meg, mintsem ezek megvalósításának módszereit. Annak érdekében, hogy a széleskörű Szabvány némelyike által megkívánt légialkalmassági szintet példákkal mutassák be, a „Megfelelés Elfogadható Módjai” cím alatt sokkal részletesebb és számszerű előírásokat építettek be. Ezen előírások célja, hogy segítséget nyújtsanak a Szerződő Államoknak a részletes és átfogó nemzeti légialkalmassági kódjaik megalkotásában és alkalmazásában.

A „Megfelelés Elfogadható Módjai”-ban megadott kódnál észrevehetően alacsonyabb kód elfogadását úgy kell tekinteni, mint a „Megfelelés Elfogadható Módjaival” kiegészített Szabvány megsértését.

Az Annex 8 módosított szövege a 4. kiadásban lett közzétéve, mely hatálytalanította az Első, a Második, és a Harmadik kiadást.

A Harmadik Léginavigációs Konferencia egy másik ajánlására a Tanács 1957-ben létrehozta a Légialkalmassági Bizottságot, melynek tagjait a közreműködni szándékozó Szerződő Államok és nemzetközi szervezetek nagy légialkalmassági tapasztalatokkal rendelkező szakértőiből választották ki.

A nemzetközi légialkalmasság jelenlegi politikája. Bizonyos aggodalomra adott okot, hogy a Megfelelés Elfogadható Módjai formájában megfogalmazott kiegészítő légialkalmassági előírások tekintetében a fejlődés igen lassú volt az eltelt évek alatt. Megjegyzendő, hogy az Annex 6-ban és az Annex 8-ban közzétett Megfelelés Elfogadható Módjai többsége 1957-ben lett kidolgozva, ebből adódóan csak azokra a repülőgéptípusokra voltak alkalmazhatók, amelyek ebben az időben üzemeltek. Ezen Megfelelés Elfogadható Módjaiban szereplő előírások naprakésszé tételére eddig semmilyen erőfeszítés nem történt, a Légialkalmassági Bizottság részéről sem készültek ajánlások a Megfelelés Elfogadható Módjainak ideiglenes kiadásában szereplő bármelyik eljárás korszerűsítésére, melyet azzal a céllal dolgoztak ki, hogy potenciális anyagként szolgáljon a teljes értékű Megfelelés Elfogadható Módjaihoz.
A Léginavigációs Bizottság ezért felkérte a Légialkalmassági Bizottságot, hogy tekintse át a létrejötte óta végbement fejlődést olyan szempontból, hogy elérték-e a kívánt eredményt, vagy sem, és hogy a részletes légialkalmassági előírások kidolgozásának elősegítésére tegyen ajánlásokat.

A Légialkalmassági Bizottság a 9. Ülésén (Montreal, 1970. november/december) a problémákat részleteiben áttekintette és azt az ajánlást fogalmazta meg, hogy fel kell hagyni a légialkalmassági előírások kidolgozásának a Megfelelés Elfogadható Módjai, illetve az Ideiglenes Megfelelés Elfogadható Módjai formájával, és az ICAO-nak ki kell dolgozni, valamint közzé kell tenni egy légialkalmassági technikai kézikönyvet, melyben összefoglalják mindazokat az irányelveket, amelyek megkönnyítik a Szerződő Államok légialkalmassági kódjainak fejlesztését és egységesítését.

A Léginavigációs Bizottság a Tanács által 1956-ban jóváhagyott légialkalmasság politika fejlődéstörténete fényében áttekintette a Légialkalmassági Bizottság ajánlásait. Arra a következtetésre jutott, hogy az ICAO légialkalmassági politikájának alapvető elvei és célkitűzései helyesek, és jelentős változtatásokra nincs szükség. Azt is megállapították, hogy a Megfelelés Elfogadott Módjai és az Ideiglenes Megfelelés Elfogadható Módjai formájában közzétett légialkalmassági előírások kidolgozásában tapasztalt lassú fejlődés fő oka az előbbi kötelező státusának mértéke volt, melyet az Annex 8 negyedik és ötödik kiadásának előszavában az alábbi megállapítás tartalmazott:

„A Megfelelés Elfogadott Módjaiban megadott légialkalmassági szintnél
érzékelhetően alacsonyabb szintű kód elfogadása a Megfelelés Elfogadott Módjaival kiegészített Szabvány megsértését jelenti. „

A Léginavigációs Bizottság számos megközelítési módot megvizsgált annak érdekében, hogy kiküszöbölje ezt a nehézséget. Végül arra a következtetésre jutott, hogy a légialkalmasság előírásai kidolgozásának gondolatát a Megfelelés Elfogadható Módjai és az Ideiglenes Megfelelés Elfogadható Módjai formájában el kell vetni, és az ICAO-nak deklarálnia kell, hogy az Egyezmény 33. Cikkelyében foglaltak megvalósításához az Államok kötelezettsége eleget tenni az Annex 8 széleskörű Szabványainak, mely, ha szükséges, kiegészül a légialkalmasság technikai tájékoztató anyagával, valamint el kell kerülni minden kötelező jellegre történő utalást, vagy kötelezettséget. Ugyanakkor fenn kell tartani azt a követelményt, hogy minden egyes Szerződő Államnak ki kell dolgoznia saját átfogó, és részletes, a légialkalmasságra vonatkozó kódjait, vagy el kell fogadnia egy másik Állam által átfogóan és részletesen kidolgozott kódot.

A Tanács 1972. március 15.-én jóváhagyta, hogy a fenti megközelítés legyen az ICAO jelenlegi politikájának az alapja a légialkalmasság területén. Ezen politikának megfelelően:

a) a nemzetközi légialkalmasság Szabványainak célja az, hogy meghatározza a légialkalmasság minimális szintjét, melyet az illetékes nemzeti hatóságok alkalmaznak, megteremtve ezzel a nemzetközi alapot az Egyezmény 33. Cikkelye alapján az Államok részéről arra, hogy elismerjék a légialkalmassági bizonyítványokat olyan repülések esetében, amikor egy másik Állam légijárműve berepül az ő területére, vagy átrepüli azt, ennek következtében elérve,- többek között,- a többi légijármű, a harmadik fél, valamint a vagyontárgyak védelmét,

b)A fenti a) pontban meghatározottak kielégítésére kidolgozott Szabványokat a Tanács úgy tekinti, mint amelyek a szükséges területen és mértékben kielégítik a Szervezetnek az Egyezmény 37. Cikkelyében foglalt kötelezettségét a légialkalmasság Nemzetközi Szabványai elfogadására,

c) A Tanács által elfogadott légialkalmassági Szabványokat teljes körű nemzetközi kódnak kell tekinteni, amelyek szükségesek az Egyezmény 33. Cikkelyéből eredő jogok és kötelezettségek hatályba léptetéséhez és ahhoz, hogy érvényt szerezzenek azoknak,

d) Az Annex 8 műszaki légialkalmassági Szabványait úgy kell közzétenni, hogy azok sokkal inkább a célokat meghatározó átfogó előírások, mintsem a végrehajtás módját meghatározó előírások legyenek. Az ICAO elismeri, hogy a légialkalmasság azon nemzeti kódjai szükségesek, melyek teljes mértékben és terjedelemben tartalmazzák mindazokat a részleteket, amelyeket az Egyes Államok szükségesnek tartanak ahhoz, hogy az egyedi Állam minden egyes légijárműve légialkalmassági bizonyítvánnyal történő ellátásához alapot szolgáltassanak,

e)Annak érdekében, hogy az Annex 8 Szabványainak alkalmazásában segítséget nyújtsunk az Államoknak ahhoz, hogy kidolgozzák saját teljes körű nemzeti kódjaikat egységes formában, részletes tájékoztató anyagot fog a Szervezet hamarosan kidolgozni és az ICAO munkanyelveken közzétenni.

A Tanács jóváhagyta a légialkalmasságra vonatkozó tájékoztató anyag kiadását is *Légialkalmassági Műszaki Kézikönyv* címmel. Megegyeztek abban, hogy ennek kiadása előtt a tájékoztató anyagot a Léginavigációs Bizottság megvizsgálja. Hivatalos jogállással azonban nem rendelkezik, és fő célja az, hogy a Szerződő Államoknak tájékoztató anyagként szolgáljon az Annex II. Rész 3. 2. 2. pontjában szereplő megfelelő légialkalmassági követelmények kidolgozásához.

Az Annex 8 nemzetközi légialkalmasság politikájával megegyező szövegét a Léginavigációs Bizottság dolgozta ki, melyet a Tanács 1972. március 15.-én hagyott jóvá.

Az „A” Táblázat a módosítások keletkezését tartalmazza, a bennük szereplő fő témák felsorolásával, valamint azokat a dátumokat, amikor az Annex-et és módosításait a Tanács elfogadta, továbbá azok hatályba léptetésének és alkalmazhatóságának idejét.

2000. június 6.-án a Léginavigációs Bizottság áttekintette a Folyamatos Légialkalmasság Munkacsoport és a Légialkalmassági Tanulmánykidolgozó Csoport ajánlását a típusalkalmasság bizonyítása folyamat bevezetésének, és a Típusalkalmassági Bizonyítvány koncepció bevezetésének fényében. Arra a megállapításra jutottak, hogy a nemzetközileg használt és ismert bizonyítványt már korábban bevezették a *Légialkalmasság Műszaki Kézikönyvében* (DOC 9051) és ennek bevezetése kiegészíti a típusalkalmasság bizonyításának folyamatát, így kerül összhangba az Annex 8 szövege a légialkalmasság nemzetközi használatával.

Továbbiakban megállapították, hogy a Lajstromozó Állam, amely meg van bízva az Egyezmény 31. Cikkelye értelmében a Légialkalmassági Bizonyítványok kiadásával és érvényesítésével, valamint a Tervező Állam két különböző Állam is lehet, elkülönülő feladatokkal és kötelmekkel és egymástól független felelősségekkel.
Ennek megfelelően, a Típusalkalmassági Bizonyítványok kiadását szabályozó követelmények az Annex 8 alkalmazható előírásainak megfelelően nem részei a „minimális szabványok”-nak, mely a Légialkalmassági Bizonyítványok kiadását és érvényesítését szabályozza, és az Egyezmény 33. Cikkelyének megfelelően az érvényességük elismeréséhez vezetnek.

2003. október 7.-én a Léginavigációs Bizottság áttekintette a Légialkalmassági Munkacsoport ajánlásait és annak a megfigyelésnek fényében, mely szerint az olyan kis repülőgépek részvétele igen számottevő a nemzetközi légiforgalomban, melyeknek a maximális légialkalmassági bizonyítvány szerinti felszálló tömege nagyobb, mint 750 kg, de nem haladja meg az 5700 kg-ot, megegyezés született a Légialkalmassági Szabványok kis repülőgépek számára történő bedolgozására az Annex-be első alkalommal, így teremtve összhangot az Annex 8 szövege és a nemzetközi alkalmazás között.

Alkalmazhatóság

A Szabványok alkalmazhatóságát a II. Rész 1. 1, 2. 1, 3. 1, és 4. 1 pontjai, a IIIA és IVA Rész 1. 1 pontja és a IIIB, a IVB, az V, a VI és a VII Részek A. 1 pontjai tartalmazzák. Az alkalmazhatóság dátuma az Egyezmény 41. Cikkelye előírásainak figyelembevételével lett meghatározva. A Tanács azonban javasolta, hogy,- amennyiben megvalósítható,- korábbi dátumokat alkalmazzanak.

Az Annex 6. I. Rész kapcsolódó Szabványai. Az Annex 6. I. Rész 5. Fejezete, mely a repülőgépek teljesítményének üzemeltetési korlátozásaival foglalkozik, tartalmaz Szabványokat, melyek kiegészítésül szolgálnak az Annex 8 légialkalmassági Szabványaihoz. Mindkettő átfogó célkitűzéseket határoz meg. Az Annex 6. I. Rész 5. Fejezetének Szabványait kiegészítették tájékoztató anyaggal zöld színű lapokon mellékletként közzétéve, melyben példákkal mutatják be a Szabványok által szándékolt teljesítményszintet.

A Tanács arra ösztönzi a Szerződő Államokat, hogy a hozzájuk látogató repülőgépekkel szemben ne támasszanak más üzemeltetési követelményeket, mint amilyeneket a Lajstromozó Állam megállapított, feltéve, hogy ezek a követelmények nem alacsonyabbak, mint az Annex 6. I. Rész 5. Fejezetének Szabványai, melyet a jelen kiadású Annex 8 kettes.(2) számú Módosításával tettek naprakésszé, a IIIA Rész 2. 2. pontjával és a IIIB, IVB, valamint az V Részek B.2. pontjával.

A Szerződő Államok tennivalói

Az eltérések bejelentése. A Szerződő Államok figyelmét felhívjuk arra a kötelezettségre, melyet az Egyezmény 38. Cikkelye ír elő, amely szerint a Szerződő Államoktól megkívánják, hogy a Nemzetközi Szabványok,- melyeket ez az Annex és módosításai tartalmaznak,- és saját nemzeti szabályozásaik és gyakorlataik közötti bármilyen eltérést bejelentsenek a Szervezetnek. A Szerződő Államokat felkérik arra, hogy folyamatosan informálják a Szervezetet bármilyen eltérésről, mely később előfordulhat, vagy egy korábban bejelentett bármilyen eltérés visszavonásáról. A jelen Annex minden egyes Módosításának elfogadása után azonnal egy külön, eltérésekre vonatkozó értesítés kérését juttatjuk el a Szerződő Államokhoz.

Az Annex szövegének felhasználása a nemzeti szabályozásban. 1948. április 13.-án a Tanács határozatot fogadott el, melyben felhívták a Szerződő Államok figyelmét arra a kívánatos tényre, hogy a Szerződő Államok használják saját nemzeti előírásaikban, amennyire csak megvalósítható, azoknak az ICAO Szabványoknak a precíz nyelvezetét, melyek szabályozó jellegűek és a Szabványoktól való eltérésekről küldjenek értesítést, beleértve minden olyan kiegészítő szabályozást, mely a léginavigáció szabályosságának és biztonságának szempontjából fontos. Ahol ez lehetséges, a jelen Annex II. Részének előírásait oly módon fogalmazták meg, hogy megkönnyítsék azok beépítését a nemzeti előírásokba nagyobb mértékű szövegváltoztatás nélkül. A jelen Annex IIIA és IIIB Részeinek előírásait, másrészről, a nemzeti kódok útján kell a repülőgépekre alkalmazni, melyek sokkal átfogóbbak és részletesebbek, mint a Szabványok, így a Tanács 1948. április 13.-i Határozata nem vonatkozik a IIIA és IIIB Részekre.

Az Annex-nek való megfelelést megvalósító nemzeti előírásokra vonatkozó információk.
Az államokat felkérjük arra, hogy a II. Rész 3. 2. 2 pontjában említett átfogó és megfelelő légialkalmassági követelmények kiválasztásáról, vagy létrehozásáról küldjenek értesítést a Szervezetnek. Mindazon Államokat kérjük, amelyek ilyen kódokat megalkottak, hogy küldjenek ezekből egy példányt, majd ezek későbbi módosításaiból is, valamint bármilyen, ezekre vonatkozó megfelelő értelmező anyagból is egy példányt. Azokat az Államokat, amelyek más Szerződő Államok kódjaiból választanak annak érdekében, hogy megfeleljenek a II. Rész 3. 2. 2 pontjának, felkérjük, hogy küldjenek értesítést az általuk igénybe venni szándékozott kódokról.

A Légialkalmassági Kézikönyvben *(DOC 9760) lévő tájékoztató anyag felhasználása.*
Felhívjuk a Szerződő Államok figyelmét arra, hogy a *Légialkalmassági Kézikönyvben* szereplő tájékoztató anyagnak az a célja, hogy segítséget nyújtson átfogó és részletes nemzeti kódjaik kidolgozásában, a nemzeti kódok egységesítése megvalósításában. Az anyag nem kötelező jellegű és a Szerződő Államok teljesen szabadon eltérhetnek ettől akár részletekben, akár módszerekben. Azt sem kívánjuk meg az Államoktól, hogy értesítsenek bármilyen eltérésről, mely előfordulhat a saját részletes nemzeti szabályozásuk és gyakorlatuk, valamint a *Légialkalmassági Kézikönyv* vonatkozó anyaga között.

Az Annex alkotóelemeinek státusza.

Egy Annex az alábbi alkotóelemekből épül fel, melyeknek nem mindegyike található meg az egyes Annex-ekben, és ezek státusza az alábbi:

1.- Az Annex jellegzetességeit összefoglaló anyag

a) *Szabványok és Ajánlott Gyakorlati Eljárások,* melyeket a Tanács az Egyezmény előírásai szerint fogadott el. Ezeket az alábbiakkal határozzuk meg:

Szabvány: Bármilyen olyan előírás a fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozólag, amelynek egységes alkalmazását szükségesnek ítélték a nemzetközi léginavigáció biztonsága és szabályossága érdekében, és amelynek meg kell felelni az Egyezmény szerint, ha ez a megfelelés nem lehetséges, akkor kötelező a Tanács értesítése a 38. Cikkely előírásainak megfelelően.

Ajánlott Gyakorlati Eljárás: Bármely olyan előírás a fizikai jellemzőkre, konfigurációra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozólag, amelyeknek egységes alkalmazását kívánatosnak ismerték el a nemzetközi léginavigáció biztonsága, szabályossága és hatékonysága érdekében, és amelyekre a Szerződő Államoknak törekedniük kell annak érdekében, hogy megfeleljenek az Egyezménynek.

b) *Függelékek:* A Tanács által elfogadott, a Szabványok és Ajánlott Gyakorlati Eljárások részét képező, de a célszerűség érdekében külön csoportosítva közzétett anyagok.

c) *Meghatározások:* A Szabványokban és az Ajánlott Gyakorlati Eljárásokban szereplő olyan fogalmak, melyek nem önmaguktól értetődőek és nincs elfogadott szótári jelentésük. Egy meghatározásnak nincs független státusza, de lényeges részét képezi minden egyes olyan Szabványnak és Ajánlott Gyakorlati Előírásnak, amelyben ezt a fogalmat használják, mivel a fogalom jelentésének változása befolyásolhatja a pontos specifikációt.

d) *Táblázatok és ábrák:* A Szabványokhoz és Ajánlott Gyakorlati Eljárásokhoz hozzátett, vagy azokat illusztráló táblázatok és ábrák,- amelyekre az adott helyen hivatkozás történik,- részét képezik az adott Szabványnak vagy Ajánlott Gyakorlati Eljárásnak és státuszuk ezekkel megegyező.

2. *A Szabványokhoz és az Ajánlott Gyakorlati Eljárásokhoz tartozó anyagok, melyeket a Tanács kiadásra jóváhagyott:*

a) *Előszó.* A Tanács tevékenységére alapozott történeti és magyarázó anyag, magába foglalva az Államok kötelezettségeit a Szabványok és az Ajánlott Gyakorlati Eljárások alkalmazására nézve, mely az Egyezményből és az Elfogadási Határozatból következik.

b) *Bevezetés.* Az Annex részeinek, fejezeteinek, vagy al-részeinek elején található magyarázó anyag, mely a szöveg alkalmazásának megértését segíti elő.

c) *Megjegyzések.* A szóban forgó Szabványokra és az Ajánlott Gyakorlati Eljárásokra vonatkozó, a szövegben szereplő anyag, - ahol ez megfelelő, - mely adatszerű információkat és hivatkozásokat biztosít, de nem képezi részét a Szabványoknak és az Ajánlott Gyakorlati Eljárásoknak.

d) *Mellékletek.* A Szabványok és az Ajánlott Gyakorlati Eljárások kiegészítésére szolgáló anyagok, vagy azok alkalmazásához szolgálnak tájékoztatásul.

Nyelv kiválasztása

Ezt az Annex-et hat nyelven – angol, arab, kínai, francia, orosz és spanyol, - fogadták el. Felkérik az egyes Szerződő Államokat, hogy nemzeti alkalmazásra és az Egyezményben előírt egyéb célok megvalósítása érdekében válasszanak egyet ezen nyelveken jóváhagyott anyagokból akár közvetlen felhasználásra, akár saját nemzeti nyelvükre történő fordítás útján, és erről küldjenek értesítést a Szervezetnek.

Szerkesztési gyakorlat

Annak érdekében, hogy az egyes megállapítások státusza az első pillantásra megállapítható legyen, a következő szerkesztési gyakorlatot követtük: A *Szabványokat* vékony álló betűkkel szedtük, az *Ajánlott Gyakorlati Eljárásokat* vékony dőlt betűkkel, státuszát az Ajánlás előtag jelzi. A *Megjegyzéseket* vékony dőlt betűkkel tüntettük fel, melyeknek státuszát a *Megjegyzés* előtag jelöli.

Az előírások szövegezésében az alábbi szerkesztési gyakorlatot követtük: Szabványok esetében a „kell" operatív igét, az Ajánlott Gyakorlati Eljárások esetében a „kívánatos" igét alkalmaztuk.

Ezen kiadványban az Annex 5-ben meghatározott Nemzetközi Mértékegység Rendszernek (SI) megfelelő mértékegységeket használtuk. Ahol az Annex 5 megengedi az alternatív, nem SI mértékegység használatát, ezeket zárójelben tüntettük fel az alap mértékegység után. Ahol kétfajta mértékegység szerepel, ott nem szabad feltételezni, hogy az értékpárok egymással azonosak és felcserélhetők. Mindazonáltal arra lehet következtetni, hogy azonos szintű biztonság érhető el akkor, ha csak az egyik mértékegység párt használjuk.

Ezen dokumentum bármely részére történő hivatkozás, melyet számmal és/vagy címmel azonosítottunk, magába foglalja annak a résznek az alrészeit is.

A. Táblázat. Az Annex 8 módosításai

Módosítás(ok)	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
1. kiadás	A Légialkalmassági Divizió első és második ülése (1946 és 1947)	-	1949. március. 1. 1949 augusztus 1. 1949. szeptember 1.
1- től 63-ig (2. kiadás)	A Légialkalmassági Divizió harmadik és negyedik ülése (1949 és 1951)	-	1950. január. 26. 1951. január. 1. 1951. február. 1.
64- től 83-ig	A Légialkalmassági Divizió harmadik és negyedik ülése (1949 és 1951)	-	1951. november. 13. 1952. április. 15. 1952. május. 15.
84 (3. kiadás)	A Légialkalmassági Divizió negyedik ülése (1951)	Alternatív teljesítmény kód mellékletként történő bedolgozása	1952. december. 2. 1953. május. 1. 1953. június. 1.
85 (4. kiadás)	Harmadik Léginavigációs Konferencia (1956)	A Közgyűlés által jóváhagyott nemzetközi légialkalmasság új politikájával egyező módosított szöveg, az Annex 8 III. Része a széleskörű Szabványokra lett limitálva, a légialkalmasság szintjére vonatkozó sokkal részletesebb példákkal, azon célból, hogy "a megfelelés elfogadható módjai" anyagrészként kerüljenek bedolgozásra.	1957. június. 13. 1957. október. 1. 1957. december. 1. Vagy 1960. június. 13. a repülőgép légialkalmassági bizonyítvánnyal való ellátásának alkalmazási napjától függően.

Módosítás(ok)	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva Hatályba lép Alkalmazható*
86 (5. kiadás)	A Légialkalmassági Bizottság negyedik ülése	A repülőgép navigációs fényeire vonatkozó Szabványok módosítása és az összeütközést megelőző villogófényekre vonatkozó követelmények	1961. december. 13. 1962. április. 1. 1964. december. 13.
87	Az Egyesült Államok Bizottságának javaslata az Egyezményes Légkör kiterjesztéséről	Az egyezményes légkör újrafogalmazása	1963. november. 12. 1964. április. 1. 1966. november. 12.
88	Az Annex 7. 2.számú Módosításának következménye	A légijármű meghatározásának változása, a III. Rész 2.2.3.2.b) pontjának módosítása a 3-hajtóműves repülőgépek bedolgozásása	1967. november 8. 1968. március 8. 1968. augusztus 22.
89	Az Annex 16 elfogadásának következménye	Hivatkozás beépítése az Annex 6 és Annex 16 zajbizonyítvány Szabványaira	1971. április 2. 1971. augusztus 2. 1972. január 6.
90	A Légialkalmassági Bizottság kilencedik ülése (1970)	Az 5. kiadásból a Megfelelőség Elfogadható Módjai közül kettőnek a törlése a repülőgép teljesítményre vonatkozólag	1971. december 10. 1972. április 10. 1972. december 7.
91 (6. kiadás)	A Közgyűlés tevékenysége a Kilencedik Légialkalmassági Bizottság ülése után	A légialkalmasság módosított politikájának megfelelő új szövegezés, A Megfelelés Elfogadható Módjai-nak törlése, ebből eredően a Légialkalmassági Műszaki Kézikönyvben tájékoztató anyag megjelentetése	1973. március 16. 1973. július 30. 1974. május 23.
92	A Légialkalmassági Bizottság tizedik ülése	A folyamatos légialkalmasság információinak továbbadására vonatkozó előírások megjelentetése, megjegyzés közzététele a légijárművek kibérléséről, bérbevételéről és cseréjéről.	1974. április 3. 1974. augusztus 3. 1975. február 27.
93	A Léginavigációs Bizottság Tanulmánya	Külső fényekre vonatkozó előírások módosítása, hogy összhangban legyenek az Annex 2 és Annex 6 új előírásaival.	1982. március 22. 1982. július 22. 1985. március 22.
94 (7. kiadás)	A Légialkalmassági Bizottság tizennegyedik ülése (1981)	Meghibásodások, hibák, hiányosságok és egyéb előfordulásokra vonatkozó új előírás közzététele és az Annex 5 előírásaival megegyezően az SI mértékegység bedolgozása	1982. december 6. 1983. április 6. 1983. november 24.
95 (8. kiadás)	Az Államok javaslata, a Közgyűlés és a Léginavigációs Bizottság tanulmányai, a HELIOPS Munkabizottság harmadik ülése	Az egyezményes légkör kiterjesztése, a kényszerleszállást követő mentésre és tűzvédelemre vonatkozó megerősített előírások, légialkalmassági követelmények a helikopterekre vonatkozólag	1988. március 22. 1988. július 31. 1991. március 22.

Módosítás(ok)	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
96	A Folyamatos Légialkalmasság Munkabizottsága (CAP/3) harmadik ülése	A Tervező Állam felelősségének és az ehhez tartozó meghatározásoknak a közzététele, a folyamatos légialkalmasságra vonatkozó információ-átadásban érintett felek felelősségeinek módosítása, a karbantartási információk előírásaira vonatkozó új követelmények.	1994. március 22. 1994. július 25. 1994. november 10.
97	Titkársági tanulmány, az ISAD munkacsoport közreműködésével	Tervezési jellemzők változásai, legkisebb kockázattal járó bombahely meghatározása, új 11. Fejezet beillesztése, mely a biztonsági előírásokat tartalmazza.	1997. március 12. 1997. július 21. 1997. november 6. 2000. március 12.
98 (9. kiadás)	A Folyamatos Légialkalmasság Munkacsoport(CAP/5) ötödik ülése, a Léginavigációs Bizottság tanulmányai	a) Az Emberi Tényezők alapelveinek, valamint az emberi teljesítőképesség, a karbantartás, a javítás és a Típusjogosítás új meghatározásai, b) A II. Rész beszerkesztése négy fejezetbe: Típusjogosítás, Gyártás, Légialkalmassági Bizonyítvány és Folyamatos Légialkalmasság c) A II. Rész előírásainak módosítása, hogy lehetővé váljon a típusjogosítás fogalom és a gyártásellenőrzés bevezetése, d) A III. Rész átszerkesztése az IIIA. Részbe (ugyanazok az előírások, mint amelyek az Annex 8, (nyolcadik kiadás) jelenlegi III. Részében találhatók beleértve a 97. számú helyesbítést is, kivéve az alkalmazhatóságra vonatkozókat és a kereszthivatkozásokat), és a III. B. fejezetet (új) e) A III.B. Rész (régi nevén III. Rész) előírásainak módosítása a teljesítményre, stabilitásra, vezethetőségre, és a rakterek tűzvédelmére vonatkozólag, valamint új előírások a kabinkörnyezetre, elektromos testelésre, kényszerleszállásra, elektromágneses interferenciára, jegesedés elleni védelemre és rendszer szoftverre. f) a Légialkalmassági Bizonyítványok angolra fordításának előírásai, és g) Az Emberi Tényezőkre vonatkozó új előírások.	2001. március 2. 2001. július 16. 2004. március 2.
99.	Léginavigációs Bizottság tanulmányai	a) a IIIA Rész címének módosítása, b) az alkalmazhatóság elő-írásainak módosítása az Annex 8-ban az Ajánlott Eljásáok bevezetésére történő	2003. május 20. 2003. október 13. 2006. május 20.

Módosítás(ok)	*Forrás(ok)*	*Tárgykör(ök)*	*Elfogadva* *Hatályba lép* *Alkalmazható*
		reflektálás céljából, a IIIA és a IIIB alkalmazhatóságának változtatása, hogy lehetővé váljon néhány előírás alkalmazásának lehetőségeaz olyan nagy repülőgépekre, melyek meghatározott maximális légialkalmassági bizonyítvány szerinti felszállótömeggel és utasülés kapacitással rendelkeznek. c) az Annex 8 IIIA és IIIB részében a tervezési, a gyártási és a biztonsági előírások módosítása azon repülőgépek vonatkozólag, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszállótömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több, mint 60, és amelyekre a jogosítás iránti kérelmet 2000. március 12.-én, illetőleg 2004. március 2.-án, vagy ezt követően nyújtottak be, valamint a légialkalmassági bizonyítvány szerinti 5700 kg és 45500 kg közötti maximális felszálló tömegű légijárművekre az Ajánlott Eljárások bevezetése. d) a belföldi kereskedelmi üzemelésben résztvevő repülőgépekre a biztonsági előírásokat illetően Ajánlott Eljárások bevezetése, e) azon repülőgépekre biztonsági előírások bevezetése, melyekre az Annex 6 előírja, hogy jóváhagyott pilótakabin ajtóval rendelkezzenek kiegészítő védelemként , és előírja a válaszfalak, a padlózatok és menyezetek további védelmét is, és f) az üzemeltetési információk és eljárások kiegészítő előírásai a IIIB Részben a legkisebb kockázatú bombahely azonosításának igényéről.	
100 (10. Kiadás)	A Légialkalmassági Munkacsoport első ülése	a) Az A és a B kategória új fogalmai, különböző forrásokból eredő károk, kielégítő bizonyítás a hajtóműre, a tűzállóságra, éghetetlenségre, új megjegyzés a kritikus hajtómű egységre b) a javítás definíciójának módosítása c) A II. Rész előírásainak módosítása, mely lehetővé teszi az Annex új részeinek bedolgozását, a 3. Fejezet módosítása azon korlátozó körülményekre vonatkozó előírások tisztázására, melyek között egy	2004. december 13. 2005. április 13. 2007. december 13.

Módosítás(ok)	Forrás(ok)	Tárgykör(ök)	Elfogadva Hatályba lép Alkalmazható
		sérült légijárműnek engedélyezett nem kereskedelmi célból elrepülni egy olyan repülőtérre, ahol vissza tudják állítani légialkalmasságát, valamint a 4. Fejezet átalakítása az Államok felelősségeinek világosabbá tétele céljából, d) A IIIA Rész előírásainak módosítása , melyek az alkalmazhatósággal és az üzemelési korlátozásokkal kapcsolatosak, és a teljesítés bizonyításával e) A IIIB Rész előírásainak módosítása, mely az alábbiakkal függ össze: alkalmazhatóság, üzemeltetési korlátozások, teljesítmény, stabilitás, szerkezet, tervezés és építés, hajtómű, üzemeltetési korlátozások, törésbiztosság és utaskabin biztonság, üzemeltetési környezet és Emberi Tényezők, f) A IV Rész átszerkesztése a IVA Részbe (az előírások azonosak az Annex 8 kilencedik kiadásban lévőkkel, a 99. számú módosítással bezárólag, kivéve az alkalmazhatósági záradékokat és kereszt-hivatkozásokat) és a IVB Rész (új) g) Az új V Rész bedolgozása – Kis Repülőgépek, VI Rész- Hajtóművek és VII Rész – Légcsavarok	

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

I. RÉSZ. MEGHATÁROZÁSOK

Ahol a Légijárművek Légialkalmassági Szabványaiban az alábbi fogalmak szerepelnek, azok jelentése a következő

Repülőgép (Aeroplane) Erőgép meghajtású, a levegőnél nehezebb légijármű, mely a felhajtóerőt elsősorban azon felületeire ható aerodinamikai reakciók révén nyeri, mely felületek a repülés adott körülményei között rögzített helyzetben maradnak.

Légijármű (aircraft) Bármely szerkezet, mely nem a földfelszínre ható levegő reakciójából nyeri a felhajtóerőt.

Várható üzemeltetési körülmények (Anticipated operating conditions) Mindazon körülmények, melyeket tapasztalatból ismerünk, vagy melyek reális valószínűséggel bekövetkezhetnek az adott légijármű üzemeltetési élettartama alatt figyelembe véve a légijármű üzemeltetési fajtáját, tekintettel a légkör meteorológiai állapotára, a domborzat alakzataira, a légijármű működtetésére, a személyzet hatékonyságára és minden egyéb olyan tényezőre, mely a repülés biztonságát érinti. A várható üzemeltetési körülmények nem foglalják magukba az alábbiakat:

a) olyan szélsőséges viszonyokat, melyek hatékonyan elkerülhetők az üzemeltetési eljárások betartásával, és

b) az olyan nagyon ritkán előforduló szélsőséges viszonyokat, melyekre a tapasztalat alapján szükségesnek és célszerűek tekintett körülményekre kidolgozott Szabványokat nem lehet vonatkoztatni, ezek magasabb légialkalmassági színvonalat kívánnának meg.

Megfelelő légialkalmassági követelmények (Appropriate airworthiness requirements)- A Szerződő Állam által a légijárművek, a hajtómű és a légcsavar osztályba sorolására létrehozott, vagy elfogadott, vagy más forrásból átvett részletes és átfogó légialkalmassági kódok gyűjteménye (lásd jelen Annex II. Részének 3. 2. 2. pontját).

Jóváhagyott (Approved) A Szerződő Állam a konkrét célra alkalmasnak, megfelelőnek elfogadta.

A kategória **(Category A)** A helikopterekkel kapcsolatosan jelenti azt a több-hajtóműves helikoptert, melyet a IVB Részben meghatározott hajtómű és rendszer izolálási jellemzőkkel terveztek meg és képes üzemelni a kritikus hajtómű meghibásodás előfordulása esetére előre kiszámított felszállási és leszállási adatokkal, melyek megfelelő nagyságú talajfelszínt és kielégítő teljesítmény kapacitást biztosítanak a repülés biztonságos folytatására, vagy a felszállás biztonságos megszakítására.

B kategória (Category B)A helikopterekkel kapcsolatosan jelenti azt az egyhajtóműves, vagy több-hajtóműves helikoptert, mely nem felel meg az A kategória szabványainak. A B kategóriájú helikoptereknek nincs garantált képességük a repülés biztonságos folytatására egy hajtómű meghibásodás esetén, és egy kényszerleszállást feltételezve.

Konfiguráció (a repülőgépekre vonatkozóan) (Configuration)(as applied to the aeroplane)
A repülőgép aerodinamikai tulajdonságait befolyásoló változtatható helyzetű szerkezeti elemek sajátos kombinációja, mint például a fékszárnyak és a futómű stb.

Kritikus hajtómű egység (ek) (Critical power-unit (s) Az a hajtómű (azok a hajtóművek), melynek meghibásodása a leghátrányosabb befolyást idézi elő a légijármű jellemző értékeiben a szempontként tekintetbe vett esethez viszonyítva.

Megjegyzés.- Bizonyos légijárműveken egynél több azonosan kritikus hajtómű-egység lehet. Ebben az esetben a „kritikus hajtómű-egység" kifejezés ezen kritikus hajtómű-egységek egyikét jelenti.

Tervezési leszálló tömeg (Design landing mass) a légijármű azon maximális tömege, amelyről a szerkezeti tervezés céljából feltételezték, hogy a légijármű ezzel a tömeggel száll le.

Tervezési felszálló tömeg (Design take-off mass) a légijármű azon maximális tömege, amelyről szerkezeti tervezés céljából feltételezték, hogy a felszálláshoz történő nekifutás kezdetekor a légijármű rendelkezni fog.

Tervezési gurulási tömeg (Design taxiing mass) a légijármű azon maximális tömege, amelyet a légijármű szilárdsági méretezésénél figyelembe vettek, hogy a légijármű elviselje a felszállás megkezdése előtti földi mozgása közben valószínűleg fellépő terheléseket.

Különböző forrásokból eredő károk (Discrete source damage) A repülőgép szerkezeti károsodása, mely valószínűleg a következőkből származik: madárral történő ütközés, el nem hárított (uncontained) légcsavar lapát meghibásodás, hajtómű meghibásodás, nagy energiájú forgó mechanizmus meghibásodása, vagy hasonló okok.

Hajtómű (Engine)Egy olyan egység, amelyet légijárművek meghajtására használnak, vagy szándékoznak használni. Ez minimálisan azokból a komponensekből és tartozékokból tevődik össze, melyek a működéshez és a vezérléshez (control) szükségesek, de nem tartozik közéjük a légcsavar (ha alkalmazható).

Biztonsági tényező (Factor of safety) Tervezési tényező, melyet a feltételezettnél nagyobb, esetlegesen előforduló terhelések, valamint a tervezésben és a gyártásban előforduló bizonytalanságok ellensúlyozására használnak.

Befejező megközelítési és felszállási terület (Final approach and take-off area) (FATO)
Az a körbehatárolt terület, amely felett a megközelítési manőver befejező szakasza a kilebegtetéshez, vagy a leszálláshoz véget ér, és amelytől a felszállás manővere kezdődik. Ha az 1. teljesítményosztályba tartozó helikopterek a FATO-t használják, a körbehatárolt terület magába foglalja a megszakított felszálláshoz rendelkezésre álló területet is.

Tűzbiztos (Fireproof) Az a képesség, hogy a lángok előidézte hőnek 15 perc időtartamig ellen tud állni.
Megjegyzés.- A láng mértékének jellemzőit az ISO 2685-ben lehet megtalálni.

Tűzálló (Fire resistant) Az a képesség, hogy a lángok előidézte hőnek 5 perc időtartamig ellen tud állni.
Megjegyzés.- A láng mértékének jellemzőit az ISO 2685-ben lehet megtalálni.

Helikopter (Helicopter) A levegőnél nehezebb olyan légijármű, melyet repülés közben lényegében a közel függőleges tengelyhez rögzített erőgép meghajtású egy vagy több forgószárnyra ható levegő reakcióereje tart fenn.

Emberi tényező elvei (Human Factors principles) Mindazon irányelvek, amelyeket a légiforgalmi tervezésben, vizsgáztatásban, a kiképzésben, valamint az üzemeltetés és karbantartás során alkalmaznak, és amely biztonságos csatlakozási felületet keres az ember és egyéb rendszer alkotóelemei között, figyelembe véve az emberi teljesítőképességet.

Emberi teljesítőképesség (Human performance) Azon emberi képességek és azok korlátozottságai, amelyek kihatással vannak a légiforgalmi üzemeltetés biztonságára és hatékonyságára.

Leszállási terület (Landing surface) A repülőtér felületének azon része, melyet a repülőtéri hatóság a légjárműveknek egy megadott irányba történő normál leszállására, vagy a vízen-siklásra igénybe vehetőek nyilvánított.

Határterhelések (Limit loads) A várható üzemeltetési viszonyok között feltételezhetően előforduló legnagyobb terhelések.

Terhelési tényező (Load factor) A repülőgép súlya és egy meghatározott terhelés arányszáma, az előbbit aerodinamikai erő, tehetetlenségi erő vagy földi hatások fogalmakban fejezik ki.

Karbantartás (Maintenance) Mindazon feladatok végrehajtása, melyek szükségesek a légijármű folyamatos légialkalmasságának fenntartásához, beleértve az alábbiak bármelyikét vagy kombinációját: nagyjavítás, felülvizsgálat, pótlás, hibajavítás, és a változtatás, vagy javítás végrehajtása.

1. ***Teljesítményosztályú helikopter*** (Performance Class 1 helicopter) Olyan teljesítménnyel rendelkező helikopter, amely hajtómű meghibásodás esetén képes leszállni a megszakított felszállásra kijelölt területen, vagy biztonságosan tudja folytatni repülését egy megfelelő leszálló területre.

2. ***Teljesítményosztályú helikopter*** (Performance Class 2 helicopter) Olyan teljesítménnyel rendelkező helikopter, amely hajtómű meghibásodás esetén képes biztonságosan folytatni a repülését kivéve, ha a meghibásodás a felszállás utáni egy meghatározott pont előtt fordul elő, vagy a leszállás előtt egy meghatározott pont után, mely esetekben kényszerleszállás válhat szükségessé.

3. ***Teljesítményosztályú helikopter*** (Performance Class 3 helicopter) Olyan teljesítménnyel rendelkező helikopter, melynek, ha a repülési profil bármely pontján hajtómű meghibásodás fordul elő, kényszerleszállást kell végrehajtania.

Hajtómű egység (Power unit) Egy vagy több hajtómű és a kiegészítő berendezéseiből álló rendszer, mely együttesen biztosítja a tolóerőt, függetlenül bármely egyéb hajtómű(vek) folyamatos működésétől, de nem tartalmazza a rövid idejű tolóerőt létrehozó berendezéseket.

Nyomásmagasság (Pressure altitude) Magasság fogalmakban kifejezett légköri nyomás érték, mely megfelel a nemzetközi Egyezményes Légkör adott nyomásértékének.

Érvényesség elismerése (Légialkalmassági bizonyítvány) (Rendering /a Certificate of Airworthiness/ valid) A Szerződő Állam olyan választható tevékenysége, melyet Légialkalmassági Bizonyítványai saját kiadásához alkalmazhat, ennek során más Szerződő Állam által kiadott Légialkalmassági Bizonyítványt a sajátjával egyenértékűnek ismer el.

Javítás (Repair) Egy repülő szerkezet légialkalmassági állapotra történő helyreállítása, ahogy azt a megfelelő légialkalmassági követelmények előírják.

Kielégítő bizonyítás (Satisfactory evidence) Dokumentációk, vagy tevékenységek olyan sora, melyet a Szerződő Állam kielégítőnek fogad el a légialkalmassági követelményeknek való megfelelés bemutatására.

Egyezményes Légkör (Standard atmosphere) Olyan légkör, mely az alábbi jellemzőkkel határozható meg:
a) a levegő tökéletesen száraz gáz,
b) a fizikai állandók a következők:

- tengerszinten mért közepes molekulasúly:
  $M_O = 28.964420 \times 10^{-3}$ kg mol^{-1}
- légköri nyomás a tengerszinten:
  $P_O = 1013.250$ hPa
- tengerszinten mért hőmérséklet:
  $t_O = 15^oC$
  $T_O = 288.15$ K
- tengerszinten mért légsűrűség:
  $p_O = 1.2250$ kg m^{-3}
- fagyáspont hőmérséklete:
  $T_i = 273.15$ K
- univerzális gázállandó:
  $R^* = 8.31432$ JK^{-1}mol^{-1}

c) A hőmérsékleti gradiensek a következők:

Geopotenciális magasság (km) -tól	- ig	Hőmérsékleti gradiens (Kelvin/szabvány geopotenciális kilométer)
-5. 0	11. 0	-6. 5
11. 0	20. 0	0. 0
20. 0	32. 0	+1. 0
32. 0	47. 0	+2. 8
47. 0	51. 0	0. 0
51. 0	71. 0	-2. 8
71. 0	80. 0	-2. 0

. Megjegyzés 1.- A szabvány geopotenciális méter értéke 9. 80665 m^2 s^{-2} *.*

Megjegyzés 2.- A változók közötti összefüggéseket, valamint a hőmérséklet, a nyomás, a sűrűség és a geopotenciális értékek táblázatait a DOC 7488 kiadvány tartalmazza.

Megjegyzés 3. – A DOC 7488 kiadvány ugyancsak tartalmazza a fajsúly, a dinamikai viszkozitási tényező, a kinematikai viszkozitási tényező és a hangsebesség értékeit különböző magasságokra.

Tervező Állam (State of Design) A típustervezésért felelős szervezet felett álló, illetékes Állam.

Gyártó Állam (State of Manufacture) A légijármű végső összeépítéséért felelős szervezet felett álló, illetékes Állam.

Lajstromozó Állam (State of Registry) Az az Állam, amelyiknek lajstromába a légijárművet bevezették.

Megjegyzés. - Abban az esetben, ha egy légijárművet lajstromba vevő nemzetközi üzemeltetési szervezet nem azonos a nemzeti alapszervezettel, akkor a szervezetet létrehozó Állam együttesen és egyetemlegesen felelős magára vállalni mindazon kötelezettségeket, melyek a Chicago-i Egyezmény értelmében a Lajstromozó Államra vonatkoznak. Ilyen tekintetben lásd a Tanács 1967.december 14-i Határozatát a Nemzetközi Üzemeltetési Szervezetek által működtetett légijárművek lajstromozása és felségjellel való ellátása című anyagban, mely a DOC 9587 számú kiadványban (A Nemzetközi Légiközlekedés Gazdasági Szabályozására vonatkozó Irányelvek és Tájékoztató Anyagok) található meg.

Felszállási felület (Take-off surface) A repülőtér felületének azon része, melyről a repülőtéri hatóság kinyilvánította, hogy egy adott irányba felszálló légijármű számára igénybe vehető normál szárazföldi vagy vízen történő nekifutásra.

Típusbizonyítvány (Type Certificate) Egy Szerződő Állam által kibocsátott azon dokumentum, mely pontosan meghatározza a légijármű-típus konstrukcióját és bizonyítja, hogy ez a konstrukció kielégíti az Állam megfelelő légialkalmassági követelményeit.

Mértékadó végső terhelés (Ultimate load) A terhelési határérték és a megfelelő biztonsági tényező szorzata.

II. RÉSZ. A LÉGIALKALMASSÁG MEGADÁSA ÉS A FOLYAMATOS LÉGIALKALMASSÁG ELJÁRÁSAI

Megjegyzés.- Annak ellenére, hogy a Nemzetközi Polgári Repülésről szóló Egyezmény a lajstromozó államok számára bizonyos funkciók ellátását meghatározta, melyeket ezek az Államok jogosultak vagy kötelesek gyakorolni, az esettől függően, a Közgyűlés A23-13 számú Határozatában azonban elismerte, hogy előfordulhat, hogy a lajstromozó Állam esetleg képtelen lesz kötelességeit megfelelően teljesíteni olyan esetekben, amikor egy másik Állam üzemeltetője a légijárművet bérli, haszonbérbe veszi vagy egymás között cseréli – különösen, ha ezt személyzet nélkül teszi. Elismerte továbbá azt, hogy az Egyezmény nem megfelelően határozza meg az Üzemeltető Államának jogait és kötelességeit mindaddig, amíg az Egyezmény 83. Cikkelye életbe nem lép. Ennek megfelelően a Tanács hangsúlyozza, hogy ha a fent említett esetekben a Lajstromozó Állam az Egyezmény által ráruházott összes funkció teljesítésére nem képes, akkor azokat a funkciókat, amelyeket az Üzemeltető Állama sokkal kielégítőbben tud teljesíteni, ruházza át az Üzemeltető Államára feltéve, hogy az utóbbi ezt elfogadja. Megállapodtak abban, hogy az Egyezmény 38. Cikkelyének érvénybe lépésétől függően a további lépések megtétele csupán a gyakorlati könnyítések tárgyát fogja képezni, és nem lesz hatással a Chicago-i Egyezmény azon előírásaira, melyek a Lajstromozó Állam, vagy bármely harmadik Állam kötelmeire vonatkoznak. Dacára annak, hogy 83. Cikkely 1997. június 20.-án életbe lépett, az ilyen átruházási egyezmények hatással lesznek azon Szerződő Államokra, amelyek ratifikálták a vonatkozó Protocol-t (DOC 9318), miután teljesítették a 83. Cikkelyben meghatározott feltételeket

1. FEJEZET. A TÍPUSALKALMASSÁG BIZONYITÁSA

1.1. Alkalmazhatóság

Ezen fejezet Szabványait minden olyan légijármű típusra alkalmazni kell, amelyre minősítési kérelmet nyújtottak be a Szerződő Államhoz 1960. június 13.-án, vagy azt követően, kivéve, hogy ezen fejezet 1.4 pontjának előírásait csak arra a légijármű típusra kell alkalmazni, amelyre a Típusalkalmassági Bizonyítvány iránti kérelmet már benyújtották a Tervező Államhoz 2004. március 2.-án, vagy ezt követően.

Megjegyzés.- Ha a légijárművet szériagyártásba kívánják venni, a tipusalkalmassági bizonyítvány iránti kérelmet rendszerint a légijármű gyártója nyújtja be.

1. 2. A megfelelő légialkalmassági követelmények tervezési szempontjai

1. 2. 1. A megfelelő légialkalmassági követelmények tervezési szempontjainak,- melyeket a Szerződő Állam a légijármű osztályára vonatkozólag a Típusalkalmassági Bizonyítvány kiállításában felhasznál, vagy az ilyen típus-alkalmassági bizonyítványban történő bármilyen változtatáskor,- olyanoknak kell lenniük, hogy azok megfeleljenek ezen Annex II. Részében foglalt Szabványoknak, és, ahol alkalmazható, ezen Annex III, IV, V, VI, vagy VII Részeinek.

1. 2. 2. A tervezésnek nem lehetnek olyan jellemzői, vagy sajátosságai, melyek a biztonság rovására mennének a várható üzemeltetési feltételek között.

1. 2. 3. Ha egy speciális légijármű tervezési sajátosságai eltérnek a megfelelő légialkalmassági követelmények tervezési szempontjaitól, vagy a III, IV, V, VI, vagy VII. Részek Szabványai nem alkalmazhatóak, a Szerződő Államnak olyan megfelelő követelményeket kell támasztani, melyek ezekkel legalább azonos biztonsági szintet nyújtanak.

1. 2. 4. Ha egy speciális légijármű tervezési sajátosságai eltérnek a megfelelő légialkalmassági követelmények tervezési szempontjai bármelyikétől, vagy a III, IV, V, VI, vagy a VII. Részek Szabványai nem kielégítőek, a Szerződő Államnak további követelményeket kell tekintetbe venni ahhoz, hogy legalább az azonos biztonsági szint elérhető legyen.

Megjegyzés.- Az ICAO kiadta a Légialkalmassági Kézikönyvet (DOC9760), mely tartalmazza a tájékoztató anyagot.

1. 3. Bizonyítás a megfelelő légialkalmassági követelmények tervezési szempontjainak teljesítéséről.

1. 3. 1. Kell lennie egy jóváhagyott tervezési anyagnak, mely tartalmazza mindazon rajzokat, specifikációkat, jegyzőkönyveket és bizonyítéki anyagokat, melyek szükségesek a légijármű tervezésének pontos megismertetéséhez és annak bizonyításához, hogy azok a megfelelő légialkalmassági követelmények tervezési szempontjaival egyezőek.

Megjegyzés.- A tervezés jóváhagyását néhány Államban megkönnyítik azáltal, hogy a tervező szervezetet hagyják jóvá.

1. 3. 2. A légijárművet olyan mértékű felülvizsgálatoknak, földi ellenőrzéseknek és próbarepüléseknek kell alávetni, melyeket az Állam szükségesnek tart annak bizonyítására, hogy a légijármű a megfelelő légialkalmassági követelmények tervezési szempontjainak megfelel.

1. 3. 3.Azon felül, hogy megállapítják egy légijárműről azt, hogy kielégíti a megfelelő légialkalmassági követelmények tervezési szempontjait, a Szerződő Államoknak más egyéb lépeseket is meg kell tenniük, amelyeket szükségesnek tartanak annak biztosítására, hogy a tervezés jóváhagyását megakadályozzák, ha ismert, vagy feltételezhető, hogy a légijármű veszélyes jellemzőkkel rendelkezik, melyekre nem fordítottak kifejezett figyelmet a követelményekhez képest.

1. 3. 4. A Szerződő Államnak, mely jóváhagyást ad ki módosítás, javítás, vagy cserealkatrész tervezésére, úgy kell ezt megtennie, hogy a légijármű kielégítő bizonyítás alapján azon légialkalmassági követelményekkel összhangban van, melyeket a Típusalkalmassági Bizonyítvány kiadásához, annak módosításaihoz, vagy későbbi követelményeihez alkalmaznak, ha az Állam ezt meghatározta.

Megjegyzés 1.-Míg egy javítás elvégezhető és úgy látszik, hogy megfelel mindazon követelmény sorozatoknak, melyeket a légijármű eredeti Típusalkalmassági Bizonyítványához választottak ki, néhány javításnál be kell mutatni, hogy a légialkalmassági bizonyítvány megadásának követelményei közül a legutoljára kiadott alkalmazható követelményeknek megfelel. Ilyen esetekben, az Államok kiadhatnak egy javítás jóváhagyást az adott légijármű típus legfrissebben közzétett követelményeire alapozva.

Megjegyzés 2.- Egy légijármű módosításának tervezésére a jóváhagyást bizonyos Államokban kiegészítő Típusalkalmassági Bizonyítvány, vagy módosított Típusalkalmassági Bizonyítvány kiadásával juttatják érvényre.

1. 4. Típusalkalmassági Bizonyítvány

1. 4. 1. A Tervező Államnak, miután kielégítő bizonyosságot szerzett arról, hogy a légijármű típus a vonatkozó légialkalmassági követelmények tervezési szempontjait kielégíti, Típusalkalmassági Bizonyítványt kell kiadnia, melyben rögzíti a légijármű típus tervezését és a tervezés jóváhagyását.

Megjegyzés.- Néhány Szerződő Állam hajtóművekre és légcsavarokra is ad ki Típusalkalmassági Bizonyítványt.

1. 4. 2. Ha egy Szerződő Állam, mely nem azonos a Tervező Állammal, egy légijármű típusra Típusalkalmassági Bizonyítványt ad ki, ennek során úgy kell eljárnia kielégítő bizonyítékok alapján, hogy a légijármű típus megfeleljen a vonatkozó légialkalmassági követelmények tervezési szempontjainak.

2. FEJEZET GYÁRTÁS

2. 1. Alkalmazhatóság

Minden légijárműre alkalmazni kell a jelen fejezetben ismertetett Szabványokat.

2. 2. Gyártás

2. 2. 1. Légijármű gyártás

A Gyártó Államnak biztosítania kell azt, hogy minden egyes légijármű, beleértve az alvállalkozók által gyártott alkatrészeket is, megfelel a jóváhagyott tervezésnek.

2. 2. 2. Alkatrészgyártás

A Szerződő Államnak, felelős lévén az alkatrészek legyártásáért, melyeket a II. Rész 1. 3. 4. pontjában hivatkozott tervezési jóváhagyás alapján állítottak elő, biztosítania kell, hogy az alkatrészek megfelelnek a jóváhagyott tervezésnek.

2. 2. 3. Gyártás ellenőrzés

Egy légijármű, vagy légijármű alkatrész gyártásának jóváhagyásakor a Szerződő Államnak biztosítania kell azt, hogy ez ellenőrzött módon történik, beleértve a minőségügyi rendszer felhasználását oly módon, hogy az építés és az összeszerelés kielégítő legyen.

Megjegyzés.- A gyártás felügyeletét bizonyos Államokban megkönnyítik azáltal, hogy a gyártó szervezetet hagyják jóvá.

2. 2. 4. Nyomon követhetőség

Olyan nyilvántartást kell fenntartani, hogy a légijármű, valamint alkatrészeinek azonosítása a jóváhagyott tervezés alapján, és a gyártás során megvalósítható legyen.

3. FEJEZET. LÉGIALKALMASSÁGI BIZONYÍTVÁNY

Megjegyzés.- Ezen Szabványokban szereplő Légialkalmassági Bizonyítvány azonos az Egyezmény 31. Cikkelyében említett Légialkalmassági Bizonyítvánnyal.

3. 1. Alkalmazhatóság

Jelen fejezet Szabványait minden légijárműre alkalmazni kell, kivéve a 3. 3. és a 3. 4. pontokat, melyek nem alkalmazhatóak az összes légijárműre, csak azokra a típusokra, melyeknek prototípusát az illetékes nemzeti hatósághoz bizonyítvány kiadás céljából 1960. június 13. előtt nyújtottak be.

3. 2. A Légialkalmassági Bizonyítvány kiadása és folyamatos érvényessége

3. 2. 1. A légialkalmassági Bizonyítványt a Szerződő Államnak kell kiadnia kielégítő bizonyítékok alapján arra vonatkozólag, hogy a légijármű a megfelelő légialkalmassági követelmények tervezési szempontjait kielégíti.

3. 2. 2. A Szerződő Állam ne bocsásson ki, és ne fogadjon el érvényesnek olyan Légialkalmassági Bizonyítványt, melyet a Nemzetközi Polgári Repülésről szóló Egyezmény 33. Cikkelye alapján szándékoznak elismertetni feltéve, hogy a légijármű bizonyítottan megfelel jelen Annex alkalmazható Szabványainak, kielégítve ezzel a megfelelő légialkalmassági követelményeket.

3. 2. 3. A Légialkalmassági Bizonyítványt meg kell újítani, vagy érvényesnek kell tekinteni a Lajstromozó Állam törvényeinek megfelelően, feltéve, ha a Lajstromozó Állam előírja, hogy a légialkalmasság folyamatossága fenntartását a légijármű meghatározott időszakonként ismétlődő felülvizsgálatai során állapítsák meg, tekintetbe véve az eltelt időt, a működés típusát, vagy pedig olyan ellenőrzési rendszer útján, melyet az Állam jóváhagyott, és amely legalább azonos eredményre vezet.

3. 2. 4. Ha egy Szerződő Állam által kibocsátott érvényes Légialkalmassági Bizonyítvánnyal rendelkező légijárművet lajstromba vesz egy másik Szerződő Állam, az új Lajstromozó Állam, amikor kiadja saját Légialkalmassági Bizonyítványát, az előbbi Légialkalmassági Bizonyítványt kielégítően bizonyítottnak tekintheti akár egészében, akár részben, és azt, hogy a légijármű megfelel ezen Annex alkalmazható Szabványainak a megfelelő légialkalmassági követelményekkel való egyezés által.

Megjegyzés.- Néhány Szerződő Állam megkönnyítheti a légijárműnek egy másik Állam lajstromába vételét oly módon, hogy egy „Légialkalmassági Export Bizonyítvány”-t, vagy hasonló megjelölésű dokumentumot bocsát ki. Annak dacára, hogy ez repülési célra nem alkalmas, az ilyen dokumentum az exportáló Állam részéről megerősítést nyújt a légijármű légialkalmassági állapotának legutóbbi kielégítő felülvizsgálatáról. A „Légialkalmassági Export Bizonyítvány” kiadásához tájékoztató anyag a Légialkalmassági Kézikönyvben található (DOC 9760).

3. 2. 5. Ha egy Lajstromozó Állam érvényesnek tekint egy másik Szerződő Állam által kiadott Légialkalmassági Bizonyítványt, alternatívaként saját Légialkalmassági Bizonyítványának kiadásához, meg kell állapítania az érvényességet az előző Légialkalmassági Bizonyítványról megfelelő végrehajtandó hatósági jogosítás útján, elfogadva azt az utóbbival azonos értékűnek.
A hatósági jogosítás érvényessége nem lehet hosszabb idejű, mint az érvényesnek tekintett Légialkalmassági Bizonyítvány érvényességi időtartama. A Lajstromozó Államnak biztosítania kell azt, hogy a légijármű folyamatos légialkalmassága a 3. 2. 3. pont szerint legyen meghatározva.

3. 3. A légialkalmassági Bizonyítvány szabvány formája

3. 3. 1. A Légialkalmassági Bizonyítványnak tartalmaznia kell az 1. számú ábrán szereplő összes információt és általában ehhez hasonlónak kell lennie.

3. 3. 2. Ha a Légialkalmassági Bizonyítványokat az angoltól eltérő nyelven állítják ki, akkor ezeknek az angol nyelvű fordítást is tartalmazniuk kell.

Megjegyzés.- A Nemzetközi Polgári Repülésről szóló Egyezmény 29. Cikkelye előírja, hogy a Légialkalmassági Bizonyítványnak minden egyes olyan légijármű fedélzetén ott kell lennie, amely részt vesz a nemzetközi forgalomban.

3. 4. A légijármű korlátai és információk

Minden egyes légijárművet el kell látni repülési kézikönyvvel, feliratokkal, vagy egyéb dokumentációval, melyben közzéteszik a jóváhagyott korlátokat, melyeken belül a légijárművet a vonatkozó légialkalmassági követelmények szerint légialkalmasnak tekintik, és további olyan utasításokkal és információval is, melyek a légijármű biztonságos üzemeltetéséhez szükségesek.

3. 5. A légialkalmasság ideiglenes megszűnése

Ha a légijármű légialkalmasságának fenntartásában bármilyen olyan hiba fordul elő, melyet a vonatkozó légialkalmassági követelményekben körülhatároltak, a légijárművet üzemeltetésre alkalmatlannak kell tekinteni mindaddig, amíg a légialkalmassági feltételeket helyre nem állították.

3. 6. A légijármű meghibásodása

3. 6. 1. Ha egy légijármű meghibásodást szenved, a Lajstromozó Államnak kell elbírálnia, vajon a meghibásodás olyan természetű-e, hogy a légijármű a vonatkozó légialkalmassági követelményekben leírtak szerint a továbbiakban nem légialkalmas.

3. 6. 2. Ha meghibásodás gyanúja merül fel, vagy ilyenről meggyőződtek olyan esetben, amikor a légijármű egy másik Szerződő Állam területén tartózkodik, a másik Szerződő Állam hatóságait fel kell jogosítani arra, hogy megakadályozzák a légijármű repülésének folytatását azzal a feltétellel, hogy erről azonnal értesítik a Lajstromozó Államot, részletesen megadva számára az összes információt annak érdekében, hogy az a 3. 6. 1. pontnak megfelelő döntését ki tudja alakítani.

3. 6. 3. Ha a Lajstromozó Állam úgy ítéli meg, hogy a bekövetkezett meghibásodás olyan természetű, hogy a légijármű a továbbiakban nem légialkalmas, meg kell tiltania a légijárműnek repülése folytatását addig, amíg a légialkalmasság feltételeit helyre nem állították. Ámbár, a Lajstromozó Állam, kivételes körülmények között, előírhat speciális korlátozó feltételeket, melyek alapján a légijárműnek engedélyezik a nem kereskedelmi célú repülést egy olyan repülőtérre, ahol vissza fogják állítani a légijármű légialkalmasságát. A speciális korlátozó feltételek előírásakor a Lajstromozó Államnak figyelembe kell vennie a Szerződő Állam által eredetileg javasolt összes korlátozást, a 3. 6. 2. pontnak megfelelően, és meg kell akadályoznia a légijárművet repülése folytatásában. A Szerződő Államnak engedélyeznie kell az ilyen repülést, vagy repüléseket az előírt határokon belül.

3. 6. 4. Ha a Lajstromozó Állam úgy ítéli meg, hogy a meghibásodás olyan természetű, melynek fennállása mellett a légijármű légialkalmassága még mindig fennáll, a légijárműnek engedélyezni fogják a repülés folytatását.

*	Lajstromozó Állam Kibocsátó Hatóság	*
LÉGIALKALMASSÁGI BIZONYÍTVÁNY		
1. A légijármű felségjele és lajstromjele …………………… …………………….	2. A gyártó cég neve és a légijármű gyári típusjelzése ** …………………………………… ……………………………………. .	3. A légijármű gyártási száma ……………………… ………………………
4. Kategóriák és/vagy üzemelés ***		
5. Ezt a Légialkalmassági Bizonyítványt a Nemzetközi Polgári Repülésről szóló 1944. évi december 7.-i Egyezmény és a +……………………… rendelkezései szerint a fenti légijármű részére bocsátottuk ki, amely légijárművet alkalmasnak kell tekinteni, ha az előzőekben említett és a vonatkozó üzemeltetési korlátozásokkal összhangban üzemeltetik és tartják karban. Kiadás dátuma: ……………………………. Aláírás:…………………………………… + = Írja be a hivatkozást a megfelelő légialkalmassági kódra.		
6. ****		

* = A Lajstromozó Állam tölti ki

** = A légijármű gyári jelzésének tartalmaznia kell a légijármű típusát és modelljét.

*** = Ez a hely rendszerint a jogosítás alapjának feltüntetésére szolgál, azaz a jogosítás kódjának, melynek az adott légijármű megfelel és/vagy annak engedélyezett üzemeltetési kategóriájának, mint pl. kereskedelmi légiszállítás, munkarepülés, vagy magántermészetű.

**** = Ezt a rovatot vagy az érvényesség időszakos megújítására kell felhasználni (megadva az érvényesség lejártának a határidejét), vagy azon nyilatkozat céljára, hogy a légijárművet folyamatos felülvizsgálati rendszer keretében tartják karban.

1. számú ábra

4. FEJEZET. A LÉGIJÁRMŰ FOLYAMATOS LÉGIALKALMASSÁGA

4. 1. Alkalmazhatóság

Jelen fejezet Szabványait minden légijárműre alkalmazni kell.

4. 2. A Szerződő Államok felelősségei a folyamatos légialkalmasság tekintetében

Megjegyzés.- A folyamatos légialkalmasság követelményeire tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található.

4. 2. 1. Tervező Állam

4. 2. 1. 1. Egy légijármű Tervező Államának:

a) közölnie kell minden egyes Szerződő Állammal, - mely a 4. 2. 3. a) pont szerint értesítette a Tervező Államot arról, hogy a légijárművet saját lajstromába felvette, és kérésre bármely más Szerződő Állammal,- bármilyen általánosan alkalmazható információt, melyet szükségesnek ítéltek meg a légijármű folyamatos légialkalmassága szempontjából, beleértve annak hajtóműveit és légcsavarjait (ahol alkalmazható), valamint a légijármű biztonságos üzemeltetésére vonatkozó információkat (a továbbiakban: a folyamatos légialkalmasság kötelező információi), valamint tájékoztatást a Típusalkalmassági Bizonyítvány felfüggesztéséről, vagy hatályon kívül helyezéséről.

Megjegyzés.- 1. A „folyamatos légialkalmasság kötelező információi” fogalom szándék szerint magába foglalja a módosítás, az alkatrész cserék kötelező követelményeit, vagy a légijármű felülvizsgálatát és az üzemeltetési korlátozások és eljárások módosítását. Az információk közül ez olyan jellegű, melyet a Szerződő Államok légialkalmasság direktívái formában adnak ki.

Megjegyzés.- 2. Az Üzemeltetésben lévő Légijárművek Folyamatos Légialkalmassága (95. számú Körlevél) biztosítja azokat a szükséges információkat, melyek elősegítik a Szerződő Államoknak más Szerződő Államok illetékes hatóságaival való kapcsolatfelvételét az üzemeltetésben lévő légijárművek folyamatos légialkalmasságának fenntartása céljából.

b) gondoskodnia kell arról, hogy ha repülőgépek esetében a légialkalmassági szerinti maximális felszállótömeg meghaladja az 5700 kg-ot, és helikopterek esetében a 3175 kg-ot, fennálljon egy rendszer azon célból, hogy:

i) megkapják a 4. 2. 3. f) pont szerint benyújtott információkat,

ii) döntést hozzanak, ha és amikor a légialkalmassággal kapcsolatosan szabályozási művelet szükséges,

iii) kidolgozzák a szükséges légialkalmassággal kapcsolatos szabályozási műveleteket, és

iv) közzétegyék a szabályozási műveletek információit, melyek magukba foglalják a 4. 2. 1. 1. a) pontban előírtakat is.

c) gondoskodni kell arról, hogy repülőgépek esetében 5700 kg légialkalmassági szerinti maximális felszállótömeg felett legyen egy folyamatos integrált szerkezeti program, mely biztosítja a repülőgép légialkalmasságát. A programnak magába kell foglalnia speciális információkat a korrózió megelőzés és az ellenőrzés tárgyában, és

d) amikor egy légijármű Gyártó Állama nem azonos a Tervező Állammal, biztosítania kell egy mindkét Állam részéről elfogadható egyezmény meglétét annak megvalósítása érdekében, hogy a gyártó szervezet együttműködjön a típus tervezéséért felelős szervezettel a légijármű üzemeltetési tapasztalataiból nyert információk értékelésében.

4. 2. 1. 2. Ha egy hajtómű, vagy légcsavar Tervező Állama nem azonos a légijármű Tervező Államával, valamennyi, a folyamatos légialkalmasságra vonatkozó információt el kell juttatni a légijármű Tervező Államának, és kérésre bármelyik Szerződő Államnak.

4. 2. 2. Gyártó Állam

Egy légijármű Gyártó Államának, ha nem azonos a Tervező Állammal, biztosítania kell egy, mindkét Állam számára elfogadható egyezmény meglétét annak érdekében, hogy a gyártó szervezet együttműködjön a típus tervezéséért felelős szervezettel a légijármű üzemeltetési tapasztalataiból szerzett információk értékelésében.

4. 2. 3. Lajstromozó Állam

A Lajstromozó Államnak:

a) amikor első alkalommal vesz lajstromba egy adott típusú légijárművet, melynek nem ő a Tervező Állama, és Légialkalmassági Bizonyítványt ad ki vagy megújít jelen rész 3. 2. pontjának megfelelően, tájékoztatnia kell a Tervező Államot arról, hogy egy ilyen légijárművet saját lajstromába vett,

b) meg kell állapítani a légijármű folyamatos légialkalmasságát az erre a légijárműre vonatkozó, érvényben lévő megfelelő légialkalmassági követelményeket figyelembe véve,

c) ki kell dolgoznia, vagy el kell fogadnia követelményeket a légijármű teljes élettartama alatti folyamatos légialkalmasság biztosítására, ide tartoznak azok a követelmények, melyek biztosítják, hogy a légijármű:

i) módosítás, javítás, vagy cserealkatrész felépítését követően folyamatosan megfeleljen az előírt légialkalmassági követelményeknek, és

ii) légialkalmas állapota fenn legyen tartva, és ez összhangban legyen az Annex 6 karbantartási követelményeivel, valamint, ahol alkalmazható, jelen Annex III., IV, és V. Részével,

d) A Tervező Államtól érkező, a folyamatos légialkalmasság kötelező információinak kézhezvétele után fogadja el a kötelező információkat közvetlenül, vagy értékelje a kapott információkat és tegye meg a megfelelő intézkedéseket,

e) biztosítsa, hogy a folyamatos légialkalmasság összes kötelező információit eljuttatja a Tervező Államhoz, melyek Lajstromozó Államként nála keletkeztek erről a légijárműről.

f) gondoskodjon arról, hogy mindazon repülőgépekre vonatkozólag, melyeknek a légialkalmassági szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, vagy helikopterek esetében a 3175 kg-ot, legyen egy rendszer, amiből a meghibásodásokra, helytelen működésre, hiányosságokra, és egyéb eseményekre vonatkozó információk, melyek a légijármű folyamatos légialkalmasságát hátrányosan befolyásolják, vagy befolyásolhatják, továbbításra kerüljenek az adott légijármű típustervezéséért felelős szervezetnek.

Megjegyzés.- A „típustervezésért felelős szervezet” értelmezéséhez tájékoztató anyagot a Légialkalmassági Kézikönyv (DOC 9760) tartalmaz.

4. 2. 4. Minden Szerződő Állam

Azon repülőgépek esetében, melyeknek a légialkalmassági szerinti maximális felszállótömege meghaladja az 5700 kg-ot, valamint helikopterek esetében a 3175 kg–ot, a szolgálati információknak egy olyan rendszerét kell létrehozni, amelyben az üzemeltetők, a típustervezésért felelős szervezetek és a karbantartó szervezetek jelentenek a légialkalmasságot meghatározó hatóságnak. Ezen információ jelentésének eljárásait szintén ki kell alakítani.

4. 3. A légijármű folyamatos légialkalmasságára vonatkozó információk

4. 3. 1. Ha a Szerződő Állam először vesz lajstromába egy bizonyos típusú légijárművet, amelynek nem ő a Tervező Állama és erre Légialkalmassági Bizonyítványt bocsát ki, vagy érvényesnek ismer el jelen fejezet 3. 2. 2. pontjával összhangban, akkor értesítenie kell a Tervező Államot arról, hogy ezen légijármű bevezetése a saját lajstromába megtörtént.

4. 3. 2. A légijármű Tervező Államának bármilyen általánosan felhasználható információt közölnie kell, melyet a légijármű folyamatos légialkalmaságához és a légijármű biztonságos üzemeltetéséhez szükségesnek találtak (a továbbiakban: a folyamatos légialkalmasság kötelező információi) az alábbiak szerint:

a) minden olyan Szerződő Államnak, amely a 4. 3. 1 pontnak megfelelően tájékoztatta a Tervező Államot arról, hogy a légijárművet saját lajstromába vette, és
b) kérésre minden más Szerződő Államnak.

1. *sz. Megjegyzés.- A 4. 3 pontban a "folyamatos légialkalmasság kötelező információi" fogalom szándék szerint magába foglalja a módosításra, alkatrészcserére, vagy a légijármű felülvizsgálatára és az üzemeltetés korlátozásaira és eljárásokra vonatkozó kötelező követelményeket. Az információk között ez olyan jellegű, melyet a Szerződő Államnak légialkalmassági irányelvek formájában kell kiadnia.*

2.sz. Megjegyzés.- A 95 számú Körlevél, melynek tárgya az Üzemeltetésben Lévő Légijárművek Folyamatos Légialkalmassága, biztosítja a szükséges információkat, ezzel segítve a Szerződő Államokat abban, hogy kapcsolatot létesítsenek más Szerződő Államok illetékes hatóságaival az üzemeltetésben lévő légijárművek folyamatos légialkalmasságának fenntartása céljából.

4. 3. 3. A Lajstromozó Államnak, ha megkapta a Tervező Államtól a folyamatos légialkalmasság kötelező információit, adoptálnia kell a kötelező információkat akár közvetlenül, akár értékelve azokat,és végre kell hajtania a megfelelő szabályozási műveleteket.

4. 3. 4. Bármely Szerződő Államnak, amely saját lajstromába vett egy olyan légijárművet, melynél a Tervező Állam nem azonos a Szerződő Állammal, és jelen fejezet 3. 2 pontjának megfelelően Légialkalmassági Bizonyítványt bocsát ki, vagy érvényesnek fogad el a légijárműre, biztosítania kell, hogy a Tervező Állam a folyamatos légialkalmasság összes kötelező információját megkapja, melyek Lajstromozó Államként nála keletkeztek erről a légijárműről.

4. 3. 5. A Lajstromozó Államnak biztosítania kell, hogy az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépekre és 3180 kg feletti maximális felszálló tömegű helikopterekre vonatkozólag rendelkezzen egy olyan rendszerrel, ahol információk találhatók a meghibásodásokról, a működési zavarokról, hibákról és egyéb olyan előfordulásokról, melyek káros hatást gyakorolnak vagy gyakorolhatnak a légijármű folyamatos légialkalmasságára és ezen információk közlésre kerüljenek a légijármű-típust tervező felelős szervezet felé.

Megjegyzés.- A "Típustervezésért felelős szervezet" értelmezéséhez tájékoztató anyag a Légialkalmassági Kézikönyv (DOC 9760) II. kötetének A Részében található.

4. 3. 6. A Tervező Államnak gondoskodni kell arról, hogy az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépekre és 3180 kg feletti maximális felszálló tömegű helikopterekre vonatkozólag legyen egy olyan rendszer, melyben:
a) megkapja a 4. 3. 5 pontnak megfelelő beérkezett információkat,
b) eldönti, hogy szükséges-e, és mikor a légialkalmasságra vonatkozó szabályozási művelet,
c) kidolgozza a légialkalmasságra vonatkozó szükséges szabályozási műveleteket, és
d) kiadja a 4. 3. 2 pontban előírt információkat a fenti szabályozási műveletekről.

4. 3. 7. A Tervező Államnak gondoskodnia kell arról, hogy az 5700 kg maximális felszálló tömeg feletti tömegre jogosított repülőgépek tekintetében legyen egy folyamatos szerkezeti teljesség program, mely biztosítja a repülőgép légialkalmasságát. A programnak magába kell foglalnia a korrózióvédelemre és ellenőrzésre vonatkozó speciális információkat.

4. 3. 8. Minden egyes Szerződő Államnak az 5700 kg feletti maximális felszálló tömegre jogosított repülőgépek esetében, és a 3180 kg feletti maximális felszálló tömegre jogosított helikopterek esetében ki kell dolgoznia azokat a szolgálati tájékoztató közleményfajtákat, melyekkel az üzemeltetők, a típus tervezéséért felelős szervezetek és a karbantartó szervezetek jelentést küldenek a saját légügyi hatóságuk részére. Az ilyen tájékoztatások jelentési eljárásait is ki kell dolgozni.

4. 3. 9. Ha a légijármű Gyártó Állama nem azonos a Tervező Állammal, akkor mindkét állam részéről elfogadható egyezményt kell kötni annak biztosítására, hogy a gyártó szervezet együttműködjön a típus tervezéséért felelős szervezettel a légijármű üzemeltetési tapasztalataiból nyert információk értékelésében.

III. RÉSZ NAGY REPÜLŐGÉPEK

IIIA. RÉSZ. 5700 KG FELETTI REPÜLŐGÉPEK, AMELYEKRE A JOGOSÍTÁSI KÉRELMET 1960. JÚNIUS 13.-ÁN VAGY EZT KÖVETŐEN, DE 2004. MÁRCIUS 2.-A ELŐTT NYÚJTOTTÁK BE

Megjegyzés – A IIIA Rész előírásai megegyeznek az Annex 8 III. Részében leírtakkal (8. Kiadás, beleértve a 97. számú Módosítást is) kivéve a módosított alkalmazhatósági megkötéseket és a kereszthivatkozásokat.

1. FEJEZET. ÁLTALÁNOS RÉSZ

1.1. Alkalmazhatóság

1. 1. 1. A 8.4. pontban foglaltak kivételével a IIIA Rész Szabványait kell alkalmazni az 1.1.3. pontban szereplő összes olyan repülőgéptípusra , melynek prototípusát a légialkalmasság megállapítása céljából a megfelelő nemzeti hatóságokhoz 1960. június 13.-án vagy ezt követően, de 2004. március 2.-a előtt nyújtották be.

1. 1. 2. A IIIA Rész 8.4. pontjában meghatározott Szabványok alkalmazhatók az 1.1.3. pontban meghatározott összes olyan repülőgéptípusra, amelynek prototípusát a megfelelő nemzeti hatóságokhoz légialkalmasság megállapítása céljából 1985. március 22.-én vagy ezt követően, de 2004. március 2.-a előtt nyújtották be.

1. 1. 3. Azokat a Szabványokat és Ajánlott Eljárásokat kivéve, amelyek egy eltérő alkalmazhatóságot határoznak meg, a IIIA Rész Szabványait és Ajánlott Eljárásait kell alkalmazni a légialkalmassági bizonyítvány szerinti 5700 kg maximális felszálló tömegnél nehezebb mindazon repülőgépekre, melyeket a nemzetközi légi forgalomban utasok, vagy áru, vagy posta szállítására terveznek használni.

Megjegyzés.- Az alábbi Szabványok nem tartalmaznak számszerű meghatározásokat, melyek a nemzeti légialkalmassági kódokban található értékekkel összehasonlíthatók lennének. A II. Rész 3. 2. 2. pontjának megfelelően ezeket ki kell egészíteni a Szerződő Államok által összeállított nemzeti követelményekkel.

1. 1. 4. Az 1.1.3. pontban hivatkozott repülőgépek esetében a II. Rész 3.2.2. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő részei által meghatározott légialkalmasság szintjének lényegében legalább azonosnak kell lennie a IIIA Rész átfogó Szabványai által megkívánt teljes szinttel.

1. 1. 5. Ha ezt külön nem jelölik, akkor a Szabványok a teljes repülőgépre vonatkoznak, beleértve a hajtóműveket, a rendszereket és a berendezéseket is.

1.2. Hajtómű egységek száma

A repülőgépnek legalább két hajtóműve kell, hogy legyen.

1.3. Üzemeltetési korlátozások

1.3.1. A repülőgépre, annak hajtóműveire és berendezéseire korlátozásokat kell megállapítani (lásd a 9. 2. pontot). A IIIA Rész Szabványainak való megfelelést meg kell állapítani, feltételezve, hogy a repülőgépet a megadott korlátozásokon belül üzemeltetik. A repülőgép biztonságát hátrányosan befolyásoló bármely körülmény(ek) esetében a korlátozásokat lényegében meg kell szüntetni, hogy az ezekből eredő balesetek valószínűsége a legmesszebbmenőkig csekély legyen.

1. 3. 2. Meg kell állapítani a repülőgép tömegének, súlypont helyzetének, terhelés elosztásának, sebességének és magasságának vagy nyomásmagasságának azokat a korlátozó értékeit, amelyeken belül a repülőgép a IIIA Rész összes vonatkozó Szabványait kielégíti, kivéve azon feltétel-kombinációkat, melyeknek elérése alapvetően nem lehetséges, ezeket nem szükséges figyelembe venni.

1. számú Megjegyzés.- A maximális üzemeltetési tömeg és a súlypont határértékei változhatnak például a magassággal és egyes üzemeltetési körülmények között, mint például: felszállás, utazórepülés, leszállás.

2. számú Megjegyzés.- A repülőgép alapvető korlátozásai közé tartoznak például az alábbiak:
- *engedélyezett maximális felszálló tömeg*
- *engedélyezett maximális gurulási tömeg*
- *engedélyezett maximális leszálló tömeg*
- *engedélyezett maximális tüzelőanyag nélküli tömeg*
- *A mellső és a hátsó súlyponthelyzetek szélső értékei különböző konfigurációkban (felszállás, utazórepülés, leszállás).*

3. számú Megjegyzés: A maximális üzemeltetési tömeg értékét korlátozhatja a Zajminősítési Szabványok alkalmazása (lásd Annex 16, I. Kötet, és Annex 6 I. és II. Részek).

1 .4. Veszélyes tulajdonságok és jellemzők
A repülőgép nem rendelkezhet olyan tulajdonságokkal, vagy jellemzőkkel, melyek veszélyeztetetté tehetik.

1. 5. A megfelelőség bizonyítása
1. 5. 1. A vonatkozó légialkalmassági követelményeknek való megfelelőség megítélését azon bizonyítékokra kell alapozni, melyeket akár tesztek, számítások eredményeiből, vagy a tesztek alapján elvégzett számításokból nyertek feltéve, hogy minden egyes esetben az elért pontosság biztosítani fogja a légialkalmasság azon szintjét, mely azonos értékű a közvetlen tesztek elvégzése során elérhető szinttel.

1. 5. 2. Az 1. 5. 1. pontban szereplő teszteknek olyanoknak kell lenniük, hogy elfogadható garanciát nyújtsanak arra, hogy a repülőgép, annak berendezései és alkotóelemei megbízhatóak és megfelelően működnek a várható üzemeltetési körülmények között.

2. FEJEZET. REPÜLÉS

2. 1. Általános rész

2. 1. 1. A 2. Fejezetben szereplő Szabványoknak való megfelelést repüléssel, vagy egyéb tesztekkel kell megállapítani, melyeket olyan repülőgépen, vagy repülőgéptípuson hajtottak végre, melyre Légialkalmassági Bizonyítványt kértek, vagy olyan számítások alapján, melyeket az ilyen tesztekre alapoztak feltéve, hogy a számításokkal nyert eredmények pontosságukban azonosak a direkt teszt eredményeivel, vagy határozottan ezt reprezentálják.

2. 1. 2. A repülőgép tömegének és súlyponthelyzetének összes alkalmazható kombinációjára meg kell állapítani a Szabványnak való megfelelést azon terhelési tartományon belül, amelyre a légialkalmassági bizonyítványt kérték.

2. 1. 3. Ahol szükséges, megfelelő repülőgép konfigurációkat kell meghatározni a teljesítménynek a repülés különböző szakaszaiban való megállapításához, és a repülőgép repülési tulajdonságainak vizsgálatához.

2. 2. Teljesítmény

2. 2. 1. Általános rész

2. 2. 1. 1. A repülőgép teljesítményéről kielégítő mennyiségű adatot kell meghatározni, és ezeket a repülőgép repülési kézikönyvében kell közzétenni annak érdekében, hogy a szükséges információk az üzemeltetők rendelkezésére álljanak a repülőgép teljes repülési tömegének ezen értékek alapján történő meghatározásához , speciálisan a tervezett repüléshez, valamint a vonatkozó üzemeltetési paraméterek meghatározásához annak érdekében, hogy a repülést nagyfokú garanciával lehessen végrehajtani, a repüléshez a biztonságos minimális teljesítmény rendelkezésre álljon.

2. 2. 1. 2. A repülőgépre közzétett teljesítmény elérésénél figyelembe kell venni az emberi teljesítőképességet, és különösen azt kell szem előtt tartani, hogy az ne igényeljen kivételes jártasságot, vagy elővigyázatosságot a hajózó személyzet részéről.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) található.

2. 2. 1. 3. A repülőgép teljesítményadatait úgy kell megadni, hogy azok egyezzenek az 1. 3. 1. ponttal, valamint a repülőgép azon rendszereinek és berendezéseinek logikus működési kombinációival, melyek a teljesítményt befolyásolhatják.

2. 2. 2. Minimális teljesítmény

A felszállásra és a leszállásra közzétett maximális tömegnél (lásd a 2. 2. 3. pontot) a repülőgépnek képesnek kell lennie a 2. 2 2. 2. 1., illetve a 2. 2. 2. 2. pontokban meghatározott minimális sebességértékek teljesítésére, mivel ez függ a repülőtér szintmagasságától, vagy a nyomásmagasságtól akár az Egyezményes Légkörben, akár adott szélcsendes légköri viszonyok között, és vízi repülőgépek esetében az adott sima vízfelületen, figyelmen kívül hagyva az akadályokat, vagy a futópályán, vagy a vízfelületen történő nekifutás hosszát.

Megjegyzés.- Ez a Szabvány lehetőséget ad arra, hogy a repülőgép repülési kézikönyvében közzétegyék a maximális felszálló tömeget és a maximális leszálló tömeget, például az alábbi viszonyok függvényében:
- *a repülőtér szintmagassága, vagy*
- *a repülőtér szintjén mért nyomásmagasság, vagy*
- *nyomásmagasság és légköri hőmérséklet a repülőtér szintjén,*

oly módon, hogy ezek felhasználásra készen rendelkezésre álljanak a repülőgép teljesítményadataival kapcsolatos üzemeltetési korlátozásokra vonatkozó nemzeti kódok alkalmazásakor.

2. 2. 2. 1. *Felszállás*

a) a repülőgépnek képesnek kell lennie a felszállásra, ha a kritikus hajtómű meghibásodik (lásd a 2. 2. 3. pontot), a többi hajtómű egység a felszálló teljesítmény határain belül működik,
b) Azon időtartam lejárta után, mely alatt a felszálló teljesítmény használható, a repülőgépnek képesnek kell lennie arra, hogy folytassa az emelkedést egy olyan magasságra, melyet tartani tud, és amelynél a repülőtér forgalmi körén képes repülni akkor, amikor a kritikus hajtómű egység üzemképtelen és a többi hajtómű egységet a maximális folyamatos teljesítmény korlátokon belül működtetik,
c) a felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lennie ahhoz, hogy az idealizált körülményektől, amelyekre az adatokat közzétették (lásd 2. 2. 3. pontot) enyhén eltérő üzemeltetési feltételek között az előre kiszámított értékektől való eltérés ne legyen aránytalan.

2. 2. 2. 2. *Leszállás*

a) a megközelítési konfiguráció kezdetétől, a kritikus hajtómű egység üzemképtelensége mellett a repülőgépnek képesnek kell lennie arra, hogy megszakított megközelítés esetében a repülést folytassa egy olyan pontig, ahonnan egy megismételt megközelítést meg tud kezdeni.
b) a leszállási konfiguráció kezdetétől akadályozott leszállás esetében a repülőgépnek képesnek kell lennie arra, hogy felemelkedjen az összes hajtómű működése mellett.

2. 2. 3. Teljesítmény adatok közzététele

A teljesítmény adatokat úgy kell meghatározni, és a repülőgép repülési kézikönyvében közzétenni, hogy azok alkalmazása az Annex 6 I. Rész 5. 2. pontjában előírt üzemetetési szabályok szerint működtetett repülőgép teljesítménye és az üzemeltetésre alkalmas útvonalak és repülőterek között biztonságos összefüggést biztosítsanak. A teljesítmény adatokat a következő szakaszokra és tartományokra kell meghatározni és közzétenni: tömeg, szintmagasság, vagy nyomásmagasság, szélsebesség, szárazföldi repülőgépek esetében a felszállási és a leszállási felület lejtése, vízi repülőgépek esetében a vízfelület viszonyai, a vízsűrűség, és a vízáramlás erőssége, valamint bármilyen egyéb olyan üzemeltetési változóra, amelyre a repülőgép légialkalmasságának megállapítását kérik.

2. 2. 3. 1. *Felszállás.* A felszállás teljesítmény adatainak magukba kell foglalniuk a gyorsítás-fékezési úthosszt és a felszállási úthosszt is.

2. 2. 3. 1. 1. *Gyorsítás-fékezési úthossz.* A gyorsítás-fékezési úthossznak azt a távolságot kell tekinteni, amely szükséges ahhoz, hogy a repülőgép fel tudjon gyorsulni és meg is tudjon állni, vagy vízi repülőgép esetében fel tudjon gyorsulni és egy kielégítően alacsony sebességre le tudjon lassulni feltételezve, hogy a kritikus hajtómű váratlanul meghibásodik egy olyan pontnál, mely nincs közelebb, annál a számításba vett kezdőpontnál, amelytől a felszállási úthosszt meghatározták (lásd 2. 2. 3. 1. 2. pontot)

2. 2. 3. 1. 2. *Felszállási úthossz.* A felszállás úthosszának magába kell foglalnia a földön, vagy vízen történő nekifutáshoz, a kezdeti emelkedéshez és a biztonságos magasságra történő emelkedéshez szükséges távolságot, feltételezve, hogy a kritikus hajtómű egység felszállás közben váratlanul meghibásodik (lásd a 2. 2. 3. 1. 1. pontot). A felszállási úthosszt olyan magasságig bezárólag kell kidolgozni, amelyet a repülőgép tartani tud, és amelyen a repülőtéri forgalmi kört végig tudja repülni. A biztonságos magasságra történő emelkedést olyan sebességgel kell végrehajtani, amely nem kevesebb, mint a 2. 3. 1. 3. pontnak megfelelően meghatározott biztonságos felszállási sebesség.

2. 2. 3. 2. *Utazórepülés.* Az útvonalon történő emelkedés teljesítménye meg kell, hogy egyezzen az emelkedési (süllyedési) teljesítmény értékével, amikor a repülőgép utazórepülés konfigurációban van, és

a) a kritikus hajtómű nem üzemel, és

b) három, vagy több hajtóműves repülőgép esetében két kritikus hajtómű nem üzemel.

A működő hajtóművek nem léphetik túl a maximális folyamatos teljesítmény értékét.

2. 2. 3. 3. *Leszállás.* Leszálló úthossznak azt a vízszintes távolságot kell tekinteni, amelyet a repülőgép megtesz a megközelítési pályán haladva a leszállási felület feletti egy bizonyos magasság átrepülésétől a leszállási felületen lévő egy bizonyos pontig, ahol a repülőgép teljesen megáll, vagy vízi repülőgép esetében ennél a pontnál kielégítően alacsony sebességet ér el. A megközelítési pályán választott pont magasságának és a megközelítés sebességének megfelelő összhangban kell lennie az üzemeltetési gyakorlattal. Ez az úthossz megnövelhető egy olyan biztonsági többletút (margin) értékével, amely szükségesnek látszik. Ha így járunk el, akkor a leszállási felület feletti kiválasztott pontot, a megközelítés sebességét és a biztonsági többletút távolságát megfelelő összefüggésbe kell hozni egymással, és előírásokat kell alkotnia normál üzemeltetési gyakorlatra, valamint az ezektől való észszerű eltérésekre.

Megjegyzés.- Ha a leszálló úthossz magába foglalja ezen Szabványban meghatározott biztonsági többletút távolságát, akkor nem szükséges, hogy az Annex 6. I. Részének 5. 2. 11. pontja alkalmazásával tegyenek engedményeket a megközelítési és leszállási technikák várható változataira.

2. 3. Repülési tulajdonságok

A repülőgépnek ki kell elégítenie a 2. 3. pont Szabványainak előírásait az adott igénynek megfelelő várható maximális magasságig bezárólag minden magasságon és a szóba jöhető magasságokra vonatkozó összes hőmérsékleti körülmény között, amelyre a repülőgépet jóváhagyták.

2. 3. 1. Kormányozhatóság

A repülőgépnek valamennyi várható üzemeltetési feltétel között kormányozhatónak és vezethetőnek kell maradnia, és képesnek kell lennie arra, hogy egyik repülési helyzetből a másikba (például: fordulók, csúsztatás oldalra, a hajtómű teljesítményének változtatása, a repülőgép konfigurációjának változtatása) sima átmenettel át tudjon térni, ne igényeljen a pilótától különleges ügyességet, elővigyázatosságot, vagy erőkifejtést még akkor sem, ha bármelyik hajtómű egység meghibásodik. A repülőgép biztonságos kormányozhatóságának technikáját a repülés minden szakaszára, és az összes repülőgép konfigurációra ki kell dolgozni, amelyre teljesítmény adatokat közzétettek.

Megjegyzés.- Ezt a Szabványt azzal a céllal hozták létre, többek között, hogy alkalmazható legyen olyan körülmények közötti üzemelésre is, amikor nincs érzékelhető turbulencia, de biztosítsa azt is, hogy turbulens levegőben a repülési tulajdonságok indokolatlan romlása ne következzen be.

2. 3. 1. 1. Kormányozhatóság a földön (vagy vízen). A várható üzemeltetési körülmények között a gurulás, felszállás és leszállás alatt a repülőgépnek kormányozhatónak kell lennie a földön (vagy a vízen).

2. 3. 1. 2. *Kormányozhatóság a felszállás alatt*. A repülőgépnek kormányozhatónak kell lennie olyan esetben is, amikor a kritikus hajtómű egység váratlanul meghibásodik a felszállás bármely pontjánál, valamint akkor is, amikor a repülőgépet a felszállási úthossz és a gyorsítás-fékezési úthossz közzétett adatai figyelembevételével vezetik.

2. 3. 1. 3. *A felszállás biztonságos ebessége*. A felszállás biztonságos sebességeinek meglétét akkor tételezhetjük fel, amikor a repülőgép teljesítmény (miután elhagyta a földfelszínt, vagy a vízfelületet) a felszállás alatt pontosan determinált oly módon, hogy megfelelő biztonsági ráhagyást foglal magába az átesési érték felett, és azon minimális sebességérték felett, amelynél a repülőgép kormányozható marad a kritikus hajtómű egység váratlan meghibásodását követően.

2. 3. 2. Kiegyenlítés (trimmelés)

A repülőgépnek olyan trimmeléssel, és egyéb tulajdonságokkal kell rendelkeznie, hogy a kívánt repülési helyzet megtartása céljából ne legyen szükség a pilóta túlzott figyelmére és rendkívüli képességeire, amikor számításba veszik a repülés azon szakaszait, melyeknél ez az igény felmerülhet, és azt is, hogy ez milyen hosszú ideig tarthat. Ezt nemcsak a normál üzemeltetésre, hanem olyan körülmények közötti üzemeltetésre is alkalmazni kell, amikor egy, vagy több olyan hajtómű egység hibásodik meg, amely (ek)re a teljesítmény jellemzőket megállapították.

2. 3. 3. Stabilitás

A repülőgép stabilitásának, az egyéb repülési jellemzőkkel, a teljesítménnyel, a szerkezeti szilárdsággal, és a legvalószínűbb üzemeltetési körülményekkel összhangban (például: repülőgép konfigurációk és sebességtartományok) olyannak kell lennie, hogy a pilóta részéről ne igényeljen túlzott koncentrálást a repülőgép vezetése, és számításba vették azt is, hogy az ilyen igény a repülés melyik szakaszában fordul elő, és ez mennyi ideig tart. A repülőgép stabilitása nem lehet olyan szintű, hogy a pilótától túlzott mértékű erőkifejtést igényeljen, vagy hogy a repülőgép manőverező képességét ez veszélyhelyzetben hátrányosan befolyásolja.

2. 3. 4. Átesés

2. 3. 4. 1. *Figyelmeztetés az átesésre.* Amikor a repülőgép közel áll az átesést akár egyenes vonalú repülésben, akár fordulóban, amikor az összes hajtómű egység működik, és akkor, ha az egyik hajtómű egység nem működik, a pilótának világos és jellegzetes figyelmeztetést kell kapnia, melynek nyilvánvalónak kell lennie az összes lehetséges konfigurációban és teljesítmény mellett, kivéve azokat, amelyeket nem kell lényegesnek tekintetni a biztonságos repülés szempontjából. Az átesésre történő figyelmeztetésnek, és a repülőgép egyéb jellemzőinek olyanoknak kell lenniük, hogy a pilóta az átesés jelzés kezdete után a repülőgép teljes kormányozhatóságának fenntartásához képes legyen az átesés bekövetkezését megakadályozni anélkül, hogy a hajtómű teljesítményét változtatná.

2.3.4.2. *A repülőgép viselkedése az átesést követően*. Bármely konfigurációban és teljesítménynél, melyről úgy vélik, hogy lényeges az átesésből történő kivétel lehetősége szempontjából, a repülőgép átesést követő viselkedése nem lehet annyira szélsőséges, hogy megnehezítse az átesésből történő azonnali kivételt anélkül, hogy túllépnék a repülőgép sebességkorlátozásait, vagy szilárdsági korlátait. Elfogadhatónak kell tekinteni a működő hajtómű egységek teljesítményének csökkentését a repülőgép átesésből történő kivétele alatt.

2. 3. 4. 3. *Átesési sebességek.* Meg kell határozni az átesési sebességeket, vagy az egyenes vonalú repülés minimális sebességeit a repülés minden egyes szakaszára (például: felszállás, utazórepülés, leszállás) a megfelelő konfigurációkra. Az átesési sebesség értékeinek meghatározásakor a számításba vett hajtómű teljesítmények közül egyetlen érték sem lehet nagyobb annál, mint amely közvetlenül az átesés feletti sebességértéknél nulla tolóerőt ad.

2. 3. 5. Flatter és veszélyes rezgés (vibráció)

Megfelelő tesztekkel bizonyítani kell, hogy a repülőgép minden egyes része az üzemeltetési korlátozásokon belül lévő összes repülőgép konfigurációban és sebességnél mentes a flattertől és veszélyes rezgéstől (lásd az 1. 3. 2. pontot). A repülőgép rezgése nem lehet olyan erős, hogy ez zavarja a repülőgép kormányozhatóságát, vagy szerkezeti károsodást okozzon, vagy a hajózó személyzetnek túlzott fáradtságot okozzon.

Megjegyzés.- A rezgés, mint az átesésre való figyelmeztetés kívánatos, és ennek kiküszöbölésére bátorítani nem áll szándékunkban.

3. FEJEZET. SZERKEZETEK

3. 1. Általános rész

A 3. Fejezet Szabványai a repülőgép minden olyan alkotóelemére vonatkoznak, melyeknek meghibásodása a repülőgép biztonságát súlyosan veszélyeztetheti.

3. 1. 1. Tömeg és tömegeloszlás

Ha ezt másképpen nem jelzik, a szerkezetre vonatkozó összes Szabványnak olyan körülmények között kell eleget tenni, amikor a tömeg az alkalmazható határértékeken belül változik, és eloszlása a lehető legkedvezőtlenebb azokon az üzemeltetési korlátozásokon belül, amelyre a bizonyítványt kérték.

3. 1. 2. Terhelési határértékek

Ha erre nézve más előírás nincs, a 3. 3, a 3. 4, és a 3. 5 pontokban megadott különböző terhelési feltételekre a külső terhelés és a megfelelő inercia-terhelések, vagy a belső erők terhelési értékeit terhelési határértékeknek kell tekinteni.

3. 1. 3. Szilárdság és deformáció

A 3. 3, a 3. 4 és a 3. 5 pontokban ismertetett különböző terhelési feltételek között semmilyen terhelési értéknél, beleértve a terhelési határértéket is, a repülőgép szerkezet egyetlen része sem szenvedhet el ártalmas alakváltozást, a repülőgép szerkezetének el kell viselnie a mértékadó (végső) tűrőterhelést is.

3. 2. Repülési sebességek

3. 2. 1. Tervezési repülési sebességek

A repülőgép tervezésekor meg kell határozni azokat a repülési sebességeket, amelyeknél a repülőgép szerkezete a tervezés szerint ellenáll a 3. 3 pont szerinti manőverezési és széllökéseknek. A tervezési repülési sebességek megállapításakor az alábbi sebességeket kell figyelembe venni:

V_A tervezési manőverezési sebesség,

V_B az a sebesség, amelynél a 3. 3. 2 pont szerinti feltételezett legnagyobb függőleges széllökésnek a repülőgép ellen tud állni,

V_C az a sebesség, amelyet a repülőgép normál utazórepülés során nem fog túllépni, figyelembe véve a széllökésekből eredő lehetséges hatásokat is turbulens viszonyok közötti repülés esetében,

V_D maximális merülősebesség, mely kielégítően nagyobb értékű, mint a c.) alpontban megadott sebesség, és amely valószínűtlenné teszi, hogy az ilyen tervezési sebességet túl lehessen lépni a várható üzemeltetési körülmények között véletlen sebességnövekedés eredményeképpen, tekintetbe véve a repülőgép repülési tulajdonságait és egyéb jellemzőit.

V_{E1} –től V_{En} azon maximális sebességek, amelyeken a fékszárny, illetve a futómű kibocsátható, vagy egyéb konfigurációváltoztatás végrehajtható.

Az a), a b), a c) és e) pontokban felsorolt V_A, V_B, V_C és V_E sebességeknek a repülőgép átesési sebességénél kielégítően nagyobb értékűeknek kell lenniük, annak érdekében, hogy a repülőgép kormányozhatósága még turbulens levegőben is biztosított legyen.

3. 2. 2. Repülési sebesség határértékek

A vonatkozó biztonsági sebességtöbblettel megnövelt tervezési repülési sebességekre alapozott repülési sebesség határértékeket, ahol ez helyénvaló, az 1. 3. 1 pontnak megfelelően fel kell tüntetni a repülőgép repülési kézikönyvében az üzemeltetési korlátozások részeként (lásd 9. 2. 2 pontot).

3. 3. Terhelések repülés közben

A 3. 3. 1, a 3. 3. 2, és a 3. 5. pontokban szereplő repülés közbeni terhelési körülményeket a 3. 1. 1. pont előírásai szerinti tömegek és tömegeloszlás, valamint a 3. 2. 1. pont előírásai szerint megválasztott sebességértékek függvényében kell számításba venni. Figyelembe kell venni az aszimmetrikus, és a szimmetrikus terheléseket is. Egy adott terhelési viszonyból eredő légellenállást, tehetetlenséget és más terheléseket olymódon kell elosztani, hogy azok a tényleges viszonyoknak megfeleljenek, vagy szigorúan közelítsenek ezekhez.

3. 3. 1. Manőverezési terhelések

Az üzemeltetési feltételek által megengedett manővereknek megfelelő terhelési tényezők alapján kell a manőverezési terheléseket kiszámítani. Ezek nem lehetnek kisebbek, mint a várható üzemeltetési feltételekhez tartozó tapasztalatok által nyert értékek.

3. 3. 2. Széllökésből eredő terhelések

A széllökésből eredő terheléseket azokra a függőleges és vízszintes széllökés sebességekre és gradiensekre kell statisztikai úton, vagy egyéb bizonyítékok alapján kiszámítani, amelyek a várható üzemeltetési feltételek között elegendőnek mutatkoznak.

3. 4. Fölfelszíntől és vízfelszíntől eredő terhelések

A repülőgép szerkezetének ellent kell tudni állnia a gurulás, a felszállás, és a leszállás alatt valószínűen fellépő, a földfelszíntől és a vízfelülettől eredő terheléseknek.

3. 4. 1. Leszállási körülmények

A leszállási körülményeknek a tervezett felszálló tömegnél és a tervezett leszálló tömegnél magukba kell foglalniuk a talajfogás, vagy a vízetérés szimmetrikus és aszimmetrikus repülőgéphelyzeteit, a süllyedés ilyen sebességértékeit és minden olyan tényezőt, mely a repülőgép szerkezetére ható terheléseket befolyásolja, és amelyek a várható üzemeltetési körülmények között előfordulhatnak.

3. 5. Egyéb terhelések

A manőverezésből és a széllökésből, a talajfogásból, vagy a vízetérésből eredő terheléseken felül és azokkal összefüggésben más egyéb terheléseket is figyelembe kell venni (repülőgép kormányterhelések, kabinnyomások, a hajtómű üzemeltetésének hatásai, a repülési konfigurációváltoztatás következtében fellépő terhelések, stb.), melyek a várható üzemeltetési körülmények között nagy valószínűséggel előfordulnak.

3. 6. Flatter, divergencia és vibráció

A repülőgép szerkezetét úgy kell megtervezni, hogy az mentes legyen a flattertől, a szerkezeti divergenciától (azaz az aerodinamikai terhelésekből származó egyenetlen szerkezeti deformációtól) és a kormányozhatóság ebből eredő elvesztésétől olyan sebességeknél, amelyek az üzemeltetési korlátozásokon belül és kielégítően azok felett vannak, hogy az 1. 3. 1 pont előírásait kielégítsék. A szerkezetnek megfelelően szilárdnak kell lennie, hogy biztosított legyen ellenálló képessége a várható üzemeltetési körülmények között esetleg keletkező vibrációval és berezgéssel szemben.

3. 7. Kifáradásból eredő törés

A repülőgép szilárdságának és szerkezeti felépítésének olyannak kell lenni, hogy a várható üzemeltetési viszonyok között a repülőgép szerkezetét érő ismétlődő terhelések, és vibráció okozta terhelések következtében előforduló végzetes kifáradási törés valószínűsége a legmesszebbmenőkig csekély legyen.

Megjegyzés.- A „legmesszebbmenőkig csekély” fogalomra vonatkozólag tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található.

4. FEJEZET TERVEZÉS ÉS GYÁRTÁS

4. 1. Általános rész

A tervezés és a gyártás minden részlete olyan legyen, hogy észszerű garanciát nyújtson arra vonatkozólag, hogy a repülőgép összes alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. Ezeket olyan gyakorlati eredményekre kell alapozni, melyek a tapasztalat során kielégítőnek bizonyultak, vagy amelyeket speciális tesztekkel, vagy egyéb megfelelő vizsgálatokkal, vagy a két utóbbi összességével igazoltak. Ezeknél az Emberi Tényezők irányelveit is figyelembe kell venni.

Megjegyzés.- Az Emberi Tényezőkre vonatkozó irányelvekre tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

4.1.1.Igazoló tesztek

A repülőgép biztonságos üzemeltetéséhez alapvetően fontos összes mozgó alkatrész működését alkalmas teszteknek kell alávetni annak érdekében, hogy bizonyítva legyen az illető alkotórészről, hogy a várható üzemeltetési körülmények között megfelelően fog működni.

4.1.2.Anyagok

A repülőgép biztonságos üzemeltetéséhez elsődlegesen fontos alkatrészek anyagainak ki kell elégíteniük a jóváhagyott előírásokat. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az anyagok, amelyeket az előírásoknak megfelelően elfogadnak, rendelkezzenek a tervezéskor feltételezett tulajdonságokkal.

4.1.3.Gyártási módszerek

A gyártási és összeszerelési módszereknek olyanoknak kell lenniük, melyekkel egy egyenletesen hibátlan szerkezetet hoznak létre, és ez a használat során megbízhatóan megőrzi szilárdságát.

4.1.4.Felületvédelem

Annak érdekében, hogy időjárási okok, korrózió, kopás következtében, vagy más, esetleg észrevétlenül maradó ok miatt a repülőgép szerkezete ne veszítse el szilárdságát, vagy ne károsodjon, a repülőgép szerkezetét védelemmel kell ellátni figyelembe véve, hogy milyen karbantartást fognak számára biztosítani.

4. 1. 5.Előírások felülvizsgálatok biztosítására

Megfelelő előírásokat kell alkotni, melyek lehetővé tesznek akár periodikusan ismétlődve, akár rendkívül nehéz üzemelési körülményeket követően, bármilyen szükséges vizsgálatot, cserét vagy a repülőgép olyan alkotórészeinek felújítását, melyek ilyen gondozást kívánnak.

4. 1. 6. A rendszerek tervezésének jellemzői

Különös figyelmet kell fordítani azokra a tervezési jellemzőkre, amelyek a hajózó személyzetek képességeire hatással vannak a repülőgép kormányozhatósága fenntartásában. Ezen jellemzők közé minimálisan beletartoznak az alábbiak:

a) *Kormányok és kormányrendszerek*. A kormányokat és kormányrendszereket úgy kell megtervezni, hogy a megszorulás, a véletlen működtetés, és a kormányfelületeket rögzítő eszközök nem szándékos bekapcsolódásának lehetősége minimális legyen.
b) *A rendszer életképessége*.

   1) Minden olyan repülőgépnél, - melynek a légiakalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy amelynek az utasülés kapacitása több mint 60, és amelynek a bizonyítvány iránti kérelmét 2000. március 12.-én vagy ezt követően nyújtották be, - a repülőgép rendszereit úgy kell megtervezni, elrendezni, és fizikailag elkülöníteni, hogy ezzel maximálisan kihasználják a biztonságos repülés és leszállás folytatásának lehetőségeit bármely olyan esemény megtörténte után, melynek során a repülőgép szerkezete vagy rendszerei kárt szenvedtek.

   2) **Ajánlás.-** *Minden olyan repülőgépnél, - melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot és amelyre a bizonyítvány iránti kérelmet 2000. március 12.-én, vagy ezt követően nyújtották be,- a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni, hogy ezzel maximálisan kihasználják a biztonságos repülés és leszállás folytatásának lehetőségeit bármely olyan esemény megtörténte után, melynek során a repülőgép szerkezete vagy rendszerei kárt szenvedtek.*

c) *A személyzet környezete*. A pilótakabint úgy kell kialakítani, hogy minimálisra csökkenjen a kormányok helytelen, vagy korlátozott működtetése a hajózó személyzet fáradtsága, tévesztése vagy akadályoztatása miatt. Minimálisan az alábbiakat kell figyelembe venni: a kormányok és a műszerek elrendezése és azonosíthatósága, a veszélyhelyzetek gyors azonosíthatósága, a kormányok érzékenysége, szellőzés, fűtés és zaj.

d) *Kilátás a pilótakabinból*. a pilótakabint úgy kell kialakítani, hogy biztosítva legyen a pilóta számára a tiszta, torzításmentes kilátás a repülőgép biztonságos vezetéséhez, a pilóta látását zavaró csillogás és tükrözés nélkül. A pilótakabin szélvédője tervezési jellemzőinek biztosítania kell azt, hogy csapadékos körülmények között is kielégítő látása legyen a pilótának a repülőgép normál vezetéséhez, valamint a megközelítések és leszállások végrehajtásához.

e) *Felkészülés veszélyhelyzetekre*. Biztosítani kell olyan módozatokat, amelyekkel automatikusan megelőzhetők a veszélyhelyzetek, vagy amelyekkel a hajózó személyzet kezelni tudja azon berendezések és rendszerek előrelátható meghibásodásaiból származó veszélyhelyzeteket, mely berendezések, és rendszerek hibája veszélyeztetné a repülőgépet. Észszerű megoldásokat kell kidolgozni a hajtómű-egység vagy a rendszerek meghibásodását követő nélkülözhetetlen szolgáltatások olyan mértékű fenntartására, amilyen mértékben ezekre a meghibásodásokra a jelen Annex és az Annex 6 I. és II. Részében foglalt teljesítmény és üzemeltetési korlátozások Szabványai ezt előírják.

f) *Tűzvédelem.* A repülőgép tervezése és gyártása során a kabin belső bútorzat anyagainak, melyeket nagyobb javítások vagy a bútorzat csere során felhasználnak, olyanoknak kell lenniük, hogy minimálisra csökkentsék a tűz keletkezésének lehetőségét repülés közben, vagy a földön, valamint tűz kialakulásakor a füst és mérgező gázok kifejlődését. Az ilyen tüzek észlelésére, lokalizálására, és eloltására olyan módozatokat kell kidolgozni, hogy ezek a repülőgépre további veszélyt ne jelentsenek.

g) *A tűz eloltása*. Olyan repülőgépeknél, amelyekre a bizonyítvány iránti kérelmet *2000.* március 12.-én vagy ezt követően nyújtották be, úgy kell megtervezni a rakodótér tűzoltó rendszereit, beleértve a bennük lévő tűzoltó anyagokat is, hogy figyelembe vesznek olyan hirtelen keletkező és nagykiterjedésű tüzet is, amely robbanóanyagból vagy gyújtóanyagból keletkezhet.

h) *A fedélzeten lévő személyek cselekvőképtelensége*.

1) Olyan repülőgépeknél, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy az utasülés kapacitása több mint 60, és amelyekre a bizonyítvány iránti kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, a tervezésbe óvintézkedéseket kell beépíteni, hogy védelmet nyújtsanak az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, beleértve mindazokat, amelyeket robbanóanyag vagy gyújtóanyag, vagy veszélyes anyagok okoztak, melyek a repülőgép fedélzetén tartózkodó személyeket cselekvőképtelenné tehetik.

2) **Ajánlás.-** *Minden olyan repülőgépnél, - melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, és amelyre a bizonyítvány iránti kérelmet 2000. március 12.-én, vagy ezt követen nyújtották be,- a tervezésbe óvintézkedéseket kell beépíteni, hogy védelmet nyújtsanak az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, beleértve mindazokat, amelyeket robbanóanyag, vagy gyújtóanyag, vagy veszélyes anyagok okoztak, melyek a repülőgép fedélzetén tartózkodó személyeket cselekvőképtelenné tehetik.*

i) *A pilótakabin védelme a füst és a gőzök ellen.*

1) Minden olyan repülőgépnél, - melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, és amelyre a bizonyítvány iránti kérelmet 2000. március 12.-én, vagy ezt követően nyújtották be, - olyan módozatokat kell kidolgozni, amellyel minimálisra csökkenthető a füst, a gőzök és a repülőgépen keletkező tűz, vagy a robbanóanyag által keletkező káros kigőzölgések bejutása a pilótafülkébe.

2) ***Ajánlás.-*** *Minden olyan repülőgépnél, - melynek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, és amelyre a bizonyítvány iránti kérelmet 2000. március 12.-én, vagy ezt követen nyújtották be, olyan módozatokat kell kidolgozni, amellyel minimálisra csökkenthető a füst, a gőzök és a repülőgépen keletkező tűz , vagy a robbanóanyag által keletkező káros kigőzölgések bejutása a pilótafülkébe.*

4. 1. 7. Kényszerleszállásra vonatkozó előírások

4. 1. 7. 1. A tervezés során gondoskodni kell arról, hogy a fedélzeten tartózkodó személyek egy kényszerleszállás esetén védettek legyenek a tűztől, és a sebességcsökkenés közvetlen hatásaitól, valamint az olyan sérülésektől, melyeket a repülőgép belső berendezéseire ható sebességcsökkenés idéz elő.

4. 1. 7. 2. Eszközöket kell biztosítani a repülőgép gyors kiürítéséhez egy kényszerleszállás után várhatóan előforduló körülmények esetére. Ezeknek az eszközöknek a repülőgép utaslétszámával és a személyzet kapacitásával összhangban kell lenniük.

4. 1. 7. 3. A kabin belső kialakításának és a vészkijáratok helyének és számának, - beleértve a menekülő útvonal és a kijáratok elhelyezkedését és kivilágítását is,- olyannak kell lennie, hogy elősegítse a repülőgép gyors kiürítését a kényszerleszállást követő várhatóan előforduló körülmények között.

4. 1. 7. 4. Vízen történő kényszerleszállásra jóváhagyott repülőgépeken, a tervezés során olyan előírásokat kell megalkotni, amelyek maximálisan megvalósítható garanciát jelentenek arra, hogy vízen történő kényszerleszállás esetében a repülőgép fedélzetén lévő utasok, és a személyzet biztonságosan kimenekíthető legyen.

4. 1. 8. Földi kiszolgálás

A tervezésnél megfelelő előírásokat kell alkotni az olyan kockázatok minimalizálására, melyek a földi üzemeltetés (például: vontatás, felemelés) során sérüléseket, esetleg észrevétlenül, a repülőgép biztonságos üzemeltetése szempontjából lényeges részein, okozhatnak. Ehhez az összes korlátozás és utasítás, mely a védelmet szolgálja, figyelembe vehető.

5. FEJEZET HAJTÓMŰVEK

5. 1. Alkalmazási terület

Az 5. Fejezet Szabványait az összes hajtóműtípusra alkalmazni kell, amelyeket repülőgépen, mint elsődleges meghajtóegységet használnak.

5. 2. Tervezés, gyártás, működés

Az egész hajtóművet segédberendezéseivel együtt úgy kell megtervezni és legyártani, hogy az az üzemeltetési határértékeken belül, a várható üzemeltetési körülmények között megbízhatóan működjön, ha megfelelően, a 7. Fejezet előírásainak figyelembe vételével építették fel a repülőgépre, és ha ez alkalmazható, alkalmas légcsavarral látták el.

5. 3. Közzétett jogosítások, feltételek és korlátozások

A hajtómű jogosításait, és azokat a légköri viszonyokat, amelyre ezt alapozták, és amelyek között a hajtóművet üzemeltetni szándékoznak, közzé kell tenni, valamint az összes üzemeltetési feltételt és a korlátozásokat.

5. 4. Tesztek

A hajtómű típus adott példányán mindazokat a teszteket sikeresen végre kell hajtani, amelyek szükségesek a közzétett jogosítások, feltételek és korlátozások érvényességének bizonyításához, valamint annak biztosításához, hogy a hajtómű kielégítően és megbízhatóan fog működni. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a)*Hajtómű hitelesítés*. A hajtómű teljesítmény- vagy tolóerő jellemzőinek megállapítására teszteket kell végrehajtani annak új állapotában, és a b) és a c) pontokban foglalt tesztek elvégzése után is. Az összes előírt teszt megtörténte után a végeredmény nem hozhat jelentős teljesítménycsökkenést.

b)*Működés*. Teszteket kell végrehajtani annak igazolására, hogy a hajtómű indítási, alapjárati, gyorsulási, rezgési, túlgyorsulási, és egyéb jellemzői kielégítőek, valamint annak bizonyítására, hogy megfelelő szabadságfokú biztonsági ráhagyással rendelkezik a robbanás, instabilitás vagy egyéb veszélyes viszonyokhoz képest, attól függően, hogy melyik alkalmazható az adott típusú hajtóműre.

c)*Élettartam.* Az elégséges élettartamra vonatkozó teszteket el kell végezni olyan teljesítménnyel, tolóerővel, sebességekkel, és egyéb üzemeltetési feltételek mellett, melyek a hajtómű megbízhatóságát és élettartamát bizonyítják. A hajtóművet tesztnek kell alávetni a közzétett határértékeket olyan mértékben meghaladó körülmények között üzemeltetve, amilyenek a tényleges működtetés során is a határértékeket meghaladóan előfordulhatnak.

6. FEJEZET LÉGCSAVAROK

6. 1. Alkalmazási terület

Jelen Fejezet Szabványait minden légcsavartípusra alkalmazni kell

6. 2. Tervezés, gyártás és működés.

A tartozékokkal összeállított komplett légcsavart úgy kell megtervezni és legyártani, hogy a várható üzemeltetési körülmények között saját üzemeltetési korlátozásain belül megbízhatóan működjön, amennyiben megfelelően illesztették a hajtóműhöz, és a hajtóművet a 7. Fejezetben foglaltaknak megfelelően építették fel a repülőgépre.

6. 3. Közzétett jogosítások, feltételek és korlátozások

A hajtómű jogosításait, és az összes üzemeltetési feltételeket és korlátozásokat közzé kell tenni, melyek között a légcsavart üzemeltetni szándékoznak.

6. 4. Tesztek

A légcsavartípus adott példányán mindazokat a teszteket megfelelően végre kell hajtani, amelyek szükségesek annak bizonyítására, hogy a légcsavar a közzétett jogosítások, feltételek és korlátozások mellett kielégítően és megbízhatóan fog működni. A teszteknek legalább az alábbiaknak kell magukba foglalniuk:

a) *Működés.* Tesztekkel kell meggyőződni arról, hogy a légcsavar szilárdsági, rezgési, és túlpörgési jellemzői kielégítőek, valamint annak bizonyítására, hogy az állásszög változtató és a vezérlő mechanizmusok megfelelően és megbízhatóan üzemelnek.

b) *Élettartam*. Szükséges időtartamban olyan teljesítménnyel, sebességekkel és egyéb üzemeltetési feltételekkel kell teszteket végrehajtani, melyek ahhoz szükségesek, hogy a légcsavar megbízhatósága és élettartama bizonyítható legyen

7. FEJEZET. A HAJTÓMŰ FELÉPÍTÉSE

7. 1. Általános rész.

7. 1. 1. Alkalmazható Szabványok

A hajtómű felépítésének ki kell elégítenie a 4. Fejezet, és a jelen Fejezet Szabványait.

7. 1. 2. A hajtómű és a légcsavar korlátozásainak való megfelelés

A hajtómű felépítését úgy kell megtervezni, hogy a hajtóművek és a légcsavarok (ha alkalmazható) használhatóak legyenek a várható üzemeltetési körülmények között. A repülési kézikönyvben meghatározott körülmények között a repülőgépnek képesnek kell lennie arra, hogy az 5, 6, és 7 Fejezetekben a hajtóművekre és a légcsavarokra meghatározott korlátozások túllépése nélkül üzemeltethető legyen.

7. 1. 3. A hajtómű fordulatszám vezérlése

Olyan felépítéseknél, ahol a meghibásodott hajtómű folyamatos továbbforgása növelné a tűz, vagy a szerkezet súlyos sérülésének kockázatát, a hajózó személyzet részére módozatokat kell kidolgozni a hajtómű forgásának repülés közbeni megállítására, vagy arra, hogy le tudja csökkenteni ezt egy biztonságos szintre.

7. 1. 4. A hajtómű újraindítása

Módozatokat kell kidolgozni a hajtóművek repülés közbeni újraindításának biztosítására a közzétett maximális magasságig bezárólag minden magasságra.

7. 2. Rendszerek és működés

7. 2. 1. A hajtóművek függetlensége

A hajtóműnek olyan rendszerűnek kell lennie, és úgy kell felépítve lennie, hogy az egyes hajtómű-egységek a hozzájuk csatlakozó rendszerekkel együtt alkalmasak legyenek az önálló vezérlésre és a többi hajtóműtől függetlenül lehessen őket működtetni, valamint olymódon, hogy a hajtómű és a rendszerek között legyen legalább egy olyan elrendezésű, amelyikben bármilyen meghibásodás, még ha az előfordulás valószínűsége a legmesszebbmenőkig csekély is, nem jár nagyobb teljesítményvesztéssel, mint amekkorát a kritikus hajtómű-egység teljes üzemképtelensége okoz.

7. 2. 2. Légcsavar vibráció

Meg kell határozni a légcsavar vibráció okozta igénybevételeket, melynek értékei nem haladhatják meg a repülőgépre megállapított üzemeltetési korlátozások között a biztonságos üzemeltetésre meghatározott értékeket.

7. 2. 3. Hűtés

A hűtőrendszernek képesnek kell lennie a hajtómű hőmérsékletét a megállapított határok között tartani (lásd 7. 1. 2 pontot) a repülőgép tervezett üzemeltetésének megfelelő maximális külső levegő hőmérséklet értékéig bezárólag. A repülőgép repülési kézikönyvében közzé kell tenni az a maximum-, és ha szükséges, azt a minimum külső levegő hőmérsékletet, melyre tekintettel a hajtómű alkalmasságát megállapították.

7. 2. 4. Csatlakozó rendszerek

A tüzelőanyag-, az olaj-, a légfelvevő rendszereknek, és azon egyéb rendszereknek, melyek csatlakoznak a hajtóműhöz, képesnek kell lenniük a hajtóműveket egyenként táplálni a számukra előírt követelményeknek megfelelően, az összes olyan körülményre, mely befolyásolja a rendszer működését a várható üzemeltetési viszonyok között. (például: hajtómű teljesítmény, a repülőgép térbeli helyzete és gyorsulásai, légköri viszonyok, folyadék hőmérsékletek).

7. 2. 5. Tűzvédelem

A hajtómű térségében, ahol a szikraforrások és az éghető anyagok egymáshoz való közelsége miatt a tűz lehetősége különösen nagyfokú, a 4. 1. 6 e) pontban meghatározott általános Szabvány betartása mellett a következőket kell alkalmazni:

a) *Elszigetelés*. Az ilyen térségeket tűzálló anyaggal kell elszigetelni a hajtómű többi olyan térségétől, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását, tekintetbe véve a tűz terjedésének valószínű keletkezési helyét és haladási pályáját.

b) *Gyúlékony folyadékok*. Az ilyen térségekben elhelyezett gyúlékony folyadékokat tartalmazó rendszerelemeknek képesnek kell lenniük arra, hogy tűz esetén magukban tartsák a folyadékot. Módozatokat kell kidolgozni a hajózó személyzet részére, amelyekkel a gyúlékony folyadékok áramlását az ilyen térségekbe le tudja zárni, ha tűz keletkezik.

c) Tűzjelzés Elegendő számú tűzérzékelőt kell biztosítani és elhelyezni az ilyen térségekben esetleg előforduló tűz gyors észlelésére.

Tűzoltás. Az ilyen térségeket olyan tűzoltó rendszerrel kell ellátni, mely képes eloltani az itt esetleg keletkezett tűzet feltéve, hogy az elszigetelés mértéke, a gyúlékony anyagok mennyisége, a szerkezet tűzálló képessége és egyéb tényezők megfelelőek ahhoz, hogy az ebben a térségben valószínűen előforduló tűz nem veszélyezteti a repülőgép biztonságát.

8. FEJEZET. MŰSZEREK ÉS BERENDEZÉSEK

8. 1. Szükséges műszerek és berendezések

A repülőgépet fel kell szerelni mindazokkal a jóváhagyott műszerekkel és berendezésekkel, melyek a repülőgép biztonságos üzemeltetéséhez szükségesek a várható üzemeltetési körülmények között. Ezeknek magukba kell foglalniuk mindazon műszereket és berendezéseket, melyek szükségesek ahhoz, hogy a hajózó személyzet az üzemeltetési korlátozásokon belül működtetni tudja a repülőgépet.

1. sz. Megjegyzés. - Egy Légialkalmassági Bizonyítvány kiadásához szükséges minimális műszereken és berendezéseken felül bizonyos körülményekre, vagy bizonyos útvonalféleségekre szükséges műszereket és berendezéseket az Annex 6 I. és II. Részei írják elő.

2. sz. Megjegyzés. - A műszerek, és berendezések tervezésekor figyelembe kell venni az Emberi Tényezőket is.

3. sz. Megjegyzés. - Az Emberi Tényezők irányelveit tartalmazó tájékoztató anyag Az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) és Az Emberi Tényezők Irányelvei a Légiforgalom Kezelésére Szolgáló Rendszer (ATM) (DOC 9758) című kiadványban találhatók meg.

8. 2. Felépítés

A műszerek és berendezések felépítésekor a 4. Fejezet Szabványainak kell megfelelni.

8. 3. Biztonsági és mentő berendezések

Az előírt biztonsági és mentőberendezéseknek, melyeket a hajózó személyzet vagy az utasok várhatóan használni, vagy működtetni fognak veszélyhelyzet esetében, megbízhatónak, azonnal hozzáférhetőnek és könnyen azonosíthatónak kell lenniük, és a működtetés módját félreérthetetlenül jelezni kell rajtuk.

*8. 4. Navigációs fények és az összeütközés elkerülésére szolgáló fények

8. 4. 1. Az Annex 2 – Repülési Szabályok előírásai szerinti fényforrásoknak - melyeknek égniük kell repülés közben, vagy egy repülőtér mozgási területén történő üzemeléskor, - olyan intenzitással, színnel, fedésterülettel, és egyéb jellemzőkkel kell rendelkezniük, hogy ezek egy másik légijármű pilótájának, vagy a földi személyzetnek a lehető legtöbb időt biztosítsák az észleléshez, vagy az észlelést követően az összeütközés elkerülése érdekében végzendő manőver végrehajtásához. Az ilyen fényforrások tervezésénél kellően figyelembe kell venni azokat a körülményeket, amelyek között ezek várhatóan rendeltetésszerűen használva lesznek.

1. sz. Megjegyzés. - Várható, hogy a fényforrásokat sokféle háttér-megvilágítás ellenében kell észlelni, ilyenek például a jellegzetes városi fények, a tiszta, csillagos ég, a holdsütötte vízfelület és az alacsony háttér-megvilágítást nyújtó nappali viszonyok. Ezen felül, az összeütközési veszély előfordulásának helyzetei leginkább a repülőterek közelforgalmi körzeteiben a legvalószínűbbek, ahol a légijárművek közel azonos sebességekkel, de valószínűen 900 km/ó (500 kt) értéket meg nem haladó sebességekkel manővereznek közepes és alacsony repülési szinteken.

2. sz. Megjegyzés. - A repülőgépek külső fényforrásainak részletes műszaki előírásait lásd a Légialkalmassági Kézikönyvben (DOC 9760).

8. 4. 2. A fényforrásokat úgy kell felépíteni a repülőgépre, hogy minimálisra csökkenjen az alábbiak valószínűsége, hogy:

a) a hajózó személyzetet kötelmeinek kielégítő ellátásában hátrányosan befolyásolja,

b) egy külső szemlélőt károsan elvakít.

Megjegyzés.- Ahhoz, hogy a 8. 4. 2. pontban leírt hatásokat el lehessen kerülni, bizonyos esetekben olyan módozatokat szükséges biztosítani, amelyekkel a pilóta kikapcsolhatja, vagy csökkentheti a villanófények intenzitását.

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* Lásd még jelen Fejezet 1. 1. 2. pontját is.

9. FEJEZET. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS TÁJÉKOZTATÁSOK

9. 1. Általános rész

Azon üzemeltetési korlátozásokat, amelyeken belül meghatározták a repülőgépnek a jelen Annex Szabványaival való egyezését, továbbá a repülőgépek biztonságos üzemeltetéséhez szükséges egyéb tájékoztatásokat, jelöléseket és elhelyezett feliratos táblákat, vagy más módozatokat, melyek hatékonyan szolgálják a célt, a repülőgép repülési kézikönyvében kell közzétenni. A korlátozásoknak és tájékoztatásoknak minimálisan tartalmazniuk kell a 9. 2, a 9. 3 és a 9. 4 pontban foglaltakat.

9. 2. Üzemeltetési korlátozások

Azok a korlátozások, amelyek túllépésének veszélye fennáll repülés közben, és amelyeket mennyiségileg meghatároztak, megfelelő mértékegységgel kell kifejezni és szükség esetén módosítani méréshibák esetében oly módon, hogy a hajózó személyzet, a rendelkezésére álló műszerekre támaszkodva, könnyen meg tudja állapítani, hogy elérte a korlátozó értékeket.

9. 2. 1. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes olyan korlátozást, mely a tömegre, a súlypont helyzetekre, a tömegeloszlásra és a padlóterhelésre vonatkozik (lásd 1. 3. 2 pontot).

9. 2. 2. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk az összes olyan sebességet (lásd 3. 2. pontot), amelyik korlátozást jelent a szerkezet teljességének, vagy a repülőgép repülési tulajdonságainak, vagy bármilyen egyéb megfontolásnak köszönhetően. Ezeket a sebességeket a repülőgép megfelelő konfigurációinak, és egyéb ide tartozó tényezőnek a figyelembevételével kell meghatározni.

9. 2. 3. A hajtómű korlátozásai

A hajtómű korlátozásainak magukba kell foglalniuk az összes olyan korlátozást, melyeket a repülőgépre felépített hajtómű különböző alkotóelemeire meghatároztak (lásd 7. 1. 2. és 7. 2. 3. pontokat).

9. 2. 4. Berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk mindazon korlátozásokat, amelyeket a repülőgépre felépített különböző berendezésekre és rendszerekre meghatároztak.

9. 2. 5. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalni minden olyan korlátozást, amelyet bármilyen, a repülőgép biztonságára hátrányosnak ítélt körülményre tekintettel határoztak meg (lásd 1. 3. 1. pontot).

9. 2. 6. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgép üzemeltetéséhez szükséges minimum létszámot, tekintettel többek között arra, hogy a megfelelő hajózó személyzeti tagok hozzáférjenek a szükséges kormányszervekhez és műszerekhez, és hogy a veszélyhelyzet esetére előírt eljárásokat végre tudják hajtani.

Megjegyzés.- Lásd Annex 6 – A repülőgép üzemeltetése, I. és II. Részt az olyan esetekre, amikor a jelen Fejezet előírásai szerinti minimális hajózó személyzet létszámát további személyzeti tagokkal kell kiegészíteni.

9. 2. 7. Repülési idő korlátozások a rendszer vagy a hajtómű-egység meghibásodása után

A rendszerek korlátozásainak magukba kell foglalniuk azt a maximális repülési időt, amelyre a rendszer megbízhatóságát megállapították az Annex 6 I. Részének 4. 7. pontja szerint megállapított küszöbidőn túli üzemeltetés jóváhagyásával összefüggésben olyan repülőgépeknél, melyek két gázturbinás hajtóművel rendelkeznek.

Megjegyzés.- Az Annex 6 I. Részének 4. 7. pontja szerint megállapított maximális repülési idő egy bizonyos útvonalra kevesebb lehet, mint a 9. 2. 7. pont szerinti meghatározott érték, az útvonalra vonatkozó üzemeltetési meggondolások miatt.

9. 3. Üzemeltetési információk és eljárások

9. 3. 1. A üzemeltetés megfelelő típusai

Fel kell sorolni részletesen az üzemeltetés mindazon típusait, amelyekre a repülőgépet megfelelőnek találták az előírt légialkalmassági követelményekkel való egyezés alapján az Annex 6 I. és II. Részének megfelelően, vagy ahogy ez általánosságban elfogadható.

9. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a repülőgép üres súlyát és a súlymérés időpontjában a repülőgép állapotát, a megfelelő súlypont helyzetet, valamint a vonatkoztatási pontokat és az adatvonalakat, amelyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- Az üres tömegbe rendszerint nem számít bele a személyzet és a hasznos terhelés tömege, a kifogyasztható tüzelőanyag és a leengedhető olaj tömege, viszont tartalmazza az állandóra beépített ballasztot, a kifogyaszthatatlan tüzelőanyag és le nem engedhető olaj tömegét, valamint a hajtóművek hűtőfolyadékának és hidraulika folyadékának teljes mennyiségét.

9. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzet üzemeltetési eljárásait, melyek jellemzőek az adott repülőgépre, és amelyek a biztonságos üzemeltetéshez szükségesek. Ezeknek magukba kell foglalniuk az egy vagy több hajtómű meghibásodása esetén követendő eljárásokat.

9. 3. 4. Információk megadása

A repülőgép jellemzőire vonatkozó összes fontos vagy rendkívüli tulajdonságról kielégítő mennyiségű információt kell adni. Közzé kell tenni a 2. 3. 4. 3. pontban foglaltaknak megfelelően előírt átesési, vagy minimális állandósult repülősebesség értékeket.

9. 3. 5. Bombának a legkisebb kockázattal járó elhelyezése

Mindazon repülőgépeken, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy amelyeknek utasülés kapacitása több mint 60, és amelyekre a jogosítás iránti kérelmet 2000. március 12.-én vagy ezt követően nyújtották be, ki kell jelölni egy olyan helyet, ahol a legkisebb kockázat mellett lehet bombát, vagy egyéb robbanó szerkezetet elhelyezni úgy, hogy minimálisra csökkenjen ezek repülőgépre gyakorolt hatása robbanás esetén.

9. 4. Teljesítményre vonatkozó információk

A repülőgépre vonatkozó teljesítményadatokat a 2. 2. pont szerint kell megadni. Ebben szerepelnie kell a különböző repülőgép konfigurációra és a hozzájuk tartozó teljesítményekre, valamint a vonatkozó sebességekre szóló információknak mindazon tájékoztatásokkal együtt, melyek segíthetik a hajózó személyzetet a közzétett teljesítmények elérésében.

9. 5. A repülőgép repülési kézikönyve

A repülési kézikönyvnek rendelkezésre kell állnia. Egyértelműen kell tartalmaznia, hogy melyik repülőgépre, vagy milyen sorozatszámú repülőgépekre vonatkozik. A repülési kézikönyvnek minimálisan tartalmaznia kell a jelen Fejezetben előírt korlátozásokat, információkat és eljárásokat.

9. 6. Jelzések és feliratok (táblák)

9. 6. 1. A műszereken, berendezéseken, vezérlőszerveken elhelyezett jelzéseknek, feliratoknak minden olyan korlátozást, vagy információt tartalmazniuk kell, amelyekre a hajózó személyzetnek repülés közben elsődlegesen figyelni szükséges.

9. 6. 2. Jelzéseket, táblákat vagy utasításokat kell biztosítani, melyek bármilyen, a földi személyzet részére fontos információt megadnak annak érdekében, hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (például vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat, és veszélyeztetheti a repülőgép biztonságát a következő repülések során.

10. FEJEZET. FOLYAMATOS LÉGIALKALMASSÁG – KARBANTARTÁSI INFORMÁCIÓK

10. 1. Általános rész

A repülőgép légialkalmassági állapotban tartására kidolgozandó eljárásokhoz felhasznált információkat közzé kell tenni. Az információknak tartalmazni kell a 10. 2, 10. 3 és 10. 4 pontokban leírtakat.

10. 2. Karbantartási információk

A karbantartási információknak tartalmazniuk kell a repülőgép leírását, és a karbantartási feladatok végrehajtásához ajánlott módszereket. Ezeknek magukba kell foglalniuk a hiba-meghatározásra vonatkozó információkat.

10. 3. Karbantartási program információi

A karbantartási program információinak magukba kell foglalniuk a karbantartási feladatokat, és a javasolt időközöket, amikor ezeket a feladatokat végre kell hajtani.

10. 4. A típustervezés jóváhagyásából eredő karbantartási információk

A Tervező Állam által kötelező jellegűnek előírt karbantartási feladatokat és gyakoriságukat ilyen felosztásban kell meghatározni a típustervezés jóváhagyásakor.

11. FEJEZET. BIZTONSÁG

11. 1. Belföldi kereskedelmi üzemelésben használatos repülőgépek

Ajánlás.- *Ebben a fejezetben közzétett Nemzetközi Szabványokat és Ajánlott Gyakorlati Eljárásokat az összes Szerződő Államnak alkalmaznia kell, amelynek repülőgépei belföldi kereskedelmi üzemelésben (légi szolgáltatásban) vesznek részt.*

11. 2. Legkisebb kockázatú bombahely

Minden olyan repülőgépen, amelynek a maximális légialkalmassági bizonyítvány szerinti felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, és amelyre a bizonyítvány iránti kérelmet 2000. március 12.-én, vagy ezt követően nyújtották be, a repülőgép tervezése során figyelmet kell fordítani arra az előírásra, hogy legyen egy olyan hely kialakítva a repülőgépen, ahol a legkisebb kockázattal lehet bombát szállítani oly módon, hogy minimálisra csökkenjenek a bomba hatásai a repülőgépre és a benne lévő személyekre.

11. 3. A hajózó személyzet kabinjának védelme

Ajánlás.- *Mindazon repülőgépeknél, melyeknek az Annex 6 I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre az illetékes nemzeti hatósághoz kérelmet nyújtottak be a típusbizonyítvány módosítására annak érdekében, hogy az magába foglaljon egy másodlagos típustervet, figyelmet kell fordítani a pilótakabin válaszfalainak, padlózatának és mennyezetének megerősítésére olymódon, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátsrapnel áthatolásának, valamint erőszakos behatolásokkal szemben is ellenállók legyenek, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.*

Megjegyzés.- Az összes kereskedelmi utasszállító repülőgépen a pilótakabin ajtó követelményeire vonatkozó Szabványok és Ajánlott Gyakorlati Eljárások megtalálhatók az Annex 6 I. Rész, 13. Fejezetben.

11. 4. Belső tér tervezése

Minden olyan repülőgépnél, amelynek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, és amelyre a bizonyítvány iránti kérelmet 2000. március 12. én, vagy ezt követően nyújtották be, figyelmet kell fordítani azon tervezési jellemzőkre, melyekkel megakadályozható fegyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetősége a fedélzeten, ezzel megkönnyítve az ilyen tárgyak utáni kutatást.

IIIB. RÉSZ. 5700 KILOGRAM FELETTI REPÜLŐGÉPEK, MELYEKRE A BIZONYÍTVÁNY IRÁNTI KÉRELMET 2004. MÁRCIUS 2.-ÁN VAGY EZT KÖVETŐEN NYÚJTJÁK BE.

“A” ALRÉSZ. ÁLTALÁNOS RÉSZ

A.1 Alkalmazhatóság

A.1.1 Az A. 1. 2 pontban megjelölt összes olyan repülőgépre vonatkoztatni kell a IIIB Rész Szabványait, amelyre a típusbizonyítvány kiadása iránti kérelmet 2004. március 2.-án vagy ezt követően nyújtják be a megfelelő nemzeti hatóságokhoz.

A. 1. 2. Azon Szabványok és Ajánlott Gyakorlati Eljárások kivételével, amelyek eltérő alkalmazhatóságot határoznak meg, jelen Rész Szabványait és Ajánlott Gyakorlati Eljárásait kell alkalmazni mindazon repülőgépekre, melyeknek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, és melyekkel utasokat, vagy árut, vagy postaküldeményeket akarnak szállítani a nemzetközi légiforgalomban.

1. sz. Megjegyzés. - Az A. 1. 2. pontban hivatkozott repülőgépeket bizonyos Államokban szállító repülőgépenként ismerik.

2. sz. Megjegyzés. - Az alábbi Szabványok nem tartalmaznak mennyiségi specifikációkat, melyeket össze lehetne hasonlítani a nemzeti légialkalmassági kódokban szereplőkkel. A II. Rész 1. 2. 1. pontjának megfelelően ezeket a Szabványokat ki kell egészíteni a Szerződő Államok által összeállított, adoptált, vagy elfogadott követelményekkel.

A. 1. 3. A II. Rész 1. 2. 1. pontjában hivatkozott széleskörű és részletes nemzeti kódok megfelelő részei által meghatározott légialkalmasság szintjének, mindazon repülőgépekre, melyekre az A. 1. 2. pont vonatkozik, lényegében azonosnak kell lennie ezen rész általános Szabványai által szándékolt teljes légialkalmassági szinttel.

A. 1. 4. Ha másként nem jelöltük, a Szabványokat a repülőgép teljes egészére kell alkalmazni, beleértve a hajtómű egységeket, a rendszereket és a berendezéseket.

A. 2. Üzemeltetési korlátozások

A. 2. 1. Korlátozó feltételeket kell meghatározni a repülőgépre, a hajtómű egységekre, és a berendezésekre (lásd G. 2. pontot). A jelen Rész Szabványainak való megfelelést meg kell valósítani feltételezve, hogy a repülőgépet a megadott korlátozásokon belül üzemeltetik. A korlátozásoknak biztonsági ráhagyást kell magukba foglalniuk, megteremtve ezzel a korlátozásokból eredő baleseteknek a legmesszebbmenőkig csekély szintű valószínűségét.

Megjegyzés.- A „legmesszebbmenőkig csekély” fogalomra vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található.

A. 2. 2. Meg kell határozni bármely paraméter korlátozó tartományait, melyeknek változása veszélyeztetheti a repülőgép biztonságos üzemeltetését, például: tömeg, súlypont helyzet, terhelés eloszlás, sebességek, külső levegő hőmérséklet és szintmagasság, vagy nyomásmagasság, amelyeken belül ezen Rész összes vonatkozó Szabványainak való megfelelést fel kell tüntetni.

Megjegyzés.- A maximális üzemeltetési tömeget korlátozhatja a Zaj Bizonyítvány Szabványainak alkalmazása (lásd Annex 16, I. Kötet, és Annex 6, I. és II. Rész).

A. 3. Veszélyes jellemzők és sajátosságok

Az összes várható üzemeltetési körülmény között a repülőgépnek nem lehet egyetlen olyan jellemzője, vagy sajátossága sem, mely repülőgépet veszélyessé teszi.

A. 4. A megfelelés bizonyítása

A megfelelő légialkalmassági követelményeknek való megfelelést bemutató módozatoknak biztosítani kell, hogy minden esetben az elért pontosság olyan mértékű, mely kielégítő biztosítékot nyújt arra nézve, hogy a repülőgép, annak alkotórészei és berendezései megfelelnek a követelményeknek, és megbízhatóak, valamint kifogástalanul működnek a várható üzemeltetési körülmények között.

“B” ALRÉSZ. REPÜLÉS

B.1 Általános rész

B.1. 1. A „B” Alrészben előírt Szabványoknak való megfelelést repüléssel vagy egyéb, olyan repülőgépen, vagy repülőgéptípusokon végrehajtott tesztekkel kell megállapítani, melyekre Típusbizonyítványt kértek, vagy az ilyen tesztekre alapozott számítások segítségével, feltéve, hogy a számításokból nyert eredmények pontosságukat tekintve azonosak a közvetlen tesztek eredményeivel, vagy megalapozottan kifejezik azt.

B. 1. 2. Minden egyes Szabvánnyal való egyezést meg kell állapítani a repülőgéptömeg és a súlyponthelyzet összes alkalmazható kombinációjára a terhelési viszonyok olyan tartományain belül, amelyekre a bizonyítványt kérik.

B. 1. 3. Ha szükséges, megfelelő repülőgép konfigurációkat kell megjelölni a repülés különböző szakaszaiban a teljesítmények megállapítása céljára, és a repülőgép repülési tulajdonságainak vizsgálata céljára.

B.2Teljesítményre vonatkozó tervezési paraméterek

B. 2. 1. A repülőgép teljesítményeiről kielégítő mennyiségű adatot kell meghatározni, és közzétenni a repülési kézikönyvben annak érdekében, hogy az üzemeltetőt el tudják látni mindazon szükséges információval, melynek alapján a repülőgép teljes tömegét meg tudja határozni, különös tekintettel a tervezett repülésre, továbbá képes legyen meghatározni a vonatkozó üzemeltetési paramétereket annak érdekében, hogy az adott repülés során ezek elfogadható garanciát jelentsenek a minimális teljesítmény elérésére.

B. 2. 2. A repülőgépre közzétett teljesítményértékek elérésében figyelembe kell venni az emberi teljesítőképességet, és nem igényelhet a hajózó személyzet részéről kivételes jártasságot vagy óvatosságot.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683) található meg.

B. 2. 3. A repülőgép közzétett teljesítményértékeit összhangba kell hozni az A2. 1 pontban foglalt megfelelősséggel, valamint a repülőgép rendszerei és berendezései közül azoknak a logikai kombinációival, melyeknek működése hatással lehet a teljesítményre.

B. 2. 4. Minimális teljesítmény

A felszállásra és a leszállásra közzétett maximális tömegnél (lásd a B2.7 pontot),- mivel függvényei a repülőtér szintmagasságának vagy a nyomásmagasságnak akár az egyezményes légkörben, vagy meghatározott szélcsendes légköri viszonyok között, és vízi repülőgépek esetében meghatározott hullámzásmentes vízfelület viszonyai között, - a repülőgépnek képesnek kell lennie a minimális teljesítményértékek elérésére, melyeket a B2.5 és a B2.6 pontokban előírtak, figyelmen kívül hagyva az akadályokat, vagy a futópályán, vagy a vízfelületen a nekifutás hosszát.

Megjegyzés.- Ez a Szabvány megengedi, hogy a maximális felszállótömeget, és a maximális leszállótömeget úgy tegyék közzé a repülőgép repülési kézikönyvében, hogy viszonyítják például:

- *a repülőtér szintmagasságához, vagy*
- *a repülőtér szintjén lévő nyomásmagassághoz, vagy*
- *a repülőtér szintjén a nyomásmagassághoz és a levegő hőmérsékletéhez,*

olymódon, hogy felhasználásra készen álljon rendelkezésre, amikor a nemzeti kódot alkalmazzák a repülőtér teljesítményének üzemeltetési korlátozásaihoz

B. 2. 5. Felszállás

a) A repülőgépnek képesnek kell lennie arra, hogy felszálljon feltételezve a kritikus hajtómű egység meghibásodását (lásd B2. 7. pontot), és a többi működő hajtómű egységek felszálló teljesítményen, vagy tolóerő teljesítményeik határértékein belül működnek.

b) Annak az időtartamnak a végén, amely alatt a felszálló teljesítményt vagy a tolóerőt alkalmazni lehet, a repülőgépnek képesnek kell lennie az emelkedés folytatására a kritikus hajtómű egység üzemképtelensége mellett és a többi működő hajtómű egységet a maximális folyamatos teljesítmény vagy tolóerő korlátozások között üzemeltetve egészen addig a magasságig, amelyet már meg tud tartani, és amelynél már folytatni tudja biztonságos repülését és a leszállást.

c) A felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lennie ahhoz, hogy biztosítsa, hogy a táblázatban feltüntetett ideális körülményektől (lásd B2. 7.) kismértékben eltérő üzemeltetési viszonyok esetében a közzétett értékektől való eltérés nem lesz aránytalanul nagy.

B. 2. 6. Leszállás

a) A megközelítési konfigurációtól kezdődően a kritikus hajtómű egység üzemképtelensége mellett a repülőgépnek képesnek kell lennie megszakított megközelítés esetében a repülés folytatására egy olyan pontig, amelytől a megközelítést megismételheti.

b) A leszállási konfigurációtól kezdődően a repülőgépnek képesnek kell lennie sikertelen leszállás esetén újra felemelkedni, ha minden hajtómű egysége működik.

B. 2. 7. Teljesítményadatok közzététele

A teljesítményadatokat úgy kell meghatározni és a repülési kézikönyvben közzétenni, hogy alkalmazásuk az Annex 6. I. Része 5. 2. pontjának megfelelően, a repülőgépre vonatkozó üzemeltetési szabályok szerinti működtetése során egy biztonságos összefüggést tegyen lehetővé a repülőgép teljesítménye és azon útvonalak és repülőterek között, melyeken képes üzemelni. A teljesítményadatokat meg kell határozni, és közzé kell tenni az alábbiakra: tömeg, szintmagasság, vagy nyomásmagasság, szélsebesség, felszállási gradiens, és szárazföldi repülőgépek esetében a leszállási felület, a vízfelület viszonyai, a víz sűrűsége és a hullámzás erőssége vízi repülőgépeknél, és bármely egyéb változóra, amelyekkel együtt a repülőgépnek légialkalmassági bizonyítványt akarnak kérni.

a) *Felszállás* A felszállási teljesítményadatoknak magukba kell foglalniuk a gyorsítás-fékezési úthosszt és a felszállási úthosszt.

b) Gyorsítás-fékezési úthossz. A gyorsítás-fékezési úthossz az a távolság, amely a repülőgép felgyorsításához és megállásához szükséges, vagy vízi repülőgépek esetében a felgyorsításhoz és a kielégítően alacsony sebességre való lelassuláshoz szükséges, feltételezve, hogy a kritikus hajtómű hirtelen meghibásodása a felszállás megkezdésének pontjától számítva nem közelebb történik meg, mint azt a felszállási úthossz megállapításakor feltételezték (lásd B2. 7 c.) pontot).

Szárazföldi repülőgépek esetében a távolság meghatározását a teljesen elkopott állapotú kerékfék szerelvények határértékei fennállására kell alapozni.

c) *Felszállási úthossz.* A felszállási úthossznak magába kell foglalnia a földön vagy vízen történő nekifutást, kezdeti emelkedést és a biztonságos magasságra történő emelkedéshez szükséges távolságot feltételezve, hogy a kritikus hajtómű hirtelen meghibásodik a felszállás folyamán (lásd a B2. 7. b) pontot). A felszállási úthossz értékeket közzé kell tenni egészen addig a magasságig bezárólag, ahonnan a repülőgép biztonságosan folytatni tudja repülését, vagy le tud szállni. A biztonságos magasságra történő emelkedést olyan sebességértékkel kell végrehajtani, mely nem kisebb értékűek, mint a B3. 2. 4. pontnak megfelelően meghatározott biztonságos felszálló sebesség.

d) *Útvonalrepülés.* Az útvonalon történő emelkedés teljesítményének azonosnak kell lennie az útvonalrepülés konfigurációban lévő repülőgép emelkedési (vagy süllyedési) teljesítményértékével, ha:

1) A kritikus hajtómű egység üzemképtelen, és
2) három, és több hajtóműves repülőgépek esetében két kritikus hajtómű egység üzemképtelen.

A működő hajtóműveket nem szabad a maximális folyamatos teljesítménynél vagy tolóerőnél nagyobb teljesítménnyel működtetni.

e) *Leszállás.* A leszállási úthossz az a vízszintes távolság, mely a leszállási felület felett a megközelítés pályáján kijelölt magasságban lévő ponttól, melyet a repülőgép átrepül, a leszállási felület azon pontjáig tart, ahol a repülőgép teljesen megáll, vagy vízi repülőgépek esetében kielégítően alacsony sebességre lelassul. A leszállási felület feletti kiválasztott magasságot és a megközelítés sebességét az üzemeltetési gyakorlatra alapozva kell meghatározni. Ez a távolság megnövelhető egy biztonsági ráhagyás értékével, amennyit szükségesnek találnak, és ha ez történik, a leszállási felület felett kiválasztott magasságot, a megközelítés sebességét és a távolsági ráhagyást megfelelően kell egymáshoz rendelni, és figyelembe kell venni a normál üzemeltetési gyakorlatban és az ettől történő észszerű eltérések esetében. Szárazföldi repülőgépek esetében ezt a távolságot olyan üzemelésre kell alapozni, amikor az összes kerékfék szerelvény állapota azok megengedhető elhasználódási tartománya határértékén van.

Megjegyzés.- Ha a leszállási távolság magába foglalja az ebben a Szabványban meghatározott biztonsági ráhagyás értékét, akkor nem szükséges engedményeket tenni az Annex 6 I. Rész 5. 2. 11 pontja szerinti megközelítési és leszállási technikák alkalmazásakor a valószínű eltérésekre.

B. 3. Repülési tulajdonságok

B. 3. 1. A repülőgépnek ki kell elégítenie a B.3. Szabványait minden magasságon egészen a maximális előre számított magasságig bezárólag, az adott követelményre vonatkozó összes hőmérsékleti viszony között, és amelyre a repülőgépet jóváhagyták.

B.3. 2 Kormányozhatóság

B. 3. 2. 1. Minden előre várható üzemeltetési körülmény között a repülőgépnek kormányozhatónak és vezethetőnek kell maradnia, és képesnek kell lennie arra, hogy simán áttérjen egyik repülési helyzetből a másikba (például: fordulók, csúsztatás oldalra, a hajtómű teljesítményének vagy a tolóerőnek a változtatása, a repülőgép konfigurációjának változása) anélkül, hogy a pilótától kivételes ügyességet, figyelmet vagy erőkifejtést igényelne, még abban az esetben sem, ha bármelyik hajtómű-egység meghibásodik. A repülőgép biztonságos vezetésének technikáját a repülés minden fázisára, minden repülési helyzetre és az összes repülőgép konfigurációra meg kell határozni, amelyekre a teljesítményadatokat közzétették.

Megjegyzés.- A jelen Szabvány célja, többek között, hogy vonatkozzon a nem észlelhető légköri turbulencia körülményei közötti üzemelésre is, és biztosítsa, hogy turbulens levegőben a repülési tulajdonságok túlzott romlása ne forduljon elő.

B. 3. 2. 2. *Kormányozhatóság a földön (vagy vízen*) A repülőgépnek kormányozhatónak kell lennie a földön (vagy a vízen) gurulás, felszállás és leszállás alatt a várható üzemeltetési körülmények között.

B. 3. 2. 3. *Kormányozhatóság felszállás alatt*. Amikor a repülőgépet a közzétett felszállási úthosszaknak és gyorsítás-fékezési távolságoknak megfelelő módon vezetik, a repülőgépnek kormányozhatónak kell maradnia akkor is, ha a felszállás bármely pontján a kritikus hajtómű-egység váratlanul meghibásodik.

B. 3. 2. 4. *Biztonságos felszállási sebesség*. Az alkalmazott biztonságos felszállási sebességértékeknek, - amikor a repülőgép teljesítménye (a talaj vagy a vízfelszín elhagyása után) megszabott a felszállás alatt, - elegendő nagyságú tűrést kell biztosítaniuk az átesés felett, és azon minimális sebességérték felett, amelynél a repülőgép kormányozható marad akkor is, ha a kritikus hajtómű-egység váratlanul meghibásodik.

B. 3. 3. Kiegyenlítés (trimmelés)

A repülőgépnek olyan kiegyenlítéssel, és egyéb jellemzőkkel kell rendelkeznie, melyek biztosítják, hogy a pilóta túlzott figyelmére vagy ügyességére ne legyen szükség a kívánt repülési helyzet megtartása érdekében, figyelembe véve azt, hogy az illető repülési helyzet a repülés melyik szakaszában fordul elő, és a körülmények mennyi ideig állnak fenn. Ezt mind a normál üzemeltetésre, mind pedig azon körülményekre is vonatkoztatni kell, amikor egy vagy több olyan hajtómű-egység hibásodik meg, amelyekre a teljesítményértékeket megállapították.

B. 4. Stabilitás és vezethetőség.

B. 4. 1 Stabilitás

A repülőgépnek olyan stabilitással kell rendelkeznie, figyelemmel a repülőgép többi repülőtulajdonságára, a teljesítményre, a szerkezeti szilárdságra, és a legvalószínűbb üzemeltetési körülményekre (például: a repülőgép konfigurációira és sebességtartományaira), mely biztosítja azt, hogy a repülőgép vezetése a pilóta részéről ne igényeljen túlzott figyelem összpontosítást az adott repülési helyzetben, amikor ez az igény felmerül, és ennek időtartamát is számításba kell venni. A stabilitás nem lehet olyan szintű, hogy a pilótától a repülőgép vezetéséhez túl nagy erőkifejtést igényeljen, vagy hogy veszélyhelyzetekben a repülőgép manőverező képességének hiánya a repülőgép biztonságát veszélyeztesse. Bizonyítani kell, hogy a meghibásodások vagy körülmények bármely olyan kombinációja, mely a pilóta kivételes ügyességének igényét eredményezi, a legkevésbé valószínű A stabilitást természetes és mesterséges úton, vagy ezek kombinációjával lehet elérni.
Ha a repülési jellemzők követelményeinek való megfelelés függ a stabilitásnövelő rendszertől, vagy bármely egyéb automatikus, vagy gépi meghajtású rendszertől, ezen rész
D. 2. pontjának való megfelelést bizonyítani kell.

Megjegyzés.- A „legkevésbé valószínű" kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyv II. Kötet „A" Részében (DOC 9760) található meg.

B. 4. 2. Átesés

B. 4. 2. 1. *Figyelmeztetés az átesésre*. Ha a repülőgép közel áll az áteséshez akár egyenes vonalú repülésben, akár fordulóban repül, és az összes hajtóműve működik, a pilótának világos és egyértelmű átesésre vonatkozó figyelmeztetést kell kapnia a repülőgépről az összes megengedhető konfigurációban, és teljesítmény, vagy tolóerőnél, kivéve azokat, amelyeket nem kell lényegesnek tekinteni a biztonságos repülés szempontjából. Az átesésre történő figyelmeztetés jelzésének és a repülőgép egyéb jellemzőinek olyanoknak kell lenniük, hogy az átesésre figyelmeztető jelzés után a pilóta képes legyen megakadályozni az átesés bekövetkezését a hajtómű teljesítményének vagy tolóerejének változtatása nélkül, és képes legyen fenntartani a repülőgép teljes kormányozhatóságát.

B. 4. 2. 2. A repülőgép viselkedése *az átesést követően*. Minden olyan konfigurációban és hajtómű teljesítménynél, amely az átesésből való kivétel szempontjából lényeges, a repülőgép átesés utáni tulajdonságai nem lehetnek annyira szélsőségesek, hogy nehézséget okozzon a sebességkorlátok, és a szilárdsági korlátok túllépése nélkül az átesésből történő azonnali kivétel.

B 4. 2. 3. *Átesési sebességek*. Meg kell határozni a repülés egyes fázisaihoz (például: felszállás, útvonalrepülés, leszállás) megfelelő konfigurációkra az átesési sebességeket, és a minimális állandósult repülősebességeket. Az átesési sebességek meghatározásához használt teljesítmény, vagy tolóerő értékek egyike sem lehet nagyobb, mint amennyi ahhoz szükséges, hogy nulla legyen a tolóerő közvetlenül az átesés feletti sebességnél.

B. 4. 3. Flatter és vibráció

B. 4. 3. 1. Alkalmas tesztekkel, analízisekkel, vagy ezek bármilyen elfogadható kombinációjával bizonyítani kell, hogy a repülőgép minden egyes része mentes a flattertől és a túlzott vibrációtól bármilyen repülési konfigurációban, és a repülőgép üzemeltetési határértékein belül az összes sebesség értéknél. (lásd az A. 2. 2. pontot). Nem fordulhat elő olyan mértékű vibráció, vagy rázkódás (berezgés), mely elegendő ahhoz, hogy szerkezeti károsodást okozzon.

B. 4. 3. 2. Nem lehet olyan mértékű vibráció vagy rázkódás (berezgés), mely elegendő ahhoz, hogy zavarja a repülőgép kormányozhatóságát, vagy hogy a hajózó személyzet túlzott elfáradását idézze elő.

Megjegyzés.- A rázkódást ajánlatos átesésre figyelmeztetésként tekinteni, és nem ajánlott az ilyen típusú rázkódás figyelmen kívül hagyása.

C. ALRÉSZ. SZERKEZET

C. 1 Általános rész

A repülőgép szerkezetét úgy kell megtervezni, legyártani és a karbantartásra, valamint a javításra vonatkozólag olyan utasításokkal kell ellátni, melyeknek az a célja, hogy a katasztrofális károsodás elkerülhető legyen a repülőgép élettartama alatt.

C. 2. Tömeg és tömegeloszlás

Ha másként nem rendelkeznek, minden esetben az összes, szerkezetre vonatkozó Szabványt ki kell elégíteni, amikor a tömeg változik az alkalmazható Szabványon belül, és eloszlása a lehető legkedvezőtlenebb módon valósul meg az üzemeltetési határértékeken belül attól függően, hogy milyen alkalmassági bizonyítványt kértek a repülőgépre.

C. 3. Teherbírási határértékek

A C. 6. pontban felsorolt különböző terhelési viszonyokra kapott külső teherbírás értékeket, és a megfelelő inercia terheléseket, vagy a belső erők terheléseit teherbírási határértékeknek kell tekinteni, feltéve, ha erre nézve más előírás nincs.

C. 4. Deformáció és törőterhelés

A C. 6. pontban leírt különböző terhelések esetében a repülőgép egyetlen részén sem keletkezhet káros deformáció semmilyen terhelésnél egészen a határértékig bezárólag, és a repülőgépnek a törőterhelést is el kell viselnie.

C. 5. Repülési sebességek

C. 5. 1. Tervezési repülési sebességek

Meg kell állapítani azokat a tervezési repülési sebesség értékeket, amelyekre a repülőgép szerkezetét megtervezik, hogy az ellenálljon a megfelelő manőverezési, és széllökés okozta terheléseknek. Az erős feláramlások, vagy a légkör változásai miatt bekövetkező véletlenszerű, kiugró hatások elkerülése érdekében tervezéskor a repülési sebességeket kielégítő sebességtöbblettel kell meghatározni ahhoz, hogy megállapítsák a gyakorlati üzemeltetési repülési sebesség határértékeket. Ezen felül, a tervezéskori repülési sebességeknek lényegesen nagyobbaknak kell lenniük, mint a repülőgép átesési sebessége, ezzel garanciát nyújtva arra, hogy a kormányozhatóság nem szűnik meg turbulens légköri viszonyok között. Figyelmet kell fordítani a tervezési manőverezési sebességre, a tervezési utazósebességre, a tervezési merülési sebességre, és bármilyen egyéb tervezési repülési sebességre, melyek a felhajtóerőt növelő szerkezettel, vagy egyéb speciális szerkezettel együtt járó konfigurációkhoz szükségesek.

C. 5. 2. Repülési sebesség határértékek

A repülési sebesség határértékeit, - melyek a megfelelő biztonsági többlettel növelt tervezési repülési sebesség értékeken alapulnak, ahol ez alkalmazható, - az A. 2. 1. pontnak megfelelően fel kell tüntetni a repülési kézikönyvben az üzemeltetési korlátozások részeként (lásd G2).

C. 6. Szilárdság

C. 6. 1. Az összes szerkezeti elemet úgy kell megtervezni, hogy az ellenálljon a várható maximális üzemi terheléseknek az összes előrelátható üzemeltetési körülmény között anélkül, hogy károsodna, maradandó alakváltoztatást szenvedne, vagy funkcionalitását elveszítené.
Ezen terhelések meghatározásakor figyelembe kell venni:

a) a repülőgép várható üzemi élettartamát,

b) a függőleges és vízszintes széllökés környezetét, számításba véve a felhasználási profilban és a terhelési konfigurációkban várható változásokat,

c) a manőverezési spektrumot, számításba véve a változásokat a felhasználási profilokban és a terhelési konfigurációkban,

d) az aszimmetrikus és a szimmetrikus terhelést,

e) a föld- és a vízfelszíntől származó terhelések, beleértve a gurulás, a leszállás, és a felszállás során fellépő terheléseket, és a földön/vízen történő mozgatás terheléseit,

f) a repülőgép sebességtartományát, számításba véve a repülőgép jellemzőit és az üzemeltetési korlátozásokat,

g) vibrációból és rázkódásból származó terheléseket,

h) korróziót és egyéb elhasználódást, az előírt karbantartás végrehajtása mellett, és a különböző üzemeltetési környezeteket, és

i) bármilyen egyéb terhelést, mint például a kormányra ható terhelések, az utaskabin túlnyomás terhelései, a hajtómű terhelései, vagy a dinamikus terhelések, melyek a nyugalmi állapot konfigurációban bekövetkező változások miatt fordulnak elő.

C. 6. 2. A különböző terhelési körülményekből eredő levegő, inerciális és egyéb terheléseket úgy kell megosztani, hogy azok nagyon közel legyenek a tényleges viszonyokhoz, vagy azokat széleskörűen reprezentálja.

C. 7. Túlélőképesség

A repülőgépet úgy kell megtervezni, hogy az a fedélzeten lévőknek maximális megvalósítható védelmet nyújtson a szerkezet meghibásodása esetén, vagy a földfelszínbe, a vízbe, vagy egy tárgyba történő ütközés miatt bekövetkezett károsodás esetén. Minimum az alábbiakat kell figyelembe venni:

a) madárral történő ütközés valószínűsége,

b) a repülőgép sárkányának, utasüléseinek energia elnyelése és fékezések,

c) a repülőgép valószínű viselkedése vízre történő kényszerleszálláskor, és

d) a kijutás lehetővé tétele a legrövidebb megvalósítható idő alatt.

C. 8. Szerkezeti élettartam

A repülőgépet úgy kell megtervezni és megépíteni, ahol ez megvalósítható, hogy megfeleljen a károsodás-tűrés elveinek, és olyannak kell lennie, hogy biztosítsa a katasztrofális megrongálódás valószínűségének legmesszebbmenőkig csekély voltát az üzemi élettartama alatt, számításba véve:

a) a várható környezeti viszonyokat,

b) az üzemeltetés során várható ismétlődő terheléseket,

c) az aerodinamikai kölcsönhatásból, vagy a belső forrásokból eredő várható vibrációkat,

d) a hőtani körfolyamatokat,

e) az előre nem látott és össze nem függő forrásokból eredő károsodást,

f) a valószínű korróziót, vagy egyéb károsodást,

g) az előírt karbantartást, és

h) a valószínű szerkezeti javításokat.

Megjegyzés.- A „legmesszebbmenőkig csekély" fogalomra vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található.

C. 9. Villámcsapás elleni védelem

A repülőgépet meg kell védeni a villámcsapás okozta katasztrofális hatásoktól. Kellő figyelmet kell fordítani a repülőgép szerkezetéhez felhasznált anyagokra.

D. ALRÉSZ. TERVEZÉS ÉS GYÁRTÁS

D. 1.Általános rész

D. 1. 1. A tervezés és gyártás részleteinek olyanoknak kell lenniük, hogy észszerű garanciát nyújtsanak a repülőgép összes alkotórésze hatékony és megbízható működésére a várható üzemeltetési körülmények között. A tervezést és a gyártást a gyakorlatra kell alapozni, amelynek során a tapasztalat bizonyítja ennek kielégítő voltát, vagy speciális tesztekkel kell ezt igazolni, vagy más, megfelelő vizsgálatokkal, vagy mindkettővel. Az Emberi Tényezők alapelveit is figyelembe kell venni.

Megjegyzés.- Az Emberi Tényezők alapelveire vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

D. 1. 2. A mozgó alkatrészek igazolása

Alkalmas tesztekkel kell bizonyítani az összes olyan mozgó alkatrész működőképességét, mely lényeges a repülőgép biztonságos üzemeltetése szempontjából annak érdekében, hogy biztosított legyen azok kifogástalan működése a rájuk vonatkozó összes üzemeltetési körülmény között.

D. 1. 3. Anyagok

A repülőgép biztonságos üzemeléséhez lényeges repülőgép alkatrészekben felhasznált összes anyag meg kell, hogy feleljen a jóváhagyott előírásoknak. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az előírásokat kielégítő elfogadott anyagok valóban rendelkezzenek mindazokkal a lényeges tulajdonságokkal, melyeket a tervezéskor feltételeztek. Az anyagok hatásait figyelembe kell venni, melyeket a fedélzeten lévő személyekre, és a földön lévő más személyekre, valamint a környezetre általában gyakorolnak mind a normál üzemeltetés során, mind pedig veszélyhelyzetekben.

D. 1. 4. Előállítási módszerek

Az előállítás és összeszerelés módszereinek olyanoknak kell lenni, hogy egyenletesen hibátlan szerkezetet hozzanak létre, mely szilárdságát megbízhatóan megtartja az üzemeltetés során.

D. 1. 5. Védelem

A szerkezetet védeni kell az állapotromlás, vagy az üzemeltetés során szilárdságának elvesztése ellen, melyet időjárás, korrózió, kopás, vagy egyéb ok idéz elő, és mely észrevétlen maradhat, ezeket figyelembe kell venni a karbantartásnál, amelyet a repülőgépen el fognak végezni.

D. 1. 6. Felülvizsgálatra vonatkozó előírások

Megfelelő előírásokat kell létrehozni annak érdekében, hogy lehetővé váljon bármilyen szükséges vizsgálat, csere, vagy a repülőgép mindazon alkatrészeinek felújítása, melyek ilyen ápolást igényelnek, akár időszakosan, akár egy rendkívül nehéz üzemelés után.

D. 2. Rendszerek tervezési jellemzői

Külön figyelmet kell fordítani azokra a tervezési jellemzőkre, melyek a hajózó személyzet képességét befolyásolják a kormányozhatóság fenntartásában. Ezeknek minimum az alábbiakat kell magukba foglalniuk:

a) *kormányok és kormányrendszerek*. A kormányokat, és kormányrendszereket úgy kell megtervezni, hogy:

1) minden egyes kormány és kormányrendszer könnyen kezelhető, hibátlan működésű és pontos kell, hogy legyen funkciójának megfelelően,
2) a repülőgép folyamatos biztonságos repülését és leszállását nem akadályozhatja meg:

i) a kormányrendszerben bármilyen egyedi meghibásodás, mely nem bizonyul túlzottan valószínűtlennek, vagy

ii) bármilyen esemény, mely a kormány megszorulását eredményezi bármilyen rendes körülmények között számításba vett pozícióban,

3) minimális legyen a megszorulás, a véletlen működtetés lehetősége, beleértve a kormányfelület rögzítő eszközeinek nem szándékolt összekapcsolódását.

4) minden egyes kormányrendszer minden elemét úgy kell megtervezni, jellegzetesen és tartósan jelölni, hogy minimálisra csökkenjen bármilyen téves összeszerelés valószínűsége, mely a rendszer hibás működését eredményezheti.

b) A rendszerek életképessége

1) Mindazon repülőgépeknél, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni egymástól, hogy maximálisan fennálljon a folytatott biztonságos repülés és leszállás lehetősége bármilyen olyan esemény után, melynek során a repülőgép szerkezete vagy rendszerei meghibásodnak.

2) **Ajánlás.-** *Azoknál a repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 7500 kg-ot, de nem éri el a 45500 kg-ot, a repülőgép rendszereit úgy kell megtervezni, elrendezni és fizikailag elkülöníteni egymástól, hogy maximálisan fennálljon a folytatott biztonságos repülés és leszállás lehetősége bármilyen olyan esemény után, melynek során a repülőgép szerkezete vagy rendszerei meghibásodnak.*

c) *A személyzet környezete.* A pilótafülkét úgy kell megtervezni, hogy a lehető legkisebb lehetőség legyen arra, hogy a hajózó személyzet a kormányokat helytelenül, vagy korlátozottan működteti fáradtság, tévedés, vagy zavaró hatások miatt. Figyelmet kell fordítani legalább az alábbiakra: a kormányok és a műszerek elrendezése és azonosítása, a veszélyhelyzetek gyors azonosítása, a kormányok érzékenysége, a szellőzés, a fűtés és a zaj.

d) *Kilátás a pilótakabinból.* A pilótafülkét úgy kell kialakítani, hogy eléggé nagyfelületű, tiszta és torzításmentes kilátást biztosítson a repülőgép biztonságos üzemeltetése érdekében, és hogy megakadályozza a csillogást és visszaverődéseket, melyek zavarják a pilótát a látásban. Az ablak tervezési jellemzőinek lehetővé kell tenni a kielégítő látást csapadékos körülmények között a repülés normál vezetéséhez, valamint a megközelítések és a leszállások végrehajtásához.

e) *Veszélyhelyzetekre vonatkozó előírások.* Olyan megoldásokat kell biztosítani, melyek vagy automatikusan megelőzik, vagy lehetővé teszik a hajózó személyzetnek, hogy kezelni tudja azokat a veszélyhelyzeteket, melyek a berendezések vagy rendszerek előre látható meghibásodásaiból keletkeznek, és amelyeknek a meghibásodása veszélyeztetheti a repülőgépet.
Észszerűen gondoskodni kell arról, hogy az alapvető szolgáltatások biztosítva legyenek, melyek a hajtómű egység vagy a rendszerek meghibásodása után tovább működnek oly mértékig, hogy az megfeleljen az ilyen meghibásodásokra vonatkozó teljesítmény és üzemeltetési korlátozásoknak, melyeket jelen Annex Szabványai és az Annex 6 I. és II. Részei előírnak.

f) *Tűzvédelem.* A repülőgépet úgy kell megtervezni és a gyártás során olyan anyagokat kell felhasználni, hogy minimálisra csökkenjen a tűz lehetősége mind repülés közben, mind a földön, és minimális legyen a füst és a mérgező gázok keletkezésének lehetősége a tűz kialakulása után, valamint késleltesse a kisülés előfordulását a kabinban. Az ilyenfajta tüzek lokalizálására, észlelésére, vagy eloltására olyan megoldásokat kell biztosítani, melyek a repülőgépre nézve további veszélyt nem jelentenek. A repülőgép mosdóiban füstérzékelő rendszereket kell elhelyezni, és beépített tűzoltórendszert minden egyes szemétgyűjtő tartályhoz, melyben az elhasznált törölközőket, papírt vagy hulladékot tárolják.

g) *A rakterek védelme.*

1) minden egyes rakteret, melyet a hajózó személyzet utasszállító repülőgépen meg tud közelíteni, fel kell szerelni tűzlefojtó rendszerrel,

2) az olyan raktereket, melyeket a hajózó személyzet nem tud megközelíteni, beépített tűzérzékelő rendszerrel és beépített tűzlefojtó vagy a tűz terjedését gátló rendszerrel kell felszerelni, és

3) a rakterek tűzlefojtó rendszereit, beleértve a tűzoltó anyagaikat is, úgy kell megtervezni, hogy számításba vesznek olyan hirtelen, és kiterjedt tűzet is, melyet robbanóanyag, vagy gyújtószerkezet, vagy veszélyes áruk idézhetnek elő.

h) *A fedélzeten tartózkodók cselekvőképtelensége.*

1) Azoknál a repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a tervezés során figyelmet kell fordítani arra, hogy védelmet biztosítsanak a kabin dehermetizálódás lehetséges esetei ellen, valamint füst és mérgező gázok jelenléte ellen, beleértve azokat is, amelyeket robbanóanyag, gyújtószerkezet, vagy veszélyes áruk okoztak, mivel mindezek a repülőgép fedélzetén tartózkodók cselekvőképtelenségét idézhetik elő.

2) **Ajánlás.-** *Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, a tervezés során figyelmet kell fordítani arra, hogy védelmet biztosítsanak a kabin dehermetizálódás lehetséges esetei ellen, valamint füst és mérgező gázok jelenléte ellen, beleértve azokat is, amelyeket robbanóanyag, gyújtószerkezet, vagy veszélyes áruk okoztak, mivel mindezek a repülőgép fedélzetén tartózkodók cselekvőképtelenségét idézhetik elő.*

i) *A pilótakabin védelme füst és gőzök ellen.*

1) Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, módozatokat kell kidolgozni arra, hogy a repülőgép fedélzetén kialakult tűz vagy robbanás által keletkezett füst, gőzök, és ártalmas kipárolgások bejutása a pilótakabinba minimális mértékű lehessen.

2) **Ajánlás.-** *Mindazon repülőgépeknél, melyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja az 5700 kg-ot, de nem éri el a 45500 kg-ot, módozatokat kell kidolgozni arra, hogy a repülőgép fedélzetén kialakult tűz vagy robbanás által keletkezett füst, gőzök, és ártalmas kipárolgások bejutása a pilótakabinba minimális mértékű lehessen*

D. 3. Aerodinamikai deformáció (Aeroelaszticitás)

A repülőgépet úgy kell megtervezni, hogy mentes legyen szerkezeti deformáció, vagy aerodinamikai deformáció hatásai miatt bekövetkező flattertől, szerkezeti elváltozástól, és a kormányozhatóság elvesztésétől, az A. 2. 1. pontban előírt tervezési burkológörbe összes sebességértékénél és még jóval azon túl is.
Számításba kell venni a repülőgép jellemzőit, valamint a pilóták közötti eltéréseket a szakértelem és teljesítőképesség terén. Az aerodinamikai kormányfelületekre megengedhető határértékeket kell előírni, valamint azt, hogy ezen határértékeket milyen módon kell figyelni annak biztosítása érdekében, hogy a repülőgép aerodinamikai deformáció okozta problémáktól mentes maradjon teljes élettartama alatt.

D. 4. A fedélzeten tartózkodók elhelyezésének jellemzői

D. 4. 1. Ülések és bekötőhevederek

A fedélzeten tartózkodók számára megfelelő ülést és bekötési lehetőségeket kell biztosítani, figyelembe véve a repülés, vagy kényszerleszállás során fellépő terhelések valószínűségét, melyekkel számolni kell. Figyelmet kell fordítani arra, hogy a fedélzeten tartózkodók sérülései minimálisak legyenek, amikor a repülőgép üzemelése alatt a körülöttük lévő szerkezetnek ütődnek.

D. 4. 2. Utaskabin környezet

A szellőztetést, a fűtést és, ahol ez megvalósítható, a hermetizálás rendszereit úgy kell megtervezni, hogy azok megfelelő környezetet teremtsenek az utaskabinban a várható repülés ideje alatt, valamint a földi vagy a vízi üzemeltetés viszonyai között. A rendszerek megtervezésekor számításba kell venni a veszélyhelyzeti viszonyokat is.

D. 5. Elektromos testelés és védelem a villámcsapás, és statikus elektromosság ellen

D. 5. 1. Az elektromos testelésnek, és a villámcsapás és statikus elektromosság elleni védelemnek olyannak kell lennie, hogy:

a) megvédje a repülőgépet, annak rendszereit, a fedélzeten tartózkodó személyeket, és azokat, akik a földön vagy vízen kapcsolatba kerülnek a repülőgéppel mindazoktól a veszélyes hatásoktól, amelyeket villámkisülés, és áramütés okoz, és

b) védelmet nyújtson az elektrosztatikus töltés felhalmozódása okozta veszélyekkel szemben.

D. 5. 2. A repülőgépet a villámcsapás katasztrofális hatásai ellen is védeni kell. Kellő figyelmet kell fordítani a repülőgép gyártása során használt anyagokra.

D. 6. Kényszerleszállásra vonatkozó rendelkezések

D. 6. 1. A repülőgép tervezésekor gondoskodni kell a fedélzeten tartózkodók védelméről kényszerleszállás esetére, hogy megvédjék őket a tűztől és a sebességcsökkenés közvetlen hatásaitól, valamint azoktól a sérülésektől, melyeket a repülőgép belső berendezési tárgyai okozhatnak a sebességcsökkenés bekövetkezése miatt.

D. 6. 2. Eszközöket kell biztosítani a repülőgép gyors kiürítéséhez olyan körülményekre, melyek valószínűleg fennállnak egy kényszerleszállást követően. Ezeket az eszközöket a repülőgép utasainak és a személyzet kapacitásának összhangba hozásával kell meghatározni, és alkalmasnak kell lenniük a kívánt cél eléréséhez.

D. 6. 3. Az utaskabin belső kialakításának, a vészkijáratok helyének és számának, - beleértve a menekülő útvonalakat és a kijáratok megvilágításának módját és azok elhelyezkedését,- olyannak kell lenni, hogy elősegítsék a repülőgép gyors kiürítését olyan valószínűen előforduló körülmények között, melyek egy kényszerleszállást követően állnak elő.

D. 6. 4. Olyan repülőgépeknél, melyeket vízre történő kényszerleszállásra alkalmasnak nyilvánítottak, a tervezésénél maximális megvalósítható mértékben kell gondoskodni arról, hogy kényszerleszállás után a repülőgép utasai, és személyzete a lehető legbiztonságosabb módon tudja elhagyni a repülőgépet.

D. 7. Földi kiszolgálás

A tervezés során megfelelően kell gondoskodni arról, hogy a földi kiszolgálás tevékenységei alatt (például: vontatás, repülőgépre csatlakozás) minimális legyen a veszély, hogy a repülőgép biztonságos üzemeltetés szempontjából lényeges részei károsodnak, és amely esetleg észrevétlen maradhat. A védekezésnek olyan fajtái, mint például utasítások és korlátozások, számításba vehetők.

“E” ALRÉSZ. HAJTÓMŰVEK

E. 1. Hajtóművek

Jelen Annex VI. Rész Szabványait kell alkalmazni minden hajtómű típusra, melyet helikopteren alkalmaznak elsődleges meghajtó egységként.

E. 2. A forgószárnyak és a hajtómű felépítése a helikopterre

E. 2. 1. Általános rész

A hajtómű felépítésének és a forgószárnyaknak meg kell felelniük a D Alrész és az E. 2. pont Szabványainak.

E. 2. 2. Tervezés, gyártás és működés

a) A tartozékokkal kiegészített forgószárnyak és a forgószárny meghajtó rendszerek összeszerelését úgy kell megtervezni és azokat legyártani, hogy megbízhatóan működjenek az üzemeltetési határértékeiken belül a várható üzemeltetési viszonyok között, ha megfelelően illesztették a hajtóműhöz és építették fel a helikopterre, a jelen alrésznek megfelelően.

b) Mindazon helikoptereknél, amelyeknek a maximális engedélyezett felszálló tömege több mint 3175 kg, vagy azon helikoptereknél, melyeket Standard A kategóriájúnak minősítettek, egy értékelést kell végrehajtani a forgószárnyakra és a forgószárny meghajtó rendszerekre annak biztosítására, hogy azok működése biztonságos az üzemeltetési viszonyok teljes tartományában. Ha ez az értékelés egy olyan meghibásodást mutat ki, mely meggátolhatja a biztonságos repülés folytatását, vagy a helikopter leszállását, olyan módozatokat kell előírni, melyekkel az ilyen meghibásodás valószínűsége a minimumra csökken.

E. 2. 3. Közzétett teljesítmény osztályok, körülmények, és korlátozások

Közzé kell tenni mindazokat a teljesítmény osztályokat, és az összes olyan üzemeltetési körülményt és korlátozást, melyek a szándék szerint szabályozzák a forgószárnyak és a forgószárny meghajtó rendszerek működését.

a) *A forgószárny maximális és minimális forgási sebességének korlátozásai.* Meg kell állapítani a forgószárnyak maximális és minimális sebességét mind a meghajtott állapot, mind pedig a meghajtás nélküli állapot viszonyaira. A maximum és a minimum értékeit befolyásoló bármilyen üzemeltetési körülményt (például: repülési sebesség) közé kell tenni.

b) *Egyhajtóműves helikoptereknél a forgószárnynak az előírtnál kisebb forgási sebességére történő figyelmeztetések, és több hajtóműves helikopterek, melyeken nincs jóváhagyott mechanizmus, mely automatikusan növeli a teljesítményt, ha a hajtómű meghibásodik.* Amikor a helikopter megközelíti a forgószárny forgási sebességhatárát, függetlenül attól, hogy a hajtómű működik vagy működésképtelen, világos és jellegzetes figyelmeztetést kell erről a pilótának kapnia. A figyelmeztetéseknek, vagy a fennálló körülmény kezdeti jellemzőinek olyanoknak kell lenni, hogy lehetővé tegyék a pilóta számára, hogy megakadályozza a figyelmeztetés kezdete után a körülmény kifejlődését, és lehetősége legyen a forgószárny forgási sebességének visszaállítására az előírt normál határértékek közé, valamint a helikopter teljes kormányozhatóságának fenntartására.

E. 2. 4. Tesztek

A forgószárnyon és a forgószárny meghajtó rendszereken kielégítő eredménnyel kell elvégezni mindazokat a teszteket, melyek annak biztosításához szükségesek, hogy ezek megfelelően és megbízhatóan fognak működni a közzétett teljesítmény osztály, az üzemi körülmények és korlátozások határértékein belül. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) *Üzemeltetés.* Tesztekkel kell bizonyítani, hogy a szilárdsági és a rezgési jellemzők kielégítőek, és bizonyítani azt, hogy a bólintásszabályozó és vezérlő mechanizmusok, valamint a szabadonpörgést biztosító mechanizmus megfelelően és megbízhatóan működik. A 3175 kg-ot meghaladó engedélyezett felszállótömeggel rendelkező helikoptereknél a túlgyorsulási jellemzőkről bizonyítani kell, hogy azok kielégítőek, és

b) *Tartósság.* Kielégítő időtartamú teszteket kell végrehajtani olyan teljesítmény-, hajtómű-, és forgószárny sebességeknél, és egyéb üzemeltetési viszonyoknál, melyek annak igazolásához szükségesek, hogy a forgószárnyak és a forgószárny meghajtó rendszerek megbízhatóak és tartósságuk megfelelő.

E. 2. 5. A hajtómű, a forgószárny és a forgószárny meghajtó rendszer

korlátozásainak való megfelelés.

A hajtómű felépítését a helikopterre úgy kell megtervezni, hogy a hajtóművek, a forgószárnyak és a forgószárny meghajtó mechanizmusok képesek legyenek megbízhatóan működni a várható üzemeltetési körülmények között. A repülési kézikönyvben meghatározott körülmények között a helikopternek képesnek kell lennie úgy üzemelni, hogy a VI. Résznek és a jelen alrésznek megfelelően a hajtóműre, a forgószárnyakra és a forgószárny meghajtó rendszerekre megadott korlátozásokat nem lépi túl.

E. 2. 6. A hajtómű rotáció szabályozása

A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű helikoptereken, és azokon a helikoptereken, amelyeket a Standard A kategóriára jogosítottak, ha a meghibásodott hajtómű további rotációja megnövelheti a tűzveszélyt, vagy egy komoly szerkezeti károsodás veszélyét, megoldásokat kell biztosítani a személyzetnek arra, hogy leállíthassa, a meghibásodott hajtómű rotációját repülés közben, vagy hogy egy biztonságos szintre csökkenthesse azt.

E. 2. 7. A hajtómű újraindítása

A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű helikoptereknél, és azoknál a helikoptereknél, melyeket a Standard A kategóriára jogosítottak, megoldásokat kell biztosítani a hajtómű repülés közbeni újraindítására a közzétett maximális magasságig bezárólag minden magasságon.

E. 2. 8. Kialakítás és működés

E. 2. 8. 1. *A hajtóművek függetlensége.* Az A kategóriájú helikoptereknél a hajtóművet úgy kell kialakítani és felépíteni a helikopterre, hogy az egyes hajtóműveket a hozzájuk tartozó rendszerekkel együtt a többiektől függetlenül lehessen vezérelni és működtetni, valamint oly módon, hogy legyen közöttük legalább egy olyan hajtómű és rendszerkialakítás, amelyben bármilyen meghibásodás, - még akkor is, ha ennek előfordulási valószínűsége bármilyen csekély,- ne idézzen elő nagyobb teljesítményvesztést, mint amilyent a kritikus hajtómű teljes üzemképtelensége okoz.

E. 2. 8. 2. *A forgószárnyak és a forgószárny meghajtó rendszerek vibrációja.* Meg kell határozni a forgószárnyakra és a forgószárny meghajtó rendszerekre a vibráció okozta terheléseket, és ezek nem haladhatják meg az üzemelésre megállapított biztonságos értékeket a helikopterre meghatározott üzemeltetési korlátozásokon belül.

E. 2. 8. 3. *Hűtés.* A hűtőrendszernek képesnek kell lennie arra, hogy a hajtómű hőmérsékletét a megadott határértékek között tartsa (lásd az E. 2. 5. pontot) a helikopter üzemeltetésére jóváhagyott minden külső levegő hőmérsékleti értéknél. A repülési kézikönyvben közzé kell tenni azt a maximum és minimum külső levegő hőmérséklet értéket, amelyet a hajtóműre megfelelőnek állapítottak meg.

E. 2. 8. 4. *Másodlagos rendszerek.* Minden egyes hajtómű, forgószárny meghajtó rendszer és a forgószárnyhoz tartozó tüzelőanyag, olaj, levegőbetáplálás és egyéb rendszereknek képesnek kell lenni a megfelelő egység kiszolgálására a meghatározott követelményeknek megfelelően minden olyan körülmény között, mely befolyásolja a rendszerek működését (például: a hajtómű teljesítmény beállítása, a helikopter térbeli helyzetei és gyorsulásai, a légköri viszonyok, folyadékhőmérsékletek) a várható üzemeltetési körülményeken belül.

E. 2. 8. 5. *Tűzvédelem.* A hajtómű azon részeiben, ahol a potenciális tűz veszélye különösen súlyos a gyúlékony anyagokra nézve a gyulladásforrások közelsége miatt, a következőket kell alkalmazni a D. 2. e) pont szerinti általános Szabványokon felül:

a) *Elkülönítés.* Az olyan zónákat, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását és a leszállást, tűzálló anyagokkal kell elkülöníteni a helikopter többi részétől (a 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű, vagy A kategóriájú helikopterek), vagy veszélyeztetheti a biztonságos leszállást (egyéb helikopterek), tekintetbe véve a tűz terjedésének valószínű keletkezési pontjait és terjedési útvonalait.

b) *Gyúlékony folyadékok.* A gyúlékony folyadékrendszer alkotórészeinek, melyeket az ilyen zónákban helyeztek el, tűzállóknak kell lenniük. Az egyes zónáknál gondoskodni kell a folyadékelvezetés lehetőségéről annak érdekében, hogy minimális legyen a kockázat, mely a gyúlékony anyagokat tartalmazó bármelyik komponens meghibásodásából ered. Megoldásokat kell a személyzet számára biztosítani arra, hogy ha tűz keletkezik, megállíthassa a gyúlékony folyadékok befolyását az ilyen zónákba. Ahol gyúlékony folyadékforrások vannak az ilyen zónákban, a körzeten belül az adott teljes rendszernek, beleértve a hordszerkezetet is, tűzállónak, vagy a tűz hatásaitól védettnek kell lenniük.

c) *Tűzjelzés.* Gázturbinás hajtómű felépítéseknél elegendő számú tűzjelzőt kell biztosítani és elhelyezni oly módon, hogy az ilyen körzetekben esetlegesen előforduló bármilyen tüzet gyorsan jelezzenek kivéve, hogyha a tűz könnyen észlelhető a pilótakabinban lévő pilóta számára repülés közben.

d) *Tűzoltás.* A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömeget meghaladó gázturbinás hajtóművű helikoptereknél az ilyen körzeteket olyan tűzoltó rendszerrel kell ellátni, mely képes az ott valószínűen előforduló bármilyen tűz eloltására, kivéve, ha az elkülönítés foka, a gyúlékony anyag mennyisége, a szerkezet tűzállósága és az egyéb tényezők olyanok, hogy a körzetben valószínűen előforduló bármilyen tűz nem veszélyeztetheti a helikopter biztonságát.

E. 3. A hajtómű felépítése

E. 3. 1. A hajtómű és a légcsavar korlátozásainak való megfelelés

A hajtómű felépítését úgy kell megtervezni, hogy a hajtóművek és a légcsavarok (ha alkalmazható) képesek legyenek megbízhatóan működni a várható üzemeltetési körülmények között. A repülési kézikönyvben közzétett körülmények között a repülőgépnek képesnek kell lennie arra, hogy a hajtóművekre és a légcsavarokra ezen alrésznek megfelelően megállapított korlátozások túllépése nélkül működjön.

E. 3. 2. A hajtómű fordulatszámának szabályozása

Olyan felépítéseknél, ahol egy meghibásodott hajtómű tovább-működése megnövelheti a tűz, vagy egy súlyos szerkezeti meghibásodás veszélyét, olyan megoldásokat kell a hajózó személyzet részére biztosítani, mellyel a személyzet leállíthatja a hajtómű működését repülés közben, vagy egy biztonságos szintre le tudja azt csökkenteni.

E. 3. 3. Gázturbinás hajtómű

Egy gázturbinás hajtómű felépítéséhez:

a) a tervezés során minimálisra kell csökkenteni a hajtómű forgó részeinek meghibásodásából, vagy hajtóműtűzből eredő veszélyt, mely áthatol a hajtómű gondolán, és

b) a hajtóművet segédberendezéseivel, rendszereivel és műszereivel úgy kell megtervezni, hogy észszerű garanciát nyújtson arra, hogy azokat a hajtómű üzemeltetési korlátozásokat, amelyek hátrányosan befolyásolják a forgó részek szerkezeti teljességét, ne lépjék túl a használat során.

E. 3. 4. A hajtómű újraindítása

Megoldásokat kell biztosítani arra, hogy a közzétett maximális magasságig bezárólag minden magasságon a hajtóművet a levegőben újra lehessen indítani.

E. 3. 5. Elrendezés és működés

E. 3. 5. 1. *A hajtómű-egységek függetlensége*

A hajtóművet úgy kell kialakítani és felépíteni, hogy minden egyes hajtómű-egység a hozzá tartozó rendszerekkel alkalmas legyen a többi egységektől független vezérlésre és működtetésre, valamint oly módon, hogy legalább egy olyan hajtómű és hozzá tartozó rendszer legyen, amelyben bármilyen meghibásodás, hacsak a valószínűség ennek előfordulására különösen alacsony mértékű is, ne okozhasson nagyobb teljesítményvesztést, mint amekkora a kritikus hajtómű-egység teljes meghibásodásából ered.

E. 3. 5. 2. *Légcsavar vibráció*

A légcsavar vibráció okozta igénybevételeket meg kell állapítani, és ezek nem léphetik túl azokat az értékeket, melyeket biztonságosnak ítéltek a működtetéshez a repülőgépre meghatározott üzemeltetési korlátozásokon belül.

E. 3. 5. 3. *Hűtés*

A hűtőrendszernek olyannak kell lennie, hogy a hajtómű részegységeinek és folyadékainak hőmérsékletét a megállapított határértékeken belül tartsa fenn (lásd E. 3. 1. pontot) olyan külső levegőhőmérsékletek mellett egészen a maximális értékig, amely megfelel a repülőgép tervezett üzemeltetésének. A repülési kézikönyvben közzé kell tenni azt a maximális, és ha szükséges, azt a minimális külső levegő hőmérsékletet, melynél a hajtóműről megállapították, hogy a működése megfelelő.

E3. 5. 4. *Kapcsolódó rendszerek*

A hajtómű-egységhez tartozó tüzelőanyag-, olaj,- levegő felvételi rendszereknek képesnek kell lenniük arra, hogy az egyes hajtóműveket táplálják az arra meghatározott követelményeknek megfelelően minden olyan körülmény között, amely a rendszerek működését befolyásolja a várható üzemeltetési viszonyok között (például: hajtómű teljesítmény, vagy tolóerő, repülőgép helyzetek, és gyorsulások, légköri viszonyok, folyadékhőmérsékletek).

E. 3. 5. 5. *Tűzvédelem*

A hajtómű olyan részeire, ahol a tűz potenciális veszélye különösen súlyos, a gyúlékony anyagokhoz közel lévő gyulladási források miatt, a következőket kell alkalmazni a D. 2. f) pontban előírt általános Szabványon felül:

a) *Izoláció. Az* ilyen részeket tűzálló anyagokkal kell elkülöníteni a repülőgép többi részétől, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását, számításba véve a keletkezés valószínű pontjait és a tűz terjedésének valószínű útvonalát.

b) *Éghető folyadékok.* Az ilyen zónákban elhelyezett tűzveszélyes folyadék- rendszer alkotórészeinek tűzállóknak kell lenniük. Minden egyes zónában levezetést kell biztosítani, hogy minimálisra csökkenjen a veszély, mely a gyúlékony folyadékokat tartalmazó bármelyik rész meghibásodásából ered. Megoldásokat kell biztosítani arra, hogy a hajózó személyzet tűz esetén meg tudja állítani a tűzveszélyes folyadék áramlását az ilyen zónákba. Ahol az ilyen zónákban gyúlékony folyadékforrás van, a zónában lévő adott teljes rendszernek, beleértve a tartószerkezetet is, tűzbiztosnak kell lennie, vagy olyan burkolatúnak, hogy védjen a tűz hatásai ellen.

c) *A tűz észlelése.* Kielégítő mennyiségű tűzérzékelőt kell biztosítani és elhelyezni oly módon, hogy az ilyen zónákban esetlegesen előforduló tűz gyors észlelését lehetővé tegye.

d) Tűzoltás. Az ilyen zónákat olyan tűzoltórendszerrel kell ellátni, mely képes az itt valószínűen keletkező bármilyen tüzet eloltani, feltéve, hogy az izolálás foka, a gyúlékony anyagok mennyisége, a szerkezet tűzállósága és egyéb tényezők olyanok, hogy az ilyen zónákban valószínűleg keletkező tűz nem veszélyeztetheti a repülőgép biztonságát.

"F" ALRÉSZ. RENDSZEREK ÉS BERENDEZÉSEK.

F. 1. Általános rész

F. 1. 1. A repülőgépet fel kell szerelni mindazon jóváhagyott műszerekkel, berendezésekkel és rendszerekkel, beleértve a tájékozódáshoz szükséges műszereket és a repülőgép-vezérlési rendszereket, melyek a várható üzemeltetési körülmények között a repülőgép biztonságos működtetéséhez szükségesek. Ezeknek magukba kell foglalniuk azokat a műszereket és berendezéseket, melyek szükségesek ahhoz, hogy a hajózó személyzet képes legyen működtetni a repülőgépet annak üzemi korlátozásain belül. A műszerek és berendezések tervezése során az Emberi Tényezők irányelveit figyelembe kell venni.

1. sz. Megjegyzés.- A Légialkalmassági Bizonyítvány kiadásához minimálisan szükséges berendezéseken és műszereken felül, sajátos körülmények esetében, vagy sajátos útvonalfajták esetében további műszerek és berendezések lehetnek szükségesek, melyeket az Annex 6. I. és II. Része ír elő.

2. sz. Megjegyzés.- A rendszerek szoftvereire vonatkozó értékeléseket lásd a H Alrészben.

3. sz. Megjegyzés.- Az Emberi Tényezőkre vonatkozó tájékoztató anyagot az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683), valamint az Emberi Tényezők Irányelvei a Légiforgalmi Szolgáltatásszervezési (ATM) Rendszerekhez (DOC 9758) című kiadványban lehet megtalálni.

F. 1. 2. Az F. 1. 1. pontban előírt műszerek, rendszerek és berendezések tervezésének és a repülőgépre történő felépítésének olyannak kell lennie, hogy:

a) fordított összefüggést biztosítson a meghibásodási körülmény valószínűsége és hatásának súlyossága között a repülőgépre és a fedélzeten tartózkodókra nézve, ahogy azt előírták a rendszer biztonsága értékelésének folyamatában,

b) rendeltetésszerűen működjön az összes várható üzemeltetési körülmény között, és

c) minimális legyen az elektromágneses interferencia közöttük.

F. 1. 3. Olyan megoldásokat kell biztosítani, melyek a hajózó személyzetet figyelmeztetik, ha a rendszer működése nem biztonságos, és lehetővé teszik számára a helyesbítő intézkedések megtételét.

F. 1. 4. Az elektromos energiaellátó rendszer tervezésének olyannak kell lennie, hogy képes legyen biztosítani az elektromos áramot a repülőgép normál üzemeltetése alatt és a lényeges áramterheléseket is ki tudja szolgálni az elektromos áramtermelő rendszert érintő meghibásodás után, a várható környezeti viszonyok között.

F. 2. Felépítés

A műszerek és berendezések felépítésének meg kell felelnie a D Alrészben foglalt Szabványoknak.

F. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági és mentőfelszereléseknek, -melyeket a hajózó személyzet, vagy az utasok várhatóan használni, vagy működtetni fognak veszélyhelyzetben, - megbízhatónak, azonnali használatra késznek és könnyen azonosíthatónak kell lenniük, és működtetési módjukat világosan kell jelölni.

F. 4. Navigációs fények és az összeütközés elkerülésére szolgáló fények

F. 4. 1. Az Annex 2-ben (Repülési szabályok) előírt fényeknek, melyeket a repülőgépen repülés közben, vagy egy repülőtér forgalmi területén történő üzemelés alatt működtetni kell, olyan intenzitásúnak, színűnek, fedésterületűnek kell lenniük, valamint olyan egyéb jellemzőkkel kell rendelkezniük, melyekkel biztosítva van egy másik légijármű pilótája, vagy a földi személyzet számára, hogy a lehető legtöbb idő álljon rendelkezésre az észlelésre és az összeütközés elkerülése érdekében szükséges manőver végrehajtására. Az ilyen fényforrások megtervezésekor kellő figyelmet kell fordítani azokra a viszonyokra, amelyek között észszerűen elvárható, hogy funkcióiknak megfeleljenek.

1. sz. Megjegyzés.- Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, mint például a tipikus városi megvilágítás fényei, a tiszta csillagos égbolt, a holdfényes vízfelület, és az alacsony háttér megvilágítású nappali időszak viszonyai. Ezen felül az összeütközési veszély körülményeinek előfordulása sokkal valószínűbb a közelforgalmi körzetekben, ahol a légijárművek közepes és alacsony repülési szinteken üzemelnek közel azonos sebességgel, mely nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

2. sz. Megjegyzés.- A repülőgépek külső fényeire vonatkozó részletes műszaki specifikációkat lásd a Légialkalmassági Kézikönyvben (DOC 9760)

F. 4. 2. A fényeket úgy kell elhelyezni a repülőgépen, hogy minimális legyen a valószínűsége annak, hogy:

a) károsan befolyásolja a hajózó személyzetet kötelmeinek kielégítő ellátásában,

b) a repülőgépen kívül lévő személyt károsan elkápráztatja.

Megjegyzés.- Az F. 4. 2. pontban felsorolt hatások elkerülése érdekében néhány esetben szükségessé válik olyan megoldás biztosítása, hogy a pilóta kikapcsolhassa, vagy csökkenthesse a villogófények intenzitását.

F. 5. Elektromágneses interferencia elleni védelem

A repülőgép elektromos rendszereit, különösen a repülés szempontjából kritikus és lényeges rendszereket meg kell védeni az elektromágneses interferenciától, melyek akár külső, akár belső forrásból származhatnak.

F. 6. Jegesedés elleni védelem

Ha jegesedési körülmények közötti repülésre kérnek jogosítást, a repülőgépről bizonyítani kell, hogy képes biztonságosan üzemelni olyan jegesedési viszonyok között, amelyekkel az összes várható üzemeltetési környezetben számolni kell.

“G” ALRÉSZ. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK.

G. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványaival való egyezést meghatározták, valamint minden olyan egyéb információt, mely a repülőgép biztonságos üzemeltetéséhez szükséges, közzé kell tenni a repülési kézikönyvben, valamint jelölések és feliratok formájában és minden olyan módon, mely a célnak hatékonyan megfelel. A korlátozásoknak és információknak minimum azokat tartalmazniuk kell, melyeket ebben az Alrészben ismertetünk.

G. 2. Üzemeltetési korlátozások

G. 2. 1. Azokat a korlátozásokat, amelyeknél ezek repülés közbeni túllépésének veszélye fennáll, és amelyeket számszerűen határoztak meg, alkalmas egységekben kell kifejezni és szükség esetén helyesbíteni kell a műszerhibák miatt oly módon, hogy a hajózó személyzet a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani, hogy mikor éri el a korlátozó értékeket.

G. 2. 2. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes tömegre, súlypont helyzetekre, tömegelosztásra és padlóterhelésre vonatkozó korlátozó értéket (lásd A. 2. 2. pontot).

G. 2. 3. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk minden olyan sebességértéket (lásd C. 5. pontot), melyek korlátozó jellegűek a szerkezeti épség, vagy a repülőgép repülési tulajdonságai, vagy egyéb megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő repülőgép konfigurációkra és egyéb odaillő tényezőkre vonatkoztatva kell megadni.

G. 2. 4. Hajtómű korlátozások

A hajtómű korlátozásainak magukba kell foglalni mindazokat a korlátozásokat, melyeket a repülőgépre felépített hajtómű különböző alkotóelemeire meghatároztak (lásd E. 3. 1. és E. 3. 5. 3. pontokat).

G. 2. 5. A berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgépre felépített különböző berendezések és rendszerek összes korlátozását.

G. 2. 6. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalniuk a repülőgép biztonsága szempontjából veszélyesnek ítélt körülmény figyelembevételével meghatározott szükséges korlátozást. (lásd A. 2. 1. pontot)

G. 2. 7. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgép üzemeltetéséhez szükséges minimális hajózó személyzeti létszámot, és egyebek mellett tekintetbe kell venni a megfelelő hajózó személyzeti tag hozzáférési lehetőségét az összes szükséges vezérlőszervhez és a műszerekhez, valamint a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 – Légijármű Üzemeltetés, I. és II. Részeit az olyan körülményekre vonatkozólag, amikor az ezen Annex-ben meghatározott minimális hajózó személyzeti létszámon felül további hajózó személyzeti tag válik szükségessé.

G. 2. 8. Repülési idő korlátozás rendszer-, vagy hajtómű meghibásodás után

A rendszer korlátozásainak magukba kell foglalniuk azt a maximális repülési időt, amelyre a rendszer megbízhatóságát megállapították, tekintetbe véve az üzemeltetés jóváhagyását olyan repülőgépeknél, melyeknek két gázturbina hajtóműve az Annex 6. I. Rész 4. 7. pontjának megfelelően megállapított küszöb időn túl van.

Megjegyzés.- Az Annex 6. I. Rész 4. 7. pontjának megfelelően megállapított maximális repülési idő egy adott útvonalra kevesebb is lehet, mint a G. 2. 8. pont szerint meghatározott érték az adott esetet érintő üzemeltetési megfontolások miatt.

G. 3. Üzemeltetésre vonatkozó tájékoztatások és eljárások

G. 3. 1. Megfelelő (választható) üzemeltetés típusok

Fel kell sorolni mindazon üzemeltetés típusokat, amelyekre a repülőgép tulajdonságai révén alkalmasnak mutatkozott a vonatkozó légialkalmassági követelményeknek való megfelelés során.

G. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a repülőgép üres tömegét a repülőgép súlymérése körülményeinek meghatározásával együtt, a vonatkozó súlyponthelyzetet, a referencia pontokat és az alapvonalakat, melyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- A repülőgép üres tömege rendszerint nem foglalja magába a személyzet és a hasznos terhelés tömegét, a kifogyasztható tüzelőanyagot és a leereszthető olaj tömegét, de magába foglalja az összes beépített ballaszt, a kifogyaszthatatlan tüzelőanyag, a le nem ereszthető olaj tömegét, valamint a hajtómű hűtő- és hidraulikafolyadékának teljes mennyiségét.

G. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott repülőgépre jellemzőek és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek tartalmazniuk kell az egy vagy több hajtóműegység meghibásodása esetén követendő eljárásokat.

G. 3. 4. Kezelési információk

A repülőgép jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról kielégítő információt kell biztosítani. Közzé kell tenni azokat az átesési sebességeket, vagy minimális repülősebesség értékeket, melyeket a B. 4. 2. 3. pont szerint kell meghatározni.

G. 3. 5. Legkisebb kockázatú bombahely

Mindazon repülőgépekben, amelyeknek a légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, ki kell jelölni egy területet, ahol a legkisebb kockázattal lehet egy bombát vagy egyéb robbanóeszközt elhelyezni annak érdekében, hogy ezek hatása robbanás esetén minimális legyen a repülőgépre.

G. 4. Teljesítményre vonatkozó információk

A repülőgép teljesítményét a B. 2. pont szerint kell közzétenni. Magába kell foglalnia a különböző repülőgép konfigurációkra vonatkozó információkat, a teljesítmény és tolóerő értékeket és a hozzájuk tartozó sebesség értékeket, valamint mindazon információkat, amelyek segíthetik a hajózó személyzetet a betervezett teljesítmény elérésében.

G. 5. Repülési kézikönyv

Repülési kézikönyv meglétét biztosítani kell. Világosan meg kell jelölni, hogy mely adott repülőgépre, vagy repülőgép-szériára vonatkozik. A repülési kézikönyvnek minimálisan ezen Alrészben előírt korlátozásokat, információkat és eljárásokat kell tartalmaznia a G. 7. pontban meghatározottak kivételével.

G. 6. Jelölések és feliratok

G. 6. 1. A műszereken, a berendezéseken, a kormányokon lévő jelöléseknek és feliratoknak tartalmazniuk kell mindazon korlátozásokat, vagy információkat, melyeket a hajózó személyzetnek elsődlegesen figyelembe kell venni a repülés alatt.

G. 6. 2. Jelöléseket, feliratokat, utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadják, és hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (például vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat és veszélyeztetheti a repülőgép biztonságát a következő repülések során.

G. 7. Folyamatos légialkalmasság

G. 7. 1. Általános rész

A repülőgép légialkalmas állapotban tartására kidolgozandó eljárásokban felhasznált információkat közzé kell tenni. Az információknak tartalmazni kell a G. 7. 2., a G. 7. 3., és a G. 7. 4. pontokban előírtakat.

G. 7. 2. Karbantartásra vonatkozó információk

A karbantartásra vonatkozó információknak magukba kell foglalniuk a repülőgép leírását és a karbantartási feladatok teljesítésének javasolt módszereit. Ezen információknak útmutatást kell tartalmazni a hiba-meghatározáshoz.

G. 7. 3. A karbantartási programra vonatkozó információk

A karbantartási programra vonatkozó információknak magukba kell foglalniuk a karbantartási feladatokat, és azokat a javasolt időintervallumokat, amikor ezeket végre kell hajtani.

G. 7. 4. A típustervezés jóváhagyásából származó karbantartási információk

A karbantartási feladatokat és azok gyakoriságát, melyeket a Tervező Állam kötelezőnek határozott meg a típus tervezésének jóváhagyásakor, ennek megfelelően kell azonosítani.

“H” ALRÉSZ. RENDSZER SZOFTVEREK

Az összes rendszer szoftvert úgy kell megtervezni és jóváhagyni, hogy biztosítsa azt, hogy az a rendszer, amelyben a szoftvert használják, megfelel a tervezett funkcióknak olyan biztonsági szinten, mely kielégíti jelen Rész követelményeit, főleg az F. 1. 2. a) és az F. 1. 3. pontokban foglaltakat.

Megjegyzés.- A rendszer szoftverek tervezésére és tesztelésére néhány Állam elfogadja a nemzeti/nemzetközi ipari szabványokat, mint például az RTCA/DO-178-at, vagy az EUROCAE ED12-t.

I. ALRÉSZ. TÖRÉSBIZTOSSÁG ÉS UTASKABIN BIZTONSÁG

I. 1. Általános rész

A törésbiztosságot figyelembe kell venni a repülőgépek tervezésénél a fedélzeten tartózkodók túlélési valószínűségének növelése érdekében.

I. 2. Kényszerleszálláskor előforduló terhelések tervezése

Kényszerleszállás (katasztrófa) eseténi terheléseket minden repülőgép kategóriára meg kell határozni annak érdekében, hogy a repülőgép belső berendezései, a bútorzat, a hordszerkezetek és a biztonsági berendezések úgy legyenek megtervezhetők, hogy a fedélzeten tartózkodók esélye a túlélésre maximális legyen. Az alábbi tényezőket kell figyelembe venni:

a) dinamikus hatások,

b) azon egységekre vonatkozó megszorító kritériumok, melyek veszélyt idézhetnek elő,

c) a törzs deformálódása a vészkijáratok körzetében,

d)a tüzelőanyag cella integritása és helye, és

e),az elektromos rendszer integritása, hogy elkerülhető legyen a gyulladás-források kialakulása.

I. 3. Az utaskabin tűzvédelme

Az utaskabint úgy kell megtervezni, hogy az védelmet nyújtson a fedélzeten tartózkodók számára tűz ellen olyan esetekben, amikor a fedélzeti rendszer meghibásodik, vagy kényszerleszállás esetében. Az alábbi tényezőket kell figyelembe venni:

a) az utaskabin belső anyagainak éghetősége,

b)a tűzállóság, és füst és mérgező gázok képződése,

c) gondoskodás biztonsági felszerelésekről, melyek lehetővé teszik a repülőgép biztonságos kiürítését, és

d) tűzérzékelő és tűzoltó berendezések.

I. 4. A repülőgép kiürítése

A repülőgépet kielégítő számú vészkijárattal kell ellátni, hogy maximális lehetőség legyen az utaskabin kiürítésére megfelelő időtartam alatt. Az alábbi tényezőket kell figyelembe venni:

a) ülések száma és az utasülések elrendezése (konfiguráció),

b) a kijáratok száma, helye és mérete,

c) a kijáratok jelölése és a használati utasítás elhelyezése,

d) a kijáratok valószínű boltozódásai,

e) a kijáratok működtetése, és

f) a repülőgép kiürítésére szolgáló felszerelések elhelyezése és súlya, például: csúszdák és mentőcsónakok.

I. 5. Világítás és jelzések

Vészvilágítást kell biztosítani, mely az alábbi jellemzőkkel rendelkezik:

a) független a fő elektromos ellátó rendszertől,

b) automatikusan működésbe lép a normál elektromos áramellátás megszűnésekor/ ütközéskor,

c) a vészkijáratokhoz vezető útvonal vizuális jelzése füsttel teli kabinkörülmények között,

d) a repülőgép belső és külső megvilágítása a kiürítés alatt, és

e) a kockázat ne növekedjen a tüzelőanyag szétömlése esetében.

I. 6. Mentőfelszerelések

A repülőgépet úgy kell felszerelni, hogy maximális lehetőséget biztosítson a személyzetnek és a fedélzeten tartózkodóknak a túlélésre a várható külső környezetben egy észszerű időtartamig. Az alábbi tényezőket kell figyelembe venni:

a) mentőtutajok/mentőmellények száma.

b) mentőfelszerelések elhelyezése a megfelelő környezetbe,

c) vészrádiók és pirotechnikai vészjeladó felszerelések, és

d) automatikus vész-rádióadók.

J. ALRÉSZ. ÜZEMELTETÉSI KÖRNYEZET ÉS EMBERI TÉNYEZŐK

J. 1. Általános rész

A repülőgépet úgy kell megtervezni, hogy lehetővé tegyék a biztonságos üzemelést az utasok teljesítőképességének határain belül és azokéin, akik működtetik, karbantartják és kiszolgálják azt.

Megjegyzés.- Az ember/gép érintkező felület gyakran a gyenge láncszem egy üzemeltetési környezetben, ezért szükséges biztosítani azt, hogy a repülőgép a repülés minden fázisában (beleértve a meghibásodások okozta csökkenést) irányítható maradjon, és hogy sem a személyzetnek, sem az utasoknak ne okozhasson kárt az a környezet, amelyben tartózkodnak a repülés időtartama alatt.

J. 2. Hajózó személyzet

J. 2. 1. A repülőgépet olyan módon kell megtervezni, hogy lehetővé tegye a hajózó személyzetnek a biztonságos és hatékony repülőgép-vezetést. A tervezésnél tekintettel kell lenni a hajózó személyzet készségeinek és fiziológiai adottságainak különbözőségeire a hajózó személyzet szakszolgálati engedély határain belül. Számításba kell venni a repülőgép különböző várható üzemeltetési körülményeit a környezetében , beleértve a meghibásodások okozta csökkent működést.

J. 2. 2. A repülőgép tervezéséből eredő, a hajózó személyzetre jutó munkaterhelésnek észszerűnek kell lennie a repülés minden fázisában. Speciális figyelmet kell fordítani a repülés kritikus szakaszaira és azon kritikus eseményekre, melyeknek előfordulására észszerűen számítani lehet a repülőgép szolgálati élettartama alatt, mint pl. egy belső hajtómű meghibásodás, vagy szélnyírásba kerülés.

Megjegyzés.- Mind az észlelési, mind a fiziológiai tényezők befolyásolhatják a munkaterhelést.

J. 3. Ergonómia

A repülőgép tervezése során figyelembe kell venni az ergonómiai tényezőket, beleértve:

a) a kényelmes használatot, és a nem szándékos helytelen használat megelőzését,

b) a kényelmes hozzáférést,

c) a munkakörnyezetet,

d) a szabványosítást és az emberközeliséget,

e) kényelmes karbantartást.

J. 4. Az üzemeltetés környezeti tényezői

A repülőgép tervezésekor figyelembe kell venni a hajózó személyzet üzemi környezetét, beleértve:

a) a repülőorvosi tényezők hatását, úgymint oxigénszint, hőmérséklet, páratartalom, zaj és vibráció,

b) a fizikai erők hatását a normál repülés alatt,

c) a nagy magasságban történő hosszantartó repülés hatását, és

d) a testi kényelmet.

“K” ALRÉSZ. BIZTONSÁG

K. 1. Belföldi kereskedelmi üzemeltetésben használatos repülőgépek

Ajánlás.- *Ebben a fejezetben közzétett Nemzetközi Szabványokat és Ajánlott Eljárásokat az összes Szerződő Államnak alkalmaznia kell azon repülőgépekre, melyeket belföldi kereskedelmi üzemelésben (légi szolgáltatásban) használ.*

K. 2. Legkisebb kockázatú bombahely

Mindazoknál a repülőgépeknél, melyeknek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása a 60-at, a repülőgép tervezése során figyelembe kell venni azt az előírást, mely szerint ki kell jelölni egy legkisebb kockázattal járó bombahelyet a repülőgépen, oly módon, hogy a bomba hatásai minimálisak legyenek mind a repülőgépre, mind a benne tartózkodó személyekre nézve.

K. 3. A hajózó személyzet kabinjának védelme

K. 3. 1. Mindazon repülőgépeknél, melyeknek az Annex 6. I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre 2006. május 20.-án, vagy ezt követően nyújtottak be kérelmet az első típusbizonyítvány kiadására az illetékes nemzeti hatósághoz, a pilótakabin válaszfalait, padlózatát és mennyezetét úgy kell megtervezni, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátrepesz áthatolásának, valamint erőszakos behatolásoknak is ellenálljanak, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.

K. 3. 2**. Ajánlás.-** *Mindazon repülőgépeknél, melyeknek az Annex 6 I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre az illetékes nemzeti hatósághoz 2006. május 20.-án vagy ezt követően kérelmet nyújtottak be a típusbizonyítvány módosítására annak érdekében, hogy az magába foglaljon egy másodlagos (derivatív) típustervet, figyelmet kell fordítani a pilótakabin válaszfalainak, padlózatának és mennyezetének megerősítésére olymódon, hogy azok ellenálljanak kisméretű kézifegyver golyóinak és gránátrepesz áthatolásának, valamint erőszakos behatolásokkal szemben is ellenállók legyenek, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.*

Megjegyzés.- Az összes kereskedelmi utasszállító repülőgép pilótakabin ajtóinak követelményeire vonatkozó Szabványok és Ajánlott Eljárások megtalálhatók az Annex 6 I. Rész, 13. Fejezetben. **.**

K. 4. A belső tér tervezése

Minden olyan repülőgépnél, amelynek légialkalmassági bizonyítvány szerinti maximális felszálló tömege meghaladja a 45500 kg-ot, vagy utasülés kapacitása több mint 60, figyelmet kell fordítani azon tervezési jellemzőkre, melyekkel megakadályozható fegyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetősége a fedélzeten, megkönnyítve ezzel az ilyen tárgyak utáni kutatási eljárásokat.

IV. RÉSZ. HELIKOPTEREK

IVA. RÉSZ. MINDAZON HELIKOPTEREKRE VONATKOZIK, MELYEKRE A LÉGIALKALMASSÁGI BIZONYÍTVÁNY IRÁNTI KÉRELMET 1991 MÁRCIUS 22.-ÉN, VAGY EZT KÖVETŐEN NYÚJTOTTÁK BE, DE NEM KÉSŐBB, MINT 2007. DECEMBER 13.

Megjegyzés.- A IVA Rész előírásai megegyeznek az Annex 8 9. kiadása IV. Részében foglaltakkal, kivéve a módosított alkalmazhatósági záradékokat és kereszthivatkozásokat.

1. FEJEZET. ÁLTALÁNOS RÉSZ

1.1. Alkalmazhatóság

1. 1. 1. Jelen fejezet Szabványait az 1. 1. 2. pontban felsorolt összes helikopter típusra alkalmazni kell, melynek prototípusát légialkalmassági bizonyítvány megszerzése céljából 1991. március 22.-én, vagy ezt követően, de 2007. december 13. előtt mutatták be a megfelelő nemzeti hatóságnak.

1. 1. 2. Jelen Rész Szabványait a nemzetközi repülésben utas, áru, vagy posta szállításában résztvevő helikopterekre kell alkalmazni.

Megjegyzés.- Az alábbi Szabványok mennyiségi specifikációt nem tartalmaznak, összehasonlítva a nemzeti légialkalmassági kódokban lévőkkel. A II. Rész 1. 2. 1. pontjának megfelelően ezeket a Szabványokat ki kell egészíteni Szerződő Államok által megalkotott, adoptált vagy elfogadott követelményekkel.

1. 1. 3. A II. Rész 1. 2. 1. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő részei által meghatározott légialkalmassági szintnek az 1. 1. 2. pontban megjelölt helikopterekre lényegében legalább azonosnak kell lenni a jelen rész széleskörű Szabványai által megcélzott általános szinttel.

1. 1. 4. Ha mást nem írtak elő, a Szabványokat a teljes helikopterre kell alkalmazni, beleértve a hajtóműveket, a rendszereket és a berendezéseket.

1. 2. Korlátozások

1. 2. 1. Korlátozó körülményeket kell meghatározni a helikopterre, annak hajtóművére és berendezéseire (lásd a 9. 2. pontot). A jelen Rész Szabványainak való megfelelést meg kell állapítani, feltételezve, hogy a helikoptert a megadott korlátozásokon belül üzemeltetik. A korlátozásokat a helikopter biztonságára veszélyt jelentő bármiféle körülménytől kellő távolságban kell kijelölni úgy, hogy az ilyen körülményből eredő baleset veszélye elhanyagolhatóan kicsiny legyen.

1. 2. 2. A tömeg, a súlyponthelyzet, a terhelés elosztás, a sebességek és a külső környezeti viszonyok korlátozó tartományait meg kell határozni, melyeken belül a jelen Rész megfelelő Szabványaival való egyezés bizonyított, kivéve azon körülmény kombinációkat, ahol ezek elérése alapvetően lehetetlen.

1. sz. Megjegyzés.- A maximális üzemeltetési tömeg és a súlypont határértékei változhatnak például az egyes magasságokkal és az egyes különálló üzemeltetési körülményekkel, mint például: felszállás, útvonalrepülés, leszállás.

2. sz. Megjegyzés.- Példának okáért az alábbi tételeket lehet a helikopter alapvető korlátozásainak tekinteni:

- *Engedélyezett maximális felszállótömeg (beleértve az elemelési tömeget),*
- *Engedélyezett maximális gurulási tömeg,*
- *Engedélyezett maximális leszállótömeg,*
- *A mellső, a hátsó és az oldalsó határoló súlyponthelyzetek a különböző konfigurációkban, és*
- *A függesztett rakomány maximális engedélyezett tömege.*

3. sz. Megjegyzés.- A maximális üzemeltetési tömeget korlátozhatja a Zajminősítési Szabványok alkalmazása (lásd Annex 16, I. Kötet, és Annex 6, III. Rész).

1. 3. Veszélyes tulajdonságok és jellemzők

Minden egyes üzemeltetési körülményt tekintetbe véve a helikopter nem rendelkezhet olyan tulajdonsággal vagy jellemzővel, melytől veszélyessé válik.

1. 4 . A megfelelőség bizonyítása

1. 4. 1. A megfelelő légialkalmassági követelményeknek való megfelelést olyan evidenciákra kell alapozni, melyeket akár tesztekből, akár számításokból, vagy a teszteken alapuló számításokból nyertek, vagy más módszerek segítségével, feltéve, hogy minden egyes esetben az elért pontosság a légialkalmasság olyan szintjét fogja biztosítani, mely azonos azzal a szinttel, amelyet a közvetlen tesztek végrehajtásával elértek volna.

1. 4. 2. Az 1. 4. 1. pontban szereplő teszteknek olyanoknak kell lenniük, hogy észszerű biztosítékot szolgáltassanak arra, hogy a helikopter, annak részei és berendezései megbízhatóak és helyesen működnek a várható üzemeltetési körülmények között.

2. FEJEZET. REPÜLÉS.

2. 1. Általános rész

2. 1. 1. A 2. Fejezetben szereplő Szabványoknak való megfelelést repüléssel, vagy egyéb tesztek alapján kell megállapítani, melyeket egy olyan helikopteren, vagy azonos típusú helikoptereken hajtottak végre, mint amilyenre a Légialkalmassági Bizonyítványt kérik, vagy az ilyen tesztekre alapozott számításokkal (vagy egyéb módszerekkel) határozták meg, feltéve, hogy a számításokból (vagy az egyéb módszerekből) nyert eredmények pontosságban azonosak a közvetlen tesztek eredményeivel, vagy szigorú alapossággal reprezentálják azokat.

2. 1. 2. A helikopter tömegének és súlypont helyzeteinek összes alkalmazható kombinációira meg kell állapítani az egyes Szabványoknak való megfelelést azon terhelési határértékein belül, amelyekre a légialkalmassági bizonyítványt kérték.

2. 1. 3. Ha szükséges, megfelelő konfigurációkat kell meghatározni a helikopter teljesítményének megállapításához a repülés különböző fázisaiban, valamint a helikopter tulajdonságainak vizsgálatához.

2. 2. Teljesítmény

2. 2. 1. Általános rész

2. 2. 1. 1. A helikopter teljesítményéről kellő mennyiségű adatot kell meghatározni és a repülési kézikönyvben közzétenni annak érdekében, hogy az üzemeltetőt ellássák a szükséges információkkal ahhoz, hogy meg tudja határozni a helikopter maximális tömegét azon értékek alapján, melyek sajátosan jellemzik a tervezett repülést, a vonatkozó üzemeltetési paramétereket annak érdekében, hogy a repülés észszerű biztonsággal legyen végrehajtható, és hogy a repülés során elérhető legyen a biztonságos minimális teljesítmény.

2. 2. 1. 2. A helikopterre közzétett teljesítményadatok elérésénél figyelembe kell venni az emberi teljesítőképességet és különösen azt, hogy ne követeljen kivételes ügyességet, vagy elővigyázatosságot a pilóta részéről.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

2. 2. 1. 3. A helikopter közzétett teljesítménye meg kell, hogy egyezzen az 1. 2. 1. pontban előírtakkal, és a helikopter rendszerei és berendezései közül azoknak logikai kombinációkban történő üzemeltetésével, melyeknek működése befolyásolhatja a teljesítményt.

2. 2. 2. Minimális teljesítmény

A felszállásra és leszállásra közzétett maximális tömegnél (lásd a 2. 2. 3. pontot) – a fel-, vagy a leszállás helyének szintmagassága, vagy nyomásmagassága akár az egyezményes légkörben, akár meghatározott szélcsendes légköri viszonyok között, valamint vízről történő üzemelés esetében meghatározott sima víztükörnél, -- a helikopternek képesnek kell lennie a 2. 2. 2. 1. és a 2. 2. 2. 2. pontok szerinti minimális teljesítményre, figyelmen kívül hagyva az akadályokat, vagy a végső megközelítés és a felszállási terület hosszát.

Megjegyzés.- Ez a Szabvány lehetőséget nyújt arra, hogy a helikopter repülési kézikönyvében a maximális felszállótömeget és a maximális leszállótömeget közzétegyék oly módon, hogy viszonyítják például a felszállás vagy a leszállás helyének:

- *szintmagasságára, vagy*
- *nyomásmagasságára, vagy*
- *nyomásmagasságára és a légköri hőmérsékletre,*

ily módon ez azonnali használatra kész adatként álljon rendelkezésre a helikopter teljesítményének üzemeltetési korlátozásainál a nemzeti kód alkalmazásában.

2. 2. 2. 1. *Felszállás*

a) Abban az esetben, ha a kritikus hajtómű egység meghibásodik a felszállás elhatározási pontjánál, vagy ezt követően (1. teljesítmény osztály), vagy meghatározott pontnál a felszállás után (2. teljesítmény osztály), az 1. és 2. teljesítmény osztályba tartozó helikoptereknek képesnek kell lenniük a repülés biztonságos folytatására úgy, hogy a többi hajtómű egységet a jóváhagyott határértékeken belül üzemeltetik.

b) A felszállás és az emelkedés minden fázisában a minimális teljesítménynek elegendőnek kell lenni ahhoz, hogy biztosítsa az ideális körülményekre meghatározott viszonyoktól (2. 2. 3. pont) kissé eltérő üzemeltetési körülmények esetében azt, hogy a közzétett értékektől való eltérés ne legyen aránytalan.

2. 2. 2. 2. *Leszállás*

a) A megközelítési konfiguráció kezdetétől a kritikus hajtómű egység meghibásodása esetében, ha az a leszállás elhatározási pontjánál, vagy ezt megelőzően fordul elő (1. teljesítmény osztály), vagy a leszállás előtti meghatározott pontnál (2. teljesítmény osztály), a helikopternek képesnek kell lennie a repülés biztonságos folytatására, a többi üzemképes hajtómű egységet a jóváhagyott határértékeken belül üzemeltetve.

b) A leszállási konfiguráció kezdetétől a helikopternek képesnek kell lennie akadályozott leszállás esetében az emelkedésre az összes hajtómű egység működése mellett.

2. 2. 3. Teljesítményadatok közzététele

A teljesítmény adatokat meg kell határozni és a helikopter repülési kézikönyvében közzé kell tenni oly módon, hogy az Annex 6 III. Részének 5. 1. 2. pontja szerint működtetett helikopter üzemeltetési szabályaiban való alkalmazásuk biztonságos kapcsolatot biztosítson a helikopter teljesítménye és azon repülőterek, helikopter leszállóhelyek és útvonalak között, amelyeken a helikoptert üzemeltetni kívánják. A teljesítmény adatokat meg kell határozni, és közzé kell tenni a következőkben felsorolt repülési fázisokra, valamint a tömeg, a szintmagasság, vagy a nyomásmagasság, a szélsebesség, és egyéb környezeti viszonyok tartományára, valamint bármilyen egyéb üzemeltetési változóra, amelyre a helikoptert jogosíttatni kívánják, és ezen felül a kétéltű (amfíbia) helikopterek esetében a vízfelszín viszonyaira és a hullámzás erősségére.

2. 2. 3. 1. *Felszállás.* A felszállás teljesítményadatainak magukba kell foglalni a szükséges felszállási távolságot és a felszállás pályáját. Az 1. teljesítmény osztályú helikopterek esetében a megszakított felszálláshoz szükséges úthosszat is tartalmazniuk kell.

2. 2. 3. 1. 1. *A felszállás elhatározási pontja* (csak az 1. teljesítmény osztályú helikopterekre).
A felszállás elhatározási pontja a felszállás pályájában lévő, és a felszálló teljesítmény meghatározásához alkalmazott pont, ahonnan akár a megszakított felszállás végrehajtható, akár, ha a kritikus hajtómű egység meghibásodott, a felszállás biztonságosan folytatható.

2. 2. 3. 1. 2. *Szükséges felszálló úthossz* (csak az 1. teljesítmény osztályú helikopterekre).
A szükséges felszálló úthossz az a vízszintes távolság, amely a felszállás megkezdésének pontjától a felszálló felület felett kiválasztott olyan pontig tart, ahol a helikopter eléri a felszállás biztonságos sebességét (V_{TOSS}), a felszállási terület egy meghatározott magasságát, és pozitív emelkedési gradienst, ha a kritikus hajtómű egység meghibásodik a felszállás elhatározási pontjánál, de a többi hajtómű egység a jóváhagyott üzemeltetési határértékeken belül működik.

2. 2. 3. 1. 3. *Megszakított (rejected) felszállás szükséges úthossza* (csak az 1. teljesítmény osztályú helikopterekre). A megszakított felszállás szükséges úthossza az a vízszintes távolság, mely a felszállás megkezdésétől addig a pontig tart, ahol a helikopter teljesen megáll, miután hajtómű meghibásodás következett be és a felszállás megszakítása a felszállás elhatározási pontjánál.

2. 2. 3. 1. 4. *Szükséges felszállási úthossz* (csak a 2. és 3. teljesítmény osztályú helikopterekre). A szükséges felszállási úthossz az a vízszintes távolság, amely a helikopter felszállásának kezdőpontjától addig a pontig tart, ahol a helikopter eléri a legjobb emelkedési sebességet (V_y), vagy a legkedvezőbb szögű emelkedéshez tartozó sebességet (V_x), vagy egy kiválasztott közbeeső sebességet (feltéve, hogy ez a sebesség nem teszi szükségessé a magasság-sebesség diagram elkerülendő tartományaiban történő repülést), és eléri a felszállási felület egy kiválasztott magasságát, miközben összes hajtóműve a jóváhagyott felszálló teljesítményen működik.

2. 2. 3. 2. *Útvonalrepülés.* Az útvonalrepülés teljesítményéhez tartoznak az emelkedés, a vízszintes repülés, vagy a süllyedés teljesítményértékei az alábbi feltételek mellett:
a)a kritikus hajtómű egység nem üzemel,

b) két kritikus hajtómű egység nem üzemel olyan helikopterek esetében, amelyeknek három, vagy több hajtómű egysége van, és

c) a működő hajtómű egység(ek) nem lépi(k) túl azt a teljesítményt, amelyre azt jogosították.

2. 2. 3. 3. *Leszállás.* A leszállás teljesítmény adatainak magukba kell foglalniuk a szükséges leszálló úthosszt, és az 1. teljesítmény osztályú helikopterek esetében a leszállás elhatározási pontját.

2. 2. 3. 3. 1. *A leszállás elhatározási pontja* (csak az 1. teljesítmény osztályú helikopterekre). A leszállás elhatározási pontja a megközelítés fázisában az a legkésőbbi pont, melytől akár a leszállást végre lehet hajtani, akár a megszakított leszállást biztonságosan lehet megkezdeni (ismételt megközelítés), miközben a kritikus hajtómű nem üzemel.

2. 2. 3. 3. 2. *Szükséges leszálló úthossz.* A szükséges leszálló úthossz az a vízszintes távolság, amely a megközelítés pályájának a leszálló felület feletti egy kiválasztott pontjánál kezdődik, és addig a pontig tart, ahol a helikopter a leszállást követően teljesen megáll.

2. 3. Repülési tulajdonságok

A helikopternek ki kell elégítenie a 2. 3. pont Szabványait minden magasságon a várható maximális magassággal bezárólag, és a magassághoz tartozó összes hőmérsékleti körülmény között, amelyre a helikoptert jogosították.

2. 3. 1. Kormányozhatóság

A helikopternek kormányozhatónak és manőverezhetőnek kell lennie az összes várható üzemeltetési körülmény között, és képesnek kell lennie arra, hogy simán térjen át egyik repülési körülményből a másikba (például: fordulók, oldalirányú csúszások, a hajtómű teljesítményének változásai, a helikopter konfigurációinak változása) anélkül, hogy kivételes képességet, figyelmet, vagy erőkifejtést kívánna meg a pilótától, még abban az esetben is, ha bármelyik hajtómű egysége üzemképtelenné válik. A repülés minden fázisára ki kell dolgozni a helikopter biztonságos kormányozhatóságának technikáját, valamint azokra a helikopter konfigurációkra, amelyekre teljesítményértéket határoztak meg.

Megjegyzés.- Ezen Szabványnak többek között az a célja, hogy olyan üzemelésre is vonatkozzon, amikor nem észlelhető légköri turbulencia körülményei állnak fenn, és célja az is, hogy biztosítsa, hogy a repülési tulajdonságok indokolatlan torzulása nem fog bekövetkezni turbulens levegőben.

2. 3. 1. 1. *Kormányozhatóság a földön (vízen).* A helikopternek kormányozhatónak kell lennie a földön (vagy a vízfelületen) gurulás, felszállás, vagy a leszállás alatt a várható üzemeltetési körülmények között.

2. 3. 1. 2. *Kormányozhatóság felszállás alatt.* A helikopternek kormányozhatónak kell lennie abban az esetben is, amikor a kritikus hajtómű egység hirtelen meghibásodik a felszállás bármely pontjánál, amikor a helikoptert a közzétett felszállási adatoknak megfelelő módon üzemeltetik.

2. 3. 2. Trim

A helikopternek olyan kiegyenlítéssel és kezelési jellemzőkkel kell rendelkeznie, hogy ne legyen szükség a kívánt repülési körülmény fenntartásához a pilóta túlzott figyelmére, ügyességére, ennek elbírálásához tekintetbe kell venni azt is, hogy az adott repülési helyzet a repülés melyik szakaszában fordul elő és a körülmények mennyi ideig állnak fenn. A kormányokhoz kapcsolódó rendszer-meghibásodás esetén nem fordulhat elő jelentős romlás a kormányozhatóság jellemzőiben.

2. 3. 3. Stabilitás

A helikopternek olyan stabilitással kell rendelkeznie a többi repülési jellemzőre vonatkozólag, teljesítményre, szerkezeti szilárdságra és a legvalószínűbb üzemeltetési viszonyokra (például a helikopter konfigurációi és sebesség tartományok), mely biztosítja, hogy a pilóta túlzott figyelem összpontosítására ne legyen szükség, amikor a repülés adott fázisában ezek az igények felmerülnek, számításba véve fennállásuk időtartamát is. Mindemellett a helikopter stabilitása nem lehet olyan, hogy a pilótától túlzott erőkifejtést igényeljen, vagy hogy a helikopter biztonságát veszélyhelyzetben a manőverezhetőség hiánya veszélyeztesse.

2. 3. 4. Autorotáció

2. 3. 4. 1. *A forgószárny fordulatszámának szabályozása.* A helikopter autorotációs jellemzőinek olyanoknak kell lenniük, hogy a pilóta számára lehetővé tegyék a forgószárny fordulatának az előírt értékeken belüli szabályozását és a helikopter teljes kormányozhatóságának fenntartását.

2. 3. 4. 2. *A helikopter viselkedése teljesítményvesztést követően.* Teljesítményvesztést követően a helikopter viselkedése nem lehet olyan szélsőséges, hogy megnehezítse a forgószárny sebességének azonnali visszaállítását anélkül, hogy a repülési sebességre, vagy a szilárdságra vonatkozó korlátozásokat túllépnék.

2. 3. 4. 3. *Autorotációs repülési sebességek.* A maximális hatótávra ajánlott autorotációs repülési sebességet, és a minimális süllyedési sebesség értékét közzé kell tenni.

2. 3. 5. Flatter és vibráció

Megfelelő tesztekkel kell bizonyítani, hogy a helikopter minden része mentes a flattertől és a túlzott vibrációtól az összes helikopter konfigurációban és az összes sebességérték mellett a helikopter üzemeltetési határértékein belül (lásd az 1. 2. 2. pontot). A vibráció nem lehet olyan mértékű, hogy zavarja a helikopter vezetését, vagy szerkezeti károsodás következzen be, vagy a személyzetnek túlzott fáradtságot okozzon.

3. FEJEZET.SZERKEZETEK

3. 1. Általános rész

A 3. Fejezet Szabványai a helikopter szerkezetének az összes olyan alkotórészére vonatkozik, amelynek meghibásodása súlyosan veszélyeztetné a helikopter biztonságát.

3. 1. 1. Tömeg és tömegeloszlás

Ha másként nem írják elő, a szerkezetre vonatkozó valamennyi Szabványnak olyan körülmények között kell megfelelni, amikor a tömeg változik az alkalmazható határértékeken belül, és eloszlása a lehető legkedvezőtlenebb azokon az üzemeltetési korlátozásokon belül, amelyre a légialkalmassági bizonyítvány megadását kérték.

3. 1. 2. Határterhelések

Ha másként nem minősítették, a 3. 4., a 3. 5., és a 3. 6. pontokban előírt különböző terhelési viszonyokra kapott külső terhelést és a megfelelő inercia terhelést, vagy ellenállás terhelést kell határterhelés értékeknek tekinteni.

3. 1. 3. Szilárdság és deformáció

A 3. 4., a 3. 5. és a 3. 6. pontokban leírt különböző terhelési viszonyok között a helikopter egyetlen szerkezeti részén sem következhet be veszélyes deformáció semmilyen terhelésnél egészen a határterhelés értékéig, - ezt is beleértve,- és a helikopter szerkezetének képesnek kell lennie a törőterhelés elviselésére is.

3. 2. Repülési sebességek

3. 2. 1. Tervezési repülési sebességek

Meg kell határozni azokat a repülési sebesség értékeket, amelyekre a helikopter szerkezetét megtervezték, hogy az ellenálljon a megfelelő manőverezési és széllökés terheléseknek a 3. 4. pontnak megfelelően.

3. 2. 2. Repülési sebességek határértékei

A biztonsági többlettel megtervezett megfelelő repülési sebességekre alapozott repülési sebesség határértékeket, ahol megfelelő, az 1. 2. 1. ponttal egyezően be kell dolgozni a helikopter repülési kézikönyvébe az üzemeltetési korlátozások részeként (lásd a 9. 2. 2. pontot). Ha a repülési sebesség korlátozás a tömeg, a tömegeloszlás, a szintmagasság, a forgószárny fordulatszáma, a teljesítmény, vagy egyéb tényezők függvénye, a repülési sebesség határértékeket ezen tényezők kritikus kombinációjára kell meghatározni.

3. 3. A fő forgószárny(ak) forgási sebesség korlátozásai

A fő forgószárny(ak) sebességtartományát úgy kell meghatározni, hogy:

a) a teljesítmény ráadásakor biztosítson megfelelő sebességtöbbletet a forgószárny sebességének változásaira, mely előfordul bármely megfelelő manőver során és megegyezik az alkalmazott vezérlőrendszer, vagy szinkronizációs rendszer fajtáival, és

b) a teljesítmény elvételekor tegye lehetővé a megfelelő autorotációs manőver végrehajtását, melyet a repülési sebesség tartományában bármely értéknél és olyan tömeg értéknél, amelyre a jogosítást kérték.

3. 4. Repülés alatti terhelések

A 3. 4. 1., a 3. 4. 2., és a 3. 6. pontokban szereplő terhelési viszonyokat tekintetbe kell venni a tömeg és a tömegeloszlás tartományára a 3. 1. 1. pontban előírtak szerint, és olyan repülési sebességeknél, melyeket a 3. 2. 1. pontnak megfelelően határoztak meg. Számításba kell venni a szimmetrikus és az aszimmetrikus terheléseket is. Az adott terhelési viszonyokból eredő légellenállást, tehetetlenségi, és egyéb terheléseket úgy kell elosztani, hogy az szorosan megközelítse a tényleges viszonyokat, vagy nagy biztonsággal reprezentálja azokat.

3. 4. 1. Manőverezési terhelések

Az üzemeltetési korlátozások által megengedett manővereknek megfelelő manőverezési terhelés tényezők alapján kell kiszámítani a manőverezési terheléseket. Ezek nem lehetnek kisebb értékűek, mint a várható üzemeltetési viszonyok között a gyakorlat által megfelelőnek mutatkozó értékek

3. 4. 2. Széllökésből eredő terhelések

A széllökésből eredő terhelések értékeit olyan függőleges és vízszintes irányú széllökés erőkre kell kiszámítani, amelyeket statisztikai, vagy egyéb, rendelkezésre álló adatok szerint megfelelőnek találnak a várható üzemeltetési körülményekre.

3. 5. A földfelszín és a víz okozta terhelések

A helikopter szerkezete legyen képes ellenállni a földfelszín, vagy a vízfelület reakcióiból eredő minden terhelésnek, ahogy alkalmazható, melyek várhatóan előfordulnak beindításkor, gurulás közben a földön vagy a vízen, a földtől való elemeléskor, földetéréskor, vagy a forgószárny fékezése során.

3. 5. 1. Leszállási viszonyok

A tervezési felszálló tömegnél és a tervezési leszálló tömegnél a leszállási viszonyoknak magukba kell foglalni a helikopter olyan szimmetrikus és aszimmetrikus helyzeteit talaj- vagy vizet- éréskor, azon süllyedési sebességeket, és minden olyan tényezőt, amely a szerkezetre ható terheléseket érinti, melyek a várható üzemeltetési körülmények között jelen lehetnek.

3. 6. Egyéb terhelések

A manőverezésből, a széllökésből, valamint a vízfelszíntől és a földtől eredő terheléseken felül, vagy ezekkel összefüggésben, figyelembe kell venni olyan egyéb terheléseket is (a kormányra ható terhelések, utaskabin nyomásértékek, a hajtómű működtetésének hatásai, a konfigurációváltoztatás következtében fellépő terhelések, a külső teher okozta terhelések, stb.), melyek valószínűleg előfordulnak a várható üzemeltetési körülmények között.

3. 7. Flatter, divergencia és vibráció

A helikopter minden részének mentesnek kell lennie a túlzott vibrációtól, vagy rezgéstől (oszcilláció) (földi rezonanciától, flattertől, stb.) a megfelelő sebesség- és teljesítményviszony
Bármelyike esetében.

3. 8. Kifáradási szilárdság

A helikopter szilárdsásának és szerkezeti felépítésének olyannak kell lenni, hogy a várható üzemeltetési viszonyok között megismétlődő terhelésekből és a rezgési terhelésekből eredő veszélyes kifáradási törés előfordulásának valószínűsége a legmesszebbmenőkig csekély legyen.

1. sz. Megjegyzés.- Ezen Szabványnak eleget lehet tenni oly módon, hogy megállapítják a szerkezet „biztonságos élettartam”, vagy „meghibásodás mentesség” jellemzőit, tekintetbe véve a megengedett terhelés várható nagyságát és gyakoriságát a várható üzemeltetési körülmények között, valamint a felülvizsgálat eljárásait. A szerkezet bizonyos részeire szükségessé válhat mind a „meghibásodás mentesség”, mind, pedig a „biztonságos élettartam” jellemzőinek meghatározása.

2. sz. Megjegyzés.- A „legmesszebbmenőkig csekély” kifejezésre tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található meg.

4. FEJEZET. TERVEZÉS ÉS GYÁRTÁS

4. 1. Általános rész

A tervezés és a gyártás minden részlete olyan legyen, hogy észszerű garanciát nyújtson arra vonatkozólag, hogy a helikopter összes alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. Ezeket olyan gyakorlati eredményekre kell alapozni, melyek a tapasztalat során kielégítőnek bizonyultak, vagy amelyeket speciális tesztekkel, vagy egyéb megfelelő vizsgálatokkal, vagy a két utóbbi összességével igazoltak. Ezeknél az Emberi Tényezők irányelveit is figyelembe kell venni.

Megjegyzés.- Az Emberi Tényezőkre vonatkozó irányelvekre tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.
4. 1. 1. Bizonyító tesztek

A helikopter biztonságos üzemelése szempontjából lényeges összes mozgó alkotórész működését megfelelő tesztekkel kell bizonyítani annak érdekében, hogy biztosított legyen, hogy ezen alkotórészek hibátlanul fognak működni a rájuk vonatkozó összes üzemeltetési körülmény között.

4. 1. 2. Anyagok

A helikopter biztonságos üzemelése szempontjából lényeges alkotórészek minden anyagának ki kell elégítenie a jóváhagyott előírásokat. A jóváhagyott előírásoknak olyanoknak kell lenniük, hogy az elfogadott anyagok, melyek megfelelnek az előírásoknak, ténylegesen rendelkezzenek a tervezés során feltételezett tulajdonságokkal.

4. 1. 3. Gyártási eljárások

A gyártási és az összeszerelési eljárásoknak olyanoknak kell lenniük, amelyeknek eredményeképpen egy állandóan szilárd szerkezet jön létre, mely a használat során megbízhatóan megőrzi ezt a tulajdonságát.

4. 1. 4. Védelem

A szerkezetet üzemeltetése közben meg kell védeni a károsodástól és szilárdságának csökkenésétől, melyek időjárási okok, korrózió, kopás, vagy egyéb okok miatt következhetnek be, és amelyek esetleg észrevétlenek maradhatnak, tekintetbe véve azt a karbantartást, melyet a helikopter részére biztosítanak.

4. 1. 5.Felülvizsgálatok biztosítása

Megfelelő előírásokkal biztosítani kell, hogy a helikopter azon alkotórészei hozzáférhetők legyenek felülvizsgálat, csere, vagy felújítás céljából, melyekre akár időszakosan, akár rendkívül nehéz üzemeltetési körülményeket követően figyelmet kell fordítani.

4. 1. 6. Rendszer tervezési jellemzők

Különös figyelmet kell fordítani azokra a tervezési jellemzőkre, amelyek hatással vannak a hajózó személyzetek képességeire a kormányozhatóság fenntartásában. Ezen jellemzők közé minimálisan beletartoznak az alábbiak:

a) *Kormányok és kormányrendszerek*. A kormányokat és kormányrendszereket úgy kell megtervezni, hogy a megszorulás, a véletlen működtetés, és a kormányfelületeket rögzítő mechanizmus nem szándékos működésbe lépésének a lehetősége minimális legyen.
   i) Minden egyes kormánynak és kormányrendszernek könnyen kezelhetőnek, simán és hatékonyan működőnek kell lennie, funkciójának megfelelően.
   ii) minden egyes kormányrendszer minden egyes elemét úgy kell megtervezni, hogy minimálisra csökkenjen bármilyen téves összeszerelés valószínűsége, mely a rendszer hibás működését idézheti elő.

a) *A személyzet környezete*. A pilótakabint úgy kell kialakítani, hogy minimálisra csökkenjen a kormányok téves, vagy korlátozott működtetése a hajózó személyzet fáradtsága, tévesztése vagy zavaró hatások következtében. Minimálisan az alábbiakat kell figyelembe venni: a kormányok és a műszerek elrendezése és azonosíthatósága, a veszélyhelyzetek gyors felismerhetősége, a kormányok érzékenysége, szellőzés, fűtés és zaj.

a) *Kilátás a pilótakabinból*. a pilótakabint úgy kell kialakítani, hogy biztosítva legyen a pilóta számára a tiszta, torzításmentes kilátás a helikopter biztonságos vezetéséhez, a pilóta látását zavaró csillogás és tükrözés nélkül. A pilótakabin szélvédője tervezési jellemzőinek biztosítania kell azt, hogy csapadékos körülmények között is kielégítő látása legyen a pilótának a helikopter normál vezetéséhez, valamint a megközelítések és leszállások végrehajtásához.

a) *Felkészülés veszélyhelyzetekre*. Olyan megoldásokat kell biztosítani, amelyek vagy automatikusan megelőzik a veszélyhelyzetet, vagy amelyekkel a hajózó személyzet kezelni tudja azon berendezések és rendszerek előrelátható meghibásodásaiból származó veszélyhelyzeteket, mely berendezések, és rendszerek hibája veszélyeztetné a helikoptert. Észszerű megoldásokat kell kidolgozni a hajtómű-egység vagy a rendszerek meghibásodását követő nélkülözhetetlen szolgáltatások olyan mértékű fenntartására, amilyen mértékben ezekre a meghibásodásokra a jelen Annex és az Annex 6. III. Részében foglalt teljesítmény és üzemeltetési korlátozások Szabványai ezt előírják.

a) Tűzvédelem. A helikopter tervezése és gyártása során a kabin belső bútorzata anyagainak, melyeket nagyobb javítások, vagy a bútorzatcsere során felhasználnak, olyanoknak kell lenniük, hogy minimálisra csökkentsék a tűz keletkezésének lehetőségét repülés közben, vagy a földön, valamint tűz kialakulásakor füst és mérgező gázok kifejlődését. Az összes hozzáférhető tüzek, - melyek előfordulhatnak,- észlelésére, lokalizálására, és eloltására olyan megoldásokat kell kidolgozni, hogy ezek a helikopterre további veszélyt ne jelentsenek.

a) *A fedélzeten lévő személyek cselekvőképtelensége*. A tervezés során óvintézkedéseket kell beépíteni az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, melyek a helikopterben tartózkodó személyeket cselekvőképtelenné tehetik.

4 1. 7. Kényszerleszállásra vonatkozó előírások

A helikopter tervezése során gondoskodni kell arról, hogy a fedélzeten tartózkodó személyek egy kényszerleszállás esetén védettek legyenek a tűztől és a sebességcsökkenés hatásaitól.
Eszközöket kell biztosítani a helikopter gyors kiürítéséhez egy kényszerleszállás utáni várhatóan előforduló körülmények esetére. Ezeknek az eszközöknek összhangban kell lenniük a helikopter utaslétszámával és a személyzet kapacitásával. Vízre történő kényszerleszállásra jóváhagyott helikopterekre a tervezés során olyan előírásokat is meg kell alkotni, amelyek maximálisan megvalósítható garanciát jelentenek arra, hogy vízre történő kényszerleszállás esetében a helikopterben lévő utasok, és a személyzet biztonságosan kimenekíthető legyen.

4. 1. 8. Földi kiszolgálás

A tervezésnél megfelelő előírásokat kell alkotni az olyan kockázatok minimalizálására, melyek a földi üzemeltetés (például: vontatás, felemelés) során a helikopter biztonságos üzemeltetése szempontjából lényeges részein sérüléseket okozhatnak, melyek esetleg észrevétlenek maradhatnak. Ehhez az összes korlátozás és utasítás, mely a védelmet szolgálja, figyelembe vehető.

5. FEJEZET. HAJTÓMŰVEK

5. 1. Alkalmazási terület

Az 5. Fejezet Szabványai az összes olyan hajtóműtípusra vonatkoznak, melyeket a helikopterben elsődleges meghajtó-egységként alkalmaznak.

5. 2. Tervezés, gyártás és működés

A teljes hajtóművet segédberendezéseivel együtt úgy kell megtervezni és legyártani, hogy megbízhatóan üzemeljen az üzemeltetési korlátozásain belül a várható üzemeltetési körülmények között, ha a 6. Fejezet szerint megfelelően építették fel a helikopterre, alkalmas forgószárnnyal és erőátviteli rendszerrel.

5. 3. Közzétett teljesítmény osztályok, viszonyok és korlátozások

A hajtómű teljesítmény osztályát és azokat a légköri viszonyokat, amelyekre ezt alapozták, közzé kell tenni, valamint az összes üzemeltetési körülményt és korlátozást, melyeken belül a hajtómű működését vezérelni szándékolták.

5. 4. Tesztek

Az adott hajtóműtípus egy példányán sikeresen végre kell hajtani mindazokat a teszteket, melyek ahhoz szükségesek, hogy bizonyítsák a közzétett teljesítmény osztályok, körülmények és korlátozások érvényességét, és garanciát jelentsenek arra, hogy a hajtómű kielégítően és megbízhatóan fog működni. A teszteknek legalább az alábbiakat kell magukba foglalni:

a) *Teljesítményhitelesítés.* A hajtómű teljesítmény jellemzőinek megállapítására teszteket kell végrehajtani nemcsak akkor, amikor a hajtómű új, hanem a b) és a c) pontban előírt tesztek végrehajtása után is. Az összes előírt teszt végrehajtása utáni végeredmény nem mutathatja azt, hogy a hajtómű teljesítménye jelentősen csökkent.

b) *Üzemelés.* Teszteket kell végrehajtani annak igazolására, hogy a hajtómű indítása, alapjárata, gyorsulása, rezgése és túlpörgése, valamint egyéb jellemzői kielégítőek, és bizonyítani kell, hogy megfelelő biztonsági rátartással rendelkezik ahhoz, hogy ne forduljon elő robbanás, befulladás, vagy egyéb veszedelmes körülmény, mely előfordulhat egy adott hajtóműtípusnál.

c) *Tartóssági vizsgálat.* Kielégítően hosszú ideig kell a teszteket végezni olyan teljesítménnyel, hajtómű és forgószárny sebességekkel, és egyéb üzemeltetési körülmények között, melyek a hajtómű megbízhatóságának és tartósságának bizonyításához szükségesek. Ezeknek a teszteknek magukba kell foglalniuk olyan üzemeltetést is, amikor a viszonyok olyan mértékben haladják meg a közzétett határértékeket, mint amilyen mértékben a tényleges üzemi használat során túlléphetik ezeket.

6. FEJEZET. FORGÓSZÁRNY ÉS ERŐÁTVITELI RENDSZEREK, A HAJTÓMŰ FELÉPÍTÉSE

6. 1. Általános rész

A hajtómű felépítésének, beleértve a forgószárnyat és az erőátviteli rendszert is, ki kell elégítenie a 4. Fejezet és a jelen Fejezet Szabványait.

6. 2.Tervezés, gyártás és működés

A forgószárnyat és az erőátviteli rendszereket tartozékaikkal együtt úgy kell megtervezni és megépíteni, hogy azok megbízhatóan működjenek az üzemeltetési határértékeken belül a várható üzemeltetési körülmények között, ha a jelen Fejezetnek megfelelően pontosan illesztették a hajtóműhöz és építették fel a helikopterre.

6. 3. Közzétett teljesítmény osztályok, viszonyok és korlátozások

Közzé kell tenni a hajtómű teljesítmény osztályait és az összes olyan üzemeltetési körülményt, valamint a korlátozásokat, melyekre a forgószárny és az erőátviteli rendszerek működésének szabályozását előirányozták.

6. 3. 1. A forgószárny maximum és minimum fordulatszámának korlátai

Meg kell határozni a forgószárnyak maximum és minimum fordulatszámát mind a meghajtott, mind a meghajtás nélküli állapotra. Közzé kell tenni minden olyan üzemeltetési körülményt (például: repülési sebesség), mely befolyásolja ezen maximum és minimum értékeket.

6. 3. 2. Figyelmeztetés a forgószárny túl alacsony, illetve túl magas fordulatszámára (túlpörgés)

A pilótának egyértelmű és jellegzetes figyelmeztetést kell kapnia, amikor a helikopter a forgószárny sebességhatáraihoz közelít akkor is, ha a hajtómű egységei üzemelnek, és akkor is, ha valamelyik üzemképtelen. A figyelmeztetésnek és az előálló helyzet kezdeti jellemzőinek olyanoknak kell lenniük, hogy lehetővé tegyék a pilóta számára a kialakult helyzet további kezelését a figyelmeztető jelzés megtörténte után, és hogy a forgószárny fordulatszámát vissza tudja állítani az előírt normál határok közé, és fenn tudja tartani a helikopter teljes kormányozhatóságát.

6. 4. Tesztek

A forgószárnyon és az erőátviteli rendszereken kielégítő eredménnyel kell elvégezni mindazokat a teszteket, melyek annak biztosításához szükségesek, hogy azok megfelelően és megbízhatóan fognak működni a közzétett teljesítmény osztály, az üzemi körülmények és a korlátozások határértékein belül. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) *Üzemelés.* Tesztekkel kell bizonyítani, hogy a szilárdsági, a rezgési és a túlpörgési jellemzők megfelelőek, és igazolni azt, hogy a bólintásszabályozó és vezérlő mechanizmusok, valamint a szabadonpörgést biztosító mechanizmus szabályszerűen és megbízhatóan működik.

b) *Tartósság.* Kielégítő időtartamú teszteket kell végrehajtani olyan teljesítmény, hajtómű és forgószárny sebességeknél, valamint egyéb üzemeltetési körülményeknél, melyek annak bizonyításához szükségesek, hogy a forgószárny és az erőátviteli rendszerek megbízhatóak és tartósságuk megfelelő.

6. 5. A hajtómű, a forgószárny, és az erőátviteli rendszerek korlátozásainak való megfelelés

A hajtómű rendszer felépítését úgy kell megtervezni, hogy a hajtóművek, a forgószárny, és az erőátviteli rendszerek használatra alkalmasak legyenek a várható üzemeltetési viszonyok között. A helikopter repülési kézikönyvében meghatározott körülmények között a helikopternek képesnek kell lennie arra, hogy a hajtóművekre, a forgószárnyra és az erőátviteli rendszerekre megállapított határértékek túllépése nélkül működjön az 5. és a 6. Fejezetnek megfelelően.

6. 6. A hajtómű rotáció vezérlése

Olyan hajtóműtípusoknál, ahol a meghibásodott hajtómű további rotációja megnövelheti a tűz, valamint a komoly szerkezeti károsodás veszélyét, megoldásokat kell biztosítani a személyzetnek arra, hogy leállíthassa a hajtómű rotációját repülés közben, vagy egy biztonságos szintre csökkenthesse azt.

6. 7. A hajtómű újraindítása

Megoldást kell biztosítani a hajtómű újraindítására repülés közben a közzétett maximális magasságig bezárólag minden magasságon.

6. 8. Elrendezés és működés

6. 8. 1. A hajtómű egységek függetlensége

Az 1. és a 2. osztályú helikopterek teljesítményének eléréséhez a hajtóművet úgy kell elrendezni és felépíteni a helikopterre, hogy minden egyes hajtómű egységet a hozzá tartozó rendszerekkel együtt a többitől függetlenül lehessen vezérelni és működtetni, valamint oly módon, hogy közöttük legyen legalább egy hajtómű egység a hozzá tartozó rendszerekkel együtt, amelynek meghibásodása, - bármilyen kicsi is ennek előfordulási valószínűsége, - nem jelent nagyobb teljesítményvesztést, mint amekkorát a kritikus hajtómű teljes meghibásodása okoz.

6. 8. 2. A forgószárny és az erőátviteli rendszereke vibrációja

A forgószárnyban és az erőátviteli rendszerekben a vibráció okozta feszültségeket meg kell határozni, melyek nem lehetnek nagyobbak, mint a helikopterre megállapított üzemeltetési korlátozásokon belül a működtetésre biztonságosnak ítélt értékek.

6. 8. 3. Hűtés

A hűtőrendszernek képesnek kell lennie arra, hogy a hajtómű és az erőátviteli rendszerek hőmérsékletét a meghatározott határértékeken belül tartsa (lásd a 6. 5. pontot) a helikopter üzemeltetésére jóváhagyott külső levegőhőmérsékletek mellett. A helikopter repülési kézikönyvében közzé kell tenni azokat a maximum és minimum hőmérsékleteket, melyek között a hajtóműről és az erőátviteli rendszerekről megállapították, hogy alkalmasak.

6. 8. 4. Csatlakozó rendszerek

Minden egyes hajtómű egységhez, erőátviteli rendszer egységhez, és minden egyes forgószárnyhoz tartozó tüzelőanyag-, levegőbetáplálás és egyéb rendszereknek képesnek kell lenniük arra, hogy kiszolgálják a megfelelő egységet az előírt követelményeknek megfelelően és minden olyan körülmény fennállása esetén, mely a rendszerek működését befolyásolja (például: hajtómű teljesítményszabályozás, a helikopter térbeli helyzete és gyorsulások, légköri viszonyok, folyadékhőmérsékletek) a várható üzemeltetési körülmények között.

6. 8. 5. Tűzvédelem

A megjelölt tűztérségekben, ahol a potenciális tűzveszély különösen súlyos a gyúlékony anyagokra nézve a begyulladás- források közelsége miatt, a következőket kell alkalmazni a 4. 1. 6. e) pontban szereplő általános Szabványokon felül:

a) *Szigetelés.* Az olyan zónákat, ahol a tűz jelenléte veszélyeztetheti a folyamatos repülést, tűzálló anyagokkal kell elszigetelni a helikopter többi részétől, számításba véve a tűz keletkezésének valószínű pontjait, és a tűz keletkezésének valószínű útvonalát.

b) *Gyúlékony folyadékok.* Az ilyen zónákban elhelyezett gyúlékony folyadékrendszer alkotóelemeinek képesnek kell lenniük a folyadék megtartására a tűz kialakulásának körülményei között. Megoldásokat kell a személyzet részére biztosítani, hogy le tudják állítani a gyúlékony anyagok veszélyes mennyiségének bejutását az ilyen zónákba, ha tűz keletkezett.

c) *A tűz észlelése.* Elegendő számú tűzjelzőről kell gondoskodni, és úgy kell elhelyezni azokat, hogy bármilyen tűz gyors észlelése biztosított legyen, mely tűz az ilyen zónákban előfordulhat.

d) *Tűzoltás.* Az ilyen zónákat olyan tűzoltó rendszerrel kell ellátni, mely képes az itt valószínűleg előforduló tűz eloltására, feltéve, hogy a szigetelés, a gyúlékony anyagok mennyisége, a szerkezet tűzállósága, és az egyéb jellemzők olyan fokúak, hogy az ezekben a zónákban valószínűen előforduló bármilyen tűz nem veszélyeztetheti a helikopter biztonságát.

7. FEJEZET. MŰSZEREK ÉS BERENDEZÉSEK

7. 1. Előírt műszerek és berendezések

A helikoptert el kell látni mindazokkal a jóváhagyott műszerekkel és berendezésekkel, melyek a helikopter biztonságos üzemeltetéséhez szükségesek a várható üzemeltetési körülmények között. Ezek között szerepelni kell mindazoknak a műszereknek és berendezéseknek, amelyekkel a személyzet a helikoptert működtetni képes az üzemeltetési határértékeken belül. A műszerek és berendezések tervezésekor figyelembe kell venni az Emberi Tényezők irányelveit.

1. sz. Megjegyzés.- A légialkalmassági Bizonyítvány kiadásához szükséges minimumon felüli műszerek és berendezések felsorolását az Annex 6 III. Részben lehet megtalálni, ezeket a különleges körülményekre, vagy a különleges útvonalfajtákra írták elő.

2. sz. Megjegyzés.- Az Emberi Tényezők irányelveire vonatkozó tájékoztató anyagot az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683), valamint a Légiforgalmi Szolgáltatás Szervezés (ATM) Rendszerei (DOC 9758) című kiadványban lehet megtalálni.

7. 2. Felépítés a helikopterre

A műszerek és berendezések felépítésének ki kell elégítenie a 4. Fejezet Szabványait.

7. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági és mentőfelszereléseknek, melyeket a személyzet, vagy az utasok várhatóan használni fognak egy kényszerleszállás alkalmával, megbízhatónak, azonnali hozzáférésre késznek, és könnyen felismerhetőnek kell lenniük, valamint a működtetésük módját egyértelműen kell jelölni.

7. 4. Navigációs fények és összeütközés elleni fények

7. 4. 1. Az Annex 2.-ben – Repülési szabályok, - előírt fényeknek, melyeket a helikopteren repülés közben működtetni kell, vagy akkor, amikor a helikopter valamely repülőtér, vagy egy helikopter – repülőtér földi mozgásterületén üzemel, olyan intenzitásúnak, színűnek, fedésterületűnek, és egyéb jellemzőkkel rendelkezőnek kell lenniük, hogy egy másik légijármű pilótájának, vagy a földön tartózkodó személyzetnek elegendő idő álljon rendelkezésre a helyzet értelmezésére és az ezt követő azon manőver végrehajtására, mely az összeütközés elkerüléséhez szükséges.

1. sz. Megjegyzés.- Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, mint például a tipikus városi megvilágítás fényei, a tiszta csillagos égbolt, a holdsütötte vízfelület, és olyan nappali megvilágítási viszonyok mellett, amikor a háttér-megvilágítás alacsony mértékű. Ezen túlmenően, az összeütközési veszélyt jelentő helyzetek legvalószínűbben olyan közelforgalmi körzetekben fordulnak elő, amelyekben a légijárművek közbeeső, vagy alacsony repülési szinteken, közel azonos sebességgel üzemelnek, mely sebesség nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

2. sz. Megjegyzés.- A helikopterek külső fényeinek műszaki specifikációját lásd a Légialkalmassági Kézikönyvben (DOC 9760).

7. 4. 2. A helikopteren a fényeket úgy kell elhelyezni, hogy az alábbi esetek lehetősége minimális legyen:

a) hátrányosan befolyásolják a hajózó személyzetet kötelmeinek kielégítő ellátásában, vagy

b) ártalmasan elvakítják a külső szemlélőt.

Megjegyzés.- A 7. 4. 2. pon6tban felsorolt hatások elkerülése érdekében bizonyos esetekben szükség lehet olyan megoldásokra a személyzet számára, amellyel a pilóta ki tudja kapcsolni a villogófényeket, vagy csökkenteni tudja azok intenzitását.

8. FEJEZET. ELEKTROMOS RENDSZEREK

Az elektromos rendszert úgy kell megtervezni és felépíteni a helikopterre, hogy az a tervezett funkciónak megfeleljen bármilyen előre látható üzemeltetési körülmény között.

9. FEJEZET. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK

9. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványainak való megfelelést meghatározták, tovább minden egyéb olyan információt, mely a helikopter biztonságos üzemeltetéséhez szükséges, közzé kell tenni a helikopter repülési kézikönyvében, vagy jelölésekkel, feliratokkal kell közzétenni, vagy olyan egyéb módon, mely hatékonyan segíti elő a cél elérését. A korlátozásoknak és az információknak legalább a 9. 2, a 9. 3, és a 9. 4 pontokban előírtakat kell magukba foglalniuk.

9. 2. Üzemeltetési korlátozások

Azokat a korlátozásokat, melyek repülés közbeni túllépésének veszélye fennáll, és amelyeket számszerűleg határoztak meg, alkalmas egységekben kell kifejezni és szükség esetén helyesbíteni kell a méréshibák miatt oly módon, hogy a hajózó személyzet a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani, hogy mikor éri el a korlátozó értékeket.

9. 2. 1. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes tömegre, súlyponthelyzetekre, tömegelosztásra és padlóterhelésre vonatkozó korlátozó értékeket (lásd az 1. 2. 2. pontot).

9. 2. 2. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk minden olyan sebességértéket (lásd a 3. 2. pontot), mely korlátozó jellegű a szerkezeti épség, vagy a helikopter repülési tulajdonságai, vagy más megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő helikopter konfigurációkra, és egyéb, odaillő tényezőre vonatkoztatva kell megadni.

9. 2. 3. Hajtómű és erőátvitel korlátozások

A hajtómű korlátozásainak magukba kell foglalni az összes olyan korlátozást, melyeket a helikopterre felépített különböző hajtóművekre és átviteli alkotóelemre meghatároztak (lásd a 6. 5. és a 6. 6. pontokat).

9. 2. 4. A forgószárnyra vonatkozó korlátozások

A forgószárny sebességkorlátozásainak magukba kell foglalniuk a maximális és a minimális forgószárny sebességeket mind a meghajtás nélküli (autorotáció), mind a meghajtott állapotra vonatkozólag.

9. 2. 5. A berendezésekre és rendszerekre vonatkozó korlátozások

A berendezésekre és rendszerekre vonatkozó korlátozásoknak magukba kell foglalni az összes olyan korlátozást, melyet a helikopterre felépített különböző rendszerekre és berendezésekre megállapítottak.

9. 2. 6. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalniuk minden olyan szükséges korlátozást, melyeket a helikopter biztonsága szempontjából veszélyesnek ítélt körülmény figyelembevételével állapítottak meg (lásd az 1. 2. 1. pontot).

9. 2. 7. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a helikopter üzemeltetéséhez szükséges minimális hajózó személyzet létszámát, figyelembe véve más egyéb mellett, a megfelelő hajózó személyzeti tag hozzáférési lehetőségét az összes szükséges vezérlőszervhez és a műszerekhez, valamint a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 –Légijármű Üzemeltetés- III. Részét az olyan körülményekre vonatkozólag, amikor jelen Annex-ben meghatározott minimális hajózó személyzeti létszámon felül további hajózó személyzeti tag válik szükségessé.

9. 3. Az üzemeltetésre vonatkozó információk és eljárások

9. 3. 1. Alkalmas üzemeltetés típusok

Részletes felsorolást kell készíteni az üzemeltetés típusairól oly módon, ahogy az Annex 6 III. Rész ezeket meghatározza, vagy ahogy ez általánosságban ismert, melyekre a helikopter alkalmasnak mutatkozott a megfelelő légialkalmassági követelményeknek való megfelelés alapján.

9. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalniuk a helikopter üres tömegét a helikopter súlymérése körülményeinek meghatározásával együtt, a vonatkozó súlyponthelyzeteket, a referencia pontokat és az alapvonalakat, melyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- A helikopter üres tömege rendszerint nem foglalja magába a személyzet és a hasznos terhelés tömegét, a kifogyasztható tüzelőanyagot és a leereszthető olaj tömegét, de magába foglalja az összes beépített ballaszt, a kifogyaszthatatlan tüzelőanyag, a le nem engedhető olaj tömegét, valamint a hajtómű hűtőfolyadékának és a hidraulika folyadéknak a teljes mennyiségét.

9. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott helikopterre jellemzőek és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek tartalmazniuk kell az egy, vagy több hajtómű egység meghibásodása esetén követendő eljárásokat.

9. 3. 4. A helikopterre vonatkozó kezelési információk

A helikopter jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról kielégítő információt kell biztosítani.

9. 4. Teljesítményre vonatkozó információk

A helikopter teljesítményét a 2. 2. pont szerint kell közzétenni. Ennek magába kell foglalnia a különböző helikopter konfigurációkra és a vele összefüggő teljesítmény és a vonatkozó sebesség információkat, melyek segítséget nyújthatnak a hajózó személyzetnek ahhoz, hogy elérje a közzétett értékeket.

9. 5. Helikopter repülési kézikönyv

A helikopter repülési kézikönyvének rendelkezésre kell állni. Világosan jelölni kell, hogy mely adott helikopterre, vagy helikopterszériára vonatkozik. A helikopter repülési kézikönyvének minimálisan az ebben a fejezetben szereplő korlátozásokat, információkat és eljárásokat kell tartalmaznia.

9. 6. Jelölések és feliratok

9. 6. 1. A műszereken, berendezéseken, a kormányokon lévő jelöléseknek és feliratoknak tartalmazniuk kell mindazon korlátozásokat, vagy információt, melyeket a hajózó személyzeteknek repülés alatt elsődlegesen figyelembe kell venni.

9. 6. 2. Jelöléseket, feliratokat, utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadjuk, és hogy kizárható legyen a tévesztés lehetősége a földi kiszolgálásban (azaz vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat, és veszélyeztetheti a helikopter biztonságát a következő repülések során.

IVB. RÉSZHELIKOPTEREK, MELYEKRE A LÉGIALKALMASSÁGI BIZONYÍTVÁNY IRÁNTI KÉRELMET 2007. DECEMBER 13.-ÁN, VAGY EZT KÖVETŐEN NYUJTOTTÁK BE

A. ALRÉSZ. ÁLTALÁNOS RÉSZ

A. 1. Alkalmazhatóság

A. 1. 1. Jelen Rész Szabványait az összes, az A. 1. 2. pontban meghatározott olyan helikopterre alkalmazni kell, melyre a Típus Bizonyítvány kiadása iránti kérelmet az illetékes nemzeti hatóságokhoz 2007. december 13.-án, vagy ezt követően nyújtják be.

A. 1. 2. Jelen Rész Szabványait azon helikopterekre kell alkalmazni, melyeknek a maximális engedélyezett felszállótömege meghaladja a 750 kg-ot, és célja, hogy a nemzetközi légiforgalomban utasokat, vagy árut, vagy postát szállítson.

Megjegyzés.- Az alábbi Szabványokban nincs mennyiségi specifikáció, ellentétben a nemzeti légialkalmassági kódokban található Szabványokkal. A II. Rész 1. 2. 1. pontjának megfelelően ezeket ki kell egészíteni a Szerződő Államok által meghatározott, elfogadott, vagy adoptált követelményekkel.

A. 1. 3. A II. Rész 1. 2. 1. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő részei által meghatározott légialkalmassági szintnek az A. 1. 2. pontban megjelölt helikopterekre lényegében legalább azonosnak kell lenni a jelen Rész Szabványai által szándékolt általános szintjével.

A. 1. 4. Ha mást nem írtak elő, a Szabványokat a teljes helikopterre kell alkalmazni, beleértve a hajtóműveket, a rendszereket és a berendezéseket is.

A. 2. Üzemeltetési korlátozások

A. 2. 1. Korlátozó körülményeket kell meghatározni a helikopterre, annak hajtóművére (hajtóműveire), és berendezéseire (lásd a G. 2. pontot). A jelen Rész Szabványainak való megfelelést úgy kell megállapítani, hogy feltételezzük, hogy a helikoptert a megadott korlátozásokon belül üzemeltetik.

Ezen üzemeltetési határértékeket meghaladó biztonsági implikációkat tekintetbe kell venni.

A. 2. 2. Bármelyik paraméter korlátozó tartományait meg kell állapítani, melyeknek változása veszélyeztetheti a helikopter biztonságos üzemeltetését, például: a tömeg, a súlypont helye, a terhelés elosztás, a sebesség, a külső levegő hőmérséklet és magasság, melyeken belül az összes ezen Részben szereplő odaillő Szabványnak való megfelelés bizonyított.

1. sz. Megjegyzés.- A maximális üzemeltetési tömeg és a súlypont határértékei változhatnak például az egyes magasságokkal, és az egyes gyakorlatilag eltérő üzemeltetési körülménnyel, mint például a felszállás, az útvonalrepülés ás a leszállás.

2. sz. Megjegyzés.- A maximális üzemeltetési tömeget korlátozhatja a Zajminősítési Szabványok alkalmazása (lásd az Annex 16. I. Kötetben, és az Annex 6. III. Részben foglaltakat).

A. 3. Veszélyes tulajdonságok és jellemzők

Az összes várható üzemeltetési körülményt tekintetbe véve a helikopter nem rendelkezhet olyan tulajdonsággal, vagy jellemzővel, mely ránézve veszélyt jelent.

A. 4. A megfelelőség bizonyítása

Azoknak a módozatoknak, melyekkel bizonyították a vonatkozó légialkalmassági követelményeknek való megfelelést, biztosítaniuk kell, hogy minden egyes esetben az elért pontosság olyan lesz, hogy észszerű biztosítékot garantáljon arra, hogy a helikopter, annak alkotórészei és berendezései megfelelnek a követelményeknek, megbízhatóak, és hibátlanul fognak működni a várható üzemeltetési viszonyok között.

B. ALRÉSZ. REPÜLÉS

B. 1. Általános rész

B. 1. 1. A jelen Alrészben ismertetett Szabványoknak való megfelelést repüléssel, vagy egyéb, egy helikopteren, vagy olyan típusú helikoptereken végrehajtott tesztekkel kell megállapítani, mint amilyenre a Légialkalmassági Bizonyítványt kérték, vagy az ilyen tesztekre alapozott számításokkal (vagy egyéb módszerekkel), feltéve, hogy a számításokból (vagy egyéb módszerekből) nyert eredmények pontosságban azonosak, vagy szigorú alapossággal reprezentálják a közvetlen tesztek eredményeit.

B. 1. 2. A helikopter tömegének és súlypont helyzeteinek összes alkalmazható kombinációira meg kell állapítani az egyes Szabványoknak való megfelelést a terhelési tartomány határértékein belül, amelyre a légialkalmassági bizonyítványt kérték.

B. 1. 3. Ahol szükséges, megfelelő helikopter konfigurációkat kell meghatározni a repülés különböző szakaszaiban a teljesítmény megállapítása, és a helikopter repülési tulajdonságainak vizsgálata céljából.

B. 2. Teljesítmény

B. 2. 1. A helikopter teljesítményéről kellő mennyiségű adatot kell meghatározni és a repülési kézikönyvben közzétenni annak érdekében, hogy az üzemeltetőket ellássák a szükséges információkkal ahhoz, hogy meg tudják határozni a helikopter maximális tömegét mindazon értékek alapján, melyek sajátosan jellemzik a tervezett repülést, valamint a vonatkozó üzemeltetési paramétereket annak érdekében, hogy a repülés észszerű biztonsággal végrehajtható legyen és a repülés során a biztonságos minimális teljesítményt elérjék.

B. 2. 2. A helikopterre közzétett teljesítmény értékek teljesítésénél figyelembe kell venni az emberi teljesítőképességet, és különösen azt, hogy ez nem követelhet kivételes ügyességet, vagy elővigyázatosságot a hajózó személyzet részéről.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyagot az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) lehet megtalálni.

B. 2. 3. A helikopter közzétett teljesítményének összhangban kell lennie az A. 2. 1. pontban foglaltakkal és a helikopter rendszerei és berendezései közül azokkal, melyeket logikai kombinációban működtetve befolyással lehetnek a helikopter működésére.

B. 2. 4. Minimális teljesítmény

A felszállásra és leszállásra közzétett maximális tömegeknél (lásd a B. 2. 7. pontot) – mivel a felszállási és leszállási hely nyomásmagassága és hőmérséklete szerepet játszik szélcsend viszonyok között, és vízi repülés esetében a sima vízfelület meghatározott körülményei között, - a helikopternek képesnek kell lennie a B. 2. 5. illetőleg a B. 2. 6. pont szerint meghatározott minimális teljesítményre, figyelmen kívül hagyva az akadályokat, vagy a végső megközelítés és a felszálló terület hosszát.

B. 2. 5. Felszállás

a) A felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lenni ahhoz, hogy biztosítsa az ideális körülményekre meghatározott viszonyoktól (lásd a B. 2. 7. pontot) kissé eltérő üzemeltetési körülmények esetén azt, hogy a közzétett értékektől való eltérés ne legyen aránytalan.

b) „A” kategóriájú helikopterek esetében, ha a kritikus hajtómű a felszállás elhatározási pontjánál, vagy ezt követően hibásodik meg, a helikopter legyen képes a biztonságos repülés folytatására, miközben a többi hajtóművet a jóváhagyott határértékeken belül működtetik.

B. 2. 6. Leszállás

a) A helikopternek képesnek kell lennie egy előkészített leszálló felületen biztonságos leszállás végrehajtására azt követően, hogy a normál útvonalrepülés során teljes teljesítményvesztés állt elő.

b) „A” kategóriájú helikoptereknél, ha a kritikus hajtómű meghibásodása a leszállás elhatározási pontjánál, vagy azt megelőzően fordul elő, a leszállási konfigurációtól kezdődően a helikopternek képesnek kell lennie a biztonságos repülés folytatására, miközben a többi hajtóműve (hajtóművei) a jóváhagyott határértékek között működik.

B. 2. 7. Teljesítményadatok közzététele

A teljesítményadatokat meg kell határozni, és közzé kell tenni a repülési kézikönyvben az alábbi tartományokra: tömeg, szintmagasság, hőmérséklet és egyéb üzemeltetési változó, melyre a helikoptert jogosíttatni kívánják, és, ezen felül, a kétéltű (amfíbia) helikopterek esetében a vízfelszín viszonyaira és a hullámzás erősségére vonatkozó teljesítményadatokat közzé kell tenni.

a) T*eljesítmény lebegéskor.* A lebegési teljesítményt mind földhatás esetében, mind földhatás-mentes esetre vonatkozólag meg kell határozni, ha az összes hajtómű üzemel.

b) *Emelkedés.* Az egyenletes emelkedési sebesség értékét meg kell határozni, miközben a hajtómű /hajtóművek a jóváhagyott határértéken, vagy ezen belül üzemel (nek).

c) S*ebességi burkológörbe (diagram).* Ha a magasság és az előre ható sebesség (beleértve a lebegést) bármilyen kombinációja fennáll, mely alatt a biztonságos leszállás nem hajtható végre a kritikus hajtómű meghibásodása után, miközben a többi hajtóművek (ha alkalmazható) a jóváhagyott határértékeken belül üzemelnek, a magasság-sebesség burkológörbét létre kell hozni.

d) *Felszállási távolság – az összes hajtómű működik.* Ahol az üzemeltetési szabályok szükségessé teszik, a felszállási távolságnak – az összes hajtómű működése mellett, - azt a vízszintes távolságot kell tekinteni, mely a felszállás megkezdésétől addig a pontig tart, ahol a helikopter eléri a legelőnyösebb emelkedési sebességig (V_y) bezárólag a választott sebességet és a felszállási felület feletti megválasztott magasságot, miközben az összes hajtómű a szükséges jóváhagyott felszálló teljesítményen üzemel.

Ezen felül, az „A" kategóriájú helikopterekre vonatkozólag:

e) *Minimális teljesítmény.* Mind a felszállásra, mind a leszállásra meg kell határozni a minimális emelkedési teljesítményt.

f) *A felszállás elhatározási pontja.* A felszállás elhatározási pontja a felszállás pályájában lévő, és a felszálló teljesítmény meghatározásához alkalmazott pont, ahol a kritikus hajtómű egység meghibásodása esetén a felszállás megszakítható, vagy biztonságosan folytatható.

g) *Szükséges felszállási úthossz.* A szükséges felszállási úthossz az a vízszintes távolság, amely a felszállás megkezdésének pontjától a felszálló felület felett kiválasztott olyan pontig tart, ahol a helikopter eléri a felszállás biztonságos sebességét (V_{TOSS}), valamint a felszállási felület feletti megválasztott magasságot, és egy pozitív emelkedési gradienst ér el, miután a kritikus hajtómű egység meghibásodott a felszállás elhatározási pontjánál, a többi hajtómű a jóváhagyott üzemeltetési határértékeken belül működik. Ha az eljárások magukba foglalják a hátrafelé repülést, ennek távolságát bele kell foglalni.

h) *Megszakított felszállás szükséges úthossza.* A megszakított felszállás szükséges úthossza az a vízszintes távolság, amely a felszállás kezdőpontjától egy olyan pontig tart, ahol a helikopter teljesen megáll a felszállás elhatározási pontjánál bekövetkezett hajtómű meghibásodást, és a felszállás megszakítását követően.

i) *A felszállás pályája – emelkedési gradiens.* A felszállás pályája – emelkedési gradiens az adott konfigurációra/konfigurációkra vonatkozó egyenletes emelkedési gradiens (ek) kell, hogy legyen, amikor a kritikus hajtómű üzemképtelenné válik, mely a felszállási távolság végétől szükséges a felszállási felület feletti meghatározott pontig.

j) *Emelkedés nem működő hajtóművel.* A nem működő hajtóművel történő emelkedésnek azon egyenletes emelkedési/süllyedési sebességnek kell lenni, amikor a kritikus hajtómű nem működik és a működő hajtómű(vek) nem lépik túl azt a teljesítményt, amelyre ezeket jogosították.

k) *A leszállás elhatározási pontja.* A leszállás elhatározási pontja a megközelítés fázisában az a legkésőbbi pont, amelytől vagy végre lehet hajtani a leszállást, vagy biztonságosan meg lehet kezdeni a megszakított leszállást (ismételt megközelítést), miközben a kritikus hajtómű nem üzemel.

l) *Szükséges leszálló úthossz.* A szükséges leszálló úthossz az a vízszintes távolság, amely a megközelítési pályának a leszálló felület feletti egy kiválasztott pontjánál kezdődik és addig a pontig tart, ahol a helikopter a leszállást követően teljesen megáll, miközben a kritikus hajtómű nem üzemel.

B. 3. Repülési tulajdonságok

B. 3. 1. A helikopternek ki kell elégítenie a jelen pont Szabványait minden magasságon a várható maximális magasságig bezárólag, a szóban forgó magasságra vonatkozó összes hőmérsékleti körülmény esetében a részletes követelményekre vonatkozólag, és amelyre a helikoptert jóváhagyták.

B. 3. 2. Kormányozhatóság

B. 3. 2. 1. A helikopternek kormányozhatónak és manőverezhetőnek kell lennie az összes várható üzemeltetési körülmény között, és képesnek kell lennie arra, hogy simán térjen át egyik repülési körülményből a másikba (például: fordulók, oldalirányú csúszások, a hajtómű teljesítményének változása, a helikopter konfigurációjának változása) anélkül, hogy kivételes képességet, figyelmet, vagy erőkifejtést kívánna a pilóta részéről, még abban az esetben is, ha bármelyik hajtómű meghibásodik. A helikopter biztonságos kormányozhatóságának technikáját a repülés minden fázisára és mindazon helikopter konfigurációra ki kell dolgozni, amelyre teljesítményértéket meghatároztak.

Megjegyzés.- Ezen Szabványnak többek között az a célja, hogy olyan üzemeltetésre is vonatkozzon, amikor a nem észlelhető légköri turbulencia körülményei állnak fenn, és az is, hogy biztosítsa azt, hogy a repülési tulajdonságok indokolatlan torzulása nem fog bekövetkezni a turbulens levegőben.

B. 3. 2. 2. *Kormányozhatóság a földön (vízen).* A helikopternek kormányozhatónak kell lennie a földön (vízen) gurulás, felszállás, vagy a leszállás alatt, a várható üzemeltetési körülmények között.

B. 3. 2. 3. *Kormányozhatóság felszállás alatt.* A helikopternek kormányozhatónak kell lennie abban az esetben is, ha a kritikus hajtómű egység a felszállás bármely pontjánál hirtelen meghibásodik, amikor a helikoptert a közzétett felszállási adatoknak megfelelő módon működtetik.

B. 3. 3. Trim

A helikopternek olyan kiegyenlítéssel (trim) és kormányzási képességekkel kell rendelkeznie, hogy biztosított legyen, hogy a kívánt repülési körülmény fenntartásához nincs szükség a pilóta túlzott figyelmére, számba véve azt, hogy a repülés melyik fázisában fordul ez elő, és mennyi ideig tart. A kormányokhoz kapcsolódó rendszerek meghibásodása esetén nem fordulhat elő jelentős romlás a kormányozhatóság jellemzőiben.

B. 4. Stabilitás és kormányzás

B. 4. 1. Stabilitás

A helikopternek olyan stabilitással kell rendelkeznie a többi repülési jellemzőre vonatkozólag, a teljesítményre, a szerkezeti szilárdságra és a legvalószínűbb üzemeltetési viszonyokra nézve (például: a helikopter konfigurációi és a sebesség tartományok), mely biztosítja, hogy a pilóta túlzott figyelemösszpontosítására ne legyen szükség, amikor a repülés adott fázisában ezek az igények felmerülnek, számításba véve fennállásuk időtartamát is. A helikopter stabilitása azonban nem lehet olyan, hogy a pilótától túlzott erőkifejtést igényeljen, vagy hogy a helikopter biztonságát veszélyhelyzetben a manőverezhetőség hiánya veszélyeztethesse.

B. 4. 2. Autorotáció

B. 4. 2. 1. *A forgószárny fordulatszámának szabályozása.* A helikopter autorotációs jellemzőinek olyanoknak kell lenniük, hogy a pilóta számára lehetővé tegyék a forgószárny fordulatának az előírt értékeken belüli szabályozását, és a helikopter teljes kormányozhatóságának fenntartását.

B. 4. 2. 2. *A helikopter viselkedése a forgószárny teljesítményvesztése után.* A forgószárny teljesítményvesztését követően a helikopter viselkedése nem lehet olyan szélsőséges, hogy megnehezítse a forgószárny sebességének azonnali visszaállítását anélkül, hogy a repülési sebességre, vagy a szilárdságra vonatkozó korlátozásokat túllépnék.

B. 4. 2. 3. *Autorotációs repülési sebességek.* Az „A" kategóriájú helikopterek esetében az autorotáció melletti leszállásokra a repülési sebesség értékeit meg kell határozni. Más egyéb helikoptereknél a maximális hatótávra ajánlott autorotáció melletti repülési sebességeket, és a minimális süllyedési sebesség értékeit kell megállapítani.

B. 4. 3. Vibráció

Nem lehet olyan nagymértékű vibráció vagy berezgés, mely zavarja a helikopter kormányzását.

B. 4. 4. Rezonancia a talajon.

A helikopter nem rendelkezhet olyan veszélyes hajlammal, hogy ingadozzon a talajon, miközben a forgószárny forog.

C. ALRÉSZ. SZERKEZETEK

C. 1. Általános rész

A helikopter szerkezetét azzal a célkitűzéssel kell megtervezni, legyártani és a karbantartására vonatkozó utasításokkal ellátni, elkerüljék a szerkezet katasztrofális sérülését a teljes üzemi élettartama alatt.

Megjegyzés.- A szerkezet magába foglalja a sárkányt, a futóművet, a vezérlő rendszert, a forgószárny lapátokat és a rotoragyat, a forgószárny oszlopot és a segédszárny felületeket.

C. 2. Tömeg és tömegeloszlás

Ha másként nem írták elő, a szerkezetre vonatkozó valamennyi Szabványnak olyan körülmények között kell megfelelni, amikor a tömeg változik az alkalmazható határértékeken belül, és eloszlása a lehető legkedvezőtlenebb azokon az üzemeltetési korlátozásokon belül, amelyre a bizonyítványt kérték.

C. 3. Határterhelések

Ha másként nem minősítették, a C. 7, a C. 8, és a C. 9 pontokban előírt különböző terhelési viszonyokra kapott külső terhelést és a megfelelő inercia terhelést, vagy ellenállás terhelést kell határterhelés értéknek tekinteni.

C. 4. Szilárdság és deformáció.

A C. 7, a C. 8, és a C. 9 pontokban leírt különböző terhelési viszonyok között a helikopter egyetlen szerkezeti részén sem következhet be veszélyes deformáció bármilyen terhelésnél egészen a határterhelés értékéig, és azt is beleértve, valamint a helikopter szerkezetének képesnek kell lennie a törőterhelés elviselésére is.

C. 5. Repülési sebességek

C. 5. 1. Tervezési repülési sebességek

Meg kell határozni azokat a tervezési repülési sebesség értékeket, amelyekre a helikopter szerkezetét megtervezték, hogy az ellenálljon a C. 7. pont szerinti manőverezési és széllökés terheléseknek

C. 5. 2. Repülési sebességek határértékei

A repülési sebességek határértékeit, melyeket a biztonsági sebességtöbblet értékével megnövelt megfelelő tervezési repülési sebesség értékekre alapoztak az A. 2. 1. pontnak megfelelően, bele kell foglalni a repülési kézikönyvbe az üzemeltetési korlátozások részeként (lásd a G. 2. 3. pontot). Amikor a repülési sebességek korlátozásaiban szerepet játszanak a tömeg, a tömegeloszlás, a szintmagasság, a forgószárny sebessége, a teljesítmény, vagy egyéb tényezők, akkor ezen tényezők kritikus kombinációjára kell a repülési sebességek határértékeit megállapítani.

C. 6. A fő forgószárny (ak) forgási sebesség korlátozásai

A fő forgószárny (ak) sebességtartományát úgy kell meghatározni, hogy:

a) a teljesítmény ráadásakor biztosítson megfelelő sebességtöbbletet a forgószárny sebességének változásaira, mely előfordul bármely megfelelő manőver során, és összhangban van az alkalmazott vezérlőrendszer, vagy szinkronizációs rendszer fajtáival, és

b) a teljesítmény elvételekor tegye lehetővé az autorotáció melletti megfelelő manőver végrehajtását a repülési sebesség és a tömeg azon tartományaiban, amelyekre a bizonyítványt kérik.

C. 7. Terhelések

C. 7. 1. A C. 7, a C. 8, és a C. 9. pontokban ismertetett terhelési viszonyoknál tekintetbe kell venni a C. 2. pontban ismertetett tömeg és tömegeloszlások tartományát, a C. 6 pontban meghatározott fő forgószárny forgási sebesség tartományát és a C. 5. 1. pontnak megfelelően megállapított repülési sebességeket. Figyelembe kell venni a szimmetrikus és az aszimmetrikus terheléseket is. Az adott terhelési körülményekből eredő aerodinamikai-, inercia- és egyéb terhelést oly módon kell elosztani, hogy az szorosan megközelítse a tényleges viszonyokat, vagy nagy biztonsággal reprezentálja azokat.

C. 7. 2. Manőverezésből eredő terhelések

A manőverezésből eredő terheléseket az üzemeltetési korlátozások által megengedett manővereknek megfelelő manőverezési terhelés tényezők alapján kell kiszámítani. Ezek nem lehetnek kisebb értékűek, mint a várható üzemeltetési viszonyok között a gyakorlati tapasztalat által megfelelőnek mutatkozó értékek.

C. 7. 3. Széllökésből eredő terhelések

A széllökésből eredő terheléseket olyan függőleges és vízszintes irány széllökés sebességekre kell kiszámítani, amelyeket statisztikai, vagy egyéb, rendelkezésre álló adatok szerint megfelelőnek találnak a várható üzemeltetési viszonyokra.

C. 8. A földfelszín és a vízfelület okozta terhelések

C. 8. 1. A helikopter szerkezetének ellen kell állnia a földfelszín, vagy a vízfelület reakcióiból eredő minden terhelésnek, ahogy alkalmazható, melyek várhatóan előfordulnak beindításkor, gurulás közben a talajon vagy a vízfelületen, a talajtól való elemeléskor, földetéréskor és a forgószárny fékezése során.

C. 8. 2. Leszállási viszonyok

A tervezési felszálló tömegnél és tervezési leszálló tömegnél a leszállási viszonyoknak magukba kell foglalniuk a helikopter szimmetrikus és aszimmetrikus helyzeteit talajt-, vagy vizet éréskor, a süllyedési sebességeket és minden olyan egyéb tényezőt, amely a szerkezetre terhelést jelent, s melyek a várható üzemeltetési körülmények között jelen lehetnek.

C. 9. Egyéb terhelések

A manőverezésből, a széllökésből, valamint a vízfelszínnel és a földfelszínnel történő érintkezésből eredő terheléseken felül, vagy ezekkel összefüggésben, figyelembe kell venni olyan egyéb terheléseket is (a kormányra ható terhelések, a pilótára ható terhelések, a hajtómű forgatónyomatéka, a konfigurációváltozás miatt fellépő terhelések, a külső teher okozta terhelések, stb.), melyek valószínűleg előfordulnak a várható üzemeltetési körülmények között.

C. 10. Kifáradási szilárdság

A helikopterszerkezet szilárdságának és gyártási módszerének olyannak kell lenni, hogy kifáradásból eredő katasztrofális törés ne következzen be az ismétlődő terhelések és vibrációs terhelések alatt a várható üzemeltetési körülmények között. Tekintetbe kell venni a környezeti károsodást, a véletlenszerű meghibásodást és a hasonló valószínű megrongálódásokat.

C. 11. Speciális tényezők

Azokat a tervezési jellemzőket (például: öntvények, teherviselő elemek, vagy szerelvények), melyeknek szilárdsága változhat a gyártási folyamat során, károsodhat a használat során, vagy bármilyen más okból, egy megfelelő tényezővel számításba kell venni.

D. ALRÉSZ.TERVEZÉS ÉS GYÁRTÁS

D. 1. Általános rész

D. 1. 1. A tervezés és a gyártás minden részlete olyan legyen, hogy észszerű garanciát nyújtson arra vonatkozólag, hogy a helikopter összes alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. Ezeket olyan gyakorlati eredményekre kell alapozni, melyek a tapasztalat során kielégítőnek bizonyultak, vagy amelyeket speciális tesztekkel, vagy egyéb megfelelő vizsgálatokkal, vagy a két utóbbi összességével igazoltak. Ezeknél az Emberi Tényezők irányelveit is figyelembe kell venni.

Megjegyzés.- Az Emberi Tényezőkre vonatkozó irányelvekre tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

D. 1. 2. A mozgó alkatrészek működésének igazolása

A helikopter biztonságos üzemeltetéséhez alapvetően fontos összes mozgó alkatrészről bizonyítani kell, az összes várható üzemeltetési körülmény között megfelelően fog működni.

D. 1. 3. Anyagok

A helikopter biztonságos üzemeltetéséhez elsődlegesen fontos alkatrészek anyagainak ki kell elégíteniük a jóváhagyott specifikációkat. A jóváhagyott specifikációknak olyanoknak kell lenniük, hogy az anyagok, amelyeket a specifikációknak megfelelően elfogadnak, rendelkezzenek a tervezéskor feltételezett lényeges tulajdonságokkal.

D. 1. 4. Gyártási módszerek

A gyártási módszereknek és az összeszerelésnek olyannak kell lenni, hogy általuk egy egyenletesen hibátlan szerkezet jöjjön létre, és ez a szerkezet a használat során megbízhatóan megőrizze szilárdságát.

D. 1. 5. Védelem

Annak érdekében, hogy időjárási okok, korrózió, kopás következtében, vagy más, esetleg észrevétlenül maradó ok miatt a helikopter szerkezete ne veszítse el a szilárdságát, vagy ne károsodjon, a helikopter szerkezetét védelemmel kell ellátni, figyelembe véve, hogy milyen karbantartást fognak számára biztosítani.

D. 1. 6. Felülvizsgálatok biztosítása

Megfelelő előírásokkal biztosítani kell, hogy lehetőség legyen a helikopter azon alkotórészeinek felülvizsgálatára, cseréjére, vagy felújítására, melyekre akár időszakosan, akár rendkívül nehéz üzemeltetési körülményeket követően figyelmet kell fordítani.

D. 1. 7. Kritikus alkatrészek

A helikopterben használt összes kritikus alkatrészt azonosítani kell, és eljárásokat kell kidolgozni annak biztosítására, hogy a kritikus alkatrészekre a teljesség előírt szintje ellenőrizve legyen a tervezés, a gyártás során, valamint ezen alkatrészek teljes üzemi élettartama alatt.

D. 2. Rendszerek tervezési jellemzői

Különös figyelmet kell fordítani azokra a tervezési jellemzőkre, amelyek hatással vannak a hajózó személyzetek képességeire a kormányozhatóság fenntartásában. Ezen jellemzők közé minimálisan beletartoznak az alábbiak:

a) Kormányok és kormányrendszerek. A kormányokat és kormányrendszereket úgy kell megtervezni, hogy a megszorulás, a véletlen működtetés, és a kormányfelületeket rögzítő mechanizmus nem szándékos működésbe lépésének a lehetősége minimális legyen.

1) Minden egyes kormánynak és kormányrendszernek könnyen kezelhetőnek, simán és pontosan működőnek kell lennie, a funkciójának megfelelően.

2) minden egyes kormányrendszer minden egyes elemét úgy kell megtervezni, vagy jellegzetesen és tartósan megjelölni, hogy minimálisra csökkenjen bármilyen téves összeszerelés valószínűsége, mely a rendszer hibás működését idézheti elő.

b) A személyzet környezete. A pilótakabint úgy kell megtervezni, hogy lehetővé váljon a kormányok működtetése anélkül, hogy a hajózó személyzettől indokolatlan figyelemösszpontosítást, vagy fáradtságot igényelne.

c) Kilátás a pilótakabinból. A pilótakabint úgy kell kialakítani, hogy biztosítva legyen a kielégítően nagyméretű, tiszta, torzításmentes látótér a helikopter biztonságos vezetéséhez az összes olyan előrelátható üzemeltetési körülmény között, amelyekre a bizonyítvány kiadását kérték.

d) Felkészülés veszélyhelyzetekre. Olyan megoldásokat kell biztosítani, amelyek vagy automatikusan megelőzik a veszélyhelyzetet, vagy amelyekkel a hajózó személyzet kezelni tudja azon berendezések és rendszerek előrelátható meghibásodásaiból származó veszélyhelyzeteket, melyek a helikopterre veszélyt jelenthetnek.

e)Tűzvédelem. A helikopternek megfelelő tűzvédelemmel kell rendelkeznie.

f) A hajózó személyzet cselekvőképtelensége. A tervezés során óvintézkedéseket kell beépíteni, hogy védelmet biztosítsanak a mérgező gázok jelenléte ellen, melyek a normál üzemeltetési körülmények között a hajózó személyzetet cselekvőképtelenné tehetik.

D. 3. Rezgés (Flatter)

Minden egyes alkalmazható sebesség-, és teljesítményviszony között a helikopter minden egyes aerodinamikai felületének mentesnek kell lenni a rezgéstől (flattertől).

D. 4. A fedélzeten tartózkodó személyek elhelyezkedésének jellemzői

D. 4. 1. Ülések és bekötések

A fedélzeten tartózkodók számára megfelelő ülést és bekötést kell biztosítani, figyelembe véve a valószínű repülést és a veszélyhelyzeti leszállási terheléseket, melyekkel számolni kell. Figyelmet kell fordítani arra, hogy minimális legyen a fedélzeten tartózkodók sérülése a környező szerkezettel való érintkezés során, a helikopter üzemelése alatt.

D. 4. 2. A kabin környezete

Szellőztető rendszereket kell tervezni, hogy biztosított legyen a kabin megfelelő környezete (levegője) a várható repülési és földi üzemeltetési viszonyok alatt.

D. 5. Elektromos testelés és védelem a villámcsapás és a statikus elektromosság ellen

D. 5. 1. Az elektromos testelésnek, valamint a villámcsapás és a statikus elektromosság elleni védelemnek olyannak kell lenni, hogy:

a) megvédje a helikoptert, annak rendszereit, a benne tartózkodókat és azokat a személyeket, akik érintkeznek a helikopterrel a földön vagy a vízen, a villám kisüléstől és az áramütéstől, és

b) meggátolja az elektrosztatikus töltés veszélyes felhalmozódását.

D. 5. 2. A helikoptert meg kell védeni a villám katasztrofális hatásaitól is. Kellő figyelmet kell fordítani a helikopter megépítésében felhasznált anyagokra.

D. 6. Kényszerleszállásra vonatkozó előírások

D. 6. 1. A helikopter tervezése során gondoskodni kell arról, hogy a fedélzeten tartózkodó személyek egy kényszerleszállás esetén védettek legyenek a tűztől és a sebességcsökkenés hatásaitól.

D. 6. 2. Eszközöket kell biztosítani a helikopter gyors kiürítéséhez a kényszerleszállás után valószínűen előforduló körülmények esetére, mely eszközöknek összhangban kell lenniük a helikopter utaslétszámával és a személyzet kapacitásával. Vízre történő kényszerleszállásra jóváhagyott helikopterekre a tervezés során olyan előírásokat is meg kell alkotni, amelyek maximálisan megvalósítható garanciát jelentenek arra, hogy vízre történő kényszerleszállás esetében a helikopterben lévő utasok, és a személyzet biztonságosan kimenekíthető legyen.

D. 7. Földi kiszolgálás

A tervezésnél megfelelő előírásokat kell alkotni az olyan kockázatok minimalizálására, melyek a földi üzemeltetés (például: vontatás, felemelés) során a helikopter biztonságos üzemeltetése szempontjából lényeges részein sérüléseket okozhatnak, melyek esetleg észrevétlenek maradhatnak. Ehhez az összes korlátozás és utasítás, mely a védelmet szolgálja, figyelembe vehető.

E ALRÉSZ.FORGÓSZÁRNYAK ÉS HAJTÓMŰ

E. 1. Hajtóművek

Jelen Annex VI. Rész Szabványait kell alkalmazni minden hajtómű típusra, melyet helikopteren alkalmaznak elsődleges meghajtó egységként.

E. 2. A forgószárnyak és a hajtómű felépítése a helikopterre

E. 2. 1. Általános rész

A hajtómű felépítésének és a forgószárnyaknak meg kell felelniük a D Alrész és az E. 2. pont Szabványainak.

E. 2. 2. Tervezés, gyártás és működés

a) A tartozékokkal kiegészített forgószárnyak és a forgószárny meghajtó rendszerek összeszerelését úgy kell megtervezni és azokat legyártani, hogy megbízhatóan működjenek az üzemeltetési határértékeiken belül a várható üzemeltetési viszonyok között, ha megfelelően illesztették a hajtóműhöz és építették fel a helikopterre, a jelen alrésznek megfelelően.

b) Mindazon helikoptereknél, amelyeknek a maximális engedélyezett felszálló tömege több mint 3175 kg, vagy azon helikoptereknél, melyeket Standard A kategóriájúnak minősítettek, egy értékelést kell végrehajtani a forgószárnyakra és a forgószárny meghajtó rendszerekre annak biztosítására, hogy azok működése biztonságos az üzemeltetési viszonyok teljes tartományában. Ha ez az értékelés egy olyan meghibásodást mutat ki, mely meggátolhatja a biztonságos repülés folytatását, vagy a helikopter leszállását, olyan módozatokat kell előírni, melyekkel az ilyen meghibásodás valószínűsége a minimumra csökken.

E. 2. 3. Közzétett teljesítmény osztályok, körülmények, és korlátozások

Közzé kell tenni mindazokat a teljesítmény osztályokat, és az összes olyan üzemeltetési körülményt és korlátozást, melyek a szándék szerint szabályozzák a forgószárnyak és a forgószárny meghajtó rendszerek működését.

a) *A forgószárny maximális és minimális forgási sebességének korlátozásai.* Meg kell állapítani a forgószárnyak maximális és minimális sebességét mind a meghajtott állapot, mind pedig a meghajtás nélküli állapot viszonyaira. A maximum és a minimum értékeit befolyásoló bármilyen üzemeltetési körülményt (például: repülési sebesség) közé kell tenni.

b) *Egyhajtóműves helikoptereknél a forgószárnynak az előírtnál kisebb forgási sebességére történő figyelmeztetések, és több hajtóműves helikopterek, melyeken nincs jóváhagyott mechanizmus, mely automatikusan növeli a teljesítményt, ha a hajtómű meghibásodik.* Amikor a helikopter megközelíti a forgószárny forgási sebességhatárát, függetlenül attól, hogy a hajtómű működik vagy működésképtelen, világos és jellegzetes figyelmeztetést kell erről a pilótának kapnia. A figyelmeztetéseknek, vagy a fennálló körülmény kezdeti jellemzőinek olyanoknak kell lenni, hogy lehetővé tegyék a pilóta számára, hogy megakadályozza a figyelmeztetés kezdete után a körülmény kifejlődését, és lehetősége legyen a forgószárny forgási sebességének visszaállítására az előírt normál határértékek közé, valamint a helikopter teljes kormányozhatóságának fenntartására.

E. 2. 4. Tesztek

A forgószárnyon és a forgószárny meghajtó rendszereken kielégítő eredménnyel kell elvégezni mindazokat a teszteket, melyek annak biztosításához szükségesek, hogy ezek megfelelően és megbízhatóan fognak működni a közzétett teljesítmény osztály, az üzemi körülmények és korlátozások határértékein belül. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) *Üzemeltetés.* Tesztekkel kell bizonyítani, hogy a szilárdsági és a rezgési jellemzők kielégítőek, és bizonyítani azt, hogy a bólintásszabályozó és vezérlő mechanizmusok, valamint a szabadonpörgést biztosító mechanizmus megfelelően és megbízhatóan működik. A 3175 kg-ot meghaladó engedélyezett felszállótömeggel rendelkező helikoptereknél a túlgyorsulási jellemzőkről bizonyítani kell, hogy azok kielégítőek, és

b) *Tartósság.* Kielégítő időtartamú teszteket kell végrehajtani olyan teljesítmény-, hajtómű-, és forgószárny sebességeknél, és egyéb üzemeltetési viszonyoknál, melyek annak igazolásához szükségesek, hogy a forgószárnyak és a forgószárny meghajtó rendszerek megbízhatóak és tartósságuk megfelelő.

E. 2. 5. A hajtómű, a forgószárny és a forgószárny meghajtó rendszer korlátozásainak való megfelelés.

A hajtómű felépítését a helikopterre úgy kell megtervezni, hogy a hajtóművek, a forgószárnyak és a forgószárny meghajtó mechanizmusok képesek legyenek megbízhatóan működni a várható üzemeltetési körülmények között. A repülési kézikönyvben meghatározott körülmények között a helikopternek képesnek kell lennie úgy üzemelni, hogy a VI. Résznek és a jelen alrésznek megfelelően a hajtóműre, a forgószárnyakra és a forgószárny meghajtó rendszerekre megadott korlátozásokat nem lépi túl.

E. 2. 6. A hajtómű rotáció szabályozása

A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű helikoptereken, és azokon a helikoptereken, amelyeket a Standard A kategóriára jogosítottak, ha a meghibásodott hajtómű további rotációja megnövelheti a tűzveszélyt, vagy egy komoly szerkezeti károsodás veszélyét, megoldásokat kell biztosítani a személyzetnek arra, hogy leállíthassa, a meghibásodott hajtómű rotációját repülés közben, vagy hogy egy biztonságos szintre csökkenthesse azt.

E. 2. 7. A hajtómű újraindítása

A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű helikoptereknél, és azoknál a helikoptereknél, melyeket a Standard A kategóriára jogosítottak, megoldásokat kell biztosítani a hajtómű repülés közbeni újraindítására a közzétett maximális magasságig bezárólag minden magasságon.

E. 2. 8. Kialakítás és működés

E. 2. 8. 1. *A hajtóművek függetlensége.* Az A kategóriájú helikoptereknél a hajtóművet úgy kell kialakítani és felépíteni a helikopterre, hogy az egyes hajtóműveket a hozzájuk tartozó rendszerekkel együtt a többiektől függetlenül lehessen vezérelni és működtetni, valamint oly módon, hogy legyen közöttük legalább egy olyan hajtómű és rendszerkialakítás, amelyben bármilyen meghibásodás, - még akkor is, ha ennek előfordulási valószínűsége bármilyen csekély,- ne idézzen elő nagyobb teljesítményvesztést, mint amilyent a kritikus hajtómű teljes üzemképtelensége okoz.

E. 2. 8. 2. *A forgószárnyak és a forgószárny meghajtó rendszerek vibrációja.* Meg kell határozni a forgószárnyakra és a forgószárny meghajtó rendszerekre a vibráció okozta terheléseket, és ezek nem haladhatják meg az üzemelésre megállapított biztonságos értékeket a helikopterre meghatározott üzemeltetési korlátozásokon belül.

E. 2. 8. 3. *Hűtés.* A hűtőrendszernek képesnek kell lennie arra, hogy a hajtómű hőmérsékletét a megadott határértékek között tartsa (lásd az E. 2. 5. pontot) a helikopter üzemeltetésére jóváhagyott minden külső levegő hőmérsékleti értéknél. A repülési kézikönyvben közzé kell tenni azt a maximum és minimum külső levegő hőmérséklet értéket, amelyet a hajtóműre megfelelőnek állapítottak meg.

E. 2. 8. 4. *Másodlagos rendszerek.* Minden egyes hajtómű, forgószárny meghajtó rendszer és a forgószárnyhoz tartozó tüzelőanyag, olaj, levegőbetáplálás és egyéb rendszereknek képesnek kell lenni a megfelelő egység kiszolgálására a meghatározott követelményeknek megfelelően minden olyan körülmény között, mely befolyásolja a rendszerek működését (például: a hajtómű teljesítmény beállítása, a helikopter térbeli helyzetei és gyorsulásai, a légköri viszonyok, folyadékhőmérsékletek) a várható üzemeltetési körülményeken belül.

E. 2. 8. 5. *Tűzvédelem.* A hajtómű azon részeiben, ahol a potenciális tűz veszélye különösen súlyos a gyúlékony anyagokra nézve a gyulladásforrások közelsége miatt, a következőket kell alkalmazni a D. 2. e) pont szerinti általános Szabványokon felül:

a) *Elkülönítés.* Az olyan zónákat, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását és a leszállást, tűzálló anyagokkal kell elkülöníteni a helikopter többi részétől (a 3175 kg-ot meghaladó maximális engedélyezett felszálló tömegű, vagy A kategóriájú helikopterek), vagy veszélyeztetheti a biztonságos leszállást (egyéb helikopterek), tekintetbe véve a tűz terjedésének valószínű keletkezési pontjait és terjedési útvonalait.

b) *Gyúlékony folyadékok.* A gyúlékony folyadékrendszer alkotórészeinek, melyeket az ilyen zónákban helyeztek el, tűzállóknak kell lenniük. Az egyes zónáknál gondoskodni kell a folyadékelvezetés lehetőségéről annak érdekében, hogy minimális legyen a kockázat, mely a gyúlékony anyagokat tartalmazó bármelyik komponens meghibásodásából ered. Megoldásokat kell a személyzet számára biztosítani arra, hogy ha tűz keletkezik, megállíthassa a gyúlékony folyadékok befolyását az ilyen zónákba. Ahol gyúlékony folyadékforrások vannak az ilyen zónákban, a körzeten belül az adott teljes rendszernek, beleértve a hordszerkezetet is, tűzállónak, vagy a tűz hatásaitól védettnek kell lenniük.

c) *Tűzjelzés.* Gázturbinás hajtómű felépítéseknél elegendő számú tűzjelzőt kell biztosítani és elhelyezni oly módon, hogy az ilyen körzetekben esetlegesen előforduló bármilyen tüzet gyorsan jelezzenek kivéve, hogyha a tűz könnyen észlelhető a pilótakabinban lévő pilóta számára repülés közben.

d) *Tűzoltás.* A 3175 kg-ot meghaladó maximális engedélyezett felszálló tömeget meghaladó gázturbinás hajtóművű helikoptereknél az ilyen körzeteket olyan tűzoltó rendszerrel kell ellátni, mely képes az ott valószínűen előforduló bármilyen tűz eloltására, kivéve, ha az elkülönítés foka, a gyúlékony anyag mennyisége, a szerkezet tűzállósága és az egyéb tényezők olyanok, hogy a körzetben valószínűen előforduló bármilyen tűz nem veszélyeztetheti a helikopter biztonságát.

F. ALRÉSZ.RENDSZEREK ÉS BERENDEZÉSEK

F. 1. Általános rész

F. 1. 1. A helikoptert el kell látni mindazokkal a jóváhagyott műszerekkel, berendezésekkel és rendszerekkel, melyek a helikopter biztonságos üzemeltetéséhez szükségesek a várható üzemeltetési körülmények között. Ezeknek magukba kell foglalni azokat a műszereket és berendezéseket, melyek ahhoz szükségesek, hogy a személyzet a helikoptert működtetni tudja annak üzemeltetési határértékein belül. A műszerek és berendezések tervezésekor figyelembe kell venni az Emberi Tényezők irányelveit.

1. sz. Megjegyzés.- A Légialkalmassági Bizonyítvány kiadásához szükséges minimumon felül azoknak a műszereknek és berendezéseknek a felsorolása, melyeket különleges körülményekre, vagy különleges útvonalfajtákra írtak elő, az Annex 6 III. Részben található meg.

2. sz. Megjegyzés.- A rendszer szoftver jogosításához lásd a H Alrészt.

3. sz. Megjegyzés.- Az Emberi Tényezők irányelveire vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683), valamint a Légiforgalmi Szolgáltatás Szervezés (ATM) Rendszerei (DOC 9758) című kiadványban található meg.

F. 1. 2. Az F. 1. 1. pontban előírt műszerek, berendezések és rendszerek tervezésének és a helikopterre történő felépítésének olyannak kell lenni, hogy:

a) A kategóriájú helikoptereknél, fordított összefüggés álljon fenn a meghibásodás körülményének valószínűsége és az ebből eredő, a helikopterre és a benne tartózkodókra gyakorolt hatások súlyossága között oly módon, ahogy azt a rendszer biztonságát felbecsülő folyamat során meghatározták,

b) rendeltetésüknek minden várható üzemeltetési körülmény között megfeleljenek, és

c) a közöttük fennálló elektromos interferencia ne befolyásolja hátrányosan a biztonságos működést.

F. 1. 3. Megoldásokat kell biztosítani arra, hogy a személyzet a veszélyes rendszerműködés körülményeiről figyelmeztetést kapjon, és lehetővé váljon számukra a helyesbítő művelet végrehajtása.

F. 1. 4. Az elektromos áramellátó rendszer tervezésének olyannak kell lenni, hogy az képes legyen a normál üzemeltetés alatt az elektromos áramellátásra, és olyannak is, hogy egyetlen meghibásodás vagy helytelen működés ne károsíthassa meg a rendszer azon képességét, hogy a biztonságos üzemeltetéshez nélkülözhetetlen áramot szolgáltassa.

F. 2. Felépítés a helikopterre

A műszerek és berendezések helikopterre történő felépítésének ki kell elégítenie a D Alrész Szabványait.

F. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági mentőfelszereléseknek, melyeket a személyzet, vagy az utasok várhatóan használni, vagy működtetni fognak veszélyhelyzetben, megbízhatónak, azonnali hozzáférésre késznek, és könnyen felismerhetőnek kell lenniük, valamint működtetésük módját egyértelműen jelölni kell.

F. 4. Navigációs fények és összeütközés elleni fények

F. 4. 1. Az Annex 2. – ben (Repülési szabályok) előírt fényeknek, melyeket a helikopteren repülés közben működtetni kell, vagy olyankor, amikor a helikopter egy repülőtér, vagy helikopter-repülőtér földi mozgásterületén üzemel, olyan intenzitásúnak, színűnek, fedésterületűnek, és egyéb jellemzőkkel rendelkezőknek kell lenniük, hogy egy másik légijármű pilótájának, vagy a földön tartózkodó személyzetnek elegendő idő álljon rendelkezésre a helyzet értelmezésére, és az ezt követő, az összeütközés elkerülésére irányuló manőver végrehajtására. Az ilyen fényforrások tervezésekor kellő figyelmet kell fordítani azokra a körülményekre, melyek között észszerűen elvárható, hogy a fényforrások betöltsék rendeltetésüket.

1. sz. Megjegyzés.- Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, mint például a tipikus városi megvilágítás fényei, a tiszta csillagos égbolt, a holdsütötte vízfelület, és az olyan nappali megvilágítási viszonyok mellett, amikor a háttér-megvilágítás alacsony mértékű. Ezen túlmenően, az összeütközés veszélyét jelentő helyzetek legvalószínűbben olyan közelforgalmi körzetekben fordulnak elő, amelyekben a légijárművek közbenső, vagy alacsony repülési szinteken, közel azonos sebességgel üzemelnek, mely nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

2. sz. Megjegyzés.- A helikopterek külső fényeinek műszaki specifikációját lásd a Légialkalmassági Kézikönyvben (DOC 9760.

F. 4. 2. A helikopterben a fényeket úgy kell elhelyezni, hogy minimálisra csökkenjen annak lehetősége, hogy ezek hátrányosan befolyásolják a hajózó személyzetet kötelmei kielégítő ellátásában.

F. 5. Az elektromágneses interferencia elleni védelem

A légijármű elektromos rendszereit, különösen a repülés szempontjából kritikus és lényeges rendszereit – ahogy megfelelő,- meg kell védeni az elektromágneses interferenciától, mely akár belső, akár külső forrásból keletkezik.

F. 6. Jegesedés elleni védelem

Ha jegesedési viszonyok közötti repülésre kéri a légialkalmassági bizonyítványt, a helikopterről bizonyítani kell, hogy képes biztonságosan üzemelni az összes jegesedési körülmény között, melyekkel valószínűen szembekerül, az összes várható üzemeltetési környezetben.

G. ALRÉSZ.ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK

G. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványainak való megfelelést meghatározták, továbbá minden olyan egyéb információt, mely a helikopter biztonságos üzemeltetéséhez szükséges, közzé kell tenni a helikopter repülési kézikönyvében, vagy jelölésekkel, feliratokkal kell közölni, vagy egyéb olyan módon, mely hatékonyan segíti elő a cél elérését.

G. 2. Üzemeltetési korlátozások

G. 2. 1. Azokat a korlátozásokat, melyeknél ezek repülés közbeni túllépésének veszélye fennáll, és amelyek számszerűleg lettek meghatározva, alkalmas egységekben kell kifejezni. Ezeket a korlátozásokat, ha szükséges, helyesbíteni kell a méréshibák miatt oly módon, hogy a hajózó személyzet a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani azt, hogy mikor éri el a korlátozó értékeket.

G. 2. 2. Terheléskorlátozások

A terhelési korlátozásoknak magukba kell foglalni az összes tömegre, súlyponthelyzetre, tömegelosztásra és a padlóterhelésre vonatkozó korlátozó értéket (lásd az A. 2. 2. pontot).

G. 2. 3. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk minden olyan sebességértéket (lásd a C. 5. 2. pontot), melyek korlátozó jellegűek a szerkezeti épség, vagy a helikopter repülési tulajdonságai, vagy egyéb megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő helikopter konfigurációkra, és egyéb, odaillő tényezőre vonatkoztatva kell megadni.

G. 2. 4. Hajtómű korlátozások

A hajtómű korlátozásoknak magukba kell foglalni mindazokat a korlátozásokat, melyeket a különböző hajtómű elemekre meghatároztak, amelyeket felépítettek a helikopterre (lásd az E. 2. 5. és az E. 2. 8. 3. pontokat).

G. 2. 5. Forgószárny korlátozások

A forgószárny sebességkorlátozásainak magukba kell foglalni a maximum és a minimum forgószárny sebességeket mind a meghajtás nélküli (autorotáció), mind pedig a meghajtott állapotra vonatkozólag.

G. 2. 6. A berendezésekre és a rendszerekre vonatkozó korlátozások

A berendezésekre és a rendszerekre vonatkozó korlátozásoknak magukba kell foglalni mindazokat a korlátozásokat, melyeket a különböző berendezésekre és rendszerekre meghatároztak, amelyeket felépítettek a helikopterre.

G. 2. 7. Egyéb korlátozások

Az egyéb korlátozásoknak magukba kell foglalni minden olyan szükséges korlátozást, melyeket a helikopter biztonsága szempontjából veszélyesnek ítélt körülmény figyelembevételével határoztak meg (lásd az A. 2. 1. pontot).

G. 2. 8. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalni a helikopter működtetéséhez szükséges minimális hajózó személyzeti létszámot, figyelembe véve más egyéb mellett, a megfelelő hajózó személyzeti tag hozzáférését az összes szükséges vezérlőszervhez és műszerekhez, valamint figyelembe véve a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 – Légijármű Üzemeltetés –III. Részét az olyan körülményekre vonatkozólag, amikor a jelen Annex-ben meghatározott minimális hajózó személyzet létszámán felül további hajózó személyzeti tag válik szükségessé.

G. 3. Üzemeltetésre vonatkozó információk és eljárások

G. 3. 1. Választható üzemeltetés típusok

Felsorolást kell készíteni mindazokról az üzemeltetés típusokról, amelyekre a helikopter, tulajdonságai révén alkalmasnak mutatkozik a megfelelő légialkalmassági követelményeknek való megfeleltetés során.

G. 3. 2. Terhelési információk

A terhelési információknak magukba kell foglalni a helikopter üres tömegét, valamint a helikopter állapotának meghatározását a súlymérés idején, a vonatkozó súlypont helyzetet és a referencia pontokat és az alapvonalakat, melyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- A helikopter üres tömege rendszerint nem foglalja magába a személyzet és a hasznos terhelés tömegét, valamint a kifogyasztható tüzelőanyag tömegét, de magába foglalja az összes beépített ballaszt, a kifogyasztható tüzelőanyag és az olajnak, a hajtómű hűtőfolyadékának, és a hidraulika folyadéknak a teljes mennyiségét.

G. 3. 3. Üzemeltetési eljárások

Közzé kell tenni mindazokat a normál és veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott helikopterre jellemzőek és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek magukba kell foglalni az egy, vagy több hajtómű egység meghibásodása esetén követendő eljárásokat.

G. 3. 4. Az információk kezelése

Kielégítő információt kell biztosítani a helikopter jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról.

G. 4. Teljesítményre vonatkozó információk

A helikopter teljesítményét a B. 2. pont szerint kell közzétenni. Ennek magába kell foglalni a különböző helikopter konfigurációkra, és a vele összefüggő teljesítmény, és a vonatkozó sebességek információit, melyek segítséget fognak nyújtani a hajózó személyzetnek a betervezett teljesítmény elérésében.

G. 5. Repülési kézikönyv

Biztosítani kell egy repülési kézikönyv meglétét. Világosan meg kell jelölni, hogy mely adott helikopterre, vagy helikopter-szériára vonatkozik. A repülési kézikönyvnek minimálisan a G. 2, a G. 3, a G. 4 és a G. 6. 1. pontokban meghatározott korlátozásokat, információkat és eljárásokat kell tartalmaznia.

G. 6. Jelölések és feliratok

G. 6. 1. A műszereken, a berendezéseken, a kormányokon lévő jelöléseknek és feliratoknak tartalmazniuk kell mindazokat a korlátozásokat, vagy információkat, melyeket a hajózó személyzetnek a repülés alatt elsődlegesen figyelembe kell venni.

G. 6. 2. Jelöléseket, feliratokat, utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadják annak érdekében, hogy a földi kiszolgálás (vontatás, tüzelőanyag tankolás, stb.) folyamán a tévesztés lehetősége eleve kizárható legyen, amely tévesztés észrevétlen is maradhat, és ez veszélyeztetheti a helikopter biztonságát a következő repülések során.

G. 7. Folyamatos légialkalmasság – karbantartási információk

G. 7. 1. Általános rész

Kell, hogy legyen egy használati utasítás a helikopter légialkalmas állapotának fenntartására kidolgozandó eljárásokban. Az információknak magukba kell foglalni a G. 7. 2, a G. 7. 3, és a G. 7. 4 pontokban előírtakat.

G. 7. 2. Karbantartási információk

A karbantartási információknak magukba kell foglalni a helikopter leírását, valamint a karbantartási feladatok végrehajtásának ajánlott módszereit. Az ilyen információknak a hiba-meghatározásra vonatkozó tájékoztatást is tartalmazni kell.

G. 7. 3. A karbantartási programra vonatkozó információk

A karbantartási program információinak magukba kell foglalni a karbantartási feladatokat és azokat az ajánlott időközöket, amikor ezeket a feladatokat végre kell hajtani.

Megjegyzés.- A helikopter típusalkalmasságra jogosításával egyidejűleg kidolgozott kezdeti karbantartási programra néha úgy hivatkoznak, mint a Karbantartás Ellenőrző Csomag (MRB) módszerére, vagy mint a folyamatos légialkalmasság érdekében kidolgozott utasítások módszerére.

G. 7. 4. A típustervezés jóváhagyásából eredő kötelező karbantartási követelmények

A típustervezés jóváhagyásának részeként a Tervező Állam által előírt kötelező karbantartási követelményeket ilyen módon kell megjelölni, és bele kell foglalni a G. 7. 3. pontban szereplő karbantartási információkba.

Megjegyzés.- A típustervezés jóváhagyásának részeként meghatározott kötelező követelményekre gyakran hivatkoznak úgy, mint a Jogosítás Karbantartási Követelményeire (CMR), és/vagy a légialkalmasság korlátozásaira.

H. ALRÉSZ.RENDSZER SZOFTVEREK

Az összes rendszer szoftvert olyan módon kell megjelölni és érvényesíteni, hogy biztosított legyen, hogy azok a rendszerek, amelyekben a szoftvert használják, eleget tesznek a szándékolt funkcióknak olyan biztonsági szinten, mely kielégíti a jelen rész követelményeit.

Megjegyzés.- Néhány Állam elfogadja a nemzeti/nemzetközi ipari szabványok használatát, mint például: a RTCA /DO-178, vagy az EUROCAE ED12, a rendszer szoftverek tervezése és tesztelése céljára.

I. ALRÉSZ.TÖRÉSBIZTOSSÁG ÉS KABINBIZTONSÁG

I. 1. Általános rész

A helikopterek tervezésénél figyelembe kell venni a törésbiztosságot a fedélzeten tartózkodók túlélési valószínűségének javítása érdekében.

I. 2. Tervezési veszélyhelyzeti leszállási viszonyok

A veszélyhelyzeti leszállás (katasztrófa) terheléseit meg kell határozni annak érdekében, hogy a belső tereket, a bútorzatot, a hordszerkezetet és a biztonsági felszereléseket oly módon lehessen megtervezni, hogy veszélyhelyzeti leszállás körülményei között a fedélzeten tartózkodóknak észszerű védelmet nyújtsanak. A figyelembe veendő tételeknek az alábbiakat kell magukba foglalniuk:
a)dinamikus hatások,

b) korlátozási kritériumok olyan tételekre, melyek veszélyt idézhetnek elő,

c) a vészkijáratok körzetében a törzs deformációja,

d) tüzelőanyag cella épsége és helye,

e) az elektromos rendszerek épsége, hogy elkerülhetők legyenek a tüzelőanyag egységek területén lévő gyulladásforrások.

I. 3. A kabin tűzvédelme

A kabint úgy kell megtervezni, hogy az védelmet nyújtson a tűz ellen a fedélzeten tartózkodónak abban az esetben, ha a fedélzeti rendszerek meghibásodása, vagy egy kényszerleszállás esete fordul elő. Az alábbi tényezőket kell figyelembe venni:

a) a kabinbelső anyagainak éghetősége,

b) tűzállóság, és mindazon helikoptereknél, amelyeknek a maximális engedélyezett felszállótömege meghaladja a 3175 kg-ot, a füstképződést,

c) a biztonsági felszerelések meglétét, melyek lehetővé teszik a biztonságos evakuálást a helikopterből, és

d) a tűzoltó berendezéseket.

1. 4. Evakuálás a helikopterből.

A helikoptert megfelelő számú vészkijárattal kell ellátni annak érdekében, hogy lehetőség legyen egy megfelelő időtartam alatt az utaskabinból történő evakuálásra. A helikopter kategóriájától és méretének megfelelően az alábbi tényezőket kell figyelembe venni:

a) az utasülések száma, és az utasülés elrendezés,

b) a kijáratok száma, elhelyezkedése és mérete,

c) a kijáratok jelölése és a használati utasítás megléte,

d) a kijáratok valószínű elzáródása,

e) a kijáratok működtetése, és

f) a helikopter kiürítéséhez a kijáratnál elhelyezett mentőberendezések (például: csúszdák és tutajok) tömege és helye.

1. 5. Világítás és jelölés

Minden olyan helikopterben, ahol az utasülések száma 10-nél több, vészvilágítást kell biztosítani, melynek az alábbi jellemzőkkel kell rendelkezni:

a) függetlennek kell lennie a fő elektromos hálózattól,

b) a vészkijáratokat vizuálisan jelölje, és

c) külső és belső megvilágításnak kell lenni a helikopter kiürítése alatt.

J. ALRÉSZ. ÜZEMELTETÉSI KÖRNYEZET ÉS EMBERI TÉNYEZŐK

J. 1. Általános rész

A helikoptert úgy kell megtervezni, hogy a használók teljesítménykorlátain belül legyen lehetőség annak biztonságos működtetésére, ide értve a személyzetet, az utasokat, a földi kiszolgáló személyzetet, és a karbantartó személyzetet.

Megjegyzés.- Egy üzemeltetési környezetben gyakran az ember/gép érintkező felület a gyenge láncszem, és ezért szükséges biztosítani azt, hogy a helikoptert a repülés minden fázisában (beleértve egy meghibásodások okozta meggyengülést) kormányozni lehessen, valamint azt, hogy se a személyzet, se az utasok ne károsodjanak attól a környezettől, amelyben őket elhelyezték a repülés ideje alatt.

J. 2. Hajózó személyzet

J. 2. 1. A helikoptert úgy kell megtervezni, hogy lehetővé tegye a hajózó személyzet számára a helikopter biztonságos és hatékony kormányzását. A tervezésnél össze kell vetni a hajózó személyzet jártasságának és fiziológiai adottságainak különbözőségét a hajózó személyzet elvárható képességeivel. Számításba kell venni a helikopternek saját környezetében elvárható üzemeltetési körülményei különbözőségét, beleértve a működés meghibásodások okozta csökkenését.

J. 2. 2. A repülés összes szakaszában a helikopter tervezéséből a hajózó személyzetre háruló munkaterhelésnek észszerűnek kell lennie. Különleges figyelmet kell fordítani a repülés kritikus szakaszaira, és azokra a kritikus eseményekre, melyekre joggal lehet számítani, hogy előfordulnak a helikopter teljes üzemi élettartama alatt, ilyen például: a hajtómű meghibásodás.

Megjegyzés.- A munkaterhelést mind az észlelési, mind a fiziológiai tényezők befolyásolhatják.

J. 3. Ergonómia

A helikopter tervezése során figyelembe kell venni az ergonómiai tényezőket, beleértve:

a) a könnyű kezelhetőséget és a véletlen téves használat megelőzését,

b) a könnyű hozzáférhetőséget,

c) a munkakörnyezetet,

d) a tipizálást és az emberközpontúságot, és

e) a karbantartás könnyű elvégezhetőségét.

J. 4. Az üzemeltetés környezeti tényezői

A helikopter tervezésénél a hajózó személyzet üzemeltetési környezetét figyelembe kell venni, beleértve:

a) a repülőorvosi tényezők hatásait, mint a zaj és a vibráció, és

b) a fizikai erők hatását a normál repülés alatt.

V. RÉSZ. KIS REPÜLŐGÉPEK

A 750 KG-OT MEGHALADÓ, DE AZ 5700 KG-OT EL NEM ÉRŐ REPÜLŐGÉPEK, MELYEKRE A BIZONYÍTVÁNY IRÁNTI KÉRELMET 2007. DECEMBER 13.-ÁN, VAGY EZT KÖVETŐEN NYUJTOTTÁK BE.

A. ALRÉSZ.ÁLTALÁNOS RÉSZ

A. 1. Alkalmazhatóság

A. 1. 1. A jelen rész Szabványai az A. 1. 2. pontban meghatározott mindazon repülőgépekre alkalmazhatók, melyekre a Típusalkalmassági Bizonyítvány kiadása iránti kérelmet a megfelelő nemzeti hatósághoz 2007. december 13.-án, vagy ezt követően nyújtották be.

A. 1. 2. Jelen Rész Szabványait mindazokra a repülőgépekre alkalmazni kell, amelyeknek a maximális engedélyezett felszállótömege több mint 750 kg, de nem haladja meg az 5700 kg-ot, és melyeket a nemzetközi légiforgalomban utasok, vagy áru, vagy posta szállítására terveznek használni.

1. sz. Megjegyzés.- Az A. 1. 2. pontban ismertetett repülőgépeket bizonyos Államokban úgy ismerik, mint normál, haszon,- és műrepülő kategóriájú repülőgépek.

2. sz. Megjegyzés.- Az alábbi Szabványok nem tartalmaznak számszerű meghatározásokat, melyek a nemzeti légialkalmassági kódokban található értékekkel összehasonlíthatók lennének. A II. Rész 1. 2. 1. pontjának megfelelően ezeket a Szabványokat ki kell egészíteni mindazokkal a követelményekkel, melyeket a Szerződő Államok felállítottak, adoptáltak, vagy elfogadtak.

A. 1. 3. A II. Rész 1. 2. 1. pontjában hivatkozott átfogó és részletes nemzeti kód megfelelő részei által meghatározott légialkalmassági szintnek az A. 1. 2. pontban megjelölt repülőgépekre lényegében legalább azonosnak kell lennie a jelen Rész átfogó Szabványai által szándékolt teljes szintnek.

A. 1. 4. Ha ezt külön nem jelölik, akkor a Szabványok a teljes repülőgépre vonatkoznak, beleértve a hajtóműveket, a rendszereket és a berendezéseket.

A. 2. Üzemeltetési korlátozások

A. 2. 1. Korlátozó körülményeket kell meghatározni a repülőgépre, annak hajtóműveire és berendezéseire (lásd a G. 2. pontot).
Meg kell állapítani a jelen rész Szabványaival való egyezést feltételezve, hogy a repülőgépet a megadott korlátozásokon belül üzemeltetik. A korlátozásoknak magukba kell foglalniuk egy biztonsági többlet értéket, ezzel biztosítva annak valószínűségét, hogy ebből eredő balesetek előfordulása a legmesszebbmenőkig csekély legyen.

Megjegyzés.- A „legmesszebbmenőkig csekély” kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található.

A. 2. 2 Bármely paraméter korlátozó tartományait, melyek változása veszélyeztetheti a repülőgép biztonságos üzemelését, például: a tömeg, a súlypont helye, a terhelés elosztása, a sebességek, a külső levegő hőmérséklete és a szintmagasság, vagy nyomásmagasság, meg kell határozni, melyeken belül a jelen rész összes vonatkozó Szabványával való egyezést ki kell mutatni.

A. 3. Veszélyes tulajdonságok és jellemzők

Az összes várható üzemeltetési körülményt figyelembe véve, a repülőgépnek nem lehet egyetlen olyan tulajdonsága sem, vagy jellemzője, mely azt veszélyessé teszi.

A. 4. A megfelelőség bizonyítása

Azoknak a módozatoknak, melyekkel demonstrálják a megfelelő légialkalmassági követelményekkel való egyezést, biztosítaniuk kell azt, hogy minden egyes esetben az elért pontosság olyan mértékű lesz, mely észszerű biztosítékot jelent arra nézve, hogy a repülőgép, annak alkotórészei és berendezései kielégítik a követelményeket, megbízhatóak és hibátlanul működnek a várható üzemeltetési viszonyok között.

B. ALRÉSZ.REPÜLÉS

B. 1. Általános rész

B. 1. 1. A jelen Alrészben előírt Szabványoknak való megfelelést repüléssel, vagy egyéb olyan repülőgépen, vagy azonos típusú repülőgépeken végrehajtott tesztekkel kell megállapítani, amelyekre Típusalkalmassági Bizonyítványt kértek, vagy az ilyen tesztekre alapozott számítások segítségével feltéve, hogy a számításokból nyert eredmények pontosságukat tekintve azonosak a közvetlen tesztek eredményeivel, vagy megalapozottan kifejezik azt.

B. 1. 2. Minden egyes Szabvánnyal való egyezést meg kell állapítani a repülőgép tömeg és a súlyponthelyzet összes alkalmazható kombinációjára a terhelési viszonyok olyan tartományain belül, amelyekre a bizonyítványt kérik.

B. 1. 3. Ha szükséges, megfelelő repülőgép konfigurációkat kell meghatározni a repülés különböző szakaszaiban a teljesítmények megállapítása céljára, és a repülőgép repülési tulajdonságainak vizsgálata céljára.

B. 1. 4. Minden egyhajtóműves repülőgépnél, vagy azon repülőgépeknél, amelyek egynél több hajtóművel rendelkeznek, s melyek nem tudnak egy pozitív emelkedési gradienst tartani a hajtómű meghibásodást követően, a tervezéskor lehetőséget kell teremteni arra, hogy a repülőgépet, a hajtómű meghibásodás esetében, egy biztonságos kényszerleszállásig lehessen működtetni előnyös körülmények között.

B. 2. Teljesítmény

B. 2. 1. A repülőgép teljesítményeiről kielégítő mennyiségű adatot kell meghatározni és közzétenni a repülési kézikönyvben azzal a céllal, hogy az üzemeltető rendelkezésére álljon mindazon szükséges információ, melynek alapján, az értékekre támaszkodva, meg tudja határozni a repülőgép teljes tömegét a tervezett repülés jellegzetességeinek, a vonatkozó üzemeltetési paramétereknek a figyelembe vételével annak érdekében, hogy a repülést észszerű garanciával lehessen végrehajtani, és az adott repülésnél elérjék a minimális biztonságos teljesítményt.

B. 2. 2. A repülőgépre közzétett teljesítményértékek elérésében figyelembe kell venni az emberi teljesítőképességet, és különösen nem igényelhet a hajózó személyzet részéről kivételes jártasságot, vagy elővigyázatosságot.

Megjegyzés.- Az emberi teljesítőképességre vonatkozó tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

B. 2. 3. A repülőgép közzétett teljesítményének összhangban kell lennie az A. 2. 1. pontban foglalt megfelelőséggel, és a repülőgép rendszerei közül azoknak a rendszereknek és berendezéseknek a logikai kombinációkban történő üzemeltetésével, amelyeknek működése befolyásolhatja a teljesítményt.

B. 2. 4. Minimális teljesítmény

Az egynél több gázturbinás hajtóművel rendelkező repülőgépre, vagy azokra, amelyeknek a maximális engedélyezett felszálló tömege meghaladja a 2721 kg-ot, a minimális teljesítményt közzé kell tenni az alábbiakra:

a) a felszállásra és a leszállásra közzétett maximális tömegnél (lásd a B. 2. 7. pontot), mivel ezek függvényei a repülőtér szintmagasságának, vagy nyomásmagasságának akár az egyezményes légkörben, akár meghatározott szélcsendes légköri viszonyok között, és

b) vízi repülőgépek esetében megadott viszonyok között, egyenletes (hullámzásmentes) vízfelületnél,

a repülőgépnek képesnek kell lennie a B. 2. 5. a), illetve a B. 2. 6. a) pontban meghatározott minimális teljesítmény elérésére, figyelmen kívül hagyva az akadályokat, vagy a futópálya, vagy a vízfelület hosszát.

Megjegyzés.- Ez a Szabvány megengedi, hogy a maximális felszálló tömeget és a maximális leszálló *tömeget a repülési kézikönyvben úgy tegyék közzé, hogy viszonyítják például:*

- *a repülőtér szintmagasságához, vagy*
- *a repülőtér szintjén lévő nyomásmagassághoz, vagy*
- *a repülőtér szintjén lévő nyomásmagassághoz és a levegő hőmérsékletéhez,*

olymódon, hogy felhasználásra készen álljon rendelkezésre, amikor a repülőgép teljesítményének üzemeltetési korlátozásaihoz a nemzeti kódot alkalmazzák.

B. 2. 5. Felszállás

a) Az egynél több gázturbinás hajtóművel rendelkező repülőgépek esetében, vagy azoknál, melyeknek a maximális engedélyezett felszálló tömege meghaladja a 2721 kg-ot, azon időszak végén, amely alatt a felszálló teljesítményt, vagy a tolóerőt alkalmazni lehet, a repülőgépnek képesnek kell lennie az emelkedés folytatására, ha a kritikus hajtómű nem működik, és a többi hajtóműve a maximális folyamatos teljesítmény vagy tolóerő határértékein belül üzemel, egészen addig a magasságig, amelyet meg tud tartani, és amelynél folytatni tudja a biztonságos repülését és a leszállást.

b) A felszállás és az emelkedés minden szakaszában a minimális teljesítménynek elegendőnek kell lennie ahhoz, hogy biztosítsa a táblázatban feltüntetett ideális körülményektől (lásd a B. 2. 7. pontot) kismértékben eltérő üzemeltetési viszonyok esetében azt, hogy a közzétett értékektől való eltérés nem lesz aránytalan.

B. 2. 6. Leszállás

a) Az egynél több gázturbinás hajtóművel rendelkező repülőgépek esetében, vagy azoknál, melyeknek a maximális engedélyezett felszálló tömege meghaladja a 2721 kg-ot, a megközelítési konfigurációtól kezdődően a kritikus hajtómű egység üzemképtelensége mellett, a repülőgépnek képesnek kell lennie megszakított megközelítés esetében a repülés folytatására egy olyan pontig, amelytől a megközelítést megismételheti.

b) A leszállási konfigurációtól kezdődően a repülőgépnek képesnek kell lennie akadályozott leszállás esetén újra felemelkedni, ha minden hajtómű egysége működik.

B. 2. 7. A teljesítményadatok közzététele

A teljesítményadatokat úgy kell meghatározni és a repülési kézikönyvben közzétenni, hogy azok biztonságos összefüggést biztosítsanak a repülőgép teljesítménye és a repülőterek, valamint azon útvonalak között, amelyeken képes üzemelni. A teljesítményadatokat meg kell határozni, és közzé kell tenni az alábbi szakaszokra: a szárazföldi repülőgépek esetében a tömegre, a szintmagasságra, vagy nyomás-magasságra, szélsebességre, a felszállási és a leszállási felület lejtésére vonatkozólag, vízi repülőgépek esetében a vízfelszín viszonyaira, a víz sűrűségére és a hullámzás erősségére vonatkozólag, és bármely egyéb változóra, amelyekre a repülőgépnek légialkalmassági bizonyítványt akarnak kérni.

a) *Felszállás.* A felszállás teljesítményadatainak magukba kell foglalni a felszálláshoz és a felszállási felület egy kiválasztott pontjáig történő emelkedéshez szükséges távolságot. A felszállásra meghatározott üzemeltetési határértékeken belül minden egyes tömegre, szintmagasságra és hőmérsékletre meg kell határozni a teljesítmény adatokat az alábbi viszonyok mellett:

– minden egyes hajtómű felszálló teljesítményen,
– fékszárnyak felszálló helyzetben (helyzetekben), és
– futómű kiengedve.

b) *Útvonalrepülés.* Az egynél több hajtóművel rendelkező repülőgépeknél az útvonalon történő emelkedés teljesítménye azonos kell, hogy legyen az útvonalrepülés konfigurációban lévő repülőgép emelkedési (vagy süllyedési) teljesítményével, amikor a kritikus hajtómű egység üzemképtelen. A működő hajtómű (hajtóművek) nem léphetik túl a maximális folyamatos teljesítmény, vagy tolóerő értékét.

c) *Leszállás*. A leszállási úthossz az a vízszintes távolság, mely a leszállási felület felett a megközelítési pályán kiválasztott magasságban lévő ponttól, amelyet a repülőgép átrepül, a leszállási felület azon pontjáig tart, ahol a repülőgép teljesen megáll, vagy, vízi repülőgépek esetében kielégítően alacsony sebességre lassul le. A leszállási felület feletti kiválasztott magasságot és a megközelítési sebességet az üzemeltetési gyakorlatra alapozva kell meghatározni. Ez a távolság megnövelhető egy olyan biztonsági többlet értékével, amennyi szükségesnek látszik, és ha ez történik, a leszálló felület feletti kiválasztott magasság, a megközelítési sebesség és a távolságtöbblet értékeit megfelelően kell egymáshoz rendelni, és gondoskodni kell ezek figyelembevételéről nemcsak a normál üzemeltetési gyakorlatban, hanem az ezektől való elfogadható eltérések esetében is.

B. 3. Repülési tulajdonságok

B. 3. 1. A repülőgépnek ki kell elégítenie a B. 3. pont Szabványait a maximális várható magasságig bezárólag minden magasságon, és a szóban forgó magasságokhoz tartozó minden hőmérséklet viszony között, amelyekre a repülőgépet jóváhagyták.

B. 3. 2. Kormányozhatóság

B. 3. 2. 1. Minden előre várható üzemeltetési körülmény között a repülőgépnek kormányozhatónak és manőverezhetőnek kell maradnia, és képesnek kell lennie arra, hogy simán térjen át egyik repülési helyzetből a másikba (például: fordulók, oldalirányú csúszások, a hajtómű teljesítmény vagy a tolóerő változása, a repülőgép konfigurációinak változása) anélkül, hogy a pilótától kivételes ügyességet, figyelmet vagy erőkifejtést igényelne, még abban az esetben is, ha bármelyik hajtómű egység üzemképtelenné válik. A repülőgép biztonságos kormányozhatóságának technikáját a repülés minden olyan szakaszára és repülőgép konfigurációra meg kell határozni, amelyekre a teljesítményadatokat közzétették.

Megjegyzés.- A jelen Szabvány célja többek között, hogy vonatkozzon a nem észlelhető légköri turbulencia körülményei közötti üzemeltetésre, és biztosítsa, hogy turbulens levegőben se forduljon elő a repülési tulajdonságok túlzott romlása.

B. 3. 2. 2. *Kormányozhatóság a földön (vízen).* A repülőgépnek kormányozhatónak kell lennie a földön (vagy a vízen) gurulás, felszállás, és leszállás alatt a várható üzemeltetési körülmények között.

B. 3. 2. 3. *Kormányozhatóság felszállás alatt.* A repülőgépnek kormányozhatónak kell lennie abban az esetben is, ha a kritikus hajtómű egység hirtelen meghibásodik a felszállás bármely pontjánál.

B. 3. 2. 4. A *felszállás biztonságos sebessége.* Akkor tételezzük fel, hogy fennállnak a felszállás biztonságos sebességei, amikor a repülőgép teljesítménye (a földfelszín vagy a vízfelület elhagyása után) a felszállás alatt meghatározottak, és megfelelő sebességtöbbletet tartalmaznak az átesési sebesség és a minimális sebesség értékei fölött, amelyeknél a repülőgép kormányozható marad a kritikus hajtómű egység hirtelen meghibásodása után.

B. 3. 3. Kiegyenlítés (trim)

A repülőgépnek olyan kiegyenlítési jellemzőkkel kell rendelkeznie, melyek biztosítják, hogy a pilóta túlzott figyelmére és abbeli képességére, hogy a kívánt repülési körülményt fenntartsa, ne legyen szükség, számításba véve azt a repülési szakaszt, ahol ezek az igények felmerülnek, és azok időtartamát. Ezt mind a normál üzemeltetésre, mind pedig azon körülményekre is alkalmazni kell, amikor egy vagy több olyan hajtómű egység hibásodik meg, amelyekre a teljesítmény értékeket megállapították.

B. 4. Stabilitás és kormányozhatóság

B. 4. 1. Stabilitás

A repülőgépnek olyan stabilitással kell rendelkeznie a többi repülési jellemzőre, a teljesítményre, a szerkezeti tartósságra, és a legvalószínűbb üzemeltetési viszonyokra (például: repülőgép konfigurációk és sebességtartományok) vonatkoztatva, hogy biztosítsák, hogy ne legyen szükség a pilóta túlzott figyelemösszpontosítására, amikor számításba veszik a repülés azon szakaszát, amelynél erre az igények felmerülnek, valamint ezek időtartamát. Ennek ellenére, a repülőgép stabilitása nem lehet olyan, hogy túlzottan igénybe vegye a pilóta erejét, vagy hogy a repülőgép biztonságát a manőverezés hiánya veszélyeztesse veszélyhelyzetben. A stabilitás természetes és mesterséges módon is elérhető, vagy ezek kombinációjával. Azokban az esetekben, amikor mesterséges stabilitásra van szükség ahhoz, hogy igazoljuk a jelen rész Szabványainak való megfelelést, bizonyítani kell azt, hogy bármilyen meghibásodás, vagy körülmény, melynél szükség lenne a pilóta kivételes képességére vagy erejére a repülőgép stabilitásának visszaállításához, a legkevésbé legyen valószínű.

Megjegyzés.- A „legkevésbé valószínű" kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyvben (DOK 9760) található meg.

B. 4. 2. Átesés

B. 4. 2. 1. *Figyelmeztetés az átesésre.* Világos és egyértelmű figyelmeztetést kell kapnia a repülőgép összes megengedhető konfigurációjában a pilótának, ha a repülőgép akár vízszintes repülésben, akár fordulóban közel van az áteséshez, kivéve azokat a konfigurációkat, amelyeket a biztonságos repülés szempontjából nem kell lényegesnek tekinteni. Az átesésre történő figyelmeztetés jelzésének, és a repülőgép egyéb jellemzőinek olyanoknak kell lenni, hogy az átesésre vonatkozó jelzés kezdetét követően a pilóta képes legyen megakadályozni az átesés bekövetkezését a hajtómű teljesítményének, vagy tolóerejének változtatása nélkül, és képes legyen fenntartani a repülőgép teljes kormányozhatóságát.

B. 4. 2. 2. *A repülőgép viselkedése az átesést követően.* Bármilyen konfigurációban, és bármilyen teljesítmény- vagy tolóerő szintnél, amelyeket úgy tekintenek, mint ahol az átesésből történő kivétel képessége lényeges, a repülőgép viselkedése az átesést követően nem lehet olyan szélsőséges, hogy a repülési sebesség korlátok, vagy a szilárdsági határértékek túllépése nélkül az azonnali kivétel nehézséget okozzon.

B. 4. 2. 3. *Átesési sebességek.* Meg kell határozni a repülés egyes fázisainak (például: felszállás, útvonalrepülés, leszállás) megfelelő átesési sebességeket, vagy a minimális állandósult repülősebességeket. Az átesési sebességek meghatározásához használt teljesítmény, vagy tolóerő értékek egyike sem lehet nagyobb, mint amennyi ahhoz szükséges, hogy nulla legyen a tolóerő közvetlenül az átesés feletti sebességnél.

B. 4. 3. Flatter és vibráció.

B. 4. 3. 1. Alkalmas tesztekkel, analízisekkel, vagy ezek bármilyen elfogadható kombinációjával kell bizonyítani, hogy a repülőgép minden egyes része mentes a flattertől és túlzott vibrációtól bármelyik repülési konfigurációban és az összes sebességértéknél a repülőgép üzemeltetési határértékein belül (lásd az A. 2. 2. pontot). Nem lehet olyan fokú vibráció, vagy berezgés, mely eléggé súlyos mértékű ahhoz, hogy szerkezeti károsodást okozzon.

B. 4. 3. 2. A repülőgép üzemeltetési határértékein belül nem lehet olyan fokú vibráció, vagy berezgés, mely elég súlyos mértékű ahhoz, hogy zavarja a repülőgép kormányzását, vagy a hajózó személyzet túlzott fáradtságát idézi elő.
Megjegyzés.- A berezgést ajánlatos átesésre történő figyelmeztetésnek tekinteni, és nem ajánlott az ilyen típusú berezgést figyelmen kívül hagyni.

B. 4. 4. Dugóhúzó (önpörgés)

Bizonyítani kell, hogy a repülőgép a normál üzemelése alatt nem mutat semmilyen tendenciát arra, hogy szándéktól függetlenül dugóhúzóba kerüljön. Ha a repülőgépet úgy tervezték meg, hogy a dugóhúzó végrehajtása lehetséges, vagy olyan repülőgépeknél, amelyeknek egy hajtómű egységével nem szándékosan ez lehetséges, akkor demonstrálni kell, hogy a kormányok normál használata mellett és a pilóta kivételes repülőgép-vezetési jártassága nélkül a repülőgépet ki lehet venni a dugóhúzóból a megfelelő kivételi határértékeken belül.

C. ALRÉSZ. SZERKEZET

C. 1. Általános rész

A repülőgép szerkezetét úgy kell megtervezni, legyártani, és a karbantartásra, valamint a javításra vonatkozólag olyan utasításokkal kell ellátni, melyeknek célja az, hogy a katasztrofális károsodás elkerülhető legyen a repülőgép üzemi élettartama alatt.

C. 2. Tömeg és tömegeloszlás

Ha másként nem rendelkeznek, a szerkezetre vonatkozó összes Szabványt ki kell elégíteni, akkor is, ha a tömeg változik az alkalmazható tartományon belül és eloszlása a lehető legkedvezőtlenebb módon valósul meg az üzemeltetési határértékeken belül attól függően, hogy milyen légialkalmassági bizonyítványt kértek a repülőgépre.

C. 3. Terhelési határértékek

Feltéve, hogy erre nézve más előírás nincs, a C. 6. pontban előírt különböző terhelési viszonyokból kapott külső teherbírás és a megfelelő inercia terhelés értékeit, vagy az ellenállás terheléseket kell terhelési határértékeknek tekinteni.

C. 4. Deformáció és törőterhelés

A C. 6. pontban leírt különböző terhelési viszonyok között a repülőgép egyetlen része sem szenvedhet el káros deformációt semmilyen terhelésnél egészen a terhelési határértékig és azzal bezárólag, valamint a repülőgépnek a törőterhelést is el kell viselnie.

C. 5. Repülési sebességek

C. 5. 1. Tervezési repülési sebességek

A repülőgép tervezésekor meg kell határozni azokat a repülési sebességeket, melyekre a repülőgépet megtervezik, hogy az ellenálljon a megfelelő manőverezési, és széllökés okozta terheléseknek. A feláramlások, vagy a légkör változásai által okozott véletlenszerű kiugró sebességek elkerülése érdekében tervezéskor a repülési sebességeket kielégítő mértékű sebességtöbblettel kell megnövelni a gyakorlati üzemeltetés repülési sebességei határértékeinek megállapításához. Ezen felül, a tervezési repülési sebességeknek lényegesen nagyobbaknak kell lenni, mint a repülőgép átesési sebessége, ily módon biztosítva, hogy turbulens levegőben a kormányozhatóság nem szűnik meg. Figyelmet kell fordítani a tervezési manőverezési sebességre, a tervezési utazósebességre, a tervezési merülési sebességre, és bármilyen egyéb tervezési repülési sebességre, melyek a felhajtóerőt növelő szerkezettel, vagy egyéb speciális szerkezettel együtt járó konfigurációkhoz szükségesek.

C. 5. 2. Repülési sebesség határértékek

A repülési sebességek határértékeit, - melyek a megfelelő biztonsági sebességtöbblettel megnövelt tervezési repülési sebességeken alapulnak, ahol ez alkalmazható, - az A. 2. 1. pontnak megfelelően közzé kell tenni a repülési kézikönyvben az üzemeltetési korlátozások részeként (lásd a G. 2. pontot).

C. 6. Szilárdság

C. 6. 1. Az összes szerkezeti elemet úgy kell megtervezni, hogy az ellenálljon a várható üzemi terheléseknek károsodás, maradandó alakváltozás, vagy a funkcionalitás elvesztése nélkül. A várható üzemi terhelések megállapításakor az alábbiakat kell számításba venni:

a) a repülőgép várható üzemi élettartama,

b) a várható függőleges és vízszintes széllökés környezet, figyelembe véve a felhasználási profilban, és a terhelési konfigurációkban várható változásokat,

c) a manőverezési spektrum, számításba véve a felhasználási profil és a terhelési konfigurációk változásait,

d) az aszimmetrikus és a szimmetrikus terhelés,

e) a talajtól és a vízfelszíntől eredő terhelések, beleértve a gurulás, a leszállás, és a felszállás terheléseit, és a földön/vízen történő repülőgép-vezetés terheléseit,

f)a repülőgép sebességtartománya, számításba véve a repülőgép jellemzőit és az üzemeltetési határértékeket,

g) a vibráció és a berezgés okozta terhelések,

h) az előírt karbantartás elvégzése mellett keletkező korrózió, vagy egyéb elhasználódás és a különböző üzemeltetési környezetek, és

i) bármilyen egyéb terhelés, mint például a kormányra ható terhelések, az utaskabin túlnyomás terhelései, a hajtómű terhelései, vagy a dinamikus terhelések, melyek a nyugalmi állapot konfigurációban bekövetkező változások miatt fordulnak elő.

C. 6. 2. Az adott terhelési körülményekből eredő levegő, inerciális és egyéb terheléseket úgy kell megosztani, hogy ezzel nagyon jól megközelítsék a tényleges viszonyokat, vagy nagy biztonsággal reprezentálják azokat.

C. 7. Túlélőképesség

A repülőgépet úgy kell megtervezni, hogy az a fedélzeten tartózkodóknak maximális megvalósítható védelmet nyújtson a szerkezet károsodása esetén, vagy a földfelszínbe, a vízbe, vagy egy tárgyba történő ütközés miatt bekövetkezett károsodás esetén. Minimálisan az alábbiakat kell figyelembe venni:

a) a sárkány, a fedélzeten tartózkodók ülései és a fékezés általi energia-elnyelés, és

b) a repülőgépből a megvalósítható legrövidebb idő alatti kijutás lehetővé tétele.

C. 8. Szerkezeti élettartam

A repülőgépet úgy kell megtervezni és megépíteni, hogy az megfeleljen a károsodástűrés, az életbiztonság, vagy az üzembiztosság elveinek, és olyannak kell lennie, hogy biztosítsa a katasztrofális megrongálódás valószínűségének legmesszebbmenőkig csekély voltát az üzemi élettartam során, figyelembe véve, ahol ez megvalósítható, az alábbiakat:

a) a várható környezetet,

b) a használat során várható ismétlődő terheléseket,

c) az aerodinamikai kölcsönhatásból, vagy belső forrásokból eredő várható vibrációkat,

d) a hőtani körfolyamatokat,

e) a véletlenszerű és a különálló forrásokból keletkező károsodásokat,

f) a valószínű korróziót, vagy egyéb károsodást,

g) az előírt karbantartást, és

h) a valószínű szerkezeti javításokat.

Megjegyzés.- A „legmesszebbmenőkig csekély” kifejezésre vonatkozó tájékoztató anyag a Légialkalmassági Kézikönyvben (DOC 9760) található meg.

D. ALRÉSZ. TERVEZÉS ÉS GYÁRTÁS

D. 1. Általános rész

D. 1. 1. A tervezés és a gyártás részleteinek olyanoknak kell lenniük, hogy észszerű garanciát nyújtsanak arra vonatkozólag, hogy a helikopter összes alkotórésze hatékonyan és megbízhatóan fog működni a várható üzemeltetési körülmények között. Ezeket olyan gyakorlati eredményekre kell alapozni, melyek a tapasztalat során kielégítőnek bizonyultak, vagy amelyeket speciális tesztekkel, vagy egyéb megfelelő vizsgálatokkal, vagy a két utóbbi összességével igazoltak. Ezeknél az Emberi Tényezők irányelveit is figyelembe kell venni.

Megjegyzés.- Az Emberi Tényezőkre vonatkozó irányelvekre tájékoztató anyag az Emberi Tényezők Kiképzési Kézikönyvben (DOC 9683) található meg.

D. 1. 2. A mozgó alkotórészek működésének bizonyítása

A helikopter biztonságos üzemeltetéséhez alapvetően fontos összes mozgó alkotórész működését demonstrálni kell annak érdekében, hogy bizonyított legyen az illető alkotórészről, hogy a várható üzemeltetési körülmények között megfelelően fog működni.

D. 1. 3. Anyagok

A helikopter biztonságos üzemeltetéséhez elsődlegesen fontos alkotórészekben felhasznált anyagoknak ki kell elégíteniük a jóváhagyott specifikációkat. A jóváhagyott specifikációknak olyanoknak kell lenniük, hogy az anyagok, amelyeket a specifikációnak megfelelően elfogadnak, rendelkezzenek a tervezéskor feltételezett lényeges tulajdonságokkal.

D. 1. 4. Gyártási módszerek

A gyártási módszereknek és az összeszerelésnek olyanoknak kell lenni, hogy általuk egy egyenletesen hibátlan szerkezet jöjjön létre, amely a használat során megbízhatóan megőrzi szilárdságát.

D. 1. 5. Védelem

A helikopter szerkezetét meg kell védeni a károsodástól, vagy a használat során szilárdsásának elvesztésétől időjárási okok, korrózió, kopás, vagy egyéb ok következtében, melyek észrevétlenek is maradhatnak, valamint figyelembe kell venni azt is, hogy a repülőgépnek milyen karbantartást fognak biztosítani.

D. 1. 6. Felülvizsgálatok biztosítása

Megfelelő előírásokkal biztosítani kell, hogy lehetőség legyen a helikopter azon alkotórészeinek felülvizsgálatára, cseréjére, vagy felújítására, melyekre akár időszakosan, akár rendkívül nehéz üzemeltetési körülményeket követően figyelmet kell fordítani.

D. 1. 7. Kritikus alkatrészek

A helikopterben használt összes kritikus alkatrészt azonosítani kell, és eljárásokat kell kidolgozni annak biztosítására, hogy a kritikus alkatrészekre a teljesség előírt szintje ellenőrizve legyen a tervezés, a gyártás során, valamint ezen alkatrészek teljes üzemi élettartama alatt.

D. 2. Rendszertervezési jellemzők

Különös figyelmet kell fordítani azokra a tervezési jellemzőkre, amelyek hatással vannak a hajózó személyzetek képességeire a kormányozhatóság fenntartásában. Ezen jellemzők közé minimálisan az alábbiak tartoznak:

a) *Kormányok és kormányrendszerek*. A kormányokat és kormányrendszereket úgy kell megtervezni, hogy a megszorulás, a véletlen működtetés, beleértve a hibás összeszerelést, és a kormányfelületeket rögzítő mechanizmus nem szándékolt működésbe lépésének a lehetősége minimális legyen.

1) Minden egyes kormánynak és kormányrendszernek könnyen kezelhetőnek, simán és hatékonyan működőnek kell lennie, funkciójának megfelelően.

2) Minden egyes kormányrendszer minden egyes elemét úgy kell megtervezni, vagy jellegzetesen és tartósan megjelölni, hogy minimálisra csökkenjen bármilyen téves összeszerelés valószínűsége, mely a rendszer hibás működését idézheti elő.

b) *A rendszer életképessége.* A repülőgép rendszereit úgy kell megtervezni és elrendezni, hogy maximális legyen a folytatott biztonságos repülés és leszállás lehetősége olyan események után, amikor a repülőgép szerkezete, vagy rendszerei kárt szenvedtek.

c) *A személyzet környezete*. A pilótakabint úgy kell megtervezni, hogy minimálisra csökkenjen a kormányok téves, vagy korlátozott működtetésének lehetősége a hajózó személyzet fáradtsága, tévesztése vagy zavaró hatások következtében. Minimálisan az alábbiakat kell figyelembe venni: a kormányok és a műszerek elrendezése és azonosíthatósága, a veszélyhelyzetek gyors felismerhetősége, a kormányok érzékenysége, szellőzés, fűtés és zaj.

d) *Kilátás a pilótakabinból*. A pilótakabin elrendezését úgy kell kialakítani, hogy biztosítva legyen egy eléggé nagyfelületű, tiszta és torzításmentes látómező a repülőgép biztonságos vezetéséhez csillogás és tükröződés nélkül, melyek zavarhatják a pilóta látását. A pilótakabin szélvédője tervezési jellemzőinek biztosítania kell azt, hogy közepes erősségű eső csapadékviszonyai között is kielégítő látása legyen a pilótának a repülőgép normál vezetéséhez, valamint a megközelítések és leszállások végrehajtásához.

e) *Felkészülés veszélyhelyzetekre*. Olyan megoldásokat kell biztosítani, amelyek vagy automatikusan megakadályozzák a veszélyhelyzetet, vagy amelyekkel a hajózó személyzet kezelni tudja azon berendezések és rendszerek előrelátható meghibásodásaiból származó veszélyhelyzeteket, mely berendezések, és rendszerek hibája veszélyeztetné a repülőgépet. Észszerű megoldásokat kell kidolgozni a hajtómű-egység vagy a rendszerek meghibásodását követő nélkülözhetetlen szolgáltatások olyan mértékű fenntartására, ahogyan az ilyen meghibásodásokra utalás történik a jelen Annex-ben, és az Annex 6. I. és II. Részében foglalt Szabványok teljesítmény és üzemeltetési korlátozásaiban.

f) *Tűzvédelem.* A repülőgép tervezése és annak gyártása során felhasznált anyagoknak olyanoknak kell lenni, hogy minimális legyen a tűz keletkezésének lehetősége repülés közben, vagy a földön, valamint tűz kialakulásakor a füst és a mérgező gázok kifejlődése, valamint olyanoknak kell lenni, hogy késleltessék a kisülés megtörténtét az utaskabinban.

g) *A rakodótér védelme.*

1) A rakodótérben lévő hőforrásokat, melyek képesek az árut, vagy a csomagokat meggyújtani, hőszigeteléssel kell ellátni, vagy el kell különíteni az ilyen gyulladások előfordulásának megelőzése érdekében, és

2) Minden egyes áru-, vagy csomagteret olyan anyagokból kell kialakítani, melyek minimum lángállók.

h) *A fedélzeten lévő személyek cselekvőképtelensége.* A tervezés során óvintézkedéseket kell beépíteni az esetleges kabin dehermetizáció előfordulása, valamint a füst, vagy mérgező gázok jelenléte ellen, melyek a repülőgépben tartózkodó személyeket cselekvőképtelenné tehetik.

D. 3. Aeroelaszticitás

A repülőgépnek mentesnek kell lennie a szerkezeti deformáció és az aeroelasztikus hatások okozta flattertől, szerkezeti elhajlástól, a kormányozhatóság megváltozásától, a kormányozhatóság elvesztésétől az A. 2. 1. pontnak megfelelő tervezési burkológörbén belül minden sebességnél, és még jóval azon kívül is. A repülőgép jellemzőit számításba kell venni.

D. 4. A fedélzeten tartózkodók elhelyezésének jellemzői

D. 4. 1. Ülések és bekötőhevederek

A fedélzeten tartózkodók számára megfelelő üléseket és bekötőhevedereket kell biztosítani, figyelembe véve a repülés és a kényszerleszállás során valószínűen fellépő azon terheléseket, amelyekkel számolni kell. Figyelmet kell fordítani arra, hogy a fedélzeten tartózkodók minimálisan sérüljenek meg, amikor a környező szerkezettel kapcsolatba kerülnek a repülőgép működése alatt.

D. 4. 2. Utaskabin környezet

A szellőztetést, a fűtést, és - ahol ez megvalósítható,- a hermetizálás rendszereit úgy kell megtervezni, hogy azok megfelelő környezetet biztosítsanak az utaskabinban a várható repülés, valamint a földi vagy vízi üzemelés viszonyai között. A rendszerek megtervezésekor számításba kell venni a veszélyhelyzeti viszonyokat is.

D. 5. Elektromos testelés és védekezés a villámcsapás és a statikus elektromosság ellen

D. 5. 1. Az elektromos testelésnek és a villámcsapás és statikus elektromosság elleni védelemnek olyannak kell lennie, hogy:

a) megvédje a repülőgépet, annak rendszereit, a benne tartózkodókat, és azokat, akik a földön vagy a vízen kapcsolatba kerülnek a repülőgéppel, a villámkisülés és az áramütés veszélyes hatásaitól, és

b) meggátolja az elektrosztatikus töltés veszélyes felhalmozódását.

D. 5. 2. A repülőgépet a villámok katasztrofális hatásaitól is meg kell védeni. Kellő figyelmet kell fordítani a repülőgép gyártásában használt anyagokra.

D. 6. Kényszerleszállásra vonatkozó előírások

D. 6. 1. A repülőgép tervezésekor gondoskodni kell arról, hogy egy kényszerleszállás esetén a fedélzeten tartózkodók védve legyenek a tűztől, és a sebességcsökkenés közvetlen hatásaitól, valamint mindazoktól a sérülésektől, melyek a repülőgép belső berendezésein a sebességcsökkenés erőhatásai által következnek be.

D. 6. 2. Eszközöket kell biztosítani a repülőgép gyors kiürítéséhez olyan körülményekre, melyek valószínűleg fennállnak egy kényszerleszállást követően. Ezeket az eszközöket a repülőgép utasainak és a személyzet kapacitásának összhangba hozásával kell meghatározni, és alkalmasaknak kell lenniük a kívánt cél eléréséhez.

D. 7. Földi kiszolgálás

Tervezési előírásokat és eljárásokat kell meghatározni a biztonságos földi kiszolgálásra (például: vontatás, felemelés). Bármilyen korlátozás és utasítás, mely az ilyen működés védelmére szolgál, számításba vehető.

E. ALRÉSZ.HAJTÓMŰ

E. 1. Meghajtó egységek

A jelen Annex VI. Részének Szabványait mindazon hajtóművekre alkalmazni kell, amelyeket a repülőgépen elsődleges meghajtó egységként használnak.

E. 2. Légcsavarok

A jelen Annex VII. Részének Szabványait minden egyes légcsavarra, amelyet repülőgépen használnak, alkalmazni kell.

E. 3. A meghajtó egység felépítése a repülőgépre

E. 3. 1. A hajtómű és a légcsavar korlátozásoknak való megfelelés

A meghajtó egység felépítését a repülőgépre úgy kell megtervezni, hogy a hajtómű és a légcsavarok (ha alkalmazható) képesek legyenek megbízhatóan működni a várható üzemeltetési körülmények között. A repülési kézikönyvben közzétett viszonyok között a repülőgépnek képesnek kell lennie arra, hogy a hajtóművekre és a légcsavarokra meghatározott korlátozások túllépése nélkül működjön a jelen alrésznek megfelelően.

E. 3. 2. A hajtómű fordulatszámának szabályozása

Olyan felépítéseknél, ahol egy meghibásodott hajtómű továbbműködése megnövelheti a tűz, vagy egy súlyos szerkezeti meghibásodás veszélyét, megoldásokat kell a hajózó személyzet részére biztosítani, mellyel leállíthatják a hajtómű működését repülés közben, vagy a fordulatszámát egy biztonságos szintre le tudják csökkenteni.

Megjegyzés.- A légcsavarlapát szeparációja (propeller blade separation) esetében a hajtómű rotációját lehetetlen leállítani.

E. 3. 3. Gázturbinás hajtómű

Egy gázturbinás hajtóműnek a repülőgépre történő felépítéséhez:

a) a tervezés során minimalizálni kell a veszélyeket, mely olyan esetekben fordul elő, amikor a hajtómű forgó részei meghibásodnak, vagy egy hajtóműtűz keletkezik, mely átégeti a hajtóműgondolát,

b) a hajtóművet a hajtómű szabályozó segédmechanizmussal, a hajtómű rendszerekkel és műszerekkel együtt úgy kell megtervezni, hogy ez észszerű garanciát nyújtson arra, hogy a használat során ne lépjék túl azokat a hajtómű üzemeltetési korlátozásokat, amelyek hátrányosan befolyásolják a forgó részek szerkezeti épségét.

E. 3. 4. A hajtómű újraindítása

Megoldásokat kell biztosítani arra, hogy a hajtóművet repülés közben újra lehessen indítani a közzétett maximális magasságig bezárólag minden magasságon.

E. 3. 5. Elrendezés és működés

E. 3. 5. 1. *A hajtómű egységek függetlensége.* A hajtóművet úgy kell elrendezni és felépíteni a repülőgépre, hogy minden egyes hajtómű egység a hozzá kapcsolódó rendszerekkel együtt alkalmas legyen a többi egységtől független vezérlésre és működésre, valamint olyan módon, hogy legyen legalább egy olyan hajtómű a hozzá kapcsolódó rendszerekkel, amelyben bármilyen meghibásodás, még ha ennek a valószínűsége a legmesszebbmenőkig csekély is, ne okozhasson nagyobb teljesítményvesztést, mint amekkora a kritikus hajtómű egység teljes meghibásodásakor következik be.

E. 3. 5. 2. *Légcsavar vibráció.* A légcsavar-vibráció okozta igénybevételeket meg kell határozni, és ezek nem léphetik túl azokat az értékeket, amelyeket biztonságosnak ítéltek a működtetéshez, a repülőgépre megállapított üzemeltetési korlátozásokon belül.

E. 3. 5. 3. *Hűtés.* A hűtőrendszernek olyannak kell lennie, hogy képes legyen a hajtómű alkotóelemeinek hőmérsékletét a megállapított határértékeken belül tartani (lásd az E. 3. 1. pontot) olyan külső levegőhőmérsékletek mellett egészen a maximális értékig, amelyek megfelelnek a repülőgép tervezett üzemeltetésének.

E. 3. 5. 4. *Kapcsolódó rendszerek.* A hajtómű egységhez tartozó tüzelőanyag-, olaj-, és levegő felvételi rendszereknek képesnek kell lenniük arra, hogy az egyes hajtóműveket táplálják az arra meghatározott követelményeknek megfelelően minden olyan körülmény között, amely a rendszerek működését befolyásolja a várható üzemeltetési körülmények között (például: hajtómű teljesítmény, vagy tolóerő, a repülőgép térbeli helyzetei és gyorsulások, légköri viszonyok, folyadékhőmérsékletek).

E. 3. 5. 5. *Tűzvédelem.* A hajtómű olyan részeire, ahol a tűz potenciális veszélye különösen súlyos a gyúlékony anyagokhoz közel lévő gyulladási források miatt, a következőket kell alkalmazni a D. 2. f) pontban szereplő általános Szabványon felül:

a) *Elszigetelés.* Az ilyen részeket tűzbiztos anyagokkal kell elszigetelni a repülőgép többi részétől, ahol a tűz jelenléte veszélyeztetheti a repülés folytatását, számításba véve a keletkezés valószínű pontjait és a tűz terjedésének valószínű útvonalát.

b) *Tűzveszélyes folyadékok.* A tűzveszélyes folyadékot tartalmazó rendszer alkotórészeinek, melyek az ilyen zónákban helyezkednek el, tűzbiztosnak kell lenniük. Minden egyes zónának kivezetést kell biztosítani, hogy minimálisra csökkenjen az a veszély, mely a tűzveszélyes folyadékokat tartalmazó bármelyik rész meghibásodásából ered. Megoldásokat kell biztosítani arra, hogy a hajózó személyzet tűz esetén meg tudja állítani a tűzveszélyes folyadék beáramlását az ilyen zónákba. Ha a tűzveszélyes folyadékok forrásai az ilyen zónákban vannak, az adott rendszer egészének, beleértve a tartószerkezetet is, tűzbiztosnak kell lennie, vagy védeni kell azt a tűz hatásaitól.

c) *A tűz észlelése.* Kielégítő mennyiségű tűzérzékelőről kell gondoskodni és elhelyezni olyan módon, hogy azok biztosítsák bármilyen tűz gyors észlelését, mely a következő repülőgép típusok ilyen zónáiban előfordulhatnak: egynél több gázturbinás, vagy turbó töltőkompresszoros hajtóművel rendelkező repülőgépek, vagy azok a repülőgépek, amelyeknél a hajtómű (hajtóművek) nem látható könnyen a pilótakabinból.

F. ALRÉSZ.RENDSZEREK ÉS BERENDEZÉSEK

F. 1. Általános rész

F. 1. 1. A repülőgépet fel kell szerelni mindazon jóváhagyott műszerekkel, berendezésekkel és rendszerekkel, beleértve a tájékozódáshoz szükséges műszereket és a repülőgép-vezérlő rendszereket, melyek a várható üzemeltetési viszonyok között s repülőgép biztonságos üzemeltetéséhez szükségesek. Ezeknek magukba kell foglalni mindazokat a műszereket és berendezéseket, melyek ahhoz szükségesek, hogy a hajózó személyzet képes legyen a repülőgépet működtetni annak üzemeltetési korlátain belül. A műszerek, és a berendezések tervezése során figyelembe kell venni az Emberi Tényezőket.

1. sz. Megjegyzés.- A Légialkalmassági Bizonyítvány kiadásához minimálisan szükséges berendezéseken és műszereken felül további műszereke és berendezések lehetnek szükségesek sajátos körülmények esetében, vagy sajátos útvonalfajták esetében, ezeket az Annex 6. I. és II. Része írja elő.

2. sz. Megjegyzés.- A rendszer szoftverekre vonatkozó értékeléseket lásd a H Alrészben.

3. sz. Megjegyzés.- Az Emberi Tényezőkre vonatkozó tájékoztató anyagot az Emberi Tényezők Kiképzési Kézikönyvében (DOC 9683), valamint az Emberi Tényezők Irányelvei a Légiforgalmi Szolgáltatás Szervezési (ATM) Rendszerekhez című kiadványban (DOC 9758) lehet megtalálni.

F. 1. 2. Az F. 1. 1. pontban előírt műszerek, rendszerek és berendezések tervezésének és a repülőgépre történő felépítésének olyannak kell lennie, hogy:

a) fordított összefüggést valósítson meg a meghibásodási körülmény valószínűsége és hatásának súlyossága között a repülőgépre, és a fedélzeten tartózkodókra nézve, ahogy azt a rendszer biztonsága értékelésének folyamatában előírták,

b) rendeltetésszerűen működjön az összes előre várható körülmény között, és

c) az elektromágneses interferencia minimális legyen közöttük.

F. 1. 3. Olyan megoldásokat kell biztosítani, melyek a hajózó személyzetet figyelmeztetik, ha a rendszer működése nem biztonságos, és lehetővé teszik számára a helyesbítő intézkedések megtételét.

F. 1. 4. Az elektromos áramellátó rendszert úgy kell megtervezni, hogy az képes legyen biztosítani az áramellátást a normál üzemelés alatt, és olyannak kell lennie, hogy egy előforduló meghibásodás, vagy helytelen működés ne károsíthassa a rendszer képességét a biztonságos üzemeltetéshez lényeges áramterhelések biztosítására.

F. 2. Felépítés a repülőgépre

A műszerek és berendezések felépítésének ki kell elégítenie a D Alrész Szabványaiban foglaltakat.

F. 3. Biztonsági és mentőfelszerelések

Az előírt biztonsági és mentőfelszereléseknek,- melyeket a hajózó személyzet, vagy az utasok várhatóan használni, vagy működtetni fognak egy veszélyhelyzet előfordulása során, - megbízhatónak, azonnali használatra késznek és könnyen azonosíthatónak kell lenniük, és működtetési módszerüket világosan kell jelölni.

F. 4. Navigációs fények és az összeütközés elleni fények

F. 4. 1. Az Annex 2-ben – Repülési szabályok, - előírt fényeknek, melyeket a repülőgépen repülés közben, vagy egy repülőtér forgalmi területén történő működés alatt üzemeltetni kell, olyan intenzitásúnak, színűnek, fedésterületűnek kell lenniük, valamint olyan egyéb jellemzőkkel kell rendelkezniük, melyek biztosítják, hogy egy másik légijármű pilótája, vagy a földi személyzet számára a lehető legtöbb idő álljon rendelkezésre az észlelésre, és az összeütközés elkerülése érdekében szükséges manőver végrehajtására. Az ilyen fényforrások megtervezésénél kellő figyelmet kell fordítani azokra a körülményekre, melyek között észszerűen elvárható, hogy funkcióiknak megfeleljenek.

Megjegyzés.- Valószínű, hogy ezeket a fényeket sokféle háttérrel szemben kell meglátni, mint például: a tipikus városi megvilágítás fényei, a tiszta csillagos égbolt, a holdfényes vízfelület, és az alacsony megvilágítású nappali időszak viszonyai. Ezen felül, az összeütközési veszély körülményeinek előfordulása sokkal valószínűbb a közelforgalmi körzetekben, ahol a légijárművek közepes és alacsony repülési szinteken üzemelnek közel azonos sebességgel, mely nem valószínű, hogy meghaladja a 900 km/ó (500 kt) értéket.

F. 4. 2. A repülőgépen a fényeket úgy kell elhelyezni, hogy minimális legyen annak lehetősége, hogy ezek károsan befolyásolják a hajózó személyzetet kötelmeinek kielégítő ellátásában.

Megjegyzés.- Az F. 4. 2. pontban felsorolt hatások elkerülése érdekében bizonyos esetekben szükségessé válik olyan megoldás biztosítása, mellyel a pilóta kikapcsolhatja a villogó fényeket, vagy csökkentheti azok intenzitását.

F. 5. Védelem az elektromágneses interferencia ellen

A repülőgép elektromos rendszereit, különösen a repülés szempontjából kritikus és lényeges rendszereket, meg kell védeni az elektromágneses interferenciától, melyek akár belső, akár külső forrásból keletkezhetnek.

F. 6. Jegesedés elleni védelem

Ha jegesedési körülmények közötti repülésre kérik a bizonyítványt, a repülőgépről bizonyítani kell, hogy képes biztonságosan üzemelni olyan jegesedési viszonyok között, melyekkel számolni kell az összes várható üzemeltetési környezetben.

G. ALRÉSZ. ÜZEMELTETÉSI KORLÁTOZÁSOK ÉS INFORMÁCIÓK

G. 1. Általános rész

Azokat az üzemeltetési korlátozásokat, amelyeken belül a jelen Annex Szabványaival való egyezést meghatározták, valamint minden egyéb olyan információt, mely a repülőgép biztonságos üzemeltetéséhez szükséges, közé kell tenni a repülési kézikönyvben, valamint jelölések és feliratok formájában, és minden olyan módon, mely a célnak hatékonyan megfelel. A korlátozásoknak és az információknak minimálisan azokat kell tartalmazniuk, amelyeket ebben az Alrészben ismertetünk.

G. 2. Üzemeltetési korlátozások

G. 2. 1. Azokat a korlátozásokat, amelyeknél ezek repülés közbeni túllépésének veszélye fennáll, és amelyeket számszerűen határoztak meg, alkalmas mértékegységekben kell kifejezni, és szükség esetén helyesbíteni a műszerhibák miatt oly módon, hogy a hajózó személyzet, a számukra rendelkezésre álló műszerek alapján azonnal meg tudja állapítani, hogy mikor éri el a korlátozó értékeket.

G. 2. 2. Terhelési korlátozások

A terhelési korlátozásoknak magukba kell foglalniuk az összes, tömegekre, súlyponthelyzetekre, tömegelosztásra, és a padlóterhelésre vonatkozó korlátozó értéket (lásd az A. 2. 2. pontot).

G. 2. 3. Repülési sebesség korlátozások

A repülési sebesség korlátozásoknak magukba kell foglalniuk az összes olyan sebességértéket (lásd a C. 5. pontot), melyek korlátozó jellegűek a szerkezeti épség, vagy a repülőgép repülési tulajdonságai, vagy egyéb megfontolások szempontjából. Ezeket a sebességértékeket a megfelelő repülőgép konfigurációkra, és egyéb, odaillő tényezőkre kell megadni.

G. 2. 4. Hajtómű korlátozások

A hajtómű korlátozásainak magukba kell foglalni mindazokat a korlátozásokat, melyeket a hajtómű azon különböző alkotórészeire határoztak meg, amelyeket a repülőgépre felépítettek (lásd az E. 3. 1. és az E. 3. 5. 3. pontokat).

G. 2. 5. A berendezésekre és a rendszerekre vonatkozó korlátozások

A berendezésekre és a rendszerekre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgépre felépített különböző berendezések és rendszerek összes korlátozását.

G. 2. 6. Egyéb korlátozások

Az egyéb korlátozásoknak a repülőgép biztonsága szempontjából veszélyesnek ítélt körülmények figyelembevételével megállapított szükséges korlátozásokat magukba kell foglalniuk (lásd az A. 2. 1. pontot).

G. 2. 7. A hajózó személyzetre vonatkozó korlátozások

A hajózó személyzetre vonatkozó korlátozásoknak magukba kell foglalniuk a repülőgép üzemeltetéséhez szükséges hajózó személyzet minimális létszámát, tekintetbe véve, más egyéb mellett, a megfelelő hajózó személyzeti tagok hozzáférését az összes szükséges vezérlőszervhez és műszerekhez, valamint a meghatározott veszélyhelyzeti eljárások végrehajtását.

Megjegyzés.- Lásd az Annex 6 – Légijármű Üzemeltetés – I és II. Részeit az olyan körülményekre vonatkozólag, amikor a jelen Annex-ben meghatározott minimum hajózó személyzet létszámon felül további hajózó személyzeti tag szükséges.

G. 3. Az üzemeltetésre vonatkozó információk és eljárások

G. 3. 1. Alkalmas üzemeltetés típusok

Fel kell sorolni mindazon üzemeltetés típusokat, amelyekre a repülőgép tulajdonságai révén alkalmasnak mutatkozott a vonatkozó légialkalmassági követelményeknek való megfelelés során.

G. 3. 2. Terhelési információk

A terhelési információknak tartalmazniuk kell a repülőgép üres tömegét, a repülőgép állapotának pontos körülírását a súlymérés idején, a megfelelő súlyponthelyzeteket, a referencia pontokat és az alapvonalakat, amelyekre a súlypontkorlátozásokat vonatkoztatták.

Megjegyzés.- A repülőgép üres tömege rendszerint nem tartalmazza a személyzet és a hasznos terhelés tömegét, a kifogyasztható tüzelőanyagot, és a leereszthető olaj tömegét, de magába foglalja az összes beépített ballasztot, a kifogyaszthatatlan tüzelőanyag, a le nem ereszthető olaj tömegét, valamint a hajtómű hűtő-, és hidraulika folyadékának teljes mennyiségét.

G. 3. 3. Üzemeltetési eljárások

Közzé kell tenni a normál és a veszélyhelyzeti üzemeltetési eljárásokat, melyek az adott repülőgépet jellemzik és annak biztonságos üzemeltetéséhez szükségesek. Ezeknek tartalmazniuk kell az egy, vagy több hajtómű-egység meghibásodása esetén követendő eljárásokat.

G. 3. 4. A repülőgép vezetésére vonatkozó információk

A repülőgép jellemzőinek bármilyen szignifikáns, vagy szokatlan tulajdonságáról kielégítő információt kell biztosítani. Közzé kell tenni azokat az átesési sebességeket, vagy minimális állandósult repülősebességeket, melyeknek meghatározása a B. 4. 2. 3. pont szerint elő van írva.

G. 4. Teljesítményre vonatkozó információk

A repülőgép teljesítményét a B. 2. pontnak megfelelően kell közzétenni. Magába kell foglalnia a különböző repülőgép konfigurációkra vonatkozó információkat, a hozzájuk tartozó teljesítmény és tolóerő értékeket, és a vonatkozó sebesség értékeket, valamint mindazon információkat, amelyek segíthetik a hajózó személyzetet a betervezett teljesítmény elérésében.

G. 5. Repülési kézikönyv

A repülési kézikönyv meglétét biztosítani kell. Világosan meg kell jelölni, hogy mely adott repülőgépre, vagy repülőgép szériákra vonatkozik. A repülési kézikönyvnek minimálisan tartalmaznia kell a G. 2, G. 3, G. 4 és a G. 6. 1. pontban meghatározott korlátozásokat, információkat és eljárásokat.

G. 6. Jelölések és feliratok

G. 6. 1. A műszereken, a berendezéseken, a kormányokon elhelyezett jelöléseknek és feliratoknak tartalmazniuk kell mindazon korlátozásokat, vagy információkat, amelyeket a hajózó személyzetnek elsődlegesen figyelembe kell venni a repülés alatt.

G. 6. 2. Jelöléseket, és feliratokat, vagy utasításokat kell biztosítani annak érdekében, hogy a földi személyzet számára lényeges információkat megadják, és hogy kizárható legyen a tevékenység hibás elvégzésének lehetősége a földi kiszolgálásban (vontatás, tüzelőanyag tankolás), mely észrevétlen is maradhat, és veszélyeztetheti a repülőgép biztonságát a következő repülések során.

G. 7. Folyamatos légialkalmasság – karbantartási információk

G. 7. 1. Általános rész

A repülőgép légialkalmas állapotban tartására kidolgozandó eljárásokban felhasznált információkat közzé kell tenni. Ezen információknak tartalmazniuk kell a G. 7. 2, G. 7. 3, és a G. 7. 4 pontokban előírtakat.

G. 7. 2. Karbantartásra vonatkozó információk

A karbantartásra vonatkozó információknak magukba kell foglalniuk a repülőgép leírását, és a karbantartási feladatok végrehajtásának javasolt módszereit. Ezen információknak útmutatást kell tartalmazni a hiba-meghatározáshoz.

G. 7. 3. A karbantartási programra vonatkozó információk

A karbantartási programra vonatkozó információknak tartalmazniuk kell a karbantartási feladatokat, és azokat a javasolt időintervallumokat, amikor ezeket végre kell hajtani.

Megjegyzés.- A repülőgép Típusalkalmassági Bizonyítványával egyidőben kidolgozott kezdeti karbantartási program információira néha úgy hivatkoznak, mint a Karbantartás Ellenőrző Csomag (MRB) módszerére, vagy mint a folyamatos légialkalmasság érdekében kidolgozott utasítások módszerére.

G. 7. 4. A típustervezés jóváhagyásából eredő kötelező karbantartási követelmények

Azokat a kötelező karbantartási követelményeket, melyeket a Tervező Állam a típustervezés jóváhagyásának részeként határozott meg, eszerint kell azonosítani, és bele kell foglalni a G. 7. 3. pont szerinti karbantartási információkba.

Megjegyzés.- A típustervezés jóváhagyásának részeként azonosított kötelező követelményekre gyakran úgy hivatkoznak, mint a Jogosítás Karbantartási Követelményei (CMR), és/vagy légialkalmassági korlátozások.

H. ALRÉSZ. RENDSZER SZOFTVEREK

Az összes rendszer szoftvert úgy kell megtervezni és jóváhagyni, hogy biztosítékot nyújtsanak arra vonatkozólag, hogy azok a rendszerek, amelyekben használják őket, megfelelnek a tervezett funkcióknak olyan biztonsági szinten, mely kielégíti a jelen Rész követelményeit, főleg azokat, melyeket az F. 1. 2. a) és az F. 1. 3. pontok tartalmaznak.

Megjegyzés.- A rendszer szoftverek tervezésére és tesztelésére néhány Állam elfogadja a nemzeti/nemzetközi ipari szabványokat, mint például: az RTCA/DO-178-at, vagy az EUROCAE ED12-t.

I. ALRÉSZ.TÖRÉSBIZTOSSÁG ÉS UTASKABIN BIZTONSÁG

I. 1. Általános rész

A fedélzeten tartózkodók túlélési valószínűségének javítása érdekében a repülőgépek tervezése során a törésbiztosságot figyelembe kell venni.

I. 2. Kényszerleszálláskor előforduló terhelések tervezése

A kényszerleszállás (repülőgép katasztrófa) eseténi terheléseket minden repülőgép kategóriára meg kell határozni annak érdekében, hogy a repülőgép belső berendezései, a bútorzat, a hordszerkezetek és a biztonsági berendezések úgy legyenek megtervezhetők, hogy a fedélzeten tartózkodók túlélési képessége maximális legyen. Az alábbi tényezőket kell figyelembe venni:

a) dinamikus hatások,

b) azon egységekre vonatkozó megszorító követelmények, melyek veszélyt idézhetnek elő,

c) a vészkijáratok körzetében a törzs deformálódása,

d) a tüzelőanyag cella integritása és helye, és

e) az elektromos rendszer integritása, hogy elkerülhető legyen a gyulladás-források kialakulása.

I. 3. Az utaskabin tűzvédelme

Az utaskabint úgy kell megtervezni, hogy az védelmet nyújtson a tűz ellen a fedélzeten tartózkodók számára olyan esetekben, amikor a fedélzeti rendszerek meghibásodnak, vagy egy repülőgép katasztrófa esetében. Az alábbi tényezőket kell figyelembe venni:

a) az utaskabin belső anyagainak éghetősége,

b) tűzállóság, valamint füst és mérgező égéstermékek képződése,

c) gondoskodás biztonsági felszerelésekről, melyek lehetővé teszik a repülőgép biztonságos kiürítését, és

d) tűzérzékelő és tűzoltó berendezések.

I. 4. A repülőgép kiürítése

A repülőgépet kielégítő számú vészkijárattal kell ellátni, hogy lehetőség legyen az utaskabin megfelelő időegység alatt kiürítésére. A repülőgép méretének megfelelően az alábbi tényezőket kell figyelembe venni:

a) Utasülések száma és az ülések elrendezése,

b) a kijáratok száma, helye és mérete,

c) a kijáratok jelölése és a használati utasítás biztosítása,

d) a kijáratok valószínű elzáródása,

e) a kijáratok működtetése, és

f) a kiürítésre szolgáló felszerelések súlya és elhelyezése a kijáratoknál, mint például: mentőtutajok.

I. 5. Világítás és jelölések

A vészvilágításnak, ha ilyen van, a következő jellemzőkkel kell rendelkeznie:

a) legyen független a fő elektromos ellátó rendszertől,

b) automatikusan lépjen működésbe a normál elektromos áramszolgáltatás megszűnésekor/ütközéskor,

c) a vészkijáratokat vizuálisan jelölje,

d) legyen megvilágítás a repülőgép belsejében és a repülőgépen kívül is a kiürítés alatt, és

e) ne álljon fenn további kockázat a tüzelőanyag szétömlése, kényszerleszállás és kisebb összeütközés eseményei során.

J. ALRÉSZ.ÜZEMELTETÉSI KÖRNYEZET ÉS EMBERI TÉNYEZŐK

J. 1. Általános rész

A repülőgépet úgy kell megtervezni, hogy lehetővé váljon a biztonságos üzemeltetés az utasok teljesítőképességének határain belül, és azokéin, akik működtetik, karbantartják és kiszolgálják azt.

Megjegyzés.- Az ember/gép érintkező felület gyakran a gyenge láncszem egy üzemeltetési környezetben, és mivel ez így van, biztosítani szükséges, hogy a repülőgép a repülés minden *fázisában irányítható maradjon (beleértve a meghibásodások okozta bármilyen mértékű csökkenést), és hogy se a személyzetnek, se az utasoknak ne okozhasson kárt az a környezet, amelyben a repülés időtartama alatt tartózkodnak.*

J. 2. Hajózó személyzet

J. 2. 1. A repülőgépet olyan módon kell megtervezni, hogy lehetővé váljon a hajózó személyzet számára a biztonságos és hatékony repülőgép-vezetés. A tervezésnél tekintettel kell lenni a hajózó személyzet készségeinek és fiziológiai adottságainak különbözőségére is a hajózó személyzet szakszolgálati engedélyezése határain belül. Számításba kell venni a repülőgép különböző várható üzemeltetési körülményeit a környezetében, beleértve a meghibásodások okozta csökkent működést.

J. 2. 2. A repülőgép megtervezéséből eredő, a hajózó személyzetre jutó munkaterhelésnek észszerűnek kell lennie a repülés minden fázisában. Speciális figyelmet kell fordítani a repülés kritikus fázisaira, és a kritikus eseményekre, melyek valószínűen várható, hogy előfordulnak a repülőgép élettartama alatt, mint egy kisebb fokú hajtómű meghibásodás, vagy szélnyírásba kerülés.

Megjegyzés.- Mind az észlelőképesség, mind a fiziológiai tényezők befolyásolhatják a munkaterhelést.

J. 3. Ergonómia

A repülőgép tervezése során figyelembe kell venni az ergonómiai tényezőket, beleértve:
a) a kényelmes használatot és a nem szándékos helytelen használat megelőzését,
b) a kényelmes hozzáférést,
c) a munkakörnyezetet,
d) a szabványosítást és az emberközeliséget,
e) a karbantartás kényelmét.

J. 4. Az üzemeltetés környezeti tényezői

A repülőgép tervezésekor figyelembe kell venni a hajózó személyzet működési környezetét, beleértve:
a) a repülő-orvosi tényezők hatását, mint az oxigénszint, a hőmérséklet, a páratartalom, a zaj és a vibráció,
b) a fizikai erők hatását a normál repülés alatt,
c) nagy magasságon történő hosszan tartó üzemelés hatását, és
d) a testi kényelmet.

VI. RÉSZ.HAJTÓMŰVEK

A ALRÉSZ.ÁLTALÁNOS RÉSZ

A. 1. Alkalmazhatóság

A. 1. 1. Az alábbi megjegyzésben foglaltak kivételével, a jelen Rész Szabványait minden típus hajtóműveire alkalmazni kell, melyeket elsődleges meghajtó egységként használnak a IIIB, a IVB, és az V. Részek előírásai szerint.

Megjegyzés.- Az alábbi Szabványok nem tartalmaznak mennyiségi specifikációkat, melyeket össze lehetne hasonlítani a nemzeti légialkalmassági kódokban található értékekkel. A II. Rész 1. 2. 1. pontjának megfelelően ezeket a Szabványokat ki kell egészíteni a Szerződő Államok által meghatározott, adoptált, vagy elfogadott követelményekkel.

A. 1. 2. Az A. 1. 1. pontban megjelölt hajtóművekre az átfogó, és részletes nemzeti kód megfelelő részei által meghatározott légialkalmasság szintjének legalább lényegében egyenlőnek kell lenni a jelen Rész széleskörű Szabványai által szándékolt teljes szinttel.

A. 2. A hajtómű felépítése és a határfelületek

A. 2. 1. A hajtómű és a légijármű közötti biztonságos és szabályszerű határfelületekre vonatkozó összes szükséges információnak rendelkezésre kell állnia.

A. 2. 2. A felépítésre vonatkozó utasításokban részletesen meg kell határozni azon körülményekre vonatkozó feltételezéseket, melyeket még előírhatnak a hajtóműre, amikor azt végül felépítik a légijárműre.

A. 3. Közzétett teljesítmény osztályok, viszonyok és korlátozások

A. 3. 1. Közé kell tenni a hajtómű tolóerő és teljesítmény értékeit, valamint azokat a légköri viszonyokat, amelyekre ezeket az értékeket alapozták, és az összes üzemeltetési körülményt és korlátozást, melyek szándék szerint szabályozzák a hajtómű működését.

A. 3. 2. Az A. 3. 1. pontban meghatározott korlátok között a hajtóműnek le kell adnia azt a tolóerőt vagy teljesítményt, mely az összes megadott repülési körülmény között előírt érték, figyelembe véve a környezeti hatásokat és viszonyokat.

A. 4. Folyamatos légialkalmasság – karbantartási információk

A. 4. 1. Általános rész

A hajtómű légialkalmas állapotban tartására kidolgozandó eljárásokban felhasznált információkat közzé kell tenni. Az információknak magukba kell foglalni az A. 4. 2, A. 4. 3, és az A. 4. 4. pontokban előírtakat.

A. 4. 2. Karbantartási információk

A karbantartási információknak tartalmazniuk kell a hajtómű leírását, valamint a karbantartási feladatok végrehajtásának ajánlott módszereit. Ezen információknak irányelveket kell magukba foglalniuk a hiba-meghatározáshoz.

A. 4. 3. A karbantartási programra vonatkozó információk

A karbantartási programra vonatkozó információknak magukba kell foglalni a karbantartási feladatokat, és azokat a javasolt időintervallumokat, amikor ezeket a feladatokat végre kell hajtani.

A. 4. 4. A típustervezés jóváhagyásából eredő kötelező karbantartási előírások

A típustervezés jóváhagyásának részeként a Tervező Állam által részletesen meghatározott kötelező karbantartási előírásokat ekként kell azonosítani, és belefoglalni az A. 4. 3. pont szerinti karbantartási információkba.

B. ALRÉSZ.TERVEZÉS ÉS GYÁRTÁS

B. 1. Működés

A hajtóművet úgy kell megtervezni és legyártani, hogy az megbízhatóan működjön az üzemeltetési határértékein belül a várható üzemeltetési viszonyok között, amikor a jelen Annex III.B, IVB, vagy V. Résznek megfelelően lett felépítve, és, ha alkalmazható, egy felépítésre jóváhagyott légcsavart illesztettek hozzá.

B. 2. Hibaanalízis

A gázturbinás hajtóművek esetében egy biztonsági becslést kell végrehajtani annak biztosítására, hogy a hajtómű az üzemeltetési viszonyok teljes tartományában biztonságosan működik. Egy összesítést kell készíteni az összes olyan előre látható meghibásodásról és a meghibásodások kombinációiról, melyek a hajtóműre veszélyes hatással lehetnek. Ha az egyes elemek elsődleges meghibásodása (például: lemezek) valószínűen veszélyes hatást eredményez a hajtóműre, a hajtómű teljességére (épségére) vonatkozó követelményeket előíró értekezletre kell bízni a megbízhatóság megítélését.

B. 3. Anyagok és gyártási módszerek

Az anyagok, valamint a gyártási folyamatok és módszerek kiválasztásánál számításba kell venni, hogy a hajtóművet milyen várható üzemeltetési környezetben fogják használni. A hajtómű megépítésében felhasznált anyagoknak, valamint a gyártási módszereknek és a folyamatoknak az ismert és megismételhető működést kell eredményezni.

B. 4. A hajtómű teljessége (épsége)

A hajtómű teljességét annak működési burkológörbéje minden pontjában bizonyítani kell, és ezt a teljességet fenn kell tartani a hajtómű üzemi élettartama alatt. A ciklikus terhelések, a környezet és az üzemeltetés által okozott csökkenés, valamint az ebből következő alkatrész meghibásodások nem csökkenthetik a hajtómű teljességét az elfogadható szintek alá. Erre tekintettel, a folyamatos légialkalmasság biztosítására vonatkozó összes szükséges utasítást közzé kell tenni.

C. ALRÉSZ.TESZTEK

A hajtómű típuson sikeresen végre kell hajtani mindazokat a teszteket, melyek szükségesek ahhoz, hogy bizonyítsák a közzétett teljesítményosztályok, körülmények és korlátozások érvényességét, és garanciát jelentsenek arra nézve, hogy a hajtómű kielégítően és megbízhatóan fog üzemelni. A teszteknek legalább az alábbiakat kell magukba foglalni:

a) T*eljesítményhitelesítés*. A hajtómű teljesítmény és tolóerő jellemzőinek meghatározása érdekében teszteket kell végrehajtani akkor, amikor a hajtómű új, majd a b) és a c) pontokban előírt tesztek teljesítése után is. Az összes előírt teszt végrehajtása után a végeredmény nem mutathat túlzott hajtómű teljesítmény csökkenést.

b) *Működés*. Teszteket kell végrehajtani annak igazolására, hogy a hajtómű indítása, alapjárata, gyorsulása, vibrációja és túlpörgése, valamint egyéb jellemzői kielégítőek, és bizonyítani kell, hogy megfelelő szabadságfok többlettel rendelkezik ahhoz, hogy ne forduljon elő robbanás, befulladás, berezgés (flatter), vagy egyéb káros körülmény, melyek előfordulhatnak egy adott típusú hajtóműnél.

c) *Tartósság.* Kielégítően hosszú ideig kell teszteket végrehajtani olyan teljesítménnyel, tolóerőnél, sebességeknél, hőmérsékleteknél, és egyéb üzemeltetési viszonyok között, melyek szükségesek ahhoz, hogy bizonyítsák a hajtómű megbízhatóságát és tartósságát. Ezeknek a teszteknek magukba kell foglalni olyan üzemelést is, amikor a viszonyok olyan mértékben lépik túl a közzétett határértékeket, mint amilyen mértékben a tényleges üzemei használat folyamán túlléphetik ezeket a határértékeket.

d) *Üzemeltetési környezet.* Teszteket kell végrehajtani annak igazolására, hogy a hajtómű jellemzői kielégítőek az üzemeltetési környezetre tekintettel.

Megjegyzés.- Az üzemeltetési környezet magába foglalhat madarakkal történő ütközés, eső és jégeső, elektromágneses interferencia és villámcsapás előfordulását.

VII. RÉSZ.LÉGCSAVAROK

A. ALRÉSZ.ÁLTALÁNOS RÉSZ

A. 1. Alkalmazhatóság

A. 1. 1. Ezen Rész Szabványait minden légcsavarra alkalmazni kell a IIIB és V. Részekben előírtak szerint.

Megjegyzés.- Az alábbi Szabványokban számszerű specifikáció nem szerepel, melyeket össze lehetne hasonlítani azokkal, melyek a nemzeti légialkalmassági kódokban találhatók. A II. Rész 1. 2. 1. pontjának megfelelően ezeket a Szabványokat ki kell egészíteni a Szerződő Államok által megalkotott, adoptált, vagy elfogadott követelményekkel.

A. 1. 2. Az A. 1. 1 pontban a légcsavarokra előírt átfogó, és részletes nemzeti kód megfelelő részei által meghatározott légialkalmassági szintnek lényegében legalább egyenlőnek kell lennie a jelen Rész széleskörű Szabványai által szándékolt teljes szinttel.

A. 2. Közzétett teljesítményosztályok, viszonyok és korlátozások

Közzé kell tenni mindazokat a teljesítményosztályokat, az összes üzemeltetési körülményt és korlátozásokat, melyek a szándék szerint szabályozzák a légcsavar működését.

A. 3. Folyamatos légialkalmasság – karbantartási információk

A. 3. 1. Általános rész

A légcsavar légialkalmas állapotban tartására kidolgozandó eljárásokban a használatra vonatkozólag információkat kell biztosítani. Ezen információknak tartalmazniuk kell az A. 3. 2., az A. 3. 3. és az A. 3 4. pontokban előírtakat.

A. 3. 2. Karbantartási információk

A karbantartási információknak magukba kell foglalni a légcsavar leírását, és a karbantartási feladatok végrehajtásának javasolt módszereit. Ezen információknak tartalmazniuk kell iránye4lveket a hiba-meghatározásra.

A. 3. 3. A karbantartási program információi

A karbantartási program információinak magukba kell foglalniuk a karbantartási feladatokat, és azokat a javasolt időintervallumokat, amikor ezeket a feladatokat el kell végezni.

A. 3. 4. A típustervezés jóváhagyásából eredő kötelező karbantartási követelmények

Azokat a kötelező karbantartási követelményeket, melyeket a Tervező Állam a típustervezés jóváhagyásának részeként határozott meg, ily módon kell azonosítani, és az A. 3. 3. pont karbantartási információiba bele kell foglalni.

B.ALRÉSZ.TERVEZÉS ÉS GYÁRTÁS

B. 1. Működés

A légcsavar összeépítését úgy kell megtervezni és végrehajtani, hogy az megbízhatóan működjön az üzemeltetési határértékein belül a várható üzemeltetési körülmények között, amikor a jelen Annex IIIB és V. Részeinek megfelelően építik fel és bizonyítják, hogy a légcsavar nem veszélyes.

B. 2. Hibaelemzés

A légcsavar biztonsági becslését el kell végezni annak biztosítása érdekében, hogy a légcsavar biztonságosan működik az üzemeltetési körülmények teljes tartományában. Összesítést kell készíteni azokról a meghibásodásokról, melyeknek hatásai veszélyt jelentenek a légcsavarra.

Ha az egyes elemek elsődleges meghibásodása (például: légcsavarlapátok) valószínűen veszélyes hatást eredményez a légcsavarra, a teljességre (épségre) vonatkozó követelményeket előíró értekezletre kell bízni a megbízhatóság megítélését.

B. 3. Anyagok és gyártási módszerek

Az anyagok, valamint a gyártási folyamatok és módszerek kiválasztásánál számításba kell venni, hogy a légcsavart milyen várható üzemeltetési környezetben fogják használni. A légcsavar megépítésében felhasznált anyagoknak, valamint a gyártási módszereknek és a folyamatoknak az ismert és megismételhető működést kell eredményezni.

B. 4. Állásszög szabályozás és kijelzés

B. 4. 1. A normál légcsavar állásszög szabályozás hiánya nem fog veszélyes túlgyorsulást okozni a várható üzemeltetési körülmények között.

B. 4. 2. A normál és a veszélyhelyzeti üzemeltetés alatt a légcsavar vezérlő rendszer meghibásodásának vagy egyedi hibájának nem szabad a légcsavarlapátok nem szándékos elmozdulását eredményezni a repülés közbeni kis állásszög helyzet alatti pozícióba. A szerkezeti elemek meghibásodását nem szükséges tekintetbe venni, ha az ilyen meghibásodás előfordulása a legmesszebbmenőkig csekélynek látszik.

C. ALRÉSZ.TESZTEK ÉS FELÜLVIZSGÁLATOK

C. 1. Lapátrögzítés teszt

A leszerelhető lapátokkal történő légcsavar összeépítéseket kielégítő, a szükségesnél nagyobb centrifugális terhelésnek kell alávetni annak biztosítására, hogy a légcsavaragy és a lapátrögzítés rendszere kielégítően és megbízhatóan fog működni a használat során várható terhelések alatt az összes előre látható üzemeltetési körülmény között.

C. 2. Üzemeltetési és tartóssági tesztek

A légcsavaron olyan teszteket kell kielégítő eredménnyel elvégezni, melyek szükségesek ahhoz, hogy biztosított legyen, hogy a légcsavar kielégítően és megbízhatóan fog működni a közzétett teljesítményosztályokban, viszonyok között és korlátozásokon belül. A teszteknek legalább az alábbiakat kell magukba foglalniuk:

a) *Működés.* Teszteket kell végrehajtani annak bizonyítására, hogy az állásszög szabályozó rendszer megfelelően és megbízhatóan működik.

b) *Tartósság*. Kielégítő időtartamú teszteket kell végrehajtani olyan teljesítmény és sebességértékeknél, és egyéb üzemeltetési körülményeknél, melyek a légcsavar megbízhatóságának és tartósságának bizonyításához szükségesek

c) *Üzemeltetési környezet*. A fix állásszögű fa légcsavarok kivételével, tesztekkel kell bizonyítani, vagy a tesztekre alapozott analízisekkel, vagy hasonló tervezéseknél szerzett gyakorlati tapasztalatokkal, hogy a légcsavar képes ellenállni egy madár valószínű becsapódásának, vagy egy villámcsapásnak anélkül, hogy hatása veszélyes lenne a légcsavarra.

VÉGE

ANNEX 9.
Egyszerűsítések

12. kiadás – 2005. július

19. módosítással

Jelen kiadvány magában foglalja a Tanács által 2005 március 8-át megelőzően elfogadott módosításokat, és 2005 november 24-től hatálytalanítja a 9.Annex összes megelőző kiadását.
A Szabványok és Ajánlott Gyakorlatok alkalmazhatóságával kapcsolatos tájékoztatót lásd az Előszóban.
Nemzetközi Polgári Repülési Szervezet

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.
MÓDOSÍTÁSOK ÉS JAVÍTÁSOK JEGYZÉKE

MÓDOSÍTÁSOK				*JAVÍTÁSOK*			
Sor szám	*Alkalmazás dátuma*	*Beépítés dátuma*	*Beépítette*	*Sor szám*	*Kiadás dátuma*	*Beépítés dátuma*	*Beépítette*
1–19	2005.November.24						

ELŐSZÓ

Történeti háttér

Az Alakiságegyszerűsítés szabványait és ajánlott gyakorlatait a Tanács első alkalommal 1949. március 25-én, a Nemzetközi Polgári Repülésről szóló Egyezmény (1944, Chicago) 37. cikkelyében foglaltak alapján fogadta el és „Szabványok és ajánlott gyakorlatok – Alakiságok egyszerűsítése” névvel az Egyezmény 9. Annexének nevezte ki. E szabványok és ajánlott gyakorlatok 1949. szeptember 1-én léptek érvénybe. A szabványok és ajánlott gyakorlatok az Alakiság egyszerűsítési divízió első, 1946. februári montreáli, és a második, 1948. júniusi genfi ülésszakán elfogadott ajánlásokra alapultak. Bővítésükre és módosításaikra a divízió soron következő ülésszakait követően folyamatosan került sor. Így a Buenos Airesben 1951. decemberében tartott harmadik ülésszak; a Manilában 1955 októberében tartott negyedik ülésszak; a Rómában, 1959. decemberben tartott ötödik ülésszak; a Mexikóvárosban 1963. márciusban és áprilisban tartott hatodik ülésszak. Továbbiakban, a Montrealban, 1968. májusban tartott hetedik ülésszak; a Dubrovnikban, 1973. márciusban tartott nyolcadik ülésszak; a Montreálban, 1979. áprilisban és májusban tartott kilencedik ülésszak; a Montreálban 1988. szeptemberben tartott tizedik, és az 1995. áprilisában tartott tizenegyedik ülésszak; végül, az Alakiságok Egyszerűsítése (FAL) munkabizottság Montreálban, 2001. februárban tartott munkaértekezlete nyomán. A divízió és a FAL munkabizottság 9. Annex módosítására tett ajánlásainak és a Tanács ezzel kapcsolatos ténykedéseinek eredményeként a 9. Annex második kiadása 1953. március 1-én, harmadik kiadása 1956 november 1-én, negyedik kiadása 1960. november 1-én, ötödik kiadása 1964 április 1-én, hatodik kiadása 1969 április 1-én, hetedik kiadása 1974 április 15-én, nyolcadik kiadása 1980 július 15-én és a kilencedik kiadása 1990. november 15-én és a tizedik kiadása 1997 április 30-án, tizenegyedik kiadása 2002 július 15-én lépett érvénybe.

A tizenkettedik kiadás – A jelenlegi kiadás többek között az Alakiság Egyszerűsítési Divízió tizenkettedik ülésszaka (FAL/12, Kairó, Egyiptom, 2004. április 1-én) által tett A-típusú ajánlásokból eredő előírásokat foglalja magában. Ide tartozik a Gépi Feldolgozású Utazási Okmányok (MRTD-ék), az utazási dokumentumok, a légi-közlekedés védelme, az utazási dokumentumokkal való visszaélés és az illegális bevándorlás, a korszerű utas tájékoztatás, a nemzetközi egészségügyi problémák és szabályok, és a repülőbaleset áldozatai és családtagjaik megsegítése témaköre. A 9. Annex e tizenkettedik kiadása 2005. július 11-én lép érvénybe és 2005. november 28-ától alkalmazandó.

Az alakiság egyszerűsítéssel kapcsolatos szabványok és ajánlott gyakorlatok az Egyezmény 37. cikkelyének az eredménye. Ez a cikkely többek között úgy rendelkezik, hogy a Nemzetközi Polgári Repülési Szervezet köteles elfogadni, illetve szükség szerint időközönként módosítani a vám- és a bevándorlási eljárásokkal, ...illetve a légi-navigáció biztonságával, rendszerességével és hatékonyságával kapcsolatos egyéb ügyekkel foglalkozó és az adott időszakban megfelelőnek látszó nemzetközi szabványokat és ajánlott gyakorlatokat".

Az alakiság egyszerűsítési szabványok és ajánlott gyakorlatok bevezetésével kapcsolatos állami feladatok irányelvét az Egyezmény 22. cikkelye nyomatékosítja. Hangsúlyozza az egyes szerződő államok által elfogadott kötelezettséget, hogy:
„a szerződő államok – speciális rendelkezések kihirdetésével, vagy egyéb módon – minden lehetséges lépést tegyenek meg a területeik között közlekedő légi-járművek navigációjának megkönnyítésre és elősegítésére, „elsősorban a bevándorlási, a karantén alkalmazási, a vám és engedélyezési törvények alkalmazása terén a légi-járművek és személyzeteik, az utasok, a személypoggyászok és a teheráru szükségtelen késedelmének elkerülésére”. Továbbá az Egyezmény 23. cikkelye nyomán, a szerződő államok mindegyike által vállalt kötelezettséget teljesítve azáltal, hogy "a gyakorlatban hasznosnak ítélhető mértékében, a nemzetközi légi-navigációt – az Egyezmény folyományaként időről-időre javasolt, vagy meghatározott gyakorlatokkal egyezésben – érintő vám- és bevándorlási eljárásokat alakítanak ki".*

*A FAL Annex előállítását az Egyezmény cikkelyei közül több is fontos tényezőként befolyásolja, amelyeket elkészítésekor figyelembe vettek. A jelen Annex rendelkezéseinek bevezetéséért felelős személy, a 22. és a 23. cikkelyen felül, a következő cikkelyeket ismerje:
10. cikkely – Leszállás vámrepülőtéren;
11. cikkely – A légügyi előírások alkalmazása;
13. cikkely – Belépési és engedélyezési előírások;
14. cikkely – A betegségek terjedésének megakadályozása
24. cikkely – Vámkötelezettség;
29. cikkely – A légi-jármű fedélzeten rendszeresítendő dokumentumok
35. cikkely – Árura vonatkozó korlátozások *

A 9. Annex szabványain és ajánlott gyakorlatain felül, a Szervezet FAL programja a következőkre alapul: a Közgyűlés FAL Határozatai és a FAL divízió találkozók B-típusú ajánlásai, azaz a 9. Annex rendelkezéseinek módosítását nem szorgalmazó ajánlások.

Alkalmazás

Az 1. Fejezet B részében közölteknek megfelelően, a jelen dokumentumban közölt szabványok és ajánlott gyakorlatok a légi-jármű üzemeltetés minden kategóriájára alkalmazandók, kivéve, ha az adott rendelkezés más kategóriák említése nélkül egy adott kategóriát megnevez.

Az alakiság egyszerűsítési szabványok és ajánlott gyakorlatok, elkerülhetetlen módon, két lehetséges forma valamelyikében jelennek meg: az egyik a "tagadó" alak, például, hogy a szerződő állam a papírmunka, a mozgásszabadság korlátozása stb. terén bizonyos maximum követelménynél többet ne támasszon, a másik az "igenlő" forma, például, hogy a szerződő állama csak átmenő forgalom, stb., terén bizonyos minimum utas kényelmi lehetőségről gondoskodjon. Az ICAO a "tagadó" rendelkezéssel kapcsolatban felmerülő minden kérdés esetében feltételezi, hogy saját követelményeit az állam - ha lehetséges, minden esetben - a szabványban, vagy az ajánlott gyakorlatban rögzített maximum követelményszint alatt tartja. Az "igenlő" rendelkezéssel kapcsolatban felmerülő minden kérdés esetében feltételezi, hogy, ha lehetséges, az állam minden esetben többet nyújt majd a szabványban, vagy az ajánlott gyakorlatban rögzített minimum követelményszintnél.

A szerződő államok ténykedése

Az eltérések bejelentése. Felhívjuk a Szerződő államok figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségükre, amely szerint a Szerződő államok a szervezetet értesíteni kötelesek mindenféle eltérésről, amely nemzeti előírásaik és gyakorlataik, tovább a jelen Annex-ben és annak bármely módosításában található nemzetközi szabványok között fennáll. A szerződő államokat felkérjük továbbá, hogy ezt a bejelentést a jelen Annex-ben és annak bármely módosításában található ajánlott gyakorlatoktól való eltérésekre is terjesszék ki. Továbbá, felkérjük a szerződő államokat, hogy a Szervezetet tartsák naprakészen informálva minden olyan eltérésről, amely a későbbiekben kialakulhat, illetve a korábbiakban jelzett bármely eltérés megszűnéséről. Eme Annex minden módosításának elfogadását követően azonnal külön, az eltérések jelentésére vonatkozó kérést juttatnak el a szerződő államok részére.

Felhívjuk az államok figyelmét a 15. Annex rendelkezéseire is, amelyek az Egyezmény 38. cikkelyének államokra vonatkozó kötelmein felül előírják, hogy a nemzeti előírások és gyakorlatok, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti lényeges eltéréseket a légiforgalmi tájékoztató szolgálat útján közzé kell tenni.

A tájékoztatás közzététele. A jelen Annex-ben meghatározott szabványok és ajánlott gyakorlatok szerint biztosított létesítmények, szolgálatok és eljárások légi-jármű üzemelést befolyásoló létrehozására és megszüntetésére, vagy ezen létesítmények megváltoztatására vonatkozó információt a 15. Annex előírásainak megfelelően kell közzétenni és érvénybe léptetni.

A szerződő állam köteles minden erőfeszítést megtenni a 15. Annex által megkövetelt (és a Légiforgalmi Tájékoztató Szolgálatok Kézikönyve - Doc 8126 által megerősítettek szerinti) FAL információk közzétételére és, elsősorban arról gondoskodni, hogy azok egyezzenek a 15. Annex tizedik kiadásában előírt, az ilyen információk megjelenítésére és tartalmára vonatkozó új követelményekkel.

Az Annex szövegének használata a nemzeti szabályozásban. 1948 április 13-án a Tanács határozatot fogadott el, melyben a szerződő államok figyelmét felhívta, hogy amennyire csak lehetséges, kívánatos, hogy nemzeti szabályozásaikban a szabályozó jellegű ICAO szabványok pontos nyelvezetét használják és ezen szabványoktól való eltéréseket jelezzék, ideértve bármiféle kiegészítő nemzeti szabályozást, amely lényeges a repülés biztonsága, vagy rendszeressége tekintetében. Ahol arra lehetőség nyílt, a jelen Annex rendelkezéseit olymódon fogalmazták meg, hogy azok nagyobb szövegmódosítás nélkül a nemzeti jogszabályba beilleszthetők legyenek.

Általános tájékoztatás

Az Annex az alábbi alkotóelemekből áll, és bár szükségszerűen nem mindegyik található meg valamennyi Annex-ben, jogállásuk a következő:

1. – Az Annex-et alkotó részek:

a) Szabványok és ajánlott gyakorlatok, amelyeket a Tanács az Egyezmény rendelkezései értelmében elfogadott. Eme Annex esetében ezek meghatározása a következő:

Szabvány: a Tanács által az Egyezmény 54 (l) pontja értelmében elfogadott minden olyan előírás, amelynek egységes alkalmazása elismerten lehetséges és szükséges a nemzetközi légi-közlekedés egyes vonatkozásainak megkönnyítéséhez és javításához, és amelyektől az eltéréseket a Szerződő állam az Egyezmény 38. cikkelye értelmében a Tanácsnak jelenteni köteles.

Ajánlott gyakorlat: a Tanács által az Egyezmény 54 (l) pontja értelmében elfogadott minden olyan előírás, amelyet általánosan betarthatónak ítélnek, és nagymértékben fontosnak tartanak a nemzetközi légi-közlekedés egyes vonatkozásainak megkönnyítéséhez és javításához, és amelyek betartására a szerződő állam az Egyezmény értelmében törekedni fog.

b) Függelékek: az Annex célszerűen külön csoportosított anyagot tartalmazó része, amely a Tanács által elfogadott szabványok és ajánlott gyakorlatok szerves részét képezik.

c) Fogalom meghatározások: A szabványokban és ajánlott gyakorlatokban használt olyan fogalmak értelmezése, amelyek önmagukat nem magyarázzák, mivel elfogadott szótári értelmezésük nincs. A meghatározás önálló jogállással nem rendelkezik, de a Tanács által elfogadott szabványok és ajánlott gyakorlatok lényeges elemei, mivel jelentésük megváltoztatása módosítaná az előírás értelmét, amelyben az illető fogalom előfordul.

2. – A Tanács által a szabványokkal és ajánlott gyakorlatokkal együttes közzétételre jóváhagyott anyag:

a) Előszó: a Tanács tevékenységét történetileg áttekintő és magyarázó anyagrész, amely a szabványok, és ajánlott gyakorlatok alkalmazására vonatkozóan tájékoztat az államoknak az Egyezményből és az elfogadási határozatból eredő kötelezettségeiről.

b) Bevezető rész: magyarázó anyag az egyes részek, fejezetek, vagy bekezdések elején, amely segítséget nyújt a szöveg alkalmazásának megértéséhez.

c) Megjegyzés: a szöveg megfelelő részébe foglalt magyarázat, tényszerű tájékoztatást, vagy útmutatást ad a kérdéses szabvány, vagy ajánlott eljárás vonatkozásában, de a szabvány, vagy az ajánlott gyakorlat részét nem képezi.

d) Melléklet: a szabványnak és ajánlott gyakorlatnak járulékos része, vagy ezek alkalmazásához útmutatóul szolgáló anyag.

Ezt az Annex-et hat - angol, arab, kínai, francia, orosz és spanyol - nyelven fogadták el. Minden Szerződő államot felkérünk rá, hogy a fentiek közül egyet válasszon ki a hazai alkalmazás és az Egyezményben meghatározott egyéb célok megvalósítására, akár közvetlen felhasználással, akár a nemzeti nyelvre történő fordítással és a Szervezetet ennek megfelelően tájékoztassák.

Annak érdekében, hogy ránézéssel megállapítható legyen valamennyi megállapítás jogi helyzete, a következő módszert alkalmaztuk: A szabványokat vékony álló betűkkel nyomtattuk, az ajánlott gyakorlatokat vékony dőlt betűkkel szedtük, amelyek előtt vastag álló betűkkel ajánlott gyakorlat kitétel olvasható; A megjegyzéseket vékony dőlt betűkkel szedtük, ezek jogi helyzetét a szöveg elején látható vékony dőlt betűvel szedett Megjegyzés szó mutatja.

A jelen okmány bármely számmal jelzett részére való hivatkozás magában foglalja az illető rész valamennyi alpontját is.

Jelen Annex-ben végig a hímnemű személyes névmást úgy kell értelmezni, hogy az hímnemű és nőnemű személyekre egyaránt vonatkozik.

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

1. FEJEZET - MEGHATÁROZÁSOK ÉS ALKALMAZÁSI ELVEK

A. – Meghatározások

Ha a repüléssel kapcsolatos szabványokban és ajánlott gyakorlatokban az alább következő kifejezéseket használják, akkor azok jelentése a következő:

Belépés/bebocsátás (admission) – személyre szóló engedély, amely az ország törvényei alapján az országba való belépésre a közhivatal biztosít

Légi-jármű felszerelés (aircraft equipment) - Repülés közben a légi-jármű fedélzetén használt felszerelések, ideértve az elsősegély és életmentő felszerelést és a járulékos készleteket, de nem a raktárkészletet, vagy a tartalék alkatrészt.

Légi-jármű üzemeltető (Aircraft operator) – A légi-jármű üzemeltetést folytató vagy az ezt felajánló személy, szervezet vagy vállalkozás.

Légi-jármű üzemeltetői dokumentumok (Airline operator's documents) - A légiforgalmi vállalatok és üzemeltetők használatára rendszeresített légi-szállító levelek /fuvarlevelek, utas jegyek és beszállító kártyák, banki és ügynöki elszámolás terv dokumentumok, túlsúlyos csomag jegyek, bemutatóra szóló egyes számlák (M.C.O.), kár és rendellenesség jelentés, csomag és árucímkék, menetrendek és tömeg, illetve súlypont helyzeti dokumentumok.

Légitársaság (Airline) - Az Egyezmény 96. cikkelyében meghatározottak szerint menetrendszerű nemzetközi légi szolgáltatást felajánló vagy folytató bármely légi szállító vállalkozás.

Megbízott ügynök (Authorized agent) – A légijármű üzemeltetőt képviselő személy, akit az üzemeltető felhatalmazott vagy megbízott, hogy az üzemeltető légi-járműveit, személyzeteit, utasait, teheráruit, postaküldeményeit, poggyászait és készleteit érintő minden beléptetési és engedélyezési formaságot a nevében intézzen, és magában foglal - ahol azt a nemzeti jogszabályok lehetővé teszik - egy, a légi-jármű fedélzetén rakomány kezelésére felhatalmazott harmadik felet.

Személypoggyász (Baggage) - Az utas, vagy a repülő személyzet személyi tulajdona, amelyet a légi-jármű az üzemeltetővel létrejött megegyezés alapján visz magával.

Határ integritás (Border integrity) – Az állam azon törvényeinek és rendelkezéseinek az alkalmazása, amelyek az áruk és/vagy személyek határokon át való mozgására vonatkoznak.

Teheráru / rakomány (Cargo) - A posta küldemény, az ellátmány, illetve a kísérettel rendelkező, vagy tévesen kezelt személypoggyászon kívül a légi-járművön szállított minden tulajdon.

Javak engedélyezése (Clearance of goods) – A javak hazai felhasználáshoz való belépéséhez, exportálásához, vagy egy másfajta vám eljárás alá helyezéséhez szükséges vám formaságok elvégzése.

Utazás megkezdése (Commencement of journey) – Az a pont, ahol a személy megkezdte az utazását anélkül, hogy tekintetbe vennénk bármely repülőteret, amelyen akár továbbmenő akár csatlakozó járat céljából a közvetlen tranzitban megállt feltéve, hogy a kérdéses repülőtér közvetlen tranzit területét nem hagyta el.

Járulékos készletek (Commissary supplies) – Egyszer használatos, vagy ismételt használatra szánt cikkek, amelyeket az üzemeltető a repülés folyamán szolgáltatásnyújtáshoz, főként az utas ellátásához és az utas kényelemhez alkalmaz.

Hajózószemélyzeti tag (Crew member) - Az üzemeltető által megbízott személy, aki a repülés ideje alatt a légi-járművön feladatot lát el.

Nyilatkozó (Declarant) – Áru nyilatkozatot kiállító, vagy bármely személy, akinek a nevében az ilyen nyilatkozatot kiállították.

Kiutasítási rendelkezés (Deportation order) – Az illetékes állam hatósága által kiadott írásos rendelkezés, amely a kiutasítottat utasítja az ország elhagyására.

Kiutasított (Deportee) – Személy, akit az adott állam hatósága törvényesen beléptetett, vagy aki törvénytelenül lépett be az országba, és az illetékes hatóságok egy későbbi időpontban hivatalosan az ország elhagyására utasít.

Közvetlen tranzit terület (Direct tranzit area) - A nemzetközi repülőtéren, a szerződő államon való áthaladás közben rövid ideig az államban tartózkodó forgalom felvételére létesített, az érintett állami hatóságok által jóváhagyott és közvetlen ellenőrzés alatt tartott külön terület.

Közvetlen tranzit megállapodás (Direct tranzit agreement) – Az érintett állami hatóságok által jóváhagyott különleges megállapodás, mely szerint a szerződő államon áthaladó és rövid ideig ott tartózkodó forgalom a hatóság közvetlen ellenőrzése alatt maradhat.

Kiszáll(ít)ás (Disembarkation) - A repülő személyzet és az útjukat ugyanazon továbbinduló járat következő szakaszán is folytató utasok kivételével, a légi-jármű elhagyása leszállását követően.

Féregtelenítés (Disinsection) - A légi-járművön, illetve a konténerben lévő rovarokat ellenőrző illetve elpusztító tevékenység.

Beszáll(ít)ás (Embarkation) - A repülés megkezdése céljából az illető személy légi-jármű fedélzetre lépése, kivéve az ugyanazon továbbinduló járat egy megelőző szakaszán beszállt repülő személyzetet, vagy utasokat.

Repülő személyzeti tag (Flight crew member) – Szakszolgálati engedéllyel ellátott személyzeti tag, akit a légi-jármű üzemeltetéséhez alapvető feladatok ellátásával bíznak meg a repülési idő tartamára.

Vámmentes terület (Free zone) – A szerződő állam felségterületének egy része, amelyre a bejuttatott bármiféle javat általában – az import illetékek és adók értelmében - úgy tekintik, mint amely a vámterületen kívül van.

Általános célú repülési tevékenység (General aviation operation) - A kereskedelmi légi szállító tevékenységtől és a munkarepüléstől eltérő bármely repülőtevékenység.

Földi berendezések (Ground equipment) - A légi-jármű földi karbantartásához, javításához és kiszolgálásához használt speciális eszközök, ideértve az ellenőrző berendezéseket, a teheráru- és az utas kezelő berendezéseket is.

Határőrizeti ellenőrzés (Immigration control) – Az államok által alkalmazott intézkedés levegőben utazók ellenőrzésére, amikor felségterületükre be kívánnak lépni, azon leszállva tovább utaznak, vagy onnan el kívánnak utazni.

Behozatali illetékek és adók (Import duties and taxes) – Vám illetékek és minden egyéb illeték, adó, vagy díj, amelyet behozatalkor, vagy azzal összefüggésben szednek be. Ebbe nem tartozik bele a nemzet más hatósága nevében a vámhatóság által nyújtott, vagy beszedett szolgáltatások megközelítőleges költségére korlátozódó egyéb díj.

Nem megfelelő dokumentumokkal rendelkező személy (Improperly documented person) – Utazó vagy utazni szándékozó személy, aki: a) lejárt úti-okmánnyal vagy érvénytelen vízummal; b) utánzott, hamisított vagy megmásított úti-okmánnyal vagy vízummal; c) más személy úti-okmányával vagy vízumával; d) úti-okmány nélkül; vagy e) a kötelező vízum nélkül kísérel meg utazni.

Nem bebocsátható személy (Inadmissable person) - Az a személy, akinek bebocsátását az állami hatóságok visszautasítják, vagy vissza fogják utasítani.

Fertőzött körzet (Infected area) (humán egészségügyi célokra) – A helyi-, vagy nemzeti közegészségügyi hatóság, vagy az Egészségügyi Világszervezet jelentése szerint földrajzi területként meghatározott térségek, amelyben aktívan terjednek az emberi és/vagy állati közvetítéssel hordozott betegségek.

Megjegyzés. - Az egészségügyi hatóságok által bejelentett fertőzött körzetekről az Egészségügyi Világ Szervezet „Weekly Epidemiological Record" (Heti Epidemiológiai Jegyzék) című kiadványában tesznek közzé tájékoztatást

Nemzetközi repülőtér (International airport) - A szerződő állam saját felségterületén arra kijelölt minden repülőtér, hogy nemzetközi belépő és induló repülőtérként szolgáljon, amelyen elvégzik a vámolással, bevándorlással, közegészséggel, állati és növényi karanténozással és hasonlókkal kapcsolatos formaságokat.

Berakodás (Lading) - A teheráru, posta küldemény, vagy ellátmány elhelyezése a légi-járművön abból a célból, hogy azokat a járat magával vigye.

Postaküldemény (Mail) - Postai hatóság által a Általános Postaszövetség (UPU – Universal Postal Union) szabályaival egyezésben vállalt és egy másik postai hatósághoz szállítás céljából indított levelek és egyéb tárgyak szállítmányai.

Tévesen kezelt (elveszett) poggyász (Mishandled baggage) – Az utastól vagy a repülő személyzettől tévedésből, vagy elkerülhetetlen módon elidegenített személypoggyász.

Kábítószer ellenőrzés (Narcotics control) - A kábítószerek és a bódítószerek légi szállítását ellenőrző intézkedések.

Csökkent képességű személy (Person with disabilities) - Fizikai (érzékszervi, vagy mozgásszervi) cselekvési korlát, szellemi fogyatékosság, öregség, betegség, vagy a cselekvőképességet korlátozó egyéb más oknál fogva a szállítás igénybevételekor magatehetetlen személy, akinek állapota külön figyelmet és azt igényli, hogy a többi utas számára rendelkezésre álló szolgáltatásokat az illető személy szükségletéhez igazítsák.

Parancsnokpilóta (Pilot-in-command) - A repülési idő alatt a légi-jármű üzemeltetéséért és biztonságáért felelős repülőgép-vezető.

Közszolgálati hatóságok (Public authorities) - A szerződő állam, jelen szabványokkal és ajánlott eljárásokkal bármiféle szempontból kapcsolatban álló minden különleges törvénye és szabályzata kiadásáért és végrehajtásáért felelős szervei, vagy tisztviselői.

Javak felszabadítása (Release of goods) – A vizsgálaton áteső javaknak a kapcsolatos személyek rendelkezésére bocsátását engedélyező vámhatósági felszabadító ténykedés.

Segélynyújtó repülés (relief flights) – Humanitárius célból végzett repülések - segélynyújtó személyzet és segély ellátmány (mint például élelmiszer, ruházat, menedékhely, orvosi és egyéb cikkek) szállítására - vészhelyzet és/vagy katasztrófa során és/vagy azt követően. Olyan esetben is, amikor az ilyen vészhelyzet és/vagy katasztrófa miatt a személyeket - az életüket és/vagy egészségüket veszélyeztető helyről ugyanazon államon belüli, vagy az ilyen személyek befogadására hajlandó más állam területén lévő, biztonságos helyre - menekítenek.

Személy eltávolítása (Removal of a person) – Az illetékes állam arra irányuló törvényes cselekedete, hogy egy személyt az állam elhagyására utasítson.

Eltávolítási rendelkezés (Removal order) – Az állam által kiállított, a felségterületéről való elvitelre utasítást adó írásos rendelkezés azon üzemeltető felé, amelynek a járatán a nem bebocsátható személy utazott az adott államba.

Kockázat megállapítás (Risk assessment) – A kiutasító állam megállapítása, hogy a kiutasított személy kísérettel vagy kíséret nélkül alkalmas a kereskedelmi légi szolgáltatás igénybevételével történő elvitelre. A megállapításnak tekintettel kell lennie minden vonatkozó tényezőre, beleértve kereskedelmi járaton történő szállításra való egészségi, szellemi és fizikai alkalmasságot, az utazási hajlandóságot vagy ellenállást, a viselkedési jegyeket és bármely erőszakra utaló előéletet.

Kockázat kezelés (Risk management) – A határőrizeti szervek számára a kockázatot jelentő küldemények és mozgások kézben tartásához szükséges információkat biztosító kezelési eljárások és gyakorlatok módszeres alkalmazása.

Védelmi felszerelés (Security equipment) - A polgári repülés és létesítményei ellen irányuló jogellenes cselekmények megakadályozásában, vagy észlelésében speciális használatra szánt egyedi eszköz, vagy rendszer alkotórésze.

Tartalék alkatrész (Spare parts) - A légi-járműbe, ideértve a hajtóművet és a légcsavart is, beszerelendő javítási, vagy csere jellegű cikkek.

Lajstromozó állam (State of registry) - Az állam, amelynek lajstromába a légi-járművet bevezették.

Ellátmány (készlet) (Stores/Supplies) – a) Ellátmány (készlet) elfogyasztásra; és b) ellátmány (készlet) elvitelre.

Ellátmány (készlet) fogyasztásra (Stores/Supplies for consumption) – A fedélzeten lévő utasok és a személyzet fogyasztására szánt javak - akár árusítottak azok, akár nem – és a légi-jármű üzemeléséhez és karbantartásához szükséges javak, ideértve az üzemanyagot és a kenőanyagokat is.

Ellátmány (készlet) elvitelre (Stores/Supplies for taken away) – A légi-jármű utasainak és személyzetének elvitel céljából eladásra szánt cikkek.

Ideiglenes bebocsátás (Temporary admission) – Vámeljárás, amely révén bizonyos cikkek a behozatali illetékek és adók alól feltételesen teljes egészében vagy részben mentesítve bevihetők egy adott vámterületre; az ilyen cikkeket egy meghatározott céllal kell importálni és azzal a szándékkal, hogy meghatározott időtartamon belüli ismét exportálni kell anélkül, hogy változást hajtanának végre rajtuk, kivéve a használatukból eredő állagromlást.

Egyjelű többszakaszos légi-járat (Through flight) – A légi-jármű sajátos üzemeltetése, amelyet az üzemeltető ugyanazon jel használatával azonosít az indulási ponttól a közbeeső ponton át a rendeltetési pontig.

Utazási dokmentum (Travel document) – Az állam vagy szervezet által kiadott útlevél vagy egyéb – személyazonosság igazolását szolgáló – okmány, amelyet a jogos birtokos nemzetközi utazásra használ.

Kiséret nélküli személypoggyász (Unaccompanied baggage) - Teher áruként szállított személypoggyász, amely lehet ugyanazon, vagy másik légi-járművön is, mint amelyiken tulajdonosa utazik.

Gazdátlan poggyász (Unclaimed baggage) - A repülőtérre érkező olyan személypoggyász, amelyet senki sem visz el, illetve nem követel.

Azonosítatlan személypoggyász (Unidentified baggage) - A repülőtéren lévő, címkével ellátott, vagy anélküli személypoggyász, amelyet senki sem visz el és azonosíthatatlan, hogy mely utashoz tartozhat.

Kirakodás (Unlading) – Leszállást követően a teheráru, postaküldemény, vagy ellátmány kirakodása a légi-járműről.

Látogató (Visitor) – Bármely személy, aki a szokásos lakóhelyétől eltérő Szerződő Állam felségterületén száll ki és lép be; törvényesen ott marad, ahogy a meglátogatott Szerződő Állam előírja a hivatalos nem bevándorlási célokra, mint például túrizmus, üdülés, sportolás, gyógykezelés, családi kapcsolatok ápolása, vallási célú zarándoklat, vagy üzletkötés esetére; és a meglátogatott felségterületen eltöltött tartózkodás alatt semmilyen haszonszerző elfoglaltságot nem folytat.

B. – Általános irányelvek

1.1 A jelen Annex-ben szereplő szabványok és ajánlott gyakorlatok előírásai a légi-jármű üzemeltetés minden kategóriájára alkalmazandók, kivéve azokat az eseteket, ahol a rendelkezés más üzemeltetési kategória említése nélkül nevez meg egyfajta üzemeltetési kategóriát.

1.2 A szerződő állam tegye meg a szükséges lépéseket az alábbiak biztosítására:

a) a személyek és a légi-jármű tekintetében a határ ellenőrzés végrehajtásához és a javak vizsgálatához/engedélyezéséhez szükséges időt a minimumon tartsák;

b) az adminisztratív és a vizsgálati követelmények alkalmazása a legkisebb kényelmetlenséget okozza;

c) a szerződő államok, üzemeltetők és repülőterek közötti vonatkozó információcserét a lehető legteljesebb mértékben bátorítsák és mozdítsák elő; és

d) optimális védelmi szint és a törvény betartása valósuljon meg.

1.3 A szerződő állam a javak határellenőrzést szolgáló ellenőrző/engedélyező eljárásaiban alkalmazza a kockázat kezelést.

1.4 Repülőterein, az eljárások hatékonyságának és hatásosságának fokozása érdekében a szerződő állam hatékony információs módszert fejlesszen ki.

1.5 A szerződő állam dolgozzon ki eljárást az adatok érkezést megelőző beszerzésére oly módon, hogy lehetővé váljon a gyorsított vizsgálat/engedélyezés.

1.6 Ezen Annex rendelkezései nem akadályozzák a nemzeti jogszabályok alkalmazását a repülés védelmi intézkedések, vagy egyéb szükséges ellenőrzések tekintetében.

2. FEJEZET – LÉGI-JÁRMŰVEK BELÉPÉSE ÉS KILÉPÉSE

A. – Általános rész

2.1 A szerződő állam megfelelő intézkedéseket léptessen érvénybe a más szerződő államba induló, vagy onnan érkező légi-jármű engedélyezéséhez, amely intézkedéseket olyan módon kell bevezetni, hogy a szükségtelen késlekedést megakadályozzák.

2.2 Az induló, vagy az érkező légi-járművek hatékony engedélyezését célzó eljárások kidolgozásakor a szerződő állam – ahol szükséges - vegye figyelembe a repülésvédelem és a kábítószer ellenőrzés céljára alkalmazott eljárásokat.

2.3 **Ajánlott gyakorlat**.- *A szerződő állam megfelelő ellenőrző hatóságai kössenek egyetértési szerződést az állam területére nemzetközi szolgáltatást biztosító légi-jármű üzemeltetőkkel és nemzetközi repülőtereik üzemeltetőivel, lefektetve benne a kábító és személyiség befolyásoló szerek nemzetközi forgalmazása által jelentett veszély leküzdése terén való együttműködésük irányelveit. Az ilyen egyetértési szerződést a vámügyi világszervezet által e célra kidolgozott mintái közül megfelelő szerint kell megformázni. Ezen felül, a szerződő államokat ösztönözzük, hogy egyetértési szerződést maguk között is létrehozzanak.*

2.4 **Ajánlott gyakorlat**.- *Az Egészségügyi Világszervezet Nemzetközi Egészségügyi Szabályzatával egyezésben, a szerződő állam egészségügyi okok miatt ne szakítsa meg a légi szállító tevékenységet. Olyan esetekben, amikor kivételes körülmények miatt e szolgáltatása felfüggesztését fontolgatja, mielőtt a szerződő állam a légi szállító tevékenység felfüggesztésére bármiféle lépést tenne, először konzultáljon az Egészségügyi Világszervezettel és a betegség előfordulási helye szerinti állam egészségügyi hatóságaival.*

B. – Dokumentumok - követelmény és alkalmazás

2.5 Légi-jármű belépéséhez, vagy indulásához a szerződő állam a jelen Fejezetben előírt okiratokon felül mást ne követeljen meg.

2.6 A szerződő állam ne követeljen vízumot, ne szedjen be vízum, vagy egyéb díjat a légi-jármű belépéséhez, vagy indulásához szükséges bármiféle okirat alkalmazásával összefüggésben

2.7 **Ajánlott gyakorlat.** - *Az arab, angol, francia, orosz vagy spanyol nyelven benyújtott légi-jármű belépéséhez, vagy indulásához szolgáló okiratot a szerződő állam fogadja el. A szerződő állam előírhatja, hogy ezeket, szóban, vagy írásban, a saját nemzeti nyelvére lefordítsák.*

2.8 A szerződő állam műszaki lehetőségeinek függvényében a légi-jármű induláshoz és belépéséhez az alábbiak szerint benyújtott dokumentumokat el kell fogadni:

a) a közszolgálati hatóságok információs rendszerére elektronikus formában továbbított dokumentum;

b) az elektronikus úton előállított, vagy továbbított papír alapú dokumentum; vagy

c) a jelen Annex-ben bemutatott formát követve kézzel kitöltött papír alapú dokumentum.

2.9 Ha adott dokumentumot továbbította az üzemeltető, vagy nevében továbbították azt, és a közszolgálati hatóságok azt elektronikus formában megkapta, akkor a szerződő állam ne követelje meg, hogy ugyanazt a dokumentumot papírformában is bemutassák.

2.10 A szerződő állam általában ne követelje meg az Általános Nyilatkozat (General Declaration) benyújtását.

2.10.1 Ha a szerződő állam az Általános Nyilatkozat (General Declaration) benyújtását továbbra is megkívánja, követelményeit korlátozza az 1. Függelékben rögzített kérdésekre. A tájékoztatást - legyen az papír formában, vagy elektronikus formában - el kell fogadni.

2.11 Ha a szerződő állam az Általános Nyilatkozatot (General Declaration) már csak tanúsítás céljából követeli meg, olyan intézkedést alkalmazzon, amely révén a tanúsítási követelmény teljesíthető a „Teheráru bizonylat” (Cargo Manifest) valamely oldalán a kívánt szövegezést tartalmazó kiegészítő nyilatkozat akár kézírással, akár gumi-bélyegzővel történő felvitelével. Az ilyen tanúsítást vagy a meghatalmazott ügynök, vagy a repülőgép parancsnok köteles aláírni.

2.12 A szerződő állam szokványos körülmények között ne írja elő az „Utas bizonylat" benyújtását (Passenger Manifest). Ha a szerződő állam az utas-bizonylat benyújtását továbbra is megkívánja, követelményeit korlátozza a 2. Függelékben rögzített elemekre. A tájékoztatást - legyen papír formában vagy elektronikus formában - el kell fogadni.

2.13 Ha a szerződő állam az utas bizonylat papír alapú bemutatását írja elő, azt fogadja el, az alábbiak közül bármelyik változatban:

a) a 3. Függelékben bemutatott és az utasítás szerint kitöltött bizonylat; vagy

b) a 3. Függelékben bemutatott, részben kitöltött bizonylat a légi-járművön lévő rakomány mindegyike légi fuvarlevelének másolatával.

2.14. A szerződő állam ne írja elő a légi-járművön maradó ellátmányról szóló írásos bevallás bemutatását.

2.15 A légi-járműre berakodott, vagy onnan kirakodott ellátmány tekintetében az „Ellátmány Jegyzék"-ben (Stores List) előírt tájékoztatás ne legyen több mint:

a) a teheráru bizonylat formanyomtatvány fejlécében jelzettek;

b) minden cikkféleség darabszáma, és

c) minden cikkféleség természete.

2.16 A szerződő állam ne írja elő a légi-járműre berakodott, vagy onnan kirakodott feladott poggyászlista, vagy tévesen kezelt poggyászlista bemutatását.

2.17 A szerződő állam a postaküldeményekről egyéb írásos nyilatkozat bemutatását ne írja elő, mint amilyen formát az Általános Postaegyesülés (UPU) érvényben lévő rendelkezései előírnak.

2.18 A szerződő állam a légi-jármű üzemeltetőt ne kötelezze, hogy a légi-jármű érkezése, vagy távozása alkalmával a fent említett okiratok közül bármelyik esetében is háromnál több példányt juttasson el a közszolgálati hatóságokhoz.

2.19 Ha a légi-jármű fedélzetéről nem szállít ki utasokat, nem rakod ki teherárut, posta- küldeményt, ellátmányt, vagy személypoggyászt, akkor a vonatkozó dokumentumokat ne követeljék feltéve, hogy az általános nyilatkozat a helyzetnek megfelelő bejegyzést tartalmaz.

C. – Dokumentumok javítása

2.20 Olyan esetekben, amikor a fent említett dokumentumok bármelyikében hibát találtak, az érintett közszolgálati hatóságoknak a meghatalmazott ügynök, vagy a légi-jármű üzemeltető számára lehetőséget kell biztosítani a hiba kijavítására, vagy alternatívaképp az ilyen hibák módosítását végezzék el maguk a közszolgálati hatóságok.

2.21 A dokumentációban észlelt hiba esetén a légi-jármű üzemeltetőjével vagy meghatalmazott ügynökével szemben ne alkalmazzanak büntetőeljárást, ha meggyőzi az illetékes hatóságot, hogy a hiba véletlen természetű volt, megtévesztő szándék nélkül és nem a teljes figyelmetlenség miatt követték el. Ha a hasonló hiba megismétlésének elkerülése érdekében szükségesnek tekintik, a büntetés a célra szükségesnél nagyobb mértékű ne legyen.

D. – Légi-jármű féregtelenítés

2.22 A szerződő állam véleménye szerint lakosainak egészségére, mezőgazdasági iparára, vagy a környezetére veszélyt előidéző területek felett végzrtt, vagy területről induló és ugyanazon légi-járművel folytatott repülések eseteire korlátozza a légi-jármű utas-kabinok és a pilótakabin személyzet és utasok jelenlétében történő bármiféle rutinszerű aeroszolos rovar mentesítési követelményét.

2.23 A légi-jármű féregtelenítését előíró szerződő állam, rendszeres időközönként, vizsgálja felül követelményeit és módosítsa azokat –amint megfelelő- minden arra vonatkozó kézzel fogható bizonyíték fényében, miszerint felségterületére légi-járművön rovarokat hurcolnak be.

2.24 Ha a féregtelenítés előírt, a szerződő állam csak azokat a módszereket – legyenek kémiaiak vagy nem kémiaiak - és/vagy rovarirtó szereket engedélyezze, vagy fogadja el, amelyeket az Egészségügyi Világszervezet ajánl és a szerződő állam hatékonynak tart.

Megjegyzés.- E rendelkezés nem zárja ki más módszerek kísérletét vagy próbáját az Egészségügyi Világszervezet végleges jóváhagyásához.

2.25 A szerződő állam biztosítsa, hogy féregtelenítő eljárása az utasok, és a személyzet egészségére ne legyen káros hatással illetve, hogy számukra a lehető legkisebb kellemetlenséget okozza.

2.26 A szerződő állam felkérésre köteles nyílt nyelven megfelelő információt nyújtani a légi-jármű üzemeltetőnek repülőszemélyzete és utasai céljára, elmagyarázva a vonatkozó nemzeti előírásokat, az előírás okait és a légi-jármű megfelelően végrehajtott féregtelenítésének biztonságos voltát.

2.27 Ha a féregtelenítést az Egészségügyi Világszervezet ajánlott eljárásaival egyezésben hajtották végre, az érintett szerződő állam fogadja el a vonatkozó igazolást az 1. Függelék rendelkezései szerinti általános nyilatkozaton, vagy tartós rovarirtás esetében a 4. Függelékben meghatározott „Tartós Féregtelenítési Igazolvány”-on.

2.28 Ha a féregtelenítést a 2.24 szerint megfelelően hajtották végre és a 2.27-ben jelzett igazolást nyújtanak be, illetve bocsátanak az érkezési állam közegészségügyi hatósága rendelkezésére, a hatóságok normál körülmények között kötelesek elfogadni azt az igazolást és megengedni az utasoknak, és a személyzetnek, hogy érkezést követően azonnal elhagyják a légi-járművet.

2.29 A szerződő állam köteles gondoskodni róla, hogy a szer, vagy a féregtelenítéshez alkalmazott bármely szer, a légi-jármű szerkezetére, vagy üzemi berendezéseire káros hatással ne legyen. A légi-jármű szerkezetet például korrózió által vélelmezhetően károsító gyúlékony vegyi összetevőket vagy oldatokat ne alkalmazzanak.

E. – Légi-jármű fertőtlenítés

2.30 A szerződő állam határozza meg azokat az állatfajtákat és állati eredetű termékeket, amelyek légi úton történő importálása megkívánja, hogy a légi-járművet fertőtlenítsék és tekintsen el a fertőtlenítéstől, ha az állatokat, vagy az állati eredetű termékeket az egészségügyi hatóságok által kiadott hivatalos igazolás kíséretében, jóváhagyott konténerekben szállítják. Ha szükséges a légi-járművet fertőtleníteni, akkor a következő előírásokat kell figyelembe venni:

a) a fertőtlenítést kizárólag a konténerekre, vagy a légi-jármű azon fedélzeti részére kell korlátozni, amelyben az illető árut szállították;

b) a fertőtlenítést gyorsan kell elvégezni; és

c) nem használhatók korrózió, vagy egyéb hatás révén a légi-jármű szerkezetében feltehetően károsodást okozó gyúlékony vegyszer összetevők, vagy oldatok, illetve az utasok egészségét valószínűleg rongáló vegyszerek.

F. – A nemzetközi általános célú repülésre és egyéb, nem menetrendszerű repülésekre hatályos intézkedések

I. Általános rész

2.31 A szerződő állam Légiforgalmi Tájékoztató Kiadványában (AIP) köteles közzétenni az általános célú repülések és az egyéb nem menetrendszerű repülések esetén alkalmazott előzetes bejelentésre és az előzetes engedélyezésért folyamodásra vonatkozó követelményeit.

2.32 A szerződő állam, ha a felségterületén leszállni szándékozó légi-járműről előzetes bejelentést, vagy előzetes engedélyezés kérelmezését követeli meg, az állam egyetlen ügynökséget jelöljön ki az ilyen bejelentések és kérelmek vételére, illetve a kormányzati válaszok összehangolására.

2.33 A szerződő állam köteles Légiforgalmi Tájékoztató Kiadványában (AIP) feltüntetni a 2.32 pontban szereplők céljára kinevezett ügynökség postai címét és -ha létezik- AFTN címét, telex számát, vagy sürgöny címét, fax számát, elektronikus postai címét, web oldalát és telefonszámát.

2.34 A szerződő államban a tervezett leszállásokról, indulásokról, vagy tranzit üzemelésről az érdekelt határőrizeti szervezetek – mint például a vám, bevándorlás, vagy karantén – értesítése, a 2.32 pont szerint kijelölt ügynökség kötelessége legyen.

II. Előzetes engedélyezés

2.35 A szerződő állam ne írja elő, hogy az előzetes engedélyezést, vagy bejelentést diplomáciai csatornákon kell jen végezni, kivéve, ha a járat diplomáciai természetű.

2.36 Az üzemeltetők részére előzetes engedélyezési kötelmet előíró szerződő állam:

a) olyan eljárást alakítson ki, amely révén az ilyen kérelmek gyorsan kezelődnek;
b) az ilyen engedély érvényességét adott időtartamra, vagy adott számú járatra határozza meg – amikor az lehetséges, és

c) az ilyen engedély kiadását ne kösse illetékek, díjak, vagy költségtérítés megfizetéséhez.

2.37 **Ajánlott eljárás**. – *Térítésért, vagy bérleti díjért utast, árut, vagy postaküldeményt szállító légi-jármű esetében a szerződő állam - az előzetes engedélyezés kérvényezéséhez - az alábbiakban felsoroltaknál többet nem követelhet:*

a) az üzemeltető neve;

b) a légi-jármű típusa és lajstromjele;

c) az illető repülőtérre érkezés és továbbindulás dátuma és időpontja;

d) helyzettől függően, az utasok és/vagy az áru felvételének, kiszállításának pontja, vagy pontjai;

e) a járat célja és az utasok száma és/vagy a rakomány természete és mennyisége; valamint

f) a bérlő neve, címe és vállalkozása – ha van.

2.37.1 **Ajánlott gyakorlat**. - *A szerződő állam Légiforgalmi Tájékoztató Kiadványában tegye közzé a*

2.37 pontban említett előzetes engedélyezési kérelem feldolgozásához a járat indulást megelőzően szükséges legrövidebb időtartamot.

2.38 Ha a repülésbiztonság érdekében a szerződő állam előzetes engedélyezést ír elő, a megállás nélkül átutazó, vagy nem kereskedelmi célból megálló légi-jármű esetében ne követeljen az előzetes engedély kérelmezés alkalmával egyéb más információt, mint amit a repülési terv tartalmaz.

Megjegyzés. – A repülési tervre vonatkozó előírásokat a 2. Annex – „Repülési szabályok" tartalmazza.

2.39 Ha a 2.38-ban említett járatok esetében a szerződő állam előzetes engedélyeztetést ír elő, ne írja elő a kérvény három munkanapnál korábban történő benyújtását.

III. Előzetes értesítés az érkezésről

2.40 A megszakítás nélküli tranzit átrepülést, vagy nem kereskedelmi célú leszállást a szerződő állam felségterületén végrehajtó légi-járműtől a szerződő állam annál korábbi előzetes bejelentést ne követeljen, mint amennyi a légiforgalmi irányítás és az illetékes határőrizeti szervezetek igényeinek kielégítéséhez szükséges.

Megjegyzés.- E rendelkezésnek nem célja megakadályozni, hogy kábítószer ellenőrzés céljából megfelelő intézkedéseket léptessenek életbe.

2.41 A szerződő állam megfelelő előzetes bejelentésként fogadja el a repülési tervben szereplő adatokat azzal a feltétellel, hogy ezt a tájékoztatást legalább két órával az érkezés előtt megkapja, továbbá, hogy a leszállás előzetesen kijelölt valamelyik nemzetközi repülőtéren történik.

IV. A légi-járművek engedélyezése és tartózkodása

2.42 **Ajánlott gyakorlat**. – *Azokon a nemzetközi repülőtereken, ahol nemzetközi általános célú repülés zajlik, e repülések számára a szerződő állam segítse elő megfelelő szintű határellenőrzés és engedélyeztetés biztosítását. A szerződő államok, együttműködve a légi-jármű üzemeltetőkkel és a repülőtér üzemeltetőkkel, célként állapítsanak meg egy repülőgépre, a szokásostól nem eltérő folyamathoz egy 60 perces összevont időtartamot, az összes előírt indulási/érkezési formalitások teljesítéséhez, beleértve a légi-közlekedés védelmével összefüggő tennivalókat, amely akkor kezdődik, amikor a hajózó-személyzet a repülőtéren az első folyamatponton megjelenik.*

Megjegyzés – A 60 perc alatt teljesítendő „ előírt indulási/érkezési formalitások"-nak tartalmazniuk kell a légi-közlekedés védelmi teendőket, és ahol alkalmazható, a repülőtéri és egyéb illetékek beszedését és a határellenőrzési intézkedéseket.

2.43 **Ajánlott gyakorlat.-** *Az olyan nemzetközi repülőtereken, ahol a nemzetközi általános célú repülések nem gyakoriak, a szerződő állam engedélyezze egyetlen állami hatóság részére, hogy az összes határőrizeti szervezet nevében végrehajtsa a légi-járművek és rakományuk engedélyeztetési feladatait.*

2.44 A nem menetrendszerinti légi szolgáltatást végző, és adott szerződő állam bármely kijelölt nemzetközi repülőterén leszálló, illetve útját megszakító és az Egyezmény 24. Cikkelyének megfelelően, a repülőtér használatára átmenetileg fizetési kötelezettség nélkül engedélyt kapó légi-jármű, az államban tartózkodáshoz az illető állam által meghatározott időtartamra anélkül kapjon engedélyt, hogy légi-jármű vámolási költség címen óvadék letételét követelnének.

3. FEJEZET - SZEMÉLYEK ÉS POGGYÁSZAIK BELÉPÉSE ÉS KILÉPÉSE

A. Általános rész

3.1 A légi úton érkező személyek engedélyezésének meggyorsítása elősegítése érdekében a szerződő állam a légi szállítási környezetnek megfelelő határellenőrzési eljárásokat fogadjon el, és oly módon alkalmazza azokat, hogy a szükségtelen késedelmet megelőzzék.

3.2 Az utasok, és személyzetek feletti határellenőrzés hatékony alkalmazását célzó eljárások kidolgozása során a szerződő állam köteles figyelembe venni a repülésvédelmi, a határvédelmi, a kábítószer ellenőrzési és bevándorlás felügyeleti intézkedések alkalmazását is, ahol alkalmazható.

3.3 A szerződő államok, amelyek utazási dokumentumaikban a személyes adatok megjelenítéséhez – beleértve a biometriai adatokat is - integrált áramköri (IC) chip-eket vagy más tetszés szerinti gépi feldolgozási technológiát alkalmaznak, kötelesek előírni, hogy kérésre a dokumentum birtokosának bemutathatóvá kell tenni a kódolt adatokat.

3.4 A szerződő államok nem hosszabbíthatják meg a gépi feldolgozású/olvasású utazási dokumentumok érvényességét.

1. Megjegyzés – A gépi feldolgozású utazási dokumentumokra vonatkozó specifikáció (DOC 9303, Sorozatok) nem engedik a gépi feldolgozású területen az érvényességi idő vagy más adat felülírását.

2. Megjegyzés – Mindazon államokban, ahol az ország törvényei és rendelkezései jelenleg lehetőséget adnak az érvényesség időszakának kiterjesztésére, belátható időn belül módosítani kell azok szövegezését.

B. Az utazáshoz szükséges dokumentumok

3.5 A felségterületére érkező, illetve az onnan távozó látogatóktól a szerződő állam a jelen fejezetben felsoroltnál több dokumentumot ne követeljen.

3.6 A fogadó állam által elismert érvényes útlevelet, és ha szükséges, érvényes vízumot jogszerűen birtokló légi-járművön utazó látogatótól az útlevélen kívül semmilyen egyéb azonosító dokumentum bemutatását ne írja elő a szerződő állam.

Megjegyzés.- A fenti szabványnak nem célja a szerződő államot visszatartani attól, hogy az érvényes útlevél helyett elfogadjon olyan hivatalos személyazonossági igazolásokat, mint például a nemzeti azonosító kártya, tengerészeti igazolvány, külföldi tartózkodási engedély és ideiglenes alternatív utazási azonosító dokumentum.

C. Az utazási dokumentumok védelme

3.7. A szerződő államok kötelesek rendszeresen naprakészen tartani utazási dokumentumaik új változataiban a védelmi tényezőket, hogy megvédjék a visszaéléstől és elősegítsék az olyan esetek felderítését, amikor e dokumentumokat jogtalanul adták ki, felülírták, vagy meghamisították.

3.8. A szerződő államok kötelesek létrehozni az utazási dokumentumok előállítása és kiadása feletti ellenőrzést, hogy megvédjék készleteiket a lopástól és az újonnan kiadott utazási dokumentumok hűtlen kezelésétől.

3.9 **Ajánlott gyakorlat** – *A szerződő államok foglalják bele a biometriai adatokat a gépi leolvasású útlevél, vízum és egyéb hivatalos utazási dokumentumaikba, felhasználva egy vagy több tetszés szerinti* *adattárolási technológiát a gépi feldolgozású terület kiegészítéséhez, amint ezt a DOC 9303, „*Gépi Feldolgozású Utazási Dokumentumok” *meghatározza. Az integrált áramköri chip-en eltárolt adat megegyezik azzal, amit az adatlapon kinyomtatnak, ami nem más, mint a gépi feldolgozású területen lévő adat és a digitalizált fotókép. Az ujjlenyomat fotóképe(i) és/vagy az írisz fotóképe(i) választható biometriai elemek azon szerződő államok részére, akik az útlevélben ki kívánják egészíteni az arc fotóképeit egyéb biometriai adattal. A gépi feldolgozású útlevelekbe biometriai adatokat is bele tévő, szerződő államoknak el kell tárolniuk egy rákapcsolás-mentes, integrált áramköri chip-ben, megfelelve az ISO/IEC 14443-nak, az ICAO által meghatározott Logikai Adatszerkezetnek (Logical Data Structure) megfelelően programozva.*

D. Utazási dokumentumok

3.10 A szerződő államoknak legkésőbb 2010 április 1-ig meg kell kezdeniük a kizárólagos gépi feldolgozású útlevél kiadást a DOC 9303 I. Fejezetében foglalt specifikációnak megfelelően.

Megjegyzés – Ezen előírásnak nem szándéka annak kizárása, hogy kényszerhelyzetben nem gépi feldolgozású útleveleket vagy korlátozott érvényességű ideiglenes utazási dokumentumokat adjanak ki.

3.10.1 A 2005 november 24 után kiadott és nem gépi feldolgozású útlevelek esetében a szerződő államoknak garantálniuk kell, hogy azok lejárati ideje 2015 november 24-énél korábbi.

3.11 **Ajánlott gyakorlat** – *Az utazás céljából elfogadott azonosító dokumentumok vagy vízumok kiadásakor a szerződő államoknak ezeket gépi feldolgozású formában kell megtenniük, ahogy azt a DOC 9303 (sorozatok) „Gépi Feldolgozású Utazási Dokumentumok” meghatározza.*

3,12 A géppel nem olvasható útlevél kiadása esetén a szerződő állam gondoskodjon róla, hogy a személyi azonosító adatok és a dokumentum kiadási adatok, illetve az adatlap formája megfeleljen a „leolvasási mező”-re vonatkozóan a Doc 9303 1. Rész, Gépi Feldolgozású Útlevél című kiadványban leírt követelményeknek. A „gépi feldolgozású terület” helyeket olyan szavakkal kell kitölteni, mint például „ez az útlevél nem gépi feldolgozásra készült”, avagy egyéb adatokkal, azért, hogy megakadályozzák a hamisított gépi olvasású jelek bevihetőségét.

3.13 **Ajánlott gyakorlat** – *A szerződő államok alakítsanak ki nyilvánosan hozzáférhető eszközt az útlevél kérvények fogadására és az útlevelek kiadására.*

3.14 A szerződő államok kötelesek kialakítani átlátható kérvényezési eljárást az útlevelek kiadására, megújítására vagy cseréjére, és e követelményeikről szóló tájékoztatót a potenciális kérvényezők rendelkezésére kell bocsátaniuk.

3.14.1 **Ajánlott gyakorlat** – *Amennyiben az útlevél kiadását vagy megújítását illetékfizetéshez kötik, az ilyen illeték összege nem haladhatja meg a kapcsolódó működés költségét.*

3.15 A szerződő államok kötelesek minden egyes személynek külön útlevelet kiadni, függetlenül az életkortól.

3.16 **Ajánlott gyakorlat** – *A szerződő államok, ha turista vagy üzleti utazás céljából adnak ki útlevelet, rendes esetben biztosítsák, hogy az ilyen útlevelek legalább 5 évre szólóan, korlátlan számú, minden államba és felségterületre irányuló utazáshoz érvényesek legyenek.*

1. Megjegyzés – Nem ajánlott a tíz évnél hosszabb érvényességi idő, tekintetbe véve a dokumentumok elhasználódását és az útlevél birtokosa küllemének változását.

2. Megjegyzés – Rövidebb érvényességi időt kívánatos alkalmazni a kényszer esetre kiállított, a diplomáciai, a szolgálati (hivatalos) és egyéb különleges célú útleveleknél.

E. Kilépő vízum

3.17 A szerződő állam ne követeljen kilépő vízumot se a külföldre utazó saját állampolgárától, se a látogatóktól azok tartózkodása befejeztével.

3.18 **Ajánlott gyakorlat.-** *A szerződő állam a nála lakhatási engedéllyel rendelkező, külföldre látogatni szándékozó külföldi személy esetében ne követeljen kilépő vízumot.*

F. Belépő / visszatérő vízum

3.19 **Ajánlott gyakorlat**. – *A látogatóként belépést kereső állampolgárok esetében a vízum iránti követelmény alól a szerződő állam a lehetőség szerint minél több államot mentesítsen, illetve szüntesse meg vonatkozó követelményét.*

3.20 A szerződő állam saját állampolgáraitól a visszatéréshez ne kérjen vízumot.

3.21 **Ajánlott gyakorlat.-** *A szerződő állam a jogszerű állandó tartózkodási engedéllyel rendelkező külföldi letelepedett személy visszatéréséhez nem szükséges, hogy vízumot igényeljen.*

3.22 A szerződő állam köteles egyszerű és átlátható kérvényezési eljárást kialakítani a belépő vízum kiadásához a lehetséges kérelmező részére és köteles gondoskodni róla, hogy az ilyen vízumok iránt benyújtott kérelmek vételét követően amilyen gyorsan csak lehetséges cselekedjen.

3.23 **Ajánlott gyakorlat**. – A vízum kiadási eljárás általában ne várja el, hogy a kérelmező személyesen jelenjen meg a kiadóhivatalban.

3.24 A lehetséges látogató számára belépő vízum kiadásakor a szerződő állam - rendes körülmények között - biztosítsa, hogy a vízum a kiadásától számított legalább hat hónap időtartamban legyen felhasználható függetlenül a belépések számától, és tudomásul véve, hogy az egyes tartózkodások időtartama korlátozható.

3.25 **Ajánlott gyakorlat** - *Géppel nem feldolgozható útlevél kiadása esetén a szerződő állam gondoskodjon róla, hogy az ilyen dokumentumok személyi azonosító adatai és a dokumentum kiadási adatai a látható területet illetően megfeleljenek a Doc 9303 2. Rész, „Gépi Feldolgozású Vízum" című kiadványban leírt követelményeknek.*

G. Beszálló / Kiszálló kártya

3.26 **Ajánlott gyakorlat**. – *A szerződő állam ne követeljen se a légi úton utazó látogatótól, se nevükben a légi-jármű üzemeltetőtől a bemutatott azonossági dokumentumaikhoz kiegészítő írásos tájékoztatót. Ha az azonossági információk összegyűjtése szükséges, a szerződő fejlesszen ki olyan rendszert, amely képes levenni ezeket a gépi feldolgozású utazási dokumentumokból, vagy egyéb forrásokból.*

3.27 Ha a szerződő állam a légi úton induló, vagy érkező látogatók személyi adatairól írásos feljegyzést igényel, információs igényét korlátozza az 5. Függelék – „Beszálló/kiszálló kártya" című részében lefektetettekre.

3.28 A szerződő állam, ha beszálló / kiszálló kártyát követel, fogadja el, hogy azokat az utas tölti ki, és ne írja elő, hogy azokat a légi-jármű üzemeltető töltse ki és ellenőrizze.

3.29 A szerződő állam, ha beszálló / kiszálló kártya bemutatását kéri, azokat ingyenesen biztosítsa a légi-jármű üzemeltetők vagy azok utazási ügynökei részére, hogy beszállítás előtt az induló utasoknak, illetve repülés közben a kiszállást megelőzően az érkező utasoknak kiosszák.

H. Oltási bizonyítvány

3.30 Ha bizonyíték szükséges a karanténozást igénylő betegséggel szembeni védekezésről, a szerződő állam köteles elfogadni az Egészségügyi Világszervezet által a Nemzetközi Egészségügyi Szabályzatban előírt „Nemzetközi Oltási vagy Újraoltási Bizonyítvány”-t.

I. Az utazási dokumentumok ellenőrzése

3.31 A szerződő államok kötelesek támogatni a légi-jármű üzemeltetőket az utasok által bemutatott úti okmányok kiértékelésében, hogy a hamísítókat és visszaélőket elriasszák.

3.32 **Ajánlott gyakorlat** – *A szerződő államok más szerződő államokkal érdemes megegyezniük annak megengedésében, hogy a repülőtereken elhelyezhessék összekötő tisztjeiket, hogy a légi-jármű üzemeltetőket támogassák a beszálló személyek utazási dokumentumai érvényességének és valódiságának megállapításában.*

3.33 A beszálló ponton a légi-jármű üzemeltetők kötelesek a szükséges megelőző intézkedéseket megtenni annak biztosítására, hogy a jelen fejezetben előírt ellenőrzési célokból az utasok birtokában vannak a tranzit és belépő államok által előírt dokumentumoknak.

J. Kilépési eljárások

3.34 A szerződő állam látogatóitól ne követelje meg, hogy jövedelemadó fizetési igazolást mutassanak be.

3.35 A szerződő állam a légi-jármű üzemeltetőt nem teheti felelőssé azért, mert bármely utasának jövedelemadó fizetési hátraléka van.

3.36 **Ajánlott gyakorlat**. – *A szerződő állam a légi-jármű üzemeltetőkkel és a repülőtér vezetéssel együttműködve köteles megcélozni, hogy a normál eljárást feltételező utas esetében az összes szükséges indulási formaság elvégzéséhez 60 perc időtartamnál többre ne legyen szükség attól a pillanattól számítva, amikor az utas a folyamat első repülőtéri pontjánál jelentkezik (azaz a légitársasági utas felvétel, a védelmi ellenőrző pont, vagy egyéb, az illető repülőtéren kialakítottak szerinti előírt ellenőrző pont).*

Megjegyzés. – Az ajánlott 60 per időtartam alatt elvégzendő „szükséges indulási formaságok” közé tartozik a légitársasági felvétel, a repülésvédelmi intézkedések, és ahol alkalmazandó, a repülőtéri díjak és egyéb illetékek beszedése, továbbá a határátlépési (kilépési) vizsgálati intézkedések, mint például az útlevél, karantén, vagy vámvizsgálat.

3.37 **Ajánlott gyakorlat**. – *A szerződő állam, ha előírja az induló utasok utazási dokumentumainak közszolgálati hatóságai általi ellenőrzését, akkor az ilyen vizsgálatok meggyorsítása érdekében a repülőtér vezetőségével együttműködve alkalmazzon megfelelő technikákat és alakítson ki* *többcsatornás vizsgálati rendszert, vagy alkalmazza az utas áramlás szabályozásának egyéb módszereit.*

3.38 A szerződő állam határellenőrzési célokból rendes körülmények között ne követelje meg a területét elhagyó utasoktól személypoggyászaik bemutatását.

K. Belépési eljárások és követelmények

3.39 **Ajánlott gyakorlat**. – *A szerződő állam a légi-jármű üzemeltetőkkel és a repülőtér vezetéssel együttműködve köteles megcélozni, hogy a légi-jármű méretétől, illetve a mentrendszerű érkezéstől függetlenül a normál eljárást feltételező utas esetében az engedélyezéséhez a légi-jármű elhagyásának pillanattól számítva 45 perc időtartamnál többre ne legyen szükség.*

3.40 Azokon a nemzetközi repülőtereken, ahol az utasforgalom nagysága az intézkedést indokolja, az ellenőrzés felgyorsítása érdekében a szerződő államok, együttműködve a repülőtér üzembentartóval, kötelesek arra szabott technológiát, több-csatornás határrendészeti ellenőrzést vagy egyéb utas-áramoltatást segítő eszközt alkalmazni.

3.41.Különleges körülményeket kivéve a szerződő államok ne tartsanak arra igényt, hogy az utasoktól vagy a hajózó-személyzettől összegyűjtsék az útleveleket vagy egyéb azonossági dokumentumokat azelőtt, mielőtt az útlevél ellenőrzési ponthoz érnek.

3.42 Az érintett közszolgálati hatóságoknak biztosítaniuk kell, hogy az utasokat és a hajózószemélyzeteket az államba való bebocsáthatóságukhoz tartozó vizsgálatra gyorsan fogadják.

Megjegyzés – Az utas vagy a hajózószemélyzet akkor tekinthető „vizsgálatra fogadottnak”, amikor kiszállás után az érintett országba belépés céljából először jelenik meg az érkező ellenőrzési ponton, amikor a vizsgáló tiszt határozatot hoz a beléptetetőségéről vagy annak ellenkezőjéről. Ez nem foglalja magában az utazási dokumentumok átnézését, amelyet közvetlenül a kiszálláskor elvégezhetnek.

3.43 A légi-jármű üzemeltetője felelős a kiszálló utasok és hajózó-személyzeti tagok felügyeletéért és a róluk való gondoskodásért a légi-jármű elhagyásától a 3.42 pontban leírt vizsgálatra fogadásukig.

3.44 **Ajánlott gyakorlat**. – *Ilyen elfogadást követően az illetékes közszolgálati hatóság válik felelőssé az utasok és a hajózó-személyzet tagjainak felügyeltéért és a róluk való gondoskodásért bebocsátásukig vagy bebocsátásra alkalmatlanságuk megállapításáig*

3.45 Az utasok és a hajózószemélyzet felügyeletéért és a róluk való gondoskodásért a légi-jármű üzemeltetőjének megszűnik a felelőssége, mihelyst az illető személy bebocsátást nyert az államba.

3.46 Minden szerződő állam közszolgálati hatósága köteles lefoglalni a csalással szerzett, hamisított vagy másolt utazási dokumentumokat. A közszolgálati hatóságnak el kell koboznia azokat az utazási dokumentumokat is, amelyeket egy személy az utazási dokumentum jogos tulajdonosát megszemélyesítve használ. Az ilyen dokumentumokat haladéktalanul ki kell vonni a használatból és vissza kell juttatni a kiállítóként megjelölt állam megfelelő hatóságának, vagy az állampolgárságnak megfelelő állam diplomáciai testületéhez.

3.47 **Ajánlott gyakorlat.-** *Ha lehetséges, a szerződő állam vezessen be az utasokról előzetes információt biztosító rendszert, amelyhez hozzátartozik bizonyos útlevél- és vízumadatok elindulást megelőző kinyerése, a részletek elektronikus úton történő továbbítása a közszolgálati hatóságaikhoz és ezen adatok érkezést megelőző kockázat kezelési célú elemzése annak érdekében, hogy az engedélyezés gyorsabbá válhasson. Az utas felvétel során, a kezelési időtartam csökkentése érdekében* *dokumentumolvasó készüléket alkalmazzanak a gépi feldolgozású dokumentumokban szereplő információk kinyeréséhez.*

3.47.1 Az utasokról továbbítandó azonosítási információk meghatározásakor a szerződő állam csak azokat a tételeket igényelje, amelyek a Doc 9303 (széria) „Gépi Feldolgozású Utazási Dokumentumok" című kiadványban foglalt előírásokkal egyezően, az útlevél és vízum leolvasási területén találhatók. Az összes igényelt információ feleljen meg az ENSZ/EDIFACT/PAXLIST üzenetformátumra vonatkozó előírásoknak.

3.47.2 **Ajánlott gyakorlat** – *A szerződő államok tartózkodjanak a légi-jármű üzemeltető pénzbeli vagy egyéb megbüntetésétől olyan hibák esetén, amelyeket a rendszer meghibásodása idéz elő, és azt eredményezi, hogy az API (Előzetes Utas Információs) rendszerekkel összefüggően semmilyen vagy téves adattovábbítás történik a közszolgálati hatóságok felé.*

3.47.3 Azok a szerződő államok, amelyek az Előzetes Utas Információs rendszeren, elektronikus formában tartanak igényt az utas adatokra, egyben nem igényelhetik nyomtatott formában az utas bizonylatot.

3.48 **Ajánlott gyakorlat** – *Az „Utas Névjegyzék" hozzáférésre (Passenger Name Record – PNR) igényt tartó szerződő államoknak az ICAO által kidolgozott útmutatásoknak megfelelőre kell szabniuk adatigényüket és az ilyen adatok kezelését.*

3.49 A szerződő állam intézkedjen róla, hogy a látogató személyazonossági dokumentumait - különleges körülmények kivételével - mind belépéskor, mind kilépéskor csak egyszer kelljen megvizsgálni.

3.50 A szerződő állam ne követeljen írásos nyilatkozatot az utas vagy hajózószemélyzet poggyászáról akkor, ha azok nem tartalmaznak vámköteles vagy korlátozott áruféleségeket.

3.51 Vámellenőrzéshez és karantén vizsgálati célokra a szerződő állam az adott repülőtér viszonyainak és forgalmának megfelelően alkalmazzon kockázat kezelésen alapuló kétcsatornás rendszert, vagy egyéb szétválasztási megoldást.

Megjegyzés. – Lásd a 6. Függeléket – a Vámhatóság Együttműködési Tanácsa – Customs Co-operatin Council (ma már Vámhatóságok Világszervezete – World Customs Organization) által ajánlott kétcsatornás rendszert.

3.52 **Ajánlott gyakorlat**. – *Olyan kivételes körülmények esetén, amikor a látogató, rajta kívülálló okok miatt az érkezést megelőzően nem rendelkezik az előírt belépési vízummal, a szerződő állam engedélyezze az ideiglenes belépést.*

3.53 **Ajánlott gyakorlat**. – *Olyan esetekben, amikor a látogató útlevelének érvényessége a vízum érvényességi időtartamának vége előtt lejárt, a vízumot kiadó állam a vízumot annak lejáratáig bezárólag továbbra is fogadja el, ha azt a látogató új útlevelével együtt mutatják be.*

3.54 A vízumot korlátozott belépési alkalomra kiadó szerződő állam köteles megfelelő, egyértelmű és nem kitörölhető módon jelezni a vízum minden egyes igénybevételét annak érdekében, hogy érvényességét tulajdonosa, az üzemeltető, vagy az állam közszolgálati hatóságai gyorsan, különleges módszer alkalmazása nélkül megállapíthassák.

3.55 Miután az utasok és a személyzet tagjai egyenként bemutatták útleveleiket, vagy egyéb hivatalos úti okmányaikat, az érintett állami hatóság a vizsgálat után - különleges és egyedi esetek kivételével - azonnal szolgáltassa vissza azokat az iratokat.

3.56 **Ajánlott gyakorlat**. – *A légi úton érkező személyek egészségügyi vizsgálatát rendszerint azokra* *kell korlátozni, akik a fertőzött területről az adott kór Nemzetközi Egészségügyi Szabályzatban (International Health Regulations) rögzített lappangási időtartama alatt érkeznek illetve szállnak ki.*

3.57 **Ajánlott gyakorlat**. – *A szerződő állam tegyen intézkedéseket, amelyek révén lehetővé válik, hogy az illető állam csak egyik repülőterén kelljen határvizsgálati formaságokon keresztül mennie az ugyanazon állam felségterületén lévő két, vagy több nemzetközi repülőtéren megálló nemzetközi járaton érkező utasnak és poggyászának.*

L. Tranzit eljárások és követelmények

3.58 Ha a repülőtéri létesítmények lehetővé teszik, az olyan utasok, hajózószemélyzet és poggyászuk számára, amelyek egy másik államból érkeznek, de még aznap ugyanazon repülőtérről ugyanazzal vagy másik járattal egy harmadik állam területére továbbutaznak, a szerződő állam közvetlen tranzit terület kialakítással vagy egyéb megoldással biztosítsa az érkezési repülőtéren a tranzit államba lépéshez szükséges határvizsgálati formaságok végrehajtása nélküli ideiglenes tartózkodás lehetőségét.

3.59 A szerződő állam a lehető legkevesebbre mérsékelje azon országok számát, amelyek állampolgáraitól közvetlen tranzit vízum meglétét követel meg amikor azok egy másik államból érkeznek, de még aznap ugyanazon repülőtérről ugyanazzal vagy egy másik járattal egy harmadik állam területére továbbutaznak.

3.60 A szerződő állam hozzon intézkedéseket, amelyek révén az előre nem látható járat törlés vagy késés miatt egy éjszakán át visszatartott tranzit utasok számára megengedhető legyen, hogy a repülőteret elszállásolás céljából elhagyhassák.

M. A tulajdonosától elválasztott poggyász kezelése

3.61 A szerződő állam engedje meg a légi-jármű üzemeltetőnek, hogy a tévesen kezelt személypoggyászokat tulajdonosuk tartózkodási helyére juttassák, és ne írja elő, hogy a légi-jármű üzemeltető köteles büntetést, illetéket, behozatali vámot vagy adót fizetni azzal az indokkal, hogy a személypoggyászt tévesen kezelték.

3.62 Repülésvédelmi, vagy egyéb szükséges vizsgálatok eseteit kivéve, a szerződő állam vizsgálat nélkül engedélyezze a tévesen kezelt poggyászok ugyanazon repülőtéren tartózkodó nemzetközi járatok közötti közvetlen átszállítását. Olyan esetekben, amikor a közvetlen átszállítás nem lehetséges, a szerződő állam köteles gondoskodni arról, hogy megfelelő intézkedéseket tettek az ilyen poggyászok megfelelő területen és biztonságos felügyelet melletti ideiglenes őrizet alatt tartásához.

3.63 A szerződő állam engedje az üzemeltetőnek, hogy a megfelelő célállomáson a tulajdonos nevében engedélyezés céljából bemutassa az azonosítatlan, a névtelen, vagy a tévesen kezelt poggyászt és, hogy a poggyászt tulajdonosához továbbíthassa.

3.64 A szerződő állam segítse elő az azonosítatlan, névtelen, vagy a tévesen kezelt poggyász felszabadítását és megfelelő továbbítása érdekében a légi-jármű üzemeltetőhöz történő visszajuttatását. A közszolgálati hatóságok által lefektetett feltételek szerint a légi-jármű üzemeltetőnek megengedhető, hogy szükség esetén az ilyen poggyászokat a tulajdonos felőli megbizonyosodás céljából kinyissa.

3.65 A vámhatóságok által átvett és kizárólagos ellenőrzésük alatt tartott, de a közszolgálati hatóságok által még nem felszabadított poggyászok őrzésének kötelezettsége és az ilyen poggyász esetében kivetendő behozatali illeték és adó megfizetésének felelőssége alól a légi-jármű üzemeltetőt mentesíteni kell.

N. A hajózószemélyzet és egyéb légi-jármű üzemeltetői alkalmazott azonosítása és belépése

3.66 A szerződő államok, együttműködve a légi-jármű üzemeltetőkkel és a repülőtér üzembentartókkal, tegyenek olyan intézkedéseket, amelyek az érkezéskor és elinduláskor felmerülő igények szerint felgyorsítják a hajózószemélyzetek és poggyászaik vizsgálatát..

3.67 A szerződő államok egyszerűsítsék és gyorsítsák fel azt a folyamatot, amelynek révén a felségterületüket bázisként igénybe vevő légi-jármű üzemeltetők hajózószemélyzeteiket „Hajózószemélyzet Azonosító Igazolvány"-hoz (Crew Member Certificates – CMCs) juttathatják.

Megjegyzés – A hajózószemélyzet azonosító igazolvány olyan kártya, amely a hajózószemélyzetek azonosítására szolgál, meghagyva, hogy a szakszolgálati engedély elsődleges funkciójaként a hajózószemélyzet munkavégzési jogosultságát tanúsítsa.

3.68 **Ajánlott gyakorlat** – *A szerződő államok a 3.67. pont szerinti igazolványt gépi feldolgozású kártya formájában állítsák ki, a Doc 9303, 3. Rész – „1. és 2. méretű Gépi Feldolgozású Hivatalos Utazási Dokumentumok"-ban meghatározott specifikációnak megfelelően.*

3.68.1 **Ajánlott gyakorlat** – *A szerződő államok alakítsanak ki olyan eljárást, amely lehetővé teszi a hajózószemélyzet azonosító igazolvánnyal ellátott bármely hajózószemélyzeti tag számára, hogy a benne foglalt adatok érvényességét megvizsgálja és áttekintse, és szükség térítésmentesen módosíttathassa.*

3.69 **Ajánlott gyakorlat** – *Ameddig a légi-jármű üzemeltetők kiadnak hajózószemélyzet azonosító kártyát, a szerződő államok a 7. Függelékben bemutatott formában tartsanak igényt az ilyen azonosító dokumentum előállítására, azaz a gépi leolvasású hajózószemélyzet igazolvány látható területének megjelenítésével egyezően, lehetőséget teremtve a géppel támogatott személyazonosításra és a védelmi célú dokumentum megerősítésre.*

3.69.1 **Ajánlott gyakorlat** – *A szerződő államok gondoskodjanak arról, hogy a kiadott, felfüggesztett vagy visszavont minden egyes hajózószemélyzeti tag igazolvány vagy egyéb azonosító dokumentum nyilvántartása elektronikus adatbázisban legyen eltárolva, megvédve a zavaró hatásoktól és az illetéktelen beavatkozástól. Az elektronikus adatbázisban és a hajózószemélyzeti tag igazolványokon eltárolt információt korlátozzák a hajózószemélyzet azonosításának megerősítéséhez alapvetően szükséges részletekre.*

3.70 A visszaéléseket megelőzendő, a hajózószemélyzeti tag igazolványok, és egyéb hivatalos hajózószemélyzet azonosító dokumentumok kiadása felett megfelelő ellenőrzést kell gyakorolni, például az alkalmazotti státusz háttérellenőrzése és igazolása, a ki nem állított kártyakészlet ellenőrzése és a kiadmányozó személyzet elszámoltatása útján.

3.71 A szerződő államok álljanak el a vízum megkövetelésétől a hajózószemélyzeti tag igazolványt felmutató érkező hajózószemélyzetek esetében, amennyiben nemzetközi járaton munkát végeznek és a fogadó állam által megengedett időtartamra – azzal a céllal, hogy a következő járaton munkát végezzenek - ideiglenes belépésért folyamodnak.

3.71.1 Ajánlott gyakorlat – A szerződő államok álljanak el a vízum megkövetelésétől a hajózószemélyzeti tag igazolványt felmutató érkező hajózószemélyzetek esetében akkor is, amikor másik légi-jármű üzemeltetővel vagy másféle szállítási módon érkeznek és a fogadó állam által megengedett időtartamra – azzal a céllal, hogy a következő járaton munkát végezzenek – ideiglenes belépésért folyamodnak.

3.72 A szerződő állam intézkedjen annak biztosítására, hogy a felségterületére, vagy az azon keresztül üzemelő külföldi légi-jármű üzemeltető műszaki szakszemélyzete ideiglenes jelleggel késedelem nélkül beléphessen felségterületére, ha sürgősen szükséges, hogy a műszaki ok miatt útját folytatni nem képes légi-jármű légi-alkalmasságát helyreállítsa. Ha az állam szavatosságot kíván például arra, hogy az ilyen személyek miből fognak felségterületén megélni és munkájuk végeztével felségterületét elhagyják, az erre vonatkozó tárgyalást a személyzet azonnali bebocsátásának késleltetése nélkül kell megtartani.

O. Repülés végrehajtást és utas-kabin biztonságot felügyelő személyzet

3.73 **Ajánlott gyakorlat.-** *A szerződő állam gondoskodjon arról, hogy a másik szerződő állam repülés végrehajtást és utas-kabin biztonságot felügyelő személyzetével, amikor azok felügyelői feladatukat látják el, ugyanolyan módon bánjanak, mint a hajózószemélyzetekkel, amikor a be – és kilépési alakiságokat folytatják.*

3.74 **Ajánlott gyakorlat.-** *A szerződő állam lássa el repülés végrehajtást és utas-kabin biztonságot felügyelő személyzeti tagokat a 8. Függelékben előírt alakiságú azonosító dokumentummal.*

3.75 **Ajánlott gyakorlat. -** *A repülés végrehajtást és az utas-kabin biztonságot felügyelők tartsák maguknál a 3.74 pontban meghatározott igazolványt, az alkalmazó államuk által kiállított felügyelői útiterv egy példányát és az érvényes útlevelét.*

3.81 **Ajánlott gyakorlat.-** *A 3.72 pontban a hajózószemélyzetek ideiglenes bebocsátására leírt kiváltságot a szerződő állam terjessze ki másik szerződő állam repülés végrehajtást és utas-kabin biztonságot felügyelő személyére feltéve, hogy fel tudja mutatni a 3.75 pontban felsorolt dokumentumokat (azaz az azonosító dokumentum, az útiterv és érvényes útlevél), és a szokványos pihenőidő leteltével kilép.*

4. FEJEZET - TEHERÁRU ÉS EGYÉB ÁRUCIKKEK BELÉPÉSE ÉS KILÉPÉSE

A. Általános rész

4.1 A légi úton szállított javak engedélyezése és átadása meggyorsításnak elősegítése érdekében a szerződő állam a légi-áru szállítási környezetnek megfelelő határellenőrzési eljárásokat fogadjon el, és oly módon alkalmazza azokat, hogy a szükségtelen késedelmet meggátolják.

4.2 **Ajánlott gyakorlat**. – *Az egyetlen légi-fuvarlevél alatt földfelszínen is és légi-úton is mozgó rakomány tekintetében a szerződő állam ugyanazokat az előírásokat és eljárásokat és azonos módon alkalmazza, mint amelyeket a kizárólag légi-úton szállított rakomány esetében alkalmaz.*

4.3 Ha a légi-úton szállított javak vizsgálatára és engedélyezésére vonatkozó előírásokat és eljárásokat vezet be, vagy módosít, a szerződő állam a 4.1 pontban rögzített tevékenység végrehajtása céljából köteles konzultálni a légi-jármű üzemeltetőkkel és más érdekelt felekkel.

4.4 Ha a szállítmány természete különféle közszolgálati hatóságok (például a vám-, az állatorvosi-, vagy közegészségügyi ellenőrök) érdeklődését is felkelti, a szerződő állam törekedjen a vizsgálat/engedélyezés hatáskörét a vámhatóságra vagy a többi hatóság valamelyikére átruházni vagy, ha ez nem célravezető, tegyen meg minden szükséges lépést, amellyel biztosíthatja, hogy az engedélyezés összehangoltan és, ha lehetséges egyidejűleg és a legkisebb késlekedéssel legyen végrehajtva.

4.5 A szerződő állam általában ne követelje meg a légi úton exportált, vagy importált rakomány fizikai vizsgálatát, és kockázat elemzést alkalmazva határozza meg, hogy mely javakat és milyen mértékben kell megvizsgálni.

4.6 Ha hasznos, a hatékonyság fokozása érdekében korszerű szűrési vagy vizsgálati módszereket kell alkalmazni az exportálandó, vagy importálandó javak fizikai vizsgálatának elősegítése érdekében.
4.7 **Ajánlott gyakorlat**. – *A nemzetközi repülőterekkel kapcsolatosan a szerződő államok létesítsenek, maguk fejlesszenek és üzemeltessenek, vagy engedélyezzék más felek részére, hogy fejlesszenek és üzemeltessenek vámszabad területeket/vámraktárházakat, illetve tegyenek közzé részletes szabályzatot azon tevékenység fajtákról, amelyek ilyen területeken végezhetők illetve nem végezhetők.*

4.8 Olyan esetekben, amikor a nemzetközi repülőtérhez kapcsolódóan nincs vámszabad terület és/vagy vámraktárház, de máshol, a közvetlen környezetében biztosítottak ilyenek, akkor a szerződő állam intézkedjen róla, hogy a légi-szállítás a szállítás egyéb módozataival azonos alapon igénybe vehesse ezeket a létesítményeket.

B. A közszolgálati hatóságok által igényelt adatok

4.9 A szerződő állam adatszolgáltatási elvárását korlátozza azokra a részletekre, amelyeket a közszolgálati hatóságok szükségesnek tartanak a behozott javak, illetve az exportálni szándékozott javak felszabadításához, vagy engedélyezéséhez.

4.10 A szerződő állam a statisztikai adatok beszerzésének idejéről és módszeréről úgy rendelkezzen, hogy annak következtében a behozott javak, illetve az exportálni szándékozott javak felszabadítása ne szenvedjen késedelmet.

4.11 A szerződő állam, műszaki lehetőségeinek függvényében, a javak behozatali vagy kiviteli dokumentumait - beleértve az árubizonylatokat és/vagy a légi-fuvarlevelet – el kell fogadni, ha azokat a közszolgálati hatóságok információs rendszerébe elektronikus formában eljuttatva nyújtják be.

4.12 Az árubizonylatot és a légi-fuvarlevelet a légi-jármű üzemeltetője, vagy annak felhatalmazott ügynöke köteles kitölteni és benyújtani. A javak engedélyezéséhez szükséges egyéb dokumentumokat a nyilatkozó személy köteles előállítani és benyújtani.

4.13 Amikor a szerződő állam megkövetel olyan dokumentumokat, mint például a kereskedelmi számla, nyilatkozat formák, az import jogosítvány és ehhez hasonlók, ne a légi-jármű üzemeltetőt kötelezze e dokumentálási kötelezettség teljesítésére, és ne is tartsa felelősnek, ne büntesse és ne részesítse hátrányban az üzemeltetőt azért, ha ezekben a dokumentumokban tárgyi pontatlanság, vagy megválaszolatlan kérdés mutatkozik hacsak ő maga a nyilatkozattevő vagy saját nevében jár el.

4.14 Ha a javak importjára vagy exportjára vonatkozó dokumentumot nyomtatvány formájában nyújtják be, a formátum alapjául az ENSZ Dokumentum Mintagyűjteménye (layout key) kell szolgáljon ami az áru bevallást illeti, az áru nyilatkozat esetében pedig a 3. Függelékében szereplő formátum követendő. Ha ezeket a dokumentumokat elektronikus úton nyújtják be, a formátum alapját az elektronikus információcsere nemzetközi szabványai képezik.

4.15 Az elektronikus adatcsere elősegítése érdekében a szerződő állam minden érintett felet – legyen az közületi vagy magán – bátorítson kompatibilis rendszer bevezetésére, és nemzetközileg elfogadott megfelelő szabványok és protokollok használatára.

4.16 **Ajánlott gyakorlat**. - *A javak felszabadításához és engedélyezéséhez alkalmazott elektronikus* *információs rendszer terjedjen ki a javak légi- és egyéb szállítási módozatok közötti átadásra is.*

4.17 Bizonyos áruféleségek behozatala, vagy kivitele esetében kiegészítő dokumentumokat - mint például engedélyeket és jogosításokat - igénylő szerződő állam tegye közzé követelményeit, és alakítson ki kényelmes eljárást az ilyen dokumentumok kiadásának kérelmezéséhez, illetve megújításához.

4.18 **Ajánlott gyakorlat**. - *A szerződő állam a lehetséges legteljesebb mértékben szüntesse meg a kisegítő dokumentumok kézi előállítására vonatkozó követelményeit, és hozzon létre olyan eljárásokat, amelyek révén e dokumentumok elektronikus eszközökkel előállíthatók.*

4.19 A szerződő állam ne követeljen a javak felszabadításához vagy engedélyezéséhez szükséges dokumentumokhoz kötődő konzuli formaságokat, vagy konzuli illetékeket.

C. Az export rakomány felszabadítása és engedélyezése

4.20 A kivitel engedélyezéséhez dokumentumot megkövetelő szerződő államok követelésüket korlátozzák egy egyszerűsített árukiviteli nyilatkozatra.

4.21 A szerződő államok gondoskodjanak arról, hogy az export rakományt a légi-jármű indulási idejére felszabadítsák.

4.22 A szerződő államok engedjék meg, hogy a légi úton kiszállítandó javak, engedélyeztetés céljából, bármelyik erre kijelölt vámhivatalnál bemutathatók legyenek. A javaknak a fenti hivataloktól arra a repülőtérre történő átszállítását, ahonnan az árut exportálni kívánják, az illető szerződő állam jogszabályaiban, előírásaiban lefektetett szabályok szerint kell végezni. Az ilyen eljárások a lehető legegyszerűbbek legyenek.

4.23 A szerződő állam magától értetődően ne kérjen bizonyítékot az exportált javak megérkezéséről.

4.24 **Ajánlott gyakorlat**. - *Abban az esetben, ha a szerződő állam közszolgálati hatósága az induló légi-járműre már berakodott szállítmány átvizsgálását igényli, rendes körülmények között engedélyezze a légi-jármű üzemeltető, vagy ahol alkalmazható, az üzemeltető felhatalmazott ügynöke számára áru visszaszállítási óvadék letétbe helyezését ahelyett, hogy az áru kirakodásával a légi-járművet késleltetnék.*

D. Az import rakomány felszabadítása és engedélyezése

4.25 A vizsgálatok ütemezésénél elsőbbséget kell biztosítani az élő állatok és a romlandó javak, illetve egyéb olyan javak számára, amelyeket a közszolgálati hatóság sürgősen szükségesként elfogad.
4.26 A személyes használatúként bevallott és feladott poggyászként szállított küldeményeket egyszerűsített megoldással kell engedélyezni.

4.27 A szerződő államok rendelkezzenek a javak egyszerűsített vámeljárással történő felszabadításáról, vagy engedélyezéséről feltéve, hogy:

a) a javakat azon legfelső érték alattira becsülték, amelynél nincs behozatali vám illeték, vagy adó; vagy

b) a javak után fizetendő behozatali illeték vagy adó kisebb, mint amit az állam a behajtandó legalacsonyabb összegként megállapított; vagy

c) a javakat azon meghatározott legkisebb értékhatárnál alacsonyabbra becsülték, amely alatt a javakat egy egyszerű bevallás alapján és az alkalmazandó behozatali illeték vagy vám megfizetésével, vagy az ilyen illeték vagy vám fejében a vámhatóságnak letétet biztosítva azonnal felszabadíthatják, vagy engedélyezhetik; vagy

d) felhatalmazott személy hozta be a javakat, és azok a javak meghatározott körébe tartoznak.

4.28 **Ajánlott gyakorlat**. – *A meghatározott követelményeket - beleértve a hivatalos követelmények teljesítéséről szóló megfelelőségi feljegyzést, és a kereskedelmi feljegyzéseket kezelő elfogadható rendszert – felmutató felhatalmazott importőr számára a szerződő államok előzetes információszolgáltatásra alapozott különleges eljárást alakítsanak ki, amely biztosítja a javak érkezéskori azonnali felszabadítását.*

4.29 **Ajánlott gyakorlat**. - *A 4.25-től a 4.28 pontig leírt különleges vagy egyszerűsített eljárásra nem elfogadható javakat, a vám- és egyéb előírások betartása függvényében, érkezéskor nyomban fel kell szabadítani, illetve engedélyezni kell. A szerződő államok, a szokványosnál több ellenőrzést nem igénylő rakományok esetében tűzzék ki célul, hogy a felszabadítást és a megfelelő dokumentumok kiadását a rakomány megérkezésétől számított 3 órán belül elvégzik. A közszolgálati hatóságok, a légi-jármű üzemeltetők, az importőrök, vagy felhatalmazott ügynökeik saját tevékenységeiket úgy hangolják össze, hogy e célkitűzés megvalósulhasson.*

4.30 **Ajánlott gyakorlat**. – *A szerződő államok a küldemény részek felszabadítására vonatkozó kérelmeket bonyolítsák, amikor már minden információt benyújtottak és teljesítették a küldemény részekre vonatkozó egyéb követelményeket.*

4.31 A szerződő államok engedjék meg, hogy a nemzetközi repülőtéren légi-járműből kirakodott javakat az államon belüli bármely engedélyezésre illetékes vámhivatalhoz szállíthassák. Az ilyenfajta szállításra vonatkozó vámeljárás a lehető legegyszerűbb legyen.

4.32 Amikor érkezéskor a javakat tévedés, kényszerhelyzet miatt, vagy azért nem rakodták ki rendeltetési helyén, mert az hozzáférhetetlen volt, akkor a szerződő államok ne rójanak ki büntetést, bírságot, vagy egyéb hasonló díjakat feltéve, hogy

a) a légi-jármű üzemeltetője vagy felhatalmazott ügynöke e tényről az előírt időtartamon belül értesíti a vámhatóságot;

b) a javak bejelentésének elmaradására olyan tényleges okot tud felhozni, amelyet a vámhatóság elfogad,

c) az árubizonylatot a helyzetnek megfelelően kijavították.

4.33 Amikor egy nemzetközi repülőtéren a javakat tévedés vagy kiszolgálási problémák miatt anélkül rakodják ki, hogy az árubizonylaton fel lenne jegyezve, a szerződő államok ne rójanak ki büntetést, bírságot vagy egyéb hasonló díjakat feltéve, hogy:

a) a légi-jármű üzemeltetője vagy felhatalmazott ügynöke e tényről az előírt időtartamon belül értesíti a vámhatóságot;

b) a javak bejelentésének elmaradására olyan tényleges okot tud felhozni, amelyet a vámhatóság elfogad,
c) az árubizonylatot a helyzetnek megfelelően kijavították, és

d) a javakat megfelelő vámintézkedések alá vették.

Ahol alkalmazható, a szerződő állam – követelményeinek betartása függvényében – segítse elő a javak valódi rendeltetési helyre juttatását.

4.34 A szerződő állam területén lévő célállomásra juttatott javak esetében, ha e javakat belföldi használatra az állam nem szabadította fel, és ezt követően elrendeli, hogy a származási pontra juttassák vissza, avagy egy másik államba legyen átirányítva, a szerződő állam a javak visszajuttatását import, export, vagy tranzit jogosítvány kérése nélkül engedje meg mindaddig, amíg az nem ütközik az érvényben lévő törvényekbe és jogszabályokba.

4.35 A légi-jármű üzemeltetőjét, vagy ahol az megfelel, a felhatalmazott ügynökét a szerződő állam köteles mentesíteni a vámilleték és adó fizetési kötelezettség alól, ha a javakat a közszolgálati hatóságai felügyelete alá helyzeték, vagy, ha a közszolgálati hatóság engedélyével - rendelkezésére bocsátás céljából - egy olyan harmadik félhez szállítják, amely a vámhatóság részére megfelelő biztosítékokat szolgáltatott.

E. Nemzetközi légi szolgáltatáshoz kapcsolódóan a légi-jármű üzemeltetők által exportált vagy importált tartalék alkatrészek, berendezések, készletek és egyéb anyagok

4.36 A szerződő állam felségterületére nemzetközi szolgáltatást nyújtó légi-jármű fedélzetén történő felhasználásra bevitt készleteket és élelmezési ellátmányokat mentesíteni kell a behozatali illetékek és adók alól, az állam vámszabályainak betartása mellett.

4.37 **Ajánlott gyakorlat.-** *A készletek, és élelmezési ellátmányok behozatala tekintetében a szerződő állam ne követeljen alátámasztó dokumentumot (mint például származási igazolást, konzuli vagy részletező számlákat).*

4.38 **Ajánlott gyakorlat.-** *A szerződő állam behozatali illeték és egyéb adó fizetési kötelezettség mentesen engedélyezze az élelmezési ellátmányok vagy készletek olyan nemzetközi járatot teljesítő légi-jármű fedélzetén, amely:*

a) más állam területén végzett közbeeső leszállás nélkül a szerződő állam felségterületén lévő két, vagy több nemzetközi repülőtéren leszáll; és

b) belföldön utazók a légi-járműre nem szállnak be.

4.39 **Ajánlott gyakorlat.-** *Rendelkezéseinek és követelményeinek betartása függvényében a szerződő állam adjon beviteli vámilleték és adómentességet a felségterületére – másik szerződő állam egy légi-jármű üzemeltetője által vagy annak nevében - importált földi és védelmi berendezésekre és azok cserealkatrészeire, útmutató anyagokra és képzési segédletekre feltéve, hogy azokat az üzemeltető vagy felhatalmazott képviselője használja fel a nemzetközi repülőterének határain belül, vagy egy engedélyezett repülőtéren kívüli létesítménynél.*

4.40 A Chicago-i Egyezmény 24. Cikkelye értelmében a beviteli illetékek, adók és egyéb díjak fizetése alól mentesített légi-jármű berendezések és tartalék alkatrészek esetében a szerződő államoknak azonnali felszabadítást, vagy engedélyezést kell biztosítaniuk, mihelyst a légi-jármű üzemeltetője vagy annak felhatalmazott ügynöke az egyszerűsített dokumentációs eljárást végrehajtotta.

4.41 Egy másik szerződő állam légi-jármű üzemeltetője által importált, vagy exportált földi és védelmi berendezések és azok cserealkatrészei, útmutató anyagok, és képzési segédletek esetében a szerződő államok haladéktalanul biztosítsák a felszabadítást vagy engedélyezést, mihelyst a légi-jármű üzemeltetője vagy annak felhatalmazott ügynöke az egyszerűsített dokumentációs eljárást végrehajtotta.

4.42 A szerződő állam - a behozatali illetékek és adók alól feltételesen mentesített légi-jármű berendezések és tartalék alkatrészek, továbbá a földi és védelmi felszerelések és azok tartalék alkatrészeinek kölcsönzését - köteles engedélyezni a másik szerződő állam légi-jármű üzemeltetői vagy azok felhatalmazott ügynökei között.

4.43 **Ajánlott gyakorlat**. – *A szerződő állam intézkedjen a jelen Annex 1. Fejezetében meghatározottak szerinti és a nemzetközi légi-szolgáltatással összefüggésben alkalmazott légi-jármű üzemeltetői dokumentumok behozatali illeték- és adómentes importálhatóságról.*

F. Konténerek és rakodólapok

4.44 A szerződő államnak, vonatkozó előírásainak és rendelkezéseinek betartása függvényében, köteles lehetővé másik szerződő államok légi-jármű üzemeltetői számára konténerek és rakodólapok ideiglenes bebocsátását - akár annak a légi-jármű üzemeltetőnek a tulajdonát képezik, amelyen beérkeztek, akár nem -, feltéve, hogy ezeket az eszközöket egy továbbinduló nemzetközi szolgáltatáson szándékoznak használni, vagy egyéb módon akarják újra exportálni.

4.45 **Ajánlott gyakorlat**. – *A szerződő államok a konténerek és a rakodólapok esetében csak akkor igényeljenek ideiglenes bebocsátási dokumentumot, ha úgy vélik, hogy nélkülözhetetlen a vámellenőrzés céljából.*

4.46 **Ajánlott gyakorlat**. – *Ahol a konténerek, és rakodólapok esetében újra-exportálási igazolásra van szükség,* a *szerződő állam bizonyítékként fogadja el a légi-jármű üzemeltető vagy felhatalmazott ügynökének vonatkozó felhasználási nyilvántartását.*

4.47 A szerződő államok intézkedjenek annak érdekében, hogy az érintett közszolgálati hatóságok felügyelet mellett a légi-jármű üzemeltetőnek belföldi használati engedély nélkül megengedjék a konténerben, vagy rakodólapon érkező továbbmenő áruszállítmány kirakodását, hogy a továbbszállításhoz szétválogathassa, és újra összeállíthassa.

4.48 A 4.44 pontban előírtak szerint a szerződő állam felségterületére bevitt konténerek, rakodólapok és kapcsolódó szerelvények esetében meg kell engedni, hogy az áru behozatali engedélyeztetése illetve export célú berakodása céljából egyszerűsített ellenőrzési és dokumentációs eljárással elhagyhassák a nemzetközi repülőtér határait.

4.49 Ha a körülmények szükségessé teszik, a szerződő államok engedjék meg az ideiglenesen bebocsátott konténerek és rakodólapok repülőtéren kívüli tárolását.

4.50 A szerződő államok vámilleték és adó fizetési kötelezettség nélkül tegyék lehetővé, hogy a légi-jármű üzemeltetők a 4.44 pontban foglaltak szerint ideiglenesen beengedett konténereket és raklapokat egymás között kölcsönözhessék feltéve, hogy az eszközöket egy továbbinduló nemzetközi szolgáltatáson szándékoznak használni, vagy egyéb módon akarják újra exportálni.

4.51 A szerződő államok engedjék meg, hogy az ideiglenesen beengedett konténerek, és rakodólapok ismételt kivitele bármely kijelölt vámhivatalon keresztül megtörténhessen.

4.52 A szerződő állam tegye lehetővé a 4.44 rendelkezése szerint beengedett konténerek és rakodó lapok javításához szükséges cserealkatrészek ideiglenes beengedését.

G. Postai dokumentumok és eljárások

4.53 A szerződő állam az Általános Posta Egyesülés érvényes jogszabályaiban előírtak szerint köteles egyrészt a postaküldeményeket kezelni, továbbítani és engedélyezni, másrészt dokumentálási kötelezettségnek eleget tenni.

5. FEJEZET – NEM BEBOCSÁTHATÓ ÉS KIUTASÍTOTT SZEMÉLYEK

A. Általános rész

5.1 A nemzetközi légi-közlekedés rendezett működési zavarainak lehető legcsekélyebbre mérséklése érdekében a szerződő államoknak egymással együtt kell működniük, hogy az ebben a fejezetben foglalt előírások alkalmazása során felmerülő bármilyen eltérést haladéktalanul megoldjanak.

5.2 A szerződő államoknak e fejezet előírásainak értelmében elő kell segíteniük a másik államból eltávolítandó személyek tranzitálását, és ki kell terjesztenie a szükséges együttműködést azon légi-jármű üzemeltetőkkel és kíséretet ellátókkal, amelyek az ilyen eltávolítást végrehajtják.

5.2.1 Az érintett állami tisztségviselőknek, azon időtartamban, amikor a felügyeletükre van bízva egy deportálandó be nem bocsátott utas vagy személy, meg kell óvniuk annak méltóságát, és tilos bármi olyat tenniük, amellyel ezt a méltóságot megsértik.

Megjegyzés – Ezeket a személyekkel az idevágó nemzetközi előírások szerint bánjanak, beleértve az Egyesült Nemzetek Szövetségének a Polgári és Politikai Jogokról szóló Nemzetközi Egyezményét.

B. Nem bebocsátható személyek

5.3 A szerződő államoknak késedelem nélkül értesíteniük kell a légi-jármű üzemeltetőt arról, hogy ha a 3.44 pont szerint egy személyt nem bebocsáthatónak találnak, és ezt amilyen gyorsan csak lehet, ezt írásban meg kell erősíteniük feléjük,

Megjegyzés – Az írásbeli értesítés lehet papír alapú, de lehet elektronikus is, mint például egy e-mail.

5.4 **Ajánlott gyakorlat –** *A közszolgálati hatóságuk útján a szerződő államok a bebocsátásra nem alkalmas személy eltávolításáról időben értekezzenek a légi-jármű üzemeltetővel annak érdekében, hogy elegendő időt adjanak a légi-jármű üzemeltetőnek arra, hogy a saját szolgálatai igénybevételével vagy valamilyen egyéb szervezéssel végre tudják hajtani a személy eltávolítását.*

Megjegyzés – Ebben az előírásban semmi nem értelmezhető oly módon, ami megengedné azon menedékjogot kérő személy eltávolítását annak a szerződő államnak a felségterületére, egy olyan országba, ahol faja, vallása, nemzetisége, különleges társadalmi csoporthoz tartozása vagy politikai nézete miatt az élete vagy szabadsága veszélyben forogna.

5.5 A szerződő államok kötelesek gondoskodni arról, hogy a nem bebocsátható személyre való tekintettel adja ki a kiutasítási rendelkezést a légi-jármű üzemeltető felé. A kiutasítás rendelkezés foglalja magában a kérdéses személy nevét, életkorát, nemét és állampolgárságát – ha ezek ismertek.

5.6 A szerződő államok olyan személy eltávolításának elrendelésekor, aki utazási dokumentumait megsemmisítette, vagy elveszítette, a 9. Függelék (1) alatt található kísérőlevelet adjanak át annak érdekében, hogy a tranzit- és/vagy az utazás kezdő állam(ok) hatóságait ellássák információval. A kísérőlevelet, a kiutasítási rendelkezést vagy bármi idevágó információt át kell adni a légi-jármű üzemeltetőnek, vagy őrizendő személyek esetében az őrzést ellátónak, aki felelősséggel tartozik a rendeltetési hely államába a közszolgálati hatósághoz történő elszállításukért.

5.7 A szerződő államoknak, amikor olyan nem bebocsátható személy eltávolításáról rendelkezik, akinek elkobozták az utazási dokumentumait, át kell adniuk egy - a 9. Függelék (2) alatt található - kísérőlevelet annak érdekében, hogy a tranzit- és/vagy az utazás kezdő állam(ok) hatóságait ellássák információval. A kísérőlevelet, csatolva hozzá az elkobozott utazási dokumentumok fénymásolatát, és a kiutasítási rendelkezést át kell adni a légi-jármű üzemeltetőnek, vagy őrizendő személyek esetében az őrzést ellátónak, aki felelősséggel tartozik a rendeltetési hely államába a közszolgálati hatósághoz történő elszállításukért.

5.8 Amennyiben a szerződő államoknak alapos okuk van feltételezni, hogy a nem bebocsátható személy ellenállást tanúsíthat az eltávolításával szemben, amennyire a menetrendi indulást megelőzően csak lehet, kötelesek tájékoztatni az érintett légi-jármű üzemeltetőt, hogy az járata biztonsága érdekében megelőző intézkedéseket foganatosíthasson.

5.9 A helytelen dokumentummal rendelkező személy felügyeletével kapcsolatos költségekért a légi-jármű üzemeltetőknek kell felelősséget vállalniuk attól a pillanattól kezdve, hogy a személyt nem bebocsáthatónak találták és visszaszállították a légi-jármű üzemeltetőhöz az államból való eltávolítás céljából.

5.9.1 Az állam köteles viselni minden egyéb kategóriába tartozó nem bebocsátható személy felügyeletéért és a róluk való gondoskodásért felmerülő költségeket attól a pillanattól kezdve, hogy a személyt nem bebocsáthatónak találták és visszaszállították a légi-jármű üzemeltetőhöz az államból való eltávolítás céljából, ideértve azokat a személyeket, akiket a légi-jármű üzemeltető szakértelmén kívül eső dokumentum problémák miatt vagy a helytelen dokumentumoktól eltérő okoknál fogva nem bocsátottak be.

5.10 Amikor egy személyt nem bebocsáthatónak találnak és visszavisznek a légi-jármű üzemeltetőhöz az állam felségterületéről való elszállításra, a légi-jármű üzemeltető nem gátolható meg abban, hogy visszakövetelje e személytől az elszállításához kapcsolódó költségeket.

5.11 A légi-jármű üzemeltető köteles a nem bebocsátott személyt elszállítani:

a) arra a pontra, ahol megkezdte utazását; vagy

b) bárhova, ahol bebocsátják

5.12 A szerződő állam köteles vizsgálatra elfogadni az olyan államból kiutasított személyt, ahol nem találták bebocsáthatónak, ha az illető a felségterületéről kezdte meg utazását. A szerződő állam nem küldheti vissza az ilyen személyt abba az országba, ahol előzőleg nem bebocsáthatónak találták.

5.13. A szerződő államoknak el kell fogadniuk az 5.6 és 5.7 pont szerint kiállított kísérőlevelet és egyéb iratokat, mint kielégítő dokumentumot a levélben meghivatkozott személy vizsgálatának lefolytatásához.

5.14 A szerződő államok nem büntethetik meg a légi-jármű üzemeltetőt, ha az odaérkező és tranzitba belépő személyeket nem megfelelő dokumentumokkal ellátottnak találják, ám a légi-jármű üzemeltetők be tudják bizonyítani, hogy megfelelő körültekintéssel jártak el annak biztosításához, hogy e személyek a fogadó államba történő belépéshez eleget tettek a dokumentálási követelményeknek.

5.15 **Ajánlott gyakorlat** *–Amikor a légi-jármű üzemeltetők a közszolgálati hatóságokkal – azok megelégedésére – együttműködnek például az érintett felek között a nem bebocsátható személyek szállításának megakadályozására tervezett intézkedésekről létrejött egyetértési nyilatkozatnak megfelelően, a szerződő államok mérsékeljék a büntetéseket és bírságokat, amelyeket egyébként alkalmaznának ilyen személyek felségterületükre szállításakor.*

5.16. A szerződő államok nem gátolhatják meg az üzemeltető légi-járművének elindulását arra várva, hogy bármelyik vele érkező utas bebocsáthatóságát eldöntsék.

Megjegyzés – Kivétel tehető ezen előírás alól nem menetrendszerinti járatoknál, vagy ha a szerződő államnak oka van úgy vélni, hogy egy adott járaton a szokásosnál nagyobb számú nem bebocsátható személy érkezett.

C. Kiutasítottak

5.17 Amikor a szerződő állam kiutasít egy személyt a felségterületéről, köteles ellátni őt kiutasítási rendelkezéssel. A szerződő állam köteles a kiutasított felé jelezni a rendeltetési hely államának nevét.

5.18 A szerződő államok, amikor felségterületükről kiutasítottakat utaztatnak el, kötelesek az elutaztatáshoz tartozó összes kötelmét, felelősségét és költségét felvállalni.

5.19 A szerződő államok, amikor a kiutasított elszállítását szervezik a légi-jármű üzemeltetővel, a lehető leghamarabb, de nem később, mint 24 órával a járat indulását megelőzően kötelesek megadni a következő tájékoztatást:

a) a kiutasítási rendelkezés egy példányát, ha a szerződő állam törvényei ezt megengedik;

b) az állam kockázatelemzését és/vagy bármi egyéb idevágó információt, ami segíti a légi-jármű üzemeltetőt abban, hogy a járatbiztonsággal összefüggő kockázatot felmérje;

c) bármely kíséret neveit és nemzetiségi hovatartozásait.

Megjegyzés – Felhívjuk a figyelmet a 17. Annex 4.fejezetében foglalt előírásokra, hogy biztosított legyen az alakisági és védelmi szabványok összehangoltsága.

5.20 A szerződő államoknak - amikor megvalósítható - közvetlen, közbeeső leszállás nélküli járatot kell igénybe venniük, amikor szervezik a kiutasított rendeltetési államba vitelét..

5.21 A szerződő államnak, amikor elszállításra állít elő egy kiutasítottat, kötelessége biztosítani, hogy a bármely tranzit- és/vagy rendeltetési állam által megkövetelt összes hivatalos utazási dokumentáció a légi-jármű üzemeltetőjének a rendelkezésére álljon.

5.22 A szerződőállamnak saját állampolgárait be kell engednie a felségterületére, ha őket egy másik államból kiutasították.

5.23 A szerződő államnak különleges elbánást kell azon más államból kiutasított személy bebocsátása iránt tanúsítania, akinek birtokában van az állam felségterületére érvényes és engedélyezett lakóhely bizonyítéka.

5.24. A szerződő állam, amikor arra a döntésre jut, hogy a kiutasított mellé kíséret kell és az útiterv része egy közbeeső államban való tranzit megállás, köteles gondoskodni arról, hogy a kíséret a kiutasított mellett marad egészen a rendeltetési helyig kivéve, ha a tranzit helyszínre való érkezést megelőzően ettől eltérő szervezésben állapodnak meg a hatóságok és az érintett légi-jármű üzemeltető.

D. Helyettesítő utazási dokumentum megszerzése

5.25. Amikor a nem bebocsátható személy visszautaztatásának és rendeltetési helyen való elfogadásának elősegítéséhez helyettesítő utazási dokumentumot kell előteremteni, a visszaszállítást elrendelő állam köteles e dokumentum előteremtéséhez a lehető legtöbb segítséget adni.

Megjegyzés – Felhívjuk a figyelmet az 5.13 szabványra a fenti szabvány alkalmazásának tisztázásához.

5.26 A szerződő állam, amikor arra kérik, hogy biztosítsa az utazási dokumentumokat egyik honfitársa visszatértének elősegítéséhez, köteles elfogadható időn belül de nem később, mint 30 nappal a kérést követően válaszolni akár úgy, hogy kiadja az utazási dokumentumokat, vagy kielégítve azzal a kérelmező államot, hogy az érdekelt személy nem az ő állampolgára.

5.27 A szerződő államnak nem kötelessége az utazási dokumentum iránti kérelmet aláíratni az érintett személlyel azon dokumentum kiadási előfeltételeként.

5.28 Amikor a szerződő állam eldöntötte, hogy az a személy, akinek megkérték az utazási dokumentumait a saját állampolgára, de a kéréstől számított 30 napon belül nem tudja az útlevelet kiadni , az államnak ki kell adnia egy sürgősségi utazási dokumentumot, amely az érintett személy állampolgárságát tanúsítja és érvényes az államba történő újra bebocsátáshoz.

5.29 A szerződő állam nem utasíthatja vissza ez utazási dokumentum kiadását állampolgárának, ellenkező esetben meggátolja visszautazását azzal, hogy állampolgárság nélkülivé teszi.

6. FEJEZET - NEMZETKÖZI REPÜLŐTEREK - FORGALMI LÉTESÍTMÉNYEK ÉS SZOLGÁLATOK

A. - Általános rész

6.1 A szerződő államoknak kell biztosítani, hogy a 9.Annex előírásait folyamatosan alkalmazzák akkor is, amikor a repülőteret privatizálják.

6.1.1 A szerződő állam köteles minden szükséges lépést megtenni a légi-jármű üzemeltetők és a repülőtér üzemeltetők együttműködésének biztosítására, gondoskodva arról, hogy nemzetközi repülőterein az utasok, a repülő személyzet, az áru- és a postaküldemények gyors kezelésére és engedélyezésére megfelelő létesítmények és szolgálatok álljanak rendelkezésre. E létesítményeknek rugalmasnak és könnyen bővíthetőknek kell lenniük, hogy a forgalom mértékének várható növekedéséhez, valamint a fokozott fenyegetési helyzetekben a fokozott védelmi intézkedésekhez legyenek igazíthatók, miközben lehetővé teszik a kábítószer ellenőrzés megfelelő intézkedéseinek alkalmazását is.

Megjegyzés.- A repülésvédelmi intézkedések alkalmazása tekintetében felhívjuk a figyelmet a 17. Annex 2. Fejezetében szereplő idevágó előírásra. Az előírás a következőképp szól:
***Ajánlás. -** Minden szerződő állam – amikor lehetséges - olymódon köteles védelmi intézkedéseket és eljárásokat kialakítani, hogy azok a legkevésbé akadályozzák, vagy késleltessék a nemzetközi polgári repülés tevékenységét feltéve, hogy ezen intézkedések, és eljárások hatékonysága nem szenved csorbát.*

6.2 A nemzetközi repülőterei utasforgalmi épületeinek lényeges megváltoztatását, vagy új épület létesítését tervezi, vagy, ha új eljárások teszik szükségessé a létesítmények átalakítását, beleértve a meglévő létesítményen belüli elrendezés változtatást is, a szerződő állam a tervezés legkorábbi szakaszában köteles minden szükséges lépést megtenni egyrészről a repülőtéri hatóságok, másrészről a légi-jármű üzemeltetők, felügyelő hatóságok, illetve a repülőtér egyéb használóit képviselő megfelelő szervezetek közötti konzultáció előmozdítására.

6.3 A szerződő állam minden szükséges lépéssel biztosítsa a repülőtér üzemeltetők és a légi-jármű üzemeltetők közötti együttműködést abból a célból, hogy a nemzetközi repülőterein felállított létesítmények és szolgálatok tervezése/kivitelezése a lehető legjobb repülőtéri forgalmi áramoltatási rendet biztosítson.

6.3.1 **Ajánlott gyakorlat. -** *Nemzetközi repülőterein csúcsforgalmi problémákat észlelő állam, a repülőterekre érvényes menetrendek megfelelő összehangolási eljárásnak megfelelően, jóval a csúcsforgalmi időszak előtt jelezze a menetrendszerű és a nem menetrendszerű járatokat üzemeltető megfelelő légi-közlekedési vállalatoknak mindazon korlátozásokat, amelyeket a forgalmi igény és a repülőtéri kapacitás egyensúlyba hozása érdekében várhatóan érvénybe léptet.*

6.4 **Ajánlott gyakorlat.-** *Ha a nemzetközi repülőtéren utas kezelési illetéket vetnek ki, és ennek beszedése az utasoktól létesítmény problémákba ütközik, akkor az illetéket - ha lehetséges - előzetes értesítést és konzultációt követően a légi-jármű üzemeltetőre kell kivetni, amely ennek fejében az illetéket az utassal téríttetí meg úgy, hogy a repülőtéren az utasnak ne kelljen újra sorba állni.*

6.5 **Ajánlott gyakorlat. -** *A nyújtott szolgáltatások ellentételezéséhez, beleértve a nemzetközi repülőtéren alkalmazott adókat és illetékeket is, fizetőeszközként legyen elfogadott a hitelkártya minden esetben, ahol erre adott a lehetőség.*

6.6 **Ajánlott gyakorlat.-** *Javasolt, hogy a légi-jármű üzemeltető a repülőtér üzemeltetővel megegyezve, de a repülőtér üzemeltető által esetlegesen alkalmazott ésszerű korlátozással kapjon lehetőséget megválasztani, hogy a földi kiszolgáláshoz saját szolgáltatást biztosít, vagy azt részben vagy teljes egészében a repülőtér igazgatóság részéről felhatalmazott egy másik léi-jármű üzemeltető által irányított szervezetre, vagy a repülőtér üzemeltetőre, vagy a repülőtér üzemeltető részéről jóváhagyott más kiszolgáló ügynökre bízza.*

B. - Repülőtéri forgalomáramlási intézkedések

I. Általános érvényű rendelkezések

6.7 A szerződő állam köteles különleges figyelmet szentelni arra, hogy a nemzetközi repülőtéren a megfelelő eszközök mindig rendelkezésre álljanak és, hogy megfelelő intézkedések legyenek érvényben az utasok késedelem nélküli kiszállításához és beszállításához.

6.7.1 **Ajánlott gyakorlat. -** *A repülőtér üzemeltetőket és a légi-jármű üzemeltetőket a szerződő állam bátorítsa minden vonatkozó repülési információ cseréjére. A forgalmas repülőtereken a légi-jármű üzemeltetőkkel elektronikus adatcserét kell elősegíteni. Ilyen esetekben az ipari szabványoknak megfelelő műszaki megoldásokat (például az UN/EDIFACT) mozdítsák elő.*

6.8 **Ajánlott gyakorlat. -** *A 6.3-ban foglalt intézkedéseket a földi forgalom számára legközvetlenebb utat biztosító módon kell megvalósítani úgy, hogy az utasok és a személypoggyászok haladási útvonala sem egymást, sem más áramlási vonalat ne keresztezzen. Az útvonalat, egyértelművé tételük mértékéig megfelelő jelzőtáblákkal kell ellátni.*

6.9 **Ajánlott gyakorlat. -** *Az ICAO és a Nemzetközi Tengerészeti Szervezet által a cél érdekében közösen létrehozott, „Repülőtéren és a Tengeri Terminálban Személytájékoztató Nemzetközi Jelzések" (International Signs to Provide Guidance to Persons at Airports and Marine Terminals (Doc 9636) címet viselő dokumentumban közzétett, a repülőteret igénybevevő utasok útbaigazítását szolgáló nemzetközi jelzéseket a lehetőség leghamarabb alkalmazni kell.*

6.9.1 **Ajánlott gyakorlat. -** *A nemzetközi repülőtereken figyelmeztető feliratokat és tájékoztató lapokat kell szembeötlően elhelyezni, amelyek az utasokat figyelmeztetik az illegális kábítószer forgalmazás súlyos következményeire és azokra a büntetésekre, amelyekkel a kábítószer törvény megsértése miatt elitélt személy sújtható.*

6.10 **Ajánlott gyakorlat. -** *Intézkedni kívánatos arról, hogy szükség esetén az utas és a hajózószemélyzeti tag fedél alatt haladhasson az utast fogadó épület és a légi-jármű között, oda is és vissza is.*

6.11 **Ajánlott gyakorlat. -** *Külön figyelmet kell fordítani a gyaloglást igénylő hosszú utas útvonalakra, továbbá tanulmányozni kell, hogy milyen gépesítési lehetőséggel segíthető a közlekedés ezeken az útvonalakon.*

6.12 **Ajánlott gyakorlat. -** *Ahol szükséges, a tisztán hallható hangosbemondó rendszerrel kiegészített repülőjárat információs táblákat vagy kijelzőket olymódon kell biztosítani, hogy az utas és a közönség teljes körű tájékoztatáshoz juthasson a járatok érkezéséről, indulásáról, törléséről és mindenek előtt az érkezési vagy indulási idők továbbá a beszállító kapuk utolsó pillanatban bekövetkezett módosulásáról.*

6.12.1 **Ajánlott gyakorlat. -** *A 6.12 Ajánlott gyakorlatban említett intézkedés megvalósítása érdekében a repülőjárat információs táblák vagy kijelzők a lehetőség szerinti legteljesebb mértékben az ICAO Doc 9249* – „Járati Közönségtájékoztató Dinamikus Kijelzők” (Dynamic Flight-related Public Information Displays)*-ben javasolt szabvány kialakítású legyenek. A szerződő állam gondoskodjon arról, hogy a „Repülőjárat Információs Kijelző Rendszer” (Flight Information Display Systems - FIDS) működtetéséért felelős hatóság számára a járatok üzemeltetésében érintett felek időben és gyorsan felfrissített módon biztosítsák a járatokkal kapcsolatos összes vonatkozó információt, beleértve az utolsó pillanatban bekövetkező változásokat is. Ezek a hatóságok legyenek felelősek a működtetéshez számukra szükséges adatelem jegyzék összeállításáért és az adatelemek közléséhez a létező ipari szabványok elfogadásával alkalmazandó kommunikációs mód létrehozásáért.*

6.13 **Ajánlott gyakorlat. -** *A szerződő állam gondoskodjon róla, hogy gyors és megbízható város és repülőtér közötti földi szállítási lehetőség álljon rendelkezésre.*

6.13.1 **Ajánlott gyakorlat. -** *A szerződő állam igyekezzen előmozdítani, hogy a repülőtér üzemeltető és a repülőtér földfelszíni megközelítésében érintett minden ügynökség és üzemeltető között a lehető legkorábbi szakaszban teljes konzultáció valósuljon meg, elősegítve a repülőtér földi megközelítésének tervezési szakaszában a fokozott egyeztetés megvalósulását, továbbá az utasok számára a vonatkozó tájékoztatás biztosítását. A szerződő állam mozdítsa azt is elő, hogy az utasok számára információ legyen biztosított egyrészt az igénybe vehető szolgáltatásokról, másrészt e szolgáltatások árairól, valamint a földi szállítás jegyváltó létesítményeiről, beleértve a fizetési módozatokat is.*

6.14 **Ajánlott gyakorlat. -** *A nemzetközi repülőtér rendelkezzen megfelelő autóparkoló létesítménnyel mind a rövid mind a hosszú időtartamú parkoláshoz.*

II. Parkolás és kiszolgálás szervezés

6.15 **Ajánlott gyakorlat.-** *A földi állásidő csökkentése és az előtéri üzemelés és engedélyezés meggyorsítása érdekében, megfelelő intézkedésekkel kényelmes parkolási és kiszolgálási lehetőséget kell biztosítani minden légi-jármű típus és kategória számára, legyen szó rendszeres, nem menetrendszerinti és általános célú repülésekről. Különösen az alábbiak lényegesek:*

a) a gyors ki- és berakodás érdekében, az utasforgalmi épülethez a lehető legközelebb és optimálisan elrendezett légi-jármű parkolóhelyek kialakítására tett intézkedések;

b) a berakodást, vagy kirakodást végző légi-járművek számára legyen elegendő állóhely az utasforgalmi épülettől távolabb, ezáltal az előtéren elkerülve a forgalom áramlásának zavarását; a távolabbi állóhelyek optimális kihasználását megfelelő szervezéssel kell biztosítani;

c) az állóhelyeket a légi-jármű földi kiszolgálásának gyors, kényelmes és biztonságos végrehajtásához szükséges minden eszközzel – beleértve a biztos lekötéshez szükséges eszközt - el kell látni;

d) elsőrendű fontosságot tulajdonítsanak annak, hogy a légi-jármű kirakodási és berakodási tevékenységhez kellő mértékű segítség álljon rendelkezésre;

e) létesítmény legyen biztosított a légi-jármű - közszolgálati hatóságok által kihirdetett időszakban *történő - üzemanyag tankolási műveleteihez;*

f) az utasforgalmi épülettől távolabb lévő állóhelyek és az utasforgalmi épület között, ha a távolság és a biztonság a rendelkezésre álló távolabbi állóhelyek optimális kihasználása érdekében szükségessé teszi, szállítási lehetőség legyen biztosított; és

g) a nemzetközi járatok számára, ha szükséges, legyen biztosítva olyan állóhely, ahol a légi-jármű, az utasok, a hajózószemélyzet és a poggyászok ellenőrzése végrehajtható.

III. - Kilépő utasok, hajózószemélyzet és poggyász

6.16 **Ajánlott gyakorlat. -** *A repülőtérre felszíni közlekedési eszközzel érkező utasoknak, személyzeti tagoknak és személypoggyászaiknak könnyű és gyors bejutási lehetőséget kell biztosítani az utasforgalmi épületbe.*

6.17 **Ajánlott gyakorlat. -** *A szerződő állam, ha a forgalom az igényt alátámasztja, gondoskodik arról, hogy a légi-jármű üzemeltetők, repülőterek és a repülőtéri kiszolgálás üzemeltetői fontolóra vegyék megfelelő méretű és a szükséges gyermek-gondozási berendezési tárgyakkal rendelkező gyermek váróterem kialakítását az indulási és a tranzit csarnokban, amellyel speciális területet nyújtanak a szülei vagy gondozói kíséretében lévő csecsemők/kisgyermekek számára. E termeket lássák el megfelelő egyértelmű jelzésekkel.*

6.18 **Ajánlott gyakorlat. -** *A repülőtér utasforgalmi épületei között, valamint az utasforgalmi épületek és a távolabb lévő parkolási lehetőséget nyújtó létesítmény között könnyű és gyakori szállításról kell gondoskodni.*

6.19 **Ajánlott gyakorlat. -** *Fontolóra kell venni, hogy a személypoggyász felvevő létesítményt a felszíni szállítás érkezési pontjához a lehető legközelebb telepítsék.*

6.20 **Ajánlott gyakorlat. -** *A szerződő állam, kellő mértékben figyelembe véve a szükséges védelmi óvintézkedéseket és ellenőrzési követelményeket tanulmányozza annak lehetőséget, hogy engedélyezi repülőtéren kívüli utas felvevő létesítmény kialakítását,*

6.21 **Ajánlott gyakorlat. -** *A légi-járművek indításának szolgálatában a szerződő államok, ha az utasokat védelmi célból, vagy kábítószer ellenőrzés céljából - amelyik megfelelő - átvizsgálják, akkor a lehetőség adta mértékben e vizsgálatokhoz specializált berendezéseket alkalmazzanak annak érdekében, hogy csökkentsék azon személyek számát, akiket más eszközökkel kell átkutatni.*

1. Megjegyzés. - Az utasok átvizsgálásánál a radiológiai módszerek alkalmazása kerülendő.

2. Megjegyzés. - A teljes fizikai átkutatás (motozás) alkalmazásakor a nyilvánosság teljes egészében kizárandó. Ha e célra szolgáló speciális helyiség nem áll rendelkezésre, akkor hordozható elválasztó fal is alkalmazható.

6.22 **Ajánlott gyakorlat. -** *A légi-járművek indításának szolgálatában a szerződő állam, ha a felségterületéről kilépő utasok poggyászait védelmi célból, vagy kábítószer ellenőrzés céljából átvizsgálja, akkor a lehetséges mértékben e vizsgálatokhoz készített célberendezéseket alkalmazzon annak érdekében, hogy csökkentse azon poggyászok számát, amelyeket egyéb eszközökkel kell átvizsgálni.*

6.23 **Ajánlott gyakorlat. -** *Az utasok, hajózószemélyzeti tagok és a poggyászok kezelésére és beszállítására - ha az engedélyezésüket felgyorsítja - egyenkénti és folyamatos "csöpögtető" módszert* *alkalmazzanak a csoportos (tömeges) módszer helyett.*

6.24 **Ajánlott gyakorlat. -** *Külön figyelmet kell fordítani a személypoggyászokat válogató, szállító, egyeztető és rakodó eszközök használatára. A lehető legteljesebb mértékben rendelkezzen az alábbiakkal:*

a) a forgalom nagyságával összhangban lévő, nagyon rövid idő alatt nagymennyiségű poggyász válogatására, szállítására és berakodására alkalmas gépesített rendszer;

b) a személypoggyászok újra egyeztetéséhez, válogatásához és nyomon követéséhez a (Licence Plate Concept) néven ismert egyedi poggyászazonosító rendszer használata. Az ACI/IATA által kidolgozott Licence Plate Concept definíciója a IATA Utas Szolgálati Konferencia Határozatok Kézikönyvében (IATA Passenger Services Conference Resolution Manual) (740. Határozat) és ugyanezen kézikönyv megfelelő ajánlott gyakorlataiban szerepel. A módszer része egy automatikusan leolvasható és a légi-jármű üzemeltetők, a repülőterek és a földi kiszolgáló ügynökségek között elektronikus úton továbbítható kódolt, egyedi számazonosítóval ellátott poggyászcímke. Ez az érintett felek számára magasabb színvonalú személypoggyász válogatást és kezelést tesz lehetővé. A poggyászegyeztető készülék (lásd a 17. Annex 4.4.3 pontját) ugyancsak használhatja ugyanezen adat elemeket.

c) olyan terület létesítése, ahol a poggyászkonténerek tárolhatók és tartalmuk átrendezhető; és

d) az üres poggyászkonténerek kezelésére és válogatására a forgalom nagyságának megfelelő gépesített kezelési lehetőség.

6.25 **Ajánlott gyakorlat. -** *A hajózószemélyzet által az üzemeltetéssel összefüggésben felkeresni szükséges területek legyenek közvetlenül elérhetőek, és ha lehet, egymás mellett helyezkedjenek el.*

IV. Belépő utas, személyzet és poggyász

6.26 A szerződő állam gondoskodjon kellő számú ellenőrző folyosóról, hogy a beérkező utasok, és hajózószemélyzeti tagok áteresztése a lehető legkisebb késedelemmel legyen végezhető. Lehetőség szerint legyenek kiegészítő folyosók, ahová a bonyolultabb esetek irányíthatók anélkül, hogy emiatt a többi utas késedelmet szenvedne.

6.27 **Ajánlott gyakorlat. -** *Külön figyelmet kell fordítani azokra a pontokra, ahol a tapasztalat szerint az utasok gyakran szenvednek késedelmet.*

6.28 Az utas bármiféle késedelmének elkerüléséhez minden szükséges lépést megtéve kell biztosítani, hogy a személypoggyász időben megérkezzen a poggyász kiadó területre.

6.28.1 **Ajánlott gyakorlat. –** *Alkalmas megoldások kívánatosak a személypoggyászok - beleértve a konténerekben lévőket is - légi-járműről történő gyors kirakodását és a személypoggyász átvételi területre juttatásához. Ennek érdekében, ha a forgalom nagysága megkívánja, gépesített csomagkirakodó és szállító rendszereket alkalmazzanak, továbbá mindig elegendő létszámú csomagkezelő személyzet álljon rendelkezésre.*

6.29 **Ajánlott gyakorlat. -** *A személypoggyász kiadó területen kellő teret kell biztosítani ahhoz, hogy minden utas könnyen felismerhesse, és magához vehesse személypoggyászát.*

6.30 **Ajánlott gyakorlat. -** *A személypoggyász kiadó területen, ha a személypoggyász mennyiség szükségessé teszi, a személypoggyászt az utas felé szállító, és felvételét az utas számára megkönnyítő gépesített poggyászterítő rendszert alakítsanak ki.*

6.30.1 **Ajánlott gyakorlat. -** *A nemzetközi repülőtérért felelős hatóságok az utasnak személypoggyásza elviteléhez biztosítsanak segédletet, az utas számára lehetővé téve, hogy személypoggyászait a poggyászkiadó területről a lehető legközelebb juttassa azokhoz a pontokhoz, ahonnan a repülőtérről távozó, illetve a repülőtér terminálok között földfelszíni szállítási lehetőség biztosított.*

V. Az utasok és hajózószemélyzetek tranzitálása és átszállítása

6.31 **Ajánlott gyakorlat. -** *A szerződő állam megfelelő biztonsági intézkedések megtételének függvényében, ha lehetséges mindig engedélyezze, hogy üzemanyag töltési műveletek alatt az utasok a légi-jármű fedélzetén maradhassanak, illetve, hogy ki- és beszállításuk végezhető legyen.*

6.31.1 **Ajánlott gyakorlat. -** *Különösen ajánlatos olyan műszaki és szabályozási intézkedéseket elfogadni, hogy az üzemanyag feltöltési művelet alatt a légi-járműhöz és onnan elvezető teleszkópos utas-hidak mindvégig igénybe vehetők legyenek.*

6.32 **Ajánlott gyakorlat. -** *A szerződő állam, ha a forgalom mértéke és jellege szükségessé teszi, gondoskodjon arról, hogy a repülőtéren olyan létesítmény álljon rendelkezésre, ahol az ideiglenesen ott tartózkodó, de ugyanazzal a légi-járművel továbbutazó, vagy más járatra átszálló hajózószemélyzet vagy utas – repülésvédelmi, vagy különleges körülmények esetét kivéve - a vizsgálati formaság elvégzésének kötelezettsége nélkül időlegesen várakozhat.*

Megjegyzés.- E rendelkezésnek nem célja kizárni a kábítószer ellenőrzéshez megfelelő intézkedések alkalmazását.

6.33 **Ajánlott gyakorlat. -** *Az egyik légi-járműről másikba átszálló és vámkezelés alá nem eső utasok kezeléséhez a tranzit területen légitársasági utas-kezelő pultokról kell gondoskodni.*

6.34 **Ajánlott gyakorlat**. *– Kívánatos megszervezni, hogy a rövid állásidővel továbbinduló hajózószemélyzeti tagok a kormányzati ügynökségekkel (például a légiforgalmi irányítással, meteorológiai szolgálattal) személyes megjelenés nélkül, a légi-jármű rakodási helyének közelében - a forgalmi előtéren lévő ponton vagy ahhoz közeli helyen - kialakított helyiségben televízión, vagy telefonon keresztül tudjanak kapcsolatba lépni.*

VI. Az utasforgalmi épületben kialakított különféle létesítmények és szolgáltatások

6.35 **Ajánlott gyakorlat. -** *A tranzitutasok számára szánt létesítmények az utas kényelmét szolgáló minden szükséges felszereléssel rendelkezzenek.*

6.35.1 **Ajánlott gyakorlat. -** *A nemzetközi repülőtéren poggyászmegőrző helyeket alakítsanak ki, ahol későbbi elvitel céljából az utas személypoggyászát hátrahagyhatja.*

6.35.2 A nemzetközi repülőtereket fel kell szerelni olyan működés biztos tároló létesítménnyel, ahol az át nem vett, azonosítatlan, vagy tévesen kezelt poggyászt az engedélyezéshez addig tárolják, míg az illető állam területén alkalmazandó kormányzati előírásokkal és eljárásokkal egyezésben nem továbbítják, nem jelentkeznek érte, vagy visszaszállításukról nem gondoskodnak. A légitársasági személyzetnek a repülőtér teljes üzemidejére hozzáférést kell biztosítani poggyászokhoz.

6.36 **Ajánlott gyakorlat. -** A*z utazni nem szándékozó közönség utasforgalmi épületbe való beengedése mértékének megfelelő intézkedéseket kell foganatosítni az induló és érkező forgalom áramlása akadályozatásának elkerülése érdekében.*

6.36.1 **Ajánlott gyakorlat. –** *Az utasforgalmi épületen belüli zsúfoltság lehető legkisebbre csökkentése érdekében intézkedés szükséges, hogy a csoportos/társas utaztatók részére az indulási és/vagy érkezési terek köz- vagy nem ellenőrzött területein kijelölt létesítmény legyen.*

6.37 **Ajánlott gyakorlat. -** *Ha az utasforgalmi épületekben csak az induló utasok részére, vagy az induló és az érkező utasok részére egyaránt vámmentes vagy egyéb termékeket árusítanak, intézkedni szükséges az üzletek alkalmas elhelyezésére, hogy nagyszámú utas kényelmesen hozzáférhessen, hogy hatékony legyen a kiszolgálás, és a vásárlóknak elegendő légteret biztosítson, elkerülendő az induló és érkező forgalom fő áramának akadályozása.*

VII. – Áru- és postaküldemény kezelő és vámengedélyező létesítmények

6.38 **Ajánlott gyakorlat. -** *A szerződő állam intézkedjen, hogy a teljes egészében árut szállító légi-jármű és rakományának beléptetése és engedélyeztetése az áru terminál területén legyen végrehajtható.*

6.39 **Ajánlott gyakorlat. -** *Az áruterminálokhoz könnyű és gyors megközelítési lehetőséget biztosítsanak, számításba véve az igen nagy méretű teherautók terület igényét a megközelítési útvonalon és a terminál előtti manőverek végrehajtásához.*
6.40 **Ajánlott gyakorlat. -** *Minden áruterminál rendelkezzen a tehergépkocsik rakfelületéhez igazítható kiadó/átvevő rakodóhelyekkel.*

6.41 **Ajánlott gyakorlat. -** *Ahol indokolt, a teheráru berakodáshoz, kirakodáshoz, földi szállításhoz és tárolásához gépesített és automatizált berendezéseket kell alkalmazni.*

6.42 **Ajánlott gyakorlat. -** A *teheráru terminálokban a légi-szállítmány kezelése és raktározása érdekében, ideértve az egység rakodó lapok és a konténer rakományok képzését és lebontását, a vámterület közelében létesített olyan megfelelő területről kell gondoskodni, amely a jogosult jármű és személy számára mind a repülőtér előtere, mind a közforgalmi oldal felől könnyen megközelíthető. Az ilyen létesítmény megoldása legyen tekintettel a repülésvédelmi és a kábítószer ellenőrzés megfelelő intézkedéseire is.*

6.43 **Ajánlott gyakorlat. -** *Az üres konténerek ideiglenes tárolására a nemzetközi repülőtéren, vagy a repülőtéren kívül megfelelő helyen megfelelő területet és létesítményt biztosítsanak.*

6.44 **Ajánlott gyakorlat. -** *Az áruterminálokat lássák el az olyan speciális rakományok tárolására szolgáló létesítményekkel, mint például az értékes küldemények, romlandó szállítmányok, emberi maradványok, radioaktív anyagok és egyéb veszélyes anyagok, valamint az élő állatok. Az áruterminál azon térségei legyenek megfelelő védelemmel ellátottak az illetéktelen személyek behatolása ellen, ahol a légi-szállításra váró normál vagy speciális árut, illetve posta küldeményeket tárolják.*

6.45 **Ajánlott gyakorlat. -** *A használaton kívüli anyagmozgató eszközök tárolására parkoló terület legyen kialakítva a teheráru épületek körül, amelyeken az eszközöket az induló és az érkező teheráru forgalom akadályoztatása nélkül kell elhelyezni.*

6.46 **Ajánlott gyakorlat**. - *Ha vegyes - utas és áru - rakományt is szállító nagy befogadóképességű légi-járművet utas-terminál közelébe állítanak be, akkor minden eszközről gondoskodjanak a nagymennyiségű légi teheráru légi-járműről történő gyors ki/berakodásához, a rakomány légi-jármű* *és áruraktár közötti gyors szállításához. Ennek érdekében az anyagmozgatás útvonalát az utasok, és személypoggyászok áramlási vonalának zavarása nélkül alakítsák ki.*

6.47 **Ajánlott gyakorlat. -** *Ahol szükséges, segítsék elő a nagymennyiségű, vagy nehéz rakomány repülőtérről az importőr vagy az ügynök vagy az árutovábbító telephelyeire jóváhagyott fuvarozással történő közvetlen elvitelét, miután az ilyen elszállítás vámengedélyeztetéshez és az ehhez kapcsolódó egyéb feltételekhez kötött.*

6.48 **Ajánlott gyakorlat. -** *A nemzetközi repülőtéren kellőképpen nagy és megfelelő területet ajánlott biztosítani, ahol a továbbmenő áruszállítmány azonnali vagy későbbi továbbszállítás céljából vámhatósági felügyelettel szétbontható, válogatható és újra összeállítható. Az ilyenfajta megoldás vegye figyelembe a vonatkozó repülésvédelmi és a megfelelő kábítószer ellenőrzési intézkedéseket.*

6.49 **Ajánlott gyakorlat. -** *Ha a repülőtér árukezelő kapacitása elégtelen és a bővítés lehetősége korlátozott vagy megoldhatatlan, repülőtéren kívüli vámszabad területen való tárolási lehetőség engedélyezhető. Az engedélyeztetés meggyorsítása és a repülőtéri raktárak zsúfoltságának enyhítése érdekében, a rakomány repülőtér és vámszabad raktár közötti szállítása a lehető legkevesebb eljárási lépést tegye szükségessé.*

6.50 **Ajánlott gyakorlat. -** *Ha a postaszállítmány mennyisége szükségessé teszi és a postai hatóságok véleménye szerint a postai küldemények továbbindítását gyorsítja, a nemzetközi repülőtéren megfelelő területet és létesítményeket ajánlatos biztosítani a postaküldemények újrafeldolgozásához, válogatásához és továbbindításához. Az ilyenfajta megoldás vegye figyelembe a vonatkozó repülésvédelmi és a megfelelő kábítószer ellenőrzési intézkedéseket.*

C. - Közegészségügyi, orvosi elsősegély, állat és növény karantén megvalósításához szükséges eszközök

6.51 A szerződő állam a repülőtér üzemeltetőkkel együttműködésben köteles gondoskodni a nemzetközi repülőtereken a közegészségügy megtartásáról, ideértve az emberi, állati és növényi karanténokat.

6.52 **Ajánlott gyakorlat. -** *A szerződő állam, minden nagyobb nemzetközi repülőterén vagy azok közelében gondoskodjon oltó, vagy újraoltó és a megfelelő bizonyítványt kiállító létesítményekről és szolgálatokról.*

6.53 **Ajánlott gyakorlat. -** *A nemzetközi repülőtéren álljanak rendelkezésre a légi-járműre, hajózószemélyzeti tagra, utasra, személypoggyászra, teherárura, posta küldeményre és ellátmányra vonatkozó közegészségügyi, állati- és növényi karanténozási intézkedések bonyolítására szolgáló megfelelő létesítmények.*

6.54 **Ajánlott gyakolrat. -** *A szerződő állam gondoskodjon olyan megoldásokról, amelyek révén a tranzitáló utas vagy hajózószemélyzeti tag a fertőzést és betegséget hordozó férgek bármiféle veszélyétől mentes területen tartózkodhasson; ha szükséges, az utas és a hajózószemélyzeti tag másik terminálra, vagy egy közeli repülőtérre - mindenféle egészségügyi veszélyeztetést kizáró - átszállítási lehetőségét biztosítsa. Az állatok esetében hasonló létesítményekről és intézkedésekről ajánlatos gondoskodni.*

6.55 A repülőtér üzemeltetőkkel és a légi-jármű üzemeltetőkkel együttműködésben a szerződő állam köteles minden lépést megtenni, amellyel biztosítható, hogy akár a repülőtéren, akár a légi-járművön való fogyasztásra szánt élelmiszer- és vízellátmány beszerzése, előállítása, kezelése, tárolása és felszolgálása higiénikusan, az ENSZ Egészségügyi Világszervezet (WHO) vonatkozó szabványaival és ajánlásaival, illetve az Élelmezési és Mezőgazdasági Szervezet (FAO) vonatkozó ajánlásaival összhangban legyen végrehajtva.

6.56 A repülőtér üzemeltetőkkel és a légi-jármű üzemeltetőkkel együttműködésben a szerződő állam köteles minden lépést megtenni, amellyel biztosítható, hogy az emberi ürülék, a szemét, a szennyvíz, a hulladék, a felhasználatlan étel vagy ételmaradék, és egyéb - az ember, az állat és a növény egészségére veszélyt jelentő - anyagok biztonságos eltávolítására és megsemmisítésére hatékony rendszer legyen kialakítva. Ez legyen összhangban az ENSZ Egészségügyi Világszervezet (WHO) vonatkozó szabványaival és ajánlásaival, illetve az Élelmezési és Mezőgazdasági Szervezet (FAO) vonatkozó ajánlásaival.

6.57 **Ajánlott gyakorlat. -** *A nemzetközi repülőtereken szervezett, azonnali válaszlépéseket tévő helyszíni elsősegélynyújtó személyzetet és létesítményt tartsanak fenn, továbbá megfelelő szervezési megoldással gondoskodjanak arról, hogy az alkalmanként előforduló súlyosabb esetek mielőbb kerüljenek az előzetes megállapodás szerinti illetékes orvosi ellátás alá.*

D. - Az engedélyező ellenőrzéshez és az ellenőrző szolgálatok működéséhez szükséges eszközök

6.58 **Ajánlott gyakorlat. -** *Az engedélyező ellenőrzés végzésével megbízott hatóságok számára szolgáló helyet és létesítményeket amennyire csak lehetséges közpénzen biztosítsák.*

6.59 Ha a 6.58 ajánlott gyakorlatban említett helyet és létesítményeket nem közpénzen biztosítja, a szerződő állam köteles gondoskodni arról, hogy ezeket a területeket és létesítményeket ne kedvezőtlenebb feltételekkel biztosítsák, mint amilyen feltételek az állam területére belépő és hasonló méretű területet és létesítményeket igénylő egyéb szállítási mód üzemeltetőjére vonatkoznak.

6.60 A szerződő államok kötelesek az érintett hatóságok elégséges és illetékmentes szolgáltatás nyújtásáról gondoskodni az üzemeltetők részére, az e hatóságok által megállapított üzemidőn belül.

Megjegyzés - Ha a forgalom nagysága és a rendelkezésre álló terület és létesítmények szükségessé teszik, a szerződő állam kívánatosnak tarthatja, hogy az utasok és személypoggyászaik részére ne csak egyetlen helyen biztosítsanak engedélyező ellenőrzést.

6.60.1 A szerződő állam a közszolgálati hatóságok szolgáltatásait elegendő mértékben úgy köteles biztosítani, hogy a tényleges igényeket és ily módon a hatóságok által meghatározott munkaidőszak alatt a forgalom nagyságát kielégítve reagáljon.

1. Megjegyzés.- A 6.60 és a 6.60.1 szabványt a Nemzetközi Egészségügyi Szabályok (1969) harmadik, 1983. évi javított kiadásának 82. cikkelye szerint kell alkalmazni, amely értelmében az egészségügyi hatóság -a Nemzetközi Egészségügyi Szabályzatban (IHR) előírt orvosi vizsgálatok egyike esetében sem vagy egy érkező utas oltásáért illetve annak igazolásáért sem róhat fel illetéket. Az IHR előírja, hogy fizetség behajtása, vagy elfogadása nem engedhető meg sem a nappali, sem az éjszakai órákban végzett vizsgálat ellenében. A 24. Cikkely előírja, hogy az egészségügyi intézkedéseket azonnal meg kell kezdeni, és késedelem nélkül végre kell hajtani.

2. Megjegyzés.- A 15. Annex - Légiforgalmi Tájékoztató Szolgálatok - értelmében az állam köteles a nemzetközi repülőterein biztosított határátlépést engedélyező szerveinek (vám, bevándorlás, egészségügy) fajtáját és üzemidejét közzétenni.

6.61 A 6.60 és 6.60.1 pontban említett nemzetközi repülőtereken a lényeges munkateher lefedésére megállapított munkaidőszakon kívül, a légi-jármű üzemeltetők részére az ilyen hatóságok szolgáltatását a szerződő állam köteles nem kedvezőtlenebb feltételekkel biztosítani, mint amilyen feltételek az állam területére belépő egyéb szállítási mód üzemeltetőjére vonatkoznak.

6.62 **Ajánlott gyakorlat. -** *A szerződő állam intézkedjen, hogy felségterületén lehetővé váljon más állam* *vonatkozó közszolgálati hatóságai képviselőinek tartózkodása a légi-járművek, utasok, hajózószemélyzeti tagok, személypoggyász, teheráru megvizsgálása, illetve a vámkezelési, bevándorlási, közegészségügyi, állati- és növényi karanténozás dokumentálása céljából azt megelőzően, hogy ezek az illető másik állam felé elindulnának feltéve, hogy ez az eljárás a másik állam területére megérkezéskor szükséges engedélyezési eljárásokat segíti. Alternatív megoldásként a szerződő államok megegyezés szerint, a fentiekben felsorolt funkciók közül bármelyik esetében, a másik államba érkezéskori engedélyeztetés elősegítését célzó, elektronikus elő-engedélyeztetést alakíthatnak ki.*

E. – Pénzváltási eszközök

6.63 A szerződő állam köteles gondoskodni arról, hogy nemzetközi repülőterein láthatók legyenek más államok pénznemeinek saját nemzeti pénznemre való átváltását szabályozó rendelkezései.

6.64 Más állam pénznemeire továbbra is átváltás ellenőrzést fenntartó szerződő állam köteles intézkedni arról, hogy:

a) közzétegye az ilyen pénznemek hivatalos és érvényes átváltási árfolyamait;

b) nemzetközi repülőterein jelenítse meg, vagy egyéb módon tegye hozzáférhetővé az illető repülőtéren az érdeklődésre elsődlegesen számításba vehető átváltási árfolyamokat.

6.65 Ha más államok pénznemei közül némelyik vagy mindegyik átváltását a szerződő állam nem ellenőrzi, nemzetközi repülőterein köteles ilyen értelmű tájékoztatást megjeleníteni.

6.66 **Ajánlott gyakorlat. -** *Más államok olyan pénznemei esetében, amelyekre az illető szerződő állam ellenőrzött beváltási árfolyamot nem alakított ki, a szerződő állam tegyen kivitelezhető intézkedéseket arra, hogy nemzetközi repülőterein az éppen érvényes szabadpiaci átváltási árfolyamról tájékoztatás álljon rendelkezésre.*

6.67 A szerződő állam köteles biztosítani, hogy nemzetközi repülőterein kormányzati ügynökségek vagy arra felhatalmazott magánügynökségek révén, az utazóközönség igényeit kielégítő időben, megfelelő lehetőség álljon rendelkezésre más államok pénznemeinek törvényes átváltásához. E lehetőség az induló és az érkező utas számára egyaránt legyen igénybe vehető.

Megjegyzés.- E rendelkezés megvalósítása során a szerződő állam lehetséges megoldásként, az induló utas számára külföldi valuta beszerzésre a nappal, vagy az éjszaka bármely időszakában lehetőséget nyújtó pénzváltó automaták alkalmazását vegye fontolóra, amelyek a nemzetközi repülőtereken igen hasznosnak bizonyultak.

6.69 **Ajánlott gyakorlat.-** *Más államok pénznemeinek behozatalát, vagy kivitelét korlátozó szerződő állam gondoskodjon róla, hogy az állam területére belépéskor az utazó igazolást kapjon kézhez, rajta feltüntetve a tulajdonában lévő valuta mennyiségét, továbbá tegye lehetővé az utas számára, hogy az állam elhagyását megelőzően az ilyen igazolást bemutató személy az igazoláson szereplő valuta mennyiséget magával vihesse. Ugyanerre a célra szolgálhat az útlevélbe, vagy egyéb hivatalos utazási dokumentumba tett bejegyzés is.*

6.70 **Ajánlott gyakorlat. -** *A saját pénznemének behozható mennyiségét korlátozó, vagy behozatalát tiltó állam, a külföldről érkező és az érvényes rendelkezések szerint engedélyezett mennyiséget meghaladó ilyen valutát bevalló utas számára ésszerű lehetőséget biztosítson, hogy ezt az összeget az érkezés nemzetközi repülőterén letétbe helyezhesse és indulás alkalmával ugyanazon a repülőtéren, vagy az érintett közszolgálati hatóságok által kijelölt egyéb más ponton visszaigényelhesse.*

F. Engedetlen utasok

6.70 **Ajánlott gyakorlat** - *A szerződő államok tegyék meg a szükséges lépéseket annak érdekében, hogy tudatosítsák az utasokban, miszerint a légi-közlekedés létesítményeiben és a légi-jármű fedélzetén elfogadhatatlan és következményekkel jár az engedetlen vagy erőszakos magatartás.*

6.71 **Ajánlott gyakorlat** – *A szerződő államok megkövetelhetik, hogy tartsanak képzést az utasokkal kapcsolatban álló alkalmazottaknak és hajózószemélyzetnek a zavaró vagy engedetlen utas magatartás észleléséről, megérzéséről és kezeléséről, az előreláthatóan eszkalálódó helyzetek felismeréséről, a krízis féken tartásáról és egyéb idevágó tudnivalókról.*

7. FEJEZET - LESZÁLLÁS NEMZETKÖZI REPÜLŐTÉRTŐL ELTÉRŐ HELYEN

A. - Általános rész

7.1 A parancsnok pilóta akaratán kívüli ok miatt másutt, mint a szerződő állam nemzetközi repülőtéren leszállt légi-jármű esetében a szerződő állam intézkedésekkel köteles biztosítani, hogy közszolgálati hatóságai minden lehetséges segítséget adjanak meg az ilyen légi-jármű részére és ennélfogva ilyen esetekben a belépés ellenőrzési formaságokat és eljárásokat a legszükségesebbre korlátozzák..

7.2 A parancsnok pilóta, vagy a rangban utána következő rendelkezésre álló hajózószemélyzeti tag köteles intézkedni, hogy a leszállásról az illetékes közszolgálati hatóságokat a lehető leghamarabb értesítsék.

B. - Rövid útmegszakítás

7.3 Ha nyilvánvaló, hogy leszállást követően a légi-jármű rövid időn belül képes folytatni útját, a következő eljárást kell alkalmazni:

7.3.1 Az ellenőrző intézkedéseket arra kell korlátozni, amelyekkel biztosítható, hogy a légi-jármű ugyanazzal a rakománnyal száll fel, mint amely érkezéskor a fedélzetén volt. Ha a rakomány, vagy annak egy része üzemi, vagy egyéb oknál fogva nem folytathatja útját az illető járaton, a közszolgálati hatóságok az engedélyezési formaságokat kötelesek megkönnyíteni és az ilyen rakomány mielőbbi rendeltetési helyére juttatása érdekében kötelesek együttműködni.

7.3.2 Szükség esetén, a közszolgálati hatóságok kötelesek az általános ellenőrzési körükbe tartozó területen belül területet kijelölni, amelyen az utas és a hajózószemélyzeti tag útmegszakítása idején mozoghat.

7.3.3 A parancsnok pilótától nem várható el, hogy a felszállás engedélyezését (minden szükséges egyéb légiforgalmi irányítói engedélyt leszámítva) egynél több kormányzati ügynökségtől kelljen kérelmeznie.

C. - A repülés újrakezdésének meg nem történte

7.4 Ha nyilvánvaló, hogy a légi-jármű nem képes folytatni útját vagy hosszabb ideig késedelmet szenved, a következő rendelkezéseket kell alkalmazni:

7.4.1 A parancsnok pilótát fel kell jogosítani az általa szükségesnek tartott vészhelyzeti lépések megtételére annak érdekében, hogy az utasok és a hajózószemélyzet épségének és biztonságának, illetve magának a légi-járműnek és rakományának a megsemmisülését elkerüljék, vagy a legcsekélyebbre csökkentsék addig, amíg az illetékes közszolgálati hatóságok utasításaira várakoznak, vagy akkor, ha sem maga sem a hajózószemélyzet nem képes e hatóságokkal kapcsolatba lépni.

7.4.2 Az utasoknak és a hajózószemélyzet tagjainak engedni kell, hogy a szükséges formaságok elvégzéséig megfelelő elhelyezést biztosítsanak maguknak, ha e formaságok gyorsan nem végezhetők el.

7.4.3 Ha a teherárut, ellátmányt és a feladott poggyászt biztonsági okok miatt a légi-járműből ki kell rakodni, azt a közelben lévő területen kell elhelyezni, és a szükséges formaságok befejezéséig ugyanott kell tartani.

7.4.4 A postaszállítmányt az Általános Postaegyesülés idevágó érvényes rendelkezései szerint letétbe kell helyezni.

8. FEJEZET – EGYÉB ELŐÍRÁSOK AZ ALAKISÁGOK EGYSZERŰSÍTÉSÉRE

A. Letét, és mentesülés az elkobozás vagy lefoglalás alól

8.1 **Ajánlott gyakorlat. -** *Ha valamely légi-jármű üzemeltetőtől a szerződő állam vám, bevándorlási, közegészségügyi, állat és növény karanténozási, vagy hasonló törvénye hatályából fakadó tartozásainak fedezésére letétet kíván meg, akkor a légi-jármű üzemeltető számára lehetővé kell tennie, hogy amikor csak lehetséges, egyetlen összesítő letétet használjon.*

8.2 **Ajánlott gyakorlat. -** *A szerződő államnak (nem az, amelyben ilyen légitársaságot létrehoztak) a területére települt légi-jármű üzemeltető légi-járműveit, földi felszereléseit, védelmi berendezéseit, tartalék alkatrészeit és műszaki ellátmányait amelyeket e szerződő államot kiszolgáló nemzetközi légi szolgáltatásban használnak fel, mentesítenie kell a légi-járművek, berendezések, alkatrészek és közhasználatra szolgáló tartalékok lefoglalásnak vagy elkobozásának terhe alól, függetlenül a szerződő állam - jogszabályai megsértésének esetére vonatkozó - elkobozási jogától.*

B. Segélynyújtás eltűnt légi-jármű felkutatásában, mentésében, balesetkivizsgálásában és roncsmentésben

8.3 A 12. Annex - *Kutatás és Mentés,* és a 13. Annex - *Légi-jármű baleset- és esemény kivizsgálás* által megkívánt minden körülményt figyelembe véve, a szerződő állam köteles intézkedni annak biztosítására, hogy valamely elveszett vagy megsérült légi-jármű felkutatásához, mentéséhez, baleset-kivizsgálásához, javításához, vagy elszállításához szükséges képesített személyzet ideiglenes jelleggel, késedelem nélkül beléphessen felségterületére.

8.3.1 A 8.3 pontban említett személyzet késedelem nélküli belépésének intézésekor, ha ilyen dokumentumot egyébként előír, a szerződő állam az útlevélen kívül semmilyen egyéb utazási dokumentumot ne követlejen (ve.ö. 3.4).

8.3.2 **Ajánlott gyakorlat. -** *Ha a 8.3. pontban említett személyzet esetében a szerződő állam továbbra is belépő vízumot követel, amikor szükséges és kivételes alapon az ilyen vízumot az érkezéskor adja ki, vagy bebocsátásukat egyéb módon segítse elő, ha az ilyen személyzet birtokol a saját államuk illetékes hatóságaitól származó elrendelést a küldetés végrehajtására (ve.ö. 3.38).*

8.3.3 **Ajánlott gyakorlat. -** *A szerződő államok biztosítsák, hogy hatóságai kellően tájékozottak a 13. és a 9. Annex légi-jármű baleset- és eseménykivizsgálás megkönnyítésével kapcsolatos rendelkezései tekintetében. Az állam ismerje fel annak szükségességét, hogy az érintett kivizsgálók a baleset vagy az esemény helyszínére közlekedésüket késedelem nélkül legyenek képesek elintézni, továbbá ha szükséges, e céljuk elérésében segítse őket.*

8.4 Minden szerződő állam köteles elősegíteni a felségterületére minden légi-jármű, szerszám, tartalék alkatrész és olyan berendezések ideiglenes belépését, amelyek egy másik állam sérült légi-járművének felkutatásához, mentéséhez, balesetének kivizsgálásához, javításához vagy elszállításához szükségesek. Mindezeket a javakat ideiglenesen vámmentesen, egyéb adók vagy költségektől mentesen kell beengedni és semmi olyan jellegű előírást nem szabad alkalmazni, amelyek a javak importálását korlátozza.

Megjegyzés – Érthető, hogy ezek az intézkedések nem zárják ki a közegészségügyi, állat- és növény karanténozási előírások végrehajtását, amikor ezekre szükség van.

8.5 Minden egyes szerződő állam köteles elősegíteni felségterületéről mind a sérült, mind a mentő légi-járművek elszállítását, velük együtt a kutatás, mentés, baleset kivizsgálás, javítás, vagy helyreállítás céljából esetleg behozott szerszámok, tartalék alkatrészek és berendezések elszállítását.

8.6 Ha a szerződő állam felségterületéről az illető állam által meghatározott időn belül nem szállítják el a sérült légi-járművet, vagy annak részeit, illetve a benne lévő ellátmányt vagy teherárut, és a kutatás, mentés, balesetkivizsgálás, javítás, vagy helyreállítás céljából ideiglenesen használt légi-járműveket, szerszámokat, alkatrészeket vagy berendezéseket, akkor azok az illető állam idevágó törvényi rendelkezéseinek hatálya alá kerülnek.

8.7 Ha valamely légi-jármű balesetének kivizsgálásával kapcsolatban szükségessé válik a sérült légi-jármű valamelyik részének műszaki ellenőrzése és vizsgálat céljából egy másik szerződő államba küldése, akkor minden érintett szerződő állam biztosítsa, hogy az ilyen részek továbbítása késedelem nélkül megtörténjen. Az érintett szerződő államok hasonlóképpen tegyék lehetővé az ilyen részek vagy alkatrészek visszaküldését, a baleset kivizsgálását végző államba, ha ez utóbbi államnak a kivizsgálás befejezése miatt szüksége van ezekre a darabokra.

C. - Segélynyújtó repülések az emberi egészséget vagy a környezetet súlyosan veszélyeztető természeti és ember által előidézett és hasonló, az Egyesült Nemzetek Szervezetének (ENSZ) segítségét igénylő katasztrófát követően

8.8 A szerződő államok kötelesek elősegíteni az ENSZ részéről elismert nemzetközi szervezet által, vagy maguk az államok által, illetve megbízásukból végrehajtott segélynyújtó repülésben résztvevő légi-járművek területükre történő belépését, arról történő kilépését, vagy azon történő áthaladását, és minden lehetséges intézkedést meg kell hozniuk azok biztonságos üzemelésének garantálására. Ilyen repülések azok a segélyrepülések, amelyeket a természeti, vagy ember által előidézett katasztrófákra, valamint hasonló, az ENSZ segítségét igénylő és az emberi egészséget, vagy a környezetet súlyosan veszélyeztető vészhelyzeti körülményekre reagálva hajtanak végre. Az ilyen repüléseket a lehető leggyorsabban meg kell kezdeni azt követően, hogy a fogadó államtól a beleegyezés megérkezett.

1. Megjegyzés. - Az Alapfogalmak Nemzetközileg Elfogadott Gyűjteménye szerint, az Egyesült Nemzetek Humanitárius Ügyek Osztálya a vészhelyzetet "hirtelen és előre nem látható, a hátrányos következmények minimumra csökkentéséhez azonnali intézkedéseket igényelő" eseménynek, míg a katasztrófát olyan eseménynek tekinti, amely "a társadalom működésében nagymértékű emberi, anyagi vagy környezeti veszteséget okozó súlyos törés, amelynek csak saját erőből történő leküzdése meghaladja az illető társadalom erejét".

2. Megjegyzés.- A segélynyújtó repülések biztonságos üzemének biztosítására szolgáló intézkedések tekintetében a következőkre hívjuk fel a figyelmet: 11. Annex – Légi-forgalmi szolgálatok; A polgári légi-jármű üzemelésre potenciálisan veszélyes katonai tevékenységekkel kapcsolatos biztonsági intézkedések kézikönyve (Doc 9554); és a Polgári légi-jármű elfogásának kézikönyve (Doc 9433).

8.9 A szerződő államoknak biztosítaniuk kell, hogy a 8.8 szabvány szerinti segélynyújtó repülésekkel érkező személyzet és cikkek belépésének engedélyezési eljárása szükségtelen késedelem nélkül végbemenjen.

D. Vészhelyzeti műveletek tenger szennyeződés és a tengeri biztonság terén

8.10 Kényszerhelyzet alkalmával a szerződő államok felségterülete tekintetében segítsék elő azoknak a légi-járműveknek belépését, átrepülését és kilépését, amelyek a tenger szennyezettségének leküzdésében vagy megakadályozásában, vagy a tenger biztonsága, az élővilág biztonsága, vagy a tengeri környezet megóvása érdekében szükséges egyéb tevékenységben vesznek részt.

8.11 Kényszerhelyzet esetén a szerződő államok a lehető legnagyobb mértékben segítsék elő a 8.10 szabványban leírt tengeri szennyezettség elleni és tengerbiztonsági tevékenységhez szükséges személyek, felszerelés, anyagok és berendezések belépését, átrepülését, kilépését.

E. A nemzetközi egészségügyi előírások és vonatkozó rendelkezések végrehajtása

8.12 A szerződő államok tegyenek eleget az Egészségügyi Világszervezet (WHO) Nemzetközi Egészségügyi Szabályainak érvényes kiadásában szereplő rendelkezéseknek. Az említett szabályok 23. cikkelyével egyezésben, a szerződő államok legfeljebb azokat az intézkedéseket alkalmazhatják az utasok, személypoggyászaik, a rakomány és egyéb cikkek beléptetésénél, amelyek a szabályzatban megengedettek.

8.13 **Ajánlott gyakorlat. -** *Olyan esetekben, amikor a járványügyi helyzet ezt lehetővé teszi, és ez az intézkedés megszünteti, vagy csökkenti a szükséges egészségügyi eljárásokat, a szerződő államok, összhangban a Nemzetközi Egészségügyi Szabályok harmadik javított 1983. évi kiadásának 85. cikkely 1. és 1/d pontjaival, egészségügyi ellenőrzés céljából vonják össze felségterületeiket, vagy létesítsenek egymás között erre vonatkozó megállapodásokat.*

8.14 A szerződő államok az egységes elfogadhatóság biztosítása érdekében tegyenek meg minden lehetséges intézkedést azért, hogy az oltási szervek az oltási, vagy újraoltási nemzetközi formanyomtatványt alkalmazzák.

8.15 **Ajánlott gyakorlat. –** *Minden egyes szerződő állam tegyen intézkedéseket annak érdekében, hogy az összes illetékes légi-jármű üzemeltető és ügynökség az indulás előtt kellő időben tájékoztatást tudjon adni utasainak az utazási céljuk államaiban érvényes oltási előírásokról, továbbá, hogy utasaikat el tudják látni a Nemzetközi Egészségügyi Szabályok (1969) megfelelő oltási, vagy újraoltási igazolás formanyomtatványával.*

8.16 A légi-jármű üzemeltetők kötelesek eleget tenni a szerződő állam minden vonatkozó követelményének, amelyek értelmében az esetleges légi betegség kivételével a légi-járművön mutatkozó bármilyen betegséget azonnal rádión keresztül tudatni kell a légi-jármű utazási célja szerinti szerződő állam egészségügyi hatóságaival, ami által lehetővé válik, hogy a légi-jármű megérkezéséig gondoskodni lehet az orvosi segítségnyújtáshoz és egészségügyi eljárásokhoz szükséges bármilyen különleges orvosi személyzet és eszköz jelenlétéről.

F. Nemzeti alakiság egyszerűsítő programok létrehozása

8.17 Minden egyes szerződő államnak ki kell alakítania nemzeti alakiság egyszerűsítő programokat az Egyezmény és a 9. Annex követelményeinek megfelelően.

8.18 Minden egyes szerződő állam köteles biztosítani, hogy a nemzeti légi szállítási alakiság egyszerűsítő programjának célja az legyen, hogy elfogadjon minden hasznos intézkedést a légi-járművek, hajózószemélyzeti tagok, utasok, teheráru, posta küldemények és raktárkészletek mozgásának elősegítése érdekében, a szükségtelen akadályok és késlekedés megszüntetésével.

8.18.1 **Ajánlott gyakorlat**. - *Az államok a nemzeti polgári alakiság egyszerűsítési programjuk létrehozásakor használják a 12. Függelékben közölt útmutató anyagot.*

8.19 Minden egyes szerződő állam köteles létrehozni nemzeti légi-szállítási alakiság egyszerűsítő bizottságot és repülőtéri alakiság egyszerűsítő bizottságot vagy hasonló koordinációs testületet a kormányhivatalok, ügynökségek és más olyan érintett állami szervek közötti együttműködés elősegítése érdekében, amelyek illetékesek vagy felelősek a nemzetközi polgári repülés és hasonlóképpen a repülőterek és a légi-jármű üzemeltetők sokféle nézőpontja tekintetében.

8.20 **Ajánlott gyakorlat. -** *A szerződő állam törekedjen a polgári repülésvédelem és az alakiság egyszerűsítési programja közötti, körülményekhez igazított szoros koordináció megvalósítására. E célból, az Alakiság Egyszerűsítési Bizottság bizonyos tagjai egyben legyenek tagjai a Repülésvédelmi Bizottságnak is.*

8.21 **Ajánlott gyakorlat. -** *A nemzeti légi-szállítási alakiság egyszerűsítő bizottság és a repülőtéri alakiság egyszerűsítő bizottság létrehozásakor az állam használja fel a 11. és 12. Függelékben található útmutatást.*

G. - Különleges segítséget igénylő utasok szállításának elősegítése

I. Általános rész

8.22 **Ajánlott gyakorlat. -** *Csökkent képességű személyeknek – utazásukkor - megkülönböztetett segítségség nyújtása szükséges annak érdekében, hogy számukra is igénybe vehető legyen a nagyközönség számára általában nyújtott minden szolgáltatás. E segítség körébe tartozik a média útján közzétett - a felismerési vagy érzékszervi hiányossággal bíró utas számára - érthető tájékoztatás és útbaigazítás.*

8.23 **Ajánlott gyakorlat. -** *A szerződő államoknak arra való tekintettel is működjenek együtt, hogy minden szükséges lépést megtesznek, amellyel az utazás kezdetétől a végéig biztosítható, hogy a csökkent képességű személyek az utazásuk elejétől a végéig annak egymáshoz kapcsolódó összes láncszeméhez hozzáférnek.*

8.24 **Ajánlott gyakorlat. -** *A szerződő államok a légi-jármű üzemeltetőkkel, repülőterekkel és a földi kiszolgáló üzemeltetőkkel tegyék meg a szükséges lépéseket a csökkent képességű személyek szállítási szolgáltatásai tekintetében egységes hozzáférési minimum szabványok létrehozására, az indulási repülőtérre érkezéstől egészen a célrepülőtér elhagyásáig.*

8.25 **Ajánlott gyakorlat. -** *A szerződő államok a légi-jármű üzemeltetőkkel, a repülőterekkel, a földi kiszolgáló üzemeltetőkkel és az utazási ügynökségekkel együtt tegyék meg a szükséges lépéseket, hogy a csökkent képességű személyek a számukra fontos információkat megkapják. Gondoskodjon arról, hogy a légi-jármű üzemeltetők, a repülőterek, a földi kiszolgáló üzemeltetők és az utazási ügynökségek legyenek olyan helyzetben, hogy a csökkent képességű személyeknek utazásukhoz az igényüktől függő szükséges segítséget megadják.*

8.26 **Ajánlott gyakorlat. -** *A szerződő államok tegyenek meg minden szükséges lépést, amellyel kiképző programok létrehozása és összehangolása céljából biztosítható a légi-jármű üzemeltetők, a repülőterek és a földi kiszolgáló üzemeltetők együttműködése, amelynek révén elérhető, hogy kiképzett személyzet áll rendelkezésre a csökkent képességű személyek segítségére.*

II. A repülőtér megközelíthetősége

8.27 A szerződő államok kötelesek meghozni a szükséges intézkedéseket, amelyekkel biztosítható, hogy a repülőtéri létesítmények és szolgáltatások alkalmazkodjanak a csökkent képességű személyek igényeihez.

8.28 **Ajánlott gyakorlat. -** *A szerződő államok gondoskodjanak arról, hogy megfelelő emelő rendszer, vagy más alkalmas berendezés legyen biztosított érkezéskor és induláskor is ott, ahol utas-híd használatának hiányában ez szükséges az idősebb, vagy a csökkent képességű utasok légi-jármű és utas-terminál közötti közlekedésének segítésére.*

8.29 **Ajánlott gyakorlat. -** *Intézkedések megtételével biztosítsák, hogy a hallás- és látáskárosult személyek a repülési információkhoz hozzájuthassanak.*

8.30 **Ajánlott gyakorlat. -** *Az utas-terminál épületnél az odavitt vagy onnan elviendő idősebb és a csökkent képességű személyek részére a fenntartott helyeket a főbejárathoz lehető legközelebb kell kijelölni. A repülőtér különböző területei elérésének megkönnyítéséhez a megközelítési útvonalaknak akadálymenteseknek kell lenniük.*

8.31 **Ajánlott gyakorlat.-** *Ahol a közérdekű szolgáltatáshoz a hozzáférhetőség korlátozott, minden* *erőfeszítést tegyenek meg a mozgásukban segítségre szoruló személyek részére az elérhető és elfogadható áru földi szállítási szolgáltatás biztosítására, a meglévő és a tervezett nyilvános átszállító rendszer alkalmassá tételével vagy speciális szállító szolgáltatás biztosításával.*

8.32 **Ajánlott gyakorlat. -** *A mozgásukban segítségre szoruló személyek részére megfelelő parkolási létesítményt biztosítsanak, továbbá a parkoló épület és az utas-terminál közötti közlekedésük elősegítésére hozzanak megfelelő intézkedéseket.*

8.33 **Ajánlott gyakorlat. -** *Elsősorban az idősebb és a csökkent képességű személyek egyik légi-járműről egy másikra történő közvetlen átszállását, ahol szükséges és lehetséges, engedélyezni kell minden esetben, amikor ezt a csatlakozó járatok közötti időtartam vagy egyéb más körülmény megkívánja.*

III. A légi szolgáltatások hozzáférhetősége

8.34 A szerződő államok kötelesek a szükséges lépéseket megtenni, amelyekkel biztosítható, hogy a csökkent képességű személyek a légi szolgáltatásokhoz a kívánatos módon hozzáférhessenek.

8.35 **Ajánlott gyakorlat. -** *A szerződő államok léptessenek életbe rendelkezéseket, amelyek által az újonnan vagy nagyobb átalakítás után szolgálatba állított légi-járműveknek teljesíteniük kell a hozzáférésükre vonatkozó egységes minimum szabványt a légi-jármű fedélzeti berendezések tekintetében, amelyek körébe tartozik a felhajtható kartámasz, a fedélzeti tolószék, a mosdók, az alkalmas világítás és a jelzések.*

8.36 **Ajánlott gyakorlat. -** *A csökkent képességű személy számára szükséges kerekesszék, különleges készülék és felszerelés utas-kabinban történő szállítása legyen díjmentes, ha a légi-jármű üzemeltető nézete szerint az ilyen szállítást az elhelyezés és a biztonsági követelmények lehetővé teszik, vagy elsőbbséget élvező poggyásznak minősítik. A vonatkozó nemzeti, vagy légi-jármű üzemeltetői szabályzatok alkalmazásának függvényében ugyancsak díjmentesen szállítandó a csökkent képességű utas társaságában lévő szolgálatot ellátó állat.*

8.37 **Ajánlott gyakorlat. -** *Elviekben, a csökkent képességű személynek legyen megengedve a döntés, hogy igényt tart-e kísérőre és, hogy orvosi engedély iránti igény nélkül repül. Ha viszont segítség vagy emelés szükséges, akkor előzetes értesítés legyen kötelező. Csak olyan orvosi esetekben legyen megengedve a légi-jármű üzemeltetőnek orvosi engedélyt követelni a csökkent képességű utastól, amikor egyértelmű, hogy az illető állapota miatt saját vagy a többi utas biztonsága nem garantálható, vagy ha nem garantálható, hogy az illető jól fogja érezni magát. Továbbá, csak olyan esetekben legyen megengedve a légi-jármű üzemeltetőnek a csökkent képességű utashoz kísérőt követelni, amikor egyértelmű, hogy az illető magatehetetlen, és mint ilyen, nem garantálható a saját vagy a többi utas biztonsága, vagy ha nem garantálható, hogy az illető jól fogja érezni magát.*

8.38 **Ajánlott gyakorlat. -** *Arra az esetre, ha kísérő jelenléte szükséges, a szerződő államok a légi-jármű üzemeltetőt bátorítsák, hogy csökkentett díjtételű szállítást kínáljon az illető kísérő személy számára.*

H. Segítségnyújtás a légi-jármű baleset áldozatainak és családtagjaiknak

8.39 A légi-jármű baleset helyszínének állama és a szomszédos államok kötelesek úgy intézkedni, hogy elősegítsék a légi-jármű baleset áldozatai családtagjainak ideiglenes alapú belépését felségterületükre.

8.40 A légi-jármű balest helyszínének állama és a szomszédos államok kötelesek olyan intézkedéseket is tenni, amellyel elősegítik, hogy felségterületükre ideiglenes alapon beléphessenek a balesetet szenvedett légi-jármű üzemeltető vagy szövetséges partnere képviselői, hogy lehetővé tegyék számukra a segítségnyújtást a túlélőknek és családtagjaik, a baleset elhunyt áldozatai családtagjainak, és az állam illetékes hatóságainak.

Megjegyzés – A „code-sharing” és hasonló szövetségesi megállapodások néha szükségessé teszik, hogy a szövetséges partner, mint „első felelős” lépjen fel az érintett üzemeltető nevében abban az esetben, amikor a szövetséges partner a baleset helyszínére előbb tud odaérni, mint az érintett üzemeltető.

8.41 **Ajánlott gyakorlat –** *A 8.39 pontban felsorolt személyek belépésének elintézésekor a baleset helyszínének állama és a szomszédos államok a kizárólagosan e személyek számára kiadott útlevélen vagy vészhelyzeti utazási dokumentumon kívül más utazási dokumentumot ne igényeljenek ahhoz, hogy ezekbe az államokba beutazhassanak. Ha a 8.39 és 8.40 pontban felsorolt személyek számára a baleset helyszínének állama vagy egy szomszédos állam belépő vízumot igényel, gyorsítsa meg ezeknek a vízumoknak a kiadását.*

8.42 A szerződő államok kötelesek szükség esetén vészhelyzeti utazási dokumentumokat kiadni a balesetet túlélt állampolgárainak.

8.43. A szerződő államok kötelesek az összes szükséges segítségnyújtást kiterjeszteni, mint például az elszállítás és vámengedély elintézése tekintetében, az emberi maradványok hazatelepítésére a származási államba az áldozat családtagjainak vagy a balesetet szenvedett üzemeltetőnek a kérésére.

1. FÜGGELÉK - ÁLTALÁNOS NYILATKOZAT (GEN.DEC.)

ÁLTALÁNOS NYILATKOZAT
(indulási/érkezési)

Üzemeltető ....

Felség- és lajstromjel * .... Járatszám .... Dátum ....

Indulási hely .... Érkezési hely...
(helység) (helység)

A JÁRAT ÚTVONALA
(a "hely" rovatban felsorolandó: az első indulási-, a közbeeső leszállások és a rendeletési helyek)

HELY	SZEMÉLYZETI TAGOK ÖSSZLÉTSZÁMA	UTASOK SZÁMA EZEN A SZAKASZON**
		Indulási helyen: Beszállók: Ugyanazon járaton továbbutazók: *Érkezési helyen:* Kiszállók: Ugyanazon járaton továbbutazók:

*Egészségügyi nyilatkozat**
Beteg személyek száma a fedélzeten, de nem a légibetegek, vagy balesettel kezeltek (ideértve azokat az utasokat, akiken hasmenés, kiütés, hideglelés tünetei, vagy jelei mutatkoznak) és az út során kiszállt személyek betegség tünetei ....

....

A betegség terjedéséhez hozzájáruló fedélzeti egyéb körülmények
....

Repülés közben végzett minden fertőtlenítés, vagy kezelés adatai (hely, dátum, idő, módszer). Ha repülés közben fertőtlenítést nem végeztek, az utolsó fertőtlenítés adatai...
....

Aláírás, ha szükséges ______________________
(illetékes személyzeti tag)

A hivatal bejegyzései

Kijelentem, hogy az Általános Nyilatkozatban és a vele együtt benyújtott összes kiegészítő űrlapon minden bejegyzés és adat teljes, szabatos, legjobb tudásom szerint a valóságnak megfelel és minden tranzit utas folytatja/folytatni fogja útját a járattal.

Aláírás ______________________________
felhatalmazott ügynök, vagy a légi-jármű parancsnoka

297 mm vagy 11 ¾ hüvelyk

210 mm (vagy 8 ¼ hüvelyk)

A formanyomtatvány mérete 210 mm x 297 mm (avagy 8 Ľ ×11 Ľ hüvelyk).

* Csak akkor kell kitölteni, ha az állam megkívánja

** Nem kell kitölteni utas bizonylat benyújtása esetén, csak akkor kell kitölteni, ha az állam ezt előírja.

2. FÜGGELÉK – UTAS BIZONYLAT

UTASBIZONYLAT

Üzemeltető ....

Nemzetiségi és lajstromjel* .... Járatszám .... Dátum ....

Beszállási pont .... Kiszállási pont ....
(helyiség) (helyiség)

Vezetéknév és kezdőbetűk	Az üzemeltető tölti ki	A hivatal tölti ki
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....

297 mm vagy 11 ¾ hüvelyk

210 mm (vagy 8 ¼ hüvelyk)

A formanyomtatvány mérete 210 mm x 297 mm (avagy 8 Ľ ×11 Ľ hüvelyk).

* Csak akkor kell kitölteni, ha az állam előírja

3. FÜGGELÉK – ÁRUBIZONYLAT

ÁRUBIZONYLAT

Üzemeltető ....

Nemzetiségi és lajstromjel* .... Járatszám .... Dátum ....

Berakodási hely .... Kirakodási hely ....
(helység) (helység)

Légifuvalevél szám	Csomagok száma	Áru jellege*	Az üzmeltető kizárólagos használatára	A hivatal tölti ki
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....

297 mm vagy 11 ¾ hüvelyk

210 mm (vagy 8 ¼ hüvelyk)

A formanyomtatvány mérete 210 mm x 297 mm (avagy 8 Ľ ×11Ľ hüvelyk).

* Csak akkor kell kitölteni, ha az állam előírja

4. FÜGGELÉK – TARTÓS FÉREGTELENÍTÉSI BIZONYÍTVÁNY

.... KORMÁNYA

TARTÓS FÉREGTELENÍTÉSI BIZONYÍTVÁNY

E légi-jármű .... belső felületei, beleértve a raktereket is, ... -án
(lajstromjel) (dátum)
permethrinnel kezelték az Egészségügyi Világszervezet ajánlásaival és ezen ajánlások módosításával összhangban (WHO Weekly Epidemological Record No. 7, 1985. 47. oldal; No. 12, 1985. 90. oldal; No. 45, 1985. 345-346 oldal); és No. 44, 1987. 335-336 oldal).

A kezelést meg kell ismételni minden esetben, ha a takarítás, vagy egyéb tevékenység a lerakódott permethrin nagy részét eltávolítja, továbbá mindenképp a fenti dátumot követő 8 héten belül.

Lejárat ideje: ....

Aláírás: ....

Megnevezés: ....

Dátum: ....

5. FÜGGELÉK - BESZÁLLÓ/KISZÁLLÓ KÁRTYA

NEMZETKÖZI
BESZÁLLÓ/KISZÁLLÓ KÁRTYA

(Kérjük nagybetűkkel nyomtatni*)

1. Név: ....
(vezetéknév) (keresztnév)

2. Születési dátum: ....
(év) (hónap) (nap)

3. Állampolgárság: ....

4. Útiokmány: ....
kibocsátó állam *Dokumentum típus* *száma*

5. Érkező utasoknak:
beszállási repülőtér ....
vagy
Induló utasoknak:
érkezési repülőtér

6. (Egyéb adatok, az állam kívánsága szerint)

a) ....

b) ....

c) ....

* A latin ABC-t alkalmazó nyelvekre vonatkozik

6. FÜGGELÉK - A VÁMÜGYI EGYÜTTMŰKÖDÉSI TANÁCS AJÁNLÁSA*

A légi úton érkező utasokra vonatkozó és a kétfolyosós rendszerre alapuló egyszerűsített vámhatósági eljárás (1971 június 8.)

"A VÁMÜGYI EGYÜTTMŰKÖDÉSI TANÁCS,

Figyelembe véve a nemzetközi repülőtérre beérkező személypoggyászok gyors felszabadítására szolgáló kétfolyosós rendszerekre vonatkozó és ICAO tanács által 1968 decemberében elfogadott Nemzetközi Polgári Repülési Szervezet Alakiság Egyszerűsítési Divíziójának B-3 ajánlását;

Tekintettel a kétfolyosós, avagy piros/zöld rendszerre vonatkozó és az Európai Polgári Repülési Konferencia második köztes ülésszakán 1969 júliusában elfogadott 11. számú ajánlására;

A nemzetközi repülőtereken az utasforgalom áramlás javítását célzó erőfeszítések segítésének szándékával;

Tekintettel arra, hogy ez a célkitűzés az utasok és a személypoggyászok vám ellenőrzése kétfolyosós rendszeren alapuló egyszerűsített eljárás bevezetésével valósítható meg;

Figyelembe véve, hogy az ilyen rendszer az ellenőrzés hatékonyságának csökkenése nélkül alkalmazható, továbbá a vámhatóságok számára a növekvő utaslétszám hatékony kezelhetőségét biztosítja anélkül, hogy arányosan növelnék a vámügyi szervek alkalmazotti létszámát;

Tekintettel arra, hogy a zökkenőmentes működés miatt alapvető fontosságú, hogy az államok a rendszer jellemzőit összehangolják;
Ajánlja, hogy a tagszervezet, a repülőtér üzemeltetővel és más illetékes hatóságokkal együttműködve, a nemzetközi repülőtereken az érkező utasok, és személypoggyászaik vámkezelésére az alább ismertetett kétfolyosós rendszert vezesse be:

1) A rendszer tegye lehetővé az utasnak, hogy a kétféle folyosó közül választhasson:

a) az egyik (zöld folyosó), a kereskedelmi árucikkekkel nem, vagy olyan árucikkel rendelkező utasok számára, amely árucikkek behozatali vámilleték és adómentesen bebocsáthatók, illetve nem esnek behozatali tilalom vagy korlátozás alá;

b) a másik (piros folyosó) a többi utas számára.

2) Mindkét folyosót egyértelműen és feltűnően kell jelezni, amely révén az utas a választási lehetőséget könnyen megértve tud választani közülük. Az alapvető megkülönböztető jelzés a következő legyen:

a) az 1) a) pontban említett folyosóé zöld alapú szabályos nyolcszög és a "NINCS VÁMKEZELENDŐ ÁRU" (NOTHING TO DECLARE) szavak;

b) az 1) b) pontban említett folyosóé piros alapú négyzet, és a "VÁMKEZELENDŐ ÁRU" (GOODS TO DECLARE) szavak;

Ezeken felül, mindkét folyosót a "VÁMKEZELÉS" (CUSTOMS - DOUANE) szavat magában foglaló felirattal kell jelezni.

3) A 2) pontban említett szöveget angolul és/vagy franciául, illetve az illető repülőtér esetében hasznosnak ítélt egyéb más nyelven kell feltüntetni.

4) Az utasoknak a megfelelő folyosó megválasztására kellőképpen figyelemfelkeltő tájékoztatással kell ráirányítani. Emiatt lényeges, hogy:

a) az utas kapjon felvilágosítást a rendszer működéséről és a zöld folyosón átvihető termékek megnevezéséről és mennyiségéről. Ez biztosítható a repülőtéren kihelyezett plakátokkal, vagy táblákkal, illetve a repülőtéren a közönség számára rendelkezésre álló, vagy az utazási irodák a légi-közlekedési vállalatok és egyéb érdekelt szervezetek által közvetlenül kiosztott tájékoztató füzetekkel.

b) a folyosókhoz vezető utak egyértelmű jelzéssel legyenek ellátva.

5) A folyosókat a személypoggyász kiadó helyet követően kell kialakítani úgy, hogy a folyosó kiválasztásakor már az utasnál legyen minden poggyásza. Továbbá, a folyosót úgy kell kialakítani, hogy onnan az utasok útja a repülőtér kijáratáig a lehető legközvetlenebb legyen.

6) A poggyászkiadó hely és a folyosók bejáratai között kellő távolságot kell biztosítani, hogy az utas számára lehetőséget adjon eldönteni, melyik folyosót válassza, és a választott folyosóba torlódás előidézése nélkül tudjon besorolni.

7) A zöld folyosón az utast ne vessék alá vámvizsgálati formalitásnak, viszont a vámhatóság végezhet helyszíni ellenőrzést; a piros folyosón haladó utasnak teljesítenie kell a vámhatóság előírt formalitásait.

Hangsúlyozza, hogy a kétfolyosós rendszer nem szükségszerűen összeférhetetlen az egyéb – például a pénzváltás - ellenőrzések alkalmazásával kivéve, ha a vonatkozó előírások az utasok és a személypoggyászaik teljes ellenőrzését követelik;

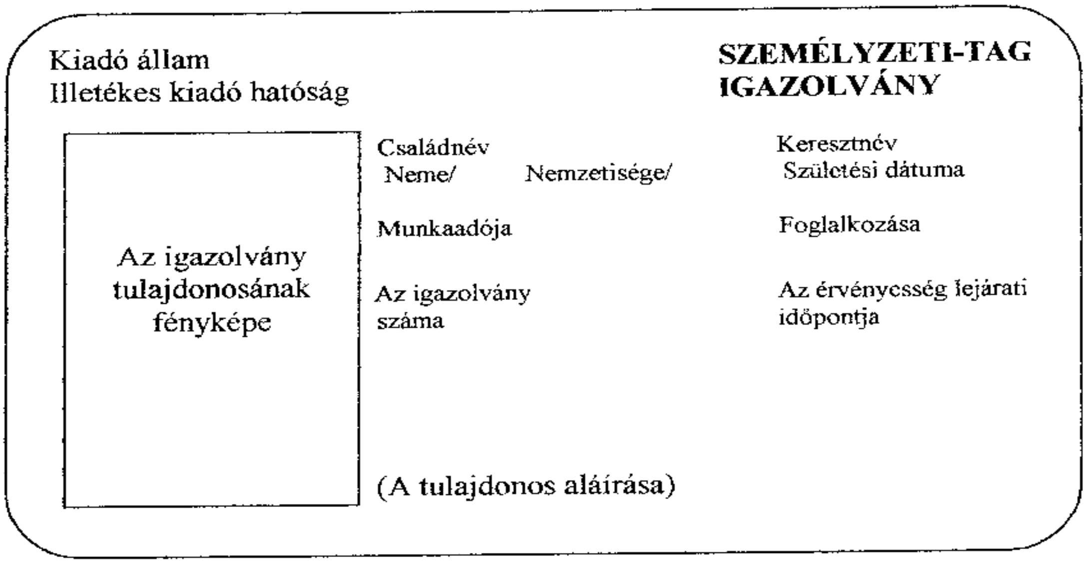
Fenti ajánlást elfogadó tagszervezeteket a Tanács felkéri, hogy a főtitkárt értesítsék:

a) az ajánlás elfogadási és alkalmazási dátumáról;

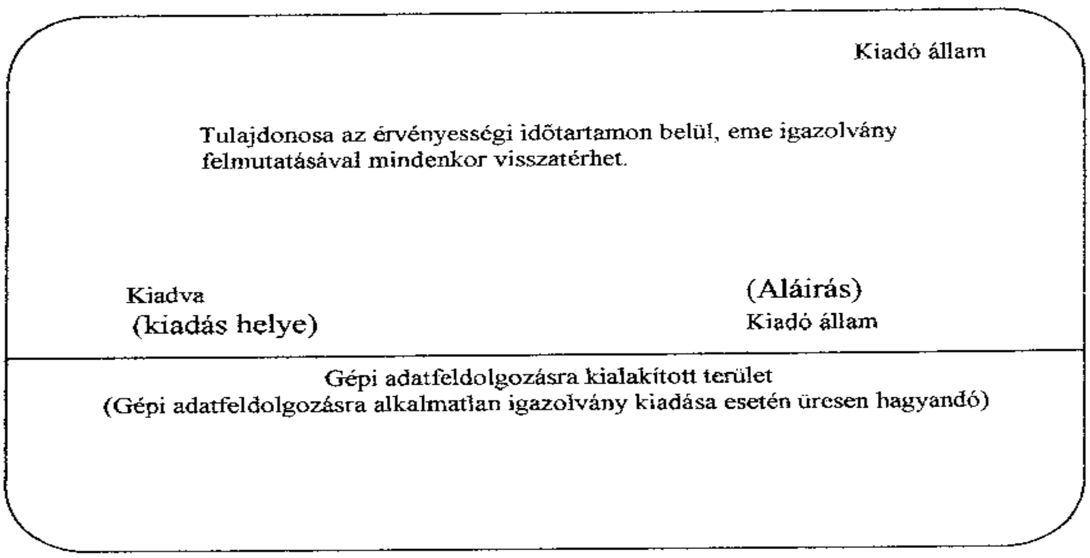
b) azokról a repülőterekről, amelyeken a kétfolyosós rendszert bevezették.

E tájékoztatókat a főtitkár megküldi a tagszervezetek vámhatóságai részére, a Nemzetközi Polgári Repülési Szervezet (ICAO) főtitkára és a Nemzetköz Szállítási Szövetség (IATA) vezérigazgatója részére.”

7. FÜGGELÉK – HAJÓZÓSZEMÉLYZETI TAG IGAZOLVÁNY (CMC)



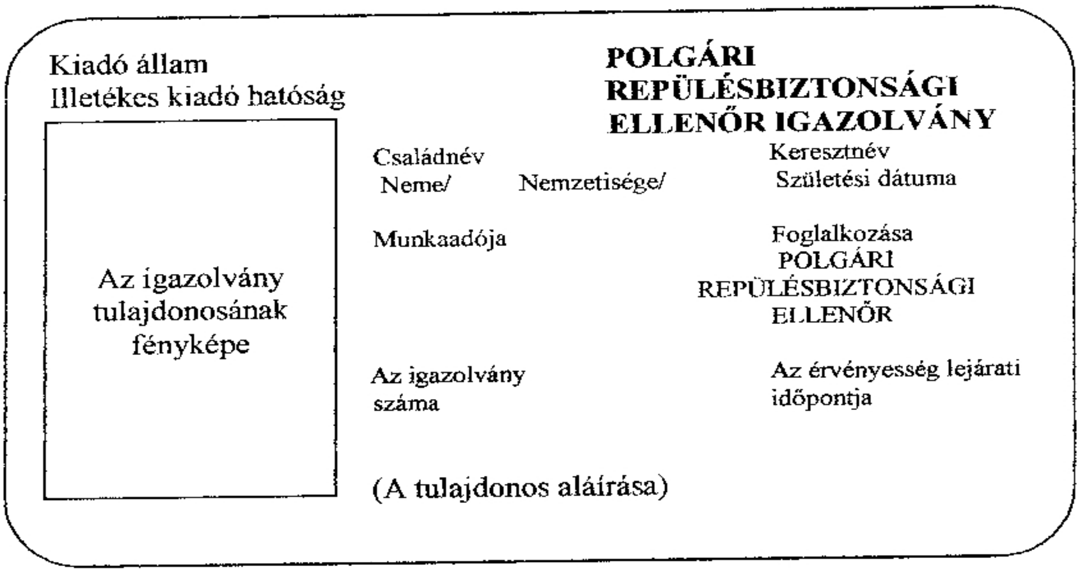
A CMC első oldala



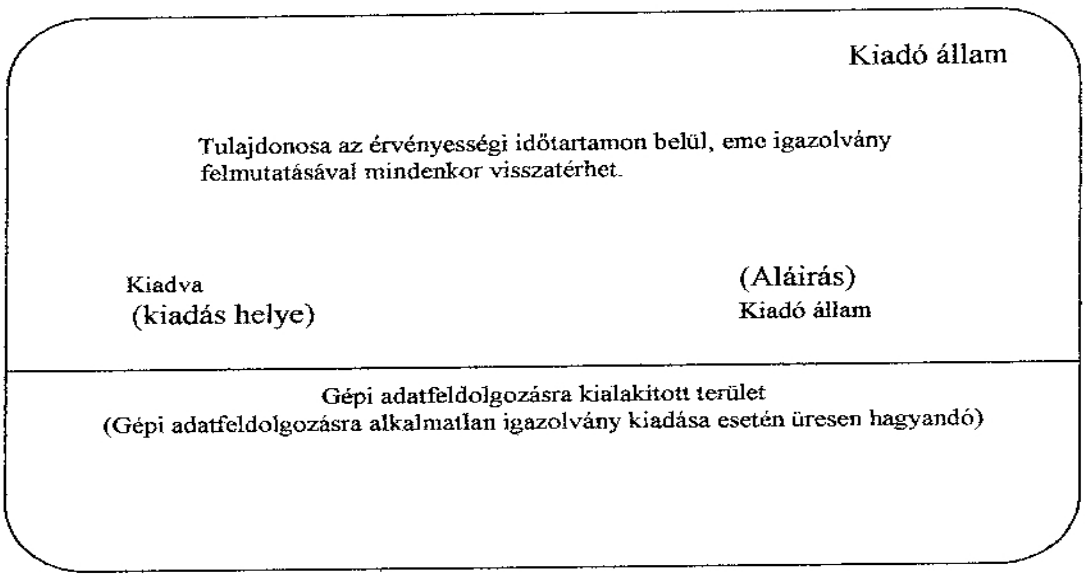
A CMC hátsó oldala

Megjegyzés.- A gépi adatfeldolgozásra alkalmas személyzeti tag igazolvány részletes leírása a Doc 9303, 3. Rész – Forma 1. és Forma 2 - Gépi adatfeldolgozásra alkalmas hivatalos utazási dokumentumok című kiadványban található.

8. FÜGGELÉK - POLGÁRI REPÜLÉSBIZTONSÁGI ELLENŐR IGAZOLVÁNY



Az igazolvány első oldala



Az igazolvány hátsó oldala

Megjegyzés.- A gépi adatfeldolgozásra alkalmas igazolvány részletes leírása a Doc 9303, 3. Rész – Forma 1. és Forma 2 - Gépi adatfeldolgozásra alkalmas hivatalos utazási dokumentumok című kiadványban található

9. FÜGGELÉK - A NEM BEBOCSÁTHATÓ SZEMÉLY VISSZAIRÁNYÍTÁSÁHOZ KÖTŐDŐ DOKUMENTUMOK JAVASOLT FORMÁJA

1. AZ ELVESZETT VAGY MEGSEMMISÜLT UTAZÁSI DOKUMENTUMOKKAL KAPCSOLATOS TANÚSÍTÓ OKIRAT (lásd az 5.6 pontot)

Feladó: a Bevándorlási, vagy más illetékes
hatóság: (neve)
Repülőtér: (neve)
Állam: (neve)
Telefonszám:
Telexcím:
Telefaxcím:

Címzett: Bevándorlási, vagy más illetékes
hatóság: (neve)
Repülőtér: (neve)
Állam: (neve)

A személy, aki részére e dokumentumot kiállítottuk, (dátum)-án, (név) repülőtérre, a (járatszám) járattal érkezett (város és állam)-ból.

Eme be nem bocsáthatónak talált személy útidokumentumait elvesztette, vagy megsemmisítette és állítása szerint/tudomásunk szerint (a nem megfelelő szövegrész áthúzással törlendő és e pont minden további alátámasztó szöveggel kiegészítendő).

Vezetéknév:

Keresztnév:

Születési dátum:
Születési hely:

Állampolgársága:

Lakóhely:

Fénykép
(ha van)

A beszállító társaságot utasítottuk az utas államunk területéről (dátum)-án, (időpont)-kor, (repülőtérnév) repülőtérről induló (járatszám) járattal történő eltávolítására.

A Nemzetközi Polgári Repülési Szervezet 9. Annexe felkéri a szerződő államot, hogy a legutolsó tartózkodási helyként területén tartózkodó és onnan a közelmúltban eltávozó utast ismételt vizsgálatra fogadja el, ha az utas belépését egy másik állam megtagadta.

Dátum:

Tisztviselő neve:
Beosztása:
Aláírása:
A bevándorlási, vagy más illetékes hatóság neve:

(Figyelmeztetés: ez NEM személyazonosság igazoló dokumentum)

2. CSALÓK ÁLTAL BEMUTATOTT hamisított, másolt vagy utánzott utazási VAGY SZRMAZÁSI dokumentumokRA vonatkozó levél(lásd az 5.7 pontot)

Feladó: a Bevándorlási, vagy más illetékes
hatóság: (neve)
Repülőtér: (neve)
Állam: (neve)
Telefonszám:
Telexcím:
Telefaxcím:

Címzett: Bevándorlási, vagy más illetékes
hatóság: (neve)
Repülőtér: (neve)
Állam: (neve)

E levélhez mellékeltük a hamisított, másolt, vagy utánzott útlevél/azonosító/származási igazolvány másolatát.
A dokumentum száma:
Az állam neve, amely nevében a dokumentumot kiadták:

A fent említett dokumentumot, magát az alábbinak valló személy használta:

Vezetéknév:

Keresztnév:

Születési dátum:

Születési hely:

Állampolgárság:

Lakóhely:

Fénykép
(ha van)

E személy (város és állam)-ból (dátum)-án a (járatszám) járattal érkezett (repülőtér neve) repülőtérre.

Tulajdonosának belépését (az állam neve)-ba megtagadtuk és a beszállító társaságot utasítottuk az utas államunk területéről (dátum)-án, (időpont)-kor, (repülőtérnév) repülőtérről induló (járatszám) járattal történő eltávolítására.

A fent említett dokumentumra tulajdonosának bűnvádi eljárásában bizonyítékként szükség esz és ezért lefoglaltuk. Mivel ez a dokumentum azon állam tulajdonát képezi, amely nevében kiadták, ezért azt a bűnvádi eljárást követően a megfelel hatóságok részére visszaszolgáltatjuk.

A Nemzetközi Polgári Repülési Szervezet 9. Annexe felkéri a szerződő államot, hogy a legutolsó tartózkodási helyként területén tartózkodó és onnan a közelmúltban eltávozó utast ismételt vizsgálatra fogadja el, ha az utas belépését egy másik állam megtagadta.

Dátum:

Tisztviselő neve és aláírása:
Beosztása:
A bevándorlási, vagy más illetékes hatóság neve:

(Figyelmeztetés: ez NEM személyazonosság igazoló dokumentum)

10. FÜGGELÉK - AZ EGYESÜLT NEMZETEK SZERVEZETÉNEK TERVEZŐ KULCSA KERESKEDELMI DOKUMENTUMOKHOZ

Szállító (exportáló)	Dátum: Hivatkozási szám: stb.
Címzett	Egyéb címek (például a vásárlóé, ha nem azonos a címzettel)
Értesítési, vagy szállítási cím:	Az országokra vonatkozó bevallás
A szállításra vonatkozó közlemények	Átadási és fizetési feltételek
Jelek és számok; a csomagok száma és fajtája; a javak jellemzése	Statisztikai szám Nettó mennyiség Érték Össz tömeg Méret
Szabad felhasználású terület	Kiadás helye és dátuma; aláírás

297 mm vagy 11 ¾ hüvelyk

210 mm (vagy 8 ¼ hüvelyk)

11. FÜGGELÉK - A REPÜLŐTÉRI ALAKISÁG EGYSZERŰSÍTÉS (FAL) MODELJE

1. A REPÜLŐTÉRI ALAKISÁG EGYSZERŰSÍTŐ PROGRAM CÉLJA

A repülőtéri alakiság egyszerűsítő program célja, hogy a 9. Annex célkitűzéseit kövesse üzemeltetési szinten, a légi-járművek, hajózószemélyzetek, utasok, és a teheráruk tekintetében a repülőtereken elősegítse a határ engedélyezési formalitások teljesítését.

2. A REPÜLŐTÉRI ALAKISÁG EGYSZERŰSÍTÉSI PROGRAM HATÓKÖRE

A repülőtéri alakiság egyszerűsítési program átöleli a 9. Annex valamennyi előírását, amely a repülőtéri határengedélyezési eljárásokra vonatkozik, de ezen eljárások megtervezését és irányítását is. Az alábbi táblázat reprezentatív felsorolást biztosít a teljesítendő feladatokról és az alkalmazandó szabványokról vagy ajánlott gyakorlatokról (SARP-ok).

Repülőtéri alakiság egyszerűsítő program feladata	*A 9. Annex (13. kiadás) szabványai vagy ajánlott gyakorlatai*
Alakítson ki, vizsgálja felül, és szükség szerint igazítsa ki adott repülőtéren a járatok belépésére és engedélyezésére vonatkozó eljárásokat	6.1.1 szabvány
Rendszeresen vizsgálja felül valamennyi résztvevő teljesítését a tekintetben, hogy milyen mértékben tartják a belépő utasok kezelésére vonatkozó 45 perces és a kilépő utasok kezelésére vonatkozó 60 perces célkitűzést. A szükséges korrekció meghatározásához alkalmazzon időméréseket és sorbaállás elemzést.	3.36 és 3.39 ajánlott gyakorlat
Alakítson ki a határőrizeti és vámvizsgálat céljára korszerű rendszereket, felhasználva az alkalmazható technológiát. Az automatizált utas engedélyező rendszer felállításában működjön együtt.	3.40 , 3.51 és 6.26 szabvány
A növekvő forgalommal lépést tartva hajtsa végre a szükséges változtatásokat a repülőtéri forgalom áramoltatásban és az ellenőrző pontokon.	6.3 szabvány
Az utasok zavarának mérséklése érdekében a vizsgálati berendezéseknél javítsa a jelzések minőségét és mennyiségét.	6.9 és 6.12.1 ajánlott gyakorlat
A vizsgálati pontok munkaerő ügyeit – műszakbeosztások, túlmunkák stb. – vizsgálja felül és törekedjen a forgalom igényéhez igazodó korrekció megtételére.	6.3.1 ajánlott gyakorlat
Az ott székelő légi-jármű üzemeltetők és vizsgálati szervek nevében az új repülőterek tervezéséhez és új vizsgálati berendezésekhez adjon inputokat.	6.2 és 6.7 szabvány
Figyelje és javítsa a poggyász eljutását a vámvizsgálati területre.	6.28 szabvány
A pénzváltással összefüggő mindennemű szolgáltatási problémára hívja fel az illetékes hatóság figyelmét. Ajánlja az érkező területeken az ATM-ek telepítését.	6.63, 6.64 és 6.65 szabvány
Úgy koordinálja az alakiság egyszerűsítési, kábítószer ellenőrzési, légi-közlekedés védelmi	8.19 szabvány

és veszélyes áru kezelési eljárásokat, hogy mind a négy program célkitűzései teljesüljenek.	
Ne feledkezzen el a teheráruról! Koordinálja a különféle vizsgálati szervek tevékenységét és elvárásait úgy, hogy a légi teheráru szállítmányok azonnali engedélyezése és elszállítása biztosítva legyen. Gondoskodjon arról, hogy a vámengedélyre várakozás közben a teheráru ki- és berakodására és biztonságos tárolására alkalmas eszközök álljanak rendelkezésre.	4.25 szabvány és 4.28, 4.29, 6.38és 6.50 ajánlott gyakorlat
Állítson fel és működtessen elektronikus rendszereket a teheráru bizonylatolására, vámengedélyezésére és feladására.	4.15 és 4.4 szabvány
Utas-szolgálat: Vizsgálja felül valamennyi együttműködő fél teljesítményét, ami a vizsgálati formaságok elvégzésére kitűzött 3 órás átfutási idő tartását illeti, és a szükséges illetve érdemi korrekciót végezze el.	4.28 és 4.29 ajánlott gyakorlat
Tekintse át a teheráru engedélyezési terület vizsgálati szerveinek munkaerő ügyeit – műszakbeosztások, túlmunkák stb. - és törekedjen a fogyasztói igényekhez igazodó korrekció megtételére.	6.60.1 szabvány

3. SZERVEZET ÉS VEZETÉS

3.1 Üzemelői szinten az alakiság egyszerűsítő program vezetésére szolgáló ajánlott eszköz a Repülőtéri Alakiság Egyszerűsítési Bizottság. Bár e bizottságok bátorítása, és a problémáikról, haladásukról való tájékoztatása szükséges a Nemzeti Alakiság Egyszerűsítési Bizottság részéről, de nem feltétlenül taroznak a nemzeti testület felügyelete alá. Legfőbb érdekük a napi problémák megoldása és a 9. Annex teljesítése.

3.2. Ajánlott, hogy a repülőtér igazgatója vezesse a bizottságot és tartson rendszeres megbeszéléseket. A tagok között kapjanak helyet a repülőtéri vizsgálati szervek – mint például a vámhatóság, a határőrség, a közegészségügy - felelős vezető tisztségviselői ugyanúgy, mint a nemzetközi forgalomban részt vevő légi-jármű üzemeltetők azon a repülőtéren tevékenykedő állomásvezetői. Mindegyik fél részvétele fontos ahhoz, hogy a repülőtéri alakiság egyszerűsítési program sikeres legyen.

12. FÜGGELÉK - A NEMZETI ALAKISÁG EGYSZERŰSÍTÉS MODELJE

1. A Nemzeti Alakiság Egyszerűsítési Program célja

A nemzeti alakiság egyszerűsítési program célja az, hogy megvalósítsa a Chicago-i Egyezmény megbízását, miszerint a szerződő államok biztosítják és egyszerűsítik a határátlépési formaságokat, amelyeknek eleget kell tenni tekintettel a nemzetközi üzemeltetésben részt vevő légi-járművekre, azok utasaira, hajózószemélyzetére és teherárujára.

2. A Nemzeti Alakiság Egyszerűsítési Program Hatóköre

A Chicago-i Egyezmény alkalmazandó cikkelyeit és ezek mindegyike megvalósításához tartozó feladatokat az e függelékhez tartozó táblázat mutatja be. A nemzeti alakiság egyszerűsítési programot ezeknek a teljesítésére irányuló cselekvés és a kapcsolódó feladatok alkotják.
(A hasonló igényű és célt kitűző kisebb államok csoportja úgy határozhat, hogy gazdasági előnyök elérése érdekében létrehoz egy alakiság egyszerűsítő alprogramot.)

3. Szervezet és vezetés

3.1 A nemzeti alakiság egyszerűsítési programért az elsődleges felelősség a Polgári Légi-közlekedési Hatóságot (PLH) és a Közlekedési Minisztériumot terheli. Mindazonáltal, a program sikere más minisztériumok és szervek részvételén is nagyban múlik, így:

- a Vámhatóságon
- az útlevél és vízumkiadó hatóságokon
- a Külügyminisztériumon
- a Mezőgazdasági és környezetvédelmi minisztériumon
- a túrizmusért felelős szerveken
- a Bevándorlási Hivatalon
- a közegészségügyi szerveken
- a személyazonosító kártyát kiállító hatóságokon
- a karanténozó szerveken

3.2 Ezeken túlmenően alapvető a repülőtér üzemeltetők (állami vagy magán) és az ott székelő nemzetközi légi-jármű üzemeltetők vagy az azokat képviselő szervezetek részvétele.

3.3. Tanácsadói funkciót ellátó egyéb jogi személyek magukban foglalják azokat a kormányzati ügynökségeket vagy nem kormányzati szervezeteket, amelyek a nemzetközi idegenforgalmat és kereskedelmet támogatják.

3.4. A nemzeti alakiság egyszerűsítő program vezetésére szolgáló ajánlott eszköz a **Nemzeti Alakiság Egyszerűsítő Bizottság**, amely egyrészt az érintett kormányzati szervek felső vezetőiből és a repülőtér illetve légi-jármű üzemeltetőket képviselő nemzeti szervezetek vezérigazgatóiból tevődik össze. Az elnök a PLH vagy a megfelelő hatóság csúcsvezetőségének tisztségviselője legyen. Ahhoz, hogy a nemzeti alakiság egyszerűsítő bizottság és a nemzeti repülésvédelmi bizottság között szoros kapcsolatot tartsanak fenn, a nemzeti repülésvédelmi bizottság megfelelő tagjai közül legyenek tagok a nemzeti alakiság egyszerűsítési bizottságban is és fordítva.

3.5. A bizottság munkájának elvégzéséhez a tagok kijelölhetnek egy vagy több személyt az általuk képviselt szervezetek középvezetői közül, akik képviselik őket törzskari szinten (munkacsoportokban).

Ezeknek a hivatalnokoknak kellő felhatalmazást kell adni ahhoz, hogy a képviselt szervezet nevében felszólalhassanak, és a bizottság munkájának elősegítéséhez szükséges akciókat kezdeményezhessenek. Az elnök kijelöli a kormányhivatalában vagy ügynökségén egy középvezető hivatalnokot, hogy elnökölje, vagy összehívja a törzskari értekezleteket.
3.6. Az elnök kizárólagos hatáskörébe tartozik a nemzeti alakiság egyszerűsítési bizottság vagy a tagok által kijelölt képviselők összehívásának, az ilyen találkozók gyakoriságának és napirendjének az eldöntése. A különféle bevezetési/alkalmazási feladatok teljesítéséhez tartozó akciótervek egyrészt a feladat természetétől, másrészt a szóban forgó témakörtől függhetnek.

4. A nemzeti alakiság egyszerűsítési program létrehozatala

Ajánlott, hogy a nemzeti alakiság egyszerűsítő programra a felhatalmazást és a Nemzeti Alakiság Egyszerűsítő Bizottság tagságát a törvényhozás, és rendeletek meghozatala útján vagy egy jogosított személy közigazgatási tevékenysége révén teremtsék meg azért, hogy biztosított legyen a közreműködő különféle szervek és iparági csoportok részvétele és a folytonosságról való gondoskodás. A Polgári Légi-közlekedés vezérigazgatója (DGCA) vagy az ennek megfelelő hatóság kezdeményezze azt az eljárást, amelynek révén megszerzi az ilyen megbízást a nemzeti politikai rendszeren keresztül.

A Chicago-i Egyezmény megbízása	*Alkalmazási feladatok*
10. Cikkely – *Leszállás vámköteles repülőtéren* …a szerződő állam felségterületére belépő mindegyik légi-jármű köteles - amennyiben az állam rendelkezései így kívánják meg – leszállni az állam által kijelölt repülőtéren vámellenőrzés és egyéb vizsgálatok céljából. A szerződő állam felségterületéről történő elinduláskor az ilyen légi-jármű köteles egy hasonlóan kijelölt vámköteles repülőtérről ezt megenni.	- Vámköteles repülőterek létesítése és ennek megfelelő újak nyitása - Olyan eljárások kidolgozása, amelyek révén a menetrendszerinti és nem menetrendszerinti üzemeltetők engedélyt kérhetnek a vámköteles repülőtereken való leszállásra és onnan való elindulásra. - A vámköteles repülőtéren a határ-ellenőrzési szolgálatok megszervezése.
13. Cikkely – *Belépési és engedélyeztetési rendelkezések* A szerződő állam azon törvényei és rendeletei, amelyek a légi-járművek utasainak, hajózószemélyzeteinek és teherárujának felségterületére történő be- és kiléptetésére vonatkoznak, mint például a belépési, engedélyezési, határőrizeti, útlevél, vám és karantén rendelkezések, az ilyen utasok, hajószemélyzetek által vagy a teheráruk tekintetében betartandók az államba történő belépéskor és abból való kilépéskor és felségterületén tartózkodás során.	- Az érdekelt határőrizeti ügynökségek támogatása, a repülőtereken hatékony vizsgálati rendszerek létrehozatalára és fenntartására, és a vonatkozó eljárásaik ésszerűsítésére tett erőfeszítéseik tekintetében. - Programok kidolgozása a védelmi problémák kezelésére, így például a dokumentumhamisításra, az illegális bevándorlásra és a csempészésre. - Különleges eseményekkor, mint például nemzetközi atlétikai verseny esetében, a nagy számú nemzetközi látogató engedélyezési előkészületeinek koordinálása.
14. Cikkely – *a fertőzés terjedésének megelőzése* Minden egyes szerződő állam egyetért azzal, hogy hatékony lépéseket tesz annak megelőzésére, hogy a légi-közlekedés útján ne terjedjen a kolera, a tífusz (járványos), a fekete himlő, pestis és ehhez hasonló más, fertőzés útján terjedő betegség, miután a szerződő államok időről időre kötelesek kijelölni…	- A légi úton terjedő fertőző betegségek megelőzésére vonatkozó nemzeti irányelvek kialakítása, felülvizsgálata és szükség szerinti módosítása, így például a légi-jármű rovarmentesítése és fertőtlenítése, a közegészségügyhöz tartozó karantén programok és egy egészségügyi vészhelyzetben alkalmazandó védelmi intézkedések.

22. Cikkely – *a formalitások egyszerűsítése* Minden egyes szerződő állam egyetért abban, hogy speciális rendeletek kiadása útján vagy más módon minden hasznos lépést megtesz, hogy elősegítse és meggyorsítsa a légi-járművek navigációját a szerződő államok felségterületei között és, hogy megelőzi a légi-járművek, hajózó személyzetek, utasok és teheráruk szükségtelen késleltetését, különösen a bevándorlásra, a karanténozásra, a vámolásra és az engedély megadásra vonatkozó törvények meghozatalakor.	- A légi úton történő nemzetközi mozgásokra vonatkozó állami vám-, határőrizeti- és karantén törvényeket alkalmazó nemzeti rendelkezéseknek a létrehozása, felülvizsgálata és szükség szerinti módosítása.
23. Cikkely – *vám- és határőrizeti eljárások* Minden egyes szerződő állam, amennyire hasznosnak tartja, megvalósítja a nemzetközi légi-fuvarozásra ható vám- és határőrizeti eljárások létesítését, azokkal a gyakorlatokkal összefüggésben, amelyek ezen egyezmény alapján időről időre létrehozhatók vagy ajánlottak.	- A 9. Annex-ben lefektetett szabványokkal és ajánlott gyakorlatokkal való harmonizáláshoz a repülőtereken teljesítendő vám- és határőrizeti eljárások létrehozása és megfelelő módosítása - A Doc 9303 – *„Gépi Feldolgozású Utazási Dokumentumok”-ban* levő ICAO specifikációnak megfelelően támogatja és pártolja az útlevelek és más utazási dokumentumok nemzeti kiadását.
37. Cikkely – *a nemzetközi szabványok és eljárások bevezetése* Minden egyes szerződő állam vállalja, hogy együttműködik mindazon rendelkezések, szabványok, eljárások és szervezetek lehető legnagyobb mértékű egységesítésének biztosításában, amelyek a légi-járművekre, a személyzetekre, a légi folyosókra és a kisegítő szolgáltatásokra vonatkoznak minden olyan esetben, amikor az ilyen egységesítések egyszerűsítik és javítják a légi-közlekedést. … (j) Vám- és határőrizeti eljárások…	- A 9. Annex ICAO általi fejlesztésében való részvétel - A nemzeti eljárások rendszeres időközönkénti felülvizsgálata annak érdekében, hogy a 9. Annex előírásaival való összhang biztosított legyen.
38. Cikkely – *kiindulás a nemzetközi szabványokból és eljárásokból* Bármely állam, amelyik nem találja célravezetőnek azt, hogy bármely ilyen nemzetközi szabványt vagy eljárást kövessen, vagy teljes összhangba hozza a saját rendeleteit és gyakorlatait a nemzetközi szabványokkal és eljárásokkal az utóbbi módosítását követően, vagy szükségesnek tartja olyan rendelkezések és gyakorlatok elfogadását, amelyek bármely sajátos tekintetben eltérnek egy nemzetközi szabvány által meghatározottaktól, köteles haladéktalanul értesíteni a Nemzetközi Polgári Légi-közlekedési Szervezetet a saját gyakorlata és a nemzetközi szabványban megállapítottak közötti eltérésről.	- Rendszeres időközönként annak áttekintése, hogy valamennyi ide tartozó szerv tartja-e magát a 9. Annex előírásaihoz, és az ICAO értesítése a nemzeti gyakorlat és a vonatkozó szabványok közötti eltérésekről.

- VÉGE -

ANNEX 10/I.
Légiforgalmi távközlés: Rádiónavigációs segédeszközök

6. kiadás – 2006. július

81. módosítással

Ez a kiadás a Tanács által 2006 február 25-e előtt elfogadott összes módosítást tartalmazza és hatálytalanítja 2006 november 23-ával az Annex 10 I. kötet minden
korábbi kiadását.
A szabványok és ajánlott gyakorlatok alkalmazhatóságával kapcsolatos információkat az Előszó tartalmazza.

Nemzetközi Polgári Repülési Szervezet

MÓDOSÍTÁSOK

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Sor szám	Alkalmazás dátuma	Beépítés dátuma	Beépítette	Sor szám	Kiadás dátuma	Beépítés dátuma	Beépítette
1 - 81	Ebbe a kiadásba bedolgozva 23/11/2006						

Előszó

Történelmi háttér

A Légiforgalmi Távközlés Szabványait és Ajánlott Gyakorlatait a Tanács először 1949. május 30-án fogadta el a Nemzetközi Polgári Repülési Egyezmény 37. cikkelyében lévő előírásoknak megfelelően (Chicago, 1944.), és az Egyezmény 10. Annex-eként jelölte ki. Ezek 1950. március 1-én léptek hatályba. A Szabványok és Ajánlott Gyakorlatok a Hírközlési Szekció 1949. januárjában tartott Harmadik Ülésszaka ajánlásain alapulnak.
Egészen a Hetedik Kiadásig és azt is beleértve, az Annex 10 egy kötetben került kiadásra, ami négy részt foglalt magába, a hozzájuk kapcsolt mellékletekkel együtt: az I. Rész "Berendezések és Rendszerek"-et, a II. Rész "Rádiófrekvenciák"-at, a III. Rész "Eljárások"-at és a IV. Rész "Kódok és Rövidítések"-et.
A 42. Módosítással a IV. Rész törlésre került az Annex-ből, és az abban a részben elhelyezett kódok és rövidítések egy új dokumentumba, a Doc 8400-ba kerültek áthelyezésre.
A 44. Módosítás 1965. május 31-i elfogadásának eredményeként az Annex 10 Hetedik Kiadása két kötetbe került felosztásra: az I. Kötetbe (Első Kiadás) - ami az I. Részt, a "Berendezések és Rendszerek"-et és a II. Részt, a "Rádiófrekvenciák"-at foglalja magába - valamint a II. Kötetbe (Első Kiadás), ami a "Hírközlési Eljárások"-at tartalmazza.
A 70. Módosítás 1995. március 20-i elfogadása eredményeként az Annex 10 átszerkesztésre került úgy, hogy öt kötetet foglal magába:
I. Kötet - Rádiónavigációs Berendezések; II. Kötet - Hírközlési Eljárások; III. Kötet - Hírközlési Rendszerek; IV. Kötet - Légtérellenőrző Radar és Összeütközés Elkerülő Rendszerek; és az V. Kötet - A Légiforgalmi Rádiófrekvencia Spektrum Felhasználása. A 70. Módosítással a III. és a IV. Kötet 1995-ben került kiadásra és az V. Kötet 1996-ban a 71. Módosítással került közzétételre.

Az "A" táblázat mutatja be az Annex 10 eredetét és az ezt követő módosítások származását a bennük lévő legfontosabb témák összefoglalásával, és azokkal az időpontokkal együtt, amikor a Tanács az Annex-et és a módosításokat elfogadta, illetve amikor azok hatályba léptek, és végül amikor alkalmazhatókká váltak.

A szerződő államok tevékenysége

Az eltérések bejelentése. A Szerződő Államok figyelmét felhívják az Egyezmény 38. cikkelye értelméből eredő azon kötelezettségükre, amely szerint a Szerződő Államokat felkérik arra, hogy jelentsenek be a Szervezetnek minden olyan eltérést, mely a nemzeti szabályaik és eljárásaik, valamint az ebben az Annex-ben lévő és ezt követően módosított Nemzetközi Szabványok között fennáll. Kérik a Szerződő Államokat, hogy ezt a bejelentést terjesszék ki az ezen Annex-ben lévő Ajánlott Gyakorlatoktól való eltérésekre is, amennyiben az ilyen eltérés lényeges jelentőséggel bír a léginavigáció biztonsága szempontjából.
Továbbá felkérik a Szerződő Államokat, hogy folyamatosan tájékoztassák a Szervezetet minden olyan eltérésről, mely ezt követően felmerül, vagy amennyiben bármely korábban bejelentett eltérés megszűnik. Egy, az eltérések bejelentésére vonatkozó külön felkérés kerül megküldésre a Szerződő Államok részére az egyes módosítások elfogadását követően azonnal.
Felhívják ezenkívül az Államok figyelmét az Annex 15 azon előírásaira, amelyek szerint a nemzeti szabályaik és gyakorlataik, valamint az ICAO Szabványok és Ajánlott Gyakorlatok között felmerülő eltéréseket a Légiforgalmi Tájékoztató Szolgálaton keresztül tegyék közzé, az Egyezmény 38.cikkelyében lefektetett, az Államokra vonatkozó kötelezettségen felül.
A tájékoztatás közzététele. Az Annex 10-ben meghatározott Szabványoknak, Ajánlott Gyakorlatoknak és Eljárásoknak megfelelően biztosított, a légijármű üzemeltetéseket érintő berendezések, szolgálatok és eljárások változásait, azok életbeléptetését és megszűntetését be kell jelenteni, és az Annex 15 előírásainak megfelelően kell érvénybe helyezni.

Az Annex szövegének használata a nemzeti szabályzatokban. A Tanács 1948. április 13-án elfogadott egy határozatot, amelyben felhívja a Szerződő Államok figyelmét annak kívánatosságára, hogy a saját nemzeti szabályaikban - amennyire az csak lehetséges - használják azoknak az ICAO Szabványoknak a pontos kifejezésmódját, amelyek szabályozás jellegűek, ugyanígy a Szabványoktól való eltérések jelölésére is, beleértve minden olyan kiegészítő nemzeti szabályzatot is, amely a léginavigáció biztonsága, vagy szabályossága szempontjából fontos. Ahol csak lehetséges, ennek az Annex-nek a szövege szándékosan olyan módon került leírásra, hogy nagyobb szövegbeli változtatás nélkül be lehessen foglalni a nemzeti törvényalkotásba.

Az Annex alkotórészeinek jogi helyzete

Egy Annex a következő alkotórészekből épül fel, azonban nem feltétlenül található meg ezek mindegyike minden egyes Annex-ben; ezek az alábbi jogi helyzetet foglalják el:

1. Az Annex-et alkotó anyagok a tulajdonképpeni:

a) *Szabványok és Ajánlott Gyakorlatok*, amelyeket a Tanács fogadott el az Egyezmény előírásainak megfelelően. Meghatározásuk a következő:

Szabvány: A fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó minden olyan meghatározás, amelynek egységes alkalmazását a nemzetközi léginavigáció biztonsága szempontjából szükségesnek tekintenek, és amelynek a Szerződő Államok az Egyezmény értelmében eleget kell, hogy tegyenek; a teljesítés lehetetlensége esetén annak bejelentése a Tanács részére a 38. cikkely alapján kötelező.

Ajánlott Gyakorlat: A fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó minden olyan meghatározás, amelynek egységes alkalmazását kívánatosnak tekintik a nemzetközi légi-navigáció biztonsága, szabályszerűsége vagy hatékonysága érdekében, és amelynek teljesítésére a Szerződő Államoknak az Egyezmény értelmében törekedniük kell.

b) *Függelékek*: a kényelmi szempontból különállóan csoportosított anyagok, de ezek részét képezik a Tanács által elfogadott Szabványoknak és Ajánlott Gyakorlatoknak.

c) *Meghatározás*: a Szabványokban és Ajánlott Eljárásokban használt azon szakkifejezések értelmezése, amelyek nem maguktól értetődőek, amennyiben azok nem rendelkeznek elfogadott szótári jelentéssel. Egy meghatározásnak nincs független jogi helyzete, de minden egyes Szabványnak és Ajánlott Gyakorlatnak, amelyben használják, elengedhetetlen részei, mivel a szakkifejezés jelentésének értelmi változása befolyásolná az előírás értelmét.

d) A *Táblázatok és ábrák* azok, amelyek kiegészítik, vagy illusztrálják azokat a Szabványokat és Ajánlott Gyakorlatokat, amelyekre azokban utalnak, ezek a vonatkozó Szabványoknak és Ajánlott Gyakorlatoknak részét képezik, és ugyanazzal a jogi helyzettel rendelkeznek.

2. *A Tanács által a Szabványokhoz és Ajánlott Gyakorlatokhoz kapcsolódóan közzétételre elfogadott anyagok*:

a) *Előszavak*, a Tanács tevékenységén alapuló történeti és magyarázó anyagokat tartalmazzák, és magukba foglalják az Államoknak az Egyezményből és az Elfogadási Határozatból következő kötelezettségeinek magyarázatát is;

b) A *Bevezetések* azok a magyarázó anyagok, amelyekkel az Annex részei, fejezetei, vagy szakaszai kezdődnek, azért, hogy a szöveg alkalmazásának megértését segítsék;

c) A *Megjegyzések* a szövegbe beépítve - ahol szükséges tárgyi információt, vagy hivatkozást adnak a Szabványokkal és Ajánlott Gyakorlatokkal kapcsolatos kérdésekben, de nem képezik a Szabványok és Ajánlott Gyakorlatok részét;

d) A *Mellékletek* a Szabványokkal, vagy Ajánlott Gyakorlatokkal kapcsolatos kiegészítő anyagokat tartalmazzák, vagy azok alkalmazásához útmutatóként kerültek beépítésre.

A szabadalmi felelősség elutasítása

Felhívjuk a figyelmet annak lehetőségére, hogy az ebben az Annex-ban lévő Szabványok és Ajánlott Gyakorlatok bizonyos elemei lehet, hogy szabadalom, vagy egyéb szellemi tulajdoni jog tárgyát képezik. Az ICAO nem vállal felelősséget, vagy kötelezettséget azért, hogy nem azonosította az ilyen jogok valamelyikét, vagy mindegyikét. Az ICAO nem foglal állást semmilyen "igényelt" találmány, vagy egyéb szellemi tulajdoni jog fennállására, érvényességére, tárgyára, vagy alkalmazhatóságára vonatkozóan, és kijelenti, hogy nincs felelőssége és kötelezettsége ennek megfelelően és erre vonatkozóan.

A nyelv kiválasztása

Ez az Annex négy nyelven került elfogadásra - angolul, franciául, oroszul és spanyolul. Minden egyes Szerződő Államot felkérnek, hogy ezeknek a különféle nyelvű szövegeknek az egyikét válasszák ki nemzeti felhasználásra, valamint az Egyezményben meghatározott egyéb célokból, akár a közvetlen felhasználás, akár a saját nemzeti nyelvre történő fordítás útján, és ennek megfelelően értesítsék a Szervezetet.

Szerkesztési gyakorlat

A következő gyakorlat kerül következetes alkalmazásra abból a célból, hogy az egyes állítások jogi helyzete egyetlen pillantással megállapítható legyen: a *Szabványok* (Standards) vékony antikva betűtípussal vannak nyomtatva; az *Ajánlott Gyakorlatok* (Recommended Practices) vékony dőlt betűvel vannak szedve, jogi helyzetüket az **Ajánlás** (**Recommendation**) szó jelzi; a *Megjegyzések* (Notes) vékony dőlt betűvel vannak szedve, jogi helyzetüket a *Megjegyzés* (Note) szó jelzi.
A következő szerkesztési gyakorlatot követtük az előírások megfogalmazásánál: a Szabványok esetében a "kell" (shall), az Ajánlott Gyakorlatok esetében pedig a "kellene" (should) műveltető igét használtuk.
Az ebben a dokumentumban alkalmazott mértékegységek megegyeznek a Nemzetközi Mértékegység Rendszerrel (SI) úgy, ahogy az a Nemzetközi Polgári Repülési Egyezmény 5. Annex-ében meghatározásra került. Ott, ahol az Annex 5 megengedi a nem-SI mértékegységek alternatív használatát, azok zárójelben feltűntetve követik az alap mértékegységet. Ahol két rendszer szerinti mértékegységek szerepelnek, nem szabad feltételezni azt, hogy az értékek egyenlők és felcserélhetők. Azt azonban el lehet fogadni, hogy a biztonság azonos szintjét lehet elérni, ha bármelyik mértékegység rendszert önállóan alkalmazzák.
Ennek a dokumentumnak egy részére való bármely utalás, amely egy számmal és/vagy címmel van azonosítva, annak a résznek az összes alpontját is magába foglalja.

’A’ Táblázat: Az Annex 10 I. Kötetének módosításai

Módosítás	Forrás(ok)	Tárgy(ak)	Elfogadva Hatályba lép Alkalmazható
1. Kiadás	A Hírközlési Szekció Harmadik Ülésszaka	A rádiónavigációs eszközökre és távközlési berendezésekre vonatkozó Szabványok és Ajánlott Gyakorlatok bevezetése az üzemeltetési módszerekkel, eljárásokkal és kódok világméretű alkalmazásával együtt.	1949. május 30. 1950. március 1. 1950. április 1.
1.	A Hírközlési Szekció Harmadik Ülésszaka	A 3 - 30 MHz-es sávban működő rádió távgépíró végberendezésre vonatkozó előírások módosítása.	1951. március 28. 1951. október 1. 1952. január 1.
2*	A Hírközlési Szekció Harmadik Ülésszaka	A rádió távgépíró rendszer tervezését érintő útmutató anyag kiegészítése.	1952. március 28. 1951. október 1. 1952. január 1.
3.	A Hírközlési Szekció Harmadik Ülésszaka	A rádiófrekvenciákra vonatkozó Szabványok és Ajánlott Gyakorlatok.	1951. március 28. 1951. október 1. 1952. január 1.
4.	A Hírközlési Szekció Harmadik Ülésszaka	A hírközlési eljárásokra vonatkozó Szabványok és Ajánlott Gyakorlatok.	1951. március 28. 1951. október 1. 1952. április 1.
5.	A Hírközlési Szekció Harmadik Ülésszaka	A kódokra és rövidítésekre vonatkozó Szabványok és Ajánlott Gyakorlatok.	1951. március 28. 1951. október 1. 1952. április 2
6.	A Hírközlési Szekció Harmadik Ülésszaka	Q-kód.	1952. április 1. 1952. július 4. 1952. szept. 1.
7.	Léginavigációs Bizottság	A magasság, a tengerszint feletti magasság és a tengerszinthez viszonyított magasság meghatározásának beépítése az Annex 10-be	1952. június 17. 1952. december 1. 1953. április 1.

8.	A Hírközlési Szekció Negyedik Ülésszaka	Meghatározásokat érintő módosítások a hallás utáni vételre szolgáló VHF /ultrarövidhullámú/ rádiótávíróra, DME-re, SRE-re, NDB-re, 75 MHz-es útvonal hely-jeladóra, ILS-re.	1952. június 17. 1952. december 1. 1953. április 1.
9.	A Hírközlési Szekció Negyedik Ülésszaka	Az eltolt frekvenciás (offset) szimplex üzemmód használatát érintő előírások	1952. június 17. 1952. december 1. 1953. április 1.
10.	A Hírközlési Szekció Negyedik Ülésszaka	Az AFS-re (Légiforgalmi Állandóhelyű Szolgálat), az AMS-re (Légiforgalmi Mozgó Szolgálat) és a rádió műsorszóró adókra vonatkozó meghatározások és eljárások.	1952. június 17. 1952. december 1. 1953. április 1.
11.	A Titkárság javaslata	Szerkesztési módosítások a 7.Módosítást követően és szerkesztési javítás a IV. Részben.	1952. június 17. 1952. december 1. 1953. április 1.
12.	A Hírközlési Szekció Negyedik Ülésszaka	A Tanács által 1952. június 17-én elfogadott 10.Módosítás 5.1.6.7 pontjának törlése.	1952. november 28. 1953. március 1. 1953. április 1.
13.	Írországnak a Hírközlési Szekció Negyedik Ülésszakán tett ajánlására vonatkozó javaslata	Egy légiforgalmi állomás és rádiókapcsolatban már nem lévő légijármű közötti forgalom közvetítését meghatározó eljárás.	1953. május 5. 1953. augusztus 15. 1953. október 1.
14.	Első Léginavigációs Konferencia	Az ILS hely-jeladók, az ultrarövid-hullámú (VHF) iránysáv-adók és az azokhoz kapcsolódó folyamatos ellenőrző berendezések telepítésére vonatkozó előírások.	1953. december 11. 1954. május 1. 1954. június 1.
15.	A Hírközlési Szekció Ötödik Ülésszaka	Az ILS iránysáv- és siklópálya-adók párosított frekvenciáira vonatkozó módosítás.	1954. november 2. 1955. március 1. 1955. április 1.
16.	A Hírközlési Szekció Ötödik Ülésszaka	A kiosztási táblázat kibővítésével és a meghatározott körülmények között a csatornák közötti minimális távolság csökkentésére tett intézkedések következtében a VHF sávokban utólagosan kijelölhető frekvenciákra vonatkozó előírás.	1954. november 2. 1955. március 1. 1955. április 1.
17.	A Hírközlési Szekció Ötödik Ülésszaka	Az ideiglenes, nagytávolságú rádiónavigációs berendezésekre és hírközlési rendszerekre vonatkozó Szabványok és Ajánlott Gyakorlatok kiegészítése; az ILS előírások korszerűsítése.	1954. december 10. 1955. április 1. 1955. október 1.
18.	A Hírközlési Szekció Ötödik Ülésszaka	A 30 MHz feletti frekvenciasávokban működő rádiónavigációs berendezések frekvenciáinak kiválasztására vonatkozó alapszabályok lefektetése, beleértve a másodlagos radarok frekvenciáit is.	1954. december 10. 1955. április 1. 1955. október 1.
19.	A Hírközlési Szekció Ötödik Ülésszaka	A feladó által meghatározott időn belül nem továbbított táviratok visszaminősítésének, vagy törlésének megkönnyítésére szolgáló eljárás, valamint a vészhelyzeti közleményekben a légijármű címzésre vonatkozó előírás követelménye.	1954. december 10. 1955. április 1. 1955. október 1.

20.	A Hírközlési Szekció Ötödik Ülésszaka	Kódok és rövidítések módosítása.	1954. december 10. 1955. április 1. 1955. október 1.
21.	Harmadik Észak-Atlanti Körzeti Léginavigációs Értekezlet	Légijárműről származó rádiótávíró közleményeknek a rádiótelefon közleményekkel való összeegyeztetése.	1955. május 27. 1955. szeptember 1. 1955. október 1.
22.	A Hírközlési Szekció Ötödik Ülésszaka	ILS iránysáv- és siklópálya-adó frekvenciák párosítása.	1955. november 18. 1956. április 1. 1956. december 1.
23.	Léginavigációs Bizottság	A rádiótelefonon használandó szavak betűzését érintő módosítás.	1955. november 18. 1956. március 1. 1956. március 1.
24.	A Meteorológiai Szekció Ötödik Ülésszaka	A Q-kód módosítása a QBB jellel.	1955. november 18 1956. április 1. 1956. december 1.
25.*	Annex 3	A Q-kód módosítása a QUK jellel (az Annex 3 módosítását követően).	1955. november 8. --------- 1956. január 1.
26.	Annex 15	A NOTAM-ok és a NOTAM-okra való utalások új meghatározása (az Annex 15 módosítását követően).	1956. február 22. 1956. július 1. 1956. december 1.
27.	Második Léginavigációs Konferencia	Az ILS belső és középső hely-jeladójának elhelyezése és az ILS vonatkoztatási pontjának helyére vonatkozó útmutató anyag.	1956. május 11. 1956. szeptember 15. 1956. december 1.
28.	A Meteorológiai Világszervezet (WMO) eljárásai és az Annex 3	A Q-kód jeleinek módosítása a felhőzet jelentéséhez és az AIREP jelentési eljárás bevezetése.	1956. május 15. 1956. szept. 15. 1956. december 1.
29.	Ausztrália javaslata	Szalag-továbbítási Szabványok.	1957. június 4. 1957. október 1. 1957. december 1.
30.*	Annex 3	A Q-kód módosítása a QUK és a QUL jelekkel (az Annex 3 módosítását követően).	1957. november 25. ------- 1957. december 1.
31.	Franciaország javaslata	A Q-kód módosítása a QNH és QNY jelekkel.	1958. március 21. 1958. augusztus 1. 1958. december 1.
32.	A Hírközlési Szekció Hatodik Ülésszaka	Az Ülés ajánlásai.	1958. június 9. 1958. október 1. 1958. december 1.
33.	Az ICAO Távgépíró Szakértők Szakcsoportja	Hírközlési üzemeltetési eljárások a kézi "tépett szalagos", a fél-automatikus és a teljesen automatikus működésű AFTN hírközlési központok közötti kompatibilitás biztosítására.	1958. december 15. 1959. május 1. 1959. október 1.

34.	Repülési Szabályok és Légiforgalmi Szolgálatok/Kutatás-Mentési Szekció	Az életmentő rádió-készülékekben való felhasználásra kiválasztható rádiófrekvenciák számának megnövelése.	1959. december 8. 1960. május 1. 1960. augusztus 1.
35.	Különleges Hírközlés / Üzemeltetési / Repülési Szabályok és Légiforgalmi Szolgálatok/Kutatás-Mentési Szekció	VOR telepítési követelmények, új DME előírások bevezetése és a VOR és DME védettségi időpont kiterjesztése 1975. január 1-ig.	1960. április 8. 1960. augusztus 1. 1961. január 1.
36.	Léginavigációs Bizottság	A "Nemzetközi rádiótávbeszélő kifejezések" helyettesítése a "Nemzetközi repülési kifejezések" anyaggal.	1960. április 8. 1960. augusztus 1. 1961. január 1.
37.	A Meteorológiai Szekció Ötödik Ülésszaka, a Légiforgalmi Tájékoztató Szolgálatok és a Légiforgalmi Térképek Szekció	A közlemények továbbítására vonatkozó eljárások; a Q-kód jeleinek módosítása.	1960. december 2. 1961. április 1. 1961. július 1.
38.	Általános Rádió-igazgatási Konferencia (OARC - 1959)	Az Annex 10 előírásainak egyeztetése a Nemzetközi Távközlési Egyesület (ITU) Nemzetközi Rádió-szabályzatának vonatkozó előírásaival.	1961. január 20. 1961. június 1. 1961. július 1.
39.	ICAO Távgépíró Szakértők Szakcsoportja	Az elterelt irányítású hírközlési eljárások egyszerűsítése, a közlemények címzésében használt két-betűs ICAO rövidítések használatának tisztázása és a csatornák közötti együttműködést érintő hírközlési eljárások.	1961. június 26. 1961. december 1. 1962. január 1.
40.	A Hírközlési Szekció Hetedik Ülésszaka	A berendezések és rendszerek általános korszerűsítése és módosítása; rádiófrekvenciák és eljárások.	1963. április 5. 1963. augusztus 1. 1963. november 1.
41.	PANS-MET	A Q-kód jelek módosítása a QFE, QFF és QNH-val való kiegészítéssel ahhoz, hogy a magasságmérő beállításának millibárban, vagy tized-millibárban való továbbítása lehetővé váljon.	1963. június 4. 1963. október 1. 1964. január 1.
42.	A Meteorológiai Távközlési Hálózat, Európa (MOTNE) Fejlesztés/Kivitelezés Szakcsoport Negyedik Értekezlete; a Hírközlési Szekció Hetedik Ülésszaka; a Német Szövetségi Köztársaság, az Egyesült Királyság és az Egyesült Államok javaslatai	Az AFTN nem-nyomtató vagy kapcsoló jelei; új útmutató anyag az ILS iránysáv felépítéséhez és annak kiértékeléséhez; út-mutató anyag az ILS iránysáv felépítéséhez és a fontosabb különleges jelentésű hírközlési szakkifejezések és azok meghatározásai; az Annex IV. Részének törlése egy új rövidítési és kód dokumentum létrehozásának eredményeként; indulási közlemények és útmutató anyag az SSR folyamatos ellenőrzéséhez.	1964. március 25. 1964. augusztus 1. 1965. január 1.

43.	A Hírközlési Szekció Hetedik Ülésszaka	Az ILS berendezések I. és II. kategóriájú teljesítményét érintő módosítások.	1964. június 23. 1964. november 1. 1965. február 1.
44.	A Hírközlési Szekció Hetedik Ülésszaka; az ICAO Távgépíró Szakértők Szak-csoportjának Ötödik Értekezlete; Repülési Szabályok és Légi-forgalmi Szol-gálatok/Kutatás-Mentési és Üzemeltetési Szekció; Léginavigációs Szolgálatok Eljárásai - Rádiótávbeszélő Eljárások	Az Annex 10 két kötetre való felosztása, az I. Kötet (Első Kiadás) az I. Rész - Berendezések és Rendszereket és a II. Rész - Rádiófrekvenciákat, valamint a II. Kötet (Első Kiadás) a Hírközlési Eljárásokat tartalmazza. Változtatások az összeköttetés megszakadása esetén követendő tevékenységre és a hírközlési figyelésnél az egyik frekvenciáról egy másikra történő áttérésnél alkalmazandó tevékenységre vonatkozó előírásokban; a távgépíró eljárásokra vonatkozó előírások; a légiforgalmi mozgó szolgálatok rádiótávbeszélő eljárásainak törlése, a mentési eljárásokra vonatkozó bizonyos alapvető eljárásokat kivéve.	1965. május 31. 1965. október 1. 1966. március 10.
45.	Negyedik Léginavigációs Konferencia; a Távgépíró Szakértők Szakcsoportjának Hatodik Értekezlete	Az ultrarövidhullámú (VHF) életmenő rádiókészülékek műszaki jellemzőinek előírásai és az "ILS referencia-magasság" fogalmának bevezetése az "ILS vonatkozási pont" helyett; számos, az AFTN fokozatos automatizálására vonatkozó AFTN műszaki előírás.	1966. december 12. 1967. április 12. 1967. augusztus 24.
46.	A Légiforgalmi Irányítás Automatizálási Szakcsoport Ötödik Értekezlete	Az ATS közleményeknek közvetlen, vagy gyűjtő /omnibus/ csatornákon történő átvitelére vonatkozó műszaki előírások és meghatározások.	1967. június 7. 1967. október 5. 1968. február 8.
47.	Hírközlési/Üzemeltetési Szekció Értekezlet	Tulajdonképpen minden jelentős előírás korszerűsítése, vagy kiterjesztése. Különös jelentőséggel az ILS és az SSR műszaki előírásainak változásaira; a LORAN-A rendszerjellemzőinek bevezetése; kibővített útmutató anyag az ultrarövidhullámú (VHF) hírközlési frekvenciák és műszaki előírásaik bevezetéséhez, és első alkalommal az automatikus rádióiránymérő (ADF), az ultrarövidhullámú (VHF) és a rövidhullámú egy-oldalsávú átvitelű (HF SSB) hírközlési rendszerek fedélzeti elemeihez.	1967. december 11. 1968. április 11. 1968. augusztus 22
48.	Hírközlési / Üzemeltetési Szekció Értekezlet; Ötödik Léginavigációs Konferencia	A VOR/DME fedésterület előírásának új módszere; előírások a rádiónavigációs berendezések működési állapotára vonatkozó információ rendelkezésre állására, a rádiónavigációs és hírközlési rendszerek tartalék áramellátására, valamint útmutató anyag a repülőterek környezetében használt rádióberendezések áramellátásának átkapcsolási időihez.	1969. január 23. 1969. május 23. 1969. szept. 18.

49.	Az Automatizált Adatcsere Rendszerek Szakcsoport Első Értekezlete; Hatodik Léginavigációs Konferencia	A 7-elemes kód bevezetése a közepes jeladási sebességű adatcsere céljaira, a használandó közepes jeladási sebesség és a hozzájuk tartozó adásmód és modulációs mód; a másodlagos légtérellenőrző radar földi berendezésre vonatkozó, a 7600 és a 7700 kód azonnali felismerését biztosító előírás, és az A-módú 2000 kód használatát érintő előírások.	1970. június 1. 1970. október 1. 1971. február 4.
50.	Az Automatizált Adatcsere Rendszerek Szakcsoport Második Értekezlete; a Léginavigációs Bizottság tanulmánya a Körzeti Léginavigációs Értekezletnek a világméretű alkalmazhatósággal kapcsolatos ajánlásairól; a Minden Időjárási Körülmények Közötti Üzemelések Szakcsoport Negyedik Értekezlete	A "Hertz (Hz)" kifejezés bevezetése a "ciklus per másodperc (c/s)" helyett a frekvencia egységeként az elektromos és rádiótechnikai anyagokban; adatátviteli sebesség meghatározása, a jeladási sebesség kibővítése 9600 bit/másodpercig és magyarázó előírás a 7-elemes kódolt karakterkészletet illetően; VOR fedélzeti berendezés repülés előtti ellenőrzésre vonatkozó előírások; az "ILS D-pont" és "ILS E-pont" meghatározása, valamint néhány változás az ILS-re és az útvonali ultrarövidhullámú (VHF) hely-jeladókra vonatkozó előírásokban.	1972. március 24. 1972. július 24. 1972. december 7.
51.	Automatizált Adatcsere Rendszerek Szakcsoport Harmadik Értekezlete; Akadálymentességi Szakcsoport Harmadik Értekezlete	A nemzetközi föld-föld adatcserére vonatkozó műszaki előírások; útmutató anyag a siklópálya antenna oldalirányú elhelyezéséhez az Annex 14 akadálykorlátozási felületeihez és a futópálya sávjain lévő akadályokra vonatkozó előírásaihoz kapcsolódóan.	1972. december 11. 1973. április 11. 1973. augusztus 16.
52.	Hetedik Léginavigációs Konferencia	Új szabvány a kényszerhelyzeti hely-jeladóra - légijármű (ELBA); előírás a kiegészítő iránysáv és siklópálya frekvencia párokra, és a 25 kHz-es csatornaosztás bevezetése a Nemzetközi Légiforgalmi Mozgó Szolgálat ultrarövidhullámú (VHF) sávjában; az ILS, SSR és VOR tökéletesített előírásainak bevezetése, valamint az ILS, DME és VOR védettségi idő meghosszabbítása 1975-ről 1985-ig.	1973. május 31. 1973. október 1. 1974. május 23.
53.	Az A17-10 és A18-10 Közgyűlési Határozat	Előírások a jogtalan beavatkozás alatt álló légijármű esetében követendő eljárásokra.	1973. december 7. 1974. április 7. 1974. május 23.

54.*	Automatizált Adatcsere Rendszerek Szakcsoport Negyedik Értekezlete	Új "G" Melléklet az I. Kötet I. Részéhez, amely útmutató anyagot tartalmaz az adatátviteli vonalakon a közepes és nagy sebességgel történő föld-föld adatcserére, és kereszt-referenciák beiktatása az I. Kötet I. Rész 4. Fejezet 4.12 pontjához.	1974. június 17. -------- --------
55.	A Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport Ötödik Értekezlete; az Elkülönítések Általános Elvét Felülvizsgáló Szakcsoport Második Értekezlete; Léginavigációs Körzeti Tervező Munkacsoport; Hetedik Léginavigációs Konferencia	Műszaki előírások és útmutató anyag az ILS iránysáv és siklópálya összetevőire; útmutató anyag a VOR által meghatározott ATS útvonalak kötelező átváltási pontjaira; az ILS telepítési előírásainak az egyéb rádiónavigációs berendezésekre vonatkozó előírásokkal való egyeztetése; az ILS berendezések közötti földrajzi elkülönítésre vonatkozó követelmény és az ultrarövidhullámú (VHF) kényszerhelyzeti csatornának (121,5 MHz) légijármű elfogása esetén való használatára vonatkozó előírások.	1975. február 4. 1975. június 4. 1975. október 9.
56.	Levelezés	A 7500 SSR kód kijelölése a jogtalan beavatkozás esetében való használatra.	1975. december 12. 1976. április 12. 1976. augusztus 12.
57.	Ázsia/Csendes-óceán Körzeti Léginavigációs Értekezlet	A 121,5 MHz-es ultrarövidhullámú (VHF) frekvencia védelmének előírása és fenntartása.	1976. június 16. 1976. október 16. 1977. október 6.
58.	A Léginavigációs Bizottság tanulmánya a futópálya küszöb - légijármű főfutó közötti biztonsági magasságról; Automatizált Adatcsere Rendszerek Szakcsoport Hatodik Értekezlete; Franciaország javaslata; az IFALPA javaslata	A 2.sz. Nemzetközi Távíró ABC és a 7-elemes kódolt karakterkészlet közötti átváltási táblázat bevezetése; az automatizált adatcserében hibaellenőrzésre használt rovatellenőrző algoritmus módosítása; az ILS referencia magasságra vonatkozó anyag módosítása; egy új anyag bevezetése a hosszúhullámú/középhullámú (LF/MF) sávban előforduló hamis sugárzásból származó interferencia lehetőségével kapcsolatban, valamint az I. Rész "C"- és "G"-Mellékletében lévő útmutató anyag módosítása.	1977. június 23. és június 27. 1977. október 27. 1978. február 23.

59.*	Kilencedik Léginavigációs Konferencia; a Léginavigációs Bizottság tanulmánya az Akadálymentességi Szakcsoport Harmadik Értekezlete 3/5. ajánlásából következő törhetőségi követelményekkel kapcsolatban; a Hírközlési Szekció Értekezlete (1976.)	SSR B - mód áttétele ki nem jelölt státuszba; kereszt-referencia az Annex 14-nek az üzemeltetési területen elhelyezett navigációs berendezések törhetőségi követelményeire vonatkozó előírásaihoz; kereszt-referencia az Annex 11-nek a VOR pontosságot és az átváltási pontot meghatározó előírásaihoz; a II. Rész "C"-Mellékletének - a Nagytávolságú Járatói Felügyeleti Összeköttetések Útmutató Alapelvének - bevezetése.	1977. december 14. 1978. április 14. 1978. aug. 10.
60.	Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport Hatodik Értekezlete	Az előnyben részesített ILS siklópálya szögnek 2,5 fokról 3 fokra való megváltoztatása.	1978. december 4. 1979. április 4. 1979. nov. 29.
61.	Az Automatizált Adatcsere Rendszerek Szakcsoport Hetedik Értekezlete; Minden Időjárási Körülmények Közötti Üzemelés Szekció Értekezlete (1978.); Hírközlési Szekció Értekezlete (1978.)	A Nemzetközi Távközlési Egyesület (ITU) által használt lapszéli sorszámok új sorozatának bevezetése és a "Nemzetközi Rádiószabályzatok" szakkifejezés tisztázása; a Légiforgalmi Állandóhelyű Távközlési Hálózat (AFTN) meghatározásának megváltoztatása; az ILS védettségi időpont megváltoztatása 1995-ig; kiegészítő információk a Mikrohullámú Leszállító Rendszerhez (MLS);a rádiófrekvenciákkal kapcsolatos előírások megváltoztatása az ITU Világ Rádió Ügyviteli Konferencia (WARC) 1978. Záró Jegyzőkönyveinek megfelelően; változások a rövidhullámú (HF) légiforgalmi mozgó szolgálati egy-oldalsávos sugárzási osztály bevezetésére vonatkozó előírásokban; a 7-elemes kódolt karakterkészletben megengedett szimbólumok tisztázása; kód- és byte-független adatátvitelt vezérlő eljárások egyszeres számozásáról azok kettős számozására való áttérés; a karakter-orientált adatátvitelt vezérlő eljárásokra vonatkozó új anyag bevezetése; a járatói felügyeleti összeköttetések meghatározásának megváltoztatása.	1979. december 10. 1980. április 10. 1980. november 27.

62.	Automatizált Adatcsere Rendszerek Szakcsoport Nyolcadik Értekezlete; a Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport Nyolcadik Értekezlete; a Léginavigációs Bizottság tanulmánya a polgári légijárművek elfogásáról; a Titkárság ajánlása a VOR és DME védettségi időpontra vonatkozóan.	A VOR és DME védettség időpontjának megváltozása; az ILS fedélzeti berendezés követelményének és a VOR/ILS berendezések közötti földrajzi elkülönítés követelményeinek megváltoztatása és kiegészítése; a csatorna állapot folyamatos ellenőrzésére és a vezérelt áramköri protokollok használatára vonatkozó anyag kiegészítése; a 7-elemes kódolt karakter-készletre vonatkozó előírások megváltoztatása azért, hogy az 5. sz. Nemzetközi ABC Nemzetközi Referencia Változatával megegyezzen; a CIDIN vonalakon alkalmazott karakter paritásra vonatkozó előírások kiegészítése; a karakter-orientált adatátvitel vezérlő eljárásokkal kapcsolatos előírások kiegészítése; elfogás esetén alkalmazandó, az ultrarövidhullámú (VHF) összeköttetésekre vonatkozó előírások megváltoztatása.	1981. december 14. 1982. április 14. 1982. november 25.
63.	A Léginavigációs Bizottság ajánlásai az IFALPA kérésére történő levegő-levegő ultrarövidhullámú (VHF) frekvenciák kiosztására; a SELCAL kódok kimerítésére vonatkozó Titkársági ajánlások; a Baleset-megelőzési és - Kivizsgáló Szakcsoport Értekezlete (1979.); a Hírközlési Szekció Értekezlete (1981.)	Változások és kiegészítések a 30 MHz feletti, meghatározott funkciók ellátására használatos levegő - levegő ultrarövidhullámú (VHF) hírközlési csatornákat biztosító frekvenciákra vonatkozó anyaghoz; az új RED SELCAL hangokkal való kiegészítésre vonatkozó anyag beépítése; a radaradatok rögzítését és megőrzését biztosító radar jellemzőkre vonatkozó anyag megváltoztatása és kiegészítése; az 1., 2., 3., 4., 5., 6. Fejezet és az "A"-Függelék jelentős megváltoztatása és kiegészítése az ILS, NDB, DME, MLS, rádiótávíró, ultrarövidhullámú (VHF) és rövidhullámú (HF) hírközlés, mentő rádió berendezés és vészhelyzeti jeladók vonatkozásában.	1982. december 13. 1983. április 13. 1983. november 24.
64.	--------------	Nincs változás	---------------

65.	A Léginavigációs Bizottság ajánlásai a 25 kHz-es csatornaosztással üzemelő légiforgalmi mozgó szolgálat ultrarövidhullámú (VHF) összeköttetések védettségi időpontjára a Holland Királyság kérésére; a Titkárságnak a légiforgalmi frekvenciasávok külső forrásoktól eredő káros interferencia kérdésére, valamint a hálózati átkapcsoló és jelző rendszerű légiforgalmi beszéd összeköttetésű áramkörökre vonatkozó ajánlásai; a Léginavigációs Bizottság ajánlásai az SSR C-mód SPI impulzuscsoportjára vonatkozóan az Egyesült Királyság kérésére; a Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport Kilencedik Értekezlete; az Automatizált Adatcsere Rendszerek Szak-csoport Tizedik Értekezlete	Változtatások a 25 kHz-es csatornaosztással üzemelő légiforgalmi szolgálati ultrarövidhullámú (VHF) összeköttetések védettségi időpontjára vonatkozó anyagban; változtatások és kiegészítések a légiforgalmi frekvenciasávoknak a külső forrásoktól eredő káros interferenciájára vonatkozó anyaghoz; kiegészítés a hálózati átkapcsoló és jelző rendszerű légiforgalmi beszéd-összeköttetésű áramkörökre vonatkozó anyaghoz; * az SSR C - mód SPI impulzuscsoport adására vonatkozó anyag változtatásai; jelentős változtatások a 3. és a 4. Fejezetben, valamint a "C"-, a "G"- és a "H" Mellékletben az ILS-re, a DME-re és a CIDIN-re vonatkozóan.	1984. december 6. 1985. április 6. 1985. november 21.
66.	Léginavigációs Bizottság	A 2000-es SSR kód; a 121,5 MHz felhasználása és előírásai.	1986. március 14. 1986. július 27. 1986. november 20.

67.	Hírközlési/Üzemeltetési Szekció Értekezlet (1985.); a Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport 10. és 11. Értekezlete; Másodlagos Légtérellenőrző Radar Javítási és Összeütközés Elkerülési Rendszer Szakcsoport Második Értekezlete; a Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport munkacsoportja és a Titkárság ajánlása az MLS alapadat szó paritás egyenletére vonatkozóan.	A jelenlegi másodlagos légtérellenőrző radar (SSR) műszaki előírásainak tökéletesítése; az SSR S-mód műszaki előírásainak bevezetése és az SSR S-mód címeknek az Államok részére történő kiosztására és a légijárművek részére való kijelölésére vonatkozó anyag; az MLS-re, DME-re és ILS-re vonatkozó anyag jelentős változtatása és kiegészítése; az ILS és MLS védettségi idő és az ICAO ILS/ /MLS átváltási terv bevezetése.	1987. március 16. 1987. július 27. 1987. október 22.
68.	A Minden Időjárási Körülmények Közötti Üzemelés Szakcsoport 11. Értekezlete; Léginavigációs Bizottság	A távolságmérő berendezés (DME) műszaki előírásainak pontosítása; a mikrohullámú leszállító rendszer (MLS) Morse-kód azonosítási követelményének törlése; a 121,5 MHz-es földi berendezés telepítésére vonatkozó új előírások.	1990. március 22. 1990. július 26. 1990. november 15.

69.	Hírközlési/ Meteorológiai Szekció (COM/MET) Értekezlet (1982.); Hírközlési/ Meteorológiai/ Üzemeltetési Szekció (COM/MET/OPS) Értekezlet (1990.); Másodlagos Légtérellenőrző Radar Javítási és Összeütközés Elkerülési Rendszer Szakcsoport Negyedik Értekezlete; az Üzemeltetési Szakcsoport Ötödik Értekezlete; az Európai Léginavigációs Tervező Csoport 30. Értekezlete; Léginavigációs Bizottság	Az AFTN közlemény-eljárások változásai és a világméretű területi előrejelző rendszer (WAFS) távközlési követelményeivel kapcsolatos anyaggal való kiegészítés; az ultrarövidhullámú (VHF) levegő - föld adat összeköttetési hírközlésre vonatkozó anyaggal való kiegészítés és változások az ultrarövidhullámú (VHF) eltolt /offset/ vivőfrekvenciás rendszerekre vonatkozó anyagban; az SSR S-móddal és a 24 bites légijármű hívórendszerrel kapcsolatos anyag korszerűsítése; az ILS berendezés pontossági kategóriák üzemeltetési céljaira vonatkozó anyag változásai; a DME/N összesített rendszer pontosságára vonatkozó anyag változtatása; a vészhelyzeti helymeghatározó adókra (ELT) vonatkozó anyag változtatásai és kiegészítése.	1993. március 22. 1993. július 26. 1993. november 11.
70.	Léginavigációs Bizottság; a Légiforgalmi Állandó helyű Szolgálati Rendszerek Adatcsere Tervezési Szakcsoportjának Harmadik Értekezlete; az Európai Léginavigációs Tervező Csoport 34. Értekezlete	Az Annex 10 anyagának öt kötetbe történő felosztása; a kézi Morse-kód eljárásokra és a távgépíró rendszerekre vonatkozó elavult előírások és útmutató anyag törlése; a közös ICAO adatcsere hálózatra (CIDIN) vonatkozó anyag bevezetése.	1995. március 20. 1995. július 24. 1995. november 9.

71.	Léginavigációs Bizottság; Speciális Hírközlési/ Üzemeltetési Szekció (COM/OPS) Értekezlet (1995.); a Minden Időjárási Körülmények Közötti Üzemeltetések Szakcsoport 12., 13. és 14. Értekezlete; a Titkárságnak az elavult anyag törlésére vonatkozó javaslatai.	A mikrohullámú leszállító rendszer (MLS) Szabványainak és Ajánlott Gyakorlatainak, valamint útmutató anyagának végleges formába öntése; az ILS/MLS átállási terv helyett a nem-látásos berendezések bevezetésére és alkalmazására vonatkozó új stratégia bevezetése; az Annex anyagának a III., IV. és V. Kötetbe való áthelyezése, ahogy az megfelelő; az elavult Consol és Loran-A előírások és a berendezések felhasználására, a kutatásra, a fejlesztésre és a kiértékelésre vonatkozó útmutató anyag törlése.	1996. március 12. 1996. július 15. 1996. november 07.
72.	------------------	Nincs változás.	--------------------
73.	Léginavigációs Bizottság	Az Emberi Tényezők vonatkozású anyag bevezetése	1998. március19. 1998. július 20. 1999. november 05.
74.	A Minden Időjárási Körülmények Közötti Üzemeltetések Szakcsoport Tizenhatodik Értekezlete; Léginavigációs Bizottság	Az alábbiak bevezetése: a) a megközelítési, le-szállási és indulási üzemeltetésekhez megkívánt navigációs teljesítmény (RNP); b) a műszeres leszállító rendszerre (ILS) és a mikrohullámú leszállító rendszerre (MLS) vonatkozó előírások korszerűsítése; és c) kapcsolódó útmutató anyag.	1999. március 18. 1999. július 19. 1999. november 04.
75.	--------------------	Nincs változás.	---------------------
76.	A Globális Navigációs Műhold Rendszer Szakcsoport (GNSSP) Harmadik Értekezlete; az Egyesült Királyság javaslata az ILS és MLS szolgáltatási követelményeinek folytonosságáról.	Globális navigációs műhold rendszer (GNSS); a III.A kategóriájú üzemeltetések alátámasztására használt ILS iránysáv-adók és MLS oldalszög berendezések szolgáltatási követelményeinek folytonossága; a Nemzetközi Távközlési Egyesület / ITU/ Nemzetközi Rádiószabályzataira vonatkozó hivatkozások korszerűsítése.	2001. március 12. 2001. július 16. 2001. november 01.

77.	A Globális Navigációs Műhold Rendszer Szakcsoport (GNSSP)	A GLONASS-vonatkozású műszaki előírások beépítése a GNSS követelményeknek a Műhold Bázisú Kiegészítő Rendszer /SBAS/ és a Földi Bázisú Kiegészítő Rendszer /GBAS/ részeibe; Előírások a GBAS helymeghatározási szolgáltatásnak a közelkörzeti területi navigációs /RNAV/ üzemeltetések alátámasztásában való felhasználására; Előírások az új 28. Típusú közleménynek az SBAS teljesítmény növelésére való felhasználásához; Kiegészítő útmutató anyag és tisztázás/szerkesztői helyesbítések beépítése a Szabványok és Ajánlott Gyakorlatokba és az útmutató anyagba.	2002. február 27. 2002. július 15. 2002. november 28.
78.		Nincs változás	
79.	A Globális Navigációs Műhold Rendszer Szakcsoport Negyedik Értekezlete	A Globális Navigációs Műhold Rendszer /GNSS/ Szabványainak és Ajánlott Gyakorlatainak /SARPs/, valamint a kapcsolódó Függőleges Vezetéses Megközelítés (APV) teljesítmény előírásaira vonatkozó útmutató anyag változásai; a Globális Helymeghatározó Rendszer (GPS) szelektív elérhetőség (SA) a jel teljesítmény-szint megszakítása és szűrése; a modernizált GLObál NAVigációs Műhold Rendszer (GLONASS-M) előírásai; frekvencia tervezési követelmények a Földi Bázisú Kiegészítő Rendszer (GBAS) részére és számos egyéb kiemelés.	2004. február 23. 2004. július 12. 2004. november 25.
80.	Tizenegyedik Léginavigációs Konferencia	A megközelítés és leszállás nem-látásos berendezései és alkalmazási stratégiájának korszerűsítése.	2005. február 25. 2005. július 11. 2005. november 24.
81.	Navigációs Rendszerek Szakcsoport	a) A földi bázisú körzeti kiegészítő rendszer (GRAS) Szabványainak és Ajánlott Eljárásainak (SARPs) bevezetése. B) Módosítások az ILS (műszeres leszállító rendszer), a DME (távolságmérő berendezés), és az MLS (mikrohullámú leszállító rendszer) rendszerek Szabványaihoz és az Ajánlott Eljárásaihoz (SARPs).	2006. február 24. 2006. július 17. 2006. november 23.

* Semmilyen Szabványt és Ajánlott Eljárást nem érint.

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

1. FEJEZET: MEGHATÁROZÁSOK

1. Megjegyzés. - A "Nemzetközi Rádiószabályzat"-ra vonatkozó minden hivatkozás a Nemzetközi Távközlési Egyesület (ITU) által közzétett Nemzetközi Rádiószabályzatra vonatkozik. A Nemzetközi Rádiószabályzat újra és újra módosításra kerül az általában két, vagy három évenként megrendezésre kerülő Rádiótávközlési Világ-Konferenciák záróközleményeiben kifejezett döntéseknek megfelelően. A Nemzetközi Távközlési Egyesület /ITU/ eljárásainak azon részeit, amelyek a légiforgalmi rádió-rendszerek frekvenciáinak a felhasználására vonatkozó további információkat tartalmazzák, a Polgári Légiközlekedés Rádió Frekvencia Spektrum Követelmények kézikönyve foglalja össze, amely egyúttal a jóváhagyott ICAO elvek ismertetését is magába foglalja *(Doc 9718).*

2. Megjegyzés. - Az Annex 10 I. Kötete a léginavigációs berendezések meghatározott berendezéseire vonatkozó Szabványokat és Ajánlott Gyakorlatokat foglalja magába. Jóllehet, a Szerződő Államok fogják meghatározni a vonatkozó Szabványokban, vagy Ajánlott Gyakorlatokban leírt feltételekkel összhangban a meghatározott berendezések telepítési szükségességének felülvizsgálatát és az érintett Szerződő Államokra vonatkozó ICAO véleményt és ajánlásokat a Tanács hajtja végre rendszeres időközönként, a szokásos módon a Körzeti Léginavigációs Értekezletek ajánlásai alapján (Doc 8144 - Körzeti Léginavigációs Értekezletek Irányelvei és Azok Végrehajtási Eljárásainak Szabályai).

Amikor a következő szakkifejezések használatosak ebben a kötetben, akkor ezek jelentése a következő:

Altitude. Tengerszint feletti magasság
Egy szintnek, egy pontnak, vagy pontként értelmezett tárgynak a közepes tengerszinttől (MSL) mért függőleges távolsága.

Effective acceptance bandwith. Tényleges vételi sávszélesség
A frekvenciáknak a kijelölt frekvenciához viszonyított azon tartománya, amelyben a vétel biztosított akkor, amikor a vevőkészülék valamennyi tűréshatárát számításba vették.

Effective adjacent channel rejection. Tényleges szomszédos csatornaszűrés
Az a szűrés, amelyet a megfelelő szomszéd csatorna frekvencián érnek el akkor, amikor a vevőkészülék minden számításba jövő tűréshatárát figyelembe vették.

Elevation. Tengerszinthez viszonyított magasság
A föld felszínén lévő, vagy ahhoz rögzített pontnak, vagy szintnek a közepes tengerszinttől mért függőleges távolsága.

Fan marker beacon. Legyező sugárnyalábú hely-jeladó
Egy olyan típusú rádió hely-jeladó, amely függőlegesen legyező alakban sugároz.

Height. Magasság
Egy szintnek, egy pontnak, vagy egy pontként értelmezett tárgynak meghatározott vonatkozási alaptól mért függőleges távolsága.

Human Factors principles. Az Emberi Tényezők alapelvei
Alapelvek, azok, amelyeket a tervezésnél, az alkalmassági bizonyítványoknál, a képzésnél, az üzemeltetésnél és a karbantartásnál alkalmaznak, és amelyek a biztonságos kapcsolatot keresik az ember és a különböző rendszer-összetevők között az emberi teljesítőképesség megfelelő figyelembevételével.

Mean power (of a radio transmitter). Átlagos teljesítmény (rádióadóé)
Az adókészülék által az antenna tápvonalba egy elegendő hosszúságú időtartam alatt betáplált átlagteljesítmény a szabályos üzemi állapotban a modulációban előforduló legalacsonyabb frekvenciával összehasonlítva.
Megjegyzés. - Szabályszerűen azt az 1/10 másodperces időt választják ki, amely alatt az átlagos teljesítmény a legnagyobb.

Pressure-altitude. Légnyomás (szerinti) magasság
Egy tengerszint feletti magasságban kifejezett olyan légnyomás, amely megegyezik a Nemzetközi Egyezményes Légkör szerint megállapított légnyomással.

Protected service volume. Védett szolgáltatási tér
A berendezés fedésterületének az a része, ahol a berendezés a vonatkozó Szabványokkal, vagy Ajánlott Gyakorlatokkal megegyező meghatározott szolgáltatást biztosítja, és amelyen belül a berendezés frekvencia védelemmel rendelkezik.

Touchdown. Földetérési pont
Az a pont, ahol az előre meghatározott siklópálya metszi a futópályát.
Megjegyzés. - A fentiekben meghatározott "földetérési pont" csak egy vonatkozási adat, és nem szükségszerűen az a pont, ahol a légijárművek a futópályát ténylegesen érintik.

Z marker beacon. Z hely-jeladó
Egy olyan típusú rádió hely-jeladó, amelynek a kisugárzott adása függőleges kúp alakú.

2. FEJEZET: A RÁDIÓNAVIGÁCIÓS BERENDEZÉSEKRE VONATKOZÓ ÁLTALÁNOS RENDELKEZÉSEK

2.1 A megközelítés, a leszállás és az indulás berendezései

2.1.1 A precíziós megközelítés és leszállás szabvány nem-látásos berendezésének:

a) olyan műszeres leszállító rendszernek (ILS) kell lenni, amely megfelel a 3. Fejezet 3.1 pontjában foglalt Szabványoknak;

b) olyan mikrohullámú leszállító rendszernek (MLS) kell lenni, amely megfelel a 3. Fejezet 3.11 pontjában foglalt Szabványoknak; és

c) olyan globális navigációs műhold rendszernek (GNSS) kell lenni, amely megfelel a 3. Fejezet 3.7 pontjában foglalt Szabványoknak.

1. Megjegyzés. - A "precíziós megközelítés és leszállás nem-látásos berendezése" szakkifejezés akkor kerül alkalmazásra, amikor az előbb említett, a 3. Fejezetben meghatározott rendszerekre vonatkozik.

2. Megjegyzés. - Az a cél, hogy mindenütt, ahol egy, a 3. Fejezet 3.1 pontjában foglalt Szabványoknak megfelelő ILS berendezés telepítésre került, ott a Szabványok változtatásai, vagy kiegészítései ne tegyék szükségessé az ilyen berendezések cseréjét 2010. január 1-e előtt.

3. Megjegyzés. - Az a cél, hogy mindenütt, ahol egy, a 3.Fejezet 3.11 pontjában foglalt Szabványoknak megfelelő MLS berendezés telepítésre került, ott a Szabványok változtatásai, vagy kiegészítései ne tegyék szükségessé az ilyen berendezések cseréjét 2015. december 31-e előtt.

4. Megjegyzés. – Az a cél, hogy mindenütt, ahol egy, a 3. Fejezet 3.7 pontjában foglalt Szabványoknak megfelelő Globális Navigációs Műhold Rendszer (GNSS) telepítésre került, ott a Szabványok *változtatásai, vagy kiegészítései ne tegyék szükségessé az ilyen berendezések cseréjét a 2.4 pontban közölt dátum előtt.*

5. Megjegyzés. - Azokat a helyeket, ahol nem-látásos berendezések telepítése szükséges, általában körzeti léginavigációs egyezmények állapítják meg.

6. Megjegyzés. – Mivel a látás szerinti tájékozódás a megközelítés végső szakaszában és a leszállás során alapvetően lényeges, a nem-látásos berendezések telepítése nem előzi meg a látásos eszközök szükségességét az alacsony látástávolságú körülmények közötti megközelítések és leszállások részére.

7. Megjegyzés. - A megközelítés és leszállás nem-látásos berendezéseit fel lehet használni az indulások alátámasztására is.

2.1.1.1 Megengedhetőnek kell lennie annak, hogy egy nem-látásos berendezést egy alternatív nem-látásos berendezéssel a körzeti léginavigációs egyezmény alapján fel lehessen váltani.

2.1.1.2 **Ajánlás.** - A 2.1.1.1 pontban jelzett megállapodásnak legalább egy ötéves előzetes értesítést kell biztosítania.
Megjegyzés. - Az a cél, hogy a nem-látásos berendezések bevezetése és alkalmazása összhangban legyen a "B"- Mellékletben magyarázott stratégiával.

2.1.1.3 Amikor egy nem-látásos berendezést biztosítanak, akkor a teljesítményének legalább annak a teljesítménynek kell megfelelni, ami az általa kiszolgált precíziós megközelítési futópálya kategóriája.

1. Megjegyzés. - A precíziós megközelítési és leszállási üzemeltetések kategóriái az Annex 6 I. Része 1. Fejezetében vannak osztályozva.

2. Megjegyzés. - Az ILS berendezés kategóriákhoz kapcsolódó működési célokra vonatkozó tájékoztatás a "C"- Melléklet 2.1 és 2.14 szakaszában kerül megadásra.

3. Megjegyzés. - Az MLS berendezés kategóriákhoz kapcsolódó működési célokra vonatkozó tájékoztatás a "G"- Melléklet 11. szakaszában kerül megadásra.

2.1.2 A nem-látásos berendezéseknek a 3. Fejezetben lévő Szabványoktól való bármilyen vonatkozású eltérését a Légiforgalmi Tájékoztató Kiadványban (AIP) közzé kell tenni.

2.1.2.1 Azokat a nem-látásos berendezéseket, amelyek nem felelnek meg:

a) a 3. Fejezet 3.1.2.1, 3.1.2.2 és 3.1.7.1 a) pontjában leírt Szabványoknak, nem lehet az ILS szakkifejezéssel megjelölni;

b) a 3. Fejezet 3.11.3 pontjában leírt Szabványoknak, nem lehet az MLS szakkifejezéssel megjelölni.

2.1.3 Mindazon esetekben, amikor nem-látásos berendezést telepítettek, amely sem nem ILS, sem nem MLS, de amely teljes egészében, vagy részben az ILS, vagy MLS használatára tervezett fedélzeti berendezésekkel használható, akkor az ilyen módon felhasználható egységek összes részletét a Légiforgalmi Tájékoztató Kiadványban (AIP) közzé kell tenni.

Megjegyzés. - Ez az előírás a vonatkozó tájékoztatások közzétételének követelményét mondja ki, nem pedig az ilyen berendezések engedélyezéséét.

2.1.4 **Ajánlás**. - *A 3.fejezet 3.2 pontjában foglalt Szabványoknak megfelelő precíziós megközelítési radar (PAR) rendszert és a légijárművekkel történő kétoldalú összeköttetésre szolgáló eszközöket, valamint ezeknek a berendezéseknek a légiforgalmi irányítással való hatékony koordinálására szolgáló* *berendezéseket kell telepíteni és üzemeltetni a nem-látásos berendezések kiegészítéseként mindenütt, ahol:*

a) a légiforgalmi irányítást az ilyen berendezések gyakorlatilag segítik a nem-látásos berendezéseket használni kívánó légijárművek kiszolgálásában; és

b) a nem-látásos berendezések felhasználásához fedélzeti berendezéssel fel nem szerelt légijáművek végső megközelítéseinek pontosságát, vagy azok meggyorsítását, illetve a megközelítésének megkönnyítését az ilyen berendezések gyakorlatilag elősegítik.

2.1.4.1 **Ajánlás.** - *A 3. Fejezet 3.2.3 pontjában foglalt Szabványoknak megfelelő precíziós megközelítési radar rendszernek csak a precíziós megközelítési radar egységét (PAR) kell telepíteni a fenti 2.1.4 pontban előírt berendezésekkel és készülékekkel együtt akkor, amikor megállapították azt, hogy a precíziós megközelítési radar rendszerhez tartozó légtérellenőrző radar egység (SRE) a légiforgalmi irányítás követelményeinek kielégítésére a nem-látásos berendezéseket használni kívánó légijárművek kezelése céljából nem szükséges.*

Megjegyzés. - Az SRE légtérellenőrző radar egység semmi esetre sem tekinthető a precíziós megközelítési radar rendszer alternatív változatának.

2.1.4.2 **Ajánlás**. - *Jóllehet, az SRE légtérellenőrző radar egység nem tekinthető a precíziós megközelítési radar rendszer alternatív változatának, a 3. Fejezet 3.2.4 pontjában foglalt Szabványoknak megfelelő SRE légtérellenőrző radar egységet és a légijárművekkel történő kétoldalú hírösszeköttetésre szolgáló berendezéseket kell telepíteni és üzemeltetni:*

a) a légiforgalmi irányítás segítségére a nem-látásos berendezéseket használni kívánó légijárművek kezelése céljából;

b) a légtérellenőrző radar megközelítésekhez és indulásokhoz.

2.1.5 **Ajánlás.** - *Egy nem-látásos berendezést - ahogy az szükséges - ki kell egészíteni egy, vagy több olyan irányvezetési tájékoztatást biztosító adatforrással, amely - ha a megfelelő eljárásokkal együtt alkalmazzák - hatékony irányvezetést biztosít a kívánt referencia repülési pályára való (manuális, vagy automatikus) helyezkedéshez és az arra való rácsatlakozáshoz.*

Megjegyzés. - Az ilyen célokra a következő irányvezetést biztosító jelforrások használatosak:

a) egy megfelelően telepített, a 3. Fejezet 3.3 pontjában leírt előírásoknak megfelelő, vagy azzal egyenértékű ultra-rövidhullámú (VHF) körsugárzó rádióirány-szögadó (VOR);

b) egy, a 3. Fejezet 3.4 pontjában leírt előírásoknak megfelelő helyzet-meghatározó, vagy helyzet-meghatározók, vagy egy megfelelően elhelyezett irányítatlan (körkörös) sugárzású rádió-irányadó (NDB);

c) egy megfelelően telepített deciméteres hullámú (UHF) távolságmérő berendezés(DME), olyan, amely megfelel a 3.Fejezet 3.5 pontjában leírt előírásoknak, és folyamatos távolság tájékoztatást biztosít a repülés megközelítési és megszakított megközelítési szakaszaiban.

2.1.6 A megközelítési, leszállási és indulási üzemeltetésekhez
megkívánt navigációs teljesítmény (RNP)

2.1.6.1 Ahol használatos, ott a megközelítési, leszállási és indulási üzemeltetésekhez megkívánt navigációs teljesítményt (RNP) az Államoknak kell előírni.

2.1.6.2 Ahol a precíziós megközelítési és leszállási üzemeltetésekre megkívánt navigációs teljesítményt (RNP) írnak elő, ott a megkívánt navigációs teljesítményt (RNP) csak a fenti 2.1.1 pontnak megfelelő szabvány nem-látásos berendezéssel lehet alátámasztani.

2.2 Rövid hatótávolságú rádiónavigációs berendezések

2.2.1 Azokon a helyeken és útvonalak mentén, ahol a forgalom sűrűsége és rossz látástávolság szükségessé teszi a navigációhoz és a légiforgalmi irányítás hatékony végrehajtásához a földi telepítésű rövid hatótávolságú rádiónavigációs berendezéseket, vagy ahol az ilyen rövid hatótávolságú berendezések a légijármű üzemeltetések biztonságos és hatékony végrehajtásához szükségesek, ott a szabványos berendezésnek a 3. Fejezet 3.3 pontjában lévő Szabványnak megfelelő, folytonos hullámú (CW) fázis-összehasonlításos típusú ultrarövidhullámú (VHF) körsugárzó rádióirány-szögadónak (VOR) kell lenni.

1. Megjegyzés. - Ez nem azt jelenti, hogy a fenti 2.2.1 pont szerint biztosított rövid hatótávolságú rádiónavigációs berendezések elsődlegesen a távolsági navigációs berendezések szerepét lássák el.

2. Megjegyzés. - Az a cél, hogy mindenütt, ahol egy, a fenti 2.2.1 pontban leírt Szabványoknak megfelelő VOR berendezést telepítettek, ott a Szabványok változásai, vagy kiegészítései ne tegyék szükségessé az ilyen berendezések cseréjét 1995. január 1-e előtt.

2.2.1.1 **Ajánlás**. - *A nemzetközi légiforgalom által rendszeresen használt repülőtereken biztosítani kell a fedélzeti VOR berendezés repülés előtti ellenőrzéséhez szükséges eszközöket.*

Megjegyzés. - A fedélzeti VOR berendezés repülés előtti ellenőrzésére vonatkozó útmutató anyagot az "E"- Melléklet tartalmazza.

2.2.2 Azokon a helyeken, ahol üzemeltetési okokból, vagy olyan légiforgalmi irányítási okok miatt, mint például a légiforgalom sűrűsége, vagy az útvonalak közelsége, pontosabb navigációs szolgáltatásra van szükség annál, mint amelyet egy VOR biztosít; a VOR kiegészítéseként (a 3. Fejezet 3.5 pontjában leírt Szabványoknak megfelelő) távolságmérő berendezést (DME) kell telepíteni és üzemben tartani.

2.2.2.1 Az 1989. január 1. után újonnan telepítésre került DME/N berendezéseknek meg kell felelniük a 3. Fejezet 3.5 pontjában ‡ -el jelölt Szabványnak.

Megjegyzés. - Az a cél, hogy mindenütt, ahol egy, a fenti 2.2.2 pontban leírt Szabványoknak megfelelő DME berendezést telepítettek, ott a Szabványok változásai, vagy kiegészítései ne tegyék szükségessé az ilyen berendezések cseréjét 2010. január 1-e előtt.

2.3 Rádióirány-adók

2.3.1 Irányítatlan (körkörös) sugárzású rádióirány-adók (NDB)

2.3.1.1 A 3. Fejezet 3.4 pontjában leírt Szabványoknak megfelelő NDB-t kell telepíteni és üzemben tartani az olyan helyszíneken, ahol egy ilyen NDB a fedélzeti iránymérő berendezéssel együtt teljesíti a rádiónavigációs berendezésre vonatkozó üzemeltetési követelményeket.

2.3.2 Ultrarövidhullámú (VHF) útvonal rádió hely-jeladók (75 MHz-es)

2.3.2.1 Ajánlás. - *Ahol valamilyen repülési útvonalon egy hely megjelölésére egy ultrarövidhullámú (VHF) hely-jeladóra van szükség, ott a 3. Fejezet 3.6 pontjában leírt Szabványnak megfelelő legyező sugárnyalábú hely-jeladót kell telepíteni és üzemben tartani.*

Megjegyzés. - Ez az ajánlás nem zárja ki a legyező sugárnyalábú hely-jeladóknak olyan pontokon való alkalmazását, amelyek nem valamely repülési útvonalon találhatók, mint pl. az IFR körülmények közötti süllyedés jelző berendezésként való felhasználás.

2.3.2.2 **Ajánlás.** - Ahol az ultrarövidhullámú (VHF) hely-jeladóra egy olyan rádiónavigációs berendezés helyzetének megjelölésére van szükség, amely irányvezetést, vagy követő irányadást biztosít, ott egy, a 3. Fejezet 3.6 pontjában leírt Szabványnak megfelelő Z – hely-jeladót kell telepíteni és üzemben tartani.

2.4 Globális Navigációs Műhold Rendszer (GNSS)

2.4.1 A 3. Fejezet 3.7 pontjában foglalt Szabványoknak megfelelő Globális Navigációs Műhold Rendszer (GNSS) a navigáció egy szabvány berendezése kell, hogy legyen.

1. Megjegyzés. – Az a cél, hogy a 3. Fejezet 3.7 pontjában foglalt Szabvány bármilyen olyan változtatása, vagy kiegészítése, ami a Globális Navigációs Műhold Rendszer (GNSS) berendezésének cseréjét szükségessé teszi, csak egy hat-éves előzetes értesítés alapján váljon alkalmazhatóvá.

2. Megjegyzés. – A Globális Navigációs Műhold Rendszerrel (GNSS) szembeni elvárás az, hogy alátámasztja a repülés minden fázisát és a repülőtér területén való üzemeltetéseket, annak ellenére, hogy a jelenlegi Szabványok és Ajánlott Gyakorlatok (SARPs) az útvonal, a közelkörzeti és a megközelítési, valamint a leszállási üzemeltetéseket egészen az I. kategóriájú precíziós megközelítésekig teszik lehetővé.

2.4.2 Megengedhető kell, hogy legyen az, hogy egy Globális Navigációs Műhold Rendszer (GNSS) műholdas szolgáltatása, amelyet azok elemeinek egyike (3. Fejezet, 3.7.2) szolgáltat, megszűntetésre kerüljön a szolgáltatást biztosító által legalább hat-éves előzetes értesítés alapján.

2.4.3 A Globális Navigációs Műhold Rendszer (GNSS) adatainak rögzítése és megőrzése

2.4.3.1 **Ajánlás**. – *Egy Államnak, amely jóváhagyja a Globális Navigációs Műhold Rendszerre (GNSS) alapozott üzemeltetéseket, biztosítania kell azt, hogy az ezekre az üzemeltetésekre vonatkozó Globális Navigációs Műhold Rendszer adatok rögzítésre kerüljenek.*

1.Megjegyzés. – Ezek a rögzített adatok elsődlegesen a balesetek és események kivizsgálásában való felhasználásra szolgálnak. Ezekkel az adatokkal alá lehet támasztani annak a rendszeres időközönkénti megerősítését is, hogy a pontosság, a teljesség /integritás/, a folyamatosság és a rendelkezésre állás a jóváhagyott üzemeltetésekhez szükséges határértékeken belül fenntartásra került.

2.Megjegyzés. – A Globális Navigációs Műhold rendszer paramétereinek rögzítésére vonatkozó útmutató anyagot a "D"- Melléklet 11. pontja foglalja magába.

2.4.3.2 ***Ajánlás***. – *A rögzített adatokat legalább egy tizennégy napos időtartamon keresztül meg kell őrizni. Amikor a rögzített adatok baleset, vagy esemény kivizsgálásához tartoznak, akkor azokat hosszabb időtartamig kell megőrizni, addig, amíg kétségtelenné nem válik, hogy a továbbiakban azokra nem lesz szükség.*

2.5 [Fenntartva]

2.6 Távolságmérő berendezések

2.6.1 **Ajánlás.** - *Amikor bármilyen rádiónavigációs célra a korábbi 2.2.2 pontban meghatározottakhoz kiegészítésként telepítésre kerül egy távolságmérő eszköz, akkor annak meg kell felelnie a 3. Fejezet 3.5 pontjában rögzített előírásoknak.*

2.7 Földi és légi ellenőrzés

2.7.1 Az olyan típusú rádiónavigációs berendezéseket, amelyekre a 3. Fejezetben leírt előírások kiterjednek, és amelyek a nemzetközi légi-navigációt alkalmazó légijárművek általi felhasználásra rendelkezésre állnak, rendszeres időközönként földi és légi ellenőrzés alá kell vetni.

Megjegyzés. - Valamennyi ICAO szabványnak megfelelő eszköz földi és légi ellenőrzésére vonatkozó útmutató anyagot tartalmaz a "C"- Melléklet, valamint a Rádiónavigációs Eszközök Ellenőrzésének Kézikönyve *(Doc 8071).*

2.8 A rádiónavigációs berendezések üzemállapotára vonatkozó tájékoztatások biztosítása

2.8.1 A repülőtéri irányítótornyokat és a közelkörzeti irányító szolgálatot biztosító egységeket késedelem nélkül el kell látni az azon a repülőtér/ek/en lévő - a megközelítések, a leszállás és a felszállás részére elengedhetetlen rádiónavigációs berendezések üzemállapotára vonatkozó tájékoztatásokkal, amelyekre a szolgálatok illetékesek.

2.9 A rádiónavigációs berendezések és hírközlési rendszerek másodlagos áramellátása

2.9.1 Az Annex 10-ben meghatározott típusú rádiónavigációs berendezéseket és a hírközlési rendszerek földi elemeit el kell látni olyan megfelelő áramellátással és eszközökkel, amelyek biztosítják a nyújtott szolgáltatás szükségletének megfelelő szolgáltatás folyamatosságát.

Megjegyzés. - Az erre a tárgyra vonatkozó útmutató anyagot a "C"- Melléklet 8. Része tartalmazza.

2.10 Az Emberi Tényezők figyelembevétele

2.10.1. **Ajánlás.** - Az Emberi Tényezők alapelveit figyelembe kell venni a rádiónavigációs berendezések tervezésében és alkalmassági bizonyítványai kiadásánál.

Megjegyzés. - Az Emberi Tényezők alapelveire vonatkozó útmutató anyag az Emberi Tényezők Gyakorlati Kézikönyvében *(Doc 9683) és a 249. számú Körlevélben (*Az Emberi Tényezők Összefoglaló Válogatása 11.sz. - Emberi Tényezők a Hírközlés, Navigáció, Légtérellenőrzés (CNS) / Légiforgalmi Szervezési (ATM) Rendszereknél*) található.*

3. FEJEZET: A RÁDIÓNAVIGÁCIÓS BERENDEZÉSEKRE VONATKOZÓ ELŐÍRÁSOK

Megjegyzés. - A berendezéseknek és eszközöknek az üzemeltetési területeken történő, a légijárművek veszélyeztetését a minimumra csökkentő célú telepítésére és felépítésére vonatkozó előírásokat az Annex 14 8. Fejezete foglalja magába.

3.1 Az ILS-re vonatkozó előírások

3.1.1 Meghatározások

Angular displacement sensitivity. Szögbeli eltolódás iránti érzékenység
A mért DDM-nek az adott vonatkozási vonaltól való szögbeli eltéréshez való aránya.

Back course sector. Hátsó irányszektor
Az az irányszektor, amely az iránysáv-adónak a futópályával ellentétes oldalán helyezkedik el.

Course line. Iránysáv vonal
A futópálya középvonalához legközelebb eső azon pontok elhelyezkedése valamely vízszintes síkban, amely pontokban a DDM értéke nulla.

Course sector. Irányszektor
Az iránysáv vonalat magába foglaló vízszintes síkban elhelyezkedő és az iránysáv vonalhoz legközelebb eső azon pontok helyeivel határolt szektor, mely pontokban a DDM értéke 0,155.

DDM - Difference in depth of modulation. DDM - Modulációs mélységkülönbség
Az erősebb jel százalékos modulációs mélysége mínusz a gyengébb jel százalékos modulációs mélysége, osztva 100-al.

Displacement sensitivity (localizer). Eltolódás iránti érzékenység (iránysáv-adó)
A mért DDM-nek az adott vonatkozási vonaltól való oldalirányú eltéréshez való aránya.

Facility Performance Category I - ILS. ILS - I. teljesítmény kategóriájú berendezés
Egy olyan ILS berendezés, amely az irányvezetési adatokat az ILS fedési határtól addig a pontig biztosítja, amelynél az iránysáv-adó irányvonala a küszöböt magába foglaló vízszintes sík feletti 60 m-es (200 láb), vagy annál kisebb magasságon metszi az ILS siklópályát.

Megjegyzés. - Ennek a meghatározásnak nem az a célja, hogy megakadályozza az I. teljesítmény kategóriájú ILS berendezés használatát a 60 m-es (200 láb) magasság alatt, látás utáni tájékozódással ott, ahol a biztosított irányvezetési adatok minősége azt lehetővé teszi és ott, ahol megfelelő üzemeltetési eljárásokat alakítottak ki.

Facility Performance Category II - ILS. ILS - II. teljesítmény kategóriájú berendezés
Egy olyan ILS berendezés, amely az irányvezetési adatokat az ILS fedési határtól addig a pontig biztosítja, amelynél az iránysáv-adó irányvonala a küszöböt magába foglaló vízszintes sík felett 15 m-es (50 láb), vagy annál kisebb magasságon metszi az ILS siklópályát.

Facility Performance Category III - ILS. ILS - III. teljesítmény kategória berendezés
Egy olyan ILS berendezés, amely - ahol szükséges - kisegítő berendezések segítségével az irányvezetési adatokat a berendezés fedési határától a futópálya felületéig és annak hosszában biztosítja.

Front course sector. Elülső irányszektor
Az az irányszektor, amely az iránysáv-adónak ugyanazon az oldalán helyezkedik el, mint ahol a futópálya van.

Half course sector. Fél irányszektor
Az irányvonalat magába foglaló vízszintes síkban elhelyezkedő és az irányvonalhoz legközelebb eső azon pontok helyével határolt szektor, mely pontokban a DDM értéke 0,0775.

Half ILS glide path sector. ILS siklópálya félszektor
Az ILS siklópályát magába foglaló függőleges síkban elhelyezkedő és a siklópályához legközelebb eső azon pontok helyével határolt szektor, mely pontokban a DDM értéke 0,0875.

ILS continuity of service. Az ILS szolgáltatási folyamatossága
Az a minőség, amely a jel kisugárzásának megszakadási ritkaságára vonatkozik. Az iránysáv-adó, vagy a siklópálya adó szolgáltatási folyamatosságának szintjét a kisugárzott irányvezető jelek el nem vesztésének valószínűségében fejezik ki.

ILS glide path. ILS siklópálya
A futópálya középvonalát magába foglaló függőleges síkban azon pontok helye, amely pontokban a DDM értéke 0, és az összes ilyen hely közül a vízszintes síkhoz a legközelebbi.

ILS glide path angle. ILS siklópálya szög
A vízszintes és az ILS siklópálya középértékét képező egyenes vonal közötti szög.

ILS glide path sector. ILS siklópálya szektor
Az ILS siklópályát magába foglaló függőleges síkban elhelyezkedő és a siklópályához legközelebb eső azon pontok helyével határolt szektor, mely pontokban a DDM értéke 0,175.

Megjegyzés. - Az ILS siklópálya szektor a futópálya középvonalát magába foglaló függőleges síkban helyezkedik el, és a kisugárzott siklópályát két részre osztja, az úgynevezett felső szektorra és az alsó szektorra, amelyek a siklópálya feletti, illetve alatti szektort jelentik.

ILS integrity. Az ILS teljessége (integritás)
A berendezés által biztosított információ pontosságába helyezett bizalomra vonatkozó minőség. Az iránysávnak, vagy a siklópályának a teljességi szintje annak a valószínűségi tényezőnek az értékében kerül kifejezésre, ami megfelel annak, hogy a berendezés nem sugároz hibás irányvezetési jeleket.

ILS Point "A". ILS "A" pont
Az ILS siklópályán elhelyezkedő és a futópálya meghosszabbított középvonalán a megközelítés irányába, a küszöbtől 7,5 km (4 tengeri mérföld) távolságra mért pont.

ILS Point "B". ILS "B" pont
Az ILS siklópályán elhelyezkedő és a futópálya meghosszabbított középvonalán a megközelítés irányába, a küszöbtől 1050 m (3500 láb) távolságra mért pont.

ILS Point "C". ILS "C" pont
Az a pont, amelyen keresztül a névleges ILS siklópálya lefelé tartó, meghosszabbított egyenes szakasza áthalad a küszöböt magába foglaló vízszintes sík felett 30 m-es (100 láb) magasságban.

ILS Point "D". ILS "D" pont
A futópálya középvonala feletti 4 m-es (12 láb) magasságban és a küszöbtől az iránysáv-adó irányában 900 m (3000 láb) távolságban lévő pont.

ILS Point "E". ILS "E" pont
A futópálya középvonala feletti 4 m-es (12 láb) magasságban és a futópálya megállási végétől a küszöb irányában 600 m (2000 láb) távolságban lévő pont.

Megjegyzés. - Lásd a "C" Melléklet C-1. sz. ábráját.

ILS reference datum (Point "T"). ILS vonatkozási pont ("T" pont)
A futópálya középvonalának és küszöbének metszéspontja felett egy előírt magasságban elhelyezkedő azon pont, amelyen keresztül az ILS siklópálya lefelé tartó meghosszabbított egyenes szakasza áthalad.

Two-frequency glide path system. Kétfrekvenciás siklópálya rendszer
Egy olyan siklópálya, amelyen belül a fedésterület az adott siklópálya csatornán belül két - egymástól független sugárzású - térerősség eloszlás különálló vivőfrekvencián való alkalmazásával kerül megvalósításra.

Two-frequency localizer system. Kétfrekvenciás iránysáv rendszer
Egy olyan iránysáv rendszer, amelyen belül a fedésterület az adott ultrarövidhullámú (VHF) iránysáv csatornán belül két - egymástól független sugárzású - térerősség eloszlás különálló vivőfrekvencián való alkalmazásával kerül megvalósításra.

3.1.2 Alapkövetelmények

3.1.2.1 A műszeres leszállító rendszernek (ILS) a következő alap elemeket kell magába foglalni:

a) az ultrarövidhullámú (VHF) iránysáv-adó berendezést, a hozzá kapcsolódó felügyelő rendszerrel, a távvezérlő és a kijelző berendezéssel;

b) a mikrohullámú (UHF) siklópálya berendezést, a hozzá kapcsolódó felügyelő rendszerrel, a távvezérlő és a kijelző berendezéssel;

c) az ultrarövidhullámú (VHF) hely-jeladókat, vagy távolságmérő berendezéseket (DME) a 3.5 pontban leírtakkal összhangban, a hozzájuk kapcsolódó felügyelő rendszerrel, a távvezérlő és a kijelző berendezéssel.

Megjegyzés. – Az ILS hely-jeladó egységének választási lehetőségeként alkalmazott DME használatával kapcsolatos útmutatást a "C"- Melléklet 2.11 pontja tartalmazza.

3.1.2.1.1 Az I., II. és III. Teljesítmény kategóriájú ILS berendezéseknél a kijelölt távvezérlő pontokon kijelzést kell biztosítani az ILS földi rendszer elemeinek üzemi állapotáról.

1. Megjegyzés. - Az a cél, hogy a légijárművek végső megközelítésen történő irányításában résztvevő légiforgalmi szolgálati egység legyen az egyike azon kijelölt ellenőrző pontoknak, amelyek késedelem nélkül megkapják az ILS üzemi állapotára vonatkozó és a felügyelő rendszerektől eredő tájékoztatást.

2. Megjegyzés. - Az a cél, hogy a légiforgalmi irányító rendszernek valószínűleg szüksége lesz olyan kiegészítő szolgáltatásokra, amelyek alapvetően lényegesek lehetnek a teljes III. kategóriájú üzemeltetési lehetőség megvalósítása érdekében, mint például kiegészítő oldal- és hosszirányú irányvezetés biztosítása a leszállás utáni kifutás és gurulás közben, valamint a rendszer működési teljessége és megbízhatósága fokozásának a biztosítására.

3.1.2.2 Az ILS berendezést úgy kell felépíteni és beállítani, hogy a küszöbtől egy meghatározott távolságra a légijárműben lévő műszerek azonos jelzései az irányvonaltól, illetve az ILS siklópályától való azonos eltéréseket jelentsenek, tekintet nélkül az éppen használt földi berendezésre.

3.1.2.3 A fenti 3.1.2.1 a) és b) pontban előírt olyan iránysáv-adó és siklópályaadó egységek, azok, amelyek egy I. Teljesítmény kategóriájú ILS berendezés rendszer részét képezik, meg kell, hogy feleljenek legalább a következőkben, a 3.1.3 és a 3.1.5 pontban előírt Szabványoknak, kivéve azokat a szabványokat, amelyek alkalmazása a II. Teljesítmény kategóriájú ILS rendszerre vannak előírva.

3.1.2.4 A fenti 3.1.2.1 a) és b) pontban előírt olyan iránysáv-adó és siklópályaadó egységek, amelyek egy II. Teljesítmény kategóriájú ILS berendezés rendszer részét képezik, úgy kell, hogy megfeleljenek az I. Teljesítmény kategóriájú ILS berendezés rendszereknél lévő azonos egységekre alkalmazható Szabványoknak, ahogy ezeket a szabványokat a következőkben a 3.1.3 és 3.1.5 pontokban lévő azonos szabványok kiegészítik, vagy módosítják, amelyek alkalmazása a II. Teljesítmény kategóriájú ILS berendezés rendszerre vannak előírva.

3.1.2.5 A fenti 3.1.2.1.1 pontban előírt olyan iránysáv-adó és siklópályaadó egységek, valamint más segédberendezések, amelyek a III. Teljesítmény kategóriájú ILS berendezés rendszer részét képezik, meg kell, hogy megfeleljenek az I. és II. Teljesítmény kategóriájú ILS berendezés rendszereknél lévő azonos egységekre alkalmazható Szabványoknak, kivéve a következőkben a 3.1.3 és 3.1.5 pontban lévő szabványok szerinti kiegészítéseket, amelyek alkalmazása a III. Teljesítmény kategóriájú ILS berendezés rendszerre van előírva.

3.1.2.6 Egy kielégítő biztonsági szint biztosítása céljából az ILS rendszert úgy kell megtervezni és fenntartani, hogy az előírt működési követelményeken belüli üzemelés valószínűsége magas fokú és az adott teljesítmény kategóriának megfelelő legyen.

Megjegyzés. - A II. és III. Teljesítmény kategóriájú ILS berendezésekre vonatkozó szabványok célja a rendszer működési teljességének, megbízhatóságának és üzemi stabilitásának legmagasabb fokon történő elérése, az előforduló legkedvezőtlenebb környezeti körülmények között is. A II. és III. kategóriájú üzemeltetéseknél az ezen cél elérésére vonatkozó útmutató anyag a "C"- Melléklet 2.8 pontjában került megadásra.

3.1.2.7 Azokon a helyeken, ahol két különálló ILS berendezés szolgálja ki egy futópálya két, egymással szembeni végét, biztosítani kell egy kényszerkapcsolót azért, hogy csak az éppen használatos megközelítési irányt kiszolgáló iránysáv-adó sugározzon, kivéve ott, ahol az iránysáv-adó üzemeltetési felhasználása ILS I. Teljesítmény kategóriájú berendezés és üzemeltetési szempontból nem eredményez káros interferenciát.

3.1.2.7.1 **Ajánlás**. - *Azokon a helyeken, ahol két különálló ILS berendezés szolgálja ki egy futópálya két, egymással szembeni végét, és ahol egy I. Teljesítmény kategóriájú ILS berendezést automatikus megközelítésekre és leszállásokra használnak, ott látásos meteorológiai körülmények mellett biztosítani kell egy kényszerkapcsolót azért, hogy csak az éppen használatos megközelítési irányt kiszolgáló iránysáv-adó sugározzon, feltéve, hogy a másik iránysáv-adó egyidejű üzemeltetési használata nem szükséges.*

Megjegyzés. - Ha mindkét iránysáv-adó sugároz, előfordulhat az, hogy az iránysáv-adók jelei a küszöb körzetében zavarják egymást. A kiegészítő útmutató anyagot a "C"- Melléklet 2.1.9 és 2.13 pontja tartalmazza.

3.1.2.7.2 Azokon a helyeken, ahol ugyanazon párosított frekvenciájú ILS berendezések szolgálják ki ugyanazon futópálya két, egymással szembeni végét, vagy különböző futópályákat ugyan azon a repülőtéren, ott biztosítani kell egy kényszerkapcsolót azért, hogy csak egy berendezés sugározhasson egy időben. Amikor egyik ILS berendezésről a másikra átkapcsolnak, mindkettő sugárzását el kell nyomni, nem kevesebb, mint 20 másodpercen keresztül.

Megjegyzés. - Az azonos frekvenciájú csatornán dolgozó iránysáv-adók üzemeltetésére vonatkozó kiegészítő útmutató anyagot a "C"- Melléklet 2.1.9 pontja és az V. Kötet 4. Fejezete tartalmazza.

3.1.3 Az ultrarövidhullámú (VHF) iránysáv-adó és a hozzá kapcsolódó felügyelő rendszer

Bevezetés. A 3.1.3 pont előírásai tartalmazzák mind a 360 fokos oldalszögön át adott pozitív irányvezetésű tájékoztatást biztosító, mind pedig az elülső fedésterületnek csak egy meghatározott részén belül ilyen irányvezetést biztosító (lásd az alábbi 3.1.3.7.4 pontot) ILS iránysáv-adókat. Ahol a pozitív irányvezetési tájékoztatásokat egy behatárolt szektorban biztosító ILS iránysáv-adókat telepítenek, ott rendszerint szükség lesz valamely megfelelően elhelyezett navigációs segédeszközöktől nyert tájékoztatásokra - a megfelelő eljárásokkal együtt - annak biztosítása céljából, hogy a szektoron kívüli bármilyen félrevezető információnak nincs üzemeltetési jelentősége.

3.1.3.1 *Általános rész*

3.1.3.1.1 Az iránysáv-adó antenna rendszerből kisugárzott jeleknek egy olyan összetett térerősség-eloszlást kell létrehozni, amely a 90 Hz-es és a 150 Hz-es hanggal amplitúdó-modulált. A sugárzási térerősség-eloszlásnak egy olyan irányszektort kell létrehozni, amelyben az egyik hang van túlsúlyban az irányszektor egyik oldalán és a másik hang van túlsúlyban az ellentétes oldalon.

3.1.3.1.2 Ha egy megfigyelő a futópálya megközelítési végétől szembe fordul az iránysáv-adóval, a rádiófrekvenciás vivőhullám 150 Hz-es modulációs mélységének a megfigyelő jobb oldalán és ennek következtében a 90 Hz-es hangnak a megfigyelő bal oldalán kell túlsúlyban lenni.

3.1.3.1.3 Az iránysáv-adó sugárzási erőterének meghatározására alkalmazott valamennyi vízszintes szögnek annak az iránysáv-adó antenna rendszernek a középpontjából kell kiindulnia, amely az elülső irányszektorban használt jeleket szolgáltatja.

3.1.3.2 *Rádiófrekvencia*

3.1.3.2.1 Az iránysáv-adónak a 108 MHz-től a 111,975 MHz-ig terjedő frekvenciasávban kell működni. Ahol egy egyedüli rádiófrekvenciás vivőhullámot alkalmaznak, ott a frekvencia tolerancia nem haladhatja meg a plusz vagy mínusz 0,005 százalékot. Ahol két rádiófrekvenciás vivőt alkalmaznak, ott a frekvencia tolerancia nem haladhatja meg a 0,002 százalékot és a vivőfrekvenciák által elfoglalt névleges sávnak a kijelölt frekvenciára szimmetrikusnak kell lenni. A vivők közötti frekvencia elkülönítés - az összes alkalmazott tűréssel együtt - nem lehet kevesebb 5 kHz-nél és nem lehet több 14 kHz-nél.

3.1.3.2.2 Az iránysáv-adó sugárzása vízszintesen polarizált kell, hogy legyen. A sugárzás függőlegesen polarizált összetevője az iránysáv vonalán nem lépheti túl azt az értéket, amely 0,016 DDM hibának felel meg akkor, amikor egy repülőgép az iránysáv vonalra helyezkedett és a vízszinteshez képest 20 fokos hossztengely körüli bedöntési helyzetben van.

3.1.3.2.2.1 A II. Teljesítmény kategóriájú berendezések iránysáv-adóinak függőlegesen polarizált sugárzási összetevője az iránysáv vonalán nem lépheti túl azt az értéket, amely 0,008 DDM hibának felel meg akkor, amikor egy repülőgép az iránysáv vonalra helyezkedett és a vízszinteshez képest 20 fokos hossztengely körüli bedöntési helyzetben van.

3.1.3.2.2.2 A III. Teljesítmény kategóriájú berendezések iránysáv-adóinak a függőlegesen polarizált sugárzási összetevője az iránysáv vonal mindkét oldalán a 0,02 DDM-el határolt szektoron belül nem haladhatja meg azt az értéket, ami a 0,005 DDM hibának felel meg akkor, amikor egy repülőgép az iránysáv vonalra helyezkedett és a vízszinteshez képest 20 fokos hossztengely körüli bedöntési helyzetben van.

3.1.3.2.3 A III. Teljesítmény kategóriájú berendezések iránysáv-adóinak az adókészülékéből kisugárzott jel semmilyen olyan összetevőt nem tartalmazhat, amely 0,005 DDM-nél nagyobb csúcstól - csúcsig értékű látszólagos iránysáv vonal ingadozást eredményez a 0,01 Hz-től a 10 Hz-ig terjedő frekvenciasávban.

3.1.3.3 *Fedésterület*

3.1.3.3.1 Az iránysáv-adónak kielégítő jeleket kell biztosítania ahhoz, hogy azok lehetővé tegyék egy szabványos fedélzeti berendezés megfelelő működését az iránysáv és a siklópálya fedésterületének szektorain belül. Az iránysáv fedésterület szektorának az iránysáv-adó antenna rendszer középpontjától a következő távolságokig kell kiterjednie:

46,3 km-ig (25 tengeri mérföld) az elülső iránysáv vonaltól plusz, vagy mínusz 10 fokon belül;

31,5 km-ig (17 tengeri mérföld) az iránysáv vonaltól mért 10 fok és 35 fok között;

18,5 km-ig (10 tengeri mérföld) a plusz, vagy mínusz 35 fokon kívül, ha ott fedésterületet biztosítanak;

kivéve azt, hogy az értékhatárok ott, ahol a terepfelszín jellegzetességek megszabják, vagy az üzemeltetési követelmények megengedik - lecsökkenthetők 33,3 km-re (18 tengeri mérföld) a plusz, vagy mínusz 10 fokos szektoron belül, és 18,5 km-re (10 tengeri mérföld) a fedésterület fennmaradó részén belül akkor, amikor a kiegészítő navigációs berendezések kielégítő fedésterületet biztosítanak a közbenső megközelítési területen belül. Az iránysáv-adó jelei az előírt távolságban vehetők kell, hogy legyenek a küszöb tengerszinthez viszonyított magassága felett 600 m-es (2000 láb) magasságon, vagy felette, vagy pedig a közbenső és végső megközelítési területen belül található legmagasabb pontok tengerszinthez viszonyított magassága feletti 300 m-en (1000 láb), attól függően, hogy melyik a magasabb. Ezek a jelek az előírt távolságokig vehetők kell, hogy legyenek az iránysáv-adó antennájától a vízszintes felett 7 fokos szöget bezáró felületig.

Megjegyzés. - Az iránysáv-adó fedésterületére vonatkozó útmutató anyag a "C"- Melléklet 2.1.11 pontjában került megadásra.

3.1.3.3.2 A térerősségnek legalább 40 mikrovolt/méter-nek kell lennie (mínusz 114 dBW/m^2) a fenti 3.1.3.3.1 pontban előírt fedésterületi szektor minden részében, az alábbi 3.1.3.3.2.1, 3.1.3.3.2.2 és 3.1.3.3.2.3 pontokban előírtak kivételével.

Megjegyzés. - Ez a minimális térerősség az ILS iránysáv-adó berendezések kielégítő üzemi felhasználásának lehetővé tételéhez szükséges.

3.1.3.3.2.1 Az I. Teljesítmény kategóriájú berendezések iránysáv-adóinál a minimális térerősség az ILS siklópályán és az iránysáv szektoron belül a 18,5 km-es (10 tengeri mérföld) távolságtól a küszöböt magába foglaló vízszintes sík feletti 60 m-es (200 láb) magasságig nem lehet 90 mikrovolt/méter-nél (mínusz 107 dBW/m^2) kevesebb.

3.1.3.3.2.2 A II. Teljesítmény kategóriájú berendezések iránysáv-adóinál az ILS siklópályán és az iránysáv szektoron belül a 18,5 km-es (10 tengeri mérföld) távolságban a minimális térerősség nem lehet kevesebb 100 mikrovolt/méter-nél (mínusz 106 dBW/m^2) és növekvően nem kevesebb, mint 200 mikrovolt/méter (mínusz 100 dBW/m^2) kell, hogy legyen, a küszöböt magába foglaló vízszintes sík feletti 15 m-es (50 láb) magasságban.

3.1.3.3.2.3 A III. Teljesítmény kategóriájú berendezések iránysáv-adóinál az ILS siklópályán és az iránysáv szektoron belül a 18,5 km-es (10 tmf) távolságban a minimális térerősség nem lehet kevesebb 100 mikrovolt/méter-nél (mínusz 106 dBW/m2) és növekvően nem kevesebb, mint 200 mikrovolt/méter (mínusz 100 dBW/m2) kell, hogy legyen, a küszöböt magába foglaló vízszintes sík feletti 6 m-es (20 láb) magasságban. Ettől a ponttól egy további pontig, ami a futópálya középvonala felett 4 m (12 láb) magasságban és a futópálya küszöbétől 300 m (1000 láb) távolságban van az iránysáv-adó felé, és azt követően a futópálya hosszában 4 m (12 láb) magasságban, a térerősség nem lehet kevesebb 100 mikrovolt/méter-nél (mínusz 106 dBW/m^2).

Megjegyzés. - A fenti 3.1.3.3.2.2 és 3.1.3.3.2.3 pontokban megadott érték a térerősség megnövelt teljességéhez szükséges jel-zaj viszony biztosításához került előírásra.

3.1.3.3.3 **Ajánlás**. - A 7 fokos szög felett a jeleket olyan alacsony értékre kell csökkenteni, amennyire az gyakorlatilag csak lehetséges.

1. Megjegyzés. - A fenti 3.1.3.3.1, 3.1.3.3.2.1, 3.1.3.3.2.2 és 3.1.3.3.2.3 pontokban foglalt követelmények azon a feltételezésen alapulnak, hogy a repülőgép közvetlenül a berendezés felé tart.

2. Megjegyzés. - A fedélzeti vevő fontosabb paramétereire vonatkozó útmutató anyag a "C"- Melléklet 2.2.2 és 2.2.4 pontjában került megadásra.

3.1.3.3.4 Amikor a fedésterületet két rádiófrekvenciás vivőt alkalmazó iránysáv-adó szolgáltatja úgy, hogy azok közül az egyik vivő az elülső irányszektorban, a másik pedig ezen szektoron kívül hozza létre a sugárzási erőtér diagramot, akkor az elülső irányszektoron belüli térben a fenti 3.1.3.3.1 pontban előírt fedésterület határokig a két vivő térbeli jel erősségének az aránya nem lehet kevesebb 10dB-nél.

Megjegyzés. - A fedésterületet két rádiófrekvenciás vivővel létrehozó iránysáv-adóra vonatkozó útmutató anyag a következőkben a 3.1.3.11.2 pont Megjegyzésében és a "C"- Melléklet 2.7 pontjában található.

3.1.3.3.5 **Ajánlás.** - A III. Teljesítmény kategóriájú iránysáv-adóknál a két vivő térbeli jel erősségének aránya nem lehet 16dB-nél kevesebb.

3.1.3.4 *Iránysáv vonal szerkezet*

3.1.3.4.1 Az I. Teljesítmény kategóriájú iránysáv-adóknál az iránysáv vonalon az elhajlásoknak nem lehetnek olyan amplitúdói, amelyek a következőket túllépik:

Sáv	*Amplitúdó (DDM) (95%-os valószínűség)*
A fedésterület külső határától az ILS "A" pontig	0,031
Az ILS "A" ponttól az ILS "B" pontig	0,031 az ILS "A" pontnál, majd lineárisan csökken 0,015-re az ILS "B" pontig
Az ILS "B" ponttól az ILS "C" pontig	0,015

3.1.3.4.2 A II. és III. Teljesítmény kategóriájú iránysáv-adóknál az iránysáv vonalon az elhajlásoknak nem lehetnek olyan amplitúdói, amelyek a következőket túllépik:

Sáv	*Amplitúdó (DDM) (95%-os valószínűség)*
A fedésterület külső határától az ILS "A" pontig	0,031
Az ILS "A" ponttól az ILS "B" pontig	0,031 az ILS "A" pontnál, majd lineárisan csökken 0,005-re az ILS "B" pontig
Az ILS "B" ponttól az ILS vonatkozási pontig	0,005
és csak a III. kategóriánál: Az ILS vonatkozási ponttól az ILS "D" pontig	0,005
Az ILS "D" ponttól az ILS "E" pontig	0,005 az ILS "D" ponton, majd lineárisan nő 0,010-re az ILS "E" pontig

1. Megjegyzés. - A fenti 3.1.3.4.1 és 3.1.3.4.2 pontokban utalt amplitúdók - amennyiben helyesen vannak beállítva - megfelelnek az iránysáv vonal középértékén kapott elhajlásoknak tulajdonítható DDM értékeknek.

2. Megjegyzés. - Az iránysáv-adó iránysáv vonal szerkezetére vonatkozó útmutató anyagot a "C"-Melléklet 2.1.4, 2.1.6 és 2.1.7 pontja tartalmazza.

3.1.3.5 *Vivőfrekvencia moduláció*

3.1.3.5.1 A rádiófrekvenciás vivőhullámnak a 90 Hz-es és a 150 Hz-es hangokkal történő névleges modulációs mélységének 20 százalékosnak kell lennie az iránysáv vonal hosszában.

3.1.3.5.2 A rádiófrekvenciás vivőhullámnak a 90 Hz-es és a 150 Hz-es hangokkal történő modulációs mélységének 18 és 22 százalékos határérték között kell lennie.

3.1.3.5.3 A moduláló hangok frekvenciájára a következő tűréshatárokat kell alkalmazni:

a) a moduláló hangnak plusz, vagy mínusz 2,5 százalékon belül 90 Hz- és 150 Hz-nek kell lennie;

b) a moduláló hangnak plusz, vagy mínusz 1,5 százalékon belül 90 Hz- és 150 Hz-nek kell lennie a II. Teljesítmény kategóriájú berendezések esetén;

c) a moduláló hangnak plusz, vagy mínusz 1 százalékon belül 90 Hz- és 150 Hz-nek kell lennie a III. Teljesítmény kategóriájú berendezések esetén;

d) a 90 Hz-es hang teljes harmonikus tartalma nem lépheti túl a 10 százalékot; ezen kívül a III. Teljesítmény kategóriájú berendezések iránysáv-adóinál a 90 Hz-es hang második harmonikusa nem lépheti túl az 5 százalékot;

e) a 150 Hz-es hang teljes harmonikus tartalma nem lépheti túl a 10 százalékot.

3.1.3.5.3.1 **Ajánlás**. - Az ILS I. Teljesítmény kategóriájú berendezésnél a moduláló hangnak plusz, vagy mínusz 1,5 százalékos tűréshatáron belül 90 Hz-nek és 150 Hz-nek kell lennie, ahol ez gyakorlatilag megvalósítható.

3.1.3.5.3.2 A III. Teljesítmény kategóriájú berendezések iránysáv-adóinál a rádiófrekvenciás vivőhullámnak a tápforrás frekvenciáján, vagy annak harmonikusain, illetve az egyéb nem-kívánt összetevők által létrehozott amplitúdó-moduláció mélysége nem haladhatja meg a 0,5 százalékot. A tápforrás azon harmonikusai, vagy más olyan nem-kívánatos zaj összetevők, amelyek a 90 Hz-es és a 150 Hz-es navigációs hangokkal, vagy azok harmonikusaival kereszt-modulációt okozhatnak, és emiatt az iránysáv vonalán ingadozásokat idézhetnek elő, nem léphetik túl a rádiófrekvenciás vivő modulációs mélységének 0,05 százalékát.

3.1.3.5.3.3 A moduláló hangokat úgy kell fázisban (fáziszárt módon) szinkronizálni, hogy a fél irányszektoron belül a demodulált 90 Hz-es és 150 Hz-es hullámformák ugyanabban az irányban a nullán:

a) az I. és II. Teljesítmény kategóriájú berendezések iránysáv-adóinál 20 fokon belül; és

b) a III. Teljesítmény kategóriájú berendezések iránysáv-adóinál 10 fokon belül haladjanak át, a 150 Hz-es összetevő fázisához viszonyítva az összetett 90 Hz-es és 150 Hz-es hullámforma minden fél-ciklusában.

1. Megjegyzés. - A fázisviszony ilyen módon való meghatározásának nem az a célja, hogy a fázisnak a fél irányszektoron belüli megmérésének a követelményét írja elő.

2. Megjegyzés. - Az ilyen mérésekre vonatkozó útmutató anyag a "C"- Melléklet C-6. számú ábráján került megadásra.

3.1.3.5.3.4 A két-frekvenciás iránysáv rendszereknél a fenti 3.1.3.5.3.3 pontban leírtakat kell alkalmazni minden egyes vivőhullámra. Azonkívül az egyik vivőhullám 90 Hz-es modulációs hangját úgy kell fázisban szinkronizálni a másik vivőhullám 90 Hz-es modulációs hangjához, hogy a demodulált hullámforma ugyanabban az irányban a nullán:

a) az I. és II. kategóriájú iránysáv-adóknál 20 fokon belül; és

b) a III. kategóriájú iránysáv-adóknál 10 fokon belül haladjon át a 90 Hz fázisához viszonyítva. Hasonlóképpen a két vivőhullám 150 Hz-es hangjait úgy kell fázisban szinkronizálni, hogy a demodulált hullámforma ugyanabban az irányban a nullán:

1) az I. és II. kategóriájú iránysáv-adóknál 20 fokon belül; és

2) a III. kategóriájú iránysáv-adóknál 10 fokon belül haladjon át a 150 Hz fázisához viszonyítva.

3.1.3.5.3.5 Alternatívaként megengedettek kell, hogy legyenek az olyan iránysáv rendszerek, amelyek a fenti 3.1.3.5.3.4 pontban leírt szabvány azonos fázisú feltételtől eltérő hangfrekvenciás fázis-szinkronizálást alkalmaznak. Ebben az alternatív rendszerben a 90 Hz-nek a 90 Hz-hez történő fázis-szinkronizálását és a 150 Hz-nek a 150 Hz-hez való fázis-szinkronizálását úgy kell beszabályozni, hogy a névleges értékeik olyan határértékeken belül legyenek, amelyek a fenti 3.1.3.5.3.4 pontban meghatározásra kerültek.

Megjegyzés. - Ez a fedélzeti vevő pontos működésének biztosítását szolgálja az iránysáv vonaltól távolabbi olyan területeken, ahol a két vivőhullám jelerőssége közel azonos.
3.1.3.5.3.6 **Ajánlás.** - *A rádiófrekvenciás vivőnél a 90 Hz-es és a 150 Hz-es hangfrekvenciák miatt kapott modulációs mélység összege nem haladhatja meg a 60 százalékot, vagy nem lehet 30 százaléknál kevesebb a megkívánt fedésterületen belül.*

3.1.3.5.3.6.1 A 2000. január 1. után elsőként telepített berendezések rádiófrekvenciás vivőinél a 90 Hz-es és a 150 Hz-es hangfrekvenciák miatt kapott modulációs mélység összege nem haladhatja meg a 60 százalékot, vagy nem lehet 30 százaléknál kevesebb a megkívánt fedésterületen belül.

1. Megjegyzés. - Ha az I. Teljesítmény kategóriájú berendezések iránysávjainál a modulációs mélység összege a 60 százaléknál nagyobb, akkor a névleges eltolódás iránti érzékenységet lehet szabályozni úgy, ahogy az a 3.1.3.7.1 pontban megadott, ahhoz, hogy a fenti modulációs határt elérjék.

2. Megjegyzés. - A két-frekvenciás rendszereknél a modulációs mélység maximális összegére vonatkozó szabványt ne alkalmazzák azokon az irányszögeken, vagy azok közelében, ahol az iránysáv és a biztonsági vivő jelek szintje amplitúdóban egyenlő (azaz azokon az irányszögeken, ahol mindkét adó rendszernek jelentős része van a teljes modulációs mélység létrehozásában).

3. Megjegyzés. - A modulációs mélység minimális összegének szabványa azon alapszik hogy a meghibásodást jelző készülék szintje olyan magasra van beállítva, hogy az 30 százalék, amint az a “C”- Melléklet 2.3.3 pontjában meghatározásra került.

3.1.3.5.3.7 Amikor az iránysáv-adót rádiótávbeszélő összeköttetésre is használják, akkor a rádiófrekvenciás vivő - a 90 Hz-es és a 150 Hz-es jelek miatt kapott - modulációs mélységeinek összege nem lépheti túl a 65 százalékot az iránysáv vonaltól számított 10 fokon belül, és nem lépheti túl a 78 százalékot az iránysáv-adó körüli bármely más pontban.

3.1.3.5.4 **Ajánlás**. - *Az ILS iránysáv rádiófrekvencia vivőhullámain azt a nem-kívánatos frekvencia- és fázis-modulációt, ami hatással lehet az iránysáv-vevők kijelzett modulációs mélység különbségére (DDM), a gyakorlatilag megvalósítható mértékre kell csökkenteni.*

Megjegyzés. - A vonatkozó útmutató anyag a "C"- Melléklet 2.15 pontjában került megadásra.

3.1.3.6 *Iránysáv vonal beállítási pontosság*

3.1.3.6.1 Az iránysáv vonal közepét úgy kell beállítani és olyan határokon belül kell tartani, hogy ez az ILS vonatkozási pontnál a futópálya középvonalától a következő eltérésekkel egyenlő értékű határokon belül legyen:

a) az I. Teljesítmény kategóriájú berendezések iránysávjainál: plusz, vagy mínusz 10,5 méteren (35 láb), vagy a 0,015 DDM érték lineáris megfelelőjén belül - amelyik a kisebb;

b) a II. Teljesítmény kategóriájú berendezések iránysávjainál: plusz, vagy mínusz 7,5 méteren (25 láb) belül;

c) a III. Teljesítmény kategóriájú berendezések iránysávjainál: plusz, vagy mínusz 3 méteren (10 láb) belül.

3.1.3.6.2 **Ajánlás.** - *A II. Teljesítmény kategóriájú iránysáv-adóknál az iránysáv vonal közepét úgy kell beállítani és fenntartani, hogy ez az ILS vonatkozási pontnál a futópálya középvonalától plusz, vagy mínusz 4,5 méteres (15 láb) eltéréssel egyenlő értékű határokon belül legyen.*

1. Megjegyzés. - Az a cél, hogy a II. és III. Teljesítmény kategóriájú berendezések úgy legyenek beállítva és fenntartva, hogy a fenti 3.1.3.6.1 és 3.1.3.6.2 pontokban előírt határértékeket csak nagyon ritka esetben érjék el. További célja az, hogy a teljes földi ILS rendszer szerkezete és működése megfelelő teljességű (integritású) legyen ezen cél elérése érdekében.

2. Megjegyzés. - Az a cél, hogy az új II. kategóriájú berendezések elégítsék ki a fenti 3.1.3.6.2 pont követelményeit.

3. Megjegyzés. - Az iránysáv-adó iránysáv vonal beállításának mérésére vonatkozó útmutató anyagot a "C"- Melléklet 2.1.4 pontja adja meg.

3.1.3.7 *Eltolódás iránti érzékenység*

3.1.3.7.1 Az ILS vonatkozási pontnál a fél irányszektoron belüli névleges eltolódás iránti érzékenységnek 0,00145 DDM/méternek (0,00044 DDM/láb) kell lenni, kivéve azt, hogy azoknál az I. kategóriájú iránysáv-adóknál, ahol az előírt névleges eltolódás iránti érzékenységet nem lehet elérni, ott az eltolódás iránti érzékenységet úgy kell beállítani, hogy az ahhoz az értékhez a lehetséges legközelebbi legyen. Az 1 és 2 futópálya kódszámú futópályák I. Teljesítmény kategóriájú berendezéseinek iránysávjainál a névleges eltolódás iránti érzékenységet az ILS "B" pontnál kell elérni. A maximális iránysáv szektor szög nem lehet 6 foknál több.

Megjegyzés. - Az 1 és 2 futópálya kódszámok az Annex 14-ben vannak meghatározva.

3.1.3.7.2 Az oldalirányú eltolódás iránti érzékenységet a következő plusz, vagy mínusz határértékeken belülre kell beállítani és azon belül kell fenntartani:

a) a névleges érték 17 százaléka az I. és II. Teljesítmény kategóriájú berendezéseknél;

b) a névleges érték 10 százaléka a III. Teljesítmény kategóriájú berendezéseknél.

3.1.3.7.3 **Ajánlás.** - *Az ILS II. Teljesítmény kategóriájú berendezéseknél az eltolódás iránti érzékenységet plusz, vagy mínusz 10 százalékos határon belüli értékre kell beállítani és fenntartani, ahol ez gyakorlatilag megvalósítható.*

1. Megjegyzés. - A fenti 3.1.3.7.1, 3.1.3.7.2 és 3.1.3.7.3 pontokban megadott értékek a megfelelő pontnál, azaz az 1 és 2 kódszámú futópályáknál az ILS "B" pontnál, a többi futópályán az ILS vonatkozási pontnál egy 210 méteres (700 láb) névleges szektorszélességen alapulnak.

2. Megjegyzés. - A két rádiófrekvenciás vivőt alkalmazó iránysáv-adók beállítására és az eltolódás iránti érzékenységére vonatkozó útmutató anyag a "C"- Melléklet 2.7 pontjában van megadva.

3. Megjegyzés. - Az iránysáv-adó eltolódás iránti érzékenységének mérésére vonatkozó útmutató anyagot a "C"- Melléklet 2.9 pontja adja meg.

3.1.3.7.4 A DDM növekedésének lényegében lineárisnak kell lenni ahhoz a szögeltéréshez viszonyítva, ami az elülső iránysáv vonaltól (ahol a DDM nulla) addig a szögig tart - az elülső iránysáv vonal mindkét oldalán -, ahol a DDM 0,180. Ettől a szögtől plusz, vagy mínusz 10 fokig a DDM nem lehet 0,180-nál kevesebb. A plusz, vagy mínusz 10 foktól a plusz, vagy mínusz 35 fokig a DDM nem lehet kisebb 0,155-nél. Ahol fedésterület szükséges a plusz, vagy mínusz 35 fokon kívül, ott a DDM a fedésterület területén belül - a hátsó irányszektor kivételével - nem lehet 0,155-nél kevesebb.

1. Megjegyzés. - A DDM-nek a szögeltéréshez viszonyított lineáris változása különösen az iránysáv-vonal közvetlen szomszédságában fontos.

2. Megjegyzés. - A 10 - 35 fokos szektorra előírt fenti DDM értékeket minimális követelményeknek kell tekinteni az ILS-nek leszállító eszközként történő alkalmazásánál. Ahol gyakorlatilag lehetséges, egy nagyobb DDM érték - például 0,180 - előnyös a nagysebességű légijárművek kiszolgálására ahhoz, hogy azon az üzemeltetésileg kívánatos távolságokban nagyszögű befogásokat hajtsanak végre, amit a 3.1.3.5.3.6 pontban megadott modulációs százalék határértékek biztosítanak.
3. Megjegyzés. - Amikor lehetséges, az automatikus repülésvezérlő rendszerek iránysáv befogási szintjét 0,175 DDM-re, vagy az alá kell beállítani azért, hogy megelőzzék a pontatlan iránysáv befogásokat.

3.1.3.8 *Beszédüzem*

3.1.3.8.1 Az I. és II. Teljesítmény kategóriájú berendezések iránysáv-adói a navigációs és azonosító jelekkel együtt működtetett föld - levegő rádiótávbeszélő kommunikációs csatornát is biztosíthatnak azzal a feltétellel, hogy az ilyen üzemeltetés semmilyen módon ne zavarja az iránysáv-adó alapvető működését.

3.1.3.8.2 A III. kategóriájú iránysáv-adók nem biztosíthatnak ilyen csatornát, kivéve ott, ahol a berendezés tervezése és üzemeltetése során külön gondoskodtak annak biztosításáról, hogy a navigációs irányvezetés zavarának semmilyen lehetősége se forduljon elő.

3.1.3.8.3 Amennyiben ilyen csatornát biztosítanak, annak meg kell felelnie a következő Szabványoknak:

3.1.3.8.3.1 A csatornának ugyanazon a rádiófrekvenciás vivőn, vagy vivőkön kell lennie, mint amit az iránysáv-adó működésére felhasználnak, és a sugárzásnak vízszintesen polarizáltnak kell lennie. Ahol két vivőt modulálnak a beszéddel, ott a két vivőn lévő modulációk viszonylagos fázisainak olyannak kell lenniük, hogy kiküszöböljék a nulla értékek előfordulását az iránysáv-adó fedésterületén belül.

3.1.3.8.3.2 A vivőnek, vagy vivőknek a rádiótávbeszélő kommunikációs összeköttetések miatti csúcs modulációs mélysége nem lépheti túl az 50 százalékot, de úgy kell beállítani, hogy:

a) a rádiótávbeszélő kommunikációs összeköttetés miatti csúcs modulációs mélység az azonosító jel modulációs mélységéhez viszonyított aránya hozzávetőlegesen 9 : 1-hez legyen;

b) a rádiótávbeszélő csatorna, a navigációs jelek és az azonosító jelek használatának eredményeként kapott modulációs összetevők összege nem haladhatja meg a 95 százalékot.

3.1.3.8.3.3 A rádiótávbeszélő csatorna hangfrekvenciás karakterisztikájának 3 dB-en belüli lapos jelgörbéjűnek kell lenni az 1000 Hz-es szinthez viszonyítva, a 300 Hz-től a 3000 Hz-ig terjedő tartományban.

3.1.3.9 *Azonosítás*

3.1.3.9.1 Az iránysáv-adónak biztosítani kell egy, a futópályára és a megközelítési irányra meghatározott azonosító jel egyidejű kisugárzását azon az iránysáv-adó céljaira használt rádiófrekvenciás vivőn, vagy vivőkön, amelyet, vagy amelyeket az iránysáv-adó működésére használnak. Az azonosító jel kisugárzása semmiképpen sem zavarhatja az iránysáv-adó alapvető működését.

3.1.3.9.2 Az azonosító jelet a rádiófrekvenciás vivő, vagy vivők A2A osztályú modulálásával kell előállítani, plusz, vagy mínusz 50 Hz-en belüli pontosságú 1 020 Hz-es moduláló hang felhasználásával. A modulációs mélységnek az 5 és 15 százalékos határokon belül kell lennie, kivéve azt, hogy ahol rádiótávbeszélő csatornát biztosítanak, ott a modulációs mélységet úgy kell beállítani, hogy a rádiótávbeszélő összeköttetéshez tartozó csúcs modulációs mélységnek az azonosító jel modulációs mélységéhez viszonyított aránya hozzávetőlegesen 9 : 1 legyen (lásd a korábbi 3.1.3.8.3.2 pontot). Az azonosító jelet hordozó sugárzások vízszintesen polarizáltak kell, hogy legyenek. Ahol két vivőt modulálnak az azonosító jellel, ott a modulációk relatív fázisának olyannak kell lennie, hogy megakadályozza a nulla értékek előfordulását az iránysáv-adó fedésterületén belül.

3.1.3.9.3 Azonosító jelként a Nemzetközi Morse kód szerinti, két, vagy három betűből álló kódot kell alkalmazni. Ezt megelőzheti az "I" betű Nemzetközi Morse kódjele, amelyet egy rövid szünet követ ott, ahol szükséges az, hogy az ILS berendezést meg lehessen különböztetni a közbenső megközelítési területen lévő más navigációs berendezésektől.

3.1.3.9.4 Az azonosító jelet hozzávetőlegesen percenként 7 szavas ütemnek megfelelő sebességgel kell kisugározni, és megközelítőleg egyenlő időközönként kell megismételni, percenként legalább hatszor, folyamatosan, amikor az iránysáv-adó üzemeltetési használatra rendelkezésre áll. Amikor az iránysáv-adó sugárzásai üzemeltetési használatra nem állnak rendelkezésre, mint például a navigációs kiegészítők eltávolítása után, vagy karbantartási, illetve ellenőrző adások alatt, az azonosító jelet meg kell szűntetni. A pontok időtartama 0,1 másodperctől 0,160 másodpercig terjedő kell, hogy legyen. A vonások időtartama jellemzően a pont időtartamának háromszorosa legyen. A pontok és/vagy a vonások közötti időköznek plusz, vagy mínusz 10 százalékkal egyenlőnek kell lenni azzal az időtartammal, ami egy pont időtartama. A betűk közötti időköz nem lehet kevesebb annál, ami három pont időtartama.

3.1.3.10 *Telepítés*

3.1.3.10.1 Az iránysáv-adó antenna rendszerét a futópálya középvonalának meghosszabbításában, a futópálya megállási végén túl kell elhelyezni, és a berendezést úgy kell beállítani, hogy az iránysáv vonalak a kiszolgált futópálya középvonalát magában foglaló függőleges síkban legyenek. Az antenna rendszernek a fenti 3.1.3.3 pontban lefektetett fedésterületi követelmények kielégítéséhez szükséges minimális magassággal kell rendelkeznie, és a futópálya megállási végétől való távolsága meg kell, hogy feleljen a biztonságos akadálymentességre vonatkozó gyakorlatoknak.

3.1.3.11 *Felügyelő rendszer*

3.1.3.11.1 Az automatikus felügyelő rendszernek riasztó jelzést kell biztosítani a kijelölt ellenőrző pontokra és a következő esetek valamelyikének bekövetkezését kell előidéznie az alábbi 3.1.3.11.3.1 pontban előírt perióduson belül, amennyiben az alábbi 3.1.3 11.3.2 pontban meghatározott feltételek bármelyike fennmarad:

a) a sugárzás megszűnése;

b) a navigációs és azonosító összetevők eltávolítása a vivőről;

c) egy alacsonyabb kategóriába való visszaállás a II. és III. Teljesítmény kategóriájú berendezések iránysáv-adójánál ott, ahol ez a követelmény fennáll.

Megjegyzés. - Az a cél, hogy a fenti 3.1.3.11.1 pontban előforduló visszaállítási lehetőség csak akkor legyen alkalmazható, ha:

1) a visszaállítási eljárás biztonságossága megalapozott; és

2) a kategória megváltoztatásáról szóló és a hajózó személyzetnek nyújtott tájékoztatás integritása megfelelő.

3.1.3.11.2 A felügyelő rendszer tevékenységének megkezdését igénylő feltételeknek a következőknek kell lenniük:

a) az I. Teljesítmény kategóriájú berendezések iránysávjainál a közepes iránysáv vonalnak az ILS vonatkozási pontnál a futópálya középvonalától 10,5 méternél (35 láb), vagy a lineárisan megfelelő 0,015 DDM-nél - amelyik kisebb - nagyobb mértékű eltolódása;

b) a II. Teljesítmény kategóriájú berendezések iránysávjainál a közepes iránysáv vonalnak az ILS vonatkozási pontnál a futópálya középvonalától 7,5 méternél (25 láb) nagyobb mértékű eltolódása;

c) a III. Teljesítmény kategóriájú berendezések iránysávjainál a közepes iránysáv vonalnak az ILS vonatkozási pontnál a futópálya középvonalától 6 méternél (20 láb) nagyobb mértékű eltolódása;

d) azoknál az iránysáv-adóknál, amelyeknél az alapfunkciókat egy-frekvenciás rendszer alkalmazásával biztosítják, a kimenő teljesítménynek a rendes érték 50 százaléka alá történő csökkenése esetén, feltéve, hogy az iránysáv-adó továbbra is kielégíti a korábbi 3.1.3.3, 3.1.3.4 és 3.1.3.5 pontok követelményeit;

e) azoknál az iránysáv-adóknál, amelyeknél az alapfunkciókat két-frekvenciás rendszer alkalmazásával biztosítják, a kimenő teljesítménynek bármelyik vivő esetében a rendes érték 80 százaléka alá történő csökkenésekor, kivéve azt, hogy ennél nagyobb - a szabvány érték 80 százaléka és 50 százaléka közé történő - csökkenés is megengedhető, azzal a feltétellel, hogy az iránysáv-adó továbbra is folytatja a korábbiakban a 3.1.3.3, 3.1.3.4 és 3.1.3.5 pontokban leírtak kielégítését;

Megjegyzés. - Fontos annak elismerése, hogy a korábbi 3.1.3.2.1 pontban előírt frekvenciakülönbség megszűnése következtében létrejövő frekvenciaváltozás veszélyes helyzetet idézhet elő. Ez a probléma nagyobb üzemi fontosságú a II. és III. kategóriájú berendezéseknél. Szükség esetén ez a probléma speciális ellenőrzési intézkedésekkel, vagy nagy megbízhatóságú áramkör-rendszer segítségével oldható meg.

f) az eltolódás iránti érzékenység megváltozásánál az iránysáv-adó berendezésnél a névleges értéktől 17 százaléknál nagyobb eltérő értékre történő eltolódáskor.

Megjegyzés. - A fenti 3.1.311.2 e) pontban említett, az ellenőrzésre alkalmazott teljesítmény-csökkenés értékének megválasztása során különös mértékben figyelemmel kell lenni a kombinált sugárzó rendszerek függőleges és vízszintes szirom szerkezetére (a függőleges szirmok kialakulása a különböző antenna magasságok következtében), amikor két vivőfrekvenciát kell alkalmazni. A vivők közötti teljesítmény-viszonyban beálló nagymértékű változások alacsony akadálymentességi területeket és hamis iránysáv vonalakat eredményezhetnek az iránysáv vonalon kívüli területeken, a korábbiakban a 3.1.3.3.1 pontban meghatározott követelmény szerinti függőleges fedésterületi határokig.

3.1.3.11.2.1 **Ajánlás.** - *Azoknál az iránysáv-adóknál, amelyeknél az alapfunkciókat két-frekvenciás rendszer alkalmazásával biztosítják, a felügyelő rendszer műveletének kezdését igénylő helyzeteknek magukba kell foglalniuk azt az esetet, amikor a DDM értéke a szükséges fedésterületen az elülső iránysáv vonaltól plusz, vagy mínusz 10 fokon túl - a hátsó irányszektor kivételével - 0,155 alá csökken.*

3.1.3.11.3 A fenti 3.1.3.11.2 a), b), c), d) és e), valamint f) pontokban meghatározott működési határokon kívüli sugárzás teljes periódusa - beleértve a nulla sugárzás periódusát (periódusait) - olyan rövid kell, hogy legyen, amilyen az gyakorlatilag lehetséges, az iránysáv-adó biztosította navigációs szolgáltatás megszakadásának kiküszöbölése szükségességével összhangban.

3.1.3.11.3.1 A fenti 3.1.3.11.3 pont alatt említett teljes periódus semmilyen körülmények között sem lépheti túl:

a 10 másodpercet az I. kategóriájú iránysáv-adóknál;

az 5 másodpercet a II. kategóriájú iránysáv-adóknál;

a 2 másodpercet a III. kategóriájú iránysáv-adóknál.

1. Megjegyzés. - Az előírt teljes időperiódusok soha túl nem léphető határértékek, és az a céljuk, hogy védjék a légijárműveket a megközelítés végső szakaszaiban az iránysáv-adó irányítási adatainak a monitor határain kívül eső meghosszabbított idejű és ismétlődő periódusaival szemben. Ezen okból ezek nemcsak a tűréshatáron kívüli működés kezdeti periódusait foglalják magukba, hanem a tűréshatáron kívüli sugárzás bármely, vagy valamennyi - beleértve a nulla sugárzási periódust is - olyan periódusainak összességét is, amelyek a szolgáltatás visszaállításának elvégzése alatt előfordulhatnak, mint például a monitor egymást követő működése és az ezt követő átkapcsolás(ok) a másik iránysáv-adó berendezés(ek)re, vagy annak (azoknak) egységeire.

2. Megjegyzés. - Üzemeltetési szempontból az a feladat, hogy semmilyen olyan irányítási adat ne kerüljön kisugárzásra a megadott időperiódusok után, amely a monitor határain kívül esik, és hogy semmilyen kísérlet ne történjen a szolgáltatás visszaállítására, amíg egy 20 másodperc nagyságrendű időperiódus el nem telik.

3.1.3.11.3.2 **Ajánlás.** - *Ahol megvalósítható, az előző 3.1.3.11.3.1 pont alatti teljes periódust úgy kell csökkenteni, hogy ne lépje túl a 2 másodpercet a II. kategóriájú iránysáv-adóknál és az 1 másodpercet a III. kategóriájú iránysáv-adóknál.*

3.1.3.11.4 A felügyelő rendszer tervezésének és működésének meg kell felelnie annak a követelménynek, hogy a navigációs irányvezetési tájékoztatás és az azonosító jel szűnjön meg, és a figyelmeztető jelzés jusson el a kijelölt távvezérlő pontokra magának a felügyelő rendszernek az üzemzavara esetén is.

Megjegyzés. - A felügyelő rendszer tervezésére és működésére vonatkozó útmutató anyag a "C"-Melléklet 2.1.8 pontjában kerül megadásra.

3.1.3.11.5 A navigációs és azonosító összetevőknek a fenti 3.1.3.11.1 b) pont szerinti kimaradása idején a vivőfrekvencián előforduló bármilyen hibás navigációs jelet el kell nyomni az előzőekben a 3.1.3.11.3.1 pontban megengedett teljes perióduson belül.

Megjegyzés. - A kisugárzott jelben előforduló veszélyes ingadozások elkerülésére a mechanikus moduláló készüléket alkalmazó iránysáv-adóknál szükség lehet a navigációs összetevők elnyomására a modulátor leállása idején is.

3.1.3.12 *A szolgáltatás teljességi és folyamatossági követelményei*

3.1.3.12.1 Annak a valószínűsége, hogy nem kerül pontatlan jel kisugárzásra bármely leszállásra a II. és III. Teljesítmény kategóriájú iránysáv-adó berendezéseknél, nem lehet kevesebb az 1 - 0,5 * 10^{-9}-nél.

3.1.3.12.2 **Ajánlás.** - *Annak a valószínűsége, hogy nem kerül pontatlan jel kisugárzásra bármely leszállásra a II. és III. Teljesítmény kategóriájú iránysáv-adó berendezéseknél, nem lehet kevesebb az 1 – 1,0 * 10^{-7}-nél.*

3.1.3.12.3 Annak a valószínűsége, hogy a kisugárzott irány-vezetési jel nem kerül elvesztésre, nagyobb legyen, mint:

a) 1 - 2 * 10^{-6} bármely 15 másodperces időtartamban a II. Teljesítmény kategóriájú iránysáv-adó berendezéseknél, vagy az olyan iránysáv-adó berendezéseknél, amelyeket a III.A kategóriájú üzemeltetésekhez akarnak felhasználni (ami a leállások közötti 2000 órás átlagos idővel egyenlő); és

b) 1 - 2 * 10^{-6} bármely 30 másodperces időtartamban azon III. Teljesítmény kategóriájú iránysáv-adó berendezéseknél, amelyeket a III. kategóriájú üzemeltetések teljes tartományában akarnak felhasználni (ami a leállások közötti 4000 órás átlagos idővel egyenlő).

3.1.3.12.4 **Ajánlás.** - Annak a valószínűsége, hogy a kisugárzott irányvezetési jel nem kerül elvesztésre, meg kell, hogy haladja az 1 - 4 * 10^{-6} értéket bármely 15 másodperces időtartamban az I. Teljesítmény kategóriájú iránysáv-adó berendezéseknél (ami a leállások közötti 1000 órás átlagos idővel egyenlő).

Megjegyzés. - A szolgáltatás teljességére és folyamatossági követelményeire vonatkozó útmutató anyag a "C"- Melléklet 2.8 pontjában található.

3.1.4 Az ILS iránysáv-vevő rendszerek interferencia érzéketlenségi teljesítménye

3.1.4.1 1998. január 1. után az ILS iránysáv-vevő rendszereknek kielégítő interferencia érzéketlenséget kell biztosítani az olyan ultrarövidhullámú (VHF) műsorszóró frekvencia-modulált adások jelei által okozott, két jelből eredő harmadrendű kereszt-modulációs zavaró hatások eredményeivel szemben, amelyeknek a szintje a következőknek felel meg:

$$2N_1 + N_2 + 72 \leq 0$$

az ultrarövidhullámú frekvencia-modulált hang-műsorszóró adások jeleinek a 107,7 - 108,0 MHz-es tartományában és

$$2N_1 + N_2 + 3\left(24 - 20\ \log\frac{\Delta f}{0.4}\right) \leq 0$$

az ultrarövidhullámú frekvencia-modulált hang-műsorszóró adások jeleinek a 107,7 MHz alatt, ott, ahol a két ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás frekvenciáinak jelei hozzák létre, a vevőn belül a két jelből eredő harmadrendű kereszt-modulációs terméket a kívánt ILS iránysáv frekvencián.

Az N1 és az N2 a két ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jeleinek szintjei (dBm) az ILS iránysáv-vevő bemenetén. Egyik jelszint sem haladhatja meg a következőkben a 3.1.4.2 pontban lefektetett érzéketlenítési követelményt.

Df = 108,1 – f_1 , ahol f_1 az az N1 frekvencia, amelyik az ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jelei sugárzására használt 108,1 MHz-hez közelebbi frekvencia.

3.1.4.2 1998. január 1. után az ILS iránysáv-vevő rendszer nem lehet leérzéketlenítve a következő táblázatnak megfelelő szintű, az ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jeleinek jelenléte esetén:

Frekvencia (MHz)	A nem-kívánt jel maximális szintje a vevő bemenetén (dBm)
88 - 102	+15
104	+10
106	+5
107,9	-10

1. Megjegyzés. - A fenti frekvenciákkal kijelölt szomszédos pontok között az összefüggés lineáris.
2. Megjegyzés. - A fenti 3.1.4.1 és 3.1.4.2 pontokban megszabott teljesítményre alkalmazandó érzéketlenségi követelményekre vonatkozó útmutató anyagot a "C"- Melléklet 2.2.9 pontja tartalmazza.

3.1.4.3 1995. január 1. után az összes, újonnan felszerelt fedélzeti ILS iránysáv-vevő rendszernek ki kell elégítenie a fenti 3.1.4.1 és 3.1.4.2 pontok előírásait.

3.1.4.4 **Ajánlás.** - Az előzőekben a 3.1.4.1 és 3.1.4.2 pontokban lévő szabványoknak megfelelő érzéketlenségi teljesítményű fedélzeti ILS iránysáv-vevő rendszereket a lehető legkorábbi időpontban üzembe kell helyezni.

3.1.5 A deciméteres hullámú (UHF) siklópálya-adó berendezés és a hozzá kapcsolódó felügyelő rendszer

Megjegyzés. - Ebben a pontban a θ jelet a névleges siklópálya szög jelölésére használjuk.

3.1.5.1 *Általános rész*

3.1.5.1.1 A mikrohullámú (UHF) siklópálya-adó antenna rendszerből kisugárzott jeleknek egy olyan összetett térerősség-eloszlást kell létrehozni, amely a 90 Hz-es és a 150 Hz-es hanggal modulált. A sugárzási térerősség-eloszlást úgy kell 'elrendezni', hogy az egy egyenes vonalú süllyedési pályát hozzon létre a futópálya középvonalát magába foglaló függőleges síkban úgy, hogy a 150 Hz-es hang legyen túlsúlyban a süllyedési pálya alatt és a 90 Hz-es hang a süllyedési pálya felett, egy legalább az 1,75 θ-val egyenlő szögig.

3.1.5.1.2 **Ajánlás**. - *A mikrohullámú (UHF) siklópályaadó berendezésnek alkalmasnak kell lennie olyan beállításra, hogy a vízszinteshez képest egy, a 2-től 4 fokig terjedő tartományban kisugárzott siklópályát hozzon létre.*

3.1.5.1.2.1 **Ajánlás**. - *Az ILS siklópálya szögének 3 foknak kell lenni. 3 fokot meghaladó siklópálya szöget lehetőleg ne alkalmazzanak, kivételként csak ott, ahol a megfelelő akadálymentességi követelmények kielégítésének egyéb módja gyakorlatilag megvalósíthatatlan.*

3.1.5.2.2 A siklópálya szöget úgy kell beállítani és határértékeken belül tartani, hogy az:

a) θ-tól 0,075 θ-n belül legyen az ILS I. és II. Teljesítmény kategóriájú berendezések siklópályáinál;

b) θ-tól 0,04 θ-n belül legyen az ILS III. Teljesítmény kategóriájú berendezések siklópályáinál.

1. Megjegyzés. - A siklópálya szögek beállítására és a határértéken belül tartására vonatkozó útmutató anyagot a "C" Melléklet 2.4 pontja adja meg.

2. Megjegyzés. - Az ILS referencia pont magasságának kiválasztásához kapcsolódó ILS siklópálya görbületére, beállítására és az adó telepítésére vonatkozó útmutató anyagot a "C"- Melléklet 2.4 pontja, valamint a C-5. ábra adja meg.

3.1.5.1.3 Az ILS siklópálya lefelé meghosszabbított egyenes szakaszának olyan magasságban kell áthaladnia az ILS referencia ponton, amely biztosítja az akadályok felett a biztonságos irányvezetést, valamint a kiszolgált futópálya biztonságos és eredményes használatát.

3.1.5.1.4 Az ILS referencia pont magasságának az ILS II. és III. Teljesítmény kategóriájú berendezéseknél 15 méternél (50 láb) kell lenni. Egy plusz 3 méteres (10 láb) nagyságrendű tűrés megengedett.

3.1.5.1.5 **Ajánlás**. - *Az ILS referencia pont magasságának az ILS I. Teljesítmény kategóriájú berendezéseknél 15 méternél (50 láb) kell lenni. Egy plusz 3 méteres (10 láb) nagyságrendű tűrés megengedett.*

1. Megjegyzés. - Az ILS referencia pontra megadott fenti magassági értékek megállapítása során a futópálya küszöbénél a légijármű siklópálya antennájának a pályája és a főfutók kerekei legalsó részének a pályája között 5,8 m(19 láb) maximális függőleges távolság került alapfeltételként elfogadásra. Az ezen alapismérvet túllépő légijárművek esetében megfelelő lépéseket lehet tenni azért, hogy vagy a kielégítő küszöb feletti akadálymentesség betartásra kerüljön, vagy helyesbíteni kell az engedélyezett üzemeltetési minimumot.

2. Megjegyzés. - A megfelelő útmutató anyag a "C"- Melléklet 2.4 pontjában került megadásra.

3.1.5.1.6 **Ajánlás.** - *Az ILS referencia pont magassága a rövid, 1 és 2 futópálya kódszámú precíziós megközelítési futópályáknál alkalmazott ILS I. Teljesítmény kategóriájú berendezéseknél 12 m (40 láb) kell, hogy legyen. Egy plusz 6 m-es (20 láb) nagyságrendű tűrés megengedett.*

3.1.5.2 *Rádiófrekvencia*

3.1.5.2.1 A siklópályaadó berendezés a 328,6 MHz-től a 335,4 MHz-ig terjedő frekvenciasávban kell, hogy működjön. Ahol egy egyedüli rádiófrekvenciás vivőhullámot használnak, ott a frekvencia tűréshatára nem lépheti túl a 0,005 százalékot. Ahol két vivőhullámos siklópálya rendszert használnak, ott a frekvencia tűréshatára nem lépheti túl a 0,002 százalékot, és a vivőfrekvenciák által elfoglalt névleges sávnak a kijelölt frekvenciára szimmetrikusnak kell lennie. A vivők közötti frekvencia elkülönítés az alkalmazott összes tűréssel együtt nem lehet sem kevesebb 4 kHz-nél, sem több 32 kHz-nél.

3.1.5.2.2 A siklópálya-adó sugárzásának vízszintesen polarizáltnak kell lennie.

3.1.5.2.3 Az ILS III. Teljesítmény kategóriájú berendezések siklópálya-adó berendezése által kisugárzott jelek semmilyen olyan összetevőt nem tartalmazhatnak, amelyek 0,02 DDM csúcstól csúcsig értéknél nagyobb látszólagos siklópálya ingadozást eredményeznek a 0,01 Hz-től a 10 Hz-ig terjedő frekvenciasávban.

3.1.5.3 *Fedésterület*

.1.5.3.1 A siklópálya-adó berendezésnek megfelelő jeleket kell biztosítani ahhoz, hogy azok lehetővé tegyék egy szabványos fedélzeti berendezés kielégítő működését az ILS siklópálya középvonalának mindkét oldalán elhelyezkedő 8 fokos oldalszögbeli szektoron belül legalább
18,5 km (10 tengeri mérföld) távolságig a vízszintes felett, felfelé 1,75 θ -ig és lefelé 0,45 θ -ig, vagy egy olyan alacsony szögig, mint lefelé a 0,30 θ , ha az a közzétett siklópálya befogási eljárás biztosításához szükséges.

3.1.5.3.2 Abból a célból, hogy a fenti 3.1.5.3.1 pontban a siklópálya-adó teljesítményére előírt fedés biztosítva legyen, ezen a fedésterületen belül a minimális térerősségnek 400 mikrovolt/méternek kell lenni (mínusz 95 dBW/m^2). Az I. Teljesítmény kategóriájú berendezések siklópályájánál ezt a térerősséget lefelé, a küszöböt magába foglaló vízszintes sík feletti 30 m (100 láb) magasságig kell biztosítani. A II. és III. Teljesítmény kategóriájú berendezések siklópályáinál ezt a térerősséget lefelé, a küszöböt magába foglaló vízszintes sík feletti 15 m (50 láb) magasságig kell biztosítani.

1. Megjegyzés. - Az előző pontokban lévő követelmények azon az alapfeltételen alapulnak, hogy a repülőgép közvetlenül a berendezés felé tart.

2. Megjegyzés. - A fedélzeti vevőkészülék lényeges paramétereire vonatkozó útmutató anyagot a "C"- Melléklet 2.2.5 pontja ad.

3. Megjegyzés. - Az ILS siklópálya középvonalának mindkét oldalán a 8 fokon kívüli fedésterületi csökkenésre vonatkozó anyag a "C"- Melléklet 2.4 pontjában található.

3.1.5.4 *Az ILS siklópálya szerkezete*

3.1.5.4.1 Az ILS I. Teljesítmény kategóriájú berendezések siklópályáinál a siklópályában előforduló elhajlásoknak nem lehetnek olyan amplitúdói, amelyek a következő értékeket túllépik:

Sáv	*Amplitúdó (DDM) (95%-os valószínűség)*
A fedésterület külső határától az ILS "C" pontjáig	0,035

3.1.5.4.2 Az ILS II. és III. Teljesítmény kategóriájú berendezések siklópályáinál a siklópályában előforduló elhajlásoknak nem lehetnek olyan amplitúdói, amelyek a következő értékeket túllépik:

Sáv	*Amplitúdó (DDM) (95%-os valószínűség)*
A fedésterület külső határától az ILS "A" pontjáig	0,035
Az ILS "A" pontjától az ILS "B" pontjáig	0,035 az ILS "A" pontjában, majd lineárisan 0,023-ra csökkenően az ILS "B" pontjáig
Az ILS "B" pontjától az ILS referencia pontjáig	0,023

1. Megjegyzés. - A fenti 3.1.5.4.1 és 3.1.5.4.2 pontokban meghatározott amplitúdók a helyesen beállított közepes ILS siklópályán kapott elhajlásokból származó DDM értékek.

2. Megjegyzés. - A megközelítés azon szakaszaiban, ahol az ILS siklópálya görbülete jelentős, az elhajlás amplitúdóit a görbült közepes pályától kell számítani, nem pedig a lefelé meghosszabbított egyenes vonaltól.

3. Megjegyzés. - Az ILS siklópálya szerkezetére vonatkozó útmutató anyag a "C"- Melléklet 2.1.5 pontjában került megadásra.

3.1.5.5 *A vivőfrekvencia modulációja*

3.1.5.5.1 A rádiófrekvenciás vivőnek mindkét, a 90 Hz-es és a 150 Hz-es hang miatti névleges modulációs mélységének 40 százalékosnak kell lennie az ILS siklópálya mentén. A modulációs mélység nem térhet a 37,5 százalék és 42,5 százalék határokon kívülre.

3.1.5.5.2 A moduláló hangfrekvenciás jelekre a következő tűréshatárokat kell alkalmazni:

a) az ILS I. Teljesítmény kategóriájú berendezés moduláló hangfrekvenciáknak 90 Hz-esnek és 150 Hz-esnek kell lenniük 2,5 százalékon belüli tűréshatárral;

b) az ILS II. Teljesítmény kategóriájú berendezés moduláló hangfrekvenciáknak 90 Hz-esnek és 150 Hz-esnek kell lenniük 1,5 százalékon belüli tűréshatárral;

c) az ILS III. Teljesítmény kategóriájú berendezés moduláló hangfrekvenciáknak 90 Hz-esnek és 150 Hz-esnek kell lenniük 1 százalékon belüli tűréshatárral;

d) a 90 Hz-es hang teljes harmonikus összetevője nem lépheti túl a 10 százalékot: ezenkívül a III. Teljesítmény kategóriájú berendezéseknél a 90 Hz-es hang másod-harmonikusa nem lépheti túl az 5 százalékot;

e) a 150 Hz-es hang teljes harmonikus összetevője nem lépheti túl a 10 százalékot.

3.1.5.5.2.1 **Ajánlás**. - *Az ILS I. Teljesítmény kategóriájú berendezésnél a moduláló jelnek 90 Hz-esnek és 150 Hz-esnek kell lennie, plusz, vagy mínusz 1,5 százalékon belül, ahol gyakorlatilag ez megvalósítható.*

3.1.5.5.2.2 A III. Teljesítmény kategóriájú berendezések siklópályaadóinál, a rádiófrekvenciás vivőhullámnak a tápforrás frekvenciáján, vagy annak harmonikusain, illetve az egyéb zaj frekvenciákon lévő amplitúdó moduláció nem haladhatja meg az 1 százalékot.

3.1.5.5.3 A moduláló hangokat úgy kell fázisban szinkronizálni, hogy a fél siklópálya szektoron belül a demodulált 90 Hz-es és 150 Hz-es hullámformák ugyanabban az irányban a nullán:

a) az I. és II. Teljesítmény kategóriájú berendezések siklópálya-adóinál 20 fokon belül; és

b) a III. Teljesítmény kategóriájú berendezések siklópályaadóinál 10 fokon belül haladjanak át a 150 Hz-es összetevő fázisához viszonyítva az összetett 90 Hz-es és 150 Hz-es hullámforma minden fél-ciklusában.

1. Megjegyzés. - A fázis-szabály ilyen módon való meghatározásának nem az a célja, hogy a fázisnak a fél siklópálya szektoron belüli megmérése követelményét írja elő.
2. Megjegyzés. - Az ilyen mérésekre vonatkozó útmutató anyag a "C"- Melléklet C-6. számú ábráján került megadásra.

3.1.5.5.3.1 A két-frekvenciás siklópálya rendszereknél a fenti 3.1.5.5.3 pontban leírtakat kell alkalmazni minden egyes vivőhullámra. Azonkívül az egyik vivőhullám 90 Hz-es modulációs hangját úgy kell fázisban szinkronizálni a másik vivőhullám 90 Hz-es modulációs hangjához, hogy a demodulált hullámforma ugyanabban az irányban a nullán:

a) az I. és II. kategóriájú siklópályaadóknál 20 fokon belül; és

b) a III. kategóriájú siklópályaadóknál 10 fokon belül haladjon át a 90 Hz fázisához viszonyítva. Hasonlóképpen a két vivőhullám 150 Hz-es hangjait úgy kell fázisban szinkronizálni, hogy a demodulált hullámforma ugyanabban az irányban a nullán:

1) az I. és II. kategóriájú siklópályaadóknál 20 fokon belül; és

2) a III. kategóriájú siklópályaadóknál 10 fokon belül haladjon át a 150 Hz fázisához viszonyítva.

3.1.5.5.3.2 Alternatívaként megengedettek kell, hogy legyenek az olyan siklópálya rendszerek, amelyek a fenti 3.1.5.5.3.1 pontban leírt szabvány azonos fázisú feltételtől eltérő hangfrekvenciás fázis-szinkronizálást alkalmaznak. Ebben az alternatív rendszerben a 90 Hz-nek a 90 Hz-hez történő fázis-szinkronizálását és a 150 Hz-nek a 150 Hz-hez való fázis-szinkronizálását úgy kell beszabályozni, hogy a névleges értékeik olyan határértékeken belül legyenek, amelyek a fenti 3.1.5.5.3.1 pontban meghatározásra kerültek.

Megjegyzés. - Ez a fedélzeti vevő pontos működésének biztosítását szolgálja a siklópálya szektoron belüli olyan területeken, ahol a két vivőhullám jelerőssége közel azonos.

3.1.5.5.4 **Ajánlás.** - *Az ILS siklópálya rádiófrekvencia vivőhullámain azt a nem-kívánatos frekvencia- és fázis-modulációt, ami hatással lehet a siklópályavevők kijelzett modulációs mélység különbségére (DDM), a gyakorlatilag megvalósítható mértékre kell csökkenteni.*

Megjegyzés. - A vonatkozó útmutató anyag a "C"- Melléklet 2.15 pontjában került megadásra.

3.1.5.6 *Az eltolódás iránti érzékenység*

3.1.5.6.1 Az ILS I. Teljesítmény kategóriájú berendezések siklópályáinál a névleges szögbeli eltolódás iránti érzékenységnek a DDM 0,0875 értéknek kell megfelelni a siklópálya feletti és alatti 0,07 θ és 0,14 θ közötti szögbeli eltérésen belül.

Megjegyzés. - A fentieknek nem célja az olyan siklópályaadó rendszerek kizárása, amelyeknek jellemzője az aszimmetrikus felső és alsó szektor.

3.1.5.6.2 **Ajánlás.** - *Az ILS I. Teljesítmény kategóriájú berendezések siklópályáinál a névleges szögbeli eltolódás iránti érzékenységnek a DDM 0,0875 értéknek kell megfelelni a siklópálya alatti 0,12 θ szögbeli eltérésnél egy plusz, vagy mínusz 0,02 θ tűréshatárral. A felső és alsó szektornak a fenti 3.1.5.6.1 pontban meghatározott határértékeken belül olyan szimmetrikusnak kell lenni, amennyire az gyakorlatilag megvalósítható.*

3.1.5.6.3 Az ILS II. Teljesítmény kategóriájú berendezések siklópályáinál a szögbeli eltolódás iránti érzékenységnek olyan szimmetrikusnak kell lenni, amennyire az gyakorlatilag megvalósítható. A névleges szögbeli eltolódás iránti érzékenységnek a DDM 0,0875-nek kell megfelelni a következő szögbeli eltéréseknél:

a) 0,12 θ-nál a siklópálya alatt egy plusz, vagy mínusz 0,02 θ toleranciával;

b) 0,12 θ-nál a siklópálya felett egy plusz 0,02 q és mínusz 0,05 θ tűréshatárral.

3.1.5.6.4 Az ILS III. Teljesítmény kategóriájú berendezések siklópályájánál a névleges szögbeli eltolódás iránti érzékenységnek a DDM 0,0875-nek kell megfelelni a siklópálya feletti és alatti 0,12 θ szögbeli eltérésnél egy plusz, vagy mínusz 0,02 θ tűréshatárral.

3.1.5.6.5 Az ILS siklópálya alatti DDM értéknek egyenletesen kell növekednie a szög csökkentésével mindaddig, amíg a 0,22 DDM értéket el nem éri. Ezt az értéket a vízszintes feletti 0,30 θ értékűnél nem kisebb szögnél kell elérni. Azonban ha ezt az értéket a 0,45 θ feletti szögnél érik el, akkor a DDM érték nem lehet kevesebb, mint 0,22 lefelé legalább 0,45 θ-ig, vagy olyan alacsony szögig, mint a 0,30 θ, amely a közzétett siklópálya befogási eljárás biztosításához szükséges.

Megjegyzés. - A siklópályaadó berendezés értékhatárainak beállítását a "C"- Melléklet C-11. ábrája mutatja be.

3.1.5.6.6 Az ILS I. Teljesítmény kategóriájú berendezések siklópályáinál a szögbeli eltolódás iránti érzékenységet a kiválasztott névleges érték plusz, vagy mínusz 25 százalékán belülre kell beállítani és a határértéken belül kell tartani.

3.1.5.6.7 Az ILS II. Teljesítmény kategóriájú berendezések siklópályáinál a szögbeli eltolódás iránti érzékenységet a kiválasztott névleges érték plusz, vagy mínusz 20 százalékán belülre kell beállítani és a határértéken belül kell tartani.

3.1.5.6.8 Az ILS III. Teljesítmény kategóriájú berendezések siklópályáinál a szögbeli eltolódás iránti érzékenységet a kiválasztott névleges érték plusz, vagy mínusz 15 százalékán belülre kell beállítani és a határértéken belül kell tartani.

Megjegyzés. - Az ILS siklópálya értékek beállítására és a határértékeken belüli tartására vonatkozó magyarázó anyag a "C"- Melléklet 2.1.5 pontjában került megadásra.

3.1.5.7 *Felügyelő rendszer*

3.1.5.7.1 Az automatikus felügyelő rendszernek riasztó jelzést kell biztosítani a kijelölt ellenőrző pontokra, és létre kell hoznia a sugárzás beszűntetését a 3.1.5.7.3.1 pontban előírt időhatárokon belül, ha az alábbi feltételek valamelyike fennáll:

a) a közepes ILS siklópálya szög elmozdulása a q szögtől a mínusz 0,075 θ-tól a plusz 1,10 θ-ig terjedő értéknél nagyobb;

b) az olyan ILS siklópályák esetében, amelyeknél az alapfunkciókat egy-frekvenciás rendszer alkalmazásával biztosítják, ott a kimenő teljesítmény 50 százalék alá történő csökkenése esetén, feltéve, hogy a siklópályaadó továbbra is kielégíti a 3.1.5.3, 3.1.5.4 és 3.1.5.5 pontokban megadott követelményeket;

c) azoknak a siklópályaadóknak az esetében, amelyeknél az alap-funkciókat két-frekvenciás rendszerek alkalmazásával biztosítják, a kimenő teljesítménynek bármelyik vivőnél a rendes érték 80 százalékánál kisebb értékre való csökkenése esetén, kivéve, hogy ennél nagyobb mértékű csökkenés - a rendes érték 80 és 50 százaléka közé - is megengedhető azzal a feltétellel, hogy a siklópályaadó továbbra is kielégíti a 3.1.5.3, 3.1.5.4 és 3.1.5.5 pontokban megadott követelményeket;

Megjegyzés. - Fontos annak felismerése, hogy a 3.1.5.2.1 pontban előírt frekvencia-különbség megszűnése következtében létrejövő frekvenciaváltozás veszélyes helyzetet teremthet. E probléma nagyobb üzemi jelentőségű a II. és III. kategóriájú berendezéseknél. Szükség esetén ez a probléma speciális ellenőrzési intézkedések, vagy nagy megbízhatóságú áramkör-rendszer segítségével oldható meg.

d) az ILS I. Teljesítmény kategóriájú berendezéseknél ha a siklópálya és a siklópálya alatti azon vonal (ahol a l50 Hz van túlsúlyban) között, amelynél a DDM 0,0875 értékű, plusz, vagy mínusz 0,0325 θ-nál nagyobb értékű szögbeli változást érzékel a rendszer;

e) az ILS II. és III. Teljesítmény kategóriájú berendezések siklópályáinál az eltolódás iránti érzékenységnek egy olyan értékre történő megváltozásakor, ami több, mint 25 százalékkal tér el a névleges értéktől;

f) az ILS siklópálya alatti azon területen - amelynél a DDM értéke 0,0875 - a vonalnak a vízszintestől mért 0,7475 θ-nál kisebb értékre való lecsökkenése;

g) a siklópálya szektor alatti meghatározott fedésterületen belül a DDM-nek a 0,175-nél kisebb értékűre csökkenése.

1. Megjegyzés. - A vízszintestől mért 0,7475 θ érték célja a kielégítő akadálymentesség biztosítása. Ez az érték a siklópálya-adó és a felügyelő rendszer szabvány előírásának más paramétereiből került levezetésre. Mivel nem cél a négy-számjegyes mérési pontosság, ezért erre a célra a 0,75 θ érték alkalmazható a felügyelő rendszer határaként. Az akadálymentességi kritériumokra vonatkozó útmutató a PANS-OPS (Doc 8168)-ban található.

2. Megjegyzés. - Az f) és g) alpontnak nem célja egy olyan különálló felügyelő rendszer iránti követelmény felállítása, amely a fél-szektor alsó határának a vízszintestől mért 0,7475 θ érték alá történő csökkenése ellen nyújtana védelmet.

3. Megjegyzés. - Az olyan siklópálya-adó berendezéseknél, amelyeknél a kiválasztott névleges szögbeli eltolódás iránti érzékenység az ILS siklópálya alatt egy olyan szögnek felel meg, amely közel van a 3.1.5.6 pontban előírt maximális határhoz, vagy azonos azzal, szükség lehet a felügyelő rendszer működési határértékeinek olyan beállítására, hogy az védelmet nyújtson a szektornak a vízszintestől mért 0,7475 θ érték alá való csökkenésével szemben.

4. Megjegyzés. - A g) alpontban leírt feltételre vonatkozó útmutató anyag a "C"- Melléklet 2.4.13 pontjában található.
3.1.5.7.2 **Ajánlás.** - *Az ILS siklópálya jellemzők felügyelő rendszerét a kisebb tűréshatárokra kell beállítani azokban az esetekben, ahol egyébként üzemeltetési hátrányok jelentkeznének.*

3.1.5.7.3 A 3.1.5.7.1 a), b), c), d), e) és f) pontokban előírt teljesítmény határokon kívül eső sugárzás teljes periódusa - beleértve a nulla sugárzás periódusa(i)t is - olyan rövid kell, hogy legyen, amilyen az gyakorlatilag csak lehetséges az ILS siklópályaadó által biztosított navigációs szolgáltatás kimaradása kiküszöbölésének szükségessége érdekében.

3.1.5.7.3.1 A 3.1.5.7.3 pont alatt említett teljes periódus semmilyen körülmények között sem lépheti túl:

a 6 másodpercet az I. kategóriájú ILS siklópálya-adóknál;

a 2 másodpercet a II. és III. kategóriájú ILS siklópálya-adóknál.

1. Megjegyzés. - Az előírt teljes időperiódusok soha túl nem léphető határértékek, és az a céljuk, hogy megvédjék a megközelítés végső szakaszaiban lévő légijárműveket az ILS siklópálya irányvezetésnek a felügyelő rendszer határain kívül eső, hosszantartó, vagy ismétlődő periódusaival szemben. Ebből az okból eredően ezek nemcsak a tűréshatárokon kívüli működés kezdeti periódusát foglalják magukba, hanem a tűréshatáron kívüli sugárzás bármely, vagy valamennyi - beleértve a nulla sugárzási periódus(oka)t is - olyan periódusainak összességét is, amelyek a szolgáltatás visszaállításának elvégzése alatt előfordulhatnak, mint például a felügyelő rendszer egymást követő működése és az azt követő átkapcsolás(ok) a másik siklópálya-adó berendezés(ek)re, vagy annak (azoknak) egységeire.

2. Megjegyzés. - Üzemeltetési szempontból az a feladat, hogy a felügyelő rendszer határain kívül semmilyen irányvezetési adat ne kerüljön kisugárzásra a megadott időperiódusok után, és hogy semmilyen további kísérlet ne történjen a szolgáltatás visszaállítására addig, amíg egy 20 másodperces nagyságrendű időtartam el nem telik.

3.1.5.7.3.2 **Ajánlás.** - *Ahol gyakorlatilag megvalósítható, a fenti 3.1.5.7.3.1 pont alatt az ILS II. és III. kategóriájú siklópályaadókra meghatározott teljes időperiódus ne lépje túl az 1 másodpercet.*

3.1.5.7.4 A felügyelő rendszer tervezése és működése meg kell, hogy feleljen annak a követelménynek, hogy a sugárzás szűnjön meg és a figyelmeztető jelzés jusson el a kijelölt távvezérlő helyekre magának a felügyelő rendszernek az üzemzavara esetén is.

Megjegyzés. - A felügyelő rendszer tervezésére és működésére vonatkozó útmutató anyag a "C"-Melléklet 2.1.8 pontjában került megadásra.

3.1.5.8 *A szolgáltatás teljességi és folyamatossági követelményei*

3.1.5.8.1 Annak a valószínűsége, hogy nem kerül pontatlan jel kisugárzásra bármely leszállásra a II. és III. Teljesítmény kategóriájú siklópálya-adó berendezéseknél, nem lehet kevesebb az 1 - 0,5 * 10^{-9}-nél.

3.1.5.8.2 **Ajánlás.** - *Annak a valószínűsége, hogy nem kerül pontatlan jel kisugárzásra bármely leszállásra az I. Teljesítmény kategóriájú siklópálya-adó berendezéseknél, nem lehet kevesebb az 1 - 0,5 * 10^{-7}-nél.*

3.1.5.8.3 Annak a valószínűsége, hogy a kisugárzott irányvezetési jel nem kerül elvesztésre, nagyobb kell, hogy legyen, mint 1 - 2 * 10^{-6} bármely 15 másodperces időtartamban a II. és III. Teljesítmény kategóriájú siklópálya-adó berendezéseknél (ami a leállások közötti 2000 órás átlagos idővel egyenlő).

3.15.8.4 **Ajánlás**. - Annak a valószínűsége, hogy a kisugárzott irányvezetési jel nem kerül elvesztésre, meg kell, hogy haladja az 1 - 4 * 10^{-6} értéket bármely 15 másodperces időtartamban az I. Teljesítmény kategóriájú siklópálya-adó berendezéseknél (ami a leállások közötti 1000 órás átlagos idővel egyenlő).

Megjegyzés. - A szolgáltatás teljességére és folyamatossági követelményeire vonatkozó útmutató anyag a "C"- Melléklet 2.8 pontjában található.

3.1.6 Az iránysáv-adó és a siklópálya-adó frekvencia párosítása

3.1.6.1 Egy műszeres leszállító rendszerrel felszerelt futópálya iránysáv-adójának és siklópálya-adójának frekvencia párosítását a következő táblázatból kell kiválasztani az V. Kötet 4. Fejezet 4.2 pontjában előírtaknak megfelelően:

Iránysáv (MHz)	*Siklópálya (MHz)*
108,1	334,7
108,15	334,55
108,3	334,1
108,35	333,95
108,5	329,9
108,55	329,75
108,7	330,5
108,75	330,35
108,9	329,3
108,95	329,15
109,1	331,4

Iránysáv (MHz)	*Siklópálya (MHz)*
109,15	331,25
109,3	332,0
109,35	331,85
109,5	332,6
109,55	332,45
109,7	332,2
109,75	333,05
109,9	333,8
109,95	333,65
110,1	334,4
110,15	334,25
110,3	335,0
110,35	334,85
110,5	329,6
110,55	329,45
110,7	330,2
110,75	330,05
110,9	330,8
110,95	330,65
111,1	331,7
111,15	331,55
111,3	332,3
111,35	332,15
111,5	332,9
111,55	332,75
111,7	333,5
111,75	333,35
111,9	331,1
111,95	330,95

3.1.6.1.1 Azokban a körzetekben, ahol a műszeres leszállító rendszerrel felszerelt futópályák iránysáv-adó és siklópálya-adó frekvencia követelményei nem indokolnak 20 párnál többet, ott azokat egymás utáni sorrendben - szükség szerint - a következő táblázatból kell kiválasztani:

Sorrend szám	*Iránysáv (MHz)*	*Siklópálya (MHz)*
1	110,3	335,0
2	109,9	333,8
3	109,5	332,6
4	110,1	334,4
5	109,7	333,2
6	109,3	332,0
7	109,1	331,4
8	110,9	330,8
9	110,7	330,2
10	110,5	329,6
11	108,1	334,7
12	108,3	334,1
13	108,5	329,9
14	108,7	330,5
15	108,9	329,3
16	111,1	331,7
17	111,3	332,3

Sorrend szám	*Iránysáv (MHz)*	*Siklópálya (MHz)*
18	111,5	332,9
19	111,7	333,5
20	111,9	331,1

3.1.6.2 Ahol meglévő ILS iránysáv-adók nemzeti követelményeket kielégítően páros tized MHz-re végződő frekvenciákon működnek, ott azok részére olyan frekvenciákat kell újra kijelölni, amelyek megfelelnek a 3.1.6.1, vagy 3.1.6.1.1 pontokban lévőknek, amilyen gyorsan csak lehetséges, és a jelenlegi kijelölt frekvenciájukon csak addig működhetnek, amíg ez az újra-kijelölés végre nem hajtható.

3.1.6.3 A nemzetközi szolgáltatásban páratlan tized MHz-re végződő frekvencián működő jelenlegi ILS iránysáv-adókra nem jelölhetnek ki páratlan tized, plusz egyhuszad MHz-re végződő új frekvenciákat, kivéve ott, ahol körzeti egyezmény alapján általánosan használják a 3.1.6.1 pontban felsorolt csatornák valamelyikét (lásd az V. Kötet, 4. Fejezet 4.2 pontját).

3.1.7 Az ultrarövidhullámú (VHF) hely-jeladók

3.1.7.1 *Általános rész*

a) Minden egyes leszállító rendszerben két hely-jeladónak kell lenni, kivéve azt, ami a 3.1.7.6.6 pontban megadásra kerül. Egy harmadik hely-jeladót is lehet telepíteni akkor, ha az Illetékes Hatóság megítélése szerint az üzemeltetési eljárások miatt egy sajátságos helyszínen egy kiegészítő jeladó szükséges.

b) A hely-jeladók meg kell, hogy feleljenek az ebben a 3.1.7 pontban előírt követelményeknek. Ha a rendszerben csak két hely-jeladó van, akkor azoknak a középső és a külső hely-jeladókra alkalmazható követelményeket kell teljesíteniük.

c) A hely-jeladóknak az ILS siklópálya mentén, a küszöbtől előre meghatározott távolság megjelölésére szolgáló sugárzási karakterisztikát kell előállítaniuk.

3.1.7.1.1 Amikor egy hely-jeladót az iránysáv-adó hátsó irányvonalához kapcsolódóan használnak fel, akkor annak meg kell felelnie a hely-jeladókra a 3.1.7 pontban előírt jellemzőknek.

3.1.7.1.2 Az iránysáv-adó hátsó irányvonalával együtt használt hely-jeladók azonosító jelei tisztán megkülönböztethetők kell, hogy legyenek a 3.1.7.5.1 pontban előírtak szerinti belső, középső és külső hely-jeladó azonosító jelétől.

3.1.7.2 *Rádiófrekvencia*

3.1.7.2.1 A hely-jeladóknak 75 MHz-en kell működniük, plusz, vagy mínusz 0,005 százalékos frekvencia tűréshatárral, és vízszintes polarizációjúak kell, hogy legyenek.

3.1.7.3 *Fedésterület*

3.1.7.3.1 A hely-jeladó rendszert úgy kell beállítani, hogy fedésterületet biztosítson az ILS siklópályán és az iránysáv-adó iránysáv vonalán mért következő távolságokon keresztül:

a) *belső hely-jeladó* (amennyiben telepítésre kerül): 150 m, plusz, vagy mínusz 50 m (500 láb, plusz, vagy mínusz 160 láb);

b) *középső hely-jeladó*: 300 m, plusz, vagy mínusz 100 m (1000 láb, plusz, vagy mínusz 325 láb);

c) *külső hely-jeladó*: 600 m, plusz, vagy mínusz 200 m (2000 láb, plusz, vagy mínusz 650 láb)

3.1.7.3.2 A 3.1.7.3.1 pontban előírt fedésterületi határokon a térerősség legalább 1,5 millivolt/méter (mínusz 82 dBW/m^2) kell, hogy legyen. Azonkívül a fedésterületen belül a térerősségnek legalább 3,0 millivolt/méterre (mínusz 76 dBW/m^2) kell emelkedni.

1. Megjegyzés. - A földi antenna megtervezésénél ajánlatos annak biztosítása, hogy a fedésterület széleinél kielégítő mértékű térerősség változás legyen. Annak biztosítása is ajánlatos, hogy az iránysáv-adó irányszektorán belül lévő légijárművek vizuális jelzést kapjanak.

2. Megjegyzés. – A szabványos fedélzeti hely-jeladó vevőberendezés kielégítő működése akkor érhető el, ha az érzékenységet úgy állították be, hogy akkor kapjanak vizuális jelzést, amikor a térerősség 1,5 millivolt/méter (mínusz 82 dBW/m^2).

3.1.7.4 *Moduláció*

3.1.7.4.1 A moduláló frekvenciáknak a következőknek kell lenniük:

a) *belső hely-jeladó* (ha ilyet telepítettek): 3 000 Hz;

b) *középső hely-jeladó*: 1 300 Hz;

c) *külső hely-jeladó*: 400 Hz.

A fenti frekvenciák tűréshatárának plusz, vagy mínusz 2,5 százaléknak kell lennie, és az egyes frekvenciák teljes harmonikus tartalma nem lépheti túl a 15 százalékot.

3.1.7.4.2 A hely-jeladók modulációs mélységének – plusz- vagy mínusz 4 százalék tűréssel - 95 százalékosnak kell lennie.

3.1.7.5 *Azonosítás*

3.1.7.5.1 A vivő energiát nem lehet megszakítani. A hangfrekvenciás modulációt a következőképpen kell billentyűzni:

a) *belső hely-jeladó* (ha ilyet telepítettek): másodpercenként 6 pont, folyamatosan;

b) *középső hely-jeladó*: egymást követő pontok és vonások folyamatos sorozata, a vonások másodpercenként 2 vonásos ütemmel, a pontok pedig másodpercenként 6 pontos ütemmel billentyűzve;

c) *külső hely-jeladó*: másodpercenként 2 vonás, folyamatosan.

Ezeket a billentyűzési ütemeket plusz, vagy mínusz 15 százalékon belül kell tartani.

3.1.7.6 *Telepítés*

3.1.7.6.1 A belső hely-jeladót, amennyiben telepítik, úgy kell elhelyezni, hogy alacsony látási körülmények között jelezze a futópálya küszöbe elérésének közvetlen közelségét.

3.1.7.6.1.1 **Ajánlás**. - *Ha a sugárzási karakterisztika függőleges, akkor a belső (közeli) hely-jeladót - amennyiben ilyet telepítenek - a küszöbtől mért 75 m (250 láb) és 450 m (1 500 láb) között kell elhelyezni, és a futópálya meghosszabbított középvonalától 30 méternél (100 lábnál) nem nagyobb távolságra.*

1. Megjegyzés. - Az a cél, hogy a belső hely-jeladó sugárzási karakterisztikája a II. kategóriájú üzemeltetésekre alkalmazható legalacsonyabb elhatározási magasságnál metssze az ILS névleges siklópálya lefelé tartó meghosszabbított egyenes szakaszát.

2. Megjegyzés. - Körültekintően kell eljárni a belső hely-jeladó telepítésénél, a belső és a középső hely-jeladó közötti zavarás kiküszöbölése érdekében. A belső hely-jeladó telepítésére vonatkozó részleteket a"C"- Melléklet 2.10 pontja tartalmazza.

3.1.7.6.1.2 **Ajánlás**. - *Ha a sugárzási karakterisztika nem függőleges, akkor a berendezést úgy kell elhelyezni, hogy az iránysáv szektoron és az ILS siklópálya szektoron belül egy olyan erőteret hozzon létre, amely lényegében azonos avval, mint amit egy függőleges sugárzási karakterisztikájú és a 3.1.7.6.1.1 pontban leírtak szerint elhelyezett antenna állítana elő.*

3.1.7.6.2 A középső hely-jeladót úgy kell elhelyezni, hogy alacsony látási körülmények között jelezze a látva repülési útmutatású megközelítés közvetlen közelségét.

3.1.7.6.2.1 **Ajánlás.** - *Ha a sugárzási karakterisztika függőleges, akkor a középső hely-jeladót a futópálya megközelítési végén lévő leszállási küszöbtől mért 1 050 m (3 500 láb) távolságra plusz, vagy mínusz 150 m-rel (500 láb) kell elhelyezni, és a futópálya meghosszabbított középvonalától 75 m-nél (250 láb) nem nagyobb oldaltávolsággal.*

Megjegyzés. - Lásd a "C"- Melléklet 2.10 pontját a belső és középső hely-jeladó telepítésére vonatkozóan.

3.1.7.6.2.2 **Ajánlás**. - *Ha a sugárzási karakterisztika nem függőleges, akkor a berendezést úgy kell elhelyezni, hogy az iránysáv szektoron és az ILS siklópálya szektoron belül egy olyan erőteret hozzon létre, amely lényegében azonos avval, mint amit egy függőleges sugárzási karakterisztikájú és a 3.1.7.6.2.1 pontban leírtak szerint elhelyezett antenna állítana elő.*

3.1.7.6.3 A külső hely-jeladót úgy kell elhelyezni, hogy biztosítsa a közbenső és végső megközelítésben lévő légijárművek részére a magassági, a távolsági és a berendezés működési ellenőrzéseket.

3.1.7.6.3.1 **Ajánlás**. - *A külső hely-jeladót a küszöbtől mért 7,2 km (3,9 tmf) távolságra kell elhelyezni, kivéve azt az esetet, amikor a terepviszonyok, vagy üzemeltetési okok miatt ez a távolság gyakorlatilag nem valósítható meg, ekkor a külső hely-jeladó elhelyezhető a küszöbtől mért 6,5 és 11,1 km (3,5 és 6 tengeri mérföld) között is.*

3.1.7.6.4 **Ajánlás.** - *Ha a sugárzási karakterisztika függőleges, akkor a külső hely-jeladó nem lehet távolabb 75 m-nél (250 láb) a futópálya meghosszabbított középvonalától. Ha a sugárzási karakterisztika nem függőleges, akkor a berendezést úgy kell elhelyezni, hogy az az iránysáv szektoron és az ILS siklópálya szektoron belül egy olyan erőteret hozzon létre, amely lényegében véve azonos azzal, mint amit egy függőleges sugárzási karakterisztikájú antenna állítana elő.*

3.1.7.6.5 A hely-jeladók helyzetét, vagy - ahol alkalmazható - a DME által megjelölt egyenértékű távolságo(ka)t - amennyiben alternatív megoldásként részben, vagy teljesen DME-t is alkalmaznak az ILS hely-jeladók helyett - az Annex 15 előírásai szerint közzé kell tenni.

3.1.7.6.5.1 Amikor így alkalmazzák, a DME-nek a hely-jeladó(k) által szolgáltatott távolsági információval – üzemeltetői szempontból – egyenértékű távolsági információt kell biztosítania.

3.1.7.6.5.2 Amikor a DME-t a középső hely-jeladó alternatívájaként használják, a DME-t frekvenciában az ILS iránysáv-adóval kell párosítani, és úgy kell telepíteni, hogy a távolság információ hibája minimális legyen.

3.1.7.6.5.3 A 3.1.7.6.5 pontban szereplő DME meg kell, hogy feleljen a 3.5 pontban rögzített előírásoknak.

3.1.7.7 *Felügyelő rendszer*

3.1.7.7.1 Egy megfelelő berendezésnek jeleket kell biztosítani egy automatikus felügyelő rendszer működéséhez. A felügyelő rendszernek riasztó jelzést kell adni valamely ellenőrzési pontra, ha a következő helyzetek valamelyike bekövetkezik:

a) a moduláció vagy billentyűzés hibája;

b) a kimenő teljesítménynek a normál teljesítmény 50 %-a alá való csökkenése.

3.1.7.7.2 **Ajánlás**. - *Minden hely-jeladót olyan felügyelő rendszerrel kell ellátni, amely megfelelő helyen jelzi a modulációs mélység 50 % alá történő csökkenését.*

3.2 A precíziós bevezető radar-rendszerre vonatkozó előírások

Megjegyzés. - Ezen előírásban mindvégig ferde távolságok kerülnek alkalmazásra.

3.2.1 A precíziós bevezető radar-rendszer a következő egységekből kell, hogy álljon:

3.2.1.1 A precíziós leszállító radar egységből (PAR).

3.2.1.2 A légtérellenőrző radar egységből (SRE).

3.2.2 Amikor csak PAR kerül alkalmazásra, akkor a berendezést a PAR, vagy a precíziós leszállító radar kifejezéssel kell megnevezni, és nem a "precíziós bevezető radar-rendszer" kifejezéssel.

Megjegyzés. - A radar adatok rögzítésére és megőrzésére vonatkozó előírásokat az Annex 11 6. Fejezete foglalja magába.

3.2.3 A precíziós leszállító radar egység (PAR)

3.2.3.1 *Fedésterület*

3.2.3.1.1 A precíziós leszállító radarnak (PAR) képesnek kell lennie a saját antennájától számított legalább 16,7 km (9 tengeri mérföld) távolságig egy olyan 15 m^2-es, vagy annál nagyobb visszaverő felületű légijármű helyzetének észlelésére és kijelzésére, amely a 20 fokos oldalszektor és a 7 fokos magassági szektor által határolt légtéren belül tartózkodik.
Megjegyzés. - A légijárművek visszaverő felülete jelentésének meghatározásához útmutatásként az alábbi táblázatba foglaltak szolgálnak:

magán légijármű (egy-motoros):	5-től 10 m^2-ig;
két-motoros kis légijármű:	15 m^2-től;
közepes nagyságú, két-motoros légijármű:	25 m^2-től;
négy-hajtóműves légijármű:	50-től 100 m^2-ig.

3.2.3.2 *Telepítés*

3.2.3.2.1 A precíziós leszállító radart (PAR) úgy kell telepíteni és beállítani, hogy biztosítsa a teljes hatásterületet azon szektoron belül, amelynek a csúcsa a földetérési ponttól a futópálya megállási végének irányában 150 m-re (500 láb) helyezkedik el, oldalszögben a futópálya középvonalától plusz, vagy mínusz 5 fokig és a magassági szögben a mínusz 1 foktól a plusz 6 fokig terjed ki.

1.Megjegyzés. - A fenti 3.2.3.2.1 pont követelményei kielégíthetőek, ha a berendezést a földetérési ponttól hátrafelé, a futópálya megállási vége irányában 915 m-re (3 000 láb), vagy annál nagyobb távolságra és a futópálya középvonalától 120 m-es (400 láb) oldaltávolságra helyezik el, vagy pedig hátrafelé 1 200 m-re (4 000 láb), vagy annál nagyobb távolságra és 185 m-re (600 láb) oldalra, amikor is a berendezést a futópálya középvonalától plusz, vagy mínusz 10 fok letapogatásra állítják be. Alternatívaként, ha a berendezést a futópálya középvonalának egyik oldalán 15 fok és a másikon 5 fok letapogatásra állítják be, akkor a minimális hátrafelé való eltolás 685 m-re (2 250 láb), illetve 915 m-re (3 000 láb) csökkenthető, 120 m-es (400 láb), illetve 185 m-es (600 láb) oldaltávolság mellett.

2. Megjegyzés. - A PAR telepítését bemutató ábrákat a "C"- Melléklet (C-14-től C-17-el bezárólag) adja meg.

3.2.3.3 *Pontosság*

3.2.3.3.1 *Oldalszög pontosság*. Az oldalszög információt olyan módon kell kijelezni, hogy az iránysáv vonal helyzettől jobbra-balra való eltérés könnyen megfigyelhető legyen. A maximális megengedhető hiba az iránysáv vonaltól való eltérésre vonatkozóan vagy a PAR antennától mért távolság 0,6 százaléka plusz az iránysáv vonaltól való oldalirányú eltérés 10 százaléka kell, hogy legyen, vagy 9 m (30 láb), az, amelyik a nagyobb. A berendezést úgy kell telepíteni, hogy a földetérési pontnál a hiba ne haladja meg a 9 métert (30 láb). A berendezést úgy kell beállítani és beszabályozni, hogy a kijelzett hiba a földetérési pontnál minimális legyen, és ne haladja meg a PAR antennától mért távolság 0,3 százalékát, vagy a 4,5 m-t (15 láb), attól függően, hogy melyik a nagyobb.
Lehetséges kell, hogy legyen két - egymástól oldalszögben 1,2 fokra lévő - légijármű helyzetének megkülönböztetése.

3.2.3.3.2 *Emelési (látóhatár feletti szögmagasság) pontosság*. Az emelési információt olyan módon kell kijelezni, hogy a berendezés által felügyelt süllyedési útvonaltól a lefelé-felfelé való eltérés könnyen megfigyelhető legyen. A maximális megengedhető hiba a bevezető vonaltól való eltérésre vonatkozóan vagy a PAR antennától mért távolság 0,4 százaléka plusz a választott siklópálya aktuális, lineáris elmozdulásának 10 százaléka kell, hogy legyen, vagy 6 m (20 láb), az, amelyik a nagyobb. A berendezést úgy kell telepíteni, hogy a földetérési pontnál a hiba ne haladja meg a 6 m-t (20 láb). A berendezést úgy kell beállítani és beszabályozni, hogy a kijelzett hiba a földetérési pontnál minimális legyen, és ne haladja meg a PAR antennától mért távolság 0,2 százalékát, vagy a 3 métert (10 láb), attól függően, hogy melyik a nagyobb.
Lehetséges kell, hogy legyen két - egymástól emelkedésben 0,6 fokra lévő - légijármű helyzetének megkülönböztetése.

3.2.3.3.3 *Távolsági pontosság*. A földetérési ponttól mért távolság kijelzésének hibája nem lépheti túl a 30 métert (100 láb) plusz a földetérési ponttól mért távolság 3 százalékát. Lehetséges kell, hogy legyen két olyan légijármű helyzetének megkülönböztetése, amelyek ugyanazon oldalszögön egymástól 120 méterre (400 láb) vannak.

3.2.3.4 A rendelkezésre álló információnak lehetővé kell tenni az ellenőrzött légijármű más légijárművekhez, vagy akadályokhoz viszonyított helyzetének meghatározását. A kijelzett információnak lehetővé kell tenni a föld feletti sebesség és a kívánt repülési pályától való eltérés, vagy az ahhoz való közeledés mértékének megítélését is.

3.2.3.5 A berendezésnek az információt másodpercenként legalább egyszer teljesen fel kell újítania.

3.2.4 A légtérellenőrző radar egység (SRE)

3.2.4.1 A precíziós bevezető radar-rendszer egységeként használt légtérellenőrző radarnak (SRE) legalább a következő általános követelményeket kell kielégíteni:

3.2.4.2 *Fedésterület*

3.2.4.2.1 A légtérellenőrző radar egység képes kell, hogy legyen 15 m^2, vagy annál nagyobb visszaverő felületű légijárművek észlelésére, amelyek az antenna rálátási vonalában, az alábbiakban leírt légtéren belül vannak:

Egy, az antenna 360 fokos körbeforgásával létrejövő függőleges síkú felület, amelyet az antenna vízszintes síkja feletti, az antennától kiinduló 1,5 fokos szögű vonal határol az antennától 37 km (20 tengeri mérföld) távolságig kiterjedően; az 1,5 fokos egyenesnek a 37 km (20 tengeri mérföld) távolságban lévő metszéspontjánál egy függőleges, az antenna szintje feletti 2 400 m (8 000 láb) magasságig tartó vonal; a 2 400 méteres (8 000 láb) magasságtól a 37 kilométeres (20 tengeri mérföld) távolságtól kiinduló vízszintes vonal, visszafelé az antenna irányában, az antennától az annak vízszintes síkja feletti 20 fokos vonallal való metszéspontjáig azaz a 2 400 méteres (8 000 láb) magasságú vonal és az antenna vízszintes síkja feletti 20 fokos vonal metszéspontjáig.

3.2.4.2.2 **Ajánlás**. - A fejlesztés során a 15 m^2 visszaverő felületű légijárműre vonatkozó fedésterület növelésére kell törekedni legalább azon a területen, ami az előző 3.2.4.2.1 pont előírásainak a következő értékbeli módosításával alakul ki:

- 1,5 fok helyett 0,5 fok;

- 37 km (20 tengeri mérföld) helyett 46,3 km (25 tengeri mérföld);

- 2 400 m (8 000 láb) helyett 3 000 m (10 000 láb);

- 20 fok helyett 30 fok.

Megjegyzés. - A légtérellenőrző radar függőleges fedésterületét bemutató ábra a "C"- Mellékletben került megadásra.

3.2.4.3 *Pontosság*

3.2.4.3.1 *Oldalszög pontosság*. Az oldalszögbeli helyzet jelzésének a tényleges helyzethez képest plusz, vagy mínusz 2 fokon belül kell lennie. Lehetséges kell, hogy legyen két olyan légijármű helyzetének megkülönböztetése, amelyek egymástól oldalszögben 4 fokra vannak.

3.2.4.3.2 *Távolsági pontosság*. A távolság jelzésében előforduló hiba nem lépheti túl a tényleges távolság 5 százalékát, vagy 150 m-t (500 láb), attól függően, hogy melyik a nagyobb. Lehetséges kell, hogy legyen két olyan légijármű helyzetének a megkülönböztetése, amelyeket a megfigyelés helyétől mért tényleges távolság 1 százalékának megfelelő, vagy 230 méteres (750 láb) távolság választ el egymástól, attól függően, hogy melyik a nagyobb.

3.2.4.3.2.1 **Ajánlás**. - *A távolság jelzésében előforduló hiba nem lépheti túl a tényleges távolság 3 százalékát, vagy 150 m-t (500 láb), attól függően, hogy melyik a nagyobb*.

3.2.4.4 A berendezésnek képesnek kell lennie a fedésterületen belül lévő bármely légijármű távolságára és oldalszögére vonatkozó információnak legalább 4 másodpercenkénti egyszeri teljes felújítására.

3.2.4.5 **Ajánlás**. - *Amennyire csak lehetséges, törekedni kell a földtől való, vagy a felhőktől és légköri csapadéktól való visszaverődések okozta zavar csökkentésére.*

3.3 Az ultrarövidhullámú (VHF) körsugárzó rádióirányszög-adóra (VOR) vonatkozó előírások

3.3.1 Általános rész

3.3.1.1 A VOR berendezést úgy kell felépíteni és beállítani, hogy a légijárművekben az azonos műszer kijelzések azonos, a VOR telepítési helyétől mért mágneses Északtól fokonként és az óramutató járásával megegyező irányú szögbeli eltéréseket (irányszögeket) jelezzenek.

3.3.1.2 A VOR adókészülék olyan rádiófrekvenciás vivőt kell, hogy sugározzon, amelyre két, egymástól különálló 30 Hz-es moduláció van ráültetve. Ezen modulációk egyikének olyannak kell lennie, hogy a fázisa független legyen a megfigyelési pont oldalszögétől (referencia fázis). A másik moduláció (változó fázis) olyan kell, hogy legyen, amelynek a fázisa a megfigyelési pontban egy olyan szöggel különbözzön a referencia fázistól, amely a megfigyelési pontnak a VOR-hoz viszonyított irányszögével egyenlő.

3.3.1.3 A referencia és a változó fázis modulációi az állomáson áthaladó referencia délkörön kell, hogy fázisban legyenek.

Megjegyzés. - A referencia és a változó fázis modulációja akkor van fázisban, amikor a rádiófrekvenciás vivőfrekvencia és az oldalsáv energia maximális összegzett értéke a változó fázis moduláció következtében a referencia fázis moduláció legmagasabb pillanatnyi frekvenciájaként azonos időpontban jelentkezik.

3.3.2 Rádiófrekvencia

3.3.2.1 A VOR berendezéseknek a 111,975 MHz-től a 117,975 MHz-ig terjedő sávban kell dolgozniuk, kivéve azt a lehetőséget, hogy a 108 - 111,975 MHz-es sávba tartozó frekvenciák is használhatók akkor, ha az V. Kötet 4. Fejezetének 4.2.1 és 4.2.3.1 pontjában leírt előírásokkal összhangban ezeknek a frekvenciáknak az alkalmazása elfogadható. A kijelölhető legmagasabb frekvenciának a 117,950 MHz-nek kell lennie. A csatornaosztás a kijelölhető legmagasabb frekvenciára vonatkoztatott 50 kHz-es lépésben történjen. Azokon a területeken, ahol a 100 kHz-es, vagy a 200 kHz-es csatornaosztás általános használatú, a rádiófrekvencia tűréshatárának plusz, vagy mínusz 0,005 százalékosnak kell lennie.

3.3.2.2 Azokon a területeken, ahol 50 kHz-es csatornaosztást használnak, az 1974. május 23. után telepített valamennyi új berendezés rádiófrekvenciás vivőjének tűréshatára plusz, vagy mínusz 0,002 százalékos kell, hogy legyen.

3.3.2.3 Azokon a területeken, ahol új VOR berendezéseket telepítenek, és az ugyanazon területen már meglévő VOR-októl 50 kHz távolságra lévő frekvenciákat jelölnek ki számukra, elsőbbséget kell adni annak biztosításához, hogy a meglévő VOR-ok rádiófrekvenciás vivőhullámának frekvencia tűréshatárát plusz, vagy mínusz 0,002 százalékra csökkentsék.

3.3.3 Polarizáció és sugárzási karakterisztika pontosság

3.3.3.1 A VOR sugárzása vízszintesen polarizált kell, hogy legyen. A sugárzás függőlegesen polarizált összetevőjének a lehető legkisebbnek kell lennie.

*Megjegyzés. - Jelenleg nem lehetséges mennyiségileg megállapítani a VOR sugárzás függőlegesen polarizált összetevőjének maximális megengedhető nagyságát. (*A Rádiónavigációs Berendezések Ellenőrzése kézikönyvben - Manual on Testing of Radio Navigation Aids (Doc 8071*) - kerültek* *megadásra olyan, a légiellenőrzési eljárásokra vonatkozó tájékoztatások, amelyekkel a függőleges polarizációnak az irányszög pontosságra gyakorolt hatásának meghatározása elvégezhető.)*

3.3.3.2 A vízszintesen polarizált VOR sugárzás által szolgáltatott oldalszög információ pontossága a VOR antennarendszer középpontjától mérve körülbelül négy hullámhossznyi távolságban, 0 és 40 fok közé eső valamennyi magassági szögön plusz, vagy mínusz 2 fokon belül kell, hogy legyen.

3.3.4 Fedésterület

3.3.4.1 A VOR-nak olyan jeleket kell biztosítania, amelyek lehetővé teszik egy szabványos fedélzeti berendezés kielégítő működését az üzemeltetési okokból szükséges magasságokon és távolságokon, egészen a 40 fokos magassági szögig.

3.3.4.2 **Ajánlás**. - A szabványos fedélzeti berendezés kielégítő működésének lehetővé tételéhez szükséges VOR jelek hatóterében a térerősség, vagy teljesítménysűrűség a minimális szolgáltatási magasságon és az előírt maximális szolgáltatási távolsági sugáron 90 mikrovolt/méter, vagy mínusz 107 dBW/m^2 kell, hogy legyen.

Megjegyzés. - Az előírt hatótávolságok eléréséhez szükséges szabványos kisugárzott teljesítményeket (ERP) a "C"- Melléklet 3.1 pontja tartalmazza.

3.3.5 A navigációs jelek modulációja

3.3.5.1 A rádiófrekvenciás vivőnek bármely térbeli pontban megfigyelve a következők szerinti két jellel kell amplitúdóban modulálva lennie:

a) egy olyan állandó amplitúdójú 9 960 Hz-es segédvivő frekvenciával, amely 30 Hz-es frekvencia-modulált és az eltérési viszonya 16 plusz, vagy mínusz 1 (azaz 15-től 17-ig):

1) a hagyományos VOR-nál ennek a frekvencia-modulált segédvivőnek a 30 Hz-es összetevője rögzített, tekintet nélkül az oldalszögre, és ezt nevezik "referencia fázisnak";

2) a Doppler VOR esetében a 30 Hz-es összetevő fázis együtt változik az oldalszöggel, és ezt nevezik "változó fázisnak";

b) a 30 Hz-es amplitúdó moduláló összetevővel:

1) a hagyományos VOR esetében ez az összetevő egy olyan körbeforgó térerősség diagramból ered, amelynek a fázisa együtt változik az oldalszöggel, és ezt nevezik "változó fázisnak";

2) a Doppler VOR esetén ez az oldalszöghöz viszonyítva állandó fázisú és állandó amplitúdójú összetevő irányítatlanul (körkörösen) kerül kisugárzásra, és ezt nevezik "referencia fázisnak".

3.3.5.2 A 9960 Hz-es segédvivő frekvencia következtében kapott rádiófrekvenciás vivő modulációs mélysége 28 és 32 százalék értéken belül kell, hogy legyen.

3.3.5.3 A 30 Hz-es, vagy a 9960 Hz-es jelekkel modulált rádiófrekvenciás vivő modulációs mélysége 5 fokig bármely emelési szögön megfigyelve 28 és 32 százalék határon belül kell, hogy legyen.

3.3.5.4 A változó és referencia fázis moduláló frekvenciájának 30 Hz-nek kell lennie, plusz, vagy mínusz 1 százalékon belül.

3.3.5.5 A segédvivő frekvencia modulációs középfrekvenciájának 9960 Hz-esnek kell lennie, plusz, vagy mínusz 1 százalékon belül.

3.3.5.6

a) A hagyományos VOR esetében a 9 960 Hz-es segédvivő frekvencia amplitúdó moduláció százaléka nem lépheti túl az 5 százalékot.

b) A Doppler VOR esetében a 9960 Hz-es segédvivő frekvencia amplitúdó moduláció százaléka nem lépheti túl a 40 százalékot akkor, amikor azt a VOR-tól legalább 300 méterre (1 000 láb) lévő pontban mérik.

3.3.5.7 Ahol 50 kHz-es csatorna kiosztású VOR-t alkalmaznak, ott a 9960 Hz-es összetevő harmonikusainak oldalsáv szintje a kisugárzott jelben nem haladhatja meg a következő, a 9 960 Hz-es oldalsáv szinthez viszonyított szinteket:

Segédvivő frekvencia	*Szint*
9 960 Hz	0 dB referencia
második harmonikus	-30 dB
harmadik harmonikus	-50 dB
negyedik harmonikus és fölötte	-60 dB

3.3.6 Beszédüzem és azonosítás

3.3.6.1 Ha a VOR egyidejűleg föld-levegő távközlési csatornát is biztosít, akkor annak ugyanazon a rádiófrekvenciás vivőn kell lennie, mint amelyet a navigációs feladatra használnak. Az ezen a csatornán történő sugárzásnak vízszintesen polarizáltnak kell lenni.

3.3.6.2 A távközlési csatornán a vivőfrekvencia csúcs modulációs mélysége nem lehet 30 százaléknál nagyobb.
3.3.6.3 A beszédcsatorna hangfrekvenciás karakterisztikájának az 1 000 Hz-es szinthez viszonyítva 3 dB-en belül kell lenni a 300 Hz-től a 3 000 Hz-ig terjedő tartományban.

3.3.6.4 A VOR-nak biztosítania kell az azonosító jel egyidejű továbbítását is ugyan azon a rádiófrekvenciás vivőn, amelyet a navigációs feladatra használnak. Az azonosító jel sugárzása vízszintesen polarizált kell, hogy legyen.

3.3.6.5 Azonosító jelként a két, vagy három betűből álló Nemzetközi Morse kódjeleket kell használni. Ezt percenként körülbelül 7 szónak megfelelő ütemben kell leadni. A jelet minden 30 másodpercben legalább egyszer meg kell ismételni, és a moduláló hang 1 020 Hz-es kell, hogy legyen, plusz, vagy mínusz 50 Hz-en belüli eltéréssel.

3.3.6.5.1 **Ajánlás**. - *Az azonosító jelet minden 30 másodpercben legalább háromszor célszerű leadni, ezen időperióduson belül egyenlő időközökben. Ezen azonosító jelek egyike hang alapú azonosítás is lehet.*

Megjegyzés. - Ahol a későbbi 3.5.2.5 pont szerint a VOR és a DME együtt kerül telepítésre, ott a következőkben a 3.5.3.6.4 pontban megadott előírások vonatkoznak a VOR azonosító jelére.

3.3.6.6 Az a modulációs mélység, amellyel az azonosító jelkód modulálja a rádiófrekvenciás vivőt, közel kell, hogy legyen a 10 százalékhoz, de nem lépheti túl azt, kivéve ott, ahol távközlési csatorna nincs, itt megengedhető kell, hogy legyen az azonosító jelkóddal történő moduláció 20 százalékot meg nem haladó értékűre való megnövelése.

3.3.6.6.1 **Ajánlás**. - *Ha a VOR egyidejűleg föld-levegő távközlési csatornát is biztosít, akkor az azonosító kódjel modulációs mélysége 5 plusz, vagy mínusz 1 százalékos kell, hogy legyen, a beszédüzem kielégítő minőségének biztosítása érdekében.*

3.3.6.7 A beszéd adása semmiképpen sem zavarhatja az alapvető navigációs funkciót. Amikor beszéd kerül kisugárzásra, akkor az azonosító kódot nem lehet elnyomni.

3.3.6.8 A VOR rendszer vevőjének működése lehetővé kell, hogy tegye a venni kívánt jel biztos azonosítását az előírt fedéshatárokon belül előforduló jelviszonyok között, valamint a fenti 3.3.6.5, 3.3.6.6 és a 3.3.6.7 pontban előírt modulációs paraméterek mellett.

3.3.7 Felügyelő rendszer

3.3.7.1 A sugárzási erőtérben elhelyezett megfelelő berendezésnek jeleket kell biztosítani egy automatikus felügyelő rendszer működéséhez. A felügyelő rendszernek riasztó jelzést kell továbbítania egy ellenőrző pontra, és vagy el kell távolítania az azonosító és navigációs összetevőket a vivőfrekvenciáról, vagy pedig meg kell szűntetnie a sugárzást, amint a meghatározott feltételekhez képest az alábbiakban felsorolt eltérések bármelyike, vagy azok kombinációja előfordul:

a) a VOR által kisugárzott irányszög információ 1 fokot túllépő változása a felügyelő rendszer telepítési helyén;

b) a rádiófrekvenciás jelek feszültség szintjének modulációs összetevőiben a felügyelő rendszernél észlelt 15 százalékos csökkenés esetén akár a segédvivő frekvenciánál, akár a 30 Hz-es amplitúdó moduláló jelnél, vagy mindkettőnél.

3.3.7.2 Magának a felügyelő rendszernek az üzemzavara esetén is riasztó jelzést kell továbbítania az ellenőrző pontra, és vagy:

a) el kell távolítania az azonosító és navigációs összetevőket a vivőfrekvenciáról; vagy

b) meg kell szűntetnie a sugárzást.

Megjegyzés. - A VOR-ra vonatkozó útmutató anyag a “C”- Melléklet 3. Részében található.

3.3.8 A VOR vevő-rendszerek interferencia érzéketlenségi teljesítménye

3.3.8.1 1998. január 1. után a VOR vevő-rendszereknek kielégítő interferencia érzéketlenséget kell biztosítani az olyan ultrarövidhullámú (VHF) műsorszóró frekvencia-modulált adások jelei által okozott, két jelből eredő harmadrendű kereszt-modulációs zavaró hatások eredményével szemben, amelyeknek a szintje a következőknek felel meg:

$$2N_1 + N_2 + 72 \leq 0$$

az ultrarövidhullámú frekvencia-modulált hang-műsorszóró adások jeleinek a 107,7 - 108,0 MHz-es tartományában és

$$2N_1 + N_2 + 3\left(24 - 20\ \log\frac{\Delta f}{0.4}\right) \leq 0$$

az ultrarövidhullámú frekvencia-modulált hang-műsorszóró adások jeleinek a 107,7 MHz alatt, ott, ahol a két ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás frekvenciáinak jelei hozzák létre, a vevőn belül a két jelből eredő harmadrendű kereszt-modulációs terméket a kívánt VOR frekvencián.

Az N_1 és az N_2 a két ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jeleinek szintjei (dBm) a VOR vevő bemenetén. Egyik jelszint sem haladhatja meg a következőkben a 3.3.8.2 pontban lefektetett érzéketlenségi követelményt.

$\Delta f = 108{,}1 - f_1$, ahol f_1 az az N1 frekvencia, amelyik az ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jelei sugárzására használt 108,1 MHz-hez közelebbi frekvencia.

3.3.8.2 1998. január 1. után a VOR vevő-rendszer nem lehet leérzéketlenítve a következő táblázatnak megfelelő szintű, az ultrarövidhullámú (VHF) frekvencia-modulált hang-műsorszóró adás jeleinek jelenléte esetén:

Frekvencia (MHz)	*A nem-kívánt jel maximális szintje a vevő bemenetén (dBm)*
88 - 102	+ 15 dBm
104	+ 10 dBm
106	+ 5 dBm
107,9	-10 dBm

1. Megjegyzés. - A fenti frekvenciákkal kijelölt szomszédos pontok között az összefüggés lineáris.

2. Megjegyzés. - A fenti 3.3.8.1 és 3.3.8.2 pontokban megszabott teljesítményre alkalmazandó érzéketlenségi követelményekre vonatkozó útmutató anyagot a "C"- Melléklet 3.6.5 pontja tartalmazza.

3.3.8.3 1995. január 1. után az összes, újonnan felszerelt fedélzeti VOR vevő-rendszernek ki kell elégítenie a fenti 3.3.8.1 és 3.3.8.2 pontok előírásait.

3.3.8.4 **Ajánlás.** - *Az előzőekben a 3.3.8.1 és 3.3.8.2 pontokban lévő szabványoknak megfelelő érzéketlenségi teljesítményű fedélzeti VOR vevő-rendszereket a lehető legkorábbi időpontban üzembe kell helyezni.*

3.4 Az irányítatlan (körkörös) sugárzású rádióirány-adóra (NDB) vonatkozó előírások

3.4.1 Meghatározások

Megjegyzés. - A "C"- Mellékletben került megadásra az útmutató anyag az NDB-k névleges fedésterülete, tényleges fedésterülete és fedésterülete jelentéséről és azok alkalmazásáról.

Average radius of rated coverage. <u>A névleges fedésterület átlagos sugara</u>
Annak a körnek a sugara, amely terület megfelel a névleges fedésterületnek.

Effective coverage. <u>Tényleges fedésterület</u>
Az NDB-t körülvevő azon terület, amelyen belül az érintett üzemeltetések jellegének megfelelő pontosságú iránymérések megkaphatók.

Locator. <u>Helyzetmeghatározó</u>
Egy végső megközelítési navigációs berendezésként felhasznált LF/MF NDB.

Megjegyzés. - A megközelítési helyzetmeghatározó irányadóknak az átlagos névleges fedésterülete általában 18,5 és 46,3 km (10 és 25 tengeri mérföld) között van.

Rated coverage. <u>Névleges fedésterület</u>
Egy NDB-t körülvevő azon terület, amelyen belül a felületi hullámok függőleges térerőssége túllépi az arra a földrajzi területre előírt minimális értéket, amelyben a rádióirány-adó elhelyezésre került.

Megjegyzés. - A fenti meghatározás célja az, hogy létrehozza a rádióirány-adók névleges jellemzői megállapításának módszerét az azon esetekben várható rendes fedésterületről, amikor az adott *irányadónál térhullám adás és/vagy rendellenes hullámterjedés, illetve más LF/MF (hosszú-, középhullámú) berendezésektől származó zavar nem fordul elő, azonban az érintett földrajzi területen előforduló légköri zajokat figyelembe veszik.*

3.4.2 Fedésterület

3.4.2.1 **Ajánlás.** - *Egy NDB névleges fedésterületén belül a térerősség minimális értékének 70° mikrovolt/méternek kell lenni.*

1. Megjegyzés. - A főleg a 30°N és 30°S szélességi körök között szükséges térerősségre vonatkozó részletes útmutató anyagot a "C"- Melléklet 6.1 pontja adja meg, és a vonatkozó ITU rendelkezéseket a Nemzetközi Rádiószabályzat B - Rész IV. Szakasz 35. cikkely VIII. fejezete foglalja magába.

2. Megjegyzés. - Azoknak a helyeknek és időpontoknak a kiválasztása, ahol és amikor a térerősséget mérik, abból a célból fontos, hogy az adott helyre vonatkozó rendellenes eredményeket elkerüljék; üzemeltetői szempontból az irányadó körüli területen lévő légiútvonalakon lévő helyek a legjelentősebbek.

3.4.2.2 Az NDB-re vonatkozó valamennyi bejelentésben, vagy közzétételnél a névleges fedésterület átlagos sugarát kell alapul venni.

1. Megjegyzés. - Az olyan területeken, ahol lényeges napszakos és évszakos változások fordulhatnak elő a névleges fedésterületben, ott ezeket a változásokat a rádióirány-adók osztályozásánál figyelembe kell venni.

2. Megjegyzés. - Azokat az irányadókat, amelyek 46,3 és 278 km (25 és 150 tengeri mérföld) közötti átlagos sugarú névleges fedésterülettel rendelkeznek, az ezen fedésterület átlag sugarához legközelebb eső 46,3 km-es (25 tengeri mérföldes) érték többszörösével lehet jelölni, és a 278 km (150 tengeri mérföld) feletti névleges fedésterületű irányadókat pedig a legközelebbi 92,7 km (50 tengeri mérföld) többszörösével.

3.4.2.3 **Ajánlás**. - Ahol egy NDB névleges fedésterülete az üzemeltetési jelentőséggel bíró különböző szektorokban lényegesen eltérő, ott az NDB osztályozását a névleges fedésterület átlag sugarának és az egyes szektorok határainak megjelölésével kell kifejezni a következők szerint:

A szektor fedésterületének sugara / a szektor oldalszög határai az irányadótól az óramutató járásával megegyező irányú mágneses irányszögben kifejezve.

Ahol szükséges az, hogy egy NDB ilyen módon kerüljön osztályozásra, ott a szektorok számát minimális értéken kell megadni, lehetőleg kettőt nem meghaladóan.

Megjegyzés. - Egy adott szektor névleges fedésterületének átlag sugara egyenlő a megfelelő terület ugyanazon körszektorának sugarával. Például:

150/210° - 30°
100/30° - 210°.

3.4.3 A kisugárzott teljesítmény korlátozásai

Az egy NDB által kisugárzott teljesítmény nem lépheti túl 2 dB-nél többel a megállapított fedésterületének eléréséhez szükséges energiát, kivéve azt, hogy ez az energia növelhető, ha körzetenként egyeztették, vagy ha más berendezésre vonatkozóan semmilyen káros zavart nem fog eredményezni.

3.4.4 Rádiófrekvenciák

3.4.4.1 Az NDB-k részére kijelölt rádiófrekvenciákat a 190 kHz és 1 750 kHz közé eső frekvenciatartományban rendelkezésre álló frekvenciákból kell kiválasztani.

3.4.4.2 Az NDB-kre alkalmazható frekvencia tűréshatárnak 0,01 százaléknak kell lennie, kivéve, hogy az 1 606,5 kHz-et és annál magasabb frekvenciákat használó és 200 W feletti antenna-teljesítményű NDB-knél a tűréshatárnak 0,005 százaléknak kell lennie.

3.4.4.3 **Ajánlás.** - *Ahol két megközelítési helyzetmeghatározó irányadót használnak egy ILS kiegészítéséhez, ott a két irányadó vivőfrekvenciája közötti frekvencia-különbség 15 kHz-nél nem lehet kevesebb a rádióiránytű helyes működésének biztosításához, és lehetőleg nem több 25 kHz-nél azért, hogy a gyors áthangolást lehetővé tegye azokban az esetekben, amikor a légijárműnek csak egy rádióiránytűje van.*

3.4.4.4 Ahol a futópálya szemben lévő két végét kiszolgáló ILS berendezésekhez kapcsoltan a megközelítési helyzetmeghatározó irányadóknak közös frekvenciát jelölnek ki, ott intézkedni kell annak biztosítására, hogy az üzemi használatban nem lévő berendezés ne sugározhasson.

Megjegyzés. - A közös frekvencia csatornákon működő megközelítési helyzetmeghatározó irányadók üzemeltetésére vonatkozó további útmutató anyagot az V. Kötet 3. Fejezetének 3.2.2 pontja tartalmaz.

3.4.5 Azonosítás

3.4.5.1 Minden egyes NDB-t külön-külön azonosítani kell egy két- vagy három-betűs Nemzetközi Morse kódjel csoporttal, amelyet percenként körülbelül 7 szónak megfelelő ütemben adnak ki.

3.4.5.2 A teljes azonosító jelet minden 30 másodpercben legalább egyszer kell adni, kivéve ott, ahol az irányadó azonosítása a vivőfrekvencia ki/be-billentyűzésével történik. Ez utóbbi esetben az azonosításnak körülbelül 1 perces időközönként kell történnie, kivéve, hogy kivételesen rövidebb időközök is alkalmazhatók olyan NDB berendezéseknél, ahol üzemeltetési szempontból kívánatosnak találják.

3.4.5.2.1 **Ajánlás**. - *Azon esetek kivételével, amikor az irányadó azonosítása a vivőfrekvencia be/ki-billentyűzésével történik, az azonosító jelet minden 30 másodpercben legalább háromszor kell adni, ezen időperióduson belül egyenlően elosztva.*

3.4.5.3 Az olyan 92,7 km (50 tengeri mérföld), vagy annál kisebb átlagos sugarú névleges fedésterületű NDB-k esetében, amelyeket elsősorban a megközelítés és valamely repülőtér körzetében való, a várakozás "eszközeként" használnak, az azonosító jelet minden 30 másodpercben legalább háromszor kell leadni, ezen időperióduson belül egyenlően elosztva.

3.4.5.4 Az azonosításra használt moduláló hangfrekvencia 1 020 Hz plusz, vagy mínusz 50 Hz, vagy pedig 400 Hz plusz, vagy mínusz 25 Hz kell, hogy legyen.

Megjegyzés. - A használandó érték meghatározását körzetileg kell végrehajtani a "C"-Melléklet 6.5 pontjában foglalt irányelvek figyelembevételével.

3.4.6 A sugárzások jellemzői

Megjegyzés. - Az alábbi előírásoknak nem céljuk az, hogy az olyan modulációk, vagy moduláció-típusok alkalmazását kizárják, amelyek az NDB berendezések esetében az azonosításra előírtakon kívül még felhasználhatók, beleértve az egyidejű azonosítást és az élőszavas modulációt is, feltéve, hogy ezek a kiegészítő modulációk lényeges mértékben nem befolyásolják az NDB-knek a jelenleg *használatos fedélzeti iránymérőkhöz kapcsolódó üzemi teljesítőképességét, és feltéve, hogy használatuk nem idézi elő más NDB-k szolgáltatásának káros interferenciáját.*

3.4.6.1 Az alábbiakban a 3.4.6.1.1 pontban leírtak kivételével az összes NDB-nek megszakítás nélküli vivőfrekvenciát kell sugározni, és az azonosításuknak be/ki-billentyűzéses amplitúdó-modulált hangnak kell lenni (NON/A2A).

3.4.6.1.1 A részben, vagy egészben várakozási, megközelítési és leszállási navigációs berendezésként szolgáló NDB-k, vagy a 92,7 km-nél (50 tengeri mérföld) kisebb átlagos sugarú névleges fedésterületű NDB-k kivételével az NDB-k modulálatlan vivőhullám (NON/A1A) be/ki-billentyűzésével is azonosíthatók - ha az utóbbiak olyan területeken vannak, amelyek irányadókkal sűrűn el vannak látva - és/vagy ott, ahol a szükséges névleges fedésterület elérése gyakorlatilag nem valósítható meg a következők miatt:

a) rádióállomásoktól származó rádiófrekvenciás zavar;

b) nagymértékű légköri zavar;

c) helyi körülmények.

Megjegyzés. - A sugárzási típus kiválasztásánál figyelembe kell venni az olyan összetévesztési lehetőségeket, amelyek abból adódnak, hogy egy légijármű egy NON/A2A berendezésről NON/A1A berendezésre hangol át anélkül, hogy a rádióiránytűjét "MCW" üzemmódról átállítaná "CW"-re (modulált folytonos hullámú üzemmódról a vivőhullámú üzemmódra).

3.4.6.2 Minden egyes hangfrekvenciás moduláló hang be/ki-billentyűzésével azonosított NDB-nél a modulációs mélységet olyan közel kell tartani a 95 százalékhoz, amennyire az szükséges.

3.4.6.3 Minden egyes hangfrekvenciás moduláló hang be/ki-billentyűzésével azonosított NDB-nél az azonosítás alatti sugárzási karakterisztika olyan kell, hogy legyen, amely biztosítja a kielégítő azonosítást az NDB névleges fedésterületének határán.

1. Megjegyzés. - Az előbbi követelmény olyan magas modulációs mélységet tesz szükségessé, amilyen gyakorlatilag csak lehetséges, az azonosítás során elegendő vivőfrekvenciás teljesítménnyel együtt.

2. Megjegyzés. - A vivőfrekvencia körüli plusz, vagy mínusz 3 kHz-es áteresztő sávú iránymérő esetében a névleges fedésterület határánál 6 dB-es jel/zaj viszony általában kielégíti az előbbi követelményeket.

3. Megjegyzés. - A modulációs mélységgel kapcsolatban a "C"- Melléklet 6.4 pontja tartalmaz néhány irányelvet.

3.4.6.4 **Ajánlás**. - *A NON/A2A sugárzású NDB-k vivőfrekvenciás teljesítménye nem csökkenhet akkor, amikor az azonosító jel kerül kisugárzásra, kivéve azt, hogy egy 92,7 km-t (50 tengeri mérföld) meghaladó átlagos sugarú fedésterülettel rendelkező NDB esetében az 1,5 dB-nél nem nagyobb teljesítménycsökkenés elfogadható.*

3.4.6.5 A nem-kívánt hangfrekvenciás modulációk összege kevesebb kell, hogy legyen, mint a vivőfrekvencia amplitúdójának 5 százaléka.

Megjegyzés. - A fedélzeti automatikus iránymérő készülék (ADF) megbízható működését jelentős mértékben károsan befolyásolhatja az, ha az irányadó sugárzása a keretantenna kapcsoló frekvenciájával, vagy annak második harmonikusával egyenlő, illetve ahhoz közel eső hangfrekvencia által előidézett modulációt tartalmaz. A jelenleg használatos berendezések esetében a keretantenna kapcsoló frekvenciái 30 Hz és 120 Hz közé esnek.

3.4.6.6 A sugárzás sávszélességét és a hamis sugárzások szintjét azon a legalacsonyabb értéken kell tartani, amelyet a műszaki állapot és a szolgáltatás természete megenged.

Megjegyzés. - A Nemzetközi Távközlési Egyesület /ITU/ Rádió-szabályzatainak (Radio Regulations) S3. cikkelye tartalmazza a berendezésekre és a sugárzásokra vonatkozó műszaki jellemzők általános előírásait. A Nemzetközi Rádiószabályzat magába foglalja a szükséges sávszélességre, frekvencia toleranciákra, hamis sugárzásokra és a sugárzások osztályozására vonatkozó speciális előírásokat (lásd az APS1, APS2 és APS3 Függelékeket).

3.4.7 A megközelítési helyzetmeghatározók telepítése

3.4.7.1 **Ajánlás**. - *Ahol megközelítési helyzetmeghatározókat használnak az ILS rendszer kiegészítéseként, ott azokat a külső és a középső hely-jeladók telepítési helyén kell elhelyezni. Ahol az ILS rendszer kiegészítéseként csak egy megközelítési helyzetmeghatározó irányadót használnak, ott előnyben kell részesíteni a külső hely-jeladó irányadók telepítési helyén való elhelyezést. Ahol ILS hiányában a végső megközelítés navigációs berendezéseként megközelítési helyzetmeghatározó irányadókat alkalmaznak, ott is olyan telepítési helyeket kell kiválasztani, mint ami ILS rendszer telepítése esetén lenne, figyelembe véve a Léginavigációs Szolgálatok Eljárásai - Légijármű Üzemeltetés (Procedures for Air Navigation Services - Aircraft Operations) (Doc 8168) vonatkozó akadálymentességi rendelkezéseit.*

3.4.7.2 **Ajánlás**. - *Ahol megközelítési helyzetmeghatározó irányadókat telepítenek, ott azokat - amennyiben gyakorlatilag megoldható - mind a középső, mind a külső hely-jeladók helyén a futópálya meghosszabbított középvonalának azonos oldalára kell elhelyezni, abból a célból, hogy a megközelítési helyzetmeghatározó irányadók között egy olyan útirányt tegyenek lehetővé, amely a futópálya középvonalával a lehető legpárhuzamosabb.*

3.4.8 Felügyelő rendszer

3.4.8.1 Minden egyes NDB-hez valamilyen olyan alkalmas berendezést kell biztosítani, amely a megfelelő helyen képes a következő körülmények bármelyikét észlelni:

a) a kisugárzott vivőfrekvenciás teljesítménynek, a névleges fedés- területen szükséges érték 50 százalékánál nagyobb mértékű csökkenését;

b) az azonosító jel adásának kimaradását;

c) magának a felügyelő rendszernek a hibás működését, vagy üzemzavarát.

3.4.8.2 **Ajánlás**. - *Amikor egy NDB-t olyan áramforrásról üzemeltetnek, amelynek a fedélzeti automatikus iránymérő készülékek kapcsolási frekvenciáihoz közel eső frekvenciája van, és ahol az NDB kivitele olyan, hogy a tápfeszültség frekvenciája valószínűleg moduláló összetevőként jelentkezhet a sugárzásban, ott a felügyelő berendezésnek alkalmasnak kell lenni a vivőfrekvencia ilyen, a tápfeszültség által okozott modulációjának észlelésére, amennyiben ez az 5 százalékot túllépi.*

3.4.8.3 A megközelítési helyzetmeghatározó működési ideje alatt a felügyelő rendszernek biztosítania kell a megközelítési helyzetmeghatározó működésének folyamatos ellenőrzését a fenti 3.4.8.1 a), b) és c) pont előírásai szerint.

3.4.8.4 **Ajánlás**. - *A nem megközelítési helyzetmeghatározó, hanem egyéb telepítésű NDB-k működési ideje alatt a felügyelő rendszert képező berendezésnek biztosítania kell az NDB-k működésének folyamatos, a 3.4.8.1 a), b) és c) pont előírásai szerinti ellenőrzését.*

Megjegyzés. - Az NDB-k vizsgálatára vonatkozó útmutató anyagot a "C"- Melléklet 6.6 pontja tartalmazza.

3.5 A deciméteres hullámú (UHF) távolságmérő berendezésre (DME) vonatkozó előírások

1. Megjegyzés. - A következő szakasz a DME berendezések két típusára vonatkozó előírásokat tartalmazza: a DME/N-t (keskeny impulzus spektrum) a 2. Fejezet 2.2.2 pontjában leírt felhasználásra és a DME/P-t (pontos távolságmérési), ahogy az a későbbi 3.11.3 pontban kerül kifejtésre.

2. Megjegyzés. - Az alábbi pontokban a ‡ jellel jelzettek az 1989. január 1. után újonnan telepített berendezésekre alkalmazhatók (2. Fejezet 2.2.2.1 pont).

3.5.1 Meghatározások

Control motion noise (CMN). Kormányzási elmozdulási zaj
Az útirányadó jel hibájának az a része, amelyet a kormányfelületek, a futók és az antenna-oszlop elmozdulása okoz, és amelyet a repülőgépnek az útirányra ráállt repülés közbeni térbeli helyzeti szöge befolyásolhat, de az, ami nem idézi elő a repülőgépnek a megkívánt iránysávtól és/vagy siklópályától való eltérését. (Lásd a későbbi 3.11 pontot.)

DME dead time. DME holtidő
Egy érvényes kérdezés dekódolását közvetlenül követő azon intervallum, amely alatt egy vett kérdés nem eredményezi egy válasz létrehozását.

Megjegyzés. - A holt idő annak meggátolására szolgál, hogy a válaszadó a több-utas hatásokból eredő visszaverődésekre válaszoljon.

DME/N. (Keskeny impulzus spektrumú távolságmérő berendezés)
Távolságmérő berendezés, elsődlegesen az útvonal és a közelkörzeti (TMA) navigációs üzemelési szükségletek kiszolgálására, amelynél az "N" a keskeny impulzus spektrum jellemzőt jelenti (a "W"-től való megkülönböztetés céljából).

DME/P. (Precíziós távolságmérő berendezés)
Az MLS távolságmérő berendezése, amelynél a "P" a pontos /pontosabb/ távolságmérést jelenti. A berendezés spektrum jellemzői megegyeznek a DME/N berendezésével.

DME/W. (Széles impulzus spektrumú távolságmérő berendezés)
Távolságmérő berendezés, elsődlegesen az útvonal és a közelkörzeti (TMA) navigációs üzemelési szükségletek kiszolgálására, amelynél a "W" a széles impulzus spektrum jellemzőt jelenti (az "N"-től való megkülönböztetés céljából).

Equivalent isotropically radiated power (e.i.r.p.). Az egyenértékű izotropikusan kisugárzott teljesítmény
Az antennába táplált teljesítmény és az antennának egy megadott irányban az izotróp antennához (minden irányban azonos tulajdonságú antennához) viszonyított teljesítmény-nyeresége (abszolút, vagy izotróp nyereség).

Final approach (FA) mode. Végső megközelítési (FA) mód
A DME/P berendezésnek az az üzemi helyzete, amely a végső megközelítésben és a futópálya körzetében való repülési üzemeltetéseket támasztja alá.

Initial approach (IA) mode. Kezdeti megközelítési (IA) mód
A DME/P berendezésnek az az üzemi helyzete, amely a végső megközelítési körzeten kívül eső területen üzemelő repülési üzemeltetéseket támasztja alá, és amelyik képes a DME/N berendezéssel együtt működni.

Key down time. Billentyűzési lenyomási idő
Az az idő, amely alatt egy Morse jel pontja, vagy vonása leadásra kerül.

MLS approach reference datum. MLS megközelítési vonatkoztatási alappont
A legalacsonyabb siklópályán a futópálya küszöbe felett meghatározott magasságban lévő pont (lásd a későbbi 3.11 pontot).

MLS datum point. MLS alappont
A futópálya középvonalán a megközelítési süllyedési szög antenna fázis középpontjához legközelebb eső pont (lásd a későbbi 3.11 pontot).

Mode W, X, Y, Z. W, X, Y, Z mód
A DME adásánál egy impulzus-pár időosztásos impulzus kódolású sugárzási módja úgy, hogy az egyes frekvenciákat nem csak egyszer lehet használni.

Partial rise time. Részleges felfutási idő
Az impulzusgörbe felfutási szakaszán az 5 és 30 százalékos amplitúdó pontok között mért felfutási idő, azaz a h és az i pontok között a 3-1. és a 3-2. sz. ábrán.

Path following error (PFE). Útvonal követési hiba
Az útirányadó jel hibájának az a része, amely előidézheti azt, hogy a légijármű a megkívánt útiránytól és/vagy siklópályától eltérjen. (Lásd alább a 3.11 pontot.)

Pulse amplitude. Impulzus magasság
Az impulzus görbe legnagyobb feszültségű helyzete, azaz az ’A’ érték a 3-1. számú ábrán.

Pulse decay time. Impulzus lefutási idő
Az impulzus görbe lefutó élén a 90 és a 10 százalékos amplitúdó pontok között mért lefutási idő, azaz az ’e’ és a ’g’ pontok között a 3-1sz. ábrán.

Pulse code. Impulzus kód
A W, X, Y és Z módokat, valamint az FA és IA módot megkülönböztető módszer.

Pulse duration. Az impulzus időtartama
Az impulzus görbe felfutó és lefutó éleinek 50 százalékos amplitúdó pontjai közötti idő, azaz a ’b’ és az ’f’ pontok között a 3-1.számú ábrán.

Pulse rise time. Impulzus felfutási idő
Az impulzus görbe felfutó élén a 10 és a 90 százalékos amplitúdó pontok között mért felfutási idő, azaz az ’a’ és a ’c’ pontok között a 3-1. számú ábrán.

Reply efficiency. Válaszadási hatékonyság
A válaszadó által adott válaszok és az összes vett érvényes lekérdezés közötti arány.

Search. Keresés
Az a helyzet, ami akkor áll fenn, amikor a DME lekérdező adó-vevő egység megpróbálja befogni és rögzíteni a kiválasztott válaszadótól a saját kérdéseire adott választ.

System efficiency. Rendszer hatékonyság
A lekérdező adó-vevő egység által feldolgozott érvényes válaszok és az általa adott összes lekérdezés közötti arány.

Track. Követés
Az a helyzet, ami akkor áll fenn, amikor a DME lekérdező adó-vevő egység rögzítette a saját lekérdezéseire adott válaszokat, és folyamatosan adja a távolság-méréseket.

Transmission rate. Adási sebesség
A válaszadó által másodpercenként leadott impulzus-párok átlagértéke.

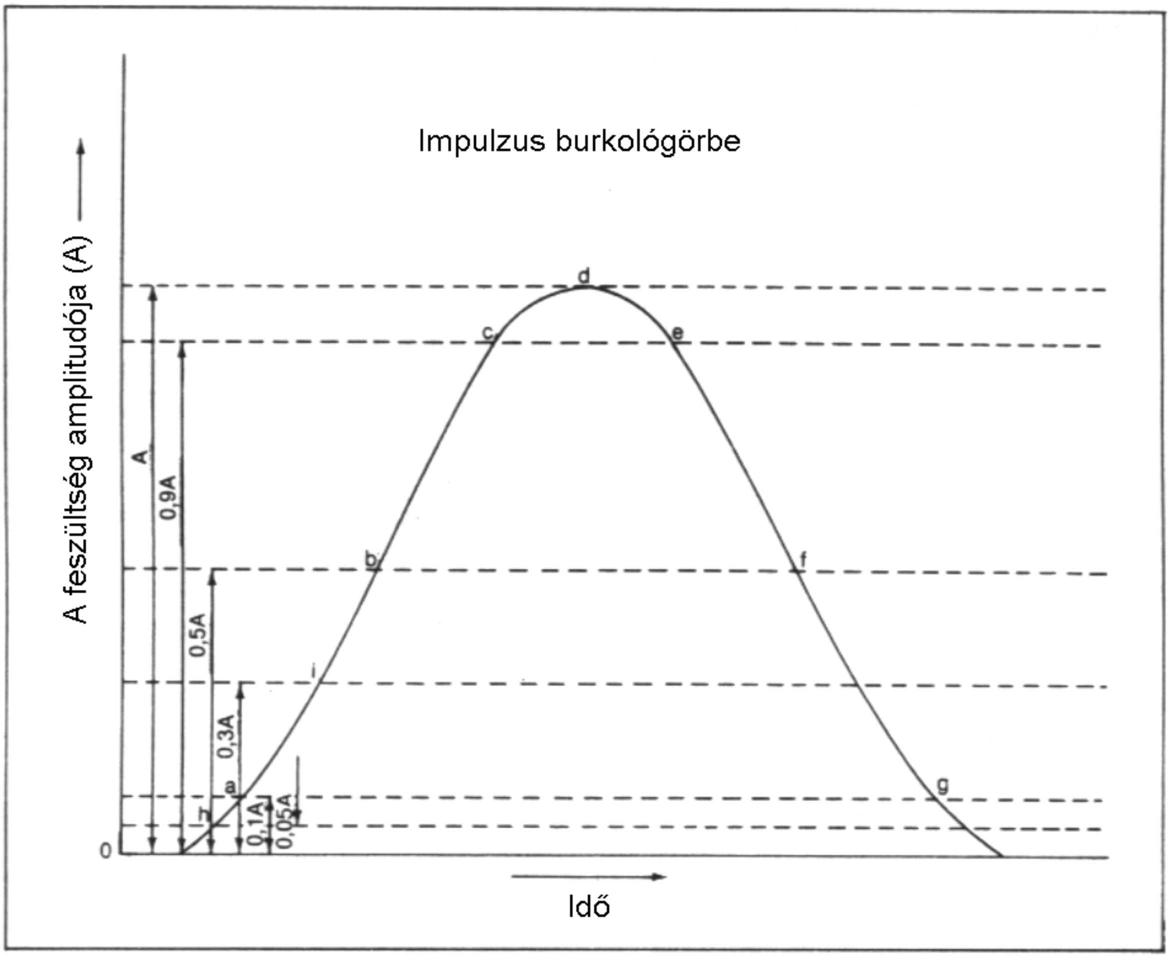
Virtual origin. A látszólagos kiindulási pont
Az a pont, ahol az impulzus felfutó élének 30 százalékos és 5 százalékos amplitúdó pontjain keresztül húzott egyenes metszi a 0 százalékos amplitúdó tengelyt (lásd a 3-2. számú ábrát).

3.5.2 Általános rész

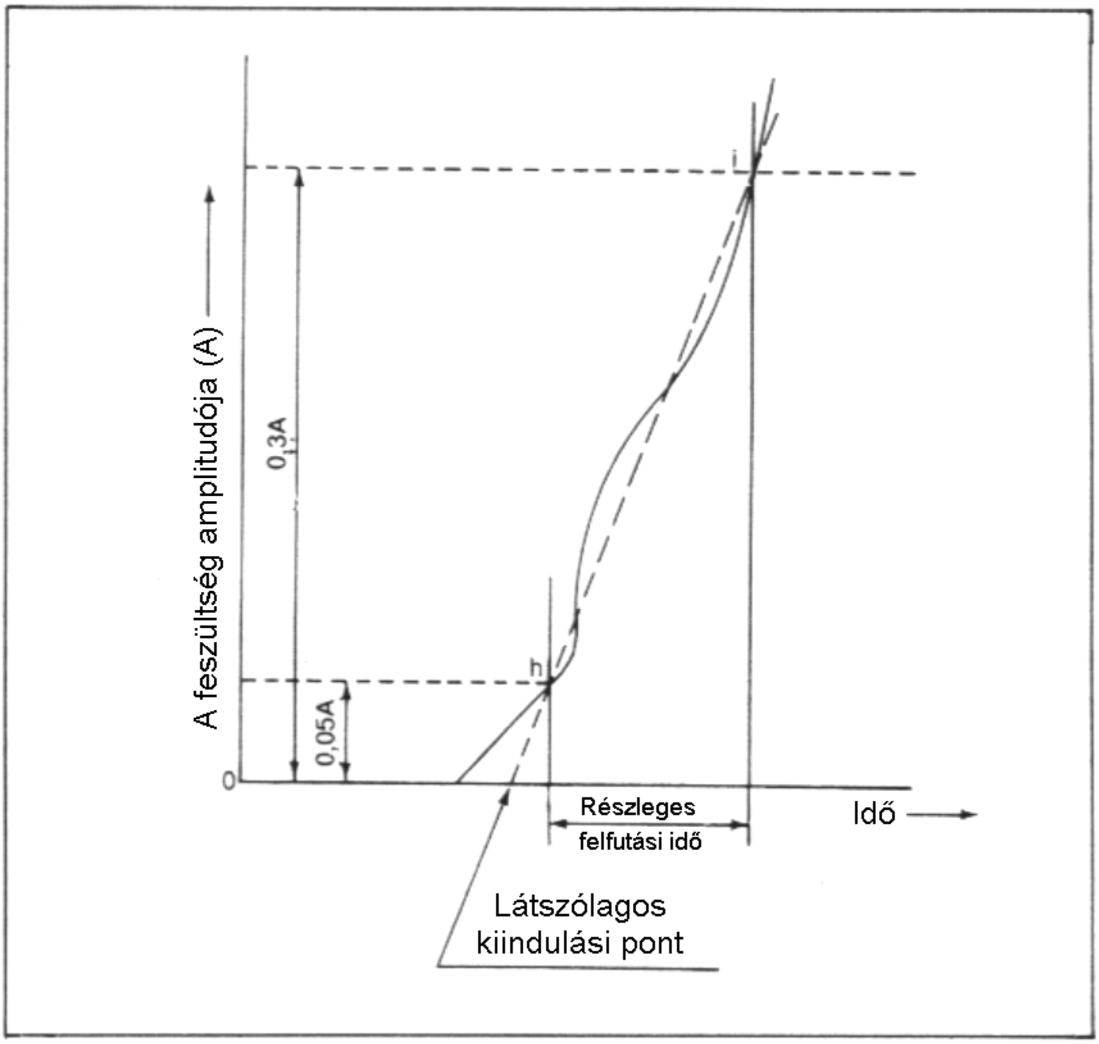
3.5.2.1 A DME rendszernek folyamatos és pontos jelzést kell biztosítania a pilótakabinban a rendszerrel ellátott légijárműnek egy, a rendszerrel felszerelt valamely földi referencia ponttól mért ferdetávolságáról.
3.5.2.2 A rendszernek két alapegységből kell állnia, az egyik a légijármű fedélzetén felszerelten, a másik a földön telepítve. A fedélzeti egységet lekérdező adó-vevő egységnek (interrogator), a földi egységet válaszadó berendezésnek (transponder) nevezzük.

3.5.2.3 Működés közben a lekérdező adó-vevő egységeknek kell kérdezniük a válaszadó berendezéseket, amelyek viszont a kérdezésekkel szinkronizált válaszokat kell továbbítsák a lekérdező egységnek, ilyen módon biztosítva a pontos távolságmérési lehetőséget.

3.5.2.4 A DME/P berendezésnek két üzemi módja - az IA (kezdeti megközelítési) és az FA (végső megközelítési) üzemmódja - kell, hogy legyen.


Impulzus burkológörbe
A feszültség amplitudója (A)
Idő
d
c
e
b
f
i
a
g
A
0,9A
0,5A
0,3A
0,1A
0,05A
0

3-1. ábra



3-2. ábra

3.5.2.5 Amikor a DME funkciókat egy ILS-el, MLS-el, vagy VOR-al társítják egy egyedüli berendezés kialakításának céljából, akkor ezeket csak úgy lehet a 2. Fejezet 2.2.2 pontjában leírtakat kielégítő módon társított berendezéseknek tekinteni, ha:

a) az alábbi 3.5.3.3.5 pont szerinti szabvány frekvencia párosításban üzemeltetik;

b) az alábbi 3.5.2.6 pontban a társított berendezésekre előírt határokon belül együtt telepítik; és

c) megfelelnek az alábbi 3.5.3.6.4 pontban leírt, azonosításra vonatkozó előírásoknak.

Megjegyzés. - Egy egyedüli DME berendezés mind egy ILS-el, mind egy MLS-el társítható.

3.5.2.6 *Az ILS-el, MLS-el, vagy a VOR-al társított DME berendezés együttes telepítési határértékei*

3.5.2.6.1 A társított VOR és DME berendezéseket a következőknek megfelelően kell együtt telepíteni:

a) *közös tengelyű telepítés*: a VOR és a DME antennák azonos függőleges tengelyre vannak elhelyezve; vagy

b) *eltolt telepítés*:

1) a repülőtéri közelkörzetekben megközelítési célokra, vagy más eljárásokra használt berendezéseknél, ahol a rendszerrel történő legpontosabb helymeghatározásra van szükség, a VOR és a DME antennája közötti távolság nem lépheti túl a 30 m-t (100 láb), kivéve, hogy a Doppler VOR berendezéseknél - amelyeknél a DME szolgáltatást egy külön berendezés biztosítja - az antennák 30 méternél (100 láb) nagyobb távolságra is elhelyezhetők, azonban ez a távolság nem lehet a 80 méternél (260 láb) több;

2) az 1) pontban jelzettektől eltérő más feladatokra a VOR és a DME antennái közötti távolság nem haladhatja meg a 600 métert (2 000 láb).

3.5.2.6.2 *A DME berendezésnek az ILS-el való társítása*

Megjegyzés. - *A "C"- Melléklet 2.11 pontja ad útmutató anyagot a DME-nek az ILS-el való társított telepítéséről.*

3.5.2.6.3 *A DME berendezésnek az MLS-el való társítása*

3.5.2.6.3.1 **Ajánlás.** - *Ha egy DME/P berendezést használnak a távolságmérési tájékoztatás biztosításához, akkor a berendezést olyan közel kell telepíteni az MLS irányszög-adó berendezéséhez (antennájához), amennyire az csak lehetséges.*

Megjegyzés. - A "G"- Melléklet 5. pontja, valamint a "C"- Melléklet 7.1.6 pontja adja meg a DME-nek az MLS-el való társított telepítésére vonatkozó útmutató anyagot. Ez az útmutató anyag magyarázza meg, részletekre kiterjedően, azokat a végrehajtandó megfelelő lépéseket, amelyekkel megelőzhető a különböző nulla távolság kijelzése akkor, amikor MLS-el társított DME/P és ILS-el társított DME/N szolgálja ki ugyanazt a futópályát.

3.5.3 A rendszer jellemzői

3.5.3.1 *Teljesítmény*

3.5.3.1.1 *Hatótávolság*. A rendszernek ferdetávolság mérő eszközként kell szolgálni a légijárműtől valamely kiválasztott válaszadó berendezésig terjedő távolság mérésére, a kiválasztott válaszadó berendezésre az üzemeltetési követelmények által előírt fedésterületi határig.

3.5.3.1.2 *Fedésterület*

3.5.3.1.2.1 Amikor a DME/N egy VOR-al társítottan kerül telepítésre, akkor fedésterületének - a megvalósítható mértékben - legalább azonosnak kell lenni a VOR fedésterületével.
3.5.3.1.2.2 Amikor a DME/N akár egy ILS-el, akár egy MLS-el kerül társítottan telepítésre, akkor fedésterületének legalább azonosnak kell lennie a megfelelő ILS, vagy MLS irányszög útirány-vezetési fedésterületi szektoréval.

3.5.3.1.2.3 A DME/P berendezés fedésterületének legalább azonosnak kell lennie az MLS irányszög útirány-vezetési fedésterületi szektoréval.

Megjegyzés. - Nem az a cél, hogy olyan üzemeltetési hatótávolság és fedésterület kerüljön előírásra, amelyben a rendszer használható; bizonyos területeken a már telepített berendezések közötti távolság korlátozhatja a hatótávolságot.

3.5.3.1.3 *Pontosság*

3.5.3.1.3.1 *Rendszer-pontosság*. Az alábbiakban meghatározott pontossági előírásokat 95 százalékos valószínűségi alapon kell kielégíteni.

Megjegyzés. - A rendszerek összegzett tűréshatárai magukba foglalják az összes forrásból eredő hibákat, úgymint a fedélzeti berendezés és a földi berendezés hibáit, a terjedési rendellenességeket és a véletlenszerű impulzus-interferencia hatásokat.

3.5.3.1.3.2 *A DME/N berendezés pontossága.* **Ajánlás**. - *A válaszadó berendezéstől számított 0-tól 370 km-ig (200 tengeri mérföld) terjedő távolságnál, az adott szolgálati alkalmazástól függően, az összesített rendszerhiba - a leolvasási hiba kivételével - nem lehet nagyobb plusz, vagy mínusz 460 m (0,25 tengeri mérföld), plusz a mért távolság 1,25 százalékánál.*

‡3.5.3.1.3.3 Az összegzett rendszerhiba nem haladhatja meg a plusz, vagy mínusz 370 m-t (0,2 tengeri mérföld).

1. Megjegyzés. - Ez a rendszer pontosság-érték azon alapul, hogy a fedélzeti lekérdező adó-vevő egység hiba-össze tevője nem lehet nagyobb, mint plusz, vagy mínusz 315 m (0,17 tengeri mérföld).

2. Megjegyzés. - A vegyes DME/N - DME/P berendezés üzemeltetésénél legalább a fenti 3.5.3.1.3.2 pontban leírt pontosság elérése a cél.

3.5.3.1.3.4 *DME/P berendezés pontossága*

1. Megjegyzés. - A DME/P berendezésre az alábbiakban két - 1. és 2. - pontossági szabványt ismertetünk, hogy figyelembe vegyük a berendezések sokféleségét.

2. Megjegyzés. - A pontossági szabványokról a "C"- Melléklet 7.3.2 pontja tartalmaz útmutatást.

3.5.3.1.3.4.1 *Hiba-összetevők*. Az útvonal-követési hiba (PFE) a DME/P berendezés hibájának - a lekérdező adó-vevő kimenetén megjelenő - azon frekvencia komponenseiből tevődik össze, amelyek az 1,5 rad/s alatt vannak. A kormányzási elmozdulási zaj (CMN) a DME/P hibájának - a lekérdező adó-vevő kimenetén megjelenő - azokból a frekvencia komponenseiből tevődik össze, amelyek a 0,5 rad/s és a 10 rad/s között vannak.

Megjegyzés. - A meghatározott hiba határértékeket annál a pontnál kell alkalmazni a repülési pálya felett, amelyet a repülési pálya magába foglal. A DME/P berendezés hibáinak értelmezéséről és ezeknek a hibáknak a repülési (légi)ellenőrzés szempontjából megfelelő időn keresztüli méréséről tájékoztatásokat tartalmaz a "C"- Melléklet 7.3.6.1 pontja.

3.5.3.1.3.4.2 A hibák a futópálya meghosszabbított középvonalán nem haladhatják meg az ennek a fejezetnek a végén lévő ”B”- táblázatban megadott értékeket.

3.5.3.1.3.4.3 A megközelítési szektorban, a futópálya meghosszabbított középvonalától távolabb, a megengedhető PFE hibára mindkét, az 1. és a 2. szabványnál megengedettnek kell lennie annak, hogy az MLS megközelítési irányszögének plusz, vagy mínusz 40 fokig terjedő növekedésével együtt a hiba lineárisan növekedjen, ahol (a 40 foknál) a megengedett hiba az 1,5-szerese annak, mint ami a futópálya meghosszabbított középvonalán ugyanannak a távolságnak megfelelő. A megengedhető CMN nem növekedhet a szöggel együtt. Nem lehet semmilyen mértékű PFE, vagy CMN értékcsökkenés a süllyedési szögnél.

3.5.3.2 *Rádiófrekvenciák és polarizáció*. A berendezéseknek a 960 MHz-től az 1 215 MHz-ig terjedő frekvenciasávban függőleges polarizációval kell üzemelniük. A lekérdező és a válaszoló frekvenciákat a csatornák között 1 MHz-es csatornaosztással kell kijelölni.

3.5.3.3 *Csatorna elosztás*

3.5.3.3.1 A DME üzemi csatornákat a lekérdező és a válaszoló frekvenciák párosításával és a párosított frekvenciák impulzus-kódolásával kell kialakítani.

3.5.3.3.2 *Impulzus-kódolás*. A DME/P rendszer csatornáinak két különböző lekérdező impulzus-kódolásuk kell, hogy legyen, úgy, ahogy a 3.5.4.4.1 pontban foglalt táblázat bemutatja. Az egyiket a kezdeti megközelítési (IA) módra, a másikat pedig a végső megközelítési (FA) módra kell felhasználni.

3.5.3.3.3 A DME üzemi csatornákat az A-táblázat (ennek a fejezetnek a végén található) 352 csatornájából kell kiválasztani, a táblázatban a csatorna-számok, a frekvenciák és az impulzus-kódolás került kiosztásra.

3.5.3.3.4 *Területi csatorna-kiosztás*

3.5.3.3.4.1 A valamely meghatározott területen használandó DME üzemi csatornák számát körzeti alapon kell eldönteni.

Megjegyzés. - A 960 - 1 215 MHz-es DME frekvenciasáv felhasználására vonatkozó Szabványok és Ajánlott Gyakorlatok az V. Kötet 4. Fejezetében találhatók.

3.5.3.3.4.2 Az ilyen meghatározott területen kijelölendő külön DME üzemi csatornákat szintén körzeti alapon kell eldönteni, figyelembe véve az azonos csatorna és a szomszédos csatorna védelmére vonatkozó követelményeket.

3.5.3.3.4.3 **Ajánlás**. - *A körzeti DME csatorna-elosztás koordinálását az ICAO-n keresztül kell végrehajtani.*
Megjegyzés. - A fenti pontokban előírtak lehetővé teszik az olyan fedélzeti lekérdező adó-vevő berendezések használatát is, amelyeknek nincs meg a teljes számú üzemi csatornájuk, ahol így kívánatos.

3.5.3.3.5 *Csatorna párosítás*. Amikor valamely DME válaszadó berendezést egy, a 108 MHz-től a 117,95 MHz-ig terjedő frekvenciasávba eső VHF navigációs berendezéssel együtt akarnak üzemeltetni és/vagy egy, az 5 031,0 MHz-től az 5 090,7 MHz-ig terjedő frekvenciasávba eső MLS irányszög-adó berendezéssel együtt, akkor a DME üzemi csatornát az "A"- táblázatban megadott VHF csatornákkal és/vagy MLS irányszög-adó frekvenciákkal kell párosítani.

Megjegyzés. - Lehetnek olyan esetek, amikor a DME mindkét - egy ILS frekvenciával és egy MLS - csatornával párosításra kerül (lásd az V. Kötet 4. Fejezetének 4.3 pontját).

3.5.3.4 *A lekérdező impulzus ismétlődési frekvenciája*

Megjegyzés. - Ha a lekérdező adó-vevő berendezés több, mint egy csatornán üzemel ugyanazon másodpercben, akkor a következő meghatározásokat kell alkalmazni az összes csatornán való lekérdezések összességére.

3.5.3.4.1 *DME/N*. A lekérdező adó-vevő berendezés átlagos impulzus ismétlődési frekvenciája (PRF) nem lépheti túl a másodpercenkénti 30 impulzuspárt, azon feltételezés alapján, hogy az időnek legalább a 95 százalékát a követési mód foglalja le.

3.5.3.4.2 *DME/N*. Ha kívánatos a keresési idő csökkentése, akkor az impulzus ismétlődési frekvencia (PRF) növelhető a keresés alatt, de nem lépheti túl a másodpercenkénti 150 impulzus-párt.

3.5.3.4.3 *DME/N*. **Ajánlás**. - *Amennyiben 15 000 impulzus-pár kisugárzásra kerül anélkül, hogy a berendezés távolság kijelzést kapna, akkor az impulzus ismétlődési frekvencia (PRF) nem lépheti túl a másodpercenkénti 60 impulzus-párt mindaddig, amíg az üzemi csatorna megváltoztatása meg nem történik, vagy a sikeres keresés be nem fejeződik.*

‡3.5.3.4.4 *DME/N*. Amikor egy 30 másodperces időszak után a követés nem jön létre, akkor ezt követően az impulzus-párok ismétlődési frekvenciája (PRF) nem haladhatja meg a 30 impulzus-párt másodpercenként.

3.5.3.4.5 *DME/P*. A lekérdező impulzus ismétlődési frekvenciája nem haladhatja meg a következőkben felsorolt másodpercenként leadott impulzus-pár számot:

a)	keresés	40
b)	földön lévő légijármű	5
c)	kezdeti megközelítési módú követés	16
d)	végső megközelítési módú követés	40

1. Megjegyzés. - A földön lévő légijármű a másodpercenkénti 5 impulzus-pár értékű impulzus ismétlődési frekvenciát (PRF) csak akkor lépheti túl, ha a légijárműnek pontos távolság tájékoztatásra van szüksége.

2. Megjegyzés. - Az a cél, hogy az összes impulzus ismétlődési frekvencia (PRF) változást automatikus eszközökkel érjék el.

3.5.3.5 *A rendszer légijármű kezelési kapacitása*

3.5.3.5.1 Egy meghatározott területen lévő válaszadó berendezés légijármű kezelési kapacitásának elegendő nagyságúnak kell lenni az adott terület forgalmi csúcsának, vagy 100 légijárműnek a kezeléséhez, amelyik a kevesebb.

3.5.3.5.2 **Ajánlás**. - Ahol egy meghatározott területen a forgalmi csúcs meghaladja a 100 légijárművet, ott a válaszadónak képesnek kell lennie ennek a forgalmi csúcsnak a kezelésére.

Megjegyzés. - A légijármű kezelési kapacitásra vonatkozó útmutató anyag a "C"- Melléklet 7.1.5 pontjában található.

3.5.3.6 *A válaszadó berendezés azonosítása*

3.5.3.6.1 Minden válaszadó berendezésnek egy, a következő formák valamelyikének megfelelő azonosító jelet kell adnia az alábbi 3.5.3.6.5 pontban előírtak szerint:

a) egy "független" azonosító jelet, amely kódolt (Nemzetközi Morse kódú) azonosító impulzusokból áll, és amely minden válaszadó által használható;

b) egy "társított" jelet, amely kimondottan az olyan VHF navigációs berendezésekkel, vagy MLS útirányszög adó berendezéssel együtt telepített válaszadók esetén használható, amelyek önmaguk is sugároznak azonosító jelet.

Megjegyzés. - Az MLS útirányszög-adó berendezés egy digitális szóval azonosítja magát, amelyet az adatcsatornán továbbít a megközelítési és hátsó-irányszög szektor fedésterületi körzetbe úgy, ahogy az a következőkben a 3.11.4.6.2.1 pontban meghatározásra kerül.

3.5.3.6.2 Az azonosítás mindkét módszerének olyan jeleket kell használni, amelyek másodpercenként 1 350 impulzus-párnak megfelelő ismétlődési frekvenciájú impulzus-pár sorozat egy megfelelő időperióduson át történő leadásából áll, és átmenetileg helyettesíteni kell minden válasz impulzust, ami egy adott időben szabályszerűen előfordulna, kivéve az alábbi 3.5.3.6.2.2 pontban leírtakat. Ezeknek az impulzusoknak ugyanolyan jellemzőik kell, hogy legyenek, mint a válaszjelek egyéb impulzusainak.

‡3.5.3.6.2.1 *DME/N.* A válasz impulzusokat a billentyűzési lenyomási idők között kell leadni.

3.5.3.6.2.2 *DME/N.* **Ajánlás**. - *Ha megkívánt az, hogy egy állandó impulzus-kitöltési tényezőt tartsanak fenn, akkor egy, az azonosító impulzus-párokkal megegyező jellemzőjű, kiegyenlítő impulzus-párt kell leadni 100 plusz, vagy mínusz 10 mikro-szekundummal minden azonosító impulzus-pár után.*

3.5.3.6.2.3 *DME/P.* A válasz impulzusokat a billentyűzési lenyomási idők között kell leadni.

3.5.3.6.2.4 A DME/P válaszadóknak az érvényes FA (végső megközelítési) módú kérdésekre a válasz impulzus-párokat ugyancsak a billentyűzési lenyomási idők között kell leadni, és ezeknek elsőbbségüknek kell lenniük az azonosító impulzus-párokkal szemben.

3.5.3.6.2.5 A DME/P válaszadók nem alkalmazhatják a fenti 3.5.3.6.2.2 pontban leírt kiegyenlítő impulzus-párokat.

3.5.3.6.3 A "független" azonosító jel jellemzői a következők kell, hogy legyenek:

a) az azonosító jelnek, az azonosító impulzusoknak az állomások kódjelének megfelelő pontok és vonások (Nemzetközi Morse kód) formájában történő adásából kell állnia, minden 40 másodpercben legalább egyszer, egypercenkénti körülbelül 6 szavas ütemben; és

b) a DME válaszadó berendezéseknél az azonosító kódjel jellemzői és betűsebessége meg kell, hogy feleljen a következőknek annak biztosítása céljából, hogy a maximális teljes billentyűzési lenyomási idő ne lépje túl az azonosító kód- csoportonkénti 5 másodpercet. A pontok időtartama 0,1 - 0,160 másodperc kell, hogy legyen. A vonások időtartama a jellemző pontokénak a háromszorosa kell, hogy legyen. A pontok és/vagy vonások közötti időtartamnak egyenlőnek kell lennie egy pont és plusz, vagy mínusz annak 10 százaléka időtartamával. A betűk, vagy számok közötti időtartam ne legyen kevesebb, mint három pont időtartama. Egy azonosító kódcsoport adásának teljes ideje nem haladhatja meg a 10 másodpercet.

Megjegyzés. - A hang azonosító jelet 1 350 impulzus-párnak megfelelő ismétlődési frekvenciával adják. Ez a frekvencia közvetlenül felhasználható a fedélzeti berendezéseknél, mint hallható hang-kimenet a légijárművezető számára, illetve más frekvenciákon is létrehozható a lekérdező adó-vevő berendezés tervezőjének szabad választása szerint (lásd a fenti 3.5.3.6.2 pontot).

3.5.3.6.4 A "társított" azonosító jel jellemzőinek a következőknek kell lenniük:

a) amikor egy VHF berendezéssel, vagy egy MLS irányszög berendezéssel társított, az azonosító jelet pontok és vonások (Nemzetközi Morse kód) formájában kell leadni úgy, ahogy a fenti 3.5.3.6.3 pontban leírásra került, és szinkronizálni kell a VHF berendezés azonosító kódjával;

b) minden egyes 40 másodperces időintervallumot fel kell osztani négy, vagy több egyenlő időtartamra, a válaszadó azonosítóját csak az egyik periódusban kell sugározni, és a társított VHF berendezés, valamint az MLS irányszög-adó berendezés kódját - ahol ezeket felszerelték - a fennmaradó idő alatt kell leadni;

c) egy MLS-el társított DME válaszadónál az azonosító jel az MLS irányszög-adó berendezésnek a későbbi 3.1.4.6.2.1 pontban meghatározott szerinti utolsó három betűje kell, hogy legyen.

3.5.3.6.5 *Az azonosítás végrehajtása*

3.5.3.6.5.1 "Független" azonosító kódjelet kell minden olyan esetben alkalmazni, amikor a válaszadó berendezés nincs kifejezetten egy VHF navigációs berendezéssel, vagy egy MLS berendezéssel társítva.

3.5.3.6.5.2 Minden olyan esetben, amikor a válaszadó berendezés kifejezetten egy VHF navigációs berendezéssel, vagy egy MLS berendezéssel társított, akkor az azonosítást a "társított" kóddal kell biztosítani.

3.5.3.6.5.3 Amikor élőszavas forgalmat sugároznak valamely társított VHF navigációs berendezésen, a válaszadó berendezés "társított" azonosító jelét nem lehet elnyomni.

3.5.3.7 *A DME/P módba való átmenet*

3.5.3.7.1 A DME/P lekérdező adó-vevő berendezésnek az 1. Szabvány pontosságnál az IA (kezdeti megközelítési) követési módról az FA (végső megközelítési) követési módra a válaszadótól 13 km (7 tengeri mérföld) távolságra kell átváltani, amikor a válaszadó felé közeledik, vagy bármely olyan helyzetben, amikor 13 km-en (7 tengeri mérföld) belül van.

3.5.3.7.2 Az 1. Szabvány pontosságnál az IA (kezdeti megközelítési) módról az FA (végső megközelítési) követési módú üzemre az átmenetet a válaszadótól 14,8 km-en (8 tengeri mérföld) belül lehet megkezdeni. A 14,8 km-en (8 tengeri mérföld) kívül a kérdező-válaszoló adó-vevő nem kérdezhet FA (végső megközelítési) módban.

Megjegyzés. - A fenti 3.5.3.7.1 pontot nem kell alkalmazni, ha a válaszadó egy DME/N berendezés, vagy ha a DME/P válaszadó FA módja üzemképtelen.

3.5.3.8 *Rendszer hatásfok.* A fenti 3.5.3.1.3.4 pontban leírt, a DME/P berendezésre vonatkozó rendszer pontosságot 50 százalékos, vagy annál nagyobb rendszer hatásfok mellett kell megvalósítani.

3.5.4 A válaszadó berendezés és a hozzá kapcsolódó felügyelő rendszer részletes műszaki jellemzői

3.5.4.1 *Adó*

3.5.4.1.1 *Üzemi frekvencia.* A válaszadó berendezés a DME csatornákra kiosztott megfelelő válasz frekvencián kell, hogy sugározzon (lásd a fenti 3.5.3.3.3 pontot).

3.5.4.1.2 *Frekvencia stabilitás.* Az üzemi rádiófrekvencia nem térhet el a kijelölt frekvenciáktól plusz, vagy mínusz 0,002 százaléknál nagyobb mértékben.

3.5.4.1.3 *Impulzus alak és spektrum.* A következőket kell alkalmazni az összes kisugárzott impulzusra:

a) *Az impulzus felfutási ideje.*

1) *DME/N.* Az impulzus felfutási ideje nem haladhatja meg 3 mikro-szekundomot.
2) *DME/P.* Az impulzus felfutási ideje nem haladhatja meg az 1,6 mikro-szekundomot. Az FA (végső megközelítési) módra az impulzus részleges felfutási ideje 0,25 mikro-szekundum kell, hogy legyen, plusz, vagy mínusz 0,05 mikro-szekundum eltéréssel. Az FA módra és az 1. pontossági szabványra vonatkozóan az impulzus görbe meredeksége a részleges felfutási idő alatt nem változhat többel, mint plusz, vagy mínusz 20 százalékkal. A 2. pontossági szabványnál a meredekség nem változhat többel, mint plusz, vagy mínusz 10 százalékkal.

3) *DME/P.* **Ajánlás.** - *A DME/P impulzus felfutási ideje ne haladja meg az 1,2 mikro-szekundomot.*

b) Az impulzus időtartama 3,5 mikro-szekundum plusz, vagy mínusz 0,5 mikro-szekundum kell, hogy legyen.

c) Az impulzus lefutási ideje névlegesen 2,5 mikro-szekundum kell, hogy legyen, de nem lépheti túl a 3,5 mikro-szekundumot.

d) Az impulzus pillanatnyi amplitúdója - a felfutó él azon pontja, amely a maximális amplitúdó 95 százalékának felel meg és a lefutó él azon pontja között, amely a maximális amplitúdó 95 százalékának felel meg - egyetlen pillanatra sem csökkenhet olyan érték alá, amely az impulzus maximális feszültség amplitúdója 95 százalékának felel meg.

e) DME/N és DME/P berendezéseknél: az impulzus modulált jel spektruma olyan legyen, hogy az impulzus tartama alatt a névleges csatorna frekvencia feletti 0,8 MHz és alatti 0,8 MHz frekvenciák körüli 0,5 MHz-es sávban lévő tényleges kisugárzott energia egyetlen esetben se lépje túl a 200 mW-ot és a névleges csatorna frekvencia feletti 2 MHz és alatti 2 MHz frekvenciák körüli 0,5 MHz-es sávban lévő tényleges kisugárzott teljesítmény egyetlen esetben se lépje túl a 2 milliwattot. Bármely 0,5 MHz-es sávban lévő hatásos kisugárzott energiának monoton csökkennie kell, ahogy a sáv középfrekvenciája távolodik a névleges csatorna-frekvenciától.

Megjegyzés. - Az impulzus spektrum mérésére vonatkozó segédanyag a "C"- Melléklet 7.1.11 szakaszában található.

f) A küszöb technika megfelelő működésének biztosítása érdekében bármely impulzus indító tranziens pillanatnyi amplitúdója, amely időben a látszólagos kiindulási pont előtt jelentkezik, az impulzus csúcs amplitúdója 1 százalékánál kevesebb kell, hogy legyen. Az indítási folyamat megkezdése nem történhet meg a látszólagos kiindulási pont előtt 1 mikro-szekundumnál korábban.

1. Megjegyzés. - Az "impulzus időtartama alatt" értett idő azt a teljes időintervallumot öleli fel, ami az impulzus adásának kezdetétől annak végéig terjed. Gyakorlati okokból ezt az időtartamot az impulzus burkológörbe felfutó élének és a lefutó élének 5 százalékos pontja között lehet mérni.

2. Megjegyzés. - A fenti 3.5.4.1.3 e) és f) pontokban meghatározott teljesítmény az impulzus adása alatti átlagos teljesítmény. Egy adott frekvenciasávban az átlagos teljesítmény az ebben a frekvenciasávban kisugárzott energia osztva az 1. Megjegyzés szerinti impulzus sugárzási idővel.

3.5.4.1.4 *Impulzus távolság*

3.5.4.1.4.1 A kisugárzott impulzus-párokat alkotó impulzusok közötti impulzus távolságoknak a 3.5.4.4.1 táblázatban megadottaknak megfelelőnek kell lenni.

3.5.4.1.4.2 *DME/N.* Az impulzus távolság tűréshatára plusz, vagy mínusz 0,25 mikroszekundum kell, hogy legyen.

3.5.4.1.4.3 *DME/N.* **Ajánlás**. - *A DME/N impulzus távolság tűréshatára plusz, vagy mínusz 0,10 mikroszekundum kell, hogy legyen.*

3.5.4.1.4.4 *DME/P.* Az impulzus távolság tűréshatárának plusz, vagy mínusz 0,10 mikroszekundumnak kell lennie.

3.5.4.1.4.5 Az impulzus távolságot az impulzusok felfutó élén lévő fél-feszültség pontok között kell mérni.

3.5.4.1.5 *Maximális kimenő teljesítmény*

3.5.4.1.5.1 *DME/N.* **Ajánlás**. - A kisugárzott csúcs-teljesítmény nem lehet kevesebb annál, mint amennyi a körülbelül mínusz 83 dBW/m^2 impulzus csúcs-teljesítmény sűrűség biztosításához szükséges, az előírt maximális szolgálati távolságban és magasságban.

‡3.5.4.1.5.2 *DME/N.* A csúcs egyenértékű izotrópikusan kisugárzott teljesítmény nem lehet kevesebb annál, mint ami annak biztosításához szükséges, hogy a mínusz 89 dBW/m^2 impulzus csúcs-teljesítmény sűrűség bármilyen üzemeltetési időjárási körülmény esetén a fenti 3.5.3.1.2 pontban meghatározott fedésterület bármely pontján meglegyen.

Megjegyzés. - Bár a fenti 3.5.4.1.5.2 pontban meghatározott szabvány egy megnövelt lekérdező adó-vevő érzékenységet foglal magába, annak az a célja, hogy a fenti 3.5.4.1.5.1 pontban meghatározott teljesítmény sűrűség a meghatározott maximális szolgálati hatótávolságon és repülési szinten elérhető legyen.

3.5.4.1.5.3 *DME/P.* A csúcs egyenértékű izotrópikusan kisugárzott teljesítmény nem lehet kevesebb annál, mint ami a következő csúcs impulzus-teljesítmény sűrűségek biztosításához - bármilyen üzemeltetési időjárási körülmény esetén – szükséges:

a) mínusz 89 dBW/m^2, a fenti 3.5.3.1.2 pontban meghatározott fedésterületen belül bármely ponton, a válaszadó antennától 13 km-nél (7 tengeri mérföld) nagyobb távolságokban;

b) mínusz 75 dBW/m^2, a fenti 3.5.3.1.2 pontban meghatározott fedésterületen belül bármely ponton, a válaszadó antennától 13 km-nél (7 tengeri mérföld) kisebb távolságokban;

c) mínusz 70 dBW/m^2 az MLS megközelítési vonatkozási alappontjánál;

d) mínusz 79 dBW/m^2, 2,5 méter (8 láb) magasságban a futópálya felülete felett, az MLS vonatkozási alappontjánál, vagy a futópálya középvonalának azon legtávolabbi pontjánál, amely a DME válaszadó antennától rálátási vonalban van.

Megjegyzés. - Az ERP-re vonatkozó útmutató segédanyagot a "C"- Melléklet 7.2.1 és 7.3.8 pontja alatt lehet megtalálni.

3.5.4.1.5.4 Bármely impulzus-pár alkotó impulzusainak csúcs-teljesítménye nem különbözhet egymástól 1 dB-nél nagyobb mértékben.

3.5.4.1.5.5 **Ajánlás**. - Az adóberendezés válaszadó képessége olyan kell, hogy legyen, ami biztosítja a válaszadó berendezés - 2 700 plusz, vagy mínusz 90 impulzus-pár átviteli sebesség melletti - folyamatos működését (ha 100 légijárművet kell kiszolgálnia).

Megjegyzés. - A légijárművek száma és az átviteli sebesség közötti összefüggésről a "C"- Melléklet 7.1.5 pontja ad segédanyagot.

3.5.4.1.5.6 Az azonosítás időtartama kivételével az adónak másodpercenként nem kevesebb, mint 700 impulzus-pár átviteli sebességgel kell dolgoznia, beleértve a véletlenszerűen eloszló impulzus-párokat és a távolság válasz impulzus-párokat is. A minimális átviteli sebességnek olyan közel kell lenni a másodpercenként 700 impulzus-párhoz, amennyire az csak gyakorlatilag lehetséges. A DME/P berendezésnél egyetlen esetben sem haladhatja meg az 1 200 impulzus-párt másodpercenként.

3.5.4.1.6 *Hamis sugárzás*. Az egyedi impulzusok sugárzása közötti szünetek alatt a válaszadó berendezés vevőkészülékével azonos jellemzőkkel rendelkező, azonban bármilyen más DME kérdező, vagy válaszoló frekvenciájára hangolt azonos vevőkészülékkel vett és mért hamis energiának több, mint 50 dB-el kell a használatos válaszadó frekvenciájára hangolt ugyanolyan vevőkészülékkel vett és mért impulzus csúcs-teljesítmény alatt lennie a szükséges impulzusok kisugárzása alatt. Ez az előírás valamennyi hamis sugárzásra vonatkozik, beleértve a modulátor és az elektromos interferenciát is.

‡3.5.4.1.6.1 *DME/N*. A fenti 3.5.4.1.6 pontban meghatározott hamis teljesítmény szintnek több, mint 80 dB-el alatta kell lenni az impulzus csúcsteljesítmény szintnek.

3.5.4.1.6.2 *DME/P*. A fenti 3.5.4.1.6 pontban meghatározott hamis teljesítmény szintnek több, mint 80 dB-el alatta kell lenni az impulzus csúcsteljesítmény szintnek.

3.5.4.1.6.3 *A frekvenciasávon kívüli hamis sugárzás*. A 10-től az 1 800 MHz-ig terjedő összes frekvencián, - de a 960 MHz-estől az 1 215 MHz-esig terjedő frekvenciasáv kivételével - a DME válaszadó adójánál a hamis kimeneti sugárzás nem haladhatja meg a mínusz 40 dBm-t a vevő sávszélességének bármelyik kHz-én.

3.5.4.1.6.4 A vevő frekvencia bármelyik CW (folyamatos hullámú) harmonikusának az izotrópikus egyenértékű kisugárzott teljesítménye bármelyik DME üzemi csatornán nem haladhatja meg a mínusz 10 dBm-t.

3.5.4.2 *Vevő berendezés*

3.5.4.2.1 *Üzemi frekvencia*. A vevő közepes frekvenciájának a kijelölt DME üzemeltetési csatornának megfelelő lekérdező frekvenciának kell lenni (lásd a fenti 3.5.3.3.3 pontot).

3.5.4.2.2 *Frekvencia stabilitás*. A vevő közepes frekvenciája a kijelölt frekvenciától nem térhet el plusz, vagy mínusz 0,002 százaléknál többel.

3.5.4.2.3 *A válaszadó érzékenysége*

3.5.4.2.3.1 Kérdező impulzus-párok nélkül - azok kivételével, amelyek az érzékenység mérésének elvégzéséhez szükségesek - a pontos jelszünetű és névleges frekvenciájú kérdező impulzus-pároknak akkor kell indítani a válaszadót, ha a válaszadó antennáján a csúcs teljesítmény-sűrűség legalább:

a) mínusz 103 dBW/m^2 a DME/N berendezésre;

b) mínusz 86 dBW/m^2 a DME/P berendezés IA (kezdeti megközelítési) módjára;

c) mínusz 75 dBW/m^2 a DME/P berendezés FA (végső megközelítési) módjára.

3.5.4.2.3.2 A fenti 3.5.4.2.3.1 pontban meghatározott minimális teljesítmény-sűrűségeknek létre kell hozni azt, hogy a válaszadó legalább:

a) 70 százalékos teljesítménnyel válaszoljon a DME/N berendezésnél;

b) 70 százalékos teljesítménnyel válaszoljon a DME/P berendezésnél az IA (kezdeti megközelítési) módban;

c) 80 százalékos teljesítménnyel válaszoljon a DME/P berendezésnél az FA (végső megközelítési) módban.

‡3.5.4.2.3.3 *A DME/N dinamika tartománya*. A válaszadónak fenn kell tartani a teljesítményét akkor, amikor a kérdező jel teljesítmény-sűrűsége a válaszadó antennáján a fenti 3.5.4.2.3.1 pontban meghatározott minimális érték és a maximum mínusz 22 dBW/m^2 között bármilyen értékű az egy ILS-el, vagy MLS-el együtt telepített berendezésnél és mínusz 35 dBW/m^2 közötti akkor, amikor más alkalmazáshoz telepítették.

3.5.4.2.3.4 *A DME/P dinamika tartománya*. A válaszadónak fenn kell tartani a teljesítményét akkor, amikor a kérdező jel teljesítmény-sűrűsége a válaszadó antennáján a fenti 3.5.4.2.3.1 pontban meghatározott minimális érték és a maximum mínusz 22 dBW/m^2 között bármilyen értékű.

3.5.4.2.3.5 A válaszadó érzékenységi szintjei a 0 és 90 százalék közötti válaszadó terhelés és a maximális átviteli sebesség mellett nem változhat 1 dB-nél többel.

‡3.5.4.2.3.6 *DME/N*. Amikor a kérdező impulzus-párok közötti jelszünet a névleges értéktől plusz, vagy mínusz 1 mikro-szekundum nagyságrendig eltér, a vevő érzékenysége nem csökkenhet többel, mint 1 dB-el.

3.5.4.2.3.7 *DME/P*. Amikor a kérdező impulzus-párok közötti jelszünet a névleges értéktől plusz, vagy mínusz 1 mikro-szekundum nagyságrendig eltér, a vevő érzékenysége nem csökkenhet többel, mint 1 dB-el.

3.5.4.2.4 Terhelés korlátozás

3.5.4.2.4.1 *DME/N*. **Ajánlás**. - Amikor a válaszadó berendezés terhelése túllépi a maximális átviteli sebesség 90 százalékát, akkor a vevőkészülék erősítését automatikusan csökkenteni kell abból a célból, hogy korlátozza a válaszadó készülék válaszait annak biztosítására, hogy a megengedhető maximális átviteli sebesség ne kerüljön túllépésre. (Az erősítés csökkentés igénybe vehető tartománya legalább 50 dB kell, hogy legyen).

3.5.4.2.4.2 *DME/P*. A válaszadó túlterhelésének megelőzése érdekében a válaszadónak automatikusan csökkentenie kell a válaszai számát úgy, hogy biztosítsa azt, hogy a maximális átviteli sebesség ne kerüljön túllépésre. Ha a vevő érzékenység csökkentés is úgy van megvalósítva, hogy teljesítse ezt a követelményt, akkor azt csak az IA (kezdeti megközelítési) módban lehet alkalmazni, és nem érintheti az FA (végső megközelítési) módot.

3.5.4.2.5 *Zaj*. Amikor a vevő a fenti 3.5.4.2.3.1 pontban meghatározott teljesítmény-sűrűséggel kerül lekérdezésre ahhoz, hogy az a maximális érték 90 százalékával egyenlő átviteli sebességet hozzon létre, akkor a zaj által létrehozott impulzus-párok nem haladhatják meg a maximális átviteli sebesség 5 százalékát.

3.5.4.2.6 *Sávszélesség*

3.5.4.2.6.1 A vevő megengedhető minimális sávszélességének olyannak kell lennie, hogy a válaszadó érzékenységi szintje ne romoljon le 3 dB-nél többel akkor, amikor a vevő teljes frekvencia-ingadozása hozzáadódik a bemenő lekérdező frekvencia plusz, vagy mínusz 100 Hz-es frekvencia-ingadozásához.

3.5.4.2.6.2 *DME/N*. A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa az előzőekben a 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek az alábbi 3.5.5.1.3 pontban meghatározottaknak.

3.5.4.2.6.3 *DME/P - IA (kezdeti megközelítési) mód*. A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa a fenti 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek az alábbi 3.5.5.1.3 pontban meghatározottaknak. A 12 dB-es sávszélesség nem haladhatja meg a 2 MHz-et és a 60 dB-es sávszélesség nem lehet nagyobb 10 MHz-nél.

3.5.4.2.6.4 *DME/P - FA (végső megközelítési) mód*. A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa a fenti 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek az alábbi 3.5.5.1.3 pontban meghatározottaknak. A 12 dB-es sávszélesség nem haladhatja meg a 6 MHz-et és a 60 dB-es sávszélesség nem lehet nagyobb 20 MHz-nél.

3.5.4.2.6.5 A megkívánt csatorna névleges frekvenciától 900 kHz-el távolabbi és a 3.5.4.2.3.3 pontban a DME/N-re, valamint a 3.5.4.2.3.4 pontban a DME/P-re meghatározott értékkel rendelkező teljesítmény-sűrűségű jelek nem indíthatják a válaszadót. A középfrekvencián beérkező jeleket legalább 80 dB-el kell elnyomni. Minden egyéb hamis választ, vagy jelet a 960 MHz-től az 1 215 MHz-ig terjedő sávban és a tükörfrekvenciákat legalább 75 dB-el kell elnyomni.

3.5.4.2.7 *Feléledési idő*. A minimális érzékenységi szint felett 0 dB és 60 dB között egy jel vétele után 8 mikro-szekundumon belül a válaszadó berendezésnek egy megkívánt jelre vonatkozó minimális érzékenységi szintje 3 dB-en belül kell, hogy legyen a vett jel nélküli helyzetben kapott értékhez képest. Ennek a követelménynek visszaverődést elnyomó áramkörökkel kell eleget tenni, ha ilyenek nem üzemelően biztosítva vannak. A 8 mikro-szekundumot a két jel felfutó élén a fél-feszültségi pontok között kell mérni, és mindkét jelnek az impulzus alakja meg kell, hogy egyezzen az alábbi 3.5.5.1.3 pontban lévő előírásokkal.

3.5.4.2.8 *Parazita sugárzások*. A vevő bármely részének, vagy kapcsolódó áramkörének sugárzása meg kell, hogy feleljen a fenti 3.5.4.1.6 pontban meghatározott követelményeknek.

3.5.4.2.9 A csillapítatlan hullám kiszűrés és a visszaverődés elnyomás

Ajánlás. - *A csillapítatlan hullám kiszűrésnek és a visszaverődés elnyomásnak kielégítőnek kell lennie arra a telepítési helyre, ahol a válaszadó berendezést használni fogják.*

Megjegyzés. - Ebben a vonatkozásban a visszaverődések azokat a nem-kívánt jeleket jelentik, amiket a több-utas átvitel (reflexiók stb.) okoz.

3.5.4.2.10 Interferencia elleni védelem

Ajánlás. - *A DME frekvenciasávon kívül eső interferencia elleni védelem kielégítő kell, hogy legyen azoknál a telepítési helyeknél, amelyeken a válaszadó berendezéseket használni fogják.*

3.5.4.3 Dekódolás

3.5.4.3.1 A válaszadó berendezésnek tartalmaznia kell egy olyan dekódoló áramkört, amely biztosítja azt, hogy a válaszadót csak az alábbi 3.5.5.1.3 és a 3.5.5.1.4 pontokban leírt lekérdező jeleknek megfelelő impulzus időtartammal és impulzus jelszünettel rendelkező vett impulzus-párok tudják indítani.

3.5.4.3.2 A dekódoló áramkör működését nem befolyásolhatják a helyes impulzus jelszünetű valódi impulzus-párok előtt, között, vagy után beérkező jelek.

‡3.5.4.3.3 *DME/N - A dekóderek kiszűrő tevékenysége*. Egy olyan kérdező impulzus-párt, amelynek a névleges értéktől plusz, vagy mínusz 2 mikro-szekundummal, vagy többel eltérő az impulzus jelszünete és bármilyen olyan jelszinttel, amely a 3.5.4.2.3.3 pontban meghatározott érték felett van, ki kell szűrni úgy, hogy az átviteli sebesség ne haladja meg a kérdések nélküli helyzetnek megfelelő értéket.

3.5.4.3.4 *DME/P - A dekóderek kiszűrő tevékenysége*. Egy olyan kérdező impulzus-párt, amelynek a névleges értéktől plusz, vagy mínusz 2 mikro-szekundummal, vagy többel eltérő az impulzus jelszünete és bármilyen olyan jelszinttel, amely a 3.5.4.2.3.4 pontban meghatározott érték felett van, ki kell szűrni úgy, hogy az átviteli sebesség ne haladja meg a kérdések nélküli helyzetnek megfelelő értéket.

3.5.4.4 *Késleltetési idő*

3.5.4.4.1 Amikor egy DME-t csak egy VHF berendezéssel társítottan telepítenek, akkor a késleltetési időnek a kérdező párt alkotó impulzus-pár második impulzusa felfutó élének fél-feszültség pontjától a válaszadásban lévő impulzus-pár második impulzusa felfutó élének fél-feszültség pontjáig tartó időnek kell lenni. Ennek a késleltetésnek meg kell egyeznie a következő táblázatban lévő értékekkel akkor, amikor az a cél, hogy a légijármű lekérdező adó-vevő berendezése jelezze a válaszadó helytől a távolságot.

Csatorna jel	*Üzemi mód*	*Az impulzus-párok közötti jelszünet (μs)*		*Késleltetési idő (μs)*	
		Lekérdezés	*Válasz*	*Első impulzus időzítés*	*Második impulzus időzítés*
X	DME/N	12	12	50	50
	DME/P IA M	12	12	50	-
	DME/P FA M	18	12	56	-
Y	DME/N	36	30	56	50
	DME/P IA M	36	30	56	-
	DME/P FA M	42	30	62	-
W	DME/N	-	-	-	-
	DME/P IA M	24	24	50	-
	DME/P FA M	30	24	56	-
Z	DME/N	-	-	-	-
	DME/P IA M	21	15	56	-
	DME/P FA M	27	15	62	-

1. Megjegyzés. - A W és az X ugyanazon a frekvencián multiplikált.

2. Megjegyzés. - A Z és az Y ugyanazon a frekvencián multiplikált.

3.5.4.4.2 Amikor egy DME-t egy MLS útirányszög adó berendezéssel társítottan telepítenek, akkor a késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó élének a fél-feszültség pontjától a válaszadásban lévő impulzus-pár első impulzus felfutó élének a fél-feszültség pontjáig tartó időnek kell lenni. Ennek a késleltetési időnek 50 mikro-szekundumosnak kell lenni az X módú csatornákra és 56 mikro-szekundumosnak az Y módú csatornáknál akkor, amikor az a cél, hogy a légijármű lekérdező adó-vevő berendezés jelezze a válaszadó helyétől a távolságot.

3.5.4.4.2.1 A DME/P válaszadóknál a késleltetési idő szabályozása nem megengedhető.

3.5.4.4.3 **Ajánlás**. - *A DME/N berendezéseknél a válaszadó berendezés késleltetési ideje beállítható kell, hogy legyen egy megfelelő értékre - a késleltetési idő névleges értékénél 15 mikroszekundummal kisebb érték, valamint a késleltetési idő névleges értéke között - azért, hogy lehetséges legyen az, hogy egy légijármű fedélzeti lekérdező adó-vevő berendezése egy, a válaszadó berendezés telepítési helyétől távolabbi valamely meghatározott pontban lévő nulla távolságot jelezzen ki.*

Megjegyzés. - Azoknál az üzemmódoknál, amelyek nem teszik lehetővé a teljes 15 mikroszekundumos szabályzási tartományt, a válaszadó időkésleltetését csak azon határok között lehet szabályozni, amit a válaszadó áramköri késleltetése és feléledési ideje ad.

‡3.5.4.4.3.1 *DME/N.* A késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó élének a fél-feszültség pontjától a válaszadásban lévő impulzus-pár első impulzusa felfutó élének a fél-feszültség pontjáig tartó időtartam kell, hogy legyen.

3.5.4.4.3.2 *DME/P - IA (kezdeti megközelítési) mód*. A késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó élének a fél-feszültség pontjától a válaszadásban lévő impulzus-pár első impulzusa felfutó élének a fél-feszültség pontjáig tartó időtartam kell, hogy legyen.

3.5.4.4.3.3 *DME/P - FA (végső megközelítési) mód*. A késleltetési időnek a kérdező impulzus-pár első impulzusát alkotó impulzus látszólagos kiindulási pontja és a válasz impulzus-pár első impulzusát alkotó impulzus látszólagos kiindulási pontja közötti időtartam kell, hogy legyen. Az érkezési idő mérésének pontja az impulzus-pár első impulzusát alkotó impulzus részleges felfutási idején belül kell, hogy legyen minden esetben.

3.5.4.4.4 *DME/N*. **Ajánlás**. - *A válaszadó berendezéseket olyan közel kell telepíteni ahhoz a ponthoz, ahova a nulla jelzést kell mutatniuk, amennyire az gyakorlatilag csak lehetséges*.

1. Megjegyzés. - Kívánatos az, hogy azon terület sugara, amelynek a felületén a kijelzés nulla, olyan kicsi legyen, amennyire az csak gyakorlatilag lehetséges, a bizonytalansági zóna minimumon tartása érdekében.

2. Megjegyzés. - A DME-nek az MLS-el való együttes telepítéséről a "C"- Melléklet 7.16 pontjában, valamint a "G"- Melléklet 5. pontjában van útmutató segédanyag megadva. Ez az útmutató anyag magyarázza meg részletekre kiterjedően azokat a végrehajtandó megfelelő lépéseket, amelyekkel megelőzhető a különböző nulla távolság kijelzése akkor, amikor egy MLS-el társítottan telepített DME/P és ILS-el társítottan telepített DME/N szolgálja ki ugyanazt a futópályát.

3.5.4.5 *Pontosság*

3.5.4.5.1 *DME/N*. A válaszadó nem járulhat hozzá plusz, vagy mínusz 1 mikro-szekundumnál (150 m (500 láb)) többel az általános rendszer-hibához.

‡3.5.4.5.2 *DME/N*. Egy valamilyen leszállási berendezéshez kapcsolt válaszadó nem járulhat hozzá plusz, vagy mínusz 0,5 mikro-szekundumnál (75 m (250 láb)) többel az általános rendszer-hibához.

3.5.4.5.3 *DME/P - FA (végső megközelítési) mód*

3.5.4.5.3.1 *1. Pontossági szabvány*. A válaszadó nem járulhat hozzá plusz, vagy mínusz 10 méternél (plusz, vagy mínusz 33 lábnál) nagyobb értékű útvonal-követési hibával (PFE) és plusz, vagy mínusz 8 méternél (plusz, vagy mínusz 26 lábnál) nagyobb értékű kormányzási elmozdulási zaj hibával (CMN) az általános rendszer-hibához.

3.5.4.5.3.2 *2. Pontossági szabvány*. A válaszadó nem járulhat hozzá plusz vagy mínusz 5 méternél (plusz, vagy mínusz 16 lábnál) nagyobb értékű útvonal-követési hibával (PFE) és plusz, vagy mínusz 5 méternél (plusz, vagy mínusz 16 lábnál) nagyobb értékű kormányzási elmozdulási zaj hibával (CMN) az általános rendszer-hibához.
3.5.4.5.4 *DME/P - IA (kezdeti megközelítési) mód*. A válaszadó nem járulhat hozzá plusz, vagy mínusz 15 méternél (plusz, vagy mínusz 50 lábnál) nagyobb értékű útvonal-követési hibával (PFE) és plusz, vagy mínusz 10 méternél (plusz, vagy mínusz 33 lábnál) nagyobb értékű kormányzási elmozdulási zaj hibával (CMN) az általános rendszer-hibához.

3.5.4.5.5 **Ajánlás**. - *Amikor a DME egy MLS irányszög-adó berendezéssel együtt van telepítve, akkor a fenti pontosságnak magába kell foglalni az impulzus távolsági tűréshatárok miatti első impulzus detektálási hibát is*.

3.5.4.6 *Hatékonyság*

3.5.4.6.1 A válaszadó válaszadási hatékonyságának legalább 70 százalékosnak kell lenni a DME/N, valamint a DME/P (a kezdeti megközelítési [IA] módban) berendezéseknél és 80 százalékosnak a

DME/P (végső megközelítési [FA] módban) berendezésnél az összes olyan válaszadó értéknél, amikor a válaszadó terhelése megfelel a korábbi 3.5.3.5 pontban megadott terhelésnek, és a minimális érzékenységi szintje megfelel a fenti 3.5.4.2.3.1, valamint a 3.5.4.2.3.5 pontban meghatározottaknak.

Megjegyzés. - A válaszadó válaszadási hatékonyságának értékelésénél számításba kell venni a DME holtidejét és a felügyelő rendszer funkció által létrejövő terhelést.

3.5.4.6.2 *A válaszadó holtideje*. A válaszadót üzemen kívüli állapotba kell állítani egy érvényes kérdező dekódolás bekövetkezése után általában egy 60 mikro-szekundumot nem meghaladó időtartamra. Az olyan különleges esetekben, amikor a válaszadó telepítésének földrajzi helye olyan, hogy az nem-kívánt reflexiós problémákat hoz létre, akkor a holtidőt meg lehet növelni, de csak avval a minimális mértékkel, ami ahhoz szükséges, hogy lehetővé váljon a visszaverődések elnyomása a DME/N berendezéseknél és a DME/P berendezések IA (kezdeti megközelítési) módjában.

3.5.4.6.2.1 A DME/P berendezés kezdeti megközelítési (IA) módjának holtideje nem zavarhatja a végső megközelítési (FA) módú csatornát és viszont.

3.5.4.7 *A felügyelő és vezérlő rendszer*

3.5.4.7.1 Minden egyes válaszadó berendezés telepítési helyén megfelelő eszközöket kell biztosítani az üzemelő válaszadó berendezés automatikus felügyeletére és vezérlésére.

3.5.4.7.2 *A DME/N felügyelő rendszerének működése*

3.5.4.7.2.1 Abban az esetben, ha az alábbi, a 3.5.4.7.2.2 pontban leírt körülmények bármelyike előfordul, a felügyelő rendszernek a következőket kell végrehajtania:

a) egy megfelelő jelzést kell adnia egy ellenőrző pontra;

b) automatikusan ki kell kapcsolnia az üzemelő válaszadót; és

c) automatikusan be kell kapcsolnia, üzembe helyezni a tartalék válaszadót, ha ilyen van.

3.5.4.7.2.2 A felügyelő rendszernek a fenti 3.5.4.7.2.1 pontban meghatározott tevékenységet akkor kell végrehajtania, ha:

a) a válaszadó késleltetése a kijelölt értéktől 1 mikro-szekundummal (150 m (500 láb)), vagy többel eltér;

b) egy valamilyen leszállási berendezéssel kapcsoltan telepített DME/N esetében akkor, ha a válaszadó késleltetése a kijelölt értéktől 0,5 mikro-szekundummal (75 m (250 láb)), vagy többel eltér.

3.5.4.7.2.3 **Ajánlás**. - *A felügyelő rendszernek a fenti 3.5.4.7.2.1 pontban meghatározott tevékenységet akkor kell végrehajtania, amikor a válaszadó impulzus-párjának első és második impulzusa közötti impulzus távolság 1 mikro-szekundummal, vagy többel eltér a korábbi 3.5.4.4.1 pont után lévő táblázatban meghatározott névleges értékektől.*

3.5.4.7.2.4 **Ajánlás**. - *A felügyelő rendszernek egy megfelelő jelzést kell létrehozni és egy ellenőrző pontra továbbítani akkor, ha a következő feltételek valamelyike előfordul:*

a) a válaszadó kimeneti leadott teljesítménye 3 dB-el, vagy többel lecsökken;

b) a válaszadó berendezés vevő érzékenységének 6 dB-es, vagy nagyobb mértékű csökkenése (feltéve, hogy ez nem a vevő automatikus erősítés-csökkentő áramköreinek működése miatt van);

c) a válaszadó berendezés válasz impulzus-párjának első és második impulzusa közötti impulzus távolság 1 mikro-szekundummal, vagy nagyobb mértékben eltér az előzőekben a 3.5.4.1.4 pontban meghatározott rendes értéktől;

d) a válaszadó berendezés vevő és adó frekvenciájának a referencia áramkörök ellenőrzési tartományán túlra történő megváltozása (amennyiben az üzemi frekvenciák nem közvetlenül kristály-vezérlésűek).

3.5.4.7.2.5 Az eszközöket úgy kell biztosítani, hogy az előzőekben a 3.5.4.7.2.2, a 3.5.4.7.2.3 és a 3.5.4.7.2.4 pontban felsorolt bármely ellenőrzés alatt álló feltétel, vagy hibás működés bizonyos időn át fennmaradhasson, mielőtt a felügyelő rendszer működésbe lépne. Ez a periódus olyan rövid kell, hogy legyen, amennyire az csak gyakorlatilag lehetséges, de nem haladhatja meg a 10 másodpercet a válaszadó berendezés által biztosított szolgáltatásnak az átmeneti hatások miatt történő megszakításainak elkerülése érdekében.

3.5.4.7.2.6 A válaszadó berendezés másodpercenkénti 120-nál többször nem indítható sem a felügyelő rendszer, sem az automatikus frekvencia szabályozás, sem mindkettő céljából.

3.5.4.7.3 *A DME/P felügyelő rendszer működése*

3.5.4.7.3.1 A felügyelő rendszernek le kell állítani a válaszadó sugárzását, és egy figyelmeztető jelzést kell adnia az ellenőrző pontra, ha a következő körülmények valamelyike a meghatározott időtartamnál hosszabb ideig fennáll:

a) egy olyan változás következik be a válaszadó útvonal-követési hiba (PFE) értékében, ami több, mint egy másodperccel meghaladja a korábbiakban a 3.5.4.5.3, vagy a 3.5.4.5.4 pontok bármelyikében meghatározott határértékeket. Ha az FA (végső megközelítési) mód határértékeit a berendezés túllépi, de az IA (kezdeti megközelítési) mód határértékein belül marad, akkor az IA (kezdeti megközelítési) mód működésben maradhat;

b) egy olyan csökkenés következik be - több, mint 1 másodperc időtartamon keresztül - a ténylegesen kisugárzott teljesítményben, ami miatt az kevesebb lesz, mint ami a korábbiakban a 3.5.4.1.5.3 pontban meghatározott követelmények kielégítéséhez szükséges;

c) 3 dB-es, vagy nagyobb értékű csökkenés következik be a válaszadó érzékenységének a korábbiakban a 3.5.4.2.3 pontban meghatározott követelményeinek kielégítéséhez szükséges értékében több, mint 5 másodperc időtartamon keresztül az FA (végső megközelítési) módban, illetve 10 másodperc időtartamon keresztül az IA (kezdeti megközelítési) módban (feltéve, hogy az nem a vevő automatikus erősítés-csökkentő áramköreinek működése miatt van);

d) a válaszadó berendezés válasz impulzus-párjának első és második impulzusa közötti impulzus távolság a korábbiakban a 3.5.4.4.1 pontban megadott táblázatban meghatározott értékektől 0,25 mikro-szekundummal, vagy annál többel eltér, több, mint 1 másodperc időtartamon keresztül.

3.5.4.7.3.2 **Ajánlás**. - *A felügyelő rendszernek létre kell hozni egy megfelelő jelzésnek egy ellenőrző pontra való továbbítását akkor, ha a válasz impulzus részleges felfutási ideje 0,3 mikro-szekundum fölé növekszik, vagy 0,2 mikro-szekundum alá csökken, és ez egy másodpercnél hosszabb időn keresztül fennáll.*

3.5.4.7.3.3 Az az időtartam, amíg a hibás útmutatást adó tájékoztatás sugárzásra kerül, nem haladhatja meg az előző 3.5.4.7.3.1 pontban meghatározott időtartamokat. A hibaelhárítási kísérleteket az elsődleges földi berendezés működésének visszaállításával, vagy egy tartalék földi berendezésre - ha ilyen van - való átállással ezen időtartam alatt kell végrehajtani. Ha a hiba a megengedett idő alatt nem kerül elhárításra, akkor a sugárzást be kell szűntetni. A lekapcsolás után a szolgáltatás "helyreállítását" nem szabad megkísérelni addig, amíg egy 20 másodperces időtartam el nem telt.

3.5.4.7.3.4 A válaszadó berendezést ellenőrzési célból nem szabad másodpercenként 120-nál többször az IA (kezdeti megközelítési) módban és másodpercenként 150-nél többször az FA (végső megközelítési) módban indítani.

3.5.4.7.3.5 *A DME/N és a DME/P berendezések felügyelő rendszereinek hibája*. Magának a felügyelő rendszernek bármelyik részében bekövetkezett hiba esetén a rendszernek automatikusan ugyanazt az eredményt kell létrehoznia, mint amit az általa ellenőrzött alkotóelem hibája esetén létrehoz.

3.5.5 A kérdező-válaszoló adó-vevő műszaki jellemzői

Megjegyzés. - A következő alpontok csak azokat a lekérdező adó-vevő jellemzőket írják elő, amelyeket meg kell határozni annak biztosítása érdekében, hogy a lekérdező adó-vevő berendezés:

a) ne veszélyeztesse a DME rendszer eredményes működését, például a válaszadó berendezés terhelésének a rendestől eltérő megnövelésével; és
b) képes legyen a pontos távolság kijelzésének megadására.

3.5.5.1 *Adó*

3.5.5.1.1 *Üzemi frekvencia*. A kérdező adónak a kijelölt DME csatornának megfelelő lekérdező frekvencián kell adni (lásd a fenti 3.5.3.3.3 pontot).

Megjegyzés. - Ez az előírás nem akadályozza meg az olyan fedélzeti lekérdező adó-vevő berendezések használatát, amelyeknek nincs meg a teljes számú üzemi csatornája.

3.5.5.1.2 *Frekvencia tartás*. Az üzemi rádiófrekvencia nem térhet el plusz, vagy mínusz 100 kHz-nél nagyobb mértékben a kijelölt értéktől.

3.5.5.1.3 *Impulzus alak és spektrum*. Az alábbiakat kell alkalmazni minden kisugárzott impulzusra:

a) *Impulzus felfutási idő*

1) *DME/N*. Az impulzus felfutási ideje nem haladhatja meg a 3 mikro-szekundumot.

2) *DME/P*. Az impulzus felfutási ideje nem haladhatja meg az 1,6 mikro-szekundumot. Az FA (végső megközelítési) módra az impulzus részleges felfutási ideje 0,25 mikro-szekundum kell, hogy legyen plusz, vagy mínusz 0,05 mikro-szekundum eltéréssel. Az FA (végső megközelítési) módra és az 1. pontossági szabványra vonatkozóan az impulzus görbe meredeksége a részleges felfutási idő alatt nem változhat többel, mint plusz, vagy mínusz 20 százalékkal. A 2. pontossági szabványnál a meredekség nem változhat többel, mint plusz, vagy mínusz 10 százalékkal.

3) *DME/P*. **Ajánlás**. - *A DME/P impulzus felfutási idő nem haladhatja meg az 1,2 mikro-szekundumot.*

b) Az impulzus szélesség 3,5 mikro-szekundum plusz, vagy mínusz 0,5 mikro-szekundum kell, hogy legyen.

c) Az impulzus lefutási ideje névlegesen 2,5 mikro-szekundum kell, hogy legyen, de nem lépheti túl a 3,5 mikro-szekundumot.

d) Az impulzus pillanatnyi amplitúdója - a felfutó él azon pontja, amely a maximális amplitúdó 95 százalékának felel meg és a lefutó él azon pontja között, amely a maximális amplitúdó 95 százalékának felel meg - egyetlen pillanatra sem csökkenhet azon érték alá, amely az impulzus maximális feszültség amplitúdójának 95 százaléka.

e) Az impulzus modulált jel spektrumának olyannak kell lennie, hogy az egyes impulzusokban lévő energiának legalább 90 százaléka legyen a névleges csatorna frekvencia középfrekvenciájához viszonyított 0,5 MHz-es sávon belül.

f) A küszöb technika megfelelő működésének biztosítása érdekében bármely impulzus indító tranziens pillanatnyi amplitúdója, amely időben a látszólagos kiindulási pont előtt jelentkezik, az impulzus csúcs amplitúdója 1 százalékánál kevesebb kell, hogy legyen.
Az indítási folyamat megkezdése nem történhet meg a látszólagos kiindulási pont előtt 1 mikro-szekundumnál korábban.

1. Megjegyzés. - Az impulzus felfutási idő (lásd a fenti 3.5.5.1.3 a) pontot) és az impulzus lefutási idő (lásd a fenti 3.5.5.1.3 c) pontot) alsó határát a fenti 3.5.5.1.3 e) pontban foglalt spektrum követelmények szabják meg.

2. Megjegyzés. - Miközben a fenti 3.5.5.1.3 e) pont egy gyakorlatilag elérhető spektrumot ír elő, kívánatos a következő spektrum szabályozási jellemzőkre törekedni: az impulzus modulált jel spektrumának olyannak kell lennie, hogy a névleges csatorna frekvencia feletti 0,8 MHz-es és alatti 0,8 MHz-es frekvenciák körüli 0,5 MHz-es sávba eső energia minden esetben legalább 23 dB-el legyen a névleges csatorna frekvencia körüli 0,5 MHz-es sávba eső energia szintje alatt. A névleges csatorna frekvencia feletti 2 MHz és alatti 2 MHz frekvencia körüli 0,5 MHz-es sávba eső energia szintje minden esetben legalább 38 dB-el legyen a névleges csatorna frekvenciák körüli 0,5 MHz-es sávba eső energia szintje alatt. A spektrum bármely további szirma kisebb amplitúdójú kell, hogy legyen, mint a névleges csatorna frekvenciához közelebb eső szomszédos szirom.

3.5.5.1.4 *Impulzus távolság*

3.5.5.1.4.1 A kisugárzott impulzusok közötti távolságnak a korábbi 3.5.4.4.1 táblázatban megadottaknak kell lenni.

3.5.5.1.4.2 *DME/N.* Az impulzus távolság tűréshatára plusz, vagy mínusz 0,5 mikro-szekundum kell, hogy legyen.

3.5.5.1.4.3 *DME/N.* **Ajánlás**. - Az impulzus távolság tűréshatára plusz, vagy mínusz 0,25 mikro-szekundum kell, hogy legyen.

3.5.5.1.4.4 *DME/P.* Az impulzus távolság tűréshatára plusz, vagy mínusz 0,25 mikro-szekundum kell, hogy legyen.

3.5.5.1.4.5 Az impulzus távolságot az impulzusok felfutó élén lévő fél-feszültség pontok között kell mérni.

3.5.5.1.5 *Impulzus ismétlődési frekvencia*

3.5.5.1.5.1 Az impulzus ismétlődési frekvenciának az előzőekben a 3.5.3.4 pontban meghatározottnak kell lennie.

3.5.5.1.5.2 A kérdező impulzusok egymást követő párjai közötti időbeni váltakozás kielégítő kell, hogy legyen ahhoz, hogy megelőzze a hamis befogást.

3.5.5.1.5.3 *DME/P.* Abból a célból, hogy az előzőekben a 3.5.3.1.3.4 pontban meghatározott rendszer-pontosság elérésre kerüljön, az egymást követő kérdező impulzus-párok közötti idő változása kielégítő mértékben ritka kell, hogy legyen ahhoz, hogy a nagyfrekvenciás több-utas terjedési hibákat lecsökkentse.

Megjegyzés. - A DME/P berendezésnél jelentkező több-utas terjedési hatásról a "C"- Melléklet 7.3.7 pontja ad útmutató anyagot.

3.5.5.1.6 *Parazita sugárzás*. Az egyes impulzusok sugárzása közötti szünetek alatt egy, a DME válaszadó berendezés vevőkészülékének azonos jellemzőivel rendelkező, azonban bármely más DME kérdező, vagy válaszoló frekvenciára hangolt vevőkészülékkel vett és mért zavaró- impulzus energiájának több, mint 50 dB-el kell a használatos kérdező frekvenciára hangolt azonos vevőkészülékkel a szükséges impulzusok kisugárzása alatt vett és mért impulzus csúcsteljesítmény alatt lennie. Ezt az előírást valamennyi zavaró-impulzus adásra alkalmazni kell. A lekérdező adó-vevő berendezés által valamely DME kérdező, vagy válaszoló frekvencián kisugárzott parazita csillapítatlan hullám nem lépheti túl a 20 mikrowattot (mínusz 47 dBW).

Megjegyzés. - Jóllehet, az impulzusok közötti parazita csillapítatlan hullám kisugárzása a mínusz 47 dBW-ot meg nem haladó szintekre van korlátozva, az Államok figyelmét nyomatékosan felhívjuk, hogy ahol DME lekérdező adó-vevő berendezéseket és másodlagos légtérellenőrző radar válaszadókat alkalmaznak ugyanazon a légijárművön, ott szükséges lehet az 1 015 MHz-től az 1 045 MHz-ig terjedő sávban a fedélzeti válaszadó védelmének biztosítása. Ez a védelem biztosítható az irányított és kisugárzott csillapítatlan hullámnak a mínusz 77 dBW nagyságrendű szintre történő korlátozásával. Ahol ez a szint nem érhető el, ott a védelem szükséges mértéke a másodlagos légtérellenőrző radar válaszadó és a DME fedélzeti antennák egymáshoz viszonyított elhelyezésének megtervezésével biztosítható. Meg kell jegyezni azt, hogy ezen frekvenciák közül csak néhány került felhasználásra a VHF/DME frekvencia-párosítási tervben.

3.5.5.1.7 **Ajánlás**. - *A fenti 3.5.5.1.6 pontban megállapított körülmények között vett és mért zavaró-impulzus energiájának 80 dB-el alatta kell lennie a szükséges vett csúcs-impulzus energiája alatt.*

Megjegyzés. - Hivatkozással a fenti 3.5.5.1.6 és a 3.5.5.1.7 pontokra, jóllehet, az ajánlott az impulzusok közötti parazita csillapítatlan hullám kisugárzásának a vett impulzus energiája alatt 80 dB-t meg nem haladó jelszintre történő korlátozása, mégis, az Államok figyelmét nyomatékosan felhívjuk arra, hogy ahol fedélzeti másodlagos légtérellenőrző radar válaszadót alkalmaznak egyazon légijárművön, szükséges lehet a közvetlen és a kisugárzott csillapítatlan hullám korlátozása az 1 015 MHz-től az 1 045 MHz-ig terjedő frekvenciasávban 0,02 mikrowattnál nem nagyobb értékre. Meg kell jegyezni azt, hogy ezen frekvenciák közül csak egynéhányat használnak fel a VHF/DME frekvencia-párosítási tervben.

3.5.5.1.8 *DME/P*. A kisugárzott csúcsteljesítmény (ERP) értéke nem lehet annál kevesebb, mint ami az előzőekben a 3.5.4.2.3.1 pontban a bármilyen időjárási körülmények közötti üzemeltetésekre szükséges energiasűrűség biztosításához szükséges.

3.5.5.2 *Késleltetési idő*

3.5.5.2.1 A késleltetési időnek meg kell egyeznie az előzőekben a 3.5.4.4.1 pont táblázatában megadott értékekkel.

3.5.5.2.2 *DME/N*. A késleltetési időnek a kérdező impulzus-párt alkotó második impulzus felfutó éle fél-feszültség pontjának 'időpontja' és az azon időpont közötti időtartamnak kell lenni, amelynél a távolság adó áramkörök elérik a nulla távolság jelzésnek megfelelő helyzetet.

3.5.5.2.3 *DME/N*. A késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó éle fél-feszültség pontjának 'időpontja' és az azon időpont közötti időtartamnak kell lenni, amelynél a távolság adó áramkörök elérik a nulla távolság jelzésnek megfelelő helyzetet.

3.5.5.2.4 *DME/P - IA (kezdeti megközelítési) mód*. A késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó éle fél-feszültség pontjának 'időpontja' és az azon időpont közötti időtartamnak kell lenni, amelynél a távolság adó áramkörök elérik a nulla távolság jelzésnek megfelelő helyzetet.

3.5.5.2.5 *DME/P - FA (végső megközelítési) mód.* A késleltetési időnek a kérdező impulzus-párt alkotó első impulzus felfutó éle látszólagos kiindulási pontjának 'időpontja' és az azon időpont közötti időtartamnak kell lenni, amelynél a távolság adó áramkörök elérik a nulla távolság jelzésnek megfelelő helyzetet. A pont fölé érkezés idejét az impulzus részleges felfutási idején belül kell mérni.

3.5.5.3 *Vevő*

3.5.5.3.1 *Üzemi frekvencia*. A vevő közepes frekvenciája a kijelölt DME üzemi csatornának megfelelő kérdező frekvencia kell, hogy legyen (lásd a fenti 3.5.3.3.3 pontot).

3.5.5.3.2 *A vevő érzékenysége*

‡3.5.5.3.2.1 *DME/N.* A fedélzeti berendezés érzékenységének elegendőnek kell lennie ahhoz, hogy megszerezze és biztosítsa a távolság tájékoztatásokat a későbbiekben a 3.5.5.4 pontban meghatározott pontossággal, a korábbiakban a 3.5.4.1.5.2 pontban meghatározott jel teljesítmény-sűrűség mellett.

Megjegyzés. - Jóllehet, a fenti 3.5.5.3.2.1 pontban lévő Szabványban a DME/N kérdező berendezésre a vevő érzékenysége jobb, mint az, ami abból a célból szükséges, hogy a mellett a teljesítmény-sűrűség mellett üzemeljen, ami a DME/N válaszadó berendezésekre a korábbiakban a 3.5.4.1.5.1 pontban megadásra került, de az a célja, hogy biztosítsa a DME/P válaszadó berendezés IA (kezdeti megközelítési) módjával való egyidejű működési lehetőséget is.

3.5.5.3.2.2 *DME/P.* A fedélzeti berendezés érzékenységének elegendőnek kell lennie ahhoz, hogy megszerezze és biztosítsa a távolság tájékoztatásokat a későbbiekben a 3.5.5.4.2 és 3.5.5.4.3 pontokban meghatározott pontossággal, a korábbi 3.5.4.1.5.3 pontban meghatározott jel teljesítmény-sűrűség mellett.

‡3.5.5.3.2.3 *DME/N.* A lekérdező berendezés teljesítménye meg kell, hogy maradjon akkor, amikor a válaszadó jeleinek teljesítmény-sűrűségi értéke az előzőekben a 3.5.4.1.5 pontban meghatározott minimum értékek és egy maximum mínusz 18 dBW/m^2 között van.

3.5.5.3.2.4 DME/P. A kérdező berendezés teljesítménye meg kell, hogy maradjon akkor, amikor a válaszadó jeleinek teljesítmény-sűrűségi értéke a 3.5.4.1.5 pontban meghatározott minimum értékek és egy maximum mínusz 18 dBW/m2 között van.

3.5.5.3.3 *Sávszélesség*

3.5.5.3.3.1 *DME/N.* A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa a 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek a 3.5.4.1.3 pontban meghatározottaknak.

3.5.5.3.3.2 *DME/P - IA (kezdeti megközelítési) mód.* A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa a 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek a 3.5.4.1.3 pontban meghatározottaknak. A 12 dB-es sávszélesség nem haladhatja meg a 2 MHz-et és a 60 dB-es sávszélesség nem haladhatja meg a 10 MHz-et.

3.5.5.3.3.3 *DME/P - FA (végső megközelítési) mód.* A vevő sávszélességének elegendőnek kell lennie ahhoz, hogy biztosítsa a 3.5.3.1.3 pontban leírtak teljesítését akkor, amikor a bemenő jelek megfelelnek a 3.5.4.1.3 pontban meghatározottaknak. A 12 dB-es sávszélesség nem haladhatja meg a 6 MHz-et és a 60 dB-es sávszélesség nem haladhatja meg a 20 MHz-et.

3.5.5.3.4 *Interferencia szűrés*

3.5.5.3.4.1 Amikor a fedélzeti vevőkészülék bemeneti csatlakozásán a közös csatornájú megkívánt és nem-kívánt DME jelek aránya legalább 8 dB, a lekérdező adó-vevő berendezésnek ki kell jeleznie a távolság tájékoztatást és egyértelmű azonosítást kell biztosítania az erősebb jeltől.

Megjegyzés. - A közös csatorna kifejezés azokra a válaszjelekre utal, amelyeknél ugyanazt a frekvenciát és ugyanazt az impulzus-pár távolságot alkalmazzák.

‡3.5.5.3.4.2 *DME/N.* A megkívánt csatorna névleges frekvenciájától 900 kHz-el távolabbi és a küszöb-érzékenységtől 42 dB értékű, vagy annál nagyobb amplitúdójú DME jeleket ki kell szűrni.

3.5.5.3.4.3 *DME/P.* A megkívánt csatorna névleges frekvenciájától 900 kHz-el távolabbi és a küszöb-érzékenységtől 42 dB értékű, vagy annál nagyobb amplitúdójú DME jeleket ki kell szűrni.

3.5.5.3.5 *Dekódolás*

3.5.5.3.5.1 A lekérdező adó-vevő berendezésnek tartalmaznia kell egy olyan dekódoló áramkört, amely biztosítja azt, hogy a vevőt csak a 3.5.4.1.4 pontban leírt impulzus szélességgel és impulzus távolsággal rendelkező vett impulzus-párok tudják indítani.

‡3.5.5.3.5.2 *DME/N - Dekóder kiszűrő tevékenysége*. Egy olyan válasz impulzus-párt, amelynek a névleges értéktől plusz, vagy mínusz 2 mikro-szekundummal, vagy többel eltérő az impulzus távolsága, és bármilyen olyan jelszinttel, amely 42 dB értékkel a vevő érzékenysége felett van, ki kell szűrni.

3.5.5.3.5.3 *DME/P - Dekóder kiszűrő tevékenysége*. Egy olyan válasz impulzus-párt, amelynek a névleges értéktől plusz, vagy mínusz 2 mikro-szekundummal, vagy többel eltérő az impulzus távolsága, és bármilyen olyan jelszinttel, amely 42 dB értékkel a vevő érzékenysége felett van, ki kell szűrni.

3.5.5.4 Pontosság

‡3.5.5.4.1 *DME/N.* A lekérdező adó-vevő berendezés nem járulhat hozzá plusz, vagy mínusz 315 m-nél (plusz, vagy mínusz 0,17 tengeri mérföld) nagyobb értékkel a teljes rendszerhibához.

3.5.5.4.2 *DME/P - IA (kezdeti megközelítési) mód.* A lekérdező adó-vevő berendezés nem járulhat hozzá plusz, vagy mínusz 30 m-nél (plusz, vagy mínusz 100 láb) nagyobb értékkel a teljes rendszerhiba útvonal-követési hibájához (PFE) és plusz, vagy mínusz 15 m-nél (plusz, vagy mínusz 50 láb) nagyobb értékkel a teljes rendszer-hiba kormányzási elmozdulási hibájához (CMN).

3.5.5.4.3 *DME/P - FA (végső megközelítési) mód*

3.5.5.4.3.1 *1. Pontossági szabvány*. A lekérdező adó-vevő berendezés nem járulhat hozzá plusz, vagy mínusz 15 m-nél (plusz, vagy mínusz 50 láb) nagyobb értékkel a teljes rendszerhiba útvonal-követési hibájához (PFE) és plusz, vagy mínusz 10 m-nél (plusz, vagy mínusz 33 láb) nagyobb értékkel a teljes rendszerhiba kormányzási elmozdulási hibájához (CMN).

3.5.5.4.3.2 *2. Pontossági szabvány*. A lekérdező adó-vevő berendezés nem járulhat hozzá plusz, vagy mínusz 7 m-nél (plusz, vagy mínusz 23 láb) nagyobb értékkel a teljes rendszerhiba útvonal-követési hibájához (PFE) és plusz, vagy mínusz 7 m-nél (plusz, vagy mínusz 23 láb) nagyobb értékkel a teljes rendszerhiba kormányzási elmozdulási hibájához (CMN).

Megjegyzés. - Az ezen pontosság elérését elősegítő szűrőkről szóló útmutató segédanyag a "C"-Melléklet 7.3.4 pontjában található.

3.5.5.4.4 *DME/P*. A lekérdező adó-vevő berendezésnek a 3.5.3.1.3.4 pontban meghatározott pontosságot 50 százalékos, vagy annál nagyobb rendszer hatékonyság mellett kell megvalósítania.

Megjegyzés. - A rendszer hatékonyságra vonatkozó útmutató segédanyag a "C"- Melléklet 7.1.1 pontjában került megadásra.

3.6 Az ultrarövidhullámú (VHF) útvonal hely-jeladóra (75 MHz) vonatkozó előírások

3.6.1 Berendezés

3.6.1.1. Frekvenciák. Az ultrarövidhullámú (VHF) útvonal hely-jeladók sugárzása a 75 MHz-es – plusz, vagy mínusz 0,005 százalék - rádiófrekvencia kell, hogy legyen.

3.6.1.2 *Sugárzási jellemzők*

3.6.1.2.1 A rádió hely-jeladóknak egy 95 százalékosnál nem kisebb, de 100 százaléknál nem nagyobb modulációs mélységű folyamatos vivőhullámot kell sugározni. A moduláció teljes harmonikus tartalma nem lépheti túl a 15 százalékot.

3.6.1.2.2 A moduláló hang frekvenciájának 3 000 Hz plusz, vagy mínusz 75 Hz-nek kell lennie.

3.6.1.2.3 A sugárzásnak vízszintesen polarizáltnak kell lenni.

3.6.1.2.4 *Azonosítás*. Ha egy rádió hely-jeladónál kódjeles azonosításra van szükség, akkor a moduláló hangot úgy kell billentyűzni, hogy a pontok, vagy vonások, illetve mindkettő adása megfelelő sorrendben történjen. A billentyűzés módjának olyannak kell lennie, hogy percenként körülbelül hat-tíz szavas ütemnek megfelelő pontot és vonást, valamint jelszünetet biztosítson. Azonosítás alatt a vivőfrekvenciát nem lehet megszakítani.

3.6.1.2.5 *Fedésterület és sugárzási karakterisztika*

Megjegyzés. - A hely-jeladók fedésterületét és sugárzási karakterisztikáját rendszerint a Szerződő Államok állapítják meg az üzemeltetési követelmények alapján, a körzeti értekezletek ajánlásait számításba véve.

A legmegfelelőbb sugárzási karakterisztika olyan lenne, amely:

a) a legyező alakú sugárnyalábot adó hely-jeladó esetében csak akkor működteti a jelzőlámpát, amikor a légijármű a hely-jeladón keresztül menő függőleges egyenes körül szimmetrikusan elhelyezkedő és a nagy- és kis-tengelyével a kiszolgált repülési útvonalnak megfelelően beállított derékszögű téglatesten belül van;

b) Z hely-jeladó esetében csak akkor működteti a jelzőlámpát, amikor a légijármű egy olyan hengertesten belül van, amelynek a tengelye azonos a hely-jeladón keresztülmenő függőleges egyenessel.

A gyakorlatban az ilyen karakterisztikák előállítása lehetetlen és egy kompromisszumos sugárzási karakterisztika szükséges. A "C"- Mellékletben a jelenleg használatos antenna rendszerek - azok, amelyek általában kielégítőnek bizonyultak - kerültek útmutatóul leírásra. Az ilyen felépítésű és az olyan újabb tervezésű rendszerek, amelyek még jobban megközelítik a fentiekben leírt legkívánatosabb sugárzási karakterisztikát, rendszerint kielégítik az üzemeltetési követelményeket.

3.6.1.2.6 *A fedésterület meghatározása*. A hely-jeladók fedésterületének határát a 3.1.7.3.2 pontban előírt térerősség alapján kell meghatározni.

3.6.1.2.7 *Sugárzási karakterisztika*. **Ajánlás**. - *A hely-jeladó sugárzási karakterisztikája rendszerint olyan kell, hogy legyen, amelynek a tengelye függőleges, és a karakterisztika erőtere szimmetrikusan helyezkedik el a tengely körül a(zok)ban a repülési útvonalakat magába foglaló síkban, vagy síkokban, amely(ek) részére a hely-jeladót telepítették.*

Megjegyzés. - Bizonyos hely-jeladók telepítésénél felmerülő nehézségek szükségessé tehetik olyan tengely alkalmazását, amely nem függőleges.

3.6.1.3 *Felügyelő rendszer*. **Ajánlás**. - *Minden hely-jeladónál olyan megfelelő felügyelő rendszert kell biztosítani, ami egy alkalmas helyre kijelzi a következőket*:

a) a kisugárzott vivő energiának a normális érték 50 százaléka alá való csökkenése;

b) a modulációs mélységnek a 70 százalék alá való csökkenése;

c) a billentyűzés kimaradása.

3.7 Globális Navigációs Műhold Rendszerrel (GNSS) szembeni követelmények

3.7.1 Meghatározások

Aircraft-based augmentation system (ABAS). Légijármű bázisú kiegészítő rendszer
Egy olyan kiegészítő rendszer, amely kiegészíti és/vagy egyesíti az egyéb Globális Navigációs Műhold Rendszer alkotóelemektől kapott információkat a légijármű fedélzetén rendelkezésre álló információkkal.

Alert. Riasztás
Egy, a légijármű többi rendszerére biztosított jelzés, vagy a légijármű vezetőjének adott kijelzés annak azonosításához, hogy a navigációs rendszer egy működési paramétere a rendszer tűréshatátán kívül van.

Alert limit. Riasztási határ
Egy adott jellemző érték méréshez, a hiba tűréshatár nem kerülhet túllépésre riasztás kiadása nélkül.

Channel of standard accuracy (CSA). Szabvány pontossági csatorna
Az a helymeghatározási sebességi és időmérési meghatározott szint, amely az összes, a Globális Navigációs Műhold Rendszert /GLONASS/ felhasználó részére egy folyamatos és világméretű alapon rendelkezésre áll.

Core satellite constellation(s). Műholdak helyzetsor rendszere
A műholdas helyzetsor rendszerek a Globális Helymeghatározó Rendszer /GPS/ és a Globális Navigációs Műhold Rendszer /GLONASS/.

Global navigation satellite system (GNSS). Globális Navigációs Műhold Rendszer /GNSS/
Egy világméretű hely- és idő meghatározó rendszer, amely egy, vagy több állandó pályájú műhold rendszert, légijármű fedélzeti vevőt és rendszer teljesség /integritás/ ellenőrzést foglal magába, a szükség szerinti kiegészítőkkel úgy, hogy az a megkívánt üzemeltetéshez szükséges navigációs teljesítményt alátámassza.

Global navigation satellite system (GLONASS). Globális Navigációs Műhold Rendszer (GLONASS)
Az Orosz Államszövetség által üzemeltetett műholdas navigációs rendszer.

Global positioning system (GPS). Globális Helymeghatározó Rendszer /GPS/
Az Egyesült Államok által üzemeltetett műholdas navigációs rendszer.

GNSS position error. Globális Navigációs Műhold Rendszer /GNSS/ pozíció hiba
A tényleges helyzet és a Globális Navigációs Műhold Rendszer /GNSS/ vevő által meghatározott helyzet közötti különbség.

Ground-based augmentation system (GBAS). Földi bázisú kiegészítő rendszer /GBAS/
Egy olyan kiegészítő rendszer, amelyben a felhasználó közvetlenül vesz kiegészítő információkat egy földi bázisú adótól.

Ground-based regional augmentation system (GRAS). Földi bázisú regionális kiegészítő rendszer /GBAS/
Egy olyan kiegészítő rendszer, amelyben a felhasználó közvetlenül vesz kiegészítő információkat egy régiót lefedő földi bázisú adók egyikétől.

Integrity. Teljesség /integritás/
Annak a bizalomnak a mértéke, amelyet a teljes rendszer által szolgáltatott információ pontosságába lehet helyezni. A teljesség /integritás/ magába foglalja a rendszernek azt a képességét, hogy a kellő időben és érvényes figyelmeztetéseket is biztosít a felhasználó részére (riasztások).

Pseudo-range. Pszeudo-távolság (hamis távolság)
A műhold általi adás időpontja és a Globális Navigációs Műhold Rendszer vevőjének vételi időpontja közötti különbség a fénynek a légüres térben mért sebességével megszorozva, beleértve a Globális Navigációs Műhold Rendszer /GNS/ vevő és a műhold idő referenciája közötti hibát is.

Satellite-based augmentation system (SBAS). Műhold bázisú kiegészítő rendszer /SBAS/
Egy széles lefedettségű kiegészítő rendszer, amelyben a felhasználó kiegészítő információkat vesz egy műhold bázisú adótól.

Standard positioning service (SPS). Szabvány /átlagos/ helymeghatározási szolgáltatás
A helymeghatározás, a sebesség és az időmérési pontosság meghatározott szintje, amely bármely, a globális helymeghatározó rendszert felhasználó részére egy folyamatos és világméretű alapon rendelkezésre áll.

Time-to-alert. Riasztási idő
Az a maximális megengedhető idő, ami a navigációs rendszer tűréshatáron kívüli helyzetének kezdete és a berendezés riasztás 'kihírdetése' között eltelik.

3.7.2 Általános

3.7.2.1 *Funkciók*

3.7.2.1.1 A Globális Navigációs Műhold Rendszernek helyzet és idő adatokat kell a légijárművek részére szolgáltatni.

Megjegyzés. – Ezek az adatok a Globális Navigációs Műhold Rendszer vevővel felszerelt légijármű vevő és a különféle, a műholdakon, vagy a földön lévő jelforrások közötti pszeudo-távolság mérésekből kerülnek származtatásra.

3.7.2.2 *A Globális Navigációs Műhold Rendszer /GNSS/ alkotóelemei*

3.7.2.2.1 A Globális Navigációs Műhold Rendszer /GNSS/ navigációs szolgáltatásait a következő – a földön, a műholdon és/vagy a légijárművek fedélzetén – felszerelt alkotóelemek különféle kombinációjának felhasználásával kell biztosítani:

a) A Globális Helymeghatározó Rendszer (GPS), amely a Szabvány Helymeghatározási Szolgáltatást (SPS) biztosítja a 3.7.3.1 pontban meghatározottak szerint;

b) A Globális Navigációs Műhold Rendszer (GLONASS), amely a Szabvány Pontosságú Csatornájú (CSA) navigációs jelet biztosítja a 3.7.3.2 pontban meghatározottak szerint;

c) A légijármű-bázisú kiegészítő rendszer (ABAS), ahogy az a 3.7.3.3 pontban meghatározásra került;

d) A műhold-bázisú kiegészítő rendszer (SBAS), ahogy az a 3.7.3.4 pontban meghatározásra került;

e) A földi bázisú kiegészítő rendszer (GBAS), ahogy az a 3.7.3.5 pontban meghatározásra került;

f) A földi bázisú regionális kiegészítő rendszer (GRAS), ahogy az a 3.7.3.5 pontban meghatározásra került; és

g) A légijármű fedélzeti Globális Navigációs Műhold Rendszer (GNSS) vevő, ahogy az a 3.7.3.6 pontban meghatározásra került.

3.7.2.3 *Térbeli és idő referencia*

3.7.2.3.1 *Térbeli referencia*. A Globális Navigációs Műhold Rendszer által a felhasználó részére biztosított helyzet információt a Geodéziai Világrendszer – 1984 (WGS-84) geodéziai alappont rendszerében kifejezve kell biztosítani.

1. Megjegyzés. – A Geodéziai Világrendszer – 84 (WGS-84)-re vonatkozó Szabványokat és Ajánlott Gyakorlatokat az Annex 4 2.Fejezete, az Annex 11 2.Fejezete, az Annex 14 I. és II. Kötetének 2.Fejezete, valamint az Annex 15 3.Fejezete foglalja magába.

2. Megjegyzés. – Ha a Globális Navigációs Műhold Rendszer /GNSS/ alkotóelemei a Geodéziai Világrendszer – 84 (WGS-84)-től eltérő koordinátákat alkalmaznak, akkor a megfelelő átszámítási paramétereket kell használni.

3.7.2.3.2 *Idő referencia*. A Globális Navigációs Műhold Rendszer /GNSS/ által a felhasználó részére biztosított idő adatokat abban az időskálában kell kifejezni, amelynek az Egyeztetett Világidő (UTC) képezi a referenciáját.

3.7.2.4 *Térbeli-jel teljesítmény*

3.7.2.4.1 A Globális Navigációs Műhold Rendszer /GNSS/ alkotóelemeinek és egy hibamentes Globális Navigációs Műhold Rendszer /GNSS/ felhasználói vevőnek a kombinációja ki kell, hogy elégítse a 3.7.2.4-1 táblázatban (a 3.7 rész végén került elhelyezésre) meghatározott térbeli-jel követelményeket.

Megjegyzés. – A hibamentes felhasználói vevő fogalom csak a különféle kombinációjú Globális Navigációs Műhold Rendszer /GNSS/ alapelemek teljesítményének meghatározási eszközeként került alkalmazásra. A hibamentes vevő az a feltételezett vevő, amely a névleges pontosságú és riasztási idő teljesítményű. Az ilyen vevőre elfogadott az, hogy nincsenek olyan hibái, amelyek a teljességére /integritás/, az elérhetőségi és folyamatossági teljesítményére hatással vannak.

3.7.3 A Globális Navigációs Műhold Rendszer /GNSS/ alkotóelemeinek műszaki előírásai

3.7.3.1 *A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározási Szolgáltatása (SPS) (L1)*

3.7.3.1.1 *A térbeli és az ellenőrzési rész pontossága*

Megjegyzés. – A következő pontossági szabványok nem foglalják magukba a légköri, vagy a vevő hibákat, ahogy az a ”D”- Melléklet 4.1.2 pontjában leírásra került.

3.7.3.1.1.1 *Helymeghatározási pontosság*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatásának /SPS/ helymeghatározási eltérés hibája nem haladhatja meg a következő határértékeket:

	Globális átlag az idő 95%-ában	A legrosszabb helyszín az idő 95%-ában
Vízszintes helymeghatározási eltérés hiba	13 m (43 láb)	36 m (118 láb)
Függőleges helymeghatározási eltérés hiba	22 m (72 láb)	77 m (253 láb)

3.7.3.1.1.2 *Idő átviteli pontosság*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatásának /SPS/ idő átviteli pontossági hibája nem haladhatja meg a 40 nano-szekundumot az idő 95 %-ában.

3.7.3.1.1.3 *Távolság tartomány pontosság*. A távolság tartomány hiba nem haladhatja meg a következő határértékeket:

a) bármely műhold távolság hibája – a következőkből a nagyobb érték:
– 30 méter (100 láb); vagy
– az adás a felhasználói távolság pontosságának (URA) 4,42-szorosa a 150 métert (490 láb) nem meghaladóan;
b) bármely műhold sebesség - távolság hibája – 0,02 méter (0,07 láb) másodpercenként; és

c) bármely műhold távolság gyorsulási hibája – 0,007 méter (0,02 láb) per másodperc a négyzeten; és

d) az összes műholdra a négyzetes közép távolság hiba - 6 méter (20 láb).

3.7.3.1.2 *Elérhetőség*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatása /SPS/ elérhetőségének a következőnek kell lenni:

≥99 százalék vízszintes szolgáltatás elérhetőség, átlagos helyszín (36 méter 95 százalékos küszöb);

≥99 százalék függőleges szolgáltatás elérhetőség, átlagos helyszín (77 méter 95 százalékos küszöb);

≥90 százalék vízszintes szolgáltatás elérhetőség, a legrosszabb helyszínen (36 méter 95 százalékos küszöb);

≥90 százalék függőleges szolgáltatás elérhetőség, a legrosszabb helyszínen (77 méter 95 százalékos küszöb).

3.7.3.1.3 *Megbízhatóság*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatása /SPS/ megbízhatóságának a következő határértékeken belül kell lenni:

a) egy nagyobb szolgáltatási hiba gyakorisága – évente háromnál nem több az állandó helyi műhold rendszerre (globális átlag);

b) megbízhatóság – legalább 99,94 százalék (globális átlag); és

c) megbízhatóság – legalább 99,79 százalék (egy pontra átlagosan).

3.7.3.1.4 *Fedettség*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatása /SPS/ fedettségének a föld felszíne felett a minimum 3000 km-es tengerszint feletti magasságig kell kiterjednie.

Megjegyzés. - A Globális Helymeghatározó Rendszer /GPS/ pontosságára, elérhetőségére, megbízhatóságára és fedettségére vonatkozó útmutató anyag a "D"- Melléklet 4.1 pontjában került megadásra.

3.7.3.1.5 *Rádiófrekvenciás (RF) jellemzők*

Megjegyzés. – A Részletes Rádiófrekvenciás (RF) jellemzők a "B"- Függelék 3.1.1.1 pontjában kerültek meghatározásra.

3.7.3.1.5.1 *Vivőhullám frekvencia*. Az egyes Globális Helymeghatározó Rendszer /GPS/ műholdaknak egy Szabvány Helymeghatározási /SPS/ jelet kell sugározni az 1575,42 MHz (GPS L1) vivőhullám frekvencián, kódosztásos többszörös /multiplex/ hozzáférést (CDMA) alkalmazva.
Megjegyzés. – Az Egyesült Államok egy új polgári frekvenciával fogja a Globális Helymeghatározó Rendszer /GPS/ műholdjait kiegészíteni, és azt fel fogja ajánlani a kritikus életbiztonsági alkalmazásokhoz. Ennek a jelnek a Szabványai és Ajánlott Gyakorlatai egy későbbi időpontra kerülhetnek kidolgozásra.

3.7.3.1.5.2 *Jel spektrum*. A Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározó Szolgáltatásának /SPS/ jel teljesítményét az L1 frekvenciához központozottan a ±12 MHz-es sáv (1563,42 – 1587,42 MHz) kell, hogy magába foglalja.

3.7.3.1.5.3 *Polarizáció*. A sugárzott rádiófrekvenciás /RF/ jelnek jobbra-forgó (az óramutató járásával megegyező) körösen polarizáltnak kell lenni.

3.7.3.1.5.4 *Jel teljesítmény szint*. Az egyes Globális Hely-meghatározó Rendszer /GPS/ műholdaknak olyan Szabvány Helymeghatározási Szolgáltatási /SPS/ navigációs jeleket kell kisugározniuk, amelyeknek elegendő teljesítményűnek kell lenni ahhoz, hogy az összes, a föld közelében lévő olyan akadálymentes helyen, amelyről a műhold 5 fokon, vagy annál nagyobb magassági szögben észlelhető, a vett rádiófrekvenciás /RF/ jel szintje a 3 dBi lineárisan polarizált antenna kimeneten a -160 dBW-tól a -153 dBW-ig terjedő tartományon belül legyen az összes olyan antenna beállításra, amely a terjedés irányára merőleges.

3.7.3.1.5.5 *Moduláció*. A Szabvány Helymeghatározási Szolgáltatás /SPS/ L1 jelet bipoláris fázis eltolásos (BPSK), egy ál-véletlen zajjal (PRN) 1,023 MHz-es torzított /durva/ hozzáférési (C/A) kóddal kell modulálni. A torzított /durva/ hozzáférési (C/A) kód-sorozatot minden egyes milliszekundumban meg kell ismételni. A kisugárzott ál-véletlen zaj /PRN/ kód-sorozatnak az 50 bit másodpercenkénti navigációs üzenet és a torzított /durva/ hozzáférési (C/A) kód Modulo 2-es összeadásának kell lenni.

3.7.3.1.6 *A Globális Helymeghatározó Rendszer /GPS/ ideje*. A Globális Helymeghatározó Rendszer /GPS/ ideje az Egyeztetett Világidőre /UTC/ vonatkoztatott idő kell, hogy legyen (az Egyesült Államok Hajózási Obszervatóriuma által kezelt időre).

3.7.3.1.7 *Koordináta rendszer*. A Globális Helymeghatározó Rendszer /GPS/ koordináta rendszerének a Geodéziai Világrendszer – 84 (WGS-84)-nek kell lenni.

3.7.3.1.8 *Navigációs információ*. A műholdak által leadott navigációs adatoknak azokat a szükséges információkat kell magukban foglalniuk, amelyek meghatározzák:

a) a műhold adási idejét;

b) a műhold helyzetét;

c) a műhold 'egészségét' /működési állapotát/;

d) a műhold óra helyesbítését;

e) a terjedési időkésés hatásait;

f) az Egyeztetett Világidőre /UTC/ való idő átvitelt; és

g) az állandó-pályájú műhold rendszer helyzeti állapotát.

Megjegyzés. – Az adatok szerkezete és tartalma a „B"- Függelék 3.1.1.2 és 3.1.1.3 pontjában külön-külön került meghatározásra.

3.7.3.2 A Globális Navigációs Műhold Rendszer /GLONASS/ Szabvány Pontossági Csatornája (CSA) (L1)

Megjegyzés. – Ebben a részben a GLONASS kifejezés a konstellációban lévő összes műholdra utal. A csak a Modernizált Globális Navigációs Műhold Rendszer (GLONASS-M) műholdakra vonatkozó Szabványok ennek megfelelően vannak minősítve.

3.7.3.2.1 *Pontosság*

3.7.3.2.1.1 *Helymeghatározási pontosság*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornája /GLONASS CSA/ helyzeti eltérés hibája nem haladhatja meg a következő határértékeket:

	Az idő 95%-ában	Az idő 99,99%-ában
Vízszintes helyzeti eltérés hiba	28 m (92 láb)	140 m (460 láb)
Függőleges helyzeti eltérés hiba	60 m (196 láb)	585 m (1 920 láb)

3.7.3.2.1.2 *Idő átviteli pontosság*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornájának /GLONASS CSA/ idő átviteli pontossági hibája nem haladhatja meg a 700 nano-szekundumot az idő 95 %-ában.

3.7.3.2.2 *Elérhetőség*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornája /GLONASS CSA/ elérhetőségének legalább 99,64 százalékosnak kell lenni (globális átlag).

3.7.3.2.3 *Megbízhatóság*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornája /GLONASS CSA/ megbízhatóságának legalább 99,98 százaléknak kell lenni (globális átlag).

3.7.3.2.4 *Fedettség*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornája /GLONASS CSA/ fedettségének legalább 99,9 százalékosnak kell lenni (globális átlag).

Megjegyzés. - A Globális Helymeghatározó Rendszer /GLONASS// pontosságára, elérhetőségére, megbízhatóságára és fedettségére vonatkozó útmutató anyag a ”D”- Melléklet 4.2 pontjában került megadásra.

3.7.3.2.5 *Rádiófrekvenciás /RF/ jellemzők*

Megjegyzés. – A Részletes Rádiófrekvenciás (RF) jellemzők a ”B”- Függelék 3.2.1.1 pontjában kerültek meghatározásra.

3.7.3.2.5.1 *Vivőhullám frekvencia*. Minden egyes Globális Navigációs Műhold Rendszer /GLONASS/ műholdnak a Szabvány Pontosságú Csatorna /CSA/ navigációs jelet a saját vivőhullám frekvenciáján, az L1 (1,6 GHz) frekvenciasávban frekvencia-osztásos /multiplex/ többszörös hozzáférést (FDMA) alkalmazva kell sugározni.
1. Megjegyzés. – A GLONASS műholdaknak lehet ugyanaz a vivőhullám frekvenciája, de ebben az esetben azok ugyanazon orbitális sík egy átellenes helyzetében kerülnek elhelyezésre.

2. Megjegyzés. – A GLONASS-M műholdak egy kiegészítő távolság meghatározási kódot fognak sugározni az L2 (1,2 GHz-es) frekvenciasávban a vivőhullám frekvenciákon, frekvencia-osztásos többszörös hozzáférést /FDMA/ alkalmazva.

3.7.3.2.5.2 *Jel spektrum*. A Globális Navigációs Műhold Rendszer Szabvány Pontosságú Csatornája /GLONASS CSA/ jel teljesítményét az egyes GLONASS vivőhullám frekvenciára központozottan a ±5,75 MHz-es sávon belüli tartomány kell, hogy magába foglalja.

3.7.3.2.5.3 *Polarizáció*. A sugárzott rádiófrekvenciás /RF/ jelnek jobbra-forgó (az óramutató járásával megegyező) körkörösen polarizáltnak kell lenni.

3.7.3.2.5.4 *Jel teljesítmény szint*. Az egyes Globális Navigációs Műhold Rendszer /GLONASS/ műholdaknak olyan Szabvány Pontosságú Csatorna /CSA/ navigációs jeleket kell kisugározniuk, amelyeknek elegendő teljesítményűnek kell lenni ahhoz, hogy az összes, a föld közelében lévő olyan akadálymentes helyen, amelyről a műhold 5 fokon, vagy annál nagyobb magassági szögben észlelhető, a vett rádiófrekvenciás /RF/ jel szintjének a 3 dBi lineárisan polarizált antenna kimeneten a -161 dBW-tól a -155,2 dBW-ig terjedő tartományon belül legyen az összes olyan antenna beállításra, amely a terjedés irányára merőleges.

1. Megjegyzés. – A 155,2 dBW teljesítmény határérték a felhasználói antenna előre meghatározott jellemzőire, 0,5 dB-es atmoszférikus veszteségre és a műhold egy olyan szögbeli elhelyezkedési hibájára van alapozva, ami nem haladja meg az egy fokot (abban az irányban, amely a jel szint növekedését eredményezi).

2. Megjegyzés. – A Modernizált Globális Navigációs Műhold Rendszer /GLONASS-M/ ugyancsak az L2-n egy távolság meghatározó kódot fog sugározni elegendő teljesítménnyel ahhoz, hogy az összes, a föld közelében lévő olyan akadálymentes helyen, amelyről a műhold 5 fokon, vagy annál nagyobb magassági szögben észlelhető, a vett rádiófrekvenciás /RF/ jel szintjének a 3 dBi lineárisan polarizált antenna kimeneten a -167 dBW-nél nem lesz kevesebb az összes olyan antenna beállításra, amely a terjedés irányára merőleges.

3.7.3.2.5.5 *Moduláció*

3.7.3.2.5.5.1 A Globális Navigációs Műhold Rendszer /GLONASS/ műholdnak a vivőhullám frekvenciáján a navigációs rádiófrekvenciás /RF/ jelet kell kisugározni a bipoláris fázis eltolásos /BPSK/ modulációjú bináris impulzus-sorozat felhasználásával. A vivőhullám fázis eltolását a π-radiánsokkal kell elvégezni ±0,2 radián maximális hibával. Az ál-véletlen kódsorozatot minden egyes milliszekundumban meg kell ismételni.

3.7.3.2.5.5.2 A moduláló navigációs jelet a következő három bináris jel Modulo-2 összeadásával kell generálni:

a) távolság meghatározó kód 511 kbit/s-al leadva;

b) navigációs közlemény 50 bit/s-al leadva; és

c) 100 Hz-es segéd meander sorozat.

3.7.3.2.6 *Globális Navigációs Műhold Rendszer /GLONASS/ idő*. A Globális Navigációs Műhold Rendszer /GLONASS/ ideje az Egyeztetett Világidőre /UTC/ vonatkoztatott idő kell, hogy legyen (Oroszország Nemzeti Idő Szolgálata által kezelt idő).

3.7.3.2.7 *Koordináta rendszer*. A Globális Navigációs Műhold Rendszer /GLONASS/ koordináta rendszerének a PZ-90-nek kell lenni.

Megjegyzés. – A Globális Navigációs Műhold Rendszer /GLONASS/ által használt PZ-90 koordináta rendszerről a Geodéziai Világrendszer – 84 /WGS-84/ koordinátáira való átszámítás a "B"- Függelék 3.2.5.2 pontjában van meghatározva.

3.7.3.2.8 *Navigációs információ*. A műhold által leadott navigációs adatoknak azokat a szükséges információkat kell magába foglalni, amelyek meghatározzák:

a) a műhold adási idejét;

b) a műhold helyzetét;

c) a műhold 'egészségét' /működési állapotát/;

d) a műhold óra helyesbítését;

e) az Egyeztetett Világidőre /UTC/ való idő átvitelt; és

f) az állandó-pályájú műhold rendszer helyzeti állapotát.

Megjegyzés. – Az adatok szerkezete és tartalma a "B"- Függelék 3.2.1.2 és 3.2.1.3 pontjában különkülön került meghatározásra.

3.7.3.3 *Légijármű-Bázisú Kiegészítő Rendszer (ABAS)*

3.7.3.3.1 *Teljesítmény*. A Légijármű-Bázisú Kiegészítő Rendszer (ABAS) funkciói az egyéb Globális Navigációs Műhold Rendszer /GNSS/ elmeinek egyikével, vagy abból többel kombinálva, és mindkét, egy hibamentes GNSS vevővel és egy hibamentes légijármű fedélzeti rendszerrel a Légijármű-Bázisú Kiegészítő Rendszer /ABAS/ funkcióra használva meg kell, hogy feleljen a 3.7.2.4 pontban meghatározott pontossági, teljességi /integritási/, folyamatossági és elérhetőségi követelményeknek.

3.7.3.4 *Műhold-Bázisú Kiegészítő Rendszer (SBAS)*

3.7.3.4.1 *Teljesítmény*. A Műhold-Bázisú Kiegészítő Rendszer (SBAS) funkciói az egyéb Globális Navigációs Műhold Rendszer /GNSS/ elmeinek egyikével, vagy abból többel kombinálva, és egy hibamentes vevővel együtt meg kell, hogy feleljen a 3.7.2.4 pontban meghatározott pontossági, teljességi /integritási/, folyamatossági és elérhetőségi követelményeknek.

Megjegyzés. – A Műhold-Bázisú Kiegészítő Rendszer /SBAS/ kiegészíti az alap állandó-pályájú műhold rendszer(eke)t azzal, hogy növeli a szolgáltatási területen belül biztosított navigáció pontosságát, *teljességét (integritás), folyamatosságát és elérhetőségét, jellemzően magába foglalva az összetett repülőtereket is.*

3.7.3.4.2 *Funkciók*. A Műhold-Bázisú Kiegészítő Rendszernek /SBAS/ a következő funkciókból egyet, vagy többet kell teljesíteni:

a) *Távolság meghatározás*: egy kiegészítő pszeudó távolság jel egy pontossági mutatóval egy Műhold-Bázisú Kiegészítő Rendszertől /SBAS/ (3.7.3.4.2.1 és "B"- Függelék 3.5.7.2);

b) *Globális Navigációs Műhold Rendszer /GNSS/ műhold állapot*: a Globális Navigációs Műhold Rendszer /GNSS/ műhold működési állapotának /egészségének/ meghatározása és továbbítása ("B"-Függelék 3.5.7.3 pont);

c) *Alap különbségi helyesbítés*: biztosítja a Globális Navigációs Műhold Rendszer /GNSS/ műhold efemerisz /keringési pálya/ és óra helyesbítést (gyors és hosszú időtartamú), a műholdaktól történő pszeudó-távolságok méréséhez való felhasználásra ("B"-Függelék 3.5.7.4 pont); és

d) *Pontos különbségi helyesbítés*: az ionoszférikus helyesbítések meghatározása és továbbítása ("B"-Függelék 3.5.7.5).

Megjegyzés. – Amikor az összes funkció biztosítva van, akkor a Műhold-Bázisú Kiegészítő Rendszer /SBAS/ az alap állandó-pályájú műhold rendszerrel kombinálva alá tudja támasztani az indulási, az útvonal, a közelkörzeti és a megközelítési üzemeltetéseket az I. kategóriájú precíziós megközelítést is beleértve. A teljesítmény elérhető szintje a Műhold-Bázisú Kiegészítő Rendszerben /SBAS/ egyesített infrastruktúrától és az érintett földrajzi terület ionoszférikus viszonyaitól függ.

3.7.3.4.2.1 *Távolság meghatározás*

3.7.3.4.2.1.1 Az atmoszférikus hatások kizárásával a Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műholdak távolság meghatározási jelének távolság hibája nem haladhatja meg a 25 métert (95 százalék).

3.7.3.4.2.1.2 Annak a valószínűsége, hogy a távolság hiba bármely órában a 150 métert meghaladja, nem lehet több 10^{-5}-nél.

3.7.3.4.2.1.3 Annak a valószínűsége, hogy egy Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műholdtól a távolság meghatározási funkció nem betervezett leállása bekövetkezik, bármely órában nem haladhatja meg a 10^{-3}-at.

3.7.3.4.2.1.4 A távolság meghatározás változás hiba nem haladhatja meg a másodpercenkénti 2 méter (6.6 láb) /szekundumot.

3.7.3.4.2.1.5 A távolsági gyorsulás hiba nem haladhatja meg a 0,019 métert (0,06 láb) másodperc-négyzetenként /m/s^2/.

3.7.3.4.3 *Szolgáltatási terület*. A Műhold-Bázisú Kiegészítő Rendszer /SBAS/ szolgáltatási területének egy, az SBAS fedettségén belüli meghatározott olyan területnek kell lenni, ahol a Műhold-Bázisú Kiegészítő Rendszer /SBAS/ kielégíti a 3.7.4.2 pont követelményeit és alátámasztja a megfelelő jóváhagyott üzemeltetéseket.
1. Megjegyzés. – A fedettségi terület az a terület, amelyen belül a Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műhold adását venni lehet (például a geostacionáris 'műhold-lábnyomok').

2. Megjegyzés. – A Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műhold fedettségi és szolgáltatási területe a "D"- Melléklet 6.2 pontjában kerül megtárgyalásra.

3.7.3.4.4 *Rádiófrekvenciás /RF/ jellemzők*

Megjegyzés. – A részletes Rádiófrekvenciás /RF/ jellemzők a "B"- Függelék 3.5.2 pontjában kerültek meghatározásra.

3.7.3.4.4.1 *Vivőhullám frekvencia*. A vivőhullám frekvenciának az 1575,42 MHz-nek kell lenni.

Megjegyzés. – 2005. után, amikor a felső GLONASS frekvenciák kiürítésre kerülnek, más típusú Műhold Bázisú Kiegészítő Rendszer /SBAS/ kerülhet bevezetésre, amely ezeknek a frekvenciáknak egy részét használja fel.

3.7.3.4.4.2 *Jel spektrum*. A sugárzás teljesítményének legkevesebb a 95 százalékát az L1 frekvenciához központosított ±12 MHz-es sávnak kell magába foglalnia. Az egy Műhold-Bázisú Kiegészítő Rendszer /SBAS/ által továbbított jel sávszélességének legalább 2,2 MHz-nek kell lenni.

3.7.3.4.4.3 *Jel teljesítmény szint*. Az egyes Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műholdaknak olyan navigációs jelet kell kisugározniuk, amelynek elegendő teljesítményűnek kell lenni ahhoz, hogy az összes, a föld közelében lévő olyan akadálymentes helyen, amelyről a műhold 5 fokon, vagy annál nagyobb magassági szögben észlelhető, a vett rádiófrekvenciás /RF/ jel szintjének a 3 dBi lineárisan polarizált antenna kimeneten a -161 dBW-tól a -153 dBW-ig terjedő tartományon belül legyen az összes olyan antenna beállításra, amely a terjedés irányára merőleges.

.7.3.4.4.4 *Polarizáció*. . A sugárzott rádiófrekvenciás /RF/ jelnek jobbra-forgó (az óramutató járásával megegyező) körkörösen polarizáltnak kell lenni.

3.7.3.4.4.5 *Moduláció*. A leadott kódsorozatnak másodpercenként 500 jel sebességű navigációs közleménynek és az 1023 bit-es ál-véletlen zaj kód Modulo-2-es összeadásának kell lenni. Ezt kell azután bináris fázis eltolással modulálni /BPSK/ a vivőhullámra egy másodpercenkénti 1,023 megachip-es sebességgel.

3.7.3.4.5 *A Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ hálózat idő (SNT).* A Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ hálózat idő (SNT) és a Globális Helymeghatározó Rendszer /GPS/ ideje közötti különbség nem haladhatja meg az 50 nano-szekundumot.

3.7.3.4.6 *Navigációs információ*. A műholdak által leadott navigációs adatoknak azokat a szükséges információkat kell magukba foglalniuk, amelyek meghatározzák:

a) A Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műhold adási idejét;

b) A Műhold-Bázisú Kiegészítő Rendszerű /SBAS/ műhold helyzetét;

c) A helyesbített műhold időt az összes műholdra;

d) A helyesbített műhold helyzetet az összes műholdra;

e) Az ionoszférikus terjedési késés hatásait;

f) A felhasználó helyzeti integritását;

g) Az Egyesített Világidőre /UTC/ való idő átvitelt; és

h) A szolgáltatási szint állapotát.

Megjegyzés. – Az adatok szerkezete és tartalma a "B"- Függelék 3.5.3 és 3.5.4 pontjában külön-külön került meghatározásra.

3.7.3.5 Föld-Bázisú Kiegészítő Rendszer (GBAS) és Föld-Bázisú Regionális Kiegészítő Rendszer (GRAS)

1. Megjegyzés. – Ahol nincs külön magyarázattal ellátva, ott a Föld-Bázisú Kiegészítő Rendszer (GBAS) Szabványok és Ajánlott Gyakorlatok (SARPs) a Föld-Bázisú Kiegészítő Rendszerre (GBAS) és a Föld-Bázisú Regionális Kiegészítő Rendszerre (GRAS) is vonatkoznak.

2. Megjegyzés. - Ahol nincs külön magyarázattal ellátva, ott a megközelítés függőleges vezetéssel (APV) utalás APV-I és APV-II - t jelent.

3.7.3.5.1 *Teljesítmény.* A Föld-Bázisú Kiegészítő Rendszer /GBAS/ funkciói az egyéb Globális Navigációs Műhold Rendszer /GNSS/ elmeinek egyikével, vagy abból többel, valamint egy hibamentes vevővel együtt kombinálva a teljesítmény meg kell, hogy feleljen a 3.7.2.4 pontban meghatározott pontossági, folyamatossági, elérhetőségi és teljességi /integritási/ követelményeknek.

Megjegyzés. – A Föld-Bázisú Kiegészítő Rendszer /GBAS/ arra a célra szolgál, hogy alátámassza a megközelítési, leszállási, felszállási és földi mozgási üzemeltetések minden típusát és támogathatja az útvonal és közelkörzeti üzemeltetéseket. A Föld-Bázisú Regionális Kiegészítő Rendszer /GRAS/ arra a célra szolgál, hogy alátámassza az útvonal, a közelkörzeti, a nem precíziós megközelítési, a felszállási és a megközelítés függőleges vezetéssel (APV) üzemeltetéseket. A következő Szabványok és Ajánlott Gyakorlatok /SARPs/ az I. kategóriájú precíziós megközelítési, megközelítés függőleges vezetéssel (APV) és a Föld-Bázisú Kiegészítő Rendszer (GBAS) helymeghatározási szolgáltatás biztosításának alátámasztására kerültek kidolgozásra. Annak érdekében, hogy az üzemeltetések közötti működőképesség és a lehetséges hatékonyágú spektrum felhasználás elérésre kerüljön, az a cél, hogy az adattovábbítás az összes üzemeltetési kategóriára azonos legyen.

3.7.3.5.2 *Funkciók.* A Föld-Bázisú Kiegészítő Rendszernek /GBAS/ a következő funkciókat kell elvégeznie:

a) Biztosítani a helyileg érvényes pszeudo-távolság helyesbítéseket;

b) Biztosítani a Föld-Bázisú Kiegészítő Rendszer /GBAS/ vonatkozású adatokat;

c) Biztosítani a végső megközelítési szakasz adatait, amikor precíziós megközelítést támogat;

d) Biztosítani az előre kiszámított távolság meghatározási forrás rendelkezésre álló adatait; és

e) Biztosítani a Globális Navigációs Műhold Rendszer /GNSS/ távolság meghatározási forrásának integritás ellenőrzését.

Megjegyzés. – További Föld-Bázisú Kiegészítő Rendszer /GBAS/ Szabványok és Ajánlott Gyakorlatok /SARPs/ kerülnek majd kidolgozásra a földi-bázisú távolság meghatározási funkció biztosításához.

3.7.3.5.3 *Fedettség*

3.7.3.5.3.1 *I. kategóriájú precíziós megközelítési és megközelítés függőleges vezetéssel (APV).* A Föld-Bázisú Kiegészítő Rendszer /GBAS/ fedettségének az egyes I. kategóriájú precíziós megközelítési, vagy megközelítés függőleges vezetéssel üzemeltetések alátámasztásához a következőknek kell lenni, kivéve azt, ahol a földfelszíni jellemzők szabják meg és az üzemeltetési követelmények megengedik:

a) Oldalirányban, a leszállási küszöb pontjának / a látszólagos küszöb pontjának (LTP/FTP) mindkét oldalától 140 m-re (450 láb) kezdődően és a végső megközelítési útvonal mindkét oldalán ±35 fokkal kiterjedően 28 km-ig (15 tengeri mérföld) és a végső megközelítési útvonal mindkét oldalán ±10 fokkal kiterjedően 37 km-ig (20 tengeri mérföld); és

b) Függőlegesen, az oldalirányú területen belül 7 foknál nagyobb magasságig, vagy a közzétett siklópálya szög (GPA) 1,75-szereséig azon vízszintes sík felett, amelynek a kiinduló pontja a Siklópálya Befogási Pontjánál (GPIP) van és 0,45 Siklópálya Szögig /GPA/ a vízszintes felett, vagy az olyan alacsonyabb szögig lefelé, ami 0,30 Siklópálya Szög /GPA/, ahogy szükséges ahhoz, hogy védelmezze a közzétett siklópálya befogási eljárást. Ezt a fedettséget kell alkalmazni a 30 m (100 láb) és a 3000 m (10000 láb) közötti küszöb feletti magasságban /HAT/.

Megjegyzés. –A Leszállási Küszöb Pont / Látszólagos Küszöb Pont (LTP/FTP) és a Siklópálya Befogási Pont (GPIP) a "B"- Függelék 3.6.4.5.1 pontjában került meghatározásra.

3.7.3.5.3.1.1 **Ajánlás**. – *Az I. kategóriájú precíziós megközelítésnél a 3.7.3.5.4 pontban meghatározott adatsugárzást ki kell terjeszteni 3,7m-re (12 lábra) a futópálya felszíne felett.*

3.7.3.5.3.1.2 **Ajánlás**. – *Az adatsugárzás körkörös legyen, ha szükség van a tervezett alkalmazások támogatására.*

Megjegyzés. - Az I. kategóriájú precíziós megközelítéshez és a megközelítés függőleges vezetéssel (APV) szolgáltatásához szükséges fedettségre vonatkozó útmutató anyagát a "D"- Melléklet 7.3 pontja adja meg.

3.7.3.5.3.2. *A Föld-Bázisú Kiegészítő Rendszer /GBAS/ helymeghatározási szolgáltatás*.
A Föld-Bázisú Kiegészítő Rendszer /GBAS/ helymeghatározási szolgáltatás területének annak a területnek kell lennie, ahol az adatsugárzást lehet venni és a helymeghatározási szolgáltatás megfelel a 3.7.2.4 pont követelményeinek, valamint támogatja a megfelelően jóváhagyott üzemeltetéseket.

Megjegyzés. – A helymeghatározási szolgáltatással kapcsolatos fedettségre vonatkozó útmutató anyagot a "D"- Melléklet 7.3 pontja adja meg.

3.7.3.5.4 *Adatsugárzási jellemzők*

Megjegyzés. – A részletes rádiófrekvenciás /RF/ jellemzők a "B"- Függelék 3.6.2 pontjában kerültek meghatározásra.

3.7.3.5.4.1 *Vivőhullám frekvencia*. Az adatsugárzásra használatos rádiófrekvenciákat a 108-tól a 117,975 MHz-ig terjedő sáv rádiófrekvenciáiból kell kiválasztani. A legalacsonyabb kiosztható frekvenciának a 108,25 MHz-nek kell lenni, és a legmagasabb kiosztható rádiófrekvencia a 117,950 MHz kell, hogy legyen. A kiosztható frekvenciák közötti elkülönítés (csatorna-távolság) 25 kHz kell, hogy legyen.

1. Megjegyzés. – A VOR/GBAS frekvencia kiosztásra és a földrajzi elkülönítési követelményekre vonatkozó útmutató anyag a "D"- Melléklet 7.2.1 pontjában került megadásra.

2. Megjegyzés. – Az ILS/GBAS földrajzi elkülönítési követelmények és a GBAS és a 118 – 137 MHz-es sávban működő VHF rádióösszeköttetési szolgálatok földrajzi elkülönítési követelményei kidolgozás alatt állnak. Addig, amíg ezek a követelmények meghatározásra és Szabványok és Ajánlott Gyakorlatokba történő foglalásra nem kerülnek, az előirányzat az, hogy a 112,050 – 117,900 MHz-es sáv frekvenciái kerülnek felhasználásra.

3.7.3.5.4.2 *Hozzáférési technika*. Egy időosztásos többszörös hozzáférésű technikát (TDMA) kell alkalmazni egy állandó keretű felépítéssel. Az adatsugárzást egytől nyolcig terjedő résekre (slot) kell kijelölni.

Megjegyzés. – A két rés a névleges kijelölés. Bizonyos Földi-Bázisú Kiegészítő Rendszerű /GBAS/ berendezésekhez, amelyek többszörös VHF adatsugárzású (VDB) átviteli antennákat használnak, a

VHF adat-sugárzás (VDB) fedésterületének növeléséhez szükség lehet kettőnél több idő-rés kijelölésére. A többszörös antennák alkalmazására vonatkozó útmutató anyag a "D"- Melléklet 7.12.3 pontjában került megadásra; néhány Földi-Bázisú Kiegészítő Rendszerű /GBAS/ berendezés egy Föld-Bázisú Regionális Kiegészítő Rendszerben /GRAS/ használhat egy idő-rést.

3.7.3.5.4.3 *Moduláció*. A Földi-Bázisú Kiegészítő Rendszer /GBAS/ adatait 3 bites szimbólumként kell kisugározni, az adatsugárzó vivőhullámot a D8PSK-val modulálva másodpercenkénti 10 500 szimbólumos sebességgel.

3.7.3.5.4.4 *Az adatsugárzás rádiófrekvenciás /RF/ térerőssége és polarizációja*.

Megjegyzés. - A Földi-Bázisú Kiegészítő Rendszer /GBAS/ a VHF adatsugárzást biztosítani tudja vagy a vízszintes (GBAS/H), vagy az ellipszis alakú (GBAS/E) polarizációval, amely felhasználja mindkettőt, a vízszintes polarizációs (HPOL) és a függőleges polarizációs (VPOL) összetevőket. Egy függőleges polarizációjú (VPOL) összetevőt felhasználó légijármű nem lesz képes az üzemeltetés lefolytatására GBAS/H berendezéssel. A vonatkozó útmutató anyag a "D"- Melléklet 7.1 pontjában került megadásra.

3.7.3.5.4.4.1 *Földi-Bázisú Kiegészítő Rendszer / Vízszintes polarizáció /GBAS/H/*

3.7.3.5.4.4.1.1 Egy vízszintesen polarizált jelet kell kisugározni.

3.7.3.5.4.4.1.2 A kisugárzott teljesítménynek (ERP) egy vízszintesen polarizált jelet kell biztosítani egy 215 mikrovolt/méter (-99 dBW/négyzetméter) maximális térerővel és egy maximum 0,350 volt/méter (-35 dBW/négyzetméter) maximális térerővel a Földi-Bázisú Kiegészítő Rendszer /GBAS/ fedésterületén. A térerősséget egy átlagként kell mérni a szinkronizáció periódusán és a szinkron vezérjel bizonytalanság feloldási mező időtartamán át. A rádiófrekvenciás /RF/ fázis-eltolás a Vízszintes Polarizáció /HPOL/ és bármilyen Függőleges Polarizációjú /VPOL/ összetevő között olyan kell, hogy legyen, hogy a "B"- Függelék 3.6.8.2.2.3 pontjában meghatározott vízszintes jel teljesítmény megérkezzen a fedésterület minden részében a Vízszintes Polarizációjú /HPOL/ felhasználókhoz.

3.7.3.5.4.4.2 *Föld-Bázisú Kiegészítő Rendszer / Ellipszis polarizáció /GBAS/E/*

3.7.3.5.4.4.2.1 **Ajánlás.** – *Egy ellipszis polarizációjú jelet kell kisugározni, ahányszor csak megvalósítható.*

3.7.3.5.4.4.2.2 Amikor egy ellipszis polarizációjú jel kerül kisugárzásra, akkor a vízszintesen polarizált összetevőnek meg kell felelnie a 3.7.3.5.4.4.1.2 pontban meghatározott követelményeknek és a kisugárzott teljesítménynek (ERP) egy vízszintesen polarizált jelet kell biztosítani egy 136 mikrovolt/méter (-103 dBW/m^2) maximális térerővel és egy maximum 0,221 volt/méter (-39 dBW/m^2) maximális térerővel a Földi-Bázisú Kiegészítő Rendszer /GBAS/ fedésterületén belül. A térerősséget egy átlagként kell mérni a szinkronizáció periódusán és a szinkron vezérjel bizonytalanság feloldási mező időtartamán át. A rádiófrekvenciás /RF/ fáziseltolás a Vízszintes Polarizáció /HPOL/ és a Függőleges Polarizációjú /VPOL/ összetevő között olyan kell, hogy legyen, hogy a "B"- Függelék 3.6.8.2.2.3 pontjában meghatározott vízszintes jel teljesítmény megérkezzen a fedésterület minden részében a Vízszintes Polarizációjú /HPOL/ és a Függőleges Polarizációjú /VPOL/ felhasználókhoz.

Megjegyzés. – A minimális és maximális térerők a 3.7.3.5.4.4.1.2 és 3.7.3.5.4.4.2.2 pontban összhangban vannak egy -87 dBm minimális vevő érzékenységgel és a 200 méteres (660 láb) minimális távolsággal az adó antennától a 43 km (23 tengeri mérföld) fedettségi tartományra.

3.7.3.5.4.5 *A szomszédos csatornákban kisugárzott teljesítmény*. A sugárzás során a teljesítmény mennyiség minden üzemeltetési körülmény esetén, amikor egy, az i-edik szomszédos csatornán központosuló 25 kHz-es sávszélességen mérik, nem haladhatja meg a 3.7.3.5-1 táblázatban (a 3.7 pont alatti rész végén került elhelyezésre) bemutatott szinteket.

3.7.3.5.4.6 *Nem-kívánt sugárzások*. A nem-kívánt sugárzások – beleértve a hamis és a sávon kívüli sugárzásokat is – meg kell, hogy feleljenek a 3.7.3.5-2 táblázatban (a 3.7 pont alatti rész végén került elhelyezésre) bemutatott értékeknek. A teljes teljesítmény bármelyik VDB harmonikusban, vagy nem-folytonos jelben nem lehet -53 dBm-nél nagyobb.

3.7.3.5.5 *Navigációs információ*. A Föld-Bázisú Kiegészítő Rendszer /GBAS/ által kisugárzott navigációs adatoknak a következő információkat kell magukba foglalni:

a) Pszeudo-távolság helyesbítések, referencia idő és teljességi /integritás/ adatok;

b) A Föld-Bázisú Kiegészítő Rendszerhez /GBAS/ kapcsolódó adatok;

c) A végső megközelítési szakasz adatai, amikor a precíziós megközelítést támogatja; és

d) A kiszámított távolság meghatározási forrás rendelkezésre álló adatai.

Megjegyzés. – Az adatok szerkezete és tartalma a ”B”- Függelék 3.6.3 pontjában került meghatározásra.

3.7.3.6 *Légijármű fedélzeti Globális Navigációs Műhold Rendszer /GNSS/ vevő*

3.7.3.6.1 A légijármű fedélzeti Globális Navigációs Műhold Rendszer /GNSS/ vevőjének azon Globális Navigációs Műhold Rendszerek elemeinek az adatait kell feldolgozni, amelyeket fel akar használni úgy, ahogy az a ”B”- Függelék 3.1 pontjában (a Globális Helymeghatározó Rendszerre /GPS/), a ”B”- Függelék 3.2 pontjában (a Globális Helymeghatározó Rendszerre /GLONASS/), a ”B”- Függelék 3.3 pontjában (a kombinált GPS és GLONASS-ra), a ”B”- Függelék 3.5 pontjában (a Műhold-Bázisú Kiegészítő Rendszerre /SBAS/) és a ”B”- Függelék 3.6 pontjában (a Föld-Bázisú Kiegészítő Rendszerre /GBAS/, valamint a Föld-Bázisú Regionális Kiegészítő Rendszerre /GRAS/) meghatározásra került.

3.7.4 Az interferenciával szembeni ellenállás

3.7.4.1 A Globális Navigációs Műhold Rendszernek /GNSS/ teljesítenie kell a 3.7.2.4 pontban és a ”B”- Függelék 3.7 pontjában meghatározott teljesítmény követelményeket a ”B”- Függelék 3.7 pontjában meghatározott interferencia környezet fennállása esetén.

Megjegyzés. – A GPS és a GLONASS helymeghatározó rendszerek az 1559 – 1610 MHz-es frekvenciasávban üzemelnek, amelyet a Nemzetközi Távközlési Egyesület /ITU/ úgy osztályozott, hogy az a rádiónavigációs műholdas szolgáltatás (RNSS) és a légiforgalmi rádiónavigációs szolgáltatás (ARNS) frekvenciája, és speciális spektrum védelmi helyzetet biztosított a rádiónavigációs műholdas szolgáltatás /RNSS/ részére. Annak érdekében, hogy elérésre kerüljenek azok a teljesítmény célok, hogy a precíziós megközelítések irányvezetése a Globális Navigációs Műhold Rendszerrel /GNSS/ és kiegészítőivel alátámasztásra kerüljön, a rádiónavigációs műholdas szolgáltatás/légiforgalmi rádiónavigációs szolgáltatás /RNSS/ARNS/ előirányzottan marad a globális kijelölés szerint csak az 1559 – 1610 MHz-es sávban, és az ezzel szomszédos frekvenciasávban működő rendszerek sugárzását akarják keményen ellenőriztetni a nemzeti és/vagy nemzetközi előírásokkal.

3.7.5 Adatbázis

Megjegyzés. – A légiforgalmi adatokra alkalmazható Szabványokat és Ajánlott Gyakorlatokat az Annex 4, az Annex 11, az Annex 14 és az Annex 15 adja meg.

3.7.5.1 Annál a Légijármű GNSS /Globális Navigációs Műhold Rendszerű/ berendezésnél, amely egy adatbázist használ, egy eszközt kell biztosítani ahhoz, hogy:

a) Felfrissítse az elektronikus navigációs adatbázist; és

b) Meghatározza a légiforgalmi adatbázis Légiforgalmi Tájékoztató Közlemények Szabályozott Kiadási Rendszerének (AIRAC) érvényességi dátumait.

Megjegyzés. – Az egy légijármű fedélzeti Globális Navigációs Műhold Rendszerű berendezés /GNSS/ jelenleg szükséges navigációs adatbázisára vonatkozó útmutató anyag a ”D”- Melléklet 11. pontjában került megadásra.

3.7.6 Állapot ellenőrzés és NOTAM

3.7.6.1 A Globális Navigációs Műhold Rendszer /GNSS/ űrbeli és földi alkotóelemeinek olyan jelenlegi és tervezett változásait, amelyek hatással lehetnek a felhasználó teljesítményére, vagy üzemeltetési hozzájárulásaira, jelenteni kell a megfelelő légiforgalmi szolgálati egységnek.

1. Megjegyzés. – Kiegészítő tájékoztatást a ”D”- Melléklet 9. pontja biztosít.

2. Megjegyzés. – Az állapotban történt változások üzemeltetési hatásának megállapításához egy szolgáltatás előrejelzési eszközre lehet szükség.

3.7.2.4-1 táblázat: Térbeli-jel teljesítmény követelmények

Jellemző üzemeltetés	Pontosság vízszintesen 95% (1. és 3. megjegyzés)	Pontosság függőlegesen 95% (1. és 3. megjegyzés)	Teljesség (integritás) (2. megjegyzés)	Idő a riasztásig (3. megjegyzés)	Folytonosság (4. megjegyzés)	Elérhetőség (5. megjegyzés)
Útvonal	3,7km (2,0 tengeri mérföld) (6. megjegyzés)	nem alkalmazható	1-1 x 10^{-7}/h	5 perc	1-1 x 10^{-4}/h-tól 1-1 x 10^{-8}/h-ig	0,99-től 0,99999-ig
Útvonal, közelkörzet	0,74km (0,4 tengeri mérföld)	nem alkalmazható	1-1 x 10^{-7}/h	15 másodperc	1-1 x 10^{-4}/h-tól 1-1 x 10^{-8}/h-ig	0,99-től 0,99999-ig
Kezdeti megközelítés, Közbenső megközelítés, Nem-precíziós megközelítések (NPA), Indulás	220m (720 láb)	nem alkalmazható	1-1 x 10^{-7}/h	10 másodperc	1-1 x 10^{-4}/h-tól 1-1 x 10^{-8}/h-ig	0,99-től 0,99999-ig
Megközelítési üzemeltetések függőleges vezetéssel (APV-I)	16,0m (52 láb)	20m (66 láb)	1-2 x 10^{-7} megközelítésenként	10 másodperc	1-8 x 10^{-6} minden 15 másodpercben	0,99-től 0,99999-ig
Megközelítési üzemeltetések függőleges vezetéssel (APV-II)	16,0m (52 láb)	8,0m (26 láb)	1-2 x 10^{-7} megközelítésenként	6 másodperc	1-8 x 10^{-6} minden 15 másodpercben	0,99-től 0,99999-ig
I. kategóriájú precíziós megközelítés (8. megjegyzés)	16,0m (52 láb)	6,0m-től 4,0m-ig (20-tól 13 lábig) (7. megjegyzés)	1-2 x 10-7 megközelítésenként	6 másodperc	1-8 x 10^{-6} minden 15 másodpercben	0,99-től 0,99999-ig

MEGJEGYZÉSEK. –

1. A 95-ik százalékosztály értékek a Globális Navigációs Műhold Rendszer /GNSS/ helymeghatározási hibáira vonatkoznak, azokra, amelyek a futópálya küszöbe feletti legalacsonyabb magasságig (HAT) tervezett üzemeltetésekhez szükségesek, ha alkalmazható.
A részletes követelmények a ”B”- Függelékben kerültek meghatározásra, és útmutató anyagot ad még a ”D”- Melléklet 3.2 pontja.

2. A teljességi /integritás/ követelmények meghatározása magába foglal egy riasztási határértéket, amellyel szemben a követelményt meg lehet állapítani. Ezek a riasztási határértékek a következők:

Az I. kategóriájú precíziós megközelítések függőleges határértékeinek tartománya a függőleges pontossági követelmények tartományára vonatkozik.

Jellemző üzemeltetés	Vízszintes riasztási határérték	Függőleges riasztási határérték
Útvonal (óceáni / kontinentális, kis forgalom sűrűségű	7,4km (4 tengeri mérföld)	nem alkalmazható
Útvonal (kontinentális)	3,7km (2 tengeri mérföld)	nem alkalmazható
Útvonal, Közelkörzeti	1,85km (1 tengeri mérföld)	nem alkalmazható
Nem-precíziós megközelítések (NPA)	556m (0,3 tengeri mérföld)	nem alkalmazható
Megközelítési üzemeltetések függőleges vezetéssel (APV-I)	40m (130 láb)	50m (164 láb)
Megközelítési üzemeltetések függőleges vezetéssel (APV-II)	40m (130 láb)	20m (66 láb)
I. kategóriájú precíziós megközelítés	40m (130 láb)	15,0m-től 10,0m-ig (50 lábtól 33 lábig)

3. A pontossági és az 'idő-a-riasztásig' követelmények magukba foglalják egy hibamentes vevő névleges teljesítményét.

4. Értéktartományok kerültek megadásra az útvonal, a közelkörzeti, a kezdeti megközelítési, a nem-precíziós megközelítési /NPA/ és az indulási üzemeltetések folyamatossági követelményére, mivel ez a követelmény számos tényező függvénye – beleértve a tervezett üzemeltetést, a forgalom sűrűségét, a légtér összetettségét és az alternatív navigációs berendezések rendelkezésre állását. A megadott alacsonyabb érték a minimális követelmény az olyan területekre, ahol alacsony a forgalom sűrűsége és a légtér összetettsége. A megadott magasabb érték az olyan területekre alkalmas, amelyekben nagy a forgalom sűrűség és bonyolult a légtér összetettsége (lásd a "D"- Melléklet 3.4 pontját).

5. Értéktartományok kerültek megadásra az elérhetőségi követelményekre, mivel ezek a követelmények az üzemeltetési szükségek függvénye, ami számos tényezőn alapszik, beleértve az üzemeltetés gyakoriságát, az időjárási környezetet, a kényszerkiesések nagyságát és időtartamát, az alternatív navigációs berendezések rendelkezésre állását, a radar lefedettséget, a forgalomsűrűséget és az ebből eredő üzemeltetési eljárásokat. A megadott alacsonyabb értékek azok a minimális használhatósági fok értékek, amelyeknél a rendszert gyakorlatilag hasznosnak véljük., de nem elegendőnek ahhoz, hogy a nem-Globális Navigációs Műhold Rendszer navigációs berendezéseket helyettesítse. Az útvonalnavigációra a megadott magasabb értékek kielégítők ahhoz, hogy a Globális Navigációs Műhold Rendszer legyen csak egy területen belül a navigációs berendezés. A megközelítésekre és az indulásokra a magasabb értékek vannak megadva, és ezek olyan repülőtereken való használhatósági követelményekre alapozottak, amelyeken nagy a forgalom, feltételezve a több futópályára-futópályáról történő üzemeltetést, de ehhez kapcsolódóan üzemeltetési eljárások biztosítják az üzemeltetések biztonságát (lásd a "D"- Melléklet 3.5 pontját).

6. Ez a követelmény jóval szigorúbb annál, mint amilyen pontosság a társított Megkívánt Navigációs Teljesítményhez /RNP/ szükséges, de ez jóval beljebb van azon a pontossági teljesítményen, ami a Globális Navigációs Műhold Rendszerrel /GNSS/ elérhető.

7. Az értéktartományok az I. kategóriájú precíziós megközelítésre vannak meghatározva. A 4,0 méteres (13 láb) követelmény az ILS előírásokon alapszik, és egy konzervatív levezetést jelent ezekből az előírásokból (lásd a "D"- Melléklet 3.2.7 pontját).

8. A GNSS-nek a II. és III. kategóriájú precíziós megközelítési üzemeltetésekre vonatkozó teljesítmény követelményei felülvizsgálat alatt állnak, és egy későbbi dátummal kerülnek majd az anyagba beépítésre.

9. A Megközelítési üzemeltetések függőleges vezetéssel APV-I. és APV-II. kifejezések a függőleges vezetéses megközelítési és leszállási üzemeltetések két különböző szintjére utalnak, és nem szükségszerűen üzemeltetési alkalmazásra szántak.

3.7.3.5-1 táblázat: Föld-Bázisú Kiegészítő Rendszer /GBAS/ szomszédos csatornákba sugárzott adási teljesítménye

Csatorna	Relatív teljesítmény	Maximális teljesítmény
1. szomszédos csatorna	-40 dBc	12 dBc
2. szomszédos csatorna	-65 dBc	-13 dBc
4. szomszédos csatorna	-74 dBc	-22 dBc
8. szomszédos csatorna	-88,5 dBc	-36,5 dBc
16. szomszédos csatorna	-101,5 dBc	-49,5 dBc
32. szomszédos csatorna	-105 dBc	-53 dBc
64. szomszédos csatorna	-113 dBc	-61 dBc
76. szomszédos csatorna és azon túl	-115 dBc	-63 dBc

MEGJEGYZÉSEK. -

1. A maximális teljesítményt akkor alkalmazzák, ha az engedélyezett adó teljesítmény meghaladja a 150 W-ot.

2. Az egyes szomszédos pontok között, amelyeket a fentiekben megállapított szomszédos csatornák jelöltek ki, az összefüggés lineáris.

3.7.3.5-2 táblázat: A Föld-Bázisú Kiegészítő Rendszer /GBAS/ adásának nem-kívánt sugárzása

Frekvencia	Relatív nem-kívánt sugárzási szint (2. megjegyzés)	Maximális nem-kívánt sugárzási szint (1. megjegyzés)
9 kHz-től 150 kHz-ig	-93 dBc (3. megjegyzés)	-55 dBm/1 kHz
150 kHz-től 30 MHz-ig	-103 dBc (3. megjegyzés)	-55 dBm/10 kHz
30 MHz-től 106,125 MHz-ig	-115 dBc	-57 dBm/100 kHz
106,425 MHz	-113 dBc	-55 dBm/100 kHz
107,225 MHz	-105 dBc	-47 dBm/100 kHz
107,625 MHz	-101,5 dBc	-53,5 dBm/10 kHz
107,825 MHz	-88,5 dBc	-40,5 dBm/10 kHz
107,925 MHz	-74 dBc	-36 dBm/1 kHz
107,975 MHz	-65 dBc	-27 dBm/1 KHz
118,000 MHz	-65 dBc	-27 dBm/1 KHz
118,050 MHz	-74 dBc	-36 dBm/1 KHz
118,150 MHz	-88,5 dBc	-40,5 dBm/10 KHz
118,350 MHz	-101,5 dBc	-53,5 dBm/10 KHz
118,750 MHz	-105 dBc	-47 dBm/100 KHz
119,550 MHz	-113 dBc	-55 dBm/100 KHz
119,850 MHz-től 1 GHz-ig	-115 dBc	-57 dBm/100 KHz
1 GHz-től 1,7 GHz-ig	-115 dBc	-47 dBm/1 KHz

MEGJEGYZÉSEK. –

1. A maximális nem-kívánt sugárzási szintet (abszolút teljesítményszint) akkor alkalmazzák, ha az engedélyezett adó teljesítmény meghaladja a 150 W-ot.

2. A relatív nem-kívánt sugárzási szintet úgy kell kiszámítani, hogy ugyanazt a sávszélességet használják a megkívánt és a nem-kívánt jelekre. Ez szükségessé teheti a nem-kívánt jelek mérésének átszámítását, ha úgy végzik, hogy az ebben a táblázatban lévő, a maximális nem-kívánt sugárzási szint oszlopban jelzett sávszélességet használják fel.

3. Ez az érték mérési korlátozásokkal van túlterhelve. A tényleges teljesítmény várhatóan jobb lesz.

4. Az egyes szomszédos pontok között, amelyeket a fentiekben megállapított szomszédos csatornák jelöltek ki, az összefüggés lineáris.

3.8 (Fenntartva)

3.9 A fedélzeti automatikus rádióiránymérő (ADF) vevő rendszerek rendszer jellemzői

3.9.1 Az iránymérés kijelzésének pontossága

3.9.1.1 Az automatikus rádióiránymérő (ADF) rendszer által adott iránymérésben nem lehet plusz, vagy mínusz 5 foknál nagyobb hiba olyan - bármely irányból vett - rádiójel mellett, amelynek a térerőssége 70 mikro-volt/méter, vagy annál nagyobb, és amelyet az ezen Annex előírásai szerint megengedett tűréshatárokon belül működő hosszúhullámú/középhullámú irányítatlan (körkörös) sugárzású rádióadó (LF/MF NDB), vagy hely-jeladó sugároz ki, és a megkívánt jeltől 90 fokos iránnyal eltérő nem-kívánt jel jelenlétében, valamint:

a) Ugyanazon a frekvencián és 15 dB-el gyengébb; vagy

b) A frekvenciától plusz, vagy mínusz 2 kHz-el eltérő frekvencián és 4 dB-el gyengébb; vagy

c) Plusz, vagy mínusz 6 kHz-el, vagy ennél nagyobb mértékben eltérő frekvencián és 55 dB-el erősebb zavaró jel esetén sem.

Megjegyzés. – A fenti irányszögbeli hiba a légijármű mágneses iránytűjének hibáját nem számítva értendő.

3.10 (Fenntartva)

3.11 A mikrohullámú leszállító rendszer (MLS) jellemzői

3.11.1 Meghatározások

Auxiliary data. Kiegészítő adatok
Az alap adatokon kívül sugárzott olyan adatok, amelyek a fedélzeti helyzet számítások pontosításához a földi berendezés telepítési helyére vonatkozó információkat és más kiegészítő információkat biztosítanak.

Basic data. Alap adatok
A földi telepítésű berendezés által sugárzott azon adatok, amelyek a leszállító rendszer üzemelésével közvetlenül kapcsolatosak.

Beam centre. Sugárnyaláb középpont
A letapogató sugárnyaláb fő szirmának felfutó és lefutó élén lévő két mínusz 3 dB-es pont közötti felezőpont.

Beamwidth. Sugárszélesség
A letapogató sugárnyaláb fő szirmának szélessége, az, amit a mínusz 3 dB-es pontoknál mérnek, és szögegységekben állapítják meg, az antenna irányítási vonalnál a vízszintes síkban az oldalszög funkcióra, a függőleges síkban a magassági szög funkcióra.

Clearance guidance sector. Kiegészítő biztonsági-vezetési szektor
A légtérnek a fedésterületen belüli azon része, amelyen belül a biztosított oldalszög útirány-vezetési tájékoztatás nem arányos a légijármű szögeltérésével, de állandó balra, vagy jobbra kijelzés áll rendelkezésére arról, hogy a légijármű az arányos útirány-vezetési szektorhoz viszonyítva melyik oldalon van.

Control motion noise (CMN). Kormányzási elmozdulási zaj
Az útirány-vezetési jel hibájának az a része, amelyet a kormány felületek, a futók és az antennaoszlop elmozdulása okoz, és amelyet a légijárműnek az útirányra ráállt repülés közbeni térbeli helyzeti szöge befolyásolhat, de az, ami nem idézi elő a légijárműnek a megkívánt iránysávtól és/vagy siklópályától való eltérését. (Lásd a korábbi 3.5 pontot.)

Coordinate system - conical. Koordináta rendszer - kúpos
Egy funkcióra akkor mondjuk, hogy kúpos koordináta rendszert használ, amikor a dekódolt útirány-vezetési szög úgy változik, mint a vevő antennát magába foglaló kúp felülete és egy, a kúp tengelyére merőleges, annak csúcspontján áthaladó sík közötti minimális szög. A kúp csúcsa az antenna fázis-

középpontja. A megközelítési oldalszög, vagy hátsó irányszektor funkcióknál a sík az a függőleges sík, amely a futópálya középvonalát foglalja magába. A magassági szög funkciónál a sík vízszintes.

Coordinate system - planar. Koordináta rendszer - síkbeli
Egy funkcióra akkor mondjuk, hogy síkbeli koordinátákat használ, amikor a dekódolt útirány-vezetési szög egy, a vevő antennát magába foglaló sík és egy referencia sík közötti szögben változik. Az oldalszög funkciókra a referencia sík a futópálya középvonalát magába foglaló sík és az a sík, ami a vevő antennát magába foglalja, és egy függőleges síkként az antenna fázis-középpontján halad át.

Coverage sector. Fedésterületi szektor
A légtér egy olyan része, amelyen belül egy meghatározott funkciójú szolgáltatás kerül biztosításra, és amelyen belül a jel teljesítmény-sűrűsége a meghatározott minimummal egyenlő, vagy annál nagyobb.

DME/P. DME/P
Az MLS berendezés távolságmérő berendezése, ahol a "P" a pontos távolságmérést jelenti. A berendezés spektrum jellemzői olyanok, mint a DME/N berendezésé.

Function. Funkció
Az MLS berendezés által biztosított speciális szolgáltatás, azaz a megközelítési oldalszög útirány-vezetés, a hátsó irányszektor útirány-vezetés, vagy az alapadat stb.

Mean course error. Közepes irányszög hiba
Az oldalszög hiba közepes értéke, a futópálya meghosszabbított középvonala mentén.

Mean glide path error. Közepes siklópálya hiba
A magassági szög hiba közepes értéke, a magassági szög-vezetési funkció által biztosított siklópálya mentén.

Minimum glide path. Minimum siklópálya
A süllyedés legalacsonyabb szögértéke az a nulla fokos magassági szögön való süllyedés, amely megegyezik a megközelítési eljárásokban közzétett értékkel és az akadálymentességi követelményekkel.

Megjegyzés. - Ez az a legalacsonyabb süllyedési szög, amelyet a műszeres futópályára engedélyeztek és közzétettek.

MLS antenna boresight. Az MLS antenna irányítási (közép) vonala
Az a sík, ami az antenna fázis-középpontján az antenna rendszert magába foglaló vízszintes tengelyekre merőlegesen áthalad.

Megjegyzés. - Az oldalszög esetében az antenna irányítási (közép) vonal és a nulla fokos oldalszög általában egy egyenesbe esik. A műszaki összefüggésben előnyben részesített meghatározás az "antenna-irányítási (közép) vonal", míg az üzemeltetési összefüggésben az előnyben részesített meghatározás a "nulla fokos oldalszög" (lásd az alábbi meghatározást).

MLS azimuth. MLS oldalszög
A vízszintes síkokban azoknak a pontoknak a helyzete, ahol a dekódolt útirány-vezetési szög állandó.

MLS approach reference datum. MLS megközelítési vonatkozási pont
Egy meghatározott magasságú pont a futópálya középvonalának és küszöbének kereszteződése fölött.

MLS back azimuth reference datum. MLS hátirány irányszög vonatkozási pont
A futópálya középvonala fölött a futópálya közepénél meghatározott magasságban lévő pont.

MLS datum point. MLS alappont
A futópálya középvonalán a megközelítési magassági szög antenna fázis-középpontjához legközelebb lévő pont.

MLS elevation. MLS magassági szög
Azoknak a pontoknak a helyzete a függőleges síkokban, ahol a dekódolt útirány-vezetési szög állandó.

MLS zero degree azimuth. MLS nulla fokos oldalszög
Az az MLS oldalszög, ahol a dekódolt útirány-vezetési szög nulla fokos.

Out-of-coverage indication signal. Fedésterületen-kívül kijelzés
A tervezett fedésterületi szektoron kívüli területre kisugárzott jel ott, ahol kifejezetten szükséges a fedélzeti riasztás jelzésből az érvénytelen jel eltávolításának megelőzése a félrevezető útirány-vezetési információk jelenléte esetén.

Path following error (PFE). Útvonal követési hiba
Az útirány-vezetési jel hibájának az a része, amely előidézheti azt, hogy a légijármű a megkívánt útiránytól és/vagy siklópályától eltérjen.

Path following noise (PFN). Útvonal követési zaj
Az útirány-vezetési jel hibájának az a része, amely előidézheti azt, hogy a légijármű a megkívánt közepes iránysáv vonaltól és közepes siklópályától eltérjen, amelyik a megfelelő.

Proportional guidance sector. Arányos útirány-vezetési szektor
A légtérnek a fedésterületen belüli azon része, melyen belül a funkciónak megfelelően biztosított oldalszög útirány-vezetési tájékoztatás egyenesen arányos a légijármű fedélzeti antennának a nulla fokos referenciától való szögeltérésével.

3.11.2 Általános rész

3.11.2.1 Az MLS egy olyan precíziós megközelítési és leszállító útirány-vezetést adó rendszer, amely helyzet-információkat és különféle föld-levegő adatokat biztosít. A helyzetre vonatkozó információkat széles fedési szektoron belül biztosítja, és az oldalszög mérésével, a magassági szög mérésével és a távolság mérésével határozza meg.

Megjegyzés. - Hacsak nincs külön jelezve az, hogy MLS légijármű fedélzeti berendezésről van szó, akkor a 3.11 szakasz szövege az MLS földi berendezésre vonatkozik.

3.11.3 MLS konfigurációk

3.11.3.1 *Alap MLS.* Az MLS alap konfigurációjának a következőket kell tartalmaznia:

a) megközelítési oldalszög berendezést, a hozzá kapcsolódó felügyelő rendszert, távirányító és kijelző berendezést;

b) megközelítési magassági szög berendezést, a hozzá kapcsolódó felügyelő rendszert, távirányító és kijelző berendezést;

c) a fontos adat szavak kódolásának és adásának eszközét, a hozzá kapcsolódó felügyelő rendszert, távirányító és kijelző berendezést;

Megjegyzés. - A fontos adatok csak azok az alapadatok és kiegészítő adatok, amelyeket a 3.11.5.4 pont meghatároz.

d) DME/N-t, a hozzá kapcsolódó felügyelő rendszert, távirányító és kijelző berendezést.

3.11.3.2 **Ajánlás**. - *Ha pontos távolság információ szükséges az oldalszög fedéserületi szektoron belül, akkor választható lehetőségként a 3. Fejezet 3.5 pontjában meghatározott szabványoknak megfelelő DME/P berendezést kell alkalmazni.*

Megjegyzés. - A DME az MLS távolság-adó berendezése, és így az az elvárás, hogy amint lehetséges, telepítésre kerüljön. Azonban az ILS-hez telepített hely-jeladó berendezéseket is fel lehet használni ideiglenesen az MLS-el együtt addig, amíg az ILS szolgáltatást ugyanazon futópályához fenntartják.

3.11.3.3 *Kibővített MLS kialakítás*. Megengedhető kell, hogy legyen az, hogy az alap MLS-ből kibővített kialakítású rendszert építsenek ki a következő funkciók, vagy tökéletesítő jellemzők közül egy, vagy több hozzáadásával:

a) hátsó irányszektor adó berendezés, a hozzá kapcsolódó felügyelő rendszerrel, távirányító és kijelző berendezéssel;

b) kilebegtetési magasság adó berendezés, a hozzá kapcsolódó felügyelő rendszerrel, távirányító és kijelző berendezéssel;

c) DME/P, a hozzá kapcsolódó felügyelő rendszerrel, távirányító és kijelző berendezéssel;

d) további kiegészítő adatszavak kódolásának és adásának eszköze, a hozzá kapcsolódó felügyelő rendszerrel, távirányító és kijelző berendezéssel;

e) egy szélesebb arányos vezetési szektor, amely meghaladja a következőkben a 3.5.11 pontban meghatározott minimumot.

1. Megjegyzés. - Jóllehet, a szabvány úgy került kidolgozásra, hogy biztosítja a kilebegtetési magasság megadásának funkcióját, mégis, ezt a funkciót nem teljesíti és a jövőbeli teljesítés sincs figyelembe véve.

2. Megjegyzés. - Az MLS jelformátum lehetőséget biztosít a rendszer további bővítésére, olyan funkciók bevezetésére, mint például a 360 fokos irányszög.

3.11.3.4 *Egyszerűsített mikrohullámú leszállító rendszer (MLS) konfigurációk*. Megengedhetőnek kell lenni annak, hogy egyszerűsített konfigurációt nyerjenek az alap mikrohullámú rendszerből (MLS) (3.11.3.1) a következő jellemzők enyhítésével:

a) a megközelítési oldalszög fedésterület csak a megközelítési területen (3.11.5.2.2.1.1) biztosított;

b) a megközelítési oldalszög és magassági szög fedésterület (3.11.5.2.2 és 3.11.5.3.2) nem kerül kiterjesztésre a küszöb feletti 30 méteres (100 láb) magasság alá;

c) az útvonal-követési hiba (PFE) és az útvonal-követési zaj (PFN) pontossági határértékei megnövelésre kerülnek úgy, hogy azok a 3.11.4.9.4 pontban a megközelítési oldalszög útirány-vezetésre meghatározott értékek és a 3.11.4.9.6 pontban a magassági szög útirányvezetésre meghatározott értékek 1,5-szeresénél nem nagyobbak legyenek;

d) a földi berendezésnek a közepes irányszög hibához és a közepes siklópálya hibához való hozzájárulása megnövelésre kerülnek úgy, hogy azok a 3.11.5.2.4 pontban és a 3.1.5.3.4 pontban meghatározott értékek 1,5-szeresei legyenek;

e) a kormányzási elmozdulási zaj (CMN) követelményeiről (3.11.4.9.4 és 3.11.4.9.6) lemondanak; és

f) a felügyelő és az irányító tevékenység időtartama (3.11.5.2.3 és 3.11.5.3.3) hat - másodperces időtartamra kerül megnövelésre.

Megjegyzés. - Az egyszerűsített mikrohullámú leszállító rendszer (MLS) konfiguráció alkalmazására vonatkozó útmutató anyagot a "G"- Melléklet 15. pontja adja meg.

3.11.4 A térbeli jel jellemzői - szög és adat funkciók

3.11.4.1 *Csatorna kiválasztás*

3.11.4.1.1 *Csatorna elrendezés*. Az MLS szög és adat funkcióinak az 5 031,0 MHz-től az 5 090,7 MHz-ig terjedő - az A-táblázatban megadott - frekvenciákban kijelölt 200 csatorna valamelyikén kell működni.

3.11.4.1.1.1 A csatorna kijelölést a 3.11.4.1.1 pontban meghatározottak kiegészítéseként az 5 030,4-től az 5 150,0 MHz-ig terjedő 'segédsávból' kell kiválasztani, ahogy az a jövő léginavigációs követelményei szerint szükséges.

3.11.4.1.2 *Csatorna párosítás a DME-vel*. Az irányszög és adat csatornáknak a távolság funkciót ellátó csatornával való párosítását az A-táblázatban leírtaknak megfelelően kell meghatározni.

3.11.4.1.3 *Frekvencia tűréshatár*. A földi telepítésű berendezés üzemi rádiófrekvenciája nem térhet el plusz, vagy mínusz 10 kHz-nél nagyobb mértékben a kijelölt frekvenciától. A frekvencia tartásnak olyannak kell lennie, hogy a névleges frekvenciától való eltérés a plusz, vagy mínusz 50 Hz-es értéken belül legyen, amikor azt 1 másodperces időtartamon keresztül mérik.

3.11.4.1.4 *A rádiófrekvenciás jel spektruma*.

3.11.4.1.4.1 A kisugárzott jelnek olyannak kell lenni, hogy az adás ideje alatt a közepes teljesítmény-sűrűség 600 méter (2 000 láb) magasság fölött ne lépje túl a mínusz 94,5 dBW/m^2 értéket az irányszög útirány-vezetésre, a névleges frekvenciától 840 kHz-re, vagy annál nagyobb középpontú 150 kHz-es sávszélességben.

3.11.4.1.4.2 A kisugárzott jelnek olyannak kell lenni, hogy az adás ideje alatt a közepes teljesítmény-sűrűség bármelyik antennától mérve 4 800m-en (2,6 tengeri mérföldön) túl és 600m-es (2 000 láb) magasság alatt ne lépje túl a mínusz 94,5 dBW/m^2 értéket az irányszög útirány-vezetésre, a névleges frekvenciától 840 kHz-re, vagy annál nagyobb középpontú 150 kHz-es sávszélességben.

1. Megjegyzés. – A 3.11.4.1.4.2 pont alatti követelmények akkor alkalmazhatók, ha egy másik MLS földi állomás üzemelési lefedési területe és a tekintetbe vett földi állomás rádió-horizontja között átfedés van.

2. Megjegyzés. – Az MLS frekvencia tervezésre vonatkozó útmutató anyag a "G"- Melléklet 9.3. pontjában került megadásra.

3.11.4.2 *Polarizáció*. Valamennyi földi telepítésű berendezéstől származó adás rádiófrekvenciájának névlegesen függőlegesen polarizáltnak kell lennie. Semmilyen polarizált összetevőnek nem lehet olyan hatása, hogy az útirány-vezetési tájékoztatásokat - az arra a helyre megengedett és a függőleges helyzettől 30 fokkal elfordított légijármű fedélzeti antennánál - az útvonal-követési hiba (PFE) 40 százaléknál nagyobb értékkel megváltoztassa, vagy létrehozza azt, hogy az útvonal-követési hiba határértékét túllépje.

3.11.4.3 Az *időosztásos multiplex (TDM) szervezése*

3.11.4.3.1 Mindkét, mind a szög információt, mind az adatot időosztásos multiplex-el kell sugározni egyetlen rádiófrekvencia csatornán.

3.11.4.3.2 *Szinkronizálás*. Azokat a földi telepítésű, irányszög és adat sugárzó berendezéstől származó adásokat, amelyek egy adott futópályát szolgálnak ki, időben kell szinkronizálni úgy, hogy az interferenciamentes működés biztosítva legyen az üzemelés közös rádiófrekvencia csatornáján.

3.11.4.3.3 *Funkció sebességek*. Az egyes kisugárzott funkciókat a következő táblázatban megadott ütemben kell kisugározni:

Funkció	Bármely 10 másodperces időtartam alatt mért átlag ütem (Hz)
Megközelítési oldalszög útirány-vezetés	13 ± 0,5
Nagysebességű megközelítési oldalszög útirány-vezetés	39 ± 1,5
Hátsó irányszektor útirány-vezetés	6,5 ± 0,25
Megközelítési magassági útirány-vezetés	39 ± 1,5
Kilebegtetési magassági útirány-vezetés	39 ± 1,5
Alap adatok	Lásd az 'A' - Függelék A-7. Táblázatát
Kiegészítő adatok	Lásd az 'A' - Függelék A-10. és A-12. Táblázatát

3.11.4.3.3.1 **Ajánlás**. - *Amikor az arányos útirány-vezetési szektor nem nagyobb plusz, vagy mínusz 40 foknál és a kilebegtetési magasság, vagy más bővített funkció nem szükséges, akkor a nagysebességű megközelítési oldalszög útirány-vezetés funkciót kell használni.*

Megjegyzés. - Az alkalmazásra vonatkozó tájékoztatás a "G"- Melléklet 2.3.3 pontjában található.

3.11.4.3.4 *Funkció időzítés*. Az egyes szög- és adat funkcióra az időzítési szabványok azok, amelyeket az A- Függelék A-1.-től A-6.-ig terjedő táblázataiban és az A-8. táblázatában meghatározásra kerültek. A földi berendezés valamennyi felsorolt funkciójának belső időzítési pontossága - a vibrálást (jitter) is beleértve – plusz, vagy mínusz 2 mikroszekundum eltéréssel a meghatározott névleges értéknek kell lenni. Az időzítési vibrálásnak 1 mikroszekundum négyzetes középértéknél (RMS) kisebbnek kell lennie.

1. Megjegyzés. - Valamennyi felsorolt funkció időzítése jelzi az adott esemény idő-rés kezdetét és az előző esemény idő-rés végét. Az aktuális adás karakterisztikája és időzítése meg kell, hogy feleljen az alkalmazandó pontokban előírtaknak.

2. Megjegyzés. - Az időzítési pontosság mérésére vonatkozó tájékoztatás a "G"- Melléklet 2.2.2 pontjában található.

3.11.4.3.5 *Funkció sorrend*. Bármely funkció adásismétlődése közötti időtartam úgy kell, hogy változzon, ami a szinkron-interferencia elleni védettséget biztosítja.

1. Megjegyzés. - Valamennyi funkció sajátos jellemzőkkel rendelkezik és az időosztásos multiplex (TDM) sorrend bármely helyén szerepelhet (a hátsó irányszektor kivételével, amelyet mindig meg kell, hogy előzzön a 2. számú alapadat szó).

2. Megjegyzés. - Néhány olyan sorrend, amely szinkron interferencia-mentesnek bizonyult, a "G"-Melléklet 2.1.4 pontjában kerül ismertetésre.

3.11.4.4 *Bevezető jelszakasz*

3.11.4.4.1 Egy bevezető jelszakasz (előtag) jelet kell sugározni a felhasználható fedési szektor egész területére, az utána következő funkció azonosítása céljából. A bevezető jelszakasznak tartalmaznia kell egy rádiófrekvenciás vivőhullám begyűjtési periódust, egy vevő referencia idő kódot és egy funkció azonosító kódot. A bevezető jelszakasz adás időzítésének az A - Függelék A-1. táblázatában meghatározottaknak kell lenni.

3.11.4.4.2 *Vivőhullám begyűjtés*. A bevezető jelszakasz adását egy modulálatlan rádiófrekvenciás vivőhullámmal kell kezdeni, úgy, ahogy az az 'A'-Függelék A-1. táblázatában meghatározásra került.

3.11.4.4.3 *Moduláció és kódolás*

3.11.4.4.3.1 *Differenciális fázis eltolásos kódolás (DPSK).* Az alábbi 3.11.4.8 pontban meghatározott bevezető jelszakasz kódokat, valamint az alap és kiegészítő adatok jeleit a rádiófrekvenciás vivőhullám differenciális fázis eltolásos kódolásával (DPSK) kell leadni. A "nullát" a 0 fokos, plusz, vagy mínusz 10 fokos fáziseltolás, az "egyet" pedig a 180 fokos, plusz, vagy mínusz 10 fokos fáziseltolás kell, hogy képviselje. A modulációs sebességnek 15 625 baud-nak (bit/mp) kell lenni. A differenciális fázis eltolásos kódolás fázisátmenete belső időzítési pontosságának a korábbi 3.11.4.3.4 pontban meghatározottnak kell lenni. A fázisátmenet során nem lehet amplitúdó-modulációt alkalmazni. Az átmeneti idő nem haladhatja meg a 10 mikroszekundumot, és a fázis-sietésnek valamint a fázis-késésnek egyformának kell lenni egy átmeneti szakaszban.

3.11.4.4.3.2 *A vevő vonatkoztatási ideje*. Minden egyes bevezető jelszakasznak magába kell foglalnia egy vevő azonosítási idő kódot, a 11101-et (az I_1 - I_5 bitek). A kódban lévő utolsó fázisátmenet középpontja idejének kell a vevő vonatkoztatási időnek lenni. A vevő vonatkoztatási idő kódot, a vevő vonatkoztatási idő kódot közvetlenül követő érvényes funkció azonosítás dekódolásának kell érvényesíteni.

3.11.4.4.3.3 *Funkció azonosítás*. A vevő vonatkoztatási idő kód után egy funkció azonosító kódnak kell következni. Ennek a kódnak abból az öt információs bitből kell állnia (I_6 - I_{10}), amelyek lehetővé teszik a 31 különböző funkció azonosítását, és még két ellenőrző bitből (I_{11} és I_{12}) úgy, ahogy azt a következő táblázat mutatja:

	Kódok						
Funkció	I_6	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}
Megközelítési oldalszög	0	0	1	1	0	0	1
Nagysebességű megközelítési oldalszög	0	0	1	0	1	0	0
Megközelítési magassági szög	1	1	0	0	0	0	1
Kilebegtetési magasság	0	1	1	0	0	0	1
Hátsó irányszektor	1	0	0	1	0	0	1
360°-os oldalszög	0	1	0	0	1	0	1
Alapadat 1	0	1	0	1	0	0	0
Alapadat 2	0	1	1	1	1	0	0
Alapadat 3	1	0	1	0	0	0	0
Alapadat 4	1	0	0	0	1	0	0
Alapadat 5	1	1	0	1	1	0	0
Alapadat 6	0	0	0	1	1	0	1
Kiegészítő adat A	1	1	1	0	0	1	0
Kiegészítő adat B	1	0	1	0	1	1	1
Kiegészítő adat C	1	1	1	1	0	0	0

Megjegyzés. - A funkció azonosító kódokat úgy kell kiválasztani, hogy az I_{11} és I_{12} paritás bitek kielégítsék az egyenleteket:

$$I_6 + I_7 + I_8 + I_9 + I_{10} + I_{11} = \text{PÁROS}$$

$$I_6 + I_8 + I_{10} + I_{12} = \text{PÁROS}$$

3.11.4.5 *Szög útirány-vezetési paraméterek.* A szög útirány-vezetési információkat a vett TO és FRO letapogató sugárnyalábok fő szirmainak középpontjai közötti idő-elkülönítés mennyiségével kell kódolni. A kódolást a fedélzeti berendezésnek kell kiértékelni az idő lineáris függvényeként a következők szerint:

$$\theta = (T_0 - t)\ V/2$$

ahol:

θ = Az oldalszög, vagy a magassági szög útirány-vezetési szögének értéke, fokokban,

t = A TO és az FRO sugárnyaláb középpontja közötti idő-elkülönítés, mikroszekundumban,

T_0 = A nulla fokoknak megfelelő TO és FRO sugárnyaláb középpontja közötti idő-elkülönítés, mikroszekundumban,

V = A letapogatási sebesség leosztási állandója mikroszekundumonként, fokokban.,

3.11.4.5.1 A szög útirány-vezetési paraméterek értékeinek a következő táblázatban bemutatottaknak kell lenni:

Funkció	Maximális letapogatási szög (fok)	A t értéke a maximális letapogatási szöghöz (μs)	T0 (μ)	V (fok/μs)
Megközelítési oldalszög	-62-től +62-ig	13 000	6 800	0,020
Nagysebességű megközelítési oldalszög	-42-től +42-ig	9 000	4 800	0,020
Hátsó irányszektor	-42-től +42-ig	9 000	4 800	-0,020
Megközelítési magassági szög	-1,5-től +29,5-ig	3 500	3 350	0,020
Kilebegtetési magasság	2-től +10-ig	3 200	2 800	0,010

1. Megjegyzés. - A TO letapogatás vége és az FRO letapogatás kezdete között van egy megfelelő időtartamú sugárzás nélküli szünet idő. A kiegészítő tájékoztatásokat a "G"- Melléklet 2.2.1 pontja adja meg.

2. Megjegyzés. - A bemutatott maximális letapogatási szögeknél elfogadott az, hogy a letapogatási szögnek - a sikeres dekódolás lehetővé tételéhez - legalább a detektált letapogatási sugárnyaláb burkológörbéje szélességének a felével meg kell haladnia (a megfelelő értékű szögben) az arányos útirány-vezetési szektor határait.

3.11.4.5.2 A földi berendezés letapogató sugárnyaláb sebessége tűréshatárának és a nulla fokoknak megfelelő TO és FRO impulzusok közötti idő-elkülönítés tűréshatárának kielégítőnek kell lenni ahhoz, hogy a következő 3.11.4.9 pontban meghatározott pontossági követelményeket kielégítse.

3.11.4.5.3 A TO és FRO letapogatási adásokat szimmetrikusan kell beszabályozni az A- Függelék A-2-től A-5-ig tartó táblázataiban felsorolt letapogatási középpontok köré. A letapogatási középpontoknak és a TO, valamint FRO letapogatási adások közötti időköz közepének egybe kell esni a plusz, vagy mínusz 10 mikroszekundumos tűréshatárral.

3.11.4.6 *Oldalszög útirány-vezetés funkciók*

3.11.4.6.1 Az útirány-vezetési szög minden egyes leadásának magába kell foglalnia egy, az óramutató járásával megegyező irányú TO letapogatást és azt követően egy, az óramutató járásával ellentétes irányú FRO letapogatást az antenna felettről nézve. A megközelítési oldalszög funkcióra a növekvő szögértékeknek kell a TO letapogatás irányába lenni. A hátsó irányszektor funkciónál a növekvő szögértékeknek kell az FRO letapogatás irányába lenni.

Megjegyzés. - A letapogatási szabályokat bemutató ábrát a "G"- Melléklet 2.3.1 pontja tartalmazza.

3.11.4.6.2 *Szektor jelek*. Minden oldalszög funkció leadási formátumának magába kell foglalnia a légijármű fedélzeti antenna kiválasztási idő-rést, a fedésterületen kívül jelzést és a vizsgáló impulzusokat, úgy, ahogy ez az ”A”- Függelék A-2 és A-3 táblázataiban meghatározásra került. A szektorjelek belső időzítési pontossága meg kell, hogy feleljen a korábbi 3.11.4.3.4 pontban a differenciális fázis-eltolásos kódolás (DPSK) leadására meghatározott belső időzítési pontosságnak.

3.11.4.6.2.1 *A földi berendezés azonosítása*. Egy adott futópályát kiszolgáló MLS berendezést egy négy-betűs, M-betűvel kezdődő betűcsoport azonosítóval kell azonosítani. Ezt az azonosító jelzést kell az első betű nélkül egy digitális szóként leadni az ”A”- Függelék A-7. táblázatában felsoroltak szerint.

Megjegyzés. - Nem szükséges az, hogy az MLS földi berendezés a szög útirány-vezetési fedésterületi szektoron kívülre azonosítót adjon le. Ha az MLS csatorna azonosítás a szög útirány-vezetési fedésterületi szektoron kívülre üzemeltetési szempontból szükséges, akkor azt biztosítani lehet egy kapcsolt telepítésű körkörös sugárzású DME-től. (Lásd az alábbi 3.11.5.5.2 pontot és a “G”- Melléklet 8.2 pontját.)

3.11.4.6.2.1.1 A jelzést az adat csatornán a megközelítési oldalszög és a hátsó irányszektor fedésterületre kell leadni.

3.11.4.6.2.1.2 Az oldalszög bevezető jelszakaszt követő - a földi berendezés azonosítására szolgáló - előzetesen kiosztott váltakozó (Morse-kód), az idő-résben lévő kód bitet a "NULLA" helyzetben kell rögzíteni.

3.11.4.6.2.2 *Légijármű fedélzeti antenna kiválasztó jel.* A légijármű fedélzeti antenna kiválasztó jelet egy "nulla" - hat-bit időtartam hosszúságú - differenciális fázis-eltolásos kódolású (DPSK) jelként kell kisugározni. A jelnek rendelkezésre kell állni azon teljes fedési szektoron belül, amelyben a megközelítési, vagy a hátsó irányszektor útirány-vezetés biztosítva van.

Megjegyzés. - Ez a jel biztosítja a legmegfelelőbb antenna kiválasztási lehetőséget egy több-antennás fedélzeti felszerelés esetén.

3.11.4.6.2.3 *Oldalszög fedésterületen-kívül jelző impulzus*. Ahol fedésterületen-kívül jelző impulzusokat használnak, ott azoknak:

a) nagyobbaknak kell lenni bármilyen, a fedésterületen kívüli szektorban lévő útirány-vezetési jelnél;

b) legalább 5 dB-el kisebbnek kell lenni a tartson-balra (tartson-jobbra) terület jelszintjénél a tartson-balra (tartson-jobbra) biztonsági területen belül, és

c) legalább 5 dB-el kisebbnek kell lenni az arányos fedési területen belüli letapogató sugárnyaláb szintjénél.

Az egyes impulzusok fél amplitúdó pontban mért időtartamának legkevesebb 100 mikroszekundumnak, a felfutási és lefutási időnek pedig 10 mikroszekundumnál kisebbnek kell lenni.

3.11.4.6.2.3.1 Ha kívánatos, akkor megengedhetőnek kell lenni két egymás utáni impulzus kisugárzásának az egyes fedésterületen-kívül jelzés idő-réseiben. Ahol ilyen impulzus-párokat alkalmaznak, ott az egyes impulzusok időtartamának legalább 50 mikroszekundumnak kell lenni, és a felfutási és lefutási időnek 10 mikroszekundumnál kisebbnek kell lenni.

3.11.4.6.2.3.2 Az egymás fedési diagramját átfedő antennákból kisugárzott fedésterületen-kívül jelző impulzusokat legalább 10 mikro-szekundummal el kell különíteni egymástól.

3.11.4.6.2.4 *Földről kisugárzott vizsgáló jelzések*

Megjegyzés. - Az oldalszög útirány-vezetési jel formátumban egy időtartam került fenntartásra a földről kisugárzott vizsgáló jelzések jövőbeli felhasználásának lehetővé tételéhez.

3.11.4.6.2.5 Kiegészítő biztonsági-vezetési szektor. Ahol a biztosított arányos útirány-vezetési szektor kisebb annál a minimális fedésterületnél, mint ami az alábbi 3.11.5.2.2.1.1 a) és 3.11.5.2.2.2 a) pontban meghatározásra kerül, ott kiegészítő biztonsági vezetést kell biztosítani a fedésterületi szektornak a tartson-balra / tartson-jobbra biztonsági impulzusok kisugárzásával való kiegészítésénél a megközelítési oldalszög, a nagysebességű megközelítési oldalszög és a hátsó irányszektor funkciók formátumában. Másik lehetőségként megengedhetőnek kell lennie annak, hogy a kiegészítő biztonsági vezetés úgy legyen biztosítva, ami lehetővé teszi azt, hogy a letapogató sugárnyaláb a kijelölt arányos útirány-vezetési szektoron kívülre is kiterjen, és megadja a tartson-balra, vagy tartson-jobbra biztonsági tájékoztatásokat, ahogy megfelelő, akkor, amikor a dekódolt szög meghaladja az arányos útirány-vezetési fedés kijelölt határait.

3.11.4.6.2.5.1 A kiegészítő biztonsági-vezetési információkat a szög letapogatási idő-réseken belül leadott impulzus-párokkal kell biztosítani. Az első impulzus-párnak magába kell foglalnia egy olyan impulzust, ami a letapogató sugárnyaláb TO letapogatásának az indulási idejével szomszédos, és egy olyan impulzust, ami a FRO letapogatás megállási idejével szomszédos. A második impulzus-párnak magába kell foglalnia egy olyan impulzust, ami a letapogató sugárnyaláb TO letapogatásának megállási idejével szomszédos, és egy olyan impulzust, ami a FRO letapogatás indulási idejével szomszédos. A tartson-jobbra biztonsági impulzusoknak pozitív szöget kell képviselni, a tartson-balra biztonsági impulzusoknak pedig negatív szöget kell képviselni. Az egyes biztonsági impulzusok impulzus-szélességének – plusz, vagy mínusz 5 mikroszekundum tűrés-határral - 50 mikroszekundumnak kell lenni. Az adó kapcsolási ideje a biztonsági impulzusok és a letapogató sugárnyaláb adása között nem haladhatja meg a 10 mikroszekundumot. Az impulzus felfutási idő az egyes biztonsági impulzusok azon éleinél, amelyek nem szomszédosak a letapogató sugárnyalábbal, 10 mikroszekundumnál kevesebb kell, hogy legyen.

3.11.4.6.2.5.2 A kiegészítő biztonsági-vezetési impulzusok térbeli jel karakterisztikáinak a következőknek kell lenni:

a) a tartson-jobbra kiegészítő biztonsági-vezetési szektorban a tartson-jobbra biztonsági-vezetési jelnek legalább 5 dB-el meg kell haladni a letapogató sugárnyaláb oldalszirmait és az összes egyéb útirány-vezetési és fedésterületen-kívül jelzés jeleit;

b) a tartson-balra kiegészítő biztonsági-vezetési szektorban a tartson-balra biztonsági-vezetési jelnek legalább 5 dB-el meg kell haladni a letapogató sugárnyaláb oldalszirmait és az összes egyéb útirány-vezetési és fedésterületen-kívül jelzés jeleit;

c) az arányos útirány-vezetési szektoron belül a biztonsági-vezetési jeleknek legalább 5 dB-el alatta kell lenni a letapogató sugárnyaláb fő szirma alatt.

3.11.4.6.2.5.3 A biztonsági-vezetési jelek teljesítménysűrűségének meg kell felelni annak, ami az alábbi 3.11.4.10.1 pont szerint szükséges.

1. Megjegyzés. - A "G"- Melléklet 2.3.4 pontja a következőkre vonatkozó tájékoztatásokat foglalja magába:

a) a biztonsági-vezetési és a letapogató sugárnyaláb időzítési rendszerét;

b) a biztonsági-vezetési és a letapogató sugárnyaláb jelei közötti átmeneti tartományban lévő impulzusok burkológörbéit;

c) a biztonsági-vezetési jelek (tartson-jobbra / tartson-balra) szabályainak változásait.

2. Megjegyzés. - Az arányos fedésterület határvonalai az alap adatokban kerülnek adásra úgy, ahogy ez az alábbi 3.11.4.8.2 pontban meghatározásra kerül.

3.11.4.7 *Magassági szög útirány-vezetési funkciók*

3.11.4.7.1 *Letapogatási szabályok*. A megközelítési magassági szög funkciónál a növekvő magassági szög útirány-vezetési szögeknek felfelé kell növekedniük. A nulla magassági szögnek egybe kell esni azzal a vízszintes síkkal, amely a megfelelő antenna fázis-középpontján áthalad. Minden egyes magassági szög leadásnak tartalmazni kell egy TO letapogatást, amelyet egy FRO letapogatás követ. A TO letapogatásnak kell a növekvő szög értékek irányában lenni.

3.11.4.7.2 *Szektor jel*. Egy fedésterületen-kívül jelző impulzus sugárzására helyet kell biztosítani a megközelítési magassági szög funkció formátumában. Ahol egy fedésterületen-kívül jelző impulzust alkalmaznak, ott annak: (1) nagyobbnak kell lenni bármilyen, a fedésterületen-kívül jelzés szektorban lévő útirány-vezetési jelnél és (2) legalább 5 dB-el kisebbnek kell lenni az útirány-vezetési szektorban lévő útirány-vezetési jeleknél. A magassági szög fedésterületen-kívül jelzés időzítésének az "A"- Függelék A-4. táblázatában megadottakkal megegyezőnek kell lenni. Az egyes impulzusok impulzusszélességének a fél amplitúdó pontokban mérve legalább 100 mikroszekundumnak és a felfutási és lefutási időknek 10 mikroszekundumnál kevesebbnek kell lenniük.

3.11.4.7.2.1 Ha kívánatos, akkor megengedhetőnek kell lenni két egymás utáni impulzus kisugárzásának az egyes akadálymentesség jelzés időréseiben. Ahol ilyen impulzus-párokat alkalmaznak, ott az egyes impulzusok időtartamának legalább 50 mikroszekundumnak, és a felfutási és lefutási időnek 10 mikroszekundumnál kisebbnek kell lenni.

3.11.4.8 *Adat funkciók*. Az MLS jel formátumban biztosítani kell az alap adatok és a kiegészítő adatok sugárzását.

Megjegyzés. - A földi berendezések adat továbbítására és felügyelő rendszerére vonatkozó követelmények a következő 3.11.5.4 pontban kerülnek meghatározásra.

3.11.4.8.1 *Adatok sugárzása*. Az adatokat a 3.11.4.4.3.1 pontban meghatározottak szerint kell sugározni.

3.11.4.8.2 *Az Alap adatok szerkezete és időzítése*. Az alap adatokat 32-bites szavakba kell kódolni, és ezeket a korábbi 3.11.4.4 pontban meghatározott funkció bevezető jelszakaszból (12 bit) és az "A"- Függelék A-7. táblázatában meghatározott adott tartalomból kell összeállítani. Az alap adat szavak időzítése az "A"- Függelék A-6. táblázatában meghatározottaknak megfelelő kell, hogy legyen. A tartalom, az ugyanazon szavak leadása közötti maximális időköz és a szavak szervezése meg kell, hogy feleljen az "A"- Függelék A-7. táblázatában meghatározottaknak. A digitális adatokat tartalmazó információkat a legkisebb helyértékű bittel kezdve kell kisugározni. A legkisebb bináris szám jelenti az alsó abszolút tartomány határt, bináris lépésekkel növekedve az abszolút tartomány felső határáig, az ”A”- Függelék A-7. táblázatában előírtaknak megfelelően.

3.11.4.8.2.1 *Az Alap adatok tartalma*. Az ”A”- Függelék A-7. táblázatában meghatározott adat elemeket a következők szerint kell értelmezni:

a) *A Megközelítési oldalszög antenna és a futópálya küszöbe közötti távolság* azt a minimális távolságot jelenti, ami a megközelítési oldalszög antenna fázis középpontja és a futópálya küszöbét magába foglaló, a futópálya középvonalára merőleges függőleges sík között van.

b) *A Megközelítési oldalszög arányos fedésterület határvonal* annak a szektornak a határvonalait jelenti, amelybe az arányos megközelítési oldalszög útirány-vezetés sugárzásra kerül.

c) *A Kiegészítő biztonsági jel típusa* az oldalszög kiegészítő biztonsági jel biztosításának módját jelenti.

d) *A Minimális siklópálya* a nulla fokos oldalszög mentén a 3.11.1 pontban meghatározottaknak megfelelő legalacsonyabb süllyedési szöget jelenti.

e) *A Hátsó irányszektor állapota* a hátsó irányszektor berendezés működési állapotát jelenti.

f) *A DME állapota* a DME berendezés működési állapotát jelenti.

g) *A Megközelítési oldalszög állapot* a megközelítési oldalszög adó berendezés működési állapotát jelenti.

h) *A Megközelítési magassági szög állapota* a megközelítési magassági szög adó berendezés működési állapotát jelenti.

i) *A Sugárnyaláb szélesség* az adott funkció antennájának a sugárnyaláb szélességét jelenti úgy, ahogy azt a 3.11.1 pont meghatározza.

j) *A DME távolság* azt a minimális távolságot jelenti, ami a DME antenna fázis középpontja és az MLS alappontját magába foglaló és a futópálya középvonalára merőleges függőleges sík között van.

k) *A Megközelítési oldalszög mágneses tájolása* azt a szöget jelenti, amely a vízszintes síkban a Mágneses Északtól az óramutató járásával megegyező irányban, a megközelítési oldalszög-adó antennájától kiindulóan a nulla-fokos megközelítési oldalszögig mért szög. A mért szög csúcspontjának a megközelítési oldalszög adó antenna fázis középpontjának kell lenni.

l) *A Hátsó irányszektor mágneses tájolása* azt a szöget jelenti, amely a vízszintes síkban a Mágneses Északtól az óramutató járásával megegyező irányban, a hátsó irányszektor adó antennájától kiindulóan a hátsó irányszektor nulla-fokos irányszögig mért szög. A mért szög csúcspontjának a hátsó irányszektor adó antenna fázis középpontjának kell lenni.

m) *A Hátsó irányszektor arányos fedésterület határvonala* annak a szektornak a határvonalait jelenti, amelybe az arányos hátsó irányszektor útirány-vezetés sugárzásra kerül.

n) *Az MLS földi berendezés azonosítója* a 3.11.4.6.2.1 pontban előírtak szerinti rendszer azonosító utolsó három karakterét jelenti. A karaktereket az 5.sz. Nemzetközi Távíró ABC (IA-5) előírásai szerint kell kódolni a b_1-től a b_6-ig terjedő bitek felhasználásával.

1. Megjegyzés. - Az 5.sz. Nemzetközi Távíró ABC (IA-5) az Annex 10 III. Kötetében van meghatározva.

2. Megjegyzés. - Ennek a kódnak a b_7 bitjét a légijármű fedélzeti vevő a b_6 bit-el való kiegészítéssel állíthatja helyre.

3.11.4.8.3 *A Kiegészítő adatok szervezése és időzítése*. A Kiegészítő adatokat 76-bites szavakba kell szervezni, és ezeknek a 3.11.4.4 pont szerint meghatározott (12-bites) funkció bevezető jelszakaszból (előtagból), az ”A”- Függelék A-9. táblázatában meghatározottaknak megfelelő (8-bites) címből és az ”A”- Függelék A-10., A-11., A-12., A-13. és A-15. táblázatában meghatározottaknak megfelelő adat tartalomból és paritás bitekből (56 bit) kell állni. Három funkció azonosító kód lefoglalásra került a Kiegészítő adat ’A’, a Kiegészítő adat ’B’ és a Kiegészítő adat ’C’ adásának jelzésére. A Kiegészítő adat funkció időzítésének annak kell lenni, ami az ”A”- Függelék A-8. táblázatában előírásra került. Két Kiegészítő adat szó formátumot kell biztosítani, egyet a digitális adatokhoz és egyet az alfanumerikus karakter adatokhoz. A digitális információkat tartalmazó adatokat először a legkisebb helyértékű bit kisugárzásával kell leadni. Az ABC-karaktereket a B1-től a B39-ig terjedő adat szavakban, az 5.sz. Nemzetközi Távíró ABC (IA-5) előírásaival összhangban kell kódolni a b_1-től a b_5-ig tartó bitek felhasználásával, és a b_1 bitet kell elsőként továbbítani. Az egyéb adat szavakban az Alfanumerikus adat karaktereket az IA-5-el összhangban kell kódolni, a hét információs bit felhasználásával és egy páros paritás bitet kell az egyes karakterekhez hozzáadni. Az alfanumerikus adatokat abban a sorrendben kell továbbítani, amely szerint kiolvasásra kerülnek Egy karakter soros továbbítása esetén az alacsonyabb helyértékű bitet kell először leadni és a paritás bitet utolsóként.

1. Megjegyzés. - Az 5. sz. Nemzetközi Távíró ABC (IA-5) az Annex 10 III. Kötetében van meghatározva.

2. Megjegyzés. - A Kiegészítő adat ’A’ tartalma a következő 3.11.4.8.3.1 pontban került meghatározásra. A Kiegészítő adat ’B’ tartalmát az alábbi 3.11.4.8.3.2 pont határozza meg. A Kiegészítő adat ’C’ tartalma nemzeti felhasználásra került fenntartásra.

3.11.4.8.3.1 *A Kiegészítő adat ’A’ tartalma*. Az ”A”- Függelék A-10. táblázatában meghatározott, A1-től A4-ig terjedő kiegészítő adat szavakban lévő adat elemeket a következők szerint kell meghatározni:

a) *A Megközelítési oldalszög antenna eltolódás* a megközelítési oldalszög antenna fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

b) *A Megközelítési oldalszög antenna távolsága az MLS alapponttól* azt a minimális távolságot jelenti, ami a megközelítési oldalszög antenna fázis középpontja és az MLS alappontját magába foglaló, a futópálya középvonalára merőleges függőleges sík között mérhető.

c) *A Megközelítési oldalszögnek a futópálya középvonalához viszonyított irányítottsága* a megközelítési oldalszög útirány-vezetés nulla foka és a futópálya középvonala közötti minimális szöget jelenti.

d) *A Megközelítési oldalszög antenna koordináta rendszere* azt a koordináta rendszert jelenti (síkbeli, vagy kúpos), amely szerint a megközelítési oldalszög antenna a szög adatokat kisugározza.

Megjegyzés. - Annak ellenére, hogy a fenti Szabvány egy más lehetőséget biztosító koordináta rendszer lehetővé tételét figyelembe véve került kidolgozásra, a síkbeli koordináta rendszer nincs bevezetve és a jövőbeni kivitelezése sincsen tervezve.

e) *A Megközelítési oldalszög antenna magassága* az antenna fázisközéppontjának az MLS alappontjához viszonyított függőleges helyzetét jelenti.

f) *A Megközelítési magassági szög antenna eltolódás* a magassági szög antenna fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

g) *Az MLS alappont - futópálya küszöb távolság* azt a távolságot jelenti, amely az MLS alappontból a futópálya középvonalán a futópálya küszöbéig mérhető.

h) *A Megközelítési magassági szög adó antenna magassága* a magassági szög adó antenna fázis középpontjának az MLS alappontjához viszonyított függőleges helyzetét jelenti.

i) *Az MLS alappont tengerszinthez viszonyított magassága* az alappontnak a közepes tengerszinthez (mean sea level = msl) viszonyított magasságát jelenti.

j) *A Futópálya küszöbének magassága* a futópálya küszöbe és az MLS alapponthoz viszonyított középvonal metszéspontjának a függőleges helyzetét jelenti.

k) A *DME eltolódása* a DME antenna fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

l) *A DME - MLS alappont távolság* a DME antenna fázis középpontja és az MLS alappontját magába foglaló, a futópálya középvonalára merőleges függőleges sík közötti minimális távolságot jelenti.

m) *A DME antenna magassága* az antenna fázis középpontjának az MLS alapponthoz viszonyított függőleges helyzetét jelenti.

n) *A Futópálya megállási végének távolsága* a futópálya megállási vége és az MLS alappont között a futópálya középvonalán mért távolságot jelenti.

o) *A Hátsó irányszektor antenna eltolódása* a hátsó irányszektor antennájának fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

p) *A Hátsó irányszektor - MLS alappont távolság* a hátsó irányszektor antenna és az MLS alappontját magába foglaló, a futópálya középvonalára merőleges függőleges sík közötti minimális távolságot jelenti.

q) *A Hátsó irányszektornak a futópálya középvonalához viszonyított irányítottsága* a nulla fokos hátsó irányszektor oldalszög és a futópálya középvonala közötti minimális szöget jelenti.

r) *A Hátsó irányszektor antenna koordináta rendszere* azt a koordináta rendszert jelenti (síkbeli, vagy kúpos), amely szerint a hátsó irányszektor antenna a szög adatokat kisugározza.

Megjegyzés. - Annak ellenére, hogy a fenti Szabvány egy más lehetőséget biztosító koordináta rendszer lehetővé tételét figyelembe véve került kidolgozásra, a síkbeli koordináta rendszer nincs bevezetve és a jövőbeni kivitelezése sincsen tervezve.

s) *A Hátsó irányszektor antennájának magassága* az antenna fázis középpontjának az MLS alapponthoz viszonyított függőleges helyzetét jelenti.

Megjegyzés. - A terv szerint további Kiegészítő adat 'A' szó nem kerül majd meghatározásra.

3.11.4.8.3.2 *A Kiegészítő adat 'B' tartalma*. A Kiegészítő adat 'B' szavakat úgy kell meghatározni, ahogy ez az "A"- Függelék A-11. és A-13. táblázatában előírásra került.

3.11.4.8.3.2.1 *A Mikrohullámú leszállító rendszer / területi navigációs (MLS / RNAV) eljárás adatai.* Ahol szükséges, ott a B1-től a B39-ig terjedő kiegészítő adat szavakat kell felhasználni az MLS /RNAV eljárásokat alátámasztó adatok továbbítására. Megengedhetőnek kell lenni annak, hogy ezeket az eljárás adatokat két különálló adatbázisba osszák: az egyikbe a megközelítési oldalszög szektorba kisugárzandó adatokat, a másikba a hátsó irányszektorba kisugárzandó adatokat. Az egyes eljárások adatait annak a fedésterületi szektornak az adatbázisába kell kisugározni, amelyikbe az eljárás megkezdődik. A megszakított megközelítési eljárás adatait abba az adatbázisba kell beépíteni, amely a hozzá kapcsolódó megközelítési eljárást tartalmazza.

3.11.4.8.3.2.2 *Az Eljárások adatbázisának szerkezete*. Ahol használatos, ott az egyes eljárások adatbázisát a következők szerint kell összeállítani:

a) egy térkép / ciklikus redundancia ellenőrző (CRC) szóval kell azonosítani az adatbázis méretet, a meghatározott eljárások számát és a ciklikus redundancia ellenőrző (CRC) kódot az adatbázis érvényesítéséhez;

b) eljárás megjelölő szavakkal kell azonosítani az adatbázison belül lévő összes megnevezett megközelítési és indulási eljárást; és

c) útvonal-pont adat szavakkal kell azonosítani az eljárások útvonal-pontjai helyeit és egymás utáni sorrendjét.

Megjegyzés. - A B1-től a B39-ig terjedő Kiegészítő adat 'B' szavak szerkezete és kódolása az "A"-Függelék A-14.-től az A-17.-ig terjedő táblázataiban kerültek meghatározásra. Az MLS / RNAV eljárások kódolására vonatkozó útmutató anyag a "G"- Mellékletben került megadásra.

3.11.4.9 *Rendszer pontosság*. Az itt meghatározott pontossági szabványokat - ha nincs másképpen jelezve - 95 százalékos valószínűségi alapon kell kielégíteni.

1. Megjegyzés. - A teljes hibahatárok magukba foglalják az összes forrásból eredő hibát, azaz a légijármű fedélzeti berendezésektől, a földi berendezésektől és a terjedési hatásokból eredő hibákat.

2. Megjegyzés. - Az a cél, hogy a hibahatárokat azon repülési pályaszakaszok hosszában alkalmazzák, amelyek magukba foglalják a megközelítési vonatkoztatási pontot, vagy a hátsó irányszektor vonatkoztatási pontját. Az MLS hibák értelmezésére az ezeknek a hibáknak a repülési ellenőrzésnek megfelelő időközök során történő mérésére vonatkozó tájékoztatásokat a "G"- Melléklet 2.5.2 pontja adja meg.

3. Megjegyzés. - A megfelelő vonatkoztatási pontoktól eltérő pontokban megengedhető teljesítmény-csökkenés elfogadható hibáinak meghatározásához először a vonatkoztatási pontban meghatározott pontosságot kell átalakítani a lineáris értékekről az azoknak megfelelő szög-értékké, az antennától kiindulóan.

3.11.4.9.1 *MLS megközelítési vonatkoztatási pont*. Az MLS megközelítési vonatkoztatási pont magasságának 15 m-nek (50 láb) kell lenni. A plusz 3 m-es (10 láb) tűréshatár a megengedhető.

1. Megjegyzés. - Az MLS megközelítési vonatkoztatási pont magasságának meghatározása üzemeltetési szempontból azért fontos, hogy az akadályok feletti biztonságos útirány-vezetés, valamint a kiszolgált pálya biztonságos és hatékony használata biztosítva legyen. A 3.11.4.9.1 pontban említett magassági adatok az Annex 14-ben meghatározott 3, vagy 4 kódszámú futópályákra elfogadottak.

2. Megjegyzés. - Ugyanakkor ez a vonatkoztatási pont olyan alkalmas pontot szolgáltat, melyhez a pontosságot és egyéb működési paramétert viszonyítani lehet.

3. Megjegyzés. - Az MLS megközelítési vonatkoztatási pont fenti magassági értékeinek elérésében egy maximum 5,8 m (19 láb) függőleges távolság került a légijárműveknek a végső megközelítésre kiválasztott fedélzeti MLS antennája pályagörbéjének és a légijármű főfutója kerekeinek a futópálya küszöbe feletti legalacsonyabb pályagörbéje között alapfeltételként figyelembevételre. Az ezt a követelményt meghaladó légijárművek esetében megfelelő lépéseket lehet tenni, vagy úgy, hogy fenntartsanak egy kielégítő akadálymentességet a küszöb felett, vagy úgy, hogy szabályozzák a megengedett üzemeltetési minimumot.

3.11.4.9.2 *Az MLS hátsó irányszektorának vonatkoztatási pontja.* Az MLS hátsó irányszektor vonatkoztatási pont magasságának 15 m-nek (50 láb) kell lenni. A plusz 3 m-es (10 láb) tűréshatár a megengedhető.
Megjegyzés. - Az MLS hátsó irányszektora vonatkozási pontja meghatározásának a célja az, hogy egy olyan megfelelő pont legyen biztosítva, amelynél a funkció pontosságát és egyéb paramétereket meg lehet határozni.

3.11.4.9.3 Az útvonal-követési hibának (PFE) magába kell foglalnia az útirány-vezetési jel hibájának a fedélzeti vevő kimenetén megjelenő azon frekvencia összetevőit is, amelyek az oldalszög útirány-vezetési információkra 0,5 rad/s alatt vannak, vagy a magassági szög útirány-vezetési információkra az 1,5 rad/s alatt vannak. A kormányzási elmozdulási zajnak magába kell foglalnia az útirány-vezetési jel hibájának a fedélzeti vevő kimenetén megjelenő azon frekvencia összetevőit is, amelyek az oldalszög útirány-vezetési információkra 0,3 rad/s alatt vannak, vagy a magassági szög útirány-vezetési információkra a 0,5 rad/s alatt vannak. Az ennek a mérésnek a céljára használatos vevő kimeneti szűrőjének sarok-frekvenciája 10 rad/s.

3.11.4.9.4 *Megközelítési oldalszög útirány-vezetési funkciók.* A megközelítési vonatkoztatási pontban a megközelítési oldalszög funkciónak a következő teljesítményt kell biztosítania:

a) az útvonal-követési hiba (PFE) nem lehet nagyobb plusz, vagy mínusz 6 m-nél (20 láb);

b) az útvonal-követési zaj (PFN) nem lehet nagyobb plusz, vagy mínusz 3,5 m-nél (11,5 láb);

c) a kormányzási elmozdulási zaj (CMN) nem lehet nagyobb plusz, vagy mínusz 3,2 m-nél (10,5 láb), vagy 0,1 foknál - amelyik a kisebb.

3.11.4.9.4.1 **Ajánlás**. - A megközelítési vonatkoztatási pontban az útvonal-követési hiba (PFE) nem lehet plusz, vagy mínusz 4 m-nél (13,5 láb) nagyobb.

3.11.4.9.4.2 A vonatkoztatási pontban meghatározott lineáris pontosságot fenn kell tartani a 3.11.5.2.2.1.2 pontban meghatározott teljes futópálya fedési körzetben, kivéve ott, ahol a 3.11.4.9.4.3 pontban foglaltaknak megfelelő csökkenés megengedett.

3.11.4.9.4.3 *A megengedett csökkenés.* A megközelítési oldalszög szögbeli útvonal-követési hibájánál (PFE), útvonal-követési zajánál (PFN) és kormányzási elmozdulási zajánál (CMN) a fedésterület határai felé a következőknek megfelelő lineáris csökkenés engedhető meg:

a) *A távolságnál.* A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a futópálya küszöbétől a futópálya meghosszabbított középvonalán 37 km-es (20 tengeri mérföld) távolságnál a megközelítési vonatkoztatási pontra meghatározott érték kétszerese lehet. A kormányzási elmozdulási zaj (CMN) határértéknek 0,1 foknak kell lenni a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán - a minimális siklópálya szögön - 37 km-re (20 tengeri mérföld) mért távolságnál.

b) *Az oldalszög értéknél.* A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a plusz, vagy mínusz 40 fokos oldalszög szögnél 1,5-szerese lehet annak az értéknek, mint amennyi a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték. A szögértékben kifejezett kormányzási elmozdulási zaj (CMN) határérték a plusz, vagy mínusz 40 fokos oldalszög szögnél 1,3-szorosa lehet annak az értéknek, mint amennyi a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték.

c) *A magassági szög értéknél.* Az útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték nem változhat a 9 fokos magassági szögig. A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a megközelítési oldalszög antenna fázis középpontjától mért 15 fokos magassági szögön kétszerese lehet a 9 fok alatti szögre, a megközelítési vonatkoztatási ponttól az ugyanazon oldalszög értéknél, az ugyanakkora távolságban megengedett értéknél. A kormányzási elmozdulási zaj (CMN) határérték nem változhat a magassági szöggel.

d) *A maximális kormányzási elmozdulási zaj (CMN).* A maximális kormányzási elmozdulási zaj (CMN) határértéke a fedésterület semelyik részében sem haladhatja meg a 0,2 fokot.

3.11.4.9.4.3.1 **Ajánlás**. - *A maximális kormányzási elmozdulási zaj (CMN) a fedésterület semelyik részében sem haladhatja meg a 0,1 fokot.*

3.11.4.9.4.4 *A maximális szögbeli útvonal-követési hiba (PFE) és útvonal-követési zaj (PFN).* A fedésterület valamennyi részében a szögbeli hiba határértékének a következőnek kell lenni:

a) az útvonal-követési hiba (PFE) nem haladhatja meg a plusz, vagy mínusz 0,25 fokot; és

b) az útvonal-követési zaj (PFN) nem haladhatja meg a plusz, vagy mínusz 0,15 fokot.

3.11.4.9.5 *Hátsó irányszektor útirány-vezetési funkciók.* A hátsó irányszektor vonatkoztatási pontban a hátsó irányszektor oldalszög funkciónak a következő teljesítményt kell biztosítania:

a) az útvonal-követési hiba (PFE) nem lehet nagyobb plusz, vagy mínusz 6 m-nél (20 láb);

b) az útvonal-követési zaj (PFN) nem lehet nagyobb plusz, vagy mínusz 3,5 m-nél (11,5 láb);

c) a kormányzási elmozdulási zaj (CMN) nem lehet nagyobb plusz, vagy mínusz 3,2 m-nél (10,5 láb), vagy 0,1 foknál - amelyik a kisebb.

3.11.4.9.5.1 *A megengedett csökkenés.* A hátsó irányszektor szög-értékben kifejezett útvonal-követési hibájánál (PFE), útvonal-követési zajánál (PFN) és kormányzási elmozdulási zajánál (CMN) a fedésterület határai felé a következőknek megfelelő lineáris csökkenés engedhető meg:

a) *A távolságnál.* A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a fedésterület határvonalánál a futópálya meghosszabbított középvonala mentén kétszerese lehet annak az értéknek, mint ami a hátsó irányszektor vonatkoztatási pontjára meghatározott érték. A szögértékben kifejezett kormányzási elmozdulási zaj (CMN) határérték a futópálya meghosszabbított középvonalán a futópálya megállási végétől a 18,5 km-es távolságban 1,3-szerese lehet annak az értéknek, mint ami a hátsó irányszektor vonatkoztatási pontjára meghatározott érték.

b) *Az oldalszög értéknél.* A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a plusz, vagy mínusz 20 fokos oldalszög szögnél 1,5-szerese lehet annak az értéknek, mint amennyi a hátsó irányszektor vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték. A szögértékben kifejezett kormányzási elmozdulási zaj (CMN) határérték a plusz, vagy mínusz 20 fokos oldalszög szögnél 1,3-szorosa lehet annak az értéknek, mint amennyi a hátsó irányszektor vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték.

c) *A magassági szög értéknél.* Az útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték nem változhat a 9 fokos magassági szögig. A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a hátsó irányszektor oldalszög antenna fázis középpontjától mért 15 fokos magassági szögön kétszerese lehet a 9 fok alatti szögre, a hátsó irányszektor vonatkoztatási ponttól az ugyanazon oldalszög értéknél, az ugyanakkora távolságban megengedett értéknél. A kormányzási elmozdulási zaj (CMN) határérték nem változhat a magassági szöggel.

d) *A maximális kormányzási elmozdulási zaj (CMN)*. A maximális kormányzási elmozdulási zaj (CMN) határértéke a fedésterület egyik részében sem haladhatja meg a 0,2 fokot.

3.11.4.9.5.2 *A maximális szögbeli útvonal-követési hiba (PFE) és útvonal-követési zaj (PFN).* A fedésterület valamennyi részében a szögbeli hiba határértékének a következőnek kell lenni:

a) az útvonal-követési hiba (PFE) nem haladhatja meg a plusz, vagy mínusz 0,50 fokot; és

b) az útvonal-követési zaj (PFN) nem haladhatja meg a plusz, vagy mínusz 0,30 fokot.

3.11.4.9.6 *Magassági szög útirány-vezetési funkció*. Egy névleges 3 fokos, vagy annál alacsonyabb értékű minimális siklópálya biztosítására telepített berendezés megközelítési magassági szög funkciójának a megközelítési vonatkoztatási pontnál a következő teljesítményt kell biztosítani:

a) az útvonal-követési hiba (PFE) nem lehet nagyobb plusz, vagy mínusz 0,6 m-nél (2 láb);

b) az útvonal-követési zaj (PFN) nem lehet nagyobb plusz, vagy mínusz 0,4 m-nél (1,3 láb);

c) a kormányzási elmozdulási zaj (CMN) nem lehet nagyobb plusz, vagy mínusz 0,3 m-nél (1 láb).

3.11.4.9.6.1 *A megengedett csökkenés*. A megközelítési magassági szög szögbeli útvonal-követési hibájánál (PFE), útvonal-követési zajánál (PFN) és kormányzási elmozdulási zajánál (CMN) a fedésterület határai felé a következőknek megfelelő lineáris csökkenés engedhető meg:

a) *A távolságnál*. A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a futópálya küszöbétől a futópálya meghosszabbított középvonalán a 37 km-es (20 tengeri mérföld) távolságnál a minimális siklópályán 0,2 fok lehet. A kormányzási elmozdulási zaj CMN) határértéknek 0,1 foknak kell lenni a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán - a minimális siklópálya szögön - 37 km-re (20 tengeri mérföld) mért távolságnál.

b) *Az oldalszög értéknél*. A szögértékben kifejezett útvonal-követési hiba (PFE) határérték és az útvonal-követési zaj (PFN) határérték a plusz, vagy mínusz 40 fokos oldalszög szögnél 1,3-szerese lehet annak az értéknek, mint amennyi a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték. A szögértékben kifejezett kormányzási elmozdulási zaj (CMN) határérték a plusz, vagy mínusz 40 fokos oldalszög szögnél 1,3-szorosa lehet annak az értéknek, mint amennyi a megközelítési vonatkoztatási ponttól a futópálya meghosszabbított középvonalán az ugyanabban a távolságban lévő érték.

c) *A magassági szögnél*. A magassági szög értékekre a minimális siklópálya, vagy a 3 fokos siklópálya felett - amelyik az alacsonyabb -, az arányos útirány-vezetési fedésterület maximális szögéig és közvetlenül a megközelítési vonatkoztatási pont felett elhelyezkedő pontban a szögbeli értékben kifejezett útvonal-követési hiba (PFE) határértéknél, az útvonal-követési zaj (PFN) határértéknél és a kormányzási elmozdulási zaj (CMN) határértéknél megengedhető az, hogy lineárisan lecsökkenjenek úgy, hogy a 15 fokos magassági szögnél a határérték a vonatkoztatási pontra meghatározott érték kétszerese legyen. A kormányzási elmozdulási zaj (CMN) értéke közvetlenül a vonatkoztatási pont felett semmilyen esetben sem haladhatja meg a plusz, vagy mínusz 0,07 fokot. A fedésterület egyéb részeiben a magassági szög szektoron belül a minimális siklópályával egyenlő magassági szögtől az arányos fedésterület maximális magassági szögig az arányos fedésterületen belül a távolságnál és az oldalszög értéknél az a) és b) pontban meghatározott értékeket kell alkalmazni.

d) Az útvonal-követési hiba (PFE), az útvonal-követési zaj (PFN) és a kormányzási elmozdulási zaj (CMN) határértékek a minimális siklópálya és a minimális siklópálya 60 százaléka között nem csökkenhetnek a magassági szöggel. A minimális siklópálya 60 százaléka alatti magassági szögek lefelé egészen a következő 3.11.5.3.2.1.2 pontban meghatározott fedésterület határvonalig és a közvetlenül a megközelítési vonatkoztatási pont alatt elhelyezkedő pontnál a szögbeli értékekben kifejezett útvonal-követési hiba (PFE) határértéknél, az útvonal-követési zaj (PFN) határértéknél és a kormányzási elmozdulási zaj (CMN) határértéknél megengedhető a megközelítési vonatkoztatási pont értékének hatszorosára való lineáris növekedés. A magassági szög szektor fedésterületének további részein a minimális siklópálya szög értéke 60 százalékával megegyező magassági szög értéktől lefelé a fedésterület határ-vonaláig, a távolsággal és az oldalszög értékben meghatározott csökkenésre az a) és b) pontban meghatározottakat kell alkalmazni. Semmilyen esetben sem megengedett az, hogy az útvonal-követési hiba (PFE) meghaladja a 0,8 fokot, vagy, hogy a kormányzási elmozdulási zaj (CMN) meghaladja a 0,4 fokot.

e) *Maximális kormányzási elmozdulási zaj (CMN)*. A minimális siklópálya 60 százalékának megfelelő értékű szög feletti magassági szögeknél a kormányzási elmozdulási zaj (CMN) határértéke a fedésterület egyik részén sem haladhatja meg a 0,2 fokot.

3.11.4.9.6.2 *A maximális szögbeli útvonal-követési hiba (PFE) és útvonal-követési zaj (PFN).* A fedésterület valamennyi részében a minimális siklópálya 60 százalékának megfelelő értékek feletti magassági szögek szögbeli hiba határértékének a következőnek kell lenni:

a) az útvonal-követési hiba (PFE) nem haladhatja meg a plusz, vagy mínusz 0,25 fokot; és

b) az útvonal-követési zaj (PFN) nem haladhatja meg a plusz, vagy mínusz 0,15 fokot.

3.11.4.9.6.3 **Ajánlás**. - *Az útvonal-követési hiba (PFE) határértékre, az útvonal-követési zaj (PFN) határértékre és a kormányzási elmozdulási zaj (CMN) határértékre szögbeli értékben kifejezett határértékek lineáris csökkenése a minimális siklópálya 60 százalékának megfelelő szög alatti szögeknél lefelé egészen a fedésterület határ-vonaláig, a megközelítési vonatkozási pontra megengedett értékek háromszorosa lehet.*

Megjegyzés. - A magassági szög szektor fedésterületének további részein a minimális siklópálya szög értéke 60 százalékával megegyező magassági szög értéktől lefelé a fedésterület határvonaláig, a távolsággal és az oldalszög értékben meghatározott csökkenésre a fenti 3.11.4.9.6.1 a) és b) pontban meghatározottakat kell alkalmazni.

3.11.4.9.6.4 **Ajánlás**. - Maximális kormányzási elmozdulási zaj (CMN). *A minimális siklópálya 60 százalékának megfelelő értékű szög feletti magassági szögeknél a kormányzási elmozdulási zaj (CMN) határértéke a fedésterület egyik részén sem haladhatja meg a 0,1 fokot.*

3.11.4.9.6.5 **Ajánlás**. - *Az útvonal-követési hiba (PFE) nem haladhatja meg a 0,35 fokot és a kormányzási elmozdulási zaj (CMN) nem haladhatja meg a 0,2 fokot.*

3.11.4.9.6.6 A 3 fokos minimális siklópályánál magasabb értékű siklópálya biztosítására telepített megközelítési magassági szög adó berendezésnek olyan szögbeli pontosságot kell biztosítani, ami nem kisebb annál, mint ami a fedésterületen belülre 3 fokos minimális siklópályát adóan telepített berendezésre előírásra került.

3.11.4.10 *Teljesítmény-sűrűség*

3.11.4.10.1 A differenciális fázis eltolásos kódolás (DPSK) a kiegészítő biztonsági-vezetési és a szög útirány-vezetés jelei teljesítmény-sűrűségének legalább a következő táblázatban megadott értékűnek kell lenni bármilyen időjárási körülmények esetén, a fedési terület bármely pontján, az alábbi 3.11.4.10.2 pontban meghatározottak kivételével.

Funkció	DPSK jelek (dBW/m^2)	DPSK jelek (dBW/m^2) antenna sugárnyaláb-szélesség			Kiegészítő biztonsági jelek (dBW/m^2)
		1°	2°	3°	
Megközelítési oldalszög útirány-vezetés	-89,5	-85,7	-79,7	-76,2	-88,0
Nagysebességű megközelítési oldalszög útirány-vezetés	-89,5	-88,0	-84,5	-81	-88,0
Hátsó irányszektor útirány-vezetés	-89,5	-88,0	-82,7	-79,2	-88,0
Megközelítési magassági szög útirány-vezetés	-89,5	-88,0	-84,5	nem alkalmazható	nem alkalmazható

Megjegyzés. - A fenti táblázat a kiegészítő biztonsági-vezetési jelek és a letapogató sugárnyaláb jeleinek minimális teljesítmény-sűrűségét határozza meg. A két jel relatív értékei a korábbi 3.11.4.6.2.5.2 pontban kerültek meghatározásra.

3.11.4.10.2 A megközelítési oldalszög útirány-vezetési szögek jelei teljesítmény-sűrűségének a fenti 3.11.4.10.1 pontban meghatározottaknál legalább a következő értékekkel nagyobbnak kell lenni:

a) 15 dB-el a megközelítési vonatkoztatási pontnál;

b) 5 dB-el az egy fokos, vagy 9 dB-el a két fokos, vagy annál nagyobb szögű sugárnyaláb szélességű antennáknál 2,5 m (8 láb) magasságban a futópálya felülete felett, az MLS alappontnál, vagy a futópálya középvonalának azon legtávolabbi pontjánál, ami az oldalszög antennától rálátási vonalban van.

1. Megjegyzés. - A futópálya felszíne közelében a megközelítési oldalszög adó berendezés általában magasabb teljesítmény-sűrűséget biztosít a szög jelekre a fenti 3.11.4.10.1 pontban meghatározottaknál azért, hogy az automata leszállási üzemeltetéseket biztosítsa. A "G"- Melléklet adja meg az antenna sugárnyaláb és a teljesítmény igényre vonatkozó tájékoztatásokat.

2. Megjegyzés. - A következő 3.11.5.2.2 és 3.11.5.3.2 pontokban leírt előírások azokat a - bonyolult földi berendezés telepítési körülményekhez - vonatkozó előírásokat adják meg, amelyek akkor szükségesek, amikor a fenti 3.11.4.10.2 pontban előírt teljesítmény-sűrűség biztosítását nem lehet megvalósítani.

3.11.5 A földi berendezések jellemzői

3.11.5.1 *Szinkronizálás és ellenőrzés*. Az időosztásos multiplex szög útirány-vezetés szinkronizálását és a korábbi, a 3.11.4.3.3 pontban felsorolt adattovábbítást ellenőrizni kell.

Megjegyzés. - A különféle MLS funkciók pontosan meghatározott ellenőrzési követelményei a következő 3.11.5.2.3 és 3.11.5.3.3 pontokban kerülnek meghatározásra.

3.11.5.1.1 *Az MLS funkciók maradék-sugárzása*. Egy MLS funkció maradék-sugárzásának azon időszak alatt, amikor más funkció kerül kisugárzásra, legalább 70 dB-el az adás alatt biztosított szint alatt kell lenni.

Megjegyzés. - Egy meghatározott funkció maradék-sugárzásának elfogadható szintje az a szint, amelynek nincs káros hatása semmilyen más funkció vételére és a berendezés telepítésétől és a légijármű helyzetétől függ.

3.11.5.2 Az oldalszög útirány-vezetést adó berendezés

3.11.5.2.1 *A letapogató sugárnyaláb jellemzői*. Az oldalszög adó földi berendezés antennájának egy olyan legyező alakú sugárzást kell előállítani, ami a vízszintes síkban keskeny és a függőleges síkban széles, és amely a letapogatást a vízszintes síkban végzi az arányos útirány-vezetési szektor határvonalai között.

3.11.5.2.1.1 *Koordináta rendszer*. Az oldalszög útirány-vezetési tájékoztatást, vagy a kúpos, vagy a síkbeli koordináta rendszerben kell kisugározni.

3.11.5.2.1.2 *Antenna sugárnyaláb szélesség*. Az antenna sugárnyaláb szélessége nem haladhatja meg a 4 fokot.

Megjegyzés. - Az a cél, hogy a detektált letapogató sugárnyaláb burkológörbéje a fedés egész területén ne lépje túl a 250 mikro-szekundumot (ez az 5 fokos sugárnyaláb szélesség megfelelője), annak érdekében, hogy a fedélzeti berendezés általi, a megfelelő szög dekódolás biztosítva legyen.

3.11.5.2.1.3 *A letapogató sugárnyaláb alakja*. A sugárnyaláb burkológörbéjének mínusz 10 dB-es pontjait a sugár középponttól legalább 0,76 sugárnyaláb szélességre, de nem többre, mint 0,96 sugárnyaláb szélességre kell eltolni.

Megjegyzés. - A leírt sugárnyaláb forma az antenna-irányítási vonalban egy megfelelő szűrőt felhasználó több-utas terjedéstől szabad környezetben értendő. A sugárnyaláb alakjára és az oldal szirmokra vonatkozó tájékoztatások a "G" Melléklet 3.1 és 3.2 pontjában találhatók.

3.11.5.2.2 Fedésterület

Megjegyzés. - Az itt meghatározott fedésterületi követelményeket bemutató diagramok a "G"- Melléklet G-5A., G-5B. és G-6. ábráin láthatók.

3.11.5.2.2.1 *Megközelítési oldalszög*. A megközelítési oldalszög adó földi berendezésnek legalább a következő légterekben kell információkat biztosítani:

3.11.5.2.2.1.1 *Megközelítési terület*.

a) Oldalirányban, egy olyan 80 fokos szektoron belül (általában az antenna-irányítási vonal körüli plusz és mínusz 40 fokig), amely a megközelítési oldalszög antenna fázis középpontjától indul ki.

b) Hosszirányban, a megközelítési oldalszög antennától 41,7 km-ig (22,5 tengeri mérföldig).

c) Függőlegesen a következők között:

1) egy olyan alsó kúpos felület, amely a megközelítési oldalszög adó antenna fázis középpontjától indul ki és felfelé hajlik addig, amíg a hosszirányú fedésterületi vonalnál a 600 m-es (2 000 láb) magasságot azon vízszintes sík felett éri el, amely az antenna fázis középpontját magába foglalja; és

2) egy olyan felső kúpos felület, amely a megközelítési oldalszög adó antenna fázis középpontjától indul ki, 15 fokos szögben felfelé hajlik és a vízszintes fölé a 6 000 m-es (20 000 láb) magasságig tart.

1. Megjegyzés. - Ahol az alsó felületen közbenső akadályok nyúlnak túl, ott az a cél, hogy nem kell útirány-vezetést biztosítani a közvetlen rálátási vonal magassága alatt.

2. Megjegyzés. - Ahol megállapították azt, hogy félrevezető információk fordulnak elő a közzétett fedésterületi szektoron kívül, és olyan megfelelő üzemeltetési eljárások nem biztosíthatók, amelyek elfogadható megoldást jelentenének, ott ezen hatások minimalizálására különböző módszerek állnak rendelkezésre. Ezek a technikai megoldások magukba foglalják az arányos útirány-vezetési szektor kiigazítását, vagy a fedésterületen-kívül jelek alkalmazását. Ezeknek a technikai megoldásoknak a felhasználására vonatkozó útmutató anyag a "G"- Melléklet 8. pontjában található.

3. Megjegyzés. - Ahol a biztosított arányos útirány-vezetési szektor kisebb annál, mint a fenti 3.11.5.2.2.1.1 a) pontban meghatározott minimális oldalirányú fedésterület, ott a fenti 3.11.4.6.2.5 pontban meghatározott kiegészítő-biztonsági vezetési jelekre van szükség.

3.11.5.2.2.1.2 *A futópálya területe.*

a) Vízszintesen a futópálya középvonalának mindkét oldalán egy olyan 45 m-es szektoron belül, amely a futópálya megállási végénél kezdődik, és a futópálya középvonalával párhuzamosan a megközelítés irányába addig terjed ki, ahol összeér az alábbi 3.11.5.2.2.1.3 pontban leírt minimális üzemeltetési fedésterülettel.

b) Függőlegesen a következők között:

1) azon vízszintes felület között, ami 2,5 m (8 láb) magasságban van a futópályának azon legtávolabbi pontja felett, ami az oldalszög adó antenna rálátási vonalában van; és

2) azon kúpos felület között, amely az oldalszög adó földi berendezés antennájánál kezdődik, és 20 fokos szögben emelkedik a vízszintes fölé a 600 m-es (2 000 láb) magasság eléréséig.

1. Megjegyzés. - A fenti b) 1) alpontban említett pont meghatározására vonatkozó tájékoztatások a "G"- Melléklet 2.3.6 pontjában vannak megadva.

2. Megjegyzés. - Az a cél, hogy a rálátási vonal alatti útirány-vezetést biztosítani lehessen addig, amíg a jel minőség ki tudja elégíteni a 3.11.4.9.4 pont pontossági követelményeit.

3.11.5.2.2.1.2.1 **Ajánlás**. - *A futópálya területén a fedésterület legalacsonyabb szintjének 2,5 m-nek (8 láb) kell lennie a futópálya középvonala felett.*

3.11.5.2.2.1.2.2 Ahol az automatikus leszállás, a leszállás utáni kifutás, vagy a felszállás alátámasztása szükséges, ott a futópálya területén a fedésterület alsó határa nem haladhatja meg a 2,5 m-t (8 láb) a futópálya középvonala felett.

Megjegyzés. - A 2,5 m-es alsó fedésterületi határértéknek az a célja, hogy minden futópályát kiszolgáljon. A 3.11.4.10.2 pontban meghatározott 2,5 m-es (8 láb) teljesítmény-sűrűség követelmény enyhítésének lehetőségére vonatkozó tájékoztatásokat a "G"- Melléklet 2.3.6 pontja adja meg.

3.11.5.2.2.1.3 *A minimális üzemeltetési fedésterület.*

a) Oldalirányban, a futópálya középvonala körüli azon plusz és mínusz 10 fokos szektoron belül, amely az MLS alappontjától indul ki.

b) Hosszirányban, a futópálya küszöbétől a megközelítés irányába a 3.11.5.2.2.1.1 b) pontban meghatározott hosszirányú fedésterületi határvonalig.

c) Függőlegesen:

1) egy olyan alsó sík között, amely magába foglalja a futópálya küszöbe feletti 2,5 m-es (8 láb) magasságú vonalat és felfelé emelkedik addig, amíg eléri a 3.11.5.2.2.1.1 c) 1) pontban meghatározott felület magasságát a hosszirányú fedésterület határvonalánál; és

2) azon felső felület között, ami a 3.11.5.2.2.1.1 c) 2) pontban meghatározásra került.

3.11.5.2.2.1.4 **Ajánlás**. - *A megközelítési oldalszög adó földi berendezésnek függőlegesen a vízszintes feletti 30 fokig kell útirány-vezetést biztosítani.*

3.11.5.2.2.1.5 A minimális arányos útirány-vezetési szektornak a következőnek kell lennie:

Megközelítési oldalszög adó antenna és a küszöb közötti távolság (AAT)	Minimális arányos lefedési terület
AAT kisebb, mint 500 m	±8°
AAT nagyobb, mint 500 m, de kisebb, mint 3 100 m	±6°
AAT nagyobb, mint 3 100 m	±4°

3.11.5.2.2.2 *Hátsó irányszektor*. A hátsó irányszektor adó földi berendezésnek legalább a következő légtérben kell információt biztosítani:

a) Vízszintesen, a futópálya középvonala körüli azon plusz, vagy mínusz 20 fokos szektoron belül, amely a hátsó irányszektor adó földi berendezés antennájától kezdődik és a megszakított megközelítés irányába a futópálya megállási végétől legalább 18,5 km-ig (10 tengeri mérföld) terjed ki.

b) Függőlegesen, a futópálya területén:

1) azon vízszintes felület között, amely 2,5 m (8 láb) magasságban van a futópálya középvonalának legtávolabbi pontja felett a hátsó irányszektor antennától rálátási vonalban; és

2) azon kúpos felület között, ami a hátsó irányszektor adó földi berendezés antennájától kezdődik és 20 fokos szögben emelkedik a vízszintes fölé a 600 m-es (2 000 láb) magasság eléréséig.

c) Függőlegesen, a hátsó irányszektor területén:

1) azon kúpos felület között, amelynek a kiinduló pontja 2,5 m (8 láb) magasságban van a futópálya megállási vége felett, és 0,9 fokkal emelkedik a vízszintes fölé; és

2) azon kúpos felület között, amely a hátsó irányszektor adó földi berendezés antennájától indul ki, és 15 fokos szögben emelkedik a vízszintes fölé a 3 000 m-es (10 000 láb) magasság eléréséig.

1. Megjegyzés. - A b) 1) alpontban említett pont meghatározására vonatkozó tájékoztatások a "G"-Melléklet 2.3.6 pontjában találhatók.

2. Megjegyzés. - Amikor a futópálya fizikai jellemzői, vagy az akadályok lehetetlenné teszik a b) és c) alpontokban meghatározott szabványok elérését, akkor az előirányzat az, hogy az útirány-vezetés nem szükséges a rálátási vonal magassága alatt.

3.11.5.2.2.2.1 **Ajánlás**. - A hátsó irányszektor adó berendezésnek a vízszintes feletti 30 fokig kell útirány-vezetést biztosítani.

3.11.5.2.2.2.2 A minimális arányos útirány-vezetési szektornak a futópálya középvonala körüli plusz, vagy mínusz 10 fokosnak kell lenni.

Megjegyzés. - Az alkalmazásra vonatkozó tájékoztatásokat a "G"- Melléklet 7.5 pontja adja meg.

3.11.5.2.3 *Ellenőrzés és vezérlés*

3.11.5.2.3.1 A megközelítési oldalszög és a hátsó irányszektor felügyelő rendszerének meg kell szűntetni a megfelelő funkció kisugárzását és egy riasztó jelzést kell leadni a kijelölt vezérlő pontokra akkor, amikor a következő körülmények valamelyike a meghatározott időtartamon túl fennáll:

a) a földi berendezés hozzájárulásával olyan változás következik be a közepes irányszög hibánál, hogy az útvonal-követési hiba (PFE) a megközelítési vonatkoztatási pontnál, vagy bármely oldalszög radiál irányában meghaladja a 3.11.4.9.4 és 3.11.4.9.5 pontokban és (az egyszerűsített mikrohullámú leszállító rendszer /MLS/ konfigurációra) a 3.11.3.4 pontban meghatározott határértékeket egy másodperc időtartamon túl, vagy (az egyszerűsített MLS konfigurációra) hat másodpercnél hosszabb időtartamon túl;

b) olyan csökkenés lép fel a kisugárzott teljesítményben, hogy az kevesebb annál, mint ami a 3.11.4.10.1 és 3.11.4.6.2.5.2 pontokban meghatározott követelmények kielégítéséhez szükséges egy másodpercnél hosszabb időtartamon keresztül;

c) egy olyan hiba van a bevezető jelszakasz differenciális fázis eltolásos kódolási adásaiban, ami bármely egy másodperces időtartam alatt egynél többször előfordul;

d) egy olyan hiba van egy meghatározott oldalszög funkció időosztásos multiplex szinkronizálásában, hogy a 3.11.4.3.2 pontban meghatározott követelmények nincsenek teljesítve, és ez a körülmény egy másodpercnél hosszabb ideig fennáll.

Megjegyzés. - Az útmutató anyagot a "G"- Melléklet 6. pontja adja meg.

3.11.5.2.3.2 A felügyelő rendszer tervezésének és működésének olyannak kell lenni, hogy meg kell szűntetnie a sugárzást és le kell adnia a riasztó jelzést a kijelölt vezérlő pontokra, magának a felügyelő rendszernek a meghibásodása esetén is.

3.11.5.2.3.3 Az olyan időtartam, amely alatt a hibás útirány-vezetési információ kisugárzásra kerül - beleértve a nulla sugárzási időtartamokat is - nem haladhatja meg a 3.11.5.2.3.1 pontban meghatározott időtartamokat. A hiba elhárításának az elsődleges földi berendezés visszakapcsolásával történő megkísérlésének, vagy a tartalék földi berendezésre történő átkapcsolásnak ezen idő alatt be kell fejeződni. Ha a hiba nem kerül a megengedett időn belül elhárításra, akkor a sugárzást le kell állítani. A lekapcsolás után a szolgáltatás visszaállítását nem lehet megkísérelni addig, amíg 20 másodperc el nem telik.

3.11.5.2.4 *A mikrohullámú leszállító rendszer /MLS/ oldalszög szolgáltatás teljességi /integritás/ és folyamatossági követelményei*

3.11.5.2.4.1 Annak a valószínűsége, hogy nem kerülnek pontatlan irányvezetési jelek kisugárzásra a II. és III. kategóriájú üzemeltetési fel-használásra tervezett MLS oldalszögön végrehajtott bármely leszállásra, nem lehet kevesebb 1 - 0,5 x 10^{-9}-nél.

3.11.5.2.4.2 **Ajánlás**. - Annak a valószínűsége, hogy nem kerülnek pontatlan irányvezetési jelek kisugárzásra az I. kategóriájú üzemeltetési felhasználásra tervezett MLS oldalszögön végrehajtott bármely leszállásra, nem lehet kevesebb 1 - 0,5 x 10^{-7}-nél.

3.11.5.2.4.3 Annak a valószínűsége, hogy a kisugárzott irány-vezetési jel nem kerül elvesztésre, nagyobb kell, hogy legyen, mint:

a) 1 - 2 x 10^{-6} bármely 15 másodperces időtartamban a II. és a III.A. kategóriájú üzemeltetési felhasználásra tervezett mikrohullámú leszállító rendszer oldalszögénél (ez a leállások közötti átlagos 2000 órás idővel egyenlő); és

b) 1 - 2 x 10^{-6} bármely 30 másodperes időtartamban a III. kategóriájú üzemeltetések teljes tartományára felhasználásra tervezett mikrohullámú leszállító rendszer oldalszögénél (ez a leállások közötti átlagos 4000 órás idővel egyenlő).

3.11.5.2.4.4 **Ajánlás**. - *Annak a valószínűsége, hogy a kisugárzott irányvezetési jel nem kerül elvesztésre, meg kell, hogy haladja az 1 - 4 x 10^{-6}-t bármely 15 másodpercben az I. kategóriájú üzemeltetési felhasználásra tervezett mikrohullámú leszállító rendszer oldalszögénél (ez a leállások közötti átlagos 1000 órás idővel egyenlő).*

Megjegyzés. - A szolgáltatás teljességi és folyamatossági követelményeire vonatkozó útmutató anyag a "G"- Melléklet 11. pontjában került megadásra.

3.11.5.2.5 *A földi berendezés pontossága*

3.11.5.2.5.1 A földi berendezésnek a közepes irányszög hibához való hozzájárulása nem haladhatja meg a plusz, vagy mínusz 3 m-rel (10 láb) egyenértékű hibát az MLS megközelítési referencia pontnál.

3.11.5.2.5.2 **Ajánlás**. - *A földi berendezésnek a kormányzási elmozdulási zajhoz (CMN) való hozzájárulása a referencia pontnál nem haladhatja meg az 1 métert (3,3 láb), vagy a 0,03 fokot - amelyik a kisebb -, 95 százalékos valószínűségi alapon figyelembe véve.*

1. Megjegyzés. - Ez egy berendezés hiba, és ez nem foglal magába semmilyen terjedési hatást.

2. Megjegyzés. - Az ennek a paraméternek a mérésére vonatkozó útmutató anyagot a "G"- Melléklet 2.5.2 pontjában lehet megtalálni.

3.11.5.2.6 Telepítés

1. Megjegyzés. - Nem cél az, hogy az MLS telepítését korlátozzuk akkor, amikor az oldalszög adó földi berendezést nem lehet a futópálya középvonalának meghosszabbításában telepíteni.

2. Megjegyzés. - Az oldalszög adó antennák kritikus és érzékenységi területeire vonatkozó útmutató anyagot a "G"- Melléklet 4.2 pontja adja meg.

3.11.5.2.6.1 Szabályszerűen a megközelítési oldalszög adó földi berendezés antennáját a futópálya középvonalának meghosszabbításában kell elhelyezni, a futópálya megállási végén túl, és úgy kell beállítani, hogy a nulla fokos iránysáv vonalat magába foglaló függőleges sík az MLS megközelítési referencia alappontot is magába foglalja. Az antenna elhelyezésének meg kell felelni az Annex 14 Szabványok és Ajánlott Gyakorlatok által meghatározott biztonságos akadálymentességnek.

3.11.5.2.6.2 A hátsó irányszektor oldalszög adó földi berendezés antennáját szabályszerűen a futópálya középvonalának meghosszabbításában kell elhelyezni a futópálya küszöbe előtti végénél, és úgy kell beállítani, hogy a nulla fokos iránysáv vonalat magába foglaló függőleges sík magába foglalja a hátsó irányszektor referencia alappontját.

3.11.5.3 Magassági szög útirány-vezetést adó berendezés

3.11.5.3.1 *A letapogató sugárnyaláb jellemzői*. A magassági szög adó földi berendezés antennájának egy olyan legyező alakú sugárzást kell előállítani, ami a függőleges síkban keskeny és a vízszintes síkban széles, és amely a letapogatást függőlegesen végzi az arányos útirány-vezetési szektor határvonalai között.

3.11.5.3.1.1 *Koordináta rendszer*. A megközelítési magassági szög útirány-vezetési tájékoztatást a kúpos koordináta rendszerben kell kisugározni.

3.11.5.3.1.2 *Antenna sugárnyaláb szélesség*. Az antenna sugárnyaláb szélessége nem haladhatja meg a 2,5 fokot.

3.11.5.3.1.3 *A letapogató sugárnyaláb alakja*. A sugárnyaláb burkológörbéjének mínusz 10 dB-es pontjait a sugár középponttól legalább 0,76 sugárnyaláb szélességre, de nem többre, mint 0,96 sugárnyaláb szélességre kell eltolni.

Megjegyzés. - A leírt sugárnyaláb forma az antenna-irányítási vonalban egy megfelelő szűrőt felhasználó több-utas terjedéstől szabad környezetben értendő. A sugárnyaláb alakjára és az oldalszirmokra vonatkozó tájékoztatások a "G"- Melléklet 3.1 és 3.2 pontjában találhatók.

3.11.5.3.2 *Fedésterület*

Megjegyzés. - Az itt meghatározott fedésterületi követelményeket bemutató diagramok a "G"- Melléklet G-10A. ábráján láthatók.

3.11.5.3.2.1 *Megközelítési magassági szög*. A megközelítési magassági szög adó földi berendezésnek legalább a következő légterekben kell információkat biztosítani.

3.11.5.3.2.1.1 *Megközelítési terület*.

a) Oldalirányban, egy olyan szektoron belül, amely a magassági szög adó antenna fázis középpontjából indul ki és a szögbeli kiterjedése legalább a megközelítési oldalszög adó földi berendezés által a hosszirányú fedésterület határáig biztosított arányos útirány-vezetési szektorral megegyező.

b) Hosszirányban, a magassági szög adó antennától a megközelítés irányába a küszöbtől 37 km-es (20 tengeri mérföld) távolságig.

c) Függőlegesen a következők között:

1) egy olyan alsó kúpos felület, amely a magassági szög adó antenna fázis középpontjától indul ki és felfelé hajlik addig, amíg a hosszirányú fedésterületi vonalnál a 600 m-es (2 000 láb) magasságot azon vízszintes sík felett éri el, amely az antenna fázis középpontját magába foglalja; és

2) egy olyan felső kúpos felület, amely a magassági szög adó antenna fázis középpontjától indul ki, 7,5 fokos szögben felfelé hajlik és a vízszintes fölé a 6 000 m-es (20 000 láb) magasságig tart.

Megjegyzés. - Amikor a megközelítési terület fizikai jellemzői lehetetlenné teszik az a), b) és c) 1) alpontokban meghatározott szabványok elérését, akkor az az előirányzat, hogy az útirány-vezetés nem szükséges a rálátási vonal alatt.

3.11.5.3.2.1.1.1 **Ajánlás**. - A megközelítési magassági szög adó földi berendezésnek arányos útirány-vezetést kell biztosítani a vízszintes feletti 7,5 foknál nagyobb szögekre akkor, amikor az üzemeltetési követelmények kielégítésére szükséges.

3.11.5.3.2.1.2 *A minimális üzemeltetési fedésterület.*

a) Oldalirányban, azon a szektoron belül, amely az MLS alappontból indul ki egy, a futópálya középvonala körüli plusz és mínusz 10 fokon belül;

b) Hosszirányban, az MLS alappontból a futópálya küszöbének irányában 75 m-től (250 láb) a 3.11.5.3.2.1.1 b) pontban meghatározott külső fedésterületi határvonalig.

c) Függőlegesen, a 3.11.5.3.2.1.1 c) 2) alpontban meghatározott felső felület és a következők közül a magasabb között:

1) azon felület, amelynek a pontjai a 2,5 méteres (8 láb) magasságban vannak a futópálya felett; vagy

2) azon sík, amely az MLS alappontból indul ki, és felfelé emelkedően a hosszirányú fedésterület határvonalánál éri el a 3.11.5.3.2.1.1 c) 1) alpontban meghatározott felület magasságát.

Megjegyzés. - A megközelítési magassági szög vízszintes sugárzási karakterisztikájára vonatkozó tájékoztatásokat a "G"- Melléklet 3.3 pontja adja meg.

3.11.5.3.3 *Ellenőrzés és vezérlés*

3.11.5.3.3.1 A megközelítési magassági szög felügyelő rendszerének meg kell szűntetni a megfelelő funkció kisugárzását és egy riasztó jelzést kell leadni a kijelölt vezérlő pontokra akkor, amikor a következő körülmények valamelyike a meghatározott időtartamon túl fennáll:

a) a földi berendezés hozzájárulásával olyan változás következik be a közepes siklópálya hibánál, hogy az útvonal-követési hiba (PFE) a megközelítési vonatkoztatási pontnál, vagy a közzétett megközelítési eljárásokhoz kapcsolódó bármely siklópálya szögön meghaladja a 3.11.4.9.6 pontban, valamint (az egyszerűsített mikrohullámú leszállító rendszer /MLS/ konfigurációra) a 3.11.3.4 pontban meghatározott határértékeket egy másodperc időtartamon túl, vagy (az egyszerűsített MLS konfigurációra) a 6 másodpercnél hosszabb időtartamon túl;

b) olyan csökkenés lép fel a kisugárzott teljesítményben, hogy az kevesebb annál, mint ami a 3.11.4.10.1 pontban meghatározott követelmények kielégítéséhez szükséges egy másodpercnél hosszabb időtartamon keresztül;

c) egy olyan hiba van a bevezető jelszakasz differenciális fázis eltolásos kódolás adásaiban, ami bármely egy másodperces időtartam alatt egynél többször előfordul;

d) egy olyan hiba van egy meghatározott magassági szög funkció időosztásos multiplex szinkronizálásában, hogy a 3.11.4.3.2 pontban meghatározott követelmények nincsenek teljesítve, és ez a körülmény egy másodpercnél hosszabb ideig fennáll.

Megjegyzés. - Az útmutató anyagot a "G"- Melléklet 6. pontja adja meg.

3.11.5.3.3.2 A felügyelő rendszer tervezésének és működésének olyannak kell lenni, hogy meg kell szűntetnie a sugárzást és le kell adnia a riasztó jelzést a kijelölt vezérlő pontokra, magának a felügyelő rendszernek a meghibásodása esetén is.

3.11.5.3.3.3 Az az időtartam, amely alatt a hibás útirány-vezetési információ kisugárzásra kerül - beleértve a nulla sugárzási időtartamokat is - nem haladhatja meg a 3.11.5.3.3.1 pontban meghatározott időtartamokat. A hiba elhárításának az elsődleges földi berendezés visszakapcsolásával történő megkísérlésének, vagy a tartalék földi berendezésre történő átkapcsolásnak ezen idő alatt be kell fejeződni. Ha a hiba nem kerül a megengedett időn belül elhárításra, akkor a sugárzást le kell állítani.

A lekapcsolás után a szolgáltatás visszaállítását nem lehet megkísérelni addig, amíg 20 másodperc el nem telik.

3.11.5.3.4 *A mikrohullámú leszállító rendszer /MLS/ megközelítési magassági szög szolgáltatás teljességi /integritás/ és folyamatossági követelményei*

3.11.5.3.4.1 Annak a valószínűsége, hogy nem kerülnek pontatlan irányvezetési jelek kisugárzásra a II. és III. kategóriájú üzemeltetési felhasználásra tervezett MLS megközelítési magassági szögön végrehajtott bármely leszállásra, nem lehet kevesebb 1 - 0,5 x 10^{-9}-nél.

3.11.5.3.4.2 **Ajánlás**. - *Annak a valószínűsége, hogy nem kerülnek pontatlan irányvezetési jelek kisugárzásra az I. kategóriájú üzemeltetési felhasználásra tervezett MLS megközelítési magassági szögön végrehajtott bármely leszállásra, nem lehet kevesebb 1 - 0,5 x 10^{-7}-nél.*

3.11.5.3.4.3 Annak a valószínűsége, hogy a kisugárzott irány-vezetési jel nem kerül elvesztésre, nagyobb kell, hogy legyen, mint 1 - 2 x 10-6 bármely 15 másodperes időtartamban a II. és III. kategóriájú üzemeltetési felhasználásra tervezett mikrohullámú leszállító rendszer megközelítési magassági szögénél (ez a leállások közötti átlagos 2000 órás idővel egyenlő).

3.11.5.3.4.4 **Ajánlás**. - *Annak a valószínűsége, hogy a kisugárzott irányvezetési jel nem kerül elvesztésre, meg kell, hogy haladja az 1 - 4 x 10^{-6}-t bármely 15 másodpercben az I. kategóriájú üzemeltetési felhasználásra tervezett mikrohullámú leszállító rendszer megközelítési magassági szögénél (ez a leállások közötti átlagos 1000 órás idővel egyenlő).*

Megjegyzés. - A szolgáltatás teljességi és folyamatossági követelményeire vonatkozó útmutató anyag a "G"- Melléklet 11. pontjában került megadásra.

3.11.5.3.5 *A földi berendezés pontossága*

3.11.5.3.5.1 A földi berendezésnek a közepes siklópálya hiba útvonal-követési hiba (PFE) értékéhez való hozzájárulása nem haladhatja meg a plusz, vagy mínusz 0,3 m-rel (1 láb) egyenértékű hibát a megközelítési vonatkoztatási pontnál.

3.11.5.3.5.2 **Ajánlás**. - *A földi berendezésnek a kormányzási elmozdulási zajhoz (CMN) való hozzájárulása a vonatkoztatási pontnál nem haladhatja meg a 0,15 métert (0,5 láb), 95 százalékos valószínűségi alapon figyelembe véve.*

1. Megjegyzés. - Ez egy berendezés hiba, és ez nem foglal magába semmilyen terjedési hatást.

2. Megjegyzés. - Az ennek a paraméternek a mérésére vonatkozó útmutató anyagot a "G"- Melléklet 2.5.2 pontjában lehet megtalálni.

3.11.5.3.6 *Telepítés*

Megjegyzés. - A magassági szög adó antennák kritikus területeire vonatkozó útmutató anyagot a "G"- Melléklet 4.2 pontja adja meg.

3.11.5.3.6.1 A megközelítési magassági szög adó földi berendezés antennáját a futópálya mellett kell elhelyezni. Az antennák telepítését az Annex 14 Szabványok és Ajánlott Gyakorlatok akadály-mentességi követelményeinek megfelelően kell telepíteni.

3.11.5.3.6.2 A megközelítési magassági szög adó földi berendezés antennáját úgy kell telepíteni, hogy a minimális siklópálya aszimptótája a futópálya küszöbénél keresztezze az MLS megközelítési vonatkoztatási pontját.

.11.5.3.6.2.1 **Ajánlás**. - *A minimális siklópálya szögnek szabályszerűen 3 foknak kell lenni, és nem haladhatja meg a 3 fokot, csak ott, ahol az akadálymentességi követelmények kielégítése más eszközökkel megvalósíthatatlan*.

Megjegyzés. - Az a cél, hogy a 3 fokosnál magasabb szögű minimális siklópálya kiválasztása inkább üzemeltetési szempontból kerüljön meghatározásra, és ne technikai tényezőként.

3.11.5.3.6.2.2 **Ajánlás**. A megközelítési magassági szög adó földi berendezés antennáját úgy kell telepíteni, hogy annak a pontnak a magassága, amely a minimális siklópálya dekódolt útirány-vezetési jelének felel meg, a futópálya küszöbe felett ne haladja meg a 18 métert (60 láb).

Megjegyzés. A magassági szög adó antennának a futópálya középvonalától való oldalirányú merőleges elhelyezése okozza azt, hogy a minimális siklópálya magassági szög útirány-vezetés a megközelítési vonatkoztatási pont felett lesz.

3.11.5.3.6.3 **Ajánlás**. - Amikor ILS és MLS egyidejűleg szolgálja ki ugyanazt a futópályát, akkor az ILS vonatkozási pontnak és az MLS megközelítési vonatkoztatási pontjának 1 m-es (3 láb) tűréshatáron belül egybe kell esni.

1. Megjegyzés. - Az a cél, hogy ez az ajánlás csak akkor legyen alkalmazható, amikor az ILS vonatkozási pont kielégíti a korábbi 3.1.5.1.4 és 3.1.5.1.5 pontok magassági előírásait.

2. Megjegyzés. - Az együtt telepített MLS / ILS elhelyezésére vonatkozó tájékoztatásokat a "G"- Melléklet 4.1 pontja adja meg.

3.11.5.4 *Adat fedésterület és ellenőrzés*

1. Megjegyzés. - Az adatok alkalmazására vonatkozó útmutató anyagot a "G"- Melléklet 2.7 pontja adja meg.

2. Megjegyzés - Az elsőrendű fontosságú adatok az alap adatok és az elsőrendű fontosságú kiegészítő adatok az A1, A2, A3 és A4 kiegészítő adatszavakban leadott adatok.

3.11.5.4.1 Alap adatok

3.11.5.4.1.1 Az 1., 2., 3., 4. és a 6. alap adat szavakat a teljes megközelítési oldalszög útirány-vezetési fedésterületi szektorba ki kell sugározni.

Megjegyzés. - Az alap adat szavak összeállítása az "A"- Függelék A-7. táblázatában került megadásra.

3.11.5.4.1.2 Ahol a hátsó irányszektor funkció biztosítva van, ott a 4., 5., és 6. alap adat szavakat a teljes megközelítési oldalszög útirány-vezetési és hátsó irányszektor fedésterületi szektorba ki kell sugározni.

3.11.5.4.2 *Kiegészítő adatok*

3.11.5.4.2.1 Az 'A1'., 'A2'., és az 'A3'. kiegészítő adat szavakat a teljes megközelítési oldalszög útirány-vezetési fedésterületi szektorba ki kell sugározni.

3.11.5.4.2.2 Ahol a hátsó irányszektor funkció biztosítva van, ott az 'A3'. és 'A4'. kiegészítő adat szavakat a teljes megközelítési oldalszög útirány-vezetési és hátsó irányszektor fedésterületi szektorba ki kell sugározni.

Megjegyzés. - A 'B42'. és 'B43'. kiegészítő adat szavakat külön-külön az 'A1'. és az 'A4'. helyen kell sugározni az olyan alkalmazási területeken, amelyek szükségessé teszik az oldalszög antenna átfordítását az 'A1'. és 'A4'. szóban rendelkezésre álló egyenes vonalú távolságon kívül.

3.11.5.4.2.3 Amikor biztosításra kerül, akkor a kiegészítő adat 'B' szavakat a teljes megközelítési oldalszög szektorban ki kell sugározni, kivéve azt, hogy a hátsó irányszektor eljárásainak adatbázisát magukba foglaló szavakat a teljes hátsó irányszektorba kell kisugározni.

3.11.5.4.2.4 **Ajánlás**. - *Ha a hátsó irányszektor funkció biztosítva van, akkor a megfelelő kiegészítő adat 'B' szavakat is ki kell sugározni.*

Megjegyzés. - A kiegészítő adat szavak összeállítása az "A"- Függelék A-10., A-12. és A-15. táblázatában került megadásra.

3.11.5.4.3 *Ellenőrzés és vezérlés*

3.11.5.4.3.1 A felügyelő rendszernek egy riasztó jelzést kell leadni a kijelölt vezérlő pontra akkor, ha a kisugárzott teljesítmény kisebb annál, mint ami a korábbi 3.11.4.10.1 pontban meghatározott differenciális fázis eltolásos kódolás (DPSK) követelményének kielégítéséhez szükséges.

3.11.5.4.3.2 Ha a megközelítési oldalszög fedésterületre kisugárzott alap adatokban az észlelt hiba legalább két egymást követő vett mintában előfordul, akkor ezeknek az adatoknak, valamint a megközelítési oldalszög és magassági szög funkcióknak a sugárzását meg kell szűntetni.

3.11.5.4.3.3 Ha a hátsó irányszektor fedésterületre kisugárzott alap adatokban az észlelt hiba legalább két egymást követő vett mintában előfordul, akkor ezeknek az adatoknak, valamint a hátsó irányszektor funkcióknak a sugárzását meg kell szűntetni.

3.11.5.5 *Távolságmérő berendezés*

3.11.5.5.1 A DME információt legalább azon a teljes fedésterületen belül kell biztosítani, amelyben a megközelítési és hátsó irányszektor útirány-vezetés rendelkezésre áll.

3.11.5.5.2 **Ajánlás**. - *A DME információt a teljes 360°-os irányszögben biztosítani kell, ha az üzemeltetési szempontból szükséges.*

Megjegyzés. - A DME földi berendezés telepítési helye a futópálya hosszától, a futópálya profiljától és a helyi terepfelszíntől függ. A DME földi berendezés telepítésére vonatkozó útmutató anyag a "C"- Melléklet 7.1.6 pontjában és a "G"- Melléklet 5. pontjában került megadásra.

3.11.6 A légijármű fedélzeti berendezés jellemzői

3.11.6.1 *Szög és adat funkciók*

3.11.6.1.1 *Pontosság*

3.11.6.1.1.1 Ahol a differenciális fázis eltolásos kódolás /DPSK/ és a letapogató sugárnyaláb jel teljesítmény-sűrűsége megfelel annak, ami a fenti 3.11.4.10.1 pontban meghatározásra került, ott a légijármű fedélzeti berendezésének képesnek kell lenni arra, hogy vegye a jeleket és bármilyen olyan dekódolt szög jelet, amelynek a kormányzási elmozdulási zaja (CMN) nem haladja meg a 0,1 fokot, kivéve azt, hogy a hátsó irányszektor útirány-vezetési funkciónál a kormányzási elmozdulási zaj (CMN) nem haladhatja meg a 0,2 fokot.

1. Megjegyzés. - Az a cél, hogy azok az alap és kiegészítő adat szavak, amelyek a kívánt üzemeltetéshez elengedhetetlen információkat tartalmaznak, egy idő-perióduson belül dekódolásra kerüljenek, és olyan integritással, amely megfelel a tervezett alkalmazásnak.

2. Megjegyzés. - A szög útirány-vezetési és az adat funkciók "begyűjtésére"és érvényesítésére vonatkozó tájékoztatások a "G"- Melléklet 7.3 pontjában kerültek megadásra.

3.11.6.1.1.2 Ahol a kisugárzott jel teljesítmény-sűrűsége elég magas ahhoz, hogy a légijármű fedélzeti vevő zaj-hozzájárulása jelentéktelenné váljon, ott a légijármű fedélzeti berendezés nem csökkentheti semelyik dekódolt szög útirány-vezetési jel pontosságát az útvonal-követési hibánál (PFE) plusz, vagy mínusz 0,017 foknál nagyobb értékben, vagy a kormányzási elmozdulási zajnál (CMN) plusz, vagy mínusz 0,015 foknál (oldalszög) és plusz, vagy mínusz 0,01 foknál (magassági szög) nagyobb értékben.

3.11.6.1.1.3 Abból a célból, hogy a pontos útirány-vezetés a futópálya felülete feletti 2,5 méternél (8 láb) elérhető legyen, a légijármű fedélzeti berendezésnek 0,04 foknál kisebb kormányzási elmozdulási zajt (CMN) kell létrehozni a fenti 3.11.4.10.2 b) alpontban megadott teljesítmény-sűrűség mellett.

3.11.6.1.2 *Dinamika tartomány*

3.11.6.1.2.1 A légijármű fedélzeti berendezésnek képesnek kell lenni a jelek "begyűjtésére" és a fenti 3.11.6.1.1.2 pontban lévő teljesítményt ki kell, hogy elégítse ott, ahol bármely kisugárzott jel teljesítmény-sűrűségének az értéke a fenti 3.11.4.10.1 pontban meghatározott minimum érték és az azon feletti maximum mínusz 14,5 dBW/m^2 érték között van.

3.11.6.1.2.2 A vevő teljesítménye nem csökkenhet a meghatározott értékeken kívülre akkor, amikor a fenti 3.11.6.1.2.1 pontban meghatározott maximális különbségű szintek állnak fenn az egyes funkciók jel teljesítmény-sűrűsége között.

3.11.6.1.3 *A vevő berendezés szög adat kimeneti szűrőjének jellemzői*

3.11.6.1.3.1 A szinuszos bemeneti frekvenciáknál a vevő kimeneti szűrői nem gerjeszthetnek a szög adatokban olyan amplitúdó ingadozást, vagy fáziskésést, ami 20 százaléknál nagyobb mértékben meghaladná azt, mint ami egy 10 rad/s sarok-frekvenciájú egypólusú aluláteresztő szűrővel elérhető.

Megjegyzés. - A csak vizuális kijelző egységek működtetésére szánt vevő kimeneteknél hasznos lehet megfelelő további szűrés. A kimenő adatok szűrésére vonatkozó kiegészítő tájékoztatások a "G" Melléklet 7.4.2 pontjában kerültek megadásra.

3.11.6.1.4 *Szomszéd csatorna hamis vétel*. A fenti 3.11.6 pontban meghatározott vevő teljesítményt kell kielégíteni akkor, amikor a kívánt jelek és az adott frekvenciára központosítottan egy 150KHz-es sávszélességben lévő szomszédos csatorna jelek között az arány egyenlő, vagy nagyobb, mint a következő pontokban ismertetett jel/zaj viszony (SNR) értékek:

a) ahogy az X1- Táblázatban megadásra kerültek, amikor a kívánt földi állomásról vett teljesítmény-sűrűség egyenlő, vagy nagyobb, mint ami az Y- Táblázatban megadásra került, vagy

b) ahogy az X2- Táblázatban megadásra kerültek, amikor a kívánt földi állomásról vett teljesítmény-sűrűség a 3.11.4.10.1.pontban meghatározott minimális sűrűségi teljesítmény értékek és az Y-Táblázatban megadott értékek között van.

Y- Táblázat

Funkció	*Sávszélesség (2. Megjegyzés)*		
	1°	*2°*	*3°*
Megközelítési oldalszög útirány-vezetés	-69,8 dBW/m^2	-63,8 dBW/m^2	-60,2 dBW/m^2
Nagysebességű megközelítési útirány-vezetés	-74,6 dBW/m^2	-69,5 dBW/m^2	-65 dBW/m^2
Megközelítési magassági szög útirány-vezetés	-71 dBW/m^2	-65 dBW/m^2	nem alkalmazható
Hátsó irányszektor	nem alkalmazható (lásd 4. Megjegyzést)	nem alkalmazható (lásd 4. Megjegyzést)	nem alkalmazható (lásd 4. Megjegyzést)

X1- Táblázat

Funkció	*Adat*	*SNR (lásd 1. Megjegyzést) Sávszélesség (2. Megjegyzés)*		
		1°	*2°*	*3°*
Megközelítési oldalszög útirány-vezetés	5 dB	24,7 dB	30,7 dB	34,3 dB
Nagysebességű megközelítési útirány-vezetés	5 dB	19,9 dB	26 dB	29,5 dB
Megközelítési magassági szög útirány-vezetés	5 dB	23,5 dB	29,5 dB	nem alkalmazható
Hátsó irányszektor (lásd 4. Megjegyzést)	5 dB	5,2 dB	11,2 dB	14,8 dB

X2- Táblázat

Funkció	*Adat*	*SNR (lásd 1. Megjegyzést) Sávszélesség (2. Megjegyzés)*		
		1°	*2°*	*3°*
Megközelítési oldalszög útirány-vezetés	5 dB	8,2 dB	14,3 dB	17,8 dB
Nagysebességű megközelítési útirány-vezetés	5 dB	3,5 dB	9,5 dB	13 dB
Megközelítési magassági szög útirány-vezetés	5 dB	3,5 dB	9,5 dB	nem alkalmazható
Hátsó irányszektor (lásd 4. Megjegyzést)	5 dB	5,2 dB	11,2 dB	14,8 dB

1. Megjegyzés – Amikor a kisugárzott kívánt jel teljesítmény-sűrűsége elég nagy ahhoz, hogy a légijármű fedélzeti vevő zaj-hozzájárulása jelentéktelenné váljon, ott a 3.11.6.1.1 pontban megállapított, a légijárműnek a magassági szög és a megközelítési oldalszög útirány-vezetéséhez (a hátsó irányszektorhoz nem) tartozó kormányzási elmozdulási zaj (CMN) hozzájárulását csökkenteni kell, összehasonlítva azzal a kormányzási elmozdulási zaj (CMN) hozzájárulással, amikor a kisugárzott kívánt jel teljesítmény-sűrűsége a minimumon van, ahogy a 3.11.4.10.1 pontban megadásra került, és ezért a minimális jel/zaj (SNR) viszony értékek magasabbak.

2. Megjegyzés – A sugárszélességek által kijelölt egymás mellett levő pontok között a kapcsolat lineáris.

3. Megjegyzés – Ezeket a jel/zaj (SNR) viszony értékeket végig tartani kell a "G"- Melléklet 9.3 pontjában ismertetett frekvencia elkülönítési kritérium alkalmazása során.

4. Megjegyzés – Mivel nincs változás a hátsó irányszektor útirány-vezetés pontosságában, amikor a légijármű fedélzeti vevő zaj jelentéktelennek vehető, ezért ugyanazok a jel/zaj (SNR) viszony értékek alkalmazandók a hátsó irányszektornál.

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
*1X	-	-	-	1 025	12	-	-	962	12
**1Y	-	-	-	1 025	36	-	-	1 088	30
*2X	-	-	-	1 026	12	-	-	963	12
**2Y	-	-	-	1 026	36	-	-	1 089	30
*3X	-	-	-	1 027	12	-	-	964	12
**3Y	-	-	-	1 027	36	-	-	1 090	30
*4X	-	-	-	1 028	12	-	-	965	12
**4Y	-	-	-	1 028	36	-	-	1 091	30
*5X	-	-	-	1 029	12	-	-	966	12
**5Y	-	-	-	1 029	36	-	-	1 092	30
*6X	-	-	-	1 030	12	-	-	967	12
**6Y	-	-	-	1 030	36	-	-	1 093	30
*7X	-	-	-	1 031	12	-	-	968	12
*7Y	-	-	-	1 031	36	-	-	1 094	30
*8X	-	-	-	1 032	12	-	-	969	12
*8Y	-	-	-	1 032	36	-	-	1 095	30
*9X	-	-	-	1 033	12	-	-	970	12
**9Y	-	-	-	1 033	36	-	-	1 096	30
*10X	-	-	-	1 034	12	-	-	971	12
**10Y	-	-	-	1 034	36	-	-	1 097	30
*11X	-	-	-	1 035	12	-	-	972	12
**11Y	-	-	-	1 035	36	-	-	1 098	30
*12X	-	-	-	1 036	12	-	-	973	12
**12Y	-	-	-	1 036	36	-	-	1 099	30
*13X	-	-	-	1 037	12	-	-	974	12
**13Y	-	-	-	1 037	36	-	-	1 100	30
*14X	-	-	-	1 038	12	-	-	975	12
**14Y	-	-	-	1 038	36	-	-	1 101	30
*15X	-	-	-	1 039	12	-	-	976	12
**15Y	-	-	-	1 039	36	-	-	1 102	30
*16X	-	-	-	1 040	12	-	-	977	12
**16Y	-	-	-	1 040	36	-	-	1 103	30

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás (folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
***17X	108.00	-	-	1 041	12	-	-	978	12
17Y	108.05	5 043.0	540	1 041	36	36	42	1 104	30
17Z	-	5 043.3	541	1 041	-	21	27	1 104	15
18X	108.10	5 031.0	500	1 042	12	12	18	979	12
18W	-	5 031.3	501	1 042	-	24	30	979	24
18Y	108.15	5 043,6	542	1 042	36	36	42	1 105	30
18Z	-	5 043,9	543	1 042	-	21	27	1 105	15
19X	108.20	-	-	1 043	12	-	-	980	12
19Y	108.25	5 044,2	544	1 043	36	36	42	1 106	30
19Z	-	5 044,5	545	1 043	-	21	27	1 106	15
20X	108.30	5 031,6	502	1 044	12	12	18	981	12
20W	-	5 031,9	503	1 044	-	24	30	981	24
20Y	108.35	5 044,8	546	1 044	36	36	42	1 107	30
20Z	-	5 045,1	547	1 044	-	21	27	1 107	15
21X	108.40	-	-	1 045	12	-	-	982	12
21Y	108.45	5 045,4	548	1 045	36	36	42	1 108	30
21Z	-	5 045,7	549	1 045	-	21	27	1 108	15
22X	108.50	5 032,2	504	1 046	12	12	18	983	12
22W	-	5 032,5	505	1 046	-	24	30	983	24
22Y	108.55	5 046,0	550	1 046	36	36	42	1 109	30
22Z	-	5 046,3	551	1 046	-	21	27	1 109	15
23X	108.60	-	-	1 047	12	-	-	984	12
23Y	108.65	5 046,6	552	1 047	36	36	42	1 110	30
23Z	-	5 046,9	553	1 047	-	21	27	1 110	15
24X	108.70	5 032.8	506	1 048	12	12	18	985	12
24W	-	5 033.1	507	1 048	-	24	30	985	24
24Y	108.75	5 047.2	554	1 048	36	36	42	1 111	30
24Z	-	5 047.5	555	1 048	-	21	27	1 111	15
25X	108.80	-	-	1 049	12	-	-	986	12
25Y	108.85	5 047.8	556	1 049	36	36	42	1 112	30
25Z	-	5 048.1	557	1 049	-	21	27	1 112	15
26X	108.90	5 033.4	508	1 050	12	12	18	987	12
26W	-	5 033.7	509	1 050	-	24	30	987	24
26Y	108.95	5 048.4	558	1 050	36	36	42	1 113	30
26Z	-	5 048.7	559	1 050	-	21	27	1 113	15
27X	109.00	-	-	1 051	12	-	-	988	12
27Y	109.05	5 049.0	560	1 051	36	36	42	1 114	30
27Z	-	5 049.3	561	1 051	-	21	27	1 114	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
28X	109.10	5 034.0	510	1 052	12	12	18	989	12
28W	-	5 034.3	511	1 052	-	24	30	989	24
28Y	109.15	5 049.6	562	1 052	36	36	42	1 115	30
28Z	-	5 049.9	563	1 052	-	21	27	1 115	15
29X	109.20	-	-	1 053	12	-	-	990	12
29Y	109.25	5 050.2	564	1 053	36	36	42	1 116	30
29Z	-	5 050.5	565	1 053	-	21	27	1 116	15
30X	109.30	5 034.6	512	1 054	12	12	18	991	12
30W	-	5 034.9	513	1 054	-	24	30	991	24
30Y	109.35	5 050.8	566	1 054	36	36	42	1 117	30
30Z	-	5 051.1	567	1 054	-	21	27	1 117	15
31X	109.40	-	-	1 055	12	-	-	992	12
31Y	109.45	5 051.4	568	1 055	36	36	42	1 118	30
31Z	-	5 51.7	569	1 055	-	21	27	1 118	15
32X	109.50	5 035.2	514	1 056	12	12	18	993	12
32W	-	5 035.5	515	1 056	-	24	30	993	24
32Y	109.55	5 052.0	570	1 056	36	36	42	1 119	30
32Z	-	5 052.3	571	1 056	-	21	27	1 119	15
33X	109.60	-	-	1 057	12	-	-	994	12
33Y	109.65	5 052.6	572	1 057	36	36	42	1 120	30
33Z	-	5 052.9	573	1 057	-	21	27	1 120	15
34X	109.70	5 035.8	516	1 058	12	12	18	995	12
34W	-	5 036.1	517	1 058	-	24	30	995	24
34Y	109.75	5 053.2	574	1 058	36	36	42	1 121	30
34Z	-	5 053.5	575	1 058	-	21	27	1 121	15
35X	109.80	-	-	1 059	12	-	-	996	12
35Y	109.85	5 053.8	576	1 059	36	36	42	1 122	30
35Z	-	5 054.1	577	1 059	-	21	27	1 122	15
36X	109.90	5 036.4	518	1 060	12	12	18	997	12
36W	-	5036.7	519	1 060	-	24	30	997	24
36Y	109.95	5 054.4	578	1 060	36	36	42	1 123	30
36Z	-	5 054.7	579	1 060	-	21	27	1 123	15
37X	110.00	-	-	1 061	12	-	-	998	12
37Y	110.05	5 055.0	580	1 061	36	36	42	1 124	30
37Z	-	5 055.3	581	1 061	-	21	27	1 124	15
38X	110.10	5 37.0	520	1 062	12	12	18	999	12
38W	-	5 037.3	521	1 062	-	24	30	999	24
38Y	110.15	5 055.6	582	1 062	36	36	42	1 125	30
38Z	-	5 055.9	583	1 062	-	21	27	1 125	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N μs	Kezdeti megköz. μs	Végső megköz. μs	Frekvencia MHz	Impulzus kódok μs
39X	110.20	-	-	1 063	12	-	-	1 000	12
39Y	110.25	5 056.2	584	1 063	36	36	42	1 126	30
39Z	-	5 056.5	585	1 063	-	21	27	1 126	15
40X	110.30	5 037.6	522	1 064	12	12	18	1 001	12
40W	-	5 037.9	523	1 064	-	24	30	1 001	24
40Y	110.35	5 056.8	586	1 064	36	36	42	1 127	30
40Z	-	5 057.1	587	1 064	-	21	27	1 127	15
41X	110.40	-	-	1 065	12	-	-	1 002	12
41Y	110.45	5 057.4	588	1 065	36	36	42	1 128	30
41Z	-	5 057.7	589	1 065	-	21	27	1 128	15
42X	110.50	5 038.2	524	1 066	12	12	18	1 003	12
42W	-	5 038.5	525	1 066	-	24	30	1 003	24
42Y	110.55	5 058.0	590	1 066	36	36	42	1 129	30
42Z	-	5 058.3	591	1 066	-	21	27	1 129	15
43X	110.60	-	-	1 067	12	-	-	1 004	12
43Y	110.65	5 058.6	592	1 067	36	36	42	1 130	30
43Z	-	5 058.9	593	1 067	-	21	27	1 130	15
44X	110.70	5 038.8	526	1 068	12	12	18	1 005	12
44W	-	5 039.1	527	1 068	-	24	30	1 005	24
44Y	110.75	5 059.2	594	1 068	36	36	42	1 131	30
44Z	-	5 059.5	595	1 068	-	21	27	1 131	15
45X	110.80	-	-	1 069	12	-	-	1 006	12
45Y	110.85	5 059.8	596	1 069	36	36	42	1 132	30
45Z	-	5 060.1	597	1 069	-	21	27	1 132	15
46X	110.90	5 039.4	528	1 070	12	12	18	1 007	12
46W	-	5 039.7	529	1 070	-	24	30	1 007	24
46Y	110.95	5 060.4	598	1 070	36	36	42	1 133	30
46Z	-	5 060.7	599	1 070	-	21	27	1 133	15
47X	111.00	.	.	1 071	12	-	-	1 008	12
47Y	111.05	5 061.0	600	1 071	36	36	42	1 134	30
47Z	-	5 061.3	601	1 071	-	21	27	1 134	15
48X	111.10	5 040.0	530	1 072	12	12	18	1 009	12
48W	-	5 040.3	531	1 072	-	24	30	1 009	24
48Y	111.15	5 061.6	602	1 072	36	36	42	1 135	30
48Z	-	5 061.9	603	1 072	-	21	27	1 135	15
49X	111.20	-	-	1 073	12	-	-	1 010	12
49Y	111.25	5 062.2	604	1 073	36	36	42	1 136	30
49Z	-	5 062.5	605	1 073	-	21	27	1 136	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
50X	111.30	5 040.6	532	1 074	12	12	18	1 011	12
50W	-	5 040.9	533	1 074	-	24	30	1 011	24
50Y	111.35	5 062.8	606	1 074	36	36	42	1 137	30
50Z	-	5 063.1	607	1 074	-	21	27	1 137	15
51X	111.40	-	-	1 075	12	-	-	1 012	12
51Y	111.45	5 063.4	608	1 075	36	36	42	1 138	30
51Z	-	5 063.7	609	1 075	-	21	27	1 138	15
52X	111.50	5 041.2	534	1 076	12	12	18	1 013	12
52W	-	5 041.5	535	1 076	-	24	30	1 013	24
52Y	111.55	5 064.0	610	1 076	36	36	42	1 139	30
52Z	-	5 064.3	611	1 076	-	21	27	1 139	15
53X	111.60	-	-	1 077	12	-	-	1 014	12
53Y	111.65	5 064.6	612	1 077	36	36	42	1 140	30
53Z	-	5 064.9	613	1 077	-	21	27	1 140	15
54X	111.70	5 041.8	536	1 078	12	12	18	1 015	12
54W	-	5 042.1	537	1 078	-	24	30	1 015	24
54Y	111.75	5 065.2	614	1 078	36	36	42	1 141	30
54Z	-	5 065.5	615	1 078	-	21	27	1 141	15
55X	111.80	-	-	1 079	12	-	-	1 016	12
55Y	111.85	5 065.8	616	1 079	36	36	42	1 142	30
55Z	-	5 066.1	617	1 079	-	21	27	1 142	15
56X	111.90	5 042.4	538	1 080	12	12	18	1 017	12
56W	-	5 042.7	539	1 080	-	24	30	1 017	24
56Y	111.95	5 066.4	618	1 080	36	36	42	1 143	30
56Z	-	5 066.7	619	1 080	-	21	27	1 143	15
57X	112.00	-	-	1 081	12	-	-	1 018	12
57Y	112.05	-	-	1 081	36	-	-	1 144	30
58X	112.10	-	-	1 082	12	-	-	1 019	12
58Y	112.15	-	-	1 082	36	-	-	1 145	30
59X	112.20	-	-	1 083	12	-	-	1 020	12
59Y	112.25	-	-	1 083	36	-	-	1 146	30
**60X	-	-	-	1 084	12	-	-	1 021	12
**60Y	-	-	-	1 084	36	-	-	1 147	30
**61X	-	-	-	1 085	12	-	-	1 022	12
**61Y	-	-	-	1 085	36	-	-	1 148	30
**62X	-	-	-	1 086	12	-	-	1 023	12
**62Y	-	-	-	1 086	36	-	-	1 149	30
**63X	-	-	-	1 087	12	-	-	1 024	12
**63Y	-	-	-	1 087	36	-	-	1 150	30

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
**64X	-	-	-	1 088	12	-	-	1 151	12
**64Y	-	-	-	1 088	36	-	-	1 025	30
**65X	-	-	-	1 089	12	-	-	1 152	12
**65Y	-	-	-	1 089	36	-	-	1 026	30
**66X	-	-	-	1 090	12	-	-	1 153	12
**66Y	-	-	-	1 090	36	-	-	1 027	30
**67X	-	-	-	1 091	12	-	-	1 154	12
**67Y	-	-	-	1 091	36	-	-	1 028	30
**68X	-	-	-	1 092	12	-	-	1 155	12
**68Y	-	-	-	1 092	36	-	-	1 029	30
**69X	-	-	-	1 093	12	-	-	1 156	12
**69Y	-	-	-	1 093	36	-	-	1 030	30
70X	112.30	-	-	1 094	12	-	-	1 157	12
**70Y	112.35	-	-	1 094	36	-	-	1 031	30
71X	112.40	-	-	1 095	12	-	-	1 158	12
**71Y	112.45	-	-	1 095	36	-	-	1 032	30
72X	112.50	-	-	1 096	12	-	-	1 159	12
**72Y	112.55	-	-	1 096	36	-	-	1 033	30
73X	112.60	-	-	1 097	12	-	-	1 160	12
**73Y	112.65	-	-	1 097	36	-	-	1 034	30
74X	112.70	-	-	1 098	12	-	-	1 161	12
**74Y	112.75	-	-	1 098	36	-	-	1 035	30
75X	112.80	-	-	1 099	12	-	-	1 162	12
**75Y	112.85	-	-	1 099	36	-	-	1 036	30
76X	112.90	-	-	1 100	12	-	-	1 163	12
**76Y	112.95	-	-	1 100	36	-	-	1 037	30
77X	113.00	-	-	1 101	12	-	-	1 164	12
**77Y	113.05	-	-	1 101	36	-	-	1 038	30
78X	113.10	-	-	1 102	12	-	-	1 165	12
**78Y	113.15	-	-	1 102	36	-	-	1 039	30
79X	113.20	-	-	1 103	12	-	-	1 166	12
**79Y	113.25	-	-	1 103	36	-	-	1 040	30
80X	113.30	-	-	1 104	12	-	-	1 167	12
80Y	113.35	5 067.0	620	1 104	36	36	42	1 041	30
80Z	-	5 067.3	621	4	-	21	27	1 041	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
81X	113.40	-	-	1 105	12	-	-	1 168	12
81Y	113.45	5 067.6	622	1 105	36	36	42	1 042	30
81Z	-	5 067.9	623	1 105	-	21	27	1 042	15
82X	113.50	-	-	1 106	12	-	-	1 169	12
82Y	113.55	5 068.2	624	1 106	36	36	42	1 043	30
82Z	-	5 068.5	625	1 106	-	21	27	1 043	15
83X	113.60	-	-	1 107	12	-	-	1 170	12
83Y	113.65	5 068.8	626	1 107	36	36	42	1 044	30
83Z	-	5 069.1	627	1 107	-	21	27	1 044	15
84X	113.70	-	-	1 108	12	-	-	1 171	12
84Y	113.75	5 069.4	628	1 108	36	36	42	1 045	30
84Z	-	5 069.7	629	1 108	-	21	27	1 045	15
85X	113.80	-	-	1 109	12	-	-	1 172	12
85Y	113.85	5 070.0	630	1 109	36	36	42	1 046	30
85Z	-	5 070.3	631	1 109	-	21	27	1 046	15
86X	113.90	-	-	1 110	12	-	-	1 173	12
86Y	113.95	5 070.6	632	1 110	36	36	42	1 047	30
86Z	-	5 070.9	633	1 110	-	21	27	1 047	15
87X	114.00	-	-	1 111	12	-	-	1 174	12
87Y	114.05	5 071.2	634	1 111	36	36	42	1 048	30
87Z	-	5 071.5	635	1 111	-	21	27	1 048	15
88X	114.10	-	-	1 112	12	-	-	1 175	12
88Y	114.15	5 071.8	636	1 112	36	36	42	1 049	30
88Z	-	5 072.1	637	1 112	-	21	27	1 049	15
89X	114.20	-	-	1 113	12	-	-	1 176	12
89Y	114.25	5 072.4	638	1 113	36	36	42	1 050	30
89Z	-	5 072.7	639	1 113	-	21	27	1 050	15
90X	114.30	-	-	1 114	12	-	-	1 177	12
90Y	114.35	5 073.0	640	1 114	36	36	42	1 051	30
90Z	-	5 073.3	641	1 114	-	21	27	1 051	15
91X	114.40	-	-	1 115	12	-	-	1 178	12
91Y	114.45	5 073.6	642	1 115	36	36	42	1 052	30
91Z	-	5 073.9	643	1 115	-	21	27	1 052	15
92X	114.50	-	-	1 116	12	-	-	1 179	12
92Y	114.55	5 074.2	644	1 116	36	36	42	1 053	30
92Z	-	5 074.5	645	1 116	-	21	27	1 053	15
93X	114.60	-	-	1 117	12	-	-	1 180	12
93Y	114.65	5 074.8	646	1 117	36	36	42	1 054	30
93Z	-	5 075.1	647	1 117	-	21	27	1 054	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
94X	114.70	-	-	1 118	12	-	-	1 181	12
94Y	114.75	5 075.4	648	1 118	36	36	42	1 055	30
94Z	-	5 075.7	649	1 118	-	21	27	1 055	15
95X	114.80	-	-	1 119	12	-	-	1 182	12
95Y	114.85	5 076.0	650	1 119	36	36	42	1 056	30
95Z	-	5 076.3	651	1 119	-	21	27	1 056	15
96X	114.90	-	-	1 120	12	-	-	1 183	12
96Y	114.95	5 076.6	652	1 120	36	36	42	1 057	30
96Z	-	5 076.9	653	1 120	-	21	27	1 057	15
97X	115.00	-	-	1 121	12	-	-	1 184	12
97Y	115.05	5 077.2	654	1 121	36	36	42	1 058	30
97Z	-	5 077.5	655	1 121	-	21	27	1 058	15
98X	115.10	-	-	1 122	12	-	-	1 185	12
98Y	115.15	5 077.8	656	1 122	36	36	42	1 059	30
98Z	-	5 078.1	657	1 122	-	21	27	1 059	15
99X	115.20	-	-	1 123	12	-	-	1 186	12
99Y	115.25	5 078.4	658	1 123	36	36	42	1 060	30
99Z	-	5 078.7	659	1 123	-	21	27	1 060	15
100X	115.30	-	-	1 124	12	-	-	1 187	12
100Y	115.35	5 079.0	660	1 124	36	36	42	1 061	30
100Z	-	5 079.3	661	1 124	-	21	27	1 061	15
101X	115.40	-	-	1 125	12	-	-	1 188	12
101Y	115.45	5 079.6	662	1 125	36	36	42	1 062	30
101Z	-	5 079.9	663	1 125	-	21	27	1 062	15
102X	115.50	-	-	1 126	12	-	-	1 189	12
102Y	115.55	5 080.2	664	1 126	36	36	42	1 063	30
102Z	-	5 080.5	665	1 126	-	21	27	1 063	15
103X	115.60	-	-	1 127	12	-	-	1 190	12
103Y	115.65	5 080.8	666	1 127	36	36	42	1 064	30
103Z	-	5 081.1	667	1 127	-	21	27	1 064	15
104X	115.70	-	-	1 128	12	-	-	1 191	12
104Y	115.75	5 081.4	668	1 128	36	36	42	1 065	30
104Z	-	5 081.7	669	1 128	-	21	27	1 065	15
105X	115.80	-	-	1 129	12	-	-	1 192	12
105Y	115.85	5 082.0	670	1 129	36	36	42	1 066	30
105Z	-	5 082.3	671	1 129	-	21	27	1 066	15
106X	115.90	-	-	1 130	12	-	-	1 193	12
106Y	115.95	5 082.6	672	1 130	36	36	42	1 067	30
106Z	-	5 082.9	673	1 130	-	21	27	1 067	15

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
107X	116.00	-	-	1 131	12	-	-	1 194	12
107Y	116.05	5 083.2	674	1 131	36	36	42	1 068	30
107Z	-	5 083.5	675	1 131	-	21	27	1 068	15
108X	116.10	-	-	1 132	12	-	-	1 195	12
108Y	116.15	5 083.8	676	1 132	36	36	42	1 069	30
108Z	-	5 084.1	677	1 132	-	21	27	1 069	15
109X	116.20	-	-	1 133	12	-	-	1 196	12
109Y	116.25	5 084.4	678	1 133	36	36	42	1 070	30
109Z	-	5 084.7	679	1 133	-	21	27	1 070	15
110X	116.30	-	-	1 134	12	-	-	1 197	12
110Y	116.35	5 085.0	680	1 134	36	36	42	1 071	30
110Z	-	5 085.3	681	1 134	-	21	27	1 071	15
111X	116.40	-	-	1 135	12	-	-	1 198	12
111Y	116.45	5 085.6	682	1 135	36	36	42	1 072	30
111Z	-	5 085.9	683	1 135	-	21	27	1 072	15
112X	116.50	-	-	1 136	12	-	-	1 199	12
112Y	116.55	5 086.2	684	1 136	36	36	42	1 073	30
112Z	-	5 086.5	685	1 136	-	21	27	1 073	15
113X	116.60	-	-	1 137	12	-	-	1 200	12
113Y	116.65	5 086.8	686	1 137	36	36	42	1 074	30
113Z	-	5 087.1	687	1 137	-	21	27	1 074	15
114X	116.70	-	-	1 138	12	-	-	1 201	12
114Y	116.75	5 087.4	688	1 138	36	36	42	1 075	30
114Z	-	5 087.7	689	1 138	-	21	27	1 075	15
115X	116.80	-	-	1 139	12	-	-	1 202	12
115Y	116.85	5 088.0	690	1 139	36	36	42	1 076	30
115Z	-	5 088.3	691	1 139	-	21	27	1 076	15
116X	116.90	-	-	1 140	12	-	-	1 203	12
116Y	116.95	5 088.6	692	1 140	36	36	42	1 077	30
116Z	-	5 088.9	693	1 140	-	21	27	1 077	15
117X	117.00	-	-	1 141	12	-	-	1 204	12
117Y	117.05	5 089.2	694	1 141	36	36	42	1 078	30
117Z	-	5 089.5	695	1 141	-	21	27	1 078	15
118X	117.10	-	-	1 142	12	-	-	1 205	12
118Y	117.15	5 089.8	696	1 142	36	36	42	1 079	30
118Z	-	5 090.1	697	1 142	-	21	27	1 079	15
119X	117.20	-	-	1 143	12	-	-	1 206	12
119Y	117.25	5 090.4	698	1 143	36	36	42	1 080	30
119Z	-	5 090.7	699	1 143	-	21	27	1 080	30

A-táblázat: DME/MLS szög, DME/VOR és DME/ILS/MLS csatornakiosztás és párosítás

(folytatás)

Csatorna párosítás				DME paraméterek					
				Lekérdezés				Válasz	
					Impulzus kódok				
						DME/P mód			
DME csatorna szám	VHF frekvencia MHz	MLS szög frekvencia MHz	MLS csatorna szám	Frekvencia MHz	DME/N µs	Kezdeti megköz. µs	Végső megköz. µs	Frekvencia MHz	Impulzus kódok µs
120X	117.30	-	-	1 144	12	-	-	1 207	12
120Y	117.35	-	-	1 144	36	-	-	1 081	30
121X	117.40	-	-	1 145	12	-	-	1 208	12
121Y	117.45	-	-	1 145	36	-	-	1 082	30
122X	117.50	-	-	1 146	12	-	-	1 209	12
122Y	117.55	-	-	1 146	36	-	-	1 083	30
123X	117.60	-	-	1 147	12	-	-	1 210	12
123Y	117.65	-	-	1 147	36	-	-	1 084	30
124X	117.70	-	-	1 148	12	-	-	1 211	12
**124Y	117.75	-	-	1 148	36	-	-	1 085	30
125X	117.80	-	-	1 149	12	-	-	1 212	12
**125Y	117.85	-	-	1 149	36	-	-	1 086	30
126X	117.90	-	-	1 150	12	-	-	1 213	12
**126Y	117.95	-	-	1 150	36	-	-	1 087	30

* Ezek a csatornák kizárólag nemzeti kiosztásra vannak fenntartva.

** Ezeket a csatornákat másodlagos alapon lehet nemzeti kiosztásra felhasználni. Ezen csatornák tartalékolásának elsődleges oka az, hogy védelmet biztosítsunk a másodlagos légtérellenőrző radar (SSR) rendszerek részére.

*** A 108,0 MHz-nek ILS szolgáltatási frekvenciaként való kijelölése nem tervezett. A hozzá kapcsolódó DME a 17X sz. üzemeltetési csatornát kényszerhelyzeti alkalmazásra lehet kijelölni.

B - táblázat: A megengedhető DME/P hibák

Hely	Szabvány	Mód	Útvonal-követési hiba (PFE)	Kormányzási elmozdulási zaj (CMN)
Az MLS megközelítési vonatkoztatási ponttól 37 km-től (20 tengeri mérföld) 9,3 km-ig (5 tengeri mérföld)	1 és 2	IA (Kezdeti megközelítés)	±250 m (±820 láb) lineárisan csökkenően ±85 m-re (±279 láb)	±68 m (±223 láb) lineárisan csökkenően ±34 m-re (±111 láb)
9,3 km-től (5 tengeri mérföld) az MLS megközelítési vonatkoztatási pontig	1	FA (Végső megközelítés)	±85 m (±279 láb) lineárisan csökkenően ±30 m-re (±100 láb)	±18 m (±60 láb)
	2	FA (Végső megközelítés)	±85 m (±279 láb) lineárisan csökkenően ±12 m-re (±40 láb)	±12 m (±40 láb)
	Lásd a Megjegyzést	IA (Kezdeti megközelítés)	±100 m (±328 láb)	±68 m (±223 láb)
Az MLS megközelítési vonatkoztatási pontnál és a teljes fedésterületen	1	FA (Végső megközelítés)	±30 m (±100 láb)	±18 m (±60 láb)
	2	FA (Végső megközelítés)	±12 m (±40 láb)	±12 m (±40 láb)
A hátsó irányszektor teljes fedésterületi légterében	1 és 2	FA (Végső megközelítés)	±100 m (±328 láb)	±68 m (±223 láb)
	Lásd a Megjegyzést	IA (Kezdeti megközelítés)	±100 m (±328 láb)	±68 m (±223 láb)

Megjegyzés. - A 9,3 km-es (5 tengeri mérföld) távolságból az MLS megközelítési vonatkoztatási pontig és a hátsó irányszektor teljes fedésterületén a kezdeti megközelítési (IA) módot lehet használni akkor, amikor a végső megközelítési (FA) mód nem üzemel.

A-FÜGGELÉK: A MIKROHULLÁMÚ LESZÁLLÍTÓ RENDSZER (MLS) JELLEMZŐI

A-1. táblázat: A bevezető jelszakasz (előtag) időzítése*

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Vivőhullám begyűjtése (folyamatos hullám - CW - adása)	0	0
A vevő vonatkoztatási idő kódja I_1 = 1 I_2 = 1 I_3 = 1 I_4 = 0 I_5 = 1	 13 1 15 16 17	 0.832 0.896 0.960 1.024 1.088**
Funkció azonosítás I_6 I_7 I_8 I_9 (lásd 3.11.4.4.3.3. pontot) I_{10} I_{11} I_{12}	 18 19 20 21 22 23 24	 1.152 1.216 1.280 1.344 1.408 1.472 1.536
A bevezető jelszakasz (előtag) vége	25	1.600

* Az összes funkcióra vonatkozik.

** A vevő szinkronizálás vonatkoztatási ideje az összes funkció időzítéséhez.

A-2. táblázat: A megközelítési oldalszög funkció időzítése

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Morse-kód (lásd a 3.11.4.6.2.1.2 pontot)	25	1.600
Antenna kiválasztás	26	1.664
Hátsó fedésterületen-kívül jelzés	32	2.048
Bal fedésterületen-kívül jelzés	34	2.176
Jobb fedésterületen-kívül jelzés	36	2.304
TO ellenőrzés	38	2.432
TO letapogatás*	40	2.560
Szünet		8.760
Fél-letapogatási pont		9.060
FRO letapogatás*		9.360
FRO ellenőrzés		15.560
Vége funkció (fedélzeti)		15.688
Vége védő-idő; vége funkció (földi)		15.900

* A TO és FRO letapogatási adások tényleges megkezdése és befejezése a biztosított arányos útirány-vezetés mértékétől függ. A megadott idő-rések egy maximális plusz, vagy mínusz 62,0 fokos letapogatást tesznek lehetővé. A letapogatási időzítésnek összeegyeztethetőnek kell lenni a pontossági követelményekkel.

A-3. táblázat: A nagysebességű megközelítési oldalszög és hátsó irányszektor funkciók időzítése

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Morse-kód (lásd a 3.11.4.6.2.1.2 pontot)	25	1.600
Antenna kiválasztás	26	1.664
Hátsó fedésterületen-kívül jelzés	32	2.048
Bal fedésterületen-kívül jelzés	34	2.176
Jobb fedésterületen-kívül jelzés	36	2.304
TO ellenőrzés	38	2.432
TO letapogatás*	40	2.560
Szünet		6.760
Fél-letapogatási pont		7.060
FRO letapogatás*		7.360
FRO ellenőrző impulzus		11.560
Vége funkció (fedélzeti)		11.688
Vége védő-idő; vége funkció (földi)		11.900

* A TO és FRO letapogatási adások tényleges megkezdése és befejezése a biztosított arányos útirány-vezetés mértékétől függ. A megadott idő-rések egy maximális plusz, vagy mínusz 42,0 fokos letapogatást tesznek lehetővé. A letapogatási időzítésnek összeegyeztethetőnek kell lenni a pontossági követelményekkel.

A-4. táblázat: A megközelítési magassági szög funkció időzítése

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Feldolgozó egység szünet	25	1.600
Fedésterületen-kívül jelzés	27	1.728
TO letapogatás*	29	1.856
Szünet		3.406
Fél-letapogatási pont		3.606
FRO letapogatás*		3.806
Vége funkció (fedélzeti)		5.356
Vége védő-idő; vége funkció (földi)		5.600

* A TO és FRO letapogatási adások tényleges megkezdése és befejezése a biztosított arányos útirány-vezetés mértékétől függ. A megadott idő-rések egy maximális mínusz 1,5 foktól plusz 29,5 fokig terjedő letapogatást tesznek lehetővé. A letapogatási időzítésnek összeegyeztethetőnek kell lenni a pontossági követelményekkel.

A-5. táblázat: A kilebegtetési funkció időzítése

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Feldolgozó egység szünet	25	1.600
TO letapogatás*	29	1.856
Szünet		3.056
Fél-letapogatási pont		3.456
FRO letapogatás*		3.856
Vége funkció (fedélzeti)		5.056
Vége védő-idő; vége funkció (földi)		5.300

* A TO és FRO letapogatási adások tényleges megkezdése és befejezése a biztosított arányos útirány-vezetés mértékétől függ. A megadott idő-rések egy maximális mínusz 2,0 foktól plusz 10,0 fokig terjedő letapogatást tesznek lehetővé. A letapogatási időzítésnek összeegyeztethetőnek kell lenni a pontossági követelményekkel.

A-6. táblázat: Az alap adat funkciók időzítése

(lásd a 3.11.4.3.4 pontot.)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Adat továbbítás (I_{13} - I_{30} bitek)	24	1.600
Paritás továbbítás (I_{31} - I_{32} bitek)	43	2.752
Vége funkció (fedélzeti)	45	2.880
Vége védő-idő; vége funkció (földi)		3.100

A-7. táblázat: Alap adatok

(lásd a 3.11.4.8.2.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
1	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 10. Megjegyzést.		I_1-I_{12}
	Megközelítési oldalszög-adó antenna - futópálya közötti küszöb távolság		6	0 m-től 6 300 m-ig	100m	I_{13} - I_{18}
	A megközelítési oldalszög arányos útirány-vezetési szektor negatív határa		5	0°-tól 60°-ig (Lásd a 11. Megjegyzést).	2^o	I_{19} - I_{23}
	A megközelítési oldalszög arányos útirány-vezetési szektor pozitív határa		5	0°-tól 60°-ig (Lásd a 11. Megjegyzést).	2^o	I_{24} - I_{28}
	A kiegészítő-biztonsági vezetési jel típusa		1	Lásd a 9. Megjegyzést.		I_{29}
	TARTALÉK		1	Lásd a 12. Megjegyzést.		I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést		I_{31} - I_{32}

A-7. táblázat: Alap adatok (folytatás)

(lásd a 3.11.4.8.2.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
2	BEVEZETŐ JELSZAKASZ (előtag)	0.16	12	Lásd 10. Megjegyzést.		I_1-I_{12}
	Minimális siklópálya		7	2°-tól 14,7°-ig	0,1°	I_{13} - I_{19}
	A hátsó irányszektor állapota		1	(Lásd a 2. Megjegyzést).		I_{20}
	A DME állapota		2	(Lásd a 7. Megjegyzést).		I_{21}-I_{22}
	A megközelítési oldalszög állapota		1	Lásd a 2. Megjegyzést.		I_{23}
	A megközelítési magassági szög állapota		1	Lásd a 2. Megjegyzést.		I_{24}
	TARTALÉK		1	Lásd a 6. és 12. Megjegyzést		I_{25} - I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést		I_{31} - I_{32}

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
3	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 10. Megjegyzést.		I_1-I_{12}
	Megközelítési oldalszög sugárnyaláb szélesség		3	0,5°-tól 4°-ig (Lásd 8. Megjegyzést).	0,5°	I_{13} - I_{15}
	Megközelítési magassági szög sugárnyaláb szélesség		3	0,5°-tól 2,5°-ig (Lásd 8. Megjegyzést).	0,5°	I_{16}-I_{18}
	DME távolság		9	0 m-től 6387,5 m-ig	12,5m	I_{19}-I_{27}
	TARTALÉK		3	Lásd a 12. Megjegyzést.		I_{28} - I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést.		I_{31} - I_{32}

A-7. táblázat: Alap adatok (folytatás)

(lásd a 3.11.4.8.2.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
4	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 4. és 10. Megjegyzést.		I_1-I_{12}
	A megközelítési oldalszög mágneses tájolása		9	0°-tól 359°-ig	1°	I_{13} – I_{21}
	A hátsó irányszektor mágneses tájolása		9	0°-tól 359°-ig	1°	I_{22}-I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést.		I_{31} - I_{32}

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
5	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 5. és 10. Megjegyzést.		I_1-I_{12}
	A hátsó irányszektor arányos útirány-vezetési szektor negatív határa		5	0°-tól 40°-ig (Lásd 11. Megjegyzést).	2°	I_{13} - I_{17}
	A hátsó irányszektor arányos útirány-vezetési szektor pozitív határa		5	0°-tól 40°-ig (Lásd 11. Megjegyzést).	2°	I_{18}-I_{22}
	Hátsó irányszektor sugár-nyaláb szélesség		3	0,5°-tól 4,0°-ig (Lásd a 8. Megjegyzést).	0,5°	I_{23}-I_{25}
	A hátsó irányszektor állapota		1	Lásd a 2. Megjegyzést.		I_{26}
	TARTALÉK		4	Lásd a 3. és 12. Megjegyzést		I_{27} - I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést		I_{31} - I_{32}

A-7. táblázat: Alap adatok (folytatás)

(lásd a 3.11.4.8.2.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
6	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 4. és 10. Megjegyzést.		I_1-I_{12}
	Az MLS földi berendezés azonosítója			Nagybetű A-tól Z-ig		
	2. karakter		6			I_{13}-I_{18}
	3. karakter		6			I_{19}-I_{24}
	4. karakter		6			I_{25}-I_{30}
	PARITÁS		2	Lásd az 1. Megjegyzést		I_{31} - I_{32}

MEGJEGYZÉSEK. –

1. Paritás bitként az I_{31} és az I_{32} került kiválasztásra az egyenlőségek kielégítésére:

$I_{13} + I_{14} ..... + I_{29} + I_{30} + I_{31}$ = PÁRATLAN
$I_{14} + I_{16} + I_{18} ..... + I_{28} + I_{30} + I_{32}$ = PÁRATLAN

2. Az állapot-jelző bit kódolása:

0 = funkció nincs kisugározva, vagy az ellenőrző üzemmódban kerül kisugárzásra (navigációs célra nem megbízható);

1 = a funkció szabályos üzemmódban kerül kisugárzásra (az Alap adat szó 2.-ben a hátsó irányszektor állapota is azt jelzi, hogy a hátsó irányszektor adása következik).

3. Ezek a bitek későbbi felhasználásra vannak fenntartva. Az egyik lehetséges felhasználás a hátsó irányszektor elhajlási lépték tényezőjének meghatározása.

4. Az Alap adat 4. és 6. szava mindkét, a megközelítési oldalszög és a hátsó irányszektor fedésterületére kisugárzásra kerül akkor, amikor a hátsó irányszektor útirány-vezetés biztosítva van, úgy, hogy közben az egyes fedésterületi szektorokban az adások közötti maximális meghatározott idő megmarad.

5. Az Alap adat 5. szava mindkét, a megközelítési oldalszög és a hátsó irányszektor fedésterületére kisugárzásra kerül akkor, amikor a hátsó irányszektor útirány-vezetés biztosítva van, úgy, hogy közben az egyes fedésterületi szektorokban az adások közötti maximális meghatározott idő megmarad.

6. Ezek a bitek a nagysebességű adásoknál való későbbi felhasználásra vannak fenntartva.

7. Az I_{21} és az I_{22} kódolása:

I_{21}	I_{22}	
0	0	A DME válaszadó üzemképtelen, vagy nem áll rendelkezésre.
1	0	Csak kezdeti megközelítési (IA) mód, vagy DME/N áll rendelkezésre.
0	1	Végső megközelítési (FA) mód, Szabvány 1. áll rendelkezésre.
1	1	Végső megközelítési (FA) mód, Szabvány 2. áll rendelkezésre.

8. A tényleges sugárnyaláb szélesség kódolt értéke (ahogy az a 3. Fejezet 3.11.1 pontjában meghatározásra került) a közelebbi 0,5 fokra van kerekítve.

9. Az I_{29} kódolása:

0 = impulzus biztonsági távolság jel,
1 = letapogatási biztonsági távolság jel.

10. A bevezető jelszakasz 12 adatbitjét egy 0,832 milliszekundumos (13 órajel impulzus) időtartamú vivőhullám előzi meg a vivőhullám begyűjtése céljából (lásd az A-1. táblázatot).

11. A letapogatási határérték nagyobb az arányos útirány-vezetési szektornak az Alap adat 1. és 5. szavában megadott határvonalánál, ahogy az a 3.11.4.5.1 pontban leírásra került.

12. Az összes tartalék bit NULLA-ra van állítva.

A-8. táblázat: A kiegészítő adat funkció időzítése

(lásd a 3.11.4.3.4 pontot)

Esemény	Az esemény idő-rés kezdési ideje	
	15,625 KHz-es órajel impulzus (szám)	Idő (milliszekundum)
Bevezető jelszakasz (előtag)	0	0
Cím továbbítás (I_{13} – I_{20} bitek)	25	1.600
Adat továbbítás (I_{21} – I_{69} bitek)	33	2.112
Paritás továbbítás (I_{70} – I_{76} bitek)	82	5.248
Vége funkció (fedélzeti)	89	5.696
Vége védő-idő; vége funkció (földi)		5.900

A-9. táblázat: A Kiegészítő adat szavak cím kódjai

Szám	I_{13}	I_{14}	I_{15}	I_{16}	I_{17}	I_{18}	I_{19}	I_{20}	Szám	I_{13}	I_{14}	I_{15}	I_{16}	I_{17}	I_{18}	I_{19}	I_{20}
1	0	0	0	0	0	1	1	1	**33**	1	0	0	0	0	1	0	1
2	0	0	0	0	1	0	1	0	**34**	1	0	0	0	1	0	0	0
3	0	0	0	0	1	1	0	1	**35**	1	0	0	0	1	1	1	1
4	0	0	0	1	0	0	1	1	**36**	1	0	0	1	0	0	0	1
5	0	0	0	1	0	1	0	0	**37**	1	0	0	1	0	1	1	0
6	0	0	0	1	1	0	0	1	**38**	1	0	0	1	1	0	1	1
7	0	0	0	1	1	1	1	0	**39**	1	0	0	1	1	1	0	0
8	0	0	1	0	0	0	1	0	**40**	1	0	1	0	0	0	0	0
9	0	0	1	0	0	1	0	1	**41**	1	0	1	0	0	1	1	1
10	0	0	1	0	1	0	0	0	**42**	1	0	1	0	1	0	1	0
11	0	0	1	0	1	1	1	1	**43**	1	0	1	0	1	1	0	1
12	0	0	1	1	0	0	0	1	**44**	1	0	1	1	0	0	1	1
13	0	0	1	1	0	1	1	0	**45**	1	0	1	1	0	1	0	0
14	0	0	1	1	1	0	1	1	**46**	1	0	1	1	1	0	0	1
15	0	0	1	1	1	1	0	0	**47**	1	0	1	1	1	1	1	0
16	0	1	0	0	0	0	1	1	**48**	1	1	0	0	0	0	0	1
17	0	1	0	0	0	1	0	0	**49**	1	1	0	0	0	1	1	0
18	0	1	0	0	1	0	0	1	**50**	1	1	0	0	1	0	1	1
19	0	1	0	0	1	1	1	0	**51**	1	1	0	0	1	1	0	0
20	0	1	0	1	0	0	0	0	**52**	1	1	0	1	0	0	1	0
21	0	1	0	1	0	1	1	1	**53**	1	1	0	1	0	1	0	1
22	0	1	0	1	1	0	1	0	**54**	1	1	0	1	1	0	0	0
23	0	1	0	1	1	1	0	1	**55**	1	1	0	1	1	1	1	1
24	0	1	1	0	0	0	0	1	**56**	1	1	1	0	0	0	1	1
25	0	1	1	0	0	1	1	0	**57**	1	1	1	0	0	1	0	0
26	0	1	1	0	1	0	1	1	**58**	1	1	1	0	1	0	0	1
27	0	1	1	0	1	1	0	0	**59**	1	1	1	0	1	1	1	0
28	0	1	1	1	0	0	1	0	**60**	1	1	1	1	0	0	0	0
29	0	1	1	1	0	1	0	1	**61**	1	1	1	1	0	1	1	1
30	0	1	1	1	1	0	0	0	**62**	1	1	1	1	1	0	1	0
31	0	1	1	1	1	1	1	1	**63**	1	1	1	1	1	1	0	1
32	1	0	0	0	0	0	1	0	**64**	0	0	0	0	0	0	0	0

MEGJEGYZÉS. - Paritás bitként az I_{19} és az I_{20} került kiválasztásra az egyenlőségek kielégítésére:

$I_{13} + I_{14} + I_{15} + I_{16} + I_{17} + I_{18} + I_{19}$ = PÁROS

$I_{14} + I_{16} + I_{18} + I_{20}$ = PÁROS

A-10. táblázat: Kiegészítő adatok

(lásd a 3.11.4.8.3.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A1	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	A megközelítési oldalszög antenna ofszet		10	-511m-től +511m-ig. (Lásd a 3. Megjegyzést).	1m	$I_{21} – I_{30}$
	A megközelítési oldalszög antenna távolsága az MLS alapponttól		13	0m-től 8 191m-ig	1m	$I_{31} – I_{43}$
	A megközelítési oldalszögnek a futópálya középvonalához viszonyított irányítottsága		12	-20,47°-tól +20,47°-ig. Lásd a 3. és 7. Megjegyzést.	0,01°	$I_{44} – I_{55}$
	A megközelítési oldalszög antenna koordináta rendszere		1	Lásd 2. Megjegyzést.		I_{56}
	A megközelítési oldalszög antenna magassága		7	-63m-től +63m-ig. Lásd a 3. Megjegyzést.	1m	$I_{57} – I_{63}$
	TARTALÉK		6	Lásd 8. Megjegyzést.		$I_{64} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-10. táblázat: Kiegészítő adatok (folytatás)

(lásd a 3.11.4.8.3.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A2	BEVEZETŐ JELSZAKASZ (előtag)	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	A megközelítési magassági szög antenna ofszet		10	-511m-től +511m-ig. (Lásd a 3. Megjegyzést).	1m	$I_{21} – I_{30}$
	MLS alappont - futópálya küszöb távolság		10	0m-től 1 023m-ig	1m	$I_{31} – I_{40}$
	A megközelítési magassági szög adó antenna magassága		7	-6,3m-től +6,3m-ig. Lásd a 3. Megjegyzést.	0,1m	$I_{41} – I_{47}$
	Az MLS alappont tengerszinthez viszonyított magassága		13	-4 095m-től +4 095m-ig. Lásd 3. Megjegyzést.	1m	$I_{48} – I_{60}$
	A futópálya küszöbének magassága		7	-6,3m-től +6,3m-ig. Lásd a 3. Megjegyzést.	0,1m	$I_{61} – I_{67}$
	TARTALÉK		2	Lásd 8. Megjegyzést.		$I_{68} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-10. táblázat: Kiegészítő adatok (folytatás)

(lásd a 3.11.4.8.3.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A3	BEVEZETŐ JELSZAKASZ (előtag) Lásd 4. Megjegyzést.	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	DME ofszet		12	-2 047m-től +2 047m-ig. (Lásd a 3. Megjegyzést).	1m	$I_{21} – I_{32}$
	DME - MLS alappont távolság		14	-8 191m-től +8 191m-ig. (Lásd a 3. Megjegyzést).	1m	$I_{33} – I_{46}$
	A DME antenna magassága		7	-63m-től +63m-ig. Lásd a 3. Megjegyzést.	1m	$I_{47} – I_{53}$
	A futópálya megállási végének távolsága		14	0m-től +16 383m-ig.	1m	$I_{54} – I_{67}$
	TARTALÉK		2	Lásd 8. Megjegyzést.		$I_{68} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-10. táblázat: Kiegészítő adatok (folytatás)

(lásd a 3.11.4.8.3.1 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A4	BEVEZETŐ JELSZAKASZ (előtag) Lásd 5. Megjegyzést.	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	A hátsó irányszektor antenna ofszet		10	-511m-től +511m-ig. (Lásd a 3. Megjegyzést).	1m	$I_{21} – I_{30}$
	Hátsó irányszektor - MLS alappont távolság		11	0m-től 2 047m-ig	1m	$I_{31} – I_{41}$
	A hátsó irányszektornak a futópálya középvonalához viszonyított irányítottsága		12	-20,47°-tól +20,47°-ig. Lásd a 3. és 7. Megjegyzést.	0,01°	$I_{42} – I_{53}$
	A hátsó irányszektor antenna koordináta rendszere		1	Lásd 2. Megjegyzést.		I_{54}
	A hátsó irányszektor antennájának magassága		7	-63m-től +63m-ig. Lásd a 3. Megjegyzést.	1m	$I_{55} – I_{61}$
	TARTALÉK		8	Lásd 8. Megjegyzést.		$I_{62} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

MEGJEGYZÉSEK. –

1. Az I_{70}-től az I_{76}-ig terjedő paritás bitek kerültek kiválasztásra a következő egyenlőségek kielégítésére.

Az I_{70} bitre:

PÁROS = $(I_{13} + ... + I_{18}) + I_{20} + I_{22} + I_{24} + I_{25} + I_{28} + I_{29} + I_{31} + I_{32} + I_{33} + I_{35} + I_{36} + I_{38} + I_{41} + + I_{44} + I_{45} + I_{46} + I_{50} + (I_{52} + ... + I_{55}) + I_{58} + I_{60} + I_{64} + I_{65} + I_{70}$

Az I_{71} bitre:

PÁROS = $(I_{14} + ... + I_{19}) + I_{21} + I_{23} + I_{25} + I_{26} + I_{29} + I_{30} + I_{32} + I_{33} + I_{34} + I_{36} + I_{37} + I_{39} + I_{42} + + I_{45} + I_{46} + I_{47} + I_{51} + (I_{53} + ... + I_{56}) + I_{59} + I_{61} + I_{65} + I_{66} + I_{71}$

Az I_{72} bitre:

PÁROS = $(I_{15} + ... + I_{20}) + I_{22} + I_{24} + I_{26} + I_{27} + I_{30} + I_{31} + I_{33} + I_{34} + I_{35} + I_{37} + I_{38} + I_{40} + I_{43} + I_{46} + I_{47} + I_{48} + I_{52} + (I_{54} + ... + I_{57}) + I_{60} + I_{62} + I_{66} + I_{67} + I_{72}$

Az I_{73} bitre:

PÁROS = $(I_{16} + ... + I_{21}) + I_{23} + I_{25} + I_{27} + I_{28} + I_{31} + I_{32} + I_{34} + I_{35} + I_{36} + I_{38} + I_{39} + I_{41} + I_{44} + + I_{47} + I_{48} + I_{49} + I_{53} + (I_{55} + ... + I_{58}) + I_{61} + I_{63} + I_{67} + I_{68} + I_{73}$

Az I_{74} bitre:

PÁROS = $(I_{17} + ... + I_{22}) + I_{24} + I_{26} + I_{28} + I_{29} + I_{32} + I_{33} + I_{35} + I_{36} + I_{37} + I_{39} + I_{40} + I_{42} + I_{45} + + I_{48} +I_{49} + I_{50} + I_{54} + (I_{56} + ... + I_{59}) + I_{62} + I_{64} + I_{68} + I_{69} + I_{74}$

Az I_{75} bitre:

PÁROS = $(I_{13} + ... + I_{17}) + I_{19} + I_{21} + I_{23} + I_{24} + I_{27} + I_{28} + I_{30} + I_{31} + I_{32} + I_{34} + I_{35} + I_{37} + I_{40} + I_{43} +I_{44} + I_{45} + I_{49} + (I_{51} + ... + I_{54}) + I_{57} + I_{59} + I_{63} + I_{64} + I_{69} + I_{75}$

Az I_{76} bitre:

PÁROS = $I_{13} + I_{14} +... + I_{75} + I_{76}$

2. Az antenna koordináta rendszerének kódja 0 = kúpos.

3. A negatív számok kódolásának konvenciója a következő:

A legnagyobb helyértékű bit az előjel bit, ez:
0 = pozitív
1 = negatív

A további bitek az abszolút értéket képviselik.

Az antenna helyzetének konvenciója a következő:

Az MLS megközelítési vonatkoztatási alapponttól az MLS alappont felé nézve a pozitív szám a futópálya középvonalától jobbra helyzetet (oldalirányú ofszet), vagy a futópálya feletti helyzetet (függőleges ofszet), vagy a futópálya megállási vége irányába való helyzetet (hossz-irányú távolság) jelenti.

Az irányítottság konvenciója a következő:
Felülnézetből, a pozitív szám jelenti az óramutató járásával megegyező irányú körforgást a futópálya középvonalától a megfelelő nulla-fokos oldalszögig.

4. Az A3. adatszó mindkét, a megközelítési oldalszög és a hátsó irányszektor fedésterületére kisugárzásra kerül akkor, amikor a hátsó irányszektor útirány-vezetés biztosítva van, úgy, hogy közben az egyes fedésterületi szektorokban az adások közötti maximális meghatározott idő megmarad.

5. Az A4. adatszó mindkét, a megközelítési oldalszög és a hátsó irányszektor fedésterületére kisugárzásra kerül akkor, amikor a hátsó irányszektor útirány-vezetés biztosítva van, úgy, hogy közben az egyes fedésterületi szektorokban az adások közötti maximális meghatározott idő megmarad.

6. A bevezető jelszakasz (előtag) 12 adatbitjét egy 0,832 milliszekundumos (13 órajel impulzus) időtartamú vivőhullám előzi meg a vivőhullám begyűjtése céljából (lásd az A-1. táblázatot).

7. Lásd az A-12. táblázat B42. és B43. adatszavait, amelyek azokra az alkalmazásokra kerültek meghatározásra, amelyek a 20,47°-nál nagyobb oldalszög antenna elfordulás leadását teszik szükségessé az A1. adat-elemben az oldalszögre és az A4.-ben a hátsó irányszektorra. Egy olyan berendezésnél, amelynek a megközelítési oldalszög elfordulása a 20,47°-nál nagyobb, a B42. adatszót kell leadni az A1. helyett. Egy olyan berendezésnél, amelynek a hátsó irányszektor elfordulása a 20,47°-nál nagyobb, a B43. adatszót kell leadni az A4. helyett.

8. Az összes tartalék bit NULLA-ra van állítva.

A-11. táblázat: A kiegészítő adat B szavak meghatározása

(lásd a 3.11.4.8.3.2 pontot)

Megjegyzés. - Az MLS / RNAV eljárásokat alátámasztó kiegészítő adat B szavak meghatározását az A-13. táblázat adja meg.

a) *Az MLS alappont földrajzi szélessége* az MLS alappont földrajzi szélességének koordinátája, - ahogy az a Geodéziai Világrendszer (WGS)-84 vonatkoztatási ellipszoidja, koordináta rendszere és a hozzá kapcsolódó alappontok szerint meghatározásra került.

b) *Az MLS alappont földrajzi hosszúsága* az MLS alappont földrajzi hosszúságának koordinátája, ahogy az a fenti a) adatszónál említettel azonos referencia ellipszoid, koordináta rendszer és alappont szerint meghatározásra került.

c) *Az MLS alappont függőleges koordinátája* az MLS alappont függőleges koordinátája, ahogy az a fenti a) adatszónál említettel azonos referencia ellipszoid, koordináta rendszer és alappont szerint meghatározásra került.

Megjegyzés. - Annak ellenére, hogy a WGS-84 ICAO Szabványként a földrajzi szélességet és hosszúságot jelző geográfiai koordinátaként jóváhagyásra került, a függőleges WGS-84 koordináták bevezetése még eldöntetlen. Ennek a bevezetéséig egy, a közepes tengerszintre (mean sea level = msl) vonatkoztatott tengerszinthez viszonyított magasságot lehet a továbbiakban is használni.

d) *A megközelítési oldalszögnek a földrajzi Északhoz viszonyított irányítottsága* a vízszintes síkban az óramutató járásával megegyező irányban a Földrajzi Északtól a megközelítési oldalszög antennától kiinduló nulla-fokos megközelítési oldalszögig mért szöget jelenti. A mért szög csúcspontjának a megközelítési oldalszög antenna fázis középpontjának kell lenni.

e) *Futópálya látástávolság (RVR)* a műszerrel mért RVR értéket jelenti a földetérési pontnál, a futópálya közepénél és a megállási végénél, a tendencia jelzésével együtt, úgy biztosítva, hogy az megfeleljen az Annex 3 4. Fejezetében leírtaknak.

f) *Talajszél* a szélsebességet és a szélirányt (mágneses) jelenti, úgy biztosítva, hogy az megfeleljen az Annex 3 4. Fejezetében leírtaknak.
g) *A Megközelítési oldalszög antenna ofszet-je* a megközelítési oldalszög antenna fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

h) *A Megközelítési oldalszög antenna távolsága az MLS alapponttól* azt a minimális távolságot jelenti, ami a megközelítési oldalszög antenna fázis középpontja és az MLS alappontját magába foglaló, a futópálya középvonalára merőleges függőleges sík között mérhető.

i) *A Megközelítési oldalszögnek a futópálya középvonalához viszonyított irányítottsága* a nulla fokos megközelítési oldalszög útirány-vezetési radiál és a futópálya középvonala közötti minimális szöget jelenti.

j) *A Megközelítési oldalszög antenna magassága* az antenna fázis középpontjának az MLS alappontjához viszonyított függőleges helyzetét jelenti.

k) *A Hátsó irányszektor antenna ofszet-je* a hátsó irányszektor antennájának fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

l) *A Hátsó irányszektor antenna - MLS alappont távolság* a hátsó irányszektor antenna és az MLS alappontját magába foglaló, a futópálya középvonalára merőleges függőleges sík közötti minimális távolságot jelenti.

m) *A Hátsó irányszektornak a futópálya középvonalához viszonyított irányítottsága* a nulla fokos hátsó irányszektor oldalszög és a futópálya középvonala közötti minimális szöget jelenti.

n) *A Hátsó irányszektor antennájának magassága* az antenna fázis-középpontjának az MLS alapponthoz viszonyított függőleges helyzetét jelenti.

o) *Az elsődleges futópálya száma* az elsődleges futópálya számot jelenti, ahogy ez az Annex 14 I. Kötetének 5. Fejezetében meghatározásra került.

p) *Az elsődleges futópálya betűjele* az elsődleges futópálya betűjelét jelenti ott, ahol az a párhuzamos futópályák közötti megkülönböztetés céljára használatos, ahogy ez az Annex 14 I. Kötetének 5.Fejezetében meghatározásra került.

q) *A másodlagos futópálya száma* a másodlagos futópálya számot jelenti, ahogy ez az Annex 14 I. Kötetének 5.Fejezetében meghatározásra került.

r) *A másodlagos futópálya betűjele* a másodlagos futópálya betűjelét jelenti ott, ahol az a párhuzamos futópályák közötti megkülönböztetés céljára használatos, ahogy ez az Annex 14 I. Kötetének 5.Fejezetében meghatározásra került.

s) *Magassági szög útirány-vezetés a másodlagos futópályára* azt jelenti, hogy van, vagy nincs olyan magassági szög útirány-vezetés, amely a másodlagos futópályára felhasználható, és ha van, akkor azt, hogy az közvetlenül eredeti szögként felhasználható-e, vagy egy kiszámított siklópályát tesz szükségessé.

t) *Minimális siklópálya a másodlagos futópályára* a másodlagos futópálya középvonalában lévő legalacsonyabb süllyedési szöget jelenti.

u) *A Megközelítési oldalszögnek a másodlagos futópálya középvonalához viszonyított irányítottsága* a nulla fokos megközelítési oldalszög útirány-vezetési radiál és a másodlagos futópálya középvonala közötti minimális szöget jelenti.

v) *A másodlagos futópálya küszöbének X koordinátája* a másodlagos futópálya küszöbe és az elsődleges futópályának az MLS alappontját magába foglaló középvonalára merőleges függőleges sík közötti minimális távolságot jelenti.

w) *A másodlagos futópálya küszöbének Y koordinátája* a másodlagos futópálya küszöbe és az elsődleges futópálya középvonalát magába foglaló függőleges sík közötti minimális távolságot jelenti.

x) *A másodlagos futópálya küszöbének Z koordinátája* a másodlagos futópálya küszöbének az MLS alappont feletti magasságát jelenti.

y) *A másodlagos futópálya küszöbének keresztezési magassága* a másodlagos futópálya felett azt a magasságot jelenti, amelynél a számított siklópálya a küszöböt keresztezi.

z) *Látszólagos oldalszög - másodlagos futópálya küszöb távolság* a másodlagos futópálya küszöbének attól a ponttól való távolságát jelenti, amelyet az arra a futópályára vezető oldalirányú útirány-vezetés kiindulási pontjának tekintenek.

Megjegyzés. - Ezt a távolságot az MLS vevővel ahhoz hasonló módon lehet felhasználni, mint a megközelítési oldalszög antenna - futópálya küszöb távolságot az oldalirányú eltérési lépték-tényező megállapításához.

A-12. táblázat: Kiegészítő adat B

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A B1-től a B39-ig terjedő szavak: Idő-invariáns (rögzített) adat elemek az MLS / RNAV eljárások alátámasztásához (lásd az A-15.sz. táblázatot).						

A B40-től a B54-ig terjedően: Egyéb rögzített adat elemek.

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B40	BEVEZETŐ JELSZAKASZ (előtag)	2.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Az MLS alappont földrajzi szélessége		23	-324 000,0 arc sec-tól +324 000,0 arc sec-ig (lásd a 2. Megjegyzést)	0,1 arc sec	$I_{21} – I_{43}$
	Az MLS alappont földrajzi hosszúsága		24	-648 000,0 arc sec-tól +648 000,0 arc sec-ig (lásd a 2. Megjegyzést)		$I_{44} – I_{67}$
	TARTALÉK		2	Lásd 9. Megjegyzést.		$I_{68} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

A-12. táblázat: Kiegészítő adat B (folytatás)

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B41	BEVEZETŐ JELSZAKASZ (előtag)	2.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Az MLS alappont függőleges koordinátája		13	-4 095 m-től +4 095 m-ig (lásd a 2. Megjegyzést)	1m	$I_{21} – I_{33}$
	A megközelítési oldalszögnek a földrajzi Északhoz viszonyított irányítottsága		20	0^o-tól 359,99^o-ig	0,01^o	$I_{34} – I_{45}$? ($I_{34} – I_{49}$)
	TARTALÉK		2	Lásd 9. Megjegyzést.		$I_{50} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B42	BEVEZETŐ JELSZAKASZ (előtag) Lásd 5. Megjegyzést.	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Megközelítési oldalszög antenna ofszet		10	-511m-től +511m-ig. (Lásd a 2. Megjegyzést).	1m	$I_{21} – I_{30}$
	A megközelítési oldalszög antenna távolsága az MLS alapponttól		13	0m-től 8 191m-ig	1m	$I_{31} – I_{43}$
	A megközelítési oldalszögnek a futópálya középvonalához viszonyított irányítottsága		14	-81,91^o-tól +81,91^o-ig (Lásd a 2.Megjegyzést)	0,01^o	$I_{44} – I_{67}$? ($I_{44} – I_{57}$)
	A megközelítési oldalszög antenna magassága		7	-63m-től +63m-ig. (Lásd a 2. Megjegyzést).	1m	$I_{58} – I_{67}$
	TARTALÉK		5	Lásd 9. Megjegyzést.		$I_{65} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-12. táblázat: Kiegészítő adat B (folytatás)

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B43	BEVEZETŐ JELSZAKASZ (előtag) Lásd 4. és 5. Megjegyzést.	1.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Hátsó irányszektor antenna ofszet		10	-511m-től +511m-ig. (Lásd a 2. Megjegyzést).	1m	$I_{21} – I_{30}$
	Hátsó irányszektor antenna - MLS alappont távolság		11	0m-től 2 047m-ig	1m	$I_{31} – I_{41}$
	A hátsó irányszektornak a futópálya középvonalához viszonyított irányítottsága		14	-81,91°-tól +81,91°-ig (Lásd a 2.Megjegyzést)	0,01°	$I_{42} – I_{55}$
	Hátsó irányszektor antenna magasság		7	-63m-től +63m-ig. (Lásd a 2. Megjegyzést).	1m	$I_{56} – I_{62}$
	TARTALÉK		5	Lásd 9. Megjegyzést.		$I_{63} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-12. táblázat: Kiegészítő adat B (folytatás)

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B44	BEVEZETŐ JELSZAKASZ (előtag)	2.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Az elsődleges futópálya száma		6	0-tól 36-ig (lásd a 10.Megjegyzést).		$I_{21} – I_{26}$
	Az elsődleges futópálya betűjele		2	Lásd a 7.Megjegyzés-t.		$I_{27} – I_{28}$
	A másodlagos futópálya száma		6	0-tól 36-ig (lásd a 10.Megjegyzést).		$I_{29} – I_{34}$
	A másodlagos futópálya betűjele		2	Lásd a 7. Megjegyzést.		$I_{35} – I_{36}$
	Magassági szög útirány-vezetés a másodlagos futópályára		2	Lásd a 8. Megjegyzést.		$I_{37} – I_{48}$
	Minimális siklópálya a másodlagos futópályára		7	2^o-tól $14{,}7^o$-ig	$0{,}1^o$	$I_{39} – I_{45}$
	A megközelítési oldalszögnek a másodlagos futópálya középvonalához viszonyított irányítottsága		16	$\pm 180{,}00^o$	$0{,}01^o$	$I_{46} – I_{61}$
	TARTALÉK		5	Lásd 9. Megjegyzést		$I_{62} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-12. táblázat: Kiegészítő adat B (folytatás)

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B45	BEVEZETŐ JELSZAKASZ (előtag)	2.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	A másodlagos futópálya küszöbének X koordinátája		15	±16 384 m	1 m	$I_{21} – I_{35}$
	A másodlagos futópálya küszöbének Y koordinátája		15	±16 384 m	1 m	$I_{36} – I_{50}$
	A másodlagos futópálya küszöbének Z koordinátája		8	±127 m	1 m	$I_{51} – I_{58}$
	A másodlagos futópálya küszöbének keresztezési magassága		5	0-tól 31 m-ig	1 m	$I_{59} – I_{63}$
	Látszólagos oldalszög - másodlagos futópálya küszöb távolság		6	0-tól 6 300 m-ig	100 m	$I_{64} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
A B55-től a B64-ig terjedő szavak: Időben változó adat-elemek. *(Megjegyzés. – Csak a B55-ös szó került meghatározásra az alábbiaknak megfelelően.)*						

A-12. táblázat: Kiegészítő adat B (folytatás)

(lásd a 3.11.4.8.3 pontot)

Szó	Az adat tartalma	Az adások közötti maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	A legkisebb helyértékű bit	Bit szám
B55	BEVEZETŐ JELSZAKASZ (előtag)	10.0	12	Lásd 6. Megjegyzést.		I_1-I_{12}
	Címzés		8			$I_{13} – I_{20}$
	Futópálya látástávolság (földetérési zóna)		11	0 - 2 555 m (lásd a 3. Megjegyzést).	5 m	$I_{21} – I_{31}$
	Futópálya látástávolság (futópálya-közép)		11	0 - 2 555 m (lásd a 3. Megjegyzést).	5 m	$I_{32} – I_{42}$
	Futópálya látástávolság (megállási vég)		11	0 - 2 555 m (lásd a 3. Megjegyzést).	5 m	$I_{43} – I_{53}$
	Talajszél sebesség		7	0 - 127 csomó	1 csomó	$I_{54} – I_{60}$
	Talajszél irány (mágneses)		9	0 - 359°	1°	$I_{61} – I_{69}$
	PARITÁS		7	Lásd 1. Megjegyzést.		$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

MEGJEGYZÉSEK. –

1. Az I_{70}-től az I_{76}-ig terjedő paritás bitek kerültek kiválasztásra a következő egyenlőségek kielégítésére.

Az I_{70} bitre:

PÁROS = $(I_{13} + ... + I_{18}) + I_{20} + I_{22} + I_{24} + I_{25} + I_{28} + I_{29} + I_{31} + I_{32} + I_{33} + I_{35} + I_{36} + I_{38} + I_{41} + + I_{44} + I_{45} + I_{46} + I_{50} + (I_{52} + ... + I_{55}) + I_{58} + I_{60} + I_{64} + I_{65} + I_{70}$

Az I_{71} bitre:

PÁROS = $(I_{14} + ... + I_{19}) + I_{21} + I_{23} + I_{25} + I_{26} + I_{29} + I_{30} + I_{32} + I_{33} + I_{34} + I_{36} + I_{37} + I_{39} + I_{42} + + I_{45} + I_{46} + I_{47} + I_{51} + (I_{53} + ... + I_{56}) + I_{59} + I_{61} + I_{65} + I_{66} + I_{71}$

Az I_{72} bitre:

PÁROS = $(I_{15} + ... + I_{20}) + I_{22} + I_{24} + I_{26} + I_{27} + I_{30} + I_{31} + I_{33} + I_{34} + I_{35} + I_{37} + I_{38} + I_{40} + I_{43} + + I_{46} + I_{47} + I_{48} + I_{52} + (I_{54} + ... + I_{57}) + I_{60} + I_{62} + I_{66} + I_{67} + I_{72}$

Az I_{73} bitre:

PÁROS = $(I_{16} + ... + I_{21}) + I_{23} + I_{25} + I_{27} + I_{28} + I_{31} + I_{32} + I_{34} + I_{35} + I_{36} + I_{38} + I_{39} + I_{41} + I_{44} + + I_{47} + I_{48} + I_{49} + I_{53} + (I_{55} + ... + I_{58}) + I_{61} + I_{63} + I_{67} + I_{68} + I_{73}$

Az I_{74} bitre:

PÁROS = $(I_{17} + ... + I_{22}) + I_{24} + I_{26} + I_{28} + I_{29} + I_{32} + I_{33} + I_{35} + I_{36} + I_{37} + I_{39} + I_{40} + I_{42} + I_{45} + + I_{48} +I_{49} + I_{50} + I_{54} + (I_{56} + ... + I_{59}) + I_{62} + I_{64} + I_{68} + I_{69} + I_{74}$

Az I_{75} bitre:

PÁROS = $(I_{13} + ... + I_{17}) + I_{19} + I_{21} + I_{23} + I_{24} + I_{27} + I_{28} + I_{30} + I_{31} + I_{32} + I_{34} + I_{35} + I_{37} + I_{40} + + I_{43} +I_{44} + I_{45} + I_{49} + (I_{51} + ... + I_{54}) + I_{57} + I_{59} + I_{63} + I_{64} + I_{69} + I_{75}$

Az I_{76} bitre:

PÁROS = $I_{13} + I_{14} +... + I_{75} + I_{76}$

2. A negatív számok kódolásának konvenciója a következő:
A legnagyobb helyértékű bit az előjel bit, ez:
0 = pozitív
1 = negatív

A további bitek az abszolút értéket képviselik.

Az antenna helyzetének konvenciója a következő:

Az MLS megközelítési vonatkoztatási alapponttól az MLS alappont felé nézve a pozitív szám a futópálya középvonalától jobbra helyzetet (oldalirányú ordináta), vagy a futópálya feletti helyzetet (függőleges ordináta), vagy a futópálya megállási vége irányába való helyzetet (hosszirányú távolság) jelenti.

Az irányítottság konvenciója a következő:

Felülnézetből, a pozitív szám jelenti az óramutató járásával megegyező irányú körforgást a futópálya középvonalától a megfelelő nulla-fokos oldalszögig.

A geodéziai koordináták konvenciója a következő:

A pozitív számok az északi földrajzi szélességet, vagy a keleti földrajzi hosszúságot jelentik.
A negatív számok a déli földrajzi szélességet, vagy a nyugati földrajzi hosszúságot jelentik.

3. Az egyes futópálya látástávolság (RVR) értékek továbbításánál felhasznált tizedik és tizenegyedik bit a tendencia tájékoztatások biztosítására használatos. A kódolás konvenciója a következő:

	Tizedik bit	Tizenegyedik bit
Kikapcsolva	0	0
Csökkenő	1	0
Egyenlő	0	1
Növekvő	1	1

4. Amikor használatos, akkor az Alap adat B43. szava mindkét, a megközelítési oldalszög és a hátsó irányszektor fedésterületére kisugárzásra kerül akkor, amikor a hátsó irányszektor útirány-vezetés biztosítva van, úgy, hogy közben az egyes fedésterületi szektorokban az adások közötti maximális meghatározott idő megmarad.

5. A B42. és B43. Adat szavak azokra az alkalmazásokra kerültek meghatározásra, amelyek a 20,47^o-nál nagyobb oldalszög antenna elfordulás leadását teszik szükségessé az A1. adat-elemben az oldalszögre és az A4.-ben a hátsó irányszektorra. Egy olyan berendezésnél, amelynek a megközelítési oldalszög elfordulása a 20,47^o-nál nagyobb, a B42. adatszót kell leadni az A1. helyett. Egy olyan berendezésnél, amelynek a hátsó irányszektor elfordulása a 20,47^o-nál nagyobb, a B43. adatszót kell leadni az A4. helyett.

6. A bevezető jelszakasz (előtag) 12 adatbitjét egy 0,832 milliszekundumos (13 órajel impulzus) időtartamú vivőhullám előzi meg a vivőhullám begyűjtése céljából (lásd az A-1. táblázatot).

7. A kódolás konvenciója a következő:

0 = nincs betű
1 = R (jobb)
2 = C (középső)
3 = L (bal)

8. A kódolás konvenciója a következő:

0 = nincs biztosítva
1 = eredeti magassági szög útirány-vezetés
2 = számított siklópálya
3 = kód nem engedélyezett

9. Az összes tartalék bit NULLA-ra van állítva.

10. A 0 futópálya szám jelölés a helikopter üzemeltetésre vonatkozik.

A-13. táblázat: Az MLS /RNAV eljárások adatbázisára vonatkozó Kiegészítő adat B elemek meghatározása

(lásd a 3.11.4.8.3.2 pontot)

a) *A megközelítési oldalszög eljárás leírók száma* az azon összes megnevezett megközelítési és indulási eljárás számát jelenti, amelyről eljárás leíró szavak kerülnek a megközelítési oldalszög fedésterületi szektorba kisugárzásra.

Megjegyzés. - A megszakított megközelítések nincsenek beszámítva, mivel azoknál nem használnak eljárás leíró szavakat. Az elsődleges futópályára vezető kiszámított középvonalú eljárások akkor kerülnek beszámításra, amikor egy eljárás leírás leadásra kerül, még akkor is, ha a hozzá kapcsolódó útvonalpont adat nem kerül leadásra a B1-től a B39-ig tartó kiegészítő szavakban.

b) *A hátsó irányszektor oldalszög eljárás leírók száma* az azon összes megnevezett megközelítési és indulási eljárás számát jelenti, amelyről eljárás leíró szavak kerülnek a hátsó irányszektor fedésterületi szektorba kisugárzásra.

Megjegyzés. - A megszakított megközelítések nincsenek beszámítva, mivel azoknál nem használnak eljárás leíró szavakat.

c) *Az utolsó megközelítési oldalszög adatbázis szó* annak a B1-től a B39-ig tartó tartományon belüli utolsó kiegészítő adat szónak a címzés kódját jelenti, amely megközelítési oldalszög fedésterületi szektorba leadásra került úgy, ahogy annak a szónak az I_{13}-tól az I_{18}-ig terjedő bitjei meghatározták.

d) *Az első hátsó irányszektor adatbázis szó* annak a B1-től a B39-ig tartó tartományon belüli utolsó kiegészítő adat szónak a címzés kódját jelenti, amely hátsó irányszektor fedésterületi szektorba leadásra került úgy, ahogy annak a szónak az I_{13}-tól az I_{18}-ig terjedő bitjei meghatározták.

e) *Megközelítési oldalszög Ciklikus Redundancia Ellenőrző (CRC) kód* megközelítési oldalszög eljárás adatbázisa ciklikus redundancia ellenőrző kódjának együtthatóját jelenti.

f) *Hátsó irányszektor Ciklikus Redundancia Ellenőrző (CRC) kód* a hátsó irányszektor eljárás adatbázisa ciklikus redundancia ellenőrző kódjának együtthatóját jelenti.

g) *A kisugárzott B42. szó* azt jelenti, hogy a B42 kiegészítő adat szó leadásra került-e az A1 szó helyett.

h) *A kisugárzott A4. szó* azt jelenti, hogy az A4 kiegészítő adat szó leadásra került-e.

i) *A kisugárzott B43. szó* azt jelenti, hogy a B43 kiegészítő adatszó leadásra került-e.

j) *Hátsó irányszektor térkép / Ciklikus Redundancia Ellenőrzés (CRC) jelzés* azt jelenti, hogy a B39 kiegészítő adat szó hátsó irányszektor térkép / Ciklikus Redundancia Ellenőrzés szóként, vagy egy megközelítési oldalszög útvonalpont adatszóként került-e leadásra.

k) *Alap jelzés* egy megközelítési eljárás elsőként átrepülendő útvonalpontjának nevét, vagy az indulási eljárás utolsóként átrepülendő útvonalpontjának nevét jelenti. A névnek egy öt betűs - az 5.sz. Nemzetközi Távíró ABC b1-től b5-ig terjedő bitjeinek megfelelően leadott - karakterből kell állni.

l) *Érvényesség jelzés* a megközelítési, vagy indulási eljárás módosítási szintjét jelenti. Az érvényesség jelzésnek egy, az 1-től a 9-ig terjedő számnak kell lenni.

m) *Útvonal jelzés* az alap jelzés által megnevezett útvonalponttól kiinduló, vagy oda vezető útvonalat jelenti. Az útvonal jelzésnek egy egyedülálló egy-betűs - az 5.sz. Nemzetközi Távíró ABC b1-től b5-ig terjedő bitjeinek megfelelően leadott - karakterből kell állni. Az "I" és "O" betűket nem lehet felhasználni. A rendelkezésre álló 24 útvonal jelzés mindegyikét csak egyszer lehet kiosztani a megközelítési oldalszög és a hátsó irányszektor eljárás leírási szavak kombinált sorozatában.

Megjegyzés. - Az MLS / RNAV üzemeltetések útvonal jelzései egyedülálló kijelölési korlátozásai egy kiindulási pontot jelentenek a szabványos útvonal kijelölési gyakorlattal, ami azért szükséges, hogy növeljük az eljárás kiválasztás integritását, és csökkentsük a légijármű-vezetők munkaterhelését.

n) *A futópálya száma* a futópálya számát jelenti az Annex 14 I. Kötete 5. Fejezetében meghatározottaknak megfelelően.

o) *A futópálya betűjele* a futópálya betűjelét jelenti az Annex 14 I. Kötete 5. Fejezetében meghatározottaknak megfelelően ott, ahol a párhuzamos futópályák közötti megkülönböztetésre alkalmazzák.

p) *Az eljárás típusa* azt jelenti, hogy az eljárás egy megközelítési eljárás, vagy egy indulási eljárás.

q) *Az első útvonalpont mutató* a megközelítési oldalszög adatbázison belül, vagy a hátsó irányszektor oldalszög adatbázison belül az útvonalpont meghatározási adatokban az eljárás első kódolt útvonalpontja sorrendi helyzetét jelenti.

r) *X koordináta* az adott útvonalpontnak a meghatározott koordináta rendszer szerinti X koordinátáját jelenti.

s) *Y koordináta követő* azt jelenti, hogy az Y koordináta egy adott útvonalpontra továbbításra kerül-e, vagy sem. Ha az Y koordináta nem kerül továbbításra, akkor az Y koordinátát nullának kell elfogadni.

t) *Y koordináta* az adott útvonalpontnak a meghatározott koordináta rendszer szerinti Y koordinátáját jelenti.

u) *Z koordináta követő* azt jelenti, hogy a Z koordináta egy adott útvonalpontra továbbításra kerül-e, vagy sem.

v) *Z koordináta* az adott útvonalpontnak a meghatározott koordináta rendszer szerinti Z koordinátáját jelenti.
w) *Következő szakasz / adatmező azonosító* azt jelenti, hogy egy adott eljárás következő szakasza egyenes, vagy ívelt, és jelzi azt, hogy melyik adatmezőben következnek az útvonalpont koordinátái.

x) *A futópálya küszöb útvonalpont magassága* az elsődleges futópálya küszöb útvonalpontjának a futópálya küszöbe feletti magasságát jelenti.

y) *Látszólagos oldalszög - útvonalpont távolság* egy, a nem az elsődleges futópálya küszöbéhez vezető megközelítési eljárásban az oldalirányú útirány-vezetés kiinduló pontjának tekintett ponttól az útvonalpontig mért távolságot jelenti.

Megjegyzés. - Ezt a távolságot az MLS vevő hasonló módon tudja felhasználni, mint a megközelítési oldalszög antenna - futópálya küszöb távolságot az eljárás oldalirányú eltérési lépték-tényezője megállapításához.

z) *A következő útvonalpont mutató* a megközelítési oldalszög adatbázison belül, vagy a hátsó irányszektor oldalszög adatbázison belül az útvonalpont meghatározási adatokban az eljárás következő kódolt útvonalpontja sorrendi helyzetét jelenti.

Megjegyzés. - A következő útvonalpont mutatót fel lehet használni annak lehetővé tételére, hogy egy, vagy több olyan útvonalpontot megosszanak, amely kifejezetten egy másik eljárás részeként van meghatározva. A megosztott útvonalpontok a megközelítési eljárások utolsó pontjai és a megszakított megközelítési, valamint az indulási eljárások kiinduló pontjai.

aa) *A megszakított megközelítés mutatója* a megközelítési oldalszög adatbázison belül, vagy a hátsó irányszektor oldalszög adatbázison belül az útvonalpont meghatározási adatokban a kapcsolódó megszakított megközelítési eljárás első kódolt (utolsó átrepült) útvonalpontja sorrendi helyzetét jelenti.

A-14. táblázat: Az MLS / RNAV eljárás adatbázisának szerkezete

(lásd a 3.11.4.8.3.2 pontot)

Adatbázis	Szó	Adattartalom
Megközelítési oldalszög	B1 B2 …. …. B(M+1) B(M+2)-től B(a)-ig	Megközelítési oldalszög térkép / CRC szó 1. Eljárás leíró szó …. …. "M" eljárás leíró szó (lásd az 1.Megjegyzést) Útvonalpont adat szó
	B(a+1)-től B(b-1)-ig	Nem használatos.
Hátsó irányszektor (Lásd a 2. Megjegyzést)	B(b) …. …. B(b+N-1) B(b+N)-től B(38)-ig B39	1. Eljárás leíró szó …. …. "N" eljárás leíró szó (lásd az 1.Megjegyzést) Útvonalpont adat szó Hátsó irányszektor térkép / CRC szó

MEGJEGYZÉSEK. –

1. Az "M" paraméter azon megnevezett megközelítési és indulási eljárások számát jelenti, amelyek a megközelítési oldalszög fedésterületi szektoron belül kezdődnek. Az "N" paraméter azon megnevezett megközelítési és indulási eljárások számát jelenti, amelyek a hátsó irányszektor fedésterületi szektoron belül kezdődnek.

2. Egy hátsó irányszektor adatbázis nélküli berendezésnél az összes szót a B39-ig fel lehet használni a megközelítési oldalszög adatbázis részére.

A-15. táblázat: Kiegészítő adat B szavak a B1-től a B39-ig

(lásd a 3.11.4.8.3.2 pontot)

Szó	Az adat tartalma	Maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	Bit szám
B1	**Megközelítési oldalszög térkép / CRC szó**				
	BEVEZETŐ JELSZAKASZ (előtag)	2.5	12		$I_1 – I_{12}$
	Címzés		8		$I_{13} – I_{20}$
	A megközelítési oldalszög eljárás leírók száma		4	0-tól 15-ig	$I_{21} – I_{24}$
	Az utolsó megközelítési oldalszög adatbázis szó		6	Lásd a 2. Megjegyzést.	$I_{25} – I_{30}$
	Megközelítési oldalszög CRC kód		32	Lásd 3. Megjegyzést	$I_{31} – I_{62}$
	Kisugárzott B42. szó		1	Lásd 4. Megjegyzést	I_{63}
	Kisugárzott A4. szó		1	Lásd 4. Megjegyzést	I_{64}
	Kisugárzott B43. szó		1	Lásd 4. Megjegyzést	I_{65}
	TARTALÉK		4	Lásd 12. Megjegyzést	$I_{66} – I_{69}$
	PARITÁS		7	Lásd 13. Megjegyzést	$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

A-15. táblázat: Kiegészítő adat B szavak a B1-től a B39-ig (folytatás)

(lásd a 3.11.4.8.3.2 pontot)

Szó	Az adat tartalma	Maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	Bit szám
	Eljárás leíró szavak A B2-től a B(M+1)-ig (megközelítési oldalszög adatbázis) (lásd az 1. Megjegyzést). A B(b)-től a B(b+N-1)-ig (hátsó irányszektor adatbázis)				
	BEVEZETŐ JELSZAKASZ (előtag)	2.5	12		$I_1 - I_{12}$
	Címzés		8		$I_{13} - I_{20}$
	Alap jelzés		25	Lásd az 5. Megjegyzést.	$I_{21} - I_{45}$
	Érvényesség jelzés		4	1-től 9-ig. Lásd a 14. Megjegyzést.	$I_{46} - I_{49}$
	Útvonal jelzés		5	Lásd 5. Megjegyzést.	$I_{50} - I_{54}$
	A futópálya száma		6	0-tól 36-ig. Lásd 15. Megjegyzést.	$I_{55} - I_{60}$
	A futópálya betűjele		2	Lásd 6. Megjegyzést.	$I_{61} - I_{62}$
	Az eljárás típusa		1	Lásd 7. Megjegyzést.	I_{63}
	Az első útvonalpont mutató		6	0-tól 63-ig. Lásd 8. és 9. Megjegyzést.	$I_{64} - I_{69}$
	PARITÁS		7	Lásd 13. Megjegyzést.	$I_{70} - I_{76}$

Megjegyzés - Az adat típusa digitális

Szó	Az adat tartalma	Maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	Bit szám
	Útvonalpont adat szavak (lásd az A-16. táblázatot) A B(M+2)-től a B(a)-ig (megközelítési oldalszög adatbázis) (lásd az 1. és a 11. Megjegyzést) A B(b+N)-től a B(38)-ig (hátsó irányszektor adatbázis)				
	BEVEZETŐ JELSZAKASZ (előtag)	2.5	12		$I_1 - I_{12}$
	Címzés		8		$I_{13} - I_{20}$
	Útvonalpont azonosító adat elemek		49	Lásd a 10. és 11. Megjegyzést.	$I_{21} - I_{69}$
	PARITÁS		7	Lásd 13. Megjegyzést.	$I_{70} - I_{76}$

Megjegyzés - Az adat típusa digitális

A-15. táblázat: Kiegészítő adat B szavak a B1-től a B39-ig (folytatás)

(lásd a 3.11.4.8.3.2 pontot)

Szó	Az adat tartalma	Maximális idő (másodperc)	Felhasznált bitek	Érték tartomány	Bit szám
B39	**Hátsó irányszektor térkép / CRC szó** (lásd az 1. és a 11. Megjegyzést).				
	BEVEZETŐ JELSZAKASZ (előtag)	2.5	12		$I_1 – I_{12}$
	Címzés		8		$I_{13} – I_{20}$
	A hátsó irányszektor oldalszög eljárás leírók száma		4	0-tól 15-ig.	$I_{21} – I_{24}$
	Az első hátsó irányszektor adatbázis szó		6	Lásd a 2. Megjegyzést.	$I_{25} – I_{30}$
	Hátsó irányszektor CRC kód		32	Lásd 3. Megjegyzést.	$I_{31} – I_{62}$
	Kisugárzott B43. szó		1	Lásd 4. Megjegyzést.	I_{63}
	TARTALÉK		5	Lásd 12. Megjegyzést.	$I_{64} – I_{68}$
	Hátsó irányszektor térkép / CRC jelzés		1	Lásd 11. Megjegyzést.	I_{69}
	PARITÁS		7	Lásd 13. Megjegyzést.	$I_{70} – I_{76}$

Megjegyzés - Az adat típusa digitális

MEGJEGYZÉSEK. –

1. A szó számoknál használt változók annak felelnek meg, ami az A-14. számú táblázatban használatos.

2. Ez az adatmező az A-9. táblázatnak megfelelően van kódolva, az I_{13}-tól az I_{18}-ig tartó bitek felhasználásával. Ebben a táblázatban az I_{25} bit adja át az A-9. táblázat I_{13} bitjének információját és az kerül először kisugárzásra.

3. A CRC kód a két polinom modulo 2-vel való osztásának a maradékát, az R(x)-t foglalja magába:

$$\left[\frac{x^{32}\ M(x)}{G(x)}\right]_{\text{mod } 2} = Q(x) + \frac{R(x)}{G(x)}$$

Az M(x) az az információs adatmező, amely az alábbiakban meghatározott megközelítési oldalszög, vagy hátsó irányszektor adatbázisból áll, a bevezető jelszakaszok, a címek, a paritás bitek és a CRC kód bitjeinek kivételével. A kiegészítő adat szavaknál ezek az I_{21}-től az I_{69}-ig terjedő bitek és az alap adat szavaknál az I_{13}-tól az I_{30}-ig terjedő bitek. Az adatbázis a következő - a jegyzékben megadott sorrendű - adat szavakból áll:

Megközelítési oldalszög adatbázis	Hátsó irányszektor adatbázis
B1 (I_{21}-től I_{30}-ig, I_{63}-tól I_{69}-ig)	B(b)-től B38-ig
B2-től B(a)-ig	B39 (I_{21}-től I_{30}-ig, I_{63}-tól I_{69}-ig bitek)
B40, B41	B40, B41, A3
A1, vagy B42, A2, A3	A4, vagy B43 (ha kisugárzásra került)
A4, vagy B43 (ha kisugárzásra került)	Alap adat 6. szó
Alap adat 6. szó	

Az M(x) az x^{32}-el van megszorozva, amely 32 nulla bitet tesz hozzá az osztandó végéhez.

A G(x) a kódgeneráló polinom, a következők szerint meghatározva:

$$G(x) = x^{32} + x^{31} + x^{14} + x^{13} + x^{9} + x^{8} + x^{4} + x^{3} + x + 1$$

A Q(x) az osztás hányadosa.

A CRC kód, az R(x), az x^{31} együtthatóval I_{31} bitként és az x^0 együtthatóval I_{62}-es bitként kerül továbbításra.

4. A kódolás konvenciója a következő:
0 = nem
1 = igen

5. A betű karakterek úgy kerülnek kódolásra, ahogy az a 3.11.4.8.3 pontban a B1-től a B39-ig terjedő adat szavakra meghatározásra került.

6. A kódolás konvenciója a következő:
0 = nincs betű
1 = R (jobb)
2 = C (középső)
3 = L (bal)

7. A kódolás konvenciója a következő:
0 = megközelítési eljárás
1 = indulási eljárás

8. Az útvonalpont mutató számok egymás utáni számozással a megközelítési oldalszög, vagy hátsó irányszektor adatbázisában lévő valamennyi útvonalpontra kijelölésre kerülnek. Ha egy útvonalpont van az elsődleges futópálya küszöbére úgy kódolva, hogy csak a futópálya küszöb keresztezési magasságot tartalmazza, akkor ez ki van hagyva az útvonalpont mutató sorozatából.

9. Ebben az adatmezőben a nulla érték azt jelenti, hogy az eljárás egy olyan számított középvonalú eljárás, amely a kiegészítő adatszavakban az A1 (vagy B42), A2, A3 és az A4 (vagy B43) szavakban megadott adatokon alapszik.

10. Az útvonalpont meghatározások változó hosszúságúak és egymás után vannak kódolva, anélkül, hogy alkalmazkodnának a szavak határaihoz. Az útvonalpont meghatározások között a tartalék bitek használata nem megengedett. Az utolsó útvonalpont szavának végén lévő bármilyen tartalék biteket nullára kell állítani. Egy megközelítési eljárás útvonalpont meghatározásai abban a sorrendben kerülnek kódolásra, ahogy a légijármű végigrepüli az eljárást. A megszakított megközelítésre, vagy az indulásra az útvonalpont meghatározások a fordított sorrendbe vannak kódolva. Azok a megszakított megközelítési, vagy indulási útvonalpontok, amelyek nem közösek a megközelítési útvonalpontokkal, az adatbázisban lévő utolsó megközelítési útvonalpont után vannak kódolva.

11.Azoknál a berendezéseknél, amelyeknek nincs hátsó irányszektoruk, a B39-es kiegészítő szót fel lehet használni útvonalpont adatszóként a megközelítési oldalszög adatbázisban. A B39-es szó I_{69}-es bitje használatos a szó alkalmazásának jelzésére. A kódolás konvenciója a következő:
0 = a B39 szó egy útvonalpont adatszó
1 = a B39 szó a hátsó irányszektor térkép / CRC szó

12. Az összes tartalék bit nullára van állítva.

13. Az I_{70}-től az I_{76}-ig terjedő paritás bitek az A-12. táblázat 1. Megjegyzésében megadott egyenlet kielégítésére kerültek kiválasztásra.

14. A 0000 kódolt érték nem megengedett.

15. A 0 futópálya szám megjelölés a helikopter üzemeltetésekre vonatkozik.

A-16. táblázat: Útvonal-pont meghatározó adat-elemek

(lásd a 3.11.4.8.3.2 pontot)

Adattartalom	Felhasznált bitek	Értéktartomány	A legkisebb helyértékű bit
X koordináta	15	±41 940 m (lásd az 1.és 2. Megjegyzést).	2,56 m
Y koordináta követő	1	Lásd a 3. Megjegyzést.	
Y koordináta	15	±41 940 m (lásd az 1.és 2. Megjegyzést).	2,56 m
Z koordináta követő	1	Lásd a 3. Megjegyzést.	
Z koordináta	13	-100-tól +8 091 m-ig (lásd az 1.és 4. Megjegyzést).	1 m
Következő szakasz / adatmező azonosító	3	Lásd az 5. Megjegyzést.	
Futópálya küszöb útvonalpont magasság	6	0-tól 31,5 m-ig (Lásd az 5. Megjegyzést).	0,5 m
Látszólagos oldalszög - útvonalpont távolság	6	0-tól 6 300 m-ig (Lásd az 5. Megjegyzést).	100 m
Következő útvonal-pont mutató	6	Lásd az 5.és 6. Megjegyzést.	
Megszakított megközelítés mutató	6	Lásd az 5.és 6. Megjegyzést.	

MEGJEGYZÉSEK. –

1. A koordináta rendszer kiindulási pontja az MLS alappont. Az X- tengely vízszintes, és a futópálya középvonalát magába foglaló függőleges síkban fekszik, és a pozitív szám a megközelítési vonatkoztatási alappont felé tartó helyeket jelenti. Az Y- tengely vízszintes és az X- tengelyre merőleges, és a pozitív szám a középvonaltól balra lévő helyeket jelenti, az MLS alapponttól a

megközelítési vonatkoztatási alappont felé nézve. A Z- tengely függőleges, és a pozitív szám jelenti az MLS alappont feletti helyet.

2. A kódolás konvenciója a következő:

A legnagyobb helyértékű bit az előjel bit:
0 = pozitív
1 = negatív

A további bitek jelentik az abszolút értékeket.

3. A kódolás konvenciója a következő:
0 = nem
1 = igen

Az "Y koordináta követő" bitjének NULLÁ-ra (nem) állítása azt jelenti, hogy az útvonalpont Y-koordinátája nulla. Ebben az esetben az Y- koordináta adatmezője nem használatos. A "Z koordináta követő" bitjének NULLÁ-ra (nem) állítása vagy azt jelzi, hogy az útvonalpont két-dimenziós vagy azt, hogy két útvonalpont között egy állandó gradiensen fekszik, és ezért van a Z- koordináta kisugározva. Ebben az utolsó két esetben a Z- koordináta adatmezője nem használatos.

4. Ez az adatmező egy előjel nélküli értékkel van kódolva, a -100 m-es eltolt helyzettel. A nulla érték ebben az adatmezőben ennek megfelelően a -100 m-es Z- koordinátát jelenti.

5. Azok az adatmezők, amelyek a következő szakasz / adatmező azonosítót követik, csak bizonyos esetekben kerülnek továbbításra. A következő szakasz / adatmező azonosító kódolása és az azt követő adatmezők felhasználása az A-17. sz. táblázatban került meghatározásra.

6. Az útvonalpont mutató számok egymás utáni számozással a megközelítési oldalszög, vagy hátsó irányszektor adatbázisában lévő valamennyi útvonalpontra kijelölésre kerülnek. Ha egy útvonalpont van az elsődleges futópálya küszöbére úgy kódolva, hogy csak a futópálya küszöb keresztezési magasságot tartalmazza, akkor ez ki van hagyva az útvonalpont mutató sorozatából. A következő útvonalpont mutató adatmező mindig egy, az aktuális útvonalpontnál alacsonyabb mutató számra utal. A megszakított megközelítési mutató adatmező mindig egy, az aktuális útvonalpontnál magasabb mutató számra utal.

A-17. táblázat: A következő szakasz / adatmező azonosítók

(lásd a 3.11.4.8.3.2 pontot)

<table>
<tr><th colspan="4">Alkalmazás</th><th></th><th colspan="3">Az azonosítót követő adatmező(k)</th></tr>
<tr><th>A követ-kező útvonal-pont helye</th><th>A megosz-tott követ-kező útvo-nalpont lásd 1. Megjegy zést)</th><th>A megsza-kított megköze-lítéshez kapcsolódva</th><th>A szakasz jellege</th><th>A következő szakasz / adatmező azonosító</th><th>Megközelítési eljárás</th><th>Megszakí-tott megközelí-tési eljárás</th><th>Indulási eljárás</th></tr>
<tr><td rowspan="4">Bárhol</td><td rowspan="2">Nem</td><td rowspan="4">Nem</td><td>Egyenes</td><td>0</td><td colspan="3" rowspan="2">A következő útvonalpont X koordinátája</td></tr>
<tr><td>Ívelt</td><td>1</td></tr>
<tr><td rowspan="2">Igen</td><td>Egyenes</td><td>2</td><td colspan="3" rowspan="2">1. Következő útvonalpont mutató
2. Következő eljárás első útvonalpont X koordinátája</td></tr>
<tr><td>Ívelt</td><td>3</td></tr>
<tr><td rowspan="2">Elsődle-ges futó-pálya küszöb</td><td rowspan="4">Nem</td><td>Nem</td><td rowspan="2">Egyenes</td><td>4</td><td>1. Futópálya küszöb útvonalpont magasság
2. Következő eljárás első útvonalpont X koordináta</td><td colspan="2">Következő eljárás első útvonalpont X koordinátája</td></tr>
<tr><td>Igen</td><td>5</td><td>1. Futópálya küszöb útvonalpont magasság
2. Megszakított megközelítés mutató
3. Következő eljárás első útvonalpont X koordináta</td><td colspan="2">Nem engedélyezett (lásd a 3. Megjegyzést)</td></tr>
<tr><td rowspan="2">Nincs</td><td>Nem</td><td>Nem (lásd a 2. Megjegyzést)</td><td>6</td><td>1. Látszólagos oldalszög útvonalpont távolság
2. Következő eljárás első útvonalpont X koordináta</td><td colspan="2">Következő eljárás első útvonalpont X koordinátája</td></tr>
<tr><td>Igen</td><td>Egyenes az első átrepülendő útvonalpontig</td><td>7</td><td>1. Látszólagos oldalszög útvonalpont távolság
2. Megszakított megközelítés mutató
3. Következő eljárás első útvonalpont X koordináta</td><td colspan="2">Nem engedélyezett (lásd a 3. Megjegyzést)</td></tr>
</table>

MEGJEGYZÉSEK. –

1. Egy megosztott útvonalpont az az útvonalpont, ami az aktuális eljárásban csak egy útvonalpont mutatóval van azonosítva. Az útvonalpont koordináták kifejezetten egy másik eljárás részeként vannak meghatározva.

2. Ezen az útvonalponton túl, az útirány-vezetési információk arra az egyenes vonalra vannak vonatkoztatva, amely az aktuális útvonalpontból van meghosszabbítva és az útvonalpontba belépő repülési pálya érintője. Egy megszakított megközelítési eljárás esetén ez a vonal metszi az utolsó megközelítési útvonalpontot.

3. A következő szakasz / adatmező azonosító 5. és 7. értékei a csak a megközelítési eljárásokban való felhasználására vannak fenntartva. A megszakított megközelítési és az indulási eljárások megoszthatják azokat a megközelítési útvonalpontokat, amelyek ezeket az értékeket használják fel, szándékosan figyelmen kívül hagyva a futópálya küszöb útvonalpont magasság, a látszólagos oldalszög - futópálya küszöb távolság és a megszakított megközelítés mutató adatmezőt.

B-FÜGGELÉK: A GLOBÁLIS NAVIGÁCIÓS MŰHOLD RENDSZER (GNSS) RÉSZLETES MŰSZAKI ELŐÍRÁSAI

1. MEGHATÁROZÁSOK

GBAS/E. Egy földi-bázisú kiegészítő rendszer /GBAS/, amely elliptikusan polarizált VHF adat-közvetítéssel sugároz.

GBAS/H. Egy földi-bázisú kiegészítő rendszer /GBAS/, amely vízszintesen polarizált VHF adat-közvetítéssel sugároz.

Receiver. Vevő. Egy alrendszer, amely veszi a Globális Navigációs Műhold Rendszer jeleit, és egy, vagy több érzékelőelemet tartalmaz.

Reserved (bit/words/fields). Fenntartott (bitek/szavak/mezők). Bitek, szavak, mezők, melyek nem kerültek kiosztásra, de amelyek egy egyedi Globális Navigációs Műhold Rendszerű alkalmazásra fenn vannak tartva.

Spare (bit/words/fields). Tartalék (bitek/szavak/mezők). Bitek, szavak, mezők, melyek nem kerültek kiosztásra, vagy fenntartásra, és amelyek a jövőbeni kiosztásra rendelkezésre állnak.

Megjegyzés. – Az összes tartalék bit nullára van állítva.

2. ÁLTALÁNOS RÉSZ

Megjegyzés. – A következő műszaki előírások a 3.Fejezet 3.7 pontja alatt leírt rendelkezéseket egészítik ki.

3. A GLOBÁLIS NAVIGÁCIÓS MŰHOLD RENDSZER (GNSS) ALKOTÓELEMEI

3.1 Globális Helymeghatározó Rendszer (GPS) Szabvány Helymeghatározási Szolgáltatás (SPS) (L1)

3.1.1 A Nem-légijármű fedélzeti alkotóelemek

3.1.1.1 RÁDIÓFREKVENCIÁS (RF) JELLEMZŐK

3.1.1.1.1 *Vivőhullám fázis zaj*. A modulálatlan vivőhullám fázis zajának spektrális sűrűségének olyannak kell lennie, hogy egy fázisszabályzó hurok 10 Hz-es egy-oldalas zajszűrővel képes legyen a vivőhullám követésére egy 0,1 radiános (1 szigma) pontossággal.

3.1.1.1.2 *Hamis sugárzás*. A sávon belüli hamis sugárzásnak legalább 40 dB-el a modulálatlan L1 vivőhullám alatt kell lenni a kijelölt csatorna sávszélesség teljes egészében.

3.1.1.1.3 *Korrelációs veszteség*. A visszanyert jel teljesítményében a jel moduláció hiányossága és a hullámforma torzítás miatti veszteség nem haladhatja meg az 1 dB-t.

Megjegyzés. – A jel-teljesítmény veszteség az egy 2,046 MHz-es sávszélességben kisugárzott teljesítmény és az egy zajmentes és veszteségmentes 1-chip korrelációs térközű és egy 2,046 MHz-es sávszélességű vevővel visszanyert jel-teljesítmény közötti különbség.

3.1.1.1.4 *A Torzított /durva/ hozzáférési (C/A) kód összeállítása és időzítése*. Az egyes Torzított /durva/ hozzáférési kód mintákat $G_i(t)$ két, a G1 és a $G2_i$ 1023 bites lineáris minta Modulo-2 összegével kell kialakítani. A $G2_i$ sorozatot úgy kell kialakítani, hogy ténylegesen el kell késleltetni a G2 sorozatot egy egészszámú chip-el azért, hogy létrejöjjön a B-1. táblázatban meghatározott 36 egyedi $G_i(t)$ minta egyike. A G1 és G2 sorozatokat egy olyan 10-fokozatú léptető regiszterrel kell összeállítani, amelynek a léptető regiszter bemenetére vonatkoztatva a következő polinom karakterisztikája van:

a) G1: $X^{10} + X^3 + 1$; és

b) G2: $X^{10} + X^9 + X^8 + X^6 + X^3 + X^2 + 1$.

A G1 és G2 sorozatok alaphelyzet beállító címsorozatának ”1111111111”-nek kell lenni. A kód fázis kijelölésnek a B-1. táblázatban bemutatottnak kell lenni. A G1 és G2 tárolókat 1,023 MHz-es ütemmel kell szinkronizálni. A Torzított /durva/ hozzáférési (C/A) kódra vonatkozó időzítési kapcsolatnak a B-1.* ábrán bemutatottnak kell lenni.

* Az összes ábra a Függelék végén került elhelyezésre.

3.1.1.2 *Adat szerkezet*. A navigációs közleményt úgy kell kialakítani, ahogy az a B-2. ábrán bemutatásra került. Az egyes oldalaknak, ahogy azt a B-6. ábra mutatja, egy 1500 bit hosszúságú keret - maximum 5-ig terjedő al-kerettel, amelyek mindegyike 300 bit hosszúságú - alap formátumot kell felhasználni. Az összes szót először a legnagyobb helyértékű bittel (MSB) adva kell továbbítani.

3.1.1.2.1 *Al-keret szerkezet*. Az egyes al-kereteket és/vagy az al-keretek oldalait egy Távolságmérés (TLM) szóval kell kezdeni, amelyet egy Átadás (HOW) szó követ. Az Átadást 8 adatszónak kell követni. Minden egyes keretben minden egyes szónak 6 paritás bitet kell magába foglalni. A TLM szó és a HOW szó formátumát a B-3. és B-4. ábrák mutatják be, külön-külön.

3.1.1.2.2 A Hét vége/kezdete. A Hét végénél/kezdeténél:

a) Az 1-től 5-ig terjedő al-keretek ciklikus lapozását az 1. al-kerettel kell újrakezdeni, függetlenül attól, hogy melyik al-keret volt utoljára a hét végét/kezdetét megelőzően leadva; és

b) A 4. és 5. al-keret 25 oldalának periódikus visszatérését az 1. oldallal kell kezdeni minden egyes al-keretnél, függetlenül attól, hogy melyik al-keret volt utoljára a Hét végét/kezdetét megelőzően leadva. Az összes adat-áttöltésnek, vagy oldal elválasztásnak a keret határainál kell megtörténnie (azaz Modulo 30 másodperc a Hét vége/kezdetéhez viszonyítva).

Megjegyzés. – A 4. és 5. al-keretekben az új adatok továbbítását ezeknek az al-kereteknek bármelyik 25 oldalával lehet megkezdeni.

3.1.1.2.3 *Adat paritás*. Az 1.-től 5.-ig terjedő al-keretek 1.-től 10.-ig terjedő szavainak mindegyike magába kell, hogy foglaljon 6 paritás bitet, mint a legkisebb helyértékű biteket (LSB). Ezenkívül, két nem-információ hordozó bitet kell biztosítani, mint a 2. és 10. szó 23. és 24. bitjét paritás kiszámítási célokra.

3.1.1.2.4 *Távolságmérés (TLM) szó*. Minden egyes TLM szónak 30 bit hosszúságúnak kell lenni, minden egyes 6 másodpercben jelentkezően az adat keretben és minden egyes al-keret első szavának is ennek kell lenni. A Távolságmérés formátuma az kell, hogy legyen, ami a B-3. ábrán bemutatásra kerül. Minden egyes Távolságmérési (TLM) szónak egy bekezdő jelszakasszal, előtaggal kell kezdődni, amit 16 fenntartott bit és 6 paritás bit követ.

3.1.1.2.5 *Átadás szó (HOW).* A HOW-nak 30 bit hosszúnak kell lenni, és minden egyes al-keret/oldal második szava kell, hogy legyen közvetlenül a TLM-et követően. Az Átadásnak (HOW) az adat-keretben minden 6. másodpercben elő kell fordulnia. Az Átadás (HOW) formátumának és tartalmának a B-4. ábrán bemutatottnak kell lenni. A teljes Hét-Idő (TOW) számlálásnak a 29 bit-es Z-számlálás 19 legkisebb helyértékű bitjéből kell állni (3.1.1.2.6). Az Átadásnak (HOW) a Hét-Idő (TOW) számlálás 17 legnagyobb helyértékű bitjével kell kezdődni. A 17. bit meg kell, hogy feleljen a Hét-Idő (TOW) számlálásnak az 1,5 másodperces korszaknál /epoch/, ami a következő ezt követő al-keret indulásánál (felfutó él) fordul elő.

3.1.1.2.5.1 *A 18. bit*. A 001 konfigurációs kóddal kijelölt műholdon a 18. bitnek egy "riasztás" kijelzésnek kell lenni. Amikor ez a kijelzés 'megjelenik' (a 18. bit "1" lesz), akkor ezen azt kell a felhasználó részére jelezni, hogy a műhold felhasználói távolság pontossága (URA) lehet, hogy rosszabb annál, mint ami az 1. al-keretben jelzett volt, és a műhold felhasználása a felhasználók kockázatát képezi.

B-1. táblázat: Kód fázis kijelölések

Műhold azonosító szám	GPS Ál-véletlen zaj (PRN) jel	G2 késleltetés (chip-ek)	Az első 10 chip nyolcas számrendszerű*
1	1	5	1440
2	2	6	1620
3	3	7	1710
4	4	8	1744
5	5	17	1133
6	6	18	1455
7	7	139	1131
8	8	140	1454
9	9	141	1626
10	10	251	1504
11	11	252	1642
12	12	254	1750
13	13	255	1764
14	14	256	1772
15	15	257	1775
16	16	258	1776
17	17	469	1156
18	18	470	1467
19	19	471	1633
20	20	472	1715
21	21	473	1746
22	22	474	1763
23	23	509	1063
24	24	512	1706
25	25	513	1743
26	26	514	1761
27	27	515	1770
28	28	516	1774
29	29	859	1127
30	30	860	1453
31	31	861	1625
32	32	862	1712
***	33	863	1745
***	34**	950	1713
***	35	947	1134
***	36	948	1456
***	37**	950	1713

* A Torzított /durva/ hozzáférési (C/A) kód első 10 chipjének az oktális írásmódja az, ahogy az ebben a számoszlopban bemutatásra került, az első számjegy egy ”1”-et képvisel az első chipre és az utolsó három számjegy a fennmaradó 9 chip hagyományos nyolcas számrendszerű feltűntetése (például, a Torzított /durva/ hozzáférési kód első tíz chipje az ál-véletlen zaj (PRN) jel 1.összeállítására: 1100 100000).
** A Torzított /durva/ hozzáférési (C/A) kódok 34-es és 37-es kódja közös.
*** Az ál-véletlen zaj /PRN/ jelnek a 33-tól a 37-ig terjedő összeállításai egyéb felhasználásokra van fenntartva (például: földi adók).

3.1.1.2.5.2 *A 19. bit.* A 19. bitet fenn kell tartani.

3.1.1.2.5.3 *A 20., 21. és 22. bitek*. Az Átadás (HOW) 20., 21. és 22. bitjének kell azonosítania azt az al-keretet, amelyben ez az adott Átadás (HOW) a második szó. Az Azonosító (ID) kódot az alábbiak szerint kell meghatározni:

Azonosító (ID)	Kód
1	001
2	010
3	011
4	100
5	101

3.1.1.2.6 *A Műhold Z-számlálása*. Minden egyes műholdnak önmagán belül vezérelnie kell egy 1,5-másodperces 'korszakot' /epoch/, hogy magába foglaljon egy megfelelő egységet az idő pontos számlálásához és közléséhez. Az ily módon meghatározott időt úgy nevezzük, hogy ez a Z-számlálás. A Z-számlálást a felhasználó részére egy 29 bites bináris számként kell biztosítani, amely a következőknek megfelelően két részből áll.

3.1.1.2.6.1 *Hét-Idő (TOW) számlálás*. A Z-számlálás 19 legkisebb helyértékű bitjével megjelenített bináris számot úgy kell besorolni, hogy az a Hét-Idő számlálás és úgy kell meghatározni, hogy ez egyenlő azon 1,5 másodperces korszakok számával, ami a megelőző hétről történt áttérés óta bekövetkezett. A számlálásnak rövid ciklusú léptetésűnek kell lenni úgy, hogy a Hét-Idő /TOW/ számlálás tartománya a 0-tól a 403 199-ig egy 1,5 másodperces korszak legyen (egy héttel egyenlő), és minden egyes hét végén vissza kell állítani nullára. A Hét-Idő számlálások nulla állapotának az 1,5 másodperces korszaknak kell lenni, avval, ami azonos a jelenlegi hét kezdetével. A Hét-Idő /TOW/ számlálás levágott változatát, ami a 17 legnagyobb helyértékű bitjéből áll, kell, hogy magába foglalja az Átadás /HOW/ az L1 lefelé irányuló adatfolyamban. A tényleges Hét-Idő /TOW/ számlálás és annak levágott Átadás /HOW/ változata közötti összefüggésnek a B-5. ábrán bemutatottnak kell lenni.

Megjegyzés. – A fent említett 'korszak' (megközelítőleg) a Szombat éjszaka/Vasárnap reggel éjfélnél jelentkezik, ahol az idő 0000 óraként van meghatározva az Egyeztetett Világidő /UTC/ szerint, ami névlegesen a Greenwich délkörre van vonatkoztatva.

3.1.1.2.6.2 Hét számlálás. A Z-számlálás 10 legnagyobb helyértékű bitjének kell a jelenlegi Globális Helymeghatározó Rendszer /GPS/ hétjére (Modulo 1024) kiosztott sorrendi szám bináris adat feltűntetésének lenni. Ennek a számlásnak a tartománya 0-tól 1023-ig terjed. A nulla állapota az a hét kell, hogy legyen, amely a (megközelítőleges) Egyeztetett Világidő nulla időpontjában jelentkező 1,5 másodperces korszakkal kezdődik. A Globális Helymeghatározó Rendszer /GPS/ hét 1023 számának a lejárásakor a GPS hét számnak nullára kell "átfordulni". A megelőző 1024 heteket a GPS idejéből egy naptári dátumra a felhasználónak kell átalakítva visszavezetni.

3.1.1.3 ADAT TARTALOM

3.1.1.3.1 *1. Al-keret – műhold óra és működési állapot*. Az 1. al-keret 3.-tól 10.-ig terjedő szavainak tartalma kell, hogy magába foglalja az idő paramétereket és az egyéb adatokat, ahogy az a B-2. táblázatban feltűntetésre került. Az egy adatállományban lévő paramétereknek érvényesnek kell lenni azon időtartam alatt, amíg leadásra kerülnek, és érvényes kell, hogy maradjon a leadás ideje után addig a kiegészítő időtartamig, amíg a következő adatállomány továbbítása megkezdődik.

3.1.1.3.1.1 *Hét számozás*. A 3. szó 10 legnagyobb helyértékű bitjének kell magába foglalnia a 29 bites Z-számlálás 10 legnagyobb helyértékű bitjét és kell képviselnie a Globális Helymeghatározó Rendszer /GPS/ érvényes hetének számát az adatátviteli időközének kezdetével az összes nullával jelezve azt, hogy a hét "nulla". A GPS hét számozását minden egyes hét korszak végénél/kezdeténél kell megemelni.

3.1.1.3.1.2 *Felhasználói Távolság Pontosság (URA)*. A 3. szó 13-tól 16-ig terjedő bitjeinek kell biztosítani az előre jelzett műhold Felhasználói Távolság Pontosságot úgy, ahogy az a B-3. táblázatban bemutatásra került.

1. Megjegyzés. – A Felhasználói Távolság Pontosság (URA) nem foglalja magába az egy-frekvenciás ionoszférikus késési modell pontatlansága miatti hiba becsléseket.

2. Megjegyzés. – Az URA a látható idő /óra/ és a műhold-állási előrejelzés pontosságának a vonatkozó statisztikai jelzése arra a távolság-meghatározási pontosságra, ami egy meghatározott műholdról az addigi adatsorozatra alapozva elérhető.

B-2. táblázat: Az 1. al-keret paraméterei

Paraméter	A bitek száma**	Osztás tényező (LSB)	Tényleges tartomány***	Mértékegység
A hét száma	10	1		hetek
Műhold pontosság	4			
Műhold működési állapot	6	1		diszkrét
T_{GD}	8*	2^{-31}		másodperc
IODC	10			
t_{oc}	16	2^{4}	604 784	másodperc
a_{f2}	8*	2^{-55}		másodperc/mp^2
a_{f1}	16*	2^{-43}		másodperc/mp
a_{f0}	22*	2^{-31}		másodperc

* Az így jelzett paramétereknek két komplemenses összetevője van, a Legnagyobb helyértékű bitet /MSB/ elfoglaló (+ vagy -) előjel bittel.
** Lásd a B-6. ábrán a teljes bit kiosztást.
*** Ha ebben az oszlopban nincs másképpen jelezve, a tényleges tartomány a maximális tartomány.
LSB = A legkisebb helyértékű bit

B-3. táblázat: Felhasználói távolság pontosság

Felhasználói távolság pontosság (URA)	Pontosság
0	2 m
1	2.8 m
2	4 m
3	5.7 m
4	8 m
5	11.3 m
6	16 m
7	32 m
8	64 m
9	128 m
10	256 m
11	512 m
12	1024 m
13	2048 m
14	4096 m
15	ne használják

3.1.1.3.1.3 *Működési állapot*. A 3. szó 17-22 bitjeinek kell tartalmaznia a kisugárzó műhold 6-bites működési állapotának jelzését. A legnagyobb helyértékű bit (MSB) jelezze ki a navigációs adat működési állapotának összegzését, ahol:

a) 0 = az összes navigációs adat érvényes; és

b) 1 = a navigációs adat egy része nem érvényes.

Az 5 legkisebb helyértékű bitnek (LSB-k) kell jeleznie a jel összetevők működési állapotát a 3.1.1.3.3.4 pontban leírtakkal összhangban. A működési állapot jelzést az egyes műholdak alkalmasságához viszonyítva kell jelezni, ahogy az a 3.1.1.3.3.5 pontban leírt konfigurációs kódnál kijelölésre került. Akármelyik műholdat, amelynek nincs meg egy bizonyos alkalmassága, "működőképes állapotú"-nak kell jelezni akkor, ha ennek az alkalmasságnak a hiánya a műhold tervezésétől elválaszthatatlan, vagy egy olyan módban van konfigurálva, amely a vevő szempontjából szabályos, és nincs szüksége erre a 'képességre'. A kiegészítő működési állapot /health/ adatokat a 4. és 5. al-keretben kell megadni.

Megjegyzés. – Az 1. al-keretben megadott adatok eltérhetnek azoktól, amelyek más műholdakra a 4. és/vagy 5. al-keretben bemutatásra kerültek, mivel az utóbbiak eltérő időben kerültek felfrissítésre.

3.1.1.3.1.4 *Adatkibocsátás, óra (IODC)*. Az 1. al-keret 3. szava 23. és 24. bitjeinek kell magukba foglalniuk az Adatkibocsátás, óra (IODC) 10-bitjéből a 2 legnagyobb helyértékű bitjét /MSB/. Az 1. al-keret 8. szavának 1.-től 8.-ig terjedő bitjeinek kell tartalmazniuk az IODC 8 legkisebb helyértékű bitjét. Az IODC-nek jeleznie kell az adatkészlet kibocsátási számát.
Az Adatkibocsátás, óra (IODC)-nek különböznie kell minden olyan értéktől, amit a műhold a megelőző 7 nap során leadott.

Megjegyzés. – Az Adatkibocsátás, óra (IODC) és az Adatkibocsátás, Efemerisz /keringési pálya/ (IODE) szakkifejezések közötti összefüggés a 3.1.1.3.2.2 pontban került meghatározásra.

3.1.1.3.1.5 *Számított csoportkésés különbözet*. A 7. szó 17.-től 24.-ig terjedő bitjeinek kell magukba foglalni a T_{GD} /Csoportkésési idő/ helyesbítési tényezőt, a műholdak csoportkésési különbözete hatásának beszámításához.

Megjegyzés. – A T_{GD} /Csoportkésési idő/ nem foglal magába semmilyen C/A-t [durva/ torzított hozzáférés]a P(Y) /precíziós/ kódban a relatív csoportkésési hibára vonatkozóan.

3.1.1.3.1.6 *Műhold óra helyesbítési paraméterek*. A 8. szó 9.-től 24.-ig terjedő bitjeinek, a 9. szó 1.-től 24.-ig terjedő bitjeinek és a 10. szó 1.-től 22.-ig terjedő bitjeinek kell tartalmazniuk azokat a paramétereket, amelyek a felhasználó részére a látszólagos műhold óra helyesbítésekhez (t_{oc}, a_{f2}, a_{f1} és a_{f0}) szükségesek.

3.1.1.3.1.7 *Fenntartott adatmezők*. A fenntartott adatmezőknek azoknak kell lenni, amelyeket a B-4. táblázat megad. Az összes fenntartott adatmezőnek a megfelelő szavakon belül érvényes paritással kell rendelkezni.

3.1.1.3.2 *2. és 3. Al-keretek – műhold efemerisz /keringési pálya/ adatok*. A 2. és 3. al-keretnek kell magába foglalnia az adattovábbító műhold efemerisz ábrázolását.

3.1.1.3.2.1 *Efemerisz paraméterek*. Az efemerisz /keringési pálya/ paramétereknek a B-5. táblázatban megadottaknak kell lenni. A 2. és 3. al-keret egyes paramétereinek, a bitek számának, a legkisebb helyértékű bitek osztás tényezőjének, a tartományának és mértékegységeinek a B-6. táblázatban meghatározottaknak kell lenni.

3.1.1.3.2.2 *Adatkibocsátás, efemerisz (IODE)*. Az Adatkibocsátás, efemerisz (IODE)-nek annak a 8 bites számnak kell lenni, ami ugyanazon adatállomány 10 bites Adatkibocsátás, óra (IODC)-nak a 8 legkisebb helyértékű bitjeivel egyenlő. Az Adatkibocsátás, efemerisz (IODE)-t mind a 2., mind a 3. al-keretben biztosítani kell az 1. al-keretben lévő Adatkibocsátás, óra (IODC) tényezőnek a 8 legkisebb helyértékű bitjével történő összehasonlítás céljából. Amikor ez a három tényező nem egyezik az adatállomány levágásának eredményeként, akkor új adatokat kell összegyűjteni. A leadott Adatkibocsátás, efemerisz (IODE)-nek eltérőnek kell lenni a műhold által a megelőző 6 órában továbbított bármilyen értéktől (1. Megjegyzés). A 2. és 3. al-keret adataiban történt bármilyen módosulást el kell végezni egy változtatással egyetértésben mindkét Adatkibocsátás, efemerisz (IODE) szóban. Az új adatállomány változtatásnak csak az óra határvonalaknál kell megtörténni, kivéve egy új adatáttöltés első adatállományát. Kiegészítésképpen a t_{oe} értéknek, amelyet a műhold egy adatáttöltés után továbbít, legalább az első adatállománya eltérő kell, hogy legyen attól, mint amit a változást megelőzően továbbított (2. Megjegyzés).

B-4. táblázat: 1. Al-keret fenntartott adatmezők

Szó	Bit
3	11 - 12
4	1 - 24
5	1 - 24
6	1 - 24
7	1 - 16

B-5. táblázat: Efemerisz adatok

M_0	Közepes anomália a referencia időnél
Δn	Közepes szögsebesség eltérés a számított értéktől
e	Excentricitás
$\sqrt{A}$	A fél nagytengely négyzetgyöke
$OMEGA_0$	A műhold pályasík felszálló csomó/pont/jának földrajzi hosszúsága a hetenkénti korszaknál
i_0	Inklinációs /pályaelhajlási/ szög a referencia időnél
ω	A földközel argumentuma
OMEGADOT	A rektaszcenzió /egyenes emelkedés/ mértéke
iDOT	A pályaelhajlás szögeinek mértéke
C_{uc}	A szélességi fok koszinusz harmonikus helyesbítési tényezőjének amplitúdója
C_{us}	A szélességi fok szinusz harmonikus helyesbítési tényezőjének amplitúdója
C_{rc}	A körpálya sugara koszinusz harmonikus helyesbítési tényezőjének amplitúdója
C_{rs}	A körpálya sugara szinusz harmonikus helyesbítési tényezőjének amplitúdója
C_{ic}	A pályaelhajlás szöge koszinusz harmonikus helyesbítési tényezőjének amplitúdója
C_{is}	A pályaelhajlás szöge szinusz harmonikus helyesbítési tényezőjének amplitúdója
t_{oe}	Referencia idő, efemerisz /keringési pálya/
IODE	Adatkibocsátás, efemerisz /keringési pálya/

B-6. táblázat: Efemerisz paraméterek

Paraméter	A bitek száma**	Osztás tényező (LSB)	Tényleges tartomány***	Mértékegység
IODE	8			
C_{IS}	16*	2^{-5}		méter
Δn	16*	2^{-43}		félkör/másodperc
M_0	32*	2^{-31}		félkör
C_{UC}	16*	2^{-29}		radián
e	32	2^{-33}	0,03	dimenzió nélküli
C_{US}	16*	2^{-29}		radián
$\sqrt{A}$	32	2^{-19}		$\text{méter}^{1/2}$
t_{oe}	16	2^4	604 784	másodperc
C_{ic}	16*	2^{-29}		radián
$OMEGA_0$	32*	2^{-31}		félkör
C_{is}	16*	2^{-29}		radián
i_0	32*	2^{-31}		félkör
C_{ic}	16*	2^{-5}		méter
ω	32*	2^{-31}		félkör
OMEGADOT	24*	2^{-43}		félkör/másodperc
iDOT	14*	2^{-43}		félkör/másodperc

* Az így jelzett paramétereknek két komplemenses összetevője van, a Legnagyobb helyértékű bitet /MSB/ elfoglaló (+ vagy -) előjel bittel.

** Lásd a B-6. ábrán a teljes bit kiosztást az al-keretben.

*** Ha ebben az oszlopban nincs másképpen jelezve, a tényleges tartomány az a maximális tartomány, ami a megadott bit kijelöléssel és osztás tényezővel elérhető.

LSB = A legkisebb helyértékű bit

1. Megjegyzés. – Az Adatkibocsátás, efemerisz/Adatkibocsátás, óra (IODE/IODC) tényezők adják a vevő részére azt az eszközt, amellyel érzékeli az efemerisz/óra 'ábrázoló' paraméterének bármilyen változását.

2. Megjegyzés. – Az első adatállomány megváltoztatható (3.1.1.2.2) az óra során bármikor, és ennek megfelelően a műhold 1 órán belül is leadhatja.

3.1.1.3.2.3 *Fenntartott adatmezők*. A 2. al-keret 10. szaván belül a 17.-től a 22.-i terjedő biteket fenn kell tartani. A fenntartott adatmezőknek az érvényes paritást kell támogatniuk a megfelelő szavakon belül.

3.1.1.3.3 *4. és 5. al-keret – kiegészítő adatok*. Mindkét, a 4. és 5. al-keretnek 25-ször szub-kommutáltnak kell lenni. A "fenntartott" oldalak és a kifejezett ismétlések lehetséges kivételével az egyes oldalaknak különböző adatokat kell a 3.-tól a 10.-ig terjedő szavaikban magukba foglalni. A 4. al-keret oldalainak 6 különböző formátumot kell felhasználniuk, és az 5. al-keret oldalainak két különböző formátumot kell használni, ahogy azt a B-6. ábra bemutatja.

A 4. al-keret oldalainak a következőknek kell lenni:

a) A 2., 3., 4., 5., 7., 8., 9. és 10. oldalak: naptár adatok a 25.-től a 32.-ig terjedő műholdakra, külön-külön. Amikor a 25. oldal 6 bites működési állapot szava 6db "egyesre" van állítva (3.1.1.3.3.4), akkor az oldal műhold azonosítójának /ID/ értéke nem lesz a 25.-től a 32.-ig terjedő tartományban;

Megjegyzés. – Ezeket az oldalakat ki lehet jelölni egyéb funkciókra. Az egyes oldalak formátumát és tartalmát a vonatkozó oldalnak a műhold azonosítója /ID/ jelöli ki.

b) 17. oldal: speciális közlemények;

c) 18. oldal: ionoszféra és Egyeztetett Világidő /UTC/ adatok;

d) 25. oldal: műhold konfiguráció a 32 műholdra; és

e) 1., 6., 11., 12., 13., 14., 15., 16., 19., 20., 21., 22., 23. és 24. oldal: fenntartott oldalak.

Az 5. al-keret oldalai a következők kell, hogy legyenek:

a) Az 1.-től a 24.-ig terjedő oldalak: naptár adatok az 1.-től a 24.-ig terjedő műholdakra; és

b) 25. oldal: műhold működési állapot adatok az 1.-től a 24.-ig terjedő műholdakra, a naptár referencia ideje és a naptár referencia hét száma.

3.1.1.3.3.1 *Adat Azonosító /ID/.* A 3. szó két legnagyobb helyértékű bitjének /MSB/ minden egyes oldalon magába kell foglalnia azt az Adat azonosítót /ID/, amely meghatározza a felhasználható Globális Helymeghatározó Rendszer /GPS/ navigációs adatszerkezetét. Az Adat azonosítónak olyannak kell lenni, ahogy azt a B-7. táblázat bemutatja, az alábbiakkal összhangban:

a) azoknál az oldalaknál, amelyek úgy vannak kijelölve, hogy egy meghatározott műhold naptár adatait foglalják magukba, az Adat azonosítónak kell meghatároznia azt az adat szerkezetet, amelyet az a műhold használ fel, amelynek a naptár adatait ez az oldal foglalja magába;

b) az összes egyéb oldalra az Adat azonosítónak kell jelezni az adattovábbító műhold adat szerkezetét; és

c) az "1" Adat azonosítót (a bináris állapot 00-val jelezve) nem lehet felhasználni.

3.1.1.3.3.2 *Műhold azonosító*. A Műhold azonosítót minden egyes oldal 3. szavának a 3.-tól a 8.-ig terjedő bitjeivel kell biztosítani. A Műhold azonosítót kétféle módon kell felhasználni:

a) azoknál az oldalaknál, amelyek egy adott műhold naptár adatait tartalmazzák, a Műhold azonosítónak ugyanazon számúnak kell lenni, mint ami annak a műholdnak az ál-véletlen zaj /PRN/ kód fázisára ki van jelölve a B-1. táblázatban megadottakkal összhangban; és

b) az összes egyéb oldalaknál a Műhold azonosító a B-7. táblázatban megadottakkal összhangban van kijelölve "oldal azonosítóként" kell, hogy szolgáljon. Az 1.-től a 32.-ig terjedő azonosítókat azokra az oldalakra kell kijelölni, amelyek a meghatározott műholdak naptár adatait foglalják magukba (az 5. al-keret 1.-től 24.-ig terjedő oldalai és a 4. al-keret 2.-től 5.-ig terjedő, valamint 7.-től 10.-ig terjedő oldalai). A "0" ID-t (binárisan mindenhol nullák) annak jelzésére kell kiosztani, hogy az egy látszólagos /dummy/ műhold, míg az 51.-től a 63.-ig terjedő azonosítókat az olyan oldalakra kell felhasználni, amelyek más naptári adatokat tartalmaznak egy meghatározott műholdra (1. és 2. Megjegyzés).

1. Megjegyzés. – Meghatározott azonosítók vannak fenntartva a 4. és 5. al-keret egyes oldalaira, azonban a 4. al-keret 2., 3., 4., 5., 7., 8., 9. és 10. oldalainak Műhold azonosítói az egyes oldalakra változtathatók, hogy annak az oldalnak a váltakozó tartalmára utaljanak.

2. Megjegyzés. – A fennmaradó ID-k (a 33.-tól az 50.-ig terjedően) nincsenek kijelölve.

B-7. táblázat: Adat azonosítók és Műhold azonosítók a 4. és 5. al-keretben.

	4. Al-keret		5. Alkeret	
Oldal	Adat azonosító	Műhold azonosító*	Adat azonosító	Műhold azonosító*
1	***	57	**	1
2****	**	25	**	2
3****	**	26	**	3
4****	**	27	**	4
5****	**	28	**	5
6	***	57	**	6
7****	**	29	**	7
8****	**	30	**	8
9****	**	31	**	9
10****	**	32	**	10
11	***	57	**	11
12	***	62	**	12
13	***	52	**	13
14	***	53	**	14
15	***	54	**	15
16	***	57	**	16
17	***	55	**	17
18	***	56	**	18
19	***	58*****	**	19
20	***	59*****	**	20
21	***	57	**	21
22	***	60*****	**	22
23	***	61*****	**	23
24	***	62	**	24
25	***	63	***	51

* A “0” a “látszólagos” műholdat jelzi. Amikor a “0”-t használják egy látszólagos műhold jelzésére, akkor az adattovábbító műhold Adat azonosítója használatos.

** Annak a műholdnak az Adat azonosítója, amelynek a Műhold azonosítója jelenik meg azon az oldalon.
*** Az adattovábbító műhold Adat azonosítója.

**** A 4. al-keret 2., 3., 4., 5., 7., 8., 9. és 10. oldalai magukba foglalhatnak naptár adatokat a 25.-től a 32.-ig terjedő műholdakra, külön-külön, vagy egyéb funkciókra vonatkozó adatokat, ahogy az a különböző Műhold azonosítókkal a bemutatott értékekből megállapítható.

***** A Műhold azonosító változtatható.

3.1.1.3.3.3 *Naptár*. Az 5. al-keret 1.-től 24.-ig terjedő oldalainak, valamint a 4. al-keret 2.-től 5.-ig és a 7.-től 10.-ig terjedő oldalainak kell magukba foglalniuk a naptár adatokat és a műhold működési állapot /health/ szót (3.1.1.3.3.4) mind a 32 műholdra. A naptár adatoknak az óra és az efemerisz paraméterek egy csökkentett-pontosságú rész-halmazának kell lenni. Az adatnak el kell foglalnia az egyes oldalak 3.-tól 10.-ig terjedő szavainak összes bitjét, kivéve a 3. szó 8 legnagyobb helyértékű bitjeit (Adat azonosító és Műhold azonosító), az 5. szónak a 17.-től a 24.-ig terjedő bitjeit (műhold működési állapot /satellite health/) és a paritásra szánt 50 bitet. A bitek számának, az osztási tényezőnek (legkisebb helyértékű bit), a távolságnak és a naptár paraméterek egységeinek azoknak kell lenni, amit a B-8. táblázat bemutat. Az egyes látszólagos /dummy/ műholdak naptár közleményeinek váltakozó “egyeseket” és “nullákat” kell érvényes paritással magukba foglalni.

3.1.1.3.3.3.1 *Naptár referencia idő*. A naptár referencia időnek – a t_{oa}-nak – a 2^{12} másodperc többszörösének kell lenni az ennek a naptár adatállománynak az első érvényes továbbítási ideje utáni körülbelül 70 órával bekövetkezően. A naptárt megfelelő gyakorisággal kell felfrissíteni annak biztosításához, hogy a Globális Helymeghatározó Rendszer /GPS/ ideje
(t) a t_{oa}-tól /referencia idő/ az adattovábbítási időtartamban 3,5 napnál kevesebbel legyen eltérő. A naptár paramétereket legalább 6-naponként egyszer fel kell frissíteni a szabályos üzemeltetés során.

3.1.1.3.3.3.2 *Naptár idő paraméterek*. A naptár idő paramétereknek egy 11 bites állandó tagból (a_{f0}) és egy 11 bites elsőfokú tagból (a_{f1}) kell állniuk.

3.1.1.3.3.3.3 *Naptár referencia hét*. Az 5. al-keret 25. oldalán lévő 3. szó 17.-től 24.-ig terjedő bitjeinek kell jelezni annak a hétnek a számát (WN_a), amelyre a naptár referencia ideje (t_{oa}) vonatkoztatva van. A Hét száma /WN_a/ kifejezésnek a teljes hét számának a 8 legkisebb helyértékű bitjéből kell állnia. Az 5. al-keret 25. oldala 3. szavának 9.-től 16.-ig terjedő bitjeinek kell magába foglalnia a t_{oa} /naptár referencia idő/ értéket, ami erre a WN_a-ra /a Hét száma/ van vonatkoztatva.

3.1.1.3.3.4 *Működési állapot /health/ összefoglalása*. A 4. és 5. al-keretnek kell tartalmaznia a műhold működési állapot adatainak két típusát:

a) a 32 oldal mindegyikének, amely tartalmazza az óra/naptár adatokat, biztosítania kell egy 8 bites műhold működési állapot szót arra a műholdra vonatkozóan, amelynek a naptár adatait az a műhold továbbítja; és

b) a 4. és 5. al-keret 25. oldalának közösen kell tartalmazni a 6 bites működési állapot adatot a 32 műholdra.

3.1.1.3.3.4.1 A 8-bites működési állapot szavaknak az 5. szó 17.-től 24.-ig terjedő bitjeit kell elfoglalniuk azon a 32 oldalon, amely a naptár adatokat tartalmazza az egyes műholdakra. A 6-bites működési állapot szavaknak az 5. al-keret 25. oldalán lévő 4.-től 9.-ig terjedő szavak 24 legnagyobb helyértékű bitjét és a 4. al-keret 25. oldalán lévő 8. szó 19.-től 24.-ig terjedő bitjeit, a 9. szó 24 legnagyobb helyértékű bitjeit és a 10. szó 18 legnagyobb helyértékű bitjeit kell elfoglalniuk.

B-8. táblázat: Naptár paraméterek

Paraméter	A bitek száma**	Osztás tényező (LSB)	Tényleges tartomány***	Mértékegység
e	16	2^{-21}		dimenzió nélküli
t_{oa}	8	2^{12}	602 112	másodperc
δ_i****	16*	2^{-19}		félkör
OMEGADOT	16*	2^{-38}		félkör/másodperc
$\sqrt{A}$	24*	2^{-11}		méter$^{1/2}$
$OMEGA_0$	24*	2^{-23}		félkör
ω	24*	2^{-23}		félkör
M_0	24*	2^{-23}		félkör
a_{f0}	11*	2^{-20}		másodperc
a_{f1}	11*	2^{-38}		másodperc/mp

* Az így jelzett paramétereknek két komplemenses összetevője van, a Legnagyobb helyértékű bitet /MSB/ elfoglaló (+ vagy -) előjel bittel.

** Lásd a B-6. ábrán a teljes bit kiosztást az al-keretben.

*** Ha ebben az oszlopban nincs másképpen jelezve, a tényleges tartomány az a maximális tartomány, ami a megadott bit kijelöléssel és osztás tényezővel elérhető.

**** Az i_0-ra vonatkoztatva = 0,30 félkör.

LSB = A legkisebb helyértékű bit

3.1.1.3.3.4.2 A 8-bites működési állapot szavak 3 legnagyobb helyértékű bitjének kell jeleznie a navigációs adatok állapotot a B-9. táblázatban megadott kódnak megfelelően. A 6-bites szavaknak a navigációs adatok állapotának egy 1-bites összegzését kell megadni a legnagyobb helyértékű bitek /MSB/ helyzetében a 3.1.1.3.1.3.pontban leírtakkal összhangban. Mind a 8-bites, mind a 6-bites működési állapot szavak 5 legkisebb helyértékű bitjének /LSB/ kell a műhold jel összetevőinek állapotát biztosítani a B-10. táblázatban megadott kódnak megfelelően.

B-9. táblázat: A navigációs adatok működési állapotának jelzése

A bitek helyzete az oldalon			Jelzés
137	138	139	
0	0	0	AZ ÖSSZES ADAT RENDBEN VAN.
0	0	1	PARITÁS HIBA – néhány, vagy az összes paritás rossz
0	1	0	TÁVOLSÁGMÉRÉS/ÁTADÁS /TLM/HOW/ FORMÁTUM PROBLÉMA – valamilyen eltérés a szabvány formátumtól (pl. a bevezető jelszakasz nincs a helyén és/vagy pontatlan), kivéve a pontatlan Z-számlálást, ahogy az ÁTADÁSban közölve van.
0	1	1	A Z-SZÁMLÁLÁS AZ ÁTADÁSban /HOW/ ROSSZ, valami probléma van a Z-számlálás értékével, nem tükrözi a tényleges kód fázist.
1	0	0	1., 2., 3. AL-KERET – egy, vagy több elem a 3.-tól a 10.-ig terjedő szavakban, egy, vagy több al-keret rossz.
1	0	1	4., 5. AL-KERET – egy, vagy több elem a 3.-tól a 10.-ig terjedő szavakban, egy, vagy több al-keret rossz.
1	1	0	AZ ÖSSZES ÁTTÖLTÖTT ADAT ROSSZ – egy, vagy több elem a 3.-tól a 10.-ig terjedő szavakban, egy (vagy több) al-keret rossz
1	1	1	AZ ÖSSZES ADAT ROSSZ – a Távolságmérés /TLM/ szó és/vagy az Átadás /HOW/ és egy, vagy több elem bármelyik (vagy több) al-keretben rossz.

B-10. táblázat: A működési állapot műhold jel összetevők kódjai

MSB				LSB	Jelzés
0	0	0	0	0	AZ ÖSSZES JEL RENDBEN VAN.
1	1	1	0	0	A MŰHOLD IDEIGLENESEN NEM MŰKÖDIK – ne használják ezt a műholdat a jelenlegi átmenet ideje alatt.______
1	1	1	0	1	A MŰHOLD IDEIGLENESEN KI VAN KAPCSOLVA - körültekintéssel használják. ______
1	1	1	1	0	TARTALÉK
1	1	1	1	1	EGYNÉL TÖBB KOMBINÁCIÓRA LENNE SZÜKSÉG A RENDELLENESSÉGEK LEÍRÁSÁRA, KIVÉVE AZOKAT, AMELYEKET CSAK ______VEL JELÖLTEK.
Minden egyéb kombináció					A MŰHOLD KÓD MODULÁCIÓS ÉS/VAGY JEL-TELJESÍTMÉNY SZINT ADATTOVÁBBÍTÁSI PROBLÉMÁKAT ÉSZLEL. A felhasználó kihagyó követési problémákat észlelhet, ha a műholdat befogja.

MSB = legnagyobb helyértékű bit
LSB = legkisebb helyértékű bit

3.1.1.3.3.4.3 Különleges jelentést kell kiadni a 4. és 5. al-keret 25. oldalán lévő 6-bites működési állapot szavak 6db "egyes" kombinációjának; ennek azt kell jelezni, hogy "a műhold, melynek az azonosítója /ID/ nem elérhető, és lehet, hogy nincs adat arra a műholdra vonatkozóan a 4., vagy 5. al-keret oldalán, ami arra van kijelölve, hogy szabályszerűen annak a műholdnak a naptár adatait tartalmazza".

Megjegyzés. – Ez a különleges jelentés csak a 4. és 5. al-keret 25. oldalára vonatkozik. Lehet ott egy másik műholdra vonatkozó adat, a fentiekben említett naptár oldalon, úgy, ahogy az a 3.1.3.3.3.3 pontban meghatározásra került.

3.1.1.3.3.4.4. A működési állapot jelzést az egyes műholdak képességeire vonatkoztatva kell biztosítani úgy, ahogy azt a 3.1.1.3.3.5 pontban a konfigurációs kód kijelöli. Ennek megfelelően bármelyik műholdat, amelynek nincs meg egy bizonyos képessége, "jó működési állapotú"-nak kell jelezni akkor, ha ennek a képességnek a hiánya a műhold tervezéséhez hozzátartozik, vagy ha egy olyan módban van konfigurálva, ami a vevő nézőpontjából szabályos és nem igényli azt a képességet. Az előre látható működési állapot adatot az adatáttöltés idején kell felfrissíteni.

1. Megjegyzés. – A leadott működési állapot adatok lehet, hogy nem egyeznek meg az adattovábbító műhold, vagy a műhold rendszerben lévő másik műholdak tényleges működési állapotával.

2. Megjegyzés. – Az 1., 4. és 5. al-keretben megadott, a másik műholdakra vonatkozó adatok eltérőek lehetnek attól, mint amit a 4. és/vagy 5. al-keretek mutatnak, mivel az utóbbiak más időpontban felújított adatok lehetnek.

3.1.1.3.3.5 *Műhold konfiguráció összegzés*. A 4. al-keret 25. oldalának kell tartalmaznia azt a 4-bit hosszúságú tagot a 32 műhold mindegyikére, amely megmutatja az egyes műholdak konfigurációs kódját. Ezeknek a 4-bites tagoknak a 4. al-keret 25. oldalán lévő 3. szó 9.-től 24.-ig terjedő bitjeit, a 4.-től a 7.-ig terjedő szavak 24 legnagyobb helyértékű bitjeit, és a 8. szó 16 legnagyobb helyértékű bitjét kell elfoglalniuk. Az egyes mezők első legnagyobb helyértékű bitjét fenn kell tartani. A 3 legkisebb helyértékű bitnek kell jelezniük az egyes műholdak konfigurációját a következő kód felhasználásával:

Kód	Műhold konfiguráció
001	Block II. műhold

3.1.1.3.3.6 *Egyeztetett Világidő /UTC/ paraméterek*. A 4. al-keret 18. oldalának kell magába foglalnia:

a) azokat a paramétereket, amelyek a Globális Helymeghatározó Rendszer /GPS/ idejének az Egyeztetett Világidő /UTC/ időhöz való vonatkoztatáshoz szükségesek; és

b) értesítést a felhasználónak a beütemezett jövőre, vagy múltra (a navigációs közlemény adatáttöltésére vonatkozóan) a szökő másodpercek (t_{LSF}) miatti delta idő értékével, a hét számával (WN_{LSF}) és a nap számával (DN) együtt a végén, hogy a szökő másodpercek melyike válik érvényessé. Az "Első nap"-nak a Hét vége/kezdetéhez viszonyított első napnak kell lennie, és a Hét száma /WN_{LSF}/ értékének a teljes hét szám 8 legkisebb helyértékű bitjéből kell állni. A nem-megcsonkított WN és a WN_{LSF} értéke közötti különbség abszolút értéke nem haladhatja meg a 127-et.
Megjegyzés. – A felhasználó ennek a paraméternek a megcsonkított jellemzőjű jellegére számít, valamint a WN, WN_t és WN_{LSF} megcsonkítására a teljes hét számának átfordulása miatt (3.1.1.2.6.2).

3.1.1.3.3.6.1 A 4. al-keret 18. oldalán a 6.-tól a 9.-ig terjedő szavak 24 legnagyobb helyértékű bitjének és a 10. szó 8 legnagyobb helyértékű bitjének kell magába foglalni az Egyeztetett Világidőnek /UTC/ a Globális Helymeghatározó Rendszer /GPS/ idejének összeegyeztetésére szolgáló paramétereket. A bit hosszak, az osztási tényezők, a távolságok és egységek ezekhez a paraméterekhez a B-11. táblázatban vannak meghatározva.

3.1.1.3.3.7 *Ionoszférikus paraméterek.* Az ionoszférikus paraméterek azok, amelyek hozzájárulnak a Globális Helymeghatározó Rendszer /GPS/ Szabvány Helymeghatározási Szolgáltatását /SPS/ felhasználó részére ahhoz, hogy az ionoszférikus késleltetés kiszámításához egy ionoszférikus modellt használjanak fel, és azt a 4. al-keret 18. oldala foglalja magába úgy, ahogy az a B-12. táblázatban meghatározásra került.

3.1.1.3.3.8 *Speciális közlemények.* A 4. al-keret 17. oldalát a speciális közlemények részére fenn kell tartani.

B-11. táblázat: Egyeztetett Világidő /UTC/ paraméterek

Paraméter	A bitek száma**	Osztás tényező (LSB)	Tényleges tartomány***	Mértékegység
A_0	32*	2^{-30}		másodperc
A_1	24*	2^{-50}		Másodperc/mp
Δt_{LS}	8*	1		másodperc
t_{ot}	8	2^{12}	602 112	másodperc
WN_t	8	1		hetek
WN_{LSF}	8	1		hetek
DN	8****	1	7	napok
Δt_{LSF}	8*	1		másodperc

* Az így jelzett paramétereknek két komplemenses összetevője van, a Legnagyobb helyértékű bitet /MSB/ elfoglaló (+ vagy -) előjel bittel.

** Lásd a B-6. ábrán a teljes bit kiosztást az al-keretben.

*** Ha ebben az oszlopban nincs másképpen jelezve, a tényleges tartomány az a maximális tartomány, ami a megadott bit kijelöléssel és osztás tényezővel elérhető.

**** Pontosan megerősített.

LSB = legkisebb helyértékű bit.

B-12. táblázat: Ionoszférikus paraméterek

Paraméter	A bitek száma**	Osztás tényező (LSB)	Tényleges tartomány***	Mértékegység
α_0	8*	2^{-30}		Másodperc
α_1	8*	2^{-27}		Másodperc/félkör
α_2	8*	2^{-24}		Másodperc/félkör^2
α_3	8*	2^{-24}		Másodperc/félkör^3
β_0	8*	2^{11}		Másodperc
β_1	8*	2^{14}		Másodperc/félkör
β_2	8*	2^{16}		Másodperc/félkor^2
β_3	8*	2^{16}		Másodperc/félkör^3

* Az így jelzett paramétereknek két komplemenses összetevője van, a Legnagyobb helyértékű bitet /MSB/ elfoglaló (+ vagy -) előjel bittel.
** Lásd a B-6. ábrán a teljes bit kiosztást az al-keretben.
*** Ha ebben az oszlopban nincs másképpen jelezve, a tényleges tartomány az a maximális tartomány, ami a megadott bit kijelöléssel és osztás tényezővel elérhető.

LSB = legkisebb helyértékű bit.

3.1.1.3.3.9 *Fenntartott adatmezők.* A 4. al-keret 3.-tól 10.-ig terjedő szavainak - kivéve az Adat azonosításra használt 58. bitet - a műhold (oldal) azonosítót, a paritás (az egyes szavak 6 legkisebb helyértékű bitjei) és a paritás számítási biteket (a 10. szó 23. és 24. bitjei), az 1., 6., 11., 12., 13., 14. 15., 16., 19., 20., 21., 22., 23. és 24. oldalon és azokat a naptár oldalakat, amelyek műhold azonosítója nulla, fenntartottként kell kijelölni. A további fenntartott biteknek a 4. és 5. al-keretben azoknak kell lenni, amit a B-13. táblázat bemutat. Az egyes szavakban a fenntartott bit helyeknek váltakozóan 1-es és 0-s bit alakzatot kell magába foglalni egy érvényes szó paritással.

3.1.2 AZ ADATFELHASZNÁLÓI PROTOKOLLOK MEGHATÁROZÁSA

Megjegyzés. – Ez a rész az adat sugárzási közlemények paraméterei közötti kölcsönhatást határozza meg. Ez azoknak a paramétereknek a meghatározásait adja meg, amelyek nem kerülnek továbbításra, de a nem-légijármű fedélzeti és a légijármű fedélzeti elemek valamelyikében, vagy mindkettőben használatosak, és amelyek meghatározzák azokat a tényezőket, amelyek a navigációs megoldásokra és azok sértetlenségére vonatkoznak.

B-13. táblázat: A 4. és 5. al-keretben lévő fenntartott bitek

Al-keret	Oldalak	Szavak	A fenntartott bitek helye a szóban
4	17	10	17 - 22
4	18	10	9 -22
4	25	8	17 - 18
4	25	10	19 - 22
5	25	10	4 - 22

B-14. táblázat: Paritás jel-átalakító algoritmusok

D_1	=	$d_1 \oplus D^*_{30}$
D_2	=	$d_2 \oplus D^*_{30}$
D_3	=	$d_3 \oplus D^*_{30}$
•		•
•		•
•		•
D_{24}	=	$d_{24} \oplus D^*_{30}$
D_{25}	=	$D^*_{29} \oplus d_1 \oplus d_2 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_{10} \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{17} \oplus d_{18} \oplus d_{20} \oplus d_{23}$
D_{26}	=	$D^*_{30} \oplus d_2 \oplus d_3 \oplus d_4 \oplus d_6 \oplus d_7 \oplus d_{11} \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{18} \oplus d_{19} \oplus d_{21} \oplus d_{24}$
D_{27}	=	$D^*_{29} \oplus d_1 \oplus d_3 \oplus d_4 \oplus d_5 \oplus d_7 \oplus d_8 \oplus d_{12} \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{19} \oplus d_{20} \oplus d_{22}$
D_{28}	=	$D^*_{30} \oplus d_2 \oplus d_4 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{13} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{20} \oplus d_{21} \oplus d_{23}$
D_{29}	=	$D^*_{30} \oplus d_1 \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_7 \oplus d_9 \oplus d_{10} \oplus d_{14} \oplus d_{15} \oplus d_{16} \oplus d_{17} \oplus d_{18} \oplus d_{21} \oplus d_{22} \oplus d_{24}$
D_{30}	=	$D^*_{29} \oplus d_3 \oplus d_5 \oplus d_6 \oplus d_8 \oplus d_9 \oplus d_{10} \oplus d_{11} \oplus d_{13} \oplus d_{15} \oplus d_{19} \oplus d_{22} \oplus d_{23} \oplus d_{24}$

Ahol:
$D_1, D_2, D_3 \ldots D_{29}, D_{30}$ azok a bitek, amelyeket a műhold továbbított;
$D_{25} \ldots D_{30}$ a számított paritás bitek;
$d_1, d_2, \ldots d_{24}$ az eredeti adat bitek;
A $\oplus$ a Modulo-2, vagy a “Kizáró-Vagy” művelet; és
A * használatos az al-keret megelőző szava utolsó két bitjének azonosításához.

3.1.2.1. *Paritás algoritmus*. A Globális Helymeghatározó Rendszer /GPS/ paritás algoritmusa a B-14. táblázatban bemutatottaknak megfelelően került meghatározásra.

3.1.2.2 *Műhold óra helyesbítési paraméterek*. A Globális Helymeghatározó Rendszer /GPS/ rendszer ideje, a t meghatározása a következő:

$$t = t_{sv} - (\Delta t_{sv})_{L1}$$

Ahol:

t	=	A Globális Helymeghatározó Rendszernek a rendszer ideje (a kezdéssel és a Hét-vége átvezetéssel helyesbítve);
t_{sv}	=	A műhold ideje a közlemény továbbításakor;
$(\Delta t_{sv})_{L1}$	=	A műhold ál-véletlen zaj /PRN/ kód fázis-eltolása;

$$(\Delta t_{sv})_{L1} = a_{f0} + a_{f1}(t - t_{oc}) + a_{f2}(t - t_{oc})^2 + \Delta t_r - T_{GD}$$

Ahol:
a_{f0}, a_{f1} és a_{f2} és t_{oc} értékeket az 1. al-keret foglalja magába; és

Δt_r = A relativisztikus helyesbítési tényező (másodperc)

$$\Delta t_r^{\prime} = Fe\sqrt{A}\ \sin E_k$$

Ahol:
Az 'e' és az 'A' értékeket a 2. és 3. al-keret foglalja magába;
E_k a B-15. táblázatban került meghatározásra; és

$$F = \frac{-2\,(\mu)^{1/2}}{c^2} = -4.442807633(10)^{-10}\ \mathrm{s/m}^{1/2}$$

Ahol:

μ	=	Geodéziai Világrendszer /WGS-84/ egyetemes gravitációs paraméter ($3{,}986005 \times 10^{14}\ m^3/s^2$)
c	=	A fény sebessége a légüres térben ($2{,}99792458 \times 10^8$ m/s)

Megjegyzés. – A 't' értéke a hét-átmenetek kezdetének, vagy végének a számításba vételére szolgál. Ez azt jelenti, hogy ha a t-t_{oc} mennyisége 302 400 másodpercnél nagyobb, akkor 604 800 másodperc kerül a t-ből levonásra, és ha a t-t_{oc} mennyisége –302 400 másodpercnél kevesebb, akkor 604 800 másodperc kerül a t-hez hozzáadásra.

3.1.2.3 *Műhold helyzet*. A pillanatnyi műhold helyzet (X_k, Y_k, Z_k) úgy van meghatározva, ahogy azt a B-15. táblázat bemutatja.

3.1.2.4 *Ionoszférikus helyesbítés*. Az ionoszférikus helyesbítés (T_{iono}) a következők szerint van meghatározva.

$$T_{iono} = \left\{ \begin{array}{l} F \times \left[5{,}0 \times 10^{-9} + AMP\left(1 - \frac{x^2}{2} + \frac{x^4}{24}\right)\right], |x| < 1{,}57 \\ F \times \left(5{,}0 \times 10^{-9}\right), |x| \geq 1{,}57 \end{array} \right\} \text{(másodperc)}$$

$$AMP = \left\{ \begin{array}{l} \sum_{n=0}^{3} \alpha_n \phi_{m,}^{n} AMP \geq 0 \\ ha \\ AMP \prec 0, AMP = 0 \\ \end{array} \right\} (\text{másodperc})$$

$$x = \frac{2\pi(t - 50400)}{PER}, (\text{radián})$$

$$PER = \left\{ \begin{array}{l} \sum_{n=0}^{3} \beta_n \phi_{m,}^{n} PER \geq 72000 \\ ha \\ PER \prec 72000, PER = 72000 \\ \end{array} \right\} (\text{másodperc})$$

ahol:

$F = 1,0 + 16,0\ [0,53 – E]^3$

α_n és β_n a műhold által továbbított adat-szavak, n = 0, 1, 2 és 3-al

$\Phi m = \Phi i + 0,064 \cos(\lambda i – 1,617)$ (félkör)

$$\lambda_i = \lambda_u + \frac{\psi \sin A}{\cos \varphi_i} (\text{félkör})$$

$$\overline{\phi_i} = \phi_u + \psi \cos A (\text{félkör})$$

$$\phi_i = \left\{ \begin{array}{l} \phi_i = \overline{\phi_i}, \text{ha} \\ \left|\overline{\phi_i}\right| \leq 0{,}416 \\ \phi_i = +0{,}416, \text{ha} \\ \overline{\phi_i} \succ 0{,}416 \\ \phi_i = -0{,}416, \text{ha} \\ \overline{\phi_i} \prec -0{,}416 \end{array} \right\} (\text{félkör})$$

$\Psi = \frac{0{,}0137}{E + 0{,}11} - 0{,}022$ (félkör)

t = 4,32 x 10^4 λi + a Globális Helymeghatározó Rendszer /GPS/ ideje (másodperc), ahol
$0 \leq t < 86\,400$,
ennek megfelelően: ha $t \geq 86\,400$ másodperc, le kell vonni 86 400 másodpercet; és
ha $t < 0$ másodperc, hozzá kell adni 86 400 másodpercet.

E = a műhold magassági szöge

3.1.2.4.1 Az ionoszférikus késés kiszámításához használt tényezők a következők:

a) A műhold által kisugárzott tényezők:

α_n = a függőleges késés amplitúdóját képviselő harmadfokú egyenlet együtthatói (4 együttható = 8 bites mindegyikük);

β_n = a modell periódusát képviselő harmadfokú egyenlet együtthatói (4 együttható = 8 bites mindegyikük);

b) A vevő által létrehozott tényezők:

E = A felhasználó és a műhold közötti magassági szög (félkör)

A = A felhasználó és a műhold közötti oldalszög a földrajzi Északtól az órajárással megegyező pozitívként mérve

Φ_u = A felhasználó geodéziai szélességi fok értéke (félkör), Geodéziai Világrendszer – 84 /WGS-84/

λ_u = A felhasználó geodéziai hosszúsági fok értéke (félkör), Geodéziai Világrendszer – 84 /WGS-84/

GPS idő = A vevő által kiszámított rendszer idő

c) Számított tényezők:

x = Fázis (radián)

F = Elhajlási tényező (dimenzió nélküli)

t = Helyi idő (másodperc)

Φ_m = Az ionoszférikus metszési pont földi vetületének föld-mágnesességi szélességi foka (a közepes ionoszfériai magasságot 350 km-ként elfogadva) (félkör)

λ_i = Az ionoszférikus metszési pont földi vetületének föld-mágnesességi hosszúsági foka (a közepes ionoszfériai magasságot 350 km-ként elfogadva) (félkör)

Φi = Az ionoszférikus metszési pont földi vetületének föld-mágnesességi szélességi foka (félkör)

Ψ = Földi középponti szög a felhasználó helyzete és az ionoszférikus metszési pont földi vetülete között (félkör)

B-15. táblázat: A koordináta rendszerek elemei

$A = (\sqrt{A})^2$	Fél-nagytengely
$n_0 = \sqrt{\dfrac{\mu}{A^3}}$	Számított közepes szögsebesség
$t_k = t - t_{oe}$	Idő az efemerisz referencia korszakától*
$n = n_0 + \Delta n$	Helyesbített szögsebesség
$M_k = M_0 + nt_k$	Átlagos anomália
$M_k = E_k - e \sin E_k$	Kepler-egyenlet az excentricitási anomáliára (lépésenkénti megközelítéssel megoldható)
$v_k = \tan^{-1}\left\{\dfrac{\sin v_k}{\cos v_k}\right\} = \tan^{-1}\left\{\dfrac{\sqrt{1-e^2}\sin E_k/(1-e\cos E_k)}{(\cos E_k - e)/(1-e\cos E_k)}\right\}$	Valós anomália
$E_k = \cos^{-1}\left\{\dfrac{e+\cos v_k}{1+e\cos v_k}\right\}$	Excentrikus anomália
$\phi_k = v_k + \omega$	Szélességi fok

Második harmonikus zavaró hatások

$\delta u_k = C_{us}\sin 2\phi_k + C_{uc}\cos 2\phi_k$	Szélességi fok helyesbítés
$\delta r_k = C_{rc}\sin 2\phi_k + C_{rs}\sin 2\phi_k$	Sugár helyesbítés
$\delta i_k = C_{ic}\cos 2\phi_k + C_{is}\sin 2\phi_k$	Mágneses elhajlás /inklináció/ helyesbítés
$u_k = \phi_k + \delta u_k$	Helyesbített szélességi fok
$r_k = A(1 - e\cos E_k) + \delta r_k$	Helyesbített sugár
$i_k = i_0 + \delta i_k + (iDOT)t_k$	Helyesbített mágneses elhajlás /inklináció/
$\left.\begin{array}{l} x'_k = r_k \cos u_k \\ y'_k = r_k \sin u_k \end{array}\right\}$	Helyzetek az orbitális síkban
$\Omega_k = \Omega_0 + (\dot{\Omega} - \dot{\Omega}_e)t_k - \dot{\Omega}_e t_{oe}$	Felszálló csomópont helyesbített földrajzi hosszúsága
$\left.\begin{array}{l} x_k = x'_k\cos\Omega_k - y'_k\cos i_k\sin\Omega_k \\ y_k = x'_k\sin\Omega_k - y'_k\cos i_k\cos\Omega_k \\ z_k = y'_k\sin i_k \end{array}\right\}$	Föld-középpontú, Föld-állandó koordináták

* A ’t’ a Globális Helymeghatározó Rendszer /GPS/ rendszer ideje az adattovábbítás időpontjában, azaz a GPS ideje a “repülési idő”-re helyesbítve (távolság/fénysebesség). Továbbá a ’t_k’ a tényleges teljes idő különbség a ’t’ idő és a korszak idő, a ’t_{oe}’ között, és számításba kell venni az átvezetéseket, a kezdetet vagy a hét-véget. Ami, ha a ’t_k’ 302 400 másodpercnél nagyobb, le kell vonni 604 800 másodpercet a ’t_k’-ból. Ha a ’t_k’ kevesebb, mint –302 400 másodperc, hozzá kell adni 604 800 másodpercet a ’tk’-hoz.

3.1.3 LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

3.1.3.1 *Globális Navigációs Műhold Rendszer /GNSS/ (Globális Helymeghatározó Rendszer /GPS/) vevő*

3.1.3.1.1 *Műhold kizárás*. A vevőnek ki kell zárni minden olyan műholdat, amelyet nem megfelelő működési állapotúnak jelöl ki a Globális Helymeghatározó Rendszer /GPS/ műhold efemerisz működési állapot hibajelzése.

3.1.3.1.2 *Műhold követés*. A vevőnek biztosítania kell azt a képességet, hogy folyamatosan nyomon kövessen minimum négy műholdat, és létre kell hoznia az azokon a méréseken alapulóan egy helymeghatározási megoldást.

3.1.3.1.3 *Doppler eltolódás*. A vevőnek képesnek kell lenni arra, hogy a dinamikus Doppler eltolódás hatását kiegyenlítse a névleges Szabvány Helymeghatározási Szolgáltatás /SPS/ jelének vivőhullám fázisán és a Torzított /durva/ Hozzáférési /C/A/ kód méréseknél. A vevőnek ki kell egyenlíteni azt a Doppler eltolódást, ami a várt alkalmazáshoz egyértelműen hozzátartozik.

3.1.3.1.4 *Interferencia ellenálló képesség*. A vevőnek ki kell elégítenie a 3. Fejezet 3.7 pontjában meghatározott interferencia ellenállósági követelményeket.

3.1.3.1.5 *Az óra és eferemerisz adatok alkalmazása*. A vevőnek biztosítania kell azt, hogy csak a pontos efemerisz és óra adatokat használja fel, mielőtt bármilyen helymeghatározási megoldást adna. A vevőnek ellenőriznie kell az Adatkibocsátás, Óra /IODC/ és az Adatkibocsátás, Efemerisz /IODE/ értékeket, és fel kell frissítenie az efemerisz és óra adatbázisát, ha ezen értékek valamelyikénél, vagy mindkettőnél egy változást észlel. A Szabvány Helymeghatározási Szolgáltatás /SPS/ vevőnek az óra és efemerisz adatokat egy adott műhold megfelelő Adatkibocsátás, Óra /IODC/ és Adatkibocsátás, Efemerisz /IODE/ adataival kell felhasználnia.

3.1.4 IDŐ

A Globális Helymeghatározó Rendszer /GPS/ idejét az Egyeztetett Világidőre /UTC/ kell vonatkoztatni (az Egyesült Államok Tengerészeti Obszervatóriuma által kezelten), a nulla idő-pont az 1980. január 5. este/1980. január 6. reggel közötti éjfélnél került meghatározásra. A GPS idejének megállapításához használt legnagyobb egységnek az 1 hétnek kell lenni, ami 604 800 másodpercként van meghatározva. A Globális Helymeghatározó Rendszer /GPS/ időléptékét az Egyeztetett Világidő /UTC/ 1 mikromásodpercen belül kell tartani (Modulo 1 másodperc) a szökő másodperc különbség egészszámú helyesbítése után. A navigációs adatoknak magukba kell foglalniuk a Globális Helymeghatározó Rendszer /GPS/ idejének az Egyeztetett Világidőre /UTC/ vonatkoztató követelmény adatait.

3.2 Globális Navigációs Műhold Rendszer (GLONASS) Szabvány pontosságú csatorna (CSA) (L1)

Megjegyzés. – Ebben a részben a GLONASS kifejezés a konstellációbn lévő összes műholdra utal. A csak a Modernizált Globális Navigációs Műhold Rendszer (GLONASS-M) műholdakra vonatkozó Szabványok ennek megfelelően vannak minősítve.

3.2.1 NEM-LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

3.2.1.1 *Rádiófrekvenciás /RF/ jellemzők*

3.2.1.1.1 *Vivőhullám frekvenciák*. Az L1 névleges értékének és a vivőhullám frekvenciáknak azoknak kell lenni, amit a következő kifejezések meghatároznak:

$$f_{k1} = f_{01} + k\Delta f_1$$

ahol:

k = -7, …, 0, 1, …, 13 a vivőhullám számok (frekvencia csatornák) a Globális Navigációs Műhold Rendszer /GLONASS/ műholdjai által továbbított jelek részére az L1 al-sávokban;

f_{01} = 1 602 MHz; és

Δf_1 = 0,5625 MHz.

A vivőhullám frekvenciákat egy, a fedélzeten lévő közös idő/frekvencia szabvány rendszerből kell folyamatosan származtatni. A frekvencia névleges értékének a földről érzékelten 5,0 MHz-el kell egyenlőnek lenni. A Globális Navigációs Műhold Rendszer /GLONASS/ műhold vivőhullám frekvenciájának a névleges értékéhez, az fk-hoz viszonyítottan $\pm 2 \times 10^{-11}$-en belül kell lenni.

1. Megjegyzés. – A vivőhullám frekvenciák /frekvencia csatornák/ vivőhullám frekvenciáinak névleges értéke, a 'k' a B-16. táblázatban került megadásra.

2. Megjegyzés. – A GLONASS-M műholdaknál a szabvány pontosságú (CSA) navigációs jel L2 csatornája az 1 242,9375 – 1 251,6875 MHz ± 0,511 MHz sávszélességet foglalja el, ahogy azt a következő kifejezések meghatározzák:

$$f_{k2} = f_{02} + k\Delta f_2,$$

$$f_{02} = 1\,246 \text{ MHz}; \Delta f_2 = 0{,}4375 \text{ MHz}.$$

Az L1 és L2 al-sávok vivőhullám frekvenciáinak minden adott 'k' arány értéke egyenlő lesz:

$$\frac{f_{k2}}{f_{k1}} = \frac{7}{9}$$

B-16. táblázat: Az L1 vivőhullám frekvenciái

Vivőhullám szám	H^A_n (lásd 3.2.1.3.4 pontot)	Az L1 al-sávban lévő frekvenciák névleges értéke (MHz)
13*	13	1 609,3125
12**	12	1 608,7500
11**	11	1 608,1875
10**	10	1 607,6250
09**	9	1 607,0625
08**	8	1 606,5000
07**	7	1 605,9375
06***	6	1 605,3750
05***	5	1 604,8125
4	4	1 604,2500
3	3	1 603,6875
2	2	1 603,1250
1	1	1 602,5625
0	0	1 602,0000
-1	31	1 601,4375
-2	30	1 600,8750
-3	29	1 600,3125
-4	28	1 599,7500
-5	27	1 599,1875
-6	26	1 598,6250
-7	25	1 598,0625

* Ezt a frekvenciát az Orosz Államszövetség felett technikai célokra lehet felhasználni 2006. előtt és a “megszületését” 2005. utánra tervezik.
** Ezeknek a frekvenciáknak a “megszületését” 2005. utánra tervezik.
*** Ezeket a frekvenciákat az Orosz Államszövetség felett 2005. után lehet technikai célokra felhasználni.

3.2.1.1.2 *Vivőhullám fázis zaj*. A modulálatlan vivőhullám fázis zajának spektrális sűrűsége olyan kell, hogy legyen, hogy egy fázisszabályzó hurok 10 Hz-es egy-oldalas zajszűrővel egy, a 0,1 radiánnál (1 szigma) nem rosszabb vivőhullám fáziskövetési pontosságot biztosítson.

3.2.1.1.3 *A GLONASS ál-véletlen zaj kód generálása*. Az ál-véletlen távolságmérő kódnak egy olyan 511 bites sorozatnak kell lenni, ami egy 9-fokozatú léptető-tároló hetedik fokozatának kimenetén kerül mintavételezésre. Az ennek a sorozatnak a létrehozásához a kezdő érték beállító sorozatnak ”111111111”-nek kell lenni. Annak a generáló polinomnak, ami a 9-fokozatú léptető-tárolónak megfelel:

$$G(x)= 1 + x^5 + x^9\text{-nek kell lenni.}$$

3.2.1.1.4 *Hamis sugárzás*. A GLONASS kijelölt sávszélességén túl a kisugárzott rádiófrekvenciás /RF/ jel teljesítménye a modulálatlan vivőhullám teljesítményéhez viszonyítva nem lehet -40 dB-nél több.
1. Megjegyzés. – Azok a GLONASS műholdak, amelyek az 1998.-tól 2005.-ig terjedő évek során és azután kerülnek pályára állításra, a Nemzetközi Rádió Tanácsadó Bizottság /CCIR/ 769. Ajánlásában található, a káros interferencia határokra vonatkozó sávon kívüli sugárzásokat kiszűrő határoló szűrőket fognak felhasználni az 1 660 – 1 670 MHz-es sávra.

2. Megjegyzés. – Azok a GLONASS műholdak, amelyek 2005. után kerülnek pályára állításra, a Nemzetközi Rádió Tanácsadó Bizottság /CCIR/ 769. Ajánlásának megfelelő – a káros interferencia határokra vonatkozó – sávon kívüli sugárzásokat kiszűrő határoló szűrőket fognak felhasználni az 1610,6 – 1613,8 MHz-es és 1 660 – 1 670 MHz-es sávra.

3.2.1.1.5 *Korrelációs veszteség*. A visszanyert jel teljesítményében a jel moduláció hiányossága és a hullámforma torzítás miatti veszteség nem haladhatja meg a 0,8 dB-t.

Megjegyzés. – A jel-teljesítmény veszteség az egy 1,022 MHz-es sáv-szélességben kisugárzott teljesítmény és az egy zajmentes veszteségmentes 1-chip korrelációs térközű és egy 1,022 MHz-es sávszélességű vevővel visszanyert jel-teljesítmény közötti különbség.

3.2.1.2 *Adat szerkezet*

3.2.1.2.1 *Általános*. A navigációs közleményt egy olyan digitális adat alakzatban kell továbbítani, amely a Hamming kód szerint kódolt, és relatív kódolásba kerül átalakításra. Szerkezetileg az adat alakzatot folyamatosan ismétlődő szuperkeretenként kell létrehozni. A szuperkereteknek kell magukba foglalniuk a kereteket és a kereteknek kell tartalmazniuk a jelsorozatokat. A különböző GLONASS modulok navigációs közleményei, jelsorozatai, keretei és szuperkeretei határait 2 milliszekundumon belülre szinkronizálni kell.

3.2.1.2.2 *A szuperkeret szerkezete*. A szuperkeretnek 2,5 perc időtartamúnak kell lenni, és 5 keretet kell magába foglalni. Az egyes szuperkereteken belül a nem-közvetlen információk teljes tartalmát (24 GLONASS műhold naptárját) kell leadni.

Megjegyzés. – A szuperkeret szerkezetét, a szuperkeretben lévő keret számokkal és a keretekben lévő jelsorozat számokkal a B-7. ábra mutatja be.

3.2.1.2.3 *A keret szerkezete*. Az egyes kereteknek 30 másodperces időtartamúnak kell lenni, és 15 jelsorozatot kell magába foglalni. Az egyes kereteken belül a közvetlen információk (efemerisz és idő paraméterek) teljes tartalmát az adott műholdra és a nem-közvetlen információk (naptár) egy részét kell leadni. Az 1.-től 4.-ig terjedő kereteknek 20 műholdra vonatkozó naptár adat részt (keretenként 5 műhold) kell magukba foglalniuk, és az 5. keretnek kell a 4 műhold fennmaradó naptár adatait tartalmazni. Egy műhold naptár adatainak két jelsorozatot kell lefoglalni.

Megjegyzés. – A keret szerkezeteket a B-8. és B-9. ábrák mutatják be.

3.2.1.2.4 *A jelsorozat szerkezete*. Az egyes jelsorozatoknak 2 másodperc időtartamúnak kell lenni, és az adatok bináris chipjeit, valamint az időjelet kell magukba foglalniuk. Ezen a 2 másodperces időtartamon belül az utolsó 0,3 másodperc során (az egyes jelsorozatok végénél) az időjelet kell továbbítani. Az időjelnek (rövidített ál-véletlen sorozat) 30 chipet kell magába foglalni, az egyes chipek 10 milliszekundum időtartamúak, és a következő sorrendjük van:

1 1 1 1 1 0 0 0 1 1 0 1 1 1 0 1 0 1 0 0 0 0 1 0 0 1 0 1 1 0.

A 2 másodperces időtartam első 1,7 másodperce során (az egyes jelsorozatok kezdeténél) 85 adatbitet (az egyes adatbiteket egy 20 milliszekundumos időtartammal) kell továbbítani bi-bináris formában. A jelsorozatban a bitek számát jobbról balra kell növelni. Az információs bitekkel együtt (a 9.-től a 84.-ig terjedő bit helyzetűek) a Hamming kód (KX) ellenőrző bitjeit (az 1.-től a 8.-ig terjedő bit helyzetűek) kell leadni. A Hamming kód kódhosszának 4-nek kell lenni. Egy jelsorozat adatait a szomszédos jelsorozat adataitól az időjellel (MB) kell elválasztani. Az adatok szavait az elől elhelyezett Legnagyobb Helyértékű Bittel /MSB/ kell bejegyezni. Minden egyes jelsorozat bit helyzetben 85 bitnek egy tétlen chipnek (”0”) kell lenni, és azt kell először továbbítani.

3.2.1.2.4.1 *Az 1.-től a 4.-ig terjedő jelsorozatok.* Az egyes keretek 1.-től 4.-ig terjedő jelsorozataiban foglalt információk annak a műholdnak kell, hogy megfeleljenek, amelyről az leadásra került. Ezt az információt a szuperkereten belül nem lehet megváltoztatni.

3.2.1.2.4.2 *Az 5.-től a 15.-ig terjedő jelsorozatok.* Az egyes keretek 5.-től a 15.-ig terjedő jelsorozatainak kell magukba foglalniuk 4, vagy 5 műhold GLONASS naptárját. Az ötödik jelsorozatban foglalt információkat a szuperkeret minden egyes keretében meg kell ismételni.

Megjegyzés. – A jelsorozatok szerkezetét a B-10. ábra adja meg.

3.2.1.3 *Adattartalom*

3.2.1.3.1 Efemerisz és idő paraméterek. Az efemerisz és idő paramétereknek a következőknek kell lenniük:

m = Jelsorozat szám a kereten belül;

t_k = Az adott napon belül a keret kezdési időpontjához viszonyított idő. Ez a műhold idő-skálájának megfelelően kerül kiszámításra. Az adott nap kezdete óta eltelt órák egész számmal kifejezve az 5. Legnagyobb Helyértékű bitben /MSB/ vannak bejegyezve. Az adott óra kezdete óta eltelt percek egész számmal kifejezve a következő 6 bitben vannak bejegyezve. Az adott perc kezdete óta eltelt 30 másodperces időtartamok az egy Legkisebb Helyértékű bitben /LSB/ van bejegyezve. A műhold idő-skálája szerinti nap kezdete egybeesik az ismétlődő szuperkeretek kezdetével;

t_b = Az adott napon belüli időköz az Egyeztetett Világidő /UTC/(SU) + 03 óra 00 percnek megfelelően. A kereten belül leadott közvetlen adatok a t_b közepére vannak vonatkoztatva. Az időköz hossza és ennek megfelelően a t_b maximális értéke a P1 jelzés értékétől függ;

$\gamma_n(t_b)$ = n-műhold előre jelzett vivőhullám frekvencia értékének relatív eltérése a névleges értéktől a t_b pillanatnyi időpontjánál, azaz:

$$\gamma_n(t_b) = \frac{f_n(t_b) - f_{Hn}}{f_{Hn}}$$

ahol:

$f_n(t_b)$ = n-műhold óráinak előre jelzett frekvenciája egy t_b pillanatnyi időpontnál;

f_{Hn} = n-műhold óráinak névleges frekvencia értéke;

tn(tb) = A helyesbítés n-műhold idejéhez t_n, a GLONASS idejéhez t_c viszonyítva, egy t_b pillanatnyi időpontnál, azaz:
$t_n(t_b) = t_c(t_b) - t_n(t_b)$

$x_n(t_b), y_n(t_b), z_n(t_b)$ = n-műhold koordinátája a PZ-90 koordináta rendszerben megadva egy t_b pillanatnyi időpontnál;

$\dot{x}_n(t_b), \dot{y}_n(t_b), \dot{z}_n(t_b)$ = n-műhold sebességi vektor összetevője a PZ-90 koordináta rendszerben megadva egy t_b pillanatnyi időpontnál;

$\ddot{x}_n(t_b)$, $\ddot{y}_n(t_b)$, $\ddot{z}_n(t_b)$ = n-műhold azon gyorsulási összetevői a PZ-90 koordináta rendszerben megadva egy t_b pillanatnyi időpontnál, amelyet a nap és a hold hatása okoz;

En = A közvetlen információk "korának" jelzése, azaz az az időköz, ami azok kiszámításának pillanatnyi ideje (adattöltés) óta eltelt az n-műhold pillanatnyi t_b idejéig;

B_n = A működési állapot jelzés. A 3-nál nagyobb értékek az adott műhold működési hibájának tényét jelzik;

P1 = Jelzés, amely a t_b paraméterek pillanatnyi és korábbi értéke közötti időközt jelzi percekben az itt bemutatottak szerint:

P1	Időköz a szomszédos t_b értékek között, percekben
0	0
1	30
10	45
11	60

P2 = Jelzés arról, hogy a t_b értéke páratlan vagy páros. Az "1"-érték egy 30 perces időközt jelez a szolgáltatási információk továbbításánál (t_b = 1, 3, 5 …), a "0"- érték egy 60 perces időközt jelez a szolgáltatási információk továbbításánál (t_b = 2, 6, 10 …);

P3 = Jelzés, ami azoknak a műholdaknak a számát adja meg, amelyekre egy naptár kerül továbbításra egy adott kereten belül. Az "1" 5 műholdnak felel meg és a "0" négy műholdat jelent; és

Δt_n = Az adott műhold által az L2 al-sávban leadott navigációs rádiófrekvenciás /RF/ jel és az L1 sávban leadott navigációs rádiófrekvenciás jel közötti időkülönbség:

$$\Delta t_n = t_{f2} - t_{f1}$$

Ahol:
a t_{f1}, t_{f2} az L1 és L2 al-sávokban a berendezés késés külön-külön, időegységben kifejezve.

3.2.1.3.2 *Efemerisz és idő paraméterek.* Az efemerisz és idő paramétereknek a B-17. táblázatban bemutatottaknak kell lenni. Azoknál a szavaknál, amelyek számszerű értékei pozitívak, vagy negatívak lehetnek, a Legnagyobb Helyértékű Bitnek kell az előjel bitnek lenni. A "0" chipnek kell a "+" előjelnek és az "1" chipnek kell a "-" előjelnek megfelelni.

3.2.1.3.3 *Az efemerisz és idő paraméterek elrendezése.* Az efemerisz és idő paraméterek elrendezésének a kereten belül a B-18. táblázatban feltüntetettnek megfelelő elrendezésűnek kell lenni.

3.2.1.3.4 *Naptár paraméterek.* A naptár paramétereknek a következőknek kell lenniük:

A = Egy mutató, amely ennek a paraméternek a naptárral való kapcsolatát mutatja;

M^A_n = Egy, az n^A-műhold változatot jelző mutató: a “00” a GLONASS műholdat jelzi, és a “01” a GLONASS-M műhold jelzése;

τ_c = A GLONASS idő-skála helyesbítése az Egyeztetett Világidő /UTC/(SU) idejéhez. A τ_c helyesbítés az N^A nap pillanatnyi idejéhez van megadva;

N^A = A naptári nap száma a 4-éves időtartamon belül a szökőév óta. A τ_c helyesbítés és a további naptár adatok (a keringések naptára és a fázisok naptára) erre a nap számra vonatkoznak;

n^A = Az n-műhold által elfoglalt sorszám;

H^A_n = Az n^A-műhold vivőhullám frekvenciájának csatorna száma (B-16. táblázat);

λ^A_n = Az n^A-műhold keringési pályájának első (az N^A napon belül) felszálló csomójának földrajzi hosszúsága a PZ-90 koordináta rendszerben;

$t\lambda^A_n$ = Az n^A-műhold első felszálló csomójának áthaladási ideje az N^A napon belül;

B-17. táblázat: Efemerisz és idő paraméterek

Paraméter	A bitek száma	Osztás tényező (LSB)	Tényleges tartomány	Egységek
m	4	1		Dimenzió nélküli
	5	1	0-tól 23-ig	óra
t_k	6	1	0-tól 59-ig	perc
	1	30	0, vagy 30	másodperc
t_b	7	15	15…1 425	perc
$\gamma_n(t_b)$	11	2^{-40}	$\pm 2^{-30}$	Dimenzió nélküli
$\tau_n(t_b)$	22	2^{-30}	$\pm 2^{-9}$	másodperc
$x_n(t_b)$, $y_n(t_b)$, $z_n(t_b)$	27	2^{-11}	$\pm 2{,}7 \times 10^{4}$	km
$\dot{x}_n(t_b)$, $\dot{y}_n(t_b)$, $\dot{z}_n(t_b)$	24	2^{-20}	$\pm 4{,}3$	km/másodperc
$\ddot{x}_n(t_b)$, $\ddot{y}_n(t_b)$, $\ddot{z}_n(t_b)$	5	2^{-30}	$\pm 6{,}2 \times 10^{-9}$	km/másodperc^2
E_n	5	1	0-tól 31-ig	nap
B_n	3	1	0-tól 7-ig	Dimenzió nélküli
P1	2	Ahogy az a 3.2.1.3.1 pontban részletezésre került		
P2	1	1	0; 1	Dimenzió nélküli
P3	1	1	0; 1	Dimenzió nélküli
$\Delta\tau_n$	5	2^{-30}	$\pm 13{,}9 \times 10^{-9}$	másodperc

B-18. táblázat: Az efemerisz és idő paraméterek elrendezése a kereten belül

Paraméter	Bitek száma	Jelsorozat szám a kereten belül	Bit szám a kereten belül
m	4	1…15	81 – 84
t_k	12	1	65 – 76
t_b	7	2	70 – 76
$\gamma_n(t_b)$	11	3	69 – 79
$\tau_n(t_b)$	22	4	59 – 80
$x_n(t_b)$	27	1	9 – 35
$y_n(t_b)$	27	2	9 – 35
$z_n(t_b)$	27	3	9 – 35
$\dot{x}_n(t_b)$	24	1	41 – 64
$\dot{y}_n(t_b)$	24	2	41 – 64
$\dot{z}_n(t_b)$	24	3	41 – 64
$\ddot{x}_n(t_b)$	5	1	36 – 40
$\ddot{y}_n(t_b)$	5	2	36 – 40
$\ddot{z}_n(t_b)$	5	3	36 – 40
E_n	5	4	49 – 53
B_n	3	2	78 – 80
P1	2	1	77 – 78
P2	1	2	77
P3	1	3	80
$\Delta\tau_n$	5	4	54 – 58

3.2.1.3.5 *A naptár adatok elkülönítése és kódolása*. A szuperkeretben leadott GLONASS naptárt a szuperkereten keresztül el kell különíteni úgy, ahogy az a B-19. táblázatban megadásra került. A naptár paraméterek szám értékeinek pozitívnak, vagy negatívnak kell lenni. A Legnagyobb Helyértékű Bitnek kell az előjel bitnek lenni, a „0” chip a „+” előjelnek kell, hogy megfeleljen, és az „1” chip feleljen meg a „-” előjelnek. A naptár paramétereket a B-20. táblázatban megadottaknak megfelelően kell kódolni.

3.2.1.3.6 *A naptár paraméterek elrendezése*. A naptár szavaknak a kereten belüli elrendezése a B-21. táblázatban megadottaknak megfelelő kell, hogy legyen.

3.2.1.4 A *GLONASS-M műholdak által sugárzott kiegészítő adatok tartalma és szerkezete*

3.2.1.4.1 *A kiegészítő adatok betűjelzése*. A GLONASS adatokhoz kiegészítőleg a GLONASS-M műholdaknak a következő kiegészítő adatokat kell sugározniuk, ahogy az a B-17A táblázatban bemutatásra került:

n - az adott navigációs jelet sugárzó műhold jelző száma: ez a GLONASS műhold-rendszeren belüli sorszámnak felel meg;

l_n - a működési állapot jelzés ('egészség') az n-ik műholdra: a „0" jelzi azt, hogy az n-ik műhold jó működési állapotú, az „1" pedig azt, hogy az n-ik műhold hibásan működik;

B1 - a ΔUT1 meghatározásának együtthatója: ez az UT1 és az UTC közötti különbséggel egyenlő, a nap (N^A) kezdetén másodpercekben kifejezve;

B2 - a ΔUT1 meghatározásának együtthatója: ez a ΔUT1 különbségének napi változásával egyenlő (egy közepes nap szerinti /égitest/ napra másodpercekben kifejezve).

Ezeket az együtthatókat kell felhasználni az UTC(SU) és az UT1 közötti átalakításhoz:

$$\Delta UT1 = UTC(SU) - UT1,$$

ahol:

UT1 - a Közepes Greenwech-i délkörre (a Pólusok mozgását számításba véve) vonatkoztatott Egyeztetett Világidő /UTC/;

UTC(SU) - az Orosz Államszövetség Állami Szabványa szerinti koordinált Egyeztetett Világidő.

$$\Delta UT1 = B1 + B2 \text{ x } (N_T - N^A),$$

KP - értesítés az UTC(± 1 s) elkövetkező szökő-másodperc helyesbítéséről a bemutatottak szerint:

KP	UTC másodperc helyesbítési adat
00	Nincs UTC helyesbítés a jelenlegi negyed végén
01	UTC helyesbítés plusz 1 s-al a jelenlegi negyed végén
11	UTC helyesbítés mínusz 1 s-al a jelenlegi negyed végén

Megjegyzés. – A GLONASS rendszer időléptékének helyesbítésére általában évente egyszer éjfélkor 00 óra 00 perc 00 másodperckor kerül sor a Nemzetközi Idő Hivatal (BIH/BIPM) előzetes értesítésének megfelelően, a negyedév végén:

December 31-től Január 1-ig - első negyed,
Március 31-től Április 1-ig - második negyed,
Június 30-tól Július 1-ig - harmadik negyed,
Szeptember 30-tól Október 1-ig - negyedik negyed.

N_T - a jelenlegi dátum, a nap naptári száma a szökőév január 1-vel kezdődő négyéves időtartamán belül;

Megjegyzés. – Az N_T-nek, a jelenlegi dátumnak az általános formájú információra (dd/mm/yy)(nap/hónap/év) történő átalakítását a D-Melléklet 4.2.7.1 pontja mutatja be.

N_4 - a négyéves időtartam száma 1996-tól kezdődően;

F_T - egy paraméter, amely megadja az előre jelzett műhold felhasználói távolság pontosságot a t_b időpontban. A kódolást B-17-B. táblázat mutatja be.

M - a navigációs jelet sugárzó műhold típusa. A 00 vonatkozik a GLONASS műholdra és a 01 utal a GLONASS-M műholdra.

P4 - egy jelzés, amely azt mutatja, hogy felfrissített efemerisz adatok állnak rendelkezésre. Az „1” azt jelzi, hogy a vezérlő szegmens egy felfrissített efemerisz, vagy frekvencia/idő paramétert táplált be.

Megjegyzés. – A felfrissített efemerisz, vagy frekvencia/idő információ a következő időközben kerül betáplálásra, a jelenlegi időköz, a t_b végét követően.

P - a vezérlő szegmens technológiai paramétere, amely jelzi a műhold üzemelési módját az idő paraméterekre vonatkozólag:

00 - a t_c paraméter a vezérlő szegmensből van továbbítva, a t_{GPS} paraméter a vezérlő szegmensből van továbbítva;
01 - a t_c paraméter a vezérlő szegmensből van továbbítva, a t_{GPS} paraméter a GLONASS-M műhold fedélzetén került kiszámításra;
10 - a t_c paraméter a GLONASS-M műhold fedélzetén került kiszámításra, a t_{GPS} paraméter a vezérlő szegmensből van továbbítva;

11 - a t_c paraméter a GLONASS-M műhold fedélzetén került kiszámításra, a t_{GPS} paraméter a GLONASS-M műhold fedélzetén került kiszámításra;
tGPS - a GPS idő helyesbítése a GLONASS időhöz viszonyítva:

$$T_{GPS} – T_{GL} = \Delta T + t_{GPS},$$

ahol:

ΔT az egészszámú része és a t_{GPS} a tört része a másodpercekben kifejezett rendszer idő-léptékek közötti különbségnek.

Megjegyzés. – Az egészszámú részt, a ΔT-t a GPS navigációs közleményből határozza meg a felhasználó vevője.

$M^A{}_n$ – az n^A műhold típusa: a „00” kódolás jelzi a GLONASS műholdat, a „01” kódolás pedig a GLONASS-M műholdat jelzi.

3.2.1.4.2 *Kiegészítő adat paraméterek*. A kiegészítő adat paraméterek a B-17-A.-tól a B-18-A.-ig terjedő táblázatokban kerültek meghatározásra.

3.2.1.4.3 *A kiegészítő adat szavak elhelyezése a GLONASS-M navigációs közleményben*. A kiegészítő adat szavaknak a GLONASS-M navigációs közleményben való elhelyezésének szükséges helye a B-18-A. táblázatban került meghatározásra.

B-17-A. táblázat: Kiegészítő adat paraméterek

Paraméterek	A bitek száma	Osztás tényező (LSB)	Mérési tartomány	Mértékegység
n	5	1	0-tól 31-ig	Dimenzió nélküli
1_n	1	1	0; 1	Dimenzió nélküli
B1	11	2^{-10}	±0,9	Másodperc
B2	10	2^{-16}	(–4,5-től 3,5-ig) × 10^{-3}	Másodperc/közepes nap szerinti nap
KP	2	1	0-tól 3-ig	Dimenzió nélküli
N_T	11	1	0-tól 1 461-ig	Napok
N_4	5	1	1-től 31-ig	Négyéves időköz
F_T	4		Lásd a B-17-B. táblázatot.	
M	2	1	0-tól 3-ig	Dimenzió nélküli
P4	1	1	0; 1	Dimenzió nélküli
P	2	1	00,01,10,11	Dimenzió nélküli
τ_{GPS}	22	2^{-30}	±1,9 × 10^{-3}	Másodpercek
M^A_n	2	1	0-tól 3-ig	Dimenzió nélküli

B-17-B. táblázat: Az F_T szó kódolása

F_T érték	Pszeudo távolság pontosság, 1 szigma (m)
0	1
1	2
2	2,5
3	4
4	5
5	7
6	10
7	12
8	14
9	16
10	32
11	64
12	128
13	256
14	512
15	Nem használatos

B-18-A. táblázat: A kiegészítő adat szavak elhelyezése a GLONASS-M közleményben

Szó	A bitek száma	Jelsorozat száma a szuperkereten belül	Bit szám a jelsorozaton belül
n	5	4, 19, 24, 49, 64	11 – 15
1_n	1	5, 7, 9, 11, 13, 15, 20, 22, 24, 26, 28, 30, 35, 37, 39, 41, 43, 45, 50, 52, 54, 56, 58, 60, 65, 67, 69, 71, 73, 75 3, 18, 33, 48, 63	9 65
B1	11	74 (a szuperkereten belül)	70 - 80
B2	10	74 (a szuperkereten belül)	60 – 69
KP	2	74 (a szuperkereten belül)	58 – 59
N_T	11	4, 19, 34, 49, 64	16 – 26
N_4	5	5, 20, 35, 50, 65	32 – 36
F_T	4	4, 19, 34, 49, 64	30 – 33
M	2	4, 19, 34, 49, 64	9 – 10
P4	1	4, 19, 34, 49, 64	34
P	2	3, 18, 33, 48, 63	66 – 67
τ_{GPS}	22	5, 20, 35, 50, 65	10 – 31
M^A_n	2	6, 8, 10, 12, 14	78 – 79

B-19. táblázat: Naptár elkülönítés a szuperkereten belül

Keret szám a szuperkereten belül	Műhold számok, amelyekre a naptár az adott kereten belül továbbításra került
1	1 … 5
2	6 … 10
3	11 … 15
4	16 … 20
5	21 … 24

B-20. táblázat: A naptár paraméterek kódolása

Paraméter	A bitek száma	Osztás tényező (LSB)	Tényleges tartomány	Egységek
M^A_n	2	1	0 … 3	Dimenzió nélküli
τ_c	28	2^{-27}	±1	másodperc
N^A	11	1	1 … 1 461	nap
n^A	5	1	1 … 24	Dimenzió nélküli
H^A_n	5	1	0 … 31	Dimenzió nélküli
λ^A_n	21	2^{-30}	±1	félkör
$t_\lambda{}^A_n$	21	2^{-5}	0 ... 44 100	másodperc
Δi^A_n	18	2^{-20}	±0,067	félkör
ΔT^A_n	22	2^{-9}	$\pm 3{,}6 \times 10^3$	másodperc/keringés
ΔT^A_n	7	2^{-14}	$\pm 2^{-8}$	másodperc/keringés^2
ε^A_n	15	2^{-20}	0 … 0,03	Dimenzió nélküli
ω^A_n	16	2^{-15}	±1	félkör
$t_\tau{}^A_n$	10	2^{-18}	$\pm 1{,}9 \times 10^{-3}$	másodperc
C^A_n	1	1	0 … 1	Dimenzió nélküli

B-21. táblázat: A naptár paraméterek elrendezése a kereten belül

Paraméter	A bitek száma	Jelsorozat szám a kereten belül	Bit szám a jelsorozaton belül
M^A_n	2	6, 8, 10, 12, 14	78 – 79
τ_c	28	5	42 – 69
N^A	11	5	70 – 80
n^A	5	6, 8, 10, 12, 14	73 – 77
H^A_n	5	7, 9, 11, 13, 15	10 – 14
λ^A_n	21	6, 8, 10, 12, 14	42 – 62
$t_{\lambda}{}^A_n$	21	7, 9, 11, 13, 15	44 – 64
Δi^A_n	18	6, 8, 10, 12, 14	24 – 41
ΔT^A_n	22	7, 9, 11, 13, 15	22 – 43
$\Delta \dot{T}^A_n$	7	7, 9, 11, 13, 15	15 – 21
ε^A_n	15	6, 8, 10, 12, 14	9 – 23
ω^A_n	16	7, 9, 11, 13, 15	65 – 80
$t_{\tau}{}^A_n$	10	6, 8, 10, 12, 14	63 – 72
C^A_n	1	6, 8, 10, 12, 14	80

Megjegyzés. – A szuperkereten belüli első négy keret jelsorozat számai vannak megadva. Nincs naptár paraméter az 5. keret 14. és 15. jelsorozatában.

3.2.2 AZ ADATFELHASZNÁLÓI PROTOKOLOK MEGHATÁROZÁSA

Megjegyzés. – Ez a rész az adat sugárzási közlemények paraméterei közötti kölcsönhatást határozza meg. Ez azoknak a paramétereknek a meghatározásait adja meg, amelyek nem kerülnek továbbításra, de a nem-légijármű fedélzeti és a légijármű fedélzeti elemek valamelyikében, vagy mindkettőben használatosak, és amelyek meghatározzák azokat a tényezőket, amelyek a navigációs megoldásokra és azok sértetlenségére vonatkoznak.

B-22. táblázat: Paritás ellenőrző algoritmus

b85, b84, … , b10, b9 az adat bitek (a helyzetük a 9.-től a 85.-ig terjedő a jelsorozatban);
β1, β2, … , β8 a Hamming kód ellenőrző bitjei (helyzetük 1.-től a 8.-ig terjed a jelsorozatban);
$c_1, c_2, \dots, c_7, c_\Sigma$ a következők felhasználásával összeállított ellenőrző összegek:

$c_1 = \beta \oplus [\Sigma_i\, b_i]_{mod2}$

i = 9, 10, 12, 13, 15, 17, 19, 20, 22, 24, 26, 28, 30, 32, 34, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84.

$c_2 = \beta_2 \oplus [\Sigma_j\, b_j]_{mod2}$

j = 9, 11, 12, 14, 15, 18, 19, 21, 22, 25, 26, 29, 30, 33, 34, 36, 37, 40, 41, 44, 45, 48, 49, 52, 53, 56, 57, 60, 61, 64, 65, 66, 67, 68, 71, 72, 75, 76, 79, 80, 83, 84.

$c_3 = \beta_3 \oplus [\Sigma_k\, b_k]_{mod2}$

k = 10, 11, 12, 16, 17, 18, 19, 23, 24, 25, 26, 31, 32, 33, 34, 38, 39, 40, 41, 46, 47, 48, 49, 54, 55, 56, 57, 62, 63, 64, 65, 69, 70, 71, 72, 77, 78, 79, 80, 85.

$c_4 = \beta_4 \oplus [\Sigma_l\, b_l]_{mod2}$

l = 13, 14, 15, 16, 17, 18, 19, 27, 28, 29, 30, 31, 32, 33, 34, 42, 43, 44, 45, 46, 47, 48, 49, 58, 59, 60, 61, 62, 63, 64, 65, 73, 74, 75, 76, 77, 78, 79, 80.

$c_5 = \beta_5 \oplus [\Sigma_m\, b_m]_{mod2}$

m = 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 81, 82, 83, 84, 85.

$c_6 = \beta_6 \oplus [\Sigma_n\, b_n]_{mod2}$

n = 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65.

$c_7 = \beta_7 \oplus [\Sigma_p\, b_p]_{mod2}$

p = 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85.

$c_\Sigma = [\Sigma\, \beta_q]_{mod2} \oplus [\Sigma\, b_r]_{mod2}$

q = 1, 2, 3, 4, 5, 5, 7, 8

r = 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85.

3.2.2.1 *Paritás ellenőrző algoritmus az adat hitelesítéshez.* A B-22. táblázatban bemutatott és a következőkben részletezett algoritmus használatos a jelsorozaton belül egy 1 bites hiba észlelésére és kijavítására, és 2, vagy több bit hiba észlelésére a jelsorozaton belül.

3.2.2.1.1 Minden egyes jelsorozat 85 adat bitet foglal magába, ahol a 77 Legnagyobb Helyértékű Bitek az adat chipek ($b_{85}, b_{84}, \dots, b_{10}, b_9$) és a 8 Legkisebb Helyértékű Bit a Hamming kód ellenőrző bitek 4 hosszban ($\beta_8, \beta_7, \dots \beta_2, \beta_1$).

3.2.2.1.2 Az 1 bites hibáknak a jelsorozaton belüli kijavításához a következő ellenőrző összegek kerülnek összeállításra: (c_1, c_2, … , c_7), és a 2 bites hibáknak az észleléséhez (vagy több-páros-szám-bit hibákhoz) egy c_Σ ellenőrző összeg kerül generálásra, ahogy az a B-22. táblázatban bemutatásra kerül. Az egyedi hibák kijavítására és a többszörös hibák észlelésére a következők használatosak:

a) Egy jelsorozat akkor tekintett helyesnek, ha az összes ellenőrző összeg (checksum) (c_1, … , c_7 és c_Σ) “0”-val egyenlő, vagy ha csak az ellenőrző összegek egyike (c_1, … , c_7) egyenlő “1”-el és a c_Σ egyenlő “1”-el.

b) Ha az ellenőrző összegekből (c_1, … , c_7) kettő, vagy több “1”-el egyenlő, és a c_Σ is “1”-el egyenlő, akkor a “b_{icor}” karakter ellentétes karakterre kerül helyesbítésre a következő bit helyzetekben:

“i_{cor}” = $c_7c_6c_5c_4c_3c_2c_1 + 8 – K$, feltéve, hogy “$i_{cor}$” Ł 85,

ahol: “$c_7c_6c_5c_4c_3c_2c_1$” az ellenőrző összegekből (c_1, … , c_7) összeállított bináris szám, úgy, hogy a c_1 a Legkisebb Helyértékű Bit /LSB/ és a c_7 a Legnagyobb Helyértékű Bit /MSB/. A ’K’ a legnagyobb helyértékű ellenőrző összeg sorszáma nem egyenlő “0”-val.

Ha az icor > 85, akkor egy páratlan számú többszörös hiba van, és az adat visszautasításra kerül.

c) Ha az ellenőrző összegekből (c_1, … , c_7) legalább egy egyenlő “1”-el és a c_Σ egyenlő “0”-val, vagy ha az összes ellenőrző összeg (c_1, … , c_7) egyenlő “0”-val, de a c_Σ egyenlő “1”-el, akkor többszörös hiba van, és az adat visszautasításra kerül.

3.2.2.2 *Műhold óra helyesbítő paraméterek*

3.2.2.2.1 A GLONASS rendszer ideje a következők szerint van meghatározva:

$$t_{GLONASS} = t_k + \tau_n(t_b) - \gamma_n(t_b)\,(t_k - t_b)$$

ahol a t_k, $\tau_n(t_b)$, $\gamma_n(t_b)$ a 3.2.1.3.1 pontban leírt paraméterek.

3.2.2.2.2 A GLONASS ideje az Orosz Nemzeti Idő Szolgálat (UTC(SU)) idejére van vonatkoztatva az alábbiak szerint:

$$t_{UTC(SU)} = t_{GLONASS} + \tau_c - 03 \text{ óra } 00 \text{ perc}$$

ahol:
τ_c egy, a 3.2.1.3.4 pontban leírt paraméter, és
03 óra 00 perc egy folyamatos idő eltolás a Moszkva-i és a Greenwich-i idő közötti különbség miatt.

3.2.2.3 *Műhold helyzet*

3.2.2.3.1 A pillanatnyi műhold helyzet a GLONASS navigációból az efemerisz paraméterek felhasználásával kerül meghatározásra, ahogy az a B-17. táblázatban megadásra kerül.

3.2.2.3.2 Az efemerisznek a pillanatnyi ideje a t_b-ből a ($|\tau_i| = |t_i - t_b| \leq 15$ perc) időtartamon belül a pillanatnyi idejű t_i-re történő átszámítása a műholdak mozgását leíró differenciál-egyenletekből a numerikus integrálási technikát felhasználva kerül végrehajtásra. Ezeknek az egyenleteknek a jobb oldali részén a gyorsulások, a μ tömegvonzási állandó és a J^2_0 geopotenciál második zónális harmonikusa - amely a föld sarki lapultságát határozza meg - felhasználásával kerülnek meghatározásra és a luni-szoláris zavaró hatás miatti gyorsulások is számításba vételre kerülnek. Az egyenletek a PZ-90 (3.2.5) koordináta rendszerbe vannak integrálva a negyedrendű Runge-Kutta technika alkalmazásával, az alábbiakban bemutatottak szerint:

$$\frac{dx}{dt} = Vx$$

$$\frac{dy}{dt} = Vy$$

$$\frac{dz}{dt} = Vz$$

$$\frac{dV_x}{dt} = -\frac{\mu}{r^3}\ x - \frac{3}{2}\ J_0^2\ \frac{\mu a_e^2}{r^5}\ x\left(1 - \frac{5z^2}{r^2}\right) + \omega^2 x + 2\omega V_y + \ddot{x}$$

$$\frac{dV_y}{dt} = -\frac{\mu}{r^3}\ y - \frac{3}{2}\ J_0^2\ \frac{\mu a_e^2}{r^5}\ y\left(1 - \frac{5z^2}{r^2}\right) + \omega^2 y + 2\omega V_x + \ddot{y}$$

$$\frac{dV_z}{dt} = -\frac{\mu}{r^3}\ z - \frac{3}{2}\ J_0^2\ \frac{\mu a_e^2}{r^5}\ z\left(1 - \frac{5z^2}{r^2}\right) + \ddot{z}$$

Ahol,

$$r = \sqrt{x^2 + y^2 + z^2}\ ;$$

μ = a föld általános tömegvonzási állandó (398 600,44 × 10^9 m^3/s^2);
a_e = a nagy fél-tengely (6 378 136 m);
$J^2{}_0$ = a geopotenciál második zónás harmonikusa (1 082 625,7 × 10^{-9}); és
ω = a föld forgási sebessége (7,292115 × 10^{-5} radián/s).

Az $x_n(t_b)$, $y_n(t_b)$, $z_n(t_b)$ koordináták és a sebesség-vektor összetevők

$\dot{x}_n(t_b) = V_x$,

$\dot{y}_n(t_b) = V_y$,

$\dot{z}_n(t_b) = V_z$ az integrálás kezdeti feltételei. A luni-szoláris zavaró hatás miatti gyorsulások , az

$\ddot{x}_n(t_b)$ $\ddot{y}_n(t_b)$ $\ddot{z}_n(t_b)$ meghatározások, állandók az integrálási intervallumban, ± 15 perc.

3.2.3 LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

3.2.3.1 *GNSS (GLONASS) vevő*

3.2.3.1.1 *Műhold kizárás*. A vevőnek ki kell zárni minden olyan műholdat, amely nem megfelelő működési állapotúként van kijelölve a Globális Navigációs Műhold Rendszer /GLONASS/ navigációs közleményében.

3.2.3.1.2 *Műhold követés*. A vevőnek biztosítania kell azt a képességet, hogy folyamatosan nyomon kövessen minimum négy műholdat, és létre kell hoznia az azok mérésén alapulóan egy helymeghatározási megoldást.

3.2.3.1.3 *Doppler eltolódás*. A vevőnek képesnek kell lenni arra, hogy a dinamikus Doppler eltolódás hatását kiegyenlítse a névleges GLONASS jel vivőhullám fázisán és a szabvány kód méréseknél. A vevőnek ki kell egyenlíteni azt a Doppler eltolódást, ami a várt alkalmazáshoz egyértelműen hozzátartozik.

3.2.3.1.4 *Interferencia ellenállóság*. A vevőnek ki kell elégítenie a 3.7 pontban meghatározott interferencia ellenállósági követelményeket.

3.2.3.1.4.1 *Rendszeren belüli interferencia*. Amikor egy navigációs jel a k = n frekvencia csatornával vételre kerül, akkor a k = n - 1 vagy a k = n + 1 frekvencia csatorna számú navigációs jelek által létrehozott interferencia nem lehet több -48 dBc-nél a földfelszínen meghatározott minimális műhold teljesítményre vonatkozóan, feltéve, hogy az ezeket a jeleket sugárzó műholdak egyidejűleg a felhasználó általi láthatósági zónában helyezkednek el.

Megjegyzés. – A rendszeren belüli interferencia a távolság meghatározó ál-véletlen jel kereszt-korrelációs tulajdonsága a frekvencia osztásos többszörös hozzáférésű rendszert illetően.

3.2.3.1.5 *Az óra és efemerisz adatok alkalmazása*. A vevőnek biztosítania kell azt, hogy csak a pontos efemerisz és óra adatokat használja fel, mielőtt bármilyen helymeghatározási megoldást adna.

3.2.3.1.6 *Szökő-másodperc helyesbítés*. A GLONASS idő szökő-másodperc helyesbítéséhez (lásd a 3.2.1.3.1, tb-t) a GLONASS vevőnek képesnek kell lenni arra, hogy:

a) Összeállítson egy szűrt és érvényes pszeudo-távolság mérés sorozatot; és

b) Újraszinkronizálja az adat jelsorozat idő jelét a jelkövetés elvesztése nélkül.

3.2.3.1.6.1 A GLONASS idő szökő-másodperc helyesbítés után a GLONASS vevőnek az Egyeztetett Világidőt /UTC/ a következők szerint kell felhasználni:

a) Felhasználni az 'öreg' (a helyesbítést megelőző) Egyeztetett Világidő /UTC/ időt az öreg efemerisz adatokkal együtt (a 00 óra 00 perc 00 másodperc UTC előtt továbbított adatok); és

b) Felhasználni a felfrissített Egyeztetett Világidőt /UTC/ az új efemerisz adatokkal együtt (a 00 óra 00 perc 00 másodperc UTC után továbbított adatok).
3.2.4 IDŐ

3.2.4.1 A GLONASS-M műholdaknál a navigációs közleménynek magába kell foglalnia azokat az adatokat, amelyek az UTC(SU) időnek az UT1-re való vonatkoztatásához szükségesek. A GLONASS idejét az UTC(SU) időhöz viszonyítva 1 milliszekundumon belül kell tartani az órák egész száma helyesbítése után a GLONASS vezérlő szegmens speciális jellemzői miatt:

$$| t_{GLONASS} - (UTC + 03 \text{ óra } 00 \text{ perc}) | < 1 \text{ ms}$$

A navigációs adatnak magába kell foglalnia azt a követelmény adatot, amely a GLONASS idejét az UTC időre (az Orosz Nemzeti Idő Szolgálat által kezelt idő, UTC (SU)) 1 mikroszekundumon belül vonatkoztatja.

1. Megjegyzés. – A GLONASS műholdak idő-léptéke időszakosan összehasonlításra kerül a központi szinkronizált idővel. A GLONASS műholdak idő-léptékének helyesbítései – a GLONASS időnek és az UTC(SU) időnek az összehasonlítása – a GLONASS föld-bázisú vezérlő komplexumokon kerülnek kiszámításra és naponta kétszer áttöltésre kerülnek a műholdakba.

2. Megjegyzés. – Nincs egészszámú másodperc különbség a GLONASS ideje és az UTC idő között. A GLONASS idő-léptéke időszakosan egészszámú másodpercekre helyesbítésre kerül az UTC *helyesbítésekkel egyidejűleg, ami a Nemzetközi Idő Hivatal /Bureau International de l'Heure/ közleménye (szökő-másodperc helyesbítés) szerint kerül végrehajtásra. Ezek a helyesbítések 00 óra 00 perc 00 másodperc UTC időben éjfélkor kerülnek végrehajtásra, az év negyedéveinek végén. A GLONASS szökő-másodperc helyesbítésnél a navigációs közleményen belüli idő-jel úgy változtatja a helyzetét (egy folyamatos idő-léptékben), hogy 2-másodperces 'korszakkal' szinkronizálttá váljon a helyesbített UTC idő-léptékhez. A GLONASS felhasználói előzetes értesítést kapnak ezekről a tervezett helyesbítésekről. A GLONASS-M műholdakra az ezekről a helyesbítésekről való előzetes értesítés a felhasználó részére a KP navigációs közlemény paraméteren keresztül kerül biztosításra.*

3.2.4.2 A közös műhold idő-lépték szinkronizáció pontosságnak 20 nanoszekundumnak kell lenni (1 szigma) a GLONASS műholdakra és 8 nano-szekundumnak (1 szigma) a GLONASS-M műholdakra.

3.2.4.3 A GPS időhöz történő helyesbítés a GLONASS időre vonatkozóan (vagy a két idő-lépték közötti különbség), amelyet a GLONASS-M műholdak sugároznak, a t_{GPS}, nem haladhatja meg a 30 nanoszekundumot (1 szigma).

Megjegyzés. – A t_{GPS} (30 ns) pontossága a GPS Szabvány Helymeghatározási Szolgáltatás /SPS/ torzított /durva/ hozzáférési jelére vonatkoztatva kerül meghatározásra, és ki lehet számítani a GLONASS-M műholdakat felhasználó GLONASS rendszer vizsgálatainak befejeztével.

3.2.5 KOORDINÁTA RENDSZER

3.2.5.1 *PZ-90 (a Föld közös szárazföldi ellipszoid és gravitációs tér paraméterei 1990.).* A GLONASS által sugárzott efemerisznek egy adott műhold adattovábbító antennája fázis középpontjának a helyzetét a PZ-90 föld-középpontú föld-állandójú vonatkoztatási rendszerben kell leírni.

3.2.5.2 *A PZ-90 és a WGS-84 közötti átszámítás*. A következő átszámítási paramétereket kell felhasználni a PZ-90 helyzet koordinátákról a WGS-84 koordináta helyzet megkapásához:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{WGS-84} = \begin{bmatrix} -1.1 \\ -0.3 \\ -0.9 \end{bmatrix} + (1 - 0.12 \times 10^{-6}) \begin{bmatrix} 1 & -0.82 \times 10^{-6} & 0 \\ +0.82 \times 10^{-6} & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{PZ-90}$$

Megjegyzés. – Az X, Y és Z méter-ben van kifejezve.

3.2.5.2.1 Az átszámítási hiba nem haladhatja meg az 1,5 métert (1 szigma) az egyes koordináta tengelyek mentén.

3.3 A GPS és a GLONASS kombinált felhasználása

3.3.1 LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

3.3.1.1 *Kombinált Globális Navigációs Műhold Rendszer /GNSS/ vevő*. A kombinált GNSS vevőnek fel kell dolgozni a GPS-től és a GLONASS-tól jövő jeleket a 3.1.3.1 pontban, a GPS (GNSS) vevőre meghatározott követelményeknek, valamint a 3.2.3.1 pontban a GLONASS vevőre meghatározott követelményeknek megfelelően.

3.3.1.1.1 *Interferencia ellenállóság*. A kombinált GNSS vevőnek ki kell elégíteni a GPS-re és a GLONASS-ra vonatkozó, a 3.7 pontban meghatározott egyedi követelményeket.

3.3.1.2 *Antenna/k/.* A GPS és a GLONASS jeleit egy, vagy több antennán keresztül kell venni.

Megjegyzés. – A GNSS vevő antenna teljesítmény jellemzői a 3.8 pontban kerültek meghatározásra.

3.3.1.3 *A koordináta rendszerek közötti átszámítás*. Az egy kombinált GPS és GLONASS vevő által biztosított helyzet információt WGS-84 földi koordinátákban kell kifejezni. A GLONASS műhold helyzetet, amely a PZ-90 koordináta rendszerben kapható meg, át kell alakítani a WGS-84 és a PZ-90 közötti különbség számításba vételével, ahogy az a 3.2.5.2 pontban meghatározásra került.

3.3.1.4 *GPS/GLONASS idő*. Amikor a GLONASS és a GPS méréseit összekapcsolják, akkor a GLONASS ideje és a GPS ideje közötti különbséget számításba kell venni.

3.4 Légijármű-bázisú kiegészítő rendszer (ABAS)

Megjegyzés. – A Légijármű bázisú kiegészítő rendszer /ABAS/ útmutató anyaga a “D”- Melléklet 5. részében került megdásra.

3.5 Műhold-bázisú kiegészítő rendszer (SBAS)

3.5.1 ÁLTALÁNOS RÉSZ

Megjegyzés. – Az ebben a részben lévő paraméterek WGS-84-ben vannak meghatározva.

3.5.2 RÁDIÓFREKVENCIÁS (RF) JELLEMZŐK

3.5.2.1 *Vivőhullám frekvencia stabilitás*. A vivőhullám frekvencia rövidtávú stabilitásának (az Allan Variancia négyzetgyöke) a műhold adó antenna kimeneténél jobbnak kell lenni 5×10^{-11}-nél az 1.-től a 10. másodpercig.

3.5.2.2 *Vivőhullám fázis zaj*. A modulálatlan vivőhullám fázis zajának spektrális sűrűségének olyannak kell lennie, hogy egy fázisszabályzó hurok 10 Hz-es egy-oldalas zajszűrővel képes legyen a vivőhullám követésére egy 0,1 radiános (1 szigma) pontossággal.

3.5.2.3 *Hamis sugárzás*. A hamis sugárzásnak legalább 40 dB-el a modulálatlan vivőhullám teljesítmény alatt kell lenni az összes frekvencián.

3.5.2.4 *Kód/vivőhullám frekvencia összefüggés*. A rövidtávú (10 másodpercnél kevesebb) viszonylagos frekvencia különbség a kód fázis sebesség és a vivőhullám frekvencia között kevesebb kell, hogy legyen 5×10^{-11}-nél (szabvány eltérés). A hosszú távon (100 másodpercnél kevesebb) az adás kód fázisának változása, a vivőhullám ciklusa a kód chipeknek az 1540-el való megszorzásával átszámítva, és az adás vivőhullám fázisának a ciklusokban való változása között a különbségnek egy vivőhullám cikluson belül kell lenni (szabvány eltérés).

Megjegyzés. – Ez a műhold adó antennájának kimenetére alkalmazandó, és nem foglalja magába a lefelé menő terjedés útján lévő ionoszférikus törés miatti kód/vivőhullám eltérést.

3.5.2.5 *Korrelációs veszteség*. A visszanyert jel teljesítményében a jel moduláció hiányossága és a hullámforma torzítás miatti veszteség nem haladhatja meg az 1 dB-t.

Megjegyzés. – A jel-teljesítmény veszteség az egy 2,046 MHz-es sávszélességben kisugárzott teljesítmény és az egy zajmentes veszteségmentes 1-chip korrelációs térközű és egy 2,046 MHz-es sávszélességű vevővel visszanyert jel-teljesítmény közötti különbség.

3.5.2.6 *Maximális kód fázis eltérés*. A közvetítő jel maximális nem-helyesbített kód fázis nem térhet el az egyenértékű Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózat idejétől (SNT) $\pm 2^{-20}$ másodpercnél többel.

3.5.2.7 *Kód/adat összefüggés*. Minden egyes 2 milliszekundumos jelnek szinkronban kell lenni minden egyes más kód 'korszakkal'.

3.5.2.8 *Közlemény szinkronizálás*. Annak az első jelnek a felfutó élét, amely a pillanatnyi közlemény első bitjétől függ, kell a Műhold Bázisú Kiegészítő Rendszerből a Műhold Hálózat Idő egy 1-másodperces 'korszakával' szinkronizáltan sugározni.

3.5.2.9 *Konvolúciós kódolás*. A 250 bit/másodperces adatfolyamot 2 jel/bit arányban kell kódolni egy konvolúciós kód alkalmazásával, hogy a korlátozott 7-es hossz 500 jel/másodperc-et eredményezzen. A konvolúciós kódolás logikai elrendezésének olyannak kell lenni, ahogy azt a B-11. ábra bemutatja, úgy, hogy a G3 kimenet került kiválasztásra az egyes 4 milliszekundumos adat bit periódusok első felére.

3.5.2.10 *Ál-véletlen zaj (PRN) kódok*. Az egyes ál-véletlen zaj /PRN/ kódoknak egy 1023 bit-es Gold kódnak kell lenni, amely önmaga is a Modulo-2-es összeadása két 1023 bites lineáris alakzatnak, a G1 és $G2_i$-nek. A $G2_i$ jelsorozatot a G2 jelsorozatnak a hozzá kapcsolt egész számú chipekkel történő késleltetésével kell létrehozni, ahogy azt a B-23. táblázat bemutatja. A G1 és G2 jelsorozatok mindegyikét úgy kell meghatározni, mint egy 10-fokozatú léptető regiszter 10. fokozatának kimenetét, ahol a léptető regiszter bemenete a Modulo-2 összeadása a léptető regiszter következő fokozatának:

a) G1: 3. és 10. fokozatok; és

b) G2: 2., 3., 6., 8., 9. és 10. fokozatok.

A G1 és G2 léptető regiszterek kezdő helyzetének "1111111111"-nek kell lenni.

B-23. táblázat: A Műhold Bázisú Kiegészítő Rendszer /SBAS/ ál-véletlen zaj /PRN/ kódjai

PRN kód szám	G2 késleltetés (chipek)	Az első 10 SBAS chip (A balról a legelső bit képviseli az először továbbított chipet, bináris)
120	145	110111001
121	175	101011110
122	52	1101001000
123	21	1101100101
124	237	1110000
125	235	111000001
126	886	1011
127	657	1000110000
128	634	10100101
129	762	101010111
130	355	1100011110
131	1012	1010010110
132	176	1010101111
133	603	100110
134	130	1000111001
135	359	101110001
136	595	1000011111
137	68	111111000
138	386	1011010111

3.5.3 ADAT SZERKEZET

3.5.3.1 *Formátum összegzés*. Az összes közleménynek magába kell foglalni egy közlemény típus azonosítót, egy bevezető jelsorozatot, az adatmezőt és a ciklikus redundancia ellenőrzést (CRC), ahogy azt a B-12. ábra bemutatja.

3.5.3.2 *Bevezető jelsorozat, előtag*. A bevezető jelsorozatnak a következő bit-sorozatból kell állni: “01010011 10011010 11000110”, három egymást követő blokkba felosztva. Minden más 24 bites bevezető jelsorozat kezdetének szinkronban kell lenni egy 6 másodperces GPS al-keret ’korszakkal’.

3.5.3.3 *Közlemény típus azonosító*. A közlemény típus azonosítónak egy, a közlemény típusát azonosító 6 bites értéknek kell lenni (a 0.tól a 63.-ig terjedő típusok), ahogy az a B-24. táblázatban meghatározásra került. A közlemény típus azonosítóval először a Legnagyobb Helyértékű Bitet kell továbbítani.

3.5.3.4 *Adatmező*. Az adatmező 212 bit kell, hogy legyen úgy, ahogy az a 3.5.6 pontban meghatározásra került. Az egyes adatmező paramétereknél először a Legnagyobb Helyértékű Bitet kell továbbítani.

3.5.3.5 *Ciklikus Redundancia Ellenőrzés (CRC)*. A Műhold Bázisú Kiegészítő Rendszer közlemény Ciklikus Redundancia Ellenőrző kódját a 3.9 pontban megadottaknak megfelelően kell kiszámolni.

3.5.3.5.1 A CRC kód hosszának k = 24 bitnek kell lenni.

3.5.3.5.2 A CRC alkotó polinomja a következő kell, hogy legyen:

$$(x) = x^{24} + x^{23} + x^{18} + x^{17} + x^{14} + x^{11} + x^{10} + x^{7} + x^{6} + x^{5} + x^{4} + x^{3} + x + 1$$

B-24. táblázat: Kisugárzott közlemény típusok

Közlemény típus	Tartalom
0	"Ne használják" (SBAS ellenőrzés mód)
1	Ál-véletlen zaj /PRN/ maszk
2-től 5-ig	Gyors helyesbítés
6	Integritás /teljesség/ információ
7	Gyors helyesbítés teljesítőképesség-csökkenési tényező
8	Tartalék
9	Geostacionárius pálya /GEO/ távolság meghatározási paraméterek
10	Teljesítőképesség-csökkenési paraméterek
11	Tartalék
12	Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózati idő/Egyeztetett Világ-idő /UTC/ eltolódási paraméterek
13-tól 16-ig	Tartalék
17	Geostacionárius pályájú műhold naptár
18	Ionoszférikus rácspont maszkok
19-től 23-ig	Tartalék
24	Kevert gyors/hosszú-távú műhold hiba helyesbítések
25	Hosszú-távú műhold hiba helyesbítések
26	Ionoszférikus késés helyesbítések
27	Műhold Bázisú Kiegészítő Rendszer üzemi közlemény
28	Óra-efemerisz kovariancia mátrix
29-től 61-ig	Tartalék
62	Fenntartott
63	Nulla közlemény

3.5.3.5.3 A Ciklikus Redundancia Ellenőrzés információs mezőjének, M(x), a következőnek kell lenni:

$$M(x) = \sum_{i-1}^{226} m_i x^{226-i} = m_1 x^{225} + m_2 x^{224} + \ldots + m_{226} x^0$$

3.5.3.5.4 Az M(x)-t a 8-bites SBAS közlemény bevezető jelszakaszából, a 6-bites közlemény típus azonosítóból és a 212 bites adatmezőből kell kialakítani. A biteket olyan sorrendben kell elrendezni és a Műhold Bázisú Kiegészítő Rendszerű műholdról továbbítani, hogy az m_1 feleljen meg a bevezető jelszakasz első továbbított bitje és az m_{226} feleljen meg az adatmező 212 bitjének.

3.5.3.5.5 A Ciklikus Redundancia Ellenőrzés kód r-bitjeit úgy kell sorrendbe rakni, hogy az r_1 legyen az első sugárzott bit és az r_{24} az utolsó sugárzott bit.

3.5.4 ADATTARTALOM

3.5.4.1 *Ál-véletlen zaj /PRN/ maszk paraméterek.* A PRN maszk paramétereknek a következőknek kell lenni:

PRN kód szám: egy szám, amely egyértelműen azonosítja a műhold PRN kódját és a hozzá kapcsolódó kijelölést, ahogy azt a B-25. táblázat bemutatja.

PRN maszk: 210 PRN maszk érték, ami megfelel a műhold PRN kód számainak. A maszknak a 210 PRN maszk értékből 51-nek kell lenni.

Megjegyzés. – A PRN maszk első továbbított bitje megfelel az 1. számú PRN kódnak.

B-25. táblázat: Ál-véletlen zaj /PRN/ kód szám kijelölés

PRN kód szám	Kijelölés
1 – 37	Globális Helymeghatározó Rendszer /GPS/
38 – 61	GLONASS résszám plusz 37
62 – 119	Tartalék
120 – 138	Műhold Bázisú Kiegészítő Rendszer /SBAS/
139 – 210	Tartalék

PRN maszk érték: egy bit PRN maszkban, ami azt jelzi, hogy az adat tartalmazza-e a kapcsolódó műhold PRN kód számát (1.-től 210.-ig).

Kódolás: 0 = az adat nem tartalmazza
1 = az adat tartalmazza

PRN maszk szám: a PRN maszkban beállított maszk értékek sorszáma (1.-től 51.-ig).

Megjegyzés. – A PRN maszk szám "1" arra a legalacsonyabb műhold PRN számra vonatkozik, amelyre a PRN maszk érték "1".

Adat kibocsátás – Ál-véletlen zaj /PRN/ (IODP): egy jelzés, ami összekapcsolja a helyesbítési adatokat a PRN maszkkal.

Megjegyzés. – A paraméterek a következő közleményekben kerülnek leadásra:

a) PRN maszk (210 PRN maszk értékből áll) az 1. típusú közleményben;

b) PRN maszk szám a 24., 25. és 28. típusú közleményekben;

c) PRN kód szám: a 17. típusú közleményben; és

d) Adat kibocsátás – Ál-véletlen zaj /IODP/ az 1.-től az 5.-ig, a 7., és 25. típusú közleményekben.

3.5.4.2 *Geostacionárius pálya (GEO) távolság meghatározási paraméterek.* A Geostacionárius pálya (GEO) távolság meghatározási paramétereknek a következőknek kell lenni:
$t_{0,GEO}$: a GEO távolság meghatározási funkció referencia ideje, az adott nap éjfélje utáni időként kifejezve.

$[X_G Y_G Z_G]$: A GEO helyzet a $t_{0,GEO}$ időpontban.

$\left[\dot{X}_G \; \dot{Y}_G \; \dot{Z}_G\right]$: a GEO sebessége a $t_{0,GEO}$ időpontban.

$\left[\ddot{X}_G \; \ddot{Y}_G \; \ddot{Z}_G\right]$: a GEO gyorsulása a $t_{0,GEO}$ időpontban.

a_{Gf0}: a GEO óra idő eltolódása a Műhold Hálózati Időre /SNT/ vonatkozóan, a $t_{0,GEO}$ időpontban meghatározva.

a_{Gf1}: a GEO óra eltolódási sebessége a Műhold Hálózati Időre /SNT/ vonatkozóan.

Felhasználói távolság pontosság (URA): a távolságmérési pontosság négyzetes középértékének jelzése az atmoszférikus hatást is beleértve, ahogy az a B-26. táblázatban leírásra került.

Megjegyzés. – Az összes paraméter a 9. típusú közleményben kerül leadásra.

B-26. táblázat: Felhasználói távolság pontosság /URA/

URA	Pontosság (rms)
0	2 m
1	2,8 m
2	4 m
3	5,7 m
4	8 m
5	11,3 m
6	16 m
7	32 m
8	64 m
9	128 m
10	256 m
11	512 m
12	1 024 m
13	2 048 m
14	4 096 m
15	“Ne használják”

3.5.4.*3 Geostacionárius pálya /GEO/ naptár paraméterek.* A Geostacionárius pálya /GEO/ naptár paramétereknek a következőknek kell lenni:

Ál-véletlen zaj /PRN/ kód szám: lásd a 3.5.4.1 pontot.
Működési állapot és helyzet: A Műhold Bázisú Kiegészítő Rendszer /SBAS/ által biztosított funkciók jelzése. A szolgáltatás biztosítók azonosítóit a B-27. táblázat mutatja be.

Kódolás:	Bit 0. (LSB)	Távolság meghatározás	Be (0)	Ki (1)
	Bit 1.	Precíziós helyesbítések	Be (0)	Ki (1)
	Bit 2.	Műhold helyzet és alap helyesbítések	Be (0)	Ki (1)
	Bit 3.	Tartalék		
	Bit 4.-től 7.-ig	A szolgáltatás biztosító azonosítója		

Megjegyzés. – A 14-es szolgáltatás biztosító azonosító a Földi Bázisú Kiegészítő Rendszerhez /GBAS/ használatos és az SBAS-re nem alkalmazható.

$\left[X_{G,A}\ Y_{G,A}\ Z_{G,A}\right]$: a GEO helyzete a $t_{almanac}$ időpontban,

$\left[\dot{X}_{G,A}\ \dot{Y}_{G,A}\ \dot{Z}_{G,A}\right]$: a GEO sebessége a $t_{almanac}$ időpontban,

$t_{almanac}$: a GEO naptár adat referencia ideje az adott nap éjfélje utáni időként kifejezve.

Megjegyzés. – Az összes paraméter 17. típusú közleményben kerül leadásra.

3.5.4.4 *Műhold helyesbítési kisugárzó paraméterek*

3.5.4.4.1 A hosszútávú helyesbítési paramétereknek a következőknek kell lenni:

Adat kibocsátás (IOD_i): egy jelzés, amely összekapcsolja az i^{th} /i-ik/ műhold hosszútávú helyesbítéseit azokkal az efemerisz adatokkal, amelyeket az a műhold ad le.

1. Megjegyzés. – A Globális Helymeghatározó Rendszerre /GPS/ az Adat kibocsátás /IOD_i/ megfelel az Adat kibocsátás, Efemerisznek /IODE/ és az Adat kibocsátás, Óra /IODC/ 8 Legkisebb helyértékű bitjeinek /LSB-k/ (3.1.1.3.1.4 és 3.1.1.3.2.2).

2. Megjegyzés. – A GLONASS-ra az Adat kibocsátás /IOD_i/ azt az időtartamot jelzi, amikor a GLONASS adatokat a Műhold Bázisú Kiegészítő Rendszer /SBAS/ adatokkal együtt kell használni. Ez két mezőből áll, ahogy azt a B-28. táblázat bemutatja.

δx_i : az i műholdra, efemerisz helyesbítés az x-tengelyre.

δy_i : az i műholdra, efemerisz helyesbítés az y-tengelyre.

δz_i : az i műholdra, efemerisz helyesbítés a z-tengelyre.

$\delta a_{i,f0}$: az i műholdra, efemerisz idő helyesbítés.

$\delta \dot{x}_i$: az i műholdra, efemerisz sebesség helyesbítés az x-tengelyre.

$\delta \dot{y}_i$: az i műholdra, efemerisz sebesség helyesbítés az y-tengelyre.

$\delta \dot{z}_i$: az i műholdra, efemerisz sebesség helyesbítés a z-tengelyre.

$\delta a_{i,f1}$: az i műholdra az efemerisz idő helyesbítés változási sebessége.

$t_{i,LT}$: A δx_i, δy_i, δz_i, $\delta a_{i,f0}$, $\delta \dot{x}_i$, $\delta \dot{y}_i$, $\delta \dot{z}_i$ és a $\delta a_{i,f1}$ paraméterek alkalmazhatósági ideje, az adott nap éjfélje után eltelt másodpercekben kifejezve.

Sebesség kód: az üzenet formátum leadásának a jelzése (B-48. táblázat és B-49. táblázat).

Kódolás: 0 = $\delta \dot{x}_i$ $\delta \dot{y}_i$ $\delta \dot{z}_i$ $\delta a_{i,f1}$ és nincs leadva.

1 = $\delta \dot{x}_i$ $\delta \dot{y}_i$ $\delta \dot{z}_i$ $\delta a_{i,f1}$ és le van adva.

Megjegyzés. – Az összes paraméter a 24. és 25. típusú közleményben kerül leadásra.

B-27. táblázat: A Műhold Bázisú Kiegészítő Rendszer /SBAS/ szolgáltatás biztosítóinak azonosítói

Azonosító	Szolgáltatás biztosító
0.	WAAS
1.	EGNOS
2.	MSAS
3.-tól 13.-ig	Tartalék
14., 15.	Fenntartva

B-28. táblázat: Adat kibocsátás /IOD$_i$/ a GLONASS műholdakra

Legnagyobb helyiértékű bit /MSB/	Legkisebb helyiértékű bit /LSB/
Érvényességi időköz (5 bit)	Várakozási idő (3 bit)

3.5.4.4.2 A gyors helyesbítési paramétereknek a következőknek kell lenni:

Gyors helyesbítés (FC$_i$): az i műholdra, a gyorsan változó hibák pszeudo-távolság helyesbítése más, mint a troposzférikus és ionoszférikus hiba, a pszeudo-távolsághoz a hosszútávú helyesbítéseknél való felhasználás után kerül hozzáadásra.

Megjegyzés. – A felhasználó vevője független troposzférikus helyesbítéseket használ fel (3.5.8.4.2 és 3.5.8.4.3).

Gyors helyesbítés típus azonosító: Egy jelzés (0, 1, 2, 3) arról, hogy a 24. típusú közlemény tartalmazza-e az ál-véletlen zaj /PRN/ maszkhoz kapcsolt gyors helyesbítés és sértetlenség /integritás/ adatot a 2.típusú, 3. típusú, 4. típusú, vagy 5. típusú közleményekből, külön-külön.

Adat kibocsátás – Gyors helyesbítés (IODF$_j$): Egy jelzés, ami összekapcsolja a Felhasználói Differenciál Távolságmérési Hibákat /UDREI$_i$/ a gyors helyesbítésekkel. A *j* indexnek azt a közlemény típust (j = 2.-től 5.-ig) kell jelezni, amelyre az Adat kibocsátás – Gyors helyesbítés (IODF$_j$)-t alkalmazza (a gyors helyesbítés típus azonosító +2).

Megjegyzés. – A gyors helyesbítés típus azonosító a 24. típusú közleményben van leadva. A Gyors Helyesbítés /FC_i/ a 2.-tól az 5.-ig típusú és a 24. típusú közleményekben van leadva. Az Adat kibocsátás – Gyors helyesbítés ($IODF_j$) a 2.-tól a 6.-ig típusú és a 24. típusú közleményekben kerül leadásra.

3.5.4.5 *A gyors és hosszútávú helyesbítések sértetlenségi paraméterei*. A gyors és hosszútávú helyesbítések sértetlenségi paramétereinek a következőknek kell lenni:

$UDREI_i$ /Felhasználói Differenciál Távolságmérési Hiba Jelzés$_i$/ : Egy jelzés, amely meghatározza a $\sigma^2_{i,UDRE}$ -t az i műholdra, ahogy az a B-29. táblázatban leírásra került.

Az óra és efemerisz megmaradó hibáinak négyzetes középérték modelje /$\sigma^2_{i,UDRE}$ /: Az i műhold felhasználói differenciál távolságmérési hibái normális eloszlásának négyzetes középértéke a gyors és hosszútávú helyesbítések alkalmazása után, az atmoszférikus hatások kizárásával és a vízszintes védelmi szint/függőleges védelmi szint számításoknál felhasználva (3.5.5.6).

Megjegyzés. – Az összes paraméter a 2.-tól 6.-ig típusú és a 24. típusú közleményekben kerül leadásra.

3.5.4.6 *Ionoszférikus helyesbítési paraméterek*. Az Ionoszférikus helyesbítési paramétereknek a következőknek kell lenni:
Ionoszférikus rácspont /IGP/ maszk: 11 ionoszférikus rácspont (IGP) sorozat sávjának maszkja, ahogy az a B-30. táblázatban meg van határozva.

B-29. táblázat: A Felhasználói Differenciál Távolságmérési Hibajelzés /UDREI$_i$/ kiértékelése

$UDREI_i$	$\sigma^2_{i,UDRE}$
0	0,0520 m^2
1	0,0924 m^2
2	0,1444 m^2
3	0,2830 m^2
4	0,4678 m^2
5	0,8315 m^2
6	1,2992 m^2
7	1,8708 m^2
8	2,5465 m^2
9	3,3260 m^2
10	5,1968 m^2
11	20,7870 m^2
12	230,9661 m^2
13	2 078,695 m^2
14	“Nem ellenőrzött”
15	“Ne használja”

Ionoszférikus rácspont /IGP/ sáv maszk: Az Ionoszférikus rácspont /IGP/ maszk értékek egy sorozata, amely megfelel a B-32. táblázatban meghatározott 11 Ionoszférikus rácspont /IGP/ sáv egyikében lévő összes Ionoszférikus rácspont /IGP/ helyzetnek.

Ionoszférikus rácspont /IGP/ maszk érték: egy bit, amely azt jelzi, hogy adat biztosításra kerül-e azon az ionoszférikus rácspont sávon belül a kapcsolódó ionoszférikus rácsponthoz.

Kódolás: 0 = adat nincs biztosítva.
1 = adat biztosítva van.

Ionoszférikus rácspont /IGP/ sáv szám: A leadásra kerülő Ionoszférikus rácspont /IGP/ sáv maszkok száma.

Ionoszférikus rácspont /IGP/ sáv azonosító: Az Ionoszférikus sávot a B-30. táblázatban meghatározottaknak megfelelően azonosító szám.

Ionoszférikus rácspont /IGP/ blokk azonosító: Az Ionoszférikus rácspont /IGP/ blokk azonosítója. Az Ionoszférikus rácspont /IGP/ blokkok 15 IGP csoportba osztva vannak meghatározva, egy IGP sáv maszkon belül az IGP-k sorrendje az, amelynek az IGP maszk értéke “1”. Az Ionoszférikus rácspont /IGP/ blokkok az IGP maszk érték továbbítás sorrendjében kerülnek számozásra, a “0”-val kezdődően.

Érvényességi időköz (V): Az az időköz, amelyre a GLONASS efemerisz adatok alkalmazhatóak (egy 30 s-os eltolással kódolva), ahogy az a B.-31. táblázatban leírásra került.

Várakozási idő (L): Az az időtartam, ami az utolsó GLONASS efermerisz adatnak a földi rész általi vételének időpontja és a GEO(t_{ltc})-nél /Geostacionárius pálya(idő/hosszútávú helyesbítés)/ a hosszútávú helyesbítési közlemény első bitjének továbbítási ideje között van, ahogy az a B-32. táblázatban leírásra került.

$IODI_k$ /Adat kibocsátás Ionoszférikus rácspont/: jelzés akkor, amikor a k-ik Ionoszférikus Rácspont /IGP/ sáv maszk változik.

IGP függőleges késés becslés: az 1575,42 MHz-es jelnél előidézett késés becslése akkor, ha az az ionoszférán az Ionoszférikus Rácspontnál /IGP/ függőlegesen eltérítődik.

Kódolás: Az "111111111" bit alakzat a "Ne használja"-t jelzi.

$GIVEI_i$ /Rácspont ionoszférikus függőleges hiba jelzés/: egy jelzés, amely a $\sigma^2_{i,GIVE}$ -t határozza meg úgy, ahogy az a B-33. táblázatban leírásra került.

A megmaradó ionoszférikus hibák négyzetes középérték modelje ($\sigma^2_{i,GIVE}$): a megmaradó ionoszférikus függőleges hibáknak az ionoszférikus rácspontnál lévő normál eloszlás négyzetes középeltérése az egy L1 jelre.

Megjegyzés. – Az összes paraméter 18. típusú és 26. típusú közleményekben kerül leadásra.

B-30. táblázat: Ionoszférikus rácspont /IGP/ helyzetek és sáv számok

Ionoszférikus rácspont /IGP/ helyzetek		Továbbítási sorrend az IGP sáv maszkban
0. sáv		
180 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N, 85N	1 – 28
175 W	55S, 50S, 45S, … , 45N, 50N, 55N	29 – 51
170 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	52 – 78
165 W	55S, 50S, 45S, … , 45N, 50N, 55N	79 – 101
160 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	102 – 128
155 W	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
150 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
145 W	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
1. sáv		
140 W	85S, 75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 28
135 W	55S, 50S, 45S, … , 45N, 50N, 55N	29 – 51
130 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	52 – 78
125 W	55S, 50S, 45S, … , 45N, 50N, 55N	79 – 101
120 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	102 – 128
115 W	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
110 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
105 W	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
2. sáv		
100 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
95 W	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
90 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N, 85 N	51 – 78
85 W	55S, 50S, 45S, … , 45N, 50N, 55N	79 – 101
80 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	102 – 128
75 W	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
70 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
65 W	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
3. sáv		
60 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
55 W	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
50 W	85S, 75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 78
45 W	55S, 50S, 45S, … , 45N, 50N, 55N	79 – 101
40 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	102 – 128
35 W	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
30 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
25 W	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
4. sáv		
20 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
15 W	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
10 W	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 77
5 W	55S, 50S, 45S, … , 45N, 50N, 55N	78 – 100

B-30. táblázat: Ionoszférikus rácspont /IGP/ helyzetek és sáv számok (folytatás)

	Ionoszférikus rácspont /IGP/ helyzetek	Továbbítási sorrend az IGP sáv maszkban
0	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N, 85N	101 – 128
5 E	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
10 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
15 E	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
5. sáv		
20 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
25 E	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
30 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 77
35 E	55S, 50S, 45S, … , 45N, 50N, 55N	78 – 100
40 E	85S, 75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	101 – 128
45 E	55S, 50S, 45S, … , 45N, 50N, 55N	129 – 151
50 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	152 – 178
55 E	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
6. sáv		
60 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
65 E	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
70 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 77
75 E	55S, 50S, 45S, … , 45N, 50N, 55N	78 – 100
80 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	101 – 127
85 E	55S, 50S, 45S, … , 45N, 50N, 55N	128 – 150
90 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N, 85N	151 – 178
95 E	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
7. sáv		
100 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
105 E	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
110 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 77
115 E	55S, 50S, 45S, … , 45N, 50N, 55N	78 – 100
120 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	101 – 127
125 E	55S, 50S, 45S, … , 45N, 50N, 55N	128 – 150
130 E	85S, 75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	151 – 178
135 E	55S, 50S, 45S, … , 45N, 50N, 55N	179 – 201
8. sáv		
140 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	1 – 27
145 E	55S, 50S, 45S, … , 45N, 50N, 55N	28 – 50
150 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	51 – 77

B-30. táblázat: Ionoszférikus rácspont /IGP/ helyzetek és sáv számok

(folytatás)

Ionoszférikus rácspont /IGP/ helyzetek		Továbbítási sorrend az IGP sáv maszkban
155 E	55S, 50S, 45S, … , 45N, 50N, 55N	78 – 100
160 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	101 – 127
165 E	55S, 50S, 45S, … , 45N, 50N, 55N	128 – 150
170 E	75S, 65S, 55S, 50S, 45S, … , 45N, 50N, 55N, 65N, 75N	151 – 177
175 E	55S, 50S, 45S, … , 45N, 50N, 55N	178 – 200
9. sáv		
60 N	180W, 175W, 170W, … , 165E, 170E, 175E	1 – 72
65 N	180W, 170W, 160W, … , 150E, 160E, 170E	73 – 108
70 N	180W, 170W, 160W, … , 150E, 160E, 170E	109 – 144
75 N	180W, 170W, 160W, … , 150E, 160E, 170E	145 – 180
85 N	180W, 150W, 120W, … , 90E, 120E, 150E	181 – 192
10. sáv		
60 S	180W, 175W, 170W, … , 165E, 170E, 175E	1 – 72
65 S	180W, 170W, 160W, … , 150E, 160E, 170E	73 – 108
70 S	180W, 170W, 160W, … , 150E, 160E, 170E	109 – 144
75 S	180W, 170W, 160W, … , 150E, 160E, 170E	145 – 180
85 S	170W, 140W, 110W, … , 100E, 130E, 160E	181 – 192

B-31. táblázat: Érvényességi időköz

Adat	Felhasznált bitek	Értéktartomány	Felbontás
Érvényességi időköz (V)	5	30 s-tól 960 s-ig	30 s

B-32. táblázat: Várakozási idő

Adat	Felhasznált bitek	Értéktartomány	Felbontás
Várakozási idő (L)	3	0 s-tól 120 s-ig	30 s

B-33. táblázat: A Rácspont Ionoszférikus Függőleges Hiba Jelzés /$GIVEI_i$/ kiértékelése

$GIVEI_i$	$\sigma^2_{i,GIVE}$
0	0,0084 m^2
1	0,0333 m^2
2	0,0749 m^2
3	0,1331 m^2
4	0,2079 m^2
5	0,2994 m^2
6	0,4075 m^2
7	0,5322 m^2
8	0,6735 m^2
9	0,8315 m^2
10	1,1974 m^2
11	1,8709 m^2
12	3.3260 m^2
13	20,787 m^2
14	187,0826 m^2
15	"Nem ellenőrzött"

3.5.4.7 *Teljesítőképesség csökkenési paraméterek.* A Teljesítőképesség csökkenési paraméterek, amikor használatosak, akkor a következőknek kell lenniük:

Gyors helyesbítési teljesítőképesség csökkenési tényező jelzés (ai_i): a gyors helyesbítési teljesítőképesség csökkenési tényezőnek (a_i) az i-ik műholdra vonatkozó jelzése, ahogy az a B-34. táblázatban leírásra került.

Megjegyzés. – Az ai_i még a gyors helyesbítések időhatár intervallumának meghatározására is használatos, ahogy az a 3.5.8.1.1 pontban leírásra került.

Rendszer várakozási idő (t_{lat}): a gyors helyesbítési teljesítőképesség csökkenés kezdete és a Felhasználói Differenciál Távolságmérési Hiba Jelzés /UDREI/ referencia ideje közötti időköz.

B_{rrc} : az a paraméter, amely korlátozza a zaj és kerekítési hibákat akkor, amikor a távolság meghatározási változás helyesbítés teljesítőképesség csökkenés számításra kerül a 3.5.5.6.2.2 pontban leírtak szerint.

C_{ltc_lsb}: a keringési pálya és az idő információk felbontóképessége miatti maximális kerekítési hiba.

C_{ltc_v1} : az idő és a keringési pálya sebesség különbségek miatt kihagyott közlemények maximális távolság meghatározási változás különbsége sebesség hiba korlátozása.
I_{ltc_v1} : a hosszútávú helyesbítések felfrissítési időköze, ha a sebességi kód = 1 (3.5.4.4.1).

C_{ltc_v0} : az a paraméter, amely két egymásra következő hosszútávú helyesbítés közötti különbséget határolja azokra a műholdakra, amelyeknek a sebesség kódja = 0.

I_{ltc_v0} : a hosszútávú közlemények minimális felfrissítési időköze, ha a sebességi kód = 0 (3.5.4.4.1).

C_{GEO_lsb} : a keringési pálya és az idő információk felbontóképessége miatti maximális kerekítési hiba.

C_{GEO_v} : az idő és a keringési pálya sebesség különbségek miatt kihagyott közlemények maximális távolság meghatározási változás különbsége sebesség hiba korlátozása.

I_{GEO} : a Geostacionárius pálya /GEO/ távolságmérési funkciós közleményeinek felfrissítési időköze.

B-34. táblázat: Gyors helyesbítési teljesítőképesség csökkenési tényező

Gyors helyesbítési teljesítőképesség csökkenési tényező jelzés (ai_i)	Gyors helyesbítési teljesítőképesség csökkenési tényező (a_i)
0	0,0 mm/s^2
1	0,05 mm/s^2
2	0,09 mm/s^2
3	0,12 mm/s^2
4	0,15 mm/s^2
5	0,20 mm/s^2
6	0,30 mm/s^2
7	0,45 mm/s^2
8	0,60 mm/s^2
9	0,90 mm/s^2
10	1,50 mm/s^2
11	2,10 mm/s^2
12	2,70 mm/s^2
13	3,30 mm/s^2
14	4,60 mm/s^2
15	5,80 mm/s^2

C_{er} : egy, a precíziós megközelítés / megközelítés – függőleges vezetés időzítésekhez felhasznált adatokon túli adatokhoz kapcsolódó megmaradó hiba korlátozása.

C_{iono_step} : az egymás után következő ionoszférikus rácspont késési értékei közötti különbség korlátozása.

I_{iono} : az ionoszférikus helyesbítési közlemények minimális felfrissítési időköze.

$C_{iono\ ramp}$ *:* az ionoszférikus helyesbítések változási sebessége.

RSS_{UDRE} *:* a hosszútávú helyesbítések maradékainak négyzetes középérték jelzése.

Kódolás: 0 = a helyesbítési maradékok lineárisan összegzettek
1 = a helyesbítési maradékok négyzetes középértékek

RSS_{iono} *:* az ionoszférikus maradékok négyzetes középérték jelzése.

Kódolás: 0 = a helyesbítési maradékok lineárisan összegzettek
1 = a helyesbítési maradékok négyzetes középértékek

$C_{covariance}$*:* Egy, a kvantálási hatás kiegyenlítésére használatos tényező, akkor, amikor a 28. típusú közlemény felhasználásra kerül.

1. Megjegyzés. – Az a_i *és a* t_{lat} *paraméterek 7. típusú közleményben kerülnek leadásra. Az összes többi paraméter 10. típusú közleményben kerül leadásra.*

2. Megjegyzés. – Ha a 28. típusú közlemény nem kerül leadásra, akkor a $C_{covariance}$ *nem alkalmazható.*

3.5.4.8 *Idő paraméterek.* Az idő paramétereknek, amikor használatosak, a következőknek kell lenniük:

Egyeztetett Világidő /UTC/ szabvány azonosító: az Egyeztetett Világidő /UTC/ referencia forrásának a jelzése a B-35. táblázatban meghatározottaknak megfelelően.

Globális Helymeghatározó Rendszer /GPS/ hét – idő számlálás: Az előző GPS hétről történő átállás óta eltelt idő másodperc száma (hasonló a 3.1.1.2.6.1 pontban megadott GPS paraméterrel, de 1-másodperc felbontású).

Globális Helymeghatározó Rendszer /GPS/ hét szám (hét számlálás): lásd a 3.1.1.2.6.2 pontot.

GLONASS jelzés: egy zászló jelzi azt, ha GLONASS idő paraméterek kerülnek biztosításra.

Kódolás: 0 = A GLONASS idő paraméterek nincsenek biztosítva.
1 = A GLONASS idő paraméterek biztosítva vannak.

B-35. táblázat: Egyeztetett Világidő /UTC/ szabvány azonosító

Egyeztetett Világidő /UTC/ szabvány azonosító	Egyeztetett Világidő /UTC/ szabvány
0	A Kommunikációs Kutatási Laboratórium, Tokyo, Japán, által kezelt Egyeztetett Világidő
1	Az Egyesült Államok Országos Szabványügyi és Technológiai Intézete által kezelt Egyeztetett Világidő
2	Az Egyesült Államok Tengerészeti Obszervatóriuma által kezelt Egyeztetett Világidő
3	A Nemzetközi Súly- és Mértékegység Hivatal által kezelt Egyeztetett Világidő
4	Az Egyeztetett Világidő Európai Laboratórium általi kezelésére fenntartva
5 – 6	Tartalék
7	Egyeztetett Világidő nincs biztosítva.

GLONASS idő eltolás ($\delta a_{GLONASS}$) : Egy, a GLONASS idő és a Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózati ideje közötti eltolás állandó részét képviselő paraméter.

Megjegyzés. – Ha a Műhold Bázisú Kiegészítő Rendszer /SBAS/ nem támasztja alá a GLONASS-t, akkor a $\delta a_{GLONASS}$ nem alkalmazható.

Egyeztetett Világidő /UTC/ paraméterek: Az A_{1SNT}, A_{0SNT}, t_{0t}, WN_t, Δt_{LS}, WN_{LSP}, DN és Δt_{LSF} azok, amelyek a 3.1.1.3.3.6 pontban leírásra kerültek, avval a kivétellel, hogy a Műhold Bázisú Kiegészítő Rendszer /SBAS/ paraméterek a Műhold Hálózat Időt /SNT/ vonatkoztatják az Egyeztetett Világidőhöz, nem pedig a Globális Helymeghatározó Rendszer /GPS/ idejét.

Megjegyzés. – Az összes paraméter 12. típusú közleményben kerül leadásra.

3.5.4.9 *Szolgáltatási körzet paraméterek.* A szolgáltatási körzet paramétereknek a következőknek kell lenniük:

Adatkibocsátás, szolgáltatás (IODS): annak jelzése, hogy a körzetben egy szolgáltatás változás kerül biztosításra.

A szolgáltatási közlemények száma: A különböző 27 típusú Műhold Bázisú Kiegészítő Rendszer szolgáltatási közlemény száma kerül leadásra. (az érték egy 1-es eltolással kerül kódolásra).

Szolgáltatási közlemény szám: A 27. típusú közlemény csomagon belül a pillanatnyilag adott közleményt azonosító sorszám (1.-től a szolgáltatási közlemények száma egy 1-es eltolással kerül kódolásra).

A körzetek száma: Azon szolgáltatási körzetek száma, amelyekre a közleményben koordináták kerülnek leadásra.

Elsőbbségi kód: A közlemény elsőbbségének jelzése, ha két közlemény átfedő körzeteket határoz meg. A magasabb értékű elsőbbségi kóddal rendelkező közlemény kapja az elsőbbséget. Amikor az elsőbbségi kód egyenlő, akkor az alacsonyabb Felhasználói Differenciál Távolságmérési Hiba Teljesítőképesség csökkenési tényezőjű (δUDRE) közlemény kapja az elsőbbséget.

δUDRE jelzés-belül: a körzeti Felhasználói Differenciál Távolságmérési Hiba Teljesítőképesség csökkenési tényező (δUDRE) jelzése, ami alkalmazható a közleményben – a B-36. táblázatnak megfelelően – meghatározott bármely körzeten belüli helyre.

δUDRE jelzés-kívül: a körzeti Felhasználói Differenciál Távolságmérési Hiba Teljesítőképesség csökkenési tényező (δUDRE) jelzése, ami alkalmazható az összes, a jelenleg adott 27. típusú közleményben – a B-36. táblázatnak megfelelően – meghatározott körzeten kívül levő helyre.

Koordináta, földrajzi szélesség: egy körzet sarkának földrajzi szélessége.

Koordináta, földrajzi hosszúság: egy körzet sarkának földrajzi hosszúsága.

A körzet alakja: annak a jelzése, hogy a körzet háromszög vagy négyszög alakú-e.

Kódolás: 0 = háromszög
1 = négyszög

1. Megjegyzés. – A Koordináta 3-nak Koordináta 1 földrajzi szélességi és Koordináta 2 földrajzi hosszúság koordinátája van. Ha egy terület négyszög alakú, akkor a Koordináta 4-nek Koordináta 2 földrajzi szélességű koordinátája és Koordináta 1 földrajzi hosszúsági koordinátája van. A körzet határát a kapcsolódó koordináták képezik az 1-2-3-1 sorrendben (háromszög), vagy az 1-3-2-4-1 sorrendben (négyszög). A határvonal szakaszoknak vagy azonos földrajzi szélességük, azonos földrajzi hosszúságuk van, vagy állandó lejtésű földrajzi szélességi fokokban/földrajzi hosszúsági fokokban megadott határvonala van. A földrajzi szélesség, vagy hosszúság változás bármilyen határvonal szakasz mentén két koordináta között ±180 foknál kevesebb.

2. Megjegyzés. – Az összes paraméter 27. típusú közleményben kerül továbbításra.

B-36. táblázat: Felhasználói Differenciál Távolságmérési Hiba

Teljesítőképesség csökkenési tényező /δUDRE/ jelzés kiértékelése

δUDRE jelzés	δUDRE
0	1
1	1,1
2	1,25
3	1,5
4	2
5	3
6	4
7	5
8	6
9	8
10	10
11	20
12	30
13	40
14	50
15	100

3.5.4.10 *Óra-efemerisz kovariancia mátrix paraméterek.* – Az óra-efemerisz kovariancia mátrix paramétereknek a következőknek kell lenni:

PRN maszk szám: Lásd a 3.5.4.1 pontot.

Lépték kitevő: A Cholesky faktorizációs elemek kódolására használatos lépték tényező kiszámításának együtthatója.

Cholesky Faktorizációs Elemek ($E_{i,j}$): Egy felső háromszög mátrix azon elemei, amelyek az információt az óra és efemerisz kovariancia mátrixban tömörítik. Ezek az elemek használatosak a Felhasználói Differenciál Távolságmérési Hiba (UDRE) becslés, teljesítőképesség csökkenési tényező (δUDRE) kiszámításához a felhasználó helyzetének függvényeként.

3.5.5 AZ ADATFELHASZNÁLÁSI PROTOKOLOK MEGHATÁROZÁSA

Megjegyzés. – Ez a rész azoknak a nem-légijármű fedélzeti, vagy légijármű fedélzeti alkotó-elemek paramétereinek a meghatározását adja meg, amelyek nem kerülnek továbbításra. Ezek a paraméterek, amelyek a Műhold Bázisú Kiegészítő Rendszerek /SBAS/ közötti együttműködő képesség biztosításához szükségesek, használatosak a navigációs megoldás és azok *sértetlenségének meghatározásához (védelmi szintek).*

3.5.5.1 *Geostacionárius pálya /GEO/ helyzet és óra*

3.5.5.1.1 *GEO helyzet számítás.* Egy Geostacionárius pálya számított helyzete bármely t_k időpontban a következő:

$$\begin{bmatrix}\hat{X}_G\\ \hat{Y}_G\\ \hat{Z}_G\end{bmatrix} = \begin{bmatrix}X_G\\ Y_G\\ Z_G\end{bmatrix} + \begin{bmatrix}\dot{X}_G\\ \dot{Y}_G\\ \dot{Z}_G\end{bmatrix}(t - t_{0,GEO}) + \frac{1}{2}\begin{bmatrix}\ddot{X}_G\\ \ddot{Y}_G\\ \ddot{Z}_G\end{bmatrix}(t - t_{0,GEO})^2$$

3.5.5.1.2 *GEO óra helyesbítés.* Az óra helyesbítést egy Műhold Bázisú Kiegészítő Rendszerű /SBAS/ Geostacionárius pályájú /GEO/ műhold *i*-re a következő egyenletnek megfelelően kell alkalmazni:

$$t = t_G - \Delta t_G$$

ahol:

t	= SBAS hálózati idő;
t_G	= a GEO kód fázis ideje a közlemény továbbításának időpontjában; és
Δt_G	= a GEO kód fázis eltolása.

3.5.5.1.2.1 A Geostacionárius pálya /GEO/ kód fázis eltolása (Δt_G) bármely *t* időpontban a következő:

$$\Delta t_G = a_{Gf0} + a_{Gf1}(t - t_{0,GEO})$$

ahol: $(t - t_{0,GEO})$ a nap-vége átmenetre van helyesbítve.

3.5.5.2 *Hosszútávú helyesbítések*

3.5.5.2.1 *Globális Helymeghatározó Rendszer /GPS/ óra helyesbítés.* Az óra helyesbítést egy Globális Helymeghatározó Rendszer /GPS/ műhold *i*-re a következő egyenletnek megfelelően kell alkalmazni:

$$t = t_{SV,i} - [(\Delta t_{SV,i})_{L1} + \delta\Delta t_{SV,i}]$$

ahol:

t	=	A Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózat ideje;
$t_{SV,i}$	=	A Globális Helymeghatározó Rendszer /GPS/ műhold ideje a közlemény továbbításakor;
$(\Delta t_{SV,i})_{L1}$	=	A műhold Ál-véletlen zaj /PRN/ kódjainak fázis eltolása, ahogy az a 3.1.2.2 pontban meghatározásra került; és
$\delta\Delta t_{SV,i}$	=	A kód fázis eltolási helyesbítése.

3.5.5.2.1.1 Az óra idő hiba számítás ($\delta\Delta t_{SV,i}$) a Globális Helymeghatározó Rendszer /GPS/ vagy Műhold Bázisú Kiegészítő Rendszerű /SBAS/ műhold *i* -re a nap bármely t_k időpontjában a következő:

$$\delta\Delta t_{SV,i} = \delta a_{i,f0} + \delta a_{i,f1}(t_k - t_{i,LT})$$

3.5.5.2.2 *GLONASS óra helyesbítés.* Az *i* GLONASS műhold óra helyesbítését a következő képlet szerint kell alkalmazni:

$$t = t_{SV,i} + \tau_n(t_b) - \gamma_n(t_b)(t_{SV,i} - t_b) - \delta\Delta t_{SV,i}$$

ahol:

t	=	A Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózat
$t_{SV,i}$	=	A GLONASS műhold ideje a közlemény továbbításakor
t_b, $\tau_n(t_b)$, $\gamma_n(t_b)$	=	GLONASS idő paraméterek, ahogy zok a 3.2.2.2 pontban meghatározásra kerültek
$\delta\Delta t_{SV,i}$	=	A kód fázis eltolás helyesbítése

A kód fázis eltolás helyesbítése a $\delta\Delta t_{SV,i}$ az *i* GLONASS műholdra:

$$\delta\Delta t_{SV,i} = \delta a_{i,f0} + \delta a_{i,f1}(t - t_{i,LT}) + \delta a_{i,GLONASS}$$

ahol a $(t - t_{i,LT})$ a nap-vége átmenetre van helyesbítve. Ha a sebesség kód = 0, akkor a $\delta a_{i,f1} = 0$.

3.5.5.2.3 *Műhold helyzet helyesbítés.* Az SBAS-helyesbített vektor egy műhold helyzetsor rendszerű, vagy SBAS műhold *i*-re a *t* időpontjában a következő:

$$\begin{bmatrix} x_i \\ y_i \\ z_i \end{bmatrix}_{\text{helyesbített}} = \begin{bmatrix} x_i \\ y_i \\ z_i \end{bmatrix} + \begin{bmatrix} \delta x_i \\ \delta y_i \\ \delta z_i \end{bmatrix} + \begin{bmatrix} \delta \dot{x}_i \\ \delta \dot{y}_i \\ \delta \dot{z}_i \end{bmatrix} (t - t_{i,LT})$$

ahol:

$(t - t_{i,LT})$ a nap-vége átmenetre van helyesbítve; és

$[x_i\ y_i\ z_i]^T$ = a műhold helyzetsor rendszerű, vagy SBAS műhold helyzet vektora, ahogy az a 3.1.2.3, 3.2.2.3 és 3.5.5.1.1 pontokban meghatározásra került.

Ha a sebesség kód = 0, akkor $\begin{bmatrix} \delta \dot{x}_i & \delta \dot{y}_i & \delta \dot{z}_i \end{bmatrix}^T = \begin{bmatrix} 0 & 0 & 0 \end{bmatrix}^T$.

3.5.5.3 *Pszeudo-távolság helyesbítések.* A helyes letelt pszeudo-távolság a *t* időpontban az *i* műholdra a következő:

$$PR_{i,\text{helyesbített}} = PR_i + FC_i + RRC_i\,(t - t_{i,0f}) + IC_i + TC_i$$

Ahol:

PR_i	=	A mért pszeudo-távolság a műhold óra helyesbítés alkalmazása után;
FC_i	=	A gyors helyesbítés;
RRC_i	=	A távolság-meghatározási változás helyesbítés;
IC_i	=	Az ionoszférikus helyesbítés;
TC_i	=	A troposzférikus helyesbítés (a negatív érték a troposzféra késleltetést jelenti); és
$t_{i,0f}$	=	A legújabb gyors helyesbítés felhasználhatósági ideje, ami a Műhold Hálózat Idő másodperc ’korszakának’ a kezdete, ami egybeesik az SBAS műholdnál a közlemény blokk első jeleinek továbbításával.

3.5.5.4 *Távolság-meghatározási változás helyesbítése (RRC).* A Távolság-meghatározási változás helyesbítés az *i* műholdra a következő:

$$RRC_i = \frac{FC_{i,current} - FC_{i,previous}}{t_{i,0f} - t_{i,0f\_previous}}$$

Ahol:

$FC_{i,current}$ /jelenlegi/	=	A legújabb gyors helyesbítés;
$FC_{i,previous}$ /előző/	=	Az előző gyors helyesbítés;
$t_{i,0f}$	=	Az $FC_{i,current}$ felhasználhatósági ideje;
$t_{i,0f\_previous}$ /előző/	=	Az $FC_{i,previous}$ felhasználhatósági ideje.

3.5.5.5 *Sugárzott iooszférikus helyesbítések*

3.5.5.5.1 *Az Ionoszférikus behatolási pont (IPP) helye.* Egy Ionoszférikus behatolási pont (IPP) helye úgy került meghatározásra, hogy az a vevőtől a műholdhoz vezető vonalszakasznak és a WGS-84 ellipszoid felett állandó 350 km-es magasságon lévő ellipszoidnak a metszéspontja. A hely WGS-84 földrajzi szélességben (ϕ_{pp}) és földrajzi hosszúságban (λ_{pp}) van meghatározva.

3.5.5.5.2 *Ionoszférikus helyesbítés.* Az ionoszférikus helyesbítés az *i* műholdra a következő:

$$IC_i = -F_{pp}\,\tau_{vpp}$$

Ahol:

F_{pp}	=	Az elhajlási tényező = ; $\left[1-\left(\frac{R_e\cos\theta_i}{R_e+h_1}\right)^2\right]^{-\frac{1}{2}}$
τ_{vpp}	=	Az interpolált függőleges ionoszférikus késés kiszámítás (3.5.5.5.3);
R_e	=	6 378,1363 km;
θ_i	=	Az *i* műhold magassági szöge; és
h_I	=	350 km

Megjegyzés. – A GLONASS műholdakra az (IC_i) ionoszférikus helyesbítést a GLONASS-GPS frekvenciák arányának $(f_{GLONASS}/f_{GPS})^2$ *négyzetével kell szorozni.*

3.5.5.5.3 *Interpolált függőleges ionoszférikus késés kiszámítás*

Amikor négy pont kerül az interpolálásnál felhasználásra, akkor az interpolált függőleges ionoszférikus késés kiszámítás a földrajzi szélességnél ϕ_{pp} és a földrajzi hosszúságnál λ_{pp} a következő:

$$\tau_{vpp} = \sum_{k-1}^{4} W_k \tau_{vk}$$

ahol:

τ_{vk} : a sugárzási hálózati pont függőleges késési értékei az Ionoszférikus Rácspont /IGP/ rács k-dik sarkánál, hogy az a B-13. ábrán bemutatásra kerül.

$W_1 = x_{pp}\, y_{pp}$

$W_2 = (1 - x_{pp})\, y_{pp}$

$W_3 = (1 - x_{pp})\,(1 - y_{pp})$

$W_4 = x_{pp}\,(1 - y_{pp})$

3.5.5.5.3.1 Az N85° és az S85° közötti Ionoszférikus behatolási pontokra:

$$x_{pp} = \frac{\lambda_{pp} - \lambda_1}{\lambda_2 - \lambda_1}$$

$$y_{pp} = \frac{\phi_{pp} - \phi_1}{\phi_2 - \phi_1}$$

ahol:
λ_1 = az Ionoszférikus Rácspontok /IGP/ földrajzi hosszúsága az Ionoszférikus behatolási ponttól /IPP/ nyugatra;
λ_2 = az IGP földrajzi hosszúsága az IPP-től keletre;
ϕ_1 = az Ionoszférikus Rácspontok /IGP/ földrajzi szélessége az Ionoszférikus behatolási ponttól /IPP/ délre;
ϕ_2 = az IGP földrajzi szélessége az IPP-től északra.

Megjegyzés. – Ha a λ_1 és λ_2 a földrajzi hosszúságban 180 fokban keresztező, akkor az x_{pp} számításnál figyelembe kell venni a megszakítást a földrajzi hosszúság értékeknél.

3.5.5.5.3.2 Az N85°-tól északra, vagy az S85°-tól délre lévő Ionoszférikus behatolási pontokra /IPP/:

$$y_{pp} = \frac{|\phi_{pp} - \phi_1|}{10^\circ}$$

$$x_{pp} = \frac{\lambda_{pp} - \lambda_3}{90^\circ} \times (1 - 2\, y_{pp}) + y_{pp}$$

ahol:
λ_1 = az Ionoszférikus behatolási ponttól /IPP/ keletre lévő második Ionoszférikus Rácspont /IGP/ földrajzi hosszúsága;
λ_2 = az IPP-től nyugatra lévő második IGP földrajzi hosszúsága;
λ_3 = az IPP-től nyugatra lévő legközelebbi IGP földrajzi hosszúsága;
λ_4 = az IPP-től keletre lévő legközelebbi IGP földrajzi hosszúsága.

Amikor az interpoláláshoz három pont kerül felhasználásra, akkor az interpolált függőleges ionoszférikus késés kiszámítás a következő:

3.5.5.5.3.3 Az S75°és N75° közötti pontokra:

$$\tau_{vpp} = \sum_{k=1}^{3} W_k \tau_{vk}$$

ahol:
$W_1 = y_{pp}$;
$W_2 = 1 - x_{pp} - y_{pp}$; és
$W_3 = x_{pp}$.

3.5.5.5.3.4 Az x_{pp} és az y_{pp} úgy kerül kiszámításra, ahogy az a négy-pontos interpolációnál van, kivéve azt, hogy a λ_1 és ϕ_1 mindig az IGP2 földrajzi hosszúsága és földrajzi szélessége, és a λ_2 és ϕ_2

a másik földrajzi hosszúság és földrajzi szélesség. Az IGP2 mindig a három pont által meghatározott háromszög átfogójával szemben lévő csúcs, az 1. Ionoszférikus Rácspontnak /IGP1/ ugyanaz a földrajzi hosszúsága, mint az IGP2-nek, és az IGP3-nak ugyanaz a földrajzi szélessége, mint az IGP2-nek (a B-14. ábrán egy példa került bemutatásra).

3.5.5.5.3.5 Az N75°-tól északra és az S75°-tól délre lévő pontokra a három-pontos interpoláció nincs biztosítva.

3.5.5.5.4 *Az Ionoszférikus Rácspontok /IGP-k/ kiválasztása.* Az Ionoszférikus Rácspontok kiválasztásának protokolja a következő:

a) Az N60° és S60° közötti Ionoszférikus behatolási pontokra /IPP/:

1) amikor négy Ionoszférikus Rácspont /IGP/ egy 5-fokszor 5-fokos cellát határoz meg az Ionoszférikus behatolási pont /IPP/ körül, az IGP maszkban "1" van állítva, akkor ezek kiválasztásra kerültek; vagy

2) amikor bármilyen három IGP egy 5-fokszor 5-fokos háromszöget határoz meg, ami körülhatárolja az IPP-t, az IGP maszkban "1" van állítva, akkor ezek kiválasztásra kerültek; vagy

3) amikor bármely négy Ionoszférikus Rácspont /IGP/ egy 10-fokszor 10-fokos cellát határoz meg az Ionoszférikus behatolási pont /IPP/ körül, az IGP maszkban "1" van állítva, akkor ezek kiválasztásra kerültek; vagy
4) amikor bármilyen három IGP egy 10-fokszor 10-fokos háromszöget határoz meg, ami körülhatárolja az IPP-t, az IGP maszkban "1" van állítva, akkor ezek kiválasztásra kerültek; vagy

5) egy ionoszférikus helyesbítés nem áll rendelkezésre.

b) Egy, az N60° és N75°, vagy az S60° és S75° közötti IPP-kre:

1) amikor négy Ionoszférikus Rácspont /IGP/ egy 5-fokos földrajzi szélességű és 10-fokos földrajzi hosszúságú cellát határoz meg az Ionoszférikus behatolási pont /IPP/ körül, az IGP maszkban "1" van állítva, akkor ezek kiválasztásra kerültek; vagy

2) amikor bármilyen három IGP egy 5-fokos földrajzi szélességű és 10-fokos földrajzi hosszúságú háromszöget határoz meg, ami körülhatárolja az IPP-t, az IGP maszkban „1" van állítva, akkor ezek kiválasztásra kerültek; vagy

3) amikor bármely négy Ionoszférikus Rácspont /IGP/ egy 10-fokszor 10-fokos cellát határoz meg az Ionoszférikus behatolási pont /IPP/ körül, az IGP maszkban „1" van állítva, akkor ezek kiválasztásra kerültek; vagy

4) amikor bármilyen három IGP egy 10-fokszor 10-fokos háromszöget határoz meg, ami körülhatárolja az IPP-t, az IGP maszkban „1" van állítva, akkor ezek kiválasztásra kerültek; vagy

5) egy ionoszférikus helyesbítés nem áll rendelkezésre.

c) Egy, az N75° és N85°, vagy az S75° és S85° közötti Ionoszférikus behatolási pontra /IPP/:

1) Amikor a két legközelebbi Ionoszférikus Rácspont /IGP/ a 75°-nál van, és a két legközelebbi IGP a 85°-nál van (30°-os földrajzi hosszúsági elkülönítéssel, ha a 9., vagy a 10. sáv használatos, az egyéb esetekben 90°-kal elkülönítve), és az IGP maszk „1"-re van állítva, akkor egy 10-fokszor 10-fokos cella van lineárisan interpolálva a 85°-os Ionoszférikus Rácspontok között azért, hogy olyan virtuális Ionoszférikus Rácspontokat adjon a földrajzi hosszúságoknál, ami egyenlő a 75°-nál lévő Ionoszférikus Rácspontok földrajzi hosszúságával; vagy

2) egy ionoszférikus helyesbítés nem áll rendelkezésre.

d) Egy, az N85°-tól északra eső Ionoszférikus behatolási pontra /IPP/:

1) amikor a négy Ionoszférikus Rácspont /IGP/ az N85° földrajzi szélességnél és a W180°, W90°, 0° és E90°-nál van, és az IGP maszkban az „1” van beállítva, akkor ezek kiválasztásra kerültek, vagy

2) egy ionoszférikus helyesbítés nem áll rendelkezésre.

e) Egy, az S85°-tól délre eső Ionoszférikus behatolási pontra /IPP/:

1) amikor a négy Ionoszférikus Rácspont /IGP/ az S85° földrajzi szélességnél és a W140°, W50°, E40° és E130°-nál van, és az IGP maszkban az „1” van beállítva, akkor ezek kiválasztásra kerültek, vagy

2) egy ionoszférikus helyesbítés nem áll rendelkezésre.

Megjegyzés. – Ez a kiválasztás csak a maszkban biztosított információn alapszik, tekintet nélkül arra, hogy a kiválasztott Ionoszférikus Rácspont /IGP/ ellenőrzött, „Nem-ellenőrzött” vagy „Ne használja” helyzetű. Ha a kiválasztott IGP-k bármelyike „Ne használja” helyzetűként kerül azonosításra, akkor az ionoszférikus helyesbítés nem áll rendelkezésre. Ha négy Ionoszférikus Rácspont került kiválasztásra, és a négyből egy „Nem-ellenőrzött” helyzetűként kerül azonosításra, akkor a hárompontos interpoláció kerül alkalmazásra, ha az Ionoszférikus Rácspont azon a háromszögű területen belül van, amelyet a biztosított három helyesbítés lefed.

3.5.5.6 *Védelmi szintek.* A vízszintes védelmi szint (HPL) és a függőleges védelmi szint (VPL) a következő:

$$HPL_{SBAS} = \begin{cases} K_{H,NPA} \times d_{major} & \text{Az útvonalra a nem-precíziós megközelítési (NPA) módokig} \\ K_{H,PA} \times d_{major} & \text{A precíziós megközelítési (PA) és a függőleges vezetéses megközelítési módokra (APV), és} \end{cases}$$

$$VPL_{SBAS} = K_{V,PA} \times d_V$$

ahol:

$$d_V^2 = \sum_{i=1}^{N} s_{v,i}^2 \, \sigma_i^2$$

= Az a négyzetes középérték eloszlási model, ami összeköti a valódi hiba eloszlást a függőleges tengelyben;

$$d_{major} = \sqrt{\frac{d_x^2 + d_y^2}{2} + \sqrt{\left(\frac{d_x^2 - d_y^2}{2}\right) + (d_{xy})^2}}$$

ahol:

$d_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma$ = Az a négyzetes középérték eloszlási model, ami összeköti a valódi hiba eloszlást az x - tengelyben;

$d_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma$ = Az a négyzetes középérték eloszlási model, ami összeköti a valódi hiba eloszlást az y - tengelyben;

$d_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,}$ = Kovariancia eloszlási model az x- és y-tengelyben;

Ahol:

$s_{x,i}$ = Az x-irány helyzet hibáinak parciális deriváltja az i-ik műhold pszeudo- távolság hibájára vonatkozóan;

$s_{y,i}$ = Az y-irány helyzet hibáinak parciális deriváltja az i-ik műhold pszeudo- távolság hibájára vonatkozóan;

$s_{V,i}$ = A fügőleges irány helyzet hibáinak parciális deriváltja az i-ik műhold pszeudo-távolság hibájára vonatkozóan; és

$\sigma^2_i = \sigma^2_{i,flt} + \sigma^2_{i,UIRE} + \sigma^2_{i,air} + \sigma^2_{i,tropo}$.

A ($\sigma^2_{i,flt}$ és $\sigma^2_{i,UIRE}$) négyzetes középértékek a 3.5.5.6.2 és 3.5.5.6.3.1 pontokban kerültek meghatározásra. A ($\sigma^2_{i,air}$ és $\sigma^2_{i,tropo}$) paramétereket a légijármű fedélzeti elemek határozzák meg (3.5.8.4.2 és 3.5.8.4.3).

Az x- és y-tengelyek a helyi vízszintes síkban lévőként kerültek meghatározásra, és a v-tengely jelenti a helyi függőlegest.

Egy általános legkisebb-négyzetek helyzet megoldásként, az S mátrix vetülete a következő:

$$S \equiv \begin{bmatrix} S_{x,1} & S_{x,2} & \cdots & S_{x,N} \\ S_{y,1} & S_{y,2} & \cdots & S_{y,N} \\ S_{v,1} & S_{v,2} & \cdots & S_{v,N} \\ S_{t,1} & S_{t,2} & \cdots & S_{t,N} \end{bmatrix} = (G^T \times W \times G)^{-1} \times G^T \times W$$

ahol:

G_i = [$-\cos El_i \cos Az_i$ $-\cos El_i \sin Az_i$ $-\sin El_i$ 1] = a G i-dik sora;

$$W^{-1} = \begin{bmatrix} w_1 & 0 & \dots & 0 \\ 0 & w_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & & \dots & w_i \end{bmatrix};$$

El_i = az i-dik távolságmérési forrás magassági szöge (fokokban);

Az_i = az i-dik távolságmérési forrás oldalszöge az x-tengelytől az óramutató járásával ellentétes irányban mérve, fokokban; és
w_i = az *i* műholdhoz kapcsolódó inverz súlyozás.

1. Megjegyzés. – Az olvashatóság növelése érdekében az i *indexek a védő mátrixok egyenleteiből elhagyásra kerültek.*

2. Megjegyzés. – A súlyozatlan legkisebb négyzetek megoldásáért, a súlyozási mátrix egy azonosító mátrix (w_i = 1).

3.5.5.6.1 *A 'K' értékek meghatározása.* A 'K' értékek az alábbiak:

$$K_{H,NPA} = 6{,}18;$$
$$K_{H,PA} = 6{,}0; \text{ és}$$
$$K_{V,PA} = 5{,}33.$$

3.5.5.6.2 *A gyors és hosszútávú helyesbítési hiba model meghatározása.* Amikor gyors és hosszútávú helyesbítések /Geostacionárius pálya /GEO/ távolságmérési paraméterek alkalmazásra kerülnek, és a teljesítőképesség csökkenési paraméterek is alkalmazottak, akkor:

$$\sigma^2_{i,flt} = \begin{cases} [(\sigma_{i,UDRE})(\delta_{UDRE}) + \varepsilon_{fc} + \varepsilon_{rrc} + \varepsilon_{ltc} + \varepsilon_{er}]^2, & \text{ha } RSS_{UDRE} = 0 \text{ (10. típusú közlemény)} \\ [(\sigma_{i,UDRE})(\delta_{UDRE})]^2 + \varepsilon^2_{fc} + \varepsilon^2_{rrc} + \varepsilon^2_{ltc} + \varepsilon^2_{er}, & \text{ha } RSS_{UDRE} = 1 \text{ (10. típusú közlemény)} \end{cases}$$

Ahol:
Ha a 27. típusú közleményt használják, akkor a δ_{UDRE} egy körzeti – fajlagos tényező, ahogy az a 3.5.4.9 részben meghatározásra került.
Ha a 28. típusú közleményt használják, akkor a δ_{UDRE} egy műhold – fajlagos tényező, ahogy az a 3.5.5.6.2.5 részben meghatározásra került.
Ha egyik közleményt sem használják, akkor a $\delta_{UDRE} = 1$.

Amikor a gyors és hosszútávú helyesbítések/Geostacionárius pálya /GEO/ távolságmérési paraméterek nem kerülnek alkalmazásra, és a teljesítőképesség csökkenési paraméterek sem alkalmazottak, akkor:

$$\sigma^2_{i,flt} = [\,(\sigma_{i,UDRE})\,(\delta_{UDRE}) + 8 \text{ m}\,]^2 .$$

Amikor a gyors helyesbítések, vagy a hosszútávú helyesbítések/Geostacionárius pálya /GEO/ távolságmérési paraméterek nem kerülnek egy műholdra alkalmazásra, vagy ha egy 28. típusú efemerisz kovariancia közlemény nem kerül vételre a műholdra vonatkozóan, de vételre kerül egy aktív 28. típusú közlemény egy eltérő műholdra vonatkozóan, akkor :

$$\sigma^2_{i,flt} = (60)^2 \text{ m}^2 .$$

3.5.5.6.2.1 *Gyors helyesbítés teljesítőképesség csökkenés.* A teljesítmény-csökkenési paraméter a gyors helyesbítési adatokra a következő:

$$\varepsilon_{fc} = \frac{a\,(t - t_u + t_{lat})^2}{2}$$

ahol:
t = A pillanatnyi idő;
t_u = (Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDREI_i$/ referencia idő): Ha az Adatkibocsátás Gyors Helyesbítés /$IODF_j$/ ≠ 3, a Műhold Hálózat Idő /SNT/ 1-másodperces korszakának kezdési ideje egybeesik annak a közlemény blokknak a továbbítása kezdetével, ami

magába foglalja a legutolsó $UDREI_i$ adatait (2.-tól 6.-ig típusú, vagy 24. típusú közlemények), ami az $IODF_j$ -t a használatos gyors helyesbítéshez illeszti. Ha az $IODF_j$ = 3-al, az SNT 1-másodperces korszakának kezdési ideje egybeesik annak a közleménynek a továbbításával, amely az i-dik műholdra a gyors helyesbítést magába foglalja; és

t_{lat} = (Ahogy az a 3.5.4.7 pontban meghatározásra került.)

Megjegyzés. – A 2.-tól az 5.-ig típusú és a 24. típusú közleményekben továbbított Felhasználói Differenciál Távolságmérési Hibáknál /UDREs/ a t_u egyenlő a gyors helyesbítés alkalmazhatósági idejével, mivel azok ugyanabban a közleményben vannak. A 6. típusú közleményben továbbított UDRE-k és ha az Adatkibocsátás Gyors Helyesbítés /IODF/ = 3, akkor a t_u ugyancsak egyenlő a gyors helyesbítések (t_{0f}) alkalmazhatósági idejével. A 6. típusú közleményben továbbított UDRE-k és ha az IODF ≠ 3, akkor a t_u úgy van meghatározva, hogy az a 6. típusú közlemény első bitjének továbbítási ideje a Geostacionárius pályánál /GEO/.

3.5.5.6.2.2 *Távolság meghatározási változás /RRC/ helyesbítés teljesítőképesség csökkenés*

3.5.5.6.2.2.1 Ha az RRC = 0, akkor $\varepsilon_{rrc} = 0$.

3.5.5.6.2.2.2 Ha az RRC ≠ 0 és az Adatkibocsátás Gyors Helyesbítés /IODF/ ≠ 3, akkor a teljesítőképesség csökkenés a gyors helyesbítési adatokra a következő:

$$\varepsilon_{rrc} = \begin{cases} 0, & \text{ha } (IODF_{current} - IODF_{previous}) \text{MOD } 3 = 1 \\ \left(\frac{aI_{fc}}{4} + \frac{B_{rrc}}{\Delta t}\right)(t - t_{0f}) & \text{ha } (IODF_{current} - IODF_{previous}) \text{MOD } 3 \neq 1 \end{cases}$$

/current = jelenlegi; previous = előző/

3.5.5.6.2.2.3 Ha az RRC ≠ 0 és az IODF = 3, akkor a teljesítőképesség csökkenés a távolság adatokra a következő:

$$\varepsilon_{rrc} = \begin{cases} 0, & \text{ha } \left|\Delta t - \frac{I_{fc}}{2}\right| = 0 \\ \left(\frac{a\left|\Delta t - \frac{I_{fc}}{2}\right|}{2} + \frac{B_{rrc}}{\Delta t}\right)(t - t_{0f}) & \text{ha } \left|\Delta t - \frac{I_{fc}}{2}\right| \neq 0 \end{cases}$$

ahol**:**

t	=	A jelenlegi idő;
$IODF_{current}$	=	A legújabb gyors helyesbítéshez kapcsolódó Adatkibocsátás – Gyors

		helyesbítés /IODF/
$IODF_{previous}$	=	Az előző gyors helyesbítéshez kapcsolódó IODF
Δt	=	$t_{i,0f} - t_{i,0f\_previous}$; és
I_{fc}	=	A felhasználó időzítési intervalluma a gyors helyesbítésekre.

3.5.5.6.2.3 *Hosszútávú helyesbítés teljesítőképesség csökkenés*

3.5.5.6.2.3.1 *Műhold helyzetsor rendszere(k)*

3.5.5.6.2.3.1.1 A sebesség kód = 1-re, a teljesítőképesség csökkenés a hosszútávú helyesbítésekre az *i* műholdra a következő:

$$\varepsilon_{ltc} = C_{ltc\_lsb} + C_{ltc\_v1} \max(0, t_{i,LT} - t, t - t_{i,LT} - I_{ltc\_v1})$$

3.5.5.6.2.3.1.2 A sebesség kód = 0-ra, a teljesítőképesség csökkenés a hosszútávú helyesbítésekre:

$$\varepsilon_{ltc} = C_{ltc\_v0} \left\lfloor \frac{t - t_{ltc}}{I_{lt-v0}} \right\rfloor$$

ahol:
t = a jelenlegi idő;
t_{ltc} = a Geostacionárius Pálya /GEO/ hosszútávú helyesbítési közleménye első bitjének továbbítási ideje; és
[x] = az *x* -nél kisebb legnagyobb egészszám.

3.5.5.6.2.3.2 *Geostacionárius pályájú műholdak.* A teljesítőképesség csökkenési paraméter a hosszútávú helyesbítésekre a következő:

$$\varepsilon_{ltc} = C_{geo\_lsb} + C_{geo\_v} \max(0, t_{0,GEO} - t, t - t_{0,GEO} - I_{GEO})$$

ahol: t = a jelenlegi idő.

3.5.5.6.2.4 *Teljesítőképesség csökkenés az útvonalról a nem-precíziós megközelítésekig*

$$\varepsilon_{er} = \begin{cases} 0, & \text{Amikor sem gyors, sem hosszútávú helyesbítések nincsenek időzítve a precíziós megközelítésre} \\ C_{er}, & \text{Amikor gyors és hosszútávú helyesbítések vannak időzítve a precíziós megközelítésekre} \end{cases}$$

3.5.5.6.2.5 *Felhasználói Differenciál Távolságmérési Hiba /UDRE/ teljesítőképesség csökkenési tényező a 28. típusú közlemény adatokkal számolva.* A δUDRE a következő:

$$\delta_{UDRE} = \sqrt{I^T \cdot C \cdot I} + \varepsilon_c$$

ahol:

$$I = \begin{bmatrix} i_x \\ i_y \\ i_z \\ 1 \end{bmatrix},$$

$$\begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix} =$$ egység-vektor a felhasználótól a műholdig a WGS-84 ECEF koordináta rendszerben.

$C = R^T \cdot R$

$\varepsilon_C = C_{kovariancia} \cdot SF$

$SF = 2^{\text{rendű exponenciális} - 5}$

$R = E \cdot SF$

$$E = \begin{bmatrix} E_{1,1} & E_{1,2} & E_{1,3} & E_{1,4} \\ 0 & E_{2,2} & E_{2,3} & E_{2,4} \\ 0 & 0 & E_{3,3} & E_{3,4} \\ 0 & 0 & 0 & E_{4,4} \end{bmatrix}$$

3.5.5.6.3 *Az ionoszférikus helyesbítési hiba modell meghatározása*

3.5.5.6.3.1 *Adási ionoszférikus helyesbítések.* Amikor Műhold Bázisú Kiegészítő Rendszerű /SBAS/-bázisú ionoszférikus helyesbítések kerülnek alkalmazásra, akkor a σ^2_{UIRE} a következő:

$\sigma^2_{UIRE} = F^2_{pp} \times \sigma^2_{UIVE}$

ahol:

F_{pp} = (ahogy a 3.5.5.5.2 pontban meghatározásra került);

$\sigma^2_{UIVE} = \sigma^2_{UIVE} = \sum_{n=1}^{4} W_n \cdot \sigma^2_{n,ionogrid}$ vagy $\sigma^2_{UIVE} = \sigma^2_{UIVE} = \sum_{n=1}^{3} W_n \cdot \sigma^2_{n,ionogrid}$

ugyanazt az ionoszférikus behatolási pont súlyozást (W_n) és a kiválasztott hálózati pontokat felhasználva az ionoszférikus helyesbítésre (3.5.5.5). Az egyes hálózati pontokra ez:

$$\sigma^2_{i,\,ionogrid} = \begin{cases} (\sigma_{GIVE} + \varepsilon_{iono})^2, & \text{ha } RSS_{iono} = 0 \text{ (10. típusú közlemény)} \\ \sigma^2_{GIVE} + \varepsilon^2_{iono}, & \text{ha } RSS_{iono} = 1 \text{ (10. típusú közlemény)} \end{cases}$$

ahol:

$$\varepsilon_{iono} = C_{iono\_step} \left\lfloor \frac{t - t_{iono}}{I_{iono}} \right\rfloor + C_{iono\_ramp}(t - t_{iono});$$

t = a jelenlegi idő;

t_{ltc} = a Geostacionárius Pálya /GEO/ ionoszférikus helyesbítési közleménye első bitjének továbbítási ideje; és

[x] = az *x* -nél kisebb legnagyobb egészszám.

Megjegyzés. – A GLONASS műholdakra, mind a σ_{GIVE}, mind a σ_{IONO} paramétereket meg kell szorozni a GLONASS – GPS frekvenciák $(f_{GLONASS}/f_{GPS})^2$ arányának négyzetével.

3.5.5.6.3.2 *Ionoszférikus helyesbítések.* Amikor Műhold Bázisú Kiegészítő Rendszerű /SBAS/-alapú ionoszférikus helyesbítéseket nem alkalmazzák, akkor a σ^2_{UIRE} a következő:

$$\sigma^2_{UIRE} = MAX\left\{\left(\frac{T_{iono}}{5}\right)^2, (F_{pp} \cdot \tau_{vert})^2\right\}$$

ahol:
T_{iono} = a kiválasztott model szerint számított ionoszférikus késés (GPS helyesbítés, vagy más modell);

F_{pp} = (ahogy a 3.5.5.5.2 pontban meghatározásra került);

$$\tau_{vert} = \begin{cases} 9\text{ m}, & 0 \le |\phi_{pp}| \le 20 \\ 4.5\text{ m}, & 20 < |\phi_{pp}| \le 55; \\ 6\text{ m}, & 55 < |\phi_{pp}| \end{cases}$$; és

ϕ_{pp} = az ionoszférikus behatolási pont földrajzi szélessége.

3.5.5.6.3.3 *GLONASS óra.* A GLONASS óra helyesbítés teljesítőképesség csökkenés paraméter a következő:

$$\varepsilon_{GLONASS\_CLOCK} = C_{GLONASS\_CLOCK} \bullet [t - t_{GLONASS\_CLOCK}]$$

ahol
t = a jelenlegi idő;
$t_{GLONASS\_CLOCK}$ = a Geostacionárius pályánál /GEO/ az időmérési közlemény (MT12) első bitjének továbbítási ideje;
[sc] = az sc-nél kisebb legnagyobb egészszám.

1. Megjegyzés. – A nem-GLONASS műholdakra az $\varepsilon_{GLONASS\_CLOCK}$ = 0.

2. Megjegyzés. – A $C_{GLONASS\_CLOCK}$ = 0,00833 cm/s.

3.5.6 KÖZLEMÉNY TÁBLÁZATOK

Az egyes Műhold Bázisú Kiegészítő Rendszer /SBAS/ közleményeket a B-37. táblázattól a B-53. táblázatig terjedően meghatározott megfelelő közlemény formátummal megegyezően kell kódolni. Az ezekben a táblázatokban lévő összes előjeles paramétert kettős kiegészítővel kell feltűntetni úgy, hogy az előjel bit foglalja el a Legnagyobb Helyértékű Bitet /MSB/.

Megjegyzés. – Az előjeles paraméterek értéktartománya kisebb, mint a jelzett, mivel a maximális pozitív érték egy értékkel kevesebbre van leszűkítve (a jelzett érték mínusz a felbontás).

B-37. táblázat: 0. típus „Ne használja” közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Tartalék	212	—	—

B-38. táblázat: 1. típus Ál-véletlen zaj /PRN/ maszk közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
A 210 PRN kód szám mindegyikére			
Maszk érték	1	0, vagy 1	1
Adatkibocsátás Ál-véletlen zaj /IODP/	2	0, vagy 3	1

Megjegyzés. – Az összes paraméter a 3.5.4.1 pontban került meghatározásra.

B-39. táblázat: 2.-tól 5.-ig terjedő típusok Gyors helyesbítés közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Adatkibocsátás – Gyors helyesbítés /$IODF_j$ /	2	0-tól 3-ig	1
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1
13 időrésre:			
Gyors helyesbítés (FC_i)	12	±256,000 m	0,125 m
13 időrésre:			
Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDREI_i$ /	4	(lásd a B-29. táblázatot)	(lásd a B-29. táblázatot)

MEGJEGYZÉSEK: -
1. Az Adatkibocsátás – Gyors Helyesbítés /$IODF_j$ / és a Gyors Helyesbítés /FC_i / paraméterei a 3.5.4.4.2 pontban kerültek meghatározásra.
2. Az Adatkibocsátás – Ál-véletlen zaj /IODP/ paramétere a 3.5.4.1 pontban került meghatározásra.
3. A Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDRE_i$ / a 3.5.4.5 pontban került meghatározásra.

B-40. táblázat: 6. típus Sértetlenségi közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
$IODF_2$	2	0-tól 3-ig	1
$IODF_3$	2	0-tól 3-ig	1
$IODF_4$	2	0-tól 3-ig	1
$IODF_5$	2	0-tól 3-ig	1
51 műholdra (az Ál-véletlen zaj /PRN/ maszk szám szerint rendezve)			
$UDREI_i$	4	(lásd a B-29. táblázatot)	(lásd a B-29. táblázatot)

MEGJEGYZÉSEK. -
1. Az Adatkibocsátás – Gyors Helyesbítés /IODF$_j$ / paraméterek a 3.5.4.4.2 pontban kerültek meghatározásra.
2. A Felhasználói Differenciál Távolságmérési Hiba Jelzés /UDRE$_i$ / a 3.5.4.5 pontban került meghatározásra.

B-41. táblázat: 7. típus Gyors Helyesbítés teljesítőképesség csökkenési tényező közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Rendszer várakozási idő (t_{lat})	4	0-tól 15 s-ig	1 s
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1
Tartalék	2	—	—
51 műholdra (az Ál-véletlen zaj /PRN/ maszk szám szerint rendezve)			
Teljesítőképesség csökkenési tényező jelzés (ai_i)	4	(lásd a B-34. táblázatot)	(lásd a B-34. táblázatot)

MEGJEGYZÉSEK. -
1. A t_{lat} és az ai_i paraméterek a 3.5.4.7 pontban kerültek meghatározásra.
2. Az Adatkibocsátás – Ál-véletlen zaj /IODP/ paraméter a 3.5.4.1 pontban került meghatározásra.

B-42. táblázat: 9. típus Távolságmérési funkció közlemények

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Tartalék	8	—	—
$t_{0,GEO}$	13	0-tól 86 384 s	16 s
URA	4	(lásd a B-26. táblázatot)	(lásd a B-26. tábl.-ot)
X_G	30	±42 949 673 m	0,08 m
Y_G	30	±42 949 673 m	0,08 m
Z_G	25	±6 710 886,4 m	0,4 m
$\dot{X}_G$	17	±40,96 m/s	0,000625 m/s
$\dot{Y}_G$	17	±40,96 m/s	0,000625 m/s
$\dot{Z}_G$	18	±524,288 m/s	0,004 m/s
$\ddot{X}_G$	10	±0,0064 m/s^2	0,0000125 m/s^2
$\ddot{Y}_G$	10	±0,0064 m/s^2	0,0000125 m/s^2
$\ddot{Z}_G$	10	±0,032 m/s^2	0,0000625 m/s^2
a_{Gf0}	12	$\pm 0{,}9537 \times 10^{-6}$ s	2^{-31} s
a_{Gf1}	8	$\pm 1{,}1642 \times 10^{-10}$ s/s	2^{-40} s/s

MEGEGYZÉS. – Az összes paraméter a 3.5.4.2 pontban került meghatározásra.

B-43. táblázat: 10. típus Teljesítőképesség csökkenési paraméter közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
B_{rrc}	10	0-tól 2,046 m-ig	0,002 m
C_{ltc_lsb}	10	0-tól 2,046 m-ig	0,002 m
C_{ltc_v1}	10	0-tól 0,05115 m/s-ig	0,00005 m/s
I_{ltc_v1}	9	0-tól 511 s-ig	1 s
C_{ltc_v0}	10	0-tól 2,046 m-ig	0,002 m
I_{ltc_v0}	9	0-tól 511 s-ig	1 s
C_{geo_lsb}	10	0-tól 0,5115 m-ig	0,0005 m
C_{geo_v}	10	0-tól 0,05115 m/s-ig	0,00005 m/s
I_{geo}	9	0-tól 511 s-ig	1 s
C_{er}	6	0-tól 31,5 m-ig	0,5 m
C_{iono_step}	10	0-tól 1,023 m-ig	0,001 m
I_{iono}	9	0-tól 511 s-ig	1 s
C_{iono_ramp}	10	0-tól 0,005115 m/s-ig	0,000005 m/s
RSS_{UDRE}	1	0, vagy 1	1
RSS_{iono}	1	0, vagy 1	1
Tartalék	88	—	—

MEGJEGYZÉS. – Az összes paraméter a 3.5.4.7 pontban került meghatározásra.

B-44. táblázat: 12. típus

Műhold Bázisú Kiegészítő Rendszer hálózati idő/Egyeztetett Világidő/UTC/ közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
A_{1SNT}	24	$\pm$ 7,45 × 10^{-9} s/s	2^{-50} s/s
A_{0SNT}	32	$\pm$ 1 s	2^{-30} s
t_{0t}	8	0-tól 602 112 s-ig	4 096 s
WN_t	8	0-tól 255 hét-ig	1 hét
Δt_{LS}	8	$\pm$ 128 s	1 s
WN_{LSF}	8	0-tól 255 hét-ig	1 hét
DN	8	1-től 7 nap-ig	1 nap
Δt_{LSF}	8	$\pm$ 128 s	1 s
UTC szabvány azonosító	3	(lásd a B-35. táblázatot)	(lásd a B-35. táblázatot)
GPS hét-idő (TOW)	20	0-tól 604 799 s-ig	1 s
GPS hét-szám (WN)	10	0-tól 1 023 hét-ig	1 hét
GLONASS jelzés	1	0 vagy 1	1
$\delta a_{i,\ GLONASS}$ (2.Megjegyzés)	24	$\pm 2{,}0 \times 10^{-8}$ s	2,0 $\times 10^{-31}$ s
Tartalék	50	—	—

MEGJEGYZÉSEK. –
1. Az összes paraméter a 3.5.4.8 pontban került meghatározásra.
2. Csak akkor alkalmazandó, ha a Műhold Bázisú Kiegészítő Rendszer /SBAS/ GLONASS időmérési közleményt küld a 12. típusú közleményben (lásd a 3.5.7.4.4 pontot, Időmérési adatok).

B-45. táblázat: 17. típus Geostacionárius pálya /GEO/ naptár közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
A 3 műhold mindegyikére:			
Tartalék	2	—	—
Ál-véletlen zaj /PRN/ kód szám		0-tól 210-ig	1
Működési helyzet és állapot		—	—
$X_{G,A}$	15	±42 598 400 m	2 600 m
$Y_{G,A}$	15	±42 598 400 m	2 600 m
$Z_{G,A}$	9	±6 656 000 m	26 000 m
$\dot{X}_G$	3	± 40 m/s	10 m/s
$\dot{Y}_G$	3	± 40 m/s	10 m/s
$\dot{Z}_G$	4	± 480 m/s	60 m/s
$t_{almanac}$ (mindhárom műholdra alkalmazva)	11	0-tól 86 336 s-ig	64 s

Megjegyzés. – Az összes paraméter a 3.5.4.3 pontban került meghatározásra.

B-46. táblázat: 18. típus Ionoszférikus Rácspont /IGP/ maszk közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Az IGP sávok száma	4	0-tól 11-ig	1
IGP sáv azonosító	4	0-tól 10-ig	1
Adatkibocsátás – ionoszféra ($IODI_k$)	2	0-tól 3-ig	1
201 Ionoszférikus rácspontra:			
IGP maszk érték	1	0, vagy 1	1
Tartalék	1	—	—

Megjegyzés. – Az összes paraméter a 3.5.4.6 pontban került meghatározásra.

B-47. táblázat: 24. típus Kevert gyors/hosszútávú műhold hiba helyesbítési közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
6 időrésre:			
Gyors helyesbítés (FC_i)	12	±256,000 m	0,125 m
6 időrésre:			
Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDREI_i$ /	4	(lásd a B-31. táblázatot)	(lásd a B-31. táblázatot)
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1
Gyors helyesbítés típus azonosító	2	0-tól 3-ig	1
Adatkibocsátás – Gyors helyesbítés /$IODF_j$ /	2	0-tól 3-ig	1
Tartalék	4	—	—
25. típusú fél-közlemény	106	—	—

MEGJEGYZÉSEK: -
1. A gyors helyesbítés típus azonosító, az Adatkibocsátás – Gyors Helyesbítés /$IODF_j$ / és a Gyors Helyesbítés /FC_i / paraméterei a 3.5.4.4.2 pontban kerültek meghatározásra.
2. Az Adatkibocsátás – Ál-véletlen zaj /IODP/ paramétere a 3.5.4.1 pontban került meghatározásra.
3. A Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDRE_i$ / a 3.5.4.5 pontban került meghatározásra.
4. A hosszútávú műhold hiba helyesbítési közlemény két fél-közleményre van felosztva. A sebesség kód = 0 fél-közlemény a B-48. táblázatban került meghatározásra. A sebesség kód = 1 fél-közlemény pedig a B-49. táblázatban került meghatározásra.

B-48. táblázat: 25. típus Hosszútávú műhold hiba helyesbítés fél-közlemény

(SEBESSÉG KÓD = 0)

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Sebesség kód = 0	1	0	1
2 műholdra:			
PRN maszk szám	6	0-tól 51-ig	1
Adat kibocsátás (IOD_i)	8	0-tól 255-ig	1
δx_i	9	± 32 m	0,125 m
δy_i	9	± 32 m	0,125 m
δz_i	9	± 32 m	0,125 m
$\delta a_{i,f0}$	10	$\pm 2^{-22}$ s	2^{-31} s
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1
Tartalék	1	—	—

MEGJEGYZÉSEK: -
1. Az Ál-véletlen zaj /PRN/ maszk szám és az Adatkibocsátás – Ál-véletlen zaj /IODP/ paraméterei a 3.5.4.1 pontban kerültek meghatározásra.

2. Az összes további paraméter a 3.5.4.4.1 pont szerint meghatározott.

B-49. táblázat: 25. típus Hosszútávú műhold hiba helyesbítés fél-közlemény (SEBESSÉG KÓD = 1)

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
1. műholdra:			
Sebesség kód = 1	1	1	1
PRN maszk szám	6	0-tól 51-ig	1
Adat kibocsátás (IOD_i)	8	0-tól 255-ig	1
δx_i	11	± 128 m	0,125 m
δy_i	11	± 128 m	0,125 m
δz_i	11	± 128 m	0,125 m
$\delta a_{i,f0}$	11	$\pm 2^{-21}$ s	2^{-31} s
$\delta \dot{x}_i$	8	± 0,0625 m/s	2^{-11} m/s
$\delta \dot{y}_i$	8	± 0,0625 m/s	2^{-11} m/s
$\delta \dot{z}_i$	8	± 0,0625 m/s	2^{-11} m/s
$\delta a_{i,f1}$	8	$\pm 2^{-32}$ s/s	2^{-39} s/s
Az alkalmazhatóság ideje ($t_{i,LT}$)	13	0-tól 86 384 s-g	16 s
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1

MEGJEGYZÉSEK: -
1. Az Ál-véletlen zaj /PRN/ maszk szám és az Adatkibocsátás – Ál-véletlen zaj /IODP/ paraméterei a 3.5.4.1 pontban kerültek meghatározásra.

2. Az összes további paraméter a 3.5.4.4.1 pont szerint meghatározott.

B-50. táblázat: 26. típus Ionoszférikus késési közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Ionoszférikus Rácspont /IGP/ sáv azonosító	4	0-tól 10-ig	1
IGP blokk azonosító	4	0-tól 13-ig	1
15 rácspont mindegyikére:			
IGP számított függőleges késés	9	0-tól 63,875 m-ig	0,125 m
Rácspont ionoszférikus függőleges hiba jelzés (GIVEI$_i$)	4	(lásd a B-33. táblázatot)	(lásd a B-33. táblázatot)
Adatkibocsátás – Ionoszférikus /IODI$_k$ /	2	0-tól 3-ig	1
Tartalék	7	—	—

Megjegyzés. – Az összes paraméter a 3.5.4.6 pontban került meghatározásra.

B-51. táblázat: 27. típus Műhold Bázisú Kiegészítő Rendszer /SBAS/ szolgáltatási közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Adatkibocsátás, szolgáltatás (IODS)	3	0-tól 7-ig	1
A szolgáltatási közlemények száma	3	1-től 8-ig	1
Szolgáltatási közlemény szám	3	1-től 8-ig	1
A körzetek száma	3	0-tól 5-ig	1
Elsőbbségi kód	2	0-tól 3-ig	1
δUDRE jelzés-belül	4	0-tól 15-ig	1
δUDRE jelzés-kívül	4	0-tól 15-ig	1
5 körzet mindegyikére:			
Koordináta, 1. földrajzi szélesség	8	± 90°	1°
Koordináta, 1. földrajzi hosszúság	9	± 180°	1°
Koordináta, 2. földrajzi szélesség	8	± 90°	1°
Koordináta, 2. földrajzi hosszúság	9	± 180°	1°
A körzet alakja	1	—	—
Tartalék	15	—	—

Megjegyzés. – Az összes paraméter a 3.5.4.9 pontban került meghatározásra.

B-52. táblázat: 63. típus Nulla /üres/ közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Tartalék	212	—	—

B-53. táblázat: 28. típus Óra-efemerisz kovariancia mátrix

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Adatkibocsátás – Ál-véletlen zaj /IODP/	2	0-tól 3-ig	1
Két műholdra PRN maszk szám	6	0-tól 51-ig	1
Lépték kitevő	3	0-tól 7-ig	1
$E_{1,1}$	9	0-tól 511-ig	1
$E_{2,2}$	9	0-tól 511-ig	1
$E_{3,3}$	9	0-tól 511-ig	1
$E_{4,4}$	9	0-tól 511-ig	1
$E_{1,2}$	10	± 512	1
$E_{1,3}$	10	± 512	1
$E_{1,4}$	10	± 512	1
$E_{2,3}$	10	± 512	1
$E_{2,4}$	10	± 512	1
$E_{3,4}$	10	± 512	1

MEGJEGYZÉSEK: -
1. Az Ál-véletlen zaj /PRN/ maszk szám és az Adatkibocsátás – Ál-véletlen zaj /IODP/ paraméterei a 3.5.4.1 pontban kerültek meghatározásra.

2. Az összes további paraméter a 3.5.4.10 pont szerint meghatározott.

3.5.7 NEM-LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

1. Megjegyzés. – Az egy meghatározott Műhold Bázisú Kiegészítő Rendszer /SBAS/ által kínált szolgáltatási szinttől függően, különböző funkciókat lehet teljesíteni, ahogy az a 3. fejezet 3.7.3.4.2 pontjában leírásra került.

2. Megjegyzés. – Azok a paraméterek, amelyekre ebben a részben utalás történik, a 3.5.4 pontban kerültek meghatározásra.

3.5.7.1 *Általános*

3.5.7.1.1 *Szükséges adatok és sugárzási szünetek.* A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ az általa alátámasztott funkciókhoz szükséges adatokat a B-54. táblázatban bemutatottaknak megfelelően kell sugároznia. Ha az SBAS olyan adatokat is sugároz, amelyek egy meghatározott funkcióhoz nem szükségesek, akkor az egyéb funkciókat alátámasztó adatokra vonatkozó követelményeket kell alkalmazni. A biztosított egyes adat-típusoknak az összes adatban való sugárzása közötti maximális időköznek a B-54. táblázatban meghatározottnak kell lenni.

3.5.7.1.2 *A Műhold Bázisú Kiegészítő Rendszer /SBAS/ rádiófrekvenciás ellenőrzése*. Az SBAS-nek ellenőriznie kell a B-55. táblázatban bemutatott SBAS műhold paramétereket és meg kell tennie a jelzett tevékenységeket.

Megjegyzés. – Az SBAS nulla /üres/ közleményeket (63. típusú közlemények) sugározhat minden egyes olyan időrésben, amelyben nincs egyéb sugározandó adat.

3.5.7.1.3 *„Ne használja”*. A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ a „Ne használja” közleményt (0.típusú közlemény) kell sugároznia akkor, amikor a felhasználókat tájékoztatni kell arról, hogy ne használják az SBAS műhold távolságmérési funkcióját és sugárzott adatait.

3.5.7.1.4 *Naptár adatok*. A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ naptár adatokat kell sugározni az SBAS műholdakra (a 3.5.4.3 pontban meghatározottan) hiba nélkül 150 km-re (81 Tengeri mérföld) a tényleges műhold helyzettől. A 17. típusú közleményekben a felhasználatlan naptár időréseket a „0” Ál-véletlen zaj /PRN/ kód számmal kell kódolni. A működési állapotnak és a helyzetnek a műhold állapotát és a szolgáltatás biztosítót kell jeleznie úgy, ahogy az a 3.5.4.3 pontban meghatározásra került.

3.5.7.1.5 **Ajánlás**. – *Az SBAS-nek naptár adatokat kell sugározni az összes SBAS műholdra, a szolgáltatás biztosítótól függetlenül.*

3.5.7.2 *Távolságmérési funkció*. Ha a Műhold Bázisú Kiegészítő Rendszer /SBAS/ távolságmérési funkciót biztosít, akkor annak a 3.5.7.1 pontban leírt követelményekhez kiegészítetten meg kell felelnie az ebben a részben foglalt követelményeknek is.

3.5.7.2.1 *Teljesítmény követelmények*

Megjegyzés. – Lásd a 3. fejezet 3.7.3.4.2.1 pontját.

3.5.7.2.2 *Távolságmérési funkció adatok*. A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ távolságmérési adatokat kell sugározni úgy, hogy az SBAS műhold helymeghatározási hiba a műhold nyomvonalában lévő valamennyi felhasználó részére a rálátási vonalra vetítve 256 méternél kevesebb legyen. Az egyes SBAS műholdaknak egy olyan felhasználói távolság pontosságot /URA/ kell sugározni, amely a Műhold Hálózati Időre /SNT/ vonatkoztatott távolságmérési pontosság szabvány eltérésének a becslését képviseli.

3.5.7.3 *Globális Navigációs Műhold Rendszer /GNSS/ műhold állapot funkció*. Amikor egy Műhold Bázisú Kiegészítő Rendszer /SBAS/ műhold állapot funkciót biztosít, akkor annak meg kell felelni az ebben a részben foglalt követelményeknek is.

3.5.7.3.1 *A műhold állapot funkciók teljesítőképessége*. Az aktív adatok bármilyen érvényes kombinációját véve a Vízszintes Védelmi Szintet /HPL_{SBAS} / a Műhold Bázisú Kiegészítő Rendszeren meghaladó vízszintes hiba valószínűségének (ahogy az a 3.5.5.6 pontban meghatározásra került) 8 egymás után következő másodpercnél hosszabb időben 10^{-7} -nél kisebbnek kell lenni bármely órában, egy nulla várakozási idejű felhasználót feltételezve.

Megjegyzés. – Az aktív adat egy olyan adatként került meghatározásra, amely nem idő-túllépéses a 3.5.8.1.1 pont szerint. Ez a követelmény műholdak helyzetsor rendszere(it) és Műhold Bázisú Kiegészítő Rendszer hibákat foglal magába.

3.5.7.3.2 *Ál-véletlen zaj /PRN/ maszk és Adatkibocsátás – PRN (IODP)*. A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ egy Ál-véletlen zaj /PRN/ maszkot és az Adatkibocsátás – PRN /IODP/ (1. típusú közlemény) kell kisugározni. A PRN maszk értékeknek jelezni kell azt, hogy ez az adat egy Globális Navigáció Műhold Rendszerű /GNSS/ műholdra biztosításra került-e, vagy sem. Az IODP-t meg kell változtatni, amikor változás van a PRN maszkban. Az IODP megváltoztatásának az 1. típusú közleményben az előtt kell megtörténni, mielőtt az IODP bármely más közleményben megváltozik. A 2.-tól az 5.-ig terjedő, a 7., a 24. és a 25. típusú közleményekben lévő IODP-nek egyenlőnek kell lenni az abban a PRN maszk közleményben sugárzott IODP-vel (1. típusú közlemény), amely azoknak a műholdaknak a kijelölésére használatos, amelyre adat került biztosításra abban a közleményben.

B-54. táblázat: Adat sugárzási időközök és biztosított funkciók

Adat típus	Max. sugárzási időtartam	Távolság mérés	GNSS Műhold állapot	Alap differenciál helyesbítés	Pontos Differenciál helyesbítés	Kapcsolódó közlemény típus
Óra-efemerisz kovariancia mátrix	120 s					28
Műhold Bázisú Kiegészítő Rendszer /SBAS/ teszt üzemmódban	6 s					0
Ál-véletlen zaj /PRN/ maszk	120 s		R	R	R	1
Felhasználói Differenciál Távolságmé-rési Hiba Jelzés /UDREI/	6 s		R*	R	R	2-től 6-ig, 24
Gyors helyesbítések	60 s		R*	R	R	2-től 6-ig, 24
Hosszútávú helyesbítések	120 s		R*	R	R	24, 25
Geostacioná-rius Pálya (GEO) távolságmérési funkció adatok	120 s	R				9
Gyors helyesbítés teljesítőképes-ség csökkenés	120 s		R*	R	R	7

B-54. táblázat: Adat sugárzási időközök és biztosított funkciók

(folytatás)

Adat típus	Max. sugárzási időtartam	Távolság mérés	GNSS Műhold állapot	Alap differenciál helyesbítés	Pontos Differenciál helyesbítés	Kapcsolódó közlemény típus
Teljesítmény-csökkenési paraméterek	120 s				R	10
Ionoszférikus rács maszk	300 s				R	18
Ionoszférikus helyesbítések, Ionoszférikus Rács Függőleges Hiba Jelzés /GIVEI/	300 s				R	26
Időmérési adatok	300 s	R (lásd a 3.Meg-jegyzést)	R (lásd a 3.Meg-jegyzést)	R (lásd a 3.Meg-jegyzést)	R (lásd a 3.Meg-jegyzést)	12
Naptár adatok	300 s	R	R	R	R	17
Szolgáltatási szint	300 s					27

MEGJEGYZÉSEK. –
1. Az „R” jelöli azt, hogy az adatot a funkció alátámasztásához sugározni kell.
2. Az „R” azt a speciális kódolást jelöli, ami a 3.5.7.3.3 pontban leírásra került.*
3. A 12.típusú közlemények csak akkor szükségesek, ha az adatok a GLONASS műholdakhoz biztosítottak.

B-55. táblázat: Műhold Bázisú Kiegészítő Rendszer /SBAS/ rádiófrekvenciás ellenőrzés

Paraméter	Referencia	Riasztási határérték	Megkívánt tevékenység
Jel teljesítmény-szint	3. fejezet 3.7.3.4.4.3	Minimum ≅ -161 dBW Maximum ≅ -153 dBW (2. Megjegyzés)	Minimum: a távolságmérési funkció megszűntetése (1. Megjegyzés). Maximum: a sugárzás megszűntetése.
Moduláció	3. fejezet, 3.7.3.4.4.5	A hullámforma torzítás ellenőrzése.	A távolságmérési funkció megszűntetése (1. Megjegyzés).
Műhold Hálózat Idő /SNT/ - Globális Helymeghatározó Rendszer /GPS/ idő	3. fejezet, 3.7.3.4.5	Nem alkalmazható. (3. Megjegyzés)	A távolságmérési funkció megszűntetése, kivéve, ha a Felhasználói Távolságmérési Pontosság /URA/ hibát tükröz.
Vivőhullám frekvencia stabilitás	3.5.2.1	Nem alkalmazható. (3. Megjegyzés)	A távolságmérési funkció megszűntetése, kivéve, ha a σ^2_{UDRE} és a Felhasználói Távolságmérési Pontosság /URA/ hibát tükröz.
Kód/frekvencia koherencia	3.5.2.4	Nem alkalmazható. (3. Megjegyzés)	A távolságmérési funkció megszűntetése, kivéve, ha a σ^2_{UDRE} és a Felhasználói Távolságmérési Pontosság /URA/ hibát tükröz.
Maximális kód fázis eltérés	3.5.2.6	Nem alkalmazható. (2. és 3. Megjegyzés)	A távolságmérési funkció megszűntetése, kivéve, ha a σ^2_{UDRE} és a Felhasználói Távolságmérési Pontosság /URA/ hibát tükröz.
Konvolúciós kódolás	3.5.2.9	Az összes sugárzott közlemény hibás.	A sugárzás megszűntetése.

MEGJEGYZÉSEK. -
1. A távolságmérési funkció megszűntetését a Felhasználói Távolságmérési Pontosság /URA/ és a σ^2_{UDRE} -nak az arra az SBAS műholdra vonatkozó „Ne használja” sugárzásával lehet végrehajtani.
2. Ezeket a paramétereket a vett jelminőségre (C/N_0 hatás) gyakorolt hatásukon lehet ellenőrizni, mivel ez a felhasználót érintő hatásuk.
3. Riasztási határértékek nincsenek meghatározva, mivel az elõidézett hiba elfogadható, feltéve, ha az a σ^2_{UDRE} és URA paraméterekben fel van tűntetve. Ha a hibát nem lehet feltűntetni, akkor a távolságmérési funkciót meg kell szűntetni.

3.5.7.3.2.1 **Ajánlás**. – *Amikor a PRN maszk megváltoztatásra kerül, akkor az SBAS-nek több alkalommal meg kell ismételnie az 1. típusú közleményt, mielőtt azt bármely más közleményekre vonatkoztatná, azért, hogy biztosítva legyen az, hogy a felhasználó az új maszkot vegye.*

3.5.7.3.3 *Sértetlenségi /integritás/ adatok*. Amikor az SBAS nem biztosítja az alap differenciál helyesbítési funkciót, akkor a gyors helyesbítések, hosszútávú helyesbítések és gyors helyesbítés teljesítőképesség csökkenési paramétereket nullára kódolva kell leadnia az összes, az Ál-véletlen zaj /PRN/ maszkban jelzett látható műholdra.

3.5.7.3.3.1 Amikor az SBAS nem biztosítja az alap differenciál helyesbítési funkciót, akkor az SBAS-nek jeleznie kell azt, hogy a műhold nem kielégítő műszaki állapotú /'egészségtelen'/ („Ne használja"), ha a pszeudo-távolság hiba a 150 métert meghaladja.

3.5.7.3.3.2 Amikor az SBAS nem biztosítja az alap differenciál helyesbítési funkciót, akkor az SBAS-nek jeleznie kell, hogy a műhold „Nem-ellenőrzött", ha a pszeudo-távolság hibát nem lehet meghatározni.

3.5.7.3.3.3 Amikor az SBAS nem biztosítja az alap differenciál helyesbítési funkciót, akkor az SBAS-nek egy Felhasználói Differenciál Távolságmérési Hiba Jelzést /$UDREI_i$ /, a 13.-at kell leadni, ha a műhold nem „Ne használja", vagy „Nem-ellenőrzött" helyzetű.

3.5.7.3.3.4 Az Adatkibocsátás – Gyors Helyesbítés /$IODF_j$ / paraméternek a 2.-tól az 5.-ig terjedő, a 6., vagy a 24. típusú közleményekben 3-al kell egyenlőnek lenni.

3.5.7.4 *Alap differenciál helyesbítési funkció*. Amikor egy Műhold Bázisú Kiegészítő Rendszer /SBAS/ biztosít egy alap differenciál helyesbítési funkciót, akkor annak teljesítenie kell az ebben a részben leírt követelményeket is, kiegészítőleg a 3.5.7.3 pontban meghatározott, a Globális Navigációs Műhold Rendszer /GNSS/ műhold állapot funkciókhoz.

3.5.7.4.1 *Az alap differenciál helyesbítési funkció teljesítőképessége*. Az aktív adatok bármilyen érvényes kombinációját véve a Vízszintes Védelmi Szintet /HPL_{SBAS} / meghaladó vízszintes hiba valószínűségének (ahogy az a 3.5.5.6 pontban meghatározásra került) 8 egymás után következő másodpercnél hosszabb időben 10^{-7}-nél kisebbnek kell lenni bármely órában, egy nulla várakozási idejű felhasználót feltételezve.

Megjegyzés. – Az aktív adat egy olyan adatként került meghatározásra, amely nem idő-túllépéses a 3.5.8.1.1 pont szerint. Ez a követelmény műholdak helyzetsor rendszere(it) és Műhold Bázisú Kiegészítő Rendszer hibákat foglalja magába.

3.5.7.4.2 *Hosszútávú helyesbítések*. Az ugyanazon szolgáltatás biztosítók SBAS műholdjai kivételével, az SBAS-nek meg kell határoznia és sugározni kell a hosszútávú helyesbítéseket minden egyes az Ál-véletlen zaj /PRN/ maszkban (PRN maszk érték „1"-el egyenlő) jelzett, látható Globális Navigációs Műhold Rendszerű /GNSS/ műholdra (lásd a Megjegyzés-t). A hosszútávú helyesbítéseknek olyanoknak kell lenni, hogy a műholdak helyzetsor rendszereinek műhold helyzet hibája a műhold nyomvonalában lévő bármely felhasználó részére a rálátási vonalban ezeknek a hosszútávú helyesbítéseknek az alkalmazása után 256 méternél kevesebb legyen. Az egyes GLONASS műholdakra a Műhold Bázisú Kiegészítő Rendszernek /SBAS/ át kell számítani a műhold koordinátákat WGS-84-re úgy, ahogy az a 3.5.5.2 pontban meghatározásra került a hosszútávú helyesbítéseket megelőzően. Az egyes Globális Helymeghatározó Rendszer /GPS/ műholdakra a sugárzott Adatkibocsátásnak illeszkedniük kell a GPS Adatkibocsátás – Efemerisszel /IODE/ és az Adatkibocsátás – Óra /IODC/ 8. Legkisebb Helyértékű Bitjével, amelyek az óra és efemerisz adatokhoz kapcsolódnak, és a helyesbítések kiszámításához használatosak (3.1.1.3.1.4 és 3.1.1.3.2.2). Az egy GPS műhold általi új efemerisz sugárzásánál az SBAS-nek folytatnia kell az 'öreg' efemerisz felhasználását, azért, hogy a gyors és hosszútávú helyesbítéseket meghatározza legalább 2 percig, de 4 percnél nem tovább. Az egyes GLONASS műholdakra az SBAS-nek kell kiszámítani és továbbítani egy olyan IOD-t, amely egy várakozási és egy érvényességi időközt foglal magába, ahogy az a 3.5.4.4.1 pontban meghatározásra került.

Megjegyzés. – A műhold láthatóságának követelménye magába foglalja a referencia állomások elhelyezését és az azokon a helyeken elért maszk szöget.

3.5.7.4.2.1 **Ajánlás.** – *A pontos távolság meghatározási helyesbítések biztosításához az SBAS-nek a minimálisra kell csökkenteni a műhold efemerisz megszakításait a hosszútávú helyesbítések alkalmazása után.*

3.5.7.4.3 *Gyors helyesbítések*. A Műhold Bázisú Kiegészítő Rendszernek meg kell határozni a gyors helyesbítéseket azokra az egyes látható Globális Navigációs Műhold Rendszer műholdakra, amelyek az Ál-véletlen zaj /PRN/ maszkban meghatározásra kerültek (PRN maszk érték „1"-el egyenlő). Kivéve, ha az IODF = 3, minden alkalommal, amikor a gyors helyesbítés adatok a 'j' típusú (j = 2, 3, 4 vagy 5) közleményben változnak, az Adatkibocsátás – Gyors helyesbítés /$IODF_j$ / sorrendjének „0, 1, 2, 0, …"-nak kell lenni.

Megjegyzés. – Ha egy riasztási helyzet áll fenn, az $IODF_j$ 3-al lehet egyenlő (lásd a 3.5.7.4.5 pontot).

3.5.7.4.4 *Időmérési adatok*. Ha a GLONASS részére adatok kerülnek biztosításra, akkor a Műhold Bázisú Kiegészítő Rendszernek /SBAS/ továbbítania kell az időmérési közleményt (12. típusú közlemény) a GLONASS idő eltolást is beleértve, ahogy az a B-44. táblázatban meghatározásra került.

3.5.7.4.5 *Sértetlenségi /integritás/ adatok.* Minden egyes műholdra, amelyre helyesbítések kerültek biztosításra, a Műhold Bázisú Kiegészítő Rendszernek /SBAS/ sértetlenségi adatokat kell sugározni (Felhasználói Differenciál Távolságmérési Hiba Jelzést /$UDREI_i$ /) és választhatóan a 27. típusú, vagy a 28. típusú közlemény adatokat a σ_{UDRE} kiszámításához, úgy, hogy a 3.5.7.4.1 pontban lévő sértetlenségi követelmények kielégítésre kerüljenek. Amikor a gyors vagy a hosszútávú helyesbítések meghaladják azok kódolási tartományát, akkor az SBAS-nek jeleznie kell azt, hogy a műhold nem kielégítő műszaki állapotú /'egészségtelen'/ („Ne használja"). Amikor a $\sigma^2_{i,UDRE}$ nem meghatározható, akkor az SBAS-nek jeleznie kell, hogy a műhold „Nem-ellenőrzött".

Amikor a 6. típusú közlemény használatos a $\sigma^2_{i,UDRE}$ sugárzásához, akkor:

a) az $IODF_j$ –nek meg kell egyezni az abban a 'j' típusú közleményben vett gyors helyesbítés $IODF_j$ –vel, amelyre a $\sigma^2_{i,UDRE}$ alkalmazható; vagy

b) az $IODF_j$ –nek egyenlőnek kell lenni 3-al, ha a σ2i,UDRE az összes olyan vett gyors helyesbítési 'j' típusú közleményre alkalmazandó, amely nincs idő túllépésben.

3.5.7.4.6 *Teljesítőképesség csökkenési adat.* Az SBAS-nek teljesítőképesség csökkenési paramétereket kell sugározni (7. típusú közlemény) a gyors helyesbítésre alkalmazandó időzítési időköz közlésére, és annak biztosítására, hogy a 3.5.7.4.1 pontban meghatározott sértetlenségi követelmények kielégítésre kerüljenek.

3.5.7.5 *Pontos differenciál helyesbítési funkció.* Ha az SBAS pontos differenciál helyesbítési funkciót biztosít, akkor annak a 3.5.7.4 pontban leírt alap differenciál helyesbítési funkció követelményeihez kiegészítőleg az ebben a részben lévő követelményeknek is meg kell felelni.

3.5.7.5.1 *A pontos differenciál helyesbítési funkció teljesítménye.* Az aktív adatok bármilyen érvényes kombinációját véve, a tolerancián kívüli helyzet valószínűségének a vonatkozó idő-a-riasztásig értéknél hosszabb idő valószínűsége 2×10^{-7}-nél kevesebb kell, hogy legyen bármely megközelítés során egy nulla várakozási idejű felhasználót feltételezve. Az idő-a-riasztásig értéknek 5,2 másodpercnek kell lenni az olyan Műhold Bázisú Kiegészítő Rendszernél /SBAS/, amely precíziós megközelítéseket, vagy APV-II üzemeltetéseket támaszt alá, és 8 másodpercnél az olyan SBAS-nél, amely APV-I üzemeltetéseket támaszt alá. A tolerancián kívüli helyzetet úgy kell meghatározni, hogy az egy olyan vízszintes hiba, ami a Vízszintes Védelmi Szint Műhold Bázisú Kiegészítő Rendszer /HPL_{SBAS}/ értékeket, vagy függőleges hiba, ami a Függőleges Védelmi Szintet /VPL_{SBAS}/ meghaladja (ahogy az a 3.5.5.6 pontban meghatározásra került). Amikor egy tolerancián-kívüli helyzet kerül észlelésre, akkor a létrejövő riasztási közleményt (a 2.-tól 5.-ig terjedő és a 6., a 24., a 26. vagy a 27. típusú közleményekben sugározva) háromszor meg kell ismételni egy, a 4 másodpercen belüli, összesen négy alkalommal előforduló riasztási helyzet első bejelentése után.

1. Megjegyzés. - Az aktív adat egy olyan adatként került meghatározásra, amely nem idő-túllépéses a 3.5.8.1.1 pont szerint. Ez a követelmény műholdak helyzetsor rendszere(i)nek hibáját és a Műhold Bázisú Kiegészítő Rendszer /SBAS/ hibáját foglalja magába.

2. Megjegyzés. – Az egymást követő közleményeket a szabályos felfrissítési gyakorisággal lehet sugározni.

3.5.7.5.2 *Ionoszférikus rácspont (IGP) maszk.* A Műhold Bázisú Kiegészítő Rendszernek /SBAS/ sugároznia kell egy Ionoszférikus Rácspont /IGP/ maszkot és az Adatkibocsátás Ionoszférikus /$IODI_k$ /-t (11.-ig a 18. típusú közleményekben a 11 IGP sávnak megfelelően). Az IGP maszk értékeknek jelezni kell azt, hogy az egyes IGP-re adatok kerültek-e biztosításra, vagy sem. Ha az IGP 9. sáv használatos, akkor az IGP maszk értékeket az 55° N-től északra a 0.-tól a 8.-ig terjedő sávokban „0”-ra kell állítani. Ha a 10. sáv használatos, akkor az IGP maszk értékeket az 55° S-től délre a 0.-tól a 8.-ig terjedő sávokban „0”-ra kell állítani. Az Adatkibocsátás Ionoszférikus /$IODI_k$ /-t meg kell változtatni akkor, amikor egy változás áll be a k-dik sáv IGP maszk értékeiben. Az új IGP maszkot a 18. típusú közleményben kell sugározni, mielőtt az vonatkoztatva lenne a kapcsolatos 26. típusú közleményben. A 26. típusú közleményben lévő $IODI_k$ -nak egyenlőnek kell lenni azzal az IGP maszk közleményben (18. típusú közlemény) sugározott $IODI_k$ -val, ami annak az IGP-nek a kijelölésére használatos, amelyre az adat abban a közleményben biztosításra került.

3.5.7.5.2.1 **Ajánlás**. – *Amikor az IGP maszk megváltoztatásra kerül, akkor az SBAS-nek több alkalommal meg kell ismételnie a 18. típusú közleményt, mielőtt azt egy 26. típusú közleményben vonatkoztatná annak biztosítására, hogy a felhasználó részére biztosítva legyen az új maszk vétele. Ugyanazt az IODIk -t kell felhasználni az összes sávra.*

3.5.7.5.3 *Ionoszférikus helyesbítés.* Az SBAS-nek ionoszférikus helyesbítéseket kell sugározni az IGP maszkban kijelölt IGP-kre (IGP maszk értékek egyenlőek „1”-el).

3.5.7.5.4 *Ionoszférikus sértetlenségi adatok.* Azokra az IGP-kre, amelyekre helyesbítések kerülnek biztosításra, a Műhold Bázisú Kiegészítő Rendszernek /SBAS/ Hálózat Ionoszférikus Függőleges Hiba Jelzés /GIVEI/ adatokat kell sugározni úgy, hogy a 3.5.7.5.1 pontban leírt sértetlenségi követelmények kielégítésre kerüljenek. Ha az ionoszférikus helyesbítés vagy a $\sigma^2_{i,GIVE}$ túllépi a kódolási tartományát, akkor az SBAS-nek jeleznie kell azt, hogy az IGP nem megfelelő /’egészségtelen’/ (a helyesbítési adatokban kijelölve). Ha a $\sigma^2_{i,GIVE}$ -t nem lehet meghatározni, akkor az SBAS-nek jeleznie kell, hogy az IGP „Nem-ellenőrzött” (a GIVEI kódolásban kijelölve).

3.5.7.5.5 *Teljesítőképesség csökkenési adatok.* Az SBAS-nek sugároznia kell a teljesítőképesség csökkenési paramétereket (10. típusú közlemény) úgy, hogy a 3.5.7.5.1 pontban leírt sértetlenségi követelmények kielégítésre kerüljenek.

3.5.7.6 *Választható funkciók*

3.5.7.6.1 *Időmérési adatok.* Amikor Egyeztetett Világidő /UTC/ idő-paraméterek kerülnek sugárzásra, akkor azoknak a 3.5.4.8 pontban (12. típusú közlemény) meghatározottaknak kell lenni.

3.5.7.6.2 *Szolgáltatás jelzés*. Amikor szolgáltatás jelzési adatok kerülnek sugárzásra, akkor azoknak a 3.5.4.9 pontban (27. típusú közlemény) meghatározottaknak kell lenni, és a 28. típusú közleményt nem kell sugározni. Az összes 27. típusú közleményben az Adatkibocsátás Szolgáltatás /IODS/ számnak növekedni kell akkor, amikor változás van bármilyen 27. típusú közlemény adataiban.

3.5.7.6.3 *Óra – efemerisz kovariancia mátrix*. Amikor az óra – efemerisz kovariancia mátrix adatok sugárzásra kerülnek, akkor azokat az összes ellenőrzött műholdra sugározni kell úgy, ahogy az a 3.5.4.10 pontban meghatározásra került (28. típusú közlemény), és a 27. típusú közleményt nem szabad leadni.

3.5.7.7 *Ellenőrzés*

3.5.7.7.1 *A Műhold Bázisú Kiegészítő Rendszer /SBAS/ rádiófrekvenciás ellenőrzése*. Az SBAS-nek ellenőriznie kell a B-55. táblázatban megadott SBAS műhold paramétereket, és végre kell hajtani a jelzett tevékenységeket.

Megjegyzés. – Az ebben a részben lévő rádiófrekvenciás ellenőrzési követelményekhez kiegészítően szükséges az is, hogy speciális intézkedésekkel kerüljön ellenőrzésre a 3. fejezet 3.7.3.4.2.1.5 pontjában meghatározott pszeudo-távolság gyorsulás és a 3.5.2.2 pontban meghatározott vivőhullám fázis zaj, valamint a fenti 3.5.2.5 pontban leírt korrelációs veszteség, kivéve, ha elemzés és vizsgálatok kimutatják azt, hogy ezek a paraméterek nem tudják meghaladni a meghatározott határértékeket.

3.5.7.7.2 *Adat ellenőrzés*. Az SBAS-nek ellenőriznie kell a műhold jeleit azért, hogy megállapítsa az olyan helyzeteket, ami a légijármű fedélzeti vevők differenciális feldolgozásának helytelen működését fogja eredményezni a követési teljesítménnyel együtt, amely „D”- Melléklet 8.11 pontjában került meghatározásra.

3.5.7.7.2.1 A földi al-rendszernek a legerősebb kollerációs csúcsot kell használni az összes, a pszeudo-távolság helyesbítések létrehozására használatos vevőben.

3.5.7.7.2.2 A földi al-rendszernek meg kell határozni az olyan helyzeteket is, amely több, mint egy nulla átmenetet okoz azoknál a légijármű fedélzeti vevőknél, amelyek a „D”-Melléklet 8.11 pontjában meghatározottak szerinti Korai – Késői megkülönböztető funkciót használják.

3.5.7.7.2.3 Az ellenőrző tevékenységnél a Felhasználói Differenciál Távolságmérési Hibát /UDRE/ a műholdra a „Ne használja”-ra kell állítani.

3.5.7.7.2.4 Az SBAS-nek ellenőriznie kell az összes aktív adatot, amelyet a szolgáltatási területen belül lévő bármely felhasználó használhat.

3.5.7.7.2.5 Az SBAS-nek 5,2 másodpercen belül létre kell hozni egy riasztást akkor, ha az aktív adatok bármely kombinációja és a Globális Navigációs Műhold Rendszer /GNSS/ térbeli-jelei egy tolerancián-kívüli helyzetet eredményeznek a precíziós megközelítésre, vagy a II. Függőleges Vezetéses Megközelítésre /APV II./ (3.5.7.5.1).

3.5.7.7.2.6 Az SBAS-nek 8 másodpercen belül létre kell hozni egy riasztást akkor, ha az aktív adatok bármely kombinációja és a Globális Navigációs Műhold Rendszer /GNSS/ térbeli-jelei egy tolerancián-kívüli helyzetet eredményeznek az útvonal-repüléstől az I. Függőleges Vezetéses Megközelítésre /APV I./ (3.5.7.4.1).

Megjegyzés. – Az ellenőrzést az összes hibás állapotra alkalmazni kell, beleértve a műholdak helyzetsor rendszere(i)ben lévő hibákat, vagy a Műhold Bázisú Kiegészítő Rendszerű műholdak hibáit is. Ez az ellenőrzés alapfeltételként elfogadja azt, hogy a légijármű fedélzeti alkotóelemek kielégítik az RTCA/DO-229B követelményeit, kivéve azt, ahogy azt a 3.5.8 pont és a „D”- Melléklet 8.11 pontja hatálytalanítja.

3.5.7.8 *A műhold helyzetsor rendszer(ek) hibáinak hibatűrése*. Egy műhold helyzetsor rendszerű műhold rendellenességének előfordulásakor a Műhold Bázisú Kiegészítő Rendszernek /SBAS/ szabályszerűen folytatnia kell a működését azoknak a szabályos működésű műholdaknak a rendelkezésre álló jeleit felhasználva, amelyeket követni lehet.

3.5.8 LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

1. Megjegyzés. – Azok a paraméterek, amelyekre ebben a részben utalások találhatók, a 3.5.4 pont alatt kerültek meghatározásra.

2. Megjegyzés. – Az ebben a részben leírt követelmények egy részét nem lehet az olyan berendezésekre alkalmazni, amelyek kiegészítő navigációs érzékelőket foglalnak magukba, mint például egy berendezést, ami integrálja az SBAS-t az inerciális navigációs érzékelőkkel.

3.5.8.1 *SBAS-alkalmasságú Globális Navigációs Műhold Rendszer /GNSS/ vevő*. Kivéve azt, ahol határozottan megjegyzésre kerül, az SBAS- alkalmasságú GNSS vevőnek fel kell dolgoznia az SBAS jeleit, és meg kell felelnie a 3.1.3.1 pontban (GPS vevő) és/vagy a 3.2.3.1 pontban (GLONASS vevő) leírt követelményeknek. Az egyes műholdakra vonatkozó pszeudo-távolság méréseket a vivőhullám mérések és egy olyan simító szűrő felhasználásával kell simítani, amelynek az eltérése 0,1 méternél kevesebb 200 másodpercen belül az indulási állapot után, a szűrőnek a 3.6.5.1 pontban meghatározott állandósult átviteléhez viszonyítva, egy, a kód fázis és az integrált vivőhullám fázis közötti eltérés jelenlétében 0,01 méter/másodperc értékig.

3.5.8.1.1 *Az adat felhasználás feltételei*. A vevőnek egy SBAS közleményből származó adatokat csak akkor kell felhasználni, amikor ezeknek a közleményeknek a Ciklikus Redundancia Ellenőrzése /CRC/ megerősítésre került. Az egy SBAS műholdtól jövő 0. típusú közlemény vétele annak a műholdnak a leválasztását kell, hogy létrehozza, és az attól a műholdtól eredő összes adatot legalább 1 percig érvényteleníteni kell. A GPS műholdakra a vevőnek csak akkor kell alkalmazni a hosszútávú helyesbítéseket, ha az Adatkibocsátás /IOD/ megegyezik mind az Adatkibocsátás efemerisszel /IODE/, mind az Adatkibocsátás órának /IODC/ a 8 legkisebb helyértékű bitjével. A GLONASS műholdakra a vevőnek csak akkor kell alkalmazni a hosszútávú helyesbítéseket, ha a GLONASS efemerisz vételének ideje (t_r) belül van a következő IOD érvényességi időközében, ahogy az a 3.5.4.4.1 pontban meghatározásra került:

$$t_{LT} – L – V \le t_r \le t_{LT} – L$$

Megjegyzés. – Ez a követelmény nem foglalja magába azt, hogy a vevőnek abba kell hagyni az SBAS műhold követését.

3.5.8.1.1.1 A vevőnek csak akkor kell a sértetlenségi, vagy helyesbítési adatokat felhasználni, ha az ahhoz az adathoz kapcsolódó Adatkibocsátás, Ál-véletlen zaj /IODP/ megegyezik az Ál-véletlen zaj /PRN/ maszkhoz kapcsolódó IODP-vel.

3.5.8.1.1.2 A vevőnek csak akkor kell az SBAS biztosítású ionoszférikus adatokat (Ionoszférikus Rácspont /IGP/ számított függőleges késés és Hálózat Ionoszférikus Függőleges Hiba Jelzés /$GIVEI_i$ /) felhasználni, ha a 26. típusú közleményben lévő Adatkibocsátás – Ionoszférikus /$IODI_k$ /-hoz kapcsolódó adatok megegyeznek a 18. típusú közleményben továbbított vonatkozó Ionoszférikus Rácspont /IGP/ sáv maszkkal.

3.5.8.1.1.3 A vevőnek fel kell használni azokat a legújabb vett sértetlenségi adatokat, amelyekre az Adatkibocsátás–Gyors Helyesbítés /$IODF_j$ / 3-al egyenlő, vagy az $IODF_j$ megegyezik az alkalmazott gyors helyesbítési adatokhoz kapcsolódó $IODF_j$ -vel (ha helyesbítések biztosításra kerülnek).

3.5.8.1.1.4 A vevőnek fel kell használni minden körzeti teljesítőképesség csökkenést a $\sigma^2{}_{i,UDRE}$ –re, ahogy azt a 27. típusú szolgáltatási közlemény meghatározza. Amikor egy 27. típusú közlemény egy új Adatkibocsátás – Szolgáltatás /IODS/ egy magasabb δUDRE-t jelez a felhasználó helyén, akkor azonnal a magasabb δUDRE-t kell alkalmazni. Egy 27. típusú közleményben lévő alacsonyabb δUDRE-t nem szabad alkalmazni addig, amíg a közlemények egy teljes sorozata az új IODS-el vételre nem került.

3.5.8.1.1.5 A vevőnek alkalmaznia kell a műhold fajlagos teljesítőképesség csökkenést a $\sigma_{i,UDRE}{}^2$ –re úgy, ahogy az a 28. típusú óra – efemerisz kovariancia mátrix közlemény által meghatározott. A 28. típusú közleményből származtatott δ_{UDRE}-t azonnal alkalmazni kell.

3.5.8.1.1.6 A Globális Helymeghatározó Rendszer /GPS/ műholdjaira a vevőnek csak akkor kell a hosszútávú helyesbítéseket alkalmazni, ha az Adatkibocsátás /IOD/ megegyezik mind az Adatkibocsátás – Efemerisszel /IODE/, mind az Adatkibocsátás – Óra /IODC/ 8. Legkisebb Helyértékű Bitjével.

Megjegyzés. – A Műhold Bázisú Kiegészítő Rendszerű /SBAS/ műholdaknál nincs olyan mechanizmus, ami összekapcsolja a Geostacionárius Pálya /GEO/ távolság-meghatározási funkció adatait (9. típusú közlemény) és a hosszútávú helyesbítéseket.

3.5.8.1.1.7 Egymást követő négy SBAS közlemény elvesztése esetén a vevő a továbbiakban nem támaszthatja alá az SBAS-en alapuló precíziós megközelítési, vagy függőleges vezetéses megközelítési /APV/ üzemeltetéseket.

3.5.8.1.1.8 A vevő nem használhat fel egy sugárzott adat paramétert, miután az a B-56. táblázatban meghatározottaknak megfelelően ’idő-túllépéses’.

B-56. táblázat: Adat idő-túllépési időközök

Adat	Kapcsolatos közlemény típus	Útvonal, Közelkörzet, Nem-precíziós megközelítés /NPA/ idő-túllépés	Precíziós megközelítés, Függőleges Vezetéses megközelítés /APV/ idő-túllépés
Óra – efemerisz kovariancia mátrix	28	360	240
Műhold Bázisú Kiegészítő Rendszer /SBAS/ teszt üzemmódban	0	Nem alkalmazható.	Nem alkalmazható.
Ál-véletlen zaj /PRN/ maszk	1	600 s	600 s
Felhasználói Differenciál Távolságmérési Hiba Jelzés /UDREI/	2.-tól 6.-ig terjedő, 24.	18 s	12 s
Gyors helyesbítések	2.-tól 5.-ig terjedő, 24.	(lásd a B-57. táblázatot)	(lásd a B-57. táblázatot)
Hosszútávú helyesbítések	24., 25.	360 s	240 s
Geostacionárius Pálya /GEO/ távolságmérési funkció adatok	9.	360 s	240 s
Gyors helyesbítés teljesítőképesség csökkenés	7.	360 s	240 s
Teljesítmény-csökkenési paraméterek	10.	360 s	240 s
Ionoszférikus rács maszk	18.	1 200 s	1 200 s
Ionoszférikus helyesbítések, Ionoszférikus Rács Függőleges Hiba Jelzés /GIVEI/	26.	600 s	600 s
Időmérési adatok	12.	86 400 s	86 400 s
Naptár adatok	17.	Nincs	Nincs
Szolgáltatási szint	27.	86 400 s	86 400 s

Megjegyzés: Az idő-túllépési időközök egy közlemény vételének befejezésétől vannak meghatározva.

B-57. táblázat: A gyors helyesbítés idő-túllépés időközök kiértékelése

Gyors helyesbítés teljesítőképesség csökkenési tényező jelzés (ai_i)	Nem-precíziós megközelítés /NPA/ idő-túllépési időköz a gyors helyesbítésre (I_{fc})	Precíziós megközelítés /PA/ idő-túllépési időköz a gyors helyesbítésre (I_{fc})
0	180 s	120 s
1	180 s	120 s
2	153 s	102 s
3	135 s	90 s
4	135 s	90 s
5	117 s	78 s
6	99 s	66 s
7	81 s	54 s
8	63 s	42 s
9	45 s	30 s
10	45 s	30 s
11	27 s	18 s
12	27 s	18 s
13	27 s	18 s
14	18 s	12 s
15	18 s	12 s

3.5.8.1.1.9 A vevő nem használhat fel egy gyors helyesbítést, ha a Távolság-meghatározási változás helyesbítéshez /RRC/ kapcsolódó Δt meghaladja a gyors helyesbítések időzítési időközét, vagy ha az RRC 'kora' meghaladja a 8Δt -t.

3.5.8.1.1.10 A Távolság-meghatározási változás helyesbítés /RRC/ számítását újra-inicializálni kell, ha egy „Ne használja", vagy a „Nem-ellenőrzött" jelzést veszik a műholdra.

3.5.8.1.1.11 Az SBAS-re alapozott precíziós megközelítéses, vagy Függőleges Vezetéses Megközelítéses /APV/ üzemeltetésekhez, a vevő csak olyan műholdakat használhat fel, amelyeknek a magassági szöge 5 fokos, vagy annál nagyobb.

3.5.8.1.1.12 A vevő a továbbiakban nem támaszthat alá SBAS-re alapozott precíziós megközelítéses, vagy APV megközelítéses üzemeltetéseket egy meghatározott műholdat felhasználva, ha a vett Felhasználói Differenciál Távolságmérési Hiba Jelzés /$UDREI_i$ / nagyobb, vagy egyenlő 12-nél.

3.5.8.2 *Távolságmérési funkció*

3.5.8.2.1 *Precíziós megközelítési és Függőleges vezetéses megközelítési üzemeltetések.* Egy SBAS műhold helyesbített pszeudo-távolság hibájában a teljes légijármű fedélzeti járulékos hiba négyzetes középértéke (1 szigma) a minimális vett jel teljesítmény szintnél (3. fejezet, 3.7.3.4.4.3) a legrosszabb interferencia környezet esetén - ahogy az a későbbiekben a 3.7 pontban meghatározásra került – egyenlő, vagy kevesebb kell, hogy legyen, mint 1,8 méter, a többutas hatásokat, a troposzférikus és az ionoszférikus megmaradó hibákat kizárva.

Megjegyzés. – A légijármű fedélzeti alkotóelemek összekapcsolják a többutas és a troposzféra által létrehozott hibákat (3.5.8.4.1). A szolgáltatás előrejelzése céljából, a többutas hibára elfogadott, hogy az 0,6 méternél (1 szigma) kevesebb.

3.5.8.2.2 *Indulási, útvonal, közelkörzeti és nem-precíziós megközelítési üzemeltetések*. Egy SBAS műhold helyesbített pszeudo-távolság hibájában a teljes légijármű fedélzeti járulékos hiba négyzetes középértéke (1 szigma) a minimális vett jel teljesítmény szintnél (3. fejezet, 3.7.3.4.4.3) a legrosszabb interferencia környezet esetén - ahogy az a későbbiekben a 3.7 pontban meghatározásra került – egyenlő, vagy kevesebb kell, hogy legyen, mint 5 méter, a többutas hatásokat, a troposzférikus és az ionoszférikus megmaradó hibákat kizárva.

3.5.8.2.3 *A Műhold Bázisú Kiegészítő Rendszerű /SBAS/ műhold helyzete*

3.5.8.2.3.1 *Helyzet számítás*. A vevőnek dekódolni kell a 9. típusú közleményt és meg kell határoznia az SBAS műhold kód fázis eltolását és helyzetét (X_G , Y_G , Z_G).

3.5.8.2.3.2 *SBAS műhold azonosítás*. Az SBAS műholdakat a vevőnek kell megkülönböztetni.

Megjegyzés. – Ezt a követelményt kell egy műholdnak a kereszt-korreláció miatti hibás adatgyűjtésére alkalmazni.

3.5.8.2.4 *Naptár adatok*

3.5.8.2.4.1 **Ajánlás**. – *Az SBAS által biztosított naptár adatokat fel lehet használni az adatgyűjtésre.*

Megjegyzés. – A Geostacionárius Pálya /GEO/ naptár adatokban biztosított működési állapot /'egészség'/ és állapot információk alátámasztják az adatgyűjtést, de ezeket nem kell felhasználni úgy, mint az arra a műholdnak a használatára vonatkozó feltételt.

3.5.8.3 *Globális Navigációs Műhold Rendszer /GNSS/ műhold állapot funkció*. A vevőnek ki kell zárni a helyzet megoldásból a műholdakat akkor, ha azok az SBAS által „Ne használja"-ként vannak azonosítva. Amikor SBAS-biztosítású sértetlenség használatos, akkor a vevőtől nem kívánható el az, hogy kizárja az olyan Globális Helymeghatározó Rendszer /GPS/ műholdakat, amelyek GPS-biztosítású efemerisz működési állapot jelzésen alapulnak, ahogy az a 3.1.3.1.1 pont szerint szükséges, vagy az, hogy kizárja az olyan GLONASS műholdakat, amelyek GLONASS-biztosítású efemerisz működési állapot jelzésen alapulnak, ahogy az a 3.2.3.1.1 pont szerint szükséges.

1. Megjegyzés. – Egy műhold helyzetsor rendszer(ek) működési állapot jelzés szerint rossz működési állapotúként kijelölt műhold esetében az SBAS képes lehet arra, hogy olyan efemerisz és óra helyesbítéseket sugározzon, ami a felhasználó részére lehetővé fogja tenni azt, hogy folytassa a műhold felhasználását.

2. Megjegyzés. – Amikor az SBAS által „Nem-ellenőrzött"-ként azonosított műholdak használatosak a helyzet megoldáshoz, akkor az SBAS nem biztosítja a sértetlenséget. A Légijármű Bázisú Kiegészítő Rendszert /ABAS/, vagy a Földi Fázisú Kiegészítő Rendszert /GBAS/ fel lehet használni a sértetlenség biztosításához, ha rendelkezésre áll.

3.5.8.4 *Alap és precíz differenciál funkciók*

3.5.8.4.1 *Műhold helyzetsor rendszer(ek) távolságmérési pontossága*. Egy GPS műhold helyesbített pszeudo-távolság hibájában a teljes légijármű fedélzeti járulékos hiba négyzetes középértéke (1 szigma) a minimális vett jel teljesítmény szintnél (3. fejezet, 3.7.3.1.5.4) a legrosszabb interferencia környezet esetén - ahogy az a későbbiekben a 3.7 pontban meghatározásra került – egyenlő, vagy kevesebb kell, hogy legyen, mint 0,4 méter, a többutas hatásokat, a troposzférikus és az ionoszférikus megmaradó hibákat kizárva. Egy GLONASS műholdra a helyesbített pszeudo-távolság hibában a teljes légijármű fedélzeti járulékos hiba négyzetes középértéke /RMS/ a minimális vett jel teljesítmény szintnél (3. fejezet 3.2.5.4 pont) a legrosszabb interferencia környezet esetén – ahogy az a 3.7 pontban meghatározásra került – egyenlő, vagy kevesebb kell, hogy legyen 0,8 méternél, a többutas terjedési hatásokat, a troposzférikus és ionoszférikus megmaradó hibákat kizárva.

3.5.8.4.2 Precíziós *megközelítési és Függőleges vezetéses megközelítési /APV/ üzemeltetések*

3.5.8.4.2.1 A vevőnek ki kell számítani és fel kell használni a hosszútávú helyesbítéseket, a gyors helyesbítéseket, a távolság meghatározási változás helyesbítéseket és a sugárzási ionoszférikus helyesbítéseket. A GLONASS műholdakra a Műhold Bázisú Kiegészítő Rendszertől /SBAS/ vett ionoszférikus helyesbítéseket meg kell szorozni a GLONASS – GPS frekvenciák arányának $(f_{GLONASS}/f_{GPS})^2$ négyzetével.

3.5.8.4.2.2 A vevőnek egy általános-legkisebb-négyzetek helyzet megoldást kell alkalmazni.

3.5.8.4.2.3 A vevőnek egy olyan troposzférikus modelt kell alkalmazni, hogy a pszeudo-távolság megmaradó értékének a középértéke (μ) 0,15 méternél kevesebb legyen, és az 1 szigma eltérés 0,07 méternél kevesebb legyen.

Megjegyzés. – Egy, az ezt a követelményt kielégítő model kidolgozásra került. Az útmutató anyag a „D”-Melléklet 6.7.3 pontjában került megadásra.

3.5.8.4.2.4 A vevőnek ki kell számítani és alkalmaznia kell a 3.5.5.6 pontban meghatározott vízszintes és függőleges védelmi szintet. Ebben a számításban a σ_{tropo} -nak a következőnek kell lenni:

$$\frac{1}{\sqrt{0.002+\sin^2(\theta_i)}}\times 0.12\text{ m}$$

ahol θ_i az i-dik műhold magassági szöge.

Azonkívül a σ_{air} -nek ki kell elégíteni azt a feltételt, hogy egy nulla középértékű szabvány eloszlás és egy, a σ_{air} -el egyenlő szabvány eltérés a légijármű fedélzeti pszeudo-távolság megmaradó hibáját az alábbiak szerint kapcsolja a hibaeloszláshoz:

$$\int_y^{\infty} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \quad \text{az összes } \frac{y}{\sigma} \ge 0 \text{ -ra és}$$

$$\int_{-\infty}^{-y} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \quad \text{az összes } \frac{y}{\sigma} \ge 0 \text{ -ra}$$

ahol:

$f_n(x)$ = a légijármű fedélzeti megmaradó pszeudo-távolság hibájának a valószínűségi sűrűség funkciója és

$$Q(x) = \frac{1}{\sqrt{2\pi}}\int_x^{\infty} e^{-\frac{t^2}{2}}dt$$

Megjegyzés. – A légijármű fedélzeti többutas terjedésre a 3.6.5.5.1 pontban meghatározott szabvány elhanyagolási tényezőt lehet felhasználni a többutas terjedési hibák összekapcsolására.

3.5.8.4.2.5 A precíziós megközelítési és a Függőleges Vetetéses Megközelítési /APV/ üzemeltetésekre a 17. típusú közleményben sugárzott szolgáltatás biztosító azonosítónak /ID/ meg kell egyezni a Végső Megközelítési Szakasz /FAS/ adatblokkban lévő szolágáltatás biztosító azonosítóval, kivéve, ha a FAS adatblokkban az Azonosító /ID/ 15-el egyenlő.

Megjegyzés. – A Műhold Bázisú Kiegészítő Rendszerre /SBAS/ a Végső Megközelítési Szakasz /FAS/ adatblokkok a légijármű fedélzeti adatbázisokban vannak tárolva. Az adat formátum a ciklikus redundancia elenőrzéses érvényesítéshez a "D"- Melléklet 6.6 pontjában került bemutatásra. Ez eltér a Földi Bázisú Kiegészítő Rendszer /GBAS/ Végső Megközelítési Szakasz /FAS/ adatblokkra a 3.6.4.5 pontban megadottaktól, amelyben a Műhold Bázisú Kiegészítő Rendszer /SBAS/ Vízszintes Riasztási Határértékeket /HAL/ és a Függőleges Riasztási Határértékeket /VAL/ foglalja magába egy adott megközelítési eljárásra. Az SBAS pszeudo-távolság helyesbítéseit felhasználva végrehajtott megközelítésekre, a FAS adatblokkban lévő szolgáltatás biztosító azonosító /ID/ ugyanaz, mint ami a 17. típusú közleményben a működési állapot /'egészség'/ és állapot információ részeként sugárzott szolgáltatás biztosító azonosító. Amikor a Végső Megközelítési Szakasz /FAS/ adatblokkjában a szolgáltatás biztosító azonosító /ID/ 15-el egyenlő, akkor bármelyik szolgáltatás biztosítót fel lehet használni. Amikor a Végső Megközelítési Szakasz /FAS/ adatblokkjában a szolgáltatás biztosító azonosító /ID/ 14-el egyenlő, akkor a Műhold Bázisú Kiegészítő Rendszer /SBAS/ precíz differenciál helyesbítéseit nem lehet a megközelítéshez felhasználni.

3.5.8.4.3 *Indulási, útvonal, közelkörzeti és nem-precíziós megközelítési üzemeltetések*

3.5.8.4.3.1 A vevőnek ki kell számítani és fel kell használni a hosszútávú helyesbítéseket, a gyors helyesbítéseket és a távolság meghatározási változás helyesbítéseket.

3.5.8.4.3.2 A vevőnek ki kell számítani és fel kell használni az ionoszférikus helyesbítéseket.

Megjegyzés. – Az ionoszférikus helyesbítések kiszámításának módszerei a 3.1.2.4 és 3.5.5.5.2 pontokban kerültek biztosításra.

3.5.8.4.3.3 A vevőnek egy olyan troposzférikus modelt kell alkalmazni, hogy a pszeudo-távolság megmaradó értékének a középértéke (μ) 0,15 méternél kevesebb legyen, és a szabvány eltérés 0,07 méternél kevesebb legyen.

Megjegyzés. – Egy, az ezt a követelményt kielégítő model kidolgozásra került. Az útmutató anyag a "D"- Melléklet 6.7.3 pontjában került megadásra.

3.5.8.4.3.4 A vevőnek ki kell számítani és alkalmaznia kell a 3.5.5.6 pontban meghatározott vízszintes és függőleges védelmi szintet. Ebben a számításban a σ_{tropo} -nak a következőnek kell lenni:

$$\frac{1}{\sqrt{0.002+\sin^2(\theta_i)}}\times 0.12 \text{ m}$$

ahol θ_i az i-dik műhold magassági szöge.

Azonkívül a σ_{air} -nek ki kell elégíteni azt a feltételt, hogy egy nulla középértékű normál eloszlás és egy, a σ_{air} -el egyenlő szabvány eltérés a légijármű fedélzeti pszeudo-távolság megmaradó hibáját az alábbiak szerint kapcsolja a hibaeloszláshoz:

$$\int_y^{\infty} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \text{ az összes } \frac{y}{\sigma} \ge 0 \text{ -ra és}$$

$$\int_{-\infty}^{-y} f_n(x)dx \le Q\left(\frac{y}{\sigma}\right) \quad \text{az összes } \frac{y}{\sigma} \ge 0 \text{ -ra}$$

ahol:

f_n (x) = a valószínűségi sűrűség funkciója a légijármű fedélzeti megmaradó pszeudo-távolság hibájának és

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_x^{\infty} e^{-\frac{t^2}{2}} dt$$

Megjegyzés. – A légijármű fedélzeti többutas terjedésre a 3.6.5.5.1 pontban meghatározott szabvány elhanyagolási tényezőt lehet felhasználni a többutas terjedési hibák összekapcsolására.

3.5.8.4.4 **Ajánlás**. – *Az indulási, útvonal, közelkörzeti és nem-precíziós megközelítési üzemeltetésekhez, a vevő felhasználhatja a sugárzott ionoszférikus helyesbítéseket, amikor az rendelkezésre áll, és egy olyan troposzférikus modelt, amelynek a teljesítménye egyenlő avval, ami a 3.5.8.4.3 pontban előírásra került.*

3.5.9 A MŰHOLD BÁZISÚ KIEGÉSZÍTŐ RENDSZEREK /SBAS/ KÖZÖTTI INTERFÉSZ (KAPCSOLAT)

Megjegyzés. –A különböző SBAS szolgáltatás biztosítók közötti interfészre vonatkozó útmutató anyag a "D"- Melléklet 6.3 pontjában került megadásra.

3.6 Földi Bázisú Kiegészítő Rendszer /GBAS/

Megjegyzés. – Ebben a részben, hacsak nincs külön kiemelve, a megközelítés függőleges vezetéssel (APV) APV-I és APV-II jelentéssel bír.

3.6.1 ÁLTALÁNOS RÉSZ

A Földi Bázisú Kiegészítő Rendszernek /GBAS/ egy földi al-rendszerből és egy légijármű fedélzeti al-rendszerből kell felépülni. A GBAS földi al-rendszereinek a Globális Navigációs Műhold Rendszer /GNSS/ távolság-meghatározási jeleihez adatokat és helyesbítéseket kell biztosítani egy digitális VHF adat sugárzással a légijármű fedélzeti al-rendszer részére.

Megjegyzés. – Az útmutató anyag a "D"- Melléklet 7.1 pontjában került megadásra.

3.6.2 RÁDIÓFREKVENCIÁS (RF) JELLEMZŐK

3.6.2.1 *Vivőhullám frekvencia stabilitás.* Az adat sugárzás vivőhullám frekvenciáját a kijelölt frekvenciához ±0,0002 százalékon belül kell tartani.

3.6.2.2 *Bit – fázis -változás kódolás.* A Földi Bázisú Kiegészítő Rendszer /GBAS/ közleményeit szimbólumokká kell összeállítani, amelyek mindegyike 3 egymást követő közlemény bitből áll. A közlemény végét 1, vagy 2 töltő bittel kell kitölteni, ha ez szükséges ahhoz, hogy a közlemény utolsó 3-bites szimbólumát kialakítsa. A szimbólumokat D8PSK vivőhullám fázis eltolássá ($\Delta\phi_k$) kell átalakítani a B-57. táblázatban megadottaknak megfelelően.

Megjegyzés. – A vivőhullám fázist a k-dik szimbólumra (ϕ_k) adja meg:

$$\phi_k = \phi_{k-1} + \Delta\phi_k$$

3.6.2.3 *Modulációs hullámforma és impulzusformáló szűrők.* A differenciál fázis kódoló kimenetet egy olyan impulzusformáló szűrővel kell szűrni, amelynek a kimenete, az s(t), a következők szerint írható le:

$$s(t) = \sum_{k=-\infty}^{k=\infty} e^{j\phi_k} h\,(t - kT)$$

ahol:

h = a felfutó koszinusz szűrő impulzus válasza;
ϕ_k = (ahogy a 3.6.2.2 pontban meghatározásra került);
t = idő; és
T = az egyes szimbólumok időtartama = 1/10 500 másodperc.

Ennek az impulzusformáló szűrőnek a névleges komplex frekvencia jelleggörbéje egy felfutó koszinusz α = 0,6 kell, hogy legyen. A felfutási idő, h(t), és a frekvencia jelleggörbe, H(f), az alapsáv szűrőkön a következő lesz:

$$h(t) = \frac{\sin\left(\frac{\pi t}{T}\right)\cos\left(\frac{\pi\alpha t}{T}\right)}{\frac{\pi t}{T}\left[1-\left(\frac{2\alpha t}{T}\right)^2\right]}$$

$$H(f) = \begin{cases} 1 & \text{az} \quad 0 \le f < \frac{1-\alpha}{2T} \quad \text{- re} \\ \frac{1-\sin\left(\frac{\pi}{2\alpha}(2fT-1)\right)}{2} & \text{az} \quad \frac{1-\alpha}{2T} \le f \le \frac{1+\alpha}{2T} \quad \text{- re} \\ 0 & \text{az} \quad f > \frac{1+\alpha}{2T} \quad \text{- re} \end{cases}$$

Az impulzusformáló szűrő kimenetének, s(t), kell a vivőhullámot modulálni.

3.6.2.4 *Hiba vektor nagyság.* A továbbított jel hiba vektor nagyságának 6,5 százalék négyzetes középértéknél (1 szigma) kisebbnek kell lenni.

3.6.2.5 *Rádiófrekvenciás adatátviteli sebesség.* A szimbólum átviteli sebességnek másodpercenként 10 500 szimbólum ± 0,005 százaléknak kell lenni, ami egy névleges 31 500 bit/másodperc átviteli sebességet eredményez.

B-58. táblázat: Adat kódolás

Közlemény bitek			Szimbólum fázis eltolás
I_{3k-2}	I_{3k-1}	I_{3k}	$\Delta\phi_k$
0	0	0	$0\pi/4$
0	0	1	$1\pi/4$
0	1	1	$2\pi/4$
0	1	0	$3\pi/4$
1	1	0	$4\pi/4$
1	1	1	$5\pi/4$
1	0	1	$6\pi/4$
1	0	0	$7\pi/4$

Megjegyzés. – Az I_j a sugározandó szinkron vezérjel j-dik bitje, ahol az I_1 az impulzussorozat első bitje.

3.6.2.6 *Sugárzás a kijelöletlen időrésekben*. Minden üzemeltetési körülmény esetén a maximális teljesítmény egy, a kijelölt frekvencián központosuló 25 kHz-es csatorna sebességen keresztül, amikor bármely kijelöletlen időrésben kerül mérésre, nem haladhatja meg a –105 dBc-t az engedélyezett adó teljesítményére vonatkoztatva.

Megjegyzés. – Ha az engedélyezett adó teljesítmény nagyobb, mint 150W, a -105 dBc lehet, hogy nem nyújt védelmet olyan időrésben történő sugárzások vétele ellen, mely másik szükséges adó számára van kijelölve olyan vevők részére, melyek a nemkívánt sugárzó antennától 200m-es távolságon belül vannak.

3.6.3 ADAT SZERKEZET

3.6.3.1 *Adó időzítés*

3.6.3.1.1 *Az adat sugárzás időzítési szerkezete*. Az időosztásos többszörös elérés (TDMA) időzítési szerkezetét a keretekre és az időrésekre kell alapozni. Az egyes kereteknek időtartamban 500 milliszekundumnak kell lenni. 2 ilyen keretet kell magába foglalnia minden egyes 1-másodperces Egyeztetett Világidő /UTC/ korszaknak. Ezekből a keretekből az elsőnek az UTC korszak kezdeténél kell kezdődni és a második keretnek az UTC korszak kezdete után 0,5 másodperccel kell elkezdődnie. A keretnek időosztásos multiplexnek kell lenni úgy, hogy annak 8 különálló (A-tól H-ig) 62,5 milliszekundumos időtartamú időrésből kell állni.

3.6.3.1.2 *Szinkron vezér jelek*. Az egyes kijelölt időréseknek legalább 1 szinkron vezér jelet kell magukba foglalni. Az időrés alkalmazásának elindításához a Földi Bázisú Kiegészítő Rendszernek /GBAS/ egy szinkron vezér jelet kell sugározni abban az időrésben, amely minden egyes 5 egymást követő keretnél van. Az egyes alkalmazott időrésekre a földi al-rendszernek egy szinkron vezér jelet kell sugározni minden egyes egymást követő 5 keretnél legalább 1 keretben.

1. Megjegyzés. – A szinkron vezér jelek egy, vagy több közleményt foglalnak magukba, és változó hosszúságúak lehetnek az időrések közötti maximális megengedett hosszig, ahogy azt a 3.6.3.2 pont megkívánja.

2. Megjegyzés. – Az időrés indítása során a légijármű fedélzeti vevő nem veheti az első négy szinkron vezérlő jelet.

3.6.3.1.3 *Időzítési előirányzat a szinkron vezérlő jelekhez*

3.6.3.1.3.1 Az egyes szinkron vezérlő jeleket egy 62,5 milliszekundumos időrésbe kell belefoglalni.

3.6.3.1.3.2 A szinkron vezérlő jel kezdetének az időrés kezdete után 95,2 mikroszekundumnál kell bekövetkezni, ± 95,2 mikroszekundum toleranciával.

3.6.3.1.3.3 A GBAS/E berendezésnél a szinkron vezérlő jel szinkronizáló és a bizonytalanság feloldó része kezdetének a vízszintes polarizációval (HPOL) együtt továbbítva 10 mikroszekundumon belül kell bekövetkezni, a függőleges polarizációval (VPOL) sugárzott szinkron vezérlő jel kezdetéhez viszonyítva.

Megjegyzés. – A B-59. táblázat mutatja be a szinkron vezérlő jel időzítését.

3.6.3.1.4 *Felfutás és adó teljesítmény stabilizálás*. Az adónak a tartós teljesítmény szintjének 90 százalékára a szinkron vezérlő jel kezdete után (2 szimbólum) 190,5 mikroszekundumon belül fel kell futni. Az adónak a szinkron vezér jel kezdete után (5 szimbólum) 476,2 mikroszekundumon belül állandósítania kell a tartós teljesítmény szintjét.

Megjegyzés. – Az adó teljesítmény állandósítási időtartamot a légijármű fedélzeti vevője felhasználhatja az automatikus erősítés szabályozása beállításához.

3.6.3.1.5 *Lefutás*. Azután, hogy egy kijelölt időrésben az utolsó információs szimbólum továbbításra került, az adó kimenő teljesítmény szintjének le kell csökkenni legalább 30 dB-el 285,7 mikroszekundumon (3 szimbólum) belül a tartós teljesítmény szintje alá.

3.6.3.2 *A szinkron vezér jel szervezése és kódolása*. Az egyes szinkron vezérlő jeleknek a B-60. táblázatban bemutatott adat elemekből kell állni. A közlemények kódolásának a következő sorrendet kell követni: alkalmazási adat formázás, impulzussorozat vevő oldali hibajavítás (FEC) generálás, alkalmazási vevő oldali hibajavítás (FEC) generálás és bit keverés.

3.6.3.2.1 *Szinkronizálás és bizonytalanság feloldás*. A szinkronizáló és bizonytalanság feloldó mezőnek az alábbiakban bemutatott 48-bites sorozatból kell állni úgy, hogy jobbról a legszélső biteket kell először leadni:

010 001 111 101 111 110 001 100 011 101 100 000 011 110 010 000

B-59. táblázat: Szinkron vezér jel időzítés

Esemény	Névleges esemény időtartam	A tartós teljesítmény névleges százaléka
Felfutás	190,5 μs	0-tól 90 %-ig
Adó teljesítmény stabilizálás	285,7 μs	90-től 100 %-ig
Szinkronizáció és bizonytalanság feloldás	1 523,8 μs	100 %
A kevert adatok továbbítása	58 761,9 μs	100 %
Lefutás	285,7 μs (1.Megjegyzés)	100-tól 0 %-ig

MEGJEGYZÉSEK. –
1. A kevert adatok továbbítására feltüntetett esemény időtartam az 1 776 bites maximális alkalmazási adat hosszra, 2 feltöltő bitre és a névleges szimbólum időtartamra vonatkozik.

2. Ezek az időzítési követelmények egy névleges szimbólum időtartamra 1 262 mikroszekundomos terjedési védettségi időt biztosítanak, ami egy körülbelül 370 km-es
(200 tengeri mérföld) egyirányú terjedési távolságot vesz figyelembe.

3. Ahol egy GBAS sugárzó antennából jövő szinkron vezér jelet lehet venni több, mint 370 km (200 tengeri mérföld) távolságból, ami nagyobb, mint a szomszédos időrést használó másik sugárzó antenna távolsága, hosszabb védelmi időre van szükség mindkét szinkron jel elvesztésének elkerüléséhez. A hosszabb védelmi idő biztosításához az első szinkron jel alkalmazási adat hosszúságának 1744 bitre való korlátozására van szükség. Ez különbséget tesz lehetővé akár 692 km (372 tengeri mérföld) távolságra történő terjedésnél, konfliktus nélkül.

B-60. táblázat: A szinkron vezér jel adattartalma

Alkotóelem	Adattartalom	A bitek száma
A szinkron vezér jel kezdete	Mind nulla	15
Teljesítmény stabilizálás		
Szinkronizálás és bizonytalanság feloldás	3.6.3.2.1	48
Kevert adatok:	3.6.3.3	
Állomás időrés azonosító (SSID)	3.6.3.3.1	3
Továbbítási hossz	3.6.3.3.2	17
Impulzus-sorozat vevő oldali hibajavítás /FEC/	3.6.3.3.3	5
Alkalmazási adat	3.6.3.3.4	1 776-ig
Alkalmazási vevő oldali hibajavítás /FEC/	3.6.3.3.5	48
Feltöltő bitek (Megjegyzés)	3.6.2.2	0-tól 2-ig

Megjegyzés. – A feltöltő bitek adat keverése választható (3.6.3.3.6).

3.6.3.3 *A kevert adatok tartalma*

3.6.3.3.1 *Állomás időrés azonosító (SSID).* Az állomás időrés azonosítónak /SSID/ annak a számszerinti értéknek kell lenni, ami a földi referencia állomás részére az első időrésre kijelölt A-tól H-ig terjedő betű kijelölésnek felel meg, azaz az ’A’ időrést a 0 képviseli, a ’B’-t az 1, a ’C’-t a 2 … és a ’H’-t a 7. Az azonosítónál a Legkisebb Helyértékű Bit-et kell először leadni.

3.6.3.3.2 *Továbbítási hossz.* A továbbítási hossznak jeleznie kell mind az alkalmazási adat, mind az alkalmazási vevő oldali hibajavítás /FEC/ bitjeinek teljes számát. A továbbítási hossznál a Legkisebb Helyértékű Bit kerül először továbbításra.

3.6.3.3.3 *Impulzussorozat vevő oldali hibajavítás /FEC/.* Az impulzussorozat vevő oldali hibajavítást az Állomás időrés azonosítóval /SSID/ és a továbbítási hossz mezőkkel kell kiszámolni egy (25, 20) blokk kód felhasználásával, a következő egyenletnek megfelelően:

$$[\, P_1, \ldots, P_5 \,] = [\, SSID_1 , \ldots, SSID_3 , TL_1 ,\ldots, TL_{17} \,]\, H^T$$

ahol:

P_n	=	Az impulzussorozat vevő oldali hibajavítás /FEC/ n-dik bitje (a P_1 –et kell először továbbítani);
$SSID_n$	=	Az állomás időrés azonosító n-dik bitje ($SSID_1$ = Legkisebb Helyértékű Bit /LSB/);
TL_n	=	A továbbítási hossz n-dik bitje (TL_1 = Legkisebb Helyértékű Bit);
H^T	=	A paritás mátrix transzformációja, az alábbiak szerint meghatározva:

$$H^T = \begin{bmatrix} 0&0&0&0&0&0&0&0&1&1&1&1&1&1&1&1&1&1&1&1 \\ 0&0&1&1&1&1&1&1&0&0&0&0&1&1&1&1&1&1&1&1 \\ 1&1&0&0&0&1&1&1&0&0&1&1&0&0&0&0&1&1&1&1 \\ 1&1&0&1&1&0&1&1&0&1&0&1&0&0&1&1&0&0&1&1 \\ 0&1&1&0&1&0&0&1&1&1&1&0&0&1&0&1&0&1&0&1 \end{bmatrix}^T$$

Megjegyzés. – Ez a kód alkalmas arra, hogy az összes egyedüli bit hibákat kijavítsa, és arra is, hogy 300 lehetséges kettős bit hibából 75-öt észleljen.

3.6.3.3.4 *Alkalmazási adat.* Az alkalmazási adatnak egy, vagy több közlemény blokkból kell állnia, ahogy az a 3.6.3.4 pontban meghatározásra került. A közlemény blokkok közvetlenül lesznek az alkalmazási adatban leképezve, nincsenek kiegészítő beavatkozási rétegek.

3.6.3.3.5 *Alkalmazási vevő oldali hibajavítás /FEC/.* Az alkalmazási vevő oldali hibajavítást az alkalmazási adatokra egy szisztematikus, fix-hosszúságú, Reed-Solomon (R-S) (255, 249) kód segítségével kell kiszámolni.

3.6.3.3.5.1 Az R-S kód mező-meghatározó primitív egyenlete, a p(x), a következő lesz:

$$p(x) = x^8 + x^7 + x^2 + x + 1$$

3.6.3.3.5.2 Az R-S kód generáló polinomjának, a g(x)-nek, a következőnek kell lenni:

$$g(x) = \prod_{i=120}^{125} (x - \alpha^i) = x^6 + \alpha^{176}x^5 + \alpha^{186}x^4 + \alpha^{244}x^3 + \alpha^{176}x^2 + \alpha^{156}x + \alpha^{225}$$

ahol az α annak a p(x)-nek a gyöke, ami a 2^8 fokú Galois Mező, GF(256) összeállításához használatos és az α^i a GF(256) i-dik primitív eleme.

3.6.3.3.5.3 Az alkalmazási vevő oldali hibajavítás összeállításánál a kódolandó adatokat, m(x), 8-bites R-S szimbólumokká kell csoportosítani. A közlemény blokkokban az összes adatmezőt, amelyek az alkalmazási adatokat meghatározzák, úgy kell elrendezni, ahogy az a B-61. és B-62. táblázatokban és a 3.6.6 pont alatti közlemény-táblázatokban előírásra került. Azonban, mivel az R-S kód egy blokk-kód, a 249 byte-nál (1 992 bit) rövidebb alkalmazási adat-blokkokat ki kell bővíteni 249 byte-ra, nullára állított virtuális töltő bitekkel, és hozzá kell toldani az alkalmazási adatokhoz. Ezek a virtuális töltő bitek nem kerülnek továbbításra a bit keverőbe. A kódolandó adatokat, m(x), a következők szerint kell meghatározni:

$$m(x) = a_{248}x^{248} + a_{247}x^{247} + \dots + a_{248\text{-length}+1}\, x^{248\text{-length}+1} + a_{248\text{-length}}\, x^{248\text{-length}} + \dots + a_1x + a_0$$

ahol:

a ’hossz’ képviseli az alkalmazási adatokban lévő 8-bites byte-ok számát;

az a_{248} képviseli a közlemény blokk azonosítóját, a jobbról a legszélső bit van a Legkisebb Helyértékű Bitként /LSB/ meghatározva, és az alkalmazási adat első bitje kerül a bit keverőbe továbbításra;

az $a_{248\text{-hossz}+1}$ jelenti a közlemény blokk Ciklikus Redundancia Ellenőrzésének /CRC/ legutolsó byte-ját, a balról a legszélső bit van a Legnagyobb Helyértékű Bitként /MSB/ meghatározva, és az alkalmazási adat utolsó bitje kerül a bit keverőbe továbbításra;

az $a_{248\text{-hossz}}, \dots, a_1, a_0$ a virtuális kitöltő bitek (ha ilyen van).

3.6.3.3.5.4 A hat R-S ellenőrző szimbólumot (b_i) úgy kell meghatározni, hogy az a közlemény polinomnak, $x^6m(x)$, a generáló polinommal, g(x),való osztásából eredő maradék tényező:

$$b(x) = \sum_{i=0}^{5} b_ix^i + b_5x^5 + b_4x^4 + b_3x^3 + b_2x^2 + b_1x + b_0 = [x^6m(x)] \bmod g(x)$$

3.6.3.3.5.5 A 8-bites R-S ellenőrző szimbólumot csatolni kell az alkalmazási adathoz. Minden egyes 8-bites R-S ellenőrző szimbólumnál a Legnagyobb Helyértékű Bitet először leadva kell továbbítani a b_0-tól a b_5-ig, azaz az első alkalmazási vevő oldali hibajavító bitnek, ami a bit keverőbe továbbításra kerül, a b_0 Legnagyobb Helyértékű Bitnek és az utolsó alkalmazási vevő oldali hibajavító bitnek, ami a bit keverőbe kerül továbbításra, a b_5 Legkisebb Helyértékű Bitnek kell lenni.

1. Megjegyzés. – Ez az R-S kód képes arra, hogy maximum 3 szimbólum hibát kijavítson.

2. Megjegyzés. – A továbbított 8-bites R-S ellenőrző szimbólumok sorrendje a csatolt alkalmazási vevő oldali hibajavításnál eltér a VHF adattovábbítás (VDL) 2. Módjától. Azonkívül a VDL 2. Módnál az egyes R-S ellenőrző szimbólumokat a Legkisebb Helyértékű Bitet először leadva kell továbbítani.

3. Megjegyzés. – Az alkalmazási vevő oldali hibajavítás /FEC/ kódolási eredményeinek példái a "D"-Melléklet 7.15 pontjában kerültek megadásra.

B-61. táblázat: A Földi Bázisú Kiegészítő Rendszer /GBAS/ közlemény blokkjának formátuma

Közlemény blokk	Bitek
Közlemény blokk fejrész	48
Közlemény	1 696-ig
Ciklikus Redundancia Ellenőrzés	32

B-62. táblázat: A közlemény blokk fejrészének formátuma

Adatmező	Bitek
Közlemény blokk azonosító	8
GBAS azonosító /ID/	24
Közlemény típus azonosító	8
Közlemény hossz	8

3.6.3.3.6 *Bit keverés*

3.6.3.3.6.1 Az ál-véletlen zaj keverő kimenetén egy 15-fokozatú generátor regiszterrel kell 'kizáró VAGY'-olni a szinkron vezér jel adatokat, az Állomás Időrés Azonosítóval /SSID/ kezdve és a vevő oldali hibajavítással /FEC/ befejezve. A kitöltő bitek bit keverése választható, és a kitöltő bitek beállítási értéke is választható.

Megjegyzés. – A kitöltő biteket a légijármű fedélzeti vevő nem használja fel, és azok értékének nincs hatása a rendszerre.

3.6.3.3.6.2 A keverő regiszter csapjainak polinomja $1 + x + x^{15}$ kell, hogy legyen. A regiszter tartalmát bitenként egy léptetés sebességgel kell váltani. A regiszter beinduló állapota, az egyes szinkron vezér jelek első Állomás Időrés Azonosítóját /SSID/ megelőzően „1101 0010 1011 001" kell, hogy legyen, balról, a legelső bittel a regiszter első fokozatában. A keverő első kimeneti bitjét az első regiszter léptetés előtt mintavételezni kell.

Megjegyzés. – A bit keverő ábrája a "D"- Melléklet 7.4 pontjában került megadásra.

3.6.3.4 *Közlemény blokk formátum*. A közlemény blokknak egy közlemény blokk fejrészből, a közleményből és egy 32 bites Ciklikus Redundancia Ellenőrzésből /CRC/ kell állni.

A B-61. táblázat mutatja be a közlemény blokk szerkezetét. Az összes előjeles paraméternek kettős kiegészítő számnak kell lenni, és az összes előjel nélküli paraméternek előjel nélküli fix-pontos számnak kell lenni. Az adatok leosztásának a 3.6.6 pont közlemény táblázataiban bemutatottaknak kell lenni. A közlemény blokkban lévő összes adatmezőt a közlemény táblázatokban meghatározott sorrendben kell továbbítani, az egyes mezők Legkisebb Helyértékű Bitjét /LSB/ először továbbítva.

Megjegyzés. - Az összes bináris adat felírás kiolvasása balról jobbra a Legnagyobb Helyértékű Bittől /MSB/ a Legkisebb Helyértékű Bitig /LSB/ történik.

3.6.3.4.1 *Közlemény blokk fejrész*. A közlemény blokk fejrésznek egy közlemény blokk azonosítót, egy Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosítót /ID/, egy közlemény típus azonosítót és egy közlemény hosszt kell magába foglalnia, ahogy az a B-62. táblázatban bemutatásra került.

Közlemény blokk azonosító: a GBAS közlemény blokk üzemelési módjának 8-bites azonosítója.

Kódolás: 1010 1010 = szabvány GBAS közlemény
1111 1111 = vizsgálati GBAS közlemény
Az összes további érték fenntartva.

GBAS azonosító /ID/: a sugárzó állomások közötti különbségtételhez a négy-karakteres GBAS azonosító.

Kódolás: Az egyes karakterek kódolása a biteket b_1-től b_6-ig terjedően felhasználva az 5.sz. Nemzetközi ABC (IA-5) felírással történik. Az egyes karaktereknél a b_1 bit kerül először továbbításra és a hat bit minden egyes karaktere leadásra kerül. Csak a nagybetűk, a számjegyek és az IA-5 „szóköz” használatos. A jobbról a legszélső karakter kerül először leadásra. Egy három-karakteres GBAS azonosítóhoz /ID/ a jobbról legszélső (az először továbbított) karakternek az IA-5 „szóközének” kell lenni.

Megjegyzés. – A GBAS azonosító /ID/ általában megegyezik a legközelebbi repülőtér helységnév azonosítójával. A GBAS ID kijelölése egyeztetésre fog kerülni - ahogy az megfelelő - az ütköztetések elkerülése céljából.

Közlemény típus azonosító: egy szám-szerű ’címke’, ami a közlemény tartalmát azonosítja (B-63. táblázat).

Közlemény hossz: a közlemény hossza 8-bites byte-okban, beleértve a 6 byte-os közlemény blokk fejrészt, a közleményt és a 4 byte-os közlemény Ciklikus Redundancia Ellenőrző kódot.

3.6.3.4.2 *Ciklikus Redundancia Ellenőrzés (CRC)*. A GBAS közlemény CRC-t a 3.9 pontban megadottaknak megfelelően kell kiszámolni.

3.6.3.4.2.1 A CRC-kód hosszának k = 32 bitnek kell lenni.

3.6.3.4.2.2 A CRC generáló polinomjának a következőnek kell lenni:

$$G(x) = x^{32} + x^{31} + x^{24} + x^{22} + x^{16} + x^{14} + x^{8} + x^{7} + x^{5} + x^{3} + x + 1$$

3.6.3.4.2.3 A CRC információs mezőjének, M(x), a következőnek kell lenni:

$$M(x) = \sum_{i=1}^{n} m_i x^{n-i} = m_1 x^{n-1} + m_2 x^{n-2} + \ldots + m_n x^0$$

3.6.3.4.2.4 Az M(x)-et a 48-bites GBAS közlemény blokk fejrészből és a különböző hosszúságú közlemény összes bitjéből kell kialakítani, a CRC-t is beleértve. A biteket a továbbítási sorrendben kell elrendezni úgy, hogy az m_n feleljen meg a közlemény bitek (n-48) legutolsó továbbított bitjének.

3.6.3.4.2.5 A CRC-t úgy kell elrendezni, hogy az r_1 legyen a legelső továbbított bit és az r_{32} a legutolsó továbbított bit.

3.6.4 ADAT TARTALOM

3.6.4.1 *Közlemény típusok.* Azoknak a közlemény típusoknak, amelyeket a Földi Bázisú Kiegészítő Rendszerrel /GBAS/ továbbítani lehet, a B-63. táblázatban felsoroltaknak kell lenni.

Megjegyzés. – Jelenleg a 256 rendelkezésre álló közlemény típusból csak 8 került meghatározásra, azzal a szándékkal, hogy a jövő szükségleteit a fennmaradó közlemény típusoknak lehet címezni.

3.6.4.2 *1. Típusú közlemény – Pszeudo-távolság helyesbítések*

3.6.4.2.1 Az 1.Típusú közleménynek kell biztosítani a differenciál helyesbítési adatokat az egyedi Globális Navigációs Műhold Rendszer /GNSS/ távolság-meghatározási forrásai részére (B-70. táblázat). A közleménynek 3 részt kell magába foglalni:

a) közlemény tájékoztatás (az érvényesség ideje, kiegészítő közlemény jelző, a mérések száma és a mérések típusa);

b) alacsony-frekvenciás információk (efemerisz dekollerációs tényező, műhold efemerisz Ciklikus Redundancia Ellenőrzés /CRC/ és műhold rendelkezésre állási információ); és

c) műhold adat mérési blokkok.

Megjegyzés. – A Műhold Bázisú Kiegészítő Rendszer /SBAS/ távolság-meghatározási források alacsony-frekvenciás adatainak továbbítása választható.

3.6.4.2.2 Az egyes 1. Típusú közleményeknek magukba kell foglalniuk az efemerisz dekollerációs tényezőt, az efemerisz CRC-t és a forrás rendelkezésre állási időtartam paramétereket egy műhold távolság-meghatározási forrására. Az efemerisz dekorrelációs tényezőt, az efemerisz CRC-t és a forrás rendelkezésre állási időtartamot a közleményben lévő első távolság-meghatározási forrásra kell alkalmazni.

3.6.4.2.3 A pszeudo-távolság helyesbítési paramétereknek a következőknek kell lenni:

Módosított Z-számítás: a közleményben lévő összes paraméter alkalmazhatósági idejének a jelzése.

Kódolás: a módosított Z-számítás újraállítja az időt, az órakor (xx:00), 20 perccel az óra után (xx:20) és 40 perccel az óra után (xx:40) a Globális Helymeghatározó Rendszer /GPS/ idejéhez vonatkoztatottan.

Kiegészítő közlemény jelző: annak a jelzése, hogy a mérési blokkok sorozatát egy egyedüli keretben egy meghatározott egyedi mérés típusra vonatkozóan, vagy egy egyedüli, 1. Típusú közlemény foglalja-e magába, vagy egy összekapcsolt közlemény pár.

Kódolás:	0	=	Egy meghatározott mérés típus összes mérési blokkját egy 1. Típusú közlemény foglalja magába.
	1	=	Az olyan 1. Típusú közlemények összekapcsolt párjának első továbbított közleménye, amelyek együtt foglalják magukba egy meghatározott mérés típus összes mérési blokkjának sorozatát.
	2	=	Tartalék.
	3	=	Az olyan 1. Típusú közlemények összekapcsolt párjának második továbbított közleménye, amelyek együtt foglalják magukba egy meghatározott mérés típus összes mérési blokkjának sorozatát.

Megjegyzés. – Amikor az 1. Típusú közlemények egy összekapcsolt párja használatos egy meghatározott mérési típusra, akkor a mérések száma, az efemerisz CRC és a forrás rendelkezésre állási paraméterek külön-külön kerülnek kiszámításra a két egyedi közlemény mindegyikére.

Mérések száma: a mérési blokkok száma a közleményben.

Mérések típusa: annak a távolság-meghatározási jelnek a típusa, amelyből a helyesbítések kiszámításra kerültek.

B-63. táblázat: A Földi Bázisú Kiegészítő Rendszer /GBAS/ VHF adat sugárzási közlemények

Közlemény típus azonosító	Közlemény név
0	Tartalék
1	Pszeudo-távolság helyesbítés
2	GBAS vonatkozású adatok
3	Fenntartva a földi-bázisú távolság-meghatározási forrás részére
4	Végső Megközelítési Szakasz /FAS/ adatok
5	Előrejelzett távolság-meghatározási forrás rendelkezésre állás
6	Fenntartott
7	Fenntartva nemzeti alkalmazásokra
8	Fenntartva ellenőrző alkalmazásokra
9 –255	Tartalék

Megjegyzés. – Lásd a 3.6.6 pontban a közlemény formátumokat.

Kódolás:	0	=	C/A, vagy CSA kód L1
	1	=	Fenntartva
	2	=	Fenntartva
	3	=	Fenntartva
	4-től 7-ig	=	Tartalék

Efemerisz dekorrelációs tényező (P): Az a tényező, amely a dekolleráció miatti megmaradó efemerisz hibákat írja le a közlemény első mérési blokkjára.

A Műhold Bázisú Kiegészítő Rendszer /SBAS/ geostacionárius műholdjaira a dekollerációs tényezőt, ha sugárzásra kerül, a kódsorban minden helyen 0-ként kell kódolni.

A Földi Bázisú Kiegészítő Rendszer /GBAS/ földi állomásaira azért, hogy a 2.típusú közleményben a kiegészítő 1. adatblokkot ne sugározzák, az efemerisz dekolláricós tényezőt a kódsorban minden helyen 0-ként kell kódolni.

Efemerisz CRC: Az efemerisz adatokkal számított Ciklikus Redundancia Ellenőrzés /CRC/ a közleményben lévő első mérési blokk helyesbítéseinek meghatározására használatos. A műholdak helyzetsor rendszere(i)vel távolság-meghatározási forrásokra vonatkozó efemerisz CRC-t a 3. pontban leírtaknak megfelelően kell kiszámítani. A CRC kód hosszának
k = 16 bit-nek kell lenni. A CRC generáló polinomja a következő:

$$G(x) = x^{16} + x^{12} + x^{5} + 1$$

A CRC információs mezője, az M(x), egy adott műholdra a következő:

$$M(x) = \sum_{i=1}^{n} m_i x^{n-i} = m_1 x^{n-1} + m_2 x^{n-2} + \ldots + m_n x^0$$

Egy Globális Helymeghatározási Rendszerű /GPS/ műholdra az M(x)-nek n = 576 bit hosszúságúnak kell lenni. Az M(x)-et egy GPS műholdra úgy kell kiszámítani, hogy az adott műhold adattovábbítás 1., 2. és 3. al-keretének a 3.-tól az S10.-ig terjedő szavai első 24 bitjét használják fel, ÉS-elve alkalmazásával /ANDed/ a B-64. táblázat GPS műhold efemerisz maszkjával. Az M(x)-et olyan sorrendben kell elrendezni, ahogy a byte-okat a GPS műhold továbbítja, de úgy, hogy az egyes byte-oknál a Legkisebb Helyértékű Bitet kell elsőnek rendelni, azaz úgy, hogy az m_1 feleljen meg az 1. al-keret 68. bitjének és az m_{576} feleljen meg a 3. al-keret 287. bitjének.

Megjegyzés. – A GPS műhold M(x)-e nem foglalja magába az 1. szót (TLM = Távolságmérés) és a 2. szót (HOW = Átadás), amelyekkel minden al-keret kezdődik, vagy az egyes szavak végén lévő 6 paritás bitet.

A GLONASS műholdra az M(x)-nek n = 340 bit hosszúságúnak kell lenni. Az M(x)-et egy GLONASS műholdra az annak a műholdnak az adattovábbítási 1., 2. 3. és 4. jelsorozatának felhasználásával kell kiszámítani, ÉS-elve alkalmazásával /ANDed/ a B-65. táblázatban lévő GLONASS műhold efemerisz maszkkal. A biteket a továbbítási sorrendben úgy kell elrendezni, hogy az m_1 feleljen meg az 1.jelsorozat 85. bitjének és az m_{340} feleljen meg a 4. jelsorozat 1. bitjének.

Egy Műhold Bázisú Kiegészítő Rendszer /SBAS/ geostacionárius műholdnak, az efemerisz CRC-t - ha továbbításra kerül - a kódsorban minden helyen nullaként kell kódolni. A CRC-t úgy kell elrendezni, hogy az r_1 legyen az elsőként továbbított bit és az r_{16} az utolsóként továbbított bit.

Forrás rendelkezésre állási időtartam: az az előre jelzett időtartam, amelyre a távolság-meghatározási forrásra vonatkozó helyesbítések várhatóan rendelkezésre állók maradnak az első mérési blokk módosított Z-számlálásához vonatkoztatva.

Kódolás: 1111 1110 = Az időtartam nagyobb, vagy egyenlő 2 540 másodperccel.
1111 1111 = Forrás rendelkezésre állási időtartam előrejelzést ez a földi al-rendszer nem biztosít.

3.6.4.2.4 A mérési blokk paraméterei a következők kell, hogy legyenek:

Távolság-meghatározási forrás azonosító /ID/: annak a távolság-meghatározási forrásnak az azonosítója, amelyre a következő mérési blokk adatok alkalmazhatók.

B-64. táblázat: GPS műhold efemerisz maszk

1. al-keret:	1. byte	2. byte	3. byte
3. szó	0000 0000	0000 0000	0000 0011
5. szó	0000 0000	0000 0000	0000 0000
7. szó	0000 0000	0000 0000	1111 1111
9. szó	1111 1111	1111 1111	1111 1111
2. al-keret	1. byte	2. byte	3. byte
3. szó	1111 1111	1111 1111	1111 1111
5.szó	1111 1111	1111 1111	1111 1111
7. szó	1111 1111	1111 1111	1111 1111
9. szó	1111 1111	1111 1111	1111 1111
3. al-keret	1. byte	2. byte	3. byte
3. szó	1111 1111	1111 1111	1111 1111
5.szó	1111 1111	1111 1111	1111 1111
7. szó	1111 1111	1111 1111	1111 1111
9. szó	1111 1111	1111 1111	1111 1111
1. al-keret	1. byte	2. byte	3. byte
4. szó	0000 0000	0000 0000	0000 0000
6.szó	0000 0000	0000 0000	0000 0000
8. szó	1111 1111	1111 1111	1111 1111
10. szó	1111 1111	1111 1111	1111 1100
2. al-keret	1. byte	2. byte	3. byte
4. szó	1111 1111	1111 1111	1111 1111
6.szó	1111 1111	1111 1111	1111 1111
8. szó	1111 1111	1111 1111	1111 1111
10. szó	1111 1111	1111 1111	0000 0000
3. al-keret	1. byte	2. byte	3. byte
4. szó	1111 1111	1111 1111	1111 1111
6.szó	1111 1111	1111 1111	1111 1111
8. szó	1111 1111	1111 1111	1111 1111
10. szó	1111 1111	1111 1111	1111 1100

B-65. táblázat: GLONASS műhold efemerisz maszk

1. Jelsorozat: 0 0000 0000 0000 0000 0000 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 111 1111 1111 0000 0000 2. Jelsorozat: 0 0000 0000 0000 0000 0000 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 111 1111 1111 0000 0000 3. Jelsorozat: 0 0000 0111 1111 1111 0000 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 1111 0000 0000 4. Jelsorozat: 0 0000 1111 1111 1111 1111 1111 1100 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

Kódolás: 1.-től 36.-ig = GPS műhold azonosítók /ID/ (Ál-véletlen zaj /PRN/)
37. = Fenntartott
38.-tól 61.-ig = GLONASS műhold azonosító (időrés szám + 37)
62.-től 119.-ig = Tartalék
120.-tól 138.-ig = SBAS műhold azonosítók /ID/ (Ál-véletlen zaj /PRN/) 139.-től 255.-ig = Tartalék

Adatkibocsátás (IOD): Az efemerisz adatokhoz kapcsolódó adatkibocsátás a pszeudo-távolság és a távolság-meghatározási változás helyesbítések meghatározásához használatosak.

Kódolás: GPS, IOD-re = GPS Adatkibocsátás, Efemerisz /IODE/ paraméter (3.1.1.3.2.2)
GLONASS IOD-re = GLONASS „t_b” paraméter (lásd 3.2.1.3.1)
SBAS, IOD-re = 1111 1111

Megjegyzés. – A GLONASS-ra az IOD Legnagyobb Helyértékű Bitjébe (MSB) 0-t építsenek be.

Pszeudo-távolság helyesbítés (PRC): a távolság-meghatározási forrás pszeudo-távolságának helyesbítése.

Távolság-meghatározási változás helyesbítés (RRC): a pszeudo-távolság helyesbítés változási gyakorisága.

σ_{pr_gnd} : a pszeudo-távolság hibához hozzájáruló, a térbeli-jelhez kapcsolódó szabályos eloszlás szabvány eltérése a referencia pontban (3.6.5.5.1, 3.6.5.5.2 és 3.6.7.2.2.4).

Kódolás: 1111 1111 = A távolság-meghatározási forrás helyesbítés érvénytelen.

B_1 –től a B_4-ig: a pszeudo-távolság helyesbítésekhez kapcsolódó azon sértetlenségi paraméterek, amelyek ugyanazon mérési blokkban kerülnek biztosításra. Az i-dik távolság-meghatározási forrásra ezek a paraméterek megegyeznek a $B_{i,1}$ –től a $B_{i,4}$-ig terjedőkkel (3.6.5.5.1.2, 3.6.5.5.2.2 és 3.6.7.2.2.4).

Kódolás: 1000 0000 = A pszeudo-távolság helyesbítések kiszámításához referencia vevő nem került felhasználásra.

3.6.4.3 *2. Típusú közlemény – Földi Bázisú Kiegészítő Rendszer /GBAS/ vonatkozású adatok.* A 2. Típusú közleményeknek annak a GBAS referencia pontnak a helyét kell azonosítani, amelyről a felhasznált GBAS-helyesbítéseket biztosítja és további egyéb GBAS vonatkozású adatokat kell adni. (B-71. táblázat). A GBAS vonatkozású adatok paramétereinek a következőknek kell lenni:

Megjegyzés. – Kiegészítő adatblokkot lehet a 2. típusú közleménybe befoglalni.
Az 1. kiegészítő adatblokk és a 2. kiegészítő adatblokk meghatározásra került. A jövőben további kiegészítő adatblokkokat lehet meghatározni. A 2.-tól a 255.-ik tartó kiegészítő adatblokkok változó hosszúságúak és a közleményhez csatolhatók az 1. adatblokk után bármilyen sorrendben.
GBAS referencia vevők: azoknak a Globális Navigációs Műhold Rendszer /GNSS/ vevőknek a száma, amelyek ebben a GBAS-ben üzembeállításra kerültek.

Kódolás: 0 = 2 referencia vevővel felszerelt GBAS
1 = 3 referencia vevővel felszerelt GBAS
2 = 4 referencia vevővel felszerelt GBAS
3 = Az ebben a GBAS földi al-rendszerbe telepített GNSS referencia vevők száma nem alkalmazható

Földi pontosság jelölő betű: a betű jelölés a GBAS által biztosított minimális térbeli-jel pontossági teljesítményt jelzi (3.6.7.1.1).

Kódolás: 0 = 'A' pontossági jelölés
1 = 'B' pontossági jelölés
2 = 'C' pontossági jelölés
3 = Tartalék

GBAS folytonossági/sértetlenségi jelölés (GCID): a GBAS működési állapotát jelző számszerű jelölés.

Kódolás: 0 = Tartalék
1 = GCID 1
2 = GCID 2
3 = GCID 3
4 = GCID 4
5 = Tartalék
6 = Tartalék
7 = Hibás működési állapot /'egészségtelen'/

1. Megjegyzés. – A GCID 2., 3. és 4. értékei abból a célból kerültek meghatározásra, hogy biztosítsák a jövő GBAS rendszereinek az I. kategóriájú berendezésekkel való kompatibilitását.

2. Megjegyzés. – A GCID 7. értéke azt jelzi, hogy egy precíziós megközelítést, vagy APV-t nem lehet megkezdeni.

Helyi mágneses elhajlás: a GBAS referencia pontjára közzétett mágneses elhajlás.

Kódolás: A pozitív érték a keleti elhajlást (a földrajzi északtól az óramutató járásával megegyező irányú), a negatív érték a nyugati elhajlást (a földrajzi északtól az óramutató járásával ellentétes irányú) jelzi.
100 0000 0000 = az ezen GBAS által alátámasztott közzétett precíziós megközelítési eljárások a földrajzi északon alapulnak.

Megjegyzés. – A helyi mágneses elhajlásnak meg kell egyezni az eljárás tervezésére meghatározott értékkel, és azok a mágneses eltérés 'korszak' éveinek megfelelően felfrissített értékek.

$\sigma_{vert\_iono\_gradient}$: a térbeli dekorreláció (3.6.5.4) miatti megmaradó ionoszférikus bizonytalansághoz kapcsolódó szabályos eloszlás szabvány eltérése.
Törési index (N_r): névleges troposzférikus törési index, ami a GBAS földi állomáshoz kapcsolódó troposzférikus helyesbítés kalibrálásához használatos (3.6.5.3).

Kódolás: Ez a mező mint kettős számú összetevőként egy +400-as eltolással kerül kódolásra. Ebben a mezőben a 0 érték egy 400-as törési indexet jelez.

Skála magasság (h_0): lépték tényező, amely a GBAS földi al-rendszerhez kapcsolódó troposzférikus helyesbítés és a megmaradó troposzférikus bizonytalanság kalibrálásához használatos (3.6.5.3).

Törési bizonytalanság (σ_n): a megmaradó troposzférikus bizonytalansághoz kapcsolódó szabályos eloszlás szabvány eltérése (3.6.5.3).

Földrajzi szélesség: a GBAS referencia pont földrajzi szélessége ív-másodpercben meghatározva.

Kódolás: A pozitív érték az északi szélességet fejezi ki.
A negatív érték a déli szélességet fejezi ki.

Földrajzi hosszúság: a GBAS referencia pont földrajzi hosszúsága ív-másodpercben meghatározva.

Kódolás: A pozitív érték a keleti hosszúságot fejezi ki.
A negatív érték a nyugati hosszúságot fejezi ki.

Referencia pont magasság: a GBAS referencia pontnak a WGS-84 ellipszoid feletti magassága.

3.6.4.3.1 *Az 1. kiegészítő adatblokk paraméterei.* Az 1. kiegészítő adatblokk paraméterei a következők:

REFERENCIA ÁLLOMÁS ADAT KIVÁLASZTÓ (RSDS): Az az azonosító szám, amely a GBAS helymeghatározási szolgáltatást biztosító állomás kiválasztására használatos.

Megjegyzés. – Az RSDS különbözik az összes többi RSDS-től és az összes Referencia Pálya Adat Kiválasztótól /RPDS/, ami az összes, a sugárzási területen belül lévő GBAS földi al-rendszer által ugyanazon a frekvencián továbbításra kerül.

Kódolás: 1111 1111 = A GBAS helymeghatározási szolgáltatás nincs biztosítva.

MAXIMÁLIS FELHASZNÁLÁSI TÁVOLSÁG (D_{max}): A GBAS referencia ponttól az a maximális távolság (ferdetávolság), amelyre a teljesség /integritás/ biztosítva van.

Megjegyzés. – Ez a paraméter nem azt a távolságot jelzi, amelyen belül a VHF adatsugárzási térerősség követelmények kielégítésre kerülnek.

Kódolás: 0 = Nincs távolság korlátozás.

GPS EFEMERISZ HIBÁS ÉSZLELÉSI EGYÜTTHATÓ, GBAS Hely-meghatározási Szolgáltatás ($K_{md\_e\_POS, GPS}$): A hibás észlelés valószínűségéből származó, a GBAS Helymeghatározási Szolgáltatáshoz kapcsolódó efemerisz hibás helyzet határ kiszámításának szorzója, feltéve, hogy egy efemerisz hiba áll fenn a GPS műholdban.

Az olyan GBAS földi al-rendszereknél, amelyek nem sugároznak helyesbítéseket a GPS távolságmérési forrásokra, vagy amelyek nem biztosítanak GBAS helymeghatározási szolgáltatásokat, ezt a paramétert a kódsorban minden helyen 0-ként kell kódolni.

GPS EFEMERISZ HIBÁS ÉSZLELÉSI EGYÜTTHATÓ I. kategóriájú precíziós megközelítés és APV ($K_{md\_e,, GPS}$): A hibás észlelés valószínűségéből származó, az I.kategóriájú precíziós megközelítéshez és APV-hez kapcsolódó efemerisz hibás helyzet határ kiszámításának szorzója, feltéve, hogy egy efemerisz hiba áll fenn a GPS műholdban.

Az olyan GBAS földi al-rendszereknél, amelyek nem sugároznak helyesbítéseket a GPS távolságmérési forrásokra, ezt a paramétert a kódsorban minden helyen 0-ként kell kódolni.

GLONASS EFEMERISZ HIBÁS ÉSZLELÉSI EGYÜTTHATÓ, GBAS Hely-meghatározási Szolgáltatás ($K_{md\_e\_POS,GLONASS}$): A hibás észlelés valószínűségéből származó, a GBAS Helymeghatározási Szolgáltatáshoz kapcsolódó efemerisz hibás helyzet határ kiszámításának szorzója, feltéve, hogy egy efemerisz hiba áll fenn a GLONASS műholdban.

Az olyan GBAS földi al-rendszereknél, amelyek nem sugároznak helyesbítéseket a GLONASS távolságmérési forrásokra vagy amelyek nem biztosítanak GBAS helymeghatározási szolgáltatásokat, ezt a paramétert a kódsorban minden helyen 0-ként kell kódolni.

GLONASS EFEMERISZ HIBÁS ÉSZLELÉSI EGYÜTTHATÓ I. kategóriájú precíziós megközelítés és APV ($K_{md\_e, GLONASS}$): A hibás észlelés valószínűségéből származó, az I.kategóriájú precíziós megközelítéshez és az APV-hez kapcsolódó efemerisz hibás helyzet határ kiszámításának szorzója, feltéve, hogy egy efemerisz hiba áll fenn a GLONASS műholdban.

Az olyan GBAS földi al-rendszereknél, amelyek nem sugároznak helyesbítéseket a GLONASS távolságmérési forrásokra, ezt a paramétert a kódsorban minden helyen 0-ként kell kódolni.

3.6.4.3.2 *Kiegészítő adat blokkok.* Az 1. kiegészítő adat blokktól eltérő kiegészítő adat blokkoknál a paramétereknek a következőknek kell lenni:

KIEGÉSZÍTŐ ADAT BLOKK SZÁM: A kiegészítő adat blokk típusának számszerű azonosítója.

Kódolás: 0-tól 1-ig = fenntartva
2 = 2. kiegészítő adat blokk, GRAS továbbító állomások
3-tól 255-ig = tartalék

KIEGÉSZÍTŐ ADAT PARAMÉTEREK: a kiegészítő adat blokk számnak megfelelően meghatározott adat készlet.

3.6.4.3.2.1 *GRAS továbbító állomások*

A 2. kiegészítő adat blokk paramétereinek a következő adatot kell tartalmazni egy, vagy több továbbító állomás számára:

CSATORNA SZÁM: Egy GBAS továbbító állomáshoz kiosztott csatorna szám, a 3.6.5.7 pontban megadottaknak megfelelően.

Megjegyzés. – Az ebben a területben lévő csatorna szám egy frekvenciára és egy Referencia Állomás Adat Kiválasztó-ra (RSDS) utal.

Δ*Földrajzi szélesség*: egy GBAS továbbító állomás földrajzi szélesség eltérése, a 2. típusú közlemény földrajzi szélesség paraméterében rögzített földrajzi szélességétől mérve.

Kódolás: A pozitív érték azt fejezi ki, hogy a GBAS továbbító állomás a GBAS referencia ponttól északra van.

A negatív érték azt fejezi ki, hogy a GBAS továbbító állomás a GBAS referencia ponttól délre van.

Δ*Földrajzi hosszúság*: egy GBAS továbbító állomás földrajzi hosszúság eltérése, a 2. típusú közlemény földrajzi hosszúság paraméterében rögzített földrajzi hosszúságától mérve.

Kódolás: A pozitív érték azt fejezi ki, hogy a GBAS továbbító állomás a GBAS referencia ponttól keletre van.
A negatív érték azt fejezi ki, hogy a GBAS továbbító állomás a GBAS referencia ponttól nyugatra van.

Megjegyzés. – A 2. kiegészítő adat blokkal kapcsolatos útmutató anyag a "D"- Melléklet 7.17 pontjában található.

3.6.4.4 *3. Típusú közlemény*

Megjegyzés. – A 3. Típusú közlemények tervezett felhasználása a földi bázisú távolság-meghatározási forrásokhoz szükséges információk biztosítása és a jövőbeli alkalmazásra kerültek fenntartásra.

3.6.4.5 *4. Típusú közlemény – Végső megközelítési szakasz (FAS)*. A 4. Típusú közleménynek egy, vagy több Végső Megközelítési Szakasz adatállományát kell magába foglalni, amelyek mindegyike egy önálló precíziós megközelítést határoz meg (B-72. táblázat). Minden egyes 4. Típusú közlemény adatállományának a következőket kell magába foglalni:

Adatállomány hossz: Az adatállományban lévő byte-ok száma. Az adatállomány magába foglalja az adatállomány hossz mezőt és a hozzá kapcsolódó Végső Megközelítési Szakasz /FAS/ adat blokkot, a FAS függőleges riasztási határértéket (FASVAL)/megközelítési állapot és FAS oldalirányú riasztási határérték (FASLAL)/megközelítési állapot mezőket.

Végső megközelítési szakasz /FAS/ adat blokk: egy paraméter sorozat egy önálló precíziós megközelítés azonosításához és a kapcsolódó megközelítési pálya meghatározásához.

Kódolás: Lásd a 3.6.4.5.1 pontot és a B-66. táblázatot.
Megjegyzés. – A FAS pálya meghatározására vonatkozó útmutató anyagot a „D"- Melléklet 7.11.1 pontja foglalja magába.

Végső megközelítési szakasz Függőleges riasztási határérték /FASVAL/ /megközelítési állapot: A FASVAL paraméter értéke, ahogy az a 3.6.5.6 pont szerint alkalmazásra kerül.

Kódolás: 1111 1111 = Ne használjon függőleges eltéréseket.

Megjegyzés. – A Végső megközelítési szakasz Függőleges riasztási határérték /FASVAL/ tartománya és felbontása a kapcsolódó Végső Megközelítési Szakasz (FAS) adat blokkban lévő megközelítési működés azonosítótól függ.

Végső megközelítési szakasz Oldalirányú riasztási határérték /FASLAL/ /megközelítési állapot: A FASLAL paraméter értéke, ahogy az a 3.6.5.6 pont szerint alkalmazásra kerül.

Kódolás: 1111 1111 = Ne használja a megközelítést.

B-65A. táblázat: GRAS továbbító állomás adat

Adat tartalom	Felhasznált bitek száma	Értéktartomány	Felbontás
Csatorna szám	16	20001-től 39999-ig	1
ΔFöldrajzi szélesség	8	±25,4º	0,2º
ΔFöldrajzi hosszúság	8	±25,4º	0,2º

B-66. táblázat: Végső megközelítési szakasz (FAS) adat blokk

Adat tartalom	Felhasznált bit	Értéktartomány	Felbontás
Üzemeltetés típus	4	0-tól 15-ig	1
SBAS szolgáltatás biztosító azonosító /ID/	4	0-tól 15-ig	1
Repülőtér azonosító	32	—	—
Futópálya azonosító szám	6	0-tól 36-ig	1
Futópálya azonosító betű	2	—	—
Megközelítési teljesítmény jelölés	3	0-tól 7-ig	1
Útvonal jelzés	5	—	—
Referencia pálya adat kiválasztó	8	0-tól 48-ig	1
Referencia pálya azonosító	32	—	—
Leszállási küszöb-pont /LTP/ /Látszólagos küszöb-pont /FTP/ földrajzi szélesség	32	± 90°	0,0005 ív-másodperc
Leszállási küszöb-pont /LTP/ /Látszólagos küszöb-pont /FTP/ földrajzi hosszúság	32	± 180°	0,0005 ív-másodperc
Leszállási küszöb-pont /LTP/ /Látszólagos küszöb-pont /FTP/ magasság	16	-512,0-tól 6 041,5 m-ig	0,1 m
Repülési pálya irány-pont ΔFPAP földrajzi szélesség	24	± 1°	0,0005 ív-másodperc
Repülési pálya irány-pont ΔFPAP földrajzi hosszúság	24	± 1°	0,0005 ív-másodperc
Megközelítési küszöb keresztezési magasság /TCH/ (Megjegyzés)	15	0-tól 1 638,35 m-ig (0-tól 3 276,7 láb-ig)	0,05 m (0,1 láb)
Megközelítési küszöb keresztezési magasság /TCH/ mértékegység kiválasztó	1	—	—
Siklópálya szög /GPA/	16	0-tól 90,0°-ig	0,01°
Útirány szélesség	8	80-tól 143,75 m-ig	0,25 m
ΔHossz távolság /eltolás/	8	0-tól 2 032 m-ig	8 m
Végső megközelítési szakasz Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—

1. Megjegyzés. – Amikor a futópálya azonosító szám 0-ra van állítva, akkor az útirány szélességmező elhagyásra kerül, és az útirány szélesség 38 méter.

2. Megjegyzés. – A tájékoztatást vagy láb-ban /feet/, vagy méter-ben lehet biztosítani, ahogy azt a megközelítési küszöb keresztezési magasság /TCH/ mértékegység kiválasztó jelzi.

3.6.4.5.1 *Végső megközelítési szakasz /FAS/ adat blokk*. A FAS adat blokknak magába kell foglalnia azokat a paramétereket, amelyek egy önálló precíziós megközelítést meghatároznak. A FAS pálya egy térbeli vonal, amelyet a Leszállási küszöb-pont/Látszólagos küszöb-pont (LTP/FTP), a Repülési pálya irány-pont (FPAP), a küszöb keresztezési magasság (TCH) és a Siklópálya szög (GPA) határoz meg. A helyi megközelítési szint síkja egy olyan sík, amely a helyi LTP/FTP-n áthaladó függőleges síkra merőleges (azaz az LTP/FTP-nél érintője az ellipszoidnak). A megközelítés helyi függőlegese az LTP/FTP-nél lévő WGS-84 ellipszoidra merőleges. A Siklópálya befogási pontja (GPIP) az a pont, ahol a végső megközelítési pálya vonala metszi a helyi szint síkját. A FAS adat blokk paraméterei a következők kell, hogy legyenek:

Üzemeltetés típus: közvetlen egyenes megközelítési eljárás, vagy más, egyéb típusú üzemeltetés.

Kódolás: 0 = közvetlen egyenes megközelítési eljárás
1-től 15-ig = tartalék

SBAS szolgáltatás biztosító azonosító /ID/: a FAS adat blokkhoz kapcsolódó szolgáltatás biztosítót jelzi.

Kódolás: Lásd a B-27. táblázatot.
14 = a FAS adat blokk csak a GBAS-el használható.
15 = a FAS adat blokkot bármelyik SBAS szolgáltatás biztosítóval együtt lehet használni.

Megjegyzés. – Ez a paraméter nem használatos a GBAS pszeudo-távolság helyesbítés felhasználásával végrehajtott megközelítésekre.

Repülőtér azonosító: a repülőtér jelölésére használatos három,- vagy négy-betűs azonosító jelzés.

Kódolás: Az egyes karakterek kódolása az 5.sz. Nemzetközi ABC (IA-5) felírása az alsó 6 bitjének felhasználásával történik. Az egyes karaktereknél a b_1 bit kerül először továbbításra és a b_6 után két kiegészítő nulla bit van, úgy, hogy a nyolc bit minden egyes karakterhez leadásra kerül. Csak a nagybetűk, a számjegyek és az IA-5 „szóköz" használatos. A jobbról a legszélső karakter kerül először leadásra. Egy három-karakteres GBAS azonosítóhoz /ID/ a jobbról legszélső (az először továbbított) karakternek az IA-5 „szóközének" kell lenni.

Futópálya azonosító szám: a megközelítési eljárás futópályájának azonosító száma.

Kódolás: 0 = helikopter-repülőtér
1-től 36-ig = futópálya azonosító szám

Futópálya azonosító betű: az egy-betűs jelölés használata akkor szükséges, amikor a párhuzamos futópályák között különbséget kell tenni.

Kódolás: 0 = nincs betű
1 = R (jobb)
2 = C (középső)
3 = L (bal)

Megközelítési teljesítmény jelölés: általános tájékoztatás a megközelítés tervezett pontossági típusáról.

Kódolás: 0 = APV (Megközelítés Függőleges Vezetéssel)
1 = I. kategória
2 = a II. kategóriára fenntartva
3 = a III. kategóriára fenntartva
4-től 7-ig = tartalék

Útvonal jelzés: egy egy-betűs azonosító, az ugyanazon futópálya-végre vezető több megközelítés közötti különbségtételre használatos.

Kódolás: A betű 5.sz. Nemzetközi ABC (IA-5) felírása a b_1 –től a b_6 –ig terjedő bitjeinek felhasználásával kerül kódolásra. A b_1 bit kerül először továbbításra. Csak a nagybetűk, az „I” és az „O” kivételével vagy az IA-5 „szóköz” használatos.

Referencia pálya adat kiválasztó (RPDS): az a szám-jelzéses azonosító, amely a FAS adat blokk kiválasztására használatos (a kívánt megközelítés).

Megjegyzés. – Egy adott FAS adat blokkra a Referencia pálya adat kiválasztó (RPDS) az összes többi RPDS-től eltérő és minden Referencia állomás adat kiválasztó (RSDS) ugyanazon a frekvencián kerül sugárzásra a rádiósugárzási területen belüli összes GBAS által.

Referencia pálya azonosító: három vagy négy alfanumerikus karakter, amelyek egyedileg jelölik a referencia pályát.

Kódolás: Az egyes karakterek kódolása az 5.sz. Nemzetközi ABC (IA-5) felírása b_1-től b_6-ig terjedő bitjeinek felhasználásával történik. Az egyes karaktereknél a b_1 bit kerül először továbbításra és a b_6 után két kiegészítő nulla bit van, úgy, hogy a nyolc bit minden egyes karakterhez leadásra kerül. Csak a nagybetűk, a számjegyek és az IA-5 „szóköz” használatos. A jobbról a legszélső karakter kerül először leadásra. Egy három-karakteres referencia pálya azonosítóhoz a jobbról a legszélső (az először továbbított) karakternek az IA-5 „szóközének” kell lenni.

Megjegyzés. – Az LTP/FTP egy pont, amelyen keresztül a végső megközelítési szakasz /FAS/ pályája a küszöb keresztezési magasság /TCH/ által meghatározott relatív magasságban áthalad. Ez általában a futópálya középvonalának és a küszöbnek a metszéspontjában helyezkedik el.

LTP/FTP földrajzi szélesség: A Leszállási Küszöb-pont/Látszólagos Küszöb-pont /LTP/FTP/ földrajzi szélessége ív-másodpercben.

Kódolás: A pozitív értékek az északi szélességet jelölik.
A negatív értékek a déli szélességet jelölik.

LTP/FTP földrajzi hosszúság: A Leszállási Küszöb-pont/Látszólagos Küszöb-pont /LTP/FTP/ földrajzi hosszúsága ív-másodpercben.

Kódolás: A pozitív értékek a keleti hosszúságot jelölik.
A negatív értékek a nyugati hosszúságot jelölik.

LTP/FTP magasság: A Leszállási Küszöb-pont/Látszólagos Küszöb-pont /LTP/FTP/ magassága a WGS-84 ellipszoid felett.

Kódolás: Ez a mező egy előjel nélküli fix-pontos számként –512 méteres eltolással kerül kódolásra. Ebben a mezőben egy nulla érték az LTP/FTP-t 512 méterrel a földi ellipszoid alá helyezi.

Megjegyzés. – A Repülési pálya irány-pont /FPAP/ egy pont, amelynek a magassága a Leszállási Küszöb-ponttal/Látszólagos Küszöb-ponttal /LTP/FTP/ azonos, és arra használatos, hogy a megközelítés irányítottságát meghatározza. A szögbeli eltérés kiindulási pontja oldalirányban 305 *méterként (1 000 láb) van meghatározva az FPAP-on az oldalirányú Végső megközelítési szakasz /FAS/ mentén. Egy olyan megközelítésnél, amely a futópályával egy egyenesbe esik, az FPAP a futópálya megállási végénél vagy azon túl van.*

ΔFPAP földrajzi szélesség: A futópálya Repülési pálya irány-pontjának az LTP/FTP-től való fölrajzi szélesség különbsége ív-másodpercben.

Kódolás: A pozitív érték az FPAP földrajzi szélességének az LTP/FTP földrajzi szélességétől északra való helyzetét jelenti.
A negatív érték az FPAP földrajzi szélességének az LTP/FTP földrajzi szélességétől délre való helyzetét jelenti.

ΔFPAP földrajzi hosszúság: A futópálya Repülési pálya irány-pontjának az LTP/FTP-től való fölrajzi szélesség különbsége ív-másodpercben.

Kódolás: A pozitív érték az FPAP földrajzi hosszúságának az LTP/FTP földrajzi hosszúságától keletre való helyzetét jelöli.
A negatív érték az FPAP földrajzi hosszúságának az LTP/FTP földrajzi hosszúságától nyugatra való helyzetét jelöli.

Megközelítési küszöb keresztezési magasság /TCH/: A Végső megközelítési szakasz /FAS/ pályájának magassága az LTP/FTP felett vagy láb-ban, vagy méter-ben meghatározva, ahogy azt a TCH mértékegység kiválasztó jelzi.

Megközelítési küszöb keresztezési magasság mértékegység kiválasztó: A TCH alkalmazott mértékegységének leírása.

Kódolás: 0 = láb
1 = méter

Siklópálya szög (GPA): A Végső megközelítési szakasz pályájának a szöge az LTP/FTP-nél lévő WGS-84 ellipszoidot érintő vízszintes síkhoz viszonyítva.
Útirány szélesség: Az LTP/FTP-nél a Végső megközelítési szakasz által meghatározott repülési pályától való azon oldalirányú eltérés, amelynél az útvonal irány-eltérés jelző a teljes-méretű eltérést eléri.

Kódolás: Ez a mező egy előjel nélküli fix-pontos számként 80 méteres eltolással kerül kódolásra. Ebben a mezőben egy nulla érték az LTP/FTP-nél egy 80 méteres útirány szélességet jelez.

ΔHossz távolság /eltolás/: A futópálya megállási végétől a Repülési pálya irány-pontig /FPAP/ mért távolság.

Kódolás: 1111 1111 = Nincs biztosítva.

Végső megközelítési szakasz Ciklikus Redundancia Ellenőrzés /CRC/: A 32-bites CRC az egyes FAS adat blokkok végéhez van csatolva abból a célból, hogy biztosítsa a megközelítési adatok sértetlenségét. A 32-bites végső megközelítési szakasz CRC-t a 3.9 pontban megadottaknak megfelelően kell kiszámolni. A CRC kód hosszának k = 32 bitnek kell lenni.

A CRC generáló polinomja a következő kell, hogy legyen:

$$G(x) = x^{32} + x^{31} + x^{24} + x^{22} + x^{16} + x^{14} + x^{8} + x^{7} + x^{5} + x^{3} + x + 1$$

A CRC információs mezőjének, M(x), a következőnek kell lenni:

$$M(x) = \sum_{i=1}^{272} m_i x^{272-i} = m_1 x^{271} + m_2 x^{270} + \ldots + m_{272} x^0$$

Az M(x)-t a kapcsolódó FAS adat blokk összes bitjéből kell képezni, a CRC kivételével. A biteket a továbbítási sorrendben kell elrendezni úgy, hogy az m_1 feleljen meg az üzemeltetési típus Legkisebb Helyértékű Bitjének /LSB/, és az m_{272} feleljen meg a Δhossz távolság /eltolás/ mező Legnagyobb Helyértékű Bitjének /MSB/. A CRC-t úgy kell elrendezni, hogy az r_1 legyen az LSB és az r_{32} pedig az MSB.

3.6.4.6 *5. Típusú közlemény – a távolság-meghatározási forrás előre jelzett rendelkezésre állása.* Amikor használatos, akkor az 5. Típusú közleménynek kell magába foglalnia a pillanatnyilag látható, vagy rövidesen láthatóvá váló távolság-meghatározási források ’felkelési’ és ’lenyugvási’ tájékoztatásait. A távolság-meghatározási forrás előre jelzett rendelkezésre állási paramétereinek a következőknek kell lenni:
Módosított Z-számítás: Az ebben a közleményben lévő paraméterek alkalmazhatósági idejének jelzése.

Kódolás: Ugyanaz, mint az 1. Típusú közlemény (3.6.4.2) módosított Z-számítás mezője.

A befogott jelforrások száma: Azoknak a jelforrásoknak a száma, amelyekre az időtartam információ alkalmazható az összes biztosított megközelítésre.

Kódolás: 0 = Csak meghatározott akadályozott megközelítésekre vannak korlátozások.
1-től 31-ig = Az érintett távolság-meghatározási források száma.

Távolság-meghatározási forrás azonosító /ID/: Ugyanaz, mint az 1.Típusú közleménynél (3.6.4.2).

Jel-forrás rendelkezésre állási érzékelés: Azt jelenti, hogy a távolság-meghatározási forrás rendelkezésre állóvá fog-e válni, vagy be fogja fejezni a rendelkezésre állást.

Kódolás: 0 = A differenciális helyesbítések biztosítása a kapcsolódó távolság- meghatározási forrástól rövidesen befejezésre kerül.
1 = A differenciális helyesbítések biztosítása a kapcsolódó távolság- meghatározási forrástól rövidesen megkezdésre kerül.

Jelforrás rendelkezésre állási időtartam: Az előre jelzett minimális rendelkezésre állási időtartam a módosított Z-számításra vonatkoztatva.

Kódolás: 111 1111 = Az időtartam 1 270 másodperccel egyenlő, vagy annál nagyobb.

Az akadályozott megközelítések száma: Azoknak a megközelítéseknek a száma, amelyekre a helyesbítések csökkentésre fognak kerülni a megközelítés egyedülálló műhold helyzet-sor takarása miatt.

Referencia pálya adat kiválasztó: Annak a Végső megközelítési szakasz /FAS/ adatoknak a jelzése, amelyre a jelforrás rendelkezésre állási adatok vonatkoznak (3.6.4.5.1).

A befogott jelforrások száma erre a megközelítésre: Azoknak a jelforrásoknak a száma, amelyeknek az időtartam információja csak erre a megközelítésre alkalmazhatóan van biztosítva.

3.6.7.4 *6. Típusú közlemény*

Megjegyzés. – A 6. Típusú közlemény jövőbeli felhasználásra van fenntartva azon információk biztosításához, amelyek a II./III. kategóriájú precíziós megközelítésekhez szükségesek.

3.6.4.8 *7. Típusú közlemény*

Megjegyzés. – A 7. Típusú közlemény az Államok saját alkalmazásai számára van fenntartva.

3.6.4.9 *8. Típusú közlemény*

Megjegyzés. – A 8. Típusú közlemény helyi és körzeti ellenőrző alkalmazások céljára van fenntartva.

3.6.4.10 *101. Típusú közlemény – GRAS Pszeudo-távolság helyesbítések (PRC)*

3.6.4.10.1 A 101. Típusú közleménynek biztosítania kell a differenciális helyesbítési adatot az egyedi GNSS távolság-meghatározási források számára (B-70A. táblázat). A közleménynek három részből kell állni:

a) közlemény információ (érvényesség ideje, kiegészítő üzenet jelzés, mérések száma és a mérés típusa);

b) alacsony-frekvenciás közlemény (efemerisz dekorrelációs paraméter, műhold efemerisz Ciklikus Redundancia Ellenőrzés (CRC) és műhold rendelkezésre állási közlemény);

c) műhold adat mérési blokkok.

3.6.4.10.2 Minden 101. Típusú közleménynek tartalmaznia kell egy műhold távolság- meghatározási forráshoz tartozó efemerisz dekorrelációs paramétert, efemerisz CRC-t és a forrás rendelkezésre állási időtartam paramétereket. Az efemerisz dekorrelációs paraméter, az efemerisz CRC és a forrás rendelkezésre állási időtartama a közleményben az első távolság- meghatározási forráshoz kell, hogy tartozzon.

3.6.4.10.3 A pszeudó-távolság helyesbítési paramétereknek a következőknek kell lenni:

Módosított Z-számítás: ahogy a 3.6.4.2.3 pontban meghatározásra került.

Kiegészítő közlemény jelző: ahogy a 3.6.4.2.3 pontban meghatározásra került, kivéve, hogy felhasználható a 101. Típusú közleményekre.

Mérések száma: ahogy a 3.6.4.2.3 pontban meghatározásra került.

Mérések típusa: ahogy a 3.6.4.2.3 pontban meghatározásra került.

Efemerisz dekorrelációs tényező (P): ahogy a 3.6.4.2.3 pontban meghatározásra került.

Efemerisz CRC: ahogy a 3.6.4.2.3 pontban meghatározásra került.

Forrás rendelkezésre állási időtartam: ahogy a 3.6.4.2.3 pontban meghatározásra került.

B paraméterek száma: ez egy jelzése annak, hogy a B paramétereket tartalmazza-e az egyes távolság-meghatározási forrás mérési blokkja.

Kódolás: 0 = B paraméterek nincsenek
1 = mérési blokkonként 4 B paraméter van.

3.6.4.10.4 A mérési blokk paramétereknek a következőknek kell lenni:

Távolság-meghatározási forrás azonosító (ID): ahogy a 3.6.4.2.4 pontban meghatározásra került.

Adatkibocsátás (IOD): ahogy a 3.6.4.2.4 pontban meghatározásra került.

Pszeudo-távolság helyesbítés (PRC): ahogy a 3.6.4.2.4 pontban meghatározásra került.

Távolság-meghatározási változás helyesbítés (RRC): ahogy a 3.6.4.2.4 pontban meghatározásra került.

σ_{pr_gnd} : ahogy a 3.6.4.2.4 pontban meghatározásra került, az értékek és a felbontási tartomány kivételével.

B_1 –től a B_4-ig: ahogy a 3.6.4.2.4 pontban meghatározásra került.

Megjegyzés. – A 101. Típusú közleményeknél a mérési blokkban a B paraméterek szerepeltetése opcionális.

3.6.5 AZ ADATFELHASZNÁLÓI PROTOKOLOK MEGHATÁROZÁSA

Megjegyzés. – Ez a rész az adat sugárzási közlemények paraméterei közötti kölcsönhatást határozza meg. Ez azoknak a paramétereknek a meghatározásait adja meg, amelyek nem kerülnek továbbításra, de a nem-légijármű fedélzeti és a légijármű fedélzeti elemek valamelyikében, vagy mindkettőben használatosak, és amelyek meghatározzák azokat a tényezőket, amelyek a navigációs megoldásokra és azok sértetlenségére vonatkoznak.

3.6.5.1 *Mért és vivőhullám-simított pszeudo-távolság.* A sugárzási helyesbítés vivőhullám-simított kódú pszeudo-távolság mérésként alkalmazható úgy, hogy még nem kerül a műhold által sugárzott troposzférikus és ionoszférikus helyesbítés alkalmazásra. A vivőhullám-simítást a következő szűrő határozza meg:

$$P_{CSCn} = \alpha P + (1-\alpha)\left(P_{CSC_{n-1}} + \frac{\lambda}{2\pi}(\phi_n - \phi_{n-1})\right)$$

ahol:

P_{CSCn}	=	A simított pszeudo-távolság;
P_{CSCn-1}	=	A korábbi simított pszeudo-távolság;
P	=	A nyers pszeudo-távolság mérés, ahol a nyers pszeudo-távolság méréseket egy, a vivőhullám által meghajtott kód hurokból mérik elsőrendűen, vagy magasabban, és egy olyan egyoldalú zaj sávszűrővel, ami 0,125 Hz-el egyenlő, vagy annál magasabb értékű;
λ	=	Az L1 hullámhossza;
ϕ_n	=	A vivőhullám fázisa;
ϕ_{n-1}	=	Az előző vivőhullám fázisa; és
α	=	A szűrő súlyozási függvénye egyenlő a 100 másodperces idő-állandóval elosztott mintavételi időközzel.

3.6.5.2 *Helyesbített pszeudo-távolság.* Egy adott műholdra a ’t’ időben a helyesbített pszeudo-távolság a következő:

$$PRcorrected = P_{CSC} + PRC + RRC \times (t - tz\text{-}count) + TC + c \times (\Delta t_{SV})_{L1}$$

ahol:

P_{CSC}	=	A simított pszeudo-távolság (a 3.6.5.1 pontban meghatározottak szerint);
PRC	=	A pszeudo-távolság helyesbítés (a 3.6.4.2 pontban meghatározottak szerint);
RRC	=	A pszeudo-távolság helyesbítés gyakorisága (a 3.6.4.2 pontban meghatározottak szerint);
t	=	Az aktuális /pillanatnyi/ idő;
tz-count	=	Az alkalmazhatóság ideje a módosított Z-számításból levezetve (a 3.6.4.2 pontban meghatározottak szerint); és
TC	=	A troposzférikus helyesbítés (a 3.6.5.3 pontban meghatározottak szerint).
c és Δt_{SV}	=	Ahogy a 3.1.2.2 pontban meg van határozva a GPS műholdak számára.

3.6.5.3 *Troposzférikus késés*

3.6.5.3.1 Egy adott műholdra a troposzférikus helyesbítés a következő:

$$TC = N_r h_0 \frac{10^{-6}}{\sqrt{0.002 + \sin^2(El_i)}} (1 - e^{-\Delta h / h_0})$$

ahol:

N_R	=	A törési index a 2. Típusú közleményből (3.6.4.3);
Δh	=	A légijármű magassága a GBAS referencia pont felett;
El_i	=	Az i-dik műhold magassági szöge; és
h_0	=	A troposzféra skála magassága a 2. Típusú közleményből.

3.6.5.3.2 A megmaradó troposzférikus bizonytalanság a következő:

$$\sigma_{tropo} = \sigma_n h_0 \frac{10^{-6}}{\sqrt{0.002 + \sin^2(El_i)}} (1 - e^{-\Delta h / h_0})$$

ahol: σ_N = A törési bizonytalanság a 2. Típusú közleményből (3.6.4.3).

3.6.5.4 *A megmaradó ionoszférikus bizonytalanság.* Egy adott műholdra a megmaradó ionoszférikus bizonytalanság a következő:

$$\sigma_{iono} = F_{pp} \times \sigma_{vert\_iono\_gradient} \times (x_{air} + 2 \times \tau \times v_{air})$$

ahol:

F_{pp}	=	A függőlegestől a ferdéig terjedő elhajlási tényező egy adott műholdra (3.5.5.5.2);
$\sigma_{vert\_iono\_gradient}$	=	(ahogy a 3.6.4.3 pontban meghatározásra került);
x_{air}	=	A távolság (ferde távolság) méterben a légijármű pillanatnyi helyzete és a 2. Típusú közleményben megadott referencia pont között;
τ	=	100 másodperc (a 3.6.5.1 pontban használt idő-állandó); és
v_{air}	=	A légijármű vízszintes megközelítési sebessége (méter/másodperc)

3.6.5.5 *Védelmi szintek*

3.6.5.5.1 *I.kategóriájú precíziós megközelítés.* A térbeli-jel függőleges és oldalirányú védelmi szintjei (a VPL és LPL) felső megbízhatósági határértékek a referencia ponthoz viszonyított helyzet hibára, és ezek meghatározása a következő:

$$VPL = MAX\ \{VPL_{HO}, VPL_{H1}\}$$
$$LPL = MAX\ \{LPL_{HO}, LPL_{H1}\}$$

3.6.5.5.1.1 *Szabvány mérési körülmények*

3.6.5.5.1.1.1 A függőleges védelmi szint (VPL_{H0}) és az oldalirányú védelmi szint (LPL_{H0}) feltételezve azt, hogy szabvány mérési körülmények állnak fenn (azaz nincs hiba), az összes referencia vevőben és az összes távolság-meghatározási forráson (műholdak), a következők szerint kerülnek kiszámításra:

$$VPL_{H0} = K_{ffmd}\sqrt{\sum_{i=1}^{N} s\_vert_i^2 \times \sigma_i^2}$$

$$LPL_{H0} = K_{ffmd}\sqrt{\sum_{i=1}^{N} s\_lat_i^2 \times \sigma_i^2}$$

ahol:

K_{ffmd}, Cat I.	=	Az a szorzó, ami a hibamentes kimaradt észlelés valószínűségéből került levezetésre;
s_vert_i	=	$s_{v,i} + s_{x,i} \times \tan(GPA)$ /Siklópálya szög/;
s_lat_i	=	$s_{y,i}$;
$s_{x,i}$	=	Az x-irányú helyzet hiba parciális differenciál-hányadosa az i-dik műhold pszeudo-távolság hibájára vonatkozóan;
$s_{y,i}$	=	Az y-irányú helyzet hiba parciális differenciál-hányadosa az i-dik műhold pszeudo-távolság hibájára vonatkozóan;
$s_{v,i}$	=	A függőleges irányú helyzet hiba parciális differenciál-hányadosa az i-dik műhold pszeudotávolság hibájára vonatkozóan;
GPA	=	A végső megközelítési pálya siklópálya szöge (3.6.4.5.1);
N	=	A helyzet-megoldáshoz használt távolság-meghatározási források száma; és
i	=	A helyzet-megoldáshoz használt távolság-meghatározási forrás indexe.

Megjegyzés. – A koordináta vonatkoztatási rendszer úgy van meghatározva, hogy az ’x’ az út-irány mentén pozitív, az ’y’ keresztirányban balra pozitív, a helyi szint érintő síkjában és a ’v’ felfelé pozitív és derékszögű az x- és y-tengelyre.

3.6.5.5.1.1.2 Az általános-legkisebb-négyzetek helyzet megoldásra az ’S’, a vetület-mátrix a következők szerint van meghatározva:

$$S \equiv \begin{bmatrix} S_{x,1} & S_{x,2} & \cdots & S_{x,N} \\ S_{y,1} & S_{y,2} & \cdots & S_{y,N} \\ S_{v,1} & S_{v,2} & \cdots & S_{v,N} \\ S_{t,1} & S_{t,2} & \cdots & S_{t,N} \end{bmatrix} = (G^T \times W \times G)^{-1} \times G^T \times W$$

ahol:

$G_i = [\ -\cos El_i \cos Az_i\ \ -\cos El_i \sin Az_i\ \ -\sin El_i\ \ 1\ ]$ = a G i-dik sora; és

$$W = \begin{bmatrix} \sigma_1^2 & 0 & \cdots & 0 \\ 0 & \sigma_2^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_N^2 \end{bmatrix}^{-1};$$

Ahol: $\sigma^2{}_i = \sigma^2{}_{pr\_gnd,i} + \sigma^2{}_{tropo,i} + \sigma^2{}_{pr\_air,i} + \sigma^2{}_{iono,i}$;

ahol:

$\sigma_{pr\_gnd,i}$	=	σ_{pr_gnd} az i-dik távolság-meghatározási forrásra (3.6.4.2);
$\sigma_{tropo,i}$	=	A megmaradó troposzférikus bizonytalanság az i-dik távolság-meghatározási forrásra (3.6.5.3);
$\sigma_{iono,i}$	=	A megmaradó ionoszférikus késés (a térbeli dekorreláció miatt) az i-dik távolság-meghatározási forrásra (3.6.5.4); és
$\sigma_{pr\_air,i}$	=	$\sqrt{\sigma^2_{receiver}(El_i) + \sigma^2_{multipath}(El_i)}$, az a szabvány eltérés, amellyel a légijármű hozzájárul az i-dik távolság-meghatározási forrás helyesbített pszeudo-távolság hibájához. A teljes légijármű hozzájárulás magába foglalja a vevő hozzájárulását (3.6.8.2.1) és egy szabvány hiba értéket a légijármű szerkezetének térbeli szórása miatt;

Ahol:

$\sigma_{multipath,i}(El_i)$	=	$0{,}13 + 0{,}53e^{-El_i/10\ deg}$, a légijármű sárkány térbeli szórási hozzájárulásának szabvány modelje méterben megadva;
El_i	=	Az i-dik távolság-meghatározási forrás magassági szöge (fokban megadva); és
Az_i	=	Az i-dik távolság-meghatározási forrás oldalszöge az x-tengelytől az óramutató járásával ellentétes irányban mérve (fokban megadva).

Megjegyzés. – Az olvashatóság növelése érdekében az 'i' *index kihagyásra került a vetület mátrix egyenletből.*

3.6.5.5.1.2 *Hibás mérési körülmények.* Amikor a 101. Típusú közleményt B paraméter blokkok nélkül sugározzák, a függőleges védelmi szint (VPL_{H1}) és az oldalirányú védelmi szint (LPL_{H1}) 0-nak van meghatározva. Más esetekben, a függőleges védelmi szint (VPL_{H1}) és az oldalirányú védelmi szint (LPL_{H1}) meghatározása - feltételezve azt, hogy az egyikben egy rejtett hiba áll fenn és csak egy referencia vevő van – a következő:

$$VPL_{H1} = \max.\ [VPL_j]$$
$$LPL_{H1} = \max.\ [LPL_j]$$

Ahol a VPL_j és az LPL_j a j-re = 1-től 4-ig

$VPL_j = |\ B\_vert_j\ | + K_{mdCat\ I.}\ \sigma_{vert,H1}$ és
$LPL_j = |\ B\_lat_j\ | + K_{md\ Cat\ I.}\ \sigma_{lat,H1}$ és

és

$$B\_vert_j = \sum_{i=1}^{N} (s\_vert_i \times B_{i,j});$$

$$B\_lat_j = \sum_{i=1}^{N} (s\_lat_i \times B_{i,j});$$

$B_{i,j}$ = A sugárzási különbségek a pszeudo-távolság helyesbítések sugárzása és a megszerzett helyesbítések sugárzása között, kizárva a j-dik referencia vevő méréseit az i-dik távolság-meghatározási forrásra;

K_{mdCatI}. = A kimaradt észlelés valószínűségéből levezetett szorzó, ha adott az, hogy a földi al-rendszer hibás;

$$\sigma^2_{vert,H1} = \sum_{i=1}^{N} (s\_vert^2_i \times \sigma\_H1^2_i);$$

$$\sigma^2_{lat,H1} = \sum_{i=1}^{N} (s\_lat^2_i \times \sigma\_H1^2_i);$$

$$\sigma\_H1^2_i = \left(\frac{M_i}{U_i}\right)\sigma^2_{pr\_gnd,i} + \sigma^2_{pr\_air,i} + \sigma^2_{tropo,i} + \sigma^2_{iono,i};$$

M_i = Azoknak a referencia vevőknek a száma, amelyek az i-dik távolság-meghatározási forrás pszeudo-távolság helyesbítésének kiszámításához használatosak (a ’B’ érték által jelzetten); és

U_i = Azoknak a referencia vevőknek a száma, amelyek az i-dik távolság-meghatározási forrás pszeudo-távolság helyesbítésének kiszámí-tásához használatosak, a j-dik referencia vevőt kizárva.

Megjegyzés. – A rejtett hiba magába foglal minden olyan hibás mérést, amit a földi rendszer nem azonnal észlel, így a sugárzott adatok érintettek, és így egy előidézett helyzet hiba áll fenn a légijármű fedélzeti al-rendszerében.

3.6.5.5.1.3 *A K-szorzók meghatározása az I. kategóriájú precíziós megközelítésekre.* A szorzók a B-67. táblázatban kerültek megadásra.

3.6.5.5.2 *GBAS helymeghatározási szolgáltatás.* A térbeli-jel vízszintes védelmi szintje egy felső megbízhatósági határérték a referencia ponthoz viszonyított vízszintes helyzet hibára és a meghatározása:

$$HPL = MAX\ \{HPL_{H0}, HPL_{H1}\}$$

B-67. táblázat: K-szórzók az I. kategóriájú precíziós megközelítéshez és APV

Szorzó	M_i			
	1 (Megjegyzés)	2	3	4
K_{ffmd}	6,86	5,762	5,81	5,847
K_{md}	Nincs használva	2,935	2,898	2,878

Megjegyzés. – APV I-es megközelítésekhez, amit a 101. Típusú közlemény sugárzások támogatnak ’B’ paraméter blokk nélkül.

3.6.5.5.2.1 *Szabvány mérési körülmények.* A vízszintes védelmi szint (HPL_{H0}) feltételezve azt, hogy szabvány mérési körülmények állnak fenn (azaz nincs hiba) az összes referencia vevőben és az összes távolság-meghatározási forráson, a következők szerint kerül kiszámításra:

$$HPL_{H0} = K_{ffmd,\ POS}\ d_{major}$$

ahol:

$$d_{major} = \sqrt{\frac{d_x^2 + d_y^2}{2} + \sqrt{\left(\frac{d_x^2 - d_y^2}{2}\right)^2 + d_{xy}^2}}$$

$$d_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma_i^2$$

$$d_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma_i^2$$

$$d_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,i} \sigma_i^2$$

$s_{x,i}$	=	Az x-irányú helyzet hiba parciális differenciál-hányadosa az i-dik műhold pszeudo-távolság hibájára vonatkozóan;
$s_{y,i}$	=	Az y-irányú helyzet hiba parciális differenciál-hányadosa az i-dik műhold pszeudo-távolság hibájára vonatkozóan;
K_{ffmd}, PosI.	=	Az a szorzó, ami a hibamentes kimaradt észlelés valószínűségéből került levezetésre;
N	=	A helyzet-megoldáshoz használt távolság-meghatározási források száma;
i	=	A helyzet-megoldáshoz használt távolság-meghatározási források távolság-meghatározási forrás indexe;
σi	=	A pszeudo-távolság hiba tényező, ahogy az a 3.6.5.5.1.1 pontban meghatározásra került.

Megjegyzés. – A GBAS helymeghatározási szolgáltatásra az x- és y-tengelyek egy önkényes derékszögű alapot határoznak meg a vízszintes síkban.

3.6.5.5.2.2 *Hibás mérési körülmények.* Amikor a 101. Típusú közleményt B paraméter blokkok nélkül sugározzák, a vízszintes védelmi szint (HPL_{H1}) 0-nak van meghatározva. Más esetekben, a vízszintes védelmi szint (HPL_{H1}), feltételezve azt, hogy egy rejtett hiba áll fenn az egyikben és csak egy referencia vevő van, a következő:

$$HPL_{H1} = \max\ [HPL_j\ ]$$

ahol a HPL_j a j-re = 1-től 4-ig:

$$HPL_j = |\ B\_horz_j\ | + K_{md\_POS}\ d_{major,\ H1}$$

és

$$B\_horz_j = \sqrt{\left(\sum_{i=1}^{N} S_{x,i} B_{i,j}\right)^2 + \left(\sum_{i=1}^{N} S_{y,i} B_{i,j}\right)^2}$$

$B_{i,j}$ = a sugárzási különbségek a pszeudo-távolság helyesbítés sugárzása és a megszerzett helyesbítések között, kizárva a j-dik referencia vevő méréseit az i-dik távolság-mérési forrásra.
K_{md_POS} = a kimaradt észlelés valószínűségéből levezetett szorzó, feltéve, hogy a földi al-rendszer hibás.

$$d_{major,H1} = \sqrt{\frac{d\_H1_x^2 + d\_H1_y^2}{2} + \sqrt{\left(\frac{d\_H1_x^2 - d\_H1_y^2}{2}\right)^2 + d\_H1_{xy}^2}}$$

$$d\_H1_x^2 = \sum_{i=1}^{N} s_{x,i}^2 \sigma\_H1_i^2$$

$$d\_H1_y^2 = \sum_{i=1}^{N} s_{y,i}^2 \sigma\_H1_i^2$$

$$d\_H1_{xy} = \sum_{i=1}^{N} s_{x,i} s_{y,i} \sigma\_H1_i^2$$

Megjegyzés. – A GBAS helymeghatározási szolgáltatásra az x- és y-tengelyek egy önkényes derékszögű alapot határoznak meg a vízszintes síkban.

$$\sigma\_H1_i^2 = \left(\frac{M_i}{U_i}\right)\sigma_{pr\_gnd,i}^2 + \sigma_{pr\_air,i}^2 + \sigma_{tropo,i}^2 + \sigma_{iono,i}^2$$

M_i = Azoknak a referencia vevőknek a száma, amelyek az i-dik távolság-meghatározási forrás pszeudo-távolság helyesbítésének kiszámításához használatosak (a ’B’ érték által jelzetten).
U_i = Azoknak a referencia vevőknek a száma, amelyek az i-dik távolság-meghatározási forrás pszeudo-távolság helyesbítésének kiszámításához használatosak, a j-dik referencia vevőt kizárva.

Megjegyzés. – A rejtett hiba magába foglal minden olyan hibás mérést, amit a földi rendszer nem azonnal észlel, úgy, hogy a sugárzott adatok érintettek, és így egy előidézett helyzet hiba áll fenn a légijármű fedélzeti al-rendszerében.

3.6.5.5.2.3 *A K-szorzók meghatározása a Földi Bázisú Kiegészítő Rendszer /GBAS/ helymeghatározási szolgáltatásra.* A K_{ffmd_POS} szorzó 10-el egyenlő és a K_{md_POS} szorzó 5,3-el egyenlő.

3.6.5.6 *Riasztási határértékek*

Megjegyzés. – A riasztási határértékek számításával kapcsolatos útmutató, beleértve a 40 000-től 99 999-ig terjedő csatorna számokhoz kapcsolódó megközelítéseket, a”D”- Melléklet 7.13 pontjában került megadásra.

3.6.5.6.1 *Az I. kategóriájú precíziós megközelítés riasztási határértékei.* A riasztási határértékek a B-68. és a B-69. táblázatban kerültek meghatározásra. Azokra a légijármű helyzetekre, amelyeknél az oldalirányú eltérés kétszer meghaladja azt az eltérést, amelynél az irány-eltérés jelző műszer a teljes skálájú oldalirányú eltérést eléri, vagy a függőleges eltérés kétszer meghaladja azt az eltérést, amelynél az irány-eltérés jelző műszer a teljes skálájú siklópálya-alatt eltérést eléri, a táblázatban mindkét, az oldalirányú és a függőleges riasztási határértékek maximális értékként vannak megadva.

3.6.5.6.2 *APV riasztási határértékek*. A 20 001 és 39 999 közötti csatorna szám tartományban lévő megközelítéseknél a riasztási határértékek a Végső megközelítési szakasz Oldalirányú riasztási határérték (FASLAL) és a Végső megközelítési szakasz Függőleges riasztási határérték (FASVAL) értékekkel egyeznek meg. A 40 000 és 99 999 közötti csatorna számú megközelítéseknél a riasztási határértékeket a fedélzeti adatbázisban tárolják.

3.6.5.7 *Csatorna szám*. Minden egyes GBAS megközelítéshez kapcsolódik egy csatorna szám a 20 001-től a 39 999-ig terjedő tartományban. Ha kiosztásra kerül, akkor a GBAS helymeghatározási szolgáltatáshoz társítva van egy különálló csatorna szám, a 20 001-től a 39 999-ig terjedő tartományban. A csatorna számot az alábbi kifejezés adja meg:

$$\text{Csatorna szám} = 20\,000 + 40(F - 108{,}0) + 411(S)$$

ahol:

F = adat sugárzási frekvencia (MHz); és
S = RPDS, vagy RSDS

és

RPDS = a referencia pálya adat kiválasztó a végső megközelítési szakasz /FAS/ adat blokkjához (ahogy az a 3.6.4.5.1 pontban meghatározásra került)
RSDS = referencia állomás adat kiválasztó a GBAS földi al-rendszerhez (ahogy az a 3.6.4.3.1 pontban meghatározásra került)

A 2. Típusú közlemény 2. adatblokkjában kisugárzott csatorna számok esetében (ahogy a 3.6.4.3.2.1 pontban meghatározásra került), csak az RSDS-ket használják.

B-68. táblázat: I. Kategóriájú Oldalirányú riasztási határérték

A légijármű helyzetének vízszintes távolsága az LTP/FTP-től, ahogy az végighalad a végső megközelítési pályán (méter)	Oldalirányú riasztási határérték (méter)
291 < D ≤ 873	FASLAL
873 < D ≤ 7 500	0,0044D(m) + FASLAL-3,85
D > 7 500	FASLAL + 29,15

LTP = Leszállási küszöb-pont
FTP = Látszólagos küszöb-pont
FASLAL = Végső megközelítési szakasz Oldalirányú riasztási határérték

B-69. táblázat: Függőleges riasztási határérték

A légijármű helyzetének az LTP/FTP feletti magassága, ahogy az a végső megközelítési pálya felé halad (láb)	Függőleges riasztási határérték (méter)
100 < H ≤ 200	FASVAL
200 < H ≤ 1 340	0, 02925H(láb) + FASVAL-5,85
H > 1 340	FASVAL + 33,35

LTP = Leszállási küszöb-pont
FTP = Látszólagos küszöb-pont
FASVAL = Végső megközelítési szakasz Függőleges riasztási határérték

1. Megjegyzés. – Amikor egy APV számára nem kerül kiadásra a FAS, a GBAS megközelítés a 40 000 és 99 999 közötti csatorna számhoz fog kapcsolódni.

2. Megjegyzés. – A csatorna szám kiválasztáshoz kapcsolódó útmutató a "D"- Melléklet 7.7 pontjában került megadásra.

3.6.5.8 Efemerisz-hiba helyzet határ.

Megjegyzés. – Az efemerisz-hiba helyzet határok csak a helyzet megoldásban (j index) használt műhold helyzetsor rendszerű távolság-mérési forrásokra kerülnek kiszámításra és más típusú távolság-mérési forrásokra nem, (Műhold Bázisú Kiegészítő Rendszer műholdakra, vagy pszeudolitekre) azokra, amelyek nincsenek kitéve a kimutathatatlan efemerisz-hibáknak. Azonban ezeknek a helyzet határoknak a kiszámításai felhasználják a helyzet megoldásban (i index) felhasznált összes távolság-mérési forrástól eredő információkat.

3.6.5.8.1 *I. kategóriájú precíziós megközelítés és APV.* A függőleges és oldal-irányú efemerisz-hiba helyzet határok a következők szerint kerülnek meghatározásra:

$$VEB = \underset{j}{MAX}\,\{VEB_j\}$$

$$LEB = \underset{J}{MAX}\,\{LEB_j\}$$

A függőleges és oldalirányú efemerisz-hiba helyzet határokat a helyzet megoldásban használatos j-dik műhold helyzetsor rendszerű távolság-mérési forrásra a következő képlet adja meg:

$$VEB_j = \left|s\_vert_j\right| x_{air} P_j + K_{md\_e,j}\sqrt{\sum_{i=1}^{N} s\_vert_i^2 \times \sigma_i^2}$$

$$LEB_j = \left|s\_lat_j\right| x_{air} P_j + K_{md\_e,j}\sqrt{\sum_{i=1}^{N} s\_lat_i^2 \times \sigma_i^2}$$

ahol:

$s\_vert_{i \text{ vagy } j}$ ahogy az a 3.6.5.5.1.1 pontban meghatározásra került
$s\_lat_{i \text{ vagy } j}$ ahogy az a 3.6.5.5.1.1 pontban meghatározásra került

x_{air} ahogy az 3.6.5.4 pontban meghatározásra került
N a helyzet megoldásban használatos távolság-mérési források száma
σ_i ahogy az a 3.6.5.5.1.1 pontban meghatározásra került
P_j a sugárzott efemerisz dekorrelációs paraméter a j-dik távolság-mérési forrásra
$K_{md\_e\_CATI}$ a sugárzott, a műhold helyzet-sor rendszerhez kapcsolódó efemerisz hibás észlelési szorzó a precíziós megközelítésre a j-dik távolság-mérési forrásra ($K_{md\_e\_CATI, GPS}$ vagy $K_{md\_e\_CATI, GLONASS}$)

3.6.5.8.2 *Földi Bázisú Kiegészítő Rendszer /GBAS/ helymeghatározási szolgáltatás.* A vízszintes efemerisz-hiba helyzet határt a következő képlet adja meg:

$$HEB = \underset{j}{MAX}\{HEB_j\}$$

A vízszintes efemerisz-hiba helyzet határt a helyzet megoldásban használatos j-dik műhold helyzetsor rendszerű távolság-mérési forrásra a következő képlet adja meg:

$$HEB_j = \left|s_{horz,j}\right| x_{air} P_j + K_{md\_e\_POS}\, d_{major}$$

ahol:

$s_{horz,j}^2 =$ $s_{xj}^2 + s_{yj}^2$
$s_{x,j}$ ahogy az 3.6.5.5.2.1 pontban meghatározásra került
$s_{y,j}$ ahogy az 3.6.5.5.2.1 pontban meghatározásra került
x_{air} a 3.6.5.4 pontban került meghatározásra
P_j a sugárzott efemerisz dekorrelációs paraméter a j-dik távolság-mérési forrásra
$K_{md\_e\_POS}$ a sugárzott, a műhold helyzetsor rendszerhez kapcsolódó hibás észlelési szorzó a GBAS helymeghatározási szolgáltatásra a j-dik távolság-mérési forrásra ($K_{md\_e\_POS, GPS}$ vagy $K_{md\_e\_POS, GLONASS}$)
d_{major} a 3.6.5.5.2.1 pontban került meghatározásra

3.6.6 KÖZLEMÉNY TÁBLÁZATOK

Minden egyes GBAS közleményt a B-70. táblázattól a B-73. táblázatig terjedően meghatározott megfelelő közlemény formátummal megegyezően kell kódolni.

Megjegyzés. – A közlemény típus szerkezete a 3.6.4.1 pontban került meghatározásra.

3.6.7 NEM-LÉGIJÁRMŰ FEDÉLZETI ALKOTÓ-ELEMEK

3.6.7.1 *Teljesítmény*

3.6.7.1.1 *Pontosság*

3.6.7.1.1.1 A GPS és GLONASS műholdak helyesbített pszeudo-távolság paramétereihez a földi alrendszer hozzájárulásának négyzetes közép-értéke (RMS) (1 szigma) a következő kell, hogy legyen:

$$RMS_{pr\_gnd} \le \sqrt{\frac{(a_0 + a_1 e^{-\theta_n/\theta_0})^2}{M} + (a_2)^2}$$

ahol:

M	=	A telepített földi referencia vevők száma;
n	=	Az n-dik távolság-meghatározási forrás;
θ_n	=	Az n-dik távolság-meghatározási forrás magassági szöge;
a_0, a_1, a_2, és a θ_0	=	A B-73. és a B-74. táblázatban meghatározott paraméterek mindegyike, ahogy a földi pontossági jelölésekre (GAD-k) meghatározásra kerültek.

1. Megjegyzés. – A GBAS földi al-rendszer pontossági követelményét a földi pontossági jelölés /GAD/ betűk és a telepített referencia vevők száma határozza meg.

2. Megjegyzés. – A helyesbített pszeudo-távolság hibához a GBAS földi al-rendszer hozzájárulását a B-74. és B-75. táblázatokban megadott görbék határozzák meg, és az SBAS műholdak hozzájárulása nem foglalja magába a légijármű berendezés zajt és a légijármű szerkezete miatti többutas terjedést.

B-70. táblázat: Az 1. Típusú pszeudo-távolság helyesbítések közleménye

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s
Kiegészítő közlemény jelző	2	0-tól 3-ig	1
Mérések száma (N)	5	0-tól 18-ig	1
Mérések típusa	3	0-tól 7-ig	1
Efemerisz dekorrelációs tényező (P)	8	0-tól $1{,}275 \times 10^{-3}$ m/m	5×10^{-6} m/m
Efemerisz CRC	16	—	—
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s
Az N mérési blokkokra			
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1
Adatkibocsátás (IOD)	8	0-tól 255-ig	1
Pszeudo-távolság helyesbítés (PRC)	16	± 327,67 m	0,01 m
Távolság helyesbítési gyakoriság (RRC)	16	± 32,767 m/s	0,001 m/s
σ_{pr_gnd}	8	0-tól 5,08 m-ig	0,02 m
B_1	8	± 6,35 m	0,05 m
B_2	8	± 6,35 m	0,05 m
B_3	8	± 6,35 m	0,05 m
B_4	8	± 6,35 m	0,05 m

B-70A. táblázat: A 101. Típusú GRAS pszeudo-távolság helyesbítések közleménye

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s
Kiegészítő közlemény jelző	2	0-tól 3-ig	1
Mérések száma (N)	5	0-tól 18-ig	1
Mérések típusa	3	0-tól 7-ig	1
Efemerisz dekorrelációs tényező (P)	8	0-tól $1{,}275 \times 10^{-3}$ m/m	5×10^{-6} m/m
Efemerisz CRC	16	—	—
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s
B paraméterek száma	1	0, vagy 4	—
Tartalék	7	—	—
Az N mérési blokkokra			
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1
Adatkibocsátás (IOD)	8	0-tól 255-ig	1
Pszeudo-távolság helyesbítés (PRC)	16	± 327,67 m	0,01 m
Távolság helyesbítési gyakoriság (RRC)	16	± 32,767 m/s	0,001 m/s
σ_{pr_gnd}	8	0-tól 50,8 m-ig	0,2 m
B paraméter blokk (ha van)			
B_1	8	± 25,4 m	0,2 m
B_2	8	± 25,4 m	0,2 m
B_3	8	± 25,4 m	0,2 m
B_4	8	± 25,4 m	0,2 m

B-71. táblázat: A 2. Típusú GBAS-vonatkozású adat-közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
GBAS referencia vevők	2	2-től 4-ig	—
Földi pontosság jelölő betű	2	—	—
Tartalék	1	—	—
GBAS folyamatossági/sértetlenségi jelölés	3	0-tól 7-ig	1
Helyi mágneses elhajlás	11	± 180°	0,25°
Tartalék	5	—	—
$\sigma_{vert\_iono\_gradient}$	8	0-tól $25{,}5 \times 10^{-6}$ m/m	$0{,}1 \times 10^{-6}$ m/m
Törési index	8	16-tól 781-ig	3
Skála magasság	8	0-tól 25 500 m-ig	100 m
Törési bizonytalanság	8	0-tól 255-ig	1
Földrajzi szélesség	32	± 90,0°	0,0005 ív-másodperc
Földrajzi hosszúság	32	± 180,0°	0,0005 ív-másodperc
GBAS Referencia pont magasság	24	± 83 886,07 m	0,01 m
Kiegészítő adat blokk 1 (ha van)			
Referencia állomás adat – kiválasztó	8	0-tól 48-ig	1
Maximális felhasználási távolság (D_{max})	8	2-től 510 km-ig	2 km
$K_{md\_e\_POS,GPS}$	8	0-tól 12,75-ig	0,05
$K_{md\_e, GPS}$	8	0-tól 12,75-ig	0,05
$K_{md\_e\_POS,GLONASS}$	8	0-tól 12,75-ig	0,05
$K_{md\_e, GLONASS}$	8	0-tól 12,75-ig	0,05
Kiegészítő adat blokk 2 (ha van)			
Kiegészítő adat blokk hosszúság	8	2-től 255-ig	1
Kiegészítő adat blokk szám	8	2-től 255-ig	1
Kiegészítő adat paraméterek	változó	—	—

GBAS = Földi Bázisú Kiegészítő Rendszer

B-72. táblázat: A 4. Típusú FAS adat közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Az N adatállományra			
Adatállomány hossz	8	2-től 212-ig	1 byte
FAS adat blokk	304	—	—
FAS függőleges riasztási határérték/megközelítési helyzet	8		
1) amikor a társított megközelítési működést jelölő APV 1-t jelez (APD 0-nak kódolva)		0-tól 50,8 m-ig	0,2 m
2) amikor a társított megközelítési működést jelölő nem APV 1-t jelez (APD nem 0-nak kódolva)		0-tól 25,4 m-ig	0,1 m
FAS oldalirányú riasztási határérték/megközelítési helyzet	8	0-tól 50,8 m-ig	0,2 m

FAS = Végső megközelítési szakasz

B-73. táblázat: Az 5. Típusú, a távolság-mérési jelforrás előre jelzett rendelkezésre állási közlemény

Adat tartalom	Felhasznált bitek	Érték tartomány	Felbontás
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s
Tartalék	2	—	—
A befogott jelforrások száma (N)	8	0-tól 31-ig	1
N befogott jelforrásra			
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1
Jelforrás rendelkezésre állás érzékelés	1	—	—
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s
Az akadályozott megközelítések száma (A)	8	0-tól 255-ig	1
’A’ akadályozott megközelítésre			
Referencia pálya adat kiválasztó	8	0-tól 48-ig	—
Befogott jelforrások száma erre a megközelítésre (N_A)	8	1-től 31-ig	1
’N_A’ befogott távolság-meghatározási forrás erre a megközelítésre			
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1
Jelforrás rendelkezésre állás érzékelés	1	—	—
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s

B-74. táblázat: GBAS – GPS pontossági követelmény paraméterek

GBAS pontossági betű jelölés	θ_n (fok)	a_0 (méter)	a_1 (méter)	θ_0 (fok)	a_2 (méter)
A	≥ 5	0,5	1,65	14,3	0,08
B	≥ 5	0,16	1,07	15,5	0,08
C	> 35	0,15	0,84	15,5	0,04
	5-től 35-ig	0,24	0	—	0,04

B-75. táblázat: GBAS – GLONASS pontossági követelmény paraméterek

Földi pontossági betű jelölés	θ_n (fok)	a_0 (méter)	a_1 (méter)	θ_0 (fok)	a_2 (méter)
A	≥ 5	1,58	5,18	14,3	0,078
B	≥ 5	0,3	2,12	15,5	0,078
C	> 35	0,3	1,68	15,5	0,042
	5-től 35-ig	0,48	0	—	0,042

3.6.7.1.1.2 Az SBAS műholdak helyesbített pszeudo-távolság pontosságában a földi al-rendszer hozzájárulásának négyzetes középértéke /RMS/ a következő kell, hogy legyen:

$$RMS_{pr\_gnd} \leq \frac{1{,}8}{\sqrt{M}} \quad \text{(méter)}$$

ahol:
M értéke annyi, ahogy a 3.6.7.1.1.1 pontban meghatározásra került.

Megjegyzés. – Az SBAS távolság-meghatározási források Földi pontossági jelölése /GAD/ kidolgozás alatt áll.

3.6.7.1.2 *Sértetlenség*

3.6.7.1.2.1 *A GBAS földi al-rendszerek sértetlenségi veszélye*

3.6.7.1.2.1.1 *I. kategóriájú precíziós megközelítés.* Annak a GBAS földi al-rendszernek, amely I. kategóriájú precíziós megközelítést biztosít, a sértetlenségi veszélye megközelítésenként 1,5 x 10^{-7} -nél kisebb, kell, hogy legyen.

1. Megjegyzés. – A GBAS földi al-rendszerre meghatározott sértetlenségi veszély a GBAS térbeli-jel sértetlenségi veszély egy olyan rész-halmaza, ahol kizárásra került a védelmi szint sértetlenségi veszélye (3.6.7.1.2.2.1) és az összes egyéb GBAS, SBAS és állandó pályájú műhold rendszer hibáknak a hatása kerül beszámításra. A GBAS földi al-rendszer sértetlenségi veszélye magába foglalja a 3.6.7.2.6 pont szerinti megkívánt műhold jel ellenőrzés sértetlenségi veszélyét és a 3.6.7.3 pontnak az ellenőrzéshez kapcsolódó sértetlenségi veszélyét.

2. Megjegyzés. – A GBAS térbeli-jel sértetlenségi veszély úgy került meghatározásra, mint annak a valószínűsége, hogy a földi al-rendszer olyan információkat biztosít, amelyek amikor egy olyan hiba-mentes vevővel kerülnek feldolgozásra, ami bármilyen, a légijármű által felhasználható GBAS adatot használ fel, akkor azok egy, a tűréshatáron kívüli oldalirányú, vagy függőleges relatív helyzet hibát *eredményeznek (hiba) kijelzés nélkül a maximális „idő-a-riasztásig” időtartamnál hosszabb ideig. Egy tűréshatáron kívüli oldalirányú, vagy függőleges relatív helyzet hiba úgy került meghatározásra, hogy ez az a hiba, ami meghaladja mind az I. kategóriájú precíziós megközelítés védelmi szintjét, mind – ha a kiegészítő 1. adatblokk sugárzásra kerül – az efemerisz-hiba helyzet határt.*

3.6.7.1.2.1.1.1 A GBAS földi al-rendszer maximális „idő – a – riasztásig” időtartamának 3 másodpercnek, vagy annál kevesebbnek kell lenni.

Megjegyzés. – A fenti az „idő – a – riasztásig” az az időtartam, ami a tűréshatáron kívüli oldalirányú, vagy függőleges relatív helyzet hiba kezdete és annak a közleménynek az utolsó bitje sugárzási ideje között van, ami a helyzetet tükröző sértetlenségi adatokat magába foglalja.

3.6.7.1.2.1.1.2 A GBAS földi al-rendszer maximális „idő – a – riasztásig” időtartamának 5,5 másodpercnek, vagy annál kevesebbnek kell lenni, amikor 101. Típusú közlemény kiadása történik.

3.6.7.1.2.1.1.3 Az I. Kategóriájú Végső megközelítési szakasz /FAS/ blokkokban a Végső megközelítési szakasz Oldalirányú riasztási határérték /FASLAL/ értékének, ahogy az a 4. Típusú közlemény FAS Oldalirányú riasztási határérték mezőben meghatározásra került, nem több, mint 40 méternek kell lenni. Az egyes Végső megközelítési szakasz /FAS/ blokkokban a Végső megközelítési szakasz Függőleges riasztási határérték /FASVAL/ értékének, ahogy az a 4. Típusú közlemény FAS Függőleges riasztási határérték mezőben meghatározásra került, nem több, mint 10 méternek kell lenni.

3.6.7.1.2.1.1.4 Megközelítés Függőleges Vezetéssel (APV) esetén a Végső megközelítési szakasz Oldalirányú riasztási határérték /FASLAL/ és a Végső megközelítési szakasz Függőleges riasztási határérték /FASVAL/ értéke nem lehet nagyobb, mint az Annex 10, I. Kötet 3.7.2.4 pontban megadott oldalirányú és függőleges riasztási határérték.

3.6.7.1.2.1.2 *GBAS helymeghatározási szolgáltatás*. A GBAS földi al-rendszernek, amely GBAS helymeghatározási szolgáltatást biztosít, a sértetlenségi veszélye óránként $9{,}9 \times 10^{-8}$ -nál kisebb, kell, hogy legyen.

1. Megjegyzés. – A GBAS földi al-rendszerre meghatározott sértetlenségi veszély a GBAS térbeli-jel sértetlenségi veszély egy olyan rész-halmaza, ahol kizárásra került a védelmi szint sértetlenségi veszélye (3.6.7.1.2.2.1) és az összes egyéb GBAS, SBAS és állandó pályájú műhold rendszer hibáknak a hatása kerül beszámításra. A GBAS földi al-rendszer sértetlenségi veszélye magába foglalja a 3.6.7.2.6 pont szerinti megkívánt műhold jel ellenőrzés sértetlenségi veszélyét és a 3.6.7.3 pontnak az ellenőrzéshez kapcsolódó sértetlenségi veszélyét.

2. Megjegyzés. – A GBAS térbeli-jel sértetlenségi veszély úgy került meghatározásra, mint annak a valószínűsége, hogy a földi al-rendszer olyan információkat biztosít, amelyek amikor egy olyan hiba-mentes vevővel kerülnek feldolgozásra, ami bármilyen, a légijármű által felhasználható GBAS adatot használ fel, akkor azok egy, a tűréshatáron kívüli oldalirányú vagy függőleges relatív helyzet hibát eredményeznek (hiba) kijelzés nélkül a maximális „idő-a-riasztásig” időtartamnál hosszabb ideig. Egy tűréshatáron kívüli oldalirányú vagy függőleges relatív helyzet hiba úgy került meghatározásra, hogy az az a hiba, ami meghaladja mind a vízszintes védelmi szintet, mind a vízszintes efemerisz-hiba helyzet határt.

3.6.7.1.2.1.2.1 A GBAS földi al-rendszer maximális „idő – a – riasztásig” időtartamának 3 másodpercnek, vagy annál kevesebbnek kell lenni, amikor 1. Típusú közlemény kiadása történik, és 5,5 másodpercnek, vagy annál kevesebbnek kell lenni, amikor 101. Típusú közlemény kiadása történik.

Megjegyzés. – A fenti az „idő – a – riasztásig” az az időtartam, ami a tűréshatáron kívüli oldalirányú, vagy függőleges relatív helyzet hiba kezdete és annak a közleménynek az utolsó bitje sugárzási ideje között van, ami a helyzetet tükröző sértetlenségi adatokat magába foglalja.

3.6.7.1.2.2 *Védelmi szint sértetlenségi veszély*

3.6.7.1.2.2.1 Annak a GBAS földi al-rendszernek, amely I. kategóriájú precíziós megközelítést, vagy APV-t biztosít, a védelmi szint sértetlenségi veszélyének megközelítésenként 5 x 10^{-8}-nál kevesebbnek kell lenni.

Megjegyzés. – Az I. kategóriájú precíziós megközelítés és az APV védelmi szint sértetlenségi veszély az, amikor a GBAS referencia ponthoz viszonyított helyzet jelzésben fel nem fedezett hibák miatt a sértetlenségi veszély nagyobb, mint a hozzájuk kapcsolt védelmi szintek, a két alábbi feltétel esetében:

a) szabvány mérési körülményeknél, ami a 3.6.5.5.1.1 pontban meghatározott; és

b) hibás mérési körülményeknél, ami a 3.6.5.5.1.2 pontban van meghatározva.

3.6.7.1.2.2.2 Annak a GBAS földi al-rendszernek, amely GBAS helymeghatározási szolgáltatást biztosít, a védelmi szint sértetlenségi veszélyének 10^{-9}-nél kevesebbnek kell lenni óránként.

Megjegyzés. – A GBAS helymeghatározási szolgáltatás védelmi szintjénél a védelmi szint sértetlenségi veszély az, amikor a helyzet jelzésben fel nem fedezett hibák miatt a sértetlenségi veszély a referencia ponthoz viszonyítva a vízszintes helyzetben a GBAS helymeghatározási szolgáltatás védelmi szintjénél nagyobb, a két alábbi helyzet esetében:

a) szabvány mérési körülményeknél, ami a 3.6.5.5.2.1 pontban meghatározott; és

b) hibás mérési körülményeknél, ami a 3.6.5.5.2.2 pontban van meghatározva.

3.6.7.1.3 *A szolgáltatás folytonossága*.

3.6.7.1.3.1 *A szolgáltatás folytonossága az I. Kategóriájú precíziós megközelítés és a Megközelítés Függőleges Vezetéssel (APV) számára*. A GBAS földi al-rendszer szolgáltatási folyamatosságának 1 – 3,3 x 10^{-6} –al egyenlőnek, vagy annál nagyobbnak kell lenni bármely 15 másodperc során.

1.Megjegyzés. – A földi al-rendszer szolgáltatási folyamatossága annak a valószínűsége, hogy bármely 15 másodperces időtartam során a VHF adat-sugárzás az adatokat a tűréshatárokon belül továbbítja, a VHF adat-sugárzás térerőssége a meghatározott tartományon belül van, és a védelmi szintek alacsonyabbak a riasztási határértékeknél, kivéve, ha konfiguráció változások történnek űr-szegmens váltás miatt.

3.6.7.1.3.2 *A szolgáltatás folytonossága a helymeghatározási szolgáltatás számára*.

Megjegyzés. – Az olyan GBAS al-rendszerekre, amelyek GBAS helymeghatározási szolgáltatást biztosítanak, lehetnek a tervezett üzemeltetésektől függően kiegészítő folytonossági követelmények is.

3.6.7.2 *Működési követelmények*

3.6.7.2.1 *Általános*

3.6.7.2.1.1 *Adat-sugárzási gyakoriság*.

3.6.7.2.1.1.1 Egy olyan GBAS földi al-rendszernek, mely támogatja az I. Kategóriás precíziós megközelítést, vagy az APV-II-t, 1. Típusú közleményeket kell kiadnia. Egy olyan GBAS földi al-rendszernek, mely nem támogatja az I. Kategóriás precíziós megközelítést, vagy az APV-II-t, 1. Típusú, vagy 101. Típusú közleményeket kell kiadnia. Egy GBAS földi al-rendszernek nem szabad mindkét, az 1. Típusú és a 101. Típusú közleményt kiadnia.

Megjegyzés, - A 101. Típusú közlemény használatával kapcsolatos útmutató anyag a ”D”- Melléklet 7.18 pontjában található.

3.6.7.2.1.1.2 Mindegyik GBAS földi al-rendszernek ki kell sugároznia 2. Típusú közleményeket.

3.6.7.2.1.1.3 Minden GBAS földi al-rendszernek ki kell sugároznia a 4. Típusú üzenetekben lévő Végső Megközelítési szakasz (FAS) blokkokat az összes olyan I. Kategóriás precíziós megközelítésekhez, amit az a GBAS földi al-rendszer támogat. Ha egy GBAS földi al-rendszer támogatja az APV-t, de nem sugároz FAS blokkokat a megfelelő megközelítésekhez, akkor ki kell adnia a 2. Típusú közleményben a kiegészítő adat blokk 1-et.

Megjegyzés. – Az APV eljárásokhoz tartozó FAS blokkokat egy adatbázisban lehet tartani a repülőgép fedélzetén. A kiegészítő adat blokk 1 kisuágárzása lehetővé teszi a fedélzeti vevőnek, hogy kiválassza azt a GBAS földi al-rendszert, amelyik a fedélzeti adatbázisban szereplő megközelítési eljárásokat támogatja. A FAS blokkokat szintén ki lehet adni fedélzeti adatbázis nélküli repülőgép működtetésének támogatásához. Ezek az eljárások eltérő csatorna számokat használnak, ahogy a ”D”- Melléklet 7.7 pontjában megadásra került.

3.6.7.2.1.1.4 Amikor az 5. Típusú közleményeket használják, a földi al-rendszernek az 5. Típusú közleményt a B-76. táblázatban megadott gyakorisággal kell kisugározni.

Megjegyzés. – Amikor a szabvány 5 fokos maszk nem elegendő a műhold láthatóságának megjelölésére, vagy a földi al-rendszer antennáinál vagy a légijárművön egy meghatározott megközelítés során, akkor az 5. Típusú közleményt lehet felhasználni a légijármű részére történő kiegészítő információk sugárzására.

3.6.7.2.1.1.5 *Adat sugárzási gyakoriság*. Azokat az összes típusú közleményeket, amelyek megfelelnek a 3. fejezet 3.7.3.5.4.4.1.2 és 3.7.3.5.4.4.2.2 pontokban leírt térerősség követelményeknek és a B-76. táblázatban megadott minimális gyakoriságnak, a fedésterületen belül, annak minden pontjában biztosítani kell. Az összetett földi al-rendszer teljes antenna rendszer kombinációjából a teljes közlemény sugárzási gyakoriság nem haladhatja meg a B-76. táblázatban megadott maximális gyakoriságot.

Megjegyzés. – Az összetett antenna rendszerek használatára vonatkozó útmutató anyagot a „D”- Melléklet 7.12.4 pontja adja meg.

3.6.7.2.1.2 *Közlemény blokk azonosító*. A közlemény blokk azonosítót /MBI/ vagy a szokásos, vagy az ellenőrzési helyzetbe kell állítani a 3.6.3.4.1 pontban megadott kódolásnak megfelelően.

3.6.7.2.2 *Pszeudó-távolság helyesbítések*

3.6.7.2.2.1 *Közlemény lappangási (várakozási) idő*. A módosított Z-számítás által jelzett idő és a kisugárzott 1. Típusú közlemény, vagy a 101. Típusú közlemény utolsó bitje közötti idő nem haladhatja meg a 0,5 másodpercet.

B-76. táblázat: Földi Bázisú Kiegészítő Rendszer /GBAS/VHF adat-sugárzási gyakoriságok

Közlemény típus	Minimális sugárzási gyakoriság	Maximális sugárzási gyakoriság
1	Az egyes mérési típusokra:	Az egyes mérési típusokra:
	Az összes mérési blokk keretenként egyszer (Megjegyzés)	Az összes mérési blokk időrésenként egyszer
2	20 egymást követő keretenként egyszer	Keretenként egyszer
4	Az összes FAS blokk 20 egymást követő keretenként egyszer	Az összes FAS blokk keretenként egyszer
5	Az összes befogott forrás 20 egymást követő keretenként egyszer	Az összes befogott forrás 5 egymást követő keretenként egyszer

Megjegyzés. – Egy 1. Típusú, vagy 101. Típusú közlemény, vagy két 1. Típusú, vagy 101. Típusú közlemény van összekapcsolva a 3.6.4.2 pontban leírt kiegészítő közlemény jelzés felhasználásával.

3.6.7.2.2.2 *Alacsony-frekvenciás adatok*. Az efemerisz változás időtartamát kivéve a közleményben lévő első távolság-mérési forrást úgy kell sorba rendezni, hogy az efemerisz dekorellációs tényező, az efemerisz CRC és a jelforrás rendelkezésre állási időtartam az egyes műhold helyzetsor rendszerek távolság-mérési forrására legalább 10 másodpercenként egyszer sugárzásra kerüljön. Az efemerisz változás időtartama alatt az első távolság-mérési forrást úgy kell elrendezni, hogy az efemerisz dekorrelációs tényező, az efemerisz CRC és a jelforrás rendelkezésre állási időtartam az egyes műhold helyzetsor rendszerek távolság-mérési forrására legalább 27 másodpercenként egyszer sugárzásra kerüljön. Amikor a műhold helyzetsor rendszer távolság-mérési forrástól egy új efemerisz adat kerül vételre, akkor a földi al-rendszereknek az egyes műholdaktól vett korábbi efemerisz adatokat kell felhasználni addig, amíg az új efemerisz adatokat folyamatosan legalább 2 percen keresztül veszi, de át kell állni az új efemerisz adatokra, mielőtt a 3 perc letelne. Amikor ez az átállás – az egy adott távolság-mérési forrás új efemerisz adatainak felhasználása – megtörténik, akkor a földi al-rendszernek egy új efemerisz CRC-t és egy jelforrás rendelkezésre állási időtartamot kell sugározni a távolság-mérési forrás 1. Típusú, vagy 101. Típusú kisfrekvenciájú információs közleményében a következő három egymást követő keretben minden egyes előfordulásnál. Egy adott távolság-mérési forrásra a földi al-rendszernek folytatnia kell a korábbi efemerisz adatoknak megfelelő adatok sugárzását addig, amíg egy új efemerisz CRC sugárzásra nem kerül az 1. Típusú, vagy a 101. Típusú kisfrekvenciájú adat közleményben (lásd a Megjegyzést). Ha az efemerisz CRC megváltozik és az Adatkibocsátás /IOD/ nem, akkor a földi al-rendszernek a távolság-mérési forrást érvénytelennek kell tekinteni.

Megjegyzés. – Az efemerisz átállás előtti késés elegendő időt hagy a légijármű fedélzeti al-rendszer részére ahhoz, hogy összegyűjtse az új efemerisz adatokat.

3.6.7.2.2.2.1 **Ajánlás**. – *Az efemerisz dekorrelációs tényezőt, az efemerisz CRC-t az egyes műhold helyzetsor rendszerű távolság-mérési forrásokra olyan gyakorisággal kell sugározni, amennyire az csak lehetséges.*

3.6.7.2.2.3 *Sugárzási pszeudo-távolság helyesbítés*. Az egyes sugárzási pszeudo-távolság helyesbítéseket az egyes referencia vevőktől számított megfelelő távolság-meghatározási forrás pszeudo-távolság helyesbítés becslések összekapcsolásával kell meghatározni. Az egyes műholdakra az ebben a kombinációban használt méréseket ugyanazon efemerisz adatokkal kell venni. A helyesbítéseket az egyes műholdakra vonatkozó simított kódú pszeudo-távolság mérésekre kell alapozni a vivőhullám méréseknél egy a 3.6.5.1 pontban leírtaknak megfelelő simító-szűrő alkalmazásával.

3.6.7.2.2.4 *Sugárzási térbeli-jel sértetlenségi paraméterek.* A földi al-rendszernek biztosítania kell a σ_{pr_gnd} és 'B' paramétereket az egyes pszeudo-távolság helyesbítésekre az 1. Típusú közleményekben úgy, hogy a 3.6.7.1.2.2 pontban meghatározott védelmi szint sértetlenségi veszély követelmények kielégítésre kerüljenek. A földi al-rendszernek biztosítania kell a σ_{pr_gnd} és ha szükséges, a 'B' paramétereket az egyes pszeudo-távolság helyesbítésekre a 101. Típusú közleményekben úgy, hogy a 3.6.7.1.2.2 pontban meghatározott védelmi szint sértetlenségi veszély követelmények kielégítésre kerüljenek

Megjegyzés. – A 'B' paraméterek kisugárzása a 101. Típusú közleményekben opcionális (választható). A 101. Típusú közleményben lévő 'B' paraméterekkel kapcsolatos útmutató anyagot a "D"- Melléklet 7.5.11 pontja tartalmazza.

3.6.7.2.2.5 **Ajánlás**. – A referencia vevő méréseket ellenőrizni kell. Hibás méréseket, vagy meghibásodott referencia vevőket nem lehet felhasználni a pszeudo-távolság helyesbítések kiszámításához.

3.6.7.2.2.6 *Az 1. Típusú közlemények, vagy a 101. Típusú közlemények ismételt továbbítása*. Egy adott mérési típushoz és egy adott kereten belül, az összes 1. Típusú, vagy 101. Típusú közlemény sugárzásoknak, vagy az olyan, az összes GBAS sugárzó állomástól érkező összekapcsolt pároknak, melyeknek azonos a GBAS azonosítása, egyforma adattartalommal kell rendelkeznie.

3.6.7.2.2.7 *Adatkibocsátás /IOD/.* A Földi Bázisú Kiegészítő Rendszer /GBAS/ földi al-rendszerének az IOD mezőket az egyes távolság-meghatározási forrás mérési blokkokban úgy kell beállítani, hogy a távolság-meghatározási forrástól vett IOD értéke megfeleljen a pszeudo-távolság helyesbítési számításokhoz használt efemerisz adatoknak.

3.6.7.2.2.8 *A jel hiba modellek alkalmazása*. Az ionoszférikus és a troposzférikus helyesbítéseket nem kell használni a pszeudo-távolság helyesbítések számításához felhasznált pszeudo-távolságoknál.

3.6.7.2.2.9 *Az 1. Típusú közlemények, vagy a 101. Típusú közlemények összekapcsolt párjai*. Amikor az 1. Típusú, vagy a 101. Típusú közlemények összekapcsolt párjai kerülnek továbbításra, akkor:

a) A két közlemény módosított Z-számításának azonosnak kell lenni;

b) A pszeudo-távolság helyesbítések minimális számának minden egyes közleményben egynek kell lenni;

c) Egy adott műholdra vonatkozó mérési blokkot egynél többször nem lehet az összekapcsolt közlemény-párokban továbbítani; és

d) A két közleményt különböző időrésekben kell leadni.

3.6.7.2.2.10 *Módosított Z-számítás felfrissítés*. A módosított Z-számítást egy adott mérési típus 1. Típusú, vagy 101. Típusú közleményében minden egyes keretnél léptetni kell.

3.6.7.2.2.11 *Efemerisz dekorrelációs tényezők.*

3.6.7.2.2.11.1 *I. kategóriájú precíziós megközelítés és Megközelítés Függőleges Vezetéssel (APV).* Azoknál a földi al-rendszereknél, amelyek sugározzák a 2. Típusú közleményben a kiegészítő 1. adatblokkot, a földi al-rendszernek sugároznia kell az efemerisz dekorrelációs tényezőt minden egyes műhold helyzetsor rendszerű távolságmérési forrásra úgy, hogy a földi al-rendszernek a 3.6.7.1.2.1.1 pontban leírt sértetlenségi veszélye kielégítésre kerüljön.

3.6.7.2.2.11.2 *GBAS helymeghatározási szolgáltatás*. Azoknál a földi al-rendszereknél, amelyek biztosítják a GBAS helymeghatározási szolgáltatást, a földi al-rendszernek sugároznia kell az efemerisz dekorrelációs tényezőt minden egyes műhold helyzetsor rendszerű távolságmérési forrásra úgy, hogy a földi al-rendszernek a 3.6.7.1.2.1.2 pontban leírt sértetlenségi veszélye kielégítésre kerüljön.

3.6.7.2.3 *Földi Bázisú Kiegészítő Rendszer /GBAS/ vonatkozású adatok*

3.6.7.2.3.1 *Troposzférikus késési paraméterek*. A földi al-rendszernek a 2. Típusú közleményben sugároznia kell egy törési indexet, egy skála magasságot és egy törési bizonytalanságot úgy, hogy a 3.6.7.1.2.2 pontban meghatározott védelmi szint sértetlenségi veszély kielégítésre kerüljön.

3.6.7.2.3.2 *A Földi folyamatossági/sértetlenségi meghatározás /GCID/ jelzése*. Ha a földi al-rendszer megfelel 3.6.7.1.2.1.1, 3.6.7.1.2.2.1 és a 3.6.7.1.3.1 pont követelményeinek, akkor a GCID-t 1-be kell állítani, más esetekben a beállítása 7 kell, hogy legyen.

3.6.7.2.3.3 *A GBAS referencia antenna fázis középpontja helyzetének pontossága*. Az egyes GBAS referencia vevők referencia antennájának fázis középpont helyzet hibája a GBAS referencia ponthoz viszonyítva 8 cm-nél kevesebb kell, hogy legyen.

3.6.7.2.3.4 **Ajánlás**. – *A GBAS referencia pont felmérési hibája. A GBAS referencia pont felmérési hibája a WGS-84-re vonatkoztatva függőlegesen 0,25 méternél, vízszintesen 1 méternél kevesebb kell, hogy legyen.*

Megjegyzés, - Az ide tartozó útmutató anyagot a "D"- Melléklet 7.16 pontja tartalmazza.

3.6.7.2.3.5 *Ionoszférikus bizonytalanság becslési paraméter*. A földi al-rendszernek egy ionoszférikus késési gradiens paramétert kell sugározni a 2. Típusú közleményben azért, hogy a 3.6.7.1.2.2 pontban meghatározott védelmi szint sértetlenségi veszély követelmény kielégítésre kerüljön.

3.6.7.2.3.6 Azok a földi al-rendszerek, amelyek biztosítják a GBAS helymeghatározási szolgáltatást, a földi al-rendszereiknek sugározni kell az efemerisz-hiba helyzet határ paramétereket, a 2.Típusú közlemény kiegészítő 1. adatblokkját felhasználva.

3.6.7.2.3.7 **Ajánlás.** – *Az összes földi al-rendszernek sugároznia kell az efemerisz-hiba helyzet határ paramétereket, a 2.Típusú közlemény kiegészítő 1. adatblokkját felhasználva.*

3.6.7.2.3.8 Azoknak a földi al-rendszereknek, amelyek sugározzák a kiegészítő 1. adatblokkot a 2. Típusú közleményben, a következő követelményeket kell alkalmazni:

3.6.7.2.3.8.1 *Maximális felhasználási távolság*. A földi al-rendszernek, egy, a GBAS referencia ponttól mért távolságot (D_{max}) kell adni, ami meghatározza azt a „kiterjedést", amelyen belül a földi al-rendszer sértetlenségi veszélye – a 3.6.7.1.2.1 pont szerint – és a védelmi szint sértetlenségi veszély – a 3.6.7.1.2.2 pont szerint – kielégítésre kerülnek.

3.6.7.2.3.8.2 *Efemerisz hibás észlelési paraméterek*. A földi al-rendszernek sugároznia kell az efemerisz hibás észlelési paramétereket az egyes műhold helyzetsor rendszerekre úgy, hogy a 3.6.7.1.2.1 pontnak megfelelő földi al-rendszer sértetlenségi veszély kielégítésre kerüljön.

3.6.7.2.3.8.3 *GBAS helymeghatározási szolgáltatás jelzés*. Amikor a földi al-rendszer nem elégíti ki a 3.6.7.1.2.1.2 pontban és a 3.6.7.1.2.2.2 pontban meghatározott követelményeket, akkor a földi al-rendszernek a referencia pálya adat kiválasztó /RSDS/ paraméter felhasználásával jeleznie kell azt, hogy a GBAS helymeghatározási szolgáltatás nincs biztosítva.

3.6.7.2.3.9 Ha a GRAS szolgáltatási területen belül a VHF adat sugárzást egynél több frekvenciával adják, akkor a GRAS földi al-rendszeren belüli minden egyes GBAS sugárzó állomás ki kell, hogy adja a kiegészítő 1. és 2. adatblokkot.

3.6.7.2.3.9.1 **Ajánlás**. – *A VHF adat sugárzásnak tartalmaznia kell a kiegészítő 2. adatblokk paramétereit a GRAS földi al-rendszeren belüli GBAS sugárzó állomásokhoz közeli és a szomszédos helyek csatorna számainak és helyeinek azonosítására.*

Megjegyzés. – Ez lehetővé teszi a GRAS földi al-rendszeren belül az egyik GBAS sugárzó állomástól a másik GBAS sugárzó állomáshoz az átmenetet.

3.6.7.2.4 *Végső megközelítési szakasz adatok*

3.6.7.2.4.1 *A Végső megközelítési szakasz /FAS/ adat pontok pontossága*. A FAS adat pontok és a GBAS referencia pont közötti relatív felmérési hiba függőlegesen 0,25 méternél kevesebb és vízszintesen 0,40 méternél kevesebb kell, hogy legyen.

3.6.7.2.4.2 *A Műhold Bázisú Kiegészítő Rendszer /SBAS/ FAS adat pontok pontossága*. Az SBAS-el való felhasználásnál a felmérési hiba az összes FAS adat pontra a WGS-84-hez viszonyítva függőlegesen 0,25 méternél, vízszintesen 1 méternél kevesebb kell, hogy legyen.

3.6.7.2.4.3 **Ajánlás**. – A Végső megközelítési szakasz CRC-t az eljárás-tervezés idején kell meghatározni, és ettől az időponttól a későbbiekben a FAS adat blokk egy nélkülözhetetlen részeként meg kell tartani.

3.6.7.2.4.4 **Ajánlás.** – A GBAS-nek meg kell adni azt a lehetőséget, hogy a Végső megközelítési szakasz/Függőleges riasztási határértéket /FASVAL/ és a Végső megközelítési szakasz/Oldalirányú riasztási határértéket /FASLAL/ minden egyes FAS adat-blokkban „1111 1111”-re állítsa azért, hogy jelezze azt, hogy a megközelítést csak oldalirányúvá korlátozza, vagy azért, hogy jelezze azt, hogy a megközelítést nem szabad felhasználni, külön-külön.

3.6.7.2.5 *A távolság-meghatározási jelforrás előre jelzett rendelkezésre állási adata*

Megjegyzés. – A távolság-meghatározási jelforrás rendelkezésre állási adat az I. kategóriára és az APV-re opcionális (választható), és lehet, hogy a jövőben szükséges lesz a lehetséges üzemeltetésekhez.

3.6.7.2.6 *A Globális Navigációs Műhold Rendszer /GNSS/ távolság-meghatározási forrásai sértetlenségének ellenőrzése*. A földi al-rendszernek ellenőrizni kell a műhold jeleket azért, hogy minden olyan helyzetet megállapítson, amely a differenciális jel-feldolgozás helytelen működését fogja eredményezni, a „D”- Melléklet 8.11 pontjában meghatározott követési feltételeknek eleget tevő légijármű fedélzeti vevőkben. A földi al-rendszernek a legerősebb korrelációs csúcsot kell felhasználni az összes, a pszeudo-távolság helyesbítések létrehozására használt vevőben. Az ellenőrző berendezés „idő – a – riasztásig” időtartamának meg kell felelni a 3.6.7.1.2 pontban megadottaknak. Az ellenőrző tevékenységnek a σ_{pr_gnd}–t az „1111 1111” bit-sorozatra kell állítani a műholdra, vagy ki kell zárni a műholdat az 1. Típusú, vagy a 101. Típusú közleményből. A földi al-rendszernek meg kell még határozni azokat a helyzeteket is, amelyek egynél több null-keresztezést eredményeznek az olyan légijármű fedélzeti vevők részére, amelyek a Korai-Késői felismerés funkciót használják, úgy, ahogy az a „D”- Melléklet 8.11 pontjában leírásra került.

3.6.7.3 *Ellenőrzés*

3.6.7.3.1 *Rádiófrekvenciás ellenőrzés*

3.6.7.3.1.1 *A VHF adat-sugárzás ellenőrzése*. Az adat-sugárzás továbbítását ellenőrizni kell. Az adattovábítást 0,5 másodpercen belül be kell szűntetni, ha bármely 3-másodperces időtartamon belül folyamatos ellentét fordul elő a továbbított felhasználói adatok és az ellenőrző rendszerben az ezt a továbbítást megelőzően származtatott és tárolt felhasználói adatok között.

3.6.7.3.1.2 *Az időosztásos többszörös elérés /TDMA/ időrés ellenőrzése*. Annak a veszélye, hogy a földi al-rendszer egy jelet egy hozzárendelés nélküli időrésben sugározzon, és hogy egy időrésen kívüli továbbítást észleljen, - olyant, ami meghaladja azt, amit a 3.6.2.6 pont megenged 1 másodpercen belül - bármely 30-másodperces időtartamban kevesebb kell, hogy legyen 1 x 10^{-7} –nél. Ha a földi al-rendszer időrésen kívüli továbbítást észlel, akkor 0,5 másodpercen belül be kell fejeznie minden adatsugárzási továbbítást.

3.6.7.3.1.3 *VHF adatsugárzás /VDB/ adó teljesítmény ellenőrzés*. Annak a valószínűsége, hogy a vízszintesen vagy elliptikusan polarizált jelek továbbítási teljesítménye bármely 30-másodperces időtartamban a névleges teljesítménytől 3 dB-nél többel 1 másodpercnél hosszabb időre megnövekszik, 2,0 x 10^{-7} -nél kevesebb kell, hogy legyen.

Megjegyzés. – A függőleges összetevő csak a GBAS/E berendezésnél kerül ellenőrzésre.

3.6.7.3.2 *Adat ellenőrzés*

3.6.7.3.2.1 *Sugárzási minőség ellenőrzés*. A földi al-rendszer ellenőrző berendezésének ki kell elégíteni a 3.6.7.1.2.1 pontban megadott idő – a – riasztásig követelményeket. Az ellenőrző berendezés tevékenységének a következők valamelyikének kell lenni:

a) Sugározni az 1. Típusú, vagy a 101. Típusú közleményeket mérési blokkok nélkül; vagy

b) Sugározni az 1. Típusú, vagy a 101. Típusú közleményeket a σ_{pr_gnd} mező beállítással annak jelzésére, hogy a távolság-meghatározási forrás érvénytelen minden távolság-meghatározási forrásra, ami az előzőleg továbbított keretben benne volt; vagy

c) Befejezni az adott sugárzást.

Megjegyzés. – Az a) és a b) ellenőrző tevékenység van előnyben részesítve a c)-vel szemben, ha az adott hiba mód lehetővé tesz egy ilyen választ, azért, mert az a) és a b) tevékenységnek csökkentett térbeli-jel idő – a – riasztásig értéke van.

3.6.7.4 *Földi bázisú távolság-meghatározási források*

Megjegyzés. – A földi bázisú távolság-meghatározási rendszerek várhatóan a 1 559 – 1 610 MHz-es sáv egy részét fogják használni - amelyet az ITU fog kiosztani az RNSS-ARNS szolgáltatás biztosítására – várhatóan ±10 MHz-et megkövetelve a középfrekvencia körül. Mint a GPS és/vagy a GLONASS kiegészítői, ezek is a GNSS részeit fogják képezni, és társított repülési-elektronikai vevőjük lesz. Az interferencia védelmi szintjüknek meg kell egyezni a GNSS vevők interferencia környezetével.

3.6.8 LÉGIJÁRMŰ FEDÉLZETI ALKOTÓELEMEK

3.6.8.1 *Globális Navigációs Műhold Rendszer /GNSS/ vevő.* A Földi Bázisú Kiegészítő Rendszerhez /GBAS/ alkalmas GNSS vevőnek fel kell dolgoznia a GBAS jeleit az ebben a részben meghatározott követelményeknek, valamint a 3.1.3.1 és/vagy a 3.2.3.1 és/vagy a 3.5.8.1 pontok követelményeinek megfelelően.

Megjegyzés. – A GBAS-képességű GNSS vevő megvalósítható a 101. Típusú közlemény, a 2. Típusú közlemény kiegészítő 2. adatblokk, vagy egy 0-s megközelítési teljesítmény kijelölő értékhez kapcsolódó adatfeldolgozás képessége nélkül.

3.6.8.2 *Teljesítmény követelmények*

3.6.8.2.1 *A GBAS légijármű fedélzeti vevő pontossága*

3.6.8.2.1.1 A GPS és a GLONASS hibában a légijármű fedélzeti vevő teljes hozzájárulásának négyzetes középértéke /RMS/ a következő kell, hogy legyen:

$$RMS_{pr\_air}(\theta_n) \le a_0 + a_1 \times e^{-(\theta n/\theta 0)}$$

ahol:

n	= az n-dik távolság-meghatározási forrás;
θ_n	= az n-dik távolság-meghatározási forrás magassági szöge;
a_0, a_1, és θ_0	= ahogy az a B-77. táblázatban a GPS-re és a B-78. táblázatban a GLONASS-ra meghatározásra került.

3.6.8.2.1.2 Az SBAS műholdak hibájában a légijármű fedélzeti vevő teljes hozzájárulásának négyzetes középértékének a 3.5.8.2.1 pontban meghatározottnak kell lenni az egyes meghatározott légijármű pontossági jelöléseknek megfelelően.

Megjegyzés. – A légijármű fedélzeti vevő hozzájárulása nem foglalja magába a repülőgép sárkány többutas terjedése által előidézett mérési hibát.

3.6.8.2.2 *VHF adat-sugárzási vevő teljesítmény*

3.6.8.2.2.1 *VHF adat-sugárzás hangolási tartomány.* A VHF adat-sugárzás vevőjének képesnek kell lenni a 108,000 – 117,975 MHz-es tartományban lévő frekvenciák 25 kHz-es osztással való behangolására.

3.6.8.2.2.2 *VHF adat-sugárzás befogási tartomány.* A VHF adat-sugárzás vevőjének képesnek kell lenni a névleges kijelölt frekvenciától ±418 Hz-el eltérő jelek befogására és befogva tartására.

Megjegyzés. – A GBAS földi al-rendszer frekvencia-stabilitása és a légijármű mozgása miatti legrosszabb helyzetű Doppler-frekvencia változás került a fenti követelményben tükrözésre. Az automatikus frekvencia szabályozás (AFC) dinamika tartományánál is figyelembe kell venni a légijármű fedélzeti VHF adat-sugárzási vevő frekvencia-stabilitási hibahalmazát.

3.6.8.2.2.3 *VHF adat-sugárzási érzékenység tartomány és közlemény meghibásodási arány.* A VHF adat-sugárzási vevőnek el kell érnie azt, hogy a közlemény meghibásodási aránya kevesebb vagy egyenlő legyen, mint egy hibás közlemény 1000 teljes-hosszúságú (222 byte-os) felhasználói adat közleményből, miközben a –87 dBm-től a –1 dBm-ig terjedő tartományban működik, feltéve, hogy az átlagos vett jel teljesítmény változékonysága egy adott időrésben az egymást követő szinkron vezér jelek között nem haladja meg a 40 dB-t. A hibás közlemények magukba foglalják azokat a közleményeket, amelyeket a VHF adat-sugárzási vevő rendszer elveszített, vagy amely nem megy át a Ciklikus Redundancia Ellenőrzésen (CRC) a Vevő oldali hibajavítás /FEC/ alkalmazása után.

B-77. táblázat: Légijármű fedélzeti GPS vevőpontossági követelmény

Légijármű pontossági jelölés	θ_n (fok)	a_0 (méter)	a_1 (méter)	θ_0 (fok)
A	≥5	0,15	0,43	6,9
B	≥5	0,11	0,13	4

B-78. táblázat: Légijármű fedélzeti GLONASS vevőpontossági követelmény

Légijármű pontossági jelölés	θ_n (fok)	a_0 (méter)	a_1 (méter)	θ_0 (fok)
A	≥5	0,39	0,9	5,7
B	≥5	0,105	0,25	5,5

Megjegyzés. – A légijármű fedélzeti VHF adat-sugárzási vevő antenna vízszintesen, vagy függőlegesen polarizált lehet. A sugárzott jelek vízszintesen és függőlegesen polarizált összetevőinek jel erősség különbsége miatt a teljes légijármű fedélzeti beépítési veszteség 15 dB-re van korlátozva a vízszintesen polarizált vevő antennákra és 11 dB-re a függőlegesen polarizált vevő antennákra.

3.6.8.2.2.4 *A VHF adat-sugárzás időrés dekódolása*. A VHF adat-sugárzási vevő meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek a kiválasztott GBAS al-rendszertől jövő összes 1., 2. és 4. Típusú közleményeknél, amelyeknek az Állomás időrés azonosítója /SSID/ megegyezik a kiválasztott GBAS al-rendszeréével. Ezeket a követelményeket ki kell elégíteni más GBAS továbbítások jelenléte esetében mindenképpen és az összes olyan időrésnél, amely a 3.6.8.2.2.5.1 b) pontban jelzett szinteket képviseli.

Megjegyzés. – A más GBAS továbbítások magukba foglalhatják: a) az azonos SSID-vel rendelkező nem 1., 2. és 4. Típusú közleményeket, és b) az eltérő SSID-vel rendelkező közleményeket.

Megjegyzés. – A 101. Típusú közlemények dekódolása. Egy, a 101. Típusú közlemény vételére alkalmas VHF adat-sugárzási vevő meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek a kiválasztott GBAS al-rendszertől jövő összes 101. Típusú közleményeknél. Ezeket a követelményeket ki kell elégíteni más GBAS továbbítások jelenléte esetében mindenképpen és az összes olyan időrésnél, amely a 3.6.8.2.2.5.1 b) pontban jelzett szinteket képviseli.

3.6.8.2.2.5 *Közös csatorna elnyomás*

3.6.8.2.2.5.1 *VHF adat-sugárzás, mint nem-kívánt jelforrás*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy olyan nem-kívánt közös csatornájú VHF adat-sugárzási jel esetében, amely vagy:

a) Ugyanarra az időrés(ek)re vannak kijelölve és 26 dB-el a megkívánt VHF adat-sugárzási jel teljesítménye alatt, vagy annál lejjebb vannak, vagy

b) Eltérő időrés(ek)re vannak kijelölve, azon teljesítményekre, amelyek 15 dBm-ig terjednek a vevő bemenetén.

3.6.8.2.2.5.2 *VOR, mint nem-kívánt jel*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy olyan nem-kívánt közös csatornájú VOR jel esetében, ami 26 dB-el alatta van a megkívánt VHF adat-sugárzási jel teljesítményének.

3.6.8.2.2.6 *Szomszédos csatorna elnyomás*

3.6.8.2.2.6.1 *Az első szomszédos 25 kHz-es csatornák (±25 kHz)*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy olyan sugárzott nem-kívánt jel jelenlétében, amely 25 kHz-el eltolt helyzetű a megkívánt csatorna mindkét oldalán, és ami vagy:

a) 18 dB-el a megkívánt jel teljesítmény felett van, akkor, amikor a nem-kívánt jel egy másik, az ugyanabban az időrésben kijelölt VHF adat-sugárzási jel, vagy

b) A teljesítményében egyenlő és a nem-kívánt jel egy VOR jel.

3.6.8.2.2.6.2 *A második szomszédos 25 kHz-es csatornák (±50 kHz)*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy olyan sugárzott nem-kívánt jel jelenlétében, amely 50 kHz-el eltolt helyzetű a megkívánt csatorna mindkét oldalán, és ami vagy:

a) 43 dB-el a megkívánt jel teljesítmény felett van, akkor, amikor a nem-kívánt jel egy másik, az ugyanabban az időrés(ek)ben kijelölt VHF adat-sugárzási forrás jele, vagy

b) 34 dB-el a megkívánt jel teljesítmény felett van és a nem-kívánt jel egy VOR jel.

3.6.8.2.2.6.3 *Harmadik és azon túli szomszédos 25 kHz-es csatornák (±75 kHz, vagy több)*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy olyan sugárzott nem-kívánt jel jelenlétében, amely 75 kHz-el, vagy többel eltolt helyzetű a megkívánt csatorna mindkét oldalán, és ami vagy:

a) 46 dB-el a megkívánt jel teljesítmény felett van, akkor, amikor a nem-kívánt jel egy másik, az ugyanabban az időrés(ek)ben kijelölt VHF adat-sugárzási forrás jele, vagy

b) 46 dB-el a megkívánt jel teljesítmény felett van és a nem-kívánt jel egy VOR jel.

3.6.8.2.2.7 *Csatornán kívüli jelek elnyomása a 108,000 – 117,975 MHz-es sávon belüli forrásokból.* Amikor nincs csatornán belüli VHF adat-sugárzási jel, akkor a VHF adat-sugárzási vevő nem adhat kimenő jelet semmilyen más kijelölhető csatorna nem-kívánt VHF adat-sugárzási csatorna jeléből.

3.6.8.2.2.8 *A 108,000 – 117,975 MHz-es sávon kívüli jel-forrásokból eredő jelek elnyomása*

3.6.8.2.2.8.1 *VHF adat-sugárzási interferencia érzéketlenség*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek egy, vagy több olyan jel jelenlétében, amely(ek)nek a frekvenciája és a teljes interferencia szintjei a B-79. táblázatban kerültek meghatározásra.

3.6.8.2.2.8.2 *Érzéketlenítés*. A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek az olyan VHF FM sugárzási jelek jelenlétében, amelyeknek a jel szintjét a B-80. és B-81. táblázatok mutatják be.

3.6.8.2.2.8.3 *VHF adat-sugárzás FM kereszt-modulációs védettség.* A VHF adat-sugárzás vevője meg kell, hogy feleljen a 3.6.8.2.2.3 pontban meghatározott követelményeknek két VHF FM sugárzás jeleinek a két jeltől eredő harmadrendű kereszt-modulációs termék interferenciájának jelenlétében, ha azok szintjei a következőknek felelnek meg:

$$2N_1 + N_2 + 72 \leq 0$$

a VHF FM műsorszóró jelekre a 107,7 – 108,0 MHz-es tartományban, és

$$2N_1 + N_2 + 3\left(24 - 20\log\frac{\Delta f}{0.4}\right) \leq 0$$

a VHF FM műsorszóró jelekre a 107,7 MHz alatt.

ahol a két VHF FM műsorszóró jelek frekvenciája a vevőn belül létrehoz egy két jel-harmadrendű kereszt-modulációs terméket a kívánt VHF adat-sugárzási /VDB/ frekvencián.

Az N_1 és az N_2 a két VHF FM jel szintje (dBm) a VHF adat-sugárzási /VDB/ vevő bemenetén. Egyik szint sem haladhatja meg a 3.6.8.2.2.8.2 pontban lefektetett érzékenység-csökkentő követelményeket.

$\Delta f = 108{,}1 - f_1$, ahol az f_1 annak a VHF FM műsorszóró jelnek az N_1 frekvenciája, amely a 108,1 MHz-hez közelebb van.

Megjegyzés. – Az FM kereszt-modulációs összetettségi követelményeket nem alkalmazzák a 108,1 MHz alatti frekvencián működő VHF adat-sugárzási csatornákra, mivel ezek 108,1 MHz alatti frekvenciák nem az általános kijelölésekre tervezett frekvenciák. Kiegészítő információ került biztosításra a "D"-Melléklet 7.2.1.2 pontjában.

3.6.8.3 *Légijármű fedélzeti működési követelmények*

3.6.8.3.1 *Az adatfelhasználás feltételei*

3.6.8.3.1.1 A vevőnek egy GBAS közleményből az adatokat csak akkor kell felhasználni, ha a közleménynek a Ciklikus Redundancia Ellenőrzése /CRC/ ellenőrzésre került.

3.6.8.3.1.2 A vevőnek csak akkor kell a közlemény adatait felhasználni, ha a közlemény blokk azonosító a „1010 1010" bit mintázatra van állítva.

3.6.8.3.1.3 A vevőnek csak a módosított Z-számítással megegyező távolság-meghatározási jelforrás blokkokat kell felhasználni.

B-79. táblázat: A nem-kívánt jelek maximális szintjei

Frekvencia	A nem-kívánt jel maximális szintje a vevő bemenetén (dBm)
50 kHz-től 88 MHz-ig	–13
88 MHz – 107,900 MHz	(lásd a 3.6.8.2.2.8.2 pontot)
108,000 MHz – 117,975 MHz	kizárva
118,000 MHz	–44
118,025 MHz	–41
118,050 MHz-től 1 660,5 MHz-ig	–13

MEGJEGYZÉSEK. –

1. A fenti frekvenciák által kijelölt egyes szomszédos pontok között az összefüggés lineáris.

2. Ezek az interferencia érzéketlenségi követelmények lehet, hogy nem elegendőek a VHF adat-sugárzási vevők és a VHF összeköttetési rend-szerek összeegyeztethetőség biztosításához, különösen az olyan légi-járműveknél, amelyek a VHF adat-sugárzáshoz függőlegesen polarizált összetevőket használnak. A COM és a NAV frekvencia kiosztás közötti koordináció nélkül, vagy a 112 – 117,975 MHz-es sáv felső végénél egy elválasztó frekvenciasávra vonatkozóan a maximális szintek, amelyek a legalacsonyabb COM VHF csatornaként vannak kijelölve (118,000; 118,00833; 118,01666; 118,025; 118,03333; 118,04166; 118,05) lehet, hogy túllépik a szintet a VHF adat-sugárzási (VDB) vevők bemenetén. Ebben az esetben valamilyen eszköz felszerelésére lesz szükség a COM jeleknek a VDB vevők bemenetén történő csillapítására (például antenna elkülönítés). A végső össze-egyeztethetőség akkor kerülhet majd biztosításra, amikor ez az eszköz a légijárműre felszerelésre került.

B-80. táblázat: A 108,025-től a 111,975 MHz-ig terjedő VHF adat-sugárzási frekvenciákra alkalmazandó érzékenység-csökkentő frekvenciák és teljesítmény követelmények

Frekvencia	A nem-kívánt jel maximális szintje a vevő bemenetén (dBm)
88 MHz ≤ f ≤ 102 MHz	15
104 MHz	10
106 MHz	5
107,9 MHz	– 10

MEGJEGYZÉSEK. –

1. A fenti frekvenciák által kijelölt egyes szomszédos pontok között az összefüggés lineáris.

2. Ez az érzékenység-csökkentő követelmény nem alkalmazandó a 107,7 MHz feletti FM vivőhullámokra és a 108,025 vagy 108,050 MHz-es VHF adat-sugárzási /VDB/ csatornákra. Lásd a "D"- Melléklet 7.2.1.2.2 pontját.

3.6.8.3.1.4 Ha a földi al-rendszer sugározza a D_{max}-ot, akkor a pszeudo-távolság helyesbítéseket csak akkor kell alkalmazni, amikor a GBAS referencia ponttól való távolság a D_{max}-nál kevesebb.

3.6.8.3.1.5 A vevőnek egy adott mérési típusra csak a legutoljára vett helyesbítés sorozatból származó pszeudo-távolság helyesbítéseket kell alkalmazni. Ha a legutoljára vett 1. Típusú, vagy a 101. Típusú közlemény mérési mezőjének száma azt jelzi, hogy nincsenek mérési blokkok, akkor a vevőnek nem kell alkalmazni a GBAS helyesbítéseket arra a mérési típusra.

3.6.8.3.1.6 A vevőnek ki kell zárni a differenciál navigációs megoldásból minden olyan távolság-meghatározási jelforrást, amelynek a σ_{pr_gnd} értéke az „1111 1111" mintázatra van állítva.

B-81. táblázat: A 112,000-tól a 117,975 MHz-ig terjedő VHF adat-sugárzási frekvenciákra alkalmazandó érzékenység-csökkentő frekvenciák és teljesítmény követelmények

Frekvencia	A nem-kívánt jel maximális szintje a vevő bemenetén (dBm)
88 MHz ≤ f ≤ 104 MHz	15
106 MHz	10
107 MHz	5
107,9 MHz	0

MEGJEGYZÉS. – A fenti frekvenciák által kijelölt egyes szomszédos pontok között az összefüggés lineáris.

3.6.8.3.1.7 A vevőnek a differenciál navigációs megoldásban csak akkor kell felhasználnia egy távolság-mérési forrást, ha az 1. Típusú, vagy a 101. Típusú közleményben a módosított Z-számítással jelzett alkalmazhatósági ideje arra a távolság-mérési forrásra 120 másodpercnél nem „öregebb” efemerisz dekorrelációs paramétert tartalmaz.

3.6.8.3.1.8 *Az I. kategóriájú precíziós megközelítést és az APV-t alátámasztó adatok felhasználási feltételei*

3.6.8.3.1.8.1 Az I. kategóriás precíziós megközelítés végső szakaszai, vagy az APV megközelítés során a vevőnek csak azokat a mérési blokkokat kell felhasználni az 1. Típusú, vagy a 101. Típusú közleményekből, amelyeket az utolsó 3,5 másodpercen belül vett.

3.6.8.3.1.8.2 A vevőnek az I. kategóriájú precíziós megközelítés, vagy az APV útirány-vezetésre az egy földi al-rendszertől eredő közlemény adatokat csak akkor kell felhasználni, ha a földi folyamatosság/sértetlenség jelölés (GCID) 1, 2, 3 vagy 4-et jelez a precíziós megközelítés végső szakaszának megkezdését megelőzően.

3.6.8.3.1.8.3 A vevőnek nem szabad figyelembe venni semmilyen változást a GCID-ben a megközelítés végső szakaszai során.

3.6.8.3.1.8.4 A vevőnek nem szabad 4. Típusú közleményben kisugárzott egyedi FAS adat blokkon alapuló függőleges útirány-vezetéses megközelítést biztosítania, ha a megközelítés végső szakaszainak megkezdése előtt vett Végső megközelítési szakasz Függőleges riasztási határérték /FASVAL/ „1111 1111”-re van állítva.

3.6.8.3.1.8.5 A vevőnek nem szabad 4. Típusú közleményben kisugárzott egyedi FAS adat blokkon alapuló alapuló oldalirányú útirány-vezetést biztosítania, ha a megközelítés végső szakaszainak megkezdése előtt vett Végső megközelítési szakasz Oldalirányú riasztási határérték /FASLAL/ „1111 1111”-re van állítva.

3.6.8.3.1.8.6 A megközelítés végső szakaszai során a 4. Típusú közleményben kiadott FASLAL és a FASVAL adatok értékeiben történt változásokat a vevőnek figyelmen kívül kell hagyni.

3.6.8.3.1.8.7 A vevőnek a FAS adatokat csak akkor kell felhasználni, ha ezekre az adatokra a FAS CRC ellenőrzésre került.

3.6.8.3.1.8.8 A vevőnek csak azokat a közleményeket kell felhasználni, amelyekre a GBAS azonosító /ID/ (a közlemény blokk fejrészében) megegyezik annak a 4. Típusú közleménynek a fejrészében lévő GBAS ID-vel, amely a kiválasztott FAS adatokat, vagy azt a 2. Típusú közleményt tartalmazza, mely a kiválasztott RSDS-t foglalja magában.

3.6.8.3.1.8.9 *Végső Megközelítési Szakasz (FAS) adat használata*

3.6.8.3.1.8.9.1 A vevőnek a 4. Típusú közleményeket a FAS meghatározására kell, hogy használja a precíziós megközelítésnél.

3.6.8.3.1.8.9.2 A vevőnek a 4. Típusú közleményeket a FAS meghatározására kell, hogy használja a 20 001 és a 39 999 csatorna számmal társított Megközelítés Függőleges vezetéssel (APV) esetén.

3.6.8.3.1.8.9.3 A vevőnek a légijármű fedélzeti adatbázisában tárolt FAS-t kell használnia a 40 000 és a 99 999 csatorna számmal társított Megközelítés Függőleges vezetéssel (APV) esetén.

3.6.8.3.1.8.10 Amikor a GBAS földi al-rendszer nem sugározza ki a 4. Típusú közleményt és a kiválasztott FAS adat a légijármű fedélzeti adatbázisából rendelkezésre áll, a vevő csak a tervezett GBAS földi al-rendszertől érkező közleményeket használhatja.

3.6.8.3.1.9 *A GBAS helymeghatározási szolgáltatást alátámasztó adatok felhasználási feltételei*

3.6.8.3.1.9.1 A vevőnek csak akkor kell a mérési blokkokat felhasználni, ha azok az utolsó 7,5 másodpercen belül kerültek vételre.

3.6.8.3.1.9.2 A vevőnek csak akkor kell az 1. Típusú közleményekből a mérési blokkokat felhasználni, ha azok az utolsó 5 másodpercen belül kerültek vételre

3.6.8.3.1.9.3 A vevőnek csak akkor kell felhasználni a közlemény adatokat, ha vett egy kiegészítő 1. adatblokkot is magában foglaló 2. Típusú közleményt, és ebben a blokkban a referencia pálya adat kiválasztó /RSDS/ paraméter azt jelzi, hogy a GBAS helymeghatározási szolgáltatás biztosítva van.

3.6.8.3.1.9.4 A vevőnek csak azokat a közleményeket kell felhasználni, amelyekre a GBAS azonosító /ID/ (a közlemény blokk fejrészében) megegyezik annak a 2. Típusú közleménynek a fejrészében lévő GBAS ID-vel, amely a kiválasztott RSDS-t tartalmazza.

3.6.8.3.2 *Sértetlenség*

3.6.8.3.2.1 *Légijármű fedélzeti hibák korlátozása.* A navigációs megoldásban felhasznált egyes műholdakra a vevőnek ki kell számítani egy $\sigma_{receiver}$ –t úgy, hogy a normál eloszlás nulla átlaggal és egy $\sigma_{receiver}$ –rel egyenlő szabvány eltéréssel határolja a vevő hozzájárulását a helyesbített pszeudo-távolság hibához a következők szerint:

$$\int_{y}^{\infty} f(x)\,dx \le Q\left(\frac{y}{\sigma}\right) \text{ az összes } \frac{y}{\sigma} \ge 0 \text{ -ra és}$$

$$\int_{-\infty}^{-y} f(x)\,dx \le Q\left(\frac{y}{\sigma}\right) \text{ az összes } \frac{y}{\sigma} \ge 0 \text{ -ra}$$

ahol:

f(x) = a megmaradó légijármű pszeudo-távolság hiba valószínűség sűrűségi függvénye, és

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_{x}^{\infty} e^{\frac{t^2}{2}} dt$$

3.6.8.3.2.2 *A GBAS sértetlenségi paraméterek felhasználása.* A légijármű fedélzeti rendszer elemeinek ki kell számítania 3.6.5.5 pontban leírt függőleges, oldalirányú és vízszintes védelmi szinteket a GBAS által sugárzott σ_{pr_gnd}, σ_N, h_0, $\sigma_{vert\_iono\_gradient}$ és 'B' paraméterek, valamint a σ_{pr_air} paraméter felhasználásával. Ha a B_{ij} paraméter az „1000 0000" bit mintázatra van állítva, jelezve azt, hogy a mérés nem áll rendelkezésre, akkor a légijármű fedélzeti rendszerének azt kell feltételeznie, hogy a B_{ij} értéke nulla. Az I. kategóriájú precíziós megközelítésre és az APV-re a légijármű fedélzeti rendszer elemeknek ellenőrizni kell azt, hogy a kiszámított függőleges és oldalirányú védelmi szintek kisebbek, mint a 3.6.5.6 pontban meghatározott megfelelő függőleges és oldalirányú riasztási határértékek.

3.6.8.3.3 *A műhold efemerisz adatok felhasználása*

3.6.8.3.3.1 *Adatkibocsátás /IOD/ ellenőrzés.* A vevőnek csak azokat a műholdakat kell felhasználni, amelyeknek a GBAS általi IOD sugárzása az 1. Típusú, vagy a 101. Típusú közleményben megegyezik a vevő által felhasznált, az idő és efemerisz adatokra vonatkozó állandó pályájú műhold helyzetsor rendszer IOD-jával.

3.6.8.3.3.2 *CRC ellenőrzés.* A vevőnek ki kell számítania az efemerisz CRC-t a helyzet megoldásban használt műhold helyzetsor rendszerek hely-meghatározási jelforrásaira. A kiszámított CRC-t érvényesíteni kell az 1. Típusú, vagy a 101. Típusú közleményben lévő efemerisz CRC sugárzással szemben az új sugárzott CRC értékhez viszonyítva 1 másodpercen belül. A vevőnek azonnal meg kell szűntetnie bármely olyan műhold felhasználását, amelyikre a kiszámított és a sugárzott CRC értékek nem megegyezőek.

Megjegyzés. – A VHF adatsugárzási kezdeti adatgyűjtés során a vevő beépíthet a helyzet megoldásba egy műholdat, mielőtt az arra a műholdra sugárzott efemerisz CRC-t venné.

3.6.8.3.3.3 *Efemerisz-hiba helyzet határok.*

3.6.8.3.3.3.1 *Efemerisz-hiba helyzet határok az I. kategóriájú precíziós megközelítésre és a Megközelítés Függőleges vezetésre (APV).* Ha a földi al-rendszer biztosítja a 2. Típusú közleményekben a kiegészítő 1. adatblokkot, akkor a légijármű fedélzeti rendszer elemeinek kell kiszámolni a 3.6.5.8.1 pontban meghatározott efemerisz-hiba helyzet határokat a helyzet megoldásban használatos egyes műhold helyzetsor rendszerű távolságmérési forrásokra a szükségszerűen sugárzott paraméterek vétele utáni 1 másodpercen belül. A légijármű fedélzeti rendszer elemeinek ki kell zárni a helyzet megoldásból azokat a műholdakat, amelyeknek a kiszámított függőleges, vagy oldalirányú efemerisz-hiba helyzet határai (VEBj, vagy LEBj) a 3.6.5.6 pontban meghatározott megfelelő függőleges és oldalirányú riasztási határértékeknél nagyobbak.

Megjegyzés. – A VHF adatsugárzási kezdeti adatgyűjtés során a vevő beépíthet a helyzet megoldásba egy műholdat, mielőtt az arra a műholdra szükségszerűen sugárzott paramétereket az efemerisz-hiba helyzet határok kiszámításához venné.

3.6.8.3.3.3.2 *Efemerisz-hiba helyzet határok a GBAS hely-meghatározási szolgáltatásra.* A légijármű fedélzeti rendszer elemeinek ki kell számítani és a helyzet megoldásban alkalmazni kell a 3.6.5.8.2 pontban meghatározott vízszintes efemerisz-hiba helyzet határt (HEBj) az egyes felhasznált műhold helyzetsor rendszerű távolságmérési forrásokra.

3.6.8.3.4 *Közlemény elvesztés*.

3.6.8.3.4.1 Az I.Kategóriájú precíziós megközelítésnél a vevőnek egy megfelelő riasztást kell adni akkor, ha az utolsó 3,5 másodpercen belül 1. Típusú, vagy 101. Típusú közleményt nem vett.

3.6.8.4.2 A Megközelítések Függőleges vezetésnél (APV) a vevőnek egy megfelelő riasztást kell adni akkor, ha az utolsó 3,5 másodpercen belül 1. Típusú, vagy 101. Típusú közleményt nem vett.

3.6.8.3.4.3 Az 1. Típusú közleményeket használó GBAS hely-meghatározási szolgáltatásnál a vevőnek egy megfelelő riasztást kell adni akkor, ha az utolsó 7,5 másodpercen belül 1. Típusú közleményt nem vett.

3.6.8.3.4.4. A 101. Típusú közleményeket használó GBAS hely-meghatározási szolgáltatásnál a vevőnek egy megfelelő riasztást kell adni akkor, ha az utolsó 7,5 másodpercen belül 101. Típusú közleményt nem vett.

3.6.8.3.5 Pszeudo-távolság mérések a levegőben. Az egyes műholdaktól eredő pszeudo-távolság méréseket simítani kell a vivőhullám mérések felhasználásával és egy olyan simító-szűrővel, amely az inicializálása után 200 másodpercen belül 0,1 méternél kisebb értékkel tér el a szűrőnek, a 3.6.5.1 pontban meghatározott állandósított állapotú átviteléhez viszonyítva, a kód fázis és az integrált vivőhullám fázis közötti 0,01 méter másodpercenkénti eltolódás jelenlétében.

3.7 Interferenciával szembeni ellenállás

3.7.1 TELJESÍTMÉNY CÉLKITŰZÉSEK

1. Megjegyzés. – A kiegészítő rendszer nélküli GPS és GLONASS vevők interferenciával szembeni ellenállása a következő teljesítmény paraméterekre vonatkoztatva kerültek mérésre:

	GPS	*GLONASS*
Követési hiba (1 szigma)	*0,4 m*	*0,8 m*

2. Megjegyzés. – Ez a követési hiba nem foglalja magában sem az olyan jel-terjedés miatti hozzájáruló tényezőket, mint a többutas terjedést, a troposzférikus és ionoszférikus hatásokat, sem az efemerisz és a GPS és GLONASS műholdak óra hibáit.

3. Megjegyzés. – Az SBAS vevőkre az interferenciával szembeni ellenállás a 3.5.8.2.1 és 3.5.8.4.1 pontokban meghatározott paraméterekre vonatkoztatva került mérésre.

4. Megjegyzés. - A GBAS vevőkre az interferenciával szembeni ellenállás a 3.6.7.1.1 és 3.6.8.2.1 pontokban meghatározott paraméterekre vonatkoztatva került mérésre.

5. Megjegyzés. – Az ebben a részben meghatározott jel szintek egy minimális szabvány antenna nyereséget foglalnak magukba az 5 fokos magassági szög felett –4,5 dBic-t. Az elfogadott maximális légijármű antenna nyereség az alacsonyabb hemiszférán –10 dBic. A nem-szabványos antennákra különféle minimális nyereséggel az 5 fokos magassági szög felett a jel – interferencia szintet szabályozni lehet addig, amíg a relatív interferencia – jel szint fenntartható lesz .

6. Megjegyzés. – Az interferencia környezetekben a kielégítendő teljesítmény követelmények a következőkben vannak a repülés különböző szakaszaira meghatározva.

3.7.2 FOLYTONOS HULLÁM (CW) INTERFERENCIA

3.7.2.1 *GPS és SBAS vevők*

3.7.2.1.1 A precíziós megközelítési szakaszban használt, vagy a légijárműveken a fedélzeten a műholdas összeköttetésre használt GPS és SBAS vevőknek a Folytonos hullámú /CW/ zavaró jelek jelenlétében ki kell elégíteniük azt a teljesítmény célt, hogy az antenna kimenetén az interferencia küszöb egyenlő legyen a B-82. táblázatban meghatározott értékekkel és a B-15. ábrán bemutatottakkal és egy -164,5 dBW megkívánt jelszinttel az antenna kimenetén.

3.7.2.1.2 A nem-precíziós megközelítéseknél használt GPS és SBAS vevőknek a B-82. táblázatban meghatározottaknál 3 dB-el kisebb interferencia küszöbű teljesítmény céloknak kell megfelelni. A közelkörzeti területeken és az útvonal-repülés állandósult helyzetű navigációjú üzemeltetéseknél, valamint az állandósult helyzetű navigációt megelőző helyzetben, és a GPS és SBAS jelek lekérdezésének megkezdésekor, az interferencia küszöbnek 6 dB-el kevesebb-nek kell lenni a B-82. táblázatban meghatározott értékeknél.

3.7.2.2 *GLONASS vevők*

3.7.2.2.1 A precíziós megközelítési szakaszban használt, vagy a légijárműveken a fedélzeten a műholdas összeköttetésre használt GLONASS vevőknek a Folytonos hullámú /CW/ zavaró jelek jelenlétében ki kell elégíteniük azt a teljesítmény célt, hogy az antenna kimenetén az interferencia küszöb egyenlő legyen a B-83. táblázatban meghatározott értékekkel és a B-16. ábrán bemutatottakkal és egy -165,5 dBW megkívánt jelszinttel az antenna kimenetén.

3.7.2.2.2 A nem-precíziós megközelítéseknél használt GLONASS vevőknek a B-83. táblázatban meghatározottaknál 3 dB-el kisebb interferencia küszöbű teljesítmény céloknak kell megfelelni. A közelkörzeti területeken és az útvonal-repülés állandósult helyzetű navigációjú üzemeltetéseknél, valamint az állandósult helyzetű navigációt megelőző helyzetben, és a GLONASS jelek lekérdezésének megkezdésekor, az interferencia küszöbnek 6 dB-el kevesebbnek kell lenni a B-83. táblázatban meghatározott értékeknél.

B-82. táblázat: Folytonos hullámú /CW/ interferencia küszöbök a GPS és SBAS vevőkre

Az interferencia jel f_i frekvencia tartománya	Interferencia küszöbök a repülés precíziós megközelítési szakaszában használt vevőkre
f_i ≤ 1315 MHz	–4,5 dBW
1315 MHz < f_i ≤ 1525 MHz	Lineárisan csökkenő a –4,5 dBW-től a –42 dBW-ig
1525 MHz < f_i ≤ 1565,42 MHz	Lineárisan csökkenő a –42 dBW-től a –150,5 dBW-ig
1565,42 MHz < f_i ≤ 1585,42 MHz	–150,5 dBW
1585,42 MHz < f_i ≤ 1610 MHz	Lineárisan növekvő a –150,5 dBW-től a –60 dBW-ig
1610 MHz < f_i ≤ 1618 MHz	Lineárisan növekvő a –60 dBW-től a –42 dBW-ig*
1618 MHz < f_i ≤ 2000 MHz	Lineárisan növekvő a –42 dBW-től a –8,5 dBW-ig*
1610 MHz < f_i ≤ 1626,5 MHz	Lineárisan növekvő a –60 dBW-től a –22 dBW-ig**
1626,5 MHz < f_i ≤ 2000 MHz	Lineárisan növekvő a –22 dBW-től a –8,5 dBW-ig**
f_i > 2000 MHz	–8,5 dBW

* Olyan légijármű fedélzeti berendezésekre alkalmazandó, ahol nincs fedélzeti műholdas összeköttetés.
** Olyan légijármű fedélzeti berendezésekre alkalmazandó, ahol van fedélzeti műholdas összeköttetés.

B-83. táblázat: Interferencia küszöbök a GLONASS vevőkre

Az interferencia jel f_i frekvencia tartománya	Interferencia küszöbök a repülés precíziós megközelítési szakaszában használt vevőkre
f_i ≤ 1315 MHz	–4,5 dBW
1315 MHz < f_i ≤ 1562,15625 MHz	Lineárisan csökkenő a –4,5 dBW-től a –42 dBW-ig
1562,15625 MHz < f_i ≤ 1583,6525 MHz	Lineárisan csökkenő a –42 dBW-től a –80 dBW-ig
1583,6525 MHz < f_i ≤ 1592,9525 MHz	Lineárisan csökkenő a –80 dBW-től a –149 dBW-ig
1592,9525 MHz < f_i ≤ 1609,36 MHz	–149 dBW
1609,36 MHz < f_i ≤ 1613,65625 MHz	Lineárisan növekvő a –149 dBW-től a –80 dBW-ig
1613,65625 MHz < f_i ≤ 1635,15625 MHz	Lineárisan növekvő a –80 dBW-től a –42 dBW-ig*
1613,65625 MHz < f_i ≤ 1626,15625 MHz	Lineárisan növekvő a –80 dBW-től a –22 dBW-ig**
1635,1525 MHz < f_i ≤ 2000 MHz	Lineárisan növekvő a –42 dBW-től a –8,5 dBW-ig*
1626,15625 MHz < f_i ≤ 2000 MHz	Lineárisan növekvő a –22 dBW-től a –8,5 dBW-ig**
f_i > 2000 MHz	–8,5 dBW

* Olyan légijármű fedélzeti berendezésekre alkalmazandó, ahol nincs fedélzeti műholdas összeköttetés.

** Olyan légijármű fedélzeti berendezésekre alkalmazandó, ahol van fedélzeti műholdas összeköttetés.

3.7.3 SÁV-HATÁROLT ZAJ-TÍPUSÚ INTERFERENCIA

3.7.3.1 *GPS és SBAS vevők*

3.7.3.1.1 Miután az állandósult helyzetű navigációs üzemeltetés létrejött, azoknak a GPS és SBAS vevőknek, amelyek a repülés precíziós megközelítési szakaszaiban használatosak, vagy a légijárműveken fedélzeti műholdas összeköttetéseket használnak, ki kell elégíteniük a teljesítmény célt, ha az 1 575,42 MHz ±Bwi/2 frekvencia tartományban zaj-típusú interferencia jelek vannak, és a teljesítmény szintek az antenna kimenetén megegyeznek a B-84. táblázatban és a B-17. ábrán meghatározott interferencia küszöbökkel és a megkívánt jel szint -164,5 dBW az antenna kimenetén.

Megjegyzés. – A Bw_i az interferencia jel egyenértékű zaj sávszélessége.

3.7.3.1.2 A nem-precíziós megközelítéseknél használt GPS és SBAS vevőknek meg kell felelniük a teljesítmény céljaiknak az interferencia küszöbükkel a B-84. táblázatban meghatározott értékeknél 3 dB-el kisebb sáv- határolt zaj kimeneti jelek esetében. A közelkörzeti területeken és az útvonal-repülés állandósult helyzetű navigációjú üzemeltetéseknél, valamint az állandósult helyzetű navigációt megelőző helyzetben, és a GPS és SBAS jelek lekérdezésének megkezdésekor, az interferencia küszöbnek a sáv-határolt zaj-típusú interferenciára 6 dB-el kevesebbnek kell lenni a B-84. táblázatban meghatározott értékeknél.

3.7.3.2 *GLONASS vevők*

3.7.3.2.1 Miután az állandósult helyzetű navigációs üzemeltetés létrejött, azoknak a GLONASS vevőknek, amelyek a repülés precíziós megközelítési szakaszaiban használatosak, vagy a légijárműveken fedélzeti műholdas összeköttetéseket használnak, ki kell elégíteniük a teljesítmény célt, miközben zaj-típusú interferencia jeleket vesznek az $f_k \pm Bw_i/2$ frekvencia sávban az antenna kimenetén olyan teljesítmény szintekkel, amelyeknél az interferencia küszöbök egyenlőek a B-85. táblázatban meghatározottakkal, és -165,5 dBW megkívánt jelszinttel az antenna kimenetén.

Megjegyzés. - Az f_k a GLONASS csatorna középfrekvenciája f_k = 1602 MHz + k x 0,6525 MHz-nél és a k = -7-től + 13-ig értékű, ahogy az a B-16. táblázatban meghatározásra került és a Bw_i az interferencia jel egyenértékű zaj sávszélessége.

3.7.3.2.2 A nem-precíziós megközelítéseknél használt GLONASS vevőknek a B-84. táblázatban meghatározottaknál 3 dB-el kisebb interferencia küszöbű teljesítmény céloknak kell a sáv-határolt zaj-típusú interferenciára megfelelni. A közelkörzeti területeken és az útvonal-repülés állandósult helyzetű navigációjú üzemeltetéseknél, valamint az állandósult helyzetű navigációt megelőző helyzetben, és a GLONASS jelek lekérdezésének megkezdésekor, az interferencia küszöböknek a sáv-határolt zaj-típusú jelekre 6 dB-el kevesebbnek kell lenni a B-85. táblázatban meghatározott értékeknél.

Megjegyzés. – A repülés megközelítési szakaszára elfogadott az, hogy a vevő követési módban működik és nem fog be új műholdakat.

3.7.3.3. *Pulzáló interferencia*. Miután az állandósult helyzetű navigációjú üzemeltetés létrejött, a vevőnek ki kell elégítenie a teljesítmény célját, miközben a B-86. táblázatban meghatározott karakterisztikájú pulzáló jeleket vesz ott, ahol az interferencia küszöb az antenna bemenetre van meghatározva.

3.7.3.4 Az SBAS és GBAS vevőknek nem szabad kiadni félrevezető információt interferencia jelenlétében, beleértve a 3.7 pontban meghatározott feletti frekvencia szinteket is.

Megjegyzés. – Az erre a követelményre vonatkozó útmutató anyag a "D"- Melléklet 10.6 pontjában került megadásra.

3.8 Globális Navigációs Műhold Rendszer /GNSS/ légijármű fedélzeti műhold vevő antenna

3.8.1 3.8.1 *Antenna fedés*. A GNSS antenna meg kell, hogy feleljen a GNSS műhold jelek vételére vonatkozó teljesítmény követelményeknek, oldalszögben 0-tól 360 fokig és magassági szögben 0-tól 90 fokig a szintbeli repülésben lévő légijármű vízszintes síkjához viszonyítva.

3.8.2 *Antenna nyereség*. A minimális antenna nyereség nem lehet kevesebb annál, mint ami a B-87. táblázatban megadásra került a horizont feletti meghatározott magassági szögre. A maximális antenna nyereség nem haladhatja meg a +7 dBic-t az 5 fok feletti magassági szögekre.

3.8.3 *Polarizáció*. A GNSS antenna polarizációjának jobbra körkörösnek kell lenni (az óramutató járásával megegyező irányú a terjedés irányára vonatkozóan).

3.9 Ciklikus Redundancia Ellenőrzés /CRC/

Az egyes CRC-ket két bináris kifejezés Modulo-2 osztásának R(x) maradékaként kell kiszámítani, a következők szerint:

$$\left\{\frac{[x^k M(x)]}{G(x)}\right\}_{\mathrm{mod}\,2} = Q(x) + \frac{R(x)}{G(x)}$$

ahol:

k	=	Az adott CRC bitjeinek száma;
M(x)	=	Az az információs mező, amely egy meghatározott polinommal képviselt CRC-vel védendő adat elemekből áll;
G(x)	=	Az adott CRC meghatározott generáló polinomja;
Q(x)	=	Az osztás hányadosa; és
R(x)	=	Az osztás maradéka, magába foglalja a CRC-t:

$$R(x) = \sum_{i=1}^{k} r_i x^{k-i} = r_1 x^{k-1} + r_2 x^{k-2} + \ldots + r_k x^0$$

B-84. táblázat: Interferencia küszöbök a precíziós megközelítéseknél használt GPS és SBAS vevők sáv-határolt zajszerű interferenciájára

Interferencia sávszélesség	Interferencia küszöb
0 Hz < Bw_i ≤ 700 Hz	–150,5 dBW
700 Hz < Bw_i ≤ 10 kHz	–150,5 + 6 $\log_{10}$ (BW/700) dBW
10 kHz < Bw_i ≤ 100 kHz	–143,3 + 3 $\log_{10}$ (BW/10000) dBW
100 kHz < Bw_i ≤ 1 MHz	–140,5 dBW
1 MHz < Bw_i ≤ 20 MHz	Lineárisan növekvő a –140,5-től a –127,5 dBW-ig*
20 MHz < Bw_i ≤ 30 MHz	Lineárisan növekvő a –127,5-től a –121,1 dBW-ig*
30 MHz < Bw_i ≤ 40 MHz	Lineárisan növekvő a –121,1-től a –119,5 dBW-ig*
40 MHz < Bw_i	–119,5 dBW*

* Az interferencia küszöb nem haladhatja meg a –140,5 dBW/MHz –t az 1 575,42 ± 10 MHz-es frekvencia tartományban.

B-85. táblázat: Interferencia küszöbök a precíziós megközelítéseknél használt GLONASS vevők sáv-határolt zajszerű interferenciájára

Interferencia sávszélesség	Interferencia küszöb
0 Hz < Bw_i ≤ 1 kHz	–149 dBW
1 kHz < Bw_i ≤ 10 kHz	Lineárisan növekvő a –149-től a –143 dBW-ig
10 kHz < Bw_i ≤ 0,5 MHz	–143 dBW
0,5 MHz < Bw_i ≤ 10 MHz	Lineárisan növekvő a –143-től a –130 dBW-ig
10 MHz < Bw_i	–130 dBW

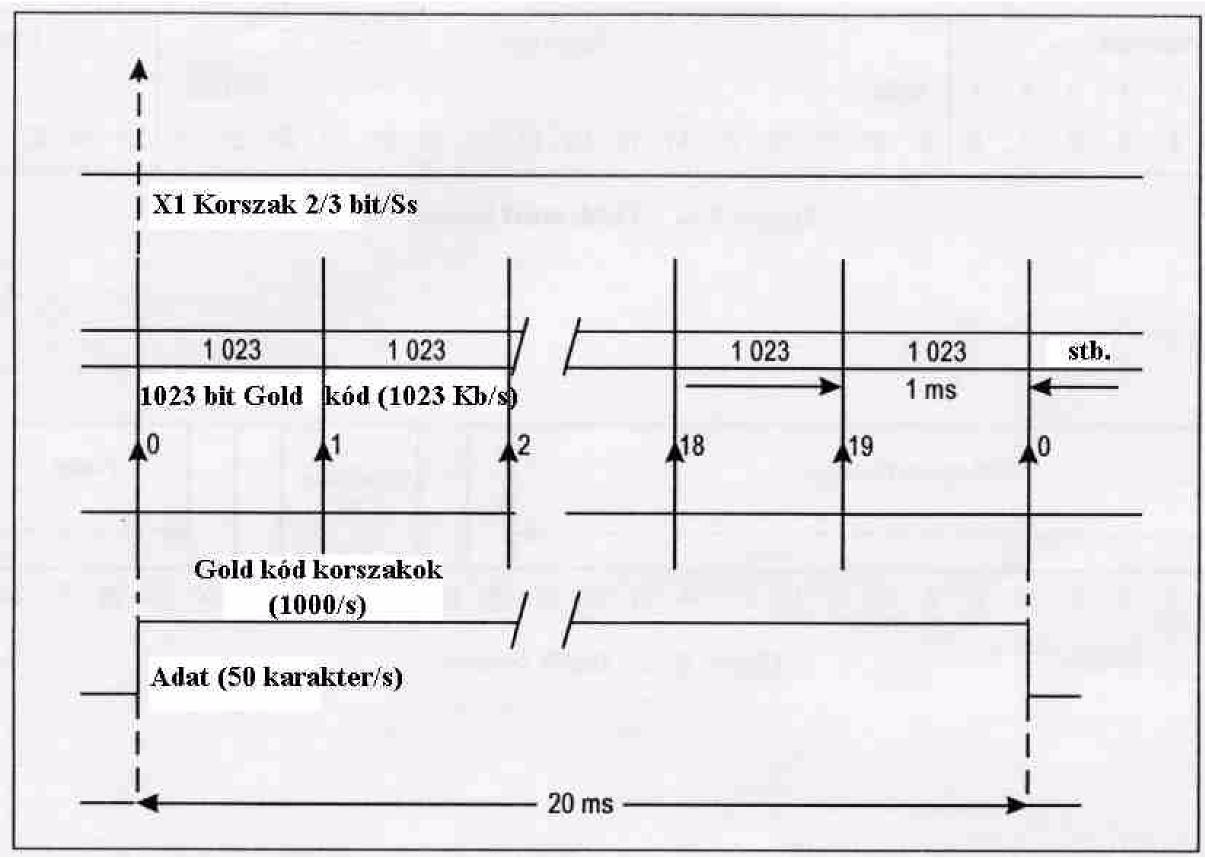
B-86. táblázat: Interferencia küszöbök impulzusos interferenciára

	GPS és SBAS	GLONASS
Frekvencia tartomány	1 575,42 MHz ± 10 MHz	1 592,9525 MHz-től az 1 609,36 MHz-ig
Interferencia küszöb (Impulzus csúcs teljesítmény)	–10 dBW	–10 dBW
Impulzus szélesség	≤ 125 μs, ≤ 1 ms*	≤ 1 ms
Impulzus kitöltési tényező	≤ 10 %	≤ 10 %

B-87. táblázat: Minimális antenna nyereség – GPS/SBAS és GLONASS

Magassági szög, fok	Minimális nyereség, dBic
0	–7,5
5	–4,5
10	–3
15-től 90-ig	–2

A B-Függelék ábrái

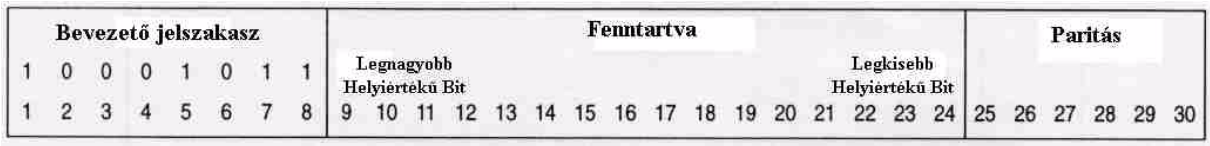


B-1. ábra: Torzított (durva) hozzáférési /C/A/ kód időzítési összefüggések

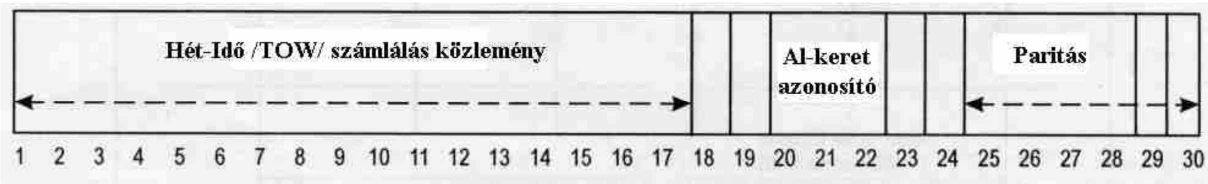
1. Al-keret	Távolság-mérés/TLM/	Átadás/HOW/	GPS hét szám, Navigációs műhold /*SV*/ pontosság és működési állapot
2. Al-keret	TLM	HOW	Efemerisz paraméterek
3. Al-keret	TLM	HOW	Efemerisz paraméterek
4. Al-keret (25 oldal)	TLM	HOW	Naptár adatok és működési állapot a 25 – 32 műholdakra, különleges körülmények, műhold konfiguráció, jelzések, ionoszféra és UTC
5. Al-keret (25 oldal)	TLM	HOW	Naptár adatok és működési állapot az 1 – 24 műholdakra és naptár referencia idő, és GPS hét szám

A fordító megjegyzése:
Az *'SV'* rövidítés a *'Space Vehicles'* rövidítése, azaz űrhajó, kozmikus űrjármű; mivel itt ez a 'navigációs műholdakra' vonatkozik, és a magyar nyelvben az űrhajó és a kozmikus űrjármű már más jelentésben tudatosult, ezért *navigációs műhold*-ként van fordítva.

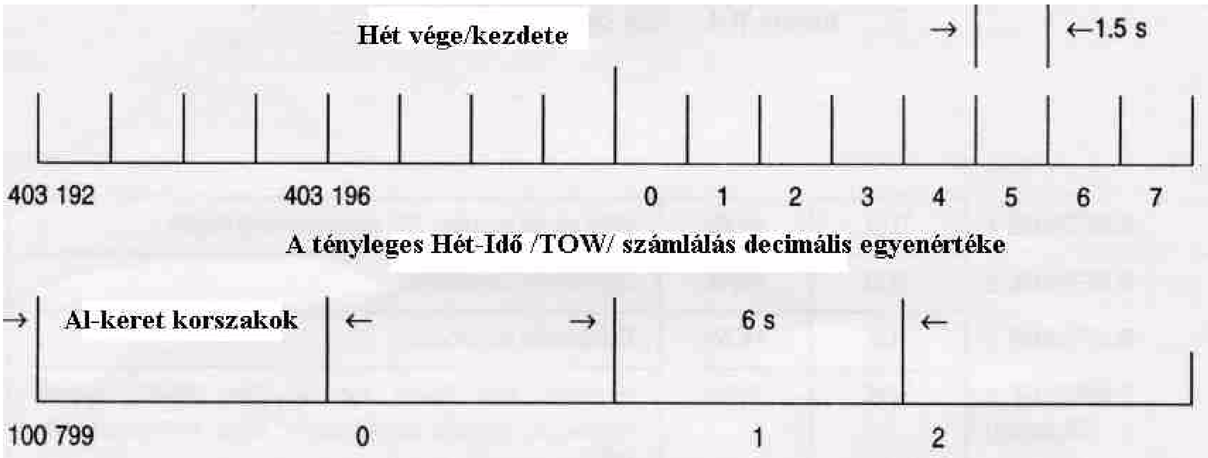
B-2. ábra: Keret szerkezet



B-3. ábra: Távolságmérés /TLM/ szó formátum



B-4. ábra: Átadás /HOW/ formátum



Az Átadás /HOW/ közlemény Hét – Idő /TOW/ számlálás decimális egyenértéke

B-5. ábra: Az Átadás /HOW/ Idő vonal összefüggése

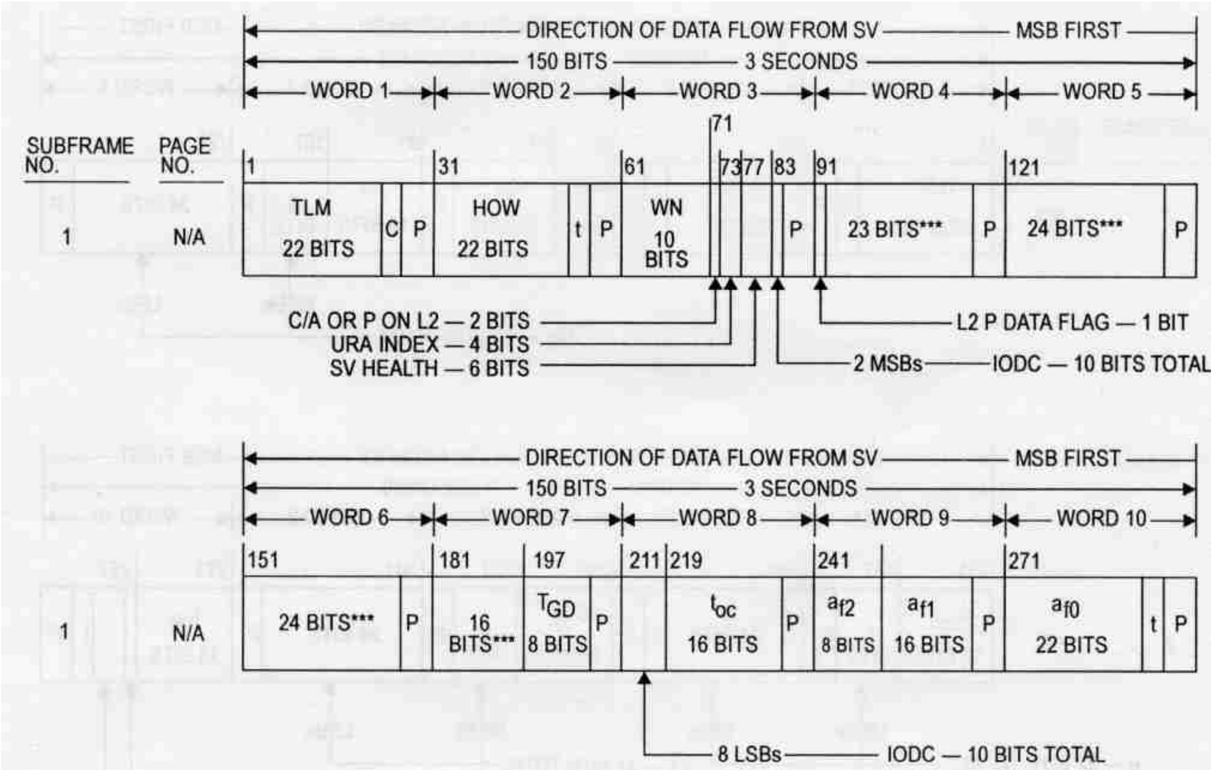
Megjegyzések:

1. A gyors földi befogás elősegítésére, az egyes al-keretek átadása /HOW/ magába foglal egy megcsonkított Hét – Idő /TOW/ számlálást.
2. Az Átadás /HOW/ a második szó az egyes al-keretekben.
3. Az Átadás /HOW/ közlemény Hét – Idő /TOW/ számlálása a tényleges TOW számlálás 17 Legnagyobb Helyértékű Bitjéből áll a következő al-keret kezdeténél.
4. Az Átadás /HOW/ közlemény Hét – Idő /TOW/ számlálásából a tényleges számlálásra való átalakításhoz a következő al-keret elejénél néggyel kell szorozni.
5. Az első al-keret szinkronban kezdődik az egyes korszakok vége/elejével.

A B-6. ábra: Adat formátum 1.-től 11.-ig terjedő ábráin a magyarázó feliratok egy része ismétlődően azonos. Ezek it vannak megadva /Fordító/:

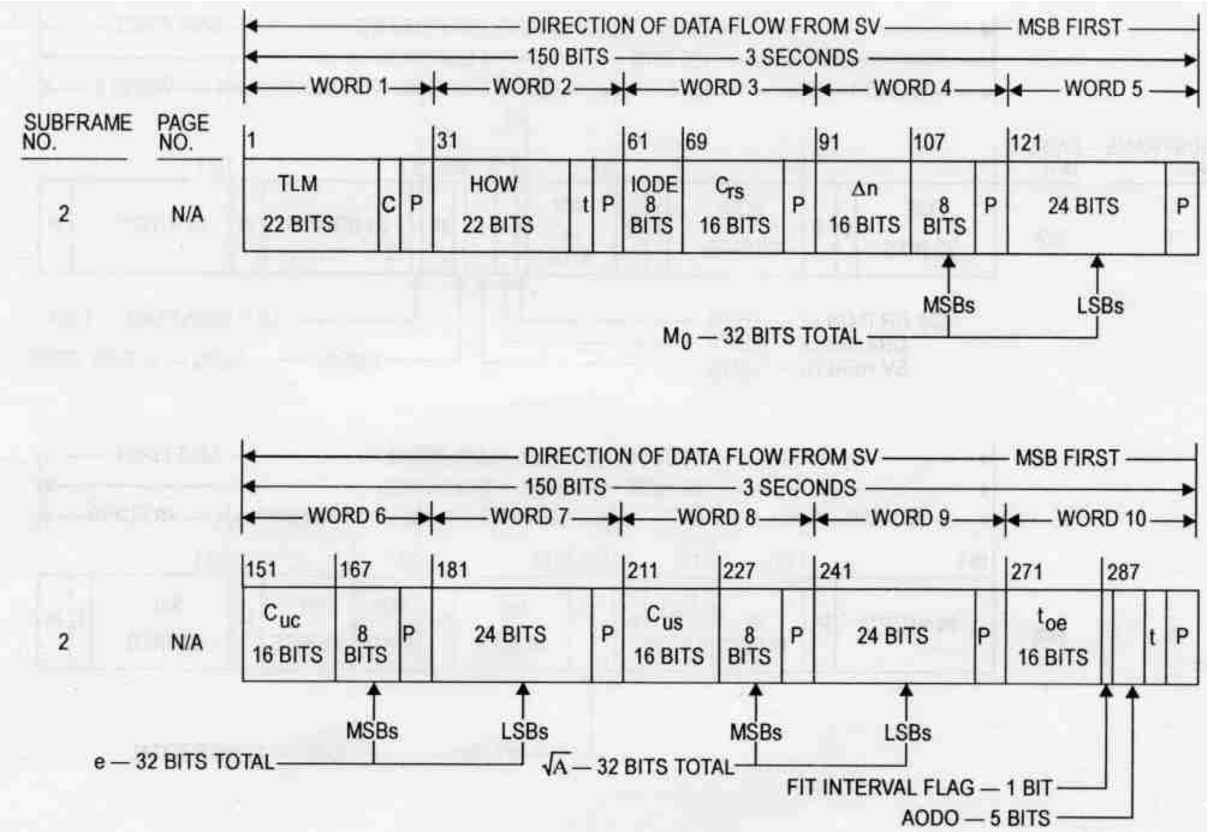
DIRECTION OF DATA FLOW FROM SV = Az adatáramlás iránya a navigációs műholdtól
MSB = Legnagyobb Helyértékű Bit
LSB = Legkisebb Helyértékű Bit
MSB FIRST = MSB először
WORD 1, 2, … 10 = 1., 2., … 10. szó
SUBFRAME NO. = Al-keret szám
PAGE NO. = Oldal szám

BITS TOTAL = Bitek összesen
TLM = Távolság-mérés
HOW = Átadás



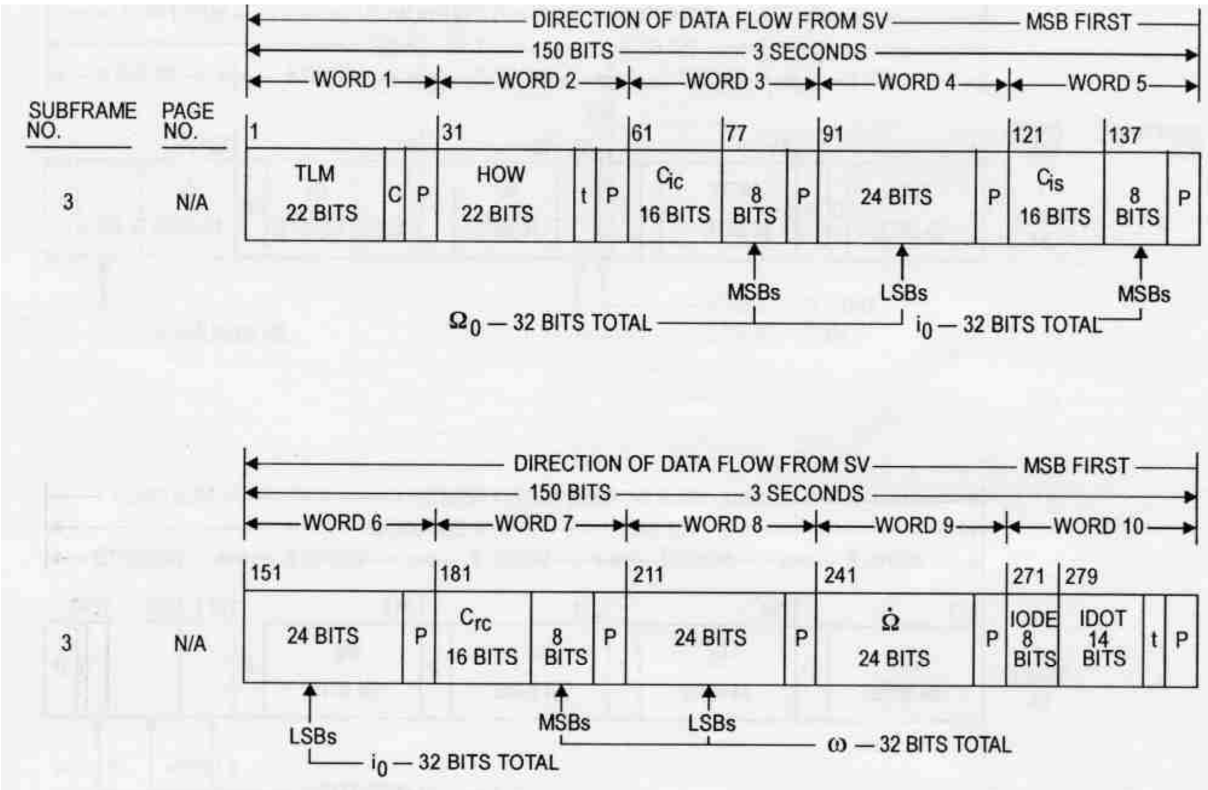
B-6. ábra: Adat formátum (1. a 11-ből)

Ábraszöveg:
C/A OR P ON L2 = Torzított /durva/ /C/A/, vagy precíziós /P/ az L2 sávon
URA INDEX = Felhasználói távolság-mérési pontosság /URA/ mutató
SV HEALTH = Navigációs műhold működési állapot
L2 DATA FLAG = L2 sáv precíziós adat jelzés
IODC = Adat-kibocsátás Óra
T_{GD} = Futás késési idő
t_{oc}, a_{f2}, a_{f1}, a_{f0} = a műhold óra helyesbítési paraméterek
*** Fenntartott
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításához használatos
C = Távolság-mérési /TLM/ bitek, 23. és 24., amelyek fenntartott bitek



B-6. ábra: Adat formátum (2. a 11-ből)

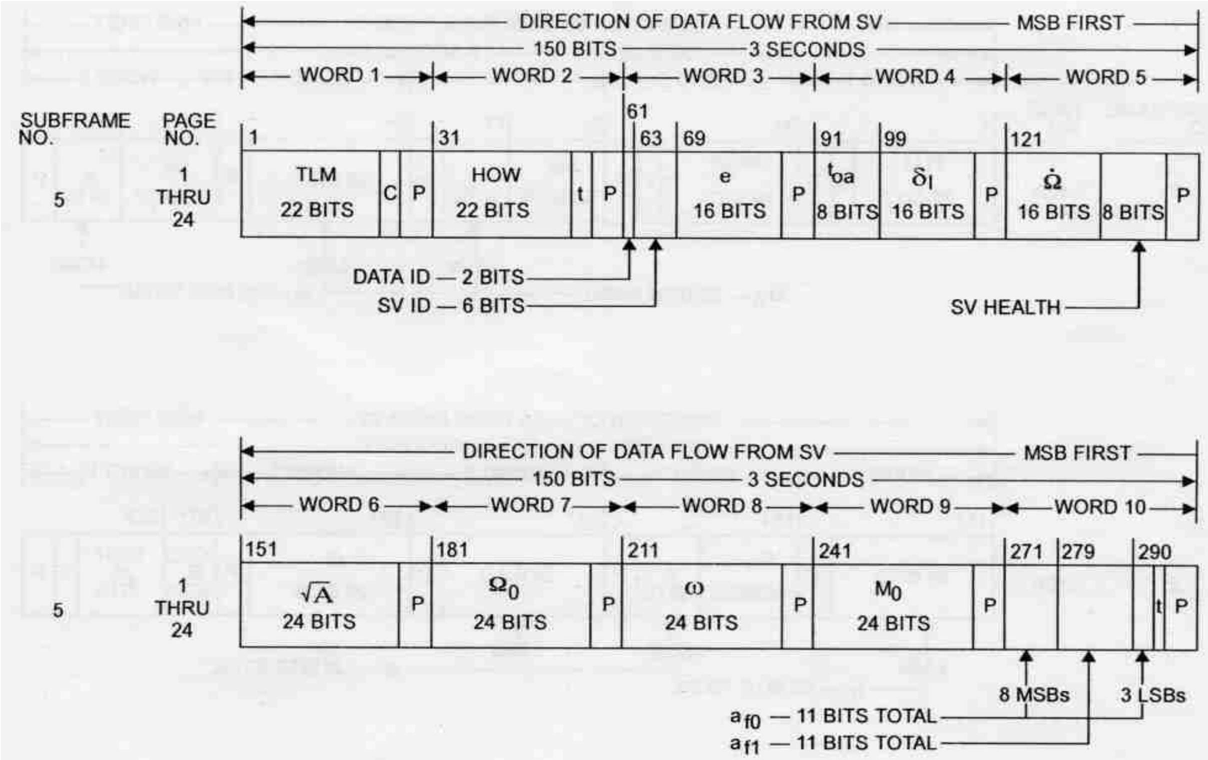
Ábraszöveg:
IODE = Adatkibocsátás efemerisz
FIT INTERVAL FLAG = Időhiba /FIT/ tartomány jelzés
C_{rs}, Δn, C_{uc}, C_{us}, t_{oe} = Efemerisz adatok /B-5. táblázat/
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



B-6. ábra: Adat formátum (3. a 11-ből)

Ábraszöveg:

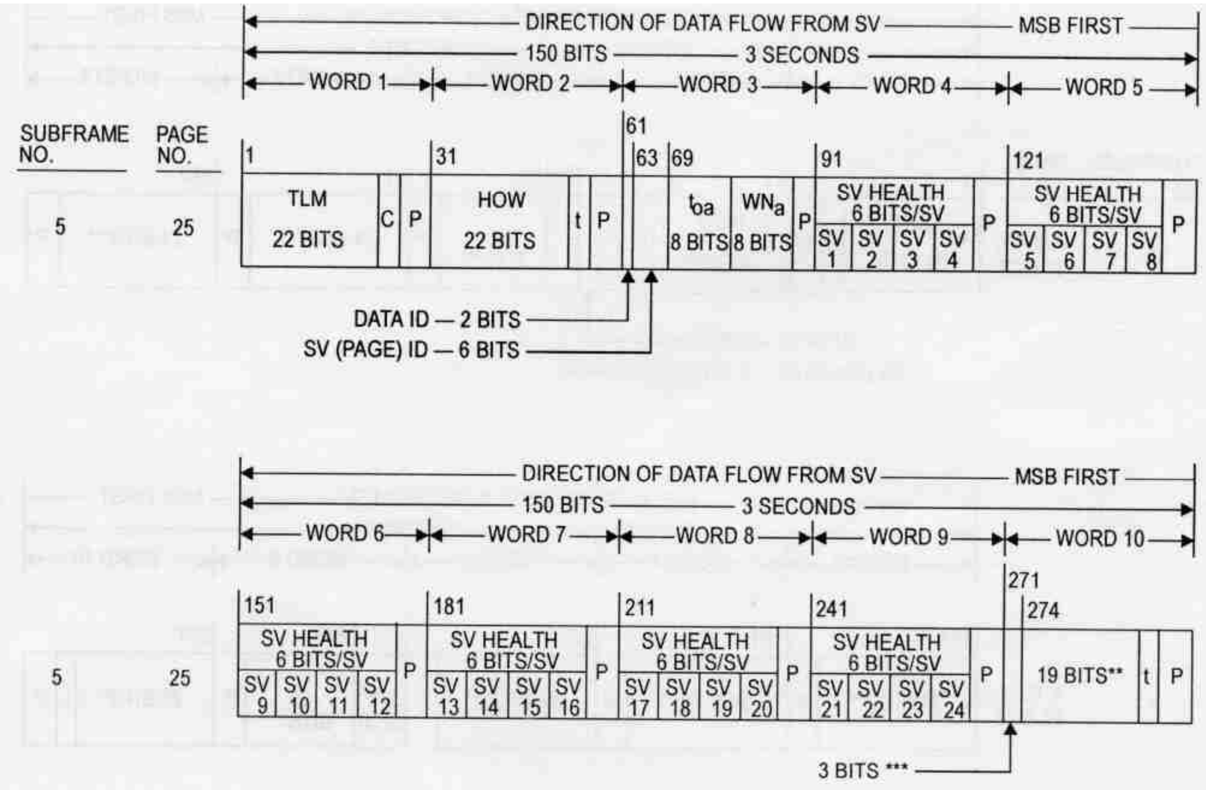
C_{ic}, C_{is}, C_{rc}, $\dot{\Omega}$ = Efemerisz paraméterek /B-6. táblázat/
IODE = Adatkibocsátás Efemerisz
IODT = Adatkibocsátás Idő
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



B-6. ábra: Adat formátum (4. a 11-ből)

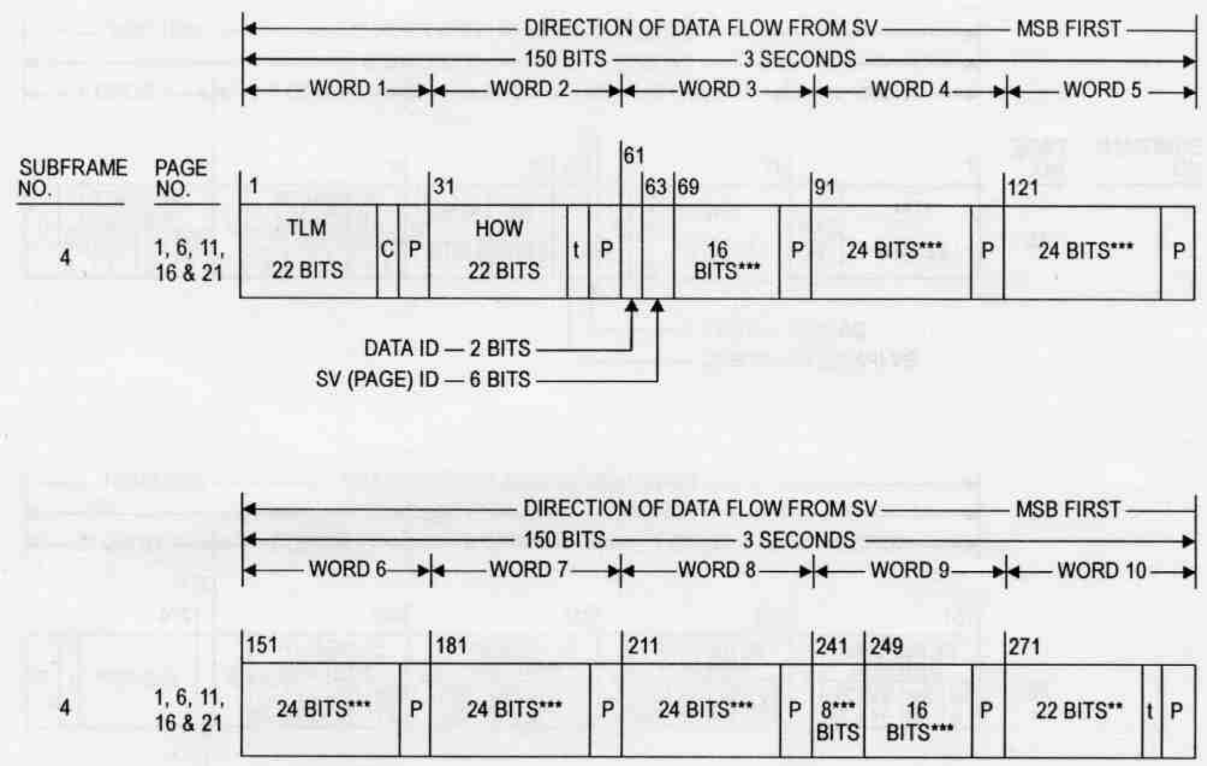
Ábraszöveg:
1 THRU 24 = Az 1.-től a 24.-ig
e, t_{oa}, δ_I, $\dot{\Omega}$, $\sqrt{A}$, Ω_0, ω, M_0 = Naptár paraméterek /B-8. táblázat/
P = 6 paritás bit
t = 2 nem-információ hordozóbit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak

Megjegyzés. – A 4. al-keret 2., 3., 4., 5., 7., 8., 9. és 10. oldalainak azonos a formátumuk az 5. al-keret 5.-től 24.-ig terjedő oldalaival.



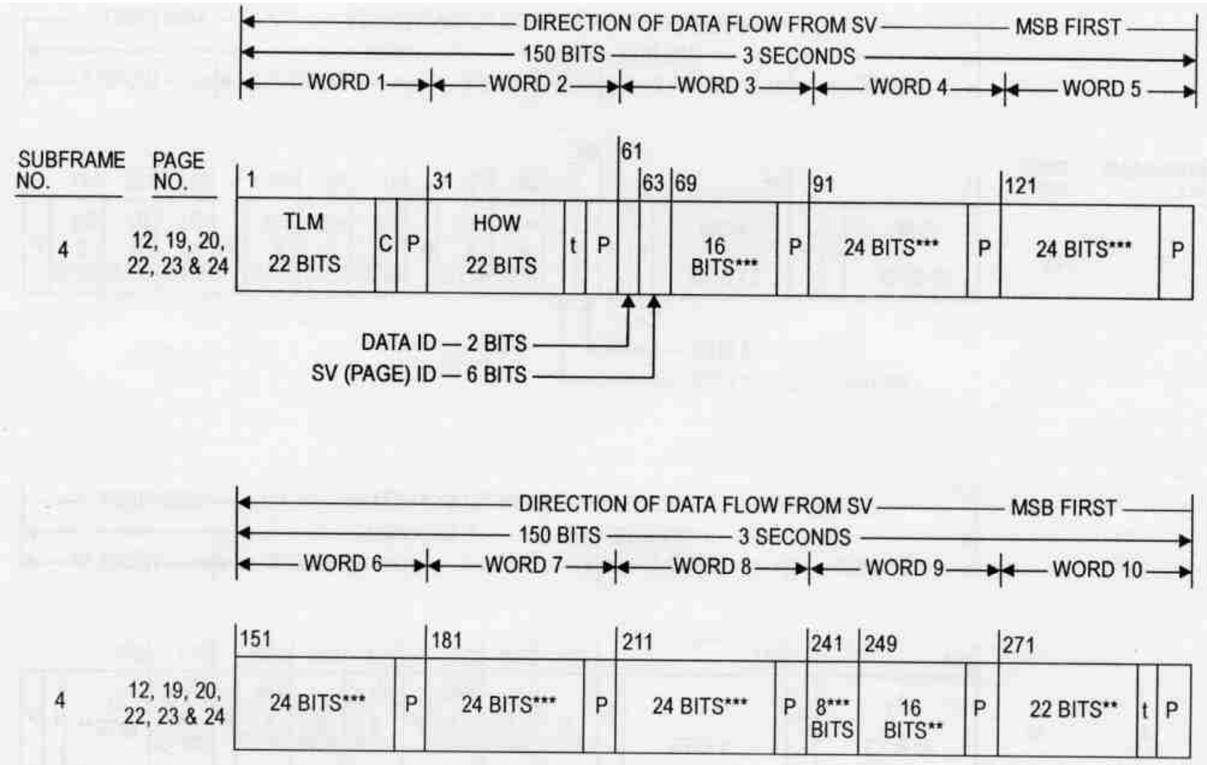
B-6. ábra: Adat formátum (5. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
t_{oa} = Naptár referencia idő
WN_a = A hét száma
SV HEALTH = Navigációs műhold /SV/ működési állapot
6 BITS/SV = 6 bit műholdanként
** Fenntartva rendszerbeli felhasználásra
*** Fenntartva
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



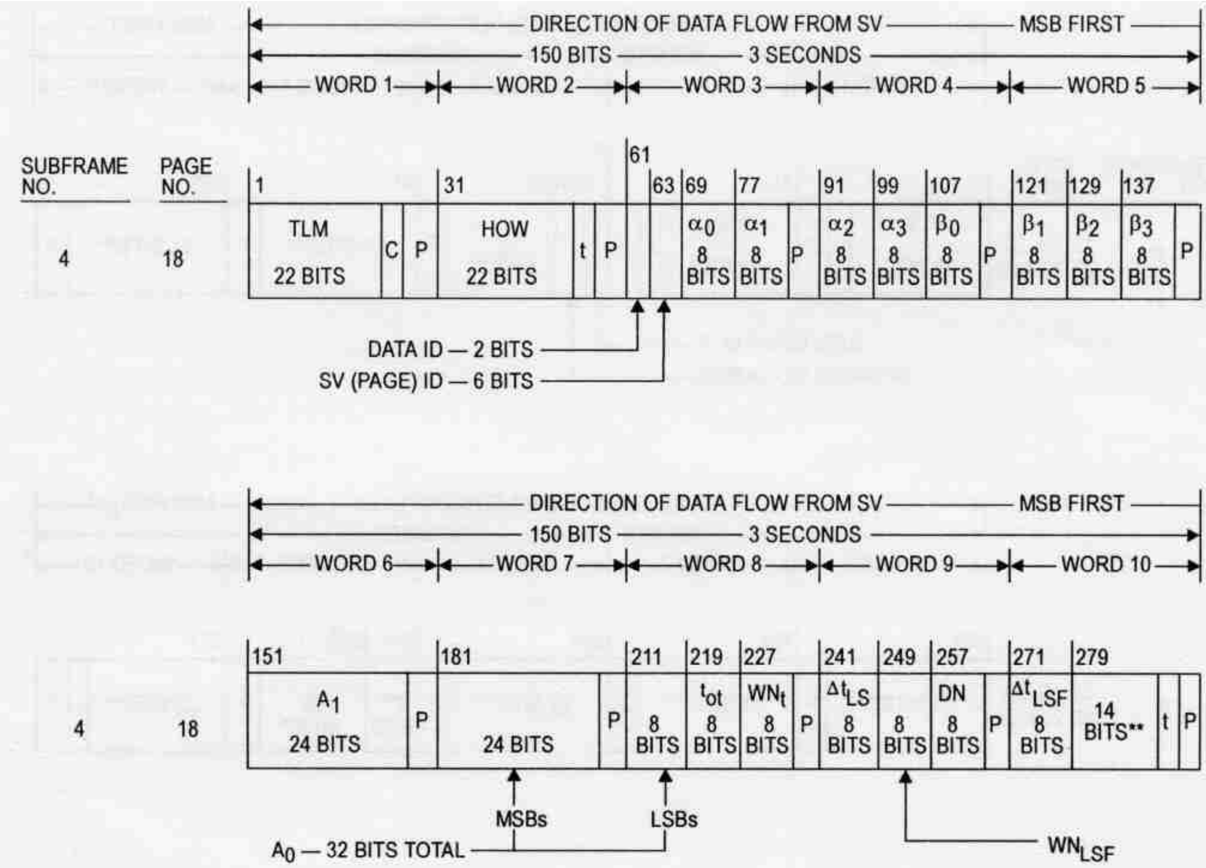
B-6. ábra: Adat formátum (6. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
** Fenntartva rendszerbeli felhasználásra
*** Fenntartva
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



B-6. ábra: Adat formátum (7. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
** Fenntartva rendszerbeli felhasználásra
*** Fenntartva
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



B-6. ábra: Adat formátum (8. a 11-ből)

Ábraszöveg:

α_0 , α_1 , α_2 , α_3 , β_0 , β_1 , β_2 , β_3 = Ionoszférikus paraméterek

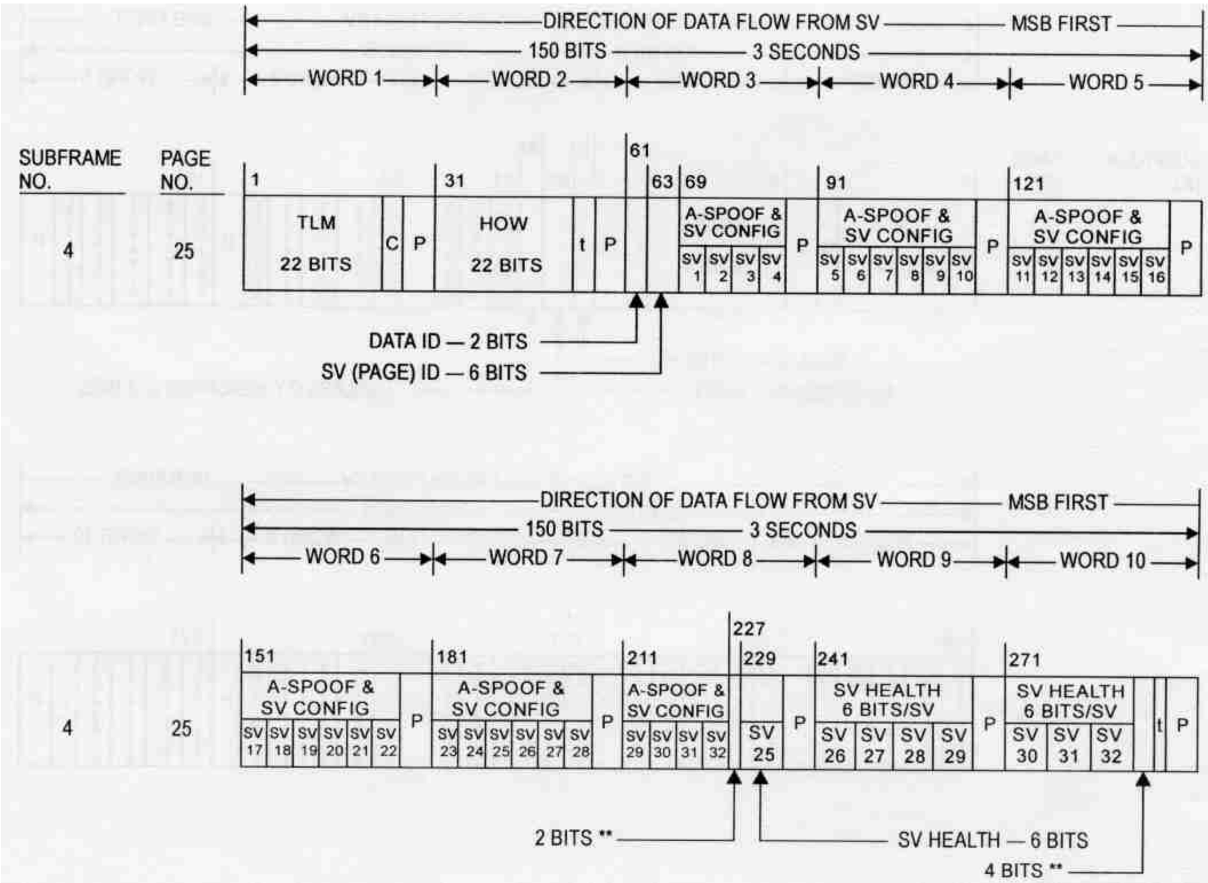
A_1, t_{ot} , WN_t , Δt_{LS} , DN, Δt_{LSF} , WN_{LSF} = UTC paraméterek

** Fenntartva rendszerbeli felhasználásra

P = 6 paritás bit

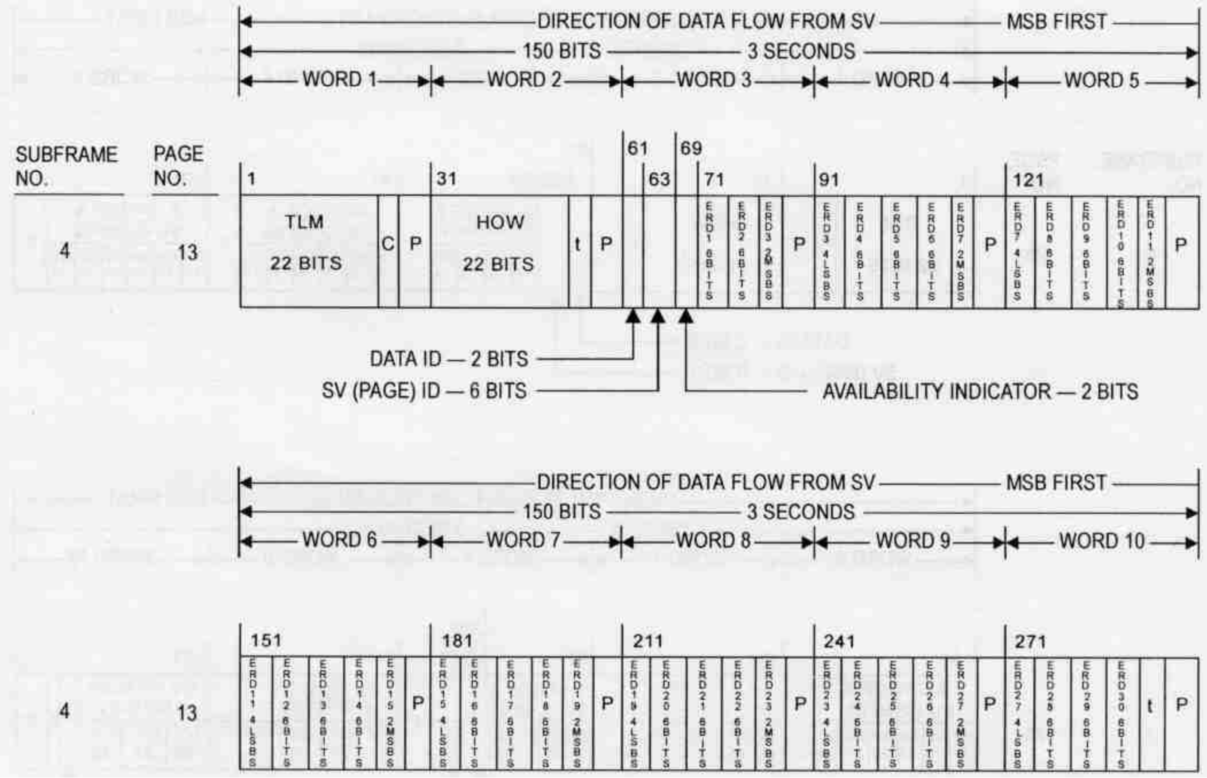
t = 2 nem-információ hordozó bit a paritás számításhoz használatos

C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



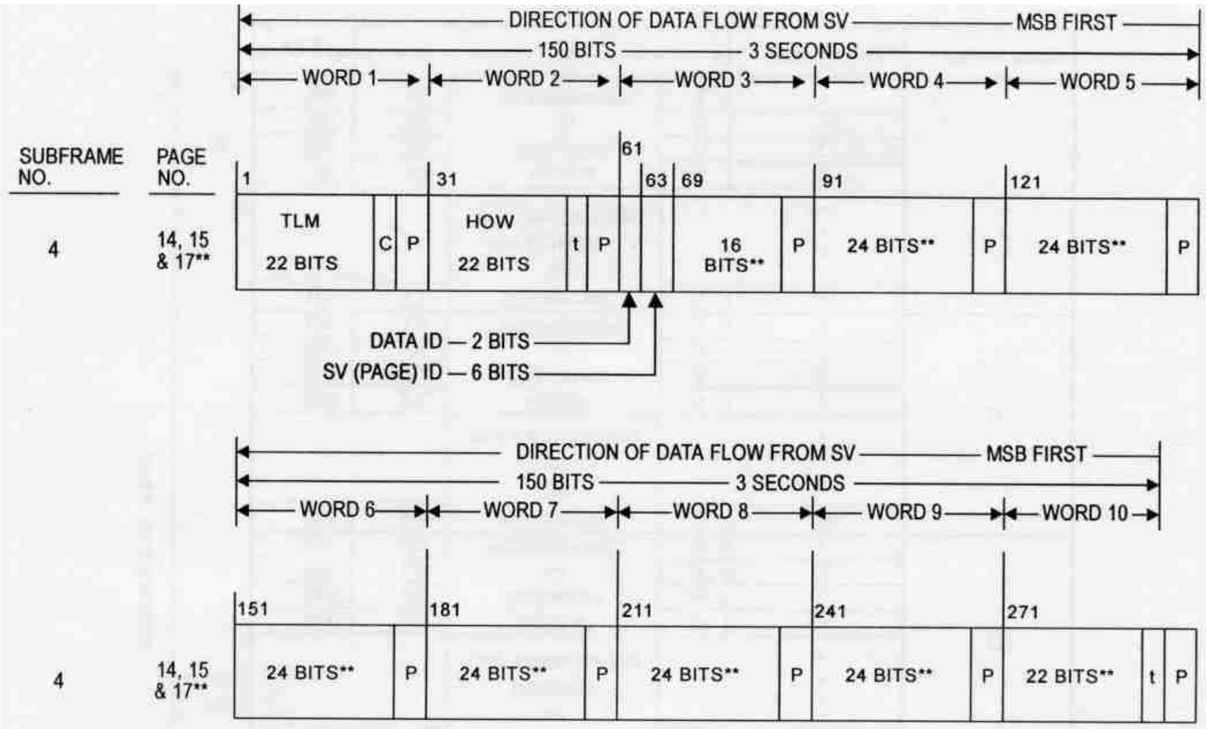
B-6. ábra: Adat formátum (9. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
A-SPOOF = ……
SV CONFIG = Navigációs műhold konfiguráció
SV HEALTH = Navigációs műhold működési állapot
** Fenntartva rendszerbeli felhasználásra
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



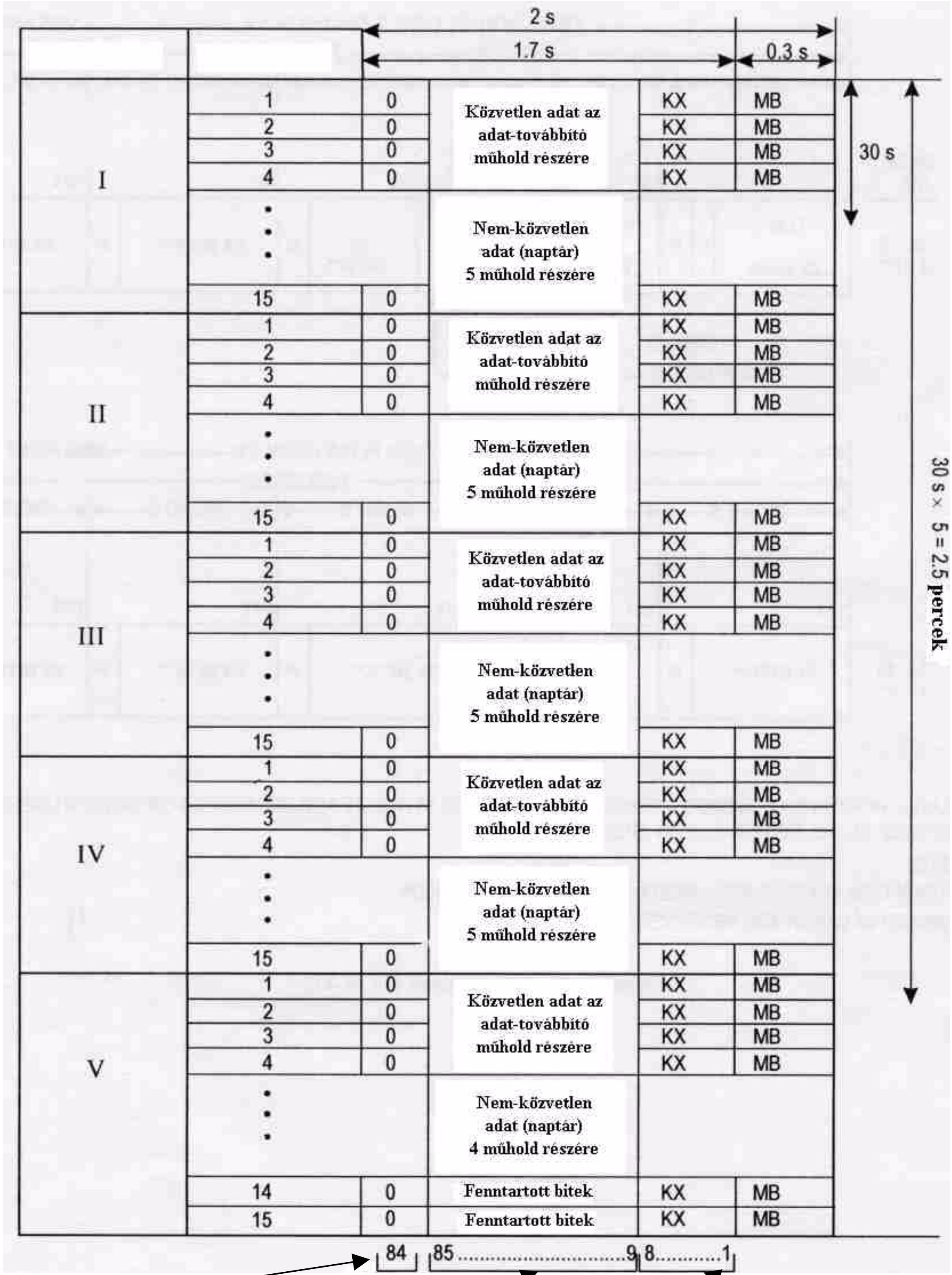
B-6. ábra: Adat formátum (10. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
AVAILABILITY INDICATOR = Rendelkezésre állás jelzés
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak



B-6. ábra: Adat formátum (11. a 11-ből)

Ábraszöveg:
DATA ID = Adat azonosító
SV (PAGE) ID = Navigációs műhold /SV/ (oldal) azonosító
** A 14. és 15. oldalakon a 3. szótól a 10. szóig terjedően jelzett helyek rendszer felhasználásra vannak fenntartva, azok, amelyek a 17. oldalon találhatók, a különleges közlemények részére fenntartottak.
P = 6 paritás bit
t = 2 nem-információ hordozó bit a paritás számításhoz használatos
C = TLM bitek, 23. és 24., azok, amelyek fenntartottak

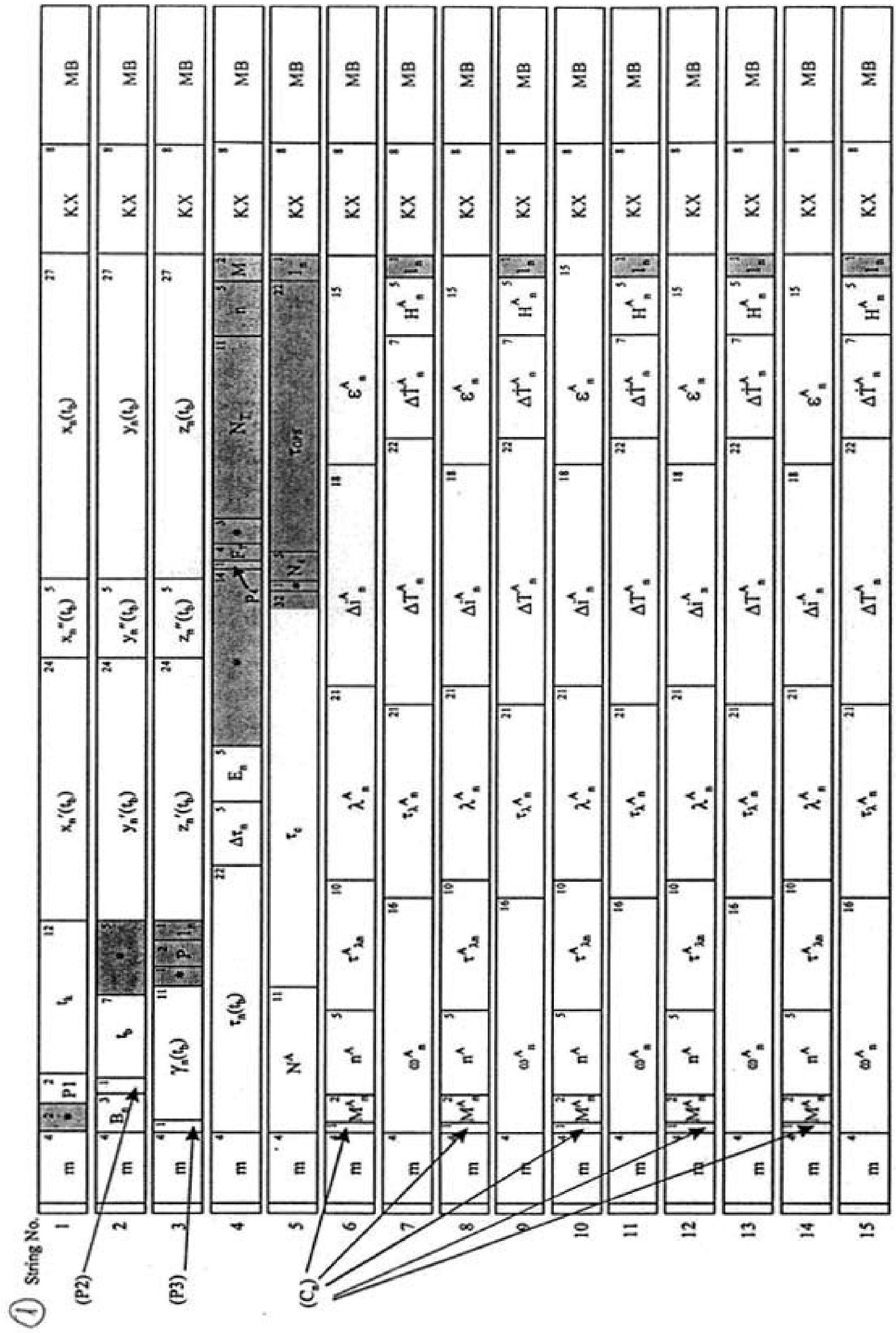


84
Bit szám a jelsorozaton belül

85.............9
Adat-bitek relatív bi-bináris kódban

8.............1
Hamming kód bitek relatív bi-bináris kódban

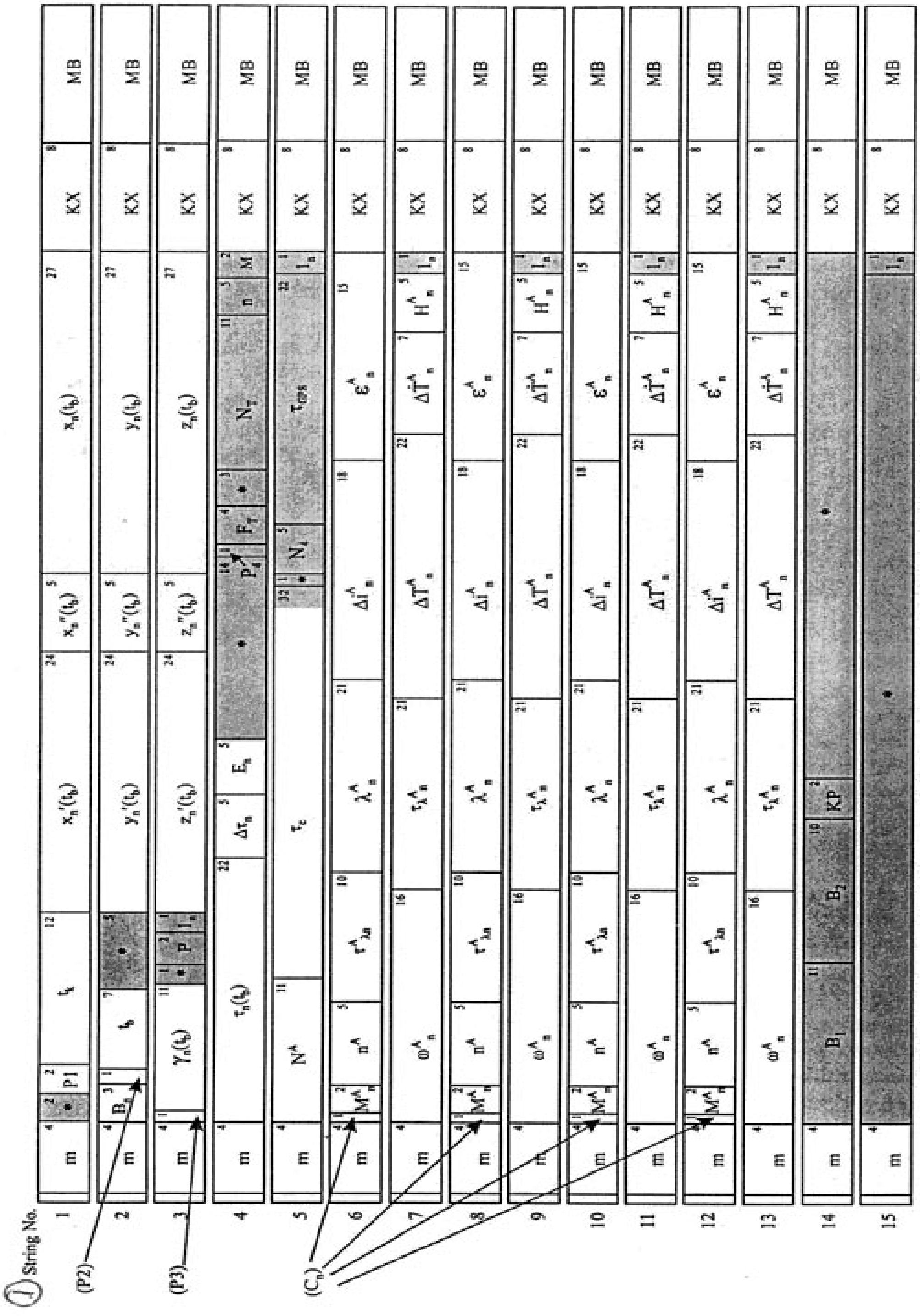
B-7. ábra: Szuper-keret szerkezet



B-8. ábra: Keret szerkezet (1.-től 4.-ig terjedő keretek)

Ábraszöveg a B-8. ábrához: 1 - Jelsorozat* Fenntartott bitek a kereten belül

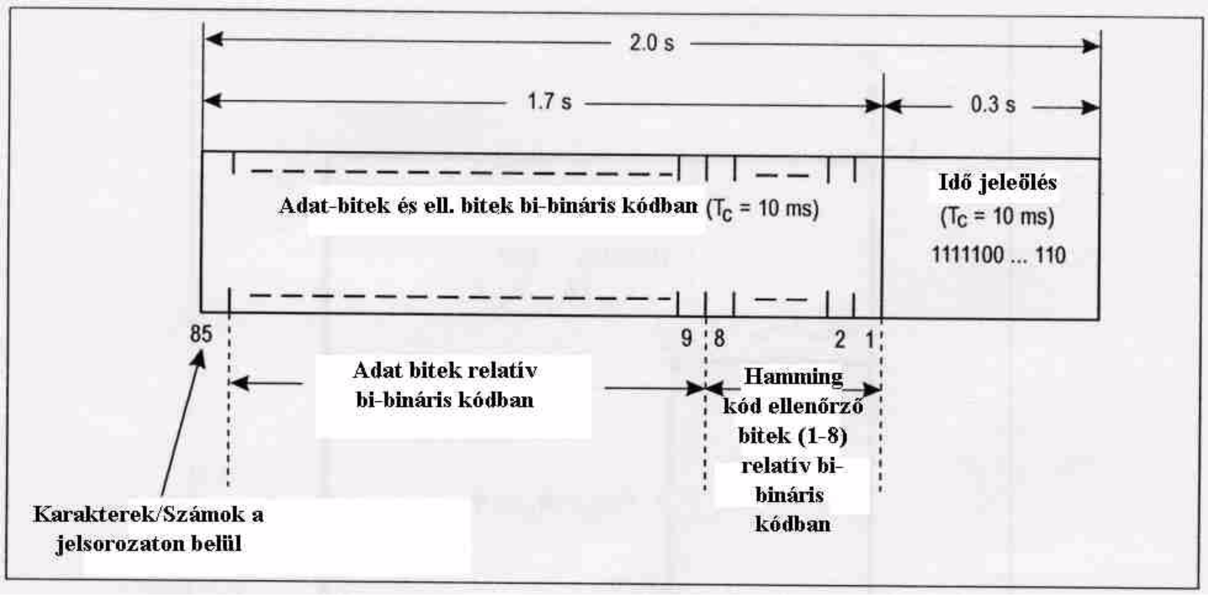
Megjegyzés. – A paraméterek adat-tartalma, meghatározása és magyarázatai a 3.2.1.3 és a 3.2.1.4 pontban vannak megadva. A GLONASS-M kiegészítésként sugárzott adatai kiemelésre kerültek az ábrán.



B-9. ábra: Keret szerkezet (5. keret)

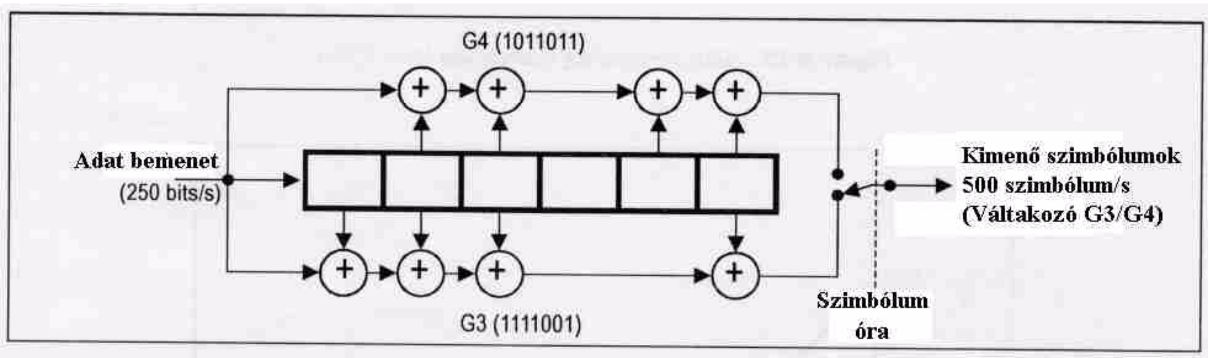
Ábraszöveg a B-8. ábrához:
1 - Jelsorozat*
Fenntartott bitek a kereten belül

Megjegyzés. – A paraméterek adat-tartalma, meghatározása és magyarázatai a 3.2.1.3 és a 3.2.1.4 pontban vannak megadva. A GLONASS-M kiegészítésként sugárzott adatai kiemelésre kerültek az ábrán.

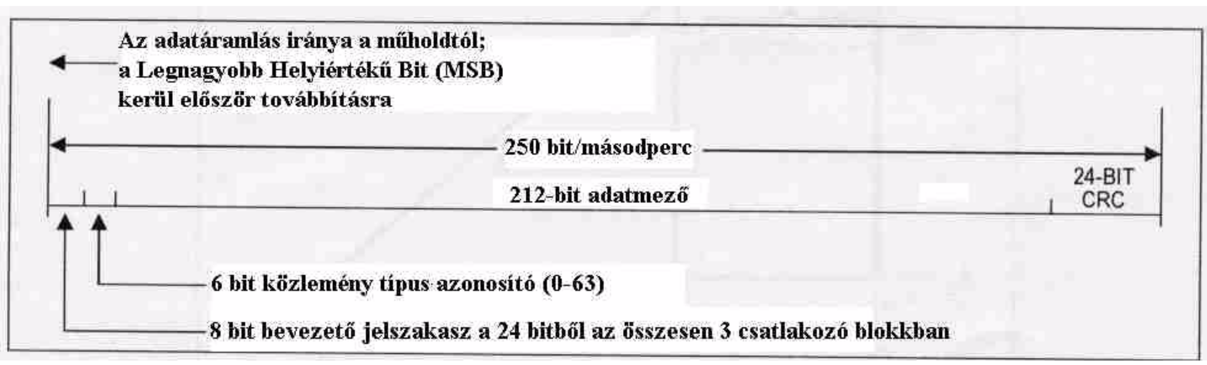


Megjegyzés. – T_C = Az egyes chipek időtartama

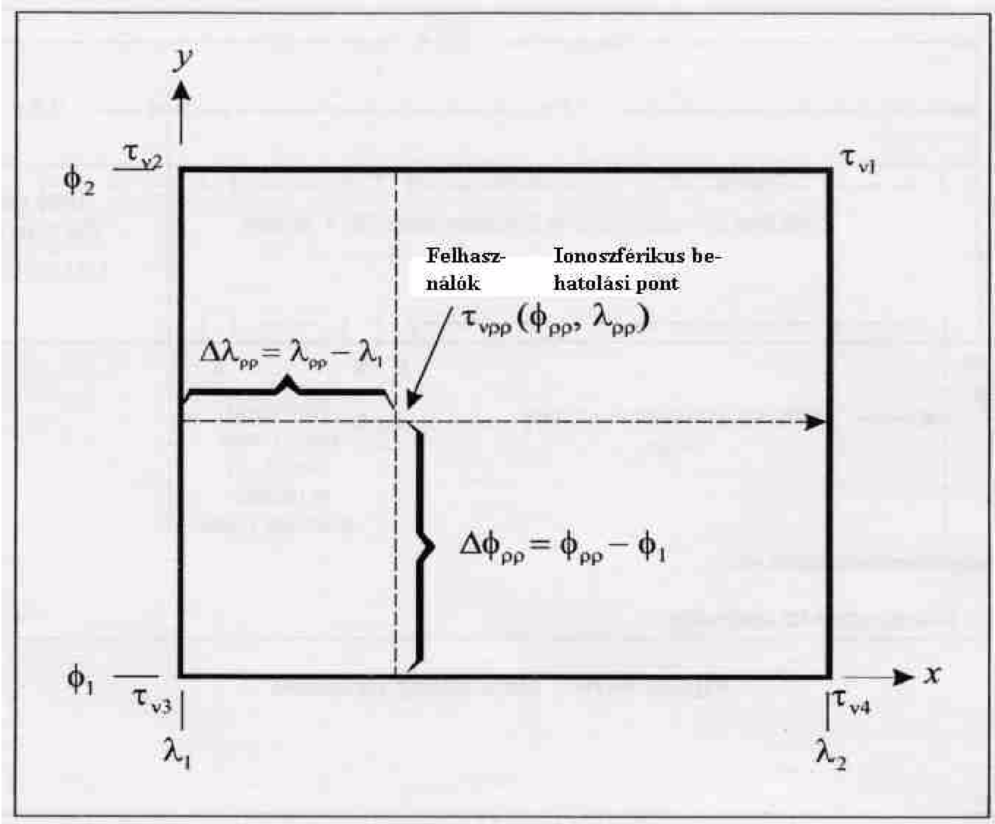
B-10. ábra: Adat jelsorozat szerkezet



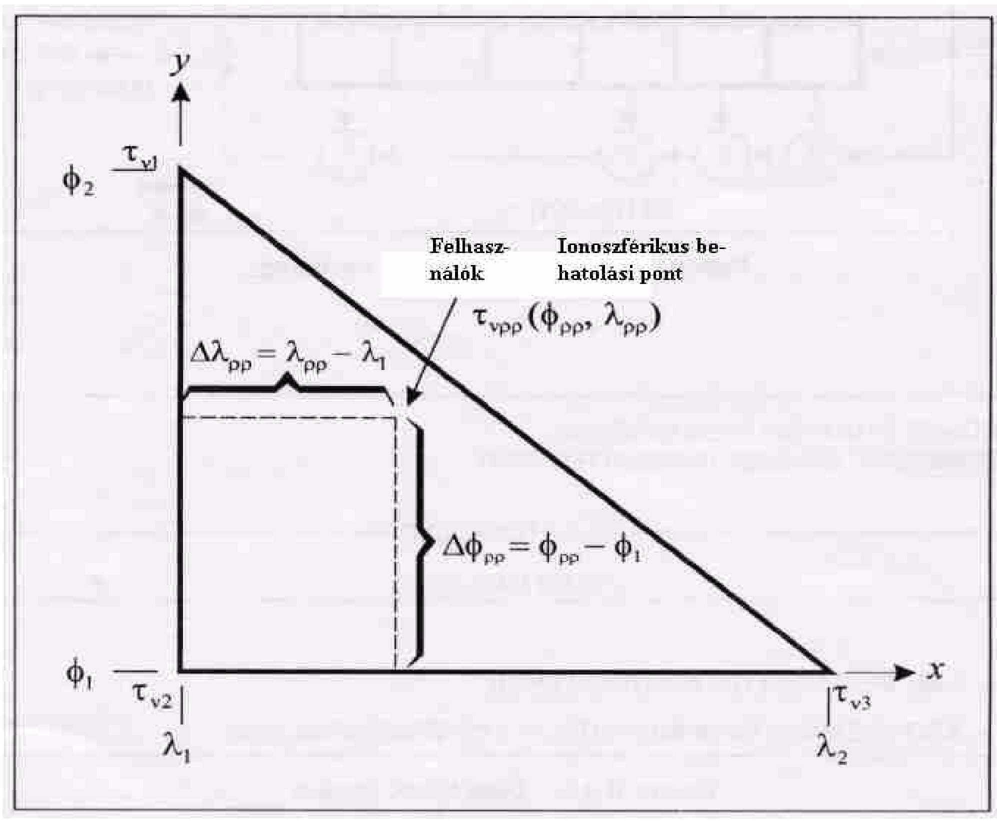
B-11. ábra: Konvolúciós kódolás



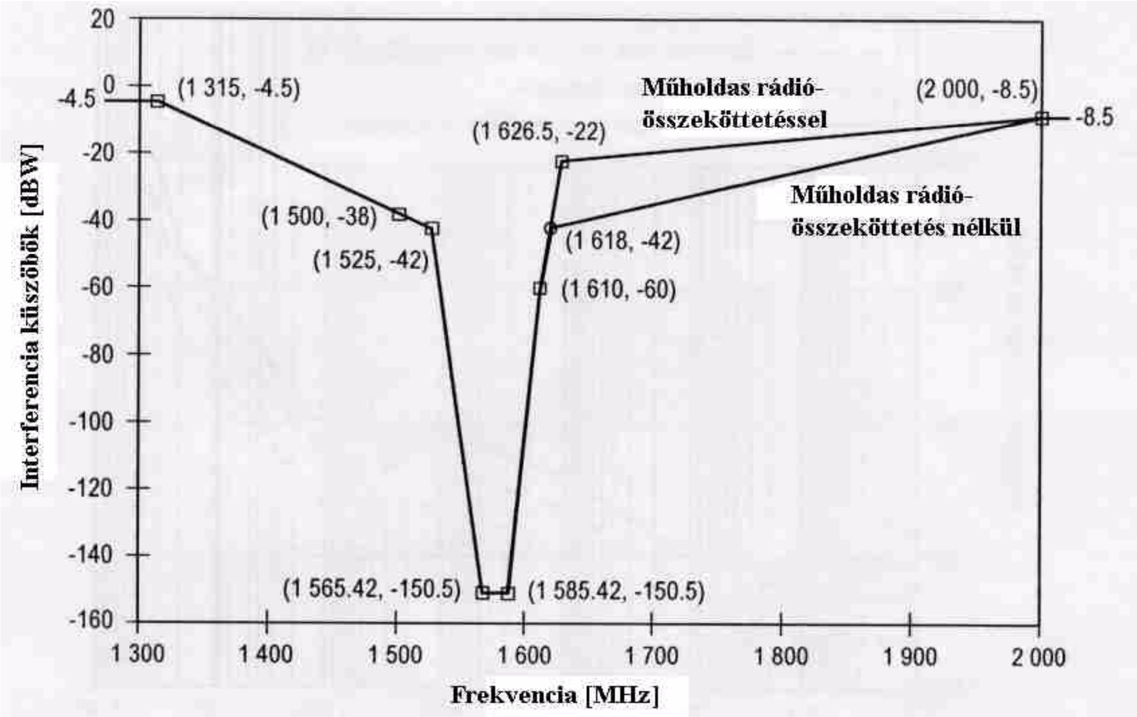
B-12. ábra: Adat blokk formátum



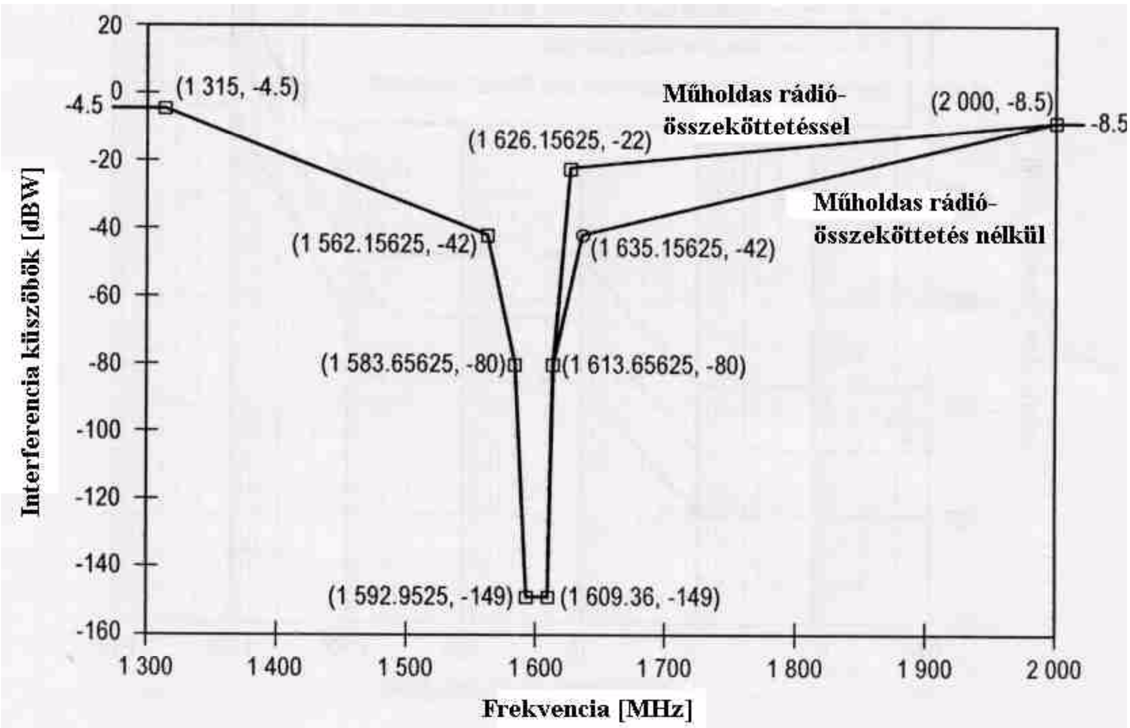
B-13. ábra: Ionoszférikus rácspont /IGP/ számozási szabályok (4 IGP-re)



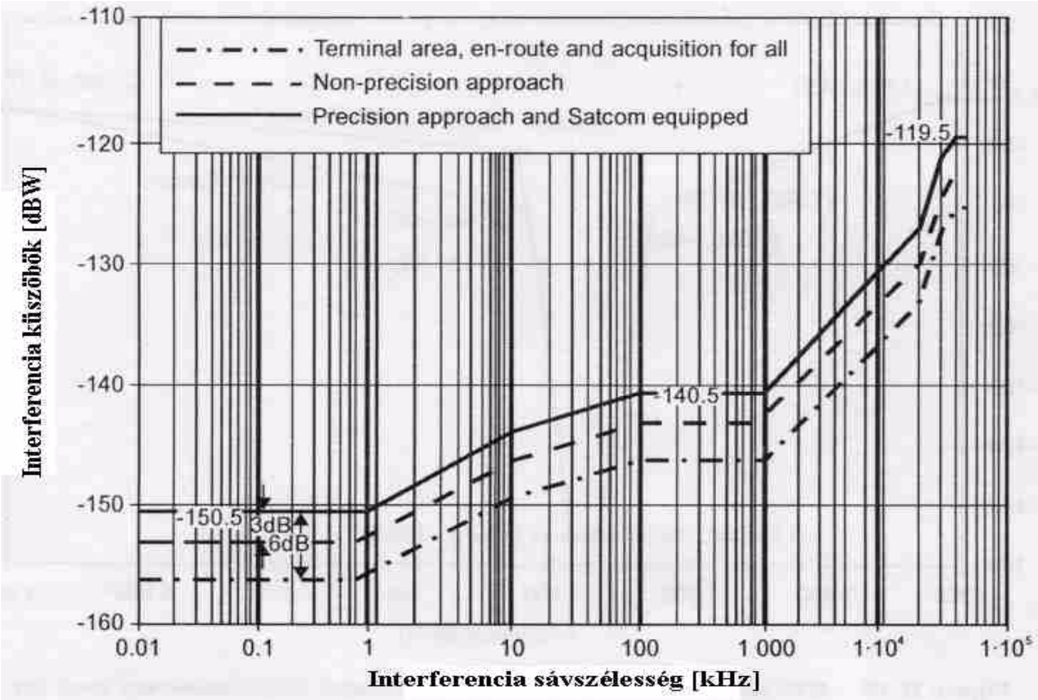
B-14. ábra: Ionoszférikus rácspont /IGP/ számozási szabályok (3 IGP-re)



B-15. ábra: Vivőhullám /CW/ interferencia küszöbök a precíziós legközelítésekben használt GPS és SBAS vevőkre

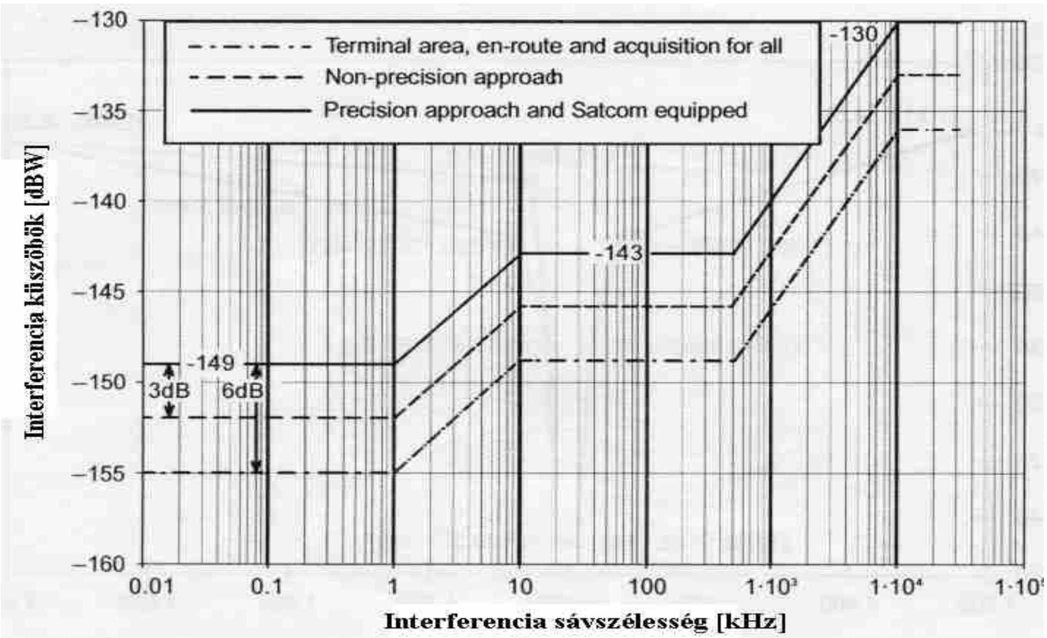


B-16. ábra: Vivőhullám /CW/ interferencia küszöbök a precíziós megközelítésekben használt GLONASS vevőkre



B-17. ábra: Interferencia küszöbök a sávszélességgel szemben a GPS és SBAS vevőkre

- · - · - Közel-körzeti és útvonal-repülés és adatgyűjtés mindenhol
- - - - Nem-precíziós megközelítés
——— Precíziós megközelítés és műholdas /Satcom/ rádió-összeköttetéssel ellátott vevő



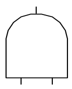
B-18. ábra: Interferencia küszöbök a sávszélességgel szemben a GLONASS vevőkre

- · - · - Közel-körzeti és útvonal-repülés és adatgyűjtés mindenhol
- - - - Nem-precíziós megközelítés
——— Precíziós megközelítés és műholdas /Satcom/ rádió-összeköttetéssel ellátott vevő

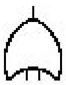
"A" MELLÉKLET: A SZOLGÁLTATÁSI CÉLOK TELJESSÉGÉNEK (INTEGRITÁS) ÉS FOLYAMATOSSÁGÁNAK MEGHATÁROZÁSA A KOCKÁZATI FA MÓDSZER FELHASZNÁLÁSÁVAL

1. A kockázati fa módszer egy grafikai mód az egy meghatározott meghibásodás állapot és az ezen állapothoz vezető okok, vagy meghibásodások közötti logikai kapcsolat kifejezéséhez. Ez a légiközlekedési iparban alkalmazásban lévő hiba fa elemzés alkalmazása.

1.1 A módszerben egy logikai szimbólum sorozat kerül alkalmazásra a különféle meghibásodások okai közötti kapcsolat ábrázolására. Ebben az útmutató anyagban a következő szimbólumok használatosak:

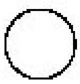


Az "ÉS" kapu azt a logikai műveletet írja le, amely által az összes bemenő eset együtt étezése szükségszerű, hogy létrehozza a kimenő esetet.



A "VAGY" kapu egy olyan helyzetet határoz meg, amely által a kimeneti eset akkor fog fennállni, amikor egy vagy több bemenő eset fennáll.

A téglalap egy olyan esetet azonosít, ami a bemenő logikai kapun keresztüljutó hibák, vagy meghibásodások kombinációjából származik.



A kör egy olyan elsődleges meghibásodási esetet ír le, ami nem igényel további kifejtést. Az így azonosított tételek meghibásodási módja és gyakorisága tapasztalati adatokból kerül levezetésre.

1.2 A módszer az esetek egymás után következésének és kombinációjának azt a vizuális ábrázolását adja meg, ami a legnagyobb meghibásodási eseményhez vezet. A módszert fel lehet használni a legnagyobb meghibásodási esemény bekövetkezése valószínűségének meghatározására, feltéve, hogy az egyedi események valószínűsége ismert, vagy megbecsülhető. Egy egyszerű hiba esetén a fa-valószínűségeket közvetlenül lehet kiszámítani, de gondosan kell eljárni akkor, amikor az elsődleges meghibásodási esemény nem független, azaz a meghibásodási események egynél több vonalvezetéssel közösek.

1.3 Ebben az útmutató anyagban az előforduló legmagasabb szintű esemény elfogadható valószínűsége a kockázat elosztásával kerül meghatározásra, és a hiba-fa a kockázatnak az integritási és a szolgáltatás folyamatossági kockázatba történő további felosztására használatos. Ennek megfelelően inkább a "kockázati fa" kifejezést használjuk a "hiba-fa" kifejezés helyett.

2. Az általános kockázati fa a légijárművek leszállási műveleteire az A-1. számú ábrán került megadásra. Ennél a fánál a legnagyobb eseménynek a légijárműnek az egy nem-légijármű fedélzeti eredetű útirány-vezetési rendszer meghibásodása miatti elvesztését vettük. Ennek az eseménynek az

okai vagy az elsődleges nem-légijármű fedélzeti eredetű útirány-vezetési berendezés integritási meghibásodása, vagy a nem-légijármű fedélzeti eredetű útirány-vezetési rendszer szolgáltatási folyamatosságának (COS) hibája (azaz mindkettő, az az elsődleges rendszer és az a bármilyen másodlagos rendszer, ami a félbeszakított megközelítés / megszakított megközelítés alátámasztására használatos). Az elsődleges nem-légijármű fedélzeti útirány-vezetési rendszernél több elem került figyelembevételre az 1-től az N-ig terjedően, például az oldalszög adó, a magassági szög adó és a DME / P az MLS esetében. A másodlagos útirány-vezetési rendszer egy alternatív nem-légijármű fedélzeti rendszer lehet, vagy bizonyos esetekben egy légijármű fedélzeti navigációs rendszer, mint például egy inerciális referencia rendszer.

2.1 A következő valószínűségeket lehet meghatározni:

P_a = A légijármű elvesztésének valószínűsége a nem-légijármű fedélzeti útirány-vezetési rendszer meghibásodása miatt.

P_b = A légijármű elvesztésének valószínűsége az elsődleges útirány-vezetés integritási meghibásodása miatt.

P_c = A légijármű elvesztésének valószínűsége a szolgáltatási folyamatosság (COS) meghibásodása miatt.

P_x = Annak a valószínűsége, hogy a légijárművezető nem képes sikeresen észlelni és közbelépni egy elsődleges útirányvezetési integritás meghibásodást követően. A kockázat csökkentő tényező csak azoknál az eseteknél lényeges, ahol az útirány-vezetési rendszer integritási meghibásodását a légijármű vezetője észlelni tudja, azaz egy I. Kategóriájú ILS megközelítésnél az elhatározási magasságon.

P_p = Az elsődleges útirány-vezetési szolgáltatási folyamatosság (COS) meghibásodásának valószínűsége.

P_d = A légijármű elvesztésének valószínűsége egy félbeszakított megközelítés / megszakított megközelítés végrehajtása során.

P_i = Az elsődleges útirány-vezetés integritási meghibásodásának valószínűsége.

P_{iN} = Az N Navigációs berendezés-egység integritási hibájának valószínűsége.

P_{pN} = Az N Navigációs berendezés-egység szolgáltatási folyamatossági (COS) meghibásodásának valószínűsége.

P_s = A légijármű elvesztésének valószínűsége egy félbeszakított megközelítés / megszakított megközelítés végrehajtása során, a másodlagos útirány-vezetéssel.

P_{s1} = A másodlagos útirány-vezetési szolgáltatási folyamatosság (COS) meghibásodásának valószínűsége.

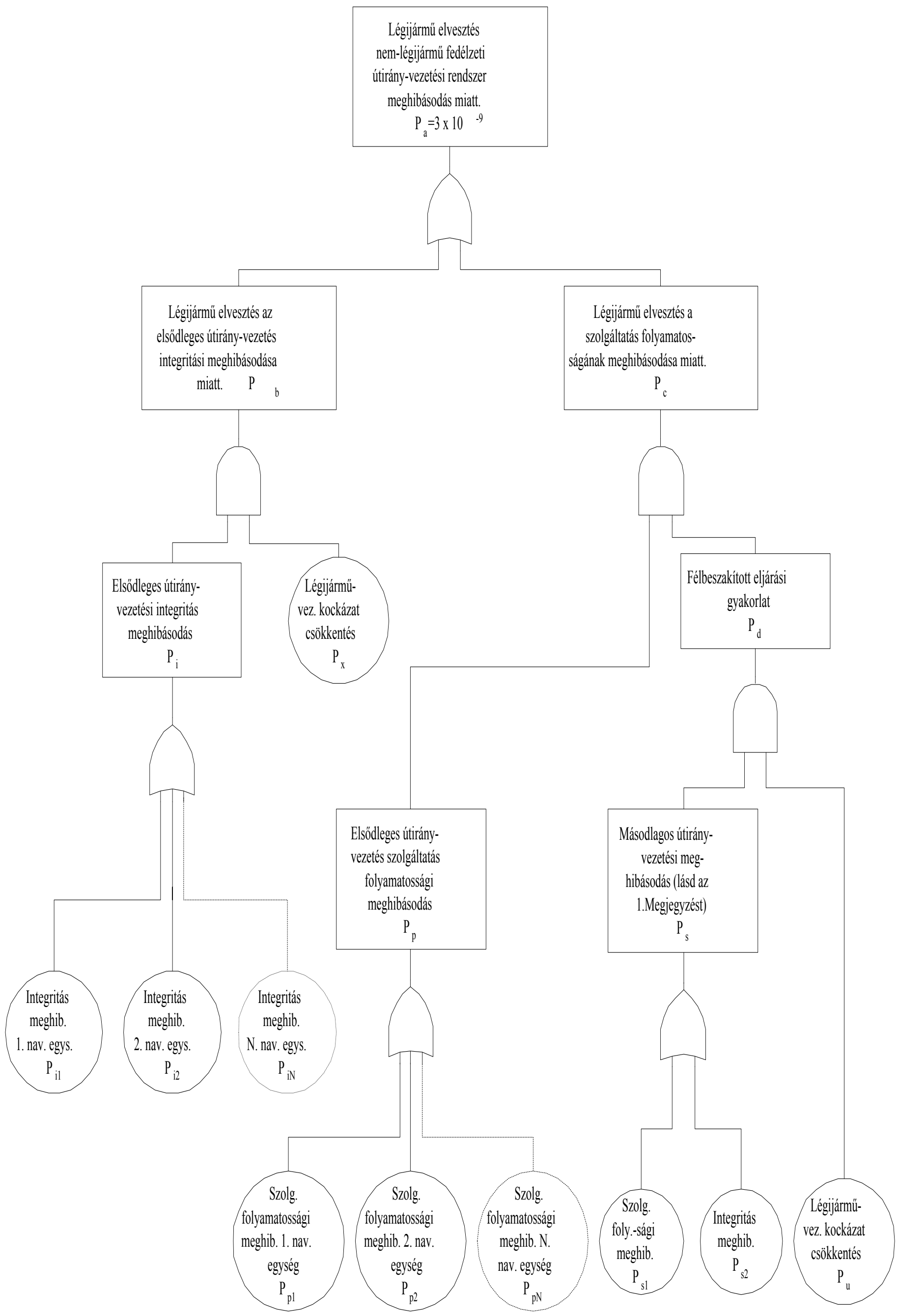
P_{s2} = A másodlagos útirány-vezetés integritási meghibásodásának valószínűsége.

P_u = Annak a valószínűsége, hogy a légijárművezető nem képes sikeresen közbelépni egy elsődleges útirány-vezetési szolgáltatás folyamatossági meghibásodást követően és nem áll rendelkezésre másodlagos útirány-vezetés.

Ahol:
$P_a = P_b + P_c$
$P_b = P_i\, P_x$
$P_i = P_{i1} + P_{i2} + ...P_{iN}$
$P_c = P_p\, P_d$
$P_p = P_{p1} + P_{p2} + ...P_{pN}$
$P_d = P_s\, P_u$
$P_s = P_{s1} + P_{s2}$

2.2 A legnagyobb esemény, P_a, elfogadható valószínűségét az összes kockázati tényezőnek a megközelítési és leszállási üzemeltetéseknél a balesetek különféle osztályaira történő felosztásával lehet meghatározni. Ezt a módszert alkalmazva a P_a elfogadható értéke 3×10^{-9}-ként került meghatározásra. Ez azzal a legkisebb valószínűséggel egyezik meg, amit az egyes földi navigációs egységekre ki lehet jelölni, ami 1×10^{-9} (szabályszerűen egyenlően elosztva az integritás és a szolgáltatási folyamatosság között).

2.3 A fenti kockázat elemzés alapfeltételként elfogadja azt, hogy nincsenek berendezés tervezési hibák.

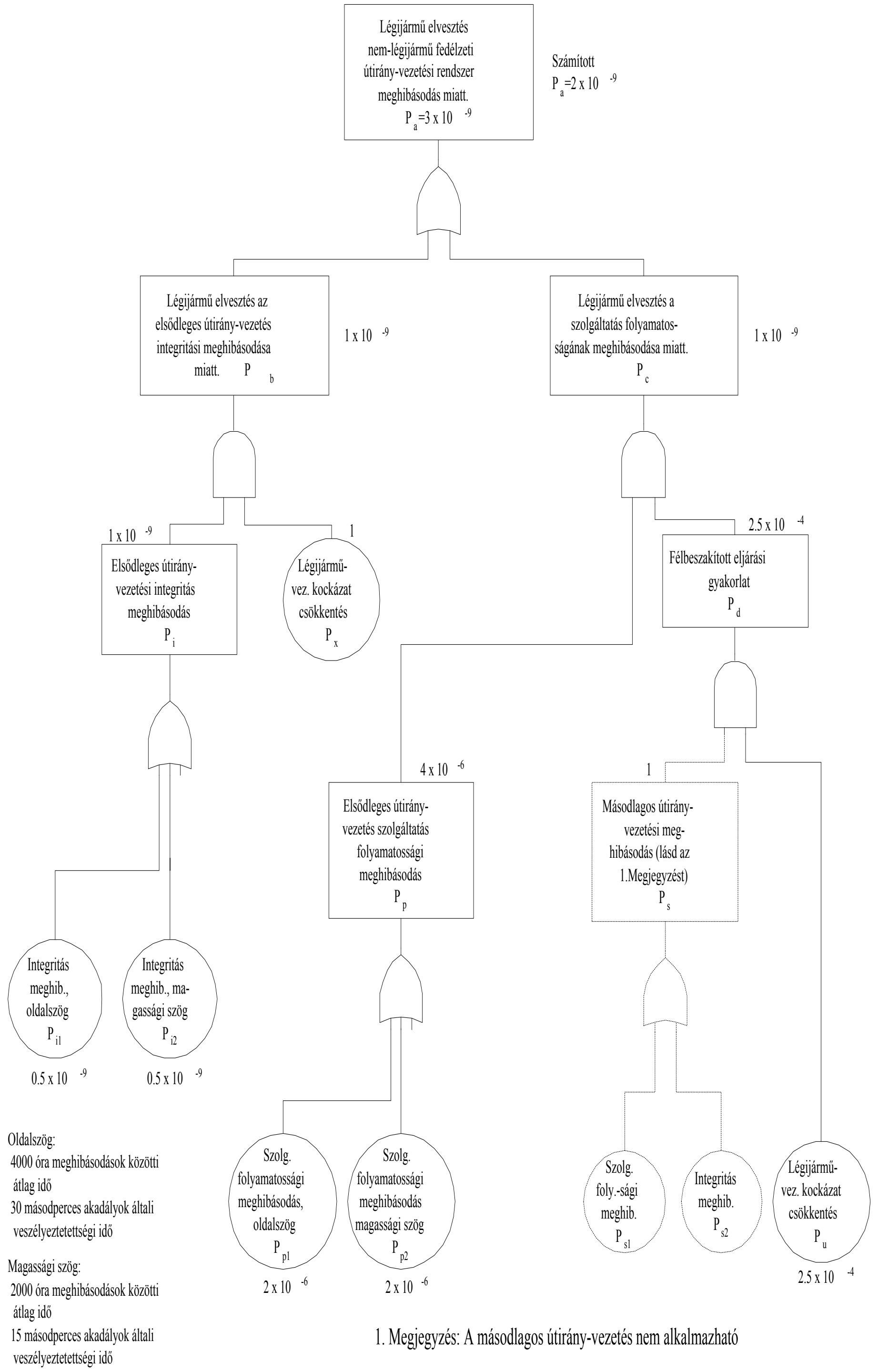


$$P_{pn} = \frac{\text{akadályok általi veszélyeztetettségi idő}}{\text{meghibásodások közötti átlagos idő}}$$

1. Megjegyzés: A másodlagos útirány-vezetés lehet légijármű fedélzeti vagy nem-légijármű fedélzeti útirány-vezetési rendszer.

A-1. ábra: Általános kockázati fa

3. *Példa a kockázati fának az MLS III. kategóriájú alap üzemeltetésekre (A-2. ábra) történő alkalmazására*.



A-2. ábra: Az MLS III. kategóriájú leszállás kockázati fája

$P_{i1} = P_{i2} = 0{,}5 \times 10^{-9}$

$P_{p1} = P_{p2} = 2 \times 10^{-6}$

Megjegyzés. - Ezek a számok a "G" Melléklet G-15. táblázata 4. szintjéből származnak, és 30 és 15 másodperces akadályok általi veszélyeztetettségi időt, valamint 4 000 és 2 000 órás meghibásodások közötti átlagos időt tételeznek fel külön-külön az oldalszög és a magassági szög adó egységekre.

$P_s = 1{,}0$

Megjegyzés. - Mivel nincs másodlagos útirány-vezetést felhasználó vezetett félbeszakított / megszakított megközelítési eljárás, így az eljárás során előforduló baleset valószínűségét 1-nek vesszük.

$P_x = 1{,}0$

Megjegyzés. - Ebben a példában alapfeltételként elfogadott az, hogy egy III. Kategóriájú üzemeltetésnél a légijármű vezetője a földi rendszer integritási meghibásodása esetén nem képes a közbelépésre. A kockázat csökkentő tényező ennek megfelelően 1-el egyenlő.

$P_u = 2{,}5 \times 10^{-4}$

Megjegyzés. - A légijárművezető kockázat csökkentő tényezője 4 000 esetben 1-re becsült érték, ami a megközelítést és a leszállást végrehajtó földi útirány-vezetési rendszereket felhasználó légijárművek baleseteinek tanulmányán alapszik. Ez a kockázat csökkentő tényező a szolgáltatás folyamatossági meghibásodást követően a légijárművezető közbelépését fogadja el.

Ennek megfelelően:

$P_i = 1 \times 10^{-9}$

$P_p = 4 \times 10^{-6}$

$P_d = 2{,}5 \times 10^{-4}$

$P_c = 4 \times 10^{-6} x 2{,}5 \times 10^{-4} = 1\ 10^{-9}$

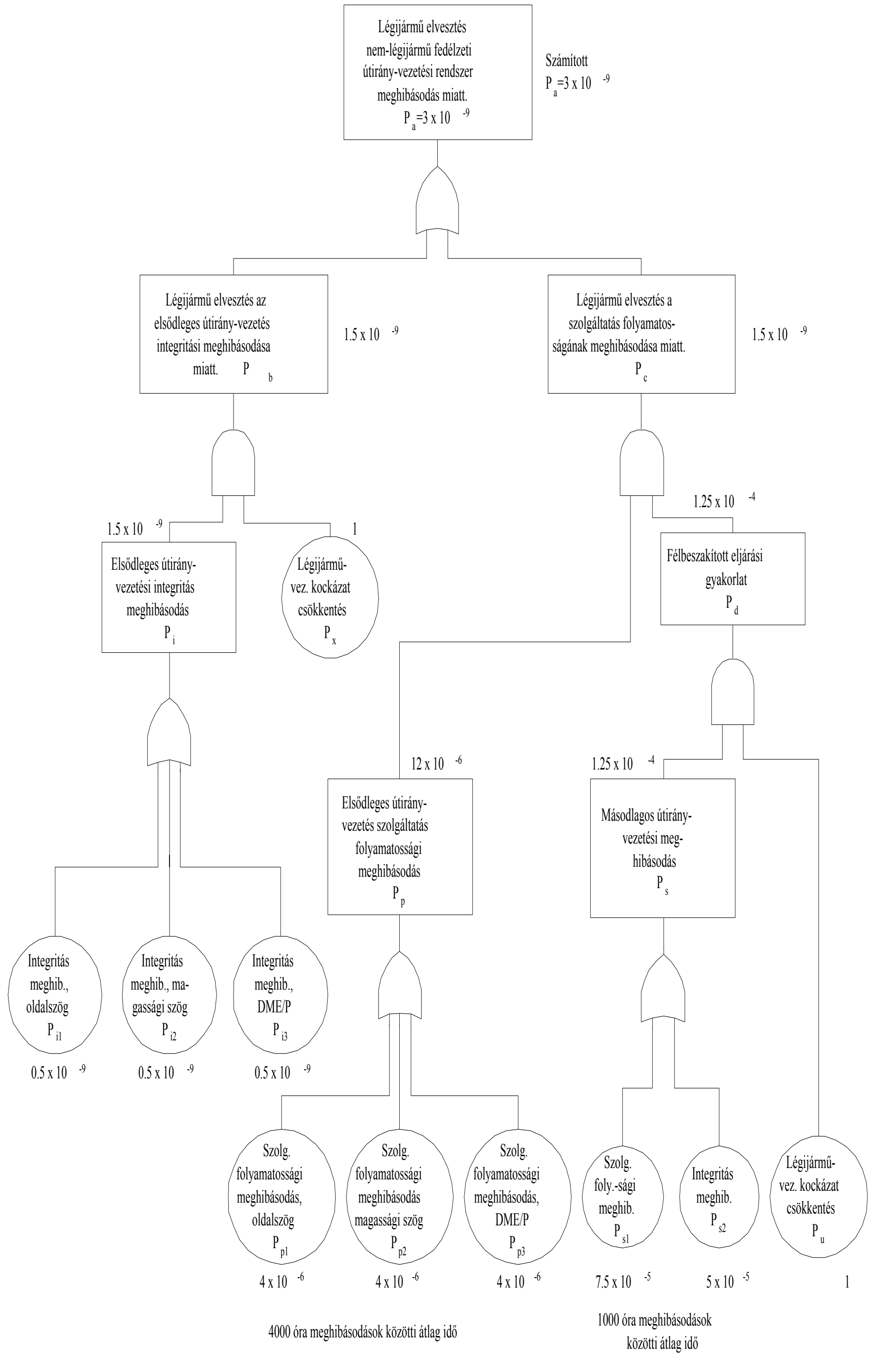
$P_b = 1 \times 10^{-9}\ 1$

és:

számított $P_a = 2 \times 10^{-9}$.

3.2 Ennek megfelelően ezért van egy 1×10^{-9} tűrés az általános követelményben.

4. *A kockázati fa alkalmazása az akadály-gazdag* környezetben végrehajtott MLS / RNAV üzemeltetésre (A-3. ábra).



A-3. ábra: MLS / RNAV akadály-gazdag környezeti kockázati fa

4.1 Ebben az esetben három navigációs egység szerepel (azaz oldalszög, magassági szög és DME / P), és mindegyiküknél alapfeltételként elfogadott az, hogy kielégítik a 4. szintű oldalszög adó berendezésre vonatkozó integritási és szolgáltatás folyamatossági (COS) követelményeket, azaz az integritás = 1 - 0,5 x 10^{-9} és a meghibásodások közötti átlagos idő MTBO = 4 000 óra.

$P_{i1} = P_{i2} = P_{i3} = 0{,}5 \times 10^{-9}$

$P_{x} = 1{,}0$

Megjegyzés. - Elfogadott az, hogy a légijárművezető nem képes arra, hogy a földi rendszer egy integritási meghibásodása esetében közbelépjen.

$P_{p1} = P_{p2} = P_{p3} = 4 \times 10^{-6}$

Megjegyzés. - Ez feltételezi azt, hogy az akadályok általi veszélyeztetettségi idő (OET) 60 másodperc, és a meghibásodások közötti átlagos idő 4 000 óra az összes földi egységre.

$P_{u} = 1{,}0$

Megjegyzés. - Feltételezett az, hogy egy útirány-vezetés nélküli félbeszakított megközelítési / megszakított megközelítési eljárás elfogadhatatlan. Ennek megfelelően egy ilyen eljárás során bekövetkező baleset valószínűségét 1-nek vettük.

4.2 Ebben az esetben az MLS / RNAV eljárás egy akadály-gazdag környezetben kerül végrehajtásra, és alapfeltételként elfogadott az, hogy a másodlagos útirány-vezetés elengedhetetlen lesz a biztonságos félbeszakított megközelítésnek / megszakított megközelítésnek az akadályok általi veszélyeztetettségi idő során történő végrehajtásához.

$P_{s_1} = 7{,}5 \times 10^{-5}$

Megjegyzés. - Ez a másodlagos útirány-vezetési földi berendezés szolgáltatás folyamatossági (COS) meghibásodásának valószínűsége. Itt elfogadott az, hogy a másodlagos útirány-vezetési rendszer meghibásodások közötti átlagos ideje (MTBO) 1 000 óra, és az akadályok általi veszélyeztetettségi idő 270 másodperc. A hiba fennállása általi veszélyeztetettségi idő a másodlagos útirány-vezetésre az eljárás azon pontjától függ, amelynél a másodlagos útirány-vezetés rendelkezésre állását megerősítik. Elfogadva azt, hogy ez az MLS / RNAV eljárás megkezdése előtt fog bekövetkezni,és nem lesz szükséges az, hogy a légijárművezető újra megerősítse a másodlagos útirány-vezetés rendelkezésre állását, az eljárás kritikus akadály-gazdag része megkezdése előtt, az akadályok általi veszélyeztetettségi idő több perc is lehet.

$P_{s_2} = 5 \times 10^{-5}$

Megjegyzés. - Ez az az integritás, ami a másodlagos útirány-vezetési rendszerhez szükséges.

Ennek megfelelően:

$P_{i} = 1{,}5 \times 10^{-9}$

$P_{b} = 1{,}5 \times 10^{-9}$

$P_{p} = 12 \times 10^{-6}$

$P_{s} = 7{,}5 \times 10^{-5} + 5 \times 10^{-5} = 1{,}25 \times 10^{-4}$

$P_d = 1,25 \times 10^{-4}$

$P_c = 12 \times 10^{-6} + 1,25 \times 10^{-4} = 1,5 \times 10^{-9}$

és:

számított $P_a = 3 \times 10^{-9}$, ahogy szükséges.

Megjegyzés. - A 60 másodpercnél nagyobb akadályok általi veszélyeztetettségi időnél az lesz szükséges, hogy vagy növeljék az elsődleges útirány-vezetés meghibásodások közötti átlag idejét, vagy növeljék a másodlagos útirány-vezetés miatti kockázat csökkentési tényezőt. Például, ha az akadályok általi veszélyeztetettségi idő 90 másodpercre növekszik, akkor az elsődleges útirány-vezetés meghibásodások közötti átlag idejét meg kell növelni 6 000 órára, vagy a másodlagos útirány-vezetés meghibásodások közötti átlag idejét 2 250 órára kell növelni. Nyilvánvaló kompromisszum van az elsődleges útirány-vezetés megbízhatósága, az akadályok általi veszélyeztetettségi idő és a másodlagos útirány-vezetés megbízhatósága és integritása között. A kockázati fa módszert fel lehet használni egy egyedi MLS / RNAV eljárás felülvizsgálatára, valamint az elsődleges és másodlagos útirány-vezetés megfelelő megbízhatósági és integritási követelményeinek meghatározására.

"B" MELLÉKLET: A MEGKÖZELÍTÉS ÉS LESZÁLLÁS NEM-LÁTÁSOS BERENDEZÉSEI BEVEZETÉSÉNEK ÉS ALKALMAZÁSÁNAK STRATÉGIÁJA

(lásd a 2. Fejezet 2.1 pontját)

1. Bevezetés

1.1 Különféle tényezők vannak hatással a minden időjárás melletti üzemeltetésekre a biztonság, a hatékonyság és a rugalmasság szempontjában kifejezve. Az új technikák fejlődése szükségesé teszi a minden időjárás melletti üzemeltetések fogalmának rugalmas megközelítését ahhoz, hogy a technikai fejlesztés összes előnyét megkapják. Ennek a rugalmasságnak a létrehozását egy stratégia teszi lehetővé, a stratégia mögötti gondolatok és célok azonosításán keresztül, és az új technikai fejlesztéseknek, vagy ötleteknek az ebbe a stratégiába való beépítésével.

1.2 A stratégia felkészít a nem-látásos berendezések alkalmazására a függőleges vezetéssel történő megközelítésre és leszállásra (APV), valamint a precíziós megközelítés és leszállás műveleteire.

2. A stratégia céljai

A stratégiának:

a) meg kell tartani a minden időjárás melletti üzemeltetéseknek legalább a jelenlegi biztonsági szintjét;

b) meg kell őrizni a szolgáltatásnak legalább a jelenlegi szintjét, vagy a tervezett javított szintet;

c) meg kell tartani az általános kölcsönös működőképességet;

d) egyeztetett körzeti tervezésen alapulóan körzeti rugalmasságot kell biztosítani;

e) alkalmazhatónak kell lenni legalább a 2015. évig; és

f) számításba kell venni a gazdaságossági, üzemeltetési és technikai kérdéseket.

3. Megfontolások

3.1 Általános rész

A következő megfontolások azon az előfeltételen alapulnak, hogy az üzemeltetési követelmények és a szükséges elkötelezettség rendelkezésre áll, és a szükséges erőfeszítéseket ráfordítják.

3.2 ILS vonatkozású megfontolások

a) Fennáll az a veszély, hogy a II. vagy III. kategóriájú ILS üzemeltetéseket bizonyos sajátságos helyeken nem lehet biztonságosan fenntartani;

b) az ILS vevők interferencia érzéketlenségi teljesítmény szabványokat az Annex 10, I. Kötet 3. Fejezet 3.1.4 pontja tartalmazza;

c) az ILS bővítését a rendelkezésre álló csatornák száma (40 csatorna) korlátozza;

d) sok öregedő ILS földi berendezést ki kell cserélni; és

e) a világ legtöbb területén az ILS fenntartható a belátható jövőben.

3.3 MLS vonatkozású megfontolások

a) Az MLS I. kategória üzemel;

b) a II. kategóriára alkalmas földi berendezés alkalmassági bizonyítványa megvan. A földi és fedélzeti IIIB berendezés alkalmassági bizonyítványa kidolgozás alatt van és 2004-2005 között fejeződik be előreláthatólag;

c) az MLS kivitelezése bizonyos helyekre tervezve van, hogy javítsa a felszállópálya felhasználhatóságát alacsony látási körülmények között is.

3.4 Műholdas Navigációs Világrendszer (GNSS) vonatkozású megfontolások

a) Szabványok és Ajánlott Gyakorlatok (SARPs) vannak életbe léptetve a GNSS számára kiegészítéssel, a Megközelítés Függőleges vezetéssel (APV) és az I. kategóriájú precíziós megközelítés támogatására;

b) Szabványok és Ajánlott Gyakorlatok (SARPs) vannak kidolgozás alatt a Földi Bázisú Regionális Kiegészítő Rendszer (GRAS) Megközelítés Függőleges vezetéssel (APV) számára.

c) a GNSS rendszerrel együttműködő Műhold Bázisú Kiegészítő Rendszer (SBAS) a Megközelítés Függőleges vezetéssel (APV) a világ néhány részében már működik.

d) a GNSS rendszerrel együttműködő Földi Bázisú Kiegészítő Rendszer (GBAS) az I. kategóriájú precíziós megközelítési műveletekhez várhatóan 2006-ban lép működésbe.

e) nem várható, hogy egy nemzetközileg elfogadott Műholdas Navigációs Világrendszer a kiegészítéseivel, ahogy szükséges, a II. és III. Kategóriájú üzemeltetésekre a 2010- 2015. közötti évek előtt rendelkezésre álljon.

f) a Műholdas Navigációs Világrendszerrel végrehajtott megközelítési, leszállási és indulási üzemeltetésekhez kapcsolódó technikai és üzemeltetési kérdéseket időszerű módon meg kell oldani;

g) a Műholdas Navigációs Világrendszerrel végrehajtott megközelítési, leszállási és indulási üzemeltetésekhez kapcsolódó rendszeresítési kérdéseket időszerű módon meg kell oldani;

3.5 Többféle végrehajtási utasítással ellátott fedélzeti megközelítési és leszállási képességgel kapcsolatos megfontolások

Ennek a stratégiának a lehetővé tételéhez egy többféle végrehajtási utasítással ellátott fedélzeti megközelítési és leszállási képesség szükséges, hogy rendelkezésre álljon.

3.6 Egyéb megfontolások

a) Növekvő igény van a II. és III. kategóriájú üzemeltetések iránt;

b) a GNSS potenciálisan egyedi üzemeltetési előnyöket tud biztosítani az alacsony látású üzemelésekhez, beleértve új eljárásokat, rugalmas telepítési követelményeket és a repülőtéri felszíni forgalomvezetés ellátását;

c) csak a három szabványos rendszer (ILS, MLS és a GNSS a kívánt kiegészítéssel) játszik szerepet az összes időjárási körülmények közötti ütemeltetések támogatásában. A szem elé vetített kijelzések, együttműködve a fejlett és/vagy szintetikus kijelző rendszerekkel, üzemeltetési előnyöket adhatnak.

d) A globális stratégia következménye, hogy nincs gyors átmenet az ILS-ből az új rendszerekre, mint a GNSS, vagy MLS. Különösen fontos a stratégia kiépítésekor, hogy a rendszerek által használt rádiófrekvenciás spektrum megfelelően védve legyen;

e) a gyakorlatban ajánlott a közvetlen átmenet az ILS-ből a GNSS-re. Néhány Államban ugyanakkor nem lehetséges ennek az átmenetnek a végrehajtása a II., vagy a III. Kategóriás jelenlegi üzemeltetési szint elvesztése nélkül;

f) amíg néhány felhasználó egy adott felszállópályánál továbbra is az ILS-re támaszkodik, az új leszállító rendszerek bevezetéséből származó üzemeltetési előnyöket korlátozhatja a több-rendszerű üzemeltetésekből származó hátrány.

g) az APV üzemeltetések irányíthatók GNSS-el, a szükséges kiegészítéssel együtt, vagy barometrikus függőleges vezetéssel, valamint ABAS, vagy DME/DME RNAV oldalirányú vezetéssel; és

h) az APV üzemeltetések magasszintű biztonságot és általában alacsonyabb üzemeltetési minimumot biztosítanak, összehasonlítva a nem-precíziós megközelítésekkel.

4. Stratégia

A fenti megfontolásokon alapulva és azzal a szükségességgel, hogy a légijárművek járatóival és a nemzetközi szervezetekkel – a biztonságot szem előtt tartva - konzultálni kell, az általános stratégia a következő:

a) folytatni kell az ILS üzemeltetéseket a szolgáltatás legmagasabb szintjén addig, amíg az üzemeltetésileg elfogadható és gazdaságosan előnyös, annak biztosításáért, hogy a repülőtér megközelítés ne legyen visszautasítva olyan repülőgép esetében, mely kizárólag ILS berendezéssel van felszerelve;

b) bevezetni az MLS-t ott, ahol üzemeltetésileg szükséges és gazdaságosan előnyös;

c) bevezetni a GNSS-t kiegészítéssel (ami ABAS, SBAS, GBAS), ahogy szükségszerű az APV és az I. kategóriájú üzemeltetések számára; ahol üzemeltetésileg szükséges és gazdaságosan előnyös, miközben biztosítani kell, hogy az egyenlítői régiókban az ionoszférikus terjedéssel kapcsolatos feladatokat kellő időben megállapítják és megoldják;

d) előmozdítani a többféle végrehajtási utasítással ellátott fedélzeti megközelítési és leszállási képesség kifejlesztését;

e) előmozdítani az APV üzemeltetések használatát, különösen azokat, melyeka GNSS függőleges vezetést használják, a biztonság és a megközelíthetőség fokozása érdekében;

f) üzemeltetési és technikai alkalmazhatósági feladatokat meghatározni és megoldani a GNSS számára, mely földi bázisú kiegészítő rendszerrel (GBAS) dolgozik és támogatja az I. és II. Kategóriájú üzemeltetéseket. Elő kell mozdítani a GNSS II. és III. Kategóriás üzemeltetéseket ott, ahol üzemeltetésileg szükséges és gazdaságosan előnyös; és

g) lehetővé tenni az egyes körzetekben, hogy kifejlesszék ezeknek a rendszereknek a bevezetésének stratégiáját az általános stratégiával párhuzamosan.

"C" MELLÉKLET: TÁJÉKOZTATÁSOK ÉS ÚTMUTATÓ ANYAG A SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK-NAK AZ ILS-re, A VOR-ra, A PAR-ra, a 75 MHz-es (ÚTVONAL) HELYJELADÓKRA (ÚTVONAL), AZ NDB-re ÉS A DME-re TÖRTÉNŐ ALKALMAZÁSÁHOZ

1. Bevezetés

Az ebben a Mellékletben lévő anyag célja az, hogy útmutatásként, vagy tisztázó célokra szolgáljon, és nem tekinthető az előírások részének, vagy az I. Kötetben foglalt Szabványok és Ajánlott Gyakorlatok részének.

A következő szöveg megértésének tisztázása és az egymással szorosan kapcsolódó fogalmak gyors eszmecseréjének elősegítésére a következő meghatározásokat építettük be.

A Műszeres Leszállító Rendszerre (ILS) vonatkozó meghatározások

Megjegyzés. - Az itt megadott szakkifejezések a legtöbb esetben alkalmasak akár előtag nélküli, akár a "névleges" és a "kimutatott" előtaggal való alkalmazásra. Az ilyen szóhasználatban a következő jelentést közvetítik:

A "névleges" előtag: *valamely alkotóelem, vagy fogalom tervezési jellemzője.*

Előtag nélkül: *egy alkotóelem, vagy egy fogalom elért jellemzője.*

A "kimutatott" előtaggal: *valamely alkotóelem, vagy fogalom elért jellemzője, úgy, ahogy az egy vevőn kimutatásra került (azaz a vevő berendezés hibáit is beleértve).*

Iránysáv adó rendszer	ILS siklópálya rendszer

Slant course line. Lejtős irányvonal
Az útirány felület és az ILS siklópálya névleges síkjának metszése által kialakuló vonal.

	False ILS glide path. Hamis ILS siklópálya A futópálya középvonalát magába foglaló függőleges síkban lévő azon pontok helye, amelynél a modulációs mélység különbség (DDM) nulla, és nem azoknak a pontoknak a helyei, amelyek az ILS siklópályát képezik.

Displacement error. Eltolódási hiba
A nulla modulációs mélység különbség (DDM) bármely pontjának szögbeli, vagy hosszirányú eltérése a névleges iránysáv vonalhoz, vagy a névleges ILS siklópályához viszonyítva külön-külön.

Linearity sector. Lineáris szektor
Az útirány szektoron, vagy egy ILS siklópálya szektoron belül az az iránysáv vonalat, vagy az ILS siklópályát magába foglaló szektor, amelyen belül az eltérés egységenkénti DDM növekedés lényegében állandó marad.

Low DDM zone. Alacsony értékű DDM zóna
Az irány szektoron, vagy egy ILS siklópálya szektoron kívüli azon szektor, amelyben a modulációs mélység különbség (DDM) a zónán belülre meghatározott minimális értéknél kisebb.

Megjegyzés. - Az ilyen zónákra vonatkozó minimális DDM értékek a 3. Fejezet 3.1.3.7 és 3.1.5.6 pontjában kerültek meghatározásra.

Plane of the nominal ILS glide path. A névleges ILS siklópálya síkja
A futópálya meghosszabbított középvonalának függőleges síkjára merőleges és a névleges ILS siklópályát magába foglaló sík.

Indicated course sector. Kimutatott irányvonal
Bármely vízszintes síkban lévő azon pontok mértani helye, amelyeknél a vevő kimutatott eltérése nulla.

Indicated ILS glide path. Kimutatott ILS siklópálya
A futópálya középvonalát magába foglaló függőleges síkban azon pontok mértani helye, amelyeknél a vevő kimutatott eltérése nulla.

Indicated slant course line. Kimutatott lejtős irányvonal
A kimutatott irány felületnek és a névleges ILS siklópálya síkjának a metszése által kialakított vonal.

Indicated ILS glide path angle. Kimutatott siklópálya szög
A kimutatott ILS siklópályának a vízszintes sík feletti szöge.

Indicated course sector. Kimutatott irány szektor
A kimutatott irányvonalat magába foglaló bármilyen vízszintes síkban lévő azon szektor, amelyben a vevő kimutatott eltérése a teljes skála eltérés értéken belül marad.

Indicated ILS glide path sector. Kimutatott ILS siklópálya szektor
A kimutatott ILS siklópályát magába foglaló azon szektor, amelyben a vevő kimutatott eltérése a teljes skála eltérés értéken belül marad.

Localizer course bend. Iránysáv irányvonal elhajlás
Az irányvonal elhajlás az iránysáv irányvonalának a névleges helyzetéhez viszonyított eltérése.

ILS glide path bend. ILS siklópálya elhajlás
Az ILS siklópálya elhajlás az ILS siklópályának a névleges helyzetéhez viszonyított eltérése.

Incremental sensitivity. Differenciális érzékenység
A vevő kijelző műszer áramának növekedése a vevő antennának a névleges irányvonaltól, vagy a névleges ILS siklópályától való eltérésben bekövetkező egységnyi változása következtében.

Flat zone. Lapos zóna
A kimutatott irányszektoron, vagy egy kimutatott ILS siklópálya szektoron belül az a zóna, amelyen belül a szektor karakterisztika görbéjének hajlásszöge nulla.

Reversal zone. Tükörzóna
A kimutatott irányszektoron, vagy egy kimutatott ILS siklópálya szektoron belül az a zóna, amelyen belül a szektor karakterisztika görbéjének hajlásszöge negatív.

2. Az ILS berendezésekre vonatkozó anyag

2.1 A Berendezés Teljesítmény Kategória üzemeltetési céljai, tervezése és fenntartási céljai, valamint irány felépítésének meghatározása

2.1.1 A 3. Fejezet 3.1.1 pontjában meghatározott Berendezés Teljesítmény Kategóriákra a következő üzemeltetési célok vonatkoznak:

I. Kategóriájú üzemeltetés: Precíziós műszeres megközelítés és leszállás 60 m-nél (200 láb) nem alacsonyabb elhatározási magassággal és vagy 800 m-nél nem kevesebb látástávolság, vagy 550 m-nél nem kevesebb futópálya menti látástávolság mellett.

II. Kategóriájú üzemeltetés: Precíziós műszeres megközelítés és leszállás 60 m-nél (200 láb) alacsonyabb, de 30 m-nél (100 láb) nem alacsonyabb elhatározási magassággal, és 350 m-nél nem kevesebb futópálya menti látástávolság mellett.

III./A Kategóriájú üzemeltetés: Precíziós műszeres megközelítés és leszállás:

a) a 30 m-nél (100 láb) alacsonyabb elhatározási magassággal, vagy elhatározási magasság nélkül; és

b) 200 m-nél nem kevesebb futópálya menti látástávolság mellett.

III./B Kategóriájú üzemeltetés: Precíziós műszeres megközelítés és leszállás:

a) 15 m-nél (50 láb) alacsonyabb elhatározási magassággal, vagy elhatározási magasság nélkül; és

b) 200 m-nél kevesebb, de 50 m-nél nem kevesebb futópálya menti látástávolság mellett.

III./C Kategóriájú üzemeltetés: Precíziós műszeres megközelítés és leszállás elhatározási magasság nélkül és a futópálya menti látástávolság korlátozása nélkül.

2.1.2 Ezeknél a céloknál az ILS-t felhasználó légijármű típusa és a légijármű repülés vezérlő rendszere(i)nek teljesítőképessége lesz fontos. A modern légijárműveket már felszerelték az olyan megfelelő tervezésű berendezésekkel, amelyek elérik ezeket a célokat. A gyakorlatban azonban az üzemeltetési lehetőségek túlnyúlhatnak a fenti 2.1.1 pontban megadott meghatározott célokon.

2.1.2.1 A meghibásodás-érzéketlen és a meghibásodás esetén is üzemképes repülés vezérlő rendszerek rendelkezésre állása egy olyan ILS földi rendszerrel együtt, amely pontos irányvezetést biztosít a szolgáltatás folyamatosság és az integritás megfelelő szintjével, a különleges esetekre lehetővé fogja tenni az üzemeltetési célok olyan megvalósítását, amelyek nem ütköznek a fenti 2.1.1 pontban leírtakkal.

2.1.2.2 A modern automata megközelítési és leszállási rendszerekkel felszerelt légijárművek esetében az ilyen rendszerek mindennapi alkalmazását a légijárműveket üzemeltető vállalatok támogatják az olyan feltételeknél, amikor a légijárművek személyzete a megközelítés folyamatát látással ellenőrizni tudja. Például, ilyen üzemeltetéseket lehet végrehajtani az ILS - I. teljesítmény kategóriájú berendezéseken, ahol az irányvezetés minősége és fedésterülete meghaladja a 3. Fejezet 3.1.3.4.1 pontjában megadott alapkövetelményeket és egészen a futópályáig kiterjed.

2.1.2.3 Abból a célból, hogy a modern légijárművek automatikus repülőgép vezérlő rendszereinek lehetséges előnyeit teljes egészében kihasználják, egy összefüggő szükségesség merült fel egy olyan rendszer iránt, ami a földi telepítésű ILS berendezéseket annál jóval tökéletesebb módon írja le, mint ami egyedül a Berendezés Teljesítmény Kategória vonatkoztatással elérhető. Ez a három minősítési jellemzőt alkalmazó ILS osztálybasorolással érhető el. Ez azoknak a teljesítmény szempontoknak a leírását adja meg, amelyeket az üzemeltetések nézőpontjából tudni kell, abból a célból, hogy eldöntsék azt az üzemeltetési alkalmazást, amelyet a meghatározott ILS alá tud támasztani.

2.1.2.4 Az ILS osztályba-sorolási rendszer egy eszközt biztosít ahhoz, hogy megismertesse azokat a kiegészítő lehetőségeket, amelyek egy adott ILS földi berendezéstől rendelkezésre állnak, azokon túl, amelyek a 3. Fejezet 3.1.1 pontjában meghatározott berendezésekhez kapcsolódnak. Ezeket a kiegészítő képességeket lehet kiaknázni abból a célból, hogy lehetővé tegyék azt, hogy a fenti 2.1.2.1 és 2.1.2.2 pont szerinti üzemeltetési felhasználás engedélyezve legyen a fenti 2.1 pontban leírt üzemeltetési célokban megállapított értékekig és azok alá.

2.1.2.5 Az osztálybasorolási rendszer egy példája az alábbi 2.14.3 pontban kerül bemutatásra.

2.1.3 Az ILS I. és II. Üzemeltetési Teljesítmény Kategóriájú célok eléréséhez megfelelő fedélzeti berendezés tűréshatárokra vonatkozó útmutató anyagot az alábbi 2.2.4 és 2.2.5 pont adja meg. A megfelelő ILS berendezéseket felhasználó II. Kategóriájú üzemeltetések esetén megvalósítható lehet az, hogy engedélyezzék az üzemeltetéseket az alacsony megközelítési sebességű és kielégítően bizonyított manőverező képességű, a II. Kategóriára meghatározottaknál kevésbé szigorú tűréshatárú fedélzeti berendezéssel felszerelt légijárművek részére.

Megjegyzés. - A következő útmutató anyag célja az, hogy segítséget nyújtson az Államok részére akkor, amikor az elhajlással rendelkező ILS iránysáv adó irányvonalú és siklópályájú berendezések elfogadhatóságát értékelik. Jóllehet, a meghatározás szerinti irányvonal elhajlás és siklópálya elhajlás külön-külön az iránysáv adó irányvonalának és a siklópályájának a névleges helyzetéhez van vonatkoztatva, a nagyfrekvenciás eltérés értékelése a közepes irányvonaltól vagy pályától való eltérésen alapszik. A 2.16 pontban és a C-2. számú ábrán bemutatott, az elhajlások értékelésére vonatkozó anyag azt jelzi, hogy az elhajlások hogyan vonatkoznak az irányvonal, vagy a pálya közepes helyzetére. A légijármű fedélzeti regisztrálás szabályszerűen ebben a formában fog történni.

2.1.4 *Iránysáv vonal elhajlások.* Az iránysáv vonal elhajlásokat a 3. Fejezet 3.1.3.4 pontjában meghatározott irány felépítésben kifejezve kell kiértékelni. A III. Kategóriájú körülmények között végrehajtott leszállásokra és leszállás utáni kifutásra tekintettel ez az irány felépítés azon a kívánalmon alapszik, hogy kielégítő irány vezetés kerüljön biztosításra a kézi vezetési és / vagy automatikus üzemeltetésekre a futópálya felülete mentén az alacsony látástávolságú körülmények esetén. Az I. Kategóriájú teljesítményre tekintettel, a megközelítési szakaszban ez az irány felépítés azon a kívánalmon alapszik, hogy a légijárműnek az iránysáv vonal elhajlása miatti eltérését (a 95 százalékos valószínűségi alapon) a 30 méteres (100 láb) magasságban 10 méternél (30 láb) kevesebb oldalirányú eltolódásra korlátozzák. A II. és III. Kategóriájú teljesítményre tekintettel a megközelítési szakaszban ez az irány felépítés azon a kívánalmon alapszik, hogy a légijárműnek az iránysáv vonal elhajlása miatti eltérését (a 95 százalékos valószínűségi alapon) az ILS B-pontja és az ILS vonatkozási pontja közötti körzetben (II. Kategóriájú berendezések), vagy a D-pontja között (III. Kategóriájú berendezések) 2 foknál kisebb bedöntési és bólintási térbeli helyzetre és az oldalirányú eltolódását 5 méternél (15 láb) kevesebbre csökkentsék.

1. Megjegyzés. - Az iránysáv vonal elhajlások elfogadhatatlanok akkor, ha eleve megakadályozzák azt, hogy a légijármű szabályos körülmények között, stabil térbeli helyzetben és az iránysáv vonaltól való eltolódás elfogadható határértékein belül, olyan helyzetben érje el az elhatározási magasságot, ahonnan a biztonságos leszállás megvalósítható lesz. Az automatikus és a fél-automatikus ráállást nagyobb mértékben befolyásolhatja az elhajlások előfordulása, mint a kézi vezetési ráállást. Miután a légijármű ráállt a megközelítésre, egy erős kormánymozdulat megakadályozhatja a megközelítés, vagy a leszállás sikeres befejezését. Azonkívül, amikor automatikus ráállást használnak fel, akkor üzemeltetési követelmény lehet az is, hogy a megközelítést az elhatározási magasság alá is folytassák. A légijármű irányvezetése kielégítő lehet akkor, ha a 3. Fejezet 3.1.3.4 pontjában leírt irány felépítésre vonatkozó előírások kielégítésre kerültek.

2. Megjegyzés. - Az olyan elhajlásokat, vagy egyéb rendellenességeket, amelyek elfogadhatatlanok, általában precíziós légi ellenőrzési technikát igénylő stabil légköri állapotok mellett végrehajtott repülésekkel kell megállapítani.

2.1.5 *ILS siklópálya elhajlások.* Az elhajlásokat a 3. Fejezet 3.1.5.4 pontjában meghatározott ILS siklópálya irány felépítéséhez viszonyítva kell kiértékelni. Az I. Kategóriájú teljesítmény szempontjából a siklópálya irány felépítése azon a kívánalmon nyugszik, hogy a légijárműnek a siklópálya elhajlása miatti eltérését (a 95 százalékos valószínűségi alapon) a 30 méteres (100 láb) magasságban 3 méternél (10 láb) kisebb függőleges eltolódásra korlátozzák. A II. és III. Kategóriájú teljesítmény szempontjából a siklópálya irány felépítése azon a kívánalmon alapszik, hogy a légijárműnek a siklópálya elhajlás miatti eltérését (a 95 százalékos valószínűségi alapon) a 15 méteres (50 láb) magasságban 2 foknál kisebb bedöntési és bólintási térbeli helyzetre és a függőleges irányú eltolódásokat 1,2 méternél (4 láb) kisebbre korlátozzák.

1. Megjegyzés. - A siklópálya irányvonal elhajlások elfogadhatatlanok akkor, ha eleve megakadályozzák azt, hogy a légijármű szabályos körülmények között, stabil térbeli helyzetben és az ILS siklópályától való eltolódás elfogadható határértékein belül, olyan helyzetben érje el az elhatározási magasságot, ahonnan a biztonságos leszállás megvalósítható lesz. Az automatikus és a fél-automatikus ráállást nagyobb mértékben befolyásolhatja az elhajlások előfordulása, mint a kézi vezetési ráállást. Azonkívül, amikor automatikus ráállást használnak fel, akkor üzemeltetési követelmény lehet az is, hogy a megközelítést az elhatározási magasság alá is folytassák. A légijármű irányvezetése kielégítő lehet akkor, ha a 3. Fejezet 3.1.4.4 pontjában leírt irány felépítésre vonatkozó előírások kielégítésre kerültek.

2. Megjegyzés. - Az olyan elhajlásokat, vagy egyéb rendellenességeket, amelyek elfogadhatatlanok, általában - szükség szerint speciális földi mérésekkel kiegészített - precíziós légi ellenőrzéssel kell megállapitani.

2.1.6 *Az iránysáv irányvonal / siklópálya irányvonal elhajlásának nagyságára vonatkozó Szabvány alkalmazása.* Az iránysáv irány felépítésére (3. Fejezet 3.1.3.4 pont) és az ILS siklópálya irány felépítésére (3. Fejezet 3.1.5.4 pont) vonatkozó előírások alkalmazásánál a következő követelményeket kell alkalmazni:

- A C-1. számú ábra azt az összefüggést mutatja be, ami a maximális (95 százalékos valószínűségű) iránysáv irányvonal / /siklópálya irányvonal elhajlásának nagysága és a futópálya küszöbétől mért távolság között a II. és III. kategóriájú teljesítményre meghatározásra került.

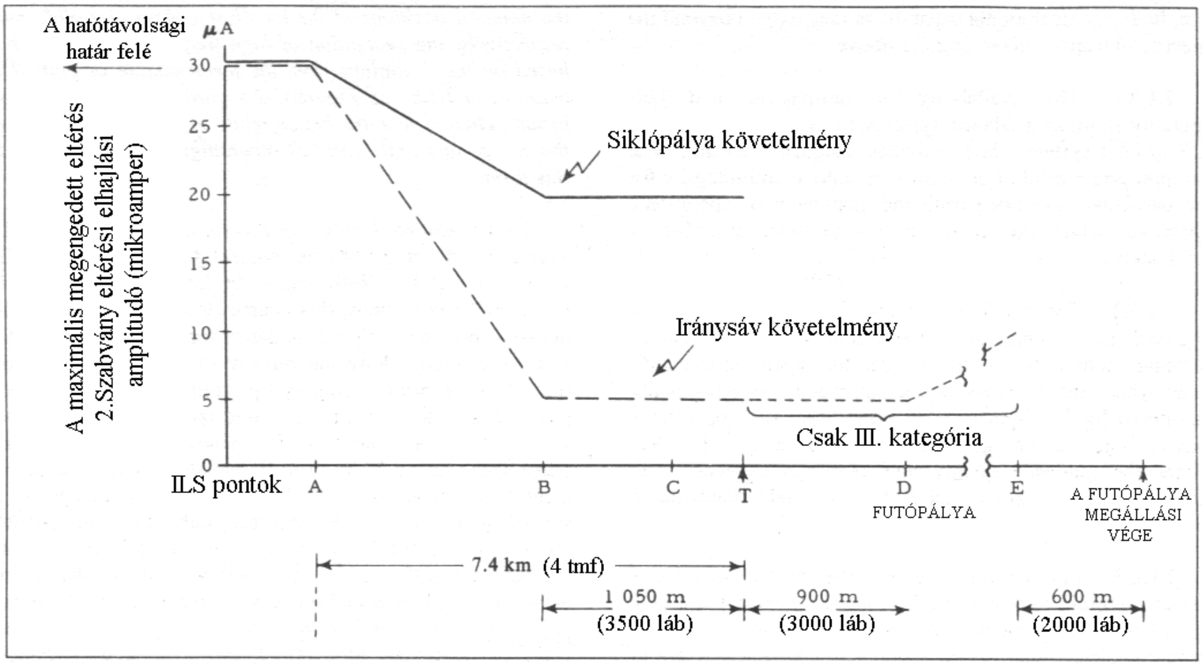
- Amikor az elhajlás nagyságát akarják a megközelítés bármely körzetében kiértékelni, akkor az ellenőrző repülés rögzített adatait - a légijármű szögbeli helyzet-hibájával helyesbítve - kell a kiértékelendő körzet középpontjához viszonyított plusz, vagy mínusz 20 másodperces időközre elemezni. A következők egy 195 km/órá-s (105 csomó) – plusz, vagy mínusz 9 km/óra (5 csomó) - légijármű föld feletti sebességen alapulnak.

A 95 százalékos maximális eltérési nagyság előírás annak a teljes időköznek a megengedhető százaléka, amelyben az irányvonal / siklópálya elhajlás nagyságának kevesebbnek kell lenni a C-1. ábrán meghatározott mennyiségnél a kiértékelés alatt álló körzetben. A C-2. számú ábra annak a módszernek egy jellemző példáját mutatja be, amit egy adott berendezés irányvonal / siklópálya elhajlás nagyságának kiértékelésére alkalmazni lehet. Ha a t_1, t_2, t_3 időközök összege - ahol az adott előírás túllépésre kerül - a teljes időnek, a 'T'-nek az 5 százalékával egyenlő, vagy annál kevesebb, akkor az a körzet, amelyet értékelnek, elfogadható. Ennek megfelelően:

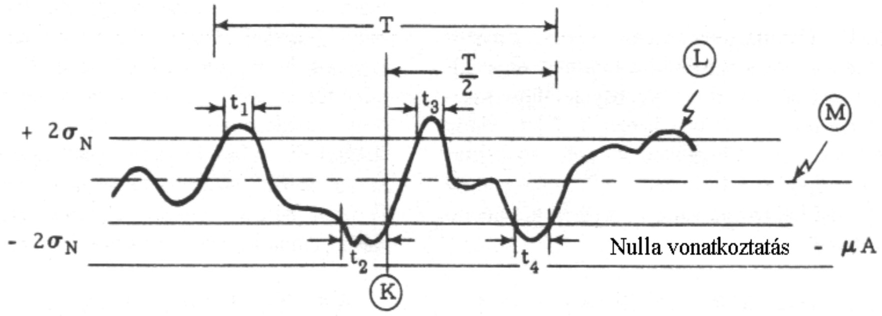
$$100\,\frac{T - [(t_1 + t_2 + \ldots)]}{T} \geq 95\%$$

Az ILS siklópálya elhajlások elemzésénél a közepes siklópályát kell alapadatként felhasználni, és nem a lefelé meghosszabbított egyenes vonalat. A görbület mértékét a földi berendezés siklópálya adó antenna rendszerének oldalirányú eltolt helyzete, az ennek az antenna-rendszernek a futópálya küszöbtől való távolsága és a végső megközelítési útvonal mentén lévő és a siklópálya adó telepítési helyén lévő talajfelszín relatív magasság szabályozza (lásd az alábbi 2.4 pontot).

2.1.7 Az ILS sugárnyaláb elhajlás felépítésében jelen lévő összetett frekvencia elemek következtében a sugárnyaláb elhajlás mért értékei a fedélzeti vevő berendezés és a rögzítő berendezés frekvencia jelleggörbéjétől függenek. Az a cél, hogy az elhajlás méréseket úgy szerezzék meg, hogy a teljes időállandót (másodpercekben) a vevő modulációs mélység különbségének (DDM) kimeneti áramkörére és a kapcsolódó rögzítő berendezés 92,6/*V* értékére alkalmazzák, ahol a *V* a légijármű vagy, a földi jármű - amelyik a megfelelő - sebessége km/órában.



C-1. ábra: A II. és III. kategóriájú iránysáv irányvonal és siklópálya maximális elhajlási nagyságának követelménye



(L) = Teodolittal helyesbített iránysáv irányvonal/siklópálya irányvonal elhajlási minták (mikroamper)

(M) = Az iránysáv irányvonal/siklópálya irányvonal elhajlásának középértékei (mikroamper)

T = A kiétrékelendő körzet ($\pm$20 másodperc széles)

$\pm 2\sigma_N$ = A maximális elhajlási nagyság előírás a (K) pontnál (mikroamper)

t_1, t_2, t_3, ... = Azok az időtartamok, ahol a zaj meghaladja a megengedhető $2\sigma_N$ értéket.
A berendezésre ebben a körzetben elfogadható érték:

$$100\,\frac{[T-(t_1+t_2+t_3\ldots)]}{T} \geq 95\%$$

C-2. ábra: Az iránysáv irányvonal / siklópálya irányvonal elhajlási magasságának (amplitúdójának) kiértékelése

2.1.8 *Felügyelő rendszer.* A rendelkezésre álló bizonyítékok azt jelzik, hogy a 3. Fejezet 3.1.3.6, 3.1.3.7 és 3.1.5.6 pontjában meghatározott határértékeken belüli teljesítmény stabilitás jóval a felügyelő rendszer határértékein belül teljes mértékben elérhető.

A folyamatos ellenőrzési határértékek kiválasztása az üzemeltetési kategória biztonsági követelményének ismeretével alátámasztott döntésen alapszik. Azonban az ilyen folyamatos ellenőrzési határértékekre vonatkozó előírások nem jelezhetik azokat a szabályos napról - napra változó teljesítmény értékeket, amelyek a beállítási hibákból és a berendezés ingadozásaiból eredhetnek. Ki kell vizsgálni és meg kell tenni a szükséges javító intézkedéseket akkor, ha a teljesítmény napról - napra gyakran ingadozik, a 3. Fejezet 3.1.3.6 , 3.1.3.7 és 3.1.5.6 pontjában meghatározott határértékeken belül. Az ilyen ingadozások okait ki kell küszöbölni:

a) az előírt ellenőrzési határértékek közelében ingadozó kritikus jel paraméterek lehetőségének nagymértékű csökkentésével;

b) az ILS szolgáltatás nagymértékű folyamatosságának biztosításával.

A következőkben néhány általános irányelvet adunk meg a felügyelő rendszerek tervezéséhez, üzemeltetéséhez és karbantartásához azért, hogy megfeleljenek a 3. Fejezet 3.1.3.11 és 3.1.5.7 pontja követelményeinek.

1) Nagyon gondosan kell eljárni annak biztosításánál, hogy a felügyelő rendszer válaszoljon a földi berendezés minden olyan eltérésére, ami kedvezőtlenül befolyásolhatja a légijármű fedélzeti rendszer üzemelését az ILS megközelítés során.

2) A felügyelő rendszernek nem szabad olyan helyi körülményekre reagálni, amelyek nincsenek hatással a fedélzeti rendszerek által észlelt navigációs információkra.

3) A felügyelő rendszer berendezése ingadozásainak nem szabad észrevehetően csökkenteni, vagy növelni a meghatározott ellenőrzési határértékeket.

4) Különleges körültekintéssel kell eljárni a felügyelő rendszer tervezésénél és üzemeltetésénél annak a célkitűzésnek a biztosításával, hogy a navigációs összetevők eltávolításra kerüljenek, vagy a sugárzást leállítsák magánál a felügyelő rendszernek a meghibásodása esetén.

5) Néhány felügyelő rendszer olyan berendezésekre támaszkodik, amelyek a jel mintákat az adó antenna-rendszer szomszédságában veszik. A tapasztalatok azt mutatják, hogy az ilyen felügyelő rendszerek külön figyelmet igényelnek a következő szempontokból:

a) ahol nagy nyílásszögű antenna-rendszereket alkalmaznak, ott gyakran nem lehetséges a felügyelő rendszer érzékelőit olyan helyen elhelyezni, hogy az érzékelési pontban a megfigyelt fázis szabály az irányvonalon a távoli-térben is fennálljon. Ennek ellenére a felügyelő rendszernek ki kell mutatni azokat az antenna és a hozzá kapcsolódó tápvonal rendszer változásokat is, amelyek jelentősen befolyásolják a távol-térben az irányvonalat;

b) a hó, állóvíz stb. okozta tényleges talajszint változások is befolyásolhatják a siklópálya felügyelő rendszerének működését és különbözően a tényleges térbeli irányvonalat, különösképpen akkor, amikor a megkívánt siklópálya sugárzási karakterisztikát a talaj síkjára vonatkoztatva alakítják ki;

c) figyelmet kell fordítani azokra az egyéb okokra is, amelyek zavarhatják a kisugárzott jel folyamatos ellenőrző érzékelését, az olyanokat, mint például a jegesedés, madarak stb.;

d) az olyan rendszereknél, ahol az ellenőrző jeleket egy visszacsatoló hurokban használják fel a megfelelő berendezés ingadozásának helyesbítésére, különleges figyelmet kell fordítani arra, hogy a magában a felügyelő rendszerben bekövetkező kívülálló hatások, vagy változások ne hozzák létre az irányvonalnak, vagy az ILS siklópályának az előírt határértékeken kívülre történő eltérését anélkül, hogy az a felügyelő rendszert riasztaná.

6) A folyamatos ellenőrzés egy lehetséges formája az olyan egybeépített felügyelő egység alkalmazása, amelyben az egyes sugárzó antenna elemeknek a távoli-térbeli irányvonal jel létrehozásához való hozzájárulását mérik magánál az antenna- rendszernél. A tapasztalat azt mutatta, hogy az ilyen felügyelő rendszerek - megfelelően felépítve - meg tudják adni a felügyelő jelzés és a távoli-térbeli kisugárzott jel közötti szoros kölcsönös viszonyt. Az ilyen típusú felügyelő rendszer bizonyos körülmények között megoldja a fenti 5) a), b) és c) pontban leírtakat.

Tudatában kell lenni annak, hogy a bármilyen térbeli pontban mért modulációs mélység különbség az elmozdulási érzékenység és az irányvonal, vagy az ILS siklópálya helyzetének függvénye. Ezt figyelembe kell venni a felügyelő rendszerek tervezésénél és üzemeltetése során.

2.1.9 *Az üzemeltetési használaton kívüli ILS iránysáv adók sugárzása.* Az üzemelő ILS iránysáv adók jeleinek erős zavarását tapasztalták a kis magasságokban megközelítéseket végrehajtó légijárművek az olyan futópályáknál, amelyek az ellentétes irányt kiszolgáló iránysáv adó berendezésekkel vannak felszerelve. Az ezeket az iránysáv adó rendszereket átrepülő légijárműveken a zavart (interferenciát) az ellentétes irányú megközelítés iránysáv adójából kisugárzott jelek keresztmodulációja okozza. Az ilyen interferencia, a kis magasságú üzemeltetések esetében, komolyan befolyásolhatja a megközelítést, vagy a leszállást, és károsan befolyásolhatja a biztonságot. A 3. Fejezet 3.1.27, 3.1.2.7.1 és 3.1.2.7.2 pontja határozza meg azokat a körülményeket, amelyek mellett az üzemeltetési használatban nem álló iránysáv adók sugárzása megengedhető.

2.1.10 Az *ILS többutas interferenciája a sugárzást visszaverő tárgyak és földi mozgások miatt*

2.1.10.1 Az ILS jelek interferenciájának előfordulása az ILS antennák körüli teljes környezettől és az antenna sugárzási karakterisztikájától függ. Bármilyen nagy sugárzást visszaverő tárgy - beleértve a

járműveket és az olyan állandóhelyű akadályokat is, mint az építmények - a kisugárzott jel fedésterületen belül potenciálisan létrehozhatja az ILS iránysáv vonal és siklópálya irány felépítésének többutas interferenciáját. A sugárzást visszaverő állandóhelyű akadályok és építmények mérete és helye az antennák irányítottsági minőségével együtt fogja meghatározni azt a statikus iránysáv, vagy siklópálya irány felépítési jellemzőt, hogy I., II., vagy III. kategóriájú lesz-e. A mozgó tárgyak lecsökkenthetik ezt az irány felépítést olymértékben, hogy az elfogadhatatlanná válik. Azt a területet, amelyen belül a lecsökkentő interferencia lehetséges, meg kell határozni és azonosítani kell.
A védőzóna kialakítása céljából ezeket a területeket két típusúra lehet felosztani, kritikus területekre és érzékenységi területekre:

a) az ILS kritikus terület egy, az iránysáv és a siklópálya adók körül kijelölt meghatározott méretű terület, ahonnan a járművek - a légijárműveket is beleértve - az összes ILS üzemeltetés végrehajtása során ki vannak zárva. A kritikus terület azért védett, mert a járműveknek és/ /vagy a légijárműveknek a határain belüli jelenléte az ILS térbeli jelek elfogadhatatlan zavarását fogják létrehozni;

b) az ILS érzékenységi terület egy, a kritikus területen kívülre kiterjedő terület, ahol a parkoló és/vagy mozgó járműveket - a légijárműveket is beleértve - ellenőrzik azért, hogy megakadályozzák az ILS jeleknek az ILS üzemeltetések során előforduló elfogadhatatlan interferenciájának lehetőségét. Az érzékenységi terület a kritikus területen kívüli, de a még általában a repülőtér határain belüli nagy mozgó tárgyak által okozott interferencia ellen biztosít védelmet.

1. Megjegyzés. - A kritikus és érzékenységi területek meghatározásának célja az, hogy kielégítő védelmet adjanak az ILS részére. Az a mód, amely szerint a szakkifejezést alkalmazzák, az Államok között változó lehet. Néhány Államban a kritikus terület kifejezést alkalmazzák még annak a területnek a leírására is, amelyre itt érzékenységi területként utaltunk.

2. Megjegyzés. - Arra lehet számítani, hogy olyan telepítési helyeken, ahol az ILS és az MLS együtt van telepítve, ott az MLS-t az ILS kritikus területen belül lehet elhelyezni, a "G"- Melléklet 4.1 Részében lévő útmutató anyagnak megfelelően.

2.1.10.2 A kritikus és érzékenységi területeknek azokat a jellemző példáit, amit védeni kell, a C-3A., C-3B., C-4A. és C-4B. számú ábra mutatja be. A kritikus terület védelménél az szükséges, hogy szabályszerűen tiltsák meg minden járműnek és a guruló, vagy parkoló légijárműveknek az erre a területre történő belépését valamennyi ILS üzemeltetés idejére. Az egyes iránysáv adóra és siklópálya adóra meghatározott kritikus területet egyértelműen ki kell jelölni. Megfelelő jelző eszközöket kell biztosítani azon gurulóutaknál és utaknál, amelyek a kritikus területbe behatolnak, azért, hogy kitiltsák a járműveket és a légijárműveket. Az érzékenységi területre vonatkozóan szükséges lehet az, hogy az összes mozgó forgalmat, vagy annak egy részét kitiltsák a lehetséges interferenciától és az üzemeltetés kategóriájától függően. Célszerű lehet a repülőtér határainak olymódon való kijelölése, hogy az magába foglalja az összes érzékenységi területet azért, hogy megfelelő ellenőrzést tudjanak biztosítani minden mozgó forgalom felett az ILS jeleinek elfogadhatatlan interferenciája megakadályozása céljából. Ha ezek a területek a repülőtér határvonalain kívülre esnek, akkor elengedhetetlen az, hogy a megfelelő hatóságokkal együttműködve, kieszközöljék a megfelelő ellenőrzés biztosítását. Üzemeltetési eljárásokat kell kifejleszteni az érzékenységi területek védelmére.

2.1.10.3 Az érzékenységi terület mérete számos tényezőtől függ, ezek az ILS antenna típusa, a terepfelszín, a mesterséges akadályok mérete és iránya, a nagy légijárműveket és járműveket is beleértve. A modern felépítésű iránysáv és siklópálya antennák nagyon hatékonyak lehetnek a zavaró lehetőségek csökkentésében, és ebből eredően az érzékenységi területek méretében. A miatt a lehetőség miatt, hogy a nagyobb típusú légijárművek nagyobb mértékben zavarják az ILS jeleit, ezekre a légijárművekre az érzékenységi terület egy jelentős távolsággal kiterjed a kritikus területen kívülre. A problémát súlyosbítja a megnövekedett földi forgalom-sűrűség.

2.1.10.3.1 Az iránysáv adó esetében az antenna fő irányú sugárzása által "megvilágított" minden nagyobb akadályt úgy kell tekinteni, mint az elfogadhatatlan jel interferencia lehetséges forrását. Ez magába foglalja a futópályán és a néhány gurulóúton lévő légijárműveket is. Az I., II. és III. Kategóriájú üzemeltetések védelmére szükséges érzékenységi területek méretei eltérőek lesznek, és a legnagyobb az lesz, ami a III. Kategóriához szükséges. Csak a legkisebb zavaró hatás engedhető meg a III. Kategóriára, de egy, a tűréshatáron kívüli irányvonal a futópálya felszíne mentén nem fogja befolyásolni az I. vagy II. Kategóriájú üzemeltetéseket. Ha az irány felépítés már a statikus többutas hatások miatt határértékű, akkor egy kismértékű további interferencia elfogadhatatlan jelet fog létrehozni. Az ilyen esetekben lehet, hogy egy nagyméretű érzékenységi területet kell elfogadtatni.

2.1.10.3.2 A siklópálya esetében a tapasztalat azt mutatja, hogy bármilyen olyan tárgyat, ami a siklópálya antenna szimmetria síkja fölé benyúlik, és az antenna oldalszög fedésterületen belül van, a jel lehetséges interferencia forrásaként kell tekinteni. Az antenna vízszintes síkja feletti felület szöge a használatos siklópálya antenna-sor típusától függ. Amikor nagyon nagy légijárművek parkolnak, vagy gurulnak a siklópálya antennától mért néhány-ezer lábon belül, vagy közvetlenül az antenna és a megközelítési siklópálya között, akkor rendszerint komoly zavart okoznak a siklópálya jelben. Másrészről a siklópálya antennától mért néhány-száz lábon túl lévő kis légijárművek hatása viszont elhanyagolhatónak látszik.

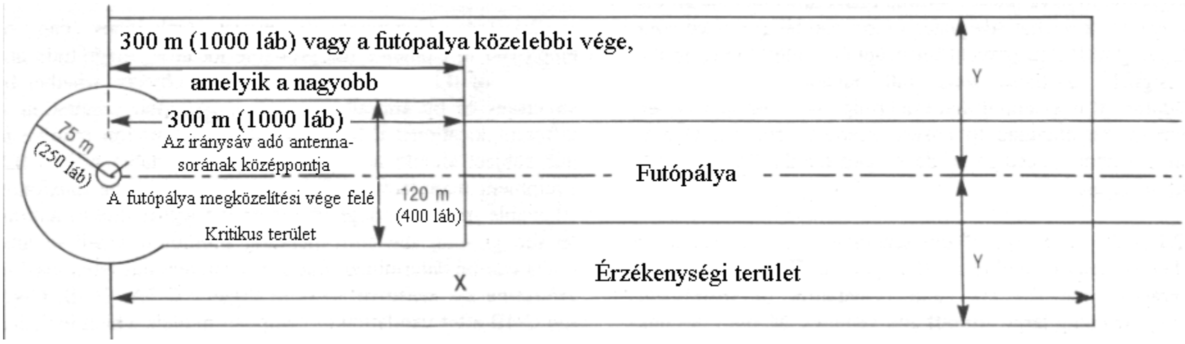
2.1.10.3.3 A tapasztalatok azt mutatják, hogy az ILS jelek visszatükröződésére és sugáreltérítésére hatással lévő azon fő tényezők, amelyek a többutas terjedési interferenciát létrehozzák, a magas és a légijárművek és járművek függőleges beállítású felületei. A valószínűleg elfogadható függőleges felület maximális magasságát a "legkedvezőtlenebb elhelyezkedésű helyzettel" együtt meg kell határozni. Ennek az oka az, hogy bizonyos elhelyezkedés határértéken kívüli iránysáv, vagy siklópálya eltéréseket okozhat nagyobb távolságokban is, mint a párhuzamos, vagy merőleges elhelyezkedések.

2.1.10.4 Számítógépes, vagy modellező technikát lehet alkalmazni az akadályok által okozott ILS zavarás valószínű helyének, nagyságának és időtartamának az olyan kiszámítására, hogy a különféle méretű és elhelyezkedésű légijárművek, vagy szerkezetek a különböző helyeken hogyan hozhatják létre. Az ezekkel a technikákkal foglalkozó kiadványok a következőket foglalják magukba:

a) általános használatúak a számítógépes matematikai modellek, és ezeket széleskörű gyakorlati szinttel rendelkező személyek alkalmazzák. Azonban a megfelelő előfeltételek és korlátozások mérnöki ismeretére és megítélésére van szükség akkor, amikor az ilyen modelleket a speciális többutas környezetben alkalmazzák. Az erre a tárgyra vonatkozó ILS teljesítmény tájékoztatásokat általában az ILS berendezések gyártói bocsátják rendelkezésükre;

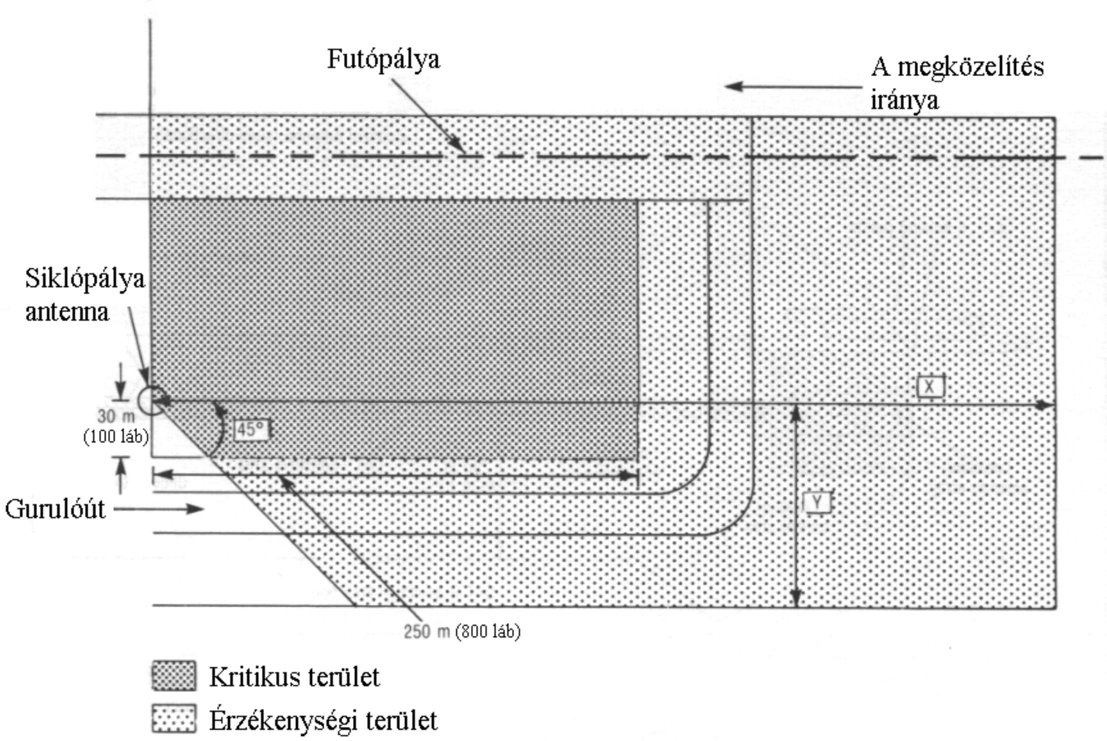
b) ahol egy ILS telepítésre került és kielégítőnek találták, ott számítógépeket és szimulációs technikát lehet alkalmazni az olyan ILS zavarás valószínű mértékének előrejelzésére, ami egy javasolt új építmény építésének eredményeként létrejöhet. Ahol az lehetséges, ott az ilyen számítógéppel segített szimuláció eredményeit az új építmény felépítése utáni tényleges repülési mérések eredményeivel való közvetlen összehasonlítással kell megerősíteni; és

c) a földön lévő légijáművek miatti maximális megengedett többutas jel csökkenést figyelembe véve meg lehet határozni a megfelelő minimális érzékenységi terület határvonalait. A C-3A, C-3B, C-4A és C-4B ábrákon megadott modellek használatosak a kritikus és az érzékenységi területek meghatározására a földön lévő légijárművek miatti maximális megengedett többutas ILS jel csökkenés figyelembe vételével. Azok a tényezők, amelyek a kritikus és érzékenységi területek méretére és alakjára hatnak, magukba foglalják: az interferenciát okozható légijármű típusokat, az antenna apertúráját és típusát (log-periódikus dipól/dipól stb.), a fedősáv jelek típusát (egy/kettős frekvencia), a javasolt üzemeltetési kategóriát, a futópálya hosszát, a meglévő építmények által okozott statikus elhajlásokat. A modellek ilyen alkalmazása magába kell, hogy foglalja azok “érvényesítését”, ami a számított eredményeknek a leparkolt légijárművek ILS jelre gyakorolt interferenciája tényleges helyszíni kimutatott adataival való összehasonlítását foglalja magába.



	1. Példa	*2. Példa*	*3. Példa*
Légijármű típus	B-747	B-747	B-727
Az iránysáv adó antenna sugárzási szöge	Jellemzően 27 m (90 láb) (Irányított két-frekvenciás, 14-elemes)	Jellemzően 16 m (50 láb) (Fél-irányított, 8-elemes)	Jellemzően 16 m (50 láb) (Fél-irányított, 8-elemes)
Érzékenységi terület (X, Y)			
I. kategória X Y	600 m (2000 láb) 60 m (200 láb)	600 m (2000 láb) 110 m (350 láb)	300 m (1000 láb) 60 m (200 láb)
II. kategória X Y	1220 m (4000 láb) 90 m (300 láb)	2750 m (9000 láb) 210 m (700 láb)	300 m (1000 láb) 60 m (200 láb)
III. kategória X Y	2750 m (9000 láb) 90 m (300 láb)	2750 m (9000 láb) 210 m (700 láb)	300 m (1000 láb) 60 m (200 láb)

C-3A. ábra: Jellemző iránysáv adó kritikus és érzékenységi terület kiterjedési változatok egy 3 000 méteres (10 000 láb) futópályára

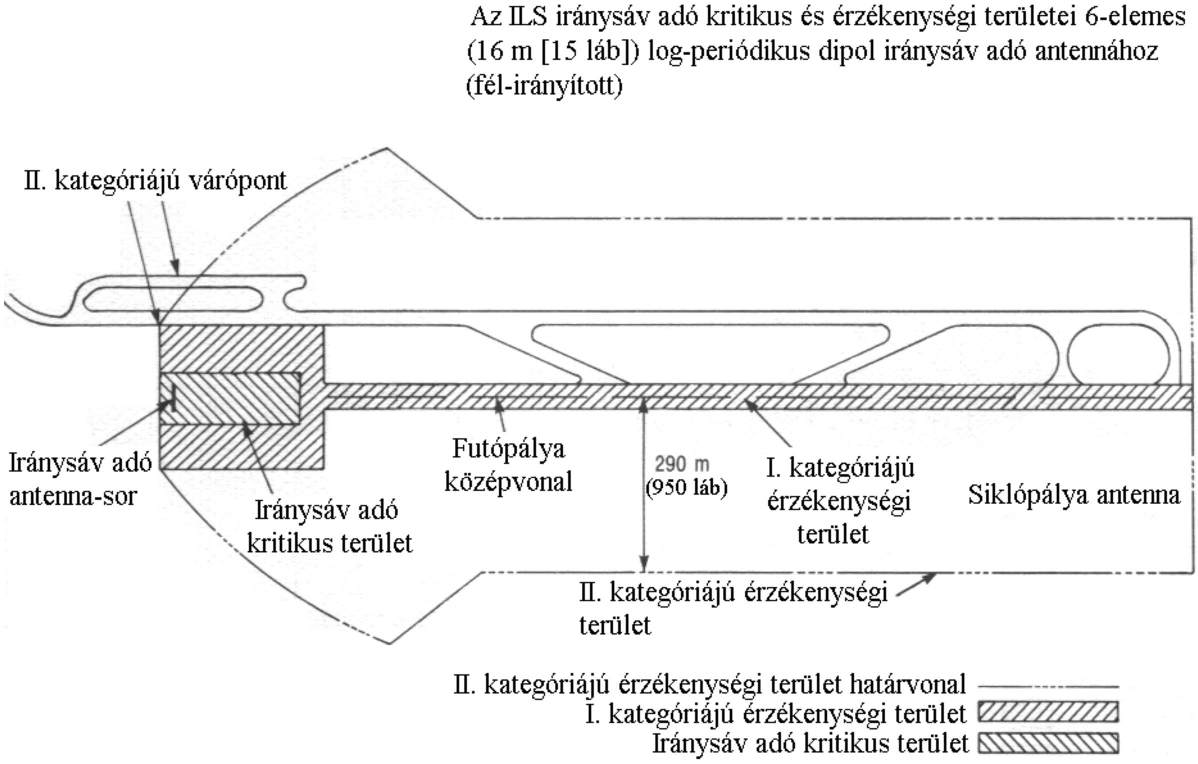


	1. Példa	*2. Példa*	*3. Példa*
Légijármű típus	B-747	B-727	könnyű és közepes*
I. kategória X	915 m (3000 láb)	730 m (2400 láb)	250 m (800 láb)
Y	60 m (200 láb)	30 m (100 láb)	30 m (100 láb)
II./III.kategória X	975 m (3200 láb)	825 m (2700 láb)	250 m (800 láb)
Y	90 m (300 láb)	60 m (200 láb)	30 m (100 láb)

* Könnyű és közepes légijárműként azokat tekintik, amelyeknek a hossza 18 m- nél (60 láb) kisebb és a magassága 6 m-nél (20 láb) kevesebb.

Megjegyzés. - Bizonyos esetekben az érzékenységi területeket a futópálya ellentétes oldalán túlra is ki lehet terjeszteni.

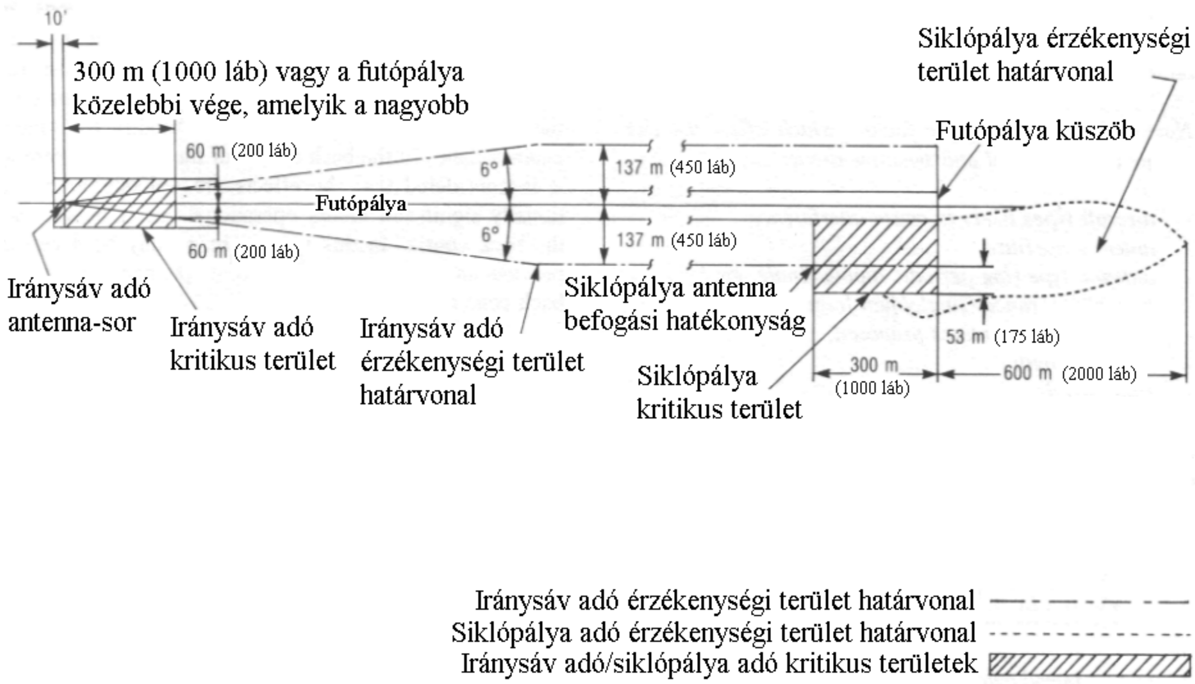
C-3B. ábra: Jellemző siklópálya adó kritikus és érzékenységi terület kiterjedési változatok



(Nem méretarányos)

C-4A. ábra: Példa a kritikus és érzékenységi területek alkalmazására speciális telepítési helyen B-747 típusú repülőgép által okozott interferenciánál

III. kategóriájú ILS iránysáv adó és siklópálya kritikus
és érzékenységi területek 24-elemes (50 m [164 láb])
iránysáv adó antennára (irányított).
Siklópálya antenna befogási hatékonyság.



C-4B. ábra: Példa a kritikus és érzékenységi területek alkalmazására speciális telepítési helyen B-747 típusú repülőgép által okozott interferenciánál

2.1.10.5 A kritikus területek ellenőrzése és az érzékenységi területek kijelölése lehetséges, hogy nem lesz elég az ILS-nek a nagy állandóhelyű földi szerkezetek által okozott többutas jelterjedés hatása elleni védelmére. Ez különösen akkor fontos, amikor az új, nagyobb légijárművek kiszolgálására szolgáló új épületek méreteit és egyéb célokat vesznek figyelembe. A repülőtér határain kívüli építmények is nehézségeket okozhatnak az ILS útirányok minőségénél még akkor is, ha azok megfelelnek az akadályok magasságára vonatkozó követelményeknek.

2.1.10.5.1 Ha a repülőtér környezetében olyan nagy állandóhelyű akadályok vannak, mint például magas épületek, amelyek azt idézik elő, hogy az iránysáv és / vagy a siklópálya irány felépítése közel van az üzemeltetési kategória tűréshatárához, akkor jóval nagyobb érzékenységi területek meghatározására lehet szükség. Ennek az az oka, hogy az ILS védelmére tervezett érzékenységi területeknél az állandóhelyű akadályok által okozott statikus sugárnyaláb elhajláshoz hozzá kell tenni a mozgó tárgyak hatását is. Azonban, a maximális elhajlási nagyság közvetlen hozzáadását nem lehet megfelelőnek tekinteni, és így a négyzetes középérték kombinációját tekintik jóval valósághűbbnek. A példák a következők:

a) az iránysáv irányvonal elhajlása statikus akadályok miatt plusz, vagy mínusz 1 ½ μA-el egyenlő. A tűréshatár plusz, vagy mínusz 5 μA. Ennek megfelelően a mozgó akadály miatt figyelembe vett tűrés az iránysáv adó érzékenységi területének meghatározásához:

$$\sqrt{5^2 - 1.5^2} = 4.77\mu A$$

b) az iránysáv irányvonal elhajlása a statikai akadályok miatt plusz, vagy mínusz 4 µA-el egyenlő. A tűréshatár plusz, vagy mínusz 5 µA. Ennek megfelelően a mozgó akadály miatt figyelembe vett tűrés az iránysáv adó érzékenységi területének meghatározásához:

$$\sqrt{5^2 - 4^2} = 3\mu A$$

A b) esetben az érzékenységi területnek nagyobbnak kell lenni, hogy ezáltal távolabb tartsa a zavart okozó tárgyakat a futópályától úgy, hogy azok az iránysáv sugárnyalábban 3 µA-es, vagy annál kisebb torzulást hozzanak létre. Ugyanezt az alapelvet kell alkalmazni a siklópálya érzékenységi területre.

2.1.11 *Útmutató anyag az ILS iránysáv elhajlási vonatkozású teljesítmény javításának üzemeltetési szempontjaihoz*

2.1.11.1 *Bevezetés.* Bizonyos helyeken a helyszínnek betudhatóan nem mindig lehetséges egyszerű szabványos ILS berendezéssel olyan iránysáv irányvonalat létrehozni, ami kielégítő mértékben mentes a zavaró elhajlásoktól, vagy rendellenességektől. Az ilyen berendezés telepítéseknél gyakran lehetséges lesz az, hogy az iránysáv irányvonal elhajlásait és rendellenességeit kielégítő mértékben csökkentsék olyan különféle módszerekkel, amelyek többsége az ebben az Annex-ben lefektetett előírásoktól bizonyos eltérések elfogadását kívánja meg, üzemeltetési szempontú esetleges hátrányokkal együtt.

2.1.11.2 *A javulást létrehozó módszerek.* Általában véve az iránysáv irányvonalának az elhajlások, vagy rendellenességek szempontjából történő javítását a sugárzásnak bizonyos irányokba való korlátozásával lehet létrehozni úgy, hogy elkerüljék, vagy minimálisra csökkentsék azokat az akadályok általi sugárzás visszaveréseket, amelyek az elhajlásokat növelik. Az olyan esetek többségében, ahol különleges kezelés szükséges, azt az akadályok irányába elhelyezett és telepített árnyékolások alkalmazásával lehet elérni. Ahol a sugárzást visszaverő akadályok száma nagy, vagy nagyméretűek, ott azonban az lehet szükséges, hogy az iránysáv adó majdnem teljes sugárzását egy, az iránysáv vonalra központosított keskeny szektorra korlátozzák. Az egyes módszerek bizonyos hátrányokkal járhatnak, amelyeket mérlegelni kell az egyedi berendezések esetében, a berendezésre épített különleges üzemeltetési alkalmazások és a következő megfontolások figyelembevételével.

2.1.11.3 *Az előzőekben említett javításokat létrehozó módszerek hátrányai*

2.1.11.3.1 A sugárzást a kiválasztott irányokban korlátozó árnyékolások alkalmazása általában az ILS két moduláló jele közötti különbséget csökkenti valamilyen más irányban avval a következménnyel, hogy az ILS kijelző műszer mutatója a közép fele mozdulhat el akkor, amikor a légijármű az ebben az irányban lévő területen áthalad. Azonban általában ez úgy tekinthető, hogy az ilyen kitérések üzemeltetési szempontból nem jelentősek, vagy megfelelő eljárások kidolgozásával áthidalhatók. Bizonyos alkalmazásoknál a jeleknek az irányszektorban, -ahol a jeleknek az árnyékoló rácsokkal, vagy reflektorokkal történő felerősítését alkalmazzák -, az árnyékoló rácsok, vagy reflektorok módosítani fogják az iránysáv adó hatótávolságot és az iránysáv hátsó irányszektorának jellemzőit. Itt azonban ismét úgy lehet tekinteni, hogy a hatások üzemeltetési szempontból valószínűleg nem jelentősek, kivéve azt, ha a hátsó irányszektor üzemeltetési felhasználását alkalmazzák. Ebben az utóbbi esetben szükséges lehet egy olyan további berendezés biztosítása, ami a hátsó irányszektort kiegészíti, vagy helyettesíti.

2.1.11.3.2 Ahol az szükséges, hogy az iránysáv adó sugárzását egy széles szektorban korlátozzák, és annak nagyobb részét az iránysáv adó első sugárnyalábjára összpontosítottan kell leszűkíteni, abból a célból, hogy az elhajlásokat kielégítő mértékben lecsökkentsék, ott a hátrányok általában a következők lesznek:

1) Az iránysáv adó tájékozódási információja abban a szektorban, amelyben a sugárzás le van szűkítve, vagy többé nem áll rendelkezésre, vagy nem lesz megbízható.

2) Gyakorlatilag megvalósíthatatlan lesz a fedélzeti vevő-rendszernek a jelölő rendszer általi előzetes ellenőrzése addig, míg a légijármű az iránysáv vonal középpontú szektoron belül van.

3) Az iránysáv vonal középpontú szektoron kívül eső területen bizonyos irányokban kielégítő sugárzás fordulhat elő ahhoz, hogy a légijármű fedélzeti ILS kijelzőt egy olyan bizonytalan módon működtesse, ami hamis kijelzésig történő növekedést adhat.

4) A hátsó irányszektor elvesztése.

2.1.11.3.3 Az 1) pontra vonatkozólag az a vélemény, hogy a tájékozódási információ szükséges, de a gyakorlat azt mutatja, hogy az ilyen információ minden esetben lehetőleg megszerezhető egy olyan kiegészítő berendezéstől, mint például egy helyjeladó. Egy ilyen kiegészítő berendezésre akkor lesz szükség, amikor az iránysáv adó sugárzása az iránysáv vonalra központosuló szűk szektorra korlátozódik. A 2) pontra vonatkozólag az a vélemény, hogy a vevő ellenőrzésének az iránysáv vonalra központosuló szektorba történő belépés előtti elvesztése üzemeltetési szempontból elfogadható.

2.1.11.3.4 A 3) pontban jelzett hátrány bizonyos esetekben komoly akadály lehet. Általában az a vélemény, hogy ennek a hátránynak az elfogadhatósága azon múlik, hogy milyen mértékű hamis kijelzés fog jelentkezni egy adott helyen, valamint az ILS berendezés felhasználásához létrehozott, vagy előírt eljárásoktól. Gyakorlatilag lehetséges olyan eljárások kidolgozása, amelyeknél az iránysáv adó jeleit mindaddig nem használják fel, amíg a légijármű nem képes ellenőrizni azt, hogy a felhasználható szektoron belül van. A tapasztalatok azt mutatják, hogy egy üzemeltetési használatban lévő berendezés esetében - eljárási szempontból - nem merül fel nehézség az irányszektoron kívüli bizonytalan műszer jelzések miatt. Az a vélemény, hogy az a kérdés, vajon üzemeltetési szempontból elfogadható-e, vagy sem a sugárzásnak az egy keskeny szektorban való összeszűkülése miatti irányszektoron kívüli jel karakterisztika, az adott érintett helyen történő egyedi kiértékelés tárgya.

2.1.11.3.5 A 4) pontban jelzett hátsó irányszektor elvesztésének több hátránya lehet. Bizonyos helyeken, a hátsó irányszektor hasznos funkcióként szolgál a más berendezésekkel való metszéspontjai által az érintett területre meghatározott eljárások elősegítésére. Azonkívül a hátsó irányszektor gyakran hasznos segítséget biztosít a megszakított megközelítési eljárásokhoz is, és gyakran fel lehet használni azoknak a leszállásokhoz történő megközelítéseknek az egyszerűbbé tételénél, amelyeket olyan körülmények tesznek szükségessé, hogy a leszállási irány ellentétes azzal az iránnyal, amit az ILS elsődlegesen kiszolgál. A hátsó irányszektor elvesztése általában megfelelő eszköz, vagy eszközök biztosítását teszi szükségessé, és a hátsó irányszektor elnyomásának elsődleges hátrányát a helyettesítő berendezés, vagy berendezések kiegészítő költségében kifejezve is figyelembe vehető.

2.1.11.4 *Az iránysáv vonalon központosuló szektor szűkítési lehetőségének mértéke.* Az a vélemény, hogy az iránysáv vonal mindkét oldalán minimálisan 10 fokos sugárzási szektor lehet az, ami még üzemeltetési szempontból elfogadható. Az a kívánatos, hogy az iránysáv adótól származó jelek karakterisztikája megegyezzen azzal, ami a 3. Fejezetben előírásra került arra a körzetre, ami az iránysáv vonal közvetlen szomszédságában van (a 0,155-től a nulláig terjedő modulációs mélység különbség), illetve a 10 fokon kívüli érték közvetlen közelében van, úgy, hogy az ILS jelző műszer kijelzései és a csatoló egységbe betáplált jelek - ha ilyen használatos - feleljenek meg a szabványos ILS-nek minden olyan szükséges manőver esetében, ami az iránysávhoz való közelítéstől az iránysáv vonalra történő ráálláshoz szükséges.

Azonban tudatában kell lenni annak, hogy egy megnövelt futópálya hosszúságnál az iránysáv irányszektorának az a része, amelyen belül az arányos útirányvezetést biztosítani kell, szűkebb lesz, annak eredményeként, hogy az iránysáv adót a 3. Fejezet 3.1.3.7.1 pontjában előírt érzékenységre szabályozzák be. Jóllehet, az arányos útirány-vezetési jel biztosításra kerül az iránysáv vonal mindkét oldalán a 0,180 modulációs mélység különbség (DDM) szintig, mégis, a 0,150 modulációs mélység különbség (DDM) feletti szint lehet, hogy nem lesz használható az automatikus repülési rendszerek részére a ráállási manőver során anélkül, hogy a rendszert felszerelnék az olyan szektorban való működésre, amelyben minimálisan 0,180 modulációs mélység különbség van biztosítva (azaz plusz, vagy mínusz 10 fok). Előnyös, ha lehetővé teszik azt, hogy az automatikus fedélzeti rendszer fel legyen szerelve úgy, hogy a 10 foknál nagyobb irányszektoron kívüli szögnél is lehetővé tegye a befogási módot; ennek megfelelően az a kívánatos, hogy megtartsuk a minimális 0,180 értékű modulációs mélység különbséget a plusz, vagy mínusz 10 foknál szélesebb szektoron, ahol az gyakorlatilag megvalósítható.

2.1.11.5 *További lehetőségek.* Ha a fenti 2.1.11.3 pontban tárgyalt korlátozott fedésterületből és módosított jel jellemzők alkalmazásából eredő hátrányok elfogadhatatlanok, akkor lehetőségek vannak két rádió viviőfrekvencia alkalmazásával az olyan fedésterület és jel jellemzők biztosítására, amelyek fenntartják az elnyomott szektorban a szabvány ILS által nyújtott alapvető információkat, és ugyanakkor az iránysáv szaktor körüli körzetben megtartják a korlátozott fedésterületi rendszer céljait. Ennek a jóval bonyolultabb rendszernek az alkalmazására a magas többutas terjedési környezetű repülőtereken lehet szükség. A két rádió vivőfrekvenciás fedésterületről szóló kiegészítő útmutató anyag az alábbi 2.7 pontban került megadásra.

2.2 Az ILS légijármű fedélzeti vevő berendezése

Megjegyzés. - Az előírt tűréshatárok azok, amelyeket szükségesnek tartanak az üzemeltetési cél eléréséhez, és ahol megfelelő, a következő megengedett eltéréseket foglalják magukba:

a) a vonatkozó földi rendszerek azon határértékeken belüli eltéréseit, ami a 3. Fejezet 3.1 pontjában meghatározásra került;

b) a légijármű környezet változásait;

c) a mérési hibákat; és

d) a szolgáltatásnak a karbantartási periódusok közötti lecsökkenését.
Az ebben a részben használt "vevő berendezés" szó magát a vevőt, az antenná(ka)t és a légijárművön belüli csatolásokat foglalja magába.

2.2.1 *Általános rész*

2.2.1.1 Abból a célból, hogy a megfelelő és megbízható működés biztosítva legyen, a vevőnek az iránysáv vonalra (központosítás) és az iránysáv szélességre (eltérés) vonatkozó kimeneti jellemzőit olyan pontossági fokon kell tartani, ami az üzemeltetési célnak megfelel. Felhívjuk a figyelmet arra, hogy számításba kell venni azokat a változó feltételeket, amelyek befolyásolhatják ezt a pontosságot.

2.2.1.2 Továbbá, annak biztosítása céljából, hogy az ILS rendszer valamennyi felhasználója egy állandó iránysáv szélességet "kapjon", szabványosítani kell az iránysáv vevő teljes erősítési tényezőjét. Hasonlók figyelembevételét kell alkalmazni a siklópálya vevő esetében.

2.2.2 *Az iránysáv adó vevő hangfrekvenciás erősítésének beállítása*

2.2.2.1 A vevő hangfrekvenciás erősítésének olyannak kell lenni, hogy egy 1 000 mikrovoltos 20 százalékban a 90 Hz-es hanggal és 20 százalékban a 150 Hz-es hanggal modulált rádiófrekvenciás bemenő jel nulla kijelzést adjon, és egyidejűleg az egyik összetevőt 4,65 százalékkal (azaz 24,65 százalékra) növelve, és a másik összetevőt 4,65 százalékkal csökkentve (azaz 15,35 százalékra) egy 3/5 értékű arányos eltérés jöjjön létre a teljes iránysáv szélesség kijelzésnél, de 9,5 mm-nél nem kisebb a skálán mérve. Ezt az erősítés beállítást azzal a szabályos tápfeszültséggel kell elvégezni, ami a fedélzeti üzemeltetési körülmények esetén fennáll.

2.2.3 *Az iránysáv vevő berendezés központosítási tűrése*

2.2.3.1 Az I., II. és III. ILS Teljesítmény Kategóriához kapcsolódó üzemeltetési célok elérése és a légijárműveknek az akadálymentességi felületeken belüli biztonságos üzemeltetésének biztosításához a vevő berendezés központosítási hibája - az összes valószínűleg előforduló légijármű üzemeltetési környezeti feltételek mellett működve és a nulla jelet (modulációs mélység különbség) véve a földi berendezés rádiófrekvenciás modulációs jellemzői és meghatározott jellemző értékeinek tűréshatárain belül, ahogy azok a 3. Fejezet 3.1.3 pontjában előírásra kerültek, egy 90 mikrovolt/méter (mínusz 107 dBW/m^2) rádiófrekvenciás térerősségnél - 68 százalékos valószínűséggel nem haladhatja meg a következő határértékeket:

I. Kategória: a teljes iránysáv szélesség kijelzés 4,66 százaléka (0,0072 DDM);

II. Kategória: a teljes iránysáv szélesség kijelzés 2,33 százaléka (0,0036 DDM);

III. Kategória: a teljes iránysáv szélesség kijelzés 1,66 százaléka (0,00258 DDM).

Megjegyzés. - Ezeket a követelményeket nagyobb, az üzemeltetési gyakorlatban valószínűleg előforduló maximális térerősség mellett is teljesíteni kell.

2.2.4 *Iránysáv vevő iránysáv vonal eltolódás iránti érzékenységi (eltérés) tűréshatár*

2.2.4.1 Amikor a vevő hangfrekvenciás erősítése a fenti 2.2.2 pontban leírtaknak megfelelően van beállítva, és a hangfrekvenciás bemenő jel egyik modulációs hangja 4,65 százalékkal meg van növelve a névleges értékéhez viszonyítva (azaz 24,65 százalék), és egyidejűleg a másik összetevő 4,65 százalékkal van lecsökkentve (azaz 15,35 százalék) a névleges értékhez viszonyítva, akkor a kijelzett eltérési jel nem térhet el plusz, vagy mínusz 0,019 modulációs mélység különbségnél nagyobb értékkel a 90 mikrovolt/méter (mínusz 107 dBW/m^2) térerősség névleges értéktől egészen addig a maximális térerősségig, ami az üzemeltetési gyakorlatban valószínűleg előfordulhat.

Megjegyzés. - Lásd az alábbi 2.2.5 pontot a jelszintekre vonatkozóan.

2.2.5 *Az iránysáv vevő rendszer minimális jelszint érzékenysége*

2.2.5.1 Az iránysáv vevő berendezés érzékenységének olyannak kell lenni, hogy az érték nagy százalékában a vevőnek használható jelet kell kijelezni, és egy tartós állandó kijelzést kell adni a 3. Fejezet 3.1.3.3.2 pontjában meghatározott minimális térerősség (40 mikrovolt/méter, vagy mínusz 114 dBW/m^2) jelenlétében.

1. Megjegyzés. - Az a maximális jelszint, ami valószínűleg előfordul a fenti 2.2.3 és 2.2.4 pontok szerint, 500 mikrovolt. Az 5 000 mikrovolt nagyságrendű jelszintek az adó berendezés közvetlen szomszédságában fordulhatnak elő (azaz akkor, amikor a légijármű átrepüli az iránysáv adót a megszakított megközelítés során, vagy akkor, amikor az iránysáv a leszállás utáni kifutási, vagy felszállási irány-vezetésre kerül felhasználásra.)

2. Megjegyzés. - A fenti 2.2.4 és 2.2.5 pontban előadott két érzékenységi szint biztosítja:

a) azt a jóminőségű kimenő jelet, ami a megközelítés céljaira szükséges; és

b) a fedésterületi tér egyéb részeiben a berendezés üzemeltetési felhasználhatósága szempontjából is kielégítő gyengébb minőségű kimenő jelet.

3. Megjegyzés. - Az iránysáv vevő rendszernek szabályszerűen működni kell az előírt minimális térerő jelenlétében a légijármű hossztengelyének a vízszintes síkban elfoglalt irányától függetlenül akkor, amikor a légijármű 20 fokos bedöntési és 10 fokos bólintási szöggel repül.

2.2.6 *Az iránysáv irányvonal eltolódásának linearitása*

2.2.6.1 A vevő kimeneti irányvonal eltolódási jelének lényegében lineáris funkciót kell képezni a vevő bemenő jel modulációs mélység különbségével. Bármely bemeneti jelnek, ami a plusz, vagy mínusz 0,155 modulációs mélység különbség értékű tartományon felül és minden olyan rádiófrekvenciás jelszint esetében, ami az üzemeltetési gyakorlatban valószínűleg előfordulhat, az eltolódás iránti érzékenységnek nem szabad a fenti 2.2.2 pontban meghatározott névleges modulációs mélység különbség/ /eltérés aránytól plusz, vagy mínusz 20 százaléknál többel eltérni. Szintén, a plusz, vagy mínusz 0,165 modulációs mélység különbség, vagy ennél nagyobb értékű bemeneti jelnél, a kimenetnek nagyobbnak kell lenni, mint a teljes irányvonal eltolódás.

Megjegyzés. - Lásd a fenti 2.2.5 pontot a jelszintekre vonatkozóan.

2.2.7 *Az iránysáv vevő sávszélessége*

2.2.7.1 A vevő sávszélességének olyannak kell lenni, hogy a 3. Fejezet 3.1.3.2.1 pontjában meghatározott jellemzőkkel bíró csatornák vételét a megfelelő vevő tűréshatárának illeszkedő számításbavételével biztosítsa.

2.2.8 *Az iránysáv vevőnek a VOR és az iránysáv jelek iránti érzékenysége*

2.2.8.1 *A vevő felépítésének a következő környezetben kell pontos működést biztosítani*:

a) a kívánt jel a nem-kívánt azonos csatorna jelet 20 dB-el, vagy többel haladja meg;

b) egy nem-kívánt jel 50 kHz-re a kívánt jeltől 34 dB-el haladja meg a kívánt jelet. (A vevőnek a próbapadon történő ellenőrzése során ebben az első szomszédos csatorna esetben a nem-kívánt jel a kombinált földi állomás (plusz, vagy mínusz 9 kHz) és a vevő frekvencia tűrés frekvencia-tartománya fölött változó.);

c) egy nem-kívánt jel 100 kHz-re a kívánt jeltől 46 dB-el haladja meg a kívánt jelet;

d) egy nem-kívánt jel 150 kHz-re, vagy annál távolabb, 46 dB-el haladja meg a kívánt jelet.

1. Megjegyzés. - Elfogadott az, hogy nem az összes jelenlegi vevő felel meg a b) követelménynek, azonban az összes, jövőben elkészülő berendezést úgy kell tervezni, hogy kielégítse ezt a követelményt.

2. Megjegyzés. - Néhány Államban kisebb földi állomás tűréseket alkalmaznak.

2.2.9 *Az ILS vevő rendszer érzéketlenségi teljesítménye a VHF FM adások jeleinek zavaró hatásával szemben*

2.2.9.1 A 3. Fejezet 3.1.4.2 pontjának 2. megjegyzésére vonatkozóan, az ott meghatározott érzéketlenségi teljesítményt a vevő rendszer szabályos teljesítményéhez viszonyított egyezményes csökkenési mértékhez kell venni a bemenő megkívánt jel szabvány körülményei mellett és jelenlétében. Ez annak biztosításához szükséges, hogy a vevő berendezésnek a próbapadi ellenőrzését egy ismételhető feltétel-rendszer és eredmények mellett lehessen elvégezni, ami elősegítse az azt követő hitelesítési jóváhagyásukat. Vizsgálatok kimutatták azt, hogy az FM interferencia jelek hatással lehetnek mind az iránysáv irányvezetési, mind a jelölő áramra, és hatásuk annak a megkívánt jelnek a modulációs mélység különbségétől függ, amit alkalmaznak. Kiegészítő tájékoztatások találhatók a Nemzetközi Távközlési Unió /ITU/ ITU-R IS.1140 számú *A 87 - 108 MHz-es műsorszóró* *szolgáltatási sáv és a 108 - 118 MHz-es légiforgalmi szolgálati sáv közötti kompatibilitás meghatározására használatos vevők jellemzőinek ellenőrzési eljárásai* című Ajánlásában.

2.2.9.2 Általánosan elfogadott módszereket és képleteket kell alkalmazni azoknak a vevőknek a lehetséges összeférhetetlenségének megállapításához, amelyek megfelelnek a 3. Fejezet 3.1.4 pontjában meghatározott általános interferencia érzéketlenségi követelményeknek. A képleteknek tisztázniuk kell a parazita sugárzással (A1 típusú) szembeni interferencia érzéketlenségi teljesítményt, a csatorna sávon kívüli (A2 típusú) interferenciával szembeni, a két-jel és három-jel harmadrendű (B1 típusú) interferenciával szembeni és a túlterhelés / érzéketlenítés (B2 típusú) interferenciával szembeni interferencia érzéketlenségi teljesítményt. Kiegészítő tájékoztatások találhatók az ITU-R IS.1009-1 sz. *Kompatibilitás a 87 - 108 MHz-es műsorszóró szolgáltatási sáv és a 108 - 137 MHz-es légiforgalmi szolgálati sáv között* Ajánlásában.

2.2.9.3 A Nemzetközi Távközlési Unió /ITU/ ITU-R IS.1009-1 Ajánlásában megadott frekvencia tervezési követelmények nem veszik számításba a lehetséges két-jel és három-jel ötödrendű (B1 típusú) intermodulációs termékeket. Mérésekkel határozták meg azt, hogy az FM állomások által a vevőkben létrehozott ötödrendű intermodulációs termékek úgy lecsökkenthetik az ILS vevők teljesítményét, hogy az a 3. Fejezet 3.1.4 pontjában leírt meghatározásoknak felel meg. Az ötödrendű intermodulációs termékek előfordulhatnak anélkül, hogy egy harmadrendű intermodulációs termék fordulna elő ugyanazon az ILS frekvencián. A frekvenciák tervezésében és az FM műsorszóró interferenciája elleni védelem felbecsülésénél szükség van arra, hogy figyelembe vegyék a két-jel és három-jel által létrehozott ötödrendű intermodulációs termékeknek az ILS vevőkön belül létrehozott termékeit.

2.2.10 *A siklópálya vevő hangfrekvenciás erősítésének beállítása*

2.2.10.1 A vevő hangfrekvenciás erősítésének olyannak kell lenni, hogy egy 600 mikrovoltos 40 százalékban a 90 Hz-es hanggal és 40 százalékban a 150 Hz-es hanggal modulált rádiófrekvenciás bemenő jel nulla kijelzést adjon, és egyidejűleg az egyik összetevőt 5,25 százalékkal (azaz 45,25 százalékra) növelve, és a másik összetevőt 5,25 százalékkal csökkentve (azaz 34,75 százalékra) egy 3/5 értékű arányos eltérés jöjjön létre a teljes irányvonal kijelzésnél, de 9,5 mm-nél nem kisebb a skálán mérve. Ezt az erősítés beállítást azzal a szabályos tápfeszültséggel kell elvégezni, ami a fedélzeti üzemeltetési körülmények esetén fennáll.

2.2.11 *A siklópálya vevő berendezés központosítási tűrése*

2.2.11.1 Az I., II. és III. ILS-Teljesítmény Kategóriához kapcsolódó üzemeltetési célok elérése és a légijárműveknek az akadálymentességi felületeken belüli biztonságos üzemeltetésének biztosításához, a vevő berendezés központosítási hibája az összes valószínűleg előforduló légijármű üzemeltetési környezeti feltételek mellett működve, és a nulla jelet (modulációs mélység különbség) véve, a földi berendezés rádiófrekvenciás modulációs jellemzői és meghatározott jellemző értékeinek tűréshatárain belül, ahogy azok a 3. Fejezet 3.1.5 pontjában előírásra kerültek, és egy 400 mikrovolt/méter (mínusz 95 dBW/m^2) rádiófrekvenciás térerősséget egy 68 százalékos valószínűséggel nem haladhatja meg a következő határértékeket:

I. kategória: a teljes irányvonal szélesség kijelzés 5,33 százaléka (0,0093 DDM);

II. kategória: a teljes irányvonal szélesség kijelzés 3,33 százaléka (0,0058 DDM);

III. kategória: a teljes irányvonal szélesség kijelzés 3,33 százaléka (0,0058 DDM).

Megjegyzés. - Ezeket a követelményeket nagyobb, az üzemeltetési gyakorlatban valószínűleg előforduló maximális térerősség mellett is teljesíteni kell.

2.2.12 *Siklópálya irányvonal eltolódás iránti érzékenységi (eltérés) tűréshatár*

2.2.12.1 Amikor a vevő hangfrekvenciás erősítése a fenti 2.2.9 pontban leírtaknak megfelelően van beállítva, és a hangfrekvenciás bemenő jel egyik modulációs hangja 5,25 százalékkal meg van növelve a névleges értékhez viszonyítva (azaz 45,25 százalék), és egyidejűleg a másik összetevő 5,25 százalékkal van lecsökkentve (azaz 34,75 százalék) a névleges értékhez viszonyítva, akkor a kijelzett eltérési jel nem térhet el plusz, vagy mínusz 0,016 modulációs mélység különbségnél nagyobb értékkel a 400 mikrovolt/méter (mínusz 95 dBW/m^2) térerősség névleges értékhez viszonyítva, egészen addig a maximális térerősségig, ami az üzemeltetési gyakorlatban valószínűleg előfordulhat.

Megjegyzés. - Lásd az alábbi 2.2.13 pontot a jelszintekre vonatkozóan.

2.2.13 *A siklópálya vevő rendszer minimális jelszint érzékenysége*

2.2.13.1 A siklópálya vevő berendezés érzékenységének olyannak kell lenni, hogy az érték nagy százalékában a vevőnek használható jelet kell kijelezni, és egy tartós állandó kijelzést kell adni a 3. Fejezet 3.1.5.3.2 pontjában meghatározott minimális térerősség (400 mikrovolt/méter, vagy mínusz 95 dBW/m^2) jelenlétében.

1. Megjegyzés. - Az a maximális jelszint, ami valószínűleg előfordul a fenti 2.2.11 és 2.2.12 pontok szerint, 2 500 mikrovolt. Ez a jelszint akkor fordul elő, amikor a légijármű a futópálya küszöbe fölött van.

2. Megjegyzés. - A fenti 2.2.12 és 2.2.13 pontban előadott két érzékenységi szint biztosítja:

a) azt a jóminőségű kimenő jelet, ami a megközelítés céljaira szükséges; és

b) a fedésterületi tér egyéb részeiben a berendezés üzemeltetési felhasználhatósága szempontjából is kielégítő gyengébb minőségű kimenő jelet.

3. Megjegyzés. - A siklópálya vevő rendszernek szabályszerűen működni kell az előírt minimális térerő jelenlétében akkor is, ha a légijármű hossztengelye a vízszintes síkban plusz, vagy mínusz 10 fokkal eltér, és ugyanakkor a bedöntése 20 fokos az iránysáv adó iránysáv vonala síkjában és a bólintása is plusz, vagy mínusz 10 fokos a vízszintes síkhoz viszonyított függőleges síkban.

2.2.14 *A siklópálya eltolódásának linearitása*

2.2.14.1 A vevő kimeneti siklópálya eltolódási jelének lényegében lineáris funkciót kell képezni a vevő bemenő jel modulációs mélység különbségével. Bármely bemeneti jelnek, ami a plusz, vagy mínusz 0,175 modulációs mélység különbség értékű tartományon felül és minden olyan rádiófrekvenciás jelszint esetében, ami az üzemeltetési gyakorlatban valószínűleg előfordulhat, az eltolódás iránti érzékenységnek nem szabad a fenti 2.2.10 pontban meghatározott névleges modulációs mélység különbség / eltérés aránytól plusz, vagy mínusz 20 százaléknál többel eltérni.
Egy 0,185, vagy annál nagyobb modulációs mélység különbségű bemenő jel esetén a kimenetnek nagyobbnak kell lenni, mint a teljes teljes irányvonal eltolódás.

Megjegyzés. - Lásd a fenti 2.2.13 pontot a jelszintekre vonatkozóan.

2.2.15 *A siklópálya vevő sávszélessége*

2.2.15.1 A vevő sávszélességének olyannak kell lenni, hogy a 3. Fejezet 3.1.5.2.1 pontjában meghatározott jellemzőkkel bíró csatornák vételét a megfelelő vevő tűréshatárának illeszkedő számításbavételével biztosítsa.

2.2.16 *A siklópálya vevőnek a siklópálya jelek iránti érzékenysége*

2.2.16.1 A vevő felépítésének a következő környezetben kell pontos működést biztosítani:

a) a kívánt jel a nem-kívánt azonos csatorna jelet 20 dB-el, vagy többel haladja meg;

b) egy nem-kívánt siklópálya jel 150 kHz-re a kívánt jeltől 20 dB-el haladja meg a kívánt jelet. (A vevőnek a próbapadon történő ellenőrzése során ebben az első szomszédos csatorna esetben a nem-kívánt jel a kombinált földi állomás (plusz, vagy mínusz 17 kHz) és a vevő frekvencia tűrés frekvencia-tartománya fölött változó.);

c) egy nem-kívánt siklópálya jel a kívánt jeltől 300 kHz-re, vagy annál távolabb 40 dB-el haladja meg a kívánt jelet.

1. Megjegyzés. - Elfogadott az, hogy nem az összes jelenlegi vevő felel meg a b) követelménynek, azonban az összes, jövőben elkészülő berendezést úgy kell tervezni, hogy kielégítse ezt a követelményt.

2. Megjegyzés. - Néhány Államban kisebb földi állomás tűréseket alkalmaznak.

2.2.17 *A függőleges polarizáció hatása az iránysáv és siklópálya vevőre*

2.2.17.1 Az iránysáv és siklópálya frekvencia-tartományban, külön-külön az iránysáv és a siklópálya antennára vonatkozó előre ható irányú, függőlegesen polarizált jelek vétele legalább 10 dB-el alatta kell legyen az ugyanabból az irányból eredő vízszintesen polarizált jelek vételének.

2.2.18 *Az iránysáv és a siklópálya vevő téves jelvétele*

2.2.18.1 Az iránysáv vevőnek egy 150 Hz-es 30 százalékig modulált rádiófrekvenciás jelre a 110 MHz-nél történő reagálásának (kijelző műszer eltérés) nagyobbnak kell lenni azon rádiófrekvenciás jelre történő reagálásánál, mint amit az azonosan modulált, de 60 dB-el nagyobb amplitudójú és a 90 kHz-től a 107,8 MHz-ig, valamint a 112,2 MHz-től az 1 500 MHz-ig változtatott jelekre ad. A siklópálya vevőnek egy 150 Hz-es 30 százalékig modulált rádiófrekvenciás jelre a 332,0 MHz-nél történő reagálásának (kijelző műszer eltérés) nagyobbnak kell lenni azon rádiófrekvenciás jelre történő reagálásánál, mint amit az azonosan modulált, de 60 dB-el nagyobb amplitudójú és a 90 kHz-től a 329,0 MHz-ig, valamint a 335,3 MHz-től az 1 500 MHz-ig változtatott jelekre ad.

2.3 Működési hiba riasztás az ILS fedélzeti rendszerben

2.3.1 Ideálisan a vevő riasztó rendszerének egy olyan eszközzel, mint a vizuális mechanikus zászló, kell figyelmeztetnie a légijármű vezetőjét bármilyen olyan elfogadhatatlan működési hiba állapotra, amely mindkét, vagy a földi, vagy a fedélzeti berendezéseken belül keletkezhet. Annak a mértéke, hogy egy ilyen ideál meddig elégíthető ki, az alábbiakban kerül meghatározásra.

2.3.2 A riasztó rendszert a két modulációs mélység összege hozza működésbe, és ennek megfelelően az ILS iránysáv modulációs összetevőinek a kisugárzott vivőfrekvenciáról való kimaradása a riasztás működésbe léptetését eredményezi.

2.3.3 A riasztó rendszernek jelezni kell a légijárművezető és az összes többi olyan fedélzeti rendszer részére, amelyek az iránysáv és a siklópálya adatokat felhasználják, a következő helyzetek bármelyikének fennállását:

a) bármilyen rádiófrekvenciás jel hiányát, valamint az egyidejű 90 Hz-es és 150 Hz-es moduláció hiányát;

b) bármelyik, a 90 Hz-es, vagy a 150 Hz-es jel modulációs mélységének a nullára csökkenését, úgy, hogy a másik megtartja a szabályos 20 százalékos és 40 százalékos modulációját külön-külön az iránysávra és a siklópályára;

Megjegyzés. - Az az elvárt, hogy az iránysáv riasztás akkor történjen meg, amikor bármelyik, vagy a 90 Hz-es, vagy a 150 Hz-es moduláció 10 százalékra lecsökken úgy, hogy a másik megtartja a szabályos értéke 20 százalékát. Az az elvárt, hogy a siklópálya riasztás akkor történjen meg, amikor bármelyik, vagy a 90 Hz-es, vagy a 150 Hz-es moduláció 20 százalékra lecsökken úgy, hogy a másik megtartja a szabályos értéke 40 százalékát.

c) a vevő útiránytól való eltérés jelzése 50 százaléka, vagy annál kisebb értékű ahhoz viszonyítva, ami a vevő hangfrekvenciás erősítési beállításának (lásd a fenti 2.2.2 és 2.2.10 pontokat) a beállítására meghatározásra került.

2.2.3.1 A riasztási jelzésnek könnyen észrevehetőnek és jól láthatónak kell lenni minden szabályszerű pilótakabinon belüli körülmény esetén. Ha egy zászlót használnak, akkor annak a kijelző műszerhez mérten olyan nagynak kell lenni, amennyire csak lehetséges.

2.4 A siklópálya adó berendezés telepítésére, magasságára, beállítására és fedésterületére vonatkozó útmutatások

2.4.1 Az ILS vonatkozási alap és az ILS siklópálya szögének beállítása adják azokat az elsődleges tényezőket, amelyek az ILS siklópálya berendezésnek a futópálya küszöbéhez viszonyított hosszirányú elhelyezését befolyásolják.

2.4.2 A siklópálya antenna-rendszernek a futópálya középvonalához viszonyított oldalirányú elhelyezése általában nem lehet kevesebb 120 méternél (400 láb). A siklópálya antenna oldalirányú elhelyezésének az eldöntésénél számításba kell venni az Annex 14-nek az akadálymentességi felületekre és a futópálya sávokon elhelyezett akadályokra vonatkozó előírásait.

2.4.3 Az ILS siklópálya antenna elhelyezésének és a siklópálya szögének kiválasztásánál a célnak annak kell lennie, hogy az ILS vonatkozási pontot a megfelelő névleges értékhez olyan közel tegyék, amennyire az csak lehetséges. Az ILS siklópálya antenna helyének és a siklópálya szögének tényleges kiválasztását számos tényező befolyásolja, beleértve a(z):

a) adott repülőtéren tervezett üzemeltetési típusok elfogadható süllyedési mértékét és/vagy megközelítési sebességét;

b) repülőtér körzetében, a végső megközelítési területen és a megszakított megközelítési területen lévő akadályok helyzetét és az azokból eredő akadálymentességi korlátozásokat;

c) technikai telepítési problémákat.

2.4.4 Az antenna elhelyezése és a siklópálya szög kiválasztását, valamint a kialakuló ILS vonatkozási pont magasságot befolyásolni fogja még:

a) a rendelkezésre álló futópálya hosszúsága;

b) az előre látott üzemeltetési korlátok.

Ahol az előbb említett követelmények alkalmazása lehetővé teszi, ott az ILS siklópálya előnyben részesített szögének 3 foknak kell lenni.

2.4.5 Ezután az ILS vonatkozási pontot és a siklópályát kell megválasztani az alábbiakban említett követelmények figyelembevételével, majd a hely alkalmasságot kell megvizsgálni, hogy biztosítja-e a *Léginavigációs Szolgálatok Eljárásai - Légijármű Üzemeltetések* (PANS-OPS, Doc 8168) által megkövetelt akadálymentességet és a telepítési helyet számításokkal és - ahol lehetséges - légi ellenőrzéssel kell megerősíteni.

2.4.6 Ahol a kiválasztott ILS vonatkozási pont, az ILS siklópálya szöge és az egyéb vonatkozó berendezés jellemzők nem biztosítják a szükséges akadálymentességet, ott a következő alternatív megoldásokat kell megvizsgálni:

1) a zavaró akadály eltávolítása;

2) egy másik magasság kiválasztása az ILS vonatkozási pontra, figyelembe véve a fenti 2.4.3 és 2.4.5 pontokban jelzett követelményeket;

3) egy másik elfogadható ILS siklópálya szög kiválasztása;

4) az akadálymentességi határok módosítása úgy, hogy a zavaró akadálynak megfeleljenek.

2.4.7 A III. Kategóriájú ILS siklópályaadó telepítési helyének szomszédságában lévő terep jóval hatékonyabb felhasználása lehetővé tételének céljából és azért, hogy ezeken a helyeken a telepítési követelményeket és az érzékenységi területeket csökkentsék, az a kívánatos, hogy a III. Kategóriájú ILS siklópálya antenna rendszer vízszintes sugárzási karakterisztikáját kialakító jeleket olyan alacsony értékűre csökkentsék, amennyire az csak lehetséges, a 3. Fejezet 3.1.5.3 pontjában meghatározott oldalszög fedésterületi határértékeken kívül. Egy másik elfogadható módszer az, hogy oldalszögben elfordítsák a siklópálya antennákat a többutas terjedési forrásoktól és ezáltal meghatározott szögekben csökkentsék a kisugárzott jelek mennyiségét úgy, hogy körben fenntartják az oldalszögbeli fedésterület határvonalait.

2.4.8 *Az ILS siklópálya görbülete*. A legtöbb esetben az ILS siklópályát a siklópálya antenna-rendszerétől kiinduló kúpos felület alkotja. Ennek a kúpfelületnek a kiindulási pontjának a futópálya középvonalától való oldalirányú kihelyezése következtében, a siklópálya geometriai helye a futópálya középvonala mentén lévő függőleges síkban egy hiperbola. A siklópálya görbülete a küszöb körzetében jelenik meg, és fokozatosan növekszik a földetérési pontig.

2.4.9 A siklópálya antenna telepítési helye és a siklópálya irányvonalnak a küszöb feletti keresztezési magassága közötti összefüggés. A siklópálya antenna hosszirányú elhelyezését úgy kell kiválasztani, hogy az megfeleljen a 3. Fejezet 3.1.5.1.4 pontjában megadott ajánlásoknak, az ILS vonatkozási pontnak a futópálya küszöbe feletti magasságára vonatkozóan. Az ILS vonatkozási pontnak a futópálya küszöbe feletti magassága ezután a siklópálya antenna hosszirányú helyzetének, a siklópálya reflexiós síkja hosszirányú lejtésének és a futópálya küszöbének a siklópálya reflexiós síkjához viszonyított helyzetének a függvénye lesz. Ezt a helyzetet adja meg képi formában a C-5. számú ábra. A siklópálya antenna hosszirányú helyzete ezután a következők szerint számítható ki:

$$D = \frac{H + Y}{\tan(\theta + \alpha)}$$

ahol:
D = az O és P közötti vízszintes távolság;

H = a névleges küszöb keresztezési magasság;

Y = a futópálya küszöbnek a P' pont feletti függőleges magassága;

θ = a névleges ILS siklópálya szög;

α = a siklópálya reflexiós síkjának a hosszirányú lejtése.

Megjegyzés. - A fenti egyenletben az α-t pozitív értékűnek kell venni az antennától a küszöb felé való lejtés esetében. Az Y-t pozitívnak kell venni akkor, ha a küszöb a reflexiós sík keresztezési vonala felett van.

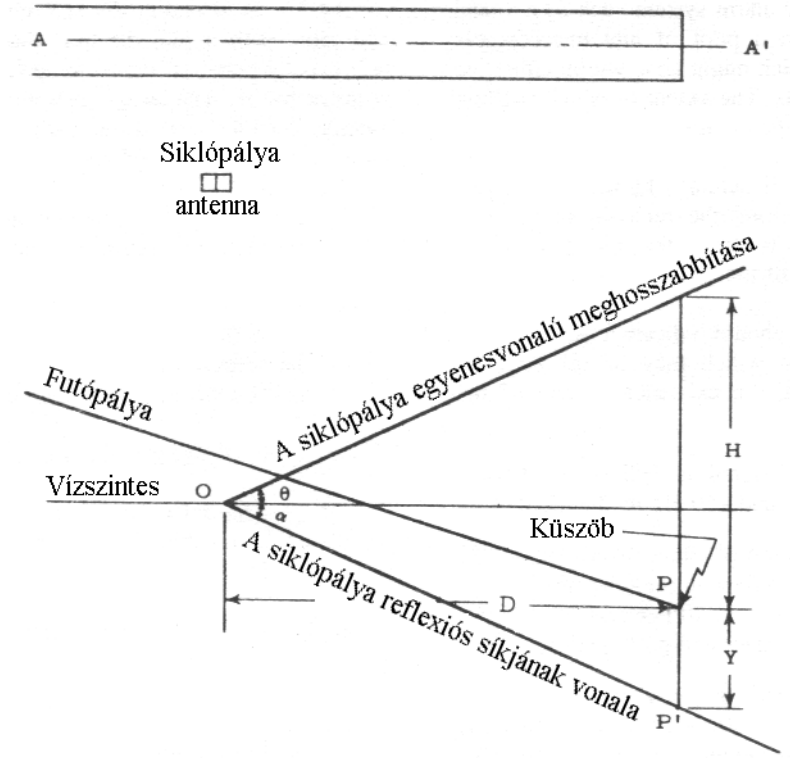
2.4.10 A siklópálya antennának a futópálya küszöbéhez viszonyított hosszirányú elhelyezésére vonatkozó, az előzőekben megadott útmutató anyag, ami figyelembe veszi azt a tényt, hogy a futópálya lehet, hogy nincs a siklópálya reflexiós síkjában, és azt, hogy a siklópálya reflexiós síkja lejtős lehet, geometriai absztrakción alapszik. Az anyag magától értetődően elfogadja azt, hogy a siklópálya elhelyezkedése a futópálya középvonalát magába foglaló függőleges síkban egy tökéletes hiperbola; következésképpen a siklópálya meghosszabbítása magától értetődően elfogadva ennek a hiperbolának a fő-érintője.
2.4.11 Valójában azonban, a siklópálya gyakran egészen szabálytalan. A közepes ILS siklópálya szög csak kalibráló repülésekkel állapítható meg; a siklópálya A- és B-pontja közötti azon rész átlagos észlelt helyzetet egy egyenes vonalként ábrázolják, és az ILS siklópálya szöge az a szög, amit az egyenes vonal és annak a vízszintes síkra való függőleges vetülete között mérnek.

2.4.12 Fontos annak elismerése, hogy a siklópálya egyenetlenségeinek hatását, ha a középső helyjeladó és a küszöb közötti körzeten belül átlagolják, akkor az valószínűleg egy olyan vonatkozási pontot vetít ki, amely ténylegesen különbözik az ILS vonatkozási ponttól. Ezt a vonatkozási pontot, amelyet itt, mint elért ILS vonatkozási pontot határoztunk meg, fontos üzemeltetési jellegűnek kell tekinteni, és el kell fogadni. Az elért ILS vonatkozási pontot csak légi ellenőrzéssel lehet megállapítani, azaz a siklópálya azon részének átlagos észlelt helyzetét, ami jellemzően a futópálya küszöbétől az 1 830 méteres (6 000 láb) és a 300 méteres (1 000 láb) távolságú pontok között van, egy egyenes vonalként tűntetik fel, és meghosszabbítják a földetérési pontig. Az a pont, ahol ez a meghosszabbított egyenes vonal "találkozik" a futópálya középvonalának a küszöbön keresztül megrajzolt függőleges vonalával, az elért ILS vonatkozási pont.

Megjegyzés. - A siklópálya szög és az elért ILS vonatkozási pont mérésére vonatkozó további útmutató anyagot a Doc 8071 adja meg.

2.4.13 A 3. Fejezet 3.1.5.3.1 pontja az egy jellemző légijármű fedélzeti berendezés kielégítő működését biztosító siklópálya fedésterületet mutatja be. Az egy berendezésre közzétett üzemeltetési eljárásoknak összeegyeztethetőknek kell lenniük a fedésterület alsó határával. Ez rendszerint a befogási magasságra végrehajtott süllyedéseket és az ezen a magasságon folytatott megközelítést jelenti addig, amíg a "süllyedj" jelzés vételre nem kerül. Bizonyos körülmények között a helyzet kereszt-ellenőrzése ennél a pontnál nem állhat rendelkezésre. Az automatikus repülés vezérlő rendszerek általában akkor kezdik meg a süllyedést, amikor az "emelkedj" jel 10 mikroampernél kisebb értékűre csökken.

2.4.14 Ennek megfelelően a cél az, hogy egy emelkedj jelzést biztosítsanak a siklópályára történő ráállást megelőzően. Jóllehet, szabvány körülmények esetén a megközelítési eljárások úgy kerülnek végrehajtásra, hogy a siklópálya jeleket nem használják fel a 0,45 θ alatt, vagy a futópályától 18,5 km-en (10 tengeri mérföld) kívül, az a kívánatos, hogy félrevezető irányvezetési tájékoztatás ne kerüljön erre a területre kisugárzásra. Ahol az eljárások olyanok, hogy a siklópálya irányvezetést lehet, hogy a 0,45 θ alatt is felhasználják, ott kielégítő óvintézkedéseket kell tenni a 0,45 θ alatti félrevezető irányvezetési információk kisugárzása elkerülésére, mind a szabályos körülmények, mind a működési hiba során, hogy ezáltal megakadályozzák azt, hogy a végső megközelítési süllyedés a megközelítésnek egy pontatlan pontján kezdődjön meg. A félrevezető irányvezetés kisugárzása ellen alkalmazható ilyen óvintézkedések magukba foglalhatják az olyan kiegészítő biztonsági-vezetési jelek kisugárzását, mint ami a 3. Fejezet 3.1.5.2.1 pontjában megadásra került, egy különálló kiegészítő biztonsági jel, felügyelő rendszer és a megfelelő földi ellenőrzés, valamint a beállítási eljárások ellenőrzésének biztosításával.



AA' METSZET NÉZET

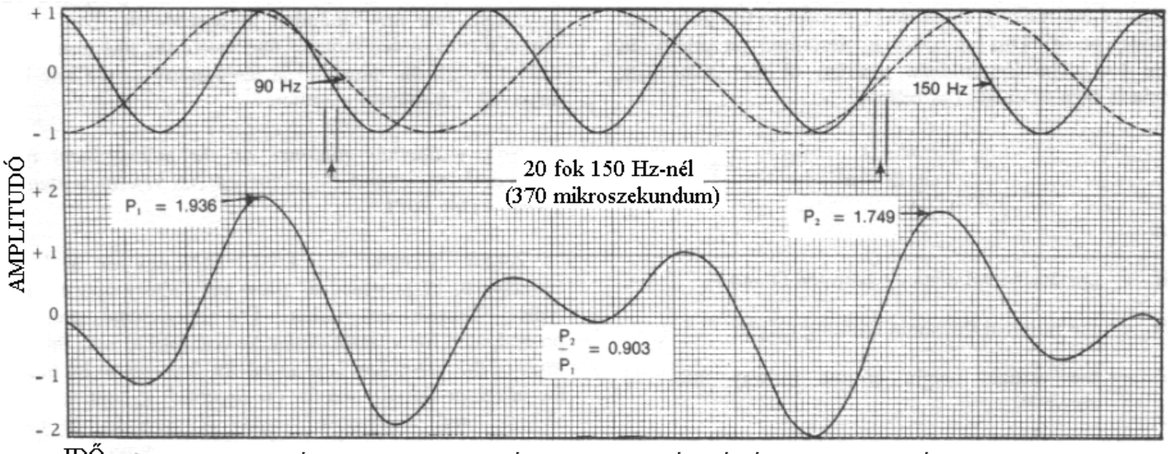
Megjegyzés. - Az OP' egyenes a siklópálya reflexiós síkjának és az AA' vonalon átmenő függőleges síknak a metszését jelenti.

C-5. ábra: A siklópálya elhelyezése lejtős futópálya esetében

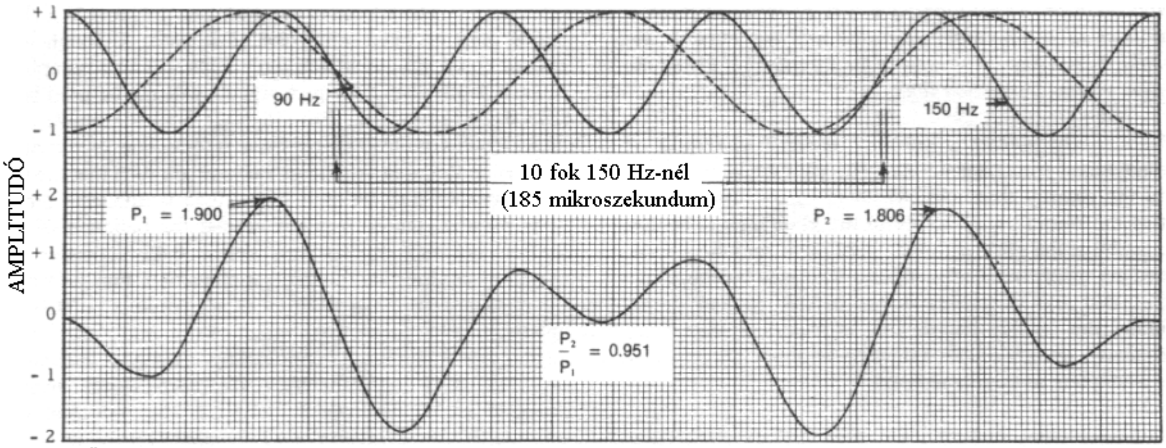
2.4.15 Ahhoz, hogy kielégítő felügyelő rendszer védelmet érjenek el, a siklópálya alatti tűréshatáron kívüli modulációs mélység különbség ellen, az alkalmazott antenna-rendszertől függően a 3. Fejezet 3.1.5.7.1 e) pontjában előírtaknak megfelelő eltolódás érzékenységi felügyelő rendszer lehet, hogy nem lesz kielégítő ahhoz, hogy a kiegészítő biztonsági-vezetés ellenőrzésére is szolgáljon. Bizonyos rendszerekben, például azoknál, amelyek többelemes antennát alkalmaznak kiegészítő biztonsági-vezetés nélkül, bizonyos antenna jelek kismértékű csökkenése komoly csökkenést tud előidézni a biztonsági-vezetési jelnél anélkül, hogy változás történne, vagy úgy, hogy csak jelentéktelen változást érzékel a siklópálya szektoron belül az eltérés érzékelő felügyelő rendszer. Ezért fontos annak biztosítása, hogy a felügyelő rendszer riasztását bármilyen, vagy az összes lehetséges olyan rosszabbodó antenna és kisugárzott jel körülménye esetére valósítsák meg, ami a biztonsági-vezetési jelnek a 0,175, vagy annál kisebb értékű modulációs mélység különbség csökkenéséhez vezet a siklópálya alatti biztonsági-vezetési jel fedésterületen.

2.5 Szemléltető ábrák

(A C-6.-tól a C-12.-ig terjedő ábrák a 3. Fejezetben tárgyalt bizonyos szabványokat szemléltetik.)



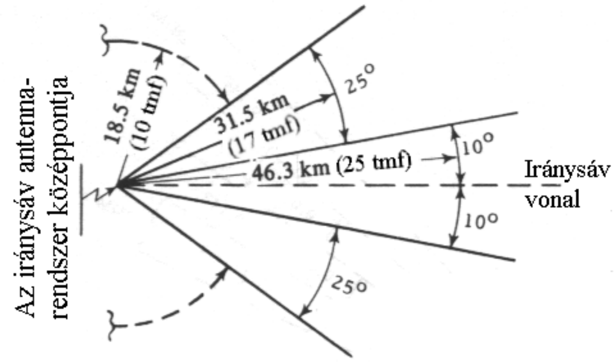
I. ÉS II. TELJESíTMÉNY KATEGÓRIÁJÚ BERENDEZÉS
IRÁNYSÁV ÉS SIKLÓPÁLYA



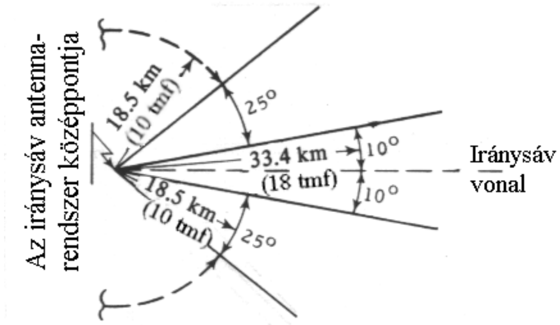
III. TELJESíTMÉNY KATEGÓRIÁJÚ BERENDEZÉS
IRÁNYSÁV ÉS SIKLÓPÁLYA

A mellékelt grafikonok azt a módszert mutatják be, amit fel lehet használni a 90 Hz-es és a 150 Hz-es hangok közötti relatív fázisszabály mérésére. Az egyes ábrák felső része az egyedi hullámokat és annak fázisszabályát mutatja be a 3. Fejezet 3.1.3.5.3.3 és 3.1.5.5.3 pontjaiban megengedett fáziskülönbségek határán. Az alsó rész azt az összetett hullámalakot mutatja be, amit egy oszcilloszkópon látni lehet. A P_1 és P_2 arányt véve, ami megadja az egységgel egyenlő, vagy annál kisebb értéket, meg lehet határozni azt, hogy a fázis a tűrésértéken belül van-e. Az ILS I. és II. Kategóriára az aránynak 0,903-nél nagyobbnak kell lenni, és a III. Kategóriára az arány 0,951-nél nagyobb kell, hogy legyen.

C-6. ábra: A 90 Hz-es és a 150 Hz-es hangok relatív hangfrekvenciás fázis helyzetét bemutató ILS hullámformák

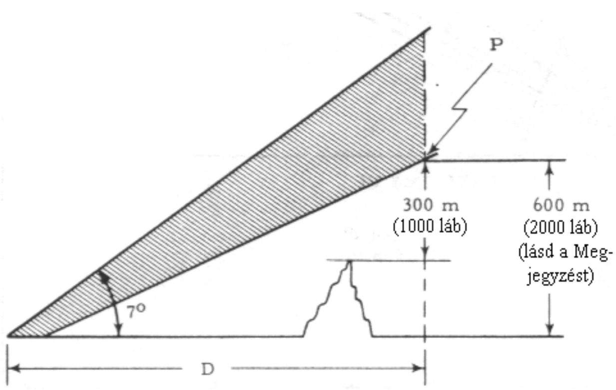


Amikor a terepviszonyok megkövetelik, vagy az üzemeltetési körülmények és az alternatív navigációs berendezések lehetővé teszik, akkor a következő fedésterületet lehet biztosítani:



Megjegyzés. - Ha a fedésterület a 3. Fejezet 3.1.3.3.1 pontjában leírtaknak megfelelően a plusz, vagy mínusz 35 fokos szektoron kívül is szükséges, akkor ez 18,5 km-ig (10 tengeri mérföld) kerül biztosításra, úgy, ahogy azt a fenti szaggatott vonalú körív jelzi.

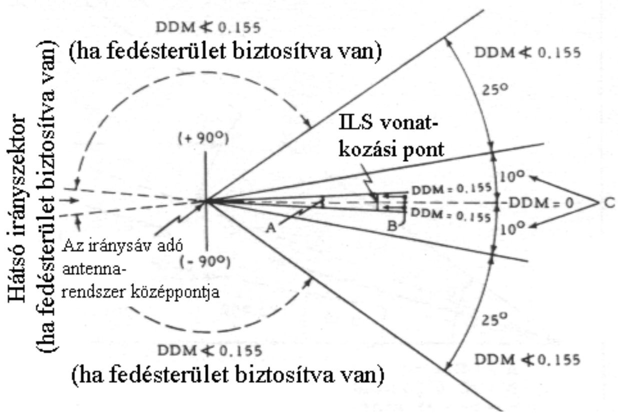
C-7. ábra: Az iránysáv oldalszögre vonatkozó fedésterülete



D = A távolságok és oldalszögek a 3.1.3.3.1 pontban kerültek meghatározásra.

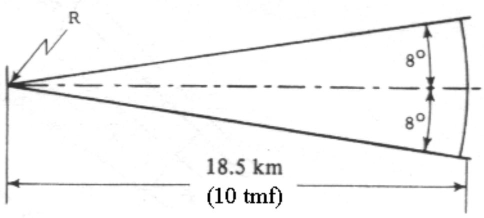
Megjegyzés. - A P-pont vagy 600 méterrel (2 000 láb) van a küszöb tengerszinthez viszonyított magassága felett, vagy 300 méterrel (1 000 láb) a közbenső, vagy a végső megközelítési területen belül lévő legmagasabb pont tengerszinthez viszonyított magassága felett, amelyik a magasabb.

C-8. ábra: Az iránysávnak a magassági szögre vonatkozó fedésterülete

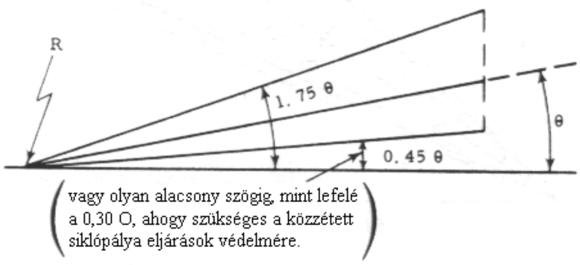


A - Iránysáv szektor > 6 fok
B - Eltolódási érzékenység = 0,00145 DDM/m (0,00044 DDM/láb) az ILS vonatkozási pontnál.
C - A modulációs mélység különbség lineáris a nullától a 0,180 értékig és azután < 0,180

C-9. ábra: A modulációs mélység különbség és az eltolódási érzékenység



(a) Oldalszögbeli fedés

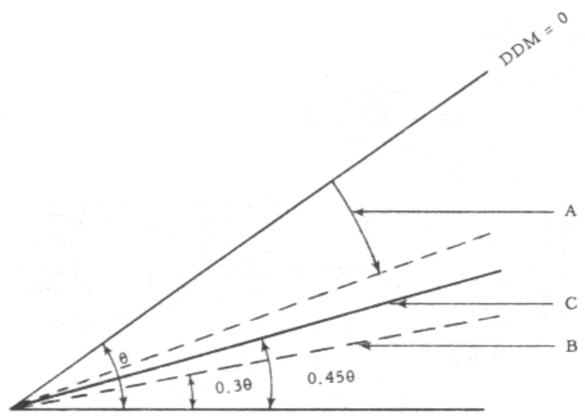


(b) Magassági szög fedés

R = Az a pont, amelynél az ILS siklópálya lefelé meghosszabbított egyenes része metszi a futópálya középvonalát.

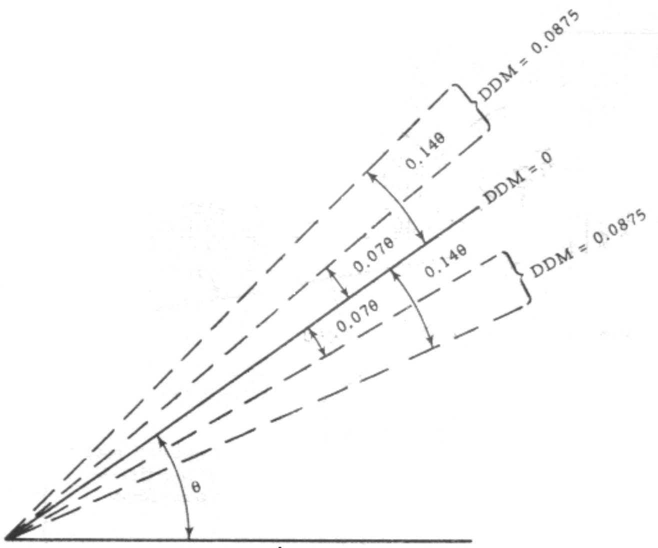
θ = az (ILS) siklópálya szög 2° és 4° között állítható be.

C-10. ábra: Siklópálya fedésterület



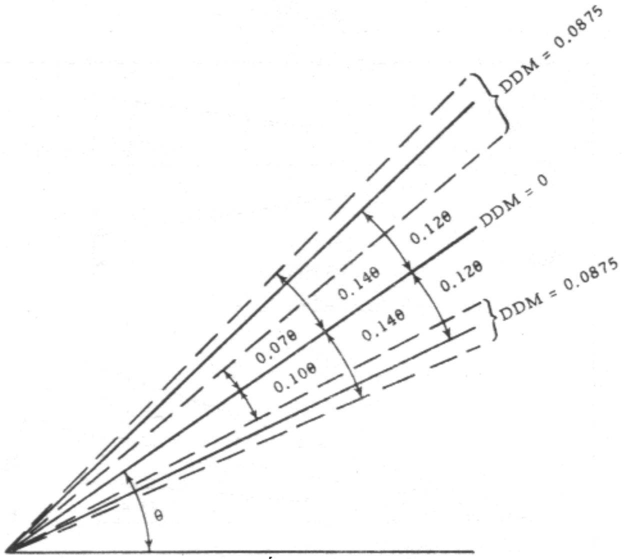
A - a DDM egyenletesen növekszik 0,22 DDM-ig
B - < 0,22 DDM lefelé a 0,3 θ-ig
C - Ha a DDM-et elérik bármilyen, a 0,45 θ feletti szögnél, akkor a DDM értéke nem lehet kevesebb 0,22-nél lefelé, legalább a 0,45 θ -ig, vagy olyan alacsony szögig, mint lefelé a 0,30 θ, ahogy szükséges a közzétett siklópálya befogási eljárás védelmére.

DDM jellemzők a siklópálya alatt
(Minden kategóriára)

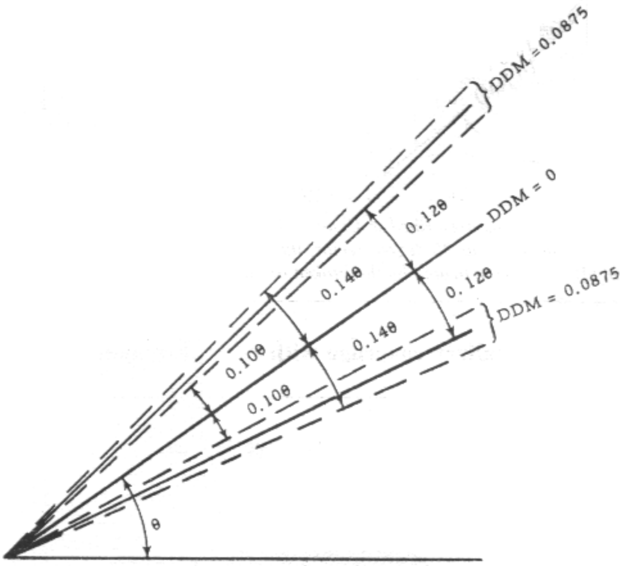


I. KATEGÓRIA

C-11. ábra: Siklópálya - modulációs mélység különbség (1. rész)



II. KATEGÓRIA

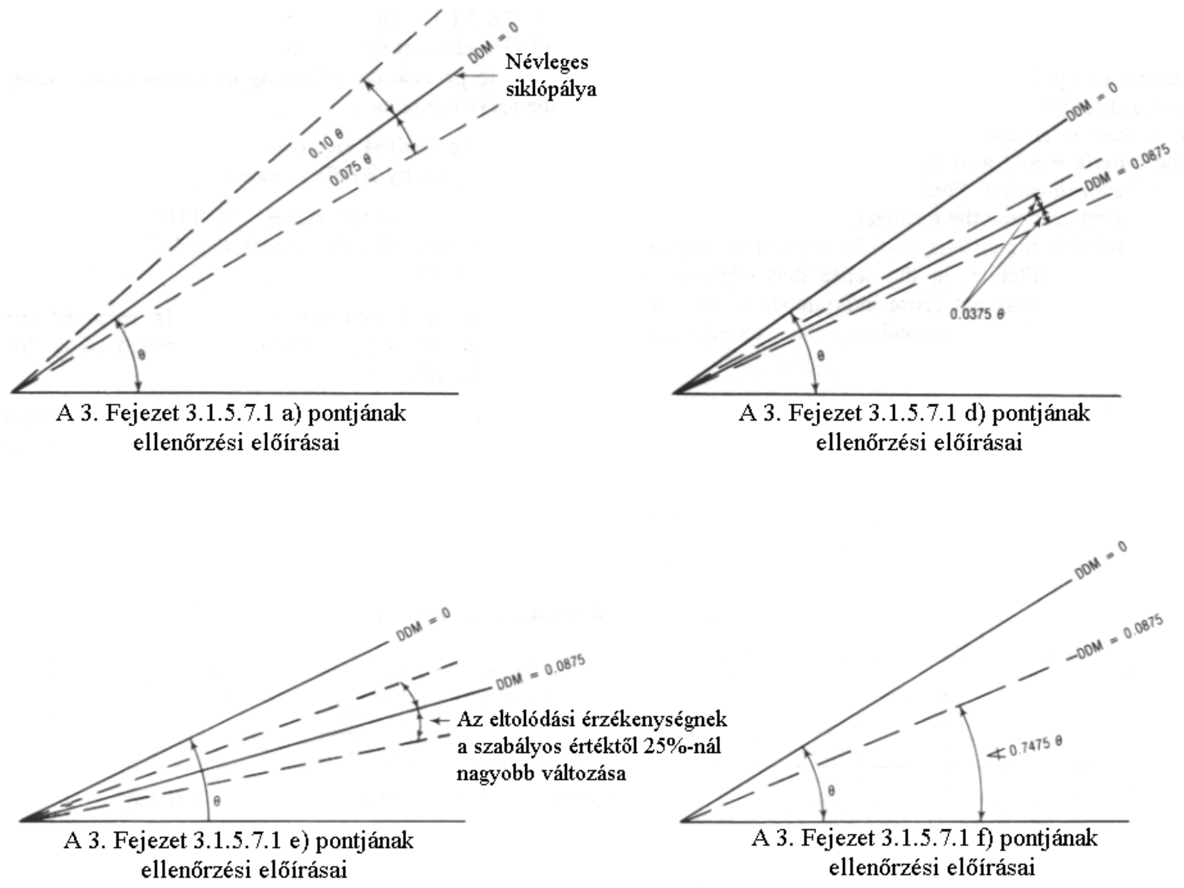


III. KATEGÓRIA

θ = Névleges siklópálya magassági szög - 2^{o} és 4^{o} között állítható be.
(A szaggatott vonal azokat a határértékeket mutatja, amelyek között a 0,0875 modulációs mélység különbséget az I., II. és III. Kategóriánál meg kell választani.)

Megjegyzés. - A C-11. ábra azokat a tűréshatárokat tűnteti fel a kisugárzott térbeli karakterisztikára, amelyek a 3. Fejezet 3.1.5.6 pontjában előírásra kerültek, azonban ezt a térberli karakterisztikát nem szabad úgy értelmezni, mint bármely meghatározott földi berendezésre jellemzőt. Ebben az összefüggésben meg kell jegyezni azt, hogy több olyan ismert típusú ILS siklópálya földi berendezés van, amelynek eltérőek a jellemzői, de amely ki tudja elégíteni a 3. Fejezet 3.1.5.6 pontjának követelményeit. Ennek megfelelően mindenütt, ahol fennáll az a követelmény, hogy ismeni kell az egy adott berendezésre vonatkozó alkalmazható tűréshatárokat, ott a referenciát a gyártó cég technikai adataiból kell megszerezni, és nem az ICAO rendszer előírásaiból.

C-11. ábra: Siklópálya - modulációs mélység különbség (2. rész)



Megjegyzés. - A szaggatott vonalak az eltolódásnak azt a megengedhető határértékét jelentik, amely előtt a felügyelő rendszer riasztási tevékenységére szükség van.

C-12. ábra: Siklópálya ellenőrzési előírások

2.6 Az ILS frekvenciák telepítési elosztása

2.6.1 A C-1. táblázatban felsorolt számok alkalmazásánál meg kell jegyezni azt, hogy ezek a zavarmentesség biztosítására vonatkoznak, a védett magasság egy pontjára és az ILS első sugárnyalábjának az irányában a szolgáltatási távolság határára. Ha fennáll a hátsó irány-szektor alkalmazásának üzemeltetési követelménye, akkor a követelményt a hátsó irányszektor megegyező pontjáig is alkalmazni kell. Ennek megfelelően az iránysáv oldalszögbeli irányítottságának figyelembevételével frekvencia tervezésre lesz szükség. Meg kell jegyezni azt, hogy a követelményt minden egyes iránysáv adó telepítésre vonatkozóan alkalmazni kell, olyan értelemben, hogy ahol két iránysáv adó van, ott lehetséges az, hogy az első nem zavarja a második használatát, és ennek ellenére a második zavart okozhat az első felhasználásában.

2.6.2 A C-1. táblázatban felsorolt számok egy olyan környezet biztosításán alapulnak, amelyen belül a fedélzeti vevő berendezések pontosan működhetnek.

C-1. táblázat: A szükséges távolsági elkülönítés

	Frekvencia távolság	A második berendezés és az első berendezés védettségi pontja közötti minimális elkülönítés km (tmf)		
		A-jegyzék	B-jegyzék	C-jegyzék
Iránysáv	Közös csatorna	148 (80)	148 (80)	148 (80)
	50 kHz	-	37 (20)	9 (5)
	100 kHz	65 (35)	9 (5)	0
	150 kHz	-	0	0
	200 kHz	11 (6)	0	0
Siklópálya	Közös csatorna	93 (50)	93 (50)	93 (50)
	150 kHz	-	20 (11)	2 (1)
	300 kHz	46 (25)	2 (1)	0
	450 kHz	-	0	0
	600 kHz	9 (5)	0	0

Az A-jegyzék olyan iránysáv vevők alkalmazására vonatkozik, amelyek 200 kHz-es csatorna elosztással és csatoltan 600 kHz-es csatorna elosztású siklópálya vevőkkel való működésre tervezettek, és csak olyan körzetekben alkalmazhatók, ahol a telepített berendezések "sűrűsége" kicsi.
A B-jegyzék olyan iránysáv vevők alkalmazására vonatkozik, amelyek 100 kHz-es csatorna elosztással és csatoltan 300 kHz-es csatorna elosztású siklópálya vevőkkel való működésre tervezettek.
A C-jegyzék olyan iránysáv vevők alkalmazására vonatkozik, amelyek 50 kHz-es csatorna elosztással és csatoltan 150 kHz-es csatorna elosztású siklópálya vevőkkel való működésre tervezettek.

1. Megjegyzés. - A fenti számjegyek a következő védettségi pontok alapfeltételként való elfogadására alapozottak: az iránysávra a 46 km-es (25 tengeri mérföld) távolságnál és 1900 m-es (6 250 láb) magasságnál, az ILS siklópályára pedig a 18,5 km-es (10 tengeri mérföld) távolságnál és 760 m-es (2 500 láb) magasságnál.

2. Megjegyzés. - Azoknak az Államoknak, amelyek a táblázatban bemutatott elkülönítéseket alkalmazzák, el kell fogadniuk annak szükségességét, hogy az ILS és VOR berendezéseket olymódon telepítik, ami eleve kizárja a légijármű fedélzeti vevőknek a nagy nem-kívánt jel szintek miatti túlterhelődési hibáját akkor, amikor a légijárművek a kezdeti és végső megközelítési szakaszokban repülnek.

3. Megjegyzés. - Azoknak az Államoknak, amelyek a táblázatban bemutatott elkülönítéseket alkalmazzák, el kell fogadniuk annak szükségességét, hogy az ILS siklópálya berendezéseket olyan módon telepítik, ami eleve kizárja a téves siklópálya kijelzéseknek a szomszédos csatorna jelek vétele miatti lehetőséget akkor, amikor a kívánt jelek sugárzása bármilyen okból megszűnik akkor, amikor a légijármű a végső megközelítési szakaszban van.

2.6.2.1 *ILS iránysáv vevők*

2.6.2.1.1 Abból a célból, hogy az 50 kHz-es csatorna elosztásra tervezett vevőknek védelmet biztosítsanak, megválasztásra kerültek azok a minimális elkülönítések, amelyek a következő minimális jel arányokat a szolgáltatási térben biztosítják:

a) a megkívánt jel az egy nem-kívánt közös csatorna jelet 20 dB-el, vagy többel haladja meg;

b) a nem-kívánt jel a megkívánt jeltől 50 kHz távolságban a megkívánt jelet 34 dB-el haladja meg;

c) a nem-kívánt jel a megkívánt jeltől 100 kHz távolságban a megkívánt jelet 46 dB-el haladja meg;

d) a nem-kívánt jel a megkívánt jeltől 150 kHz, vagy annál nagyobb távolságban a megkívánt jelet 50 dB-el haladja meg.

2.6.2.1.2 Abból a célból, hogy a 100 kHz-es csatorna elosztásra tervezett vevőknek védelmet biztosítsanak, megválasztásra kerültek azok a minimális elkülönítések, amelyek a következő minimális jel arányokat a szolgáltatási térben biztosítják:

a) a megkívánt jel az egy nem-kívánt közös csatorna jelet 20 dB-el, vagy többel haladja meg;

b) a nem-kívánt jel a megkívánt jeltől 50 kHz távolságban a megkívánt jelet 7 dB-el haladja meg;

c) a nem-kívánt jel a megkívánt jeltől 100 kHz távolságban a megkívánt jelet 46 dB-el haladja meg;

d) a nem-kívánt jel a megkívánt jeltől 150 kHz, vagy annál nagyobb távolságban a megkívánt jelet 50 dB-el haladja meg.

2.6.2.2 *ILS siklópálya vevők*

2.6.2.2.1 Abból a célból, hogy a 150 kHz-es csatorna elosztásra tervezett vevőknek védelmet biztosítsanak, megválasztásra kerültek azok a minimális elkülönítések, amelyek a következő minimális jel arányokat a szolgáltatási térben biztosítják:

a) a megkívánt jel az egy nem-kívánt közös csatorna jelet 20 dB-el, vagy többel haladja meg;

b) a nem-kívánt siklópálya jel a megkívánt jeltől 150 kHz távolságban a megkívánt jelet 20 dB-el haladja meg;

c) a nem-kívánt siklópálya jel a megkívánt jeltől 300 kHz távolságban a megkívánt jelet 40 dB-el haladja meg.

2.6.2.2.2 Abból a célból, hogy a 300 kHz-es csatorna elosztásra tervezett vevőknek védelmet biztosítsanak, megválasztásra kerültek azok a minimális elkülönítések, amelyek a következő minimális jel arányokat a szolgáltatási térben biztosítják:

a) a megkívánt jel az egy nem-kívánt közös csatorna jelet 20 dB-el, vagy többel haladja meg;

b) a nem-kívánt siklópálya jel a megkívánt jeltől 150 kHz távolságban ne haladja meg a megkívánt jelet (0 dB jel arány);

c) a nem-kívánt siklópálya jel a megkívánt jeltől 300 kHz távolságban a megkívánt jelet 20 dB-el haladja meg;

d) a nem-kívánt siklópálya jel a megkívánt jeltől 450 kHz, vagy nagyobb távolságban a megkívánt jelet 40 dB-el haladja meg.

2.6.3 A számítások azon az alapfeltételen alapulnak, hogy a megkívánt jelnek biztosított védelem a nem-kívánt jel zavaró hatásával szemben 20 dB legyen. Ez az ILS szolgáltatási hatótávolsága határánál 15 mikroampernél nem nagyobb zavarásnak felel meg.

2.6.4 Amennyiben a megkívánt és a nem-kívánt vivőfrekvenciák egy interferencia hangot hoznak létre, ez a védelmi arány biztosítja azt, hogy az a műszereket nem befolyásolja. Azonban azoknál az eseteknél, ahol egy beszédüzemű berendezés használatos, ott az interferencia hang azt a berendezést zavarhatja.

2.6.5 Általában az ILS rendszereknek a nemzetközi használatát a 3. Fejezet 3.1.6.1.1 pontjában felsorolt frekvencia-párosítás korlátozza, ennek követelménye az, - feltéve, hogy azok az iránysáv egységre is megfelelnek - hogy a siklópálya elemeket automatikusan magukba foglalják. Bizonyos zsúfolt helyeken, ahol a frekvenciákat mind az első tizes, mind a második tizes frekvencia-pár sorozatból kell kijelölni, szükséges lehet az, hogy a sorozatból bizonyos párokat kiválogassanak, abból a célból, hogy az alábbi 2.6.6 pontban megadott minimális földrajzi elkülönítést kielégítsék.

Példa: A 3. Fejezet 3.1.6.1.1 pontjára utalva meg kell jegyezni azt, hogy az ILS 2. sorszám-párnál az iránysáv frekvenciája 109,9 MHz. A 12-es és 19-es sorszámú párok azonban, jóllehet, széles frekvencia elkülönítést biztosítanak a 2-es sorszámú ponttól, az iránysáv viszonyában a 334,1 MHz-es és a 333,5 MHz-es kijelölt frekvenciájúak a siklópályákra, és mindkettő az első szomszédos csatorna (300 kHz-es frekvencia elkülönítés) a 2-es sorszámú siklópálya csatornához viszonyítva. Ha az ILS csatornák kiválasztása vagy az első tíz, vagy a második tíz párosításra kerül korlátozásra, akkor a minimális siklópálya frekvencia elkülönítés 600 kHz lesz.

2.6.6 *A szükséges távolsági elkülönítés táblázata* [lásd a C-1. táblázatot]

2.6.7 A C-1. táblázatban megadott számok alkalmazása csak az azon alapfeltételek által meghatározott korlátozásokon belül lesz kifogástalan, amelyek magukba foglalják azt, hogy a berendezések lényegében körsugárzó jellegűek, megegyező a kisugárzott teljesítményük, és a térerő hozzávetőlegesen egyenesen arányos a magassági szög szögértékével a 10 fokig terjedő szögekre, valamint azt, hogy a légijármű antennája alapvetően irányítatlan (körkörös) jellegű.

Ha az elkülönítési távolságok jóval pontosabb meghatározására van szükség a frekvencia-zsúfolt körzetekben, ott azt a minden egyes berendezésre vonatkozó megfelelő terjedési görbékkel lehet meghatározni, figyelembe véve a meghatározott irányítottsági tényezőket, a kisugárzott teljesítmény jellemzőket és az olyan üzemeltetési követelményeket, mint a fedésterület. Ahol lecsökkentett elkülönítési távolságokat határoznak meg az irányítottságot stb. figyelembe véve, ott - amikor csak lehetséges - légi ellenőrzésekkel méréseket kell végezni az ILS védettségi pontjánál, és a megközelítési útirány minden pontján "bizonyítani" kell, hogy lehetséges-e a legkevesebb 20 dB-es védettség biztosításának a gyakorlati elérése.

2.7 Az iránysáv és siklópálya fedések létrehozása két rádiófrekvenciás vivőhullámmal

2.7.1 Az iránysáv fedés létrehozható két, az iránysáv frekvencia csatornán belül egymástól elválasztott különböző vivőhullámon kisugárzott összetett térerősség elosztás segítségével. Az egyik térerősség elosztás megadja a pontos iránysáv és eltolódási jelzéseket az első iránysáv szektorban, a másik pedig biztosítja az ILS jelzéseket az első iránysáv szektoron kívül azért, hogy a 3. Fejezet 3.1.3.3 és 3.1.3.7 pontjában leírt fedésterületi követelményeket kielégítse.
A jelek közötti megkülönböztetés a fedélzeti vevőkészülékben az erősebb jelnek a vevőberendezés általi befogásával történik. A befogás hatásossága az alkalmazott detektor típusától függ, általában azonban, ha a két jel közötti arány 10 dB, vagy annál nagyobb nagyságrendű, akkor a gyengébb jel nem idéz elő lényegesen nagy hibákat a demodulált kimenő jelben. Az első irányszektoron belüli legelőnyösebb teljesítmény elérése érdekében a következő útmutató anyagot kell alkalmazni a két vivőhullámú iránysáv adó rendszerek üzemeltetésénél.

2.7.2 Az iránysáv adót úgy kell megtervezni és karbantartani, hogy a két kisugárzott térbeli jel aránya az első irányszektoron ne csökkenjen 10 dB alá. Különös figyelmet kell fordítani a két antenna-rendszer által létrehozott függőleges szirom szerkezetére, ami magasságban különböző és távolságban elválasztott lehet, és ezáltal változásokat hozhat létre a jel erősségek arányában a megközelítés során.

2.7.3 A vevő átviteli sávszűrőjének hullámosságára megengedett 6 dB miatt az iránysáv vevőnél érzékenységi eltérés fordulhat elő akkor, amikor a biztonsági vezetési frekvenciát eltávolítják az irányvezetési frekvenciáról. Ennek a hatásnak a csökkentésére - különösen a III. Kategóriájú üzemeltetéseknél - az irányvezetési-biztonsági vezetési jel arányát 10 dB-ről 16 dB-re kell növelni.

2.7.4 A hibák kockázatát tovább csökkenti az, ha a két kisugárzott jel aránya a 10 dB alá csökken, és a két jelből eredő névleges iránysáv vonal irányítottsági különbségét olyan alacsonyan kell tartani, amennyire az csak lehetséges.

2.7.5 Azoknál a siklópályáknál, amelyeknél alkalmazzák a két vivőhullámot, az összetett térerősség eloszlás létrehozására ugyanazon a rádiófrekvenciás csatornán használják fel. Az antennák különleges kialakításai és az antenna áramok elosztása és fázisolása lehetővé teheti a siklópályaadó berendezések olyan különleges terepviszonyú helyszíneken történő telepítését is, ahol egyébként nehézséget okozna az egy-frekvenciás rendszer elhelyezése. Az ilyen helyszíneken javulás érhető el az alacsony szögű sugárzás csökkentésével. A második vivőhullámot a siklópálya alatti körzet fedésének biztosítására használják.

2.8 Integritás és a szolgáltatás folyamatossága - ILS földi berendezés

2.8.1 Bevezetés

2.8.1.1 Ennek az anyagnak az a célja, hogy tisztázza az ILS iránysáv és siklópálya földi berendezés szolgáltatási céljainak integritását és folyamatosságát, illetve útmutatóul szolgáljon a mérnöki tervezéshez és a berendezés rendszer-jellemzőihez. A szolgáltatás integritását és folyamatosságát üzemeltetési nézőpontból szükségszerűen ismerni kell annak érdekében, hogy döntés szülessen arról az üzemeltetési alkalmazásról, amelyet az ILS alá tud támasztani.

2.8.1.2 Általánosan elfogadott az, hogy az üzemeltetési céltól függetlenül, a leszállás során a végzetes baleset bekövetkezésének átlagos mértéke az egész rendszer - amelyet a földi berendezés, a légijármű és a légijárművezető képez - hibái, vagy hiányosságai miatt nem haladhatják meg az 1×10^{-7} valószínűséget. Erre a követelményre gyakran általános kockázati tényezőként utalnak.

2.8.1.3 Egy I. Kategóriájú üzemeltetés esetén, annak a felelőssége, hogy a fenti célok biztosításra kerülnek, a légijármű vezetőjére van ráruházva. A III. Kategóriájú üzemeltetéseknél a fenti cél a szükséges, de most ahhoz hozzátartozik az egész rendszer. Ebben az összefüggésben az a legfontosabb, hogy törekedjenek a földi berendezés szolgáltatása legmagasabb szintű integritásának és folyamatosságának elérésére. Az integritás annak biztosításához szükséges, hogy a megközelítésben lévő légijármű részére alacsony legyen a hamis útirány-vezetés vételének valószínűsége; a szolgáltatás folyamatossága annak biztosításához szükséges, hogy a légijármű részére a megközelítés végső szakaszaiban kicsi legyen annak valószínűsége, hogy az útirány-vezetési jel 'elveszik'.

2.8.1.4 Úgy látszik, hogy a különféle üzemeltetési követelményeknek a szolgáltatás különféle integritási és folyamatossági céljai felelnek meg. Az alábbi 2.14 pont a szolgáltatás integritásának és folyamatosságának négy szintjét állapítja meg, és írja le.

2.8.2 A szolgáltatási szintek integritásának és folyamatosságának megvalósítására és megőrzésére vonatkozó útmutató anyag

2.8.2.1 Egy integritás hiba akkor fordulhat elő, amikor egy olyan jel kerül kisugárzásra, amely a meghatározott tűréshatárokon "kívül van", vagy azért, mert a felügyelő egység nem ismeri fel, vagy azért, mert az ellenőrző áramkörök elmulasztják a hibás jel eltávolítását. Az ilyen hiba egy veszélyhelyzet részét képezheti, ha nagy hibát eredményez.

2.8.2.2 Nyilvánvalóan nem az összes integritás hiba veszélyes a megközelítés valamennyi szakaszában. Például a megközelítés kritikus szakaszai során az iránysáv szélességben nagy hibát, vagy irányvonal eltolódást létrehozó észrevétlen hibának különleges jelentősége van, ellenben egy, a modulációs mélység, az iránysáv, vagy a siklópálya biztonsági-vezetési jelekben és az iránysáv azonosítóban előforduló észre nem vett jel elvesztés nem fog szükségszerűen veszélyes helyzetet létrehozni. Azok a meghatározási ismérvek azonban, hogy melyik hiba mód lényeges, magukba foglalják az összes olyan veszedelmes hiba körülményt, ami nem kétségbevonhatatlanul nyilvánvaló az automatikus repülési rendszer, vagy a légijármű vezetője részére.

2.8.2.3 Különösen fontos az, hogy olyan felügyelő rendszerek tervezésre kerüljenek, amelyek biztosítják a hibamentes üzemeltetést a 3. Fejezet 3.1.3.11.4 és 3.1.5.7.4 pontjában leírt Szabványoknak való megfeleléssel. Ez gyakran szigorú tervezési elemzést igényel. A felügyelő rendszer hibái különben lehetővé tehetik a hibás jelek kisugárzását. Néhány olyan lehetséges körülmény, ami a veszély részét képezheti, a II. és III. Kategóriájú üzemeltetési teljesítményeknél:

a) egy nem észlelt, jelentősen az iránysáv, vagy a siklópálya felügyelő rendszere ellenőrzési határain kívülre történő irányvonal eltolódás;

b) egy nem észlelt olyan hiba, ami jelentősen megváltoztatja az iránysáv szélességet és a siklópálya érzékenységet;

c) egy nem észlelt olyan hiba, ami az iránysáv lassú ciklikus elmozdulását idézi elő, olyan, a megközelítést végrehajtó légijármű által szemmel látható hibákat létrehozóan, ami amplitúdóban jelentős mértékben meghaladja a 3. Fejezet 3.1.3.4.2 pontjában az iránysávadóra és a 3. Fejezet 3.1.5.4.2 pontjában a siklópályaadóra az ILS "B"- és "T"-pontja közötti értékre előírtakat.

2.8.2.4 A védelem legmagasabb szintje a felügyelő egység és a hozzá kapcsolódó vezérlő rendszer észre nem vett hibájának kockázata ellen szükséges. Ezt úgy lehet elérni, hogy gondosan megtervezik az ilyen előfordulások lehetőségének az alacsony szintre való csökkentését, és elvégzik a felügyelő rendszer teljesítményének karbantartási ellenőrzését olyan időközönként, amelyet a tervezési elemzés határozott meg. Egy ilyen elemzést fel lehet használni a rendszer integritás szintjének a minden egyes leszállásra vonatkozó kiszámítására. A következő képletet meghatározott típusú ILS berendezésekre lehet alkalmazni, és egy példát ad a rendszer integritás, *I*, meghatározására - az észre nem vett hibás kisugárzású adások valószínűségének, *P*, kiszámításából.

(1) $I = 1 - P$

$$P = \frac{T_1 T_2}{\alpha_1 \alpha_2 M_1 M_2} \quad \text{amikor } T_1 < T_2$$

ahol:

I = integritás;

P = az adó és a felügyelő rendszerben előforduló olyan egyidejű hibák valószínűsége, amelyek észre nem vett hibás sugárzást eredményeznek;

M_1 = adó meghibásodások közötti átlagos idő (MTBF);

M_2 = a felügyelő és a hozzá kapcsolódó vezérlő rendszer meghibásodásai közötti átlagos idő;

1
α_1 = az adóban bekövetkező olyan meghibásodások aránya, amely hibás jelek kisugárzását eredményezte az összes adó hiba gyakoriságához viszonyítva;
1
α_2 = a felügyelő és a hozzá kapcsolódó vezérlő rendszer olyan meghibásodási gyakoriságának aránya, amely egy hibás jel kimutatására való képtelenséget eredményezett az összes, a a felügyelő és a hozzá kapcsolódó vezérlő rendszer hiba gyakoriságához viszonyítva;

T_1 = az adó ellenőrzések közötti időtartam (órákban);

T_2 = a felügyelő és a hozzá kapcsolódó vezérlő rendszer ellenőrzései közötti időtartam (órákban).

Amikor a $T_1 \geq T_2$, akkor a felügyelő rendszer ellenőrzéseit adó ellenőrzésnek lehet tekinteni. Ebben az esetben ennek megfelelően a $T_1 = T_2$ és a képlet a következő lesz:

(2) $$P = \frac{T_2^2}{\alpha_1 \alpha_2 M_1 M_2}$$

2.8.2.5 Az integritást illetően, mivel a felügyelő, vagy vezérlő rendszeren belüli veszélyes meghibásodás előfordulásának valószínűsége rendkívüli módon távoli, azért az, hogy egy magasfokú bizonyossággal megállapítsák a szükséges integritás szintet, szükségessé tenne egy olyan többsávos kiértékelési időtartamot, ami a berendezés meghibásodások közötti átlagos idő /MTBF/ meghatározásához szükséges. Az ilyen elnyújtott időtartam elfogadhatatlan, és ennek megfelelően a megkívánt integritás szintet csak a berendezés szigorú tervezési elemzésével lehet előre 'megjósolni'.

2.8.2.6 A berendezés meghibásodások közötti átlag idejét /MTBF/ és a szolgáltatási folyamatosságát az alap felépítési jellemzők és az üzemeltetési környezet szabályozza. A berendezések felépítésénél a legmegfelelőbb mérnöki munkát, anyagokat és alkatrészeket kell alkalmazni, és szigorú ellenőrzéseket kell végrehajtani a gyártás során. Alapvetően biztosítani kell azt, hogy a berendezést olyan környezeti feltételek mellett üzemeltessék, amit a gyártó meghatározott. A gyártót fel kell kérni arra, hogy biztosítsa azokat a tervezési részleteket, ami lehetővé teszi a meghibásodások közötti átlagos időnek /MTBF/ és a szolgáltatás folyamatosságának a kiszámíthatóságát. Az az elvárás, hogy a berendezés meghibásodások közötti átlag idejét egy üzemeltetési körülmények melletti értékeléssel kell megerősíteni, az üzemeltetési tényezőket számításba véve, például a repülőtéri környezetet, a zord éghajlati körülményeket, az elektromos energiaellátás rendelkezésre állását és a karbantartás minőségét és gyakoriságát. A szolgáltatás 2., 3. vagy 4. szintű integritása és szolgáltatási folyamatossága kiértékelési időtartamának elegendő hosszúságúnak kell lenni ahhoz, hogy a megkívánt szint magasfokú bizonyossággal történő elérését meghatározzák. A következő mérlegelendő tényezőket kell alkalmazni:

a) a minimálisan elfogadható bizonyossági szint 60 százalék. Az ILS szolgáltatási szintjétől függően ez eltérő értékelési időtartamokat eredményezhet. A repülőtéri környezet hatásának értékelésénél jellemzően egy egy-éves időtartamú minimális kiértékelési időtartam szükséges egy meghatározott repülőtéren. Ennek az időtartamnak a lecsökkentése olyan esetekben lehetséges, ahol az üzemeltetési környezet jól ellenőrzött és egy másik, már „bizonyított” telepítéshez hasonló. Az azonos típusú és hasonló üzemeltetési és környezeti körülmények melletti üzemeltetésre később telepített berendezésnél azután eltérő berendezés értékelési időtartamok következhetnek.
Jellemzően ezekre a későbbi telepítésű berendezésekre a minimális időtartamok a 2. szolgáltatási szintre 1600 óra, a 3.szolgáltatási szintre 3200 óra és a 4.szolgáltatási szintre legkevesebb 6400 óra. Ahol több egyforma rendszert üzemeltetnek hasonló körülmények mellett, ott lehetséges az, hogy az értékelést az összes rendszer halmozott üzemeltetési óráira alapozzák. Ez egy lecsökkentett értékelési időtartamot eredményez; és

b) az értékelési időtartam alatt el kell dönteni azt, tervezési hiba okozta-e az egyes leállásokat, vagy egy olyan alkatrész hibája, amelynek ez a szabvány meghibásodási gyakorisága. A tervezési hibákhoz tartoznak például azok az üzemi alkatrészek, amelyek az előírásaikon túli tartományban működtek (túlmelegedés, túláram, túlfeszültség stb. körülmények). Ezeket a tervezési hibákat úgy lehet kezelni, hogy az üzemeltetési körülményeket visszaveszik az alkatrész szabvány üzemeltetési körülményeire, vagy úgy, hogy az alkatrészt kicserélik egy olyannal, ami az üzemeltetési körülményeknek jobban megfelel.
Ha a tervezési hibát ily módon kezelik, akkor az értékelést tovább lehet folytatni, és ezt a leállást nem kell számolni, alapfeltételként elfogadva azt, hogy ez a tervezési hiba - nagy valószínűséggel - nem fog megismétlődni. Ugyanez alkalmazható bármely olyan eset miatti leállásra, amelyet az üzemeltetési körülmények végleges változtatásával csökkenteni lehet.

2.8.2.7 A szolgáltatás működési folyamatosságát az üzemszünetek közötti átlagos idővel /MTBO/ lehet kimutatni, ahol az üzemszünetet a térbeli-jel bármilyen előre nem várt megszűnéseként lehet meghatározni. Ezt a teljes berendezésre vonatkozó működőképes állapotnak az üzemeltetési hibákkal történő elosztásával kell kiszámítani. A meghibásodások közötti átlagos idő /MTBF/ és az üzemszünetek közötti átlagos idő /MTBO/ nem mindig egyenlő, mivel nem minden berendezés hiba fog szükségszerűen egy üzemszünetet okozni, például egy olyan eset, amikor az adó hibája a készenléti adóra történő azonnali átállást hozza létre. Az alábbi 2.14 pontban megadott, a szolgáltatás folyamatosságára várható, üzemszünetek közötti /MTBO/ minimális átlagos idő értékek több rendszer többéves üzemeltetési tapasztalataiból kerültek levezetésre. Annak meghatározásához, hogy egy ILS berendezés működési jegyzőkönyvei beigazolják-e a 2., 3. vagy 4. szint kijelölését, a következő tényezők szakszerű megfontolásai szükségesek:

1) a működési jegyzőkönyvek és az egy megfelelő időtartamon keresztül megalapozott rendszer-felhasználási tapasztalatok (lásd a 2.8.2.6 pontot);

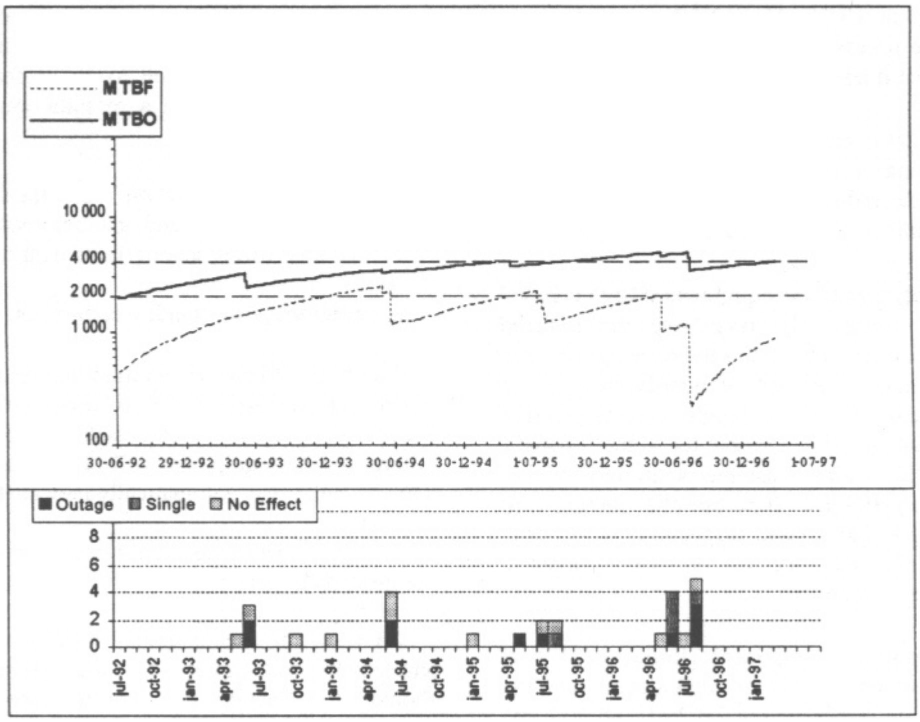
2) az ilyen típusú ILS berendezésre megállapított átlagosan elért üzemszünetek közötti átlagos idő /MBTO/; és

3) a meghibásodások gyakoriságának /irányzata/ trendje.

Egy kiosztott kijelölést nem lehet gyakran változtatgatni. Egy adott telepítésű berendezés működése kiértékelésének alkalmas módszere az, hogy rögzítik a hibákat, és kiszámítják a berendezés utolsó öt - nyolc hibájának üzemszünetek közötti átlagos idejét. Erre a módszerre egy jellemző rögzítési módot ad meg a C-12A és C-12B ábra.

2.8.2.8 A berendezés értékelése során és az üzemeltetési szolgálatba állítását követően folyamatosan jegyzőkönyvezni kell az összes berendezés hibát, vagy üzemszünetet azért, hogy megerősítsék a kívánt szolgáltatási folyamatosság fenntartását.

XX IRÁNYSÁVADÓ

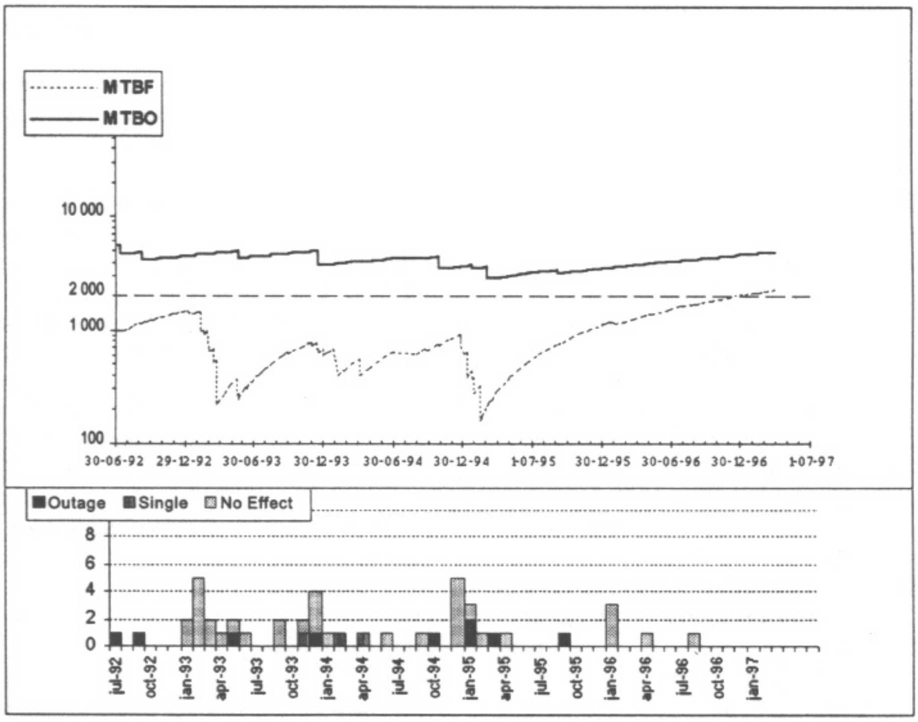


C-12A. ábra: Példa az iránysávadó üzemszünetek jegyzőkönyvi rögzítésére

Jelmagyarázat:

MTBF = Meghibásodások közötti átlagos idő
MTBO = Üzemszünetek közötti átlagos idő
Outage = Leállás
Single = Egyes
No Effect = Nincs hatás

XX SIKLÓPÁLYAADÓ



C-12B: Példa a siklópályaadó üzem szünetek jegyzőkönyvi rögzítésére

Jelmagyarázat:

MTBF = Meghibásodások közötti átlagos idő
MTBO = Üzemszünetek közötti átlagos idő
Outage = Leállás
Single = Egyes
No Effect = Nincs hatás

2.8.2.9 A következő kialakítás példát ad egy olyan tartalékolt berendezési elrendezésre, ami valószínűleg megfelel a 3. és 4. szintű integritási és szolgáltatás folyamatossági céloknak. Az iránysávadó berendezést két - folyamatosan működő - adó alkotja, az egyik az antennára kapcsolva és a készenléti pedig egy műterhelésre kötve. Ezekhez az adókhoz kapcsolódik a következő funkciókat ellátó működési felügyelő rendszer:

a) megfigyeli, hogy a fő adó és az antenna-rendszer üzeme az előírt határértékeken belül van-e a több felügyelő egység közötti többségi választás eszközével;

b) a készenléti berendezés felügyeletével.

2.8.2.9.1 Amikor a felügyelő rendszer a berendezések valamelyikét 'kiselejtezi', akkor a berendezés szolgáltatási szintjének folyamatossága le fog csökkenni azért, mert a többi berendezés hibájából bekövetkező jel megszűnés valószínűsége meg fog növekedni. Ezt a teljesítmény változást automatikusan ki kell jelezni a távvezérlő helyeken.

2.8.2.9.2 Egy, az iránysávadóhoz alkalmazott rendszerrel megegyező felügyelő rendszer kialakítást kell alkalmazni a siklópályaadó berendezésnél.

2.8.2.9.3 A fő és a készenléti adók közötti kölcsönös interferencia csökkentése érdekében, azaz az utóbbitól származó minden parazita sugárzás ellen annak a sugárzása legalább
50 dB-el a fő adó vivőhullám szintje alatt kell legyen az antenna rendszernél mérve.

2.8.2.9.4 A fenti példában a berendezésnek magába kell foglalni egy olyan felszerelést, ami lehetővé teszi a felügyelő rendszer ellenőrzéseit a gyártó által meghatározott, a gyártó tervezési elemzéséből következő időközönként, a szükséges integritási szint elérésének biztosítására. Az ilyen ellenőrzések, amelyek kézi, vagy automatikus ellenőrzések lehetnek, azt az eszközt biztosítják, amely megvizsgálja a felügyelő rendszer pontos működését, beleértve az ellenőrző áramköröket és az átváltó kapcsoló rendszert is. Az automatikus felügyelő rendszeri integritás ellenőrzések elfogadásának az az előnye, hogy az iránysáv és a siklópálya által biztosított szükséges üzemeltetési szolgáltatásban nem lesz megszakítás. Amikor ezt a technikát alkalmazzák, akkor fontos annak a biztosítása, hogy az ellenőrző ciklus teljes időtartama elég rövid legyen ahhoz, hogy ne haladja meg a 3. Fejezet 3.1.3.11.3 vagy 3.1.5.7.3 pontjában előírt teljes időtartamot.

2.8.2.9.5 A berendezés működésének az elsődleges áramellátás hibája miatti megszakadását egy megfelelő készenléti áramellátás biztosításával lehet elkerülni, például telepekkel, vagy "szünetmentes" generátorokkal. Ilyen feltételek mellett a berendezés képes lesz a folyamatos működésre azon időtartam alatt, amikor a légijármű a megközelítés kritikus szakaszaiban lehet.

2.8.2.9.6 A rendszer kritikus alkotó részeinek meghibásodására - mint például az elsődleges áramellátás hibájára - vonatkozóan figyelmeztetéseket kell adni a kijelölt ellenőrző pontokon.

2.8.2.10 Abból a célból, hogy az olyan berendezések hibáit csökkentsék, amelyek a felügyelő rendszer tűrési határértékeinek közelében üzemelnek, a felügyelő rendszer részére hasznos lehet az, hogy egy olyan rendszert iktassanak be, ami egy előzetes riasztó figyelmeztető jelet ad a kijelölt vezérlő pontokra akkor, amikor az ellenőrzött paraméterek elérik azt a határt, ami a felügyelő rendszer figyelmeztető jelzési határértékeinek a 75 százalékával egyenlő.

2.8.2.11 A térbeli-jel integritásának az olyan csökkenéssel szembeni védelmét is figyelembe kell venni, amit az ILS frekvenciasávra ható külső rádió interferencia okozhat, vagy az ILS jelek visszasugárzásából eredhet. Az utóbbira vonatkozóan a kritikus és az érzékenységi területek védelme érdekében végrehajtandó intézkedések a fenti 2.1.10 pontban az általános előírásoknál kerültek megadásra. A rádió interferenciára vonatkozóan szükséges lehet annak rendszeres időközönként történő felülvizsgálata, hogy az interferencia szintje nem jelent-e veszélyt.

2.8.2.12 Egy távolban elhelyezett felügyelő berendezés kiegészítő védelmet nyújthat azáltal, hogy figyelmeztető jelzést biztosít az ellen az egészen ritka valószínűségű - az iránysávadó berendezéstől eredő - hamis információ sugárzás ellen, amelyre a 2.8.5 pontban leírtak utalnak.

2.8.2.13 Általában véve az ellenőrző rendszerek berendezéseinek tervezése azon az alapelven alapszik, hogy folyamatosan megfigyeljék a kisugárzott térbeli-jelet a fedésterületi tér meghatározott pontjaiban azért, hogy biztosítva legyen a 3. Fejezet 3.1.3.11 és 3.1.5.7 pontjaiban meghatározott Szabványoknak való megfelelés.
Jóllehet, az ilyen felügyelet bizonyos mértékben jelzést biztosít arról, hogy a térbeli-jel a fedésterületi térben az összes többi ponton is hasonlóképpen a tűréshatáron belül van, ez mégis nagymértékben csak következtetés. Ennek megfelelően elengedhetetlen az, hogy szigorú légi és földi ellenőrzéseket hajtsanak végre rendszeres időközönként azért, hogy biztosítsák a térbeli-jel integritását a teljes fedésterületi téren belül.

2.8.2.14 Egy, a 2.8.2.9 pontban leírtakkal megegyező berendezés rendszer és a 2.8.2.11, 2.8.2.12 és 2.8.2.13 pontokban leírt útmutatások alkalmazását lehet szabályszerűen elvárni a 2. szintű integritás és szolgáltatás folyamatossági célok eléréséhez.

2.8.2.15 A különböző típusú üzemeltetésekkel együttjáró tényezők elemzése lehetővé teszi az integritás megkívánt szintjének meghatározását, a minden egyes leszállásra vonatkozó valószínűségben kifejezve a megengedett teljes kockázati tényező követelményből meghatározva. Lásd a 2.14.2 c) pontot.

2.8.3 A III. Kategóriájú üzemeltetésekhez elengedhetetlenül szükséges szigorú integritási és szolgáltatás folyamatossági követelmények szükségessé teszik az ILS III. Teljesítmény Kategóriájú berendezések alkalmazását, azokét, amelyek a meghibásodásokkal szemben kielégítő biztonságot nyújtanak. Hibaként az van meghatározva, hogy a teljesítmény kívül van a felügyelő rendszerre a 3. Fejezet 3.1.3.11 pontjában a III. Kategóriájú iránysávadókra és a 3.1.5.7 pontjában a III. Kategóriájú siklópályaadókra meghatározott tűréshatárokon. A földi berendezés üzembiztonságának nagyon nagynak kell lenni annak biztosításához, hogy a megközelítés és a leszállás kritikus szakasza során a biztonságot ne befolyásolja hátrányosan a földi berendezés hibája akkor, amikor a légijármű olyan magasságban vagy helyzetben van, ahol már nem képes a biztonságot javító tevékenység végrehajtására. A teljesítményt az előírt határértékek között nagy valószínűséggel biztosítani kell. A berendezés megbízhatóságát a meghibásodások közötti átlag időben /MTBF/ kifejezve egyértelműen arra a rendszer alapú hiba valószínűségre kell vonatkoztatni, ami a teljes térbeli-jel bármely jellemzőjére hatással lehet. A rendszernek biztosítani kell a felügyelő rendszerek meghibásodásával szembeni legmagasabb fokú védelmet a földi berendezés teljesítményében előforduló hiba észlelése érdekében. Az az ajánlott, hogy az Államok törekedjenek olyan nagyfokú megbízhatóság elérésére, amely a technikai és gazdaságossági határral csak megvalósítható.

2.8.3.1 A következő kialakítás példát ad egy olyan kettős tartalékolt berendezési elrendezésre, ami megfelel a III. Kategóriájú üzemeltetésekhez. Az iránysávadó berendezést két folyamatosan működő adó alkotja, az egyik egy antenna terhelésre kapcsolva. Ezekhez az adókhoz kapcsolódik - a következő funkciókat ellátó - működési felügyelő rendszer:

a) megfigyeli, hogy a fő adó és az antenna-rendszer üzeme az előírt határértékeken belül van-e a több felügyelő egység közötti többségi választás eszközével;

b) a készenléti berendezés felügyeletével.

2.8.3.1.1 Amikor a felügyelő rendszer a berendezések valamelyikét 'kiselejtezi', akkor a berendezés a továbbiakban nem fog megfelelni a III. Kategóriájú állapotnak, mert a többi berendezés hibájából bekövetkező jel megszűnés valószínűsége túl magas lesz. Ezt az alacsonyabb kategóriára való visszaállást automatikusan ki kell jelezni a távvezérlő helyekre.

2.8.3.1.2 Egy, a siklópályaadóhoz alkalmazottal megegyező felügyelő rendszer kialakítást kell alkalmazni.

2.8.3.1.3 A fő és a készenléti adók közötti kölcsönös interferencia csökkentésére, azaz az utóbbitól származó minden parazita sugárzás ellen annak a sugárzása legalább 50 dB-el a fő adó vivőhullám szintje alatt kell legyen az antenna rendszernél mérve.

2.8.3.2 A védelem legmagasabb szintje a felügyelő rendszer észre nem vett meghibásodás következménye ellen szükséges. Ezt úgy lehet elérni, hogy gondosan megtervezik az ilyen előfordulások lehetőségének alacsony szintre való csökkentését, és elvégzik a felügyelő rendszer teljesítményének karbantartási ellenőrzését olyan időközönként, amit a tervezési elemzés határozott meg.

2.8.4 A II. és III. Kategóriájú ILS iránysáv- és siklópályaadó földi berendezésekre alkalmazható kiegészítő útmutató anyagot az alábbiakban adjuk meg.

2.8.4.1 A berendezés megbízhatóságát az alap felépítési jellemzők és az üzemeltetési környezet 'szabályozza'. A berendezések felépítésénél a legmegfelelőbb tervezési munkát, anyagokat és alkatrészeket kell alkalmazni, és szigorú ellenőrzést kell alkalmazni a gyártás során. A berendezést azoknál a környezeti körülményeknél kell üzemeltetni, amelyek megfelelnek a gyártók tervezési követelményeinek. Az az elvárás, hogy a berendezés megbízhatóságát elemzéssel meg kell erősíteni a II. és III. Kategóriájú szolgáltatás bevezetése előtt. Tervezési elemzéssel kell felülvizsgálni a berendezés előre meghatározott teljesítményét.

2.8.5 Az iránysáv adó távolban telepített felügyelő berendezéseire vonatkozó útmutató anyagot az alábbiakban adjuk meg.

2.8.5.1 A távolban telepített felügyelő berendezéseket az iránysáv beállításának ellenőrzésére biztosítják, de fel lehet használni az iránysáv érzékenységének ellenőrzésére is. A távolban telepített felügyelő berendezés a beépített és a közelben telepített felügyelő berendezéstől függetlenül működik. Elsődleges célja az, hogy az iránysáv hibás beállításának veszélye ellen vagy a közelben telepített, illetve a beépített felügyelő berendezések meghibásodása ellen védelmet nyújtson. Azonkívül a távolban telepített felügyelő rendszer növelni fogja a kombinált felügyelő rendszernek azt a képességét, hogy reagáljon a sugárzó elemek fizikai változásaiból, vagy a földi reflexiós jellemzők eltéréséből eredő hatásokra. Ezenkívül még azokat a többutas terjedési hatásokat és futópálya körzeti zavaró tényezőket, - amelyeket a közelben telepített és a beépített felügyelő rendszerek nem látnak, - alapjában véve ellenőrizni lehet egy, a megközelítési útvonal alá elhelyezett megfelelő vevő(k) köré épített távolban telepített felügyelő rendszer alkalmazásával. A berendezést fel lehet használni passzív, vagy 'beavatkozó' felügyelő rendszerként.

2.8.5.2 A távolban telepített felügyelő berendezést általában nélkülözhetetlennek tartják a III. Kategóriájú üzemeltetésekhez, míg a II. Kategóriához általában kívánatosnak tartják. Ezenfelül az I. Kategóriájú telepítéseknél a távolban telepített felügyelő berendezés egy értékes eszközként szolgál a hagyományos felügyelő rendszer kiegészítéseként.

2.8.5.3 Távolban telepített felügyelő berendezés által vett jelre a futópályán, vagy annak a körzetében történő légijármű mozgások rövid idejű zavaró hatást fognak gyakorolni, és a tapasztalatok azt mutatják, hogy a távolban telepített felügyelő berendezést nem célszerű beavatkozó felügyelő rendszerként alkalmazni. Amikor passzív felügyelő rendszerként használják, akkor intézkedni kell arról, hogy a minimálisra csökkentsék az ilyen átmeneti zavaró hatásokat, és lecsökkentsék a zavaró leminősítő jelzések előfordulását; az ennek elérésére szolgáló módszereket az alábbi 2.8.5.4 pont ismerteti. A távolban telepített felügyelő berendezésnek az interferencia hatásokra adott válasza lehetőséget ad arra, hogy kijelezzék a légiforgalmi irányító munkahelyeken azt, amikor az iránysáv jelek átmeneti zavaró hatása fennáll. Azonban a tapasztalatok azt mutatták, hogy azok a légijárművek mozgásai miatti zavarások, amelyek a futópályán történő mozgásokból eredhetnek - a földetérési zónát is beleértve -, nem mindig észlelhetők a távolban telepített felügyelő berendezésekkel. Ezért nem szabad elfogadni azt, hogy a távolban telepített felügyelő berendezések a futópályán történő légijármű mozgások átfogó felderítését biztosítani tudják.

2.8.5.3.1 A távolban telepített felügyelő rendszer további lehetséges alkalmazásai:

a) hasznos karbantartási eszközként szolgál egy hordozható távolban telepített ellenőrző berendezés helyett az iránysáv és/vagy az iránysáv eltérési érzékenység ellenőrzése céljára;

b) felhasználható a távolról érkező jel teljesítmény folyamatos rögzítésének biztosítására a távolról érkező jel minőségének és a jel zavarás mértékének kimutatására.

2.8.5.4 A zavaró leminősítő jelzések előfordulása lecsökentésének lehetséges módszerei a következők:

a) egy, a rendszeren belül 30-tól 120 másodperc között beállítható időkésleltetés beépítése;

b) egy olyan 'helyesség-bizonyító' technika alkalmazása, amely biztosítja azt, hogy csak azok a jelzések kerüljenek a vezérlő rendszerhez továbbításra, amelyeket átmeneti zavarok nem érintettek;

c) az aluláteresztő szűrés alkalmazása.

2.8.5.5 Egy jellemző távolban telepített felügyelő rendszer egy antennából, az ultrarövidhullámú (VHF) vevőből és a hozzá kapcsolódó azon ellenőrző egységekből áll, amelyek a modulációs mélység különbség (DDM) kijelzést, a moduláció összeg és a rádiófrekvenciás jelszint jelzését biztosítják. A vevő antenna általában irányított típusú azért, hogy a nem-kívánt interferenciát a minimálisra csökkentse, és az akadálymentességi határértéknek megfelelően a lehető legnagyobb magasságúnak kell lennie. Az iránysáv vonal felügyelésére az antenna általában a futópálya meghosszabbított középvonalában kerül elhelyezésre. Ahol kívánatos az, hogy az eltolódási érzékenységet is ellenőrizze, ott egy kiegészítő vevő és felügyelő egység kerül elhelyezésre, az antennáját a futópálya meghosszabbított középvonalának egyik oldalán megfelelően elhelyezve. Néhány rendszernél több, térben összetartóan elhelyezett antennát alkalmaznak.

2.9 Az iránysáv és siklópálya eltolódási érzékenység

2.9.1 Jóllehet, bizonyos iránysáv és siklópálya beállítások és az eltolódási érzékenység az ILS vonatkozási pontjához kapcsolódóan előírásra került, azonban ez nem azt jelenti, hogy ezeknek a paramétereknek a mérését ebben a pontban kell elvégezni.

2.9.2 Az iránysávadó felügyelő rendszerének a 3. Fejezet 3.1.3.7 és 3.1.3.11 pontjában megadott értékei és beállítási, valamint karbantartási értékhatárai az eltolódási érzékenység százalékos változásaként kerültek meghatározásra. Ez az elmélet, amely a korábbi kiadványokban lévő szögszélességi előírásokat helyettesíti, azért került bevezetésre, mert a légijármű útirány-vezetési rendszereinek reagálása közvetlenül az eltolódási érzékenységhez kapcsolódik. Meg kell jegyezni azt, hogy a szögszélesség az eltolódási érzékenységgel fordítottan arányos.

2.10 Az ILS helyjeladók telepítése

2.10.1 A belső és a középső helyjeladók közötti interferencia szempontok, valamint az üzemeltetésileg elfogadható minimális időköz a belső és a középső helyjeladó fényjelzései között, korlátozni fogják azt a maximális magasságot, amit a belső helyjeladóval jelezni lehet az ILS siklópályán a futópálya küszöbe feletti 37 m-es (120 láb) magasságra azoknál a helyjeladóknál, amelyek az Annex 10 jelenlegi tűréshatárán belül telepítenek. Egy egyedi helyszín tanulmány fogja meghatározni azt a maximális magasságot, amelyet jelezni lehet, tudomásul véve azt a tényt, hogy egy jellemző fedélzeti helyjeladó vevő berendezéssel egy 140 csomós légijármű sebességnél a középső és a belső helyjeladó közötti fényjelzésre az üzemeltetésileg minimálisan elfogadható időköz 3 másodperc nagyságrendű.

2.10.2 Olyan telepítésű ILS berendezések esetében, amikor egymáshoz közel - például 500 méteres (1 650 láb) térközzel - elhelyezett párhuzamos futópályákat szolgálnak ki, különleges intézkedések szükségesek a helyjeladók kielégítő működésének biztosításához. Egyes Államok gyakorlatilag megfelelőnek találták azt, hogy egyetlen közös felhasználású külső helyjeladót használnak mindkét ILS berendezéshez. Azonban különleges intézkedések szükségesek - például módosított sugárzási iránykarakterisztika - a középső helyjeladók esetében azért, hogy a kölcsönös interferenciát elkerüljék, különösen azoknál az eseteknél, ahol a futópályák egymástól hosszirányban lépcsőzetesen eltoltak.

2.11 A DME berendezésnek az ILS helyjeladók helyetti alkalmazása

2.11.1 Amikor egy DME berendezést használnak az ILS helyjeladók helyett, akkor a DME-t a repülőtéren úgy kell elhelyezni, hogy a nulla távolsági kijelzés egy, a futópálya közelében lévő pontnál legyen. Amikor a DME együttműködik egy nulla távolságú eltolásos ILS-el, akkor ezt a képességet ki kell zárni az RNAV megoldások közül.

2.11.2 A háromszögelési hiba csökkentése céljából a DME-t úgy kell telepíteni, hogy kis értékű szöget (például, 20 foknál kisebbet) biztosítson a megközelítési útirány és a DME-hez tartó irány között annál a pontnál, ahol a távolság információ szükséges.

2.11.3 A DME berendezésnek a középső helyjeladó helyett történő alkalmazásánál alapfeltétel az, hogy a DME rendszer pontossága 0,37 km (0,2 tengeri mérföld), vagy annál jobb legyen, és a fedélzeti kijelzés felbontóképességének olyannak kell lenni, hogy lehetséges legyen ennek a pontosságnak az elérése.

2.11.4 Jóllehet, nem kimondottan szükségszerű az, hogy a DME frekvencia párosítva legyen az iránysávadóval akkor, amikor a külső helyjeladó helyett használják, de a frekvencia párosítás mindenkor előnyös, amikor a DME az ILS-el együtt kerül felhasználásra, mivel egyszerűsíti a légijárművezető munkáját, és lehetővé teszi azt, hogy a két ILS vevővel felszerelt légijármű mindkét vevőjét az ILS csatornán használja.

2.11.5 Amikor a DME frekvenciában párosítva van az iránysávadóval, akkor a DME válaszadó azonosító jelet a frekvenciában párosított iránysávadóból "társult" jelként kell adni.

2.12 Az ILS-hez társuló tájékozódási vezetést adó kiegészítő források alkalmazása

2.12.1 Egy ILS megközelítést megkezdő légijárművet egyéb földi telepítésű berendezések, mint például VOR-ok, légtérellenőrző radar, vagy - ahol ezeket a berendezéseket nem tudták biztosítani - helyzet-meghatározó jeladók által biztosított tájékozódási vezetéssel lehet segíteni.

2.12.2 Ahol azt a meglévő közelkörzeti, vagy útvonal berendezések nem biztosítják, egy megfelelően telepített VOR berendezés hatékony átmenetet tud biztosítani az ILS-re. Ennek a célnak az eléréséhez a VOR berendezést az iránysáv irányvonalon, vagy egy olyan helyzetben lehet telepíteni, ahol az iránysáv irányvonalától olyan távolságban van, hogy egy radiálja olyan szöggel keresztezi az iránysáv irányvonalát, ami lehetővé teszi a sima átmenetet az útvonalra rácsatlakozás esetén is. A VOR telepítési helyszíne és a kívánt pont közötti távolságot ismerni kell akkor, amikor a ráállás pontosságát és a követési hibákhoz biztosított rendelkezésre álló légteret meghatározzák.

2.12.3 Ahol egy megfelelően telepített VOR biztosítása gyakorlatilag nem lehetséges, ott egy bevezető helyzet-meghatározó jeladó, vagy egy NDB tud segítséget nyújtani az ILS-re történő ráálláshoz. A berendezést az iránysávadó irányvonalában kell elhelyezni a futópálya küszöbétől megfelelő távolságra ahhoz, hogy a legmegfelelőbb ráállást biztosítsa.

2.13 ILS - I. teljesítmény kategóriájú berendezések felhasználása az automatikus megközelítések és leszállások során olyan látási körülmények esetén, ami lehetővé teszi az üzemeltetésnek a légijárművezető általi látásos ellenőrzését

2.13.1 Az ILS - I. Teljesítmény Kategóriájú berendezések megfelelő minőségűek ahhoz, hogy - olyan típusú légijármű fedélzeti repülőgép vezérlő rendszerrel társítva, amelyek nem kizárólag az ILS érzékelőktől származó útirány-vezetési tájékoztatásokra támaszkodnak - felhasználhatók legyenek azokhoz az automatikus megközelítésekhez és leszállásokhoz, amelyeket olyan látási körülmények mellett hajtanak végre, ami lehetővé teszi a légijármű vezetője részére az üzemeltetés látás szerinti ellenőrzését.

2.13.2 Ahhoz, hogy a légijármű üzemeltető vállalatokat az egyedi ILS berendezéseknek az ilyen üzemeltetésekre való megfelelőségéről történő előzetes értékelésében segítsék, kérik az Államokat, hogy tegyék közzé:

a) a 3. Fejezet 3.1 pontjától való bármilyen vonatkozású eltérést;

b) a 3. Fejezet 3.1.3.4 és 3.1.5.4 pontjában foglalt előírások teljesítésének mértékét az iránysáv és a siklópálya sugárnyaláb szerkezetére vonatkozóan; és
c) az ILS vonatkozási pontjának a futópálya küszöbe feletti magasságát.

2.13.3 Az olyan zavarok elkerülése érdekében, amelyek megakadályozhatják egy automatikus megközelítés és leszállás végrehajtását, szükséges az, hogy helyi rendelkezésekkel biztosítsák - a gyakorlatilag lehetséges mértékben - az ILS kritikus és érzékenységi területének védelmét.

2.13.4 Ahol két önálló ILS berendezés szolgálja ki egy futópálya két ellentétes végét, ott egy kényszer-kapcsolóval kell biztosítani azt, hogy csak az egyik megközelítési irányt kiszolgáló iránysávadó sugározhasson.

2.14 ILS osztályba sorolás - kiegészítő ILS leírási módszer a berendezés üzemeltetési felhasználásának elősegítése céljából

2.14.1 Az alábbiakban megadott osztályba sorolási rendszer az érvényben lévő berendezés teljesítmény kategóriákkal együtt arra a célra szolgál, hogy az ILS leírásának egy jóval átfogóbb jellegű módszerét biztosítsa.

2.14.2 Az ILS osztályba sorolás három jelcsoport felhasználásával a következők szerint kerül meghatározásra:

a) I., II. vagy III.: ezek a jelek a 3. Fejezet 3.1.3 és 3.1.5 pontjában meghatározott berendezés teljesítmény kategóriának való megfelelést jelzik;

b) A, B, C, T, D, vagy E: ezek a jelek azokat az ILS pontokat határozzák meg, ameddig az iránysáv szerkezete megfelel a 3. Fejezet 3.1.3.4.2 pontjában megadott iránysáv szerkezetnek, a T betű kivételével, ami a futópálya küszöbét jelöli. A pontok a 3. Fejezet 3.1.1 pontjában kerültek meghatározásra.

c) 1., 2., 3. vagy 4.: ezek a számok a C-2. táblázatban megadott integritási és szolgáltatás folyamatossági szintet jelzik.

Megjegyzés. - A meghatározott ILS üzemeltetéshez kapcsolódóan az a cél, hogy az integritási és szolgáltatás folyamatossági szint jellemzően a következőkhöz kapcsolódjon:

1) A 2. szintű teljesítmény célja az, hogy az ILS berendezést az olyan alacsony látástávolságú üzemeltetések alátámasztására használják, ahol az ILS irányvezetést a leszállási szakasz helyzet tájékoztatásánál látásos segédeszközökkel egészítik ki. Ez a szint kívánatos célja az I. Kategóriájú üzemeltetéseket alátámasztó berendezéseknek;

2) A 3. szintű teljesítmény célja az, hogy az ILS berendezést olyan üzemeltetések alátámasztására használják fel, amelyek magasszintű bizalmat helyeznek az ILS által nyújtott irányvezetésre egészen a földetérési pontig. Ez a szint a II. és III.A. Kategóriájú üzemeltetéseket alátámasztó berendezések szükségletének jellemzője; és

3) A 4. szintű teljesítmény célja az, hogy az ILS berendezést az olyan üzemeltetések alátámasztására használják fel, amelyek magasszintű bizalmat helyeznek az ILS által nyújtott irányvezetésre egészen a földetérési pontig és a leszállás utáni kifutás-kigurulás során. Ez a szint alapjában a III. Kategóriájú üzemeltetések teljes sorának szükségleteire vonatkozik.

C-2. táblázat: Integritási és szolgáltatás folyamatossági célok

Szint	Iránysáv, vagy siklópálya		
	Integritás	Szolgáltatás folyamatosság	Meghibásodások közötti átlag idő (óra)
1	Nincs leírva, vagy kevesebb, mint ami a 2. szinthez szükséges.		
2	1 - 10^{-7} minden egyes leszálláshoz	1 - 4 x 10^{-6} minden 15 másodperces időtartamban	1 000
3	1 - 0,5 x 10^{-9} minden egyes leszálláshoz	1 - 2 x 10^{-6} minden 15 másodperces időtartamban	2 000
4	1 - 0,5 x 10^{-9} minden egyes leszálláshoz	1 - 2 x 10^{-6} minden 30 másodperces időtartamban (iránysáv) 15 másodperc (siklópálya)	4 000 (iránysáv) 2 000 (siklópálya)

Megjegyzés. - A jelenleg már telepített berendezésekre abban az esetben, ha a 2. szintű integritási érték nem áll rendelkezésre, vagy nem lehet azonnal kiszámítani, az szükséges, hogy legalább az integritás egy részletes elemzését végezzék el az ellenőrzött meghibásodás ellen biztosított üzemeltetés biztosításához.

2.14.3 Egy példaként, egy olyan ILS - II. Teljesítmény Kategóriájú berendezés, amely kielégíti az ILS - III. Teljesítmény Kategóriájú berendezés iránysáv irányvonal szerkezeti követelményeket egészen az ILS "D" pontjáig, és megfelel a 3. szintű integritási és szolgáltatási célok folyamatosságának, a leírás szerint II/D/3 osztályú lesz.

2.14.4 Az ILS osztályok csak a földi ILS egységekre kerülnek alkalmazásra. Az üzemeltetési kategóriák figyelembevételének magába kell foglalni az olyan további kiegészítő tényezőket is, mint az üzemeltető képességei, a kritikus és az érzékenységi terület védelme eljárási követelmények, valamint az olyan kiegészítő eszközök, mint a futópálya látástávolság-mérő, fénytechnika.

2. 15 Az ILS vivőfrekvencia és fázis-moduláció

2.15.1 Az ILS rádiófrekvenciás vivőfrekvenciáján a megkívánt 90 Hz-es és 150 Hz-es amplitúdó-moduláción (AM) kívül nem-kívánt frekvencia-moduláció (FM) és/vagy fázis-moduláció (PM) fordulhat elő. Ez a nem-kívánt moduláció a középfrekvenciás szűrő átviteli sávjának hullámossága meredekségének detektálása miatt központosítási hibát okozhat az ILS vevőknél.

2.15.2 Erre a lehetőségre a továbbított rádiófrekvenciás vivő-frekvenciának egy olyan középfrekvenciába kell esni, ahol az átviteli sávnak nagy a meredeksége. A meredekség a nem-kívánt 90 Hz-es és 150 Hz-es frekvencia változásokat ugyanolyan frekvenciájú amplitúdó-modulációra alakítja át. Hasonlóképpen, a nem-kívánt 90 Hz-es és 150 Hz-es összetevők közötti frekvencia-modulációs eltérések bármilyen különbségét modulációs mélység különbséggé alakítja át, ami azután eltolást hoz létre a vevőben. A mechanizmus a fázis-modulációra megegyezik a frekvencia-modulációval, mivel a fázis-moduláció olyan frekvencia változást okoz a frekvenciában, ami a fázisban való változásnak (radiáns) a moduláló frekvenciával való szorzatával egyenlő.

2.15.3 A nem-kívánt frekvencia-moduláció és/vagy fázis-moduláció hatását a kívánt amplitúdó-modulációhoz való vektor-összeadás összegzi. A detektált frekvencia vagy fázisban vagy ellenfázisban van az amplitúdó-modulációval, attól függően, hogy a vivő középfrekvencián az átviteli sáv meredekség pozitív, vagy negatív. A detektált fázis-moduláció az amplitúdó-modulációval kvadratúra-modulációban van, és ugyancsak pozitív, vagy negatív lehet az átviteli sáv meredekségétől függően.

2.15.4 Az olyan 90 Hz-től és a 150 Hz-től eltérő frekvenciájú nem-kívánt frekvencia-moduláció és/vagy fázis-moduláció, amelyek átjuthatnak a vevő 90 Hz-es és 150 Hz-es hangfrekvenciás szűrőjén, ugyancsak változásokat okozhatnak az ILS rádiófrekvenciás vivőfrekvenciájának megkívánt 90 Hz-es és 150 Hz-es amplútidó-modulációján, és ez a vevőben modulációs mélység különbség eltolási hibát eredményez. Ennek megfelelően elengedhetetlen az, hogy amikor a nem-kívánt frekvencia-modulációs és fázis-modulációs szinteket mérik, akkor a legalább olyan széles átviteli sávú hangfrekvenciás sávszűrőket kell használni, mint amilyen hangszűrője az ILS vevőknek van. Ezek a szűrők jellemzően egy kereskedelmi moduláció-mérő ellenőrző berendezésbe - a demodulációs és a mérő áramkörök közé - kerülnek behelyezésre, annak biztosítására, hogy csak az ILS alkalmazásnál érintett spektrumsáv összetevők kerüljenek mérésre. Az ilyen mérések szabványosítására az alábbiakban megadott szűrő jellemzőket ajánljuk:

Frekvencia (Hz)	*90 Hz-es átviteli sávát-eresztő szűrő csillapítás, dB*	*150 Hz-es átviteli sáváteresztő szűrő csillapítás, dB*
≤45	-10	-16
85	-0,5	(nincs meghatározva)
90	0	-14
95	-0,5	(nincs meghatározva)
142	(nincs meghatározva)	-0,5
150	-14	0
158	(nincs meghatározva)	-0,5
≥300	-16	-10

2.15.5 Az előnyben részesített maximális határértékek - ahogy az az alábbiakban bemutatásra kerül - az EUROCAE ED-46B és ED-47B dokumentumaiban az ILS vevő központosítási hiba határokból meghatározott, a nem-kívánt modulációs szintek és a központosítási hibák között észlelt kölcsönösség eddigi legrosszabb esetein alapulnak:

A berendezés típusa	*90 Hz csúcs eltérés, FM Hz/PM radiáns (1. Megjegyzés)*	*150 Hz csúcs eltérés, FM Hz/PM radiáns (2. Megjegyzés)*	*Eltérési különbség, Hz (3. Megjegyzés)*
Iránysáv, I.Kategória	135/1,5	135/0,9	45
Iránysáv, II.Kategória	60/0,66	60/0,4	20
Iránysáv, III.Kategória	45/0,5	45/0,3	15
Siklópálya, I.Kategória	150/1,66	150/1,0	50
Siklópálya, II., vagy III. Kategória	90/1,0	90/0,6	30

1. Megjegyzés. - Ezt az oszlopot alkalmazzák a csúcs frekvenciára, vagy a fázis eltérésre, ahogy azt a 90 Hz-es hangszűrőn a 2.15.4 pontban meghatározottaknak megfelelően mérik.

2. Megjegyzés. - Ezt az oszlopot alkalmazzák a csúcs frekvenciára, vagy a fázis eltérésre, ahogy azt a 150 Hz-es hangszűrőn a 2.15.4 pontban meghatározottaknak megfelelően mérik.

3. Megjegyzés. - Ezt az oszlopot alkalmazzák a 2.15.4 pontban meghatározott szűrőkkel kapott nem-kívánt 90 Hz-es frekvencia-modulációs (vagy a megfelelő fázis-modulációs) és a 150 Hz-es frekvencia-modulációs (vagy a megfelelő fázis-modulációs) mérések közötti csúcs frekvencia eltérés különbségére. A 90 Hz-en és a 150 Hz-en mért fázis-modulációnak megfelelő eltérést az egyes radiánsban mért csúcs fázis-modulációnak az annak megfelelő Hz-ben mért moduláló frekvenciával történő megszorzásával számítják ki.

3. A VOR-ra vonatkozó anyag

3.1 A VOR kisugárzott teljesítményére (ERP) és fedésterületére vonatkozó útmutató anyag

3.1.1 A 3. Fejezet 3.3.4.2 pontjában meghatározott térerősség a következők figyelembevételén alapszik:

Légijármű fedélzeti vevő érzékenység	-117 dBW
Adás oldali veszteség, ütközési csillapítás, antenna sugárzási diagram eltérés egy izotróp antennához viszonyítva	+7 dBw
Teljesítmény szükséglet az antennánál	-110 dBW

A 100 dBW-os teljesítmény szükségletet a 118 MHz-en mínusz 107 dBW/m^2-es teljesítmény-sűrűségnél lehet elérni; a mínusz 107 dBW/m^2 90 mikrovolt/méterrel egyenlő, azaz plusz 39 dB 1 mikrovolt/méterre vonatkoztatva.

Megjegyzés. - Egy izotróp (minden irányban azonos tulajdonságú) antenna esetében a teljesítmény-sűrűséget a következő módon lehet kiszámítani:

$$P_d = P_a - 10 \log \frac{\lambda^2}{4\pi}$$

ahol:

P_d = a teljesítmény-sűrűség dBW/m^2-ben,

P_a = a teljesítmény a vételi pontnál dBW-ban,

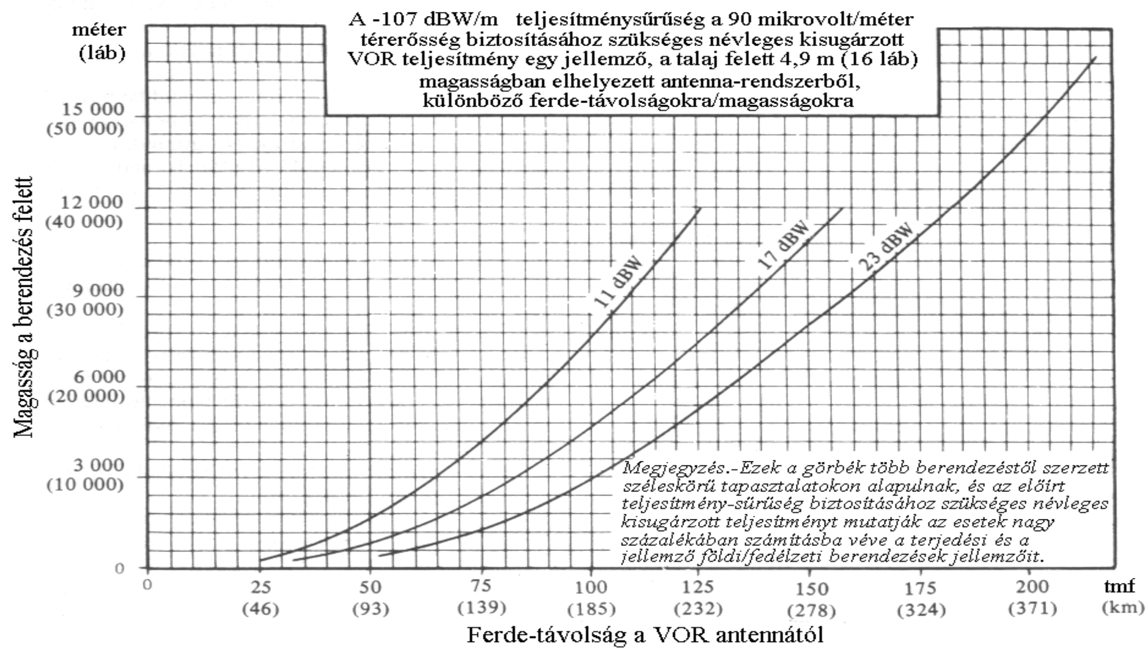
λ = a hullámhossz méterben.

3.1.2 A kisugárzott teljesítménynek /ERP/ az a szükséges névleges értéke, ami a 90 mikrovolt / méter (mínusz 107 dBW/m^2) térerősség eléréséhez kell, a C-13. számú ábrán került megadásra. A fedésterületre - bonyolult terepviszonyok és telepítési körülmények esetén - szükséges lehet az, hogy a kisugárzott teljesítményt megfelelően növeljék. Fordított esetben, a gyakorlati tapasztalat azt mutatja, hogy kedvező telepítési körülmények és kevésbé pesszimisztikus feltételek mellett gyakran azt találják, hogy a tényleges "szolgálatban" kielégítő rendszer működés érhető el alacsonyabb kisugárzott teljesítménnyel /ERP/ is.

Megjegyzés. - A névleges kisugárzott teljesítmény adatok - a magasság és távolság függvényében kifejezve - különböző forrásokból (mint például az ITU-R és NBS) származó alap elméleti adatok figyelembevételén alapulnak, és a jellemző üzemeltetési gyakorlatot tükröző tapasztalatok alapján módosítottak.

3.1.3 A C-13. számú ábra alkalmazását a következő példák mutatják be. Ahhoz, hogy a szükséges térerősséget a 342 km-es távolságban (185 tengeri mérföld) / 12 000 m magasságban (40 000 láb), a 300 km-es távolságban (162 tenger mérföld) / 12 000 m magasságban (40 000 láb), valamint a 166,5 km-es távolságban (90 tengeri mérföld) / 6 000 m-es magasságban (20 000 láb) elérjék, külön-külön plusz 23 dBW, plusz 17 dBW és plusz 11 dBW névleges kisugárzott teljesítményre van szükség.

3.1.4 Abból a célból, hogy megkönnyítsék a frekvencia és berendezés tervezést, amikor gyakorlatilag megvalósítható, a plusz 23 dBW-nak, a plusz 17 dBW-nak és a plusz 11 dBW-nak megfelelő kisugárzott teljesítmény kategóriákat kell alkalmazni. Ezeket a kisugárzott teljesítmény értékeket kell a Körzeti Tervezési Eljárások során közölni.



Megjegyzés. - Ezek a görbék csak a fedésterület teljesítmény viszonyt mutatják. A frekvencia tervezésre vonatkozó útmutatásokat a "C"- Melléklet 3.4 pontja adja meg.

C-13. ábra

3.1.5 Egy plusz 23 dBW kisugárzott teljesítménnyel működő VOR megközelíti az Annex 10-ben a korábbiakban A-kategóriájúként nevezett VOR-t (200 W-os adóteljesítmény). A kisugárzott teljesítmény és az adó kimenő teljesítménye közötti lehetséges összefüggést a következő példák mutatják be:

	I. Példa	*II. Példa*
Adó teljesítmény	+23 dBW	+18 dBW
Földi adás oldali veszteség	-2 dB	-1 dB
Az egy izotróp antennához viszonyított antenna nyereség	+2 dB	+6 dB
ERP	+23 dBW	+23 dBW

Hasonlóképpen, egy plusz 17 dBW kisugárzott teljesítménnyel működő VOR megközelíti az Annex 10-ben a korábbiakban B-kategóriájúként nevezett VOR-t (50 W-os adóteljesítmény). A kisugárzott teljesítmény és az adó kimenő teljesítménye közötti lehetséges összefüggést a következő példák mutatják be:

	I. Példa	*II. Példa*
Adó teljesítmény	+17 dBW	+10 dBW
Földi adás oldali veszteség	-2 dB	-1 dB
Az egy izotróp antennához viszonyított antenna nyereség	+2 dB	+8 dB
ERP	+17 dBW	+17 dBW

3.1.6 Elismert az, hogy a fenti kisugárzott teljesítmény /ERP/ kategóriákkal nagyobb fedésterületet lehet elérni annál, mint ami bizonyos üzemeltetési követelményekhez szükséges. Egy megfelelő kisebb fedésterületet el lehet érni egy olyan VOR berendezéssel, amelynek a kisugárzott teljesítménye körülbelül 11 dBW, a következők szerint:

	I. Példa	*II. Példa*
Adó teljesítmény	+11 dBW	+7 dBW
Földi adás oldali veszteség	-2 dB	-1 dB
Az egy izotróp antennához viszonyított antenna nyereség	+2 dB	+5 dB
ERP	+11 dBW	+11 dBW

3.2 A VOR telepítésére vonatkozó útmutató anyag

3.2.1 A telepítési helynek a környezet legmagasabb pontjának kell lenni azért, hogy a legnagyobb rálátási vonal fedésterületet kapják, és vízszintesnek, vagy az állomástól kifelé lejtőnek kell lenni (a 4 százalékot meg nem haladó lejtéssel legalább a 300 méteres (1 000 láb), de inkább a 600 méteres (2 000 láb) távolságig. A telepítési hely körvonalának az antenna rendszerhez viszonyítottan legalább 300 méteres (1 000 láb) sugárban kör alakúnak kell lenni. A telepítési helynek - amennyire az csak lehetséges - fém vezetékektől és kerítésektől messze kell lenni. A fém vezetékek és kerítések magassága az antenna rendszertől nézve nem zárhat be 1,5 foknál nagyobb függőleges szöget, vagy nem nyúlhat 0,5 foknál magasabbra a vízszintes fölé. Ezeket a határértékeket 50 százalékkal meg lehet növelni olyan kerítések, vagy vezetékek esetében, amelyek lényegében sugárirányúak az antenna rendszerre, vagy 10 foknál nem nagyobb vízszintes szöget zárnak be. Közepes magasságú, 9 méteres (30 láb) magasságot elérő egyedüli fákat a 150 méteres (500 láb) távolságon kívül meg lehet hagyni. Facsoportok 2 foknál nagyobb értékű függőleges szöget bezáróan, vagy az állomástól mért 300 m-en (1 000 láb) belül nem lehetnek. Gondoskodni kell a 600 méteres (2 000 láb) távolságig terjedően a fák eltávolításáról, ha az szükségesnek bizonyul. Semmilyen épület nem zárhat be 1,2 fokosnál nagyobb függőleges szöget, illetve nem lehet elhelyezve az állomástól mért 150 méteren (500 láb) belül.

Elhanyagolható mennyiségű fémtartalmú és kevés fém későbbi beépítésére tervezett fából készült építmények 2,5 fokos függőleges szöget bezáróan helyezhetők el.

3.2.2 Hegyvidéki terepen a legelőnyösebb telepítési hely gyakran a hegycsúcson történő telepítés lesz. A telepítési helyszínnek a legmagasabb hozzáférhető hegycsúcsnak, vagy hegynek kell lenni úgy, hogy annak tetejét legalább egy 45 méteres (150 láb) sugarú körön belül laposra kell elegyengetni. Az ilyen helyen az antenna rendszert körülbelül fél-hullámhossznyira kell a föld felszíne fölé felszerelni az elegyengetett terület közepén, és az adó épületet az elegyengetett területen túl kell elhelyezni, a lejtőn lefelé elegendő távolságra ahhoz, hogy az antenna rendszer optikai rálátási vonala alatt legyen. Az antenna rendszer optikai rálátási vonalában a 45 méter (150 láb) és a 360 méter (1 200 láb) között semmilyen talaj kiemelkedés, fák, vagy elektromos vezetékek, épületek stb. nem lehetnek.

3.3 A VOR pontosságra gyakorolt "polarizációs hiba" hatás meghatározása

3.3.1 Mivel ezideig nem lehetséges annak meghatározása, hogy mekkora a VOR sugárzás minimális megengedhető függőleges polarizációjú összetevőjének az értéke, ezért megbízható légi ellenőrzések szükségesek - az iránymérési kijelzések pontosságára ható - a "polarizációs hibák" miatti hatások megállapítására.

3.3.2 Három módszer áll rendelkezésre a "polarizációs hibák" hatásának meghatározásához:

a) 30 fokos szárnybillegtetés;

b) egy földi ellenőrző pont felett 8 útirány lerepülése;

c) egy 30 fokos bedöntésű kör lerepülése.

Ezek közül a módszerek közül az első azoknak a polarizációs hibáknak a mérésére szolgál, amik akkor jelentkeznek, amikor a légijármű a hossztengelye körül elfordul, miközben egy adott VOR radiálon repül. A második módszernél nyolc különböző géptengely irányon mérik a polarizációs hibát úgy, hogy közben a légijármű nincs bedöntési helyzetben. A harmadik módszernél valamennyi géptengely irányra mérik úgy, hogy a légijármű 30 fokos bedöntési helyzetben van. A légi ellenőrzések az alábbiak szerint kerülnek végrehajtásra:

3.3.3 *30 fokos szárnybillegtetés.* A légijármű egy állandó géptengely irányon repül a VOR berendezés felé, és lassú bedöntéseket végez a plusz 30 foktól a mínusz 30 fokosig. Az útirány eltérési kijelző áramát mérik, és átalakítják útirány eltolódási fokokká.

3.3.4 *Nyolc útirány repülése egy földi ellenőrzési pont felett.* A légijármű egy meghatározott földi ellenőrzési pont felett nyolc különböző, egymástól 45 fokkal eltérő géptengely irányon repül. Az útirány eltérési kijelző áramát rögzítik, és megjelölik azt, amikor a légijármű az ellenőrző pont felett van. Minden egyes géptengely irányszögön a kijelzett irányszöget összehasonlítják azzal a kijelzett iránryméréssel, ami akkor van, amikor a légijármű a VOR felé repül, és amikor az ellenőrző pont felett van.

3.3.5 *30 fokos bedöntésű körrepülés.* A légijármű először a VOR berendezés felé repülve átrepül egy földi ellenőrző pont felett. Ettől a ponttól körbe repül, állandóan 30 fokos bedöntéssel. Az útirány eltérési kijelző áramot rögzítik, mielőtt a légijármű ezt a kört repüli, és átalakítják az attól kijelzett iránymeréshez viszonyított hiba fokokba, ami az eljárás kezdetén volt, amikor a légijármű az ellenőrző pont felett volt. A légijármű irányának a VOR berendezéshez viszonyított iránymérési változását le kell vonni az útirány eltérési hibából. Az eredmény, miután a vevő hibát levonták, az elfogadott polarizációs hiba.

3.3.6 A polarizációs ellenőrzések elvégzésére megfelelő a 300 méteres (1 000 láb) magasság. A 3.3.4 és 3.3.5 pontban megadott légi ellenőrzéseket egy olyan ellenőrző ponthoz viszonyítva lehet elvégezni, amely körülbelül 34,4 km-re (18 tenger mérföld) van a VOR berendezéstől.

3.4 A VOR típusú berendezések földrajzi elkülönítési követelményei

3.4.1 Az alábbi C-3. táblázatban felsorolt értékek alkalmazásánál meg kell jegyezni azt, hogy ezek meghatározott magasságokra elfogadott összefüggésekből kerültek levezetésre. Az értékek alkalmazásánál a körzeti értekezletek csak addig a mértékig adnak védelmet, ameddig üzemeltetésileg szükséges magasságban és távolságban - a képletek alkalmazásával - a követelményeket bármilyen távolságra, vagy magasságra ki lehet számítani.

3.4.2 A táblázatba foglalt számok azzal az alapfeltétellel kerültek kiszámításra, hogy a légijármű fedélzeti vevő effektív szomszédos csatorna-szűrése 60 dB-nél jobb lefelé, a következő kijelölhető csatorna felé.

3.4.3 A számítások azon az alapfeltételen alapulnak, hogy megkívánt jelnek a nem-kívánt jel interferenciájával szembeni biztosított védelme 20 dB, ami megfelel egy, a nem-kívánt jel miatti 1 foknál kevesebb iránymérési hibának.

3.4.4 Ismert az, hogy a szomszédos csatornán történő üzemelés esetében van a VOR berendezés közelében egy olyan kis terület, amelyen belül az egy másik VOR berendezést felhasználó légijármű interferenciát idézhet elő. Azonban ennek a területnek a szélessége olyan kicsi, hogy az interferencia időtartama elhanyagolható, és a legtöbb esetben ez akkor várható, amikor a légijármű az egyik berendezésről a másikra fog átkapcsolni.

C-3. táblázat: A földrajzi elkülönítési távolságok értékei közös csatornájú üzemeltetésekre

		Egyenlő kisugárzott teljesítményű VOR berendezésekre		A kisugárzott teljesítményben 6 dB-el eltérő VOR berendezésekre				A kisugárzott teljesítményben 12 dB-el eltérő VOR berendezésekre			
		Min. földrajzi elkülönítés a berendezések között $2D_1 + \frac{20}{S}$ *ha* $D_1 > D_2$ vagy $2D_2 + \frac{20}{S}$ *ha* $D_2 > D_1$		Minimális földrajzi elkülönítés a berendezések között $2D_1 + \frac{20-K}{S}$ *ha* $D_1 > D_2 + \frac{K}{S}$ vagy $2D_2 + \frac{20+K}{S}$ *ha* $D_1 < D_2 + \frac{K}{S}$				Minimális földrajzi elkülönítés a berendezések között $2D_1 + \frac{20-K}{S}$ *ha* $D_1 > D_2 + \frac{K}{S}$ vagy $2D_2 + \frac{20+K}{S}$ *ha* $D_1 < D_2 + \frac{K}{S}$			
Magasság m (láb)	S dB/km (dB/tmf)	K dB	$\frac{20}{S}$ km (tmf)	K dB	$\frac{K}{S}$ km (tmf)	$\frac{20-K}{S}$ km (tmf)	$\frac{20+K}{S}$ km (tmf)	K dB	$\frac{K}{S}$ km (tmf)	$\frac{20-K}{S}$ km (tmf)	$\frac{20+K}{S}$ km (tmf)
1	2	3	4	5	6	7	8	9	10	11	12
1 200 (4 000)	0,32 (0,60)	0	61 (33)	6	19 (10)	43 (23)	80 (43)	12	37 (20)	24 (13)	98 (53)
3 000 (10 000)	0,23 (0,43)	0	87 (47)	6	26 (14)	61 (33)	113 (61)	12	52 (28)	35 (19)	137 (74)
4 500 (15 000)	0,18 (0,34)	0	109 (59)	6	33 (18)	76 (41)	143 (77)	12	67 (36)	44 (24)	174 (94)
6 000 (20 000)	0,15 (0,29)	0	128 (69)	6	39 (21)	89 (48)	167 (90)	12	78 (42)	52 (28)	206 (110)
7 500 (25 000)	0,13 (0,25)	0	148 (80)	6	44 (24)	104 (56)	193 (104)	12	89 (48)	59 (32)	237 (128)
9 000 (30 000)	0,12 (0,23)	0	161 (87)	6	48 (26)	113 (61)	209 (113)	12	96 (52)	65 (35)	258 (139)
12 000 (40 000)	0,10 (0,19)	0	195 (105)	6	59 (32)	135 (73)	254 (137)	12	119 (64)	78 (42)	311 (168)
18 000 (60 000)	0,09 (0,17)	0	219 (118)	6	65 (35)	154 (83)	284 (153)	12	130 (70)	87 (47)	348 (188)

3.4.5 A földrajzi elkülönítés kiszámításához elfogadott képletek a következők (a tengeri mérföld értékek is behelyettesíthetők a kilométer helyére):

A — *minimális földrajzi elkülönítés (azonos csatorna):*
vagy

$$2\,D_1 + \frac{20-K}{S}\ \text{km}$$

ahol:

$$D_1 > D_2 + \frac{K}{S}$$

vagy

$$2\,D_2 + \frac{20+K}{S}\ \text{km}$$

ahol:

$$D_1 < D_2 + \frac{K}{S}$$

B — *földrajzi elkülönítés (szomszédos csatorna):*

az azonos telepítési hely esete:

$$< \frac{40-K}{S}$$

a nem-azonos telepítési hely esete:

$$> 2D_1 - \frac{40+K}{S}\ km$$

ahol:

$$D_1 > D_2 + \frac{K}{S}$$

vagy

$$2D_2 - \frac{40-K}{S}\ km$$

ahol:

$$D_1 < D_2 + \frac{K}{S}$$

C — *földrajzi elkülönítés (szomszédos csatorna)*
(100 kHz-es csatorna-osztással tervezett vevők 50 kHz-es csatorna-osztású környezetben)

Ha 26 dB-nél nem jobb effektív szomszédos csatorna szűrésű berendezést használnak (azaz egy 100 kHz-es vevőt egy 50 kHz-es környezetben), akkor a 6. számot kell behelyettesíteni a 40. szám helyére a fenti szomszédos csatorna képletbe. Ebben a példában a földrajzi azonos telepítési hely képlet nem használható, mivel a biztosított védelem határértékű lehet.

Ez a következő képlethez vezet:

$$> 2D_1 + \frac{6+K}{S}\ km$$

ahol:

$$D_1 > D_2 + \frac{K}{S}$$

vagy

$$2D_2 - \frac{6-K}{S}\ km$$

ahol:

$$D_1 < D_2 + \frac{K}{S}$$

A fenti képletekben:

D_1, D_2 = a két berendezés szükséges szolgálati távolsága (km).

K = az az arány (dB), amivel a D_1 fedésterületet biztosító berendezés kisugárzott teljesítménye meghaladja a D_2 fedésterületet biztosító berendezését.

Megjegyzés. - Ha a D_2 fedésterületet biztosító berendezés nagyobb kisugárzott teljesítményű, akkor a "K"-nak negatív értéke lesz.

S = az állandó magasság melletti távolsággal szemben a térerősséget mutató görbe lejtése (dB/km).

3.4.6 A C-3. táblázatban felsorolt számjegyek olyan környezeti feltételek biztosítására alapultak, amelyeken belül a fedélzeti vevők pontosan tudnak működni.

3.4.6.1 Az 50 kHz-es csatorna-osztással való működésre tervezett VOR vevők védelmének céljára minimális elkülönítési távolságok kerültek meghatározásra azzal a céllal, hogy a következő minimális jelviszonyokat biztosítsák a szolgálati területen belül:

a) a megkívánt jel 20 dB-el, vagy többel haladja meg a nem-kívánt azonos csatorna jelet;

b) egy nem-kívánt jel 50 kHz távolságban a megkívánt jeltől, legfeljebb 34 dB-el haladja meg a megkívánt jelet;

c) egy nem-kívánt jel 100 kHz távolságban a megkívánt jeltől, legfeljebb 46 dB-el haladja meg a megkívánt jelet;

d) egy nem-kívánt jel 150 kHz és nagyobb távolságban a megkívánt jeltől, legfeljebb 50 dB-el haladja meg a megkívánt jelet.

3.4.6.2 A 100 kHz-es csatorna-osztással való működésre tervezett VOR vevők védelmének céljára minimális elkülönítési távolságok kerültek meghatározásra azzal a céllal, hogy a következő minimális jelviszonyokat biztosítsák a szolgálati területen belül:

a) a megkívánt jel 20 dB-el, vagy többel haladja meg a nem-kívánt azonos csatorna jelet;

b) egy nem-kívánt jel 50 kHz távolságban a megkívánt jeltől, legfeljebb 7 dB-el haladja meg a megkívánt jelet;

c) egy nem-kívánt jel 100 kHz távolságban a megkívánt jeltől, legfeljebb 46 dB-el haladja meg a megkívánt jelet;

d) egy nem-kívánt jel 150 kHz és nagyobb távolságban a megkívánt jeltől, legfeljebb 50 dB-el haladja meg a megkívánt jelet.

3.4.7 A fenti 3.4.6 pontban megadott számok használata, vagy más távolságoknak és magasságoknak megfelelő számok alkalmazása magába foglalja annak az alapfeltételnek az elismerését, amit az a behelyettesítés jelent, hogy ez az elkülönítési távolságok kiszámításának egy megközelítő módszere, és a számok alkalmazása csak az alapfeltételként felállított korlátozások között lesz pontos. Az alapfeltétel magába foglalja azt, hogy a térerősségnek a távolsággal történő változása ("S" tényező) a különböző vételi magasságokon csak a VOR feletti körülbelül 5 fokos magassági szögig és a rádió rálátási vonalban érvényes. Ha a frekvencia-zsúfolt területeken az elkülönítési távolságok jóval pontosabb meghatározása szükséges, akkor azt az egyes berendezésekre a megfelelő terjedési görbékkel lehet meghatározni.

3.4.8 Az 50 kHz-es csatorna-osztású elrendezés szükségessé teszi a 3. Fejezet 3.3.2.2 és 3.3.5.7, valamint az Annex 10 V. Kötete 4. Fejezetének 4.2.4 pontjában leírtak teljesítését. Ahol különleges körülmények miatt a 100 kHz-es csatorna-osztásról az 50 kHz-es csatorna-osztásra történő átállás kezdeti periódusában alapvetően fontos az olyan közeli VOR berendezések figyelembevétele, amelyek nem felelnek meg a 3. Fejezet 3.3.2.2 és 3.3.5.7 pontjában és az Annex 10 I. Kötet 4. Fejezetének 4.2.4 pontjában leírtaknak, ott ezek és az új, az 50 kHz-es csatorna-osztású berendezések között nagyobb földrajzi elkülönítésre lesz szükség annak biztosításához, hogy a nem-kívánt jel által okozott iránymérési hiba egy foknál kevesebb legyen. Azzal az alapfeltétellel, hogy az ilyen berendezések által kisugárzott jel
9 960 Hz-es oldalsáv szintjeinek harmonikus hullámai nem haladják meg a következő szinteket:

9 960 Hz	0 dB referencia
2. harmonikus	-20 dB
3. harmonikus	-30 dB
4. harmonikus és felette	-40 dB

a fenti 3.4.5 pontban megadott elkülönítési képleteket kell alkalmazni a következők szerint:

a) ahol csak az 50 kHz-es csatorna-osztásra tervezett vevők részére kell védelmet biztosítani, ott a 40-es számot a 20-ra kell kicserélni a "B" képletben a nem-azonos telepítésű helyzetnél;

b) ahol az szükséges, hogy védelmet biztosítsanak a 100 kHz-es csatorna-osztásra tervezett vevők részére, ott az "A" alatt lévő azonos csatorna képletet kell alkalmazni az azonos csatorna helyzetre, arra a magassági tartományra, amelyre a védelem szükséges.

3.4.9 Amikor DME / N berendezéseket és VOR berendezéseket kívánnak egymással társítva üzemeltetni a 3. Fejezet 3.5.3.3.5 pontjában leírtak szerint, és azoknak azonos a szolgáltatási területe, ott a DME részére szükséges mindkét, az azonos csatorna és a szomszédos csatorna földrajzi elkülönítési követelményt kielégítő az ebben a részben a VOR-ra megadott számítások szerinti elkülönítés, feltéve azt, hogy a VOR és a DME közötti távolság nem haladja meg a 600 métert (2 000 láb).
Azonban, ha DME / W berendezést alkalmaznak, akkor az első szomszédos csatorna minimális elkülönítési távolságnak a DME / W berendezésekre egyenlőnek kell lenni a VOR azonos csatornára meghatározott elkülönítési távolsággal. A második szomszédos csatorna minimális elkülönítési távolságnak a DME / W berendezésekre egyenlőnek kell lenni a VOR-ra meghatározott első

szomszédos csatorna elkülönítéssel. Egy lehetséges interferencia helyzet fordulhat elő a DME "Y" csatornák használata esetén, mivel két, egymástól 63 MHz-re elkülönített DME földi állomás között interferencia fordulhat elő, amikor azonos frekvencián adnak és vesznek (például a 17 Y csatornától eredő adások interferenciát okozhatnak a 80 X és 80 Y csatornák vételénél). Bármilyen földi vevő érzékenységi csökkentésének elkerülésére a berendezések között minimum 18,5 km (10 tengeri mérföld) földi elkülönítési távolság szükséges.

3.5 A VOR / ILS berendezések földrajzi elkülönítési követelményei

3.5.1 A következőkben, a 3.5.3.1 és a 3.5.3.2 pontban megadott számok alkalmazásánál nem szabad megfeledkezni arról, hogy a következő alapfeltételek kerültek elfogadásra:

a) az iránysáv vevő jellemzői azok, amelyek a korábbi 2.6.2 pontban kerültek megadásra, és a VOR vevő jellemzői azok, amiket a fenti 3.4.2 pont ír elő;

b) a védettség az ILS rendszerre és a VOR rendszerre 20 dB, a korábbi 2.6.3 és 3.4.3 pontokban megadottak szerint külön-külön;

c) az ILS védettségi pontja a felhasználási vonalon mért 46,25 km-es (25 tengeri mérföld) szolgáltatási távolságban az 1 900 m-es (6 250 láb) magasságú pontban van.

Megjegyzés. - Az erősen irányított ILS iránysáv adó antenna-rendszerek megjelenésével a legkritikusabb védelmi pont nem a futópálya meghosszabbított középvonalán lesz. Az irányított antennák következtében a kritikus védelmi pontok a maximális távolságnál, a futópálya középvonalától vagy plusz, vagy mínusz 10 fokra, vagy plusz, vagy mínusz 35 fokra lesznek. Ezeknek a pontoknak a védelmét kell megvizsgálni a frekvencia kijelölési folyamat során.

3.5.2 Jóllehet, nemzetközi VOR és ILS berendezések nem fognak ugyanazon a frekvencián megjelenni, előfordulhat az, hogy egy nemzetközi VOR berendezés fogja ideiglenesen megosztani ugyanazt a frekvenciát, és hasonló alapon, egy nemzeti ILS berendezéssel. Ezért az útmutató anyag úgy került megadásra, hogy tartalmazza nemcsak az 50 kHz-es, vagy 100 kHz-es elkülönítésű VOR-ra és az ILS berendezésre, hanem azonos csatorna alkalmazására szükséges földrajzi elkülönítést is.

3.5.3 A két berendezés felhasználásának eltérő jellegzetességei miatt, a közös interferencia elkerülésére a VOR / ILS minimális földrajzi elkülönítésének követelményét, ahol az vonatkozó, különállóan kell megállapítani.

3.5.3.1 *Azonos csatorna esetén*

a) Az ILS rendszer védelme megkívánja azt, hogy egy 17 dBW (50 W) kisugárzott teljesítményű VOR legalább 148 km (80 tenger mérföld) távolságra legyen az ILS védelmi pontjától.

b) Avval az alapfeltétellel, hogy egy 17 dBW (50 W) kisugárzott teljesítményű VOR-nak a védelme a 46,25 km-es (25 tenger mérföld) szolgáltatási távolságig és a 3 000 méteres (10 000 láb) magasságig biztosítva legyen, a VOR rendszer védelme azt kívánja meg, hogy az ILS legalább 148 km-re (80 tengeri mérföld) legyen a VOR-tól.

c) Ha a VOR védelme, mondjuk, 92,5 km-ig (50 tengeri mérföld) és 6 000 m-ig (20 000 láb) szükséges, akkor az ILS-nek legalább 250 km-re (135 tengei mérföld) kell lenni a VOR-tól.

3.5.3.2 *A szomszédos csatorna esetén.* A VOR rendszer védelme a berendezések földrajzi elkülönítése nélkül hatékonyan biztosítható. Azonban, ebben az esetben:

a) ha egy olyan iránysáv vevőt használnak, amely 100 kHz-es csatorna-osztásra tervezett, és egy olyan területen, ahol a navigációs berendezések kijelölt osztása 100 kHz-es, az ILS rendszer védelme azt kívánja, hogy egy 17 dBW (50 W) kisugárzott teljesítményű VOR legalább 9,3 km-re (5 tenger mérföld) legyen az ILS védelmi pontjától;

b) ha egy olyan iránysáv vevőt használnak, amely 100 kHz-es csatorna-osztásra tervezett, és egy olyan területen, ahol a navigációs berendezések kijelölt osztása 50 kHz-es, az ILS rendszer védelme azt kívánja, hogy egy 17 dBW (50 W) kisugárzott teljesítményű VOR legalább 79,6 km-re (43 tenger mérföld) legyen az ILS védelmi pontjától.

3.5.4 A fenti 3.5.3 pontban megadott számok használata, vagy más távolságoknak és magasságoknak megfelelő számok alkalmazása magába foglalja annak az alapfeltételnek az elismerését, amit az a behelyettesítés jelent, hogy az az elkülönítési távolságok kiszámításának egy megközelítő módszere, és a számok alkalmazása csak az alapfeltételként felállított korlátozások között lesz pontos. Ha a frekvencia-zsúfolt területeken az elkülönítési távolságok jóval pontosabb meghatározása szükséges, akkor azt az egyes berendezésekre a megfelelő terjedési görbékkel lehet meghatározni.

3.5.5 Az ILS rendszernek a VOR interferenciája elleni védelme szükséges ott, ahol a VOR berendezés egy ILS megközelítési útvonal közelében kerül telepítésre. Az ilyen esetekben az ILS vevő kimeneten a lehetséges keresztmodulációs hatások miatti zavaró jel elkerülése érdekében az ILS és a VOR csatorna frekvenciái között megfelelő frekvencia elkülönítést kell alkalmazni. A frekvencia elkülönítés a VOR és az ILS teljesítmény-sűrűség arányának és a fedélzeti berendezések jellemzőinek függvénye lesz.

3.6 Vételi funkció

3.6.1 *Érzékenység.* Miután a légijármű fedélzeti tápvonal illesztést, a csillapítási veszteséget és az antenna polárgörbéjének eltéréseit megfelelően figyelembe vették, a vételi funkció érzékenységének olyannak kell lenni, hogy az esetek nagy százalékában biztosítsa az alábbi 3.6.2 pontban meghatározott kimeneti pontosságot egy olyan jelnél, amelynek a térerőssége 90 mikrovolt/méter, vagy mínusz 107 dBW/m^2.

3.6.2 *Pontosság.* A fedélzeti berendezés hiba hozzájárulása nem haladhatja meg a plusz, vagy mínusz 3 fokot egy 95 százalékos valószínűséggel.

1. Megjegyzés. - A vevő hiba hozzájárulásának értékelésénél számításba kell venni:

1) a földi VOR berendezés modulációs összetevőjének tűréshatárát, ahogy azt a 3. Fejezet 3.3.5 pontja meghatározza;

2) a földi VOR berendezés jel szintjének és vivőhullám frekvenciájának eltérését;

3) a nem-kívánt VOR és ILS jelek hatását.

2. Megjegyzés. - A légijármű fedélzeti VOR berendezésnél nincs figyelembe véve semmilyen olyan speciális rendszer beépítése, amelyet a légijármű fedélzeten a VOR információ feldolgozásához biztosítani lehet, és amely önmaga is bevihet hibákat a rendszerbe (például: a rádiómágneses irányszög kijelző (RMI) stb.).

3.6.3 *A zászló riasztás működése.* Ideálisan a zászló riasztásnak kell figyelmeztetnie a légijármű vezetőjét bármilyen olyan elfogadhatatlan működési hibáról, ami vagy a földi, vagy a fedélzeti berendezésekben előfordulhat. Az a mérték, amennyire ezt az ideális helyzetet ki lehet elégíteni, az alábbiakban kerül meghatározásra.

3.6.3.1 A zászló riasztási mozgást két áram összege hozza működésbe, azok, amelyek a VOR iránymérési összetett jel 30 Hz-es és 9 960 Hz-es elemeiből származnak, ennek megfelelően ezeknek az összetevőknek a kisugárzott vivőhullámról való eltávolítása a zászlók megjelenését eredményezi. Mivel a VOR földi felügyelő rendszere megszakítja az iránymérési összetevő sugárzását akkor, amikor bármilyen elfogadhatatlan körülmény lép fel a földön, azonnal kijelzés lesz a légijárművön, amint a rendszer használhatatlan.

3.6.3.2 A zászló riasztó mozgató áram még a fedélzeti berendezés automatikus erősítés-szabályzásának és a vevő második detektor fokozatát követő bármilyen erősítésnek is függvénye. Ennek megfelelően egy pontosan beállított fedélzeti vevőnél a zászló éppen akkor válik nem-láthatóvá, amikor egy, a 3. Fejezet 3.3.5 pontjában meghatározott modulációs jellemzőknek megfelelő VOR jel kerül vételre, és abban az esetben lesz újra látható, amikor csökkenés következik be a vevő teljes erősítési jellemzőiben.
Megjegyzés. - Bizonyos vevő típusoknál a mechanikus zászlótól eltérő egyéb figyelmeztető jelzést alkalmaznak az itt leírt funkció végrehajtására.

3.6.4 *A VOR vevőnek a VOR és az iránysáv jelekre való érzékenysége*

3.6.4.1 A vevő felépítésének biztosítani kell annak pontos működését a következő környezetben:

a) amikor a megkívánt jel a nem-kívánt azonos csatornájú jelet 20 dB-el, vagy többel meghaladja;

b) amikor a megkívánt jeltől 50 kHz távolságban a nem-kívánt jelet 34 dB-nek megfelelő értékkel meghaladja (a vevőnek a próbapadi ellenőrzése során ebben az első szomszédos csatorna esetben a nem-kívánt jel a kombinált földi állomás frekvencia-tartománya felett (plusz, vagy mínusz 9 kHz) és a frekvencia tűréshatárban változik);

c) amikor egy nem-kívánt jel a megkívánt jeltől 100 kHz távolságban 46 dB-nek megfelelő értékkel meghaladja a megkívánt jelet;

d) amikor egy nem-kívánt jel a megkívánt jeltől 150 kHz, vagy annál nagyobb távolságban 50 dB-nek megfelelő értékkel meghaladja a megkívánt jelet.

1. Megjegyzés. - Elfogadott az, hogy nem az összes, jelenleg használatos vevő felel meg a b) alpont követelményeinek, az összes jövőben használatba kerülő berendezést úgy kell megépíteni, hogy eleget tegyenek ennek a követelménynek.

2. Megjegyzés. - Néhány Államban kisebb földi állomás tűréshatárokat alkalmaznak.

3.6.5 *A VOR vevő rendszer érzéketlenségi teljesítménye a VHF FM adások jeleinek zavaró hatásával szemben*

3.6.5.1 A 3. Fejezet 3.3.8 pontjának megjegyzéseire vonatkozóan, az ott meghatározott érzéketlenségi teljesítményt a vevő rendszer szabályos teljesítményéhez viszonyított egyezményes csökkenési mértékhez kell venni a bemenő megkívánt jel szabvány körülményei mellett és jelenlétében. Ez annak biztosításához szükséges, hogy a vevő berendezésnek a próbapadi ellenőrzését egy ismételhető feltétel-rendszer és eredmények mellett lehessen elvégezni, ami elősegítse az azt követő hitelesítési jóváhagyásukat. Vizsgálatok kimutatták azt, hogy az FM interferencia jelek hatással lehetnek mind az irányvezetési, mind a zászló áramra, és hatásuk annak a megkívánt jelnek a modulációs mélység különbségétől (DDM) függ, amit alkalmaznak. Kiegészítő tájékoztatások találhatók a Nemzetközi Távközlési Uniónak /ITU/ *A 87 - 108 MHz-es műsorszóró szolgáltatási sáv és a 108 - 118 MHz-es légiforgalmi szolgálati sáv közötti kompatibilitás meghatározására használatos vevők jellemzőinek mérési eljárásai* című, ITU-R IS.1140 számú Ajánlásában.

3.6.5.2 Általánosan elfogadott módszereket és képleteket kell alkalmazni azon vevők lehetséges összeférhetetlenségének megállapításához, amelyek megfelelnek a 3. Fejezet 3.3.8 pontjában meghatározott általános interferencia érzéketlenségi követelményeknek.
A képleteknek tisztázniuk kell a parazita sugárzással (A1 típusú) szembeni interferencia érzéketlenségi teljesítményt, a csatorna sávon kívüli (A2 típusú) interferenciával szembeni, a két-jel és három-jel harmadrendű (B1 típusú) interferenciával szembeni és a túlterhelés / érzéketlenítés (B2 típusú) interferenciával szembeni interferencia érzéketlenségi teljesítményt. Kiegészítő tájékoztatások találhatók a Nemzetközi Távközlési Uniónak /ITU/ az ITU-R IS.1009-1 sz. *Kompatibilitás a 87 - 108 MHz-es műsorszóró szolgáltatási sáv és a 108 - 137 MHz-es légiforgalmi szolgálati sáv között* tárgyú Ajánlásban.

3.6.5.3 A Nemzetközi Távközlési Unió /ITU/ ITU-R IS.1009-1 Ajánlásában megadott frekvencia tervezési követelmények nem veszik számításba a lehetséges két-jel és három-jel ötödrendű intermodulációs termékeket. Mérésekkel határozták meg azt, hogy az FM állomások által a vevőkben létrehozott ötödrendű intermodulációs termékek úgy lecsökkenthetik a VOR vevők teljesítményét, hogy az a 3. Fejezet 3.3.8 pontjában leírt meghatározásoknak felel meg. Az ötödrendű intermodulációs termékek előfordulhatnak anélkül, hogy egy harmadrendű intermodulációs termék fordulna elő ugyanazon a VOR frekvencián. A frekvenciák tervezésében és az FM műsorszóró interferenciája elleni védelem felbecsülésénél szükség van arra, hogy figyelembe vegyék a két-jel és három-jel által létrehozott ötödrendű intermodulációs termékeknek a VOR vevőkön belül létrehozott termékeit.

3.7 A VOR rendszer pontossága

Megjegyzés. - A VOR rendszer teljesítmény értékeinek meghatározására vonatkozó útmutató anyagot foglal magába még az Annex 11 "A"- Melléklete is.

3.7.1 *Cél.* Az alábbi tájékoztató anyag célja az, hogy segítséget nyújtson a VOR rendszerek felhasználásához. Nem az a cél, hogy bemutassa az oldalirányú elkülönítési szabványokat, vagy a minimális akadálymentességet, jóllehet, ezek is természetesen kiindulási pontot adnak azok meghatározásában. Az elkülönítési szabványok, vagy a minimális akadálymentességek meghatározásánál szükségszerűen számításba kell venni még több olyan tényezőt, amellyel az alábbi anyag nem foglalkozik.

3.7.1.1 Azonban szükséges az, hogy egy rendszer-felhasználási pontossági számot közöljünk az Államokkal, útmutatóként a VOR rendszerek tervezéséhez.

3.7.2 *A szakkifejezések magyarázata.* A következő szakkifejezéseket az itt megadott jelentésekkel használjuk:

a) ***VOR radial signal error.*** *VOR radiál jelhiba.* A földi VOR állomástól egy mérési pontig mért névleges mágneses iránymérés és a VOR jel által az ugyanarra a pontra kijelzett iránymérés közötti különbség. A VOR radiál jelhiba bizonyos állandó elemekből tevődik össze, mint például az útirány eltolódási hibából, valamint a telepítési hely és terepfelszín hatások következtében előforduló hibákból, továbbá bizonyos rendszertelenül változó hibákból. A VOR radiál jelhiba csak a földi állomáshoz kapcsolódik, és kizárja az egyéb hiba- tényezőket, azaz például a légijármű fedélzeti berendezés hibáit és a vezetési pontatlanságot.

b) ***VOR radial variability error.*** *VOR radiál változékonysági hiba.* A VOR radiál jelhibájának az a része, ami várhatóan változik egy alapvetően állandó hibatag körül. A radiál változékonysági hiba a változó hibák összege.

c) ***VOR radial displacement error.*** *VOR radiál eltolódási hiba.*
A VOR radiál jelhibájának az a része, amely állandó, és amelyet egy hosszú időtartamra változatlannak lehet tekinteni.

d) ***VOR airborne equipment error.*** *VOR fedélzeti berendezés hiba.* A légijármű fedélzetén lévő berendezés azon képessége hiányának tulajdonítható hiba, hogy a radiál jelben lévő iránymérési információt pontosan továbbítsa. Ez a hiba magába foglalja a fedélzeti vevőkészülék és a légijárművezető részére az információk megjelenítésére felhasznált műszerek hiba hozzájárulását.

e) ***VOR aggregate error.*** *VOR egyesített (kummulatív) hiba.* A földi VOR állomástól egy mérési pontig mért mágneses iránymérés és a fedélzeti VOR berendezés által a meghatározott pontossággal kijelzett iránymérés közötti különbség. Jóval egyszerűbben megfogalmazva az az abban az információban lévő hiba, ami a légijárművezető előtt megjelenítésre kerül, amiben számításba van véve nemcsak a földi berendezés és a terjedési út hibája, hanem azok a hibák is, amelyeket a légijármű fedélzeti VOR vevő és a repülőgép műszerei adnak hozzá a hibához. A teljes VOR radiál jelhiba, mind az állandó, mind a változó használatos itt.

f) ***VOR pilotage element.*** *VOR légijárművezetői hibaelem.* A VOR navigációs felhasználásával az annak a ténynek tulajdonítható hiba, hogy a légijármű vezetője vagy nem tartja, vagy nem képes pontosan a légijárművet a VOR radiálon, vagy a részére kijelzett iránymérésen tartani.

g) ***VOR system use error.*** *A VOR rendszer felhasználási hibája.*
A VOR egyesített hiba és a légijárművezetői hiba négyzetes középértéke. Ezt a kombinációt lehet annak a valószínűségnek a meghatározására felhasználni, hogy egy, a VOR-t felhasználó légijármű meddig marad egy előírt tűréshatáron belül.

3.7.3 *A VOR rendszer felhasználási pontosságának meghatározása*

3.7.3.1 A VOR rendszer felhasználási pontossága a következő hibaelemek figyelembevételével kerül levezetésre:

a) *VOR radiál jelhiba* (Eg). Ezt az elemet a VOR radiál eltolódási hiba és a radiál változékonysági hiba alkotja. Ezt az olyan tényezők figyelembevételével lehet meghatározni, mint a változatlan radiál eltolódás, az ellenőrzés, a polarizációs hatások, a terepfelszín hatásai és a környezet-változások.

b) *VOR fedélzeti berendezés hiba* (Ea). Ez az elem magába foglalja a fedélzeti VOR rendszer összes olyan tényezőjét, amelyek hibát eredményezhetnek (az egyes VOR kijelzőkön megjelenített iránytű információk alkalmazásából eredő hibák nincsenek figyelembevéve).

c) *A VOR légijárművezetői hibaeleme* (Ep). Az erre a hibaelemre alkalmazott értékek azok, amelyek a PANS-OPS-ban (Doc 8168) légijárművezetői tűréshatárként kerülnek alkalmazásra.

Megjegyzés. - Fennáll még egy mérési hiba is, de a hibák általános tárgyalásánál ez úgy tekinthető, mint egy, a többi hiba értékében eloszló hiba.

3.7.3.2 Mivel amikor az a), b) és c) pontokban lévő hibákat rendszer alapon (nem pedig bármelyik adott radiálra) veszik figyelembe, akkor azok független változók, ezért azokat a négyzetes középérték (RSS) módszerével lehet összekapcsolni akkor, amikor ugyanazt a valószínűségi szintet adják minden egyes elemnek. Ezen anyag céljára az egyes elemek 95 százalékos valószínűséggel lettek figyelembevéve.

Ennek megfelelően a következő képleteket kapjuk:

VOR egyesített hiba =

$\sqrt{Eg^2 + Ea^2}$

VOR rendszer felhasználási hiba =

$\sqrt{Eg^2 + Ea^2 + Ep^2}$

3.7.3.3 A következő példák csak a VOR rendszer hibáját adják meg, de a számításokat el lehet végezni a VOR egyesített hiba meghatározására is, ha úgy kívánják. Ezeknek a képleteknek az alkalmazásával meg lehet állapítani egy, vagy több hibaelem növekedésének, vagy csökkenésének a rendszerre gyakorolt hatását.

Megjegyzés. - A VOR radiál jelhibával kapcsolatos valamennyi érték azokra a radiálokra vonatkozik, amelyekre semmilyen korlátozást nem tettek közzé.

3.7.3.4 A fenti 3.7.1 pontban jelzett fenntartással úgy gondoljuk, hogy egy VOR rendszer felhasználási pontosságára a 95 százalékos valószínűségi alapon a plusz, vagy mínusz 5 fok elfogadható számérték az Államok részére a VOR rendszerek alkalmazásának tervezésénél (lásd még az alábbi 3.7.3.5 pontot). Ez a szám a következő hiba összetevőknek felel meg:

VOR radiál jelhiba:
a plusz, vagy mínusz 3°-os érték (95 százalékos valószínűséggel), a gyakorlatban könnyen elérhető.

VOR légijármű fedélzeti berendezés hiba:
plusz, vagy mínusz 3° (95 százalékos valószínűséggel), rendszer jellemző érték (lásd a fenti 3.6.2 pontot).

VOR légijárművezetői hibaelem:
plusz, vagy mínusz 2,5° (95 százalékos valószínűséggel), a PANS-OPS-nak megfelelően (lásd még az alábbi 3.7.3.8 pontot).

3.7.3.5 Míg a 95 százalékos valószínűségi alapú plusz, vagy mínusz 5 fokos érték egy olyan használható érték, amely széleskörű gyakorlati tapasztalatokon alapul, és sok Államban alkalmazzák, meg kell jegyezni, hogy ezt az értéket csak akkor lehet elérni, ha azok a hibaelemek, amelyek ezt létrehozzák, meghatározott tűréshatárokon belül maradnak. Nyilvánvaló az, hogyha a VOR rendszer elemeknek tulajdonítható hiba nagyobb a leírt értékeknél, akkor a létrejövő VOR rendszer felhasználási hiba ugyancsak nagyobb lesz. Ennek ellentétéként, ahol valamelyik, vagy az összes VOR rendszer hibaelem kisebb annál, mint ami a fenti számításban alkalmazva volt, a létrejövő VOR rendszer felhasználási hiba ugyancsak kisebb lesz.

3.7.3.6 A következő példák - amelyek ugyancsak gyakorlati tapasztalatokból erednek - kiegészítő tervezési útmutatóként szolgálnak az Államok részére:

A - *VOR radiál jelhiba:*
Plusz, vagy mínusz 3,5° (95 százalékos valószínűséggel), ezt néhány Államban teljes földi rendszer hibaként használják.

VOR fedélzeti berendezés hiba:
plusz, vagy mínusz 4,2° (95 százalékos valószínűséggel), amit néhány Állam minimális teljesítmény értékként az üzemeltetések bizonyos osztályaira elfogad.

VOR légijárművezetői hibaelem:
plusz, vagy mínusz 2,5° (95 százalékos valószínűséggel), a PANS-OPS előírásaival megegyezően (lásd még az alábbi 3.7.3.8 pontot).

Számított VOR rendszer felhasználási pontosság:
plusz, vagy mínusz 6° (95 százalékos valószínűséggel).

B - *VOR radiál jelhiba:*
plusz, vagy mínusz 1,7° (95 százalékos valószínűséggel), széleskörű légi ellenőrzési mérésekre alapozva, amelyet egy Államban hajtottak végre több VOR berendezés mérésével.

VOR fedélzeti berendezés hiba:
plusz, vagy mínusz 2,7° (95 százalékos valószínűséggel), sok légitársaság üzemeltetési mérései által elért érték.

VOR légijárművezetői hibaelem:
plusz, vagy mínusz 2,5° (95 százalékos valószínűséggel), a PANS-OPS előírásaival megegyezően (lásd még az alábbi 3.7.3.8 pontot).

Számított VOR rendszer felhasználási pontosság:
plusz, vagy mínusz 4° (95 százalékos valószínűséggel).

3.7.3.7 A VOR rendszer jóval valószerűbb alkalmazását lehet elérni a meghatározott körülmények között ténylegesen fennálló hibák megállapításával és nem a mindent felölelő általánosítás alkalmazásával, amely alaptalanul optimista, vagy pesszimista eredményeket adhat. Az egyedi alkalmazásoknál lehetséges lesz az, hogy a plusz, vagy mínusz 5 foknál kisebb értékű rendszer felhasználási pontossági értékeket alkalmazzanak, ha egy, vagy több hibaelem kisebb azoknál az értékeknél, amelyek a plusz, vagy mínusz 5 fokos számításhoz kerültek felhasználásra. Illetve fordítva, egy plusz, vagy mínusz 5 foknál nagyobb értékű rendszer felhasználási pontossági értékre lenne szükség akkor, amikor ismert az, hogy a radiálok gyenge minőségűek, vagy jelentős telepítési helyszíni hibák állnak fenn, illetve egyéb okok indokolják. Azonban ehhez a tanácshoz kiegészítőleg elengedhetetlenül szükséges egy figyelmeztetés a rendszer egyes, egyedüli elemeinek alacsonyabb értékei alkalmazásánál (például a radiál jelhibánál) abból az alapfeltételből kiindulóan, hogy a rendszer pontosságban egy átfogó javulás fog jelentkezni. Egyértelműen nyilvánvaló az, hogy bizonyos körülmények között az nem fordulhat elő, és nem alkalmazhatnak alacsonyabb rendszer pontossági értékeket másfajta olyan 'megerősítés' nélkül (pl. radarral való megfigyelés nélkül), amely a teljes teljesítmény tényleges növekedésének elérését igazolja.

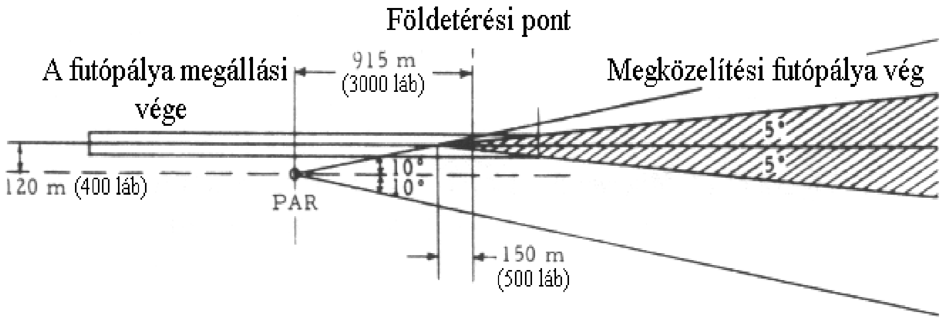
3.7.3.8 Meg kell jegyezni azt, hogy az olyan irányszögadó berendezéseknél, mint a VOR, a szög-értékben kifejezett légijárművezetői hibaelem nagyobb lesz, ahogy a légijármű közeledik az információ-forráshoz. Így, mivel a földi rendszer és a fedélzeti hiba hozzájárulása szög-értékben kifejezve az összes gyakorlati szempontból minden távolságban állandó, a rendszer általános felhasználási pontossági értékeinek figyelembevétele során számításba kell venni a nagyobb légijárművezetői hibaelem előfordulását akkor, amikor a légijármű a VOR közelében van. Azonban ezek a nagyobb légijárművezetői hibaelemek nem eredményeznek az útiránytól való nagy oldalirányú eltéréseket akkor, amikor a légijármű a berendezés közelében van.

3.8 A VOR-ok átkapcsolási pontjai

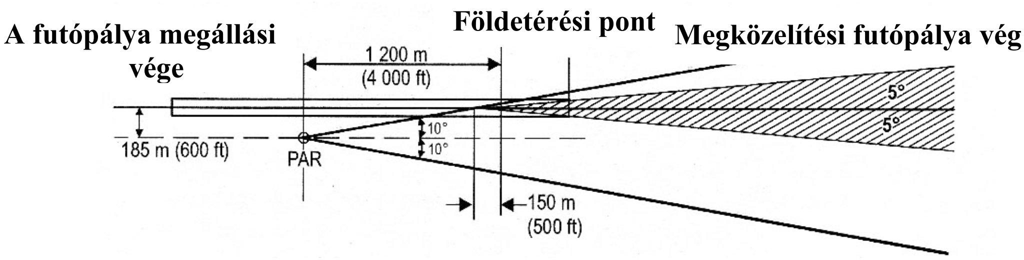
A VOR-al meghatározott ATS útvonalakon az átkapcsolási pontok meghatározására vonatkozó útmutató anyagot az Annex 11 "A"- Melléklete foglalja magába.

4. Precíziós megközelítési radar rendszer

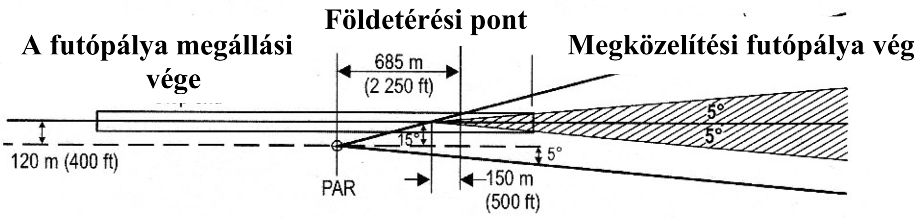
C-14.-től a C-18.-ig terjedő ábrák mutatják be a 3. Fejezet 3.2 pontjában lévő Szabványokat.



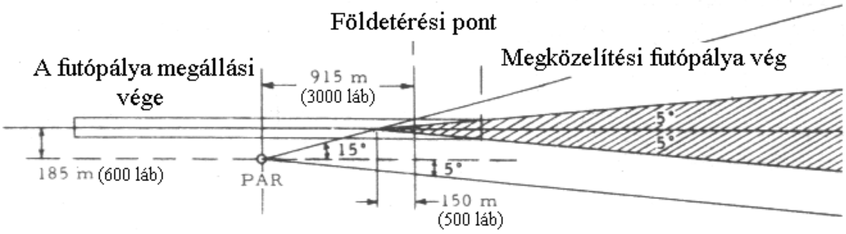
C-14. ábra: A Precíziós Megközelítési Radarnak (PAR) a földetérési ponthoz viszonyított minimális 'hátrafelé' történő elhelyezése 120 méteres (400 láb) oldalirányú eltolásos telepítésnél, amikor a letapogatás a futópályára vezető iránytól (QDR) plusz, vagy mínusz 10 fokra van beállítva



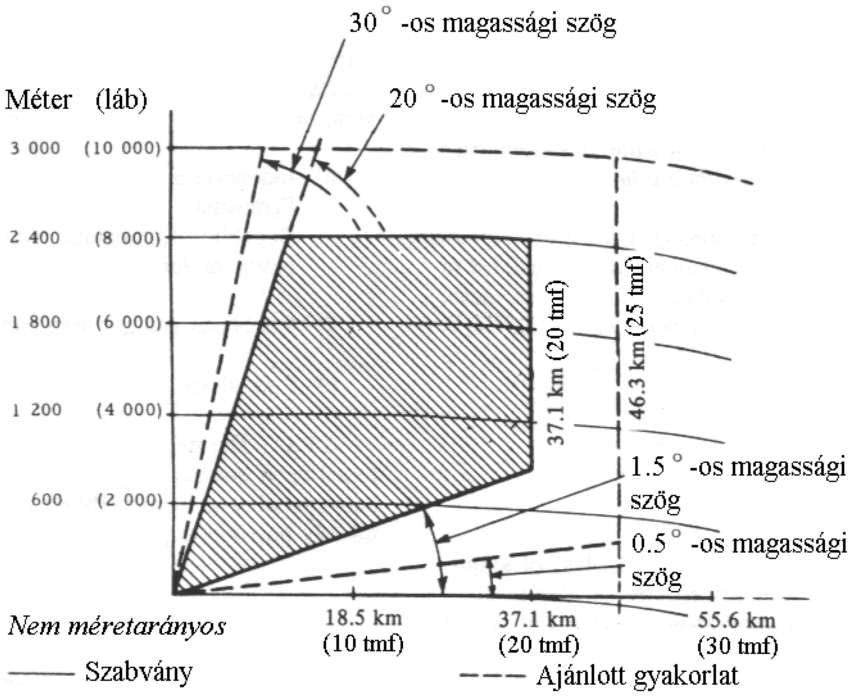
C-15. ábra: A Precíziós Megközelítési Radarnak (PAR) a földetérési ponthoz viszonyított minimális 'hátrafelé' történő elhelyezése 185 méteres (600 láb) oldalirányú eltolásos telepítésnél, amikor a letapogatás a futópályára vezető iránytól (QDR) plusz, vagy mínusz 10 fokra van beállítva



C-16. ábra: A Precíziós Megközelítési Radarnak (PAR) a földetérési ponthoz viszonyított minimális 'hátrafelé' történő elhelyezése 120 méteres (400 láb) oldalirányú eltolásos telepítésnél, amikor a letapogatás a futópályára vezető iránytól (QDR) 5 és 15 fokra van beállítva



C-17. ábra: A Precíziós Megközelítési Radarnak (PAR) a földetérési ponthoz viszonyított minimális 'hátrafelé' történő elhelyezése 185 méteres (600 láb) oldalirányú eltolásos telepítésnél, amikor a letapogatás a futópályára vezető iránytól (QDR) 5 és 15 fokra van beállítva



C-18. ábra: A precíziós megközelítési radar rendszer Légtérellenőrző Radar Egysége (SRE) - függőleges fedésterület egy 15 m^2-es visszaverő felületű légijárműre

5. Előírások a 75 MHz-es (útvonal) helyjeladókra

5.1 A helyjeladó antenna-rendszerei

5.1.1 *Általános rész.* Az alábbiakban azok a helyjeladó antenna-rendszer típusok kerülnek leírásra, amelyeket a jelenlegi gyakorlatban gyakran használnak. Ezek a típusúak azok a legegyszerűbb kialakítások, amelyek a szabvány követelményeknek megfelelnek; különleges esetekben jobb teljesítményű antenna-rendszerekre (lásd az alábbi 5.1.4 pont Megjegyzését) lehet szükség.

5.1.2 *Z helyjeladók*

a) *Sugárzó rendszerűek.* A sugárzó rendszer két vízszintes, egymást derékszögben keresztező dipól-elemből áll, amelyek mindegyikét két kollineáris fél-hullámhossz sugárzó elem képezi, a középpontjukból egymástól körülbelül fél hullámhossz távolságra elhelyezve, és egy negyed hullámhosszal az ellensúly fölé felépítve. A dipólokban lévő áramokat és azok egymáshoz viszonyított elemeit úgy kell beállítani, hogy:

1) az egyik dipól-rendszerben lévő áram a másik rendszerekben lévőkhöz viszonyítva egyenlő legyen, de 90^{o}-os időbeni fáziseltolású legyen;

2) az egyedi dipól-rendszer sugárzó elemei áramainak egyenlőnek és időbeli fázisban lévőnek kell lenni.

b) *Ellensúly.* A négyszög alakú, minimálisan 9 m × 9 m-es ellensúlynak általában a földfelszín felett körülbelül 1,8 méteres (6 láb) magasságban kell lenni, és ha dróthálóból készült, akkor a hálószem 7,5 cm × 7,5 cm-t nem meghaladó méretű kell, hogy legyen.

5.1.3 *A csak kis magasságokban történő felhasználású legyező alakú sugárnyalábú helyjeladók (kis teljesítményű legyező alakú sugárnyalábú helyjeladók).* A sugárzó rendszernek képesnek kell lenni arra, hogy a 3. Fejezet 3.1.7.3.2 pontjában leírtak szerinti térerősséget biztosítsa.

5.1.4 *Általános felhasználású legyező alakú sugárnyalábú helyjeladók (nagy teljesítményű legyező alakú sugárnyalábú helyjeladók)*

a) *Sugárzó rendszer.* A sugárzó rendszer négy vízszintes kollineáris fél- hullámhosszú (körülbelül) sugárzó elemből áll, körülbelül egy-negyed hullámhosszal az ellensúly fölé felépítve. Az egyes antenna- elemekben az áramnak fázisban kell lenni és az áram-aránynak
1 : 3 : 3 : 1-nek kell lenni.

Megjegyzés. - Az antenna-elemek közötti áramelosztás és azoknak az ellensúly feletti magassága módosítható azért, hogy a különleges üzemeltetési körülményekhez sugárzási karakterisztikát biztosítson. Megnövelt függőleges sugárzási karakterisztika a meghatározott üzemeltetési igényekhez úgy érhető el, hogy szabályozzák a dipól antenna-rendszernek az ellensúly feletti magasságát az egy-negyed hullámhosszig, vagy annál magasabbra, de a fél-hullámhossznál kisebb értékre.

b) *Ellensúly.* Egy négyszög alakú ellensúlyt, minimálisan 6 × 12 méteres méretűt, általában 1,8 méterre (6 láb) a földfelszín felett kell elhelyezni, és ha dróthálóból készült, akkor a hálószemek mérete nem haladhatja meg a 7,5 cm × 7,5 cm-t.

5.2 A négy-jelsávos rádiójeladóhoz kapcsolódó helyjeladók azonosító kódolása

5.2.1 A négy-jelsávos rádiójeladók szakaszain elhelyezett legyező alakú sugárnyalábú helyjeladókhoz szabályszerűen nem szükséges az adott földrajzi helyre vonatkozó azonosító jel, csak az a jel, amely azt a szakaszt jelzi, amelyhez a helyjeladók kapcsolódnak.

5.2.2 Abban az esetben, amikor a négy-jelsávos rádiójeladónak csak egy helyjeladó van minden szakaszán elhelyezve, a jelenlegi gyakorlat az, hogy a helyjeladót az egyedüli vonással azonosítják a földrajzi Észak irányában, vagy a földrajzi Északhoz közel eső irányban és az óramutató járásával egyező irányban haladóan (Keletre) azonosítják, a további szakaszokban két, három, vagy négy vonással attól függően, hogy a szakasz, amelyhez kapcsolódik a második, harmadik, vagy negyedik szakasz az Északtól az óramutató járásával megegyező irányban. Ahol egynél több legyező alakú sugárnyalábú helyjeladó kapcsolódik a négy-jelsávos rádiójeladó egy szakaszához, ott az állomáshoz legközelebbi helyjeladót kell csak vonásokkal azonosítani, a következő legközelebbit a vonások előtt két ponttal és a harmadikat a vonásokat megelőzően három ponttal, és így tovább.

Megjegyzés. - Bizonyos különleges körülmények esetén a fenti kódolási rendszer félreérthetőséghez vezethet a földrajzilag egymáshoz közel lévő különböző, de egymást átfedő, szakaszokhoz kapcsolódó két helyjeladó miatt. Az ilyen esetekben az a kívánatos, hogy a helyjeladók esetében az egyiknek megkülönböztető azonosító kódjelet használjanak.

6. Az NDB-re vonatkozó anyag

6.1 Útmutató anyag a 30° N és 30° S szélességi körök közötti telepítésű NDB-k térerősségi követelményeihez

6.1.1 Abból a célból, hogy kielégítő szolgáltatást biztosítsanak a 30° N és 30° S szélességi körök között elhelyezett NDB-k névleges fedésterületén belül, 120 mikrovolt / méteres minimális értékű térerősség szükséges, kivéve ott, ahol az NDB-k üzemeltetése során több éven keresztül szerzett gyakorlati tapasztalatok azt mutatják, hogy a 70 mikrovolt / méteres minimális térerősség kielégítő ahhoz, hogy az üzemeltetési követelmények kielégítésre kerüljenek. Egyes különleges területeken a 120 mikrovolt / métert jelentősen meghaladó térerősségre lesz szükség. Ezek a területek:

a) Indonézia és Pápua Új-Guinea, Myanmar, Maláj félsziget, Thai- föld, Laoszi Demokratikus Népköztársaság, Kambodzsai Demokratikus Köztársaság, Vietnám és Észak-Ausztrália;

b) Karib Szigetek és Dél-Amerika északi részei;

c) Közép- és Dél-Közép Afrika.

6.1.2 A 120 mikrovolt / méter térerősség a napjainkig szerzett gyakorlati tapasztalatokon alapszik és egy kompromisszum a műszakilag kívánatos és gazdságosan még biztosítható érték között.

6.2 Útmutató anyag a névleges és a tényleges fedésterület jelentéséről és alkalmazásáról

6.2.1 Névleges fedésterület

6.2.1.1 A 3. Fejezet 3.4.1 pontjában meghatározott névleges fedésterület az NDB tényleges teljesítményének mérhető módon történő meghatározási eszköze, amely a frekvenciától, a kisugárzott teljesítménytől, valamint az NDB és a határon lévő pont közötti vezetőképességi úttól függ, ahova a térerősség minimális értéke előírásra került.

6.2.1.2 A névleges fedésterületről megállapították, hogy az egy hasznos eszköz a körzeti tervezés elősegítéséhez, és egyes esetekben a tényleges fedésterületre is vonatkoztatható.

6.2.1.3 A névleges fedésterületnek a frekvencia tervezésre történő alkalmazását a következő követelmények szabályozzák:

6.2.1.3.1 A frekvenciákat az érintett NDB-k névleges fedésterületének figyelembevételével úgy kell elrendezni, hogy bármely NDB jel erősségének aránya a névleges fedésterülete határvonalánál, az azonos csatornájú állomások és a szomszédos csatornájú állomások miatti teljes térerősségre viszonyítva (a jellemző fedélzeti vevő szelektivitás jelleggörbéjének megfelelően figyelembevéve) ne legyen 15 dB-nél kevesebb, nappal.

6.2.1.3.2 Az Annex 10 V. Kötetének "B"- Mellékletében megadott értékeket kell alkalmazni, ahogy megfelelőek, a szomszédos csatornájú jelek csillapítására figyelembe vett tűrések meghatározásánál.

6.2.1.4 A névleges fedéterületnek a frekvencia elosztási tervezésben történő alkalmazásából következik az - hacsak nincs másképpen előírva -, hogy a káros interferencia elleni védelem csak az NDB névleges fedésterületén belül biztosítható, és csak akkor, ha az NDB kisugárzott teljesítményét úgy állítják be, hogy a névleges fedésterület határán a megkívánt térerősség elfogadhatóan közeli határértékeken belül legyen biztosítva. Az olyan területeken, ahol az NDB-k telepítési sűrűsége nagy, bármely olyan NDB, amely a névleges fedésterülete határán olyan jelet ad, ami az érintett körzetre megállapodottnál jelentősen nagyobb, általában káros interferenciát fog létrehozni az érintett területeken lévő azonos csatornájú, vagy szomszédos csatornájú NDB-k névleges fedésterületén belül, és korlátozni fogja azoknak az NDB-knek a számát, amelyek a körzetben rendelkezésre álló frekvencia-tartományon belül telepíthetőek. Ennek megfelelően az a fontos, hogy a kisugárzott teljesítménynek a névleges fedésterület biztosításához szükséges értéken felülre történő növelését - különösen éjszaka, amikor a térhullámú terjedés nagy távolságban is interferenciát idézhet elő -, nem lehet végrehajtani anélkül, hogy a valószínűleg érintett további állomásokat üzemeltető hatóságokkal azt ne egyeztetnék (lásd a 3. Fejezet 3.4.3 pontját).

6.2.1.5 A frekvencia tervezést jelentős mértékben elősegíti az, ha a kívánt fedésterületen belül közös minimális térerősségi értéket használnak.

6.2.1.6 Széleskörű tapasztalatok kimutatták azt, hogy az olyan viszonylag alacsony zajszintű területeken, mint például Európa, a 70 mikrovolt / méteres érték kielégítő térerősséget ad.

6.2.1.6.1 Tapasztalatok bizonyítják azt is, hogy a 120 mikro-volt / méteres érték általában kielégítő a nagyobb zajszintű területeken, de a nagyon magas zajú területeken ez nem lesz megfelelő. Az ilyen területeken az alábbi 6.3 pontban megadott tájékoztatásokat lehet általános útmutatásként felhasználni.

6.2.2 *A tényleges fedésterülettel való összefüggés*

6.2.2.1 A névleges fedésterületnek a tényleges fedésterülettel a következő feltételek esetén lehet szoros összefüggése:

a) akkor, amikor a névleges fedésterületen belül a minimális térerősség olyan, hogy az az idő legnagyobb részében meghaladja a légköri és egyéb zajok miatti térerősséget, és kielégítő annak biztosításához, hogy az utóbbiak nem fogják torzítani a légijárműveknek biztosított tájékoztatást olyan mértékben, hogy az használhatatlan legyen;

b) akkor, amikor a megkívánt jelnek az interferáló jelekhez viszonyított térerősség aránya a fedésterületen belül minden pontban meghaladja azt a minimális szükséges értéket, ami annak biztosításához szükséges, hogy az interferáló jelek ugyancsak nem fogják olyan mértékben torzítani a légijárműveknek biztosított tájékoztatást, hogy az használhatatlan legyen.

6.2.2.2 Mivel szabályszerűen a fedésterületen belül a leggyengébb jel annak határvonalánál fog jelentkezni, azért ezek a feltételek maguk után vonják azt, hogy a térerősség a határvonalnál olyan legyen, hogy a légköri zajszintekhez viszonyított aránya használható kijelzést biztosítson a légijármű fedélzetén az idő legnagyobb részében a határvonal értékre vonatkoztatva, és az általános tervezésnek kell biztosítani azt, hogy ezen értékeknek az aránya az interferáló jelek szempontjából az idő legnagyobb részében meghaladja a kívánt értéket.

6.2.2.3 Jóllehet, a frekvencia elosztásnál használt 70 mikro-volt / méteres értéket Európában (a 30^{o}-os földrajzi szélességtől Északra) eredményesnek találták ahhoz, hogy megadja azokat a fedésterületi értékeket, amelyek az idő legnagyobb részében szorosan megközelítik a tényleges fedésterületet, túlságosan korlátozott tapasztalat áll rendelkezésre annak bizonyításához, hogy a 120 mikrovolt / méteres érték alkalmas a magas zajszintű területeken történő általános alkalmazásra. Az várható, hogy a magas zajszintű területek névleges fedésterületi határvonalain a 120 mikrovolt / méteres értéken alapuló térerősség a legtöbb esetben az elért tényleges fedésterületnél lényegesen nagyobb lesz. Az ilyen területeken a névleges fedésterület és az átlagosan elért tényleges fedésterület közötti jobb kölcsönös viszony biztosítása érdekében az lehet a tanácsos, hogy olyan határvonali értéket válasszanak meg, amely az azon a területen lévő zajnak az olyan területen lévő zajhoz való jóval közelebbi arányosságán alapszik, amelyre már kielégítő határvonali értéket határoztak meg (pl. Európa), vagy egy olyan megfelelő értéket határozzanak meg, ami egy ismert teljesítményű területen lévő NDB ténylegesen elért tényleges fedésterületének statisztikai vizsgálatából származik.

6.2.2.4 Fontos annak tisztánlátása azonban, hogy a különböző területeken fennálló zajszintek egyszerű összehasonlításán alapuló minimális térerősség értékek esetleg nem lesznek kielégítőek az olyan tényezők miatt, mint például a zaj előfordulási gyakorisága, tulajdonsága és a légijármű fedélzeti vevőberendezésére gyakorolt hatása, valamint a kapcsolódó légiforgalmi mozgások természete, amelyek mind módosíthatják az ilyen módon meghatározott arányokat.

6.2.2.5 A világ különböző részein fennálló napszaki és évszaki zaj értékeket a Nemzetközi Távközlési Unió (ITU) korábbi Nemzetközi Rádió Tanácsadó Bizottsága (CCIR) 322. Jelentése teszi közzé.

6.2.2.5.1 Ezeknek az értékeknek a tényleges helyi körülményekkel való összehasonlítása és az ADF (automatikus rádióirány kereső) berendezések eredményes üzemeltetési felhasználásához szükséges jel - zaj viszony bevezetése még nincs teljes mértékben meghatározva.

6.2.3 Tényleges fedésterület

6.2.3.1 A tényleges fedésterület - ahogy az a 3. Fejezet 3.4.1 pontjában meghatározásra került - az egy NDB-t körülvevő azon terület, amelyen belül az érintett üzemeltető felhasználható tájékoztatást kaphat egy meghatározott időben. Ez ennek megfelelően az NDB felhasználhatóságának mértéke a fennálló körülmények között.

6.2.3.2 A tényleges fedésterületet az NDB-től vett állandó (nem-elhalkuló) jel erősségének az ADF vevőkészülék által vett összes zajhoz viszonyított aránya korlátozza. Amikor ez az arány egy határérték alá csökken, akkor nem juthatnak hozzá használható irányméréshez. Azt is meg kell jegyezni, hogy egy NDB tényleges fedésterületét bizonyos esetekben a felhasználható azonosító jel adástávolsága is korlátozhatja.

6.2.3.3 Az NDB-től vett jel erősségét a következők határozzák meg:

a) az NDB antennájába betáplált teljesítmény;

b) az antenna sugárzási hatásfoka, amely az antenna magasságától és a sugárzó rendszer egyéb jellemzőitől függően változó;

c) az NDB és a vevőberendezés közötti terjedési út vezetőképesssége, amely jelentősen változó lehet az egyik helytől a másikra és a szárazföld felett mindig kisebb, mint a tengervíz felület felett;

d) az üzemi rádió rádiófrekvencia.

6.2.3.4 A vevőkészülék által vett zaj az alábbiaktól függ:

a) a vevőberendezés sávszélessége;

b) a légköri zaj szintje, ami az érintett földrajzi területnek megfelelően változó, a napszaktól és az évszaktól függő, és amely nagyon magas szintet érhet el a helyi zivatarok során;

c) az NDB és a vevőberendezés közötti terjedési út vezetőképesség, amely jelentősen változó lehet az egyik helytől a másikra és a szárazföld felett mindig kisebb, mint a tengervíz felület felett;

d) a légijárműben jelentkező elektromos zaj miatti zaj szintje, vagy az ipari zaj (elektromos motorok stb. által létrehozott zaj) akkor, amikor az NDB fedésrterülete ipari területekre is kiterjed.

6.2.3.4.1 Meg kell jegyezni azt, hogy a zaj hatása az ADF vevő és a hozzá kapcsolódó berendezések jellemzőitől, valamint a zaj természetétől is (pl. állandó zaj, pulzáló zaj) függ.

6.2.3.5 Egy további tényező, amely az NDB tényleges fedésterületét korlátozza, éjszaka jelentkezik, amikor a jel azon összetevői között lép fel kölcsönhatás, amelyek külön-külön a vízszinrtes síkban (földhullám terjedés) és az ionoszféráról való vissszaverődés (térhullám terjedés) útján terjednek. Amikor az ilyen összetevők között olyan kölcsönhatás van, hogy ezek az ADF vevőhöz fáziskülönbséggel érkeznek, akkor iránymérési hibákat hoznak létre (éjszakai hatás).

6.2.3.6 Így be kell látni azt, hogy egy NDB tényleges fedésterülete olyan sok olyan tényezőtől függ, ami változó, hogy lehetetlen az, hogy egy NDB tényleges fedésterülete egyszerű módon meghatározásra kerüljön. Minden NDB tényleges fedésterülete valójában a napszak és az évszak függvényében változó.

6.2.3.6.1 Ennélfogva bármilyen olyan kísérlet, hogy a tényleges fedésterület úgy kerüljön meghatározásra, hogy megkapható legyen a napszak bármely időpontjára, vagy egy egész éven át, vagy egy olyan fedésterületi számot eredményezne, ami túl kicsi lenne (mivel ez lenne az a fedésterület, ami a légköri zaj legrosszabb körülményei mellett elérhető), egy teljesen félrevezető képet adna az NDB hatékonyságáról, vagy olyan nagy teljesítményt és költséges antenna-rendszert (a szükséges teljesítménynek a legrosszabb feltételek melletti biztosítása) foglalna magába, hogy egy ilyen NDB telepítését eleve megakadályozná a telepítési és üzemeltetési költségek figyelembevétele. Semmilyen egyenlet nem adható meg annak meghatározására, hogy milyen névleges fedésterület lenne egyenértékű a megkívánt tényleges fedésterülettel, és az összefüggést körzetileg kell megállapítani.

6.2.3.7 Azok, akik az NDB fedésterület üzemeltetési szempontjaiban érintettek, a követelményeket rendszerint a megkívánt üzemi fedésterület kérdésében fogják mérlegelni, és a körzeti tervezésben általában arra lesz szükség, hogy az ilyen követelményeket a névleges fedésterület szempontjából értelmezzék, amiből az NDB szükséges alapvető jellemzői levezethetők lesznek, és ami meg fogja határozni azt a területet is, amelyet a káros interferencia ellen védeni kell. Semmilyen egyenlet nem adható meg annak meghatározására, hogy milyen névleges fedésterület lenne egyenértékű a megkívánt üzemeltetési fedésterülettel, és az összefüggést körzetileg kell megállapítani.

6.2.3.8 Néhány Államban rögzítették az NDB-k adatait és azok tényleges fedésterületét; és a hasonló információk összegyűjtése gyakorlatilag egy hasznos módszer lenne egy adott terület berendezései tényleges fedésterületének a névleges fedésterületben kifejezett értékeléséhez.

Ez a tájékoztatás hasznos lenne a jövő körzeti tervezéséhez is. A tényleges fedésterület megállapításához kapcsolódó számos tényező csökkentése céljából kívánatos lenne a rádióirányszög kijelző reagálásában kifejezett hasznos fedésterületi határvonal meghatározása követelményének megállapítása. Az előbbiekben említett adatok, az NDB fedésterületén belül mért tényleges térerősséggel együtt, lehetővé tennék a meglévő berendezések hatékonyságának a meghatározását is, és útmutatást adnának azokhoz a tökéletesítésekhez, amelyek szükségesek lehetnek a megkívánt tényleges fedésterület eléréséhez.

6.3 Az NDB-k fedésterülete

6.3.1 Bevezetés

6.3.1.1 Az alábbi tanulmány az ITU rendelkezésére álló legújabb hullámterjedési és zaj adatokon alapszik. Ezeket az adatokat ez a Melléklet az NDB-k tervezésére vonatkozó általános irányelvként foglalja magába. Különösen felhívjuk a figyelmüket a megadott elfogadott feltételekre.

6.3.1.2 Az anyag alkalmazásakor a feltételeknek a vizsgálat alatt álló egyedi körülményekre vonatkozó érvényességét gondosan meg kell vizsgálni, és különösképpen azt kell megjegyezni, hogy a feltételezett jel - zaj arányok további jelentékeny mértékű tanulmányozást igényelnek, mielőtt elfogadhatók lennének a hasznos vételt korlátozó arányok tipikus példájaként.

6.3.2 Feltételek

1. Üzemi frekvencia — 300 kHz.
Vonatkoztatva még azonban - ahol megfelelő - a 200 kHz-es és 400 kHz-es frekvenciákra.

2. a) Átlagos talaj vezetőképesség:
($\sigma = 10^{-13}$ elektromágneses egység)

b) Átlagos tengervíz vezetőképesség:
($\sigma = 4{,}10^{-11}$ elektromágneses egység)

3. A légköri zaj szintje (RMS = négyzetes középérték), ami valószínűleg előfordul: 1) nappal, 2) éjszaka, a szárazföld felett az említett földrajzi szélességi sávban. [A várható zaj értékei az ITU-R P.372-6 Ajánlásából kerültek levezetésre és a nap-éj egyenlőségi periódusok alatti nappali és éjszakai átlagos zaj értékeként kerültek elfogadásra, azaz azok az értékek, amelyek az év 20-25 százalékában várhatóan nagyobbak.]

4. Az NDB antennájába bevezetett teljesítmény:
a) 5 kW
b) 1 kW
c) 500 W
d) 100 W
e) 50 W
f) 10 W

5. Az antennák sugárzási hatásfokának átlagos értékei, azaz az, amely a következő:

$$\left[\frac{\text{Kisugárzott teljesítmény}}{\text{Az antennába bevezetett teljesítmény}}\right]$$

	Az antennába bevezetett teljesítmény	*Az antenna sugárzási hatásfoka*
a)	5 kW	20 % (-7 dB)
b)	5 kW	10 % (-10 dB)
c)	1 kW	8 % (-11 dB)
d)	500 W	5 % (-13 dB)
e)	100 W	3 % (-15 dB)
f)	50 W	2 % (-17 dB)
g)	10 W	1 % (-20 dB)
h)	10 W	0,3 % (-25 dB)

i) Az a) alatti értékek azért kerültek beépítésre, mert ezt a hatásfokot egy - a rendszerint alkalmazottnál - jobb kialakítású antenna-rendszer alkalmazásával el lehet érni.

ii) A h) alatti értékek azért kerültek beépítésre, mert számos kis- teljesítményű antennánál nagyon rossz hatásfokú antennát használnak.

6. Az ADF vevő admitancia sávja 6 kHz.

7. A jel - (medián) - zaj (négyzetes középérték) szükséges aránya:

a) 15 dB nappal;

b) 15 dB éjszaka.

6.3.3 A tanulmányok eredményei

A. — *A névleges fedésterület határvonalán szükséges minimális térerősség:*

	Földrajzi szélesség	*Nappal 15 dB-es jel-zaj viszonynál*	*Éjjel 15 dB-es jel-zaj viszonynál*
	5°N - 5°S	320 µV/m (+50 dB)	900 µV/m (+59 dB)
	5° - 15°N&S	85 µV/m (+39 dB)	700 µV/m (+57 dB)
	15° - 25°N&S	40 µV/m (+32 dB)	320 µV/m (+50 dB)
	25° - 35°N&S	18*µV/m (+25 dB)	120 µV/m (+42 dB)
	> 35°N&S	18*µV/m (+25 dB)	50 µV/m (+35 dB)

A számok mellett feltűntetett csillag azt jelzi, hogy magasabb térerősség értékre, lehetséges, hogy a feltűntetett érték kétszeresére, vagy háromszorosára lesz szükség (plusz 6-tól plusz 10 dB-ig) a nagy légijármű zajú és / vagy ipari zajú területeken.

B. — *Az NDB-k azon fedésterülete (olyan kör sugarában* - kilométerben megadva - amelynek a középpontjában van az NDB), amely az elfogadott feltételek mellett várható:

1) *Nappal, szárazföld felett,* és *15 dB-es jel-zaj arányra* a fedésterület határvonalánál:

Földrajzi szélesség	*Az antennába bevezetett teljesítmény*			
	(a) *5 kW*	(b) *5 kW*	(c) *1 kW*	(d) *500 W*
5°N - 5°S	320	300	170	120
5° - 15°N&S	510	470	320	250
15° - 25°N&S	> 600	600	450	350
25° - 35°N&S	> 600 *	> 600*	600 *	500 *
> 35°N&S	> 600 *	> 600 *	> 600 *	500 *

Földrajzi szélesség	*Az antennába bevezetett teljesítmény*			
	(e) *100 W*	(f) *50 W*	(g) *10 W*	(h) *10 W*
5°N - 5°S	50	30	10	< 10
5° - 15°N&S	150	90	40	10
15° - 25°N&S	220	160	70	45
25° - 35°N&S	330 *	250 *	130 *	80 *
> 35°N&S	330 *	250 *	130 *	100 *

2) *Éjszaka, szárazföld felett,* és *15 dB-es jel-zaj arányra* a fedésterület határvonalánál:

Földrajzi szélesség	*Az antennába bevezetett teljesítmény*			
	(a) *5 kW*	(b) *5 kW*	(c) *1 kW*	(d) *500 W*
5°N - 5°S	190	150	85	50
5° - 15°N&S	210	180	110	70
15° - 25°N&S	320	300	170	120
25° - 35°N&S	390	390	280	200
> 35°N&S	390	390	390	310

Földrajzi szélesség	*Az antennába bevezetett teljesítmény*			
	(e) *100 W*	(f) *50 W*	(g) *10 W*	(h) *10 W*
5°N - 5°S	20	< 10	< 10	< 10
5° - 15°N&S	25	15	< 10	< 10
15° - 25°N&S	50	30	10	< 10
25° - 35°N&S	100	70	25	15
> 35°N&S	180	120	50	30

6.3.3.1 Valamennyi fenti táblázathoz meg kell jegyezni azt, hogy:

a) a távolságok kilométerben vannak megadva, az ITU gyakorlatának megfelelően;

b) az utolsó oszlopban, a 10 W-os fejléc alatt feltűntetett számok azzal a feltétellel kerültek kiszámításra, hogy kisteljesítményű NDB-nél nagyon rossz hatásfokú antennát használnak (lásd az 5 h) alatti feltételt);

c) a számok mellett feltűntetett csillag azt jelzi, hogy a fedésterületet a légijármű és az ipari zajok korlátozhatják.

6.3.3.2 Azt is meg kell jegyezni, hogy:

a) ha a 200 kHz-es frekvenciát alkalmazzák a 300 kHz helyén, akkor az nem fogja észrevehetően befolyásolni egy kisteljesítményű, kis hatótávolságú NDB fedésterületét, azonban a nagyobb teljesítményű és nagyobb hatótávolságó rádióirányadók (például azok, amelyeknek a hatótávolsága 150 km, vagy több) fedésterülete a táblázatban feltűntetettekkel összehasonlítva körülbelül 20 százalékkal megnövekszik;

b) ha a 400 kHz-es frekvenciát alkalmazzák a 300 kHz helyén, akkor az nem fogja észrevehetően befolyásolni egy kisteljesítményű, kis hatótávolságú NDB fedésterületét, azonban a nagyobb teljesítményű és nagyobb hatótávolságó rádióirányadók (például azok, amelyeknek a hatótávolsága 150 km, vagy több) fedésterülete a táblázatban feltűntetettekkel összehasonlítva körülbelül 25 százalékkal lecsökken;

c) egy keskenyebb sávszélességű ADF vevőkészülék alkalmazása, a többi tulajdonságot változatlannak véve, szélesebb fedésterületet biztosít ugyanazon kisugárzott teljesítménynél, vagy azonos fedésterületet és javuló hatékonyságú jel-zaj viszonyt.

Például, ha a 6 kHz helyett 1 kHz-es admittancia sávot használnak, akkor a fedésterület akár 30 százalékig terjedő értékkel is megnövekedhet, ugyanazon kisugárzott teljesítmény mellett, vagy alternatívaként a tényleges jel-zaj viszony akár 8 dB-ig terjedően is megnövekedhet.

d) ha az NDB fedésterületének egy szektora tenger felett van, az adott szektoron belül nagyobb fedésterület várható a következők miatt:

1) a tengervíz felszín felett jobb a felületi hullámterjedés, mint a szárazföld felett;

2) a zajszint, amely a szárazföld felett magasabb, gyakran egészen meredeken csökken a szárazföldtől mért távolság növekedésével. Ennélfogva az várható, hogy a táblázatban feltűntetett értékek nappal körülbelül 30 százalékkal és éjszaka körülbelül 20 százalékkal megnövekedhetnek akkor, ha a terjedési út a tengerszint felszíne felett van;

e) ha azonban a rádióirányadó egy, a szárazföldtől távol lévő szigeten van telepítve (például a Közép-Csendes, vagy a Közép- Atlanti óceánban, de nem a Karib-tengeren), akkor a rádióirányadó fedésterülete valószínűleg jóval nagyobb lesz, különösen a trópusi szélességi fokokon, annál, mint ami a táblázatokban feltűntetésre került, és az ilyen esetekben azokkal megegyező számokat lehet elfogadni, mint amelyek a 35^{o} Észak és Dél szélességi körökön túlra kerültek megadásra, minden szélességnél a miatt az alacsonyabb szintű légtéri zaj miatt, ami a közép-óceáni területeken a szárazföldek felett, vagy azok közelében tapasztalatakhoz viszonyítva fennáll.

6.3.4 A rádióirányadó fedésterületének éjszakai csökkenése az "éjszakai hatás" miatt:

a) Azok a távolságok éjszaka, amelyeken a vett erőtér felületi hullámú és térhullámú összetevői valószínűleg egyenlőek, a következők:

Frekvencia	*Szárazföld felett*	*Tenger felett*
200 kHz	500 km	550 km
300 kHz	390 km	520 km
400 kHz	310 km	500 km

b) Azok a távolságok éjszaka, amelyeknél a vett erőtér felületi hulllám össszetevője valószínűleg 10 dB-el meghaladja a térhullámú összetevőt, a következők:

Frekvencia	*Szárazföld felett*	*Tenger felett*
200 kHz	300 km	320 km
300 kHz	230 km	300 km
400 kHz	200 km	280 km

c) Ez az, aminek következtében nem valószínű, hogy megbízható iránymérések kaphatók éjszaka a vett erőtér két összetevőjének egymásra hatása miatt, a 6.3.4 b) pontban feltűntetett értékeknél jóval nagyobbb távolságokban. Ezek a távolságok függetlenek az NDB teljesítményétől.

d) Ezenkívül meg kell jegyezni azt is, hogy amíg a jó vezetés szárazföldi útjai az éjszakai hatás miattt csak egy kicsit nagyobb távolságúak lesznek, jelentősebbek annál, mint ami a rossz vezetésű utakra megadásra került, az éjszakai hatás jóval rövidebb távolságokra válhat hangsúlyozottá. Ez bizonyos mértékben még a sugárzó rendszer jellemzőitől függő is lesz.

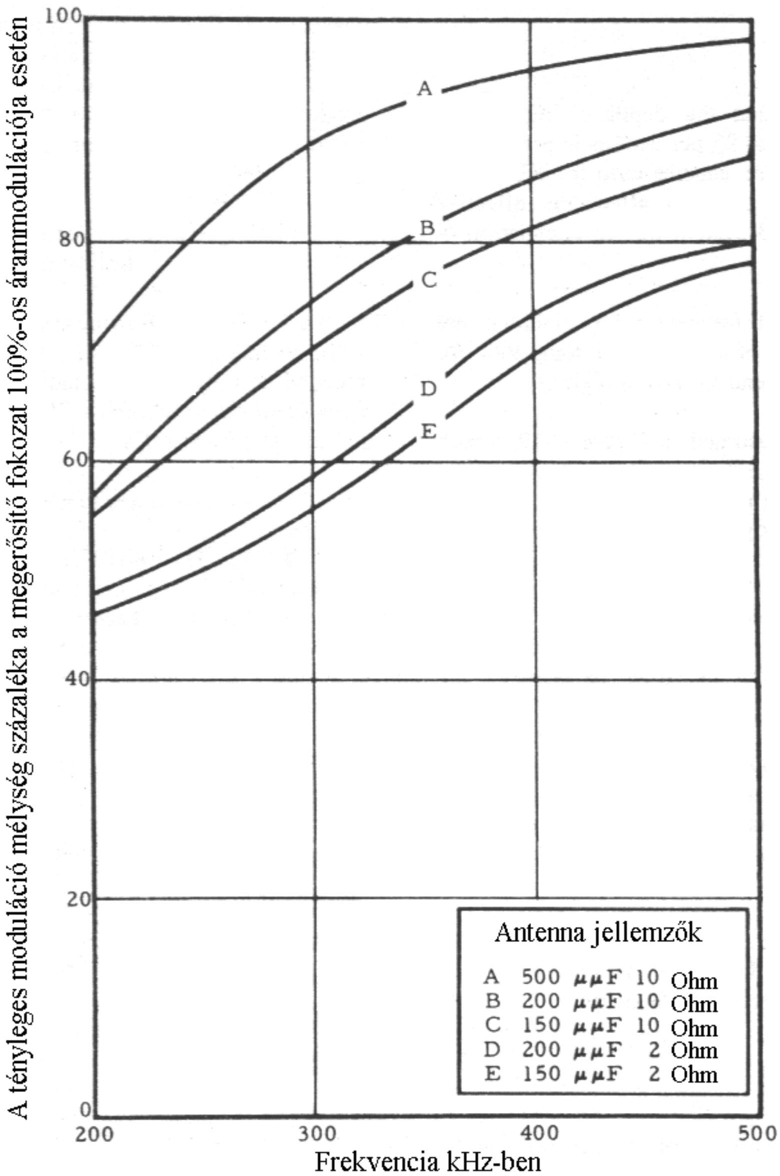
6.4 Az NDB-k üzemeltetését befolyásoló megfontolások

6.4.1 *Modulációs mélység*

6.4.1.1 Arra az előírásra vonatkozóan, hogy a modulációs mélységet annyira közel kell tartani a 95 százalékhoz, amennyire az gyakorlatilag megvalósítható, meg kell jegyezni azt, hogy az NDB-knél alkalmazott frekvenciáknál az általánosan használt kis antennák - az oldalsávok csillapítása miatt - hatással lehetnek az NDB rendszerek modulációs mélységére.

6.4.1.2 Ennél a frekvencia tartománynál az antennák szabályszerűen csak egy kis részét képezik a hullámhossz hosszának; így ennek megfelelően magas a reaktanciájuk, és magas Q értékre hajlamosak.

6.4.1.3 Ezt a hatást mutatja be a C-19. számú ábra, amely egy Állam mérései alapján került összeállításra. Ezeknél a méréseknél a modulációs frekvencia 1 020 Hz volt. Ha egy alacsonyabb modulációs frekvenciát használnának, akkor a hatás kisebb lenne.



Megjegyzés.-Ezeknél a méréseknél a moduláló frekvencia 1020 Hz volt.

C-19. ábra: Az antenna Q értékének a kisugárzott jel modulációs mélységére gyakorolt hatása

6.4.1.4 A csillapítás csökkentése céljából megpróbálták a Q értékét csökkenteni. Ezt kétféleképpen lehet végrehajtani, vagy a kapacitásának, vagy az ellenállásának a növelésével.

6.4.1.5 Egy kiegészítő ellenállásnak az antennába történő beiktatása csökkenti a teljesítményt, míg ellenben a kapacitás növelésének a hatása az, hogy csökkenti a rendszer feszültségét és ezáltal csökkenti a szigetelési problémákat.

6.4.1.6 Ezen okokból kívánatosnak tekinthető az, hogy növeljék az antenna kapacitását egy olyan antenna csúcs-terhelés alkalmazásával, mint például az úgynevezett ernyő csúcs-kapacitás.

6.4.2 *Földelési rendszerek*

6.4.2.1 A frekvencia tervezés azon az alapfeltételen nyugszik, hogy a térerősséget a pontos értékén fogják tartani. Ha a földelési ellenállás nagy (azaz nem kielégítő a földelési rendszer), akkor nemcsak a sugárzási hatékonyság lesz kicsi, hanem a kisugárzott teljesítmény lesz érzékeny az éghajlati viszonyok változásaira és az egyéb, földelési veszteséget befolyásoló tényezőre. Minden esetben a földelési rendszernek a lehető legjobbnak kell lenni az összes helyi körülményt beszámítva.

6.5 A NON / A2A üzemmódú NDB-k modulációs frekvenciája kiválasztását befolyásoló megfontolások

6.5.1 Annak a ténynek a felismerése, hogy a modern keskeny sávú automatikus rádióiránymérő (ADF) vevőknek megnövelt szelektivitási jellemzőjük van, szükségessé válik annak a tényezőnek a vizsgálata, hogy ezeknek a készülékeknek a hangfrekvenciás oldalsáv csillapítása a jel tényleges modulációs mélységének csökkentését is létrehozza, azaz az a távolság, amelynél a kielégítő azonosítás elérhető, ennek megfelelően lecsökken. Az ilyen körülmények mellett - úgy gondoljuk, hogy - a 400 Hz jobb azonosítási szolgáltatást fog biztosítani, mint az 1 020 Hz. Nyilvánvaló azonban az, hogy a nagy légköri zaj esetén az
1 020 Hz-es magasabb frekvencia jóval könnyebben olvasható jelet biztosíthat.

6.6 Útmutató anyag az NDB-k ellenőrzéséhez

6.6.1 Az alábbi pontokban a különféle ellenőrzések kívánt időszakosságának irányelvei kerülnek megadásra. Ezeknek az adatoknak csak általános útmutatás a céljuk, és elfogadott az, hogy számos helyi körülmény fogja befolyásolni az Államokat a saját ellenőrző programjuk meghatározásakor.

6.6.1.1 *Vivőfrekvencia*

6.6.1.1.1 A vivőfrekvencia pontosságát időszakosan ellenőrizni kell egy pontos szabványhoz viszonyítva annak biztosításához, hogy a 3. Fejezet 3.4.4.2 pontjában meghatározott tűréshatárokon belül marad. Egy szabvány mérőeszközt, például egy kristály-vezérelt - az üzemi frekvenciához viszonyított 0,001 százalékos pontosságú - frekvenciamérő felhasználása ajánlott erre a célra.

6.6.1.1.2 A vivőfrekvencia stabilitásának ellenőrzését a következők szerint kell elvégezni:

a) legalább félévenként a kristály-vezérelt adóknál;

b) legalább havonta egyszer a nem-kristály-vezérelt adóknál.

6.6.1.1.3 Ha gyakorlatilag megvalósítható, akkor az ellenőrzéseket rövidebb időszakonként kell elvégezni.

6.6.1.2 *A moduláló hang frekvenciája*

6.6.1.2.1 Az azonosító frekvenciára vonatkozó követelmények a 3. Fejezet 3.4.5.4 pontjában kerültek előírásra. Egy olyan hangfrekvenciás jelgenerátor alkalmazása javasolt kalibrációs szabványként, amelynek a pontossága a meghatározott frekvenciához viszonyítva 0,5 százalékos, vagy annál jobb pontosságú.

6.6.1.2.2 Ezt az ellenőrzést legalább havonta egyszer el kell végezni.

6.6.1.3 *A felületi hullám térerőssége*

6.6.1.3.1 Az az ajánlott, hogy távol-téri térerősség méréseket végezzenek egy olyan térerősség jelző berendezéssel, amely képes annak ellenőrzésére, hogy az NDB kisugárzott teljesítménye megfelel a 3. Fejezet 3.4.3 pontjában leírtaknak.

6.6.1.3.2 Ezt az ellenőrzést legalább havonta egyszer el kell végezni.

6.6.1.4 *Modulációs mélység*

6.6.1.4.1 A 3. Fejezet 3.4.6.2 pontja előírja azt, hogy a vivőfrekvencia modulációs mélységét annyira közel kell tartani a 95 százalékhoz, amennyire az csak lehetséges. Egy, az NDB adó frekvenciáján működni képes oszcilloszkóp ajánlható erre az ellenőrzési célra.

6.6.1.4.2 Ezt az ellenőrzést az oszcilloszkóp felhasználásával legalább három hónaponként el kell végezni. Ezenkívül a modulációs mélység hozzávetőleges ellenőrzését egy kalibrált diódás-voltmérő felhasználásával gyakrabban is el lehet végezni, de az nem kielégítő az oszcilloszkópot alkalmazó ellenőrzés helyettesítésére.

6.6.1.4.3 A nem-kívánt hangfrekvenciás modulációt legalább három hónaponként meg kell mérni annak biztosításához, hogy az nem haladja meg a 3. Fejezet 3.4.5.6 pontjában megadott határértékeket. Egy oszcilloszkóp ajánlott ehhez az ellenőrzéshez.

6.6.1.5 *A vivőhullám teljesítmény csökkenése a modulációval*

6.6.1.5.1 Amikor a moduláció rákerül a vivőhullámra, akkor a vivőhullám teljesítménye nem csökkenhet a 3. Fejezet 3.4.6.4 pontjában meghatározott értéknél többel. Ennek biztosításához az ajánlott módszer egy olyan hitelesített távközlési vevőnek - amelynek egy folyamatos hullámú középfrekvenciás kristályszűrője van - egy megfelelő távoli helyen való felhasználása az adó térerejének jelzésére, amelynek a szelektivitása kielégítő ahhoz, hogy a hangfrekvenciás oldalsávokat kiszűrje.

6.6.1.5.2 Egy alternatív, de valószínűleg kevésbé pontos módszer a vivőhullám teljesítmény-csökkenésének meghatározására az antennába táplált áram összehasonlítása az adó modulált és modulálatlan állapotában.

6.6.1.5.3 Ezt az ellenőrzést legalább havonta egyszer el kell végezni.

7. A DME berendezésekre vonatkozó anyag

7.1 A DME / N és DME / P berendezésekre vonatkozó útmutató anyag

7.1.1 A rendszer hatékonysága

7.1.1.1 A rendszer hatékonysága a fedélzet - föld kapcsolatú jelromlás (garble), a földi válaszadó berendezés holtideje, a föld - fedélzet kapcsolatú jelromlás (garble) és a kérdező adó-vevő feldolgozó egység hatékonysága. Mivel ezeknek a hatékonysági összetevőknek mindegyike statisztikailag független, ezért egyenként lehet őket kiszámítani, és azután ezeket összekapcsolni ahhoz, hogy a rendszer hatékonyságát megadja. Egy egyedüli összetevő hatását úgy kell meghatározni, mint a kérdező adó-vevőnek a saját kérdéseire adott válaszjelek érvényes válaszainak százalékos arányát, feltételezve azt, hogy az összes egyéb összetevő "nincs jelen". A rendszer hatékonysága azután az egyedi összetevők szorzata.

7.1.1.2 A rendszer hatékonyságának számításánál a hiányzó válaszokat, valamint a vett válaszok által létrehozott távolságmérések pontosságát kell figyelembe venni. A hiányzó válaszok a jelromlás miatti jel interferenciából, vagy a válaszadó holtidő periódusa alatt vett kérdésekből jöhetnek létre. Azokat a válaszokat, amelyek olyan jelentős hibákat tartalmaznak, amelyek elegendően nagyok ahhoz, hogy a kérdező adó-vevő jelfeldolgozása visszautasítsa azokat, ugyancsak hiányzó válaszként kell kezelni a hatékonysági összetevő kiszámításánál.

7.1.1.3 A jelromlás miatti interferencia arány a csatorna kiosztási terv, a forgalmi terhelés és a földi válaszadó, valamint a kérdező adó-vevő sávszélesség függvénye. Mivel a végső megközelítési (FA) módnál szélesebb a vevő sávszélessége, mint a kezdeti megközelítési (IA) módnál, ezért az jóval érzékenyebb az interferenciára. Ezek a tényezők beépítésre kerültek a DME / P rendszer meghatározásába, és általában nem igényelnek az üzemeltetési hatóságoktól különleges számításba vételt.

7.1.2 Fedélzet - föld kapcsolatú jelromlás

7.1.2.1 A fedélzet - föld kapcsolatú jelromlás akkor fordul elő, amikor a földi válaszadónál az érvényes kérdezéseket a többi repülőgéptől eredő egyidejű kérdezések zavarják, és ennek eredménye a jel elvesztése, vagy a beérkezési idő mérési hibák létrehozása. Ez a nem-kívánt levegő - föld terhelés a kiszolgáló válaszadó környezetében lévő kérdező légijárművek számának függvénye és még a kérdező frekvenciák megfelelő kiosztásától, valamint a válaszadónál vett jel amplitudójától függ.

Megjegyzés. - A válaszadó - válaszadó közötti jelromlást a csatornákat elosztó hatóságok ellenőrzik.

7.1.3 Föld - fedélzet kapcsolatú jelromlás

7.1.3.1 A föld - fedélzet kapcsolatú jelromlás akkor fordul elő, amikor a kérdező adó-vevőnél az érvényes válaszok más válaszadók jeleivel interferálnak, és ez jel elvesztés, vagy a beérkezési idő impulzus mérés hibáit hozza létre. A jeltorzulási interferencia felléphet bármilyen olyan válaszadótól, amelynek a frekvenciája a kérdező adó-vevő sávszélességén belül van, beleértve azokat is, amelyek ugyanazon a frekvencián, de más impulzus kódolással működnek.
Ez a nem-kívánt föld - levegő terhelés a kérdező adó-vevő környezetében lévő válaszadók számának a függvénye és még a válasz-frekvenciák megfelelő kiosztásától, valamint a kérdező adó-vevőnél vett jel amplitúdójától függ.

7.1.4 A kérdező jelfeldolgozó egység hatékonysága

7.1.4.1 A kérdező jelfeldolgozó egység hatékonyságát a kérdező adó-vevő által feldolgozott válaszok számának a jelromlás nélküli és a válaszadó holtidő hatása nélküli kérdezések számához viszonyított aránya adja meg. Ez a hatékonyság a válaszjel impulzusok küszöbszintjétől és a vevő zajszintjétől függ.

7.1.5 A kiszolgált légijárművek és a jelátviteli sebesség közötti összefüggés

7.1.5.1 A maximális válaszadó jelátviteli sebesség előírás meghatározza a maximális átlagos adó jeltovábbítási teljesítmény szintet. A 3. Fejezet 3.5.4.1.5.5 pont azt ajánlja, hogy a válaszadó jelátviteli sebesség képessége 2 700 másodpercenkénti impulzus-pár legyen akkor, amikor 100 légijárművet szolgál ki. Ez a 100 légijárműtől eredő jellemző válaszadó terhelést jelképezi. A tényleges jelátviteli sebesség képesség meghatározásával azt kell abba beleérteni, hogy egy adott berendezésnél a forgalmi csúcs körülmények esetén mi az a maximális kérdezési szám, ami várható. A válaszadó lekérdezési terhelésének kiszámításánál a következőket kell számításba venni:

a) forgalmi csúcsterhelést létrehozó légijárművek számát;

b) az egyes légijárműveken alkalmazott kérdező berendezések számát;

c) a használatos kérdező berendezések üzemeltetési módjának megoszlását (például kereső, kezdeti megközelítési, végső megközelítési és földi ellenőrzés);

d) a megfelelő impulzus ismétlődési frekvenciát, ahogy az a 3. Fejezet 3.5.3.4 pontjában megadásra került.

7.1.5.2 Megadva a válaszadóra jutó, a forgalmi csúcsból eredő lekérdezési terhelést, valamint a válaszadónak az ezen terhelés melletti válaszolási hatékonyságát, ki lehet számítani a létrejövő válaszolási sebességet, és ezáltal meg lehet határozni a szükséges adási teljesítőképességet. Ez a válaszadási sebesség az a szint, ami ha túllépésre kerül, a vevő érzékenység csökkenését eredményezi (ahogy az a 3. Fejezet 3.5.4.2.4 pontjában meghatározásra került), azért, hogy a válaszadási sebességet a berendezés a maximális szinten vagy az alatt tartsa.

7.1.6 Az ILS-hez, vagy az MLS-hez kapcsolt DME telepítése

7.1.6.1 A DME-nek - ahol csak lehetséges - a légijármű vezetője részére a kijelzett nulla távolságot a földetérési pontnál kell biztosítania, azért, hogy a jelenlegi üzemeltetési követelményeket kielégítse.

7.1.6.2 A DME válaszadó optimális telepítési helye több technikai és üzemeltetési tényezőtől függ. A DME / N berendezést együtt lehet telepíteni az ILS-el, vagy az MLS-el ott, ahol az üzemeltetési követelmények lehetővé teszik. A DME / P berendezés, amely nagyobb pontosságot és fedésterületet biztosít a futópálya teljes körzetében, az olyan jóval rugalmasabb és fejlettebb technikájú üzemeltetésekhez szükséges, mint ami az MLS-el érhető el.

7.1.6.3 A DME / N esetében a nulla távolság kijelzésére vonatkozó előírást úgy lehet elérni, hogy a válaszadót olyan közel telepítik ahhoz a ponthoz, ahova a nulla távolság kijelzés szükséges, amennyire az csak lehetséges. Alternatívaként, a válaszadó időkésleltetését lehet úgy beállítani, hogy lehetővé tegye a légijármű kérdező részére a nulla távolságnak a DME antennától egy meghatározott távolságra való kijelzését. Amikor a nulla távolságnak nem a DME antenna a referencia pontja, akkor gondoskodni kell arról, hogy ez a tájékoztatás közzétételre kerüljön.

7.1.6.4 A DME / P esetében, abból a célból, hogy a berendezés a pontossági és fedésterületi követelményeknek megfeleljen, különösen a futópálya körzeti követelményeknek, az az ajánlott, hogy a DME / P berendezés olyan közel kerüljön az MLS oldalszög adó berendezéshez, amennyire az csak lehetséges, az akadálymentességi követelményeknek megfelelően. Egy teljes MLS technikai képességgel felszerelt légijármű részére a megkívánt nulla távolság kijelzést az MLS alap-adatok felhasználásával lehet biztosítani. Jegyezzék meg azt, hogy a DME / P válaszadó időkésleltetését nem szabad ebből a célból szabályozni.

7.1.6.5 Kívánatos, hogy az összes felhasználó kapjon földetérésnél kijelzett nulla távolságot, tekintet nélkül a légijárművön felszerelt berendezésre. Ez szükségessé teszi a DME / P-nek a földetérési pontnál a futópályára merőlegesen történő elhelyezését. Ebben az esetben a DME / P-re vonatkozó pontossági követelmények nem felelnek meg a futópályán. Meg kell jegyezzük, hogy az MLS 3. Alap Adatszó csak bizonyos határok között engedélyezi a DME / P koordinátáinak kódolását.

7.1.6.6 Amikor egy MLS / DME / P és egy ILS / DME / N szolgálja ki ugyanazt a futópályát, akkor egy, a minimális MLS technikai képességgel felszerelt légijármű a nulla távolság kijelzést a megközelítési oldalszög adó berendezés telepítési helyére kaphatja meg akkor, amikor az MLS szerint üzemel, és nulla távolság kijelzést kaphat a földetérési pontra akkor, amikor az ILS szerint üzemel. Mivel ezt különösen az ATC nézőpontjából üzemeltetésileg elfogadhatatlannak tartják, és ha az ILS / MLS / DME frekvencia megháromszorozódás meghiúsítja a DME / N frekvencia kijelölését, és ez nem lehetséges, akkor a DME / P berendezés telepítését el kell halasztani addig, amíg a DME / N visszavonásra kerül.

7.1.6.7 A DME / N kérdező által biztosított nulla távolság kijelzés névleges helyét közzé kell tenni.

7.1.6.8 A DME telepítési helyének vizsgálatánál az olyan technikai tényezőket is számításba kell venni, mint a futópálya hossza, profilja, a helyi terepviszonyok és a válaszadó antenna magassága, ahhoz, hogy a kielégítő jelszintet a futópálya küszöbének körzetében és a futópálya teljes hosszában biztosítsák. Figyelemmel kell lenni arra is, hogy ahol távolság tájékoztatás szükséges, a futópálya körzetében, ott a kiválasztott telepítési hely ne okozza azt, hogy a kérdező elveszítse a követést a sebesség változása miatt.

7.1.7 Földrajzi elkülönítési követelmények

7.1.7.1 Abból a célból, hogy a jelenlegi antenna tervezési, berendezés jellemzők és szolgálati hatótávolság figyelembevételét lehetővé tegyék, a DME csatornákon üzemelő különféle berendezések interferencia-mentes üzemeltetésének biztosításához a szükséges jelviszonyokat az alábbi 7.1.8, 7.1.9 és 7.1.10 pontban adjuk meg. Ezeket a jelviszonyokat figyelembevéve a berendezések földrajzi elkülönítését könnyen ki lehet fejezni a terjedési úton bekövetkező veszteségek számításba vételével.

7.1.8 *A megkívánt és nem-kívánt (D/U) jelviszonyok a fedélzeti vevőnél*

7.1.8.1 A C-4. táblázat adja meg azokat a szükséges megkívánt / nem-kívánt jelviszonyokat, amelyek a megkívánt válaszadó jelek védelméhez a légijármű fedélzeti vevőjének szükségesek, azokkal a különféle azonos csatornájú / szomszédos csatornájú, azonos kódú / eltérő kódú, nem-kívánt válaszadó válaszjelek kombinációjával szemben, amelyek előfordulhatnak. A kezdeti kijelölésnél a megkívánt / nem-kívánt jelviszonyokra a légijármű fedélzeti berendezés 6-mikromásodperces dekóder lezárás alkalmazásával kell védeni. A frekvencia kijelölés végrehajtásánál minden egyes berendezést úgy kell kezelni, mint egy olyan megkívánt forrást, ami a másiknál nem-kívánt forrásként jelentkezik. Ha mindkettő kielégíti az egyedi megkívánt / nem-kívánt jelviszony követelményét, akkor a csatorna kiosztás végrehajtható.

7.1.8.2 Ennek megfelelően, a DME csatorna kijelölés a következőktől függ:

a) *Azonos csatornák kijelölése.* Ez a helyzet akkor áll fenn, amikor mind a megkívánt, mind a nem-kívánt jelek egy csatornán üzemelnek (W, X, Y vagy Z), ami azonos frekvenciájú és azonos kódú. A megkívánt / nem-kívánt jelviszonynak legalább 8 dB-nek kell lenni a teljes szolgálati hatótávolságon belül.

b) *Azonos frekvencia eltérő kód kijelölése.* Ez a helyzet akkor áll fenn, amikor az egyik berendezés egy X csatornán üzemel és a másik egy W csatornán. Hasonló Y csatorna és Z csatorna kombináció is alkalmazható.

c) *Első szomszédos frekvencia, ugyanazon kód kijelölése.* Ez a helyzet akkor áll fenn, amikor mind a megkívánt, mind a nem-kívánt berendezések W, X, Y vagy Z típusúak.

d) *Első szomszédos frekvencia, eltérő kód kijelölése.* Ez a helyzet akkor áll fenn, amikor az egyik berendezés egy X csatornán működik, és a másik egy W csatornán, de 1 MHz-es eltolással a válaszadó válasz-frekvenciái között. Egy hasonló Y csatorna és Z csatorna kombináció is alkalmazható.

e) *Második szomszédos frekvencia azonos, vagy eltérő kód kijelölése.* A második szomszédos frekvencia kombinációkat általában nem szükséges védeni. Azonban különös figyelmet kell fordítani a C-4. táblázat 4. Megjegyzésére, különösen akkor, ha a nem-kívánt berendezés egy DME / P válaszadó.

C-4. táblázat: A megkívánt / nem-kívánt jel védelmi aránya (dB)

A kijelölés típusa		A	B
Azonos frekvencia			
	Azonos impulzus kód	8	8
	Eltérő impulzus kód	8	-42
Első szomszédos frekvencia			
	Azonos impulzus kód	$-(P_u - 1)$	-42
	Eltérő impulzus kód	$-(P_u + 7)$	-75
Második szomszédos frekvencia			
	Azonos impulzus kód	$-(P_u + 19)$	-75
	Eltérő impulzus kód	$-(P_u + 27)$	-75

1. Megjegyzés. - Az A-oszlopban lévő megkívánt / nem-kívánt jel viszonyok azokat a DME / N kérdező berendezéseket védik, amelyek az X, vagy Y csatornákon működnek. Az A-oszlopnál a dekóder lezárásra 6 mikromásodperc került alkalmazásra.

2. Megjegyzés. - A B-oszlopban lévő megkívánt / nem-kívánt jelviszonyok azokat a DME / N vagy DME / P kérdező berendezéseket védik, amelyeknél a 3. Fejezet 3.5.5.3.4.2 és 3.5.5.3.4.3 pontjában leírtakkal megegyező megkülönböztetéseket alkalmaznak, és a 3. Fejezet 3.5.5.3.5 pontjában megadottaknak megfelelő dekóder lezárást biztosítják.

3. Megjegyzés. - A P_u a nem-kívánt jel kisugárzott csúcsteljesítménye dBW-ban.

4. Megjegyzés. - A frekvencia védelmi követelmény a megkívánt és nem-kívánt jelet adó berendezés antenna karakterisztikájától és a nem-kívánt jelet adó berendezés kisugárzott teljesítményétől függ.

5. Megjegyzés. - A szomszédos csatorna védelmének megállapításánál az A-oszlopban lévő megkívánt / nem-kívánt jelviszony nagysága nem haladhatja meg a B-oszlopban lévő értékek nagyságát.

7.1.9 *Különleges figyelembe veendő* tényezők *a DME Y és Z csatornák kijelöléséhez*

7.1.9.1 Azon Y, vagy Z csatornák kijelölésénél, amelyeknek a válasz frekvenciája 63 MHz 'távolságra' van egy másik csatorna válasz frekvenciájától (akár egy W, X, Y vagy Z csatornától), vagy viszont, a berendezések között minimálisan 28 km (15 tengeri mérföld) távolsági elkülönítés szükséges.

7.1.10 *Különleges figyelembe veendő tényezők a DME W, vagy Z csatornák kijelölésében*

Azon W, vagy Z csatornák kijelölésénél, amelyeknek a válasz frekvenciája 63 MHz 'távolságra' van egy Y csatorna válasz frekvenciájától, vagy viszont, a berendezések között minimálisan olyan elkülönítési távolság szükséges, ami legalább egyenlő az Y csatornájú berendezés szolgálati hatótávolságával plusz 28 km-el (15 tengeri mérföld).

7.1.11 *Különleges figyelembe veendő tényezők az impulzus spektrum mérések elvégzéséhez*

A 3.5.4.1.3 e) pontban meghatározott 0,5 MHz-es mérési frekvenciasávban lévő kisugárzott teljesítmény úgy számítható ki, hogy összegezzük a frekvencia-tartományban lévő teljesítmény-sűrűség spektrumot, vagy ezzel egyenértékűen úgy, hogy összegezzük az idő- tartományban az időegységenkénti pillanatnyi teljesítményt a megfelelő analóg, vagy digitális jelfeldolgozó technikát alkalmazva. Ha az összegzés a frekvencia-tartományban kerül végrehajtásra, akkor a spektrum elemző felbontási sávszélességének arányosnak kell lenni a DME impulzus idő-tartományának az 5 százalékával. Ha az összegzés az idő-tartományban kerül végrehajtásra, a 0,5 MHz-es öt-pólusú (vagy több) szűrő kimeneten, akkor az idő mintavételi gyakoriságnak arányosnak kell lenni az impulzus spektrum szélességgel.

7.1.12 *Különleges figyelembe veendő tényezők az ILS-hez kapcsoltan telepített DME / P berendezéseknél*

7.1.12.1 Azoknál a futópályáknál, ahol az a cél, hogy egy ILS-hez kapcsolt DME-t telepítsenek, és ahol kezdeti MLS / RNAV üzemeltetéseket terveznek, a DME / P berendezés telepítését kell előnyben részesíteni.

7.1.12.2 Amikor az a cél, hogy a DME / P távolságmérő információját a közelkörzet teljes területén fel akarják használni, ott a pontos jelszünetű kérdező impulzus-párokat és a névleges frekvenciát a válaszadónak kell indítani, akkor, ha a válaszadó antennánál a csúcs teljesítmény-sűrűség legalább mínusz 93 dBW/m^2. Ez az érzékenységi szint a 3. Fejezet 3.5.4.2.3.1 pontjában lévő értékeken alapszik, és a DME / P kezdeti megközelítési módjára van alkalmazva, ahol ennél a szintnél a DME / P kezdeti megközelítési mód célja az, hogy megfeleljen a DME / N válaszadási teljesítményének és legalább a DME / N pontosságának.

7.2 A csak a DME / N berendezésre vonatkozó útmutató anyag

7.2.1 A DME / N berendezések kisugárzott teljesítménye (ERP)

7.2.1.1 A 3. Fejezet 3.5.4.1.5.1 pontjában előírt teljesítmény-sűrűség a következő alapfeltételeken alapszik:

Légijármű fedélzeti vevő érzékenység	-112 dBW
Légijármű fedélzeti tápvonal veszteség	+3 dB
Légijármű fedélzeti sugárzási diagram veszteség egy izotróp antennához viszonyítva	+4 dB
Az antennánál szükséges teljesítmény	-105 dBW

Az antennánál a mínusz 105 dBW mínusz 83 dBW/m^2-nek felel meg a közepes átviteli frekvenciánál.

Megjegyzés. - Az egy izotróp antennára vonatkozó teljesítmény-sűrűséget a következő módon lehet kiszámítani:

$$P_d = P_a - 10 \log \frac{\lambda^2}{4\pi}$$

ahol: P_d *= a teljesítmény-sűrűség dBW/m*^{2}*-ben;*

P_a *= a teljesítmény a vételi pontnál dBW-ban;*

λ *= a hullámhossz méterben.*

7.2.1.2 A mínusz 83 dBW/m^2 teljesítmény-sűrűség eléréséhez szükséges kisugárzott teljesítmény névleges értékei a C-20. számú ábrán kerültek megadásra. A nehéz terepviszonyok és telepítési körülmények melletti fedésterületre szükséges lehet az, hogy a kisugárzott teljesítményt megfelelően növeljék. Ellenkező esetben kedvező telepítési körülmények esetén a megállapított teljesítmény-sűrűséget kisebb kisugárzott teljesítménnyel is el lehet érni.

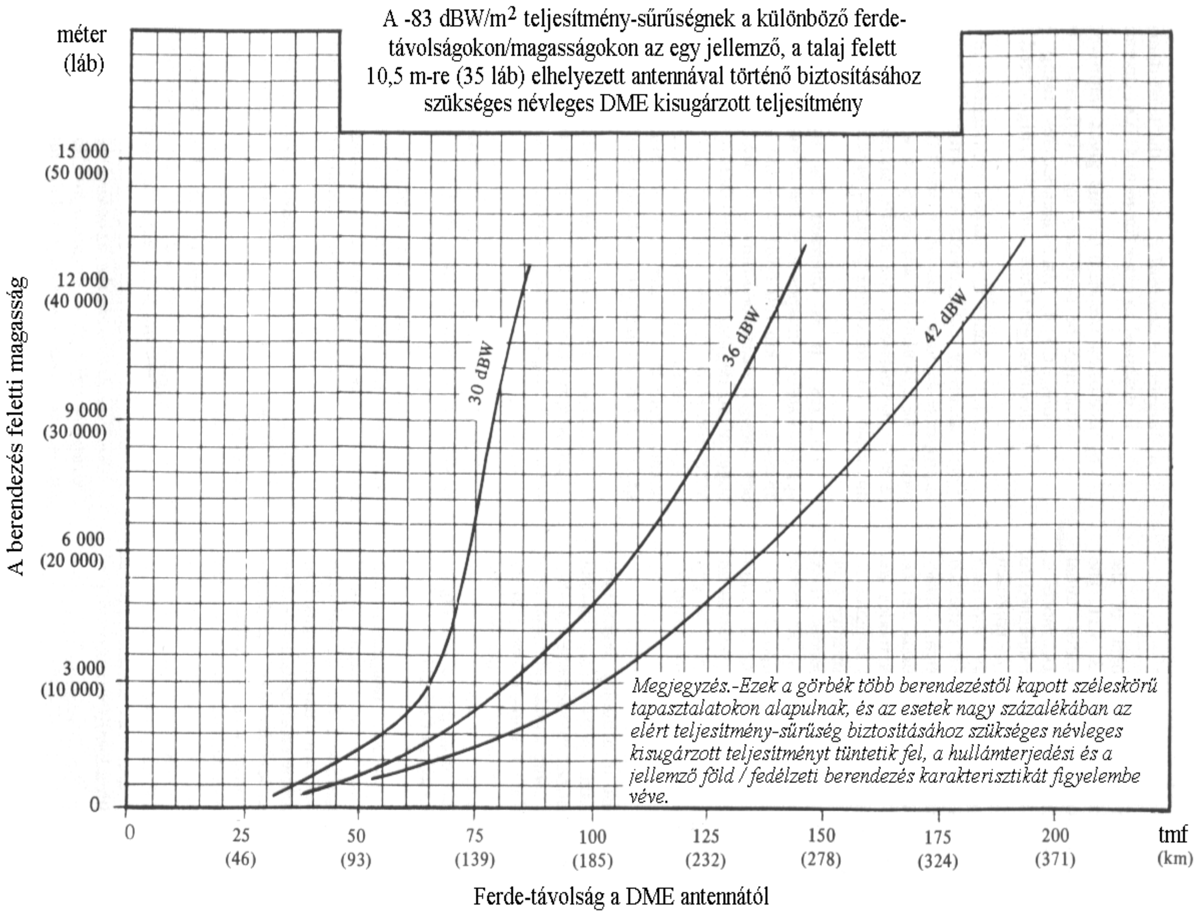
7.2.1.3 A C-20. sz. ábra alkalmazását a következő példák mutatják be. Azért, hogy a szükséges névleges teljesítmény-sűrűség elérésre kerüljön a 342 km-es ferdetávolságnál (185 tengeri mérföld) a 12 000 m (40 000 láb) magasságon és a 263 km-es (142 tengeri mérföld) ferdetávolságnál a 12 000 m (40 000 láb) magasságon, illetve a 135 km-es (73 tengeri mérföld) ferdetávolságnál a 6 000 m-es (20

000 láb) magasságon külön-külön plusz 42 dBW, plusz 36 dBW, illetve plusz 30 dBW kisugárzott teljesítményre lesz szükség.

7.3 A csak a DME / P berendezésre vonatkozó útmutató anyag

7.3.1 A DME / P berendezés rendszer leírása

7.3.1.1 A DME / P berendezés a 3. Fejezet 3.11 pontjában leírt mikrohullámú leszállító rendszer szerves része. A DME / P jel formátum két üzemelési módot határoz meg, a kezdeti megközelítési (IA) és a végső megközelítési (FA) módot. A kezdeti megközelítési mód kompatibilis és együtt működtethető a DME / N-el és arra a célra tervezték, hogy javított pontosságot biztosítson a megközelítés és a leszállás kezdeti szakaszaiban. A végső megközelítési mód lényegesen nagyobb pontosságot biztosít a végső megközelítési területen. Mindkét üzemmód egy egyedüli DME / P földi berendezésben van egyesítve, és a rendszer jellemzője olyan, hogy a DME / N és a DME / P funkcióit össze lehet kapcsolni egy egyedüli kérdezőben. A kezdeti megközelítési és a végső megközelítési módok a 3. Fejezet 3.5.4.4 pontjában meghatározott impulzus kódokkal kerülnek azonosításra. Az MLS megközelítési szektorában a DME / P berendezés fedésterületének legalább 41 km-nek (22 tengeri mérföld) kell lenni a földi válaszadótól mérve. Az a cél, hogy a kérdező ne működjön a válaszadó telepítési helyétől mért 13 km-nél (7 tengeri mérföld) nagyobb távolságban végső megközelítési üzemmódban, jóllehet, a kezdeti megközelítési módról való átállás a válaszadótól mért 15 km-nél (8 tengeri mérföld) kezdődhet meg. Ezek a számok azon az előfeltételen alapulóan kerültek kiválasztásra, hogy a válaszadó a futópálya megállási végén túl, a futópálya küszöbétől körülbelül 3 600 m (2 tengeri mérföld) távolságra van telepítve.



C-20. ábra

7.3.1.2 A megközelítési és leszállási műveletek végső szakaszaiban előforduló pontosság csökkenés nagyobb lehetséges okozója a többutas (jel-visszaverődéses) interferencia. A DME / P berendezés végső megközelítési módja minimálisra csökkenti ezeket a hatásokat úgy, hogy olyan szélessávú impulzus jelfeldolgozást alkalmaz, amelynél gyors az impulzus-felfutás felfutási ideje és a beérkezési időt a vett impulzusok egy olyan alacsony pontján méri, ahol még nincs a többutas terjedés miatt jelentős jelromlás. Ezzel szemben egy alacsonyabb impulzus felfutási időt és egy magasabb, az 50 százalékos jelszintnél bekövetkező küszöbértéket alkalmaznak a DME / N berendezésekben.

7.3.1.3 Mivel a végső megközelítési mód a 13 km-nél (7 tengeri mérföld) kisebb távolságban kerül alkalmazásra, az adó megfelelő jelszintet tud biztosítani ahhoz, hogy a szükséges pontosságot anélkül kielégítse, hogy a gyors impulzus felfutási idő rontaná a válaszadó impulzus spektrum követelményeit. Az 50 százalékos küszöbérték és a keskenyebb vevő sávszélesség alkalmazása a kezdeti megközelítési módnál lehetővé tesz egy kielégítő, de kisebb követelményű teljesítményt a fedésterületi határvonalakig. A válaszadó határozza meg a lekérdezési módot egy lekérdező kódnak az olyan felhasználásával, ami időzíti a válasz késését a megfelelő mérési referenciától. A kezdeti megközelítési mód együttműködőképes a DME / N berendezéssel és lehetővé teszi azt, hogy egy DME / N kérdező kerüljön a DME / P válaszadóval együtt felhasználásra úgy, hogy legalább elérje a DME / N válaszadó pontosságát. Hasonlóképpen a DME / P kérdezőt fel lehet használni a DME / N válaszadóval együtt.

7.3.2 *A DME / P berendezés rendszer pontossági követelményei*

7.3.2.1 *A DME / P berendezés pontossági követelményei*

7.3.2.1.1 Amikor a DME / P berendezés pontossági követelményeit mérlegelik, akkor azok az üzemeltetések, amelyeket a végső megközelítési mód szolgálati hatótávolságában végre lehet hajtani, két csoport valamelyikébe sorolhatók. Ez vezetett arra, hogy két pontossági szabvány került meghatározásra a végső megközelítési módra:

a) *1. pontossági szabvány:* ez a kisebb követelményű és a legtöbb hagyományos fel- és leszállású (CTOL) üzemeltetés kiszolgálására tervezett pontosság;

b) *2. pontossági szabvány:* ez megnövelt pontosságot ad, és ez lehet szükséges a függőleges fel- és leszállású (VTOL), valamint a rövid fel- és leszállású (STOL) üzemeltetésekhez, valamint az MLS kilebegtetési magassági vezérlést felhasználó hagyományos fel- és leszállású üzemeltetések kilebegtetési manővereihez és a hagyományos fel- és leszállású üzemeltetések nagysebességű futópálya elhagyási manővereihez.

7.3.2.1.2 A C-5. táblázat mutatja be a DME és a jellemző pontossági követelmények alkalmazását. Ez segítséget fog nyújtani a megfelelő pontossági szabvány kiválasztásához úgy, hogy azok megfeleljenek az üzemeltetési követelményeknek. A számítások a DME antenna és a futópálya küszöb közötti 1768 méteres (5 800 láb) távolságon alapulnak. A következő pontok a C-5. táblázatra vonatkoznak.

7.3.2.1.3 Az a cél, hogy a DME / P pontossága körülbelül feleljen meg az oldalszög funkció útvonal-követési hiba (PFE) értékének az MLS vonatkozási ponttól mért 37 km-es (20 tengeri mérföld) távolságnál, mind a meghosszabbított középvonal mentén, mind a 40 fokos oldalszög értékeknél. Ugyanígy a DME / N berendezés hibája az MLS fedésterületének határvonalainál egyezzen meg a 3. Fejezet 3.5.3.1.3.3 pontja rendszer pontossági 0,37 km-es (0,2 tengeri mérföld) értékével. A kormányzási elmozdulási zaj (CMN) a plusz, vagy mínusz 0,1 fok kormányzási elmozdulási érték lineáris megfelelője legyen, ahogy az az oldalszög útirány-vezetési szög funkcióra meghatározásra került.

7.3.2.1.4 Az útvonal-követési hiba (PFE) az oldalszög szöghibának felel meg, a kormányzási elmozdulás zaj (CMN) körülbelül az oldalszög útirány-vezetési szög rendszerre meghatározott 0,1 fok kormányzási elmozdulási zaj (CMN) lineáris megfelelője.

7.3.2.1.5 A plusz, vagy mínusz 30 méteres útvonal-követési hiba (PFE) plusz, vagy mínusz 1,5 méteres függőleges hibának felel meg egy 3 fokos magassági szögnél.

7.3.2.1.6 A kilebegtetés megkezdése az MLS megközelítési vonatkozási pont közelében történik, az MLS magassági szöge és a DME / P biztosítja a függőleges útirány-vezetést az automatikus leszálláshoz akkor, amikor a futópálya küszöbe alatti terepfelszín egyenetlen.

7.3.2.1.7 Az érzékenység módosulása, vagy a robotpilóta erősítés szabályozására vonatkozó körülmények nem függnek közvetlenül a pontosságtól.

C-5. Táblázat

Funkció	Jellemző távolság a küszöbtől	Útvonal-követési hiba (95 %-os valószínűség)	Kormányzási elmozdulási zaj
Megközelítés (7.3.2.1.3)			
— a futópálya meghosszabbított középvonalán	37 km (20 tengeri mérföld)	±250 m (± 820 láb)	±68 m (±223 láb)
— a 40°-os oldalszögnél	37 km (20 tengeri mérföld)	±375 m (±1 230 láb)	±68 m (±223 láb)
Megközelítés (7.3.2.1.4)			
— a futópálya meghosszabbított középvonalán	9 km (5 tengeri mérföld)	±85 m (±279 láb)	±34 m (±111 láb)
— a 40°-os oldalszögnél	9 km (5 tengeri mérföld)	±127 m (±417 láb)	±34 m (±111 láb)
Helyjeladó helyettesítés			
— külső helyjeladó	9 km (5 tengeri mérföld)	±800 m (±2 625 láb)	nem alkalmazható
— középső helyjeladó	1 060 m (0,57 tengeri mérföld)	±400 m (±1 312 láb)	nem alkalmazható
A 30 méteres elhatározási magasság meghatározása (100 láb) (7.3.2.1.5)			
— 3°-os siklópálya (hagyományos fel- és leszállás)	556 m (0,3 tengeri mérföld)	±30 m (±100 láb)	nem alkalmazható
— 6°-os siklópálya (rövid fel- és leszállás)	556 m (0,3 tengeri mérfölf)	±15 m (±50 láb)	nem alkalmazható
A kilebegtetés megkezdése egyenetlen terep felett (7.3.2.1.6)			
— 3°-os siklópálya (hagyományos fel- és leszállás)	0	±30 m (±100 láb)	±18 m (±60 láb)
— 6°-os siklópálya (rövid fel- és leszállás)	0	±12 m (±40 láb)	±12 m (±40 láb)
Érzékenység módosulás (7.3.2.1.7)			

C-5. Táblázat (folytatás)

Funkció	Jellemző távolság a küszöbtől	Útvonal-követési hiba (95 %-os valószínűség)	Kormányzási elmozdulási zaj
(robotpilóta erősítés szabályozása)	37 km-től (20 tengeri mérföld) 0-ig	±250 m (±820 láb)	nem alkalmazható
Kilebegtetési manőver MLS kilebegtetési magassággal (7.3.2.1.8)			
— Hagyományos fel- és leszállás	0	±30 m (±100 láb)	±12 m (±40 láb)
— Rövid fel- és leszállás	0	±12 m (±40 láb)	±12 m (±40 láb)
Hosszú kilebegtetési riasztás (7.3.2.1.9)	A futópálya körzete	±30 m (±100 láb)	nem alkalmazható
Hagyományos fel- és leszállás nagysebességű leszállás utáni kifutás / futópálya elhagyás (7.3.2.1.10)	A futópálya körzete	±12 m (±40 láb)	±30 m (±100 láb)
Felszállási emelkedés és megszakított megközelítés	0-tól 9 km-ig (5 tengeri mérföld)	±100 m (±328 láb)	±68 m (±223 láb)
Függőleges fel- és leszállású megközelítések (7.3.2.1.11)	925 m-től (0,5 tengeri mérföld) 0-ig	±12 m (±40 láb)	±12 m (±40 láb)
Koordináta "áttétel" (7.3.2.1.12)	-	±12 m-től ±30 m-ig (±40 láb-tól ±100 láb-ig)	±12 m (±40 láb)

7.3.2.1.8 Az a cél, hogy ezt az előírást alkalmazzák akkor, amikor a függőleges útirány-vezetést és az automatikus leszállás süllyedési mértéket levezetik az MLS kilebegtetési magasságából és a DME / P berendezéstől.

Megjegyzés. - Jóllehet, a szabvány kidolgozásra került az MLS kilebegtetési magassági funkció biztosításához, mégis ez a funkció nem került bevezetésre, és a jövőben sem szándékozunk bevezetni.

7.3.2.1.9 Ez jelzi a légijármű vezetője részére azt, hogy a légijármű a földetérési zónán túl száll le.

7.3.2.1.10 A leszállás utáni kifutási pontossági követelmény a rendszer fejlődési lehetőségeit tükrözi. Ennél az alkalmazásnál a leszállás utáni kifutási útvonal-követési hibát (PFE) annak a lehetőségnek a szükségessége szabja meg, hogy a leszállás utáni kifutási sebesség csökkentését és a futópályáról történő legurulást úgy optimalizálják, hogy az a futópálya foglaltsági idejét csökkentse.

7.3.2.1.11 Az a cél, hogy biztosítsák a légijármű vezetőjét arról, hogy a légijármű a leszállási futópálya felület felett van, mielőtt tovább süllyedne.

7.3.2.1.12 Kívánatos lehet az, hogy az MLS koordinátáit egy kiindulási nulla-pontból a másikba akkor 'tegyék át', amikor az antennák nem a 3. Fejezet 3.11.5.2.6, vagy 3.11.5.3.5 pontjában leírtaknak megfelelően kerültek telepítésre. A táblázatban lévő számadatok a függőleges fel- és leszállási üzemeltetésekre jellemzőek, a tényleges értékek a telepítés geometriájától lesznek függőek.

7.3.3 *A DME / P berendezés hibahalmaza*

A DME / P berendezés 1. és 2. pontossági szabványa hibahalmazainak példáját a C-6. táblázat mutatja be. Amikor a meghatározott hiba összetevőket egyedileg nem haladják meg a hibák a gyakorlatban, akkor elvárható lehet az, hogy elérésre kerül az a teljes rendszer teljesítmény, ami a 3.5.3.1.3.4 pontban előírásra került. A rendszer hiba jelromlási résztvevőjét úgy kell kiszámítani, hogy veszik a meghatározott fedélzet - föld kapcsolatú környezetből kapott hibáknak és a meghatározott föld - fedélzet kapcsolatú környezet hibáknak a négyzetes középértékét (RSS) és leveszik - négyzetes középérték alapon - a jelromlás nélküli környezetből kapott hibákat.

C-6. táblázat: A DME / P berendezés hibahalmazának példája

Hiba-forrás	Hiba összetevő	Végső megközelítési mód 1. Szabvány		Végső megközelítési mód 2. Szabvány		Kezdeti megközelítési mód	
		Útvonal-követési hiba m (láb)	Kormány-zási elmozdulás zaj m (láb)	Útvonal-követési hiba m (láb)	Kormány-zási elmozdulás zaj m (láb)	Útvonal-követési hiba m (láb)	Kormány-zási elmozdulás zaj m (láb)
Belső műszer	Válaszadó	±10 (±33)	±8 (±26)	±5 (±16)	5± (±16)	±15 (±50)	±10 (±33)
	Kérdező	±15 (±50)	±10 (±33)	±7 (±23)	±7 (±23)	±30 (±100)	±15 (±50)
Telepítési helyszín vonatko-zású	Fedélzet - föld kapcsolatú	±10 (±33)	±8 (±26)	±3 (±10)	±3 (±10)	±37 (±121)	±20 ± (66)
	Visszaverőd éses többutas	±10 (±33)	±8 (±26)	±3 (±10)	±3 (±10)	±37 (±121)	±20 (±66)
Telepítési helyszín vonatko-zású	Nem-visszaverődé ses (szóródá-sos) többutas	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)	±3 (±10)
	Jelromlás (garble)	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)	±6 (±20)

1. Megjegyzés. - A "nem-visszaverődéses többutas" és a "jelromlás" hibák számjegyei a fedélzet -föld és a föld - fedélzet összetevők összegei.

2. Megjegyzés. - Az útvonal-követési hiba magába foglalja mind a küszöb-beállítási előfeszítés, mind az idő-változói összetevőket. A fenti táblázatban az idő-változói összetevőknél és a legtöbb telepítési helyszíni vonatkozású hibánál elfogadott az, hogy ezek alapvetően statisztikailag függetlenek. A *küszöb-beállítási előfeszítés összetevőt nem lehet összhangba hozni semmilyen meghatározott statisztikai megoszlással.*

Ezeknek a hibahalmazoknak a figyelembevételénél óvatosan kell eljárni az egyedi összetevők bármilyen meghatározott matematikai módszer szerinti összekapcsolásánál.

3. Megjegyzés. - Az adó hullámformájánál 1 200 nanoszekundumos felfutási idő került alapfeltételként elfogadásra.

7.3.4 *A rendszer beállítása*

7.3.4.1 Mivel a DME / P berendezést különféle módon lehet beállítani, a berendezés belső műszer-hibái és a feltételezett terjedési hibái azok a jellemző hibák, amelyek a berendezés felépítéséből eredően hozzáférhetők, azzal, amit a belső időkésleltetési eltérés-helyesbítés lehetősége biztosít, és ami beiktatja az időzítési referencia pont küszöbhelyzetének beállítását egy impulzus-pár első impulzusának a felfutó élén, a következő technikák alkalmazásával:

a) *Kezdeti megközelítési (IA) mód*. Hagyományos technika, ami a küszöböt az 50 százalékos amplitúdó pontnál állítja be.

b) *Végső megközelítési (FA) mód*. Késleltetés-csillapítás és összehasonlítás (DAC) technika, ami a küszöböt az 5 százalékos és 30 százalékos amplitúdó pont közé állítja be.

7.3.4.2 Az 1. pontossági szabványt úgy lehet elérni, hogy egy 100 nanoszekundumos késleltetést és egy, az 5-től a 6 dB-ig terjedő csillapítást alkalmaznak. Az is szükséges még, hogy az amplitúdó küszöbpont mind a késleltetett impulzusnál, mind a csillapított impulzusnál a részleges felfutási időn belülre essen.

7.3.4.3 A fenti példák nem zárják ki azt, hogy a beérkezési idő mérésének technikájánál egy, a késleltetés - csillapítás és összehasonlítás (DAC) technikától eltérő módszert alkalmazzanak, de minden esetben szükséges az, hogy a küszöb-mérések az impulzus részleges felfutási ideje során történjenek meg.

7.3.5 *A DME / P berendezés kérdező jelfeldolgozása*

7.3.5.1 *A befogás során*

a) A kérdező befogja és érvényesíti a jelet 2 másodpercen belül az előtt, mielőtt a követési módra átállna, még akkor is, ha a szomszédos csatornáktól olyan töredék jelek és szabálytalan impulzus-párok fordulnak elő, amelyek 50 százalékos rendszer teljesítményt eredményeznek.

b) A befogott jel elvesztése után mind a kezdeti megközelítési, mind a végső megközelítési módban a kérdező egy másodpercen belül egy figyelmeztető kimenetet ad, amely idő alatt a vezetési információ folyamatosan kijelzésre kerül. A jel elvesztése után a kérdező a kezdeti megközelítési módban visszatér a kereső módba azért, hogy a követést újra létrehozza.

7.3.5.2 *A követő mód során*

7.3.5.2.1 Amikor a követési mód létrejött, akkor a vevő kimeneten érvényes vezetési információk lesznek a figyelmeztető jelzés törlése előtt. Ez az érvényesítési folyamat folyamatosan addig üzemel, ameddig a kérdező adó-vevő a követési módban lesz. A kérdező a követési módban marad addig, amíg a rendszer teljesítmény 50 százalékos, vagy annál nagyobb. A követő mód során a vevő védelmet biztosít a rövid időtartamú, nagy amplitúdójú hibás jelekkel szemben.

7.3.5.3 *Távolság adat szűrő*

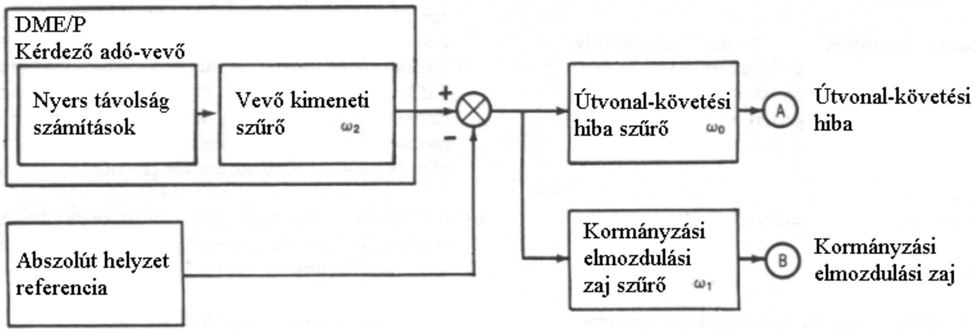
A 3. Fejezet 3.5.3.1.3.4 pontjában leírt pontossági előírásoknál, valamint az előző 7.3.3 pontban tárgyalt hibahalmaznál alapfeltételként elfogadott volt az, hogy a magasabb frekvencia zaj összetevőket egy qw sarok-frekvenciájú aluláteresztő szűrő korlátozza, ahogy az a C-21. számú ábrán meghatározásra került. A felhasználói alkalmazástól függően, a zaj csökkentésére további szűrést lehet felhasználni, feltéve azt, hogy az így létrehozott fáziskésés és amplitúdó eltérés nem fogja károsan befolyásolni a légijármű repülőgép vezérlő rendszerének dinamikus viselkedését. A következő pontokban olyan kiegészítő jellemzőket ajánlunk, amelyeket az adatszűrő berendezésbe kell beépíteni.

7.3.5.4 *Sebességi memória*

Az adatszűrőnél szükség lehet egy sebességi memóriára ahhoz, hogy a 3. Fejezet 3.5.3.1.3.4 pontjában előírt pontosság elérésre kekrüljön az 50 százalékos rendszer teljesítmény mellett. Meg kell jegyezni azt, hogy a kezdeti megközelítési módban az adás azonosítása során alacsony rendszer teljesítmény fordulhat elő.

7.3.5.5 *A 'kívül eső' jelek kiszűrése*

7.3.5.5.1 Azokat a távolsági meghatározásokat, amelyek jelentősen eltérnek a korábbi szűrt távolsági meghatározásoktól, mivel ezek nem lehetnek a légijármű elmozdulásából származó eredmények, hibásnak kell tekinteni. Az ilyen adatokat az adatszűrő berendezéssel ki kell szűrni.



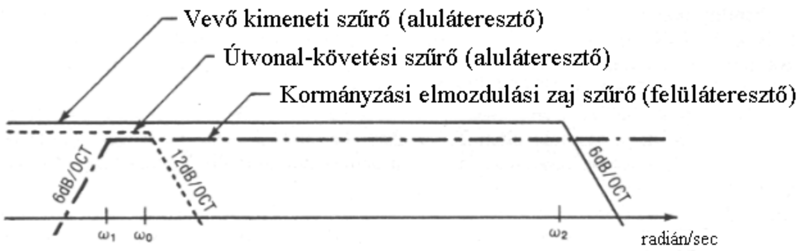
Útirány-vezetési funkció	Sarokfrekvenciák (radián/sec)		
	ω_0	ω_1	ω_2*
DME/P	1.5	0.5	10

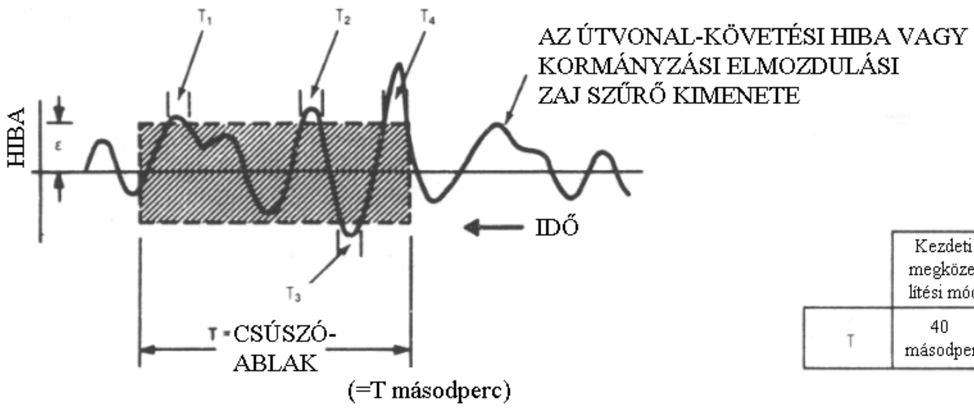
Vevő kimeneti szűrő: $\frac{\omega_2}{S + \omega_2}$

Útvonal-követési szűrő: $\frac{\omega_n^2}{S^2 + 2\zeta\,\omega_n\,S + \omega_n^2}$ $\zeta = 1;\ \omega_0 = .64\ \omega_n$

Kormányzási elmozdulási zaj szűrő: $\frac{S}{S + \omega_1}$

* Ezek a sarokfrekvenciák bizonyos berendezéseknél 10 rad/sec-nél kevesebbek lehetnek





	Kezdeti megközelítési mód	Végső megközelítési mód
T	40 másodperc	10 másodperc

C-21. ábra

7.3.6 *A DME / P berendezés hibamérési módszerei*

7.3.6.1 *Rendszer hibák*

7.3.6.1.1 A DME / P berendezés pontosságai a 3. Fejezet 3.5.4.1.3.4 pontjában az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) értékében kerültek meghatározásra. Ezek a paraméterek a DME / P 'vezető jelei' és a légijármű közötti kölcsönhatást írják le olyan tényezőkben, amelyek közvetlenül vonatkoztathatók a légijármű helymeghatározási hibáira és a repülés vezérlő rendszerek felépítésére.

7.3.6.1.2 A pontossági szabványoknak való megfelelés meghatározása céljából az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) összetevők egy valamilyen T másodperces időtartamon keresztül (ahol a T = 40 másodperc a kezdeti megközelítési (IA) és 10 másodperc a végső megközelítési (FA) módra) történik úgy, hogy a repülési hibák a DME / P fedésterületi határvonalain belül rögzítésre kerülnek. A 95 százalékos valószínűségi követelményt akkor veszik kielégítettnek, amikor az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) összetevők nem haladják meg a teljes időtartam alatt az előírt hiba határértékeket, ami az 5 százaléknál több lenne az értékelési időtartamon belül. Ezt a C-21. ábra mutatja be. A DME / P berendezés 'vezető jeleinek' az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) összetevői értékelésénél a légijármű tényleges helyzete - egy megfelelő helymeghatározási vonatkoztatás szerinti meghatározott helyzete - kerül az egy hibajelet képező vezető jel adataiból kivonásra. Ezt a hibajelet azután az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) szűrők szűrik, ahol a kimenő jelek az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) összetevők megfelelő értékelését adják. Ezek a szűrők a C-21.számú ábrán kerültek meghatározásra.

7.3.6.1.3 Ezeket a szűrőket lehet felhasználni a 3. Fejezet 3.5.4.5.3 és 3.5.4.5.4 pontjában meghatározott válaszadó berendezés belső műszerhiba összetevőjének meghatározásához is. Hasonlóképpen lehet a kérdező berendezés belső műszerhiba összetevőit - a 3. Fejezet 3.5.5.4 pontjában meghatározott hibát - is meghatározni.

7.3.7 *Többutas hatások*

7.3.7.1 A valószínűleg előforduló többutas terjedés esetén a DME / P berendezés pontossági előírásai feltételezik azt, hogy a teljesítmény nem csökken le egy meghatározott határérték alá, és azt, hogy ez a csökkenés egyenlő mértékben jelentkezik mind a kérdezőnél, mind a válaszadó vevőjénél.

7.3.7.2 Annak biztosításához, hogy a berendezés az előírások szerint működjön, a rendszer végső megközelítési (FA) módú üzemeltetéséhez a következőket kell alkalmazni:

a) ha egy olyan kielégítő teljesítményű jel kerül alkalmazásra a vevőkre, amelynél a termikus zaj összetevője jelentéktelen, akkor az első jelhez viszonyított 0 és 350 nanoszekundum közötti késleltetésű második jel olyan amplitúdójával, ami 3 dB-el, vagy annál többel az első jel alatt van és a lengési frekvenciája 0,05 és 200 Hz között van, nem hozhat létre a vevő kimenetnél plusz, vagy mínusz 100 nanoszekundumnál (15 m) nagyobb hibákat;

b) a 350 nanoszekundumnál nagyobb késleltetésnél a hiba hozzájárulás jelentős mértékben le fog csökkenni. A jellemző érték a plusz, vagy mínusz 7 nanoszekundum (1 m) lesz.

7.3.7.3 A légijármű fedélzeti DME antennát úgy kell elhelyezni, hogy eleve megakadályozza az előre irányban az antenna-nyereség csökkenését akkor, amikor a légijármű a leszállási helyzetben van. Bármilyen ilyen antenna-nyereség csökkenés megnövelheti a többutas terjedési hiba összetevőt akkor, amikor a légijármű a megközelítési, vagy leszállási szakaszban van, és amikor a legnagyobb DME pontosságra van szükség.

7.3.8 *A DME / P berendezés* teljesítmény szükségleti összetevői

7.3.8.1 A C-7. és a C-8. táblázat példát ad a hagyományos fel- és leszállású levegő - föld és föld - levegő teljesítmény szükséglet összetevőiről. A megengedett kisugárzott teljesítmény csúcsérték azon az impulzus alakon alapszik, ami megfelel a 3. Fejezet 3.5.4.1.3 e) pontban megadott spektrum-korlátozásoknak.

7.3.8.2 A teljesítmény szükséglet összetevőinek számításánál alapfeltételként elfogadott az, hogy a légijrámű antennáját nem árnyékolja le a légijármű sárkány szerkezete, a kibocsájtott helyzetben lévő futóműveket is beleértve.

C-7. táblázat: Hagyományos fel- és leszállású üzemeltetések föld - levegő teljesítmény szükséglet összetevők

A teljesítmény szükséglet összetevők elemei	41 km (22 tengeri mérföld)	13 km (7 tengeri mérföld)	Vonatkoztatási pont	Leszállás utáni kifutás
Kisugárzott csúcs-teljesítmény, dBm	55	55	55	55
Földi többutas terjedési veszteség, dB	-5	-3	-4	-17
Antenna karakterisztika veszteség, dB	-4	-2	-5	-5
Terjedési út veszteség, dB	-125	-115	-107	-103
Ellenőrző rendszer veszteség, dB	-1	-1	-1	-1
Polarizáció és eső miatti veszteség, dB	-1	-1	0	0
A légijárművel vett jel, dBm	-81	-67	-62	-71
Teljesítmény-sűrűség a légijárműnél, dBW/m^2	-89	-75	-70	-79
Légijármű antenna-nyereség, dB	0	0	0	0
Légijárművön belüli tápvonal veszteség, dB	-4	-4	-4	-4
Vett jel a kérdezőnél, dBm	-85	-71	-66	-75
Vevő zaj videó, dBm (Zaj tényező (NF) = 9 dB) Középfrekvenciás sávszélesség: 3,5 MHz Középfrekvenciás sávszélesség: 0,8 MHz	-109	-103	-103	-103
Jel-zaj viszony (videó), dB	24	32	37	28

C-8. táblázat: Hagyományos fel- és leszállású üzemeltetések levegő - föld teljesítmény szükséglet összetevők

A teljesítmény szükséglet összetevők elemei	41 km (22 tengeri mérföld)	13 km (7 tengeri mérföld)	Vonatkoztatási pont	Leszállás utáni kifutás
Kérdező adó teljesítmény, dBm	57	57	57	57
Légijármű antenna-nyereség, dB	0	0	0	0
Légijárművön belüli tápvonal veszteség, dB	-4	-4	-4	-4
Kisugárzott csúcs-teljesítmény, dBm	53	53	53	53
Földi többutas terjedési veszteség, dB	-5	-3	-4	-17
Terjedési út veszteség, dB	-125	-115	-107	-103
Polarizáció és eső miatti veszteség, dB	-1	-1	0	0
A válaszadó antennánál vett jel, dBm	-78	-66	-58	-67
A földi antenna nyeresége, dB	8	8	8	8
Karakterisztika veszteség, dB	-4	-2	-5	-5
Tápvonal veszteség, dB	-3	-3	-3	-3
A válaszadónál vett jel, dBm	-77	-63	-58	-67
Vevő zaj videó, dBm (Zaj tényező (NF) = 9 dB) Középfrekvenciás sávszélesség: 3,5 MHz Középfrekvenciás sávszélesség: 0,8 MHz	-112	-106	-106	-106
Jel-zaj viszony (videó), dB	35	43	48	39

7.3.8.3 A videó teljesítmény jel-zaj viszony a középfrekvenciás teljesítmény jel-zaj viszonyára van vonatkoztatva, a következő módon:

$$\text{Jel / Zaj (videó)} = \text{Jel / Zaj (középfrekvenciás)} + 10 \log \frac{\text{középfrekvenciás zaj sávszélesség}}{\text{videó zaj sávszélesség}}$$

1. Megjegyzés. - A távolságok a válaszadó antennájától vannak mérve.

2. Megjegyzés. - A frekvencia-függő jellemzők 1 088 MHz-re kerültek kiszámításra.

7.3.9 *A DME / P berendezés ellenőrző idő-késleltetésének mérése*

7.3.9.1 A szükséges idő-késleltetés mérést az útvonal-követési hiba (PFE) szűrő kimenetének mérésével lehet elvégezni egy 1 másodpercen belüli döntés szerinti ellenőrző mérés végrehajtásával. Azonban mivel a válaszadó útvonal-követési hibája egy hosszan változó hiba összetevő, ezért egy egyenértékű mérést kell végezni szűrés nélküli idő-késleltetési minták 1 másodperces átlagolásával.

8. Az energia-ellátás átkapcsolási idejére vonatkozó anyag

8.1 A repülőterek körzetében használt földi telepítésű rádiónavigációs berendezések energia-ellátásának átkapcsolási ideje

A rádiónavigációs berendezések és a hírközlési rendszerek földi berendezései energia-ellátásának az átkapcsolási ideje a futópálya típusától függ. A C-9. táblázat mutatja be azokat a jellemző átkapcsolási időket, amelyeknek a jelenleg rendelkezésre álló elektromos energia-ellátó rendszerek meg tudnak felelni.

C-9. táblázat: A repülőtereken használt földi telepítésű rádiónavigációs berendezések energia-ellátásának átkapcsolási ideje

A futópálya típusa	Az energia-ellátást igénylő berendezés	Maximális átkapcsolási idő (másodperc)
Műszeres megközelítés	SRE VOR NDB Iránymérő (D/F) berendezés	15 15 15 15
Precíziós megközelítés I. Kategória	ILS iránysáv ILS siklópálya ILS középső helyjeladó ILS külső helyjeladó PAR	10 10 10 10 10
Precíziós megközelítés II. Kategória	ILS iránysáv ILS siklópálya ILS belső helyjeladó ILS középső helyjeladó ILS külső helyjeladó	0 0 1 1 10
Precíziós megközelítés III. Kategória	(ugyanaz, mint a II. kategóriánál)	

„D" MELLÉKLET: TÁJÉKOZTATÁS ÉS ÚTMUTATÓ ANYAG A GLOBÁLIS NAVIGÁCIÓS MŰHOLD RENDSZER (GNSS) SZABVÁNYAINAK ÉS AJÁNLOTT GYAKORLATAINAK ALKALMAZÁSÁHOZ

1. Meghatározások

Bi-bináris ***/Bi-binary/.*** A bi-bináris kódolás „Manchester kódolás"-ként ismeretes. Erre néha úgy is utalnak, mint „Differenciál Manchester kódolás"-ra. Ezt a rendszert használva az él átmenet az, ami a bitet meghatározza.

Chip ***/Chip/.*** Egy egyedüli digitális bit az ál-véletlen bit jelsorozat kimenetén.

Gold kód ***/Gold code/.*** Azoknak a GPS által használt egyedülálló kódoknak a kategóriája, amelyek feltárják a korlátozott kereszt-korrelációs és a csúcson-kívüli auto-korrelációs értékeket.

Szelektív rendelkezésre állás (SA) ***/Selective availability (SA)/.*** A technikai megoldások egy sorozata a teljes pontosság visszautasítására és a helymeghatározás a sebesség és az idő pontosság szintjének kiválasztására, a felhasználók részére rendelkezésre álló GPS szabvány helymeghatározási szolgáltatási jelénél.

Megjegyzés. – A Globális Helymeghatározó Rendszer /GPS/ Szelektív rendelkezésre állása /SA/ 2000. május 1-jének éjjelén megszűntetésre került.

2. Általános

A GNSS-re vonatkozó Szabványok és Ajánlott Gyakorlatok magukba foglalják a 3. Fejezet 3.7.2.2 pontjában azonosított alkotóelemekre vonatkozó előírásokat.

3. Navigációs rendszer teljesítmény követelmények

3.1 Bevezetés

3.1.1 A navigációs rendszerek teljesítmény követelményei a *Szükséges Navigációs Teljesítmény (RNP) Kézikönyv*-ben (Doc 9613) és a *Megközelítési, Leszállási és Indulási Üzemeletetésekhez Szükséges Navigációs Teljesítmény (RNP) Kézikönyv*-ben (előkészületben) vannak meghatározva egy egyedüli légijárműre és a teljes rendszerre, ami magába foglalja a térbeli-jelet, a légijármű fedélzeti berendezését és a légijármű azon képességét, hogy végigrepülje a megkívánt 'pályagörbét'. Ezek a teljes rendszer követelmények kerültek kiindulási pontként felhasználásra a Globális Navigációs Műhold Rendszer /GNSS/ térbeli-jel teljesítmény követelményeinek származtatására. A GNSS esetében azok a csökkentő konfigurációk, amelyek hatással lehetnek a többszörös légijárművekre /multiple aircraft/, figyelembe vételre kerültek. Ennek megfelelően, bizonyos térbeli-jel teljesítmény követelmények jóval szigorúbbak a rendszer többszörös légijárművek általi felhasználását számításba véve.

3.1.2 A Függőleges Vezérléssel /APV/ végrehajtott megközelítések két típusa, az APV-I. és az APV-II. használ fel függőleges vezetést a siklópályához viszonyítva, de a berendezés, vagy a navigációs rendszer nem elégíti ki a precíziós megközelítéshez kapcsolódó összes követelményt. Ezek az üzemeltetések összekapcsolják azt az oldalirányú teljesítményt, ami egyenlő az ILS I. kategóriájú iránysávadóra vonatkozó követelményekkel a függőleges vezetés különböző szintjeivel együtt. Mindkét, az APV-I. és az APV-II. biztosítanak megközelítési előnyöket egy nem-precíziós megközelítéshez viszonyítva, és az a szolgáltatás, amit nyújtanak, az üzemeltetési követelményektől és a Műhold Bázisú Kiegészítő Rendszer /SBAS/ infrastruktúrájától függ. Az APV-I. és az APV-II. meghaladja a jelenlegi Területi Navigációs /RNAV/ barometrikus magasságmérőt felhasználó megközelítések (oldalirányú és függőleges) követelményeit, és a vonatkozó fedélzeti berendezések ennek megfelelően alkalmasak lesznek a barometrikus VNAV függőleges vezetéssel végrehajtott egközelítésekre /APV/ és az RNAV nem-precíziós megközelítésekre.

3.2 Pontosság

3.2.1 A GNSS helyzet hiba a számított helyzet és a tényleges helyzet közötti különbség. Egy meghatározott helynél a számított helyzetre a valószínűségnek legalább 95 százaléknak kell lennie annak, hogy a helyzet hiba a pontossági követelményen belül van.

3.2.2 Az állandó-helyű, föld-bázisú rendszereknek – mint például a VOR-nak és az ILS-nek – viszonylag ismétlődő hiba jellemzőjük van, úgy, hogy a teljesítményük egy rövid időtartam során mérhető (például a légi ellenőrzés során) és elfogadott az, hogy a rendszer pontossága az ellenőrzés után nem fog változni. Azonban, a GNSS hibák állandóan változnak. A keringő műholdak és a GNSS hiba jellemzői olyan helyzet hibákat eredményeznek, amelyek egy egy-órás időtartam alatt is megváltoznak. Azonkívül még, maga a pontosság (a hibahatár a 95 százalékos valószínűséggel) is változik az eltérő műhold elrendezés miatt. Mivel nem lehetséges az, hogy a rendszer pontosság folyamatosan mérésre kerüljön, a GNSS ’kivitelezése’ megnövekedett bizalmat követel meg a hibák elemzésében és a karakterizálásában. Egy ’csúszó-idejű ablakon’ belüli méréseken alapuló értékelés a GNSS-re nem alkalmas.

3.2.3 Több GNSS rendszer hibája az idővel lassan változik, a kiegészítő rendszerekben és a felhasználói vevőkben lévő szűrés miatt. Ez egy néhány-perces időtartamon belül kisszámú önálló mintát eredményez. Ez a kérdés nagyon fontos a precíziós megközelítési alkalmazásnál, mivel ez foglalja magába azt, hogy van egy olyan 5 százalékos valószínűség, amikor a helyzet hiba meghaladhatja a megközelítéshez szükséges teljes pontosságot. Azonban a 3.2.2 pontban leírt változó pontosság miatt ez a valószínűség általában jóval alacsonyabb.

3.2.4 A 95 százalékos pontossági követelmény úgy van meghatározva, hogy ez biztosítja a légijárművezető általi elfogadást, mivel ez azt a hibát képviseli, amit jellemzően tapasztalni is fog. A GNSS pontossági követelmény meg kell, hogy feleljen annak a legrosszabb helyzetű geometriának, amely mellett a rendszert használhatónak nyilvánították. A statisztikai, vagy valószínűségi bizalmat nem tartják egy adott távolságmérési jel geometriánál valószínűségi alapnak.

3.2.5 Ennek megfelelően a GNSS pontossága úgy került meghatározásra, mint az egyes és minden egyes minta valószínűsége, és nem úgy, mint a minták százaléka egy meghatározott mérési időtartamban. Az önálló minták egy nagy sorozatánál legalább a minták 95 százalékának a 3. Fejezet 3.7.2.4-1. táblázatában megadott pontossági követelményeken belül kell lenni. Az adat a legrosszabb esetű geometriához van mérve abból a célból, hogy a keringő műholdak geometriája által okozott rendszer pontosság változékonyságot kiküszöböljék.

3.2.6 Egy példa arra, hogy ezt az elvet hogyan lehet alkalmazni a nem-precíziós megközelítési üzemeltetésekhez szükséges teljesítménynek a GPS-el történő alátámasztásra. Tegyük fel azt, hogy a rendszer olyan nem-precíziós megközelítések alátámasztására tervezett, amikor a precíziós pontosság vízszintes gyengítése (HDOP) 6-nál kisebb, vagy avval egyenlő. Ennek a teljesítménynek a bemutatására mintákat kell venni egy hosszabb időtartamon keresztül (például 24 órán át). A mért helyzet hiba, a *g*, az egyes *i* mintákra, *gi*-ként kerül jelzésre. Ez a hiba a legrosszabb esetű geometriához van mérve, mint 6×g*i*/HDOP. A mért hibák kilencvenöt százalékának 220 méternél kevesebbnek kell lenni ahhoz, hogy a rendszer kielégítse a nem-precíziós pontossági követelményeket a legrosszabb esetű geometriájú körülményeknél. Az összegyűjtött minták teljes számának elegendőnek kell lenni ahhoz, hogy az eredmény statisztikailag jellemző legyen, a hibák dekorrelációs idejét számításba véve.

3.2.7 A függőleges pontossági értékek egy sorozata került az I.Kategóriájú precíziós megközelítési üzemeltetésekre meghatározásra, azok, melyek összekötik azokat a különféle értékeket, amelyek alátámaszthatnak egy, az ILS-el egyenlő értékű üzemeltetést. A számos érték különböző csoportokból származik, az ILS szabványok különféle értelmezését felhasználva. Ezekből a származtatásokból a legalacsonyabb értékek kerültek elfogadásra egy konzervatív értékként a GNSS-re, ez a minimális érték van a távolságra megadva. Mivel ez az érték konzervatív, és mivel a Globális Navigációs Műhold Rendszer /GNSS/ hiba jellemzői eltérnek az ILS-étől, lehetséges, hogy az I. Kategóriájú üzemeltetéseket el lehet érni a pontosság és a riasztási határértékek nagyobb értékeinek alkalmazásával a tartományon belül. A nagyobb értékek megnövekedett elérhetőséget eredményeznének az üzemeltetésekre. A tartomány maximális értékei kerültek ajánlásra megfelelő értékekként, az érvényesítéstől függően.

3.2.8 Speciális riasztási határértékek kerültek meghatározásra az egyes kiegészítő rendszerekre. A Földi Bázisú Kiegészítő Rendszernél /GBAS/ műszaki előírások határozzák meg a légijárművek részére történő riasztási érték sugárzását. A GBAS szabványok 10 méteres riasztási határértéket követelnek meg. A Műhold Bázisú Kiegészítő Rendszerre /SBAS/ műszaki előírások határozzák meg a riasztási határérték szabványosítását egy felfrissíthető adatbázison keresztül (lásd a *Minimális Üzemeltetési Teljesítmény Szabványok a Globális Helymeghatározó Rendszer/Nagy Kiterjedésű Kiegészítő Rendszer- (GPS/WAAS)-re Légijármű Fedélzeti Berendezés-* (RTCA/DO-229C)-t).

3.2.9 A GPS SPS pozíció hiba (lásd 3. Fejezet 3.7.3.1.1.1 pontot) a pozíció hibák (műhold óra és efemerisz hibák) közül csak a világűr és a vezérlés részbe számít bele; nem tartozik bele az ionoszférikus és troposzférikus késleltetési modell hibákba, a többutas hatások miatt keletkező hibákba és a vevő mérési-zaj hibákba (”D”- Melléklet, 4.1.2 pont). Ezek a hibák a vevő szabványokban vannak megemlítve. Az ABAS-képességgel rendelkező berendezés kimenetén mérhető felhasználói helyzetmeghatározási hibát főleg a felhsznált GNSS vevő okozza.

3.2.9.1 Az Alapvető GNSS vevőknél a vevő minősítési szabványok megkövetelik a felhasználói helyzetmeghatározási pontosság meglétét interferencia megléte esetén egy szelektíven rendelkezésre álló modellnél (SA), ami vízszintesen kevesebb, mint 100m (az idő 95 százalékában) és függőlegesen 156m (az idő 95 százalékában). A vevő szabványok nem követelik meg, hogy egy Alapvető GNSS vevő a ”B”- Függelék, 3.1.2.4 pontjában lefektetett ionoszférikus korrekciót alkalmazzon.

Megjegyzés. – Az ’Alapvető GNSS vevő’ meghatározás egy olyan GNSS repülő elektronikát jelent, mely minimálisan megfelel annak a GPS vevő követelményeinek, amit az Annex 10, I. kötet, valamint az Egyesült Államok Szövetségi Légügyi Hivatal (FAA) által módosított RTCA/DO-208 dokumentum (TSO-C129A) műszaki meghatározásai ismertet, vagy amit az EUROCAE ED-72-A (vagy annak megfelelő) tartalmaz.

3.2.9.2 A szelektív rendelkezésre állás (SA) szüneteltetése miatt a GPS reprezentatív felhasználói helyzetmeghatározási pontosságát körültekintően a D-0. Táblázatban látható módon állapítják meg. A számok azt feltételezik, hogy a névlegesen 24 GPS műholdból a legrosszabb esetben két műhold elromlott. Ráadásul, egy 7m-es (1 σ) ionoszférikus késleltetési modell hibát, egy 0,25m-es (1 σ) maradék troposzférikus késleltetési hibát és egy 0,80m-es (1 σ) vevő zaj hibát feltételeztek. A szelektív rendelkezésre állás (SA) szüneteltetése után (”D”- Melléklet, 1. pont) a túlsúlyban levő pszeudó-távolsági hiba a GPS Állandó Helyzetmeghatározó Szolgálat felhasználói számára az az ionoszférikus hiba lesz, ami az ionoszférikus korrekciók alkalmazása után marad. Ez a hiba szintén nagyon változó és olyan feltételektől függ, mint a felhasználói földmágneses földrajzi szélesség, a naptevékenység szintje (azaz a napciklus), az ionoszférikus aktivitás szintje (azaz van-e mágneses

vihar, vagy nincs), a pszeudó-távolsági mérés tengerszint feletti magassági szöge, az évszak és a napszak.
A 0. Táblázatban szereplő feltételezett ionoszférikus késleltetési modell hiba általánosságban óvatos számításon alapszik, ennek ellenére léteznek olyan feltételek, amikor a feltételezett 7m (1 σ) hiba a maximális naptevékenység alatt nem megfelelő.

D-0. Táblázat: GPS felhasználói helyzetmeghatározási pontosság

	GPS felhasználói helyzetmeghatározási pontosság az idő 95%-ában, átfogó átlag
Vízszintes helyzetmeghatározási hiba	33m (108 láb)
Függőleges helyzetmeghatározási hiba	73m (240 láb)

3.2.10 A Műhold Bázisú Kiegészítő Rendszer (SBAS) és a Földi Bázisú Kiegészítő Rendszer (GBAS) vevői sokkal pontosabbak, a pontosságukat valós időben a szabványos hiba modelleket használó vevő jellemzi, ahogy a 3. Fejezet 3,5 pontja tartalmazza az SBAS számára, valamint a 3. Fejezet 3,6 pontja a GBAS számára.

1. Megjegyzés. - Az 'SBAS vevő' meghatározás egy olyan GNSS repülő elektronikát jelent, mely minimálisan megfelel annak az SBAS vevő követelményeinek, amit az Annex 10, I. kötet, valamint az Egyesült Államok Szövetségi Légügyi Hivatal (FAA) által módosított RTCA/DO-229C dokumentum (TSO-C145A/TSO-C146A) műszaki meghatározásai ismertet, (vagy annak megfelelő).

2. Megjegyzés. - A 'GBAS vevő' meghatározás egy olyan GNSS repülő elektronikát jelent, mely minimálisan megfelel annak a GBAS vevő követelményeinek, amit az Annex 10, I. kötet, valamint az Egyesült Államok Szövetségi Légügyi Hivatal (FAA) által módosított RTCA/DO-253A dokumentum (TSO-C161 és TSO-C162) műszaki meghatározásai ismertet, (vagy annak megfelelő).

3.3 Sértetlenség és idő-a-riasztásig

3.3.1 A sértetlenség annak a bizalomnak a mértéke, amelyet a teljes rendszer által biztosított információ pontosságára lehet helyezni. A sértetlenség magába foglalja a rendszernek azt a képességét, hogy a kellő időben és érvényesen figyelmeztetéseket biztosít a felhasználó számára (riasztások), amikor a rendszert nem szabad a tervezett üzemeltetésre felhasználni (vagy a repülés szakaszára).

3.3.2 Annak biztosításához, hogy a helyzet hiba elfogadható legyen, egy olyan riasztási határérték került meghatározásra, ami a biztonságos üzemeltetéshez megengedhető legnagyobb helyzet hibát képviseli. A helyzet hiba nem lépheti túl ezt a riasztási határértéket annak közlése nélkül. Ez analóg az ILS-el, mivel akkor is lecsökkenhet a rendszer úgy, hogy a hiba nagyobb, mint a 95 százalékos érték, de az ellenőrző berendezés határértékein belül.

3.3.3 A navigációs rendszer sértetlenségi követelménye az, hogy egy egyedüli légijármű részére az útvonal, a közelkörzeti, a kezdeti megközelítési, a nem-precíziós megközelítési és az indulási repülésben alátámasztást biztosítson $1 - 1 \times 10^{-5}$ óránkénti értékként elfogadva.

3.3.4 A műhold-bázisú navigációs rendszernél a térbeli-jel az útvonal repülési környezetben egyidejűleg nagy számú légijármű nagy területen történő kiszolgálására szolgál, és a rendszer sértetlenségi hiba hatása a légiforgalom vezetési rendszerére nagyobb lesz, mint a hagyományos navigációs rendszereké. A 3. Fejezet 3.7.2.4-l táblázatában lévő teljesítmény követelmények ennek megfelelően jóval nagyobb követelményűek.

3.3.5 A precíziós megközelítési üzemeltetésekre a sértetlenségi követelmények a Globális Navigációs Műhold Rendszer /GNSS/ térbeli-jel követelményeire a 3. Fejezet 3.7.2.4-l táblázatba úgy kerültek kiválasztásra, hogy megegyeznek az ILS követelményekkel.

3.4 A szolgáltatás folyamatossága

3.4.1 A szolgáltatás folyamatossága a rendszernek az a képessége, hogy a feladatát nem-tervezett megszakítások nélkül hajtsa végre a tervezett üzemeltetése során.

3.4.2 *Útvonal repülés*

3.4.2.1 Az útvonal repülési üzemeltetésekre a szolgáltatás folyamatossága a navigációs rendszer azon képességére vonatkozik, hogy navigációs jel kimenetet biztosítson az előírt pontossággal és sértetlenséggel a tervezett üzemeltetés teljes egészében, feltételezve azt, hogy az üzemeltetés kezdeténél rendelkezésre állt. A navigációs rendszer riasztásainak előfordulásai – vagy a ritka hibamentes teljesítmény miatt, vagy a hibák miatt – képezik a folyamatossági hibákat. Mivel az ilyen működéseknek az időtartama változó, a folyamatossági követelmény a valószínűség óránkénti előfordulása alapján került meghatározásra.

3.4.2.2 A navigációs rendszer folyamatossági követelménye egy egyedi légijármű részére $1 - 1 \times 10^{-4}$ óránként. Azonban a műhold-bázisú rendszer térbeli-jele nagy számú légijárművet egy nagy területen belül szolgál ki. A 3. Fejezet 3.7.2.4-l táblázatában megadott folyamatossági követelmények képviselik a GNSS-re vonatkozó térbeli-jel követelményeket, azaz ezekből erednek a leállások közötti átlagos idő (MTBO) követelmények a GNSS rendszer alkotó-elemeire.

3.4.2.3 Egy értéktartomány került a 3. Fejezet 3.7.2.4-l táblázatában megadásra a térbeli-jel folyamatossági követelményeire az útvonal repülési üzemeltetésekhez. Az alacsonyabb érték az a minimális folyamatosság, amelynél a rendszert gyakorlatilag használhatónak tekintjük. Ez az olyan területekre megfelelő, ahol alacsony a forgalom sűrűsége, és kicsi a légtér összetettsége. Az ilyen területeken a navigációs rendszer hibájának hatása kevés légijárműre korlátozódik, és ennek megfelelően nincs szükség a folyamatossági követelmény jelentős növelésére az egy egyedüli légijárműre vonatkozó ($1 - 1 \times 10^{-4}$ óránként) követelményen túl. A megadott legmagasabb érték (azaz az $1 - 1 \times 10^{-8}$ óránként) az olyan területekre megfelelő, ahol nagy a forgalom sűrűsége és a légtér összetettsége, ahol a hiba sok légijárművet fog érinteni. Ez az érték az olyan navigációs rendszerekre megfelelő, ahol nagyfokú a navigációs rendszer megbízhatósága iránti és a lehetséges légtér-ellenőrzés iránti igény. Ez az érték megfelelően magas ahhoz a várható helyzethez, ami a rendszer élettartama során bekövetkező kis valószínűségű rendszer hibán alapszik. A folyamatosság középső értékeit (például
$1 - 1 \times 10^{-6}$ óránként) megfelelőnek tartjuk az olyan területekre, ahol nagy a forgalom sűrűség és a légtér összetettség, és ahol nagyfokú a navigációs rendszer megbízhatósága iránti igény, de amelyben a navigációs rendszer meghibásodásai miatti ’csökkenés’ lehetséges. Az ilyen ’csökkenés’ lehetséges az alternatív navigációs eszközök felhasználása miatt, vagy az ATC légtér-felderítésének felhasználásával és az elkülönítési minimumok beavatkozásos fenntartásával. A folyamatossági teljesítmény értékei a légtér szükségleteinek megfelelően került meghatározásra a navigációs alátámasztásra ott, ahol a Globális Navigációs Műhold Rendszer /GNSS/ vagy a meglévő navigációs berendezés infrastruktúrát helyettesíti, vagy ahol ilyen infrastruktúra a korábbiakban nem létezett.

3.4.3 *Megközelítés és leszállás*

3.4.3.1 A megközelítési és leszállási üzemeltetésekhez a szolgáltatás folyamatossága a navigációs rendszer azon képességére vonatkozik, hogy navigációs jel kimenetet biztosítson az előírt pontossággal és sértetlenséggel a megközelítés során, feltételezve azt, hogy az üzemeltetés kezdeténél rendelkezésre állt. A navigációs rendszer riasztásainak előfordulásai – vagy a ritka hibamentes teljesítmény miatt, vagy a hibák miatt – képezik a folyamatossági hibákat. Ebben az esetben a folyamatossági követelmény egy rövid sugárzási idő valószínűségeként került meghatározásra.

3.4.3.2 A megközelítési és leszállási műveletek folyamatossági követelményeit csak a követelményeknek a légijármű fedélzeti vevő és a rendszer nem-légijármű fedélzeti elemei közötti szétosztása jeleníti meg. Eben az esetben nem tartják szükségesnek a követelménybeli növelést a rendszernek a több légijármű általi felhasználásához kapcsolódóan. A folyamatossági érték elfogadottan csak a megszakított megközelítéshez kapcsolódó kockázatra vonatkozik, és minden egyes légijárművet függetlennek lehet tekinteni. Azonban néhány esetben szükség lehet a folyamatossági értékek növelésére, tekintettel arra, hogy egy rendszer hibát két futópálya között kell összefüggésbe hozni (azaz az egymáshoz közel elhelyezkedő, párhuzamos futópályákra történő megközelítéseknél egy közös megközelítési rendszer alkalmazása esetén).

3.5 Rendelkezésre állás

3.5.1 A Globális Navigációs Műhold Rendszer /GNSS/ rendelkezésre állását a rendszer navigációs célokra történő felhasználási idejének azon része adja, amely során megbízható navigációs információkat biztosít a légijármű személyzete, a robotpilóta, vagy más repülés vezérlő rendszer részére.

3.5.2 Amikor a GNSS rendelkezésre állási követelményének megállapítása történik, akkor az alátámasztott szolgáltatás megkívánt szintjét kell figyelembe venni. Ha a műholdas navigációs szolgáltatás tervezett felhasználása egy meglévő útvonal navigációs berendezés infrastruktúra helyettesítése, akkor a GNSS-t azzal a rendelkezésre állással kell összevetni, amelyet a meglévő infrastruktúra biztosított. A szolgáltatás csökkenés üzemeltetési hatásának kiértékelését el kell végezni.

3.5.3 Ahol a GNSS rendelkezésre állása alacsony, még ot is lehetséges a műholdas navigációs szolgáltatás felhasználása, a navigációs üzemeltetési időnek arra az időtartamára történő korlátozásával, amikor a rendszer előreláthatóan rendelkezésre fog állni. Ez abban az esetben lehetséges, ha a GNSS alkalmatlansága a nem kielégítő műhold állás miatt ismétlődően jelentkező. Az ilyen korlátozások mellett csak az a folyamatossági kockázat marad, ami a szükséges rendszer összetevők hibájához kapcsolódóan az előrelátható idő jelzése és az üzemeltetés végrehajtásának ideje között áll fenn.

3.5.4 *Útvonal repülés*

3.5.4.1 Egy területre, vagy üzemeltetésre a jellemző rendelkezésre állási követelményeknek a következőkön kell alapulni:

a) A forgalom sűrűsége és összetettsége;

b) Az alternatív navigációs berendezések;
c) Az elsődleges/másodlagos légtér-felderítés fedése;

d) A légiforgalmi és a légijármű vezetési repülési eljárások; és

e) A kényszer-kiesések időtartama.

3.5.4.2 Ebből az okból, a Globális Navigációs Műhold Rendszer /GNSS/ Szabványok és Ajánlott Gyakorlatok /SARPs/ egy érték sorozatot határoz meg a rendelkezésre állási követelményekre. A követelmény az, hogy a légtérben a GNSS alátámassza az egyedüli-eszközű üzemeltetéseket a forgalom különféle szintje és összetettsége esetén. Az érték tartomány alsó vége csak annyi, hogy a rendszer kielégítő legyen a kis forgalom sűrűségű és összetettségű légtérben az egyedüli-eszközű navigáció biztosításához.

3.5.4.3 Miközben a kiegészítő rendszerek csökkenteni tudják a GNSS függőséget egy meghatározott műhold-sor elemre, ugyanakkor nem biztosítanak használható szolgáltatást a műhold-sor elemek nélkül. Egy területen belül egy meghatározott kiegészítő rendszer rendelkezésre állási követelményeinél számításba kell venni a GNSS műhold-sor elemeknek azt a lehetséges teljesítőképesség csökkenését (azaz a műhold-sor elemek minimális konstellációját (a műholdak számát és különféleségét), ami elvárható).
Üzemeltetési eljárásokat kell kidolgozni az ilyen esetre, amikor a teljesítőképesség csökkenéses konfiguráció előfordul.

3.5.5 *Megközelítés*

3.5.5.1 Az egy területre jellemző követelményeket a következőkre kell alapozni:

a) A forgalom sűrűsége és összetettsége;

b) Az egy kitérő repülőtérre történő megközelítéshez való elrepülés és ott a megközelítés végrehajtásának eljárásai;

c) A kitérő repülőtéren használandó navigációs rendszer;

d) A légiforgalmi és a légijármű vezetési eljárások;

e) A kényszer-kiesések időtartama; és

f) A kényszer-kiesések földrajzi kiterjedése.

3.5.5.2 Amikor a GNSS-re alapozott megközelítési rendszerek üzemeltetési eljárásait kidolgozzák, akkor egy kényszer-kiesés időtartamát és annak a kitérő repülőtérre való hatását figyelembe kell venni. Jóllehet, olyan GNSS kényszer-kiesések fordulhatnak elő, amelyek számos megközelítésre hatással lehetnek, a megközelítés szolgáltatását mindenféle karbantartási művelet nélkül helyre lehet állítani a műholdak keringése miatt.

3.5.6 *A Globális Navigációs Műhold Rendszer /GNSS/ rendelkezésre állásának meghatározása*

A GNSS rendelkezésre állása bonyolult kérdés a műholdaknak az egy figyelembe vett területhez viszonyított mozgása miatt, és mivel potenciálisan hosszú idő szükséges egy műholdnak a meghibásodása esetén annak kijavítására. A rendelkezésre állás pontos méréséhez több évre lenne szükség ahhoz, hogy lehetővé váljon egy Meghibásodások Közötti Átlagos Idő /MTBF/ és a javítási időknél hosszabb mérési időtartam. A GNSS rendelkezésre állását inkább a tervezéssel, az elemzéssel és a modellezéssel lehet meghatározni, nem pedig méréssel. A 3. Fejezet 3.7.2.4 pontjában meghatározott rendelkezésre állást, mint tervezési rendelkezésre állást kell alkalmazni.

Megjegyzés. – A rádióösszeköttetések és a navigációs berendezések megbízhatóságához és rendelkezésre állásához tartozó kiegészítő útmutató anyagot az „F”- Melléklet tartalmazza.

4. A Globális Navigációs Műhold Rendszer /GNSS/ alkotó-elemei

4.1 Globális Helymeghatározó Rendszer /GPS/

Megjegyzés. – A GPS-re vonatkozó kiegészítő tájékoztatásokat a „Globális Helymeghatározó Rendszer Szabvány Helymeghatározási Szolgáltatás – Teljesítmény Szabvány", 2001. október, valamint az Interfész Vezérlési Dokumentum (ICD)-GPS-200C című anyagban lehet találni.

4.1.1 A teljesítmény szabványok arra az alap-feltételre alapozottak, hogy egy reprezentatív Szabvány Helymeghatározási Szolgáltatású /SPS/ vevő kerül felhasználásra. A reprezentatív vevőnek a következők a jellemzői: az ICD-GPS-200C-nek megfelelően került megtervezésre; egy 5-fokos fedő szöget használ; a műhold helyzet és a geometriai távolság számítások végrehajtásánál a Geodéziai Világrendszer – 1984 (WGS-84) Föld-Központú, Föld-Állandójú (ECEF) koordináta rendszer legfrissebb kialakítását használja fel; az összes, hatóterében lévő műhold adataiból összeállítja a helyzet és idő megoldást; kiegyenlíti a dinamikus Doppler-eltolódás hatását a névleges Szabvány Helymeghatározási Szolgáltatás /SPS/ távolság-mérési jel vivő bázisán és a Torzított /Durva/ Hozzáférési /C/A/ kód méréseknél kizárja a GPS nem megfelelő működési állapotú műholdakat a helyzet megoldásból; felhasználja a legújabb és a belsőleg megegyező efemerisz és idő adatokat az összes olyan műholdra, amelyet a helyzet megoldásához felhasznál; és elveti a nyomkövetést abban az esetben, ha egy GPS műhold leállítja a C/A kódjának sugárzását. Az idő átviteli pontosság egy olyan 'helyhez' kötött vevőre vonatkozik, ami egy geodéziailag felmért helyen működik. Egy 12-csatornás vevő ki fogja elégíteni a 3. Fejezet 3.7.3.1.1.1 és 3.7.3.1.2 pontjában meghatározott teljesítmény követelményeket. Egy olyan vevő, amely csak négy műholdat képes követni ("B"- Függelék 3.1.3.1.2) nem fogja elérni a teljes pontossági és rendelkezésre állási teljesítményt.

4.1.2 *Pontosság.* A pontosság egy reprezentatív vevővel kerül mérésre, és egy 24 órás mérési időtartamon keresztül a fedésterület bármely pontján belül. A helymeghatározási és időmérési pontosság csak a térbeli-jelet (SIS) foglalja magába, és nem épít be olyan hibaforrásokat, mint az ionoszféra, a troposzféra, az interferencia, a vevő-zaj vagy a többutas hatás. A pontosság levezetése azon alapszik, hogy a 24 műholdas műhold-rendszerből a legrosszabb két műholdat, valamint a 6 méteres műhold-rendszer RMS térbeli-jel /SIS/ felhasználói távolságmérési hibát (URE) nem veszik figyelembe.

4.1.3 *Távolság tartomány pontosság.* A távolság tartomány pontosságot egy olyan műhold szabja meg, amely jó működési állapotot /healthy/ és Torzított /Durva/ Hozzáférési /C/A/ kódot jelez, és nem számít bele a szabályos üzemelési jellemzőin kívüli műhold hibákba. A távolság pontossági határértékeket túl lehet lépni a műhold hibák, vagy anomáliák során, miközben az adatokat a műholdba betáplálják. A távolság hibahatárok kimagasló értéke egy nagyobb szolgáltatási hibát eredményez, ahogy az a 4.1.6 pontban leírásra került. A sebesség távolság hibahatár a maximum bármely műholdra bármely 3-másodperces időtartamon keresztül és a fedésterületen belüli bármelyik ponton mérve. A távolság gyorsulási hibahatár a maximum bármely műholdra bármely 3-másodperces időtartamon keresztül és a fedésterületen belüli bármelyik ponton mérve. A négyzetes középértékű távolság hiba pontosság, az RMS Felhasználói Távolságmérési Hiba /URE/ átlaga az összes műholdra egy 24 órás időtartamon keresztül, a fedésterületen belüli bármely pontra mérve. Szabályos körülmények esetén az összes műhold megtartja ugyanazokat a szabványokat, úgy, hogy a rendelkezésre állás modelezés céljából alkalmas annak feltételezésére, hogy az összes műhold RMS térbeli-jel felhasználói távolság hibája /SIS URE/ 6 méter. A szabványok azokra távolság tartási hibákra korlátozottak, amelyek a térbeli és vezérlési szegmensekre engedélyezettek.

4.1.4 *Rendelkezésre állás.* A rendelkezésre állás egy bármely 24 órás időtartam idejének a százaléka, amikor az előre meghatározható 95 százalékos helymeghatározási hiba (a térbeli és vezérlési szegmens hibái miatt) a küszöb értékénél kevesebb, a fedésterületen belül bármely ponton. Ez egy 36 méteres vízszintes 95 százalékos küszöbön alapszik; egy 77 méteres függőleges 95 százalékos küszöbön; egy reprezentatív vevő felhasználásával; és bármely 24 órás időtartamon a fedésterületen belül működően értendő. A szolgáltatás rendelkezésre állás feltételezi azt a legrosszabb kombinációt, hogy két műhold üzemképtelen.

4.1.4.1 *Összefüggés a kiegészítő rendszerek rendelkezésre állásáról.* A Légijármű Bázisú Kiegészítő Rendszer /ABAS/, a Földi Bázisú Kiegészítő Rendszer /GBAS/ és a Műhold Bázisú Kiegészítő Rendszer /SBAS/ rendelkezésre állásának nincs közvetlen összefüggése a 3. Fejezet 3.7.3.1.2 pontjában meghatározott GPS rendelkezésre állásra. Az Államoknak és az üzemeltetőknek kell kiértékelni a kiegészítő rendszerek rendelkezésre állását a követelményekhez kapcsolódó kiegészítő teljesítménnyel történő összehasonlítással. A rendelkezésre állás elemzése egy alapfeltételként elfogadott műhold rendszeren alapszik, és azon a valószínűségen, hogy egy adott számú műhold van. 24 működő műhold áll rendelkezésre a műhold-pályán, 0,95 valószínűséggel (átlagolva bármely napra), ahol egy műhold akkor van működőképesként meghatározva, ha az képes – de nem szükségszerű, hogy sugározza is – egy felhasználói távolság meghatározási jel adására. A 24 névleges sík/térköz helyzetben legalább 21 műholdnak jól működőképesre /healthy/ beállítottnak kell lenni, és a navigációs jelet 0,98 valószínűséggel (éves átlagolásban) sugároznia kell.

4.1.5 *Megbízhatóság.* A megbízhatóság egy meghatározott időtartamon belül százalékban kifejezett azon idő, amikor a Szabvány Helymeghatározási Szolgáltatás /SPS/ Térbeli-jel /SIS/ Felhasználói távolságmérési hiba /URE/ a távolság hibahatár értékeken belül marad, a fedésterületen belül bármely adott ponton, az összes jó működési állapotú /healthy/ GPS műholdra. A megbízhatósági szabvány egy-éves időtartamon keresztüli méréseken és a fedés-területen belüli napi értékek átlagán alapszik. Egy adott pont átlagos megbízhatósága feltételezi azt, hogy a teljes szolgáltatási hiba ideje 18 óra lesz az adott pont felett. (3 hiba, amelyek mindegyike 6 órán keresztül tart.)

4.1.6 *Nagyobb szolgáltatási hiba.* Egy nagyobb szolgáltatási hiba úgy került meghatározásra, hogy az egy idő intervallumon keresztül fennálló állapot, amely során jó működőképességű /healthy/ GPS műholdak távolság-meghatározási jel hibája (az atmoszférikus és vevő hibákat kizárva) meghaladja a távolságmérési hibahatár értéket. Ahogy az a 3. Fejezet 3.7.3.1.1.3a) pontjában meghatározásra került, a távolságmérési hibahatár érték a következőkből a nagyobbik érték:

a) 30 méter; vagy
b) a Felhasználói Távolságmérési Pontosság /URA/ 4,42-szorosa , a 150 métert nem meghaladóan.

4.1.7 *Fedésterület.* A Szabvány Helymeghatározási Szolgáltatás /SPS/ az a földi fedésterületet támasztja alá, ami a föld felszínétől 3 000 kilométeres magasságig terjed.

4.2 GLONASS

Megjegyzés. – A GLONASS-ra vonatkozó kiegészítő tájékoztatásokat az Orosz Államszövetség Védelmi Minisztériumának Tudományos Koordinációs Téjékoztatásügyi Központja, Moszkva által kiadott GLONASS Interfész Vezérlési Dokumentumá-ban *lehet megtalálni.*

4.2.1 *Műhold kiválasztás.* A teljesítmény szabvány meghatározások arra az alapfeltételre alapozottak, hogy a szabvány pontossági csatornájú (CSA) vevő azt a műholdat fogja kiválasztani, amely minden egyes 5 percben a minimális helyzet-pontosság gyengülésen /PDOP/ alapszik, vagy bármikor azt a helyzet-megoldásban használt műholdat, amely beáll a maszk-szög alá.

4.2.2 *Pontosság.* A pontosságot a fedésterület, a rendelkezésre állási és a megbízhatósági szabványok és egy, a föld bármely pontjára mért 24 órás időtartam szabja meg.

4.2.3 *Idő átviteli pontosság.* Az idő átviteli pontosságot a fedésterület, a rendelkezésre állási és a megbízhatósági szabványok és egy, a föld bármely pontjára mért 24 órás időtartam szabja meg. Ez a GLONASS CSA vevő idejére van alapozva, ahogy az a helyzet-megoldás adat kimenetének felhasználásával kiszámításra kerül. Az idő átviteli pontosság az Egyeztetett Világidőre vonatkozóan került meghatározásra, ahogy azt az Orosz Nemzeti Idő Szolgálat (UTC(SU)) fenntartja.

4.2.4 *Rendelkezésre állás.* A rendelkezésre állást a fedésterület és egy jellemző 24 órás időtartam alatti (egy 60 napos átlagolási időtartam felhasználásával meghatározott) földfelszín feletti átlagolás szabja meg.

4.2.5 *Megbízhatóság.* A megbízhatóságot a fedésterület; a szolgáltatás rendelkezésre állása; a 200 métert nem meghaladó, előre meghatározható vízszintes megbízhatósági küszöb; egy, a mintavételezési időtartamon belüli nagyobb – maximum 18 órás – szolgáltatási hibás működés; és egy, a föld felszíne feletti egy-éves időtartam napi értékekre átlagolva adja meg.

4.2.5.1 *Nagyobb szolgáltatási hiba.* A nagyobb szolgáltatási hiba úgy van meghatározva, hogy az egy eltávolodás a szabvány távolság-mérési jel jellemzőktől olyan módon, ami egy megbízhatósági, vagy rendelkezésre állási szolgáltatási hibát okozhat. A nagyobb szolgáltatási hiba úgy került meghatározásra, hogy az egy eltávolodás a szabvány távolság-mérési jel jellemzőktől a következő módok valamelyikén:

a) olyan statisztikai eltávolodás a névleges rendszer távolságmérési pontosságtól, ami a Szabvány Pontossági Csatornában /CSA/ 150 métert meghaladó pillanatnyi távolság-meghatározási hibát okoz, vagy;

b) egy CSA távolságmérési jel, navigációs közlemény szerkezeti, vagy navigációs közlemény tartalmi megsértés, ami hatással van a CSA vevők minimális távolság-meghatározási jel vételére, vagy feldolgozó-képességére.

4.2.6 *Fedésterület.* A fedésterületet négy, vagy több műhold láthatóságának valószínűsége 24 órás időtartamban átlagolva a föld felszíne felett; egy 6, vagy annál kevesebb helyzet-pontosság gyengülés /PDOP/ négy műholdtól; egy 5-fokos maszk-szög; és a huszonnégy üzemelő műholdnak a naptár szerinti meghatározású helyzetsora /konstellációja/ szabja meg.
4.2.7 *GLONASS idő.* A GLONASS idő létrehozása a GLONASS Központi Szinkronizáló idején alapszik. A Központi Szinkronizáló hidrogén /atom/ órájának napi bizonytalansága 5×10^{-14}-nél nem rosszabb. A GLONASS idő és az Egyezetett Világidő, Oroszország /UTC(SU)/ ideje közötti különbség 1 milliszekundumon belül van. A navigációs közlemény tartalmazza a GLONASS időnek az UTC(SU)-hoz viszonyított szükséges adatait 0,7 mikro-szekundumon belüli pontossággal.

4.2.7.1 *A GLONASS-M aktuális adat információinak a közös formába történő átalakítása*. A műhold navigációs közlemény tartalmazza az aktuális adat információt az NT paraméterben. Ezt a közös formába a következő képlettel lehet átalakítani:

a) Az aktuális év-számnak, a J-nek, egy négy-éves időtartamban való kiszámítása:
Ha $1 \le N_T \le 366$; $J = 1$;
Ha $367 \le N_T \le 731$; $J = 2$;
Ha $732 \le N_T \le 1096$; $J = 3$;
Ha $1097 \le N_T \le 1461$; $J = 4$.

b) Az aktuális év a közös formában a következő képlettel kerül kiszámításra:

$$Y = 1996 + 4(N_4 - 1) + (J - 1)$$

c) Az aktuális nap és hónap (dd/mm) abból a referencia táblázatból kerül kiemelésre, ami a felhasználó berendezésének ROM-jában került tárolásra. A táblázat közös kapcsolatban van az N_T paraméterrel és a közös formátum dátummal.

4.2.8 *GLONASS koordináta rendszer.* A GLONASS koordináta rendszere a PZ-90, ahogy azt *A Föld Paraméterei, 1990 (PZ-90)* leírja, amit az Orosz Államszövetség Védelmi Minisztérium Topográfiai Szolgálata, Moszkva – kiadványában ismerteti.

4.2.8.1 A PZ-90 paraméterei magukba foglalják az alapvető geodéziai állandókat, az egységes földi ellipszoid méreteit, a föld gravitációs erőterének jellemzőit és a Kraszovszkij ellipszoid (koordináta rendszer, 1942.) elemeinek az egységes földi ellipszoidra vonatkoztatott orientációját.

4.2.8.2 A meghatározás szerint, a PZ-90 koordináta rendszer egy geocentrikus Descartes-féle derékszögű koordináta rendszerű aritmetikai tér, amelynek a kiindulópontjai a föld testjének középpontjában helyezkednek el. A Z-tengely az Egyezményes Földi pólusokra irányul, hogy azt a Nemzetközi Föld Forgási Szolgálat ajánlja. Az X-tengely a föld egyenlítői síkjának és a Nemzetközi Idő Hivatal által megállapított nulla-délkör metszéspontjára irányul. Az Y-tengely tölti be a jobbra-forgás /az óramutató forgásával egyező irányú/ koordináta rendszert.

4.3 A pontosság gyengülése

A pontosság gyengülése (DOP) tényező azt fejezi ki, hogy a távolságmérési pontosságot hogyan lehet egy geometriai hatással a helyzet-pontosság csökkenéséhez mérni. Az optimális geometriát (azaz a legalacsonyabb DOP értéket) négy műholddal lehet elérni akkor, amikor három műhold a horizonton egyenlő térközökben helyezkedik el, minimális magassági szöggel és egy műhold közvetlenül a vevő felett van.

A geometriára azt lehet mondani, hogy a távolság tartomány pontosságot a pontosság gyengülési tényezővel /DOP/ „gyengíti”.

4.4 Globális Navigációs Műhold Rendszer /GNSS/ vevő

4.4.1 A vevő által okozott hibáknak kétféle következménye lehet a navigációs rendszer teljesítményére, ezek a felhasználó részére biztosított információk félbeszakítása, vagy a félrevezető kimeneti információk. Ezen esetek egyike sincs a térbeli-jel követelményekben figyelembe véve.

4.4.2 A GNSS légijármű fedélzeti elemeinek névleges hibáját a vevő-zaj, az interferencia és a többutas terjedési és troposzférikus model megmaradó hibái határozzák meg. A meghatározott vevő-zaj követelmények mind a Műhold Bázisú Kiegészítő Rendszer /SBAS/, mind a Földi Bázisú Kiegészítő Rendszer /GBAS/ légijármű fedélzeti vevőjére magukba foglalják a B-Függelék 3.7 pontjában meghatározott védő maszk alatti bármilyen interferencia hatását. A megkívánt teljesítmény olyan vevők által került kimutatásra, amelyek keskeny korrelátor térközt, vagy kód-kiegyenlítő technikát alkalmaznak.

5. Légijármű-bázisú kiegészítő rendszer (ABAS)

5.1 Az ABAS kiegészíti és/vagy összegzi a Globális Navigációs Műhold Rendszer /GNSS/ elemeitől kapott információkat a légijármű fedélzetén rendelkezésre álló információkból abból a célból, hogy a 3. Fejezet 3.7.2.4 pontjában meghatározott értékeknek megfelelő üzemeltetést biztosítsa.

5.2 Az ABAS olyan feldolgozási kapcsolásokat foglal magába, amelyek biztosítják:

a) A sértetlenség ellenőrzését a helyzet megoldásokra a redundáns információk (például: a többszörös távolság-mérések) felhasználásával. Az ellenőrző rendszerek általában két funkciót foglalnak magukba: a hiba érzékelést és a hiba kizárást. A hiba érzékelés célja az, hogy észlelje a helymeghatározási hiba jelenlétet. Az észlelés után a megfelelő hiba kizárás meghatározza és kizárja a hiba forrását (anélkül, hogy szükségszerűen az azonosítaná azt az egyedi forrást, ami a problémát okozza), és ezáltal lehetővé teszi a GNSS navigációnak a megszakítás nélküli folytatását. A sértetlenség ellenőrzésének két alapvető osztálya van: a Vevő sértetlenség önellenőrző rendszer (RAIM), ami kizárólagosan a GNSS információkat használja fel, és a Légijármű sértetlenség önellenőrző rendszer (AAIM), ami kiegészítő légijármű fedélzeti információkat használ fel (például: a légnyomásos magasságmérő, óra és inerciális navigációs rendszer (INS));

b) A helyzet megoldás folyamatossági segítése alternatív forrásokból származó információk felhasználásával, mint az Inerciális Navigációs Rendszerrel /INS/, a légnyomásos magasságmérővel és külső órával;

c) A helyzet megoldás rendelkezésre állásának segítése (a folyamatosság segítésével azonos); és

d) A pontosság segítése a meghatározott távolságok megmaradó hibáinak becslésével.

5.3 A nem-GNSS információkat a GNSS információkkal kétféle módon lehet egyesíteni:

a) A GNSS megoldási algoritmusán belül egyesítve (Egy példa: a magasságmérési adatoknak egy kiegészítő műhold mérés jellegű modellezése); és

b) Külsőleg az alap GNSS helyzet számításhoz (Egy példa: a magasságmérési adatok összehasonlítása a megegyezés szempontjából a függőleges GNSS megoldással, ahol egy jelzés /zászló/ jelenik meg akkor, ha az összehasonlítás hibás /eltérő/.).

5.4 Az egyes kapcsolatoknak speciális előnyeik és hátrányaik vannak, és lehetetlen az összes lehetséges összekapcsolás leírása az elért teljesítmény számszerű értékeivel. Ugyanez vonatkozik arra a helyzetre, amikor több GNSS elem kerül egyesítésre (például: GPS és GLONASS).

6. Műhold-bázisú kiegészítő rendszer (SBAS)

6.1 Egy SBAS három különálló elemből épül fel:

a) a földi infrastruktúrából;

b) az SBAS műholdakból; és

c) az SBAS légijármű fedélzeti vevőből.

6.1.1 A földi infrastruktúra magába foglalja azokat az ellenőrző és jelfeldolgozó állomásokat, amelyek a navigációs műholdaktól az adatokat veszik és kiszámítják a sértetlenséget, a helyesbítéseket és a távolság-meghatározási adatokat, azokat, amelyek az SBAS térbeli-jelet képezik. Az SBAS műholdak közvetítik azokat az adatokat, amelyeket a földi infrastruktúrából a műholdak részére továbbítottak, az SBAS légijármű fedélzeti vevők részére, hogy azok meghatározzák azokat a helyzet és idő információkat, amelyeket a műholdak helyzet-sora(i) és az SBAS műholdak alkalmaznak. Az SBAS légijármű fedélzeti vevők begyűjtik a távolság és helyesbítési adatokat, és ezeket használják fel a sértetlenség meghatározásához és a származtatott helyzet-pontosság növeléséhez.

6.1.2 Az SBAS földi hálózat méri a távolság-meghatározási forrás és az SBAS vevő közötti pszeudo-távolságot az ismert helyen, és önálló helyesbítéseket biztosít a távolság-meghatározási forrás efemerisz hibáknál, az óra /idő/ hibáknál és az ionoszférikus hibáknál. A troposzférikus késési modelt a felhasználó alkalmazza.

6.1.3 A távolság-meghatározási forrás efemerisz hiba és a lassú mozgási idő hiba az elsődleges alapjai a hosszútávú korrekcióknak. A távolság-meghatározási idő hiba a hosszútávú helyesbítéseknél kerül szabályozásra, és a troposzférikus hiba a gyors helyesbítés elsődleges alapja. A több távolság-meghatározási forrás közötti ionoszférikus hibák előre meghatározott ionoszférikus rács-pontoknál lévő függőleges ionoszférikus hibákként vannak összekapcsolva. Ezek a hibák az ionoszférikus helyesbítések elsődleges bázisai.

6.2 A Műhold Bázisú Kiegészítő Rendszer /SBAS/ fedésterülete és szolgáltatási területei

6.2.1 Fontos az, hogy különbséget tegyünk egy SBAS fedésterülete és szolgáltatási területe között. Egy fedésterület egy, vagy több szolgáltatási területet foglal magába, ezek mindegyike képes arra, hogy alátámassza a 3. Fejezet 3.7.3.4.2 pontjában meghatározott SBAS összes, vagy néhány funkciójára alapozott üzemeltetéseket. Ezeket a funkciókat azokat az üzemeltetésekre lehet vonatkoztatni, amelyeket alátámasztanak a következők:

a) Távolság-meghatározás: az SBAS biztosítja a távolság-meghatározási forrást más egyéb kiegészítő rendszerrel, rendszerekkel (ABAS, GBAS és másik SBAS);

b) Műhold állapot és alap differenciál helyesbítések: az SBAS útvonal, közelkörzeti és nem-precíziós megközelítési szolgáltatásokat biztosít. Különféle üzemeltetéseket (azaz Megkívánt Navigációs Teljesítmény /RPN/ típusokat) lehet alátámasztani a különböző szolgáltatási területeken;

c) Pontos differenciál helyesbítések: az SBAS Megközelítés Függőleges Vezetéssel-t /APV/ és a precíziós megközelítési szolgáltatást (azaz az APV-I.-t, APV-II.-t és a precíziós megközelítést) lehet alátámasztani különböző szolgáltatási területeken).

6.2.2 A D-1. ábra (az összes ábra a melléklet végénél került elhelyezésre) mutatja be a kezdeti fedésterületet és a körülbelüli kezdeti szolgáltatási területeket a három SBAS-re: a Széles Területű Kiegészítő Rendszer-t (WAAS), az Európai Geostacionárius Navigációs Átfedő Szolgáltatás-t (EGNOS) és a Többfunkciós Közlekedési Műhold (MTSAT) Műhold Bázisú Kiegészítő Rendszer-t (MSAS).

6.2.3 Egy SBAS pontos és megbízható szolgáltatást biztosíthat a meghatározott szolgáltatási terület(ek)en kívül is. A távolság-meghatározási, a műhold állapot és az alap differenciál helyesbítési funkciók felhasználhatóak a teljes fedésterületen belül is. Ezeknek a funkcióknak a teljesítménye technikailag elegendő lehet az útvonal, a közelkörzeti és a nem-precíziós megközelítési üzemeltetések alátámasztására, az ellenőrző és teljességi adatoknak az állandó-pályájú műhold rendszerekre és/vagy az SBAS műholdakra történő biztosításával. A sértetlenség szempontjából a veszélyeztető lehetőség az a műhold efemerisz hiba, amit az SBAS földi hálózat nem tud érzékelni, miközben az egy elfogadhatatlan hibát hoz létre a szolgáltatási területen kívül. A nem-precíziós megközelítésre meghatározott 0,3 tengeri mérföldes, vagy annál nagyobb riasztási határértékek elérése nagyon valószínűtlen.

6.2.4 Az egyes Államok felelősek azért, hogy a légtereiken belül meghatározzák az SBAS szolgáltatási területeket, és jóváhagyják az SBAS-bázisú üzemeltetéseket. Bizonyos esetekben, az Államok fel fognak állítani SBAS földi infrastruktúrát egy meglévő SBAS-hez kapcsolódóan. Ezeknek szükséges lesz az, hogy elérjék a Megközelítés Függőleges Vezetéssel /APV/-hez, vagy a precíziós megközelítéshez szükséges teljesítményt. Más esetekben az Államok egyszerűen jóváhagyhatnak szolgáltatási területeket és a rendelkezésre álló SBAS jeleket felhasználó, SBAS-alapú üzemeltetéseket. Mindkét esetben az egyes Államok felelősek annak biztosításáért, hogy az SBAS kielégíti a 3. Fejezet 3.7.2.4 pontjának követelményeit a légterükön belül, és hogy a légterükről megfelelő üzemelési állapot jelentések és NOTAM-ok kerülnek biztosításra.

6.2.5 Az SBAS-alapú üzemeltetések jóváhagyása előtt az Államnak meg kell határoznia azt, hogy a javasolt üzemeltetéseket egy, vagy több SBAS kellően alátámasztja. Ennek a meghatározásánál az SBAS-jelek felhasználásának gyakorlatára kell összpontosítani, számításba véve az SBAS földi hálózat relatív elhelyezkedését. Ez magában foglalhatja az SBAS-ek üzemeltetéséért felelős Állam(okk)al, vagy szervezet(ekk)el való együttműködést. Egy olyan légtérnél, ami viszonylag távol helyezkedik el az SBAS földi hálózattól, lecsökkenhet azoknak a látható műholdaknak a száma, amelyekre az SBAS állapot és alap helyesbítéseket biztosít. Mivel az SBAS vevők képesek arra, hogy egyidejűleg két SBAS adatait használják fel, és az önálló hiba észlelés és kizárás alkalmazására, amikor az szükséges, a rendelkezésre állás még így is elegendő lehet az üzemeltetések jóváhagyásához.

6.2.6 Az államtól elvárt az, hogy mielőtt az SBAS jelekre alapozott eljárásokat közzétenné, egy állapot ellenőrzést és egy NOTAM rendszert biztosítson. Egy rendszer elem hibájának a szolgáltatásra gyakorolt hatása meghatározásához matematikai szolgáltatási teljesítmény modellt kell felhasználni. Az Állam a modellt, vagy az SBAS üzemeltetőjétől szerezheti be, vagy kifejlesztheti saját modelljét. Az alap rendszer elemeinek pillanatnyi és előrejelzett állapot adatai és annak a helynek az adatai felhasználásával, ahova az Állam az üzemeltetéseket jóváhagyta, a modell képes lesz azonosítani azt a légteret és azokat a repülőtereket, ahol szolgáltatási kimaradások várhatóak, és ezt lehet felhasználni a NOTAM-ok létrehozásához. A modellhez szükséges rendszer alkotóelem állapot adatokat (pillanatnyi és előrejelzett), vagy az SBAS szolgáltatás biztosítóval kötött kétoldalú szerződésen keresztül lehet beszerezni, vagy pedig az adatok egy valós idejű 'sugárzási' kapcsolatán keresztül, ha az SBAS szolgáltatást biztosító az adatok biztosításának ezt az útját választja.

6.2.7 A résztvevő Államok, vagy körzetek az ICAO-n keresztül fognak koordinálni annak megvalósításáért, hogy az SBAS megszakítás nélküli globális fedést biztosítson, számításba véve azt, hogy az a légijármű, amelyik a jel felhasználásra fel van szerelve, üzemeltetési korlátozásokat szenvedhet el abban az esetben, ha egy Állam, vagy egy körzet nem engedélyezi egy, vagy több SBAS jelnek a légterében történő felhasználását. Az ilyen esetben lehet, hogy a légijármű vezetőjének teljes egészében le kell választania a Globális Navigácós Műhold Rendszert /GNSS/, mivel a légijármű berendezései nem teszik lehetővé az összes SBAS, vagy egy meghatározott SBAS leválasztását.

6.2.8 Mivel az SBAS geostacionárius pályájú műhold fedésterülete (lábnyom) egymást átfedi, „interfész kérdések" lesznek az SBAS-ek között. Minimumként az SBAS légijármű fedélzeti vevőknek képesnek kell lenniük bármilyen SBAS fedésterületén belül üzemelni. Egy SBAS szolgáltatást biztosító részére lehetséges az, hogy olyan geostacionárius pályájú műholdat ellenőrizzen, és sértetlenségi és helyesbítési adatokat küldjön arról, amelyek egy másik SBAS szolgáltatás biztosítóhoz tartoznak. Ez növeli a rendelkezésre állást, a távolság-meghatározási források hozzáadásával. Ehhez a növekedéshez nem szükséges semmilyen 'összekapcsolás' az SBS rendszerek között, és ezt az összes SBAS szolgáltatás biztosítónak teljesítenie kell.

6.2.9 Az integrálás egy másik szintjét lehet megvalósítani az SBAS hálózatok közötti egyedül álló összekapcsolással (azaz önálló műhold összeköttetéssel). Ebben az esetben az SBAS-ek vagy elsődleges műhold mérési adatokat tudnak cserélni egy, vagy több referencia állomástól, vagy feldolgozott adatokat (helyesbítési, vagy sértetlenségi adatokat) a törzs állomásaitól. Ezt az információt fel lehet használni a rendszer hiba-tűrésének és pontosságának növelésére, az adatok középérték meghatározásán keresztül, vagy a teljesség növelésére egy kereszt-ellenőrzési mechanizmuson keresztül.
A rendelkezésre állást ugyancsak növelni lehet a szolgáltatási területen belül, és a műszaki teljesítmény ki fogja elégíteni a GNSS Szabványok és Ajánlott Gyakorlatok előírásait a teljes fedésterületen belül (azaz a műholdak efemerisz ellenőrzése javulni fog). Végül, az SBAS ellenőrző és állapot adatokat lehet cserélni a rendszer karbantartásának növelésére.

6.3 Sértetlenség

6.3.1 A sértetlenség előírásai összetettek, mivel a jellemző tulajdonságok egy része az SBAS földi hálózaton belül kerül meghatározásra és a térbeli-jelbe továbbításra, míg a többi jellemző tulajdonság a légijármű fedélzetén lévő SBAS berendezésen belül kerül meghatározásra. A műhold működési állapotára és az alap helyesbítési funkciókra vonatkozó, az efemerisz és óra /idő/ helyesbítésekre vonatkozó hiba bizonytalanságot az SBAS földi hálózat határozza meg. Ezt a bizonytalanságot egy nulla-átlagú szórásnégyzet modellezi, a normális eloszlást, ami a felhasználói differenciál távolság-mérési hibát (UDRE) írja le az egyes távolság-meghatározási forrásokra, a gyors és a hosszútávú helyesbítések alkalmazása után, valamint az atmoszférikus hatások és vevő hibák kizárásával.

6.3.2 A pontos differenciál funkcióhoz az ionoszférikus helyesbítés egy hiba bizonytalansága is meghatározásra kerül. Ezt a bizonytalanságot egy nulla átlagú szórásnégyzet modellezi, a normális eloszlást, ami az L1, a maradék Felhasználói Ionoszférikus Távolság Hibát (UIRE) írja le az egyes távolság-meghatározási forrásokra, az ionoszférikus helyesbítések alkalmazása után. Ez a szórásnégyzet egy, a Sugárzási Hálózati Ionoszférikus Függőleges Hiba (GIVE) felhasználásával egy ionoszférikus modellből kerül meghatározásra.

6.3.3 Van egy véges valószínűség arra, hogy egy SBAS vevő nem fog venni egy SBAS közleményt. Abból a célból, hogy az ilyen esetben a navigáció folytatódjon, az SBAS teljesítőképesség csökkenési paramétereket sugároz a térbeli-jelben. Ezek a paraméterek több matematikai modellben kerülnek felhasználásra a kiegészítő maradék hibák leírására mindkét, azokhoz az alap és a pontos differenciál helyesbítésekhez, amelyeket az elöregedett, de aktív adatok hoznak létre. A modellek a Felhasználói Differenciál Távolságmérési Hiba /UDRE/ és a Felhasználói Ionoszférikus Távolság Hiba (UIRE) szórásnégyzetének módosítására használatosak, ahogy az megfelelő.

6.3.4 A fentiekben leírt egyedi hiba bizonytalanságokat használja fel a vevő arra, hogy kiszámítsa a navigációs megoldás egy hiba modelljét. Ezt úgy végzi el, hogy a pszeudo-távolság hiba modelleket kivetíti a helyzet területére. A Vízszintes Védelmi Szint (HPL) egy korlátozást biztosít a vízszintes helyzet hibára a sértetlenségi követelményekből levezetett valószínűséggel. Hasonlóképpen, a Függőleges Védelmi Szint (VPL) biztosítja a függőleges helyzet korlátozást. Ha a kiszámított HPL egy meghatározott üzemeltetésre meghaladja a Vízszintes Riasztási Határértéket (HAL), akkor az SBAS sértetlensége nem elegendő annak az üzemeltetésnek az alátámasztására. Ugyanez igaz a precíziós megközelítési és a Megközelítés Fügőleges Vezetéssel /APV/ üzemeltetésekre is, ha a VPL meghaladja a Függőleges Riasztási Határértéket (VAL).

6.3.5 Egy SBAS szolgáltatás biztosító részére az egyik legnagyobb kihívást jelentő feladat a Felhasználói Differenciál Távolságmérési Hiba /UDRE/ és a Hálózati Ionoszférikus Függőleges Hiba /GIVE/ szórásnégyzeteinek meghatározása úgy, hogy a védelmi szint sértetlenségi követelmények kielégítésre kerüljenek anélkül, hogy befolyása lenne a rendelkezésre állásra.
Egy egyedi SBAS teljesítménye függ a hálózat konfigurációjától, a földrajzi kiterjedéstől és a sűrűségtől, a felhasznált mérések típusától és minőségétől, valamint az adatok feldolgozásához használt algoritmusoktól. A modell szórásnégyzet meghatározásának általános módszere a 13. Részben került leírásra.

6.3.6 *Maradék óra és efemerisz hiba* (σ_{UDRE}). A megmaradó óra hiba jól leírható egy nulla átlagú normális eloszlással, mivel több vevő van, ami ebben a hibában részt vesz. A megmaradó efemerisz hiba a felhasználó helyzetétől függő. A pontos differenciál funkció érdekében az SBAS szolgáltatás biztosító biztosítani fogja azt, hogy a megmaradó hiba az összes felhasználó részére egy meghatározott szolgáltatási területen belül a σ_{UDRE}-ben tükrözésre kerüljön. Az alap differenciál funkcióra a megmaradó efemerisz hibát, mint figyelmen kívül hagyhatót, lehet kiértékelni és meghatározni.

6.3.7 *Függőleges ionoszférikus hiba* (σ_{GIVE}). A megmaradók ionoszférikus hibát jól jeleníti mg egy nulla átlagú normális eloszlás, mivel több vevő van, ami az ionoszférikus becslésben részt vesz. A hibák a mérési zajból, az ionoszférikus modellből és az ionoszféra térbeli dekorrelációjából erednek.

Az ionoszférikus hiba által okozott helyzet hibát magának az ionoszférának a pozitív korrelációja csillapítja. Ezenkívül a megmaradó ionoszférikus hiba eloszlásnak levágott végei vannak, azaz az ionoszféra nem tud létrehozni negatív késést és így egy maximális késése van.

6.3.8 *Légijármű fedélzeti alkotó-elem hibák.* Az összetett többutas szóródás és a vevő hozzájárulás úgy kerül korlátozásra, ahogy az a 13. Részben van leírva. Ezt a hibát a többutas szóródásra és a vevő hozzájárulására lehet felosztani úgy, ahogy az a B-Függelék 3.6.5.5.1 pontban meghatározásra került, és a többutas szóródás egy szabvány modelljét lehet felhasználni. A vevő hozzájárulást a pontossági követelményekből (B-Függelék 3.5.8.2 és 3.5.8.4.1 pont) lehet venni és extrapolálni a jellemző jel körülményekre. Kifejezetten a légijárműnél el lehet fogadni azt, hogy $\sigma^2_{air} = \sigma^2_{vevő} + \sigma^2_{többutas}$ hibája van, ahol elfogadott az, hogy a $\sigma_{vevő}$-t az az RMS_{pr_air} határozza meg, ami a Földi Kiegészítő Rendszer /GBAS/ Légijármű-fedélzeti Pontossági Jelölés A-berendezésre előírt, és a $\sigma t_{öbbutas}$-t a B-Függelék 3.6.5.5.1 pontja határozza meg. A légijárműnek a többutas szóródásban való hozzájárulása magában foglalja a magától a légijárműtől eredő reflexiós hatásokat. A más tárgyaktól eredő reflexió által eredményezett többutas hibák nem kerültek számításba. Ha a tapasztalat azt mutatja, hogy ezek a hibák nem elhanyagolhatóak, akkor azokat üzemeltetési szempontból számításba kell venni.

6.3.9 *Troposzférikus hiba.* A vevőnek fel kell használni egy modellt a troposzférikus hatások helyesbítéséhez. A modell maradék hibáját a maximális torzítás, valamint a B-Függelék 3.5.8.4.2 és 3.5.8.4.3 pontjában meghatározott szórásnégyzet eltérés szűkíti. Ennek az átlagnak a hatásait a földi al-rendszernek kell számításba venni. A légijármű fedélzeti felhasználók egy meghatározott modellt alkalmaznak a maradék troposzférikus hibára (σ_{tropo}).

6.4 Rádiófrekvenciás /RF/ jellemzők

6.4.1 *Műhold Bázisú Kiegészítő Rendszer /SBAS/ ál-véletlen zaj (PRN) kódok.* Az RTCA/DO-229C ”A”- Függeléke két módszert biztosít az SBAS PRN kód generálására.

6.4.2 *Műhold Bázisú Kiegészítő Rendszer /SBAS/ hálózat idő.* Az SBAS hálózat idő egy, az SBAS által fenntartott idő referencia a helyesbítések meghatározása céljára. Amikor a helyesbítések alkalmazásra kerülnek, akkor a felhasználó beállítási ideje az SBAS hálózat idejére vonatkozó, és nem pedig a műhold helyzet-sor rendszer idejére. Ha helyesbítések nem kerülnek alkalmazásra, akkor a helyzet megoldás egy összetett, a műhold helyzet-sor rendszer/műhold bázisú kiegészítő rendszer hálózat idejére kerül vonatkoztatásra a felhasznált műholdaktól függően, és a létrejövő pontosságot a közöttük lévő különbség fogja befolyásolni.

6.4.3 *A Műhold Bázisú Kiegészítő Rendszer /SBAS/ konvolúciós kódolása.* Az SBAS közlemények konvolúciós kódolására és dekódolására vonatkozó tájékoztatásokat az RTCA/DO-229C ”A”-Függelékében lehet megtalálni.

6.4.4 *Közlemény időzítés.* A felhasználók konvolúciós dekódere egy rögzített késleltetést fog bevezetni, ami az ő megfelelő algoritmusuktól függ (általában 5 befogás hossz, vagy 35 bit), amelyet ki kell egyenlíteniük a vett jelből az SBAS hálózati idő (SNT) meghatározásához.

6.5 Műhold Bázisú Kiegészítő Rendszer /SBAS/ adat jellemzők

6.5.1 *SBAS közlemények.* A korlátozott sávszélesség miatt az SBAS adatok olyan közleményekbe vannak kódolva, amelyek célja az, hogy a minimálisra csökkentsék a szükséges adat átmenetet. Az RTCA/DO-229C ”A”- Függeléke adja meg az SBAS közlemények részletes előírásait.

6.5.2 *Adatsugárzási időközök.* Az SBAS közlemények közötti maximális sugárzási időközök a ”B”-Függelék B-54. táblázatában kerültek meghatározásra. Ezek az időközök olyanok, hogy az SBAS szolgáltatási területére belépő felhasználó képes egy helyesbített helyzet információ kimenetet kapni, az SBAS által biztosított sértetlenségi információval együtt, elfogadható időn belül. Az útvonal, a közelkörzeti és a nem-precíziós megközelítési /NPA/ üzemeltetésekhez szükséges adatok 2 percen belül vételre fognak kerülni, míg a precíziós megközelítési üzemeltetésekre ez maximum 5 percet fog jelenteni. A sugárzások közötti maximális időközök nem garantálják a pontossági teljesítmény egy meghatározott szintjét, ahogy az a 3. Fejezet 3.7.2.4-1. táblázatában meghatározásra került. Abból a célból, hogy egy adott pontossági teljesítmény biztosítva legyen, az egyes szolgáltatás biztosítók el fognak fogadni egy sugárzási időköz rendszert az olyan különféle paramétereket figyelembe véve, mint például a konstelláció típusa (azaz GPS Szelektív elérhetőséggel /SA/, GPS SA nélkül) vagy az ionoszférikus aktivitás.

6.5.2.1 A gyors helyesbítésekre a B-54. táblázat lehetővé teszi azt, hogy a maximális sugárzási időköz 60 másodperc legyen. A B-56. táblázat megadja a különféle adat közleményekre az adat idő túllépési időközöket a B-57. táblázatra hivatkozva, ami a gyors helyesbítések idő túllépési időközét a gyors helyesbítések teljesítőképesség csökkenési jelzése (ai_i) függvényeként mutatja be. Azonban ha a szolgáltatás biztosító a gyors helyesbítés sugárzási időközeként a 60 másodpercet választja és az ai_i 15 volt, akkor a felhasználó amiatt, hogy az adat idő túllépés megelőzi a következő sugárzást, nem kapná meg a gyors helyesbítéseket a Nem-precíziós megközelítési (NPA) és a Függőleges útirány vezetéses megközelítés – I. (APV-I.) minden egyes percének 42 másodpercére és az APV-II., valamint a Precíziós megközelítés (PA) minden egyes percének 48 másodpercére.

Abból a célból, hogy biztosítva legyen az, hogy a légijármű fedélzeti elemei érvényes gyors helyesbítéseket ilyen megszakítások nélkül dolgozzanak fel, a gyors helyesbítésekre a maximális sugárzási időközt olyan értékre kell beállítani, ami az NPA és az APV-I. gyors helyesbítési idő túllépésének az egyharmada, és az APV-II. és a PA gyors helyesbítési idő túllépésének a fele, ahogy azt az ai_i meghatározza.

Megjegyzés. – A maximális gyors helyesbítés sugárzási időközöket az egyes ai_i-kre az RTCA/DO-229C A-8. táblázatában lehet megtalálni.

6.5.3 *Idő-a-riasztásig.* A D-2. ábra adja meg a 3. Fejezet 3.7.2.4-1. táblázatában meghatározott teljes idő-a-riasztásig kiosztás magyarázó anyagát. Az idő-a-riasztásig követelmények a B-Függelék 3.5.7.3.1, 3.5.7.4.1 és 3.5.7.5.1 pontjában leírtak (a GNSS műhold állapotok, az alap differenciál helyesbítések és a pontos differenciál helyesbítési funkcióknak – külön-külön – megfelelő), a D-2. ábrában bemutatottak pedig magukba foglalják mind a földi, mind az űrbeli elosztást.

6.5.4 *Troposzférikus funkció.* Mivel a troposzférikus törés egy helyi elhajlási jelenség, ezért a felhasználók fogják kiszámítani a saját troposzférikus késési helyesbítéseiket. A precíziós megközelítésre egy troposzférikus késési becslés került leírásra az RTCA/DO-229C-ben, ennek ellenére más modellt is fel lehet használni.

6.5.5 *Többutas szóródási megfontolások.* Az SBAS hely-meghatározási hibáinak az egyik legnagyobb hozzájárulója a többutas szóródás, és mind a földi, mind a légijármű fedélzeti elemekre hatással van. Az SBAS földi elemeinél hangsúlyt kell fektetni a többutas szóródás hatásának lecsökkentésére, vagy csillapítására, amennyire az csak lehetséges, úgy, hogy a térbeli-jel bizonytalansága kicsi legyen. Több csillapítási technika került tanulmányozásra mind az elméleti, mind a tapasztalati távlatokban. A legjobb megközelítés az SBAS referencia állomásoknak a minimális többutas szóródási hibákkal való megválasztására:

a) Annak biztosítása, hogy többutas szóródási csökkentő jellemzőjű antenna kerüljön kiválasztásra;

b) A földi síkfelület technika mérlegelése;

c) Annak biztosítása, hogy az antenna egy alacsony többutas terjedési hatású helyszínen kerüljön elhelyezésre; és

d) Többutas szóródás csökkentő vevő hardver és jelfeldolgozó technika alkalmazása.

6.5.6 *GLONASS adat kibocsátás.* Mivel a meglévő GLONASS felépítés nem biztosít egy egyértelműen meghatározott azonosítót az efemerisz és az óra adatok sorozatának azonosítására, ezért az SBAS egy különleges mechanizmust fog felhasználni ahhoz, hogy a sugárzott helyesbítések alkalmazásában minden bizonytalanság elkerülésre kerüljön. Ez a mechanizmus a D-3. ábrában kerül elmagyarázásra. A várakozási idő és az érvényességi időtartam meghatározását a hozzá kapcsolódó kódolási követelményekkel együtt a
”B”- Függelék 3.5.4 részében lehet megtalálni. A felhasználó a vett hosszú-távú helyesbítéseket csak akkor alkalmazhatja, ha a fedélzeten felhasznált GLONASS efemerisz és óra adatállomány az érvényességi időtartamon belül kerül vételre.

6.6 Műhold Bázisú Kiegészítő Rendszer /SBAS/ Végső Megközelítési Szakasz (FAS) adatblokk

6.6.1 A Műhold Bázisú Kiegészítő Rendszer /SBAS/ Végső Megközelítési Szakasz (FAS) adatblokk egy meghatározott megközelítési eljárásra a D-1. táblázatban kerül bemutatásra. Ez ugyanolyan, mint a Földi Bázisú Kiegészítő Rendszer /GBAS/ Végső Megközelítési Szakasz /FAS/ adatblokkja, amely a ”B”- Függelék 3.6.4.5 pontjában került meghatározásra azzal a kivétellel, hogy az SBAS FAS adatblokk magába foglalja még a megközelítési eljárásra használatos Oldalirányú /Vízszintes/ Riasztási Határértéket /HAL/ és a Függőleges Riasztási Határértéket /VAL/ úgy, ahogy az a 6.3.4 pontban leírásra került.

6.6.2 A Műhold Bázisú Kiegészítő Rendszer /SBAS/ Végső Megközelítési Szakasz (FAS) adatblokkja és néhány Földi Bázisú Kiegészítő Rendszer /GBAS/ megközelítés egy közös fedélzeti adatblokkban van tárolva, mely támogatja mind a Műhold Bázisú Kiegészítő Rendszert /SBAS/, mind a Földi Bázisú Kiegészítő Rendszert /GBAS/. Ezen az adatbázison belül minden egyes megközelítéshez egyedi csatorna kiosztásnak kell tartoznia és ezt a polgári hatóságoknak kell koordinálnia. Az Államok a felelősek az adatbázisba kerülő Végső Megközelítési Szakasz (FAS) adat biztosításáért. Egy egyedi megközelítési eljárás Végső Megközelítési Szakasz (FAS) adatblokkja a ”B”- Függelék 3.6.4.5.1 pontja és a B-66. Táblázat alatt van ismertetve.

D-1. Táblázat: Műhold Bázisú Kiegészítő Rendszer (SBAS)

Végső Megközelítési Szakasz (FAS) adatblokk

Adattartalom	Felhasznált bitek száma	Érték tartomány	Felbontás
Üzemeltetés típusa	4	0-tól 15-ig	1
SBAS szolgáltatás biztosító azonosító (ID)	4	1-től 15-ig	1
Repülőtér azonosító (ID)	32	-	-
Futópálya azonosító száma (1. Megjegyzés)	6	0-tól 36-ig	1
Futópálya azonosító betűjele	2	-	-
Megközelítési teljesítmény kijelölő	3	0-tól 7-ig	1
Útvonal jelzés	5	-	-
Referencia pálya adat kiválasztó	8	0-tól 48-ig	1
Referencia pálya azonosító	32	-	-
Leszállási küszöb-pont / Látszólagos küszöb-pont (LTP/FTP) földrajzi szélesség	32	±90,0°	0,0005 arc szekundum

Adattartalom	Felhasznált bitek száma	Érték tartomány	Felbontás
Leszállási küszöb-pont / Látszólagos küszöb-pont (LTP/FTP) földrajzi hosszúság	32	±180,0º	0,0005 arc szekundum
Leszállási küszöb-pont / Látszólagos küszöb-pont (LTP/FTP) magasság	16	-512,0-tól 6041,5m-ig	0,1m
Repülési pálya irány-pont ∆FPAP földrajzi szélesség	24	±1,0º	0,0005 arc szekundum
Repülési pálya irány-pont ∆FPAP földrajzi hosszúság	24	±1,0º	0,0005 arc szekundum
Megközelítési küszöb keresztezési magasság (TCH) (2. Megjegyzés)	15	0-tól 1638,35m-ig (0-tól 3276,7 láb)	0,05m (0,1 láb)
Megközelítési küszöb keresztezési magasság (TCH) mértékegység kiválasztó	1	-	-
Siklópályaszög (GPA)	16	0-tól 90º-ig	0,01º
Útirány szélesség a küszöbnél (1. Megjegyzés)	8	80,0-tól 143,75m-ig	0,25m
∆Hosszúság (távolság) eltolás	8	0-tól 2032m-ig	8m
Oldalirányú Vízszintes riasztási határérték (HAL)	8	0-tól 50,8m-ig	0,2m
Függőleges riasztási határérték (VAL) (3. Megjegyzés)	8	0-tól 50,8m-ig	0,2m
Végső megközelítés szakasz Ciklikus Redundancia Ellenőrzés (CRC)	32	-	-

1. Megjegyzés. – Amikor a futópálya száma 00-ra van állítva, akkor az útirány szélesség mező figyelmen kívül van hagyva és az útirány szélessége 38 m.

2. Megjegyzés. – Az információ megadható méterben, vagy lábban, amit a megközelítési küszöb keresztezési magasság (TCH) mértékegység jelez.

3. Megjegyzés. – A 0-s értékű Függőleges Riasztási Határérték (VAL) azt jelzi, hogy függőleges eltéréseket nem használnak (azaz megközelítés csak oldalirányú útirány-vezetéssel)

7. Földi Bázisú Kiegészítő Rendszer (GBAS) és Földi Bázisú Regionális Kiegészítő Rendszer (GRAS)

Megjegyzés. – Ebben a részben, kivéve ott, ahol külön meg van említve, a Megközelítés Függőleges Vezetéssel (APV) elnevezés APV-I-t és APV-II-t jelent.

7.1 Rendszer leírás

7.1.1 A GBAS földi és légijármű fedélzeti alkotó-elemeket foglal magába. Egy GBAS földi al-rendszer (földi állomás) tipikusan a következőkből épül fel: egy egyedül álló VHF adat sugárzó (VDB) adó a sugárzó antennával – ezt sugárzó állomásnak jelölik, - valamint több referencia vevő. Egy GBAS földi al-rendszer állhat több VDB adóból és antennából, melyek megosztoznak egy közös GBAS azonosítón (GBAS ID) és frekvencián ugyanúgy, mint a kisugárzandó adaton.
Egy GBAS földi al-rendszer (földi állomás) támogatni tudja a 'fedésterületén belül' lévő összes légijármű fedélzeti al-rendszert – ellátva a légijárműveket megközelítési adatokkal és a GNSS műholdak helyesbítési és sértetlenségi információival.
Az összes olyan nemzetközi repülőgép, mely alátámasztja a Megközelítés Függőleges Vezetéssel-t (APV), köteles kezelni a fedélzeti adatbázison belül a megközelítési adatot.
A 4. Típusú üzenetet kell kisugározni, ha a földi al-rendszer támogatja az 1. Kategóriájú precíziós megközelítéseket. A 4. Típusú üzenetet akkor is ki kell sugározni, amikor a földi al-rendszer APV megközelítéseket támogat, miközben a megközelítési adatra a fedélzeti adatbázisban szereplő Államnak erre nincs szüksége.

Megjegyzés. – A GBAS al-rendszerek közötti teljesítmény követelmények kiosztását és a kiosztás módszertanát az RTCA/DO-245 Minimális Repülési Teljesítmény Szabványok a Globális Helymeghatározó Rendszerre/Helyi Körzeti Kiegészítő Rendszerre (GPS/LAAS)-ban lehet megtalálni. A Földi Bázisú Regionális Kiegészítő Rendszer (GRAS) fedélzeti berendezés számára a Minimális Működési Teljesítmény Szabványok kidolgozás alatt van, ezt az RTCA végzi.

7.1.2 A GBAS földi al-rendszerek két szolgáltatást biztosítanak: a precíziós megközelítési szolgáltatást és a GBAS hely-meghatározási szolgáltatást. A precíziós megközelítési szolgáltatás 'eltérési' repülési pálya-vezetést biztosít a végső megközelítési szakaszokra, míg a GBAS hely-meghatározási szolgáltatás vízszintes helyzet információkat biztosít az RNAV üzemeltetéseknek a közelkörzeti területen belüli alátámasztásra. A két szolgáltatás között a másik alapvető megkülönböztetés az eltérő teljesítmény követelmények, összekapcsolódva a támogatott egyedi eljárásokkal (lásd 3.7.2.4-1. Táblázatot), beleértve az eltérő sértetlenségi /integritás/ követelményeket, amelyek a 7.5.1 pontban kerülnek tárgyalásra.

7.1.3 A GBAS földi al-rendszerek elsődleges megkülönböztető jellemzője az, hogy sugározzák-e a kiegészítő efemerisz-hiba helyzet határ paramétereket. Ez a jellemző a hely-meghatározási szolgáltatáshoz szükséges, de választható a megközelítési szolgáltatásokhoz is. Amikor a kiegészítő efemerisz-hiba helyzet határok nem kerülnek sugárzásra, akkor a földi al-rendszer felelős a távolság-mérési források efemerisz adatai sértetlenségének biztosításáért anélkül, hogy a légijárművek az efemerisz határokat számítanák és alkalmaznák, ahogy az a 7.5.9 pontban tárgyalásra kerül.

7.1.4 Ennek megfelelően a GNSS szabványoknak eleget tevő GBAS földi al-rendszereknek többféle lehetséges konfigurációja van:

a) Az a konfiguráció, amely csak az I. kategóriájú megközelítéseket támasztja alá;

b) Az a konfiguráció, amely alátámasztja az I. Kategóriájú precíziós megközelítéseket és az APV-t, és még sugározza a kiegészítő efemerisz-hiba helyzet határ paramétereket is; és

c) A konfiguráció, amely alátámasztja az I. Kategóriájú precíziós megközelítést, az APV-t és a GBAS hely-meghatározási szolgáltatást, miközben sugározza a b) pontban hivatkozott efemerisz-hiba helyzet határ paramétereket is.

d) A konfiguráció, amely alátámasztja az APV és GBAS hely-meghatározási szolgáltatást és a Földi Bázisú Regionális Kiegészítő Rendszeren (GRAS) belül használják.

7.1.5 A felhasználó szempontjából egy Földi Bázisú Regionális Kiegészítő Rendszer (GRAS) földi al-rendszer (földi állomás) egy, vagy több GRAS földi al-rendszerből áll (ahogy a 7.1.1-től a 7.1.4 pontig ismertetve van), mindegyik egy egyedi GBAS azonosítóval rendelkezik és alátámasztják a hely-meghatározási szolgáltatást és az APV-t, ahol szükséges. Több GBAS sugárzó állomás használatával és a 101. Típusú üzenet kisugárzásával a GRAS alkalmassá válik, hogy támogassa az útvonal eljárásokat a GBAS hely-meghatározási szolgáltatáson keresztül, miközben támogatja a körzeti, az indulási és APV eljárásokat is egy nagyobb lefedési területen, mint azt tipikusan a GBAS teszi. Néhány GRAS alkalmazásnál a 101. Típusú üzenetben kisugárzott helyesbítések a lefedési területen elosztott referencia vevők hálózatából megszerzett adat felhasználásával számíthatók ki. Ez lehetővé teszi a mérési hibák és a vevő hibák észlelését és csökkentését.

7.1.6 Egy GBAS földi al-rendszer (földi állomás) minden sugárzó állomása azonos adatot sugároz ki azonos frekvencián, ugyanazzal a GBAS azonosítóval. A repülőgép fedélzeti vevőjének nem szükséges és nem is tud különbséget tenni a GBAS földi al-rendszer különböző sugárzó állomásaitól érkező üzenetei között. Amikor két ilyen sugárzó állomás lefedési területén belül van, a vevő kétszer kapja meg és dolgozza fel ugyanazt az üzenetet eltérő idő-osztásos többszörös hozzáférésű (TDMA) időrésben.

7.1.7 Az RTCA/DO-253A szabványú GBAS földi és a fedélzeti egységek közötti működőképességet a ”B”- Függelék 3.6.8.1 pont tartalmazza. Az RTCA/DO-253A előírásnak megfelelő GBAS vevők nem lesznek kompatibilisek a 101. Típusú üzeneteket sugárzó GRAS földi al-rendszerekkel. Ugyanakkor az RTCA GRAS MOPS-nak megfelelő GRAS és GBAS vevők kompatibilisek a GBAS földi al-rendszerekkel. A Szabványok és Ajánlott Gyakorlatok-nak megfelelő GBAS vevők lehet, hogy nem tudják dekódolni helyesen a GBAS földi al-rendszerektől az APV-hez kiadott Végső Megközelítési Szakasz (FAS) adatot.
Ezek a vevők a Végső Megközelítési Szakasz Oldalirányú Riasztási Határérték (FASLAL) és a Végső Megközelítési Szakasz Függőleges Riasztási Határérték (FASVAL) adatot úgy kezelik, mintha 1. Kategóriás precíziós megközelítésű vezetés lenne. A biztonságos üzemeltetés biztosítása érdekében megfelelő üzemeltetési szigorításokat kell alkalmazni.

7.1.8 A GBAS VDB adat sugárzás vagy vízszintes, vagy elliptikus polarizációval (GBAS/H, vagy GBAS/E) történik. Ez lehetővé teszi a szolgáltatás biztosítóknak azt, hogy hozzá igazítsák a sugárzást az üzemeltetési követelményeikhez és a felhasználói közösséghez.

7.1.9 A légijárművek többsége vízszintesen polarizált VDB adat sugárzási vevő antennával lesz felszerelve, ami képes lesz arra, hogy a VDB adat sugárzást mind a GBAS/H, mind a GBAS/E berendezésektől vegyék. A légijárművek egy része függőlegesen polarizált antennával lesz felszerelve, felszerelési korlátozások, vagy gazdaságossági megfontolások miatt. Ezek a légijárművek nem egyeztethetők össze a GBAS/H berendezéssel, és ennek megfelelően olyan GBAS-alapú üzemeltetésekre korlátozottak, amelyeket GBAS/E támaszt alá.

7.1.10 A GBAS szolgáltatás biztosítóknak közzé kell tenniük a földi állomások típusát (GBAS/H, vagy GBAS/E) az egyes GBAS állomásokra a Légiforgalmi Tájékoztató Kiadványban (AIP). Azoknak a légijármű üzemeltetőknek, akik függőlegesen polarizált vevő antennákat használnak, figyelembe kell venni ezt az információt, amikor a repülési üzemeltetéseiket kezelik, beleértve a repülés tervezési és esetleges eljárásokat is.

7.2 Rádiófrekvenciás /RF/ jellemzők

7.2.1 *Frekvencia és időrés tervezés*

7.2.1.1 *Teljesítmény tényezők*

7.2.1.1.1 Egy tervezett GBAS állomás és meglévő VOR, vagy GBAS telepített berendezések közötti földrajzi elkülönítéseknél a következő tényezőket kell számításba venni:

a) A tervezett GBAS fedésterületének kiterjedését, a minimális térerősségét és a kisugárzott teljesítményét (ERP) a GBAS helymeghatározási szolgáltatást is beleértve, ha ilyet biztosítanak. A fedésterületre és a térerősségre vonatkozó minimális követelményeket a 3. Fejezet 3.7.3.5.3 és 3.7.3.5.4.4 pontjában lehet megtalálni külön-külön. A kisugárzott teljesítményt /ERP/ ezekből a követelményekből lehet meghatározni;

b) A környezetben lévő VOR és GBAS állomások fedésterületének kiterjedését, minimális térerősségét és kisugárzott teljesítményét /ERP/, a GBAS helymeghatározási szolgáltatást is beleértve, ha ilyet biztosítanak. A VOR-ra vonatkozó fedésterület és térerősség előírásokat a 3. fejezet 3.3 pontjában lehet megtalálni; és a megfelelő útmutató anyagot a "C"- Melléklet adja meg;

c) A VHF adat sugárzás /VDB/ vevők teljesítményét, beleértve a közös-csatorna és a szomszédos csatorna csillapítást és az FM sugárzás jeleitől származó kereszt-modulációs termékek iránti érzékenység csökkentést és védettséget. Ezek a követelmények a
"B"-Függelék 3.6.8.2.2 pontjában találhatók;

d) A VOR vevők teljesítményét, beleértve a közös-csatorna és szomszédos csatorna csillapítást a VHF adat sugárzás (VDB) jeleire. Mivel a meglévő VOR vevők nem kifejezetten úgy voltak megtervezve, hogy elnyomják a VHF adat sugárzás adásait, a megkívánt – nem-kívánt (D/U) jel arányok a VHF adat sugárzás /VDB/ közös csatorna és szomszédos csatorna elnyomása tapasztalati alapon kerültek meghatározásra. A D-2. táblázat összegzi az elfogadott jel arányokat nagyszámú 50 kHz-s csatorna-elosztással tervezett VOR vevő tapasztalati teljesítményeire alapozva;

e) A frekvencia „zsúfoltságú" területeken/körzetekben a frekvencia szétválasztás pontos meghatározására lehet szükség a megfelelő követelmények alkalmazásával.
7.2.1.1.2 A VHF adat sugárzás /VDB/ névleges kapcsolat kiosztása a D-3. táblázatban kerül bemutatásra. A táblázatban elfogadott számok egy 3000 m-es (10 000 láb) közepes tengerszint feletti magasságra /MSL/ és olyan adó antennára épülnek, amelyet úgy terveztek, hogy elnyomja a földi besugárzást abból a célból, hogy a halkulási veszteséget a fedésterület határvonalainál egy maximális 10 dB-es értékre korlátozza. A GBAS/E berendezés esetében a 10 dB magában foglalja még a vízszintes és függőleges összetevők közötti interferencia miatti jel veszteség bármilyen hatását is.

7.2.1.2 *Frekvenciamodulációs /FM/ érzéketlenség*

7.2.1.2.1 Miután a 'tervezett' frekvencia azonosításra került, az, amely a GBAS és a VOR frekvencia elválasztási követelményeket kielégíti, meg kell határozni a frekvenciamodulációs /FM/ továbbítással való összeférhetőségét is. Ezt úgy kell elvégezni, hogy azt a módszert kell alkalmazni, mint amit az FM-nek a VOR-ral történő összeegyeztethetőségénél használtak. Ha az FM sugárzás megsérti ezt a követelményt, akkor egy választható kijelölt frekvenciát kell figyelembe venni.

D-2. táblázat: Elfogadott Megkívánt $[D/U]_{required}$ jel arányok a VOR-nak a GBAS VHF adat sugárzás /VDB/ elleni védelméhez

Frekvencia eltolás	A VOR vevők védelméhez szükséges $[D/U]_{required}$ arány (dB)
Közös csatorna	26
$\mid f_{VOR} – f_{VDB} \mid$ = 25 kHz	0
$\mid f_{VOR} – f_{VDB} \mid$ = 50 kHz	–34
$\mid f_{VOR} – f_{VDB} \mid$ = 75 kHz	–46
$\mid f_{VOR} – f_{VDB} \mid$ = 100 kHz	–65

D-3. táblázat: Névleges VHF adat sugárzási /VDB/ kapcsolat kiosztás

VHF adat sugárzási /VDB/ kapcsolat elemek	A kapcsolat kiosztás függőleges elemei a fedésterület határánál	A kapcsolat kiosztás vízszintes elemei a fedésterület határánál
Szükséges vevő érzékenység (dBm)	–87	–87
Maximális légijármű kivitelezési veszteség (dB)	11	15
A légijármű antennája utáni teljesítmény szint (dBm)	–76	–72
Üzemeltetési határérték (dB)	3	3
Jel-feszültség csökkenési határérték (dB)	10	10
Szabadtér-beli jel út veszteség (dB) 43 km-nél (23 tengri mérföld)	106	106
Névleges kisugárzott teljesítmény (dBm)	43	47

7.2.1.2.2 Az érzéketlenítés nincs alkalmazva a 107,7 MHz feletti FM vivőhullámokra és a 108,050 MHz-es VHF adat sugárzó /VDB/ csatornákra, azért, mert az ilyen magas szintű sugárzások csatornán kívüli összetevői a 107,7 MHz feletti FM állomásoktól zavarni fogják a Földi Bázisú Kiegészítő Rendszer /GBAS/ VHF adat sugárzási (VDB) üzemeltetéseket a 108,025 és a 108,050 MHz-en, ennélfogva ezeket a kijelöléseket ki kell zárni, kivéve bizonyos speciális kijelöléseknél, az olyan földrajzi területeken, ahol a működő FM sugárzó állomások száma kevés, és az interferencia létrehozása a VHF adat sugárzó vevőknél valószínűtlen.

7.2.1.2.3 A frekvencia-modulációs /FM/ kereszt-modulációs érzéketlenségi követelmények nem alkalmazandók a 108,1 MHz alatt üzemelő VDB csatornákra, ennélfogva a 108,1 MHz alatti kijelöléseket ki kell zárni, kivéve bizonyos speciális kijelöléseknél, az olyan földrajzi területeken, ahol a működő FM sugárzó állomások száma kevés, és nem valószínű az, hogy kereszt-modulációs termékeket hoznak létre a VDB vevőknél.

7.2.1.3 *Földrajzi elkülönítési módszerek*

7.2.1.3.1 Az alábbi módszereket lehet felhasználni a GBAS –GBAS közötti, valamint a GBAS – VOR közötti szükséges földrajzi elkülönítés meghatározásához. Ezek arra támaszkodnak, hogy megvédjék a minimális megkívánt – nem-kívánt jel arányt. A $[D/U]_{required}$ úgy van meghatározva, mint az a jel arány, amelyet arra tervezetek, hogy megvédje a megkívánt jelet egy nem-kívánt adás közös csatorna, vagy szomszédos csatorna interferenciájától. A $[D/U]_{required}$ értékei, amelyek a GBAS vevőnek a nem-kívánt GBAS, vagy VOR jelektől való védelméhez szükségesek, a "B"- Függelék 3.6.8.2.2.5 és 3.6.8.2.2.6 pontjában kerültek meghatározásra. Azok a $[D/U]_{required}$ értékek, amelyek a VOR vevőnek a GBAS VHF Adat-sugárzás /VDB/ adásaitól való védelmére szántak – ahogy azt a D-2. Táblázat bemutatja – nem kerültek a Szabványok és Ajánlott Gyakorlatokban /SARPs/ meghatározásra, és azokat az elfogadott értékeket mutatják be, amelyek ellenőrző méréseken alapulnak.

7.2.1.3.2 A földrajzi elkülönítés leszűkítésre került a $[D/U]_{required}$ megvédésére a megkívánt jel fedésterület határvonalánál, ahol a megkívánt jel teljesítményt a 3. Fejezetben lévő minimális térerő követelményekből vezették le. A megkívánt jelszint, dBm-re átalakítva, $P_{D,min}$-ként van jelölve. A nem-kívánt jelre megengedett ($P_{U,allowed}$) jel teljesítmény a következő:

$$P_{U,allowed}\,(\text{dBm}) = (P_{D,min}\,(\text{dBm}) - [D/U]_{required}\,(\text{dBm}))$$

A nem-kívánt jel teljesítmény, a P_U dBm-re átalakítva:

$$P_U\,(\text{dBm}) = (Tx_U\,(\text{dBm}) - L\,(\text{dB}))$$

ahol:

Tx_U = a nem-kívánt jel adójának kisugárzott teljesítménye; és

L = a nem-kívánt jel adójának átviteli vesztesége, beleértve a szabad-térbeli átviteli veszteséget, az atmoszférikus és föld hatásokat. Ez az átviteli veszteség a nem-kívánt jel adója és a megkívánt jel fedésterületi körzetének határa közötti távolságtól függ.

Annak biztosítására, hogy a $D/U_{required}$ kielégítésre kerüljön, a P_U kisebb, egyenlő, mint $D_{U,allowed}$.

Egy csatorna kijelölésének a korlátozása ennek megfelelően:

$$L(\text{dB}) \geq ([D/U]_{required}\,(\text{dB}) + Tx_U\,(\text{dBm}) - P_{D,min}\,(\text{dBm}))$$

7.2.1.3.3 Az átviteli veszteséget az ITU-R Ajánlás P.528-2-ben lévő szabvány terjedési modellből lehet megkapni, vagy a rádióhorizontig terjedő szabadtérbeli csillapításból és azután egy állandó 0,5 dB/tengeri mérföld csillapítási tényezőből. Ez a két módszer egy kissé eltérő földrajzi elkülönítést eredményez a közös csatornára és az első szomszédos csatornákra, és azonos elkülönítést, amint a második szomszédos csatorna kerül figyelembevételre. A szabadtérbeli terjedés közelítése alkalmazásra került ebben az útmutató anyagban.

7.2.1.4 *Példa a GBAS/GBAS földrajzi elkülönítési követelményekre*

7.2.1.4.1 A GBAS VHF adat sugárzás /VDB/ közös csatornájú átvitelére, amely azonos időrésre van kiosztva, a vízszintes polarizáció paraméterei a következők:

D/U	=	26 dB ("B"- Függelék 3.6.8.2.2.5.1 pont);
$P_{D,min}$	=	–72 dBm (ez megfelel 215 mikrovolt/méter-nek, 3. Fejezet 3.7.3.5.4.4 pontja); és
Tx_U	=	47 dBm (kapcsolt kiosztás példa, D-2. Táblázat);

Ennek megfelelően:

$$L \geq (47 + 26 - (-72)) = 145\ \text{dB}.$$

7.2.1.4.2 A közös csatornájú, közös résidejű GBAS VDB kiosztások földrajzi elkülönítését úgy lehet megkapni, hogy meghatározzák azt a távolságot, amelynél az átviteli veszteség 145 dB-el egyenlő a 3000 m-es (10 000 láb) tengerszint feletti magasságon, azon pont felett, ahol a GBAS VDB adó antennája van. Ez a távolság 318 km (172 tengeri mérföld) egy szabadtér-beli csillapítási megközelítést használva és egy elfogadható adó antenna magasságot figyelembe véve. Ezután a minimális szükséges földrajzi elkülönítést meg lehet határozni ennek a távolságnak a GBAS adó 43 km-es (23 tengeri mérföld) távolsága és a fedésterület határvonala közötti névleges távolsághoz történő hozzáadásával. Ez egy közös csatornájú, közös résidejű 361 km-es (195 tengeri mérföld) újrafelhasználási távolságot eredményez.

7.2.1.5 *Irányvonalak a GBAS/GBAS földrajzi elkülönítési követelményhez.* A fentiekben leírt módszer alkalmazásával jellemző földrajzi elkülönítési követelményeket lehet meghatározni a GBAS – GBAS és a GBAS – VOR elkülönítésekre. A létrejövő GBAS – GBAS közötti minimálisan szükséges földrajzi elkülönítési követelmények eredményei a D-4. Táblázatban kerültek összefoglalásra.

Megjegyzés. – Az olyan GBAS adók közötti földrajzi elkülönítési követelmények, amelyek GBAS helymeghatározási szolgáltatást biztosítanak, kidolgozás alatt állnak. Körültekintő értékeket – amelyek a rádióhorizontnak felelnek meg – lehet alkalmazni ideiglenes értékként az azonos frekvenciájú, szomszédos idősésű adókra annak biztosítására, hogy az időrések nem fognak átfedést adni.

7.2.1.6 *Irányvonalak a GBAS/VOR földrajzi elkülönítési követelményekhez.* A GBAS/VOR minimális földrajzi elkülönítési követelmények a D-5. Táblázatban kerültek összefoglalásra, ezek ugyanazon a módszeren és névleges VOR fedésterület kiterjedésen alapulnak, mint ami a ”C”- Mellékletben található.

1. Megjegyzés. – Amikor a VOR és a GBAS közötti földrajzi elkülönítés meghatározásra kerül, akkor a VOR mint megkívánt jel, a korlátozó eset általában a VOR fedésterületei körzetének nagyobb védettségi magassága miatt.

2. Megjegyzés. – Csökkentett földrajzi elkülönítési követelményeket lehet elérni az ITU-R Ajánlás P.528-2-ben meghatározott szabvány terjedési modellek alkalmazásánál.

D-4. táblázat: A jellemző GBAS/GBAS frekvencia kijelölési követelmény

A nem-kívánt VDB csatorna azonos időrésben	Útvonal veszteség (dB)	Minimális szükséges földrajzi elkülönítés a TxU = 47 dBm-re és PD,min = –72 dBm-re km-ben (tmf)
Közös csatorna	145	361 (195)
1. szomszédos csatorna (±25 kHz)	101	67 (36)
2. szomszédos csatorna (±50 kHz)	76	44 (24)
3. szomszédos csatorna (±75 kHz)	73	Nincs korlátozás.
4. szomszédos csatorna (±100 kHz)	73	Nincs korlátozás.

Megjegyzés. – Nem várhatóak földrajzi adó korlátozások a közös frekvenciájú szomszédos idősésű adók között, feltéve, hogy a nem-kívánt jelű VDB sugárzó antenna legalább 200 m-re van azoktól a területektől, ahol a megkívánt jel a minimális térerőnél van.

D-5. táblázat: A minimális szükséges földrajzi elkülönítés egy VOR fedésterületre (12 000 m (40 000 láb) szinten)

Nem-kívánt GBAS VDB csatorna	Útvonal veszteség (dB)	A V OR fedésterület sugara		
		342 km (185 tengeri mérföld)	300 km (162 tengeri mérföld)	167 km (90 tengeri mérföld)
Közös csatorna	152	892 km (481 tengeri mérföld)	850km (458 tengeri mérföld)	717km (386 tengeri mérföld)
$\lvert f_{Megkívánt} - f_{Nem\text{-}kívánt} \rvert = 25$ kHz	126	774 km (418 tengeri mérföld)	732 km (395 tengeri mérföld)	599 km (323 tengeri mérföld)
$\lvert f_{Megkívánt} - f_{Nem\text{-}kívánt} \rvert = 50$ kHz	92	351 km (189 tengeri mérföld)	309 km (166 tengeri mérföld)	176 km (94 tengeri mérföld)
$\lvert f_{Megkívánt} - f_{Nem\text{-}kívánt} \rvert = 75$ kHz	80	344 km (186 tengeri mérföld)	302 km (163 tengeri mérföld)	169 km (91 tengeri mérföld)
$\lvert f_{Megkívánt} - f_{Nem\text{-}kívánt} \rvert = 100$ kHz	61	Nincs korlátozás.	Nincs korlátozás.	Nincs korlátozás.

Megjegyzés. – A számítások a 112 MHz-es referencia frekvencián alapulnak és a GBAS Tx_U = 47 dBm és a VOR $P_{D,min}$ = –79 dBm.

7.2.2 A GBAS/ILS és a GBAS/VHF hírközlés földrajzi elkülönítési követelményei kidolgozás alatt állnak.

7.2.3 *Az ILS-el való kompatibilátás.* Addig, amíg a GBAS VDB és az ILS kompatibilitási követelményei kidolgozásra nem kerülnek, a VHF adat sugárzást /VDB/ nem lehet kijelölni a 112,025 MHz alatti csatornákra. Amikor egy magas frekvencia kijelölésű ILS van ugyanazon a repülőtéren, ahol a VHF adat sugárzás /VDB/ frekvenciája a 112 MHz közelében van, akkor szükségszerűen figyelembe kell venni az ILS és a VDB kompatibilitását. A VDB csatornák kijelölésének megfontolásai magukba foglalják az ILS és a VDB közötti frekvencia elkülönítést, az ILS fedésterülete és a VDB közötti távolsági elkülönítést, a VDB és az ILS térerősségét, valamint a VDB és az ILS érzékenységét. Egy GBAS berendezésre – aminek az adó teljesítménye 150 W-ig terjedő (GBAS/E), 100 W a vízszintes összetevőre és 50 W a függőleges összetevőre, vagy 100 W (GBAS/H), a 16. csatornájának (és azon túl) –106 dBm-el alatta kell lenni a VDB adótól 200 m-es távolságnál, beleértve egy +5 dB-es pozitív visszaverődés figyelembevételét is. Ez a –106 dBm-es számjegy egy –86 dBm-es iránysávadó jelet feltételez az ILS vevő bemenetén és egy minimális 20 dB-es jel-zaj arányt.

7.2.4 *Kompatibilitás a VHF összeköttetésekkel.* A 116,400 MH-es GBAS VHF adat sugárzásnál /VDB/ szükségszerű a VHF összeköttetések és a GBAS VDB kompatiblitásának számításba vétele. Ezeknek a VDB csatornáknak a kijelölésénél a meggondolások magukba foglalják a VHF összeköttetések és a VDB közötti frekvencia elkülönítést, az adók és a fedésterületi körzetek közötti távolsági elkülönítést, a térerőket, a VDB jel polarizációját, valamint a VDB és a VHF érzékenységét. Mindkettőt, a légijármű fedélzeti (mozgó) és a légiforgalmi irányítási (állandó-helyű) VHF összeköttetési berendezéseket is számításba kell venni.
Egy GBAS/E berendezésre, aminek a maximális adó teljesítménye 150 W-ig terjedő, (100 W a vízszintes összetevőre és 50 W a függőleges összetevőre) a 64. csatornájának (és azon túl) –120 dBm-el alatta kell lenni a VDB adótól 200 m-es távolságnál, beleértve egy +5 dB-es pozitív

visszaverődés figyelembevételét is. Egy GBAS/H berendezésre – aminek az adó maximális teljesítménye 100 W terjedő – a 32. csatornájának (és azon túl) –120 dBm-el alatta kell lenni a VDB adótól 200 m-es távolságnál, beleértve egy +5 dB-es pozitív visszaverődés figyelembevételét, valamint egy 10 dB-es polarizációs elkülönítést is. Meg kell jegyezni azt, hogy a VHF adat sugárzás /VDB/ és a VHF adat összeköttetés /VDL/ adó maszkjának különbségei miatt különálló elemzést kell végezni annak biztosítására, hogy a VDL ne zavarja /interferencia/ a VDB-t.

7.2.5 Egy olyan GBAS földi al-rendszernél, ami csak egy vízszintesen polarizált jelet sugároz, azt a követelményt, hogy elérjék a minimális érzékenységhez kapcsolódó teljesítményt, a térerő követelményen keresztül közvetlenül ki lehet elégíteni. Egy olyan GBAS földi al-rendszernél, ami ellipszis polarizációjú összetevőkkel sugároz, a Vízszintes Polarizációjú /HPOL/ és a Függőleges Polarizációjú /VPOL/ összetevők közötti ideális fáziseltolás 90 fokos. Abból a célból, hogy biztosítva legyen az, hogy a megfelelő vett teljesítmény a szabályos légijármű manőverek során a GBAS teljes fedésterületén megmaradjon, a sugárzó berendezéseket úgy kell megtervezni, hogy a HPOL és VPOL jel összetevőket egy 90 fokos RF fáziseltolással sugározzák. Ennek a fáziseltolásnak állandónak kell maradni az idő és a környezeti körülmények minden esetén. A névleges 90 foktól való eltérést számításba kell venni a rendszer tervezésnél és a kapcsolat kiosztásnál, úgy, hogy a polarizációs veszteség miatti bármilyen elhalkulás /fading/ ne veszélyeztesse a minimális vevő érzékenységet. Rendszer minősítési és légi ellenőrzési eljárások fogják számításba venni a fáziseltolásnak azt a megengedhető eltérését, ami összeegyeztethető a GBAS fedésterülete kiterjedésének teljes egészében az előirányzott jelszinttel. Mindkét, a vízszintes és a függőleges térerő biztosításának az egyik módja az egy olyan egyedüli VDB antenna használata, ami egy elliptikusan polarizált jelet sugároz, és repülés közben ellenőrzi a függőleges és vízszintes jelek tényleges térerősségét a fedésterületen belül.

7.3 Fedésterület

7.3.1 Az I. Kategóriájú precíziós megközelítést alátámasztó GBAS fedésterületet a D-4. ábra rajzolja le. Amikor a kiegészítő efemerisz-hiba helyzet határ paraméterek sugárzásra kerülnek, akkor a differenciális helyesbítéseket csak a 2. Típusú közleményben meghatározott maximális felhasználási távolságon (D_{max}) belül lehet felhasználni.

7.3.2 A GBAS helymeghatározási szolgáltatás alátámasztásához szükséges fedésterület a tervezett különleges üzemeltetések függvénye. Erre a szolgáltatásra az optimális fedésterület ’körsugárzóként’ tervezett abból a célból, hogy alátámassza azokat az üzemeltetéseket, amelyeket a GBAS helymeghatározási szolgáltatás precíziós megközelítési fedésterület légterén kívül hajtanak végre. Nem várható az, hogy a GBAS fedésterületét megnöveljék arra a célra, hogy az a helymeghatározási szolgáltatást is ellássa.

7.3.3 A GBAS helymeghatározási szolgáltatás felhasználhatóságának határát a Maximális felhasználási távolság /D_{max}/ adja meg, ami azt a legnagyobb távolságot határozza meg, amelyen belül a megkívánt sértetlenség /integritás/ biztosítva van, és a differenciális helyesbítéseket mind a helymeghatározási szolgáltatásra, mind a precíziós megközelítésre fel lehet használni.
Azonban a D_{max} nem ’körvonalazza’ azt a fedésterületet, ahol a 3. Fejezet 3.7.3.5.4.4 pontjában meghatározott térerősségi követelmények kielégítésre kerülnek, és nem is egyezik meg ezzel a területtel. Ennek megfelelően a GBAS helymeghatározási szolgáltatásra alapozott üzemel-tetéseket csak azon a fedésterület(ek)en belülre lehet alapozni, ahol a térerősség követelmények teljesülnek a D_{max} távolságon belül.

7.4 Adat szerkezet

Egy bit rejtjelező/rejtjelfejtő a D-5. ábrán került bemutatásra.

Megjegyzés. – A VHF adat sugárzás adat szerkezetére vonatkozó kiegészítő tájékoztatások az RTCA/DO-246B-ben, a GNSS Alapú Precíziós Megközelítés Helyi Körzeti Kiegészítő Rendszer (LAAS) – Térbeli-jel Interferencia Ellenőrző Dokumentum-ban (ICD) *találhatók.*

7.5 Sértetlenség

7.5.1 Különböző sértetlenségi szintek kerültek meghatározásra a precíziós megközelítési üzemeltetésekre és a GBAS helymeghatározási szolgáltatásra alapozott üzemeltetésekre. A térbeli-jel sértetlenségi veszély az I. Kategóriájú megközelítésenként 2×10^{-7}. Azoknak a földi al-rendszereknek, amelyeket a GBAS helymeghatározási szolgáltatás felhasználásával egyéb üzemeltetések végrehajtásának alátámasztására is terveztek, ki kell elégíteniük a közelkörzeti üzemeltetésekre meghatározott térbeli-jel sértetlenségi követelményeket, ami óránként 1×10^{-7} (3. fejezet 3.7.2.4.-1 táblázat). Ennek megfelelően kiegészítő lépésekre van szükség a helymeghatározási szolgáltatásoknak a jóval szigorúbb követelményű alátámasztására. A térbeli-jel sértetlenségi veszély fel van osztva a földi al-rendszer sértetlenségi veszélyre és a védelmi szint sértetlenségi veszélyre. A földi al-rendszer sértetlenségi veszély rész a földi al-rendszer hibáit, valamint a műhold helyzet-sor rendszer és a Műhold Bázisú Kiegészítő Rendszer /SBAS/ hibákat fedi úgy, mint jel minőség-hibákat és efemerisz-hibákat. A védelmi szint sértetlenségi veszély rész a ritka hibamentes teljesítmény veszélyeket és az egy referencia vevő mérései hibáinak esetét fedi. Mindkét esetben a védelmi szint egyenletek biztosítják azt, hogy a légijármű fedélzeti vevője által felhasznált műhold geometriai hatások számításba vételre kerüljenek. Ez a következő pontokban kerül jóval részletesebben leírásra.

7.5.2 A Földi Bázisú Kiegészítő Rendszer /GBAS/ földi al-rendszer meghatároz egy helyesbített pszeudo-távolság hiba bizonytalanságot a referencia pontra (σ_{pr_gnd}) vonatkozó hibára, valamint a függőleges (σ_{tropo}) és a vízszintes (σ_{iono}) térbeli dekorrelációból eredő hibákra. Ezek a bizonytalanságok nulla-átlagú normál szórásnégyzetes értékeivel vannak modellezve, amelyek ezeket a hibákat az egyes távolság-meghatározási forrásokra leírják.

7.5.3 A fentiekben leírt egyedi hiba bizonytalanságokat használja fel a vevő a navigációs megoldásnál a hiba modell kiszámításához. Ezt úgy végzi, hogy kivetíti a pszeudo-távolságot a helyzet tartományra. Az általános módszerek annak meghatározásához, hogy a modell szórásnégyzet kielégítő-e a védelmi szint sértetlenségi veszély biztosításához, a 13. részben kerülnek leírásra. Az Oldalirányú Védelmi Szint (LPL) biztosítja az oldalirányú helyzet hiba határolást egy olyan valószínűséggel, amit a sértetlenségi követelményből származtat. Hasonlóképpen a Függőleges Védelmi Szint (VPL) biztosítja a függőleges helyzet határolást. Az I. Kategóriájú precíziós megközelítésre, ha a számított LPL meghaladja az Oldalirányú Riasztási Határértéket (LAL), vagy a VPL meghaladja a Függőleges Riasztási Határértéket (VAL), akkor a sértetlenség nem kielégítő ahhoz, hogy az üzemelést alátámassza.
A helymeghatározási szolgáltatásra nem kerültek a szabványban riasztási határértékek meghatározásra, csak az, hogy a vízszintes védelmi szintet és az efemerisz-hiba helyzet határokat kell kiszámítani és alkalmazni. A riasztási határértékek a végrehajtott üzemeltetésekre alapozva kerülnek meghatározásra. A légijármű alkalmazni fogja a kiszámított védelmi szintet és efemerisz-hiba határértékeket, és ellenőrzi azt, hogy azok kisebbek-e mint a riasztási határértékek. Két védelmi szint került meghatározásra, az egyik, amely azt a helyzetet célozza meg, amikor az összes referencia vevő hibamentes (H_0 - Szabvány Mérési Körülmények) és a másik, ami azt a helyzetet, amikor a referencia vevők egyike hibás méréseket tartalmaz (H_1 - Hibás Mérési Körülmények). Kiegészítésképpen egy efemerisz-hiba helyzet határ határértéket biztosít a távolságmérési forrás efemerisz-hibája miatti helyzet hibákhoz is. Az I. Kategóriájú precíziós megközelítésekre egy oldalirányú határérték /LEB/ és egy függőleges határérték /VEB/ került meghatározásra. A helymeghatározási szolgáltatásra a vízszintes efemerisz-hiba határérték /HEB/ van meghatározva.

7.5.4 *A földi rendszer hozzájárulása a helyesbített pszeudo-távolság hibához (σpr_gnd).* Azok a hibaforrások, amelyek ehhez a hibához hozzájárulnak, a vevő zaját, a többutas visszaverődést és az antenna fázis-középpontjának a kalibrálásában jelentkező hibákat foglalják magukba. A vevő zajnak egy nulla-átlagú normál eloszlású hibája van, míg a több-utas visszaverődés és az antenna fázis-középpont kalibrálás egy kis négyzetes közép hibát eredményezhet.

7.5.5 *Megmaradó troposzférikus hibák.* A troposzférikus paraméterek a 2. Típusú közleményekben kerülnek továbbításra a troposzféra hatásainak modelezésére, amikor a légijármű a referencia ponttól eltérő magasságban van. Ezt a hibát jól le lehet írni egy nulla-átlagú normál eloszlással.

7.5.6 *Megmaradó ionoszférikus hibák.* Egy ionoszférikus paraméter kerül a 2. Típusú közleményekben sugárzásra az ionoszférikus hatásoknak a referencia pont és a légijármű közötti hatásai modellezésére. Ezt a hibát jól le lehet írni egy nulla-átlagú normál eloszlással.

7.5.7 *A légijármű fedélzeti vevőjének hozzájárulása a helyesbített pszeudo-távolság hibához.* A vevő hozzájárulása úgy van határolva, ahogy az a 13. Részben leírásra került. Azt a maximális hozzájárulást, ami a GBAS szolgáltatás biztosító által elemzésre használatos, a pontossági követelményből lehet venni, ahol az az elfogadott, hogy a $\sigma_{receiver}$ egyenlő az RMS_{pr_air}-el a GBAS A-jelölésű Repülési Pontosságú berendezésre.

7.5.8 *Repülőgép test többutas visszaverődési hiba.* A repülőgép test többutas visszaverődéséből eredő hiba hozzájárulás a "B"-Függelék 3.6.5.5.1 pontjában került meghatározásra. A más egyéb tárgyakról való tükröződésekből eredő többutas szóródási hibák nem kerültek figyelembevételre. Ha a tapasztalatok azt jelzik, hogy ezek a hibák nem elhanyagolhatóak, akkor ezeket számításba kell venni üzemeltetési szempontból, vagy a földfelszín által (vissza)sugárzott paraméterek megnövekedésén keresztül (azaz σ_{pr_gnd}).

7.5.9 *Efemerisz-hiba bizonytalanság.* Az efemerisz-hibák eredményeként létrejövő pszeudo-távolság hibák (amik úgy kerültek meghatározásra, mint a tényleges műhold helyzet és a sugárzott adatokból meghatározott műhold helyzet közötti eltérés) térbelileg dekorreláltak, és ennek megfelelően különbözőek lesznek a különböző helyeken lévő vevők részére. Amikor a felhasználók viszonylag közel vannak a GBAS referencia ponthoz, az efemerisz-hibák miatti differenciál hibák kicsik lesznek, és mind a helyesbítések, mind a bizonytalansági paraméterek, σ_{pr_gnd} , amelyeket a földi al-rendszer küld, érvényesek lesznek ahhoz, hogy a durva méréseket helyesbítsék, és a védelmi szintet kiszámítsák. Azoknak a felhasználóknak a részére, akik távolabb vannak a GBAS referencia ponttól, az efemerisz-hibák elleni védelmet két eltérő módon lehet biztosítani:

a) a földi al-rendszer nem sugározza a kiegészítő efemerisz-hiba helyzet határ paramétereket. Ebben az esetben a földi al-rendszer felelős a sértetlenség biztosításáért, a műhold efemerisz-hibák esetében, anélkül, hogy a légijárművek az efemerisz határokat kiszámítanák és alkalmaznák. Ez korlátozást okozhat a GBAS referencia pont és az elhatározási tengerszint feletti magasság/repülőtér feletti magasság közötti távolságban, attól függően, hogy a földi al-rendszer figyelembe veszi-e a távolság-mérési forrás efemerisz-hibák megállapítását. A 'megállapítás' egyik eszköze az SBAS által sugárzott műhold sértetlenségi információk felhasználása; és

b) a földi al-rendszer egy olyan kiegészítő efemerisz-hiba helyzet paramétert ad le, ami lehetővé teszi a légijármű fedélzeti vevője részére azt, hogy kiszámítsa az efemerisz-hiba határt. A paraméterek a következők: az efemerisz-hiba helyzet határ egyenletekben használt ($K_{md\_e\_()}$) együttható, ahol a () jelölés jelentése: "GPS", "GLONASS", "POS,GPS", vagy "POS GLONASS"; a differenciál helyesbítésekhez használt maximális felhasználási távolság, a (D_{max}), és az efemerisz dekorrelációs paraméterek (P). Az 1. Típusú közleményben lévő (P) efemerisz dekorrelációs paraméter úgy írja le a megmaradó hibát, hogy az a referencia pont és a légijármű közötti távolság függvénye. A P értékei m/m-ben vannak kifejezve. A P értékeit a földi al-rendszer az egyes műholdakra határozza meg. A P értékeit befolyásoló fő tényezők egyike a földi al-rendszer ellenőrző egységének felépítése. A földi ellenőrző berendezés minőségét az a legkisebb efemerisz-hiba (vagy a Minimális Kimutatható Hiba (MDE)) fogja leírni, amit ki tud mutatni. Egy meghatározott műholdra a P paraméter és az MDE közötti összefüggést a $P_i = MDE_i/R_i$ képlettel lehet közelíteni, ahol az R_i a földi al-rendszer referencia vevő antennájá(i)tól az előre jelzett távolságokból a legkisebb, a P_i érvényességi időtartam alatt. Mivel ez a műhold geometriától függő, a P paraméterek értékei lassan változóak. Azonban a földi al-rendszer részére nem követelmény a dinamikusan változó P. Ha statikus P paramétereket lehetne küldeni, akkor azok teljesen biztosítanák a sértetlenséget. Ebben az utóbbi esetben az elérhetőség kismértékben lecsökkenne. Általánosan ahogy az MDE értéke kisebbé válik, úgy az átfogó GBAS elérhetőség javul.

7.5.10 *Efemerisz-hiba/meghibásodás ellenőrzés.* Több különféle típusú ellenőrzési megközelítése van az efemerisz-hibáknak/meghibásodásoknak, ezek:

a) Hosszú alapvonal. Ez a földi al-rendszernél azt teszi szükségessé, hogy egymástól elkülönített és nagy távolságban elhelyezett vevőket használjon az olyan efemerisz-hibák kimutatására, amelyek egy egyedüli vevővel nem érzékelhetők. A hosszabb alapvonalak az MDE-n belüli jobb teljesítményre vezetnek;

b) SBAS. Mivel az SBAS kiegészítő rendszer, biztosítja a műhold teljesítményének ellenőrzését, az efemerisz adatokat is beleértve, így az SBAS által sugárzott sértetlenségi információkat fel lehet használni az efemerisz érvényességének jelzéseként. Az SBAS felhasználása a földi al-rendszernél a vevők nagyon hosszú alapvonalon való telepítését igényli, ennek megfelelően ez optimális teljesítményt biztosít az efemerisz ellenőrzéséhez, és ezáltal kis MDE-k érhetők el; és

c) Efemerisz adat ellenőrzés. Ez a megközelítés azt foglalja magába, hogy a sugárzott efemeriszek az egymás után következő műhold körönként összehasonlításra kerülnek. Van egy olyan feltételezés, hogy a csak az efemerisz-hiba miatti hiba veszély a műhold helyzetsor földi vezérlő hálózatából ered. A manőverezési utasítás nélküli műhold manőverei miatti hibák valószínűtlenségének elegendőnek kell lenni ahhoz, hogy ez a megközelítés a szükséges sértetlenséget biztosítsa.

7.5.10.1 Az ellenőrző rendszer felépítése (példaként az, ami a Minimális kimutatható hibával /MDE/ érhető el) a sértetlenségi veszély követelményeken és azon a hiba modellen alapszik, amely elleni védelemre az ellenőrző rendszert szánják. A GPS efemerisz-hiba határt a 3.fejezet 3.7.3.1.3 pontjában megadott megbízhatósági követelményekből lehet meghatározni, mivel így egy efemerisz-hiba az a hiba, ami egy nagyobb szolgáltatási hibát képezne.

7.5.10.2 A GLONASS vezérlő része az efemerisz és idő paramétereket ellenőrzi, és bármilyen rendellenes helyzetben megkezdi az új és pontos navigációs közlemény leadását. Az efemerisz- és idő paraméter hibák nem haladják meg a 70 méteres távolságmérési hibákat. A GLONASS műhold hiba gyakorisága az efemerisz és idő paraméter hibákat is beleértve nem haladja meg a 4×10^{-5} -t műholdanként és óránként.

7.5.11 Egy tipikus GBAS földi al-rendszer a referencia pont közvetlen szomszédságában telepített 2-4 referencia vevő méréseit dolgozza fel. A repülőgép vevője nagyszámú hiba, vagy hiba állapot ellen védett egy egyedülálló referencia vevőben úgy, hogy az 1. Típusú, vagy a 101. Típusú közleményből származó B paramétereket feldolgozzák és összehasonlítják a különböző referencia vevőből származó adattal. A referencia vevő mérésekben megfelelően felépített redundanciával rendelkező alternatív rendszer kialakítások alkalmazhatnak olyan feldolgozó algoritmusokat, melyek képesek azonosítani nagyszámú hibákat, vagy meghibásodásokat az egyes vevőkben. Ez felhasználható egy széles területen elosztott vevőkkel és ionoszférikus áthatolási pontok megfelelő sűrűségével rendelkező GRAS hálózatnál arra, hogy elkülönítsék a vevő hibákat az ionoszférikus hatásoktól. A sértetlenség (integritás) megvalósítható csak a védelmi szintek használatával a normál mérési állapotoknál (VPL_{HO} és LPL_{HO}), a megfelelő K_{ffmd} és σ_{pr_gnd} értékekkel. Ez a B paramétereket nem tartalmazó 101. Típusú közlemény használatával valósítható meg.

7.6 A szolgáltatás folyamatossága

7.6.1 *A földi folyamatossági és sértetlenségi kijelölő.* A földi folyamatossági és sértetlenségi kijelölő (GCID) a GBAS földi al-rendszerek osztályozását biztosítja. A földi al-rendszer kielégíti az I. Kategóriájú precíziós megközelítési, vagy az APV követelményeket akkor, amikor a GCID 1-re van állítva. A GCID 2, 3 és 4 olyan jövőbeli üzemeltetések alátámasztására vannak tervezve, amelyek követelményei jóval szigorúbbak, mint az I. Kategóriájú üzemeltetéseké. A GCID a földi rendszer állapotának egy olyan tervezett jelzése, ami akkor használatos, amikor egy légijármű kiválaszt egy megközelítést. Nem az a célja, hogy helyettesítse, vagy kiegészítse az 1. Típusú közleményekben közölt folyamatos sértetlenségi jelzéseket. A GCID nem biztosít semmilyen jelzést a földi al-rendszernek a GBAS helymeghatározási szolgáltatás alátámasztási képességéről.

7.6.2 *A földi al-rendszer szolgáltatási folyamatossága.* A GBAS földi al-rendszerekkel szemben az az elvárás, hogy feleljenek meg a "B"- Függelék 3. fejezetének 3.6.7.1.3 pontjában meghatározott folyamatosságnak azzal a céllal, hogy az I. Kategóriájú precíziós megközelítést és az APV-t alátámasszák.
Azoknak a GBAS földi al-rendszereknek, amelyek arra a célra is szolgálnak, hogy más üzemeltetéseket is alátámasszanak, a GBAS helymeghatározási szolgáltatás felhasználásán keresztül teljesíteniük kell a közelkörzeti területi működéshez szükséges minimális folyamatossági követelményt, ami $1 - 10^{-4}$/óra. (3. fejezet 3.7.2.4-1. táblázat). Amikor az I. Kategóriájú precíziós megközelítésre megkívánt folyamatosság ($1 - 3{,}3 \times 10^{-6}$/15 másodperc) óránkénti értékre kerül átalakításra, akkor az nem elégíti ki az $1 - 10^{-4}$/óra minimális folyamatossági követelményt. Ennek megfelelően kiegészítő intézkedések szükségesek ahhoz, hogy az egyéb üzemeltetések által megkívánt folyamatosság kielégíthető legyen. Az egyik módszer a teljesítés igazolására annak elfogadása, hogy a légijármű fedélzeti rendszere felhasználja mind a Földi Bázisú Kiegészítő Rendszert /GBAS/, mind a Légijármű Bázisú Kiegészítő Rendszert /ABAS/ a tartalék biztosításához, és azt, hogy az ABAS kielégítő pontosságot biztosít a tervezett üzemeltetéshez.

7.7 GBAS csatorna kiválasztás

7.7.1 A GBAS-nél használt csatorna számok megkönnyítik az illeszkedést a légijármű berendezése és azon térbeli-jel között, ami összhangban van az ILS-el és az MLS-el való illesztésekkel. A légijármű pilótakabinjának egység berendezését és a személyzetnek a GBAS-hez való kapcsolódását 5-számjegyes csatorna számok bevitelére lehet alapozni. Egy olyan illeszkedés, ami a megközelítés kiválasztáson és a repülés vezérlési funkción alapszik, és az ILS-nél fennálló jelenlegi gyakorlathoz hasonló, ugyancsak lehetséges. A GBAS csatorna számot tárolni lehet egy fedélzeti navigációs adatbázisban, egy megnevezett megközelítés egy részeként. A megközelítést a nevével lehet kiválasztani, és a csatorna számot automatikusan biztosítani lehet a berendezés részére, hogy annak ki 'kelljen' választani a megfelelő GBAS megközelítési adatokat a sugárzott adatokból. Hasonlóképpen a GBAS helymeghatározási szolgáltatás felhasználását is lehet egy 5-számjegyű csatorna szám kiválasztásra alapozni. Ez lehetővé teszi a Végső megközelítési szakasz /FAS/ adatok által meghatározott megközelítésektől eltérő üzemeltetések végrehajtását is.

7.7.2 A 20 001 és a 39 999 közötti csatorna számokból választanak egyet, amikor Végső Megközelítési Szakasz (FAS) adatot sugároznak ki a 4. Típusú közleményben. A 40 000 és a 99 999 közötti csatorna számokból választanak egyet, amikor a fedélzeti adatbázisból egy Megközelítés Függőleges Vezetéssel-hez (APV) kapcsolt FAS adathoz jutnak hozzá.

7.8 Referencia pálya adat-kiválasztó /RPDS/ és Referencia állomás adat-kiválasztó /RSDS/

Egy térképezési vázlat egy egyedi csatorna-szám kijelölést biztosít minden egyes GBAS megközelítésre. A csatorna-szám öt számjegyből áll, a 20 001-től a 39 999-ig terjedő tartományban. A csatorna-szám lehetővé teszi a GBAS légijármű fedélzeti al-rendszernek a pontos frekvenciára hangolást, és annak a Végső Megközelítési Szakasz (FAS) adatblokknak a kiválasztását, amely a kívánt megközelítést meghatározza. A pontos FAS adatblokk a referencia pálya adat-kiválasztóval (RPDS) kerül kiválasztásra, ami a 4. Típusú közleményben a FAS meghatározási adat egy részeként került beépítésre. A D-6. táblázat példákat mutat be a csatorna-szám, a frekvencia és az RPDS közötti összefüggésre. Ugyanilyen térképezési vázlatot kell alkalmazni a helymeghatározási szolgáltatásnak a Referencia állomás adat-kiválasztó /RSDS/ általi kiválasztására. Az RSDS a 2. Típusú közleményben

kerül sugárzásra, és lehetővé teszi egy olyan egyedüli GBAS földi al-rendszer kiválasztását, amely biztosítja a helymeghatározási szolgáltatást.
Az olyan földi al-rendszereknél, amelyek nem biztosítják a helymeghatározási szolgáltatást, de sugározzák a kiegészítő efemerisz adatokat, az RSDS a 255-re van kódolva. Az egy földi al-rendszer által sugárzott összes RPDS-nek és RSDS-nek egyedülinek kell lenni a sugárzási frekvencián a jel felhasználási földrajzi körzetén belül. Az RSDS értéke nem lehet azonos egyetlen sugárzott RPDS értékkel sem.

D-6. táblázat: Csatorna kijelölési példák

Csatorna-szám (N)	Frekvencia MHz-ben (F)	Referencia pálya adat- kiválasztó (RPDS), vagy Referencia állomás adat-kiválasztó (RSDS) szám
20 001	108,025	0
20 002	108,05	0
20 003	108,075	0
…..	…..	…..
20 397	117,925	0
20 398	117,95	0
20 412 (Megjegyzés)	108,025	1
20 413	108,05	1
…..	…..	…..

Megjegyzés. – A 20 398 és a 20 412 közötti csatornák nem oszthatók ki, mivel a csatorna algoritmusa olyan frekvenciákra jelöli ki azokat, amelyek kívül esnek a 108,025 MHz és a 117,950 MHz közötti tartományon. Hasonló csatorna kiosztási 'rés' fordul elő az egyes RPDS átmeneteknél is.

7.9 A Referencia Pálya Adat-kiválasztó /RPDS/ és a Referencia Állomás Adat-kiválasztó /RSDS/ kijelölése a szolgáltatás biztosítója által

Az RPDS és RSDS kijelöléseket ellenőrizni kell azért, hogy a csatorna számok duplikált használatát az adat sugárzó frekvencia védelmi területén belül elkerüljék. Ennek megfelelően a GBAS szolgáltatás biztosítónak biztosítania kell azt, hogy az RPDS és RSDS csak egyszer kerül kijelölésre egy meghatározott GBAS földi al-rendszer rádió hatótávolságán belül. Az RPDS és RSDS kijelölését a frekvencia kijelölésnek és a VHF adat sugárzás időréseinek kijelölésével együtt kell kezelni.

7.10 GBAS azonosító

A GBAS azonosító /ID/ használatos egy, a GBAS fedésterületi körzetén belüli egy adott frekvencián működő földi al-rendszer egyedülálló azonosítására. A légijármű navigálásakor egy GBAS földi al-rendszer egy, vagy több GBAS sugárzó állomásának adását fogja felhasználni (amiket a közös GBAS azonosító fog jellemezni).

7.11 Végső megközelítési szakasz (FAS) pálya

7.11.1 A FAS pálya egy térbeli vonal, amelyet a Leszállási küszöb pontja/Látszólagos küszöb pontja (LTP/FTP), a Repülési pálya irány pont (FPAP), a Küszöb keresztezési magasság (TCH) és a Siklópálya szöge (GPA) határozza meg. Ezek a paraméterek azokból az adatokból kerülnek meghatározásra, amelyeket a 4. Típusú közleményen belül a FAS adatblokk biztosít. Az ezen paraméterek és a FAS pálya közötti összefüggést a D-6. ábra mutatja be.

7.11.1.1 Az SBAS és néhány GBAS megközelítés számára szükséges FAS adatot a közös fedélzeti adatbázisban tárolják, mely támogatja mind az SBAS-t, mind a GBAS-t. Az Államok a felelősek az APV eljárások támogatásához szükséges FAS adat biztosításáért, amikor a 4. Típusú közleményt nem sugározzák ki. Ezek az adatok azokat a paramétereket tartalmazzák, melyek a FAS blokkban és az RSDS-ben vannak, valamint a kiosztott sugárzási frekvenciát is tartalmazzák. Egy adott megközelítési eljáráshoz szükséges FAS blokkot a
"B"- Függelék, 3.6.4.5.4 pontja és a B-66. Táblázat ismerteti.

7.11.2 *A Végső megközelítési szakasz /FAS/ pálya meghatározása*

7.11.2.1 *Oldalirányú irányítottság.* A Leszállási küszöb pont/Látszólagos küszöb pont /LTP/FTP/ jellemzően a futópálya küszöbénél, vagy annak közelében van. Azonban azért, hogy üzemeltetési körülmények, vagy fizikai korlátozások kielégítésre kerüljenek, az LTP/FTP lehet nem a futópálya küszöbénél is. A Repülési pálya irány pont /FPAP/ az LTP/FTP-hez kapcsolódóan használatos a megközelítés oldalirányú referencia síkjának meghatározására. Egy közvetlen egyenes megközelítésre, ami a futópályával egy vonalban van, a Repülési pálya irány pont /FPAP/ a futópálya megállási végénél, vagy azon túl van. Az FPAP nem kerül elhelyezésre a futópálya megközelítési vége elé.

7.11.2.2 *ΔHossz eltérés.* A Δhossz eltérés a futópálya végétől az FPAP-ig tartó távolságot határozza meg. Ez a paraméter azért van biztosítva, hogy lehetővé tegye a légijármű fedélzeti berendezése számára a futópálya végéig tartó távolság kiszámítását. Ha a Δhossz eltérés nincs beállítva úgy, hogy megfelelően jelezze a futópálya végét az FPAP-hoz viszonyítva, akkor a szolgáltatás biztosítónak biztosítania kell azt, hogy a paraméter „nincs biztosítva"-ként kerüljön kódolásra.

7.11.2.3 *Függőleges irányítottság.* A helyi függőleges a megközelítésre a WGS-84 ellipszoidra merőlegesként van meghatározva az LTP/FTP-nél, és ez jelentősen eltérhet a helyi gravitációs vektortól. A megközelítésre a helyi szint síkja úgy van meghatározva, hogy az az LTP/FTP-n áthaladó helyi függőlegesre merőleges sík (azaz az LTP/FTP-nél lévő ellipszoid érintője). Az Alapsík keresztezési pont (DCP) egy, a Küszöb keresztezési magasság /TCH/ által meghatározott pontnál lévő magasság az LTP/FTP felett. A Végső megközelítési szakasz /FAS/ pályája úgy van meghatározva, hogy egy vonal egy szögértékkel (amit a Siklópálya szöge /GPA/ határoz meg) ahhoz a helyi szintű síkhoz van viszonyítva, amely az Alapsík keresztezési ponton /DCP/ halad át. A Siklópálya befogási pont /GPIP/ az a pont, ahol a Végső megközelítési pálya keresztezi a helyi szint síkját. A GPIP ténylegesen – a futópálya görbületétől függően – lehet a futópálya felülete fölött, vagy előtt.

7.11.3 *„ILS-el hasonlónak látszó" eltérés számítások.* A jelenlegi légijármű tervezéshez való összeegyeztethetőségért a légijármű berendezései számára kívánatos az, hogy a kimenő vezetési információk a Végső megközelítési szakasz /FAS/ pályája által meghatározott megkívánt repülési pályához viszonyított eltérések formájában kerüljenek kiadásra.
A 4. Típusú közlemények tartalmazzák azokat a paramétereket, amelyek az ILS követelményekkel megegyező eltérések kiszámítását alátámasztják.

7.11.3.1 *Az oldalirányú eltérés meghatározása.* A D-6. ábra mutatja be a Repülési pálya irány pont /FPAP/ és az oldalirányú szög elétérések kiindulópontja közötti összefüggést. Az útirány szélesség paraméter és az FPAP használatos az oldalirányú eltérések kiindulópontjának és érzékenységének meghatározásához. Az FPAP elhelyezésének és az útirány szélesség értékének szabályozásával egy GBAS útirány szélességet és érzékenységet be lehet állítani a kívánt értékre. Ezeket be lehet állítani úgy, hogy egybeessenek egy meglévő ILS útirány szélességével és érzékenységével. Ez szükséges lehet, például, a meglévő látásos leszállási segédeszközökkel való összeegyeztethetőséghez.

7.11.3.1.1 *Az oldalirányú eltérés referenciája.* Az oldalirányú eltérés referencia síkja az a sík, ami magába foglalja az LTP/FTP-t, az FPAP-t és egy, a WGS-84 ellipszoidnak az LTP/FTP-nél lévő merőleges vektorát. Az egyenes-vonalú oldalirányú eltérés az a távolság, ami a számított légijármű helyzet az oldalirányú eltérés referencia síktól. A szögbeli oldalirányú eltérés a GBAS oldalszög referencia pontjához (GARP) viszonyított megfelelő oldalszög eltérés. A GARP az FPAP-on túl az eljárás középvonalában egy állandó 305 méteres
(1 000 láb) eltolású pontként került meghatározásra.

7.11.3.1.2 *Oldalirányú elmozdulási érzékenység.* Az oldalirányú elmozdulási érzékenységet a légijármű fedélzeti berendezése határozza meg a FAS adatblokkhoz megadott útirány szélességből. A szolgáltatás biztosítójának felelőssége az, hogy az útirány szélesség paramétert olyan értékre állítsa be, hogy az a teljes skálájú kitérésnek (azaz 0,155 Modulációs mélység különbség /DDM/, vagy 150 μA) megfelelő szöget adjon minden üzemeltetési kényszert figyelembe véve.

7.11.3.2 *Függőleges eltérések.* A függőleges eltéréseket a légijármű fedélzeti berendezése számítja ki egy GBAS magassági referencia ponthoz (GERP) vonatkoztatva. A GERP lehet a Siklópálya befogási pontnál /GPIP/, vagy a GPIP-től oldalirányban egy állandó GERP eltolási értékkel, 150 m-el eltoltan. Az eltolt GERP alkalmazása lehetővé teszi a siklópálya eltérésnél azt, hogy ugyanazt a hiperbolikus hatást hozza létre, mint ami az ILS, vagy MLS normál eltolási karakterisztikája (200 láb alatt). Annak az eldöntését, hogy a GERP eltolt vagy sem, a légijármű fedélzeti berendezés végzi a meglévő légijármű rendszerekkel kompatíbilis működési követelményekkel összhangban. A szolgáltatás biztosítóknak tudniuk kell azt, hogy a felhasználók kiszámíthatják a függőleges eltéréseket a GERP felhasználásával, amely bármelyik helyzetben van elhelyezve. A függőleges eltérések érzékenysége a légijármű fedélzeti berendezésben automatikusan van beállítva a Siklópálya szög /GPA/ egy funkciójaként. A GPA és a függőleges eltérés érzékenység közötti összefüggés megegyezik az ILS által biztosított siklópálya elmozdulási érzékenységgel.

7.11.4 *A futópálya középvonalával nem egy egyenesbe eső megközelítések.* Bizonyos üzemeltetések megkövetelhetik egy olyan megközelítési szakasz meghatározását, amely nem esik egy egyenesbe a futópálya középvonalával, ahogy azt a D-7. ábra bemutatja. Azokra a megközelítésekre, amelyek nem esnek egy egyenesbe a futópályával, az LTP/FTP lehet, hogy igen, lehet, hogy nem a futópálya meghosszabbított középvonalán van. Az ilyen típusú megközelítéseknél a Δhossz eltérésnek nincs jelentése és így „nem-biztosított”-ra kell állítani.

7.11.5 *SBAS szolgáltatás biztosító.* Egy közös formátum használatos a Végső megközelítési szakasz /FAS/ adatblokkban, amelyet mind a GBAS, mind az SBAS rendszernek fel kell használni. Az SBAS szolgáltatás biztosító azonosító /ID/ mező azt azonosítja, hogy melyik SBAS rendszer(eke)t használhatja az a repülőgép, amely a megközelítése során a FAS adatokat felhasználja. A GBAS szolgáltatás biztosító megakadályozhatja a bármelyik SBAS szolgáltatáshoz kapcsolódó FAS adatok felhasználását. A GBAS-en alapuló precíziós megközelítéseknél ez a mező nem használatos, és a légijármű fedélzeti GBAS berendezés szándékosan figyelmen kívül hagyhatja azt.

7.11.6 *Megközelítés azonosító.* A szolgáltatás biztosító felelős azért, hogy minden egyes megközelítésre kijelöljön egy megközelítés azonosítót. A megközelítés azonosításának egyedülállónak kell lenni egy nagy földrajzi területen belül. Az egy adott repülőtéren lévő több futópálya megközelítéseinek azonosítását úgy kell kiválasztani, hogy az összetévesztés és a téves azonosítás lehetőségét lecsökkentsék. A megközelítés azonosítását fel kell tűntetni azon a közzétett térképen, amely a megközelítést leírja.

7.12 Repülőtéri telepítési megfontolások

7.12.1 A GBAS földi al-rendszer telepítése különleges megfontolásokat foglal magába a referencia vevő antennák és a VHF adat sugárzó /VDB/ antenna(k) leendő elhelyezéseinek kiválasztásában. Az antenna elhelyezés tervezésénél az Annex 14 akadálykorlátozási követelményeit ki kell elégíteni.

7.12.2 *A referencia vevő antennák elhelyezése.* A helyszínt úgy kell kiválasztani, hogy az egy akadályoktól mentes terület legyen, úgy, hogy lehetővé tegye a műholdak jeleinek vételét olyan ’alacsony’ magassági szögben, amennyire az csak lehetséges. Általánosságban, ha bármi kitakarja a GNSS műholdakat az 5 foknál magasabb magassági szögekben, az csökkenteni fogja a rendszer rendelkezésre állását.

7.12.2.1 A referencia vevők antennáit úgy kell megtervezni és elhelyezni, hogy csökkentsék azokat a többutas szóródási jeleket, amelyek a megkívánt jelet zavarják. Az antennáknak a közel a földfelszín síkjához történő telepítése csökkenti az antenna reflexiókból eredő hosszú késleltetésű többutas szóródást. A felépítési magasságnak elegendőnek kell lenni ahhoz, hogy megelőzzék az antennák hóval való beborítását, vagy a karbantartó személyzet, illetve a földi forgalom általi interferenciát. Az antennát úgy kell elhelyezni, hogy bármilyen fém-szerkezet, mint például levegő szellőztetők, csövek és más antennák, az antenna közel-területi hatásain kívül legyenek.

7.12.2.2 Az egyes referencia vevő antenna elhelyezéseknél a több-utas visszaverődési hiba nagysága mellett a korrelációs fokot is számításba kell venni. A referencia vevő antennákat olyan helyeken kell elhelyezni, amelyek önálló többutas visszaverődési környezetet biztosítanak.

7.12.2.3 Az egyes antennák felszerelése magába kell foglaljon olyan felépítést, ami nem fog meghajolni a szél hatására, vagy jég terhelése alatt. A referencia vevő antennákat olyan területeken kell elhelyezni, ahol az átjárás ellenőrzött. A forgalom hozzájárulója lehet a többutas szóródás miatti hibának, vagy akadályozhatja az antennáktól a műholdra való rálátást.

7.12.3 *A VHF adat-sugárzó /VDB/ antenna elhelyezése.* A VDB antennát úgy kell elhelyezni, hogy egy akadálymentes rálátási vonal álljon fenn az antennától a fedésterület kiterjedésén belül minden alátámasztott Végső megközelítési szakasz /FAS/ pontra. Tekintetbe kell venni még a minimális adó-vevő elkülönítés biztosítását is, úgy, hogy a maximális térerősség ne kerüljön túllépésre. Abból a célból, hogy a szükséges fedés egy többszörös FAS-ra is biztosítva legyen egy adott repülőtéren, továbbá abból a célból, hogy a VDB antenna telepítési rugalmasságát lehetővé tegyék, az adó antenna körüli tényleges fedésterületi kiterjedésnél szükség lehet egy lényegesen nagyobb területre, mint ami egy egyedüli FAS részére szükséges. Ennek a fedésterület biztosításnak a képessége a VDB antenna helyének a futópályához viszonyított helyzetétől és a VDB antenna magasságától függ. Általánosságban mondva, megnövelt antenna magasságra lehet szükség a felhasználók részére az alacsony magasságokon a kielégítő jel erősség biztosításához, de ez elfogadhatatlan többutas szóródási nullát is eredményezhet a kívánt fedésterületi kiterjedésen belül. A megfelelő antenna magasságok meghatározását elemzésre alapozva kell meghozni annak biztosítása érdekében, hogy a jel erősség követelmények a teljes kiterjedésen belül kielégítésre kerüljenek. Figyelmet kell még fordítani a többutas szóródási környezetben lévő terep jellegzetességekre és épületekre is.

7.12.4 *Több adó antenna felhasználása a VDB fedésterületének javítása céljából.* Néhány GBAS berendezés telepítésnél korlátozások állnak fenn az antenna elhelyezésnél, a helyi terep, vagy akadályok földi többutas szóródást és/vagy jel-blokkolást eredményezhetnek úgy, hogy bonyolulttá teszik az előírt térerősség biztosítását a fedésterület terjedelmén belüli minden ponton. Néhány GBAS földi berendezésnél alkalmazni lehet egy, vagy több kiegészítő antenna rendszert úgy telepítve, hogy olyan diverziti jel-utat biztosítsanak, ami által azok közösen megfeleljenek a fedésterületi követelményeknek.

7.12.4.1 Amikor többszörös antenna rendszerek használatosak, akkor az antenna sorrendet és a közlemény ütemezést úgy kell elrendezni, hogy a fedésterületen belül minden pontban olyan sugárzást biztosítson, ami következetesen betartja az előírt minimális és maximális adat sugárzási átviteli sebességet és térerőt, anélkül, hogy meghaladná a vevő alkalmazkodási képességét az adásról adásra történő jelerősség változásokban egy adott időrésben. A vevőnek az elveszett, vagy duplikált közleményeket érintő feldolgozási kérdéseinek elkerülése céljából egy egyedüli kereten belül lévő adott mérési típusú – az 1. Típusú közlemények, vagy az összekapcsolt 1. Típusú közlemény-párok – összes adat továbbítását azonos adat-tartalommal kell biztosítani.

7.12.4.2 Egy példa a többszörös antennák használatára, amikor két, ugyanazon helyen telepített, de a föld felszíne felett különböző magasságban elhelyezett antennát használnak egy berendezésnél. Az antennák magassága úgy van megválasztva, hogy az egyik antenna karakterisztikája kitölti a másik antenna karakterisztikájában a földfelszín síkja által eredményezett reflexiók miatt létrejövő nullákat. A földi állomás váltogatja a sugárzást a két antenna között, az egyes keretek egy, vagy két kijelölt időrését használva az egyes antennákra. Az 1. Típusú közlemények keretenként egyszer kerülnek sugárzásra antennánként. Ez lehetővé teszi egy, vagy két 1. Típusú közlemény vételét keretenként, attól függően, hogy vajon a felhasználó egy antenna karakterisztika ’nulláján’ belül tartózkodik-e. A 2. és 4. Típusú közlemények az első antennáról egy keretben kerülnek sugárzásra, azután a második antennáról a következő keretben. Ez lehetővé teszi minden 2. és 4. Típusú közlemény egyikének vételét egy, vagy két keretben a felhasználó helyzetétől függően.

7.13 Az oldalirányú és a függőleges riasztási határértékek meghatározása

7.13.1 Az oldalirányú és a függőleges riasztási határértékek az I. Kategóriájú precíziós megközelítésekre vonatkozóan úgy kerülnek kiszámításra, ahogy az a ”B”- Függelék B-68. és B-69. táblázataiban meghatározásra került. Ezekben a számításokban a D és H paramétereknek a jelentése a D-8. ábrán került bemutatásra.

7.13.2 Az 1. Kategóriájú precíziós megközelítésekre vonatkozó függőleges riasztási határérték léptéke a Leszállási küszöb pontja/Látszólagos küszöb pontja (LTP/FTP) felett 60m (200 láb) magasságtól kezdődik. Egy olyan eljárásnál, ahol a döntési magasság több, mint 60m (200 láb), a VAL azon a döntési magasságon nagyobb lesz, mint a kisugárzási FASVAL.

7.13.3 Az oldalirányú és a függőleges riasztási határértékek a 40 000 és 99 999 közötti csatorna számokhoz kapcsolódó APV eljárásokra vonatkozóan ugyanúgy kerülnek kiszámításra, ahogy az SBAS-t használó APV eljárásoknál történnek, amit a ”D”- Melléklet, 3.2.8 pontja tartalmaz.

7.14 Ellenőrző és karbantartó tevékenységek

7.14.1 Speciális ellenőrzési követelményekre, vagy beépített vizsgálatokra lehet szükség, és ilyeneket kell meghatározni egyedileg az Államoknak. Mivel a VHF adat sugárzás /VDB/ jelei a kritikusak a GBAS földi állomások üzemeltetésénél, a VDB bármilyen hibáját, - azaz hogy sikeresen továbbítsa a felhasználható jeleket a kijelölt időréseken belül és a teljes fedésterületi körzeten belül - amint csak lehetséges, ki kell javítani. Ennek megfelelően ajánlott az, hogy irányvonalként a következő feltételeket alkalmazzák a VDB ellenőrző berendezés kivitelezésénél:

a) Teljesítmény. Egy jelentékeny teljesítmény csökkenést 3 másodpercen belül észlelni kell.

b) Közlemény típus elvesztése. Bármelyik beütemezett közlemény típus(ok) továbbításának hibája. Ezt arra a hibára lehet alapozni, hogy egy egyedüli közlemény típusnak az egymás utáni sorrendben, vagy a különféle közlemény típusok egy kombinációjának a továbbítása hiányzik.

c) Az összes közlemény típus elvesztése. Bármelyik közlemény típus továbbításának 3 másodperccel egyenlő, vagy annál hosszabb idejű hibáját észlelni kell.

7.14.2 Egy hiba észlelésekor és egy második adó hiányában a VDB szolgáltatás befejezését kell számításba venni, ha a jelet nem lehet megbízhatóan felhasználni a fedésterületen belül, oly mértékig, hogy az a légijárművek üzemeltetését jelentős mértékben befolyásolná. Az üzemeltetési eljárásokban megfelelő tevékenységeket kell figyelembe venni annak az esetnek az enyhítésére, ha a jel a szolgáltatásból eltávolításra kerül. Ez magában foglalhatja a diszpécser szolgálat karbantartó specialistái általi GBAS VDB javítását, vagy különleges ATC eljárásokat. Kiegészítőleg, karbantartási tevékenységet kell végrehajtani, amikor lehetséges, az összes beépített vizsgálati észlelésű hibák esetében a GBAS szolgáltatás elvesztésének megelőzése érdekében.

7.15 Példák a VHF adat sugárzási /VDB/ közleményekre

7.15.1 A VDB közlemények kódolására példák találhatók a D-7.-től a D-10.-ig terjedő táblázatokban. A példák bemutatják a különféle alkalmazási paraméterek kódolását, beleértve a Ciklikus Redundancia Ellenőrzést (CRC) és a Vevő oldali hibajavítás (FEC) paramétereit, valamint a bit ’rejtjelezés’ és a D8PSK szimbólum kódolás eredményeit. A közlemény paraméterek műszaki értékei ezekben a táblázatokban a közlemény kódolási folyamatot mutatják be, és nem szükségszerűen a tényleges értékek képviselői.

7.15.2 A D-7. táblázat egy példát ad az 1. Típusú VDB küldeményre. A kiegészítő közlemény jelzés mező annak jelzésére került kódolásra, hogy ez a két 1. Típusú közleményből az első, amit ugyanazon a kereten belül továbbítani kell. Ez bemutatás céljából került ide; a második 1. Típusú közlemény nem jellemzően szükséges, kivéve, hogy több távolság-mérési forrás helyesbítés sugárzását teszi lehetővé annál, mint amit egy egyedüli közlemény be tud fogadni.

7.15.3 A D-7A. táblázat egy példát ad a 101. Típusú VDB küldeményre. A kiegészítő közlemény jelzés mező annak jelzésére került kódolásra, hogy ez a két 101. Típusú közleményből az első, amit ugyanazon a kereten belül továbbítani kell. Ez bemutatás céljából került ide; a második 101. Típusú közlemény nem jellemzően szükséges, kivéve, hogy több távolság-mérési forrás helyesbítés sugárzását teszi lehetővé annál, mint amit egy egyedüli közlemény be tud fogadni.

7.15.4 A D-8. táblázat példákat ad arra, amikor egy 1. Típusú VDB közlemény és egy 2. Típusú VDB közlemény egy egyedül álló szinkron vezérjel után van kódolva (azaz két közlemény kerül sugárzásra egy egyedüli adattovábbítási időrésben). Az 1. Típusú közlemény kiegészítő közlemény jelzés mezője azért van kódolva, hogy jelezze azt, miszerint ez két 1. Típusú közleményből a második, amit ugyanazon a kereten belül továbbítani kell. A 2. Típusú közlemény magába foglalja az 1. kiegészítő adatblokkot. A D-8A. Táblázat példát mutat arra, amikor az 1. Típusú és a 2. Típusú közlemények kiegészítő 1. és 2. adatblokkal rendelkeznek.

7.15.5 A D-9. táblázat egy példát mutat be a 4. Típusú két Végső megközelítési szakasz /FAS/ adatblokkot magába foglaló közleményre.

7.15.6 A D-10. táblázat egy példát ad az 5. Típusú közleményre. Ebben a példában a jelforrás rendelkezésre állási időtartamok az összes megközelítésre és két távolság-meghatározási jelforrásra vannak biztosítva. Kiegészítőleg, a jelforrás rendelkezésre állási időtartamok két egyedi megközelítésre vannak biztosítva: az első megközelítésnek két befogott távolság-meghatározási forrása van és a második megközelítés egy befogott távolság-meghatározási forrással rendelkezik. A 2. Típusú közlemény tartalmaz kiegészítő 1. adatblokkot.

7.16 GBAS felmérési pontosság

A navigációs berendezések felmérési pontosságának szabványait az Annex 14 – *Repülőterek* foglalja magába. Ezenkívül a *Geodéziai Világrendszer-1984*. (WGS-84) (Doc 9674) *Kézikönyv* ad útmutatásokat az egyes repülőtereken lévő felmérési ellenőrző pontok hálózatának létesítéséről és arról, hogy a hálózatot hogyan kell a WGS-84 koordináták megállapítására felhasználni. Addig, amíg a GBAS-re speciális követelmények nem kerülnek kidolgozásra, az Annex 14-ben lévő, a repülőtéren elhelyezett navigációs berendezések felmérési pontosságára vonatkozó követelményeket kell alkalmazni.

A ”B”- Függelékben lévő, a 3.fejezet 3.6.7.2.3.4 pontban leírt ajánlások a GBAS referencia pontjának felmérési pontjára vonatkozóan azt célozzák, hogy tovább csökkenjen a hiba - a WGS-84 helymeghatározásban a levegőben lévő a GBAS helymeghatározási szolgáltatást felhasználó számára – egy olyan értékre, ami kisebb annál, mint amit a ”B”- Függelék 3. fejezete 3.6.7.2.4.1 és 3.6.7.2.4.2 pontjai követelményként megállapítanak a GBAS szabványokban és hogy tovább növelje a felmérési pontosságot ahhoz hasonlítva, ami az Annex 14-ben előírásra került. A GBAS-ben használt összes légiforgalmi adat sértetlensége megegyezik a 3. fejezet 3.7.2.4-1. táblázatában leírt sértetlenségi követelményekkel.

7.17 2. Típusú közlemény kiegészítő 2. adatblokk

A 2. Típusú közlemény kiegészítő 2. adatblokk felhasználható a GRAS-nál, azért hogy lehetővé tegye, hogy a GRAS fedélzeti al-rendszer a GBAS sugárzó állomások között kapcsolhasson, különösen akkor, ha a GBAS sugárzó állomások eltérő frekvenciákat használnak. A kiegészítő 2. adatblokk az éppen vett GBAS sugárzó állomás és a többi szomszédos, vagy közeli GBAS sugárzó állomás csatorna számát és helyét azonosítja.

D-7. táblázat: Példa az 1. Típusú VHF adat sugárzási /VDB/ közleményre

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság felbontás	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	-	-	E	100
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	536	000 0000 1000 0110 00
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	-	-	–	0000 1
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKK					
Közlemény Blokk (1. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	BELL	0000 1000 0101 0011 0000 1100
Közlemény típus azonosító	8	1-től 8-ig	1	1	0000 0001
Közlemény hossz	8	10-től 222 byte-ig	1 byte	61	0011 1101

D-7. táblázat: Példa az 1. Típusú VHF adat sugárzási /VDB/ közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BONTÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Közlemény (1. Típusú példa)					
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s	100 s	00 0011 1110 1000
Kiegészítő közlemény jelző	2	0-tól 3-ig	1	A párból az első	01
Mérések száma	5	0-tól 18-ig	1	4	0 0100
Mérések típusa	3	0-tól 7-ig	1	C/A L1	000
Efemerisz dekorrelációs paraméter (P)	8	0-tól $1{,}275\times10^{-3}$ m/m-ig	5×10^{-6} m/m	1×10^{-4}	0001 0100
Efemerisz Ciklikus Redundancia Ellenőrzés /CRC/	16	–	–	–	0000 0000 0000 0000
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s	Nincs bizto-sítva	1111 1111
Mérési Blokk 1.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	2	0000 0010
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	255	1111 1111
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+1,0 m	0000 0000 0110 0100
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	–0,2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	0,98 m	0011 0001
B_1	8	±6,35 m	0,05 m	+0,10 m	0000 0010
B_2	8	±6,35 m	0,05 m	+0,15 m	0000 0011
B_3	8	±6,35 m	0,05 m	–0,25 m	1111 1011
B_4	8	±6,35 m	0,05 m	Nem haszná-latos	1000 0000

D-7. táblázat: Példa az 1. Típusú VHF adat sugárzási /VDB/ közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Mérési Blokk 2.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	4	0000 0100
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	126	0111 1110
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	–1,0 m	1111 1111 1001 1100
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	+0,2 m/s	0000 0000 1100 1000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	0,34 m	0001 0001
B_1	8	±6,35 m	0,05 m	+0,20 m	0000 0100
B_2	8	±6,35 m	0,05 m	+0,30 m	0000 0110
B_3	8	±6,35 m	0,05 m	–0,50 m	1111 0110
B_4	8	±6,35 m	0,05 m	Nem haszná-latos	1000 0000
Mérési Blokk 3.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	12	0000 1100
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	222	1101 1110
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+1,11 m	0000 0000 0110 1111
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	-0,2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	1,02 m	0011 0011
B_1	8	±6,35 m	0,05 m	+0,10 m	0000 0010
B_2	8	±6,35 m	0,05 m	+0,25 m	0000 0101
B_3	8	±6,35 m	0,05 m	–0,25 m	1111 1011
B_4	8	±6,35 m	0,05 m	Nem haszná-latos	1000 0000

D-7. táblázat: Példa az 1. Típusú VHF adat sugárzási /VDB/ közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Mérési Blokk 4.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	23	0001 0111
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	80	0101 0000
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	–2.41 m	1111 1111 0000 1111
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	–0,96 m/s	1111 1100 0100 0000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	0.16 m	0000 1000
B_1	8	±6,35 m	0,05 m	+0,20 m	0000 0100
B_2	8	±6,35 m	0,05 m	+0,30 m	0000 0110
B_3	8	±6,35 m	0,05 m	–0,50 m	1111 0110
B_4	8	±6,35 m	0,05 m	Nem haszná-latos	1000 0000
Közlemény Blokk Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	1100 0010 1111 0011 0000 1011 1100 1010
ALKALMAZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/	48	—	—	—	0110 0011 1110 1001 1110 0000 1110 1101 0010 1001 0111 0101
Bemenet a bit keverőbe (2. Megjegyzés)	0 46 10 10 55 30 CA 10 80 BC 17 C2 20 28 00 00 FF 40 FF 26 00 1C FF 8C 40 C0 DF 01 20 7E 39 FF 13 00 88 20 60 6F 01 30 7B F6 00 1C FF CC 40 A0 DF 01 E8 0A F0 FF 02 3F 10 20 60 6F 01 53 D0 CF 43 AE 94 B7 07 96 C6				
Kimenet a bit keverőből (3. Megjegyzés)	0 60 27 98 1F 2F D2 3B 5F 26 C2 1B 12 F4 46 D0 09 81 B6 25 1C 18 D0 7C 2A 7F B9 55 A8 B8 27 17 3A 60 EB 5F 1B 3B A5 FE 0A E1 43 D7 FA D7 B3 7A 65 D8 4E D7 79 D2 E1 AD 95 E6 6D 67 12 B3 EA 4F 1A 51 B6 1C 81 F2 31				
Töltő bitek	0-tól 2-ig	—	—	0	
Teljesítmény lefutás	9	—	—	—	000 000 000
D8PSK szimbólumok (4. Megjegyzés)	00000035 11204546 31650100 12707716 71645524 74035772 26234621 45311123 22460075 52232477 16617052 04750422 07724363 40733535 05120746 45741125 22545252 73171513 51047466 13171745 10622642 17157064 67345046 36541025 07135576 55745512 222				

MEGJEGYZÉSEK. –

1. A jobbról a legszélső bit a legkisebb helyértékű bitje /LSB/ a bináris paraméter értéknek, és ez az első bit, ami továbbításra, vagy a bit-keverőbe kerül küldésre. Az összes adatmező a táblázatban meghatározott sorrendben kerül leadásra.

2. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

3. Ebben a példában a kitöltő bitek nincsenek keverve.

4. Ez a mező képviseli a fázist, a $\pi/4$ egységben (például egy 5-ös érték egy $5\pi/4$ radián fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

D-7A. táblázat: Példa a 101. Típusú VHF adat sugárzási /VDB/ közleményre

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság felbontás	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	-	-	E	100
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	416	00000000110100000
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	-	-	–	11011
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKK					
Közlemény Blokk (1. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	ERWN	00010101 00100101 11001110
Közlemény típus azonosító	8	1-től 8,101-ig	1	101	0110 0101
Közlemény hossz	8	10-től 222 byte-ig	1 byte	46	0010 1110
Közlemény (101. Típusú példa)					
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s	100 s	00 0011 1110 1000
Kiegészítő közlemény jelző	2	0-tól 3-ig	1	A párból az első	01
Mérések száma	5	0-tól 18-ig	1	4	0 0100
Mérések típusa	3	0-tól 7-ig	1	C/A L1	000
Efemerisz dekorrelációs paraméter (P)	8	0-tól $1{,}275\times10^{-3}$ m/m-ig	5×10^{-6} m/m	$0{,}115\times10^{-3}$ m/m	0001 0111
Efemerisz Ciklikus Redundancia Ellenőrzés /CRC/	16	–	–	0	0000 0000 0000 0000

D-7A. táblázat: Példa a 101. Típusú VHF adat sugárzási /VDB/ közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZNÁLT BITEK	ÉRTÉK TARTOMÁNY	FELBONTÁS	ÉRTÉKEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s	Nincs biztosítva	1111 1111
B paraméterek száma	1	0-tól 1-ig	1	0	0
Tartalék	7			0	000 0000
Mérési Blokk 1.					
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1	2	0000 0010
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	255	1111 1111
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+3,56 m	0000 0001 0110 0100
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	–0,011 m/s	1111 1111 1111 0101
σ_{pr_gnd}	8	0-tól 50,8 m	0,2 m	9,8 m	0011 0001
Mérési Blokk 2.					
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1	4	0000 0100
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	126	0111 1110
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	–1,0 m	1111 1111 1001 1100
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	+0,002 m/s	0000 0000 0000 0010
σ_{pr_gnd}	8	0-tól 50,8 m	0,2 m	3,4 m	0001 0001
Mérési Blokk 3.					
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1	12	0000 1100
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	222	1101 1110
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+4,11 m	0000 0001 1001 1011
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	-0,029 m/s	1111 1111 1110 0011
σ_{pr_gnd}	8	0-tól 50,8 m	0,2 m	10,2 m	0011 0011
Mérési Blokk 4.					
Távolság-meghatározási forrás azonosító /ID/	8	1-től 255-ig	1	23	0001 0111

D-7A. táblázat: Példa a 101. Típusú VHF adat sugárzási /VDB/ közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	80	0101 0000
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	–2.41 m	1111 1111 0000 1111
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	–0,096 m/s	1111 1111 1010 0000
σ_{pr_gnd}	8	0-tól 50,8 m	0,2 m	1,6 m	0000 1000
Közlemény Blokk Ciklikus Redundancia Ellenőrzés /CRC/	32	-	-	-	1000 1000 1001 1111 0111 1000 0000 0100
ALKALMA-ZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/	48	-	-	-	1100 1100 1110 0110 1111 0110 1100 1110 1101 0110 0110 0010
Bemenet a bit keverőbe (2. Megjegyzés)	0 41 60 1B 55 73 A4 A8 A6 74 17 C2 20 E8 00 00 FF 00 40 FF 26 80 AF FF 8C 20 7E 39 FF 40 00 88 30 7B D9 80 C7 FF CC E8 0A F0 FF 05 FF 10 20 1E F9 11 46 6B 73 6F 67 33				
Kimenet a bit keverőből (3. Megjegyzés)	0 67 57 93 1F 6C BC 83 79 EE C2 18 12 34 46 D0 09 C1 09 FC 3A 84 80 0F E6 9F 18 6D 77 8E 1E 60 19 1B BA FF BC AB 68 26 7B E7 BC CE FA 0B D3 C4 43 C8 E0 B6 FA 42 84 A1				
Töltő bitek	0-tól 2-ig	—	—	0	
Teljesítmény lefutás	9	—	—	—	000 000 000
D8PSK szim-bólumok (4. Megjegyzés)	00000035 11204546 31650105 06345463 57026113 51374661 15123376 12066670 44776307 04225000 02735027 73373152 13230100 04706272 74137202 47724524 12715704 15442724 01101677 44571303 66447212 222				

MEGJEGYZÉSEK. –

1. A jobbról a legszélső bit a legkisebb helyértékű bitje /LSB/ a bináris paraméter értéknek, és ez az első bit, ami továbbításra, vagy a bit-keverőbe kerül küldésre. Az összes adatmező a táblázatban meghatározott sorrendben kerül leadásra.

2. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

3. Ebben a példában a kitöltő bitek nincsenek keverve.

4. Ez a mező képviseli a fázist, a π/4 egységben (például egy 5-ös érték egy 5π/4 radián fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

D-8. táblázat: Példa egy egyedül álló jelsorozatban továbbított

1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság fel-bontás	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	–	–	E	10 0
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	544	000 0000 1000 1000 00
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	–	–	–	0000 0
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKKOK					
Közlemény Blokk 1. (1. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	BELL	0000 1000 0101 0011 0000 1100
Közlemény típus azonosító	8	1-től 8-ig	1	1	0000 0001
Közlemény hossz	8	10-től 222 byte-ig	1 byte	28	0001 1100
Közlemény (1. Típusú példa)					
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s	100 s	00 0011 1110 1000
Kiegészítő közlemény jelző	2	0-tól 3-ig	1	A párból a második	11
Mérések száma	5	0-tól 18-ig	1	1	0 0001
Mérések típusa	3	0-tól 7-ig	1	C/A L1	000
Efemerisz Dekorrelációs Paraméter (P)	8	0-tól $1{,}275\times10^{-3}$ m/m-ig	5×10^{-6} m/m	0 (SBAS)	0000 0000
Efemerisz Ciklikus Redundancia Ellenőrzés /CRC/	16	–	–	0	0000 0000 0000 0000
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s	Nincs bizto-sítva	1111 1111

D-8. táblázat: Példa egy egyedül álló jelsorozatban továbbított

1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Mérési Blokk 1.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	122	0111 1010
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	2	0000 0010
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+1,0 m	0000 0000 0110 0100
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m	0,001 m/s	–0,2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	1,96 m	0110 0010
B_1	8	±6,35 m	0,05 m	+0,10 m	0000 0010
B_2	8	±6,35 m	0,05 m	+0,15 m	0000 0011
B_3	8	±6,35 m	0,05 m	–0,25 m	1111 1011
B_4	8	±6,35 m	0,05 m	Nem használatos	1000 0000
Közlemény Blokk 1. Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	1011 0101 1101 0000 1011 1100 0101 0010
Közlemény Blokk 2. (2. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	—	—	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	—	—	BELL	0000 1000 0101 0011 0000 1100
Közlemény típus azonosító	8	1-től 8-ig	1	2	0000 0010
Közlemény hossz	8	10-től 222 byte-ig	1 byte	34	0001 0010

D-8. táblázat: Példa egy egyedül álló jelsorozatban továbbított

1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Közlemény (2. Típusú példa)					
Földi Bázisú Kiegészítő Rendszer /GBAS/ referencia vevők	2	2-től 4-ig	1	3	01
GBAS pontossági jelölés betű	2	—	—	B	01
Tartalék	1	—	—	0	0
GBAS folyamatossági/ sértetlenségi jelölés	3	0-tól 7-ig	1	1	001
Helyi mágneses elhajlás	11	±180°	0,25°	58° E	000 1110 1000
Tartalék	5	—	—	0	0000 0
$\sigma_{vert\_iono\_gradient}$	8	0-tól 25,5 x 10^{-6} m/m-ig	0,1 x 10^{-6} m/m	0	0000 0000
Törési index	8	16-tól 781-ig	3	379	1111 1001
Skála magasság	8	0-tól 25 500 m-ig	100 m	100 m	0000 0001
Törési bizonytalanság	8	0-tól 255-ig	1	20	0001 0100
Földrajzi szélesség	32	±90,0°	0,0005 arcsec	45°40' 32"N	0001 0011 1001 1010 0001 0001 0000 0000
Földrajzi hosszúság	32	±180,0°	0,0005 arcsec	93°25' 13"W	1101 0111 1110 1000 1000 1010 1011 0000
Ellipszoid magasság	24	±83 886,07 m	0,01 m	892,55 m	0000 0001 0101 1100 1010 0111
Kiegészítő Adatblokk 1.					
Referencia Állomás Adat-kiválasztó	8	0-tól 48-ig	1	5	0000 0101
Maximális felhasználási távolság (D_{max})	8	2-től 510 km-ig	2 km	50 km	0001 1001
$K_{md\_e\_POS,GPS}$	8	0-tól 12,75-ig	0,05	6	0111 1000
$K_{md\_e\_CAT1,GPS}$	8	0-tól 12,75-ig	0,05	5	0110 0100
$K_{md\_e\_POS,GLONASS}$	8	0-tól 12,75-ig	0,05	0	0000 0000
$K_{md\_e\_CAT1,GLONASS}$	8	0-tól 12,75-ig	0,05	0	0000 0000

D-8. táblázat: Példa egy egyedül álló jelsorozatban továbbított

1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Közlemény Blokk 2. Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	0101 1101 0111 0110 0010 0011 0001 1110
ALKALMAZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/	48				1110 1000 0100 0101 0011 1011 0011 1011 0100 0001 0101 0010
Bemenet a bit-keverőbe (2. Megjegyzés)	0 41 10 00 55 30 CA 10 80 38 17 C3 80 00 00 00 FF 5E 40 26 00 1C FF 46 40 C0 DF 01 4A 3D 0B AD 55 30 CA 10 40 44 A4 17 00 00 9F 80 28 00 88 59 C8 0D 51 17 EB E5 3A 80 A0 98 1E 26 00 00 78 C4 6E BA 4A 82 DC DC A2 17				
Kimenet a bit-keverőből (3. Megjegyzés)	0 67 27 88 1F 2F D2 3B 5F A2 C2 1A B2 DC 46 D0 09 9F 09 25 1C 18 D0 B6 2A 7F B9 55 C2 F3 15 45 7C 50 A9 6F 3B 10 00 D9 71 17 DC 4B 2D 1B 7B 83 72 D4 F7 CA 62 C8 D9 12 25 5E 13 2E 13 E0 42 44 37 45 68 29 5A B9 55 65				
Töltő bitek	0-tól 2-ig	—	—	1	0
Teljesítmény Lefutás	9	—	—	1	000 000 000
D8PSK szimbólumok (4. Megjegyzés)	00000035 11204546 31650105 67443352 35201160 30501336 62023576 12066670 74007653 30010255 31031274 26172772 76236442 41177201 35131033 33421734 42751235 60342057 66270254 17431214 03421036 70316613 46567433 66547730 34732201 40607506 014444				

MEGJEGYZÉSEK. –

A jobbról a legszélsõ bit a legkisebb helyértékû bitje /LSB/ a bináris paraméter értéknek, és ez az elsõ bit, ami továbbításra, vagy a bit-keverõbe kerül küldésre. Az összes adatmezõ a táblázatban meghatározott sorrendben kerül leadásra.

1. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

2. Ebben a példában a kitöltő bitek nincsenek keverve.

3. Ez a mező képviseli a fázist, a $\pi/4$ egységben (például egy 5-ös érték egy $5\pi/4$ radián fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

D-8A. táblázat: Példa az 1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre, kiegészítő 1. és 2. adatblokkal

ADAT TARTALOM LEÍRÁS	FELHASZNÁLT BITEK	ÉRTÉK TARTOMÁNY	FELBONTÁS	ÉRTÉKEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság felbontás	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	–	–	E	100
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	544	0000001001010000
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	–	–	–	10110
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKKOK					
Közlemény Blokk 1. (1. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	ERWN	00010101 00100101 11001110
Közlemény típus azonosító	8	1-től 8-ig	1	1	0000 0001
Közlemény hossz	8	10-től 222 byte-ig	1 byte	28	0001 1100
Közlemény (1. Típusú példa)					
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s	100 s	00 0011 1110 1000
Kiegészítő közlemény jelző	2	0-tól 3-ig	1	A párból a második	11
Mérések száma	5	0-tól 18-ig	1	1	0 0001
Mérések típusa	3	0-tól 7-ig	1	C/A L1	000
Efemerisz Dekorrelációs Paraméter (P)	8	0-tól $1{,}275\times10^{-3}$ m/m-ig	5×10^{-6} m/m	0 (SBAS)	0000 0000
Efemerisz Ciklikus Redundancia Ellenőrzés /CRC/	16	–	–	0	0000 0000 0000 0000
Forrás rendelkezésre állási időtartam	8	0-tól 2 540 s-ig	10 s	Nincs biztosítva	1111 1111

D-8A. táblázat: Példa az 1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre, kiegészítő 1. és 2. adatblokkal

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Mérési Blokk 1.					
Távolság-meg-határozási forrás azonosító /ID/	8	1-től 255-ig	1	122	0111 1010
Adat kibocsátás (IOD)	8	0-tól 255-ig	1	2	0000 0010
Pszeudo-távolság helyesbítés (PRC)	16	±327,67 m	0,01 m	+2,09 m	0000 0000 1101 0001
Távolság-helyesbítési gyakoriság (RRC)	16	±32,767 m/s	0,001 m/s	–0,2 m/s	1111 1111 0011 1000
σ_{pr_gnd}	8	0-tól 5,08 m	0,02 m	1,96 m	0110 0010
B_1	8	±6,35 m	0,05 m	+0,10 m	0000 0010
B_2	8	±6,35 m	0,05 m	+0,15 m	0000 0011
B_3	8	±6,35 m	0,05 m	–0,25 m	1111 1011
B_4	8	±6,35 m	0,05 m	Nem használatos	1000 0000
Közlemény Blokk 1. Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	00110010 10100100 11001011 00110000
Közlemény Blokk 2. (2. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	—	—	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	—	—	ERWN	00010101 00100101 11001110
Közlemény típus azonosító	8	1-től 8-ig	1	2	0000 0010
Közlemény hossz	8	10-től 222 byte-ig	1 byte	40	0010 1000

D-8A. táblázat: Példa az 1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre, kiegészítő 1. és 2. adatblokkal

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZNÁLT BITEK	ÉRTÉK TARTOMÁNY	FELBONTÁS	ÉRTÉKEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Közlemény (2. Típusú példa)					
Földi Bázisú Kiegészítő Rendszer /GBAS/ referencia vevők	2	2-től 4-ig	1	3	01
GBAS pontossági jelölés betű	2	—	—	B	01
Tartalék	1	—	—	0	0
GBAS folyamatossági/ sértetlenségi jelölés	3	0-tól 7-ig	1	1	001
Helyi mágneses elhajlás	11	±180°	0,25°	58° E	000 1110 1000
Tartalék	5	—	—	0	0000 0
$\sigma_{vert\_iono\_gradient}$	8	0-tól 25,5 x 10^{-6} m/m-ig	0,1 x 10^{-6} m/m	0	0000 0000
Törési index	8	16-tól 781-ig	3	379	1111 1001
Skála magasság	8	0-tól 25 500 m-ig	100 m	100 m	0000 0001
Törési bizonytalanság	8	0-tól 255-ig	1	20	0001 0100
Földrajzi szélesség	32	±90,0°	0,0005 arcsec	45°40' 32"N	0001 0011 1001 1010 0001 0001 0000 0000
Földrajzi hosszúság	32	±180,0°	0,0005 arcsec	93°25' 13"W	1101 0111 1110 1000 1000 1010 1011 0000
Ellipszoid magasság	24	±83 886,07 m	0,01 m	892,55 m	0000 0001 0101 1100 1010 0111
Kiegészítő Adatblokk 1.					
Referencia Állomás Adat-kiválasztó	8	0-tól 48-ig	1	5	0000 0101
Maximális felhasználási távolság (D_{max})	8	2-től 510 km-ig	2 km	50 km	0001 1001
$K_{md\_e\_POS,GPS}$	8	0-tól 12,75-ig	0,05	6	0111 1000
$K_{md\_e, GPS}$	8	0-tól 12,75-ig	0,05	5	0110 0100
$K_{md\_e\_POS,GLONASS}$	8	0-tól 12,75-ig	0,05	0	0000 0000
$K_{md\_e, GLONASS}$	8	0-tól 12,75-ig	0,05	0	0000 0000
Kiegészítő Adat Blokkok					
Kiegészítő Adat Blokk Hossz	8	2-től 255-ig	1	6	0000 0110
Kiegészítő Adat Blokk Szám	8	2-től 255-ig	1	2	0000 0010
Kiegészítő Adat Blokk 2					
Csatornaszám	16	20001-től 39999-ig	1	25001	0110 0001 1010 1001

D-8A. táblázat: Példa az 1. Típusú és 2. Típusú VHF adat sugárzási /VDB/ közleményekre, kiegészítő 1. és 2. adatblokkal

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Δ földrajzi szélesség	8	±25,4º	0,2º	5,2	0001 1010
Δ földrajzi hosszúság	8	±25,4º	0,2º	-3,4	1110 1111
Közlemény Blokk 2. Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	11100000 01110010 00011101 00100100
ALKALMAZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/	48				1110 0010 0101 1100 0000 1111 1010 1011 0011 0100 0100 0000
Bemenet a bit-keverőbe (2. Megjegyzés)	0 42 90 0D 55 73 A4 A8 80 38 17 C3 80 00 00 00 FF 5E 40 8B 00 1C FF 46 40 C0 DF 01 0C D3 25 4C 55 73 A4 A8 40 14 A4 17 00 00 9F 80 28 00 88 59 C8 0D 51 17 EB E5 3A 80 A0 98 1E 26 00 00 60 40 95 86 58 F7 24 B8 4E 07 02 2C D5 F0 3A 47				
Kimenet a bit-keverőből (3. Megjegyzés)	0 64 A7 85 1F 6C BC 83 5F A2 C2 1A B2 DC 46 D0 09 9F 09 88 1C 18 D0 B6 2A 7F B9 55 84 1D 3B A4 7C 13 C7 D7 3B 40 00 D9 71 17 DC 4B 2D 1B 7B 83 72 D4 F7 CA 62 C8 D9 12 25 5E 13 2E 13 E0 5A C0 CC 79 7A 5C A2 DD B9 75 B6 95 64 52 78 3F				
Töltő bitek	0-tól 2-ig	—	—	1	0
Teljesítmény Lefutás	9	—	—	1	000 000 000
D8PSK szimbólumok (4. Megjegyzés)	00000035 11204546 31650107 56336574 60137224 74145772 26467132 56422234 30443700 05565722 06506741 73647332 27242654 63345227 31575333 33421734 42751235 60342057 66270254 17431214 03421036 70316613 46567433 62077121 37275607 55315167 17135031 34423411 274444				

MEGJEGYZÉSEK. –

A jobbról a legszélsõ bit a legkisebb helyértékû bitje /LSB/ a bináris paraméter értéknek, és ez az elsõ bit, ami továbbításra, vagy a bit-keverõbe kerül küldésre. Az összes adatmezõ a táblázatban meghatározott sorrendben kerül leadásra.

1. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

2. Ebben a példában a kitöltő bitek nincsenek keverve.

3. Ez a mező képviseli a fázist, a π/4 egységben (például egy 5-ös érték egy 5π/4 radián fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

D-9. táblázat: Példa a 4. Típusú közleményre

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság fel-bontás	48				010 0011 1110 1111 1100 0110 0011 1011 0000 0011 1100 1000 0
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	–	–	D	01 1
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	784	000 0000 1100 0100 00
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	–	–	–	0000 0
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKK					
Közlemény Blokk (4. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	CMJ	0000 1100 1101 0010 1010 0000
Közlemény típus azonosító	8	1-től 8-ig	1	4	0000 0100
Közlemény hossz	8	10-től 222 byte-ig	1 byte	92	0101 1100
Közlemény (4. Típusú példa)					
Végső megközelítési szakasz /FAS/ adat-állomány 1.					
Adatállomány hossz	8	2-től 212-ig	1 byte	41	0010 1001
FAS adatblokk 1.					
Művelet típus	4	0-tól 15-ig	1	0	0000
Műhold Bázisú Kiegészítő Rendszer /SBAS/ szolgáltatás biztosító	4	0-tól 15-ig	1	15	1111
Repülőtér azonosító	32	-	-	LFBO	0000 1100 0000 0110 0000 0010 0000 1111
Futópálya azonosító szám	6	0-tól 36-ig	1	15	00 1111
Futópálya azonosító betű	2	-	-	R	01
Megközelítési teljesítmény jelölés	3	0-tól 7-ig	1	I. Kat.	001
Útvonal jelzés	5	-	-	C	0001 1
Referencia pálya adat kiválasztó (RPDS)	8	0-tól 48-ig	1	3	0000 0011

D-9. táblázat: Példa a 4. Típusú közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Referencia pálya azonosító	32	—	—	GTBS	0000 0111 0001 0100 0000 0010 0001 0011
Leszállási küszöb pont/látszólagos küszöb pont /LTP/FTP/ földrajzi szélesség	32	±90°	0,0005 arcsec	43,6441075° N	0001 0010 1011 1010 1110 0010 1000 0110
LTP/FTP földrajzi hosszúság	32	±180°	0,0005 arcsec	1,345940°E	0000 0000 1001 0011 1101 1110 1001 0000
LTP/FTP magasság	16	–512,0-től 6 041,5 m-ig	0,1 m	197,3	0001 1011 1011 0101
ΔRepülési pálya irány pont /ΔFPAP/ földrajzi szélesség	24	±1°	0,0005 arcsec	–0,025145°	1111 1101 0011 1100 1100 1100
ΔFPAP földrajzi hosszúság	24	±1°	0,0005 arcsec	0,026175°	0000 0010 1110 0000 0010 1100
Megközelítési küszöb keresztezési magasság (TCH)	15	0-tól 1 638,35 m-ig (0-tól 3 276,7 láb-ig)	0,05 m (0,1 láb)	17,05 m	000 0001 0101 0101
Megközelítési TCH mértékegység kiválasztó	1	0 = láb; 1 = m	–	méter	1
Siklópálya szög (GPA)	16	0-tól 90°-ig	0,01°	3°	0000 0001 0010 1100
Útirány szélesség	8	80,0-től 143,75 m-ig	0,25 m	105	0110 0100
Δhossz távolság (eltolás)	8	0-tól 2 032 m-ig	8 m	0	0000 0000
FAS adatblokk 1. Ciklikus Redundancia Ellenőrzés /CRC/	32	-	-	-	1010 0010 1010 0101 1010 1000 0100 1101
FAS Függőleges Riasztási Határérték /FASVAL/ /Megközelítési állapot	8	0-tól 25,4-ig	0,1 m	10	0110 0100
FAS Oldalirányú Riasztási Határérték /FASLAL/ /Meg-közelítési állapot	8	0-tól 50,8-ig	0,2 m	40	1100 1000
Végső megközelítési szakasz /FAS/ adatállomány 2.					
Adatállomány hossz	8	2-től 212-ig	1 byte	41	0010 1001

D-9. táblázat: Példa a 4. Típusú közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZNÁLT BITEK	ÉRTÉK TARTOMÁNY	FELBONTÁS	ÉRTÉKEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
FAS adatblokk 2.					
Művelet típus	4	0-tól 15-ig	1	0	0000
Műhold Bázisú Kiegészítő Rendszer /SBAS/ szolgáltatás biztosító	4	0-tól 15-ig	1	01	0001
Repülőtér azonosító	32	—	—	LFBO	0000 1100 0000 0110 0000 0010 0000 1111
Futópálya azonosító szám	6	0-tól 36-ig	1	33	10 0001
Futópálya azonosító betű	2	—	—	R	01
Megközelítési teljesítmény jelölés	3	0-tól 7-ig	1	I. Kat.	001
Útvonal jelzés	5	—	—	A	0000 1
Referencia pálya adat kiválasztó (RPDS)	8	0-tól 48-ig	1	21	0001 0101
Referencia pálya azonosító	32	—	—	GTN	0000 0111 0001 0100 0000 1110 0010 0000
Leszállási küszöb pont/látszólagos küszöb pont /LTP/FTP/ földrajzi szélesség	32	±90°	0,0005 arcsec	43,6156350° N	0001 0010 1011 0111 1100 0001 1011 1100
LTP/FTP földrajzi hosszúság	32	±180°	0,0005 arcsec	1,3802350°E	0000 0000 1001 0111 1010 0011 0001 1100
LTP/FTP magasság	16	–512,0-től 6 041,5 m-ig	0,1 m	200,2 m	0001 1011 1101 0010
ΔRepülési pálya irány pont /ΔFPAP/ földrajzi szélesség	24	±1°	0,0005 arcsec	0,02172375°	0000 0010 0110 0010 1111 1011
ΔFPAP földrajzi hosszúság	24	±1°	0,0005 arcsec	–0,0226050°	1111 1101 1000 0100 0011 1100
Megközelítési küszöb keresztezési magasság (TCH)	15	0-tól 1 638,35 m-ig (0-tól 3 276,7 láb-ig)	0,05 m (0,1 láb)	15,25 m	000 0001 0011 0001
Megközelítési TCH mértékegység kiválasztó	1	0 = láb; 1 = m	–	méter	1
Siklópálya szög (GPA)	16	0-tól 90°-ig	0,01°	3,01°	0000 0001 0010 1101

D-9. táblázat: Példa a 4. Típusú közleményre

(folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTOMÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Útirány szélesség	8	80,0-től 143,75 m-ig	0,25 m	105	0110 0100
Δhossz távolság (eltolás)	8	0-tól 2 032 m-ig	8 m	0	0000 0000
FAS adatblokk 2. Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	1010 1111 0100 1101 1010 0000 1101 0111
FAS Függőleges Riasztási Határérték /FASVAL/ /Megközelítési állapot	8	0-tól 25,4-ig	0,1 m	10	0110 0100
FAS Oldalirányú Riasztási Határérték /FASLAL/ /Meg-közelítési állapot	8	0-tól 50,8-ig	0,2 m	40	1100 1000
Közlemény Blokk Ciklikus Redundancia Ellenőrzés /CRC/	32	—	—	—	0101 0111 0000 0011 1111 1110 1001 1011
ALKALMAZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/	48	—	—	—	0001 1011 1001 0001 0010 1010 1011 1100 0010 0101 1000 0101
Bemenet a bit-keverőbe (2. Megjegyzés)	1 82 30 00 55 05 4B 30 20 3A 94 0F F0 40 60 30 F2 98 C0 C8 40 28 E0 61 47 5D 48 09 7B C9 00 AD D8 33 3C BF 34 07 450 AA 81 34 80 26 00 B2 15 A5 45 26 13 94 08 F0 40 60 30 86 90 A8 04 70 28 E0 3D 83 ED 48 38 C5 E9 00 4B D8 DF 46 40 3C 21 BF 8C 81 B4 80 26 00 EB 05 B2 F5 25 13 D9 7F C0 EA A1 A4 3D 54 89 D8				
Kimenet a bit-keverőből (3. Megjegyzés)	1 A4 07 88 1F 1A 53 1B FF A0 41 D6 C2 9C 26 E0 04 59 89 CB 5C 2C CF 91 2D E2 2E 5D F3 07 1E 45 F1 53 5F C0 4F 53 E4 64 F0 23 C3 ED 05 A9 E6 7F FF FF B5 49 81 DD A3 F2 B5 40 9D A0 17 90 12 60 64 7C CF E3 BE A0 1E 72 FF 61 6E E4 02 44 D9 1E D2 FD 63 D1 12 C3 5A 00 0E F8 89 FE 4C 12 0C 78 4F 9D 55 08 16 F6				
Töltő bitek	0-tól 2-ig	—	—	1	0
Teljesítmény lefutás	9	—	—	—	000 000 000
D8PSK szimbólumok (4. Megjegyzés)	0000003511204546316504322300771662170713052556673176724345377776157763461661570543615214576405133401677521423130444306130115026677434175560327624163052753654001524705142032257533346255543770760565276063144462431631013537222501207604075264351034577140777704156652736001223240074020314433627544444				

MEGJEGYZÉSEK. –

1. A jobbról a legszélső bit a legkisebb helyértékű bitje /LSB/ a bináris paraméter értéknek, és ez az első bit, ami továbbításra, vagy a bit-keverőbe kerül küldésre. Az összes adatmező a táblázatban meghatározott sorrendben kerül leadásra.

2. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

3. Ebben a példában a kitöltő bitek nincsenek keverve.

4. Ez a mező képviseli a fázist, a $\pi/4$ egységben (például egy 5-ös érték egy $5\pi/4$ radián fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

D-10. táblázat: Példa az 5. Típusú közleményre

ADAT TARTALOM LEÍRÁS	FELHASZNÁLT BITEK	ÉRTÉK TARTOMÁNY	FELBONTÁS	ÉRTÉKEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
SZINKRON VEZÉRJEL ADAT TARTALOM					
Teljesítmény felfutás és beállítás	15				000 0000 0000 0000
Szinkronizáció és bizonytalanság felbontás	48				0100 0111 1101 1111 1000 1100 0111 0110 0000 0111 1001 0000
KEVERT ADATOK					
Állomás időrés azonosító (SSID)	3	–	–	D	01 1
Adattovábbítás hossz (bitek)	17	0-tól 1 824 bitig	1 bit	272	000 0000 0100 0100 00
Impulzus-sorozat vevő oldali hibajavítás /FEC/	5	–	–	–	0001 1
ALKALMAZÁSI ADAT KÖZLEMÉNY BLOKK					
Közlemény Blokk (5. Típusú közlemény)					
Közlemény Blokk fejrész					
Közlemény blokk azonosító	8	–	–	Normál	1010 1010
Földi Bázisú Kiegészítő Rendszer /GBAS/ azonosító /ID/	24	–	–	CMJ	0000 1100 1101 0010 1010 0000
Közlemény típus azonosító	8	1-től 8-ig	1	5	0000 0101
Közlemény hossz	8	10-től 222 byte-ig	1 byte	28	0001 1100
Közlemény (5. Típusú példa)					
Módosított Z-számítás	14	0-tól 1 199,9 s-ig	0,1 s	100 s	00 0011 1110 1000
Tartalék	2	—	—	—	00
A befogott jelforrások száma (N)	8	0-tól 31-ig	1	2	0000 0010
Első befogott jelforrás					
Távolság-meghatározási forrás azonosító	8	1-től 255-ig	1	4	0000 0100
Jelforrás rendelkezésre állási leolvasás	1	—	—	Meg fog szűnni	0
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s	50 s	0000 101
Második befogott jelforrás					
Távolság-meghatározási forrás azonosító	8	1-től 255-ig	1	3	0000 0011

D-10. táblázat: Példa az 5. Típusú közleményre (folytatás)

ADAT TARTALOM LEÍRÁS	FELHASZ-NÁLT BITEK	ÉRTÉK TARTO-MÁNY	FEL-BON-TÁS	ÉRTÉ-KEK	BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)
Jelforrás rendelkezésre állási leolvasás	1	—	—	Meg fog kezdőd-ni	1
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s	200 s	0010 100
Akadályozott megközelítések száma (A)	8	0-tól 255-ig	1	2	0000 0010
Első akadályozott megközelítés					
Referencia pálya adat kiválasztó (RPDS)	8	0-tól 48-ig	1	21	0001 0101
A befogott jelforrások száma az első akadályozott megközelítésnél (N_A)	8	1-től 31-ig	1	2	0000 0010
Az elsõ akadályozott megközelítés elsõ befogott távolság-meghatározási forrása					
Távolság-meghatározási forrás azonosító	8	1-től 255-ig	1	12	0000 0110
Jelforrás rendelkezésre állási érzék	1	—	—	Meg fog szűnni	0
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s	250 s	0011 001
Az elsõ akadályozott megközelítés második befogott távolság-meghatározási forrása					
Távolság-meghatározási forrás azonosító	8	1-től 255-ig	1	14	0000 1110
Jelforrás rendelkezésre állási érzék	1	—	—	Meg fog szűnni	0
Jelforrás rendelkezésre állási időtartam	7	0-tól 1 270 s-ig	10 s	1 000 s	1100 100
Második akadályozott megközelítés					
Referencia pálya adat kiválasztó (RPDS)	8	0-tól 48-ig	1	14	0000 1110
A befogott jelforrások száma az első akadályozott megközelítésnél (N_A)	8	1-től 31-ig	1	1	0000 0001

D-10. táblázat: Példa az 5. Típusú közleményre (folytatás)

<table>
<tr><th>ADAT TARTALOM LEÍRÁS</th><th>FELHASZ-NÁLT BITEK</th><th>ÉRTÉK TARTO-MÁNY</th><th>FEL-BON-TÁS</th><th>ÉRTÉ-KEK</th><th>BINÁRIS ÁBRÁZOLÁS (1. Megjegyzés)</th></tr>
<tr><td colspan="6">A második akadályozott megközelítés elsõ befogott távolság-meghatározási forrása</td></tr>
<tr><td>Távolság-meghatározási forrás azonosító</td><td>8</td><td>1-től 255-ig</td><td>1</td><td>12</td><td>0000 1100</td></tr>
<tr><td>Jelforrás rendelkezésre állási érzék</td><td>1</td><td>—</td><td>—</td><td>Meg fog szűnni</td><td>0</td></tr>
<tr><td>Jelforrás rendelkezésre állási időtartam</td><td>7</td><td>0-tól 1 270 s-ig</td><td>10 s</td><td>220 s</td><td>0010 110</td></tr>
<tr><td>Közlemény blokk Ciklikus Redun-dancia Ellenőrzés /CRC/</td><td>32</td><td>—</td><td>—</td><td>—</td><td>1101 1011 0010 1111 0001 0010 0000 1001</td></tr>
<tr><td>ALKALMAZÁSI VEVŐ OLDALI HIBAJAVÍTÁS /FEC/</td><td>48</td><td>—</td><td>—</td><td>—</td><td>0011 1110 1011 1010 0001 1110 0101 0110 1100 1011 0101 1011</td></tr>
<tr><td>Bemenet a bit-keverőbe (2. Megjegyzés)</td><td colspan="5">1 82 20 18 55 05 4B 30 A0 38 17 C0 40 20 50 C0 94 40 A8 40 30 4C 70 13 70 80 30 34 90 48 F4 DB DA D3 6A 78 5D 7C</td></tr>
<tr><td>Kimenet a bit-keverőből</td><td colspan="5">1 A4 17 90 1F 1A 53 1B 7F A2 C2 19 72 FC 16 10 62 81 E1 43 2C 48 5F E3 1A 3F 56 60 18 86 EA 33 F3 B3 09 07 26 28</td></tr>
<tr><td>Töltő bitek</td><td>0-tól 2-ig</td><td>—</td><td>—</td><td>0</td><td></td></tr>
<tr><td>Teljesítmény lefutás</td><td>9</td><td></td><td></td><td></td><td>000 000 000</td></tr>
<tr><td>D8PSK szimbólumok (3. Megjegyzés)</td><td colspan="5">0000003511204546316504322056660551067602416124477363463220700103224006601332124166231163643777110173115743023234451466444444</td></tr>
</table>

MEGJEGYZÉSEK. –

1. A jobbról a legszélső bit a legkisebb helyértékű bitje /LSB/ a bináris paraméter értéknek, és ez az első bit, ami továbbításra, vagy a bit-keverőbe kerül küldésre. Az összes adatmező a táblázatban meghatározott sorrendben kerül leadásra.

2. Ez a mező hexadecimálisan van kódolva, és az első bitjével kerül a bit-keverőbe továbbításra, mint a legnagyobb helyértékű bit /MSB/. Az első karakter egy egyedülálló bitet képvisel.

3. A szimbólumokat a közlemény első szimbólumához viszonyított differenciál fázisuk ábrázolja, $\pi/4$ egységben (például egy 5-ös érték egy $5\pi/4$ radiáns fázist képvisel) az első szimbólum fázisára vonatkoztatottan.

7.18 101. Típusú közlemény

A 101. Típusú közlemény az 1. Típusú közlemény alternatívája, amit azért fejlesztettek ki, hogy megfeleljen a GRAS rendszerek speciális szükségleteinek. A két közlemény típus tartalma és alkalmazása közötti elsődleges különbség kettős: a) a 101. Típusú közleménynek nagyobb a σ_{pr_gnd} értéktartománya és b) a földi rendszer idő-a-risztásig ideje nagyobb a rendszer sugárzó 101. Típusú közlemények számára. Egy rendszerben az első állapot tipikusan ott fordul elő, ahol egy sugárzó állomás nagy területet fed le, így a dekorrelációs hibák megnövelik a pszeudó-távolság korrekciós hibák felső határértékét. A második állapot olyan rendszerekre jellemző, ahol a központi mester állomás egy nagy területet lefedő több vevőről érkező jeleket dolgoz fel.

8. A Jel minőség ellenőrzés (SQM) tervezés

8.1 A Jel minőség ellenőrzés (SQM) célja az, hogy észlelje a műhold jel rendellenességeket annak érdekében, hogy megelőzze azt, hogy a légijármű fedélzeti vevők félrevezető információkat (MI) használjanak fel. A félrevezető információ /MI/ egy nem-észlelt légijármű fedélzeti pszeudo-távolság differenciál hiba, amely nagyobb annál a maximális hibánál (MERR), amit el lehet tűrni. Ezek a nagy pszeudo-távolság hibák a műhold ’hasznos terhelési’ jellemzői által okozott torzított /durva/ hozzáférési /C/A/ kód korrelációs csúcs torzítása miatt vannak. Ha a referencia vevő úgy van használva, hogy létrehozza a differenciál helyesbítéseket, és a légijármű fedélzeti vevőjének van eltérés mérő mechanizmusa (azaz vevő sávszélesség és követő kör korrelátor szünet), akkor a jel-torzítás különböző módon érinti azokat. A Jel minőség ellenőrzésnek /SQM/ védenie kell a légijármű fedélzeti vevőjét azokban az esetekben, amikor a mechanizálás nem azonos. Az SQM teljesítményének további meghatározója a műhold hiba érzékelésének valószínűsége és a műhold hiba helytelen jelentésének valószínűsége.

8.2 Azokat a jel hatásokat, amik létrehozhatják azt, hogy egy Föld Bázisú Kiegészítő Rendszer /GBAS/, vagy Műhold Bázisú Kiegészítő Rendszer /SBAS/ egy félrevezető információt adjon le, három különböző hatásként kategorizálhatók a korrelációs funkcióra, a következők szerint:

a) Holt zónák: Amikor a korrelációs funkció elveszti a csúcsát, akkor a vevők diszkriminátor funkciója egy ’lapos pontot’, vagy holt zónát fog magába foglalni. Ha a referencia vevő és a légijármű fedélzeti vevője ennek a holt zónának különböző részeit rögzíti, akkor az félrevezető információt /MI/ eredményezhet.

b) Hamis csúcsok: Ha a referencia vevő és a légijármű fedélzeti vevő különböző csúcsokat rögzít, akkor az MI-t eredményezhet.

c) Torzítások: Ha a korrelációs csúcs eltorzult, és egy légijármű más korrelátor szünetet használ ahhoz képest, mint amit a referencia vevők alkalmaznak, akkor félrevezető információ /MI/ tapasztalható.

8.3 Fenyegetés modell alkalmazása javasolt a Jel minőség ellenőrzés /SQM/ kiértékelésének három részére, ami létrehozhatja a fentiekben felsorolt három korrelációs csúcs ’kórképet’.

8.4 Az ’A’ fenyegetés modell egy szabvány torzított hozzáférési /C/A/ kódot foglal magában, kivéve azt, hogy a pozitív chipeknek egy olyan lefutó éle van, ami annak a chipnek a pontos vég-idejéhez viszonyítva siet, vagy késik. Ez a fenyegetés modell a Navigációs adat egységben (NDU) kapcsolódik a hibához, a GPS, vagy GLONASS műhold digitális szegmensében.

8.4.1 Az ’A’ fenyegetés modellnek egy GPS-re egy egyedüli paramétere van, a Δ, ami a sietés ($\Delta < 0$), vagy a késés ($\Delta > 0$) a chip tört részében kifejezve. Ennek a paraméternek a tartománya $-0{,}12 \leq \Delta \leq 0{,}12$. A GLONASS-ra a egy egyedüli paraméter van, a Δ, ami a sietés ($\Delta < 0$), vagy a késés ($\Delta > 0$) a chip tört részében kifejezve. Ennek a paraméternek a tartománya $-0{,}11 \leq \Delta \leq 0{,}11$.

8.4.2 Ezen a tartományon belül az ’A’ fenyegetés modell létrehozza a fentiekben leírt holt zónákat. (A sietéses hullámformát nem kell ellenőrizni, mivel azok korrelációs funkciója egyszerűen előreviszi a korrelációs funkciót a késésre; ennélfogva a félrevezető információ /MI/ fenyegetés egyforma.)

8.5 A ’B’ fenyegetés modell bevezeti az amplitúdó-modulációt és a teljesítőképesség csökkenést a GPS, vagy GLONASS műhold analóg részében. Meghatározottabban, az egy másodrendű rendszer kimenetéből áll akkor, amikor a névleges C/A kód alapsáv jele a bemenet. A ’B’ fenyegetés modell elfogadja azt, hogy a teljesítőképesség csökkent műhold al-rendszert egy lineáris rendszerként be lehet vinni egy komplex konjugált pólus-pár által. Ezek a pólusok a $\sigma \pm j2\pi f_d$-nél vannak, ahol a ’σ’ a csillapító tényező neper/másodperc; és az ’f_d’ a rezonancia frekvencia ciklus/másodperc egységekben.

8.5.1 Egy másodrendű rendszer egység ugrásra adott válaszát a következő adja:

$$e(t) = \begin{cases} 0 & t \le 0 \\ 1 - \exp(-\sigma t)\left[\cos\omega_d t + \dfrac{\sigma}{\omega_d}\sin\omega_d t\right] & t \ge 0 \end{cases}$$

ahol a $\omega_d = 2\pi f_d$.

8.5.2 A ’B’ fenyegetés modell a GPS-re a másodrendű rendellenességeknek megfelelően a Δ, f_d és σ paraméterekre a következő tartományokat használja fel:

$$\Delta = 0;\ 4 \le f_d \le 17;\quad \text{és}\quad 0{,}8 \le \sigma \le 8{,}8.$$

A ’B’ fenyegetés modell a GLONASS-ra a másodrendű rendellenességeknek megfelelően a Δ-ra a következő paraméter tartományokat használja fel:

$$\Delta = 0;\ 10 \le f_d \le 20;\quad \text{és}\quad 2 \le \sigma \le 8.$$

8.5.3 Ezeken a paraméter tartományokon belül a ’B’ fenyegetés modell létrehozza a korrelációs csúcs torzításokat, valamint a hamis csúcsokat.

8.6 A ’C’ fenyegetés modell mindkettőt, a sietés/késés-t és az amplitúdó-modulációt is bevezeti. Kifejezetten, ez a másodrendű rendszerből eredő kimenetekből áll akkor, amikor a C/A kód jel a bemenetnél sietést, vagy késést szenved el. A hullámforma a fentiekben leírt két hatás kombinációja.

8.6.1 A ’C’ fenyegetés modell a GPS-re a Δ-ra, f_d-re és σ-ra a következő paraméter tartományokat használja fel:

$$-0{,}12 \le \Delta \le 0{,}12;\ 7{,}3 \le f_d \le 13;\quad \text{és}\quad 0{,}8 \le \sigma \le 8{,}8.$$

A ’C’ fenyegetés modell a GLONASS-ra a Δ-ra, f_d-re és σ-ra a következő paraméter tartományokat használja fel:

$$-0{,}11 \le \Delta \le 0{,}11;\ 10 \le f_d \le 20;\quad \text{és}\quad 2 \le \sigma \le 8.$$

8.6.2 Ezen paraméter tartományokon belül a ’C’ modell létrehoz holt zónákat, korrelációs csúcs torzításokat és hamis csúcsokat.

8.7 A GPS-től és a GLONASS-tól eltérően a Műhold Bázisú Kiegészítő Rendszer /SBAS/ jelet a szolgáltatás biztosító helyezi üzembe és ellenőrzi. Ezen felül a szolgáltatás biztosító folyamatosan ellenőrzi az SBAS-ból jövő jelek minőségét. Ebből a célból egy fenyegetés modell kerül meghatározásra és közzétételre a szolgáltatás biztosító által az egyes SBAS műholdakra. Az SBAS jel minőség ellenőrzés /SQM/ úgy lesz megtervezve, hogy az összes, a D-12. táblázatban leírtaknak megfelelő repülési elektronikát védje. A Fenyegetés modell közzététele azokra az esetekre szükséges, ahol a szolgáltatás biztosító lehetővé teszi azt, hogy a szomszédos szolgáltatás biztosítótól eredő SBAS távolság-meghatározási jelek felhasználásra kerüljenek a precíziós megközelítések számára az SBAS, vagy GBAS által. Ezekben az esetekben a szolgáltatás biztosító folyamatosan ellenőrizni fogja a szomszédos műholdtól eredő SBAS távolság-meghatározási jelet.

8.8 Abból a célból, hogy egy meghatározott folyamatos ellenőrző rendszer teljesítményét ellenőrizzék, az ellenőrző berendezés határértékeit úgy kell meghatározni és beállítani, hogy védje az egyedi műholdak pszeudo-távolság hibáit, a védelmi szintre vonatkozóan a földi al-rendszerek teljességi kockázatának felhasználásával. A Maximális eltűrhető hibát (MERR-ként jelezve) az egyes 'i' távolság-meghatározási forrásokban a Földi Bázisú Kiegészítő Rendszer /GBAS/-ben lehet meghatározni, mint:

$MERR = K_{ffmd}\sigma_{pr\_ground,i}$ és

$$MERR = K_{V,PA}\sqrt{\sigma^2_{i,UDRE} + \min\left\{\sigma^2_{i,UIRE}\right\}}$$

Az SBAS megközelítés függőleges vezetéssel /APV/ és precíziós megközelítésekre, ahol a $\min\left\{\sigma^2_{i,UIRE}\right\}$ minimális lehetséges érték valamennyi felhasználó részére. A MERR a hibamentes felhasználói vevő kimeneten kerül kiértékelésre, és a műhold magassági szögétől és a földi rendszer teljesítményétől függően változó.

8.9 A Jel minőség ellenőrzés /SQM/ úgy van megtervezve, hogy a Felhasználói differenciális távolságmérési hibát /UDRE/ olyan értékre korlátozza, ami a MERR alatt van egy műhold rendellenesség esetében. Jellemzően az SQM méri a különféle korrelációs csúcs értékeket és olyan 'jelközöket' és arány metrikát hoz létre, amelyek leírják a korrelációs csúcs torzításokat. A D-9. ábra mutatja be egy hibamentes, szűrés nélküli korrelációs csúcs tetejének jellemző pontjait.

8.9.1 Egy korrelátor pár használatos a nyomkövetéshez. Az összes egyéb korrelátor érték ehhez a korrelátor párhoz viszonyítottan kerül mérésre.

8.9.2 Az ellenőrző metrika két típusa van kialakítva: a korai– mínusz–késői metrika (D), amelyek a csúcs torzítások által okozott nyomkövetési hibákra utalnak, és az amplitúdó viszony metrika (R), amellyel a meredekséget mérik és az /amplitúdó/ csúcs egyenletesség, vagy a közel többszörös csúcsokra utalnak.

8.9.3 Szükséges az, hogy a Jel minőség ellenőrzés /SQM/ vevő rendelkezzen egy olyan előkorrelációs sávszélességgel, ami megfelelően széles ahhoz, hogy mérje a keskeny térköz metrikát, úgy, hogy az ne okozzon maga is jelentős csúcs-torzítást vagy, hogy eltakarja azokat a rendellenességeket, amelyeket a műholdak hibái okoztak. Jellemzően, az SQM vevőnek a GPS-re legalább 16 MHz-es és a GLONASS-ra legalább 15 MHz-es előkorrelációs sávszélességgel kell rendelkezni.

8.9.4 Az ellenőrző metrika ezután alul-áteresztő digitális szűrőkkel kerül simításra. Ezeknek a szűrőknek az idő-állandója rövidebb annál, mint amit kapcsoltan (és 100 másodpercre szabványosítottan) a referencia vevők alkalmaznak a differenciál helyesbítések származtatására és a légijármű fedélzeti vevők a pszeudo-távolság mérések simításához (vivőhullám simításra felhasználva). A simított metrika kerül ezután a küszöbökkel összehasonlításra. Ha a küszöbök bármelyike túllépésre kerül, akkor egy riasztás jelentkezik arra a műholdra.

8.9.5 A küszöbök használatosak azoknak a teljesítményeknek a származtatására, amelyek Minimális észlelhető hibák-ként (MDE-k) és Minimális észlelhető arányok-ként (MDR-ek) kerülnek meghatározásra. A hibamentes adás hibás észlelésének valószínűsége és a kimaradt észlelés valószínűsége használatos az MDE-k és MDR-ek származtatására. A (D) és (R) metrika zaj $\sigma_{D,test}$-ként és $\sigma_{R,test}$-ként jelölve – az alábbiakban – uralja a többutas visszaverődési hibákat. Jegyezzék meg, hogy a metrika ellenőrzéseknek is lehet egy középértéke (μ_{test}), amit az SQM vevő szűrőjének torzítása okoz. A küszöb ellenőrzéseket is számításba kell venni a középértékeknél.

8.9.6 Azok az MDE és MDR értékek, amelyek a Jel minőség ellenőrzés /SQM/ teljesítmény szimulációkban használatosak, a következő egyenletekre alapozva kerültek kiszámításra:

$$MDE = (K_{ffd} + K_{md})\ \sigma_{D,test} \text{ és}$$
$$MDR = (K_{ffd} + K_{md})\ \sigma_{R,test}$$

ahol:

K_{ffd} = 5,26 Ami a jellemző hibamentes érzékelés szorzója egy $1{,}5 \times 10^{-7}$ ellenőrzésenkénti hibás érzékelési valószínűséget képvisel;

K_{md} = 3,09 Ami a jellemző kimaradt észlelés szorzója egy 10^{-3} ellenőrzésenkénti kimaradt észlelési valószínűséget képvisel;

$\sigma_{D,test}$ Az eltérési ellenőrzés metrika ’D’ mért értékeinek szabvány eltérése; és

$\sigma_{R,test}$ Az arány ellenőrzés metrika ’R’ mért értékeinek szabvány eltérése.

8.9.7 Ha reflexió független SQM vevők használatosak a hibák érzékeléséhez, akkor a szigma értékeket le lehet csökkenteni a független ellenőrző berendezések számának négyzetgyökével.

8.9.8 Hiba akkor kerül bejelentésre, ha

$$|\ D,test - \mu_{D,test}\ | \geq MDE, \text{ vagy}$$
$$|\ R,test - \mu_{R,test}\ | \geq MDR$$

bármelyik elvégzett ellenőrzésre, ahol a $\mu_{X,test}$ az ’X’ ellenőrzés középértéke hibamentes SQM vevő szűrő torzításra visszavezetve, valamint hogy a korrelációs csúcs torzítás sajátosan jellemző az egyedi C/A kód Ál-véletlen zajára /PRN/. (A C/A kódok korrelációs csúcsai nem mindegyikének azonos a meredeksége. A szimulációs környezetben azonban ezt a PRN torzítást figyelmen kívül lehet hagyni, és pontos korrelációs csúcsot lehet használni, eltekintve a szimulált szűrő torzítástól.)

8.10 Az ellenőrzési statisztika szabvány eltéréseit $\sigma_{D,test}$ -ként és $\sigma_{R,test}$ -ként az adatgyűjtésen keresztül lehet meghatározni egy több-kollerátorú vevőn a várható üzemeltetési környezetben. Az adatgyűjtő vevő a korrelátorok egy egyszerű nyomkövető párját használja fel és kiegészítő korreláció funkció mérési pontokat, amelyek ehhez a nyomkövető párhoz vannak kapcsolva, ahogy az a D-9. ábrán bemutatásra kerül. Az adatok az összes rendelkezésre álló mérési pontra összegyűjtésre és simításra kerülnek abból a célból, hogy a metrikájuk kiszámításra kerüljön. Ezeknek a metrikáknak a szabvány eltérése határozza meg $\sigma_{D,test}$ -et. Az is lehetséges, hogy ezeket az egy szigma ellenőrző statisztikákat kiszámítják, ha a telepítési környezet többutas visszaverődési modellje rendelkezésre áll.

8.10.1 Az eredményként kapott $\sigma_{D,test}$ nagymértékben függő attól a többutas szóródási környezettől, amelyben az adatok összegyűjtésre kerültek. A többutas szóródás miatti eltérés egy nagyságrenddel nagyobb lehet annál, mint amit a zaj eredményezhet még a minimális vivőfrekvencia zaj szintnél is.

Ez a helyzet magyarázza meg az antenna tervezés és a telepítési követelmények fontosságát, amelyek elsődleges tényezők annak a többutas szóródási szintnek a meghatározásában, ami a vevőbe be fog lépni. A többutas szóródás csökkenése jelentős mértékben le fogja csökkenteni a létrejövő Minimális észlelhető hibát /MDE/ és ezáltal növeli a Jel minőség ellenőrzés /SQM/ teljesítőképességét.

8.10.2 A $\mu_{D,test}$ és a $\mu_{R,test}$ középértékei másrészről egy viszonylag hibamentes környezetben kerültek meghatározásra, úgy mint egy GPS és GLONASS jel szimulátor bemenetként való felhasználásán keresztül. Ezek a középértékek a névleges Jel minőség ellenőrzési /SQM/ vevők autokorrelációs csúcsainak szűrő torzítását modellezik, beleértve a szomszédos mellék autokorrelációs csúcsok miatti torzítási hatásokat. A közepes értékek eltérhetnek az ezekre a jellemzőkre alapozott különféle Ál-véletlen zajokra.

8.11 A földi ellenőrző berendezésnél abból a célból, hogy a felhasználókat a fentiekben leírt különféle fenyegetés modellek ellen megvédjék, az szükséges, hogy elfogadjuk, hogy a légijármű fedélzeti vevőknek speciális karakterisztikája van. Ha az ilyen korlátozás nem kerülne elfogadásra, akkor a földi ellenőrző berendezés komplexitása szükségtelenül túl magas lenne. A technológia fejlődése a légijármű fedélzeti vevőkben megnövelt észlelési képességhez vezethet, és csökkentheti a jelenlegi kényszert.

8.11.1 A kettős delta-korrelátoroknál a légijármű fedélzeti vevője a legerősebb korrelációs csúcsot követi a teljes kódsorozat során a navigációs megoldásban használt minden egyes távolság-meghatározási forrásra.

8.11.2 A kettős delta-korrelátoroknál az elő-korrelátor szűrő legalább oktávonként 30 dB-el ’előre gördül’ az átváltási sávban.

8.11.3 A következő paraméterek használatosak a követési teljesítmény adatok leírására a műholdak egyes típusára:

a) A pillanatnyi korrelátor térköz úgy van meghatározva, hogy az a korrelációs funkció korai és késői mintái egy egyedi sorozat közötti térköz;

b) Egy átlagos korrelátor térköz úgy van meghatározva, hogy az a pillantnyi korrelátor térköz egy egy-másodperces átlaga. Az átlag minden egyes egy-másodperces időkeretre vonatkozik;

c) A diszkriminátor Δ a korai-mínusz-késői minták egy átlagán alapszik a meghatározott tartományon belüli térközökkel, vagy a $\Delta = = 2\Delta_{d1} - \Delta_{2d1}$ típusú mindkét értékre, a d_1-re és a $2d_1$-re a meghatározott tartományban. Akár koherens, vagy nem-koherens diszkriminátor használatos;

d) A differenciál csoport-futási időt kell alkalmazni a teljes légijármű fedélzeti rendszerre a korrelátort megelőzően, az antennát is beleértve. A differenciál csoport-futási idő a következők szerint van meghatározva:

$$\left|\frac{d\phi}{d\omega}(f_c) - \frac{d\phi}{d\omega}(f)\right|$$

ahol:

f_c a prekorrelációs sávszűrő középfrekvenciája;

f bármilyen frekvencia az előkorrelációs szűrő 3 dB-es sávszélességén belül;

ϕ az előkorrelációs sávszűrő és az antenna összekapcsolt fázis válasza; és

ω egyenlő 2πf-el.

8.11.4 Az olyan légijármű fedélzeti vevőknél, amelyek korai-késői korrelátorokat használnak és a GPS műholdakat követik, a berendezés előkorrelációs sávszélesség a korrelátor térköz és a differenciál csoportfutási idő a D-11. táblázatban meghatározott tartományon belül van.

8.11.5 Az olyan légijármű fedélzeti vevőknél, amelyek korai-késői korrelátorokat használnak és a GLONASS műholdakat követik, a berendezés előkorrelációs sávszélesség a korrelátor térköz és a differenciál csoport-futási idő a D-12. táblázatban meghatározott tartományon belül van.

8.11.6 Az olyan légijármű fedélzeti vevőknél, amelyek kettős-delta korrelátorokat használnak és a GPS műholdakat követik, a berendezés előkorrelációs sávszélesség a korrelátor térköz és a differenciál csoport-futási idő a D-13. táblázatban meghatározott tartományon belül van.

8.11.7 Az olyan légijármű fedélzeti vevőknél, amelyek korai-késői, vagy kettős-delta korrelátorokat használnak és az SBAS műholdakat követik, a berendezés előkorrelációs sávszélesség a korrelátor térköz és a differenciál csoport-futási idő a D-14. táblázatban meghatározott tartományon belül van.

9. Állapot ellenőrzés és NOTAM

9.1 Rendszer állapot

9.1.1 A Földi Bázisú Kiegészítő Rendszer /GBAS/ teljesítőképesség csökkenésének általában helyi hatásai vannak, és ez főleg a megközelítési üzemeltetésekre hat. A GBAS rendszer teljesítőképesség csökkenését a megközelítési vonatkozású információkhoz kell szolgáltatni.

9.1.2 A műhold helyzetsor rendszer(ek), vagy a Műhold Bázisú Kiegészítő Rendszer /SBAS/ teljesítőképesség csökkenésének nem csak helyi hatása van, hanem kiegészítő következményei lesznek egy szélesebb területre, és közvetlen hatással lehet az útvonal-repülési üzemeltetésekre. Ezeknek az elemeknek a teljesítőképesség csökkenését a területi vonatkozású információkhoz kell szolgáltatni. Egy példa erre egy műhold hibája.

9.1.3 A GRAS működés teljesítőképesség csökkenésének helyi és/vagy nagy területű hatásai lehetnek. Ennek megfelelően, ha a teljesítőképesség csökkenésnek csak helyi hatásai vannak, a GRAS rendszer teljesítőképesség csökkenési információját a 9.1.1 pontnak megfelelően kell szolgáltatni. Ha a teljesítőképesség csökkenésnek nagy területű hatásai vannak, a GRAS rendszer teljesítőképesség csökkenési információját a 9.1.2 pontnak megfelelően kell szolgáltatni.

9.1.4 Az információt úgy kell szolgáltatni, hogy jelezze a GNSS-nek egy meghatározott üzemeltetés alátámasztására vonatkozó képtelenségét. Például a GPS/SBAS lehet, hogy nem támasztja alá egy meghatározott megközelítés precíziós megközelítési üzemeltetését. Ezt az információt automatikusan, vagy kézi bevitellel lehet létrehozni a rendszer teljesítmény modelljére alapozva.

D-11. táblázat: GPS nyomkövetési korlátozások a korai-késői korrelátorokra

Tartomány	3 dB-es előkorrelációs sávszélesség, BW	Átlagos korrelátor térköz (chipek)	Pillanatnyi korrelátor térköz (chipek)	Differenciál csoport-futási késleltetési idő
1	2 < BW ≤ 7 MHz	0,045 – 1,1	0,04 – 1,2	≤ 600 ns
2	7 < BW ≤ 16 MHz	0,045 – 0,21	0,04 – 0,235	≤ 150 ns
3	16 < BW ≤ 20 MHz	0,045 – 0,12	0,04 – 0,15	≤ 150 ns
4	20 < BW ≤ 24 MHz	0,08 – 0,12	0,07 – 0,13	≤ 150 ns

D-12. táblázat: GLONASS nyomkövetési korlátozások a korai-késői korrelátorokra

Tartomány	3 dB-es előkorrelációs sávszélesség, BW	Átlagos korrelátor térköz tartomány (chipek)	Pillanatnyi korrelátor térköz tartomány (chipek)	Differenciál csoport-futási késleltetési idő
1	7 < BW ≤ 9 MHz	0,05 – 1,0	0,045 – 1,1	≤ 100 ns
2	9 < BW ≤ 15 MHz	0,05 – 0,2	0,045 – 0,22	≤ 100 ns
3	15 < BW ≤ 18 MHz	0,05 – 0,1	0,045 – 0,11	≤ 100 ns

D-13. táblázat: GPS nyomkövetési korlátozások a kettős-delta korrelátorokra

Tartomány	3 dB-es előkorrelációs sávszélesség, BW	Átlagos korrelátor térköz tartomány (chipek)	Pillanatnyi korrelátor térköz tartomány (chipek)	Differenciál csoport-futási késleltetési idő
1	2 < BW ≤ 7 MHz	0,045 – 0,6	0,04 – 0,65	≤ 600 ns
2	7 < BW ≤ 14 MHz	0,045 – 0,24	0,04 – 0,26	≤ 150 ns
3	14 < BW ≤ 16 MHz	0,07 – 0,24	0,04 – 0,26	≤ 150 ns

D-14. táblázat: SBAS távolság-meghatározási funkció nyomkövetési korlátozások

Tartomány	3 dB-es előkorrelációs sávszélesség, BW	Átlagos korrelátor térköz (chipek)	Pillanatnyi korrelátor térköz (chipek)	Differenciál csoport-futási késleltetési idő
1	2 < BW ≤ 7 MHz	0,045 – 1,1	0,04 – 1,2	≤ 600 ns
2	7 < BW ≤ 20 MHz	0,045 –1,1	0,04 – 1,2	≤ 150 ns

9.2 Tájékoztatás a teljesítőképesség csökkenés típusáról

A következő tájékoztatásokat kell szolgáltatni:

a) A szolgáltatás nem-elérhető;

b) A szolgáltatás leminősítését, ha alkalmazható; és

c) A teljesítőképesség csökkenés idejét és várható időtartamát.

9.3 Az értesítések ütemezése

Tervezett eseményeknél az értesítést legalább 72 órával az eseményt megelőzően át kell adni a NOTAM hatóságnak. Nem-tervezett események esetén a NOTAM hatóságot 15 percen belül értesíteni kell. Az értesítést a 15 perces, vagy annál hosszabb időtartamú eseményekről kell adni.

10. Interferencia

10.1 Potenciális interferencia

A műholdas navigációs rendszereknek, azaz a GPS-nek és a GLONASS-nak, jellemzőjük a viszonylag gyenge vett jel teljesítmény, ami azt jelenti, hogy egy interferencia jel létrehozhatja a szolgáltatás elvesztését. A szolgáltatás fenntartása céljából szükséges lesz annak biztosítása, hogy a Szabványok és Ajánlott Gyakorlatokban /SARPs/ meghatározott maximális interferencia szintek ne kerüljenek túllépésre.

10.2 Az antenna bemenet interferencia küszöbének meghatározása

Az interferencia küszöb szintek jelzései az antenna bemenetre vannak vonatkoztatva. Ebben az összefüggésben az „antenna bemenet” kifejezés az antenna és a GNSS vevő közötti kapcsolatot jelenti, ahol a műhold jel teljesítménye megfelel a névleges minimális vett jel teljesítménynek, ami -164,5 dBW a GPS-re és -165,5 dBW a GLONASS-ra. A potenciális interferencia forrástól való lecsökkent távolság miatt azoknak a GNSS vevőknek, amelyek a repülés megközelítési szakaszában használatosak, magasabb interferencia küszöbjük van, mint azoknak a vevőknek, amelyek csak az útvonal-repülési navigációra használatosak.

10.3 Sávon-belüli interferencia források

A sávon-belüli káros interferencia potenciális forrása bizonyos Államokban az Állandóhelyű szolgálatok működése. Bizonyos Államokban van olyan elsődleges kiosztás a pont – pont mikróhullámú összeköttetési állandóhelyű szolgálatok számára, amelyek a GPS és a GLONASS által használt frekvenciasávban működnek.

10.4 Sávon-kívüli interferencia források

A sávon-kívüli potenciális interferencia források magukba foglalják a légiforgalmi VHF és UHF adások harmonikus és zavaró sugárzásait. A sávon-kívüli zaj a rádió és TV műsorszórás diszkrét zavaró termékei és keresztmodulációs termékei ugyancsak interferencia problémákat okozhatnak.

10.5 Légijármű által létrehozott források

10.5.1 A légijárműveken lévő GPS és GLONASS berendezések potenciális káros interferenciája a légijármű típusától, annak méretétől és a felszerelt adó berendezéstől függ. A GNSS antenna elhelyezésnél számításba kell venni a fedélzeti interferencia lehetőségét (főleg a SATCOM-ét).

10.5.2 Azoknak a GNSS vevőknek, amelyeket a légijármű fedélzetén a SATCOM berendezéssel együtt használnak, magasabb interferencia küszöbjüknek kell lenni az 1 610 MHz és az 1626,5 MHz közötti frekvencia-tartományban, mint az olyan légijárművek fedélzeti vevőinél, amelyeknek nincs SATCOM berendezésük. Ennek megfelelően az interferencia küszöbre vonatkozó előírások különbséget tesznek a két eset között.

Megjegyzés. – A kisugárzott SATCOM légijármű földi állomások határértékei az Annex 10 III. kötete I. része 4. fejezetének 4.2.3.5 pontjában került megadásra.

10.5.3 A fő csökkentési technika a fedélzeti interferenciára magában foglalja az árnyékolást, a szűrést, a vevő felépítési technikát és különösen a nagyobb légijárműveken az antennák fizikai elkülönítését, az adókat és a kábelezést. A vevő felépítési technika magán foglalja az adaptív szűrők és az interferencia törlő technikákat, hogy csökkentsék a keskeny sávon-belüli interferenciát. Az antenna felépítési technikák magukban foglalják az adaptív nulla irányítású antennákat, az antenna nyereségnek az interferencia forrás irányába történő csökkentésére, anélkül, hogy a műholdaktól jövő jel teljesítmény csökkenne.

10.6 Sértetlenség interferencia jelenlétében

A Műhold Bázisú Kiegészítő Rendszer /SBAS/ és a Föld Bázisú Kiegészítő Rendszer /GBAS/ vevőkkel szembeni azon követelmény, hogy ne jelezzenek ki félrevezető információt interferencia jelenlétében, azt célozza, hogy megelőzzék a félrevezető információk kijelzését az olyan nem-tervezett interferencia helyszíneken, amelyek előfordulhatnak. Nem az a szándék, hogy határozottan megcélozzuk a szándékosan előidézett interferenciát. Valójában lehetetlen az, hogy vizsgálatokkal teljes egészében felülvizsgáljuk ezt a követelményt, a teljesítés egy elfogadható eszközét meg lehet találni a megfelelő, az RTCA és az EUROCAE által kiadott Minimális Üzemeltetési Teljesítmény Szabványokban.

11. A GNSS paraméterek rögzítése

11.1 Abból a célból, hogy egy esemény, vagy egy baleset kivizsgálásának utólagos lefolytatása lehetséges legyen (2.Fejezet 2.4.3 pont), a GNSS információkat mindkét helyen, az üzemeltetéshez felhasznált kiegészítő rendszernél és a megfelelő műhold helyzetsor rendszer(ek)nél rögzíteni kell. Ennek megfelelően a rögzítendő paraméterek függetlenek az üzemeltetés típusától, a felhasznált kiegészítő rendszertől és a műhold rendszer elemektől. Egy adott szolgáltatási területen belül az összes, a felhasználók részére rendelkezésre álló paramétert a szolgáltatási területen belüli jellemző helyeken rögzíteni kell.

11.2 Nem az a cél, hogy egy független garanciát biztosítsanak arról, hogy a GNSS pontosan működik, és nem az, hogy a rendszer ellenőrzés egy másik szintjét biztosítsák a rendellenes teljesítmény, vagy a bemenő adatok szempontjából egy NOTAM feldolgozásra. Nem szükségszerű az, hogy a rögzítő rendszer a GNSS szolgáltatástól független legyen, és meg lehet bízni egy másik Államot, vagy mást is. Abból a célból, hogy egy meghatározott GNSS konfiguráció által biztosított helyzet, sebesség és idő jelzések későbbi rekonstrukciója biztosítva legyen, az az ajánlott, hogy az adatokat általában 1 Hz-es ütemmel pontosan 'jegyezzék fel'.

11.3 A GNSS műhold helyzetsor rendszerre a következő ellenőrzött elemeket kell rögzíteni az összes látható műholdra:

a) Az észlelt műhold vivőfrekvencia-zaj sűrűségét (C/N_0);

b) Az észlelt műhold „durva” pszeudo-távolság kódját és vivőhullám fázis méréseit;

c) A sugárzott műhold navigációs közleményeket; és

d) A vonatkozó rögzítő vevő állapot információit.

11.4 Az SBAS-nél a következő ellenőrzött elemeket kell rögzíteni az összes látható geostacionárius műholdról a fentiekben, a GNSS műhold helyzetsor rendszerre megadott ellenőrzött elemeken kívül:

a) Az észlelt geostacionárius műhold vivőfrekvencia-zaj sűrűségét (C/N_0);

b) Az észlelt műhold „durva” pszeudo-távolság kódját és vivőhullám fázis méréseit;

c) A sugárzott SBAS adat-közleményeket; és

d) A vonatkozó rögzítő vevő állapotának információit.

11.5 A GBAS-nél a következő ellenőrzött elemeket kell rögzíteni a fentiekben felsorolt, a GNSS műhold helyzetsor rendszerre és SBAS-re megadott ellenőrzött elemeken kívül (ahogy megfelelő):

a) A VHF adatsugárzási (VDB) teljesítmény szintet;

b) A VDB állapot információit; és

c) A sugárzott GBAS adat-közleményeket.

12. A GNSS teljesítmény értékelése

A 11. rész pontjaiban leírt adatokat a szolgáltatási területen belüli GNSS teljesítmény rendszeresen ismétlődő megerősítésével is alá lehet még támasztani.

13. GNSS és adatbázis

Megjegyzés. – A légiforgalmi adatokra vonatkozó előírásokat az Annex 11 2.fejezete és az Annex 15 3.fejezete foglalja magában.

13.1 Az adatbázis a legfrissebb, az érvényben lévő AIRAC ciklusra vonatkoztatva, ami általában azt jelenti, hogy a legfrissebb adatbázis kerül a rendszerbe betáplálásra az egyes 28 napos periódusonként. Az érvénytelen navigációs adatbázissal történő üzemeltetést el kell kerülni.

13.2 Bizonyos helyzetekben az egy lejárt adatbázis felhasználásával történő üzemeltetést is le lehet biztonságosan folytatni egy módszer végrehajtásával és/vagy olyan eljárások alkalmazásával, amelyek biztosítják azt, hogy a szükséges adatok pontosak. Ezekhez a módszerekhez és/vagy eljárásokhoz az Államok előzetes jóváhagyása szükséges.

13.2.1 Ezeket az eljárásokat a következő módszerek valamelyikére lehet alapozni:

a) Megkövetelni a légijármű személyzetétől, hogy az üzemeltetés előtt ellenőrizzék a kritikus adatbázis információkat a folyamatban lévő közzétételű információkkal szemben. (Ez a módszer növeli a munkaterhelést és gyakorlatilag nem az összes alkalmazásra választható meg.); vagy

b) Lemondani a folyamatban lévő adatbázis iránti követelménytől és a légijármű személyzete által gyakran ellenőrizni az adatbázis információkat. Ezt a lemondást csak nagyon speciális esetekben lehet alkalmazni ott, ahol a légijármű egy szigorúan korlátozott földrajzi területen kerül üzemeltetésre, és ahol a területet egy egyedüli szabályozó ügynökség ellenőrzi, vagy több ügynökség, amelyek koordinálják ezt a folyamatot; vagy

c) Más jóváhagyott módszert alkalmazni, ami a biztonság egyenértékű szintjét biztosítja.

14. A megmaradó hibák modellezése

14.1 A sértetlenségi követelményeknek az SBAS-re és a GBAS-re való alkalmazása megkívánja azt, hogy egy minta-eloszlás kerüljön felhasználásra a pszeudo-távolság hiba jellemzők leírására. A Vízszintes Védelmi Szint/Oldalirányú Védelmi Szint /HPL/LPL/ és a Függőleges Védelmi Szint /VPL/ modellek (lásd 7.5.3 pontot), amelyek megalkotásra kerültek, az egyedi hiba összetevők olyan modelljein alapulnak (a pszeudo-távolság tárgykörében), amelyek függetlenek, nulla-átlagúak, normál eloszlásúak. Ezen modell és a valós hiba eloszlás közötti összefüggést meg kell határozni.

14.2 A védelmi szint kockázat követelmény biztosításának az egyik módját kielégíti a modell négyzetes középeltérés (σ^2) meghatározása úgy, hogy a halmozott hiba eloszlás elégíti ki a feltételeket:

$$\int_y^{\infty} f(x)dx \le Q\left(\frac{y}{\sigma}\right) \qquad \text{az összes } \frac{y}{\sigma} \ge 0 \text{ -ra és}$$

$$\int_{-\infty}^{-y} f(x)dx \le Q\left(\frac{y}{\sigma}\right) \qquad \text{az összes } \frac{y}{\sigma} \ge 0 \text{ -ra}$$

ahol:

f(x) = a valószínűségi sűrűség a légijármű fedélzeti megmaradó pszeudo-távolság hibájának a függvénye, és

$$Q(x) = \frac{1}{\sqrt{2\pi}} \int_x^{\infty} e^{-\frac{t^2}{2}} dt.$$

14.3 Ezt a módszert közvetlenül lehet alkalmazni akkor, amikor a hiba összetevők nulla-átlagúak, szimmetrikusak és egymódusú valószínűségi sűrűség-függvényük van. Ez a helyzet a vevőnek a helyesbített pszeudo-távolság hibához való hozzájárulásában, mivel a légijármű elemek nincsenek kitéve a kisfrekvenciás megmaradó többutas szóródási hibáknak.

14.4 Ezt a modelt ki lehet terjeszteni a nem-nulla-átlagú megmaradó hibákra, megemelve a model négyzetes középeltérését, úgy, hogy kiegyenlítse a középérték lehetséges hatását a helyzet tartományban.

14.5 A pszeudo-távolság hiba modellek hitelesítésénél számos tényezőt figyelembe kell venni, beleértve:

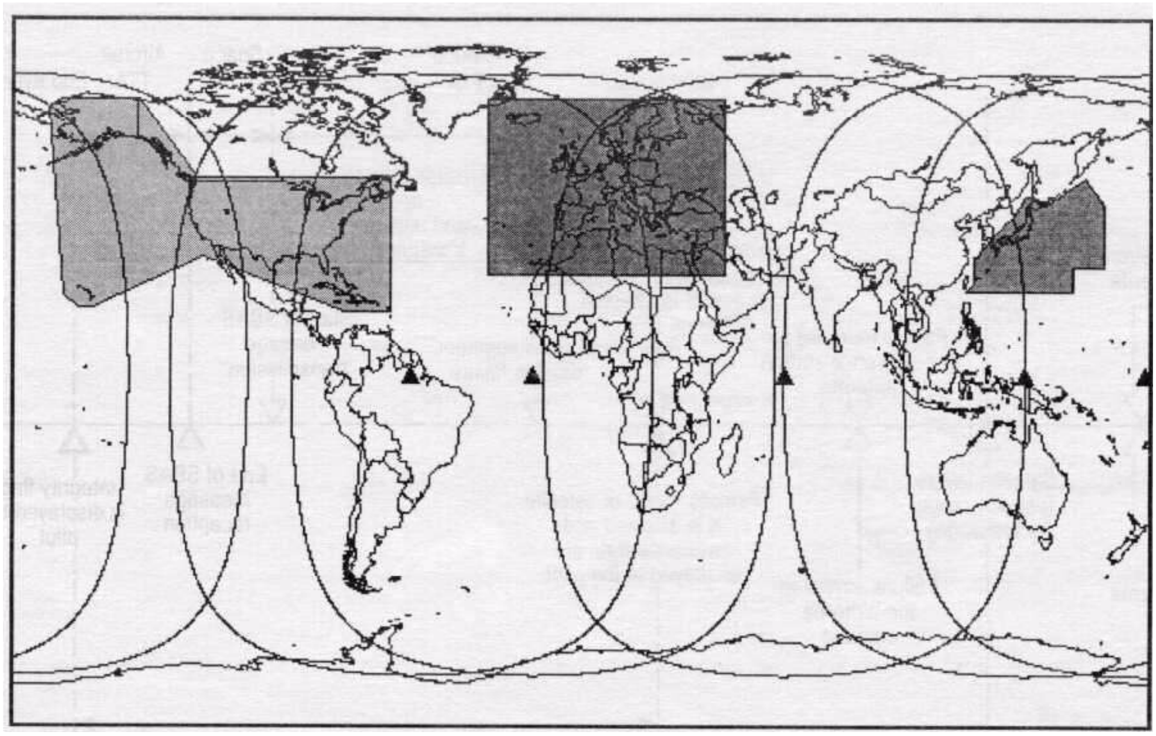
a) A hiba összetevők jellegét;

b) Annak a mintának a méretét, ami az adatgyűjtés és az egyes eloszlások felbecslésének megbízhatóságához szükségesek;

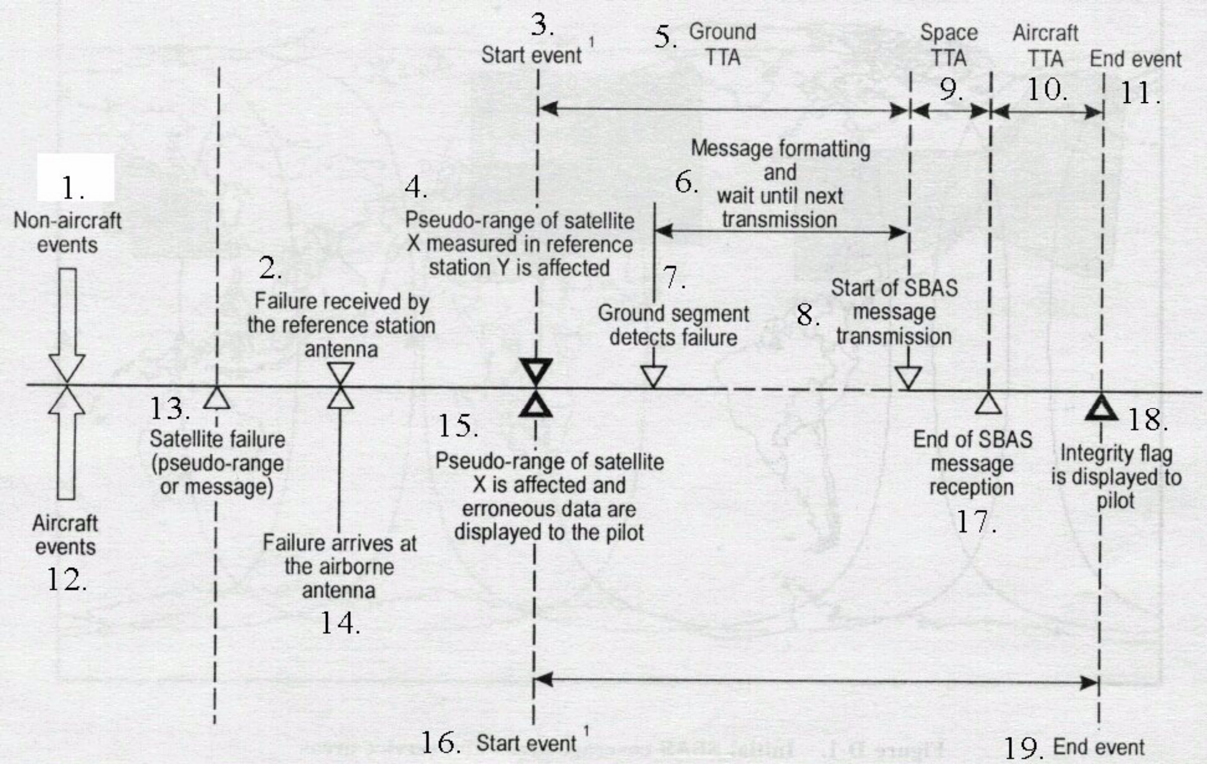
c) A hibák korrelációs idejét; és

d) Az egyes eloszlásoknak a földrajzi helyre és az időre vonatkozó érzékenységét.

Ábrák a "D"- Melléklethez



D-1. ábra: Kiinduló SBAS fedésterületi körzetek és szolgáltatási területek

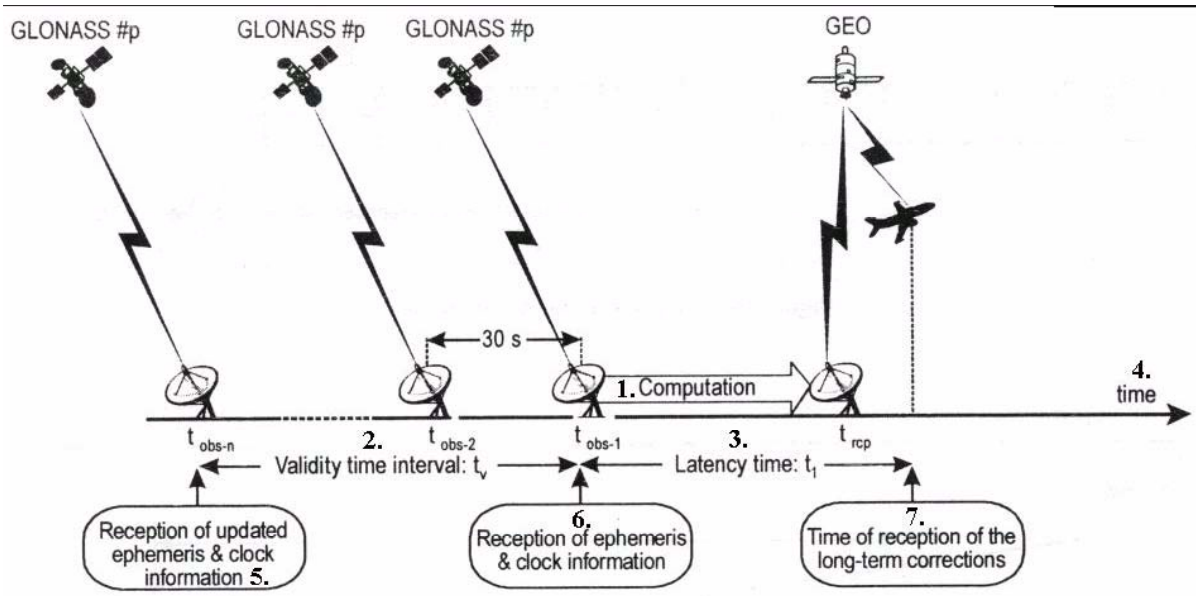


Megjegyzés: [1]
Mindkét esemény egyidejűnek van tekintve. Pontosan nem ez az eset a meghatározott vevők teljesítmény különbsége miatt. Van egy kis különbség a vevők feldolgozása miatt azon időpontok között, amikor a pszeudo-távolság mérés érintett lesz, és amikor a hibás adat kijelzésre kerül. Gyakorlati okokból ez ebben az ábrában nem jelenik meg.

D-2. ábra: SBAS idő-a-riasztásig /TTA/

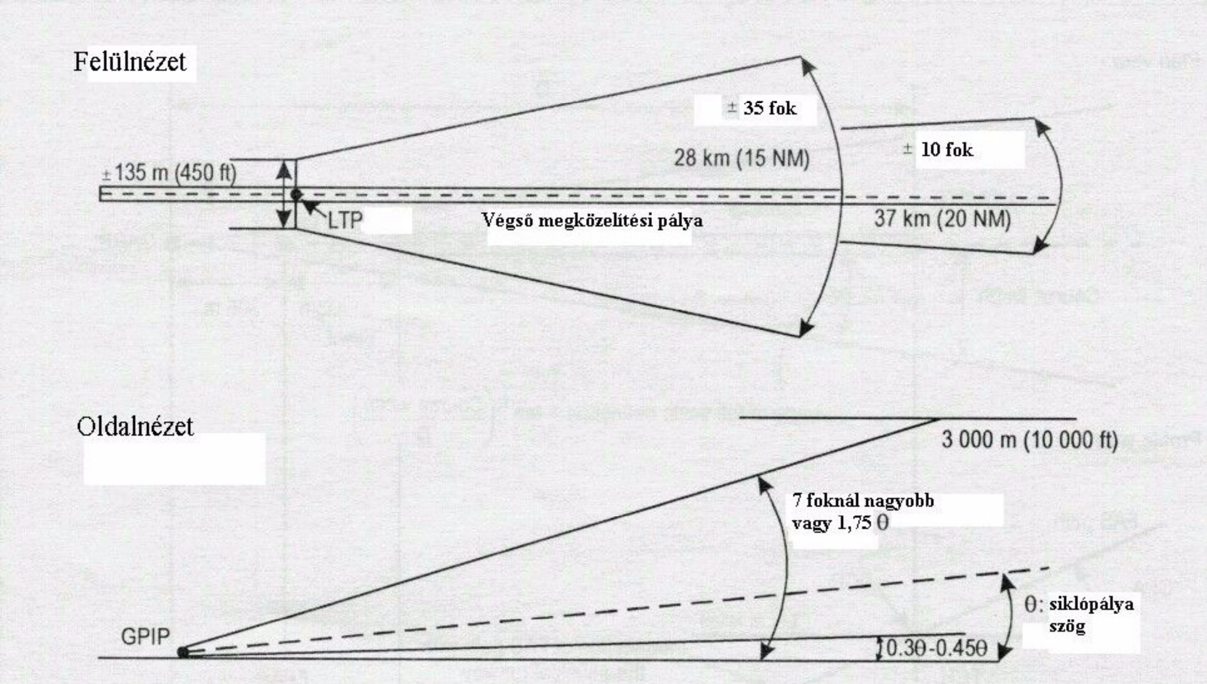
Ábraszöveg a D-2. ábrához:

1 – Nem légijármű fedélzeti események
2 – A referencia állomás antennája által vett hiba
3 – Az esemény kezdete[1]
4 – Az X műhold pszeudo-távolsága érintett az Y referencia állomásban mérten
5 – Földi idő-a-riasztásig /TTA/
6 – Közlemény összeállítás és várakozás a következő adásig
7 – A földi rész észleli a hibát
8 – Az SBAS közlemény továbbításának kezdete
9 – Térbeli idő-a-riasztásig
9 – Légijármű fedélzeti idő-a-riasztásig
10 – Az esemény vége
12 – Légijármű földi események
13 – Műhold hiba (pszeudo-távolság, vagy közlemény)
14 – A hiba megérkezik a légijármű fedélzeti antennához
15 – Az X műhold pszeudo-távolsága érintett és hibás adat kerül a légijármű vezető részére kijelzésre
16 – Az esemény kezdete[1]
17 – Az SBAS közlemény vételének vége
18 – A sértetlenségi jelzés a légijármű vezető részére kijelezve
19 – Az esemény vége



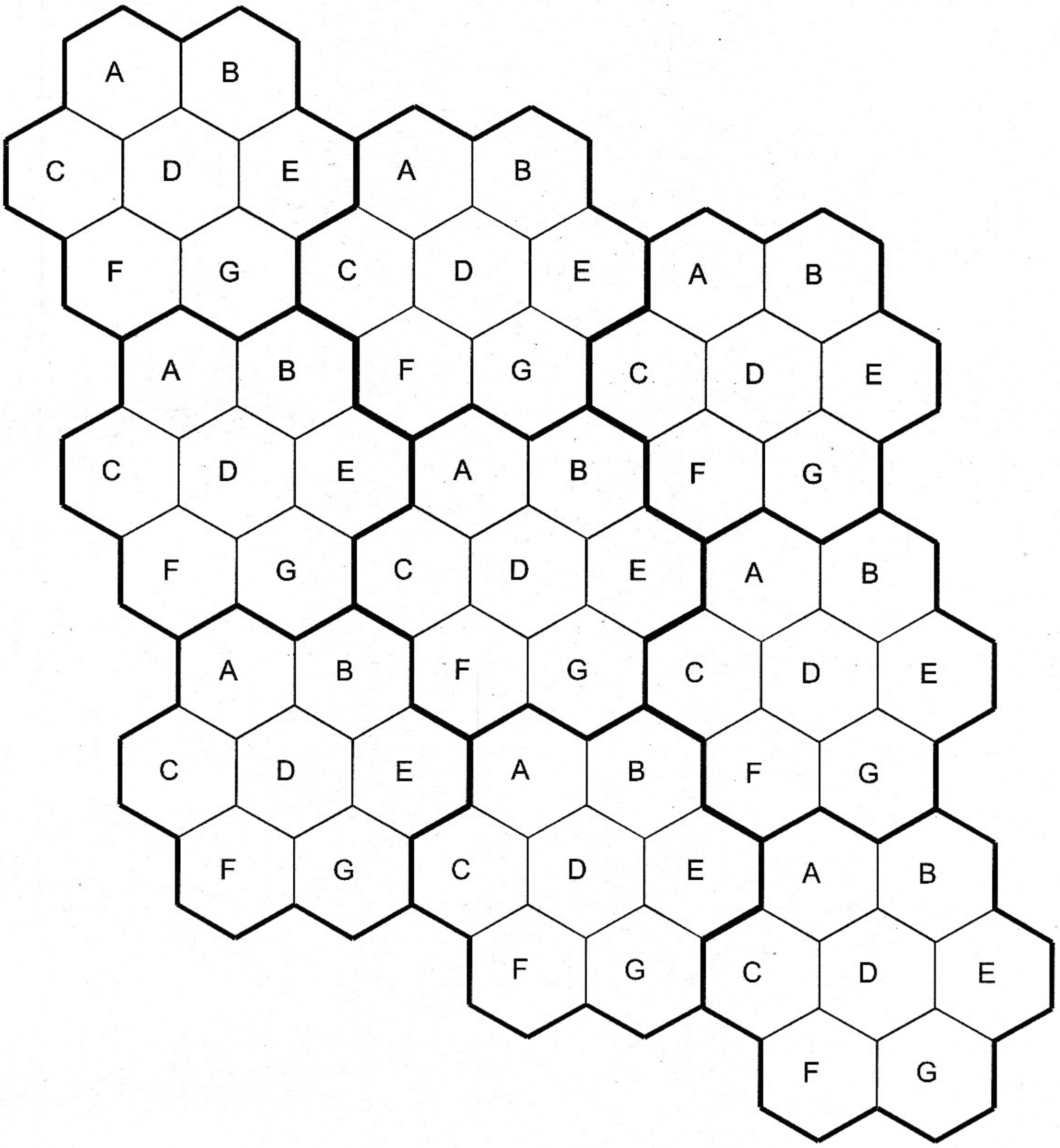
D-3. ábra: GLONASS idő

1 – Számolás
2 – Érvényességi idő időtartam
3 – Várakozási idő
4 – Idő
5 – Felfrissített efemerisz és óra információk vétele
6 – Efemerisz és óra információk vétele
7 – A hosszú-távú helyesbítések vételének ideje

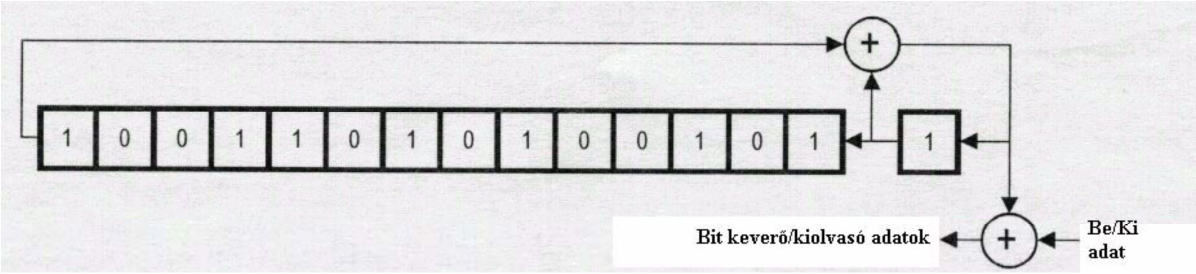


D-4. ábra: A GBAS minimális fedésterülete

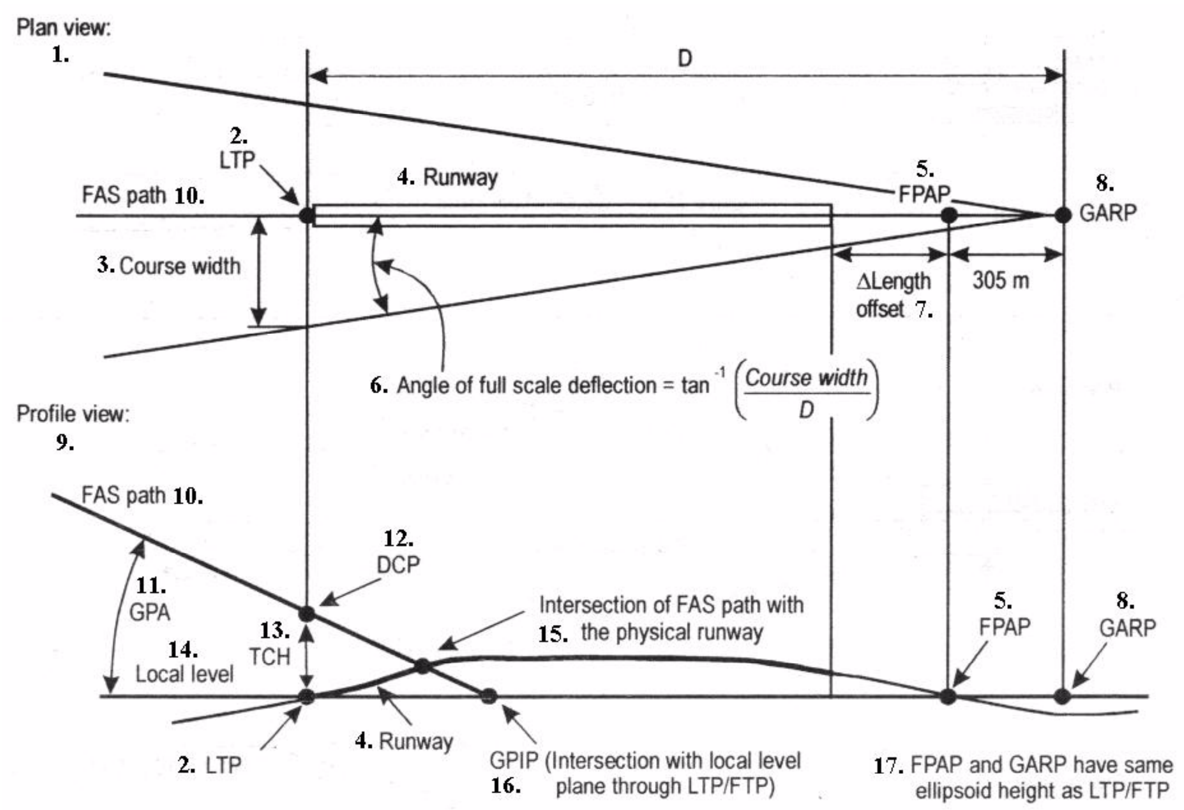
GPIP – Glide path intersection point = Siklópálya befogási pont
LTP – Landing threshold point = Leszállási küszöb pont



D-4A. ábra: Többszörös időréseket használó egy-frekvenciás GRAS VHF hálózat



D-5. ábra. Bit keverő/kiolvasó (kikeverő)



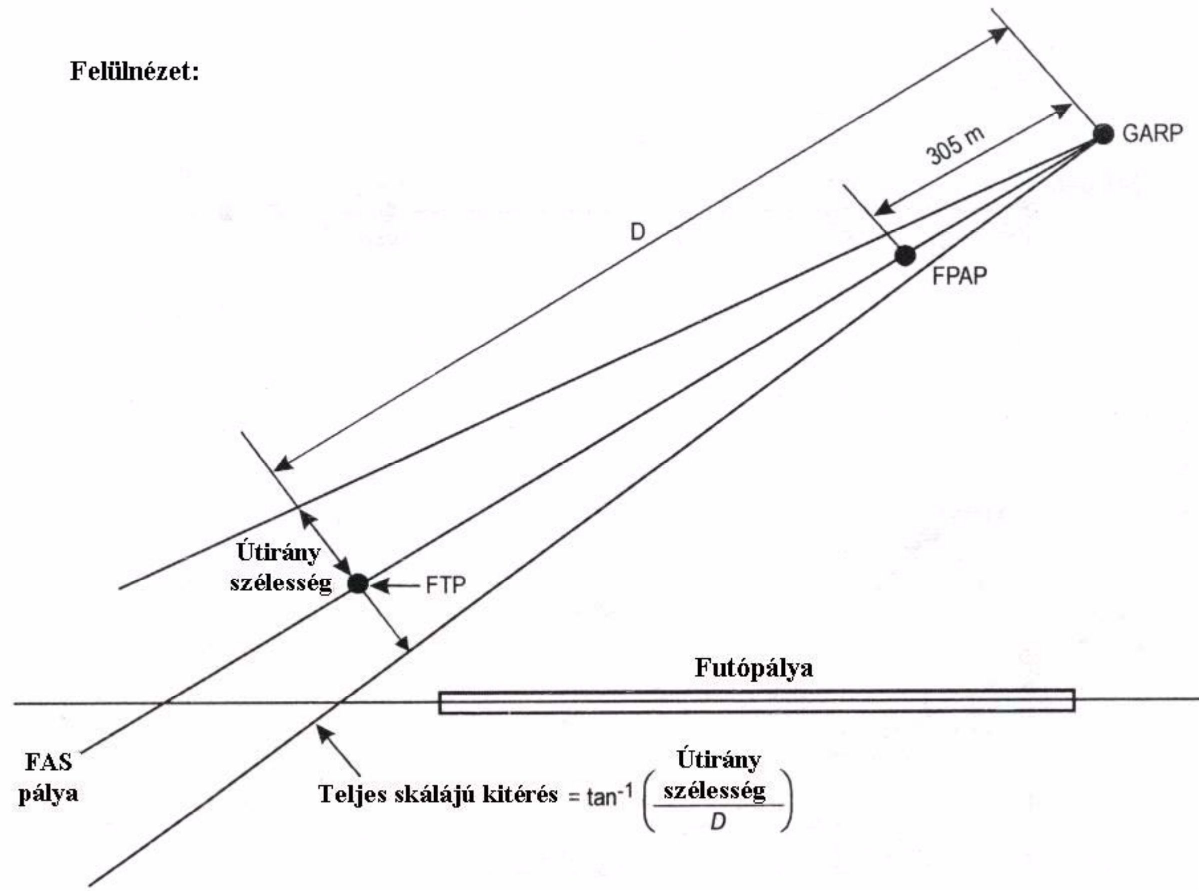
D-6. ábra. A végső megközelítési szakasz (FAS) pálya meghatározása

1 – Felülnézet
2 – LTP = *Landing threshold point* = Leszállási küszöb pont
3 – Útirány szélesség
4 – Futópálya
5 – FPAP = *Flight path alignment point* = Repülési pálya irány pont

6 – A teljes skálájú kitérés szöge = $\tan^{-1} \times \left[\dfrac{\text{Útirány szélesség}}{\text{D}}\right]$

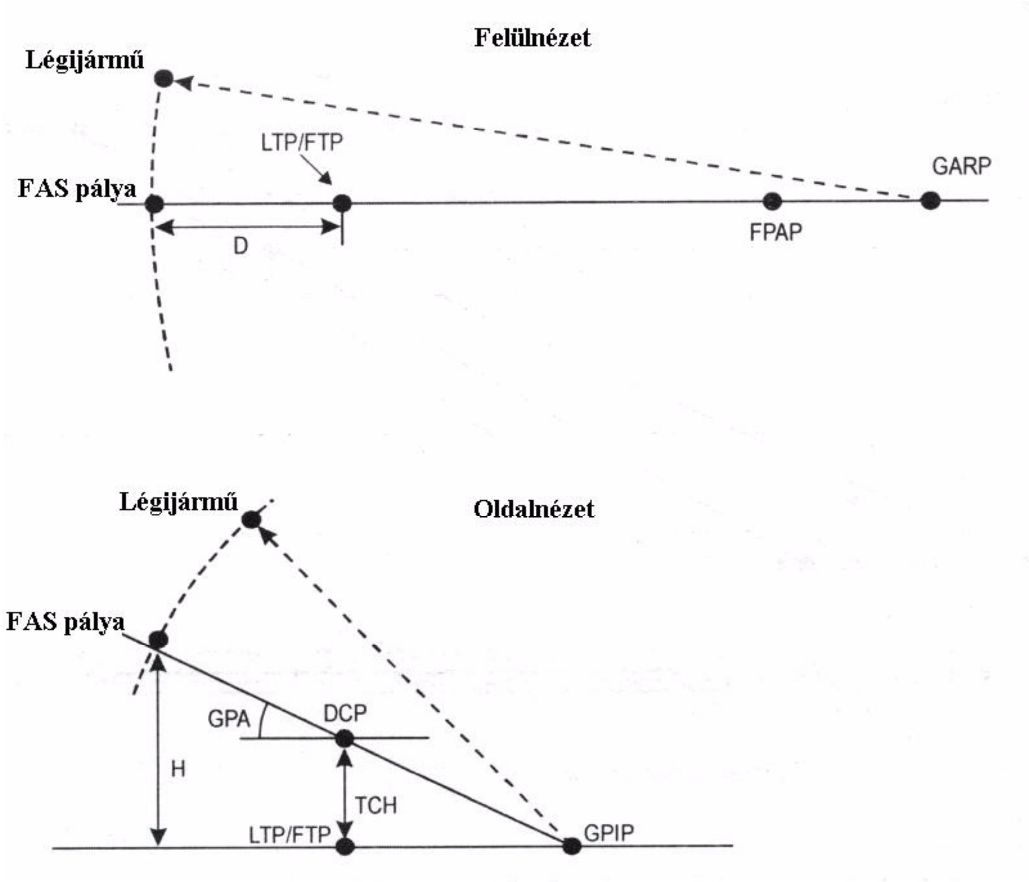
7 – Δ eltolás hossz
8 – GARP = *GBAS azimuth reference point* =GBAS oldalszög referencia pont
9 – Oldalnézet

10 – FAS path = Final approch segment path = Végső megközelítési szakasz pálya
11– GPA = *Glide path angle* = Siklópálya szög
12 – DCP = *Datum crossing point* = Alapsík metszési pont
13 – TCH = *Threshold crossing height* = Küszöb keresztezési magasság
14 – Helyi szint
15 – A FAS pályának a fizikai futópályával való metszéspontja
16 – GPIP = *Glided path intersection point* = Siklópálya befogási pont (az LTP/FTP-n keresztül menő helyi szint síkjával való keresztezés)
17 – Az FPAP-nak és a GARP-nak ugyanaz az ellipszoid magassága, mint az LTP/FTPnek
18 – Fictitious threshold point = Látszólagos küszöb pont (lásd a D-7. ábrát)



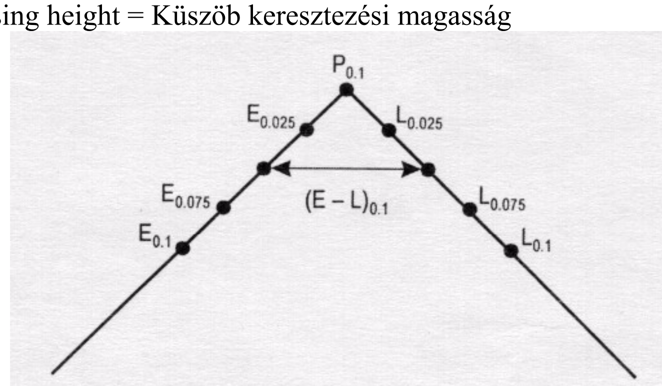
D-7. ábra: Végső megközelítési szakasz /FAS/ pálya meghatározás azokra a megközelítésekre, amelyek nem esnek egy egyenesbe a futópályával

FAS - Final approach segment = Végső megközelítési szakasz
FPAP - Flight path alignment point = Repülési pálya irány pont
FTP - Fictitious threshold point = Látszólagos küszöb pont
GARP - GBAS azimuth reference point =GBAS oldalszög referencia pont
GPIP - Glided path intersection point = Siklópálya befogási pont



D-8. ábra: A 'D' és 'H' paraméterek meghatározása a riasztási határérték számításokban

DCP - Datum crossing point = Alapsík metszési pont
FAS - Final approach segment = Végső megközelítési szakasz
FPAP - Flight path alignment point = Repülési pálya irány pont
FTP - Fictitious threshold point = Látszólagos küszöb pont (Lásd a D-7. ábrát)
GARP - GBAS azimuth reference point =GBAS oldalszög referencia pont
GPA - Glide path angle = Siklópálya szög
LTP - Landing threshold point = Leszállási küszöb pont
TCH - Threshold crossing height = Küszöb keresztezési magasság



D-9. ábra: A „közeli" korrelációs csúcs és a mért korrelátor értékek

"E" MELLÉKLET: A VOR LÉGIJÁRMŰ FEDÉLZETI BERENDEZÉSEK REPÜLÉS ELŐTTI ELLENŐRZÉSÉRE VONATKOZÓ ÚTMUTATÓ ANYAG

1. A VOR légijármű fedélzeti berendezések ellenőrző berendezéseire (VOT) vonatkozó előírások

1.1 Bevezetés

Azon Államok részére, útmutatásként, akik biztosítani kívánnak a VOR légijármű fedélzeti berendezések részére egy repülés előtti ellenőrző mérő jelet, a VOR légijármű fedélzeti berendezések ellenőrző berendezésének (VOT) javasolt jellemzői a következőkben kerülnek megadásra.

1.2 Általános rész

1.2.1 A VOR ellenőrző berendezést (VOT) úgy kell megtervezni, hogy biztosítsa azokat a jeleket, amelyek lehetővé teszik egy tipikus légijármű fedélzeti VOR berendezés kielégítő működését, a repülőtér azon részein, ahol a repülés előtti ellenőrzés elvégzése alkalmas és kívánatos.

1.2.2 A VOR ellenőrző berendezést (VOT) úgy kell megszerkeszteni és beállítani, hogy a légijármű fedélzeti VOR irányszög kijelző akkor jelezze a "FROM" (-tól) nulla fokot, amikor a vevő berendezés nem tér el a kalibrálásától. Ez a kijelzés a légijárműnek a VOR ellenőrző berendezéshez (VOT) viszonyított szögbeli helyzetétől függetlenül a fedésterületen belül állandó marad.

1.2.3 Azon mód következtében, amelynek megfelelően a VOR ellenőrző berendezést (VOT) felhasználják, semmilyen alapvető szükség nincs arra, hogy bármilyen helyen a berendezést megkettőzzék.

1.2.4 A VOR ellenőrző berendezésnek (VOT) olyan rádiófrekvenciás vivőhullámot kell kisugároznia, amely két önálló 30 Hz-es modulációval kerül összekapcsolásra. Ezeknek a modulációknak azonosnak kell lenni a VOR-hoz kapcsolódó referencia fázisú és változó fázisú jelekével. Ezeknek a modulációknak a fázisa független kell, hogy legyen az irányszögtől, és egymással mindig egybe kell esniük.

1.3 Rádiófrekvencia

A VOR ellenőrző berendezésnek (VOT) a 108 MHz-től a 117,975 MHz-ig terjedő frekvenciasávban kell működni egy olyan módon kiválasztott megfelelő VOR csatornán, hogy ne zavarjon semmilyen ultrarövidhullámú navigációs, vagy hírközlési szolgálatot. A legmagasabb kiosztható frekvencia a 117,95 MHz lehet. A rádiófrekvenciás vivőhullám frekvencia tűréshatárának plusz, vagy mínusz 0,005 százaléknak kell lenni, kivéve azt, ami a 3. Fejezet 3.3.2.2 és 3.3.2.3 pontjában meghatározásra került.

1.4 Polarizáció és pontosság

1.4.1 A VOR ellenőrző berendezés (VOT) sugárzásának vízszintesen polarizáltnak kell lenni.

1.4.2 A VOR ellenőrző berendezéstől (VOT) eredő sugárzás által továbbított "iránymérési" pontosságnak plusz, vagy mínusz 1 foknak kell lenni.

Megjegyzés. - Mivel a rádióferekvenciás vivőhullámon a két moduláció minden időben fázisban van, ezért a maradék függőlegesen polarizált energiának nincs hatása a berendezés pontosságára.

1.5 Fedésterület

1.5.1 A fedésterületi követelmények és ebből eredően az a teljesítmény, amit ki kell sugározni, szükségszerűen és jelentékeny mértékben a helyi körülményektől függ. Bizonyos telepítési helyeknél olyan kis töredék teljesítmény is, mint az 1 W, kielégítő lesz, míg más esetekben, különösen, ha egy egyedüli berendezés két, vagy több egymáshoz közel álló repülőteret szolgál ki, több-wattos rádiófrekvenciájú teljesítmény kisugárzására lehet szükség.

1.5.2 Ahol szükséges az, hogy azonos csatornájú VOR, VOT és ILS iránysáv adó részére védelmet biztosítsanak a VOT-tól eredő zavarás ellen, ott a rádiósugárzást úgy kell korlátozni, hogy a szükség szerint biztosítva legyen az, hogy a további azonos csatornára kijelölt berendezések zavarása ne forduljon elő.

1.6 Moduláció

1.6.1 A rádiófrekvenciás vivőhulámnak, ahogy az a tér bármely pontjában észlelésre kerül, két jellel amplitúdó-moduláltnak kell lenni a következők szerint:

a) egy állandó amplitúdójú 9 960 Hz-es segédvivő frekvenciának, 30 Hz-es frekvencia-modulációval és 16 plusz, vagy mínusz 1-es (azaz 15-től 17-ig) eltérési viszonnyal;

b) 30 Hz.

1.6.2 A 9 960 Hz-es és a 30 Hz-es jelek modulációs mélységének az egyes összetevőkre a 28 százalékig terjedő határértéken belül kell lenni.

1.6.3 Azt a jelet, amely frekvenciában modulálja a 9 960 Hz-es segédvivő frekvenciát és azt a jelet, amely amplitúdó-modulálja a rádiófrekvenciás vivőhullámot 30 Hz plusz, vagy mínusz 1 százalékon belül kell tartani.

1.6.4 A 9 960 Hz-es segédvivő frekvenciát plusz, vagy mínusz 1 százalékon belül kell tartani.

1.6.5 Az adó kimeneten lévő 9 960 Hz-es segédvivő frekvencia amplitúdó-modulációjának százalékos értéke nem lehet 5 százaléknál nagyobb.

1.7 Azonosítás

1.7.1 A VOR ellenőrző berendezésnek (VOT) egy 1 020 Hz-es azonosító jelet kell adni. A VOR ellenőrző berendezés (VOT) azonosító kódját az illetékes hatóságnak úgy kell kiválasztani, hogy az összetéveszthetetlenül megkülönböztető legyen az ellenőrző feladatot adóan, és ha szükséges, a telepítési helyet illetően is.

Megjegyzés. - Egy Államban ott, ahol a VOR ellenőrző berendezés (VOT) fedésterülete egy egyedüli repülőtérre korlátozódik, az azonosítás egy folyamatos pont-sorozatot tartalmaz.

1.7.2 A rádiófrekvenciás vivőhullámnak az azonosító jellel történő modulációja mélységének körülbelül 10 százaléknak kell lenni.

1.8 Felügyelő rendszer

1.8.1 Alapjában véve nincs szükség a VOR ellenőrző berendezés (VOT) folyamatos automatikus felügyelő figyelésére, feltéve, hogy az amplitúdó-modulált és a frekvencia-modulált 30 Hz-es összetevőinek relatív fázisa mechanikusan szinkronizálva van, és berendezések állnak rendelkezésre a VOR ellenőrző berendezés (VOT) állapotának rendszeres ellenőrzésére és távolból történő felügyeletére.

1.8.2 Az automatikus felügyelő rendszer biztosítása megkettőzheti a VOR ellenőrző berendezés (VOT) telepítési költségét, és ennek megfelelően több illetékes hatóság valószínűleg csak a távoli felügyelő és vezérlő pont létrehozását alkalmazza. Azonban ahol az Állam a VOR ellenőrző berendezés üzemeltetési felhasználása figyelembevételével úgy dönt, hogy automatikus felügyeletet biztosít, ott a felügyelő rendszernek egy figyelmeztető jelzést kell továbbítani egy vezérlő pontra, és le kell állítania az adást, ha a megállapított feltételekhez képest a következő eltérések valamelyike fennáll:

a) a VOR ellenőrző berendezés (VOT) által kisugárzott "iránymérési" információnak - az ellenőrző berendezés helyén mért - 1 fokot meghaladó változása;

b) a felügyelő rendszer helyén, a 9 960 Hz-es, vagy a 30 Hz-es jelek szintjének az 50 százalékos csökkenése.

A felügyelő rendszer meghibásodásának automatikusan be kell szüntetnie az adást.

2. A repülőtéri VOR ellenőrző-pontok kiválasztása és felhasználása

2.1 Általános rész

2.1.1 Amikor egy, a repülőtérhez viszonyítottan megfelelően elhelyezkedő VOR berendezés rendelkezésre áll a légijármű fedélzeti VOR berendezések repülés előtti ellenőrzéséhez, akkor az ellenőrzést a repülőtér alkalmas részein elhelyezett, megfelelően kalibrált és jelzett ellenőrző-pontokkal lehet megkönnyíteni.

2.1.2 Az előforduló körülmények széleskörű eltérései következtében gyakorlatilag nem valósítható meg az, hogy bármilyen szabvány követelményt, vagy gyakorlatot meghatározzunk a repülőtéri VOR ellenőrző-pontok kiválasztásához. Azonban azon Államok részére, amelyek biztosítani kívánják ezt a lehetőséget, a felhasználható pontok kiválasztásához útmutatásként szolgálhatnak a következő megfontolandó tényezők.

2.2 Az ellenőrző-pontok elhelyezési követelményei

2.2.1 A közeli VOR jel erősségének kielégítőnek kell lenni ahhoz, hogy biztosítsa egy jellemző légijármű fedélzeti VOR berendezés kielégítő működését. Kihangsúlyozottan a teljes zászló működést (nem látható zászló) kell biztosítani.

2.2.2 Az ellenőrző-pontokat az üzemeltetési megfelelés határértékein belül, épületektől, vagy egyéb olyan tükrözést okozó tárgyaktól (állandó jellegű, vagy mozgó) távol kell elhelyezni, amelyek esetleg csökkenthetik a VOR jelek pontosságát, vagy stabilitását.

2.2.3 A vett VOR iránymérésnek bármely kiválasztott ponton ideálisan plusz, vagy mínusz 1,5 fokon belül kell lenni, a felméréssel, vagy térkép-szerkesztéssel pontosan meghatározott irán: iránnyméréshez viszonyítva.

Megjegyzés. - A plusz, vagy mínusz 1,5 fok értéknek nincs olyan közvetlen üzemeltetési jelentősége, hogy a vett iránymérés a közzétett iránymérés legyen, azonban, ahol egy nagyobb eltérést észlelnek, ott fennáll a rossz stabilitás bizonyos lehetősége.

2.2.4 A kiválasztott pont VOR informcióját üzemeltetésileg csak akkor lehet felhasználni, ha a közzétett irányméréshez viszonyítva egyenletesen plusz, vagy mínusz 2 fokon belülinek találják. A VOR informciónak a kiválasztott pontnál való stabilitását egy kalibrált vevő berendezéssel rendszeres időközönként ellenőrizni kell annak biztosításához, hogy a plusz, vagy mínusz 2 fokos tűréshatár a VOR vevő antenna tájolási helyzetétől függetlenül kielégítésre kerüljön.

Megjegyzés. - A plusz, vagy mínusz 2 fokos tűréshatár a kiválasztott ponton az információ állandóságára vonatkozik, és magába foglalja a pont ellenőrzésére használt kalibrált VOR vevő pontosságának kismértékű tűrését is. A 2 fokos érték nem vonatkozik a légijármű fedélzeti VOR berendezés alkalmassági, vagy alkalmatlansági értékére, ez a Hatóságok és a felhasználók döntésének ügye a végrehajtandó üzemeltetések figyelembevételével.

2.2.5 Azokat az ellenőrző-pontokat, amelyek ki tudják elégíteni a fentiekben megadott követelményeket, az érintett üzemeltetőkkel történő egyeztetés után kell kiválasztani. Az ellenőrző-pontok biztosítása általában a várakozó kitérőkben, a futópályák végein, valamint a karbantartási és rakodási területeken kívánatos.

2.3 A VOR ellenőrző-pontok jelölése

Minden egyes VOR ellenőrző-pontot megkülönböztető módon kell megjelölni. Ennek a jelölésnek magába kell foglalnia azt a VOR iránymérést, amit a légijármű vezetője a légijármű fedélzeti VOR berendezésen venni fog akkor, ha a berendezése pontosan működik.

2.4 A VOR ellenőrző-pontok felhasználása

Az a pontosság, amellyel a légijármű vezetőjének meg kell határoznia a légijárműnek az ellenőrző-ponthoz viszonyított helyzetét, a VOR állomás távolságától függ. Azokban az esetekben, ahol a VOR viszonylag közel van az ellenőrző-ponthoz, különös figyelmet kell fordítani arra, hogy a légijármű VOR vevő antennája közvetlenül az ellenőrző-pont felett legyen.

"F" MELLÉKLET: A RÁDIÓÖSSZEKÖTTETÉSI ÉS NAVIGÁCIÓS BERENDEZÉSEK MEGBÍZHATÓSÁGÁRA ÉS ÜZEMKÉSZSÉGÉRE VONATKOZÓ ÚTMUTATÓ ANYAG

1. Bevezetés és alapvető fogalmak

Ennek a Mellékletnek az a célja, hogy útmutató anyagként szolgáljon azon Tagállamok részére, amelyek hasznosnak találják az üzemeltetési követelményekkel megegyező berendezés megbízhatósági és üzemkészségi fok megadását.

Az ebben a Mellékletben lévő anyag célja az, hogy útmutató és tisztázó célra szolgáljon, és nem képezi az ebben az Annex-ben lévő Szabványok és Ajánlott Gyakorlatok részét.

1.1 Meghatározások

Facility availability. Berendezés üzemkészsége
A tényleges üzemelési időnek a meghatározott üzemelési időhöz viszonyított aránya.

Facility failure. Berendezés meghibásodása
Bármilyen olyan előre nem várt esemény, amely egy olyan üzemeltetésileg jelentős időtartamot hoz létre, amelynek során egy berendezés a meghatározott tűréshatárok között nem biztosítja szolgáltatását.

Facility reliability. Berendezés megbízhatósága
Az a valószínűség, hogy a földi berendezés a meghatározott tűréshatárok között üzemel.

Megjegyzés. - Ez a meghatározás arra a valószínűségre utal, hogy a berendezés egy meghatározott időtartamon keresztül üzemelni fog.

Mean time between failure (MTBF). A meghibásodások közötti átlag idő (MTBF)
Egy berendezés tényleges működési ideje osztva az ugyanazon időtartam alatti összes berendezés meghibásodás számával.

Megjegyzés. - Az üzemelési idő általában úgy kerül megálasztásra, hogy magába foglaljon legalább öt - de inkább több - berendezés meghibásodást abból a célból, hogy a kapott szám egy elfogadhatóbb mértékű bizonyosságot adjon.

Signal reliability. Jel megbízhatóság
Az a valószínűség, hogy az előírt jellemzőjű térbeli jel a légijármű részére rendelkezésre áll.

Megjegyzés. - Ez a meghatározás arra a valószínűségre utal, hogy a jel egy meghatározott időtartamon keresztül rendelkezésre áll.

1.2 Berendezés megbízhatóság

1.2.1 A megbízhatóság tényezők kombinációja által érhető el.
Ezek a tényezők változók és egyedileg lehet azokat szabályozni egy olyan egységes megközelítéssel, ami optimális, és összhangban áll az egyedi környezet körülményeivel és szükségleteivel. Egy tényező bizonyos mértékben ellensúlyozható lehet, például az alacsony megbízhatóság, a megnövelt karbantartó személyzet biztosításával és / vagy a berendezés tartalékolásával. Hasonlóképpen a karbantartó személyzet alacsony szintű hozzáértése a nagy megbízhatóságú berendezés biztosításával.

1.2.2 A következő képlet százalékban fejezi ki a berendezés megbízhatóságot:

$$R=100\ e^{-t/m}$$

ahol:

R = megbízhatóság (annak a valószínűsége, hogy a berendezés az előírt tűréshatáron belül üzemképes lesz a t idő alatt, azonkívül ezt úgy is nevezik, hogy a hibamentes működés valószínűsége, P_S);

e = a természetes logaritmus alapja;

t = az érintett időtartam;

m = a meghibásodások közötti átlag idő.

Látható az, hogy a megbízhatóság úgy növekszik, ahogy a meghibásodások közötti átlag idő (MTBF) növekszik. Egy magasfokú megbízhatósághoz és a t üzemeltetési szempontból jelentős értékeihez nagy meghibásodások közötti átlag időre lesz szükség, ennek megfelelően a meghibásodások közötti átlag idő a megbízhatóság kifejezésének egy másik, jóval megfelelőbb módja.

1.2.3 A gyakorlati tapasztalatok azt mutatják, hogy a fenti képlet az elektronikus berendezések többségére igaz ott, ahol a meghibásodások a Poisson féle eloszlást követik. Nem lesz alkalmazható a berendezés működésének kezdeti idején, amikor viszonylag nagyszámú az egyedi alkatrészek idő előtti meghibásodása, és akkor sem lesz igaz, amikor a berendezés közeledik a felhasználhatósági idejének végéhez.

1.2.4 Számos berendezés típusnál, amely hagyományos alkatrészeket használ fel, 1 000 órás, vagy annál több meghibásodások közötti átlag időt értek el. Az 1 000 órás meghibásodások közötti átlag idő jelentőségének jelzésére a megfelelő 24 órás megbízhatóság körülbelül 97,5 százalékos (azaz a berendezés meghibásodási valószínűség egy 24 órás időtartam alatt körülbelül 2,5 százalék).

1.2.5 Az F-1. számú ábra mutatja be a berendezés hibamentes működésének, P_S, az egy t időtartam utáni valószínűségét különféle meghibásodások közötti átlag idő értékekre.

Megjegyzés. - Fontos az, hogy annak valószínűsége, hogy a hibamentes működés időtartama egyenlő legyen a meghibásodások közötti átlag idővel (MTBF), csak 0,37 (37 százalék); ennek megfelelően nem feltételezett az, hogy a meghibásodások közötti átlag idő meghibásodás- mentes időtartam.

1.2.6 Látni lehet azt, hogy a meghibásodások közötti átlag idő szabályozása létre fogja hozni a megbízhatóság kívánt fokát. Azok a tényezők, amelyek hatással vannak a meghibásodások közötti átlag időre, és ebből eredően a berendezés megbízhatóságára, a következők:

a) a berendezés velejáró megbízhatósága;

b) a tartalékolás foka és típusa;

c) a kiszolgáló ellátó berendezések megbízhatósága, például az energiaellátásé, a telefoné, vagy a vezérlő vonalaké;

d) a karbantartás foka és minősége;

e) környezeti tényezők, például a hőmérséklet és a páratartalom.

1.3 A berendezés üzemkészsége

1.3.1 Az üzemkészséget, százalékban, ki lehet fejezni a tényleges üzemelési időt az egy hosszú időszakot vevő meghatározott üzemeltetési idő elosztásával kapott arányban.

Jelképesen,

$$A = \frac{\text{tényleges üzemelési idő (100)}}{\text{meghatározott üzemelési idő}}$$

Például, ha egy berendezés összességében 700 órát működött szabályszerűen egy 720 órás hónapban, akkor abban a hónapban az üzemkészsége 97,2 százalék volt.

1.3.2 A magasfokú berendezés üzemkészség biztosításához fontos tényezők a következők:

a) berendezés megbízhatóság;

b) a karbantartó személyzetnek a meghibásodásokra történő gyors intézkedése;

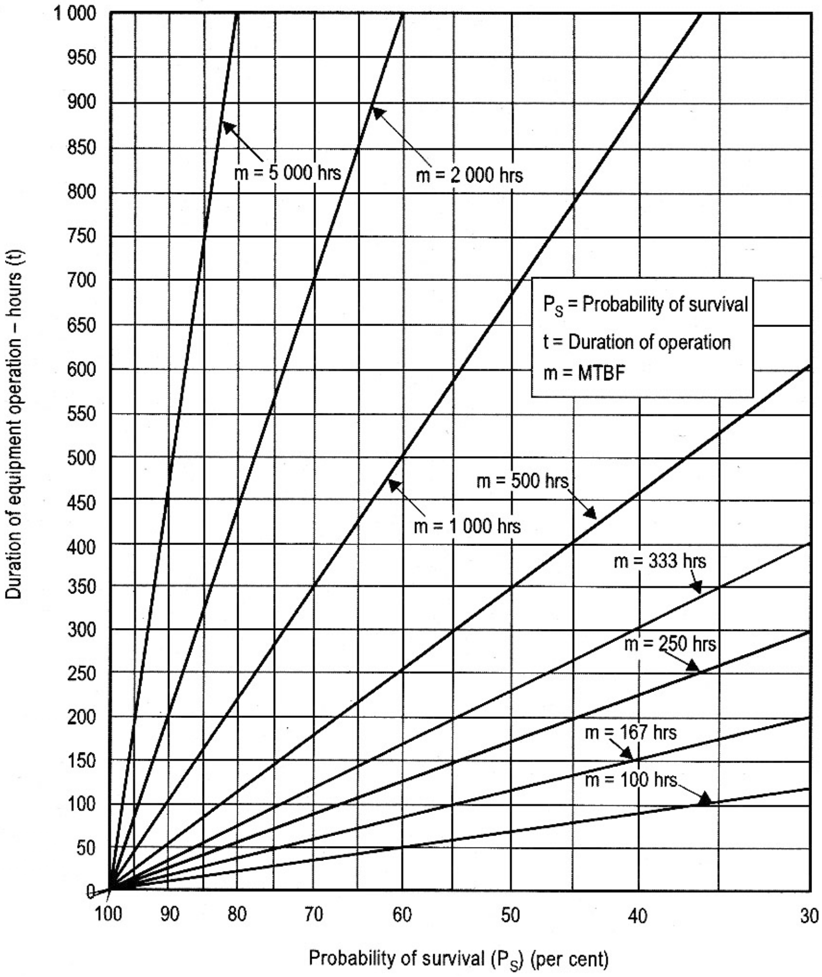
c) a karbantartó személyzet kielégítő gyakorlata;

d) olyan berendezés tervezés, amely biztosítja az alkarészekhez való jó hozzáférhetőséget és karbantarthatóságot;

e) hatékony logisztikai alátámasztás;

f) a megfelelő ellenőrző berendezések biztosítása;

g) készenléti berendezések és / vagy eszközök.



Vízszintes tengely = P_S – fennmaradási valószínűség százalékban
Függőleges tengely = berendezés üzemelési ideje órában
m = A meghibásodások közötti átlag idő (MTBF)

F-1. ábra: A Ps = 100 e-t/m szerkesztése

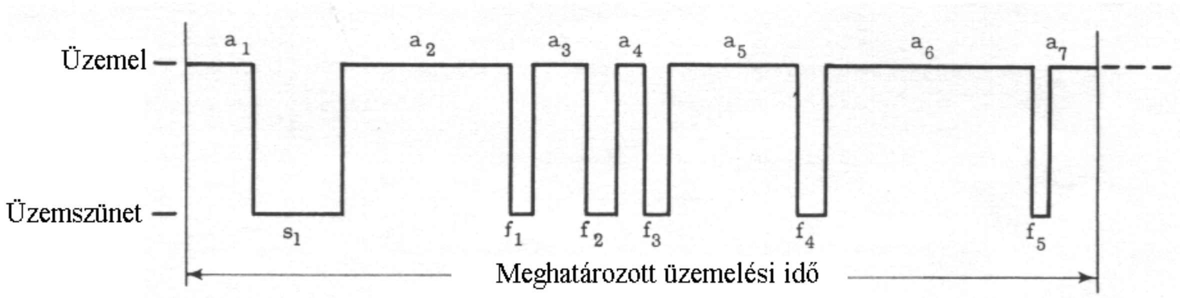
2. A megbízhatóság és üzemkészség gyakorlati szempontjai

2.1 A megbízhatóság és az üzemkészség mérése

2.1.1 *Megbízhatóság.* Azt az értéket, amit a meghibásodások közötti átlagos idő ad, a gyakorlatban szükségszerűen egy becslésnek kell tekinteni, mivel a méréseket egy véges időtartamon keresztül kell végezni. A meghibásodások közötti átlag időnek egy véges időtartamon keresztüli mérése lehetővé teszi a Hatóságok részére a berendezéseik megbízhatósági variációinak a meghatározását.

2.1.2 *Üzemkészség (rendelkezésre állás).* Ez ugyancsak fontos abbban, hogy egy jelzést biztosít arról a fokról, amelynek megfelelően egy berendezés (vagy a berendezések csoportja) a felhasználók rendelkezésére áll. Az üzemkészség közvetlenül vonatkozik arra az elért hatékonyságra, hogy hogyan álítják vissza a berendezéseket a szabályos szolgáltatásukba.

2.1.3 Az alap mennyiségeket és a méréseik módszerét az F-2. számú ábra mutatja be. Ezeknek az értékeknek nem az a céljuk, hogy egy olyan jellemző helyzetet mutassanak be, ami szabályszerűen nagyobb számú üzemképtelen időtartamot foglal magába a meghatározott üzemelési idő alatt. Azt is el kell fogadni, hogy a megbízhatóság és üzemkészség legcélszerűbb értékeinek megkapásához annak a meghatározott üzemelési időnek, amely során a méréseket végzik, olyan hosszúnak kell lenni, ami gyakorlatilag csak lehetséges.



Tényleges üzemelési idő = $a_1 + a_2 + a_3 + a_4 + \ldots a_n$
a = üzemelési időtartam
Üzemszüneti idő = $s_1 + \ldots + s_n + f_1 + f_2 + \ldots + f_n$
s = tervezett leállítási időtartam
f = hiba időtartam
Meghatározott üzemelési idő = A tényleges üzemelési idő és az üzemszüneti idő összege

F-2. ábra: A berendezés üzemkészségének és megbízhatóságának értékelése

2.1.4 Az F-2. ábrán bemutatott mennyiségeket alkalmazva, amelyek egy tervezett leállítási időtartamot és öt hiba időtartamot foglalnak magukba, ki lehet számítani a meghibásodások közötti átlag időt (MTBF) és az üzekészség (A) idejét a következők szerint:

Legyen:

$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 + a_7$	=	5 540 óra
s_1	=	20 óra
f_1	=	2 1/2 óra
f_2	=	6 1/4 óra
f_3	=	3 3/4 óra
f_4	=	5 óra
f_5	=	2 1/2 óra
Meghatározott üzemelési idő	=	5 580 óra

Meghibásodások közötti átlag idő:

$$\text{MTBF} = \frac{\text{Tényleges üzemelési idő}}{\text{A hibák száma}} = \frac{\sum_{i=1}^{7} a_1}{5}$$

$$= \frac{5540}{5} = 1\,108 \text{ óra}$$

Üzemkészség:

$$A = \frac{\text{Tényleges üzemelési idő x 100}}{\text{Meghatározott üzemelési idő}} = \frac{\sum_{i=1}^{7} a_i \times 100}{\sum_{i=1}^{7} a_i + s_1 + \sum_{i=1}^{5} f_i}$$

$$= \frac{5540}{5580} \text{x}100 = \text{99,3 százalék}$$

"G" MELLÉKLET: TÁJÉKOZTATÁSOK ÉS ÚTMUTATÓ ANYAG AZ MLS SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK ALKALMAZÁSÁHOZ

1. Meghatározások

(lásd még a 3. Fejezet 3.11.1 pontját)

Dynamic side-lobe level. Dinamikus oldalszirom szint
Az a szint, amely az idő 3 százalékában meghaladja a letapogató antenna távoli térerősségi sugárzási karakterisztikájának a fősugárnyalábján kívüli részét, ahogy azt a funkció letapogatási sebességre egy 26 kHz-es sugárnyaláb burkológörbéjű videoszűrőt alkalmazva mérik. A 3 százalékos szintet az oldalszirom időtartam arány azon része határozza meg, amely meghaladja a teljes letapogatási időtartamra meghatározott szintet.

Effective side-lobe level. Tényleges oldalszirom szint
A letapogató sugárnyaláb oldalszirmának az a szintje, amelyen belül egy meghatározott többutas környezet sajátos útirány-vezetési szög hibát eredményez.

MLS point D. MLS D-pont
A futópálya középvonala felett 2,5 m (8 láb) magasságú és a futópálya küszöbétől az oldalszög antenna irányában 900 méter (3 000 láb) távolságra lévő pont.

MLS point E. MLS E-pont
A futópálya középvonala felett 2,5 m (8 láb) magasságú és a futópálya megállási küszöbétől a futópálya küszöbe irányában 600 méter (2 000 láb) távolságra lévő pont.

Standard receiver. Szabvány vevőkészülék
Az a légijármű fedélzeti vevő modell, amelyről feltételezett az, hogy szétválasztja az MLS hiba összetevőket. A kiemelkedő jellemzők a következők: (1) a jelfeldolgozás a sugárnyaláb középpontok mérésén alapszik; (2) elhanyagolható a központosítási hiba; (3) a kormányzási elmozdulási zaj (CMN) a 3. Fejezet 3.11.6.1.1.2 pontban megadott értékeknél kisebb, vagy azzal egyenlő; (4) egy 26 kHz-es sávszélességű kétpólusú aluláteresztő sugárnyaláb burkológörbe szűrővel felszerelt; és (5) a szögadat kimeneti szűrést egy egypólusú aluláteresztő 10 radians/másodperces sarokfrekvenciájú szűrő végzi.

2. A "térbeli jel" jellemzői - szög- és adat funkciók

2.1 A jelformátum szervezése

2.1.1 A jelformátum időosztásos multiplexen alapszik, amelyben az egyes szög útirány-vezetési funkciók egymás után kerülnek kisugárzásra, és valamennyi ugyanazon a frekvencián van kisugározva. A rendszer a szög információkat az egymást követő nagymértékben irányított modulálatlan legyező alakú sugárnyalábok közötti különbség mérésével nyeri. A funkciókat bármilyen sorrendben lehet továbbítani. Ajánlott idõrések biztosítottak a megközelítési oldalszög, a megközelítési magassági szög, a kilebegtetési magasság és a hátsó irányszektor szög funkciók részére. Az egyes letapogatási sugárnyalábokat és az adatok továbbítását megelőzően egy bevezető jelszakasz van, amelyet egy szektor antenna a teljes fedésterületi légtérbe kisugároz. A bevezető jelszakasz azonosítja a következő letapogatási funkciót, és szinkronizálja a légijármű fedélzeti vevőjének jelfeldolgozó áramköreit és logikáját is.

2.1.2 A szögletapogatási funkción kívül vannak az alap és kiegészítő adat funkciók, mindegyikük saját bevezető jelszakasszal, amelyek ugyancsak kisugárzásra kerülnek a szektor antennákról. A bevezető jelszakasz teszi lehetővé az egyes funkciók felismerését és független feldolgozását. Következésképpen funkciókkal lehet kiegészíteni, vagy funkciókat lehet elhagyni a földi rendszer-felépítésből anélkül, hogy az a vevő működésére hatással lenne. A bevezető jelszakaszban és az adat funkciókban alkalmazott kódok differenciális fáziseltolásos kódolással (DPSK) moduláltak.

2.1.2.1 *A differenciális fáziseltolásos kódolású (DPSK) adat jel jellemzők.* A differenciális fáziseltolásos kódolású (DPSK) adatok a rádiófrekvenciás vivőhullám differenciális fázis modulációjával kerülnek leadásra 0, vagy 180 fokos relatív fázis állapottal. A differenciális fáziseltolásos kódolású adat jeleknek a következők a jellemzőik:

adat sebesség 15,625 kHz
bit hossz 64 mikroszekundum
logikai "0" nincs fázis átmenet
logikai "1" fázis átmenet

2.1.3 A szögfunkciók szervezésére és az időzítésre vonatkozó példák a G-1 és a G-2 (az összes ábra a fejezet végén került elhelyezésre) ábrákon kerülnek bemutatásra. Az adat tételek részleteit és meghatározásait a G-1 számú ábra mutatja be, és a 3. Fejezet 3.11.4.8 pontjában kerültek megadásra.

2.1.4 A G-3A, G-3B és G-3C ábrákon bemutatott szög útirány-vezetés és az adatok továbbításának sorrendje bebizonyítja azt, hogy kielégítő szabadságfok van biztosítva a szinkron interferencia ellen.

2.1.4.1 Ezeknek a sorrendeknek a szerkezete arra a célra szolgál, hogy kielégítő véletlenszerű elrendezést biztosítson az olyan szinkron interferencia kizárása érdekében, mint amit a légcsavar forgási hatásai okozhatnak.

2.1.4.2 A G-3A ábrán bemutatott sorrendi párok az összes funkció továbbítását biztosítják. Bármelyik olyan funkciót, amelyre nincsen szükség, törölni lehet, feltéve, hogy a fennmaradó funkciók a kijelölt időperiódusban kerülnek továbbításra.

2.1.4.3 A G-3B ábrán bemutatott sorrendi párok biztosítják a nagysebességű megközelítési oldalszög funkciót. Bármelyik olyan funkciót, amelyre nincsen szükség, törölni lehet, feltéve, hogy a fennmaradó funkciók a kijelölt időperiódusban kerülnek továbbításra

2.1.4.4 A G-3C ábra azt a teljes idő multiplex átviteli ciklust mutatja be, amelyet a G-3A ábrán, vagy a G-2B ábrán bemutatott sorrendi párokból össze lehet állítani. A sorrendek közötti nyitott időperiódusokat lehet a kiegészítő adat szavak - ahogy jelezve van - továbbítására felhasználni. Az alap adat szavakat is le lehet adni bármelyik nyitott időperiódusban.

2.1.4.5 Az A1 - A4, B1 - B39, B40 - B45 és a B55 szavakban meghatározott alap adatok és kiegészítő adatok továbbítására a bemutatott ciklusban kielégítő idő áll rendelkezésre, feltéve, hogy az adatok is nem használt időrések során, vagy a sorrendeken belüli adat szavak részére szánt időrésekben kerülnek leadásra.

2.1.4.6 Jóval hatékonyabb sorrendeket lehet kijelölni a sorrendeken belüli időzítés és a sorrendek közötti közök szabályozásával azért, hogy lehetővé váljon további kiegészítő adat szavak továbbítása. Az ilyen sorrendeket úgy kell meghatározni, hogy a G-3A, G-3B és G-3C ábrákon bemutatott sorrendekkel azonos értékű szabadságfokot biztosítsanak a szinkron interferencia ellen. A frekvencia-tartomány elemzési technikát lehet felhasználni annak kimutatására, hogy az alternatív sorrendek kielégítően véletlenszerűek.

2.2 Szög útirány-vezetési paraméterek

2.2.1 Azok a szög útirány-vezetési paraméterek, amelyek meghatározzák az MLS szög mérési eljárását, a 3. Fejezet 3.11.4.5 pontjában kerültek meghatározásra. Az a két további paraméter, amely a rendszer működésének láthatóvá tételéhez hasznos, a fél-letapogatási idő (T_m) és a szünet idő. Ezeket a 3. Fejezet előírásaiból lehet levezetni, és referenciaként az alábbi táblázatban kerülnek bemutatásra.

A jel formátum fél-letapogatási és szünet ideje
(lásd a G-2 ábrát)

Funkció	*Fél-letapogatási* idő, T_m (μs)*	*Szünet idő (μs)*
Megközelítési oldalszög	7 972	600
Nagysebességű megközelítési oldalszög	5 972	600
Hátsó irányszektor	5 972	600
Megközelítési magassági szög	2 518	400
Kilebegtetési magasság	2 368	800

* A vevő referencia idejéből mérve
(lásd az A-Függelék A-1. táblázatát).

2.2.2 *A funkció időzítési pontossága.* A Baker-kód referencia időmeghatározási pontatlansága miatt és mivel az adó áramkörei a differenciális fázisbillentyűzéses moduláció fázisait, vagy amplitúdóját a fázis átmenetek során simítják, nem lehetséges a jel időzítésének a térbeli jeltől 2 mikroszekundumnál jobb pontosságú meghatározása. Ezért az szükséges, hogy a 3. Fejezet 3.11.4.3.4 pontjában meghatározott időzítési pontosságot a földi berendezésnél mérjék meg. A földi berendezésben megfelelő mérőpontokat kell biztosítani.

2.3 Oldalszög útirány-vezetési funkciók

2.3.1 *Letapogatási konvenciók.* A G-4. ábra mutatja be a megközelítési oldalszög és a hátsó irányszektor letapogatási konvencióit.

2.3.2 *Fedésterületi követelmények.* A G-5. és G-6. ábrák szemléltetik a 3. Fejezet 3.11.5.2.2 pontjában meghatározott oldalszög fedésterületi követelményeket.

2.3.2.1 Amikor a megközelítési oldalszög, vagy a hátsó irányszektor antenna helye a futópálya középvonalától szükségszerűen eltérő helyzetű, akkor a következő tényezőket kell figyelembe venni:

a) a futópálya teljes területének fedésterületi követelményei;

b) a felhasználható vonatkoztatási alappont pontossági követelményei;

c) átmenet a megközelítési oldalszögből a hátsó irányszektorba; és

d) a mozgó járművek, a légijárművek és a repülőtér szerkezete miatti lehetséges zavaró tényezők.

2.3.2.2 Egy eltérő helyzetű oldalszög antenna szabályszerűen úgy van beállítva, hogy a nulla-fokos oldalszög, vagy párhuzamos a futópálya középvonalával, vagy úgy, hogy a tervezett alkalmazás egy üzemeltetésileg előnyös pontjánál metszi a futópálya meghosszabbított középvonalát. A nulla-fokos oldalszögnek a futópálya középvonalához viszonyított irányítottsága a kiegészítő adatokban kerül továbbításra.

2.3.3 *Nagysebességű megközelítési oldalszög.* Ahol a megközelítési arányos útirány-vezetési szektor plusz, vagy mínusz 40 fokos, vagy kevesebb, ott az oldalszög funkciónál egy nagyobb letapogatási sebességet lehet alkalmazni. A nagysebességű megközelítési oldalszög funkció felhasználható a nagy sugárnyaláb szélességű (pl. a 3 fokos) antennák által okozott kormányzási elmozdulási zaj (CMN) növekedés ellensúlyozására. A kormányzási elmozdulási zaj (CMN) csökkentése két előnyt biztosít: 1) csökkenteni lehet a szög útirány-vezetési térbeli jel teljesítménysűrűség követelményeit, és 2) a dinamikus oldalszirom szint követelményeket enyhíteni lehet.

2.3.3.1 Általában ez a funkció csökkenteni fogja az olyan kormányzási elmozdulási zajt (CMN), mint amilyent a nagy sávszélességű, nem korrelált zajforrások okoznak, szétszórt többutas zajként, vagy vevő termikus zajként egy négyzetgyök 1/3-os tényezővel az alap 13 Hz-es funkció sebességhez viszonyítva. Azonban ezt a teljes négyzetgyök 1/3-os teljesítménysűrűség csökkenést nem lehet realizálni az összes földi antenna sugárnyaláb szélességre azon követelmény miatt, hogy kielégítő teljesítménysűrűséget kell biztosítani az egy egyedüli letapogatáson alapuló jel "megszerzés" érdekében. A differenciális fáziseltolásos kódolású adáshoz szükséges teljesítmény olyan lehet, hogy nem lehet megtakarítást realizálni a földi berendezések adóinál a nagyobb adat sebesség alkalmazásával (lásd a G-1. táblázatot) (Az összes táblázat a fejezet végén került elhelyezésre).

2.3.3.2 Azonban a kormányzási elmozdulási zaj (CMN) teljesítmény vonatkozásában a megnövelt adat sebesség teljes előnye felhasználható. Például a G-2. táblázatban bemutatott minimális jelszinteknél az oldalszög kormányzási elmozdulási zaj (CMN) a 0,10 fokról 0,06 fokra csökkenthető az 1-fokos és 2-fokos sugárnyaláb szélességű antennáknál.

2.3.4 *Kiegészítő biztonsági vezetés*

2.3.4.1 Ahol használatos, ott a kiegészítő biztonsági vezetési impulzusok az arányos útirány-vezetési szektor széleinél a letapogató sugárnyaláb jelek mellett kerülnek kisugárzásra, ahogy azt a G-7. ábra időzítési rajza bemutatja. Az arányos útirány-vezetési szektor határvonala a letapogatási start/stop szögeken belül egy sugárnyaláb szélességnél került megállapításra úgy, hogy a letapogató sugár és a kiegészítő biztonsági jelek közötti átmenet az arányos útirány-vezetési szektoron kívül jelentkezik. Az azokra az összetett hullámformákra vonatkozó példákat, amelyek az átmenet során előfordulhatnak, a G-8. számú ábra mutatja be.

2.3.4.2 Amikor a kiegészítő biztonsági vezetés egy keskeny sugárnyaláb szélességű (például egy fokos) letapogató antennához kapcsolódóan kerül biztosításra, akkor a letapogató sugárnyaláb antenna 15 mikroszekundumig sugároz úgy, hogy közben 'álló helyzetben van' a letapogatási start/stop szögeknél.

2.3.4.3 Bizonyos telepítési helyeknél nehézséget jelenthet a 3. Fejezet 3.11.6.2.5.2 pontjában leírt amplitúdó követelmények kielégítése, a kiegészítő biztonsági vezetési jelek reflexiója miatt. Ezeken a helyeken a letapogatási szektor kibővíthető.

2.3.4.4 Figyelmet kell fordítani a tartson-jobbra / tartson-balra kiegészítő biztonsági vezetés konvenciójának változására akkor, amikor az oldalszög adó berendezések egy ellentétes irányból kerülnek megközelítésre (például: megközelítés a hátsó irányszektor antennája felé).

2.3.5 *A megközelítési oldalszög ellenőrzése.* Az ellenőrzés célja az, hogy a közzétett megközelítési eljárás megfelelő útirány-vezetési teljessége (integritása) szavatolva legyen. Nem az a cél, hogy az összes oldalszög szög egymástól függetlenül ellenőrizve legyen, hanem az, hogy legalább egy megközelítési oldalszög, - szabályszerűen az, amely a futópálya meghosszabbított középvonalával van egy egyenesbe állítva, -ellenőrizve legyen, és az, hogy megfelelő eszközök legyenek, amelyek biztosítják azt, hogy a többi oldalszög szög teljesítménye és teljessége fennmarad.

2.3.6 *Az alsó fedésterületi határ megállapítása.* Amikor a futópálya küszöbe nincs a megközelítési oldalszög antenna rálátási vonalában, akkor a megközelítési oldalszög fedésterületnek a futópálya közelében lévő alsó határvonalát szimulációval és / vagy helyszíni mérésekkel kell meghatározni. Az oldalszög fedésterület közzétett alsó határa a futópálya felülete felett az a magasság, ami kielégíti a 3. Fejezet 3.11.4.9.4 pontjának pontossági követelményeit a helyszíni mérések szerint meghatározva.

2.3.6.1 Ha az üzemeltetések a 2.3.6 pontban elérhető fedésterületi határ alatti fedést tesznek szükségessé, akkor az oldalszög antennát el lehet helyezni a futópálya középvonalától eltérő helyzetben és el lehet tolni a futópálya küszöbe felé úgy, hogy fedje a földetérési területet. A légijármű fedélzeti berendezésnek kell az oldalszög útirány-vezetési, a precíziós távolsági és a földi berendezés telepítési helyének koordinátáit felhasználva kiszámítani a középvonali megközelítést.

2.3.6.2 A számított középvonalas megközelítéssel elérhető leszállási minimum egyebek mellett az MLS megközelítési oldalszög, a DME/P válaszadó és a fedélzeti berendezések kombinált megbízhatóságának és integritásának a függvénye.

2.4 Magassági szög útirány-vezetési funkciók

2.4.1 *Letapogatási konvenció.* A G-9. számú ábra mutatja be a megközelítési magassági szög letapogatási konvenciót.

2.4.2 *Fedésterületi követelmények.* A G-10A. és a G-10B. számú ábra szemlélteti a 3. Fejezet 3.11.5.3.2 pontjában meghatározott magassági szög követelményeket.

2.4.3 *A magassági szög ellenőrzése.* Az ellenőrzés célja az, hogy a közzétett megközelítési eljárás megfelelő útirány-vezetési teljessége (integritása) szavatolva legyen. Nem az a cél, hogy az összes magassági szög egymástól függetlenül megfigyelésre kerüljön, hanem az, hogy legalább egy, - szabályszerűen a minimális siklópálya - kerüljön megfigyelésre, és az, hogy megfelelő eszközök legyenek, amelyek biztosítják azt, hogy a többi magassági szög teljesítménye és teljessége fennmarad.

2.5 Pontosság

2.5.1 *Általános rész*

2.5.1.1 A rendszer pontosság a 3. Fejezetben az útvonal-követési hiba (PFE), útvonal-követési zaj (PFN) és kormányzási elmozdulási zaj (CMN) egységekben került meghatározásra. Ezeknek a paramétereknek az a céljuk, hogy leírják a szög útirány-vezetési jelnek és a légijárműnek a kölcsönhatását, olyan mértékekben, amelyek közvetlenül vonatkoztathatók a légijármű útirány-vezetési hibákra és a repülőgép vezérlő rendszerek tervezésére. Annak megállapítására, hogy a térbeli jel alkalmas-e a légijármű útirány-vezetésére, ezeket a hibákat kell figyelembe venni a vonatkozó frekvencia-tartományban. Az útvonal-követési hiba magába foglalja a közepes irányszög hibát és az útvonal-követési zajt.

2.5.2 *Az MLS mérésének metodikája*

2.5.2.1 Az útvonal-követési hiba (PFE), az útvonal-követési zaj (PFN) és a kormányzási elmozdulási zaj (CMN) a G-11. számú ábrán meghatározott szűrők felhasználásával értékelhető. A szűrő jellemzői a jelenlegi repülőgépek széles körének átviteli tulajdonságain alapulnak, és kielégítőnek tartják belátható időn belüli légijármű tervezés szempontjából is.

2.5.2.2 Míg az útvonal-követési hiba (PFE) szakkifejezés az egy megkívánt repülési pálya és az útirány-vezetési jelet követő repülőgép tényleges repülési pályája közötti különbséget sugalmazza, addig a gyakorlatban ez a hiba úgy kerül kiértékelésre, hogy a légiellenőrzést végrehajtó légijárművezető utasítást kap egy kívánt MLS oldalszögön történő repülésre, és feljegyzik a légijármű fedélzeti berendezésnek az útvonal-követési hiba (PFE) szűrő kimeneti útirány-vezetési kijelzései és az adott légijárműnek egy megfelelő helyzet-referencia alapján meghatározott helyzet mérései közötti különbséget. Ugyanezt a technikát alkalmazzák a megfelelő szűrővel a kormányzási elmozdulási zaj (CMN) meghatározásához.

2.5.2.3 *Hiba kiértékelés.* Az útvonal-követési hiba (PFE) értékeléseket az útvonal-követési hiba (PFE) szűrő kimeneten lehet megkapni (a G-11. sz. ábrán az "A" ellenőrző pont). A kormányzási elmozdulási zaj (CMN) értékeléseket a kormányzási elmozdulási zaj (CMN) szűrő kimeneten lehet megkapni (a G-11.sz. ábrán a "B" ellenőrző pont). A szűrők sarokfrekvenciáit a G-11.számú ábra mutatja be.

2.5.2.3.1 A megközelítési oldalszög, vagy a hátsó irányszektor útvonal-követési hiba (PFE) és kormányzási elmozdulási zaj (CMN) értékeket a fedésterületi határokon belül 40 másodperces időközök során feljegyzett repülési hibaként kell értékelni (azaz T = 40, a G-12. ábrán). A megközelítési magassági szög útvonal-követési hiba (PFE) és kormányzási elmozdulási zaj (CMN) értékeket a fedésterületi határokon belül 10 másodperces időközök során feljegyzett repülési hibaként kell értékelni (azaz T = 10, a G-12. ábrán).

2.5.2.3.2 A 95 százalékos valószínűségi követelmény teljesítését úgy kell értelmezni, hogy az útvonal-követési hiba (PFE), vagy a kormányzási elmozdulási zaj (CMN) értéke a kiértékelési időtartamokban 5 százaléknál nagyobb értékkel nem haladhatja meg a meghatározott hiba határértékeket (lásd a G-12. ábrát).

2.5.2.3.3 Egy másik repülési ellenőrzési eljárást is lehet alkalmazni, olyat, amely nem abszolút vonatkoztatásra támaszkodik. Ebben az eljárásban, az útvonal-követési hiba (PFE) szűrő kimenetén létrejött repülési feljegyzéseknek csak az ingadozási össztevőit mérik, és hasonlítják össze az útvonal-követési zaj (PFN) szabvánnyal. Az útvonal-követési hiba (PFE) átlagos értékére alapfeltételként elfogadják azt, hogy ne haladja meg a légiellenőrzési időtartam során meghatározott közepes irányszög beállítást. Ennek megfelelően a közepes irányszög beállítást hozzáadják az útvonal-követési hiba (PFE) mérésekhez, a meghatározott rendszer útvonal-követési hibával (PFE) történő összehasonlításra. A kormányzási elmozdulási zajt hasonlóképpen lehet kiértékelni, anélkül, hogy a közepes irányszög beállítást számításba vennék.

2.5.2.4 *A földi és a légijármű fedélzeti műszer-hibák.* A földi és a fedélzeti berendezések által létrehozott műszer-hibákat olyan mérésekkel lehet meghatározni, amelyeket visszavert jel nélküli, vagy egyéb, minden olyan terjedési rendellenesség nélküli környezetben végeznek, amely a sugárnyaláb burkológörbéjének zavarását okozhatná.

2.5.2.4.1 Először, a szabvány fedélzeti vevőhöz kapcsolódó műszer-hibákat kell meghatározni egy próbapadi műszer felhasználásával, és a központosítási hibát nullára kell állítani. A fedélzeti berendezés hibáit egy szabvány próbapadi ellenőrző-készlet felhasználásával 40 másodperces adatrögzítéssel lehet venni. Ezután az adatokat négy 10 másodperces időtartományra lehet felosztani. Az egyes időtartományok átlagát kell útvonal-követési hibának (PFE) tekinteni, míg a társult ingadozás négyzetgyökének kétszerese a kormányzási elmozdulási zaj (CMN).

Megjegyzés. - A vevő kimenetet ki lehet értékelni az útvonal-követési hiba (PFE) és a kormányzási elmozdulási zaj (CMN) szűrők felhasználásával is, ha ez előírt.

2.5.2.4.2 Másodszor, ezt a szabvány vevőt használják fel a teljes rendszer műszer-hiba mérésére úgy, hogy a földi berendezést egy antenna hatósugarában, vagy valamilyen más reflexió-mentes környezetben működtetik. Mivel a vevő központosítási hiba elhanyagolhatóvá vált, a mért útvonal-követési hibát (PFE) a földi berendezésnek lehet tulajdonítani. A földi berendezés kormányzási elmozdulási zaját (CMN) úgy kapják meg, hogy az ismert szabvány vevő kormányzási elmozdulási zaj (CMN) ingadozást kivonják a mérések kormányzási elmozdulási zaj ingadozásából. Az egy 10 másodperces mérési időtartam átlagos hibáját kell az útvonal-követési hibának (PFE), míg a különbségi ingadozás négyzetgyökének kétszeresét kell a műszer kormányzási elmozdulási zaj hibának tekinteni.

2.6 Teljesítménysűrűség

2.6.1 *Általános rész*

2.6.1.1 A szög teljesítmény határokra három követelmény került meghatározásra:

a) a szög egyszeri-letapogatási vételéhez 14 dB-es jel-zaj arány (SNR) szükséges a sugárnyaláb burkológörbe szűrőn mérve (azaz a video jel-zaj arány);

b) a szög kormányzási elmozdulási zajt (CMN) meghatározott határértékeken belül kell tartani;

c) a differenciális fáziseltolásos kódolású (DPSK) adattovábbításnak legalább 72 százalékos valószínűségűnek kell lenni a fedésterület határvonalainál.

2.6.1.2 A kormányzási elmozdulási zaj (CMN) forrása a 37 km-nél (20 tenger mérföld) elsődlegesen a vevő belső termikus zaja. A zaj által létrehozott hibát (d) a következőkkel lehet kiszámítani:

$$d\theta = \frac{\theta_{BW}}{2\left(\sqrt{SNR}\ \sqrt{g}\right)}$$

$$g = \frac{\text{Funkció mintavételi sebesség}}{2\ (\text{Szűrő zaj sávszélesség})}$$

ahol Θ_{BW} az antenna sugárnyaláb szélesség fokokban és a *g* a funkció mintavételi sebességének a vevő kimeneti szűrő zaj sávszélességéhez viszonyított aránya. Egy egy-pólusú szűrőnél a zaj sávszélesség a 3 dB-es sávszélesség $\pi/2$-szerese. Ez a kifejezés a kormányzási elmozdulási zajnak (CMN) a földi antenna sugárnyaláb szélességétől és a mintavételi sebességtől való függését tükrözi.

2.6.2 *A rendszer teljesítmény szükséglete*

2.6.2.1 A rendszer teljesítmény szükségletét a G-1. táblázat mutatja be. A 3. Fejezet 3.11.4.10.1 pontjában meghatározott teljesítménysűrűség a G-1. táblázatban a légijármű antennájáról meghatározott jel teljesítményre van vonatkoztatva, a következő összefüggéssel:

$$\text{Teljesítmény az izotróp antennára (dBm)} = \text{Teljesítménysűrűség (dBW/m}^2\text{)} - 5{,}5$$

2.6.2.2 A szög funkció mérése alapfeltételként egy 26 kHz-es sugárnyaláb burkológörbe szűrő sávszélességet fogad el. A fenti 2.6.1 pontban megadott videó (jel-zaj viszony) a következők szerint kapcsolatos a középfrekvenciás (KF) jel-zaj viszonnyal:

$$\text{Jel-zaj viszony (Videó)} = \text{Jel-zaj viszony (KF)} + 10 \log \left[\frac{\text{KF zaj sávszélesség}}{\text{Videó zaj sávszélesség}}\right]$$

2.6.2.3 A differenciális fáziseltolásos kódolás bevezető jelszakaszának elemzésénél alapfeltételként elfogadott: 1) a vivőhullámot visszaállító fázis szinkronizáló hurok fedélzeti vevő alkalmazása; és 2) az, hogy a vevő bevezető jelszakasz dekódolója minden olyan bevezető jelszakaszt visszautasítson, amely nem elégíti ki a Barker kódot, vagy nincs bevezető jelszakasz paritás ellenőrzése.

2.6.2.4 A G-1. táblázatnak az a)-tól az e)-ig terjedő alpontjai a légijármű helyzetére, vagy az időjárásra vonatkozó funkciók, és így rendszertelen előfordulású esetnek tekintett. Ez az, amiért csak nagyon ritka esetekben fogják egyidejűleg elérni a legkedvezőtlenebb értéküket. Ennek megfelelően ezeket a veszteségeket véletlenszerű változóknak lehet tekinteni, és a négyzetes középértéküket kell veszteség összetevőként venni.

2.6.2.5 Az automatikus leszállási üzemeltetések alátámasztásához a 3. Fejezet 3.11.4.10.1 pontjában megközelítési oldalszög szög jelekre meghatározottaknál nagyobb teljesítménysűrűségre van szükség az alsó fedésterületi határvonalon a futópálya felülete feletti kormányzási elmozdulási zajnak a 0,04 fokra történő csökkentéséhez. Szabályszerűen, ez a kiegészítő teljesítménysűrűség természetes következményként fog jelentkezni amiatt, hogy ugyanazon adót használják a letapogató sugárnyaláb és a differenciális fáziseltolásos kódolás biztosítására, és figyelembe vesznek olyan egyéb teljesítmény feleslegeket, mint a rendelkezésre álló légijármű antenna nyereség, a terjedési veszteségek, a fedésterületi veszteségek a széles szögek esetében és az eső miatti veszteség, amelyeket - legalábbis részben - a futópálya körzetében ki lehet hagyni a számításból (lásd a G-1. táblázatot).

2.6.3 *Fedélzeti teljesítmény szükséglet*

2.6.3.1 A G-2. táblázat a fedélzeti teljesítmény szükséglet egy olyan példáját mutatja be, amelyet a teljesítménysűrűség szabványok kidolgozásához használtak fel.

2.7 Adat alkalmazások

2.7.1 *Alapadat.* A 3. Fejezet 3.11.4.8.2.1 pontjában meghatározott alapadatok arra a célra biztosítottak, hogy lehetővé tegyék a légijármű fedélzeti vevők részére a különféle földi berendezés kialakítások letapogató sugárnyaláb információinak feldolgozását, és hogy úgy szabályozzák a kimenő adatokat, hogy azok értelmezhetőek legyenek a légijármű vezetője és a fedélzeti rendszer számára. Az adatfunkciók még arra is használatosak, hogy kiegészítő információkat biztosítsanak (például állomás azonosítást és berendezés állapotot) a légijárművezető, vagy a fedélzeti rendszer részére.

2.7.2 *Kiegészítő adatok*

2.7.2.1 A 3. Fejezet 3.11.4.8.3.1 és 3.11.4.8.3.2 pontjában meghatározott kiegészítő adatok arra a célra biztosítottak, hogy digitálisan elküldjék felfelé a következő információ típusokat:

a) *A földi berendezés telepítési geometriáját leíró adatok.* Ezek az A1-A4 szavakban és a B40-B54 szavak egy részében kerülnek továbbításra.

b) *Az MLS / RNAV üzemeltetéseket alátámasztó adatok.* Ezek a B1-B39 szavakban kerülnek továbbításra.

c) *Üzemeltetési tájékoztatási adatok.* Ezek a B55-B64 szavakban kerülnek továbbításra.
2.7.2.2 A kiegészítő adat szavak átviteli sebessége a következő feltételeken alapszik:

a) Azokat az adatokat, amelyeknek a dekódolása az MLS fedésterületére való kilépéshez viszonyított hat másodpercen belül szükséges, az adások közötti 1 másodperces maximális időközzel kell továbbítani (lásd a 7.3.3.1.1 pontot).

b) Azokat az adatokat, amelyek egy szándékolt üzemeltetéshez szükségesek, de nem kell az, hogy hat másodpercen belül dekódolásra kerüljenek, az adások közötti 2 másodperces maximális időközzel kell továbbítani. Ez a sebesség lehetővé fogja tenni az adat elvesztése esetén a riasztás létrehozását 6 másodpercen belül.

c) Az üzemeltetési tájékoztatási adatokat az adások közötti 10 másodperces maximális időközzel kell továbbítani. Ez lehetővé fogja tenni az adat elvesztése esetén a riasztás létrehozását 30 másodpercen belül.

2.7.3 *Az MLS / RNAV , a B1-től a B39-ig terjedő adatszavak alkalmazása*

2.7.3.1 A B1-től a B39-ig terjedő, az MLS / RNAV üzemeltetések lehetővé tételére kijelölt kiegészítő adatszavakban foglalt adatok csak az MLS adatszavakon belüli adattartalom felhasználását támasztják alá. Abból a célból, hogy a számított középvonalas megközelítések mind az elsődleges, mind a másodlagos futópályákra, valamint hogy az íves megközelítések és indulások, továbbá a megszakított megközelítések alátámasztásra kerüljenek, ezek az adatok az eljárás típusára (megközelítés, vagy indulás), az eljárás nevére, a futópályára és az útvonal-pontokra vonatkozó információkat foglalják magukba.

2.7.3.2 A megközelítési oldalszöggel és a hátsó irányszektorral együtt továbbított adatok külön vannak választva. Ez például azt jelenti, hogy mindegyiknek lesz egy önálló Ciklikus Redundancia Ellenőrzése (CRC), és a légijármű fedélzeti berendezések függetlenül fogják dekódolni azokat. Az egy adott MLS / RNAV eljárásra vonatkozó adatok abba a fedésterületi részbe kerülnek kisugárzásra, ahol az eljárás megkezdődik. Szabályszerűen ez azt jelenti, hogy a megközelítési és a megszakított megközelítési adatok a megközelítési oldalszög területre lesznek kisugározva, és az indulási adatokat a hátsó irányszektor berendezés fogja továbbítani. Azonban azokat az útvonal-pontokat, amelyek egyaránt tartoznak a megközelítéshez, megszakított megközelítéshez, vagy az induláshoz, le lehet adni, vagy az oldalszög, vagy a hátsó irányszektor fedésterületre. Például, egy indulási eljárás megkezdődhet az oldalszög fedésterületen, és ennek megfelelően az adatot le lehet adni a megközelítési oldalszöggel. Ha az eljárás egy közös fedésterületi részen belül kezdődik, akkor a kapcsolódó adatokat le lehet adni csak az egyik területre, kivéve azt, ahol az üzemeltetési körülmények másképpen szabják meg.

2.7.3.3 Az eljárásokat útvonal-pontok sorozata határozza meg. Az útvonal-pontokat egy Descartes-féle derékszögű koordináta rendszer szerint határozzák meg X, Y és Z koordinátákkal, amelyeknek a kiinduló pontja az MLS alappont. A koordináta rendszert a
G-13. ábra mutatja be.

2.7.3.4 Az útvonal-pontok közötti szakaszok vagy egyenesek, vagy ívesek. Az íves szakaszok két útvonal-pontot összekötő körívként kerülnek meghatározásra úgy, ahogy azt a G-14. számú ábra bemutatja. A kör íve mindig a megelőző és a következő – egyenes, vagy köríves - szakasz érintője. Egy megközelítési eljárás végső megközelítési szakaszának és a kiindulási útvonal-pontra mutató szakaszának, illetve az indulási eljárás, vagy a megszakított megközelítési eljárás utolsó átrepült útvonal-pontjától meghosszabbított szakasznak mindig egyenesnek kell lenni. Vannak az egyenes szakaszoknak, vagy a köríves szakaszok érintőinek meghosszabbított szakaszai. Ezek az egyenes szakaszok nem igényelnek szükségszerűen útvonal-pontot a fedésterület határvonalán, így az ilyen útvonal-pontokat "meg lehet takarítani".

2.7.3.5 Bármilyen típusú eljárásban a kódolás a futópálya küszöbétől legtávolabb lévő ponttól kezdődik, és a futópályához legközelebb lévő útvonal-pontnál fejeződik be. A megközelítési eljárás összes útvonal-pontját kódolni kell, mielőtt bármilyen megszakított megközelítési útvonal-pont, vagy indulási útvonal-pont kódolásra kerülne. Ez a szabály leegyszerűsíti a dekódolást azáltal, hogy különválasztja a megközelítéshez tartozó útvonal-pontokat a többi útvonal-ponttól. Több eljárás megosztottan használhat fel egy, vagy több útvonal-pontot. Amikor ez a helyzet fennáll, akkor megvalósítható az, hogy az az információ csak egyszer kerül leadásra. A megosztottan felhasznált útvonal-pontnak a megközelítési eljárás utolsó pontjainak és a megszakított megközelítési, vagy indulási eljárás kiindulási pontjainak kell lenni. A megközelítések, a megszakított megközelítések és az indulások felhasználhatnak megosztott adatokat, feltéve, hogy az adatok ugyanabba a fedésterületi szektorba kerülnek kisugárzásra. Amikor egy útvonal-pont egy olyan eljárással kerül megosztottan felhasználásra, amely előzetesen meghatározásra került az adatbázisban, akkor azt egy útvonal-pontot követő útvonal-pont mutatóval kell jelezni. Ez az útvonal-pont mutató adja meg az első megosztottan használt útvonal-pontnak az adatbázisban lévő helyét.

2.7.3.6 Az útvonal-pont mutató az a számszerű érték, amely azt a folytatólagos sorrendet mutatja meg, amelynek megfelelően az útvonal-pont az adatbázisban jegyzékbe van véve. A kódolásban ez arra használatos, hogy jelezze, az útvonal-pontok az eljárásban hol helyezkednek el. Az eljárás leírásában nulla útvonal-pont mutató azt jelzi, hogy az egy számított középvonalas eljárás, ahol nincsenek útvonal-pontok biztosítva.

2.7.3.7 Jóllehet, az útvonal-pontok X, Y és Z koordinátákkal kerülnek meghatározásra, az esetek nagy részében az összes koordináta nem kerül leadásra. Egy, az elsődleges futópálya középvonalán lévő útvonal-pontnak az Y koordinátája nulla. Azt az adatmezőt, amely ezt az értéket határozza meg, el lehet hagyni úgy, hogy az "Y koordináta követő" bitet NULLÁ-ra állítják.

2.7.3.8 Amikor a Z koordináta nem szükséges repülési pálya felépítési adatként, akkor azt meg lehet "takarítani" úgy, hogy ez az érték nem kerül továbbításra. Ezt a "Z koordináta követő" bit NULLÁ-ra állításával lehet jelezni. Ezt a kezdeti megközelítési útvonal-pontokra lehet alkalmazni, a végső megközelítési navigációs pontot megelőző pontokra, ahol az útirány-vezetés még magasság-mérésen alapszik, nem pedig a számított MLS függőleges helyzeten. Ezt alkalmazni lehet még az olyan útvonal-pontokra is, melyek meghatározott Z értékű útvonal-pontok közötti folyamatos süllyedési gradiensű repülési pályán helyezkednek el. Ebben az esetben a fedélzeti berendezés számolja ki a Z koordinátát egy folyamatos süllyedési gradienst figyelembe véve. A megszakított megközelítéseknek és az indulási útvonalaknak a hátsó irányszektor fedésterületen elhelyezkedő útvonal-pontjai ugyancsak a Z koordináta elhagyásának lehetséges pontjai, mivel itt a függőleges útirány-vezetés nem áll rendelkezésre. A hátsó irányszektorban történő alkalmazásnál a Z koordinátát le lehet adni a fedélzeti berendezés általi olyan felhasználásra, amely "megmagyarázza" a légijármű vízszintes helyzetét.
Ez lehetővé teszi azoknak az oldalirányú hibáknak a lecsökkentését, amelyeket az X - Y koordinátákra a ferde távolságnál a kúpos hátsó irányszektor oldalszög értékekre való áttérés vezethet be.

2.7.3.9 Az útvonal-pont koordinátákat követő 3-bites adatmező a következő szakasz / mező azonosítót foglalja magába. Ez az adatelem azt jelzi, hogy az eljárás következő szakasza egyenes, vagy íves, illetve azt, hogy az átrepülendő útvonal-pont az eljárás utolsóként meghatározott pontja, és hogy az eljárás kapcsolódik-e egy meghatározott megközelítéshez, vagy egy másik, egy megszakított megközelítési mutatóval, vagy következő útvonal-pont azonosított eljárás megosztottan használt részéhez. Ez jelzi még azt is, hogy egy futópálya küszöb keresztezési magasság, vagy a látszólagos oldalszög - útvonal-pont távolság adatmező került-e az útvonal-pont meghatározáshoz hozzákapcsolásra.

2.7.3.9.1 Az A-Függelék A-17.sz. táblázatában foglalt azonosítók néhány jellegzetes alkalmazása az alábbiakban kerül megadásra. A jegyzék nem az összes alkalmazást foglalja magába:

a) a 0 és 1 azonosítók akkor használatosak, amikor az eljárás következő útvonal-pontja nem egy megosztottan felhasznált útvonal-pont, vagy egy megosztottan felhasznált útvonal-pont először kódolva;

b) a 2 és 3 azonosítók arra használatosak, hogy az eljárás olyan útvonal-pontjaira utaljanak, amelyek már kódolva volta, és egy másik eljárással megosztottan használatosak. Ezeknek az útvonal-pontoknak a kódolása nem kerül megismétlésre, de a mutató lehetővé teszi az eljárásnak a másik eljárással megosztottan használt útvonal-pontokkal való összekapcsolását;

c) a 4 és 5 azonosítók az elsődleges futópályánál végződő, vagy onnan kezdődő eljárás a következő, az utolsó útvonalpontjához használatosak. Az utolsó útvonal-pont a futópálya küszöbe. Ehhez az útvonal-ponthoz csak a futópálya küszöbének keresztezési magassága van meghatározva, mivel a futópálya küszöbének az MLS alapponthoz viszonyított pontos helyzete a kiegészítő A-szavakban kerül megadásra. A 4 azonosító akkor használatos, amikor az MLS / RNAV megszakított megközelítési útirány-vezetés nem szükséges, és az 5 azonosító akkor, amikor egy "megszakított megközelítési mutató" következik;

d) a 6 és 7 azonosítók bármely eljárás utolsó útvonal-pontja jelzésére használatosak, kivéve a fenti c) pontban leírtakat. Az elsődleges futópályánál ezek az azonosítók akkor használatosak, amikor az utolsó útvonal-pont X, Y és Z koordinátáinak meghatározása teljes egészében szükséges. Ezek az azonosítók használatosak még a másodlagos futópályákhoz és a helikopter leszálló helyekhez. A 6 azonosító akkor használatos, amikor nem következik megszakított megközelítés és a 7 azonosító akkor, amikor megszakított megközelítés következik; és

e) az 5 és 7 azonosítókat nem lehet a megszakított megközelítéseknél az indulásoknál alkalmazni.

2.7.3.10 A következő konvenció a további MLS alap- és kiegészítő adatokra az, hogy az összes, az adatbázisban kódolt digitális adatot elsőként a legkisebb helyiértékű bitet leadva kell leadni, és az előjel bitet a legnagyobb helyiértékű bitként kell továbbítani, az EGY-el jelölve a negatív értéket. Figyelembe kell venni azt, hogy a kiegészítő adatszavak címei használatosak az utolsó megközelítési oldalszög adatbázis szó jelzésére, és az első hátsó irányszektor oldalszög adatbázis szó a legnagyobb helyiértékű bit elsőként történő leadásával történik.

2.7.4 *Példa az MLS / RNAV adatszavak alkalmazására*

2.7.4.1 A következő pontok egy példát adnak a B1 - B39 kiegészítő adatszavakba foglalt MLS / RNAV adatszavak adat elosztási eljárására. A megközelítési és indulási eljárások egy minta elrendezését adjuk meg, valamint annak a folyamatnak a leírását, amellyel a különféle útvonal-pontok és a hozzájuk kapcsolódó eljárás jellemzők értelmezésre és a továbbításhoz összeállításra kerülnek.

2.7.4.2 A G-3. táblázat egy megközelítési, megszakított megközelítési és indulási eljárás sorozatot ír le, két feltételezett futópályára. A G-4. táblázat a G-3. táblázatban jelzett és a G-15. számú ábrán bemutatott minta eljárások útvonal-pont adatait tartalmazza.

2.7.4.3 Mielőtt az eljárási adatokat beillesztenék a B1 - B39 szavakba, először az MLS / RNAV adatok jellemzőit kell megérteni abból a célból, hogy optimálisan használják fel a rendelkezésre álló számú adatszót. A G-3. és G-4. táblázatban lévő adat sorozatnál a következő sajátos jellemzőket kell megjegyezni: a KASEL és NELSO eljárások megosztottan használják ugyanazokat az útvonal-pontokat, azaz az 1.számút (WP 1) és a 2.számút (WP 2); a KASEL és NELSO eljárások kapcsolódnak egy megszakított megközelítési eljáráshoz; a SEMOR eljárás egy másodlagos futópálya megközelítése; a LAWSO egy indulási eljárás és a hátsó irányszektor fedésterületére lesz kisugározva; az összes, a precíziós végső megközelítési navigációs ponton (PFAF) kívül eső útvonalpontnál nem szükséges a Z koordináta továbbítása; az Y koordináta nem kerül majd továbbításra több útvonal-pontnál, azoknál, amelyek az elsődleges futópálya meghosszabbított középvonalán helyezkednek el.

2.7.4.4 Az A-Függelék A-15. táblázatában meghatározott B1 adatszó a megközelítési oldalszög fedésterületi szektorba kisugározandó MLS / RNAV adatok szerkezetét határozza meg. Ez a szó magába foglalja még a megközelítési oldalszög ciklikus redundancia ellenőrzési kódját is. A megközelítési oldalszög szektorba kisugározandó eljárások száma 3. Ezt a G-3. táblázatból lehet meghatározni. Az utolsó megközelítési oldalszög MLS / RNAV adatszó adatszó címzését azután kell meghatározni, miután a teljes sorozat a formátumba beillesztésre került. Ebben az esetben az utolsó szó címzése a B11. A ciklikus redundancia ellenőrzési (CRC) kód úgy került kiszámításra, ahogy az az A-15. táblázat 3. Megjegyzésében leírásra került. A B42 és a B43 szavak nem kerülnek továbbításra, úgy, hogy a vonatkozó biteket NULLÁ-ra kell állítani. Az A4 szó leadásra kerül, úgy, hogy a vonatkozó biteket EGY-re kell állítani. A B1 adatszó kódolását a G-5. táblázat mutatja be.

2.7.4.5 Az A-Függelék A-15. táblázatában meghatározott B39 adatszó a hátsó irányszektor fedésterületi szektorba kisugározandó MLS / RNAV adatok szerkezetét határozza meg. Ez a szó magába foglalja még a hátsó irányszektor ciklikus redundancia ellenőrzési kódját (CRC) is. A hátsó irányszektorba kisugározandó eljárások száma 1. Az első hátsó irányszektor MLS / RNAV adatszó

adatszó-címzését azután kell meghatározni, miután a teljes sorozat a formátumba beillesztésre került. Ebben az esetben az első szó címzése a B36.
A ciklikus redundancia ellenőrzési (CRC) kód úgy került kiszámításra, ahogy az az A-15. táblázat 3. Megjegyzésében leírásra került. A B43 szó nem kerül továbbításra, úgy, hogy a vonatkozó biteket NULLÁ-ra kell állítani. A hátsó irányszektor térkép / ciklikus redundancia ellenőrző jelzés bit EGY-re van állítva, annak jelzésére, hogy ez a térkép / ciklikus redundancia ellenőrző szó. A B39 adatszó kódolását a G-5. táblázat mutatja be.

2.7.4.6 Az A-Függelék A-15. táblázatában meghatározott eljárás leíró szavak az összes megközelítési és indulási eljárás számára kerültek meghatározásra. A megszakított megközelítési eljárások az adat formátumban a megközelítési eljárásokkal vannak összekapcsolva, ennélfogva nem igényelnek eljárás leírót. A minta adat sorozat eljárás leíró szavait a G-6. táblázat mutatja be. Meg kell jegyezni azt, hogy az eljárás leíró adatszavakat nem lehet addig teljes egészükben meghatározni, amíg az útvonal-pont adatok tényleges kijelölése be nem fejeződik, mivel szükség van az egyes eljárásokhoz kapcsolódó "első útvonal-pont mutatóra". Ez az adatelem az első útvonal-pont az eljárás egymás után következő sorozatában. A mutató úgy kerül összeállításra, ahogy az a fenti 2.7.3.6 pontban leírásra került. Meg kell jegyezni azt, hogy az eljárás név "érvényesség jelző" (lásd a G-4. táblázatot) az eljárás változat száma és az értéke 1-től 9-ig terjed.

2.7.4.7 Az útvonal-pont adat kiosztási folyamatnak az A-Függelék A-15., A-16. és A-17. táblázatában leírtaknak kell megfelelni. A G-7. táblázat mutatja be a minta adat sorozat kiosztását. A bevezető jelszakaszok, a címek és a paritás bitek kihagyásra kerültek a táblázatból. Közvetlenül a megközelítési eljárás leíró szavak után az adatszóval kezdve, az első eljárás első útvonal-pontja kerül kiosztásra. A minta adat sorozatnál ez azt jelenti, hogy a B5 adatszó, útvonal-pont adattal. A következő lépés az adatnak a megfelelő formátumba való beillesztése. Az eljárások adatai mindig a kiindulási útvonal-pont X koordinátájával kezdődnek. Az adatbázis szerkezete lehetővé teszi azt, hogy az egyedi adatelemek átfedjenek a kiegészítő adatszavak között. Például, a KASEL eljárás 3. útvonal-pontja (WP 3) X koordinátájának az első 14 bitje a B5 szóban kerül leadásra. Az utolsó bit a B6-ban van továbbítva.

2.7.4.7.1 Az útvonal-pont koordináta legkisebb helyiértékű bitjének súlyozása miatt a kódolt útvonal-pont koordinátát kerekíteni kell. Az a kívánatos, hogy olyan eredmény kerüljön elérésre, ami a lehető legközelebb van a tényleges útvonal-pont értékéhez. Az ilyen kerekítést általában a legkisebb helyértékű bit súlyozása felének a tényleges értékhez való hozzáadásával és ezután az eredménynek egészszámmal való elosztásával hajtjuk végre. Például, a KASEL eljárás 2. útvonalpontjának (WP 2) az X koordinátája 6 556 m (tényleges). A kódolt bináris érték 2 561 lesz, mivel

$$Integer\left[\frac{\left(|6\ 556| + \frac{2.56}{2}\right)}{2.56}\right] = 2\ 561$$

A negatív számoknál az előjel bitet kell áthozni a számításba.

2.7.4.8 Az X koordináta után az "Y koordináta követő" bit következik. Ezt a bitet a KASEL 2. útvonal-pontra (WP 2) és az 1. útvonal-pontra (WP 1) - ahogy azt a G-7. táblázat mutatja - nullára kell állítani, és az Y koordináta nem kerül továbbításra. Ahogy az a KASEL 3. útvonal-pontnál (WP 3) bemutatásra kerül, az Y koordinátára szükség van, és az "Y koordináta követő" bit után leadásra kerül.
2.7.4.9 Az "Y koordináta követő" bit kódolásától függően az Y koordináta információk után a "Z koordináta követő" bit kerül kódolásra. A KASEL eljárás 4. útvonal-pontjánál (WP 4) nem szükséges a Z koordináta, mivel az a precíziós végső megközelítési navigációs pont
/PFAF/ előtt van. A Z koordináta ugyancsak nem szükséges a 2. útvonal-ponthoz (WP 2), mivel az egy folyamatos siklópályán van a 3. útvonal-pont (WP 3) és az 1. útvonal-pont (WP 1) között. Ahogy az látható, a KASEL 3. útvonalpontnál (WP 3) a Z koordinátára szükség van, és a "Z koordináta követő" bit után leadásra kerül.

2.7.4.10 A következő szakasz / adatmező azonosító az A-Függelék A-17. táblázatának megfelelően kerül kiosztásra. A KASEL eljárás 2. útvonal-pontját (WP 2) követő azonosítónál az 5. érték azt jelzi, hogy a küszöb útvonal-pont magassága a következőkben lesz leadva, a megszakított megközelítési eljárás útvonal-pont mutatóját követően. A NELSO eljárásnál, mivel az utolsó két útvonal-pontot megosztottan használja fel a KASEL eljárással, a 3. útvonal-pontot (WP 3) követő azonosítójának az értéke 3, ami azt jelzi, hogy a következő útvonal-pont mutatója a következőkben lesz leadva. Ebben az esetben a mutató 3. és ez a KASEL eljárás 2. útvonal-pontjára (WP 2) mutat. A megszakított megközelítési eljárásnál az azonosító 6-ra van állítva, ami azt jelzi, hogy ez az eljárás utolsó útvonal-pontja. A másodlagos futópálya eljárásánál, a SEMOR-nál az azonosító ugyancsak 6-ra van állítva. Ebben az esetben azonban ez azt jelzi, hogy a látszólagos oldalszög - útvonal-pont távolság következik.

2.7.4.11 A G-8. táblázat mutatja be az indulási eljárás útvonal-pontjainak kiosztását. Az indulási adatok a B36 szóval, az eljárás leírással kezdődnek. Az útvonal-pont adatok a B37 szóban kezdődnek. Az indulási adatok ugyanannak a módszernek az alkalmazásával kerülnek kiosztásra, mint a megközelítési adatok.

2.7.4.12. Miután az adatbázis teljes egészében kiosztásra került, a ciklikus redundancia ellenőrző (CRC) értékeket lehet kiszámítani a B1 - B39 és az egyéb szükséges adatelemek felhasználásával. A G-9. táblázat mutatja be ennek a számolásnak egy olyan minta adat sorozatra kapott eredményeit, amelyek magukba foglalják a kiegészítő adat A szavakat, a B6 alapszót és a B40 - B41 kiegészítő szavakat.

2.8 A szomszédos csatorna zavarás figyelembevétele

2.8.1 A szabvány úgy került megszerkesztésre, hogy legalább egy 5 dB-es tűréssel számoltak a kisugárzott teljesítmény ingadozásnál a minimális teljesítménysűrűség előírások felett. Az interferencia előírások a legrosszabb esetű antenna sugárnyaláb szélesség kombináción, adatátviteli sebességen és nem-kívánt zavaró szinkronizáláson alapulnak.

3. Földi berendezés

3.1 A letapogató sugárnyaláb formája

3.1.1 Az oldalszög letapogató sugárnyaláb burkológörbéje az antenna irányítási vonalon és a magassági szög letapogató sugárnyaláb burkológörbéje az elsőbbségi magassági szögnél - ahogy azt egy szabvány vevő detektálja - meg kell, hogy egyezzen a G-16. ábrán meghatározott határértékekkel nagy jel-zaj viszonyú körülmények és elhanyagolható többutas terjedés esetén (azaz egy, az antenna tartományon belüli vizsgálat során). A -10 dB-es szimmetria a pontossági teljesítményre vonatkozóan a berendezés tervezésnél nem szükségszerűen elvárt.

3.2 A letapogató sugárnyaláb oldalszirommal

3.2.1 *Előírt teljesítmény adatok.* Az antenna oldalszirom tervezésnek a következő két feltételt kell kielégíteni: 1) a dinamikus oldalszirom szint nem akadályozhatja meg azt, hogy a fedélzeti vevő befogja és kövesse a fő sugárnyalábot. A kielégítő teljesítményt nem lehet biztosítani akkor, ha a dinamikus oldalszirmok a mínusz 10 dB-es szint felett maradnak; 2) a tényleges oldalszirom szint összeegyeztethető a rendszerhiba határral.

3.2.2 A tényleges oldalszirom szint (P_{ESL}) a dinamikus oldalszirom szintre (P_{DYN}) vonatkoztatva:

$$P_{ESL} = K\, P_{DYN}$$

ahol *K* az a csökkentő tényező, amely az antenna kivitelezésétől függ.
A csökkentő tényező a következőktől függő lehet:

a) az irányított antenna elemek rendszerétől, amelyek csökkentik a többutas jelszintet a fedésterületre viszonyítva;

b) a dinamikus oldalszirmok szabálytalanságának fokától.

Megjegyzés. - A dinamikus oldalszirmoknak kicsi a fontossága akkor, amikor a mért dinamikus oldalszirom szintek kisebbek a meghatározott tényleges oldalszirom szinteknél.

3.2.3 Az oldalszög antenna oldalszirmaiból eredő oldalirányú többutas visszaverődés és a magassági szög antenna oldalszirmaiból eredő földi többutas visszaverődés zavarhatja a fő sugárnyalábot és szögbeli hibákat hozhat létre. Annak biztosítására, hogy az antenna oldalszirmok által létrehozott dv hiba a terjedési hibákon belül legyen, a megkívánt tényleges oldalszirom szintet, ESL, a következők szerint lehet felbecsülni:

$$P_{ESL} = \frac{d\theta}{\theta_{BW} P_R P_{MA}}$$

ahol a P_R a többutas akadály visszaverődési együttható, Θ_{BW} a földi antenna sugárnyaláb szélessége és P_{MA} az elmozdulás átlagoló tényező.

3.2.4 Az elmozdulás átlagoló tényező a jellemző többutas terjedés geometriájától, a légijármű sebességétől, a funkció adatsebességétől és a kimeneti szűrő sávszélességétől függ. Amikor a többutas terjedés geometriájának és a légijármű sebességének kombinációja olyan, hogy a többutas lengési frekvencia 1,6 Hz-nél nagyobb, akkor az elmozdulási tényező a következő:

$$P_{MA} = \sqrt{\frac{2\ (\text{kimeneti szűrő zaj-sávszélesség})}{\text{Funkció adatsebesség}}}$$

3.2.5 Ezt a tényezőt tovább lehet csökkenteni a magasabb többutas terjedési lengési frekvenciáknál, ahol a többutas terjedés által létrehozott sugárnyaláb torzulások nem összefüggőek a TO és FRO letapogatások közötti időközben.

3.3 Megközelítési magassági szög antenna karakterisztikája

3.3.1 Amikor a többutas terjedés hatásának korlátozása szükséges, akkor a megközelítési magassági szög antenna vízszintes sugárzási karakterisztika fokozatos jel utóelnyomása szükséges az antenna-irányítási vonaltól távolodva. Jellemzően a megközelítési magassági antenna vízszintes sugárzási karakterisztikáját az antenna-irányítási vonaltól 20 fokra 3 dB-el és az antenna-irányítási vonaltól 40 fokra 6 dB-el kell csökkenteni. A tényleges többutas terjedési körülményektől függően a vízszintes sugárzási karakterisztika több, vagy kevesebb utóelnyomást igényelhet.

3.4 Megközelítési / hátsó irányszektor oldalszög csatornák

3.4.1 Amikor egy futópályához mindkét megközelítési irányra MLS-t telepítenek, és a berendezés nincs a megközelítésre használatban, akkor hátsó irányszektor oldalszög adóként üzemeltethető. Amikor kívánatos az, hogy eltérő csatornát jelöljenek ki minden egyes futópálya irányra, akkor szükségszerűen az oldalszög adó egységek különböző frekvenciákon lesznek üzemeltetve az üzemeltetési módtól függően – megközelítési, vagy hátsó irányszektor oldalszög. Figyelemmel kell lenni a csatorna kiosztásnál arra, hogy a két frekvencia elég közel legyen azért, hogy az oldalszög antenna függőleges sugárzási karakterisztikájának bármilyen mechanikai szabályozása elkerülhető legyen akkor, amikor a megközelítési irányt átfordítják.

3.4.2 A frekvencia elkülönítést úgy kell korlátozni, hogy a hátsó irányszektorra a sugárzási karakterisztika erősítési tényezőjének vesztesége (optimális megközelítési értékhez viszonyítva) képes legyen "befogadni" azokat az adó teljesítmény határértékeket, amelyek a G-1. táblázatban a hátsó irányszektor funkcióra megadásra kerültek.

4. A telepítésre vonatkozó megfontolások

4.1 MLS / ILS együttes telepítés

4.1.1 *Az MLS magassági szög antennája*

4.1.1.1 *Bevezetés*

4.1.1.1.1 Amikor az MLS magassági szög adó antennáját együtt telepítik egy ILS siklópálya adóval, akkor egy döntés sorozatot kell hozni ahhoz, hogy a magassági szög adó antennájának elhelyezését meghatározzák. A telepítési feltételek úgy kerültek kidolgozásra, hogy azok az MLS magassági szög adó berendezésnek az ILS siklópálya adó jeleire való hatások minimálisra csökkentésén alapulnak. A feltételek a térbeli jellel, az üzemeltetésnél a kritikus területekkel és az akadálymentességi megfontolásokkal együtt befolyással lesznek a magassági szög antenna végső elhelyezésére.

4.1.1.1.2 A cél az, hogy a magassági szög adó antenna telepítésének egy megközelítő területével kezdjenek, és azután csökkentsék le azt a területet az adott berendezés optimális elhelyezésére. Ezt a célt úgy lehet elérni, hogy végighaladnak a tények és figyelembe veendők sorozatán. A döntéshozó folyamat egy logikai folyamatábraként a G-17. számú ábrán kerül bemutatásra.
Ezeknek az útmutató vonalaknak nem az a céljuk, hogy egy mindent magukba foglaló MLS telepítési kézikönyvként szolgáljanak, hanem csak arra szolgálnak, hogy kiegészítő útmutatásokat adjanak akkor, amikor az MLS-nek az ILS-el való együttes telepítése szükséges.

4.1.1.1.3 A G-17. ábrára hivatkozva a szakasz számok a három telepítési geometria egyikének felelnek meg, mint például az alábbi 4.1.1.2 "a magassági szög antennának a siklópálya adó és a futópálya közötti telepítése", stb. Minden egyes blokk előtt a számok arra a meghatározott paragrafusra utalnak, amelyek a G-17. ábra alátámasztó szövegei. Ez a paragrafus adja meg annak / azoknak a tényező(k)nek a részletesebb leírását, amelyeket annál a lépésnél meg kell fontolni.

4.1.1.1.4 A magassági szög adó antenna telepítésének két általános területét a G-18. számú ábra mutatja be. A siklópálya adó elhelyezésétől függően vagy az egyik, vagy a másik terület nem áll fenn. Azonkívül ezeknek a területeknek már a figyelembevételüket megelőzően ki kell elégíteni a térbeli jel követelményeket.

4.1.1.2 *A magassági szög adó antennának siklópálya adó és a futópálya közötti telepítése*

4.1.1.2.1 A magassági szög adó antenna hátrafelé elhelyezése (a futópálya küszöbtől) az MLS megközelítési vonatkozási pont (ARD) magasságától függ. Az MLS megközelítési vonatkozási pontnak (ARD) ki kell elégíteni a 3. Fejezet 3.11.4.9.1 pontjában meghatározott követelményeket. A magassági szög adó antenna hátrafelé elhelyezését a következő egyenlettel lehet meghatározni (lásd a G-19. sz. ábrát):

$$SB = \frac{ARDH - RPCH}{\tan\theta} \geq \frac{15 - RPCH}{\tan\theta}$$

ahol:

az összes távolság méterben mért;

SB a magassági szög antenna fázis középpontjának hátrafelé való elhelyezési távolsága a futópálya küszöbétől a futópálya középvonalával párhuzamosan;

RPCH a magassági szög antenna fázis középpontjának relatív magassága a futópálya felületének a küszöbnél lévő szintjével összehasonlítva. (Ez magában foglalja a magassági szög antenna fázis középpontjának a magasságát és a terep magassági különbséget a futópálya küszöbe és a magassági szög antenna helyszíne között.);

ARDH a kívánt MLS megközelítési vonatkozási pont magasság; és a minimális siklópálya; és

Θ a minimális siklópályaszög.

4.1.1.2.2 A magassági szög antenna kúpos koordináta rendszere és a futópálya középvonalától való eltolt (ordináta) helyzete fogja létrehozni azt a minimális magassági szög útirány-vezetést, ami a megközelítési referencia pont felett van. A 3. Fejezet 3.11.5.3.5.2.2 pontjának ajánlását figyelembe véve az eltolt helyzetet a következő egyenlettel lehet korlátozni:

$$(OS)^2 + (SB)^2 \leq \left[\frac{(18 - RPCH)}{\tan\theta}\right]^2$$

ahol:
az összes távolság méterben mért; és

OS az eltolási távolság a magassági szög antenna fázis középpontja és a futópálya középvonalát magába foglaló függőleges sík között (lásd a G-19. számú ábrát).

4.1.1.2.3 Ezenfelül az MLS megközelítési vonatkozási pontnak egy méteren belül egybe kell esni az ILS vonatkozási ponttal, ahogy az a 3. Fejezet 3.11.5.3.5.3 pontjában meghatározásra került. Ez a következő egyenletben megadva:

$$\frac{RDH - 1 - RPCH}{\tan\theta} \leq SB \leq \frac{RDH + 1 - RPCH}{\tan\theta}$$

ahol:
az összes távolság méterben mért; és

RDH az ILS vonatkozási pont magassága.

4.1.1.2.4 A G-18. ábra 1. Területe átlós határvonalának meghatározásához két tényezőt kell számításba venni. Az első az, hogy a magassági szög antenna nem nyúlhat be abba a területbe, amelyen keresztül a Fresnel közeltér húzódik az ILS siklópálya migrációjához a megközelítés során. Általában ezt a követelményt úgy lehet elérni, hogy a magassági szög antennát az átlós vonalnak a futópálya oldala felőli részén túl, a siklópálya antenna oszlopa és a futópálya küszöbnél lévő középvonala között helyezik el. A G-18. ábrán lévő értéke a siklópálya antenna oszlopának a futópálya küszöbénél lévő középvonalához viszonyított helyzetétől függ. A második tényező az, hogy a minimálisra csökkentsék a siklópálya antenna sugárzási karakterisztikájának az oldalirányú "behatolási mélységét" (lásd az alábbi 4.1.1.3.2 pontot). Azonban erre a magassági szög antenna területre a második tényező kielégítése kívánatos, de nem elengedhetetlen.

4.1.1.2.5 Miután a fenti követelményekre alapozva meghatározták a magassági szög antenna elhelyezésének elfogadható távolságát, a magassági szög antenna minimális oldalirányú eltolt helyzetét (ordináta) kell meghatározni, az Annex 14 4. Fejezetében megadott akadálykorlátozási követelmények szerint.

4.1.1.2.6 Amikor az csak lehetséges, a magassági szög antenna helyzetét úgy kell szabályozni, hogy a minimálisra csökkentsék a magassági szög antenna kritikus területének a repülési üzemeltetésekre gyakorolt hatását. Továbbá, az lenne a kívánatos, hogy a magassági szög antenna elhelyezését olymódon válasszák meg, ami a maximálissá teszi az MLS magassági szög antenna kritikus területének és az ILS siklópálya adó kritikus területének egybeesését. Ez az egybeesés a minimálisra fogja csökkenteni az összekapcsolt kritikus területek "megnagyobbodását". Annak szükségessége miatt, hogy a magassági szög antennát a siklópálya adó antenna előtt kell elhelyezni, szabályszerűen a magassági szög antennát a siklópálya adó kritikus területére kell elhelyezni. A magassági szög antenna kritikus területet lásd a következőkben, a 4.3 pont alatti szakaszban. A siklópálya adó kritikus területének leírását lásd a "C"- Melléklet 2.1.10 pontja alatti szakaszban.

4.1.1.2.7 Miután a magassági szög antenna helye megállapításra került, a magassági szög antenna felügyelő egységének elhelyezését kell megtalálni. A magassági szög jelet úgy kell megfigyelni, ahogy az a korábbi 2.4.3 pontban meghatározásra került. A magassági
szög földi felügyelő egységének magassága a minimális siklópálya szög egységet alkotó felügyelő egységétől és az akadálymentességi követelménytől függ. A következő megfontolandó tényezők nyújthatnak segítséget a felügyelő egység elhelyezésének meghatározásához:

a) Az a kívánatos, hogy a földi felügyelő egység olyan közel legyen a távoltérhez, amennyire az gyakorlatilag csak megvalósítható azért, hogy a minimálisra csökkenjen a közeltéri hatás a felügyelő rendszerben.
Azonban ezt a távolságot korlátozni kell azért, hogy az antenna és a földi felügyelő egység közötti jármű és légijármű forgalom miatti téves riasztásokat elkerüljék.

b) Az a kívánatos, hogy a minimálisra csökkentsék a magassági szög jeleknek a felügyelő egység általi - a végső megközelítési területre ható - blokkolását és torzítását. Ezt úgy lehet elérni, hogy a felügyelő egységet a magassági szög antenna antenna- irányítási vonalától oldalirányban 30 fokig terjedően és 40 métertől (130 láb) 80 méterig (260 láb) terjedő távolságban helyezik el, az adott berendezés felépítésétől függően.

c) A földi felügyelő egységnek az antenna középvonalától oldalirányban való elhelyezését a megfelelő megfigyelési érzékenység fenntartása és a mechanikai stabilitás korlátozza. Nem az a cél, hogyha lehet, akkor a földi felügyelő egység oldalirányú elhelyezése meghaladja a magassági antenna középvonalától mért 30 fokot.

d) A magassági szög földi felügyelő egységét úgy kell elhelyezni, hogy elkerüljék azt, hogy hatással legyen, vagy behatást kapjon az ILS siklópálya földi felügyelő egység/re/től.

4.1.1.3 *A magassági szög antennának a siklópálya adó helyénél nagyobb eltolt oldalirányú távolságban való telepítése*

4.1.1.3.1 Amikor a magassági szög adó antennát a futópálya középvonalától a 130 métertől (430 láb) a 180 méterig (590 láb) terjedő eltolt oldaltávolságban helyezik el, akkor az elért megközelítési vonatkozási pont magasság kúpos hatása válik lényegesebbé. A berendezéstől függően a magassági szög antenna hátrafelé elhelyezését lehet, hogy szabályozni kell azért, hogy kielégítse a korábbi 4.1.1.2.1, 4.1.1.2.2 és 4.1.1.2.3 pontokban tárgyalt követelményeket.

4.1.1.3.2 Amikor a magassági szög antennát a futópálya középvonalától a telepített siklópálya adó helyénél nagyobb eltolt oldalirányú távolságnál helyezik el, akkor a magassági szög antenna nem nyúlhat be a siklópálya oldalirányú sugárzási karakterisztikájába. A G-18. számú ábrán a Φ értéke az ott lévő siklópálya adó antenna típusától és a magassági szög adó berendezés fizikai jellemzőitől függ. Általában a "Φ" a siklópálya adó antenna oldalirányú sugárzási karakterisztikájának -10 dB-es pontjait jelzi. A -10 dB-es értéket le lehet csökkenteni -4 dB-re, különösen a siklópálya antennák befogási hatékonyságára, a siklópálya jel minősége felülvizsgálatától függően.

4.1.1.3.3 Miután a fenti követelményekre alapozva meghatározták a magassági szög antenna elhelyezésének elfogadható távolságát, azt a helyet lehet, hogy tovább kell határolni azért, hogy kielégítse az Annex 14 akadálykorlátozási követelményeit, különösképpen a gurulóút - akadály elkülönítési követelményeket.

4.1.1.4 *Alternatívák*

4.1.1.4.1 Ha a magassági szög antennának a siklópálya adó antennával való együttes telepítését nem lehet teljesen megvalósítani, akkor alternatívaként a magassági szög antennát a futópálya ellentétes oldalán lehet elhelyezni.

4.1.2 *MLS oldalszög antenna*

4.1.2.1 *Bevezetés*

4.1.2.1.1 Amikor az MLS oldalszög antennáját együtt telepítik egy ILS siklópálya adóval, akkor egy döntés sorozatot kell hozni ahhoz, hogy az oldalszög adó antennájának elhelyezését meghatározzák. A telepítési feltételek úgy kerültek kidolgozásra, hogy azok az MLS oldalszög adó berendezésnek az ILS siklópálya adó jeleire - és fordítva -való hatások minimálisra csökkentésén alapulnak. A feltételek a térbeli jellel, az üzemeltetésnél a kritikus területekkel és az akadálymentességi megfontolásokkal együtt befolyással lesznek az oldalszög adó antenna végső elhelyezésére. Mivel egy "púpos" futópálya, vagy a megközelítési fénytechnikai rendszer miatt szükséges lehet az oldalszög adó antenna fázis középpontja magasságának megemelése, ezért ezeket a tényezőket figyelembe kell venni akkor, amikor a következő követelmények bármelyikét alkalmazzák.

4.1.2.1.2 A cél az, hogy az oldalszög adó antenna telepítésének egy megközelítő területével kezdjenek, és azután csökkentsék le azt a területet az adott berendezés optimális elhelyezésére. Ezt a célt úgy lehet elérni, hogy végiglépkednek egy megfontolási sorozat jegyzéken, ami egy logikai folyamatábraként a G-20. számú ábrán kerül bemutatásra.

4.1.2.1.3 A G-20. ábrára hivatkozva a szakasz számok a négy telepítési geometria egyikének felelnek meg, (például az alábbi 4.1.2.2 "az iránysáv adó antenna előtt elhelyezett oldalszög adó antenna", stb.) Minden egyes blokk előtt a számok arra a meghatározott paragrafusra utalnak, amelyek a G-20. ábra alátámasztó szövegei. Ez a paragrafus adja meg azoknak a tényezőknek a részletesebb leírását, amelyeket annál a lépésnél meg kell fontolni.

4.1.2.1.4 Az oldalszög adó antenna telepítésének általános területét a G-21. számú ábra mutatja be.

4.1.2.2 *Az iránysáv adó antenna előtt elhelyezett oldalszög adó antenna*

4.1.2.2.1 Az oldalszög adó antennát az iránysáv irányvonalára szimmetrikusan legalább 30 méterrel (100 láb) az iránysáv adó antenna antenna-sora előtt kell elhelyezni. A maximális távolság értéket (a változtatható "X" a G-21. ábrán) az a követelmény határozza meg, hogy az Annex 14-nek a követelményeit mind az oldalszög adó antenna szerkezetére, mind az oldalszög felügyelő egységre vonatkozóan kielégítsék. Ez az oldalszög antenna előnyben részesített telepítési helye. Azonban, például olyan tényezők miatt, mint az iránysáv közeltéri felügyelő egységének helyzete, szükség lehet az oldalszög adó antenna elhelyezésének módosítására. Az oldalszög adó antennát nem lehet úgy elhelyezni, hogy az lezárja az iránysáv adó antenna és az iránysáv földi felügyelő egysége közötti rálátási vonalat. Amiatt, hogy az oldalszög adó berendezés lezárja az ILS földi ellenőrző pont rálátási vonalat, lehetséges lesz az, hogy az ILS földi ellenőrző pontokat új helyre kell kijelölni.

4.1.2.2.2 Az a kívánatos, hogy a DME / P antennáját együtt telepítsék az oldalszög adó antennával, amikor az csak lehetséges. Azonban, ha a DME / P antennát nem lehet az oldalszög adóval együtt telepíteni az akadálykorlátozási követelmények miatt, akkor egy oldalirányban eltolt DME / P elhelyezést, vagy egy alternatív együtt telepítési elrendezést lehet figyelembe venni (lásd a "C"- Melléklet 7.1.6 pontját és az alábbi 5. szakaszt).

4.1.2.2.3 Amikor lehetséges, az oldalszög adó antenna elhelyezését úgy kell szabályozni, hogy a minimálisra csökkenjen az oldalszög adó antenna kritikus területének a repülési üzemeltetésekre való hatása. Azonkívül, kívánatos lehet az, hogy a maximálisra növeljék az oldalszög adó és az iránysáv adó kritikus területeinek egybeesését. Ha szükségszerű az, hogy az oldalszög adó antennát az iránysáv adó antenna közvetlen szomszédságába telepítsék, akkor szabályszerűen az antennáknak csak az egyikét telepítsék a másik antenna kritikus területén belülre. Az oldalszög adó antenna kritikus területet lásd az alábbi 4.3 pontban. Az iránysáv adó kritikus területet lásd a "C"- Melléklet 2.1.10 szakaszban.

4.1.2.2.4 Miután az oldalszög adó antenna megfelelő helyét meghatározták, meg kell találni az oldalszög antenna földi felügyelő egységének helyét. Az oldalszög adó antennát úgy kell megfigyelni, ahogy az a korábbiakban, a 2.3.5 pontban meghatározásra került. A földi felügyelő rendszer előnyben részesített helye a futópálya meghosszabbított középvonala. Azonban a felügyelő egység oszlopa az oldalszög jelek károsodásának forrása lehet. Ennek megfelelően, ha ez a felügyelő rendszer elhelyezés elfogadhatatlan jel-csökkenést hoz létre, vagy nem kielégítő megfigyelési képességet okoznak a lámpasorok szerkezeti rendszerei, az ILS iránysáv adó stb., akkor egy másik földi felügyelő egység hely lehet kívánatos. Ezt a második megoldást csak akkor ajánljuk, amikor a megközelítési radiál teljes felügyelete rendelkezésre áll. A következő megfontolandó tényezők nyújthatnak segítséget a felügyelő egység elhelyezésének meghatározásához:

a) Az a kívánatos, hogy a földi felügyelő egység olyan közel legyen a távoltérhez, amennyire az gyakorlatilag csak megvalósítható azért, hogy a minimálisra csökkenjen a közeltéri hatás a felügyelő rendszerben. Azonban ezt a távolságot korlátozni kell azért, hogy a felügyelő egység és az oldalszög antenna közötti jármű és légijármű forgalom miatti téves riasztásokat elkerüljék.

b) Az a kívánatos, hogy a minimálisra csökkentsék az oldalszög jeleknek a felügyelő egység általi - a végső megközelítési területre ható - blokkolását és torzítását. A földi felügyelő egységet olyan távol kell elhelyezni az oldalszög adó antenna fázis középpontja alá, amennyire gyakorlatilag csak lehetséges.

c) A földi felügyelő egységnek az antenna középvonalától oldalirányban való elhelyezését korlátozni kell a megfelelő megfigyelési érzékenység fenntartása és a mechanikai stabilitás megtartása érdekében.

d) Az oldalszög adó antenna földi felügyelő egységét úgy kell elhelyezni, hogy elkerüljék azt, hogy hatással legyen az ILS iránysáv adó figyelő egységére, vagy behatást kapjon attól.

4.1.2.3 *Az ILS iránysáv adó mögött elhelyezett oldalszög adó antenna*

4.1.2.3.1 Az iránysáv adó antenna és az MLS oldalszög adó antenna közötti távolság az akadálykorlátozási követelményektől, a rendelkezésre álló tényleges területtől, az iránysáv adó hátsó irányszektor adásától és a DME / P antennának az oldalszög adó antennával való együttes telepítésének kívánatosságától függ. Ha az iránysáv hátsó irányszektor adását használják, akkor egy legalább 30 méteres (100 láb) távolságot kell az oldalszög és az iránysáv adó antennák között biztosítani, és az oldalszög adó antennát az iránysáv adó iránysáv középvonalára szimmetrikusan kell telepíteni. Az olyan iránysáv adó antennák esetében, amelyeknek nagy az előre-hátra teljesítmény-aránya, lehetséges lesz a 30 méteres (100 láb) elkülönítés csökkentése.
Miután az oldalszög és az iránysáv adó antennák közötti távolság ismertté válik, a G-22. számú ábrát lehet felhasználni az oldalszög adó antenna fázis középpontja magasságának az iránysáv adó antenna-sorhoz viszonyított magasságának meghatározására.
Annak biztosítására, hogy az ILS iránysáv adó által okozott jel-szóródás miatti oldalszög útirány-vezetési hiba jelentéktelen (0,03 fok) maradjon, az oldalszög fedésterület teljes területén a "W" pontot

(G-22. ábra) kell jellemzően megválasztani ahhoz, hogy a G-22. ábra változó "X" értékét meghatározzák. Ha ennek a pontnak a kiválasztása egy olyan oldalszög adó antenna elhelyezést eredményez, ami megsérti az akadálymentességi követelményeket, vagy egy olyan torony-építésű telepítést kíván, ami nem megvalósítható, akkor a következő tevékenységeket lehet figyelembe venni:

a) ismerve az érintett meghatározott iránysáv adó és oldalszög adó berendezéseket, elemzést lehet elvégezni az oldalszög adó antenna fázis középpontjának meghatározásához.
Általában az az ajánlott, hogy az oldalszög adó antenna fázis középpontjának magasságát úgy válasszák meg, hogy az iránysáv adó által okozott jel-szóródás miatti útirány-vezetési hiba 0,03 fokra legyen korlátozva. Azonban ezt a kijelölést meg lehet növelni azután, hogy figyelembe veszik az egyéb hibaforrások hozzájárulását is, az olyanokat, mint a földi és légijármű fedélzeti hibák, az épületektől eredő oldalszirom visszaverődések, a földfelszíni visszaverődések és a "zavaró" légijárművek miatti hibák (lásd a G-10. táblázatot); és

b) a W - W_N vonalon (G-22. számú ábra) ki lehet választani egy pontot a változó "X" értékének meghatározásához. Az az előnyösebb, ha a pontot úgy választják meg, hogy olyan közel legyen a "W" ponthoz, amennyire csak lehetséges, és annak az érintett eljárásokhoz üzemeltetésileg elfogadottnak kell lenni. Mivel ennek a követelménynek a kifejlesztéséhez felhasznált hiba elosztás a teljes terjedési hiba halmaznak csak egy kis részét képezi, az oldalszög jel kielégítheti a pontossági követelményeket még azon sík alatt is, ami magába foglalja az oldalszög adó antenna fázis középpontjára kiválasztott pontot. Azt a pontot, amelyre az elfogadható oldalszög jel fennáll, a minimális siklópálya szögön repülési mérésekkel lehet meghatározni.

4.1.2.3.2 Ha az iránysáv adó közeltéri figyelő egysége a futópálya meghosszabbított középvonalában van, akkor az oldalszög adó antenna fázis középpontja magasságának (PCH), vagy az iránysáv adó felügyelő egysége magasságának szabályozására lehet szükség, azért, hogy a minimálisra csökkentsék az iránysáv adó felügyelő egysége oszlopának az oldalszög jelekre gyakorolt hatását. Azonban az előre látható, hogy akkor, amikor a felügyelő egység oszlopának magassága azonos, vagy alacsonyabb az iránysáv adó antenna elemeinek magasságánál, a felügyelő egység oszlopának jelenléte miatti további szabályozásra nem lesz szükség.

4.1.2.4 *Egybeépített oldalszög és iránysáv adó kialakítás*

4.1.2.4.1 *Oldalszög adó antenna az iránysáv antenna-sor alá beépítve*

4.1.2.4.1.1 Ennél a kialakításnál az első figyelembe veendő tényező az akadálymentességi felületnek az iránysáv adó antenna-sora feletti magasságának meghatározása. A földfelszín és az akadálymentességi felület ezen pontja közötti függőleges távolságnak legalább egyenlőnek kell lenni az oldalszög adó antenna magasságával, beleértve a talapzatot és plusz azt a szükséges függőleges 'távolságot', ami az oldalszög adó antenna teteje és az iránysáv adó antenna elemek teteje között szükséges. Ha ezt a feltételt nem lehet betartani, akkor egy másik egybeépített kialakítást kell figyelembe venni.
4.1.2.4.1.2 A 24-elemes log-periódikus iránysáv adónál szerzett kísérleti eredmények azt jelzik, hogy az oldalszög adó antenna teteje és az iránysáv adó antenna elemek alja közötti függőleges térköznek legalább 0,5 méternek (1,6 láb) kell lenni, és egy, a 0,7 méternél (2,3 láb) nagyobb térköz az előnyösebb. Az olyan iránysáv adóknál, amelyeknél az elemeknek viszonylag magasabb a csatolása, a megnövelt függőleges térközt előnyösebbnek tartják.

4.1.2.4.2 *Oldalszög adó antenna az iránysáv adó antenna-soron belülre egybeépítve*

4.1.2.4.2.1 Ennél a kialakításnál nem lehet szükség az akadálymentességi felület magasságának figyelembe vételére, mivel az oldalszög antenna általában alacsonyabb a jelenlegi iránysáv adó antennáknál. Amikor az oldalszög antennát beépítik, akkor az iránysáv antennák bizonyos módosítására van szükség, amelyek befolyással lehetnek az iránysáv térbeli jelére. Azonban a hatások nagymértékben az iránysáv adó típusától függőek.

4.1.2.4.2.2 A két-frekvenciás dipol-antennás iránysáv adóknál szerzett kísérleti eredmények azt jelzik, hogy lehetséges ezeknek a hatásoknak a kiegyenlítése az iránysáv adó antennák kisebb helyszíni módosításaival. Ennek az egybeépített kialakításnak az alkalmazhatóságát az egyes iránysáv adó típusoknál kell megerősíteni.

4.1.2.4.3 Ha egy ILS közeltéri felügyelő egység van elhelyezve, akkor szükséges annak meghatározása, hogy növeljék az oldalszög antenna fázis középpontjának magasságát, vagy csökkentsék az iránysáv adó felügyelő egységének magasságát, ami azért szükséges, hogy a minimálisra csökkentsék a felügyelő egység oszlopának az oldalszög jelekre gyakorolt hatását. Általában kielégítő eredményeket lehet elérni úgy, hogy az oldalszög antenna fázis középpontját körülbelül 0,3 méterrel (1 láb) a figyelő egység oszlopa fölé helyezik el. Ez az érték az iránysáv adó felügyelő egységének felépítésétől és elhelyezésétől függ.

4.1.2.5 *Oldalirányban eltolt helyzetű oldalszög antenna*

4.1.2.5.1 Bizonyos helyeken, ahol az ILS-t és az MLS-t egybeépítve akarják telepíteni, lehetséges, hogy az lehetetlen lesz az MLS antennának az ILS iránysáv antenna alatti, vagy mögötti elhelyezését, vagy az ILS iránysáv antennába való beépítését érintő korlátozások miatt. Ezeken a helyeken kedvező megoldás lehet az, hogy az MLS és a DME / P antennát egy oldalirányú eltolt helyzetben telepítik. A kiegészítő adatokba beadott telepítési információk lehetővé fogják tenni a légijármű fedélzeten az MLS megközelítési középvonal kiszámítását.

4.1.2.5.2 Az ilyen telepítési elrendezésnél az oldalszög adó antennaháznak az előnyös elhelyezése az iránysáv-adó antenna síkjában van (az 1. Terület a G-21. számú ábrán). Az oldalszög adó berendezés és az iránysáv-adó antennasora (utolsó antenna-elem) között a 3 méteres minimális távolságot tartjuk kedvezőnek.

4.1.2.5.3 Ha az oldalszög adó antenna ilyen, az iránysáv-adóhoz viszonyított oldalirányú eltolt helyzetű telepítése gyakorlatilag nem megoldható, akkor az oldalszög adó antennát az iránysáv-adó antennasor síkja mögött lehet telepíteni (a 2. Terület a G-21. sz. ábrán). Az oldalszög adó antenna oldalirányú eltolt telepítésénél legalább 3 m (10 láb) távolságot kell biztosítani, és az oldalszög adó arányos oldalszög útirány-vezetési területére az iránysáv-adó antennasor nem nyúlhat be.

4.1.2.5.4 Ha az oldalszög adó antennát az iránysáv-adó antennasor síkja előtt kell elhelyezni, akkor az az iránysáv jelek teljesítmény-csökkenését eredményezheti. Az a terület, ahol az oldalszög adó berendezésnek az iránysáv-adó jeleire való legkisebb hatása várható, a 3. Terület a G-21. ábrán. Az oldalszög adó antenna elhelyezését egy oldalszög adó berendezés modell felhasználásával lehet vizsgálni.

4.2 Az MLS-nek a megközelítési fénytechnikai rendszeren belüli telepítése

4.2.1 Az ellentétes futópálya irányú megközelítéseket kiszolgáló megközelítési fénytechnikai rendszer befolyásolja az MLS oldalszög adó antenna elhelyezését. A célravezető telepítéshez figyelembe veendő tényezők a fedésterületi követelmények (lásd a korábbi 2.3.2 pontot), annak szükségessége, hogy elkerüljék a fények láthatóságának lezárását, az akadálykorlátozási követelmények és a lámpaszerkezetektől bekövetkező oldalszög jel többutas terjedés elkerülése.

4.2.2 Ezek a követelmények azokra a jellemző telepítésekre alkalmazhatók, ahol a megközelítési fények lényegében egyenlő magasságban kerültek felépítésre, vagy ahol a futópálya végétől mért növekvő távolság függvényében emelkednek.

4.2.3 A következő útmutatások az MLS-nek a jelenleg használatos fénytechnikai rendszer tartószerkezetek közötti telepítésén alapulnak. Jóval célszerűbb lenne olyan lámpaszerkezetek felhasználása, amelyek nincsenek hatással a térbeli jelre, ha ilyenek rendelkezésre állnak.

4.2.4 Ha az MLS oldalszög adó antennának a futópálya meghosszabbított középvonalán 60 méterrel (200 láb) a megközelítési fénytechnikai rendszer távolabbi végén túli telepítése nem lehetséges, vagy gyakorlatilag nem megvalósítható, akkor az antennát el lehet helyezni a fénytechnikai rendszer síkjának határvonalain belül, a következőkben megadott követelmények szerint:

a) a vízszintes síkban, az antennát a futópálya meghosszabbított középvonalában kell elhelyezni, a futópálya megállási végétől 300 méternél nem közelebbi távolságban és a legközelebbi lámpa helyzetétől - a futópálya megállási vége felé - amilyen távolra csak lehetséges. (Ez az oldalszög adó berendezés hátsó részét egy lámpa helyzettel szemben helyezi el.)

b) az oldalszög adó berendezés elhelyezésének olyannak kell lenni, hogy a megközelítési fénytechnikai rendszer fényeinek árnyékolását a minimálisra kell csökkenteni, különösképpen az elhatározási magasság határvonalain belül. Az oldalszög adó berendezés nem takarhat ki semmilyen más lámpá(ka)t, csak olyat, amelyik egy keresztfénysor, vagy egy középvonal fény rövid keresztfénysorának a középső részén helyezkedik el (lásd az Annex 14 I. Kötet "A"- Melléklete 11.3 részében a további útmutatásokat).

4.2.4.1 Ha a szomszédos lámpasorok közötti térköz 30 méter (100 láb), vagy több, akkor az antenna fázis középpontjának legalább 0,3 méterrel (1 láb) a futópálya megállási vége felé lévő legközelebbi lámpasor fény-középpontja felett kell lenni. Ezt le lehet csökkenteni 0,15 méterre (0,5 láb), ha szükséges, és a telepítési helyszín máskülönben mentes a jelentős többutas terjedési problémától. Az szükségessé teheti egy magasabb szintű oldalszög adó berendezés alkalmazását.
4.2.4.2 Ha a szomszédos lámpasorok közötti térköz 30 méternél (100 láb) kevesebb, akkor az antenna fázis középpontnak legalább 0,6 méterrel (2 láb) a futópálya megállási vége felé lévő legközelebbi lámpasor fény-középpontja felett kell lenni.

4.3 A kritikus és érzékenységi területek

4.3.1 Az MLS jelei interferenciájának előfordulása az MLS antennák és az antenna sugárnyaláb szélességek körüli reflektáló és árnyékoló környezet függvénye. A vevő helyétől 1,7 sugárnyaláb szélességen belüli járműveket, vagy állandó akadályokat "sugárnyalábon belülinek" tekintjük, és ezek a fő sugárnyaláb többutas terjedési interferenciáját fogják létrehozni az MLS útirány-vezetési jeleiben. Jellemzően a földi berendezés sugárnyaláb szélességei úgy kerültek meghatározásra, hogy nem áll fenn oldalszög sugárnyalábon belüli reflexió a végső megközelítési útirány mentén, és nem áll fenn magassági szög sugárnyalábon belüli többutas terjedés a meghatározott siklópályán. Azonban mozgó akadályok beléphetnek a sugárnyalábon belüli többutas terjedési területekre és létrehozhatnak zavaró tükrözéseket, vagy az útirány-vezető jelek olyan mértékű kitakarását, hogy a jel minőség elfogadhatatlanná válik. Azokat a területeket, amelyeken belül a járművek csökkentett teljesítményt hozhatnak létre, meg kell határozni és azonosítani. A védő zóna követelmény kifejlesztése céljából ezeket a területeket két típusúra lehet felosztani, azaz kritikus területekre és érzékenységi területekre.

a) Az MLS kritikus terület egy pontosan meghatározott méretű terület az oldalszög és a magassági szög adó antennák körül, ahonnan a járművek - a légijárműveket is beleértve - 'ki vannak tiltva' minden MLS üzemeltetés idején. Ez a terület azért védett, mert a járművek és / vagy a légijárművek jelenléte a területen belül az útirány-vezetési jelek elfogadhatatlan zavarását fogja okozni.

b) Az MLS érzékenységi területe egy, a kritikus területen túlra kiterjedő terület, az, ahol az ott parkoló és / vagy ott lévő járművek - a légijárműveket is beleértve - mozgását szabályozzák, hogy megelőzzék az MLS jelek elfogadhatatlan interferenciájának létrejöttét az MLS üzemeltetések idején. Az érzékenységi terület védelmet biztosít a kritikus területeken kívüli, de még a repülőtér határain belüli nagyméretű akadályok által okozott interferenciával szemben.

1. Megjegyzés. - Ahol az útirány-vezetési jel zavarása csak a földfelszín feletti valamilyen magasságban fordulhat elő, ott a "kritikus tér" vagy "érzékenységi tér" szakkifejezést használjuk.

2. Megjegyzés. - A kritikus és érzékenységi területek meghatározásának célja az, hogy megfelelő védelmet nyújtsanak az MLS útirány-vezetési jelei részére. Az a mód, amelynek megfelelően ezt a szakkifejezést alkalmazzák, az Államok között változó lehet. Néhány Államban a "kritikus terület" szakkifejezést használják annak a területnek a leírására is, amelyre itt az érzékenységi terület kifejezés utal.

4.3.2 A kritikus és érzékenységi területeknek azok a jellemző példái, amelyeknek védelmet kell biztosítani, a G-23. és G-24. ábrán kerülnek bemutatásra. A G-23. és G-24. számú ábrákhoz kapcsolódó táblázatos értékeket azokra a megközelítési eljárásokra kell alkalmazni, amelyeknek a magassági szöge három fokos, vagy annál nagyobb értékű.

A jel minőség biztosításához az szükséges, hogy szabályszerűen tiltsák meg a járművek és a guruló, vagy parkoló légijárművek belépését és tartózkodását ezen a területen belül az összes MLS üzemeltetés idején. Minden egyes oldalszög és magassági szög antenna kritikus területet meg kell határozni. Megfelelő jelző eszközök biztosítása válhat szükségessé az olyan gurulóutakon és utakon, amelyek a kritikus területekbe belenyúlnak, a járművek és légijárművek belépésének korlátozása céljából.

4.3.3 Számítógépes modellezési technikát lehet alkalmazni a különféle méretű és elhelyezkedésű, különböző helyzetű építmények, vagy repülőgépek által okozott jel zavarás nagyságának és fennállási idejének kiszámítására. A jellemző paraméterek, amelyek az ilyen modellezés működtetéséhez szükségesek, azok az antenna sugárnyaláb szélesség és a reflektáló, valamint az árnyékoló akadályok mérete, helye és elhelyezkedése. A földön lévő légijárművek által okozott maximális megengedhető többutas jel csökkenés számításba vételével meghatározhatók a megfelelő kritikus és érzékenységi területek. Ez a módszer került alkalmazásra a G-23. és G-24. ábra kidolgozásánál, számítógéppel történt modellezés olyan megerősítése után, amely magába foglalta a kiválasztott pontok számítógépes eredményeinek és a parkoló légijárműveknek az MLS útirány-vezetési jeleire gyakorolt interferenciája tényleges területi és helyszíni adataival való összehasonlítását.

4.3.4 A kritikus területek ellenőrzése és az érzékenységi területeknek a repülőtéren történő kijelölése tulajdonképpen általában kielégítő lesz az MLS jeleinek a nagy állandó földi 'szerkezetek' által okozott többutas terjedési hatások elleni védelmére. Ez különösképpen akkor fontos, amikor egy új épület méreteit tervezik. A repülőtér határain kívül lévő 'szerkezetek' általában nem fognak problémát okozni az MLS jel minőségére addig, ameddig a szerkezetek az akadálykorlátozási követelményeket kielégítik.

4.3.5 A védett zónák határvonala (azaz az összekapcsolt kritikus és érzékenységi területek) úgy került meghatározásra, hogy a határvonalon kívüli légijárművek és járművek által okozott interferencia nem fog létrehozni a terjedési hatásra jellemzően megengedetteket meghaladó hibákat. Azoknak a megengedhető hibáknak a levezetésénél, amelyek a középvonali megközelítési profilokat védik, ahogy azt a G-10. és G-11. számú táblázat bemutatja, a "tiszta" és az "összetett" terjedési környezet megkapásához a következők szerint járjanak el. A megengedett rendszer hibák a megközelítési vonatkozási pontra (ARD) meghatározott rendszer hiba határértékekből és a terjedési anomáliákra rendelkezésre álló rendszer hiba halmaznál létrejövő fennmaradó részből kerülnek (négyzetes középérték (RSS) alapon) kizárásra. A földi reflexió mind a tiszta, mind az összetett helyszíneknél 'beépítésre' került, mivel az összetett környezetekben egy olyan határérték is fenn van tartva, ami befogadja a kiegészítő hibaforrásokat is, az olyanokat, mint például a tartószerkezet rezgése, a hullámelhajlásos jelek például a megközelítési fénytechnikai rendszer (ALS) lámpáiról és tartószerkezeteiről, vagy a jóval erősebb oldalirányú reflexió.
Végül a fennmaradó hiba maradék 70 százaléka került kijelölésre a védett zónák határvonalának meghatározásához. Ennek megfelelően fennmaradó hiba részek állnak rendelkezésre a védett zónák határainál a szélsőséges esetekre történő meghatározásához, a nagyon tiszta terjedési környezetre - a csak földi reflexiók figyelembevételére, és a nagyon összetett környezetre - a terjedési hibák számos jelentős forrására.

4.3.6 Az MLS kritikus területei kisebbek, mint az ILS kritikus területei. Ahol az MLS antennák az ILS antennák közeli szomszédságában kerültek elhelyezésre, ott az ILS kritikus területek a legtöbb esetben védelmet biztosítanak az MLS-re a megegyező megközelítési pályákra.
Megjegyzés. - Az MLS kritikus és érzékenységi területeinek csökkentését olyan mérések, vagy elemzések útján lehet megkapni, amelyek az adott környezetet veszik figyelembe. Az az ajánlott, hogy a minta méréseket legalább 15 méterenként (50 láb) végezzék el.

4.3.7 *Oldalszög.* Az olyan oldalszög adó antennáknál, amelyek egy, a nulla fokos oldalszögön kijelölt megközelítést szolgálnak ki, az oldalszög adó antenna és a futópálya megállási vége közötti területet kell kritikus területként kijelölni. A G-23. számú ábrán lévő érzékenységi terület biztosít további jel védelmet akkor, amikor alacsony látástávolság melletti üzemeltetések vannak folyamatban. Általában véve, az oldalszög antenna érzékenységi területe a futópálya határvonalain belülre fog esni úgy, hogy megfelelő ellenőrzést lehet gyakorolni minden mozgó forgalom felett azért, hogy megakadályozzák az MLS jelek elfogadhatatlan zavarását. A G-12A. táblázatban megadott érzékenységi terület hosszak kifejlesztésénél az volt alapfeltételként elfogadva, hogy a leszállt B-727 (vagy B-747) típusú repülőgép már elhagyta a futópályát, mielőtt a leszálló repülőgép eléri a 90 méteres (300 láb) magasságot (vagy a 180 métert (600 láb) a B-747-nél)). Ez az alapfeltétel a következő figyelembe veendő tényezők eredményeként jött létre:

a) 5,6 km-es (3 tengeri mérföld) elkülönítést a B-747 méretű repülőgép mögött;

b) 3,7 km-es (3 tengeri mérföld) elkülönítést a B-727 méretű repülőgép mögött;

c) a futópálya foglaltsági idő a leszállt repülőgépnél 30 másodperc, és

d) a megközelítést végrehajtó repülőgép sebessége körülbelül 220 km/óra (2 tengeri mérföld/perc).

4.3.7.1 Egy olyan oldalszög adó antennánál, amely egy oldalirányban eltolt helyzetű megközelítést szolgál ki, a kritikus és érzékenységi területek az oldalszög adó antenna elhelyezésétől és a megközelítési útiránynak a nulla fokos oldalszöghöz viszonyított betájolásától függőek. A kritikus terület az oldalszög adó előtti legalább 300 méteres (1 000 láb) távolságig terjed ki. A folyamatban lévő leszállási üzemeltetések ideje alatti árnyékolás elkerülése céljából további védelem került biztosításra egy érzékenységi terület formájában. A G-12B. számú táblázat adja meg az oldalirányban eltolt telepítésű oldalszög adónál alkalmazott érzékenységi terület hosszát. Amikor az eljárás egy olyan oldalszög mentén kerül végrehajtásra, ami nem a nulla fokos oldalszög, akkor a felülnézeti meghatározásnál a sugárnyaláb kiterjedést kell figyelembe venni. A G-25. ábra mutatja be a jellemző példákat.

Megjegyzés. - Ezt az útmutató anyagot kell a hátsó irányszektor funkciót biztosító oldalszög adó antennára is alkalmazni.

4.3.7.2 *A számított középvonalas megközelítés kritikus és érzékenységi területe.*
A G-26.számú ábra adja meg azoknak a területeknek az általános illusztrációját, amelyeket a nem ellenőrzött földi forgalmi mozgásoktól védeni kell. Ennek a területnek a pontos alakja az oldalszög antenna elhelyezésétől, az oldalszög antenna - futópálya küszöb távolságtól, az elhatározási magasságtól, a berendezésnél üzemeltetett légijárművek típusától és a többutas terjedési környezettől függ.

4.3.7.2.1 A védendő terület meghatározásánál a következő lépések alkalmasak:

a) határozza meg az AG vonal (G-26. ábra) irányát az oldalszög adó antennától (A-pont) a futópálya középvonalának azon legközelebbi pontjáig, ahol az útirány-vezetés szükséges (G-pont);

b) jelölje be a C-pontot az AG- egyenesen az oldalszög antennától akkora távolságra, amit a G-12C, vagy G-12D táblázatban talál az oldalszög antenna - futópálya küszöb távolságra, a földön üzemelő legnagyobb repülőgép méretére és a G-pontnak a minimális siklópályán megadott magasságát;

c) az AB-egyenesnek azonos a hossza az AC-egyenesével és az AC-, valamint az AB-egyenesek egy, a sugárnyalábon belüli többutas terjedés (1,7 sugárnyaláb szélesség) értékkel és egy, a repülési pálya eltérésre figyelembe vett értékkel - ami a megközelítést végrehajtó légijárműnek a névleges megközelítési útiránytól való eltérését veszi számításba - egyenlő értékű szöggel széttartóak;

d) határozza meg az AF-egyenes irányát az oldalszög antennától az F-pontig, ami a minimális siklópályán lévő 300 méteres (1 000 láb) magasságban van;

e) határozza meg az AD-egyenes irányát, aminek a szögbeli széttartása 1,7 sugárnyaláb szélesség az AF-egyenestől;

f) határozza meg az AD-egyenes hosszát a G-12C, vagy G-12D. táblázatból, vegye az F-pont magasságára vonatkozó információval együtt; és

g) a védendő terület az ABCD pontokkal határolt sokszög.

4.3.7.2.2 Jellemzően a G-26. ábra ABCD sokszögének az oldalszög adó antennától legalább az első 300 méteren (1 000 láb), vagy 600 méteren (2 000 láb) belüli részét kell kijelölni külön-külön kritikus területként ott, ahol B-727, vagy B-747 méretű repülőgépek üzemelnek. A terület fennmaradó részét érzékenységi területként jelölik ki. Ahol lehetséges, ott az oldalszög adó antennáját a futópálya azon oldalán lévő eltolt helyzetben jelöljék ki, amelyik a működő futópályákkal ellentétes oldal. Az olyan berendezéseknél, ahol az oldalszög adó antenna hátrafelé elhelyezése 300 méternél kevesebb, vagy ahol a futópálya megállási vége előtt helyezik el, ott egy részletes elemzéssel és a repülőtér elrendezésének figyelembevételével a védendő terület csökkentését alá lehet támasztani.

4.3.7.3 *Az MLS / RNAV eljárások kritikus és érzékenységi területei.* Az MLS / RNAV megközelítési eljárások kritikus és érzékenységi területeit ki kell bővíteni azért, hogy védelmet nyújtsanak a felhasználási szektoron belül a sugárnyalábon belüli többutas terjedéssel szemben. Ezek a kibővített területek olyan megközelítési eljárásokat védenek, amely eljárások az ILS-el nem lehetségesek. A védendő terület hossza a G-13. táblázatból kiválasztott üzemeltetési minimális magasságú felülettől függ. A védendő terület meghatározására vonatkozó tájékoztatásokat a G-27. számú ábra adja meg. A széles körű vizsgálatok során elvégzett szimuláció azt mutatta, hogy ott, ahol B-727 méretű repülőgépek üzemelnek, kielégítő védelmet lehet nyújtani akkor, ha a védett terület első 300 méterét (1 000 láb) jelölik ki kritikus területként, és a fennmaradó részt érzékenységi területként.

A B-747 méretű repülőgépre a megfelelő hossz a 600 méter (2 000 láb). A magasabb megközelítési hossz-szelvényekre a G-13. táblázatból bevezetett hosszak, vagy az itt leírtakkal megegyező értékek kisebbek lehetnek ezeknél az értékeknél; ebben az esetben a teljes kiterjesztett területet kritikus területként lehet kijelölni. Megnövelt rugalmasságot lehet elérni úgy, ha egy, a meghatározott megközelítési szelvényt és a repülőtér környezetét figyelembe vevő elemzést végeznek el.

4.3.8 *Magassági szög.* A védendő magassági szög terület a G-24. számú ábrán bemutatott kritikus térből ered. Általában nincs érzékenységi terület a magassági szög antennára meghatározva. Mivel a kritikus tér alacsonyabb felülete általában jóval a földfelszín felett van, egy légijármű addig várakozhat a magassági szög adó antenna közelében, amíg a kritikus tér alsó határvonalát nem sérti meg.

4.3.8.1 Egy 1,0 fokos sugárnyaláb szélességű, szabályszerű telepítésű magassági szög adó antenna és sík földfelszín esetében a legtöbb repülőgép típus törzse "be fog illeni" a hossz-szelvény, a G-24. ábra kritikus terének alacsonyabb felülete alá.

4.3.8.2 Az 1,5 fokos sugárnyaláb szélességű magassági szög adó antennának a G-24. ábra kritikus tér hossz-szelvénye alsó felületének az egy légijármű törzse általi korlátozott benyúlást úgy lehet "eltűrni", hogy a kritikus tér alsó részét az 1,5 fokos és az 1,7 sugárnyaláb szélességű, a minimális siklópálya alatti részt érzékenységi térként határozzák meg. Az olyan helyszíneken, amelyek jól teljesítik a tűréshatárokon belüli értéket, a repülőgépek várakozhatnak az antenna előtt, feltéve, hogy:
a) a siklópálya és a repülőgép törzsének teteje közötti szögelkülönítés legalább 1,5 fok;
b) a repülőgép függőleges vezérsíkja nem sérti meg a kritikus tér alsó felületet; és
c) a törzs derékszögben áll a középvonalra.

4.3.8.3 Az MLS / RNAV megközelítési eljárásoknál a magassági szög kritikus területének felülnézete részét ki kell bővíteni azért, hogy biztosítsa a magassági szög jel minőséget. Ezek a kibővített területek védik azokat a megközelítési eljárásokat, amelyek az ILS-el nem lehetségesek.
Az oldalnézet jellemzői (G-24. ábra) változatlanok maradnak, semmi más nem változik, csak az alacsonyabb határvonal a névleges megközelítési útirányra van vonatkoztatva. Ez az útmutató anyag az oldalnézetek széles sorozatát fedi. Megnövelt rugalmasságot lehet elérni úgy, hogyha elvégzik a meghatározott megközelítési oldalnézetnek az adott repülőtér környezetében való elemzését.

5. A DME földi berendezés telepítésére vonatkozó üzemeltetési megfontolások

5.1 A DME berendezésnek, amikor csak lehetséges, nulla távolság jelzést kell adni a légijármű vezetője részére a földetérési pontnál, abból a célból, hogy a jelenleg érvényes üzemeltetési követelményeket kielégítsük.

5.1.1 Amikor egy DME / P berendezést telepítenek az MLS-el, akkor az MLS adatokból származó koordináta információkat felhasználó fedélzeti berendezés az MLS vonatkozási ponthoz viszonyított nulla távolság jelzést kaphatja meg. A DME nulla távolságot a DME / P helyéhez kell viszonyítani.

6. A földi berendezés felügyelő rendszere és vezérlési tevékenysége között kölcsönös kapcsolat

6.1 A felügyelő és vezérlési tevékenység közötti kölcsönös kapcsolatot annak biztosításához tartják szükségesnek, hogy a légijármű ne vehessen egy olyan hiányos útirány-vezetést, amely veszélyeztetheti a biztonságot, hanem minden időben folyamatosan olyan érvényes útirány-vezetést vegyen, amelyet biztonságosan felhasználhat még abban az esetben is, ha bizonyos funkciók sugárzása megszűnik.

Megjegyzés. - A földi berendezés felügyelő és vezérlési tevékenysége közötti kölcsönös kapcsolatot a G-14. táblázat mutatja be.

7. Fedélzeti berendezés

7.1 Általános rész

7.1.1 Az ezen részben található fedélzeti berendezés paraméterek és tűrések arra a célra szolgálnak, hogy a 3. Fejezet 3.11 pontjában lévő Szabványok értelmezését lehetővé tegyék, és ahol lehetséges, magukba foglalják a megengedett eltéréseket a következőkre vonatkozóan:

a) a földi berendezés paramétereinek változására a 3. Fejezet 3.11 pontjában meghatározott határértékeken belül;

b) azokra a légijármű sebességekre, manőverekre és magasságokra, amelyek rendes körülmények között egy adott fedésterületen belül előfordulnak.

1. Megjegyzés. - A fedélzeti berendezés magába foglalja a légijármű antennáit, a fedélzeti vevőt, a pilóta interface berendezését és a szükséges belső kapcsolatokat.

2. Megjegyzés. - Az MLS repülési elektronika részletes "Minimális Teljesítmény Előírások" című anyagot az EUROCAE és az RTCA állította össze és koordinálta. Az ICAO időről időre elküldi a Szerződőd Államoknak ezen szervezetek minden olyan kiadványának jegyzékét, amelyeket nemzetközi szinten egyeztettek a Hetedik Léginavigációs Konferencia 3/18(a) és 6/7(a) számú Ajánlásainak megfelelően.

7.1.2 *Funkció dekódolás*

7.1.2.1 A fedélzeti berendezésnek képesnek kell lenni a megközelítési oldalszög, a nagysebességű megközelítési oldalszög, a hátsó irányszektor oldalszög és a megközelítési magassági szög funkciók, valamint a tervezett üzemeltetéshez szükséges adatok dekódolására és feldolgozására.

7.1.2.2 Azonkívül a vevőnek olyan technikát kell felhasználni, amely megakadályozza az olyan funkciók feldolgozását, amelyek az adatmezőkön belüli, vagy az alap és kiegészítő adatszavakban, valamint a letapogató sugárnyalábok oldalszirom sugárzásaiból eredő beágyazott funkció bevezető jelszakaszok jelenlétéből erednek. Ennek a megvalósítását lehetővé tevő egyik technika az összes bevezető jelszakasz dekódolása. A bevezető jelszakasz dekódolása után az összes funkció bevezető jelszakasz észlelése és dekódolása letiltásra kerül a funkció hosszának megfelelő időtartamra.

7.1.2.3 A távolság tájékoztatást függetlenül kell dekódolni.

7.1.3 A vevőnek dekódolni kell azt a teljes szögtartományt, amelyet az egyes funkciók jel formátuma lehetővé tesz. Az útirány-vezetési szöget a vevő a TO és FRO letapogatások vett burkológörbéi közötti időközök mérésével határozza meg. A dekódolt szög a 3. Fejezet 3.11.4.5 pontjában megadott képlet szerint van erre az időközre vonatkoztatva.

7.1.4 A vevőnek képesnek kell lenni minden egyes sugárzott funkció szabályos feldolgozására, függetlenül attól, hogy a funkció az adás sorrendjében hol helyezkedik el.

7.1.5 Amikor az MLS megközelítési oldalszög és hátsó irányszektor információkat a kiválasztón és / vagy a fedélzeti műszereken megjelenítik, akkor azokat mágneses fokokban kell kijelezni. Az automata radar kijelzős vevők részére a vonatkozó információt a földi állomás a 4. alap adat szó részeként adja le.

7.1.6 A vevőnek képesnek kell lenni a megközelítési útirány, a magassági szög és a hátsó irányszektor radiál - ha ilyent biztosítottak - mind manuális, mind automatikus kiválasztására. Az automatikus módban a kiválasztás a következők szerint történik.

7.1.6.1 *Megközelítési oldalszög* válassza ki a megközelítési oldalszög mágneses betájolása megfordított szögértékét a 4. alap adatszóból.

7.1.6.2 *Magassági szög* válassza ki a minimális siklópályát a 2. alap adatszóból.

7.1.6.3 *Hátsó irányszektor* válassza ki a hátsó irányszektor szögének mágneses betájolását a 4. alap adatszóból.

Megjegyzés. - A vevő jelzi azt, amikor az eltérés a hátsó irányszektor jelre vonatkozik.

7.1.7 Az MLS fedélzeti vevő rendszerének olyan integritás összeegyeztethetőségének kell lenni az MLS teljes integritásával, ami legalább 1 - 1 10^{-7} minden egyes leszállásnál.

7.1.8 Az MLS / RNAV üzemeltetéseknél használt fedélzeti berendezéseknél biztosítani kell azt a képességet, hogy a kiválasztott eljárást egyértelműen kijelezze.

7.2 Rádiófrekvenciás jelleggörbe

7.2.1 *Vételi sávszélesség*

7.2.1.1 A vevőnek ki kell elégíteni a vételi és teljesítmény követelményeket akkor, amikor a vett jel frekvencia eltolódása a szabvány csatorna középfrekvenciától plusz, vagy mínusz 12 kHz-ig terjed. Ez a szám plusz, vagy mínusz 10 kHz-es lehetséges földi adó eltolódást és plusz, vagy mínusz 2 kHz-es Doppler eltolódást vesz figyelembe. A vevőnek dekódolni kell valamennyi funkciót, függetlenül attól, hogy az egyik funkció frekvencia eltolódása eltolódik a másiktól.

7.2.2 *Szelektivitás*

7.2.2.1 Amikor a vevőt egy nem működő csatornára hangolják, és egy, a 3. Fejezet 3.11.4.10.1 pontjában a megközelítési oldalszög differenciális fáziseltolásos kódolású meghatározott érték felett 33 dB-es jelszintű nem-kívánt MLS jelet adnak a fennmaradó csatornák bármelyikére, a vevő nem érzékelheti a jelet.

7.2.3 *Csatornán belüli hamis vétel*

7.2.3.1 A 3. Fejezet 3.11.6 pontjában meghatározott vevő teljesítményt akkor is ki kell elégíteni, amikor a vevő ugyanazon a csatornán a 3. Fejezet 3.11.4.1.4 pontjában meghatározottat meg nem haladó szintű interferenciát vesz.

7.2.4 *Sávon kívüli adásokból eredő interferencia*

7.2.4.1 A 3. Fejezet 3.11.6 pontjában leírt vevő teljesítményt akkor is ki kell elégíteni, amikor egy -124,5 dBW/m^2-t meg nem haladó szintű nem-kívánt vett jelből eredő interferencia van az MLS vevő antennán.

7.3 Jel feldolgozás

7.3.1 *Vétel (jel begyűjtés)*

7.3.1.1 A vevőnek egy, a 3.11.4 pontban leírt követelményeknek megfelelő bemenő útirány-vezetési jel előfordulása esetén be kell fogni és érvényesíteni kell az útirány-vezetési jeleket a követési módra történő átállás előtt 2 másodpercen belül, a megközelítés kritikus része mentén, és 6 másodpercen belül a fedésterület határvonalánál.

7.3.2 *Követés*

7.3.2.1 A követés során a vevőnek védelmet kell biztosítani a rövid időtartamú nagy amplitúdójú hamis jelek ellen. Az útirányra való ráállás után a vevőnek érvényes útirány-vezetési tájékoztatást kell adni a figyelmeztető jelzés eltávolítása előtt. A követési mód során az érvényesítési folyamatnak tovább kell működni.

7.3.2.2 A követési jel egy másodpercnél hosszabb idejű elvesztése után a vevőnek figyelmeztető jelzést kell adni. Az egy-másodperces időtartamon belül az útirány-vezetési információnak az utolsó kimeneti értéken kell maradni.

1. Megjegyzés. - Egy érvényesített útirány-vezetési jel az, amelyik a következő követelményeket kielégíti:

a) helyes funkció azonosítás dekódolt;

b) a bevezető jelszakasz időzítő jel dekódolt;

c) a "TO" és "FRO" letapogató sugárnyalábok vagy a bal / jobb biztonsági vezetési jelek jelen vannak, és a középponti időhöz viszonyítottan szimmetrikusan helyezkednek el; és

d) az észlelt sugárnyaláb szélesség 25-től 250 mikroszekundumig terjed.

2. Megjegyzés. - Az útirány-vezetési jel érvényesítése szükségessé teszi azt is, hogy a vevő ismétlődően megerősítse, miszerint a vett és követett jel a legnagyobb és legfolytonosabb jel a fedésterületen belül.

7.3.3 *Adat funkciók*

7.3.3.1 *Adat felismerés.* A fedélzeti adatfelismerési teljesítmény akár az alap-, akár a kiegészítő adatként biztosított adatfunkciókra két egységre van osztva: az adatgyűjtésre megengedett időre és a megszerzett adatokban előforduló felderítetlen hiba valószínűségére.

7.3.3.1.1 A minimális jel teljesítmény-sűrűségnél az alap adatszó 2. felismerésének ideje - amely a 6,25 Hz-es átviteli sebességgel kerül leadásra - nem haladhatja meg a két másodpercet egy 95 százalékos valószínűségi alapon. Az 1 Hz-es átviteli sebességgel leadott adatok felismerésének ideje nem haladhatja meg a 6 másodpercet a 95 százalékos valószínűségi alapon.

7.3.3.1.2 Az adatfelismerési folyamatban a vevőnek dekódolnia kell a megfelelő adatszavakat és meghatározott ellenőrzéseket kell végrehajtania azokon, annak biztosítására, hogy a felderítetlen hibák valószínűsége ne haladja meg az 1×10^{-6} értéket a minimális jel teljesítmény-sűrűség mellett azokra az adatokra, amelyek az integritás ilyen szintjét igénylik. A felderítetlen hibákra ajánlott teljesítmény előírások szükségessé tehetik az egyszerű dekódoláson túl az adatoknak a fedélzeten történő további feldolgozását. Például ezeket az ugyanazon adatszavak többszörös minta szerinti feldolgozásánál lehet elérni.

7.3.3.1.3 Ha a vevő nem tudja 'begyűjteni' a tervezett üzemeltetéshez szükséges adatokat, akkor egy megfelelő figyelmeztetést kell biztosítania.

7.3.3.1.4 A minimális jel teljesítmény-sűrűség mellett az MLS / RNAV üzemeltetések alátámasztásához szükséges (kiegészítő adatszavak B1 - B41, A1/B42, A2, A3, A4/B43 és az alap adatszó 6.) összes adatszó 'begyűjtésének' ideje nem haladhatja meg a 20 másodpercet egy 95 százalékos valószínűségi alapon. az MLS / RNAV berendezésnek biztosítania kell azt, hogy a felderítetlen hibák valószínűsége erre az adat-blokkra ne haladja meg a $0{,}5 \times 10^{-9}$-t. Ez a teljesítmény 2 dB-es jel-zaj javulást fogad el alapfeltételként. Ezt csökkentett kábelcsillapításon, teljesítőképesség határon működő, vagy megnövelt vevő érzékenységen keresztül lehet elérni (lásd a fedélzeti teljesítmény halmazt, ami a G-2. táblázatban került megadásra). Azonkívül az ezen felüli jelszintekkel az adatfelismerési időnek a tervezettnek megfelelően 20 másodpercnél kevesebbnek kell lenni.

7.3.3.2 *Adat érvényesítés.* Az adatok felismerése után a vevőnek ismétlődően meg kell erősítenie azt, hogy a vett adatok azonosak a felismert adatokkal. A vevő dekódol több olyan egymás után következő és egyforma adatot, amelyek eltérnek azoktól, amit az előzőekben begyűjtött, mielőtt megkezdené az új dekódolt adat elfogadásának tevékenységét.

7.3.3.2.1 Az MLS / RNAV üzemeltetések alátámasztásához szükséges adatokra a fedélzeti berendezés alkalmazza a ciklikus redundancia ellenőrzést (CRC) azért, hogy biztosítsa azt, hogy az adat kielégítő integritása elérésre került. Az adatokat, amiket folyamatosan vesz, folyamatosan érvényesíti is. Az MLS / RNAV berendezések nem fogadnak el egy új adat-blokkot felhasználásra addig, amíg azt a ciklikus redundancia ellenőrzés nem érvényesíti.

7.3.3.3 *Adat elvesztés.* Hat másodpercen belül, hogy az alap, vagy kiegészítő adat elveszett, amit egy 2 másodperces, vagy annál kisebb maximális időközzel adnak le, a vevőnek biztosítani kell egy megfelelő figyelmeztető jelzést, és el kell távolítania a meglévő adatokat. Harminc másodperccel az olyan kiegészítő adatok elvesztése után, amelyek nem tartoznak a korábbiakban említettek közé, a vevőnek biztosítania kell egy megfelelő figyelmeztető jelzést.

7.3.3.3.1 Az MLS / RNAV üzemeltetések alátámasztásához szükséges adatokat a fedélzeti berendezésnek nem kell eltávolítania a meglévő adatokból az érvényesítést követően, kivéve csak a fenti 7.3.3.2.1 pontban leírt feltételek mellett. Egy olyan MLS / RNAV adatblokkot, amelyet a ciklikus redundancia ellenőrzés érvényesített, nem kell eltávolítani addig, amíg egy új adatblokk vételre nem kerül, egy eltérő földi berendezés azonosítóval az alap adatszó 6-ban, egy új MLS csatorna kerül kiválasztásra, vagy az áram kikapcsolásra kerül. Azonkívül, az adatblokk nem kerül eltávolításra akkor, amikor átmenet történik a hátsó irányszektor fedésterületre.

7.3.4 *Többutas terjedési teljesítmény*

7.3.4.1 Ahol a kisugárzott jel teljesítmény-sűrűsége elég nagy ahhoz, hogy a fedélzeti berendezés termikus zaját jelentéktelenné tegye, ott a következő előírásokat kell alkalmazni a 0,05 Hz és a 999 Hz közötti lengési frekvenciákra.

7.3.4.1.1 *A sugárnyalábon belüli többutas hullámterjedés.* Azok a többutas hulámterjedésből származó jelek, amelyeket a közvetlen jeltől két sugárnyaláb szélességnél kisebbre kódoltak, és amelyeknek az amplitúdója 3 dB-el, vagy többel a közvetlen jel alatt van, nem csökkenthetik le a szög útirány-vezetési pontosság kimenetet plusz, vagy mínusz 0,5 sugárnyaláb szélességnél nagyobb értékkel (csúcs-hiba).

7.3.4.1.2 *Sugárnyalábon kívüli többutas hullámterjedés.* Azok a többutas hullámterjedésből származó jelek, amelyeket a közvetlen jeltől két sugárnyaláb szélességnél nagyobbra kódoltak, és amelyeknek az amplitúdója 3 dB-el, vagy többel a közvetlen jel alatt van, nem csökkenthetik le a szög útirány-vezetési pontosságot plusz, vagy mínusz 0,02 sugárnyaláb szélességnél nagyobb értékkel.

7.3.5 *Biztonsági vezetés*

7.3.5.1 A fedélzeti berendezésnek biztonsági vezetési tájékoztatást kell biztosítani akkor, amikor az antenna egy érvényes biztonsági vezetési jel környezetben van.

7.3.5.2 Amikor a dekódolt szög kijelzés a 3. Fejezet A-7. táblázatában meghatározott arányos vezetési szektoron kívül van, akkor az MLS útirány-vezetési jelet biztonsági vezetési jelként kell értelmeznie.

7.3.5.3 Amikor biztonsági vezetési impulzusokat sugároznak, akkor a vevőnek képesnek kell lenni azon impulzus burkológörbe alakok távolságának feldolgozására, amelyek a biztonsági vezetési és letapogató sugárnyaláb jelei közötti átmenetben jelenhetnek meg. Egy egyedi impulzus burkológörbe a vevő helyzetétől, a letapogató antenna sugárnyaláb szélességétől és a biztonsági vezetési és letapogató sugárnyaláb jelek relatív fázisától és amplitúdó arányától függ, ahogy az a G-8. számú ábrán bemutatásra került. A vevőtől megkívánt még az is, hogy feldolgozza az 1,5 fokos nagyságrendig terjedő (csúcs amplitúdó) kijelzett szög gyors változásait, akkor, amikor az arányos útirány-vezetési határokon kívül van.
7.3.5.4 Azoknak a vevőknek, amelyek képesek arra, hogy kiválasszák, vagy kijelezzék a plusz, vagy mínusz 10 foknál nagyobb oldalszög szög útirány-vezetési tájékoztatásokat, az alap adatokban lévő arányos fedésterületi határértékeket dekódolni kell, és fel kell azt használni a hibás útirány-vezetés felhasználásának kizárására.

7.4 Vezetés és kimenet

7.4.1 *Megközelítési oldalszög és megközelítési magassági szög eltérési lépték-tényező*

7.4.1.1 *Megközelítési oldalszög.* Amikor a megközelítési oldalszög eltérési információnak az a célja, hogy ugyanazt az érzékenységi jellemzőt adja meg, mint az ILS, akkor az a "megközelítési oldalszög antenna - futópálya küszöb távolság" egyik funkciója és az alap adatok által továbbítani kell a következő táblázatban leírtaknak megfelelően:

Megközelítési oldalszög antenna - futópálya küszöb távolság (ATT)	Névleges iránysáv szélesség
0 - 400 m	±3,6 fok
500 - 1 900 m	± 3,6 fok
2 000 - 4 100 m	$\pm \arctan\left(\frac{105}{ATT}\right) fok$
4 200 - 6 300 m	1,5 fok

7.4.1.2 *Megközelítési magassági szög.* Az eltérési információ a kézzel, vagy automatikusan kiválasztott magassági szög (Θ) egy folyamatos funkciója a Θ/4 = a névleges siklópálya szélesség fele képletnek megfelelően úgy, hogy a siklópálya szélességek névlegesen a következő példáknak felelnek meg:

A kiválasztott magassági szög (fok)	Névleges siklópálya szélesség (fok)
3	0,75
7,5	1,875

Megjegyzés. - Ezek az érzékenységi jellemzők alkalmazhatók a 7,5 fokig terjedő magassági szögekre.

7.4.2 *A szög adat kimeneti szűrő jellemzői*

7.4.2.1 *Fáziskésés.* A megfelelő robotpilóta csatlakozó egység biztosításához a vevő kimeneti szűrőn a szinuszos bemeneti frekvenciákra nem rendelkezhet olyan fáziskéséssel, ami meghaladja:

a) a 4 fokot a 0,0-tól a 0,5 rad/s-ig az oldalszög funkcióra; és

b) a 6,5 fokot a 0,0-tól az 1,0 rad/s-ig és a 10 fokot az 1,5 rad/s-nál a magassági szög funkcióra.

7.4.3 *A minimális siklópálya.* Ahol fennáll a megközelítési magassági szög kiválasztásának lehetősége, ott egy megfelelő figyelmeztető jelzést kell adni akkor, amikor a kiválasztott szög alacsonyabb annál a minimális siklópályánál, amely az alap adatszó 2-ben megadásra került.

7.4.4 *Állapotjelző bitek.* Egy megfelelő figyelmeztetést kell biztosítani akkor, amikor a felismert alap adatokban a funkció állapotjelző bit azt jelzi, hogy a megfelelő funkció nem kerül sugárzásra, vagy ellenőrző üzemmódban kerül sugárzásra.

7.5 A hátsó irányszektor útirány-vezetés felhasználása a megszakított megközelítésekre és az indulásokra

7.5.1 *A felhasználható hátsó irányszektor szögek*

7.5.1.1 Repülési ellenőrzések eredményei azt jelezték, hogy a hátsó irányszektor szögei a futópálya középvonalától a 30 fokig felhasználhatók a megszakított megközelítések és az indulások navigációs útirány-vezetésére. Megfelelő befogási technikával nagyobb eltolt szögek is elfogadhatók lehetnek, egészen a hátsó irányszektor fedésterületének repülhető határértékéig. Az indulási útirány-vezetéshez fel lehet használni a hátsó irányszektor jelet középvonal útirány-vezetésként a felszállási nekifutás és a kezdeti indulás teljes területén. Az a cél, hogy egy, a hátsó irányszektor befogásához végrehajtott forduló egy üzemeltetésileg elfogadható magasságon kezdődjön meg, és az előírt eljárás a vonatkozó akadálymentességi követelményeknek megfelelően védett legyen.

7.5.2 *A hátsó irányszektor eltérési léptéke*

7.5.2.1 A leolvasási hátsó irányszektor eltérésnek kielégítőnek kell lenni ahhoz, hogy alátámassza azokat a hátsó irányszektor indulásokat és megszakított megközelítéseket, amelyek nem a megközelítési iránnyal egybeesően kijelöltek, valamint azokat a megszakított megközelítéseket és indulási útirányokat, amelyek a megközelítési iránnyal egybeesően kerültek kijelölésre. A leolvasási eltérési hatás akkor a legkifejezettebb, amikor egy, a hátsó irányszektor szög befogására való manőverezés történik. A nagyon érzékeny leolvasás oldalirányú eltolódású átstartolást fog okozni, és korlátozza a jel repülhetőségét, ellenben a nagyon intenzív leolvasás a légtér nagymértékű felhasználását fogja eredményezni. A 6 fokos névleges iránysáv szélességi érzékenység egy elfogadható befogást biztosít a hátsó irányszektorban a megszakított megközelítés és az indulás során.

7.5.3 A megközelítési oldalszögnél a hátsó irányszektorra történő átkapcsolás

7.5.3.1 Egy hátsó irányszektor útirány-vezetést felhasználó megszakított megközelítés megkezdését követően az útirány-vezetést át kell kapcsolni a megközelítési oldalszögről a hátsó irányszektor szögére. Az átkapcsolás akár automatikusan, akár kézzel, a megközelítési oldalszög útirány-vezetésről a hátsó irányszektor útirány-vezetésre azt a célt szolgálja, hogy folyamatos repülhető útirány-vezetés legyen biztosítva a teljes megszakított megközelítési szakaszban. Az átkapcsolás bekövetkezése nem várható addig, amíg a légijármű nem vesz egy érvényesített hátsó irányszektor jelet, de a bekövetkezése várható az előtt, mielőtt a megközelítési oldalszög útirány-vezetés a repüléshez túl érzékennyé válik. A megközelítési oldalszög elvesztésére alapozott átkapcsolás nem következhet be addig, amíg a repülőgép nincs annyira közel a megközelítési oldalszög antennához, hogy az repülhetetlen útirány-vezetést eredményez. A csak egy magassági szögvezetés elvesztésén alapuló átkapcsolás bekövetkezhet azt megelőzően, hogy a légijármű egy érvényes hátsó irányszektor jelet vesz.
Azonban az átkapcsolást lehet a magassági szögvezetés elvesztésére alapozni azután, miután a hátsó irányszektor jel érvényesítésre került. Az automatikus átkapcsolás az oldalszög antennák közötti középső-pontban, vagy annak közelében egy olyan módszert fog biztosítani, ami a folyamatos útirány-vezetést eredményezi az átmenet során. A középső-pont átkapcsolási módszer szükségessé teszi a DME információknak az MLS vevő általi felhasználását. Óvintézkedéseket kell tenni az ellen, hogy a megközelítési hátsó irányszektor oldalszög átkapcsolás ne következzen be automatikusan anélkül, hogy a megszakított megközelítés megkezdődne.

8. A közzétett MLS fedésterületi szektorok határán és az azon kívüli területen történő üzemeltetések

8.1 Az arányos oldalszög útirány-vezetési szektor határértékek az alap adatszó 1- és 5-ben kerültek kisugárzásra. Ezek a határértékek nem az MLS megközelítési és hátsó irányszektora maximális repülhető szögeit jelzik, mivel azok általában néhány fokkal ezen határértékeken belül lesznek. Például a ±40 fokos arányos útirány-vezetési szektort biztosító megközelítési oldalszögeknél a repülhető MLS megközelítési oldalszögek egy ±3 fokos teljes iránysáv szélességgel körülbelül ±37 fokig terjednek ki. A hátsó irányszektorra a repülhető hátsó irányszektor szögek - teljes iránysáv szélességnél - az arányos útirány-vezetési szektor határértékein belül 6 fokkal lesznek.

8.2 Az alap MLS antenna tervezés eleve kizárja a fedésterületeken kívüli nem-kívánt jelek létrehozását. Bizonyos rendkívüli telepítési körülmények esetén, az MLS jelek reflektálódhatnak a közzétett fedésterületen kívüli területekre elégséges erősséggel ahhoz, hogy hibás útirány-vezetési tájékoztatást okozzanak a vevő részére. A jelenleg érvényben lévő eljárások szerint a telepítést végző hatóságnak kell meghatározni az üzemeltetési eljárásokat olyan további navigációs berendezések felhasználásával, amelyek a légijárművet a leszállító rendszer fedésterületén belülre hozzák, anélkül, hogy az érintett /a fenti/ területen áthaladna, vagy közzé tehet olyan tájékoztató anyagokat, amelyek figyelmeztetik a légijárművezetőket a körülményekre. Ezenkívül, az MLS jel formátum lehetővé teszi két olyan technika alkalmazását, ami tovább csökkenti a hibás zászló működés előfordulási valószínűséget.

8.2.1 Ha a nem-kívánt MLS jelek reflexiótól származnak, és az üzemeltetési feltételek lehetővé teszik, akkor a fedésterületi szektort be lehet állítani (növelve, vagy csökkentve) úgy is, hogy a vevőnél vagy a közvetlen jel lesz bármilyen reflexiónál nagyobb, vagy a visszaverő felületre nem jut sugárzás. Ezt a technikai megoldást nevezik fedésterület szabályozásnak.

8.2.2 Fedésterületen-kívül jelzést (OCI) lehet kisugározni a fedésen kívüli szektorba, amelyeket a vevő arra használhat fel, hogy biztosítsa a zászló jelzést bármikor, ha egy nem-kívánt útirány-vezetési jelet észlel. Ezt úgy lehet megválasztani, hogy egy olyan fedésterületen-kívül jelet sugároznak ebbe a körzetbe, amelynek a nem-kívánt útirány-vezetési jelnél nagyobb a jel nagysága.

8.3 Ha üzemeltetési szempontból szükséges az, hogy a kiválasztott MLS csatorna vételét az MLS-re közzétett fedésterületi szektorokon kívül hitelesítsék, akkor az a cél, hogy ez a hitelesítés a kapcsolódó DME azonosításából kerüljön levezetésre. Az MLS állapot információk nem állnak a légijármű rendelkezésére a közzétett MLS fedésterületi szektorokon kívül.

9. Elkülönítési követelmények a jelviszony és a terjedési veszteség mértékében kifejezve

9.1 Földrajzi elkülönítés

9.1.1 Az alábbi 9.2 és 9.3 pontokban leírt elkülönítési követelmények a megkívánt jel / zaj arányaként kerültek megadásra, és amikor ezeket a megfelelő terjedési veszteségekkel összekapcsolják, akkor lehetséges lesz az MLS C-sávú frekvenciák kijelölésének megállapítása az azonos csatornák és a szomszédos csatornák interferenciája szempontjából. Amikor az MLS berendezések frekvenciáit kiválasztják, akkor a berendezés DME / P elemére, vagy egy kapcsolódó DME / N berendezésre az ennek a résznek a "C"- Mellékletében megadott azonos követelményeket kell figyelembe venni.

9.2 Az azonos frekvenciára vonatkozó követelmények

9.2.1 Az azonos frekvenciájú MLS csatorna kiosztást azért kell létrehozni, hogy eleve megakadályozzák a differenciális fáziseltolásos kódolás bevezető jelszakaszainak az egy nem-kívánt azonos frekvenciájú berendezéstől való 'begyűjtését'. A nem-kívánt jel szükséges szintje mínusz 120 dBm-nél kevesebb, ami 2 dB-el van egy érzékeny MLS fedélzeti rendszer szintje alatt, ahogy az alábbiakban látható:

—	vevő érzékenység	=	-112 dBm
—	a légijármű antenna nyereségének a minimum feletti tűrése	=	-6 dBm
			-118 dBm

A G-1. táblázatban lévő rendszer teljesítmény összegzést figyelembe véve, ez azt mutatja, hogy a légijárműnél a minimális jel szintnek legalább mínusz 95 dBm-nek kell lenni, a mínusz 120 dBm követelmény úgy érhető el, ha a nem-kívánt azonos csatornát olyan földrajzi elkülönítéssel helyezik el, ami meghaladja a rádióhorizont távolságot a kívánt berendezésre közzétett fedésterületi szektor minden pontján.

Megjegyzés. - A differenciális fáziseltolásos kódolási jel a letapogató sugárnyalábnál több védelmet kíván, úgy, hogy a nem-kívánt azonos csatornájú jelnek a mínusz 120 dBm-re történő határolása mellett a letapogató sugárnyalábtól eredő interferencia elhanyagolható.

9.3 A szomszédos frekvenciára vonatkozó követelmények

9.3.1 Az első és második szomszédos frekvenciákhoz tartozó adó spektrum jellemzőkre vonatkozó előírások hiányát figyelembe véve, az ezeken a frekvenciákon működő földi állomásokat olyan földrajzi elkülönítéssel kell elhelyezni, ami meghaladja a rádióhorizont távolságot a kívánt berendezésre közzétett fedésterületi szektor minden pontján.

Megjegyzés – Ahol különleges szempontok miatt (például, ILS/MLS/DME csatorna párosítás miatt) az első és a második szomszédos csatornát ki kell osztani, a vevő védelmének egy kevésbé körültekintő eljárása az, amikor garantáljuk, hogy a 3.11.6.1.4 pontban megállapított minimális Jel / Zaj arány

(SNR) értékek rendelkezésre állnak a kívánt berendezés érvénybe léptetett fedésterületi szektorának bármelyik pontján, miközben a nem-kívánt berendezés folyamatosan sugároz.

9.3.2 A harmadik és a további szomszédos csatornáknál, az ezeken a frekvenciákon működő földi állomásokat olyan földrajzi elkülönítéssel kell elhelyezni, ami garantálja, hogy a 3.11.6.1.4 pontban megállapított minimális Jel / Zaj arány (SNR) értékek rendelkezésre állnak a kívánt berendezés érvénybe léptetett fedésterületi szektorának bármelyik pontján, miközben a nem-kívánt berendezés folyamatosan sugároz.

9.3.2.1 Ha az érvénybe léptetett fedésterületi szektorának bármelyik pontjától kevesebb, mint 4 800 m távolságból nincs nem-kívánt MLS sugárzás, a 3. Fejezet 3.11.4.1.4.2 pontban megállapított -94,5 dBW/m^2 maximális teljesítmény, összehasonlítva a 3. Fejezet 3.11.4.10.1 pontban megállapított minimális teljesítmény sűrűséggel, biztosítja, hogy a jel / zaj arány (SNR) értékek elérhetők lesznek. Semmilyen kényszer nem látható előre.

9.3.2.2 Ha az érvénybe léptetett fedésterületi szektorának bármelyik pontjától kevesebb, mint 4 800 m távolságból van nem-tervezett MLS sugárzás, az ilyen sugárzással létrejövő maximális teljesítményt, amit a kívánt névleges frekvenciára központosítva egy 150 kHz-es sávban mérnek az adás idő alatt a szög és adat jeleknél, meg kell állapítani, figyelembe véve a frekvencia elkülönítést, az adó spektrum teljesítményeket és antenna lefedést, valamint az adott terjedési veszteségeket. Aztán ezt a maximális teljesítményt össze kell hasonlítani a kívánt szög és adat szintekkel annak érdekében, hogy megállapítható legyen, hogy a minimális jel / zaj viszony (SNR) értékek megfelelnek a 3.11.6.1.4 pontban megállapított értékekkel. Ha nem, egy nagyobb frekvencia elkülönítést biztosító csatornát kell választani azért, hogy csökkenjen a maximális nem-kívánt teljesítmény, az adó spektrum jellemzőinek elősegítése érdekében.

9.4 A frekvencia tervezés ismérvének kidolgozása

9.4.1 A frekvencia tervezés ismérvének kidolgozásakor a vezér tényező az MLS földi állomásból kisugárzott spektrum. Amikor a frekvencia tervezés ismérvének kidolgozása a harmadik és a fölötte lévő csatornákra történik, ideális esetben az egyedi MLS földi állomások kisugárzott spektrum kimenetét kell figyelembe venni. Ugyanakkor lehetséges egy adott földrajzi területnél, hogy egy olyan általános MLS adó jelet használjanak, mely megfelel az adott terület követelményeinek.

10. Az MLS-nek különleges helyszíneken történő telepítésére vonatkozó anyag

10.1 Az MLS berendezés teljesítménye a teljes fedésterületi térben

10.1.1 Elfogadott az, hogy bizonyos helyszíneken az MLS-re vonatkozó, a 3. Fejezet 3.11 pontjában meghatározott követelményeket nem lehet kielégíteni a teljes fedésterületi térben a jelre gyakorolt környezeti hatások miatt. Az az elvárás, hogy az ilyen helyszíneken a 3. Fejezet 3.11 pontjának követelményeit legalább az összes közzétett műszeres eljárás útirány-vezetési szektorában egy olyan meghatározott pontig kielégítik, amelyen túl az MLS útirány-vezetése a tervezett üzemeltetéshez már nem használatos. Ahhoz, hogy a megfelelő hatóságoknak segítséget nyújtsanak az ilyen egyedi MLS telepítéseknek a tervezett üzemeltetésekre vonatkozó alkalmassága kezdeti értékeléséhez, a vonatkozó fedési korlátozásokat közzé kell tenni.

11. Az MLS földi berendezés szolgáltatásának integritása és folyamatossága

11.1 Bevezetés

11.1.1 Ennek az anyagnak az a célja, hogy egy leírását adja az MLS földi berendezés szolgáltatási céljainak integritásáról és folyamatosságáról, és útmutatóul szolgáljon a mérnöki tervezéshez és a berendezés rendszer-jellemzőihez. A szolgáltatás integritását és folyamatosságát az üzemeltetési nézőpontból szükségszerűen ismerni kell annak érdekében, hogy döntés szülessen arról az üzemeltetési alkalmazásról, amelyet az MLS alá tud támasztani.

11.1.2 Általánosan elfogadott az, hogy az üzemeltetési céltól függetlenül, a leszállás során a végzetes baleset bekövetkezésének átlagos mértéke az egész rendszer - amelyet a földi berendezés, a légijármű és a légijárművezető képez - hibái, vagy hiányosságai miatt nem haladhatják meg az 1×10^{-7} valószínűséget. Erre a követelményre gyakran általános kockázati tényezőként utalnak.

11.1.3 Egy I. Kategóriájú üzemeltetés esetén, amikor a pontosság és az integritás minimális követelményei szükségesek a leszállás korai szakaszában, annak a felelőssége, hogy a fenti célok biztosításra kerülnek, a légijármű vezetőjére van ráruházva. A III. Kategóriájú üzemeltetéseknél a fenti cél a szükséges, de most ahhoz hozzátartozik az egész rendszer. Ebben az összefüggésben az a legnagyobb fontosságú, hogy törekedjenek a földi berendezés szolgáltatása legmagasabb szintű integritásának és folyamatosságának elérésére. Az integritás annak biztosításához szükséges, hogy a megközelítésben lévő légijármű részére alacsony legyen a hamis útirány-vezetés vételének valószínűsége, a szolgáltatás folyamatossága annak biztosításához szükséges, hogy a légijármű részére a megközelítés végső szakaszaiban kicsi legyen annak valószínűsége, hogy az útirány-vezetési jel 'elveszik'.

11.1.4 Úgy látszik, hogy a különféle üzemeltetési követelményeknek a szolgáltatás különféle integritási és folyamatossági céljai felelnek meg. A G-15. táblázat a szolgáltatás integritásának és folyamatosságának négy szintjét állapítja meg, és írja le, azokat, amelyek azokra az alap eljárásokra alkalmazhatók, ahol a DME nem kritikus alkotóelem.

11.2 A szolgáltatási szintek integritásának és folyamatosságának megvalósítása és megőrzése

11.2.1 Egy integritás hiba akkor fordulhat elő, amikor egy olyan jel kerül kisugárzásra, amely a meghatározott tűréshatárokon "kívül van", illetve pontatlan (egy digitális adat esetében), vagy azért, mert a felügyelő egység nem ismeri fel, vagy azért, mert az ellenőrző áramkörök elmulasztják a hibás jel eltávolítását. Egy ilyen hiba egy veszélyhelyzet részét képezheti, ha nagy hibát eredményez.

11.2.2 Nyilvánvalóan nem az összes integritás hiba veszélyes a megközelítés valamennyi szakaszában. Például a megközelítés kritikus szakaszai során egy jelentős útvonal-követési hibát (PFE) létrehozó észrevétlen hibának különleges jelentősége van, ellenben egy, a biztonsági-vezetési, vagy az azonosító jelekben előforduló észre nem vett jel elvesztés nem fog szükségszerűen veszélyes helyzetet létrehozni. Azok a meghatározási ismérvek azonban, hogy melyik hiba mód lényeges, magukba foglalják az összes olyan veszedelmes hiba körülményt, ami nem kétségbevonhatatlanul nyilvánvaló az automatikus repülési rendszer, vagy a légijármű vezetője részére.

11.2.3 Különösen fontos az, hogy olyan felügyelő rendszerek kerüljenek tervezésre, amelyek biztosítják a hibamentes üzemeltetést a 3. Fejezet 3.11.5.2.3 és 3.11.5.3.3 pontjában leírt Szabványoknak való megfeleléssel. Ez gyakran szigorú tervezési elemzést igényel. A felügyelő rendszer hibái különben lehetővé tehetik a hibás jelek kisugárzását.
Néhány olyan lehetséges körülmény, ami a veszély részét képezheti, a II. és III. Kategóriájú üzemeltetési teljesítményeknél:

a) egy olyan észre nem vett hiba, ami az útvonal-követési hiba (PFE) jelentős növekedését okozza a megközelítést végző légijármű szempontjából nézve;

b) egy észre nem vett hiba a minimális siklópályában, az alap adatszó 2-ben leadva;

c) egy olyan észre nem vett hiba az időosztásos multiplex (TDM) szinkronizálásban, ami egy egymásra tolódást hoz létre; és

d) a teljesítmény olyan csökkenése, ami a kormányzási elmozdulási zajt (CMN) elfogadhatatlan határokra növeli.

11.2.4 A védelem legmagasabb szintje a felügyelő egység és a hozzá kapcsolódó vezérlő rendszer észre nem vett hibájának kockázata ellen szükséges. Ezt úgy lehet elérni, hogy gondosan megtervezik az ilyen előfordulások lehetőségének az alacsony szintre való csökkentését, és elvégzik a felügyelő rendszer teljesítményének időszakos ellenőrzését olyan időközönként, amelyet a tervezési elemzés határozott meg. Egy ilyen elemzést fel lehet használni a rendszer integritás szintjének a minden egyes leszállásra vonatkozó kiszámítására. A következő képletet meghatározott típusú MLS berendezésekre lehet alkalmazni, és egy példát ad a rendszer integritás *I*, meghatározására, az észre nem vett hibás kisugárzású adások valószínűségének *P*, kiszámításából.

$$I = 1 - P$$

$$P = \frac{T^2}{\alpha_1 \alpha_2 M_1 M_2}$$

ahol:
I = integritás;

P = az adó és a felügyelő rendszerben előforduló olyan egyidejű hibák valószínűsége, amelyek észre nem vett hibás sugárzást eredményeznek;

M_1 = adó meghibásodások közötti átlagos idő (MTBF);

M_2 = a felügyelő és a hozzá kapcsolódó vezérlő rendszer meghibásodásai közötti átlagos idő;

$\frac{1}{\alpha_1}$ = az adóban bekövetkező olyan meghibásodások gyakoriságának aránya, amely hibás jelek kisugárzását eredményezte az összes adó hiba gyakoriságához viszonyítva;

$\frac{1}{\alpha_2}$ = a felügyelő és a hozzá kapcsolódó vezérlő rendszer olyan meghibásodási gyakoriságának aránya, amely egy hibás jel kimutatására való képtelenséget eredményezett az összes, a felügyelő és a hozzá kapcsolódó vezérlő rendszer hiba gyakoriságához viszonyítva;

T = a felügyelő és a hozzá kapcsolódó vezérlő rendszer ellenőrzései közötti időtartam (órákban).

Ez a példa képlet egy olyan tartalék nélküli felügyelő rendszer felépítésre alkalmazható, amelynél egy egyértékű T-t alkalmaznak a felügyelő és a hozzá kapcsolódó vezérlő rendszer összes alkotóelemére.

11.2.5 Az integritást illetően, mivel a felügyelő, vagy vezérlő rendszeren belüli veszélyes meghibásodás előfordulásának valószínűsége rendkívüli módon távoli, azért az, hogy egy magasfokú bizonyossággal megállapítsák a szükséges integritás szintet, szükségessé tenne egy olyan többsávos kiértékelési időtartamot, ami a berendezés meghibásodások közötti átlagos idejének (MTBF) meghatározásához szükséges. Az ilyen elnyújtott időtartam elfogadhatatlan, és annak megfelelően a megkívánt integritás szintet csak a berendezés szigorú tervezési elemzésével lehet előre "megjósolni". Azonban az elemzésben a bizonyosság fokát az adó és a felügyelő rendszer funkciója közötti függetlenség kimutatásával lehet elérni. Az adó és a felügyelő rendszer előre megjósolt teljesítményét azután önállóan lehet értékelni, ami jóval valószínűbb becslési időtartamot eredményez.

11.2.6 A meghibásodások közötti átlagos időt (MTBF) és a berendezés szolgáltatásának folyamatosságát az alap felépítési jellemzők és az üzemeltetési környezet 'szabályozza'. Az alap felépítési jellemzők a berendezés alkatrészeinek meghibásodási gyakoriságát és az alkatrészek közötti fizikai kapcsolatot foglalják magukba. A meghibásodási gyakoriság (1/MTBF) és a szolgáltatás folyamatossága nem minden esetben egymással összefüggő, mivel nem minden berendezés hiba fog szükségszerűen egy üzemszünetet eredményezni, mint például egy olyan eset, amikor az adó hibája a készenléti adóra történő azonnali átállást eredményezi. A gyártótól elvárt az, hogy biztosítsa azokat a tervezési részleteket, amik ismeretében lehetővé válik a meghibásodások közötti átlagos időnek és a szolgáltatás folyamatosságának a kiszámíthatósága. A berendezés tervezésénél a legalkalmasabb tervezési technikát, anyagokat és alkatrészeket kell alkalmazni, és szigorú ellenőrzést kell alkalmazni a gyártás során. Alapvető annak biztosítása, hogy a berendezés a gyártó által meghatározott környezeti körülményeken belül működjön.

11.2.7 A szolgáltatás folyamatosságának tervezésénél az az elvárás, hogy az haladja meg az alábbi 12.4 pontban megadottakat egy olyan tűréssel, ami csak megvalósítható. Ennek az okai a következők:

a) az üzemeltetési környezetben tapasztalt meghibásodások közötti átlagos idő gyakran rosszabb annál, mint amit a tervezési számításokkal meghatároznak az üzemeltetési tényezők hatásai miatt;

b) a 12.4 pontban megadott szolgáltatás folyamatossági célok az üzemeltetési környezetben elérendő minimális értékek. Bármilyen ezen értékek fölé történő teljesítmény növekedés fokozza a leszállási üzemeltetések általános biztonságát;

c) a tűréshatár a szolgáltatási cél folyamatossága és az elért "érték" között abból a célból szükséges, hogy csökkentse egy berendezés alkalmasságának a statisztikai bizonytalanság miatt meghatározott szolgáltatási szintje alapján történő téves visszautasítását.

Megjegyzés. - A 3. és 4. szintű szolgáltatás folyamatossági értékek magukba foglalják azt a tényezőt, amivel számításba vették az útirány-vezetés elvesztése esetében a légijármű vezetőjének a végzetes baleset elkerülési képességét. Kívánatos, hogy ezt a tényezőt a gyakorlatilag megvalósítható maximális mértékben lecsökkentsék ahhoz, hogy a lehetséges legnagyobb szolgáltatás folyamatossági szintet elérjék a 3. és 4. szintű berendezéseknél.

11.2.8 A tapasztalatok azt mutatják, hogy gyakran különbség van a szolgáltatás folyamatosságának számított és az üzemeltetési környezetben észlelt értékei között, egyrészt azért, mert a berendezés teljesítménye eltérhet a számított értéktől, másrészt az üzemeltetési tényezők hatása miatt, azaz a repülőtéri környezet, a barátságtalan időjárási körülmények, az energiaellátási problémák, valamint a karbantartás minősége és gyakorisága stb. miatt. Ezen okokból azt ajánljuk, hogy a berendezés meghibásodások közötti átlagos idejét és a szolgáltatás folyamatosságát egy üzemeltetési környezeti kiértékeléssel erősítsék meg. A szolgáltatás folyamatosságát az üzemszünetek közötti átlagos idővel lehet kiértékelni, ahol az üzemszünetet a térbeli-jel bármilyen előre nem várt megszűnéseként lehet meghatározni. Ezt a teljes berendezési működőképes állapotnak az üzemeltetési hibákkal történő elosztásával kell kiszámítani. A szolgáltatás 2., 3., vagy 4. szintű integritására és szolgáltatási folyamatosságára a kiértékelési időtartamnak elegendő hosszúságúnak kell lenni ahhoz, hogy a megkívánt szintnek a magasfokú bizonyossággal való elérését meghatározzák. Annak meghatározásához, hogy egy egyedi berendezés működési jegyzőkönyvei beigazolják-e a 2., 3., vagy 4. szint kijelölését, a következő tényezők szakszerű megfontolásai szükségesek:

a) a működési jegyzőkönyvek és az egy megfelelő időtartamon keresztül megalapozott rendszer-felhasználási tapasztalatok;

b) az ilyen típusú berendezésre megállapított átlagosan elért üzemszünetek közötti átlagos idő (MBTO); és

c) a meghibásodások gyakoriságának /irányzata/ trendje.

11.2.9 Az elfogadás/elutasítás megbízhatóság jellemzően elfogadott foka a 60 százalék. Az MLS szolgáltatási szintjétől függően ez eltérő értékelési időtartamokat eredményezhet. A repülőtéri környezet hatásának értékelésénél jellemzően egy egy-éves időtartamú minimális kiértékelési időtartam szükséges egy meghatározott repülőtéren. Ennek az időtartamnak a lecsökkentése az olyan esetekben lehetséges, ahol az üzemeltetési környezet jól ellenőrzött és egy másik, már "bizonyított" telepítéshez hasonló. Az azonos típusú és hasonló üzemeltetési és környezeti körülmények melletti üzemeltetésre később telepített berendezésnél azután eltérő berendezés értékelési időtartamok következhetnek. Jellemzően ezekre a későbbi telepítésű berendezésekre a minimális időtartamok a 2. szolgáltatási szintre 1600 óra, a 3.szolgáltatási szintre 3200 óra és a 4.szolgáltatási szintre legkevesebb 6400 óra. Ahol több egyforma rendszert üzemeltetnek hasonló körülmények mellett, ott lehetséges az, hogy az értékelést az összes rendszer halmozott üzemeltetési óráira alapozzák. Ez egy lecsökkentett értékelési időtartamot eredményez.

11.2.10 Az értékelési időtartam alatt el kell dönteni azt, tervezési hiba okozta-e az egyes leállásokat, vagy egy olyan alkatrész hibája, amelynek ez a szabvány meghibásodási gyakorisága. A tervezési hibákhoz tartoznak például azok az üzemi alkatrészek, amelyek az előírásaikon túli tartományban működtek (túlmelegedés, túláram, túlfeszültség stb. körülmények).
Ezeket a tervezési hibákat úgy lehet kezelni, hogy az üzemeltetési körülményeket visszaveszik az alkatrész szabvány üzemeltetési körülményeire, vagy úgy, hogy az alkatrészt kicserélik egy olyannal, ami az üzemeltetési körülményeknek jobban megfelel. Ha a tervezési hibát ily módon kezelik, akkor az értékelést tovább lehet folytatni, és ezt a leállást nem kell számolni, alapfeltételként elfogadva azt, hogy ez a tervezési hiba - nagy valószínűséggel - nem fog megismétlődni. Ugyanez alkalmazható bármely olyan eset miatti leállásra, amelyet az üzemeltetési körülmények végleges változtatásával csökkenteni lehet.

11.2.11 Egy adott telepítésű berendezés működése kiértékelésének alkalmas módszere az, hogy rögzítik a hibákat, és kiszámítják a berendezés utolsó öt - nyolc hibájának üzemszünetek közötti /MTBO/ átlagos idejét. Erre a módszerre egy jellemző rögzítési módot ad meg a
G-35A és a G.35B ábra.

11.2.12 A berendezés értékelése során és az üzemeltetési szolgálatba állítását követően folyamatosan jegyzőkönyvezni kell az összes berendezés hibát vagy üzemszünetet azért, hogy megerősítsék a kívánt szolgáltatási folyamatosság fenntartását.

Megjegyzés. - Ha egy berendezéshez tartalék, vagy készenléti egységek szükségesek a kívánt szolgáltatási folyamatosság eléréséhez, akkor egy olyan rendszer szükséges, mint ami a 11.3.4 pontban leírásra kerül, annak biztosításához, hogy a készenléti berendezés rendelkezésre álljon, amikor szükséges.

11.3 Az integritást és a szolgáltatási folyamatosságot érintő kiegészítő szempontok

11.3.1 A III. Kategóriájú üzemeltetésekhez elengedhetetlenül szükséges szigorúbb integritási és szolgáltatás folyamatossági követelmények szükségessé teszik azt, hogy a berendezéseknek kielégítő biztosítékuk legyen a hibákkal szemben. A földi berendezés megbízhatóságának nagyon magas értékűnek kell lenni, és ahhoz, hogy a megközelítés kritikus szakasza és a leszállás biztosítva legyen, egy földi berendezés hiba nem ronthatja el a biztonságot akkor, amikor a légijármű egy olyan magasságon, vagy helyzetben van, hogy képtelen egy biztonságos helyesbítő tevékenységet végrehajtani. A meghatározott határértékeken belüli teljesítményt nagy valószínűséggel biztosítani kell. A berendezés megbízhatóságát a meghibásodások közötti átlagos időben (MTBF) kifejezve tisztán arra a rendszer alapú meghibásodás valószínűségre kell vonatkoztatni, amely a teljes térbeli-jel bármilyen jellemzőjére hatással lehet.

11.3.2 A következő kialakítás példát ad egy olyan tartalékolt berendezési elrendezésre, ami valószínűleg megfelel a 3. és 4. szintű integritási és szolgáltatás folyamatossági céloknak. Az oldalszög adó berendezést két adó és a hozzá kapcsolódó - a következő funkciókat ellátó - felügyelő rendszer alkotja:

a) megfigyeli, hogy a fő adó és az antenna-rendszer üzeme az előírt határértékeken belül van-e a több felügyelő egység közötti többségi választás eszközével; és

b) a készenléti berendezés felügyeletével.
11.3.2.1 Amikor a felügyelő rendszer a berendezések valamelyikét 'kiselejtezi', akkor a berendezés szolgáltatási szintjének folyamatossága le fog csökkenni azért, mert a többi berendezés hibájából bekövetkező jel megszűnés valószínűsége meg fog növekedni. A teljesítmény változást automatikusan ki kell jelezni a távvezérlő helyeken.

11.3.2.2 Egy, az oldalszög adóhoz alkalmazottal megegyező felügyelő rendszer kialakítást kell alkalmazni a magassági szög adó berendezésnél.

11.3.3 A fenti példában a berendezésnek magába kell foglalni egy olyan felszerelést, ami lehetővé teszi a felügyelő rendszer ellenőrzéseit a gyártó által meghatározott, a gyártó tervezési elemzéséből következő időközönként, a szükséges integritási szint elérésének biztosítására. Az ilyen ellenőrzések, amelyek kézi, vagy automatikus ellenőrzések lehetnek, azt az eszközt biztosítják, amely megvizsgálja a felügyelő rendszer pontos működését, beleértve az ellenőrző áramköröket és az átváltó kapcsoló rendszert is. Az a kívánatos, hogy ezeket az ellenőrzéseket olymódon hajtsák végre, hogy ne legyen megszakítás az üzemeltetési szolgáltatásban. Egy automatikus felügyelő rendszer integritás vizsgálat megvalósításának az az előnye, hogy azt jóval gyakrabban végre lehet hajtani, és ezáltal magasabb szintű integritás érhető el.

11.3.4 A berendezés működésének az elsődleges áramellátás hibája miatti megszakadását egy megfelelő készenléti áramellátás biztosításával lehet elkerülni, például telepekkel, vagy "szünetmentes" generátorokkal. Ilyen feltételek mellett a berendezés képes lesz a folyamatos működésre azon időtartam alatt, amikor a légijármű a megközelítés kritikus szakaszaiban lehet. Következésképpen a készenléti áramellátásnak megfelelő kapacitással kell rendelkeznie ahhoz, hogy a szolgáltatást legalább két percen keresztül fenntartsa.

11.3.5 A rendszer kritikus alkotó részeinek meghibásodására - mint például az elsődleges áramellátás hibájára - vonatkozó figyelmeztetéseket kell adni, ha a hiba hatással van az üzemi felhasználásra kijelölt vezérlő pontokra.

11.3.6 Abból a célból, hogy az olyan berendezések hibáit csökkentsék, amelyek a felügyelő rendszer tűrési határértékeinek közelében üzemelnek, a felügyelő rendszer részére hasznos lehet az, hogy egy olyan rendszert iktassanak be, ami egy előzetes riasztó figyelmeztető jelet ad a kijelölt vezérlő pontokra akkor, amikor az ellenőrzött paraméterek elérik azt a határt, ami a felügyelő rendszer figyelmeztető jelzési határértékeinek a 75 százalékával egyenlő.

11.3.7 A térbeli-jel integritásának az olyan csökkenéssel szembeni védelmét is figyelembe kell venni, amit az MLS frekvenciasávra ható külső elektromágneses interferencia okozhat, vagy az MLS jelek visszasugárzásából eredhet.

11.3.8 Egy területi felügyelő rendszer további védelmet tudn nyújtani azáltal, hogy figyelmeztető jelzést biztosít az MLS antenna fizikai mozgása miatt bekövetkező megnövekedett útvonal-követési hibahatárok esetén, illetve védelmet nyújt belső, felügyelő rendszerbeli hibák ellen.

11.3.9 Általában véve az ellenőrző rendszerek berendezéseinek tervezése azon az alapelven nyugszik, hogy folyamatosan megfigyeljék a kisugárzott térbeli-jelet a fedésterületi tér meghatározott pontjaiban azért, hogy biztosítva legyen a 3. Fejezet 3.11.5.2.3 és 3.11.5.3.3 pontjaiban meghatározott Szabványoknak való megfelelés. Jóllehet, az ilyen felügyelet bizonyos mértékben jelzést biztosít arról, hogy a térbeli-jel a fedésterületi térben az összes többi ponton is hasonlóképpen a tűréshatáron belül van, ez mégis nagymértékben csak következtetés. Ennek megfelelően elengedhetetlen az, hogy szigorú ellenőrzéseket hajtsanak végre rendszeres időközönként azért, hogy biztosítsák a térbeli-jel integritását a teljes fedésterületi téren belül.

11.3.10 Egy, a fenti 11.3.2 pontban leírtakkal megegyező berendezés rendszer és a fenti 11.3.5, 11.3.6, 11.3.7, 11.3.8 és 11.3.9 pontokban leírt útmutatások alkalmazását lehet szabályszerűen elvárni a 2. szintű integritás és szolgáltatás folyamatossági célok eléréséhez.

12. Az MLS megközelítési oldalszög, magassági szög és a DME földi berendezések osztályozása

12.1 A következő pontokban leírt osztályozási rendszernek az a célja, hogy időben szűkre szabott módon azonosítsa azokat a nélkülözhetetlen információkat, amelyeket a műszeres eljárások tervezői, a légijármű üzemeltetők és a légiforgalmi szolgálatok használnak fel egy meghatározott MLS berendezés teljesítményére vonatkozóan. A tájékoztatások a légiforgalmi tájékoztató kiadványokban (AIP) kerülnek közzétételre.

12.2 Az MLS berendezés teljesítményre vonatkozó információk magukba kell, hogy foglalják:

a) az oldalszög arányos útirány-vezetési szektor határértékeit;

b) a függőleges útirány-vezetés határértékeit ;

c) az útirány-vezetési jelnek a futópálya hosszában való rendelkezésre állását; és

d) az útirány-vezetési jelet (oldalszög, magassági szög és DME).

12.3 Az egy meghatározott MLS berendezésre vonatkozó információkat magába foglaló osztályozási rendszert a következő formátumokat felhasználva kell meghatározni:

a) *Az oldalszög arányos útirány-vezetési szektor határértékei.* Ez az adatmező egy meghatározott MLS-re az oldalszög arányos útirány-vezetési szektor határvonalait azonosítja úgy, ahogy az az alap adatszó 1-ben meghatározásra került. A két értéket egy kettőspont választja el (XX:YY), és jelzi a szektor határértékeket úgy, ahogy az a megközelítés irányából látható; az első érték a szektor határérték a nulla fokos oldalszögtől balra és a második érték a szektor határérték a nulla fokos oldalszögtől jobbra.

b) *Függőleges útirány-vezetési határérték.* Ez az adatmező, ami közvetlenül az oldalszög határértékek után került elhelyezésre (formátum XX:YY/ZZ m (vagy XX:YY/ZZ láb)), azt a minimális magasságot (méter-ben, vagy láb-ban) jelenti a végső megközelítési szakaszban a minimális siklópálya (MGP) mentén a futópálya küszöbe felett, amelynek megfelelően a rendszer megfelel a 3. Fejezet 3.11 pontjában meghatározott jel jellemzőknek.

c) *Futópálya útirány-vezetés.* A D, vagy E betűk (ahogy az a “G"- Melléklet 1. részében meghatározott) jelzik azokat a pontokat, ameddig az oldalszög útirány-vezetés a futópálya hosszában megfelel a 3. Fejezet 3.11 pontjában meghatározott jel jellemzőknek (formátum XX:YY/ZZ/E). Ha az útirány-vezetési jel a futópálya hosszában nem felel meg a fent említett jellemzőknek, akkor egy vonást (—) kell a formátumban használni.

d) *Az útirány-vezetési jel megbízhatósága.* Az 1, 2, 3, vagy 4-es szám jelzi az útirány-vezetési jel integritásának és szolgáltatási folyamatosságának szintjét (G-15. táblázat). Az A betű, ami a 3., vagy 4. szint meghatározás után van elhelyezve, azt jelzi, hogy a magassági szög és a DME / P céljai egyenlő értékűek az oldalszög céljaival, a G-15. táblázat 6. Megjegyzésének megfelelően (formátum: XX:YY/ZZ/E/4).

1. Megjegyzés. - Ahol a DME nem szükséges a tervezett MLS üzemeltetésekhez, ott nem kell a DME /P megbízhatóságát az MLS osztályozásba beépíteni.

2. Megjegyzés. - Ahol egy 'feljavított' magassági szög és / vagy DME / P megbízhatóság szükséges a G-15. táblázat 6. Megjegyzésének megfelelően a tervezett MLS / RNAV üzemeltetésekhez, ott a 'feljavított' magassági szög és / vagy DME / P megbízhatóságot be kell építeni az MLS osztályozásba.

12.3.1 Bármilyen, az Annex 10 Szabványai alá történő jel csökkenést, vagy a korábbiakban közzétett teljesítmény alá csökkenést a megfelelő hatóság közzé kell, hogy tegye (2. Fejezet 2.1.2 pont és a fenti 10. rész).

12.4 A G-15. táblázat az MLS alap- és az MLS / RNAV üzemeltetések szolgáltatás folyamatossági és integritási céljait adja meg.

Megjegyzés. - A meghatározott MLS üzemeltetésekre vonatkozóan az a cél, hogy az integritás és a szolgáltatás folyamatossága jellemzően a következőkkel társuljon:

1) a 2. szintű teljesítmény célja az, hogy az MLS berendezést az olyan alacsony látástávolságú üzemeltetések alátámasztására használják, ahol az MLS irányvezetést a leszállási szakasz helyzet tájékoztatásánál látásos segédeszközökkel egészítik ki. Ez a szint kívánatos célja az I. Kategóriájú üzemeltetéseket alátámasztó berendezéseknek;

2) a 3. szintű teljesítmény célja az, hogy az MLS berendezést olyan üzemeltetések alátámasztására használják fel, amelyek magasszintű bizalmat helyeznek az MLS által nyújtott irány-vezetésre egészen a földetérési pontig. Ez a szint a II. Kategóriájú és a III.A. Kategóriájú üzemeltetéseket alátámasztó berendezések szükségletének jellemzője; és

3) a 4. szintű teljesítmény célja az, hogy az MLS berendezést az olyan üzemeltetések alátámasztására használják fel, amelyek magasszintű bizalmat helyeznek az MLS által nyújtott irányvezetésre egészen a földetérési pontig és a leszállás utáni kifutás-kigurulás során. Ez a szint alapjában a III. Kategóriájú üzemeltetések teljes sorának szükségleteire vonatkozik.

12.5 Az MLS berendezés osztályozásának következő példája:

40 : 30 / 50 láb / E / 4A

azt a rendszert jelöli, amelynél:

a) az arányos útirány-vezetési szektor a nulla fokos oldalszögtől 40 fok balra és 30 fok jobbra;

b) a függőleges útirány-vezetés a futópálya küszöbe feletti 50 láb magasságig alkalmazható;

c) a leszállás utáni kifutási útirány-vezetés az MLS E-pontig alkalmazható; és
d) az integritás és a szolgáltatás folyamatossága 4. szintű úgy, hogy a magassági szög és a DME / P céljai megegyeznek az oldalszögével.

13. Számított középvonalas megközelítések

13.1 Általános rész

13.1.1 A számított középvonalas megközelítések az alábbiak szerint figyelembe véve egy számított, a futópálya középvonala mentén elhelyezkedő pályán alapulnak, ott, ahol az oldalszög antenna nem a futópálya meghosszabbított középvonalában van elhelyezve. A számított középvonalas megközelítés legegyszerűbb formája az, amelynél a névleges útirány a nulla-fokos oldalszöggel párhuzamos. Abból a célból, hogy egy MLS / RNAV üzemeltetést végrehajtsanak, az alap MLS vevőben rendelkezésre állónál nagyobb 'képességű' berendezés szükséges.

13.1.2 A számított középvonalas megközelítések az MLS elsődleges futópályára azoknál a futópályáknál kerülnek végrehajtásra, amelyeknek az MLS földi berendezéssel való ilyen összefüggése a kiegészítő adatszavakban azonosításra kerül.

13.1.3 Amikor a végső szakaszt az MLS fedésterületi tere magába foglalja, akkor a számított középvonalas megközelítéseket egy egyenes végső megközelítési szakasz mentén lehet végrehajtani, egy süllyedési gradiensen, egészen az elhatározási magasságig (DH) süllyedve.
A számított középvonalas megközelítések olyan elhatározási magasságokat eredményezhetnek, amelyek felette vannak annak az elhatározási magasságnak, ami egy, a középvonallal egybeeső MLS megközelítéssel elérhető.

13.2 A számított középvonalas megközelítés hiba összegzése

13.2.1 A Légiforgalmi Rádiótechnikai Bizottság /RTCA/ (RTCA/DO-198) írja le az MLS területi navigációs (RNAV) berendezés teljes rendszer hiba összegzését. Ez a hiba összegzés a következő hozzájáruló tényezőket foglalja magába:

a) a földi berendezés teljesítménye;

b) a fedélzeti jelátalakító teljesítménye;

c) a földi berendezés geometriai hatása;

d) az MLS / RNAV számítógép számítási hibája; és

e) a repülési vezetési technikai hiba (FTE).

13.2.2 A fenti hiba-összetevőket a repülési vezetési technikai hiba /FTE/ kivételével teljes helyzet-hibának nevezik. Az MLS megközelítési vonatkozási ponttól 3,7 km-en (2 tengeri mérföld) belül a magengedett oldalirányú teljes helyzet-hiba az MLS / RNAV berendezésre az MLS alap-pont feletti 60 méteres (200 láb) magasságú helyzetben egy 3-fokos magassági szögön és egy 3 000 méteres (10 000 láb) hosszúságú futópályánál 15 m (50 láb) (lásd az alábbi megjegyzést).
Hasonlóképpen a megengedett függőleges teljes helyzet-hiba 3,7 m (12 láb) ugyanabban a helyzetben. A teljes helyzet-hiba összegzés egy része az MLS / RNAV számítógép teljesítményére (számítási hiba) van fenntartva. Az MLS megközelítési vonatkozási ponttól 3,7 km-en (2 tengeri mérföld) belül, a hiba összegzésnek a számítási hibára fenntartott része ± 0,6 m (2 láb) mind oldalirányban, mind magasságban. A 13.5 pontban bemutatott eredmények ennek a számítási pontossági követelménynek a teljesítésétől függőek.

13.2.3 A megengedett oldalirányú teljes helyzet-hibára a négyzetes középérték módszert alkalmazva - az MLS / RNAV számítógép teljesítményt kihagyva - az eredmény ± 15 méternél (50 láb) valamivel kevesebb. Hasonlóképpen a megengedett függőleges teljes helyzet-hiba - a számítási hibát kihagyva - valamivel kevesebb, mint ± 3,7 méter (12 láb). Ennélfogva a földi rendszer teljesítménye, a fedélzeti jelátalakító teljesítménye, valamint a földi rendszer geometriájának hatása miatti összegzett hiba várhatóan nem haladja meg a ± 15 métert (50 láb) oldalirányban és a 3,7 métert (12 láb) függőlegesen az előbb leírt helyzetben. Ezt az információt és alapfeltételt a földi és a fedélzeti jelátalakító teljesítményére felhasználva, megkapható a maximális megengedhető oldalszög és magassági szög antenna eltolt /ordináta/ helyzet (geometriai hatás) a futópálya középvonalától.

13.2.4 A kormányzási elmozdulási zaj /CMN/ nem haladja meg a ± 7,3 métert (24 láb) oldalirányban és a ± 1,9 métert (6,3 láb) függőlegesen, vagy a lineáris megfelelőjét a ± 0,1 fokot; amelyik a kevesebb. A lineáris értékek a következő névleges antenna elhelyezésen alapulnak: oldalszög antenna - futópálya küszöb távolság 3 300 méter (11 000 láb) és alap-pont - küszöb távolság 230 méter (760 láb), 3 fokos magassági szögnél. Az MLS megközelítési vonatkozási ponttól 3,7 km-en (2 tengeri mérföld) belül a kormányzási elmozdulási zaj /CMN/ összegzésen belül a számítási hibára fenntartott rész 1,1 méter (3,5 láb) oldalirányban és 0,6 méter (2 láb) függőlegesen.

Megjegyzés. - Az összes hiba 95 százalékos hibát jelent.

13.3 Telepítési és pontossági megfontolások

13.3.1 Elméleti és üzemeltetési elemzések kimutatták azt, hogy több tényezőnek lesz hatása az oldalszög antenna oldalirányú eltolt (ordináta) helyzete értékének nagyságára, megengedhető és még elérhető az az oldalirányú és függőleges helyzet pontosság, ami a 13.2 pontban került meghatározásra.

13.3.2 *Az oldalszög és a magassági szög antennák közötti távolság*

13.3.2.1 Egy adott oldalszög antenna oldalirányú eltolt helyzetnél, egy 'rövid' oldalszög - magassági szög antenna távolság viszonylag nagy oldalszög szögeket eredményez a megközelítési vonatkozási pont közelében lévő helyzeteknél. Ennek eredményeként, a DME-től származó hiba hozzájárulás nagy, és az oldalirányú pontosság elfogadhatatlanul lecsökkenhet. Egy olyan futópályánál, ahol 'nagy' az oldalszög antenna oldal-irányú eltolt helyzete és 'rövid' az oldalszög - magassági szög antenna távolsága, inkább egy DME / P alkalmazására lehet szükség, nem pedig DME / N-re, azért, hogy a szükséges oldalirányú pontosság elérésre kerüljön.

13.3.3 *Oldalszög pontosság*

13.3.3.1 A 13.5 pontban bemutatott oldalszög antenna eltolt helyzet (ordináta) határértékek a ± 6 méteres (20 láb) oldalszög útvonalkövetési hiba pontossági előíráson alapulnak (lásd a 3. Fejezet 3.11.4.9.4 pontját). Az ajánlott ± 4 méteres (13,5 láb) oldalszög pontossági előírás nagyobb oldalszög antenna eltolt helyzetet tesz lehetővé és még mindig elérhető lesz a szükséges számított helyzet pontosság az elhatározási magasságnál /DH/. Az oldalszög pontosságra elfogadott az, hogy a 3. Fejezet 3.11.4.9 pontjában leírtaknak megfelelően csökken.

13.3.4 *DME pontosság*

13.3.4.1 A helyzet-meghatározásban kisebb hibákat eredményez az, ha DME / P berendezést használnak, és a végső megközelítési szakasz az MLS megközelítési referencia ponttól mért 9,3 km-en (5 tengeri mérföld) belül van. Két DME / P végső megközelítési mód pontossági szabvány van ebben a körzetben. Amikor a DME / P berendezésre azt az oldalszög antenna eltolt helyzetű /ordináta/ értéket alkalmazzák, ami a 13.5 pontban bemutatásra kerül, akkor az az 1. pontossági Szabványon alapuló végső megközelítési módot adja. Nagyobb oldalszög antenna eltolt helyzetű /ordináta/ értékeket lehet megengedni akkor, ha a DME / P berendezésre a 2. pontossági Szabványt kielégítő végső megközelítési módot alkalmazzák. A DME / P 1.Szabványú végső megközelítési mód távolság-mérési pontosságára az az elfogadott, hogy a 3. Fejezet 3.5.3.1.3.4 pontjában leírtak és a B-táblázatban megadottak szerint csökken. A DME / N-re az az elfogadott, hogy a 3. Fejezet 3.5.3.1.3.2 pontjában leírtak szerint csökken.

13.3.5 *A magassági szög információnak az oldalirányú helyzet kiszámításában való felhasználása*

13.3.5.1 Általában, az az oldalirányú helyzet számítás, ami kizárja a magassági szög információt, elegendő lesz az elsődleges futópályára végrehajtott számított középvonalas megközelítésekhez. Ha a magassági szög információ nem használatos az oldalirányú számításokban, akkor az oldalirányú hiba megnövekszik. Ez a hiba az oldalszög szög, a magasság és a csökkenő távolság függvényében növekszik. A 13.5 pontban bemutatott megengedhető oldalszög antenna eltolt helyzetek lecsökkennek akkor, ha a magassági szög tájékoztatások nem használatosak az oldalirányú számításokban. A magassági szög pontosságra elfogadott az, hogy a 3. Fejezet 3.11.4.9 pontjában leírtaknak megfelelően csökken.

13.4 A berendezések figyelembevétele

13.4.1 A fedélzeti jelátalakító, az MLS földi berendezés és az MLS / RNAV fedélzeti elektronika teljesítménye gyakorol hatást a számított középvonalas megközelítések alkalmazási tartományára. A 13.5 pontban bemutatott információk a következő berendezések figyelembevételén alapszik.

13.4.2 *Fedélzeti jelátalakítók*

13.4.2.1 Elfogadott az, hogy a vevő dekódolni fogja az összes, az MLS számított középvonalú megközelítéshez szükséges kiegészítő adatszót, kivéve azt, ha az adatszavakban lévő információ más repülési elektronikai forrástól - a kiegészítő adatszavakhoz szükségessel - megegyező pontossággal és integritással rendelkezésre áll. A digitális MLS szög adatok és távolság adatok szükségesek az oldalirányú és a függőleges helyzet kiszámításához. A szög adat kvantálás 0,01 fok. A távolság kvantálás 2,0 m (0,001 tengeri mérföld).

13.4.3 *Területi navigációs (RNAV) számítások*

13.4.3.1 Nincs alapfeltétel elfogadva arról, hogy az RNAV helyzet-számítás hol kerül elvégzésre. A számított középvonalas megközelítés hiba összegzésének egy része a számítási hiba részére került fenntartásra. Ez lehetővé teszi a rugalmas algoritmus alkalmazást.

13.4.4 *A megengedhető oldalszög adó antenna eltolt helyzet /ordináta/ kiszámítási technikák*

13.4.4.1 A Légiforgalmi Rádiótechnikai Bizottság (RTCA) (RTCA/DO-198 D-Függelék) több különböző helyzet-meghatározó algoritmust állapít meg. A különböző algoritmusok különféle földi berendezés elhelyezést tudnak kezelni. Az az algoritmus, ami arra a célra tervezett, hogy bármilyen földi berendezés elrendezést kezeljen, az RTCA 12-eset algoritmus. A megengedhető antenna oldalirányú helyzet értékeket a Monte Carlo szimulációs technika alkalmazásával nyerték. Az eredményeket még egy közvetlen elemzési módszer alkalmazásával is megkapták. Az elemzési módszer a maximális MLS szög és távolság hibák geometriai transzformációs módszerét alkalmazza a rendszer teljesítmény meghatározásához. A Monte Carlo technika az MLS / RNAV rendszer utánzásán keresztül egy statisztikai módszerként használatos a rendszer teljesítmény meghatározásához.

13.4.4.2 *A helyzet-meghatározás lehetséges korlátozásai.* A földi berendezés geometriájától függően a helyzet-meghatározó algoritmusokra a lehetséges összetett megoldások tere áll fenn. Az összetett megoldások tere a magassági szög antennának és a DME válaszadónak a futópályához viszonyított elhelyezésétől és a számított megközelítési útvonaltól függ. A legkihangsúlyozottabb hatás akkor fordul elő, amikor a DME válaszadó a megközelítési útvonal elhatározási magasság (DH) pontja és a magassági szög adó antenna közötti területen helyezkedik el. A helyzet bizonytalanságát akkor lehet feloldani, amikor a DME válaszadót a megközelítési irány felől nézve a magassági szög adó antenna mögé helyezik el. Amikor a DME válaszadó a magassági szög antenna előtt van elhelyezve, akkor nem lehet a helyzet bizonytalanságot feloldani.

13.4.5 *A földi berendezés geometriája*

13.4.5.1 A névleges földi berendezés geometria a földi összetevők relatív helyzetében kifejezve a G-29. számú ábrán került lerajzolásra. A DME / P válaszadóra itt alapfeltétel az, hogy a megközelítési oldalszög adó antennával van együtt telepítve. Amikor DME / P földi berendezés nem áll rendelkezésre, akkor a DME / N válaszadóra alapfeltétel az, hogy az MLS megközelítési oldalszög adó és magassági szög adó antennák között van elhelyezve.

13.4.5.2 A DME / N által létrehozott viszonylag nagy hiba miatt, a DME / N válaszadó elhelyezésének nincs jelentős hatása a számított megengedhető oldalszög adó antenna oldalirányú eltolt elhelyezésre. Ez lehetővé teszi a DME / N berendezésnek az oldalszög adó és a magassági szög adó antennák között egy nagy területen belüli elhelyezését. Hasonlóképpen a magassági szög adó antenna oldalirányú eltolt helyzetének is kicsi lesz a hatása.

13.5 A megengedhető megközelítési oldalszög adó antenna eltolt helyzetek az elsődleges futópályára számított középvonalas megközelítéseknél

13.5.1 *DME eredmények*

13.5.1.1 A maximális oldalszög adó eltolt helyzet, a körülmények egy adott sorozatára azt a legnagyobb oldalirányú eltolt helyzetet jeleni, amit nem lehet túllépni a 13.2 pontban megadott számított középvonalas megközelítés hiba összegzésben. A DME / P eredmények az oldalszög adó és a magassági szög adó távolság függvényeként vannak bemutatva. A DME / P berendezéssel megengedett oldalszög adó antenna oldalirányú eltolt helyzeteket a G-30. számú ábra mutatja be.

13.5.1.2 Egy adott oldalszög adó - magassági szög adó távolságra, az oldalszög adó antennát az árnyékolt terület bármely helyére el lehet helyezni, és a létrejövő számított középvonalas megközelítés kielégíti a 13.2 pont követelményeit.

13.5.1.3 Eredményeket kaptak akkor is, amikor DME / N távolságmérési pontosságokat alkalmaztak. Ezeket az eredményeket a G-31. számú ábra mutatja be.

13.6 Alacsony látástávolság esetén végrehajtott megközelítések

13.6.1 *A lehetséges alkalmazások*

13.6.1.1 Az alacsony látástávolság esetén végrehajtott számított középvonalas megközelítés lehetséges alkalmazását az elsődleges műszeres futópályákra való üzemeltetésekre lehet korlátozni azon geometriai megfontolások miatt, amit a kielégítő pontosság elérése magában foglal. Az elsődleges műszeres futópályához történő felhasználások, ahol a számított középvonalas megközelítési képesség hasznos lehet, azok, ahol az oldalszög adónak a futópálya középvonalától oldalirányú eltolt helyzetű telepítését a "szigorú" telepítési korlátozások teszik szükségessé. Ezek lehetnek azok az oldalirányú eltolt helyzetű alkalmazások, ahol az alacsony látástávolság esetén végrehajtott üzemeltetéseket előnyösnek tekintik.

13.6.1.2 Az elvárt fedélzeti felszerelésnek az ilyen alacsony látástávolságú üzemeltetések számított középvonalas megközelítéseire nem-számított magassági útirány-vezetést kell felhasználni (alapfeltételként elfogadva azt, hogy a magassági szög adó antenna szabályszerűen van telepítve), és az oldalirányú útirány-vezetést az oldalszög (beleértve az MLS telepítési adatokat is, amelyeket az alap és a kiegészítő adat funkciók foglalnak magukba), valamint a DME / P válaszadótól származó távolság adatokból kell származtatni.

13.6.2 *A fedélzeti rendszer teljesítménye*

13.6.2.1 Biztonsági-kritikus, a nem-számított középvonalas alacsony látástávolságú megközelítések útirány-vezetéséhez kapcsolódó szoftvert nagyrészt magukba foglalnak az MLS vevők. A számított középvonalas megközelítéseknél a DME kérdező adó-vevőt és a navigációs számításokat is számításba kell venni. A biztonsági-kritikus szoftvert ezekre a funkciókra meg kell tervezni, ki kell dolgozni, dokumentálni kell és ki kell értékelni.

13.6.2.2 A szükséges algoritmusok viszonylag egyszerűek, és nem okoz semmilyen alkalmassági elfogadási nehézséget. Azonban a repülőgép vezérlő számítógép rendszerekkel (FMS) szerzett tapasztalatok azt jelzik, bonyolult lenne egy jelenlegi repülőgép vezérlő rendszeren (FMS) belül egy biztonsági-kritikus funkció alkalmasságát hitelesíttetni. A jelenlegi repülőgép vezérlő rendszerek (FMS) felépítése nincs úgy részekre osztva, hogy az lehetővé tegye a különféle funkcióknak a különféle kritikussági szintű hitelesítését, egy repülőgép vezérlő rendszer (FMS) mérete és összetettsége eleve kizárja a teljes repülőgép vezérlő rendszer számítógép biztonsági-kritikus hitelesítését. Következésképpen, a repülőgép vezérlő rendszer berendezéshez valamilyen alternatív felszerelést lehet számításba venni az alacsony látástávolságú üzemeltetésekre tervezett számított középvonalas berendezés alkalmassághoz (azaz a robotpilótába beépítetten, vagy az MLS vevőbe beépítetten). Ezeknek az alternatív rendszereknek olyan útirány-vezetési kimenetet kell biztosítaniuk, mint amilyen kimeneti jellemzőkkel a szabályszerű egyenes megközelítések rendelkeznek.

13.6.3 *A földi rendszer teljesítménye*

13.6.3.1 A fenti 13.3.5 pontban alapfeltételként elfogadott felszerelésre alapozva a magassági szög útirány-vezetés pontosan ugyanazon a módon kerülne felhasználásra, ahogy az az alap MLS megközelítéseknél történik. Ennek megfelelően a magassági szög adó földi berendezés integritása és szolgáltatási céljainak folyamatossága változatlan marad, annak megfelelően, ami a G-15. táblázatban már megadásra került. Az oldalirányú útirány-vezetésre a G-15. táblázatban az oldalszögre megadott integritási és a szolgáltatás céljainak folyamatossága követelményeket a kombinált oldalszög és DME rendszerre kellene alkalmazni, és az mindkettő céljaira szigorúbb követelményt eredményez annál, mint ami az alap MLS üzemeltetésekhez szükséges. Azonban egy alacsony látástávolságú számított középvonalas üzemeltetést a 30 méteres (100 láb) elhatározási magasságig el lehet érni egy olyan földi berendezés felhasználásával, amely kielégíti a G-15. táblázatba foglalt 4. szintű célokat.

13.6.4 *Pontosság*

13.6.4.1 Az MLS / RNAV alá fogja támasztani a számított repülési pályákat az I. Kategóriájú elhatározási magasságokig azokra az elsődleges futópályákra, amelyeknek a korlátozásai olyanok, mint ami a G-30. számú ábrán meghatározásra került. Azonkívül bizonyos meghatározott körülmények esetén az MLS / RNAV kielégítő pontosságot nyújthat a II. és III. Kategóriájú megközelítések alátámasztásához. Abból a célból, hogy ezt megvalósítsák, a fedélzeti felszerelésnek olyannak kell lenni, mint ami a 13.6.1.2 pontban megállapított.

13.6.4.2 A II. és III. Kategóriájú eljárások hiba összetevői a következők. A III. Kategóriára az oldalirányú pontossági követelmények megegyeznek a megközelítési vonatkozási pontra meghatározott MLS megközelítési oldalszög pontosságokkal. Ezek a követelmények a következők: 6 m (20 láb) az útvonal-követési hibára (PFE) és 3,2 m (10,5 láb) a kormányzási elmozdulási zajra (CMN) (3. Fejezet 3.11.4.9.4 pont).
A II. Kategóriára az oldalirányú követelményeket úgy lehet megkapni, hogy kiszélesítik a megengedett III. Kategóriájú értékeket a megközelítési vonatkozási ponttól kifelé a II. Kategóriájú elhatározási magasságig, a 30 méterig (100 láb). Az ezeknek az értékeknek a kiszámításához használt egyenletek (méterben kifejezve) a következők:

$$PFE = 6 \times \frac{(D_{AZ-ARD} + R)}{D_{AZ-ARD}}$$

$$CMN = 3{,}2 \times \frac{\left(D_{AZ-ARD} + R\right)}{D_{AZ-ARD}}$$

$$R = \frac{DH_{CatII} - DH_{CatII}}{\tan\theta}$$

ahol:

D_{AZ-APS} = a megközelítési oldalszög adó antenna és a megközelítési alappont (küszöb) közötti távolság
R = (az elhatározási magasság) $DH_{Cat\ II}$ és $DH_{Cat\ III}$ közötti távolság
Θ = magassági szög
(*PFE* = útvonal-követési hiba; *CMN* = kormányzási elmozdulási zaj)

Egy példaként, egy 3 000 méteres futópályára és egy 3-fokos magassági szögre, a megközelítési oldalszög adó 300 méteres hátrafelé elhelyezéssel, egy III. Kategóriájú 15 méteres (50 láb) elhatározási magassággal és egy II. Kategóriájú 30 méteres (100 láb) elhatározási magassággal a következő értékeket kapják:

D_{AZ-APS} = 3 300 m
R = 286 m
$PFE_{DH\ Cat\ II}$ = 6,5 m (21,3 láb)
$CMN_{DH\ Cat\ II}$ = 3,5 m (11,5 láb)

13.6.4.3 A számított középvonalas megközelítési képesség a II. Kategóriájú elhatározási magasságig nem fogja szükségszerűen alátámasztani az automata-leszállású üzemeltetéseket, mivel az útirány-vezetést nem lehet biztosítani lefelé egészen a futópályáig és a futópálya körzetében. Azonkívül még a II./III. Kategóriára vonatkozó jóval szigorúbb hiba tűréshatárok több "visszatartást" eredményeznek az antenna telepítésében, mint az I. Kategóriánál. Elsődlegesen ez a korlátozás a megközelítési oldalszög antennának a futópálya középvonalától való oldalirányú eltolt helyzetű telepítésére vonatkozik.

13.7 Számított középvonalas megközelítések párhuzamos másodlagos futópályákra

13.7.1 A másodlagos futópálya - ahogy itt meghatározásra került - az a futópálya, amelynek eltérő a geometriai kapcsolata azzal a futópályával, amit az 'A' kiegészítő adatszó magába foglal. A számított középvonalas megközelítések a párhuzamos másodlagos futópályákra azok a megközelítések, amelyek egy olyan meghosszabbított futópálya középvonal számított repülési pályája mentén kerülnek végrehajtásra, amelyet nem egy MLS oldalszög radiállal és / vagy magassági szöggel egy egyenesbe állítottak, hanem az elsődleges futópálya középvonalával párhuzamosak.

13.7.2 Az ebben a részben lévő anyag útmutatásokat ad a számított középvonalas megközelítések megengedhető futópálya geometriáira a párhuzamos másodlagos futópályákra a 60 méteres (200 láb) elhatározási magasságig. Az ebben a részben lévő anyag az MLS és a DME / P (1.Szabvány) Szabványok és Ajánlott Gyakorlatok elméleti alkalmazásán alapszik. Az alkalmazott hiba összegzés az a konzervatív hiba összegzés, ami a 13.2 pontban megállapításra került, és ennek a hiba összegzésnek az enyhítése a 13.7.6.1 pontban került leírásra.

13.7.3 *A futópálya geometriájának szempontjai*

13.7.3.1 A G-32. számú ábra a futópálya és a berendezések geometriáját mutatja be. A másodlagos futópálya helyzete oldalirányban van megállapítva a futópálya távolságok között, méterben megadva. A negatív értékek a másodlagos futópálya elhelyezését jelentik az elsődleges futópályától balra. A másodlagos futópálya hosszirányú helyzetére mint küszöb lépcsőzésre utalunk az elsődleges futópályához vonatkoztatva. A negatív értékek a küszöb lépcsőzést jelentik az elsődleges futópálya küszöbe irányában.

13.7.4 *Nagy futópálya térköz szempontok*

13.7.4.1 További megfontolások szükségesek az olyan számított középvonalas megközelítéseknél, ahol nagy térközű párhuzamos futópályák vannak. A figyelembe veendő tényezőknek magukba kell foglalniuk:

a) a DH körzetében szükséges kielégítő jel fedésterület bizonyos párhuzamos futópálya geometriáknál szükségessé tehet egy olyan magassági szög adó antennát, amelynek a ± 40 foknál nagyobb a fedésterülete;

b) ezekre az üzemeltetésekre az MLS antennák körüli kritikus területek megnövekedhetnek; és

c) ezek az üzemeltetések szükségessé tehetik a magassági szög útirány-vezetést az elsődleges futópálya minimális siklópályája alatt.

13.7.5 *A futópálya geometriája*

13.7.5.1 A G-33. számú ábra a megengedett futópálya térközöket és a küszöb lépcsőzéseket mutatja be a másodlagos futópályára. Ez egy 3 000 méteres (10 000 láb) hosszúságú elsődleges futópálya eredményeit mutatja be. A geometria az elsődleges futópálya hosszával kismértékben változik. Az árnyékolt terület azokat az eredményeket mutatja be, amelyeket egy jelenlegi MLS és DME / P (1. Szabvány) Szabványok és Ajánlott Gyakorlatok és a 13.2 pontban megadott hibahalmaz felhasználásával kaptunk. A G-33. sz. ábra alkalmazásakor vezessék be a másodlagos futópálya térközét és küszöb lépcsőzését az ábrába. Ha a kapott pont az árnyékolt területen belül fekszik, akkor a számított középvonalas megközelítés a 60 méteres (200 láb) elhatározási magasságig /DH/ egy 3-fokos magassági szögön lehetséges.

Megjegyzés. - Az 1 200 méteres futópálya küszöb lépcsőzés közelében lévő körvonalas terület a felhasznált magassági útirány-vezetés felső határa miatt áll fenn. Erre a területre nem várható el az, hogy bármilyen üzemeltetési korlátozásnál szerepe legyen.

13.7.6 *A futópálya geometria kiterjesztése*

13.7.6.1 A repülési és földi ellenőrzések azt mutatták, hogy az árnyékolt területet a következők kiegészítőleges figyelembevételével ki lehet terjeszteni:

a) a szögbeli kiterjesztés úgy lehetséges, hogyha a meglévő magassági szög útirány-vezetés felhasználását kiterjesztik a minimális előírt oldalszög arányos útirány-vezetési szektoron kívülre. A magassági szög útirány-vezetést ennél a szögbeli kiterjesztésnél ellenőrizni kell; és
b) a radiál kiterjesztés úgy lehetséges, hogy kismértékben enyhítik a függőleges hiba összegzést 4,9 méterre (16 láb). Ez az enyhítés még így is nagyon körültekintő, és a megfelelő ILS hiba összegzés 66 százalékával [7 m (24,1 láb)] egyenlő értékű.

13.7.6.2 A G-33. számú ábra alkalmazását egy, az A-ponttal jelzett példa mutatja be. Az előbb említett kiterjesztést alkalmazva a számított középvonalas megközelítés egy másodlagos futópályára egy -1 400 méteres futópálya térközzel és +200 méteres küszöb lépcsőzéssel lehetséges.

14. A G-15. táblázat szolgáltatási szint céljainak az MLS / RNAV üzemeltetésekre való alkalmazása

14.1 Az alábbiakban tárgyalt MLS / RNAV eljárásokat a G-15. táblázatban meghatározott integritási és szolgáltatási cél folyamatossági követelményeket kielégítő földi berendezésekkel lehet lefolytatni. Ezeknek az üzemeltetéseknek a többségét csak a 2. szintű célokat kielégítő MLS földi berendezésekkel lehet végrehajtani. Az eljárások további többségénél nem szükséges a pozitív útirány-vezetés a félbeszakított megközelítés / megszakított megközelítés folyamán. Ahol az eljárási eszközök nem tudják biztosítani a szükséges akadálymentességet egy útirány-vezetés-nélküli félbeszakított megközelítés / megszakított megközelítés folyamán, ott a másodlagos útirány-vezetés valamilyen formájára lesz szükség. A másodlagos útirány-vezetési rendszer pontossági követelményét az ‘akadály-gazdagsági’ környezet természete fogja meghatározni.

14.1.1 Azoknál a ritka eseteknél, ahol az MLS / RNAV eljárás egy akadály-gazdag környezetben van, a számított akadályok általi veszélyeztetettségi idő (OET) szükségessé teheti az olyan magasszintű berendezés típusok alkalmazását, mint amilyenek a leszálláshoz szükségesek.

14.1.2 *A kritikus szakaszok meghatározása*

14.1.2.1 A következő szakkifejezések használatosak az MLS / RNAV eljárás kritikus szakasza hosszának meghatározásához:

Obstacle rich environment. Akadály-gazdag környezet. Az a környezet, ahol nem lehetséges az útirány-vezetés nélküli félbeszakított megközelítési / megszakított megközelítési eljárásnak az eljárási eszközökkel történő megszerkesztése. Másodlagos útirány-vezetésre lesz szükség a szektor minimális magasságra való emelkedés végrehajtásához.

Critical segment. Kritikus szakasz. Egy olyan szakasz, amelyen egy útirány-vezetés nélküli félbeszakított megközelítés / megszakított megközelítés a légijárművet egy akadály általi veszélyeztetésnek teszi ki.
Obstacle exposure time (OET). Akadály általi veszélyeztetettségi idő (OET). Az az időtartam, ami egy MLS / RNAV eljárás kritikus szakaszában történő repüléséhez szükséges. Ez az idő a nem-repülőgépes útirány-vezetési berendezés szükséges szolgáltatási szintjének meghatározásához használatos.

14.1.2.2 Az akadályok általi veszélyeztetettségi idő /OET/ meghatározása céljából a következő eljárást lehet követni (lásd a G-34. számú ábrát):

a) határozzák meg, hogy az útirány-vezetés-nélküli félbeszakított megközelítési / megszakított megközelítési felületnek bármely olyan lehetséges irányba való kijelölésével, amelyet az MLS / /RNAV eljárásból alkalmazni lehet, a félbeszakított megközelítés / megszakított megközelítés során van-e akadály-gazdag környezet;

b) határozzák meg, hogy eljárási eszközökkel lehetséges-e az akadályok elkerülése anélkül, hogy másodlagos útirány-vezetésre szükség lenne; és

c) határozzák meg az akadályok általi veszélyeztetettségi időt /OET/, mint azt az időtartamot, amely során az akadály az útirány-vezetés-nélküli félbeszakított megközelítési / megszakított megközelítési felületen belül van, miközben nincs eljárási lehetőség az akadály elkerültetésére.

14.2 Számított középvonalas üzemeltetések

14.2.1 Amikor az üzemeltetéseket az elsődleges futópályákra hajtják végre, akkor ezekhez az üzemeltetésekhez olyan fedélzeti berendezés szükséges, ami csak az oldalirányú útirány-vezetést számolja ki.
A függőleges útirány-vezetést a magassági funkció közvetlenül biztosítja. Az oldalirányú útirány-vezetést biztosító fedélzeti berendezésnek ugyanazon integritással kell rendelkezni, mint ami az MLS vevőnél szükséges az alap MLS üzemeltetések végrehajtásához egy egyenértékű elhatározási magasságig. Azoknál a számított középvonalas üzemeltetéseknél, amelyeket az I. Kategóriájú elhatározási magasság alatti elhatározási magasságig hajtanak végre, az szükséges, hogy a DME-nek olyan pontossága, integritása és szolgáltatási szint folyamatossága legyen, ami az üzemeltetés típusához alkalmazható.

14.2.2 Amikor az üzemeltetések egy párhuzamos másodlagos futópályára kerülnek végrehajtásra, akkor ezekhez az üzemeltetésekhez az szükséges, hogy a fedélzeti rendszer mind az oldalirányú, mind a függőleges útirány-vezetést kiszámítsa. Az elhatározási magasságokat az MLS jel fedésterületre és az elérhető számított útirány-vezetési pontosságra lehet korlátozni.

14.2.3 A 2. szintű szolgáltatási célokat kielégítő MLS földi berendezés elegendő lehet a számított középvonalas üzemeltetésekre akkor, amikor:

a) az üzemeltetés I. Kategóriájú, vagy magasabb elhatározási magasságig kerül végrehajtásra; és

b) a fedélzeti berendezés által biztosított referencia repülési pálya megszerkesztése és a számított oldalirányú és függőleges útirány-vezetés kielégíti az integritásnak az MLS vevő által az alap MLS üzemeltetésre biztosított szintjével azonos szintet.

14.2.4 Amikor a számított középvonalas üzemeltetések az I. Kategóriájú elhatározási magasság alatti magasságig kerülnek végrehajtásra, akkor az MLS földi berendezés szolgáltatási szintjének meg kell felelni az alkalmazott elhatározási magasság értéknek. Megegyezően a számított útirány-vezetést biztosító fedélzeti berendezésnek ugyanazzal az integritással kell rendelkeznie, mint ami annak az alap vevőnek lenne, ami az MLS alap üzemeltetéseket a megegyező elhatározási magasságig vezetné le.

14.3 MLS ívelt repülési pálya eljárások

14.3.1 Ezeket az eljárásokat gondosan meg kell vizsgálni ahhoz, hogy a földi berendezés szükséges szolgáltatási szintjét meghatározzák. Az MLS ívelt repülési pályájú üzemeltetésekhez az integritás és szolgáltatási folyamatosság szint legszigorúbb követelményeit az elhatározási magasságot megelőző repülési pálya szakaszra lehet alapozni. Ezekben a helyzetekben az MLS földi berendezés integritási és szolgáltatás folyamatossági céljait nem lehet kizárólag a leszállási kategóriára alapulóan kiszámítani. Azoknál az üzemeltetéseknél, ahol az akadálymentességi követelmények nagyfokú bizalmat helyeznek az útirány-vezetés pontosságára, a földi berendezés integritását és szolgáltatási céljainak folyamatosságát az "A"- Mellékletben leírt kockázati fa módszer felhasználásával lehet meghatározni. A következő körülményeket kell még számításba venni:

a) a fedélzeti berendezésnek rendelkezni kell azzal a képességgel, hogy megszerkessze a referencia repülési pályát, és kiszámítsa a függőleges és oldalirányú útirány-vezetést a fordulók során is pozitív ellenőrzést biztosítva; és

b) a fedélzeti rendszer integritásának és szolgáltatási folyamatosságának meg kell egyezni az eljárás biztonságos végrehajtásához szükséges útirány-vezetési pontosság megbízhatósági fokával.

15. Az egyszerűsített MLS konfiguráció alkalmazása

15.1 Miközben az alap és a kibővített Mikrohullámú Leszállító Rendszer konfigurációra vonatkozó Szabványok és Ajánlott Gyakorlatok egy térbeli-jel szabványt határoznak meg, addig a 3. Fejezet 3.11.3.4 pontjában meghatározott egyszerűsített MLS konfiguráció lehetővé teszi az MLS-nek a megközelítési és indulási üzemeltetések Megkívánt Navigációs Teljesítmény /RNP/ alapú alátámasztására való felhasználását (2. Fejezet 2.1.6).

15.2 A mérsékelt fedésterületi, pontossági és felügyelő rendszeri határértékek nem haladják meg azt, ami a 3. Fejezet 3.1 pontjában az ILS I. Berendezés Teljesítmény Kategóriára meghatározásra került. Így az egyszerűsített Mikrohullámú Leszállító Rendszer konfiguráció képes arra, hogy az I. Kategóriájú üzemeltetéseket az oldalszög és a magassági szög antennák méretének jelentős lecsökkentésével alátámassza. A berendezés komplexitásának további csökkentése érhető el, mivel lemondtak a kormányzási elmozdulási zaj /CMN/ követelményekről azoknál a megközelítéseket és leszállásokat kiszolgáló berendezéseknél, amelyeknél nincs szükség az automata rácsatlakozásokra.

15.3 Az egyszerűsített MLS kompatíbilis az alap és a kibővített MLS konfigurációkkal.

TÁBLÁZATOK A "G"- MELLÉKLETHEZ

G-1. táblázat: A rendszer teljesítmény összegzése

(±40° oldalszög fedésterület; 0 - 20° függőleges fedés; 37 km-es (20 tengeri mérföld) hatótávolság)

Teljesítmény összegzési elemek (1. Megjegyzés)	Megközelítési oldalszög funkció					Magassági szög funkció			Hátsó irányszektor funkció			
	Differenci-ális fázis-tolásos kódolás	Bizton-sági vezetés	Sugárnyaláb szélesség			Differenci-ális fázis-tolásos kódolás	Sugárnya-láb szélesség		Differenci-ális fázis-tolásos kódolás	Sugárnyaláb szélesség		
			1°	2°	3° (2. Meg-jegyzés)		1°	2°		1°	2°	3°
Jel szükség-let a légijár-műnél (dBm)	-95	-93,5	-91,2	-85,2	-81,7	-95	-93,5	-90	-95	-93,5	-88,2	-84,7
Terjedési veszteség (dB) (3., 4. Meg-jegyzés)	139	139	139	139	139	138,1	138	138	133,9	134	133,9	133,9
Valószínű-ségi vesz-teségek (dB):												
a) Polarizáció	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
b) Eső	2,2	2,2	2,2	2,2	2,2	2,2	2,2	2,2	1,3	1,3	1,3	1,3
c) Légköri	0.3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3
d) Vízszintes többutas terjedés	3.0	3.0	0,5	0,5	0,5	3	-	-	3	0,5	0,5	0,5
e) Függőleges többutas terjedés	2.0	2.0	2.0	2.0	2.0	2	1	1	2	2	2	2
Négyzetes középérték (RSS) teljes az a)-tól az e)-ig (dB)	4,3	4,3	3,1	3,1	3,1	4,3	2,5	2,5	3,9	2,5	2,5	2,5
Vízszintes és függőle-ges sugárzá-si karakte-risz-tika veszteség (dB)	-	1	2	2	2	-	6	6	-	2	2	2

G-1. táblázat: A rendszer teljesítmény összegzése (folytatás)

(±40° oldalszög fedésterület; 0 - 20° függőleges fedés; 37 km-es (20 tengeri mérföld) hatótávolság)

Teljesítmény összegzési elemek (1. Megjegyzés)	Megközelítési oldalszög funkció					Magassági szög funkció			Hátsó irányszektor funkció			
	Differenci-ális fázis-tolásos kódolás	Bizton-sági vezetés	Sugárnyaláb szélesség			Differenci-ális fázis-tolásos kódolás	Sugárnya-láb szélesség		Differenci-ális fázis-tolásos kódolás	Sugárnyaláb szélesség		
			1°	2°	3° (2. Megjegy-zés)		1°	2°		1°	2°	3°
Felügyelő egység határérték (dB)	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Antenna nyereség (dB) (5. Megjegyzés)	-	-13,3	-23	-20	-18	-	-20,8	.17,8	-	-23	-20	-18
Hasznos teljesítmény nyereség a fedésterület határainál (dB)	-7,3	-	-	-	-	-7,3	-	-	-7,3	-	-	-
Szükséges adóteljesít-mény (dBm)	42,5	39	31,4	40,4	41,1	41,6	33,8	40,3	37,1	23,4	31,7	37,2
Példa 20 W-os adónál (dBm)	43	43	43	43	43	43	43	43	43	43	43.0	43
Adóteljesít-mény tűrés (dB)	0,5	4	11,6	2,6	1,9	1,4	9,2	2,7	5,9	19,6	11,3	5,8

MEGJEGYZÉSEK. –

1. A veszteségek és az a ntenna nyereségek jellemző értékek.

2. A nagy adatsebesség a 3o-os oldalszög sugárnyaláb szélességnél csökkenteni fogja a szükséges adóteljesítményt 4,8 dB-el.

3. Az oldalszög adó antenna távolságát 41,7 km-nek (22,5 tengeri mérföld) véve.

4. A hátsó irányszektor antenna távolságát 23,1 km-nek (12,5 tengeri mérföld) véve.

5. A szükséges adóteljesítményt nagyobb hatékonyságú antennák alkalmazásával le lehet csökkenteni.

G-2. táblázat: Fedélzeti teljesítmény összegzés

Teljesítmény összegzési elemek	Diffe-ren-ciális fázis tolásos kódolás	Biz-ton-sági veze-tés	Megközelítési oldalszög funkció				Magassági szög funkció		Hátsó irányszektor funkció		
			Sugárnyaláb szélesség				Sugárnyaláb szélesség		Sugárnyaláb szélesség		
			1°	2°	3°	3° (1. Meg-jegy-zés)	1°	2°	1°	2°	3°
A szükséges középfrekvenciás jel-zaj viszony (dB):											
a) A 72 %-os dekódolási sebességhez	5,0	-	-	-	-	-	-	-	-	-	-
b) A 0,1° kormányzási elmozdulási zajhoz (2. Megjegyzés)	-	-	8,8	14,8	18,3	13,5	-	10,0	-	11,8	15,3
c) Vételhez	-	6,5	-	-	-	-	6,5	-	6,5	-	-
Zajteljesítmény a 150 kHz-es középfrekvenciás sávszélességnél (dBm)	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0	-122,0
A középfrekvenciánál szükséges jel teljesítmény (dBm)	-117,0	-115,5	-113,2	-107,2	-103,7	-108,5	-115,5	-112,0	-115,5	-110,2	-106,7
Zajtényező (dB)	11	11	11	11	11	11	11	11	11	11	11
Kábel veszteség (3. Megjegyzés) (dB)	5	5	5	5	5	5	5	5	5	5	5
Fedélzeti antenna nyereség (dBi)	0	0	0	0	0	0	0	0	0	0	0
Tűrés (dB)	6	6	6	6	6	6	6	6	6	6	6
A légijárműnél szükséges jel (dBm)	-95,0	-93,5	-91,2	-85,2	-81,7	-86,5	-93,5	-90,0	-93,5	-88,2	-84,7

MEGJEGYZÉSEK. –
1. Nagysebességű megközelítési oldalszög funkció.
2. 0,2°-os kormányzási elmozdulási zaj a hátsó irányszektor funkcióra.
3. Mind az első, mind a hátsó antenna kábel veszteségre a szabvány telepítésnélnél biztosítva. További veszteségeket (11 dB-ig terjedően) lehet megengedni a légiszállítási osztályú repülési elektronikánál.

G-3. táblázat:

RNAV eljárási minta a 23R futópályára telepített MLS-re

(lásd a G-15. ábrát)

Az eljárás neve	Az eljárás típusa	Futó-pálya	Megszakított megközelítés	Az útvonal-pontok száma	Megközelítési. oldalszög (AAZ), vagy Hátsó irány-szektor oldalszög (BAZ)
KASEL -1-A	Megközelítési	23R	Igen	4	AAZ
NELSO-1-B	Megközelítési	23R	Igen	3	AAZ
Nem alkalmazható	Megszakított megközelítési	23R	Nem alkalmazható	2	AAZ
SEMOR-1-C	Megközelítési	26 (Megjegyzés)	Nem	2	AAZ
LAWSO-6-D	Indulási	23R	Nem alkalmazható	3	BAZ

Megjegyzés. - A 26-os futópálya egy másodlagos futópálya. A látszólagos oldalszög útvonal-pont távolság 3 000 m.

G-4. táblázat: Útvonal-pont tájékoztatási minta MLS/RNAV eljárásokhoz

Alap jelzés	Érvényesség jelzés	Útvonal jelzés	Útvonal-pont szám	X (méter)	Y (méter)	Z (méter)	Megjegyzések
KASEL	1	A	4	8 200	-9 094	Nem alkalmazható	Nincs Z
			3	9 954	-5 336	789	Precíziós megközelítési navigációs pont (PFAF)
			2	6 556	0	344	Nincs Z, nincs Y
			1	259	0	16,8 (Megjegyzés)	Küszöb
NELSO	1	B	3	9 742	6 499	819	Precíziós megközelítési navigációs pont (PFAF)
			2	7 556	0	344	Megosztottan használt KASEL-el
			1	259	0	16,8 (Megjegyzés)	Megosztottan használt KASEL-el
Nem alkalmazható (megszakított megközelítés)	Nem alkalmazható	Nem alkalmazható	2	-7 408	0	Nem alkalmazható	Nincs Z, nincs Y
			1	0	0	Nem alkalmazható	Nincs Z, nincs Y
SEMOR	1	C	2	5 567	-5 276	346	Precíziós megközelítési navigációs pont (PFAF)
			1	159	-2 401	16	Küszöb
LAWSO	6	D	3	-8 018	3 057	Nem alkalmazható	Nincs Z
			2	-4 964	0	Nem alkalmazható	Nincs Z, nincs Y
			1	0	0	Nem alkalmazható	Nincs Z, nincs Y

Megjegyzés. - Ez az érték a futópálya küszöbének keresztezési magassága, a futópálya küszöb talajszintjéhez vonatkoztatva. A futópálya küszöb magassága az MLS alapponthoz vonatkoztatottan a kiegészítő szó A2-ben kerül megadásra.

G-5. táblázat: Példa a B1 és B39 adatszavak kijelölésére

Az adatszó megnevezése	Adat-szó	Bitek száma	Adat elem	Érték	Kódolás
Megközelítési oldalszög térkép / Ciklikus redundancia ellenőrzés	B1	$I_{21\text{-}24}$	Az eljárás leírók száma	3	1100
		$I_{25\text{-}30}$	Az utolsó megközelítési oldalszög adat alap szó	11	001011 (2.Meg-jegyzés)
		$I_{31\text{-}62}$	Ciklikus redundancia ellenőrzési (CRC) kód	Lásd a G-9. táblázatot.	
		I_{63}	B42. szó kisugározva	Nincs	0
		I_{64}	A4. szó kisugározva	Igen	1
		I_{65}	B43. szó kisugározva	Nincs	0
		$I_{66\text{-}69}$	Tartalék	Nullák	0000
Hátsó irányszektor térkép / Ciklikus redundancia ellenőrzés (3. Megjegyzés)	B39	$I_{21\text{-}24}$	Az eljárás leírók száma	1	1000
		$I_{25\text{-}30}$	Az első hátsó irányszektor adat alap szó	36	100100 (2. Meg-jegyzés)
		$I_{31\text{-}62}$	Ciklikus redundancia ellenőrzési (CRC) kód	Lásd a G-9. táblázatot.	
		I_{63}	B43. szó kisugározva	Nincs	0
		$I_{64\text{-}68}$	Tartalék	Nullák	00000
		I_{69}	Hátsó irányszektor térkép / Ciklikus redundancia ellenőrzés (CRC) jelző	térkép / Ciklikus redundan-cia ellen-őrzés (CRC)	1

MEGJEGYZÉSEK. –

1. A bit kódolás úgy van bemutatva, hogy az alacsonyabb bit szám van a baloldalon.

2. Az adat szó címek az "A"- Függelék A-9. táblázatában vannak meghatározva, a legnagyobb helyértékű bittel az első helyen.

3. A hátsó irányszektor adatbázis nélküli berendezések a B39-ig terjedően az összes szót felhasználhatják a megközelítési oldalszög adatbázisban.

G-6. táblázat: Példa az eljárás leíró szavak kijelölésére

Adat elem	Bitek száma	Eljárás leíró adat szavak							
		KASEL B2		NELSO B3		SEMOR B4		LAWSO B36	
		Érték	Kódo-lás	Érték	Kódo-lás	Érték	Kódo-lás	Érték	Kódo-lás
Alap jelzés (első karakter)	I_{21}-I_{25}	K	11010	N	01110	S	11001	L	00110
Második karakter	I_{26}-I_{30}	A	10000	E	10100	E	10100	A	10000
Harmadik karakter	I_{31}-I_{35}	S	11001	L	00110	M	10110	W	11101
Negyedik karakter	I_{36}-I_{40}	E	10100	S	11001	O	11110	S	11001
Ötödik karakter	I_{41}-I_{45}	L	00110	O	11110	R	01001	O	11110
Érvényesség jelzés	I_{46}-I_{49}	1	1000	1	1000	1	1000	6	0110
Útvonal jelzés	I_{50}-I_{54}	A	10000	B	01000	C	11000	D	00100
Futópálya szám	I_{55}-I_{60}	23	111010	23	111010	26	010110	23	111010
Futópálya betű	I_{61}-I_{62}	R	10	R	10	-	00	R	10
Az eljárás típusa	I_{63}	Meg-közelí-tés	0	Meg-közelí-tés	0	Meg-közelí-tés	0	Indulás	1
Első útvonal-pont mutató	I_{64}-I_{69}	1	100000	4	001000	5	101000	1	100000

Megjegyzés. - A bit kódolás úgy van bemutatva, hogy az alacsonyabb bit szám van a baloldalon.

G-7. táblázat: Példa az MLS / RNAV megközelítési eljárások útvonal-pont kijelölésére

Az eljárás neve	Adat szó	Bitek száma	Adat elem	Érték	Kódolás	Útvonal-pont (WP) mutató
KASEL	B5	I_{21-35}	WP 4 - X koordináta	8 200 m	110000010011000	1
		I_{36}	Y koordináta követő	Igen	1	
		I_{37-51}	WP 4 - Y koordináta	-9 094 m	000001111011001	
		I_{52}	Z koordináta követő	Nincs	0	
		I_{53-55}	Következő szakasz / adatmező azonosító	Egyenes = 0	0000	
		I_{56-69}	WP 3 - X koordináta (az első 14 bit)	9 954 m	00001100111100	2
	B6	I_{21}	WP 3 - X koordináta (az utolsó bit)		0	
		I_{22}	Y koordináta követő	Igen	1	
		I_{23-37}	WP 3 - X koordináta	-5 336 m	001001000001001	
		I_{38}	Z koordináta követő	Igen	1	
		I_{52-54}	Következő szakasz / adatmező azonosító	ívelt = 1	100	
		I_{55-59}	WP 2 - X koordináta	6 556 m	100000000101000	3
	B7	I_{21}	Y koordináta követő	Nincs	0	
		I_{22}	Z koordináta követő	Igen	1	
		I_{23-35}	WP 2 - Z koordináta	344 m	0011110110000	
		I_{36-38}	Következő szakasz / adatmező azonosító	5	101	
		I_{39-44}	Küszöb útvonal-pont magasság	16,8 m	010001	
		I_{45-50}	Megszakított megközelítés mutató	7	1110000	
NELSO		I_{51-65}	WP 3 - X koordináta	9 742 m	101110110111000	4
		I_{66}	Y koordináta követő	Igen	1	
		I_{67-69}	WP 3 - Y koordináta (első 3 bit)	6 499 m	110	
	B8	I_{21-32}	WP 3 - Y koordináta (utolsó 12 bit)		101111001000	
		I_{33}	Z koordináta követő	Igen	1	
		I_{34-46}	WP 3 - Z koordináta	819 m	1110100111000	
		I_{47-49}	Következő szakasz / adatmező azonosító	megosztott = 3	110	
		I_{50-55}	Következő útvonal-pont mutató	3	110000	

G-7. táblázat: Példa az MLS / RNAV megközelítési eljárások útvonal-pont kijelölésére

(folytatás)

Az eljárás neve	Adat szó	Bitek száma	Adat elem	Érték	Kódolás	Útvonal-pont (WP) mutató
SEMOR		I_{56-69}	WP 2 - X koordináta (az első 14 bit)	5 567 m	11111110000100	5
	B9	I_{21}	WP 2 - X koordináta (az utolsó bit)		0	
		I_{22}	Y koordináta követő	Igen	1	
		I_{23-37}	WP 2 - Y koordináta	-5 276 m	101100000001001	
		I_{38}	Z koordináta követő	Igen	1	
		I_{39-51}	WP 2 - Z koordináta	346 m	0111110110000	
		I_{52-54}	Következő szakasz / adatmező azonosító	egyenes = 0	000	
		I_{55-69}	WP 1 - X koordináta	159 m	011111000000000	6
	B10	I_{21}	Y koordináta követő	Igen	1	
		I_{22-36}	WP 1 - Y koordináta	-2 401 m	010101011100001	
		I_{37}	Z koordináta követő	Igen	1	
		I_{38-50}	WP 1 - Z koordináta	16 m	0010111000000	
		I_{51-53}	Következő szakasz / adatmező azonosító	6	011	
		I_{54-59}	Látszólagos oldalszög távolság	3 000 m	011110	
Megszakított megközelítés		I_{60-69}	WP 2 - X koordináta (az első 10 bit)	-7 408 m	0111001011	7
	B11	I_{21-25}	WP 2 - X koordináta (az utolsó 5 bit)		01001	
		I_{26}	Y koordináta követő	Nincs	0	
		I_{27}	Z koordináta követő	Nincs	0	
		I_{28-30}	Következő szakasz / adatmező azonosító	egyenes = 0	000	
		I_{31-45}	WP 1 - X koordináta	0	000000000000000	8
		I_{46}	Y koordináta követő	Nincs	0	
		I_{47}	Z koordináta követő	Nincs	0	
		I_{48-50}	Következő szakasz / adatmező azonosító	6	011	
		I_{51-59}	Tartalék	nullák	000...000	

Megjegyzés. - A bit kódolás úgy van bemutatva, hogy az alacsonyabb bit szám van a baloldalon.

G-8. táblázat: Példa az MLS / RNAV indulási eljárás útvonal-pont kijelölésére

Az eljárás neve	Adat szó	Bitek száma	Adat elem	Érték	Kódolás	Útvo-nal-pont (WP) mutató
LAWSO	B37	I_{21-35}	WP 3 - X koordináta	-8 018 m	001111000011001	1
		I_{36}	Y koordináta követő	Igen	1	
		I_{37-51}	WP 3 - Y koordináta	3 057 m	010101010010000	
		I_{52}	Z koordináta követő	Nincs	0	
		I_{53-55}	Következő szakasz / adatmező azonosító	ívelt = 1	100	
		I_{56-59}	WP 2 - X koordináta (az első 14 bit)	-4 964 m	11001001111000	2
	B38	I_{21}	WP 2 - X koordináta (az utolsó bit)		1	
		I_{22}	Y koordináta követő	Nincs	0	
		I_{23}	Z koordináta követő	Nincs	0	
		I_{24-26}	Következő szakasz / adatmező azonosító	egyenes = 0	000	
		I_{27-41}	WP 1 - X koordináta	0	000000000000000	3
		I_{42}	Y koordináta követő	Nincs	0	
		I_{43}	Z koordináta követő	Nincs	0	
		I_{44-46}	Következő szakasz / adatmező azonosító	Utolsó WP = 6	011	
		I_{47-69}	Tartalék	nullák	000...000	

Megjegyzés. - A bit kódolás úgy van bemutatva, hogy az alacsonyabb bit szám van a baloldalon.

G-9. táblázat: Példa a teljes MLS / RNAV adatbázisra

	B i t h e l y e k															
	1	2			3		4			5		6			7	
Szó	3456	7890	1234	5678	9012	3456	7890	1234	5678	9012	3456	7890	1234	5678	9012	3456
A1	0000	0111	0011	0010	0101	1101	1001	1000	0010	0110	0010	0100	0000	0000	0000	0100
A2	0000	1010	0011	0010	0111	0000	0010	0111	1001	1000	0000	0000	0110	0000	0001	1010
A3	0000	1101	0011	0010	0001	0111	0110	0110	0011	0000	0100	0110	0111	0000	0111	1101
A4	0001	0011	0011	0010	0111	0000	0010	0000	0000	0000	0001	0000	0000	0000	0110	1000
B1	0000	0111	1100	0010	1100	0111	0100	0111	1111	0000	0001	1001	0001	0000	0010	0111
B2	0000	1010	1101	0100	0011	0011	0100	0011	0100	0100	0011	1010	1001	0000	0111	1001
B3	0000	1101	0111	0101	0000	1101	1001	1111	0100	0010	0011	1010	1000	0100	0000	1101
B4	0001	0011	1100	1101	0010	1101	1110	0100	1100	0110	0001	0110	0001	0100	0011	1110
B5	0001	0100	1100	0001	0011	0001	0000	0111	1011	0010	0000	0001	1001	1110	0000	0001
B6	0001	1001	0100	1001	0000	0100	1110	0111	1011	0001	0010	0000	0001	0100	0011	0000
B7	0001	1110	0100	1111	0110	0001	0101	0001	1110	0010	1110	1101	1100	0111	0110	1001
B8	0010	0010	1011	1100	1000	1111	0100	1110	0011	0110	0001	1111	1100	0010	0000	0011
B9	0010	0101	0110	1100	0000	0100	1101	1111	0110	0000	0001	1111	0000	0000	0101	0110
B10	0010	1000	1010	1010	1110	0001	1001	0111	0000	0001	1011	1100	1110	0101	1110	0100
B11	0010	1111	0100	1000	0000	0000	0000	0000	0000	1100	0000	0000	0000	0000	0110	0100
B36	1001	0001	0011	0100	0011	1011	1001	1111	0011	0001	0011	1010	1011	0000	0010	0101
B37	1001	0110	0011	1100	0011	0011	0101	0101	0010	0000	1001	1001	0011	1100	0100	0000
B38	1001	1011	1000	0000	0000	0000	0000	0000	1100	0000	0000	0000	0000	0000	0001	1101
B39	1001	1100	1000	1001	0010	1011	0010	0001	1000	1011	1111	0010	0000	0000	1010	1001
B40	1010	0000	0111	0011	0110	0110	0110	1000	0101	0110	0101	0010	0010	1010	0110	1001
B41	1010	0111	1100	0000	0000	0110	1101	1001	0111	0000	0000	0000	0000	0000	0001	1111
B44	1011	0011	1110	1010	0101	1000	0100	1010	0000	1110	1110	1000	1000	0000	0001	1011
B45	1011	0100	1111	1001	0000	0000	0000	1101	0010	0100	0000	0000	0010	1111	0000	0011
BD W6	0011	0011	1000	1000	0011											

Megjegyzés. - Az I_1-től az I_{12}-ig terjedő bevezető jelszakasz (előtag) bitek nincsenek feltüntetve.

G-10. ábra: Hiba felosztási részek az MLS oldalszög adó antenna kritikus és érzékenységi területének kijelöléséhez

(a távolságok méter-ben (láb-ban); a hiba értékek fok-ban)

		Oldalszög adó antenna - küszöb távolság méter (láb)							
		1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 360 (11 000)	3 660 (12 000)	3 960 (13 000)
Antenna sugárnyaláb szélesség		2°	2°	2°	2°	2°	1°	1°	1°
a)	Rendszer összegzés az útvonal-követési hibára (PFN) = 3,5 m (11,5 láb)	0,1098	0,0941	0,0824	0,0732	0,0659	0,0599	0,0549	0,0507
b)	Megengedett földi berendezés hiba	0,0120	0,0120	0,0120	0,0120	0,0120	0,0120	0,0120	0.0120
c)	Megengedett földi reflexió	0,0400	0,0400	0,0400	0,0400	0,0400	0,0200	0.0200	0,0200
d)	Tiszta helyszíni hiba felosztási rész $\left[d = \sqrt{a^2 - b^2 - c^2}\right]$	0,1016	0,0844	0,0710	0,0601	0,0510	0,0552	0,0497	0,0450
e)	Megközelítési fénytechnikai rendszer (ALS) / felügyelő berendezés oszlop megengedett hiba	0,0300	0,0300	0,0300	0,0300	0,0300	0,0150	0,0150	0,0150
f)	Összetett helyszíni hiba felosztási rész $\left[f = \sqrt{d^2 - e^2}\right]$	0,0970	0,0788	0,0643	0,0521	0,0412	0,0531	00474	0,0424
g)	A 70 százalékos összetett helyszíni hiba felosztási rész	0,0679	0,0552	0,0450	0,0365	0,0288	0,0372	0,0332	0,0297
a)	Rendszer összegzés a kormányzási elmozdulási zajra (CMN) = 3,2 m (10,5 láb)	0,1003	0,0859	0,0752	0,0668	0,0602	0,0547	0,0501	0,0463
b)	Megengedett földi berendezés hiba	0,0315	0,0270	0,0236	0,0210	0,0189	0,0172	0,0158	0,0145
c)	Megengedett fedélzeti berendezés hiba	0,0150	0,0150	0,0150	0,0150	0,0150	0,0150	0,0150	0,0150
d)	A szerkezet rezgésére megengedett hiba	0,0320	0,0320	0,0320	0,0320	0,0320	0,0320	0,0320	0,0320
e)	Tiszta / összetett helyszíni hiba felosztási rész $\left[e = \sqrt{a^2 - b^2 - c^2 - d^2}\right]$	0,0884	0,0735	0,0620	0,0527	0,0449	0,0380	0,0319	0,0261
f)	A 70 százalékos összetett helyszíni hiba felosztási rész	0,0619	0,0515	0,0434	0,0369	0,0314	0,0266	0,0223	0,0183

G-11. táblázat: Hiba felosztási részek az MLS magassági szög adó antenna kritikus területének kijelöléséhez

(az összes felosztási rész érték fok-ban)

Antenna sugárnyaláb szélesség	1,5°	1,0°
a) Rendszer összegzés az útvonal-követési hibára (PFN) = = 0,4 m (1,3 láb)	0,083	0,083
b) Megengedett földi berendezés hiba	0,010	0,010
c) Megengedett oldalszirom reflexiók	0,055	0,037
d) Tiszta helyszíni hiba felosztási rész $\left[d = \sqrt{a^2 - b^2 - c^2}\right]$	0,061	0,073
e) Függőleges sugár elhajlás (földi felügyelő rendszerek)	0,030	0,030
f) Megengedett oldalirányú reflexió	0,031	0,043
g) Összetett helyszíni hiba felosztási rész $\left[g = \sqrt{d^2 - e^2 - f^2}\right]$	0,043	0,051
h) A 70 százalékos összetett helyszíni hiba felosztási rész	0,030	0,036
a) Rendszer összegzés a kormányzási elmozdulási zajra (CMN) = = 0,3 m (1,0 láb)	0,064	0,064
b) Megengedett földi berendezés hiba	0,032	0,032
c) Megengedett fedélzeti berendezés hiba	0,010	0.010
d) Megengedett oldalszirom reflexiók	0,015	0,010
e) A szerkezet rezgésére megengedett hiba	0,010	0,010
f) Tiszta / összetett helyszíni hiba felosztási rész $\left[f = \sqrt{a^2 - b^2 - c^2 - d^2 - e^2}\right]$	0,052	0.053
g) A 70 százalékos összetett helyszíni hiba felosztási rész	0,036	0,037

G-12A. táblázat: A jellemző oldalszög adó antenna érzékenységi terület hosszak (a nulla fokos oldalszög mentén kijelölt megközelítés, lásd a 4.3.7 pontot)

(a távolságok méter-ben (láb-ban); mindkét mértékegységnél kerekített értékekkel)

Oldalszög adó antenna - küszöb távolság	2,0° sugárnyaláb szélesség					1,0° sugárnyaláb szélesség		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-747, tiszta helyszín	490	520	580	610	640	670	700	700
	(1 600)	(1 700)	(1 900)	(2 000)	(2 100)	(2 200)	(2 300)	(2 300)
B-727, tiszta helyszín	300	300	300	300	300	300	460	490
	(1 000)	(1 000)	(1 000)	(1 000)	(1 000)	(1 000)	(1 500)	(1 600)
B-747, összetett helyszín	490	550	580	640	700	730	760	820
	(1 600)	(1 800)	(1 900)	(2 100)	(2 300)	(2 400)	(2 500)	(2 700)
B-727, összetett helyszín	300	300	300	460	550	460	490	550
	(1 000)	(1 000)	(1 000)	(1 500)	(1 800)	(1 500)	(1 600)	(1 800)

G-12B. táblázat: A jellemző oldalszög adó antenna érzékenységi terület hosszak (oldalirányban eltolt (ordináta) helyzetű megközelítés, lásd a 4.3.7.1 pontot)

(a távolságok méter-ben (láb-ban); mindkét mértékegységnél kerekített értékekkel)

Oldalszög adó antenna - küszöb távolság	2,0° sugárnyaláb szélesség					1,0° sugárnyaláb szélesség		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-747, tiszta helyszín	640	730	790	880	880	920	940	1 010
	(2 100)	(2 400)	(2 600)	(2 900)	(2 900)	(3 000)	(3 100)	(3 300)
B-727, tiszta helyszín	300	300	300	300	300	300	490	550
	(1 000)	(1 000)	(1 000)	(1 000)	(1 000)	(1 000)	(1 600)	(1 800)
B-747, összetett helyszín	670	760	820	880	1 010	980	1 070	1 130
	(2 200)	(2 500)	(2 700)	(2 900)	(3 300)	(3 200)	(3 500)	(3 700)
B-727, összetett helyszín	300	300	330	460	550	490	520	550
	(1 000)	(1 000)	(1 100)	(1 500)	(1 800)	(1 600)	(1 700)	(1 800)

G-12C. táblázat: A jellemző oldalszög adó antenna érzékenységi terület hosszak (számított középvonalas megközelítés, lásd a 4.3.7.2 pontot, tiszta helyszínek)

(a távolságok méter-ben (láb-ban); mindkét mértékegységnél kerekített értékekkel)

Oldalszög adó antenna - küszöb távolság	2,0° sugárnyaláb szélesség					1,0° sugárnyaláb szélesség		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-727, tiszta helyszín								
Magasság: 300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)
75 (250)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	490 (1 600)	550 (1 800)
60 (200)	300 (1 000)	300 (1 000)	300 (1 000)	460 (1 500)	490 (1 600)	610 (2 000)	610 (2 000)	670 (2 200)
45 (150)	300 (1 000)	300 (1 000)	490 (1 600)	550 (1 800)	610 (2 000)	670 (2 200)	760 (2 500)	820 (2 700)
Magasság: 30 (100)	300 (1 000)	520 (1 700)	610 (2 000)	700 (2 300)	820 (2 700)	920 (3 000)	980 (3 200)	1 100 (3 600)
15 (50)	610 (2 000)	730 (2 400)	880 (2 900)	1 010 (3 300)	1 070 (3 500)	1 100 (3 600)	1 040 (3 400)	1 190 (3 900)
B-747, tiszta helyszín								
300 (1 000)	430 (1 400)	460 (1 500)	490 (1 600)	520 (1 700)	520 (1 700)	550 (1 800)	580 (1 900)	610 (2 000)
75 (250)	640 (2 100)	730 (2 400)	790 (2 600)	850 (2 800)	880 (2 900)	920 (3 000)	940 (3 100)	1 010 (3 300)
Magasság: 60 (200)	700 (2 300)	790 (2 600)	820 (2 700)	920 (3 000)	940 (3 100)	940 (3 100)	1 010 (3 300)	1 010 (3 300)
45 (150)	760 (2 500)	820 (2 700)	920 (3 000)	1 010 (3 300)	1 070 (3 500)	1 070 (3 500)	1 190 (3 900)	1 400 (4 600)
30 (100)	850 (2 800)	960 (3 100)	1 100 (3 600)	1 250 (4 100)	1 400 (4 600)	1 550 (5 100)	1 710 (5 600)	1 890 (6 200)
15 (50)	1 070 (3 500)	1 340 (4 400)	1 580 (5 200)	1 830 (6 000)	1 980 (6 500)	2 040 (6 700)	2 070 (6 800)	2 070 (6 800)

G-12D. táblázat: A jellemző oldalszög adó antenna érzékenységi terület hosszak (számított középvonalas megközelítés, lásd a 4.3.7.2 pontot, összetett helyszínek)

(a távolságok méter-ben (láb-ban); mindkét mértékegységnél kerekített értékekkel)

Oldalszög adó antenna - küszöb távolság	2,0° sugárnyaláb szélesség					1,0° sugárnyaláb szélesség		
	1 830 (6 000)	2 140 (7 000)	2 440 (8 000)	2 750 (9 000)	3 050 (10 000)	3 350 (11 000)	3 660 (12 000)	3 960 (13 000)
B-727, összetett helyszín								
Magasság: 300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)	300 (1 000)
75 (250)	300 (1 000)	300 (1 000)	330 (1 100)	460 (1 500)	550 (1 800)	490 (1 600)	520 (1 700)	550 (1 800)
60 (200)	300 (1 000)	330 (1 100)	330 (1 100)	490 (1 600)	550 (1 800)	580 (1 900)	610 (2 000)	730 (2 400)
45 (150)	330 (1 100)	330 (1 100)	490 (1 600)	550 (1 800)	670 (2 200)	700 (2 300)	790 (2 600)	880 (2 900)
Magasság: 30 (100)	330 (1 100)	550 (1 800)	640 (2 100)	730 (2 400)	1 010 (3 300)	940 (3 100)	1 040 (3 400)	1 160 (3 800)
15 (50)	640 (2 100)	790 (2 600)	940 (3 100)	1 070 (3 500)	1 250 (4 100)	1 250 (4 100)	1 280 (4 200)	1 430 (4 700)
B-747, összetett helyszín								
300 (1 000)	430 (1 400)	460 (1 500)	490 (1 600)	520 (1 700)	670 (2 200)	550 (1 800)	580 (1 900)	610 (2 000)
75 (250)	670 (2 200)	760 (2 500)	820 (2 700)	880 (2 900)	1 010 (3 300)	980 (3 200)	1 070 (3 500)	1 130 (3 700)
Magasság: 60 (200)	730 (2 400)	820 (2 700)	920 (3 000)	1 010 (3 300)	1 130 (3 700)	1 040 (3 400)	1 070 (3 500)	1 220 (4 000)
45 (150)	820 (2 700)	880 (2 900)	980 (3 200)	1 100 (3 600)	1 220 (4 000)	1 100 (3 600)	1 190 (3 900)	1 430 (4 700)
30 (100)	920 (3 000)	1 010 (3 300)	1 130 (3 700)	1 280 (4 200)	1 430 (4 700)	1 580 (5 200)	1 770 (5 800)	1 950 (6 400)
15 (50)	1 100 (3 600)	1 370 (4 500)	1 620 (5 300)	1 830 (6 000)	2 130 (7 000)	2 230 (7 300)	2 350 (7 700)	2 380 (7 800)

G-13. ábra: A minimális magassági felület szöge és a kapcsolódó védett fedésterületi tér hossza az MLS / RNAV megközelítési eljárásokra

A védett fedésterületi tér hossza L [m(láb)] PCH = 2,0 m	A minimális magassági felület szöge (fok), θ	
	B-727	B-747
300 (1 000)	1,81	3,49
450 (1 500)	1,23	2,36
600 (2 000)	0,95	1,79
750 (2 500)	0,77	1,44
900 (3 000)	N/A	1,21

A következő képletet lehet alkalmazni a minimális magassági felület szögének (θ) meghatározásához az oldalszög antenna fázis középpontjára vonatkozóan egy tetszés szerinti védett fedésterületi tér hosszra, "L".

$$\theta = \tan^{-1}\left[\frac{TFH + \frac{\sqrt{\lambda(L)}}{4} - PCH}{L}\right]$$

ahol:
TFH = függőleges vezérsík magasság;
PCH = az MLS antenna fázis középpontjának magassága;
λ = az MLS hullámhossza.

Megjegyzés. - A függőleges vezérsík magasság (TFH) 10,4 m-rel egyenlő a B-727-re, illetve 19,3 m-rel a B-747-re és a λ = 0,06 m. Az MLS antenna fázis középpontjának magasságát és az L távolságot méterben kell megadni akkor, ha a TFH és a λ méterben van megadva.

G-14. táblázat: A földi berendezés felügyelő és vezérlési tevékenysége közötti kölcsönös kapcsolat

	Eredő tevékenység						
Alrendszer meghibásodás	Megköze-lítési oldalszög	Megköze-lítési magassági szög	Hátsó irány-szektor	A megközelíté-si oldalszög fedésterület-re kisugárzott alap adat	A hátsó irányszektor fedésterület-re kisugárzott alap adat	Kiegé-szítő adat	DME / N, vagy DME / P
Megközelítési oldalszög	*	*		+		+	
Megközelítési magassági szög		*					
Hátsó irány-szektor			*		+		
A megközelítési oldalszög fedésterületre kisugárzott alap adat	*	*		*		+	
A hátsó irányszektor fedésterületre kisugárzott alap adat			*		*		
Kiegészítő adat	+	+		+		*	
DME / N, vagy DME / P							*

* Azt jelzi, hogy a sugárzásnak meg kell szűnni.

+ Azt jelzi, hogy a sugárzást folytatni lehet, amikor üzemeltetési szempontból szükséges.

G-15. táblázat: Szolgáltatás folyamatossági és integritási célok az MLS alap és MLS / RNAV üzemeltetésekre

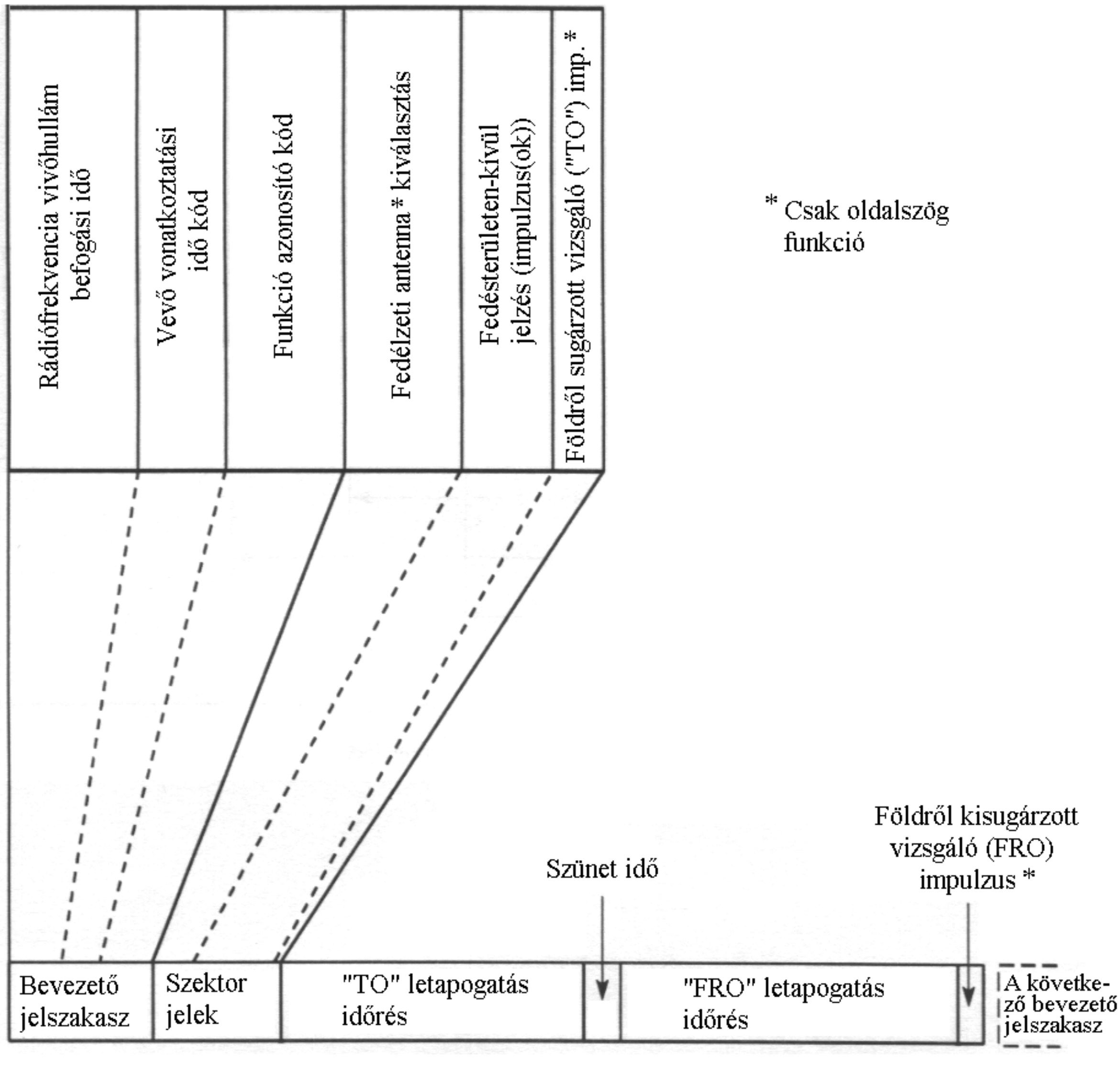
Szint	Oldalszög, vagy magassági szög			DME / P (6. Megjegyzés)		
	Integritás minden egyes leszálláshoz	A szolgáltatás folyamatossága	A meg-hibásodások közötti átlag idő (óra)	Integritás minden egyes leszálláshoz (4. Meg-jegyzés)	A szolgáltatás folyamatos-sága	A meg-hibásodások közötti átlag idő (óra)
1	Nincs leírva, de a tervek szerint megfelel a 2. szintű követelményeknek (3. Megjegyzés).					
2	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000
3	$1 - 0{,}5 \times 10^{-9}$	$1 - 2 \times 10^{-6}$ (15 s)	2 000	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000
4 (5.Megj)	$1 - 0{,}5 \times 10^{-9}$	$1 - 2 \times 10^{-6}$ (30 s Az) (15 s El) (6. Megjegyzés)	4 000 Az 2 000 El (6. Megjegyzés)	$1 - 1 \times 10^{-7}$	$1 - 4 \times 10^{-6}$ (15 s)	1 000

Az = oldalszög
El = magassági szög

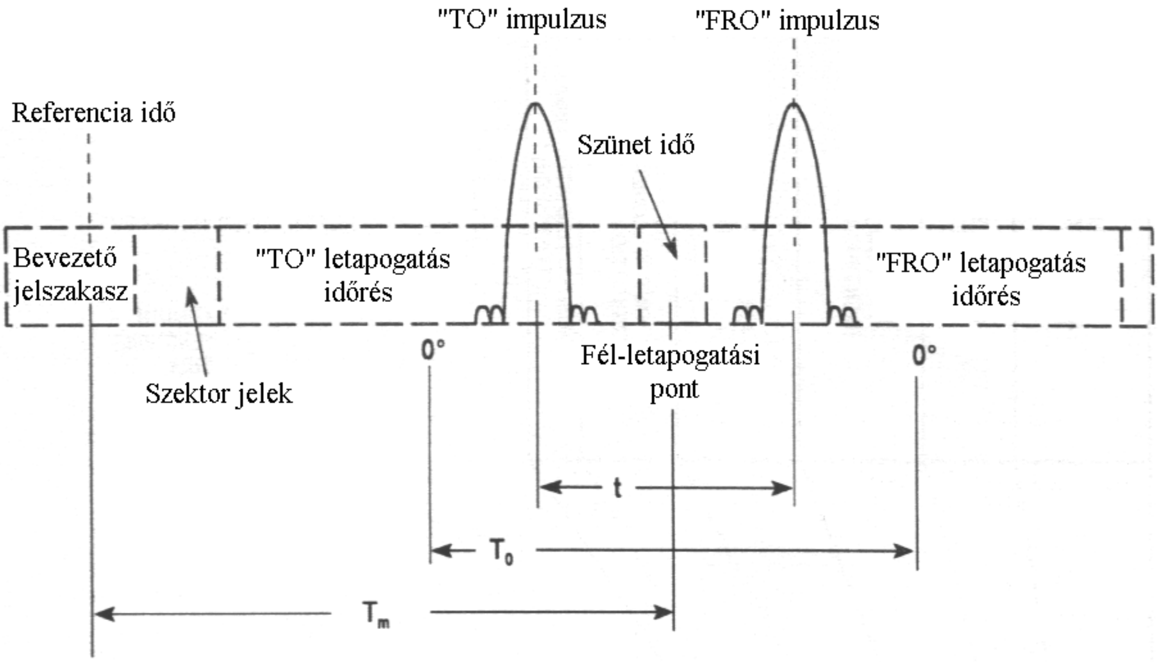
MEGJEGYZÉSEK. –

1. Az adat szavak szolgáltatási folyamatossága és integritása az egyes szolgáltatási szintek szög funkciójának meghatározott értékeibe van belefoglalva.
2. A hátsó irányszektor nem szükséges az alap üzemeltetéshez.
3. Az a cél, hogy minden berendezés legalább a 2. szintű követelménynek feleljen meg.
4. Amikor DME / N használatos az MLS-el, akkor az értékeket le lehet csökkenteni $1 - 1 \times 10^{-5}$-re.
5. A 4. szintű sugárzási idők az ILS-el szerzett tapasztalatokon alapszanak, és összhangban vannak a jelenlegi üzemeltetési lehetőségekkel. Ahogy tapasztalatokat szereznek az MLS-el és azok megnövelt üzemeltetési lehetőségeket javasolnak, szükséges lehet ezeknek az értékeknek a helyesbítése.
6. Az MLS / RNAV eljárások szükségessé tehetik azt, hogy a 3. és 4. szintű integritási, szolgáltatás folyamatossági és meghibásodások közötti átlagos idő célok a magassági szögnél, a DME / P-nél és ha használatos, a hátsó irányszektornál is egyenlőek legyenek a megközelítési oldalszög adó berendezésekével.

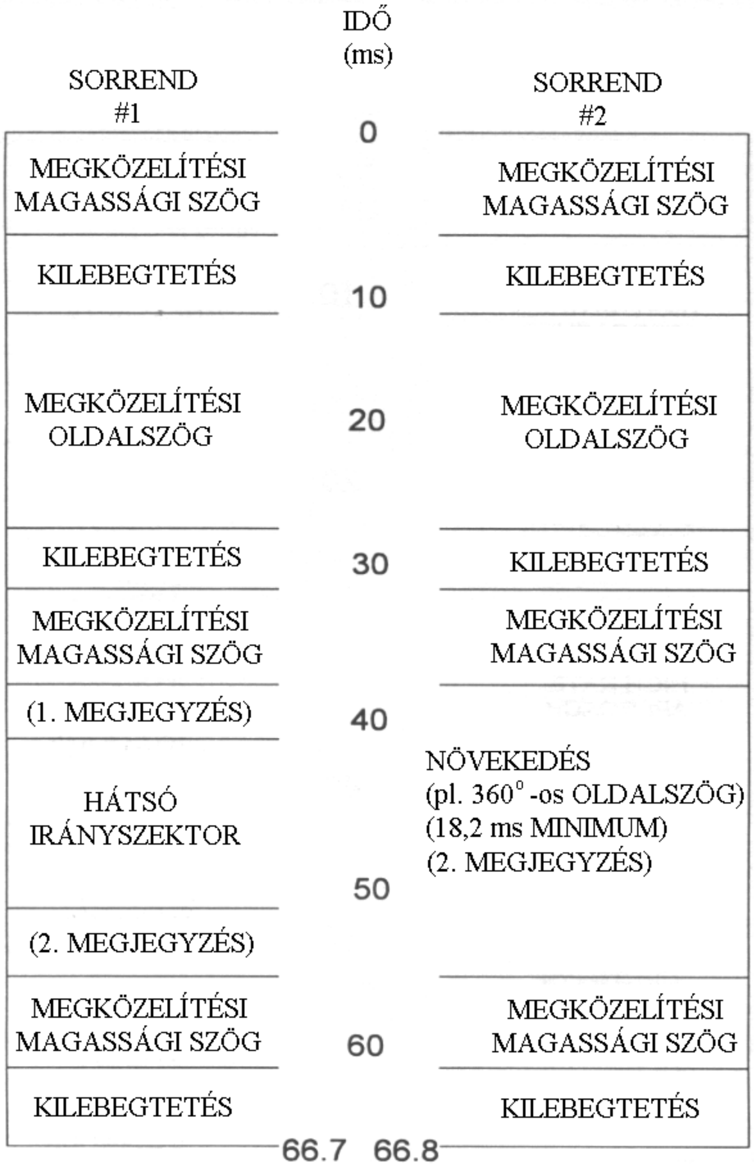
Ábrák a "G"- Melléklethez



G-1. ábra: A szög funkció



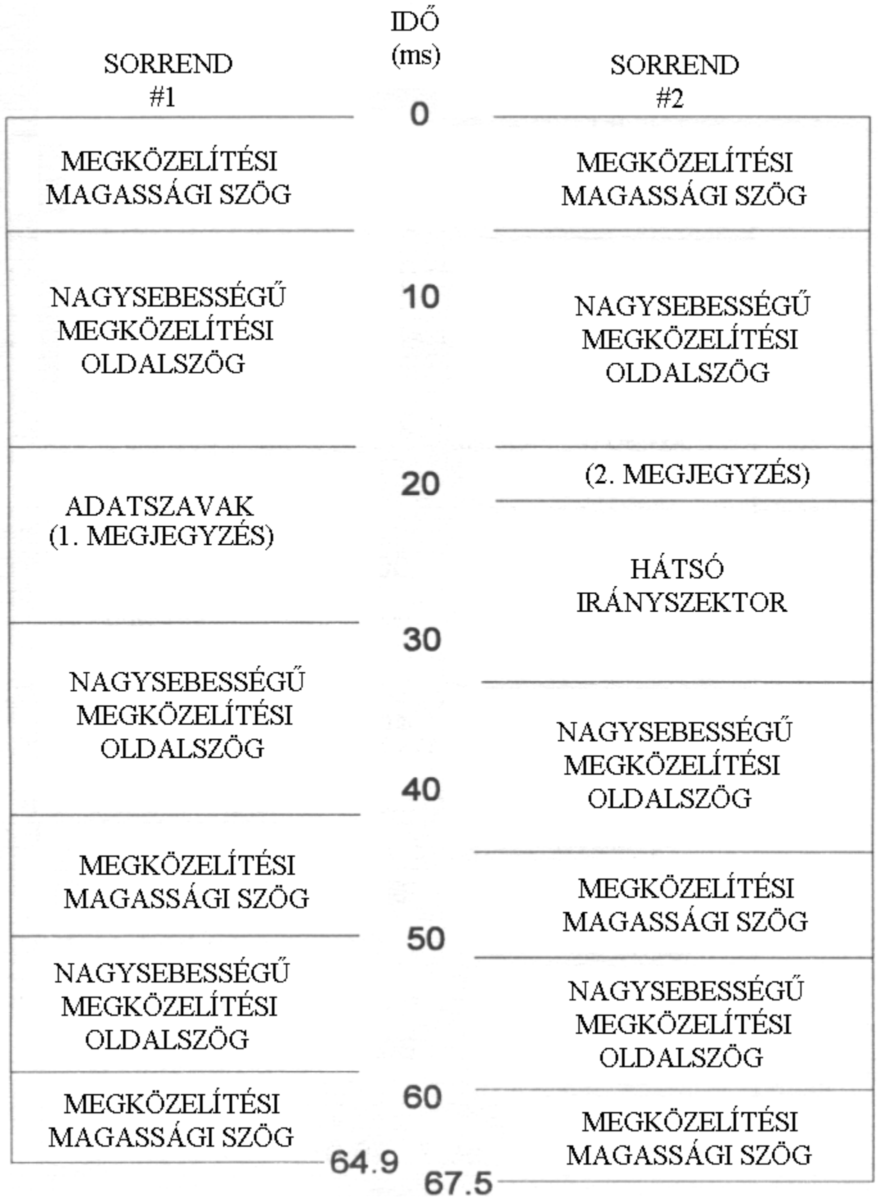
G-2. ábra: A szög letapogatás időzítési paraméterei



Megjegyzések:

1. Amikor hátsó irányszektort biztosítanak, akkor az alap adatszó 2-t csak ebben a helyzetben kell leadni.
2. Az adatszavak bármelyik szabad időperiódusban leadhatók.
3. A sorozat (sorrend) #1 plusz a sorozat (sorrend) #2 teljes időtartama nem haladhatja meg a 134 ms-ot.

G-3A. ábra: Az MLS szög útirány-vezetési funkciót biztosító adás sorrendi párok

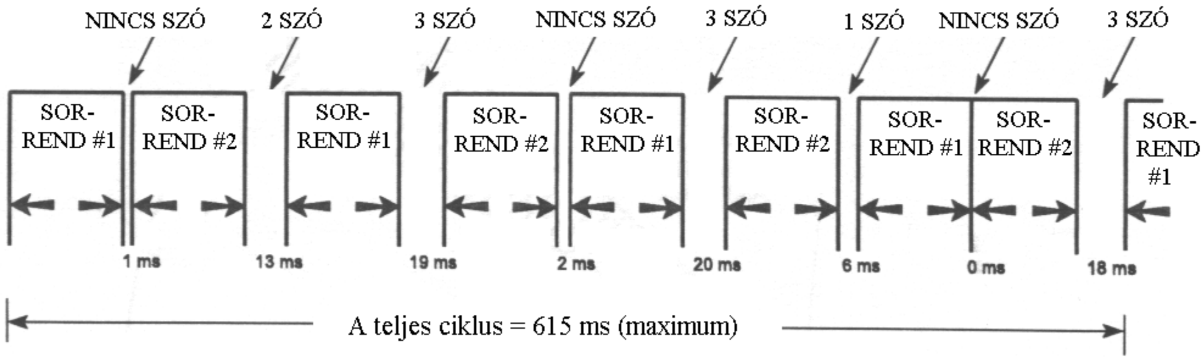


(3. Megjegyzés)

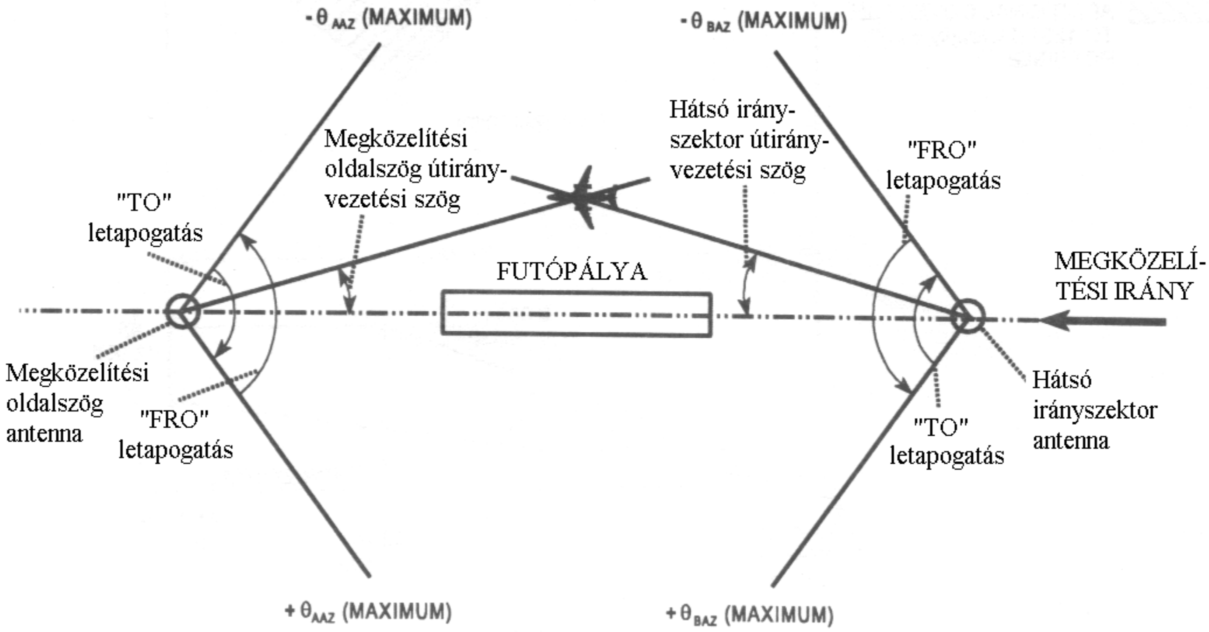
Megjegyzések:

1. Az adatszavak bármelyik szabad időperiódusban leadhatók.
2. Amikor hátsó irányszektort biztosítanak, akkor az alap adatszó 2-t csak ebben a helyzetben kell leadni.
3. A sorozat (sorrend) #1 plusz a sorozat (sorrend) #2 teljes időtartama nem haladhatja meg a 134 ms-ot.

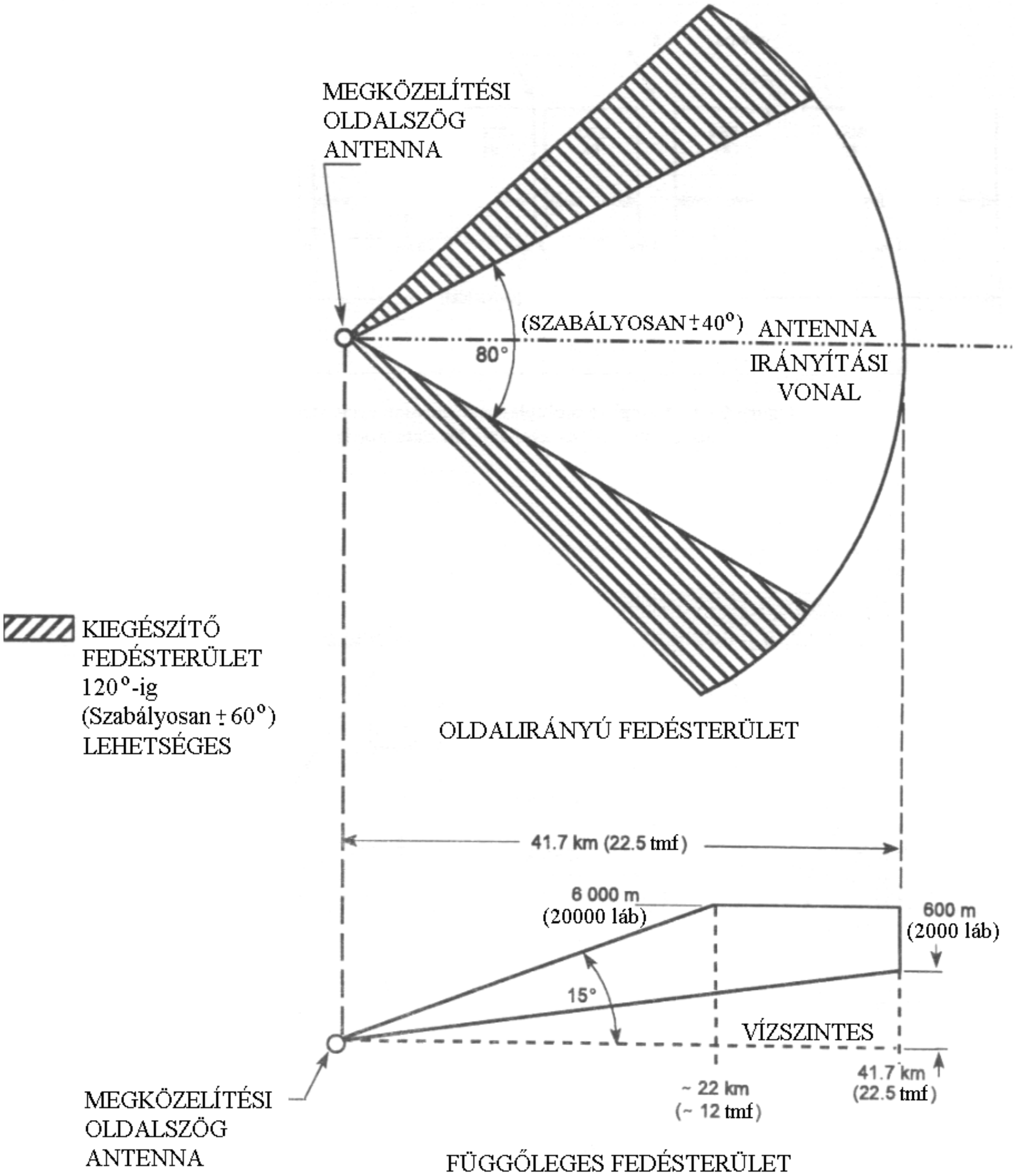
G-3B. ábra: Az MLS nagysebességű megközelítési oldalszög útirány-vezetési funkciókat biztosító adás sorrendi párok



G-3C. ábra: Teljes multiplex adás ciklus az adatszavak továbbítására rendelkezésre álló szabad időperiódusok bemutatásával



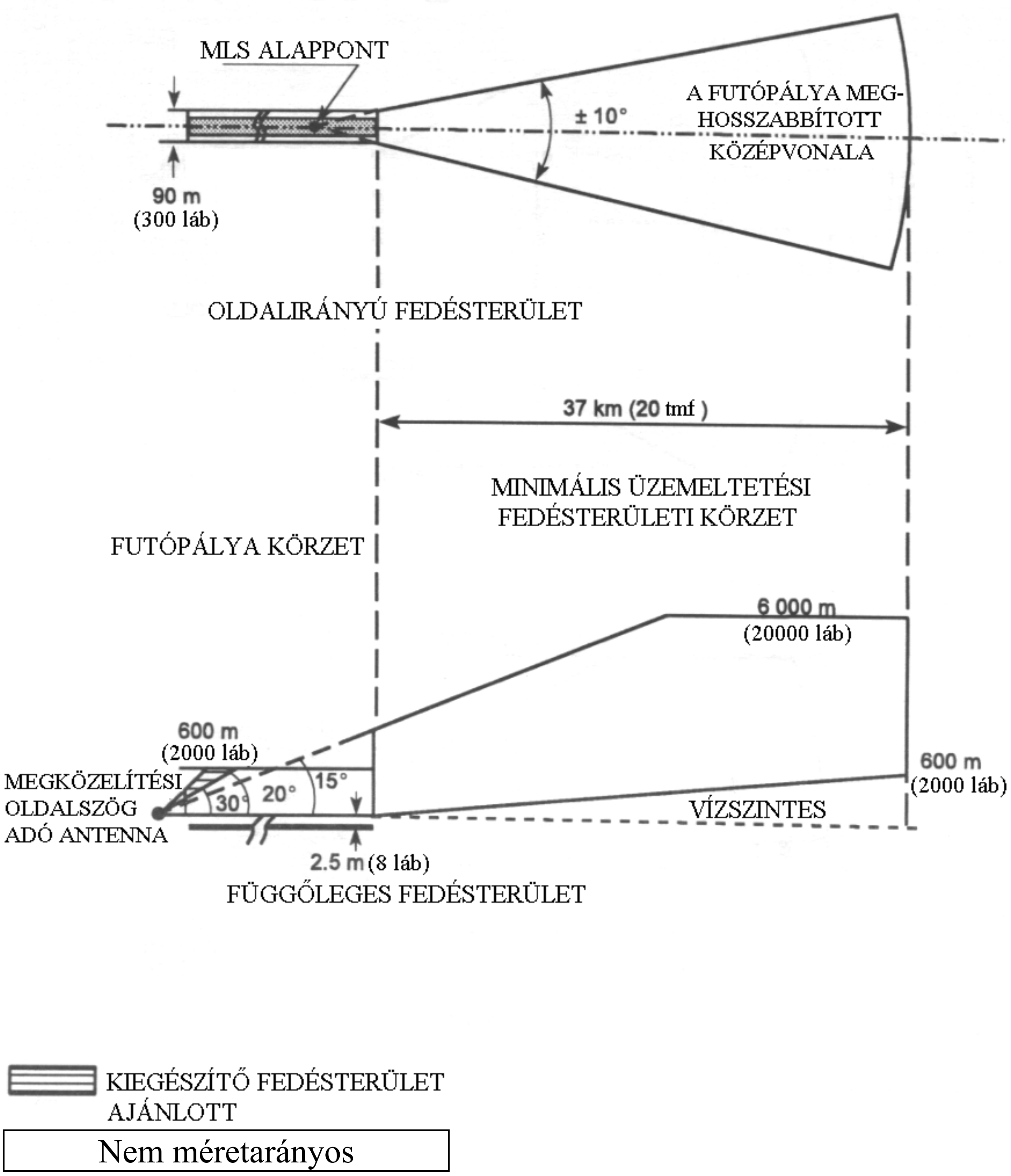
G-4. ábra. Az oldalszög útirány-vezetési funkciók letapogatási szabályai



Nem méretarányos

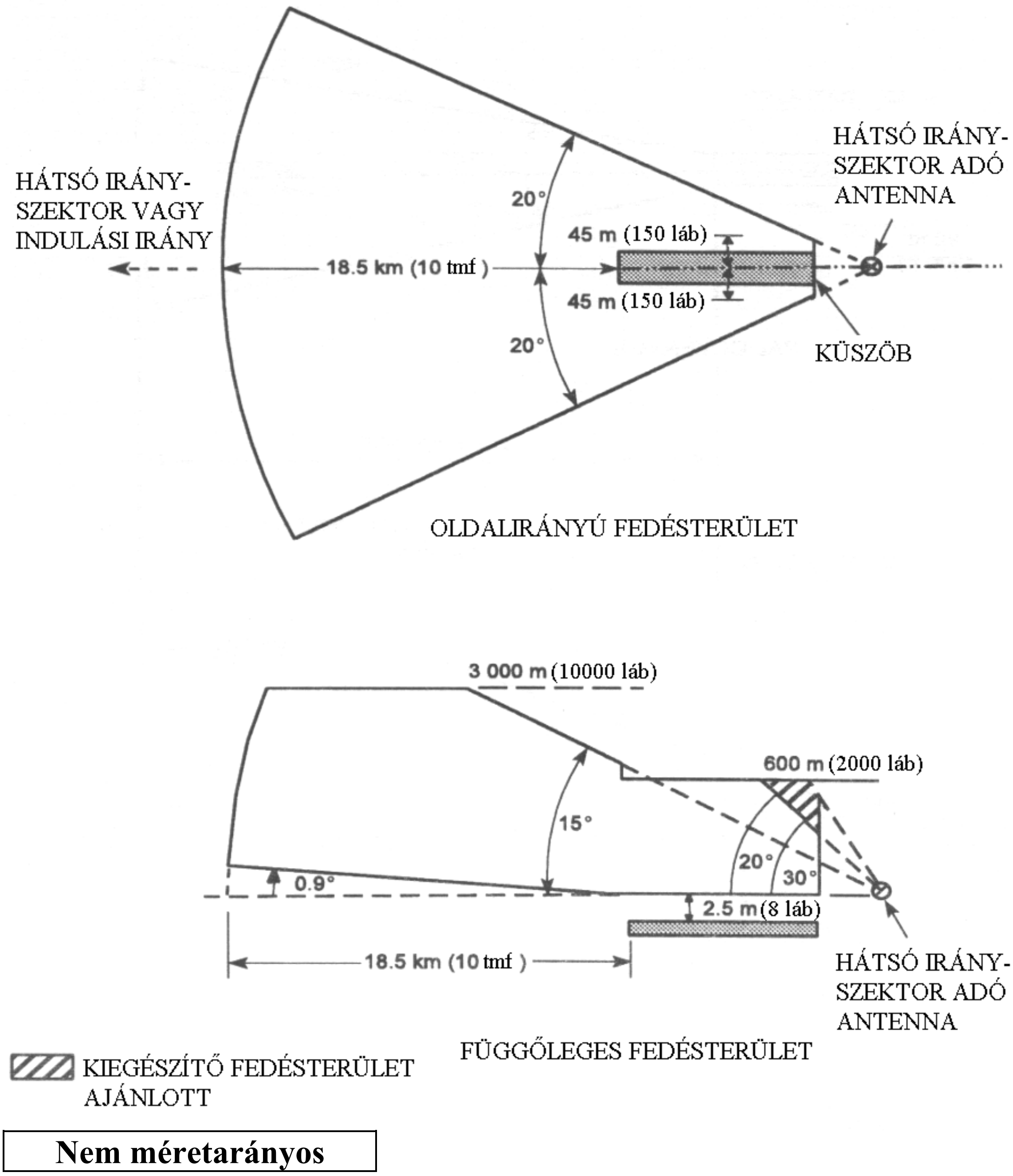
Megjegyzés. - A fentiek a telepített antenna fázis középpontjából kiinduló fedésterületi szektort ábrázolják.

G-5A. ábra: A megközelítési oldalszög körzet fedésterülete

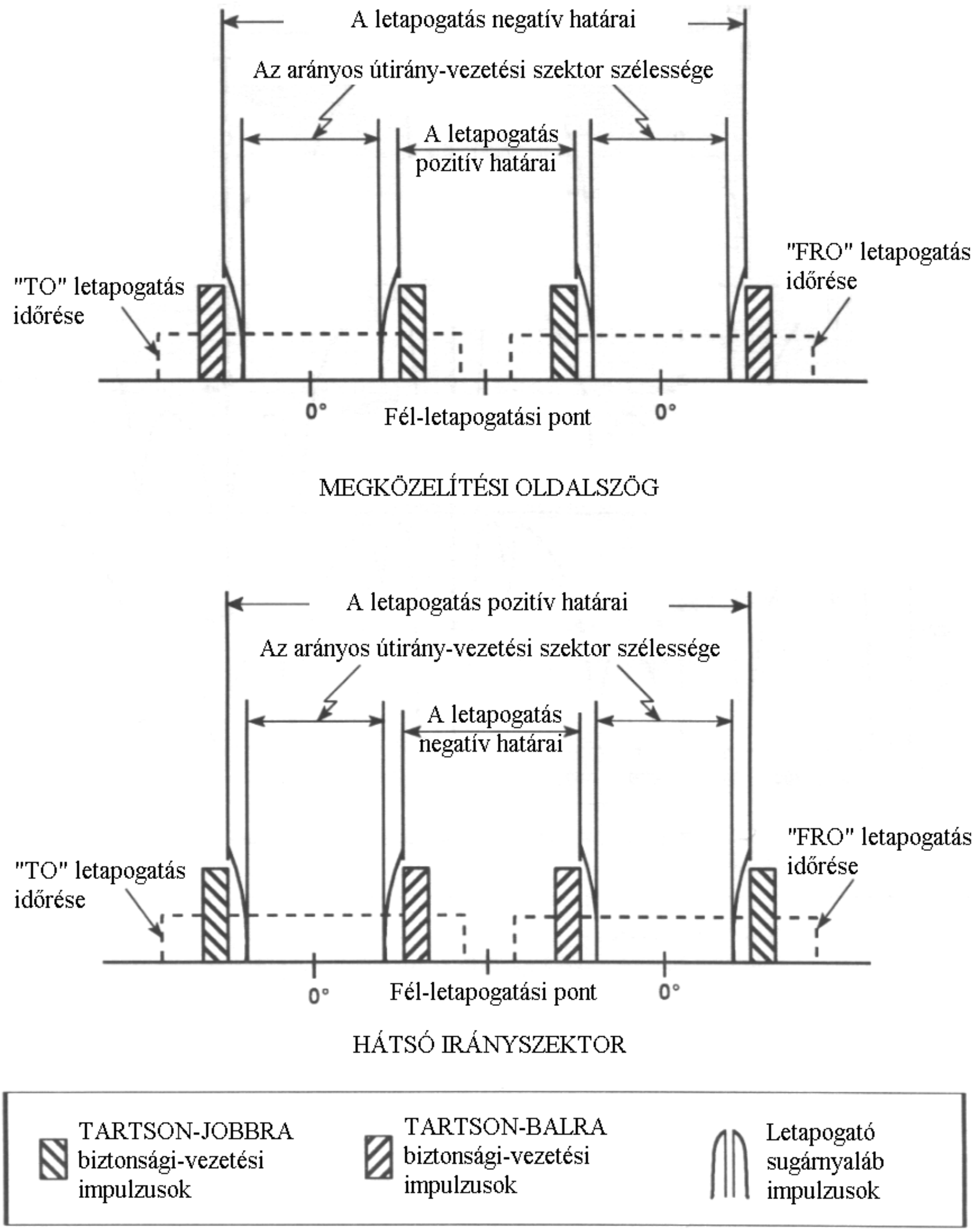


Megjegyzés. - A fentiek a szükséges minimális arányos útirány-vezetési szektort ábrázolják, a berendezés telepítési helyétől és tájolásától függetlenül

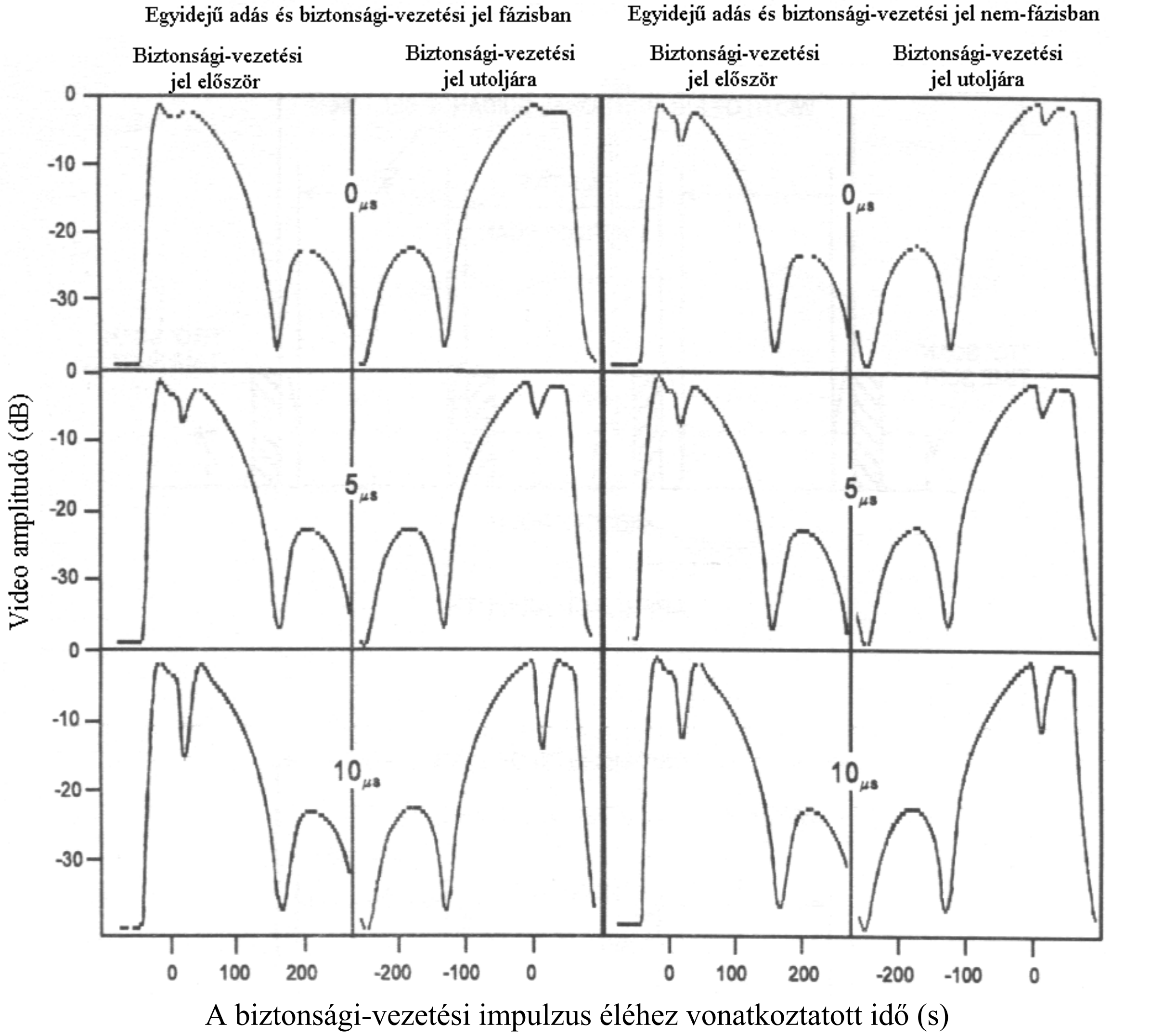
G-5B. ábra: Az oldalszög futópálya körzet fedésterület és a minimális üzemeltetési fedésterületi körzet



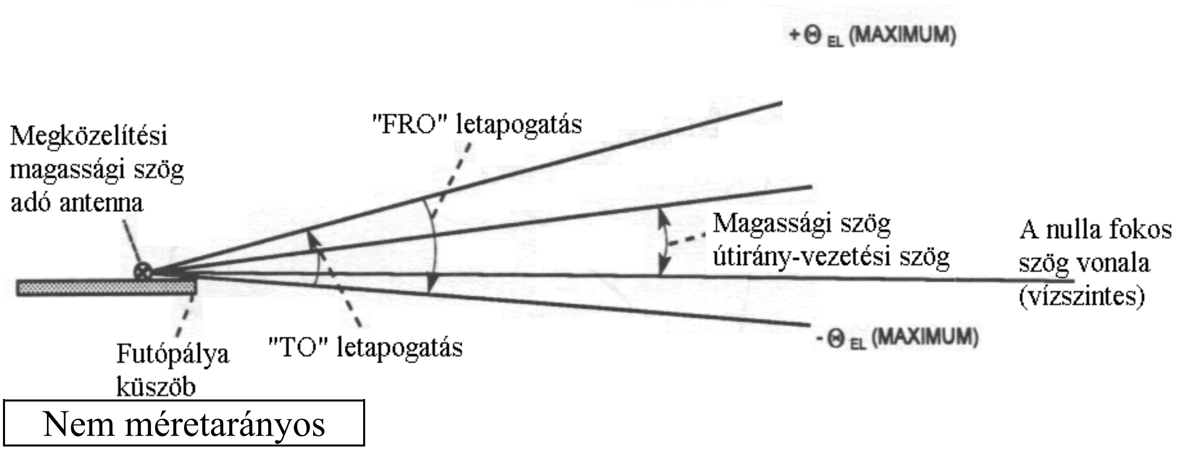
G-6. ábra: Hátsó irányszektor körzet fedésterület



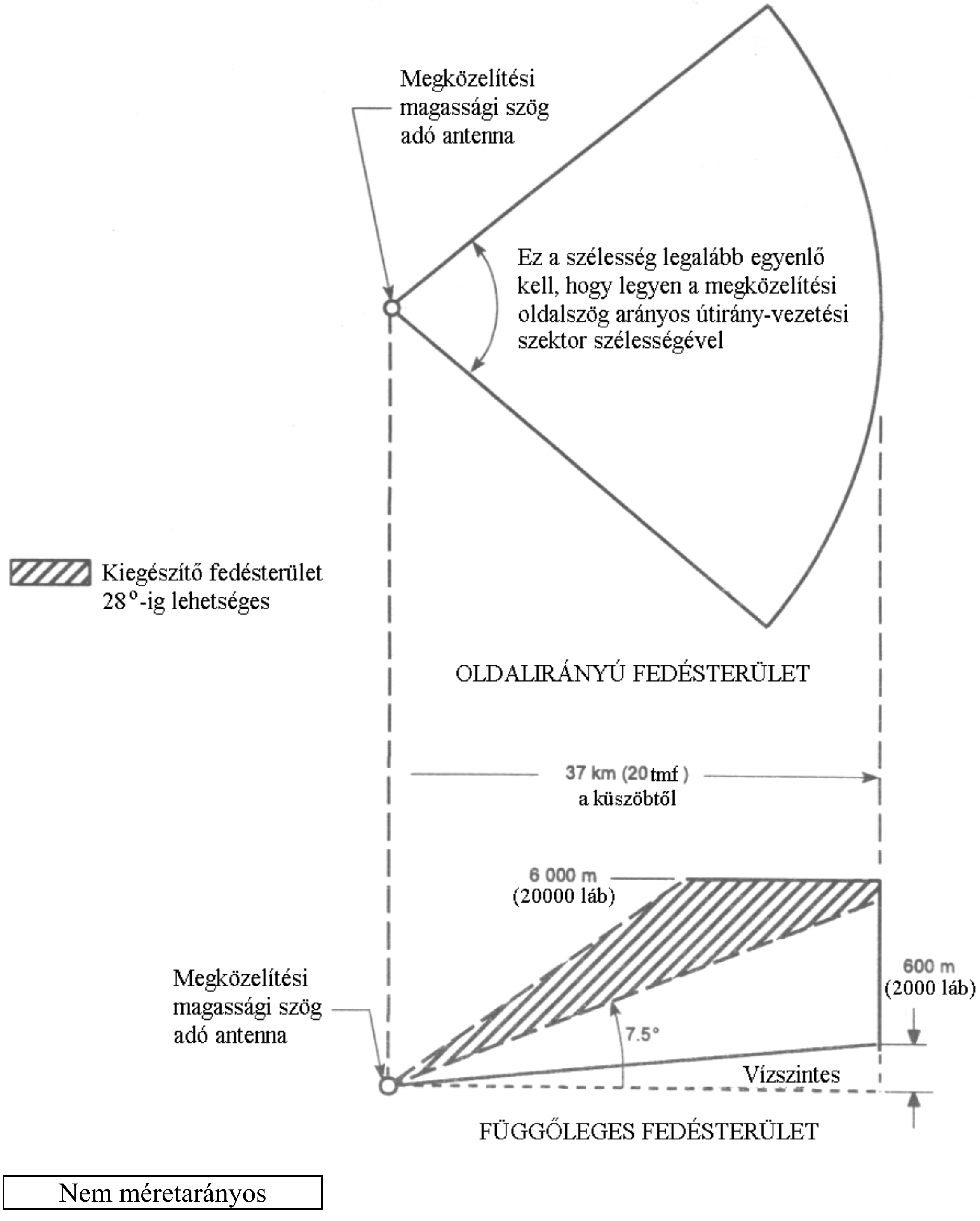
G-7. ábra: Biztonsági-vezetési impulzus szabályok az oldalszög funkcióknál



G-8. ábra: Példák az egyidejű adás (SB) / biztonsági-vezetési átmeneti tartomány vett videó hullámformáira a 0, az 5 és a 10 mikroszekundumos átkapcsolási időknél



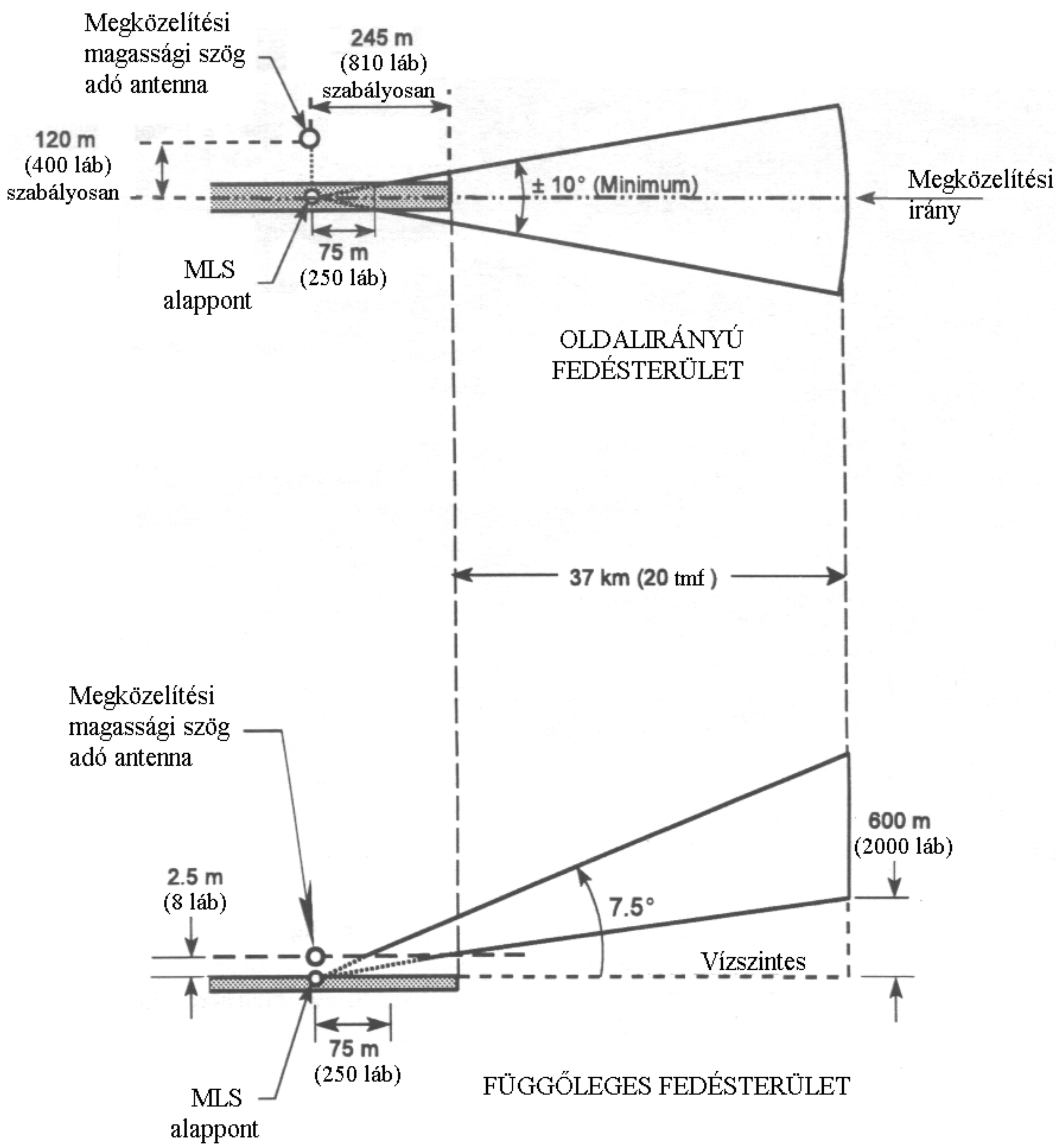
G-9. ábra: A megközelítési magassági szög funkció letapogatási konvenciója



Megjegyzés. - A fentiek a telepített antenna fázis középpontjától kiinduló fedésterületi szektort ábrázolják

.

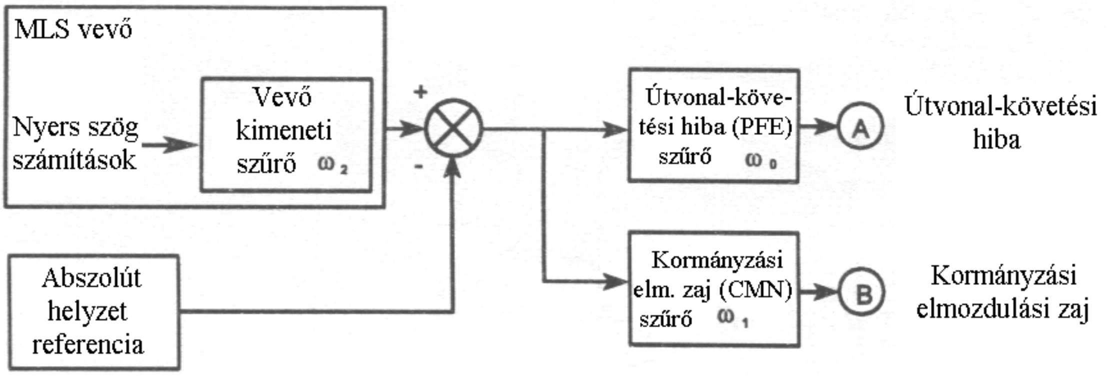
G-10A. ábra: A magassági szög megközelítési körzet fedésterülete



Nem méretarányos

Megjegyzés. - A fentiek a szükséges minimális arányos útirány-vezetési szektort ábrázolják, a berendezés telepítési helyétől és tájolásától függetlenül.

G-10B. ábra: A magassági szög minimális üzemeltetési fedésterülete

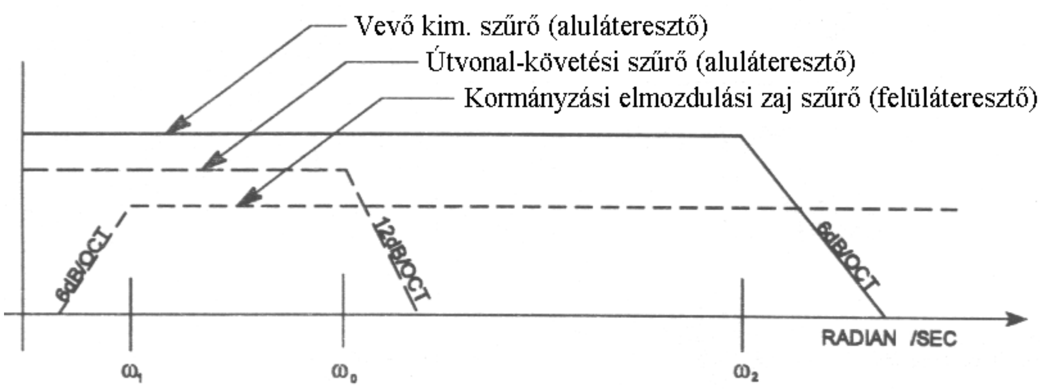


Útirány-vezetési funkció	Sarok-frekvenciák (rad/s)		
	ω_0	ω_1	ω_2
Megközelítési oldalszög	0,5	0,3	10
Megközelítési magassági szög	1,5	0,5	10
DME / P	1,5	0,5	10

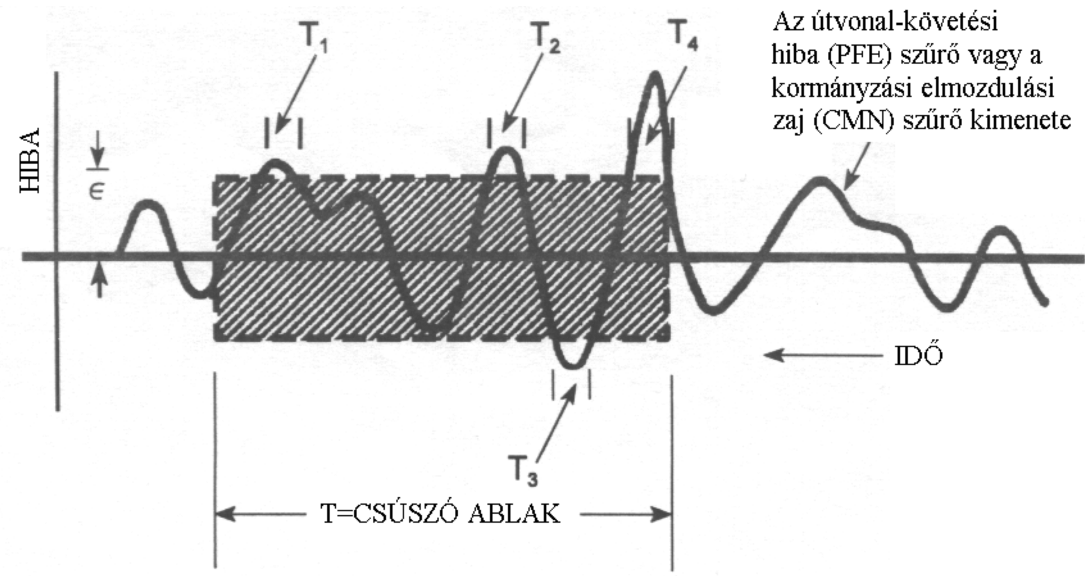
VEVŐ KIMENETI SZŰRŐ

ÚTVONAL-KÖVETÉSI SZŰRŐ $\dfrac{\omega_n}{S^2 + 2\zeta\omega S + \omega_n^{\,2}}$ $\zeta = 1$, $\zeta_0 = 0{,}64\,\zeta_n$

KORM. ELMOZD. ZAJ SZŰRŐ $\dfrac{S}{S + \omega_1}$ $S = j\zeta$



G-11. ábra: Szűrő kialakítások és sarokfrekvenciák



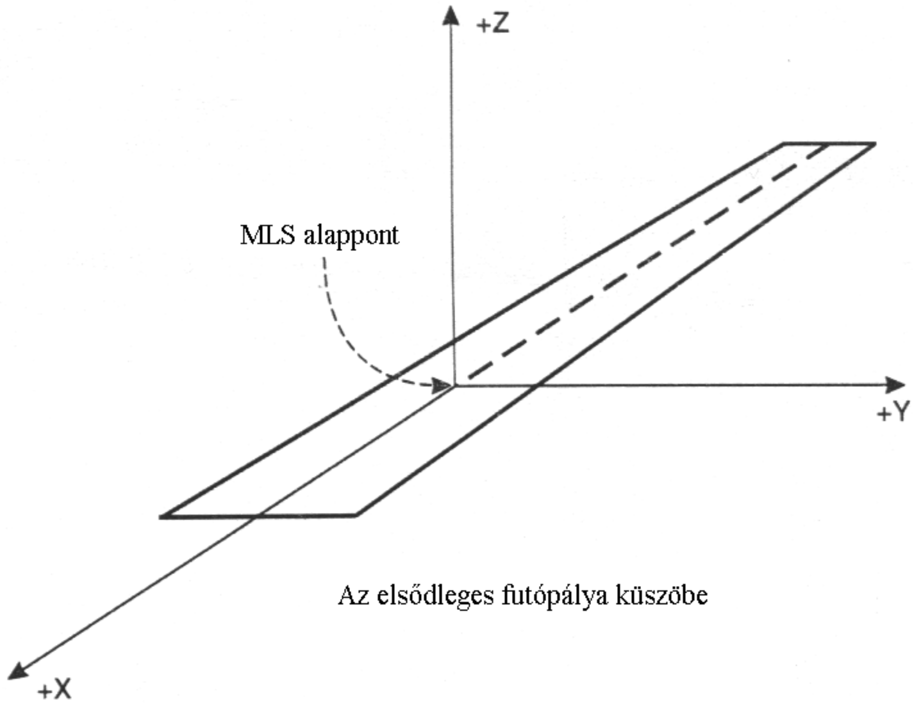
Megjegyzések:

∈ = Hiba előírás
T = Az értékelt rész
T_1, T_2, T_3.... = Azok az időtartamok, amikor a hiba meghaladja az előírásokat.

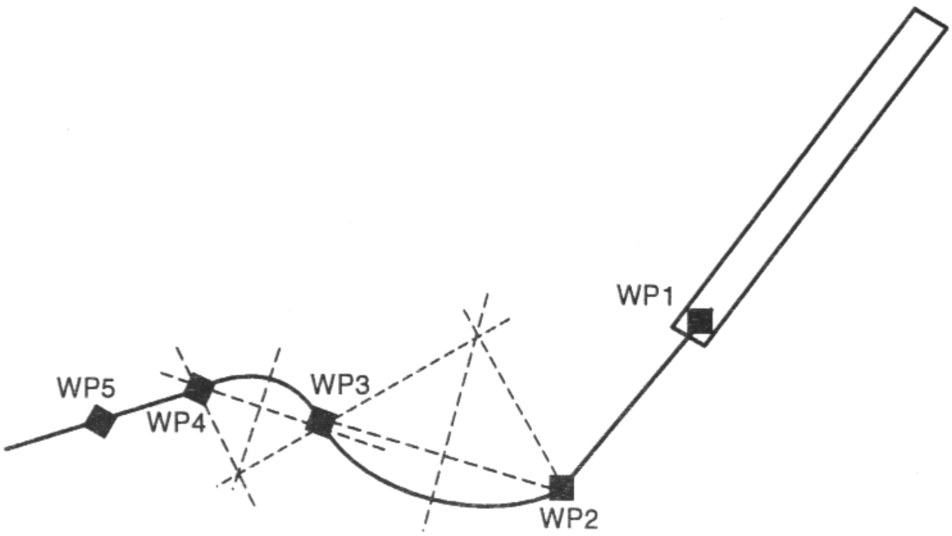
A földi berendezésre ebben a részben elfogadhatónak kell lenni annak, hogy a következő egyenlőtlenségnek igaznak kell lenni.

$$\frac{(T_1 + T_2 + T_3 + \ldots)}{T} \leq 0{,}05$$

G-12. ábra: MLS mérési módszer

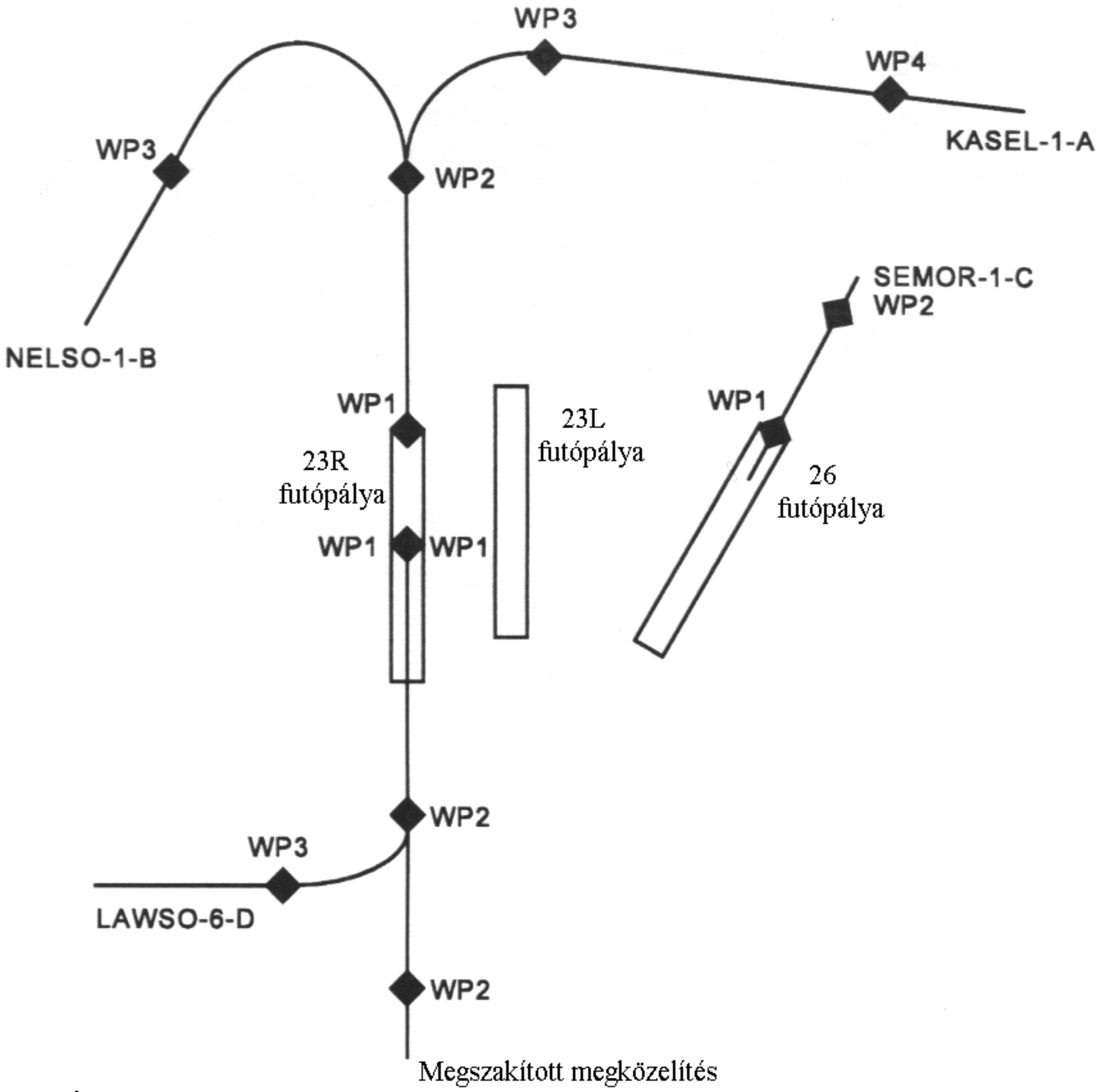


G-13. ábra: Az MLS / RNA útvonal-pont koordináta rendszer



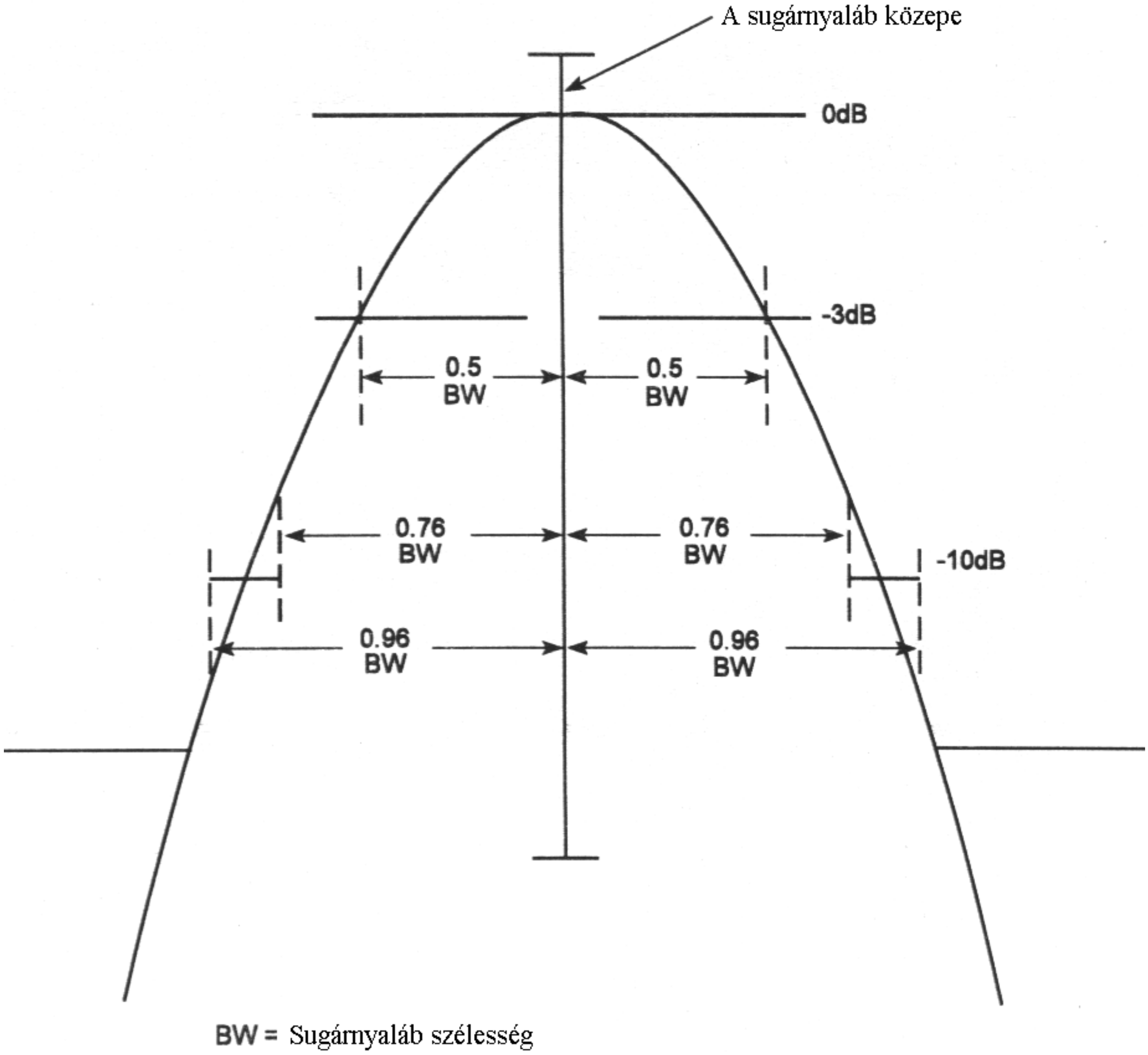
WP = Útvonal-pont

G-14. ábra: Az ívelt szakaszok meghatározása



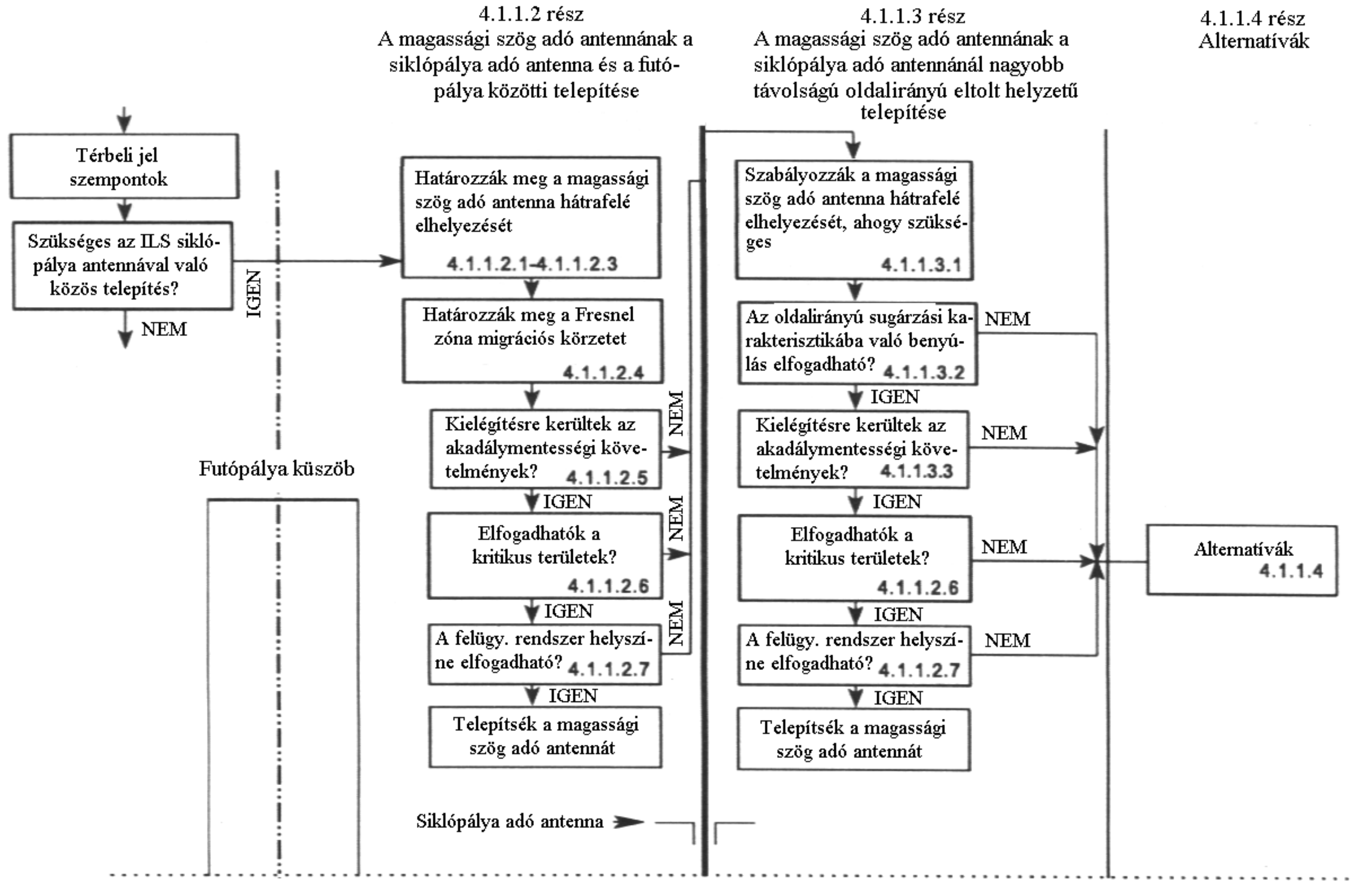
WP = Útvonal-pont

G-15. ábra: A minta MLS / RNAV eljárás rajza

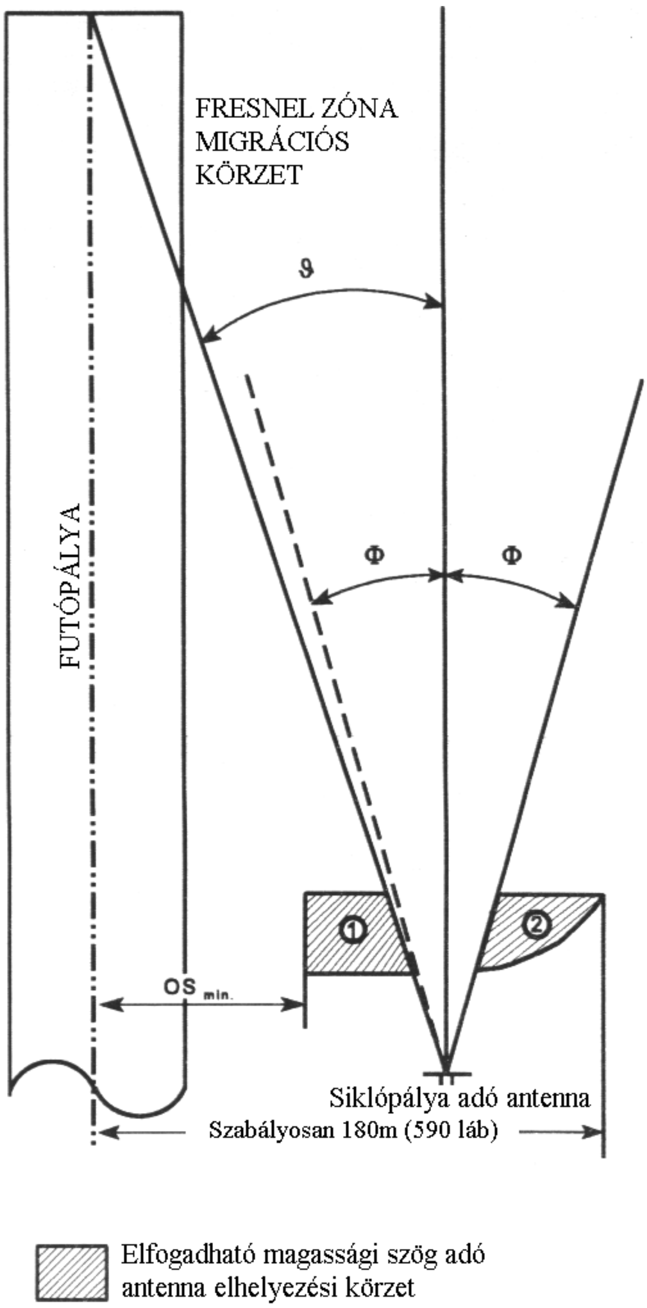


Megjegyzés. - A sugárnyaláb burkológörbéje a mérés előtt egy 26 kHz-es video szűrővel kerül simításra.

G-16. ábra: A távol-téri dinamikus térbeli jel

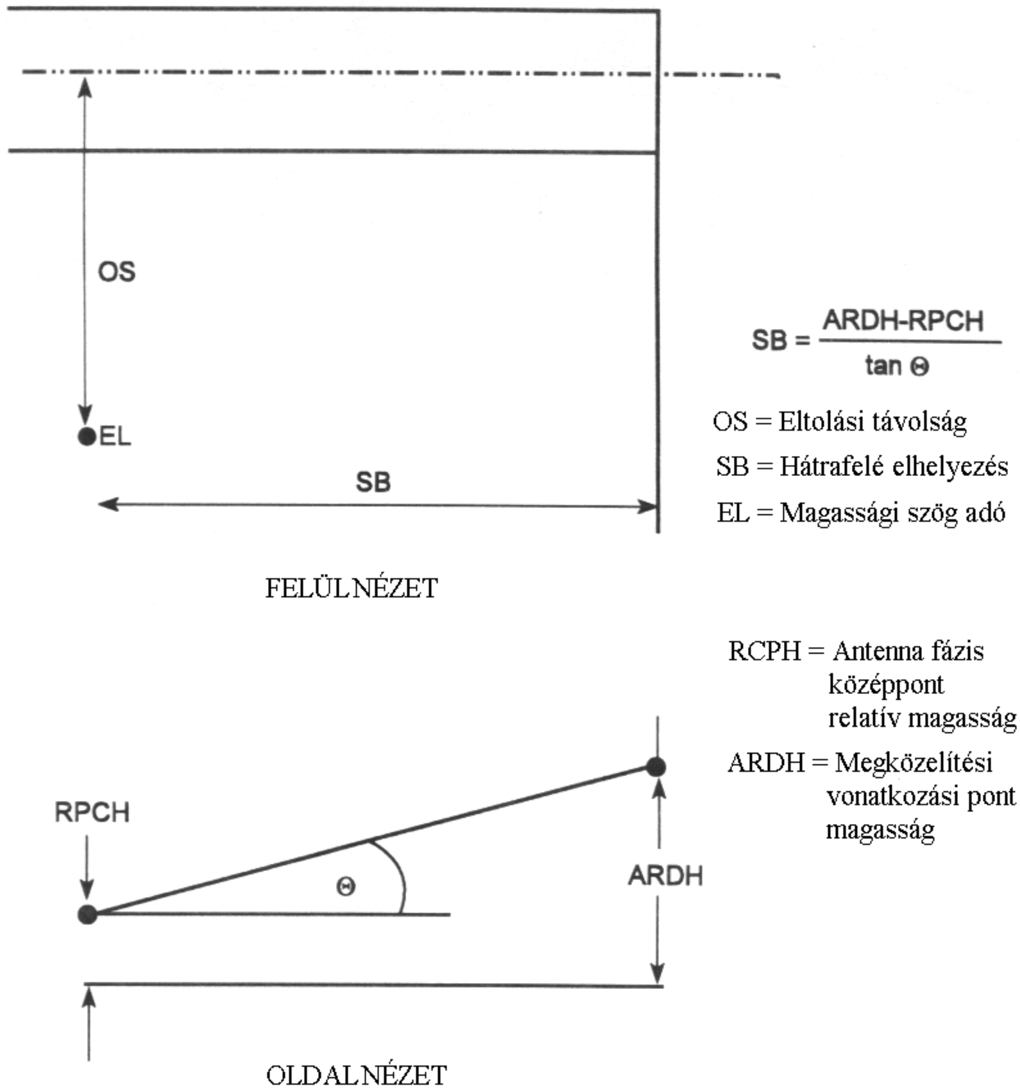


G-17. ábra: Magassági szög adó / siklópálya adó logikai folyamatábra

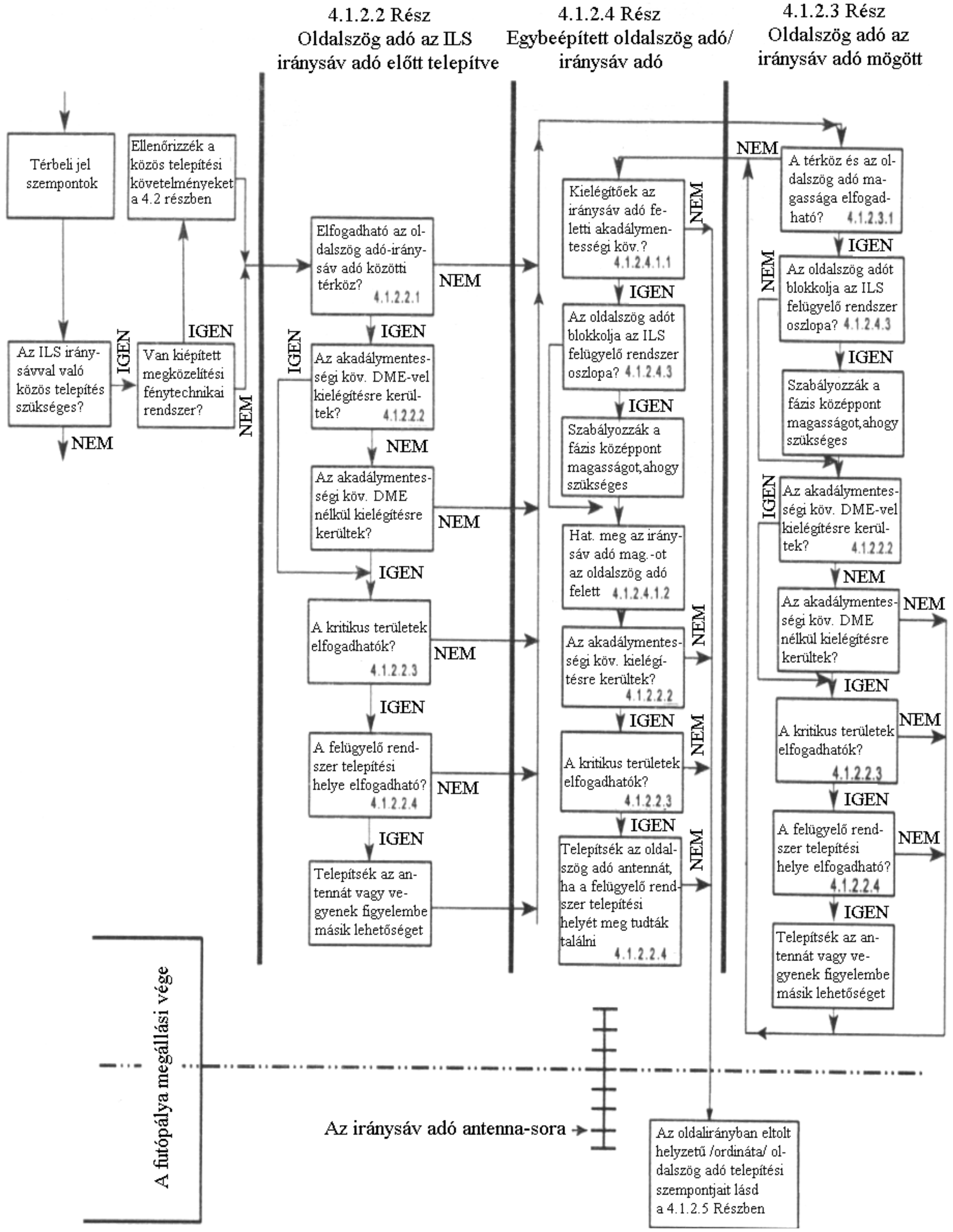


Megjegyzés. - Ha $|\vartheta| < |\Phi|$, *akkor az oldalirányú sugárzási karakterisztikába való belenyúlási tényező érvényesül az 1.körzet Fresnel zóna tényezője felett.*

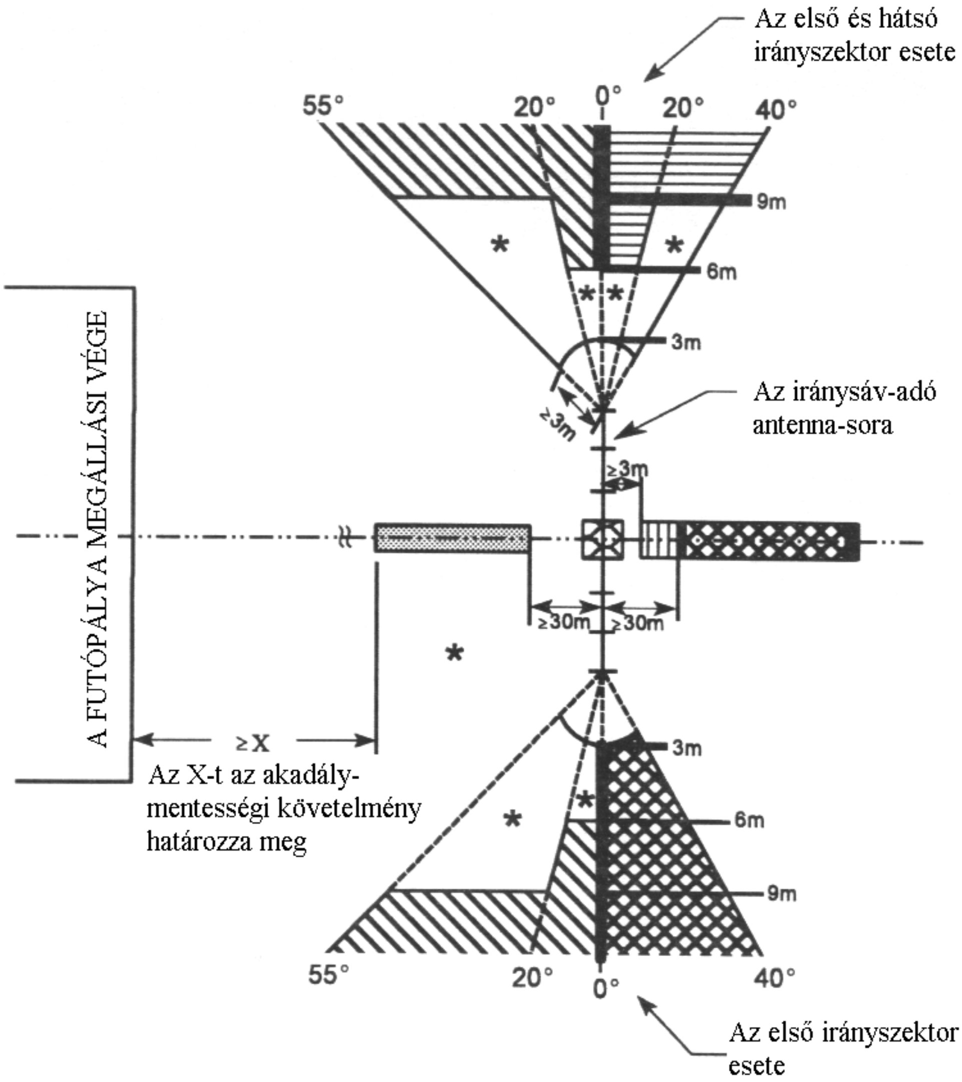
G-18. ábra: Magassági szög adó antenna körzetek az ILS-el való közös telepítésre (3o-os minimális siklópálya)



G-19. ábra: Magassági szög adó elhelyezési paraméterek



G-20. ábra: Oldalszög adó / iránysáv adó logikai folyamatábra



G-21. ábra: Oldalszög adó antenna telepítési körzetek az ILS-el való együttes telepítésnél

OLDALIRÁNYÚ ELTOLT HELYZETŰ /ORDINÁTA/ OLDALSZÖG ADÓ TELEPÍTÉS

1.TERÜLET:
Ajánlott telepítési helyzetek.
(Közvetlenül oldalt)

2.TERÜLET:
Nincs mérhető hatása az iránysáv adó első irányszektorára.

3. TERÜLET:
Mérhető csökkenést okoz az iránysáv adó első irányszektorának jelénél vagy az oldalszög adó jelénél.

Azokat a kiegészítő követelményeket jelzi, amelyek akkor állnak fenn, ha az iránysáv adó hátsó irányszektorát használják.

*
Elfogadhatatlan csökkenés az iránysáv adó jeleinél ezeken a területeken lép fel.

OLDALSZÖG ADÓ ELHELYEZÉSEK

KÖZÉPVONAL

FÖLDFELSZÍNI FELÉPÍTÉSŰ

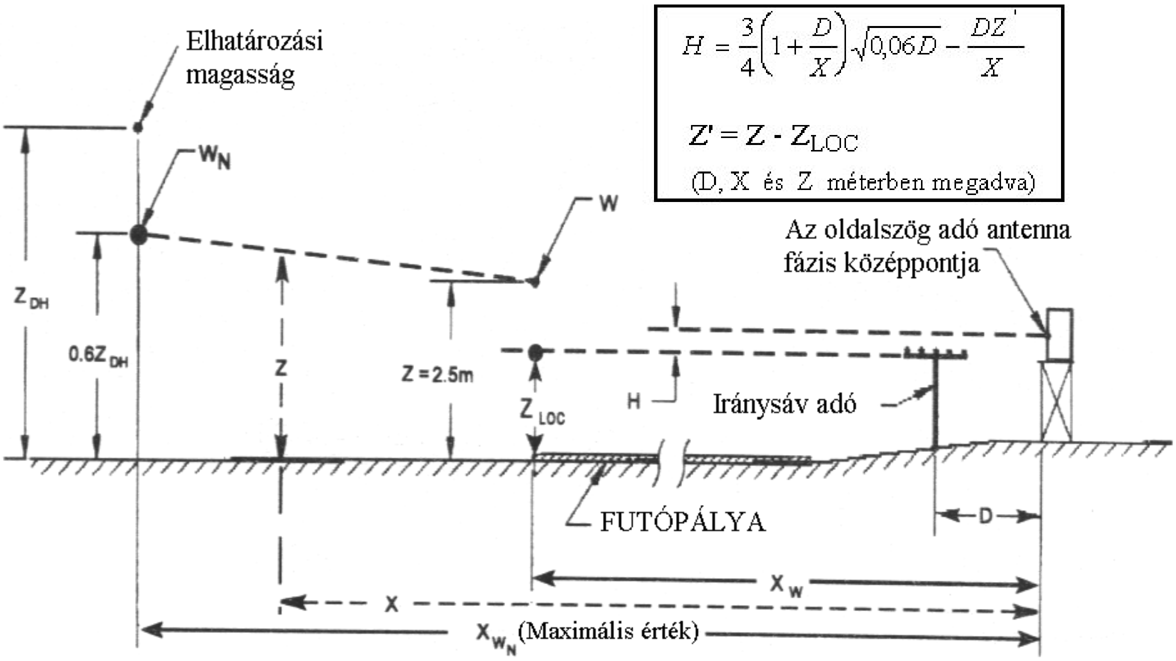
EGYBEÉPÍTETT

EMELT SZINTŰ
(iránysáv adó hátsó irányszektor nélkül)

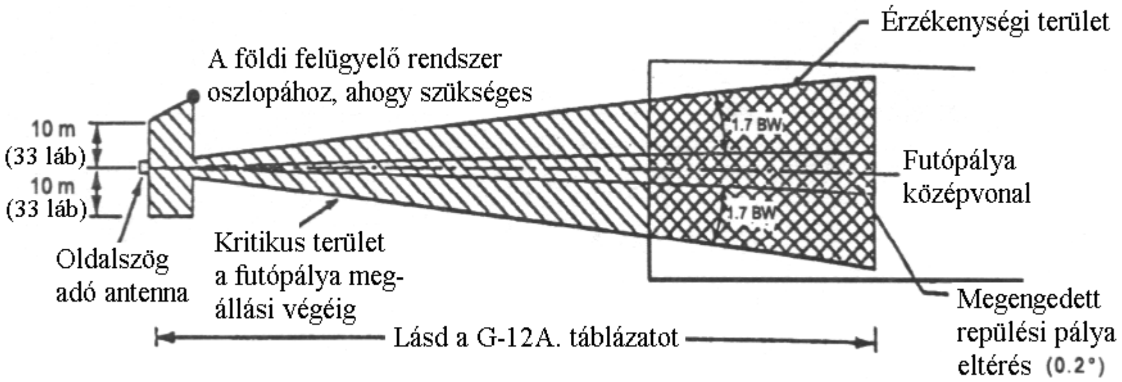
EMELT SZINTŰ
(iránysáv adó hátsó irányszektorral vagy anélkül)

OLDALIRÁNYÚ ELTOLT HELYZETŰ /ORDINÁTA/: LÁSD A BALOLDALI MAGYARÁZATOT.

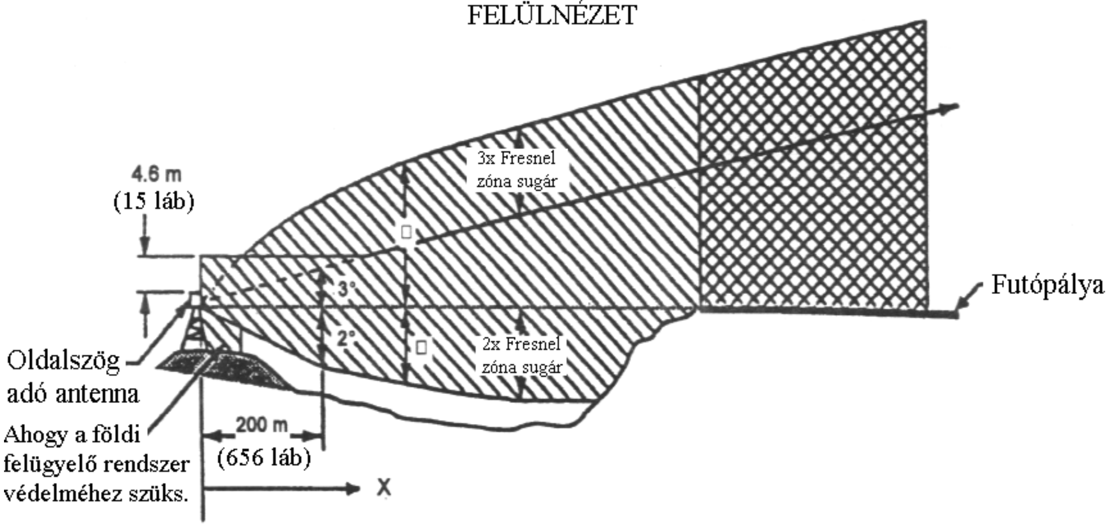
G-21. ábra (folytatás): Oldalszög adó antenna telepítési körzetek az ILS-el való együttes telepítésnél



G-22. ábra: Az oldalszög adó antenna fázis középpontjának magassági követelménye akkor, amikor az oldalszög adó antenna az ILS iránysáv mögé kerül elhelyezésre



FELÜLNÉZET



OLDALNÉZET

* Az oldalszög adó antennától vízszintesen mérve.

** Az oldalszög adó antenna sugárzási aperturájának aljától függőlegesen mérve

BW = Sugárnyaláb szélesség

Az α és β értékei

* x m (láb)	** α m (láb)	** β m (láb)
30 (100)	1,1 (3,5)	5,7 (18,6)
75 (250)	2,7 (8,7)	10,5 (34,3)
150 (500)	5,3 (17,5)	17,1 (56,2)
225 (750)	7,5 (24,5)	23,2 (76,0)
300 (1 000)	8,6 (28,3)	28,9 (94,8)

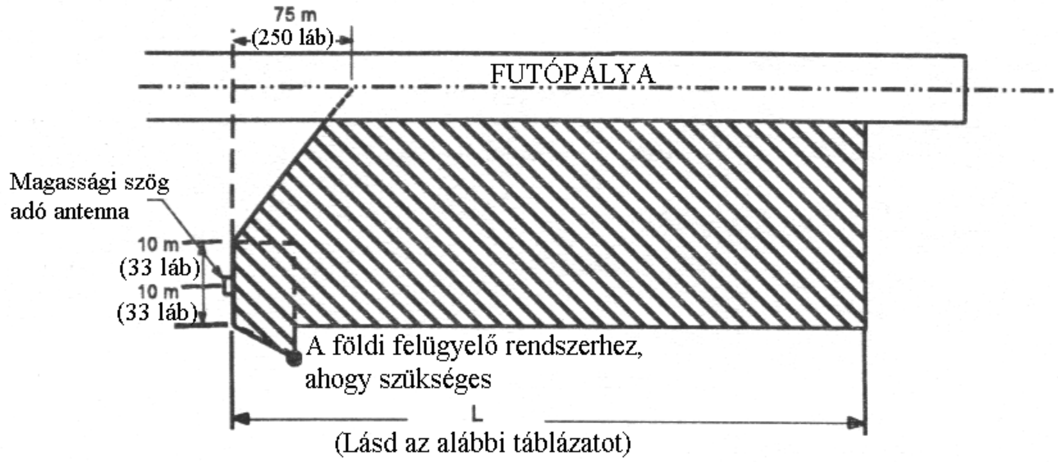
Ahol:

$$\alpha = 0{,}035\,X \qquad X < 200\ \mathrm{m}$$

$$\alpha = 2\sqrt{0{,}06X} \qquad X > 200\ \mathrm{m}$$

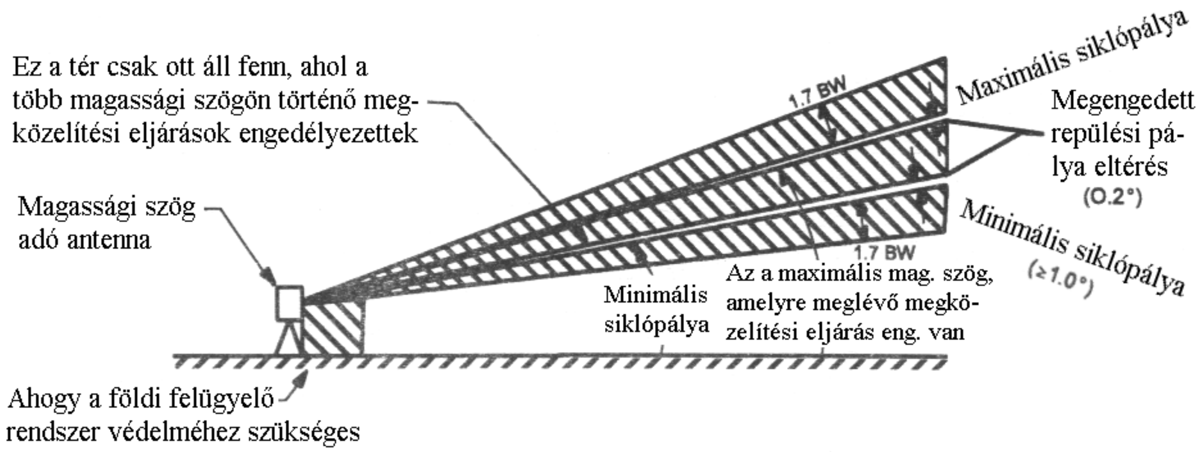
$$\beta = X\tan 3^{o} + 3\sqrt{0{,}06X}$$

G-23. ábra: A jellemző oldalszög adó antenna kritikus és érzékenységi területek



Sugár-nyaláb szélesség	Tiszta helyszín		Összetett helyszín	
	B-747	B-727	B-747	B-727
1,0°	320 m (1050 láb)	170 m (560 láb)	385 m (1260 láb)	180 m (600 láb)
1,5°	400 m (1310 láb)	250 m (820 láb)	565 m (1860 láb)	300 m (990 láb)

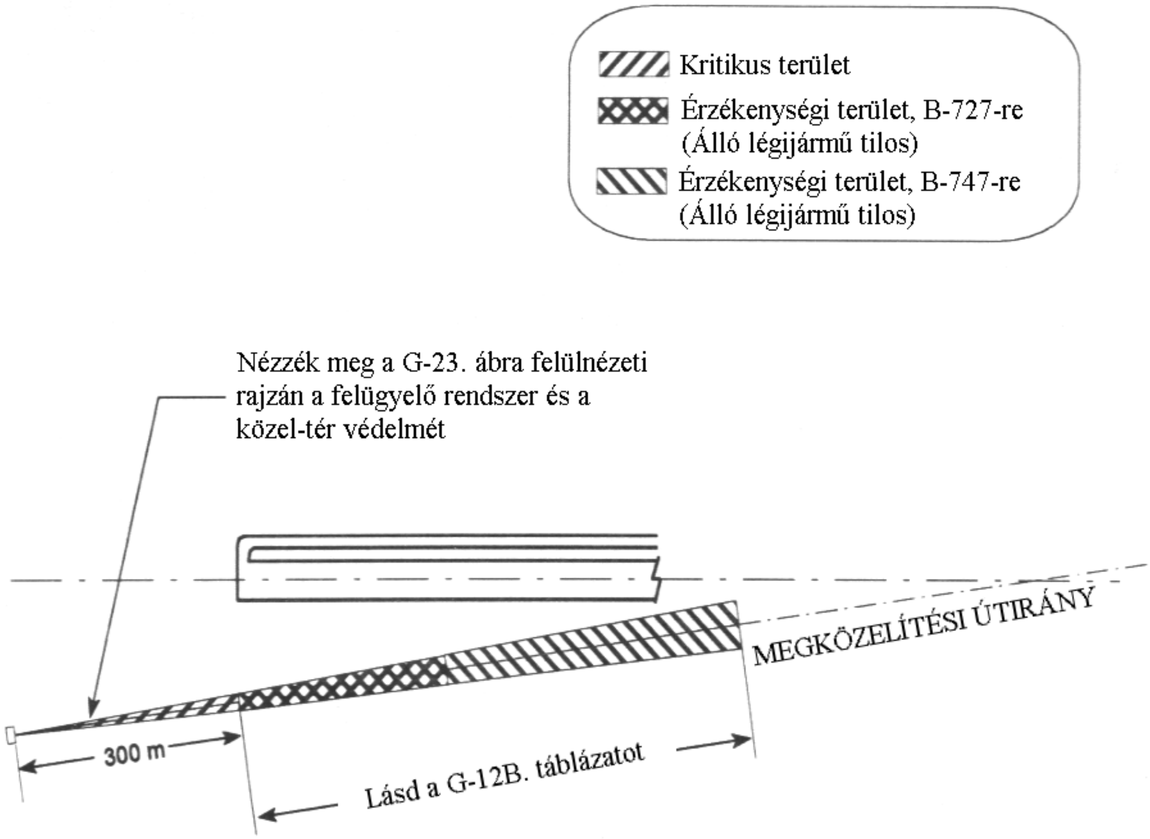
FELÜLNÉZET



OLDALNÉZET

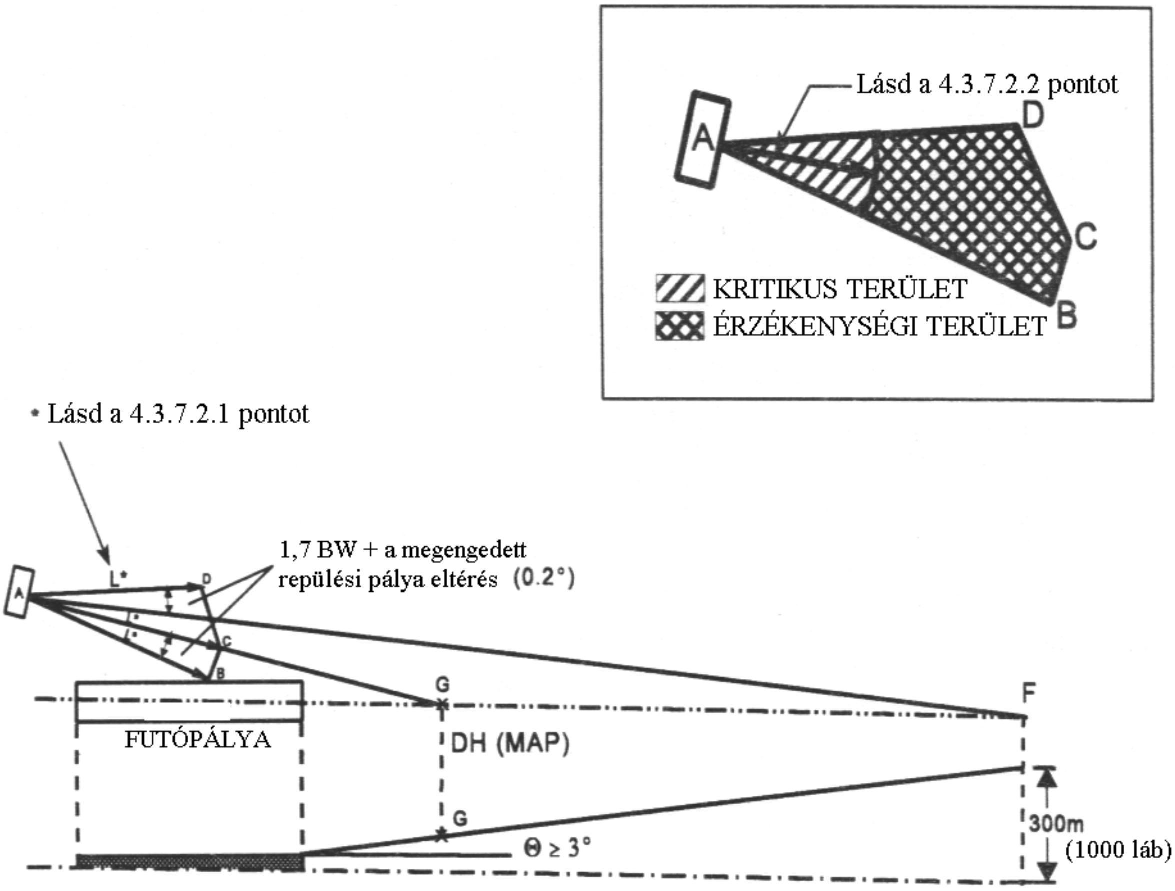
G-24. ábra: A jellemző magassági szög adó antenna kritikus

és érzékenységi területek / terek



Megjegyzés. - Az oldalnézet a G-23. ábrán került bemutatásra.

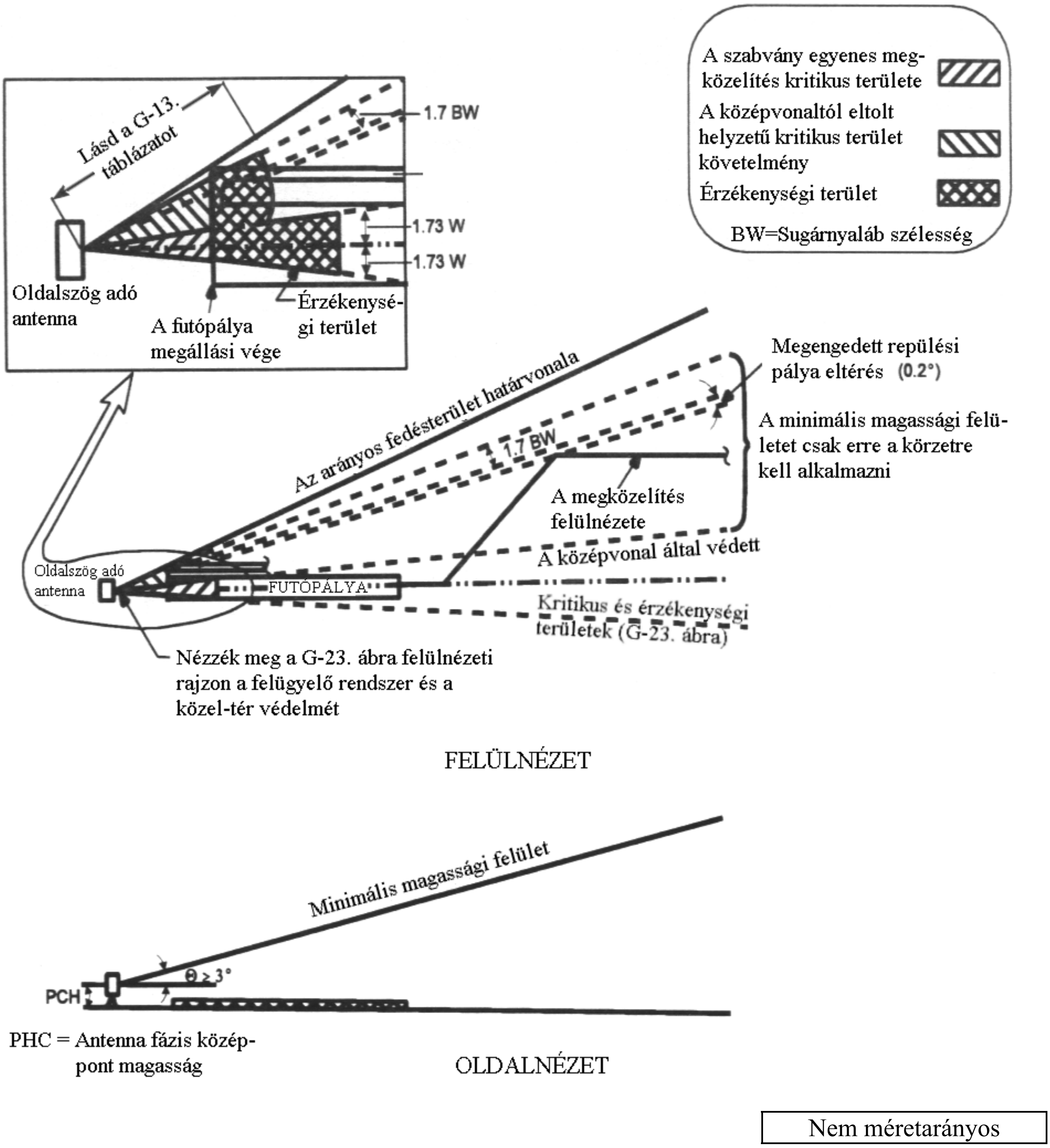
G-25. ábra: Jellemző oldalszög adó antenna kritikus és érzékenységi területek az oldalirányban eltolt helyzetben telepített oldalszög adóra



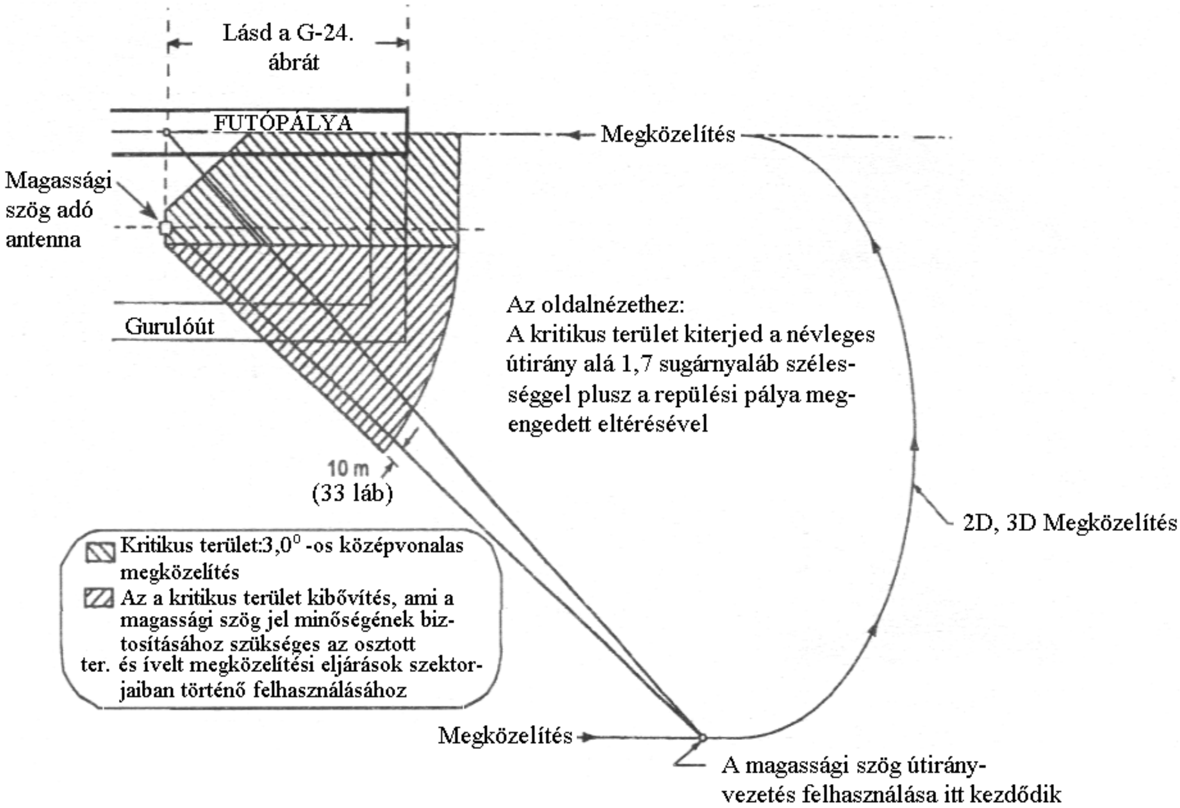
DH = Elhatározási magasság
MAP = Megszakított megközelítési pont
BW = Sugárnyaláb szélesség

Nem méretarányos

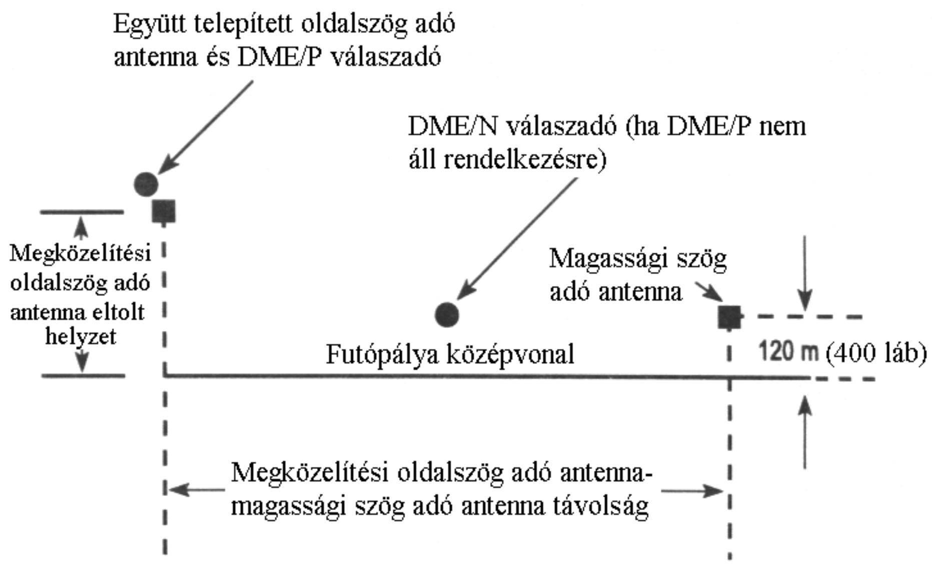
G-26. ábra: A jellemző oldalszög adó antenna kritikus és érzékenységi területek / tér a számított középvonalas eljárásra



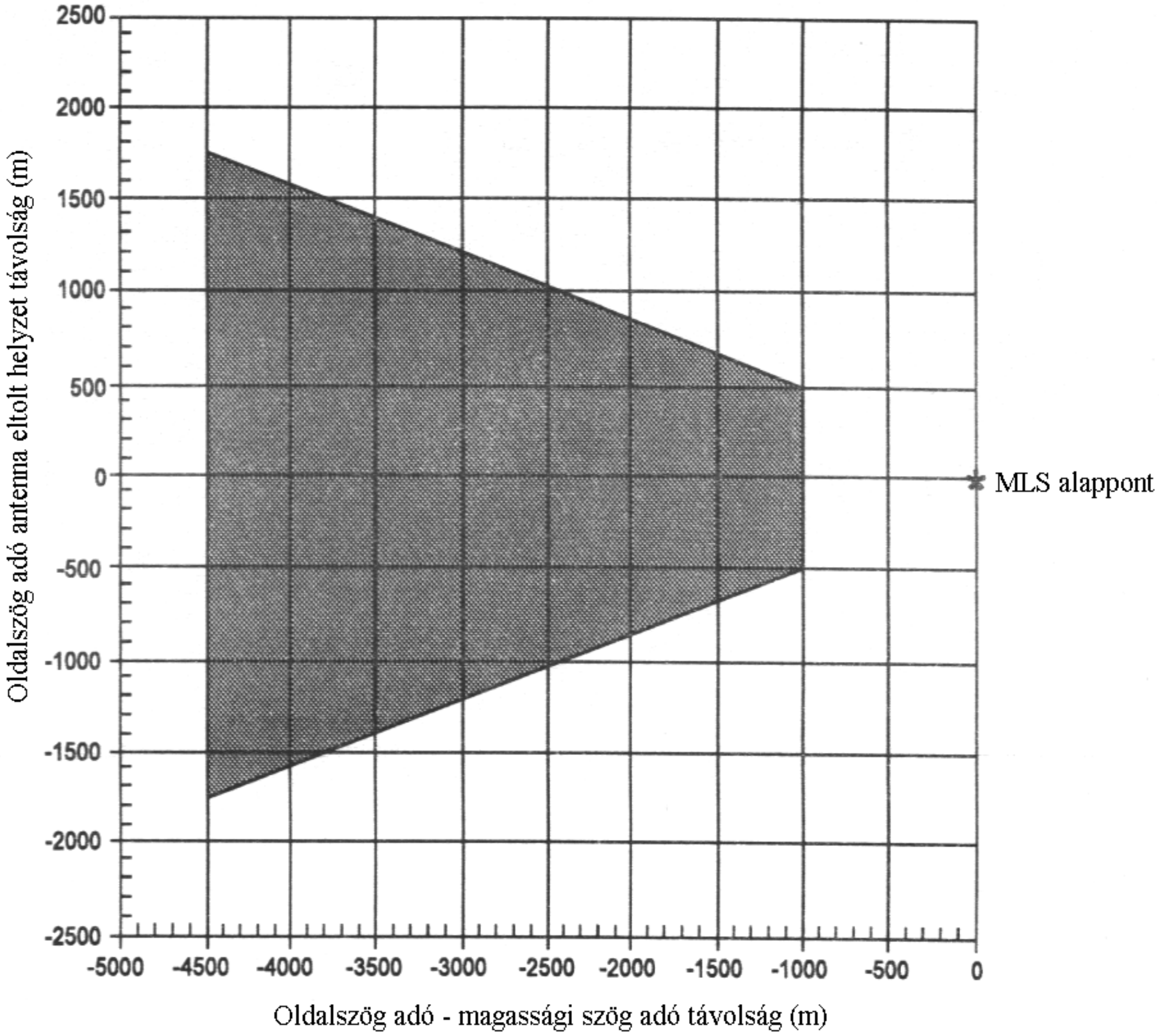
G-27. ábra: A jellemző oldalszög adó antenna kritikus és érzékenységi terület kibővítés az osztott területű és ívelt megközelítésekre



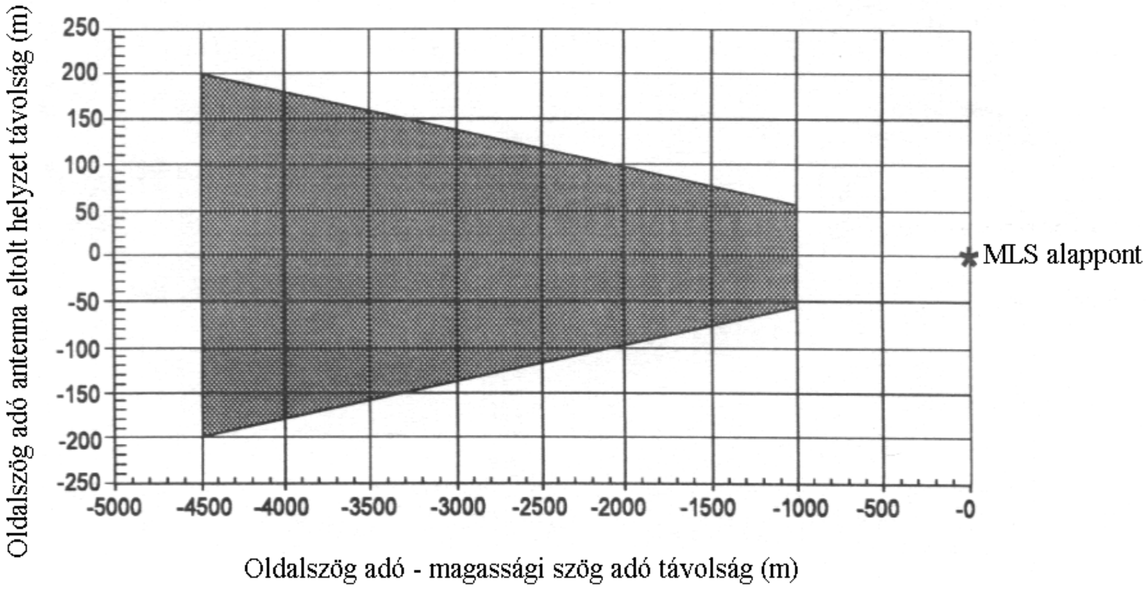
G-28. ábra: A jellemző magassági szög adó antenna kritikus terület kibővítés az osztott területű és ívelt megközelítésekre



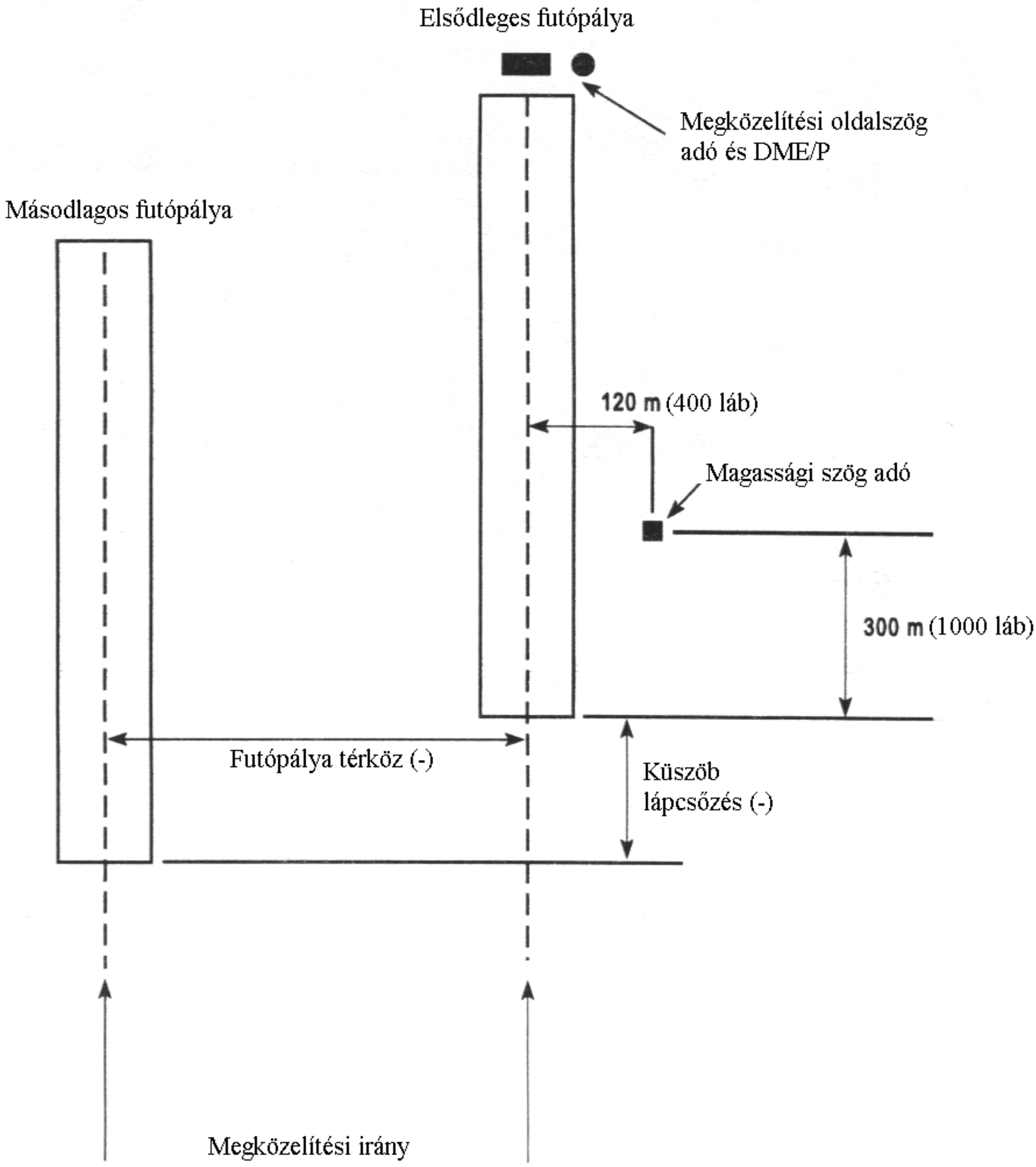
G-29. ábra: Földi berendezés geometria a számított középvonalas megközelítésekhez



G-30. ábra: Megengedett oldalszög adó antenna oldalirányú eltolt helyzetek a számított középvonalas megközelítésekre, DME / P (1. Szabvány) osztályozással

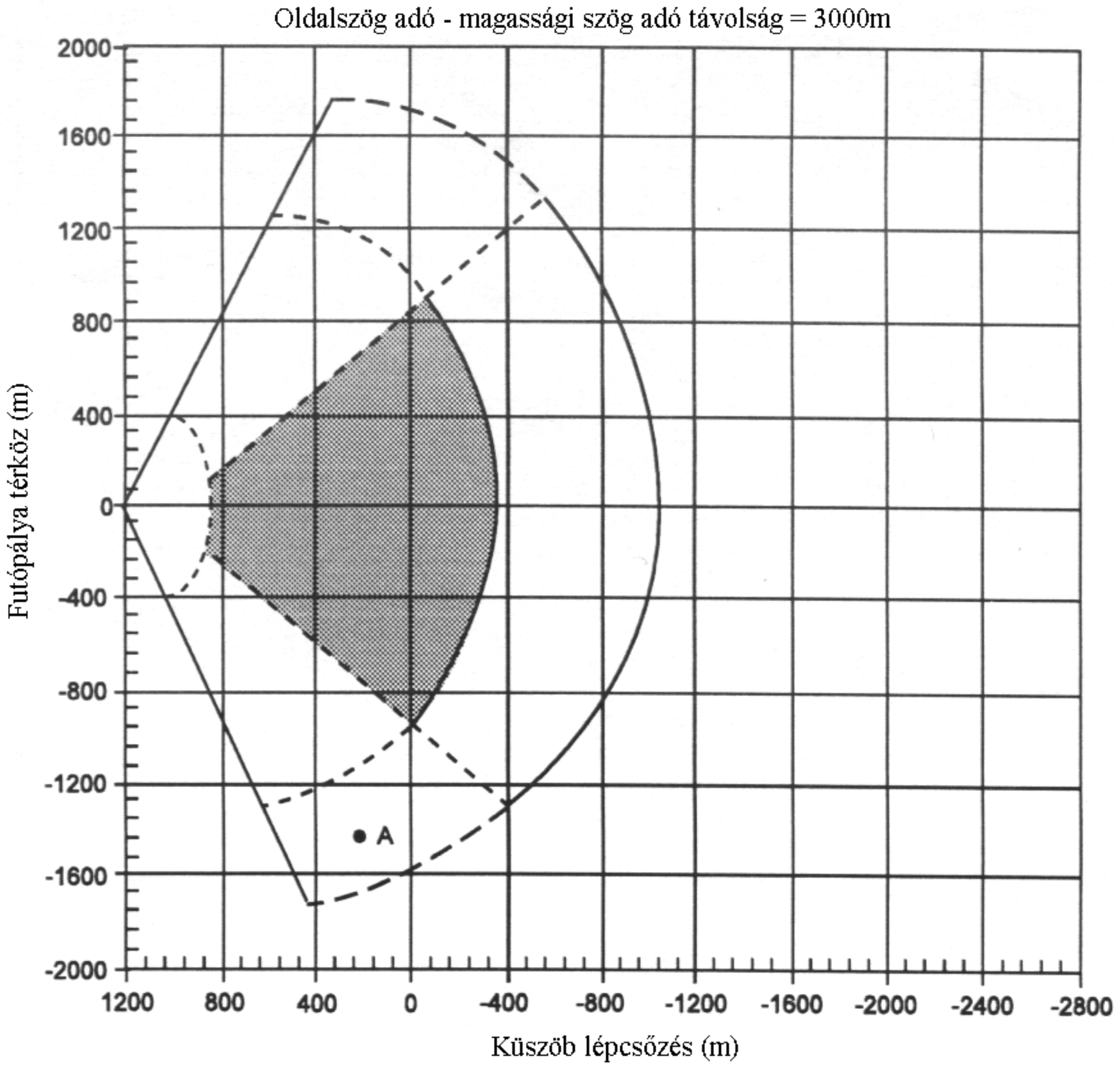


G-31. ábra: Megengedett oldalszög adó antenna oldalirányú eltolt helyzetek a számított középvonalas megközelítésekre, DME / N osztályozással



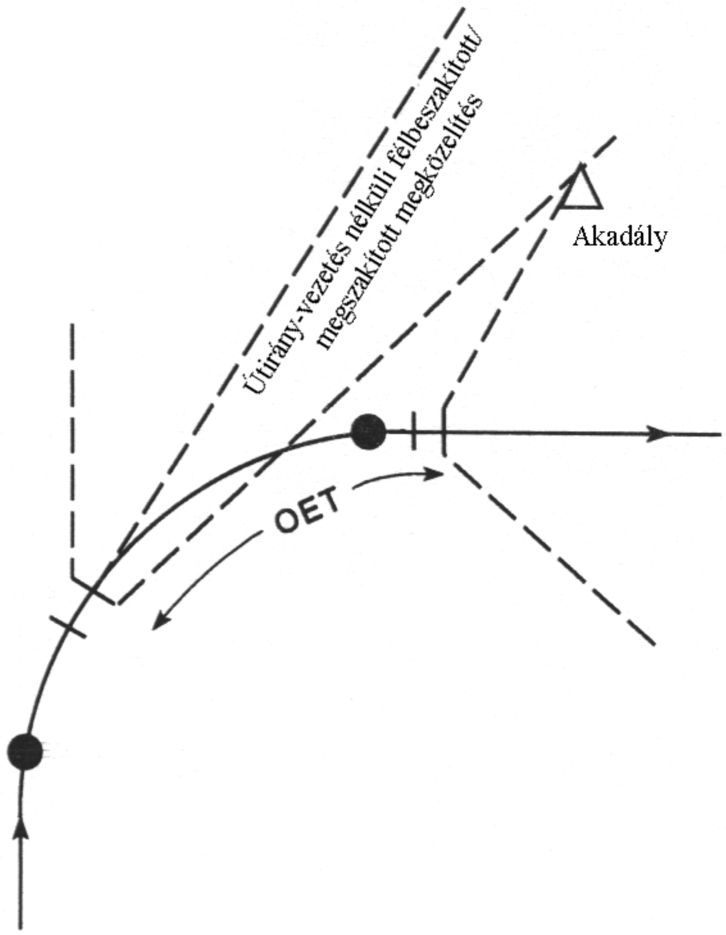
Megjegyzés. - A magassági szög adó antennára bemutatott helyzet azokkal a jellemző értékekkel került meghatározásra, amelyek a G-33. számú ábrán bemutatott adatok kiszámításához voltak felhasználva.

G-32. ábra: Futópálya és berendezés geometria a párhuzamos másodlagos futópályákra történő számított középvonalas megközelítésekre

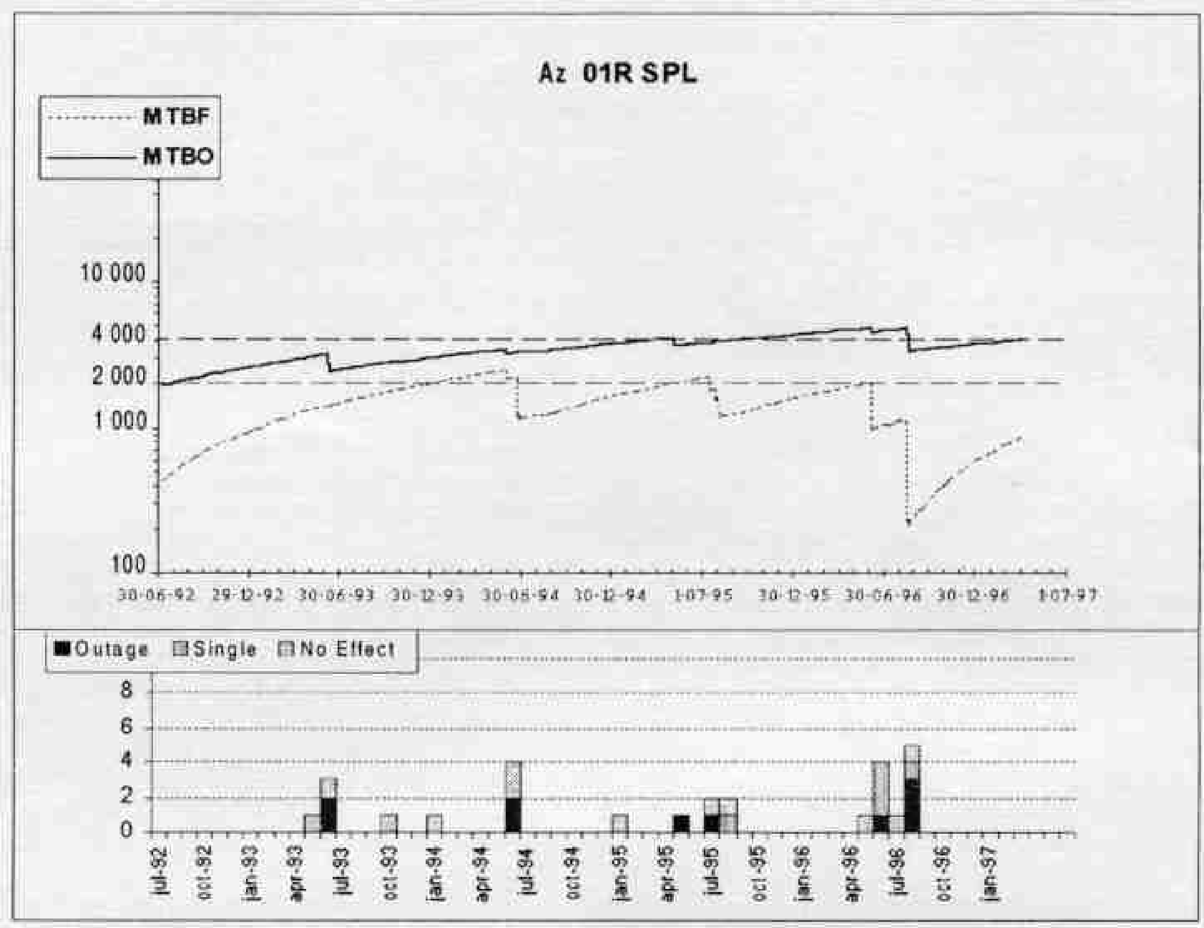


Megjegyzések:
1. A radiál határvonalak a magassági szög adó antenna teljesítményétől függőek.
2. Az A-pont a 13.7.6 pontban leírt példát mutatja be (jelöli).

G-33. ábra: Megengedett futópálya geometriák a párhuzamos másodlagos futópályákra történő számított középvonalas megközelítésekre



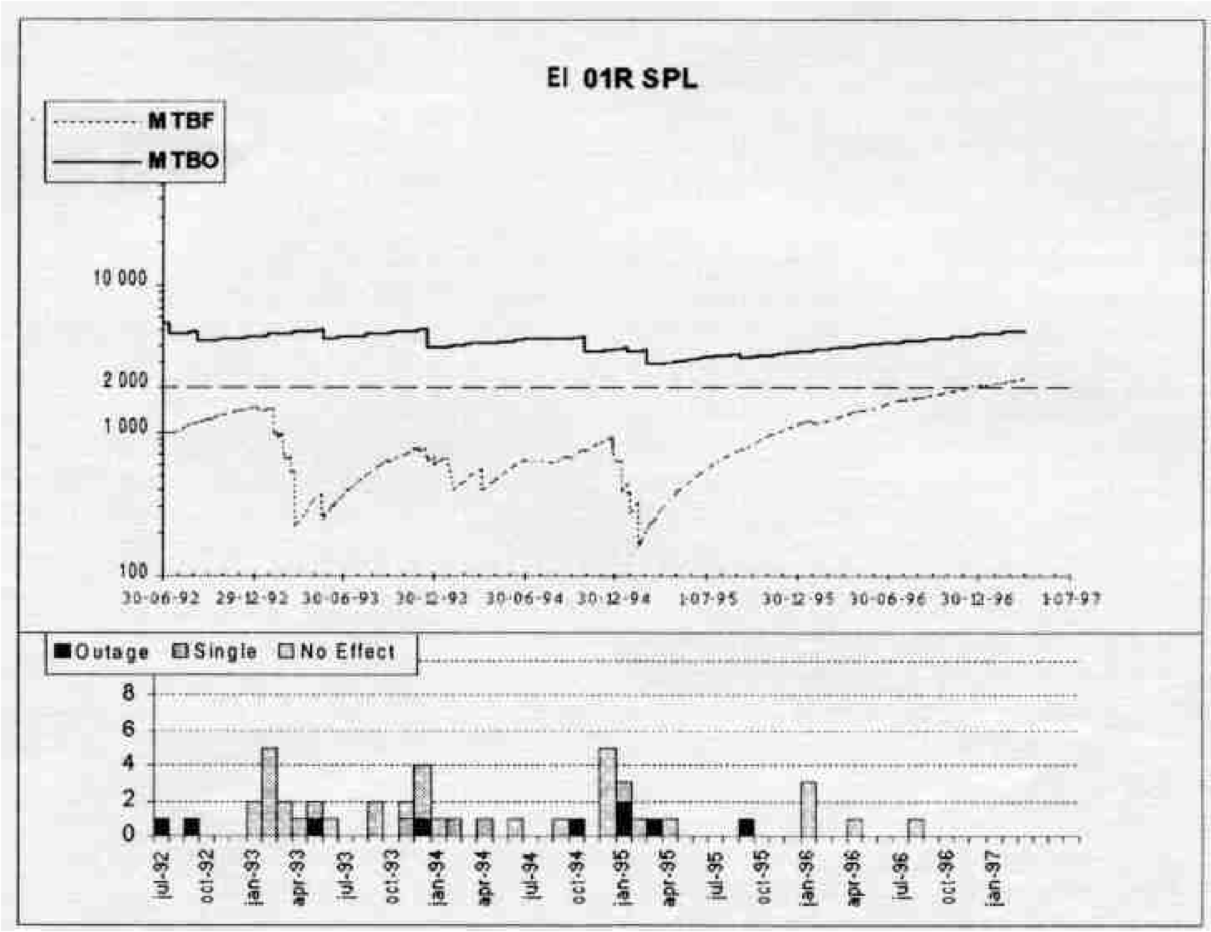
G-34. ábra: Az akadály általi veszélyeztetettségi idő (OET) meghatározása



Jelmagyarázat:

MTBF = Meghibásodások közötti átlagos idő
MTBO = Üzemszünetek közötti átlagos idő
Outage = Leállás
Single = Egyes
No Effect = Nincs hatás

G-35A. ábra: Példa az oldalszög adó üzemszünetek jegyzőkönyvi rögzítésére



Jelmagyarázat:

MTBF = Meghibásodások közötti átlagos idő
MTBO = Üzemszünetek közötti átlagos idő
Outage = Leállás
Single = Egyes
No Effect = Nincs hatás

G-35B. ábra: Példa a magassági szög adó üzemszünetek jegyzőkönyvi rögzítésére

ANNEX 10/II.
Légiforgalmi távközlés: Összeköttetési eljárások

A II kötet 6. kiadása – 2001 október
81. módosítással

NEMZETKÖZI SZABVÁNYOK, AJÁNLOTT GYAKORLATI ELJÁRÁSOK LÉGINAVIGÁCIÓS SZOLGÁLATOK SZÁMÁRA
LÉGIFORGALMI TÁVKÖZLÉS
10. ANNEX
A NEMZETKÖZI POLGÁRI REPÜLÉSI EGYEZMÉNYHEZ

MÓDOSÍTÁSOK, KIEGÉSZÍTÉSEK

A módosítások kiadását rendszeresen közlik az ICAO Journal-ban és a havonta megjelenő Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids (Melléklet, Kiegészítés az ICAO Kiadványok és Audio-vizuális Segédeszközök Listájához), melyeket e kiadványok tulajdonosai kísérjenek figyelemmel! Az alább biztosított táblázat e módosítások, kiegészítések nyilvántartására szolgál.

MÓDOSÍTÁSOK ÉS HIBÁK JEGYZÉKE

MÓDOSÍTÁSOK			
Sorszám	Hatálybalépés dátuma	Bevezetés dátuma	Bevezette
Hatodik kiadás (magában foglalja az 1-76 Módosításokat)	2001. július 16.	2001. november 1.	
77. Módosítás (a II. Kötetet nem érintette)			
78. Módosítás (a Tanács 2003. március 5-én fogadta el)	2003. július 14.	2003. november 27.	
79. Módosítás (a II. Kötetet nem érintette)			
80. Módosítás (a II. Kötetet nem érintette)	2005. július 11.	2005. november 24.	
81. Módosítás (a II. Kötetet nem érintette)			

ELŐSZÓ

Történeti áttekintés

A Légiforgalmi Távközlés Szabványait és Ajánlott Gyakorlatait a Tanács először 1949. május 30-án fogadta el, a Nemzetközi Polgári Repülési Egyezmény 37. Cikkelyében lévő előírásoknak megfelelően (Chicago, 1944.), és az Egyezmény 10. Annex-eként jelölte ki. Ezek 1950. március 1-én léptek hatályba. A Szabványok és Ajánlott Gyakorlatok a Hírközlési Szekció 1949. januárjában tartott Harmadik Ülésszaka ajánlásain alapulnak.

Egészen a Hetedik Kiadásig és azt is beleértve, az Annex 10t egy kötetben került kiadára, ami négy Részt foglalt magába, a hozzájuk kapcsolt mellékletekkel együtt: az: I. Rész "Berendezések És Rendszerek"-et, a II. Rész "Rádiófrekvenciák"-at, a, III. Rész "Eljárások"-at és a IV. Rész "Kódok és Rövidítések"-et.

A 42. Módosítással a IV. Rész törlésre került az Annex-ből; és az abban a részben elhelyezett kódok és rövidítések egy új dokumentumba, a Doc 8400-ba kerültek áthelyezésre.

A 44. Módosítás 1965. május 31-i elfogadásának eredményeként az Annex 10 Hetedik Kiadása két kötetbe került felosztásra: az I. Kötetbe (Első Kiadás), ami két részt tartalmazott: az I. Részt, a "Berendezések és Rendszerek,"-et és a II. Részt, a "Rádiófrekvenciák"-at foglalja magába, valamint a II. Kötetbe (Első Kiadás), ami a "Hírközlési Eljárások"-at tartalmazza.

A 70. Módosítás 1995. március 20-i elfogadásának eredményeként, az Amex 10 átszerkesztésre került úgy, hogy öt kötetet foglal magába: I. Kötet - Rádiónavigációs Berendezések; II. Kötet - Hírközlési Eljárások; III. Kötet - Hírközlési Rendszerek; IV. Kötet - Légtérellenőrző Radar és Összeütközés Elkerülő Rendszerek; és az V. Kötet - A Légiforgalmi Rádiófrekvencia Spektrum Felhasználása. A 70. Módosítással a III. és a IV. Kötet 1995-ben került kiadásra és az V. Kötet kiadása a 71.Módosítással volt tervezve.

A II. Kötet olyan anyagot tartalmaz, amelynek a jogi helyzete a Léginavigációs Szolgálatok Eljárásai (PANS) volt. Ezt az utóbbi anyagot a II. Kötet Első Kiadása előtt a PANS - Rádiótávbeszélő Eljárások (Doc 7181) foglalta magába, és ez a dokumentum most hatálytalanításra került.

Az "A" táblázat mutatja be az Annex 10 eredetét és a 43. Módosítást követő módosítások származását, a bennük lévő legfontosabb témák összefoglalásával együtt, ahol megfelelő, és azokat az időpontokat, amikor a Tanács a z Annex-et és a módosításokat elfogadta, illetve amikor azok hatályba léptek, és végül amikor alkalmazhatóakká váltak.

A Szerződő Államok tevékenysége

Az eltérések bejelentése. A Szerződő Államok figyelmét felhívják az Egyezmény 38. Cikkelye értelméből eredő azon kötelezettségükre, amely szerint a Szerződő Államokat felkérik arra, hogy jelentsenek be a Szervezetnek minden olyan eltérését és gyakorlatot, mely a nemzeti szabályaik és eljárásaik, valamint az ebben az Annex-ben lévő és ezt követően módosított Nemzetközi Szabványok között fennáll. Kérik a Szerződő Államokat, hogy azt a bejelentést terjesszék ki az ezen Annex-ben lévő Ajánlott Gyakorlatoktól való eltérésekre is, amennyiben az ilyen eltérés lényeges jelentőséggel bír a léginavigáció biztonsága szempontjából. Továbbá felkérik a Szerződő Államokat, hogy folyamatosan tájékoztassák a Szervezetet minden olyan eltérésről, mely ezt követően felmerül, vagy amennyiben bármely korábban bejelentett eltérés megszűnik. Egy, az eltérések bejelentésére vonatkozó külön felkérés kerül megkküldésre a Szerződő Államok részére azonnal ezen Annex egyes módosításainak elfogadását követően .

Felhívják továbbá az Államok figyelmét az Annex 15 azon előírásaira, amelyek szerint a nemzeti szabályaik és gyakorlataik, valamint az ICAO Szabványok és Ajánlott Gyakorlatok között felmerülő eltéréseket a Légiforgalmi Tájékoztató Szolgálaton keresztül tegyék közzé, az Egyezmény 38. cikkelyében lefektetett, az Államokra vonatkozó kötelezettségen felül.

A tájékoztatás közzététele. Az Annex 10-ben meghatározott Szabványoknak, Ajánlott Gyakorlatoknak és Eljárásoknak megfelelően biztosított, a légijármű üzemeltetéseket érintő berendezések, szolgálatok és eljárások változásait, azok életbeléptetését és megszüntetését be kell jelenteni, és az Annex 15 előírásainak megfelelően kell érvénybe helyezni.

Az Annex szövegének használata a nemzeti szabályozatokban. A Tanács 1948. április 13-án elfogadott egy határozatot, amelyben felhívja a Szerződő Államok figyelmét annak kívánatosságára, hogy saját nemzeti szabályaikban - amennyire csak lehetséges - használják azoknak az ICAO Szabványoknak a pontos kifejezésmódját, amelyek szabályás jellegűek, ugyanígy a Szabványoktól való eltéréseke jelölésére is, beleértve minden olyan kiegészítő nemzeti szabályzatot is, amely a léginavigáció biztonsága vagy szabályossága szempontjából fontos. Ahol csak lehetséges, ennek az Annex-nek a szövege szándékosan olyan módon került leírásra, hogy nagyobb szövegbeli változtatás nélkül be lehessen foglalni a nemzeti törvényalkotásba.

Az Annex 10 II. Kötetébe foglalt Légiforgalmi Szolgálatok Eljárásai nem képviseli azt a jogi helyzetet, mint amit a Tanács által az Egyezményhez csatolt Annex-ek Szabványai nyújtanak, és ennek megfelelően nem esik azon kötelezettség alá, amit az Egyezmény 38. Cikkelye szerinti ráruházna, azaz, hogy a "nem-alkalmazás" esetét jelentő eltérést közzé kell tenni. Azonban felhívják az Államok figyelmét a vonatkozó, az Annex 15-ben leírt előírásokira, hogy az Államok a Légiforgalmi Tájékoztató Kiadványukban vegyék jegyzékbe a saját eljárásaik és a vonatkozó ICAO eljárások közötti jlényeges különbségeket.

Az Annex alkotó-részeinek jogi helyzete

Egy Annex az alábbi alkotó-részekből épül fel, azonban nem feltétlenül található meg ezek mindegyike, de szükségszerűen megtalálhatók minden egyes Annex-ben; ezek az alábbi jogi helyzetet foglalják el:

1. – Az Annex-et alkotó anyagok a tulajdonképpeni:

a) *Szabványok és Ajánlott Gyakorlatok,* amelyeket a Tanács fogadott el az Egyezmény előírásainak megfelelően. Meghatározásuk a következő:

Szabvány: Minden olyan - a fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó - meghatározás, amelynek egységes alkalmazását a nemzetközi léginavigáció biztonsága szempontjából szükségesnek tekintenek, és amelynek a Szerződő Államok az Egyezmény értelmében eleget kell, hogy tegyenek; a teljesítés lehetetlensége esetén annak bejelentése a Tanács részére a 38. Cikkely alapján kötelező.

Ajánlott Gyakorlat: Fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó minden olyan meghatározás, amelynek egységes alkalmazását kívánatosnak tekintik a nemzetközi léginavigáció biztonsága, szabályszerűsége vagy hatékonysága érdekében, és amelynek teljesítésére a Szerződő Államoknak az Egyezmény értelmében törekedniök kell

b) *Függelékek:* a kényelmi szempontból különállóan csoportosított anyagok, de ezek részét képezik a Tanács által elfogadott Szabványoknak és Ajánlott Gyakorlatoknak.

c) *Meghatározás:* a Szabványokban és Ajánlott Gyakorlatokban használt azon szakkifejezések értelmezése, amelyek nem maguktól értetődőek, amennyiben azok nem rendelkeznek elfogadott szótári jelentéssel. Egy meghatározásnak nincs független jogi helyzete, de minden egyes Szabványnak és Ajánlott Gyakorlatinak, amelyben használják, elengedhetetlen részei, mivel a szakkifejezés jelentésének értelmi változása befolyásolná az előírás értelmét.

d) A *Táblázatok* és *ábrák* azok, amelyek kiegészítik vagy illusztrálják azokat a Szabványokat és Ajánlott Gyakorlatokat, amelyekre azokban utalnak; ezek a vonatkozó Szabványoknak és Ajánlott Gyakorlatoknak részét képezik, és ugyanazzal a jogi helyzettel rendelkeznek.

2. – A Tanács által a Szabványokhoz és Ajánlott Gyakorlatokhoz kapcsolódóan közzétételre elfogadott anyagok:

a) *Előszavak,* a Tanács tevékenységén alapuló történeti és magyarázó anyagokat tartalmazzák, és magukba foglalják az Államoknak - a Szabványoknak és Ajánlott Gyakorlatoknak és az Ajánlott Eljárásoknak - az Egyezményből és az Elfogadási Határozatból következő kötelezettségeinek magyarázatát is.

b) A *Bevezetések*, melyek magyarázó anyagot tartalmaznak az Annex részeinek, fejezeteinek vagy szakaszainak elején, hogy segítsenek a szöveg alkalmazásának megértésében;

c) A *Megjegyzések* a szövegbe foglalva, értelemszerűen, hogy a kérdéses Szabvánnyal vagy Gyakorlati Ajánlással kapcsolatban tényszerű tájékoztatást vagy támpontot adjanak, ezek azonban nem képezik a Szabványok vagy Gyakorlati Ajánlások részét;

d) *Mellékletek*, melyek a Szabványokat és Gyakorlati Eljárásokat kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához nyújtanak útmutatást.

Felelősség elhárítás szabadalmakra vonatkozóan

Felhívjuk a figyelmet annak a lehetőségre, hogy az ebben az Annex-ben lévő Szabványok és Ajánlott Gyakorlatok bizonyos elemei lehet, hogy szabadalom vagy egyéb szellemi tulajdoni jog tárgyát képezik. Az ICAO nem vállal felelősséget vagy kötelezettséget azért, hogy nem azonosította az ilyen jogok valamelyikét vagy mindegyikét. Az ICAO nem foglal állást semmilyrn "igényelt" találmány vagy egyéb szellemi tulajdoni jog fennállására, érvényességére, tárgyára vagy alkalmazhatóságára vonatkozóan, és azt "vállalja", hogy nincs felelősségeés kötelezettsége ennek megfelelően és erre vonatkozóan.

A nyelv kiválasztása

Ez az Annext négy nyelven került elfogadásra - angolul, franciául, oroszul és spanyolul. Minden egyesi Szerződő Államot felkérnek, hogy ezeknek a különféle nyelvű szövegeknek az egyikét válasszák ki nemzeti felhasználásra, valamint az Egyezményben meghatározott egyéb célokból, akár a közvetlen felhasználás, akár a saját nemzeti nyelvre történő fordítás útján, és ennek megfelelően értesítsék a Szervezetet.

Szerkesztési gyakorlat

A következő gyakorlat kerül következetes alkalmazásra abból a célból, hogy az egyes állítások jogi helyzete egyetlen pillantással megállapítható legyen: a *Szabványok* vékony antikva betű típussal vannak nyomtatva; az *Ajánlott Gyakorlatok* vékony dőlt betűvel vannak szedtve, jogi helyzetüket az **Ajánlás** szó jelzi; a *Megjegyzések* vékony dőlt betűvel vannak szedve, jogi helyzetüket a *Megjegyzés* szó jelzi.

A következő szerkesztési gyakorlatot követtük az előírások megfogalmazásánál: a Szabványok esetében a "kell", az Ajánlott Gyakorlatok esetében pedig a "kellene" felszólító igét használtuk.

Az ebben a dokumentumban alkalmazott mértékegységek megegyeznek a Nemzetközi Mértékegység Rendszerrel (SI) úgy, ahogy az a Nemzetközi Polgári Repülési Egyezmény 5. Annex-ében meghatároztásra került. Ott, ahol az Annex 5 megengedi a nem-SI mértékegységek alternatív használatát, azok zárójelben feltűntetve követik az alap mértékegységetl. Ahol a két rendszer szerinti mértékegységek szerepelnek, nem szabad feltételezni azt, hogy az értékek egyenlők és felcserélhetők. Azt azonban el lehet fogadni, hogy a biztonság azonos szintjét lehet elérni, ha bármelyik mértékegyég rendszert önállóan alkalmazzák.

Ennek a dokumentumnak egy részére való bármely utalás, amely egy számmal és/vagy címmel van azonosítva, annak a résznek az összes al-részét is magába foglalja.

Az Annex 10. II. kötet anyagának betűtformájára vonatkozóan, a Léginavigációsi Szolgálatok Eljárásai vékony dőlt betűkkel vannak szedve, és a jogi helyzetüket a **PANS** előtag jelzi.

"A" táblázat: Az Annex 10 - II. Kötetének módosításai

Módosítás	Forrás(ok)	Tárgya(k)	Elfogadás - Hatálybalépés - Bevezetés dátuma
44	A Hírközlési /COM/ Szekció Hetedik ülése	A II. kötet létrehozása azoknak az eljárásoknak a beépítése, amelyeket korábban a Doc 7181 - *PANS* - *"Rádiótávbeszélő Eljárás*ok" foglaltak magukba, szükségessé vált a khírközlési eljárásokra vonatkozó előírások általános átrendezése, és ez az új II. kötetben meg is történt.	1965. május 31 1965. október 1 1966. március 10
45	A Távgépíró Szakértők szak- csoportjának Hatodik. ülése; Negyedik Léginavigációs /AN/ konferencia	A Légiforgalmi Állandóhelyű Távközlési Szolgálat /AFTN/ eljárásainak több részletes megváltoztatása; az 5. és 6. fejezet módosítása, azoknak az eljárásoknak a jóval pontosabb közlése, amelyek a légijármű vezetője és a légiforgalmi irányító közötti közvetlen összeköttetése során történik, és a 3.7 pont - "A Rövidítések és kódok" átfogalmazása, egy, a 42. Módosítás által bevezetett nem szándékos jelentés helyesbítése.	1966. december 12 1967. április 12 1967. augusztus 24
46	A Légiforgalmi Irányítás /ATC/ Automatizálási Szakcsoport Ötödik ülése	A Légiforgalmi Irányítás /ATC/ számítógépében való fel- használásra tervezett Légiforgalmi Szolgálati /ATS/ közlemények továbbításának eljárásai.	1967. június 7 1967. október 5 1968. február 8
47	A Hírközlési / Üzemeltetési /COM/OPS/ Szekció ülése	Új, egyszerűsített Légiforgalmi Mozgó-szolgálati Vészhelyzeti Eljárások bevezetése, amelyek alkalmasabbak a nemzetközi polgári légiközlekedés speciális követelményeihez.	1967. december 11 1968. április 11 1968. augusztus 22
48	A Távgépíró Szakértők Szak- csoportjának Hetedik. ülése	Változtatások bevezetése a közlemények osztályozásában és a telex-eljárásokban, az AFTN automatikus üzemelésében szerzett tapasztalatok fényében.	1969. január 23 1969. május 23 1969. szeptember 18

49	Az Automatizált Adatcsere Rendszerek Szakcsoportjának Első ülése; Hatodik Léginavigációs /AN/ konferencia	Előírás a 7-bites kód használatára adattovábbításra közepes jelátviteli sebességnél; a légiforgalmi mozgó szolgálat közleményeinek kategóriáira vonatkozó előírások bevezetése. A Regionális Kiegészítő Eljárások állandósításának és beterjesztésének tanulmányozása alapján, ez a következő témákra vonatkozó eljárásokat vonja maga után: Megfelelő kikerülő útvonal-listák az AFTN hírközlési összeköttetési központokban; a GG vagy magasabb prioritás jelzéssel ellátott AFTN közlemények korai feladása; a 121,5 MHz frekvencia figyelése hosszú-távú víz fölötti repülések során; a légijármű által leadott légijelentést, vagy meteorológiai tájékoztatást tartalmazó	1970. június 1 1970. október 1 1971. február 4
50	Az 5. Észak-Atlanti Körzeti Légi- navigációs /NAT RAN/ ülés; az Automatizált Adatcsere Rendsze- rek Szakcsoport Második ülése; Léginavigációs tanulmány a Körzeti Léginavigációs /RAN/ ülés ajánlásainak világméretű alkalmazhatóságáról; Hatodik Léginavigációs /AN/ konferencia	A "Hertz (Hz)" szó bevezetése a "ciklus per szekundum (c/s)" helyett, mint a frekvencia elektromos és rádiótechnikai mértékegysége; változások az AFTN forgalmazás naplóinak rövid- és hosszú-távú megőrzéséről és a hírközlési összeköttetési naplók 30 napos megőrzéséről szóló előírásokban; a II. Kötet Bevezetésének kibővítése a 7-bites kódolt karakterkészletről szóló anyaggal; az "ATS közvetlen beszéd-üzemű kör", a "Meteorológiai operatív csatorna" és a "Meteorológiai operatív távközlési hálózat" meghatározások bevezetése; a 3. és 4. Fejezetek előírásainak újraszervezése, azzal, hogy a 3. Fejezetbe csoportosították a nemzetközi légiforgalmi távközlési szolgálat négy részére vonatkozó általános előírásokat, a 4. Fejezetbe pedig a légi- forgalmi állandóhelyű szolgálatra vonatkozó előírásokat; az AIREP formátumú légi-jelentések rögzítésére vonatkozó előírások.	1972. március 24 1972. július 24 1972. december 7
51.	Hatodik EUM Körzeti Légi- navigációs ülés	Az AFTN közlemények előre meghatározott szétosztásának rendszerére vonatkozó előírások bevezetése.	1972. december 11 1973. április 11 1973. augusztus 16
52[1]			
53[1]			

54[2]	Az Automatizált Adatcsere Rend- szerek Szakcsoportjának Negyedik ülése	Az adatcsere sebességére vonatkozó kereszt-referenciák beépítése az I. Kötet I. Része 4. Fejezetének 4.12 pontjába és a II. Kötet Bevezetésébe.	1974. június 17. – –
55[1]			
56[1]			
57	Ázsia / Óceánia Körzeti Léginavi- gációs Ülés	Módosítások bizonyos kijelölt területeket keresztező légijárművek személyzetének a 121,5 MHz kényszerhelyzeti ultrarövidhullámú /VHF/ frekvencia figyelésének kötelezettségére vonatkozóan, valamint az óceáni hajó-rádióállomások kizárása azoknak a légi- forgalmi állomásoknak a köréből, amelyekkel a rádiókapcsolat felvételét meg lehet kísérelni a levegő-föld összeköttetés megszakadása esetén.	1976. június 16 1976. október 16 1977. október 6
58	Az Automatizált Adatcsere Rend- szerek Szakcsoportjának Hatodik ülése	A Légiforgalmi Állandóhelyű Szolgálat /AFS/ közleményeinek megengedett tartalmára, és az AFTN rendszerben torzítottan érkező közlemények ismétlésének kérésére vonatkozó módosítás, valamint egy közlemény formátum bevezetése a 7-bites kódolt karakter-készletre.	1977. június 27 1977. október 27 1978. február 23
59	Hírközlési /COM/ Szekció ülése (1976.)	A Légiforgalmi Állandóhelyű Távközlési Szolgálat /AFTN/ közlemények cím-részére vonatkozó módosítás.	1977. december 14 1978. április 14 1978. augusztus 10
60	Az Európai /EUR/ Léginavigációs Tervező Csoport Nyolcadik ülése; az Európa / Észak-Amerika / /Észak-Atlanti /EUR/NAM/NAT/ Körzeti Ttervező Csoport Harmadik ülése	Az ultrarövidhullámú /VHF/ 25 kHz-es csatornák kijelölése; az AFTN közlemények rövid-távú megőrzése.	1978. december 4 1979. április 4 1979. november 29

61	Az Automatizált Adatcsere Rend- szerek Szakcsoportjának Hetedik ülése; Hírközlési /COM/ Szekció ülés (1978.)	A Nemzetközi Távközlési Unió (ITU) által használt marginális sorozatszámok új sorozatának bevezetése és a "Rádiószabályzat" szakkifejezés tisztázása; változások a Légiforgalmi Állandóhelyű Távközlési Szolgálat /AFTN/ meghatározásában; az "operatív repülés-üzemi felügyeleti összeköttetések" meghatározásának bevezetése; új előírások a rövidített címzésre vonatkozóan; változások a maximális közlemény-hosszra vonatkozó elő- írásokban; változások a repülések rendszerességével kapcsolatos közleményekre vonatkozó előírásokban.	1979. december 10 1980. április 10 1980. november 27
62	Az Automatizált Adatcsere Rend- szerek Szakcsoportjának Nyolcadik ülése	Változások és kiegészítések a szolgálati közleményekre, a többsoros címzésre és a rövid címzésre vonatkozó előírásokban; változások és kiegészítések a csatorna-ellenőrző adásokra és a vezérelt áramkörök protokoljának használatára vonatkozó elő- írásokban; változások és kiegészítések a sérült közlemények észlelésére vonatkozó előírásokban; kiegészítés az AFTN közleményeknek kód- és bájt- független vonalakon és hálózatokon történő leadására vonatkozó előírásokhoz.	1981. december 14 1982. április 14 1982. november 25
63	Az Automatizált Adatcsere Rend- szerek Szakcsoportjának Kilencedik ülése	A közlemények elsőbbségére és az elsőbbség jelzőkre vonatkozó előírások változása.	1982. december 13 1983. április 13 1983. november 24
64	Léginavigációs Bizottság	Új és javított rádiótávbeszélő eljárások bevezetése a légiforgalmi mozgó szolgálatban történő használatra.	1983. március 30 1983. július 29 1984. június 7

65	A Léginavigációs Bizottságnak /ANC/ a dátum/idő meghatározási módjára vonatkozó ajánlásai; Hírközlési / Meteorológiai /COM/MET/ Szekció ülés (1982); A Légiforgalmi Szolgálat Adat- gyűjési, - feldolgozási és - továbbítási Szakcsoport /ATS/ Harmadik ülése; az Automatizált Adatcsere Rendszerek Szakcsoportjának Tizedik ülése	Egyesített világ-idő (UTC); változások az AFTN közlemények szöveg-hosszában és a mozgási és irányítási közlemények elsőbbségei; az AFTN csatornák tesztelésének eljárásai; új anyag az AFTN címek rövidítéséről a "C" Mellékletben.	1984. december 6 1985. április 6 1985. november 21
66[1]			
67	Nyolcadik ülés, a Tanács 10.ülésszaka; a Hírközlési/Meteo-rológiai /COM/MET/ Szakcsoport ülése (1982.); Léginavigációs Bizottság	Az ICAO új három-betűs jelölések eredményeként változások és szerkesztési átrendezések az AFTN eljárásokban; változások az AFTN-re vonatkozó, előre meghatározott szétosztási rendszerben; egy új eljárás bevezetése az egész százasoknak a továbbítási eljárásaira vonatkozóan; új eljárások bevezetése az ultrarövid- hullámú /VHF/ levegő-levegő összeköttetési csatornák használatára; az Annex 10 II. Kötet összes angol nyelvű változatának a szerkesztői átrendezése a jelenlegi angol nylevű rádiótelefon kifejezésekben.	1987. március 16 1987. július 27 1987. október 22
68	Léginavigációs Bizottság	Új eljárások a légijárművek rádiótelefon hívójelének szabályokba foglalásához; változtatások a légijárművek káros interferencia hatások elleni védelmére; új eljárásoka 121,5 MHz-es frekvencia figyelésére vonatkozóan.	1990. március 29 1990. július 30 1990. november 15
69	Hírközlési/Meteorológiai /COM/MET/ Szakcsoport ülés (1982.); Hírközlési/Meteorológiai/ Üzemeltetési /COM/MET/OPS/ Szakcsoport ülés (1990)	Változások az AFTN közlemény eljárásokban és egy kiegészítő anyag a világméretű területi /meteorológiai/ előrejelző rendszer (WAFS) távközlési követelményeivel kapcsolatban; kiegészítő anyag az ultrarövidhullámú /VHF/ levegő-föld adatkapcsolat összeköttetésekre vonatkozólag és a VHF eltolt-frekvenciájú vivőhullám rendszerekre vontkozó anyag változásai.	1993. március 22 1993. július 26 1993. november 11

70 (5. kiadás)	Léginavigációs Bizottság	Új kifejezések a számoknak a rádiiótelefonon történő továbbítására. Számos változás az AFTN eljárásokban a közlemények elfogadásával és továbbításával, a közlemények kategóriáival kapcsolatban, és a rádiótávbeszélőre vonatkozó elavult anyag törlése.	1995. március 20 1995. július 24 1995. november 9
71	Léginavigációs Bizottság; a Légi-forgalmi Távközlési Hálózat Szak- csoport (ATNP) első ülése	Változások a Légiforgalmi Állandóhelyű Távközlési Hálózat eljárásaiban.	1996. március 12 1996. július 15 1996. november 7
72	Léginavigációs Bizottság; a Légi-forgalmi Mozgó-szolgálati Összeköttetések Szakcsoport (AMCP) negyedik ülése	A rádiótelefon / R/T / eljárások módosítása a 8.33 kHz-es csatornaosztás bevezetését érintően; a VDL (VHF Data Link) meghatározásának törlése.	1997. március 12. 1997. július 21 1997. november 6
73	Léginavigációs Bizottság; a Légi-forgalmi Távközlési Hálózat Szak- csoport (ATNP) második ülése	A Légiforgalmi Állandóhelyű Távközlési Hálózaton /AFTN/ keresztül továbbított meteorológiai közlemények összeállításának változásai; az Emberi Tényezőkkel (Human Factors) kapcsolatos anyagok bevezetése	1998. március 19. 1998. július 20. 1998. november 5.
74	Léginavigációs Bizottság	A légijárművezetők közötti /összeköttetési/ levegő-levegő csatorna bevezetése.	1999. március 18. 1999. július 19. 1999. november 4.
75[3]			
76 (6. kiadás)	A Légiforgalmi Távközlési Hálózat Szakcsoport (ATNP) harmadik ülése; a Titkárság tevékenysége a Több résztvevő Ügynökséget érintő Légiforgalmi Szolgálai Eljárásokat Koordináló Munkacsoport (MAPCOG) javaslatai alapján; a Berendezés-függő Automatikus Légtér-ellenőrzési Szakcsooport (ADSP) ötödik ülése; a Légi-forgalmi Mozgó Szolgálati Összeköttetések Szakcsoport (AMCP) hetedik ülése; Titkárság	A Légiforgalmi Állandóhelyű Szolgálat (AFS) eljárási előírásai a beszéd-üzemű és adat-összeköttetési elemekre; az egyedüli, a légijárművezetők közötti levegő-levegő frekvencia bevezetésének eredményéből következő változások; az elavult rádió-távíró technikák referenciáinak törlése; rádiótelefon élőszavas és szabvány kifejezések; számos adatkapcsolati alkalmazásra vonatkozó technológia; a Nemzetközi Távközlési Unió (ITU) Rádiószabályzatára vonatkozó referenciák felfrissítése.	2001. március 12. 2001. július 16. 2001. november 1.

77[4]			
78	Léginavigációs Bizottság	Nyelvi jártassági követelmények.	2003. március 5. 2003. július14. 2003. november 27.
79	_	Nincs változás.	
80.	Európai Légi-navigációs Tervező Csoport (EANPG); Légiforgalmi Távközlési Szak-csoport (ACP)	A VHF rádiótávbeszélő összeköttetési adó- csatornák jelölési el-járásainak változtatásai.	2005. febr. 25. 2005. júl. 11. 2005. nov. 24.
81..	Nincs változás		

1 A módosítás csak az I. Kötetet érintette.

2 Nem érint semmilyen Szabványt vagy Ajánlott Gyakorlatot.

3 Csak a III. és V. Kötetet érintette.

4 Nem érinti a II. Kötetet.

Bevezetés

A nemzetközi légiforgalmi távközlési szolgálat célja a nemzetközi léginavigáció biztonságához, rendszerességéhez és hatékonyságához szükséges távközlési hálózat és rádióberendezések biztosítása.

Ebben a kiadványban rögzítjük a nemzetközi Légiforgalmi Távközlési Szolgálat eljárásait, világméretű használatra. Elismerjük, hogy bizonyos esetekben szükség lehet Kiegészítő Eljárásokra annak érdekében, hogy megfeleljenek az ICAO Körzetek konkrét követelményeinek. Bármely ilyen célra javasolt Kiegészítő Eljárásnak, a körzetre specifikus követelménynek kell lennie, és nem lehet olyan előírás, amely bele van foglalva a világméretű ICAO Eljárásokba, vagy azokkal ellentmondásban van.

Ebben a dokumentumban helyt adtunk az ITU Rádiószabályzat bizonyos elemeinek, ahol ez helyénvaló. Felhívjuk ezen Eljárások felhasználóinak figyelmét arra, hogy a Nemzetközi Távközlési Egyezmény Rádiószabályzat függeléke átfogó természetű, ezért minden ide tartozó esetben alkalmazni kell.

A "Rádiószabályzat"-ra történő minden hivatkozás a Nemzetközi Távközlési Unió (ITU) által kiadott Rádiószabályzatra értendő.

A kommunikációs eljárásokat a DOC 8400-ban található Rövidítésekkel és Kódokkal, valamint azokkal az
egyéb kódokkal és rövidítésekkel együtt kell alkalmazni, amelyeket az ICAO a távközlésben történő használatra jóváhagy.

A II. Kötet számos olyan, tájékoztatások cseréjére vonatkozó eljárást tartalmaz, amelyet elsősorban a kis modulációs sebességű távközlésre dolgoztak ki, ahol a 2-es és 3-as számú Nemzetközi ABC kódolt karakterei használatosak. A közepes és nagy jelátviteli sebességnél használt 5-ös számú Nemzetközi ABC-re (IA-5) vonatkozó előírások a 10-es Annex III. kötetében találhatók.

1. FEJEZET: MEGHATÁROZÁSOK

Amikor az ebben a kiadványban lévő kifejezéseket használjuk, akkor a jelentésük az ebben a fejezetben meghatározott jelentésben.

1.Megjegyzés: További speciális távközlési szakkifejezések és jelentéseik az "A" melléklet jegyzékében kerültek felsorolásra..

2.Megjegyzés: A "Rádiószabályzat"-ra történő minden hivatkozás a Nemzetközi Távközlési Unió (ITU) által kiadott Rádió- szabályzatra értendő. A "Rádiószabályzat"-ot rendszeresen kiegészítik azokkal a határozatokkal, melyek a rendesen 2 – 3 évenként megtartott World Radiocommunication Conference *(Rádiókommunikációs Világ Tanácskozás)* Záróokmányában *jelennek meg. Az ITU folyamatban lévő ügyeiről - mivel azok kihatással vannak a légiközlekedésben használt rádióberendezések frekvencia használatára - a* "Radio Frequency Spectrum Requirements for Civil Aviation" *(Polgári Légiforgalmi Rádiófrekvencia-tartomány Követelményeinek Kézikönyve) tartalmaz további információkat, beleértve az ICAO jóváhagyott hivatalos célkitűzéseiről, álláspontjáról szóló hivatalos kiadványt is (Doc 9718).*

1.1 Szolgálatok

Aeronautical broadcasting service - *Légiforgalmi rádióadó szolgálat*.
A léginavigácóval kapcsolatos tájékoztatások adására létesített rádióadó szolgálat.

Aeronautical fixed service (AFS) - *Légiforgalmi állandóhelyű szolgálat.*
Távközlési szolgálat meghatározott állandóhelyű pontok között, amelyet elsősorban a léginavigáció biztonsága és a légiforgalmi szolgálatok rendszeres, hatékony és gazdaságos üzemelése céljából nyújtanak.

Aeronautical fixed telecommunication network (AFTN) - *Légiforgalmi állandóhelyű távközlési hálózat*. Légiforgalmi állandóhelyű áramkörök világméretű rendszere, amely a légiforgalmi állandóhelyű szolgálat részét képezi, és amelyet az azonos vagy kompatibilis kommunikációs jellemzőkkel rendelkező légiforgalmi állandóhelyű állomások közötti közlemény- és/vagy digitális adatcsere céljából hoztak létre.

Aeronautical mobile service (RR S1.32) - *Légiforgalmi mozgó szolgálat (RR S1.32)*. Mozgó szolgálat légiforgalmi állomások és légijármű-állomások között, vagy légijármű-állomások között, amelyben mentőtutaj-állomások is részt vehetnek; a kényszerhelyzeti helymeghatározó rádió-irányjeladó állomások szintén részt vehetnek ebben a szolgálatban a kijelölt vész- és kényszerhelyzeti frekvenciákon.

Aeronautical mobile (R)* R - Route = Útvonal
* ***service (RR S1.33)*** - *Légiforgalmi mozgó "R"* szolgálat (RR S1.33)*. Olyan légiforgalmi mozgó szolgálat, amelyet a repülések biztonságával és rendszerességével kapcsolatos rádiólevelezés céljára tartanak fenn, elsősorban az nemzeti és nemzetközi polgári légiútvonalakon.

Aeronautical mobile-satellite service (RR S1.35)- *Légiforgalmi mozgó-műholdas szolgálat (RR S1.35)*
Olyan mozgó-műholdas szolgálat, amelyben a mozgó földi állomások, légijárművek fedélzetén találhatók. A mentőtutaj-állomások és a kényszerhelyzeti helymeghatározó rádió-helyjeladó állomások szintén részt vehetnek ebben a szolgálatban.

Aeronautical mobile-satellite (R)* R - Route = Útvonal
* ***service (RR S1.36)***- *Légiforgalmi mozgó-műholdas "R"* szolgálat (RR S1.36)*. Olyan légiforgalmi mozgó-műholdas szolgálat, amelyet a repülések biztonságával és rendszerességével kapcsolatos rádiólevelezésre tartanak fenn, elsősorban a nemzeti és nemzetközi lpolgári égiútvonalakon.

Aeronautical radio navigation service (RR S1.46) - *Légiforgalmi rádiónavigációs szolgálat (RR S1.46)*. A légijárműveken történő felhasználásra, azok hatékony és biztonságos üzemelése érdekében nyújtott rádiónavigációs szolgálat.

Megjegyzés. - Referenciaképpen, valamint a légiforgalmi rádiónavigációs szolgálat fenti meghatározásának jobb megértése végett hivatkozunk az alábbi Rádiószabályzatokra:
RR S1.10 Rádiónavigáció: *Navigáció céljára használt rádió-helymeghatározás, beleértve az akadályokra történő figyelmeztetést is.*

RR S1.9 Rádió-helymeghatározás : *Egy tárgy helyzetének, sebességének és/vagy egyéb jellemzőinek meg- határozása, vagy ezekre a paraméterekre vonatkozó információ megszerzése, a rádióhullámok terjedési tulajdonságainak felhasználásával.*
Aeronautical telecommunication service - *Légiforgalmi távközlési szolgálat.* Bármely légiforgalmi céllal nyújtott távközlési szolgálat.

International telecommunication service - *Nemzetközi távközlési szolgálat.* Távközlési szolgálat különböző Államok hivatalai vagy állomásai között, vagy olyan mozgó állomások között, amelyek különböző Államokhoz tartoznak, vagy különböző Államokban vannak**.**

1.2 Állomások

Aerodrome control radio station - *Repülőtéri légiforgalmi irányítás rádióállomása*. A repülőtéri irányítótorony és a légijárművek, vagy mozgó légiforgalmi állomások közötti rádiólevelezést biztosító állomás.

Aeronautical fixed station - *Légiforgalmi állandóhelyű állomás.*
A légiforgalmi állandóhelyű szolgálat állomása.

Aeronautical station (RR S1.81)- *Légiforgalmi állomás (RR S1.81).*
A légiforgalmi mozgó szolgálat földi állomása. Bizonyos esetekben a légiforgalmi állomás lehet például hajó fedélzetén, vagy tengeri bója fedélzetén is.

Aeronautical telecommunication station - *Légiforgalmi távközlési állomás*.
A légiforgalmi távközlési szolgálat állomása.

AFTN communication centre - *AFTN kommunikációs (távközlési) központ*.
Olyan AFTN állomás, amelynek elsődleges feladata a hozzá kapcsolt további AFTN állomásoktól (vagy állomásoknak) az AFTN forgalmazás átjátszása (közvetítése), vagy ismételt feladása.

AFTN destination station - *AFTN célállomás*.
Az az AFTN állomás, amelynek a közleményt és/vagy digitális adatokat megküldték, feldolgozásra, illetve a címzettnek történő kézbesítésre.

AFTN origin station - *AFTN feladó állomás*.
Az az AFTN állomás, amely a közleményt és/vagy digitális adatokat elfogadta ahhoz, hogy az AFTN hálózaton keresztül továbbítsa.

AFTN station - *AFTN állomás.*
Olyan állomás, amely a légiforgalmi állandóhelyű távközlési hálózat (AFTN) részét képezi és akként is üzemel, egy Állam fennhatósága vagy el1enőrzése alatt.

Air-ground control radio station - *Levegő-föld irányítási rádióállomás*.
Olyan légiforgalmi távközlési állomás, amelynek elsődleges feladata egy adott területen belül a légijárművek üzemeltetésével és irányításával kapcsolatos kommunikáció kezelése.

Aircraft station (RR S1.83) - *Légijármű-állomás (RR S1.83)*
A légiforgalmi mozgó szolgálat mozgó állomása, amely nem mentőtutaj-állomás, és amely légijármű fedélzetén van elhelyezve.

Communication centre - *Kommunikációs központ*.
Légiforgalmi állandóhelyű állomás, amely a hozzá közvetlenül kapcsolódó több más légiforgalmi állandóhelyű állomástól (vagy állomásnak) a távközlési forgalmazás átjátszását (közvetítését), vagy ismételt feladását végzi.

Mobile surface station - *Mozgó földi állomás*.
A légiforgalmi távközlési szolgálatban résztvevő állomás, amely nem légijármű-állomás, és amelyet mozgás közbeni, vagy előre nem meghatározott pontokon történő megállás közbeni használatra szánnak.

Network station - *Hálózati állomás*.
Rádiótávbeszélő hálózat részét képező légiforgalmi állomás.

Radio direction finding (RR S1.12) - *Rádió-iránymérés (RR S1.12)*.
Rádió helymeghatározás, amelynek során rádióhullámok vételét használják fel egy állomás, vagy objektum irányának meghatározására.

Radio direction-finding station (RR S1.91) - *Rádió iránymérő állomás (RR S1.91)* Rádió-iránymérést végző rádió helymeghatározó állomás.

Megjegyzés: A rádió-iránymérés légiforgalmi alkalmazása a légiforgalmi navigációs szolgálat körébe tartozik.

Regular station - *Illetékes állomás*.
Az az állomás, amelyet rendes körülmények között az útvonal levegő-föld rádiótávbeszélő hálózatát alkotó állomások közül kiválasztottak arra, hogy a légijárművekkel összeköttetést tartson vagy azok adását vegye.

Tributary station - *Alárendelt állomás*.
Egy légiforgalmi állandóhelyű állomás, amely kaphat és küldhet közleményeket és/vagy digitális adatokat, de amely nem végez átjátszást, kivéve hasonló állomások kiszolgálása céljából, amelyek rajta keresztül lettek egy kommunikációs központhoz kapcsolva.

1.3 Összeköttetési módszerek

Air-ground communication - *Levegő-föld összeköttetés*.
Kétirányú összeköttetés a légijárművek és a föld felszínén található állomások, vagy helyszínek között.

Air-to-ground communication - *Levegő-föld irányú összeköttetés..*
Egyirányú összeköttetés a légijárművektől a föld felszínén található állomások vagy helyszínek felé.

Blind transmission - *Vak-adás*.
Egy állomás adása egy másik állomásnak olyan körülmények között, amikor kétirányú összekötetést nem sikerült létrehozni, de feltételezik, hogy a hívott állomás képes venni az adást.

Broadcast - *Általános adás*.
A léginavigációval kapcsolatos tájékoztatások adása, amelyet nem egy konkrét állomásnak vagy állomásoknak címeznek.

Duplex - *Duplex*.
Olyan összeköttetés, amelyen keresztül két állomás között egyidejűleg mindkét irányban folyhat távközlés.

Ground-to-air communication **-** *Föld-levegő irányú összeköttetés.*
Egyirányú összeköttetés a föld felszínén található állomásoktól vagy helyszínektől a légijárművek felé.

Interpilot air-to-air communication **-** *Légijárművezetők közötti levegő-levegő összeköttetés.*
Kétirányú összeköttetés egy kijelölt levegő-levegő csatornán, mely lehetővé teszi a távoli, vagy óceáni területek fölött repülést végző, a VHF földi állomások hatótávolságán kívül eső légijárművek számára, hogy egymás közt kicserélhessék a szükséges üzemeltetési információkat és elősegítsék az üzemeltetési problémák megoldását.

Non-network communication **-** *Hálózaton kívüli összeköttetés.*
Rádiótávbeszélő összeköttetés, melyet a légiforgalmi mozgó szolgálat egy állomása hajt végre, de amelyet nem egy rádiótávbeszélő hálózat részeként hajtanak végre.

Radiotelephony network - *Ráditávbeszélő hálózat*
Légiforgalmi rádiótávbeszélő állomások egy csoportja, amelyek ugyanazon csoportba tartozó rádiófrekvenciákon üzemelnek és figyelnek, és amelyek egy meghatározott módon segítik egymást abban, hogy biztosítsák a levegő-föld összeköttetés maximális megbízhatóságát és a levegő-föld forgalmazás elosztását.

Readback **-** *Visszaolvasás*
Egy eljárás, amely szerint a vevő állomás visszaismétli a vett közleményt, vagy annak egy megfelelő részét az adó állomásnak, abból a célból, hogy megerősítést nyerjen a közlemény pontos vételéről.

Simplex **-** *Szimplex*
Egy módszer, melyben két állomás között egyszerre csak egy irányban folyhat távközlés.

Telecommunication (RR S1.3) **–** *Távközlés (RR S1.3)*
Bármilyen jellegű jelek, jelzések, írások, képek és hangok, vagy bármiféle tartalom (átvitt jelé) továbbítása, kisugárzása, vagy vétele vezetéken keresztül, rádióhullámok útján, optikai módon, vagy egyéb elektromágneses rendszerek segítségével.

1.4 Iránymérés

Homing **-** *Iránykeresés, célra repülés*
Eljárás, melyben egy rádióállomás iránymérő berendezését használják egy másik rádióállomás adásának felhasználásával, ahol legalább az egyik állomás mozgó állomás, és ahol a mozgó állomás folyamatosan halad a másik állomás felé.

Radio bearing - *Rádió-irányszög*.
Egy meghatározott elektromágneses hullámforrás látszólagos iránya és egy vonatkoztatási irány közötti szög, ahogy azt egy rádió-iránymérő állomás meghatározta. Földrajzi rádió-irányszögről (true radio bearing) beszélünk akkor, ha a vonatkoztatási irány a földrajzi Észak. Mágneses rádió-irányszögről (magnetic radio bearing) beszélünk akkor, ha a vonatkoztatási irány a mágneses Észak.

1.5 Távgépíró rendszerek

Automatic relay installation - *Automatikus átjátszó állomás*.
Olyan távgépíró berendezés (állomás), ahol automatikus berendezést alkalmaznak a közlemények átvitelére a bejövő és a kimenő vonalak között.

Megjegyzés: Ez a megnevezés magába foglalja a teljesen automatikus és a fél-automatikus állomásokat is.

Fully automatic relay installation - *Teljesen automatikus átjátszó állomás.*
Olyan távgépíró berendezés (állomás), ahol egy bejövő közlemény közvetítési feladatainak értelmezése és az ebből következően szükséges kapcsolatok létrehozása - a közlemény újra-feladása céljából -, valamint minden egyéb rendes átjátszási tevékenység automatikusan történik, ezért kezelői beavatkozásra - a felügyeletet kivéve - nincs szükség.

Message field - *Közleménymező.*
Egy közlemény valamely kijelölt része, amely meghatározott adatelemeket tartalmaz.

Semi-automatic relay installation - *Félautomata átjátszó állomás.*
Olyan távgépíró állomás, ahol egy bejövő közlemény közvetítési feladatainak értelmezéséhez és az ebből következően szükséges kapcsolatok létrehozásához - a közlemény iújra-feladása céljából - kezelő személy beavatkozása szükséges, de ahol az átjátszással kapcsolatos minden egyéb rendes tevékenység automatikusan történik.

Teletypewriter tape - *Távgépíró szalag.*
Az a szalag, amelyen a jeleket az ötegységes Start-Stop kód segítségével, teljesen elválasztott perforációval (Chad Type) vagy részlegesen elválasztott perforációval (Chadless Type) rögzítik, távgépíró vonalakon történő továbbítás céljából.

"Torn-tape" relay installation - K*ézi ("tépett szalagos") átjátszó állomás.*
Olyan telex állomás, amelyben a közleményeket telex szalag formájában veszik és játsszák át, és ahol az átjátszással kapcsolatos minden tevékenységhez a kezelő beavatkozása szükséges.

1.6 Ügynökségek

Aeronautical telecommunication agency - *Légiforgalmi távközlési ügynökség.*
Egy ügynökség, amely a légiforgalmi távközlési szolgálat egy vagy több állomásának üzemeltetéséért felelős.

Aircraft operating agency - *Légijármű-üzemeltető ügynökség (járató).*
Az a személy, szervezet vagy vállalkozás, amely egy légijármű üzemeltetésével foglalkozik, vagy arra ajánlkozik.

1.7 Frekvenciák

Primary frequency - *Elsődleges frekvencia*.
Az a kijelölt rádiótávbeszélő frekvencia, amelyet egy légijármű elsődlegesen használhat a levegő-föld kommunikációra egy rádiótávbeszélő hálózatban.

Secondary frequency - *Másodlagos frekvencia*.
Az a kijelölt rádiótávbeszélő frekvencia, amely levegő-föld kommunikáció céljából egy légijármű részére tartalékként áll rendelkezésre egy rádiótávbeszélő hálózatban.

1.8 Adatkapcsolati összeköttetések

Controller-pilot data link communications (CPDLC) – *Légiforgalmi Irányító és Légijárművezető Közötti Digitálisi Adatcsere (CPDLC)*
A légiforgalmi irányító és a légijárművezető közötti távközlési módszer, ahol az ATC közleményeket adatátviteli összeköttetés segítségével továbbítják..

Current data authority – *Az Adatkapcsolatot Jelenleg Biztosító Egység*

Egy olyan kijelölt földi rendszer, melyen keresztül a Légiforgalmi irányítás – légijárművezető közötti adatkapcsolati összeköttetési (CPDLC) párbeszéd létrehozása megengedett a pilótakabin és az adott légijármű irányításáért pillanatnyilag felelős légiforgalmi irányító között.

Downstream data authority *– A Soronkövetkező Adatkapcsolatot Biztosító Egység*
Egy, a jelenlegi adatkapcsolati egységtől különböző, kijelölt földi rendszer, amelyen keresztül a légijárművezető összeköttetésbe léphet egy illetékes ATC (Légiforgami Irányító) egységgel, abból a célból, hogy egy későbbi engedélyt beszerezhessen.

Next data authority *– Az Adatkapcsolatot Legközelebb Biztosító Egység*
Az a földi rendszer, amelyet az *Adatkapcsolatot Jelenleg Biztosító Egység* jelöl ki, abból a célból, hogy a későbbi összeköttetés és irányítás átadás megtörténhessen.

1.9 Vegyes meghatározások

Aeronautical fixed circuit - *Légiforgalmi állandóhelyű távközlési áramkör.*
A légiforgalmi állandóhelyű szolgálat (AFS) részét képező áramkör.

Aeronautical fixed telecommunication network circuit - *Légiforgalmi állandóhelyű távközlési hálózati (AFTN)* vonal.
A légiforgalmi állandóhelyű távközlési hálózat (AFTN) részét alkotó vonal.

Aeronautical teleocommunication log - *Légiforgalmi távközlési napló*.
Egy légiforgalmi távközlési állomás tevékenységéről készült feljegyzések.

Air-report - *Légi jelentés (AIREP jelentés)*.
Levegőben lévő légijárműtől származó jelentés, amelyet a helyzetjelentésekre és az operatív és/vagy meteorológiai jelentésekre vonatkozó követelményeknek megfelelően állítottak össze.

Megjegyzés. - Az AIREP űrlap ismertetését a PANS – RAC (Doc 4444) tartalmazza.

Altitude - *Tengerszint feletti magasság*.
Egy felületnek, pontnak vagy pontként értelmezett tárgynak a közepes tengerszinttől mért függőleges távolsága.

ATS direct speech circuit - *A Légiforgalmi Szolgálatok (ATS) közvetlen beszéd-üzemű vonala.*
A légiforgalmi állandóhelyű szolgálat (AFS) távbeszélő-összeköttetési vonala, amely a légiforgalmi szolgálatok (ATS) egységei közötti közvetlen információ cserére szolgál.

Automatic telecommunication log - *Automatikus távközlési napló (állomásnapló).*
Egy légiforgalmi távközlési állomás tevékenységéről elektronikus, vagy mechanikus eszközökkel készített feljegyzések.

Flight level - *Repülési szint*.
Egy azonos légnyomású pontokból álló felület (nyomásfelület), amelyet egy pontosan meghatározott nyomású referenciaszinthez, az 1013,2 hPa-hoz viszonyítanak, és amelyet a többi ilyen felületektől meghatározott légnyomás intervallumok választanak el.

1. Megjegyzés. - Egy barometrikus (nyomás-értéken alapuló) magasságmérő, melyet a Nemzetközi Egyezményes Légkörnek megfelelően kalibrálnak:

a) ha a **QNH** (Tengerszintre Átszámított Légnyomás) referencia nyomás-értéket állítják be rajta, akkor **Tengerszint feletti magasságot (Altitude)** mér;

b) ha a **QFE** referencia nyomás-értéket állítják be rajta, akkor a **Magasságot (Height)** a QFE referencia szint felett méri;

c) ha az 1013,2 hPa referencia nyomásértéket állítják be rajta, akkor használatával a **Repülési Szinteket (Flight level)** lehet mérni.

2. Megjegyzés. - Az előbbi első megjegyzésben használt **"Magasság" ("Height")** és "**Tengerszint feletti magasság" ("Altitude")** *inkább Barometrikus Magasságot és Tengerszint Feletti Magasságot jelent, mint geometriait.*

Frequency channel - *Frekvencia-csatorna.*
A frekvencia-spektrum egy összefüggő, folytonos része, amely egy meghatározott rádiósugárzás fajta felhasználásával adattovábbításra, átvitelre alkalmazható.

Megjegyzés. - A adásfajták osztályozását és az egyes átvitel-típusokhoz megfelelő frekvencia sprektum-tartományokról szóló információkat (sávszélességeket) az ITU Rádiószabályzat S2 cikkelye és az S1 Függelék tartalmazza.

Height - *Magasság (föld feletti).*
Egy felületnek, pontnak vagy pontként értelmezett tárgynak egy meghatározott referenciaszinttől mért függőleges távolsága.

Human performance - *Emberi teljesítőképesség*
Az emberi képességek és ezeknek a képességeknek a korlátai, melyek hatással vannak a légiközlekedés üzemeltetésének biztonságára és hatékonyságára.

Location indicator – *Helységnév-kód.*
Az ICAO által előírt szabályoknak megfelelően kialakított négybetűs kódcsoport, amelyet egy légiforgalmi állandóhelyű állomás helységnevéhez rendelnek hozzá.

Meteorological operational channel - *Meteorológiai operatív csatorna.*
A légiforgalmi állandóhelyű szolgálat (AFS) egy csatornája, amelyet a légiforgalmi meteorológiai tájékoztatások cseréjére használnak.

Meteorological operational telecommunication network - *Meteorológiai operatív távközlési hálózat.*
Meteorológiai operatív csatornák integrált rendszere, amely a légiforgalmi állandóhelyű szolgálat (AFS) részét képezi, és amely légiforgalmi meteorológiai tájékoztatások cseréjére szolgál a hálózaton belüli légiforgalmi állandóhelyű állomások között.

Megjegyzés. - Az "integrált" szó olyan üzemmódot jelent, amely lehetővé teszi, hogy a hálózaton belüli állomások az információkat az előzetesen megállapított menetrend szerint tudják adni és venni.

NOTAM - *NOTAM.*
Bármely légiforgalmi berendezés, szolgálat, eljárás létesítéséről, állapotáról, változásáról, vagy veszély fennállásáról szóló értesítés, amelynek idejében való ismerete elengedhetetlenül szükséges a repülésben érdekelt személyzet részére. Az értesítés szétosztása távközlési eszközökkel történik.

Operational control communications – *Repülésüzemi Felügyeleti Összeköttetések*
Olyan összeköttetések, amelyek egy repülés megkezdése, folytatása, átirányítása vagy befejezése fölötti felügyelet gyakorlásához szükségesek, a légijármű biztonsága, valamint a repülés rendszeressége és hatékonysága érdekében.

Megjegyzés. - Az ilyen összeköttetések általában a légijármű és a légijárművet üzembentartó ügynökség közötti közleményváltásokhoz szükségesek.

Route segment - *Útvonalszakasz*
Egy útvonal vagy egy útvonal része, amelyet általában közbenső leszállás nélkül repülnek végig.

Routing Directory - *(Közlemény) továbbítási útvonal lista*
Egy távközlési központban található lista, amely minden egyes címzetthez hozzárendeli a használandó kimenővonalat.

SNOWTAM - *SNOWTAM*
Különleges NOTAM sorozat, amely a mozgási területen található - veszélyt jelentő - hó, jég, latyak, vagy hóval, latyakkal és jéggel kapcsolatosan keletkező állóvizek okozta körülmények jelenlétéről, vagy eltakarításáról tájékoztat egy erre meghatározott kód-rendszer segítségével.

2. FEJEZET: A NEMZETKÖZI LÉGIFORGALMI TÁVKÖZLÉSI SZOLGÁLATRA VONATKOZÓ ADMINISZTRATÍV ELŐÍRÁSOK

2.1 A szolgálat felosztása

A nemzetközi Légiforgalmi Távközlési Szolgálatot négy részre kell felosztani:

1) Légiforgalmi Állandóhelyű Szolgálat (AFS)

2) Légiforgalmi Mozgó Szolgálat (AMS)

3) Légiforgalmi Rádiónavigációs Szolgálat (ARNS)

4) Légiforgalmi Rádióadó Szolgálat (ABS)

2.2 Távközlés - hozzáférés

Az összes légiforgalmi távközlési állomást, beleértve azokat a végberendezéseket és közbenső berendezéseket is, amelyek egy Légiforgalmi Távközlési Hálózat (ATN) részét alkotják, meg kell védeni az illetéktelen közvetlen hozzáféréstől és távveléréstől.

2.3 Üzemidő

2.3.1 Az Illetékes Hatóság az ellenőrzése alá tartozó, a Nemzetközi Légiforgalmi Távközlési Szolgálat részét képező állomások és irodák szokásos üzemidejéről köteles tájékoztatni azokat a légiforgalmi távközlési képviseleteket, melyeket a többi érintett hivatal az erről szóló tájékoztatások vételére kijelölt.

2.3.2 Amikor ez szükséges és, az Illetékes Hatóság a szokásos üzemidő változásáról köteles tájékoztatni azokat a légiforgalmi távközlési képviseleteket, melyeket a többi érintett hivatal az erről szóló tájékoztatások vételére kijelölt, mielőtt ezek a változások hatályba lépnének. Az ilyen változásokat, amikor szükséges, NOTAM-ban is közzé kell tenni.

2.3.3 Ha a nemzetközi légiforgalmi távközlési hálózat egy állomása, vagy egy légijármű üzemeltetést végző szervezet képviselete változtatást kér egy másik állomás üzemidejében, akkor az ilyen változtatást a lehető leghamarabb kell kérelmezni, miután a változtatás szükségessége ismertté vált. A változtatást kérő állomást, vagy a légijármű üzemeltetést végző szervezet képviseletét minél hamarabb tájékoztatni kell kérésének eredményéről.

2.4 Felügyelet

2.4.1 Minden államnak ki kell jelölnie azt a hatóságot, mely felelősséggel tartozik azért, hogy a nemzetközi Légiforgalmi Távközlési Szolgálat az ezen Anex-ben található eljárásoknak megfelelően üzemeljen.

2.4.2 **Ajánlás –** *Az itt található eljárások alkalomszerűen előforduló megsértését, amikor az nem súlyos, lehetőleg az érintett felek közötti közvetlen kapcsolattal kell lerendezni, akár levelezés, akár személyes találkozás útján.*

2.4.3 Amikor egy állomás ezen eljárásokat súlyosan vagy ismételten megsérti, akkor erről az ezt észlelő hatóság éljen kifogással azon Állam 2.4.1 pont alapján kijelölt hatóságához címezve, amelyhez az állomás tartozik.

2.4.4 **Ajánlás** - *A 2.4.1 pont értelmében kijelölt hatóságok lehetőség szerint cseréljék ki egymás között információikat a távközlési, rádiónavigációs, operatív és karbantartó rendszerek működéséről, a szokatlan sugárzási jelenségekről, stb.*

2.5 Felesleges, szükségtelen adások

Minden Államnak biztosítania kell, hogy a területén lévő állomások szándékosan ne sugározzanak szükségtelen vagy ismeretlen jeleket, közleményeket vagy adatokat.

2.6 Interferencia

Valamennyi hivatal, mielőtt bármely állomás számára ellenőrzések, vagy kísérletek végrehajtását engedélyezne, a káros interferencia elkerülése céljából elő kell írja, hogy az összes lehetséges elővigyázatossági intézkedést tegyék meg, például a frekvencia vagy az adásidő gondos megválasztását, valamint a sugárzási energia csökkentését, vagy ha lehetséges, elnyomását. A ellenőrzések vagy kísérletek eredményeként jelentkező káros interferenciát minél hamarabb meg kell szüntetni.

3. FEJEZET: A NEMZETKÖZI LÉGIFORGALMI TÁVKÖZLÉSI SZOLGÁLAT ÁLTALÁNOS ELJÁRÁSAI

3.1 Általános rész

Az ebben a fejezetben leírt eljárások általános természetűek, és értelemszerűen - ahol megfelelő - az ebben a kötetben található más fejezetekre is alkalmazni kell őket

Megjegyzés. - Az érintett szolgálatokra vonatkozó részletes eljárásokat a 4., 5., 6., 7. és 8. fejezetek tartalmazzák.

3.2 Üzemidő meghosszabbítása; valamint az állomások bezárása

3.2.1 A nemzetközi légiforgalmi távközlési szolgálat állomásainak rendes üzemidejüket szükség szerint meg kell hosszabbítaniuk, úgy, hogy a repülések üzemeltetéséhez szükséges forgalmazást biztosíthassák.

3.2.2 Mielőtt egy állomás bezárna, szándékát közölnie kell az összes olyan állomással, mellyel közvetlen össze- köttetésben áll, meg kell erősítse, hogy nincs szükség üzemidejének meghosszabbítására, valamint közölnie kell az ismételt nyitásának időpontját, ha ez a normál üzemidejétől eltérő.

3.2.3 Ha az állomás rendszeres jelleggel egy közös vonalon lévő hálózatban működik, akkor zárási szándékát vagy az ellenőrzőállomásnak, vagy ha ilyen nincs, akkor a hálózatban található összes többi állomásnak be kell jelentenie. Ezután még két percig figyelésen kell maradnia, és csak akkor zárhat be, ha eközben nem kapott hívást.

3.2.4 Ha egy nem folyamatos üzemben dolgozó állomás kényszerhelyzeti, sürgősségi, jogellenes beavatkozással vagy elfogással kapcsolatos forgalmazással van elfoglalva, vagy várhatóan ilyen forgalmazásban fog részt venni, akkor rendes üzemidejét meg kell hosszabbítania, hogy biztosíthassa eaz zen összeköttetések alátámasztását.

3.3 Közlemények elfogadása, feladása és kézbesítése

3.3.1 A légiforgalmi távközlési szolgálat csak a 4.4.1.1 pontban meghatározott feltételeknek megfelelő közleményeket fogadhat el továbbításra.

3.3.1.1 A közlemény elfogadhatóságának megállapítása annak az állomásnak a felelőssége, ahol a közleményt továbbításra benyújtották.

3.3.1.2 Miután a közleményt elfogadhatónak ítélték, akkor az elsőbbségi besorolásának (prioritásának) megfelelően kell továbbítani, átjátszani és/vagy kézbesíteni, megkülönböztetés, vagy indokolatlan késleltetés nélkül.

3.3.1.3 **Ajánlás.** – *Egy közleményt átjátszó bármely állomást felügyelő hatóság lehetőleg nyújtson be kifogást egy későbbi időpontban a közleményt továbbításra átvevő állomást felügyelő hatóság felé, ha olyan közleményt talált, amelyet elfogadhatatlannak ítélt.*

3.3.2 Csak az olyan közlemények fogadhatók el továbbításra, amelyek a légiforgalmi távközlési szolgálat részét képező állomásnak szólnak, kivéve, ha az érintett távközlési hatósággal erről külön megegyezést kötöttek.

3.3.2.1 Egy közleményt, melyet két vagy több címre küldenek, akár ugyanazon állomáson belül találhatók ezek a címek, akár különböző állomásokon, a 4.4.3.1.2.3 pontban leírtak betartásával egyetlen közleményként kell elfogadni.

3.3.3 A légijárművet üzemeltető ügynökség (járató) számára kezelt közlemények csak akkor fogadhatók el, ha azokat a távközlési állomásnak az illető ügynökség erre felhatalmazott képviselője nyújtja be az ide vonatkozóan előírt formában, vagy abban az esetben, ha a közleményt az ügynökségtől egy jogosítással rendelkező vonalon keresztül kapják.

3.3.4 A Légiforgalmi Távközlési Szolgálat minden állomása számára, mely állomásról egy vagy több légijármű-üzemeltető ügynökségnek (járatónak) közleményeket kézbesítenek, minden légijármű-üzemeltető ügynökség számára ki kell jelölni egy egyedüli irodát, a légiforgalmi távközlési ügynökség és az érintett légijármű-üzemeltető ügynökség közötti megállapodás alapján.

3.3.5 A Nemzetközi Légiforgalmi Távközlési Szolgálat állomásainak feladata az általuk kiszolgált repülőtér(ek) határán belül található címzet(tek)nek a közlemények kézbesítése, továbbá ezeken a határokon kívül csak azon címzet(tek)nek, melyek erre külön megállapodást köthettek az érintett hivatallal.

3.3.6 A közleményeket vagy írásban, vagy más egyéb állandó formában kell kézbesíteni, ahogy azt a hatóság előírta.

3.3.6.1 **Ajánlás.** - *Abban az esetben, ahol a közlemények kézbesítésére telefon-, vagy hangos beszélő rendszert használnak - hangrögzítési lehetőség nélkül -, a közleményt lehetőség szerint minél hamarabb írásban is adják át, a kézbesítés hitelesítéseként.*

3.3.7 Azokat a közleményeket, amelyeket egy, a levegőben lévő légijármű a légiforgalmi mozgó szolgálat részeként adott fel, és amelyeket a légiforgalmi állandóhelyű távközlési hálózaton keresztül kell továbbítani - a közlemény kézbesítésének teljesítése érdekében - a légiforgalmi távközlési állomás az AFTN-en történő feladás előtt, alakítsa azt át a 4.4.2 pontban előírt közlemény-formátumba.

3.3.7.1 Azokat a közleményeket, amelyeket egy, a levegőben lévő légijármű a légiforgalmi mozgó szolgálat részeként adott fel, és amelyeket a légiforgalmi állandóhelyű szolgálat segítségével, de nem az AFTN vonalon keresztül kell továbbítani, a légiforgalmi távközlési szolgálat állomása szintén dolgozza fel újra a 4.4.2 pontban előírt formátumba; kivételt képez, ha a 3.3.5 pont előírásai szerint, a légijárművekről származó közlemények előzetesen meghatározott szétosztása érdekében előzetes és más intézkedések történtek a légiforgalmi távközlési ügynökség és az érintett légijármű-üzemeltető ügynökség között.

3.3.7.2 A levegőben lévő légijárműtől származó, konkrét címzés nélküli közleményeket (beleértve a légijelentéseket is), ha azok meteorológiai tájékoztatást tartalmaznak, késedelem nélkül továbbítani kell a vétel helyével összeköttetésben lévő, társult meteorológiai hivatalnak.

3.3.7.3 A levegőben lévő légijárműtől származó, konkrét címzés nélküli közleményeket (beleértve a légijelentéseket is), ha azok a légiforgalmi szolgálatokkal kapcsolatos tájékoztatást tartalmaznak, késedelem nélkül továbbítani kell a közleményt vevő távközlési állomással összeköttetésben lévő, együttműködő légiforgalmi szolgálati egységnek.

3.3.7.4 **PANS** (Légiforgalmi Szolgálatok Eljárásai) - *A légijelentések AIREP formátumban történő leírásakor az ICAO által erre a célra jóváhagyott adatszabályokat kell alkalmazni, amikor az csak lehetséges.*

Megjegyzés. - A légijelentések összeállítására vonatkozó előírásokat, beleértve az adatszabályokat is, valamint azt, hogy az ilyen jelentések elemeit milyen sorrendben és formátumban kell a légijármű-állomásoknak leadniuk, valamint a légiforgalmi állomásoknak rögzíteniük és újra feladniuk, a PANS-ATM (Doc 4444) tartalmazza.

3.3.7.5 **PANS** (Légiforgalmi Szolgálatok Eljárásai) - *Ha az AIREP formában lévő légijelentéseket távgépíró eszközzel kell továbbítani (beleértve a telexet is), akkor a továbbított szövegnek olyannak kell lennie, ahogy azt a 3.3.7.4 pontban leírásra került*

3.4 Az idő rendszer

3.4.1 A Légiforgalmi Távközlési Szolgálat valamennyi állomásának az Egyeztetett Világ-időt (UTC - Universal Co-ordinated Time) kell használnia. Az éjféli időpontot, ha ez a nap végét jelzi, 2400-val, ha a nap kezdetét jelzi, 0000-val kell leírni.

3.4.2 A dátum-idő csoport hat számjegyből áll; az első kettő a hónap napja, az utolsó négy számjegy pedig az órák és percek UTC-ben.

3.5 Az összeköttetés, forgalmazás rögzítése

3.5.1 Általános rész

3.5.1.1 A Légiforgalmi Távközlési Szolgálat minden állomásán írásos vagy automatikus távközlési naplót kell vezetni, a légijármű-állomást kivéve, amikor az rádiótávbeszélő berendezést használ a közvetlen összeköttetésre egy légiforgalmi állomással, akkor nem kell távközlési naplót vezetnie.

Megjegyzés. - A távközlési napló védelemként szolgál, abban az esetben, ha a kezelő szolgálati tevékenységét kivizsgálás alá kéne vonni. Ez jogi bizonyítékként is használható.

3.5.1.1.1 **Ajánlás**. - *A légiforgalmi állomásoknak a közleményeket a vétel után lehetőleg rögtön fel kell jegyezniük, kivéve, ha egy kényszerhelyzet során a folyamatos kézi feljegyzés késedelmet okozna az összeköttetésben, akkor a közlemények feljegyzését ideiglenesen meg lehet szakítani, majd a lehető legkorábbi alkalmas időpontban be kell fejezni.*

Megjegyzés: - A rádió-távbeszélő összeköttetés esetében kívánatos, hogy hangrögzítés álljon rendelkezésre a kézi rögzítés szüneteltetésének idejére.

3.5.1.1.2 **Ajánlás**. - *Amikor egy légijármű-állomás fedélzetén a kényszerhelyzeti összeköttetésről, káros interferenciáról, vagy az összeköttetés megszakadásáról feljegyzést készítenek, akár egy rádiótávbeszélő naplóban, akár más módon, akkor ehhez a feljegyzéshez lehetőség szerint mellékeljék az időpontot és helyet, valamint a légijármű repülési magasságát is.*

3.5.1.2 Az írásos naplókba csak a szolgálatban lévő kezelők tehetnek bejegyzéseket, kivéve, hogy más személyek, akiknek tudomása van a bejegyzésekkel kapcsolatos tényekről, a naplóban igazolhatják a kezelői bejegyzések pontosságát.

3.5.1.3 Minden bejegyzésnek teljesnek, világosnak, pontosnak és érthetőnek kell lenni. A naplóba ne írjanak fölösleges jegyzeteket, vagy jelöléseket.

3.5.1.4 Az írásos naplókban minden szükséges javítást csak az a személy végezhet el, aki az eredeti bejegyzést írta. A javítást úgy kell elvégezni, hogy a helytelen bejegyzést egy egyenes vonallal (kézzel vagy írógéppel) áthúzza, a javítást névjelével igazolja, és feltünteti a javítás dátumát és időpontját. A javított szöveget az utolsó bejegyzés utáni következő sorba kell írni.

3.5.1.5 Az írásos vagy automatikusan rögzített távközlési naplókat legalább harminc napig meg kell őrizni. Ha a naplókra kivizsgálás, vagy vizsgálat során szükség van, akkor ennél hosszabb ideig is meg kell őket őrizni, egészen addig az időpontig, amikor nyilvánvalóvá válik, hogy nincs rájuk tovább szükség.

3.5.1.6 Az írásos naplókba az alábbi információkat kell bejegyezni:

a) az állomást üzemeltető képviselet /ügynökség/ neve;
b) az állomás azonosítója;
c) dátum;
d) az állomás nyitásának és bezárásának időpontja;

e) minden egyes kezelő aláírása, azon időpontok feltüntetésével, amikor az illető átveszi és befejezi a szolgálatot;

f) a figyelt frekvenciák felsorolása és az egyes frekvenciákon tartott felügyelet típusa (folyamatos vagy menetrend szerinti);

g) azon közbenső mechanikus átjátszó állomások kivételével, ahol ezen paragrafus előírásait nem kell betartani, fel kell jegyezni minden összeköttetést, ellenőrző adást vagy összeköttetési kísérletet, melyekben fel kell tűntetni az összeköttetés szövegét, a befejezés időpontját, azon állomások nevét, amelyekkel felvették a kapcsolatot, és a használt frekvenciát. Az összeköttetés szövegét el lehet hagyni a naplóból, ha a kezelt közlemények másolatai rendelkezésre állnak és a napló részét képezik;

h) fel kell jegyezni minden vészhelyzeti közleményt és a velük kapcsolatban tett intézkedéseket;

i) az összeköttetés körülményeinek és a felmerült nehézségeknek rövid leírását, beleértve a káros interferenciát is. Az ilyen feljegyzéseknek tartalmazniuk kell, ha ez lehetséges, azt az időpontot, amikor az interferenciát tapasztalták, annak jellemzőit, rádiófrekvenciáját, valamint a zavaró jel azonosítását;

j) az összekötetés megszakadásának rövid leírását, amely a berendezések meghibásodása vagy egyéb hiba miatt következett be, megadva az összeköttetés szünetelésének időtartamát és a végrehajtott intézkedéseket;

k) minden egyéb kiegészítő információ leírását, amelyet a kezelő az állomás tevékenységének részeként hasznosnak tart.

3.6 A rádióösszeköttetés felvétele

3.6.1 Minden állomásnak válaszolnia kell a légiforgalmi távközlési szolgálat más állomásai által hozzá intézett hívásokra, és kérésre a közleményváltásban részt kell vennie.

3.6.2 Minden állomásnak a kielégítő szolgáltatás fenntartásához szükséges minimális teljesítménnyel kell sugároznia.

3.7 Rövidítések és kódok használata

3.7.1 A nemzetközi légiforgalmi távközlési szolgálatban rövidítéseket és kódokat akkor lehet használni, amikor azok az alkalomhoz illőek, és használatuk lerövidíti, vagy másképpen segíti az összeköttetést.

3.7.1.1 Ha a közlemények szövegében az ICAO által jóváhagyottakon kívül más rövidítéseket és kódokat is használnak, akkor a közlemény feladójának, a közleményt továbbításra elfogadó távközlési állomás kérésére, ezen állomás rendelkezésére kell bocsátania a használt rövidítések és kódok megfejtését.

Megjegyzés. - Amikor az megfelelő, az ICAO által jóváhagyott rövidítéseket és kódokat használják, például azokat, amelyek a PANS-ABC (Doc 8440-es) kiadványban szerepelnek, akkor ez a 3.7.1.1 pontban leírt előírások alkalmazásának szükségességét feleslegessé teszi.

3.8 Közlemények törlése, érvénytelenítése

3.8.1 A közleményeket a távközlési állomás csak akkor törölheti, ha a törlésre a közlemény feladója felhatalmazta.

4. FEJEZET: LÉGIFORGALMI ÁLLANDÓHELYŰ SZOLGÁLAT (AFS - AERONAUTICAL FIXED SERVICE)

4.1 Általános rész

4.1.1 A légiforgalmi állandóhelyű szolgálat magába kell foglalja az alább felsorolt rendszereket és alkalmazásokat, melyeket a nemzetközi légiforgalmi távközlési szolgálatban a föld-föld (azaz a pont - pont és a pont - több-pont közötti) összeköttetésekben használnak fel:

a) A Légiforgalmi Szolgálatok (ATS) közvetlen élőszavas vonalai és hálózatai;
b) Meteorológiai üzemeltetési vonalak, hálózatok és általános adó-rendszerek;
c) A Légiforgalmi Állandóhelyű Távközlési Hálózat (AFTN);
d) Az ICAO Közös Adattovábbító Hálózata (Common ICAO Data Interchange Network - CIDIN);
e) A Légiforgalmi Szolgálatok (ATS) közleményeket kezelő szolgáltatásai; és
f) A Központok Közötti Összeköttetés (ICC).

1. Megjegyzés: A légiforgalmi szolgálatok (ATS) közvetlen élőszavas vonalaira vonatkozó előírásokat a 4.2 pont foglalja magába.

2. Megjegyzés: A meteorológiai operatív vonalakat és a meteorológiai operatív távközlési hálózatokkal kapcsolatos előírásokat a 4.3 pont tartalmazza.

3. Megjegyzés: Az AFTN "tárol - és – továbbít" közlemény kézbesítő szolgáltatást nyújt szöveges közlemények átvitelére ITA-2 és IA-5 formátumban, karakter-központú eljárások felhasználásával. Az AFTN-re vonatkozó előírásoka 4.4 pontban találhatók.

4. Megjegyzés: Az ICAO Közös Adattovábbító Hálózata (Common ICAO Data Interchange Network - CIDIN) közös továbbító szolgáltatást biztosít mind bináris, mind szöveges közlemények átvitelére, az AFTN és OPMET alkalmazások támogatására. A CIDIN-nel kapcsolatos eljárások szabályait a 4.5 pont tartalmazza.

5. Megjegyzés: Az ATS (Légiforgalmi Szolgálatok) Közleményeit Kezelő Szolgáltatás (ATSMSH - Air Traffic Services Message Handling Services) alkalmazásai lehetővé teszik az ATS közlemények cseréjét a szolgáltatást használók között a Légiforgalmi Távközlési Hálózaton (ATN - Aeronautical Telecommunication Network) és az Internet Összeköttetési Szolgáltatáson (ICS - Internet communication service) keresztül. Az ATS közleményeket kezelő szolgáltatással kapcsolatos előírásokat a 4.6 pont foglalja magába.

6. Megjegyzés: A Központok Közötti Összeköttetési (ICC - inter-cntre communications) alkalmazások lehetővé teszik az információ-cserét az ATS egységek között a Légiforgalmi Távközlési Hálózat (ATN - Aeronautical Telecommunication Network) felhasználásával és az Internet Összeköttetési Szolgáltatáson (ICS - Internet communication service) keresztül, az értesítés, koordináció, irányítás átadás és repüléstervezés, légtérgazdálkodás és az áramlásszabályozás támogatására. A Központok Közötti Összeköttetést érintő előírások a 4.7 pontban találhatóak.

7. Megjegyzés: A Légiforgalmi Távközlési Hálózatnak (ATN - Aeronautical Telecommunication Network) a Légiforgalmi Szolgálatok Közleményeit Kezelő Szolgáltatásai (ATSMSH - Air Traffic Services Message Handling Services) és a Központok Közötti Összeköttetés (ICC - Inter-Centre Communications) alkalmazásai lehetővé teszik a meglevő AFTN és CIDIN felhasználók és rendszerek részére, hogy az ATN rendszerébe integrálódhassanak.

4.1.2 Az AFS közlemények megengedett tartalma

Megjegyzés: A 4.1.2 pont előírásai nem vonatkoznak a Légiforgalmi Szolgálatok közvetlen beszédüzemű vonalain történő összeköttetésekre.

4.1.2.1 A szöveges közleményekben az alábbi karaktereket szabad használni:

Betűk: ABCDEFGHIJKLMNOPQRSTUVWXYZ

Számok: 1 2 3 4 5 6 7 8 9 0

Egyéb jelek:
- (kötőjel)
? (kérdőjel)
: (kettőspont)
((nyitó zárójel)
) (záró zárójel)
. (pont, pont a mondat végén, vagy tizedes pont)
, (vessző)
' (aposztróf)
= (kettős kötőjel, vagy egyenlőségjel)
/ (törtvonal, vagy ferde zárójel)
+ (összeadásjel)

A fent felsoroltakon kívül egyéb karaktereket csak akkor szabad használni a közleményekben, ha az a szöveg megértéséhez feltétlenül szükséges. Ha egyéb jeleket is használtak, azokat pontosan meg kell határozni.

4.1.2.2 A távgépíró vonalakon keresztül történő közleményváltásra a 2. számú Nemzetközi Távíró ABC (ITA-2) alábbi jelei megengedettek:

az 1 – 3-as számú jelek	- betű- és számkészletben is
a 4-es számú jel	- csak betűkészletben
az 5-ös számú jel	- betű- és számkészletben is
a 6 – 8-as számú jelek	- csak betűkészletben
a 9-es számú jel	- betű- és számkészletben is
a 10-es számú jel	- csak betűkészletben
a 11 – 31-es számú jelek	- betű- és számkészletben is

1. Megjegyzés: A "betűkészlet"-en és a "számkészlet"-en a készülék váltóbillentyűjével létrehozott állapotot kell érteni, amely állapotba a csatornához kapcsolt készüléket a jel vétele előtt helyezték.

2. Megjegyzés: A fenti jelek használatakor többek között figyelembe kell venni a 4.4.5.3 pont előírásait is.

3. Megjegyzés: A 4.1.2.2 pont előbb felsorolt előírásai nem kívánják megakadályozni az alábbiak használatát:

a) a 6, 7 és 8-as számú jelek használatát számkészletben, kétoldalú egyezmény megkötését követően, azon Államok között, amelyek közvetlenül egymáshoz kapcsolódó távközlési állomásokkal rendelkeznek, *b) a 10-es számú jel használatát számkészletben, elsőbbségi riasztójelzésként (lásd a 4.4.4.3 pontot); és*

c) a 4-es számú jel használatát számkészletben, csak operatív célra, nem egy közlemény részeként.

4.1.2.3 A távgépíró vonalakon történő közleményváltásra az 5-ös számú Nemzetközi ABC (IA-5) alábbi karakterei a megengedettek:

- a 0/1 – 0/3 közötti és a 0/7-es karakterek – az elsőbbségi riasztójelzésekben (*lásd a* 4.4.15.2.2.5 *pontot*), a 0/10, 0/11-es karakterek a záró karaktersorozatban (*lásd a* 4.4.15.3.12.1 *pontot*), a 0/13-as karakter;
- a 2/0, 2/7 – 2/9, 2/11 – 2/15-ös karakterek;
- a 3/0 – 3/10, 3/13, 3/15-ös karakterek;
- a 4/1 – 4/15-ös karakterek,
- az 5/0 – 5/10-es karakterek; és
- a 7/15-ös karakter.

Megjegyzés: A megelőző 4.1.2.3 pont előbb felsorolt előírásai nem a teljes IA-5-ös ABC használatát kívánják megakadályozni, miután az érintett Hatóságok erről megállapodtak.

4.1.2.4 Római számokat nem szabad használni. Ha egy közlemény feladója arról akarja tájékoztatni a címzettet, hogy római számokat szándékozott írni, akkor arab számokat írjon és tegye eléjük a "ROMAN" (római) szót.

4.1.2.5 Az ITA-2 kóddal leírt közlemények nem tartalmazhatják az alábbiakat:

1) egymás után, megszakítás nélkül következő 26, 3, 26 és 3-as számú jeleket, ebben a sorrendben (sem betűkészletben, sem számkészletben), ez csak a fejlécben fordulhat elő, a 4.4.2.1.1 pont előírásai szerint; és

2) egymás után, megszakítás nélkül következő négy darab 14-es számú jelet (sem betűkészletben, sem számkészletben), ez csak a záró szakaszban fordulhat elő, a 4.4.6.1 pont előírásai szerint.

4.1.2.6 Az IA-5 kóddal leírt közlemények nem tartalmazhatják az alábbiakat:

1) a 0/1 karaktert (SOH), ez csak a fejlécben fordulhat elő, ahogy az a 4.4.15.1.1 a) pont előírásaiban meghatározásra került;

2) a 0/2 karaktert (STX), ez csak a feladó sorban fordulhat elő, ahogy azt a 4.4.15.2.2.7 pont előírja;

3) a 0/3 karaktert (ETX), ez csak a záró-részben fordulhat elő, ahogy az a 4.4.15.3.12.1 pontban előírásra került;

4) egymás után, megszakítás nélkül következő 5/10, 4/3, 5/10 és 4/3 karaktereket, ebben a sorrendben (ZCZC);

5) egymás után, megszakítás nélkül következő 2/11, 3/10, 2/11, és 3/10 karaktereket, ebben a sorrendben (+:+:);

6) egymás után, megszakítás nélkül négyszer következő 4/14 karaktert (NNNN); és

7) egymás után, megszakítás nélkül négyszer következő 2/12 karaktert („„„).

4.1.2.7 A közlemények szövegét nyílt nyelven, vagy a 3.7 pontban előírt rövidítések és kódok használatával kell megfogalmazni. A feladó kerülje a nyílt nyelv használatát, ha a szöveg hossza megfelelő rövidítésekkel és kódokkal csökkenthető. Ne használjon olyan szavakat és kifejezéseket, amelyek nem fontosak .

4.1.2.8 Ha a közlemény feladója a közlemény szövegrészének bizonyos helyein sorigazítási kódot [<≡] kíván küldeni (lásd a 4.4.5.3 és 4.4.15.3.6 pontokat), akkor minden ilyen helyre ki kell írni a [<≡] jelsorozatot.

4.2 Légiforgalmi szolgálatok közvetlen élőszavas összeköttetései (ATS vonalak)

Megjegyzés: A légiforgalmi szolgálatok közvetlen élőszavas közleményváltásaival kapcsolatos előírásokat az Annex 11 - 6. fejezete tartalmazza.

4.3 Meteorológiai operatív csatornák és meteorológiai operatív távközlési hálózatok

A meteorológiai operatív csatornákon és a meteorológiai operatív távközlési hálózatokon használt eljárásoknak összeegyeztethetőeknek kell lenniük a Légiforgalmi Állandóhelyű Távközlési Hálózat (AFTN) eljárásaival.

Megjegyzés: Az "összeegyeztethető" (kompatibilis) olyan üzemeltetési módot jelent, amely biztosítja, hogy a meteorológiai operatív csatornákon váltott közleményeket a légiforgalmi állandóhelyű távközlési hálózaton is le lehessen adni anélkül, hogy annak káros hatása lenne a légiforgalmi állandóhelyű távközlési hálózat működésére és fordítva.

4.4 Légiforgalmi állandóhelyű távközlési hálózat (AFTN)

4.4.1 Általános rész

4.4.1.1 *Közlemények kategóriái.* A 3.3 pont előírásait is figyelembe véve, a légiforgalmi állandóhelyű távközlési hálózatnak az alábbi kategóriákba sorolható közleményeket kell kezelnie:

a) vészhelyzeti közlemények *(distress messages)*;
b) sürgősségi közlemények *(urgency messages)*;
c) repülésbiztonsággal kapcsolatos közlemények; *(flight safety messages)*
d) meteorológiai közlemények;
e) a repülések rendszerességét elősegítő közlemények;
f) a Légiforgalmi Tájékoztató Szolgálat (AIS) közleményei;
g) légiforgalmi adminisztrációs, igazgatási közlemények;
h) szolgálati közlemények.

4.4.1.1.1 *Vészhelyzeti közlemények (SS sürgősségi jelzéssel)*. Ebbe a kategóriába azok a közlemények tartoznak, amelyeket a mozgó állomások adnak föl, és amelyben azt közlik, hogy súlyos és közvetlen veszély fenyegeti őket, valamint minden egyéb olyan közlemény, amely a vészhelyzetben lévő mozgó állomásnak történő azonnali segítségnyújtással kapcsolatos.

4.4.1.1.2 *Sürgősségi közlemények (DD elsőbbségi jelzéssel)*. Ebbe a kategóriába azok a közlemények tartoznak, amelyek egy hajó, légijármű vagy egyéb jármű biztonságával, vagy a fedélzetén, illetve a látótávolságában lévő személy biztonságával kapcsolatosak.

4.4.1.1.3 *Repülésbiztonsági közlemények (FF elsőbbségi jelzéssel)*. Ebbe a kategóriába tartoznak:
a) a légijárművek mozgásával és irányításával kapcsolatos közlemények, ahogy azokat a PANS-ATM (Doc 4444) 10. Fejezete meghatározza;
b) a légijárművet üzemeltető ügynökség (járató) által feladott közlemények, amelyek közvetlenül, haladék nélkül érintenek egy repülésben lévő, vagy indulni készülő légijárművet;
c) a meteorológiai közlemények a SIGMET tájékoztatásra, a különleges légijelentésekre, az AIRMET közleményekre, a vulkáni hamufelhők és trópusi ciklonok tanácsadói információira és az előrejelzések módosításaira korlátozottak..

4.4.1.1.4 *Meteorológiai közlemények (GG elsőbbségi jelzéssel)*.

Ebbe a kategóriába tartoznak:
a) az előrejelzéseket, pl. közelkörzeti/repülőtéri előrejelzéseket (TAF-okat), területi és útvonali előrejelzéseket tartalmazó közlemények;
b) észleléseket és jelentéseket tartalmazó közlemények, mint pl. a METAR és a SPECI.

4.4.1.1.5 *A repülések rendszerességét elősegítő közlemények (GG elsőbbségi jelzéssel)*.

Ebbe a kategóriába tartoznak:

a) légijárművek terhelésével kapcsolatos, a súly és súlypont számításához szükséges közlemények;

b) a légijárművek üzemeltetési menetrendjében beálló változásokkal kapcsolatos közlemények;

c) a légijárművek karbantartásával, szervizelésével kapcsolatos közlemények;

d) az utasokra, személyzetre és árura vonatkozó kollektív követelmények változásával kapcsolatos közlemények, melyek a szokásos üzemeltetési menetrendtől való eltérésre vonatkoznak;

e) a nem tervezett - szokásostól eltérő - leszállásokkal kapcsolatos közlemények;

f) a nem menetrendszerű repülések számára a repülés előtt léginavigációs szolgálatok biztosítását és operatív kiszolgálást kérő közlemények, pl. átrepülési engedély kérése;

g) a légijármű-üzemeltető ügynökségek (járatók) által feladott, a légijármű érkezését, vagy indulását jelentő közlemények;

h) alkatrészekkel vagy anyagokkal kapcsolatos közlemények, melyekre sürgősen szükség van a légijárművek üzemeltetéséhez.

4.4.1.1.6 *Légiforgalmi tájékoztató szolgálat (AIS) közleményei (GG elsőbbségi jelzéssel)*.

Ebbe a kategóriába tartoznak:

a) A NOTAM-okkal kapcsolatos közlemények;

b) A SNOWTAM-okkal kapcsolatos közlemények.

4.4.1.1.7 *Légiforgalmi adminisztratív közlemények (KK elsőbbségi jelzéssel).*

Ebbe a kategóriába tartoznak:

a) a légijárművek üzemeltetésének biztonsága vagy rendszeressége érdekében biztosított létesítmények üzemeltetésével, vagy fenntartásával, karbantartásával kapcsolatos közlemények;

b) a légiforgalmi távközlési szolgálatok működésével kapcsolatos közlemények;

c) a Polgári Légügyi Hatóságok között váltott, a légiforgalmi szolgálatokkal kapcsolatos közlemények.

4.4.1.1.8 Az információ-kérő közleményeket ugyanolyan elsőbbségi jelzéssel kell ellátni, mint amilyennel azt a közleményt láttak el, amellyel kérnek, kivéve, ha a repülés biztonsága érdekében ennél magasabb prioritás indokolt.

4.4.1.1.9 *Szolgálati közlemények (megfelelő elsőbbségi jelzéssel).*

Ebbe a kategóriába tartoznak a légiforgalmi állandóhelyű állomásoktól származó közlemények, amelyekben tájékoztatást vagy megerősítést kérnek más, olyan közleményekkel kapcsolatban, amelyeket a légiforgalmi állandóhelyű hálózat látszólag helytelenül továbbított, vagy amelyekkel a csatorna-sorszámok megerősítését kérik, stb.

4.4.1.1.9.1 A szolgálati közleményeket a 4.4.2 vagy a 4.4.15 pontban előírt formában kell elkészíteni. Amikor a 4.4.3.1.2 vagy a 4.4.15.2.1.3 pont előírásait alkalmazzák egy olyan szolgálati közleményre, amelynek címzettje egy csak helységkóddal azonosított légiforgalmi állandóhelyű állomás, akkor közvetlenül ez után a helységkód után az ICAO három-betűs "YFY" azonosítóját kell beilleszteni, amelyet egy megfelelő nyolcadik betű kövessen.

4.4.1.9.2 A szolgálati közleményeket a megfelelő elsőbbségi jelzéssel kell ellátni.

4.4.1.1.9.2.1 **Ajánlás.** - *Ha a szolgálati közlemények korábban feladott közleményekre vonatkoznak, lehetőleg ugyanazzal az elsőbbségi jelzéssel lássák el, mint az(oka)t, amely(ek)re vonatkoznak.*

4.4.1.1.9.3 Az átviteli hibákat javító szolgálati közleményeket minden olyan címzettnek meg kell küldeni, aki a hibás adást meg fogja kapni.

4.4.1.1.9.4 A szolgálati közleményre adott választ annak az állomásnak kell megcímezni, amely az eredeti szolgálati közleményt feladta.

4.4.1.1.9.5 **Ajánlás.** - *A szolgálati közlemények szövege a lehető legtömörebb legyen.*

4.4.1.1.9.6 A szolgálati közleményeket, kivéve azokat, amelyek SS közlemény vételét nyugtázzák, az SVC rövidítéssel kell azonosítani, amely a szöveg első eleme legyen.

4.4.1.1.9.7 Amikor a szolgálati közlemény egy korábban kezelt közleményre hivatkozik, akkor a korábbi közleményre a megfelelő közlemény-azonosítóval (lásd a 4.4.2.1.1 b) és 4.4.15.1.1. b) pontokat), vagy a feladási időt és a feladót jelző azonosító karaktercsoportok megadásával (lásd a

4.4.4 és a 4.4.15.2.2 pontokat) kell hivatkozni, azokkal, amelyekkel a hivatkozott közleményt egyértelműen meghatározzák.

4.4.1.2 *Elsőbbségi sorrend.*

4.4.1.2.1 A Légiforgalmi állandóhelyű távközlési hálózaton a közlemények továbbításának elsőbbségi sorrendje a következő:

Közlemény továbbításának elsőbbségi sorrendje	*Elsőbbségi jelzés*
1	SS
2	DD FF
3	GG KK

4.4.1.2.2 **Ajánlás.** *Az azonos elsőbbségi jelzéssel rendelkező közleményeket lehetőleg abban a sorrendben továbbítsák, amilyen sorrendben azokat feladásra benyújtották.*

4.4.1.3 *A közlemények továbbítási útvonalának meghatározása*

4.4.1.3.1 Minden közleményt a rendelkezésre álló leggyorsabb továbbítási útvonalon kell a címzettnek leadni.

4.4.1.3.2 A közlemény-forgalom gyorsítására, ha szükséges, előzetes megállapodásokat kell kötni a kitérő útvonalakról. Minden távközlési központnak rendelkeznie kell a megfelelő kitérő útvonal listával, amelyet az érintett távközlési központokat üzemeltető Hatóság(ok) jóváhagyott (jóváhagytak), és szükség esetén ezeket kell használni.

4.4.1.3.2.1 **Ajánlás.-** *Kitérő továbbítási útvonalat kell választani:*

1) egy teljesen automatizált távközlési központban:

a) közvetlenül a vonal megszakadásának észlelése után, ha a forgalmazást egy teljesen automatizált távközlési központon keresztül irányítják át;

b) a vonal megszakadásának észlelésétől számított 10 percen belül, ha a forgalmazást egy nem teljesen automatizált távközlési központon keresztül irányítják át;

2) egy nem teljesen automatizált távközlési központban a vonal megszakadásának észlelésétől számított 10 percen belül.

Ott, ahol nem kötöttek előzetes kétoldalú vagy többoldalú megállapodásokat, az átirányítás szükségességéről az érintetteket szolgálati közleményben kell értesíteni.

4.4.1.3.3 Mihelyt nyilvánvalóvá válik az, hogy a légiforgalmi állandóhelyű szolgálat segítségével nem lehet a közleményt elfogadható időintervallumon belül továbbítani, és amennyiben a közlemény annál az állomásnál van, ahol azt benyújtották, akkor meg kell kérdezni a feladót, hogy milyen intézkedéseket tegyenek, kivéve, ha:

a) erről másképp nem egyezik meg az érintett állomás és a közlemény feladója; vagy

b) léteznek olyan megállapodások, amelyek értelmében a késedelmet szenvedő közleményeket automatikusan átirányítják a kereskedelmi távközlési szolgálatokhoz, a feladó értesítése nélkül.

Megjegyzés.- Az "elfogadható időintervallum" azt jelenti, valószínűnek látszik az, hogy a közleményt nem tudják kézbesíteni a címzettnek az érintett közlemény kategóriájára vonatkozó rögzített átviteli idő- intervallumon belül, vagy, ha ilyen nincs, azon időtartamon belül, amelyben a feladó és az érintett távközlési állomás előzetesen megegyezett.

4.4.1.4 *A közlemények forgalmának felügyelete*

4.4.1.4.1 *A közlemények forgalmának folytonossága.* A vevő állomásnak ellenőriznie kell a bejövő közlemények közlemény-azonosítóját, hogy meggyőződjön róla, az adott csatornán érkező összes közlemény csatorna-sorszáma a helyes sorrendben érkezik-e.

4.4.1.4.1.1 Ha a fogadó állomás azt észleli, hogy egy vagy több csatorna-sorszám hiányzik, teljes szolgálati közleményt kell, hogy küldjön (lásd a 4.4.1.1.9 pontot) az őt megelőző állomásnak, amelyben visszautasítja minden olyan üzenet vételét, amelyet a hiányzó sorszámmal/sorszámokkal adtak fel. Az ilyen szolgálati közlemény szövegének tartalmaznia kell a QTA jelzést, a MIS eljárás-jelzést, amit egy, vagy több hiányzó közlemény-azonosító követ (lásd a 4.4.2.1.1.3 és a 4.4.15.1.1.4 pontokat), valamint a szöveg vége jelet (lásd a 4.4.5.6 és a 4.4.15.3.12 pontokat).

Megjegyzés:- Az alábbi példák a fenti eljárás alkalmazását szemléltetik. A második példában az elválasztó kötőjel (-) nyílt szövegben azt jelenti, hogy valamennyitől - valameddig.

1) ha egy csatorna-sorszám hiányzik:
SVC→QTA→MIS→ABC↑123↓<≡

2) ha több csatorna-sorszám hiányzik:
SVC→QTA→MIS→ABC↑123-126↓<≡

4.4.1.4.1.1.1 Amikor a 4.4.1.4.1.1 pont előírásait alkalmazzák, a szolgálati közlemény segítségével a hiányzó közlemény(ek)ről értesített állomás újbóli felelőssége lesz azon közlemény(ek) ismételt továbbítása, amelye(ke)t már korábban a hivatkozott sorszámmal továbbított, és ez(eke)t a közlemény(eke)t új (sorrendileg helyesen következő) közlemény-azonosítóval köteles újra továbbítani. A fogadó állomásnak úgy kell szinkronizálnia, hogy a következő várható csatorna-sorszám az utolsó sikeresen vett csatorna-sorszám plusz egy legyen.

4.4.1.4.1.2 **Ajánlás.-** *Ha a fogadó állomás azt észleli, hogy egy közlemény csatorna-sorszáma kisebb a vártnál, akkor erről lehetőleg értesítse az őt megelőző állomást az alábbi szövegű szolgálati közleménnyel:*

1) az SVC rövidítés;

2) az LR eljárás-jelző, amelyet a vett közlemény-azonosító követ;

3) az EXP eljárás-jelző, amelyet a várt közlemény-azonosító követ;

4) a szöveg vége jel (ETX).

Megjegyzés:- A következő példa mutatja be a fenti eljárás alkalmazását:

SVC→LR→ABC→123→↓EXP→ABC↑135↓<≡

4.4.1.4.1.2.1 **Ajánlás**.- *Amikor a 4.4.1.4.1.2 pont előírásait alkalmazzák, a sorrenden kívüli közleményt vevő állomás lehetőleg úgy szinkronizálja a vételi sorát, hogy a következő várt csatorna-sorszám az utoljára sikeresen vett csatorna-sorszám plusz egy legyen! Az előző állomás lehetőség szerint ellenőrizze a kimenő csatorna-sorszámait, és ha szükséges, javítsa azok sorrendjét!*

4.4.1.4.2 *Eltévedt közlemények*

Megjegyzés: Egy közleményt akkor kell eltévedtnek tekinteni, ha nincs benne semmi olyan közvetlen, vagy közvetett továbbítási utasítás, amely alapján a vevő-állomás intézkedni tudna.

4.4.1.4.2.1 Ha a vevő-állomás azt észleli, hogy eltévedt közlemény került hozzá, akkor
1) vagy szolgálati közleményt küld (lásd a 4.4.1.1.9 pontot) az előző állomásnak, amelyben visszautasítja az eltévedt közlemény vételét;
2) vagy magára vállalja a közlemény továbbítását valamennyi megjelölt címzettnek.

Megjegyzés:- Az 1)-es módszer a kézi ("tépett szalagos") átjátszó állomások esetében javasolható, vagy a folyamatos szalaggal dolgozó félautomata átjátszó-állomások esetén. A 2)-es módszer a teljesen automatikus átjátszó-állomások esetében, vagy a folyamatos szalagot nem használó félautomata állomások esetében lehet célravezető.

4.4.1.4.2.2 Amikor a 4.4.1.4.2.1 pont 1)-es alpontjának előírásait alkalmazzák, akkor a szolgálati közleménynek az SVC rövidítésből, a QTA jelzésből, az MSR eljárás-jelzésből kell állnia, melyeket az eltévedt közlemény azonosítója (lásd a 4.4.2.1.1.3 és a 4.4.15.1.1.4 pontokat) és a szöveg vége jel (lásd a 4.4.5.6 és a 4.4.15.3.12 pontokat) követ.

Megjegyzés:- Az alábbi példa a fenti eljárás alkalmazását mutatja be:

SVC→QTA→MSR→ABC↑123↓<≡

4.4.1.4.2.3 Amikor a 4.4.1.4.2.2 pont alkalmazásának következményeképpen egy feladó állomás szolgálati közlemény útján értesül róla, hogy az egyik közlemény eltévedt, akkor újra át kell vennie a közleményért a felelősséget, és szükség szerint újra fel kell adnia a helyes kimenő csatornán vagy csatornákon.

4.4.1.4.3 Ha egy vonal szakadttá válik, de alternatív lehetőségek rendelkezésre állnak, az érintett állomások kölcsönös közlemények segítségével tájékoztatják egymást az utolsó küldött és vett közlemények csatorna-sorszámáról. Az ilyen közleményváltást teljes szolgálati közlemények formájában (lásd a 4.4.1.1.9 pontot) kell végrehajtani, amelyek szövegének tartalmaznia kell az SVC rövidítést, az LR és LS eljárás-jelzéseket, amelyeket a kérdéses közlemény(ek) azonosítója követ, és a szöveg vége jel (lásd a 4.4.5.6 és a 4.4.15.3.12 pontokat).

Megjegyzés: Az alábbi példa a fenti eljárás alkalmazását szemlélteti:

SVC→LR→ABC↑123↓→LS→BAC↑321↓<≡

4.4.1.5 *Az összeköttetés meghibásodása*

4.4.1.5.1 Ha az összeköttetés bármely állandóhelyű vonalon meghibásodik, az érintett állomásnak - amilyen hamar csak lehetséges, -meg kell kísérelnie az összeköttetés helyreállítását.

4.4.1.5.2 **Ajánlás**.- *Ha az összeköttetést elfogadható időn belül nem lehetséges helyreállítani a szabvány állandóhelyű szolgálati vonalon, akkor lehetőleg egy alkalmas alternatív vonalat kell* *használni. Amennyiben lehetőség van rá, meg kell kísérelni az összeköttetés felvételét az állandóhelyű szolgálat bármely rendelkezésre álló, erre feljogosított vonalán.*

4.4.1.5.2.1 Ha ezek a kísérletek sikertelenek maradnak, akkor csak kivételes és ideiglenes intézkedésként megengedhető bármely rendelkezésre álló levegő/föld frekvencia használata, ha biztosítható, hogy ez a repülésben lévő légijárműveket nem zavarja.

4.4.1.5.2.2 Ha egy rádióösszeköttetés a jel fokozatos elhalkulása, vagy kedvezőtlen terjedési viszonyok miatt megszakad, akkor az általában használatos szabvány állandóhelyű szolgálati frekvencián folyamatos vételi figyelést kell tartani. Annak érdekében, hogy ezen a frekvencián az összeköttetést minél hamarabb helyre lehessen állítani, le kell adni az alábbiakat:

a) a DE eljárás-jelzést;
b) az adóállomás azonosító jelét, háromszor egymás után;
c) a szövegigazítási jelet [<≡]
d) az RY betűket szünet nélkül, annyiszor egymás után, amennyi a papír példányon három sort megtölt;
e) a szövegigazítási jelet [<≡]
f) a "közlemény vége" jelet (NNNN).

A fenti jelsorozatot szükség szerint lehet ismételni.

4.4.1.5.2.3 Ha egy állomás az összeköttetési vonalban vagy a berendezések működésében hibát észlel, azonnal értesítse azokat az állomásokat, amelyekkel közvetlen összeköttetésben van, ha a hiba miatt ezeknek az állomásoknak módosítaniuk kell a közlemények útvonalát. A rendes üzemi körülmények helyreállásáról szintén értesítést kell küldeni ugyanezeknek az állomásoknak.

4.4.1.5.3 Amikor a kitérő útvonalra irányított forgalmazást nem fogadják el automatikusan, vagy ha előre meghatározott kitérő útvonalakat nem jelöltek ki, akkor ideiglenes kitérő útvonalat kell meghatározni szolgálati közlemények cseréjének segítségével. Az ilyen szolgálati közlemények tartalma:
1) az SVC rövidítés;
2) a QSP eljárás-jelzés;
3) ha szükséges, az RQ, NO vagy CNL eljárás-jelzések, kitérő útvonal kérésére, visszautasítására vagy törlésére;
4) azoknak az útvonal-körzeteknek, Államoknak, területeknek, helységeknek vagy állomásoknak az azonosítói, amelyekre a kitérítés vonatkozik;
5) a szöveg vége (ETX) jel.

Megjegyzés: Az alábbi példák mutatják be a fent említett eljárások alkalmazását:
a) kitérő útvonal kérése :
SVC→QSP→RQ→C→K→BG→BI↓<≡

b) kitérő útvonal elfogadása:

SVC→QSP→C→K→BG→BI↓<≡

c) kitérő útvonal elutasítása:

SVC→QSP→NO→C→K→BG→BI↓<≡

d) kitérő útvonal törlése:

SVC→QSP→CNL→ C→K→BG→BI↓<≡

4.4.1.6 *Az AFTN forgalmazási jegyzőkönyvek hosszú-távú tárolása.*

4.4.1.6.1 Minden közleményt, amelyet az AFTN feladó állomás leadott, teljes egészében meg kell őrizni legalább 30 napig.

Megjegyzés. - Bár az AFTN feladó állomás felelős annak biztosításáért, hogy az AFTN forgalmazás rögzítve legyen, nem feltétlenül ez az az egység, ahol a jegyzőkönyveket vezetik és őrzik. Helyi megállapodás alapján az érintett Állam megengedheti, hogy ezeket a feladatokat a közlemények feladói végezzék el.

4.4.1.6.2 Az AFTN vevő állomásoknak legalább 30 napig meg kell őrizniük mindazon feljegyzéseket, amelyek alapján valamennyi vett közleményt és az ezekkel kapcsolatban tett intézkedéseket azonosítani lehet.

Megjegyzés. - A 4.4.1.6.2 pontnak a közlemények azonosítására vonatkozó előírását a közlemények fejlécének, valamint cím és feladó részének feljegyzésével lehet teljesíteni.

4.4.1.6.3 **Ajánlás.-** *Az AFTN távközlési központok lehetőség szerint legalább 30 napig őrizzék meg azokat a feljegyzéseket, amelyek alapján minden átjátszott vagy újra-feladott közleményt és az ezekkel kapcsolatban tett összes intézkedést azonosítani lehet.*

1.Megjegyzés. - A 4.4.1.6.3 pontnak a közlemények azonosítására vonatkozó előírását a közlemények fejlécének, valamint cím és feladó részének feljegyzésével lehet teljesíteni.

2.Megjegyzés. - Az AFTN forgalmazási jegyzőkönyvek AFTN távközlési központokban történő rövid távú megőrzéséről a 4.4.1.7 pont rendelkezik.

4.4.1.7 *Az AFTN forgalmazási jegyzőkönyvek rövid távú megőrzése*

4.4.1.7.1 A 4.4.1.7.2 pontban leírtak kivételével, az AFTN távközlési központoknak legalább egy órán át meg kell őrizniük minden olyan közlemény teljes másolatát, melyet az adott központ átjátszott vagy újra feladott.

4.4.1.7.2 Amennyiben az AFTN távközlési állomások között nyugtázás történik, akkor az átjátszó állomás úgy tekinthető, hogy a továbbiakban nem felelős azon közlemények újra feladásáért vagy ismétléséért, amelyekre pozitív nyugtázást kapott, és így azt a feljegyzéseiből törölheti.

Megjegyzés. - Az AFTN forgalmazási jegyzőkönyveknek az AFTN távközlő központokban történő hosszú távú megőrzéséről a 4.4.1.6 pont rendelkezik.

4.4.1.8 Az AFTN csatornákon történő ellenőrzések eljárásai

4.4.1.8.1 **Ajánlás**.- *Az AFTN csatornákon ellenőrzés és vonal-javítás céljából leadott ellenőrző közlemények lehetőleg az alábbiakat tartalmazzák:*
1) a közlemény eleje jel;
2) a QJH eljárás-jel;
3) a feladó azonosítója;
4) az ITA-2 kód használata esetén az RY karakter, vagy az IA-5 kód használata esetén az U(5/5) *(2/10) karakterek sorozata három sorban egymás után; és
5) a "közlemény vége" jel.

4.4.2 Közlemény-formátumok - 2-es számú Nemzetközi Távíró ABC (ITA-2)

A 4.4.1.8 és a 4.4.9.3 pontokban előírtak kivételével minden közleménynek a 4.4.2.1-től a 4.4.6.1-ig terjedő pontokban előírt elemeket kell tartalmaznia.

1.Megjegyzés: Az ITA-2 közlemény-formátumot a 4-1. ábra mutatja be.

2.Megjegyzés: A következőkben leírt, közlemény-formátumra vonatkozó szabványokban az alábbi szimbólumokat használtuk a 2-es sz. Nemzetközi Távíró ABC bizonyos karaktereihez rendelt funkciók megjelölésére (lásd a III. Kötet, 1 Rész, 8.2.1 pontját és a 8-1. táblázatát):

Szimbólum	*Jelentés*
<	KOCSI VISSZA (*27-es számú jel*)
≡	SOREMELÉS (*28-as számú jel*)
↓	BETŰVÁLTÓ (*29-es számú jel*)
↑	SZÁMVÁLTÓ (*30-as számú jel*)
→	SZÓKÖZ (*31-es számú jel*)

4.4.2.1 *Fejrész*

4.4.2.1.1 A fejrésznek az alábbi elemekből kell állnia:
a) "közlemény eleje" jelzés, a **ZCZC** karakterek;
b) a közlemény azonosítója, amelynek elemei:
1) a vonal /áramkör/ azonosítója;
2) a csatorna-sorszám.
c) további szolgálati információk (ha szükséges), amelynek elemei:
1) egy SZÓKÖZ;
2) legfeljebb tíz karakter.
d) jelköz.

4.4.2.1.1.1. A vonal azonosítója az adóállomás által kiválasztott és hozzárendelt három betűből kell, hogy álljon; az első betű a vonal adóállomás felöli végét, a második a vonal vevő-állomás felöli végét azonosítja, a harmadik pedig a csatornát. Ahol az adó- és a vevőállomás között csak egyetlen csatorna létezik, akkor erre a célra az "A" betűt kell használni. Ha az állomások között több csatorna is van, akkor a csatornákat az "A", "B", "C", stb. betűkkel kell azonosítani, a megfelelő sorrendben.

4.4.2.1.1.2 A távközlési állomásoknak 001 és 000 (az 1000 helyett) közötti háromjegyű, sorrendben növekvő csatorna-sorszámokat kell kijelölni valamennyi, közvetlenül egyik állomástól a másiknak küldött közleményhez. Minden csatornán külön sorszámozást kell alkalmazni, és minden nap 0000 órakor új sorozatot kell kezdeni.

4.4.2.1.1.2.1 **Ajánlás.-** *Hogy elkerüljék ugyanazon sorszámok ismétlődését 24 órán belül, megengedhető a négy-jegyű csatorna-sorszámok használata, amennyiben erről a vonal üzemeltetéséért felelős hatóságok megállapodást kötnek.*

4.4.2.1.1.3 A közlemény-azonosítót a vonalon a következő sorrendben kell leadni:
a) SZÓKÖZ [→];
b) az adó végberendezés betűjele;
c) a vevő végberendezés betűjele;
d) csatorna-azonosító betű;
e) SZÁMVÁLTÓ [↑];
f) csatorna-sorszám (3 számjegy).

4-1. ábra: Az ITA-2 közlemény-formátum

<table>
<tr><th colspan="2">Közlemény rész</th><th>A közlemény rész összetevője</th><th>Az összetevő eleme</th><th>Távgépíró jele</th></tr>
<tr><td colspan="2" rowspan="4">FEJLÉC
(lásd 4.4.2.1)</td><td>Közlemény kezdeti jel</td><td>-</td><td>ZCZC</td></tr>
<tr><td>Közlemény azonosítója</td><td>a) Egy szóköz
b) Feladó terminál betűjele
c) Vevő terminál betűjele
d) Csatorna-azonosító betű
e) Egy számváltó
f) Csatorna sorszám (3 szám)
(Példa: NRA062)</td><td>→…↑…</td></tr>
<tr><td>(ha szükséges) további szolgálati jelzések</td><td>a) Egy szóköz
b) Legfeljebb 10 karakter
(Példa: 2 70930)</td><td>→→→→→↓</td></tr>
<tr><td>Elválasztó jelsorozat</td><td>Öt szóköz
Egy betűváltó</td><td><≡</td></tr>
<tr><td rowspan="4">CÍMZÉS
(lásd 4.4.3)</td><td rowspan="10">A söveg állandó része</td><td>Szövegigazítási funkció</td><td>Egy kocsi vissza, egy soremelés</td><td>··</td></tr>
<tr><td>Elsőbbségi jelzés</td><td>A megfelelő kétbetűs csoport</td><td></td></tr>
<tr><td>Címzettek megjelölése</td><td>Egy szóköz és egy nyolcbetűs csoport, minden egyes címzettre. (Példa: EGLLZRZX → EDLLYKYX → EGLLACAM)</td><td></td></tr>
<tr><td>Szövegigatítási funkciók</td><td>Egy kocsi vissza, egy soremelés</td><td><≡</td></tr>
<tr><td rowspan="4">FELADÓ
(lásd 4.4.4)</td><td>Feladási idő</td><td>Egy számváltó
A hatbetűs dátum-idő csoport, amikor a közleményt feladásra benyújtották
Egy betűváltó</td><td>↑…...↓</td></tr>
<tr><td>Feladó azonosítója</td><td>Egy szóköz
A feladót azonosító nyolcbetűs csoport</td><td>→……</td></tr>
<tr><td>Elsőbbségi figyelem felhívó jelzés (csak telex üzemben, a Kényszerhelyzeti Köz-lemények megjelölésére)</td><td>Egy számváltó
A 2-es számú távíró ABC 10. számú jele, ötször egymás után</td><td>↑ figyelmeztető
Jelek ↓</td></tr>
<tr><td>Szövegigazítási funkció</td><td>Egy kocsi vissza, egy soremelés</td><td><≡</td></tr>
<tr><td rowspan="2">SZÖVEG
(lásd 4.4.5)</td><td>Szöveg kezdete</td><td>A címzett(ek) specifikus megjelölése (ha szükséges), mindegyik után egy kocsi vissza, egy soremelés (ha szükséges)
Az angol FROM szó (ha szükséges)
(lásd 4.4.5.2.3)
A feladó specifikus megjelölése (ha szükséges)
Az angol STOP szó, utána egy kocsi vissza, egy soremelés (ha szükséges)
(lásd 4.4.5.2.3); és/vagy
A feladó hivatkozási jele (ha szükséges)</td><td></td></tr>
<tr><td>Közlemény szövege</td><td>A közlemény szövege, melyben minden nyomtatott sort egy kocsi vissza, egy sor-
emelés követ, kivéve az utolsó sort.</td><td></td></tr>
</table>

		Megerősítés(*ha szükséges*)	a) Egy kocsi vissza, egy soremelésb) CFM rövidítés, amit a szöveg megerősítendő része követ	
		Helyesbítés (*ha szükséges*)	a) Egy kocsi vissza, egy soremelés b) COR rövidítés és a megelőző szövegben ejtett hibák javítása	
		Szöveg-vége jel	a) Egy betűváltó b) Egy kocsi vissza, egy soremelés	↓<≡
		Lapemelés jelsorozat	Hét soremelés	≡≡≡≡≡≡≡
		Közlemény-vége jel	Négy darab N betű (14 számú jel(	NNN
Záró rész (lásd 4.4.5)		Közlemény elválasztó jel (*csak kézi "tépett szalagos" átjátszó állomásnak továbbított közleményben használatos*)	Tizenkettő darab betűváltó jel	↓↓↓↓↓↓↓↓↓↓↓↓
		Szalagemelés (lásd 4.4.7)	További betűváltó jelek azokban az esetekben, ha előzetes megállapodásokat kötöttek arra, hogy a bejövő vonalakon szalagemelést kell alkalmazni (lásd 4.4.7)	

(a fenti ábra a 4.4.2 - 4.4.9.1 pontokban leírt távgépíró közlemény formátumát mutatja be)

Jelmagyarázat:

Szimbólum	*Jelentés*
< KOCSI VISSZA	(27-es számú jel)
≡ SOREMELÉS	(28-as számú jel)
↓ BETŰVÁLTÓ	(29-es számú jel)
↑ SZÁMVÁLTÓ	(30-as számú jel)
→ SZÓKÖZ	(31-es számú jel)

4.4.2.1.2 A távgépíró üzemben közvetlenül a 4.4.2.1.1.3 pontban leírt közlemény-azonosító után egy jelköz jelet kell küldeni, amely öt darab SZÓKÖZ-ből [→→→→→] és egy BETŰVÁLTÓ-ból áll [↓].

Megjegyzés:- Az alábbi példák a közlemény-azonosítóra vonatkozó szabványok (lásd a 4.4.2.1.1 b) és a 4.4.2.1.1.3 pontot) alkalmazását mutatják be:

Szalag *Nyomtatott példány*

→GLB→039→→→→→↓ **GLB039**

(Ez azt jelenti, hogy ez volt aznap a 39. közlemény, amit a vonal "B" csatornáján továbbítottak a "G" állomástól az "L" állomásnak.)

4.4.2.1.3 A közlemény-azonosító után további szolgálati tájékoztatás beszúrását meg kell engedni, amennyiben a vonal üzemeltetéséért felelős hatóságok erről megállapodást kötöttek. Az ilyen további szolgálati információt egy SZÓKÖZ-zel kell kezdeni és utána legfeljebb tíz karakter állhat, és nem foglalahatnak kijelölési funkciót (<≡) magukba.

4.4.2.1.4 **Ajánlás**.- *Hogy elkerülhető legyen a kitérő útvonalra vonatkozó jelzés téves értelmezése (különösen, ha figyelembe vesszük, hogy a fejrész az átvitel során részlegesen sérülhet is), a fejrészben sehol ne forduljon elő egymás után két 22-es számú jel (sem betűkészletben, sem számkészletben).*

4.4.3 Címzés

4.4.3.1 A címnek az alábbi elemeket kell magába foglalnia:
a) kijelölési funkció [<≡];
b) elsőbbségi jelzés;
c) címzett(ek) megjelölése;
d) kijelölési funkció [<≡].
4.4.3.1.1 Az elsőbbségi jelzésnek a feladó által hozzárendelt, megfelelő két betűből kell állnia, a következő szabályok szerint:

A közlemény kategóriája	*Elsőbbségi jelzés*
*vész*helyzeti közlemények (lásd 4.4.1.1.1)	SS
sürgősségi közlemények (lásd 4.4.1.1.2)	DD
repülésbiztonsági közlemények (lásd 4.4.1.1.3)	FF
meteorológiai közlemények (lásd 4.4.1.1.4)	GG
a repülések rendszerességét elősegítő közlemények (lásd 4.4.1.1.5)	GG
légiforgalmi tájékoztató szolgálatok közleményei (lásd 4.4.1.1.6)	GG
légiforgalmi adminisztratív közlemények (lásd 4.4.1.1.7)	KK
szolgálati közlemények (lásd 4.4.1.1.9)	*(ahogy megfelelő)*

4.4.3.1.2 A címzett megjelölése - amely elé közvetlenül egy SZÓKÖZ-t kell tenni, kivéve, ha az a címzés második vagy harmadik sorának első címzett-jelölése - az alábbi elemekből kell, hogy álljon:

a) a célállomás helyének négybetűs helységnév azonosító kódja;

b) a címzett szervezetet/funkciót (légiforgalmi hatóság, szolgálat vagy légijármű üzemeltető ügynökség) azonosító három-betűs kód;

c) még egy betű, amely a címzett szervezeten/funkción belül egy osztályt, részleget, vagy eljáró egységet azonosít. Ha nincs szükség ilyen konkrét megjelölésre, akkor az X betű használható.

1. Megjegyzés. - A négy-betűs helység jelölések jegyzékéz a Doc 7910 - "Helység Jelölések" *tartalmazza.*

2. Megjegyzé. -: A három-betűs kódokat a Doc 8585 - "Légijármű-üzemeltető ügynökségek, légiforgalmi hatóságok és szolgálatok kódjai" *tartalmazza.*

4.4.3.1.2.1 Ha egy közleményt olyan szervezetnek kell címezni, amelynek nem osztottak ki. a 4.4.3.1.2 pontban említett típusú ICAO három-betűs azonosító kódot, akkor a célállomás négy-betűs helység jelölése után az ICAO három-betűs YYY kódot (vagy, katonai szervezet vagy szolgálat esetében az ICAO három-betűs YXY kódot) kell írni. A címzett szervezet nevét ilyenkor a közlemény szövegrészének első elemeként kell feltűntetni. Az ICAO három-betűs YYY vagy YXY kód után a következő (nyolcadik) betűnek a helykitöltő X betűnek kell lennie.

4.4.3.1.2.2 Ha a közleményt egy, a levegőben repülő légijárműnek kell megcímezni, és a közlemény, mielőtt a légiforgalmi mozgó szolgálat továbbítaná, az útjának egy részét az AFTN hálózaton keresztül teszi meg, akkor annak a légiforgalmi állomásnak a helység jelölése után, amelynek továbbítania kell a közleményt a légijármű részére, az ICAO hárombetűs ZZZ kódot kell írni. Ezután a légijármű azonosítóját a közlemény szöveg-részének első elemeként kell feltüntetni. Az ICAO hárombetűs ZZZ kód után a következő (nyolcadik) betűnek a helykitöltő X betűnek kell lennie.

Megjegyzés. - Az alábbi példák a 4.4.3.1.2.1 és a 4.4.3.1.2.2 pontokban leírt szabványok alkalmazását mutatják be:

1) címzett-jelölések (lehetséges típusok):

LGATZTZX	repülőtéri irányító torony (ZTZ) az LGAT helységben /Athén/;
LGATYMYF	a meteorológiai hivatal (YMY) "F" egysége az LGAT helységben;
LGATKLMN	a KLM légijármű-üzemeltető "N" jelű részlege az LGAT helységben;
LGATYYYX	az a légijármű-üzemeltető ügynökség, amelynek neve a közlemény szövegének elején szerepel, és amelynek iroda-helyiségét az LGAT állomás szolgálja ki;
LGATZZZX	a légiforgalmi állomásnak (LGAT) továbbítania kell ezt a közleményt, a légiforgalmi mozgó szolgálat útján, annak a légijárműnek, amelynek azonosítója a közlemény szövegének elején szerepel.

2) az ICA0 három-betűs YYY kód használata:

Az alábbi példában egy fiktív közleményt mutatunk be, amelyet (mondjuk) a "Pingvin Légitársaságnak" címeztek NCRG-be, és a feladó ugyanennek a légijármű-üzemeltető ügynökségnek a PHNL-beli irodája. A példa a közleményt a géptávíró nyomtatott példányán mutatja be, a fejrész és a befejező rész nélkül:

(Cím)	*GG NCRGYYYX*
(Feladó)	*311521 PHNLYYYX*
(Szöveg)	*AIR PENGUIN FLIGHT 801 CANCELLED*
	(= az AIR PENGUIN 801-es járat törölve)

3) az ICAO három-betűs ZZZ kód használata:

Az alábbi példában egy fiktív közleményt mutatunk be, amelyet a GABCD légijárműnek címeztek, az NZAA légiforgalmi állomás útján, a feladó az NZZC körzeti irányító központ. A példa a közleményt a géptávíró nyomtatott példányán mutatja be, fejrész és befejező rész nélkül:

(Cím)	*FF NZAAZZZX*
(Feladó)	*031451 NZZCZQZX*
(Szöveg)	*GABCD CLR DES 5000FT HK NDB*
	(= GABCD, a süllyedés engedélyezve 5000 lábra HK NDB-re)

4.4.3.1.2.3 A teljes címzést a nyomtatott példányon legfeljebb három sorra kell korlátozni, és - a 4.4.14 pontban leírtak kivételével - minden címzettet külön meg kell jelölni, akár ugyanazon a helyen találhatóak, akár nem.

4.4.3.1.2.3.1 Ha a közleményeket nyomtatott példányban nyújtják be továbbításra, és több címzettet is tartalmaznak, mint amennyi három sorban elfér a nyomtatott formátumon, az ilyen közleményeket továbbítás előtt két, vagy több közleménnyé kell átalakítani, melyek egyenként meg kell, hogy feleljenek a 4.4.3.1.2.3 pont előírásainak. Az átalakítás során a címzettek megjelölését - amennyire csak lehetséges - olyan sorrendben kell feltüntetni, amely biztosítja, hogy a következő távközlési központokban a lehető legkevesebb számú újra-feladásra legyen szükség.

4.4.3.1.2.3.2 A távgépíró-vonalakon a közlemény cím-részében a címzetteket megjelölő csoportok minden sorának befejeződése után egy kijelölési funkciót kell küldeni [<≡].

4.4.4 Feladó

A feladó résznek az alábbi elemekből kell állnia:
a) feladási idő;
b) a feladó megjelölése;
c) elsőbbségi jel (ha szükséges);
d) választható fejrész mező;
e) kijelölési funkció [<≡].

4.4.4.1 A feladási idnek hat számjegyű dátum-időpont karakter-csoportból kell felépülnie,, amely a közlemények továbbításra való benyújtásának dátumát és időpontját jelzi (lásd a 3.4.2 pontot); távgépíró-üzemben a feladási időt egy BETŰVÁLTÓT [↓]-nak kell követnie.

4.4.4.2 A feladó azonosítója, amelyet közvetlenül egy SZÓKÖZ [→] előz meg, az alábbi elemekből épül fel:

a) annak a helynek a négy-betűs helység jelölése, ahol a közleményt feladták;

b) a közleményt feladó szervezet/hatáskör (légiforgalmi hatóság, légiforgalmi szolgálat vagy légijármű-üzemeltető ügynökség) három-betűs azonosító jelzése;

c) még egy betű, amely a feladó szervezet/hatáskör egy osztályát, részlegét vagy egységét, eljárását jelzi. Ha ilyen konkrét megadott azonosításra nincs szükség, akkor az "X" betű beszúrásával kell a címzést befejezni.

4.4.4.2.1 Ha a közleményt olyan szervezet küldi, amelynek nem osztottak ki. a 4.4.4.2 b) pontban leírt típusú ICAO három-betűs azonosító jelölést, akkor a feladás helyét jelző négy-betűs helység jelölés után közvetlenül az ICAO három-betűs YYY jelölést kell írni, amelyet a X betű követ (illeetve katonai szervezet vagy szolgálat esetében az ICAO három-betűs YXY jelölést, amelyet a helykitöltő X betű követ). A szervezet (vagy katonai szolgálat) nevét később a közlemény szövegének első elemeként kell feltűntetni.

4.4.4.2.2 Amennyiben a közleményt levegőben repülő légijármű adta fel, és a közlemény útjának egy részét az AFTN hálózaton teszi meg, mielőtt kézbesítik, a feladó csoportban azt a légiforgalmi állomást kell megjelölni, amelyik a közleményt az AFTN-hez továbbította, ami után közvetlenül az ICAO három-betűs ZZZ jelölés és a helykitöltő X betű következik. A légijármű azonosító jelét (hívójelét) a közlemény szövegének első elemeként kell feltűntetni.

4.4.4.2.3 Az AFTN-en továbbított olyan közlemények számára, amelyeket egy másik hálózatban adtak föl, ki kell jelölni egy érvényes AFTN feladó megjelölést, amelyet - megegyezés alapján - az AFTN hálózatot a külső hálózattal összekötő közvetítő, vagy kapu- (gateway) berendezés használ.

Megjegyzés:- Az alábbi példa a 4.4.4.2.2 pontban leírt eljárás alkalmazását mutatja be, egy fiktív közleménnyel, amelyet a KLM153 hívójelű légijármű adott fel, a CZEG-ben található Körzeti Irányító Központnak (ACC-nek) címezve, és a közleményt a CYCB-ben lévő légiforgalmi állomáson keresztül küldik el. A példa a közleményt a távgépíró nyomtatott formájú példányán mutatja, a fejrész és a zárórész nélkül:

(Cím)	*FF CZEGZRZX*
(Feladó)	*031821 CYCBZZZX*
(Szöveg)	*KLM153 [a szöveg hátralevő része, ahogy azt a légijárműtől vették]*

4.4.4.3 Az elsőbbségi jelzést csak a vészhelyzeti közlemények esetén kell használni. Ha használják, akkor az alábbi elemekből kell, hogy álljon, az alábbi sorrendben :
a) SZÁMVÁLTÓ [↑];
b) ÖT darab 10-es számú jel egymás után (szám-készletben);
c) BETŰVÁLTÓ [↓].

1. Megjegyzés. - A 2. számú Nemzetközi Távíró ABC 10-es számú jelének szám-készletbeli alakja általában megegyezik a légiforgalmi állandóhelyű vonalakon használatos távgépírókon a "J" betű szám-készletbeli alakjával.

2. Megjegyzés. - Az elsőbbségi riasztó jelzés a vevő távgépíró-állomáson megszólaltatja a csengőt. A teljesen automatizált állomások hasonló figyelmeztető jelzést adhatnak az SS sürgősségi jelzés észlelésekor. Ezek a jelzések hívják fel az automata átjátszó központokban a felügyelő személyzet, az alárendelt állomásokon pedig kezelő személyzet figyelmét arra, hogy a közlemény azonnali figyelmet követel.

4.4.4.4 A feladó sorban további adatok közlését is meg kell engedni, feltéve hogy a feladó rész teljes hossza nem haladja meg a 69 karaktert, és hogy ez az érintett hatóságok megállapodásának tárgyát kell, hogy képezze.

4.4.4.4.1 **Ajánlás.-** *A szabadon választható adatok jelenlétét lehetőleg egy szóközzel jelezzék, az adatokat egy kijelölési funkcióval zárják le.*

4.4.4.4.2 **Ajánlás.-** *Ha egy közleményben a forrás és a cél címzések között további címzési információk cseréje szükséges, akkor azt lehetőleg a szabadon választható adatmezőben (ODF) tegyék, az alábbi meghatározott formátumban:*
a) a kiegészítő címzés funkció paraméter-kódját egy egyes számmal és egy ponttal (1.) kell jelezni;
b) ezután három módosító karakter és egy egyenlőségjel (=) következik, majd a kiadott 8-karakteres ICAO címzés; és
c) a kiegészítő címzés paraméter-mezőjét egy kötőjellel (-) zárják le.

4.4.4.4.2.1 **Ajánlás.-** *Ha a szolgálati közleményekre, vagy kérdésekre a külön cím nem egyezik meg a feladó megjelölésével, akkor lehetőleg az SVC módosító jelzést kell használni.*

4.4.4.5 A feladó részt egy kijelölési funkcióval [<≡] kell lezárni.

4.4.5 Szöveg

4.4.5.1 A közlemények szövegét a 4.1.2 pont előírásainak megfelelően kell megfogalmazni.

4.4.5.2 Ha a feladóra utaló hivatkozást használnak, akkor az a szövegrész elején kell legyen, kivéve a 4.4.5.2.1 és a 4.4.5.2.2 pontban leírtak esetét.

4.4.5.2.1 Ha a címzett-megjelölés második elemét az YXY, YYY vagy ZZZ három-betűs ICAO jelölés alkotja (lásd a 4.4.3.1.2.1 és a 4.4.3.1.2.2 pontokat), és ezért szükség van a szövegben a közlemény címzettjének pontos meghatározására, akkor ezt az azonosító karakter-csoportot a feladóra való hivatkozás elé kell írni (ha van ilyen), és ezzel ez a szöveg első eleme lesz.

4.4.5.2.2 Ha a feladó-megjelölés második elemét az ICAO három-betűs YXY, YYY vagy ZZZ jelölés alkotja (lásd a 4.4.4.2.1 és a 4.4.4.2.2 pontokat), és ezért szükség van a szövegben azon szervezet (vagy katonai szolgálat), vagy légijármű nevének közlésére, amely a közleményt feladta, akkor ezt az azonosítót a szöveg első elemeként kell beilleszteni a közleménybe.

4.4.5.2.3 Amikor a 4.4.5.2.1 és a 4.4.5.2.2 pontok előírásait alkalmazzák olyan közleményekre, amelyekben az ICAO három-betűs YXY, YYY vagy ZZZ azonosítóját/azonosítóit két vagy több különböző szervezet (vagy katonai szolgálat) megjelölésére használják, akkor a szövegbe illesztett azonosítók sorrendje meg kell egyezzen a közlemény címzési és feladó részében használt teljes sorrenddel. Ilyen esetben minden címzett-megjelölés után közvetlenül egy kijelölési funkciót kell küldeni. Ilyenkor a közleményt feladó (YXY, YYY vagy ZZZ kóddal jelölt) szervezet neve elé a "FROM" ("...-TÓL") szót kell írni. Az ilyen azonosítók után a szövegrészbe, a szöveg többi részének kezdete elé a "STOP" szót és egy kijelölési funkciót kell írni.

4.4.5.3 A szöveg minden nyomtatott sora után egy kijelölési funkciót [<≡] kell küldeni, kivéve a szöveg utolsó sorát (lásd a 4.4.5.6 pontot).

4.4.5.4 Távgépíró üzemben, ha a szöveg egy részét meg kívánják erősíteni, akkor ezt a megerősítést az utolsó szövegcsoporttól egy kijelölési funkcióval [<≡] kell elválasztani, majd a CFM rövidítéssel kezdve a megerősített szövegrész következik.

4.4.5.5 Távgépíró hálózatban, ha észlelik, hogy a szövegben gépelési hiba történt, akkor a hibajavítást az utolsó szövegcsoporttól, vagy megerősítéstől (ha van ilyen) egy kijelölési funkcióval [<≡] kell elválasztani. Ezután a COR rövidítés és maga a helyesbítés következik.

4.4.5.5.1 A helyi kikézbesítés előtt, az állomás személyzetének el kell végeznie a nyomtatott példányon az összes jelzett helyesbítést.

4.4.5.6 A szöveg végén az alábbi szöveg vége jelet kell küldeni:

Egy BETŰVÁLTÓ [↓], kijelölési funkció [<≡].

4.4.5.7 Az AFTN feladó állomás által begépelt közlemény szövegének hossza nem haladhatja meg az 1800 karaktert.

1. Megjegyzés - Ha a légiforgalmi állandóhelyű távközlési hálózaton keresztül olyan közleményt kívánnak továbbítani, amelynek szövegrész hossza meghaladja az 1800 karaktert, akkor a 4.4.5.7 pont előírásainak értelmében az AFTN feladó állomásnak az ilyen közleményt több közleményre bontva kell feladnia, amely közlemények szövege egyenként sem haladhatja meg az 1800 karakter hosszúságot. A II. kötet "B" melléklete tartalmaz útmutatást arra vonatkozóan, hogyan kell egy hosszú közleményt több különálló közleményre bontani.

2. Megjegyzés - A karakterek számába bele kell számítani minden, a szövegben található nyomtatható és nem nyomtatható karaktert is, a szöveg elejét jelző kijelölő funkciót és a szöveg vége jelet kivéve.

4.4.6 A záró rész

4.4.6.1 A záró résznek az alábbi elemekből kell állnia:
a) lap-emelés jel, vagyis hét darab SOREMELÉS [≡ ≡ ≡ ≡ ≡ ≡ ≡];
Megjegyzés - Ez, valamint az ezt megelőző kijlölési funkcióban található egy SOREMELÉS, már elegendő elkülönítést biztosít a közlemények között, a nyomtatott példányokon.
b) a "közlemény vége" jel, vagyis négy darab "N" betű (a 14-es számú jel betű-készletbeli alakja), megszakítatlan karakter-sorozatként.

Megjegyzés. - Ez az összetevő - amelyet a közlemény első továbbításának pillanatától a végső kézbesítésig mindig sértetlenül továbbítani kell, - azért szükséges, hogy a félautomata vagy teljesen automatikus átjátszó berendezéseken az állomások közötti továbbítás érdekében létrehozott összeköttetéseket fel lehessen szabadítani a további közlemények fogadásához.
Ezt kiegészítőleg, ha a közleményt csak kézi ("tépett szalagos") átjátszó állomásnak adják le:
c) közlemény-elválasztó jel, azaz BETŰVÁLTÓ [↓] tizenkétszer egymás után megszakítatlan karakter-sorozatként.

1. Megjegyzés. - Az egyik közlemény "közlemény vége" jele és a következő közlemény "közlemény eleje" jele között a közlemények továbbítása során csak betűváltó jeleket szabad továbbítani.

2. Megjegyzés. - Az alábbi példa a 4.4.2-től a 4.4.6.1-ig terjedő pontokban leírt eljárások alkalmazását mutatja be, a közlemény nyomtatott példányán:

(Fejrész)	**ZCZC LPA183*
(Cím)	*GG LGGGZRZX LGATKLMW*
(Feladó)	*201838 EGLLKLMW*
(Szöveg)	*Szükség szerint*
(Zárórész)	*(Lapemelés)*
	*NNNN***

**2.A Megjegyzés. - Ha ez a közlemény egy sorozat egyik tagja, és a vevő távgépíró kezelője nem alkalmazott kézi lapemelést az egyes közlemények között, akkor az előző közlemény NNNN jelzése itt jelenik meg.*

***2.B Megjegyzés. - A 2A megjegyzésben leírt körülmények között a következő vett üzenet fejrésze a nyomtatott lapon ezen a helyen íródik ki.*

2.C Megjegyzés. - A gyakorlatban az állomásokon a nyomtatott közleményeket úgy választják el, hogy a lapemelés sorozatnál tépik el a papírt. A "közlemény vége" jel ezért a következő közlemény részévé válik. Nem valószínű azonban, hogy ez a nyilvánvaló áthelyeződés bármilyen félreértést okozna a feladó és a vevő között, hiszen a gyakorlatban a "közlemény vége" jelnek nyomtatott formában nincs jelentősége.

4.4.6.2 Az AFTN feladó állomás által leírt AFTN közlemény hossza nem haladhatja meg a 2100 karaktert.

Megjegyzés.- A karakterek számába bele kell számolni a közleményben található összes nyomtatható és nem nyomtatható karaktert, a beleértve közlemény eleje jelet (ZCZC), és a "közlemény vége" (NNNN) jelet is.

4.4.7 Szalagtovábbítás

4.4.7.1 **Ajánlás.-** *A kézi ("tépett szalagos - torn tape") és a félautomata, folyamatos szalagot használó állomások esetében, ha a 4.4.6.1 pontban leírt jeleken kívül további vezérlő jelekre van szükség annak* *biztosítására, hogy a szalag a vevő állomás újralyukasztó gépéről megfelelően kerüljön tovább, amikor a "közlemény vége" jelet nem követi azonnal a következő közlemény kezdetét jelző jel, akkor lehetőleg a vevő állomáson helyben intézkedjenek annak elkerülése érdekében, hogy ezeket a vezérlőjeleket ne az adó állomásnak kelljen leadnia.*

Megjegyzés. - A kézi ("tépett szalagos") állomásokon általában szükség van olyan berendezésre, amelynek segítségével a szalagot előre lehet mozgatni az újralyukasztó berendezésből, legalább annyira, hogy a kezelő a megfelelő ponton tudja eltépni a szalagot, olyan esetekben, amikor a kezelő már készen áll a szalag eltépésére, de még nem jött következő közlemény, amely a szalagot a berendezésen előre mozgatta volna. A félautomata állomásokon, ahol folyamatos szalaggal dolgoznak, hasonló körülmények között, hasonló eljárásra lehet szükség, hogy a szalagot annyira előre lehessen mozgatni, hogy a "közlemény vége" jel eljusson a leadó berendezésig.

4.4.7.1.1 Ha a 4.4.7.1 pont előírásai nem alkalmazhatók, akkor megállapodást kell kötni a leadó állomással, hogy az, minden egyedülálló közlemény után, vagy egy közlemény-sorozat végén, leadja az előre meghatározott számú BETŰVÁLTÓ jelből [↓] álló sorozatot, a 4.4.6 pontban előírt elemeket kiegészítve.

4.4.8 Rövidített címzés

Amikor a 4.4.3 vagy a 4.4.15.2.1 pont előírásait alkalmazzák, az AFTN távközlő központnak a címzésből ki kell hagynia az összes olyan címzett megjelölését, amely nem szükséges ahhoz, hogy:
a) az AFTN távközlő központ, amelynek elküldték a közleményt, azt tovább tudja küldeni;
b) az AFTN célállomás a közleményt kézbesíteni tudja a címzett(ek)nek;
c) egy több-pontos hálózat esetén az állomás-csoportok a közleményt tovább tudják küldeni, vagy helyben kézbesíteni tudják.

4.4.9 Távgépíró-üzemeltetési eljárások - általános rész

4.4.9.1 *Sor-vége funkciók*

4.4.9.1.1 A nyomtatott példány egy sora összesen legfeljebb 69 karaktert és/vagy szóközt tartalmazhat.

4.4.9.1.2 A közlemény szövegének minden nyomtatott sora után egy "KOCSI-VISSZA" [<] és egy SOREMELÉS [≡] jelet kell továbbítani.

4.4.9.2 *Az adások időtartama.* Szimplex vonalak esetében az egy közleményként leadott közlemény-sorozatok adásideje nem lehet hosszabb kb. öt percnél. A helyesen vett összes közleményt azonnal továbbítani, vagy kézbesíteni kell, anélkül, hogy megvárnák a sorozat végét.

4.4.9.3 *Csatorna-ellenőrző adások.* A 4.4.9.3.3 és a 4.4.9.3.5 pontban leírtak kivételével, a távgépíró vonalakon rendszeres időközönként az alábbi jelsorozatot kell elküldeni:
1) fejrész (lásd 4.4.2.1.1 pontot);
2) kijelölési funkció [<≡];
3) a CH eljárás-jelzés;
4) kijelölési funkció [<≡];
5) a "közlemény vége" jel [NNNN];
6) a közlemény-elválasztó jel [↓↓↓↓↓↓↓↓↓↓↓↓] (ha szükséges).

A vevő állomásnak ekkor ellenőriznie kell ennek a vett adásnak a közlemény-azonosítóját, hogy meggyőződjön arról, hogy annak sorszáma vajon illeszkedik-e az adott bejövő csatornán vett többi közlemény közé.

Megjegyzés.- Ennek az eljárásnak az alkalmazása bizonyos mértékig biztosítani tudja, hogy a csatornán a közlemény-sorszámok folytonossága fennmaradjon.

4.4.9.3.1 **Ajánlás.-** *Ha egy vonalon éppen nincs forgalom, akkor a 4.4.9.3 pontban leírt ellenőrző közleményt adják le lehetőleg minden óra (H) + 00; H + 20, H + 40 perckor.*

4.4.9.3.2 Ha az időszakonként ismétlődő csatorna-ellenőrző adás nem érkezik meg az adott csatorna számára előírt időponthoz képest egy kölcsönösen egyeztetett megengedhető időintervallumon belül, akkor szolgálati közleményt kell küldeni annak az állomásnak, amelytől az ellenőrző adást várták. Ennek a szolgálati közleménynek a szövege a következőkből kell, hogy álljon:

1) az SVC rövidítés;
2) az MIS eljárás-jelzés;
3) a CH eljárás-jelzés;
4) az idő, amikorra az adást várták (választható);
5) az LR eljárás-jelzés;
6) az utolsó vett közlemény azonosítója;
7) a szöveg-vége jel.

Megjegyzés: A következő példa a fenti eljárás alkalmazását mutatja be:
SVC→MIS→CH→[↑1220↓→]LR→ABC↑123↓<≡

4.4.9.3.3 Ha a távgépíró csatorna vezérelt hálózati protokol-rendszer segítségével üzemel, és ha az illetékes Hatóságok között erről kötött megállapodást követik, akkor a 4.4.9.3 pontban leírt adást nem kell elvégezni.

4.4.9.3.4 *Csatorna-ellenőrző adások és az állomás rádió-azonosító*. Annak érdekében, hogy teljesítsék az ITU előírását, amely alapján az állomás rádió-azonosító jelét rendszeres időközönként le kell adni, azok az AFTN állomások, melyek rádió-távgépíró csatornákon dolgoznak, összevonhatják az állomás rádió-azonosító jelének leadását a 4.4.9.3 pontban leírt csatorna-ellenőrző adással. Ebben az esetben a kombinált adást az alábbik szerint kell leadni:

1) fejrész (*lásd* a 4.4.2.1.1 pontot);
2) kijelölési funkció [<≡];
3) a CH eljárás-jelzés;
4) kijelölési funkció [<≡];
5) a DE eljárás-jelzés, egy SZÓKÖZ [→], majd a kiosztott ITU rádió-hívójel;
6) kijelölési funkció [<≡];
7) közlemény-vége jel [NNNN];
8) közlemény-elválasztó jel [↓↓↓↓↓↓↓↓↓↓↓↓] (ha szükséges).

Megjegyzés.- Ennek a formátumnak az alkalmazása teszi lehetővé azt, hogy ezt a speciális adást a teljesen automatikus kapcsoló-központok a felügyelő személyzet beavatkozása nélkül képesek kezelni.

4.4.9.3.4.1 **Ajánlás.-** *Ha több-csatornás rádió-távgépíró vonalakat használnak (pl. MET és AFTN), az állomás rádió-hívójelét lehetőleg csak a vonal egyik csatornáján adják le. Lehetőség szerint azt a csatornát válasszák, amelyik erre a célra a legmegfelelőbb, oly módon, hogy a leadott azonosító adás az adott csatornán használt formátumnak megfelelő legyen. Amikor AFTN csatornát választanak, akkor az azonosító adást ajánlott a csatorna-ellenőrző adással összevonni.*

4.4.9.3.5 Amikor a távgépíró vonalon Automatikus Hiba-javító /Automatic Error Correction (ARQ)/ berendezés működik, és ha az illetékes Hatóságok erről kötött megállapodását követik, akkor a 4.4.9.3 pontban leírt adást nem kell leadni. Azonban, azoknak az állomásoknak be kell tartaniuk a 4.4.9.3.4 pont előírásait, melyek olyan rádió-távgépíró csatornákat használnak az AFTN-en, melyekhez szükség van az állomás rádió-azonosító jelére.

Megjegyzés. - A fentieket nem szabad úgy értelmezni, mintha az ICAO előírná az automatikus *hibajavító (ARQ) berendezések üzembe állítását a nemzetközi légiforgalmi állandóhelyű vonalakon.*

4.4.10 A távgépíró (telex) adások szokásos eljárásai

4.4.10.1 A közleményeket a továbbküldésre vonatkozó, előre meghatározott felelősség szerint kell továbbítani, ahogy abban a közvetlen összeköttetésben lévő állomások üzemeltetéséért felelős Hatóságok kölcsönösen megegyeztek (*lásd* a 4.4.1.3 és a 4.4.1.5.2.3 pontokat is).

4.4.10.1.1 A 4.4.10.1 pontban említett felelősséggel kapcsolatos megállapodásokból következően, az AFTN minden állomásának alkalmaznia kell egy Közlemény-továbbítási Útvonal-Listából (Routing List) álló Közlemény-továbbítási Útvonal Jegyzéket (Routing Directory), melytől a 4.4.10.1.1.1 pont előírásai szerint nem térhet el.

4.4.10.1.1.1 Ha egy bejövő közlemény a fejrész után következő sorokban csak azonos helység jelöléseket tartalmaz, akkor a vevő állomásnak magára vállalnia a közlemény tovább-küldésének felelősségét. Ha lehetséges, a közlemény ilyen tovább-küldését a célállomására a szokásos kimenő vonalon kell végrehajtani; ha ez a vonal nem alkalmazható, akkor megfelelő alternatív kimenő vonalat kell használni. Ha ezen eszközök közül egyik sem működik, akkor a közleményt nem lehet visszaküldeni azon a vonalon, amelyen kapták, csak ha előtte egy szolgálati közleményben (lásd a 4.4.1.1.9 pontot) értesítik erről a megelőző adást lebonyolító állomást.

4.4.10.1.1.2 **Ajánlás. -** *Amennyiben az AFTN közlemény feladója nem képes a szolgálati közleményeket kezelni, lehetőség szerint egyezzen meg a vele összeköttetésben lévő AFTN központtal, hogy milyen módszerrel kezeljék az egymás közötti szolgálati közleményeket.*

Megjegyzés.- A 4.4.4.4.2 és a 4.4.4.4.2.1 pontban egy, a szolgálati címzés szabadon választható adatmezőben történő meghatározására szolgáló módszer található.

4.4.10.1.2 *Az adás formája - távgépíró üzem.* Minden adásnak az alábbi sorrendben kell felépülnie (*lásd* a 4-2. ábrát).

4.4.10.1.2.1 *Kezdő impulzus*. Ha a vevő állomás időkapcsolóval felszerelt berendezést használ, amely leállítja a távgépíró készülék motorját, amikor a csatornán nincs forgalom, akkor egy 20-30 milliszekundumos SZÜNET /SPACING/ IMPULZUST kell küldeni, ha a csatornán már legalább 30 másodpercig nem volt adás, majd ezután legalább 1,5 másodperc szünetet kell hagyni a fejrész leadásának megkezdése előtt.

1. Megjegyzés. - Ez megfelel egy BETŰVÁLTÓ [↓] *jel és egy legalább 1,37 másodperces szünet (vagyis egy folyamatos JELZÉS IMPULZUS /Marking Impulse/) elküldésének.*

2. Megjegyzés. - Ennek az eljárásnak az alkalmazása lehetővé teszi, hogy a vevő berendezés szinkronba kerülhessen, mielőtt a vonalon a fejrész továbbítása megkezdődik.

4.4.10.1.3 *Közlemény-formátum.* Minden közleményt a 4.4.2 pont előírásai (ITA-2 formátum), vagy a 4.4.15 pont előírásai (IA-5 formátum) szerint kell összeállítani.

KEZDŐ IMPULZUS *(ha szükséges)*		FEJRÉSZ	CÍMZÉS	FELADÓ	SZÖVEG	ZÁRÓRÉSZ

4-2. ábra: Az adás formája - távgépíró üzemben (lásd a 4.4.10.1.2 pontot)

4.4.10.1.3.1 **Ajánlás. -** *Az Annex 10, III. kötetének 8.6.3 és 8.6.4 pontjaiban leírt adatkapcsolati protokol eljárásokat alkalmazó vonalakon a Fejrész Sort - az SOH karakter kivételével - lehetőleg el kell hagyni.*

4.4.10.1.4 *Újra-feldolgozási eljárások*

4.4.10.1.4.1 Ha egy közleményt újra fel kell adni, akkor az az állomás, amelyik a közleményt továbbításra megkapta, a közlemény előző fejrészét törli. Az újbóli adás az új fejrésszel kezdődik, a kimenő csatornának megfelelő közlemény-továbbítási azonosítóval.

4.4.10.1.4.1.1 Amikor a 4.4.10.1.4.1 pont előírásait alkalmazzák, a közlemény cím-részének adását valamikor az első kijelölési funkciót [<≡] közvetlenül megelőző 5 SZÓKÖZ-ből, egy BETŰVÁLTÓ-ból álló [→→→→→↓] jelsorozat idején kell megkezdeni.

4.4.10.1.4.1.2 Az alárendelt és a kézi ("tépett szalagos") átjátszó állomásokon, amelyek nincsenek automatikus közlemény-sorszámot előállító berendezésekkel felszerelve, és ahol ezért szükséges a szalagra néhány további távgépíró-karaktert lyukasztani a közlemény-eleje jelzés elé, azért, hogy ez a jelzés ne sérüljön a további feladáskor, az ilyen további karaktereknek BETŰVÁLTÓ [↓] jeleknek kell lenniük. Ezután a tovább-küldéskor a kimenő csatornán az adást a közlemény-eleje jelhez minél közelebb kell megkezdeni, amennyire ez gyakorlatilag lehetséges.

4.4.10.1.4.1.3 Olyan állomásokon, ahol a közlemény fejrészét automatikus berendezés állítja elő, azon a ponton és akkor, amikor az adás a kimenő csatornán megtörténik, de a közlemény többi részét szalag-lyukasztással készítik el, és ezért szükséges, hogy a címzés kezdetén lévő kijelölési funkció [<≡] elé a szalagra néhány további távgépíró-karaktert lyukasszanak, hogy eleve kizárja a kijelölési funkció sérülését, az ilyen kiegészítő karaktereknek BETŰVÁLTÓ [↓] jeleknek , vagy SZÓKÖZ-öknek [→] kell lenniük. Ezután a tovább-küldéskor a kimenő csatornán az adást a közlemény első kijelölési funkciójához [<≡] minél közelebb kell megkezdeni, amennyire ez gyakorlatilag lehetséges.

4.4.10.1.4.2 A kézi ("tépett szalagos") átjátszó állomásokon a kapott szalagokat a közlemény-elválasztó jelben kell eltépni (*lásd* a 4.4.6.1 és a 4.4.7.1 pontokat), úgy, hogy az előző "közlemény-vége" jel sértetlen maradjon.

4.4.10.1.4.2.1 A 4.4.10.1.4.2 pont előírásainak alkalmazása után a szalagon maradt, megrövidült (vagyis, 12 BETŰ- VÁLTÓ [↓] jelnél rövidebb) közlemény-elválasztó jelet törölni kell, ha szükséges, elektronikus eszközökkel, mielőtt a közleményt újra feladják egy automatikus átjátszó állomásnak. Ha a közleményt egy másik kézi ("tépett szalagos") átjátszó állomásnak kell újra feladni, akkor:
1) a megrövidült közlemény-elválasztó jelet ki kell egészíteni egy teljes elválasztó jelzéssé [↓↓↓↓↓↓↓↓↓↓↓↓] (azaz 12 db [↓]) a szükséges számú további BETŰVÁLTÓ [↓] jel leadásával; vagy
2) a szalagon maradt, megrövidült közlemény-elválasztó jelzést el kell távolítani, és egy új, teljes közlemény-elválasztó jelet kell helyette betenni az újra-feldolgozás folyamán, a 4.4.6.1 c) pont előírásainak megfelelően.

4.4.10.1.5 A kézi ("tépett szalagos"), vagy félautomata állomásokon, ha csak lehetséges, tovább-küldés előtt egy hibátlan szalagpéldányt kell beszerezni. Ha a szalag olvashatatlan, vagy sérült, akkor az állomás nem küldheti tovább a közleményt, kivéve, ha józan megfontolás alapján ez valószínűleg nem okoz hibát a következő átjátszó állomások berendezéseinek működésében.

4.4.10.1.6 *A közlemények vételének nyugtázása.* Távgépíró-üzemben, a 4.4.10.1.6.1 pontban leírt eset kivételével, a vevő-állomásnak nem kell a bejövő üzenetek vételét igazoló nyugtázó közleményt küldenie. Ehelyett a 4.4.1.4.1 pont előírásait kell alkalmazni.

4.4.10.1.6.1 Vészhelyzeti közlemények (SS elsőbbségi jelzéssel - *lásd* a 4.4.1.1.1 pontot) vételét az AFTN célállomásnak egyedileg nyugtáznia kell, egy szolgálati közlemény (*lásd* a 4.4.1.1.9 pontot) küldésével, a feladó AFTN állomásnak. A vétel ilyen nyugtázását teljes közlemény formájában kell kiadni, amelyet a közleményt feladó AFTN állomásnak címeznek, és az SS elsőbbségi jelzéssel kell ellátni és az ehhez kapcsolódó elsőbbségi figyelemfelhívó jelzéssel (lásd a 4.4.4.3 pontot). A közlemény szövegének az alábbiakat kell mgába foglalnia:

1) az R eljárás-jelzés;

2) a nyugtázott közlemény feladója (lásd a 4.4.4 pontot), az elsőbbségi figyelem-felhívó jelzés, vagy választható fejrész adatok nélkül;

3) a szöveg-vége jel [↓<≡]

Megjegyzés. - A következőpélda a 4.4.10.1.6.1 pontban leírt eljárás alkalmazását mutatja be:

Fej-rész (lásd a *4.4.2.1.1* pontot)

<≡SS→LECBZRZX<≡

↑121322↓→EGLLYFYX (elsőbbségi figyelemfelhívó jelzés) <≡

R→↑121319↓→LECBZRZX↓<≡

Záró rész (lásd a *4.4.6* pontot)

4.4.10.1.7 Abban az esetben, ha egy több címzettel rendelkező közlemény egyik címzettje a közlemény ismétlését kéri a feladó állomástól, a feladó állomás csak az ismétlést kérő címzettnek fogja megcímezni az ismételten leadott közleményt. Ilyen körülmények között a DUPE eljárás-jelet nem kell befoglalni.

4.4.11 Intézkedések abban az esetben, ha a távgépíró átjátszó állomás sérült, vagy rosszul formázott közleményt talál.

4.4.11.1 Ha egy átjátszó állomás még az újra-feladás megkezdése előtt észleli, hogy egy közlemény a "közlemény- vége" jel előtt valamelyik ponton megsérült, vagy rosszul formázták, és jó oka van azt hinni, hogy a sérülés még az előtt következett be, hogy az előző állomás a közleményt megkapta, akkor szolgálati közleményt (*lásd* a 4.4.1.1.9 pontot) kell küldenie annak a feladónak, akit a sérült vagy rosszul formázott közlemény feladó-megjelölése azonosít, és ebben a szolgálati közleményben a hibásan vett közlemény ismétlését kell kérnie.

1. Megjegyzés. - A következő példa bemutatja egy, a fenti eljárás szerint összeállított szolgálati közlemény szokásos szövegét, amelyben egy olyan sérült közlemény ismétlését kéri, amelynek feladó része "141335 CYULACAX" volt:
SVC→QTA→RPT→141335→↑CYULACAX↓<≡

2. Megjegyzés. - A sérülés észlelése általában csak a kézi ("tépett szalagos" /"torn tape"/) átjátszó állomásokon lehetséges.

4.4.11.2 Amikor a 4.4.11.1 pont előírásait alkalmazzák, a sérült közlemény feladó részében azonosított feladó vissza kell, hogy vegye a felelősséget a sérült közleményért, és a 4.4.11.3 pont előírásait köteles teljesíteni.

4.4.11.3 A 4.4.11.2 pont előírásainak alkalmazása után a következő újra-feldolgozást kell elvégezni, mielőtt a közlemény hibátlan változatát másodjára is feladják ugyanannak a címzettnek vagy címzetteknek:
1) új fejrész *beillesztése*;

2) a közlemény záró részének *eltávolítása* (*lásd* a 4.4.6.1 pontot);
3) ehelyett a DUPE eljárás-jelzés *beillesztése*, amely elé legalább egy BETŰVÁLTÓ [↓] jelet, utána pedig 1 db KOCSI VISSZA és 8 db SOREMELÉS jelet kell tenni, majd következnek a “közlemény-vége” jel, és amennyiben szükséges (*lásd* a 4.4.6 és a 4.4.7 pontokat), a közlemény-elválasztó jelzés és a szalag-továbbítás BETŰVÁLTÓ [↓] jelei.

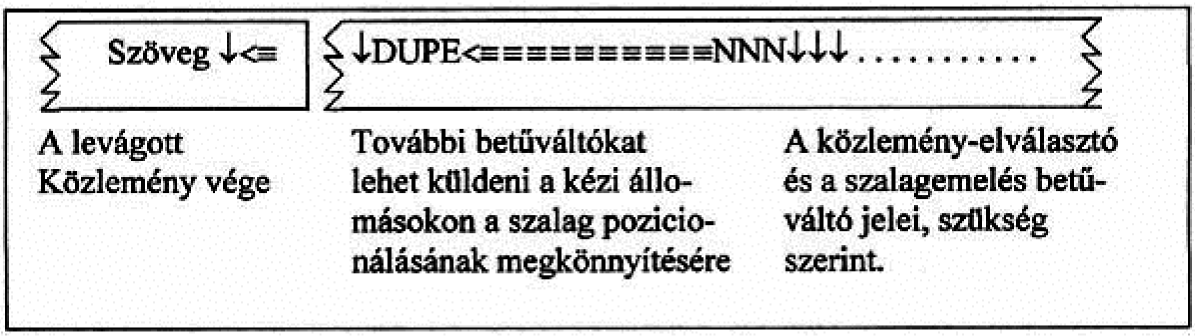
Megjegyzés.- A 4-3. ábrán látható példa bemutatja ennek az eljárásnak az alkalmazását.

4.4.11.4 Ha egy átjátszó állomás még az újra-feladás megkezdése előtt észreveszi, hogy egy vagy több közlemény - még a “közlemény-vége” jel előtt valamelyik ponton - megsérült, és jó oka van azt hinni, hogy a sérülés az előző állomástól neki történő tovább-küldés során vagy az után történt, akkor szolgálati közleményt (*lásd* a 4.4.1.1.9 pontot) kell küldenie az előző állomásnak, amelyben visszautasítja a sérült közlemény vételét, és a hibás közlemény (vagy közlemények) ismétlését kéri.

1. Megjegyzés. - A következő példa a fenti eljárás alkalmazását mutatja be. A 2)*-ként jelzett példában a kötőjel (-) elválasztót nyílt szövegben "valamennyitől - valameddig"-nek kell értelmezni.*

1) *csak egy közlemény sérülése esetén:*
SVC→QTA→RPT→ABC↑123↓<≡

2) *több közlemény sérülése esetén:*
SVC→QTA→RPT→ABC↑123-126↓<≡



4-3. ábra: Példa a 4.4.11.3 pontban leírt eljárás alkalmazására.

2. Megjegyzés. - A sérülés észlelése általában csak a "tépett-szalagos" átjátszó állomásokon lehetséges.

4.4.11.5 Amikor a 4.4.11.4 pont előírásait alkalmazzák, akkor annak az állomásnak, amelyik veszi a szolgálati közleményt, vissza kell vennie a felelősséget a hivatkozott közleményért. Ezután köteles a hivatkozott közlemény sérülésmentes másolatát ismételten továbbítani egy új (azaz megfelelően sorszámozott) közlemény azonosítóval (*lásd* a 4.4.2.1.1 b) pontot). Ha ez az állomás nincs birtokában az eredeti közlemény sérülésmentes változatának, akkor a 4.4.11.1 pontban leírtak szerint kell, hogy eljárjon.

4.4.11.6 Ha mielőtt az újra-feladás megkezdődne, az átjátszó állomás észleli, hogy a vett közlemény rendelkezik felismerhető "közlemény-vége jellel", de az megsérült, akkor az állomás, ha szükséges, köteles kijavítani ezt a sérülést mielőtt a közleményt továbbítaná.

Megjegyzés. - A sérülés észlelésének ilyen körülményei általában csak a kézi ("tépett szalagos" /"torn tape"/) átjátszó állomásokon lehetségesek, és a leírt eljárás azokban az esetekben lehet alapvető fontosságú, amikor a közleményeket félautomata vagy teljesen automatikus állomások felé továbbították.

4.4.11.7 Ha egy átjátszó állomás egy közlemény újra-feladása közben észreveszi, hogy a közlemény - még a "közlemény-vége jel" előtt - valamely ponton megsérült, és még van ideje intézkedni, mielőtt a pontos "közlemény-vége jelet" leadná, akkor
1) törölnie kell a közleményt úgy, hogy a csatornára a ↓<≡QTA→QTA↓<≡ jelsorozatot adja le, amelyet teljes záró rész követ (*lásd* a 4.4.6 pontot);
2) visszaveszi a közleményért a felelősséget;
3) teljesíti a 4.4.11.1, vagy a 4.4.11.4 pont előírásait, amelyik a megfelelő.

Megjegyzés. - A sérülés észlelésének ilyen körülményei általában csak a kézi ("tépett szalagos") átjátszó állomásokon lehetségesek, vagy félautomata állomásokon, melyek folyamatos szalagot használnak.

4.4.11.8 Ha egy állomás egy közlemény teljes egészében történő leadása után veszi észre, hogy a közlemény szöveg-, vagy feladó része sérült, vagy hiányos, és ha a közlemény hibátlan példánya a rendelkezésére áll, akkor valamennyi érintett címzettnek szolgálati közleményt kell küldjön, az alábbi szöveggel:

SVC CORRECTION *(a hibás közlemény feladó része)*
STOP *(majd a helyes szöveg).*

Megjegyzés. - A sérülés észlelésének ilyen körülményei általában csak a kézi ("tépett szalagos") átjátszó állomásokon lehetségesek, vagy félautomata állomásokon, melyek folyamatos szalagot használnak.

4.4.11.9 Amikor egy átjátszó állomás a közlemény szöveg-részének leadása után veszi észre, hogy a közleménynek nyilvánvalóan sérült "közlemény-vége" jelzése van, akkor szabályos "közlemény-vége" jelet kell, hogy beillesszen és leadjon a csatornán.

Megjegyzés. - A sérülés észlelésének ilyen körülményei általában csak a kézi ("tépett szalagos") átjátszó állomásokon lehetségesek, vagy félautomata állomásokon, melyek folyamatos szalagot használnak.

4.4.11.10 Ha egy átjátszó állomás egy közlemény szöveg-részének leadása után észreveszi, hogy a közleménynek nincs teljes "közlemény-vége" jelzése, de gyakorlatilag nincs lehetősége kideríteni, hogy a hiba csak a "közlemény-vége" jelzésben jelentkezett, vagy az eredeti szöveg egy része is elveszett, akkor a csatornán a következő jelsorozatot adja le:
1) ↓<≡CHECK≡TEXT≡
NEW→ENDING→ADDED→
2) a saját állomás-azonosítója;
3) ↓<≡
4) szabályos záró rész, a 4.4.6.1 pont előírásai szerint.

1. Megjegyzés. - A szalagos példányon ez a beszúrás a következőképpen jelenik meg:
↓<≡CHECK≡TEXT≡
NEW→ENDING→ADDED→LOWWYFYX↓<≡
≡≡≡≡≡≡≡NNNN↓↓↓ . . .

2. Megjegyzés. - A nyomtatott példányon ez a beszúrás a következőképpen jelenik meg:
CHECK
TEXT
NEW ENDING ADDED LOWWYFYX
NNNN

3. Megjegyzés. - A nyomtatott példány lépcsőzetes írásmódjának célja az, hogy azonnal felhívja a címzett figyelmét a beszúrásra.

4. Megjegyzés. - SZÁMVÁLTÓ [↑] *beszúrása biztosítja a helyes működést ott, ahol Első Sor Figyelő Készülékkel (First Line Monitoring Equipment) dolgoznak, ahol a feladó részben előforduló SZÁMVÁLTÓ jelet használják ezen berendezés lekapcsolására, és ahol a közlemény hiányzó része tartalmazza ezt a SZÁMVÁLTÓ jelet.*

5. Megjegyzés. - A sérülés észlelése általában csak a teljesen automatikus, vagy a folyamatos szalag nélkül dolgozó félautomata állomások számára lehet fontos.

4.4.11.11 **Ajánlás. -** *Ha egy átjátszó állomás a 4.4.11.9 vagy a 4.4.11.10 pontban leírt eljárásokat alkalmazza, akkor - amennyire ez gyakorlatilag lehetséges - gondoskodjon róla, hogy az abban meghatározott jelsorozatokat még bármely későbbi közlemény teljes "közlemény- kezdete" jelzése előtt leadja.*

4.4.11.12 Ha egy átjátszó állomás észreveszi, hogy olyan közleményt kapott, amelynek címzés-sora teljesen sérült, akkor szolgálati közleményt kell küldenie a megelőző állomásnak, amelyben visszatasítja a sérült közlemény vételét.

4.4.11.12.1 Ennek a szolgálati közleménynek a szövege a következő:
1) az SVC rövidítés;
2) a QTA eljárás-jelzés;
3) az ADS eljárás-jelzés;
4) a visszautasított közlemény azonosítója;
5) a CORRUPT szó;
6) a szöveg-vége jel.

Megjegyzés. - A következő példa a fenti eljárás alkalmazását mutatja be:
SVC→QTA→ADS→ABC↑123↓→CORRUPT↓<≡

4.4.11.12.2 Annak az állomásnak, amelyik ilyen szolgálati közleményt vett, újra el kell vállalnia a felelősséget az említett közleményért, és ismét fel kell adnia a közleményt a helyesbített címzéssel és az új közlemény-azonosítóval.

4.4.11.13 Ha egy átjátszó állomás észreveszi, hogy egy vett közlemény címzett megjelölése érvénytelen (vagyis nem 8 karakter hosszú), vagy a címzett megjelölése ismeretlen, akkor a közleményt tovább kell küldenie azokra az érvényes címekre, amelyek felé neki tovább-küldési felelőssége van, a rövidített címzési eljárást alkalmazva (*lásd* a 4.4.8 pontot).

4.4.11.13.1 Ezenkívül - a 4.4.11.13.3 pontban leírt eset kivételével - az állomás szolgálati közleményt kell, hogy küldjön az előző állomásnak, amelyben a hiba kijavítását kéri. Ennek a szolgálati közleménynek a szövege az alábbiakból álljon:

1) az SVC rövidítés;
2) az ADS eljárás-jelzés;
3) a hibás közlemény azonosítója;
4) egy kijelölési funkció;
5) a vett közlemény első címsora, ahogy vette;
6) egy kijelölési funkció;
7) vagy a
   a) CHECK szó, ha a közlemény címzett megjelölése érvénytelen volt; vagy az
   b) UNKNOWN szó, ha a közlemény címzett megjelölése ismeretlen volt;

8) az érvénytelen, vagy ismeretlen címzett megjelölés(ek);
9) a szöveg-vége jel.

Megjegyzés: A következő példák a 4.4.11.13.1 pontban leírt eljárás alkalmazását mutatják be:
a) érvénytelen címzett-megjelölés esetén:
SVC→ADS→ABC↑123↓<≡
GG→EGLLACAX→EPKYTYX→CYAAYFYX→
CYQXAFX<≡CHECK→CYQXAFX↓<≡
b) ismeretlen címzett-megjelölés esetén:
SVC→ADS→ABC↑123↓<≡
GG→EGLLACAX→EGEHYTYX→CYAAYFYX→
CYQXACAX<≡UNKNOWN→EGEHYTYX↓<≡

4.4.11.13.2 A 4.4.11.13.1 pontban leírt szolgálati közleményt vevő állomás - amennyiben a helyes címzés rendelkezésére áll - megismétli a közleményt csak annak a bizonyos címzettnek a részére, a rövidített címzési eljárás alkalmazásával (*lásd* a 4.4.8 pontot), vagy ha a helyes címzés nem áll a rendelkezésére, akkor a 4.4.11.13.1 pontban leírt eljárás szerint jár el.

4.4.11.13.3 Ha a 4.4.11.13 pontban leírt eljárást alkalmazzák ismeretlen címzett esetén, és ha a közlemény feladó részében nincs hiba, akkor az állomás szolgálati közleményt kell, hogy küldjön a feladó részére. Ennek a szolgálati közleménynek a szövege tartalmazza az alábbiakat:

1) az SVC rövidítést;
2) az ADS eljárás-jelzést;
3) a hibás közlemény feladó részét;
4) egy kijelölési funkciót;
5) a vett közlemény első címsorát, ahogy vette;
6) egy kijelölési funkciót;
7) az UNKNOWN /ISMERETLEN/ jelölést;
8) az ismeretlen címzett(ek) megjelölését;
9) a szöveg-vége jelet.

Megjegyzés. - A következő példa a fenti eljárás alkalmazását mutatja be:
SVC→ADS→↑141335↓→CYULACAX<≡
GG→EGLLACAX→EGEHYTYX→CYAAYFYX→
CYQXACAX<≡UNKNOWN→EGEHYTYX↓<≡

4.4.11.13.4 Az ilyen szolgálati közleményt vevő állomásnak be kell szereznie a címzett pontos megjelölését, és meg kell ismételnie a közleményt a címzettnek, a rövidített címzési eljárás alkalmazásával (*lásd* a 4.4.8 pontot).

4.4.11.14 Ha az első átjátszó állomás észreveszi azt, hogy olyan közleményt kapott, amelynek a feladó sora sérült, vagy a feladó megjelölése teljesen hiányzik, akkor:
a) abbahagyja a közlemény feldolgozását;
b) szolgálati közleményt küld annak az állomásnak, amelyiktől a közleményt kapta.

4.4.11.14.1 Ennek a szolgálati közleménynek a szövege a következőket kell, hogy magába foglalja:
1) az SVC rövidítést;
2) a QTA eljárás-jelzést;
3) az OGN eljárás-jelzést;
4) a visszautasított közlemény azonosítóját;
5) a CORRUPT megjelölést;
6) a szöveg-vége jelet.

Megjegyzés. - A következő példa a fenti eljárás alkalmazását mutatja be:
SVC→QTA→OGN→ABC↑123↓→CORRUPT↓<≡

4.4.11.14.2 A 4.4.11.14.1 pontban leírt szolgálati közleményt vevő állomásnak az említett közleményért vissza kell vennie a felelősséget, és ismét fel kell, hogy adja a közleményt a hibátlan feladó résszel és új közlemény azonosítóval.

Megjegyzés. - Amikor a 4.4.11.14 pont előírásait alkalmazzák, az AFTN közlemények feladó része feldolgozá- sának minimális követelményei az alábbiak:
1) a dátum-idő csoport hat számjegyből kell, hogy álljon;
2) a feladó megjelölésének nyolc betűből kell állnia.

4.4.11.15 Ha az első átjátszó állomás észreveszi, hogy egy közleményt rossz feladó- megjelöléssel vettek, akkor az alábbiakat kell végrehajtania:
a) abbahagyja a közlemény feldolgozását; és
b) szolgálati közleményt küld annak az állomásnak, amelytől a közleményt vette.

4.4.11.15.1 Ezen szolgálati közlemény szövegének tartalmaznia kell:
1) az SVC rövidítést;
2) a QTA eljárás-jelzést;
3) az OGN eljárás-jelzés;
4) a visszautasított közlemény azonosítóját;
5) az INCORRECT jelzést; és
6) a szöveg-vége jelet.

Megjegyzés. - Az alábbi ITA-2 példa a fenti eljárás alkalmazását mutatja be:
SVC→QTA→OGN→ABC↑123↓→INCORRECT↓<≡

4.4.11.15.2 Egy, a 4.4.11.15.1 pontban leírt szolgálati közleményt vevő állomásnak vissza kell vennie a felelősséget az említett közleményért, ismét fel kell adnia a közleményt egy pontos feladó megjelöléssel és - ha megfelelő - egy új közlemény-azonosítóval.

Megjegyzés. - Amikor a 4.4.11.15 pont előírásait alkalmazzák, akkor a közvetítő állomás követelménye az, hogy minimumként a feladó megjelölésének első karakterét ellenőrizzék, mivel a helység jelölés első karaktere az a hely, amelynek a közleményt feladaták.

4.4.12 A szalagok előkészítése során elkövetett hibák javítása

4.4.12.1 Az olyan közlemények, amelyeknek szalagját a feladó állomáson készítik elő, ismert, kijavítatlan hibákkal nem kerülhetnek be az AFTN hálózatba.

4.4.12.2 Ha a hibát még a közlemény szöveg-része előtt követik el, akkor a javítást úgy kell elvégezni, hogy a hibás szalagot eldobják, majd újat készítenek helyette.

4.4.12.3 Ha csak lehetséges, a közlemény szöveg-részében elkövetett hibákat úgy kell kijavítani, hogy a szalagot visszaléptetik és a nem kívánt részt a BETŰVÁLTÓ jellel [↓] felülírják.

4.4.12.4 Ahol a 4.4.12.3 pontban leírt eljárás nem lehetséges, ott a szöveget úgy kell javítani, hogy közvetlenül a hiba után az [→E→E→E→] hibajelzést írják, majd leírják az utolsó helyes szót vagy szócsoportot, és aztán folytatják a szalag írását.

4.4.12.5 Ha sem a 4.4.12.3, sem a 4.4.12.4 pontban leírt eljárás nem alkalmazható, mert a szövegben elkövetett hibát csak a lyukasztási folyamat későbbi szakaszában veszik észre (de még a "közlemény-vége" jel hozzáadása előtt), akkor az állomásnak a 4.4.5.5 pontban leírtak szerint kell eljárnia.

4.4.12.6 A záró résznek hibátlannak kell lennie.

4.4.13 A közlemény feladása során elkövetett hibák javítása, ha a közlemény már a készítés közben bekerül az AFTN hálózatba

4.4.13.1 Ha a közlemény már a készítés során bekerül az AFTN hálózatba, nem szabad a közleményt "közlemény vége" jellel lezárni, ha az ismert, kijavítatlan hibákat tartalmaz.

4.4.13.2 Ha ilyen körülmények között hibát követnek el a közleményben még a szöveg-rész előtt bárhol, akkor a befejezetlen közleményt törölni kell a ↓<≡QTA→QTA↓<≡ jelsorozat leadásával, amelyet egy teljes záró rész követ (*lásd* a 4.4.6 pontot).

4.4.13.3 A szövegben elkövetett, és azonnal észrevett hibákat úgy kell javítani, hogy beírják az [→E→E→E→] hibajelzést, majd az utolsó helyes szót vagy szócsoportot, aztán folytatják a közlemény beírását.

4.4.13.4 Abban az esetben, ha a szövegben elkövetett hibát csak a feladás későbbi szakaszában veszik észre, akkor az állomásnak a 4.4.5.5 pontban leírt előírások szerint kell eljárnia.

4.4.13.5 Abban az esetben, ha a szöveg feladása során nyilvánvalóvá válik, hogy a közleményt törölni kellene, akkor az állomásnak a 4.4.13.2 pontban leírt előírások szerint kell eljárnia.

4.4.14 AFTN közlemények előre meghatározott szétosztási rendszere

4.4.14.1 Ha az érintett Hatóságok (kormányzati szervek) az AFTN közlemények számára előre meghatározott szétosztási rendszer alkalmazásában állapodnak meg, akkor az alábbiakban meghatározott rendszert kell alkalmazni.

4.4.14.2 Az Előre Meghatározott Szétosztási Címzett Kijelölést (PDAI /Predetermined Distribution Addressee Indicator/) a következőképpen kell összeállítani:
a) Az első és második betű:
Azon Állam távközlő központja Helységnév Azonosítójának első két betűje, mely állam hozzájárult a rendszer bevezetéséhez, és amely egy olyan hálózaton keresztül kapja a közleményeket, amely számára előre meghatározott továbbítási útvonal-kiválasztási felelőssége van;
b) A harmadik és negyedik betű:
A ZZ betűk, a speciális szétosztás szükségességének jelzésére;
c) A hatodik, hetedik és nyolcadik betű:
1) Az A-tól Z-ig terjedő sorozatból kiválasztott hatodik, hetedik és nyolcadik betű, amely azt az országos és/vagy nemzetközi szétosztási listá(ka)t jelöli meg, amelye(ke)t a vevő AFTN központnak kell használnia;
2) Az ötödik betű helyén az "N" és "S" betűket értelemszerűen a NOTAM illetve a SNOWTAM megjelölésére tartják fönn (*lásd* az Annex 15 5. Függelékét);
d) A nyolcadik betű:

Vagy a helykitöltő "X" betű, vagy az A-tól Z-ig terjedő sorozat egy betűje, amely további azonosításként szolgál az országos és/vagy nemzetközi szétosztási listá(k) megjelölésére, melye(ke)t az átvevő AFTN központnak kell használnia.

1. Megjegyzés. - Annak érdekében, hogy elkerüljék az AFTN "közlemény-eleje" jelzéssel az összetévesztés lehetőségét, a "ZC" vagy "CZ" betűkombinációk nem használhatók.

2. Megjegyzés. - Azért, hogy elkerüljék az AFTN "közlemény-vége" jelzéssel történő összetévesztés lehetőségét, az "NN" betűkombináció nem használható.

4.4.14.3 **PANS** (Légiforgalmi Szolgálatok Eljárásai)**. -** *Az Előre Meghatározott Szétosztási Címzett Kijelöléseket (PDAIs /Predetermined Distribution Addressee Indicators/) - ha csak lehetséges - használni kell az azon Államok között küldött AFTN közleményekben, amelyek megállapodtak az előre meghatározott szétosztási rendszer használatában.*

4.4.14.4 Azokat az AFTN közleményeket, amelyek a vevő Állam által kiosztott PDAI (Előre Meghatározott Szétosztási Címzett Kijelölés) megjelöléseivel rendelkeznek, a 4.4.14.5 pontban leírt kapcsolódó címzett-listán felsorolt címzettekhez kell irányítani.

4.4.14.5 Az Államok a kiválasztott PDAI megjelöléseket és a hozzájuk tartozó címzett megjelölések listáit meg kell, hogy küldjék a következők részére::
a) azoknak az Államoknak, amelyektől AFTN közleményeket kapnak előre meghatározott körű szétosztásra, hogy a helyes továbbítási útvonal-kiválasztást biztosíthassák; és
b) azoknak az Államoknak, amelyek AFTN közleményeket állítanak össze előre meghatározott körű szétosztásra, hogy megkönnyítsék az újra-feladási kérelmek kezelését és segítsék a feladókat a PDAI megjelölések helyes használatában.

4.4.14.5.1 Egy PDAI-hez tartozó címzett megjelölések listájában az alábbi elemeknek kell szerepelni:
a) címzett megjelölések nemzeti szétosztásra; vagy
b) címzett megjelölések nemzetközi szétosztásra; vagy
c) PDAI megjelölések nemzetközi szétosztásra; vagy
d) az a), b) és c) elemek bármely kombinációja.

4.4.15 Közlemények formátuma - 5-ös számú Nemzetközi ABC (IA-5)

Ha az érintett Hatóságok az 5-ös számú Nemzetközi (IA-5) ABC használatában állapodtak meg, akkor a 4.4.15-től a 4.4.15.3-ig terjedő pontokban leírt közlemény-formátumot kell használniuk. Az IA-5-öt használó Hatóságok felelőssége annak biztosítása, hogy alkalmazkodjanak azokhoz a szomszédos AFTN állomásokhoz, amelyek a 4.4.2 pontban leírt formátumú ITA-2 kódot használják.

Minden közleményt - a 4.4.1.8 és a 4.4.9.3 pontban leírtak kivételével - a 4.4.15.1-től a 4.4.15.6-ig terjedő pontokban leírt elemekből kell összeállítani.

1. Megjegyzés. - A 4-4. ábra mutatja be az IA-5 közlemény-formátumot.

2. Megjegyzés. - Az alább részletezett, a közlemény-formátumra vonatkozó szabványokban a következő szimbólumokat használtuk az IA-5 bizonyos jeleihez rendelt funkciók megjelölésére. (Lásd a III. Kötet, I. Rész, 8.6.1 pontját, valamint a 8-2. és 8-3. Táblázatokat.)

Jel	*Jelentés*
<	KOCSI VISSZA (a 0/13 karakter pozíció)
≡	SOREMELÉS (a 0/10 karakter pozíció)
→	SZÓKÖZ (a 2/0 karakter pozíció)

4.4.15.1 *Fej-rész*

4.4.15.1.1. A fej-rész az alábbi elemekből kell , hogyálljon:
a) fej-rész - kezdete jel (SOH), a 0/1 karakter;
b) közlemény-azonosító, amelynek az elemei:
1) az áramkör vagy vonal azonosítója;
2) csatorna-sorszám;
c) további szolgálati információk (ha szükséges), amelynek elemei:
1) egy SZÓKÖZ;

2) és legfeljebb 10 karakter.

4.4.15.1.1.1 A pont-pont közötti áramkörök vagy vonalak esetén az azonosító az adó-állomás által kiválasztott és hozzárendelt három betűből áll; az első betű a vonal adó felőli végét, a második a vevő felőli végét, a harmadik pedig a csatornát azonosítja. Ha csak egy csatorna létezik, akkor az " A" betűt kell használni. Ha az állomások között több csatorna is van, akkor a csatornákat sorrendben az “A”, “B”, “C”, stb. betűkkel kell azonosítani. Több-pontú csatornák esetében az azonosító a vonalat ellenőrző vagy vezérlő (“master”) állomás által kiválasztott és hozzárendelt három betűből áll.

4.4.15.1.1.2 A 4.4.15.1.1.3 pontban leírtak kivételével, a távközlési állomásoknak minden, közvetlenül az egyik állomástól a másikhoz küldött közleménynek háromjegyű csatorna-sorszámot kell kijelölniük, amely 001-től 000-ig (mely 1000-et jelent) terjed. Minden csatornán külön kell a közleményeket sorszámozni, és minden nap 0000 órakor új számsorozatot kell kezdeni.

4.4.15.1.1.3 **Ajánlás. -** *Annak érdekében, hogy elkerülhető legyen ugyanazon sorszámok ismételt előfordulása 24 órán belül, lehetőleg meg kell engedni a csatorna-sorszámok bővítését, ha erről a vonal üzemeltetéséért felelős Hatóságok megállapodást kötöttek.*

4.4.15.1.1.4 A közlemény-azonosítót a vonalon az alábbi sorrendben kell leadni:
a) az adó-terminál betűjele;
b) a vevő-terminál betűjele;
c) csatorna-azonosító betű;
d) a csatorna-sorszám.

4.4.15.1.1.5 Meg kell engedni további szolgálati tájékoztatás beszúrását a közlemény-azonosító után, ha erről a vonal üzemeltetéséért felelős Hatóságok megállapodást kötöttek. Az ilyen további szolgálati információ elé egy SZÓKÖZT [→] kell tenni, majd ezt legfeljebb tíz karakter követheti, melyeket a közlemény fej-részébe kell beilleszteni, közvetlenül a csatorna-sorszám utolsó számjegye után, és nem tartalmazhatnak semmilyen kijelölési funkciót. Ha ilyen tájékoztatást nem szúrtak be, akkor a 4.4.15.1.1.4 pontban részletezett adatok után közvetlenül a 4.4.15.2 pontban leírt adatok következzenek.

4.4.15.2 *Címzés*

4.4.15.2.1 A címzés az alábbi elemekből kell, hogy álljon:
a) kijelölési funkció [<≡];
b) elsőbbségi jel;
c) címzett(ek) megjelölése;
d) kijelölési funkció [<≡].

4.4.15.2.1.1 Az elsőbbségi jelnek - a feladó által hozzárendelt - megfelelő két-betűs csoportból kell állnia a következőknek megfelelően:

zlemény rész		A közlemény rész összetevője	Az összetevő eleme		Távgépíró jele
A FEJRÉSZ	FEJRÉSZ SOR (ld. 4.4.15.1.1)	A "Fejrész Kezdete" karakter	Egy karakter (0/1)		**SOH**
		Közlemény azonosító	a) Egy szóköz b) Vevő terminál betűjele c) Csatorna - azonosító betű d) Csatorna sorszám	(Példa: NRA062)	......
		(ha szükséges) további szolgálati jelölések, tájékoztatások	a) Egy szóköz b) Nem több, mint legfeljebb a sor végéig	(Példa: 270930)	→
	CÍMZÉS (ld. 4.4.15.2.1)	Szövegigazító funkció	Egy KOCSI-VISSZA, egy SOREMELÉS		<≡
		Elsőbbségi jelzés	a megfelelő kétbetűs csoport		• •
		Címzett(ek) megjelölése	Egy szóköz Egy nyolcbetűs csoport **(Példa: → EGLLZRZX → EGLLYKYX → EGLLACAD)**	sorban minden címzettnek	
	FELADÓ RÉSZ (ld. az 4.4.15.2.2.)	Szövegigazító funkció(k)	Egy KOCSI-VISSZA, egy SOREMELÉS		<≡
		Feladási idő	6 számjegyből álló dátum-idő csoport, amikor a közleményt továbbításra benyújtották		......
		Feladó megjelölése	a) Egy szóköz b) Egy nyolcbetűs csoport a feladó azonosítására		→......
		Elsőbbségi Riasztó Jelzés (csak távgépíró üzemmódban használják Vészhelyzeti-közlemények esetén)	Öt karakter (0/7)(BEL)		
		Opcionális Fejrész információ	További adatok, legfeljebb a sor végéig. Ld. 4.4.15.2.2.6		
		Szövegigazító funkció	Egy KOCSI-VISSZA, egy SOREMELÉS		<≡
		Szöveg eleje karakter	Egy karakter (0/2)		**STX**
	SZÖVEG (Ld. 4.4.15.3)	Szöveg kezdete	(ha szükséges) a címzett(ek) közelebbi megjelölése *(ha szükséges)* valamint mindegyik után egy KOCSI VISSZA, egy SOREMELÉS. Az angol FROM szó (ha szükséges) (Ld.4.4.15.3.5) A feladó közelebbi megjelölése *(ha szükséges)* Az angol STOP szó, melyet egy KOCSI VISSZA, egy SOREMELÉS követ *(ha szükséges)* (Ld. 4.4.15.3.5) és/vagy a feladó hivatkozási adata *(ha használnak ilyet)*		
		A közlemény szövege	A közlemény szövege, mely szöveg minden nyomtatott sorát egy KOCSI-VISSZA, egy SOREMELÉS karakter zár, kivéve az utolsó sort (Ld. 4.4.15.3.6)		
		Megerősítés *(ha szükséges)*	a) Egy KOCSI-VISSZA, egy SOREMELÉS b) a CFM rövidítés, melyet a szöveg megerősítendő része követ		
		Javítás *(ha szükséges)*	a) Egy KOCSI-VISSZA, egy SOREMELÉS b) a COR rövidítés, melyet a megelőző szövegben elkövetett hibák javítása követ		
	ZÁRÓRÉSZ (Ld. 4.4.15.3.12.1)	Szövegigazító funkció	Egy KOCSI-VISSZA, egy SOREMELÉS		<≡
		Lapemelés	Egy karakter (0/11)		VT
		"Szöveg vége" karakter	Egy karakter (0/3)		ETX

4-4. ábra Az 5-ös számú Nemzetközi ABC (IA-5)

(ez az ábra a 4.4.15 pont alatt részletezett közlemény-formátumot mutatja be)

Elsőbbségi jelzés	*Közlemény kategóriája*
SS	vészhelyzeti közlemények
DD	sürgősségi közlemények (*lásd* a 4.4.1.1.2 pontot)
FF	repülésbiztonsági közlemények (*lásd* a 4.4.1.1.3 pontot)
GG	meteorológiai közlemények (*lásd* a 4.4.1.1.4 pontot)
GG	a repülések rendszerességét elősegítő közlemények (*lásd* a 4.4.1.1.5 pontot)
GG	légiforgalmi tájékoztató szolgálatok közleményei (*lásd* a 4.4.1.1.6 pontot)
KK	légiforgalmi adminisztrációs közlemények (*lásd* a 4.4.1.1.7 pontot)
ahogy megfelelő	szolgálati közlemények (*lásd* a 4.4.1.1.9 pontot)

4.4.15.2.1.2 Az elsőbbségi sorrend megegyezik a 4.4.1.2 pontban leírtakkal.

4.4.15.2.1.3 Minden címzett megjelölés elé egy SZÓKÖZt kell tenni, kivéve, ha az a második vagy harmadik címzett sorban található első ilyen címzett megjelölés. A címzett megjelölés az alábbi elemekből kell, hogy álljon:
a) a célállomás négy-betűs helység jelölése;
b) a címzett szervezetet (légiforgalmi hatóságot, szolgálatot, vagy légijármű üzemeltető ügynökséget) azonosító három-betűs jelzés;
c) egy további betű, amely a címzett szervezeten belül egy osztályt, részleget, vagy eljáró egységet azonosít. Az X betűt kell használni helykitöltésre, ha ilyen további azonosításra nincs szükség.

4.4.15.2.1.3.1 Ha egy közleményt olyan szervezetnek kell címezni, amelynek nem osztottak ki a 4.4.15.2.1.3 pontban leírt típusú ICAO három-betűs jelzést, akkor a célállomás négy-betűs helység jelölése után az ICAO három-betűs YYY (vagy, katonai szervezet, vagy szolgálat esetében az ICAO három-betűs YXY) jelzést kell írni. A címzett szervezet nevét ilyenkor a közlemény szövegének első elemeként kell feltüntetni. Az ICAO három-betűs YYY vagy YXY jelzés után a következő (nyolcadik) betűnek a helykitöltő X betűnek kell lennie.

4.4.15.2.1.3.2 Amikor egy közleményt egy repülésben lévő légijárműnek kell megcímezni, és a közlemény - mielőtt a Légiforgalmi Mozgó Szolgálat továbbítaná - útjának egy részét az AFTN hálózaton keresztül teszi meg, akkor annak a légiforgalmi állomásnak a helység jelölése után, amelynek továbbítania kell a közleményt a légijármű részére, az ICAO három-betűs ZZZ jelzést kell írni. Ezután a légijármű azonosítóját a közlemény szövegrészének első elemeként kell feltüntetni. Az ICAO három-betűs ZZZ jelzés után a következő (nyolcadik) betűnek a helykitöltő X betűnek kell lennie.

4.4.15.2.1.4 A teljes címzés a nyomtatott példányon legfeljebb három sort foglalhat el, és a 4.4.16 pontban leírtak kivételével, külön címzett megjelölést kell használni minden egyes címzettre, akár egy helyen találhatók azok, akár nem.

4.4.15.2.1.5 A címzett megjelölés csoportok befejezése után közvetlenül egy kijelölési funkciót kell beilleszteni.

4.4.15.2.1.6 Ha a közleményt továbbításra nyomtatott formában veszik át, és a közlemény több címzett megjelölést tartalmaz, mint amennyi a nyomtatott lapon három sorban elfér, akkor az ilyen közleményeket, tovább-küldés előtt két vagy több közleményre kell bontani, amelyek már megfelelnek a 4.4.15.2.1.5 pont előírásainak. Az ilyen átalakítás során - amennyire az gyakorlatilag lehetséges - a címzett-megjelöléseket olyan sorrendbe kell rendezni, hogy a soron- következő távközlési központokban a lehető legkevesebb számú újra-feladásra legyen szükség.

4.4.15.2.2 *Feladó rész*

A feladó résznek az alábbi elemekből kell állnia:
a) feladási idő;
b) feladó megjelölése;
c) elsőbbségi jelzés (ha szükséges);
d) választható fej-rész információ;
e) kijelölési funkció [<≡];
f) szöveg-kezdete karakter, a 0/2 karakter (STX).

4.4.15.2.2.1 A feladási idő egy hat-számjegyű dátum-idő csoportból kell, hogy felépüljön, mely azt jelzi, hogy a közleményt feladásra mikor nyújtották be (*lásd* a 3.4.2 pontot).

4.4.15.2.2.2 A feladó megjelölése, amely elé közvetlenül egy SZÓKÖZt kell tenni, a következő elemekből kell, hogy álljon:
a) a feladás helyének négy-betűs helység jelölése;
b) a közleményt feladó szervezetet/hatáskört (légiforgalmi hatóságot, légiforgalmi szolgálatot vagy légijármű-üzemeltető ügynökséget) azonosító három-betűs jelzés;
c) egy további betű, amely a feladó szervezeten belül egy osztályt, részleget vagy eljáró egységet azonosít. Az X betűt kell használni helykitöltésre, ha ilyen további azonosításra nincs szükség.

4.4.15.2.2.3 Ahol a közlemény feladója olyan szervezet, amelynek nem osztottak ki a 4.4.15.2.2.2 pontban leírt típusú ICAO három-betűs jelzést, a feladás helyének négy-betűs helység jelölése után azonnal az ICAO három-betűs YYY jelzést és a helykitöltő X betűt kell írni (vagy, katonai szervezet vagy szolgálat esetében az ICAO három-betűs YXY jelzést és a helykitöltő X betűt kell írni). A szervezet (vagy katonai szolgálat) nevét ezután a közlemény szövegének első elemeként kell feltűntetni.

4.4.15.2.2.3.1 Az AFTN-en továbbított olyan közlemények számára, amelyeket egy másik hálózatban adtak föl, ki kell jelölni egy érvényes AFTN feladó megjelölést, amelyet - megegyezés alapján - az AFTN-t a külső hálózattal összekötő relé- (relay), vagy kapu- (gateway) berendezés használ.

4.4.15.2.2.4 Ha a közlemény feladója egy repülésben lévő légijármű, és a közleményt útvonalának egy részén az AFTN hálózaton keresztül kell tovább-küldeni, mielőtt kézbesíteni lehetne, akkor a feladó megjelölése annak a légiforgalmi állomásnak a négy-betűs helység jelölése, amely a közleményt az AFTN-nek továbbította, majd az ICAO három-betűs ZZZ jelzés és a helykitöltő X betű következik. A légijármű azonosítóját (hívójelét) ezután a közlemény szövegének első elemeként kell megadni.

4.4.15.2.2.5 Az elsőbbségi jelzést csak vészhelyzeti közlemények esetében kell használni. Amikor használják, akkor öt egymás után következő BEL (0/7, csengő) karakterből kell, hogy álljon.

Megjegyzés.- Az elsőbbségi jelzés a vevő távgépíró-készülékben lévő csengőt (figyelemfelkeltő jelzést) szólaltatja meg, eltérően a teljesen automatikus távközlési állomások esetén, melyek hasonló figyelmeztető jelzést adhatnak az SS sürgősségi jelzés észlelésekor, ezáltal riasztják az átjátszó központokban a felügyelő személyzet, az alárendelt állomásokon pedig a kezelő személyzet figyelmét, és így a közleményre azonnali figyelmet fordíthatnak.

4.4.15.2.2.6 A feladó sorban további szabadon választható adatok közlését is meg kell engedni, feltéve, hogy teljes hossza nem haladja meg a 69 karaktert, és hogy ez az érintett Hatóságok megállapodásának tárgyát képezi.

4.4.15.2.2.6.1 **Ajánlás. -** *A szabadon válaszható adatmező kezdetét egy SZÓKÖZzel, a végét egy kijelölési funkcióval kell jelezni.*

4.4.15.2.2.6.2 **Ajánlás. -** *Ha egy közleményben a 'forrás' és a 'cél' címzések között további címzési információk cseréje szükséges, akkor azt lehetőleg a szabadon választható adatmezőben (ODF) tegyék, az alábbi meghatározott formátumban:*
a) a kiegészítő címzés funkció paraméter-kódját egy egyes karakterrel és egy ponttal (1.) jelezzék;
b) ezután három módosító karakter és egy egyenlőségjel (=) következzen és a kiadott 8-betűs ICAO címzés; majd
c) a kiegészítő címzés paraméter-mezőjét egy kötőjellel (-) zárják le.

4.4.15.2.2.6.2.1 **Ajánlás. -** *Amikor a szolgálati közleményekre, vagy kérdésekre a külön cím nem egyezik meg a feladó megjelölésével, akkor lehetőleg az SVC módosító jelzést kell használni.*

4.4.15.2.2.7 A feladó részt egy kijelölési funkcióval [<≡] és a “szöveg-kezdete” (STX) (0/2) karakterrel kell lezárni.

4.4.15.3 *Szöveg*

4.4.15.3.1 A közlemények szövegét a 4.1.2 pont előírásainak megfelelően kell megfogalmazni, és az STX és az ETX között lévő valamennyi adatból kell állnia.

Megjegyzés.- Ha a közlemény szövegét nem kell ITA-2 kódba és formátumba átalakítani, és nem ütközik azokkal az ICA0 közlemény típusokkal vagy formátumokkal, amelyek a PANS - ATM-ben (Doc 4444) vannak leírva, a Hatóságok teljes mértékben kihasználhatják az 5-ös számú Nemzetközi ABC-ben (IA-5) rendelkezésre álló karaktereket.

4.4.15.3.2 Ha feladóra vonatkozó hivatkozási adatot használnak, akkor azt a szöveg elejére kell tenni, kivéve a 4.4.15.3.3 és a 4.4.15.3.4 pontban megadottakat.

4.4.15.3.3 Ha a címzett megjelölés második elemét, az YXY, azYYY vagy a ZZZ három-betűs ICAO jelölés alkotja (*lásd* a 4.4.15.2.1.3.1 és a 4.4.15.2.1.3.2 pontokat), és ezért szükségessé válik a szövegben a közlemény címzettjének közlése, akkor ezt az azonosító karakter-csoportot a feladóra való hivatkozás elé kell írni (ha van ilyen), és ezzel ez a szöveg első elemévé válik.

4.4.15.3.4 Ha a feladó megjelölés második elemét az YXY, az YYY vagy a ZZZ három-betűs ICAO jelzés alkotja (*lásd* a 4.4.15.2.2.3 és 4.4.15.2.2.4 pontokat), és ezért szükségessé válik a szövegben a közleményt feladó szervezet (vagy katonai szolgálat), vagy a légijármű nevének közlése, akkor ezt az azonosítót a szöveg első elemeként kell megadni.

4.4.15.3.5 Amikor a 4.4.15.3.3 és a 4.4.15.3.4 pontok előírásait alkalmazzák olyan közlemények esetében, amelyekben az ICAO három-betűs YXY, YYY vagy ZZZ jelzéset két vagy több különböző szervezet (vagy katonai szolgálat) megjelölésére is használták, akkor a szövegben a további azonosítók sorrendje meg kell, hogy egyezzen a közlemény címzés- és címzett-megjelölésében használt teljes sorrenddel. Ilyen esetben minden címzett megjelölés után egy kijelölési funkciót kell tenni. A közleményt feladó (YXY, YYY vagy ZZZ jelzéssel megjelölt) szervezet neve elé ilyenkor a "FROM" szót kell írni. Az azonosítók után, a szöveg többi része elé, a "STOP" szót kell írni, amelyet egy kijelölési funkció kell, hogy kövessen.

4.4.15.3.6 A szöveg minden nyomtatott sora után egy kijelölési funkciót kell küldeni. A távgépíró üzemben - ha a szöveg egy részét meg kívánják erősíteni, akkor - a megerősítést az utolsó szöveg-csoporttól egy kijelölési funkcióval kell elválasztani [<≡], és ezt a CFM rövidítéssel kell jelezni, amely után a megerősített szöveg-rész következik.

4.4.15.3.7 Ha a közleményeket "off-line", hálózati kapcsolat nélküli üzemmódban, vagyis papírszalag lyukasztásával készítik el, akkor a szövegben elkövetett hibákat úgy kell kijavítani, hogy visszaléptetik, és a hibás karaktereket a DEL (7/15) karakterrel írják felül.

4.4.15.3.8 "On-line" üzemmódban (azaz hálózati kapcsolatban), a szövegben elkövetett hibákat úgy kell javítani, hogy közvetlenül a hiba után beszúrják az →E→E→E→ jel-sorozatot, majd újragépelik az utolsó helyes szót (vagy szócsoportot).

4.4.15.3.9 Ha nem fedezik fel, csak a feladási folyamat későbbi fázisában, hogy a szövegben hiba történt, akkor a javítást az utolsó szöveg-csoporttól, vagy megerősítéstől (ha van ilyen) egy kijelölési funkcióval [<≡] kell elválasztani. Ezután a COR rövidítésnek és a javított szövegnek kell következnie.

4.4.15.3.10 Az állomásoknak el kell végezniük a nyomtatott példányon minden jelzett javítást, mielőtt a közleményt helyben kézbesítik, vagy kézi üzemeltetésű vonalra vinnék át.

4.4.15.3.11 Az AFTN feladó állomás által begépelt szövegek nem lehetnek 1800 karakternél hosszabbak. Az AFTN feladó állomásnak az 1800 karakternél hosszabb AFTN közleményeket külön közleményekre bontott formában kell, hogy feladja. A II. kötet "B" melléklete tartalmaz útmutató anyagot arra vonatkozóan, hogy egy hosszú közleményt hogyan kell különálló közleményekre bontani. Ha a közleményeket vagy adatokat csak közepes, vagy nagy sebességű vonalakon továbbítják, akkor a szöveg lehet 1800 karakternél hosszabb is, feltéve, ha ettől a hálózat, vagy a vonal teljesítmény-karakterisztikája nem romlik, és ha erről az érintett Hatóságok megállapodást kötöttek.

Megjegyzés.- A karakterek számába beleszámít a szöveg-formátum minden nyomtatható és nem nyomtatható (vezérlő) karaktere, amelyek a „szöveg-eleje” jel és a záró rész első kijelölésió funkciója között vannak, de ezeket az előbbieket kivéve.

4.4.15.3.12 *Záró rész*

4.4.15.3.12.1 A közlemény záró része az alábbi elemekből kell, hogy álljon, a megadott sorrendben:
a) egy kijelölési funkció [<≡] a szöveg utolsó sora után;
b) lap-emelés karakter, a 0/11 karakter (VT / Függőleges Tabulátor/);
c) szöveg-vége karakter, 0/3 (ETX).

4.4.15.3.12.1.1 **Ajánlás. -** *Az állomás 5-ös számú Nemzetközi ABC-t (IA-5) használó terminál-berendezései (lapnyomtatók) lehetőség szerint legyenek képesek arra, hogy elegendő számú soremelés jelet generáljanak a helyi állomás számára, ha FÜGGŐLEGES TABULÁTOR (0/11) karaktert vesznek.*

4.4.15.3.12.1.2 **Ajánlás. -** *Ha a közlemény nem halad át ITA-2 kódot használó AFTN hálózati szakaszokon, vagy ha a Hatóságok intézkedtek arról, hogy a közleményhez automatikusan hozzáadják a második kocsi vissza jelet, mielőtt egy ITA-2 kódot használó vonalra küldik a közleményt, akkor a kijelölési funkcióban és a sor- vége funkcióban megengedhető az egy kocsi vissza jel használata, ha erről az érintett Hatóságok megállapodást kötöttek.*

4.4.15.3.12.1.3 Az AFTN feladó állomás által benyújtott közlemények nem lehetnek 2100 karakternél hosszabbak.

Megjegyzés.- A karakterek számába beleszámít minden nyomtatható és nem nyomtatható (vezérlő) karakter, amely a közleményben található, beleértve a fejrész-kezdete (SOH /Start-of-Heading/) karaktertől a szöveg-vége karakterig.

4.4.15.4 A 4.4.15.5 - 4.4.15.6 és a 4.4.16 pontokban leírt eseteket kivéve, az IA-5 kódban írt közleményekre a 4.4.8 és a 4.4.9-től a 4.4.13-ig terjedő pontokban leírt eljárásokat kell alkalmazni.

4.4.15.5 *Csatorna-ellenőrző adások.* Abban az esetben, ha a csatorna állapotának folyamatos ellenőrzése nem biztosított, a távgépíró-vonalakon az alábbi jelsorozatot kell rendszeres időközönként leadni:

1) fejrész-sor	(*lásd* a 4.4.15.1.1 pontot);
	S
2) kijelölési funkció	T ;
	X
3) az eljárás-jelzés	CH ;
	E
4) kijelölési funkció	T .
	X

A vevő állomásnak ezután ellenőriznie kell a bejövő adás azonosítóját, hogy megbizonyosodjon arról, beleillik-e az az azon a csatornán vett adások sorozatába.

Megjegyzés. - Ennek az eljárásnak az alkalmazása bizonyos mértékig biztosítani képes a csatornán az adások folytonosságának fenntartását; ennél azonban sokkal kedvezőbb a folyamatosan ellenőrzött csatorna használata, mivel ezzel az adatok sértetlensége is javul.

4.4.15.5.1 **Ajánlás. -** *Ha egy vonal az adott pillanatban nem foglalt és nem folyamatosan ellenőrzött, akkor az ellenőrzést a 4.4.15.5 pontban leírt adást lehetőség szerint minden órában, minden óra 20 perckor és minden óra 40 perckor végezzék el (H + 00; H + 20; H + 40).*

4.4.15.6 A vészhelyzeti közlemények (distress messages) (SS elsőbbségi jelzéssel, *lásd* a 4.4.1.1.1 pontot) vételét az AFTN célállomásnak egyedileg kell nyugtáznia úgy, hogy szolgálati közleményt (*lásd* a 4.4.1.1.9 pontot) küld a feladó AFTN állomásnak. A vétel nyugtázását az AFTN feladó állomásnak címzett teljes közlemény formájában kell elvégezni, amelyet SS elsőbbségi jelzéssel és az ehhez kapcsolódó sürgősségi figyelem-felhívó jelzéssel *(lásd* a 4.4.16.2.2.5 pontot) kell ellátni. A közlemény szövege a következő kell, hogy legyen:
1) az R eljárás-jelzés;
2) a nyugtázott közlemény feladó-sora (lásd a 4.4.15.2.2 pontot), az elsőbbségi figyelem-felhívó jelzés, vagy a szabadon választható fej-rész információk nélkül;
3) a záró rész (lásd a 4.4.15.3.12.1 pontot).

Megjegyzés. - Az alábbi példa a 4.4.15.6 pontban leírt eljárás alkalmazását mutatja be:
Fej-rész (*lásd* a 4.4.15.1.1 pontot)
<≡ SS → LECBZRZX <≡
121322 → EGLLYFYX (elsőbbségi figyelem-felhívó jelzés) <≡
S
TR→ 121319 → LECBZRZX<≡
X
Záró rész (*lásd* a 4.4.15.3.12.1 pontot).

4.4.16 Intézkedések abban az esetben, ha a számítógépes AFTN átjátszó állomás sérült, IA-5 kódú közleményt talál.

4.4.16.1 A folyamatosan ellenőrzött csatornákon a sérülés észlelése és annak javítása az összeköttetést ellenőrző protokol feladata kell, hogy legyen, ezért ilyenkor a későbbi szolgálati közlemények, vagy a "CHECK TEXT NEW ENDING ADDED" (“ellenőrizze a szöveget, a közlemény új záró részt kapott”) szövegű közlemények küldésére nincs szükség.

4.4.16.2 Azokon a csatornákon, melyeken nem alkalmaznak folyamatos ellenőrzést, az átjátszó állomásnak az alábbi eljárásokat kell követnie:

4.4.16.2.1 Ha egy közlemény vétele közben az átjátszó állomás azt észleli, hogy a közlemény - még a "szöveg-vége" karakter előtt - valamelyik ponton megsérült, akkor: 1) a közlemény tovább-küldésére vonatkozó kötelezettségét érvényteleníti; 2) szolgálati közleményt kell küldenie a közleményt továbbító állomásnak, amelyben a közlemény ismételt feladását kéri.

Megjegyzés. - Az alábbi példa bemutatja egy ilyen szolgálati közlemény tipikus szövegét, amelyben egy sérült közleménnyel kapcsolatban a fenti eljárást alkalmazták:
SVC→QTA→RPT→ABC 123 (zárór ész - *lásd* a 4.4.15.3.12.1 pontot)

4.4.16.2.2 Amikor a 4.4.16.2.1 pont előírásait alkalmazzák, a szolgálati közleményt vevő állomás újra magára kell, hogy vállalja az említett közleményért a felelősséget, egy új - (azaz sorrendileg helyes) - közlemény-azonosítóval (lásd a 4.4.15.2.1 pontot). Ha ennek az állomásnak nem áll rendelkezésére az eredeti közlemény hibátlan példánya, akkor egy közleményt kell küldenie a feladónak, akit a sérült közlemény feladó megjelölése azonosít, amelyben a hibásan vett közlemény ismétlését kéri.

Megjegyzés. - Az alábbi példa bemutatja egy ilyen szolgálati közlemény tipikus szövegét, amelyben a fenti eljárást alkalmazták egy sérült közleménnyel kapcsolatban, amelynek feladó része "141335 CYULACAX" volt:
SVC→QTA→RPT→141335→CYULACAX
(zárórész - *lásd* 4.4.15.3.12.1)

4.4.16.3 Ha egy átjátszó állomás a közlemény szöveg-részének leadása után észleli, hogy a közleményben nincs teljes szöveg-vége karakter, de gyakorlatilag nincs lehetősége kideríteni, hogy a hiba csak a szöveg-vége karaktert érintette, vagy a hiba következtében az eredeti szöveg egy része is elveszett, akkor a csatornára a következő üzenetet küldi:
1) <≡CHECK≡TEXT≡
NEW→ENDING→ADDED
2) a saját állomás azonosítója;
3) (záró rész - *lásd* a 4.4.15.3.12.1 pontot).

4.4.17 AFTN közlemények továbbítása kód- és bájt-független vonalakon és hálózatokon

Amikor az AFTN közleményeket az AFS (Légiforgalmi Állandóhelyű Szolgálat /Aeronautical Fixed Service/) kód- és bájt-független vonalain és hálózatain továbbítják, az alábbi előírásokat kell alkalmazni.

4.4.17.1 A 4.4.17.3 pontban leírtakat kivéve, a közlemény fej-rész sorát el kell hagyni. A közleménynek egy kijelölési funkcióval kell kezdődnie, amelyet a címzés követ.

4.4.17.2 A közleménynek teljes záró résszel kell végződnie.

4.4.17.3 **Ajánlás. -** *Műszaki ellenőrzés céljára a belépő központoknak lehetőség szerint meg kell engedni, hogy további adatokat küldjenek a vonalra, a közlemény első kijelölési funkciója előtt és/vagy záró része után. Az ilyen adatokat a vevő állomás figyelmen kívül hagyhatja.*

4.4.17.3.1 Amikor a 4.4.17.3 pont előírásait alkalmazzák, a hozzáfűzött kiegészítő adatok között nem fordulhat elő sem KOCSI-VISSZA, sem SOREMELÉS karakter, sem a 4.1.2.4 pontban felsorolt bármelyik kombináció.

4.5 Az ICAO Közös Adattovábbító Hálózata (CIDIN)

1. Megjegyzés. - Az ICAO Közös Adattovábbító Hálózata (CIDIN) /Common ICAO Data Interchange Network/ egyedi alkalmazásokból és a föld-föld közlemények cseréjére létesített, összeköttetést biztosító szolgáltatások- ból épül fel, a Nemzetközi Távíró és Távbeszélő Bizottság (CCITT) /Comite Consultatif International Telegraphique et Telephonique/ X.25 Ajánlásán alapuló protokolokat *használ, hogy ezzel kód- és bájt-független kommunikációs hátteret, eszközöket biztosíthasson.*

2. Megjegyzés. - Az ICAO Közös Adattovábbító Hálózatának (CIDIN) legfontosabb célja az, hogy javítsa az AFTN-t, valamint hogy támogassa a nagyméretű közlemények továbbítását és a rendszerrel szemben nagyobb követelményeket támasztó alkalmazások működését, mint például amilyen az Üzemeltetési Meteorológiai Információ-szolgáltatás (OPMET) is, két vagy több földi rendszer között.

3. Megjegyzés. - Az Európában alkalmazott CIDIN összekötetési eljárásokat részletesen az EUR CIDIN Kézikönyv mutatja be.

4.6 Az ATS /Légiforgalmi Szolgálatok/ Közleményeit Kezelő Szolgáltatás (ATSMHS)

Az ATS /Légiforgalmi Szolgálatok/ közleményeit kezelő szolgáltató (ATSMHS) alkalmazás, ATS közlemény szolgáltatását kell igénybe venni a felhasználók közötti ATS közlemények cseréje céljából az ATN (Légiforgalmi Távközlési Hálózat /Aeronautical Telecommunication Network/) hálózatok közötti összeköttetéseken keresztül.

1. Megjegyzés. - Az ATS (Légiforgalmi Szolgálatok) közlemények kezelését végző számítógépes szolgáltatói alkalmazásban az "ATS közlemény szolgáltatás" (ATS message service) célja az, hogy a közleményekkel kapcsolatosan általános szolgáltatásokat biztosítson az ATN Internet Összeköttetési Szolgáltatásán /ATN Internet Communication Service/ (ICS) keresztül. Ez adott esetben összeköttetési rendszerként használható, melyben a felhasználók számítógépes alkalmazásai (programjai) az ATN-en keresztül kommunikálnak egymással. Ezt például meg lehet valósítani az ATS közlemény szolgáltatáshoz kapcsolódó Felhasználói Program Interfészek /azaz összeköttetési kapcsolat-rendszerek/ (API = Application Program/me/ Interfaces) segítségével.

2. Megjegyzés. - Az ATS közlemények kezelését végző számítógépes szolgáltatói alkalmazás részletes leírása a Légiforgalmi Távközlési Hálózat (ATN) /Aeronautical Telecommunication Network/ Műszaki Előírások Kézikönyvé-ben *(Doc 9705), a III. Al-kötetben található.*

3 .Megjegyzés. - Az "ATS közlemény szolgáltatás"-t (ATS message service) - az ATN Internetes Összeköttetési Szolgáltatásán keresztül - az ISO/IEC (Nemzetközi Szabványügyi Szervezet/Nemzetközi Elektro- technikai Bizottság /International Organization for Standardization/International Electrotechnical Comission/) 10021-es, valamint az ITU-T (Nemzetközi Távközlési Unió - Távközlési Szabványosítási Szektora /International Telecommunication Union - Telecommunication Standardization Sector/) X.400-as előírása, és a Légiforgalmi Távközlési Hálózat (ATN) /Aeronautical Telecommunication Network/ Műszaki Előírások*kal foglalkozó* Kézikönyvben *(Doc 9705) található további követelmények alapján megvalósított közlemények kezelését végző számítógépes szolgáltatói alkalmazásokkal biztosítják. A két dokumentum-sorozat, azaz az ISO/IEC MOTIS (Nemzetközi Szabványügyi Szervezet/Nemzetközi Elektrotechnikai Bizottság, Közlemény-Központú Szöveg Közvetítő Rendszer /Message-Oriented Text Interchange System/) nemzetközi szabványai és az ITU-T X.400-as Ajánlásainak Sorozata (1988, vagy későbbi) elvben igazodik egymáshoz. Azonban csekély számban léteznek eltérések. Az előbb említett dokumentumban - ahol alkalmazható - hivatkozások találhatóak a vonatkozó ISO Nemzetközi Szabványokra és a Nemzetközi Szabványosítási Profilokra, Feladatkörökre (ISP /International Standairdized Profiles/). Ahol szükséges, például a kölcsönös együttműködés okán, vagy, hogy a különbségeket kihangsúlyozzák, oda hivatkozásokat helyeztek el a kapcsolódó X.400 Ajánlásokra.*

4. Megjegyzés. - Az ATS Közleményeket Kezelő szolgáltatásokat megvalósító alábbi ATN végfelhasználói rendszer ("end system") típusokat határozták meg a Légiforgalmi Távközlési Hálózat (ATN /Aeronautical Telecommunication Network/) Műszaki Előírásokkal *foglalkozó* Kézikönyv *(Doc 9705), III. Alkötetében:*
1) egy ATS közlemény központi kiszolgáló egység /szerver/;

2) egy ATS közlemény felhasználói ügynökség;
3) egy AFTN / AMHS (Légiforgalmi Állandóhelyű Távközlési Hálózat / ATS Közlemény Kezelő Rendszer /ATS message handling system/) közötti átjáró kapu (gateway); és
4) a CIDIN/AMHS (az ICAO Közös Adat-továbbító Hálózata /Common ICAO Data Interchange Network/ ATS Közlemény Kezelő Rendszer /ATS message handling system)/ közötti átjáró kapu (gateway).

Az előbbiekben felsorolt bármely két ATN végfelhasználói rendszer között kapcsolatot lehet teremteni az Internetes Összeköttetési Szolgáltatáson keresztül (lásd a 4-1 Táblázatot).

4-1. táblázat – Az ATS Közleményeket Kezelő szolgáltatásokat megvalósító ATN végfelhasználói rendszerek közötti összeköttetés

ATN 1.Végfelhasználói Rendszer	ATN 2. Végfelhasználói Rendszer
ATS Közlemény Szerver	ATS Közlemény Szerver
ATS Közlemény Szerver	AFTN/AMHS közötti átjáró kapu (gateway)
ATS Közlemény Szerver	CIDIN/AMHS közötti átjáró kapu (gateway)
ATS Közlemény Szerver	ATS Közlemény Felhasználói Ügynökség
AFTN/AMHS közötti átjáró kapu (gateway)	AFTN/AMHS közötti átjáró kapu (gateway)
CIDIN/AMHS közötti átjáró kapu (gateway)	CIDIN/AMHS közötti átjáró kapu (gateway)
CIDIN/AMHS közötti átjáró kapu (gateway)	AFTN/AMHS közötti átjáró kapu (gateway)

4.7 Központok-közötti Összeköttetés (ICC)

A központok-közötti összeköttetési (ICC) alkalmazások készletét kell alkalmazni az ATS közlemények cseréjére a Légiforgalmi Szolgálatok felhasználói között az ATN Interneten keresztül.

1. Megjegyzés. - Az ICC alkalmazások készlete lehetővé teszi az információk cseréjét az alábbi üzemeltetési szolgáltatások támogatására:
a) repülés bejelentése;
b) repülés koordinációja;
c) irányítás átadása és rádió-összeköttetés átadása;
d) repülés tervezés;
e) légtér-gazdálkodás; és
f) áramlás-szabályozás.

2. Megjegyzés. - Az ICC készlet számára kifejlesztett alkalmazások közül az első az ATS Berendezések Közötti Adat-összeköttetés (AIDC /ATS Interfacility Data Communication/)

3. Megjegyzés. - Az AIDC alkalmazás az olyan információk cseréjét biztosítja ATS egységek között (ATSUs /ATS Units/), mellyel támogatja az olyan kritikus légiforgalmi irányítási (ATC) funkciókat, mint amilyen a repülési adatok továbbítása az olyan légijárművekről, amelyek a FIR (Repülés-Tájékoztató Körzet /Flight Information Region/) határához közelednek, a határ átrepülési feltételeinek koordinálása, valamint az irányítási felelősség és az összeköttetés átadása.

4. Megjegyzés. - Az AIDC alkalmazás részletes specifikációja a Légiforgalmi Távközlési Hálózat (ATN /Aeronautical Telecommunication Network/) Műszaki Előírásai*val foglalkozó* Kézikönyvé*nek (Doc 9705), III. Alkötetében található.*

5. Megjegyzés. - Az AIDC alkalmazás csak szigorúan ATC alkalmazás, az ATS egységek közötti taktikai irányítási tájékoztatások, adatok cseréjére. Ez az alkalmazás nem támogatja az információcserét más berendezésekkel, intézményekkel.

6. Megjegyzés. - Az AIDC alkalmazás az alábbi üzemeltetési szolgáltatásokat támogatja:
a) repülés bejelentése;
b) repülés koordinációja;
c) a közvetlen irányítási felelősség átadása;
d) a rádió-összeköttetés átadása; és
e) általános információk továbbítása (repüléssel kapcsolatos adatok, vagy kötetlen szöveges üzenetek, közlemények, azaz nem kötött formátumú közlemény).

5. FEJEZET: LÉGIFORGALMI MOZGÓ SZOLGÁLAT – BESZÉD-ÜZEMŰ ÖSSZEKÖTTETÉSEK

5.1 Általános rész

Megjegyzés: Ezen rendelkezések értelmében a légiforgalmi mozgó szolgálatra alkalmazható össszekötetési eljárások - ahogy megfelelő - a légiforgalmi mozgó-műholdas szolgálatra is alkalmazhatók.

5.1.1 Bármilyen összeköttetés során, mindenkor a legmagasabb fokú fegyelmet kell tanúsítani.

5.1.1.1 Minden olyan helyzetben, amelyek esetére szabványos ICAO kifejezéseket határoztak meg, ezeket a kifejezéseket kell alkalmazni. Csak ha a szabványos kifejezések egy szándékolt átvitelre nem alkalmazhatók, akkor kell köznyelvet használni.

Megjegyzés. - Részletes nyelvismereti követelmények az Annex 1, Függelékében vannak feltüntetve.

5.1.1.2 Az 5.1.8 pontban meghatározott közleményeken kívül, kerülni kell a közlemények továbbítását a légiforgalmi mozgó szolgálat frekvenciáin akkor, amikor a légiforgalmi állandóhelyű szolgálat is képes a szándékolt célokat kielégíteni.

5.1.1.3 **Ajánlás. -** Valamennyi összeköttetés során tekintetbe kell venni az emberi teljesítőképesség azon korlátainak következményeit, melyek hatással lehetnek a közlemények hibátlan vételére és megértésére.

Megjegyzés. - Az emberi teljesítőképességgel foglalkozó tájékoztató anyag az Emberi Tényezők Képzési Kézikönyvben *(Doc 9683) található.*

5.1.2 Amikor arra van szükség, hogy egy légijármű állomás ellenőrzés vagy beállítás céljából adjon jeleket, - amelyek valószínűleg zavart fognak okozni egy szomszédos légiforgalmi állomás munkájában, - akkor ki kell kérni az illető állomás beleegyezését, mielőtt a jeleket leadják. Az ilyen adásokat a minimálisra kell korlátozni.

5.1.3 Amikor arra van szükség, hogy a légiforgalmi mozgó szolgálat egy állomása ellenőrző-jeleket adjon, akár az adó beállítására egy hívás előtt, akár a vevő beállítására, az ilyen jelek nem tarthatnak 10 másodpercnél tovább, tartalmát pedig a rádió-távbeszélő használata esetén kimondott számokból kell összeállítani (ONE/egy/, TWO/kettő/, THREE/három/, stb.), amelyeket az ellenőrző-jeleket adó állomás hívójele követ. Az ilyen adásokat a minimálisra kell korlátozni.

5.1.4 Ha egyéb előírás másképp nem rendelkezik, az összeköttetés felvétele annak az állomásnak a kötelessége, amelynek továbbítandó közleménye van.

Megjegyzés. - Azokra az esetekre, amikor SELCAL berendezést használatnak, az összeköttetés felvételére vonatkozó eljárásokat az 5.2.4 pont foglalja magába.

5.1.5 **Ajánlás. -** *Egy légiforgalmi állomás meghívása után legalább 10 másodperces szünet tartandó a második hívás előtt. Ennek célja a fölösleges hívások kiküszöbölése azon idő alatt, amíg a légiforgalmi állomás felkészül a legelső hívás megválaszolására.*

5.1.6 Ha egy légiforgalmi állomást egyszerre több légijármű állomás is hív, a légiforgalmi állomásnak kell eldönteni, hogy a légijárműveknek milyen sorrendben kell folytatniuk a közlemény-váltást.

5.1.7 A légijármű állomások közötti összeköttetés során a közlemény-váltás időtartamát a vevő légijármű állomás- nak kell meghatároznia, kivéve ha egy légiforgalmi állomás belép az összeköttetésbe. Ha az ilyen közlemény-váltás ATS frekvencián történne, akkor előzetesen kérni kell a légiforgalmi állomás beleegyezését. Rövid közlemény-váltásokhoz nem kell ilyen engedélyt kérni.

5.1.8 Közlemény-kategóriák

A légiforgalmi mozgó szolgálat által kezelt közlemények fajtáit, valamint az összeköttetés felvételekor és a közlemény-váltáskor alkalmazandó elsőbbségi sorrendet az alábbi táblázat tartalmazza.

Közlemény-kategória és elsőbbségi sorrend	*Rádiótávbeszélő jelzés*
a) Vészhelyzeti hívások, vészhelyzeti közlemények és vészhelyzeti forgalmazás	MAYDAY
b) Sürgősségi közlemények, beleértve azokat a közleményeket is, melyeket a betegszállító légijármű jelzés előzött meg	PAN, PAN vagy PAN, PAN MEDICAL
c) Irányméréssel kapcsolatos közlemények	-----
d) Repülésbiztonsággal kapcsolatos közlemények	-----
e) Meteorológiai közlemények	-----
f) Repülések rendszerességével kapcsolatos közlemények	-----

1. Megjegyzés. - A jogtalan beavatkozásra vonatkozó közlemények olyan kivételes körülményeket feltételeznek, amelyek esetleg megakadályozhatják az olyan elfogadott, megszokott közlemény-váltási eljárások alkalmazását, amelyek alapján a közlemények kategóriáját és elsőbbségét általában meghatározzák.

2. Megjegyzés. - A NOTAM-ok a c)-től f)-ig bármelyik sürgősségi kategóriába tartozhatnak. A NOTAM besorolását az határozza meg, hogy mi a tartalma, és hogy mennyire fontos az érintett légijármű(vek) számára.

5.1.8.1 A vészhelyzeti közleményeket és a vészhelyzeti forgalmazást az 5.3 pont előírásai szerint kell kezelni.

5.1.8.2 A sürgősségi közleményeket és sürgősségi forgalmazást, beleértve azokat a közleményeket is, amelyeket a betegszállító légijármű jelzéssel vezettek be, az 5.3 pont előírásai szerint kell kezelni.

Megjegyzés. - A "betegszállító" (medical transports) kifejezést az 1949-es Genfi Egyezmény és Kiegészítő Jegyzőkönyvei határozták meg (lásd még az RR S33 III. Rész), a következő jelentéssel: "bármely földi, vízi vagy légi közlekedési eszköz, akár polgári, akár katonai, ideiglenes vagy állandó, amelyet kizárólagosan egészségügyi szállításra (medical transportation) jelöltek ki, és amely a konfliktusban résztvevő valamelyik Fél illetékes hatóságának ellenőrzése alatt áll."

5.1.8.3 *Az irányméréssel kapcsolatos közlemény-váltásokat* a 6. Fejezet előírásai szerint kell kezelni.

5.1.8.4 *A repülésbiztonsággal kapcsolatos közlemények* az alábbiak lehetnek:
1) légijárművek mozgásával és irányításával kapcsolatos közlemények [*lásd* a PANS-ATM (Doc 4444) előírásait];
2) egy légijármű-üzemeltető ügynökség (járató) vagy egy légijármű által feladott közlemények, amelyek azonnali fontosságúak egy repülésben lévő légijármű számára;

3) meteorológiai tanácsadás, amely azonnali fontosságú egy repülésben lévő, vagy indulni készülő légijármű számára (akár egyedileg, akár általános adással leadott közleményről van szó);
4) egyéb olyan közlemények, amelyek repülésben lévő, vagy indulni készülő légijárműve(ke)t érintenek.

5.1.8.5 A *meteorológiai közlemények* légijárművektől származó, vagy légijárműveknek szóló meteorológiai tájékoztatást tartalmaznak, kivéve az 5.1.8.4 pont 3) bekezdésben említetteket.

5.1.8.6 A *repülések rendszerességével kapcsolatos közlemények* az alábbiak lehetnek:
1) a légijárművek üzemeltetésének biztonsága vagy rendszeressége szempontjából alapvető fontosságú létesítmények üzemeltetésével vagy karbantartásával kapcsolatos közlemények;
2) légijárművek szervizelésével kapcsolatos közlemények;
3) rendelkezések a légijármű járató képviselői felé, ha a rendes üzemeltetési menetrendtől történt elkerülhetetlen eltérés miatt az utasokkal és a személyzettel kapcsolatos követelmények megváltoztak. Az utasok vagy a személyzet egyéni igényeinek továbbítása nem megengedett ebben a közlemény fajtában;
4) a légijármű által végrehajtandó, a szokásostól eltérő leszállásokkal kapcsolatos közlemények;
5) azonnal szükséges légijármű-alkatrészekkel és -anyagokkal kapcsolatos közlemények;
6) a légijárművek üzemeltetési menetrendjében történt változásokkal kapcsolatos közlemények.

5.1.8.6.1 A közvetlen légijármű-vezető - légiforgalmi irányító összeköttetési csatornákat használó légiforgalmi szolgálati egységektől csak akkor várható el, hogy a repülések rendszerességét, folyamatosságát szolgáló közleményeket továbbítsanak, ha ez nem akadályozza elsődleges feladataik ellátását, és közben más csatorna nem áll rendelkezésre az ilyen közlemények kezelésére.

Megjegyzés. - A fenti 5.1.8.4 pont 2) bekezdésében és az 5.1.8.6 pont 1)-től 6)-ig terjedő bekezdéseiben említett közlemények tipikus példái az 1. Fejezetben részletesen leírt repülés-üzemi felügyeleti összeköttetéseknek .

5.1.8.7 **Ajánlás. -** *Lehetőség szerint az azonos elsőbbségű közleményeket általában olyan sorrendben kell továbbítani, amilyen sorrendben azokat továbbításra megkapták.*

5.1.8.8 A légijármű-vezetők közötti levegő-levegő közlemény-váltások tárgya a repülések biztonságosságát és rendszerességét befolyásoló bármilyen közlemény lehet. Ezeknek a közleményeknek a kategóriáját és elsőbbségét - az 5.1.8 ponttal összhangban - a tartalmuk alapján kell megállapítani.

5.1.9 Közlemények törlése

5.1.9.1 *Befejezetlen adások.* Amikor egy közleményt még nem adtak le teljes egészében, amint utasítás érkezik a közlemény törlésére, akkor a közleményt továbbító állomásnak utasítania kell a vevő állomást a befejezetlen adás figyelmen kívül hagyására. Ezt a megfelelő rádió-távbeszélő kifejezés használatával kell megtenni.

5.1.9.2 *Befejezett adások*

Ajánlás. - *Amikor egy befejezett közleményt helyesbítésre várva függőben tartanak, és a vevő állomást tájékoztatni kell arról, hogy a közleményt ne továbbítsa, vagy amikor a közleményt nem lehet a címzetthez eljuttatni illetve tovább-küldeni, akkor az adást törölni kell. Ezt a megfelelő rádió-távbeszélő kifejezés használatával kell megtenni.*

5.1.9.3 Az adást törlő állomás felelős minden szükséges további intézkedés megtételeéért.

5.2 Rádió-távbeszélő eljárások

Megjegyzés. - Amikor Kiválasztó Hívás (Selective Calling /SELCAL/) berendezést használnak, akkor bizonyos itt következő előírások helyett az 5.2.4 pontban leírt előírások válnak érvényessé.

5.2.1 Általános rész

5.2.1.1 **PANS. - *(Légiforgalmi Szolgálatok Eljárásai)*** – *Amikor a légiforgalmi irányító, vagy a légijármű- vezető beszéd-üzemű összeköttetéstt kezdeményez, akkor az erre adott válasznak is beszéd-üzeműnek kell lennie. A 8.2.12.1 pontban leírtak kivételével, ha a légiforgalmi irányító, vagy a légijárművezető CPDLC- /légiforgalmi igányító - légijárművezető közötti digitális adatcseré/-n keresztül kezdeményez összeköttetést, akkor az erre adott válasznak is CPDLC-n keresztül kell érkeznie.*

5.2.1.2 A használandó nyelv

5.2.1.2.1 A levegö-föld rádió-távbeszélő összeköttetést a földi állomás által rendszeresen használt nyelven, vagy angol nyelven kell lebonyolítani.

1. Megjegyzés. - A földi állomás által rendes körülmények között használt nyelv nem feltétlenül egyezik meg annak az Államnak a nyelvével, ahol a földi állomás található. Megállapodás lehetséges a közös nyelvhasználatra - körzeti előírásként - az egy *adott körzetbden lévő földi állomások számára.*

2. Megjegyzés. - A légiforgalmi rádió-távbeszélő összeköttetéseknél megkövetelt nyelvismeret szintjét az Annex 1, Függeléke határozza meg.

5.2.1.2.2 Az angol nyelvnek "rendelkezésre kell állnia" bármely légijármű fedélzeti állomás kérésére, és ezen a nyelven "kell rendelkezésre állnia" minden olyan földi állomásnak, amely nemzetközi légiközlekedési szolgálatok általi használatra kijelölt repülőtereket és útvonalakat szolgál ki.

5.2.1.2.3 Egy adott földi állomáson rendelkezésre álló nyelveknek a Légiforgalmi Tájékoztató Kiadvány meghatározott részében és más ilyen, a jellemzőkkel foglalkozó közzétett légiforgalmi tájékoztatásokban megadottnak kell lenni.

5.2.1.3 *Szavak betűzése a rádió-távbeszélő összeköttetések során.* Amikor a rádió-távbeszélő összeköttetés során kétes helyesírású tulajdonneveket, szolgálati rövidítéseket, vagy szavakat kell betűzni, akkor erre az 5-1. ábrán található ABC-t kell használni.

1. Megjegyzés. - Az ABC-ben található szavak, valamint a számok kiejtése a beszélő anyanyelvi szokásaitól függően változhat. A kiejtési változatok túlzott eltérésének kiküszöbölése érdekében az ICAO-tól beszerezhető a kívánatos kiejtést szemléltető poszter.

2. Megjegyzés. - Az 5.2.1.3 pontban részletesen leírt Kiejtési ABC használatát írják elő a Tengerészeti Mozgó Szolgálatnál is. (ITU Rádió Szabályzat, S14-es Függelék).

5.2.1.4 *Számok továbbítása rádió-távbeszélő összeköttetések során*

5.2.1.4.1 *Számok továbbítása*

5.2.1.4.1.1 Minden számot, kivéve az 5.2.1.4.1.2 pontban felsoroltakat, úgy kell továbbítani, hogy minden egyes számjegyet külön kell kimondani.

Megjegyzés. - Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be (a kiejtést lásd az

5.2.1.4.3.1 pontban).

légijármű-hívójelek (aircraft call sign)	*továbbításuk*
CCA 238	Air China **two three eight**
OAL 242	Olympic **two four two**
repülési szintek (flight levels)	*továbbításuk*
FL 180	flight level **one eight zero**
FL200	flight level **two zero zero**
géptengely-irányszögek (headings)	*továbbításuk*
100 fok	heading **one zero zero**
080 fok	heading **zero eight zero**
szélirány és szélsebesség (wind direction and speed)	*továbbításuk*
200 fokról 70 csomó	wind **two zero zero** degrees, **seven zero** knots
160 fokról 18 csomó, szél-lökés 30 csomó	wind **one six zero** degrees, **one eight** knots, gusting **three zero**
transzponder-kódok (transponder codes)	*továbbításuk*
2 400	squawk **two four zero zero**
4 203	squawk **four two zero three**
futópálya (runway)	*továbbítása*
27	runway **two seven**
30	runway **three zero**
magasságmérő-beállítás (altimeter settings)	*továbbítása*
1010	QNH **one zero one zero**
1000	QNH **one zero zero zero**

5.2.1.4.1.2 A tengerszint feletti magasság (altitude), felhőalap, látástávolság és futópálya-menti látástávolság (RVR) értékek továbbítása során, ha a szám egész százasokat vagy ezreseket tartalmaz, akkor a százasok vagy ezresek számát számjegyenként ki kell mondani, amelyet a HUNDRED vagy THOUSAND szó követ értelemszerűen. Ha a számban ezresek és egész százasok kombinációja található, akkor az ezresek számában minden számjegyet külön ki kell mondani, amelyet a THOUSAND szó követ, majd ezután következik a százasok száma és a HUNDRED szó.

Megjegyzés.- A következő példák ennek az eljárásnak az alkalmazását mutatják be (lásd 5.2.1.4.3.1 a kiejtésre vonatkozóan).

Betű	*Szó*	*Közelítő kiejtés*	
		Nemzetközi fonetikai jelekkel	*Latin ABC szerint (angol kiejtési szokások szerint) leírva*
A	Alfa	'ælfa	AL FAH
B	Bravo	'bra:'vo	BRAH VOH
C	Charlie	'tʃa:li *vagy* 'ʃa:li	CHAR LEE v*agy* SHAR LEE
D	Delta	'delta	DELL TAH
E	Echo	'eko	ECK OH
F	Foxtrot	'fɔkstrɔt	FOKS TROT
G	Golf	gɔlf	GOLF
H	Hotel	ho:'tel	HO TELL
I	India	'indi a	IN DEE AH
J	Juliett	'dʒu:li 'et	JEW LEE ETT
K	Kilo	'ki:lo	KEY LOH
L	Lima	'li:ma	LEE MAH
M	Mike	maik	MIKE
N	November	no'vembə	NO VEM BER
O	Oscar	'ɔska	OSS CAH
P	Papa	pə'pa	PAH PAH
Q	Quebec	ke'bek	KEH BECK
R	Romeo	'ro:mi o	ROW ME OH
S	Sierra	si'era	SEE AIR RAH
T	Tango	'tængo	TANG GO
U	Uniform	'ju:nifɔ:m *vagy* 'u:nifɔrm	YOU NEE FORM vagy OO NEE FORM
V	Victor	'vikta	VIK TAH
W	Whiskey	'wiski	WISS KEY
X	X-ray	'eks'rei	ECKS RAY
Y	Yankee	'jænki	YANG KEY
Z	Zulu	'zu:lu:	ZOO LOO

Megjegyzés. - A latin ABC használatának megközelítő bemutatásához a szótagok hangsúlyozása aláhúzásra került.

5-1. ábra: A rádió-távbeszélő betűzési ABC (lásd az 5.2.1.3 pontot)

1. Megjegyzés. - Az ABC-ben található szavak kiejtése a beszélő anyanyelvi szokásaitól függően változhat. A kiejtési változatok túlzott eltérésének kiküszöbölése érdekében, az ICAO-tól beszerezhető a kívánatos kiejtést szemléltető poszter.

2. Megjegyzés. - Az 5.2.1.3 pontban részletesen leírt Kiejtési ABC használatát írják elő a Tengerészeti Mozgó Szolgálatnál is. (ITU Rádió Szabályzat, S14-es Függelék).

tengerszint feletti magasság (altitude)	*továbbításuk*
800	**eight hundred**
3 400	**three thousand four hundred**
12 000	**one two thousand**

felhőalap (cloud height)	*továbbításuk*
2 200	**two thousand two hundred**
4 300	**four thousand three hundred**
látástávolság (visibility)	*továbbításuk*
1 000	visibility **one thousand**
700	visibility **seven hundred**
futópálya menti látástávolság (runway visual range)	*továbbításuk*
600	RVR **six hundred**
1 700	RVR **one thousand seven hundred**

5.2.1.4.1.3 A tizedespontot tartalmazó számokat az 5.2.1.4.1.1 pontban található szabályok szerint kell továbbítani, úgy, hogy a tizedespontot a megfelelő sorrendet betartva a "DECIMAL" (TIZEDES) szóval kell jelölni.

1. Megjegyzés. - Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be:

Szám	*Továbbítás módja*
100.3	ONE ZERO ZERO DECIMAL THREE
38 143.9	THREE EIGHT ONE FOUR THREE DECIMAL NINE

2. Megjegyzés. - A VHF frekvenciák azonosítására a tizedespont után használt számjegyek számát a csatorna-osztás határozza meg (a 25 kHz-es osztással elválasztott frekvenciákra az 5.2.1.7.3.4.3 pont, illetve a 8,33 kHz-es osztással elválasztott frekvenciákra pedig az 5.2.1.7.3.4.4 pont előírásai vonatkoznak).

3. Megjegyzés. - A 8.33 kHz-es és a 25 kHz-es osztáshoz tartozó csatorna-osztási / frekvencia párosítási kapcsolatokat az V. kötet 4.1 (bis) táblázata foglalja össze.

5.2.1.4.1.4 **PANS. -** *Időadat továbbításakor általában csak az óra perceit szükséges megadni. Minden egyes számjegyet külön kell kimondani. Az órát is közölni kell azonban, ha annak elhagyása bármilyen zavart okozhatna.*

Megjegyzés. - Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be, amennyiben az 5.2.1.2.2 pont előírásait alkalmazzák:

Idő	*Továbbítása*	
0920	*(de. 9:20)*	TOO ZE-RO, v*agy* ZE-RO NIN-er TOO ZE-RO
1643	*(du.. 4:43)*	FOW-er TREE, vagy WUN SIX FOW-er TREE

5.2.1.4.2 *Számok ellenőrzése, megerősítése*

5.2.1.4.2.1 Ha szükséges a számok pontos vételének ellenőrzése, megerősítése, akkor a közleményt továbbító személy felkéri a közleményt vevő személyt a számok visszaolvasására.

5.2.1.4.3 *Számok kiejtése*

5.2.1.4.3.1 Az 5.2.1.2.2 pont előírásainak alkalmazása során a számokat az alábbi kiejtéssel kell továbbítani:

Szám, vagy közlemény számrésze	*Kiejtés (angol kiejtési megfeleltetéssel)*
0	ZE-RO
1	WUN
2	TOO
3	TREE
4	FOW-er
5	FIFE
6	SIX
7	SEV-en
8	AIT
9	NIN-er
Decimal	DAY-SEE-MAL
Hundred	HUN-dred
Thousand	TOU-SAND

Megjegyzés. - A fenti táblázatban a nagybetűvel írt szótagok a hangsúlyosak. Például, a ZE-RO szóban mindkét szótag egyformán hangsúlyos, míg a FOW-er szóban a hangsúly az első szótagra esik.

5.2.1.5 *Adás-technika*

5.2.1.5.1 **PANS**. - *Minden írott közleményt az adás megkezdése előtt lehetőség szerint egyszer végig kell olvasni, hogy elkerülhető legyen a fölösleges késedelem a továbbítás során.*

5.2.1.5.2 A közleményt adó fogalmazzon tömören, normál társalgási hanghordozást használva.

Megjegyzés. – Lásd a nyelvismereti követelményeket az Annex 1-hez tartozó Függelékben.

5.2.1.5.3 **PANS. -** *A beszéd adás-technikája lehetőség szerint olyan legyen, hogy biztosítsa minden adás során az elérhető legtisztább érthetőségét. Ennek a célnak az elérése érdekében szükséges, hogy a hajózó és a földi személyzet lehetőleg:*
a) minden szót tisztán és világosan ejtsen ki;
b) egyenletes tempóban beszéljen, a beszéd sebessége ne haladja meg a 100 szót percenként. Ha a közlemény légijárműnek szól és a tartalmát le kell írni, akkor beszéljen lassabban, hogy legyen elég idő a közlemény leírására. A számok előtti és utáni kis szünet elősegítheti azok megértését;
c) tartsa a beszéd hangerejét állandó szinten;
d) ismerje a mikrofon-kezelési technikát, különösen azt, hogy a mikrofont állandó távolságban tartsa a szájától, ha nem alkalmaznak állandó hangerőt beállító áramkört;
e) ha szüksges az, hogy elfordítsa a fejét a mikrofontól, átmenetileg függessze fel a beszédet.

5.2.1.5.4 **Ajánlás**.- *A beszéd- és adás-technikát lehetőleg az adás idején uralkodó körülményekhez kell igazítani.*

5.2.1.5.5 **PANS. -** *A továbbításra elfogadott közleményeket lehetőség szerint vagy jól érthető szövegként, vagy jóváhagyott szakkifejezések használatával kell továbbítani anélkül, hogy a közlemény értelmét bármilyen módon megváltoztatnák. A közlemény szövegében előforduló, elfogadott ICAO rövidítéseket általában azokkal a nem-rövidített szavakkal vagy kifejezésekkel ajánlott helyettesíteni, melyeket ezek a rövidítések a továbbításra használt nyelven jelentenek, kivéve azokat a rövidítéseket, amelyeket a gyakori és általános használat következtében a légiközlekedés szakszemélyzete rendszerint megért.*

Megjegyzés. - A PANS-ABC (Doc 8400) kiadvány rövidítéseket kódoló része külön is jelzi azokat a rövidítéseket, amelyek a fenti 5.2.1.5.5 pontban említett kivételek közé tartoznak.

5.2.1.5.6 **PANS. -** *Az összeköttetés meggyorsítása céljából a fonetikus betűzést el lehet hagyni, ha ez nem veszélyezteti a közlemény pontos vételét és érthetőségét.*

5.2.1.5.7 **PANS. -** *Hosszú közlemények továbbításakor, az adást lehetőleg időről időre meg kell szakítani néhány pillanatra, hogy a közleményt adó személy meggyőződhessen arról, hogy a használt frekvencián nincs zavarás, és ezzel lehetőséget adjon a vevő személynek arra, hogyha szükséges, a közlemény nem vett részeinek ismétlését kérhesse.*

5.2.1.5.8 Szükség szerint az alábbi szavakat és kifejezéseket kell használni a rádió-távbeszélő összeköttetések során, a táblázatban megadott jelentés szerint:

Kifejezés	*Jelentés*
ACKNOWLEDGE	"Tudassa velem, hogy vette és megértette ezt a közleményt!"
AFFIRM	"Igen."
APPROVED	"A tervezett tevékenységre az engedély megadva."
BREAK	"Jelzem a közlemény egyes részei közötti elválasztást." *(Akkor kell használni, ha nem különülnek el világosan a szöveg és a közlemény egyéb részei.)*
BREAK BREAK	"Jelzem, hogy itt van a különböző légijárműveknek szóló közlemények közötti elválasztás a frekvencia nagy terhelése miatt."
CANCEL	"Vegye semmisnek a korábban kiadott engedélyt!"
CHECK	"Ellenőrizzen egy rendszert vagy eljárást!" *(Más jelentésben ne használja. Általában nem várnak rá választ.)*
CLEARED	"Felhatalmazom, hogy a megadott feltételek szerint járjon el."
CONFIRM	"Kérem a következők megerősítését: *(engedély, utasítás, rendelkezés, információ)*."
CONTACT	"Létesítsen összeköttetést ... -val."
CORRECT	"Helyes", vagy "Pontos".
CORRECTION	"Hiba történt ebben az adásban *(vagy* a jelzett közleményben). A helyes változat a következő: ...."
DISREGARD	"Ne vegye figyelembe!"

GO AHEAD	"Jöhet a közleménye." *Megjegyzés.- Nem használandó, ha fennáll annak a veszélye, hogy a "GO AHAED" ("FOLYTASSA")* *kifejezést a légijármű tévesen továbbhaladásra való felhatalmazásként értelmezhetné. A "GO* *AHAED" kifejezés kihagyható, és a helyette használt válasz a hívó légiforgalmi állomás hívójeléből,* *és azt követően a válaszoló légiforgalmi állomás hívójeléből álljon.*
HOW DO YOU READ	"Milyen az adásom érthetősége?"*(lásd az* 5.2.1.8.4 *pontot).*
I SAY AGAIN	"Ismétlem az érthetőség, vagy a nyomatékosítás érdekében"
MAINTAIN	"Folytassa a meghatározott körülmény(ek)nek megfelelő módon", vagy szó szerinti értelmében, pl. "Maintain VFR" ("Folytassa VFR szabályok szerint").
MONITOR	"Figyeljen a ... (frekvencián)."
NEGATIVE	"Nem" *vagy* "Nincs engedélyezve." *vagy* "Ez nem helyes." *vagy* "Nem alkalmas."
OVER	"A közleményemnek vége, választ várok Öntől." *(Megjegyzés.- VHF csatornákon általában* *nem használatos.)*
OUT	"Ezt a közleményváltást befejeztem, választ nem várok." *(Megjegyzés: VHF csatornákon* *általában nem használatos.)*
READ BACK	"Ismételje meg a teljes közleményt, vagy annak meghatározott részét, pontosan úgy, ahogyan azt vette!"
RECLEARED	"Az utoljára kiadott engedélyében változás történt, és ez az új engedély hatálytalanítja a korábbi engedélyt vagy annak egy részét."
REPORT	"Jelentse nekem a következő információkat ..."
REQUEST	"Szeretném tudni..." *vagy* "Szeretném megszerezni (megkapni) az ..."
ROGER	"Teljes egészében vettem az utolsó közleményét." *Megjegyzés. - Semmilyen körülmények között sem szabad válaszul olyan közleményekre használni,* *amelyek visszaolvasást (READ BACK) igényelnek, vagy közvetlen megerősítő (AFFIRM), vagy* *elutasító (NEGATIVE) választ.*
SAY AGAIN	"Ismételje meg a teljes utolsó adását, vagy az alábbi részét!"
SPEAK SLOWER	"Csökkentse a beszéd sebességét." *(Megjegyzés: A normál beszédsebességet lásd az 5.2.1.5.3 b) pontban.)*
STANDBY	"Várjon, hívni fogom." *Megjegyzés.- A hívó fél rendszerint ismét megpróbálja a kapcsolat felvételét, ha a késedelem* *hosszúra nyúlik. A STANDBY nem egy jóváhagyás, vagy visszautasítás.*

UNABLE "Nem tudom teljesíteni a kérését, utasítását, vagy engedélyét."
Megjegyzés. - Az UNABLE kifejezés után általában közölni szokták az okot is.

WILCO *(A "will comply" kifejezés rövidítése.)*
"Megértettem a közleményét, és az abban foglaltaknak megfelelően fogok eljárni."

WORDS TWICE a) *Kérésként:* "A kommunikáció (ti. vétel) nehézségekbe ütközik. Kérem, minden szót, vagy
szócsoportot adjon kétszer!"
b) *Információként:* "Mivel az adás nehézségekbe ütközik, ezért ebben a közleményben minden
szót vagy szócsoportot kétszer adok."

5.2.1.6 *Közlemények összeállítása*

5.2.1.6.1 Azoknak a közleményeknek, amelyeket kizárólag a légiforgalmi mozgó szolgálat kezel, az alábbi részekből kell állnia, az itt leírt sorrendben:
a) hívás, amely tartalmazza a címzettet és a feladót (*lásd* az 5.2.1.7.3 pontot);
b) szöveg (*lásd* az 5.2.1.6.2.1.1 pontot).

Megjegyzés.- Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be:

(hívás) NEW YORK RADIO SWISSAIR ONE ONE ZERO
(szöveg) REQUEST SELCAL CHECK ("SELCAL ellenőrzést kérek!"), vagy
(hívás) SWISSAIR ONE ONE ZERO NEW YORK RADIO
(szöveg) CONTACT SAN JUAN ON FIVE SIX ("Lépjen összeköttetésbe ..... ").

5.2.1.6.2 Azokat a közleményeket, melyeket a továbbítás során részben AFTN-en keresztül is kell kezelni, valamint hasonlóképpen azokat a közleményeket, melyeket nem az előre meghatározott szétosztási rendnek megfelelő módon kezelnek (*lásd* a 3.3.7.1 pontot), az alábbiak szerint kell összeállítani:

5.2.1.6.2.1 *Ha egy légijármű a feladója :*
1) hívás (lásd az 5.2.1.7.3 pontban);
2) a "FOR" szó;
3) a címzett szervezet neve;
4) a célállomás neve;
5) a szöveg.

5.2.1.6.2.1.1 A szöveg a lehető legrövidebb formában tartalmazza a szükséges információkat; teljes mértékben ki kell használni az ICAO kifejezéseket.

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be:

(hívás) BOSTON RADIO SWISSAIR ONE TWO EIGHT

(címzés) FOR SWISSAIR BOSTON

(szöveg) NUMBER ONE ENGINE CHANGE REQUIRED (Az egyes számú hajtómű cseréje szükséges)

5.2.1.6.2.2 *Ha a közleményt egy légijárműnek címezik:* Ha egy, a 4.4.2 pont előírásai szerint összeállított közleményt egy légiforgalmi állomás közvetít egy, a levegőben repülésben lévő légijármű számára, akkor a közleménynek a légiforgalmi mozgó szolgálat segítségével történő továbbítása során az AFTN közlemény-formátum fej-részét és címzését el kell hagyni.

5.2.1.6.2.2.1 Amikor az 5.2.1.6.2.2 pont előírásait alkalmazzák, a légiforgalmi mozgó szolgálat közleménye az alábbi részeket kell, hogy magában foglalja:
a) a szöveget [beleértve az AFTN közleményben található minden helyesbítést (COR) is];
b) a "FROM" szót;
c) a feladó szervezet nevét és a feladás helyét (az AFTN közlemény feladó-részéből átvéve).

5.2.1.6.2.2.2 **PANS.** .- *Ha a légiforgalmi állomás által egy repülésben lévő légijárműnek továbbítandó közleményben elfogadott ICAO rövidítések vannak, akkor a közlemény továbbítása során ezeket általában azokkal a nem-rövidített szavakkal vagy kifejezésekkel ajánlott helyettesíteni, melyeket ezek a rövidítések a továbbításra használt nyelven jelentenek, kivéve azokat a rövidítéseket, amelyeket a gyakori és általános használat következtében a légiközlekedés szakszemélyzete rendszerint megért.*

Megjegyzés. - Az 5.2.1.6.2.2.2 pontban említett kivételeket képező rövidítések a PANS-ABC (Doc 8400) rövidítések kdolási részében vannak külön meghatározva.

5.2.1.7 *Hívás*

5.2.1.7.1 R*ádió-távbeszélő hívójelek légiforgalmi állomások számára*

Megjegyzés. - A hívójelek összeállítási szabályait az ITU S19 Rádió Szabályzatának III. és VII. Része tartalmazza.

5.2.1.7.1.1 A légiforgalmi mozgó szolgálat keretein belül a légiforgalmi állomásokat az alábbiakkal kell azonosítani:
a) a hely nevével; és
b) a rendelkezésre álló egység vagy szolgálat megjelölésével.

5.2.1.7.1.2 Az egységet vagy szolgálatot az alábbi táblázat alapján kell azonosítani, azzal a kivétellel, hogy a hely, vagy az egység/szolgálat nevét el lehet hagyni, feltéve, hogy már kielégítő összeköttetést sikerült létesíteni.

Egység/szolgáltatás megjelölése	*Hívójel utótag*
Körzeti irányító központ	CONTROL
Bevezető irányítás	APPROACH
Bevezető radar-irányítás érkezőknek	ARRIVAL
Bevezető radar-irányítás indulóknak	DEPARTURE
Repülőtéri irányítás	TOWER
Gurító irányítás	GROUND
Radar-irányítás (általában)	RADAR
Precíziós bevezető- radar-irányítás	PRECISION
Iránymérő állomás	HOMER
Repülés-tájékoztató szolgálat	INFORMATION
Engedély-kiadás	DELIVERY
Előtéri irányítás	APRON
Társasági diszpécser	DISPATCH
Légiforgalmi állomás	RADIO

5.2.1.7.2 A légijárművek rádió-távbeszélő hívójelei

5.2.1.7.2.1 *Teljes hívójelek*

5.2.1.7.2.1.1 Egy légijármű rádió-távbeszélő hívójele az alábbi típusok valamelyike kell , hogy legyen:
a) típusú – a karakterek megegyeznek a légijármű lajstromjelével; vagy
b) típusú – a légijármű járatójának rádió-távbeszélő megjelölése, amelyet a légijármű lajstromjelének utolsó négy karaktere követ;
c) típusú – a légijármű járatójának rádió-távbeszélő megjelölése, amelyet a járatot azonosító jelzés követ.

1. Megjegyzés. - A fenti a) típusú hívójelben használható előtag lehet a légijármű gyártójának neve vagy modelljének neve (lásd az 5.1 táblázatot).

2. Megjegyzés. - A b) és c) típusú rádió-távbeszélő azonosítókat a Doc 8585, Légijármű Járatók, Légiforgalmi Szervezetek, Hatóságok és Szolgálatok Azonosítói /Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services/ *tartalmazza.*

3. Megjegyzés. - Az előbbiekben felsorolt hívójelek közül bármelyik beírható az ICAO repülési terv 7. rovatába, mint a légijármű azonosítója. A repülési terv kitöltésére vonatkozó útbaigazításokat a PANS-ATM, Doc 4444 tartalmazza.

5.2.1.7.2.2 *Rövidített hívójelek*

5.2.1.7.2.2.1 A légijárművek fenti 5.2.1.7.2.1.1 pontban bemutatott rádió-távbeszélő hívójeleit - a c) típusú hívójel kivételével, - az 5.2.1.7.3.3.1 pontban leírt feltételekkel le lehet rövidíteni. A rövidített hívójeleknek az alábbi formátumúaknak kelllenniük:
a) típusú – a lajstromjel első karaktere és legalább a hívójel utolsó két karaktere; vagy
b) típusú – a légijármű járatójának rádió-távbeszélő megjelölése és legalább a hívójel utolsó két karaktere;

5-1. táblázat: Példák teljes és rövidített hívójelekre

(lásd az 5.2.1.7.2.1 és az 5.2.1.7.2.2 pontokat)

		a) típus		b) típus	c) típus
Teljes hívójel	N 57826	*CESSNA FABCD	*CITATION FABCD	VARIG PVMA	SCANDINAVIAN 937
Rövidített hívójel	N26	CESSNA CD	CITATION CD	VARIG MA	(nem rövidíthető)
	vagy	vagy	vagy	vagy	
	N826	CESSNA BCD	CITATION BCD	VARIG VMA	

* Ezek a példák az 5.2.1.7.2.1.1 pont 1. Megjegyzésében található előírások alkalmazását mutatják be.

c) típusú – nem rövidíthető formátum.

Megjegyzés.- A fenti a) típusú hívójelben az első karakter helyett akár a légijármű gyártójának, akár a légijármű modelljének neve használható.

5.2.1.7.3 *Rádió-távbeszélő eljárások*

5.2.1.7.3.1 A légijármű a rádió-távbeszélő hívójelének típusát repülés közben nem változtathatja meg, kivéve ha erre - ideiglenes jelleggel - egy légiforgalmi irányító egység a repülés biztonsága érdekében utasítja.

5.2.1.7.3.1.1 Hacsak nem a repülés biztonsága érdekében szükséges, a légijárműhöz felszállása közben, a végső megközelítés utolsó fázisában és a leszállás utáni kifutás közben nem szabad közleményt intézni.

5.2.1.7.3.2 *Rádió-távbeszélő összeköttetés létesítése*

5.2.1.7.3.2.1 Az összeköttetés felvételekor mindig a teljes rádió-távbeszélő hívójelet kell használni. Az összeköttetést létesítő légijárműnek a hívást az 5-2. táblázatban foglaltak szerint kell végrehajtania.

5.2.1.7.3.2.2 **PANS**. - *Azoknak az állomásoknak, melyeknek egy közleményt valamennyi olyan állomás számára kell továbbítaniuk, amelyek azt valószínűleg hallani fogják, az ilyen adást lehetőleg az "ALL STATIONS" ("MINDEN ÁLLOMÁSNAK") általános hívással kell kezdeniük, amelyet a hívó állomás azonosítója kell, hogy kövessen.*

Megjegyzés. - Az ilyen általános hívásokra nem várnak választ, kivéve, ha ezt követően az egyes állomásokat fel nem kérik a nyugtázásra.

5.2.1.7.3.2.3 Az előbbi hívásokra az 5-3. táblázatnak megfelelően kell válaszolni.

5.2.1.7.3.2.4 **PANS. -** *Ha egy állomás hívást vett, de nem biztos a hívó állomás azonosítójában, akkor lehetőleg az alábbiak adásával válaszoljon.*

STATION CALLING . . . (*a meghívott állomás neve*), SAY AGAIN YOUR CALL SIGN ("Ismételje a hívójelét!").

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be:
(CAIRO állomás válasza)
STATION CALLING CAIRO *(szünet)* SAY AGAIN YOUR CALL SIGN
/"A Kairó-t hívó állomásnak. *(szünet)* Ismételje meg a hívójelét!"/

5.2.1.7.3.2.5 A közlemény-váltást egy hívással és egy válasz-adással kell kezdeni, amikor az összeköttetést szeretnék létrehozni, kivéve, ha bizonyosak abban, hogy a hívott állomás venni fogja a hívást; ebben az esetben a hívó állomás leadhatja a közleményét anélkül, hogy megvárná a hívott állomás jelentkezését.

5.2.1.7.3.2.6 A légijárművezetők közötti, levegő-levegő közlemény-váltást a 123,45 MHz-es csatornán kell kezdeményezni, akár egy meghatározott légijármű állomásnak szóló közvetlen hívással, vagy általános hívással, figyelembe véve ezen csatorna használatának feltételeit.

Megjegyzés. - A levegő-levegő csatornák használatának feltételeit lásd az Annex 10, V. Kötet, 4.1.3.2.1 pontban, valamint a II. Kötet, 5.2.2.1.1.4 pontban.

5.2.1.7.3.2.6.1 **PANS .-** *Mivel a légijármű egynél több frekvencián is figyelhet, a kezdeti hívás lehetőleg tartalmazza a csatorna megkülönböztető "INTERPILOT" megjelölését.*

Megjegyzés. - Az alábbi példák ezen hívási eljárások alkalmazását mutatják be:

CLIPPER123 – SABENA901 – INTERPILOT – DO YOU READ
("CLIPPER123 – A SABENA901 hívja az INTERPILOT csatornán – hallja az adásomat?"), *vagy*

ANY AIRCRAFT VICINITY OF 30 NORTH 160 EAST - JAPANAIR 401 - INTERPILOT – OVER
("Bármely légijármű az Északi szélesség 30 és a Keleti hosszúság 160 körzetében – a JAPANAIR 401 hívja az INTERPILOT csatornán – Vétel")

5-2. táblázat: Rádió-távbeszélő hívási eljárások*

(lásd az 5.2.1.7.3.2.1 p*ontot)*

	a) típus	*b) típus*	*c) típus*
A hívott állomás megnevezése	NEW YORK RADIO	NEW YORK RADIO	NEW YORK RADIO
A hívó állomás megnevezése	GABCD**	SPEEDBIRD ABCD**	AEROFLOT321**

** Bizonyos esetekben, amikor a hívást a légiforgalmi állomás kezdeményezi, a hívást kódolt impulzus-jelek leadásával is végre lehet hajtani.*

*** A rádió-távbeszélő hívójel és a légijármű típusa kivételével a hívójel minden karakterét külön ki kell mondani. Az egyes betűket az 5.2.1.3 pontban előírt rádió-távbeszélő ABC szerint kell kiejteni. A számokat az 5.2.1.4 pont előírásai szerint kell kimondani.*

5-3. táblázat: Rádió-távbeszélő eljárások válasz esetére

(lásd az 5.2.1.7.3.2.3 *pontot)*

	a) típus	*b) típus*	*c) típus*
A hívott állomás megnevezése	GABCD*	SPEEDBIRD ABCD*	AEROFLOT321*
A válaszoló állomás megnevezése	NEW YORK RADIO	NEW YORK RADIO	NEW YORK RADIO
Felkérés az adás folytatására	GO AHEAD	GO AHEAD	GO AHEAD

** A rádiótávbeszélő megjelölés és a légijármű típusa kivételével a hívójel minden karakterét külön ki kell mondani. Az egyes betűket az 5.2.1.3 pontban előírt rádiótávbeszélő ABC szerint kell kiejteni. A számokat az 5.2.1.4 pont előírásai szerint kell kimondani.*

5.2.1.7.3.3 *A kapcsolat-felvétel utáni rádió-távbeszélő közlemény-váltások*

5.2.1.7.3.3.1 A fenti 5.2.1.7.2.2 pontban leírt rövidített rádió-távbeszélő hívójeleket csak akkor szabad használni, ha már sikeres összeköttetést sikerült létrehozni, és ha hívójel összetévesztés bekövetkezése nem valószínű. A légijármű állomásnak csak akkor szabad a rövidített hívójelét használnia, ha a légiforgalmi állomás már intézett hozzá hívást ilyen módon.

5.2.1.7.3.3.2 Az összeköttetés létrehozása után a folyamatos kétirányú kommunikáció engedélyezett minden további azonosítás, vagy hívás nélkül, a közlemény-váltás befejezéséig.

5.2.1.7.3.3.3 Az esetleges összetévesztés elkerülése érdekében, amikor ATC engedélyeket adnak ki, valamint az ilyen engedélyek visszaolvasásakor, a légiforgalmi irányítók és a légijárművezetők mindig kötelesek hozzátenni annak a légijárműnek a hívójelét, amelyre az adott engedély vonatkozik.

5.2.1.7.3.4 *Az adó frekvencia azonosítása, jelölése*

5.2.1.7.3.4.1 **PANS. -** *Mivel a légiforgalmi állomás kezelője általában több frekvencián figyel, a hívás után lehetőleg azonosítania kell a használt frekvenciát, hacsak nincs egyéb ismert, megfelelő módszer a frekvencia azonosítására.*

5.2.1.7.3.4.2 **PANS. -** *Ha nem valószínű, hogy összetévesztheti, akkor a HF csatornák azonosításakor az első két számjegyet kell megadni (kHz-ben) az adó csatorna azonosítására.*

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be:

(PAA 325 hívja Kingstont a 8871 kHz-es frekvencián)
KINGSTON CLIPPER THREE TWO FIVE - ON EIGHT EIGHT

5.2.1.7.3.4.3 **PANS. -** *Ha a VHF kommunikációs csatornákat 25 kHz-es osztással választják el egymástól, a rádió-távbeszélő közlemény-váltások során az adó vivőfrekvencia azonosítására csak az első 5 számjegy használata szükséges. A tizedespont után csak két fontos számjegyet kell használni. Ha itt két nulla áll, akkor egy nulla számít fontos számjegynek.*

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be:

Csatorna	*Továbbítása*
118.000	*ONE ONE EIGHT DECIMAL ZERO*
118.025	*ONE ONE EIGHT DECIMAL ZERO TWO*

5.2.1.7.3.4.4 **PANS. -** *Amennyiben a VHF összeköttetési csatornákat 8.33 kHz-es osztással választják el egymástól a rádió-távbeszélő közlemény-váltások során, az adásra használt frekvencia azonosítójának lehetőleg mind a 6 számjegyét használni kell. A tizedespont után az összes csatorna számára három számjegyet kell használni.*

1. Megjegyzés. - Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be:

Csatorna	*Továbbítása*
118.005	*ONE ONE EIGHT DECIMAL ZERO ZERO FIVE*
118.010	*ONE ONE EIGHT DECIMAL ZERO ONE ZERO*
118.025	*ONE ONE EIGHT DECIMAL ZERO TWO FIVE*

2. Megjegyzés. - A szám szerinti megjelölés megegyezik az V. kötet 4-1. (bis) táblázatában felsorolt csatorna-azonosítókkal.

5.2.1.8 *Ellenőrző adások*

5.2.1.8.1 **PANS. -** *Az ellenúrző adásoknak az alábbi formai követelményeknek kell megfelelniük:*
a) a hívott állomás azonosítója;
b) a légijármű azonosító jelzése;
c) a "RADIO CHECK" szavak;
d) a használt frekvencia.

5.2.1.8.2 **PANS. -** *Az ellenőrző adásra adott válasz az alábbiakban közölt kell, hogy legyen:*
a) a légijármű azonosítója;
b) a válaszoló légiforgalmi állomás azonosító jele;
c) a légijármű adásának érthetőségére vonatkozó információk.

5.2.1.8.3 **PANS. -** *Az ellenőrző adást és az arra adott választ a légiforgalmi állomáson rögzíteni kell.*

5.2.1.8.4 **PANS. -** *Amikor az ellenőrzést elvégezték, akkor az alábbiaknak megfelelő érthetőségi fokozat szerint kell értékelni azt.*
Érthetőségi fokozatok
1 Érthetetlen
2 Szakadozottan érthető
3 Érthető, de csak nehézségekkel
4 Érthető
5 Tökéletesen érthető

5.2.1.9 *Közlemény-váltás*

5.2.1.9.1 A közlemény-váltásnak tömörnek és egyértelműnek kell lennie, ahol lehetséges, a szabványos szakmai kifejezések használatával.

5.2.1.9.1.1 **Ajánlás. -** *A rövidítési eljárásokat lehetőleg csak akkor kell használni, ha már az összeköttetést létrehozták, és ahol nem valószínű, hogy ez összetévesztést okozhat.*

5.2.1.9.2 *A vétel nyugtázása.* A vevő állomás kezelőjének meg kell győződnie arról, hogy a közleményt pontosan vette, mielőtt a vételt nyugtázná.

Megjegyzés. - A vétel nyugtázását nem szabad összetéveszteni a rádió távközlési hálózat üzemi tevékenységeibe való bekapcsolódás igazolásával.

5.2.1.9.2.1 Ha egy közlemény vételének nyugtázását egy légijármű-állomás továbbítja, akkor a nyugtázó közlemény a légijármű hívójeléből áll.

5.2.1.9.2.2 **PANS. -** *A légijármű-állomás a légiforgalmi irányítás fontos (lényeges) közleményeinek, vagy azok bizonyos részeinek vételét lehetőleg visszaolvasással igazolja/nyugtázza, majd a visszaolvasást a saját rádió-hívójelével fejezze be!*

1. Megjegyzés. - A visszaolvasási kötelezettség alá eső légiforgalmi irányítói engedélyeket, utasításokat és tájékoztatásokat a PANS-ATM (Doc 4444) határozza meg.

2. Megjegyzés. - Az alábbi példák ennek az eljárásnak az alkalmazását mutatják be:
(ATC engedély egy légijármű számára a hálózat egyik állomásától):
Állomás:
TWA NINE SIX THREE MADRID
Légijármű:
MADRID TWA NINE SIX THREE - GO AHEAD
Állomás:
TWA NINE SIX THREE MADRID - ATC CLEARS
TWA NINE SIX THREE TO DESCEND TO NINE THOUSAND FEET

Légijármű (nyugtázza a közleményt):
CLEARED TO DESCEND TO NINE THOUSAND FEET - TWA NINE SIX THREE

Állomás (jelzi a visszaolvasás pontosságát):
MADRID

5.2.1.9.2.3 Ha egy közlemény vételének nyugtázását egy légiforgalmi állomás továbbítja:
1) egy légijármű-állomás felé: a nyugtázás a légijármű hívójeléből áll, amelyet, amennyiben szükségesnek ítélik, ki lehet egészíteni a légiforgalmi állomás hívójelével;
2) egy másik légiforgalmi állomás felé: a nyugtázás a közleményt nyugtázó légiforgalmi állomás hívójeléből kell, hogy álljon.

5.2.1.9.2.3.1 **PANS.-** *A légiforgalmi állomásnak a helyzet-jelentéseket és egyéb, a repülés előrehaladásával kapcsolatos közleményeket úgy kell nyugtáznia, hogy visszaolvassa a jelentést és a visszaolvasást a saját hívójelével zárja, kivéve, hogy a visszaolvasási eljárást ideiglenesen fel lehet függeszteni, valahányszor ez enyhíti a közleményváltásra használt csatorna zsúfoltságát.*

5.2.1.9.2.4 **PANS.** - *Ellenőrzés céljából megengedhető kell, hogy legyen az, hogy a vevő állomás magát a közleményt is visszaolvassa, mintegy a vétel kiegészítő nyugtázásaként. Ilyen esetekben annak az állomásnak, amelynek a közleményt visszaolvasták, a saját hívójele leadásával kell nyugtáznia a visszaolvasás helyességét.*

5.2.1.9.2.5 **PANS.** - *Ha ugyanabban a közleményben helyzet-jelentés és egyéb tájékoztatás (pl. időjárás- jelentés) is található, a tájékoztatást úgy kell nyugtázni, hogy a helyzet-jelentés visszaolvasása után a "WEATHER RECEIVED" ("IDŐJÁRÁSI TÁJÉKOZTATÁST VETTEM") szavakat kell használni, kivéve, ha a hálózat más állomásainak szükséges a tájékoztatás vétele. Egyéb közleményeket a légiforgalmi állomásnak csak a saját hívójelének közlésével kell nyugtáznia.*

5.2.1.9.3 *A közlemény-váltás befejezése.* A rádió-távbeszélő közlemény-váltást a vevő állomásnak kell befejeznie, a saját hívójele leadásával.

5.2.1.9.4 *Helyesbítések és ismétlések*

5.2.1.9.4.1 Ha az adás során hibát követtek el, akkor a "CORRECTION" szót kell használni, utána meg kell ismételni az utolsó helyesen vett csoportot, vagy kifejezést, majd legvégül le kell adni a szöveg helyes változatát.

5.2.1.9.4.2 Ha egy helyesbítést legjobban a teljes közlemény megismétlésével lehet végrehajtani, a kezelőnek a "CORRECTION, I SAY AGAIN" kifejezést kell használnia, mielőtt a közleményt másodszor is leadná.

5.2.1.9.4.3 **Ajánlás.** - *Ha egy közleményt továbbító kezelő úgy gondolja, hogy annak vétele valószínűleg nehézségekbe fog ütközni, akkor a közlemény fontos elemeit lehetőleg kétszer kell leadnia.*

5.2.1.9.4.4 Ha a vevő állomás kezelője kételkedik az általa vett közlemény helyességében, akkor a közlemény teljes, vagy részleges ismétlését kell kérnie.

5.2.1.9.4.5 Ha a teljes közlemény ismétlésére van szükség, akkor a "SAY AGAIN" szavakat kell használni. Ha a közleménynek csak egy részét kell megismételni, akkor a kezelő a következőket kell, hogy mondja: "SAY AGAIN ALL BEFORE... (az első kielégítően vett szó)"; vagy "SAY AGAIN ... (a hiányzó rész előtti utolsó szó) TO ... (a hiányzó rész utáni első szó)"; vagy "SAY AGAIN ALL AFTER ... (az utolsó kielégítően vett szó)".

5.2.1.9.4.6 **Ajánlás.** - *A közlemény meghatározott elemeinek ismétlését azok megfelelő megnevezésével lehet kérni, például: "SAY AGAIN ALTIMETER" (Ismételje meg a magasságmérő beállítását!), "SAY AGAIN WIND" (Ismételje meg a szelet!).*

5.2.1.9.4.7 Ha a visszaolvasás ellenőrzésekor a kezelő pontatlan elemeket fedez föl, akkor ezt követően a "NEGATIVE I SAY AGAIN" kifejezést kell használnia, majd helyesen meg kell ismételje a kérdéses közlemény elemeket.

5.2.1.9.5 *"Operations normal" ("Normális Üzemi Körülmények") jelentések*

PANS. - *Ha a légijármű "Normális Üzemi Körülmények" jelentést továbbít, akkor a közleménynek az előírt hívásból és az "OPERATIONS NORMAL" szavakból kell állnia.*

5.2.2 Összeköttetés létrehozása és biztosítása

5.2.2.1 *Frekvencia figyelés / Szolgálati idő*

5.2.2.1.1 Repülés közben a légijármű-állomások kötelesek az illetékes Hatóság által előírt módon figyelni, és - a repülés biztonságát érintő okok kivételével - ezt a figyelést nem függeszthetik fel az érintett légiforgalmi állomás(ok) tájékoztatása nélkül.

5.2.2.1.1.1 A hosszú-távú, víz feletti repülést végző, vagy az olyan kijelölt területek felett repülő légijárműveknek, melyek fedélzeten kötelező, hogy kényszerhelyzeti helyjeladó (ELT) legyen, folyamatosan figyelniük kell a 121,5 MHz VHF kényszerhelyzeti frekvencián, kivéve, amikor a légijármű más VHF csatornán éppen forgalmaz, illetve amikor a fedélzeti berendezéseinek jellemzői ezt korlátozzák, vagy a pilótafülkében uralkodó pillanatnyi munka- terhelés nem teszi lehetővé két csatorna egyidejű figyelését.

5.2.2.1.1.2 A légijárműveknek folyamatosan figyelniük kell a 121,5 MHz VHF kényszerhelyzeti frekvencián az olyan körzetekben, vagy útvonalakon, ahol lehetséges a légijármű elfogása, vagy fennáll egyéb veszélyes helyzet lehetősége, és ahol ezt a követelményt az Illetékes Hatóság előírta.

5.2.2.1.1.3 **Ajánlás.**- *Az 5.2.2.1.1.1 és az 5.2.2.1.1.2 pontokban leírt körülményektől eltérő repülések során a légijárműveknek a lehető legteljesebb mértékben figyelniük kell a 121,5 MHz kényszerhelyzeti frekvenciát.*

5.2.2.1.1.4 A levegő-levegő VHF összeköttetési csatorna felhasználójának gondoskodnia kell arról, hogy megfelelő figyelést biztosítson a kijelölt ATS frekvenciákon, a légiforgalmi kényszerhelyzeti csatorna frekvenciáján és minden egyéb kötelezően figyelendő frekvencián.

5.2.2.1.2 A légiforgalmi állomásoknak az Illetékes Hatóság által előírt figyelést kell biztosítaniuk.

5.2.2.1.3 A légiforgalmi állomásoknak az egységek szolgálati ideje alatt folyamatosan figyelniük kell a 121,5 MHz VHF kényszerhelyzeti csatornán, ahol az ehhez szükséges berendezések föl vannak szerelve.

Megjegyzés. - Lásd az Annex 10, V. Kötet, 4.1.3.1.1 pontjában a légiforgalmi állomásokon a 121,5 MHz frekvencia használatával kapcsolatos rendelkezéseket.

5.2.2.1.4 Amikor szükség van arra, hogy egy légijármű-állomás vagy egy légiforgalmi állomás bármilyen okból felfüggessze az üzemelését - ha lehetősége van rá -, akkor értesítenie kell az érintett többi állomást az üzemelés várható újra-kezdési időpontjának megadásával. Amikor az üzemelést újra-kezdi, erről tájékoztatnia kell a többi érintett állomást.

5.2.2.1.4.1 Amikor szükség van arra, hogy az üzemelést az eredeti értesítésben megadott időn túl is felfüggesszék, akkor lehetőség szerint az először közölt időpontban, vagy ahhoz minél közelebb kell leadni az üzemelés újra- kezdésének módosított időpontját.

5.2.2.1.5 **Ajánlás** .- *Ha egy ilégiforgalmi rányító két vagy több ATS frekvenciát is használ egyidőben, akkor fontolóra kell venni olyan átjátszó berendezések biztosítását, amelyekkel a frekvenciák bármelyikén zajló ATS-, valamint légijármű adásokat egyidejűleg le lehet adni a többi használatos frekvencián is, hogy a hatótávolságon belül lévő légijármű-állomások hallhassák a légiforgalmi irányítótól származó és hozzá intézett összes közleményt.*

5.2.2.2 *A hálózati üzemelés alapelvei (HF kommunikáció)*

5.2.2.2.1 **PANS.** - *Egy adott rádió-távbeszélő hálózatba tartozó légiforgalmi állomásoknak segítséget kell nyújtaniuk egymásnak az alábbi hálózati alapelvek szerint, annak érdekében, hogy képesek legyenek a hálózat illetékességi területén belül található repülési útvonalakon közlekedő légijárművek által megkövetelt levegő-föld kommunikációs szolgálat biztosítására.*

5.2.2.2.2 **PANS.** - *Ha a hálózat nagyszámú állomásból áll, a hálózati összeköttetési szolgáltatást bármely meghatározott útvonal-szakaszon repülő légijármű számára azoknak a kiválasztott állomásoknak kell nyújtaniuk, amelyeket az adott útvonal-szakaszra illetékes /kijelölt/ állomásoknak ("regular stations") neveznek.*

1. Megjegyzés. - Egy megadott útvonal-szakaszra az illetékes/kijelölt állomások kiválasztása - ahol szükséges - körzeti vagy helyi megállapodás alapján történik, ha szükséges, a hálózatért felelős Államok között folytatott konzultáció után.

2. Megjegyzés. - Elvileg, az illetékes állomások azok az állomások lesznek, amelyek az adott útvonal-szakaszokon közlekedő légijárművekkel közvetlenül kapcsolatban álló helységeket szolgálják ki, azaz a fel- és leszállási pontokat, a megfelelő repülés-tájékoztató központokat, vagy körzeti irányító központokat, és bizonyos esetekben, egyéb megfelelő helyen telepített állomások is lehetnek, amelyekre a rádiófedés teljessé tételéhez, vagy az adások vételéhez szükség van.

3. Megjegyzés. - Az illetékes állomások kiválasztásakor figyelembe kell venni a használatban lévő frekvenciákon a rádióhullámok terjedési tulajdonságait is.

5.2.2.2.3 **PANS.** - *Olyan területeken, vagy útvonalakon, ahol a rádióhullámok terjedési jellemzői, a repülések útvonalának hossza vagy a légiforgalmi állomások közötti távolság további intézkedéseket tesz szükségessé ahhoz, hogy ilymódon a levegő/föld kommunikáció folyamatosságát a teljes útvonal-szakaszon biztosítsák, az illetékes állomásoknak meg kell osztaniuk egymás között az elsődleges figyelési felelősséget úgy, hogy minden egyes állomás a repülés azon szakaszán nyújtson elsődleges figyelő-szolgálatot, amely szakaszon a légijármű közleményeit a leghatékonyabban képes kezelni.*

5.2.2.2.4 **PANS.** - *Az elsődleges figyelő-szolgálat végzése során minden illetékes állomás, többek közt:*

a) felelősséggel tartozik a légijárművekkel folytatott kommunikáció céljára megfelelő elsődleges és másodlagos frekvenciák kijelöléséért;

b) vennie kell a helyzet-jelentéseket, és kezelnie kell a légijárművektől származó és a légijárműveknek címzett egyéb, a repülések biztonságos végrehajtása szempontjából elengedhetetlen közleményeket;

c) felelősséggel tartozik a rádióhiba esetére előírt eljárások végrehajtásáért (lásd az 5.2.2.7.2 pontot).

5.2.2.2.5 **PANS.** - *Az elsődleges figyelő-szolgálat átadása egyik állomástól a másiknak általában akkor történik meg, amikor a légijármű átlépi a repülés-tájékoztató körzet vagy a légiforgalmi irányító körzet határát; ezt a figyelő-szolgálatot - amennyire csak lehetséges - bármely időben annak az állomásnak kell nyújtania, amely azt a repülés-tájékoztató központot vagy körzeti irányító központot szolgálja ki, amelynek területén belül a légijármű tartózkodik. Azonban, ha az összeköttetés körülményei ezt szükségessé teszik, egy állomástól megkövetelhetik, hogy az ilyen földrajzi határokon túl is fenntartsa a figyelő-szolgálatot, vagy hogy a figyelő-szolgálatot azelőtt átadja a következő állomásnak, mint ahogy a légijármű elérné a határt, ha ezzel a levegő-föld összeköttetésben észrevehető javulás érhető el.*

5.2.2.3 *A használatos frekvenciák*

5.2.2.3.1 A légijármű-állomások a megfelelő rádiófrekvenciákon kötelesek üzemelni.

5.2.2.3.1.1 A levegő-föld irányító rádióállomás köteles kijelölni az(oka)t a frekvenciá(ka)t, amelye(ke)t, az irányítása alatt álló légijármű-állomásoknak szokványos körülmények között használniuk kell.

5.2.2.3.1.2 **PANS.** - *Hálózatban történő üzemelés esetén az elsődleges és másodlagos frekvenciák első kijelölését a hálózat azon állomásának kell megtennie, amellyel a légijármű a repülés előtti ellenőrzést elvégzi, vagy felszállása után az első összeköttetés felvételét végrehajtja. Ennek az állomásnak kell gondoskodnia arról is, hogy a hálózat többi állomása szükség szerint értesüljön a kijelölt frekvenciá(k)ról.*

5.2.2.3.2 **Ajánlás.** - *Egy légiforgalmi állomás, amikor az 5.2.2.3.1.1 vagy az 5.2.2.3.1.2 pontoknak megfelelő módon kijelöli a frekvenciákat, lehetőleg vegye figyelembe az alkalmazható hullám-terjedési adatokat és azt a távolságot, amelyen keresztül szükség van az összeköttetés fenntartására.*

5.2.2.3.3 **Ajánlás.** - *Ha egy légiforgalmi állomás által kijelölt valamely frekvencia alkalmatlannak bizonyul, a légijármű-állomás lehetőség szerint javasoljon egy másik frekvenciát.*

5.2.2.3.4 **PANS.**- *Amikor a hálózat állomásai az 5.1.1 pont előírásai ellenére a levegő-föld frekvenciákat az állomások közötti koordináció és együttműködés szempontjából szükséges közlemények továbbítására használják, akkor az ilyen közlemény-váltásokat olyan hálózati frekvenciák felhasználásával kell lebonyolítani, amelyeket az adott pillanatban nem használnak fokozott levegő-föld forgalmazásra. A légijármű-állomásokkal folytatott közlemény-váltások minden esetben elsőbbséget kell élvezzenek a földi állomások közötti közlemény-váltásokkal szemben.*

5.2.2.4 *Az összeköttetés felvétele*

5.2.2.4.1 A légijármű-állomások - amennyiben ez lehetséges - közvetlenül azzal a levegő-föld irányító rádióállomással legyenek összeköttetésben, amely megfelel annak az adott körzetnek, ahol a légijárművek éppen repülnek. Ha erre nem képesek, akkor a légijármű-állomásoknak fel kell használniuk bármely rendelkezésére álló, és alkalmas közvetítő eszközt ahhoz, hogy a közleményeiket a levegő-föld irányító rádióállomásnak eljuttassák.

5.2.2.4.2 Ha egy légiforgalmi állomásról egy légijármű-állomással nem lehet rendes összeköttetést létesíteni, akkor a légiforgalmi állomásnak fel kell használnia bármely rendelkezésére álló, alkalmas közvetítő eszközt arra, hogy a légijármű-állomás számára a közleményeit továbbítsa. Ha mindezek a próbálkozások eredménytelenek maradnak, akkor az illetékes Hatóság által előírt eljárások szerint értesíteni kell a közlemény feladóját.

5.2.2.4.3 **PANS.** - *Hálózati üzemelés esetén, ha a légijármű-állomás és egy illetékes állomás között az elsődleges és a másodlagos frekvencián történt hívással nem sikerült összeköttetést teremteni, akkor valamelyik másik, az adott repülés tekintetében illetékes állomásnak kell lehetőség szerint segítséget nyújtania, akár úgy, hogy felhívja az elsőként hívott állomás figyelmét, vagy ha egy hívás egy légijármű- állomástól származik, akkor válaszol a hívásra, és magára vállalja a forgalmazást.*

5.2.2.4.3.1 **PANS.** - *A hálózat többi állomásának hasonló intézkedésekkel lehetőleg csak akkor kell segítséget nyújtaniuk, ha az illetékes állomásokkal az összeköttetés felvételére irányuló kísérletek sikertelenek maradtak.*

5.2.2.4.4 **PANS.** - *Az 5.2.2.4.3 és az 5.2.2.4.3.1 pont előírásait ezenkívül még az alábbi esetekben kell alkalmazni:*
a) az érintett légiforgalmi szolgálati egység kérésére;
b) ha a várt összeköttetés egy légijárművel a várható időn belül nem jön létre, ezért rádióhiba előfordulására gyanakszanak.

Megjegyzés. - Az adott időtartamot az illetékes ATS Hatóság írhatja elő.

5.2.2.5 *HF összeköttetés átadása*

5.2.2.5.1 **PANS.** - *A légijármű-állomást az arra hivatott légiforgalmi állomásnak fel kell kérnie arra, hogy térjen át egyik rádiófrekvenciáról, vagy hálózatról egy másikra. Ilyen közlemény hiányában a légijármű- állomásnak lehetőség szerint értesítenie kell az adott légiforgalmi állomást, mielőtt egy másik frekvenciára áttérne.*

5.2.2.5.2 **PANS.** - *Egyik hálózatról a másikra történő áttérés esetén az átadásnak lehetőleg addig kell megtörténnie, amíg a légijármű egy olyan állomással áll összeköttetésben, amely mindkét hálózatban üzemel, hogy ezzel biztosítsák az összeköttetés folyamatosságát. Ha azonban a hálózatok közti váltást azzal egyidőben kell elvégezni, hogy az összeköttetést egy másik hálózati állomásnak átadják, akkor az átadást a két hálózati állomásnak lehetőség szerint koordinálnia kell, mielőtt a frekvenciaváltást tanácsolnák, vagy arra felhatalmazást adnának. A légijárművel közölni kell az átadás után használandó elsődleges és másodlagos frekvenciákat is.*

5.2.2.5.3 Amikor egy légijármű-állomás az egyik rádiófrekvencia figyeléséről egy másik frekvencia figyelésére tért át, ha az illetékes ATS Hatóság ezt megköveteli, tájékoztassa az érintett légiforgalmi állomást, hogy megkezdte az összeköttetés figyelését az új frekvencián.

5.2.2.5.4 **PANS.** - *Amikor a légijármű felszállása után a légijármű-állomás bejelentkezik egy hálózathoz, akkor meg kell adnia felszállásának idejét, vagy az utolsó ellenőrző pont átrepülésének idejét a megfelelő illetékes állomásnak.*

5.2.2.5.5 **PANS.** - *Amikor a légijármű-állomás új hálózatba lép át, akkor meg kell adnia az utolsó ellenőrző pont feletti átrepülésének idejét, vagy az utolsó jelentett pozíciója idejét a megfelelő illetékes állomásnak.*

5.2.2.5.6 **PANS.** - *Mielőtt a légijármű-állomás elhagyná a hálózatot, lehetőleg minden esetben értesítenie kell a megfelelő illetékes állomást erről a szándékáról - az alábbiak közül - a megfelelő kifejezés továbbításával:*
a) amikor a légijármű-vezető - légiforgalmi irányytó között használt csatornára tér át:
Légijármű: CHANGING TO ... (ÁTKAPCSOLOK A) ... – *(a megfelelő légiforgalmi szolgálati egység neve)*
b) leszállás után:
Légijármű: LANDED ... (LESZÁLLTAM) .... *(hely) ... (idő)*

5.2.2.6 *VHF összeköttetés átadása*

5.2.2.6.1 A légijárművet az illetékes légiforgalmi állomásnak kell felkérnie arra, hogy térjen át egyik frekvenciáról a másikra, az jóváhagyott eljárásoknak megfelelően. Ilyen felkérés hiányában a légijármű-állomásnak kell értesítenie az illetékes légiforgalmi állomást, mielőtt áttér egyik frekvenciáról a másikra.

5.2.2.6.2 Amikor az első kapcsolatot felveszi, illetve a VHF frekvencia elhagyásakor, a légijármű-állomásnak továbbítania kell minden olyan tájékoztatást, amit az illetékes Hatóság előírt számára.

5.2.2.7 *Összeköttetési hiba*

5.2.2.7.1 *Levegő-föld összeköttetés*

5.2.2.7.1.1 Ha egy légijármű-állomásnak nem sikerül összeköttetést létesítenie a légiforgalmi állomással a kijelölt frekvencián, akkor meg kell kísérelnie az összeköttetés felvételét egy az útvonalnak megfelelő másik frekvencián. Amennyiben ez a kísérlet sem sikerül, a légijármű-állomásnak az útvonalnak megfelelő frekvencián meg kell próbálnia összeköttetést létesíteni más légijárművekkel, vagy más légiforgalmi állomásokkal. Ezenkívül, egy hálózatban működő légijárműnek a megfelelő VHF frekvenciát figyelnie kell, hogy képes legyen a közelében lévő légijáművektől érkező hívások vételére.

5.2.2.7.1.2 Ha az 5.2.2.7.1.1 pontban leírt kísérletek eredménytelenek maradnak, a légijármű-állomásnak a "TRANSMITTING BLIND" (vak-adás) kifejezés után közleményét kétszer le kell adnia a kijelölt frekvenciá(ko)n, és ha szükséges, hozzá kell tennie a címzette(ke)t is, aki(k)nek a közleményt szánja.

5.2.2.7.1.2.1 **PANS. -** *Hálózati üzemelés esetén a vak-adással leadandó közleményt kétszer kell leadni az elsődleges és a másodlagos frekvencián is. A frekvencia-váltás előtt a légijármű-állomásnak be kell jelentenie, hogy melyik frekvencia az, amire át fog váltani.*

5.2.2.7.1.3 A v*evőkészülék meghibásodása*

5.2.2.7.1.3.1 Ha egy légijármű-állomás a vevőkészülék hibája miatt nem képes összeköttetést létesíteni, akkor jelentéseit továbbítania kell a használatos frekvencián a megkívánt időpontokban vagy földrajzi helyeken, a "TRANSMITTING BLIND DUE TO RECEIVER FAILURE" ("VAK-ADÁS A VEVŐKÉSZÜLÉK HIBÁJA MIATT") kifejezés után. A légijármű-állomás le kell, hogy adja a szükségesnek ítélt közleményét, majd meg kell ismételnie az egészet. Ezen eljárás során a légijárműnek közölnie kell a következő tervezett adásának időpontját is.

5.2.2.7.1.3.2 Ha a légijármű, légiforgalmi irányítói szolgáltatásban vagy tanácsadói szolgáltatásban részesül, az 5.2.2.7.1.3.1 pont előírásainak betartásán felül adjon tájékoztatást a légijármű parancsnok-pilótájának a repülés folytatásával kapcsolatos szándékáról is.

5.2.2.7.1.3.3 Ha a légijármű a fedélzeti berendezés hibája miatt nem képes összeköttetést létesíteni, akkor ha rendelkezik az ehhez szükséges berendezéssel, állítsa be a megfelelő SSR kódot a rádióhiba jelzésére.

Megjegyzés. - A rádióhiba esetén használható általános szabályokat a Chicagói Egyezmény, ICAO Annex 2 (a Nemzetközi Polgári Repülési Szervezet Egyezményének 2. Függeléke) tartalmazza.

5.2.2.7.2 *Föld-levegő összeköttetés*

5.2.2.7.2.1 Amikor a légiforgalmi állomás nem képes összeköttetést létesíteni egy légijármű-állomással, miután hívta azokon a frekvenciákon, amelyeken a légijármű feltételezhetően figyel, akkor:
a) kérjen fel segítség-nyújtásra más légiforgalmi állomásokat, úgy, hogy a légijárművet meghívják és közvetítik a forgalmazást, ha az szükséges;
b) kérje fel az útvonalon repülő légijárműveket, hogy kíséreljék meg az összeköttetés felvételét az adott légijárművel, és közvetítsék a forgalmazást, ha szükséges.

5.2.2.7.2.2 Az 5.2.2.7.2.1 pont előírásait szintén alkalmazni kell:
a) az érintett légiforgalmi szolgálati egység kérésére;
b) ha a várt összeköttetés egy légijárművel a várható időszakon belül nem jön létre, és ezért rádióhiba előfordulására gyanakszanak.

Megjegyzés. - Az adott időtartamot az illetékes ATS Hatóság írhatja elő.

5.2.2.7.2.3 **Ajánlás. -** *Ha az 5.2.2.7.2.1 pontban leírt kísérletek sikertelenek maradnak, a légiforgalmi állomás a légijárműnek címzett közleményeket - a légiforgalmi irányítói engedélyeket tartalmazó közlemények kivételével - vak-adással kell, hogy leadja azo(ko)n a frekvenciá(ko)n, amelye(ke)n a légijármű feltételezhetően figyel.*

5.2.2.7.2.4 Vak-adással a légijárművek számára nem szabad légiforgalmi irányítói engedélyeket továbbítani, kivéve azt az esetet, ha a közlemény feladója ezt határozottan kéri.

5.2.2.7.3 *A rádióhiba bejelentése.* A levegő-föld irányítói rádióállomás a lehető leghamarabb értesítse a levegő-föld összeköttetés bármely hibájáról az érintett légiforgalmi szolgálati egységeket és a légijárművek járatóit.

5.2.3 A HF közlemények kezelése

5.2.3.1 *Általános előírások*

5.2.3.1.1 **PANS. -** *Hálózati üzemelés esetén a légijármű-állomásnak - ha az össszeköttetés körülményei megengedik - a közleményeit lehetőleg a hálózat azon állomásainak kell leadnia, amelyektől azokat a lehető legkönnyebben, leggyorsabban lehet továbbítani a végső rendeltetési helyeikre. A légijárműveknek különösen a légiforgalmi szolgálatok által megkívánt jelentéseket kell annak a hálózati állomásnak leadniuk, amely azt a repülés-tájékoztató központot, vagy körzeti irányító központot szolgálja ki, amelynek területén belül a légijármű éppen repül. Fordított esetben, a repülésben lévő légijárműveknek szánt közleményeket - amikor csak lehetséges - a légijárművekhez közvetlenül arról a hálózati állomásról kell továbbítani, amelyik a közlemény feladójának helyét szolgálja ki.*

Megjegyzés. - Egy légijárműnek kivételesen szüksége lehet arra, hogy olyan légiforgalmi állomással vegye fel az összeköttetést, amely a repülés adott útvonal-szakaszán belül illetékes hálózaton kívül esik. Amikor a figyelést az illetékes ATS Hatóság előírja, ez megengedhető a légijárművek számára, amennyiben ezt meg lehet tenni anélkül, hogy a légijármű megszakítaná a figyelést azon az összeköttetési hálózaton, amely a repülés adott útvonal-szakaszán illetékes, és feltéve, hogy ezzel nem okoznak zavaró kölcsönhatást más légiforgalmi állomások működésében.

5.2.3.1.2 **PANS. -** *Egy bizonyos légijárműtől valamely hálózati állomásnak szóló közleményeket - amennyiben lehetséges - a hálózat többi olyan állomásának is vennie és nyugtáznia kell, amelyek olyan helyeket szolgálnak ki, ahol az adott információra szintén szükség van.*

1. Megjegyzés. - A címzés nélküli levegő-föld közlemények szétosztására vonatkozó eljárások meghatározása több-oldalú vagy helyi megállapodások útján történik.

2. Megjegyzés. - Elvben az adásokat venni köteles állomások számát, az operatív követelményeknek megfelelően, a lehetséges minimumon kell tartani.

5.2.3.1.2.1 **PANS. -** *Az adás vételét lehetőleg közvetlenül azután kell nyugtázni, miután azon állomás, amelyiknek a közleményt továbbították nyugtázta azt.*

5.2.3.1.2.2 **PANS. -** *A vett adást úgy kell nyugtázni, hogy a közleményt vevő állomás leadja a saját rádió- hívójelét, amelyet a ROGER szó követ - ha szükségesnek ítélik -, valamint annak az állomásnak a hívójelét, amelyik a közleményt leadta.*

5.2.3.1.2.3 **PANS. -** *Ha az adás vételét egy percen belül nem nyugtázzák, akkor annak az állomásnak kell azt továbbítania, amelyik vette a légijárműtől a közleményt, általában a légiforgalmi állandóhelyű* *szolgálaton keresztül, annak/azoknak/ az állomás(ok)nak, amely(ek) nem nyugtázta/nyugtázták/ az adás vételét.*

5.2.3.1.2.3.1 **PANS. -** *Ha rendkívüli körülmények között szükség van rá, hogy az adást a levegő-föld csatornákon keresztül továbbítsák, akkor lehetőség szerint az 5.2.2.3.4 pont előírásait kell betartani.*

5.2.3.1.2.4 **PANS. -** *Ha a továbbítás a légiforgalmi állandóhelyű távközlési hálózaton keresztül történt, akkor a közleményeket az érintett hálózati állomás(ok)nak kell megcímezni.*

5.2.3.1.2.5 **PANS. -** *Az(ok)nak az állomás(ok)nak, amely(ek) részére a közleményeket továbbították, el kell, hogy végezze/végezzék/ a közlemények helyi szétosztását, ugyanolyan módon, mintha a közleményeket közvetlenül a légijárművektől kapta/kapták/ volna a levegő-föld csatornán.*

5.2.3.1.2.6 Az a légiforgalmi állomás, amelyik egy repülésben lévő légijárműről leadott légijelentést (AIREP), vagy meteorológiai tájékoztatást tartalmazó közleményt vesz, köteles késedelem nélkül továbbítani:
1) az állomással kapcsolatban álló légiforgalmi szolgálati egységnek és meteorológiai hivatalnak;
2) az érintett légijármű járatójának, vagy képviselőjének, ha az adott járató kifejezetten kérte, hogy az ilyen közleményeket megkapja.

5.2.3.1.3 **PANS. -** *Az 5.2.3.1.2 pont előírásait, ha ez megvalósítható, a nem-hálózati üzemelés esetén is alkalmazni kell.*

5.2.3.1.4 **Ajánlás. -** *Ha egy légiforgalmi állomás egy repülésben lévő légijárműnek címzett közleményt vesz, olyat, amelynek a közlemény címzésében ez a címzés szintén szerepel, és ha ez az állomás nem képes összeköttetést létesíteni azzal a légijárművel, amelyiknek a közleményt címezték, akkor a közleményt lehetőség szerint továbbítsa az útvonalon található azon légiforgalmi állomások számára, amelyek feltételezhetően összeköttetést tudnak létesíteni a légijárművel.*

Megjegyzés. - Ez nem zárja ki a közleményt továbbító állomás részéről, hogy a címzett légijárműnek leadja az eredeti közleményt, ha a későbbiek során a továbbító állomás mégis összeköttetést tud teremteni az adott légijárművel.

5.2.3.1.4.1 **Ajánlás. -** *Ha a légiforgalmi állomás, amelynek a közleményt címezték, nem tudja továbbítani a közleményt az 5.2.3.1.4 pont előírásai szerint, akkor erről lehetőleg értesítse a közleményt feladó állomást.*

5.2.3.1.4.2 A közleményt továbbító légiforgalmi állomásnak helyesbítenie kell a közlemény címzését oly módon, hogy a saját helység jelölése helyére annak a légiforgalmi állomásnak a helység jelölését írja, amelyiknek a közlemény továbbításra került.

5.2.3.2 *Az ATS (Légiforgalmi Szolgálatok) közlemények továbbítása légijárművek számára*

5.2.3.2.1 **PANS. -** *Ha a légijárműnek egy ATS közleményt nem lehet kézbesíteni az ATS által meghatározott időn belül, akkor a légiforgalmi állomásnak értesítenie kell a közlemény feladóját. Ezután nem kell további intézkedést tennie ezzel a közleménnyel kapcsolatban, hacsak az ATS erre kifejezetten utasítást nem ad.*

5.2.3.2.2 **PANS. -** *Ha egy ATS közlemény kézbesítése bizonytalan, mert nem lehetséges egy közlemény vételének nyugtázását biztosítani, akkor a légiforgalmi állomásnak azt kell feltételeznie, hogy a légijármű nem vette a közleményt, és a közlemény feladóját azonnal értesítenie kell arról, hogy bár a közleményt továbbította, de azt nem nyugtázták.*

5.2.3.2.3 **PANS. -** *Az a légiforgalmi állomás, amely átvette a közleményt az ATS-től, nem ruházhatja át a közleménynek légijármű számára történő kézbesítése felelősséget egy másik állomásra. Jóllehet, összeköttetési nehézségek esetén, ha erre felkérik őket, más állomásoknak is segítséget kell nyújtaniuk a közleménynek a légijármű részére történő közvetítésében. Ebben az esetben annak az állomásnak, amelyik a közleményt az ATS-től átvette, lehetőleg késedelem nélkül egyértelmű megerősítést kell beszereznie arról, hogy a légjármű hibátlanul nyugtázta a közleményt.*

5.2.3.3 *A levegő-föld közlemény-váltások rögzítése távgépírón*

5.2.3.3.1 **PANS. -** *Távgépírón történő rögzítés során az alábbi eljárást kell alkalmazni:*
a) minden sort a bal margónál kell kezdeni;
b) minden adás egy új sorban kell, hogy kezdődjön;
c) minden közlemény-váltásnak az alábbi elemek egy részét, vagy az összes elemet tartalmaznia kell, a következő sorrendben:

1) a hívó állomás hívójele;
2) a közlemény szövege;
3) a hívott állomás, vagy a vevő állomás hívójele, amelyet a megfelelő rövidítés követ, az alábbiak jelzésére: "Vett adás"; "Visszaolvasás ", vagy "Nem volt hallható válasz";
4) az adás vételét nyugtázó állomás(ok) hívójele, amelyet a megfelelő rövidítés követ annak jelzésére, hogy "Vett adás";
5) a használt frekvencia megjelölése;
6) a közlemény-váltás ideje UTC-ben;
d) a közlemény szövegének hiányzó részeit három ponttal (szóköz **.** *szóköz* **.** *szóköz* **.** *szóköz),* vagy *három M betűvel (szóköz M szóköz M szóköz M szóköz) kell jelezni;*
e) a gépelési hibák javítását a billentyűzet segítségével leadott (szóköz E szóköz E szóköz E szóköz) karakter-sorozattal kell bevezetni, ami után a helyes szöveget kell legépelni. A bejegyzés elvégzése után észlelt hibákat az utolsó bejegyzés után kell javítani, a COR rövidítés használatával, amelyet a helyes adat kövessen.

5.2.4 A SELCAL eljárások

Megjegyzés. - Az 5.2.4 pontban leírt eljárások akkor alkalmazhatók, ha SELCAL-t használnak, és ilyenkor ezek helyettesítik az 5.2.1 pontban leírt, a hívással kapcsolatos bizonyos eljárásokat.

5.2.4.1 Általános rész

5.2.4.1.1 **PANS. -** *A SELCAL néven ismert szelektív hívó rendszer alkalmazása során az élőszóval történő hívást a légjármű felé kódolt impulzus-sorozat továbbításával helyettesítik a rádió-távbeszélő csatornáin keresztül. Egy szelektív hívás négy előre kiválasztott hang-impulzusból áll, amelyek továbbításához körülbelül két másodpercre van szükség. A hang-impulzusokat a légiforgalmi állomás kódoló berendezése állítja elő, és a fedélzeten található vevő készülék hangfrekvenciás (audio) kimenetéhez kapcsolt dekódoló berendezés veszi. A kijelölt impulzus-kód (SELCAL-kód) vétele bekapcsolja a pilótafülke hívórendszerét, fény- és/vagy hangjelzés formájában.*

Megjegyzés.- A SELCAL-kódok korlátozott száma miatt ugyanaz a kód több légjármű részére is kijelölésre kerülhet. Ezért az ebben a fejezetben található pontos RTF (rádió-távbeszélő) eljárások használata kiemelten fontos, amikor SELCAL használatával hozzák létre az összeköttetést.

5.2.4.1.2 **PANS. -** *A SELCAL-t a megfelelően felszerelt állomásoknak kell használniuk szelektív hívásra az útvonal-repülési föld-levegő HF és VHF rádió csatornákon.*

5.2.4.1.3 **PANS. -** A *SELCAL-lal felszerelt légjárműveken a légijárművezető továbbra is képes hagyományos figyelést folytatni a frekvencia hallgatásával, ha erre szükség van.*

5.2.4.2 *A légijármű SELCAL kódjának bejelentése a légiforgalmi állomások számára*

5.2.4.2.1 **PANS. -** *A légijármű-üzemeltető ügynökségének (járatójának) és a légijárműnek felelőssége arról gondoskodni, hogy minden légiforgalmi állomás, amellyel a légijármű rendes körülmények között összeköttetést létesít egy adott repülés során, ismerje a légijármű rádió-távbeszélő hívójeléhez rendelt SELCAL-kódot.*

5.2.4.2.2 **PANS. -** *Amikor ez megvalósítható, a légijármű-üzemeltető ügynökség (járató) rendszeres időközönként küldje szét minden érintett légiforgalmi állomásnak a légijárműveihez, vagy járataihoz rendelt SELCAL-kódok listáját.*

5.2.4.2.3 **PANS. -** *A légijárműnek az alábbiakat kell végrehajtania:*
a) a SELCAL-kódját bele kell írnia az illetékes légiforgalmi szolgálati egységnek benyújtott repülési tervbe; és
b) gondoskodnia kell róla, hogy a HF légiforgalmi állomás rendelkezzen a helyes SELCAL-kóddal úgy, hogy átmenetileg összeköttetést létesít a HF légiforgalmi állomással, mialatt a légijármű még az VHF fedés- területen belül található.

Megjegyzés. - A repülési terv kitöltésére vonatkozó előírásokat a "Légiforgalmi Szolgálatok Eljárásai - Légiforgalmi Irányítás Szervezés" /PANS-ATM/ (Doc 4444) kiadvány tartalmazza.

5.2.4.3 *Repülés előtti ellenőrzés*

5.2.4.3.1 **PANS. -** *A légijármű-állomás lépjen összeköttetésbe az illetékes légiforgalmi állomással és kérjen repülés előtti SELCAL ellenőrzést, és ha szükséges, adja meg a SELCAL-kódját.*

5.2.4.3.2 **PANS. -** *Amikor elsődleges és másodlagos frekvenciákat jelöltek ki, a SELCAL ellenőrzést rendes körülmények között először a másodlagos, azután az elsődleges frekvencián kell elvégezni. A légjármű- állomás ezután készen áll a folyamatos közlemény-váltásra az elsődleges frekvencián.*

5.2.4.3.3 **PANS. -** *Ha a repülés előtti ellenőrzés során kiderül, hogy akár a földi, akár a fedélzeti SELCAL berendezés működésképtelen, akkor a légijárműnek lehetőség szerint folyamatosan figyelnie kell további repülése során, egészen addig, amíg a SELCAL ismét használhatóvá válik.*

5.2.4.4 *Az összeköttetés felvétele*

5.2.4.4.1 **PANS. -** *Ha egy légiforgalmi állomás SELCAL használatával kezdeményez hívást, a légijármű a rádió-hívójelével és a "GO AHEAD" ("JÖHET A KÖZLEMÉNYE") kifejezéssel kell, hogy válaszoljon.*

5.2.4.5 *Útvonal-repülés során alkalmazandó eljárások*

5.2.4.5.1 **PANS.** - *A légijármű-állomásnak gondoskodnia kell róla, hogy az illetékes légiforgalmi állomások értesüljenek arról, hogy SELCAL figyelést hozott létre vagy tart fenn.*

5.2.4.5.2 **PANS.** - *Ha a körzeti léginavigációs egyezmények ezt így írják elő, a légjárműtől az előre tervezett jelentések továbbításának kérését a légiforgalmi állomás SELCAL használatával is kezdeményezheti.*

5.2.4.5.3 **PANS. -** *Mihelyt egy bizonyos légijármű-állomás SELCAL figyelést hozott létre, a légiforgalmi állomások lehetőleg a SELCAL-t használják akkor, amikor a légijárművet hívniuk kell.*

5.2.4.5.4 **PANS. -** *Abban az esetben, ha a SELCAL jelre nem érkezik válasz az elsődleges frekvencián végrehajtott két hívás és a másodlagos frekvencián végrehajtott további két hívás után sem, akkor a légiforgalmi állomásnak vissza kell térnie az élőszóban történő híváshoz.*

5.2.4.5.5 **PANS. -** *Hálózatban üzemelő állomásoknak azonnal tájékoztatniuk kell egymást, ha egy földi, vagy egy fedélzeti SELCAL berendezés működésében zavar áll be. Hasonlóképpen, a légijármű (vezetője) is gondoskodjon arról, hogy a repülésével kapcsolatban álló légiforgalmi állomás azonnal tudomást szerezzen a fedélzeti SELCAL berendezésének bármilyen meghibásodásáról, és arról, hogy a továbbiakban élőszóban kell hívnia a légijárművet.*

5.2.4.5.6 **PANS. -** *Minden állomást értesíteni kell akkor, amikor a SELCAL berendezés újra működőképessé válik.*

5.2.4.6 *SELCAL-kódok kiosztása a légijárművek részére*

5.2.4.6.1 **PANS. -** *Elméletben, a SELCAL-kód a légijárművön a rádió-távbeszélő hívójelhez kell, hogy kötődjön, vagyis ha a rádió-hívójelben járatszámot (szolgálati számot) használnak, a SELCAL-kódot a légijárművön a járatszám mellett kell bejegyezni. Minden egyéb esetben a SELCAL-kódot a légijárművön a légijármű lajstromjele mellett kell bejegyezni.*

Megjegyzés. - A járatók világszerte egyre gyakrabban használják a légitársaság nevének rövidítését és a járat szolgálati számát rádiót-ávbeszélő hívójelnek. A légijárművön található SELCAL berendezésnek ezért olyannak kell lennie, amely lehetővé teszi, hogy egy adott kódot a légijármű járatszámához rendeljenek, vagyis olyan berendezésre van szükség, amely képes a kód-kombinációk átállítására. A jelenlegi állapot szerint azonban sok légijárművön a SELCAL berendezés egy-kódos típusú, és az ilyen légijárművek nem tudják teljesíteni a fenti alapelvet. Ez nem zárhatja ki a járatszám típusú hívójelek használatát egy ilyen felszereléssel rendelkező légijárművön, ha ezt a fajta hívójelet kívánják használni, de alapvetően fontos, hogy ha egy-kódos típusú fedélzeti berendezést használnak járatszám típusú rádió-hívójellel együtt, akkor a földi állomásokat tájékoztatni kell minden egyes repülés esetén, hogy milyen SELCAL-kód áll rendelkezésre a légijárművön.

5.3 Vészhelyzeti és sürgősségi rádiótávbeszélő eljárások

5.3.1 Általános rész

Megjegyzés. - Az 5.3 pontban leírt vészhelyzeti és sürgősségi eljárások a rádió-távbeszélő használatára vonatkoznak. Az ITU Rádió Szabályzat S30 cikkelye és az S13 Függelék előírásai általánosan alkalmazhatóak, kivéve, hogy az S30.9 lehetővé teszi más eljárások alkalmazását is ott, ahol kormányzati szinten különleges egyezményeket kötöttek, valamint alkalmazhatóak a légijármű állomások és a tengerészeti mozgó szolgálat állomásai közötti rádiótávbeszélő összeköttetések esetére is.

5.3.1.1 Minden vészhelyzettel, vagy sürgősségi állapottal, körülménnyel kapcsolatos közlemény vészhelyzeti és sürgősségi forgalmazásnak minősül. A vészhelyzeti és a sürgősségi körülmények az alábbiak szerint kerültek meghatározásra:
a) *Kényszerhelyzet /Distress/:* az az állapot, amelyben súlyos és/vagy közvetlen közeli veszély áll fenn, és késedelem nélküli segítségnyújtásra van szükség.
b) *Sürgősség /Urgency/:* az az állapot, amely egy légijármű vagy egyéb jármű, illetve a légijármű fedélzetén vagy a látótávolságon belül lévő személy biztonságát érinti, de amely nem igényli az azonnali segítségnyújtást.

5.3.1.2 A "MAYDAY" rádió-távbeszélő vészhelyzeti kódot és a "PAN PAN" rádió-távbeszélő sürgősségi kódot kell használni vészhelyzetre, illetve sürgősségi állapotra vonatkozó rádió-forgalmazás bevezetéseként, a körülményekhez igazodva.

5.3.1.2.1 A vészhelyzeti és sürgősségi forgalmazás során - bármely későbbi összeköttetés elején, - megengedett a vészhelyzeti és sürgősségi rádió-távbeszélő kódszavak használata.

5.3.1.3 A vészhelyzetben vagy sürgősségi körülmények között lévő légijárművek számára címzett közlemények feladója - az ilyen közlemények számában, terjedelmében és tartalmában - szorítkozzon a körülmények által megkövetelt minimális mértékre.

5.3.1.4 Ha a légijármű által hívott állomás a vészhelyzeti vagy sürgősségi közlemény vételét nem nyugtázza, más állomások kötelesek segítséget nyújtani, ahogy az a helyzetnek megfelelően az 5.3.2.2 és 5.3.3.2 pontban előírásra került.

Megjegyzés.- A "más állomások" fogalma minden olyan állomásra vonatkozik, amely vette a vészhelyzeti vagy sürgősségi közleményt, és bizonyos abban, hogy azt a címzett állomás nem nyugtázta.

5.3.1.5 A vészhelyzeti és sürgősségi forgalmazást általában azon a frekvencián kell fenntartani, amelyen ez a közlemény-váltás elkezdődött, addig, amíg úgy nem ítélik, hogy kielégítőbb segítséget lehet nyújtani, ha az érintett légijárművel az összeköttetést egy másik frekvencián folytatják.

Megjegyzés. - Szükség szerint a 121,5 MHz, vagy egyéb rendelkezésre álló VHF, vagy *HF frekvencia használható.*

5.3.1.6 Általánosságban, a vészhelyzeti és sürgősségi forgalmazás során, a rádió-távbeszélő adásokat lassan és érthetően kell továbbítani, a rögzítés elősegítésére minden szót tisztán kiejtve.

5.3.2 Vészhelyzeti rádió-távbeszélő közlemények

5.3.2.1 *A vészhelyzetben lévő légijármű tevékenysége*

5.3.2.1.1 Azonkívül, hogy egy vészhelyzetben lévő légijárműnek az általa leadott vészhelyzeti közleményt a MAYDAY rádió-távbeszélő vészhelyzeti kóddal kell, hogy bevezessen (*lásd* az 5.3.1.2 pontot), melyet háromszor meg kell ismételnie:
a) a vészhelyzeti közleményt az adott időben használatos levegő-föld frekvencián kell leadni;
b) a vészhelyzeti közlemény az alábbi elemek közül minél többet tartalmazzon, érthetően elmondva, és ha lehet, az alábbi sorrendben:
1) a címzett/hívott állomás neve (ha az idő és a körülmények megengedik);
2) a légijármű azonosítója;
3) a vészhelyzeti állapot természete;
4) a légijármű parancsnokának szándéka;
5) a légijármű pillanatnyi helyzete, repülési magassága (pl. repülési szint /flight level/, tengerszint feletti magasság /altitude/, stb., amelyik alkalmazható), és útirány-szöge /heading/.

1. Megjegyzés. - A fentieket ki lehet egészíteni az alábbi intézkedésekkel:
a) A vészhelyzetben lévő légijármű a vészhelyzeti közleményét leadja a 121,5 MHz kényszerhelyzeti frekvencián, vagy más légiforgalmi mozgó szolgálati frekvencián, ha ezt szükségesnek vagy kívánatosnak tartja. A kényszerhelyzeti frekvencián nem minden légiforgalmi állomás tart folyamatos figyelőszolgálatot;
b) A légijármű a vészhelyzeti közleményét általános adással adja le, ha az idő és a körülmények ezt előnyössé teszik;
c) A légijármű a tengerészeti mozgó szolgálat rádió-távbeszélő hívási frekvenciáin ad;
d) A légijármű felhasznál minden rendelkezésére álló eszközt, hogy felhívja magára a figyelmet és állapotát mások tudomására hozza (beleértve a megfelelő SSR üzemmód és kód aktivizálását is);
e) Bármelyik állomás bármilyen rendelkezésére álló eszközt felhasznál, hogy egy vészhelyzetben lévő légijárműnek segítséget nyújtson;

f) A fenti 5.3.2.1.1 b) pontban felsorolt elemek bármilyen variációját használja, amikor nem maga az adó állomás van vészhelyzetben, feltéve, hogy ezt a körülményt a vészhelyzeti közleményben világosan közli.

2. Megjegyzés. - A címzett állomás általában az az állomás lesz, amellyel a légijármű összeköttetésben van, vagy amelynek illetékességi területén belül a légijárművet éppen üzemeltetik.

5.3.2.2 *A címzett állomás, vagy a vészhelyzeti közleményt elsőként nyugtázó állomás eljárásai*

5.3.2.2.1 A vészhelyzetben lévő légijármű által meghívott állomás, vagy a vészhelyzeti közleményt elsőként nyugtázó állomás köteles:
a) azonnal nyugtázni a vészhelyzeti közleményt;
b) átvenni az összeköttetés irányítását, vagy meghatározott módon és érthetően átruházni ennek felelősségét; ha ez megtörtént, erről értesítse a légijárművet;
c) azonnali intézkedésekkel gondoskodni arról, hogy minden szükséges információt elérhetővé tegyenek:
1) az érintett ATS egység részére;
2) az érintett járató vagy annak képviselője részére, az előre meghatározott eljárások szerint;
Megjegyzés. - Az érintett járató értesítésének követelménye nem rendelkezik elsőbbséggel bármely más intézkedés előtt, amely a vészhelyzetben lévő repülés, vagy a körzetben tartózkodó bármely egyéb repülés biztonságával van összefüggésben, vagy amely kihatással lehet a többi, a körzetbe később várható repülés előrehaladására.
d) szükség szerint figyelmeztetni a többi állomást, hogy ne küldjenek át más légijárművet arra a csatornára, amelyiken a vészhelyzettel kapcsolatos forgalmazás folyik.

5.3.2.3 *Adástilalom elrendelése*

5.3.2.3.1 A vészhelyzetben lévő állomásnak, vagy a vészhelyzeti forgalmazást irányító állomásnak jogában áll az adástilalom elrendelése, akár a mozgó szolgálat minden állomásának az adott körzeten belül, akár bármely állomásra vonatkozóan, amely zavarja a vészhelyzeti forgalmazást. A körülményektől függően ezeket az utasításokat vagy "minden állomásnak", vagy csak egy adott állomásnak kell megcímezni. Mindkét esetben az alábbi szavakat kell használni:

- a "STOP TRANSMITTING" ("Tartson adásszünetet / Fejezze be az adást") kifejezést;
- a MAYDAY rádió-távbeszélő vészhelyzeti kódot.

5.3.2.3.2 Az 5.3.2.3.1 pontban leírt kódok használata a vészhelyzetben lévő légijármű-állomás és a vészhelyzeti forgalmazást irányító állomás számára korlátozottak.

5.3.2.4 *A többi állomás eljárásai*
5.3.2.4.1 A vészhelyzeti közleményeknek korlátlan elsőbbségük van minden egyéb közleményváltással szemben. Egy állomás, amely tudatában van ezeknek a vészhelyzeti körülményeknek, nem adhat az érintett frekvencián, kivéve ha:
a) a vészhelyzet megszűnt, vagy a vészhelyzeti forgalmazás befejeződött;
b) az összes vészhelyzeti forgalmazást más frekvenciára küldtek át;
c) a forgalmazást irányító állomás az adásra engedélyt ad;
d) saját maga az, aki segítséget kell, hogy nyújtson.

5.3.2.4.2 Bármely állomás, amely tud a vészhelyzeti forgalmazásról, és maga nem tud segítséget nyújtani a vészhelyzetben lévő állomásnak, ettől függetlenül köteles figyelni az ilyen közlemény-váltást, amíg nyilvánvalóvá nem válik, hogy az érintett állomás megkapja a segítséget.

5.3.2.5 *A vészhelyzeti forgalmazás és az adásszünet befejezése*

5.3.2.5.1 Ha egy légijármű a továbbiakban már nincs vészhelyzetben, köteles a vészhelyzeti állapotot törlő közleményt leadni.

5.3.2.5.2 Ha a vészhelyzeti forgalmazást irányító állomás bizonyossá válik, hogy a vészhelyzeti közlemény-váltás befejeződött, akkor azonnali intézkedéseket kell tegyen annak biztosítására, hogy ezt a tájékoztatást minél hamarabb a tudomására hozzák:
1) az érintett ATS egységnek;
2) az érintett járatónak, vagy képviselőjének, az előre meghatározott intézkedések szerint.

5.3.2.5.3 A vészhelyzeti forgalmazást és az adásszünetet egy olyan közlemény kiadásával kell befejezni, amely tartalmazza a "DISTRESS TRAFFIC ENDED" kifejezést, azon a frekvencián vagy frekvenciákon, amelyet a vészhelyzeti forgalmazás során használtak. Ezt a közleményt csak a vészhelyzeti forgalmazást irányító állomás adhatja le akkor, miután vette az 5.3.2.5.1 pontban leírt közleményt, ha az illetékes Hatóság erre a tevékenységre felhatalmazta.

5.3.3 Sürgősségi rádió-távbeszélő közlemények

5.3.3.1 *A sürgősségi helyzetet jelentő légijármű tevékenysége, az 5.3.3.4 pontban leírtak kivételével*

5.3.3.1.1 Azonkívül, hogy a sürgősségi közleményt a PAN PAN rádió-távbeszélő sürgősségi kóddal kell kezdeni (*lásd* az 5.3.1.2 pontot), azt lehetőleg háromszor megismételve, valamint a kódcsoport minden egyes tagját a francia "panne" szóval megegyező módon kiejtve, a sürgősségi állapotot jelentő légijárműnek még az alábbi eljárásokat kell betartania:
a) a sürgősségi közleményét az adott időben használatos levegő-föld frekvencián kell leadnia;
b) a sürgősségi közleménynek az alábbi elemek közül mindazokat tartalmaznia kell, melyekre szükség van, érthetően elmondva, és lehetőségek szerint az alábbi sorrendben:
1) a címzett állomás neve;
2) a légijármű azonosítója;
3) a sürgősségi állapot természete;
4) a légijármű parancsnokának szándéka;
5) a légijármű pillanatnyi helyzete, repülési magassága (azaz repülési szint /flight level/, tengerszint feletti magasság /altitude/, stb., amelyik alkalmazható), és útirány-szöge /heading/;
6) minden egyéb hasznos információ.

1. Megjegyzés. - A fenti 5.3.3.1.1 pont előírásai nem zárják ki azt, hogy egy légijármű általános adással adja le a sürgősségi közleményét, ha az idő és a körülmények ezt előnyösebbé teszik.

2. Megjegyzés. - A címzett állomás általában az az állomás lesz, amelyik a légijárművel összeköttetésben volt, vagy amelynek illetékességi körzetében a légijármű pillanatnyilag üzemel.

5.3.3.2 *A címzett állomás, vagy a sürgősségi közleményt elsőként nyugtázó állomás eljárásai*

5.3.3.2.1 Egy sürgősségi helyzetet bejelentő légijármű által meghívott állomás, vagy a sürgősségi közleményt elsőként nyugtázó állomás köteles:
a) nyugtázni a sürgősségi közleményt;
b) azonnali intézkedéseket foganatosítani annak biztosítására, hogy amilyen gyorsan csak lehet, minden szükséges tájékoztatás hozzáférhetővé váljon:
1) az érintett ATS egységek részére;
2) az érintett járatók vagy képviselőik számára, az előre meghatározott eljárások, intézkedések szerint;
Megjegyzés. - Az érintett járató értesítésének követelménye nem rendelkezik elsőbbséggel bármely más intézkedés előtt, amely a sürgősségi helyzetben lévő repülés, vagy a körzetben tartózkodó bármely

egyéb repülés biztonságával van összefüggésben, vagy amely kihatással lehet a többi, a körzetbe később várható repülés előrehaladására.
c) ha szükséges, vegye át a forgalmazás irányítását.

5.3.3.3 Az összes többi állomás eljárása

5.3.3.3.1 A sürgősségi közleményeknek elsőbbségük van minden egyéb közleménnyel szemben, kivéve a vészhelyzeti közleményeket, ést az összes állomásnak vigyáznia kell, hogy ne zavarja a sürgősségi állapottal kapcsolatos forgalmazást.

5.3.3.4 *Az egészségügyi szállítást végző légijármű eljárásai*

5.3.3.4.1 Az 5.3.3.4.2 pontban leírt jel használata azt kell, hogy jelezze, hogy az azt követő közlemény egy védett egészségügyi repülésre vonatkozik, amely megfelel az 1949-es Genfi Egyezményeknek és Kiegészítő Jegyző- könyveinek.

5.3.3.4.2 Az egészségügyi szállítást végző légijármű bejelentésére és azonosítására a lehetőleg háromszor ismételt PAN PAN rádió-távbeszélő sürgősségi jel használatos, amelyben a szavakat a francia "panne" szó kiejtésével megegyezően mondják ki, és ezt az egészségügyi szállító repülések számára kijelölt MAY-DEE-CAL szó kell, hogy kövesse, a francia "médical" szó kiejtésével megegyezően kimondva. A fenti jelölések használata azt jelzi, hogy az ezt követő közlemény védett egészségügyi szállító repülésre vonatkozik. A közleménynek az alábbi adatokat kell tartalmaznia:
a) az egészségügyi szállító légijármű hívójele, vagy az azonosítás egyéb módja;
b) az egészségügyi szállító légijármű helyzete;
c) az egészségügyi szállító repülést végző légijárművek száma és típusa;
d) a tervezett útvonal;
e) az útvonalra, valamint a felszállásra és érkezésre tervezett idő, értelemszerűen; és
f) bármely egyéb információ, mint amilyen a repülési magasság, a figyelt rádió-frekvenciák, a használt nyelvek, valamint a rendelkezésre álló SSR üzemmódok és kódok.

5.3.3.5 *A címzett állomás, vagy az egészségügyi szállítást végző légijármű közleményét vevő további állomások eljárásai*

5.3.3.5.1 Az 5.3.3.2 és az 5.3.3.3 pont előírásait, értelemszerűen, az egészségügyi szállító légijármű közleményeit vevő állomásokra is alkalmazni kell.

5.4 Jogellenes beavatkozással kapcsolatos közlemények

Egy jogtalan beavatkozás alatt álló légijármű által meghívott állomásnak, vagy a légijármű hívását elsőként nyugtázó állomásnak minden lehetséges segítséget meg kell adni a légijármű részére, beleértve az illetékes ATS egység, valamint bármely más állomás, szervezet vagy személy értesítését, amely helyzeténél fogva képes az érintett légijármű repülését segíteni.

6. FEJEZET LÉGIFORGALMI RÁDIÓNAVIGÁCIÓS SZOLGÁLAT

6.1 Általános előírások

6.1.1 A légiforgalmi rádiónavigációs szolgálatba bele kell, hogy tartozzon a nemzetközi légiforgalmi szolgálatoknál használatos rádiónavigációs eszközök összes típusa és rendszere.

6.1.2 Egy rádiónavigációs eszközt, berendezést, amely nincs folyamatos üzemben, ha lehetséges, üzembe kell állítani, ha azt egy légijármű, vagy bármely, a felügyeletét ellátó földi hatóság, vagy egy légijármű járató felhatalmazott képviselője kéri.

6.1.2.1 **Ajánlás. -** *A légijármű az ilyen kéréseket lehetőség szerint az érintett légiforgalmi állomásnak adja le, a rendes körülmények között használt levegő-föld frekvencián.*

6.1.3 Intézkedni kell arra vonatkozóan, hogy a helyi légiforgalmi tájékoztató szolgálati egység késedelem nélkül megkaphassa az alapvetően fontos információkat a nem-látásos /non-visual/ segédeszközök működési állapotáról, a repülés előtti eligazításhoz szükséges formában, az Annex 15 előírásainak megfelelően.

6.2 Iránymérés

Bevezető Megjegyzések

1) *Az iránymérő állomások akár önállóan működnek, akár két, vagy több állomást tartalmazó csoportokban, egy fő iránymérő állomás irányítása alatt.*

2) *Az önállóan működő iránymérő állomás csak saját magához képest mérve tudja megállapítani a légijármű helyzetének irányát.*

6.2.1 **Ajánlás. -** *Az önállóan működő iránymérő állomás, kérésre, lehetőség szerint a következő adatokat adja meg:*
1) a légijármű földrajzi rádió-irányszöge (True Bearing), a megfelelő kifejezés használatával;
2) a légijármű által követendő földrajzi (tényleges) irányszög (True Heading), ha az iránymérő állomás felé akar repülni, a szél-eltérítés figyelembevétele nélkül, a megfelelő kifejezés használatával;
3) a légijárműnek mágneses rádió-irányszöge (Magnetic Bearing), a megfelelő kifejezés használatával;
4) a légijármű által követendő mágneses irányszög (Magnetic Heading), ha az iránymérő állomás felé akar repülni, a szél-eltérítés figyelembevétele nélkül, a megfelelő kifejezés használatával;

6.2.2 **Ajánlás. -** *Ha az iránymérő állomások hálózatként működnek a légijármű helyzetének megállapítású- hoz, akkor az egyes állomások az általuk mért rádió-irányszögeket azonnal küldjék el az iránymérő hálózatot vezérlő állomásnak, azért, hogy lehetővé tegyék a légijármű helyzetének meghatározását.*

6.2.2.1 **Ajánlás.-** *A hálózatot vezérlő állomás a légijárműveknek, kérésre, lehetőleg az alábbi módszerekkel adja meg azok helyzetét:*
1) helyzet egy adott viszonyítási ponthoz képest, vagy szélességi és hosszúsági fokokban megadva, a megfelelő kifejezés használatával;
2) a légijárműnek az iránymérő állomástól, vagy egyéb meghatározott ponttól mért földrajzi irányszöge (True Bearing), a megfelelő kifejezés használatával, valamint távolsága az iránymérő állomástól vagy vonatkoztatási ponttól, a megfelelő kifejezés használatával;
3) a légijármű által akkor követendő mágneses irányszög, a szél-eltérítés figyelembevétele nélkül, ha az iránymérő állomás, vagy egyéb meghatározott pont irányában akar repülni, a megfelelő kifejezés

használatával, valamint távolsága az iránymérő állomástól vagy az adott ponttól, a megfelelő kifejezés használatával.

6.2.3 A légijármű-állomások általában az illetékes légiforgalmi állomástól, vagy az iránymérő hálózatot vezérlő állomástól kérik az állomástól mért rádió-irányszögek, vagy oda vezető irányszögek, valamint helyzetük megadását.

6.2.4 Az állomástól mért rádió-irányszög, vagy az oda vezető irányszög, vagy a helyzet kéréséhez a légijármű állomásnak a "figyelési frekvencián" meg kell hívnia a légiforgalmi állomást, vagy az iránymérést vezérlő állomást. Ezután a légijármű, a megfelelő kifejezés használatával, meg kell, hogy adja a kért szolgáltatás típusát.

6.2.5 Amikor az iránymérő állomás, vagy állomás-soport készen áll a mérésre, a légijármű-állomás által eredetileg hívott állomás, ahol szükséges, adásra kéri fel a légijárművet az iránymérés elvégzéséhez; ha szükséges, közli, hogy a légijármű-állomásnak erre a célra melyik frekvenciát kell használnia, hogy hányszor kell megismételnie az adását, az adás szükséges időtartamát, vagy bármely, az adással kapcsolatos különleges követelményt.

6.2.5.1 Rádió-távbeszélő üzemben a rádió-irányszöget kérő légijármű-állomás az adását hívójelének megismétlésével kell, hogy befejezze. Ha az adás így is túl rövid volt ahhoz, hogy az iránymérő állomás meg tudja határozni a légijármű rádió-irányszögét, akkor a légijárműnek hosszabb ideig kell adásban lennie úgy, hogy egymásután kétszer, kb. tíz másodpercig ad, vagy másféle olyan jelzést ad, mint amit az iránymérő állomás kérhet tőle.

Megjegyzés. - Vannak olyan típusú VHF/DF iránymérő állomások, amelyeknek modulált jelre (beszédre) van szükségük a rádió-irányszög megállapításához.

6.2.6 Ha az iránymérő állomás mérésének eredményét nem ítéli kielégítőnek, akkor fel kell kérnie a légijármű- állomást adásának megismétlésére.

6.2.7 Amikor útirány-szöget (heading), vagy rádió-irányszöget (bearing) kértek, az iránymérő állomásnak azt a légijármű-állomás részére az alábbi formában kell megadnia:
1) a megfelelő kifejezés;
2) rádió-irányszög (bearing), vagy útirány-szög (heading) a rádió-iránymérő állomáshoz viszonyítva, három számjeggyel megadva;
3) a rádió-irányszög pontossági osztálya;
4) a mérés időpontja, ha szükséges.

6.2.8 Ha a légijármű földrajzi helyzetét kérték, az iránymérést vezérlő állomásnak, miután a térképen az egyidejűleg végzett összes mérés eredményét összegezte, meg kell, hogy határozza a légijármű megfigyelt helyzetét, és a mérés eredményét a légijármű-állomás részére a következő formában kell megadnia:
1) a megfelelő kifejezés;
2) a légijármű földrajzi helyzete;
3) a helyzet meghatározásának pontossági osztálya;
4) az észlelés időpontja.

6.2.9 Amint a légijármű-állomás megkapta a kért rádió-irányszöget, vagy útirány-szöget, vagy a tájékoztatást a földrajzi helyzetéről, vissza kell, hogy ismételje a közleményt, hogy azt az állomás megerősítse, vagy helyesbítse.

6.2.10 Amikor a légijármű helyzetét rádiói-rányszög (bearing), vagy útirány-szög (heading), valamint távolság segítségével adják meg egy ismert ponthoz viszonyítva, amely ha nem a mérést végző, a földrajzi helyzetet közlő állomás, akkor a vonatkozási pont a repülőtér, nagyobb város, vagy földrajzi tereptárgy lehet. A repülőteret előnyben kell részesíteni más pontokkal szemben. Amikor vonatkozási pontnak nagyobb lakott területet, vagy várost adnak meg, akkor a rádió-irányszöget, útirány-szöget és a távolságot anak középpontjától kell mérni.

6.2.11 Amikor a légijármű helyzetét földrajzi szélességben és hosszúságban fejezik ki, akkor azt fokokból és percekből álló számcsoporttal kell megadni, melyet értelemszerűen a földrajzi szélesség esetében az N /Észak/, vagy S /Dél/ betű, a földrajzi hosszúság esetén az E /Kelet/, vagy W /Nyugat/ betű követ. Rádiót-ávbeszélő üzemben a NORTH, SOUTH, EAST és WEST szavakat kell használni.

6.2.12 Az iránymérő állomás értékelése alapján a mérések, rádió-irányszögek és földrajzi helyzetek pontosságát az alábbi táblázat szerint kell osztályozni:
Rádió-irányszögek:
"A" osztály - plusz/mínusz 2 fokon belüli pontosság;
"B" osztály - plusz/mínusz 5 fokon belüli pontosság;
"C" osztály - plusz/mínusz 10 fokon belüli pontosság;
"D" osztály - a "C" osztálynál kevésbé pontos.

Földrajzi helyzetek:
"A" osztály - 9,3 km-en (5 NM) belüli pontosság;
"B" osztály - 37 km-en (20 NM) belüli pontosság;
"C" osztály - 92 km-en (50 NM) belüli pontosság;
"D" osztály - a "C" osztálynál kevésbé pontos.

6.2.13 Az iránymérő állomásoknak jogukban áll megtagadni a rádió-irányszögek, útirány-szögek, vagy földrajzi helyzetek közlését, ha a mérés körülményei nem megfelelőek, vagy ha a rádió-irányszögek nincsenek az állomás kalibrálási határain belül, és meg kell adniuk a szolgáltatás megtagadásának okát is.

7. FEJEZET LÉGIFORGALMI HÍRKÖZLŐ SZOLGÁLAT

7.1 Általános előírások

7.1.1 A rádió-adás anyaga
A rádió-adás anyagának szövegét a feladónak kell elkészítenie, a leadni kívánt formában.

7.1.2 Frekvenciák és adás-idők
7.1.2.1 Az adást a meghatározott frekvenciákon, a megadott időpontokban kell elvégezni.

7.1.2.2 Valamennyi adás tervezett időpontját és frekvenciáját a megfelelő dokumentumokban kell közzétenni. Ha a frekvenciákban vagy az adások időpontjában bármely változás történne, azt a változtatás előtt legalább két héttel NOTAM-ban kell közzétenni.* Ezenkívül, ha lehetséges, bármely ilyen változást valamennyi rendszeres adásban be kell jelenteni a változtatást megelőző 48 órán belül úgy, hogy az erről szóló tájékoztatást egyszer le kell adni minden adás elején és végén.

**Megjegyzés. - Ez nem zárja ki valamely szükséghelyzetben a frekvencia azonnali megváltoztatását, ha ez olyan körülmények miatt elengedhetetlen, amelyek nem teszik lehetővé - legalább két héttel a változtatás előtt - egy erre vonatkozó NOTAM kiadását.*

7.1.2.3 A tervezett adásokat (az egymás utáni, kollektív típusú /"sequential collective type"/ adások kivételével) a tervezett időben kell kezdeni, egy általános hívással. Ha egy adást késleltetni kell, akkor egy rövid tájékoztatást kell sugározni a tervezett időpontban, melyben közölni kell az adást vevő állomásokkal, hogy "maradjanak vétel-készen" ("stand by"), megadva a késés percben meghatározott, várható időtartamát.

7.1.2.3.1 Miután egyértelműen közölték, hogy egy adott időszakra maradjanak vétel-készen, az adást nem szabad a megadott időszak vége előtt elkezdeni.

7.1.2.4 Ha az adásokat idő-elosztásos rendszerben végzik, minden állomás pontosan a számára kiosztott időszak lejártakor be kell, hogy fejezze az adását, függetlenül attól, hogy sikerült-e a teljes anyagot továbbítania.

7.1.2.4.1 Az egymás utáni, kollektív típusú adás esetén minden egyes állomásnak készen kell állnia adásának elkezdésére a kijelölt időpontban. Ha egy állomás, bármely ok miatt, nem kezdené meg adását a kijelölt időpontban, ebben az esetben a sorban közvetlen utána következő állomásnak várnia kell, majd a számára kijelölt időpontban kell elkezdenie az adását.

7.1.3 A szolgáltatás megszakadása
Abban az esetben, ha a szolgáltatás megszakadna a közvetítésért felelős állomáson, akkor a közvetítést, ha lehetséges, egy másik állomásnak kell folytatnia addig, amíg a normál szolgáltatás helyre nem áll. Ha ez nem lenne lehetséges, és az adás olyan jellegű, hogy azt állandóhelyű állomások általi vételre szánják, akkor azoknak az állomásoknak, amelyeknek az adást rögzíteniük kell, folytatniuk kell a figyelést a meghatározott frekvenciákon, amíg a normál szolgáltatás helyre nem áll.

7.2 A rádió-távbeszélő hírközlési eljárások

7.2.1 A rádió-adás technikája

7.2.1.1 A rádió-ávbeszélőn keresztül leadott közlemények legyenek - az érthetőség veszélyeztetése nélkül - a lehető legpontosabban megfogalmazottak, legrövidebbek és legtömörebbek.
7.2.1.2 A rádió-ávbeszélő adások során a beszéd sebessége ne haladja meg a percenkénti 100 szót.

7.2.2 Az általános (körözvény) hívás bevezető része

Rádió-távbeszélő üzemben valamennyi rádió-adás bevezető része az általános (körözvény) hívásból, az állomás nevéből, valamint választhatóan az adás időpontjából (UTC) épüljön fel.

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be:
(általános hívás) ALL STATIONS (Minden állomásnak ..)
(a THIS IS szavak) (ez a ..)
(az állomás neve) NEW YORK RADIO
(a rádió-adás ideje) TIME ZERO ZERO FOUR FIVE (az időpont 0045)

8. FEJEZET LÉGIFORGALMI MOZGÓ SZOLGÁLAT - ADATKAPCSOLATI ÖSSZEKÖTTETÉSEK

8.1 Általános előírások

1. Megjegyzés. - Jóllehet a 8. Fejezet előírásai elsődlegesen a Légiforgalmi Irányítás – légijárművezető közötti digitális adatkapcsolati összeköttetések alkamazására (CPDLC) vonatkoznak, a 8.1 pont előírásai más jellegű adatkapcsolati alkalmazásokra is érvényesek lehetnek, ahol alkalmazhatóak, beleértve az Adatkapcsolat – Légiforgalmi Tájékoztató Szolgálat felhasználást (pl. D-ATIS, D-VOLMET, stb.) is.

2. Megjegyzés. - Ezen rendelkezések értelmében a légiforgalmi mozgó szolgálatra alkalmazható összeköttetési eljárások, értelemszerűen, a légiforgalmi mozgó-műholdas szolgálatra is alkalmazhatók.

8.1.1 Az adatkapcsolati közlemények összeállítása

8.1.1.1 A közlemények szövegét a szabványos közlemény formátumban kell összeállítani (pl. szabványos CPDLC közlemények), nyílt szöveggel, vagy rövidítések és kódok felhasználásával, ahogy ez a 3.7 pontban leírásra került. A nyílt szöveges változat kerülendő, amennyiben a közlemény szövege nagymértékben rövidíthető megfelelő rövidítések és kódok használatával. Kerülni kell az olyan felesleges szavakat és szókapcsolatokat, mint amilyenek az udvariassági kifejezések.

8.1.1.2 Az alábbi karaktereket lehet felhasználni a közlemények összeállítására:
Betűk: ABCDEFGHIJKLMNOPQRSTUVWXYZ
(csak nagybetűk használatával)
Számok: 1 2 3 4 5 6 7 8 9 0
Egyéb jelek:
- (kötöjel)
? (kérdőjel)
: (kettőspont)
((nyitó zárójel)
) (záró zárójel)
. (pont, pont a mondat végén, vagy tizedes pont)
, (vessző)
' (aposztróf)
= (kettős kötőjel, vagy egyenlőségjel)
/ (törtvonal, vagy ferde zárójel)
+ (összeadásjel)
és a szóköz karakter.

A felsorolt karaktereken kívül más karaktereket nem szabad használni a közleményekben.

8.1.1.3 Római számokat nem lehet használni. Ha a közlemény feladója azt szeretné, hogy a címzettet értesítsék arról, hogy római számokat akartak használni a közleményben, akkor arab számot, vagy számokat kell írni, melyek elé a ROMAN ("római") szót kell beszúrni.

8.1.2 Az adatkapcsolati közlemények kijelzése

8.1.2.1 A földi és fedélzeti berendezéseknek lehetővé kell tenniük a közlemények megfelelő megjelenítését, szükség szerinti nyomtatását, valamint tárolását olyan formában, ami lehetővé teszi a kellő időben és kényelmes módon a közlemények visszakeresését, ha az ilyen tevékenység szükségessé válna.

8.1.2.2 Amikor szöveges kijelzésre van szükség, az angol nyelvű megjelenítés a minimális követelmény.

8.2 CPDLC - A Légiforgalmi Irányítás és a légijárművezető közötti digitális adatkapcsolati összeköttetési eljárások

Megjegyzés. - A CPDLC közlemények ebben a fejezetben hivatkozott készlete a PANS-ATM (Légiforgalmi Szolgálatok Eljárásai - Légiforgalmi Irányítás Szervezés), 5. Függelékében található meg.

8.2.1 Valamennyi összeköttetés során mindig a legtökéletesebb fegyelmet kell tanúsítani, betartani.

8.2.1.1 **Ajánlás. -** *A közlemények összeállításánál lehetőleg figyelembe kell venni az emberi teljesítőképesség azon korlátait, amelyek hatással lehetnek a közlemények hibátlan vételére és megértésére.*

Megjegyzés. - Az emberi teljesítőképességgel foglalkozó tájékoztató anyagok az alábbi kiadványokban találhatóak: Az Emberi Tényezőkkel Kapcsolatos Oktatási Kézikönyv *(Doc 9683) és az* Emberi Tényezővel Kapcsolatos Irányelvek az ATM (Légiforgalmi Irányítás Szervezési) Rendszerekben *(Doc 9758).*

8.2.2 A földi és fedélzeti berendezéseknek biztosítaniuk kell a légiforgalmi irányítók és a légijárművezetők számára azt a képességet, hogy az általuk küldendő bármely üzemeltetéssel kapcsolatos közleményt átnézhessék és jóváhagyhassák.

8.2.3 A földi és fedélzeti rendszereknek biztosítaniuk kell a légiforgalmi irányítók és a légijárművezetők részére azt a képességet, hogy bármely általuk vett, üzemeltetéssel kapcsolatos közleményt átnézhessék, jóváhagyhassák, és ha ez alkalmazható, nyugtázhassák.

8.2.4 A légiforgalmi irányító számára biztosítani kell annak lehetőségét, hogy válaszolhasson a közleményekre, beleértve a kényszerhelyzeti közleményeket is, engedélyeket, utasításokat és tanácsokat adhasson, valamint hogy információkat kérhessen és adhasson.

8.2.5 A légijárművezető számára biztosítani kell annak lehetőségét, hogy válaszolhasson a közleményekre, engedélyeket és információkat kérhessen, tájékoztatásokat jelenthessen, valamint hogy egy kényszerhelyzetet bejelenthessen vagy törölhessen.

8.2.6 A légijárművezető és a légiforgalmi irányító számára biztosítani kell annak lehetőségét, hogy egymással olyan közleményeket válthassanak, melyek nem felelnek meg az előre meghatározott közlemény formátumoknak (azaz szabad szöveges közlemények /free text messages/).

8.2.7 Hacsak az illetékes ATS hatóság másként nem rendelkezik, a CPDLC közlemények szóbeli visszaolvasását nem szabad megkövetelni.

8.2.8 A CPDLC létesítése

8.2.8.1 A légiforgalmi irányítót és a légijárművezetőt tájékoztatni kell akkor, amikor a CPDLC kapcsolat sikeresen létrejött.

8.2.8.2 **PANS. -** *A CPDLC-t elegendő időben kell létrehozni ahhoz, hogy ezzel biztosítsák azt, hogy a légijármű az illetékes ATC egységgel álljon összeköttetésben.*

8.2.8.3 A légiforgalmi irányítót és a légijárművezetőt tájékoztatni kell amikor a CPDLC kapcsolat rendelkezésre áll üzemeltetési felhasználásra, az első kapcsolat-felvételnél, valamint akkor is, ha egy meghibásodás után a CPDLC kapcsolat újra helyreáll.

8.2.8.4 A légijárművezetőnek képesnek kell lennie a légiforgalmi irányító szolgáltatást biztosító légiforgalmi irányító egység azonosítására, bármikor, a szolgáltatás igénybevétele során.

8.2.8.5 Amikor a fedélzeti rendszer úgy érzékeli, hogy rendelkezésre áll a CPDLC kapcsolat üzemeltetési felhasználásra, akkor el kell küldenie a FOLYAMATOS ADAT JOGOSULTSÁG /CURRENT DATA ATHORITY/ CPDLC fedélzetről leadott közlemény elemet.

8.2.8.6 *A fedélzetről kezdeményezett CPDLC*

8.2.8.6.1 **PANS. -** *Amikor a Légiforgalmi Irányítás /ATC/ valamely egysége egy váratlan, CPDLC-re irányuló kérést vesz egy légijárműről, akkor meg kell tudja a légijárműtől a kéréséhez vezető körülményeket, hogy meghatározhassa a további intézkedéseket.*

8.2.8.6.2 **PANS. -** *Amikor az ATC egység visszautasít egy CPDLC-re irányuló kérést, meg kell adja a légijárművezető számára a visszautasítás okát, egy megfelelő CPDLC közlemény felhasználásával.*

8.2.8.7 *Az ATC egység által kezdeményezett CPDLC*

8.2.8.7.1 Egy ATC egység csak akkor létesíthet CPDLC kapcsolatot egy légijárművel, ha az adott légijármű még nem létesített CPDLC összeköttetést, vagy ha erre a légijárművel folyamatos CPDLC összeköttetésben lévő ATC egység feljogosítja.

8.2.8.7.2 Amikor egy CPDLC kapcsolat-felvételre irányuló kérést egy légijármű utasít vissza, akkor a visszautasítás okát vagy a NINCS FOLYAMATOS ADAT JOGOSULTSÁG /NOT CURRENT DATA AUTHORITY/, vagy a "NOT AUTHORIZED NEXT DATA AUTHORITY" NEM ENGEDÉLYEZETT A KÖVETKEZŐ ADAT JOGOSULTSÁG /NOT AUTHORIZED NEXT DATA AUTHORITY/ CPDLC fedélzetről küldött közlemény elem segítségével kell közölje, amelyik értelemszerűen az ideillő. A helyi eljárásoknak kell szabályozniuk azt, hogy vajon a visszautasítás okát megjelenítik-e a légiforgalmi irányító számára. Az ATC egység által kezdeményezett CPDLC kapcsolat-felvétel fedélzeti visszautasításának más, az előbb felsoroltaktól eltérő oka nem megengedett.

8.2.9 Az üzemeltetési CPDLC közlemények cseréje

8.2.9.1 A légiforgalmi irányítók és a légijárművezetők CPDLC közleményeiket az előre meghatározott közlemények (közlemény elemek) készletéből, egy szabad szöveges közleményből, vagy ezen elemek kombinációjából kell, hogy összeállítsák.

8.2.9.1.1 **PANS. -** *Amikor CPDLC összeköttetést használnak, és a célnak megfelelő közleményt a PANS-ATM 5. Függelékében található CPDLC szabványos közlemények készlete tartalmazza, akkor a kapcsolódó szabványos közleményt kell használni.*

8.2.9.1.2 **PANS. -** *A 8.2.12.1 pontban előírtak kivételével, ha egy légiforgalmi irányító, vagy egy légijárművezető CPDLC-n keresztül küld közleményt, akkor lehetőség szerint a válasznak is CPDLC-n keresztül kell érkeznie. Amikor a légiforgalmiirányító vagy a légijárművezető beszéd-üzemű összeköttetésben áll, akkor a választ beszéd-üzemű adásban kell leadni.*

8.2.9.1.3 **PANS. -** *Ha egy üzemeltetési választ igénylő CPDLC közleményt a későbbiekben beszéd-üzemű adásban intéznek el, akkor az alkalmazható CPDLC közlemény-lezáró választ kell elküldeni azért, hogy ily módon biztosítsák a CPDLC közlemény-váltás megfelelő szinkronizálását.*

8.2.9.2 Egy CPDLC közlemény összeállításánál nem szabad ötnél több közlemény elemet felhasználni, és az elemek közül csak kettő tartalmazhat útvonal-engedély változókat.

8.2.9.2.1 **PANS. -** *Ahol ez lehetséges, kerülni kell a hosszú közlemények használatát, vagy az olyan közleményekét, amelyek összetett engedély elemeket, vagy engedélyek és információk kombinációját tartalmazzák.*

*Megjegyzés. - A helyi üzemeltetési eljárások kidolgozásával és a CPDLC hatékony, megfelelő üzemeltetési módszereivel foglalkozó tájékoztató anyag az "*Emberi Tényezővel Kapcsolatos Irányelvek az ATM Rendszerekben" című dokumentumban található (Human Factors Guidelines for Air Traffic Management (ATM) Systems - *Doc 9758*).

8.2.9.3 A CPDLC földi rendszereknek és a fedélzeti rendszereknek alkalmasnak kell lenniük a CPDLC közlemények sürgősségi és riasztási jellemző (tulajdonságainak) alkalmazására úgy, hogy a megjelenítés megváltoztatásával felhívják a felhasználók figyelmét a nagyobb elsőbbségű közleményekre.

Megjegyzés. - Egy közlemény vételekor a közlemény jellemzői a CPDLC használójától bizonyos közlemény-kezelési követelmények betartását követelik meg. Valamennyi CPDLC közlemény három jellemzővel rendelkezik: sürgősségi, riasztási és válasz-adási jellemzővel. Amikor egy közlemény összetett közlemény elemeket tartalmaz, akkor a legmagasabb elsőbbséggel rendelkező közlemény elem adott típusa válik az egész közlemény jellemző típusává.

8.2.9.3.1 A sürgősségi jellemzőnek (urgency attribute) kell leírnia a végfelhasználó számára megjelenített, vett közlemények besorolási követelményeit. A sürgősségi típusok a 8-1 Táblázatban találhatók.

8.2.9.3.2 A riasztási jellemzőnek (alert attribute) kell meghatároznia a közlemény vétele után a szükséges riasztás típusát. A riasztás típusait a 8-2 Táblázat tartalmazza.

8.2.9.3.3 A válaszadási jellemzőnek (response attribute) kell meghatároznia az érvényes válaszokat az adott közlemény elem számára. A válasz típusok a 8-3 Táblázatban találhatók az "uplink" (légijárműnek szóló) közleményekre és a 8-4 Táblázatban a "downlink" (légijárműről származó) közleményekre.

8.2.9.3.3.1 **PANS. -** *Amikor egy több elemből álló közleményre kell válaszolni, és a válasz formája egy közlemény elem, akkor a választ az összes közlemény elemre kell vonatkoztatni.*

Megjegyzés. - Például egy több elemből álló közlemény tartalma a: CLIMB TO FL310 MAINTAIN MACH.84. *Az erre érkező* WILCO *válasz mind a két közlemény elemre vonatkozik, és mindkét utasítás elem teljesítését jelenti.*

8.2.9.3.3.2 **PANS.-** *Ha a légijármű egy egyetlen közlemény elemből álló engedélyt, vagy egy több elemből álló engedély közlemény bármely részét nem képes végrehajtani, akkor a légijármű vezetőjének egy* UNABLE *választ kell küldenie az egész közleményre.*

8.2.9.3.3.3 **PANS. -** *A légiforgalmi irányítónak egy* UNABLE *közleménnyel kell válaszolnia, amely a kérés összes elemére vonatkozik, amennyiben egy egyetlen elemből, vagy egy több elemből álló engedélykérésnek nincs olyan eleme, amely jóváhagyható lenne. A folyamatban, érvényben lévő engedélyeket nem szabad megismételni.*

8.2.9.3.3.4 **PANS. -** *Amikor egy egyetlen elemből, vagy egy több elemből álló engedély-kérésnek az összes elemét jóvá lehet hagyni, akkor a légiforgalmi irányítónak olyan engedélyekkel kell válaszolnia, amelyek a kérés minden egyes elemére válaszolnak. Ennek a válasznak lehetőleg egyetlen, a fedélzetre irányuló ("uplink") közleménynek kell lennie.*

8.2.9.3.3.5 **PANS. -** *Amikor egy légiforgalmi irányító egy több elemből álló engedélykérést csak részben tud jóváhagyni, akkor a kérésre úgy kell válaszolnia, hogy engedélyeket ad ki a jóváhagyható* *részekre, és azokra a részekre, amelyek nem hagyhatók jóvá, a folymatban, érvényben lévő engedély(eke)t kell megismételnie, vagy eltérő engedély(eke)t kell kiadnia.*

Megjegyzés. - Például egy több elemből álló fedélzetről származó ("downlink") közlemény az alábbi bemutatott közlemény elemeket tartalmazza:

MAINTAINING FL310
REQUEST CLEARANCE YQM YYG YYT YQX TRACK
X EINN FPL EDDF
REQUEST CLIMB FL350
WE CAN ACCEPT FL390 AT 1139Z
REQUEST MACH .84

Az alábbiakat tartalmazó közleménnyel válaszolható meg:
CLEARED YQM YYG YYT YQX TRACK X EINN FPL EDDF
CLIMB TO FL350
REPORT REACHING
CROSS 52N 30W AT OR AFTER 1150Z
NO SPEED RESTRICTION

8.2.9.3.3.6 **PANS. -** *Amikor egy CPDLC közlemény több, mint egy közleménye lemet tartalmaz és a közleményre a válasz jellemző Y, ha felhasználják, akkor az egyetlen válasz közleménynek a megfelelő számú válaszokat kell tartalmaznia, ugyanabban a sorrendben.*

Megjegyzés.- Például egy több elemből álló "uplink" (légijárműnek szóló) közlemény tartalma:
CONFIRM SQUAWK
WHEN CAN YOU ACCEPT FL410

Az alábbi közleménnyel válaszolható meg:
SQUAWKING 5525
WE CAN ACCEPT FL410 AT 1636Z

8-1. táblázat: Sürgősségi jellemző típusok (fedélzetre irányuló és a légijárműről származó)

Típusa	Leírás	Elsőbbség
D	Distress *(Vészhelyzet)*	1
U	Urgent (*Sűrgősség)*	2
N	Normal *(Normál)*	3
L	Low *(Alacsony)*	4

8-2. táblázat: Riasztási jellemző típusok (fedélzetre irányuló és légijráműtől származó)

Típusa	Leírás	Elsőbbség
H	High (*Magas)*	1
M	Medium (*Közepes)*	2
L	Low *(Alacsony)*	3
N	Nincs szükség riasztásra	4

8-3. táblázat: Válaszadási jellemzők (fedélzetre irányuló)

Típusa	Válasz szükséges	Érvényes válaszok	Elsőbbség
W/U	Igen	WILCO, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (csak ha szükséges), ERROR	1
A/N	Igen	AFFIRM, NEGATIVE, STANDBY, NOT CURRENT DATA AUTHORTI'Y, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (csak ha szükséges), ERROR	2
R	Igen	ROGER, UNABLE, STANDBY, NOT CURRENT DATA AUTHORITY, NOT AUTHORIZED NEXT DATA AUTHORITY, LOGICAL ACKNOWLEDGEMENT (csak ha szükséges), ERROR	3
Y	Igen	Bármely fedélzetről származó CPDLC közlemény, LOGICAL ACKNOWLEDGEMENT (csak ha szükséges)	4
N	Nem, kivéve ha logikai nyugtázásra van szükség	LOGICAL ACKNOWLEDGEMENT (csak ha szükséges), NOT CURRENT DATA AUTHORTI'Y, NOT AUTHORIZED NEXT DATA AUTHORITY, ERROR	5

8-4. táblázat Válaszadási jellemzők (légijárműtől származó)

Típusa	Válasz szükséges	Érvényes válaszok	Elsőbbség
Y	Igen	Bármely fedélzetre irányuló CPDLC közlemény, LOGICAL ACKNOWLEDGEMENT (csak ha szükséges)	1
N	Nem, kivéve ha logikai nyugtázásra van szükség	LOGICAL ACKNOWLEDGEMENT (csak ha szükséges), SERVICE UNAVAILABLE, FLIGHT PLAN NOT HELD, ERROR	2

8.2.9.4 Amikor egy földi, vagy fedélzeti rendszer "ERROR" (Hiba) CPDLC közleményt hoz létre, akkor a hiba okát is mellékelni kell a közleményben.

8.2.9.5 Az illetékes ATS hatóságnak ki kell választania azokat a PANS-ATM 5. Függelékében található közleményelemeket, melyek a saját légterében az üzemeltetést támogatják Amennyiben egy ATS hatóság úgy dönt, hogy ezeknek a közleménye lemeknek csak egy részhalmazát választja, és a vett közlemény nem tartozik ezek közé, akkor az ATC egységnek a "SERVICE UNAVAILABLE" közleményelem fedélzetre irányuló továbbításával kell válaszolnia.

Megjegyzés. - A vett közlemény további feldolgozására nincs szükség.

8.2.9.5.1 **Ajánlás. -** *Egy légiforgalmi irányító számára lehetőleg csak az adott irányító szektor tevékenységének megfelelő "uplink" közleményeket kell biztosítani.*

Megjegyzés. - A PANS-ATM 5. Függelékében található CPDLC közlemény készletet úgy fejlesztették ki, hogy az különböző ATM (Légiforgalmi Irányítás Szervezési) körülményeknek is megfeleljen.

8.2.9.5.2 Amennyiben az illetékes hatóság szükségesnek ítéli, további előre összeállított szabad szöveges közleményeket kell a légiforgalmi irányító rendelkezésére bocsátani, azokra az esetekre, amikor a PANS-ATM által rendelkezésre álló szabványos (CPDLC) közlemények készlete nem alkalmazható bizonyos követelmények esetén. Ilyen esetekben az illetékes hatóságnak - az üzemeltetőkkel és más, esetleg érintett ATS hatóságokkal konzultálva - össze kell állítania egy listát az előre elkészített szabad szöveges közleményekből.

8.2.9.5.3 A CPDLC közleményelemek felhasznált részhalmazaival, és amennyiben van ilyen, bármely kiegészítő, előre összeállított, szabad szöveges közleménnyel kapcsolatos információt közzé kell tenni a Légiforgalmi Tájékoztató Kiadványban (AIP).

8.2.9.6 *A CPDLC átadása*

*Megjegyzés. - A CPDLC átadásával kapcsolatos részletes tájékoztató a "*Manual of Air Traffic Services Data Link Applications"-ban *(DOC 9694) dokumentumban található.*

8.2.9.6.1 **PANS. -** *Amikor a CPDLC átadásra került, akkor a beszéd-üzemű rádió-összeköttetés és a CPDLC kapcsolat párhuzamosan kell létrejöjjön.*

8.2.9.6.2 **P ANS.-** *Amikor egy légijárművet egy olyan ATC egységtől küldtek át, ahol rendelkezésre áll a CPDLC, egy olyan ATC egységnek, ahol a CPDLC nem használható, a CPDLC összeköttetés bezárását egyidőben kell elkezdeni a beszéd-üzemű rádió-összeköttetés átadásával.*

8.2.9.6.3 Amikor egy CPDLC átadása következtében az adatkapcsolat felett rendelkező egység megváltozik, és még mindig vannak olyan közlemények, amelyekre még nem érkezett lezáró válasz (azaz még közlemények várhatóak), akkor erről a CPDLC átadást végző légiforgalmi irányítót értesíteni kell.

8.2.9.6.3.1 Amennyiben egy légiforgalmi irányító át kell küldje a légijárművet anélkül, hogy válaszolna bármely, még elintézetlen, a fedélzetről származó ("downlink") közlemény(ek)re, a rendszernek rendelkeznie kell azzal a képességgel, hogy automatikusan megküldje a megfelelő lezáró, válaszközlemény(eke)t. Ilyen esetekben, bármely automatikusan elküldendő lezáró válasz közlemény(ek) tartalmát közzé kell tenni a helyi utasításokban.

8.2.9.6.3.2 Amikor a légiforgalmi irányító úgy dönt, hogy átküldi a légijárművet anélkül, hogy megvárná valamely függőben lévő uplink közleményére(közleményeire) a légijárművezető válaszát, a földi rendszernek képesnek kell lennie arra, hogy minden egyes közlemény tekintetében automatikusan lezárja a párbeszédet, mielőtt az átküldés megtörténne.

8.2.9.6.3.2.1 **PANS.-** *A légiforgalmi irányítónak vissza kell térnie a beszédüzemű rádió-összeköttetésre, hogy bármely bizonytalanságot tisztázzon, amely(ek) a függőben lévő közleménnyel(közleményekkel) lehet(nek) kapcsolatban.*

8.2.9.6.4 Amennyiben a CPDLC átadása nem jelenti az adatkapcsolat felett rendelkező egység megváltoztatását, és még további befejezetlen közlemények vannak folyamatban, ezeket a közleményeket vagy az illetékes légiforgalmi irányító számára kell eljuttatni, vagy le kell zárni azokat, a helyi utasításoknak, és ha szükséges, az együttműködési egyezményeknek megfelelő módon.

8.2.10 A CPDLC közlemények kijelzése

Ajánlás. - *Azok az ATC egységek, melyek a PANS-ATM-ben található CPDLC szabványos közleményeket használják, a kapcsolódó szöveget, mely az adott közleményhez társítható, lehetőleg úgy kell megjelenítsék, ahogy azt a PANS-ATM, 5. Függelékében bemutatásra került.*

8.2.11 Szabad szöveges közlemények

PANS. - *A légiforgalmi irányítók és pilóták számára a 8.2.9.5.2 pontban bemutatott, előre összeállított, szabad szöveges közleményeken kívül, más szabad szöveges közlemény használatát lehetőleg el kell kerülni.*

Megjegyzés. - Jóllehet elismert, hogy a nem szokásos és a kényszerhelyzet okozta körülmények szükségessé tehetik a szabad, szöveges közlemények használatát, különösen ha a beszéd-üzemű rádió-összeköttetésben hiba lép fel, a szabad szöveges közlemények használatának elkerülése a tévedés és félreérthetőség lehetőségének csökkentését szolgálja.

8.2.12 Kényszerhelyzetek, veszélyhelyzetek és a berendezés meghibásodása során követendő eljárások

8.2.12.1 **PANS. -** *Amikor egy CPDLC kényszerhelyzeti közleményt vettek, a légiforgalmi irányítónak a lehető leghatékonyabb módon kell nyugtáznia a közlemény vételét.*

8.2.12.2 **PANS. -** *Amikor CPDLC-n keresztül egy olyan jelentésre válaszolnak, amely jogellenes beavatkozásra utal, a "ROGER 7500" fedélzetre irányuló közleményt kell használni.*

8.2.12.3 **PANS. -** *Amikor CPDLC-n keresztül bármely más kényszerhelyzeti közleményre válaszolnak, a "ROGER" fedélzetre irányuló közleményt kell használni.*

8.2.12.4 Amikor egy CPDLC közleményre logikai nyugtázás szükséges, és/vagy egy üzemeltetői válasz, és ez nem érkezik meg, a légijárművezetőt, vagy a légiforgalmi irányítót erre, értelemszerűen, figyelmeztetni kell.

8.2.12.5 *A CPDLC meghibásodása*

8.2.12.5.1 **Ajánlás. -** *A CPDLC hibáját lehetőleg kellő időben észlelni kell.*

8.2.12.5.2 A légiforgalmi irányítót és a légijárművezetőt azonnal figyelmeztetni kell a CPDLC hibás működésére, amint a hibát észlelték.

8.2.12.5.3 **PANS. -** *Amikor a légiforgalmi irányítót, vagy a légijárművezetőt figyelmeztették arra, hogy a CPDLC meghibásodott, és a CPDLC helyreállítása előtt valamelyiküknek összeköttetésbe kell lépnie, akkor vissza kell térniük a beszéd-üzemű kapcsolat-tartásra, ha ez lehetséges, és az információkat a: "CPDLC FAILURE" - kifejezéssel kell bevezetni.*

8.2.12.5.4 **PANS. -** *Azon légiforgalmi irányítók, akiktől megkívánják, hogy a teljes CPDLC földi rendszer hibájáról információkat közvetítsenek valamennyi olyan állomásnak, amely valószínűleg hallhatja a közleményt, az ilyen általános hívással kiadott közleményt az "ALL STATIONS CPDLC FAILURE" ("MINDEN ÁLLOMÁSNAK, A CPDLC MEGHIBÁSODOTT") kifejezéssel kell bevezetniük, melyet a hívó állomás azonosítója kell, hogy kövessen.*

Megjegyzés. - Az ilyen általános hívásra nem várnak választ, kivéve, ha ezt követően az egyes állomásokat felkérik a vétel nyugtázására.

8.2.12.5.5 **PANS. -** *Amikor a CPDLC meghibásodik, és az összeköttetésekben visszatérnek a beszéd-üzemű rádió-kapcsolatra, az összes lezáratlan CPDLC közleményt úgy kell tekinteni, hogy nem jutott el a címzetthez, és a függőben lévő közleményekkel kapcsolatos teljes közlemény-váltást lehetőleg újra kell kezdeni a beszéd-üzemű rádió-kapcsolat felhasználásával.*

8.2.12.5.6 **PANS. -** *Amikor a CPDLC meghibásodott, de helyreállítják mielőtt beszéd-üzemű összeköttetésre kellene áttérni, az összes függőben lévő befejezetlen közleményt úgy kell tekinteni, hogy nem jutott el a címzetthez, és a befejezetlen közleményeket illető teljes közlemény-váltást újra kell kezdeni a CPDLC-n keresztül.*

8.2.12.6 *A CPDLC szándékos kikapcsolása*
8.2.12.6.1 Amennyiben a kommunikációs hálózat, vagy a CPDLC földi rendszerének időleges üzemszüneteltetése előre tervezett, egy NOTAM-ot kell kiadni, amellyel az összes érintett felet előzetesen értesíteni kell az üzemszünet tervezett időtartamáról, és ha szükséges, a felhasználandó beszéd-üzemű rádió-kapcsolat frekvenciáinak részleteiről.

8.2.12.6.2 Az ATC-vel pillanatnyilag kapcsolatban lévő légijárműveket szóban, vagy a CPDLC-n keresztül értesíteni kell a CPDLC szolgáltatás küszöbön álló kieséséről.

8.2.12.6.3 A légiforgalmi irányítónak és a légijárművezetőnek biztosítani kell a CPDLC szolgáltatás azonnali leállításának lehetőségét.

8.2.13 Amennyiben egy légijárművel a CPDLC tesztelése kihatással lehet a légijármű számára nyújtott légiforgalmi szolgáltatásokra, akkor koordináció szükséges az ilyen ellenőrzést megelőzően.

8.2.14 A soronkövetkező irányító egységtől származó engedély-továbbítási szolgáltatás /DCDS/
8.2.14.1 Az illetékes ATS hatóságnak kell eldöntenie azt, hogy egy ATC egységnél alátámasztják-e az útvonal soronkövetkező légiforgalmi irányító egységétől származó engedély továbbítási szolgáltatást.

8.2.14.2 *A soronkövetkező irányító szolgálati egységtől származó engedély-továbbítási szolgáltatás /DCDS/ létrehozása*

8.2.14.2.1 A DCDS szolgáltatását csak a fedélzeti rendszernek kell kezdeményeznie. A kezdeményezésnek jeleznie kell, hogy ez az összeköttetés csak a DCDS-től származó engedély vételére szolgál.

8.2.14.2.2 Amikor egy ATC egység visszautasítja a DCDS-t, meg kell adja a légijárművezetőnek a visszautasítás okát is, a "SERVICE UNAVAILABLE" a légiforgalmi irányító és a légijárművezetők közötti digitális adat-kapcsolati /CPDLC/ közlemény használatával.

8.2.14.3 *A soronkövetkező irányító szolgálati egységtől származó engedély-továbbítási szolgáltatás /DCDS/ üzemeltetése*

8.2.14.3.1 A légiforgalmi irányítót és a légijárművezetőt értesíteni kell, amikor a DCDS rendelkezésre áll az üzemeltetésre.

8.2.14.3.2 A légiforgalmi irányítót és a légijármű vezetőjét értesíteni kell arról, ha a DCDS meghibásodik.

8.2.14.3.3 Azokat a Légiforgalmi Irányítás - légijárművezetők közötti digitális adat-kapcsolati /CPDLC/ közlemény elemeket, amelyek a soronkövetkező irányító szolgálati egységtől származó engedély-továbbítási szolgáltatás-/DCDS/ban megengedett közlemények, körzeti léginavigációs megállapodásokban /Regional Air Navigation Agreement/ kell meghatározni.

8.2.14.3.4 A soronkövetkező szolgálati egységtől származó engedély-továbbítási szolgáltatáson leadott engedély- kérésnek a légiforgalmi irányító számára egyértelműen azonosítottnak kell lennie, hogy az egy ilyen kérés.

8.2.14.3.5 A soronkövetkező szolgálati egységtől származó engedély-továbbítási szolgáltatásban leadott engedélynek a légijárművezető számára egyértelműen azonosítottnak kell lennie, hogy az egy ilyen engedély.

8.2.14.4 *A soronkövetkező szolgálati egységtől származó engedély-továbbítási szolgáltatás /DCDS/ befejezése*

8.2.14.4.1 A DCDS befejezését csak a légijármű fedélzeti rendszer kezdeményezheti.

8.2.14.4.2 A soronkövetkező szolgálati egységtől származó engedély-továbbítási szolgáltatás-/DCDS/-t egy ATC egységgel akkor kell befejezni, amikor a soronkövetkező szolgálati egységtől származó engedély-továbbítási szolgáltatás válik folyamatos adat-jogosultságú szolgálattá.

MELLÉKLETEK AZ ANNEX 10 - II. KÖTETÉHEZ

A II. kötet "A" Melléklete -

A LÉGIFORGALMI TÁVKÖZLÉS TERVEZÉSÉVEL KAPCSOLATOS SPECIÁLIS TÁVKÖZLÉSI KIFEJEZÉSEK ÉS MEGHATÁROZÁSAIK LISTÁJA

1964. március 25-én a Tanács, az ötvenegyedik ülésszaka 11. értekezletén, az ICAO-n belüli általános felhasználásra jóváhagyta az alábbi speciális távközlési kifejezéseket és azok meghatározásait. A Tanács a továbbiakban felkérte az Államokat, hogy ezeket a szakkifejezéseket a jóváhagyott jelentésükben használják, különösen az ICAO-val folytatott levelezésük, kapcsolat-tartásuk során, az ICAO ülések számára benyújtott vitairataikban, és minden más vonatkozó szöveges dokumentumaikban.

A csillaggal jelölt szakkifejezéseket már az Annex 10 szövegében is felhasználták és meghatározták, míg a további szakkifejezések általános használatban vannak a légiforgalmi távközlés szakembereinek körében, de már néhány ICAO értekezleten nehézségeket okoztak, vagy a különböző összejövetelek által az adott szakkifejezésre egymásnak ellentmondó meghatározások születtek.

1. Általános használatra

***Aeronautical telecommunication agency- Légiforgalmi távközlési ügynökség**.*
A Légiforgalmi Távközlési Szolgálat egy, vagy több állomásának üzemeltetéséért felelős ügynökség.

***Aeronautical telecommunication service - Légiforgalmi távközlési szolgálat**.*
Bármely légiforgalmi célra létesített távközlési szolgálat.

Aeronautical telecommunication station - Légiforgalmi távközlési állomás.
A légiforgalmi távközlési szolgálat egy állomása.

Aircraft operating agency - Légijármű-üzemeltető ügynökség (járató).
Az a személy, szervezet vagy vállalkozás, amely egy légijármű üzemeltetésével foglalkozik, vagy arra ajánlatot tesz.

Double channel simplex - Két-csatornás szimplex.
Egyszerű szimplex összeköttetési módszer, amely minden irányba egy- egy frekvencia-csatornát használ.

Megjegyzés. - Ezt a módszert néha kereszt-hullámsáv módszernek is nevezték.

Duplex - Duplex.
Olyan összeköttetés, amelyen keresztül két állomás között, egyidejűleg, mindkét irányban folyhat közlemény-váltás.

Frequency channel - Frekvencia-csatorna.
A frekvencia-spektrum egy összefüggő, folytonos része, amely egy meghatározott rádió-sugárzás fajta felhasználásával adat-továbbításra, átvitelre alkalmazható.

Megjegyzés. - Az adásfajták osztályozását és az egyes átvitel típusokhoz megfelelő frekvencia-spektrum tartományokról szóló információkat (sávszélességeket) az ITU Rádió Szabályzat S2 cikkelye, valamint az S1 Függelék határozza meg.

International telecommunication service - Nemzetközi távközlési szolgálat.
Távközlési szolgálat különböző Államok hivatalai vagy állomásai között, vagy olyan mozgó állomások között, amelyek nem ugyanabban az Államban vannak, vagy különböző Államok fennhatósága alá tartoznak.

Offset frequency simplex - Eltolt frekvenciás szimplex.
Az egyszerű, szimplex összeköttetési módszernek olyan változata, amely a két állomás közötti minden irányban egy-egy, frekvenciasávban kissé eltérő, azonban az üzemeltetésre kijelölt azonos frekvencia tartományba tartozó csatornát használ.

Simplex - Szimplex.
Egy módszer, melyben két állomás között egyszerre csak egy irányban folyhat távközlés.

Megjegyzés. - A légiforgalmi mozgó szolgálat esetében ez a módszer az alábbi részekre osztható fel:
a) egycsatornás szimplex;
b) kétcsatornás szimplex;
c) eltolt frekvenciás szimplex.

Single channel simplex - Egycsatornás szimplex.
Olyan szimplex összeköttetés, ahol a mindkét irányú összeköttetéshez ugyanazt a frekvenciát használják.

2. A légiforgalmi állandóhelyű szolgálat tervezése során használatos kifejezések

Aeronautical fixed service (AFS) - Légiforgalmi állandóhelyű szolgálat.
Meghatározott állandó helyek között létesített távközlési szolgálat, melynek feladata elsősorban a léginavigáció biztonságának, valamint a légiforgalom rendszeres, hatékony és gazdságos működésének elősegítése.

Aeronautical fixed telecommunication network (AFTN) - Légiforgalmi állandóhelyű távközlési hálózat.
A légiforgalmi állandóhelyű áramkörök világméretű rendszere, amelyet a légiforgalmi állandóhelyű szolgálat részeként közlemények, és/vagy digitális adatok olyan állandóhelyű légiforgalmi állomások közötti cseréje érdekében hoztak létre, amely állomások azonos, vagy összeegyeztethető távközlési jellemzőkkel rendelkeznek.

AFTN communication centre - AFTN kommunikációs (távközlő) központ.
Olyan AFTN állomás, amelynek elsődleges feladata a hozzá kapcsolt további AFTN állomásoktól (vagy állomásoknak) az AFTN forgalmazás átjátszása (közvetítése), vagy ismételt feladása.

AFTN destination station - AFTN célállomás.
Az az AFTN állomás, amelynek a közleményt megküldték a címzettnek történő helyi kézbesítésre.

AFTN entry-exit points - AFTN be- és kilépőpontok.
Központok, amelyeken keresztül egy ICAO Léginavigációs Körzetbe belépő vagy kilépő AFTN közleményeknek keresztül kell haladniuk.

AFTN group - AFTN csoport.
A légiforgalmi állandóhelyű hálózat három vagy több rádióállomása, amelyek ugyanazon a rádiófrekvencián forgalmaznak.

AFTN origin station - AFTN feladó állomás.
Az az AFTN állomás, ahol a közleményeket átadják az AFTN hálózaton keresztül történő továbbításra.

AFTN station - AFTN állomás.
Olyan állomás, amely a légiforgalmi állandóhelyű távközlési hálózat (AFTN) részét képezi és annak megfelelően üzemel, egy Állam fennhatósága vagy ellenőrzése alatt.

Automatic relay installation - Automatikus átjátszó állomás.
Olyan távgépíró berendezés, ahol automatikus készüléket alkalmaznak a közlemények átvitelére a bejövő és a kimenő vonalak között.

Megjegyzés: Ez a megnevezés magába foglalja a teljesen automatikus és a fél-automatikus állomásokat, berendezéseket is.

Channel – Csatorna.
A két pont közötti közvetlen állandóhelyű szolgálati összeköttetésre szolgáló egyszerű eszköz.

Circuit - Vonal.
Összeköttetési rendszer, amely magába foglalja a két pont között létező összes közvetlen AFTN csatornát.

Communication centre - Kommunikációs központ.
Légiforgalmi állandóhelyű állomás, amely a hozzá közvetlenül kapcsolódó más légiforgalmi állandóhelyű állomások közötti távközlési forgalmazás átjátszását vagy iújra-feladását végzi.

Fully automatic relay installation - Teljesen automatikus átjátszó állomás.
Olyan távgépíró berendezés, ahol egy bejövő közlemény közvetítési feladatainak értelmezése és az ebből következően szükséges kapcsolatok létrehozása a közlemény iújra-feladása céljából, valamint minden egyéb sendes átjátszási tevékenység automatikusan történik, ezért kezelői beavatkozásra - a felügyeletet kivéve - nincs szükség.

Incoming circuit responsibility list - Bejövő vonalak felelősségi listája.
Egy kommunikációs központ minden egyes bejövő vonalához egy olyan lista, mely azokat a helység azonosítókat sorolja fel, amelyek számára az adott vonalon érkező közlemények tekintetében átjátszási felelősséget kell vállaljanak.

Location indicator - Helységnév-kód.
Az ICAO által előírt szabályoknak megfelelően kialakított és valamely légiforgalmi állandóhelyű állomás helységére kijelölt négy-betűs kódcsoport.

Relay time - Átjátszási idő.
Egy COM központ átjátszási ideje az az időtartam, amely a közlemény központban történő teljes vételének időpontja és egy kimenő vonalon történt teljes leadásának időpontja között eltelik.

Route (AFTN) - Adásvonal (AFTN).
Egy vonal egy bizonyos csatornája által követett nyomvonal.

Routing (AFTN) - Közlemény-útvonal (AFTN).
Az a kiválasztott útvonal, amelyet a közleményeknek az AFTN hálózaton keresztül követniük kell, az átvétel és a címzettnek történő kézbesítés között.

Routing Directory - Adásvonal- címjegyzék
Egy távközlési központban található lista, amely minden egyes címzetthez hozzárendeli a használandó kimenő-vonalat.

Routing List - Adásvonal-lista.
Egy távközlési központban található lista, amely minden egyes címzetthez hozzárendeli a használandó kimenő-vonalat.

Semi-automatic relay installation - Félautomata átjátszó állomás
Olyan távgépíró állomás, ahol egy bejövő közlemény közvetítési feladatainak értelmezéséhez és az ebből következően szükséges kapcsolatok létrehozásához, a közlemény újra-feladása céljából, kezelő személy beavatkozása szükséges, de ahol az átjátszással kapcsolatos minden egyéb rendes tevékenység automatikusan történik.

"Torn-tape" relay installation - Kézi ("tépett szalagos") átjátszó állomás.
Olyan telex állomás, amelyben a közleményeket telex-szalag formájában veszik és játsszák át, és ahol az átjátszással kapcsolatos minden tevékenységhez a kezelő beavatkozása szükséges.

Transit time - Átfutási idő.
Az az időtartam, amely attól az időponttól telik el, hogy a közleményt az AFTN állomáson, a hálózaton történő továbbítás céljára leadják, addig az időpontig, amikor a közlemény a címzett számára hozzáférhetővé válik.

Tributary station - Alárendelt állomás.
Olyan légiforgalmi állandóhelyű állomás, amely kaphat és küldhet közleményeket és/vagy digitális adatokat, de amely nem végez átjátszást, kivéve azon hasonló állomások kiszolgálása céljából, amelyeket ezen keresztül kapccsoltak egy távközlési központhoz.

3. A légiforgalmi mozgó szolgálat tervezése során használatos kifejezések

Aerodrome control radio station - Repülőtéri légiforgalmi irányítás rádióállomása
A repülőtéri irányító torony és a légijárművek vagy mozgó légiforgalmi állomások közötti rádiól-evelezést biztosító állomás.

Aeronautical mobile service - Légiforgalmi mozgó szolgálat.
Légiforgalmi állomások és légijármű-állomások között, vagy légijármű-állomások közötti mozgó szolgálat, melyben mentőtutajok is részt vehetnek; kijelölt segélykérő és kényszerhelyzeti frekvenciákon működő kényszerhelyzeti hely-jeladó állomások ugyancsak részt vehetnek ebben a szolgálatban.

Aeronautical station - Légiforgalmi állomás.
A légiforgalmi mozgó szolgálat földi állomása. Bizonyos esetekben a légiforgalmi állomás hajó fedélzetén, vagy tengerben épült emelvényen is elhelyezhető.

Aircraft station - Légijármű-állomás.
A légiforgalmi mozgó szolgálat mozgó állomása, amely nem mentőtutaj-állomás, és amely légijármű fedélzetén van elhelyezve.

Air-ground communication - Levegő-föld összeköttetés.
Kétirányú összeköttetés a légijárművek és a föld felszínén található állomások vagy helyek között.

Air-ground control radio station - A légiforgalmi irányítás levegő-föld rádióállomása.
Olyan légiforgalmi távközlési állomás, amelynek elsődleges feladata egy adott területen belül a légijárművek üzemelésével és irányításával kapcsolatos távközlési forgalom lebonyolítása.

Air-to-ground communication – Levegő-föld irányú kommunikáció.
Egyirányú összeköttetés a légijárművekről a föld felszínén található állomások vagy helyek felé.

Alternative means of communication - Alternatív távközlési eszközök.
Az elsődlegesen használt módszer mellett alkalmazott,azonos műszaki jellemzőkkel rendelkező összeköttetés.

General purpose system (GP) - Általános célú rendszer (GP).
Levegő-föld rádió-távbeszélő berendezések, amelyek az 5.1.8 pontban felsorolt valamennyi forgalmazást kezelni tudják.

Megjegyzés.- Ebben a rendszerben az összeköttetés általában közvetett, vagyis egy harmadik személy közvetítésével történik.

Ground-to-air communication - Föld-levegő irányú összeköttetés.
Egyirányú összeköttetés a föld felszínén található állomásoktól, vagy helyektől a légijárművek felé.

Non-network communications - Hálózaton kívüli távközlés.
Rádió-távbeszélő összeköttetés, melyet a légiforgalmi mozgó szolgálat egyik olyan állomása hajt végre, amely nemképezi részét rádió-távbeszélő hálózatnak.

Operational control communications - Repülés-üzemi (Járatói) Felügyeleti Összeköttetések
Olyan összeköttetések, amelyek egy repülés megkezdése, folytatása, átirányítása vagy befejezése fölötti felügyelet gyakorlásához szükségesek, a légijármű biztonsága, valamint a repülés rendszeressége és hatékonysága érdekében.

Megjegyzés. - Az ilyen összeköttetések általában a légijármű és a légijárművet üzembentartó ügynökség közötti közlemény-váltáshoz szükségesek.

"Pilot-controller system" - "Pilóta-irányító rendszer".
Olyan levegő-föld rádiót-ávbeszélő berendezések, amelyeket elsősorban azért hoztak létre, hogy eszközt biztosítsanak a légijárművezetők és a légiforgalmi irányítók közötti közvetlen összeköttetéshez.

Primary means of communication - Elsődleges összeköttetési módszer.
A légijármű és a földi állomások közötti összeköttetés fenntartására elsősorban alkalmazott módszer, ahol altermatív módszer igénybevételére is lehetőség van.

Radiotelephony network - Rádió-távbeszélő hálózat.
Légiforgalmi rádió-távbeszélő állomások egy csoportja, amelyek ugyanazon családba tartozó rádió-frekvenciákon üzemelnek és figyelnek, és amelyek meghatározott módon segítik egymást, hogy biztosítsák a levegő-föld összeköttetés maximális megbízhatóságát, üzembiztosságát és a levegő-föld forgalmazás elosztását.

Regular station - Illetékes állomás.
Egy állomás, amelyet a légi-útvonal levegő - föld rádiót-ávbeszélő hálózatot alkotó állomások közül kiválasztottak arra, hogy rendes körülmények között a légijárművekkel tartsa a kapcsolatot, vagy azok adását vegye.

A II. kötet "B" melléklete -

ÚTMUTATÓ ANYAG HOSSZÚ KÖZLEMÉNYEK TOVÁBBÍTÁSÁHOZ AZ AFTN SEGÍTSÉGÉVEL

1. Bevezetés

Azt az összeköttetési követelményt, hogy több külön közleménybedn kell leadni az AFTN hálózaton azt a szöveget, amelynek hossza meghaladja az 1800 karaktert, részletesen a 4.4.5.7 és 4.4.15.3.11 pontok tartalmazzák. Ha a közleményeket két vagy több részre kell osztani, akkor az alábbi eljárást kell alkalmazni.

2. Eljárás

Minden közlemény résznek ugyanazt a címzést és feladó jelzést kell tartalmaznia, valamint minden rész szöveges részének végén meg kell adni a rész sorszámát, az alábbiak szerint:

(Az első közlemény vége) / / END PART 01 / /
(A második közlemény vége) / / END PART 02 / /
... stb. ...
(Az utolsó közlemény vége) / / END PART XX/XX / /

Megjegyzés. - Az alábbi példa ennek az eljárásnak az alkalmazását mutatja be, egy három részes közlemény esetén. A közlemény sorszámát jelző szöveg beleszámít a szöveg karaktereinek számába.

a) *Első közlemény:*

(Címzés) GG EGLLYMYX
(Feladó) 102030 KWBCYMYX
(Szöveg) szöveg
/ / END PART 0l / /
(Zárórész) NNNN

b) *Második közlemény:*

(Címzés) GG EGLLYMYX
(Feladó) 102030 KWBCYMYX
(Szöveg) a szöveg folytatása
/ / END PART 02 / /
(Zárórész) NNNN

c) *Harmadik, és egyben utolsó közlemény:*

(Címzés) GG EGLLYMYX
(Feladó) 102030 KWBCYMYX
(Szöveg) a szöveg maradéka
/ / END PART 03/03 / /
(Zárórész) NNNN

ANNEX 10/III.
Légiforgalmi távközlés:
(I. Rész – Digitális adatközlő rendszerek
II. Rész – Hangtávközlő rendszerek

III.kötet 1. kiadás – 1995. július
81. módosítással
NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

LÉGIFORGALMI TÁVKÖZLÉS
10. ANNEX
A NEMZETKÖZI POLGÁRI REPÜLÉSI EGYEZMÉNYHEZ
III. KÖTET

ICAO
AZ ANNEX 10. HARMADIK KÖTET ELSŐ KIADÁSÁT A TANÁCS 1995. MÁRCIUS 20-ÁN FOGADTA EL ÉS AZ 1995. NOVEMBER 9-ÉN VÁLIK ALKALMAZHATÓVÁ.

A SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK ALKALMAZHATÓSÁGÁRA VONATKOZÓ TOVÁBBI INFORMÁCIÓKAT AZ ELŐSZÓ TARTALMAZZA
NEMZETKÖZI POLGÁRI REPÜLÉSI SZERVEZET

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

LÉGIFORGALMI TÁVKÖZÉS
10. ANNEX
A NEMZETKÖZI POLGÁRI REPÜLÉSI EGYEZMÉNYHEZ
III. KÖTET - HÍRKÖZLÉSI RENDSZEREK
(I. RÉSZ – DIGITÁLIS ADAT-ÖSSZEKÖTETÉSI RENDSZEREK;
II. RÉSZ – BESZÉD-ÜZEMŰ ÖSSZEKÖTTETÉSI RENDSZEREK)
A III. KÖTET ELSŐ KIADÁSA – 1995. JÚLIUS
NEMZETKÖZI POLGÁRI REPÜLÉSI SZERVEZET

Az Annex 10 III. Kötet Módosításainak ellenőrző jegyzéke

	Hatálybalépés dátuma	**Alkalmazhatóság dátuma**
Első kiadás		
71. Módosítás (a Tanács elfogadta 1976 március 12-én)	**1996. júl. 15.**	**1996. júl. 15.**
72. Módosítás (a Tanács elfogadta 1997. március 12-én)	**1997. júl. 21.**	**1997. júl. 21.**
73. Módosítás (a Tanács elfogadta 1998. március 19-én)	**1998. júl. 20.**	**1998. júl. 20.**
74. Módosítás (a Tanács elfogadta 1999. március 18-án)	**1999. júl. 19.**	**1999. júl. 19.**

75. Módosítás **(a Tanács elfogadta 2000. március 13-án)**	**2000. júl. 17.**	**2000. júl. 17.**
76. Módosítás **(a Tanács elfogadta 2001. március 12-én)**	**2001. júl. 16.**	**2001. nov. 1.**
77. Módosítás **(A Tanács elfogadta 2002. február 27-én)**	**2002. júl. 15.**	**2002. nov. 28.**
78. Módosítás **(A Tanács elfogadta 2003. március 5-én)**	**2003. júl. 14.**	**2003. nov. 27.**
79. Módosítás **(A Tanács elfogadta 2004. február 23-án)** **Cserelapok: (iv), (x), 5-30, 279, 282I, és a 282L-től a 282T-ig, valamint a 338-tól a 338D-ig terjedő oldalak**	**2004. júl. 12.**	**2004. nov. 25.**
80. Módosítás **(A Tanács 2005. február 25-én fogadta el)** **Cserelapok (x) és a 353-tól a 356A-ig terjedő oldalak.**	**2005. július 11.**	**2005. november 24.**
81. Módosítás ()	Kötetet nem érintette	

ELŐSZÓ

Történelmi háttér

A Légiforgalmi Távközlés Szabványait és Ajánlott Gyakorlatait a Tanács először 1949. május 30-án fogadta el a Nemzetközi Polgári Repülésről szóló Egyezmény 37. cikkelyében lévő előírásoknak megfelelően (Chicago, 1944) és az Egyezmény 10. Annex-eként jelölte ki. Ezek 1950. március 1-jén lépett hatályba. A Szabványok és Ajánlott Gyakorlatok a Hírközlési Osztály 1949. januárjában tartott Harmadik Ülésszaka ajánlásain alapulnak.

Egészen a Hetedik Kiadásig és azt is beleértve, az Annex 10 egy kötetben került kiadásra, ami négy Részt foglalt magába, a hozzájuk kapcsolt mellékletekkel együtt: az I. Rész – Berendezések és Rendszerek, a II. Rész – Rádiófrekvenciák, a III. Rész – Eljárások és a IV. Rész – Kódok és rövidítések.

A 42. Módosítással a IV. Részt törölték az Annex-ből; és az ebben a részben található kódokat és rövidítéseket egy új dokumentumba, a Doc 8400-ba tették át.

A 44. Módosítás 1965. évi május 31-i elfogadásának eredményeként az Annex 10 Hetedik Kiadása két kötetbe került felosztásra: az I. Kötetbe (Első kiadás) - ami az I. Résztt, a "Berendezések és Rendszerek"-et és a II. Részt,a "Rádiófrekvenciák"-at foglalja magába, valamint a II. Kötetbe (Első kiadás), ami a "Hírközlési Eljárások"-at tartalmazza.

A 70. Módosítás 1995. évi március 20-i elfogadásának eredményeként az Annex 10 átszerkesztésre került úgy, hogy öt kötetet foglal magába: I. Kötet – Rádiónavigációs Berendezések; II. Kötet – Hírközlési eljárások; III. Kötet – Hírközlési rendszerek; IV. Kötet – Légtér-ellenőrző radar és Összeütközést Elkerülő Rendszerek; és az V. Kötet – A Légiforgalmi Rádiófrekvencia Spektrum Felhasználása. A 70. Módosítással a III. és a IV. Kötet 1995-ben került kiadásra és az V. Kötet kiadását a 71. Módosítással tervezték.

Az "A" táblázat mutatja be az Annex 10 III. Kötetének a 70. sz. Módosítást követő eredetét, a bennük lévő legfontosabb témák összefoglalásával, és azokkal az időpontokkal együtt, amikor a Tanács az Annex-et és a módosításokat elfogadta, amikor azok hatályba léptek, és végül amikor alkalmazhatókká váltak.

A Szerződő Államok tevékenysége

Az eltérések bejelentése. A Szerződő Államok figyelmét felhívják az Egyezmény 38. cikkelye értelméből eredő azon kötelezettségükre, amely szerint a Szerződő Államokat felkérik arra, hogy jelentsenek be a Szervezetnek minden olyan eltérést, mely a nemzeti szabályaik és eljárásaik, valamint az ebben az Annex-ben lévő és ezt követően módosított Nemezetközi Szabványok között fennáll.Kérik a Szerződő Államokat, hogy ezt a bejelentést terjesszék ki az ezen Annex-ben lévő Ajánlott Gyakorlatoktól való eltérésekre is, amennyiben az ilyen eltérés lényeges jelentőséggel bír a léginavigáció szempontjából. Továbbá felkérik a Szerződő Államokat, hogy folyamatosan tájékoztassák a Szervezetet minden olyan eltérésről, amely ezt követően felmerül vagy amennyiben bármely korábban bejelentett eltérés megszűnik. Egy, az eltérések bejelentésére vonatkozó külön felkérés kerül megküldésre a Szerződő Államok részére az egyes módosítások elfogadását követően azonnal.

Felhívják ezenkívül az Államok figyelmét az Annex 15 azon előírásaira, amelyek szerint a nemzeti szabályaik és gyakorlataik, valamint az ICAO Szabványok és Ajánlott Gyakorlatok között felmerülő eltéréseket a Légiforgalmi Tájékoztató Szolgálaton keresztül tegyék közzé, az Egyezmény 38. cikkelyében lefektetett, az Államokra vonatkozó kötelezettségen felül.

A tájékoztatás közzététele. Az Annex 10-ben meghatározott Szabványoknak, Ajánlott Gyakorlatoknak és Eljárásoknak megfelelően biztosított, a légijármű üzemeltetéseket érintő berendezések, szolgálatok és eljárások változásait, azok életbeléptetését és megszűntetését be kell jelenteni, és az Annex 15 előírásainak megfelelően kell érvénybe helyezni.
Az Annex szövegének használata a nemzeti szabályzatokban. A Tanács 1948. április 13-án elfogadott egy határozatot, amelyben felhívtj a Szerződő Államok figyelmét annak kívánatosságára, hogy a saját nemzeti szabályaikban - amennyire az csak lehetséges - használják azoknk az ICAO Szabványoknak a pontos kifejezésmódját, amelyek szabályozás jellegűek, ugyamígy a Szabványoktól való eltérések jelölésére is, beleértve minden olyan kiegészítő nemzeti szabályzaot is, amely a léginavigáció biztonsága vagy szabályossága szempontjából fontos. Ahol csak lehetséges, ennek az Annex-nek a szövege szándékosan olyan módon került leírásra, hogy nagyobb szövegbeli változtatás nélkül be lehessen foglalni a nemzeti törvényalkotásba.

Az Annex alkotó-részeinek jogi helyzete

Egy Annex a következő alkotó-részekből épül fel, azonban nem feltétlenül található meg ezek mindegyike minden egyes Annex-ben; és ezek az alábbi jogi helyzetet foglalják el:

1. – Az Annex-et alkotó anyagok a tulajdonképpeni:

a) *Szabványok és Ajánlott Gyakorlatok,* amelyeket a Tanács fogadott el az Egyezmény előírásainak megfelelően.

Meghatározásuk a következő:

Szabvány: A fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó minden olyan meghatározás, amelynek egységes alkalmazását a nemzetközi léginavigáció biztonsága szempontjából szükségesnek tekintenek, és amelynek a Szerződő Államok az Egyezmény értelmében eleget kell, hogy tegyenek; a teljesítés lehetetlensége esetén annak bejelentése a Tanács részére a 38. Cikkely alapján kötelező .

Ajánlott Gyakorlat: Fizikai jellemzőkre, összetételre, anyagra, teljesítőképességre, személyzetre vagy eljárásra vonatkozó minden olyan meghatározás, amelynek egységes alkalmazását kívánatosnak tekintik a nemzetközi léginavigáció biztonsága, szabályszerűsége vagy hatékonysága érdekében, és amelynek teljesítésére a Szerződő Államoknak az Egyezmény értelmében törekedniök kell.

b) *Függelékek,* a kényelmi szempontból külön csoportosított anyagok, de ezek részét képezik a Tanács által elfogadott Szabványoknak és Ajánlott Gyakorlatoknak.

c) *Meghatározások,* a Szabványokban és Ajánlott Gyakorlatokban használt azon szakkifejezések értelmezése, amelyek nem maguktól értetődőek, amennyiben azok nem rendelkeznek elfogadott szótári jelentéssel.. Egy meghatározásnak nincs független jogi helyzete, de minden egyes Szabványnak és Ajánlott Gyakorlatnak, amelyben használják, elengedhetetlen részei, mivel a szakkifejezés jelentésének értelmi változása befolyásolná az előírás értelmét.

d) *Táblázatok* és *ábrák,* azok, amelyek kiegészítik vagy illusztrálják azokat a Szabványokat és Ajánlott Gyakotrlatokat, amelyekre azokban utalnak, ezek a vonatkozó Szabványoknak és Ajánlott Gyakorlatoknak részét képezik, és ugyanazzal a jogi helyzettel rendelkeznek.

2. – A Tanács által a Szabványokhoz és Ajánlott Gyakorlatokhoz kapcsolódóan közzétételre elfogadott anyag:

a) *Előszavak*, a Tanács tevékenységén alapuló történeti és magyarázó anyagokat tartalmazzák, és magukba foglalják az Államoknak az Egyezményből és az Elfogadási Határozatból következő - a Szabványok és Ajánlott Gyakorlatok alkalmazására vonatkozó - kötelezettségeinek magyarázatát is, ami a Chicagói Egyezményen és annak Végrehajtási Határozatán alapszik;

b) *Bevezetések,* azok a magyarázó anyagok, amelyekkel az Annex részei, fejezetei vagy szakaszai kezdődnek, azért, hogy a szöveg alkalmazásának megértését segítsék;

c) A *Megjegyzések* a szövegbe beépítve - ahol szükséges - tárgyi információt vagy hivatkozást adnak a Szabványokkal vagy Ajánlott Gyakorlatokkall kapcsolatos kérdésekben, de nem képezik a Szabványok és Ajánlott Gyakorlatok részét;

d) A *Mellékletek* a Szabványokkal és Ajánlott Gyakorlatokkal kapcsolatos kiegészítő anyagokat tartalmazzák, vagy azok alkalmazásához útmutatóként kerültek beépítésre.

A szabadalmi felelősség elutasítása

Felhívjuk a figyelmet annak lehetőségére, hogy az ebben az Annex-ben lévő Szabványok és Ajánlott Gyakorlatok bizonyos elemei lehet, hogy szabadalom vagy egyéb szellemi tulajdoni jog tárgyát képezik. Az ICAO nem vállal felelősséget vagy kötelezettséget azért, hogy nem azonosította az ilyen jogok valamelyikét vagy mindegyikét. Az ICAO nem foglal állást semmilyen "igényelt" találmány vagy egyéb szellemi tulajdoni jog fennállására, érvényességére, tárgyára vagy alkalmazhatóságára vonatkozóan, és azt "vállalja", hogy nincs felelőssége és kötelezettsége ennek megfelelően és ere vonatkozóan.

A nyelv kiválasztása

Ez az Annex négy nyelven került elfogadásra - angolul, franciául, oroszul és spanyolul. Minden egyes Szerződő Államot felkérnek, hogy ezeknek a különféle nyelvű szövegeknek az egyikét válasszák ki nemzeti felhasználásra,valamint az Egyezményben meghatározott egyéb célokból, akár a közvetlen felhasználás, akár a saját nemzeti nyelvre töténő fordítás útján, és ennek megfelelően értesítsék a Szervezetet.

Szerkesztési gyakorlat

A következő gyakorlat kerül következetesen alkalmazásra abból a célból, hogy az egyes állítások jogi helyzete egyetlen pillantással megállapítható legyen: a *Szabványok* vékony antikva betűtípussal vannak nyomtatva; az Ajánlott Gyakorlatok vékony dőlt betűvel vannak szedve, jogi helyzetüket az **Ajánlás** szó jelzi; a *Megjegyzések* vékony dőlt betűvel vannak szedve, jogi helyzetüket a Megjegyzés jelzi.

A következő szerkesztési gyakorlatot követtük az előírások megfogalmazásánál:: a Szabványok esetében a "kell", az Ajánlott Gyakorlatok esetében pedig a "kellene" műveltető igét használtuk. Az ebben a dokumentumban alkalmazott mértékegységek megegyeznek a Nemzetközi Mértékegység Rendszerrel (SI) úgy, ahogy az a Nemzetközi Polgári Repülési Egyezmény 5.Annex-ében meghatározásra került. Ott, ahol az Annex 5 megengedi a nem-SI mértékegységek alternatív használatát, azok zárójelben feltűntetve követik az alap mértékegységet. Ahol a két rendszer szerinti mértékegységek szerepelnek, nem szabad feltételezni azt, hogy az értékek egyenlők és felcserélhetők. Azt azonban el lehet fogadni, hogy a biztonság azonos szintjét lehet elérni, ha bármelyik mértékegység rendszert önállóan alkalmazzák.

Ennek a dokumentumnak bármely részére történő hivatkozás, amelyet egy számmal és/vagy címmel azonosítottak, magába foglalja annak a résznek az összes al-részét is.

“A” táblázat. A Annex 10, III. Kötet módosításai

Módosítás	*Forrás(ok)*	*Témakör(ök)*	*Elfogadva* *Hatályos* *Alkalmazható*
70	Léginavigációs Bizottság; A Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMPC) Harmadik Ülése	Az új III. Kötet és a Légiforgalmi Mozgó-Műholdas Szolgálatokra (AMSS) vonatkozó Szabványok és Ajánlott Gyakorlatok bevezetése	1995. márc. 20. 1995. júl. 24. 1995. nov. 9.
71	Léginavigációs Bizottság; Speciális Hírközlési/Üzemeltetési Szekció (SP COM/OPS/95) ülés (1995); a Másodlagos Légtér-ellenőrző Radar Fejlesztési és Összeütközés Elkerülési Rendszerek Szakcsoport (SICASP) Ötödik Ülése; a Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMCP) harmadik ülése	Kiegészítő előírások a Légiforgalmi Távközlési Hálózat /ATN/ S-Módú al-hálózatára vonatkozóan; kiegészítő anyag a 8,33 kHz-es csatorna elkülönítés bevezetéséhez kapcsolódóan; változások az ultra- rövidhullámú VHF sáv levegő-föld összeköttetések védelmére vonatkozó anyagban;	1996. márc. 12. 1995. júl. 15. 1996. nov. 7.

		kiegészítés a VHF digitális összeköttetés /VDL/ rádió-frekvenciás jellemzőire vonatkozó műszaki előírásaihoz.	
72	Léginavigációs Bizottság; A Légiforgalmi Mozgó- Szolgálati Összeköttetések Szakcsoport (AMPC) Negyedik Ülése	Az ultra-rövidhullámú digitális összeköttetésre (VDL) vonatkozó Szabványok és Ajánlott Gyakorlatok /SARPs/ bevezetése és útmutató anyag; a VDL meghatá-rozása és a levegő-föld adatcsere elavult anyagának törlése.	1997. márc. 12. 1997. júl. 21. 1997. nov. 6.
73	Léginavigációs Bizottság; a LégiforgalmiTávközlési Hálózat Szakcsoport (ATNP) második ülése; a Másodlagos Légtér-ellenőrző Radar Fejlesztési és Összeütközés Elkerülési Rendszerek Szakcsoport (SICASP) Hatodik Ülése	Az ATN-re vonatkozó anyag bevezetése; változtatások az S-Módú alhálózat előírásaiban.	1998. márc. 19. 1998. júl. 20. 1998. nov. 5.
74	A Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMCP) Ötödik Ülése; Léginavigációs Bizottság	Az alábbiak bevezetése: a) Rövidhullámú adat-kapcsolatok előrásai; b) változások a kényszerhelyzeti helyjeladó adóberendezéseinek előírásaiban.	1999. márc. 18. 1999. júl. 19. 1999. nov. 4.
75.	A Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMCP) Hatodik Ülése; Léginavigációs Bizottság	Változtatások a Légiforgalmi Mozgó-Műholdas Szolgálat /AMSS/ Szbványok és Ajánlott Gyakorlatok-/SARPs/-ban; egy új antenna típus bevezetése; egy új beszéd-üzemű csatorna típus és kiemelt elő- írások az AMSS rendszerek közötti együttműködő-képességre;	2000. márc. 13. 2000. júl. 17. 2000. nov. 2.

		változtatások a VHF digitális összeköt- tetések /VDL/ Szabványok és Ajánlott Gyakorlatok-/SARPs/-ban azzal a lehetséges interferencia csök- kentéssel kapcsolatban, amelyet a jelenlegi Ultra-rövidhullámú /VHF/ beszéd-üzemű összeköttetési rend- szereknél a VHF digitális össze- köttetési adók okozhatnak; változ- tatások az Ultra-rövidhullámú /VHF/ beszéd-üzemű összeköttetési Szab- ványok és Ajánlott Gyakorlatok- /SARPs/-ban az ugyanazon légijármű fedélzetén lévő VDL adóktól eredő interferencia érzéketlenség növelésére.	
76	A LégiforgalmiTávközlési Hálózat Szakcsoport (ATNP) harmadik ülése; a Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMCP) Hetedik Ülése; a Titkárság tevékenysége a Légiforgalmi Szolgálatok /ATS/ Beszéd-üzemű Kapcsolás és Jelzés Vizsgáló Csoport (AVSSSG) segítségével	A Légiforgalmi Távközlési Hálózat (ATN) rendszer szervezési, biztonsági és igazgatási szolgálatai; a CDIN-re vonatkozó részletes anyag eltávolítása; integrált beszéd-üzemű és adat-kapcsolati rendszer (VDL Mode 3); az adat-kapcsolatot kielégítő légtér-ellenőrzési alkal- mazások (VDL Mode 4); az összes, a VDL 1-es üzemmódra vonatkozó előírás törlése; a VDL 2-es üzemmódra vonatkozó részletes műszaki előírások eltávolítása; a légiforgalmi élőszavas áramkörök; az ITU Rádió- Szabályzatra való hivatkozások felfrissítése.	2001. márc. 12. 2001. júl. 16. 2001. nov. 1.
77	A Másodlagos Légtér-ellenőrző Radar Fejlesztési és Összeütközés Elkerülési Rendszerek Szakcsoport (SICASP)	Az S-Módú alhálózat (I. Rész), Légijármű címzési rendszer (I. Rész).	2002. febr. 27. 2002. júl. 15. 2002. nov. 28.

78.	Léginavigációs Bizottság	A rádiófrekvenciás csatornákra vonatkozó műszaki előírások változásai; s kényszerhelyzeti helyjeladók (ELTs) lajstromozásának bevezetése; a VDL 3- és 4-es üzemmód beépítése a Légiforgalmi Távközlési Hálózat /ATN/ al-hálózati elsőbbségek táblázatába (3-3. táblázat); szerkesztői módosítások.	2003. márc. 5. 2003. júl. 14. 2003. nov. 27.
79.	Légiforgalmi Mozgó-Szolgálati Összeköttetések Szakcsoport (AMCP) Nyolcadik Ülése	Változások a Rövidhullámú adatkapcsolatokra (HFDL) vonatkozó műszaki előírásokban, azért, hogy összehangolásra kerüljenek a Nemzetközi Távközlési Unió /ITU/ Rádió-Szabályzatának vonatkozó előírásaival; frekvencia-modulációs /FM/ érzéketlenségi jellemzők bevezetése a VDL Mode 4-re; annak a megjegyzésnek a törlése, amely azt közölte, hogy a VDL Mode 4 Szabványait és Ajánlott Gyakorlatait kell alkalmazni a légtér-ellenőrzési berendezésekre.	2004. febr. 23. 2004. júl. 12. 2004. nov. 25.
80.	Léginavigációs Bizottság	A 406 MHz-es frekvencián üzemelő kényszerhelyzeti helyjeladó adóberendezésekben (ELT-k) használt elhelyezési protokolokra vonatkozó előírások.	2005. febr. 25. 2005. júl. 11. 2005. nov. 24.
81.	Nincs változás		

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

I. RÉSZ – DIGITÁLIS ADAT-ÖSSZEKÖTTETÉSI RENDSZEREK

1. FEJEZET. MEGHATÁROZÁSOK

1. Megjegyzés. – A "Radio Regulations"-ra történő minden hivatkozás a Nemzetközi Távközlési Egyesület (ITU) által közzétett Nemzetközi Rádió-Szabályzatra vonatkozik. A Nemzetközi Rádió-Szabályzat újra és újra módosításra kerül az általában két vagy háromévenként megrendezésre kerülő Rádió-távközlési Világ-konferenciák (World Radiocommunication Conferences) záróközleményeiben kifejezett döntéseknek megfelelően. A Nemzetközi Távközlési Egyesület /ITU/ eljárásainak azon részeit, melyek a légiforgalmi rádiórendszerek frekvenciáinak a felhasználására vonatkozó további információkat tartalmazzák, a Polgári Légiközlekedés Rádiófrekvencia Spektrum Követelmények Kézikönyve (Handbook on Radio Frequency Spectrum Requirements for civil Aviation) *(Doc 9718) foglalja össze, amely egyúttal a jóváhgyott ICAO elvek ismertetését is magába foglalja.*

2. Megjegyzés. – Az Annex 10-nek ez a Része az összeköttetési rendszerek meghatározott berendezéseire vonatkozó Szabványokat és Ajánlott Gyakorlatokat foglalja magába. Jóllehet, a Szerződő Államok fogják meghatározni a vonatkozó Szabványokban vagy Ajánlott Gyakorlatokban leírt feltételekkel összhangban a meghatározott berendezések telepítési szükségességének felülvizsgálatát, és az érintett Szerződő Államokra vonatkozó ICAO véleményt és az ajánlásokat a Tanács hajtja végre rendszeres időközönként, a szokásos módon a Körzeti Léginavigációs Értekezletek ajánlásai alapján (Doc 8144, Körzeti Léginavigációs Értekezletek Irányelvei és azok Végrehajtási Eljárásainak Szabályai).

3. Megjegyzés. – Ez a fejezet az összeköttetési rendszerekre vonatkozó általános meghatározásokat foglalja magába. Az ebben a kötetben lévő egyes rendszerekre vonatkozó speciális meghatározások a megfelelő fejezetekben találhatók.

4. Megjegyzés. – Az összeköttetési rendszerek másodlagos energia-ellátásra és a megbízhatóságukra, valamint a rendelkezésre állásukra vonatkozó anyagot az Annex 10, I. Kötet 2.9 pontja és az "F" Melléklet foglalja magába külön-külön.

Aeronautical telecommunication network(ATN). <u>Légiforgalmi Távközlési Hálózat (ATN).</u> Egy belső hálózati kiépítés, amely lehetővé teszi a földi, levegő-föld és repülési adat al-hálózatok számára az együttműködést egymás között, a Nemzetközi Szabványügyi Szervezet (ISO) Nyilt Rendszer Összekapcsolás (OSI) referencia modelen alapuló közös interfész szolgáltatás és protokolok elfogadásával.

Aircraft address. <u>Légijármű címzés.</u> Huszonnégy bit egyedi kombinációja, amely egy légijármű számára kijelölésére rendelkezésre áll a levegő-föld összeköttetés, a navigáció és légtér-ellenőrzés céljára.

Aircraft earth station (AES). <u>Légijármű fedélzeti földi állomás (AES).</u> Mozgó földi állomás a repülési mozgó műholdas szolgáltatásban, amely egy légijármű fedélzetén van elhelyezve (lásd még ("GES").

Bit error rate (BER). <u>Bit hiba-arány (BER).</u> Egy mintavételben található bit hibák száma, osztva a mintavételben lévő összes bitek számával, általában sok ilyen mintavétellel átlagolva.

Carrier-to-multipath ratio (C/M). <u>Direkt több-utas vivőfrekvenciás teljesítmény viszonyszám.</u> A vivőfrekvencia teljesítmény közvetlenül vett, azaz visszaverődés nélküli viszonyszáma, a több-utas teljesítményhez, azaz a visszavert vivőfrekvencia teljesítményhez képest.

Carrier-to-noise density ratio (C/N_0). Vivőfrekvencia zajsűrűség viszonyszám (C/N_0). A teljes vivőfrekvencia teljesítmény viszonyszáma az 1 Hz sávszélességhez tartozó átlagos zaj-teljesítményhez képest, amelyet rendszerint dBHz-ben fejeznek ki.

Channel rate. Csatorna átviteli sebesség. Az a sebesség, amellyel biteket visznek át az RF csatornán keresztül. Ezek a bitek tartalmazzák azokat a biteket, amelyeket keretezésre és hiba-korrekcióhoz használnak, valamint az információt hordozó biteket. A kötegelt adatátvitel esetében az átviteli sebesség a kötegelés időtartama alatti pillanatnyi kötegelési sebességre vonatkozik.

Channel rate accuracy. Csatorna átviteli sebesség pontossága. Ez annak az órajelnek a relatív pontossága, amelyhez az átvitt csatorna-biteket szinkronizálják. Például, az 1,2 kbit/s csatorna átviteli sebességnél a 10^6 egy részének maximális hibája, amely magában foglalja a maximálisan megengedett órajel-hibát, $\pm 1{,}2 \times 10^{-3}$ Hz.

Circuit mode. Áramköri módozat. Az összeköttetési hálózatok egy konfigurációja, amely megjeleníti egy speciális célú átviteli útvonal alkalmazási területét.

Doppler shift. Doppler-eltolódás. A vevő egységnél megfigyelt frekvencia-eltolódás, amely az adó egység és a vevő egység közötti relatív elmozdulás következménye.

End-to-end. Végponttól-végpontig. Teljes kommunikációs úthoz tartozó, vagy arra vonatkozó, tipikusan (1) az információ-forrás és a kommunikációs rendszer közötti, az átviteli végen lévő interfésztől (2) a kommunikációs rendszer és az információ-használó, vagy -feldolgozó, vagy alkalmazó közötti, a vételi végen lévő interfészig tartó összeköttetési útvonal.

End-user. Végfelhasználó. Az információ végső forrása és/vagy felhasználója.

Energy per symbol to noise density ratio. (E_s/N_0) Jel-zaj teljesítmény viszony (E_s/N_0). A csatorna-szimbólumonként kisugárzott átlagos energia és az átlagos zaj teljesítmény viszonyszáma az 1 Hz sávszélességben, rendszerint dB-en kifejezve. Az A-BPSK és A-QPSK esetében egy csatorna-szimbólum egy csatorna-bitnek felel meg.

Equivalent isotropically radiated power (e.i.r.p.) Izotropikusan kisugárzott egyenértékű teljesítmény (e.i.r.p.) Az antennába táplált teljesítmény és az antennának egy megadott irányban az izotróp antennához viszonyított teljesítmény nyeresége *(abszolút vagy izotróp nyereség).*

Forward error correction (FEC). Adat-továbbítási hiba védelem (FEC). A továbbított jel redundáns információval oly módon történő kiegészítésének folyamata, amely lehetővé teszi a továbbításban jelentkező hibák kijavítását a vevőnél.

Gain-to-noise temperature ratio. Nyereség-zaj hőmérsékleti viszonyszám. Az antenna al-rendszer vevő oldali kimenetén az antenna-nyereség és zaj viszonyszáma rendszerint dB/K-ban kifejezve. A zajt annak a hőmérsékletnek az értékeként fejezik ki, amellyel egy 1 Ohm-os ellenállás hőmérsékletének emelkedni kell az ugyanakkora zaj teljesítmény-sűrűség előállításához.

Ground earth station. Földi telepítésű földi állomás (GES). A műholdas állandóhelyű szolgálat, vagy néhány esetben a műholdas légiforgalmi mozgó-szolgálat földi állomása, amelyet egy meghatározott állandó földi helyre telepítenek a műholdas légiforgalmi mozgó-zolgálat részére távkapcsolat nyújtása céljából.

Megjegyzés. – Ezt a meghatározást az ITU Nemzetközi Rádió-Szabályzata a "repülési földi állomás" meghatározásaként használja. A Szabványok és Ajánlott Gyakorlatok-(SARPs)-ban alkalmazott "GES" meghatározásának az a célja, hogy egyértelműen megkülönböztesse ezt egy légijármű fedélzetén elhelyezett földi állomástól (AES), amely egy légijármű fedélzetén lévő mozgó állomás.

Mode S subnetwork. Mód S al-hálózat. A másodlagos légtér-ellenőrző radar (SSR) Mode S kérdező és válaszadó egységek felhasználásával - meghatározott protokolok szerint végzett digitális adatcsere céljára szolgáló eszköz.

Packet. Adatcsomag. Hálózati szintű összeköttetési eszközök közötti adatcsere alapegysége.

Packet layer protocol (PLP). Adatcsomag réteg protokol (PLP). Egyenrangú egységek közötti hálózati szintű összeköttetés létesítésére és fenntartására, valamint adatcsomagok átvitelére szolgáló protokol. Ezen szabványvonatkozásában a hivatkozott kifejezés arra a protokolra vonatkozik, melyet az ISO 8208 szabványban határoztak meg.

Point-to-point. Ponttól-pontig. Két, főképpen végfelhasználói berendezés, egymással való kölcsönös összeköttetéséhez tartozó, vagy arra vonatkozó, két különálló végfelhasználót összekötő szolgáltatás kommunikációs útvonala, megkülönböztetésként a közvetítő- és a több-pontú szolgáltatástól.

Slotted aloha. Időosztásios távközlési csatorna használat. Véletlenszerű hozzáférhetőség stratégiája, ahol több felhasználó egymástól függetlenül férhet hozzá ugyanahhoz az adatátviteli csatornához, de minden összeköttetést egy rögzített résidőre kell korlátozni. Az összes felhasználó ismeri ugyanazon résidő szerkezetet, de egyéb koordináció nincs a felhasználók között.

Switched virtual circuit (SVC). Kapcsolt virtuális áramkör (SVC). Az ISO 8208 protokolon belül szolgáltatott elsődleges áramkör vezérlő eljárás. A hálózati forrásokat dinamikusan kiosztják, amikor szükség van rájuk, és felszabadítják, ha már nincs igény rájuk.

Time division multiplex (TDM). Időosztásos multiplex (TDM). Egy csatorna-megosztási stratégia, amelyben az azonos forrásból származó, de különböző rendeltetési helyű információ-csomagokat időrendben sorba-rendezik ugyanazon a csatornán.

Time division multiplex access (TDMA). Időosztásos multiplex hozzáférés (TDMA). Egy RF csatorna időmegosztásos használatán alapuló, többszörös hozzáférési séma, amely a következőket alkalmazza: (1) diszkrét szomszédos idő-réseket, mint alapvető megosztott forrást; és (2) működő protokolok egy halmazát, amely lehetővé teszi a használók számára, hogy együttműködjenek egy vezérlő irányító állomással a csatorna elérés elősegítésére.

Transit delay. Átviteli késedelem. Az összeállított adatcsomag továbbítására irányuló kérés és a vevő-oldali megfelelő csomag vételére és felhasználására vagy továbbítására való készségre vonatkozó jelzés között eltelt idő, kötegelt adat rendszerekben.

VHF digital link (VDL). VHF (ultrarövidhullámú) digitális összeköttetés. A repülési távközlési hálózat (ATN) alkotó részét képező mozgó al-hálózat, amely a repülési mozgó VHF frekvencia-sávban üzemel. Ezenkívül, a VDL nem-ATN funkciókat is szolgáltat, mint például digitalizált hangot.

2. FEJEZET. ÁLTALÁNOS RÉSZ

(Kidolgozás alatt)

3. FEJEZET. LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT

3.1 MEGHATÁROZÁSOK

1. Megjegyzés. – A következő meghatározásokat az ISO/IEC 7498-1, Information technology – Open Systems Interconnection – Basic Reference Model (Információs technológia – Nyilt rendszerek belső kapcsolás – Alap referencia model) (*Reference: ITU-T Rec. X. 200 (1194) és az ICAO Doc 9705 –* Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN) (Légiforgalmi Távközlési Hálózat Műszaki Előírásai Kézikönyv) *meghatározásaiból vettük.*

2. Megjegyzés. – Az ICAO Doc 9705 több kiadást ért meg. Ennek a dokumentumnak mindegyik alkötete jelezte az előírások alakulását az egymást követő kiadások között.

3. Megjegyzés. – Az ICAO Doc 9705 I. alkötete egy kereszt-hivatkozási grafikont szolgáltat a változatok (azaz beépített szoftver képessége) és kiadványok (azaz műszaki előírások) között.

Accounting management. Forgalmi kezelés**.** Egy olyan rendszer kezelési berendezés, amely a felhasználók hálózati erőforrás felhasználásait kezeli, ellenőrzi és korlátozza az erőforrások felhasználását.

ADS application. ADS alkalmazás. Egy olyan Légiforgalmi Távközlési Hálózati /ATN/ alkalmazás, amely a légijárművektől származó automatikus berendezés-függő légtér-ellenőrző /ADS/ adatokkal látja el a Légiforgalmi Szolgálati /ATS/ Egysége(ke)t, légtérellenőrzési célokra.

Aeronautical administrative communication (AAC). Légiforgalmi igazgatási közlemény-váltás. Repülés-üzemeltető ügynökségek által használt, a repülési és szállítási szolgáltatásaikra vonatkozó üzleti közlemény-váltás. Ezt a közlemény-váltási formát széleskörűen alkalmazzák, mint például la repülési és földi szállításokra, könyvelésre, személyzet és légijármű üzembe-állítására, vagy más logisztikai célokra a teljes repülés üzemeltetés hatékonyságának fenntartása vagy növelése érdekében.

Aeronautical operational control (AOC). Repülés-üzemi járatói felügyelet (AOC). A repülések indítás, folytatása, átirányítása vagy befejezése céljából, azok biztonsága, rendszeressége és hatékonysága érdekében végzett felügyelet ellátásához megkövetelt jártói kapcsolat-tartás.

Aeronautical passanger communication) (APC). Légiutasok távközlése (APC). Nem biztonsági jellegű beszéd- és adat-szolgáltatási kapcsolat-tartás utasok és repülő-hajózó személyzeti tagok részére személyes közlemény váltáshoz.

AIDC application. ATS Egységek közötti automatikus adatcsere (AIDC) alkalmazás. Egy olyan Légiforgalmi Távközlési Hálózati /ATN/ alkalmazás, melynek rendeltetése a Légiforgalmi Irányítás (ATC) Légiforgalmi Szolgálati Egységei (ATSUs) közötti információ cserére szzolgál, a repülési értesítések, a repülés koordináció, az összeköttetés átadása, a légtérellenőrzési adatok továbbítása,valamint általános adatok továbbítása céljára.

Air traffic service. Légiforgalmi szolgálat. (ATS) Gyűjtőfogalom, ami jelenthet repülés-tájékoztató szolgálatot, repülőtéri repülés-tájékoztató szolgálatot, riasztó szolgálatot, légiforgalmi tanácsadó szolgálatot, légiforgalmi irányító szolgálatot (körzeti, bevezető, vagy repülőtéri).

Application. Alkalmazás. Egy információs rendszer végső felhasználása; magától a rendszertől való megkülönböztetésként.

Application entity (AE). Alkalmazási entitás (AE). Az alkalmazási folyamat azon része, amely a Nyílt Rendszerek Összekapcsolásának (OSI) környezetén belül az összeköttetéseket érinti. Egy alkalmazási folyamat szempontjait, amelyeket az OSI céljainál figyelembe kell venni, egy vagy több Alkalmazási Entitás (AE) képviseli.

Application information. Alkalmazási információ. Az alkalmazási nevekre utal (például: az AE /Alkalmazási entitás/ minősítők mint az ADS /Automatikus berendezés-függő légtér-ellenőrző rendszer/ és a CPC), a típus száma és a címzése (a hosszú vagy rövid TSAP, ahogyan szükséges), minden egyes alkalmazásnál.

ATIS application. ATIS alkalmazás. Egy olyan FIS /Repülés-tájékoztató Szolgálati Alkalmazás/, ami alátámasztja a D-ATIS- /Digitális Automatikus Közel-körzeti Tájékoztató Szolgálat/-ot.

ATN directory services (DIR). ATN katalógus szolgáltatás (DIR) Egy szolgáltatás, amely biztosítja egy alkalmazási entitás vagy felhasználó részére azt, hogy az ATN közösségben egy elosztott katalógus adatbázisról lekérdezhessen és visszakereshessen címzési, biztonsági és műszaki képességi információkat az ATN közösségen belüli más felhasználókról és entitásokról.

ATN security services. ATN biztonsági szolgáltatás. A biztonság előírások információs készlete, amely lehetővé teszi a vevő 'végső' állomás vagy közbenső rendszer állomás részére a vett információk forrásának egyértelmű azonosítását (hitelesen), és ezen információk sértetlenségének ellenőrzését.

ATN systems management (SM). ATN rendszer kezelés (SM). Berendezések készlete azon források vezérlésére, koordinálására és ellenőrzésére, amely lehetővé teszi azt, hogy az összeköttetések az ATN rendszerben létrejöjjenek. Ezek a berendezések magukba foglalják a hiba kezelését, az elszámolás, a felépítés kezelést, a teljesítmény kezelését és a biztonsági kezelést.

ATSC class. ATSC osztály. Az ATSC osztály paraméter lehetővé teszi az ATSC használója számára a felkínált adatoknál várható szolgáltatási minőség meghatározását. Az ATSC osztály értéke az ATN végtől-végig való átvitel 95 százalékos valószínűségű késése fogalmával van meghatározva.

ATS communications (ATSC). ATS összeköttetés (ATSC). A légiforgalmi szolgáltatásokkal kapcsolatos összeköttetés, a légiforgalmi szolgáltatások a légiforgalmi irányítást, a repülési és meteorológiai információkat, a helyzet-jelentéseket és a repülés biztonságával, valamint rendszerességével kapcsolatos szolgáltatásokat foglalja magában. Ez az összeköttetés egy vagy több légiforgalmi szolgálati adminisztrációt foglal magában. Ezt a fogalmat címzésekkel kapcsolatos adminisztratív célokra használják.

ATS interfacility data communication (AICD). ATS egységek közötti automatikus adatcsere (AIDC). Automatizált adatcsere légiforgalmi szolgálati egységek között, különösen a repülések koordinációja és átadása vonatkozásában..

ATS message handling services (ATSMHS). ATS közlemény továbbítási eljárások (ATSMHS). Az ATS közlemények ATN-en keresztüli cseréjéhez használt eljárások oly módon, hogy egy ATS közlemény továbbítása általában nem korrelál a szolgálatot nyujtó másik ATS közlemény továbbításával. Két ATS közlemény kezelési szolgálat van, az ATS közlemény-küldő szolgálat és az ATN átmenő szolgálat.

ATS unit (ATSU). ATS egység (ATSU). Gyűjtőfogalom, amely jelenthet légiforgalmi irányító egységet, repülés-tájékoztató egységet vagy légiforgalmi szolgálatok bejelentő irodáját.

Authentication. Hitelesítés. Egy személy/felhasználó/hálózati entitás azonosságának bizto- sítására használt folyamat.

Authorized path. Engedélyezett összeköttetési útvonal. Összeköttetési útvonal, amelyet az adott terület ügyvezetése(i) mint adott forgalom típushoz és kategóriához alkalmasat, előre meghatározott (meghatároztak).

Automatic dependent surveillance (ADS). Berendezés-függő automatikus légtér-ellenőrző rendszer (ADS). Légtér-ellenőrzési mód, amikor egy légijármű adatátviteli csatornán keresztül automatikusan továbbítja a fedélzeti navigációs és helyzet-jelentő rendszerektől származó adatokat, beleértve a légijármű hívójelét, a négy-dimenziós helyzet-tájékoztatást és szükség szerint, egyéb adatokat is.

Automatic terminal information service (ATIS). Automatikus közel-körzeti tájékoztató szolgálat (ATIS). Egész nap, vagy a nap meghatározott részében aktuális, rutin jellegű tájékoztatások biztosítása az érkező és az induló légijárművek részére.

Adat-kapcsolat - Automatikus közel-körzeti tájékoztató szolgálat (D-ATIS). Adat-kapcsolat útján történő ATIS biztosítása.

Beszéd-üzemű - Automatikus közel-körzeti tájékoztató szolgálat. (Beszéd-üzemű ATIS). Folyamatos és ismétlődő, általános adások útján történő ATIS biztosítása.

Configuration management. Konfigurációs kezelési eljárás. ATN rendszer kezelési berendezés a kezelők részére a távirányítású elemek konfigurációinak megváltoztatásához.

Context management (CM) application. Bejelentkezési eljárás. Olyan ATN alkalmazás, amely bejelentkezési szolgáltatást nyújtva, kezdeti légijármű beiktatást, továbbá a légijárműre vonatkozó összes többi adat-kapcsolat alkalmazás jegyzéke beiktatását teszi lehetővé az ATN-be. Magában foglalja továbbá az ATS egységek közötti címzés küldő funkciót.

Megjegyzés. – A bejelentkezési eljárás egy elismert OSI bemutató réteg fogalom. Az OSI használatnak és az ATN használatnak egyébként nincs közös területe.

Context management (CM) server. Bejelentkezési eljárás szerver. Egy olyan Légiforgalmi Szolgálati /ATS/ berendezés, amely képes arra, hogy alkalmazási információt biztosítson más ATSU-kra vonatkozóan légijárműtől, vagy ATSU-tól kérve.

Controller-pilot data link communication (CPDLC). Légiforgalmi irányító és légijármű- vezető közötti digitális adatcsere. A légiforgalmi irányító és a légijárművezető közötti távközlési módszer, ahol az ATC közleményeket adatátviteli összeköttetés segítségével továbbítják.

CPDLC application. CPDLC alkalmazás. Olyan Légiforalmi Távközlési Hálózati /ATN/ alkalmazás, amely eszközt biztosít a légiforgalmi irányítói adat-összeköttetésben az irányító, a vevő vagy a soronkövetkező Légiforgalmi Szolgálati /ATS/ egységek és a légijármű között, a levegő-föld és föld-föld alhálózatokat felhasználva, és ami összeegyeztethető az ICAO szakkifejezésekkel ,a Légiforgalmi Irányítás jelenlegi élőszavas összeköttetéseivel.

Data integrity. Adat sértetlenség. Annak a valószínűsége, hogy az adat nem változik meg, illetve nem sérül meg.

D-METAR. D-METAR. A Digitális Adat-kapcsolaton keresztül biztosított repülési időjárás-jelentő szolgálat jelölésére használatos rövidítés.

End system (ES). Vég-rendszer (ES). Rendszer, amely tartalmazza az OSI hét rétegét és egy vagy több végső felhasználó alkalmazási folyamatot foglal magába.

End to end. Végpontttól-végpontig. Teljes kommunikációs úthoz tartozó vagy arra vonatkozó, tipikusan (1) az információ-forrás és a kommunikációs rendszer közötti, az átviteli végen lévő interfésztől (2) a kommunikációs rendszer és az információ használó vagy feldolgozó, illetve alkalmazó közötti, a vételi végen lévő interfészig tartó összeköttetési útvonal.

Entity. Entitás**.** Aktív elem bármely rétegben, amely lehet vagy egy szoftver entitás (mint például egy folyamat) vagy egy hardver entitás (mint például egy intelligens input-output chip).

Fault management. Meghibásodás kezelés. Egy olyan Légiforgalmi Távközlési Hálózati /ATN/ rendszer kezelő berendezés, amely érzékeli, elkülöníti és kijavítja a problémákat.

FIS application. Repülés-tájékoztató Szolgálati /FIS/ alkalmazás. Egy olyan Légiforgalmi Távközlési Hálózat /ATN/ alkalmazás, amely a légijárművek részére tájékoztatásokat és hasznos tanácsokat biztosít a repülések biztonságos és eredményes lefolytatásához.

Flight information service. **(FIS)** Repülés-tájékoztató Szolgálat (FIS). Olyan szolgálat, amelyet a repülések biztonságos és hatékony végrehajtásához hasznos tanácsok és tájékoz- tatások adása céljából nyújtanak.

Inter-centre communications (ICC) Központok közötti digitális közlemény-váltás (ICC). Az ICC az ATS egységek közötti adat-kapcsolati összeköttetést jelent, az ATS támogatása érdekében olyan területeken, mint például repülésekről szóló előzetes tájékoztatás, koordinálás, irányítás-átadás, repüléstervezés, légtér-gazdálkodás és légiforgalmi áramlás- szervezés.

Intermediate system (IS). Közbenső rendszer. Rendszer, amely átviteli és útvonalazási funkciót lát el és az OSI referencia model legalsó három rétegére szorítkozik.

Internet communications service. Hálózatok közötti távközlési szolgáltatás. A hálózatok közötti távközlési szolgáltatás egy hálózatközi architektúra, amely lehetővé teszi földi, levegő-föld és repülés-elektronikai alhálózatok együttműködését közös interfész szolgálatok és protokolok elfogadásával az ISO/OSI referencia model alapján.

METAR application. METAR alkalmazás. Egy olyan Repülés-tájékoztatási Szolgálati /FIS/ alkalmazás, amely alátámasztja a. D-METAR közlemények továbbítását.

Open systems interconnection (OSI) reference model. Nyílt rendszerek (OSI) referencia model. Model, amely szabvány megközelítést szolgáltat a hálózat tervezéshez, modularitást bevezetve a funkciók komplex együttesének hét jobban kezelhető, önálló funkcionális rétegre osztásával. Ezeket egyezményesenn általában függőlegesen rakott halmazként írják le.

Megjegyzés – Az OSI referencia modelt az ISO/IEC 7498-1 határozza meg. .

Performance management. Teljesítmény felügyelet. Egy Légiforgalmi Távközlési Hálózati /ATN/ rendszer felügyelő berendezés, amely ellenőrzi és kiértékeli a rendszer teljesítményét.

Subnetwork. Alhálózat. Az adathálózat tényleges megvalósítása, amely homogén protokolt és címzés-tervet alkalmaz és egyetlen hatóság irányítása alatt áll.

System level requirement. Rendszerszint követelmény. A rendszerszint követelmény egy magasszintű műszaki követelmény, amely üzemelési követelményekből, technológiai korlátozásokból és szabályozási korlátozásokból (adminisztratív és intézményi) van levezetve. A rendszerszint követelmények szolgálnak alapul a funkcionális követelményekhez és az alacsonyabb szintű követelményekhez.

Transit delay. Átviteli késedelem. Köteg adat-rendszerekben egy összeállított adat-köteg továbbítására irányuló kérés és a vevő oldal arra vonatkozó jelzése között eltelt idő, hogy a hozzátartozó köteget vette és felhasználásra vagy továbbításra kész.

Upper layers (UL) communications service. Felső rétegű (UL) kommunikációs szolgáltatás. Az OSI referencia model gyűjtő, bemutató és alkalmazó rétegeihez tartozó fogalom.

3.2 BEVEZETÉS

3.2.1 A Légiforgalmi Távközlési Hálózat (ATN) olyan alkalmazási entitásokat és összeköttetési szolgáltatásokat foglal magába, amelyek lehetővé teszik a földi, levegő-föld és repülési adat alhálózatok részére a Nemzetközi Szabványügyi Szervezet (ISO) Nyílt Rend- szerek (OSI) összeköttetési referencia modeljén alapuló közös interfész szolgáltatásainak és protokoljainak együttműködését. Az ATN koncepcionális modeljét a 3-1.* ábra mutatja be.

* Az összes ábra ennek a fejezetnek a végén található.

3.2.2 A Légiforgalmi Távközlési Hálózat /ATN/ és a hozzá kapcsolódó alkalmazási folyamatok úgy vannak tervezve, hogy alátámasszák az összeköttetést, a navigációt, a légtér-ellenőrzést és légiforgalmi szolgáltatás szervezési (CNS/ATM) rendszereket. A Légiforgalmi Távközlési Hálózat /ATN/:

a) kifejezetten és kizárólagosan arra a célra szolgál, hogy összeköttetési szolgáltatást biztosítson a légiforgalmi szolgáltatásokat biztosító szervezeteknek és a légijármű üzemeltető cégeknek, az összeköttetési forgalom következő típusain keresztül:

1) a Légiforgalmi Szolgálatok összeköttetései (ATSC);

2) a Repülés-üzemi járatói felügyelet (AOC);

3) a Légiforgalmi igazgatási közlemény-váltás (AAC); és

4) a légiutasok távközlése (APC);

b) a felhasználó számára átlátható módon biztosítja azt a megbízható végpontból-végpontig összeköttetési szolgáltatást, amely a légiforgalmi szolgálatok között a biztonságos és hatékony ellátás alátámasztásához szükséges, az alábbiak között:

1) a légijármű fedélzeti rendszerek és a földi rendszerek; valamint

2) az összetett földi rendszerek között;

c) olyan adat-összeköttetési szolgáltatást nyújt, amely alkalmas a felhasználók biztonsági és biztonságossági követelményeinek teljesítésére;

d) nemzetközileg elismert adat-összeköttetési szabványokon alapul, amely meg fogja könnyíteni a jól alkalmazkodó rendszerek fejlesztését, és támogatja a versenyképes hálózati szolgáltatás biztosítását;

e) eltérő szolgáltatási típusokat/kategóriákat/osztályokat foglal magába (beleértve az előnyben részesített/kiválasztott levegő-föld alhálózatokat), olyanokat, amilyeneket a különböző alkalmazások megkívánnak;

f) meghatároz egy olyan felépítést, ami lehetővé teszi a nyilvános és a magán alhálózatok integritását, mind a levegő-föld, mind a föld-föld összeköttetésekre. Ez lehetővé teszi a meglévő/tervezett infrastruktúra és hálózati technológia felhasználását, valamint megadja a kivitelezőknek a hálózat méretének
megvalósításához úgy, hogy a növekvő felhasználói igények kielégíthetőek; és

g) hatékonyan használja fel a sávszélesség korlátozott levegő-föld alhálózatot és annak megfelelően csökkenti a költségeket.

3.2.3 A jelenleg meghatározott Légiforgalmi Távközlési Hálózati /ATN/ alkalmazások úgy kerültek kidolgozásra, hogy biztosítják a légiforgalmi összeköttetéseket, a légtérellenőrzést és a tájékoztató szolgálatokat. Ezek az alkalmazások a következő légiforgalmi szolgáltatás szervezési feladatok alátámasztására szolgálnak:

a) Légiforgalmi szolgálatok (ATS);

1) Légiforgalmi irányító szolgálat (ATC);

2) Repülés-tájékoztató szolgálat (FIS); és

3) Riasztó szolgálat;

b) Légiforgalmi áramlás-szervezés (ATFM); és

c) Légtér-szervezés.

3.2.4 Ez a fejezet a Légiforgalmi Távközlési Hálózat /ATN/ átfögó és általános előírásait foglalja magába. A részletes műszaki előírások a Doc 9705-ben találhatók. Ennek a fejezetnek a fennmaradó része a következő követelmények és funkciók ismertetéséhez szervezett:

a) általános;

b) rendszerszint követelmények;

c) ATN alkalmazási követelmények;

d) ATN összeköttetési szolgáltatási követelmények;

e) ATN elnevezés és címzés;

f) ATN rendszer kezelési követelmények; és

g) ATN biztonsági követelmények.

3.3 ÁLTALÁNOS RÉSZ

3.3.1 A Légiforgalmi Távközlési Hálózat (ATN) adat-összeköttetési szolgáltatást és alkalmazási entitásokat kell biztosítania az alábbiak alátámasztására:

a) a Légiforgalmi szolgálatok (ATS) közvetítése a légijárművek részére;

b) ATS információk cseréje az ATS egységek között; és

c) egyéb alkalmazások, mint például repülés-üzemi járatói felügyelet (AOC) és légiforgalmi igazgatási közlemény-váltás (AAC).

1. Megjegyzés. – Gondoskodni kell az olyan információ-csere befogadásáról, mint például az dőjárás, a repülési tervek, a NOTAM-ok és a tényleges valós-idejű légiforgalmi áramlás-szervezés a légijárműveket üzemeltető ügynökségek /járatók/ földi-bázisú rendszerei és az ATS egységek között.

2. Megjegyzés. – Gondoskodni kell a légiutasok összeköttetési (APC) rendszerének befogadásáról is.

3.3.2 Amikor az ATN-t a légiforgalmi szolgálatok alátámasztására használják, akkor meg kell, hogy feleljen az ebben a fejezetben lévő előírásoknak.

3.3.3 A Légiforgalmi Távközlési Hálózat /ATN/ használatára vonatkozó követelményeket a körzeti léginavigációs egyezmények alapján kell előírni.

3.3.4 **Ajánlás.** – *A polgári repülési hatóságoknak kell koordinálni a nemzeti hatóságokkal és a légiforgalmi berendezés gyártó iparral azokat a Légiforgalmi Távközlési Hálózati /ATN/ kivitelezési szempontokat, amelyek lehetővé fogják tenni az ATN világméretű biztonságát, együttműködő-képességét és hatékony felhasználását, ahogy megfelelő.*

3.4 RENDSZERSZINT KÖVETELMÉNYEK

Megjegyzés. – A rendszerszint követelmények magasszintű műszaki követelmények, amelyek az üzemeltetési követelményekből, a technológiai korlátozásokból és szabályozási korlátozásokból (adminisztratív és intézményi) származtattak. Ezek a rendszerszint követelmények képezik az alapját a funkcionális követelményeknek és az alacsonyabb szintű követelményeknek.

3.4.1 Az ATN-nél a Nemzetközi Szabványügyi Szervezetnek (ISO) a Nyílt rendszerek összekapcsolására (OSI) vonatkozó szabványait kell alkalmazni.

3.4.2 Az ATN-nek egy eszközt kell biztosítani az átmenet megkönnyítéséhez az alkalmazás entitások és/vagy az összeköttetési szolgáltatások jövőbeli változataihoz.

Megjegyzés. – Az a cél, hogy a jövőbeli változatok felé történő fejlődés a visszafelé való kompatibilitást az előző változatokka biztosítsa.

3.4.3 Az ATN-nek ehetővé kell tennie a jelenlegi AFTN/CIDIN felhasználók és rendszerek átmenetét az ATN felépítésbe.

Megjegyzés. – Az AFTN-ről vagy a CIDIN-ből az átmenet a Légiforgalmi Távközlési Hálózatba /ATN/ azok az AFTN/AMHS és a CIDIN/AMHS kapuk kezelik /AMHS= Légiforgalmi Szolgálatok Közlemény-kezelő Szolgáltatás/ külön-külön, amelyek a Doc 9705, III. Al-kötetében vannak meghatározva.

3.4.4 Az ATN-nél olyan intézkedéseket kell hozni, amelyek által csak az irányító Légiforgalmi Szolgálati /ATS/ egység adhat Légiforgalmi irányítási /ATC/ utasításokat a légtérben üzemelő légijárművek részére.

Megjegyzés. – Ez a légiforgalmi irányító és a légijármű-vezető közötti digitális adatcsere (CPDLC) összeköttetés alkalmazási adat-kapcsolat entitás folyamatos adat-jogosultságon és a soronkövetkező egység adat-jogosultságon keresztül kerül elérésre.

3.4.5 A Légiforgalmi Távközlési Hálózatnak /ATN/ előre meghatározott továbbítási útvonal listán alapuló továbbítási útvonalakat kell biztosítani.

3.4.6 Az ATN-nek eszközt kell biztosítania ahhoz, hogy meghatározza azt, hogy az adat-összekötetést csak a felhasználó által meghatározott forgalom fajtához és kategóriához jogosított útvonalon keresztül lehessen végrehajtani.

3.4.7 Az ATN-nek ATSC osztályzatot kell felkínálnia a 3-1.* táblázatban lévő követelményekkel összhangban.

* Az összes táblázat a fejezet végén került elhelyezésre.

1. Megjegyzés. – Amikor egy Légiforgalmi Távközlési Hálózati /ATN/ alkalmazás meghatároz egy ATSC osztályzatot, akkor az adat-csomagot az ATN internet összeköttetési szolgálatba "a legjobb erőfeszítési alapon" kell elküldeni. A "legjobb erőfeszítési alap" azt jelenti, hogy amikor egy útvonal az ATSC osztály részére rendelkezésre áll, akkor az adat-csomagot azon az útvonalon kell továbbítani. Amikor az ilyen továbbítási útvonal nem áll rendelkezésre, akkor az adat-csomagot az első olyan ismert útvonalon kell továbbítani, amelynek az ATSC osztályzata magasabb a kért útvonalnál, vagy ha nincs ilyen útvonal, akkor az ATSC osztályzatnál a kértnél alacsonyabb első ismert útvonalon kell továbbítani.

2. Megjegyzés. – Az ATN összeköttetési szolgálat nem fogja tájékoztatni az alkalmazási entitásokat akkor, ha a kért ATSC osztály nem volt elérhető. Az alkalmazási entitás felelőssége az, hogy meghatározza azt a tényleges átviteli késedelmet, amelyet helyi eszközökkel, például idő-bélyegzéssel lehet megállapítani.

3.4.8 Az ATN-nek a 3-2. és 3-3. táblázatban meghatározott közlemény elsőbbségnek megfelelően kell működnie.

3.4.9 Az ATN-nek eleget kell tennie az alkalmazási információk cseréjének, amikor egy vagy több jogosult vonala rendelkezésre áll.

3.4.10 Az ATN-nek értesítenie kell a megfelelő alkalmazási folyamatot, amikor nem áll rendelkezésre jogosult vonala.

3.4.11 Az ATN-nek egy eszközt kell biztosítania ahhoz, hogy egyértelműen megcímezze az összes ATN végponti és közbenső rendszert.

3.4.12 A Légiforgalmi Távközlési Hálózatnak lehetővé kell tennie a közlemény vevője részére azt, hogy azonosítsa a közlemény feladóját.

3.4.13 Az ATN címzési és elnevezési tervének lehetővé kell tennie azt az Államok vagy a szervezetek számára, hogy a saját adminisztratív területeiken belül címeket és elnevezéseket jelöljenek ki.

3.4.14 Az ATN-nek fenn kell tartania az adat-összeköttetést az állandóhelyű és a mozgó szolgálati rendszerekkel.

3.4.15 Az ATN-nek biztosítania kell az ATN mozgó szolgálati hálózatával a kapcsolatot úgy, ahogy az ebben az Annex-ben meghatározásra került.

3.4.16 Az ATN-nek gondoskodnia kell arról, hogy hatékonyan felhasználja a korlátozott sávszélességű alhálózatokat.

3.4.17 Az ATN-nek lehetővé kell tennie azt, hogy egy légijármű fedélzeti közbenső rendszer összekapcsolásra kerüljön egy földi közbenső rendszerrel az együtt-futó mozgó szolgálati alhálózatokon keresztül.

3.4.18 Az ATN-nek lehetővé kell tennie azt, hogy egy légijármű fedélzeti közbenső rendszer összekapcsolásra kerüljön az összetett földi közbenső rendszerekkel.

3.4.19 Az ATN lehetővé kell tennie az alkalmazási entitások közötti címzés információk cseréjét.

3.4.20 A Légiforgalmi Távközlési Hálózatnak alá kell támasztania a Bejelentkezési Eljárás (CM) kezelési alkalmazást akkor, ha más levegő-föld alkalmazásokat is alátámaszt.

3.4.21 Az ATN-nek képesnek kell lenni a társ-társ alkalmazás összekapcsolására, fenntartására, felszabadítására és megszüntetésére a bejelentkezési eljárás (CM) alkalmazásnál.

3.4.22 Az ATN-nek képesnek kell lenni pártól-párig alkalmazás együttesek létrehozására, fenntartására, felszabadítására és megszüntetésére az automatikus függő légtérellenőrzés (ADS) alkalmazásnál.

3.4.23 Az ATN-nek képesnek kell lenni a társ-társ alkalmazás összekapcsolására, fenntartására, felszabadítására és megszüntetésére az légiforgalmi irányító-légijárművezető közötti digitális adatcsere (CPDLC) alkalmazásnál.

3.4.24 Az ATN-nek képesnek kell lenni a társ-társ alkalmazás összekapcsolására, fenntartására, és megszüntetésére az automatikus közel-körzeti tájékoztató szolgálat (ATIS) alkalmazásnál.

3.4.25 Az ATN-nek képesnek kell lenni a társ-társ alkalmazás összekapcsolására, fenntartására, felszabadítására és megszüntetésére az légiforgalmi szolgálatok közleményeit kezelő szolgáltatás (ATSMHS) alkalmazással.

3.4.26 Az ATN-nek képesnek kell lenni a társ-társ alkalmazás összekapcsolására, fenntartására, felszabadítására és megszüntetésére az ATS egyégek közötti adat-csere (AIDC) alkalmazásnál.

3.4.27 Ahol az ATN-en belül a napra a pontos időt használják, ott annak az Egyeztetett Világidőhöz (UTC) 1 másodpercen belüli pontosságúnak kell lenni.

Megjegyzés. – Az idő pontossági érték a meghatározott pontossági értéknek legfeljebb a kétszeresével egyenlő szinkronizációs hibát eredményezhet.

3.4.28 A végrendszernek gondoskodnia kell annak biztosításáról, hogy annak valószínűsége, hogy nem észlel egy 255 oktettes közleményt, amelyet a hálózatok közötti távközlési szolgáltatásban (internet) rossz helyre továbbított, nem továbbított, vagy elrontott, kisebb vagy egyenlő legyen 10^{-8}-nal közleményenként.

Megjegyzés. – Elfogadott az, hogy a Légiforgalmi Távközlési Hálózat alhálózatai biztosítják az adatok azon sérthetetlenségét, amely a rendszerszint követelménnyel összeegyeztethető.

3.4.29 Az ATN védelmi szolgálata ATN vég-rendszerének képesnek kell lennie arra, hogy a társ-végrendszer azonosságot hitelesítse, az alkalmazási közlemények forrását azonosítsa, és az alkalmazási közlemények adat-sértetlenségét biztosítsa.

Megjegyzés. – Az alkalmazás közlemények ebben az összefüggésben a Légiforgalmi Szolgálatokra /ATS/, rendszer kezelésre és az igazgatási szolgálatokra vonatkozik.

3.4.30 ATN földi és levegő-föld határvonal közbenső rendszer ATN védelmi szolgálatának képesnek kell lennie a társ-közbenső rendszer azonosságának hitelesítésére, a továbbítási útvonal információs forrásának hitelesítésére, és a továbbítási útvonal információk adat integritásának biztosítására.

3.4.31 Az ATN-nek képesnek kell lennie a társ-társ alkalmazás összekapcsolására, fenntartására, felszabadítására az igazgatási tájékoztatások közlemény-cseréjéhez kapcsolódóan.

3.4.32 Egy Légiforgalmi Távközlési Hálózat rendszer kezelést alátámasztó ATN rendszernek elő kell segítenie az ATN üzemeltetés fokozott folyamatosságát, beleértve az összeköttetési szolgáltatás ellenőrzését és minőségének fenntartását.

3.4.33 Az ATN-nek képesnek kell lennie a Rendszer kezelés (SM) alkalmazás össze- kapcsolására, fenntartására, felszabadítására és megszűntetésére a társ-társ alkalmazásokhoz kapcsolódóan.

3.4.34 Az ATN-nek képesnek kell lennie a repülési rutin időjárás-jelentő szolgálat (METAR) alkalmazás összekapcsolására, fenntartására, felszabadítására és megszűntetésére a társ-társ alkalmazásokhoz kapcsolódóan.

3.5 A LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT /ATN/ ALKALMAZÁSI KÖVETELMÉNYEI

1. Megjegyzés. – ATN alkalmazás(ok) megvalósítása egy Államon vagy egy körzeten belül nem vonja maga után az összes, az alábbiakban meghatározott ATN alkalmazás megvalósítását.

2. Megjegyzés. – Az ATN alkalmazásnak egy előre-meghatározott részegysége műszaki előírásainak megvalósítása úgy megengedett, ahogyan az a Doc 9705-ben részletesen meghatározott.

3.5.1 Rendszer alkalmazások

Megjegyzés. – Rendszer alkalmazások olyan szolgáltatásokat biztosítanak, amelyek a Légiforgalmi Távközlési Hálózat /ATN/ levegő-föld alkalmazásainak, föld-föld alkalmazásainak és/vagy az ATN összeköttetési szolgálatok működéséhez szükségesek.

3.5.1.1 A BEJELENTKEZÉSI ELJÁRÁS (CM) ALKALMAZÁS

Megjegyzés. – A Bejelentkezési eljárás /CM/ alkalmazás biztosítja egy légijármű részére azt a lehetőséget, hogy egy Légiforgalmi Szolgálati /ATS/ földi rendszerhez bejelentkezzen; bizonyos essetekben a földi rendszer fogja kérni a légijárműtől, hogy vegye fel az összeköttetést egy meghatározott földi rendszerrel. Miután a megfelelő kapcsolat létrejött, a Bejelentkezési eljárás /CM/ biztosítja az információ-cserét minden egyes alátámasztott ATN alkalmazás részére, beleértve az egyes hálózati címzéseket is, ahogy megfelelő. A védelmi szolgálatot alátámasztó ATN rendszerekre a CM biztosítja az adat-csere kulcsot és a kulcs kezelési információt is. A CM biztosítja még a bejelentkezési információ felfrissítésének lehetőségét is, és egy ATS földi rendszer részére azt a képességet, hogy továbbítsa a bejelentkezési információt egy másik ATS földi rendszerhez. A CM bejegyezteetési funkciója teszi lehetővé az információknak a földön vagy a légijárművön lévő további alkalmazásaival való megosztási lehetőséget.

3.5.1.1.1 A Légifogalmi Távközlési Hálózatnak képesnek kell lennie a következő Bejelentkezési eljárás /CM/ alkalmazási feladatok ellátására:

a) bejelentkezés;

b) kapcsolat felvétel;

c) adat-felfrissítés;

d) CM szerver lekérdezés;

e) CM szerver felfrissítés;

f) földi továbbítás; és

g) bejegyeztetés.

Megjegyzés. – A CM alkalmazásra vonatkozó műszaki előírások a Doc 9705, II. Alkötetében vannak meghatározva.

3.5.1.2 LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT /ATN/ KATALÓGUS SZOLGÁLTATÁS (DIR)

3.5.1.2.1 Az ATN-nek képesnek kell lennie a következő DIR alkalmazás funkciók alátámasztására:

a) katalógus összeállítás;

b) ja katalógus információ visszakeresése; és

c) a katalógus információ cseréje.

1. Megjegyzés. – Az ATN Katalógus Szolgáltatás lehetőséget biztosít egy alkalmazás vagy egy felhasználó részére, hogy lekérdezze az elosztott katalógus adatbázist és, hogy visszakeresse a címzési, védelmi és műszaki lehetőségi tájékoztatásokat. A Katalógus Szolgáltatás (DIR) lehetőséget biztosít a meghatározott és jogosított felhasználók részére, hogykiegészítsék, töröljék és módosítsák a katalógus adatbázis részeit, azokat amelyekért felelősek. A Katalógus Szolgáltatás az ATN-en keresztül az összes olyn alkalmazás és felhasználó részére "felajánlott", aki eleget tesz a Doc 9705, VII. Alkötet műszaki előírásainak.

2. Megjegyzés. – A katalógus hozzárendelés feladata az, hogy társítást hozzon létre két olyan katalógus összetevő között, amelyek a további katalógus funkciókat támasztják alá. A katalógus hozzárendelés állítja fel az alkalmazási összefüggést és az egyéb katalógus funkciók használatának összeköttetési kapcsolata alapjául szolgál.

3.5.1.3 EGYÉB RENDSZER ALKALMAZÁSOK

(Kidolgozás alatt)

3.5.2 Levegő-föld alkalmazások

Megjegyzés. – A levegő-föld alkalmazások földi összetevői foglalják magukba azokat a rendszereket, amelyek a levegő-föld közlemények tartalmát továbbítják a föld-föld összeköttetési vonalakon.

3.5.2.1 AUTOMATIKUS BERENDEZÉS-FÜGGŐ LÉGTÉR-ELLENŐRZŐ RENDSZER (ADS) ALKALMAZÁS

Megjegyzés. – Az ADS alkalmazást egy légijármű fedélzeti és egy földi rendszer alkotja. A légijármű fedélzeti ADS alkalmazási képes arra, hogy a Léégiforgalmi Távközlési Hálózat /ATN/ összeköttetési szolgálatán keresztül automatikusan továbbítsa a földi rendszer részére az adatokat a fedélzeti navigációs rendszerekből. (pl. légijármű azonosítót, a négy-dimenziós helyzetet, a szándékot és kiegészítő adatokat, ahogy szükséges). Az ADS alkalmazás a szolgáltatást azokon a kapcsolatokon keresztül biztosítja, amelyek a rendszer levegőbeni és földi egységei között létrejönnek (azaz igény kapcsolat, szakaszosan ismétlődő kapcsolat, esemény kapcsolat és kényszerhelyzeti kapcsolat) és a két ADS földi rendszer között (azaz a soronkövetkező egységgel való kapcsolat).

3.5.2.1.1 A Légiforgalmi Távközlési Hálózat-/ATN/-nek képesnek kell lenni a következő ADS alkalmazások alátámasztására:

a) igény kapcsolatok;

b) szakaszosan ismétlődő kapcsolatok;

c) esemény kapcsolatok;

d) kényszerhelyzeti kapcsolatok; és

e) a soronkövetkező egységgel való kapcsolatok

Megjegyzés. – A Berendezés-függő Automatikus Légtér-ellenőrző Rendszer /ADS/ alkalmazásra vonatkozó műszaki előírások a Doc 9705, II. Alkötetében vannak meghatározva.

3.5.2.2 LÉGIFORGALMI IRÁNYÍTÓ ÉS LÉGIJÁRMŰVEZETŐ KÖZÖTTTI DIGITÁLIS ADAT-KAPCSOLAT (CPDLC) ALKALMAZÁS

Megjegyzés. – A CPDLC alkalmazást egy légijármű fedélzeti és egy földi rendszer alkotja, és ezek lehetőséget biztosítanak az adat-kapcsolati összeköttetésekre a Légiforgalmi Szolgálati /ATS/ egységek és az irányításuk alatt álló légijárművek között és/vagy azon légijárművekkel, amelyek az irányításuk alá kerülnek. A CPDLC alkalmazás rendelkezik azzal a képességgel, hogy létrehozza, kezelje és befejezze a CPDLC dialógusokat a légiforgalmi irányító - légijárművezető közlemény-váltásokban és a földi közlemények továbbításában.

3.5.2.2.1 A Légiforgalmi Távközlési Hálózat-/ATN/-nek képesnek kell lennie az alábbi CPDLC alkalmazási funkciók alátámasztására:

a) légiforgalmi irányító - légijárművezető közötti közlemény-váltás;

b) az adat jogosultság átadása;

c) a soronkövetkező irányítási engedély kérése; és

d) adat-továbbítás a föld felé.

Megjegyzés. – A CPDLC alkalmazásra vonatkozó műszaki előírások a DOC 9705, II. Alkötetében vannak meghatározva.

3.5.2.3 REPÜLÉS-TÁJÉKOZTATÓ SZOLGÁLATI (FIS) ALKALMAZÁS

Megjegyzés. – A FIS alkalmazások repülés-tájékoztató szolgálatot biztosít a légtér felhasználók részére a földi FIS rendszerektől.

3.5.2.3.1 AUTOMATIKUS KÖZEL-KÖRZETI TÁJÉKOZTATÓ SZOLGÁLAT (ATIS) ALKALMAZÁS

3.5.2.3.1.1 A Légiforgalmi Távközlési Hálózat-/ATN/-nek képesnek kell lenni a következő ATIS alkalmazás funkciók alátámasztására:

a) légijármű által kezdeményezett FIS igény kapcsolatok;

b) légijármű által kezdeményezett FIS adat-felfrissítési kapcsolatok; és

c) mindkét irányú, mind a légijármű, mind a föld által kezdeményezett FIS kapcsolatok törlése.

Megjegyzés. – Az ATIS alkalmazásokra vonatkozó műszaki előírások a Doc 9705, II. Alkötetében vannak meghatározva.

3.5.2.3.2 REPÜLÉSI RUTIN IDŐJÁRÁS-JELENTÉSI SZOLGÁLAT (METAR) ALKALMAZÁS

3.5.2.3.2.1 A Légiforgalmi Távközlési Hálózat-/ATN/-nek képesnek kell lennie a légijármű által kezdeményezett FIS igény kapcsolat esetén a METAR alkalmazási funkció alátámasztására.

Megjegyzés. – A METAR alkalmazásra vonatkozó műszaki előírások a Doc 9705, II. Alkötetében vannak meghatározva.

3.5.2.3.3 EGYÉB FIS ALKALMAZÁSOK
(Kidolgozás alatt.)

3.5.2.4 EGYÉB LEVEGŐ-FÖLD ALKALMAZÁSOK
(Kidolgozás alatt.)

3.5.3 Föld-föld közötti alkalmazások

Megjegyzés. – A föld-föld közötti alkalmazások úgy vannak meghatározva, mint Légiforgalmi Távközlési Hálózati /ATN/ alkalmazások, az azokban a földi bázisú rendszerekben lévő azon alkalmazások, amelyek kizárólag csak azokkal a társ- alkalmazásokkal cserélnek információt, amelyek szintén a földi rendszerekben vannak.

3.5.3.1 KÖZPONTOK KÖZÖTTI DIGITÁLIS KÖZLEMÉNY-VÁLTÁS (IIC)

Megjegyzés. – A központok közötti digitális közlemény-váltás alkalmazások teszik lehetővé a légiforgalmi szolgálati egységek közötti információ-cserét.

3.5.3.1.1 LÉGIFORGALMI SZOLGÁLATI /ATS/ EGYSÉGEK KÖZÖTTI AUTOMATIKUS ADAT-CSERE (AIDC)

Megjegyzés. – Az AIDC egy olyan ATN alkalmazás, amely két légiforgalmi szolgálati egység között használatos a Légiforgalmi Szolgálati /ATS/ információk cseréjére: az aktív repülésre vonatkozó repülési jelentésekre, a repülés koordinációra, az irányítás átadására, a légtér-ellenőrzési adatokra és a szabad (szerkesztetlen) szöveg adatokra vonatkozóan.

3.5.3.1.1.1 A Légiforgalmi Távközlési Hálózat-/ATN/-nek képesnek kell lennie az alábbi AIDC alkalmazás funkciók alátámasztására:

a) repülési jelentések;

b) repülés koordináció;

c) az irányítás átadása;

d) az összeköttetés átadása;

e) a légtér-ellenőrzési adatok átadása; és

f) általános adatok átadása.

Megjegyzés. – Az AIDC alkalmazásra vonatkozó műszaki követelmények a Doc 9705. III. Alkötetében vannak meghatározva.

3.5.3.2 A LÉGIFORGALMI SZOLGÁLATOK /ATS/ KÖZLEMÉNY TOVÁBBÍTÁSI ELJÁRÁSAI (ATSMHS) ALKALMAZÁSOK

Megjegyzés. – Az ATS közlemény továbbítási eljárások (ATSMHS) alkalmazások egy fő funkciót foglalnak magukba, név szerint az ATS közlemény szolgáltatás funkciót. Az ATS közlemény szolgáltatási funkció lehetővé teszi azt, hogy a közlemények cseréje a szolgáltatás felhasználók között megtörténjen az általános közlemény szolgáltatások által. Az ATSMHS alkalmazás magába foglalja az AFTN/ATN és CIDIN/ATN kapuk meghatározását.

3.5.3.2.1 Az ATN-nek képesnek kell lenni az ATS közlemény továbbítási eljárásai (ATSMHS) alkalmazásban az ATS közlemény szolgáltatások alátámasztására.

Megjegyzés. – Az ATSMHS alkalmazásra vonatkozó műszaki követelmények a Doc 9705, III. Alkötetében vannak meghatározva.

3.5.3.3 EGYÉB FÖLD-FÖLD ALKALMAZÁSOK

(Kidolgozás alatt.)

3.6 AZ ATN TÁVKÖZLÉSI SZOLGÁLTATÁS KÖVETELMÉNYEI

Megjegyzés. – Az ATN Távközlési Szolgáltatás követelményei meghatározzák a Nyílt Rendszerek /OSI/ referencia model 3-tól 6-ig terjedő rétegei, valamint a 7. réteg egy része iránti követelményeket. Ezek a szolgálatok veszik át az egyes ATN alkalmazások által létrehozott egy-egy információt és hajtják végre a végponttól-végpontig összeköttetési szolgálat feladatát a szabvány protokolok felhasználásánál felhasználásával?. Ezek az összeköttetési szolgáltatási követelmények két részre vannak osztva. A felső réteg össze- köttetési szolgálatok határozzák meg a Szabványokat az 5-7 rétegre. Az 1. és 2. rétegekre vonatkozó követelmények az ATN Szabványok és Ajánlott Gyakorlatok /ATN SARPs/ tárgykörén kívül esnek.

3.6.1 Felső rétegű összeköttetési szolgáltatás

3.6.1.1 A felső réteg összeköttetési szolgáltatás magába kell, hogy foglalja:

a) a gyűjtő réteget;

b) a bemutató réteget;

c) az alkalmazási entitás szerkezetet;

d) az összekapcsolás irányító szolgálati elemet (ACSE);

e) a védelmi alkalmazás szolgáltatási célt (ASO) az ATN rendszert alátámasztó védelmi szolgáltatáshoz; és

f) vezérlő műveletet (CF).

1. Megjegyzés. – Az ATSMHS alkalmazás - az ATS közlemény szolgáltatási funkció kivételével - az összes ATN alkalmazás felső réteg össszeköttetési szolgáltatásra vonatkozó műszaki előírások a Doc 9705, IV. Alkötetében vannak meghatározva.

2. Megjegyzés. – Az ATSMHS alkalmazás ATS közlemény szolgáltatási funkcióra vonatkozó felső réteg összeköttetési szolgáltatás műszaki előírása a Doc 9705, III. Al- kötetében vannak meghatározva.

3.6.2 Légiforgalmi Távközlési Hálózat /ATN/ Hálózatok közötti távközlési szolgáltatás /Internet/

Megjegyzés. – Az ATN Internet szolgáltatási követelmények azokra a végponti rendszerekre és a közbenső rendszer funkcionális entitásaira alkalmazhatók, amelyek együtt az ATN Internet összeköttetési szolgáltatást biztosítják. Az ATN Inernet összeköttetési szolgáltatás a felhasználók részére (azaz a felső rétegekhez) a szállítási réteg szolgáltatás interfészen kresztül van biztosítva.

3.6.2.1 Az ATN vég-rendszernek (ES) képesnek kell lennie az ATN Internet alátámasztására, beleértve a:

a) szállítási réteget; és

b) a hálózati réteget is.

3.6.2.2 Egy ATN közbenső rendszernek (IS) eleget kell tennie az ATN hálózati réteg előírásoknak úgy, ahogy az érintett ATN közbenső rendszer megfelelő osztályzatának megfelel.

Megjegyzés. – Az ATN közbenső rendszer különböző osztályzatainak száma, amelyre a hálózat réteg profilok meg vannak határozva, a Doc 9705, V. Alkötetében találhatók.

3.7 A LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT /ATN/ ELNEVEZÉSI ÉS CÍMZÉSI KÖVETELMÉNYEI

Megjegyzés. – Az ATN elnevezési és címzési vázlat-tervezése támasztja alá az információs célok félreérthetetlen azonosításának alapelvét és a teljes címzési szabványosítást.

3.7.1 Az ATN-nek előírásokat kell biztosítani az alkalmazási réteg elnevezéséhez..

3.7.2 Az ATN-nek előírásokat kell biztosítani a hálózati és szállítási réteg címzéséhez.

Megjegyzés. – Az ATN alkalmazási réteg elnevezésére vonatkozó előírások a Doc 9705, IV. Alkötetében vannak meghatározva; a hálózati és szállítási címzésekre vonatkozó előírások az V. Alkötetben vannak meghatározva és a jegyzékbe vételi szolgáltatás a IX. Alkötetben került meghatározásra ugyanabban a dokumentumban.

3.8 A LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT /ATN/ RENDSZER KEZELÉSI KÖVETELMÉNYEK

1. Megjegyzés. – Az ATN rendszer kezelési (SM) alkalmazás biztosítja egy Rendszer kezelő /SM/ részére azt a lehetőséget, hogy információt cseréljen egy Rendszer kezelői /SM/ ügynökséggel és/vagy más rendszer kezelővel.

2. Megjegyzés. – Egy Légiforgalmi Távközlési Hálózat /ATN/ rendszer kezelési /SE/ szolgáltatások műszaki előírásainak alátámasztása egy Állami vagy körzeti alapon lehetséges.

3.8.1 Az ATN-nek képesnek kell lennie a következő rendszer kezelési alkalmazási funkciók alátámasztására:

a) Hiba kezelés;

b) Konfiguráció kezelés;

c) Forgalmi kezelés;

d) Teljesítmény kezelés; és

e) Védelmi kezelés.

Megjegyzés. – Az ATN Rendszer kezelésre vonatkozó műszaki előírások a Doc 9705, VI. Alkötetében kerültek meghatározásra.

3.8.1.1 Azoknak az ATN végponti rendszereknek és közbenső rendszereknek, amelyek az ATN rendszer kezelő alkalmazásokat alátámasztják és a rendszer kezelőknek /SM/ biztosítaniuk kell a kezelt adatokhoz való hozzáférést.

Megjegyzés. – A rendszer kezelési /SM/ alkalmazások kezelt céljainak meghatározását és a hozzáférési előírásokat a Doc 9705, VI. Alkötete határozza meg.

3.9 LÉGIFORGALMI TÁVKÖZLÉSI HÁLÓZAT /ATN/ BIZTONSÁGI KÖVETELMÉNYEK

3.9.1 Az ATN védelmét a műszaki előírások, a helyi fizikai biztonsági intézkedések és az eljárási biztonsági rendszabályok konfigurációjával kell elérni.

1. Megjegyzés. – Az ATN védelmére vonatkozó műszaki előírások a Doc 9705-ben vannak meghatározva és a fizikai, valamint az eljárási védelmi intézkedések az Annex 17-ben, illetve a Védelmi Kézikönyvben kerültek meghatározásra.

2. Megjegyzés. – Az ATN biztonsági szolgálatok műszaki előírásainak alátámasztására Állami vagy körzeti alapon lehet szükség.

3.9.1.1 **Ajánlás.** – *Az alábbi fizikai és eljárási technikákat lehet felhasználni az ATN végponti rendszerek, a közbenső rendszerek, al-hálózati kezelők, katalógus központi kiszolgáló egységek és al-hálózatok védelmének biztosításához:*

a) Korlátozott fizikai hozzáférés az ATN végponti rendszerekhez, közbenső rendszerekhez, SM munkaállomásokhoz, a katalógus központi kiszolgáló egységekhez és az alhálózati kapcsolókhoz, hálózati kezelőkhöz és a további alapvető hálózati alrendszerekhez;

b) Korlátozott felhasználói hozzáférés - csak feljogosított személyek részére - az ATN végponti rendszerekhez, közbenső rendszerekhez, katalógus központi kiszolgáló egységekhez, valamint az /SM/ munkaállomásokhoz; és

c) Az ATN földi végponti berendezések, a közbenső rendszerek és az SM munkaállomások táv-hozzáférésének megtiltása, vagy korlátozott hozzáférés biztosítása.

3.9.2 ATN biztonsági irányelvek

Megjegyzés. – Az összeköttetések ellenőrzése és a harmadik fél forgalmi elemzése nem jelent biztonsági veszélyt, és az ATS osztályzatra nem tekinthető biztonsági fenyegetésnek. Azonban néhány Légiforgalmi Szolgálati és/vagy nem-légiforgalmi szolgálati felhasználónak és alkalmazásnak lehetnek olyan helyi vagy szervezési irányelvei, amelyekben az összeköttetések ellenőrzését, valamint a harmadik fél forgalmazásának elemzését biztonsági fenyegetésnek tekinthetik egyéb vonatkozásokban, például gazdasági megfontolásokból.

3.9.2.1 A Légiforgalmi Szolgálatok /ATS/ közleményeit védeni kell a hibás megjelenítés, a módosítás és a visszajátszás ellen.

1. Megjegyzés. – Ez azt jelenti, hogy a Légiforgalmi Távközlési Hálózati /ATN/ entitások közötti adat-, közlemény-cseréknél magas szintű lesz annak a szavatossága, hogy a közlemény onnan jön, ahonnan azt igénylik, nem kerül meghamisításra és nem egy már elavult közlemény megismétlése.

2. Megjegyzés. – A védelem szintje a biztonság fenyegetésének típusa függvényében és a felhasználó vagy a felhasználói feldolgozás által kiválasztott ATN biztonsági szolgáltatási szint függvényében változó lehet.

3.9.2.2 Az ATS közlemények biztonságára vonatkozó kérést tiszteletben kell tartani.

Megjegyzés. – A biztonsdág mellőzése iránti kérés figyelembe vehető. Ez azt jelenti, hogyha a biztonság alkalmazása elmulasztásra kerül és a tárgyalás a mellőzésről a helyi irányelven alapszik.

3.9.2.3 Azokat az ATN szolgáltatásokat, amelyek légijárművekhez küldött és azoktól érkező közleményeket támasztanak alá, védeni kell a szolgáltatás visszautasítási támadásoktól olyan valószínűségi szintnek megfelelően, amely megegyezik a megkívánt alkalmazási szolgáltatás rendelkezésre állásának, ahogyan azt a helyi irányelvek meghatározzák.

1. Megjegyzés. – A "szolgáltatás visszautasítás" kifejezés azt a körülményt írja le, amikor az információkhoz és más ATN forrásokhoz való törvényes hozzáférés szándékosan akadályozva van.

2. Megjegyzés. – Ez jazt is elentheti, hogy egy alternatív összeköttetési útvonal rendelkezésre áll abban az esetben, ha az egyik útvonal szolgáltatási tilalomnak van alávetve.

TÁBLÁZATOK A 3. FEJEZETHEZ

3-1. táblázat. A Légiforgalmi Szolgálatokkal kapcsolatos összeköttetési osztályok átviteli késései

Maximális egy-utas ATN végberendezés-végberendezés átviteli késés 95 %-os valószínűséggel (másodperc)	*ATSC osztály*
Fenntartott	A
4,5	B
7,2	C
13,5	D
18	E
27	F
50	G
100	H
Nincs érték meghtározva	Nincs preferencia

1. Megjegyzés. - Az ATN végberendezéstől - végberendezésig átviteli késés körülbelül 90 %-át jelenti a rendszer végfelhasználói közötti végberendezéstől - végberendezésig tartó teljes késés értékének.

2. Megjegyzés. - A 95 %-os valószínűség a kért ATSC osztálynak megfelelő útvonal rendelkezésre állásán alapszik.

3-2. táblázat. A Légiforgalmi Távközlési Hálózat /ATN/ összeköttetési elsőbbségeinek jegyzéke

Közlemény kategóriák	*ATN alkalmazás*	*A megfelelő protokol elsőbbség*	
		Szállítási réteg elsőbbség	*Hálózati réteg elsőbbség*
Hálózat/rendszer kezelés	SM	0	14
Vészhelyzeti összeköttetések		1	13
Sürgősségi összeköttetések		2	12
Magas elsőbbségű repülés-biztonsági közlemények	CPDLC, ADS	3	11
Szabvány elsőbbségű repülés-biztonsági közlemények	AIDC, ATIS	4	10
Meteorológiai összeköttetések	METAR	5	9
Repülés menetrendszerűségi összeköttetések	CM, ATSMHS	6	8
Légiforgalmi tájékoztató szolgálati közlemények		7	7
Hálózati/rendszer adminisztráció	SM, DIR	8	6
Légiforgalmi igazgatási közlemények		9	5
<Kijelöletlen>		10	4
Sürgős elsőbbségű adminisztratív és ENSz különjárati összeköttetések		11	3
Magas elsőbbségű adminisztratív és Állami/Kormányzati összeköttetések		12	2
Normál elsőbbségű adminisztratív összeköttetések		13	1
Alacsony elsőbbségű adminisztratív összeköttetések és a légiutasok közleményei		14	0

Megjegyzés. – A jegyzékben bemutatott hálózati réteg elsőbbségeket csak a kapcsolatmentes hálózatra alkalmazzák, és nem alkalmazzák al-hálózati elsőbbségekre.

3-3. táblázat: Az ATN hálózat elsőbbség jegyzéke a mozgó al-hálózat elsőbbségre

Közlemény kategóriák	*ATN hálózat réteg elsőbb-ség*	*A megfelelő mozgó al-hálózat elsőbbség (lásd a 4.Megjegyzést)*					
		Légifor-galmi mozgó műholdas szolgála-tok /AMSS/	*URH digitális adat-kapcsolat /VDL/ 2. Mód*	*URH digitális adat-kapcsolat /VDL/ 3. Mód*	*URH digitális adatkap-csolat /VDL/ 4. Mód (lásd az 5.Megj.-t)*	*S-módú Másodlagos Légtér-ellenőrző Radar*	*Rövid-hullámú /HF/ adat-kapcsolat /HFDL/*
Hálózat/Rendszer kezelés	14	14	Lásd az 1.Megj.-t	3	Magas	Magas	14
Vészhelyzeti összeköttetések	13	14	Lásd az 1.Megj.-t	2	Magas	Magas	14
Sürgősségi összeköttetések	12	14	Lásd az 1.Megj.-t	2	Magas	Magas	14
Magas elsőbbségű repülésbiztonsági közlemények	11	11	Lásd az 1.Megj.-t	2	Magas	Magas	11
Szabvány elsőbbségű repülésbiztonsági közlemények	10	11	Lásd az 1.Megj.-t	2	Magas	Magas	11
Meteorológiai összeköttetések	9	8	Lásd az 1.Megj.-t	1	Közepes	Alacsony	8
Repülés menet-rendszerűségi összeköttetések	8	7	Lásd az 1.Megj.-t	1	Közepes	Alacsony	7
Légiforgalmi tájékoztató szolgálati közlemények	7	6	Lásd az 1.Megj.-t	0	Közepes	Alacsony	6
Hálózat/rendszer adminiszráció	6	5	Lásd az 1.Megj.-t	0	Közepes	Alacsony	5
Légiforgalmi igazgatási közlemények	5	5	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélyezett
<Kijelöletlen>	4	Kijelöletlen	Kijelöletlen	Kijelöletlen	Kijelöletlen	Kijelöletlen	Kijelöletlen
Sürgős elsőbbségű kormányzati és Egyesült Nemzetek különjárati összeköttetések	3	3	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélyezett
Magas elsőbbségű adminisztratív és Állami/Kormány összeköttetések	2	2	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélyezett
Szabályos elsőbb-ségű igazgatási közlemények	1	1	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélyezett

Alacsony sürgős-ségű igazgatási közlemények és a légiutasok közleményei	0	0	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélye-zett	Nem engedélyezett

1. Megjegyzés. – Az URH digitális adat-kapcsolat /VDL/ 2. Módnak nincs speciális al-hálózati elsőbbségi mechanizmusa.

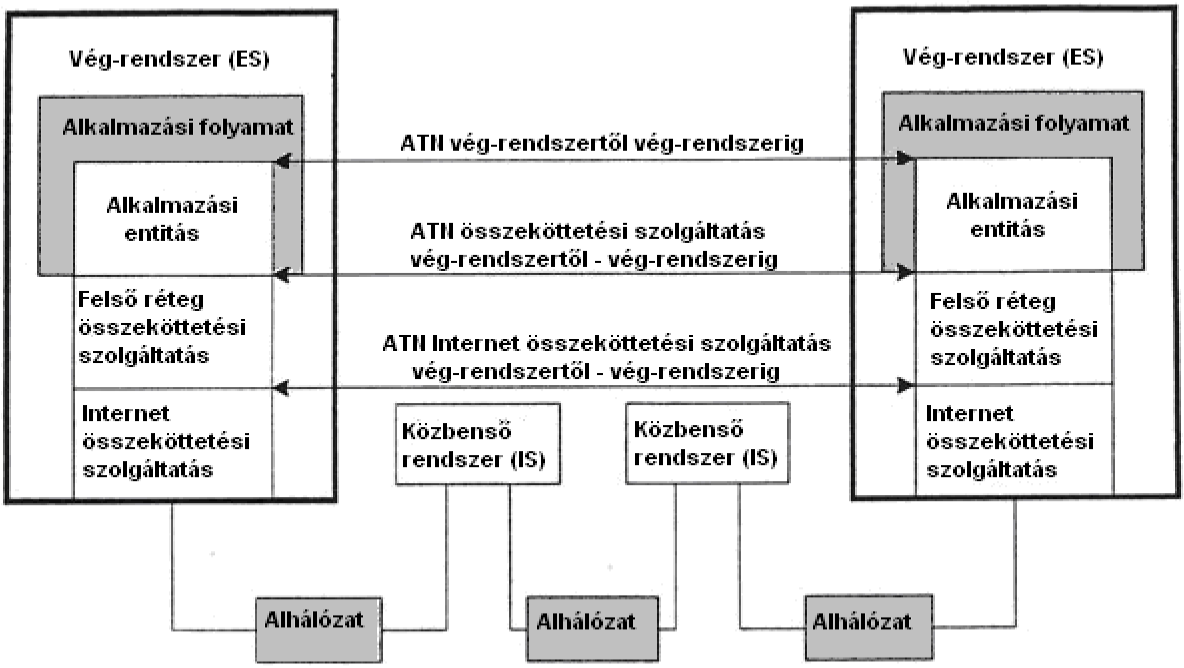
2. Megjegyzés. – A Légiforgalmi mozgó műholdas szolgálat /AMSS/ Szabványok és Ajánlott Gyakorlatok /SARPs/ anélkül határozzák meg az al-hálózat elsőbbségre a közlemény kategóriák jegyzékét, hogy határozottan utalnának az ATN hálózat réteg elsőbbségre.

3. Megjegyzés. – A „Nem engedélyezett" kifejezés azt jelenti, hogy csak a repülés biztonságára és rendszerességére vonatkozó közleményeknek a továbbítása engedélyezett ezen az al-hálózaton, ahogy azt az al-hálózat SARP-ja meghatározza.

4. Megjegyzés. – Csak azok a mozgó al-hálózatok kerültek jegyzékbe vételre, amelyekre al-hálózati SARP-ok vannak, és amelyekre határozott alátámasztást biztosítanak az ATN határvonal közbenső rendszer (BIS) műszaki előírásai.

5. Megjegyzés. - Az URH digitális adat-kapcsolat /VDL/ 4. Módú al-hálózat alátámasztást biztosít a légtér-ellenőrző alkalmazásokhoz (például Berendezés-függő Automatikus Légtér-ellenőrzés /ADS/).

ÁBRÁK A 3. FEJEZETHEZ



3-1. ábra:. A Légiforgalmi Távközlési Hálózat /ATN/ koncepcionális modelje

1. Megjegyzés. – Árnyékolás jelzi azokat az elemeket, amelyek ezeknek a Szabványoknak és Ajánlott Gyakorlatoknak /SARPs/ a tárgykörén kívül esnek. A felhasználói követelmény meghatározza az alkalmazás entitás és a felhasználó közötti kapcsolódást és biztosítja az ATN funkcionalitásának és együttműködésének biztosítását.

2. Megjegyzés. – Az ábra az ATN-nek egy egyszerűsített modelljét mutatja be, de nem szemlélteti az összes képességét (pl. a tárolási és továbbítási képességet, amely az ATS közlemény kezeléső szolgálata részére biztosítva van).

3. Megjegyzés. – Az ATN-en belül különböző vég-berendezéstől - vég-berendezésig pontok vannak meghatározva bizonyos vég-rendszertől - vég-rendszerig teljesítmény-követelmények meghatározására. Szükség lehet azonban ezektől eltérő vég- berendezéstől - vég-berendezésig pontok meghatározására ahhoz, hogy megkönnyítsék ezeknek a teljesítmény-követelményeknek való megfelelés minősítését. Ezekben az esetekben a vég-berendezéstől - vég-berendezésig pontokat világosan meg kell határozni és összefüggésbe kell hozni az ábrán bemutatott vég-rendszertől - vég-rendszerig pontokkal.

4. Megjegyzés. – Egy IS a funkcionalitásnak egy fogalmi képviselete, és nem tartozik pontosan egy továbbítási útvonalhoz. Egy olyan továbbítási útvonal-rendszer kezelő alkalmazást valósít meg, ami igényli a vég-rendszer protokoljait, és a rendszer kezelő alkalmazást használva, úgy is működik, mint egy vég-rendszer.

4. FEJEZET: LÉGIFORGALMI MOZGÓ-MŰHOLDAS SZOLGÁLAT (AMSS)

4.1 CSATORNA TÍPUSOK MEGHATÁROZÁSAI ÉS LEÍRÁSAI; ÁLTALÁNOS RÉSZ; RENDSZER-KÉPESSÉGEK

4.1.1 Csatorna típusok meghatározásai és leírásai

4.1.1.1. Meghatározások

Application. Alkalmazás. Egy információs rendszer végső felhasználása, magától a rend- szertől való megkülönböztetésként.

Aviation-BPSK. Repülési-BPSK /bináris fázis-billentyűzés (A-BPSK). A bináris fáziseltolás moduláció speciális formája, amelyet az AMSS-ben 2,4; 1,2 és 0,6 kbit/s csatorna átviteli sebességeknél használnak. Az A-BPSK egy olyan modulációs technika, amely a “0”-t a –90°-os fáziseltolódásra, és az “1”-et a + 90°-os fáziseltolódásra képezi le. A fázis-kódolt A-BPSK adatfolyamot ezt követően olyan szűrővel szűrik, amely kielégíti a 4. Fejezet 1. Függelékében lévő A1-1 és A1-2 táblázatokban meghatározott amplitúdó- és fázis versus frekvencia korlátokat.

Aviation-QPSK. Repülési-QPSK /kvaternes (négyes) fázis-billentyűzés/ (A-QPSK). Az offset négyes fáziseltolás moduláció speciális formája, amelyet a 2400 bit/s-nál nagyobb AMSS csatorna átviteli sebességeknél használnak. Az A-QPSK egy olyan modulációs technika, amely a “0”-t a 0 fokra és az “1”-et a “180”-fokra, vagy a “0”-t a 90 fokra és az “1”-t a 270-fokra képezi le váltakozva a két alternatíva között az egymást követő bitek alapján. A kódolt A-QPSK adatfolyamot ezt követően oly módon szűrik, hogy a modulált spektrum megfeleljen a 4. Fejezet 1. Függeléke A1-3 táblázatában meghatározottt amplitúdó-maszknak és az A1-2 táblázatban meghatározott fázismaszknak.

Burst. Impulzusköteg. Időegység által meghatározott, egy vagy több vonatkoztatott jel-egység szoros halmaza, amely felhasználói információkat és protokolokat, jelzéseket és valamilyen szükséges bekezdő jel-szakaszt szolgáltat.

Cyclic redundancy check. Ciklikus redundancia ellenőrzés. Minden jel-egység utolsó két byte-ja a teljes jel-egység ciklikus redundancia ellenőrzését végzi el a következők szerint. A hibajelzésre szolgáló ellenőrző biteket egy szabvány hosszúságú impulzus-egység első 10 oktettjéből vagy egy megnövelt hosszúságú impulzus-egység első 17 oktettjéből vagy az impulzusköteg azonosító első 4 oktettjéből vizsgálják a következő generátor polinom segítségével:
$x^{16} + x^{12} + x^5 + 1$

Megjegyzés. – Lásd a CCITT (Piros Könyv) X. 25. Ajánlás 2.2.7 szakaszát a számítási módszert és a bit sorrendet illetően.

Direct link service (DLS). Hibajavítás nélküli adat-kapcsolat (DLS). Adat összeköttetési szolgáltatás, amely nem kisérli meg az észlelt vagy nem-észlelt hibák automatikus helyesbítését a levegő-föld összeköttetési útvonal kapcsolati rétegében (a hiba ellenőrzést a vég-felhasználói rendszerekben végezhetik).

Epoch. Időköz. Egy esemény vagy egymással kapcsolatban álló események sorozatának kezdete és vége közötti, vagy élettartamára vonatkozó időtartam.

Frame. Keret. Egy struktúrált összeköttetési kapcsolat architektúra ismétlődő idő-szegmense, amely idő szerint számítható összeköttetési tevékenységeket biztosít az idő-szegmens kezdete és vége között.

Global beam. Globális sugárnyaláb. **M**űhold antenna irányítottság, amelynek fő nyalábja befogja a műhold látósugarában lévő teljes föld felületet.

Initial signal unit (ISU). Bevezető jel-egység (ISU). Az első jel-egység az egységek sorozatából, amelyet SSU-k követnek.

Link interface control infomation (LICI). Adat-kapcsolati réteg vezérlés (LICI). Vezérlés információ, amelyet a kapcsolati réteg és bármely szolgálatának felhasználója között az adat-kapcsolati réteg adat-egység (LIDU) részeként egymásközt cserélnek.

Link interface data unit (LIDU). Adat-kapcsolati réteg adat-egysége (LIDU). A teljes információ, amelyet egyetlen interakció kereten belül juttatnak keresztül a kapcsolati réteg és a kapcsolat szolgáltatás felhasználója közötti interfészen. Minden egyes LIDU tartalmaz összekötő interfész szabályozó információt (LICI) és ugyancsak tartalmazhat egy egyedi adat-kapcsolati réteg adat-egység (LSDU) elemet is.

Link service data unit (LSDU). Adat-kapcsolati réteg adat-egység elem (LSDU). Az adat-kapcsolati réteg adat-egység (LIDU) egy része és megegyezik az al-hálózat protokol adat-egységével (SNPDU).

Lone signal unit (LSU). Egyeddülálló jel-egység (LSU). Egyedüli jel, amely önmagában teljes közleményt képez.

Near-geostationary orbits. Közel-geostacionárius földkörüli pályák.A közel-geostacionárius földkörüli pályán üzemelő műholdak keringési ideje 24 óra, és az egyenlítői síktól való el- hajlásuk maximálisan 5 fok.

Network co-ordination station (NCS). Hálózat koordináló állomás (NCS). A teljes AMS(R)S rendszer lényegi része, amely a következő funkcionális kötelezettségeinek tesz eleget: a műholdas körzetén belül koordinálja a kommunikációs forgalmat és a műholdas összekapcsolhatóságot; és rendszerközti koordinációt lát el más műholdak által kiszolgált szomszédos műholdas körzetekkel.

P channel synchronization. P csatorna szinkronizációA P csatorna demodulátor állapota, amikor a P csatorna egyedi szavát megbízható módon érzékelik.

P channel degradation/loss. P csatorna teljesítmény-csökkenés/veszteség. Egy bejelentés, amelyet akkor adnak ki, amikor a P csatorna bit-hiba aránya egy 3 perces átlagoló időtartam alatt a 10^{-4} fölé emelkedik, vagy több mint 10 rövid idejű megszakítás (a P csatorna szinkronizációjának 10 másodpercnél rövidebb ideig tartó elvesztése) tapasztalható bármely 3-perces időtartamon belül; vagy amikor a P csatorna szinkronizáció 10 másodpercnél hosszabb időre elveszik.

Q number, Q level, Q precedence. Q szám, Q szint, Q elsőbbség. Egy közlemény vagy jelzéssorozat továbbítási sorrendiségének meghatározása, a 0 és 15 közötti számok alkalmazásával (először a 15-ös számot továbbítják).

Reliable link service (RLS). Megbízható adat-kapcsolati szolgáltatás (RLS). Egy, aműhold al-hálózat által biztosított olyan távközlési szolgáltatás, amely a hibaérzékeléssel és a hibásnak talált jel-egységek megismételt elküldésére irányuló kéréssel a kapcsolatában automatikus hibakezelést végez.

Satellite region. Műholdas körzet. Egy műhold látókörzetében található földrajzilag meghatározott részterület, amelyen belül e műhold szolgáltatásokat képes nyújtani.

Satellite service area. Műholdas szolgáltatási terület. Egy műhold látókörzetében található, földrajzilag meghatározott részterület, amelyen belül ez a műhold szolgáltatásokat nyújt. Figyelembe veendő, hogy egy műholdas szolgáltatási terület számos okból kifolyólg tovább osztható üzemeltetési műszaki jellemzők, feltételek és egyéb más korlátozó tényezők szerint.

Signal unit (SU). Jel-egység (SU). Ellenőrzésre és jelzésre, valamint felhasználói adat-csomag adat-átvitelre használt, időben rendezett, egymást követő adat-oktett együttesek. A P, T és C csatornákban használt szabvány hosszúságú SU-k 96 bitesek (12 oktett). Az R csatorna SU-k 152 bitesek (19 oktett), és a T csatorna 48 bites (6 oktett) fej-rész SU-t használ.

Spot beam. Irányított sugárnyaláb. Műhold antenna irányítottság, amelynek fő nyalábja a műhold látószögében lévő földfelületnél lényegesen kisebb területet fed be. Úgy is tervezhető, hogy tekintetbe véve a felhasználói földi állomások földrajzi megoszlását, javítsa a rendszer forrás-hatékonyságát.

Subsequent signal unit (SSU). A bevezető jel-egységet követő jel-sorozat. Az SU-k egy sorozatában a kezdeti jel-egységet követő jel-egység(ek).

Superframe. Szuperkeret. Adatátviteli keretek ismétlődő, időben struktúrált együttese, amely szuperkeret markert is tartalmaz (lásd még a "keret" meghatározásánál).

4.1.1.2 CSATORNATIPUSOK ISMERTETÉSE

4.1.1.2.1 *P csatorna.* Adat-csomag módozatú időosztásos multiplex (TDM) csatorna, amelyet folyamatosan továbbítanak a földi telepítésű földi állomásról (GES) a légijármű irányba, jelző- és felhasználói adatok vitele céljából. A rendszerkezelői funkciók céljára használt P csatorna jelölése P_{smc}, míg az egyéb funkciók elvégzésére használt P csatorna jelölése P_d. A P_{smc} és p_d funkciók szerinti jelölés nem feltétlenül alkalmazandó a különálló fizikai csatornákra.

4.1.1.2.2 *R csatorna.* Véletlen hozzáférésű (résidő kiosztásos Aloha) csatorna, amelyet a légijármű földi irányból, jelző- és felhasználói adatok átvitelére használnak. A rendszerkezelői funkciók céljára használt R csatorna jelölése R_{smc}, míg az egyéb funkciók elvégzésére használt R csatorna jelölése R_d. Az R_{smc} és R_d funkciók szerinti jelölés nem feltétlenül alkalmazandó a különálló fizikai csatornákra.

4.1.1.2.3 *T csatorna.* Rezervációs időosztásos muliplex hozzáférésű (TDMA) csatorna, amelyet csak a légijármű felőli irányból használnak. A vevő földi telepítésű földi állomás (GES) időréseket foglal le a légijármű fedélzeti földi állomások (AES) által igényelt adat-továbbítások számára a közlemény hosszúságának megfelelően. A küldő (AES) a lefoglalt időrésekben a prioritásnak megfelelően továbbítja a közleményt.

4.1.1.2.4 *C csatorna.* Áramkör üzemmódú egy csatorna per vivőfrekvenciás csatorna (SPC), amelyet mind a légijármű felőli, mind a légijármű felé tartó irányban használnak. Ez a csatorna időosztásos multiplexelt, az elsődleges csatorna hang vagy adat-forgalom szolgáltatás céljára, és az alsáv csatorna jelzés, ellenőrzés és adat közlemények szolgáltatásár használt. A csatorna használatát minden egyes művelet kezdetén és végén kijelölési és bontó-jelek szabályozzák.

4.1.2 Általános rész

4.1.2.1 Amikor közel-geostacionárius keringésű műholdakat használó légiforgalmi mozgó-hűholdas szolgáltatást (AMSS) hoznak létre és működtetnek a légiforgalmi szolgálatok segédeszközeként, annak meg kell felelnie a 4.1 - 4.10 pontok előíásainak.

4.1.2.2 Az AMSS berendezés kötelező jellegű felszerelésére vonatkozó követelményeket, ideértve a rendszer műszaki jellemzőinek szintjét, a körzeti léginavigációs egyezményekre alapozva kell kialakítani, amelyek meghatározzák a berendezés számára szolgáló üzemeltetési légteret, valamint a megvalósítási időskálákat.

4.1.2.3 A 4.1.2.1 pontban jelzett egyezmények legalább 2 éves határidőt kell, hogy biztosítsanak a fedélzeti rendszerek kötelező alkalmazására.

4.1.2.4 **Ajánlás.** – *A polgári repülési hatóságoknak a lehetőségek szerint egyeztetniük kell a nemzeti hatóságokkal és szolgáltatást biztosítókkal az AMSS megvalósításának azon szempontjait, amelyek lehetővé teszik az egész világon történő alkalmazhatóságát és optimális felhasználhatóságát.*

Megjegyzés. – Az AMSS használatára vonatkozó ICAO 24 bites légijármű címzések kiosztásának és kijelölésének előírásait a 9. fejezet tartalmazza.

4.1.3 Rendszer műszaki jellemzők

Megjegyzés. – A légiforgalmi mozgó-műholdas szolgálatot (AMSS) ellátó rendszer a légijármű földi állomásból (AES), a műholdból és a földi telepítésű földi állomásból (GES) áll. Az 1 (2, 3 vagy 4) szintű rendszer egy 1. (2, 3 vagy 4) szintű műszaki jellemzőkkel bíró AES-ből, egy vagy több műholdból, valamint egy vagy több olyan GES-ből áll, amely(ek) műszaki jellemzői biztosítják az AES összes műszaki jellemzőivel történő kompatibilis működést. Ilyen rendszerek többszörös szolgáltatásai egyidejűleg létezhetnek. A különböző rendszerek közötti együttműködés alapszintje biztosítva van.

4.1.3.1 *Hatáskör.* A rendszer műszaki jellemzőinek szintje kell, hogy magába foglalja az AES, a műhold és a GES teljesítményeit. Minimum feltételként az összes AES-nek rendelkeznie kell az 1. műszaki jellemzői képességű szinttel és a GES-hez való bejelentkezést követően folyamatosan figyelnie kell a P csatornát. Minden egyes GES-nek mindenkor, amikor AMS(R)S-t üzemeltet, rendelkeznie kell minimum feltételként 1. szintű műszaki jellemzőjű képességi szinttel.

4.1.3.1.1 Lenni kell egy P csatorna és egy R csatorna P_{smc} és R_{smc} műszaki jellemzőjű képességnek, amelyek minden egyes műholdas szolgálati terület részére rendszer-vezérlési funkciókat biztosítanak.

4.1.3.1.2 Abban az esetben, amikor egy adó csatornát osztanak meg az R és T csatornák között, az R csatorna adásait, amikor az csak szükséges, késleltetni kell a T csatornán folyó adás megszakításának elkerülése céljából.

4.1.3.2 *Az 1. szint*. Az 1. szintű műszaki jellemzőkkel rendelkező AES-nek a következő műszaki jellemzőjű képességekkel kell rendelkeznie:

a) egy P csatornán történő adat-fogadás és adat-feldolgozás a 0,6 és 1,2 kbit/s csatorna átviteli sebességgel; és

b) egy R és egy T csatornán történő adat-feldolgozás és adat-továbbítás a 0,6 és 1,2 kbit/s csatorna átviteli sebességgel.

Az R és a T csatornán folyó egyidejű átviteleket nem kell megkövetelni.

4.1.3.2.1 Az 1. szintű műszaki jellemzőkkel rendelkező légijármű fedélzeten elhelyezett földi állomás-/AES/-nek a földi telepítésű földi állomás-/GES/-hez történő bejelentkezés után folyamatosan tudnia kell fogadni és feldolgozni a P csatornát az AES-nek címzett közlemények vételének és a GES által adott parancsokra való reagálások biztosítása céljából.

4.1.3.2.2 **Ajánlás.** – *Az 1. szintű műszaki jellemzőjű képességekkel rendelkező AES-nek rendelkeznie kell a 4.1.3.2 pontban a kiegészítő 2.4 kbit/s csatorna átviteli sebesség számára meghatározott műszaki jellemzőkkel.*

Megjegyzés. – Az 1. szintű műszaki jellemzőjű képességekkel rendelkező AES a nyílt rendszerek összekapcsolásán alapuló alapvető adat-csomag összeköttetést végez a légi közlekedés összeköttetéseinek biztonságos ellátása céljából. Az 1. szintű műszaki jellemzőkkel rendelkező AES egy vevő- és egy adó-csatornát követel meg.

4.1.3.3 *A 2.szint.* A 2. szintű műszaki jellemzőkkel rendelkező AES-nek a következő műszaki jellemzőkkel kell rendelkeznie:

a) egy P csatornán történő adat-fogadás és adat-feldolgozás a 0,6 és 10,5 kbit/s csatorna átviteli sebességekkel; és

b) egy R és egy T csatornán történő adat-feldolgozás és adat-továbbítás a 0,6 és 10,5 kbit/s csatorna átviteli sebességekkel.

Az R és a T csatornán folyó egyidejű továbbításokat nem kell megkövetelni. A több mint egy P csatornán történő egyidejű vételt nem kell megkövetelni.

4.1.3.3.1 **Ajánlás.** – *A 2. szintű műszaki jellemző képességgel rendelkező AES-nek rendelkeznie kell a kiegészítő 4,8 kbit/s csatorna átviteli sebesség számára a 4.1.3.3 a) pontban meghatározott műszaki jellemzőkkel.*

4.1.3.4 *A 3. szint.* A 3. szintű műszaki jellemzőkkel bíró AES-nek a következő műszaki jellemzőkkel kell rendelkeznie:

a) 2. szintű műszaki jellemzőkkel rendelkező AES; és

b) egy, a C csatornán 8,4 vagy 21,0 kbit/s csatorna átviteli sebességű digitális információk vételét, feldolgozását és adását biztosító képességgel. A C csatorna akár R csatornával vagy T csatornával történő egyidejű működését nem kell megkövetelni.

4.1.3.4.1 **Ajánlás.** – *A 3. szintű műszaki jellemzőkkel bíró Légijármű fedélzetén elhelyezett földi állomás-/AES/-nek az 5,25; a 6,0 és a 10,5 kbit/s csatorna átviteli sebességeket kell biztosítania.*

Megjegyzés. – A 3. szintű műszaki jellemzőkkel bíró AES-nek a 2. szintű adat-csomag továbbítási módozaton felül digitalizált beszéd-üzemű képességet kell biztosítania a C csatornán. A kizárólagos hozzárendeléssel kapcsolatos követelményeket a 4.8 és a 4.9 szakaszok tartalmazzák. Két vevő- és egy adó-csatorna a követelmény.

4.1.3.5 *A 4. szint.* A 4. szintű műszaki jellemzőkkel bíró AES-nek a következő műszaki jellemzőjű képességekkel kell rendelkeznie:

a) 3. szintű műszaki jellemzőkkel bíró AES; és

b) egy C csatorna és egy R csatorna egyidejű működése; és

c) a C csatorna és a T csatorna egyidejű működése.

A három csatorna (C, R és T) egyidejű működését nem kell megkívánni.

4.1.3.5.1 **Ajánlás.** – *Egy 4. szintű műszaki jellemző képességekkelel bíró AES-nekt az 5,25; a 6,0 és a 10,5 kbit/s csatorna átviteli sebességeket kell biztosítania.*

Megjegyzés. – A 4. szintű műszaki jellemző képességekkel bíró AES digitalizált hang-képességeket biztosít a C csatornán és ezzel egyidejűleg adat-csomag mód adatátviteli képességekkel rendelkezik az R csatornán vagy a T csatornán. Két vevő- és két adó-csatorna megkövetelt.

4.1.3.5.2 **Ajánlás.** - *A 4. szintű műszaki jellemző képességekkel bíró AES-nek képesnek kell lenni az R és a T csatornán való egyidjű átvitelre akkor, amikor a C csatorna nincs hsználatban.*

4.2 SZÉLESSÁVÚ RÁDIÓFREKVENCIÁS JELLEMZŐK

4.2.1 Frekvenciasávok

4.2.1.1 AMS(R)S SÁVOK HASZNÁLATA

Megjegyzés. – A közlemények kategóriáti és a légiforgalmi mozgó (R) szolgálaton belüli egymáshoz viszonyított elsőbbségeiket az Annex 10, II. Kötet 5.1.8 pontja határozza meg. Ezek a kategóriák és elsőbbségek azonosan érvényesek a légiforgalmi mozgó (R) műholdas szolgáltatásra (lásd Nemzetközi Távközlési Unió /ITU/ Rádió-Szabályzat S44 Cikkely).

4.2.1.1.1 Minden egyes légijármű fedélzetén elhelyezett földi állomást és földön telepített földi állomást úgy kell tervezni, hogy biztosítható legyen az Annex 10, II. Kötet 5.1.8 pontjában meghatározott közleményeknek a 4.2.1.2 és 4.2.1.3 pontokban megállapított sávokon belüli frekvenciák vagy az állomás által hangolható frekvenciákat használó, más típusú közlemények adása és/vagy vétele általi késedelem elkerülése. Az Annex 10, II. Kötet 5.1.8 pontja által meg nem határozott közleményfajták szükség esetén figyelmeztetés nélkül megszüntethetők az Annex 10, II. Kötet 5.1.8 pontja által meghatározott közleményfajták adásának és vételének lehetővé tétele céljából.

Megjegyzés. – Lásd ITU Rádió-Szabályzat S5.357A sz.

4.2.1.2 LÉGIJÁRMŰHÖZ

4.2.1.2.1 A légijármű telepítésű földi állomásnak képesnek kell lennie az 1544-1555 MHz frekvenciasávban történő vételre.

Megjegyzés. – Az 1544–1545 MHz-es sáv mozgó műholdas szolgálat általi használata a vészhelyzeti és biztonsági üzemeltetésre van korlátozva.

4.2.1.2.2 **Ajánlás.** – *A légijármű telepítésű földi állomás legyen képes az 1555–1559 MHz frekvenciasávban történő vételre.*

Megjegyzés. – Az 1555–1559 MHz sávot az országok védetté tehetik és felhasználhatják nemzeti és nemzetközi AMS(R)S célokra.

4.2.1.2.3 **Ajánlás.** – *A légijármű telepítésű földi állomásnak ugyancsak képesnek kell lennie az 1525–1544 MHz frekvenciasávban történő vételre.*

Megjegyzés. – Az 1525–1544 MHz sáv felhasználható a tengeri mozgó-műholdas szolgálat állomásaival vészhelyzeti és nyilvános célokból történő közlemény-váltásokra az ITU Rádió- Szabályzat S41 Cikkelyével összhangban.

4.2.1.3 A LÉGIJÁRMŰTŐL

4.2.1.3.1 A légijármű fedélzetén telepített földi állomás legyen képes az 1645,5–1656,5 MHz frekvenciasávban történő adásra.

Megjegyzés. – Az 1645,5–1646,5 MHz-es sáv mozgó-műholdas szolgáltatás általi használata a vészhelyzeti és biztonsági üzemeltetésre korlátozott.

4.2.1.3.2 **Ajánlás.** – *A légijármű telepítésű földi állomás legyen képes az 1656,5–1660,5 MHz frekvenciasávban történő adásra.*

Megjegyzés. – Az 1656,5–1660,5 MHz sávot az Államok védetté tehetik és felhasználhatják nemzeti és nemzetközi AMS(R)S célokra.

4.2.1.3.3 **Ajánlás.** – *A légijármű telepítésű földi állomás legyen képes az 1626,5–1645,5 MHz frekvenciasávban történő adásra is.*

Megjegyzés. – Az 1626,5–1645,5 MHz sáv felhasználható a tengeri mozgó-műholdas szolgálat állomásaival vészhelyzeti és nyilvános célokból történő közlemény-váltásokra az ITU Rádió- Szabálxzat S41 Cikkelyével összhangban.

4.2.1.4 HANGOLÁSI NÖVEKMÉNYEK

4.2.1.4.1 A légijárműtől és a légijárműhöz irányú átvitel sávjaiban a csatornákat 2,5 kHz növekményekben kell kijelölni.

4.2.1.4.2 A légijármű telepítésű földi állomás csatorna kijelölését és hangolását a GES vezérlése alatt kell megvalósítani.

4.2.1.5 CSATORNA-SZÁMOZÁS

4.2.1.5.1 A csatorna-számot (Ct) a légijárműhöz irányú átviteli út középfrekvenciájának figyelembe-vételével kell meghatározni a következő képlet szerint:
Ct = (az adás frekvenciája (MHz) - 1 510,0)/0,0025

4.2.1.5.2 A csatornaszámot (Cf) a légijárműtől irányú átviteli út középfrekvenciájának figyelembe-vételével kell meghatározni a következő képlet szerint:
Cf = (az adás frekvenciája (MHz) - 1 611,5)/0,0025

4.2.2 Frekvencia pontosság

A légijármű telepítésű földi állomás adás-frekvenciája - ahogy az a műholdról vehető - nem térhet el a névleges csatorna-frekvenciától több mint ±383 Hz-el bármely ok következtében.

Megjegyzés. – Egy szubszonikus légijármű által vett adások frekvenciája nem térhet el a névleges csatorna-frekvenciától több mint ±2,18 kHz-el bármely ok következtében.

4.2.3 Légijármű fedélzetén elhelyezett földi állomások rádiófrekvenciás jellemzői

Megjegyzés. – A következő követelmények a teljes adás- és vételi frekvenciasávokra érvényesek.

4.2.3.1 ÁLTALÁNOS ANTENNA JELLEMZŐK

4.2.3.1.1 *Referencia fedésterület.* Az Antenna-rendszereket úgy kell felszerelni, hogy az adási és a vételi teljesítmény követelményeit kielégítsék egy 360 fokos oldalszogű és egy, a vízszintes síktól számított 5–90 fokos magassági szögek által meghatározott szintbeli repülést végző légijárművek részére.

4.2.3.1.1.1 **Ajánlás.** – *Az antenna-rendszereket a maximálisan lehetséges mértékig úgy kell felszerelni, hogy az adási és vételi teljesítmény követelményeket kielégítsék egy 360 fokos oldalszög és egy, a vízszintes síktól számított 5–90 fokos magassági szögeken belüli fedés légtérben +20/–5 fok bólintással és ±25 fokos bedöntéssel repülést végző légijárművek részére.*

4.2.3.1.2 *Polarizáció*. Az ITU Rádio-Szabályzat S1.154 sz. meghatározásának megfelelően a polarizációnak mind a vétel, mind az adás esetében jobbra-körkörösnek kell lennie.

4.2.3.1.3 *Antenna-kapcsolás.* Azoknak a légijármű telepítésű földi állomásoknak, amelyek egynél több antennát igényelnek, képesnek kell lenniük az ugyanazon antenna al-rendszerben lévő egyik antennáról a másik antennára való átváltásra, oly módon, hogy a jelmegszakítás ne legyen 40 ms-nál nagyobb.

Megjegyzés. – A 4.2.3.2, 4.2.3.2 bis *és a 4.2.3.3 pontok csak a nagy-, közepes- és kis-nyereségű antennákkal szemben támasztott követelményeket körvonalazzák. Ez nem zárja ki más nyereségű antennák jövőben történő bevezetését; egy ilyen bevezetés előtt elvégzendő megfontolások közül néhány az Annex 10, III. Kötet, I. Része A Mellékletében található útmutató anyagban került ismertetésre.*

4.2.3.2 KIS-NYERESÉGŰ ANTENNA AL-RENDSZEREK

4.2.3.2.1 *Nyereség-zaj hőmérsékleti viszonyszám.* Kis-nyereségű antennákat alkalmazó vevő al-rendszereknek el kell érniük a –26 dB/K-nél nem kisebb nyereség-zaj hőmérsékleti viszonyszámot (G/T) a 4.2.3.1.1 pontban meghatározott referencia fedés légtér nem kevesebb mint 85 szá- zalékában; és a –31 dB/K-nél nem kisebb nyereség-zaj hőmérsékleti viszonyszámot a fedés légtér fennmaradó 15 százalékában. Ez alól az egyedüli kivétel a horizontális síktól számított 70 foknál nagyobb magassági szögű régió, ahol a G/T nem lehet kevesebb, mint –28 dB/K.

4.2.3.2.2 *Axiális arány.* Az axiális arány kisebb kell, hogy legyen, mint 6 dB a 45 és 90 fok közé eső, és kisebb mint 20 dB az 5 és 45 fok közé eső magassági szögek esetében, vagy az AES antennának elegendő antenna-nyereséggel kell rendelkeznie az axiális arány által okozott veszteségen felüli további polarizációs veszteség kompenzálására. A kompenzáció figyelembevételekor azt kell feltételezni, hogy a műhold axiális aránya 2,5 dB, a polarizációs ellipszisek főtengelyei pedig ortogonálisak.

4.2.3.2.3 **Ajánlás.** – *A maximálisan lehetséges mértékig arra kell törekedni, hogy a G/T ne legyen kisebb, mint –26 dB/K és az axiális arány kisebb legyen, mint 6 dB a referencia fedés légtér 100 százalékában.*

4.2.3.2 *bis* KÖZEPES-NYERESÉGŰ ANTENNA AL-RENDSZEREK

Lásd 4.2.3.6 pontot.

4.2.3.3 NAGY-NYERESÉGŰ ANTENNA AL-RENDSZEREK

4.2.3.3.1 *Nyereség-zaj hőmérsékleti viszonyszám.* A nagy-nyereségű antennákat alkalmazó vevő al-rendszereknek el kell érniük a –13 dB/K-nél nem kisebb nyereség-zaj hőmérsékleti viszonyszámot (G/T) a referencia fedés légtér nem kevesebb, mint 75 százalékában és a –25 dB/K-nél nem kisebb nyereség-zaj hőmérsékleti viszonyszámot a 4.2.3.1.1 pontban meghatározott fedés légtér fennmaradó 25 százalékában.

4.2.3.3.2 *Axiális arány.* Az axiális aránynak kisebbnek kell lenni, mint 6 dB a 45 és 90 fok közé eső, és kisebb mint 20 dB az 5 és 45 fok közé eső magassági szögek esetében, vagy az AES antennának elegendő antennanyereséggel kell rendelkeznie az axiális arány által okozott veszteségen felüli további polarizációs veszteség kompenzálására. A kompenzáció figyelembevételekor azt kell feltételezni, hogy a műhold axiális aránya 2,5 dB, a polarizációs ellipszisek főtengelyei pedig ortogonálisak.

4.2.3.2.3 **Ajánlás.** – *A maximálisan lehetséges mértékig arra kell törekedni, hogy a G/T ne legyen kisebb, mint -26 dB/K és az axiális arány kisebb legyen, mint 6 dB a referencia fedés légtér 100 százalékában.*

4.2.3.3.4 *Megkülönböztetés. –* Az antenna-nyereségi alakzatnak, mind az adó-, mind a vevő-funkcióknál nem kevesebb, mint 13 dB-el kell különbséget tennie a 45 fok, vagy annál nagyobb földrajzi hosszúság eltéréssel rendelkező, venni kívánt és nem-kívánt műholdak irányai között, a 4.2.3.1.1 pontban meghatározott referencia fedés légtér nem kevesebb, mint 75 száza- lékában.

4.2.3.3.4.1 **Ajánlás.** – *Az antenna-nyereség alakzat mind az adó-, mind a vevőf-unkcióknál nem kisebb mint 13 dB-el tegyen különbséget a 45 fok vagy annál nagyobb földrajzi hosszúság eltéréssel rendelkező kívánt és nem-kívánt műholdak irányai között a 4.2.3.1.1 pontban meghatározott referencia fedés légtér 100 százalékában.*

4.2.3.3.5 *Fázis megszakítás.* Egy kapcsolt iránysugarú antenna szomszédos iránysugár helyzetei közötti iránysugár-vezérlés átmenetei a kisugárzott jelekben nem okozhatnak 12 foknál nagyobb RF fázis átmeneteket az összes szomszédos lehetséges iránysugár-kombinációk 99 százalékában.

4.2.3.3.5.1 **Ajánlás.** – *Egy kapcsolt iránysugarú antenna szomszédos iránysugár helyzetei közötti iránysugár-vezérlési átmenetei a kisugárzott jelben ne okozzanak 12 fokos továbbított jelnél nagyobb RF fázis átmenetet az összes szomszédos lehetséges iránysugár-kombinációk 100 százalékában.*

Megjegyzés. – Ez a követelmény az összes radar-rendszer esetében csak az egyedi antenna teljesítményre vonatkozik.

4.2.3.4 A VEVŐVEL SZEMBEN TÁMASZTOTT KÖVETELMÉNYEK

4.2.3.4.1 *A vevő hamis és lineáris teljesítménye.* A 4.4.2.3 és 4.4.5.4 pontokban meghatározott megkívánt teljesítményt úgy kell elérni, hogy a vevő antennát a maximális nyereség irányában megvilágítják egy, az 1525-1559 MHz sávban szétosztott –100 dBW/m^2 teljesítmény fluxus-sűrűséggel.

4.2.3.4.2 *A vevő átviteli sávon kívüli teljesítménye.* A 4.4.2.3 és a 4.4.5.4 pontokban meg- határozott megkívánt teljesítményt az átviteli sávon kívüli, a rendes üzemeltetési feltételekre jellemző szinteken fellépő interferencia jelenlétében kell elérni.

4.2.3.4.3 *Vételi fázis-zaj.* A vevő és a demodulátor olyan tervezésű kell, hogy legyen, hogy teljes egészében megfeleljenek azoknak a teljesítmény követelményeknek, amikor a vételi fázis-zaj karakterisztika nem haladja meg a 4-1. táblázatban* meghatározott maszk értékeit.

* Az összes táblázat ennek a fejezetnek a végén található.

4.2.3.4.4 *Befogadási tartomány.* A vevő képes kell, hogy legyen a jelek befogására és azok megtartására a névleges frekvenciától ±2,180 kHz-ig való frekvencia-eltéréssel a 4-2. táblázatban bemutatott vivőfrekvencia-zaj viszonynál.

4.2.3.4.5 *Vételi Doppler viszonyszám.* A vevő képes kell, hogy legyen a 4.3.3 pontban meghatározott teljesítmény befogására és megtartására a másodpercenkénti 30 Hz-es frekvencia fváltozási sebességgel.

4.2.3.5 AZ ADÓVAL SZEMBEN TÁMASZTOTT KÖVETELMÉNYEK

4.2.3.5.1 *EIRP /Izotrópikusan kisugárzott egyenértékű teljesítmény/ HATÁRÉRTÉKEK*

4.2.3.5.1.1 Kis-nyereségű antenna üzemeltetésekor a műhold irányába mutató vivőfrekvencia minimális EIRP értéke - a maximális beállításra állítva - 13,5 dBW kell, hogylegyen. A bármely irányban kisugárzott EIRP nem haladhatja meg a 22,8 dBW értéket.

4.2.3.5.1.1 *bis* Közepes-nyereségű antenna üzemelésnél a műhold irányába mutató vivőfrekvencia minimális EIRP értéke - a maximális beállításra állítva - 12,5 dBW kell, hogy legyen. A bármely irányban kisugárzott EIRP nem haladhatja meg a 34,8 dBW értéket.

4.2.3.5.1.2 Nagy-nyereségű antenna üzemeltetésekor a műhold irányába mutató vivőfrekvencia minimális EIRP értéke - a maximális beállításra állítva - 25,5 dBW kell, hogy legyen. A bármely irányban kisugárzott EIRP nem haladhatja meg a 34,8 dBW értéket maximális beállításban.

4.2.3.5.1.3 A maximális beállításnál kisebb beállítások esetében a bármely irányban kisugárzott vivőfrekvenciákkénti EIRP nem haladhatja meg a enni kívánt műhold felé kisugárzott EIRP-t 5 dB-nél nagyobb értékkel.

4.2.3.5.1.4 Több vivőfrekvenciás üzemelés esetén a megengedhető maximális üzemeltetési EIRP legyen az a szint, amelyen:

a) az aktív forrásokból származó teljes intermodulációs termék hozzájárulás a 4.2.3.5.7 pontban maximálisan megengedett (sávon belüli intermodulációs termékek), vagy

b) a nyereség-zaj hőmérsékleti viszonyszám a 4.2.3.2.1 vagy 4.2.3.3.1 pontban, meghatározott - aszerint, hogy melyik alkalmazható - a megengedett minimumként.

4.2.3.5.2 *EIRP vezérlés.* A venni kívánt műhold irányába mutató vivőfrekvenciánkénti EIRP a GES-től érkező utasítással egy 15 dB-es tartományon belül 1 dB-es fokozatonként állítható kell, hogy legyen.

4.2.3.5.3 **Ajánlás.** – *A teljesítmény-szabályozási tartomány minimális EIRP értékének a sáv átviteli sebesség és a műhold iránysugár jellemzők függvényének kell lennie - az interferencia lehetőség csökkentése céljából.*

4.2.3.5.4 *Lekapcsolt vivőfrekvenciás szint.* Az 1626,5–1660,5 MHz sávban összegezett, bármely irányba mutató EIRP, leállított vivőfrekvenciák esetén, legyen –24,5 dBW vagy kevesebb.

4.2.3.5.5 *EIRP bejelentkezés.* Egy Földi telepítésű földi állomás-/GES/-hez történő bejelentkezéskor a Légijármű fedélzetén elhelyezett földi állomás-/AES/-nek az EIRP-je legalább 13,5 dBW legyen.

4.2.3.5.6 *Sávon belüli hamis EIRP.* Modulált vivőfrekvencia bármely szinten, a maximálisan megengedhető üzemeltetési EIRP-ig történő átvitelénél az összetevő kisugárzott, egy 4 kHz sávra vonatkoztatott, sávon belüli hamis és zaj EIRP (intermodulációs termékek kizárva) nem haladhatja meg a –55 dBc értéket. Ez a követelmény nem vonatkozhat a 4.3.2.1 pontban meghatározott vivőfrekvencia középfrekvenciájának mindkét oldali frekvenciasávjára.

4.2.3.5.7 INTERMODULÁCIÓS TERMÉKEK

4.2.3.5.7.1 A többszörös vivőfrekvenciás AES esetén a kisugárzott intermodulációs termékek nem okozhatnak káros interferenciát a műholdas navigációs vevő működésében ott, ahol az ilyen vevő ugyanazon légijárművön üzemel, amikor két egyforma vivőfrekvenciát továbbít, amelyek teljes teljesítménye egyenlő az AES maximálisan megengedhető üzemeltetési EIRP-jével.

4.2.3.5.7.2 Az AES adó-vevő nem továbbíthat olyan újonnan kijelölt frekvencián, amely ötödrendű intermodulációs terméket állítana elő 1610,0 MHz alatti frekvencián.

4.2.3.5.7.3 Frekvencia kezelési eljárásokat kell használni az AES által sugárzott 1610 MHz alatti, ötöd- és annál alacsonyabb rendű intermodulációs termékek kiküszöbölésére.

4.2.3.5.8 *Sávon kívüli EIRP sűrűségi szintek.* Amikor bármely szinten egy vivőfrekvenciát sugároznak a 4.2.3.5.1 pontban meghatározott maximális teljesítményszintig, az AES által bármely irányba keltett hamis felharmonikusokat és zajt magában foglaló, sávon kívüli EIRP-je nem haladhatja meg a 4-3. táblázatban bemutatott szinteket.

4.2.3.5.8.1 **Ajánlás.** – *Az 1605–1610 MHz között az EIRP sűrűség nem haladhatja meg a –140 dBc/1 MHz értéket.*

4.2.3.5.9 *Fázis-zaj.* Egy modulált vivőfrekvencián indukált fázis-zaj teljesítmény spektrális sűrűség nem haladhatja meg a 4-4. táblázatban meghatározott tartományt.

4.2.3.5.10 *Az adó Doppler mértéke.* A sugárzott jel frekvencia változtatásainak maximális mértéke, amelyet a légijármű műhold irányába történő gyorsulásánál kompenzálnak, nem haladhatja meg a másodpercenkénti 15 Hz értéket. A Doppler szabályozási felbontása nem haladja meg a 10 Hz-et és a járulékos frekvencia változtatásokat a kisugárzott jel fázis-megszakítása nélkül kell elvégezni.

4.2.3.5.11 A Légiforgalmi mozgó-műholdas szolgálati /AMSS/ adások nem okozhatnak káros interferenciát a műholdas navigációs vevő működésében, ahol ilyen vevőt ugyanazon a légijárművön üzemeltetnek, mint az AES-t.

4.2.3.6 KÖZEPES-NYERESÉGŰ ANTENNA AL-RENDSZEREK

4.2.3.6.1 *Nyereség-zaj hőmérséklet viszonyszám.* Közepes-nyereségű antennákat alkalmazó vevő al-rendszerek el kell, hogy érjék a –19 dB/K-nél nem kisebb nyereség-zaj hőmérséklet viszonyszámot a

4.2.3.1.1 pontban meghatározott referencia fedés légtér nem kevesebb, mint 85 százalékán. Ez alól egyetlen kivétel az a körzet, amely több, mint 70 fokos magassági szögre van a vízszintes síktól, ahol a G/T nem lehet kisebb, mint –21 db/K.

4.2.3.6.2 *Axiális arány.* Az axiális aránynak 6 dB-nél kisebbnek kell lenni a 4.2.3.1.1 pontban hivatkozott referencia fedési légtér 85 százalékán, ahol a G/T-nek meg kell haladnia a –19 dB/K értéket, vagy az AES antennának elegendő nyereséggel kell rendelkeznie az axiális arány által okozott veszteségen felüli további polarizációs veszteség kompenzálására. A kompenzáció meglétéhez feltételezni kell, hogy a műhold axiális arányának 2,5 dB-nek kell lennie, merőleges polarizációs ellipszis főtengelyekkel.

4.2.3.6.3 **Ajánlás.** – *A G/T ne legyen kevesebb, mint –19 dB/K és az axiális arány legyen kevesebb, mint 6 dB a referencia fedési légtér 100 százalékán.*

4.2.3.6.4 *Megkülönböztetés.* Az antenna-nyereség alakzat mind az adó-, mind a vevő- funkcióknál 7 dB-nél nem kisebb mértékben tegyen különbséget a 80 fok vagy annál nagyobb földrajzi hosszúság-eltéréssel rendelkező venni kívánt és nem-kívánt műholdak irányai között a 4.2.3.1.1 pontban meghatározott referencia lefedési légtér 85 százalékán.

4.2.3.6.5 **Ajánlás.** – *Az antenna-nyereség alakzat mind az adó-, mind a vevő-funkcióknál nem kevesebb, mint 7 dB különbséget tegyen a 80 fok vagy annál nagyobb földrajzi hosszúság- eltéréssel rendelkező kívánt és nem-kívánt műholdak irányai között a 4.2.3.1.1 pontban meghatározott fedés légtér 100 százalékában.*

4.2.3.6.6 *Fázis megszakítás.* Egy kapcsolt iránysugarú antenna szomszédos sugárhelyzetei közötti sugár vezérlési átmenete a vevő és adó jelfázisában nem okozhatnak 30 foknál nagyobb RF fázis átmeneteket az összes lehetséges szomszédos sugár kombinációk 99 százalékában.

4.2.3.6.7 **Ajánlás.** – *Egy kapcsolt iránysugarú antenna szomszédos sugárhelyzetei közötti sugár vezérlési átmenetei a vett és a továbbított jelben nem okozhatnak 30 foknál nagyobb RF fázis-átmeneteket az összes lehetséges szomszédos sugár kombinációk 100 százalékában.*

4.3 RF CSATORNA MŰSZAKI JELLEMZŐK

4.3.1 Moduláció

4.3.1.1 *A 2.4 kbit/s és annál kisebb csatorna átviteli sebességek modulációja.* A 2,4; 1,2 és 0,6 kbit/s csatorna átviteli sebességek modulációjának reepülési bináris fázis-billentyűzésűnek kell lenni (A-BPSK).

4.3.1.2 *A 2,4 kbit/s és annál nagyobb csatorna átviteli sebességek modulációja.* A 2,4 kbit/s csatorna átviteli sebességnél nagyobb csatorna átviteli sebességek modulációjának repülési kvadratúra fázis-billentyűzésűnek kell lenni (A-QPSK).

4.3.2 *Kisugárzott teljesítmény spektrális sűrűség.* A következő kisugárzott teljesítmény spektrális sűrűség-határokat kell alkalmazni az adott irányban csúcs spektrális sűrűséghez normalizált bármely irányban. A határokat egy egyedi vivőfrekvenciára kell alkalmazni és a vivőfrekvenciában kell központosulniuk. Az alsó határ nem alkalmazható akkor, amikor az impulzus-köteg kezdetekor az AES a modulálatlan bevezető jel-szakaszt sugározza.

4.3.2.1 *A légijárműtől.* A Légijármű fedélzetén elhelyezett földi állomás /AES/ által sugárzott teljesítmény tartománynak a 4-5. táblázatban meghatározott maszk értékei közé kell esnie.

4.3.2.2 *A légijárműhöz.* Az AES által vett teljesítmény tartománynak az A-BPSK esetében a 4-6. táblázatban, az A-QPSK esetében a 4-7. táblázatban és a 4-7A. táblázatban meghatározott maszk értékei közé kell esnie.

4.3.3 *Demodulátor teljesítmény.* Ahol a csatorna átviteli sebességeket a 4.1 pontban meghatározottak szerint valósítják meg, az összezavart jelek megtisztítása után a csatorna demodulátorok bit hiba-arány (BER) teljesítménye legyen egyenlő vagy jobb a 4-8. táblázatban bemutatottaknál. Ezt a teljesítményt a következő feltételek szerint kell elérni:

a) a venni kívánt vivőfrekvencia bármelyik oldalán lévő két szomszédos interferáló vivőfrekvencia jelenlétében, amelyek a venni kívánt, a meghatározott névleges vivőfrekvencia tagolástól egy frekvencia bizonytalansággal eltérő vivőfrekvenciának a szintjénél 5 dB-lel nagyobbak, valamint az AES demodulátort illetően a maximálisan megengedhető üzemeltetési EIRP-ig történő működtetéssel;

b) a 4.2.3.5.9 pontban meghatározott maximális fázis-zaj műszaki jellemzőivel kisugárzott jel vétele alatt;

c) a másodpercenkénti sűrűséggel megjelenő 12°-os RF fázis megszakítások közben; és

d) Rician csatorna feltételek között 7 dB vivőfrekvencia több-utas viszonyszámú 20, 60 és 100 Hz elhalkuló sávszélességnél kis-nyereségű antennát, vagy kis- és nagy-nyereségű antennát használó rendszerek esetén;
vagy 10 dB csak nagy-nyereségű antennákat használó rendszerek esetén.

Megjegyzés. - A bit hiba teljesítmény célokat az AMS(R)S rádió-kapcsolatokra az ITU-R M.1037.sz. Ajánlás foglalja magába.

4.3.4 Rákapcsolódási teljesítmény

4.3.4.1 *A szuperkeret szinkronizáció eléréséhez szükséges idő.* Az utasítás kiadása és a műholdi szuperkeret szinkronizáció elvégzése céljából az antennára való kerülés közötti időperiódus nem haladhatja meg a 16 másodpercet.

Megjegyzés. – Ez azt feltételezi, hogy az AES ennek a P csatornának a műholdas szolgáltatási területén belül van.

4.3.4.2 **Ajánlás.** – *Az utasítás kiadásától a műhold szuperkeret szinkronizáció elvégzése céljából az antennára való kerülésig tartó időperiódus a lehető legrövidebb legyen.*

4.3.4.3 C-CSATORNA LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZET FÖLDI ÁLLOMÁS /AES/ DEMODULÁTOR BEFOGÁS

4.3.4.3.1 *21,0 KBIT/S CSATORNA ÁTVITELI SEBESSÉG*

4.3.4.3.1.1 *Keret befogás*. Az impulzus-köteg bevezető jelszakaszát követő első egyedülálló szónál a keret befogás sikertelenségének valószínűsége kisebb kell, hogy legyen, mint egy a 10^4-hez, beleértve a Gauss csatorna 1,2 dB-es E_s/N_0 értékénél a 4.3.3 a) és b) pontok feltételeit is; és a maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ±30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.3.1.2 *Téves keret befogás*. A téves keret befogás valószínűségének kisebbnek kell lennie, mint egy a 10^5-hez a Gauss csatorna 0 dB-es E_s/N_0 is, és a maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ±30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.3.1.3 *A keret befogás újra-megszerzése.* A keret befogás elvesztése esetén az újra- megszerzésnek 3 másodpercen belül kell megvalósulnia az idő 99 százalékánál, a Gauss csatorna 0 dB-es E_s/N_0 értékénél, belevéve a 4.3.3 a) és b) pontok feltételeit is, és a maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ±30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.3.2 *84 KBIT/S CSATORNA ÁTVITELI SEBESSÉG*

4.3.4.3.2.1 *Keret befogás*. Az első egyedülálló szónál a keret befogás sikertelensége valószínűségének kisebbnek kell lennie, mint egy a 10^3-ban a Gauss csatorna 4,1 dB-es E_s/N_0 értékénél, belevéve a 4.3.3 a) és b) pontok feltételeit is, és maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ± 30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.3.2.2 *Téves keret befogás*. A téves keret befogás valószínűségének kisebbnek kell lennie, mint egy a 10^4-hez a Gauss csatorna 4,1 dB-es E_s/N_0 értékénél, belevéve a 4.3.3 a) és b) pontok feltételeit is, és maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ±30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.3.2.3 *A keret befogás újra-megszerzése*. A keret befogás elvesztése esetén az újra- megszerzést 0,5 másodpercen belül kell megvalósítani az összes eset 90 százalékában, a Gauss csatorna 4,1 dB-es E_s/N_0 értékénél, belevéve a 4.3.3 a) és b) pontok feltételeit is, és a maximális bekezdő impulzus-köteg - bekezdő impulzus-köteg közötti ±30 Hz-es frekvencia bizonytalansággal, valamint a 4.4.5.1 pont alatti maximális csatorna átviteli sebesség pontossági eltéréssel.

4.3.4.4 C CSATORNA FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS /GES/ DEMODULÁTOR RÁKAPCSOLÓDÁS

4.3.4.4.1 *21,0 kbit/s csatorna átviteli sebesség*. Egy Gauss csatornánál és a 4.3.3 a) és b) pontok feltételei mellett ±600 Hz frekvencia eltolódással és ±0,5 Hz óra-frekvencia eltolódással az első egyedi szóra való keret befogás megvalósulása sikertelenségének a valószínűsége kisebb kell, hogy legyen 1,7 dB-es E_s/N_0 értékénél. A téves befogás valószínűségének kisebbnek kell lenni az egy a 10^5-hez az 1,7 dB-es E_s/N_0 értéknél. Amennyiben keret elvesztés történne, akkor azt 3,0 másod- percen belül újra meg kell szerezni a teljes idő 99 százalékában az 1,7 dB-es E_s/N_0 értéknél.

4.3.4.4.1. *bis 8,4 kbit/s csatorna átviteli sebesség.* Egy Gauss csatornánál a 4.3.3 a) és b) pontok feltételei mellett ±600 Hz frekvencia eltolódással és ±0,5 Hz óra-frekvencia eltolódással ez első egyedi szóra való keret befogás megvalósulása sikertelenségének a valószínűsége kisebb kell, hogy legyen, mint 1 a 10^3-hoz 4,4 dB-es E_s/N_0-nál. A téves befogás valószínűségének kisebbnek kell lenni, mint 1 a 10^4-hez 4,4 dB-es E_s/N_0-nál. Ha keret elvésztés történne, akkor azt 0,5 másod- percen belül újra meg kell szerezni a teljes idő 90 százalékában 4,4 dB-es E_s/N_0 értéknél.

4.3.4.4.2 *Egyéb C csatorna átviteli sebességek*. A GES demodulátor keret-kapcsolat sikertelen létrejötte valószínűségének kisebbnek kell lennie, mint egy a 10^2-hoz a C csatorna adásának kezdetétől számított 0,75 másodpercen belül.

4.3.4.4.3 **Ajánlás.** – *A GES demodulátor C csatorna keret-kapcsolat kialakításának a C csatorna adásának megkezdését követően a lehető leggyorsabban létre kell jönnie.*

4.4 CSATORNA-FORMÁTUM TÍPUSOK ÉS ÁTVITELI SEBESSÉGEK

4.4.1 Általános

4.4.1.1 *Légijármű rendszer-időzítő vonatkoztatási pont.* Az AES által gerjesztett és vett jelek vonatkoztatási időzítő pontja az antennánál kell, hogy legyen.

4.4.1.2 *Csatorna átviteli sebességek*. A csatorna átviteli sebességeknek, mint a 4.1.3 pontban meghatározott rendszer műszaki jellemzői szintjéhez alkalmazhatóak, a 4-9. táblázatban meghatározottaknak megfelelőeknek kell lenniük.

4.4.1.3 *Jel egységek (SU).* A P-, R-, T- és alsávi C-csatornákon keresztül továbbítandó összes információnak jel egység formátumúnak kell lennie. A P-, T- és alsávi C-csatorna jel egységeknek 96 bitből kell állniuk. Az R-csatorna minden jel egységének 152 bitből kell állnia. A jel egység formátumainak a 2. Függelékben meghatározottaknak megfelelőnek kell lenniük.

4.4.1.3.1 *Ciklikus redundancia ellenőrzés (CRC).* Minden egyes jel egység utolsó két bájtjának a jel egység ciklikus redundancia ellenőrzését kell szolgálnia. Bármely beérkezett jel egységet, amely nem felel meg a ciklikus redundancia ellenőrzésnek, figyelmen kívül kell hagyni.

4.4.1.3.2 *Jel minőség kiértékelés*. Az AES-nek az olyan információkat, mint a P-csatorna degradáció/veszteség és a C-csatorna bit hiba-aránya, az AES és a GES vezérlési funkciók rendelkezésére kell bocsátania, ahogy megfelelő.

4.4.2 P-csatorna

4.4.2.1 *Csatorna átviteli sebesség pontosság*. A csatorna átviteli sebesség hiba-aránya nem haladhatja meg az egy a 10^6-hoz értéket.

4.4.2.2 KERET FORMÁTUM

4.4.2.2.1 *Általános jellemzők*. Minden P-csatorna keretnek vagy 500 ms-nak, vagy az 500 ms többszörösének kell lenni azért, hogy egy 8 másodperces szuperkeret egyszerű leszármaztatását eredményezze, amit az R- és T-csatorna rés-idő kiosztására kell felhasználni. Minden egyes P-csatorna keretnek a következők szerint azonosított öt mezőből kell állnia: formátum azonosító, szuper-keret határ-jel, ál-mező (a 2,4 kbit/s-nál nagyobb adat sebességek részére), információs mező és egyedi szó, amint azt a 4-1*. ábra a 2,4 kbit/s és ennél kisebb, valamint a 4-2. ábra a 2,4 kbit/s-nál nagyobb csatorna átviteli sebességek esetére mutat be.

4.4.2.2.2 *Formátum azonosító*. Ennek a mezőnek a következő 4 bitből kell állnia: 0001. Egyéb értékek a jövőbeni alkalmazásokra vannak fenntartva.

4.4.2.2.3 *Szuper-keret határ-jel*. Ennek a mezőnek a következő 12 bitből kell állnia:
– 4 bit egy új szuper-keret kezdetének a jelzésére

1111 a 8 másodperces szuper-keret 0. kerete esetén

0000 a szuper-keret összes egyéb kerete számára

– 4 bit a szuper-keret keretének jelzésére

0000, 0001, 0010, 0011 a 0,6 kbit/s sebesség esetén

0000, 0001,…0111 az 1,2 kbit/s sebesség esetén

000,0000,…1111 a 2,4 kbit/s és nagyobb sebességek esetén

– 4 bit, amelyek az előző 4 bitet ismétlik.

4.4.2.2.4 *Ál-mező*. A 2,4 kbit/s feletti csatorna átviteli sebességek esetén ennek a mezőnek a következőnek kell lenni:

16 bitnek a 4,8 kbit/s sebesség esetén

178 bitnek a 10,5 kbit/s sebesség esetén.

* Az összes ábra a fejezet végén került elhelyezésre.

Az ál-mezőnek a 0001-ek sorozatából kell állnia, ahol a 0001 annyiszor ismétlődik, amíg a szükséges bitek számát elérrik.

Megjegyzés. – Az ál-mezőt azért alkalmazzák, hogy minden egyes keret 0,5 másodperc hosszúságú legyen. A 2,4 kbit/s és az az alatti adatátviteli sebességek esetében nincs szükség ál-mező alkalmazására.

4.4.2.2.5 *Információs mező.* Az információs mezőnek többszörös jel egységeket kell tartalmaznia, amelyeket rejtjeleznek, kódolnak és összesorolnak, ebben a sorrendben. Az információs mezőben található bitek számának a 4-10. táblázatban meghatározottaknak kell megfelelniük.

Megjegyzés. – Az információs mezőben található bitek száma az adatátviteli sebességtől és az információs mező összesoroló blokkjainak a számától függ.

4.4.2.2.5.1 *Rejtjelezés*. Egy 15 fokozatú rejtjelező generátor-regisztert kell alkalmazni az adatok vevő oldali hibajavításának (FEC) kódolása előtti rejtjelezésére. A rejtjelező és a rejtjel-megfejtő generátor-regiszterének polinomja $1 + X + X^{15}$ legyen. A rejtjelező és rejtjel-megfejtő óra-jelét az információs sebességre kell beállítani az első rejtjelezett bit első léptetés előtti kibocsátásával. Programozási parancsok hiányában a léptető regisztert a 1101 0010 1011 001 értékekre kell inicializálni (a léptető regiszter első fokozat legbaloldalibb bit) minden egyes keret információs mezejének kezdetekor. A rejtjelező és rejtjel-megfejtő funkcióknak a 4-3. ábrán bemutatottaknak kell lenniük. A rejtjelezőt minden egyes keret információs mezejének kezdetekor újra-inicializálni kell.

Megjegyzés. – A rejtjelező koncepció magyarázatát az ITU-R Ajánlások S.446-4, Annex I., Section 4.3.1 Method I. tartalmazza.

4.4.2.2.5.2 *Vevő oldali hibajavítás (FEC).* A 4.4.5.3.3.5.2 pontban szereplő szabványt kell alkalmazni.

Megjegyzés. – A P-csatornán nincsenek túlcsordulás bitek.

4.4.2.2.5.3 *Összesorolás.* Minden P-csatornának blokk összesorolást kell alkalmaznia. Az összesoroló oszlop mélysége (sorok száma) 64 adás-bit kell, hogy legyen, az oszlopok száma a 4-11. táblázatban szereplő adási sebességtől függő. Az adónál a konvolúciós kódoló kimenő adatait 64-bites oszlopokba kell írni, addig, amíg az előírt oszlopszám meg nem telik. Ezt követően a sorokat a $Row_j = (Row_i *27)$ modulo 64 algoritmus alkalmazásával permutálni kell. Ezt követően az összesoroló tartalmát sorról-sorra továbbítani kell a 4-4. ábra szerint. A vevő oldalon a demodulátorból érkező nyers döntési adatokat soronként be kell írni az összesorolóba, majd amikor az megtelik, az összesoroló sorait a $Row_j = (Row_i *19)$ moduló 64 átalakító algoritmus alkalmazásával permutálni kell. Ezt követően a nyers döntési adatokat oszloponként be kell olvasni a vevő oldali hibajavítás dekóderbe.

4.4.2.2.6 *Egyedi szó.* Az A-BPSK-nál minden P-csatorna keretnek a 32 bites 1110 0001 0101 1010 1110 1000 1001 0011 egyedi szóra kell végződnie, ahol a bal szélső bit kerül először továbbításra. Az A-QPSK-nál az egyedi szónak az A-BPSK egyedi szavának kell lenni, amelyet megismételnek minden azonos fázisú és kvadratúra csatornán.

4.4.2.3 *Teljesítmény.* A teljes fizikai szintet úgy kell konfigurálni és üzemeltetni, hogy az átlagos bit-hiba mérték 10^{-5}, vagy kisebb legyen a rejtjel-megfejtés után.

4.4.3 R-csatorna

4.4.3.1 *Csatorna átviteli sebesség pontossága.* A csatorna átviteli sebesség hiba-mértéke nem haladhatja meg az egy a 2R-ben értéket - ahol az R a csatorna átviteli sebesség - és az egy rész a 10^4-hez érték.

4.4.3.2 *Impulzus-köteg időzítés.* Minden egyes R csatorna impulzus-köteg kezdete meg kell hogy jelenjen a vett P-csatorna szuper-keret által meghatározott R-csatorna résének kezdete ±300 s-on belül. Amint azt a 4-5. ábra mutatja, minden P-csatorna szuper-keret meg kell hogy határozzon 8, 16, 32 és 64 véletlen elérésű rést a 0,6; 1,2; 2,4 és 10,5 kbit/s R-csatorna adatátviteli sebességek számára, hol az értékek a felsorolás sorrendje szerint tartoznak össze.

4.4.3.3 IMPULZUS-KÖTEG FORMÁTUM

4.4.3.3.1 *Általános jellemzők.* Minden egyes R-csatorna impulzus-kötegnek három mezőből kell állnia: bekezdő jel-szakasz, az egyedi szó és az információs mező, amint azt a 4-6. ábra mutatja.

4.4.3.3.2 *Bevezető jel-szakasz.* Az R-csatorna bevezető jel-szakaszának egy modulálatlan és az azt követő modulált részből kell állnia. Ezek hossza az adatátviteli sebességtől függ, amint azt a 4-12. táblázat mutatja. Az A-BPSK bevezető jel-szakasz modulálatlan része állandó fázisú jel kell, hogy legyen, és a modulált résznek a szabvány A-BPSK modulátorhoz bemenő váltakozó “0” és “1” értékekből kell állnia. A modulált rész első bitjének “0”-nak kell lennie és –90 fokos fázis-változást kell biztosítania a modulálatlan jel fázisához viszonyítva. Az A-QPSK bevezető jelszakasz modulálatlan részének egy olyan állandó fázisú jelnek kell lennie, amely megfelel egy olyan ideális A-QPSK modulátor kimenetének, amelynek bemenetén minden érték “0”. A modulált résznek váltakozó “0” és “1” (“0”-val kezdődően az első bitben) értékekből kell állnia az I. csatornán és folyamatos “0” értékekből a Q-csatornán.
Megjegyzés. – Szándék szerint a bekezdő jel-szakasz modulálatlan részét vivőfrekvencia akvizícióra, a modulált részét órajel akvizícióra kell használni.

4.4.3.3.3 *Egyedi szó.* A 4.4.2.2.6 pont alatti szabványt kell alkalmazni.

4.4.3.3.4 *Információs mező.* Minden R-csatorna bekezdő jelsorozat információs mezejének 160 bitből kell állnia, és tartalmazni kell egy kibővített jel-egységet, plusz 8 túlcsordulás bitet a konvolúciós kódolást megelőzően, ahol a kibővített jel-egységnek 152 bittel kell rendelkeznie és a túlcsordulás mezőnek 0000 0000-nak kell lennie. Az információs mezőt rejtjelezni, kódolni és összesorolni kell, ebben a sorrendben.

4.4.3.3.4.1 *Rejtjelezés.* A 4.4.2.2.5.1 pont alatti szabványt kell alkalmazni, azzal a kivétellel, hogy a túlcsordulás-bitek nem rejtjelezendők.

4.4.3.3.4.2 *Vevő-oldali hibajavítás (FEC) kódolás.* A 4.4.2.2.5.2 pont alatti szabványt kell alkalmazni azon kivétellel, hogy a kódolót minden impulzus-köteg információs mezejének kezdetekor az összes 0-ás állapotba kell újra-inicializálni.

4.4.3.3.4.3 *Összesorolás.* Az összes R-csatornának blokk összesorolást kell alkalmaznia. Az összesorolóban lévő sorok számának 64 átviteli bitnek, míg az oszlopok számának 5-nek kell lenni. Az összesorolóban lévő sorok felcserélését a 4.4.2.2.5.3 pont szerint kell végrehajtani.

4.4.3.4 *Teljesítmény.* A 4.4.2.3 pont alatti szabványt kell alkalmazni.

4.4.4 T-csatorna.

4.4.4.1 *Csatorna átviteli sebesség pontossága.* A csatorna átviteli sebesség hiba-mértéke nem haladhatja meg az egy a 2R-ben értéket - ahol R a csatorna átviteli sebesség - és az egy 10^{4}-hez érték.

4.4.4.2 *A P-csatornára vonatkozó időzítés.* Minden T-csatorna impulzus-köteg kezdetének a vett P-csatorna szuper-keret által meghatározott kijelölt T-csatorna rés kezdetétől számított ±300 s-on belül kell megjelennie. Amint azt a 4-7. ábra mutatja, minden P-csatorna szuper-keretet fel kell osztani egyenként 64 T-csatorna rést tartalmazó 16 névleges keretre. Két különböző légijármű T-csatorna impulzus-kötegei közötti legrövidebb őridő a GES vezérlése alatt áll és 5 résnyinek kell lennie.

4.4.4.3 IMPULZUS-KÖTEG SZERKEZET

4.4.4.3.1 *Általános jellemzők.* Minden T csatorna impulzus-kötegnek három mezőből kell állnia: a bevvezető szakasz, az egyedi szó és az információs mező, amint azt a 4-8. ábra mutatja.

4.4.4.3.2 *Bevezető jel-szakasz.* A 4.4.3.3.2 pont alatti szabványt kell alkalmazni.

4.4.4.3.3 *Egyedi szó.* A 4.4.2.2.6 pont alatti szabványt kell alkalmazni.

4.4.4.3.4 *Információs mező.* Minden T-csatorna impulzus-köteg információs mezejének tartalmaznia kell egy bekezdő szakasz azonosítót, "n" jel-egységet /SU/ és 16 túlcsordulás bitet a konvolúciós kódolást megelőzően, az alábbiak szerint:

Bekezdő szakasz azonosító – ez a mező 48 bitet tartalmaz, ami a kezdeményező légijárművet és a rendeltetési GES-t azonosítja.

n jel-egység – 2-től 31-ig terjedő, egyenként 96 bitből álló szabvány hosszúságú jel-egység, és

Túlcsordulás – 16 bitből álló mező (mindegyik 0) a konvolúciós kódoló kiürítésére.

Az információs mezőt rejtjelezni, kódolni és összesorolni kell, ebben a sorrendben.

4.4.4.3.4.1 *Rejtjelezés.* A 4.4.2.2.5.1 pont alatti szabványt kell alkalmazni, azon kivétellel, hogy a rejtjelezőt minden impulzus- köteg információs mezejének kezdetén újra-nicializálni kell.

4.4.4.3.4.2 *Vevő-oldali hibajavítás (FEC) kódolás.* A 4.4.2.2.5.2 pont alatti szabványt kell alkalmazni, azon kivétellel, hogy a konvolucíós kódolót minden impulzus-köteg információs keretének kezdeténél az összes 0 állapotába kell újra-inicializálni.

4.4.4.3.4.3 *Összesorolás.* Az összes T-csatornánál blokk összesorolást kell alkalmazni. Az összesorolóban lévő sorok számának 64 átviteli bitnek kell lenni, miközben az oszlopok száma a 4-13. táblázatban szereplő adatátviteli sebességtől kell, hogy függjön. Az adó-oldalon a konvolúciós kódoló kimenő jeleit 64 bites oszlopokba kell írni, amíg a meghatározott oszlopszám megtelik. Az összesoroló sorkicserélő algoritmusának összhangban kell állnia a 4.4.2.2.5.3 pont alattiakkal.

4.4.4.4 *Teljesítmény*. A 4.4.2.3 pont alatti szabványt kell alkalmazni.

4.4.5 C-csatorna

4.4.5.1 *Csatorna átviteli sebesség pontossága.* A csatorna átviteli sebesség hibamértéke nem haladhatja meg az egy a 2R-ben értéket, ahol R a csatorna átviteli sebesség, és az értéke egy a 10^4-hez.

4.4.5.2 ÁTVITELI FORMÁTUMOK

4.4.5.2.1 *Bevezető jelszakasz.* Az impulzus-köteg bevezető jelszakaszának az összes C-csatorna átviteli sebességnél - kivéve a 8,4 kbit/s csatornát - egy modulálatlan vivő részből és az azt követő modulált részből kell állnia. Ezek hosszúságának a 4-14. táblázatban szereplő csatorna átviteli sebességtől kell függnie, amint az alkalmazható a 4.1.3 pontban meghatározott rendszer műszaki jellemzőkre. A bevezető jelszakasznak a 4.4.3.3.2 pont és a 4-14. táblázat szövege szerintinek kell lennie. A 8,4 kbit/s csatornának nem lehet bevezető jelszakasza.

4.4.5.2.2 *BEFEJEZŐ JELSZAKASZ*

4.4.5.2.2.1 *8,4 kbit/s-os C-csatorna.* A C-csatorna befejező jelszakaszának váltakozva "1" és "0" értékekből ("1"-el kezdődően) kell állnia az I-csatornán és a Q-csatornán. A 8,4 kbit/s C-csatorna befejező jelszakasz hossznak egyenlőnek kell lennie 104 bittel.

4.4.5.2.2.2 *Az összes többi C-csatorna.* Az összes többi C-csatorna befejező jelszakaszának folyamatos "0"-kból kell állnia az I- csatornán és váltakozva "0" és "1"-ekből ("0"-val kezdődően) a Q-csatornán. A befejező jelszakasz hosszának egyenlőnek kell lennie egy egyedülálló összesoroló blokkal az összesorolós csatornák esetében, és 96 bittel kell egyenlőnek lennie az összesorolás nélküli csatornák esetében.

4.4.5.2.3 *A LÉGIJÁRMŰHÖZ*

4.4.5.2.3.1 *A 8,4 kbit/s-os C-csatorna.* A C-csatornának impulzus-köteg üzemmódban kell működnie a légijármű irányában. Ebben az üzemmódban a C-csatornának egy sorozat egymással szomszédos keretből kell állnia, amelyet egy befejező jelszakasz követ. Mindegyik keretnek két mezőből kell állnia: az egyedi szó és az információ mezőből, ahogyan azt a 4-9. *bis* ábra feltünteti. Mindegyik keretnek 500 ms hosszúságúnak kell lenni.

4.4.5.2.3.2 *Az összes többi C-csatorna.* Az összes többi C-csatornának impulzus-köteg üzemmódban kell működnie a légijárműhöz irányban. Ebben az üzemmódban a C-csatorna impulzus-kötegnek egy bevezető jelszakaszból kell állnia, amit egy sorozat egymással határos keret követ, ami után egy befejező jelszakasz következik. Minden keretnek három mezőből kell állnia: egy egyedi szóból, egy ál-mezőből és információs mezőből a 4-9. és a 4-10. ábráknak megfelelően. Minden keretnek 500 ms hosszúságúnak kell lennie.

4.4.5.2.4 *A LÉGIJÁRMŰTŐL*

4.4.5.2.4.1 *A 8,4 kbit/s-os C-csatorna.* A C-csatornának folyamatos üzemmódban kell működnie a légijármű felőli irányból. Ebben az üzemmódban a C-csatornának két mezőből kell állnia: az egyedi szó és az információs mezőből a 4-9. *bis* ábra szerint. Mindegyik keretnek 500 ms hosszúságúnak kell lenni.

4.4.5.2.4.2 *Az összes többi C csatorna.* Az összes többi C-csatornának folyamatos üzemmódban kell működnie a légijármű felőli irányból. Minden átvitelnek a 4.4.5.2.1 pontban meghatározott bevezető jelszakasszal kell kezdődnie. Ebben az üzemmódban a C-csatorna keretnek három mezőből kell állnia: az egyedi szóból, az ál-mezőből és az információs mezőből a 4-9. és a 4-10. ábra szerint. Minden keret hosszúságának 500 ms kell lennie.

Megjegyzés. - A P-, R- és T-csatornák információs mezői a vevő-oldali hibakorrekciós kódolás utáni információs bitekre vonatkoznak. A C-csatorna esetében az információs mező kódolást tartalmazhat is, meg nem is, a szóbanforgó C-csatorna típusától függően.

4.4.5.3 KERET FORMÁTUM

4.4.5.3.1 *AZ EGYEDI SZÓ*

4.4.5.3.1.1 *A 8,4 kbit/s-os C-csatorna.* Az egyedi szónak két 52 bites szakaszból kell állnia az A-QPSK jel
I- és Q-csatornáin:

I	1010	1011	0011	0111	0110	1001	0011	1000	1011	1100
	1010	0011	0000							
Q	0000	1100	0101	0011	1101	0001	1100	1001	0110	1110
	1100	1101	0101							

elsőként a bal-szélső bit továbbításával.

4.4.5.3.1.2 *Az összes többi C-csatorna.* Az A-QPSK jel I- és Q-csatornáin az egyedi szónak két azonos 44 bites sorozatból kell állnia: 0100 0010 1101 1010 1111 0011 0100 1011 1011 0001 0001, ahol a legbaloldalibb bit kerül először átvitelre.

4.4.5.3.2 *Ál-mező.* Ahol a csatorna átviteli sebességek a 4-9. táblázatban meghatározottak szerint és a 4-9., 4-9. *bis* és 4-10. ábrán bemutatottak szerint kerülnek alkalmazásra, az ál-mezőben lévő bitek számának a következőknek kell lenni:

- 62 a 10,1 kbit/s esetén;
- 44 a 21,0 kbit/s esetén;
- 37 az 5,25 kbit/s esetén; és
- 32 a 6,0 kbit/s esetén;
- 0 a 8,4 kbit/s esetén.

Az ál-biteknek az 5,25; 6,0; 10,5 és 21,0 kbit/s-os csatornáknál a 0101 1010 0011 1100 sorozatból kell állnia addig ismételve, amíg a szükséges bit számot el nem nyerik. A 8,4 kbit/s-os C-csatornánál egyetlen d3 bit van, amelyet a vevő-oldali hiba korrekció kódolása után adnak hozzá. A d3 bit értéke 1-re van állítva, ahogyan azt a 4-9. *bis* ábra mutatja.

4.4.5.3.3 *A KÓDOLT CSATORNÁK INFORMÁCIÓS MEZŐI*

4.4.5.3.3.1 A 8,4 kbit/s csatorna átviteli sebességnél ennek a mezőnek 4096 bitet kell tartalmaznia, amelyet 16 egyenként 256 bites összesoroló blokkra kell osztani. A 21,0 kbit/s csatorna átviteli sebességnél a mezőnek 10368 bitet kell tartalmaznia, amelyet 27 egyenként 384 bites összesoroló blokkra kell osztani.

4.4.5.3.3.2 **Ajánlás. -** *Az ajánlott 6,0 kbit/s csatorna átviteli sebesség esetén ennek a mezőnek 2880 bitet kell tartalmazni, ami egyenként 192 bitet tartalmazó 15 összesoroló blokkra van felosztva.*

4.4.5.3.3.3 *Az alsávi adatokat tartalmazó inormációs mező szerkezete.* A rejtjelezést, vevő-oldali hibajavítási (FEC) kódolást és összesorolást megelőzően az információs mezőnek egy kitöltő mezőből kell állnia, amit 25 váltakozó alsávi adat és átlátszó adat (hang) almező követ a 4-9. vagy 4-9. *bis* ábra szerint, ahogy megfelelő.

4.4.5.3.3.3.1 A 21,0 kbit/s csatorna átviteli sebesség esetén a kitöltő mezőnek 84 nullából kell állnia, minden almezőnek 12 alsávi adat bitet és 192 elsődleges bitet kell tartalmaznia, valamint a 25. alsávi adat almező utolsó 12 bitjét nullákkal kell kitölteni.

4.4.5.3.3.3.2 **Ajánlás.** - *Az ajánlott 6,0 kbit/s csatorna átviteli sebesség esetén a kitöltő mezőnek 40 nullából kell állnia, minden almezőnek 8 alsávi adat bitet és 48 elsődleges bitet kell tartalmaznia, valamint a 25. alsávi adat almező utolsó 8 bitjét nullákkal kell kitölteni.*

4.4.5.3.3.3.3 A 8,4 kbit/s csatorna átviteli sebességnél a kitöltő mezőnek egyetlen, 1-re állított értékű referencia bitből kell állnia, és mindegyik almezőnek 12 alsáv adat bitet és 96 elsődleges bitet kell tartalmaznia.

4.4.5.3.3.4 *Rejtjelezés.* A 4.4.2.2.5.1 pont alatti szabványt kell alkalmazni.

4.4.5.3.3.5 *Vevő-oldali hiba korrekció (FEC) kódolás*

4.4.5.3.3.5.1 *A 8,4 kbit/s-os C-csatorna.* A FEC egy k = 7-ben korlátozott hosszúságú, 2/3 mértékű lyukasztott konvolucíós kódolásból és egy nyers döntési Viterbi dekóderből áll. Ehhez a kódhoz tartozó generátor polinomok a következők legyenek:

G1: $1 + X^2 + X^3 + X^5 + X^6$

G2: $1 + X + X^2 + X^3 + X^6$

A kódoló bemeneti/kimeneti összefüggés: három kimeneti bit minden két bemeneti bithez, minden négy továbbított bit negyedik bitje elhagyásra kerül. A sorozat:

Bemeneti bit	1	2
Kimeneti sorozat	G_1 G_2	G_{-1}

4.5.3.3.5.2 *Egyéb C-csatorna átviteli sebességek.* Az információs mezőt az 1/2 mértékű vevő-oldali hibakorrekció kódolásra kell használni. A FEC kódolást egy 7-es hosszúságra korlátozott 1/2 mértékű konvolúciós kódolóval valósítják meg. A kódolt szimbólumok kimeneti sorozatának G1, G2-nek kell lennie (ahogyan a 4.4.5.3.3.5.1 pontban meghatározásra került és a 4-3. ábra bemutatja). A konvolúciót nem lehet keretek között iniciálni.

4.4.5.3.3.6 *Összesorolás*

4.4.5.3.3.6.1 Az összesorolóban a sorok számának 64 átviteli bitnek kell lenni. A 8,4 kbit/s csatorna átviteli sebességnél az oszlopok számának 4-nek kell lenni. A 21,0 kbit/s csatorna átviteli sebességnél az oszlopok számának 6-nak kell lenni.

4.4.5.3.3.6.2 **Ajánlás.** - *Az ajánlott 6,0 kbit/s csatorna átviteli sebesség esetén az összesorolóban lévő sorok számának 64 átviteli bitnek, és az összesoroló oszlopok számának 3-nak kell lenni.*

4.4.5.3.3.6.3 Az adónál a konvolúciós kódoló kimeneti jeleit 64 bites oszlopokba kell írni, amíg a meghatározott oszlopszám meg nem telik. Ezt követően a sorokat a 4.4.2.2.5.3 pontban meghatározott algoritmus szerint permutálni kell.

4.4.5.3.4 *A kódolatlan csatornák információs mezői.* Ahol a csatorna átviteli sebességeket a 4.1 pontban meghatározottak szerint alkalmazzák, ott a 10,5 kbit/s csatorna átviteli sebesség esetén ennek a mezőnek 5100 bitet, valamint az ajánlott 5,25 kbit/s csatorna átviteli sebesség esetén 2500 bitet kell tartalmaznia.

4.4.5.3.4.1 *Alsávi adatokat tartalmazó információs mező szerkezete.* A rejtjelezést megelőzően ezt a mezőt a 4-10. ábra szerint 25 váltakozó alsávi adat és elsődleges mezőre kell felosztani. Ahol a csatorna átviteli sebességeket a 4.1.3 pontban meghatározottak szerint alkalmazzák, ott a 10,5 kbit/s csatorna átviteli sebesség esetén minden almezőnek 12 alsávi adat bitet és 192 elsődleges bitet kell tartalmazni, a 25. alsávi adat almező utolsó 12 bitjét nullákkal kell kitölteni. Ahol a csatorna átviteli sebességeket a 4.1.3 pontban meghatározottak szerint alkalmazzák, ott az 5,25 kbit/s csatorna átviteli sebesség esetén minden almezőnek 4 alsávi adat bitet és 96 elsődleges bitet kell tartalmaznia, a 25. alsávi adat almező utolsó 4 bitjét nullákkal kell kitölteni.

Megjegyzés. – Az összesorolás nem alkalmazható a 10,5 és az 5,25 kbit/s csatorna átviteli sebességek esetében, mert ezeken a sebességeken az adatok nincsenek vevő-oldali hibakorrekció szerint kódolva.

4.4.5.4 *Teljesítmény.* A C-csatorna fizikai rétegét úgy kell konfigurálni és üzemeltetni, hogy az átlagos bit hibamérték 10^{-3} vagy kisebb legyen a rejtjel-megfejtést követően.

Megjegyzés. – A vett Bit hiba-arány-/BER/-nak a GES általi mérései lehetővé teszik a GES-nek az AES felé irányuló utasításai részére az AES kisugárzott teljesítményének szabályozását. A GES ugyancsak veszi az AES által készített teljesítmény adatmérési értékeket a GES kimenő teljesítménye beszabályozásának lehetővé tétele érdekében.

4.5 ADATKAPCSOLATI RÉTEG P-CSATORNA ÉS R-CSATORNA PROTOKOLOK

4.5.1 Általános

Megjegyzés. – A Légiforgalmi Mozgó-Műholdas Szolgálat /AMSS/ protokolok a Nyílt rendszerek összekapcsolása /OSI/ rétegelt referencia model fogalmaival kerültek meghatározásra. A 4.5 rész a P- és az R-csatornák adatkapcsolati rétegének funkcionális követelményeit határozza meg a Légijármű fedélzetén elhelyezett földi állomás /AES/ ésa Földi telepítésű földi állomás /GES/ közötti felhasználói adatok átvitele és jelátvitel céljából.

4.5.1.1 Minden AES és GES esetében az adatkapcsolati réteg kapcsolódó felületet kell, hogy képezzen az alábbiakhoz:

a) az alhálózati réteg;
b) az AES/GES vezérlés;
c) áramkör-üzemmódú szolgáltatások;
d) fizikai réteg.

4.5.1.2 Az adatkapcsolati szolgáltatás felhasználó meghatározásnak, amikor a 4.5 pontban meghatározott adatkapcsolati réteggel való összefüggésben használják, akkor a fenti felsorolás a), b) és c) tételeit kell tartalmaznia.

4.5.2 Adatkapcsolati réteg adat egység (LIDU)

4.5.2.1 Az adatkapcsolati réteg adat egységnek a teljes információs egységnek kell lennie, amit az adatkapcsolati szolgáltatás felhasználó és az adatkapcsolati réteg közötti interfészen keresztül továbbítanak egyetlen kölcsönhatással. Minden adatkapcsolati réteg adat egységnek tartalmaznia kell adatkapcsolati réteg vezérlő információt (LICI) és ha szükséges, egy adatkapcsolati szolgáltatás adat egység elemet /LSDU/.

4.5.2.2 Az adatkapcsolati réteg és az alhálózat réteg között kicserélt LIDU-nak tartalmaznia kell egy LSDU-t és LICI-t, kivéve, hogy az átviteli állapot jelző LIDU-nak (4-25. táblázat) - amelyet az adatkapcsolati réteg ad át az al-hálózati rétegnek - az adó végen csak LICI-t kell tartalmaznia. Az adatkapcsolati réteg és az AES/GES vezérlés között, valamint az adatkapcsolati réteg és az áramkör üzemmódú szolgáltatás között kicserélt LIDU csak LICI-t tartalmazzon.

4.5.2.3 ADATKAPCSOLATI RÉTEG VEZÉRLÉS INFORMÁCIÓ (LICI)

4.5.2.3.1 Az adatkapcsolati réteg és az a-lhálózati réteg között kicserélt LICI paramétereket a 4-11. táblázat szerint kell meghatározni.

4.5.2.3.2 Az adatkapcsolati réteg és az áramköri üzemmódú szolgálatok között kicserélt LICI paramétereket a 4-38. táblázat szerint kell meghatározni.

4.5.2.3.3 Az adatkapcsolati réteg és az AES, valamint GES vezérlési funkciók között kicserélt LICI paramétereket a 4.9.2.1.2 pont és a 4-45. táblázat szerint kell meghatározni.

4.5.2.4 AZ ADATKAPCSOLATI SZOLGÁLTATÁS ADAT EGYSÉG (LSDU)

Megjegyzés. – Az adatkapcsolati szolgáltatás adat egység (LSDU) a LIDU egy részét képezi, azt, amely azonosságát megőrzi az adatkapcsolat szolgáltatás két egymással kommunikáló felhasználója között.

4.5.2.4.1 Az adatkapcsolat szolgáltatási adat egységnek (LSDU) tartalmazni kell kapcsolat szolgáltatás felhasználói adatokat és azokat az al-hálózati rétegből érkező LIDU-ból kell kiemelni.

4.5.2.4.2 *AZ ADATKAPCSOLAT SZOLGÁLTATÁSI ADAT EGYSÉG FORMÁTUM*

Az LSDU formátumnak azonosnak kell lenni a 4.7 pontban meghatározott Műholdas al-hálózat-függő funkció /SSND/ alréteg műholdas al-hálózati protokol adat egységeivel (SNPDU).

4.5.3 Adatkapcsolati protokol adat egység (LPDU)

4.5.3.1 Az adatkapcsolati protokol adat egységeknek (LPDUs) a 4.5.3.2 pontban meghatározott jel egységeknek (SU) kell lenniük.

4.5.3.2 JEL EGYSÉG (SU)

4.5.3.2.1 A jel egységeknek a P- és az R-csatornák viszonylatában két hosszúságnak kell lennie:

a) 96 bit (12 oktett): szabvány hosszúságú jel egység a P-csatornára;

b) 152 bit (19 oktett): megnövelt hosszúságú jel egységek az R-csatornára.

4.5.3.2.2 Minden jel egységnek /SU/ tartalmaznia kell vezérlés információt és tartalmazhat a jel egység típusától függő felhasználói adatokat.

4.5.3.2.3 *LIDU LEKÉPEZÉSE – SU KÉSZLETBE*

4.5.3.2.3.1 Az adatkapcsolati réteg által vett minden LIDU-t, az egyszintű adatkapcsolati réteghez való továbbítás előtt, egy jel egység készletbe kell leképezni. Minden jel egységnek, vagy egy "magányos jel egységnek" (LSU) nevezett egyedi jel egységből, vagy több mint egy jel egységből kell állnia, amelyet első jel-egységének a "kezdő jel-egységnek (ISU)" és az azt követőknek a "soronkövetkező jel-egységeknek (SSUs)" kell lenniük.

4.5.3.2.3.2 *Az LSDU-ból és LICI-ből álló LIDU*

4.5.3.2.3.2.1 A P-csatorna esetén a 2, 3 vagy 4 oktett hosszúságú LSDU-t a 4. Fejezet 2. Függelékének A2-37., A2-39. és A2-40. ábrái szerint kell szabvány hosszúságú LSDU-ba leképezni. A 4 oktettnél nagyobb hosszúságú LSDU-nak egy ISU-ban kell végződnie, amit maximum 63 SSU követ. A négy oktettnél hosszabb LSDU első oktettjét egy ISU 2 oktettes felhasználói adatmezőbe kell leképezni (4. Fejezet 2. Függelék A2-37. ábra). A fennmaradó oktetteket a sorszámokkal ellátott (4. Fejezet 3. Függelék 59. Szakasz) soronkövetkező SSU-k 8 oktettes felhasználói adatmezeibe kell leképezni (4. Fejezet 2. Függelék A2-38. ábra). Az SSU-k száma az LSDU oktettjeinek számától függ. A SU készlet minden jel egységének vezérlési információját a LICI-ben található információból, valamint a belső adatkapcsolati réteg protokol folyamatai által generált információkból kell leképezni.

Megjegyzés. – Minden ISU tartalmaz olyan információt, ami az SU készlet utolsó SSU-jának felhasználói adatmezejében lévő oktettek számát jelzi.

4.5.3.2.3.2.2 Az R-csatornánál egy LSDU-nak maximálisan 3 kibővített hosszúságú SU-ba kell leképezést végeznie az SU készlet LSDU felhasználói adatmezejében lévő első 11 oktettet tartalmazó (4. Fejezet 2. Függelék A2-44. ábra) ISU-jával. A fennmaradó oktetteket az SSU-k 11 oktettes felhasználói adatmezeibe kell leképezni, a sorrend kijelölő mutató által szabályozott sorrendben (4. Fejezet 3. Függelék 58. tétel). Az SU készlet minden jel egységének vezérlő információját a LICI-ben található információból, valamint a belső adatkapcsolati réteg protokol folyamatai által generált információkból kell leképezni.

4.5.3.2.3.3 *A csak LICI-ből álló LIDU*

A csak LICI-ből álló LIDU esetében az SU készletet a LICI-ben található információ, valamint a belső adatkapcsolati réteg protokol folyamatai által a megfelelő SU vezérlő információ mezőibe generált információk leképezésével kell létrehozni.

4.5.3.2.4 *SU KÉSZLET – LIDU LEKÉPEZÉS*

4.5.3.2.4.1 A vételi oldalon az SU készletet LIDU-vá kell visszaalakítani a kapcsolat szolgáltatás felhasználójához való eljuttatása előtt.

4.5.3.2.4.2 Felhasználói adatokat tartalmazó SU(k) SU készlete esetében a keletkező LIDU-nak LSDU-t és LICI-t kell tartalmaznia. Az LSDU-t a vett teljes SU készlet minden SU-ja felhasználói adatmezőinek kombinálásával kell visszaállítani. A LICI-t az SU(k) ellenőrző információiból kell előállítani.

4.5.3.2.4.3 Felhasználói adatokat nem tartalmazó SU(k) SU készlete esetében a keletkező LIDU-nak csak LICI-t kell tartalmaznia. A LICI-t aZ SU-k vezérlő információiból kell előállítani.

4.5.3.3 JELEGYSÉG FORMÁTUM

4.5.3.3.1 A P- és R-csatornán továbbított összes SU formátumának meg kell felelnie a 4. Fejezet 2. Függelékében bemutatottaknak. A jel egység mező leképezése és a bitek továbbítása az A2-1. ábra szerint kell, hogy történjen. A jel egység mező kódolása és meghatározásai a 4. Fejezet 3. Függelékében meghatározottaknak megfelelőek kell ,hogy legyenek.

4.5.3.3.2 A vevő adatkapcsolati réteg által fel nem ismert SU-kat figyelmen kívül kell hagyni.

Megjegyzés. – A 4. Fejezet 2. Függelékében meg nem határozott SU-k az AMSS szolgáltató és AMSS felhasználó közötti kölcsönös megegyezés alapján biztonsági kérdéseket nem érintő szolgáltatások esetében felhasználhatók.

4.5.4 LIDU útválasztás

A vevő adatkapcsolati rétegnek a LICI-ben (akár a GES, akár az AES esetében), a közlemény típus paramétert kell használnia a LIDU megfelelő adatkapcsolati szolgáltatás felhasználóhoz való irányítása céljából. Az alsávi C- vagy R/P-csatornákon való továbbítás esetén a továbbító adatkapcsolati rétegnek (akár a GES, akár az AES esetében) az áramkör üzemmódú szolgáltatásoktól (4-38. táblázat) kapott LICI-ben alkalmazni kell az útvonali paramétert a SU készlet megfelelő LIDU-hoz való irányítás céljából.

4.5.5 Elsőbbség (Q szám)

Egy LIDU-ból generált SU készlet minden SU-ját a kapcsolati rétegnek egy sorrenddel (Q számmal) kell megjelölnie az elsőbbség paraméternek megfelelően, amelyet a LICI-ben a kapcsolat szolgáltatás felhasználója juttat el hozzá. Minden adatkapcsolati jelző jel egység részére ki kell jelölni a közlemény típusának megfelelő Q számot. A Q számnak a 0 (legalacsonyabb elsőbbség) és a 15 (legmagasabb elsőbbség) közötti tartományban kell elhelyezkednie.

4.5.6 A Közvetlen összeköttetési szolgáltatás /DLS/ és a Megbízható összeköttetési szolgáltatás /RLS/ szolgáltatások

4.5.6.1 Az adatkapcsolati réteg két különböző típusú szolgáltatást kell hogy nyújtson, közvetlen összeköttetési szolgáltatás (DLS) és megbízható összeköttetési szolgáltatás (RLS) néven.

4.5.6.2 A DLS-nek egy olyan adatkapcsolati réteg szolgáltatásnak kell lenni, amelyben a SU-kat bármelyik elvesztett SU azonosítása és újra-továbbítása nélkül kell az egyszintű adatkapcsolati réteghez továbbítani.

Megjegyzés. – DLS csak az AES/GES vezérlő funkciók és áramköri üzemmódú szolgáltatások részére áll rendelkezésre.

4.5.6.3 Az RLS-nek egy olyan adatkapcsolati réteg szolgáltatásnak kell lenni, amely biztosítja bármely elveszett SU(k) azonosítását és újra-továbbítását.

4.5.7 P-csatorna protokol

Megjegyzés. – Ebben a szakaszban az "AES" és "GES" kifejezések használata az AES-en és GES-en belüli P csatorna protokoll adatkapcsolati réteg funkcióira vonatkozik.

4.5.7.1 ÁLTALÁNOS

A P-csatorna adatkapcsolati réteg funkcióinak a 4.5.7.2 és 4.5.7.3 pontokban meghatározottaknak megfelelőnek kell lenni.

4.5.7.2 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.5.7.2.1 Egy LIDU vételekor a GES ki kell, hogy jelöljön részére egy rendelkezésre álló referencia számot (amely olyan, hogy pillanatnyilag ugyanazzal a Q számmal nincs egy LIDU-ra kijelölve) valahányszor, amikor ez a 4.5.7.2.2 pontnak megfelelően megvalósítható; ugyanakkor, a GES nem jelölhet ki referencia számot olyan LIDU-k részére, amelyek áramköri üzemmódú szolgáltatásoktól érkeztek és az olyan rendszertábla adási LIDU-k számára, amelyek a GES vezérlés felől érkeztek. Ha nem lehet referencia számot kijelölni egy LIDU számára, akkor a LIDU-t addig kell tárolni, amíg egy referencia számot a részére ki nem osztanak.

Megjegyzés. – Az áramkör üzemmódú LIDU-kat az áramköri üzemmódú szolgáltatások látják el alkalmazási referencia számokkal.

4.5.7.2.2 Bármely Q elsőbbségi szintnél egy egyedi AES-hez rendelt LIDU részére történő referencia szám minden egyes kijelölésének az összes, ehhez az AES-hez rendelt, ugyanazon a Q szinten lévő referencia szám nélküli LIDU közül a legrégebbihez kell történnie. A GES nem oszthat ki referencia számot egy RLS LIDU részére, ha már van egy másik LIDU részére ugyanazon Q számmal érvényesen kijelölt és ugyanazon AES-nek megcímzett referencia szám. A DLS LIDU kivételével, amit LSU-kba képeznek le, ugyanazon Q számmal rendelkező LIDU-k részére két egymást követő referencia szám nem jelölhető ki. Az RLS esetében a GES által kijelölt referencia szám nem lehet egyenlő az ugyanazon Q számmal rendelkező RLS-nek utoljára kiosztott, és ugyanazon AES-nek megcímzett referencia számmal.

4.5.7.2.3 A DLS esetében a referencia számot a kijelölése után azonnal fel kell szabadítani. Az RLS esetében a referencia számot azután kell felszabadítani, miután a GES egy átviteli állapotjelző LIDU-t küld (4-25. táblázat) a GES adatkapcsolati szolgáltatás felhasználója részére. A GES a 4.5.7.2.2 pontnak megfelelően nem jelölhet ki újra egy felszabadított referencia számot addig, amíg a felszabadítása előtt rendelkezésre álló összes referencia szám kijelölésre nem kerül. Ez alól az egyedüli kivétel az az eset lehet, amikor egy DLS LSU-ba leképezést végző LIDU számára referencia szám került kijelölésre, ami azonnal újra kijelölhető egy LSU-ba leképezést végző másik DLS LIDU részére.

4.5.7.2.4 A LIDU részére történő referencia szám kijelölését követően vagy az áramkör üzemmódú LIDU vételekor a 4.5.3.2.3 pontnak megfelelően egy SU készletet kell létrehozni. A legrégebben továbbításra váró SU-k közül mindig a legnagyobb számmal rendelkezőt kell először továbbítani. Egy SU készlet ISU-ját vagy adás-ismétlő RTX SU-ját kell az SSU-kat megelőzően továbbítani és az SSU-k továbbítását a csökkenő besorolási számaik szerint kell elvégezni (4. Fejezet 3. Függeléke 59. tétel). A teljes SU készlet továbbítását követően a GES-nek a következőket kell elvégeznie:

4.5.7.2.4.1 A Megbízható összeköttetési szolgáltatás /RLS/ esetében:

a) Ha egy olyan P-csatorna nyugtázó (PACK) SU (4. Fejezet 2. Függeléke, A2-49. ábra) érkezik az AES-től, amely nem jelez hibát az SU készletben, akkor a GES-nek sikeres átvitelt jelző (4-25. táblázat) átviteli állapotjelző LIDU-t kell küldenie a GES kapcsolati szolgáltatás felhasználója részére.

b) Ha az AES-től egy olyan P-csatorna nyugtázó SU érkezik, amely az SU készleten belül hiányzó SU-kat jelez és a PACK SU készletből nem érkezik egy másik PACK SU tG2 másodpercen belül (4. Fejezet 4. Függeléke) azon időponttól számítva, hogy a PACK SU készlet utolsó PACK SU-ja megérkezett, vagy ha nem várható, hogy több hiányzó SU-t azonosító PACK SU érkezik, akkor a GES-nek egy adás-ismétlő SU készletet kell továbbítania. Az adás-ismétlő SU-nak egy adás-ismétlő fej-rész (RTX) SU-t (4. Fejezet 2. Függelék A2-41. ábra) kell tartalmaznia, amit a PACK SU készlet vett PACK SU-jaiban azonosított, hiányzó SU-k követnek. Ezt követően a GES-nek a 4.5.7.2.4.1 pont szerint kell eljárnia, azonban, ha az AES-től az SU készletből hiányzó SU-kat jelző PACK SU készlet érkezik, mielőtt a teljes adás-ismétlő SU készlet továbbításra kerül, akkor a GES-nek figyelmen kívül kell hagynia a vett PACK SU-t.

c) Ha az SU készlet teljes adás-ismétlését kérő PACK SU (4. Fejezet, 2. Függeléke, A2-49. ábra) érkezik az AES-től, akkor a GES-nek egy ISU és SSU-k sorozataként a teljes SU készletet újra kell továbbítania. Ezt követően a GES-nek a 4.5.7.2.4.1 pont szerint kell eljárnia.

d) Ha az AES-től nem érkezett az SU készlethez társított PACK SU tG1 másodpercen belül (4. Fejezet 4. Függeléke) azon időponttól számítva, hogy az SU készlet utolsó SSU-ja (eredeti vagy adás-ismétlő) továbbításra került, akkor a GEs-nek egy Nyugtázást kérő (RQA) SU-t (4. Fejezet 2. Függeléke A2-27. ábra) kell továbbítania az AES felé. A GES-nek az RQA SU-t minden tG1 másodpercben továbbítania kell az utolsó RQA SU elküldését követően, amíg válasz nem érkezik az AES-től, vagy a továbbított RQA SU-k száma egyenlő lesz öttel. Ha az RQA SU ötödik elküldését követően eltelik tG1 másodperc anélkül, hogy az AES felől megérkezne a megfelelő PACK SU, akkor a GES-nek hibajelző átviteli állapotjelzőt (4-25. táblázat) kell küldenie a GES adatkapcsolati szolgáltatás felhasználójához, és meg kell szüűtetnie az SU készlet feldolgozását; egyéb esetekben a GES-nek a 4.5.7.2.4.1 pont szerint kell eljárnia.

4.5.7.2.4.2 Ha az AES felől olyan SU készletet azonosító PACK SU érkezik, amely nincs jelen a GES-ben, akkor a vett PACK SU-t figyelmen kívül kell hagyni.

4.5.7.2.5 Ha nincsenek továbbításra váró SU-k (adat vagy jelző), akkor a GES-nek egy AES rendszertábla adási SU-t (4. Fejezet 2. Függeléke A2-30.-tól az A2-34.-ig terjedő ábrák) kell továbbítania, amennyiben a GES vezérlés felől érkezett LIDU-ból ilyet előállítottak; egyéb esetekben a GES-nek egy kitöltő SU-t (4. Fejezet 2. Függeléke, A2-42. ábra) kell kibocsátania.

4.5.7.3 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.5.7.3.1 Egy LSU-ból álló SU készlet vételekor az AES-nek a 4.5.3.2.4 pont szerint egy LIDU-t kell létrehoznia és az AES adatkapcsolati szolgáltatás megfelelő felhasználójához eljuttatnia. Ezt követően RLS-t felhasználó LSU esetén az AES-nek hibamentességet jelző PACK SU-t kell küldenie a GES-nek. Az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására, és ezt követően újra el kell küldenie ezt a PACK SU-t, amennyiben az SU készletet azonosító RQA SU-t vesznek egy ugyanezzel a Q számmal rendelkező másik SU készlet előtt.

4.5.7.3.2 Egy SU készletből álló SU-k vételekor az AES-nek a vett SU-kat egy SU készletbe kell újra-társítania referencia számaik, Q számaik és sorozat számaik alapján (4. Fejezet 3. Függeléke 43., 46.

és 59.) Az ilyen SU készlet esetében, ha egy SSU érkezik a megfelelő ISU nélkül, vagy előtte RTX SU érkezett, akkor az AES-nek figyelmen kívül kell hagynia az az SSU-t.

4.5.7.3.3 Többszörös SU-kból álló SU készlet esetén egy ISU vételét követően az AES-nek meg kell határoznia, hogy a GES felől várhatók-e az ISU által fejrészezett SU készletnek megfelelő további SSU-k a következő feltételnek megfelelően:

Nem várhatók az SU készletnek megfelelő SSU-k, a akár az SU készlet utolsó SSU-ja, vagy a befejezésre váró SU-nál kisebb Q számmal ellátott SU, vagy a befejezésre váró SU-val azonos Q számú, de más referencia számú, vagy egy AES rendszertábla adási SU, vagy kitöltő SU kerül vételre.

Megjegyzés. – Ezen feltételek alkalmazásához az AES az összes vett SU-t, az AES ID-jüktől függetlenül, figyelembe veszi.

4.5.7.3.3.1 Amikor egy azonos Q számú és AES ID-jű, de különböző referencia számú befejezésre váró SU készlet érkezik a GES felől, az AES-nek figyelmen kívül kell hagynia a befejezésre váró nem teljes SU készletet.

4.5.7.3.3.2 Az AES-nek figyelmen kívül kell hagynia a vett SU készletet (befejezett vagy nem befejezett), ha annak a Q száma és referencia száma megegyezik az utoljára befejezett és egy LIDU-ba azonos Q szám alatt újra összeállított SU készletével.

4.5.7.3.4 Ha nem számítanak az SU készletnek megfelelő további SU-kra, akkor az AES-nek meg kell határoznia, hogy vannak-e hiányzó SU-k a vett SU készletben. Ezt követően az AES-nek a következőket kell tennie:

4.5.7.3.4.1 Közvetlen összeköttetési szolgáltatás /DLS/ esetében:

a) Ha nincsenek hiányzó SU-k, akkor az AES-nek a 4.5.3.2.4 pont szerint újra össze kell állítania az SU-kat egy LIDU-ba és azt továbbítania kell az AES adatkapcsolati szolgáltatás megfelelő felhasználója felé.

b) Ha vannak hiányzó SU-k, akkor az AES-nek figyelmen kívül kell hagynia a nem teljes SU készletet.

4.5.7.3.4.2 Megbízható összeköttetési szolgáltatás /RLS/ esetében:

a) Ha nincsenek az SU készletben hiányzó SU-k, akkor az AES-nek a 4.5.3.2.4 alrész szerint az SU készletet egy LIDU-ba kell újra összeállítania és azt továbbítania kell az adatkapcsolati szolgáltatás megfelelő felhasználójához. Ezt követően az AES-nek egy hibamentességet jelző PACK SU-t kell küldenie a GES-nek. Ha ezt követően ugyanazon SU készlet részére egy nyugtázást kérő RQA SU érkezik, akkor az AES-nek egy R-csatorna frekvencia kiválasztására kell utasítást adni, és azt követően újra továbbítani kell a PACK SU-t.

b) Ha a hiányzó SU-k száma kevesebb mint 43, akkor az AES-nek egy vagy több, a PACK SU készletet alkotó PACK SU-t kell küldenie a GES részére, azonosítva a hiányzó SU-kat és kérve azok adás-ismétlését.

Megjegyzés. – Egy hibajelző PACK SU három hiányzó SU-t azonosíthat.

c) Ha egy SU készletből több mint 42 SU hiányzik, akkor az AES-nek egy PACK SU-ból álló, a teljes SU készlet adás-ismétlését kérő PACK SU készletet kell elküldenie a GES részére.

4.5.7.3.4.2.1 Egy részleges vagy teljes adás-ismétlést kérő PACK SU-nak a GES részére történő elküldését követően az AES-nek a következőket kell elvégeznie:

a) Ha egy RQA SU érkezik a GES-től tA1 másodperccel (4. Fejezet 4. Függeléke) azon időpont után, hogy a PACK SU-t a GES-hez továbbították, akkor az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására és azt követően az utolsó PACK SU készletet újra továbbítania kell a GES részére, valamint a
4.5.7.3.4.2.1 pont szerint kell eljárnia. Amennyiben a teljes PACK SU készlet továbbítása előtt egy RQA SU érkezik a GES-től, akkor az AES-nek az RQA SU-t figyelmen kívül kell hagynia.

b) Egy RTX SU által fejlécelt SU-k vagy GES-től érkező ISU vételekor az AES-nek meg kell határoznia, hogy várhatók-e a 4.5.7.3.3 pontban meghatározott feltételeket kielégítő, az újra-továbbított SU készletnek megfelelő további SU-k. Ezt követően az AES-nek meg kell határoznia, hogy az RTX SU-ban azonosított hiányos SU készlet jelen van-e vagy nincs jelen az AES-ben. Ha a hiányos SU készlet nincs jelen az AES-ben, akkor az AES-nek figyelmen kívül kell hagynia az RTX SU által fejrészezett vett SU készletet, a másik esetben az AES-nek az RTX SU által fejlrészezett, vett SU-kat be kell illesztenie a hiányos SU készletbe. A vett, újra-továbbított SU-k hiányos SU készletbe történő beillesztése és a duplikált SU-k (szükség szerint) figyelmen kívül hagyása után az AES-nek meg kell határoznia, hogy a keletkezett SU készlet teljes-e, vagy nem. Ezt követően az AES-nek a következőket kell elvégeznie:

1) Ha az SU készlet teljes, akkor az AES-nek egy hibátlanság jelző PACK SU-t kell küldenie a GES részére. Ezt követően az AES-nek a teljes SU készletet a 4.5.3.2.4 pont szerint újra össze kell egy LIDU-ba állítania, és azt el kell küldenie az AES adatkapcsolati szolgáltatás megfelelő felhasználójához. Ha ezt követően ugyanazon SU készlet részére egy nyugtázást kérő RQA SU érkezik ezen AES egy azonos Q számú másik SU készlete előtt, akkor az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására és azt követően újra továbbítania kell a PACK SU-t.

2) Ha az SU készlet nem teljes, akkor az AES-nek a 4.5.7.3.4.2 b) és c) pontjaival összhangban egy PACK SU készletet alkotó egy vagy több PACK SU-t kell továbbítania a GES részére. Ezt követően az AES-nek a
4.5.7.3.4.2.1 pont szerint kell eljárnia.

c) Ha a GES-től az újra-továbbítást igénylő teljes PACK SU elküldését követő tA1 másodpercen belül (4. Fejezet 4. Függeléke) nem érkezik válasz, akkor az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására, és azt követően a PACK SU készletet a hiányzó SU-k azonosításával ismét el kell küldenie a GES-hez. Az AES-nek a PACK SU-t minden tA1 másodpercben (4. Fejezet 4. Függeléke) újra továbbítania kell az utolsó elküldött PACK SU időpontját követően, addig, amíg a GES-től egy megfelelő újra-továbbított SU készlet érkezik, vagy amíg az ugyanazon hiányzó SU-kat azonosító PACK SU készlet továbbításának száma egyenlő lesz öttel. Ha a PACK SU készlet ötödik újra-küldése után eltelik a tA1 másodperc az újra-továbbított SU-k GES-től való vétele nélkül, akkor az AES-nek figyelmen kívül kell hagynia a befejezetlen SU készletet.

4.5.7.3.5 A GES-től érkező nyugtázási (RQA) SU kérésre az AES-nek egy a teljes PACK SU készlet újra-továbbítását kérő PACK SU küldésével kell válaszolnia, ha az RQA SU olyan SU készletet azonosít, amely nem érkezett az AES-hez.

4.5.7.3.6 Az AES adatkapcsolati rétegnek a rendszertábla adás-javító számát továbbítania kell az AES vezérléshez a műhold/sugár-azonosító P_{smc}-csatornán vett rendszertábla adási sorozat első SU-jának vételekor. Egy teljes vagy részleges adás-sorozat szériának megfelelő adás LIDU-t (lásd 4. 10.4.5.2.2) kell összeállítani és az AES vezérléshez eljuttatni, miután a széria összes várható SU-jai megérkeztek, vagy miután egy másik, a befejezésre váró szériával egyenlő vagy annál nagyobb revízió számú sorozat egy SU-ja megérkezik.

4.5.8 R-csatorna protokol

Megjegyzés. – A 4.5.8 pontban használt “AES” és GES” kifejezések az AES-en és a GES-en belüli R-csatorna protokol adatkapcsolati réteg funkcióira vonatkoznak.

4.5.8.1 ÁLTALÁNOS

4.5.8.1.1 Az R-csatorna protokollal kapcsolatos adatkapcsolati réteg funkcióknak meg kell felelniük a 4.5.8.2 és a 4.5.8.3 pontokban meghatározottaknak.

4.5.8.2 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.5.8.2.1 Az RLS LIDU-jának vételekor az AES-nek egy referencia számot (4. Fejezet ,3. Függeléke 46. tétel) kell kijelölnie számára, ha nincs érvényes referencia szám kijelölve az RLS egy olyan LIDU-jának, amelynek "Q" száma megegyezik a vett LIDU "Q" számmal. A DLS LIDU-jának vételekor az AES-nek ki kell jelölnie egy rendelkezésre álló (azonos Q számmal rendelkező LIDU-nak jelenleg ki nem osztott) referencia számot a részére, azonban az AES nem jelölhet ki referencia számot az áramköri üzemmódú szolgálatoktól érkezett LIDU-k részére. Ha egy LIDU-nak nem jelölnek ki referencia számot, akkor a LIDU-t addig kell tárolni, amíg számára egy referencia szám kijelölésre kerül. A referencia számok minden egyes kijelölését a referencia számok nélküli legrégebben vett LIDU-k részére kell elvégezni. Az egyforma Q számmal rendelkező LIDU-k azonos referencia számokkal való két egymást követő kijelölése nem történhet meg, azon két LIDU kivételével, amelyek DLS LSU-ba kerültek leképezésre.

Megjegyzés. – Áramkor üzemmódú szolgáltatás LIDU-i az áramkör üzemmódú szolgáltatás által vannak kijelölve alkalmazási referencia számokhoz.

4.5.8.2.2 A DLS esetében a referencia számot rögtön a kijelölését követően fel kell szabadítani. Az RLS esetében a referencia számot azután kell felszabadítani, hogy az AES egy átviteli állapotjelző LIDU-t (4-25. táblázat) küld az AES adatkapcsolati felhasználójának. Az AES nem oszthat ki újra egy felszabadított referencia számot addig, amíg a felszabadítása előtt rendelkezésre álló összes referencia szám kijelölésre nem kerül. Ez alól az egyedüli kivétel az a referencia szám, amely egy LSU-ba leképezett DLS LIDU részére került kijelölésre, s ami azonnal újra kijelölhető egy LSU-ba leképezett másik DLS LIDU számára.

4.5.8.2.3 Egy LIDU részére történt referencia szám kijelölését követően vagy egy áramkör üzemmódú szolgálatoktól érkező LIDU vételekor a 4.5.3.2.3 pontnak megfelelően egy SU készletet kell létrehozni. Az átvitelre váró összes SU közül a legnagyobb Q számmal rendelkező legrégebbi SU-kat kell minden esetben először továbbítani. Egy SU készlet SU-jait kijelölő számaik emelkedő sorrendje alapján kell továbbítani (4. Fejezet 3. Függeléke 58. tétel).

4.5.8.2.4 *RLS esetében.* Minden átvitelre kerülő SU készlet esetében az AES-nek a következőket kell végrehajtani:

a) Válaszolnia kell a rendeltetési GES-től érkező R-csatorna nyugtázási (RACK) SU-kra a következők szerint:

1) Ha a RACK SU (4. Fejezet 2. Függeléke A2-28. ábra) azt jelzi, hogy a GES-nél az SU készletet teljes egészében vették, akkor az AES-nek egy, a sikeres átvitelt jelző átviteli állapotjelző LIDU-t (4-25. táblázat) kell küldenie az AES adatkapcsolati szolgáltatás felhasználója számára.

2) Ha a RACK SU (4. Fejezet 2. Függeléke A2-29. ábra) egy vagy több olyan SU-t azonosít, amely(ek)et még nem vett, akkor az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására, és a hiányzó SU-kat a kijelölő számaik emelkedő sorrendje alapján újra-továbbítania kell. Bármely egyéb, hiányzó SU-kat azonosító RACK SU vételekor az AES-nek figyelmen kívül kell hagynia azt, ha az előzőleg vett RACK SU által azonosított összes hiányzó SU átvitele még nem fejeződött be. Ugyanakkor, akár ha:

i) az első RACK SU-n kívül még öt másik, hiányzó SU-kat azonosító RACK SU érkezik, mielőtt az AES teljes egészében továbbítja az első RACK SU-ban azonosított bármely hiányzó SU-t, vagy

ii) az első RACK SU két hiányzó SU-t azonosított, és az egyik továbbításra került, és a továbbítást követően öt újabb, hiányzó SU-t azonosító RACK SU érkezik egy másik SU továbbítása nélkül, akkor az AES-nek egy hibás átvitelt jelző átviteli állapotjelző LIDU-t (4-25. táblázat) kell továbbítania az AES adatkapcsolati felhasználója részére, és meg kell szüntetnie azon SU készlet feldolgozását.

Megjegyzés. – Az AES-nél vett RACK SU egy SU készlet legfeljebb két hiányzó SU-ját azonosíthatja.

b) Ha egy RACK SU a rendeltetési GES-től nem érkezik meg tA3 másodpercen belül (4. Fejezet 4. Függeléke) azon időponttól számítva, hogy egy készlet utolsó SU-ja (az eredeti SU készlet vagy az eredeti SU készletnek megfelelő továbbított SU készlet) továbbításra kerül, akkor az AES-nek utasítást kell adnia egy R-csatorna frekvencia kiválasztására a rendelkezésre álló R-csatorna frekvenciák csoportjából és újra továbbítania kell az SU készletet. Az AES-nek ezt az eljárást addig kell ismételnie, amíg a GES-től egy nyugtázás érkezik, azzal a kivétellel, hogy ugyanazon SU készlet újra-továbbításának a száma nem haladhatja meg az ötöt. Ha egy RACK SU az ötödik ismétlést követően tA3 másodpercen belül nem érkezik meg, akkor az AES-nek egy hibás átvitelt jelző átviteli állapotjelző LIDU-t (4-25. táblázat) kell továbbítania az AES adatkapcsolati felhasználója részére és meg kell szüntetnie az SU készletnek a feldolgozását.

4.5.8.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.5.8.3.1 A bejelentkezett AES-től érkező SU-kat a GES-nek az AES ID-jének, Q számának, referencia számának és sorozat kijelölőjének (4. Fejezet, 3.Függeléke 58. tétel) megfelelően kell rendeznie.

4.5.8.3.2 *A Megbízható összeköttetési szolgáltatás /RLS/ esetében*

4.5.8.3.2.1 Azután, hogy egy SU készlet SU-ját a készlet befejezése nélkül veszi a GES, akkor a GES-nek a fennmaradó hiányzó SU-kat azonosító RACK SU-t kell küldenie az AES részére, ha az alábbiak bármelyike igaz:

a) ha a vett SU az SU készlet utolsó SU-ja, vagy az SU készlet hiányzó SU-jainak utolsó SU-ja;

b) ha tG4 másodperc hosszúságú időperiódus (4. Fejezet 4. Függeléke) eltelik anélkül, hogy egy másik SU (DLS vagy RLS) érkezne ugyanazon AES-től; vagy

c) ha a GES ugyanazon AES-től egymást követően vesz egy kisebb Q számú SU-t, vagy egy azonos Q számú, de eltérő referencia számú, DLS-t jelző SU-t.

Ha a hiányzó SU-kat azonosító RACK SU elküldése után a GES nem vesz tG3 másodpercen belül válasz SU-kat, akkor az AES részére újra kell továbbítania a RACK SU-t azon kivétellel, hogy a RACK SU elküldése helyett az SU készletet figyelmen kívül kell hagynia, ha összességében hat azonos RACK SU kerülhet elküldésre és az utolsó RACK SU átvitele óta eltelt tG3 másodpercen belül nem érkezett hiányzó SU. A GES-nek ugyancsak figyelmen kívül kell hagynia egy befejezetlen SU készletet, ha a készlet SU-jaival azonos Q számú, de eltérő referencia számú, RLS-t jelző SU érkezik ugyanazon AES-től.

4.5.8.3.2.2 Amikor egy teljes SU készletet vesz, a GES-nek a 4.5.3.2.4 pont szerint LIDU-t kell újra összeállítania, el kell küldenie az adatkapcsolati szolgáltatás megfelelő felhasználójához, és az AES részére egy hibamentességet jelző RACK SU-t kell küldenie.

4.5.8.3.2.3 Egy LIDU kialakítása után a GES-nek figyelmen kívül kell hagynia az ugyanazon AES-től egymást követően vett azonos Q számú és referencia számú összes SU készletet, amíg legalább egy azonos Q számú és eltérő referencia számú SU érkezik ugyanazon AES-től, valamint minden egyes figyelmen kívül hagyott SU készlet esetében egy hibamentességet jelző RACK SU-t kell újra-küldenie az AES felé.

4.5.8.3.2.4 Amikor két vagy több azonos Q számú és referencia számú, valamint sorozat jelölő SU érkezik ugyanazon AES-től a megfelelő LIDU kialakítása előtt, akkor egy kivételével az összeset figyelmen kívül kell hagyni.

4.5.8.3.3 *A Közvetlen összeköttetésiszolgáltatás /DLS/ esetében*

Miután egy SU készlet egy SU-ját a készlet befejezése nélkül veszi a GES, akkor a GES-nek figyelmen kívül kell hagynia a vett SU-kat, ha az alábbiak közül bármelyik igaz:
a) ha a vett SU az SU készlet utolsó SU-ja;
b) ha tG4 másodperc hosszúságú időperiódus (4. Fejezet 4. Függeléke) eltelik anélkül, hogy egy másik SU (DLS vagy RLS) érkezne ugyanazon AES-től; vagy
c) ha a GES ugyanazon AES-től egymást követően vesz egy kisebb Q számú SU-t, vagy egy azonos Q számú, de eltérő referencia számú SU-t.

Ha és amikor az SU készlet teljessé válik, akkor a GES-nek a 4.5.3.2.4 pont szerint egy LIDU-ba kell újra összeállítania azt és továbbítania kell az adatkapcsolati szolgáltatás megfelelő felhasználójához. Azonban, ha a teljes SU készlet SU-i egy különböző GES ID-t határoznak meg, és az SU készlet megfelel egy áramkör üzemmódú szolgáltatási LIDU-nak, akkor a GES-nek az SU készletet annak a GES-nek kell elküldenie, amelynek az ID-je meg van határozva.

4.6 ADATKAPCSOLATI RÉTEG T-CSATORNA ÉS ALSÁV C-CSATORNA PROTOKOLOK

4.6.1 Általános

4.6.1.1 A T-csatorna és alsávi C-csatorna adatkapcsolati rétegének felhasználói adat és jelzés átviteli funkcióinak meg kell felelni ük az ezen részben meghatározottaknak.

4.6.1.2 A 4.5 pontban meghatározott P- és R-csatornákat a T- és az alsávi C-csatornák beállítására kell felhasználni a 4.6.5 és 4.6.6 pontokban ismertettek szerint.

4.6.2 Adatkapcsolati réteg adat-egység (LIDU)

4.6.2.1 Az adatkapcsolati réteg és az al-hálózati réteg között a T-csatornán való továbbítással kicserélt LIDU-nak tartalmaznia kell az adatkapcsolati réteg vezérlést (LICI) és az adatkapcsolati szolgáltatási adat-egységet (LSDU), azzal a kivétellel, hogy az adatkapcsolati réteg által az al-hálózati réteghez az átviteli végnél továbbított adatátviteli állapotjelző LIDU-nak (4-25. táblázat) csak LICI-t kell tartalmaznia.

4.6.2.2 Az adatkapcsolati réteg és az áramkör üzemmódú szolgáltatások, valamint az adatkapcsolati réteg és AES/GES vezérlési funkciók között az alsávi C-csatornán való továbbításra kicserélt LIDU-nak csak LICI-t kell tartalmaznia.

4.6.2.3 ADATKAPCSOLATI RÉTEG VEZÉRLÉS (LICI)

4.6.2.3.1 Az adatkapcsolati réteg és az al-hálózati réteg között kicserélt LICI paramétereknek a 4-25. táblázatban meghatározottak szerintinek kell lenniük.

4.6.2.3.2 Az adatkapcsolati réteg és az áramkör üzemmódú szolgáltatások között kicserélt LICI paramétereknek a 4-38. táblázatban meghatározottak szerintinek kell lenniük. Az adatkapcsolati réteg és az al-hálózati vezérlési funkciók között kicserélt LICI paramétereknek a 4-44. és a 4-45. táblázatokban meghatározottak szerintinek kell lenniük.

4.6.2.4 ADATKAPCSOLATI SZOLGÁLTATÁSI ADAT-EGYSÉG (LSDU)

Az adatkapcsolati szolgáltatási adat-egységnek (LSDU) adatkapcsolati szolgáltatási felhasználói adatokat kell tartalmaznia és az al-hálózati rétegből érkező LIDU-ból kell kivonatolni.

4.6.3 Jel egység (SU)

4.6.3.1 A T-csatorna esetében két hosszúságú, az alsávi C-csatorna esetében egy hosszúságú SU-knak kell lenni:

a) 48 bit (6 oktett): impulzus-köteg azonosító egyenkénti jel egység (LSU) (4. Fejezet 2. Függeléke A2-43. ábra) a T-csatorna esetében.

b) 96 bit (12 oktett): szabvány hosszúságú SU-k a T- és az alsávi C-csatorna esetében.

4.6.3.2 A műholdas al-hálózati rétegből vett LIDU-nak megfelelő SU készlet minden SU-jának tartalmaznia kell a szabályozási és a felhasználói adatokat. Az áramkör üzemmódú szolgálatoktól és AES/GES vezérléstől érkezett LIDU-nak megfelelő SU készlet SU-jainak csak szabályozási információt kell tartalmaznia.

4.6.3.3 LIDU LEKÉPEZÉSE SU KÉSZLETBE

4.6.3.3.1 *LSDU-BÓL ÉS LICI-BŐL ÁLLÓ LIDU ESETÉBEN*

Egy LIDU-t egy SU készletbe kell leképezni. Minden SU készletnek egy “kezdő jel egységből” (ISU) kell állnia, amelyet maximum 63 “soronkövetkező jel egység” (SSU) követ. Az LSDU első két oktettjét az ISU két oktettes felhasználói adatmezejébe kell leképezni (4. Fejezet 2. Függeléke A2-37. ábra). A fennmaradó oktetteket a sorozat számok által szabályozott SSU-k 8-oktettes felhasználói adatmezeibe kell leképezni (4.Fejezet 3. Függelék 59. tétel). Az SSU-k számát az LSDU-ban lévő oktettek száma határozza meg. Az SU készlet minden egyes SU-jában lévő szabályozási információt a LICI-ben tartalmazott és a belső adatkapcsolati réteg protokol folyamatai által előállított információkból kell leképezni.

4.6.3.3.2 *LICI-BŐL ÁLLÓ LIDU ESETÉBEN*

A csak LICI-t tartalmazó LIDU esetében az SU készletet a LICI-ben található és a belső adatkapcsolati réteg folyamatai által előállított információknak a megfelelő SU szabályozó információs adatmezőibe való leképezésével kell előállítani.

4.6.3.4 SU KÉSZLET LEKÉPEZÉSE LIDU-BA

4.6.3.4.1 Egy SU készletet egy LIDU-ba kell leképezni, mielőtt továbbításra kerül az adatkapcsolati réteg felhasználója felé.

4.6.3.4.2 Egy felhasználói adatokat tartalmazó SU-(k)ból álló SU készlet esetében a keletkező LIDU-nak LSDU-t és LICI-t kell tartalmaznia. A keletkező LIDU LSDU-ját a vett teljes SU készlet egyes SU-jai felhasználói adatmezőinek egyesítésével kell újra összeállítani. A hozzárendelt LICI-t az SU-k vezérlő információiból kell előállítani.

4.6.3.4.3 Felhasználói adatokat nem tartalmazó SU-kból álló SU készlet esetében a keletkező LIDU-nak csak LICI-t kell tartalmaznia. A LICI-t a vett SU-k vezérlő információiból kell előállítani.

4.6.3.5 JEL EGYSÉG FORMÁTUM

4.6.3.5.1 A T-csatornán és az alsávi C-csatornán továbbított összes SU formátumának meg kell felelni a 4. Fejezet 4. Függelékében ábrázoltaknak. Az impulzus egység mező-leképezésének és a bitek továbbítási sorrendjének meg kell felelni az A2-1. ábrán bemutatottaknak. A jel egység mező kódolásának és meghatározásainak meg kell felelni a 4. Fejezet 3. Függelékében meghatározottaknak.

4.6.3.5.2 A vevő adatkapcsolati réteg által fel nem ismert SU-kat figyelmen kívül kell hagyni.

Megjegyzés. – A 4. Fejezet 2. Függelékében meg nem határozott SU-k egy AMSS szolgáltatás biztosítója és felhasználója közötti kölcsönös megállapodás szerint alkalmazhatók biztonságot nem érintő szolgálatok esetében.

4.6.4 T-csatorna átviteli protokol

Megjegyzés. – A 4.6.4 pontban használt "AES" és "GES" kifejezések az AES-en és a GES-en belüli T-csatorna átviteli protokol adatkapcsolati réteg funkcióira vonatkoznak.

4.6.4.1 ÁLTALÁNOS

A T-csatorna átviteli protokolok esetében az adatkapcsolati réteg funkcióknak meg kell felelni a 4.6.4.2 és a 4.6.4.3 pontokban meghatározottaknak.

4.6.4.2 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.6.4.2.1 Egy LIDU vételekor az AES-nek a 4.6.3.3.1 pont szerint egy SU készletet kell előállítania.

Megjegyzés. – A LIDU-k a T-csatorna foglalási protokolja által kijelölt referencia számúak.

4.6.4.2.2 *SU átvitel.* A T-csatornán az SU-kat kötegelt adatátviteli foglalásokban kell továbbítani. Az átvitelre váró összes SU közül a legnagyobb Q számmal rendelkező SU-k legrégebbi SU-ját kell elsőként továbbítani. Egy SU készlet ISU-ját vagy Adás-ismétlő /RTX/ SU-ját kell az SSU-k előtt továbbítani, és az SSU-kat csökkenő sorszámaik alapján kell továbbítani (4. Fejezet 3. Függeléke 59. tétel). Minden egyes bekezdő jelszakasz kezdetekor (a 4.4.4.3.4 pontban meghatározottak szerint) egy bekezdő jelszakasz azonosító SU-t (4. fejezet 2. függeléke A2-43. ábra) kell továbbítani. Amikor egy bekezdő jelszakasz átvitele közben nem áll SU továbbításhoz rendelkezésre, akkor egy kitöltő SU-t (4. Fejezet 2. Függeléke A2-42. ábra) kell továbbítani. Ugyanakkor, amennyiben a kötegelt foglalásos adatátvitel kezdetekor nem állnak SU-k a rendelkezésre, akkor az AES-nek meg kell akadályoznia a megfelelő kötegelt adatátviteli impulzusok továbbítását.

4.6.4.2.3 *Az RLS esetében.* Minden egyes továbbított SU készlet esetében az AES-nek a következőket kell végrehajtania:

a) válaszolnia kell minden T-csatorna nyugtázási közleményre (TACK), amelyet a rendeltetési GES küld válaszként az SU készletnek a P-csatornán keresztül, a következők szerint:

1) Amikor a TACK SU (4. Fejezet 2. Függelék A2-29. ábra) azt jelzi, hogy a GES-nél az SU készlet teljes egészében megérkezett, akkor az AES-nek egy sikeres átvitelt jelző (4-25. táblázat) átviteli állapotjelző LIDU-t kell küldenie az adatkapcsolati szolgáltatás felhasználójának;

2) Amikor a TACK SU (4. fejezet 2. függeléke A2-29. ábra) azt jelzi, hogy a teljes U készlet elveszett, akkor az AES-nek a teljes eredeti SU készletet újra ki kell bocsátania;

3) Amikor a TACK SU (4. Fejezet 2. Függeléke A2-29. ábra) elveszett SU-kat jelez a GES-nél, ha nem várható ugyanazon SU készlet újabb hiányzó SU-it jelző újabb TACK SU, vagy ha egy vagy több TACK SU várható, de egy sem érkezik az előző TACK SU vételétől számított tA5 másodpercen belül (4. Fejezet 4. Függeléke), akkor az AES-nek újra-továbbítania kell a vett TACK-SU-kban jelzett SU-kat. Bármely továbbított SU előtt egy adás-ismétlő fejrész (RTX) SU-t (4. Fejezet 2. Függeléke A2-41. ábra) kell továbbítani. Ezt követően, ha ugyanazon SU készlethez rendelt hiányzó SU-kat jelző bármely további TACK SU érkezik, mielőtt a teljes adás-ismétlő SU készlet továbbításra kerül, akkor az AES-nek figyelmen kívül kell hagynia a vett TACK SU-t.

Azonban az AES nem továbbíthatja ugyanazon készletet, akár az eredeti, akár az adás-ismétlő SU készletet, háromnál több alkalommal. Amennyiben a harmadik átvitel után az AES olyan TACK SU-t vesz, ami ugyanazon SU készlet negyedik továbbítását eredményezné, akkor az AES-nek egy hibát jelző átviteli állapotjelző LIDU-t kell küldenie az adatkapcsolati szolgáltatás felhasználójának, és meg kell szüntetnie az SU készlet feldolgozását.

b) Ha nem érkezik az SU készlethez rendelt nyugtázás a rendeltetési GES-től tA4A másodperccel (4. Fejezet 4. Függelék) a készlet utolsó SU-ja (akár az eredeti készlet vagy az eredeti készletnek megfelelő adás-ismétlő készlet SU-i) továbbításának időpontja óta, vagy a 4.6.5.2.6 b) pontban meghatározottak szerint figyelmen kívül hagyták, akkor az AES-nek egy nyugtázási kérelmet, (RQA) SU-t (4. Fejezet 2. Függeléke A2-48. táblázat) kell továbítania. Ezt követően az AES-nek egy R-csatorna kiválasztására kell utasítást adni, és az előző RQA SU továbbítását követő minden tA4B másodpercben (4. Fejezet 4. Függeléke) újra továbbítania kell az RQA SU-t, amíg egy megfelelő TACK SU érkezik. Ugyanakkor, ha nem érkezik egy megfelelő TACK SU tA4B másodpercen belül, az ötödik RQA SU kibocsátása után, akkor az AES-nek egy hibát jelző átviteli állapotjelző LIDU-t (4-25. táblázat) kell küldenie az adatkapcsolati szolgáltatás felhasználójának, és meg kell szüntetnie az SU készlet feldolgozását.

4.6.4.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.6.4.3.1 Egy bejelentkezett AES-től érkező SU-kat a GES-nek újra össze kell rendeznie, és az AES ID-jének, Q számának, referencia számának és sorszámának megfelelően készletekbe kell rendeznie, amint az a 4. Fejezet 3.Ffüggelékében meg van határozva. A vett SSU-t figyelmen kívül kell hagyni, ha a megfeleleő ISU vagy RTX SU nem érkezett meg.

Megjegyzés. – Egy T-csatorna impulzus-köteghez társított AES ID meghatározható akár az impulzus-köteg ID SU-jából, ha az megérkezett, vagy az ugyanazon impulzus-kötegen belüli bármely olyan SU-ból, amely egy AES ID mezőt tartalmaz.

4.6.4.3.2 Egy ISU vételét követően a GES-nek meg kell állapítania, hogy a vett ISU által fejrészelt SU készletnek megfelelő további SSU-k várhatók-e vagy sem az AES-től a következő kritériumoknak megfelelően:

Nem várnak az SU készletnek megfelelő további SSU-kat, amennyiben akár a készlet utolsó SSU-ja, akár ugyanazon AES kisebb Q számú SU-ja, vagy ugyanazon AES azonos Q számú, de eltérő referencia számú SU-ja, vagy az AES ID-nek megfelelő kitöltő SU-ja érkezik meg.

4.6.4.3.3 Amikor nem várnak egy SU készletnek megfelelő több SU-t, akkor a GES-nek meg kell határoznia, hogy vannak-e a vett SU készletben hiányzó SU-k. Ezt követően a GES-nek a következőket kell végrehajtania:

a) ha az SU készlet teljes, akkor egy T-csatorna nyugtázási (TACK) SU-t (4. Fejezet 2. Függeléke A2-29. ábra) kell küldenie jelezvén, hogy nincsenek hiányzó SU-k, valamint az SU készletből a 4.6.3.4 pont szerint egy LIDU-t kell összeállítania és azt továbbítania kell az adatkapcsolati szolgáltatás megfelelő felhasználójához;

b) ha az SU készlet nem teljes, akkor egy vagy több, a hiányzó SU-kat azonosító TACK SU-t kell továbbítania az AES-hez a következők szerint:

1) ha az SU készletből több mint 42, vagy kevesebb mint 4 SU hiányzik, akkor csak egy TACK SU-t (4. fejezet 2. függelék A2-29. ábra) kell küldeni. Az első esetben a TACK SU-nak a teljes SU készlet, amíg a második esetben az összes hiányzó SU újra-küldésére vonatkozó igényt kell jelölnie;

2) egyéb esetben az összes hiányzó SU-t jelölő, maximálisan 14 TACK SU-t (4. fejezet 2. függeléke A2-29. ábra) kell az AES felé elküldeni.

4.6.4.3.3.1 Ha a vett SU készlet a GES-nél befejezésre váró újra-továbbított SU készlettel azonos, akkor a GES-nek ezeket a készleteket egy olyan új SU készlet kialakítására kell felhasználni, ami a lehetőség szerint a legteljesebb, mielőtt a 4.6.4.3.3 a) és b) pontokban megadottak szerint nyugtázást küld.

4.6.4.3.3.2 Minden befejezett SU készlet esetében a GES-nek figyelmen kívül kell hagynia az összes rákövetkező azonos Q számú, AES ID-jű és referencia számú SU készletet (teljes vagy nem teljes), amíg egy azonos Q számú, AES ID-jű és párosított referencia számú (a 4.6.5.2.2 pontban megadott párosítási sémának megfelelően) SU készlet érkezik.

4.6.4.3.4 Egy RTX SU vételét követően (4. fejezet 2. függeléke A2-41. ábra) a GES-nek a 4.6.4.3.2 pontban meghatározott feltételek szerint meg kell határoznia, hogy a vett RTX SU által fejrészezett, az újra-továbbított készletnek megfelelő további SU-k várhatók-e az AES-től. Amikor még nem számítanak újabb SU-kra, akkor a GES-nek az újra-továbbított SU-kat a megfelelő (nem teljes) SU készletbe kell behelyeznie és a 4.6.4.3.3 pont szerint nyugtáznia kell.

4.6.4.3.5 Az AES-től érkező nyugtázási (RQA) SU-ra vonatkozó igényre a GES-nek az RQA SU-ban jelzett SU készletnek megfelelő legutoljára küldött TACK SU-k készletének újra-továbbításával kell válaszolnia. Ha az RQA SU egy olyan befejezésre váró SU készletet azonosít a GES-nél, amelyhez nem továbbítottak TACK SU-t, akkor a GES-nek a hiányzó SU-k újra-továbbítását kérő TACK SU-t kell küldenie. Ha az RQA SU a GES-nél nem vett SU készletet azonosít, akkor a GES-nek a teljes SU készlet újra-továbbítását kérő TACK SU-t kell elküldenie.

4.6.4.3.6 Ha a GES egy befejezésre váró SU készlet AES ID-jével és Q számával és a 4.6.5.2.2 pontban megadott párosítási sémának megfelelően az SU készlet referencia számához párosított referencia számmal megegyező ISU-t vesz, akkor a GES-nek figyelmen kívül kell hagynia a várakozó SU készletet.

4.6.5 T-csatorna foglalási protokol

Megjegyzés. – A 4.6.5 pontban használt "AES" és "GES" kifejezések az AES és GES-ben belüli T-csatorna foglalási protokoll adatkapcsolati réteg funkcióira vonatkoznak.

4.6.5.1 ÁLTALÁNOS

A T-csatorna foglalási protokolok esetében az adatkapcsolati réteg funkcióknak meg kell felelni a 4.6.5.2 és
a 4.6.5.3 pontokban meghatározottaknak.

4.6.5.2 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.6.5.2.1 Egy 33 oktettet meghaladó LSDU-t tartalmazó LIDU vételekor az AES-nek a LIDU-t a T -csatorna protokolhoz kell irányítania.

Megjegyzés. – Egy 33 vagy kevesebb oktettből álló LSDU-t tartalmazó LIDU az R-csatorna protokolhoz vagy a T -csatorna protokolhoz irányítható.

4.6.5.2.2 A LIDU-knak a T-csatorna protokolhoz való továbbítása előtt az AES-nek ki kell jelölnie számára egy rendelkezésre álló (még ki nem jelölt) referencia számot (4. fejezet 3. függeléke 46. tétel). Ha egy LIDU-nak nem jelölnek ki referencia számot, akkor a LIDU-t addig kell tárolni, amíg egyet kijelölnek a számára. Minden egyes referencia szám kijelölését a referencia szám nélküli legrégebben vett LIDU részére kell elvégezni. A T-csatorna LIDU részére kijelölendő referencia számokat párokként kell meghatározni úgy, mint (0, 1); (2, 3); (4, 5); (6, 7); (8, 9); (10, 11); (12, 13); (14, 15). Ha egyszer felszabadították, egy párból nem szabad referencia számot újra kijelölni, addig, amíg a pár másik számát ki nem jelölik és fel nem szabadítják. Az AES nem jelölhet ki egy olyan párból referencia számot, amelynek másik számát éppen felszabadították, addig, amíg a felszabadítás előtt a kijelölésre rendelkezésre álló összes párból referencia számokat ki nem jelölnek. A kijelölt referencia számot kell használnia mind a T-csatorna átviteli protokolnak, mind a T-csatorna foglalási protokolnak.

4.6.5.2.3 Egy SU készlet továbbításának foglalására szolgáló kéréshez az AES-nek a foglalást kérő (REQ) SU-t kell küldenie a GES-nek, amely jelzi a referencia számot, Q számot és a továbbítandó SU készlet hosszát.

4.6.5.2.4 Az AES-nek a REQ SU-t kell továbbítania az R-csatornán (4. fejezet 2. függeléke A2-47 ábra) vagy a T-csatornán (4. fejezet 2. függeléke A2-7. ábra) a GES részére a következő követelménynek megfelelően:

A T-csatornát kell használni, ha az AES éppen egy T-csatorna bekezdő jelszakaszt továbbít, és elegendő hely van a REQ SU tárolására, vagy ha éppen egy T-csatorna bekezdő jelszakasz indítása esedékes a következő 8 másodperces idő-ablakon belül; egyéb esetekben az R csatornát kell használni.

4.6.5.2.5 Amikor a T-csatornát használják egy REQ SU továbbítására a GES részére, akkor a kért hosszúságot egy SU-val meg kell növelni.

4.6.5.2.6 Egy REQ SU-nak a GES-hez való elküldését követően az AES-nek a következőket kell végrehajtania:

a) Ha a T-csatornát egy REQ SU továbbítására használták és sem egy megfelelő foglalási (RES) SU (4. fejezet 2. függeléke A2-23. ábra), sem egy megfelelő rövidesen megjelenő foglalási (RFC) SU (4. fejezet 2. függeléke A2-24. ábra) nem érkezik GES-től tA6 másodpercen belül (4. fejezet 4. függeléke) azon időponttól számítva, hogy a REQ SU-t elküldték a T-csatornán, akkor az AES-nek a 4.6.5.2.4 pont szerint a REQ SU-t ismét el kell küldenie a T- vagy R-csatornán az utoljára kért hosszal azonos továbbítási hosszal, vagy ha a T-csatornát használják, eggyel megnövelt hosszal. Ezt követően az AES-nek a 4.6.5.2.6 pont szerint kell eljárnia.

b) Ha az R-csatornát használták az REQ SU továbbítására, és egy megfelelő RFC SU nem érkezett a GES felől a tA7 másodpercen belül (4. fejezet 4. függeléke) azon időponttól, hogy a REQ SU-t az R-csatornán elküldték, akkor az AES-nek utasítást kell adni egy R-csatorna frekvencia kiválasztására és a 4.6.5.2.4 ponttal összhangban ismét el kell küldenie a REQ SU-t a T- vagy R-csatornán azzal a kért átviteli hosszal, amely egyenlő az utoljára kért hosszal, vagy eggyel hosszabb, ha a T-csatornát használják. Ezt követően az AES-nek a 4.6.5.2.6 pontban foglaltak szerint kell eljárnia. Ugyanakkor, ha tA7 másodperc eltelik a REQ SU R-csatornán való egymást követő ötödik továbbítása után anélkül, hogy megfelelő RES SU vagy RFC SU érkezne a GES-től, akkor az AES-nek meg kell szakítania a megfelelő LIDU fenntartási eljárását és figyelmen kívül kell hagynia az utoljára kibocsátott REQ SU-ban azonosított SU-k számát. Ha a figyelmen kívül hagyott SU-k között van egy ISU, akkor az AES-nek a figyelmen kívül hagyott ISU által fejrészezett teljes SU készletet figyelmen kívül kell hagynia még akkor is, ha az a REQ SU-ban azonosított SU-k számánál több SU figyelmen kívül hagyását eredményezi. Ezt követően az AES-nek a teljesen figyelmen kívül hagyott SU készletre vonatkozó, hibát jelző átviteli állapotjelző LIDU-t (4-25. táblázat) kell küldenie az AES adatkapcsolati szolgáltatás megfelelő felhasználójához. Ha a figyelmen kívül hagyott SU-k között van egy RTX SU, akkor az AES-nek az RTX SU által fejrészelt teljes SU készletet figyelmen kívül kell hagynia. Ha a figyelmen kívül hagyott SU-k között van egy REQ SU, akkor az AES-nek a 4.6.5.2.4 pont szerint a REQ SU-t ismét újra-továbbítania kell az R- vagy T-csatornán.

c) Ha a GES-től egy REQ SU-nak megfelelő RES SU érkezik, akkor az AES-nek a RES SU-ban lévő foglalási információt a T-csatorna átviteli protokolhoz kell küldenie. A T-csatorna bekezdő jelszakaszban a foglalási kezdő keretszámnak vagy az aktuális keretszámra vagy az aktuális keretszámot követő 15 keret egyikére kell vonatkoznia.

d) Ha a GES-től egy REQ SU-nak megfelelő RFC SU érkezik, akkor az AES-nek ki kell számolnia a tA8-at (4. fejezet 4. függeléke) a várhatóan megérkező RES SU részére az RFC SU-ban meghatározott késésnek megfelelően. Ezt követően az AES-nek a következőket kell elvégeznie:

1) Ha nem érkezik a GES-től az RFC SU készletnek megfelelő RES SU vagy RFC SU az RFC SU vételét követő tA8 másodpercen belül, akkor az AES-nek a 4.6.5.2.4 ponttal összhangban egy REQ SU-t kell küldenie a T- vagyaz R-csatornán a GES-nek, amelynek a hosszúsága megegyezik a megfelelő RFC SU-hoz rendelt hosszúsággal, vagy eggyel nagyobb, ha a T-csatornát használják. Ezt követően az AES-nek a 4.6.5.2.6 pont szerint kell eljárnia.

2) Ha a GES-től egy először vett REC SU-hoz kapcsolódó RFC SU érkezik, akkor az AES-nek fel kell frissítenie a megfelelő tA8-at a RFC SU-ban meghatározott új késésnek megfelelően;

3) Ha a GES-től egy, az RFC SU-nak megfelelő RES SU érkezik, a tA8 másodpercen belül, attól az időtől számítva, amikor a RFC SU vételre került, az AES-nek a RES SU-ban lévő foglalási információt a T-csatorna átviteli protokolhoz kell elküldeni;

4.6.5.2.7 Amikor az AES T-csatorna átviteli protokolja egy olyan TACK SU-t vesz, ami hiányzó SU-k újra-ismétlését kéri, akkor az AES-nek ki kell számítania a tA8-at, annak a késésnek megfelelően, ami a TACK SU-ban meghatározott a várható RES SU érkezésére. Az AES-nek ezután a következőket kell végrehajtania:

a) Ha nem érkezik a GES-től a TACK SU-nak megfelelő RES SU vagy RFC SU, a SU teljes vételét követő tA8 másodpercen belül, akkor az AES-nek egy olyan REQ SU-t kell elküldenie a GES részére a T- vagy az R-csatornán a 4.6.5.2.4 pontban leírtaknak megfelelően, amelynek a hosszúsága megegyezik a TACK SU készletből hiányzó SU-k számának hosszúságával, vagy eggyel nagyobb, ha a T-csatornát használják és az AES-nek ezt követően a 4.6.5.2.6 pont szerint kell eljárnia.

b) Ha a GES-től egy előzően vett TACK SU készlethez kapcsolódó RFC SU érkezik, akkor az AES-nek fel kell frissítenie a megfelelő tA8-at az RFC SU-ban meghatározott új késésnek megfelelően.

c) Ha a GES-től egy RES SU érkezik a teljes TACK SU vételét követő tA8 másodpercen belül, akkor az AES-nek a RES SU-ban lévő foglalási információt az AES T-csatorna átviteli protokoljához kell küldenie.

Megjegyzés. – A RES-ben vagy RFC SU-ban lévő RFC jelző mező (4. fejezet 3. függeléke 50. tétel) szerepe az, hogy különbséget tegyen a REQ SU-khoz rendelt RES vagy RFC SU-k, és a TACK SU-k vagy RFC SU-khoz rendelt RES vagy RFC SU-k között.

4.6.5.2.8 Ha egy olyan RES SU érkezik a GES-től, amely nem egyezik meg az AES által küldött egyetlen REQ SU-val vagy RFC SU-val vagy az AES által vett TACK SU-val sem, akkor az AES-nek a RES SU-ban lévő foglalási információt a T-csatorna átviteli protokolhoz kell küldenie.

4.6.5.2.9 Ha az AES nem képes a kijelölt T-csatorna bekezdő jelszakasz foglalására egy T- csatorna bekezdő jelszakaszt továbbítani, akkor az AES-nek egy, a nem továbbított bekezdő jelszakasz foglalást kérő REQ SU-t kell küldenie a GES-nek.

4.6.5.2.10 Amikor egy AES egy átadási eljárás (4.9) eredményeként befejezi egy GES-sel az összeköttetést, akkor mind az AES-nek, mind a GES-nek fel kell szabadítaniuk az adatkapcsolati réteg összes forrását, amelyeket adat-összeköttetés céljára közöttük kiosztottak.

4.6.5.2.11 Egy LIDU számára kijelölt referencia számot fel kell szabadítani, ha a LIDU-nak megfelelő SU készlethez kapcsolódó várható foglalásokat az AES-nél vették, vagy a LIDU-nak megfelelő foglalási eljárást megszakították, valamint egy sikeres átvitelt vagy hibát jelző átviteli állapotjelző LIDU (4-25. táblázat) az adatkapcsolati réteg felhasználójához való kibocsátása után.

4.6.5.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.6.5.3.1 Az AES-től érkező REQ SU vételekor a GES-nek a REQ SU-ban azonosított SU készlet részére ki kell jelölnie egy vagy több bekezdő jelszakasz foglalást az AES felé. Amikor a GES egy hibát jelző TACK SU készletet továbbít az AES felé, akkor a GES-nek ki kell jelölnie egy vagy több, egy RTX SU-ból és az azt követő hiányzó SU-kból álló részleges SU készlet újra- továbbítására szolgáló bekezdő jelszakasz foglalást.

Megjegyzés. – Egy hibát jelző TACK SU a következő RES SU számára előre beállított késést meghatározó mezőt tartalmaz.

4.6.5.3.2 A GES-nek egy RES SU-t kell küldenie az AES felé egy olyan adott időpontban, hogy az egy rákövetkező 8 másodperces maximális késést biztosítson a tervezett SU készlet adásideje előtt. Ha a kiosztott foglalás időpontjának kezdésse kívül van a 8 másodperces időablakon, akkor a GES-nek egy RFC SU-t kell küldenie az AES részére a késést jelezve, és azt követően kell a RFC SU-t elküldenie, miután a tényleges időpont a beütemezett foglalási időponttól számított 8 másodpercen belül van. Ha egy hibákat jelző TACK SU készlettel társított foglalás, vagy korábban továbbított RFC SU nem hajtható végre a TACK SU készletben, vagy az RFC SU-ban meghatározott késési tartományon belül, akkor a GES-nek egy RFC SU-t kell küldenie az AES felé mielőtt a késési periódus eltelik. Az RFC SU-nak egy új késést kell jeleznie a foglaláshoz. A GES-nek egy RES SU-t kell küldeni az AES-nek annyival korábban, hogy az időben megérkezzen ahhoz, hogy az AES egy SU készlet küldését megkezdje a foglalási kötegelt adatátvitel kezdetekor.

4.6.5.3.3 A GES nem jelölhet ki egymást átfedő foglalásokat ugyanazon a -csatornán. Egy foglalás vége és a következő foglalás kezdete közötti időintervallumnak elegendő hosszúnak kell lennie ahhoz, hogy biztosítsa azt, hogy a GES által foglalt T-csatorna bekezdő jelszakaszok nem fedik át egymást. Egy hosszú SU készletet szünetekkel elválasztott többszörös bekezdő jelszakaszokkal kell kijelölni. A különböző SU készletek részére a többszörös bekezdő jelszakasz foglalásoknak vagy egyedi foglalásoknak olyannak kell lenniük, hogy lehetővé tegyenek legalább egy R-csatorna bekezdő jelszakasz adást minden 8. másodpercben. A T-csatorna bekezdő jelszakasz hosszúságát úgy kell megválasztani, hogy az biztosítsa azt, hogy az R- és T-csatorna adások megfelelnek a 4.7 pontban foglalt teljesítmény követelményeknek. Minden foglalásos bekezdő jelszakasz hosszúságának elegendőnek kell lenni azon bekezdő jelszakasz azonosító SU elhelyezésére, amely bevezet minden egyes T-csatorna bekezdő jelszakaszt, valamint a teljes foglalási hosszúságnak a kértnél legalább egy SU-val hosszabbnak kell lennie. A GES-nek olyan foglalásokat kell alkalmaznia, hogy ne kelljen soha egyetlen adott AES-től sem megkívánni az AES-hez kijelölt T- csatornák csoportjához tartozó, egynél több T-csatornán történő adást.

4.6.6 Alsáv C-csatorna a légijárműhöz protokol

Megjegyzés. – Ebben az alfejezetben az AES és GES kifejezések használata a GES-en és AES-en belüli, a légijárművek felé irányuló alsávi C csatorna adatkapcsolati réteg funkciókra vonatkozik.

4.6.6.1 ÁLTALÁNOS

A légijárművek felé irányuló egyedi alsávi C-csatorna adatkapcsolati réteg funkcióknak a 4.4.4.2 és 4.6.6.3 pontokban meghatározottaknak kell lenni.

4.6.6.2 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.6.6.2.1 Az áramkör üzemmódú összeköttetési szolgáltatás felhasználójától (4-38. táblázat), vagy GES vezérléstől (4-45. táblázat) kapott LIDU vételekor a GES-nek a LIDU-ból elő kell állítania egy SU készletet. Minden SU készletnek vagy egy egyedüli jel egységből, amelyet "egyedüli jel egység"-nek (LSU) neveznek, vagy több olyan jel egységből kell állnia, amelyekből az első egy "kezdeti jel egység" (ISU) és az azután következők a "soronkövetkező jel egységek" (SSU). A jel egységet a LICI-ben lévő információ leképezésével és a belső adatkapcsolati réteg protokol folyamatok által a megfelelő jel egység szabályozó információs mezejébe generálva kell előállítani.

4.6.6.2.2 Az összes adásra váró jel egység közül a legrégebbi, legmagasabb Q számmal rendelkező jel egységet kell elsőnek továbbítani. Egy többszörös jel egységekből álló jel egység készlet jel egységeit sorszámaik csökkenő sorrendjében kell továbbítani (4. Fejezet 3. fFggeléke, 59. tétel).

Megjegyzés. – Az alsávi C-csatorna adatkapcsolati réteg a GES-ben nem jelöl ki az áramkör üzemmódú összeköttetési szolgálat felhasználójától kapott LIDU-nak referencia számot. Ehelyett alkalmazási referencia számot jelöl ki az áramköri üzemmódú szolgálat, és ezt juttatják el a LICI-ben lévő adatkapcsolati réteghez.

4.6.6.2.3 Ha nincsenek továbbítandó jel egységek, akkor a GES-nek kitöltő jel egységeket kell küldenie (4. Fejezet 2 Függelék, A2-42. ábra).

4.6.6.3 LÉGIJÁRMŰ FEDÉLZETEN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.6.6.3.1 Egy egyedüli jel-egységből álló jel-egység készlet részére az AES-nek egy olyan LIDU-t kell előállítania, amely csak LICI-t tartalmaz, és a LIDU-t továbbítania kell a megfelelő össze- köttetési szolgáltatás felhasználójához az AES-ben. A LICI-t a beérkezett egyedüli jel-egység szabályozó információjából kell létrehozni.

4.6.6.3.2 Többszörös jel egységekből álló jel egység készlet részére az AES-nek a beérkezett jel egységeket újra kell társítani és rendezni egy jel egység készletbe az alkalmazási referencia száma (4. fejezet 3. függeléke, 4. szakasz), sorszámai (4. Fejezet 3. Függelék 59. szakasz), és Q számai (4. fejezet 3. függelék 43. szakasz) alapján. Egy kezdeti jel egység vételét követően az AES-nek meg kell határoznia, hogy várható-e a GES-től a kezdeti jel egység által fejrészezett jel egység készletnek megfelelő további rákövetkező jel egység a következő kritériumoknak megfelelően:

Nem várhatók a jel egység készletnek megfelelő további egyedülálló jel egységek, ha akár a jel egység készlet utolsó egyedülálló jel egysége, vagy egy kitöltő jel egység érkezik, vagy ha a csatorna bontódik.

Ha egy olyan kezdeti jel egység vagy egyedülálló jel egység érkezik, amelynek Q száma megegyezik a befejezésre váró jel egység készlet Q számával, akkor az AES-nek érvénytelenítenie kell a befejezésre váró, nem teljes jel egységet.

4.6.6.3.2.1 Ha nem várhatók további jel egységek, amelyek megfelelnek egy jel egység készlet továbbításához, akkor az AES-nek meg kell határoznia, hogy vannak-e hiányzó jel egységek. Az AES-nek a továbbiakban a következőket kell végrehajtania:

a) ha nincsenek hiányzó jel egységek, akkor az AES-nek a 4.6.3.4.3 pont szerint újra össze kell állítania a jel egységeket egy LIDU-ba, és azt továbbítania kell a megfelelő összeköttetési szolgáltatás felhasználójához az AES-ben;

b) ha van hiányzó jel egység, akkor az AES nem állíthat elő LIDU-t a beérkezett hiányos jel egység készletből; helyette tárolnia kell a beérkezett jel egységeket, amíg a többi hiányzó jel egység a jel egység készlet újra-továbbításakor megérkezik, vagy amíg a csatorna bontódik.

4.6.6.3.3 *C-csatorna áthallás érzékelése.* Ha egy beérkezett jel egység vagy jel egység készlet egy olyan AES azonosítót (ID) vagy alkalmazási referencia számot tartalmaz, amely különbözik a C- csatorna létrehozásakor meglévőtől, akkor az AES-nek az AES vezérlést utasítania kell, hogy akadályozza meg a C-csatorna frekvenciáján történő adást, és utasítania kell az AES áramköri üzemmódú szolgálatot a hívás befejezésére.

4.6.7 A légijárműtől jövő alsávi C-csatorna protokolja

Megjegyzés. - A 4.6.7 pontban az AES és GES kifejezések használata az AES-en és a GES-en belül a légijárműtől jövő alsávi C-csatorna adás adatkapcsolati réteg funkciókra vonatkozik.

4.6.7.1 ÁLTALÁNOS

A kapcsolati réteg funkcióknak egy, a légijárműtől jövő adás egyedi alsávi C-csatorna esetében a 4.6.7.2 és a 4.6.7.3 pontokban foglaltaknak kell megfelelniük.

4.6.7.2 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES)

4.6.7.2.1 Az áramkör üzemmódú kapcsolat szolgáltatás felhasználójától (4-38. táblázat), vagy az AES vezérléstől (4-44. táblázat) kapott LIDU vételekor az AES adatkapcsolati rétegnek a 4.6.6.2.1 pont szerint elő kell állítania a megfelelő jel egység készletet.

4.6.7.2.2 Az összes adásra váró jel egység közül a legrégebbi, legnagyobb Q számmal rendelkező jel egységet kell elsőnek továbbítani. Egy többszörös jel egységekből álló jel egység készlet jel egységeit sorszámaik csökkenő sorrendjében kell továbbítani (4. fejezet 3. függeléke, 59. tétel).

Megjegyzés. – Az alsávi C-csatorna adatkapcsolati réteg az AES-ben nem jelöl ki az áramkör üzemmódú kapcsolat szolgáltatás felhasználójától kapott LIDU-nak referenci azámot. Ehelyett alkalmazási referencia számot jelölnek ki az áramkör üzemmódú szolgálatok és ezt juttatják el a LICI-ben lévő adatkapcsolati réteghez.

4.6.7.2.3 Ha nincsenek továbbítandó jel egységek, akkor az AES-nek kitöltő jel egységeket kell küldenie (4. fejezet 2. függeléke, A2-42. ábra).

4.6.7.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

4.6.7.3.1 Egy egyedülálló jel egységekből álló jel egység készlet részére a GES-nek a 4.6.6.3.1 pont szerinti LIDU-t kell előállítania és továbbítania a GES-ben lévő kapcsolat szolgáltatás felhasználójához.

4.6.7.3.2 Többszörös jel egységekből álló jel egység készlet részére a GES-nek a beérkezett jel egységeket újra kell társítani és rendezni egy jel egység készletbe az alkalmazási referencia száma (4. fejezet 3. függeléke, 4. tétel), sorszámai (4. fejezet 3. függelék 59. tétel) és Q számai (4. fejezet 3. függelék 43. tétel) alapján. Egy kezdő jel egység /ISU/ vételét követően a GES-nek meg kell határoznia, hogy várható-e az AES-től a kezdő jel egység által fejrészezett jel egység készletnek megfelelő további soronkövetkező jel egységek /SSUk/ a következő követelménnyel összhangban:

Nem várhatók a jel egység készletnek megfelelő további egyedüli jel egységek, ha akár a jel egység készlet utolsó egyedüli jel egysége, vagy egy kitöltő jel egység érkezik, vagy ha a csatorna bontódik.

Ha egy olyan kezdő jel egység /ISU/ vagy egyedüli jel egység /LSU/ érkezik, amelynek Q száma megegyezik az előállításra váró jel egység készlet Q számával, akkor a GES-nek érvénytelenítenie kell az előállításra váró, nem teljes jel egység készletet.

4.6.7.3.2.1 Ha nem várhatók további olyan jel egységek, amelyek megfelelőek egy jel egység készlet továbbításához, akkor a GES-nek meg kell határoznia, hogy vannak-e hiányzó jel egységek. A GES-nek a továbbiakban a következőket kell végrehajtania:

a) ha nincsenek hiányzó jel egységek, akkor a GES-nek a 4.6.3.4.3 pont szerint újra össze kell állítania a jel egységeket egy LIDU-ba és azt továbbítania kell a megfelelő kapcsolat szolgáltatás felhasználójához a GES-be;

b) ha van hiányzó jel egység, akkor a GES nem hozhat létre LIDU-t a beérkezett hiányos jel egység készletből; helyette tárolnia kell a beérkezett jel egységeket addig, amíg a többi hiányzó jel egység a jel egység készlet újra-továbbításakor megérkezik, vagy amíg a csatorna bontódik.

4.7 MŰHOLDAS AL-HÁLÓZATI RÉTEG

4.7.1 Általános előírások

4.7.1.1 ARCHITEKTÚRA

4.7.1.1.1 A műholdas al-hálózati rétegnek (SSNL) az AES-ben és a GES-ben kapcsolat-orientált kötegelt adatszolgáltatást kell biztosítani az al-hálózati szolgáltatás (SNS) felhasználói közötti al-hálózati kapcsolatok (SNCS) létrehozásával. Az AES-ben és GES-ben a műholdas al-hálózati rétegnek /SSNL/ az alábbi három funkciót kell tartalmaznia:
a) műholdas al-hálózat-függő (SSND) funkció;
b) al-hálózati hozzáférési (SNAc) funkció; és
c) egybedolgozó (IW) funkció.
A műholdas al-hálózat-függő (SSND) funkcionak kell végrehajtani a műholdas al-hálózat-függő protokolt (SSNDP) az AES és a GES minden párja között az al-hálózati protokol adategységek (SNPDU) cseréjével. Végre kell hajtania az SSNDP légijármű (SSNDPA) funkciót az AES-ben és az SSNDP föld (SSNDPG) funkciót a GES-ben. Az al-hálózati hozzáférési funkciónak kell végrehajtani az ISO 8208 protokolt az AES vagy GES és a csatolt útvonal-kiválasztó között ISO 8208-as csomagok cseréjével. Végre kell hajtania az ISO 8208 DCE funkciót az AES-ben és GES-ben. Az IW funkciónak (IWF) kell biztosítania a szükséges harmonizációs funkciókat az SSND, az SNAc és a DN funkciók között. A 4-11. ábra mutatja az SSND, IW és SNAc funkciókat, valamint az ATN műholdas al-hálózati protokol felépítését.

4.7.1.1.2 A DCE kifejezésnek a használatakor az ISO 8208 DCE jelentéssel kell bírnia.

4.7.1.1.3 Az SSNL-nek az adatkapcsolati réteggel és az AES/GES vezérléssel kell illeszkednie.

4.7.1.2 SZOLGÁLTATÁSOK

A Műholdas al-hálózati réteg-/SSNL/-nek a következő szolgáltatásokat kell biztosítania:

a) a továbbított információ átláthatósága – biztosítania kell az oktett-igazított SSNL felhasználói adat és/vagy ellenőrző információt; és

b) a szolgáltatás kiválasztás minősége – eszközt kell biztosítani az SNS felhasználók részére, hogy kérjék és elfogadják az SSNL felhasználói adatok átvitelére a szolgáltatás minőségét.

4.7.2 Adatcsomag teljesítmény

4.7.2.1 MEGHATÁROZÁSOK

4.7.2.1.1 Az adatcsomag teljesítménnyel kapcsolatos kifejezések az ISO 8348-ban (első kiadás) található meghatározásokon alapulnak. Az AMSS al-hálózati rétegre alkalmazott meg- határozásokban az ISO 8348-ban szereplő "hálózat" szót és rövidítését, az "N"-t felváltja az "al-hálózat" és rövidítése az "SN", ahol csak előfordulnak. A további meghatározások a következők:

4.7.2.1.2 *Adat-átviteli késés (95 százalékos).* A késések statisztikai eloszlásának 95 százaléka, amelynél az átviteli késés az átlag.

4.7.2.1.2 *bis Adat-továbbítási késés.* Az ISO 8348-nak megfelelően az adatkésések statisztikai eloszlásának
átlagértéke.

4.7.2.1.3 *Al-hálózati szolgáltatási adat-egység (SNSDU).* Az al-hálózati felhasználói adatok mennyisége, amelynek identitását megőrzik az al-hálózati kapcsolat egyik végétől a másikig.

Megjegyzés. – Az al-hálózati teljesítmény egy sor tényezőtől függ, ideértve az összeköttetési forgalom szintjét is. Az itt megadott teljesítmény értékek a csúcsforgalmi órákra vonatkoznak.

4.7.2.2 A SZOLGÁLTATÁS SEBESSÉGE

4.7.2.2.1 *KAPCSOLAT LÉTREHOZÁSI KÉSÉS*

Megjegyzés. – A kapcsolat létrehozási késés, amint azt az ISO 8348 meghatározza, magában foglal egy olyan összetevőt, ami a hívott al-hálózati szolgáltatás felhasználójának tulajdonítható, ami az SN-KAPCSOLÁS jelzése és az SN-KAPCSOLÁS válasza közötti idő. Ez a felhasználói összetevő a műholdas al-hálózat határain kívüleső eseményeknek köszönhető és ezért nem tartozik az AMSS műszaki paraméterei közé.

4.7.2.2.1.1 A kapcsolat létrehozási késés nem haladhatja meg a következő maximális értékeket:

Az AES által használt minimális csatorna átviteli sebesség (bit/s)	Maximális kapcsolati késés (95 százalék) (másodperc)
600	70
1200	45
2400	25
4800	25
10500	25

4.7.2.2.2 *ADAT-TOVÁBBÍTÁSI KÉSÉS*

Megjegyzés. – Az ISO 8348-cal összhangban az adat-továbbítási késés értékei egy 128 oktett rögzített hosszúságú SNSDU-n alapszanak. Az adat-továbbítási késéseket átlag-értékekként határozzák meg. (A 4.7.2.1.2 és a 4.7.2.1.2 bis pontok a vonatkozóak.)

4.7.2.2.2.1 Az adat-továbbítási késés nem haladhatja meg a következő maximális értékeket:

Az AES által használt minimális csatorna-átviteli sebesség (bit/s)	Maximális adat-továbbítási késés (másodperc)		
	Légijárműhöz		Légijárműtől
	Legmagasabb elsőbbségű szolgáltatás	Legalacsonyabb elsőbbségű szolgáltatás	Legmagasabb elsőbbségű szolgáltatás
600	12	40	40
1200	8	25	30
2400	5	12	15
4800	4	7	13
10500	4	5	13

Megjegyzés. – Bármely AES-ben a légijárműtől érkező kisebb elsőbbségű forgalom további késéseket szenvedhet a légijárműtől érkező forgalmi terhelés mennyiségétől és sebességétől függően.

4.7.2.2.3 *ADAT-ÁTVITELI KÉSÉS (95 SZÁZALÉKOS)*

Megjegyzés. – Az ISO 8348-cal összhangban a 95 százalék adat-átvitel késési érték a rögzített 128 oktett SNSDU hosszúságon alapszik. A 95 százalékos adat-átviteli késés a 4.7.2.1.2 pontban van meghatározva.
Az adatátviteli késés (95 százalékos) nem haladhatja meg a következő maximális értékeket:

Az AES által használt minimális csatorna-átviteli sebesség (bit/s)	Maximális adat-átvitelii késés (95 százalék) (másodperc)		
	Légijárműhöz		Légijárműtől
	Legmagasabb elsőbbségű szolgáltatás	Legalacsonyabb elsőbbségű szolgáltatás	Legmagasabb elsőbbségű szolgáltatás
600	15	110	80
1200	9	60	65
2400	6	30	35
4800	5	20	30
10500	4	10	30

Megjegyzés. – Bármely AES-ben a légijárműtől érkező alacsonyabb elsőbbségű forgalom további késéseket szenvedhet a légijárműtől érkező forgalmi terhelés mennyiségétől és sebességétől függően.

4.7.2.2.4 *KAPCSOLAT-BONTÁSI KÉSÉS*

A kapcsolat-bontási késés (95 százalékos) nem haladhatja meg a 30 másodpercet.

4.7.2.3 A SZOLGÁLTATÁS MEGBÍZHATÓSÁGA

4.7.2.3.1 *MARADÉK-HIBA ARÁNY*

A maradék-hiba arány a légijárműtől érkező adásban nem haladhatja meg a 10^{-4} per al-hálózati szolgáltatási adat egység-/SNSDU/-t. A maradék-hiba arány a légijármű részére továbbított adásban nem haladhatja meg a 10^{-6} per SNSDU-t.

Megjegyzés. – A maradék-hiba arány magában foglalja a fel nem ismert hiba valószínűségét, egy SNSDU elvesztésének a lehetőségét és egy SNSDU megduplázásának a valószínűségét.

4.7.2.3.2 *ÖSSZEKÖTTETÉSI HIBA TŰRÉS*

4.7.2.3.2.1 Egy al-hálózat kapcsolat /SNC/ szolgáltató által kezdeményezett SNC bontás valószínűsége nem haladhatja meg a 10^{-4}-t bármely egyórás időtartamon belül.

Megjegyzés. – A GES-től GES-nek történő átadásból vagy az AES kijelentkezésből, illetve a virtuális hívás /VC/ kizárólagos hozzárendelésből keletkező összeköttetés bontása ki van zárva ebből a műszaki leírásból.

4.7.2.3.2.2 Egy SNC szolgáltató által kezdeményezett visszaállítás valószínűsége nem haladhatja meg a 10^{-1}-t bármely egyórás időtartamon belül.

4.7.3 Műholdas al-hálózat-függő protokol szolgáltatások és üzemelések

4.7.3.1 ÁLTALÁNOS ELŐÍRÁSOK

Mivel a Műhold al-hálózat-függő funkció protokol, légijármű /SSNDPA/ és a Műhold al-hálózat-függő funkció protokol, föld /SSNDPG/ közötti funkcionális különbségek minimálisak, ezért üzemeléseiket az SSNDPX viszonylatában kell meghatározni, ahol az X jelentheti akár az A-t, akár a G-t. Ahol különbségek fordulnak elő, ott az SSNDPA és az SSNDPG funkciókat külön-külön kell meghatározni.

4.7.3.2 MŰHOLD AL-HÁLÓZAT-FÜGGŐ PROTOKOL ELTITÁSOK

Megjegyzés. – Minden egyes AES és GES pár között legalább egy pár SSNDPA és SSNDPG entitás van. A 4-12. ábra két pár SSNDPA és SSNDPG entitást ábrázol két AES és egy GES között.

4.7.3.2.1 Az ebben a részben meghatározott SSNDPX minden SSNDPX entitásra kell, hogy vonatkozzon.

4.7.3.3 LOGIKAI CSATORNÁK

Megjegyzés. – Az SSNDPA-k és SSNDPG-k közötti kapcsolatot logikai csatornákon keresztül hozzák létre. Minden SSNDPX entitás pár között maximálisan 255 csatorna hozható létre. Minden logikai csatornát saját 1-től 255-ig terjedő logikai csatornaszám (LCN) azonosítja. Az LCN 0 foglalt.

4.7.3.3.1 Egy új föld-levegő kapcsolat létrehozása céljából az SSNDPG-nek az 1-től 127-ig terjedő tartományból kell kijelölnie egy logikai csatorna számot a tartományban lévő legkisebb számú kész állapotú logikai csatorna kiválasztásával. Egy új levegő-föld kapcsolat felállításához az SSNDPA-nak a 128-tól 255-ig terjedő tartományból kell kijelölnie egy logikai csatorna számot a tartományban lévő legnagyobb számú kész állapotú logikai csatorna választásával.

4.7.3.4 ÜZEMELÉSEK

Az SSNDPX virtuális hívás szolgáltatásnak (VC) három megkülönböztethető fázison kell áthaladnia:

a) kapcsolat létrehozás;

b) adatátvitel; és

c) kapcsolat bontása.

Megjegyzés. – Az SSNDPX helyi kezdeményezésű, vagy távoli kezdeményezésű üzemelések fogalmaiban kerül meghatározásra. A helyi kezdeményezésű üzemelés az eljárást az SSNDPX-ben határozza meg a helyi SNS felhasználótól kiinduló üzemelések kezelése céljából, amíg a távoli kezdeményezésű az *eljárást az SSNDPX-ben a távoli SNS felhasználótól kiinduló üzemelések kezelése céljából határozza meg.*

4.7.3.5 KAPCSOLAT LÉTREHOZÁSA

Megjegyzés. – A kapcsolat létrehozása közben maximálisan 128 oktett felhasználói adat továbbítható.

4.7.3.5.1 A kapcsolat létrehozási eljárást minden kapcsolat létrehozási kérésre függetlenül alkalmazni kell.

4.7.3.5.2 A felhasználói adatokat mindkét irányban átlátható módon kell továbbítani.

4.7.3.5.3 *HELYI KEZDEMÉNYEZÉS*

4.7.3.5.3.1 *Szabvány üzemelés*

4.7.3.5.3.1.1 Amikor az SSNDPX egy hívás-kérési adatcsomagot fogad az IWF-től, akkor ki kell jelölnie egy kész állapotban lévő logikai csatornát egy kapcsolat-kérési SNPDU segítségével, a hívás-kérési adatcsomagot a távoli SSNDPX-hez kell továbbítania és a logikai csatornát az IWF hívás-kérési állapotba kell állítania.

4.7.3.5.3.1.2 Ha a hívást elfogadták a távoli SSNDPX-nél, akkor egy kapcsolat-megerősítő SNPDU érkezik. Ezt követően az SSNDPX-nek a logikai csatornát az adat-átviteli/forgalom-vezérlés (forgalom-vezérlés kész/nincs távoli vagy helyi megszakítás függőben) állapotba kell állítani, és egy hívás kapcsolva adatcsomagot kell továbbítania az IWF-hez. A hívás-kapcsolt adatcsomagnak alapértelmezési értékeket kell használni (ha vannak ilyenek) azon beállítások esetében, amelyek nem kerülnek továbbításra a műholdas al-hálózaton keresztül, a 4.7.3.16 pontban meghatározott SNPDU adatcsomag leképezési szabályok szerint.

4.7.3.5.3.1.3 Ha az SSNDPX nem kap sem egy kapcsolat-megerősítő, sem egy kapcsolat-bontási SNPDU-t a távoli SSNDPX-től mielőtt az időzítő (lásd tN1, 4-18. táblázat) lejár, akkor egy kapcsolat-bontási eljárást kell kezdeményeznie.

4.7.3.5.3.2 *Egyéb üzemelés*

Ha nem állnak rendelkezésre források, vagy egy megkívánt beállítási érték nem megengedett, akkor a kezdeményező SSNDPX-nek egy bontás-jelző adatcsomagot kell küldenie az IWF-nek.

4.7.3.5.4 *TÁVOLI KEZDEMÉNYEZÉS*

4.7.3.5.4.1 *Szabvány üzemelés*

4.7.3.5.4.1.1 Amikor az SSNDPX egy kapcsolat létrehozási SNPDU-t vesz a távoli SSNDPX-től, akkor a kiválasztott logikai csatornát a beérkező hívás állapotába kell állítania. Az SSNDPX-nek egy beérkező hívási adatcsomagot kell továbbítania az IWF-hez, alapértelmezési értékeket használva az olyan beállítások esetében, amelyek nem kerülnek továbbításra a műholdas al-hálózaton keresztül (lásd 4.7.3.16 pont).

4.7.3.5.4.1.2 Amikor az SSNDPX egy hívás-fogadási köteget kap az IWF-től, akkor egy kapcsolat megerősítő SNPDU-t kell továbbítania a távoli SSNDPX-nek és a logikai csatornát adat-átviteli/forgalom-vezérlés állapotba (forgalom-vezérlés kész/nincs távoli vagy helyi megszakítás függőben) kell állítania, amikor az illeszkedő adatkapcsolati rétegtől megkapja azt az információt, hogy a kapcsolat megerősítő SNPDU feldolgozásra került (hibázás/siker LIDU).

4.7.3.5.4.2 *Egyéb működés*

4.7.3.5.4.2.1 Ha a vevő SSNDPX nem tudja a kérést támogatni, akkor egy kapcsolat-bontási SNPDU-t kell
továbbítania a kezdeményező SSNDPX-hez.

4.7.3.5.4.2.2 Ha egy kiválasztott beállítási érték nem megengedett, akkor a vevő SSNDPX-nek egy kapcsolat-bontási eljárást kell kezdeményeznie.

4.7.3.6 KAPCSOLAT-BONTÁS

Megjegyzés. – Egy al-hálózati kapcsolatot bármelyik fél bármikor felbonthat, ha a logikai csatorna az adat-átviteli, IWF hívás-kérési, vagy beérkező hívás állapotában van. A kapcsolat bontva SNPDU az IWF által szolgáltatott felhasználói adatokat tartalmazhat (maximum 128 oktett).

4.7.3.6.1 A felhasználói adatokat mindkét irányban átlátható módon kell továbbítani.

4.7.3.6.2 Az SSNDPX-nek garantálnia kell az adatkapcsolati réteghez már továbbított adat/megszakítási SNPDU-k és a rákövetkezőkben továbbított kapcsolat bontva vagy kapcsolat-bontás befejezve SNPDU között a sorrendben történő továbbítást.

4.7.3.6.3 *HELYI KEZDEMÉNYEZÉS*

4.7.3.6.3.1 Amikor az SSNDPX egy bontás kérési adatcsomagot vesz az IWF-től, akkor a logikai csatornát a helyi bontás-kérő állapotba kell állítani, egy kapcsolat bontva SNPDU-t kell előállítania és azt továbbítania kell a távoli SSNDPX-nek. Ezt követően csak a kapcsolat bontva SNPDU-t vagy a kapcsolat-bontás befejezve SNPDU-t fogadhatja. Minden más SNPDU-t érvényteleníteni kell. Az SSNDPX-nek minden nem törlés kérési adatcsomag vételét ugyancsak hibaként kell értékelnie és azt érvényteleníteni kell.

4.7.3.6.3.2 Amikor az SSNDPX egy kapcsolat-bontás befejezve adatcsomagot vesz, miután a kapcsolat-bontás befejezve sikeresen el lett küldve, akkor a logikai csatornát vissza kell állítania a kész állapotba. Ha az SSNDPX egy kapcsolat bontva SNPDU-t vesz a távoli SSNDPX-től, akkor nem kell egy kapcsolat-bontás teljes SNPDU vételére számítania.

4.7.3.6.3.3 Ha az SSNDPX-hez nem érkezik válasz a távoli SSNDPX-től, mielőtt a társított időzítő lejár (lásd tN6, 4-18. táblázat), akkor a logikai csatornát vissza kell állítania a kész állapotba.

4.7.3.6.4 *TÁVOLI KEZDEMÉNYEZÉS*

Amikor az SSNDPX egy kapcsolat bontva SNPDU-t vesz, akkor a távoli bontás kérése állapotba kell lépnie és egy törlés jelzés adatcsomagot kell küldenie az IWF felé. Ugyancsak létre kell hoznia egy kapcsolat-bontás befejezve SNPDU-t, azt el kell küldenie a távoli SSNDPX felé, valamint a logikai csatornát vissza kell állítania a kész állapotba.

4.7.3.6.5 *SSNDPX KEZDEMÉNYEZÉS*

Ha az SSNDPX entitásnak egy kapcsolatot meg kell szakítania, akkor a logikai csatornát a helyi bontás-kérés állapotába kell állítania, egy bontás adatcsomagot kell küldenie az IWF felé, valamint egy kapcsolat-bontási SNPDU-t kell továbbítania a távoli SSNDPX felé. Válaszként egy kapcsolat-bontás befejezve, vagy kapcsolat bontva SNPDU vételére kell várnia a távoli SSNDPX felől, és a logikai csatornát vissza kell állítania a kész állapotba, amikor a várt válasz megérkezik, vagy az időzítési felügyelet lejár (lásd tN6, 4-20. táblázat).

4.7.3.7 ADAT-ÁTVITEL

4.7.3.7.1 Az adat-átviteli eljárást minden olyan logikai csatornára alkalmazni kell, amelyik az adat-átviteli/forgalom-vezérlési állapotban van.

4.7.3.7.2.1 *ADAT-ÁTVITELI ELJÁRÁS*

4.7.3.7.2.1 Az adatokat átláthatóan és sorrendben kell továbbítani az SNS felhasználók között.

4.7.3.7.2.2 Egy M-bites SNPDU sorozatnak egy vagy több adat – SNPDU sorozatból kell állnia. Az utolsó kivételével minden adat – SNPDU-nak tartalmazni kell a felhasználói adatok maximum 503 oktettjét és annak az M-bitjét 1-re kell állítani. A sorozathoz tartozó utolsó SNPDU felhasználói adatmezőjének a hossza rövidebb lehet a maximális hossznál és annak az M-bitjét 0-ra kell állítani.

4.7.3.7.2.3 *Helyi kezdeményezés*

4.7.3.7.2.3.1 Az IWF-től érkezett M-bit adatcsomag sorozatot egy M-bites SNPDU sorozatként kell továbbítani a távoli SSNDPX felé.

4.7.3.7.2.3.2 Egy M-bites adatcsomag sorozathoz tartozó egy vagy több adatcsomagnak az IWF-től történő vétele esetén az SSNDPX-nek elő kell állítania egy vagy több adat-SNPDU-t az M-bitet felhasználva az azonos sorozat következő adat – SNPDU-jainak jelzésére, és azokat továbbítania kell a távoli SSNDPX részére.

Megjegyzés. – A sorozatban szükséges adat-SNPDU-k száma az M-bites adatcsomag sorozathoz tartozó adatcsomagokban lévő felhasználói adatok mennyiségétől függ.

4.7.3.7.2.3.3 Az SSNDPX-nek minden adat-SNPDU-hoz ugyancsak ki kell jelölnie egy SNPDU számot. Egy adott kapcsolat viszonylatában az SNPDU számoknak egymásra következőknek kell lenniük. Az adat-SNPDU-k sorozatszámozását moduló 256-tal kell elvégezni és az SNPDU számoknak a 0-tól 255-ig terjedő teljes tartományban kell ciklikusan változniuk. A műholdas összeköttetésen elsőként küldendő adat-SNPDU SNPDU számának nullával kell egyenlőnek lenni, amikor a logikai csatorna éppen belép a forgalom-vezérlésre kész állapotba.

4.7.3.7.2.4 *Távoli kezdeményezés*

4.7.3.7.2.4.1 A távoli SSNDPX-től érkezett M-bites SNPDU sorozatot egy M-bites csomag sorozatként kell az IWF részére továbbítani.

4.7.3.7.2.4.2 Egy M-bites SNPDU sorozat vételekor az SSNDPX-nek egy M-bites csomag sorozatot kell előállítania, az M-bitet az ugyanazon sorozat következő csomagjának jelzésére felhasználva, ahogy szükséges, és azt továbbítania kell az IWF felé.

Megjegyzés. – Az M-bites csxomag sorozatban lévő adatcsomagok száma az M-bites SNPDU sorozatban lévő felhasználói adatok mennyiségétől és a csomag méretétől függ.

4.7.3.7.2.4.3 Ha egy olyan adat-SNPDU érkezik, amely a maximális méretnél kisebb és az M-bitje = 1, valamint a D-bit = 0, akkor az SSNDPX-nek egy visszaállítási eljárást kell kezdeményeznie (lásd 4.7.3.8.2.1 pont).

4.7.3.7.3 *FORGALOM-VEZÉRLÉS*

4.7.3.7.3.1 Az SSNDPX-en belül forgalom-vezérlést kell alkalmazni az adat-tárolók túlcsordulásának megelőzése érdekében.

4.7.3.7.3.2 Az adatok áramlásának megszakítására a vevő SSNDPX-nek egy olyan forgalom-vezérlési SNPDU-t kell előállítania, amelynek az forgalom-vezérlési ok mezője a felfüggesztésére és a távoli SSNDPX-hez való továbbítására van beállítva. A forgalom-vezérlési (felfüggesztési) SNPDU-ban az SNPDU számát az utoljára vett és fogadott adat-SNPDU SNPDU számára kell beállítani. Ha van sorozaton kívüli adat-SNPDU az SSNDPG-ben, akkor az ok mezőjében felfüggesztésre beállított forgalom-vezérlési SNPDU-ban lévő SNDPU számot a sorozaton kívüli SNPDU előtt vett és elfogadott SNPDU-nak az SNPDU számára kell beállítani. Amikor ezt követően a vevő SNDPX képes az adat-átvitel folytatására, akkor a forgalom-vezérlési ok mezőjében folytatásra beállított forgalom-vezérlési SNPDU-t kell továbbítania.

4.7.3.7.3.3 Amikor az SSNDPX egy olyan forgalom-vezérlési SNPDU-t vesz, amelynek a forgalom-vezérlési mezője felfüggesztésre van beállítva, akkor abba kell hagynia az adat-SNPDU-k továbbítását a jelzett logikai csatornán. Ha a forgalom-vezérlési (felfüggesztési) SNPDU-ban lévő SNPDU-szám különbözik az utolsóként továbbított adat-SNPDU számától és az az adat-SNPDU, amelynek az SNPDU száma egyenlő a forgalom-vezérlési (felfüggesztési) SNPDU plusz egy moduló 256 nincs már az adat-tárolóban, akkor az SSNDPX-nek logikai csatorna visszaállítását kell kezdeményeznie. Amikor az SSNDPX egy olyan forgalom-vezérlési SNPDU-t vesz, amelynek az ellenőrző mezője folytatásra van beállítva, akkor újból el kell kezdenie az adat-SNPDU-k továbbítását a jelzett logikai csatornán. Az első (újra) továbbított adat-SNPDU SNPDU-számának egyenlőnek kell lenni a korábban vett forgalom-vezérlési (felfüggesztési) SNPDU plusz egy moduló 256 SNPDU számával, amennyiben visszaállítási eljárást nem kezdeményeztek.

4.7.3.7.3.4 Ha a vevő SSNDPX nem képes az adat-átvitel folytatására, mielőtt a társított időzítő lejár (lásd tN7, 4-18. és 4-20. táblázatok), akkor a logikai csatorna visszaállítását kell kezdeményeznie.

4.7.3.7.4 *GYORSÍTOTT ADAT-ÁTVITEL*

Megjegyzés. – A gyorsított adat-átvitel lehetővé teszi egy SSNDPX számára azt, hogy egy megszakítás csomagban lévő felhasználói adatot a távoli SSNDPX-nek továbbítson, megkerülve bármely olyan forgalom-vezérlést, amelyet az al-hálózati réteg entitás alkalmazhatott volna.

4.7.3.7.4.1 A gyorsított adat-átviteli eljárás függetlenül alkalmazható az egyes logikai csatornákra, amelyek adat-átvitel állapotban vannak, és nem kezdeményezhető akkor, amikor egy bontási vagy visszaállítási eljárás van folyamatban.

4.7.3.7.4.2 Egyidőben mindegyik irányban csak egy, 32 oktett felhasználói adat hosszúságú SNPDU megszakítás engedélyezhető.

4.7.3.7.4.3 *Helyi kezdeményezés*
4.7.3.7.4.3.1 Amikor a kezdeményező SSNDPX megszakítás csomagot vesz az IWF-től és feltételezve, hogy nincs előző megszakítási SNPDU, amely megszakítás-megerősítés SNPDU-ra vár, akkor az SSNDPX-nek egy megszakítás SNPDU-t kell generálnia és továbbítani a távoli SSNDPX-nek, és várni egy megszakítás-megerősítő SNPDU-ra; egyébként az SSNDPX-nek a megszakítás csomagot ki kell selejteznie.

4.7.3.7.4.3.2 Egy megszakítás-megerősítő SNDPU vétele után az SSNDPX-nek létre kell hoznia egy megszakítás-megerősítés csomagot és azt továbbítania kell az IWF-hez.

4.7.3.7.4.3.3 Ha az SSNDPX nem veszi a megszakítás-megerősítés SNDPU-t mielőtt a hozzátartozó időzítő (lásd tN4 a 4-18. táblázatban és a 4-20. táblázatban) lejár, akkor a logikai csatorna visszaállítását kell kezdeményeznie.

4.7.3.7.4.4 *Távoli kezdeményezés*

4.7.3.7.4.4.1 Amikor az SSNDPX egy megszakítási SNPDU-t vesz, akkor egy megszakítási csomagot kell továbbítania az IWF-hez.

4.7.3.7.4.4.2 Amikor az SSNDPX egy megszakítás-megerősítő csomagot vesz az IWF-től, akkor létre kell hoznia egy megszakítás-megerősítő SNPDU-t és azt el kell küldenie a távoli SSNPDX-nek.

4.7.3.8 KAPCSOLAT VISSZAÁLLÍTÁS

4.7.3.8.1 Amikor az SSNDPX hibát érzékel annak az SSNDPX-nek a működésében, amelynek részére vissza kell állítani a virtuális áramkört (lásd 4-24. táblázat), akkor a logikai csatornát a helyi visszaállítási állapotba kell állítania, végre kell hajtania a visszaállítás eljárást és egy visszaállítás SNPDU-t kell küldenie a távoli SSNDPX felé.

Megjegyzés. – Az ok és hibamegállapító kódok jelzik, hogy a visszaállítást csak a műholdas al-hálózaton belül kell-e végrehajtani, vagy azt ki kell-e terjeszteni az IWF-re is.

4.7.3.8.2 *VISSSZAÁLLÍTÁSI TEVÉKENYSÉG*

A visszaállítási eljárás ideje alatt az SSNDPX által a következő tevékenységet kell végrehajtani, tekintettel az adat-átviteli működésére:

a) azokat az SNPDU-kat, amelyek még nem kerültek továbbításra az adatkapcsolati réteghez, érvényteleníteni kell;
b) azokat az SNPDU-kat, amelyek vételére egy visszaállítás SNPDU vétele/adása előtt került sor, de nem képeznek egy M-bites SNPDU sorozatot, ki kell üríteni az újra- összeállítási területről;
c) a várható (adat) SNPDU-számot 0-ra kell visszaállítani és az azt követően továbbított adat SNPDU-kat 0-tól kezdődően kell számozni; és
d) a bármely nem odatartozó megszakítási SNPDU-knak a távoli SSNDPX-hez vagy -tól megerősítés nélkül kell maradniuk, és a tN4-et meg kell állítani.

4.7.3.8.3 *VISSZAÁLLÍTÁSI ELJÁRÁSOK*

4.7.3.8.3.1 A vissszaállítási eljárásokat csak az adat-átviteli állapotban lévő logikai csatornákra kell alkalmazni.

4.7.3.8.3.2 Az SSNDPX-nek garantálnia kell a már az adatkapcsolati réteghez továbbított adat/megszakítási SNPDU-k és a rákövetkezőkben küldött visszaállítás vagy visszaállítás- megerősítő SNPDU között a sorrendben való továbbítást.

4.7.3.8.3.3 *Helyi/SSNDPX kezdeményezés*
4.7.3.8.3.3.1 Amikor a kezdeményező SSNDPX egy visszaállítás kérő csomagot vesz az IWF-től, vagy egy olyan hibát érzékelt, amikor vissza kell állítania az SVC-t, akkor a logikai csatornát a helyi visszaállítás állapotba kell állítania, végre kell hajtania a vissza- állítási akciót, egy új visszaállítás SNPDU-t kell küldenie a távoli SSNDPX-hez, és el kell indítania egy tN3 időzítőt (lásd 4-18. táblázat). Ha a 4.7.3.9 pont alatti hibajavító eljárások megkövetelik, akkor az SSNDPX-nek egy visszaállítás jelző csomagot kell továbbítania az IWF-nek.

4.7.3.8.3.3.2 A visszaállítás-megerősítő SNPDU távoli SSNDPX-től való vételekor vissza kell állítania a logikai csatornát az adat-átviteli/forgalom-vezérlésii állapotba.

4.7.3.8.3.3.3 Ha az SSNDPX nem kap választ az SSNDPX-től mielőtt a hozzátartozó időzítő lejár (lásd tN3, 4-18. táblázat), akkor egy kapcsolat-bontó eljárást kell kezdeményeznie.

4.7.3.8.3.4 *Távoli kezdeményezés*

4.7.3.8.3.4.1 Amikor az SSNDPX egy visszaállítás SNPDU-t vesz, akkor a logikai csatornát a távoli visszaállítási állapotba kell állítania, végre kell hajtania az visszaállítási akciót és egy visszaállítás-jelző csomagot kell küldenie az IWF-nek, a követelmények szerint (lásd 4-24. táblázat).

4.7.3.8.3.4.2 Az SSNDPX-nek egy visszaállítás-megerősítő SNPDU-t kell küldenie a távoli SSNDPX részére és a logikai csatornát az adat-átviteli állapotba kell visszaállítania, amikor megkapja az adatkapcsolati rétegtől azt az információt, hogy az visszaállítás- megerősítő SNPDU sikeresen továbbításra került.

4.7.3.8.3.5 *Egyidejű visszaállítás*

Ha az SSNDPX egy visszaállítás SNPDU-t küld és azt követően egy visszaállítás SNPDU-t vesz, akkor:

a) nem küldhet egy visszaállítás-megerősítő SNDPU-t; és

b) nem számíthat egy visszaállítás-megerősítő SNPDU vételére.

4.7.3.9 HIBA ELJÁRÁSOK

Megjegyzés. – Az SSNDPX által felismert hibákat a következő események eredményezhetik:

– csatorna teljesítőképesség-csökkenés vagy a szinkronzáció elvesztése;
– AES kijelentkezés;

– GES és GES közötti átadás;

– kapcsolati torlódás;

– egy kijavítatlan átviteli hiba;

– egy távoli SSNDPX protokol-hiba;

– egy protokol-hiba az IWF/SSNDPX interfész eljárásban.

4.7.3.9.1 Amikor a 4-22. – 4-24. táblázatokban leírt hibát érzékelnek, akkor az SSNDPX-nek a vonatkozó kapcsolat visszaállítását, vagy bontását kell kezdeményeznie.

4.7.3.9.2 Az IWF-et a hibákról a vonatkozó csomagban lévő ok és hibakereső paraméterek segítségével kell értesíteni. A távoli SSNDPX-et az SNPDU-k megfelelő mezőinek használatával kell értesíteni, úgy mint: visszaállítás vagy bontási ok és hibakereső kód.

4.7.3.9.3 Az SSNDPX által előállított és a távoli SSNDPX-nek továbbított ok mezők kódolásának meg kell felelni a 4-16. táblázatban foglaltaknak.

4.7.3.9.4 A megfelelő SSNDPX által létrehozott hibakereső kódmező kódolásának meg kell felelni a 4-17. táblázatban foglaltaknak.

4.7.3.9.5 *BEJELENTKEZÉS/KIJELENTKEZÉS*

Megjegyzés. – A bejelentkezés és a kijelentkezés eljárásait a 4.7.6 pont tartalmazza.

4.7.3.9.6 *KEZDEMÉNYEZŐ SSNDPX HIBAJAVÍTÁS*

4.7.3.9.6.1 Az SSNPDU-k elvesztéséből vagy késéséből származó adás-hibákat akkor, amikor egy választ várnak, vagy a lejárati idővel, vagy az adatkapcsolati réteg által jelentett hiba LIDU-val kell észlelni.

4.7.3.9.6.2 Lejárt idő esetén az SSNDPX által követendő tevékenységeket a 4-18. táblázat ismerteti.

4.7.3.9.6.3 Az adatkapcsolati réteg általi, SNPDU továbbítási hiábról szóló tájékoztatás esetén az SSNDPX által követendő tevékenységeket a 4-19. táblázat ismerteti. Egy LIDU hiba (adat/megszakítás) vétele, miközben a vonatkozó LCN akár helyi/távoli újraállítás, akár helyi/távoli bontás-kérő állapotban van, nem késztetheti az SSNSD al-hálózati entitást egy (további) kapcsolati visszaállítás létrehozására.

4.7.3.9.7 *PROTOKOL-HIBA*

Megjegyzés. – A protokol-hibák két típusa fordulhat elő az SSNDPX-nél. Ezek a következők:

a) szintaktikai hiba, ami akkor fordul elő, ha a vett SNPDU nem felel meg a műholdas al-hálózati formai követelményeknek; és

b) logikai hiba, ami akkor fordul elő, ha az SSNDPX a társ-entitásától egy olyan SNPDU-t vesz, ami a logikai csatorna pillanatnyi állapota szerint nem fogadható el adat-bevitelként.

4.7.3.9.7.1 Amikor az SSNDPX egy protokol-hibát érzékel, a 4-21. - 4-24. táblázatokban foglaltak szerint kell válaszolnia. Ezeket a táblázatokat minden logikai csatorna állapothoz elkészítették.

4.7.3.9.8 *SORRENDEN KÍVÜLI ADAT-SNPDU ELJÁRÁS*

4.7.3.9.8.1 Az SSNDPX-nek a vett adat-SNPDU-kat az SNPDU-számának megfelelő sorrendben kell feldolgoznia az IWF felé továbbítandó adatcsomagok létrehozása céljából. Az SSNDPX-nek a duplikált SNPDU-kat érvénytelenítenie kell.

Megjegyzés. – A GES-nél a vevő adatkapcsolati réteg az SSNDPG részére az SNPDU-kat váltott sorrendben is továbbíthatja. Az SSNDPG megfelelő sorrendbe rendezi az adat-SNPDU-kat, mielőtt az IWF-nek elküldi azokat.

4.7.3.9.8.2 *SSNDPG tevékenységek sorrenden kívüli adat-SNPDU-k esetében:*

Egy adat-SNPDU-t akkor és csak akkor kell sorrenden kívülinek meghatáározni, ha az SNPDU-száma nem azonnal következik az utolsó adatcsomag létrehozásában használt utolsóként vett adat-SNPDU SNPDU-száma után.
Megjegyzés. – Az SNPD-számok moduló 256 alapján növekednek. Így, a 255-ös SNPDU-számot a 0 SNPDU-szám követi.

4.7.3.9.8.2.1 Ha egy sorrenden kívüli adat-SNPDU nem duplikált, akkor az SSNSDPG-nek tárolnia kell a sorrenden kívüli adat-SNPDU-t. Ha már nem áll rendelkezésre több tárolóhely, akkor az SSNDPG-nek a logikai csatornát visszaállítás állapotba kell helyeznie, és a visszaállítást ki kell terjesztenie az IWF-re is.

4.7.3.9.8.2.2 A tárolt adat-SNPDU-kat fel kell dolgozni adatcsomagok létrehozása céljából, amikor az megtehető egy sorrenden kívüli feltétel létrehozása nélkül. Az adatcsomagokat - amint lehetséges - továbbítani kell az IWF részére.

4.7.3.9.8.3 *SSNDPA tevékenységek sorrenden kívüli SNPDU-k esetében.*

Ha egy nem duplikált, de az utoljára vett adat-SNPDU SNPDU-számát nem azonnal követő adat-SNPDU kerül vételre, akkor az SSNDPA-nak a kapcsolat visszaállítását kell kezdeményeznie.

4.7.3.10 AL-HÁLÓZATI PROTOKOL ADAT-EGYSÉG /SNPDU/ FORMÁTUMOK

4.7.3.10.1 *ÁLTALÁNOS SNPDU FORMÁTUM*

4.7.3.10.1.1 Egy SNPDU-nak legalább két oktettből kell állnia. Az 1. számú oktettnek kell tartalmaznia a
D- és M-biteket, valamint az SNPDU típus azonosító mezőt. A 2. számú oktettnek kell tartalmazni a logikai csatorna-szám mezőt; az adott SNDPU típusától függően további oktettek is megkövetelhetők. Az általános SNPDU formátumnak a 4-13. ábra szerint meghyatározottnak kell lennie.

4.7.3.10.1.2 A D-bitnek az 1. számú oktett 7., az M-bitnek az 1. számú oktett 8. bitjének kell lennie.

4.7.3.10.1.3 Az M-bitet egy adat-SNPDU sorozatból álló M-bit SNPDU sorozatban kell alkalmazni; minden más SNPDU-ban 0-ra kell állítani.

Megjegyzés. – A D-bit a végberendezés - végbrendezés közötti nyugtázásra használható (a vétel megerősítése).

4.7.3.10.1.4 Az SNPDU típus-azonosító mezőnek az 1. számú oktett 1-6 bitjeinek kell lenni. Az SNPDU típus-azonosító mező kódolásának a 4-15. táblázatban megadottaknak megfelelőnek kell lenni.

4.7.3.10.1.5 A 2. számú oktettnek kell tartalmaznia a logikai csatorna-szám mezőt.

Megjegyzés. – A következő részekben a mezők meghatározása a vonatkozó SNPDU-ban való megjelenhetésük sorrendje alapján történt.

4.7.3.10.2 *KAPCSOLAT-KÉRÉSI SNPDU*

4.7.3.10.2.1 A kapcsolat-kérési SNPDU formátumának a 4-14. ábrán meghatározottaknak megfelelőnek kell lennie.

4.7.3.10.2.2 *SNDPU típus-azonosító mező*

4.7.3.10.2.2.1 Az 1., 2., 3. és 6. biteknek a következő jelző biteknek kell lenniük:

a) 1. bit, szolgáltatási mező jelen van;

b) 2. bit, a hívott NSAP cím jelen van;
c) 3. bit, a hívó NSAP cím jelen van; és

d) 6. bit, gyors kiválasztás válasz-korlátozással.

4.7.3.10.2.2.2 Az 1., 2. és 3. bitet 1-re kell állítani, ha a megfelelő mezők jelen vannak a kapcsolat-kérési SNPDU-ban; máskülönben 0-ra kell azokat állítani. A 6. bitet 1-re kell állítani a gyors kiválasztás válasz-korlátozás alkalmazása esetén; máskülönben 0-ra kell állítani.

4.7.3.10.2.3 *DTE cím-hossz mező*

A 3. oktettnek a hívó és hívott DTE cím-hossz mezőkből kell állni. A 8-tól 5-ig terjedő biteknek kell meghatározniuk a hívó DTE cím hosszát fél-oktettekben. A 4-től 1-ig terjedő biteknek kell meghatározniuk a hívott DTE cím hosszát fél-oktettekben. Minden cím-hossz mezőnek binárisan kódoltnak kell lenni, ahol az 5. vagy 1. bitnek a jelző bitek alsacsonyabb érékű bitjének kell lenni.

4.7.3.10.2.4 *A hívó- és a hívott DTE mezők*

4.7.3.10.2.4.1 Amikor a DTE cím-hossz mezők jelzik, a DTE cím-hossz mezőt követő oktetteknek tartalmaznia kell a hívott DTE címet, amit a hívó DTE cím követ.

4.7.3.10.2.4.2 Egy cím minden számjegyét egy fél-oktettben Binárisan Kódolt Decimális formában kell kódolni, ahol az 5. vagy az 1. bitnek kell a számjegyek alacsonyabb értékű bitjének kell lenni.

4.7.3.10.2.4.3 A magasabb értékű számjegytől kezdve a DTE címet egymást követő oktettekben kell kódolni, oktettenként két számjeggyel. Minden oktettben a magasabb értékű számjegyet a 8.-tól az 5.-ig terjedő bitekben kell kódolni. Amikor a hívott plusz hívó DTE mezőkben lévő számjegyek teljes száma páratlan, a kombinált mezőket a kombinált mezők utolsó oktettjeinek 4.-től 1.-ig terjedő bitjeiben 0 értékek beállításával fel kell kerekíteni egy integrált oktett-számra.

4.7.3.10.2.5 *Hívott és a hívó Hálózati réteg szolgálat elérési pont /NSAP/ cím mezők*

Amikor a hívott és a hívó NSAP cím 'jelen van' jelző bitek jelzik, akkor a hívó és a hívott DTE mezőket követő oktetteknek tartalmazniuk kell a hívott NSAP cím mezőt, majd a hívó NSAP cím mezőt.

4.7.3.10.2.6 *Szolgáltatási mező hossz*

Amikor a szolgáltatási mező hossz 'jelen van' jelzőbit jelzi, akkor a következő oktettnek a szolgáltatási mező hosszát oktettekben kell tartalmaznia. A szolgáltatási mező hosszmezőt binárisan kell kódolni, ahol az 1. bitnek a mező alacsonyabb értékű bitjének kell lenni.

4.7.3.10.2.7 *Szolgáltatási mező*

Amikor a szolgáltatási mező 'jelen van' jelzőbit jelzi, akkor a szolgáltatási mező hosszmezőt követő oktetteknek kell tartalmazniuk a szolgáltatások kódjait és paramétereit.

4.7.3.10.2.8 *Hívás felhasználói adat mező*

A következő oktetteket kell a hívó felhasználói adatok szállítására használni, ha ilyenek vannak. Ha a gyors kiválasztás szolgáltatást nem használják, akkor nem több, mint 16 oktettnyi adatnak kell jelen lenni. Ha a gyors kiválasztási szolgáltatást használják, akkor nem több, mint 128 oktettnyi adatnak kell jelen lenni.

4.7.3.10.3 *KAPCSOLAT MEGERŐSÍTŐ SNPDU*

4.7.3.10.3.1 A kapcsolat megerősítő SNPDU formátumának a 4-15. ábrán meg- határozottnak kell lenni.
4.7.3.10.3.2 *SNPDU típus-azonosító mező*

4.7.3.10.3.2.1 Az 1. és 2. számú biteknek a következő jelző biteknek kell lenniük:

a) 1. bit: szolgáltatási mező 'jelen van'; és

b) 2. bit: NSAP cím 'jelen van'.

4.7.3.10.3.2.2 Ezeket a biteket 1-re kell állítani, ha a megfelelő mezők jelen vannak; ellenkező esetben 0-ra kell állítani.

4.7.3.10.3.3 *Hívott NSAP cím mező*

Amikor az NSAP cím 'jelen van' jelző bit jelzi, a logikai csatorna-szám mezőt követő oktetteknek a hívott NSAP címből kell állniuk.

4.7.3.10.3.4 *Szolgáltatási hossz mező*

Amikor a szolgáltatási mező 'jelen van' jelző bit jelzi, akkor a következő oktettnek a szolgáltatási mező hosszát oktettekben kell tartalmaznia. A szolgáltatási hossz jelzőnek binárisan kódoltnak kell lennie, ahol az 1. bitnek kell a mező alacsonyabb értékű bitjének lenni.

4.7.3.10.3.5 *Szolgáltatási mező*

Amikor a szolgáltatási mező 'jelen van' jelző bit jelzi, a szolgáltatási mezőt követő oktetteknek kell tartalmazniuk a szolgáltatások kódjait és paramétereit.

4.7.3.10.3.6 *A hívott felhasználói adat mező*

A következő oktetteket kell a hívott felhasználói adatok továbbítására használni, ha vannak ilyenek. Ha a gyors kiválasztás értéket használják, akkor nem több, mint 128 oktettnyi adatnak kell jelen lenni.

4.7.3.10.4 KAPCSOLAT BONTVA SNPDU

4.7.3.10.4.1 A kapcsolat bontva SNPDU formátumnak a 4-16. ábrán megadottaknak megfelelőnek kell lenni.

4.7.3.10.4.2 *SNPDU típus-azonosító mező*

4.7.3.10.4.2.1 A 2. bitnek kell az NSAP cím 'jelen van' jelző bitnek lenni.

4.7.3.10.4.2.2 Ezt a bitet 1-re kell állítani, ha a hívott NSAP cím mező jelen van; egyébként 0-ra.

4.7.3.10.4.3 *Hívott NSAP cím mező*

Ennek a mezőnek a 4.7.3.10.3.3 pont alatti kódolássall megegyező kódolásúnak kell lenni.

4.7.3.10.4.4 *A törlést létrehozó ok mező*

4.7.3.10.4.4.1 A következő oktettnek kell a törlést létrehozó ok mezőnek lenni. Tartalmaznia kell a kapcsolat bontását létrehozó törlési okot.

4.7.3.10.4.4.2 Az SSNDPX által létrehozható törlést létrehozó mező kódolásának a 4-16. táblázatban megadottak szerintinek kell lenni.

4.7.3.10.4.5 *Hibakereső kód mező*

A törlést létrehozó mezőt követő oktettnek kell a hibakereső kód mezőnek lenni. Kiegészítő információt kell tartalmaznia a kapcsolat bontásának okát illetően. A hibakereső kód mező kódolásának a 4-16. táblázatban található törlés kiváltó októl kell függenie. A hibakerső kód mező kódolásának az SSNDPX által kezdeményezett kapcsolat-bontás esetén a 4-17. táblázatban meghatározottak szerintinek kell lenni.

4.7.3.10.4.6 *Törlés felhasználói adat mező*

A hibakereső kód mezőnek a felhasználói adat mezőnek kell lenni. Ha 'jelen van', akkor nem több, mint 128 oktettnyi felhasználói adatot kell tartalmaznia.

4.7.3.10.5 *A KAPCSOLAT-BONTÁS BEFEJEZVE SNPDU*

A kapcsolat-bontás befejezve SNPDU formátumnak a 4-17. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.6 *ADAT SNPDU*

4.7.3.10.6.1 Az adat SNDPU formátumnak a 4-18. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.6.2 *M-bit*

Az M-bitet 1-re kell állítani, ha az SNPDU nem az utolsó az adat-SNPDU M-bit sorozatában; máskülönben 0-ra kell állítani.

4.7.3.10.6.3 *SNPDU-szám mező*

A 3. oktettnek kell tartalmaznia a 8 bites SNPDU-számot.

4.7.3.10.6.4 *Felhasználói adat mező*

Az SNPDU-szám mezőt követő mezőnek kell tartalmaznia a felhasználói adatokat. Ez a mező maximálisan 503 oktettet tartalmazhat.

4.7.3.10.7 *MEGSZAKÍTÁSI ADAT SNPDU*

4.7.3.10.7.1 A megszakítási adat SNPDU-nak a 4-19. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.7.2 *Megszakítási felhasználói adat mező*

A logikai csatorna-szám mezőt követő mezőnek kell a megszakítási felhasználi adat mezőnek lenni. Ez a mező maximálisan 32 oktettet tartalmazhat.

4.7.3.10.8 *MEGSZAKÍTÁS-MEGERŐSÍTŐ SNPDU*

A megszakítás-megerősítő SNPDU formátumnak a 4-20. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.9 *VISSZAÁLLÍTÁS SNPDU*

4.7.3.20.9.1 A visszaállítás SNPDU formátumnak a 4-21. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.9.2 *A visszaállítást kiváltó ok*

A 3. oktettnek kell a visszaállítást kiváltó ok mezőnek lenni és tartalmaznia kell a visszaállítás kiváltó okát. Amikor a visszaállítást az SSNDPX kezdeményezi, akkor a visszaállítási SNPDU-ban lévő visszaállítást kiváltó ok mező kódolásának a 4-16. táblázat- ban megadottak szerintinek kell lenni.

4.7.3.10.9.3 *Hibakereső kód*

4.7.3.10.9.3.1 A 4. oktettnek kell a hibakereső kód mezőnek lenni és további információkat kell tartalmaznia a visszaállítást kiváltó okról. A hibakereső kód mező kódolásának a 4-16. táblázatban megadott visszaállítást kiváltó októl kell függenie. A hibakerső kód mező kódolásának, amikor az SSNDPX kezdeményezi a visszaállítást, a 4-17. táblázatban megadottak szerintinek kell lenni.

4.7.3.10.9.3.2 Ha a visszaállítás mező “IWF kezdeményezés”-t jelez, akkor a hibakereső kód mezőt változtatás nélkül kell továbbítani az IWF felől annak eredményeképpen, hogy az már egy vissszaállítási eljárást kezdeményezett.

4.7.3.10.10 *VISSZAÁLLÍTÁS-MEGERŐSÍTŐ SNPDU*

A visszaállítás-megerősítő SNPDU formátumának a 4-22. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.11 *FORGALOM-VEZÉRLŐ (FELFÜGGESZT) SNPDU*

4.7.3.10.11.1 A forgalom-vezérlő (felfüggeszt) SNPDU formátumnak a 4-23. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.11.2 *Forgalom-vezérlés ok mező*

A 3. oktettnek kell tartalmaznia a forgalom-vezérlés ok mezőt. Ezt a mezőt 11001001-re (felfüggeszt) kell állítani.

4.7.3.10.11.3 *SNPDU-szám mező*

A 4. oktettnek kell tartalmaznia a sorrendben utolsóként vett és elfogadott adat-SNDPU 8-bites SNPDU-számát.

4.7.3.10.12 *FORGALOM-VEZÉRLÉS OK (ÚJRA KEZD) SNPDU*

4.7.3.10.12.1 A forgalom-vezérlés (újra kezd) SNPDU formátumnak a 4-24. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.12.2 *Forgalom-vezérlés mező*
A 3. oktettnek kell tartalmaznia a forgalom-vezérlés ok mezőt. Ezt a mezőt 11001011-re (újra kezd) kell állítani a társ-állomástól való továbbítás folytatására.

4.7.3.10.13 *KAPCSOLAT- KÉRÉS/MEGERŐSÍTÉS SNPDU SZOLGÁLTATÁS MEZŐK*

4.7.3.10.13.1 A szolgáltatás mezőnek csak akkor kell jelen lenni, amikor a szolgáltatás mező 'jelen van', jelző bitje pedig egyre van állítva a kapcsolat-kérésben és a kapcsolat- megerősítő SNPDU-ban.

4.7.3.10.13.2 A szolgáltatás mezőnek minden megkívánt szolgáltatáshoz vagy szolgáltatás-csoporthoz egy beállítási elemet kell tartalmaznia. Minden szolgáltatási elem első oktettjének annak a szolgáltatási mezőnek kell lenni, amelynek jeleznie kell a megkívánt szolgáltatás vagy szolgáltatás-csoport kódját. A szolgáltatási elem fennmaradó oktettjeinek kell tartalmaznia a szolgáltatási paraméter-mezőt.

4.7.3.10.13.3 *Ajánlott szolgáltatások*
Ajánlás. – *Az SSNDPX-nek a következő szolgáltatásokat kell alátámasztania:*

a) áteresztő teljesítmény szerinti osztály egyeztetés

b) a továbíbtás késés kiválasztása és jelzése; és

c) gyors kiválasztás.

4.7.3.10.13.4 *Áteresztő teljesítmény szerinti osztály egyeztetés (TCN) szolgáltatás formátuma.*

Az áteresztő teljesítmény szerinti osztály egyeztetés (TCN) szolgáltatás formátumának a 4-25. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.13.5 *Továbbítási késés kiválasztás és jelzés (TDSAI) szolgáltatás formátuma.*
A továbbítási késés kiválasztás és jelzés szolgáltatás mező formátumának a 4-26. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.13.6 *Gyors kiválasztás szolgáltatás mező formátum*

A gyors kiválasztás szolgáltatás mező formátumának a 4-27. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.13.7 *Gyorsított adategyeztetés*

A gyorsított adategyeztetés szolgáltatás formátumának a 4-28. ábrán meghatározottak szerintinek kell lenni.

4.7.3.10.14 *HIBAKERESŐ KÓDOK*

Amikor az SSNDPX megszakítást/visszaállítást kezdeményez, akkor a kapcsolat bontva és visszaállítva SNDPU-kban lévő hibakeereső kód mező kódolásának a 4-17. táblázatban meghatározottak szerintinek kell lenni.

4.7.3.11 IDŐZÍTÉSI ÉRTÉKEK

Az időzítési értékeknek a 4-20. táblázatban meghatározottak szerintinek kell lenniük.

4.7.3.12 ÁLLAPOT-DIAGRAMMOK

A következő állapotok állapot-diagrammjait az alábbiak szerint kell megadni:

a) A logikai csatorna kapcsolat létrehozás/megszakítás állapot-diagramnak a 4-29. ábrán meghatározottak
szerintinek kell lenni.

b) A visszaállítási és forgalom-vezérlési állapot-diagramnak a 4-30. ábrán meghatározottak szerintinek kell
lenni.

4.7.3.13 ÁLLAPOT-TÁBLÁZATOK

4.7.3.13.1 Az SSNDPX bármely állapotában végzett tevékenységnek a 4-21 – 4-24. táblázatok által megadottnak kell lenni.

4.7.3.13.2 Az állapot-táblázatokban a következő konvenciókat kell alkalmazni:

a) végzett cselekmény, ami lehet:

– szabvány, amint azt a 4.7.3.5 – 4.7.3.8 pontok meghatározzák;

– a vett SNPDU érvénytelenítése és ezt követően nincs esemény az SNPDU vételének eredményeként;

– hiba, a táblázatban meghatározott módon;

b) D = a jelzett hiba észlelésekor kibocsátott megfelelő SNPDU (kapcsolat megszakítva, vagy visszaállítva) hibakereső kód mezőjében lévő hibakereső kód.

4.7.3.14 ADATKAPCSOLATI INTERFÉSZ FUNKCIÓKTÓL FÜGGŐ MŰHOLDAS AL-HÁLÓZAT

4.7.3.14.1 Az adatkapcsolati réteghez kapcsolódó interfész funkcióknak a következőket kell tartalmazniuk:

a) adatkapcsolati réteg adat egységek (LIDU-k) előállítása és vétele;

b) vett SNPDU-k kapcsolatnak megfelelő útvonal kiválasztása;

c) további SNPDU-k továbbításra történő kiválasztása adott Q számmal rendelkező logikai csatornák közötti ciklikus rend szerinti kiválasztáshoz és az elsőbbség biztosítása megszakítási SNPDU-k számára az ugyanazon Q számmal rendelkező adat-SNPDU-kkal szemben; és

d) helyi nyugtázás (siker/hiba) útvonal kiválasztása az RLS adás állapot-jelző LIDU-k számára.

4.7.3.14.2 Az SSNDPX és az adatkapcsolati réteg között továbbított LIDU-(k)nak tartalmazni kell a 4-25. táblázatban meghatározott LIDU-kat.

4.7.3.15 A CSOMAGNAK AZ SNPDU-BA VALÓ LEKÉPEZÉSI SZABÁLYAI

4.7.3.15.1 Az ISO 8208 csomag mezőknek az SNPDU megfelelő mezőibe történő leképezési szabályainak az ebben a részben meghatározottak szerintinek kell lenniük.

4.7.3.15.2 *DTE CÍMEK*

4.7.3.15.2.1 A kapcsolat-kérő SNPDU-ban az ISO 8208 hívás-kérő csomagban lévő hívott DTE címet és a hívó DTE cím mezőt közvetlenül le kell képezni a hívott DTE címbe és a hívó DTE cím mezőkbe.

4.73.15.2.2 Az ISO 8208 hívás elfogadva csomagban a hívó és a hívott DTE címeket nem szabad a műholdas kapcsolaton keresztül továbbítani.

4.7.3.15.3 *HÁLÓZATI RÉTEG SZOLGÁLAT ELÉRÉSI PONT /NSAP/ CÍM*

4.7.3.15.3.1 A kapcsolatkérő SNPDU-ban az ISO 8208 híváskérő csomag hívott cím kiterjesztési és hívó cím kiterjesztési paraméter-mezőit közvetlenül le kell képezni a hívott NSAP címbe és a hívó NSAP cím mezőkbe.

4.7.3.15.3.2 Ha az ISO 8208 hívás elfogadva vagy törlés-kérő csomagban lévő hívott cím kiterjesztésű paraméter egyenlő a megfelelő kapcsolat-kérő SNDPU hívott NSAP címével, akkor a hívott cím kiterjesztést nem szabad a műholdas kapcsolaton keresztül továbbítani; ellenkező esetben közvetlenül le kell képezni a vonatkozó SNPDU-ba.

4.7.3.15.4. *AL-HÁLÓZATI KAPCSOLATI ELSŐBBSÉG*

4.7.3.15.4.1 Az ISO 8208 hívás-kérő csomagban egy kapcsolat elsőbbség adatainak célértékét az adatkapcsolati réteghez továbbított LIDU Q számába kell leképezni a 4-26. táblázatban meghatározottak szerint. Ezt az értéket kell használni, amíg a kapcsolat felépítési eljárás be nem fejeződik.

4.7.3.15.4.2 Az ISO 8208 hívás elfogadva csomagban egy kapcsolati elsőbbség adatainak kiválasztott értékét az adatkapcsolati réteghez továbbított LIDU Q számba kell leképezni a 4-26. táblázatban meghatározottak szerint. Ezt az értéket kell használni az SNC hátralévő részében.

4.7.3.15.4.3 Ha egy érvénytelen elsőbbségi érték fordul elő a hívás-kérési vagy hívás elfogadva kötegben, akkor az SSNDPX-nek vissza kell utasítania a hívást. A törlés-kérő csomagban lévő hibakereső kódot "kapcsolat visszautasítása – a kívánt szolgáltatási minőség nem áll rendelkezésre – (állandó feltétel)"-re kell állítani.

4.7.3.15.4.4 Ha a hívá-skérő csomagban egy kapcsolat adatainak elsőbbsége nem kerül jelzésre, akkor egy előre beállított alapértéket (SNC elsőbbség = 0) kell alkalmazni.

4.7.3.15.5 *AZ ÁTERESZTŐ TELJESÍTMÉNY SZERINTI OSZTÁLY-EGYEZTETÉS*

4.7.3.15.5.1 Az áteresztőt eljesítmény szerinti osztály-egyeztetést egymástól függetlenül minden adatátviteli irányban alkalmazni kell.

4.7.3.15.5.2 *Áteresztő teljesítmény*

Az áteresztő teljesítmény al-paraméterét a következő értékek valamelyikeként kell meghatározni (nem meghatározott, 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000 bit/s).

4.7.3.15.6 *ADAT-TOVÁBBÍTÁSI KÉSÉS*

4.7.3.15.6.1 Az egyeztetett adat-továbbítási késést mindkét irányban alkalmazni kell.

4.7.3.15.6.2 *Légijármű által kezdeményezett kapcsolat létrehozása*

4.7.3.15.6.2.1 Az SSNDPA-nak az adat-továbbítási késés kiválasztási és kijelzési (TDSAI) értékét a hívás-kérő csomagban közvetlenül le kell képeznie a kapcsolat-kérő SNDPU ugyanazon beállítási értékébe.

4.7.3.15.6.2.2 Ha az SSNDPG egy hívás elfogadva köteget vesz az IWF-től válaszul egy beérkező TDSAI szolgáltatással, akkor a kapcsolat-megerősítő SNPDU-ban lévő ugyanazon szolgáltatást kell továbbítani az SSNDPA-hoz.

4.7.3.15.6.3 *Földi kezdeményezésű kapcsolat létrehozása*

Ha az SSNDPG az IWF-től TDSAI szolgáltatással rendelkező hívás-kérési csomagot vesz, akkor az SSNDPG-nek a kapcsolat-kérő SNPDU-ban az adat-SNPDU műholdas al-hálózati tranzitkéséseként egy 131 oktettből álló középértéket kell továbbítania az SSNDPA felé.

4.7.3.15.7 *GYORS KIVÁLASZTÁS*

A gyors kiválasztási szolgáltatást a következők szerint kell kezelni:

a) Egy gyors kiválasztás szolgáltatás kérés nélküli hívás-kérés csomagot úgy kell leképezni, hogy az SNPDU válaszban nem szerepel a korlátozás (használat nincs megengedve) a gyors kiválasztásra vonatkozóan;
b) Egy gyors kiválasztás szolgáltatás kérést jelző hívás-kérés csomagot - ha nincs válasz-korlátozás, akkor - úgy kell leképezni a kapcsolat-kérésbe, hogy az SNPDU válaszban nem szerepel a korlátozás (használat nincs megengedve) a gyors kiválasztásra vonatkozóan;

c) Egy gyors kiválasztás kérést jelző gyors kiválasztás kérést - ha van válasz-korlátozás, akkor - úgy kell leképezni a kapcsolat-kérésbe, hogy az SNDPU-válaszban szerepeljen a korlátozás (használat nincs megengedve) a gyors kiválasztásra vonatkozóan.

4.7.3.15.8 *GYORSÍTOTT ADAT-EGYEZTETÉS*

A hívás-kérő vagy hívás elfogadva csomagban lévő gyorsított adat-egyeztetési szolgáltatás kérést nem szabad leképezni a megfelelő kapcsolat-kérő vagy kapcsolat-megerősítő SNPDU-ba, hacsak a beállítási érték nincs "a gyorsított adatok nincsenek használva"-ra állítva.

4.7.3.15.9 *OK ÉS HIBAKERESŐ KÓDOK*

4.7.3.15.9.1 A törlés ok, a visszaállítás ok és a hibakereső kód mezőket a csomagokból módosítás nélkül kell a megfelelő SNPDU-hoz eljuttatni.

4.7.3.15.9.2 Ha az SSNDPX kezdeményezte a törlési vagy visszaállítási eljárást, akkor a törlés okot, a visszaállítás okot és a hibakereső kód mezőket a 4-16. és 4-17. táblázatban foglaltak szerint kell beállítani.

4.7.3.15.10 *ADATOK*

4.7.3.15.10.1 Ha egy M-bites csomag sorozat adatcsomagjaiban lévő felhasználói adat mező kisebb mint az adat-SNPDU maximális felhasználói adat mező-hossz előre beállított alapértéke, akkor ezeket a mezőket egy M-bites SNDPU sorozatként kell megformálni.

4.7.3.15.10.2 Ha egy M-bites csomag sorozat adatcsomagjaiban lévő felhasználói adat mező nagyobb mint az adat-SNPDU maximális felhasználói adat mező-hossz előre beállított alapértéke, akkor ezeket a mezőket egy M-bites SNDPU sorozat kialakítására szegmensekre kell osztani.

4.7.3.16 AZ SNPDU-NAK CSOMAGBA VALÓ LEKÉPEZÉSI SZABÁLYAI

4.7.3.16.1 Ezt a részt az SNPDU mezőknek az ISO 8208 kcsomagok megfelelő mezőibe való leképezésének szabályai szerint kell meghatározni.

4.7.3.16.2 *DTE CÍM*

4.7.3.16.2.1 A kapcsolat-kérő SNPDU-ban lévő hívott DTE cím és hívó DTE cím mezőket közvetlenül kell leképezni a hívott DTE címbe és hívó DTE cím- ezőkbe a beérkező hívás-csomagban.

4.7.3.16.2.2 Mind a hívó, mind a hívott DTE cím mezőket újra létre kell hozni akkor, amikor egy hívás kapcsolva csomag kerül továbbításra, ha azok jelen voltak a megfelelő hívás-kérő csomagban.

4.7.3.16.3 *NSAP CÍM*

4.7.3.16.3.1 A kapcsolat-kérő SNPDU-ban lévő hívott NSAP címet és a hívó NSAP cím mezőt közvetlenül kell leképezni a hívott cím kiterjesztésbe és hívó cím kiterjesztési paraméter-mezőkbe a beérkező híváskcsomagban.

4.7.3.16.3.2 A kapcsolat megerősítő vagy kapcsolat megszakítva SNPDU-ban lévő hívott NSAP cím mezőt a hívás kapcsolva vagy törlés jelző csomagban lévő hívott cím kiterjesztési mezőbe kell leképezni.

4.7.3.16.4 *ELSŐBBSÉG*

A kapcsolat-kérő és kapcsolat-megerősítő SNPDU-khoz társított Q számot az adatok cél- és kiválasztott elsőbbségi értékeibe kell leképezni az ISO 8208 beérkező hívásban és hívás kapcsolva csomagban lévő elsőbbség beállítás kapcsolati mezőben.

4.7.3.16.5 *ÁTERESZTŐ TELJESÍTMÉNY SZERINTI OSZTÁLY-EGYEZTETÉS*

4.7.3.16.5.1 Az áteresztő teljesítmény szerinti osztály-egyeztetést egymástól függetlenül minden adatátviteli irányban alkalmazni kell.

4.7.3.16.5.2 *Áteresztő teljesítmény*

Az áteresztő teljesítmény al-paraméterét a következő értékek valamelyikeként kell meghatározni (nem meghatározott, 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000 bit/s).

4.7.3.16.6 *ADAT-TOVÁBBÍTÁSI KÉSÉS*

4.7.3.16.6.1 Az egyeztetett adat-továbbítási késést mindkét irányban alkalmazni kell.

4.7.3.16.6.2 *A légijármű által kezdeményezett kapcsolat létrehozása.*

4.7.3.16.6.2.1 Ha az SSNDPG egy kapcsolat-kérő SNPDU-t vesz egy TDSAI szolgáltatással rendelkező SSNDPA-tól, akkor az SSNDPG-nek az IWF részére az adat-SNPDU műholdas al-hálózati átlagos tranzitkéséseként egy 131 oktettből álló értéket kell továbbítania a beérkező hívás-csomagban.

4.7.3.16.6.2.2 Az SSNDPA-nak a kapcsolat-megerősítő SNPDU-ban lévő TDSAI beállítási értéket közvetlenül kell leképeznie a hívás kapcsolva csomagban lévő ugyanazon beállítási értékbe.

4.7.3.16.6.3 *Földi kezdeményezésű kapcsolat létrehozása*

4.7.3.16.6.3.1 Az SSNDPA-nak a kapcsolat-kérő SNPDU-ban lévő TDSAI beállítási értéket közvetlenül kell leképeznie a beérkező híváscsomagban lévő ugyanazon beállítási értékbe.

4.7.3.16.6.3.2 Ha az SSNDPG egy hívás-megerősítő SNPDU-t vesz az SSNDPA-tól válaszul egy TDSAI szolgáltatás kapcsolat-kérő SNDPU-ra, akkor a hívás kapcsolva kötegben lévő ugyanazon szolgáltatást kell továbbítani az IWF felé.

4.7.3.16.7. *GYORS KIVÁLASZTÁS*

A gyors kiválasztás szolgáltatást a következők szerint kell kezelni:

a) Egy olyan kapcsolat-kérést, amely nem korlátozza a gyors kiválasztás szolgáltatási kérést (használat nincs megengedve), azt a válasz-SNPDU beérkező hívás-csomagba a gyors kiválasztás nélkül kell leképezni.

b) Egy olyan kapcsolat-kérést, amely nem korlátozza a gyors kiválasztás szolgáltatási kérést (használat nincs megengedve), azt a válasz-SNPDU beérkező hívásкötegbe a gyors kiválasztás szolgáltatásnak a ("válasz nincs korlátozva") paraméterével kell leképezni.

c) Egy olyan kapcsolat-kérést, amely korlátozza a gyors kiválasztás szolgáltatási (használat nincs megengedve) kérést, azt a válasz-SNPDU beérkező hívásкötegbe a gyors kiválasztás szolgáltatási "válasz korlátozva" paraméterével kell leképezni.

4.7.3.16.8 *GYORSÍTOTT ADAT-EGYEZTETÉS*

Ha a gyorsított adat-egyeztetés szolgáltatás nincs jelen a kapcsolat-kérő vagy kapcsolat- megerősítő SNPDU-ban, akkor ezt a szolgáltatási értéket a paraméterének "gyorsított adatok használata"-ra állításával hozzá kell adni a megfelelő beérkező híváshoz vagy kapcsolt hívás csomaghoz; ellenkező esetben ezt a szolgáltatást a megfelelő csomaghoz kell leképezni.

4.7.3.16.9 *OK ÉS HIBAKERESŐ KÓDOK*

A törlés ok, visszaállítás ok és hibakereső kódmezőket az SNPDU-kból módosítás nélkül kell a megfelelő csomagokhoz továbbítani.

4.7.3.16.10 *ADATOK*

4.7.3.16.10.1 Ha egy M-bites SNPDU sorozat adat-SNPDU-iban lévő felhasználói adat mező kisebb mint az adat-csomag maximális felhasználói adat mező hossz előre beállított alapértéke, akkor ezeket a mezőket egy M-bites csomag sorozat kialakítására össze kell kapcsolni.

4.7.3.16.10.2 Ha egy M-bites SNPDU sorozat adat-SNPDU-iban lévő felhasználói adat mező nagyobb mint az adatcsomag maximális felhasználói adat mező-hossz előre beállított alapértéke, akkor ezeket a mezőket egy M-bites csomagsorozat kialakítására szegmensekre kell felosztani.

4.7.3.17 KAPACITÁS

Az SSNDPA-nak egyidejűleg legalább nyolc egymástól független logikai csatornát kell alátámasztania.

4.7.4 ISO 8208 DCE protokol üzemelések

4.7.4.1 ÁLTALÁNOS ELŐÍRÁSOK

4.7.4.1.1 Az ISO 8208 DCE és az ISO 8208 DTE közötti protokolnak meg kell felelni az ISO 8208 második kiadásának.

4.7.4.1.2 *CSOMAG RÉTEG ENTITÁS*

Megjegyzés. – Az ISO 8208 DCE-n belül egynél több DCE/DTE interfész is lehet, pl. egy GES egynél több földi ATN útvonal-kijelöléshez is kapcsolódhat. Egy ilyen entitás létezik a DCE-ben minden DCE/DTE interfész esetében. Annak eldöntése, hogy melyik entitást kell használni egy rendeltetési hely elérésére, az az itt meghatározott protokolhoz egy külsőleg végrehajtott funkció. A 4.7.4 pontban meghatározott protokol a DCE-ben lévő minden csomag réteg entitásre vonatkozik.

4.7.4.2 MEGFELELÉSI KÖVETELMÉNYEK

4.7.4.2.1 *TÁMOGATOTT SZOLGÁLTATÁSOK ÉS KÉPESSÉGEK*

A következő szolgáltatásokat és képességeket kell alátámasztani:

a) virtuális hívás szolgáltatás;

b) 128 oktettnyi felhasználói adatmező az adatcsomagokban; és

c) gyorsított adat-átvitel, azaz egy 32 oktettig terjedő felhasználói adatmezővel alkalmazott megszakító csomagok használata.

4.7.4.2.2 *TÁMOGATOTT SZOLGÁLTATÁSOK*
A következő szolgáltatásokat kell alátámasztani:

a) a hívó cím kiterjesztése és hívott cím kiterjesztése;

b) elsőbbség.

Megjegyzés. – Egy kapcsolat elérésére és fenntartására szolgáló legkisebb cél és elfogadható értékeket, valamint egy kapcsolat adatainak a legkisebb elfogadható értékeit nem kell alátámasztani.

4.7.4.2.3 *AJÁNLOTT SZOLGÁLTATÁSOK*

Ajánlás. – *A következő szolgáltatásokat kell alátámasztani:*

a) átmeneti teljesítmény osztály-egyeztetés;

b) adat-továbbítási késés kiválasztása és jelzése;

c) gyors kiválasztás;

d) gyors kiválasztás elfogadása.

4.7.4.3 ÜZEMELÉSEK

4.7.4.3.1 *KÜLSŐ KÖLCSÖNHATÁSOK*

Megjegyzés. – Bizonyos DCE eljárások kezdeményezését az ISO 8208 DCE-n kívüli elemek irányítják. Hasonlóan, bizonyos ISO 8208 DCE események előfordulását ennek megfelelően kell jelenteni. Ezek a külső kölcsönhatások a következőket foglalják magukba:

a) az adatkapcsolati réteg kérése, kimenő csomagok továbbítása;

b) vétel, az adatkapcsolati rétegtől beérkező csomagok;

c) kérések fogadása az IWF-től bizonyos ISO 8208 protokol eljárások kezdeményezésére, beleértve:

1) egy virtuális hívás kezdeményezése;

2) egy virtuális hívás fogadása;

3) egy virtuális hívás befejezés;,

4) adat- és megszakítási információ átvitele; és

5) egy logikai csatorna újra-inicializálása.

d) bizonyos ISO 8208 protokol események előfordulásának jelentése az IWF-nek, ideértve:

1) egy virtuális hívás beállítására szóló beérkező kérés vétele;

2) egy virtuális hívás beállítása elfogadásának vétele;

3) egy virtuális hívás befejezése;

4) adat- és megszakítási információk vétele; és

5) egy logikai csatorna újra inicializálása.

4.7.4.3.1.1 Az ISO 8208 DCE-nek az összes hiba nélküli ISO 8208 csomagot el kell fogadnia az ISO 8208
DTE-től.

4.7.4.3.2 *LOGIKAI CSATORNÁK*

Megjegyzés. – Minden egyes virtuális hívás és állandó virtuális áramkör kap egy logikai csatorna-azonosítót, ami egy, az 1-től 4095-ig terjedő tartományban lévő szám. Minden virtuális hívás esetén egy logikai csatorna-azonosító kerül kijelölésre a hívás beállítási fázisa során egy korábban elfogadott logikai csatorna-azonosító tartományból. Minden állandó virtuális áramkör esetén egy logikai csatorna-azonosító kerül kijelölésre a DTE-vel egyetértésben. A DCE-knek a logikai csatornák egy bizonyos ideig tartó használatáról a DTE-vel történik megegyezés.

4.7.4.3.3 *ÁLLAPOT ÁTMENETEK*

4.7.4.3.3.1 Az ISO 8208 műszaki előírásai és meghatározásai formátum meghatározásokra, hibakereső és ok kódokra, szolgáltatási regisztrációs protokolokra (ha használnak) és a forgalom-vezérlésre vonatkoznak az ISO 8208 interfészen.

1. Megjegyzés. – Az ISO 8208 DCE egy állapot-gépként került meghatározásra. Egy ISO 8208 csomag a DTE-től kiválthat állapot átmenetet, csakúgy, mint az IWF-től érkező csomag. A következő állapot átmenet (ha van ilyen), ami akkor történik, amikor a DCE a DTE-től egy csomagot fogad, a 4-29. ÷ 4-34. táblázatokban van meghatározva. Ezek a táblázatok a 4-31. ábrán lévő felépítés szerint vannak elrendezve.

2. Megjegyzés. – Egy csomag fogadásakor a cselekmény szabályosnak vagy hibásnak minősül az "A =" bevitel alatt. A kialakult állapotot az "S =" bevitel jelzi.

4.7.4.3.3.2 Ha egy állapot átmenet meg van határozva, akkor az elvégzendő tevékenységnek a 4-29. ÷ 4-34. táblázatokban meghatározottak szerintinek kell lenni.

4.7.4.3.4 *A CSOMAGOK ELRENDEZÉSE*

Amikor a DTE-től egy csomag érkezik, a 4-29 ÷ 4-34. táblázatokban a zárójelekben szereplő kifejezések azt határozzák meg, hogy a csomagot továbbítani kell-e, vagy sem az IWF-nek. Ha a zárójelben nincs megjegyzés felsorolva, vagy úgy van felsorolva, mint nem továbbított, akkor a csomagot érvényteleníteni kell. Az ISO 8208 DCE-nek az IWF felől egy csomagot vagy továbbítania kell, vagy nem a DTE-nek oly módon, amely kompatibilis az ISO 8208-cal.

4.7.4.3.5 *HIBAKERESŐ ÉS OK KÓDOK.*

Bizonyos feltételek esetén a 4-29. – 4-34. táblázatok egy hibakereső kódot közölnek, amit a jelzett állapotba való belépéskor az előállított csomagnak tartalmaznia kell. A "D =" kifejezésnek a hibakereső kódot kell jelölnie. Amikor "A = DIAG", akkor az elvégzendő cselekménynek egy ISO 8208 hibakereső csomag létrehozásának és a DTE-hez való továbbításának kell lenni; a jelzett hibakereső kódnak kell meghatározni a csomag hibakereső mezőjének tartalmát. Bármely csomagtípus ok mezőjében az ok mező 8-as bitjét 0-ra kell állítani annak jelzésére, hogy a feltételt az ISO 8208 interfész felismerte.

Megjegyzés. – A 4-29. – 4-34. táblázatokat úgy határozták meg, hogy az SSNDPX és ISO 8208 DCE funkciók egyidejűleg tudnak működni. Míg az aszinkron működés megfelelő megvalósítási stratégiát jelent, az SSNDPX és ISO 8208 üzemelések számára az nem követelmény.

4.7.4.3.6 *DCE IDŐZÍTŐ*

Megjegyzés. – Bizonyos körülmények között a DTE-nek egy, a DCE-től kibocsátott csomagra megadott időn belül kell válaszolni.

4.7.4.3.6.1 A 4-35. táblázat tartalmazza azokat a körülményeket és a tevékenységet, amelyeket a DCE-nek kezdeményeznie kell a megadott idő lejáratakor.

4.7.4.4 KAPACITÁS

Az AES DCE-nek legalább nyolc egyidejű, egymástól független logikai csatornát kell alátámasztania.

4.7.4.5 VIRTUÁLIS HÍVÁS /VC/ KIZÁRÁS

A legkisebb elsőbbségű logikai csatornát és a társított virtuális hívást törölni kell, ami a magasabb elsőbbségű szolgáltatás iránti kérés fogadásához szükséges.

Megjegyzés. – A logikai csatornáknak és virtuális hívásoknak 0 elsőbbségű szintjük van, hacsak az ISO 8208 elsőbbségi szolgáltatás aktiválásra nem került a hívás beállításakor.

4.7.5 Összerendező funkció

4.7.5.1 SSNDPX/IWF INTERFÉSZ

4.7.5.1.1 Az IWF és az SSNDPX között kicserélt ISO 8208 csomagoknak a 4-36. táblázatban meghatározottak szerintinek kell lenni.

4.7.5.1.2 *BEÉRKEZŐ HÍVÁS CSOMAG KEZELÉSE*

Az IWF-nek a gyorsított adat-egyeztetés szolgáltatással és "gyorsított adatok használata" paraméterrel beérkező hívás csomagot a megfelelő ISO 8208 DCE entitáshoz kell továbbítani.

Megjegyzés. – Ha a szolgáltatás paraméterében "nincs gyorsított adathasználat", akkor az IWF a beérkező hívás csomagot vagy ezzel a beállítási értékkel, vagy nélküle továbbítja.

4.7.5.1.3 *HÍVÁS KAPCSOLÁSOS CSOMAG KEZELÉS*

Ha a gyorsított adat-egyeztetés szolgáltatás paramétere "gyorsított adatok használata"-ra van állítva a hívás kapcsolásos csomagban, akkor az IWF-nek ezt a beállítási értéket és paraméterét a csomaggal továbbítania kell a megfelelő ISO 8208 DCE entitáshoz. Minden virtuális hívás esetén az IWF-nek az SSNDPX logikai csatornáját társítania kell a megfelelő ISO 8208 DCE logikai csatornához.

Megjegyzés. – Ha a gyorsított adat egyeztetés szolgáltatás paramétere "nincs gyorsított adathasználat"-ra van állítva, akkor az IWF vagy ezzel az értékkel, vagy enélkül továbbítja a hívás kapcsolási csomagot.

4.7.5.1.4 *TÖRLÉS JELZŐ CSOMAG KEZELÉS*

4.7.5.1.4.1 Az IWF-nek el kell különítenie az SSNDPX logikai csatornát a megfelelő ISO 8208 DCE logikai
csatornától és a csomagot az ISO 8208 DCE entitáshoz kell továbbítania.

4.7.5.1.5 *AZ ADAT, A MEGSZAKÍTÁS, A MEGSZAKÍTÁS-MEGERŐSÍTÉS ÉS A VISSZAÁLLÍTÁS CSOMAG KEZELÉSE.*

4.7.5.1.5.1 Az adat, a megszakítás, a megszakítás-megerősítés és a visszaállítás jelzési csomagokat a megfelelő ISO 8208 DCE entitáshoz kell továbbítani egy kapcsolat létrehozásának befejezése után létrehozott logikai csatorna-társításra alapozva.

4.7.5.2 ISO 8208 DCE/IWF INTERFÉSZ

4.7.5.2.1 Az IWF és az ISO 8208 DCE között kicserélt ISO 8208 csomagoknak a 4-37. táblázatban meghatározottaknak megfelelőnek kell lenni.

4.7.5.2.2 *A HÍVÁS-KÉRŐ CSOMAG KEZELÉS*

Ha a hívás-kérő csomag nem tartalmazza a gyorsított adat-egyeztetés szolgáltatást, akkor az IWF-nek ezt a beállítási értéket a "nincs gyorsított adathasználat"-ra állított paraméterével hozzá kell adnia a csomaghoz és továbbítania kell a megfelelő SSNDPX entitáshoz; más esetben az IWF-nek a hívás-kérő csomagot ezzel a beállítási értékkel és paraméterrel kell továbbítani. Ha az opcionális hívott DTE cím érvénytelen, akkor az IWF-nek egy törlés jelző csomagot kell visszaküldenie az ISO 8208 entitásnak.

4.7.5.2.3 *ELFOGADOTT HÍVÁS CSOMAG KEZELÉS*

Ha az elfogadott hívás csomag nem tartalmazza a gyorsított adategyeztetés szolgáltatást, akkor az IWF-nek ezt a szolgáltatást a paraméterével "nincs gyorsított adathasználat"-ra állítva hozzá kell adnia a csomaghoz és a megfelelő SSNDPX entitáshoz kell továbbítania; más esetben az IWF-nek az elfogadott hívás csomagot ezzel az értékkel és paraméterrel kell továbbítania. Minden virtuális hívás esetén az IWF-nek az ISO 8208 DCE logikai csatornát társítania kell a megfelelő SSNDPX logikai csatornával.

4.7.5.2.4 *A TÖRLÉS-KÉRÉS CSOMAG KEZELÉSE*

Az IWF-nek el kell különítenie az ISO 8208 DCE logikai csatornát a megfelelő SSNDPX logikai csatornától, és a csomagot az SSNDPX entitáshoz kell továbbítania.

4.7.5.2.5 *AZ ADAT, A MEGSZAKÍTÁS, A MEGSZAKÍTÁS-MEGERŐSÍTÉS ÉS A VISSZAÁLLÍTÁS CSOMAG KEZELÉSE*

Az adat, a megszakítás, a megszakítás-megerősítés és a visszaállítás kérő csomagokat a megfelelő SSNDPX entitáshoz kell továbbítani egy kapcsolat létrehozásának befejezése után létrehozott logikai csatorna-társításra alapozva.

4.7.5.3 (Fenntartott)
4.7.5.4
4.7.5.4 AZ ISO 8208 LOGIKAI CSATORNA ÉS SSNDPX LOGIKAI CSATORNA TÁRSÍTÁSA

Megjegyzés. – Az ISO 8208 DCE logikai csatornaa zonosítónak és egy SNC SSNDPX logikai csatorna azonosítójának nem kell azonosnak lennie.

4.7.5.5 ADAT-ÁTVITELI ELJÁRÁSOK

4.7.5.5.1 *FORGALOM-VEZÉRLÉS*

Forgalom-vezérlést kell alkalmazni az SSNDPX és az ISO 8208 DCE között a tárolt adatok túlcsordulásának megelőzése céljából.

4.7.5.6 OK ÉS HIBAKERESŐ KÓDOK

4.7.5.6.1 Az IWF-nek ki kell cserélnie a DCE-től érkezett ISO 8208 csomagokban lévő "helyi eljárási hiba" okot a "távoli eljárási hiba" okra, mielőtt azokat az SSNDPX részére továbbítaná. Az IWF-nek ki kell cserélnie az SSNDPX-től érkezett SNPDU-ban lévő "helyi összeköttetési hiba" okot a "hálózati torlódás" okra, mielőtt azt a DCE-nek továbbítaná. Az összes egyéb okot változtatás nélkül kell továbbítani.

4.7.5.6.2 A hibakereső kódokat változtatás nélkül kell továbbítani.

4.7.6 Kezelési interfész

4.7.6.1 AES KEZELÉSI INTERFÉSZ

4.7.6.1.1 Az AES kezelési interfésztől az SSNL-hez továbbított bejelentkezési helyzet változásainak a 4.9.2.1.1 pontban meghatározottak szerintinek kell lenni.

4.7.6.1.2 Amikor az AES vagy kijelentkezik vagy egyéb módon szünteti meg a GES-sel az összeköttetést, akkor az AES SSNL-nek ezzel a GES-sel az összes kapcsolatot törölnie kell.

4.7.6.1.3 *ÖSSZEKAPCSOLHATÓSÁGI (CN) ÉRTESÍTÉS ESEMÉNY*
4.7.6.1.3.1 A CN funkciót a CN entitás által kell végrehajtani.

4.7.6.1.3.1 *bis* Összekapcsolási és elhagyási esemény

Az AES-nek összekapcsolási és elhagyási esemény üzenetet kell szolgáltatni a légijármű útvonal-kijelölési funkciója részére annak jelzésére, hogy a levegő-föld adatkapcsolat rendelkezésre áll, vagy hogy nem áll rendelkezésre, külön-külön. Az összekapcsolási és elhagyási üzenetnek elegendő információt kell tartalmaznia az útvonal-kijelölő funkció részére ahhoz, hogy megállapítsa a bejelentkező GES-hez csatolt DTE(k) címét (címeit).

Megjegyzés. – Ez végrehajtható például a GES/műhold ID-nek az AES-től az útvonal-kijelölő funkcióhoz történő továbbításával, amely kereső táblázatot tartalmaz a DTE cím(ek)re vonatkozóan, azért, hogy a DTE címe(ke)t közvetlenül az AES-től az útvonal-kijelolő funkcióhoz továbbítsa.

4.7.6.1.3.2 (Fenntartott)

4.7.6.1.3.3 (Fenntartott)

4.7.6.2 GES VEZÉRLÉSI INTERFÉSZ

4.7.6.2.1 A GES vezérléstől az SSNL-hez továbbított bejelentkezési állapot változásainak a 4.10.3.2 pontban meghatározottaknak kell lenni.

4.7.6.2.2 Amikor az AES kijelentkezik a GES-től, akkor az SSNL-nek az AES-sel társított összes kapcsolatot törölnie kell, és fel kell szabadítania az ezen SNC(k)-hez társított összes forrást. Továbbá, a GES-nek biztosítania kell a csatolt ATN földi útvonal-kijelölők részére egy elhagyási esemény jelzést a 24-bites ICAO légijármű azonosító hivatkozásával.

4.8 ÁRAMKÖRI ÜZEMMÓDÚ SZOLGÁLTATÁSOK

4.8.1 Légiforgalmi mozgó-műholdas (R) szolgálat /AMS(R)S/ áramköri üzemmód általános követelményei

Megjegyzés. – Az AMS(R)S áramköri üzemmódú szolgáltatás egy hírközlés iszolgáltatás a légijárművek és a földi berendezések között, amely az összeköttetési eszközök egyikeként a műholdas összeköttetéseket használja. Az AMS(R)A áramkör üzemmódú szolgáltatás lehetőséget biztosít egy megosztás nélküli, központokon keresztül felépített áramkör létrehozására és fenntartására a légijárművek és földi felhasználók között, igény esetén. Az áramköri üzemmódú szolgáltatás elsődleges célja a biztonságos rádiótávbeszélő összeköttetés biztosítása. A központokon keresztül felépített áramkört a hívás időtartamára hozzák létre, hacsak automatikusan ki nem jelölték tartalék-forrásoknak egy magasabb elsőbbségű hívás-kísérlet számára történő újbóli kiosztására. Az AMS(R)S központokon keresztül felépített áramkörök összekapcsolhatók egy vagy több földi telepítésű hírközlési berendezéssel az AMS(R)S al-hálózattal tandemben. Ezek a berendezések magukban foglalhatnak biztonsági kapcsolási hálózatokat vagy cél-orientált áramköröket.

4.8.1.1 *AMS(R)S áramköri üzemmódú szolgálatok.* Az áramkör üzemmódú AMS(R)S hírközlési szolgálatokat kell biztosítani a 3-as és 4-es szintű AES(k) számára. Ezeknek vészhelyzeti, sürgősségi, repülésbiztonsági és egyéb, meteorológiára, valamint repülési tevékenységekre vonatkozó közleményekből kell állni.

Megjegyzés. – Nem AMS(R)S áramköri kapcsolású, nem biztonsági kommunikációs célú beszéd-üzemű és adatszolgáltatást be nem avatkozási alapon támogathat az AMS(R)S, feltéve, hogy a 4.8.3.2 pont előírásai teljesülnek.

4.8.1.2 *Fontossági sorrend.* Az ATS összeköttetési célú AMS(R)S szolgáltatásoknak elsőbbséget kell élvezniük a nem-AMS(R)S összeköttetésekkel szemben.

4.8.1.3 *Nem-AMS(R)S összeköttetések.* A nem-AMS(R)S összeköttetés nem zavarhatja az AMS(R)S összeköttetést.

4.8.2 Az áramköri üzemmódú rendszer szerkezete

4.8.2.1 Az AES áramköri üzemmódú szolgáltatásoknak képesnek kell lenni a légi kezdeményezésű hívásokban használandó egyedi GES meghatározására és nem korlátozhatók a bejelentkezési GES-ekre. Fordítva, egy földről kezdeményezett hívást, amely bármely GES földi hálózattól érkezik és rendelkezik az AES aktuális-bejelentkezési információjával, inkább ezen GES által kell létrehozni, mintsem azon GES-sel, amelyikhez az AES bejelentkezett.

4.8.2.2 *Áramköir üzemmódú adatkapcsolati réteg jelző interfész.* Az AES és a GES áramköri üzemmódú szolgáltatási eljárásoknak az AMS(R)S adatkapcsolati réteget kell használniuk a jelző információ cseréjére. Ezt az információt áramköri üzemmódú- adatkapcsolati interfész adat egységekben (CM-LIDU) kell szállítani. Az adatkapcsolati réteg felhasználójaként, az AMS(R)S áramköri üzemmódú eljárásoknak a 4.5 és 4.6 pontokban meghatározott adatkapcsolati interfész szolgáltatásait kell használni. Minden CM-LIDU-nak az adatkapcsolati réteg által megkövetelt specifikus adatkapcsolati réteg vezérlés információs (LICI) paraméterekből kell állnia. A CM-LIDU-kat és vonatkozó (LICI) paramétereiket a 4-38. táblázat határozza meg.

4.8.2.3 ÁRAMKÖR ÜZEMMÓDÚ TELEFON-TECHNIKAI ÖSSZEDOLGOZÓ INTERFÉSZ

Megjegyzés. – Az áramkör üzemmódú telefon-technikai összedolgozó interfész útmutató anyagát az I. Rész A-Függeléke tartalmazza.

4.8.2.3.1 Az AES és GES áramköri üzemmódú szolgáltatás eljárásainak az ITU CCITT Q.601-Q.608 ajánlásoknak megfelelő, szabványosított összedolgozó telefon-technikai eseményekből álló összedolgozó interfészen keresztül együtt kell dolgoznia külső telefon-technikai hálózatokkal. Az áramköri üzemmódú eljárások által használt össze- dolgozó telefon-technikai események készletének, valamint az események és a megfelelő CM-LIDU-k közötti leképező paraméterekkel szemben támasztott követelményeknek a 4-39. ÷ 4-42. táblázatokban meghatározottak szerintinek kell lenni.

Megjegyzés. – Az ITU CCIT Q.601-Q.608 ajánlások részleteit a CCITT Kék Könyv, VI. Kötet - VI. 6. Füzete tartalmazza.

4.8.2.4 EGYÉB AES ÁRAMKÖRI ÜZEMMÓDÚ RENDSZER INTERFÉSZEK

4.8.2.4.1 *AES kezelési interfész.* Az AES áramköri üzemmódú szolgáltatások és AES kezelés között kicserélt specifikus információknak a 4.9 pontban meghatározottak szerintinek kell lenniük.

4.8.2.4.2 *AES beszéd-üzemű kodek külső interfész.* Az AES külső beszéd-üzemű interfésznek kétirányú beszéd-üzemű információt kell szállítania a légijármű-specifikus audio-rendszereknek megfelelő formában.

4.8.2.5 EGYÉB GES ÁRAMKÖR ÜZEMMÓDÚ RENDSZER INTERFÉSZEK

4.8.2.5.1 *GES kezelési interfész.* A GES áramköri üzemmódú szolgáltatások és GES kezelés között kicserélt specifikus információknak a 4.10 pontban meghatározottak szerintinek kell lenni.

4.8.2.5.2 *Beszéd-üzemű kodek külső interfész.* A GES külső beszéd-üzemű interfésznek kétirányú hangcsatornás információt kell szállítania a földi hálózat audio-csatornáinak megfelelő formában.

4.8.3 Az AMS(R)S szolgáltatás követelményei

4.8.3.1 *Összekapcsolhatóság.* Az AMS(R)S szolgáltatásnak alá kell támasztania a központokon keresztül kapcsolt áramkörök kérésre történő létrehozását egy GES szolgáltatási területén belül lévő bármely légijármű és a GES-t kiszolgáló földi hálózatok között. Az AMS(R)S szolgáltatásnak lehetővé kell tenni egy áramköri kapcsolási tranazakció létrehozását egy légijármű és egy földi hálózat között egy olyan GES-en keresztül, amelyik nem azonos azzal a GES-sel, amelyikhez a légijármű bejelentkezett.

4.8.3.2 *Elsőbbség és előjog.* Az AMS(R)S hívásoknak elsőbbséggel kell rendelkezniük minden nem-AMS(R)S hívással szemben, és szükség esetén képesnek kell lenniük a nem-AMS(R)S hívásokkal szemben előjog érvényesítésére az áramköir üzemmód szolgáltatás azonnali elérésének biztosítása céljából. Az AMS(R)S hívásokat a 4-43. táblázatban meghatározott elsőbbségi szintekkel összhangban kell létrehozni és fenntartani. Egy folyamatban lévő AMS(R)S hívásnál magasabb elsőbbséggel rendelkező AMS(R)S hívásnak képesnek kell lennie az alacsonyabb szolgáltatási elsőbbségel rendelkező hívással szemben előjog érvényesítésére az áramkör üzemmódú szolgáltatás azonnali elérésének biztosítása céljából. Egy GES és egy földi hálózat közötti interfészen áthaladó összes AMS(R)S hívási kísérletet a társított elsőbbségi kategóriának megfelelően kell meghatározni.

4.8.3.3 *Szolgáltatási minőség.* A GES-nek olyan megfelelő mennyiségű C-csatorna forrással kell rendelkeznie, hogy egy légi, vagy földi kezdeményezésű hívás GES-nél történő vételénél, a GES-en belüli blokkolás valószínűsége ne legyen nagyobb 0,01-nél. A rendelkezésre álló GES C-csatorna forrásoknak az összes hátrasorolható forrást (mint pl. azok, amelyeket a nem-biztonsági felhasználók használnak) magukba kell foglalni.

4.8.4 Az AMS(R)S teljesítmény követelmények

4.8.4.1 HÍVÁS-FELDOLGOZÁSI KÉSÉSEK

1. Megjegyzés. – Az AMS(R)S al-hálózat hozzáférési késés teljesítmény-követelményeinek útmutató anyaga, valamint az, hogy azok milyen hatást gyakorolnak a földfelszíni ATS hálózatok tervezésére, az I. Rész A-Függelékében található.
2. Megjegyzés. – Az A5-1a) a "hozzáférés késés" CM-LIDU, az, amely az A2-45. és A2-46. ábrákon bemutatott két különböző hozzáférési kérés SU egyikével kapcsolódik. Az első az alapszinti szabvány, a második az, amely valamivel kisebb kapcsolat létrehozási késést szolgáltat.

4.8.4.1.1 *LÉGI KEZDEMÉNYEZÉS*

4.8.4.1.1.1 *A GES jelzés továbbítási késése.* Egy GES esetében a földfelszíni hálózat összedolgozó interfésze felé irányuló hívás-kezdeményezési esemény előállítására (lásd 4-42. táblázat, FITE 18) a GES adatkapcsolati rétegben lévő összes AES hívási információ első beérkezése utáni maximális időbeli késés 1,0 másodperces kell, hogy legyen (95 százalék).

Megjegyzés. – Az AES hívás információkat az R-csatornán keresztül vett "hozzáférés kérés" CM-LIDU és a C-csatornán keresztül vett CM-LIDU önmagában tartalmazza. Az A2-45. és A2-46. ábra két hozzáférés kérés SU-t mutat be.

4.8.4.1.1.2 *GES C-csatorna kijelölés késés.* A GES maximális időbeli késésének egy "C-csatorna kijelölés" CM-LIDU-nak a P-csatorna adatkapcsolati réteg általi kiszolgálására való felsorakoztatásához, egy "hozzáférési kérés" CM-LIDU-nak a GES-be történő érkezését követően, 1,5 másodpercnek kell lenni (95 százalék).

4.8.4.1.1.3 *Az AES C-csatorna kijelölés válaszának késése.* Az AES maximális időbeli késésének egy C-csatorna vivőfrekvencia kisugárzásának megkezdéséhez, miután egy "C-csatorna kijelölés" CM-LIDU érkezett az AES adatkapcsolati rétegbe, 1,0 másodpercnek kell lenni (95 százalék).

4.8.4.1.2 *FÖLDI KEZDEMÉNYEZÉSEK*

4.8.4.1.2.1 *A GES C-csatorna kijelölés késése.* Egy GES maximális időbeli késésének a P-csatorna által szolgáltatott "C-csatorna kijelölés" CM-LIDU felsorakoztatására egy hívás kezdeményező esemény (lásd 4-41. táblázat, FITE 18) a földi telepítésű összedolgozó interfészhez való megérkezését követően, 1,5 másodpercnek kell lenni (95 százalék).

4.8.4.1.2.2 *Az AES C-csatorna kijelölés késése.* Az AES maximális időbeli késésének egy C-csatorna vivőfrekvencia kisugárzásának a "hívás bejelentés" CM-LIDU és a "C-csatorna kijelölés" CM-LIDU-nak az AES adatkapcsolati rétegben történő megérkezését követő megkezdéséhez, 1,0 másodpercnek kell lenni (95 százalék).

Megjegyzés. – A földi kezdeményezésű hívások AES eljárásai egy AES-től megkívánják, hogy megvárja mindkét CM-LIDU sikeres vételét, mielőtt a C-csatorna adása elkezdődhet. Ezek az eljárások a rendes sorrendtől eltérő potenciális vétel kezelését szolgáló hibajavító logikát foglalják magukba.

4.8.4.2 ÁTVITELI KÉSÉS

4.8.4.2.1 Az AMS(R)S al-hálózatban egy 21,0 kbit/s sebességgel működő C-csatorna teljes megengedhető átviteli késése nem lehet több, mint 0,485 másodperc.

4.8.4.2.2 Az AES-nek és GES-nek tulajdonítható maximális átviteli késésnek egyenként 0,080 másodpercnek kell lenni.

1. Megjegyzés. - Az RF terjedési késésnek (legrosszabb terjedési útvonal geometria) a 0,285 másodperc és a vokóder keret-kisugárzási késésének a 0,040 másodperc rögzített átviteli késési összetevőt jelölték ki. A 0,040 másodperces vokóder keret-kibocsátási késés a legrosszabb szinkronizáció esetére vonatkozik, amikor az első 0,020 másodperces vokóder beszéd-üzemű keret egy további C-csatorna összerendező blokk által késést szenved.

2. Megjegyzés. – Az AMS(R)S al-hálózat teljes átviteli késését úgy határozták meg, mint azt az időt, amely attól a pillanattól kezdődik, amikor a beszéd eljut az AES-hez, vagy a GES-hez és abban a pillanatban ér véget, amikor a beszéd a GES vagy AES megfelelő párjainak összekapcsolódó hálózatába belép. Ez a késés tartalmazza a vokóder feldolgozási idejét, a fizikai réteg késését, az RF terjedési késését és bármilyen más, az AMS(R)S al-hálózaton belül lévő késést.

4.8.4.3 ÚTVONAL-TÉVESZTÉS

A belső feldolgozás vagy jelzési hibák által okozott GES-en belüli útvonal-tévesztések valószínűsége nem haladhatja meg az 1 per 10^6-t.

Megjegyzés. – Útvonal-tévesztés akkor fordulhat elő, ha a GES tévesen értelmezi (1) a hálózati azonosítót, vagy a "rövidített hozzáférési cím – telefon" CM-LIDU-ban lévő (légi kezdeményezés esetén) a földi címzés számjegyeit vagy (2) az AES azonosítót vagy a földi telepítésű hálózatnál (földi kezdeményezés esetén) az összedolgozó interfésztől kapott FITE 18-ban lévő terminál azonosítót.

4.8.5 Áramkör üzemmódú beszéd-üzemű kódoló/dekódoló

4.8.5.1 *Áramkör üzemmódú beszéd-üzem.* Áramkör üzemmódú beszéd-üzemnél mindegyik C-csatornához a megfelelő beszéd-üzemű kódoló/dekódolós algoritmust kell használni az AES-nél és a GES-nél, ahogyan az alábbiakban jelezve van.

4.8.5.1.1 *21,0 kbit/s C-csatorna.* A 9,6 kbit/s-os kódoló/dekódoló algoritmust (lásd a 4. Fejezet 7. Függeléke) kell használni a 21 kbit/s C-csatornával (lásd 4.4.5 pont).

Megjegyzés. – A beszéd-üzemű kódoló algoritmus BT (korábban British Telecom) szabadalmi jogok és szerzői jogok által védett. A BT hozzájárult ahhoz, hogy ilyen szabadalmi jogok és szerzői jogok alatt szabadalmi díj mentes, nem kizárólagos licenceket nyújt az összes AES és GES előállítónak kizárólag a polgári repülési mobil műholdas összeköttetések megvalósítására (amelybe beletartoznak az AMSS és AMS(R)S összeköttetések, ahogyan az a 4. Fejezetben leíásra került). Ezek a gyártók a szabadalmi díj mentes licence megegyezést kötnek a BT Laboratories-el, mielőtt az algoritmust beépítik a polgári repülési mobil műholdas összeköttetésre szolgáló berendezésekbe.

4.8.5.1.2 *A 8,4 kbit/s C-csatorna.* A 4,8 kbit/s-es kódoló/dekódoló algoritmust kell használni a 8,4 kbit/s csatornával (lásd 4.4.5 pont).

Megjegyzés. – Az információkat a műszaki előírások 4,8 kbit/s-os kódoló/dekódoló algoritmus műszaki jellemzőiről a "Low Level Description" ("Alacsony szint ismertetése") dokumentum 1.5 számú, 1996. május 3-iki keltezésű, a Digital Voice Systems Inc (DVSI), Egyesült Államok által kialakított változata tartalmazza.

A dokumentumban ismertetett 4,8 kbit/s kódoló/dekódoló technológia DVSI szabadalmi jogok és szerzői jogok által védett. A gyártóknak licence egyezményt kell kötniük a DVSI-vel az algoritmus részletes leírásának megszerzését megelőzően, az AMSS szolgáltatást működtető berendezésbe való beépítése előtt. Az ICAO-nak címzett, 1998. november 10-ikén kelt levelében a DVSI megerősítette elkötelezettségét a technológia felhasználás engedélyezésére a légiközlekedési berendezések gyártói és eladói számára elfogadható feltételek mellett, amelyeket diszkrimináció mentes alapon tárgyaltak meg.

4.8.6. AMS(R)S áramkör üzemmódú eljárások

Az AMS(R)S áramkör üzemmódú eljárások a következő négy funkcionális területet ölelik fel:

a) Az AES áramkör üzemmódú szolgáltatások esetében:

i) AES kimenő logikai eljárás (légi kezdeményezésnél); és

ii) AES bejövő logikai eljárás (földi kezdeményezésnél).

b) A GES áramkör üzemmódú szolgáltatások esetében:

i) GES kimenő logikai eljárás (földi kezdeményezésnél); és

ii) GES bejövő logikai eljárás (légi kezdeményezésnél).

4.8.6.1 AMS(R)S ÁRAMKÖRI ÜZEMMÓDÚ ELJÁRÁSOK

1. Megjegyzés. – Elfogadott az, hogy egy AMS(R)S áramkör üzemmódú szolgáltatási eljárás az itt leírt eljárásokban külön meghatározott pontos kód értékek nélkül kódolni vagy értelmezni fogja bármely továbbított vagy vett CM-LIDU vonatkozó paramétereit. A paraméter-kódolásra vonatkozó specifikus követelmények a 4. Fejezet 5. Függelékében meghatározott összedolgozó telefon-technikai események leképezési követelményeiben találhatók.

2. Megjegyzés. – A "C-csatorna források" kifejezés magában foglal minden szükséges C-csatorna hardvert és a C-csatorna fenntartását biztosító elegendő adó-teljesítményt.

4.8.6.1.1 *AES ÁRAMKÖR ÜZEMMÓDÚ LOGIKA*

Megjegyzés. – Az AES kimenő, illetve bejövő eljárások által az összedolgozó telefon-technikai események és CM-LIDU-k közötti leképezések követelményeit a 4. Fejezet 5. Függelékében az A5-1-től

A5-11-ig, illetve A5-12 - A-18-ig ábrák tartalmazzák. Az áramkör üzemmódú konfiguráció paramétereket (pl. a 4.8.6.1.1.1 pontban használtakat) a 4. Fejezet 6. Függeléke határozza meg.

4.8.6.1.1.1 *AES kimenő áramkör üzemmódú eljárás.* Egy “AMS(R)S hívás-kezdeményezés”-i eseménynek (FITE 18) az összedolgozó interfésznél történő vétele arra kell, hogy indikálja az AES áramkör üzemmódú
szolgáltatásokat, hogy egy egyedi alkalmazási referencia-számot jelöljenek ki a hívás részére. Ezt követően az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

a) ha nem áll rendelkezésre elegendő AES C-csatorna forrás, és a blokkolás azoknak a hívásoknak tulajdonítható, amelyek az adott hívási kisérlettel azonos vagy nagyobb C-csatorna elsőbbségű számmal üzemelnek, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás sikertelen – hálózati torlódás”-i eseményt (BITE 12) kell visszaküldeniük az összedolgozó interfészhez és minden hívási tevékenységet be kell fejezniük; vagy

b) ha elegendő C-csatorna forrás áll rendelkezésre, vagy ha a blokkolást okozó hívások legalább egyike az adott hívási kisérletnél kisebb C-csatorna elsőbbségű számmal üzemel, akkor az AES áramkör üzemmódú szolgáltatásoknak az alábbiakat kell végrehajtani, és azt követően egy GES áramköri üzemmódú szolgálattól érkező C-csatorna kijelölésre kell várniuk.

1) ha a hívás elsőbbségű vészhelyzeti/sürgősségi, akkor az AES áramkör üzemmódú szolgáltatásoknak az nA21 “hozzáférés kérés – telefon” CM-LIDU-kat kell az adatkapcsolati réteghez továbbítaniuk; vagy

2) ha a hívás elsőbbsége repülésbiztonsági, akkor az AES áramkör üzemmódú szolgáltatásoknak az nA22 “hozzáférési kérés – telefon” CM-LIDU-kat kell az adatkapcsolati réteghez továbbítaniuk; vagy

3) ha a hívás elsőbbsége üzemeltetési rendszerességű/meteorológiai, akkor az AES áramkör üzemmódú szolgáltatásoknak az nA23 “hozzáférési kérés – telefon” CM-LIDU-kat kell az adatkapcsolati réteghez továbbítaniuk.

4.8.6.1.1.1.1 Az AES áramkör üzemmódú szolgáltatásoknak az alábbiakat kell végrehajtani, miközben a GES áramköri üzemmódú szolgálatoktól érkező válaszokra várakoznak:

a) Ha a GES áramkör üzemmódú szolgáltatásoktól a legutolsó "hozzáférési kérés – telefon” CM-LIDU elküldése után tA50 másodperccel nem érkezik válasz, akkor az AES-nek egy R-csatorna frekvencia kiválasztására kell utasítást adnia, és azt követően az eredeti mennyiségű CM-LIDU-t továbbítani kell, feltéve, hogy a CM-LIDU sorozat újra-továbbításainak teljes száma nem haladja meg a négyet. Ha a CM-LIDU sorozat negyedik újra-továbbítása után tA50 másodperccel nem érkezett válasz, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás sikertelen – vonal üzemen kívül” eseményt (BITE 17) kell az összedolgozó interfészhez visszaküldeniük és minden hívási tevékenységet meg kell szüntetniük; vagy

b) ha egy “törlés továbbítás” esemény (FITE 22) kerül vételre az összedolgozó interfésznél, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat csatorna-felszabadítás” CM-LIDU-t kell továbbítaniuk az R-csatornán az adatkapcsolati réteghez és minden hívási tevékenységet meg kell szüntetniük; vagy

c) ha a hívási kisérlet egy magasabb elsőbbségű hívás által hátrasorolódik, akkor az AES áramkör üzemmódú szolgáltatásoknak egy a “hívott bont” eseményt (BITE 25) az összedolgozó interfészhez, és egy “hívási folyamat – csatorna-felszabadítás” CM-LIDU-t az adatkapcsolati réteghez kell továbbítaniuk az R-csatornán, és minden hívási tevékenységet be kell fejezniük; vagy

d) ha az alábbiak közül bármelyik válasz érkezik, az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

1) Ha akár egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU vagy egy “hívási folyamat – csatorna-felszabadítás” CM-LIDU érkezik, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívott bont” eseményt (BITE 25), vagy egy megfelelő “sikertelen hívás” eseményt (BITE 14, 15, 16, 17 vagy 20) kell továbbítaniuk az összedolgozó interfészhez, amint azt a vett CM-LIDU-ban lévő ok helyzet, ok osztály és ok érték-paraméterek meghatározzák. Ezt követően az AES áramkör üzemmódú szolgáltatásoknak minden hívási tevékenységet meg kell szüntetniük; vagy

2) ha egy “C-csatorna kijelölés”-i CM-LIDU kerül vételre, akkor az AES áramkör üzemmódú szolgáltatásoknak C-csatorna források kiosztására kell felkérniük az AES vezérlést és aktiválniuk kell egy C- csatorna Q szám értékkel bíró kijelölt frekvencián egy C-csatorna egységet a 4-43. táblázat szerint.

Megjegyzés. – Ez azt jelenti, hogy a C-csatorna Q számát az adatkapcsolati rétegben lévő áramkör üzemmódú kezdeti hívás-jelzésben használt Q számból származtatják.

Azt követően az AES áramköri üzemmódú szolgálatoknak egy “hívás-tájékoztatás-szolgálatok cím” CM-LIDU-t kell meghatározatlan időn keresztül az adatkapcsolati réteghez továbbítaniuk minden tA29 másodpercben és összeköttetést kell teremteniük a C-csatorna audio interfésze, valamint a hívó interfésze között.

Megjegyzés. – A “hívás-tájékoztatás – szolgálati cím” CM-LIDU által szállított információ redundáns a “hozzáférési kérés” CM-LIDU által szállított információval, amikor a felhasznált hozzáférés kérési eljárás nem az “általános hozzáférés kérés” eljárás. Ebben az esetben ezt az információt a nem AMS(R)S felhasználóknak nyújtott AMSS szolgáltatást biztosító GES-ek által alkalmazott áramköri folytonossági teszt-eljárásokkal való kompatibilitás fenntartására használják; és ez az információ nem kerül benyújtásra a GES-hez digitális analízis elvégzése céljából.

4.8.6.1.1.1.2 Ha a C-csatorna egység aktiválását követő tA28 másodpercen belül nem érkezik válasz a GES áramkör üzemmódú szolgáltatástól, akkor az AES áramkör üzemmódú szolgáltatásoknak hat “hívási folyamat – csatorna megszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül küldeniük az adatkapcsolati réteghez, egy “sikertelen hívás – vonal üzemen kívül” eseményt (BITE 17) kell az összedolgozó interfészhez küldeniük küldeniük és minden hívási tevékenységet be kell szüntetniük, ellenkező esetekben az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

a) ha egy vagy több “hívás folyamat-ellenőrzés” CM-LIDU-k kerülnek vételre, akkor az AES áramkör üzemmódú szolgáltatásoknak azokat figyelmen kívül kell hagyniuk; vagy

b) ha egy vagy több “hívási folyamat-csatorna-megszakítás" CM-LIDU kerül vételre, vagy ha egy “bontás továbbítás” esemény (FITE 22) érkezik az összedolgozó interfészhez, akkor az AES áramkör üzemmódú szolgáltatásoknak hat “hívás folyamat-csatorna-megszakítás” CM-LIDU-kat kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez küldeniük, és egy megfelelő telefon-technikai eseményt (BITE 14, 15, 16, 17, 20, vagy 25) kell visszaküldeniük az összedolgozó interfészhez és meg kell szüntetniük minden hívási tevékenységet; vagy

c) ha egy “hívás folyamat – kapcsolás” CM-LIDU kerül vételre, vagy ha a CM-LIDU úgy érkezik, hogy megelőzi akár egy “hívási folyamat-ellenőrzés” CM-LIDU, vagy egy “hívási folyamat – hívási kisérlet eredménye” CM-LIDU, amelyeket korábban a C-csatorna egység aktivizálást követő tA28 másodpercen belül vettek, akkor az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

1) biztosítani kell, hogy a “hívás-információ - szolgálat cím” CM-LIDU ismétlődő továbbítása megszakadjon; és

2) egy “válasz” eseményt (BITE 22) kell továbbítani az összedolgozó interfészhez és az adatkapcsolati réteghez egy pozitív “telefon-technikai nyugtázás” CM-LIDU-t kell továbbítani a C-csatorna alsávon keresztül. Ha további “hívás folyamat – kapcsolás” CM-LIDU-k kerülnek vételre a kezdeti “hívás folyamat – kapcsolás” CM-LIDU-t követően, akkor az AES áramkör üzemmódú szolgáltatásoknak mindegyikre válaszolniuk kell egy pozitív “telefon-technikai nyugtázás” CM-LIDU-nak a GES áramkör üzemmódú szolgáltatás adatkapcsolati rétegéhez való továbbításával; vagy

Megjegyzés. – Ezen a ponton a végponttól végpontig hívás jön létre.

d) ha egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU (egy “címzés komplett” esemény jelzésére bekódolva) kerül vételre, vagy ha az úgy érkezik, hogy megelőzi egy “hívási folyamat – ellenőrzés” CM-LIDU, amit korábban a C-csatorna egység aktivizálását követő tA28 másodpercen belül vettek, akkor az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

1) biztosítani kell, hogy a “hívás-információ – szolgálat cím” CM-LIDU ismétlődő továbbítása megszakadjon, és

2) egy “címzés komplett” eseményt (BITE 5) kell továbbítani az összedolgozó interfészhez és az adatkapcsolati réteghez egy pozitív “telefon-technikai nyugtázás” CM-LIDU-t kell továbbítania a C-csatorna alsávon keresztül. Ha további “hívás folyamat - hívási kísérlet eredménye” CM-LIDU-k kerülnek vételre a kezdeti “hívás folyamat – hívás kísérlet eredménye” CM-LIDU-t követően, akkor az AES áramkör üzemmódú szolgáltatásoknak mindegyikre válaszolniuk kell egy pozitív “telefon-technikai nyugtázás”-i CM-LIDU-nak a GES áramkör üzemmódú szolgáltatások adatkapcsolati rétegéhez való továbbításával;

e) vagy ha a C-csatorna forrásokat hátrasorolják egy magasabb elsőbbségű hívás miatt, akkor az AED áramkör üzemmódú szolgáltatásoknak hat “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C- csatorna alsávon keresztül az adatkapcsolati réteghez továbbítaniuk, egy “hívott bont” eseményt (BITE 25) kell visszaküldeniük az összedolgozó interfészhez, és meg kell szűntetniük minden hívási tevékenységet; vagy

f) ha C-csatorna alsávi adatkapcsolati réteg a hívás beszüntetésére ad utasítást, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívott bont” eseményt (BITE 25) kell az összedolgozó interfészhez továbbítaniuk és be kell szüntetniük minden hívási tevékenységet.

4.8.6.1.1.2 *AES bejövő áramkör üzemmódú eljárás.* Ezt az eljárást az alábbi egymással kölcsönös összefüggésben lévő eljárásoknak kell meghatározniuk:

a) AES bejövő áramköri üzemmódú hívás-kezdeményezés – 4.8.6.1.1.2.1;

b) AES bejövő C-csatorna folyamatosság ellenőrzés – 4.8.6.1.1.2.2.;

c) AES bejövő légijármű felőli befejezés – 4.8.6.1.1.2.3;

d) AES bejövő C-csatorna fenntartás – 4.8.6.1.1.2.4.

4.8.6.1.1.2.1 *AES bejövő áramkör üzemmódú hívás-kezdeményezés.* Akár egy “hívás-bejelentés vagy egy egyedi alkalmazási referencia-számmal bíró “C-csatorna kijelölés” CM-LIDU vételekor, az AES áramkör üzemmódú szolgáltatásoknak a következőket kell elvégezniük:

a) ha egy “C-csatorna kijelölés” került vételre, akkor az AES áramkör üzemmódú szolgáltatlásoknak egy negatív “telefon-technikai nyugtázás” CM-LIDU-t (a “hívás-bejelentés” CM-LIDU hiányának jelzésére kódolva) kell az R-csatornán keresztül az adatkapcsolati réteghez továbbítaniuk és a következőket kell végrehajtaniuk:

1) ha sem egy vonatkozó “hívás-bejelentés” CM-LIDU, sem egy “hívás folyamat – csatornafelszabadítás” CM-LIDU nem érkezik a legutolsó negatív “telefon-technikaii nyugtázás” CM-LIDU továbbítását követő tA27 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak a negatív “telefon-technikai nyugtázás” CM-LIDU-t az R-csatornán keresztül az adatkapcsolati réteghez kell továbbítaniuk és megérkezésükre további tA27 másodpercet kell várniuk; feltéve, hogy a “telefon-technikai nyugtázás” CM-LIDU ismétléseinek teljes száma nem haladja meg a négyet. Ha az előbbiekben említett CM-LIDU-k egyike sem érkezik meg a “telefon-technikai nyugtázás” CM-LIDU negyedik megismétlését követő tA27 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU-t kell az R-csatornán keresztül az adatkapcsolati réteghez továbbítaniuk és meg kell szüntetniük minden hívási tevékenységet; vagy

2) ha egy “hívási folyamat – csatorna-felszabadítás” CM-LIDU érkezik a “telefon-technikai nyutázás” CM-LIDU legutolsó továbbítását követő tA27 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak meg kell minden hívási tevékenységet szüntetniük; vagy

3) ha a hívást egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU-t kell az R csatornán keresztül az adatkapcsolati réteg felé továbbítaniuk és minden hívási tevékenységet meg kell szüntetniük; vagy

4) ha a vonatkozó “hívás-bejelnlés” CM-LIDU a “telefon-technikai nyugtázás” CM-LIDU legutolsó továbbítását követő tA27 másodpercen belül kerül vételre, akkor az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

i) ha a hívott terminál egy olyan hívás által foglalt, amelynek előbbségi száma egyenlő vagy magasabb a folyamatban lévő hívás elsőbbségi számával, vagy ha a C-csatorna források nem állnak rendelkezésre, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat – hívás kísérlet eredménye” CM-LIDU-t kell az R-csatornán az adatkapcsolati réteghez továbbítaniuk és minden hívási tevékenységet meg kell szüntetniük; vagy

ii) ha mind a hívott terminál, mind a C-csatorna források rendelkezésre állnak, akkor az AES áramkör üzemmódú szolgáltatásoknak az AES kezelést fel kell kérniük C-csatorna források kijelölésére és egy C- csatorna Q számértékkel bíró C-csatorna egység kijelölt frekvencián történő aktivizálására a 4-43. táblázat szerint.

Megjegyzés. – Ez azt jelenti, hogy a C-csatorna Q számát az adatkapcsolati rétegben lévő áramkör üzemmódú kezdeti hívás-jelzésben használt Q számból származtatják.

Ezt követően az AES áramkör üzemmódú szolgáltatásoknak egy “hívási folyamat – ellenőrzés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítaniuk, és a 4.8.6.1.1.2.2 pont alatti AES beérkező C-csatorna folyamatossági ellenőrzési eljárást kell végrehajtaniuk; vagy

b) ha egy “hívás-bejelentés” CM-LIDU került vételre, akkor az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végezniük:

1) ha egy “hívás folyamat – csatorna-bontás” CM-LIDU érkezik a “hívás-bejelentés” CM-LIDU vételét követő tA25 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak minden hívási tevékenységet meg kell szüntetniük; vagy

2) ha sem egy “C csatorna kijelölés” CM-LIDU, sem egy “hívás folyamat – csatorna-megszakítás” CM-LIDU nem érkezik a “hívás-bejelentés” CM-LIDU vételét követő tA25 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak egy negatív “telefon-technikai nyugtázás” CM-LIDU-t (a “C-csatorna kijelölés” CM-LIDU hiányának jelölésére bekódolva) kell az R-csatornán keresztül az adatkapcsolati réteghez továbbítaniuk és további tA27 másodpercet kell várniuk azok megérkezésére.

Ha tA27 másodperc elteltével a CM-LIDU-k egyike sem érkezik meg, akkor az AES áramkör üzemmódú szolgáltatásoknak a negatív “telefon-technikai nyugtázás” CM-LIDU-t ismét továbbítaniuk kell az adatkapcsolati réteghez és újabb tA27 másodpercet kell várniuk; feltéve, hogy a negatív “telefon-technikai nyugtázás” CM-LIDU-k ismétléseinek teljes száma nem haladja meg a négyet. Ha a negatív “telefon-technikai nyugtázás” CM-LIDU negyedik ismétlését követő tA27 másodpercen belül sem érkezik meg egyik CM-LIDU sem, akkor az AES áramkör üzemmódú szolgálatoknak egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU-t kell az R-csatornán keresztül az adatkapcsolati réteghez továbbítani, és minden hívási tevékenységet meg kell szüntetniük; vagy

3) ha a hívást egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat – hívás kisérlet eredménye” CM-LIDU-t kell az R cstornán keresztül az adatkapcsolati réteghez továbbítaniuk és minden hívási tevékenységet meg kell szüntetniük; vagy

4) ha egy “C-csatorna kijelölés” CM-LIDU kerül vételre akár a “hívás-bejelentés” CM-LIDU vételét követő tA25 másodpercen belül, akár a legutolsó negatív “telefon-technikai nyugtázás” CM-LIDU kisugárzásának vételét követő tA27 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végrehajtaniuk:

i) ha a hívott terminál egy olyan hívás által foglalt, amelynek elsőbbsági száma egyenlő vagy magasabb a folyamatban lévő hívás elsőbbségi számával, vagy ha C-csatornaforrások nem állnak rendelkezésre, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívás folyamat – hívás kísérlet eredménye” CM-LIDU-t kell az R-csatornán az adatkapcsolati réteghez továbbítaniuk, és minden hívási tevékenységet meg kell szüntetniük; vagy

ii) ha mind a hívott terminál, mind a C-csatorna források rendelkezésre állnak, akkor az AES áramkör üzemmódú szolgáltatásoknak az AES kezelést fel kell kérniük a 4-43. táblázat szerinti C-csatorna Q számértékkel bíró források kijelölésére és a kijelölt frekvencián egy C-csatorna egység aktivizálására. Azt követően az AES áramkör üzemmódú szolgáltatásoknak egy “hívási folyamat – ellenőrés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítaniuk és végre kell hajtaniuk a 4.8.6.1.1.2.2 pont alatti AES bejövő C- csatorna folyamatossági ellenőrzési eljárást.

4.8.6.1.1.2.2 *AES bejövő C-csatorna folyamatossági ellenőrzés.* Amint az a 4.8 pontban más helyen megkövetelt, az AES áramkör üzemmódú szolgáltatásoknak C-csatorna folyamatossági ellenőrzést kell teljesíteniük a következők végrehajtásával:

a) ha sem egy “hívás folyamat – ellenőrzés” CM-LIDU, sem egy “hívás folyamat – csatorna-megszakítás” CM-LIDU nem érkezik a legutolsó “hívás folyamat – ellenőrzés” CM-LIDU továbbításától számított tA26 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak egy másik “hívás folyamat – ellenőrzés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítaniuk, amíg az alábbiak közül valamelyik meg nem történik:

1) ha sem egy “hívás folyamat – ellenőrzés” CM-LIDU, sem egy “hívás folyamat – megszakítás” CM-LIDU nem érkezik a C-csatorna egység aktivizálását követő tA41 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak le kell állítania a “hívás folyamat – ellenőrzés” CM-LIDU-k továbbítását, majd egy “hívás folyamat – hívás kísérlet eredménye” CM-LIDU-t kell az R-csatornán továbbítaniuk az adatkapcsolati réteghez és minden hívási tevékenységet meg kell szüntetniük; vagy

2) ha egy “hívás folyamat – csatorna-megszakítás” CM-LIDU kerül vételre a C-csatorna egység aktivizálását követő tA41 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak minden hívási tevékenységet meg kell szüntetniük; vagy

3) ha a C-csatornát egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívási folyamat – hívás kisérlet eredménye” CM-LIDU-t kell az R-csatornán keresztül az adatkapcsolati réteghez továbbítaniuk és minden hívási tevékenységet meg kell szüntetniük; vagy

4) ha egy “hívás kísérlet – ellenőrzés” CM-LIDU kerül vételre a C-csatorna egység aktivizálást követő tA41 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásoknak létre kell hozni a C-csatorna egység és a légijármű hálózat továbbító áramköre közötti áramköri útvonalat. Ezt követően az AES áramkör üzemmódú szolgáltatásoknak egy pozitív “telefon-technikai nyugtázás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítaniuk, egy “AMS(R)S hívás-kezdeményezés” eseményt (FITE 18) kell az összedolgozó interfészhez továbbítaniuk és várakozniuk kell a hívott terminálhoz menő hívás befejezésére, amint az az AES bejövő légijárművi befejezési eljárás 4.8.6.1.1.2.3 pontjában meg van határozva.

4.8.6.1.1.2.3 *AES bejövő légijárművi befejezése.* Amint az a 4.8 pontban máshol előírásra kerül, az AES áramkör üzemmódú szolgáltatásoknak a következőket kell végrehajtani egy hívott terminálhoz a légijárművi hálózaton keresztül eljuttatott hívás befejezésére:

a) ha egy vagy több “hívási folyamat – ellenőrzés” CM-LIDU került vételre, akkor az AES áramkör üzemmódú szolgáltatásnak egy pozitív “telefon-technikai nyugtázás” CM-LIDU-t kell továbbítani a C-csatorna alsávon át az adatkapcsolati réteghez; vagy

b) ha nem érkezik “válasz” esemény (BITE 22) az összedolgozó interfésztől az “AMS(R)S hívás-kezdeményezés” esemény (FITE 18) továbbítását követő tA42 másodpercen belül, vagy ha a C-csatornát egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásoknak egy “hívó bont” eseményt (FITE 22) kell az összedolgozó interfészhez küldenie, hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania és minden hívási tevékenységet meg kell szüntetnie; vagy

c) ha egy "hívás-folyamat - csatorna-megszakítás" CM-LIDU kerül vételre, tA42 másodpercen belül, az "AMS(R)S hívás-kezdeményezés" esemény (FITE 18) továbbítása után, vagy ha a C-csatornát egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor a AES áramkör üzemmódú szolgáltatásnak egy 'hívó bont" eseményt (FITE 22) kell küldenie az össszedolgozó interfészhez hat "hívás-folyamat - csatorna-megszakítás" CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania, és minden hívási tevékenységet meg kell szűntetnie; vagy

d) ha egy “válasz” esemény (BITE 22) érkezik az összedolgozó interfésztől az “AMS(R)S hívás-kezdeményezés” esemény (FITE 18) továbbítását követő tA42 másodpercen belül, akkor az AES áramkör üzemmódú szolgáltatásnak egy “hívás folyamat – kapcsolás” CM-LIDU-t kell az adatkapcsolati réteghez továbítania, és végre kell hajtania a 4.8.6.1.1.2.4 pontban meghatározott AES bejövő C-csatorna fenntartási eljárást.

4.8.6.1.1.2.4 *AES bejövő C-csatorna fenntartás.* Amint azl a 4.8 pontban más helyen előírásra kerül, az AES áramkör üzemmódú szolgáltatásnak lehetővé kell tennie a végpont-végpont közötti kapcsolat folytatását, miközben az alábbiakat elvégzi a C-csatorna fenntartása céljából:

a) ha az utolsó “hívás folyamat – kapcsolás” CM-LIDU továbbítását tkövetően tA26 másodpercen belül sem egy pozitív “telefon-technikai nyugtázás” CM-LIDU, sem egy “hívott bont” esemény (BITE 25) nem érkezik az összedolgozó interfésztől, akkor az AES áramkör üzemmódú szolgáltatásnak a “hívás folyamat – kapcsolás” CM-LIDU-t ismét továbbítania kell a C-csatorna alsávon át az adatkapcsolati réteghez; vagy

b) ha az első “hívás folyamat – kapcsolás” CM-LIDU továbbítását követő tA30 másodpercen belül sem egy pozitív “telefon-technikai nyugtázás” CM-LIDU, sem egy “hívott bont” esemény (BITE 25) nem érkezik az összedolgozó interfésztől, akkor az AES áramkör üzemmódú szolgáltatásnak a “hívás folyamat – kapcsolás” CM-LIDU továbbítását le kell állítania, egy “hívó bont” eseményt (FITE 22) kell továbbítania az összedolgozó interfészhez, hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell továbbítania a C-csatorna alsávon át az adatkapcsolati réteghez és minden hívási műveletet meg kell szüntetnie; vagy

c) ha az első “hívás folyamat – kapcsolás” CM-LIDU továbbítását követő tA30 másodpcen belül egy “hívás folyamat – csatorna-megszakítás” CM-LIDU kerül vételre, akkor az AES áramkör üzemmódú szolgáltatásnak le kell állítania a “hívási folyamat – kapcsolás” továbbítását, egy “hívó bont” eseményt (FITE 22) kell az összedolgozó interfészhez küldenie, hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C- csatorna alsávon át továbbítania az adatkapcsolati réteghez, és minden hívási tevékenységet be kell fejeznie; vagy

d) ha a C-csatornát egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásnak egy “hívó bont” eseményt (FITE 22) kell küldenie az öddzrdolgozó interfészhez, hat “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át továbbítania az adatkapcsolati réteghez ,és minden hívási tevékenységet meg kell szüntetnie; vagy

e) ha egy vagy több pozitív “telefon-technikai nyugtázás” CM-LIDU kerül vételre, akkor az AES áramkör üzemmódú szolgáltatásnak le kell állítania a “hívás folyamat – kapcsolás” CM-LIDU-k továbbítását és az alábbiakat kell végrehajtania, miközben lehetővé teszi a C-csatorna működését:

Megjegyzés. – Ez a helyzet abban a logikai eljárásban, ahol a végpont-végpont távközlési csatorna kész a használatra és a légi- és földi felhasználók megkezdhetik a "társalgás"-t.

1) ha egy “hívott bont” esemény (BITE 25) érkezik az összedolgozó interfésztől, akkor az AES áramkör üzemmódú szolgáltatásnak hat “hívás folyamat – csatornaf megszakítás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania, és minden hívási tevékenységet meg kell szüntetnie; vagy

2) ha egy “hívási folyamat – csatorna-megszakítás” CM-LIDU kerül vételre, akkor az AES áramkör üzemmódú szolgáltatásnak “hívó bont” eseményt (FITE 22) kell küldenie az összedolgozó interfészhez, hat “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania, és minden hívási tevékenységet meg kell szüntetnie; vagy

3) ha a C-csatornát egy magasabb delsőbbségű hívás miatt hátrább kell sorolni, akkor az AES áramkör üzemmódú szolgáltatásnak “hívó bont” eseményt (FITE 22) kell küldenie az összedolgozó interfészhez, hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át továbbítania az adatkapcsolati réteghez, és minden hívási tevékenységet meg kell szüntetnie; vagy

Megjegyzés. – A fenti logikai átmenetek figyelik a hívás-törlést vagy a normál hívás-bontás tevékenységen, vagy egy AES-kezdeményezésű C-csatorna hátrábbsoroláson keresztül.

f) ha a C-csatorna alsávi adatkapcsolati réteg a hívás befejezésére ad utasítást, akkor az AES áramkör üzemmódú szolgáltatásnak egy “hívó bont” eseményt (FITE 22) kell az összedolgozó interfészhez küldeni,e és minden hívási tevékenységet meg kell szüntetnie.

4.8.6.1.2 *GES ÁRAMKÖR ÜZEMMÓDÚ LOGIKA*

Megjegyzés. – A GES kimenő és bejövő eljárások által az összedolgozó telefon-technokai események és a CM-LIDU-k közötti leképezése követelményeit a 4. Fejezet 5. Függelékében az A5-19-től A5-27-ig és A5-8-tól A5-40-ig ábrák foglalják magukba.

4.8.6.1.2.1 *GES kimenő áramkör üzemmódú eljárás.* Ezt az eljárást az alábbi egymással kölcsönös összefüggésben lévő eljárásoknak kell meghatározni:

a) GES kimenő áramkör üzemmódú hívás-kezdeményezés – 4.8.6.1.2.1.1;

b) GES kimenő C- csatorna létrehozás – 4.8.6.1.2.1.2;

c) GES kimenő C-csatorna folyamatossági ellenőrzés – 4.8.6.1.2.1.3;

d) GES kimenő C-csatorna fenntartás – 4.8.6.1.2.1.4; és

e) GES kimenő C-csatorna felszabadítás őr – 4.8.6.1.2.1.5.

4.8.6.1.2.1.1 *GES kimenő áramkör üzemmódú hívás-kezdeményezés*. Egy “AMS(R)S hívás-kezdeményezés” esemény (FITE 18) vétele az összedolgozó interfészben arra kell, hogy késztesse a GES áramköri üzemmódú szolgáltatást, hogy az egy egyedi alkalmazási referencia-számot jelöljön ki a hívás számára. Ha az AES nincs bejelentkezve, akkor a GES áramkör üzemmódú szolgáltatásnak egy “sikertelen hívás – küldjön hibajelzést” eseményt (BITE 20) kell továbbítania az összedolgozó interfészhez és minden hívási tevékenységet meg kell szüntetnie; ellenkező esetben a GES áramkör üzemmódú szolgáltatásnak a GES vezérlést fel kell kérnie a hívás részére történő C-csatorna források 4-43. táblázat szerinti C-csatorna Q számmal való kijelölésre.

Megjegyzés. – Ez azt jelenti, hogy a C-csatorna Q számát az adat-kapcsolati rétegben lévő áramkör üzemmódú kezdeti hívás jelzésben használt Q számból származtatják.

Ezt követően a GES áramkör üzemmódú szolgáltatásnak a következőket kell végrehajtania:

a) ha egy “hívó bont” esemény (FITE 22) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szűntetnie; vagy

b) ha a C-csatorna források nem állnak rendelkezésre, akkor a GES áramkör üzemmódú szolgáltatásnak egy “sikertelen hívás – hálózati torlódás” eseményt (BITE 12) kell továbbítania az összedolgozó interfészhez és minden hívási tevékenységet meg kell szűntetnie; vagy

c) ha a C-csatorna források rendelkezésre állnak, akkor a GES áramkör üzemmódú szolgáltatásnak egy olyan “hívás-bejelentés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítania, amelyet azonnal követ egy “C- csatorna kijelölés” CM-LIDU. Ezt követően a GES áramkör üzemmódú szolgáltatásnak a GES vezérlést fel kell kérnie a korábban kijelölt C-csatorna egység kijelölt frekvencián történő aktivizálására, majd a C-csatorna 4.8.6.1.2.1.2 pont szerinti létrehozására.

4.8.6.1.2.1.2 *GES kimenő C-csatorna létrehozás.* Amint az a 4.8 pontban máshol előírásra kerül, a GES áramkör üzemmódú szolgáltatásnak a következőket kell végrehajtania egy földi kezdeményezésű C-csatorna használatának létrehozására:

a) ha, akár a “hívás-bejelentés” vagy a “C-csatorna kijelölés” CM-LIDU legutolsó továbbítását követő tG16 másodpercen belül egy negatív “telefon-technikai nyugtázás” CM-LIDU kerül vételre, akkor a GES áramkör üzemmódú szolgáltatásnak a vett CM-LIDU-ban jelzett hiányzó CM-LIDU-t ismét továbbítania kell az adatkapcsolati réteghez, és további tG16 másodpercig várakoznia kell; vagy

b) ha semmi sem érkezik az AES áramkör üzemmódú szolgáltatástól, akár a “hívás-bejelentés”, vagy a “C-csatorna kijelölés” CM-LIDU utolsó továbbítását követő tG16 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak mindkét CM-LIDU-t ismét továbbítania kell az adatkapcsolati réteghez -és további tG16 másodpercig várakoznia kell. Ha a további tG16 másodperces periódust követően sem érkezik semmi, akkor a GES áramkör üzemmódú szolgáltatásnak egy “sikertelen hívás – vonal üzemen kívül” eseményt (BITE 17) kell az összedolgozó interfésznek küldenie, és egy “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a P-csatornán át az adatkapcsolati réteghez továbbítania. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie; ellenkezp esetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg az első “hívási folyamat – csatorna-megszakítás” CM-LIDU továbbítását követő tG23 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak ismét továbbítania kell a CM-LIDU-t. Ha a légijárműtől jövő vivőfrekvencia nem szűnik meg a második tG23 másodperces periódus lejártával, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

c) ha egy “hívás folyamat – hívási kísérlet eredménye" CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak egy megfelelő “sikertelen hívás” eseményt (BITE 12, 16 vagy 17) kell az összedolgozó interfészhez küldenie. Továbbá, a GES áramkör üzemmódú szolgáltatásnak tG23 másodpercet várakoznia kell a C-csatorna légijárműtől jövő vivőfrekvenciájának megszűnésére. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie, ellenkező esetben, ha a légijármű felől érkező vivőfrekvencia a periódus végére megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie. Ha a légijárműtől jövő vivőfrekvencia nem szűnik meg ugyanazon perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak a periódus minden hívás tevékenységét meg kell szüntetnie; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotot az ellenőrző funkcióhoz kell továbbítani.

d) ha egy “hívó bont” esemény (FITE 22) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak hat olyan “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania, amelyet egy “hívás folyamat – csatorna-megszakítás” CM-LIDU követ a P-csatornán keresztül. Ezt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtania a 4.8.6.1.2.1.5 pontban meghatározott C-csatorna felszabadítás őrző eljárást; vagy

e) ha egy “hívás folyamat – ellenőrzés” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívás folyamat – ellenőrzés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítania, majd végre kell hajtania a 4.8.6.1.2.1.3 pontban meghatározott GES kimenő C-csatorna folyamatossági ellenőrző eljárást.

4.8.6.1.2.1.3 *GES kimenő C-csatorna folyamatosság ellenőrzés.* A földi kezdeményezésre használandó C-csatorna áramkör folyamatosságának ellenőrzésekor a GES áramkör üzemmódú szolgáltatásnak a következőket kell elvégeznie:

a) ha tG34 másodperc telt el az első “hívás folyamat – ellenőrzés” CM-LIDU-nak az AES áramkör üzemmódú szolgáltatáshoz való küldése óta, akkor a GES áramkör üzemmódú szolgáltatásnak egy “sikertelen hívás – vonal üzemen kívül” eseményt (BITE 17) kell az összedolgozó interfészhez küldenie és egy “hívás folyamat – csatornaf-megszakítás” CM-LIDU-t kell a P-csatornán keresztül az adatkapcsolati réteghez továbbítania. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie; ellenkező setben, ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg a “hívás folyamat – csatornaf-megszakítás” CM-LIDU első továbbítását követő tG23 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak a CM-LIDU-t a P-csatornán keresztül ismét továbbítania kell és további tG23 másodpercig várakoznia kell. Ha a légijárműtől jövő vivőfrekvencia akármelyik periódus alatt megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie. Ha a légijárműtől jövő vivőfrekvencia a második periódus végére nem szűnik meg, akkor a GES áramkör üzemmódú szolgáltatásnak a periódus végén minden hívási tevékenységet meg kell szüntetni; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

b) ha nem telt el tG34 másodperc az első “hívás folyamat – ellenőrzés” CM-LIDU-nak az AES áramkör üzemmódú szolgáltatáshoz való küldése óta, akkor a GES áramkör üzemmódú szolgáltatásnak a következőket kell végrehajtania, miközben ezzel egyidőben minden tG35 másodpercben egy “hívás folyamat – ellenőrzés” CM-LIDU-t továbbít az AES áramkör üzemmódú szolgáltatás adatkapcsolati rétegéhez.

1) ha egy “hívás folyamat – hívási kisérlet eredménye” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak be kell fejeznie a “hívási folyamat – ellenőrzés” CM LIDU-k küldését az AES áramkör üzemmódú szolgáltatás részére. Ezt követően a GES áramkör üzemmódú szolgáltatásnak egy megfelelő “sikertelen hívás” eseményt (BITE 12, 16 vagy 17) kell az összedolgozó interfészhez továbbítania és tG23 másodpercet várakoznia kell a C-csatorna légijárműtől jövő vivőfrekvencia megszűnésére. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie; ellenkező esetben, ha a légijármű felől érkező vivőfrekvencia megszűnik a periódus végére, akkor a GES áramkör üzemmódú szolgálatnak a periódus végén minden hívási tevékenységet be kell fejeznie. Ha a légijárműtől jövő vivőfrekvencia nem szűnik meg ennek az időpontnak a lejártáig, akkor a GES áramkör üzemmódú szolgálatnak a periódus végén minden hívási tevékenységet be kell fejeznie; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

2) ha egy “hívó bont” esemény (FITE 22) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon át az adatkapcsolati réteghez továbbítania, meg kell állítania a “hívási folyamat – ellenőrzés” CM-LIDU-k továbbítását, majd végre kell hajtania a 4.8.6.1.2.1.5 pontban meghatározott GES kimenő C-csatorna felszabadítás őrző eljárását; vagy

3) ha egy “hívási folyamat – csatorna-megszakítás” CM-LIDU érkezik az AES áramkör üzemmódú szolgáltatástól, a GES áramkör üzemmódú szolgáltatásnak egy “hívott bont” eseményt (BITE 25) kell az összedolgozó interfészhez továbbítania és meg kell állítania a “hívás folyamat – ellenőrzés” CM-LIDU-k küldését. Ezt követően a GES áramkör üzemmódú szolgálatnak tG23 másodpercet várakoznia kell a C- csatorna légijárműtől jövő vivőfrekvenciájának megszűnésére. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, minden hívási tevékenységet meg kell szüntetnie; ellenkező esetben, ha a légijárműtől jövő vivőfrekvencia a periódus alatt megszűnik, a GES áramkör üzemmódú szolgáltatásnak minden hívást meg kell szüntetnie. Ha a légijárműtől jövő vivőfrekvencia nem szűnik meg ezen perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak a periódus végén minden hívási tevékenységet meg kell szüntetnie; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

4) ha egy pozitív “telefon-technikai nyugtázás” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítania a “hívás folyamat – tellenőrzés” CM-LIDU-k továbbítását. Ezt követően a GES áramkör üzemmódú szolgáltatásoknak egy “címzés befejezés” eseményt (BITE 5) kell küldeni az összedolgozó interfészhez és végre kell hajtani a 4.8.6.1.2.1.4 pontban meghatározott GES kimenő C-csatorna fenntartási eljárást; vagy

5) ha egy “hívás folyamat – kapcsolás” CM-LIDU érkezik, a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a “hívási folyamat – ellenőrzés” CM-LIDU-k továbbítását. Azt követően a GES áramkör üzemmódú szolgáltatásnak egy “címzés befejezés” eseményt (BITE 5) és egy “válasz” eseményt (BITE 22) kell küldeni az összedolgozó interfészhez, egy pozitív “telefon-technikai nyugtázás”-i CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani és végre kell hajtani a 4.8.6.1.2.1.4 pontban meghatározott GES kimenő C-csatorna fenntartási eljárást.

4.8.6.1.2.1.4 *GES kimenő C-csatorna fenntartás.* Amint az más helyen a 4.8 pontban már megkövetelt, a GES áramkör üzemmódú szolgáltatásnak biztosítania kell a földi telepítésű hálózat továbbító áramköre és a C-csatorna egység közötti áramköri útvonalat, majd a következőket kell végrehajtania a C-csatorna fenntartása céljából:

a) a ha egy “hívási folyamat – kapcsolás” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak egy pozitív “telefon-technikai nyugtázás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítania. Ha korábban nem érkezett egy azonos CM-LIDU a 4.8.6.1.2.1.2 pontban meghatározott GES kimenő C-csatorna létrehozási eljárás alatt, akkor a GES áramköri üzemmódú szolgáltatásnak az összedolgozó interfészhez szintén továbbítani kell egy “válasz” eseményt (BITE 22); vagy

b) ha egy “hívó bont” esemény érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani. Ezt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.1.5 pontban meghatározott GES kimenő C-csatorna-bontás őrző eljárását; vagy

c) ha a C-csatorna légijárműtől érkező vivőfrekvenciája több mint tG19 másodpercig kimarad, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívott bont” eseményt (BITE 25) kell az összedolgozó interfészhez továbbítani. Ezt követően a GES áramkör üzemmódú szolgáltatásnak hat “hívásfolyamat – csatorna- megszakítás” CM-LIDU-t kell a C-csatorna alsávon az adatkapcsolati réteghez küldeni és végre kell hajtani a 4.8.6.1.2.1.5 pontban meghatározott C- csatorna-bontás őrző eljárását; vagy

d) ha a C-csatornát egy magasabb elsőbbségű hívás miatt hátrább kell sorolni, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívott bont” eseményt (BITE 25) kell az összedolgozó interfészhez továbbítani. Azt követően a GES áramkör üzemmódú szolgáltatásnak hat “hívás folyamat – csatorna-megszkítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez küldeni, és végre kell hajtani a 4.8.6.1.2.1.5 pontban meghatározott GES kimenő C-csatorna bontás őrző eljárást; vagy

e) ha egy “hívás folyamat – csatorna-megszakítás” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívott bont” eseményt (BITE 25) kell az összedolgozó interfészhez továbbítani, és minden hívási tevékenységet meg kell szüntetni.

4.8.6.1.2.1.5 *GES kimenő C-csatorna-bontás őrző.* Egy földi kezdeményezésre használt C-csatorna felszabadításhoz a GES áramkör üzemmódú szolgáltatásnak a következőket kell végrehajtani, ahogy az már más helyen, a 4.8. pont ban leírásra került.

a) ha a C-csatorna légijárműtől jövő vivőfrekvencia megszűnik a hat közül utolsónak küldött “hívási folyamat – csatorna-megszakítás” CM-LIDU továbbításától számított tG17 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni; vagy

b) ha a C-csatorna légijárműtől jövő vivőfrekvenciája nem szűnik meg a hat közül utolsóként továbbított “hívás folyamat – csatorna-megszakítás” CM-LIDU elküldésétől számított tG17 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak tizenkettő “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon és egy “hívás folyamat – csatorna-megszakítás” CM-LIDU-t a P-csatornán keresztül az adatkapcsolati réteghez továbbítani. Ha a légijárműtől jövő frekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie. Ellenkező esetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia megszűnik a “hívás folyamat – csatorna-megszakítás” CM-LIDU-nak a P-csatornán való továbbításától számított tG18 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie. Ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg ugyanazon tG18 másodperces perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak a periódus végén minden hívási tevékenységet meg kell szüntetni.

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

c) ha egy "hívás folyamat - csatorna-megszakítás" CM-LIDU kerül vételre, akkor a GES áramkör üzemmódú szolgáltatásnak várnia kell a C-csatorna alsávnak a légijárműtől jövő megszűntetésére. Ha a légijárműtől jövő vivőcsatorna nincs jelen, akkor meg kell szűntetni minden hívási tevékenységet; ellenkező esetben, ha a "hívás folyamat - csatorna-megszakítás" CM-LIDU vétele után tG18 másodpercen belül a légijárműtől jövő C-csatorna vivőhullám megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szűntetni. Ha a légijárműtől jövő vivőfrekvencia nem szűnik meg ezen az időponton belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet be kell fejeznie.

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

4.8.6.1.2.2 *GES beérkező áramkör üzemmódú eljárás.* Ezt az eljárást a következő egymással összefüggő eljárásoknak kell meghatározni:

a) GES bejövő áramkör üzemmódú hívás-kezdeményezés – 4.8.6.1.2.2.1;

b) GES bejövő két-irányú beállítás – 4.8.6.1.2.2.2;

c) GES bejövő C-csatorna létrehozás – 4.8.6.1.2.2.3;

d) GES bejövő földi csatorna befejezés – 4.8.6.1.2.2.4;

e) GES bejövő C-csatorna fenntartás – 4.8.6.1.2.2.5;

f) GES bejövő C-csatorna bontás őrzés – 4.8.6.1.2.2.6.

4.8.6.1.2.2.1 *GES beérkező áramkör üzemmódú hívás-kezdeményezés.* Egy egyedi alkalmazási referencia-számmal rendelkező “hozzáférési kérés – telefon” CM-LIDU egy AES-től való vételekor, a GES áramkör üzemmódú szolgáltatásnak fel kell kérnie a GES vezérlést egy C-csatorna kijelölésére, a 4-43. táblázatbeli C-csatorna Q számmal ellátott C-csatorna forrásokból.

Megjegyzés. – Ez azt jelenti, hogy a C-csatorna Q számát az adatkapcsolati rétegben lévő áramkör üzemmódú kezdeti hívás-jelzésben használt Q számból kell származtatni.

A GES áramkör üzemmódú szolgáltatásnak ezután a következőket kell végrehajtani:

a) ha egy “hívás folyamat – csatorna-megszakítás” CM-LIDU érkezik a GES vezérlés C-csatorna források kijelölését megelőzően, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni; vagy

b) ha C-csatorna források nem állnak rendelkezésre, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívási folyamat – hívási kísérlet eredménye” CM-LIDU-t kell a P-csatornán keresztül az adatkapcsolati réteghez továbbítani. Ezt követően a GES áramkör üzemmódú szolgáltatásnak tG9 másodpercet várakoznia kell az aktuális alkalmazási referencia-számmal bíró eredeti “hozzáférés kérés – telefon” CM-LIDU megismétlésének potenciális vételére. Ha egy ilyen további CM-LIDU érkezik az AES áramkör üzemmódú szolgáltatástól, akkor a GES áramkör üzemmódú szolgáltatásnak a “hívás folyamat – hívás kísérlet eredménye” CM-LIDU-t ismét továbbítania kell, ellenkező esetben a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szűntetni a kezdeti tG9 másodperces időtartam lejárta után.

Máskülönben, a GES áramkör üzemmódú szolgáltatásnak egy “C-csatorna kijelölés” CM-LIDU-t kell az adatkapcsolati réteghez továbbítani. Ezzel egyidejűleg, a GES áramkör üzemmódú szolgáltatásnak fel kell kérnie a GES vezérlést a korábban kijelölt C-csatorna egység aktivizálására. Bármely, a C-csatorna egység aktivizálását megelőzően vett (azonos alkalmazási referencia-számú) redundáns “hozzáférési kérés – telefon” CM-LIDU-t figyelmen kívül kell hagyni. Ezt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.2 pontban meghatározott GES beérkező két-irányú beállítási eljárást.

Megjegyzés. – A C-csatorna egység aktivizálását megelőzően előfordulhat redundáns "hozzáférési kérés – telefon" CM-LIDU-k vétele; az ilyen CM-LIDU AES által végzett sorozatos továbbításának eredményeként. A redundáns CM-LIDU-k következmény nélkül figyelmen kívül hagyhatók.

4.8.6.1.2.2.2 *GES bejövő két-irányú beállítás.* Ahogy az a 4.8 pontban más helyen is előírásra került, a GES áramkör üzemmódú szolgálatnak el kell végezni a "hozzáférési kérés – telefon" CM-LIDU-ban meghatározott hálózati azonosító útvonal-kiválasztás vizsgálatát, miközben ezzel egyidejűleg a következőket is teljesíti:

1. Megjegyzés. – Az útvonal-kiválasztási elemzést egy olyan GES-specifikus eljárásnak tekintjük, amelyben a hálózati azonosítót használják azon beszéd-üzemű áramkörök specifikus csoportjának azonosítására, amelyek egymással összekötik a GES-t és a megkívánt földi telepítésű áramkör kapcsolású beszéd-üzemű hálózatokat.

2. Megjegyzés. – Az ebben az al-részben szereplő logikai egység kezdeményezi a földi telepítésű hívás befejezést, miközben ezzel egyidejűleg kezdeményezi a C-csatorna létrehozását.

a) ha egy kiegészítő aktuális alkalmazási referencia-számmal bíró "hozzáférési kérés – telefon" CM-LIDU érkezik az AES áramkör üzemmódú szolgáltatástól a legutolsó "C-csatorna kijelölés"-i CM-LIDU adatkapcsolati réteghez történt továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak a "C-csatorna kijelölés" CM-LIDU-t ismét továbbítania kell az AES áramkör üzemmódú szolgáltatáshoz; vagy

b) ha egy "hívás-információ – szolgálati cím" CM-LIDU nem kerül vételre az utolsó "csatorna kijelölés" CM-LIDU adatkapcsolati réteghez történt továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES beérkező bontás őrző eljárást; vagy

c) ha egy "hívás folyamat – csatorna-megszakítás" CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell várni a C-csatorna légijárműtől jövő vivőfrekvencia megszűnését. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, minden hívási tevékenységet meg kell szüntetnie; ellenkező esetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia a "hívás folyamat – csatorna-megszakítás" CM-LIDU vételét követő tG24 másodpercen belül szűnik meg, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni. Ha a vivőfrekvencia nem szűnik meg ugyanazon tG24 másodperces perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet a periódus végén; kell megszűntetni; vagy

Megjegyzés. – Egy légijárműtől jövő nem megszüntetett frekvencia állapotát egy ellenőrző funkcióhoz kell továbbítani.

d) ha egy "hívás információ – szolgálati cím" CM-LIDU kerül vételre a C-csatorna egység aktivizálását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak meghatározatlan ideig minden tG10 másodpercben a "hívás folyamat – ellenőrzés" CM-LIDU-kat kell továbbítania; vagy

4) ha az útvonal-kiválasztási elemzés azt mutatja, hogy a hívás befejezése akár a GES kapcsoló-berendezésében, akár a földfelszíni hálózathoz vezető továbbító áramkör csoportban lévő torlódás miatt van blokkolva, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellenőrzést" CM-LIDU-k továbbítását, és azt követően hat "hívás folyamat – csatorna-megszakítás" CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez küldenie. Ezt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzés eljárást; vagy

f) ha az útvonal-kiválasztási elemzés sikeresen talál a földfelszíni hálózathoz egy továbbító áramkört, akkor a GES áramkör üzemmódú szolgáltatásnak egy "AMS(R)S hívás-kezdeményezés" eseményt (FITE 18) kell a földfelszíni hálózatnál lévő összedolgozó interfészhez továbbítani. Ha egy "hívási nformáció – szolgálati cím" CM-LIDU már megérkezett, akkor a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.4 pontban meghatározott GES bejövő földfelszíni befejezési eljárást; ellenkező esetben a GES áramkör üzemmódú szolgáltatásnak várakoznia kell a 4.8.6.1.2.2.3 pontban meghatározott GES bejövő C-csatorna létrehozási eljárás végrehajtásával a C-csatorna kapcsolat létrehozására.

4.8.6.1.2.2.3 *GES bejövő C-csatorna létrehozása*. Ahogy az a 4.8 pont más alpontjaiban már előírásra került, a GES áramkör üzemmódú szolgáltatásnak a következőket kell végrehajtani, miközben várakozik a C-csatorna létrehozására:

Megjegyzés. – Ebben az al-részben lehetőség van arra, hogy jelző események kerüljenek vételre a földfelszíni hálózattól. Ezért, ha bármilyen telefon-technikai összedolgozó esemény érkezik a földfelszíni hálózatnál lévő összedolgozó interfészhez, azokat a következő al-részekben meghatározott logikai egységek általi értelmezése céljából sorrendi sorozatban kell tartani.

a) ha egy kiegészítő aktuális alkalmazási referencia-számmal bíró "hozzáférési kérés – telefon" CM-LIDU kerül vételre az AES áramkör üzemmódú szolgáltatástól, a legutolsó "C-csatorna kijelölés" CM-LIDU adatkapcsolati réteghez történt továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak a "C-csatorna kijelölés" CM-LIDU-t ismét továbbítani kell az AES áramkör üzemmódú szolgáltatáshoz; vagy

b) ha egy "hívás folyamat – csatorna-megszakítás" CM-LIDU érkezik a C-csatorna aktivizálását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellenőrzés" CM-LIDU-k továbbítását, és egy "hívó bont" eseményt (FITE 22) kell küldenie az összedolgozó interfészhez. (Ha további "hívás folyamat – csatorna-megszakítás" CM-LIDU-k kerülnek vételre, akkor a GES áramkör üzemmódú szolgáltatásnak figyelmen kívül kell hagyni azokat.) Azt követően a GES áramkör üzemmódú szolgáltatásnak a "hívás folyamat – csatorna-megszakítás" CM-LIDU vételét követően tG24 másodpercet kell várakozni a C-csatorna légijárműtől jövő vivőfrekvencia megszűnésére. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, minden hívási tevékenységet meg kell szüntetnie; ellenkező esetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia a tG24 másodperces perióduson belül megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie. Ha a légéijárműtől jövő vivőfrekvencia nem szűnik meg ugyanezen az időtartamon belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szűntetni az időtartam végén;vagy

Megjegyzés. – Egy légijárműtől jövő nem megszüntetett frekvencia állapotát egy ellenőrző funkcióhoz kell továbbítani.

c) ha nem érkezik egy "hívás információ-szolgálati cím" CM-LIDU a legutolsó "C-csatorna kijelölés" CM-LIDU-nak az adatkapcsolati réteghez történt továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak egy "hívó bont" eseményt (FITE 22) kell küldeni az összedolgozó interfészhez ,és végre kell hajtania 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzési eljárást; vagy

d) ha egy "hívás információ – szolgálati cím" CM-LIDU érkezik a C-csatorna egység aktivizálását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak meghatározatlan időn keresztül, minden tG10 másodpercben a "hívási folyamat – ellenőrzés" CM-LIDU-kat kell elküldenie, és végre kell hajtania a 4.8.6.1.2.2.4 pontban meghatározott GES beérkező földfelszíni befejezési eljárást.

4.8.6.1.2.2.4 *GES bejövő földfelszíni befejezés.* Miközben a GES áramkör üzemmódú szolgáltatás a földfelszíni hálózaton keresztül létrehozandó hívás befejezésére vár, biztosítania kell a C-csatorna egység és a földfelszíni hálózat továbbító áramköre közötti áramköri útvonalat, miközben ezzel egyidejűleg minden tG10 másodpercben egy "hívási folyamat – ellenőrzés" CM-LIDU-t továbbít az adatkapcsolati réteghez, meghatározatlan időn keresztül. Ezenkívól a következőket is el kell végeznie:

Megjegyzés. – Ezen a ponton a GES-en keresztül létrejön az áramkör folyamatosság a C-csatorna és a földfelszíni hálózati áramkör között. A hívás befejezése a hálózaton keresztül még folyamatban van és a hálózat hívási folyamatának hangjai hallhatók lehetnek a légijárművön lévő fél számára. Ha a hívott fél válaszol a hívási kisérletre, ezt a földfelszíni hálózattól érkező "válasz" esemény (BITE 22) vétele jelzi az összedolgozó interfészben.

a) ha a C-csatorna légijárműtől jövő vivőfrekvencia több mint tG13 másodpercre megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak egy "vevő bont" eseményt (FITE 22) kell az összetdolgozó interfészhez továbbítani. A FITE 22 esemény elküldése után, a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellelnőrzés" CM-LIDU-k küldését. Ezt követően a GES áramkör üzemmódú szolgáltatásnak hat "hívási folyamat – csatornaf-megszakítás" CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani. Azt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontási őrzés eljárást; vagy

b) ha akár egy "bejövő oldal felszabadítása" esemény (BITE 29) vagy egy "sikertelen hívás" esemény (BITE 12, 14, 15, 16, 17 vagy 20) érkezik az összedolgozó interfésztől, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítania a "hívási folyamat – ellenőrzés" CM-LIDU-k továbbítását. Ezt követően a GES áramkör üzemmódú szolgáltatásnak hat "hívás folyamat – csatorna-megszakítás" CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani. Azt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzési eljárást; vagy

c) ha egy "hívás folyamat – csatorna-bontás" CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellenőrzés" CM-LIDU-k továbbítását, és egy "hívó bont" eseményt (FITE 22) kell az összedolgozó interfészhez küldeni. (Ha további "hívás folyamat – csatorna-bontás" CM-LIDU-k érkeznek, a GES áramkör üzemmódú szolgáltatásnak azokat figyelmen kívül kell hagyni). Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie; egyébként, ha a C-csatorna légijárműtől jövő vivőfrekvencia tG14 másodpercen belül megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetnie. Ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg ugyanezen perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni a periódus végén; vagy

Megjegyzés. – Egy légijárműtől jövő nem megszüntetett frekvencia állapotát egy ellenőrző funkcióhoz kell továbbítani.

d) ha egy "címzés befejezés" esemény (BITE 5) vagy egy "küldés befejezve" esemény (BITE 27) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellenőrzés" CM-LIDU-k küldését. Ezt követően minden tG10 másodpercben egy "hívás folyamat – hívás kisérlet eredménye" CM-LIDU-t kell az adatkapcsolati réteg felé továbbítania, addig, amíg egy pozitív "telefon-technikaii nyugtázás" CM-LIDU nem érkezik. Ha a "hívás kisérlet – hívás kisérlet eredménye" CM-LIDU első továbbítását követő tG11 másodpercen belül nem érkezik pozitív "telefon-technikai nyugtázás" CM-LIDU, akkor a GES áramkör üzemmódú szolgáltatásnak egy "hívó bont" eseményt (FITE 22) kell az összedolgozó interfészhez továbbítani, hat "hívási folyamat - csatorna-megszakítás" CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez küldeni, és végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzési eljárást, egyéb esetekben a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.5 pontban meghatározott GES beérkező C-csatorna fenntartási eljárást; vagy

e) ha egy "válasz" esemény (BITE 22) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell állítani a "hívás folyamat – ellenőrzés" CM-LIDU-k továbbítását. Azt követően minden tG10 másodpercben egy "hívás folyamat – kapcsolás" CM-LIDU-t kell küldenie az adatkapcsolati réteghez addig, amíg egy pozitív "telefon-technikaii nyugtázás" CM-LIDU nem érkezik. Ha nem érkezik egy pozitív "telefon-technikai nyugtázás" CM-LIDU az első "hívás folyamat –

kapcsolás” CM-LIDU továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak egy “vhívó bont” eseményt (FITE 22) kell az összedolgozó interfésznek küldenie, hat “hívási folyamat – csatorna-bontás” CM-LIDU-t kell a C-csatorna alsávon keresztül továbbítani az adatkapcsolati réteghez, és végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzési eljárást, ellenkező esetben, a GES áramkör üzemmódú szolgálatnak végre kell hajtani a 4.8.6.1.2.2.5 pontban meghatározott GES bejövő C-csatorna fenntartási eljárást.

4.8.6.1.2.2.5 *GES bejövő C-csatorna fenntartás.* A GES áramkör üzemmódú szolgáltatásnak biztosítani kell a végpont-végpont közötti áramkör üzemmódú kapcsolat folyamatosságát, amíg a következők valamelyike be nem következik:

a) ha egy “válasz” esemény (BITE 22) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak minden tG10 másodpercben egy “hívási folyamat – kapcsolás” CM-LIDU-t kell az adatkapcsolati réteghez továbbítani, amíg egy pozitív “telefon-technikai nyugtázás” CM-LIDU nem érkezik. Ha nem érkezik pozitív “telefon-technikai nyugtázás” CM-LIDU az első “hívási folyamat – kapcsolás” CM-LIDU továbbítását követő tG11 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak egy “hívó bont” eseményt (FITE 22) kell küldeni az összedolgozó interfészhez, hat “hívási folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani és végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzés eljárást. Ellenkező esetben a GES áramkör üzemmódú szolgáltatásnak biztosítani kell a végpont-végpont közötti áramkör üzemmódú kapcsolat folyamatosságát; vagy

b) ha egy “hívott bont” esemény (BITE 25) érkezik az összedolgozó interfészhez, akkor a GES áramkör üzemmódú szolgáltatásnak hat “hívás folyamat – csatornamegszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez továbbítani. Azt követően a GES áramkör üzemmódú szolgáltatásnak végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES beérkező bontási őrzés eljárást; vagy

c) ha a C-csatorna légijárműtől jövő vivőfrekvencia több mint tG13 másodpercig kimarad, akkor a GES áramkör üzemmódú szolgáltatásnak “hívó bont” eseményt (FITE 22) kell az összedolgozó interfésznek küldeni. Azt követően a GES áramkör üzemmódú szolgáltatásnak hat “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati réteghez toábbítani és végre kell hajtani a 4.8.6.1.2.2.6 pontban meghatározott GES bejövő bontás őrzési eljárást; vagy

d) ha egy “hívás folyamat – csatorna-megszakítás” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak “hívó bont” eseményt (FITE 22) kell az összedolgozó interfészhez küldeni. (Ha további “hívás folyamat – csatorna-megszakítás” CM-LIDU-k érkeznek, akkor a GES áramkör üzemmódú szolgáltatásnak azokat figyelmen kívül kell hagyni.) Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie; ellenkező essetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia a “hívás folyamat – csatorna-megszakítás” CM-LIDU vételét követő tG14 másodpercen belül nem szűnik meg, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni. Ha a C- csatorna légijárműtől jövő vivőfrekvencia ugyanazon tG14 másodperces perióduson belül megszűnik, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni a periódus végén.

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát egy ellenőrző funkcióhoz kell továbbítani.

4.8.6.1.2.2.6 *GES bejövő bontás őrzés*. Egy légi kezdeményezési célra használt C-csatorna bontásához a GES áramkör üzemmódú szolgáltatásnak a következőket kell elvégezni, ahogy az a 4.8 pont szerint szükséges:

a) ha a C-csatorna légijárműtől jövő vivőfrekvencia megszűnik a hat “hívás folyamat – csatorna-megszakítás” CM-LIDU utolsó CM-LIDU-jának továbbítását követő tG12 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni; vagy

b) ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg a hat “hívás folyamat – csatorna-megszakítás” CM-LIDU utolsó CM-LIDU-jának továbbítását követő tG12 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak olyan tizenkettő “hívás folyamat – csatorna-megszakítás” CM-LIDU-t kell a C-csatorna alsávon keresztül az adatkapcsolati rétegnek továbbítani, amelyet egy a P-csatornán keresztül küldött “hívás folyamat – csatorna-megszakítás” CM-LIDU követ. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetni. Ellenkező esetben, ha a C-csatorna légijármű felől érkező vivőfrekvencia megszűnik a P-csatornán keresztül küldött “hívás folyamat – csatorna-megszakítás” CM-LIDU továbbítását követő tG14 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni. Ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg ugyanazon tG14 másodperces perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni a periódus végén; vagy

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

c) ha egy “hívás folyamat – csatorna-megszakítás” CM-LIDU érkezik, akkor a GES áramkör üzemmódú szolgáltatásnak meg kell várnia a C-csatorna légijárműtől jövő vivőfrekvencia megszűnését. Ha a légijárműtől jövő vivőfrekvencia nincs jelen, akkor minden hívási tevékenységet meg kell szüntetnie, ellenkező esetben, ha a C-csatorna légijárműtől jövő vivőfrekvencia megszűnik a “hívás folyamat – csatorna-megszakítás” CM-LIDU vételét követő tG14 másodpercen belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni. Ha a C-csatorna légijárműtől jövő vivőfrekvencia nem szűnik meg ugyanazon tG14 másodperces perióduson belül, akkor a GES áramkör üzemmódú szolgáltatásnak minden hívási tevékenységet meg kell szüntetni a periódus végén.

Megjegyzés. – Egy légijárműtől jövő meg nem szüntetett frekvencia állapotát az ellenőrző funkcióhoz kell továbbítani.

4.8.7 Az ATS-specifikus földi telepítésű hálózatok szabványai

Megjegyzés. – A légiforgalmi beszéd-üzemű áramkörök kapcsolási és jelzési útmutató anyagát a 183. sz. ICAO Körlevél – ATS Beszéd-üzemű áramkörök – Kapcsolt hálózati tervezés, és az I. Rész A-Függeléke tartalmazza.

4.8.7.1 *Zárt felhasználói csoport.* Az AMS(R)S hangcsatornás szolgálatot, ideértve a légijárművek és földi telepítésű hálózatok összekapcsolását, egy zárt felhasználói csoportnak kell tekinteni olyan mértékben, hogy az egy nem-nyilvános biztonsági szolgáltatás, és amelyhez csak az ATS és az AOC felhasználók férnek hozzá és ezt szigorúan a biztonsági tájékoztatások továbbítására használják.

Megjegyzés. – A zárt felhasználói csoport meghatározása értelmileg magába foglalja azt, hogy érvényben van egy saját számozási terv. Egy biztonsági szolgálat telefon-technikai számozási tervének nem kell megfelelni a CCITT E. 163. Ajánlásban meghatározott nemzetközi nyilvános kapcsolt telefon-hálóat (PSTN) számozási tervére előírtaknak.

4.8.7.2 *Biztonsági földi telepítésű saját hálózatok.* A GES-nek tandemban együtt kell működnie az ATS igazgatóságok és a légijármű üzemeltetők által megvalósítható saját földi hálózatokkal. Ezeknek a hálózatoknak kell biztosítani a GES létesítmények és a megfelelő ATS, vagy légijármű üzemeltetők között az összeköttetési képességet és együtt kell működniük az itt meghatározott GES áramkör üzemmódú eljárásokkal.

4.8.7.2.1 A GES és az igazgatóságok vagy légijámű üzmeltetők közötti légiforgalmi beszéd-üzemű áramkörök kapcsolási és jelző interfészeinek használatát egyedi megállapodások alapján kell meghatározni.

4.8.7.2.1.1 **Ajánlás.** – *A földi telepítésű hálózatoknak biztosítani kell:*
a) a földi félhez való elsőbbségi hozzáférést anélkül, hogy az kedvezőtlenül befolyásolja a földi fél bármely meglévő összeköttetését;

b) automatikus visszahívás azokban az esetekben, amikor egy hívást egy foglaltsági feltétel blokkol a földi félnél;

c) kitérő útvonalak lehetősége, amikor szükséges és megvalósítható;

d) a bejövő légi kezdeményezésű hívások feladójának azonosítását, amikor megvalósítható; és

e) hívá-továbbítást, amikor szükséges és megvalósítható.

Megjegyzés. – A hívás-továbbítás biztosítja, hogy a kezelő személyzettel időszakosan el nem látott munkahelyekre irányuló hívások automatikusan átirányuljanak egy megfelelő kezelői munkahelyre.

4.8.7.2.2 A földi telepítésű hálózat által használt csengető hang jellemzőinek, a foglaltsági jelzésnek és a torlódási jelzésnek meg kell felelni az ITU CCITT E. 180. Ajánlásnak.

Megjegyzés. – Az ITU CCITT ES. 180. Ajánlás részleteit a CCITT Kék Könyv, II. Kötet – II-2 .Füzete tartalmazza.

4.8.7.3 *Egy foglalt földi félhez irányuló légi kezdeményezésű kísérletek regisztrációja.* Egy földi telepítésű hálózat vagy földi rendeltetési hely részére felajánlott összes hívás kisérletet a 4.8.3.2 pontban meghatározott elsőbbségi és előjogi szolgáltatással kell végrehajtani.

4.8.7.3.1 **Ajánlás.** – *Ha a földi félnél egy légi kezdeményezésű hívás kisérlet foglaltság miatt blokkolva van, akkor a földi felhasználó, vagy a földi hálózat által a hívás kisérlet rögzítését fenn kell tartani az eredeti légijárműnek szóló földi kezdeményezésű visszahívás céljára. A GES-től nem kell megkívánni olyan specifikus funkciók ellátását, amelyek lehetővé teszik egy blokkolt hívás kisérlet GES-vezérelt belső sorrendben való tartását későbbi szolgáltatás céljára.*

4.8.8 Telefon-technikai számozási terv

4.8.8.1 *Általános*. Az AMS(R)S áramkör üzemmódú szolgáltatás számára egy általános telefon-technikai számozási tervet kell létrehozni a földi telepítésű hálózatokkal való általános együttműködés elősegítése céljából.

4.8.8.2 LÉGIJÁRMŰ SZÁMOZÁS

4.8.8.2.1 *Specifikus követelmények.* A légijármű címzési tervben 10 számjegyből álló rögzített hosszúságú címet kell kijelölni. Minden kiosztott címnek azonos hosszúságúnak kell lenni.

4.8.8.2.2 *Címzés elemzése.* Az egyedi légijármű rendeltetési helyek számozásának tartalmazni kell a légijármű nyolc oktális számjegyben kifejezett AES azonosítóját, amelyhez kapcsolódik a decimális 00-99 közötti számozású, légijárművön lévő hívó vagy hívott terminál decimális két-számjegyes azonosítója. Az első 10 terminál címet (00 - 09) ATS alkalmazások céljára kell fenntartani.

4.8.8.2.2.1 Az AES áramkör üzemmódú szolgáltatásnak egy saját, 100 bevitelből álló terminál azonosító cím-helyet kell fenntartani, a légijárművön lévő minden AMS(R)S biztonsági terminálhoz. Ezen cím-hely használatát, szemben a nem biztonsági szolgálat által használt párhuzamos cím-helyével, a hívási kisérlethez társított elsőbbségbőll kell az AES áramkör üzemmódú szolgáltatásnak származtatni.

4.8.8.2.2.2 **Ajánlás.** – *A légijármű gyártók és az ATS igazgatóságok közötti későbbi kölcsönös egyezményeknek kell biztosítani, hogy a "00" légijármű terminál azonosító minden földi kezdeményezésű, egy légijármű felé irányuló, biztonsági hang-csatornás hívás alapértelmezésű rendeltetési helyként kerüljön kijelölésre. A fedélzeti hangfrekvenciás kezelő rendszereknek az ezen terminál azonosító felé küldött bármely beérkező híváshoz hozzá kell társítani egy megfelelő, fedélzeten rendelkezésre álló hang-csatornát (pl.: fedélzeti hangfrekvenciás panelen lévő "SATCOM 1" vagy "SATCOM 2"). A "05"–"09" terminál azonosítókat a fax-készülékek, vagy más digitális terminálok jövőbeni alkalmazására kell fenntartani.*

4.8.8.3 FÖLDI SZÁMOZÁS

4.8.8.3.1 *Földi rendeltetési hely címzés.* Amikor létezik egy, speciálisan biztonsági áramkör üzemmódú szolgáltatások támogatására tervezett saját hálózat, akkor az összes földi címnek 10 számjegy hosszúságúnak kell lenni. Más esetekben a biztonsági hívások földi címei változó hosszúságúak, és összhangban kell lenniük annak a hálózatnak a számozási tervével, amely hálózathoz a hívás irányul.

4.8.8.3.1.1 *Címzés elemzés.* Amikor létezik egy speciálisan biztonsági áramkör üzemmódú szolgáltatások támogatására tervezett saját hálózat, akkor az egyedi földi rendeltetési helyek számozásának a következő számjegy sorozatból kell állnia:
a) egy "8"-as számjegy;

b) a rendeltetési Államot jelölő három számjegyből álló országkód;

c) egy három-számjegyes szolgáltatás kód, amely a rendeltetési Államban lévő rendeltetési létesítményt jelöli. Egy Államon belül az egyedi létesítményeknek kijelölendő kód értékeket a rendeltetési Állam igazgatóságának kell meghatározni és közzétenni; és
d) egy három-számjegyes ügynökség kód, amely a rendeltetési létesítményben lévő rendeltetési ügynökséget jelöli. Egy létesítményen belül az egyedi ügynökségeknek kiosztandó kód értékeket a létesítményt ellenőrző szervezeti entitásnak kell meghatározni és közzétenni.

1. Megjegyzés. – A GES-től nem követelik meg egy légi kezdeményezésű AMS(R)S hívás időtartama alatt vett egyetlen földi cím konvertálását sem. A földi telepítésű hálózat bármely címet átkonvertálhat - ha szükséges - a hálózat számára megkövetelt címre.

2. Megjegyzés. – A GES üzemeltetők a hálózat üzemeltetőjével kötött egyezmény alapján átkonvertálhatnak egy földi címet egy földi hálózat által megkövetelt címre.

3. Megjegyzés. – Az ország kódok az ITU Nemzetközi Rádió-Szabályzat 43. Függeléke 1. Táblázata szerinti ITU ország kódok alapján kerültek meghatározásra. Ugyanakkor, országonként csak egy kód használható az AMS(R)S szolgálat biztonsági és szabályozó kommunikáció számára.

4.8.8.3.2 *Hálózati azonosító.* A "10-es" hálózati azonosítót kell alkalmazni minden légi kezdeményezésű biztonsági hívásban, amelyek egy speciálisan biztonsági áramkör üzemmódú szolgáltatások támogatására tervezett saját hálózathoz irányulnak.

Megjegyzés. – A GES üzemeltetők, valamint az érintett ATS igazgatóságok és légijármű üzemeltetők közötti előzetes egyezmény alapján kiegészítő hálózati azonosítók alkalmazhatók a biztonsági összeköttetések esetében.

4.9 LÉGIJÁRMŰ FEDÉLZETÉN ELHELYEZETT FÖLDI ÁLLOMÁS (AES) KEZELÉSE

4.9.1 Általános

Az AES kezelési funkcióknak tartalmazni kell az AES-ben végrehajtott funkciókat egy bejelentkezési folyamat kezdeményezésére és végrehajtására, egy bejelentkezési állapot fenntartására, egy kijelentkezési folyamat kezdeményezésére és végrehajtására, valamint egy GES-sel való adat- és beszéd-összeköttetés kezelésére.

4.9.2 AES kezelési interfészek

4.9.2.1 Az AES kezelésnek a következő AES entitások számára kell interfészeket biztosítania:

a) al-hálózati réteg;
b) adatkapcsolati réteg;
c) fizikai réteg;
d) áramkör üzemmódú szolgáltatás.

4.9.2.1.1 *AL-HÁLÓZATI RÉTEG*

Az AES kezelés és az al-hálózati réteg között kicserélt információknak a következőket kell tartalmazni az al-réteg felé:

1) bejelentkezési állapot: bejelentkezés, kezdeti vagy megújított/kijelentkezett;

2) bejelentkezési GES azonosító (ha be volt jelentkezve);

3) AES azonosító.

4.9.2.1.2 *ADATKAPCSOLATI RÉTEG*

Az AES kezelés és az adatkapcsolati réteg között kicserélt információknak a 4.5.2 pontban leírt adatkapcsolati réteg adat egység (LIDU) formáját kell öltenie. Az ezen interfészen keresztül kicserélt összes LIDU-nak a 4-44. táblázatban meghatározottak szerintinek kell lenni, azon kivétellel, hogy az AES vezérléshez küldött információknak is tartalmazni kell olyan interfész kezelő információt, ami az AES kezelést egy R-csatorna véletlenszerű kiválasztására utasítja.

Megjegyzés. – Az adatkapcsolati réteg a jel egységeket a vett LIDU-kban lévő információknak megfelelően állítja össze. A LIDU formátumok nincsenek előírva. A jel egység formátumai a 4. Fejezet 2. Függelékében találhatók.

4.9.2.1.3 *FIZIKAI RÉTEG*

Az AES kezelése és a fizikai réteg között kicserélt információnak a következőket kell tartalmazni:
a) a fizikai réteg felé:
1) Az adó- és a vevő-csatorna egységek frekvenciái;

2) csatorna egység mód-kiválasztás (R-, T- vagy C-csatorna);

3) csatornaátviteli sebesség;

4) adó-teljesítmény beállítások;

5) csatorna egység száma;

b) a fizikai réteg felől:

1) P-csatorna veszteség/teljesítmény-csökkenés jelzése,

2) P-csatorna szinkronizáció jelzése;

3) minden egyes, C-csatornát vevő csatorna egység számított bit-hiba aránya..

4.9.2.1.4 *ÁRAMKÖR ÜZEMMÓDÚ SZOLGÁLTATÁS*

Az AES kezelése és az áramkör üzemmódú szolgáltatás közötti információknak a következőket kell tartalmazni:

a) az áramkör üzemmódú szolgáltatás felé:

1) bejelentkezési állapot, (vagyis bejelentkezett/kijelentkezett);

2) bejelentkezési GES azonosító;

3) csatorna egység száma, a csatorna egység kijelölés számára válaszul minden egyes kérésre;

b) az áramkör üzemmódú szolgáltatás felől:

1) egy adó-csatorna egység és társított Q-szám kijelölésére szóló kérés, alkalmazási referencia-szám, frekvencia, csatorna-átviteli sebesség és kezdő EIRP;

2) egy vevő-csatorna egység és társított Q-szám kijelölésére szóló kérés, alkalmazási referencia-szám, frekvencia és csatorna-átviteli sebesség;

3) egy R-csatorna véletlenszerű kiválasztására szóló parancs.

4.9.3 AES kezelési funkciók

4.9.3.1 Az AES kezelésnek a következő funkciókat kell végrehajtania:

a) AES táblázat-kezelés;

b) AES bejelentkezési állapot kezelés;

c) AES csatorna-kezelés.

4.9.3.2 AES TÁBLÁZAT-KEZELÉS

4.9.3.2.1 Az AES táblázat-kezelésnek a következő két táblázatot kell fenntartania:

a) rendszer táblázat;

b) bejelentkezés-megerősítő tábla.

4.9.3.2.2 *RENDSZER TÁBLÁZAT*

A műholdas szolgáltatási területen belül ennek a táblázatnak a tartalmát minden egyes sugárnyaláb esetében a GES által biztosítani kell (lásd 4.10.4.2.2).

4.9.3.2.3 *AES RENDSZER TÁBLÁZAT FELFRISSÍTÉS*

A rendszertáblázatok tartalmának felfrissítése céljából az AES kezelésnek a következő eljárásokat kell alkalmazni:

a) *A bejelentkezést megelőzően.* Miután az AES kezelés egy műhold/sugárnyaláb-azonosító P_{smc} frekvencián egy adás-sorozatot vesz, meg kell határoznia, hogy a vett sorozat rész- vagy teljes sorozat (lásd
4.10.4.5.2) és azt követően a következőket kell tenni:

1) ha egy rész-sorozat, akkor a vett rész-sorozatban meghatározott helyesbítő számot az AES kezelésnek össze kell hasonlítania a rendszer táblázatban lévő megfelelő aktuális adatszegmens helyesbítő számával. Ha a vett helyesbítő szám eggyel nagyobb az aktuáliss számnál, akkor az AES-nek a vett sorozatnak megfelelően fel kell frissíteni a rendszer táblázatát. Ha a vett helyesbítő sorozat egy teljes sorozat, akkor az AES-nek a rendszer táblázatát annak megfelelően kell felfrissíteni.

2) ha a vett sorozat egy teljes sorozat, akkor az AES-nek a rendszer táblázatát annak megfelelően kell frissíteni.

b) *Bejelentkezés után.* Amikor az AES egy rész-sorozatot vesz a bejelentkezett GES-től, akkor annak megfeleleően fel kell frissítenie a rendszer táblázatát.

4.9.3.2.4 *BEJELENTKEZÉS MEGERŐSÍTŐ TÁBLÁZAT*

Ennek a táblázatnak a következőket kell tartalmazni:

a) műhold azonosító;

b) sugárnyaláb azonosító;

c) bejelentkezés GES azonosító;

d) kezdeti EIRP az R-csatornák részére;

e) P_d csatorna frekvencia és csatorna átviteli sebesség;

f) R_d csatorna frekvenciák és csatorna átviteli sebesség;

g) T-csatorna frekvenciák és csatorna átviteli sebesség;

h) az AES által egyidejűleg támogatható C-csatornák száma (beleértve egy C-csatornát, amely olyan adót
használ, amelyet a 3. Szintű AES C-, R- és T-csatornák megosztottan használnak).

4.9.3.2.5 *BEJELENTKEZÉS MEGERŐSÍTŐ TÁBLÁZAT FELFRISSÍTÉS*

A bejelentkezési megerősítő táblázat tartalmát, a h) bekezdés kivételével, akkor kell felfrissíteni, amikor az AES kezelés bejelentkezik, megújítja bejelentkezését, vagy befejez egy adatcsatorna újra-kijelölési eljárást a GES-nél (4.9.3.3.4.1 f).)

4.9.3.3 AES BEJELENTKEZÉS ÁLLAPOT KEZELÉS

4.9.3.3.1 Mielőtt egy AES megkezdi a felhasználói összeköttetés szolgáltatás biztosítását, az AES kezelésnek sikeresen be kell fejeznie a 4.9.3.3.4 pontban megadott bejelentkezési eljárást egy kiválasztott GES-nél. A bejelentkezési eljárás kezdeményezését megelőzően az AES kezelésnek a 4.9.3.3.2 pont szerint ki kell választani egy alkalmas műhold, sugárnyaláb és GES kombinációt.

4.9.3.3.2 *MŰHOLD, SUGÁRNYALÁB ÉS GES KIVÁLASZTÁS*

A műhold, a sugárnyaláb és a GES kiválasztását oly módon kell elvégezni, hogy az AES képes legyen a kiválasztott GES P_{smc} csatornáján a megfelelő jelszint vételére. A jelszint megfelelőségét a fizikai rétegből érkező P-csatorna szinkronizáció jelzés (4.9.2.1.3 b)) vételére kell alapozni. A kiválasztáshoz használt információnak a rendszer táblázat legaktuálisabb változatában meghatározottak szerintinek kell lenni. A rendszer táblázat aktualitását az éppen AES-nél tartott rendszer táblázat helyesbítő számának (4. fejezet 3. függeléke, 49. tétel) a műhold/sugárnyaláb-azonosító P_{smc} csatornán vett rendszer táblázat-adás helyesbítő számával történő összehasonlításával kell meghatározni. Ha szükséges, a rendszer táblázatot a 4.9.3.2.3 pontban megadottakkal összhangban kell felfrissíteni.

4.9.3.3.3 *BEJELENTKEZÉSI ELJÁRÁS*

4.9.3.3.3.1 Egy bejelentkezési eljárás kiválasztott GES-nél történő kezdeményezésének vagy automatikusnak, vagy egy vett utasításra való válasznak kell lenni. Az AES kezelésnek egy bejelentkező GES kiválasztását követően azonnal kezdeményeznie kell a bejelentkezési eljárást. Ha az AES képes venni egy műhold azonosító P_{smc} csatornát és nincs hibás berendezése, akkor mindig bejelentkezettnek kell lenni egy kiválasztott GES-hez azokban az időperiódusokban, amikor AMS(R)S működés tervezett.

4.9.3.3.3.2 A kiválasztott GES-hez való bejelentkezéshez az AES kezelésnek egy bejelentkezést kérő LIDU-t kell a GES-nek R_{smc} csatorna frekvenciák közül véletlenszerűen kiválasztott R_{smc} csatorna frekvencián továbbítva a rendszer táblázatban megadott GES R_{smc} -ből kiválasztani. Ezt követően az AES kezelésnek a következőket kell elvégezni:

a) Ha tA11 másodperc (4. fejezet 4. függeléke) eltelik a GES-től érkező válasz nélkül, amint az a b) és e) pontokban lejebb meg van határozva, akkor az AES kezelésnek utasítást kell adni egy R_{smc} frekvencia kiválasztására, és azt követően a bejelentkezést kérő LIDU-t újból továbbítania kell a GES részére. Az AES kezelésnek utasítást kell adni egy R_{smc} csatorna frekvencia kiválasztására, majd a bejelentkezést kérő LIDU-t minden tA11 másodpercben újból továbbítania kell, addig, amíg válasz nem érkezik, kivéve azt, hogy a bejelentkezést kérő LIDU-k továbbításának száma nem haladhatja meg az ötöt. Ha az ötödik továbbítást követő tA11 másodpercen belül nem érkezik válasz, akkor az AES kezelésnek meg kell szakítani a bejelentkezési eljárást a kiválasztott GES-hez, és a 4.9.3.3.2 pontnak megfelelően ki kell egy GES-t választani és azt követően a 4.9.3.3.3 pontnak megfelelően be kell jelentkeznie a kiválasztott GES-hez.

b) Ha tA11 másodpercen belül az AES kezelés vesz egy bejelentkezést megerősítő LIDU-t és a csatorna szabályozó LIDU-k (P/R és T-csatorna ellenőrző LIDU-k) jelezve vannak a bejelentkezést megerősítő LIDU-ban, akkor az AES kezelésnek utasítást kell adni egy R_d csatorna frekvencia kiválasztására és azt követően az összes, várt LIDU pontos vételét jelző bejelentkezést nyugtázó LIDU-t kell a GES felé sugároznia. Ha a bejelentkezést nyugtázó LIDU küldését követő tA12 másodpercen belül az AES nem vesz a GES-től egy bejelentkezést nyugtázó LIDU-t a kijelölt P_d csatornán, akkor utasítást kell adnia egy R_d csatorna frekvencia kiválasztására, és azt követően újból továbbítania kell a bejelentkezést nyugtázó LIDU-t. Az AES kezelésnek utasítást kell adni egy R_d csatorna frekvencia kiválasztására és azt követően ugyanazon LIDU-t tA12 másodpercenként újra kell továbbítania, amíg a GES-től egy bejelentkezést nyugtázó LIDU nem érkezik, kivéve, hogy a bejelentkezési nyugtázások újbóli továbbításainak teljes száma nem haladhatja meg a négyet. Ha a negyedik továbbítást követő tA12 másodpercen belül még nem érkezik a GES-től bejelentkezés nyugtázó LIDU, akkor az AES vezérlésnek meg kell szakítani a kiválasztott GES-hez való bejelentkezési eljárást, a 4.9.3.3.2 pontnak megfelelően ki kell választani egy GES-t és azt köetően a 4.9.3.3.3 pont szerint be kell jelentkezni a kiválasztott GES-hez; ellenkező esetben, amikor egy bejelentkezést nyugtázó LIDU érkezik, az AES-t bejelentkezettnek kell tekinteni. Ezt követően az AES kezelésnek ezt az információt közvetítenie kell a különböző interfészeken - ahol alkalmazható - és fel kell frissítenie a bejelentkezést megerősítő táblázatát.

c) Ha néhány, de nem az összes várt LIDU érkezik meg tA11 másodpercen belül, akkor az AES kezelésnek egy bejelentkezés nyugtázó LIDU-t kell a hiányzó LIDU-kat jelző GES-hez továbbítani. Ha az AES bejelentkezés nyugtázó LIDU továbbítását követő tA11 másodpercen belül az AES kezelés még mindig nem kapott meg minden várt LIDU-t, akkor utasítást kell adnia egy R_{smc} csatorna frekvencia kiválasztására, majd azt követően újból továbbítania kell egy másik bejelentkezést nyugtázó LIDU-t, jelezvén az összes hiányzó LIDU-t ugyanazon GES-hez. Az AES kezelésnek utasítást kell adni egy R_{smc} csatorna frekvencia kiválasztására és azután minden tA11 másodpercben meg kell ismételnie a bejelentkezést nyugtázó LIDU-k továbbítását, jelezvén az összes hiányzó LIDU-t, addig, amíg az összes várt LIDU meg nem érkezik, kivéve, hogy a továbbított bejelentkezést kérő LIDU-k (a fenti a) pont alatt) és a bejelentkezést nyugtázó LIDU-k teljes száma nem haladhatja meg az ötöt. Ha az ötödik továbbítást követő tA11 másodperc után az összes várt LIDU nem érkezik meg, akkor az AES kezelésnek meg kell szakítani a bejelentkezési eljárást a kiválasztott GES-hez, a 4.9.3.3.2 pont szerint ki kell egy GES-t választania, majd azt követően a 4.9.3.3.3 pont szerint be kell jelentkeznie a kiválasztott GES-hez. Ha, és amikor a megkövetelt időn belül az AES kezelés megkapja az összes várt LIDU-t, akkor egy hibamentességget jelző bejelentkezést nyugtázó LIDU-t kell a GES-hez továbbítania, majd a b) pont alattiak szerint kell folytatnia.

d) Ha egy bejelentkezést visszautasító LIDU érkezik, akkor az AES kezelésnek a LIDU-ban jelzett visszautasítási oknak (4.Ffejezet 3.Ffüggeléke, 44. tétel) megfelelően kell válaszolnia.

e) Ha egy kijelentkezési kérés érkezik a GES-től, akkor az AES kezelésnek az AES-t kijelentkezettnek kell tekinteni és azonnal fel kell függesztenie a továbbítást aíz R- és T-csatornákon a GES részére. A GES-t ideiglenesen "nem-elérhető"-nek kell ekinteni. (Lásd a 4. Fejezet 3. Függelékének 44. elemét.)

f) Ha egy szelektív bontás adás LIDU érkezik a GES-től, akkor az AES-nek azonnal fel kell függesztenie minden továbbítást a LIDU-ban meghatározott frekvencián.

4.9.3.3.3.2.1 Ha a bejelentkezési eljárás alatt az AES kezelés egy P-csatorna veszteség/teljesítmény-csökkenés jelzést vesz (a 4. Fejezet 1. Függelékében van meghatározva), akkor meg kell szakítania a bejelentkezési eljárást a kiválasztott GES-hez, ki kell választania a 4.9.3.3.2 pont szerint egy GES-t és a 4.9.3.3.3 pontnak megfelelően be kell jelentkeznie a kiválasztott GES-hez.

4.9.3.3.4 *A BEJELENTKEZÉST KÖVETŐ ELJÁRÁSOK*

4.9.3.3.4.1 Az AES kezelésnek meg kell kisérelni a kijelentkezést, mielőtt megszünteti a kapcsolatot a bejelentkezett GES-sel.

Megjegyzés. – A P-csatorna vesztesége vagy teljesítmény-csökkenése eleve kizár bármilyen kijelentkezési kísérletet (4.9.3.3.4.4 pont).

4.9.3.3.4.2 Az AES kezelésnek a bejelentkezett GES-től érkező LIDU-kra a következők szerint kell válaszolni:

a) *A rendszer táblázat adási LIDU-k rész-sorozata:* az AES kezelésnek a rendszer táblázatát a 4.9.3.2.3 pontban jelzettek szerint kell felfrissíteni;

b) *Bejelentkezés visszajelzési LIDU:* az AES kezelésnek kell a bejelentkezési eljárást kezdeményezni (4.9.3.3.3) a kiválasztott GES-hez, amelyik az, amit a visszajelzési LIDU meghatároz;

c) *Bejelentkezés lekérdezés LIDU:* ha az AES kezelés egy bejelentkezési lekérdezés LIDU-ra jelezte válasz-adási képességét (a bejelentkezést kérő LIDU-ban LOV = 0 beállításával, 4-44. táblázat), akkor egy bejelentkezés nyugtázás GES-hez küldésével kell válaszolnia;

d) *Szelektív bontás adás LIDU:* az AES kezelésnek azonnal meg kell akadályoznia a LIDU-ban meghatározott frekvencián történő bármilyen adást.

Megjegyzés. – A GES bármikor küldhet egy szelektív bontás adást a bejelentkezett AES-e felé.

e) *GES csatorna állapot jelentés LIDU:* az AES kezelésnek egy olyan AES csatorna-jelentés LIDU küldésével kell válaszolni, amely megfelel a vett LIDU-ban jelzett C-csatornának. A vett LIDU-ban jelzett bármely adó-csatorna EIRP beállítást a 4.9.3.4.1.3.2 pontnak megfelelően kell elvégezni;

f) *Bejelentkezés kezelés/adat csatorna újra-kijelölés LIDU:* az AES kezelésnek egy bejelentkezés kezelés/újra-kiosztásra kész LIDU-val kell válaszolnia, majd a következőket kell tennie:

1) ha tA11 másodpercen belül (4. Fejezet 4. Függeléke) az AES kezelés nem kapja meg az összes várt LIDU-t (egy bejelentkezés-megerősítő LIDU-t és vagy egy P/R-csatorna vezérlő LIDU-t, vagy egy T-csatorna vezérlő LIDU-t vagy mindkettőt), akkor az AES kezelésnek egy bejelentkezés irányító/újra-kiosztás visszautasító LIDU-t kell a GES-hez küldenie;

2) ha az összes várt LIDU megérkezik, akkor az AES kezelésnek utasítást kell adni egy R_d-csatorna frekvencia kiválasztására és azt követően egy bejelentkezési nyugtázó LIDU-t kell a GES-hez küldenie. Ha az AES kezelés nem kap a GES-től vissza egy bejelentkezés-nyugtázó LIDU-t a bejelentkezés-nyugtázó LIDU elküldésétől számított tA12 másodpercen belül (4. fejezet 4. függeléke), akkor utasítást kell adnia egy R_d csatorna frekvencia kiválasztására és azt követően újra kell továbbítani ugyanazon LIDU-t. Az AES kezelésnek utasítást kell adni egy R_d csatorna frekvencia kiválasztására és azt követően minden tA12 másodpercben meg kell ismételni ugyanazon LIDU újra-továbbítását addig, amíg egy bejelentkezés-nyugtázás nem érkezik a GES-től, kivéve, hogy a bejelentkezés-nyugtázó LIDU-k továbbításának teljes száma nem haladhatja meg a négyet. Ha a negyedik adást követő tA12 másodpercen belül nem érkezik bejelentkezést nyugtázó LIDU a GES-től, akkor az AES kezelésnek kezdeményeznie kell a bejelentkezési eljárást (4.9.3.3.3) az aktuális bejelentkezett GES-nél, amennyiben megfelelő jelszint érkezik a bejelentkezett GES P_{smc} csatornán; ellenkező esetben, egy másik, a GES kiválasztási eljárás által (4.9.3.3.2) kiválasztott GES-nél kell azt kezdeményeznie. Ha egy bejelentkezést nyugtázó LIDU érkezik a GES-től, akkor az AES kezelésnek fel kell frissítenie a bejelentkezést megerősítő táblázatát.

g) *Kijelentkezés kérő LIDU:* az AES kezelésnek az AES-t kijelentkezettnek kell tekinteni és azonnal le kell tiltani adását a GES-hez az R- és T-csatornákon. A GES-t "átmenetileg nem-rendelkezésre álló"-nak kell tekinteni (lásd 4. Fejezet 3. Függeléke, 44. tétel).

4.9.3.3.4.2.1 **Ajánlás.** – *Egy GES-től való Nemzetközi Világ-idő adás LIDU vételekor, az AES-nek az idő információt a légijárművön belüli megfelelő alkalmazási folyamatok rendelkezésére kell bocsátani. A LIDU-ban lévő idő információt pontosnak kell tekinteni a következő P-csatorna szuperkeret első bitje vételének pillanatában (4.4.2).*

4.9.3.3.4.3 Az AES kezelésnek a vett utasításokra a következők szerint kell válaszolni:

a) *Kijelentkezési utasítás:* Az AES kezelésnek egy kijelentkezést kérő LIDU-t kell a GES-hez küldeni, továbbítani kell a kijelentkezés állapotot a 4.9.2 pontban meghatározott módon az AES kezelési interfészeken, és azt követően a következőket kell tennie:

1) ha egy kijelentkezést nyugtázó LIDU a GES-től nem érkezik meg a kijelentkezést kérő LIDU kibocsátását követő tA10 másodpercen belül (4. Fejezet 4. Függeléke), akkor az AES kezelésnek egy másik kijelentkezést kérő LIDU-t kell újból elküldenie. Az AES kezelésnek újra ki kell bocsátania ugyanazon LIDU-t minden tA10 másodpercben, amíg a GES-től egy kijelentkezést nyugtázó LIDU nem érkezik, kivéve, hogy a kijelentkezést kérő LIDU-k továbbításának teljes száma nem haladhatja me az ötöt. Ha az ötödik továbbítást követő tA10 másodpercen belül nem érkezik kijelentkezés-nyugtázási LIDU, akkor az AES kezelésnek az AES-t kijelentkezettnek kell tekinteni;

2) amikor egy kijelentkezést nyugtázó LIDU érkezik a bejelentkezett GES-től, akkor az AES kezelésnek az AES-t kijelentkezettnek kell tekinteni;

b) *GES-GES átadási utasítás:* Az AES kezelésnek ugyanazon a műholdas szolgáltatási területen belül, mint amit a 4.9.3.3.3 pont alatti eljárást alkalmazó aktuális GES használ, be kell jelentkezni a meghatározott GES-hez. Azonban a 3. szintű AES esetén, ha az AES adó-csatorna egységet egy áramkör üzemmódú hívásra használják, az AES kezelésnek kezdeményezni kell a bejelentkezési eljárást, miután az áramkör üzemmódú hívás befejeződik;

c) *Műhold-műhold átadási utasítás:* Az AES kezelésnek először minden korábban létrehozott áramkör üzemmódú hívást három percig fenn kell tartani, vagy addig, amíg minden hívást törölnek, illetve amelyik elsőként bekövetkezik. Három perc elteltével az AES kezelésnek törölni kell minden meglévő áramkör üzemmódú hívást. Miután minden hívást törölt, az AES kezelésnek a meghatározott műhold szolgáltatási területén ki kell választani egy megfelelő sugárnyalábot. Ha nem található megfelelő sugárnyaláb, akkor az AES kezelésnek a 4.9.3.3.2 pont szerint egy másik műholdat és annak szolgáltatási területéről egy sugárnyalábot kell választani. Ezt követően az AES kezelésnek a 4.9.3.3.2 szerint egy olyan GES-t kell kiválasztania, amely alátámasztja a kiválasztott sugárnyalábot, és automatikusan be kell jelentkeznie a kiválasztott GES-hez a 4.9.3.3.3 pontban leírt eljárást alkalmazva.

4.9.3.3.4.4 Az AES kezelésnek az AES fizikai réteg interfészen keresztül a hozzá továbbított jelzésekre a következők szerint kell válaszolni:

P_d csatorna-veszteség/teljesítmény-csökkenés jelzés: az AES kezelésnek meg kell kísérelni (1) egy megfelelő jel-szint visszaállítását ugyanazon a P_d-csatornán, és folytatni a normál működést, vagy (2) megújítani az ugyanazon GES-hez való bejelentkezését a bejelentkezési eljárás ugyanazon GES-hez való újbóli kezdeményezésével, vagy (3) újra kezdeményezni a műhold, a sugárnyaláb és a GES kiválasztást és a 4.9.3.3.2 pont, valamint a 4.9.3.3.3 pont által meghatározott bejelentkezési folyamatot. Minden R- és T-csatorna továbbítást meg kell akadályozni, ha veszteség vagy teljesítmény-csökkenés van a P_d csatornán. Meg kell engedni egy meglévő áramkör üzemmódú hívás C-csatorna továbbítást, feltéve, hogy a vett C-csatorna adások bit-hiba mértéke nem haladja meg a névleges értéket bármely rákövetkező, 40 másodpercnél hosszabb periódus esetén.

4.9.3.4 AES CSATORNA KEZELÉS

4.9.3.4.1 *CSATORNA EGYSÉG ELLENŐRZÉS*

4.9.3.4.1.1 Az AES kezelésnek kell ellenőriznie az összes adó- és vevő-csatorna egységet az AES fizikai réteghez kapcsolódó interfészen keresztül.

4.9.3.4.1.2 *Csatorna egység frekvencia és csatorna átviteli sebesség ellenőrzés.* Az AES kezelésnek kell ellenőrizni az összes AES vevő- és adó-csatorna egység frekvencia és csatorna átviteli sebesség beállításait. A P_{smc} és R_{smc} csatornák frekvenciáinak és csatorna átviteli sebességeinek olyannak kell lenni, amint azt a rendszer táblázat tartalmazza. A P_d, R_4 és T-csatornák frekvenciáinak és csatorna átviteli sebességeinek a GES által, a bejelentkezést megerősítő LIDU-ban, és a P/R-csatorna ellenőrző, valamint a T-csatorna ellenőrzlő LIDU-kban meghatározottak szerintinek kell lenni. Amikor az áramkör üzemmódú szolgáltatástól az AES kezelés kérést kap bizonyos frekvencia beállítási- és csatorna átviteli beállítási értékekkel bíró adó- és vevő-csatorna egységek kijelölésére, akkor ezeket a kijelöléseket és beállításokat a fizikai réteggel való kommunikáció révén kell megoldania és ezeket a kijelöléseket, valamint beállításokat vissza kell közvetítenie az áramkör üzemmódú szolgáltatásnak. Ugyanakkor, az AES kezelésnek biztosítania kell, hogy a kijelölt frekvenciákat ne használják olyan adásokra, amelyek intermodulációs terméket állíthatnak elő, amik a légi- járműveken lévő műholdas navigációs vevő-berendezések működésére nézve veszélyes interferenciát hoznak létre, és szükség esetén hátrább kell sorolnia egy alacsonyabb elsőbbségű hívást.

4.9.3.4.1.2.1 Az AES kezelésnek végre kell hajtani az R-csatorna frekvenciák véletlenszerű kiválasztását válaszul az adatkapcsolati rétegben, az áramkör üzemmódú szolgáltatásban és magában az AES kezelésben lévő protokolok által előállított utasításokra. Minden kiválasztásnak addig kell megmaradni, amíg egy másik véletlenszerű kiválasztásra sor nem kerül.

4.9.3.4.1.3 *Csatorna egység teljesítmény ellenőrzés.* Az AES kezelésnek kell vezérelni minden AES adó- csatorna EIRP beállítási értékét az AES kezelés-fizikai réteg interfészen keresztül.

4.9.3.4.1.3.1 Az AES kezelésnek a 4.2.3.5.5 pont alatti EIRP beállítási értékeket kell használni a bejelentkezést kérő LIDU R_{smc} csatornán való továbbításra. Azután, az AES vezérlésnek az R_d csatornán az EIRP-t a GES által, vagy a bejelentkezést megerősítő LIDU-n keresztül, vagy az adat EIRP-n keresztül közvetített kezdeti EIRP értékre kell beállítani. A T-csatorna kezdeti EIRP beállítási értéket az R_d csatorna és a T-csatorna csatorna átviteli sebesség arányának, valamint a kijelölt R_d csatorna kezdeti EIRP-nek megfelelően kell kiszámítani.

Megjegyzés. – A bejelentkező GES felelős az R_d és a T-csatornák EIRP beállítási értékei finomítási mértékének meghatározásáért.

4.9.3.4.1.3.2 Egy C-csatorna esetében az AES kezelésnek kell az áramkör üzemmódú szolgáltatástól a fizikai réteghez közvetíteni az adó-csatorna egység kezdeti EIRP beállítási értékét. A rákövetkező EIRP beállítási finomításokat a GES-től kapott GES csatorna-állapot jelentő LIDU-kban lévő EIRP finom-beállítási értékeknek megfelelően kell elvégezni.

Megjegyzés. – A C-csatorna teljesítmény-szabályozásához és finom-beállításához szükséges minden döntés annál a GES-nél születik, amelyen keresztül a hívás létrejön, és ez a C-csatorna alsávon továbbítódik az AES áramkör üzemmódú szolgáltatáshoz.

4.9.3.4.1.4 *A 3-as szintű AES csatorna egység kapcsolás.* Egy 3-as szintű AES esetében az egyedüli adó-csatorna egységet meg kell osztani az R/T-csatorna mód és a C-csatorna adás mód között.

4.9.3.4.1.4.1 Az adó-csatorna egységet az R/T-csatorna módba kell kapcsolni, ha ezt nem hajtaná végre, az megakadályozná az alábbiak továbbítását:

a) bármely csomag üzemmódú adat jel egység továbbítását, amelynek elsőbbsége nagyobb, mint az áramkör üzemmód folyamatban lévő hívásának elsőbbsége, vagy

b) bármely adatkapcsolati jelző jel egység továbbítását, amelyhez olyan csomag üzemmódú adat jel egységek társulnak, amelyeknek az elsőbbsége magasabb az áramkör üzemmódú folyamatban lévő hívás elsőbbségénél; vagy

c) bármely hívás beállítási jelző jel egység továbbítását, amelyhez olyan áramkör üzemmódú hívás társul, amelynek eaíz lsőbbsége magasabb az áramkör üzemmód folyamatban lévő hívásának elsőbbségénél.

4.9.3.4.1.4.2 Az adó-csatorna egységet C-csatorna módba kell kapcsolni, ha amikor ez nem történik meg, az megakadályozná egy olyan áramkör üzemmódú hívás létrehozását, vagy folytatódását, amelynek elsőbbsége magasabb az adatkapcsolat rétegben lévő összes csomag módú adat jel egység elsőbbségénél és azoknál a csomag módú adat jel egységek elsőbbségénél, amelyekhez az adatkapcsolati rétegben lévő összes jelző jel egység társul.

4.10 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁSOK (GES) KEZELÉSE

4.10.1 Általános rész

Megjegyzés. – Ez a rész határozza meg a GES-nél megkövetelt azon kezelési funkciókat, amelyek kezdeményezik és végrehajtják a bejelentkezési eljárásokat, valamint az AES és GES közötti adat- és beszéd-összeköttetéseket kezelik.

4.10.1.1 A GES-nek kell végrehajtani az ezen részben meghatározott funkciók sorozatát a bejelentkezett AES-eivel, az össze- köttetési csatornák létrehozására és fenntartására, valamint minden bejelentkezett AES-éről a rendelkezésre álló információt meg kell osztania az AMS(R)S szolgáltatást ugyanazon műholdon keresztül támogató összes többi GES-sel.

4.10.2 GES kezelési felépítés

4.10.2.1 FÖLD – LEVEGŐ

A műholdas szolgáltatási területen bárhol, az AES-nek legalább egy 600 bit/s csatorna átviteli sebességű egyedi P_{smc} csatornával kell rendelkezni a P_{smc} csatornát támogató műhold és a sugárnyaláb azonosítására.

4.10.2.2. FÖLD – FÖLD

Ugyanazon a műholdas szolgáltatási területen belül a GES-ek között kommunikációnak kell fennállni a 4.10.4 pontban meghatározott GES kezelési funkciók végrehajtásához szükséges információk cseréje céljából.

4.10.3 GES kezelési interfészek

4.10.3.1 A GES vezérlésnek illeszkedni kell az al-hálózati réteghez, az áramkör üzemmódú szolgáltatáshoz, az adatkapcsolati réteghez, valamint a fizikai réteghez a GES táblázat kezelése, a bejelentkezési állapot kezelése és a csatorna-kezelés részére szükséges vezérlési információk cseréje céljából.
4.10.3.2 AL-HÁLÓZATI RÉTEG

A következő vezérlő információkat kell cserélni a GES vezérlése és a GES-ben lévő al-hálózati réteg között:

a) Az al-hálózati réteghez:

1) bejelentkezési állapot információk:

i) bejelentkezett/kijelentkezett;

ii) AES azonosító;

iii) GES azonosító

2) a T-csatorna minimális csatorna átviteli sebessége;

3) P_d és R_d csatornák csatorna átviteli sebessége.

4.10.3.3 ÁRAMKÖR ÜZEMMÓDÚ SZOLGÁLTATÁS

A GES-ben a következő vezérlő információkat kell cserélni a GES kezelése és az áramkör üzemmódú szolgáltatás között:

a) Az áramkör üzemmódú szolgáltatáshoz:

1) bejelentkezési állapot információk:

i) bejelentkezett/kijelentkezett;

ii) AES azonosító;

iii) GES azonosító;

2) EIRP érték;

3) kijelölt frekvencia (Q szám, alkalmazási referencia-szám);

4) a hangfrekvenciás csatorna jellemzői;

5) kijelölt csatorna egység (Q szám, alkalmazási referencia-szám);

6) előjogosítású csatorna egység (Q szám, alkalmazási referencia-szám);

b) Az áramkör üzemmódú szolgálattól:

1) a hangfrekvenciás csatorna műszaki jellemzői;

2) a frekvencia iránti kérés (Q szám, alkalmazás referencia-szám);

3) csatorna egység iránti kérés (Q szám, alkalmazási referencia-szám).

4.10.3.4 ADAT-KAPCSOLATI RÉTEG

4.10.3.4.1 A GES-ben a GES kezelése és az adatkapcsolati interfész közötti kezelési információ-cserének a 4-45. táblázat szerintinek kell lenni.

4.10.3.4.2 Az információk cseréjét az adatkapcsolati réteg adat egységek (LIDU) formájában kell bonyolítani. A LIDU-knak csak adatkapcsolati réteg vezérlési információt (LICI) kell tartalmazni.

Megjegyzés. – A GES kezeléstől vett összes LIDU-t a 4.5.5.2.3 pont szerint az adatkapcsolati rétegben egy megfelelő jelegység-készletbe kell leképezni.

4.10.3.5 FIZIKAI RÉTEG

A következő vezérlési információkat kell a GES kezelése és a GES-ben lévő fizikai réteg között cserélni:

a) A fizikai réteghez (minden csatorna esetében):

1) frekvencia;

2) csatorna átviteli sebesség beállítás (ha kiválasztható);

3) teljesítmény beállítás;

4) üzemmód (T, vagy R, vagy C, ha kiválasztható);

5) csatorna egység szám;

b) A fizikai rétegtől (minden csatorna esetében):

1) svárható C-csatorna bit-hiba arány;

2) csatorna egység száma;

3) üzemmód.

4.10.4 GES kezelési funkciók

4.10.4.1 A GES kezelésnek a következő funkciókat kell elvégezni:

a) A GES táblázat kezelése;

b) A GES bejelentkezési állapot kezelése;

c) A GES csatorna kezelése;

d) A GES rendszer-adás.

4.10.4.2 GES TÁBLÁZAT KEZELÉSE

4.10.4.2.1 A GES kezelésnek a következő táblázatokat kell fenntartani:

a) AES rendszer-táblázat;

b) AES bejelentkezési állapot táblázat.

4.10.4.2.2 *AES RENDSZERTÁBLÁZAT*

4.10.4.2.2.1 Egy műholdas szolgáltatási terület AES rendszer-táblázatának tartalmaznia kell a kezdeti keresési adatokat (keresési frekvenciák a műhold és sugárnyaláb azonosítására) és a területi adatokat (információ a műholdas szolgáltatás területén lévő összes GES-ről).
4.10.4.2.2.2 Egy műhold szolgáltatási területen mindegyik GES-nek mind a kezdeti keresési, mind a körzeti adatokat közvetítenie kell. A kezdeti keresési adatok a 4.10.4.2.2.3 pontban leírt információkból állnak az összes műhold rendszer mindegyik műholdas szolgáltatási területénél, amelyek a SARP-oknak megfelelő AMS(R)S szolgáltatásokat biztosítanak a közel geoszinkron műholdak esetén. A körzeti adatoknak a 4.10.4.2.2.4 pontban ismertetett információkból kell állniuk ennél a műholdas szolgáltatási területnél. A kezdeti keresési adatokat időszerűen cserélni kell az összes AMS(R)S szolgáltató között és ezeket közös kezdeti keresési adatokként kell sugározni.

4.10.4.2.2.3 Egy műholdas szolgáltatás terület kezdeti keresési adatainak magukba kell foglalniuk a következő műhold/sugárnyaláb azonosító információkat minden olyan sugárnyaláb esetében, amely egy műhold/ /sugárnyaláb azonosító P_{smc} csatornát támaszt alá a műhold szolgáltatási területén.

a) elsődleges műhold/sugárnyaláb azonosító P_{smc} csatorna frekvencia 600 bit/s átviteli sebességgel;

b) másodlagos műhold/sugárnyaláb azonosító P_{smc} csatorna frekvencia 600 bit/s átviteli sebességgel;

c) műhold azonosító;

d) a műhold helyzete, pálya-elhajlás és a derékszögi felemelkedési időköz;

e) sugárnyaláb azonosító (a csak-irányított-sugárnyalábos műholdak esetén).

4.10.4.2.2.4 Egy műholdas szolgáltatási terület körzeti adatainak a következő információkat kell tartalmazniuk:

a) rendszer-táblázat helyesbítési szám;

b) műhold azonosító;

c) globális sugárnyalábos műhold esetén, a globális sugárnyalábot támogató GES mindegyikénél:

1) GES azonosító;

2) P_{smc} és R_{smc} csatorna frekvenciák; és

3) P_{smc} és R_{smc} csatorna átviteli sebességek;

d) a csak -irányított- sugárnyalábos műhold esetén:

1) a sugárnyaláb azonosítója (azonos az e) pont alattival a kezdeti keresésnél);

2) GES irányított sugárnyaláb-táblázat, amely jelzi, hogy a GES melyik irányított sugárnyalábban sugároz; és

3) minden GES esetében, amely alátámaszt egy irányított sugárnyalábot:

i) GES azonosító;

ii) P_{smc} és R_{smc} csatorna frekvenciák; és

iii) P_{smc} és R_{smc} csatorna átviteli sebességek.

4.10.4.2.3 *AES BEJELENTKEZÉSI ÁLLAPOT TÁBLÁZAT*

4.10.4.2.3.1 Minden GES-nek fenn kell tartani egy AES bejelentkezési állapot táblázatot, amelynek a 4.10.4.2.3.2 és a 4.10.4.2.3.3 pontokban meghatározott információkat kell tartalmaznia.

4.10.4.2.3.2 A GES-nek az AES bejelentkezési állapot táblázatában minden hozzá bejelentkezett AES, vagy ugyanazon műholdas szolgáltatási területen más GES-hez bejelentkezett AES esetében, a következő információkat kell tartalmaznia:

a) AES azonosító;

b) műhold azonosító;

c) sugárnyaláb azonosító;

d) bejelentkezési GES azonosító.

4.10.4.2.3.3 A GES-hez bejelentkezett minden egyes AES esetében a GES-nél lévő AES bejelentkezési állapot táblázatnak a 4.10.4.2.3.2 pontban meghatározottakon túlmenően tartalmaznia kell a következő információkat:

a) Az AES részére kijelölt P-csatorna frekvencia;

b) Az AES részére kijelölt R-csatorna frekvenciák;

c) Az AES részére kijelölt T-csatorna frekvenciák;

d) A P-, R-, T- és C-csatornák csatornaá tviteli sebesség képességei;

e) AES aktivitás jelző (aktív vagy inaktív).

4.10.4.2.3.4 *AES bejelentkezési állapot táblázat felfrissítés.*

A GES-nek fel kell frissíteni az AES bejelentkezési állapot táblázatát, amikor egy AES bejelentkezik (kezdeti vagy megismételt), vagy kijelentkezik ettől a GES-től, vagy amikor a GES egy AES-re vonatkozó bejelentkezési, vagy kijelentkezési információt kap egy másik GES-től.

4.10.4.3 GES BEJELENTKEZÉSI ÁLLAPOT KEZELÉS

4.10.4.3.1 A GES bejelentkezési állapot kezelési funkciónak kell az AES bejelentkezést/kijelentkezést kezelni, megerősíteni minden bejelentkezett AES-e tevékenységét, megújítani a bejelentkezést (amikor szükséges) és az AES-ek felé újra kijelölni adat csatornákat (amikor szükséges).

4.10.4.3.2 *BEJELENTKEZÉS*

Megjegyzés. – Az AES egy bejelentkezést kezdeményez egy bejelentkezést kérő LIDU-nak a GES-hez való küldésével (4.9.3.3.3) miután az AES kiválasztott egy műholdat, egy sugárnyalábot és egy GES-t.

4.10.4.3.2.1 Egy AES bejelentkezési kérésének visszautasításához a GES kezelésnek a bejelentkezést kérő LIDU-ra egy olyan bejelentkezést visszautasító LIDU-nak az AES-hez való küldésével kell válaszolni, ami jelzi a visszautasítás okát.

4.10.4.3.2.1 *bis*. Az "Ok" kód és az "AES nem engedélyezett" (lásd 4. Fejezet 3. Függeléke, 44. tétel) küldését (egy bejelentkezés kérés LIDU-ra adott válasznál) csak egy olyan AES részére kell küldeni, amelyet nem hatalmaztak fel a műholdas rendszer használatára.
Megjegyzés. – A bejelentkezést kérő LIDU-ban lévő "alkalmazás Q száma" paraméter fogja jelezni azt, hogy a légijármű vészhelyzetben van-e vagy sem. Az "alkalmazás Q száma" paramétert 15-re állítják egy vészhelyzetben lévő légijármű esetében.

4.10.4.3.2.2 Egy AES bejelentkezési kérésének elfogadásához a GES kezelésnek a bejelentkezést kérő LIDU-ra egy olyan bejelentkezést megerősítő LIDU-nak az AES-hez való küldésével kell válaszolni, amelyet egy P/R csatorna vezérlő LIDU és egy T-csatorna vezérlő LIDU követ, és szükség vsn új P_d, R_d és T-csatornák kijelöléséhez az AES részére.

4.10.4.3.2.3 Azon bejelentkezést megerősítő LIDU AES-hez való küldését követően, amelyet - amint az a bejelentkezést megerősítő LIDU-ban jelezve van - a csatorna ellenőrző LIDU-k követnek (P/R és T csatorna vezérlő LIDU-k), vagy az AES-től kapott bejelentkezést nyugtázó LIDU-ban azonosított hiányzó LIDU-k továbbítását követően, a GES vezérlésnek a következőket kell tenni:

a) Ha nem érkezik válasz az AES-től azon időpontot követő tG26 másodpercen belül (4. fejezet 4. függeléke), amikor a csatorna vezérlő LIDU-k által követett bejelentkezést megerősítő LIDU-t elküldték, vagy az AES-től kapott bejelentkezést megerősítő LIDU-ban jelzett hiányzó LIDU-kat újból továbbították, akkor a GES kezelésnek egy másik olyan bejelentkezést megerősítő LIDU-t kell az AES-hez küldeni, amelyet a megkívánt csatorna ellenőrző LIDU-k követnek. A GES kezelésnek a csatorna ellenőrző LIDU-k által követett bejelentkezést megerősítő LIDU-t minden tG6 másodpercben el kell küldeni az AES felé, amíg egy válasz nem érkezik, vagy a csatorna ellenőrző LIDU-k által követett bejelentkezést megerősítő elküldött LIDU továbbításának száma egyenlő nem lesz néggyel. Ha nem érkezik válasz tG26 másodpercen belül a csatorna ellenőrző LIDU-k által követett bejelentkezést megerősítő LIDU elküldése után, akkor a GES kezelésnek törölni kell a kérelmező AES-t az AES bejelentkezési állapot táblázatából, és azt követően kijelentkezési tájékoztatást kell küldenie a többi, ugyanazon műholdas szolgáltatási területen lévő GES-nek, ha az AES azonosítása az AES bejelentkezési állapot táblázatban a GES-hez bejelentkezettként történt meg.

b) Ha egy hibamentességet jelző bejelentkezést nyugtázó LIDU érkezik az AES-től, akkor a GES kezelésnek egy bejelentkezést nyugtázó LIDU-t kell küldeni az AES-nek az újonnan kijelölt P_d csatornán keresztül. Azt követően, a GES kezelésnek minden alkalommal, amikor egy másik bejelentkezést nyugtázó LIDU érkezik az AES-től tG27 másodpercen belül (4. fejezet 4. függeléke) az utolsó bejelentkezést nyugtázó LIDU AES részére való küldése után, egy másik bejelentkezést nyugtázó LIDU-t kell az AES-hez küldeni. A GES kezelésnek a fenti eljárást addig kell ismételnie, amíg az alábbiak közül valamelyik be nem következik:

1) nem érkezik bejelentkezést nyugtázó LIDU az AES-től tG27 másodpercen belül az utolsó bejelentkezést nyugtázó LIDU AES-hez való küldése után;

2) egy olyan R-csatorna jel egység érkezik az AES-től, amelyik nem bejelentkezést kérő LIDU, vagy bejelentkezést nyugtázó LIDU, ami után a GES kezelésnek fel kell frissítenie az AES bejelentkezési állapot táblázatát a 4.10.4.2.3 pontban meghatározottak szerint, valamint az ugyanazon műholdas szolgáltatási területen lévő más GES-ek részére bejelentkezési információt kell küldeni.

c) Ha a hiányzó LIDU-kat azonosító bejelentkezést nyugtázó LIDU érkezik az AES-től, akkor a GES kezelésnek újból ki kell sugározni a hiányzó LIDU-kat az AES részére és a 4.10.4.3.2.3 pont szerint kell folytatnia.

4.10.4.3.2.4 Ha egy másik bejelentkezést kérő LIDU érkezik az AES-től, mielőtt a GES kezelés befejezi a korábban érkezett bejelentkezést kérő LIDU-ra történő válaszadását, a GES kezelésnek érvényteleníteni kell az utoljára vett bejelentkezést kérő LIDU-t.

4.10.4.3.3 *KIJELENTKEZÉS*

Megjegyzés. – AES kijelentkezés kezdeményezhető az AES által egy kijelentkezést kérő LIDU-nak a GES-hez való küldésével, vagy a GES által egy kijelentkezést kérő LIDU-nak az AES-hez való küldésével. A GES kezdeményezésű kijelentkezés célja a GES azon képességének biztosítása, hogy befejezhesse a nem-kívánatos AES adásokat.

4.10.4.3.3.1 Egy AES-től érkező kijelentkezési kérés vételekor a GES kezelésnek a következőket kell tenni:

a) ha az AES bejelentkezési állapot táblázatában az AES azonosítása a GES-hez bejelentkezettként történt meg, akkor törölni kell az AES-t az AES bejelentkezési állapot táblázatból, és a kijelentkezési információt kell továbbítani az ugyanazon műholdas szolgáltatási területen lévő többi GES-hez, valamint kijelentkezést nyugtázó LIDU-t kell küldeni az AES-hez; vagy

b) ha az AES nem került azonosításra a GES-hez bejelentkezettként az AES bejelentkezési állapot táblázatában, de a bejelentkezés folyamatában van, a kijelentkezést nyugtázó LIDU-t kell küldeni az AES felé.

4.10.4.3.3.2 Egy kijelentkezést kérő LIDU-nak az AES-hez történt küldését követően a GES kezelésnek az AES-t kijelentkezettnek kell tekintenie.

4.10.4.3.4 *A BEJELENTKEZÉS MEGERŐSÍTÉSE*

Megjegyzés. – A GES kezelésben az AES bejelentkezési állapot táblázata a GES-hez bejelentkezett minden AES esetében tartalmaz egy aktivitási jelzőt. Az AES aktivitási jelző “aktív” beállítású akkor, amikor bármilyen adat/jelzés érkezik az AES-től. Az aktivitási jelző “inaktív” beállítású, ha nem érkezik adat vagy jelzés az AES-től tG6 másodpercen belül (4. fejezet 4. függeléke) az aktivitási jelző utolsó “aktív” beállításának időpontja után.

4.10.4.3.4.1 A GES kezelésnek az AES aktivitási jelzőt a következő két módszer egyikével kell megeerősítenie:

a) közvetlen megerősítés;

b) közvetett megerősítés.

Megjegyzés. – Az AES bejelentkezési megerősítésének felelőssége csak az AES-hez bejelentkezett GES-ekre vonatkozik.

4.10.4.3.4.2 *Közvetlen megerősítés*

Ha nem érkezik adat/jelzés átvitel a bejelentkezési GES-hez, vagy az ugyanazon műholdas szolgáltatási területen lévő másik bejelentkezési GES-hez a bejelentkezési lekérdezési LIDU-ra válaszolni képes AES-től tG6 másodpercen belül (4. fejezet 4. függeléke) azon időponttól számítva, hogy az AES aktivitási jelzőjét utoljára inaktívvá állították be, akkor a GES kezelésnek egy bejelentkezést lekérdező LIDU-t kell az AES-nek küldeni. Ezt követően a GES kezelésnek a következőket kell tenni:

a) Ha nem érkezik az AES-től bejelentkezést nyugtázó LIDU tG8 másodpercen belül (4. fejezet 4. függeléke) a bejelentkezést lekérdező LIDU elküldése után, a GES kezelésnek egy másik bejelentkezést lekérdező LIDU-t kell küldeni az AES részére. A GES kezelésnek minden tG8 másodpercben újból továbbítani kell a bejelentkezést lekérdező LIDU-t az AES felé, amíg egy bejelentkezést nyugtázó LIDU nem érkezik, vagy a bejelentkezést lekérdező LIDU-k elküldésének teljes száma egyenlő nem lesz öttel. Amikor tG8 másodperc eltelik az ötödik bejelentkezést lekérdező LIDU elküldése után anélkül, hogy az AES-től egy bejelentkezést nyugtázó LIDU érkezne, akkor a GES kezelésnek törölni kell az AES-t az AES állapot táblázatából, valamint kijelentkezési információt kell küldenie az ugyanazon műholdas szolgáltatási területen lévő többi GES-nek.

b) Ha egy bejelentkezést nyugtázó LIDU érkezik az AES-től, akkor a GES kezelésnek az AES aktivitási jelzőjét az AES bejelentkezési állapot táblában “aktív”-ra kell állítani.

4.10.4.3.4.3 *Közvetett megerősítés*

Az AES-nek 12 órán át inaktívnak kell maradni, mielőtt a GES kezelés kijelentkezettnek tekinti.

4.10.4.3.5 *BEJELENTKEZÉSI KIJELZÉS*

A GES adatkapcsolati réteg általi, olyan AES-től való R-csatorna jel egység (ISU vagy egy C-csatorna hozzáférést kérő jel) vételekor, amelyik nincs a GES AES bejelentkezési állapot táblázatában, a GES kezelésnek egy bejelentkezési kijelzés LIDU-t kell küldeni az AES részére.

4.10.4.3.6 *CSATORNA ÚJRA-KIJELÖLÉS*

4.10.4.3.6.1 A GES kezelésnek rendelkezni kell az adat csatornák egy bejelentkezett AES részére történő újra-kijelölésének a képességével.

4.10.3.6.2 Egy adat csatorna újra-kijelölési kérés vételekor a GES kezelésnek egy bejelentkezést szabályozó/adat csatorna újrakijelölő LIDU-t kell az AES részére küldeni. Ezt követően a GES kezelésnek a következőket kell tenni:

a) Ha nem érkezik válasz az AES-től tG31 másodpercen belül (4. fejezet 4. függeléke) azon időponttól számítva, hogy a bejelentkezés szabályozó/adat csatorna újrakijelölő LIDU-t az AES-hez küldték, akkor a GES kezelésnek egy másik bejelentkezési szabályozó/adat csatorna újrakijelölő LIDU-t kell az AES részére küldeni. Ha ismét nem érkezik válasz tG31 másodpercen belül, akkor a GES kezelésnek meg kell szakítani az adatcsatorna újra-kijelölési eljárást.

b) Ha az AES-től adat csatorna újra.kijelölést visszautasító LIDU érkezik, akkor a GES kezelésnek meg kell szakítani az adat csatorna újra-kijelölési eljárást.

c) Ha egy bejelentkezési szabályozó/kijelölésre kész LIDU érkezik az AES-től, akkor a GES kezelésnek egy olyan bejelentkezést megerősítő LIDU-t kell az AES-nek küldeni, amelyet egy P/R csatorna ellenőrző LIDU és egy T-csatorna vezérlő LIDU követ - szükség szerint -, amelyek tartalmazzák az újra-kijelölt csatorna tájékoztatást.A GES kezelésnek ezután a következőket kell végrehajtani:

1) Ha nem érkezik válasz az AES-től tG32 másodpercen belül (4. fejezet 4. függeléke) azon időponttól számítva, hogy a csatorna vezérlő LIDU-k által követett bejelentkezést megerősítő LIDU-t elküldték, akkor a GES kezelésnek egy olyan másik bejelentkezést megerősítő LIDU-t kell küldeni a korábbi P_d csatornán, amit egy P/R csatorna vezérlő és T-csatorna vezérlő LIDU-k követnek, szükség szerint. Ha tG32 másodpercen belül ismét nem érkezik válasz, akkor a GES kezelésnek meg kell szakítani az adatc satorna újra-kijelölési eljárást.

2) Ha egy hibamentességet jelző bejelentkezést nyugtázó LIDU érkezik az AES-től az újonnan kijelölt R_d csatornán, akkor a GES kezelésnek egy bejelentkezést nyugtázó LIDU-t kell küldeni az AES részére az újonnan kijelölt P_d csatornán. Ha egy másik bejelentkezést nyugtázó LIDU érkezik tG33 másodpercen belül (4. fejezet 4. függeléke) az utolsó bejelentkezést nyugtázó LIDU küldési időpontját követően, akkor a GES kezelésnek egy másik bejelentkezést nyugtázó LIDU-t kell küldenie az AES-nek az új P_d csatornán. A GES kezelésnek a fenti eljárást addig kell ismételnie, amíg nem nem érkezik a másik válasz az AES-től tG33 másodpercen belül az utolsó bejelentkezési nyugtázás GES általi elküldésétől számított időpontot követően. Azt követően a GES kezelésnek fel kell frissíteni az AES bejelentkezési állapot táblázatát az AES-nek kijelölt új csatorna frekvenciákkal.

3) Ha az AES-től egy adat csatorna újra-kijelölést visszautasító LIDU érkezik, akkor a GES kezelésnek meg kell szakítani az adat csatorna újra-kijelölési eljárást.

4.10.4.4 GES CSATORNA KEZELÉSE

4.10.4.4.1 A GES csatorna kezelésnek kell ellenőrizni az AES/GES csatorna összeállítást, a csatorna teljesítményt és a csatorna frekvenciát.

4.10.4.4.2 *A CSATORNA ÖSSZEÁLLÍTÁS KEZELÉSE*

4.10.4.4.2.1 *GES csatorna összeállítás a kezelési összeköttetésekhez*

Mindegyik GES részére az összeköttetésekhez a rendszer összeállításnak a következő csatornákat kell biztosítani:

a) legalább egy adó P_{smc} csatornát és

b) legalább négy vevő R_{smc} csatornát.

4.10.4.4.2.2 *Az AES csatorna összeállítás kijelölése és szabályozása*

4.10.4.4.2.2.1 A bejelentkezés időtartama alatt a GES kezelésnek az AES részére ki kell jelölni egy olyan P_d csatornát, amely biztosítja a 4.7 és 4.8 pontok teljesítmény követelményeinek kielégítését.

4.10.4.4.2.2.2 A bejelentkezés időtartama alatt a GES kezelésnek az AES részére ki kell jelölni az R-csatornák egy csoportját, és egy, vagy több T-csatornát oly módon, ami biztosítja a 4.7 és 4.8 pontok teljesítmény követelményeinek kielégítését.

4.10.4.4.2.2.3 A C-csatorna(k) esetében a GES kezelésnek a C-csatornát(kat) hívásonként kell kijelölni.

4.10.4.4.2.2.4 Bejelentkezés után a GES kezelésnek - szükség esetén - szabályoznia kell az AES csatorna összeállítást a 4.10.4.3.6 pontban meghatározott csatorna újra-kijelölés kezdeményezésével.

4.10.4.4.2.2.5 A GES-nek vagy a rendszer kezelésnek biztosítania kell azt, hogy az AES részére ne kerüljenek olyan frekvenciák kijelölésre, amelyek olyan kereszt-modulációs termékeket hoznak létre, amik káros interferenciát okoznak a légijármű fedélzetén lévő műholdas navigációs vevő működésében.

4.10.4.4.3 *CSATORNA TELJESÍTMÉNY KEZELÉS*

4.10.4.4.3.1 *AES teljesítmény beállítás*

Megjegyzés. – A bejelentkezést megelőzően az AES az előre beállított alapértékeket fogja használni a bejelentkezést kérő LIDU-nak a GES kezeléshez való továbbítása céljából.

4.10.4.4.3.1.1 Az R- és T-csatornák esetében a bejelentkezési folyamat időtartama alatt a GES kezelésnek egy kezdeti teljesítmény beállítást kell kijelölni az AES részére, az AES részére küldött bejelentkezést megerősítő LIDU-ban lévő “kezdeti EIRP” érték szerint. A kezdeti EIRP értéket úgy kell meghatározni, hogy a GES-nél a számított bit-hiba arány ne haladja meg a 10^{-5}-t.

4.10.4.4.3.1.1 *bis.* **Ajánlás.** - *A megnövelt teljesítmény kezelési hatékonyság érdekében az R- és T-csatorna EIRP-ket az adat EIRP továbbított LIDU-kból kell meghatározni (A2-6. ábra) mind a globális, mind a sugárnyaláb csatornáknál. Globális sugárzású csatornánál a csatorna frekvencia legnagyobb helyiértékű bitjét “0”-ra (zérus) kell beállítani. A sugárnyláb csatornánál a csatorna frekvencia legnagyobb helyiértékű bitjét “1”-re (egy) kell állítani.*

Megjegyzés. – Az AES saját csatorna egység teljesítmény-szintjét vagy a bejelentkezést megerősítő LIDU-ban, vagy a bejelentkező LIDU-ban lévő EIRP érték szerint fogja szabályozni.

4.10.4.4.3.1.2 A C-csatorna esetében a kezdeti EIRP értéket a GES kezelésnek hívásonként kell kijelölni és azokat a C-csatorna kijelölő LIDU-ban lévő áramkör üzemmódú szolgáltatáson keresztül kell az AES-hez eljuttatni.

4.10.4.4.3.2 *C-csatorna teljesítmény beállítása*

4.10.4.4.3.2.1 A légijármű felé irányuló C-csatorna esetén a GES kezelésnek kell a GES EIRP-t beállítani az AES kezeléstől kapott csatorna állapo tjelentő LIDU-ban lévő Bit-hiba arány /BER/ értéknek megfelelően. A beállítási EIRP-től meg kell követelni, hogy nem nagyobb, mint a 10^{-3} BER értéket tartson fenn.

4.10.4.4.3.2.2 A légijárműtől irányú C-csatorna esetében a GES kezelésnek meg kell határozni az AES EIRP beállítást, amelytől megkövetelik a nem nagyobb, mint 10^{-3} BER érték fenntartását, amelynek az alapját a GES-nél mért BER érték jelenti. A beállítást a csatorna állapotjelentő LIDU-ban kell az AES kezeléshez továbbítani.

4.10.4.4.4 *CSATORNA FREKVENCIA KEZELÉS*

4.10.4.4.4.1 *AES frekvencia beállítás*

Megjegyzés. – A bejelentkezést megelőzően az AES a rendszer táblázatból az R_{smc} csatorna frekvenciát fogja használni a bejelentkezést kérő LIDU-nak a GES kezeléshez való küldése céljából.

4.10.4.4.4.1.1 A P-, R- és T-csatornák esetén a GES kezelésnek ki kell jelölni a kezdeti P-, R- és T-csatorna frekvenciákat az AES részére (ha a P_d/R_d frekvencia különbözik a P_{smc}/R_{smc} frekvenciáktól) P/R csatorna ellenőrző LIDU -knak és a T-csatorna ellenőrző LIDU-knak az AES-hez való küldésével a vett bejelentkezést kérő LIDU-ra adott bejelentkezést megerősítő LIDU-t követően.

4.10.4.4.4.1.2 Egy C-csatorna esetén a GES kezelésnek kell kijelölni az AES C-csatorna adó/vevő frekvenciát a kijelölt frekvenciák GES-ben lévő áramkör üzemmódú szolgáltatás által továbbított C-csatorna kijelölő LIDU-nak az AES-hez történő továbbításával.

4.10.4.4.4.2 *AES csatorna frekvencia újra-kijelölése*

4.10.4.4.4.2.1 A P- és R-csatornák esetében a GES kezelésének kell beállítani a korábban az AES részére kijelölt P/R csatorna frekvenciákat a 4.10.4.3.6 pontban meghatározott csatorna újra-kijelölési eljárás kezdeményezésével, és a bejelentkezést megerősítő LIDU-t követő, az újonnan kijelölt frekvenciák P/R csatorna kezelő LIDU-kban való elküldésével.

4.10.4.4.4.2.2 A T-csatorna esetében a GES kezelésnek kell szabályozni a T-csatorna frekvenciákat a csatorna újra-kijelölési eljárás kezdeményezésével és a T-csatorna kezelő LIDU-nak a bejelentkezést megerősítő LIDU-t követően az AES-hez való továbbításával.

4.10.4.4.5 *CSATORNA INTERFERENCIA KEZELÉS*

A GES kezelésnek egy vagy több tartalék frekvenciát kell fenntartani minden GES részére az általa támogatott összes sugárnyalábban, amit P_{smc} csatorna és R_{smc} csatorna frekvenciákként kell használni a korábban kijelölt P_{smc} csatorna és R_{smc} csatorna frekvenciák interferenciája esetén. Abban az esetben, ha átkapcsolásra van szükség, akkor a GES kezelésnek a rendszer-táblázatnak megfelelően kell azt felfrissíteni.

4.10.4.4.6 *AZ ELŐJOG KEZELÉSE*

4.10.4.4.6.1 *A hang-csatornának a hang-csatornával szembeni előjoga*

Miután az áramköri üzemmódú szolgáltatás a GES-ben egy C-csatorna kijelölő LIDU-t továbbít az AES-hez, a GES kezelésnek azonnal rendelkezésre kell bocsátani egy csatorna egységet a legkisebb elsőbbségű hívás kiszolgálására az új hívás esetén, amikor csatorna egységek nem állnak rendelkezésre, és jeleznie kell a csatorna egység rendelkezésre állását a GES-ben lévő áramkör üzemmódú szolgáltatásnak.

4.10.4.4.6.2 *Az adat-csatornának a hang-csatornával szembeni előjoga*

A GES-nek rendelkezni kell a spektrum- és a teljesítmény-forrásoknak az áramkör üzemmódú szolgáltatásból a csomag üzemmódú szolgáltatásba történő újra-kijelölés képességével a csomag üzemmódú szolgáltatás követelményeinek kielégítése céljából.

4.10.4.5 GES RENDSZER ADÁS

4.10.4.5.1 A GES kezelésnek továbbítani kell a rendszer-táblázat adatokat az AES részére az AES-ben lévő adatok és idő aktualitásának fenntartása céljából.

4.10.4.5.2 *RENDSZER-TÁBLÁZAT ADÁS*

4.10.4.5.2.1 A GES kezelésnek a rendszer-táblázat adatoknak az AES részére történő továbbítását a következők közül egy vagy több adási LIDU segítségével kell elvégezni:

a) adási index;

b) GES P/R csatorna értesítés;

c) műhold azonosító értesítés;

d) GES sugárnyaláb alátámasztás értesítés;

e) adat EIRP táblázat adás.

4.10.4.5.2.2 A rendszer-táblázat adatokat a következő két formában kell továbbítani:

a) a legutóbbi felfrissítéseket tartalmazó rész-sorozat; és

b) a teljes kutatási és körzeti adatok felfrissítését tartalmazó teljes sorozat.

4.10.4.5.2.3 Egy rész-sorozatnak egy vagy több, a 4.10.4.5.2.1 pontban meghatározott adási LIDU-ból kell állni.

4.10.4.5.2.4 A teljes sorozatnak tartalmaznia kell a 4.10.4.5.2.1 pont alatti összes adási LIDU-t. A műholdas szolgáltatási területen minden sugárnyaláb részére egy műhold/sugárnyaláb azonosító P_{smc} csatornát alátámasztó teljes sorozatnak kell lenni.

4.10.4.5.2.5 A rész- és teljes sorozatnak egyenként tartalmazni kell egy adási index LIDU-t.

1. Megjegyzés. – Az adási index LIDU minden LIDU számára egy "létezés" zászlót biztosít a teljes sorozatban.

2. Megjegyzés. – A teljes sorozat GES P_{smc} és R_{smc} csatorna sorozatai legfeljebb 64 LIDU-t tartalmazhatnak, az adási index LIDU-ban lévő "kezdeti sorozatszám" méret miatt. Abban az esetben, ha a sorozat több LIDU-t tartalmaz, akkor a GES P_{smc} és R_{smc} csatorna sorozat második sorozata kerül felhasználásra.

4.10.4.5.2.6 A GES-nek a részsorozatot az általa alátámasztott összes P-csatornán továbbítani kell. Azonkívül, a GES-nek az általa alátámsztott minden műhold/sugárnyaláb azonosító P_{smc} csatornán továbbítani kell a teljes sorozatot. Egy műholdas szolgáltatási területen minden GES-nek minden hozzá bejelentkezett AES-hez továbbítani kell minden rész-sorozatot a műholdas szolgáltatási területen lévő bármely GES által végzett felfrissítés miatt.

4.10.4.5.2.7 A rész-sorozatot kétszer olyan gyakran kell továbbítani, mint a teljes sorozatot.

4.10.4.5.3 *SZELEKTÍV BONTÁSI ADÁS*

Megjegyzés. – A szelektív bontás adási LIDU-t az összes bejelentkezett AES utasítására használják meghatározott L-sávú frekvenciá(ko)n történő adás megszüűtetése céljából.

4.10.4.5.3.1 A GES kezelésnek egy vagy több szelektív bontás adási LIDU-t kell küldeni az AES részére, ha az alábbi események közül bármelyik előfordul:

a) kérés bizonyos csatornák bontására;

b) áramkör üzemmódú hívások esetében, ha a sávon belüli csatorna törlés szolgáltstások (mint pl.: a C-csatorna alsávi csatorna bontó jelzés-átviteli szolgáltatás) hatástalanok.

4.10.4.5.4 **Ajánlás.** – *A GES kezelésnek egy AES bejelentkezést követően továbbítani kell a rendszer-időt az AES részére a rendszer-idő adási LIDU összes P frekvencián való sugárzásával. A rendszer-idő adási LIDU-ban lévő időnek a vonatkozó P-csatorna következő szuperkeret első bitjének az AES-nél történő vétele az előre jelzett ideje kell, hogy legyen.*

4.10.5 Műholdas rendszer kezelés

Legalább egy műhold/sugárnyaláb azonosító P_{smc} csatornának mindig aktívnak kell lenni minden olyan sugárnyaláb esetében, amelyik alátámaszt egy műhold/sugárnyaláb azonosító P_{smc} csatornát.

A NEGYEDIK FEJEZET TÁBLÁZATAI

4-1. táblázat: Vételi fázis-zaj maszkok

Eltolódása a vivőfrekvenciától (Hz)	Fázis-zaj (dBc)
10	-34
100	-65
1000	-73
3000	-77
10000	-79
35000	-79

1. A vivőfrekveniához viszonyított egy-oldalsávos fázis-zaj mérés.

2. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell ábrázolni egy függvényben, amelyben a frekvencia logaritmikus.

Megjegyzés. – Ennek a maszknak az ábrázolása megtalálható az Annex 10, III. kötet I. Rész "A"-Mellékletében található útmutató anyagban.

4-2. táblázat: P -csatorna rákapcsolódási vivőfrekvencia zajszint

Átviteli sebességek (bit/s)	C/No (dB-Hz)	Névleges csatornatávolság (kHz)
600	31,9	5
1 200	35,0	5
2 400	38,0	5
4 800	39,5	5
10 500	42,9	10
10 500	43,3	7,5

4-3. táblázat:A maximális harmonikus, diszkrét hamis jel és zaj-erősség szintek

Frekvencia (MHz)	EIRP (sűrűség)
1 525 alatt	- 135 dBc/4 kHz
1 525-től 1 559-ig	- 203 dBc/4 kHz
1 559-től 1 585-ig	- 155 dBc/MHz
1 585-től 1 605-ig	- 143 dBc/MHz
1 605-től 1 610-ig	- 117 dBc/MHz
1 610-től 1 614-ig	- 95 dBc/MHz
1 614-től 1 660-ig	- 55 dBc/4 kHz[1]
1 660-tól 1 670-ig	- 55 dBc/20 kHz[1]
1 670-től 1 735-ig	- 55 dBc/4 kHz
1 735-től 12 000-ig	- 105 dBc/4 kHz
12 000-től 18 000-ig	- 70 dBc/4 kHz

[1] A sugárzási sávon belül, a vivőhullámtól ± 35 kHz-en belüli frekvencia-sávot kivéve.

4-4. táblázat: A kisugárzott fázis-zaj szint

Távolság a vivőfrekvenciától (Hz)	Fázis-zaj (dBc)
10	- 40
100	- 67
500	- 72
1 100	- 80
X	- 80

1.A vivőfrekvenciához viszonyított egy-oldalsávos fázis-zaj mérés.

2. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell ábrázolni egy függvényben, amelyben a frekvencia logaritmikus.

3. Az X 35 kHz-cel vagy a jel-sebesség négyszeresével egyenlő, amelyik a kevesebb.

4. Ahol diszkrét spektrális összetevő van, ott a diszkrét fázis össszetevők és a folyamatos spektrális összetevők vannak átlagolva a sávszélességben a ± 10 Hz-el, a diszkrét összetevő mindkét oldalán, és ez nem haladhatja meg a fázis-zaj maszkot.

Megjegyzés. - Ennek a maszknak a magyarázata az I. Rész "A"-Mellékletének útmutató anyagában található.

4-5. táblázat: Az AES adások előírt spektrális határértékei

Frekvencia eltolódás	Csillapítás (dB) (a maximális burkolószinthez viszonyítva)
+/-0,75 SR	0
+/-1,40 SR	20
+/-2,80 SR	40
35 kHz	40

1. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell meghatározni.

2. Az SR jel átviteli sebesség egyenlő az A-BPSK átviteli sebességével és az A-QPSK átviteli sebességének felével.

4-6. táblázat: Az AES által vett A-BPSK előírt spektrális határértékei

Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitudó válasz (dB)	Szabványosított frekvencia	Amplitudó válasz (dB)
-X	-40	-	-
-0,75	-40	-	-
-0,66	-12	-	-
-0,56	-3,5	-	-
-0,4	0,25	-0,1	-3
0,4	0,25	0,1	-3
0,56	-3,5	-	-
0,66	-12	-	-
0,75	-40	-	-
X	-40	-	-

1. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez és az amplitúdót a 0 frekvenciánál 0 dB-hez szabványosítják.

2. X egyenlő 35 kHz. Nagyobb frekvencia eltolások esetében a 4.2.3.5.6 pont zavarófrekvencia követelményeket kell alkalmazni.

Megjegyzés. – Ennek a maszknak a magyarázatát az I. Rész "A"- Mellékletében található útmutató anyag tartalmazza.

4-7. táblázat. Az AES által vett A-QPSK előírt spektrális határértéke 100 százalék határértéknél

Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitudó válasz (dB)	Szabványosított frekvencia	Amplitudó válasz (dB)
-X	-40	-	-
-0,625	-40	-	-
-0,5	-20	-	-
-0,425	-10	-	-
-0,375	-6	-	-
-0,275	-3	-	-
-0,175	-1	-	-
-0,075	0,25	-0,05	-3
0,075	0,25	0,05	-3

0,175	-1	-	-
0,275	-3	-	-
0,375	-6	-	-
0,425	-10	-	-
0,5	-20	-	-
0,625	-40	-	-
X	-40	-	-

1. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez és az amplitúdót a 0 frekvencia 0 dB-hez szabványosítják.

2. X egyenlő 35 kHz. Nagyobb frekvencia eltolások esetében a 4.2.3.5.6 pont hamis jel követelményeket kell alkalmazni.

Megjegyzés. – Ennek a maszknak a magyarázatát az I. Rész "A"- Mellékletében található útmutató anyag tartalmazza.

4-7A táblázat: Az AES által vett A-QPSK előírt spektrális határértékei 60 százalék legördülésnél

Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitudó válasz (dB)	Szabványosított frekvencia	Amplitudó válasz dB)
-X	-40	-X	-
-0,839	-40	-0,839	-
-0,43	-35	-0,43	-
-0,41	-10	-0,41	-
-0,375	-13	-0,375	-25
-0,357	-	-0,357	-15
-0,34	-8	0,34	-11
-0,286	-4,4	-0,286	-6,4
-0,232	-1,6	-0,232	-2,6
-0,16	0	0,16-	-1
-0,125	0,25	-0,125	-
-0,107	-	-0,107	-0,25
0,107	-	0,107	-0,25
0,125	0,25	0,125	-
0,16	0	0,16	-1
0,232	-1,6	0,232	-2,6
0,286	-4,4	0,286	-6,4
0,34	-8	0,34	-11
0,357	-	0,357	-15
0,375	-13	0,375	-25
0,41	-22	0,41	-
0,43	-35	0,43	-
0,839	-40	0,839	-
X	40	X	-

1. A maszkot a fenti pontokon keresztül húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez és az amplitúdót a 0 frekvencia 0 dB-hez szabványosítják.

2. X egyenlő 35 kHz. Nagyobb frekvencia eltolások esetében a 4.2.3.5.6 pont hamis jel követelményeket kell alkalmazni.

Megjegyzés. - Ennek a maszknak a magyarázatát az I. Rész "A"-Mellékletében található útmutató anyag tartalmazza.

4-8. táblázat: Demodulátor teljesítmény

Csatorna típus	Előírt BER	E_s/N_0 [1] (dB)
P: 0,6; 1,2 és 2,4 kbit/s	10^{-5}	7,3
R, T: 0,6; 1,2 és 2,4 kbit/s	10^{-5}	7,5
P: 4,8 és 10,5 kbit/s	10^{-5}	5,4
R, T: 4,8 és 10,5 kbit/s	10^{-5}	5,7
C: 5,25 kbit/s	10^{-3}	10,8
C: 6,0 kbit/s	10^{-3}	3,9
C: 8,4 kbit/s, 7,5 kHz[2,3]	10^{-3}	7,0
C: 10,5 kbit/s, 7,5 kHz[2]	10^{-3}	10,8
C: 10,5 kbit/s, 7,5 kHz[2]	10^{-3}	12,7
C: 21,0 kbit/s	10^{-3}	5,4

1. E_sN_0 a csatorna bit periódusonként a zaj teljesítmény-sűrűség felé kibocsátott átlagos energia arány.

2. Csatorna elosztás.

3. A demodulátor teljesítményt a szomszédos csatornáknak a vivőfrekvencia felé való 1,5 kHz-es frekvencia eltolásával kell vizsgálni.

4-9. táblázat: Átviteli sebességek

Csatorna átviteli sebességek (kbit/s)	Alkalmazható csatornák	
	AES vétel	AES adás
0,6	P	R, T
1,2	P	R, T
2,4	P	R, T
4,8	P	R, T
5,25	C	C
6,0	C	C
8,4	C	C
10,5	P, C	R, T, C
21,0	C	C

4-10. táblázat: P-csatorna információs mező összetevők

	Csatorna átviteli sebesség (kbit/s)				
	0.6	1.2	2.4	4.8	10.5
Bitek száma	1152	1152	1152	2304	4992
Összerendező blokkok száma	3	2	1	1	1
Összerendező blokkok/SU-k száma	2	3	6	12	26

4-11. táblázat: P-csatorna összerendező szerkezet

	Csatorna átviteli sebesség (kbit/s)				
	0,6	1.2	2.4	4.8	10.5
Összerendező oszlopok	6	9	18	36	78

4-12. táblázat: R- és T-csatorna bevezető jelszakasz szerkezet

	Csatorna átviteli sebesség (kbit/s)			
	0.6	1.2	2.4	10.5
Modulálatlan vivő (egyenlő bit periódusok)	150	126	78	248
Modulált bitek	74	74	74	256
Összes	224	200	152	504

4-13. táblázat: T-csatorna összerendező szerkezet

	Csatorna átviteli sebesség (kbit/s)			
	0.6	1.2	2.4	10.5
Összerendező oszlopok:				
első blokk	5	5	5	8-95[1]
következő blokkok	3	3	3	nincs

1. Az összerendező oszlopok száma hármas lépcsőzésben 8 és 95 között változik, és az az adatok mennyiségének megfelelően kerül megválasztásra.

4-14. táblázat: C-csatorna bevezető jelszakasz

	Csatorna átviteli sebesség (kbit/s)				
	5.25	6.0	8.4	10.5	21.0
Modulálatlan vivő (egyenlő bit periódusok)	80	96	nem szükséges	160	336
Modulált bitek	128	144	0	256	504
Összes	208	240	0	416	840

4-15. táblázat: SNPDU típusú azonosító kódolás

Kód	SNPDU típus
Bitek 654321	(Lásd a 4-13.számútól a 4-24. számúig terjedő SNPDU formátum ábrákat)
000000	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., NINCS HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000001	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., NINCS HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000010	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000011	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., HÍVOTT NSAP ADD.,SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000100	KAPCSOLAT KÉRÉS, NSAP ADD HÍVÁS, NINCS HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000101	KAPCSOLAT KÉRÉS, NSAP ADD HÍVÁS, NINCS HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000110	KAPCSOLAT KÉRÉS, NSAP ADD. HÍVÁS, HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
000111	KAPCSOLAT KÉRÉS, NSAP ADD HÍVÁS, HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, NINCS KORLÁTOZÁS A VÁLASZRA
001000	KAPCSOLAT MEGERŐSÍTÉS, NINCS HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ
001001	KAPCSOLAT MEGERŐSÍTÉS, NINCS HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ
001010	KAPCSOLAT MEGERŐSÍTÉS, HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ
001011	KAPCSOLAT MEGERŐSÍTÉS, HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ
0011XX	TARTALÉKOK
010000	KAPCSOLAT MEGSZAKÍTVA, NINCS HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ
010010	KAPCSOLAT MEGSZAKÍTVA, HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ
0100X1	TARTALÉKOK
0101XX	TARTALÉKOK
011000	KAPCSOLAT-MEGSZAKÍTÁS TELJES
011010	TARTALÉK
0111X0	TARTALÉKOK
011XX1	TARTALÉKOK
100000	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., NINCS HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100001	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., NINCS HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100010	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100011	KAPCSOLAT KÉRÉS, NINCS HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100100	KAPCSOLAT KÉRÉS, HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA

100101	KAPCSOLAT KÉRÉS, HÍVÓ NSAP ADD., NINCS HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100110	KAPCSOLAT KÉRÉS, HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., NINCS SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
100111	KAPCSOLAT KÉRÉS, HÍVÓ NSAP ADD., HÍVOTT NSAP ADD., SZOLGÁLTATÁS MEZŐ, KORLÁTOZÁS A VÁLASZRA
101XXX	TARTALÉKOK
110000	ADAT
100001	TARTALÉK
100010	MEGSZAKÍTÁS
100011	VISSZAÁLLÍTÁS
110100	FENNTARTVA
110101	TARTALÉK
11011X	TARTALÉKOK
111000	FENNTARTVA
111001	FORGALOM-VEZÉRLÉS
111010	MEGSZAKÍTÁS MEGERŐSÍTÉS
111011	VISSZAÁLLÍTÁS MEGERŐSÍTÉS
11110X	TARTALÉKOK
111110	TARTALÉK
111111	FENNTARTVA

4-16. táblázat: SSNDPX által előállított ok mező kódolás

Előállítási körülmény	Megszakítás/visszaállítás ok mező kódolás	
	bitek 8765	bitek 4321
SSNDPX által kezdeményezett megszakítás (helyi összeköttetési hiba)	1001	0011
SSNDPX által kezdeményezett megszakítás (érvénytelen szolgáltatás kérés)	1000	0011
SSNDPX által kezdeményezett megszakítás (hálózati telítettség)	1000	0101
SSNDPX által kezdeményezett visszaállítás (helyi összeköttetési hiba)	1000	0101
SSNDPX által kezdeményezett visszaállítás (hálózati telítettség)	1000	0111

4-17. táblázat: Hibakereső kód mező kódolás (SSND al-réteg által kezdeményezett)

Előállítási körülmény	Hibakereső mező kódolás (tízes számrendszer)	Alkalmazható SNPDU-k
SSNDP működés:		
Szétkapcsolás (ideiglenes, pl. átadás)	1110 0001 (225)	Megszakítva
Szétkapcsolás (állandó, pl. kijelentkezés)	1110 0010 (226)	Megszakítva
Nem tud kapcsolatot létrehozni (ideiglenes)	1110 0011 (227)	Megszakítva
Nem tud kapcsolatot létrehozni (állandó)	1110 0100 (228)	Megszakítva
Kapcsolat visszautasítása – a szolgáltatás kért minősége nem biztosítható (transiens körülmény)	1110 0101 (229)	Megszakítva
Kapcsolat visszautasítása – a szolgáltatás kért minősége nem biztosítható (állandó körülmény)	1110 0110 (230)	Megszakítva
Protokol hiba (SNPDU típus érvénytelen a következő állapotokban).		
Kész állapot	0001 0100 (20)	Megszakítva
IWF hívás kérési állapot	0001 0101 (21)	Megszakítva
Beérkező hívás állapota	0001 0110 (22)	Megszakítva
Adatátviteli állapot	0001 0111 (23)	Megszakítva
Távoli törlési kérés állapota	0001 1010 (26)	Megszakítva
Forgalom-vezérlés állapota	0001 1011 (27)	Visszaállítás
Távoli visszaállítás kérés állapota	0001 1101 (29)	Visszaállítás
Protokol hiba (SNPDU nincs megengedve):		
Azonosíthatatlan SNPDU	0010 0001 (33)	Megszakítva, Visszaállítás
Érvénytelen LCN (lásd 4.7.3.3)	0010 0010 (34)	Visszaállítás
Túl rövid SNPDU	0010 0110 (38)	Megszakítva, Visszaállítás
Túl hosszú SNPDU	0010 0111 (39)	Megszakítva, Visszaállítás
Az SNPDU típusa nem kompatibilis a szolgáltatással	0010 1010 (42)	Megszakítva
Jogosulatlan megszakítás megerősítő SNPDU	0010 1011 (43)	Visszaállítás
Jogosulatlan megszakító SNPDU	0010 1100 (44)	Visszaállítás
Érvénytelen hívott DTE cím	0100 0011 (67)	Megszakítva
Érvénytelen hívó DTE cím	0100 0100 (68)	Megszakítva
Érvénytelen szolgáltatási hosszúság	0100 0101 (69)	Megszakítva
D-bit eljárás nincs támogatva	1010 0110 (166)	Visszaállítás
Átviteli hiba:		
Nincs további információ	0000 0000 (0)	Megszakítva, Visszaállítás
Érvénytelen SNPDU szám	0000 0001 (1)	Visszaállítás
Újratovábbítási számlálás túllépve	1001 0000 (144)	Megszakítva, Visszaállítás
Az időzítés lejárt:		
tN1 (kapcsolat megerősítő SNPDU esetében)	0011 0001 (49)	Megszakítva
tN3 (visszaállítást megerősítő SNPDU esetében)	0011 0011 (51)	Megszakítva
tN4 (megszakítás megerősítő SNPDU esetében)	0011 1001 (57)	Visszaállítás
tN7 (forgaílom-vezérlő (felfüggeszt) felügyelet)	0011 1011 (59)	Visszaállítás

4-18. táblázat: SSNDPX idő ellenőrzés

Időzítő kialakítás	Kezdő esemény	Rendes körülmények között befejeződik	Az időzítő lejártát követő esemény
tN1	Kapcsolatkérő SNPDU kibocsátása	Kapcsolat megerősítő vagy kapcsolat megszakító SNPDU vétele	Az SSNDPX-nek a kapcsolat megszakítását kell kezdeményeznie
tN3	Visszaállítás SNPDU kibocsátása	Visszaállítás megerősítő vagy visszaállítás SNPDU vétele	Az SSNDPX-nek a kapcsolat megszakítását kell kezdeményeznie
tN4	Megszakító SNDPU kibocsátása	Megszakítást megerősítő SNPDU vétele	Az SSNDPX-nek a kapcsolat biddzaállítását kell kezdeményeznie
tN6	Kapcsolat megszakítás SNPDU kibocsátása	Teljes kapcsolat megszakítás, vagy kap-csolat megszakítás SNPDU vétele	A logikai csatorna kész állapotba való visszatérése
tN7	Forgalom-vezérlő (felfüggeszt) SNPDU kibocsátása.	Forgalom-vezérlő (folytat) SNPDU kibocsátása	Az SSNDPX-nek a kapcsolat visszaállítását kell kezdeményeznie

MEGJEGYZÉSEK:

1. A tN2, tN5 és tN8 fenntartott időzítők.

2. Az időzítők akkor indulnak, amikor az adatkapcsolati rétegből az SSNDPX sikeres átviteli jelzést kap az átviteli állapot jelző LIDU-ban, hacsak a távoli SSNDPX-től érkező SNPDU az állapot jelző vétele előtt meg nem érkezik.

4-19. táblázat: SSNDPX adat-átviteli hibafelügyelet – „Hiba” LIDU vétele

Hibaként jelentett SNPDU típus	SSNDPX tevékenység
KAPCSOLAT KÉRÉS	Törlést jelző csomagot küld az IWF felé és a logikai csatornát visszaállítja készenléti állapotba
KAPCSOLAT MEGERŐSÍTÉS, KAPCSOLAT-MEGSZAKÍTÁS BEFEJEZÉS, MEGSZAKÍTÁS MEGERŐSÍTÉS	Nincs tevékenység
VISSZAÁLLÍTÁS MEGERŐSÍTÉS	Újra megpróbál egy alkalommal. Ha az újrapróbálkozás sikertelen, akkor visszaállítja a logikai csatornát az adat-átviteli állapotba
KAPCSOLAT MEGSZAKÍTÁS	Újra megpróbál egy alkalommal. Ha az újrapróbálkozás sikertelen, akkor visszaállítja a logikai csatornát készenléti állapotba
ADAT, MEGSZAKÍTÁS	SSNDPX a kapcsolat visszaállítását kezdeményezi (visszaállítás oka = „hálózati telítettség”)
FORGALOM-VEZÉRLÉS	SSNDPX a kapcsolat bontását kezdeményezi (bontás oka = „hálózati telítettség”)
VISSZAÁLLÍTÁS	Újra megpróbál egy alkalommal. Ha az újrapróbálkozás sikertelen, akkor kapcsolatbontást kezdeményez (bontás oka = „hálózati telítettség”)

Megjegyzés. – A távoli SSND al-réteg entitás által megerősített SNPDU-k esetében a megfelelő hiba LIDU feldolgozása csak akkor érvényes, ha az a másik végponttól várható válasz vétele előtt megérkezik.

4-20. táblázat: SSNDPX időzítők

Időzítő	Érték (másodperc)
tN1	180
tN3	120
tN4	120
tN6	120
tN7	60

4-21. táblázat: SSNDPX tevékenységek – bármely állapot

Távoli SSNDPX felől érkezett SNPDU vétele	Bármely állapot
Bármely SNPDU érvénytelen SNPDU típussal	Érvénytelenít
Bármely 2 oktett hossznál rövidebb SNPDU	Érvénytelenít

Megjegyzés. – Az SNPDU típus érvénytelen, ha a 4-15. táblázatban „tartalék”-, vagy „fenntartott”-ként került azonosításra.

4-22. táblázat: SSNDPX tevékenységek – kapcsolat-teremtési állapotok

Távoli SSNDPX-től vett SNPDU tevékenységek	Hívás beállítási állapotok (1,3 Megjegyzések)		
	Készenléti állapot	IWF hívás kérés	Beérkező hívás
KAPCSOLAT KÉRÉS	Tevékenység: Szabályos (az IWF felé továbbít)	Nem alkalmazható	Tevékenység: Hibaküldés KAPCSOLAT BONTÁS-t küld D = 0001 0110 (törlést IWF-re kiterjeszt)
KAPCSOLAT MEGERŐSÍTÉS	Tevékenység: Hiba* KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0100	Tevékenység: Szabályos (IWF-hez továbbít) vagy Tevékenység: Hiba (2. Megjegyzés), KAPCSOLAT MEGSZAKÍTÁS-t küld (törlést IWF-re kiterjeszt) D = 0010 1010	Tevékenység: Hiba KAPCSOLAT BONTÁS-t küld D = 0001 0110 (törlést IWF-re kiterjeszt)
KAPCSOLAT BONTÁS	Tevékenység: Normál (nem továbbít)	Tevékenység: Szabályos (IWF-hez továbbít)	Tevékenység: Normál (IWF-hez továbbít)
KAPCSOLAT MEGSZAKÍTÁS TELJES	Tevékenység: Hiba* KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0100	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0101 (törlést IWF-re kiterjeszt)	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0110 (törlést IWF-re kiterjeszt)
ADAT, MEGSZAKÍTÁS, MEGSZAKÍTÁS MEGERŐSÍTÉS, VISSZAÁLLÍTÁS, VISSZAÁLLÍTÁS MEGERŐSÍTÉS, FORGALOM VEZÉRLÉS	Tevékenység: Hiba* KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0100	Tevékenyég: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0101 (törlést IWF-re kiterjeszt)	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0110 (törlést IWF-re kiterjeszt)

* Az SSNDPX belső kapcsolat-bontás kérés (azaz az IWF nincs tájékoztatva)

MEGJEGYZÉSEK:

1. Azon esetekben, amikor a logikai csatorna állapotának az SNPDU nem elfogadható (azaz Tevékenység = Hiba), akkor a törlési ok mező 147-tel, azaz az SSND helyi összeköttetési hibával egyenlő.

2. A hiba előfordulhat, akkor ha gyors kiválasztással kérnek korlátozott választ.

3. Ha a logikai csatorna állapotának az SNPDU elfogadható (azaz a Tevékenység = Szabályos), de formátum hibát tartalmaz, vagy másképpen elfogadhatatlan, akkor az SSND egy kapcsolat-megszakítási eljárást kezdeményez (az alkalmazható hibakereső kódok a 34, 38, 39, 67, 68, 69, 225–230).

4-23. táblázat: SSNDPX tevékenységek – adat-átviteli és kapcsolat-megszakítási állapotok

Távoli SSNDPX-től vett SNPDU tevékenységek	Adatátviteli és hívástörlő állapotok		
	Adat-átvitel	Helyi törlési kérés*	Távoli törlési kérés
KAPCSOLAT KÉRÉS	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0111 (lásd 1. Megjegyzést) (törlést kiterjeszt a IWF-re)	Tevékenység: figyelmen kívül hagy	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 1010
KAPCSOLAT MEGERŐSÍTÉS	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0111 (lásd az 1. Megjegyzést) (törlést kiterjeszt a IWF-re)	Tevékenység: figyelmen kívül hagy	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 1010
KAPCSOLAT MEGSZAKÍTÁS TELJES	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 0111 (lásd az 1. Megjegyzést) (törlést kiterjeszt a IWF-re)	Tevékenység: Szabályos	Esemény: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 1010
KAPCSOLAT MEGSZAKÍTÁS	Tevékenység: Szabályos (IWF felé továbbít)	Tevékenység: Szabályos (IWF felé nem továbbít)	Tevékenység: figyelmen kívül hagy
ADAT, MEGSZAKÍTÁS, MEGSZAKÍTÁS MEGERŐSÍTÉS, VISSZAÁLLÍTÁS, VISSZAÁLLÍTÁS MEGERŐSÍTÉS, FORGALOM VEZÉRLÉS	Lásd a 4-24. táblázatot	Tevékenység: figyelmen kívül hagy	Tevékenység: Hiba KAPCSOLAT MEGSZAKÍTÁS-t küld D = 0001 1010

* Belső törlés (a kapcsolat létrehozásánál) vagy az IWF általi törlés kérés.

MEGJEGYZÉSEK:

1. A törlési ok mező 147-tel, azaz az SSND helyi összeköttetési hibával egyenlő.

2. Ha az SNPDU elfogadható a logikai csatorna állapotának (azaz Tevékenység = Szabályos), de formátum hibát tartalmaz, akkor az SSND egy kapcsolat- megszakítási eljárást kezdeményez (az alkalmazható hibakereső kódok 38, 39).

4-24. táblázat: SSNDPX tevékenységek – adat-átviteli állapotok

Távoli SNDPX-től vett SNPDU	Adat-átviteli állapotok		
	Forgalom-vezérlés	Helyi visszaállítási kérés	Távoli visszaállítási kérés
VISSZAÁLLÍTÁS	Tevékenység: Szabályos	Tevékenység: Szabályos (nem továbbít)	Tevékenység: Figyelmen kívül hagy
VISSZAÁLLÍTÁS MEGERŐSÍTÉS	Tevékenység: Hiba VISSZAÁLLÍTÁS SNPDU-t küld D=0001 1011 (a reset-et kiterjeszti az IWF-re)	Tevékenység: Szabályos (nem továbbít)	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU-t küld D=0001 1101
MEGSZAKÍTÁS	*Nem-távoli megszakítás függő:* Tevékenység: szabályos *Folyamatban lévő távoli megszakítás:* Tevékenység: Hiba, VISSZAÁLLÍTÁS SNPDU-t küld D=0010 1100 (a visszaállítást kiterjeszti az IWF-re)	Tevékenység: Figyelmen kívül hagy	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU-t küld D=0001 1101
MEGSZAKÍTÁS MEGERŐSÍTÉS	Nem helyi megszakítás függő: Tevékenység: Hiba, VISSZAÁLLÍTÁS SNPDU-t küld D=0010 1011 (a visszaállítást kiterjeszti az IWF-re) Tevékenység: Szabályos	Tevékenység: Figyelmen kívül hagy	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU- t küld D=0001 1101
ADAT érvényes SNPDU számmal	Tevékenység: Szabályos (ha a forgalom-vezérlés kész); vagy Tevékenység: Figyelmen kívül hagy (ha a forgalom-vezérlés nem kész)	Tevékenység: Figyelmen kívül hagy	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU-t küld D=0001 1101
ADAT érvénytelen SNPDU számmal (helyreállíthatatlan)	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNPDU-t küld D=0000 0001 (a VISSZAÁLLÍTÁS-t kiterjeszti az IWF-re), vagy Tevékenység: Figyelmen kívül hagy (ha a forgalom-vezérlés nem kész)	Tevékenység: Figyelmen kívül hagy	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU-t küld D=0001 1101
FORGALOM-VEZÉRLÉS (felfüggeszt) érvényes SNPDU számmal, vagy forgalom-vezérlés (folytat)	Tevékenység: Szabályos	Tevékenység: Figyelmen kívül hagy	Tevékenység: Hiba, VISSZAÁLLÍTÁS SNDPU- t küld D=0001 1101
FORGALOM-VEZÉRLÉS (felfüggeszt) érvénytelen SNPDU számmal		Tevékenység: Hiba,VISSZAÁLLÍTÁS SNDPU-t küld D=0000 0001a VISSZAÁLLÍTÁS-t kiterjeszti az IWF-re)	Tevékenység: Hiba,VISSZAÁLLÍTÁS SNDPU-t küld D=0001 1101

MEGJEGYZÉSEK:

1. Azon esetekben, amikor az SNPDU nem fogadható el a logikai csatorna állapotának (vagyis Tevékenység = Hiba), akkor a visszaállítási ok mező 133-al, vagyis az SSND helyi kapcsolati hibával egyenlő.

2. Ha az SNPDU megfelel a logikai csatorna állapotának (vagyis Tevékenység = Szabályos), de formátumhibát tartalmaz, akkor az SSND egy összeköttetési visszaállítási eljárást kezdeményez (az alkalmazható hibakereső kódok az 1, 38, 39).

4-25. táblázat: Adat-kapcsolati interfész adat egységek és paraméterek összefoglalása

Irány	LIDU név	Paraméterek
Az al-hálózati réteg felől az adat-kapcsolati réteg felé	Adat	GES ID (AES-ben) vagy AES ID (GES-ben) RLS Q szám LSDU
Az adat-kapcsolati réteg felől az al-hálózati réteg felé	Adat	GES ID (AES-ben) vagy AES ID (GES-ben) RLS Q szám LSDU
	Továbbítási állapot jelzés	RLS Siker/Hiba LSDU első két oktettje

4-26. táblázat: Al-hálózati összeköttetés elsőbbség leképezés

A közlemények kategóriái	Elsőbbség/Q szám leképezés		
	SNC elsőbbség a HÍVÁSKÉRÉS-ben/ /HÍVÁS ELFOGAD-VA csomag	Q szám	SNC elsőbbség a BEÉRKEZŐ HÍVÁS-ban/HÍVÁS KAPCSOLVA csomag
Meghatározatlan	255	0	Nincs
Fenntartott	254-15	Érvénytelen/hívást visszautasít	Nem alkalmazható
Vészhelyzeti össze-köttetés, sürgősségi összeköttetés, hálózat/rendszer kezelés	14	14	14
Fenntartott	13	Érvénytelen/hívást visszautasít	Nem alkalmazható
Fenntartott	12	Érvénytelen/hívást visszautasít	Nem alkalmazható
Irányméréssel kap-csolatos összeköttetés, repülésbiztonsági köz-lemények	11	11	11
Foglalt	10	Érvénytelen/hívást visszautasít	Nem alkalmazható

Foglalt	9	Érvénytelen/hívást visszautasít	Nem alkalmazható
Meteorológiai összeköttetés	8	8	8
A repülés rendszeres-ségével kapcsolatos összeköttetés	7	7	7
Légiforgalmi tájékoztató szolgálati közlemények	6	6	6
Légiforgalmi igazgatási közlemények, hálózat/rendszer adminisztráció	5	5	5
Fenntartott	4	Érvénytelen/hívást visszautasít	Nem alkalmazható
Sürgős elsőbbségi igazgatási és ENSZ különjárati össze-köttetések	3	3	3
Sűrgős elsőbbségű igazgatási és állami/kormányzati összeköttetés	2	2	2
Normál elsőbbségi/ /igazgatási	1	1	1
Alacsony elsőbbségű igazgatási	0	0	nincs

1. Megjegyzés. – Az SNC 255 elsőbbségi értéket (meghatározatlan) a hívás-kérés/hívás elfogadva csomagban a 0-val egyenlő Q számba és a beérkező hívás/hívás kapcsolva csomagban „nincs” elsőbbséggel kell leképezni.

2. Megjegyzés. – A hálózat/rendszer kezelés és igazgatás nem végfelhasználó üzenetek kategóriái, hanem ezeket az ATN vagy más hálózat kezelés/igazgatás használja fel.

4-27. táblázat: DCE tevékenységek újra-indításnál, hívás beállítási és hívás törlési állapotok

DCE állapot	Állapot meghatározás	Az állapotba való belépéskori tevékenység
r1	CSOMAG RÉTEG KÉSZ	Az összes VC visszakerül a p1 állapotba (lásd p1 állapot KÉSZ magyarázatot) és az összes PVC visszakerül a d1 (fogalom-vezérlés kész) állapotba.
r2	DTE ÚJRA-INDÍTÁSI KÉRÉS	A DCE minden VC-t visszajuttat a p1 állapotba (lásd a p1 állapot magyarázatot) és egy újra-indítási megerősítő csomagot küld a DTE-hez.
r3	DCE ÚJRA-INDÍTÁSI JELZÉS	A DCE minden VC-t visszajuttat a p1 állapotba (lásd a p1 állapot magyarázatot) és egy újra-indítási jelző csomagot küld a DTE felé.
p1	KÉSZ	Felszabadítja a VC csatornához rendelt összes forrást.
p2	DTE HÍVÁS-KÉRÉS	Meghatározza, hogy van-e elegendő forrás a kérés támogatására; ha igen, akkor forrásokat oszt ki és ISO 8208 hívás-kérő csomagot küld az IWF felé; ha nem, akkor DCE törlés-jelzési csomagot visz a DTE állapothoz (p7). A források meghatározása és kiosztása az ISO 8208-ban meghatározottak szerint.
p3	DCE BEÉRKEZŐ HÍVÁS	Meghatározza, hogy van-e elegendő forrás a kérés alátámasztására; ha igen, akkor forrásokat oszt ki és ISO 8208 beérkező hívás csomagot továbbít a DTE-nek; ha nem, akkor egy törlés-kérési csomagot küld az IWF felé. A források meghatározása és kiosztása az ISO 8208-ban meghatározottak szerint.
p4	ADAT-ÁTVITEL	Nincs tevékenység.
p5	HÍVÁS-ÜTKÖZÉS	A beérkező hívás-csomag megfelelő törlés kérési csomagot küld az IWF-nek (a DTE a hívás-ütközési állapotában figyelmen kívül hagyja a beérkező hívást) és folytatja a DTE hívás-kérési csomaggal.
p6	DTE TÖRLÉS-KÉRÉS	Felszabadítja a VC csatornához hozzárendelt összes forrást. Egy ISO 8208 törlés-megerősítő csomagot küld a DTE felé, egy törlés-kérési csomagot az IWF-nek, és p1 állapotba lép.
p7	DCE TÖRLÉS JELZÉS A DTE FELÉ.	ISO 8208 törlés jelző csomagot továbbít a DTE-nek.

Megjegyzés. – A táblázatban szereplő állapot lista különbözhet az ISO 8208-ban használatos állapot listától.

4-28. táblázat: DCE tevékenységek újra-indítási, megszakítási és forgalom-vezérlésii állapotai

DCE állapot	Állapot meghatározás	Tevékenység az állapotba való belépéskor
d1	FORGALOM-VEZÉRLÉS KÉSZ	Nincs esemény.
d2	VISSZAÁLLÍTÁS KÉRÉSE A DTE ÁLTAL	Az ablakból a DTE felé kibocsátott adatcsomagok eltávolítása; érvényteleníti a részlegesen továbbított M-bit sorozatokat és érvényteleníti a DTE-hez való továbbításra váró megszakítási és megszakítást megerősítő csomagokat; nullára állítja az összes ablakszámlálót. Újra-indítás megerősítő csomagot küld a DTE felé. Visszaállítja a csatornát d1 állapotba.
d3	DCE VISSZAÁLLÍTÁS JELZÉS A DTE FELÉ	Az ablakból a DTE felé kibocsátott adatcsomagok eltávolítása; érvényteleníti a részlegesen továbbított M-bit sorozatokat és érvényteleníti a DTE-hez való továbbításra váró megszakítási és megszakítást megerősítő csomagokat; nullára állítja az összes ablakszámlálót. Újra-indítás megerősítő csomagot küld a DTE felé.
i1	DTE MEGSZAKÍTÁS KÉSZ	Nincs tevékenység.
i2	DTE MEGSZAKÍTÁS ELKÜLDVE	A DTE-től érkezett megszakítási csomagot az IWF felé továbbítja.
j1	DCE MEGSZAKÍTÁS KÉSZ	Nincs tevékenység
j2	DCE MEGSZAKÍTÁS ELKÜLDVE	Az IWF-től érkezett megszakítási csomagot a DTE felé továbbítja.
f1	DCE VÉTEL KÉSZ	Nincs tevékenység.
f2	DCE VÉTEL NEM KÉSZ	Nincs tevékenység
g1	DTE VÉTEL KÉSZ	Nincs tevékenység
g2	DTE VÉTEL NEM KÉSZ	Nincs tevékenység

Megjegyzés. – A táblázatban használt értékek különbözhetnek az ISO 8208-ban használatos értékektől.

4-29. táblázat: DCE állapot táblázat – bármely állapot

DTE felől érkezett	DCE speciális esetek Bármely állapot
Bármely, 2 oktettnél rövidebb csomag	A = DIAG D = 38
Bármely, érvénytelen általános formátum azonosítóval rendelkező csomag	A = DIAG D = 40
Bármely, ki nem jelölt logikai csatorna azonosítóval rendelkező csomag	A = DIAG D = 36
Bármely, érvényes általános formátum azonosítóval és egy kijelölt logikai csatorna azonosítóval rendelkező csomag (egy 0-ás logikai csatorna azonosítót tartalmaz)	Lásd a 4-30. táblázatot

4-30. táblázat: DTE hatás a DCE újra-indítási állapotokra

DTE felől érkezett csomag	DCE újra-indítási állapotok (Lásd 6. és 7. megjegyzést)		
	Csomagréteg KÉSZ (Lásd az 1. Megjegyzést) r1	DTE ÚJRA-INDÍTÁSI KÉRÉS (Lásd a 4. Megjegyzést) r2	DCE ÚJRA-INDÍTÁSI JELZÉS (Lásd az 5. Megegyzést) r3
Olyan csomagok, amelyek 1 oktettnél rövidebb csomag típus azonosítóval rendelkeznek és a kijelölt logikai csatorna azonosítójuk <> 0	Lásd a 4-31. táblázatot	A = HIBA S = r3 D = 38 (Lásd a 3. Megegyzést)	A = ÉRVÉNYTELENÍT
Olyan 0-ás logikai csatorna azonosítóval rendelkező csomag, amit nem újra-indítási DCE támogat	A = DIAG D = 36	A = DIAG D = 36	A = DIAG D = 36
Olyan nem meghatározott csomag típus azonosítóval rendelkező, vagy DCE által nem támogatott csomag, amelynek a kijelölt logikai csatorna azonosítója <> 0	Lásd a 4-31. táblázatot	A = HIBA S = r3 D = 33 (Lásd a 3. Megjegyzést)	A = ÉRVÉNYTELENÍT
Olyan újra-indítási kérés, vagy újra-indítást megerősítő csomag, amelynek a kijelölt logikai csatorna-azonosítója <> 0	Lásd a 4-31. táblázatot	A = HIBA S = r3 D = 41 (Lásd a 3. Megjegyzést)	A = ÉRVÉNYTELENÍT
Újrai-indítási kérés	A = SZABÁLYOS (Lásd az 1. Megjegyzést) S = r2	A = ÉRVÉNYTELENÍT	A = SZABÁLYOS (4.2) S = p1 vagy d1 (lásd a 2. Megjegyzést)
Újra-indítás megerősítése	A = HIBA S = r3 D = 17 (Lásd a 8. Megjegyzést)	A = HIBA S = r3 D = 18 (Lásd a 3. Megjegyzést)	A = SZABÁLYOS (4.4) S = p1 vagy d1 (lásd a 2. Megjegyzést)
Újra-indítási kérés vagy újra-indítás megerősítő csomag formátum hibával	A = DIAG D = 38, 39, 81 vagy 82	A = ÉRVÉNYTELENÍT	A = HIBA D = 38, 39, 81 vagy 82
Hívás beállítás, törlés, adatok, meg- szakítás, forgalom-vezérlés vagy visszaállítás csomag	Lásd a 4-31. táblázatot	A = HIBA S = R3 D = 18	A = ÉRVÉNYTELENÍT

Csomagok, amelyek csomag típus azonosítója 1 bájtnál rövidebb és a logikai csatorna azonosítója 0-val egyenlő	A = DIAG D = 38	A = HIBA S = r3 D = 38	A = ÉRVÉNYTELENÍT
Olyan nem meghatározott csomag típus azonosítóval rendelkező, vagy DCE által nem támogatott csomag, amelynek a kijelölt logikai csatorna azonosítója 0-val egyenlő	A = DIAG D = 33	A = HIBA S = r3 D = 33 (Lásd a 4. Megjegyzést)	A = ÉRVÉNYTELENÍT

MEGJEGYZÉSEK:

1. Egy újra-indítást kérő csomag vétele a DCE-t arra készteti, hogy a DCE adathalmazhoz társított minden egyes VC részére törlést kérő csomagot bocsásson ki az IWF felé.

2. A VC csatornák p1 állapotba, a PVC csatornák d1 állapotba térnek vissza.

3. A DCE nem reagál.

4. Az újra-indítást kérő csomag nem kerül továbbításra az IWF felé.

5. A DCE az r3 állapotba való belépéskor ellenőrzi az r2 feldolgozás befejezését, és egy ISO 8208 újra-indítási jelző csomagot küld a DTE felé, ha az r3 állapotba az r2 állapoton keresztül történik a belépés. Ha az r3 állapotba való belépés nem az r2 állapoton keresztül történik, akkor a DCE végrehajtja az összes intézkedést, amelyeket rendes körülmények között az r2 állapotba való belépéskor hajt végre, és kibocsát egy ISO 8208 újra-indítási jelző csomagot a DTE felé, valamint egy törlést kérő csomagot küld a DCE adathalmazhoz tartozó minden egyes VC részére az IWF felé.

6. A táblázatban szereplő rövidítések a következők: A = a megteendő intézkedés, S = az állapotba való belépés, D = az intézkedés eredményeként keletkezett csomagokban használandó hibakereső kód. Az érvénytelenítés azt jelzi, hogy a vett csomagot a bufferekből ki kell törölni.

7. Az A = NORMÁL /Szabályos/ felirat alatti zárójelben szereplő számok az ISO 8208 második kiadásának bekezdéseit jelölik. A DCE ugyanazon intézkedést kell, hogy végrehajtsa, mint a DTE, amikor DCE-ként működik, a vett csomagok rendes körülmények között történő feldolgozásának végrehajtása céljából. Ha nincs bekezdésre való hivatkozás, akkor a rendes körülmények között történő feldolgozás a táblázatban került meghatározásra.

8. A hibaeljárás az r3 állapotba való belépésből és a DTE felé történő újra-indítási jelző csomag küldéséből áll.

4-31. táblázat: DTE hatás a DCE hívás beállítási és törlési állapotokra

DTE felől vett csomag	DCE hívás beállítás és törlési állapotok (Lásd az 5. és a 6. Megjegyzéseket)						
	KÉSZ p1	DTE HÍVÁS-KÉRÉS p2	DCE BEÉRKEZŐ HÍVÁS p3	ADAT-ÁTVITEL p4	HÍVÁS ÜT-KÖZÉS p5; Lásd az 1. és a 4. Megjegyzéseket	DTE TÖRLÉS-KÉRÉS p6	DCE TÖRLÉS JELZÉS A DTE FELÉ p7
1 oktettnél rövidebb csomag típus azonosítóval rendelkező csomag	A = HIBA S = p7 D = 38	A = HIBA S = p7 D = 38 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 38 Lásd a 2. Megjegyzést	Lásd a 4-32. táblázatot	A = HIBA S = p7 D = 38 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 38 Lásd a 2. Megjegyzést	A = ÉRVÉNYTELENÍT
Olyan csomag, amelynek meghatározatlan a csomag típus azonosítója vagy a DCE nem támogatja	A = HIBA S = p7 D = 33	A = HIBA S = p7 D = 33 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 33 Lásd a 2. Megjegyzést	Lásd a 4-32. táblázatot	A = HIBA S = p7 D = 33 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 33 Lásd a 2. Megjegyzést	A = ÉRVÉNYTELENÍT
ÚJRAINDÍTÁS-KÉRÉS VAGY ÚJRAINDÍTÁS-MEGERŐSÍTŐ csomag, amelynek a logikai csatorna azonosítója nem egyenlő 0-val	A = HIBA S = p7 D = 41	A = HIBA S = p7 D = 41 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 41 Lásd a 2. Megjegyzést	Lásd a 4-32. táblázatot	A = HIBA S = p7 D = 41 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 41 Lásd a 2. Megjegyzést	A = ÉRVÉNYTELENÍT
HÍVÁS-KÉRÉS	A = SZABÁLYOS (5.2.2) S = p2 (továbbít)	A = HIBA S = p7 D = 21 Lásd a 2. Megjegyzést	A = SZABÁLYOS (5.2.5) S = p5	A = HIBA S = p7 D = 23 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 24 Lásd a 2. Megjegyzést	A = HIBA S = p7 D = 25 Lásd a 2. Megjegyzést	A = ÉRVÉNYTELENÍT

HÍVÁS ELFOGAD-VA	A = HIBA S = p7 D = 20	A = HIBA S = p7 D = 21 Lásd a 2. Megjegy-zést	A = SZABÁ-LYOS (5.2.4) S = p4 (továbbít) A = HIBA S = p7 D = 41 Lásd a 2. és 3. Megjegy-zést	A = HIBA S = p7 D = 23 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 24 Lásd a 2. és 4. Megjegy-zést	A = HIBA S = p7 D = 25 Lásd a 2. Megjegy-zést	A = ÉRVÉNY-TELENÍT
TÖRLÉSI KÉRÉS	A = SZABÁ-LYOS (4.5.5.2) S = p6	A = SZABÁ-LYOS (4.5.5.2) S = p6 (továbbít)	A = SZABÁ-LYOS (4.5.5.2) S = p6 (továbbít)	A = SZABÁ-LYOS (4.5.5.2) S = p6 (továbbít)	A = SZABÁ-LYOS (4.5.5.2) S = p6 (továbbít)	A = ÉRVÉNY-TELENÍT	A = SZABÁ-LYOS (4.5.5.2) S = p1 (nem továbbít)
TÖRLÉS-MEGERŐ-SÍTÉS	A = HIBA S = p7 D = 20	A = HIBA S = p7 D = 21 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 22 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 23 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 24 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 25 Lásd a 2. Megjegy-zést	A = SZABÁ-LYOS (5.5.4) S = p1 (nem továbbít)
Adat, megszakítási, forgalom-vezérlés, vagy visszaállítás csomagok	A = HIBA S = p7 D = 20	A = HIBA S = p7 D = 21 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 22 Lásd a 2. Megjegy-zést	Lásd a 4-32. táblázatot	A = HIBA S = p7 D = 24 Lásd a 2. Megjegy-zést	A = HIBA S = p7 D = 25 Lásd a 2. Megjegy-zést	A = ÉRVÉNY-TELENÍT

MEGJEGYZÉSEK:

1. A p5 állapotba való belépéskor a DCE a beérkező hívásnak megfelelő törlést kérő csomagot küld az IWF felé (a DTE a hívás ütközési állapotában figyelmen kívül hagyja a beérkező hívást) és végrehajtja a DTE hívás-kérést.

2. A hibaeljárás a p7 állapotba való belépéskor meghatározott intézkedések végrehajtásából (beleértve egy törlés jelző csomag küldését a DTE-nek) és egy törlést kérő csomag IWF felé való továbbításából áll.

3. A gyors-kiválasztó szolgáltatás válasz-adásra vonatkozó korlátozása megakadályozza, hogy a DTE egy hívás elfogadási csomagot küldjön.
4. A DTE-nek hívás ütközés esetén érvényteleníteni kell a DCE-től kapott hívás-kérő csomagot.

5. A táblázatban szereplő rövidítések a következők: A = a megteendő intézkedés, S = az állapotba való belépés, D = az intézkedés eredményeként keletkezett csomagokban használandó hibakerső kód. Az érvénytelenítés azt jelzi, hogy a vett csomagot a bufferekből ki kell törölni.

6. Az A = NORMÁL /Szabályos/ felirat alatti zárójelben szereplő számok az ISO 8208 második kiadásának bekezdéseit jelölik. A DCE ugyanazon intézkedést kell, hogy végrehajtsa, mint a DTE,

amikor DCE-ként működik, a vett csomagok rendes körülmények között történő feldolgozásának végrehajtása céljából. Ha nincs bekezdésre való hivatkozás, akkor a rendes körülmények között történő feldolgozás a táblázatban került meghatározásra.

7. Ha a csomag a logikai csatorna állapotának elfogadható (vagyis: Tevékenység = Szabályos), de formátum hibát tartalmaz, vagy más miatt nem elfogadható, akkor a DCE-nek egy kapcsolat-megszakító eljárást kell kezdeményeznie (az alkalmazható hibakereső kódok: 34, 38, 39, 65, 66, 67, 68, 69, 73, 77, 82). Ha ilyen hiba kerül megállapításra - p1 vagy p7 állapotban -, akkor a DCE nem küld törlés-kérési csomagot az IWF felé.

4-32. táblázat: DTE hatás a DCE visszaállítás állapotokra

DTE-től kapott csomag	DCE visszaállítás állapot (Lásd a 2. és 3. Megjegyzést)		
	FORGALOM-VEZÉRLÉS KÉSZ d1	DTE VISSZAÁLLÍTÁS KÉRÉS d2	DCE-TŐL VISSZAÁLLÍTÁS KÉRÉS A DTE FELÉ d3
1 oktettnél rövidebb csomag típus azonosítóval rendelkező csomag	A = HIBA S = d3 D = 38 (Lásd az 1. Megjegyzést)	A = HIBA S = d3 D = 38 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT
Meg nem határozott csomag típus azonosítóval rendelkező, vagy DCE által nem támogatott csomag	A = HIBA S = d3 D = 33 (Lásd az 1. Megjegyzést)	A = HIBA S = d3 D = 33 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT
ÚJRA-INDÍTÁS KÉRÉS, vagy ÚJRA-INDÍTÁS MEGERŐSÍTŐ csomag, amelynek a logikai csatorna azonosítója <> 0	A = HIBA S = d3 D = 41 (Lásd az 1. Megjegyzést)	A = HIBA S = d3 D = 41 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT
VISSZAÁLLÍTÁS KÉRÉS	A = SZABÁLYOS (8.2) S = d2 (továbbít)	A = ÉRVÉNYTELENÍT	A = SZABÁLYOS (8.3) S = d1 (nem továbbít)
VISSZAÁLLÍTÁS MEGERŐSÍTÉS	A = HIBA S = d3 D = 27 (Lásd az 1.Megjegyzést)	A = HIBA S = d3 D = 28 (Lásd az 1. Megjegyzést)	A = SZABÁLYOS (8.4) S = d1 (nem továbbít)
MEGSZAKÍTÁS csomag	Lásd a 4-33. táblázatot	A = HIBA S = d3 D = 28 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT

MEGSZAKÍTÁS MEGERŐSÍTŐ csomag	Lásd a 4-33. táblázatot	A = HIBA S = d3 D = 28 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT
ADAT vagy forgalom-vezérlő csomag	Lásd a 4-33. táblázatot	A = HIBA S = d3 D = 28 (Lásd az 1. Megjegyzést)	A = ÉRVÉNYTELENÍT

MEGJEGYZÉSEK:

1. A hibaeljárás a d3 állapotba való belépéskor a meghatározott intézkedések végrehajtásából (amely magába foglalja egy visszaállítás jelző csomag DTE felé való továbbítását) és egy visszaállítás kérő csomag IWF felé való küldéséből áll.

2. A táblázatban szereplő rövidítések a következők: A = a megteendő intézkedés, S = az állapotba való belépés, D = az intézkedés eredményeként keletkezett csomagokban használandó hibakereső kód. Az érvénytelenítés azt jelzi, hogy a vett csomagot az AES bufferekből ki kell törölni.

3. Az A = NORMÁL /Szabályos/ felirat alatti zárójelben szereplő számok az ISO 8208 második kiadásának bekezdéseit jelölik. A DCE ugyanazon intézkedést kell, hogy végrehajtsa, mint a DTE, amikor DCE-ként működik, a vett csomagok rendes körülmények között történő feldolgozásának végrehajtása céljából. Ha nincs bekezdésre való hivatkozás, akkor a rendes körülmények között történő feldolgozás a táblázatban került meghatározásra.

4. Ha a csomag a logikai csatorna állapotának elfogadható (vagyis: Tevékenység = Szabályos), de formátum hibát tartalmaz, akkor a DCE-nek egy kapcsolat bontó eljárást kell kezdeményeznie (az alkalmazható hibakereső kódok: 38, 39, 81, 82).

4-33. táblázat DTE hatás a DCE megszakítás átviteli állapotokra

DTE-től kapott csomag	DTE/DCE MEGSZAKÍTÁS ÁTVITELI ÁLLAPOTOK (lásd a 2. és 3. Megjegyzést)	
	DTE MEGSZAKÍTÁS KÉSZ i1	DTE MEGSZAKÍTÁS ELKÜLDVE i2
MEGSZAKÍTÁS (lásd az 1. Megj.-t)	A = SZABÁLYOS (6.8.2) S = i2 (továbbít)	A = HIBA S = d3 D = 44 (lásd a 4. Megj.-t)

DTE-től kapott csomag	DTE/DCE MEGSZAKÍTÁS ÁTVITELI ÁLLAPOTOK (lásd a 2. és 3. Megjegyzést)	
	DTE MEGSZAKÍTÁS KÉSZ j1	DTE MEGSZAKÍTÁS ELKÜLDVE j2
MEGSZAKÍTÁS-MEGERŐSÍTÉS (lásd az 1. Megj.-t)	A = HIBA S = d3 D = 43 (lásd a 4. Megj.-t)	A = SZABÁLYOS (6.8.3) S = j1 (továbbít)

MEGJEGYZÉSEK:

1. Ha a csomag elfogadható a logikai csatorna számára (vagyis: intézkedés = szabályos), de formátum hibát tartalmaz, akkor a hibakeresést kell alkalmazni (lásd a 4. Megjegyzést).

2. A táblázatban szereplő rövidítések a következők: A = a megteendő intézkedés, S = az állapotba való belépés, D = az intézkedés eredményeként keletkezett csomagokban használandó hibakereső kód.

3. Az A = SZABÁLYOS felirat alatti zárójelben szereplő számok az ISO 8208 második kiadásának bekezdéseit jelölik. A DCE ugyanazon intézkedést kell, hogy végrehajtsa, mint a DTE a vett csomagok rendes körülmények között történő feldolgozásának végrehajtása céljából. Ha nincs bekezdésre való hivatkozás, akkor a rendes körülmények között történő feldolgozás a táblázatban került meghatározásra.

4. A hibakereső eljárás a d3 állapotba való belépéskor a meghatározott intézkedések végrehajtásából (amely magába foglalja egy visszaállítás jelző csomag DTE felé való továbbítását) és egy visszaállítás kérőcsomag IWF felé való küldéséből áll.

4-34. táblázat: DTE hatás a DCE forgalom-vezérlő átviteli állapotokra

DTE-től érkező csomag	DCE forgalom-vezérlő átviteli állapotok (lásd a 2. Megjegyzést)	
	DCE VÉTELRE KÉSZ f1	DCE VÉTELRE NEM KÉSZ f2
ADAT csomag érvénytelen PR-rel	A = HIBA S = d3 D = 2 (lásd a 4. Megj.-t)	A = HIBA S = d3 D = 2 (lásd a 4. Megj.-t)
ADAT csomag érvényes PR-rel, de érvénytelen PS-sel, vagy helytelen formátumú felhasználói adat mezővel	A = HIBA S = d3 D = (lásd az 5. Megj.-t) (lásd a 4. Megj.-t)	A = ÉRVÉNYTELENÍT (PR adatfeldolgozás)
ADAT csomag érvényes PR-rel és 1-re állított M-bittel, ha a felhasználói adat mező részlegesen megtelt, vagy a D-bit 1-re van állítva (ha nincs alátámasztva)	A = HIBA S = d3 D = 165 vagy 166 (lásd a 4. Megj.-t)	A = ÉRVÉNYTELENÍT (PR adatfeldolgozás)
ADAT csomag érvényes PR-rel, PS-sel és helyes formátumú felhasználói adat mezővel	A = SZABÁLYOS (továbbít)	A = ÉRVÉNYTELENÍT (PR adatfeldolgozás) (lásd a 7. Megj.-t)
DTE-től érkező csomag	DCE forgalom-vezérlő átviteli állapotok (lásd a 2. és a 3. Megjegyzést)	
	DTE VÉTELRE KÉSZ g1	DTE VÉTELRE NEM KÉSZ g2
RR vagy RNR csomag érvénytelen PR-rel	A = HIBA S = d3 D = 2 (lásd a 4. Megj.-t)	A = HIBA S = d3 D = 2 (lásd a 4. Megj.-t)
RR csomag érvényes PR-rel (lásd a 6. Megj.-t)	A = SZABÁLYOS (4.7.1.5)	A = SZABÁLYOS (4.7.1.5) S = g1
RNR csomag érvényes PR-rel (lásd a 6. Megj.-t)	A = SZABÁLYOS (4.7.1.6) S = g2	A = SZABÁLYOS (4.7.1.6)

MEGJEGYZÉSEK:

1. Az RR és RNR eljárások helyi DTE/DCE esetek és a megfelelő csomagok nem kerülnek továbbításra az IWF felé.

2. A táblázatban szereplő rövidítések a következők: A = a megteendő intézkedés, S = az állapotba való belépés, D = az intézkedés eredményeként keletkezett csomagokban használandó hibakereső kód. Az érvénytelenítés azt jelzi, hogy a vett csomagot az AESbufferekből ki kell törölni.

3. Az A = SZABÁLYOS felirat alatti zárójelben szereplő számok az ISO 8208 második kiadásának bekezdéseit jelölik. A DCE ugyanazon intézkedést kell, hogy végrehajtsa, mint a DTE, amikor DCE-ként működik, a vett csomagok rendes körülmények között történő feldolgozásának végrehajtása céljából. Ha nincs bekezdésre való hivatkozás, akkor a rendes körülmények között történő feldolgozás a táblázatban került meghatározásra.

4. A hibakeresés a d3 állapotba való belépéskor a meghatározott intézkedések végrehajtásából (amely magába foglalja egy visszaállítás jelző csomag DTE felé való továbbítását) és egy visszaállítás kérő csomag IWF felé való küldéséből áll.

5. A hibajkereső kódok a következők: D = 1 érvénytelen PS esetén; D = 39 a 128 oktettnél nagyobb felhasználói adat mező esetén; D = 82 azon felhasználói adat mező esetén, amelyhez nem rendeltek oktettet.

6. Az RR, RNR, vagy VISSZAUTASÍT csomagok esetében harmadik oktetten túlmenően egy másik, vagy több oktett jelenléte hibaként könyvelendő el. Habár egy érvényes P(R) elfogadható a kiemelkedő adat csomagok helyzetének felfrissítésére, a DCE-nek a 4. Megjegyzésben foglaltak szerint hibaeljárást kell kezdeményeznie (ahol D = 39).

7. Amennyiben lehetséges ,a DCE-nek ezen csomagokat szabályos körülmények között kell feldolgoznia. Másfelől, a DCE meghatározhat egy belső mechanizmust annak jelzésére, hogy az érvényes adat csomagok érvénytelenítésre kerültek egy vételre-nem-kész feltétel alatt. Ebben az esetben, amikor a vételre-nem-kész feltétel megszűnik, a DCE-nek egy visszaállítás jelző csomag DTE-hez történő továbbításával (D = 0, nincs további információ) és egy visszaállítás-kérő csomag IWF-hez való juttatásával vissza kell állítania a logikai csatornát.

4-35. táblázat: DCE időzítő

Időzítő típusa	Időhatár alapérték	Kezdő esemény	Rendes körülmények között megszünteti a	Az időzítő lejártakor végrehajtandó tevékenységek
tN10	60 s	a DCE kibocsát egy ÚJRAI-NDÍTÁS JELZŐ csomagot	ÚJRA-INDÍTÁS MEGERŐSÍTŐ vagy ÚJRA-INDÍTÁS KÉRŐ csomag vétele	a DCE belép az r1 állapotba és kibocsáthat egy HIBAKERESŐ csomagot (D = 52)
tN11	180 s	a DCE kibocsát egy BEÉRKEZŐ HÍVÁS csomagot	HÍVÁS ELFOGADVA vagy TÖRLÉS-KÉRÉS vagy HÍVÁS-KÉRÉS csomag vétele	a DCE egy TÖRLÉS JELZÉS csomagot (D = 49) jelezve p7 állapotba lép be (lásd a Megj.-t)
tN12	60 s	a DCE kibocsát egy VISSZAÁLLÍTÁS JELZÉS csomagot	VISSZAÁLLÍTÁS MEGERŐSÍTŐ vagy VISSZAÁLLÍTÁS KÉRŐ csomag vétele	a DCE egy TÖRLÉS JELZÉS csomagot (D = 51) jelezve p7 állapotba lép be (lásd a Megj.-t)
tN13	60 s	a DCE kibocsát egy TÖRLÉS JELZÉS csomagot	TÖRLÉS MEGERŐSÍTÉS vagy TÖRLÉS KÉRÉS csomag vétele	a DCE belép a p1 állapotba és kibocsáthat egy HIBAKERESŐ csomagot (D = 50)

Megjegyzés: – A törlés kiterjed az IWF-re, azaz a DCE-nek ki kell bocsátania egy törlés kérést az IWF felé.

4-36. táblázat: SSNDPX/IWF interfész

Az SSNDPX-től érkezett csomagok	Tevékenység
BEÉRKEZŐ HÍVÁS	Lásd a 4.7.5.1.2 pontot
HÍVÁS KAPCSOLVA	Lásd a 4.7.5.1.3 pontot
TÖRLÉS JELZÉS	Lásd a 4.7.5.1.4 pontot
ADATOK	Lásd a 4.7.5.1.5 pontot
MEGSZAKÍTÁS	Lásd a 4.7.5.1.5 pontot
MEGSZAKÍTÁS-MEGERŐSÍTÉS	Lásd a 4.7.5.1.5 pontot
VISSZAÁLLÍTÁS JELZÉS	Lásd a 4.7.5.1.5 pontot

Az SSNDPX felé küldött csomagok
HÍVÁS-KÉRÉS HÍVÁS ELFOGADVA TÖRLÉS-KÉRÉS ADATOK MEGSZAKÍTÁS MEGSZAKÍTÁS-MEGERŐSÍTÉS VISSZAÁLLÍTÁS-KÉRÉS

4-37. táblázat: ISO 8208 DCE/IWF interfész

Az ISO 8208 DCE-től érkezett csomagok	Tevékenység
HÍVÁS-KÉRÉS	Lásd a 4.7.5.2.2 pontot
HÍVÁS ELFOGADVA	Lásd a 4.7.5.2.3 pontot
TÖRLÉS-KÉRÉS	Lásd a 4.7.5.2.4 pontot
ADATOK	Lásd a 4.7.5.2.5 pontot
MEGSZAKÍTÁS	Lásd a 4.7.5.2.5 pontot
MEGSZAKÍTÁS-MEGERŐSÍTÉS	Lásd a 4.7.5.2.5 pontot
VISSZAÁLLÍTÁS-KÉRÉS	Lásd a 4.7.5.2.5 pontot

Az ISO 8208 DCE felé küldött csomagok
BEÉRKEZŐ HÍVÁS
HÍVÁS KAPCSOLVA
TÖRLÉS JELZÉS
ADATOK
MEGSZAKÍTÁS
MEGSZAKÍTÁS-MEGERŐSÍTÉS
VISSZAÁLLÍTÁS JELZÉS
ÚJRA-INDÍTÁSI JELZÉS

4-38. táblázat: Áramkör üzemmód – kapcsolati interfész adat egységek

LIDU	LICI paraméterek
1. Hozzáférés kérés – telefon	Közlemény típusa (összes)
2. Hívás-közlés	AES ID (összes)
3. C-csatorna kijelölés	GES ID (összes)
4. Hívás-tájékoztatás – szolgálati cím	Q szám (összes)
5. Hívási folyamat – hívási kisérlet eredménye	Alkalmazási hivatkozási szám (összes)
6. Hívási folyamat – csatorna bontás	Forrás (1,2)
7. Hívási folyamat – adat üzemmód	Szolgáltatás iránya (1,2)
8. Hívási folyamat – ellenőrzés	Szolgáltatási ID (1,2)
9. Hívási folyamat – kapcsolás	Hálózati ID (1)
10. Telefonos nyugtázás	Áramköri adatsebesség (1,2)
	Hangcsatorna jellemzők (1,2)
	Hívott terminál (2)
	Hívó terminál (1,4)
	Kezdő EIRP Érték (3)
	Vevőcsatorna frekvenciája (3)
	Adócsatorna frekvenciája (3)
	Jelentés típusa (5,6,7,8,9)
	S (5,6)
	Elhelyezkedés (5,6)
	Ok osztály (5,6)
	Ok érték (5,6)
	Számjegy 0,1 (1)
	Számjegy 2-9 (1,4)
	Nyugtázás/negatív nyugtázás (10)
	Útvonal-meghatározás (5,6,10)
	Hiányzó CM-LIDU közlemény típusa (10)

4-39. táblázat: AES kimenő eljárás – összedolgozó telefonos események

Esemény típusa	Esemény neve	Paraméter leképező követelmények (Ábra*)	Légijármű hálózattal összedolgozó interfész-től/-hez
FITE 18	Hívó fél kategória jelző – AMS(R)S hívás-kezdeményezés	A5-1 a), b)	-tól
FITE 22	Törlés továbbítás	A5-2	-tól
BITE 5	Címzés teljes	A5-3	-hez
BITE 12	Hívás sikertelen – hálózati torlódás	A5-4	-hez
BITE 14	Hívás sikertelen – címzés hiányos	A5-5	-hez
BITE 15	Hívás sikertelen – ki nem osztott szám	A5-6	-hez
BITE 16	Hívás sikertelen – a hívott fél foglalt	A5-7	-hez
BITE 17	Hívás sikertelen – vonal meghibásodás	A5-8	-hez
BITE 20	Hívás sikertelen – hiba jelzés küldése	A5-9	-hez
BITE 22	Válasz	A5-10	-hez
BITE 25	Törlés vissza	A5-11	-hez

* Az ábrák a 4. Fejezet 5. Függelékében kerültek elhelyezésre.

4-40. táblázat: AES beérkező eljárás – összedolgozó telefonos események

Esemény típusa	Esemény neve	Paraméter leképező követelmények (Ábra*)	Légijármű hálózattal összedolgozó interfész-től/-hez
FITE 18	Hívófél kategória jelző – AMS(R)S hívás-kezdeményezés	A5-12	-hez
FITE 22	Törlés továbbítás	A5-13	-hez
BITE 12	Hívás sikertelen – hálózati torlódás	A5-14	-tól
BITE 16	Hívás sikertelen – a hívott fél foglalt	A5-15	-tól
BITE 17	Hívás sikertelen – vonal meghibásodás	A5-16	-tól
BITE 22	Válasz	A5-17	-tól
BITE 25	Törlés vissza	A5-18	-tól

* Az ábrák a 4. Fejezet 5. Függelékében kerültek elhelyezésre.

4-41. táblázat: GES kimenő eljárás – összedolgozó telefonos események

Esemény típusa	Esemény neve	Paraméter leképező követelmények (Ábra*)	Földfelszíni hálózattal összedolgozó interfész-től/-hez
FITE 18	Hívó fél kategória jelző – AMS(R)S hívás-kezdeményezés	A5-19	-tól
FITE 22	Törlés továbbítás	A5-20	-tól
BITE 5	Címzés teljes	A5-21	-hez
BITE 12	Hívás sikertelen – hálózati torlódás	A5-22	-hez
BITE 16	Hívás sikertelen – a hívott fél foglalt	A5-23	-hez

BITE 17	Hívás sikertelen – vonal meghibásodás	A5-24	-hez
BITE 20	Hívás sikertelen – hiba jelzés küldése	A5-25	-hez
BITE 22	Válasz	A5-26	-hez
BITE 25	Törlés vissza	A5-27	-hez

* Az ábrák a 4. Fejezet 5. Függelékében kerültek elhelyezésre.

4-42. táblázat: GES bejövő eljárás – összedolgozó telefonos események

Esemény típusa	Esemény neve	Paraméter leképező követelmények (Ábra*)	Földfelszíni hálózattal összedolgozó interfész-től/-hez
FITE 18	Hívó fél kategória jelző – AMS(R)S hívás-kezdeményezés	A5-28	-hez
FITE 22	Törlés továbbítás	A5-29	-hez
BITE 5	Címzés teljes	A5-30	-tól
BITE 12	Hívás sikertelen – hálózati torlódás	A5-31	-tól
BITE 14	Hívás sikertelen – címzés hiányos	A5-32	-tól
BITE 15	Hívás sikertelen – ki nem osztott szám	A5-33	-tól
BITE 16	Hívás sikertelen – előfizető foglalt	A5-34	-tól
BITE 17	Hívás sikertelen – vonal meghibásodás	A5-35	-tól
BITE 20	Hívás sikertelen – hiba jelzés küldése	A5-36	-tól
BITE 22	Válasz	A5-37	-tól
BITE 25	Törlés vissza	A5-38	-tól
BITE 27	Küldés befejezve – beszéd feltételének beállítása	A5-39	-tól
BITE 29	Beérkező oldal elbontása	A5-40	-tól

* Az ábrák a 4. Fejezet 5. Függelékében kerültek elhelyezésre.

4-43. táblázat: Áramköri üzemmódú elsőbbségek

Elsőbbség	Szolgáltatás	Adatkapcsolati réteg Q száma	C-csatorna Q száma	Meghatározás
1	AMS(R)S	15	15	Vész- és sürgősségi hívás
2	AMS(R)S	12	12	Repülésbiztonság
3	AMS(R)S	10	10	Menetrend-szerűségi és meteorológiai
4	AMSS	9	4	Nyilvános levelezés

4-44. táblázat: AES vezérlés – adatkapcsolati réteg interfész adategységek

LIDU név	LIDU paraméterek[1]
Az adatkapcsolati rétegtől	Alkalmazás Q száma (14)
1. Bejelentkezés megerősítés	Közlemény típusa (összes)
2. Bejelentkezés nyugtázása	AES ID (összes)
3. Kijelentkezés nyugtázása	GES ID (összes)
4. Bejelentkezés visszautasítása	Műhold ID (1, 9c, 9d, 14)
5. Bejelentkezés lekérdezés	Kezdő EIRP (1)
6. Bejelentkezés kijelzés	TDMA közlemény (1)
7. P/R csatorna vezérlés	Vételi bit-hiba arány (19)
8. T-csatorna vezérlés	EIRP beállítás (13)
9. AES rendszertáblázat adás	P/R közlemény (1)
a) index	Hangfrekvenciás csatorna jellemzők (1, 14)
b) GES P/R csatorna értesítés	Csatorna átviteli sebesség(ek) (7, 8, 9d)
c) műhold ID csatornaértesítés	Ok (4)
d) sugárnyaláb ID csatorna értesítés	P, R csatorna frekvenciák (7, 9b, d)
e) GES sugárnyaláb alátámasztás értesítése	T-csatorna frekvenciák (8)
f) adat EIRP táblázat adás	Frekvenciák száma (7, 8)
10. Rendszer-idő adása	Sugárnyaláb ID-k (1, 9d, 14)
11. Szelektív bontás értesítése	Helyesbítő szám (9a, b, c, d, e)
12. Bejelentkezési adat csatorna újra-kijelölése	Alkalmazási referencia szám (13, 19)
13. Csatorna állapot jelentés	Műhold pálya-elhajlás (9c)
13a. Kijelentkezés kérés	Műhold derékszögű felemelkedés (9c)
	Műhold földrajzi hosszúsága (9c)
Adatkapcsolati réteghez:	Műhold/sugárnyaláb azonosító frekvenciák (9c)
14. Bejelentkezési kérés	Század, év, hónap, nap, óra, másodperc (10)
15. Kijelentkezési kérés	Adat átviteli sebesség képessége (14)
16. Bejelentkezés nyugtázása	ACK/NAK közlemények 1-3 (2, 3, 16)
17. Bejelentkezés vezérlés kész az újra-kijelölésre	AES osztálya (1, 14)
18. Bejelentkezés újra-kijelölés visszautasítás	C-csatornák száma (14)
19. Csatorna állapot jelentés	Kezdet/megújítás (14)
	Elsődleges/másodlagos (14)
	Létezés (9a)
	NOT (transzmitterek száma) (14)
	Jelentés típus (13, 19)
	LOV (bejelentkezés igazolás) (14)
	Csatorna frekvencia (11)
	AAS (9e)
	Antenna nyereség (14)
	Adat EIRP (globális vagy helyi) (9f)
	Adat EIRP táblázat sorozat szám (9f)
	DETC/DETP (9a)
	ISU/SSU (9f)
	SIN/DOU (9f)

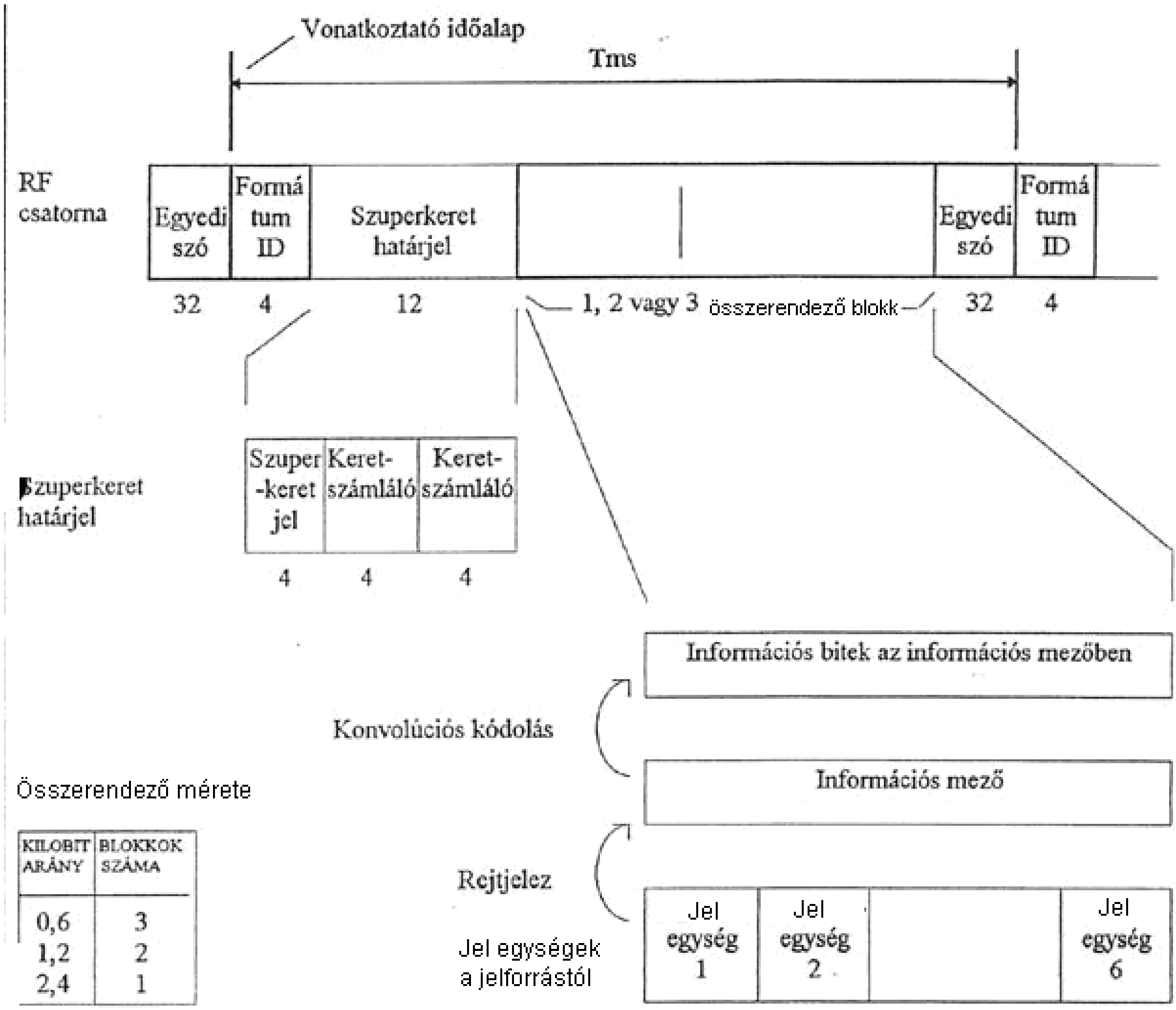
[1] A LIDU paraméterek meghatározása a 4. Fejezet C-Függelékében megadottak szerint kell, hogy történjen. Minden egyes LIDU paraméterhez hozzárendelt szám(ok)nak a paramétert tartalmazó LIDU-kat kell jelölnie.

4-45. táblázat: GES vezérlés – adatkapcsolati réteg interfész adat egységek (LIDU-k)

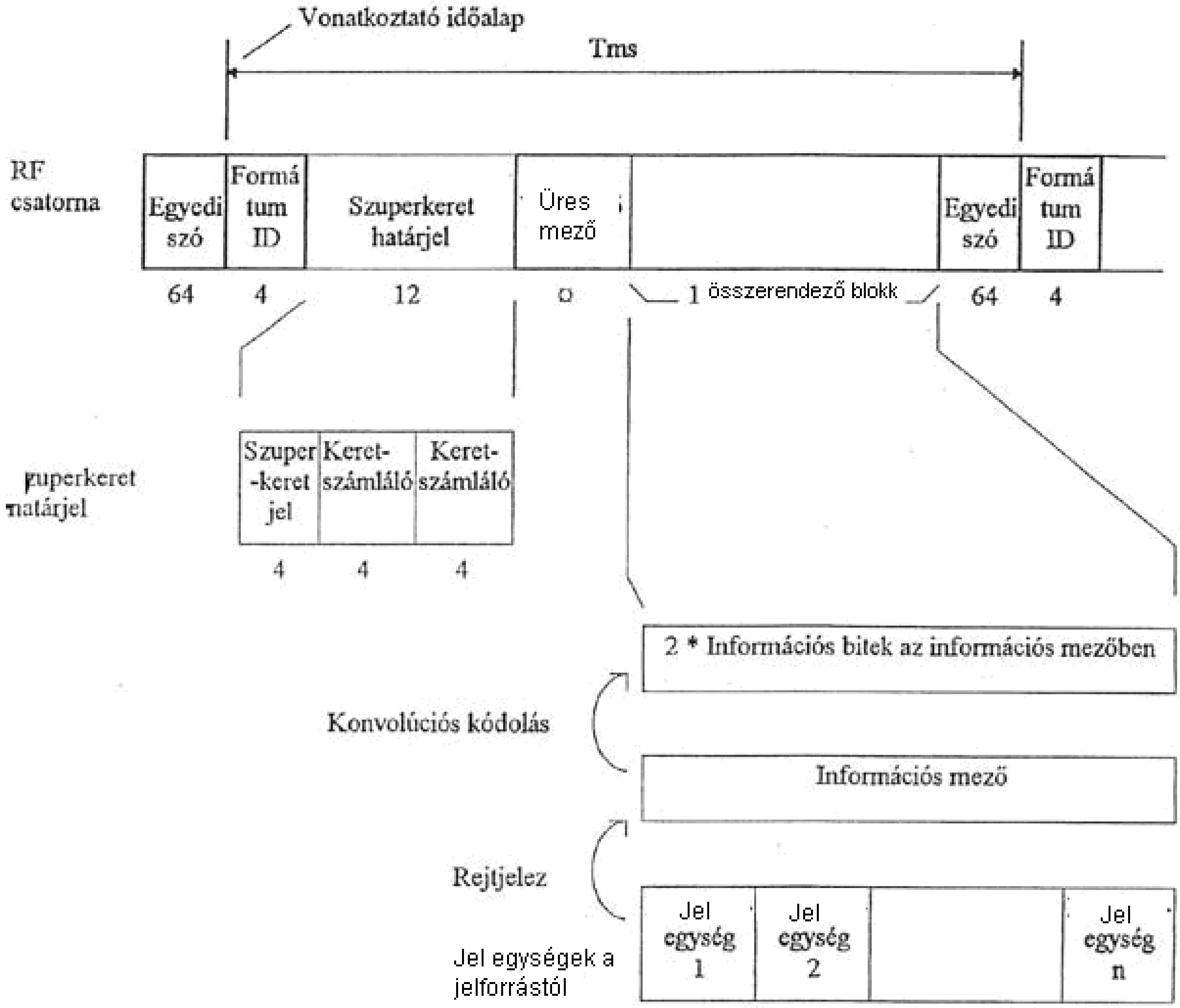
LIDU név	LIDU paraméterek[1]
Az adatkapcsolati réteghez	Közlemény típusa (összes)
1. Bejelentkezés megerősítés	AES ID (összes)
2. Bejelentkezés nyugtázás	GES ID (összes)
3. Kijelentkezés nyugtázás	Alkalmazás Q száma (13)
4. Bejelentkezés visszautasítás	Műhold ID (1, 9c, 9d, 13)
5. Bejelentkezés lekérdezés	Kezdő EIRP (1)
6. Bejelentkezés kijelzés	BER (18)
6. P/R csatorna vezérlés	TDMA közlemény (1)
8. T-csatorna vezérlés	P/R közlemény (1)
9. AES rendszer-táblázat adás	Hangfrekvenciás csatorna jellemzők (1, 13)
a) index	Bit sebesség (7, 8, 9d)
b) GES P/R csatorna értesítés	Ok (4)
c) műhold ID csatorna értesítés	P-, R-csatorna frekvenciák (7, 9b)
d) sugárnyaláb ID csatorna értesítés	T-csatorna frekvencia (8)
e) GES sugárnyaláb alátámsztás értesítése	Frekvenciák száma (7, 8)
f) adat EIRP tábla adás	Sugárnyaláb ID-k (1, 9c, 9d, 13)
10. Rendszer-idő adása	Helyesbítő szám (9a, b, c, d, e)
11. Szelektív bontás értesítése	Műhold ipálya-elhajlás (9c)
12. Bejelentkezés vezérlési adat csatorna újra-kijelölés	EIRP beállítás (12a)
12a. Csatorna állapot jelentés	Műhold derékszögű felemelkedés (9c)
12b. Kijelentkezés kérés	Műhold földrajzi hosszúság (9c)
	Műhold/sugárnyaláb azonosító frekvencia (9c)
	Század, év, hónap, nap, óra, perc, másodperc (10)
	ACK/NAK, MSG1, MSG2, MSG 3 (2, 3, 15)
Adatkapcsolati rétegtől:	C-csatornák száma (13)
13. Bejelentkezés kérés	Kezdő/megújítás (13)
14. Kijelentkezés kérés	Elsődleges/másodlagos (13)
15. Bejelentkezés nyugtázása	NOT (13)
16. Bejelentkezés vezérlés kész az újra-kijelölésre	Sugárnyaláb ID P-csatorna frekvencia (9c)
17. Bejelentkezés újra-kijelölés visszautasítás	Sugárnyaláb alátámasztási táblázat (9e)
18. Csatorna állapot jelentés	Jelentés típusa (12a, 18)
	Alkalmazás referencia száma (12a, 18)
	AES besorolási osztály (13)
	LOV (13)
	Adó csatorna frekvencia (11)
	Létezés (9a)
	AAS (9e)
	Antenna nyereség (13)
	Adat EIRP (globális vagy helyi) (9)
	Létezés (9a)
	AAS (9e)
	Antenna nyereség (13)
	Adat EIRP (globális vagy helyi) (9)
	Adat EIRP táblázat sorozat száma (9f)
	DETC/DETP (9a)
	ISU/SSU (9f)
	SIN/DOU (9f)

[1] A LIDU paraméterek meghatározása a 4. Fejezet C-Függelékében megadottak szerint kell, hogy történjen. Minden egyes LIDU paraméterhez hozzárendelt szám(ok)nak a paramétert tartalmazó LIDU-kat kell jelölnie.

A 4. FEJEZET ÁBRÁI

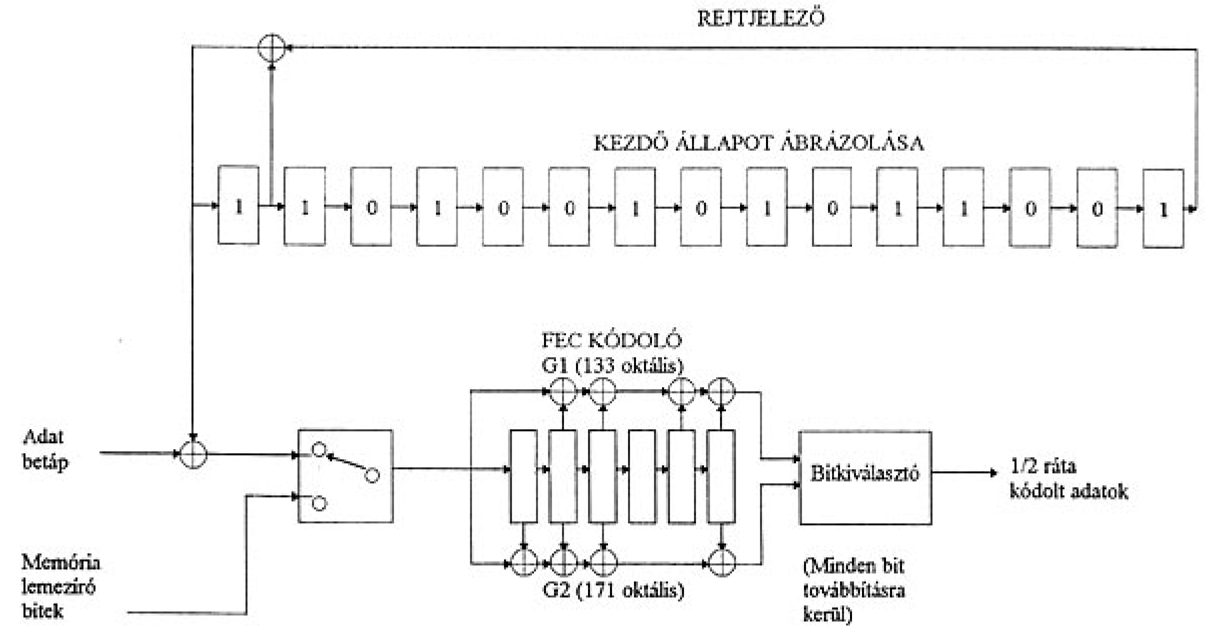


4-1. ábra
P-csatorna formátum (0,6; 1,2 és 2,4 kbit/s)

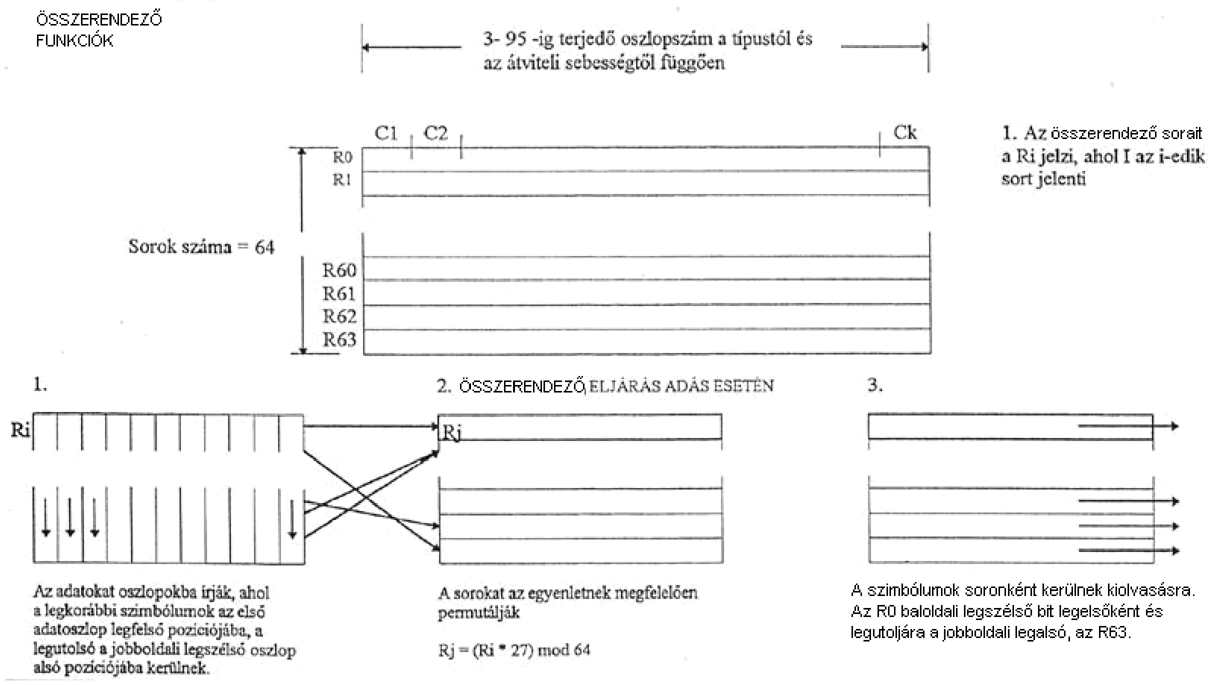


* 16 bit a 4,8 kbit/s és 178 bit a 10,5 kbit/s esetén

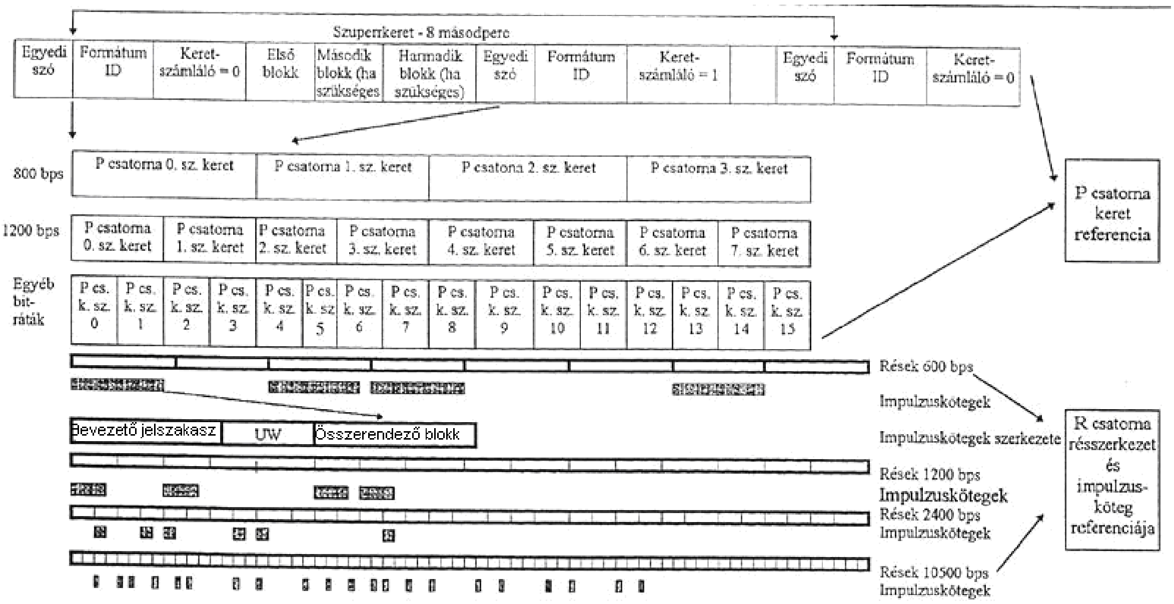
4-2. ábra
P csatorna formátum (4,8 és 10,5 kbit/s)



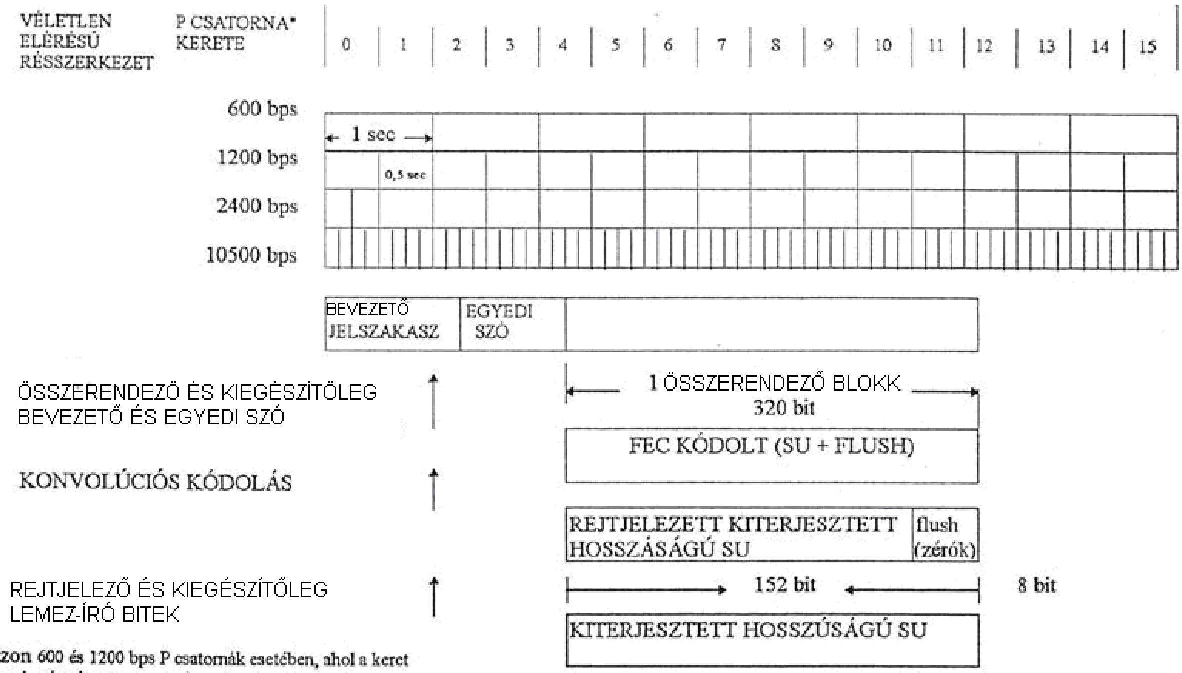
4-3. ábra
A rejtjelező és a konvolúciós kódoló funkciói



4-4. ábra
Összerendező funkciók

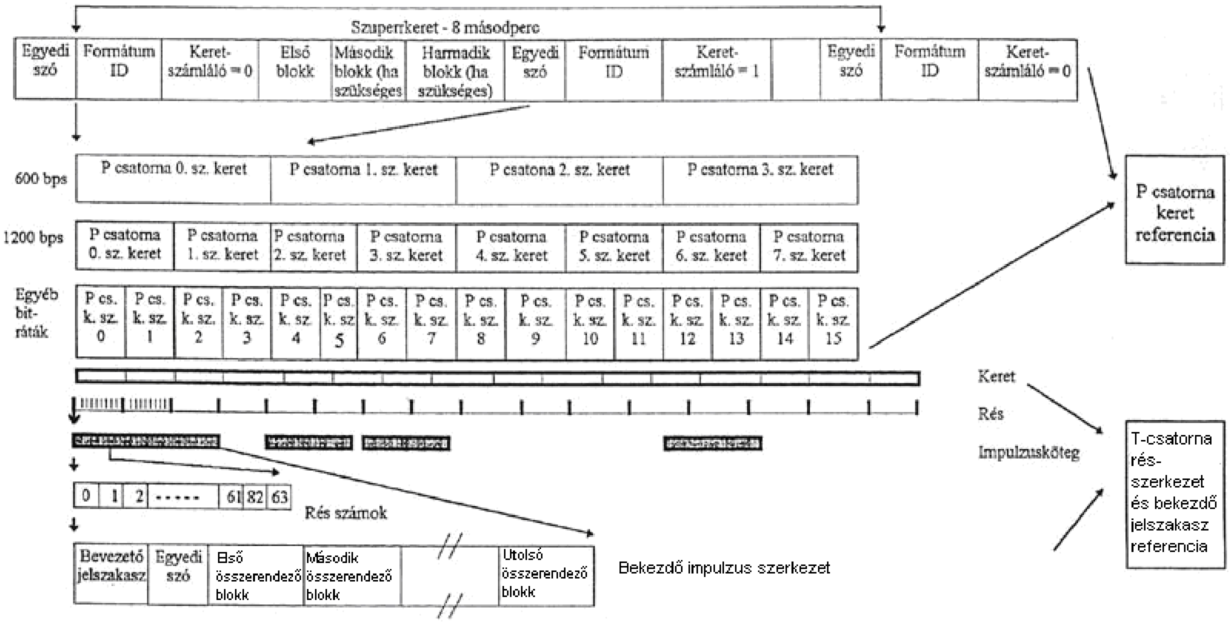


4-5. ábra
A P- és R-csatornák közötti időzítési referenciák

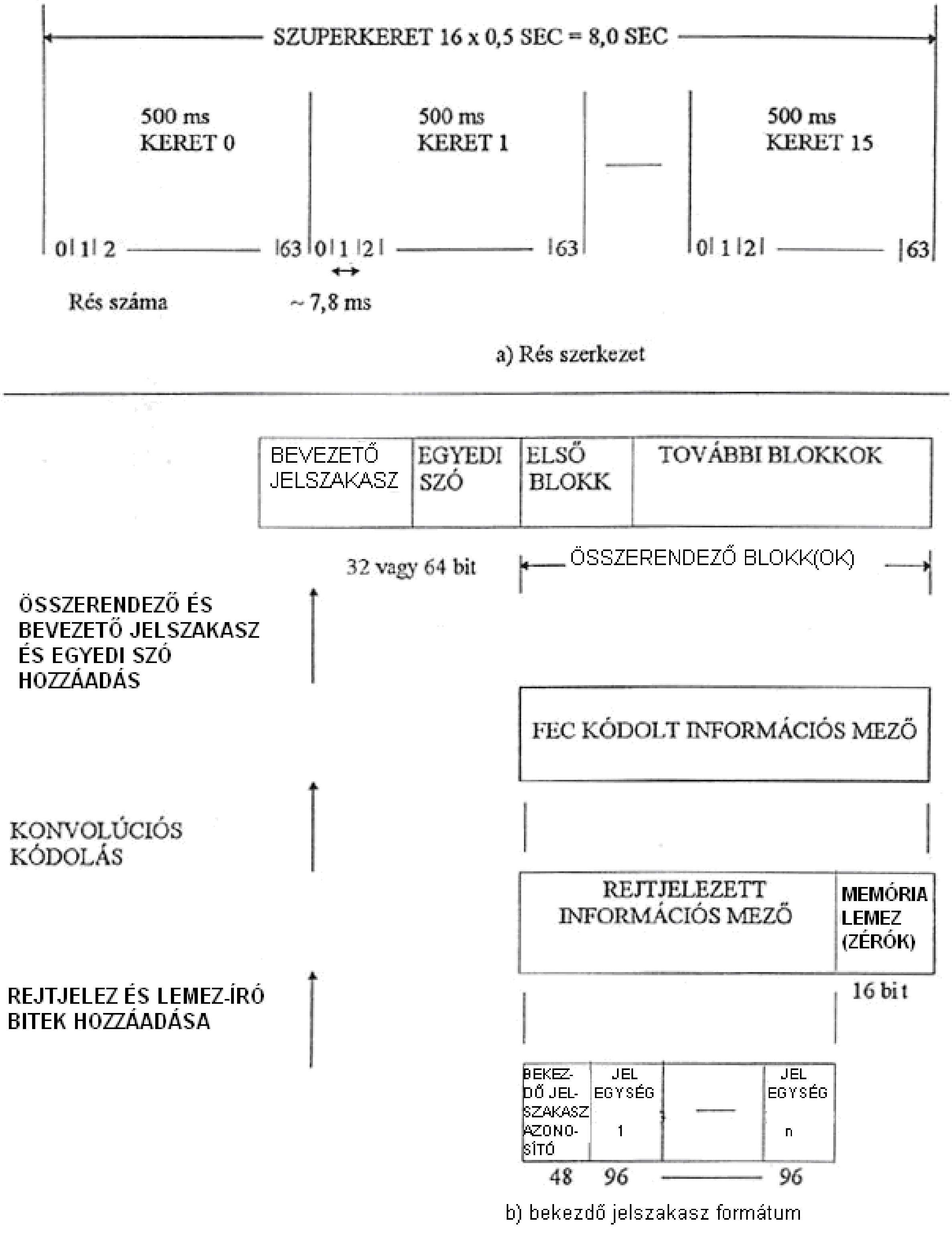


* Azon 600 és 1200 bps P csatornák esetében, ahol a keret 2 vagy 1 másodperc, a szuperkeret 8 másodperces és 4 vagy 8 P csatorna keretből áll.

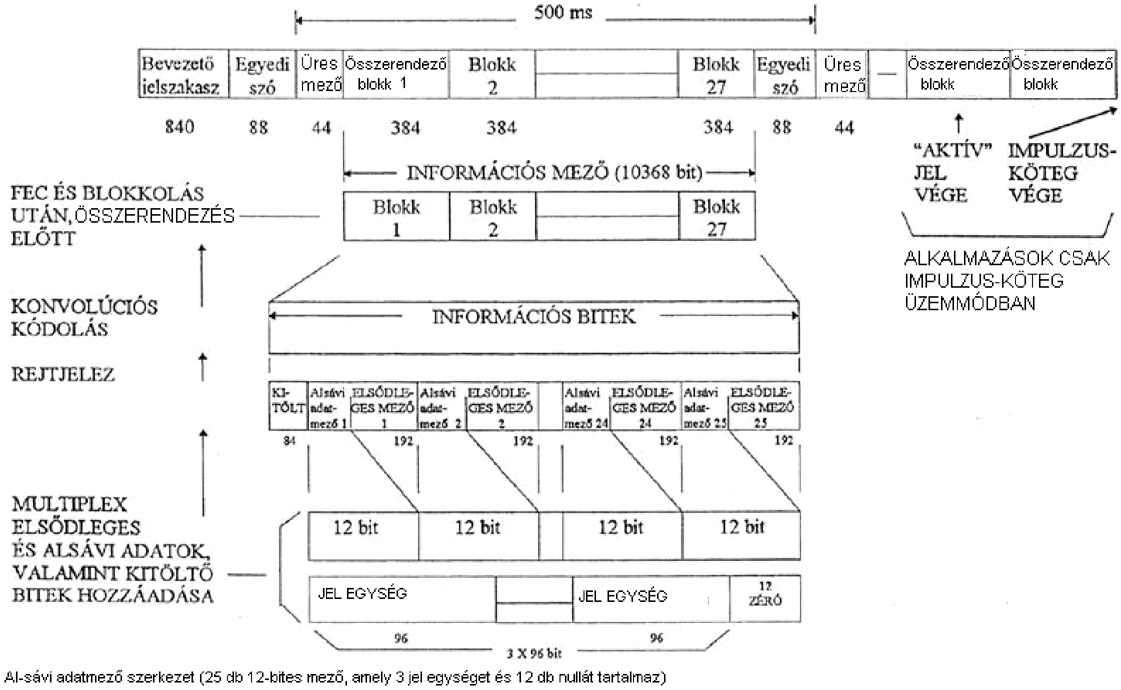
4-6. ábra
R-csatorna bekezdő jelszakasz formátum



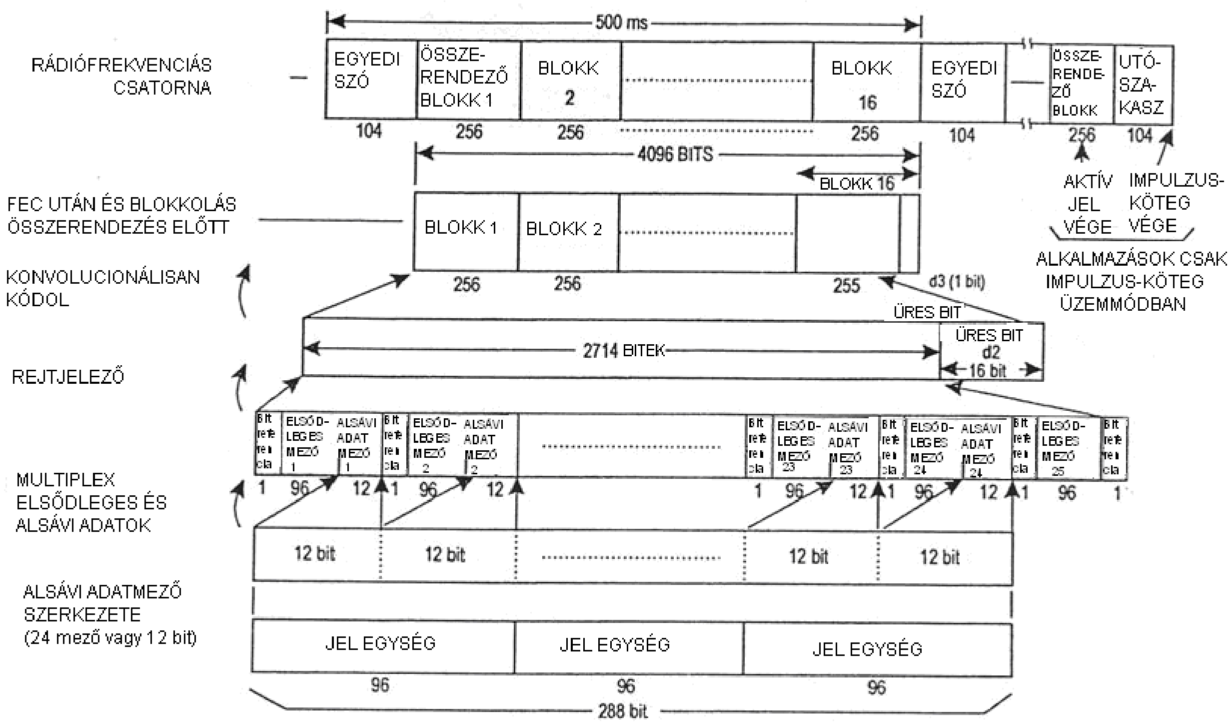
4-7. ábra
A P- és T-csatornák közötti időzítési referenciák



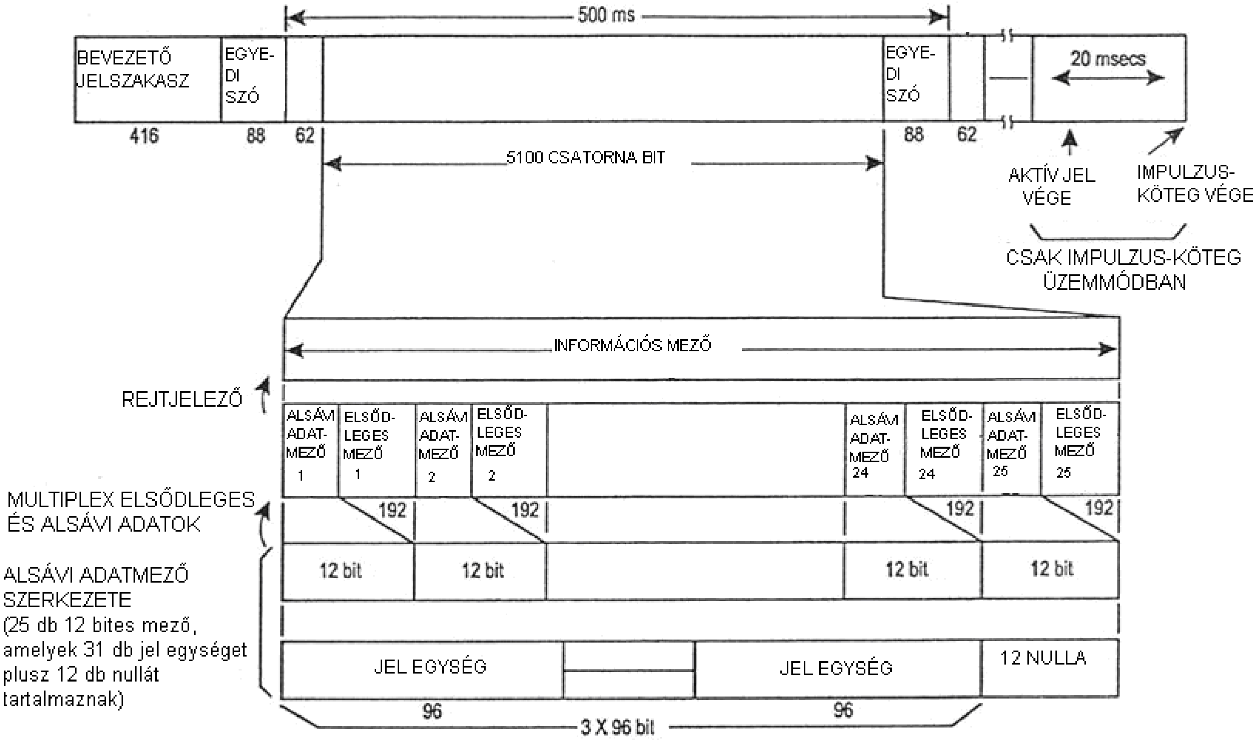
4-8. ábra
T-csatorna formátum



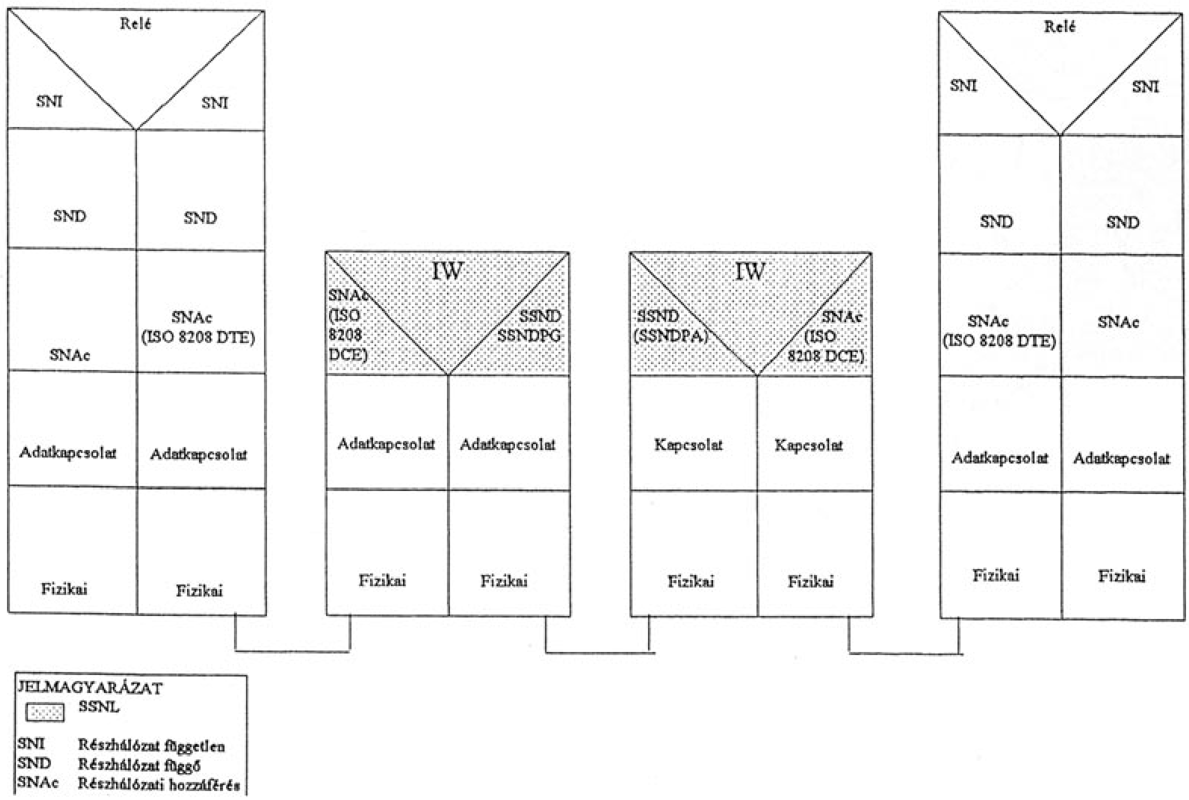
4-9. ábra
C-csatorna formátum a 21,0 kbit/s csatorna sebességnél



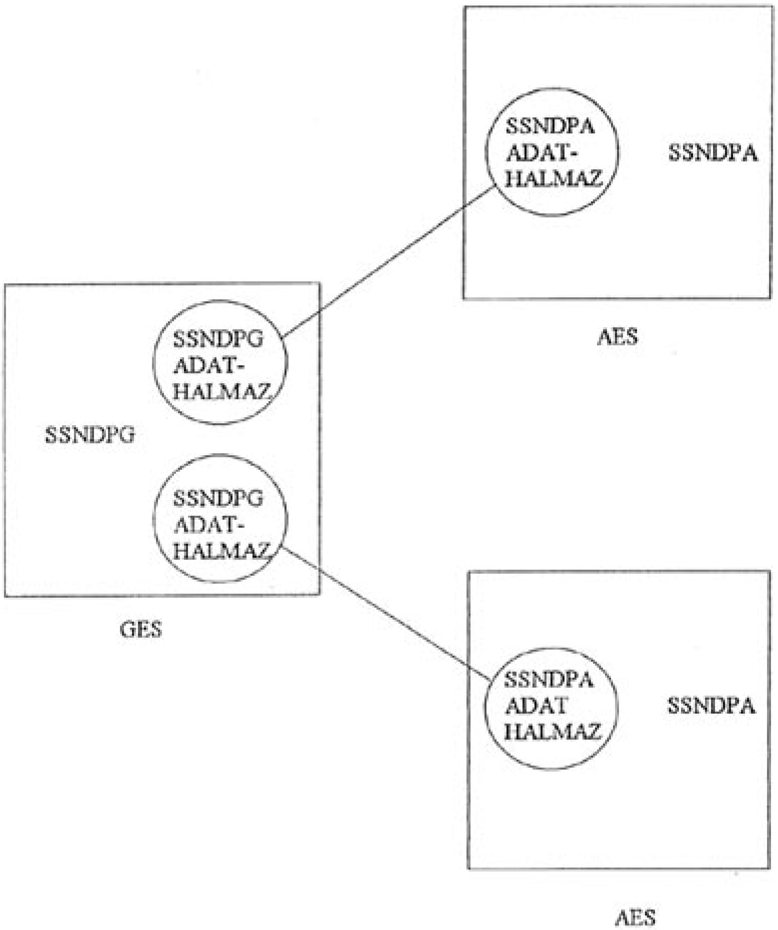
4-9. *bis* ábra.
C-csatorna formátum 8,4 kbit/s átviteli sebesség esetén



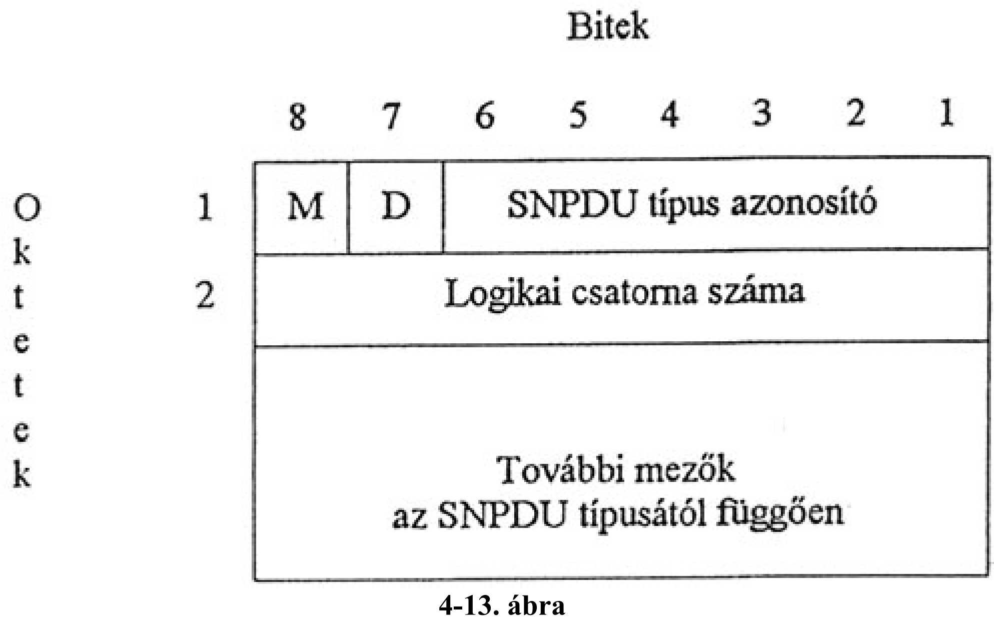
4-10. ábra
C-csatorna formátum 10,5 kbit/s átviteli sebesség esetén



4-11. ábra
Az SSNL funkciói és az ATN műholdas al-hálózat



4-12. ábra
Műhold al-hálózat függő funkció protokol földi/fedélzeti (SSNDPX) adathalmazok



4-13. ábra
Egy al-hálózati protokol adat egység /SNPDU /általános formátuma

Bitek

Oktetek	8	7	6	5	4	3	2	1
1	0	X	X	0	0	X	X	X
2	Logikai csatorna száma							
3	DTE címzés hosszúsága							
	Hívott DTE**							
	Hívó DTE**							
	Hívott NSAP*							
	Hívó NSAP*							
	Eszköz mezőhosszúság*							
	Eszközök*							
	Felhasználói adatok hívása*							

* Ha van

** Ha a hosszúság nem egyenlő 0-val

4-14. ábra
Kapcsolat-kérő al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek	8	7	6	5	4	3	2	1
1	0	X	0	0	1	0	X	X
2	Logikai csatorna száma							
	Hívott NSAP címzés*							
	Eszköz mezőhosszúság*							
	Eszközök*							
	Felhasználói adatok hívása*							

* Ha van

4-15. ábra
Kapcsolat-megerősítő al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek	8	7	6	5	4	3	2	1
1	0	0	0	1	0	0	X	0
2	Logikai csatorna száma							
	Hívott NSAP címzés*							
	Törlést kiváltó ok							
	Hibamegállapító kód							
	Felhasználói adatok törlése*							

* Ha van

4-16. ábra
Kapcsolatbontási al-hálózati protokol adat egység / SNPDU/ formátum

Bitek

Oktetek		8	7	6	5	4	3	2	1
	1	0	0	0	1	1	0	0	0
	2	Logikai csatorna száma							

4-17. ábra
Kapcsolat-bontás befejezés al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek		8	7	6	5	4	3	2	1
	1	M	D	1	1	0	0	0	0
	2	Logikai csatorna száma							
	3	SNPDU szám							
		Felhasználói adatok							

4-18. ábra
Adat al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek		8	7	6	5	4	3	2	1
	1	0	0	1	1	0	0	1	0
	2	Logikai csatorna száma							
		Megszakítási felhasználói adatok							

4-19. ábra
Megszakítási adatok al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek		8	7	6	5	4	3	2	1
	1	0	0	1	1	1	0	1	0
	2	Logikai csatorna száma							

4-20. ábra
Megszakítás-megerősítő al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek	8	7	6	5	4	3	2	1
1	0	0	1	1	0	0	1	1
2	Logikai csatorna száma							
3	Forgalom-vezérlést kiváltó ok							
4	Hibakereső kód							

4-21. ábra
Visszaállítás al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

Oktetek	8	7	6	5	4	3	2	1
1	0	0	1	1	1	0	1	1
2	Logikai csatorna száma							

4-22. ábra
Visszaállítás-megerősítő al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

		8	7	6	5	4	3	2	1
Oktetek	1	0	0	1	1	1	0	0	1
	2	Logikai csatorna száma							
	3	Forgalom-vezérlést kiváltó ok							
	4	SNPDU szám							

4-23. ábra
Forgalom-vezérlés (felfüggeszt) al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

		8	7	6	5	4	3	2	1
Oktetek	1	0	0	1	1	1	0	0	1
	2	Logikai csatorna száma							
	3	Forgalom-vezérlést kiváltó ok							

4-24. ábra
Forgalom-vezérlő (folytat) al-hálózati protokol adat egység /SNPDU/ formátum

Bitek

	8	7	6	5	4	3	2	1
Kód:	0	0	0	0	0	0	1	0

	8 7 6 5	4 3 2 1
Paraméter mező:	A hívott DTE felől*	A hívó DTE felől*

*Az egyes áteresztő-képességi osztályok jelzése a négy binárisan kódolt bit és a táblázatban jobboldalt feltűntetett áteresztő-képességi értékeknek felel meg.

Bitek: 8765 vagy bitek: 4321	Az ISO 8208-ban meghatározott áteresztő teljesítmény szerinti osztály (bit/sec)
0000	Foglalt
0001	Foglalt
0010	Foglalt
0011	75
0100	150
0101	300
0110	600
0111	1200
1000	2400
1001	4800
1010	9600
1011	19200
1100	48000
1101	64000
1110	Foglalt
1111	Foglalt

4-25. ábra
Áteresztő-képességi osztály-egyeztető (TCN) szolgáltatás mező

Bitek

	8	7	6	5	4	3	2	1
Kód:	0	1	0	0	1	0	0	1

	8 7 6 5 4 3 2 1
Paraméter mező 1. oktet	Átviteli késedelem milliszekundumban (nagyobb helyiértékű bitek)

	8 7 6 5 4 3 2 1
2. oktet	Átviteli késedelem milliszekundumban (kisebb helyiértékű bitek)

4-26. ábra
Az átviteli késedelem kiválasztási és kijelzési szolgáltatás formátuma

Bitek

	8	7	6	5	4	3	2	1
Kód:	0	0	0	0	0	0	0	1

	8	7	6	5	4	3	2	1
Paraméter mező:	0	0	0	0	0	0	0	0

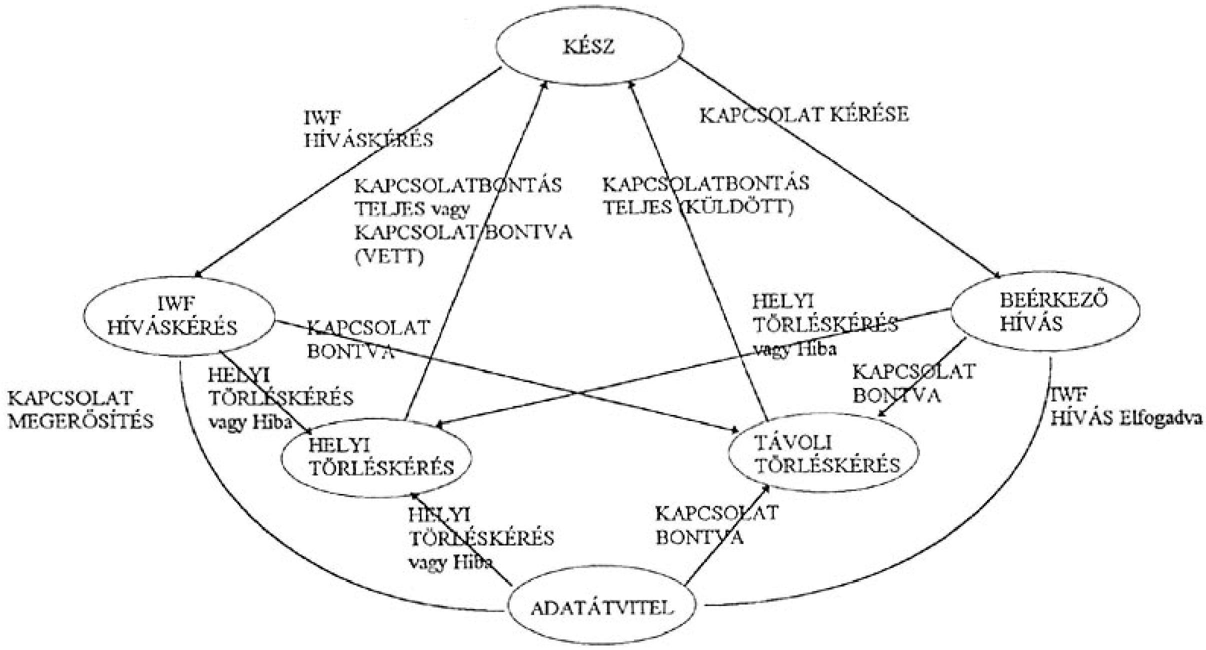
4-27. ábra
Gyors-kiválasztás (használat nem megengedett) szolgáltatás formátum

Bitek

	8	7	6	5	4	3	2	1
Kód:	0	0	0	0	1	0	1	1

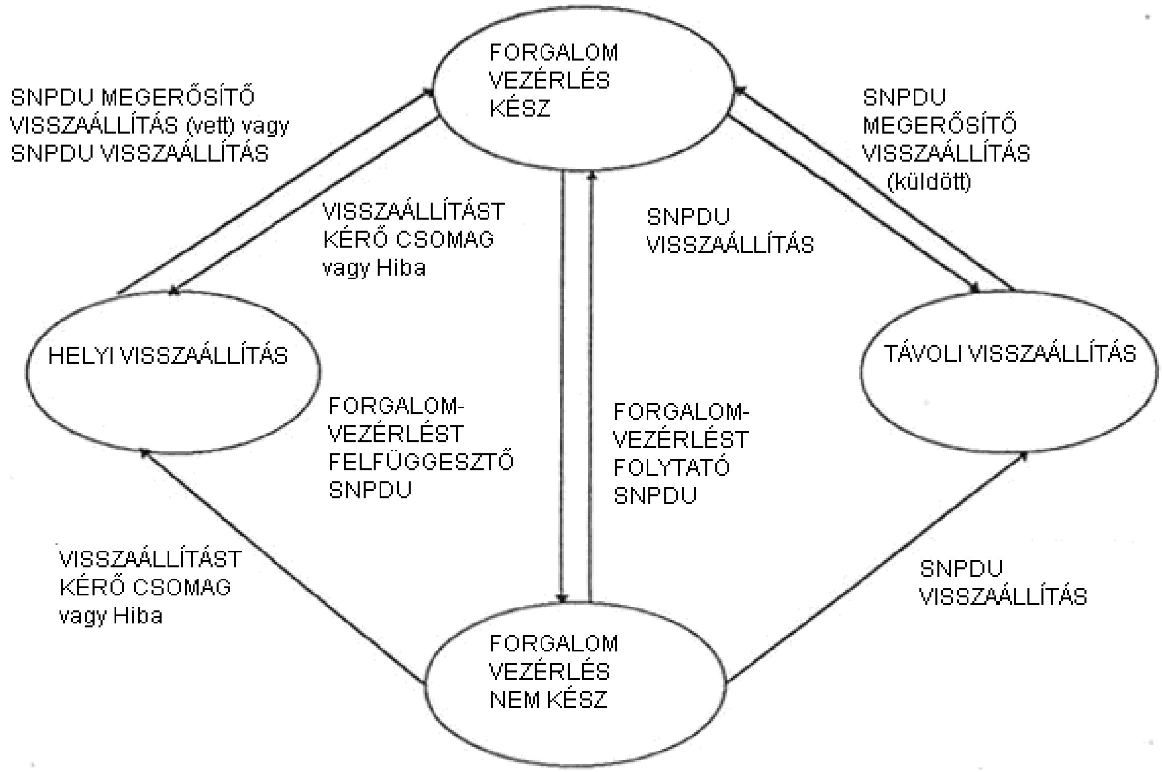
	8	7	6	5	4	3	2	1
Paraméter mező:	0	0	0	0	0	0	0	0

4-28. ábra
Gyorsított adat egyeztetés („a gyorsított adatokat nem használják”) szolgáltatás formátum

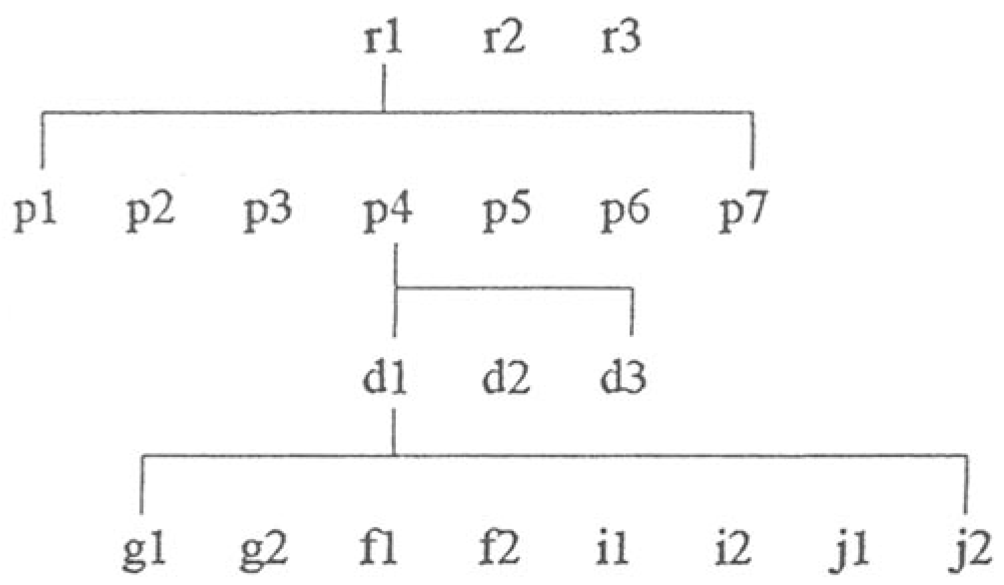


4-29. ábra
Kapcsolat létrehozási és bontási állapot diagram

IWF = *Összerendező szolgáltatás*



4-30. ábra
Az adat-átviteli állapoton belüli visszaállítás és forgalom-vezérlő állapot diagram



4-31. ábra
Az ISO 8208 hálózati végponti berendezés /DCE/ al-állapoti hierarchia

A 4. Fejezet 1. Függeléke

AZ A-BPSK ÉS AZ A-QPSK SZŰRŐK VÁLASZ-MASZKJAI

A1-1. táblázat: Az A-BPSK frekvencia jelleggörbe határértékekkel szemben szükséges szűrő-amplitúdó

Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitúdó válasz (dB)	Szabványosított frekvencia	Amplitúdó válasz (dB)
0	0,25	0	-0,25
0,8	0,25	0,6	-0,25
1,133	-3,5	0,9	-2,5
1,333	-12	1,05	-5,5
1,533	-40	1,22	-12
-	-	1,333	-28
-	-	1,333	-45

A maszkokat a fenti pontokon át húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez kettővel osztva, valamint az amplitúdót egy 0 frekvencián 0 dB-re szabványosították. A maszkot az útmutató anyag magyarázza el.

A1-2. táblázat: Az A-BPSK és az A-QPSK frekvencia jelleggörbe határértékekkel szemben szükséges szűrő-fázis 100 százalékos határértékkel

Felső határ		Alsó határ	
Szabványosított frekvencia	Fázis válasz (fok)	Szabványosított frekvencia	Fázis válasz (fok)
0	1,8	0	-1,8
1,0	1,8	1,0	-1,8
1,0	2,8	1,0	-2,8
1,25	$\geq 2{,}8$	1,25	$\leq -2{,}8$

A maszkokat a fenti pontokon át húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez kettővel osztva, valamint az amplitúdót egy 0 frekvencián 0 dB-re szabványosították. A maszkot az útmutató anyag magyarázza el.

A1-2 *bis* táblázat: Az A-QPSK frekvencia jelleggörbe határértékekkel szemben szükséges szürő fázis 60 százalékos határértékkel

Felső határ		Alsó határ	
Szabványosított frekvencia	Fázis válasz (fok)	Szabványosított frekvencia	Fázis válasz (fok)
0	1,8	0	-1,8
0,25	1,8	0,25	-1,8
0,25	2,8	0,25	-2,8
0,31	2,8	0,31	-2,8

A maszkokat a fenti pontokon át húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez kettővel osztva, valamint az amplitúdót egy 0 frekvencián 0 dB-re szabványosították. A maszkot az útmutató anyag magyarázza el.

A1-3. táblázat: Az A-QPSK frekvencia jelleggörbe határértékekkel szemben szükséges szűrő-amplitúdó 100 százalékos határértékkel

Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitúdó válasz (dB)	Szabványosított frekvencia	Amplitúdó válasz (dB)
0	0,25	0	-0,25
0,3	0,25	0,2	-0,25
0,7	-1	0,5	-1
1,1	-3	0,9	-3
1,5	-6	1,2	-6
1,7	-10	1,5	-10
2,0	-20	1,7	-16
2,5	-40	1,733	-27
3,0	-40	1,733	-40

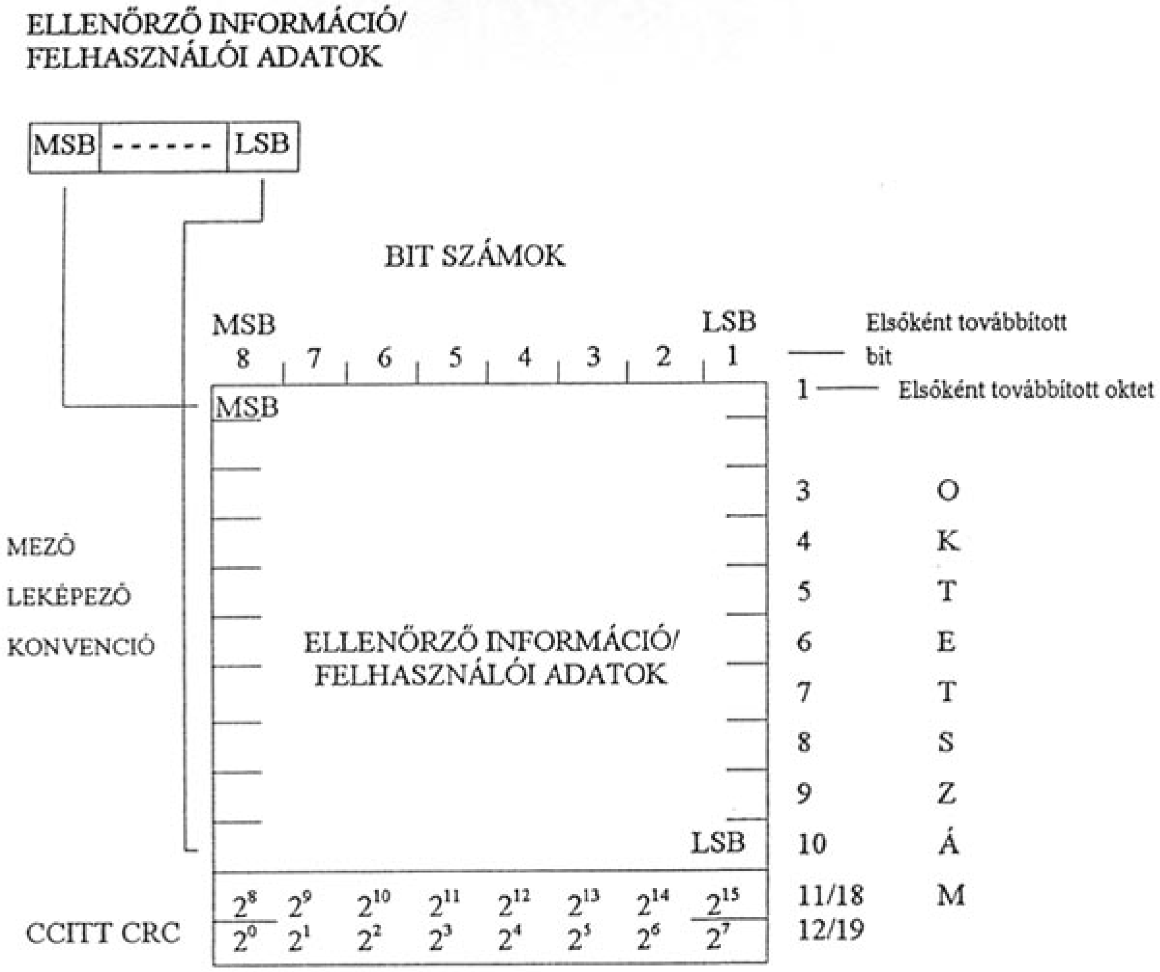
A maszkokat a fenti pontokon át húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez kettővel osztva, valamint az amplitúdót egy 0 frekvencián 0 dB-re szabványosították. A maszkot az útmutató anyag magyarázza el.

A1-3 *bis* táblázat: Az A-QPSK frekvencia jelleggörbe határértékekkell szemben szükséges szűrő-amplitúdó 60 százalékos határértékkel

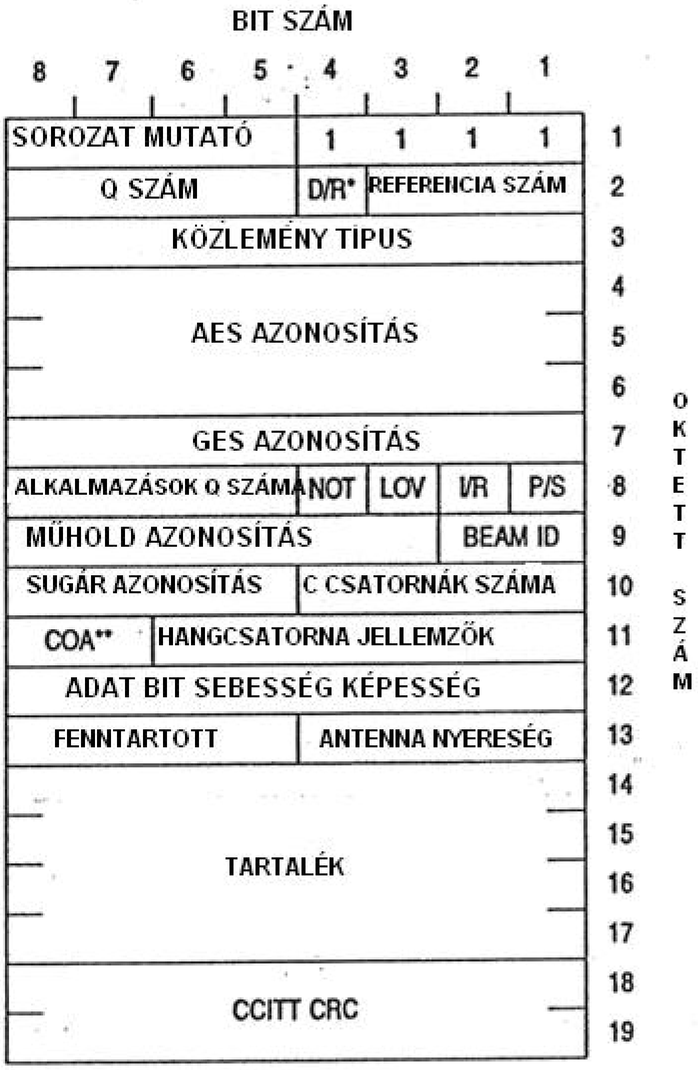
Felső határ		Alsó határ	
Szabványosított frekvencia	Amplitúdó válasz (dB)	Szabványosított frekvencia	Amplitúdó válasz (dB)
0	0,25	0	-0,25
0,5	0,25	0,43	-0,25
0,64	0	0,64	-1
0,93	-1,6	0,93	-2,6
1,14	-4,4	1,14	-6,4
1,36	-8	1,36	-11
1,5	-13	1,43	-15
1,64	-22	1,5	-25
1,71	-35		
3,36	-40		
16,67	-40		

A maszkokat a fenti pontokon át húzott egyenes vonalakkal kell meghatározni, ahol a frekvenciákat az átviteli sebességhez kettővel osztva, valamint az amplitúdót egy 0 frekvencián 0 dB-re szabványosítják. A maszkot az útmutató anyag magyarázza el.

A 4. Fejezet 2. Függeléke
JEL EGYSÉG FORMÁTUMOK

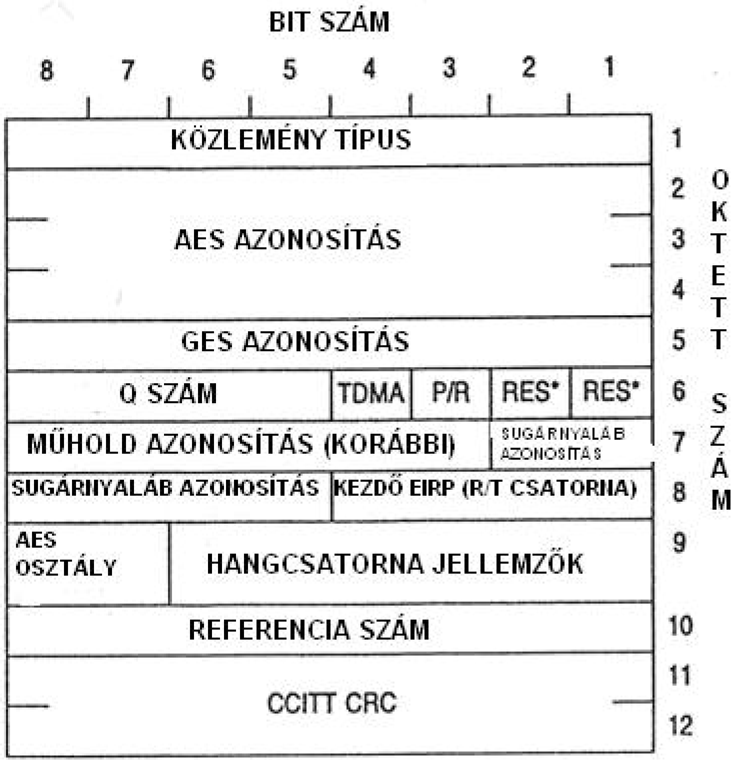


A2-1. ábra
Jel egység mező leképezés és bit továbbítási sorrend



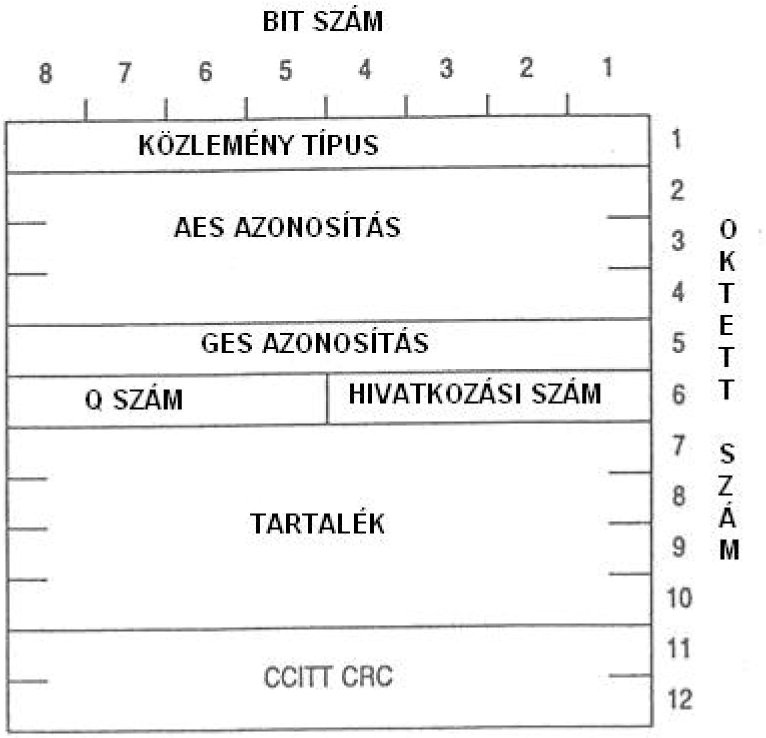
* DLS/RLS mindig 0-ra állítva
** AES osztály

A2-2. ábra
Bejelentkezés kérés - R-csatorna



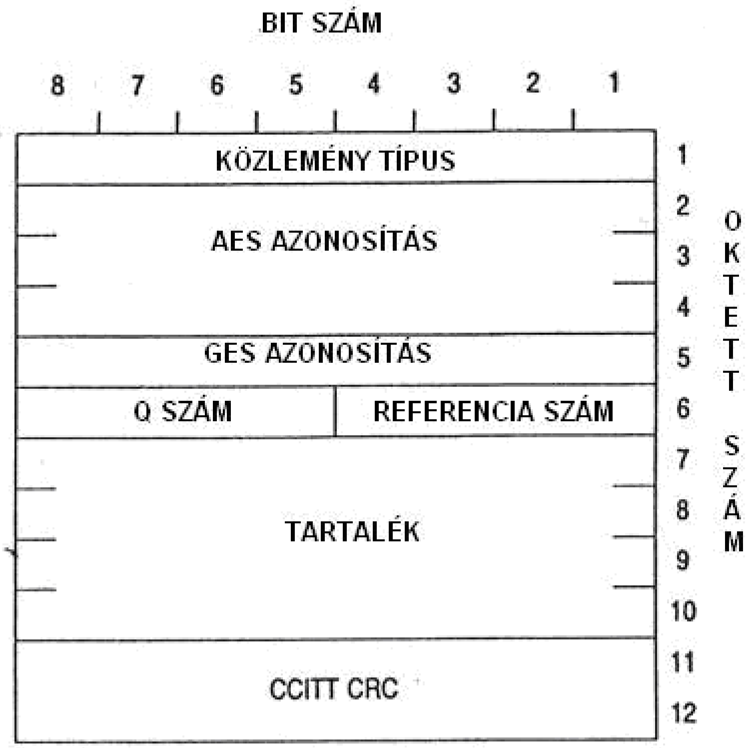
* Fenntartott

A2-3. ábra
Bejelentkezés megerősítés – P-csatorna



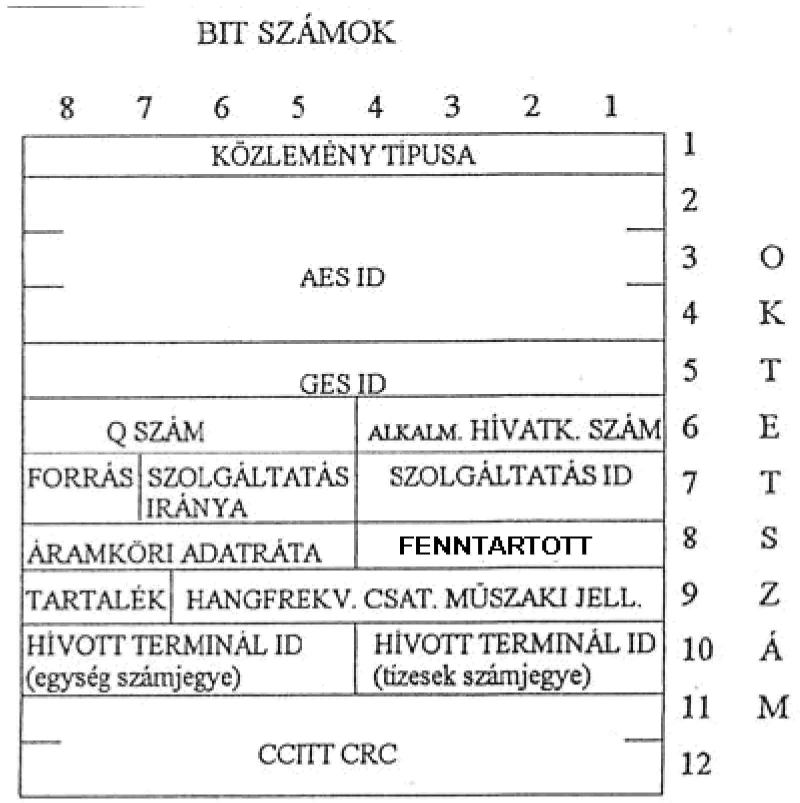
A2-4. ábra
Bejelentkezés vezérlés – P-csatorna
Bejelentkezés lekérdezés/bejelentkezés kijelzés/kijelentkezés nyugtázás/adat-csatorna újra-kijelölés

A2-5. ábra
Jelentkezés vezérlés – P-csatorna
Bejelentkezés visszautasítás

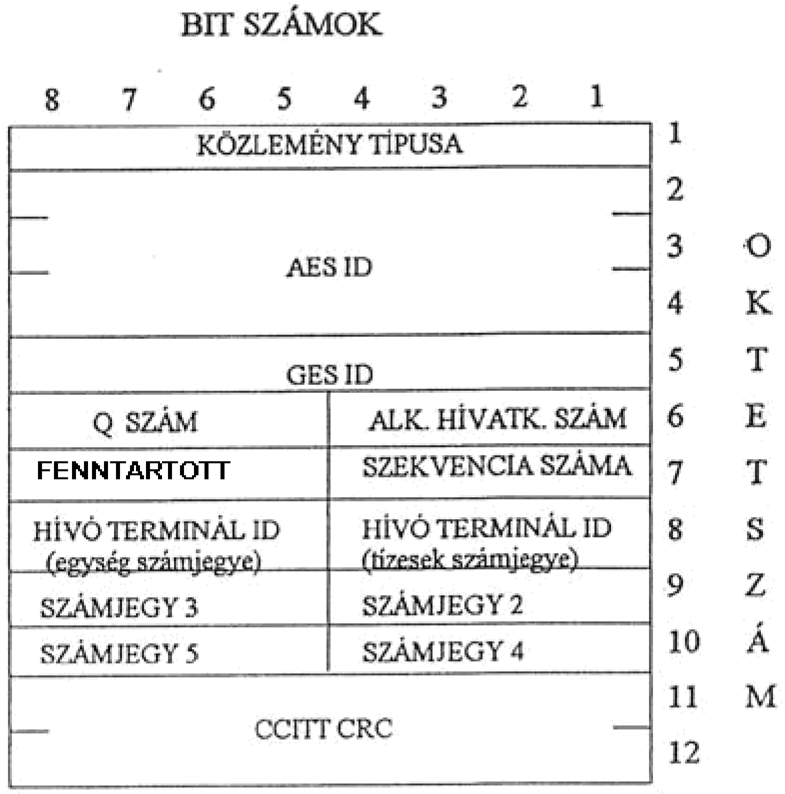


A2-6. ábra
Jelentkezés vezérlés – P-csatorna
Kijelentkezés kérés

A2-7. ábra
Hozzáférés kérés adat – T-csatorna
Foglalás kérés (REQ)



A2-8. ábra
Telefonos hívás bejelentés – P-csatorna

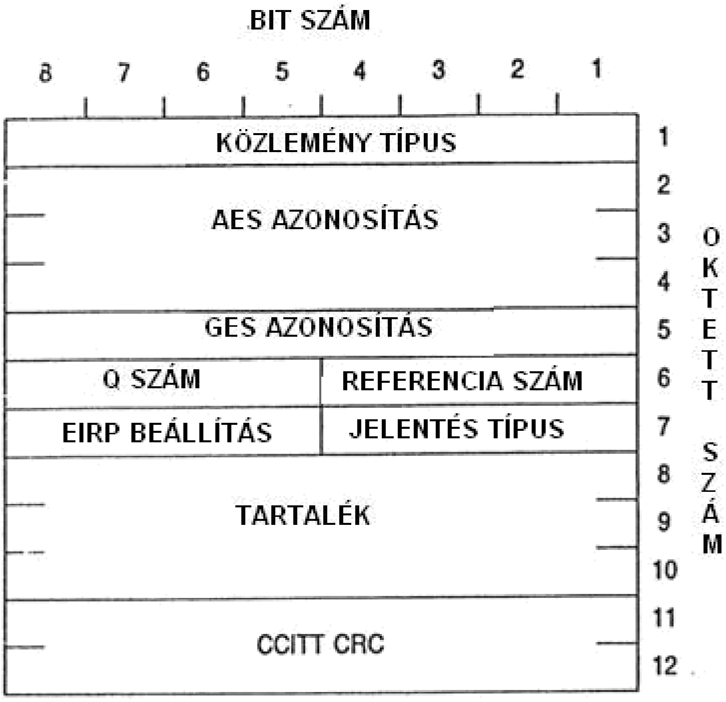


A2-9. ábra
Telefonos hívás-tájékoztatás – légijármű C-csatorna alsávtól
Szolgálati cím (Kezdő jel egység (ISU))

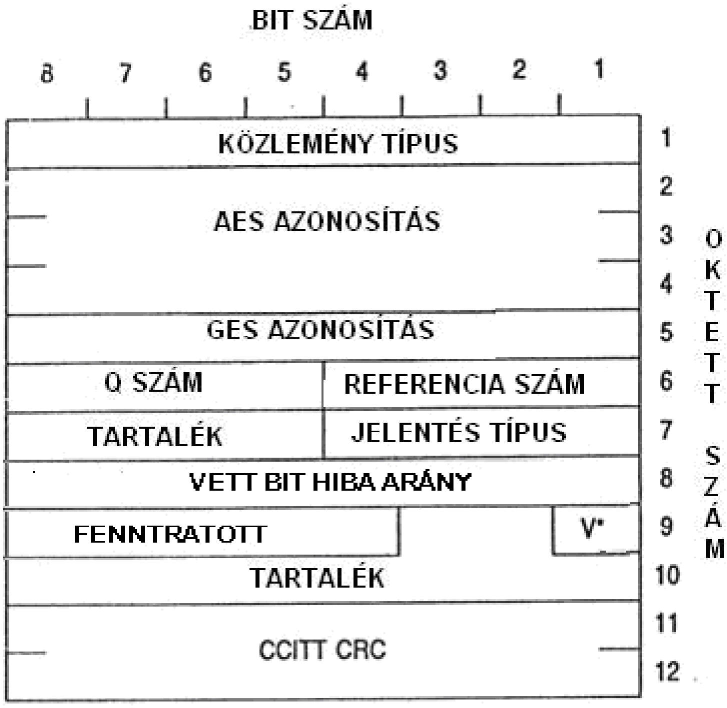
BIT SZÁMOK

8 7 6 5	4 3 2 1	OKTETSZÁM
1 1	SZEKVENCIA SZÁMA	1
Q SZÁM	ALKALM. HÍVATK. SZÁM	2
SZÁMJEGY 7	SZÁMJEGY 6	3
SZÁMJEGY 9	SZÁMJEGY 8	4
FENNTARTOTT	FENNTARTOTT	5
FENNTARTOTT	FENNTARTOTT	6
FENNTARTOTT	FENNTARTOTT	7
FENNTARTOTT	FENNTARTOTT	8
TARTALÉK	TARTALÉK	9
TARTALÉK	TARTALÉK	10
CCITT CRC		11
		12

A2-10. ábra
Telefonos hívás-tájékoztatás – légijármű C-csatorna alsávtól
Szolgálati cím (Soronkövetkező jel egység (SSU))

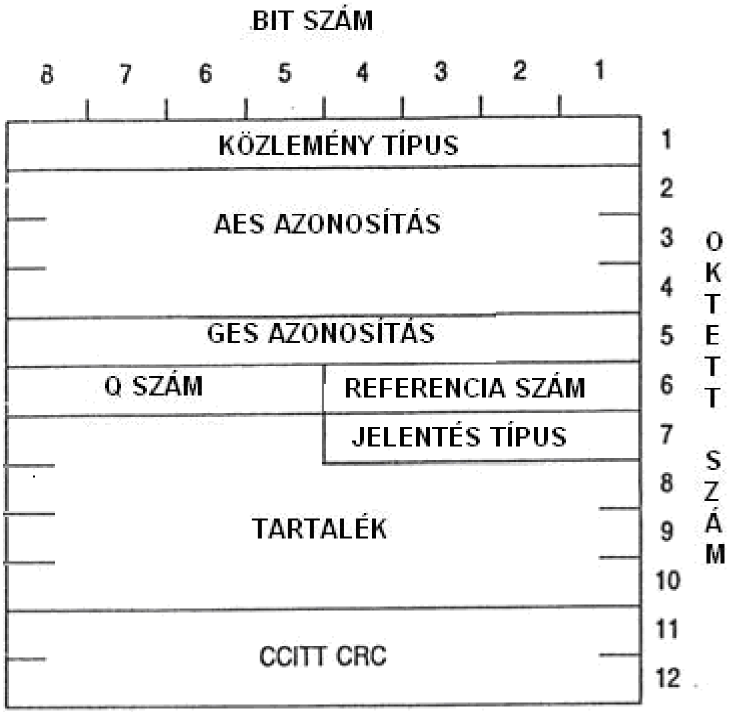


A2-11. ábra. Hívás folyamat – a légijármű C-csatorna alsávjához
Csatorna állapot jelentés

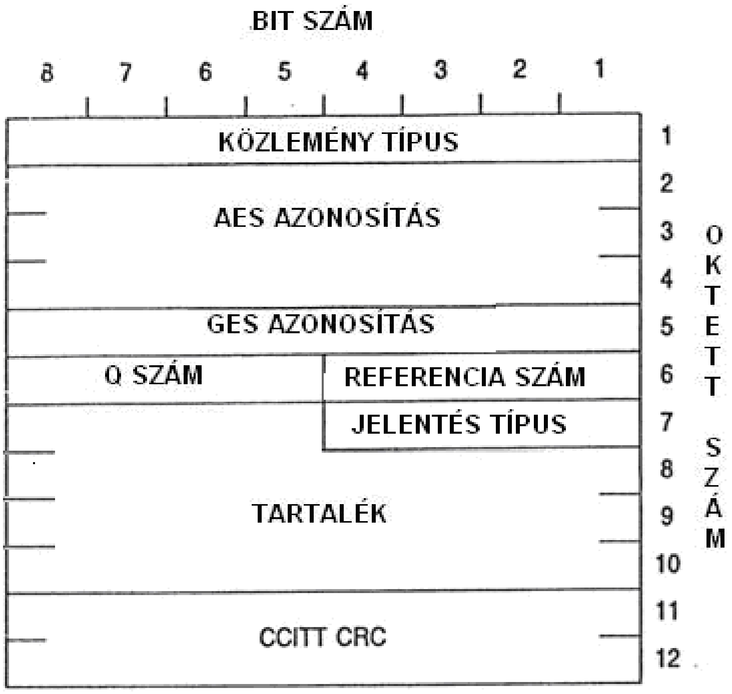


* Érvényességi jelző

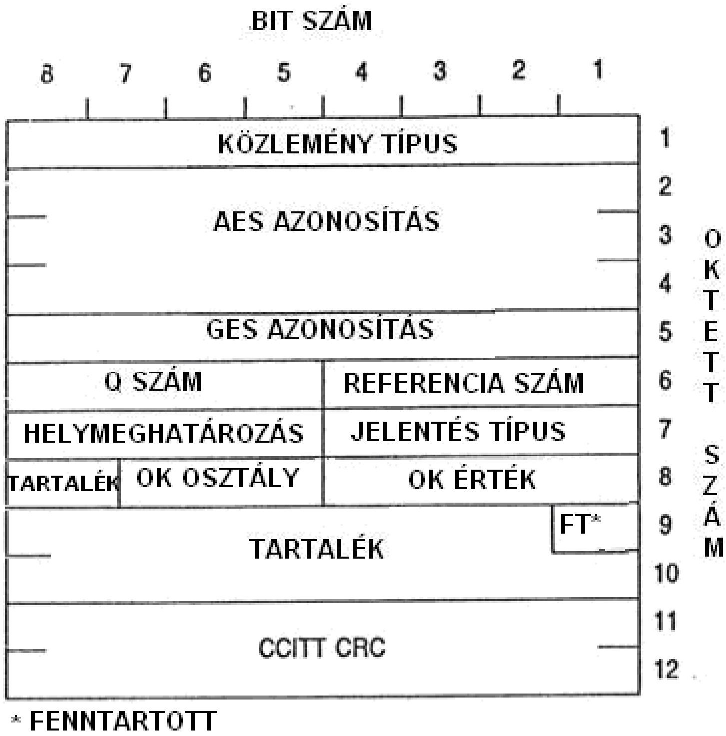
A2-12. ábra
Hívási folyamat – a légijárműtől C-csatorna alsávjától
Csatorna állapot jelentés



A2-13. ábra
Hívási folyamat – légijármű-höz-/től légijármű C-csatorna alsáv



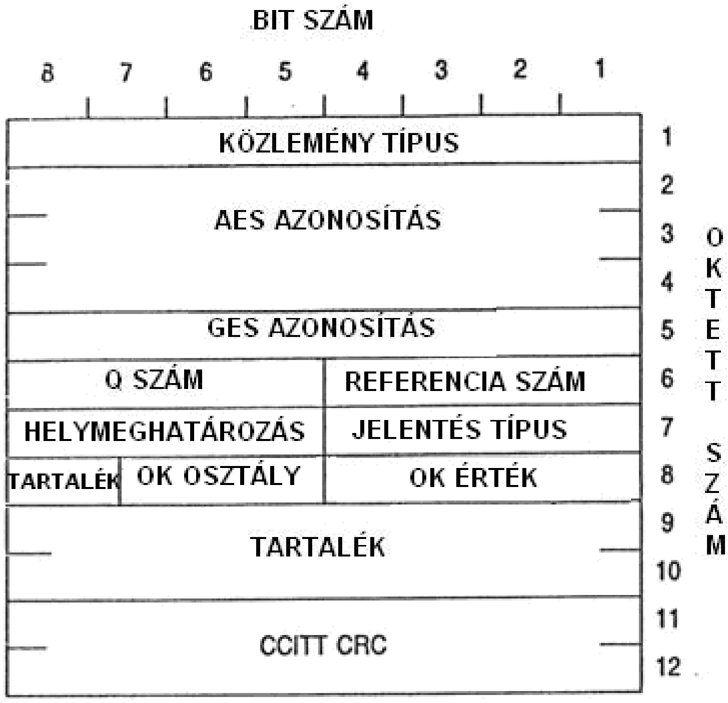
A2-14. ábra
Hívási folyamat – légijármű-höz/től C-csatorna alsáv
Ellenőrzés



A2-15. ábra

Hívási folyamat – a égijármű-höz/től C-csatorna alsáv vagy a P-csatorna

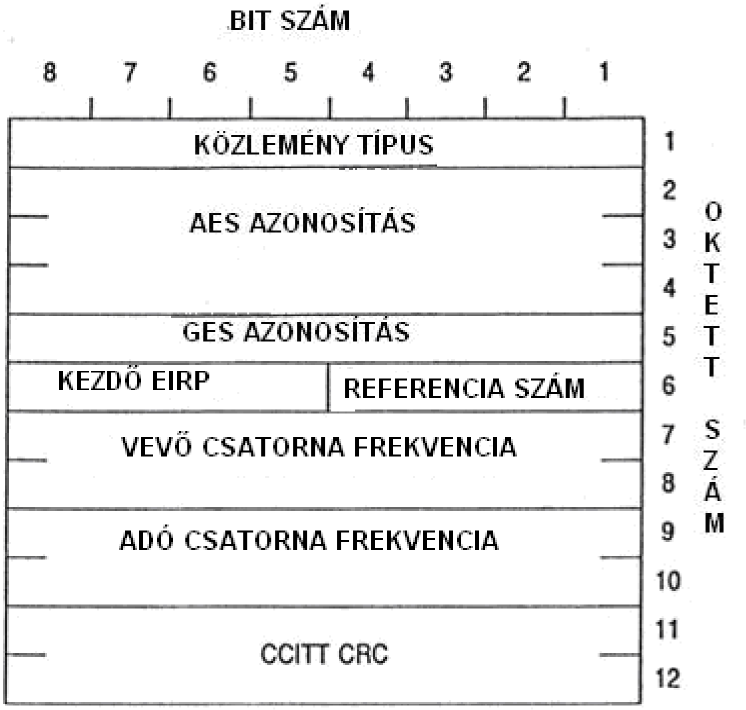
Hívási kísérlet eredmény



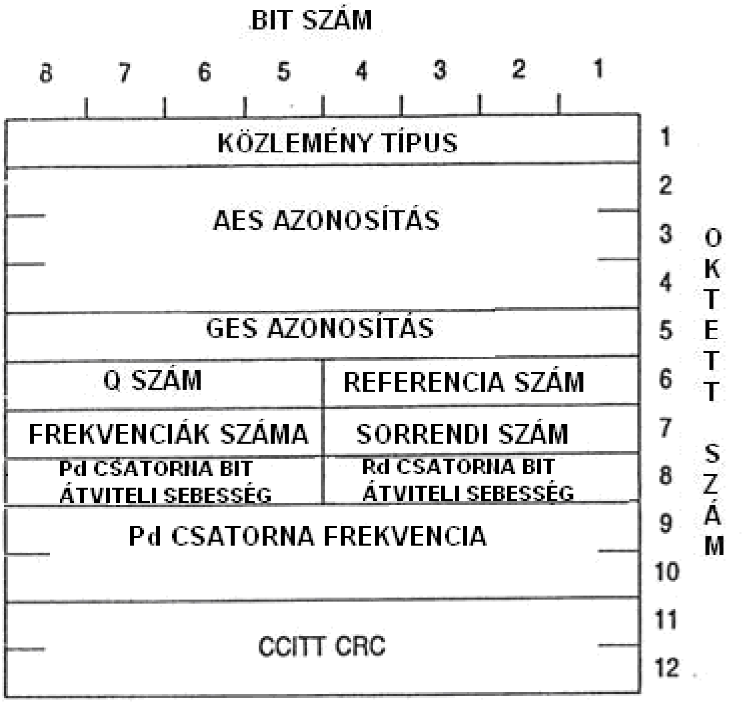
A2-16. ábra

Hívási folyamat – a légijármű-höz/től C-csatorna alsáv vagy a P-csatorna

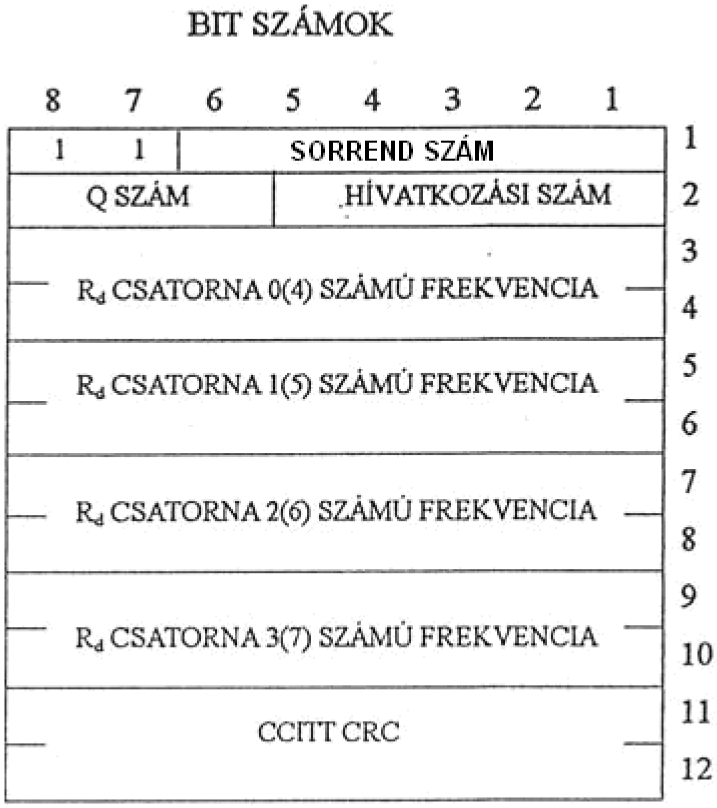
Csatorna bontás



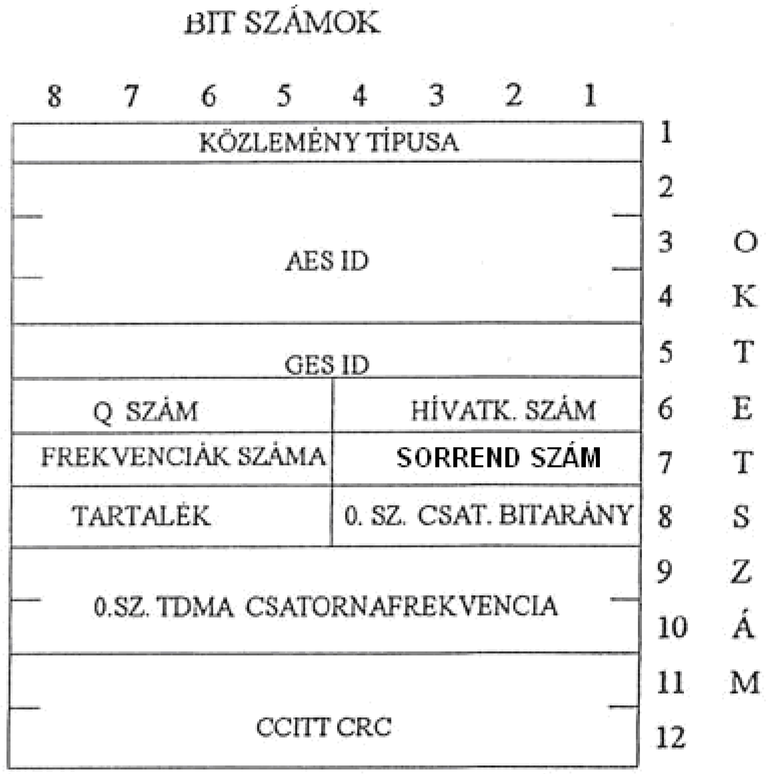
A2-17. ábra
C-csatorna kijelölés – P-csatorna



A2-18. ábra
P/R csatorna vezérlés – P-csatorna
(Kezdő jel egység (ISU))

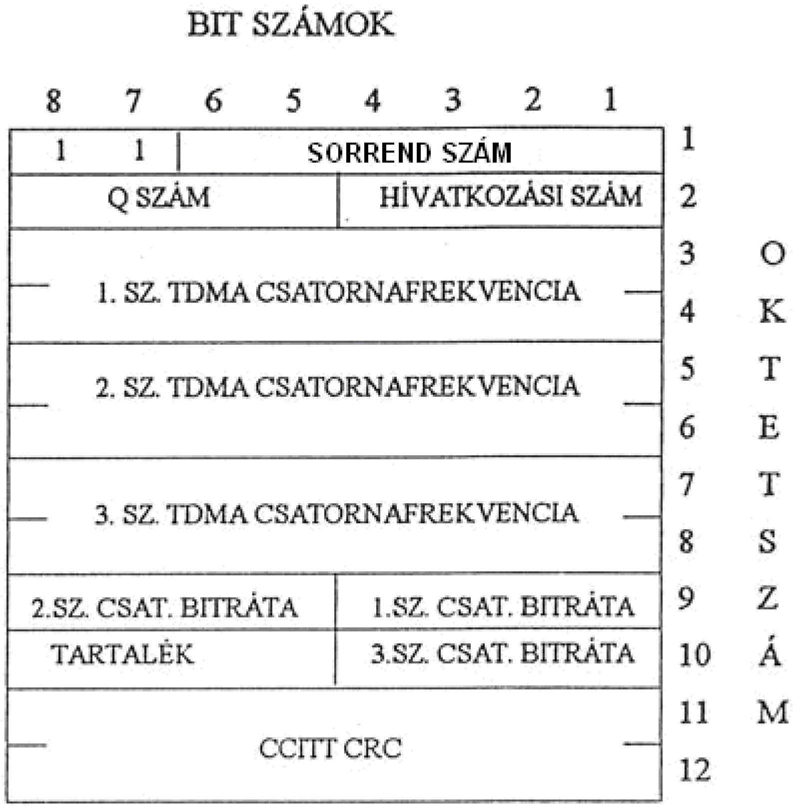


A2-19. ábra
P/R csatorna vezérlés – P-csatorna
(Soronkövetkező jel egység (SSU))



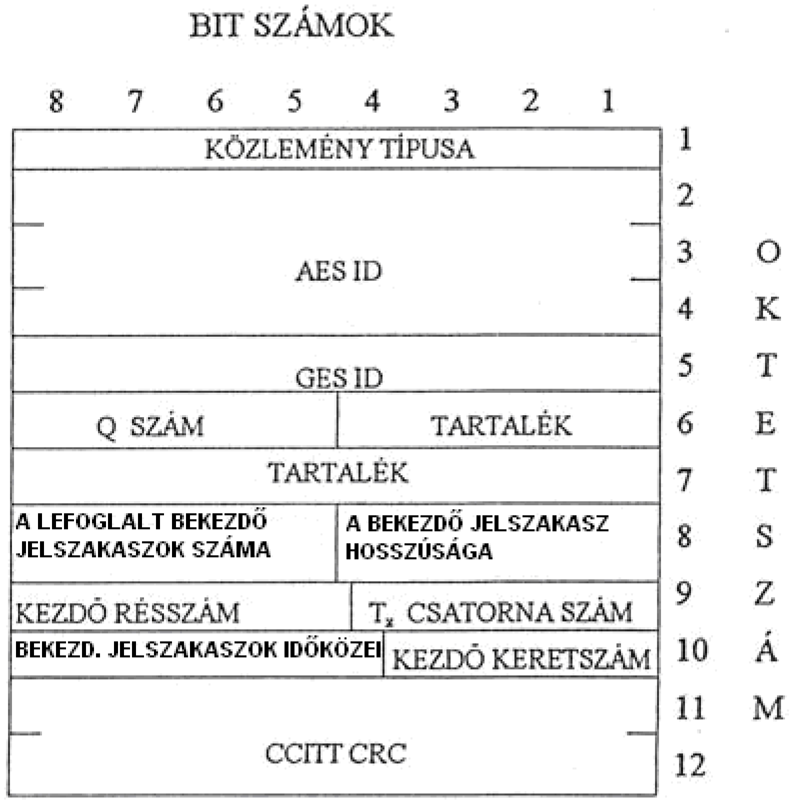
A2-20. ábra
T-csatorna vezérlés – P csatorna
(Kezdő jel egység (ISU))

TDMA = *Időosztásos multiplex hozzáférés*



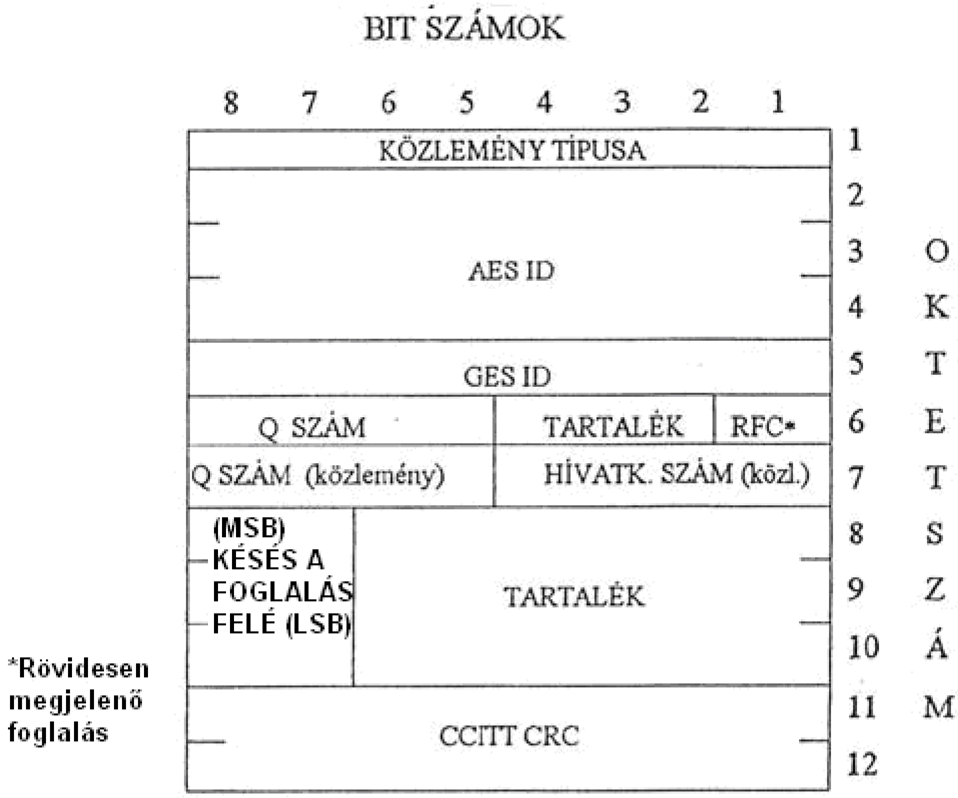
A2-21. ábra
T-csatorna vezérlés – P-csatorna
(Soronkövetkező jel egység (SSU))

TDMA = *Időosztásos multiplex hozzáférés*

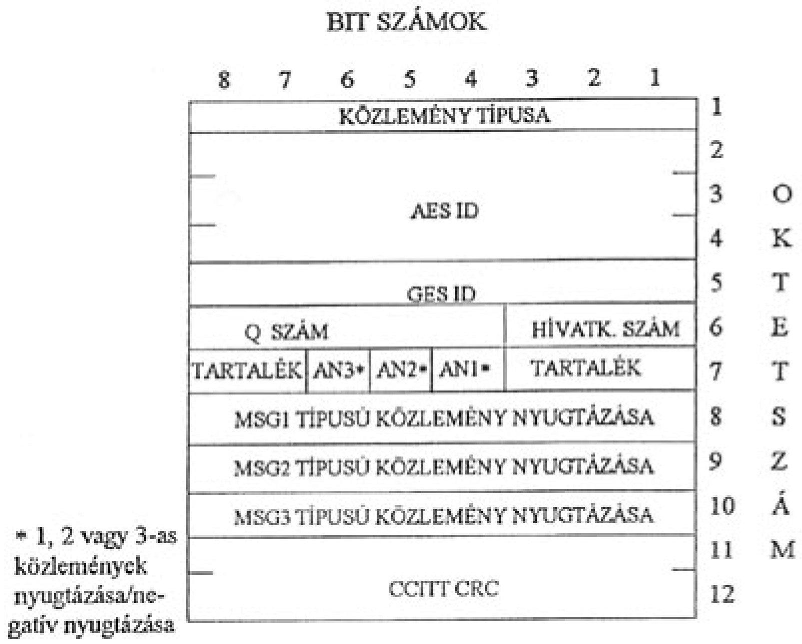


A2-22. ábra
Nem kért lefoglalás – P-csatorna

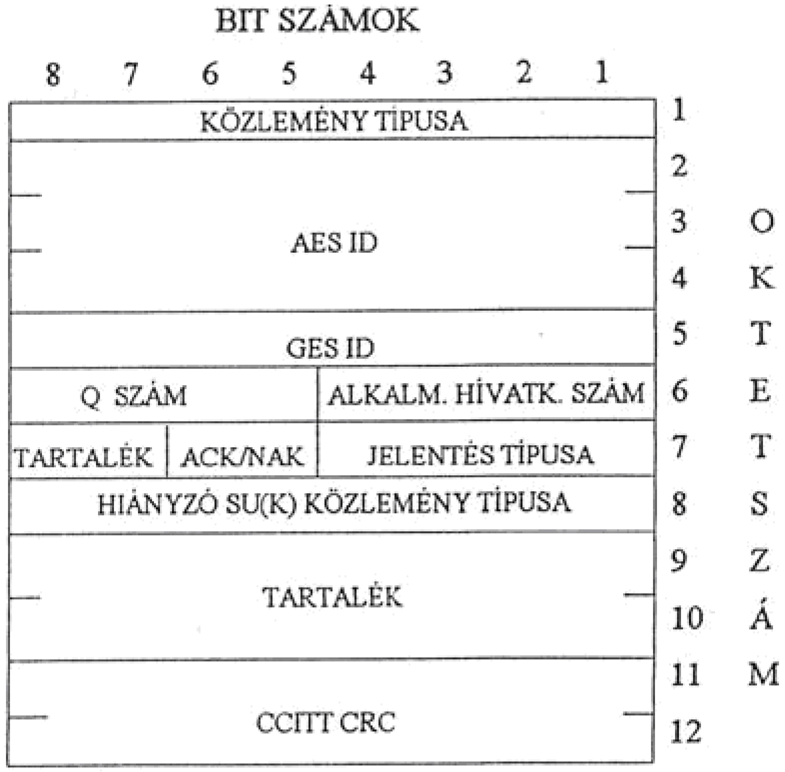
A2-23. ábra
T-csatorna kijelölés – P-csatorna
Lefoglalt jel egység /RES SU/



A2-24. ábra
Rövidesen megjelenő jel egységek – P-csatorna
Rövidesen megjelenő foglalás, egyedüli jel egység /RFC LSU/

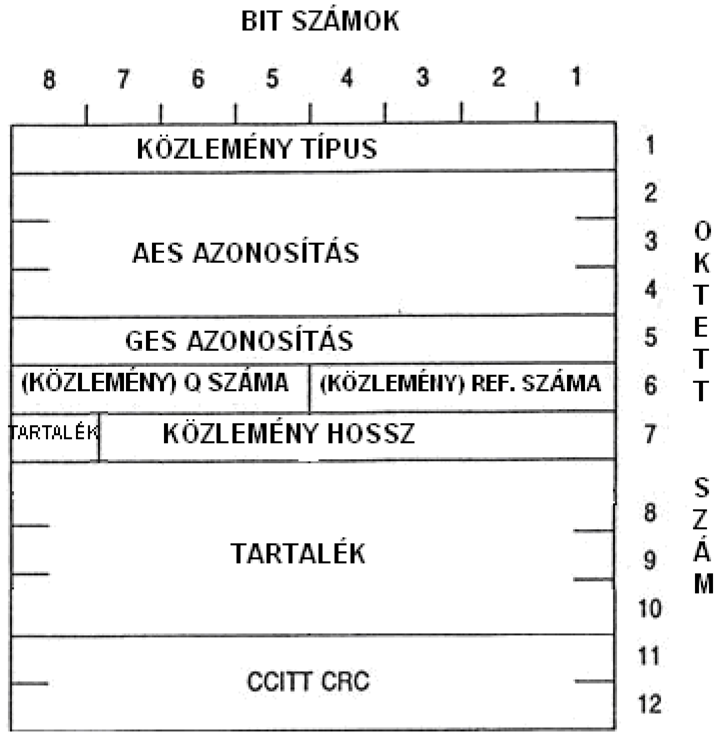


A2-25. ábra
Bejelentkezés nyugtázás – P-csatorna

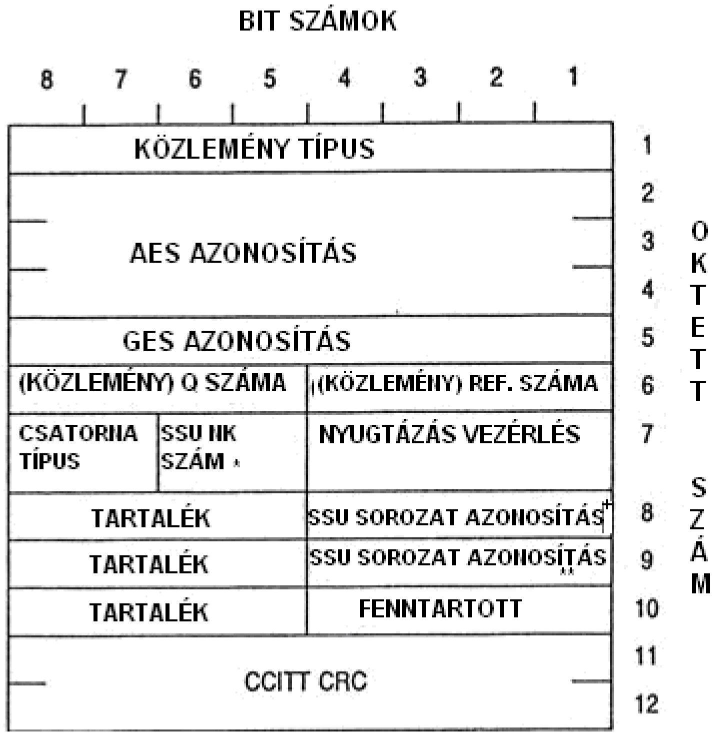


A2-26. ábra
Telefon-technikai nyugtázás – C-csatorna P/alsáv

ACK = *nyugtázás*
NAK = *negatív /nem/ nyugtázása*

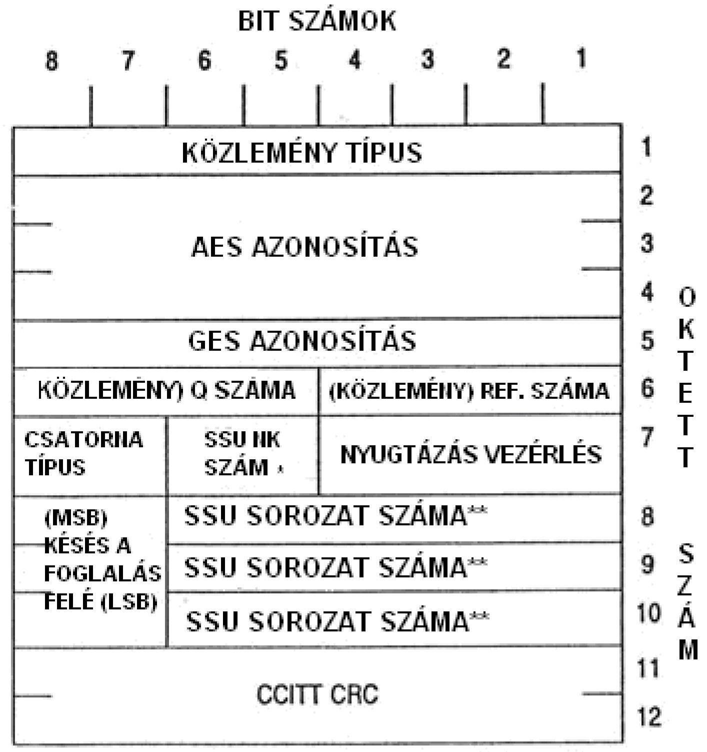


A2-27. ábra
Nyugtázás kérelem - P-csatorna



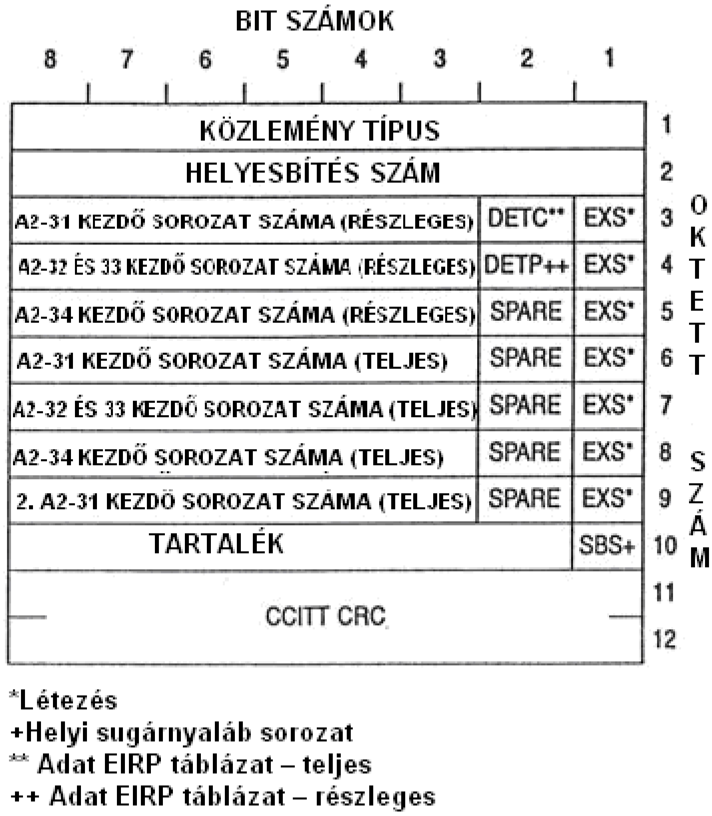
*SSU-k száma hiba jelző nyugtázásban
**Tartalék a RACK-ben, amely egy hiányzó SU-t azonosít és a RACK-ben hibátlanságot jelez
+Tartalék a RACK-ben, amely hibamentességet jelez

A2-28. ábra.
Nyugtázás – P-csatorna
R-csatorna nyugtázás (RACK)

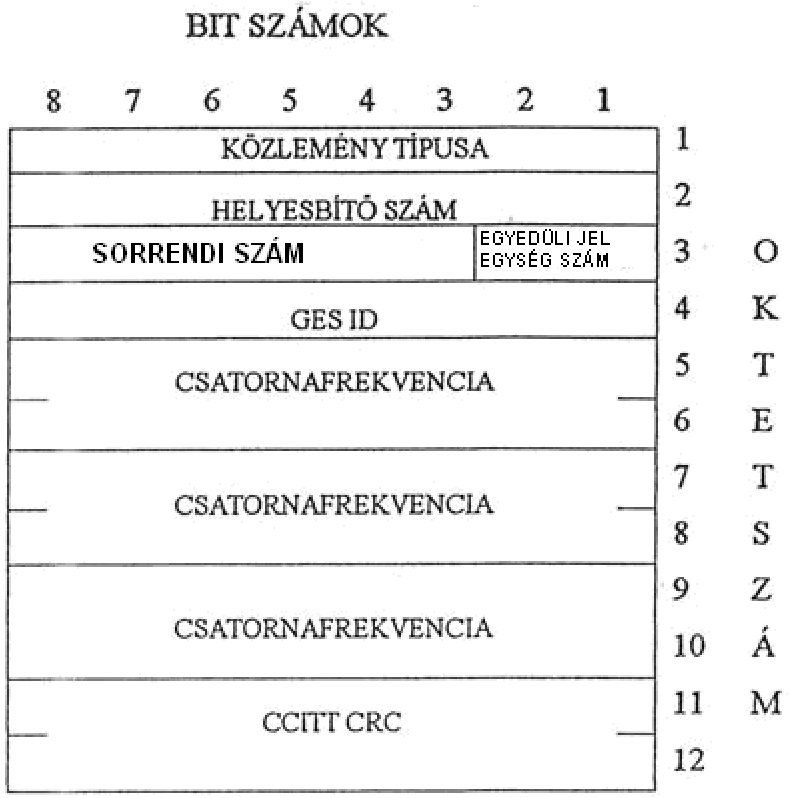


*SSU-k száma a hiba jelző nyugtázásban
**Tartalék a teljes újra-továbbítást kérő TACK-ben és hibátlanság jelzés a TACK-ben
+Tartalék, TACK hibátlanság jelző

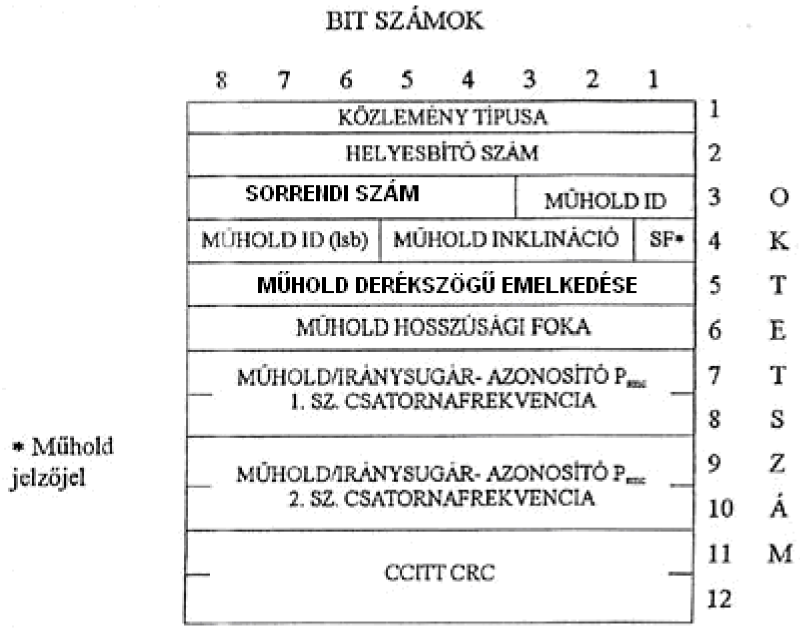
A2-29. ábra.
Nyugtázás – P-csatorna
T-csatorna nyugtázás (TACK)



A2-30. ábra.
AES rendszer-táblázat adás – P-csatorna
Globális sugár sorozat index

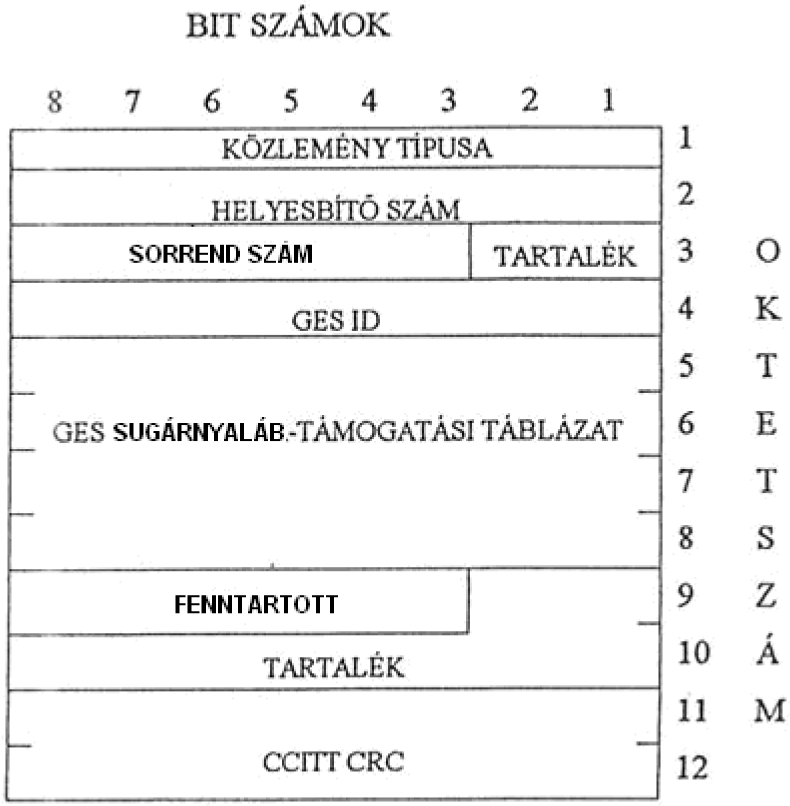


A2-31. ábra
AES rendszer-táblázat adás – P-csatorna
GES P/R csatorna értesítés



A2-32. ábra
AES rendszer-táblázat adás – P-csatorna
Műhold/sugárnyaláb azonosító csatorna értesítés

A2-33. ábra
AES rendszer-táblázat adás – P csatorna
Sugárnyaláb azonosító csatorna értesítés

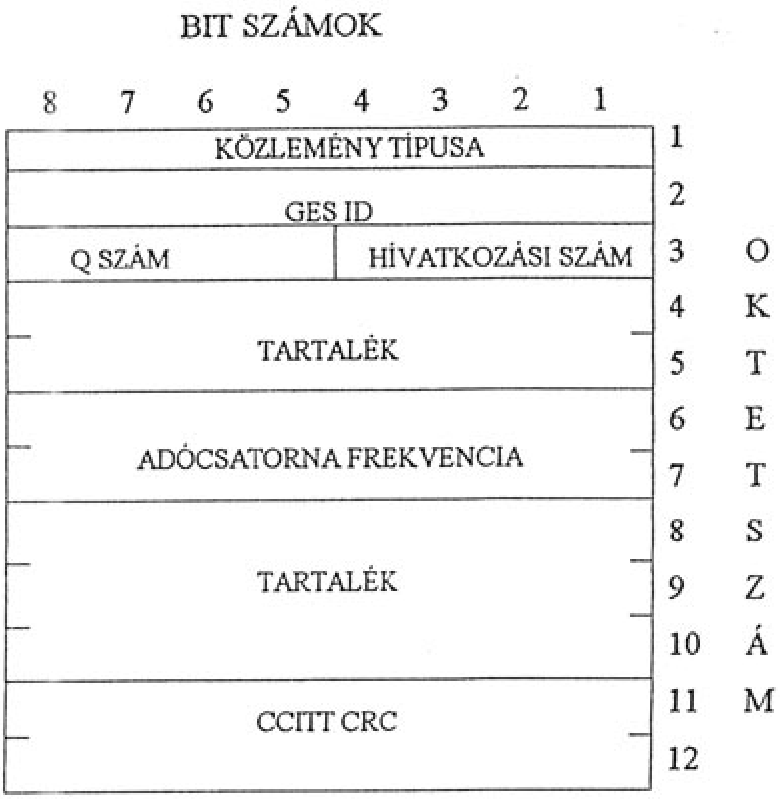


A2-34. ábra
AES rendszer-táblázat adás – P-csatorna
GES iránysugár alátámasztási értesítés

BIT SZÁMOK

8	7	6	5	4	3	2	1		
KÖZLEMÉNY TÍPUSA								1	
GES ID								2	
Q SZÁM				HÍVATKOZÁSI SZÁM				3	O
SZÁZAD								4	K
ÉV								5	T
HÓNAP								6	E
NAP								7	T
ÓRA								8	S
PERC								9	Z
MÁSODPERC								10	Á
CCITT CRC								11	M
								12	

A2-35. ábra
Rendszer adás – P-csatorna
Egyeztetett Világ-idő

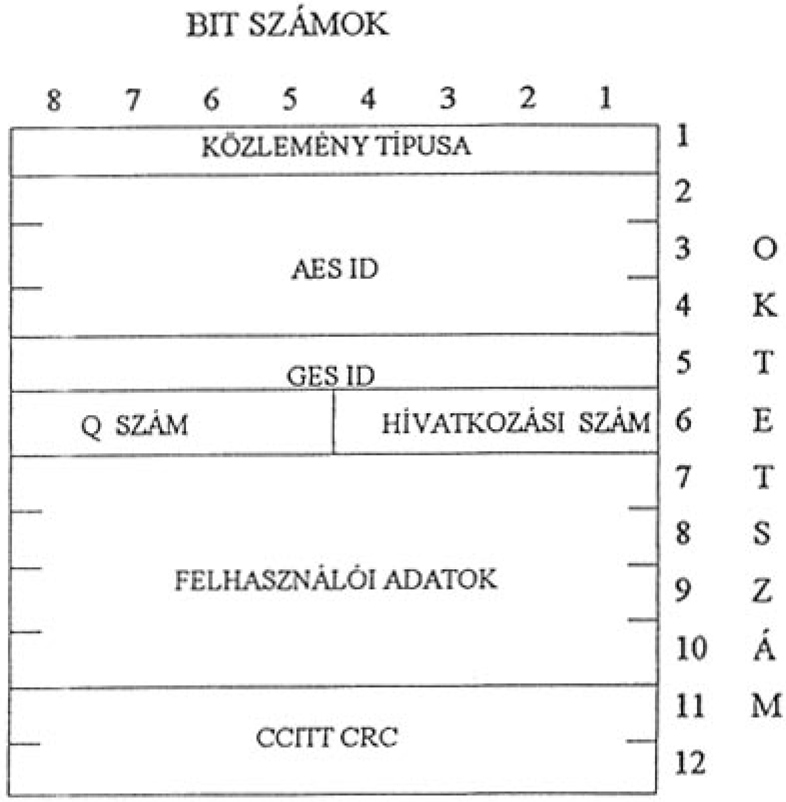


A2-36. ábra
Rendszer adás – P-csatorna
Szelektív bontás

A2-37. ábra
Felhasználói adatok – P/T csatorna
Kezdő jel egység /ISU/

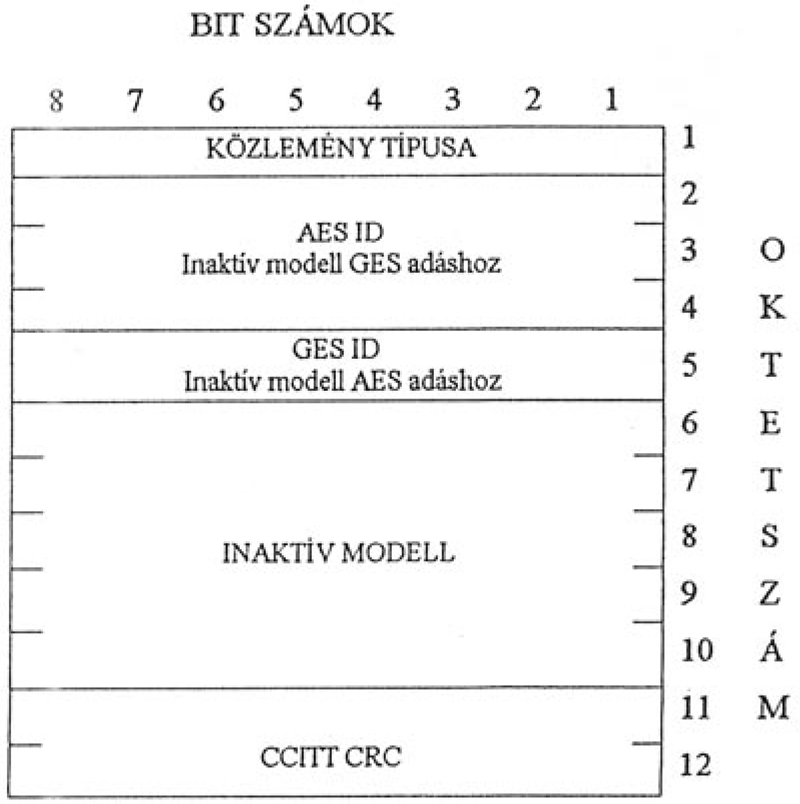
A2-38. ábra
Felhasználói adatok – P/T csatorna
Soronkövetkező jel egység /SSU/

A2-39. ábra
Felhasználói adatok – P-csatorna
3 oktett Utolsó jel egység /LSU/

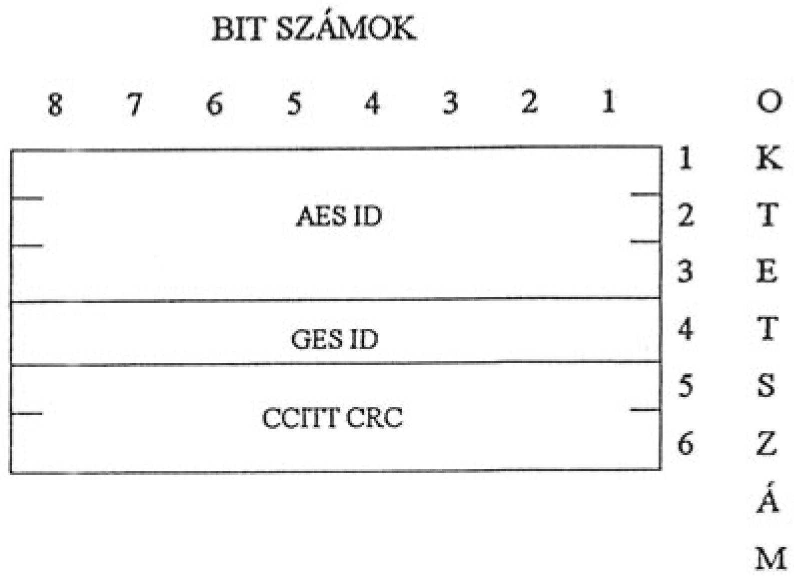


A2-40. ábra
Felhasználói adatok – P csatorna
4 oktett Utolsó jel egység /LSU/

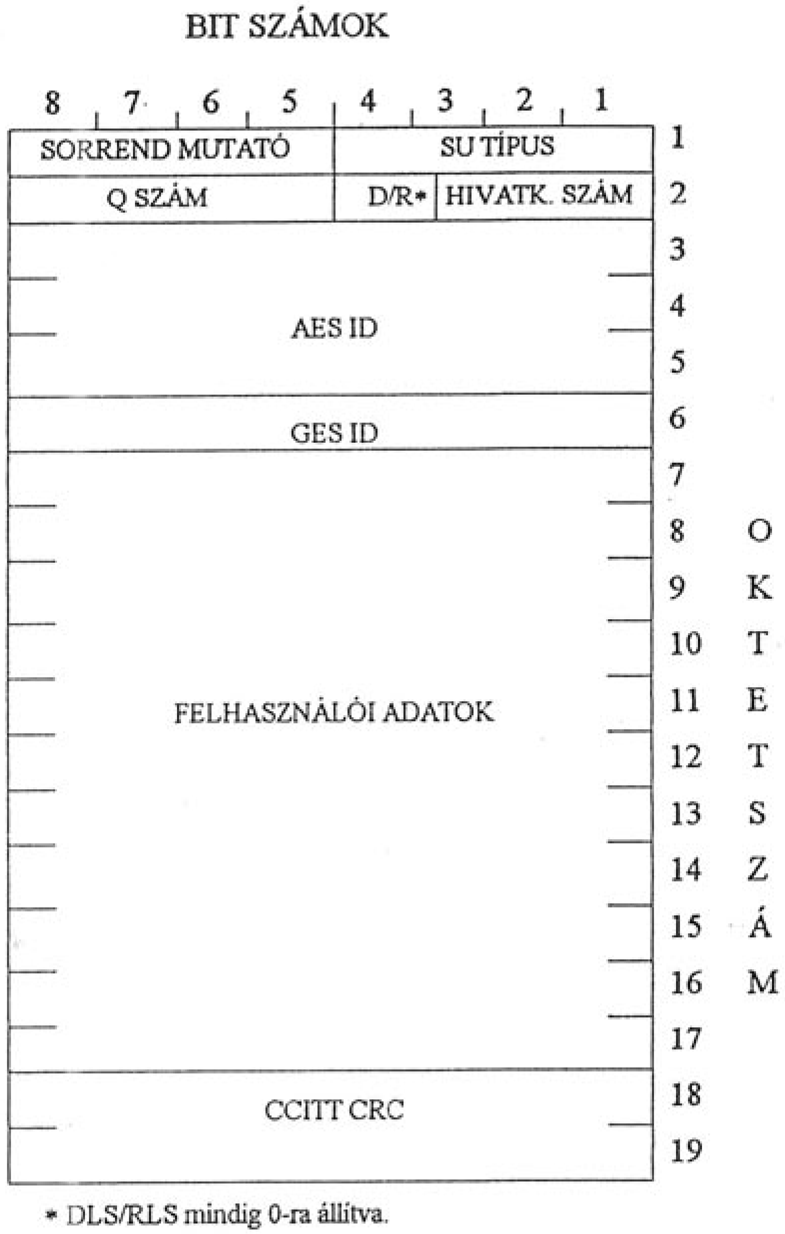
A2-41. ábra
Adás-ismétlő fej-rész – P/T csatorna
Adás-ismétlő jel egység /RTX SU/



A2-42. ábra
Kitöltő jel egység – P-, T- és a C-csatorna alsáv a légijármű-höz/-től
Kitöltő jel egység /FISU/

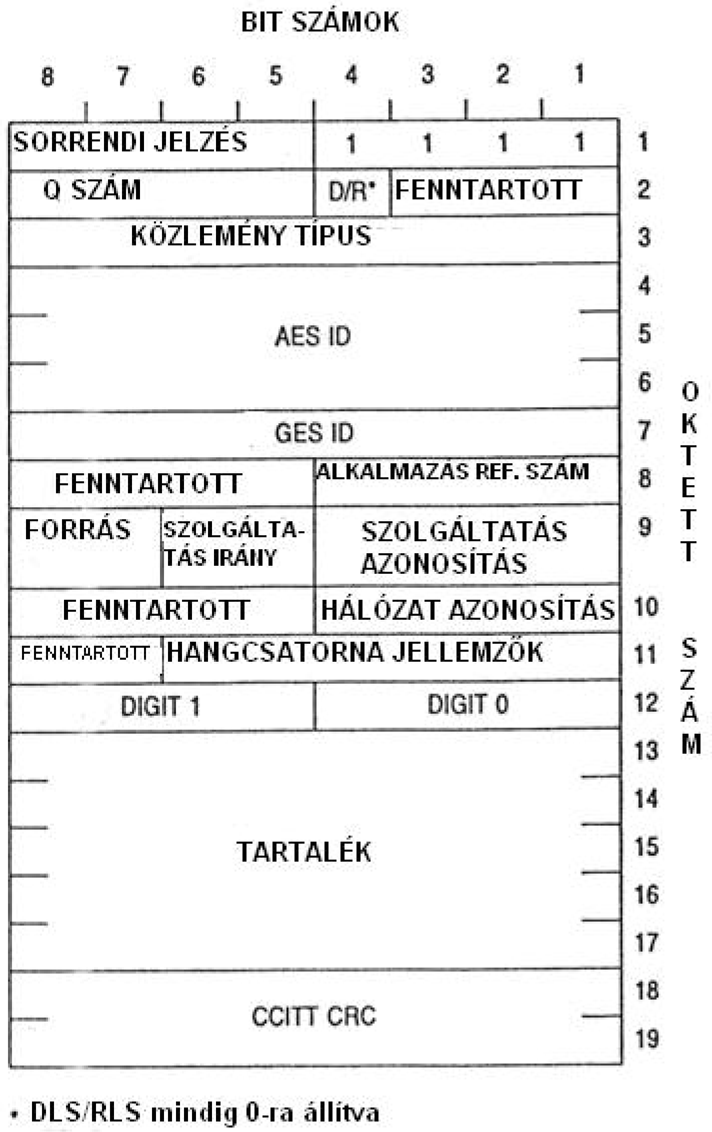


A2-43. ábra
Bekezdő /jelszakasz/ azonosító – T-csatorna



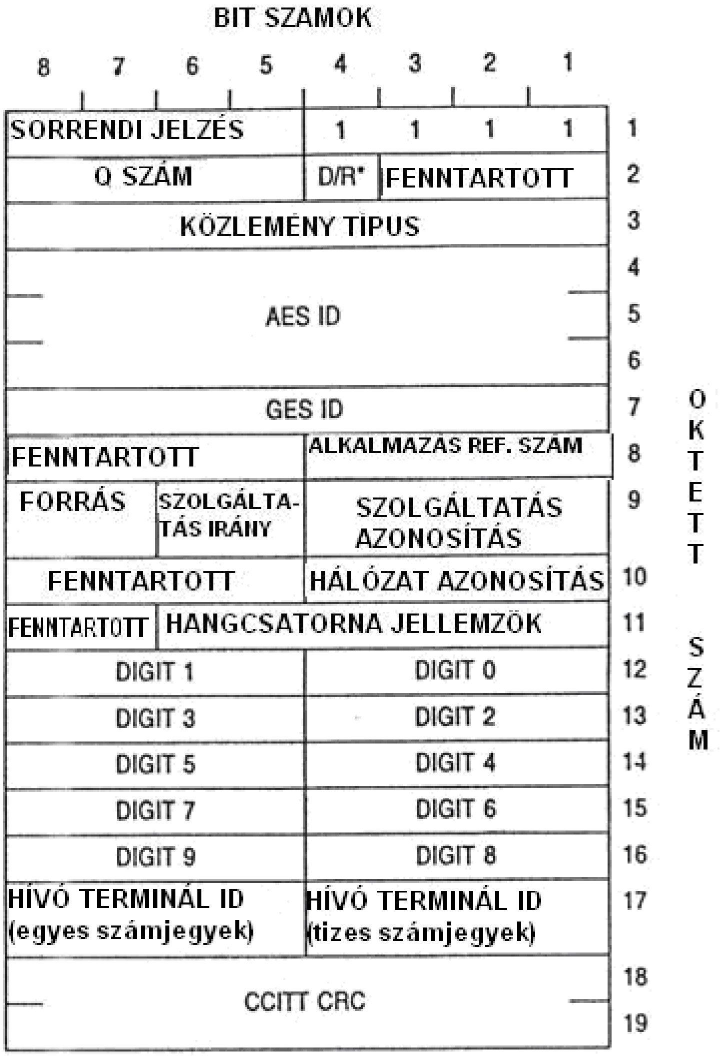
A2-44. ábra
Felhasználói adatok – R-csatorna
Kezdő jel egység / Soronkövetkező jel egység (ISU/SSU)

DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*



A2-45. ábra
Általános hozzáférési kérés, telefon – R-csatorna

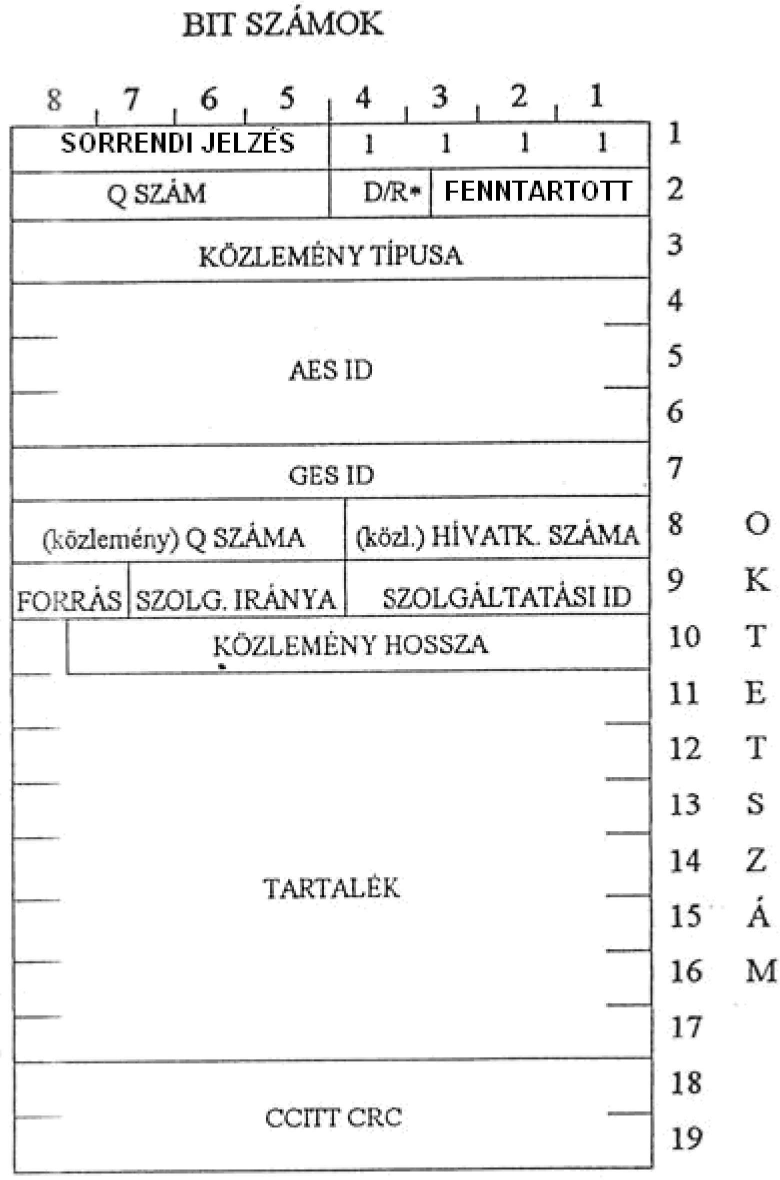
DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*



• DLS/RLS mindig 0-ra állítva

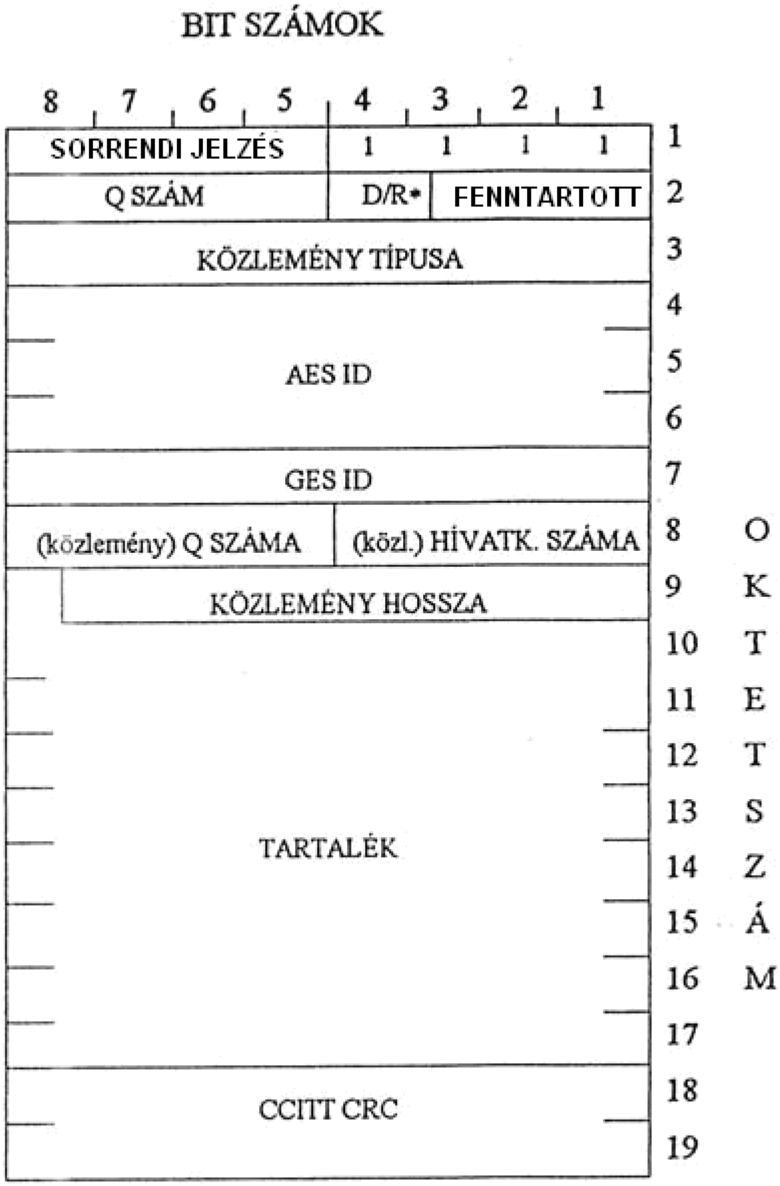
A2-46. ábra
Rövidített hozzáférési kérés, telefon – R-csatorna

DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*

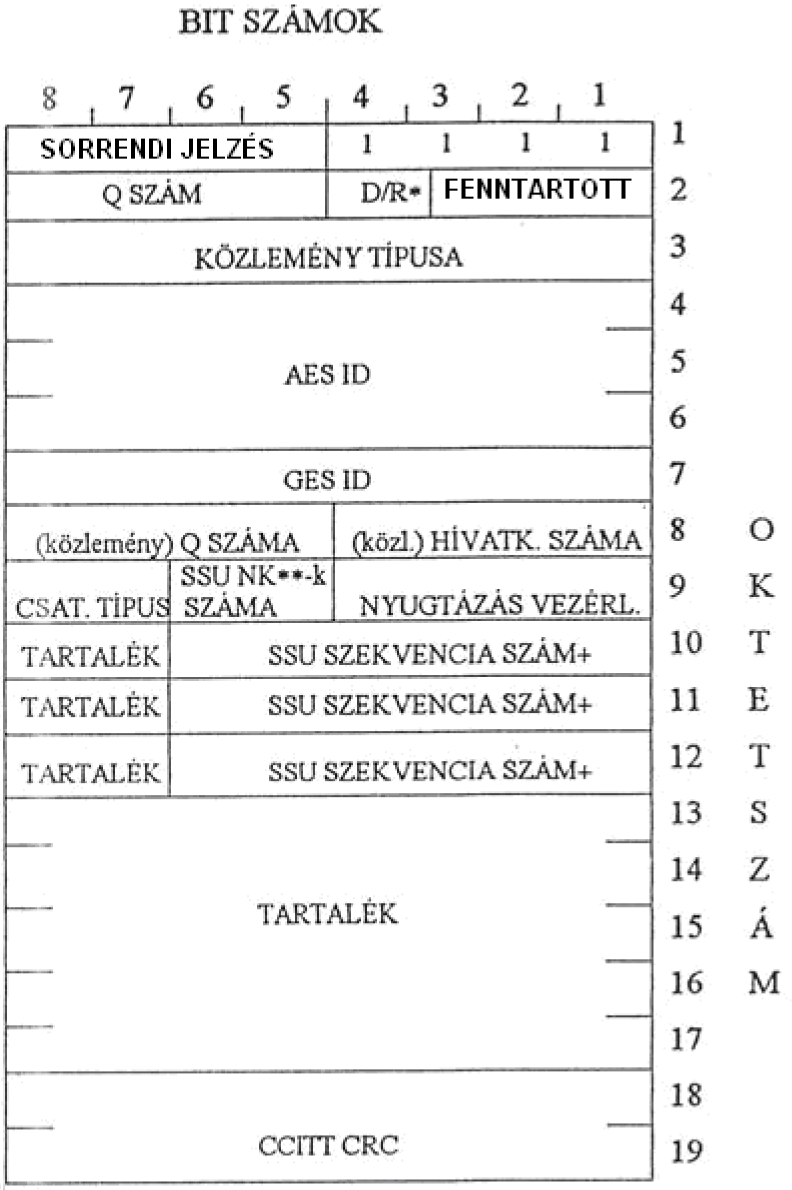


A2-47. ábra
Hozzáférési kérés adatok – R-csatorna
Foglalási kérelem (REQ)

DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*

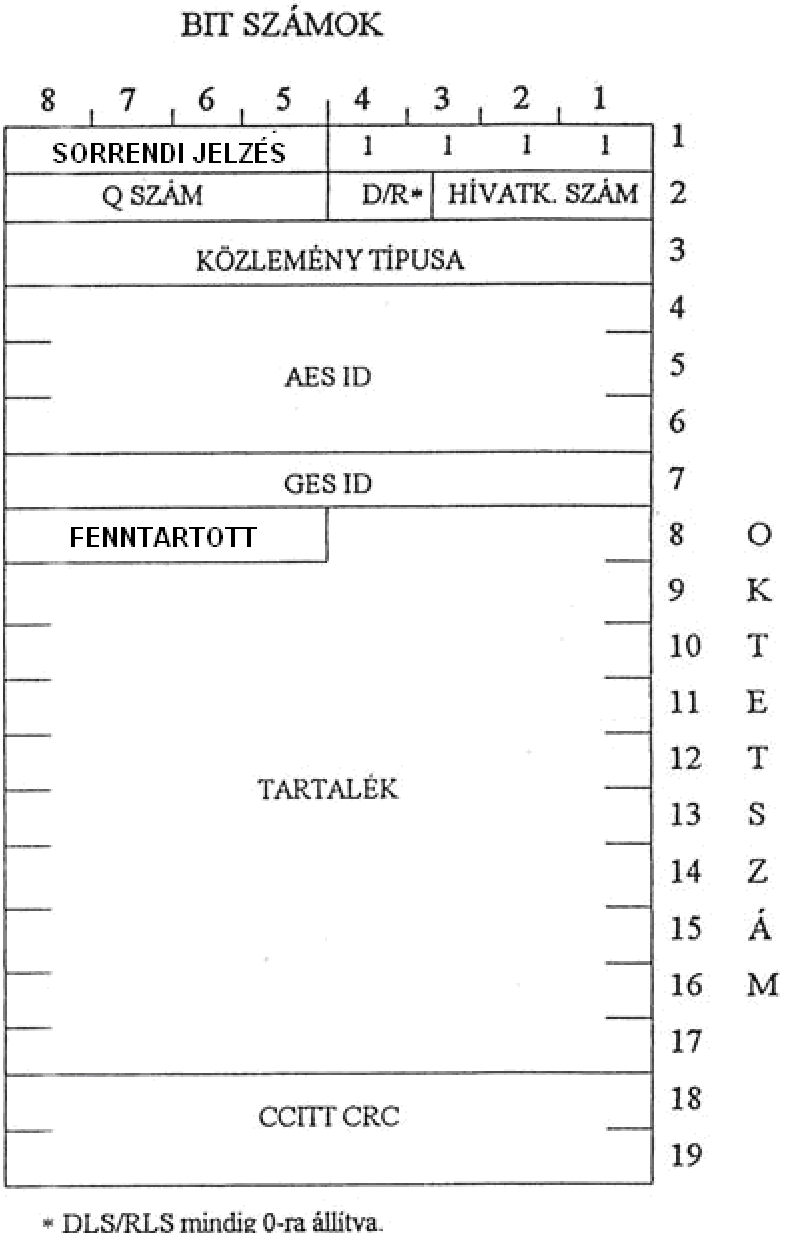


A2-48. ábra
Nyugtázási kérelem – R-csatorna
Nyugtázás kérelem /RQA/ jel egység /SU/

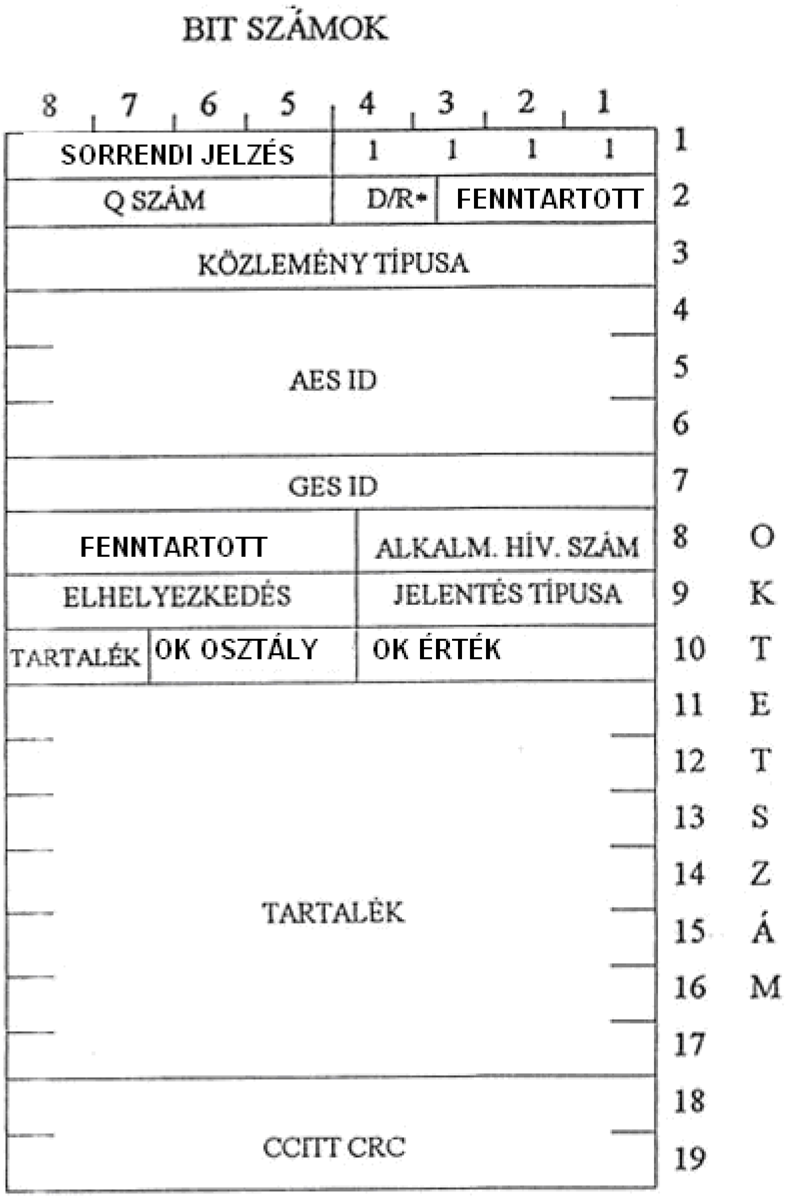


* DLS/RLS mindig 0-ra állítva.
** Hibát jelző nyugtázásban lévő SSU-k száma
+ Egy teljes újratovábbítást igénylő PACK-ban és hibát nem jelző PACK-ban lévő tartalék

A2-49. ábra
Nyugtázás – R-csatorna
P-csatorna nyugtázás (PACK)

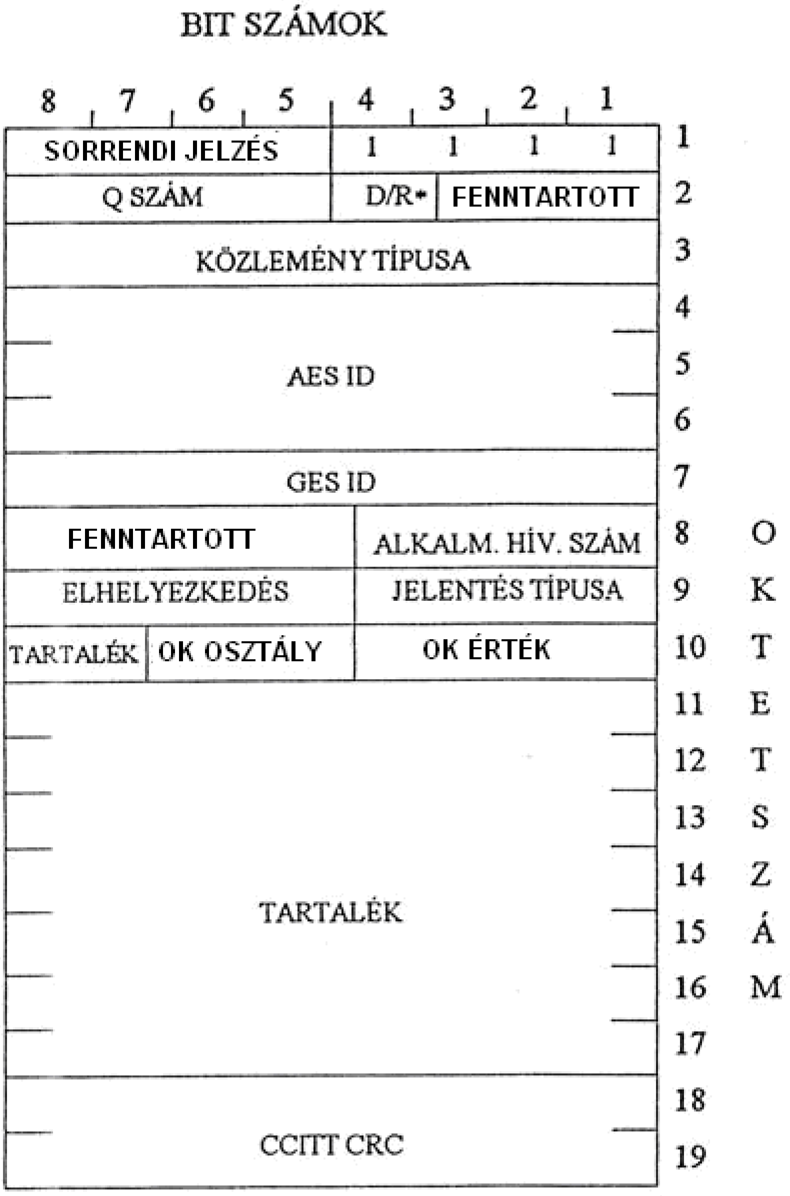


A2-50. ábra
Napló vezérlés – R-csatorna
Kijelentkezési kérés/újra-kijelölésre kész/újra-kijelölés visszautasítás



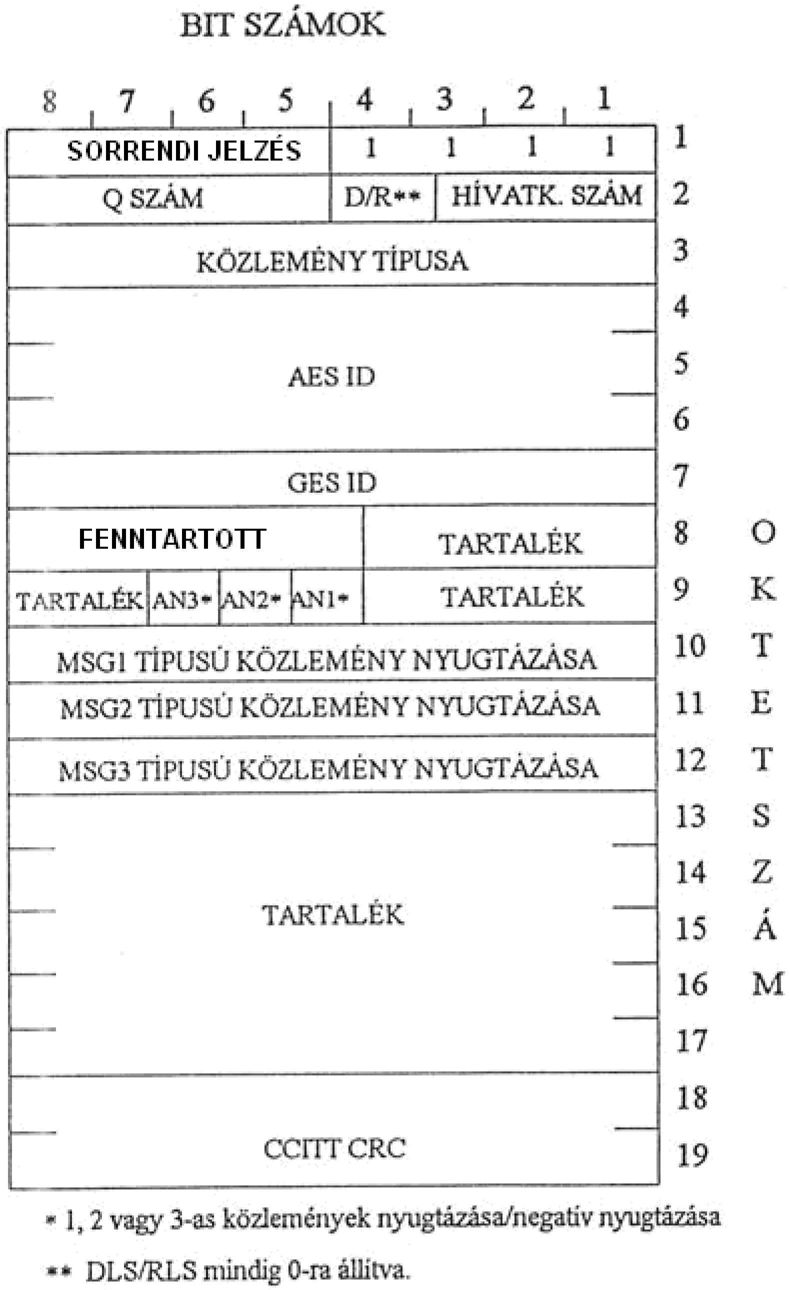
* DLS/RLS mindig 0-ra állítva.

A2-51. ábra
Hívási folyamat – R-csatorna
Csatorna bontás



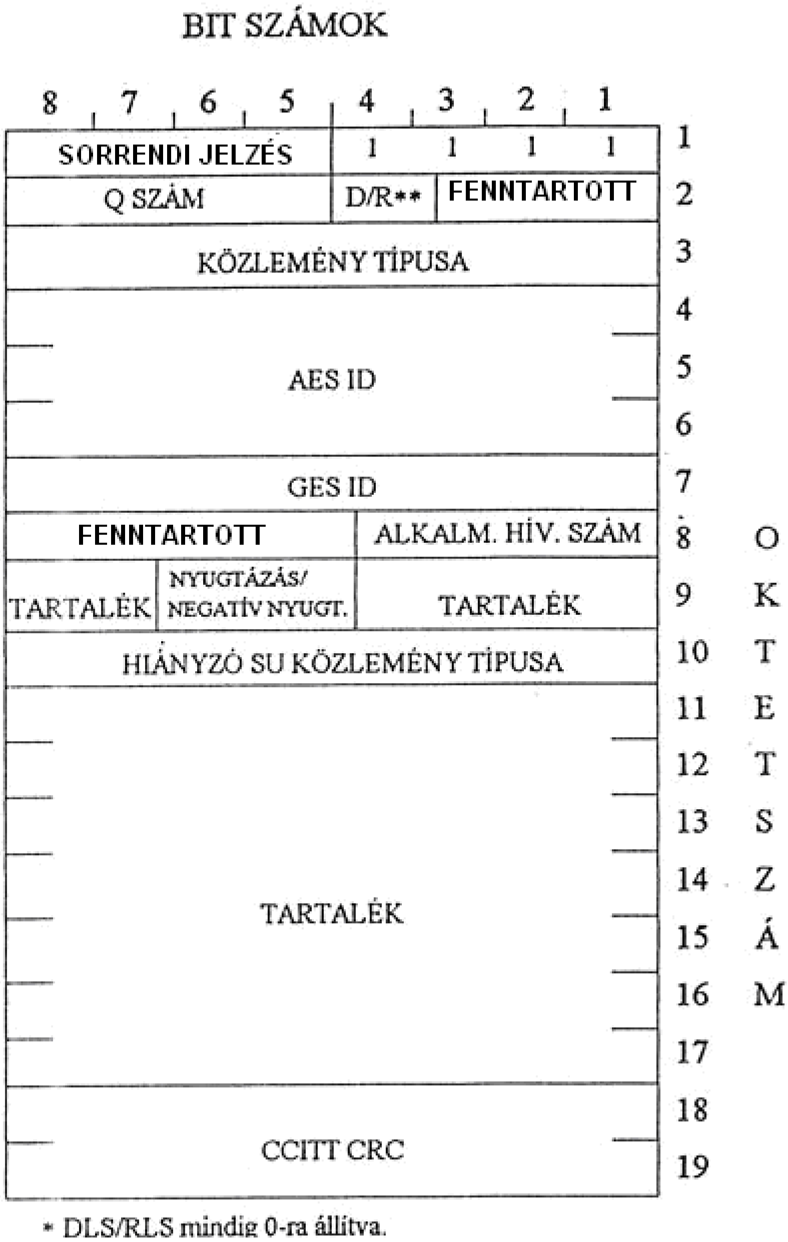
* DLS/RLS mindig 0-ra állítva.

A2-52. ábra
Hívási folyamat – R-csatorna
Hívási kísérlet eredménye



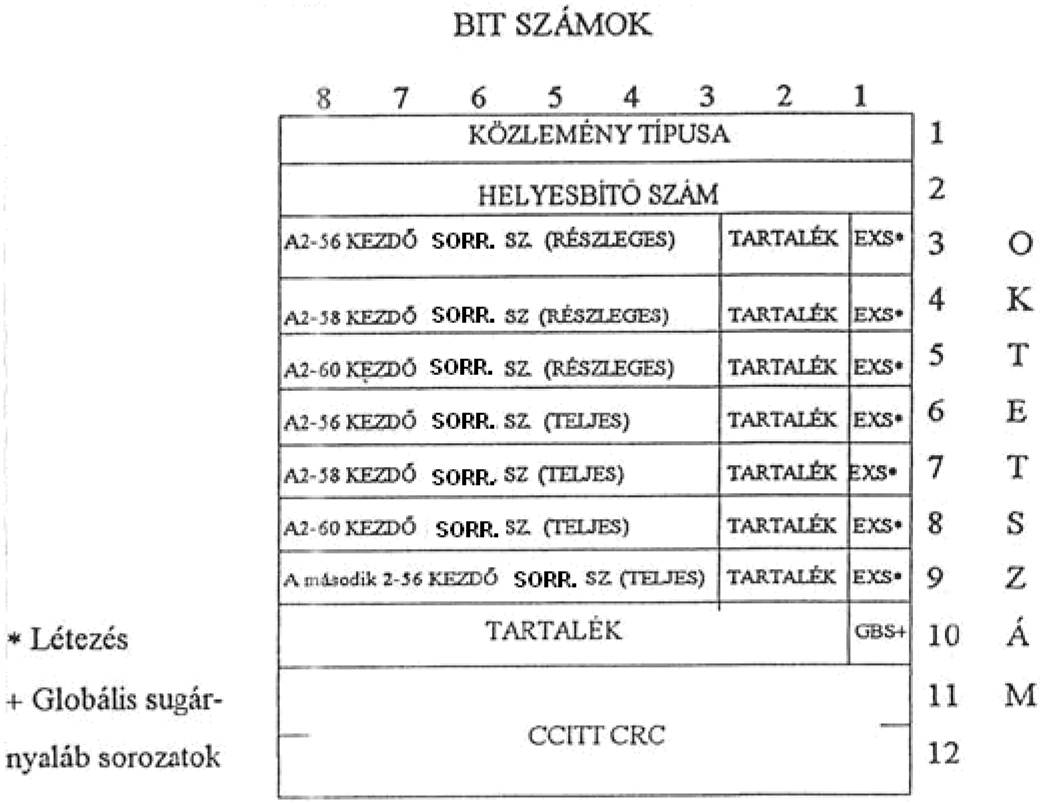
A2-53. ábra
Bejelentkezési nyugtázás – R-csatorna

DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*

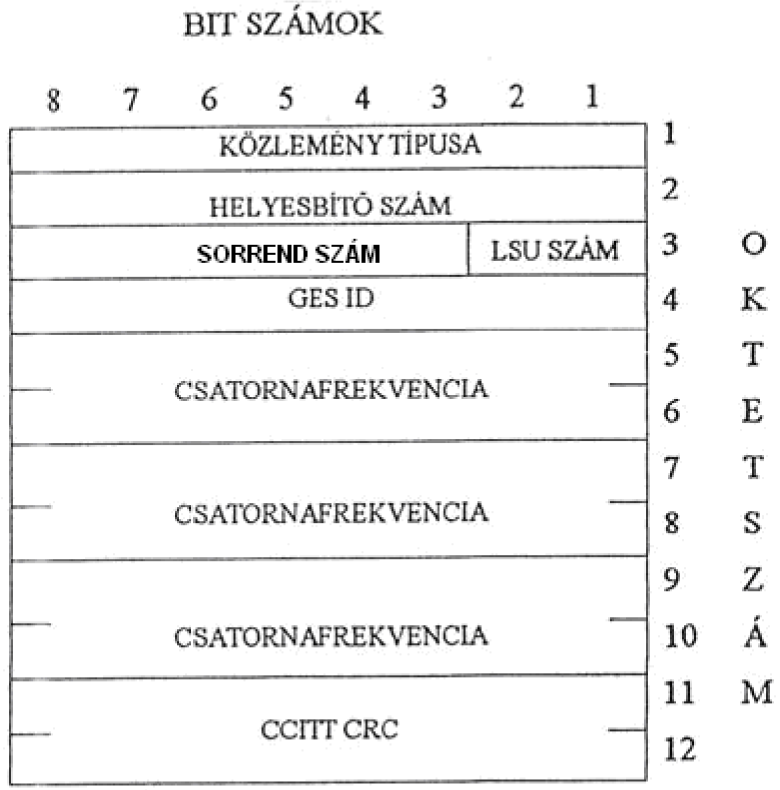


A2-54. ábra
Telefon-technikai nyugtázás – R-csatorna

DLS = *Közvetlen összeköttetési szolgáltatás*
RLS = *Megbízható összeköttetési szolgáltatás*



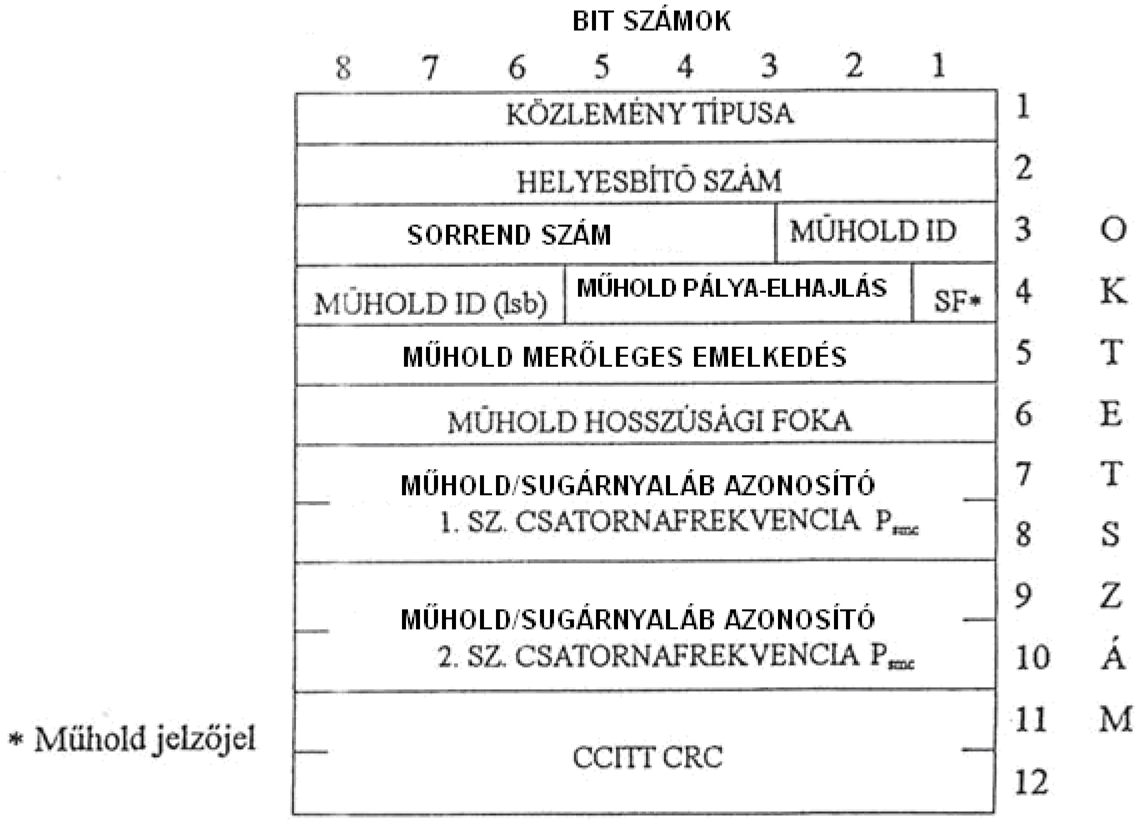
A2-55. ábra
AES rendszer-táblázat adás – P-csatorna
Irányított sugárnyaláb sorozatok indexe



A2-56. ábra
AES rendszertáblázat adás – P-csatorna
Irányított sugárnyaláb sorozatok GES P/R csatorna értesítő jel egységek /SU/

LSU = *Egyedi jel egység*

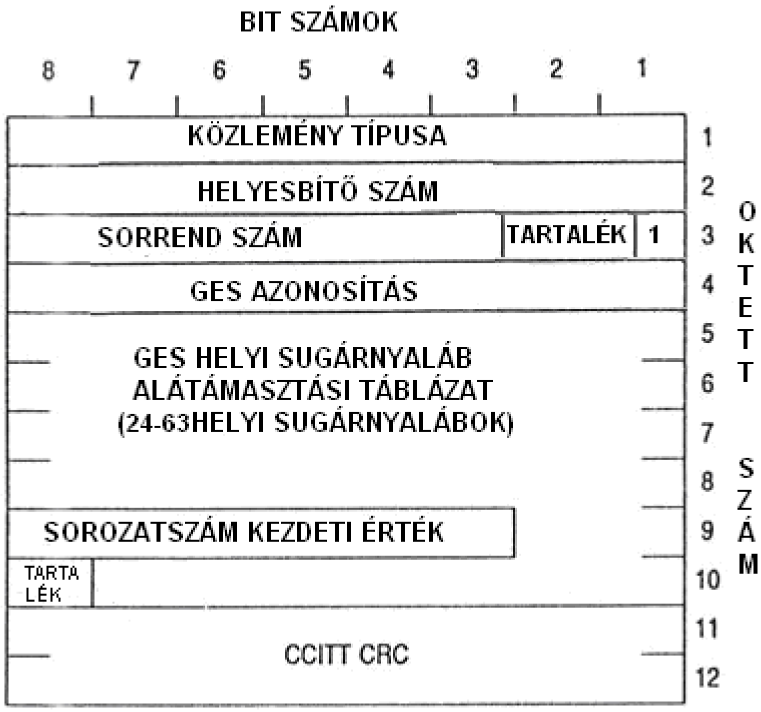
A2-57. ábra
AES rendszer-táblázat adás – P-csatorna
Irányított sugárnyaláb sorozatok GES P/R csatorna értesítő utolsó soronkövetkező jel egysége /SSU/



A2-58. ábra
AES rendszer-táblázat adás – P-csatorna
Irányított sugárnyaláb sorozatok műhold/sugárnyaláb azonosító /ID/ csatorna értesítő, kezdő jel egység /ISU/

A2-59. ábra
AES rendszer-táblázat adás – P-csatorna
Helyi sugárnyaláb sorozat műhold/sugárnyaláb azonosítás csatorna értesítés SSU

A2-60. ábra
AES rendszer-táblázat adás – P-csatorna
Helyi sugárnyaláb sorozat GES sugárnyaláb alátámasztás értesítés
(1-23 sugárnyalábok)



A2-61. ábra
AES rendszer-táblázat adás – P-csatorna
Helyi sugárnyaláb sorozat GES sugárnyaláb alátámasztás értesítés
(24–63 sugárnyalábok)

A2-62. ábra
Adat EIRP táblázat adás

A 4. fejezet 3. függeléke

JEL EGYSÉG MEZŐ KÓDOLÁS ÉS KIJELÖLÉS

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1a AAS
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3 AES ID
3a Antenna nyereség
4 Alkalmazási referencia szám
5 Sugárnyaláb ID
6 Bekezdő jelszakasz intervallum
7 Bekezdő jelszakasz hossz
8 Hívott/hívó végberendezés
9 Ok osztály
10 Ok érték
11 Csatorna bit sebesség
12 Csatorna frekvencia
13 Csatorna típus
14 Áramköri adat-átviteli sebesség
15 Áramköri adat-átviteli követelmény
16 AES osztály
17 CCITT CRC
18 Adat bit sebesség képesség

18a Adat EIRP (globális vagy sugárnyaláb)
18b Adat EIRP táblázat sorozat szám
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19a DETC/DETP (adat EIRP táblázat teljes/adat EIRP táblázat részleges)
20 Számjegy
21 DLS/RLS
22 EIRP beállítás
23 Létezés /meglét/
24 GES ID
25 GES sugárnyaláb alátámasztó táblázat
26 Üresjárati séma
27 Kezdeti EIRP
27a ISU/SSU (kezdeti jel egység/soronkövetkező jel egység)
28 I/R (kezdet/megújítás)
29 Hossz
29a Globális sugárzás sorozat (GBS)
30 Helység
31 LSU szám
31a LOV
32 Közlemény hossz
33 Közlemény tipus
34 Hálózati ID
35 NOT (adók száma)
36 Fenntartott bekezdő jelszakaszok száma
37 C-csatorna száma
38 Frekvenciák száma
39 Az utolsó SSU oktettjeinek száma
40 SSU-k száma (Az Ack-ban)
41 P/R MSG
42 P/S (elsődleges/másodlagos)
43 Q szám (elsőbbség)
44 Ok
45 Vételi bit hiba arány
46 Referencia szám
47 Jelentés típus
48 Fenntartott
49 Helyesbítési szám
50 RFC jelző jel
51 S (kódolási szabvány)
52 Műhold jelző jel
53 Műhold ID
54 Műhold pálya-elhajlás
55 Műhold hosszúsági foka
56 Műhold merőleges helyzet
58 Sorrendi szám jelző
59 Sorrendi szám
60 Sorrendi szám (eltérés érték)
61 Szolgáltatási irány
62 Szolgáltatás azonosság
621 SIN/DOU (egyedüli/kettős)
63 Forrás
64 Tartalék
64a Irányított Sugárnyaláb Sorozat (SPS)
65 Indító keret szám
66 Indító rés szám

67 SU típus
68 TDMA MSG
69 T_X csatorna szám
70 Egyeztetett Világ-idő
71 Hang csatorna jellemzők

JEL EGYSÉG MEZŐ KÓDOLÁS JELÖLÉSEK

Megjegyzés. – A kódok decimális értékeik szerint kerülnek feltüntetésre, hacsak a HEX betűk nem jelzik a hexadecimális értékek szerinti feltüntetést. A FENNTARTOTT jelzéssel ellátott kódokat egyes AMSS rendszer megvalósításoknak tartják fenn.

1. ACK/NAK (1 bit) Nyugtázás/NEM nyugtázás

Kód	Funkció
0	NAK, a jelzett közleményt újra-továbbítani
1	ACK, a jelzett közleményt nem kell újra-továbbítani

1a AAS (1 bit) Rövidített hívás létrehozás

Ennek a mezőnek kell jeleznie, hogy a GES alátámsaztja a „Rövidített Hívás Létrehozás” eljárást.

Kód	Funkció
0	A GES nem támasztja alá a „Rövidített Hívás Létrehozás” eljárást
1	A GES alátámasztja a „Rövidített Hívás Létrehozás” eljárást

2. Nyugtázás vezérlés (4 bit)

Kód	Funkció
0	Ez a nyugtázás tartalmazza az összes újratovábbítási kérést
1-13	A megmaradó újratovábbítást kérő ACK közlemények száma (csak PACK és TACK SU-kra alkalmazható).
14	A teljes közleményben nincsenek hibák
15	A teljes közleményt továbbítsa újra (csak PACK és TACK SU-kra alkalmazható)

3. AES ID (3 oktett)

Ennek a mezőnek az AES 24-bites légijármű címzésének kell lennie (lásd 9. fejezet).

3a. Antenna nyereség (4 bit)

Ennek a mezőnek kell jeleznie az antenna nyereséget egy 3. 4. osztályú AES (lásd 16) részére. Ennek a mezőnek kell képeznie a tartalékot az 1. osztályú AES számára.

Kód	Funkció
0	Nagy nyereség
1	Közepes nyereség
2-15	Tartalék

4. Alkalmazási referencia szám (4 bit)

Ennek a mezőnek kell tartalmaznia az áramkör üzemmódú szolgáltatások által az áramkör üzemmódú hívás részére kijelölt közvetlen bináris referencia számot.
Az alkalmazási referencia számának egyértelműen kell azonosítania egy AES/GES pár közötti hívást. Az alkalmazási referencia számokat levegő-föld hívások esetében az AES-nek a 0-7 intervallumból, és az egy adott AES-hez szóló föld-levegő hívások esetében a GES-nek a 8-15 intervallumból ciklikusan kell kijelölni.

5. Sugárnyaláb ID (6 bit)

Kód	Funkció
0	Globális sugárnyaláb
1-63	Irányított sugárnyalábok

6. Bekezdő jelszakasz intervallum (4 bit)

Többszörös bekezdő jelszakasz lefoglalásban ennek a mezőnek azt kell mutatnia, hogy 2^{BI} keretenként egy bekezdő jelszakasz van, ahol BI = bekezdő jelszakasz intervallum.

7. Bekezdő jelszakasz hossz (5 bit)

Ennek a mezőnek a bekezdő jelszakasz hosszt kell megmutatnia a jel egységek számának kifejezését használva.

8. Hívott/hívó végberendezés (8 bit)

Binárisan kódolt decimális (BCD) kódolás, ahol a legnagyobb helyiértékű számjegyek a legkisebb helyiértékű fél oktettben jelennek meg és vice versa.

9. Ok osztály (3 bit)

Ennek a mezőnek a kijelölését és értelmezését az S (kódolás szabvány) mező (51. rovat) számára kijelölt értékének kell meghatároznia. Az ok osztályát az ok értékével (10. rovat) összekapcsolva kell használni a tényleges ok jelentésének azonosítására.

CCITT Q.931 szabvány kódolás:

Kód	Funkció
0	Szabályos esemény
1	Szabályos esemény
2	Forrás nem áll rendelkezésre
3	Szolgáltatás vagy választási lehetőség nem áll rendelkezésre
4	Szolgáltatást vagy választást nem valósítottak meg
5	Érvénytelen közlemény (pl. paraméter tartományon kívül)
6	Protokoll hiba (pl. ismeretlen közlemény)
7	Együttműködés

Műhold hálózat specifikus kódolása

Kód	Funkció
0	PSTN/ISDN hívás folyamat események
1	Hívás előjegyzés
2	Forrás nem áll rendelkezésre
3	Érvénytelen paraméter
4	Üzemen kívül
5	Hálózat meghibásodás
6	Szolgáltatás/választási lehetőség nincs alátámasztva
7	Szabályos esemény

10. Ok érték (4 bit)

Ennek a mezőnek a kijelölését és értelmezését az S (kódolási szabvány) mezőnek (51. tétel) kijelölt érték által kell megadni. Az ok értéket az ok osztállyal (9. tétel) együttesen kell használni a tényleges ok jelentésének azonosítása céljából. Az alább megadottak azok az értékek, amelyek a R2, 5. számú CCITT és a TUP, 7. számú CCITT PSTN jelző-rendszerekkel való összedolgozáshoz szükségesek.

CCITT Q.931 szabvány kódolás:

Ok osztály	Ok érték	Funkció
0	1	Nem kiosztott szám
0	3	Nincs útvonal a rendeltetési helyre
1	0	Normál törlés
1	1	Felhasználó foglalt
1	2	Felhasználó nem válaszol
1	3	Hívott felhasználó foglalt (felhasználó riasztva)
1	5	Hívás visszautasítva
1	11	Rendeltetési hely üzemen kívül
1	12	Érvénytelen (hiányos) szám formátum
1	15	Szabályos, nincs meghatározva
2	2	Nem áll áramkör/csatorna rendelkezésre
2	6	Hálózat nem működik
2	10	Kapcsoló-berendezés torlódás
4	2	Csatorna típus nincs kivitelezve

Műhold hálózat specifikus kódolása:

Ok osztály	Ok érték	Funkció
0	1	Címzés teljes
1	1	Hívás előjegyezve
2	1	Csatorna nem áll rendelkezésre
2	2	Csatornaegység nem áll rendelkezésre
2	3	Analóg adatberendezés nem áll rendelkezésre
2	4	Digitális adatberendezés nem áll rendelkezésre
3	1	Fenntartott
3	2	Érvénytelen/hiányos címzés
4	1	Rendeltetési hely üzemen kívül
4	2	AES nincs jogosítva
4	3	Beérkező hívások akadályozva
5	1	Folyamatossági hiba vagy nincs válasz
6	1	Fenntartott
6	2	A kívánt analóg adat sebesség nincs alátámasztva
6	3	A kíánlt digitális adat sebesség nincs alátámasztva
6	4	Hang-csatorna típus nincs alátámasztva
6	5	Szolgáltatás típusa nincs alátámasztva
7	1	Felhasználó foglalt
7	2	Nem kiosztott szám
7	3	AES hiányzik
7	4	Helyi sugárnyaláb átadva
7	15	Meghatározatlan ok

11. Csatorna átviteli sebesség (vétel vagy adás) (4 bit)

Kód	Funkció
1	600 bit/s
1	1 200 bit/s
2	2 400 bit/s
3	4 800 bit/s
4	6 000 bit/s
5	5 250 bit/s
6	10 500 bit/s
7	8 400 bit/s
8	kijelöletlen
9	21 000 bit/s
10-15	Kijelöletlen

12. Csatorna frekvencia (2 oktett)

Legmagasabb helyiértékű bit: 1 = irányított sugárnyaláb, 0 = globális sugárnyaláb
Legkisebb helyiértékű 15 bit = 0000-tól 7FFF-ig (HEX)
A frekvencia N bináris számként kerül meghatározásra, ahol:
frekvencia (MHz) = Alap (MHz) + N * 0,0025 MHz;
alap = 1 510,0000 MHz a vételi csatornák esetében;
alap = 1 611,5000 MHz az adó csatornák esetében.
A mindenhol NULLA kódot a nulla érték jelzésére kell használni.

13. Csatorna típus (2 bit)

Ezt a mezőt azon csatorna azonosítására kell használni, amelyet a nyugtázott közlemény esetében használtak.

Kód	Funkció
0	R-csatorna
1	P-csatorna
2	T-csatorna
3	Kijelöletlen

14. Áramköri adatátviteli sebesség (4 bit)

Ezt a mezőt az AES-nek a megkövetelt áramkör üzemmódú adatátviteli sebesség (modem típus, ha alkalmazható) jelzésére kell használnia. A GES-nek ugyancsak ezt kell használnia az AES-nek a ténylegesen elért adat-átviteli sebességről való tájékoztatására, ami különbözhet a megkövetelt adat-átviteli sebességtől, ha több-sebességes modemet alkalmaznak, vagy ha a modem-szinkronizációt nem érik el.
A kódolásnak az áramköri adatszolgáltatás típusától kell függnie, amint azt a szolgáltatási azonosító mező jelzi (62. tétel).

Analóg-összekapcsoló adatszolgáltatás:

Kód	Funkció
0	Adat üzemmód nincs megkövetelve/teljesítve
1	1 200 bit/s: CCITT V.22
2	1 200 bit/s: CCITT V.22 *bis*
3	2 400 bit/s: CCITT V.22 *bis*
4	4 800 bit/s: CCITT V.32
5	9 600 bit/s: CCITT V.32
6	1 200 bit/s: CCITT V.23
7-14	Kijelöletlen
15	Fax (3. csoport) szolgáltatás: CCITT T.30

Digitális-összekapcsoló adatszolgáltatás:

Kód	Funkció
0	Adat üzemmód nincs megkövetelve/teljesítve
1	1 200 bit/s
2	2 400 bit/s
3	4 800 bit/s
4	9 600 bit/s
5-15	Kijelöletlen

15. Áramköri adatokkal szemben támasztott követelmény (2 bit)
Ezt a mezőt az AES-nek arra kell használnia, hogy jelezze, ha az összes föld-levegő áramköri üzemmódú hívásnak a GES által ki kell jelölni az áramköri üzemmódú szolgáltatás ellátására alkalmas csatorna-berendezést és amennyiben igen, akkor milyen típusú összekapcsoló képességre van szükség.

Kód	Funkció
00	Áramköri üzemmódú adatszolgáltatás nem szükséges
01	Analóg összekapcsoló szolgálat szükséges
10	Digitális összekapcsoló szolgálat szükséges
11	Kijelöletlen

16. AES osztály (2 bit)
Az AES-eket a berendezéseik konfigurációjának és képességeinek megfelelően kell osztályozni a következők szerint:

1. osztály: Csak kis-nyereségű antenna, csak csomag üzemmódú szolgáltatások;
2. osztály: Fenntartott;
3. osztály: Nagy-nyereségű vagy közepes nyereségű antenna, áramköri üzemmódú és csomag üzemmódú (egyidejű és nem-egyidejű) szolgáltatások;
4. osztály: Nagy-nyereségű vagy közepes nyereségű antenna; csomag üzemmódú szolgáltatások.

Kód	Funkció
0	1. osztály
1	Fenntartott
2	3. osztály
3	4. osztály

17. CCITT CRC (16 bit)
Minden jel egységnek 16 ellenőrző bitet (az utolsó két oktettet) kell hibakeresés céljából magába foglalni. Ezeket az ellenőrző biteket a szabvány hosszúságú jel egység első 10 oktettjéből, a kibővített hosszúságú jel egység első 17 oktettjéből, vagy a bekezdő jelszakasz azonosító jel egység első 4 oktettjéből kell kiszámolni (4. Fejezet, 2. Függelék, A2-47. ábra) a következő generáló polinom alkalmazásával:
$X^{16} + X^{12} + X^5 + 1$
(Lásd a CCITT Vörös Könyv, X. 25 Ajánlás, 2.2.7 Szakasz)
A vevő oldali végen az ellenőrző biteket minden egyes vett jele gység esetében ki kell számolni, és ha eltérés van a vett ellenőrző bitektől, akkor a jel egységet érvényteleníteni kell.

18. Adat-átviteli sebesség képesség (1 oktett)
Ebben a mezőben minden egyes bitnek a megfelelő csatorna/bit-sebesség kombináció AES-ben való meglétét („1”) vagy hiányát („0”) kell jeleznie a következők szerint:

Bit	Kombináció	
1	P-csatorna	1 200 bit/s
2	P-csatorna	2 400 bit/s
3	P-csatorna	4 800 bit/s
4	P-csatorna	10 500 bit/s
5	R-/T-csatorna	2 400 bit/s
6	R-/T-csatorna	10 500 bit/s
7	R-/T-csatorna	4 800 bit/s
8	Kijelöletlen	

Megjegyzés. – A 0,6 és 1,2 kbit/s P-, R- és T-csatornák minden AES esetében kötelezők.

18a. Adat EIRP (globális vagy helyi) (8 bit)
Az adat EIRP szintet globális vagy helyi sugárnyaláb működés esetén N bináris számként fejezik ki, ahol:
Adat EIRP = N* 0,1 dBW
Az EIRP tartománynak 0,1-től 25,5 dB-ig kell tartani. Az EIRP értékek minden fajta antennára érvényesek. A csupa nulla kódot a NULLA érték jelölésére kell használni.

18b. Adat EIRP táblázat sorrendi szám (6 bit)
Az adat EIRP táblázat SU-k sorrendi száma. A mezőt az ISU-ban abban a sorrendben lévő SSU-k teljes számával kell egyenlőre állítani, amely ennek az ISU-nak megfelel (azaz a teljes sorrendnek, ha az ISU egy teljes sorozat, egyéb esetben a részleges sorrendnek). Az értéket eggyel kell csökkenteni minden soronkövetkező SSU-nál, amíg a sorrend utolsó SSU-jának értéke zérus nem lesz.

19. Visszaállítás késés (6 bit)
Ennek a mezőnek azt a késést kell jelölnie, amíg a GES elküldi az AES felé a foglalást. A késést a szuperkeretek közvetlen bináris számaként kell megadni
.

19a. DETC/DETP (1 bit)
Ennek a mezőnek azt kell jeleznie, hogy teljes (DETC) vagy részleges (DETP) adat EIRP táblázatok adásba kerültek-e.

Kód	Funkció
0	Az adat EIRP táblázatok nem kerültek adásba
1	Az adat EIRP táblázatok adásba kerültek

20. Számjegy
Ennek a mezőnek egy binárisan kódolt decimális számjegynek kell lennie. A számjegyek vége kódnak F (HEX) kombinációnak kell lennie.

21. DLS/RLS (1 bit)

Kód	Funkció
0	Közvetlen összeköttetési szolgáltatás (DLS)
1	Megbízható összeköttetési szolgáltatás (RLS)

22. EIRP beállítás (4 bit)
Ezt a mezőt az aktuális átviteli szinthez viszonyított egyenértékű izotrópikusan kisugárzott teljesítmény beállítási érték jelzésére kell használni a következők szerint:

Kód	Funkció
0	Nincs beállítás
1	+ 1 dB
2	+ 2 dB
3	+ 3 dB

4-12	Kijelöletlen
13	- 3 dB
14	- 2 dB
15	- 1 dB

23. Létezés /meglét/ (1 bit)

Kód	Funkció
0	Ez az adás-sorozat nem kerül átvitelre
1	Ez az adás-sorozat átvitelre kerül

24. GES ID (1 oktett)

Ennek a mezőnek a GES-nek adott 8 bites azonosítónak kell lennie.

25. GES sugárnyaláb alátámasztási táblázata (32 bit)

Ennek a mezőnek az AES Rendszer Táblázat Adás P-csatorna helyi sugárnyaláb sorozat GES sugárnyaláb alátámasztás közlés jel egység (A2-60. ábra) 5. oktettje 1. bitjétől kell kezdődnie és a 7. oktett 8. bitjével kell végződnie. Minden egyes bitnek meg kell felelni egy műhold sugárnyalábnak az első bitben lévő globális sugárnyalábbal kezdődően, majd az 1, 2, 3. stb. helyi sugárnyalábbal folytatódóan egészen a 23. helyi sugárnyalábig.

Ennek a mezőnek az AES Rendszer Táblázat Adás P-csatorna, helyi sugárnyaláb sorozat GES sugárnyaláb alátámasztás közlés jel egység (A2-61. ábra) 5. oktettje 1. bitjétől kell kezdődnie és a 10. oktett 7. bitjével kell végződnie. Minden egyes bitnek meg kell felelni egy műhold sugárnyalábnak az első bitben lévő globális sugárnyalábbal kezdődően, majd a 24, 25, 26. stb. helyi sugárnyalábbal folytatódóan egészen a 63. helyi sugárnyalábig.Az egyes biteket a következők szerint kell kódolni:

Kód	Funkció
0	A GES nem támasztja alá a sugárnyalábot
1	A GES alátámasztja a sugárnyalábot

26. Üresjárati séma

Minden helyen nulla.

27. Kezdeti EIRP (4 bit)

Az EIRP értéknek a következőkkel kell egyenlőnek lennie:
(-1,5 + N) dBW 1. osztályú AES esetében (ahogyan a 16. szakaszban meghatározásra került);
(-0,5 + N) dBW 3/4 osztályú, közepes nyereségű antennával rendelkező AES esetén;
(10,5 + N) dBW 3/4 osztályú, nagy-nyereségű antennával rendelkező AES esetén;
ahol N ennek a mezőnek az értéke (0–15 tartomány).

27a. ISU/SSU (1 bit)

Ennek a bitnek 0-nak kell lennie az egy készletben lévő SU-k sorozatának kezdeti jel egységénél. Ennek a bitnek 1-nek kell lennie mindegyik, a sorozatban soronkövetkező jel egységnél.

28. I/R (kezdeti/megújítási) (1 bit)

Ennek a mezőnek azt kell jeleznie, hogy a bejelentkezési kérés kezdeti-e vagy megújítási.

Kód	Funkció
0	Kezdeti bejelentkezés
1	Bejelentkezés megújítás

29. Hosszúság (8 bit)
Ennek a mezőnek kell az elkövetkező oktettek száma közvetlen bináris megjelenítőjének lennie.

29a. Globális sugárnyaláb-sorozatok (GBS) (1 bit)
Ennek a mezőnek azt kell jeleznie a helyi sugárnyaláb sorozat adás index jel egységében, hogy globális sugárnyaláb sorozat jelen van, vagy nincs. Ezt a mezőt 1-re kell állítani, ha a globális sugárnyaláb sorozatok jelen vannak; máskülönben 0-ra.

30. (Ok) helyzet (4 bit)
Ennek az információ elemnek kell jeleznie az ok értékére és osztályára vonatkozó információ elemek elhelyezkedését. Értelmezését az S (kódolási szabvány) információ elemnek kiosztott értékkel kell megadni, amely meghatározza, hogy a CCITT Q.931 szabvány kódolás vagy a műhold hálózat specifikus kódszabályait kell-e alkalmazni.

CCITT Q.931 szabvány kódolás

Kód	Funkció
0	Felhasználó
1	Helyi felhasználót kiszolgáló magán hálózat
2	Helyi felhasználót kiszolgáló nyilvános hálózat
3	Tranzit hálózat
4	Távoli felhasználót kiszolgáló nyilvános hálózat
5	Távoli felhasználót kiszolgáló magán hálózat
7	Nemzetközi hálózat
10	Összedolgozó ponton túli hálózat

Az összes egyéb érték foglalt.

Műhold-hálózati specifikus kódolás:

Kód	Funkció
1	AES – felhasználói hálózati oldal
2	AES – műholdhálózati oldal
3	GES – műholdhálózati oldal
4	GES – állandóhelyű hálózati oldal
5	Fennartott
6	Összedolgozás a földi hálózattal

Az összes egyéb érték nem kijelölt.

31. LSU szám (2 bit)

Kód	Funkció
0	A kezdeti LSU jelölése és az LSU P_{smc}, R_{smc}, O, $R_{smc}1$ frekvenciákat tartalmaz ebben a sorrendben
1	Az LSU P_{smc}, R_{smc}, O, $R_{smc}1$ frekvenciákat tartalmaz ebben a sorrendben (mint a 0 kód esetében, de ez a sorozatban bárhol előfordulhat)
2	Az LSU $R_{smc}2$, $R_{smc}3$, $R_{smc}4$ frekvenciákat tartalmaz ebben a sorrendben
3	Az LSU $R_{smc}5$, $R_{smc}6$, $R_{smc}7$ frekvenciákat tartalmaz ebben a sorrendben

31a. LOV (1 bit)

Ennek a mezőnek a GES-től érkező bejelentkezési lekérdezésre válaszoló AES képességet kell jelölnie.

Kód	Funkció
0	Az AES képes a válasz-adásra
1	Az AES nem képes a válasz-adásra

32. Közlemény hossz (7 bit)

Ennek a mezőnek kell jelölnie, közvetlen bináris számban, egy jel egység készletben lévő jel egységek számát (2 felhasználói oktett a kezdeti jel egységben és 8 oktett a soronkövetkező jel egységenként). A T-csatorna kapacitás kérésre való használatakor ezt a számot eggyel növelni kell minden egyes esetben, ha egy kérést (kezdeti vagy ismételt) a T-csatornán keresztül közvetítenek. Egy kezdeti jel egység legnagyobb hosszúságát 64-re (jel egység) kell korlátozni.

33. Közlemény típus (1 oktett)

Ennek a mezőnek kell azonosítania a közlemény típusát. A közlemény típusok teljes készletének olyannak kell lennie, amint az az ezen függelék végén található „Közlemények típusai felsorolása" táblázatban szerepel.

34. Hálózati ID (4 bit)

Kód	Funkció
0	Kijelöletlen
1	E164/E163
2	X.121
3	F.69
4	Magán hálózat – nem következik címzés
5	Magán hálózat – címzés következik
6-14	Az alkalmazható nyilvános – és magán hálózatok számára kódolandó (SITA, ARINC,stb.)
15	Vészhívás

35. NOT (1 bit)

Ennek a mezőnek az AES adó-képességét kell jelölnie.

Kód	Funkció
0	Azt jelzi, hogy az AES egy adóval rendelkezik
1	Azt jelzi, hogy az AES több adóval rendelkezik

36. Foglalt bekezdő jelszakaszok száma (3 bit)

Ennek a mezőnek a foglalt bekezdő jelszakaszok számát kell egy bináris számként azonosítania.

Kód	Funkció
0	Kijelöletlen
1-7	1-7 foglalt bekezdő jelszakaszok

37. C-csatornák száma (5 bit)

Ennek a mezőnek egy közvetlen bináris számként az AES részére biztosított hang-csatornák számát kell jelölnie. Ennek a mezőnek 1-nek kell lennie 3-as szintű AES esetében.

38. Frekvenciák száma (4 bit)

Ennek a mezőnek egy közvetlen bináris számként (pl. 1 = 1 frekvencia), a kiosztott frekvenciák számát kell jelölnie.

39. Az utolsó SSU oktettjeinek száma (4 bit)

Ennek a mezőnek egy közvetlen bináris számként (pl. 1 = 1 oktett), az SU készlet utolsó SSU felhasználói adatmezejében lévő felhasználói adatok oktettjeinek számát kell jelölnie.

40. Az SSU-k száma (ACK/NAK-ban) (2 bit)

Kód	Funkció
0	Nincs SSU, csak akkor használatos, amikor az ACKCTL mező 14-el vagy 15-el egyenlő
1	Egy SSU
2	Két SSU
3	Három SSU

41. P/R MSG (1 bit)

Ennek a mezőnek azt kell jeleznie, hogy a bejelentkezés megerősítő SU-hoz kapcsolódik-e P/R csatorna ellenőrző SU.

Kód	Funkció
0	Nincs társítva P/R csatorna ellenőrző SU
1	Van társítva P/R csatorna ellenőrző SU

42. P/S (elsődleges/másodlagos) (1 bit)

Ennek a mezőnek azt kell jeleznie, hogy a bejelentkezés elsődleges vagy másodlagos-e.

Kód	Funkció
0	Elsődleges bejelentkezés
1	Másodlagos bejelentkezés

43. Q szám (elsőbbség) (4 bit)

A következő táblázatnak kell jelölnie a Q számok kiosztási sémáját a különböző kategóriájú közlemények részére a P, R, T- és alsávi C-csatornákon történő továbbítás céljából. Az egyedi jel egység közlemény típusok számára kijelölt tényleges Q számoknak meg kell felelniük a jelen függelék végén lévő közlemény típusok listájában meghatározottaknak.

Kód	Funkció
15	Vészhelyzet/sűrgősségi C-csatorna kérés/jelölés jelzés; vészhelyzeti/sürgősségi T-csatorna kérés jelzés; összes T-csatorna kijelölés jelzés (beleértve az elkövetkezendő foglalási jelzést); adatkapcsolati réteg protokol jelzés a vészhelyzeti adatforgalom számára (Q = 14)
14	Vészhelyzet/sürgősségi csomag-módú adatok
13	Repülésbiztonsági adatkapcsolati réteg protokol jelzés, egyéb biztonsági és nem-biztonsági adatforgalom (Q = 0–3, 5–8, 11); AES/GES kezelési SU-k; repülésbiztonsági és egyéb „biztonsági” T-csatorna kérési jelzések (Q = 11, 5–8); a kérés/kijelölés jelzés kivételével
12	Repülésbiztonsági C-csatorna kérés/kijelölés jelzés
11	Repülésbiztonsági csomag-módú adatok
10	Egyéb „biztonsági” C-csatorna kérés/kijelölés jelzés
9	„Nem-biztonsági” C-csatorna kérés/kijelölés jelzés; „nem-biztonsági” T-csatorna kérés jelzés (Q = 0–3)
5–8	Egyéb „biztonsági” csomag-módú adatok (Lásd a 4-12 táblázatot)
4	Fenntartva a „nem-biztonsági” C-csatorna elsőbbség esetre
0–3	„Nem-biztonsági” csomag-módú adatok (Lásd a 4-12 táblázatot)
NA	Rendszer-táblázat közvetítő SU-k és kitöltő SU

44. Ok (4 bit)

Kód	Funkció	Visszautasítási kategória
0	A bejelentkezési táblázat tele van	Ideiglenesen nem áll rendelkezésre
1	A kért hangcsatornás jellemző nem áll rendelkezésre	Állandó jelleggel nem áll rendelkezésre
2	A kért sugárnyalábot nem szolgáltatják	Érvénytelen paraméterek
3	Állandóhelyű hálózat hibája	Ideiglenesen nem áll rendelkezésre
4	Kijelöletlen	
5	Érvénytelen műholdazonosító	Érvénytelen paraméterek
6	Érvénytelen GES azonosító	Érvénytelen paraméterek
7	P/R/T csatornák nem állnak rendelkezésre	Ideiglenesen nem áll rendelkezésre
8	Csomag-módú adatszolgáltatások nem állnak rendelkezésre	Nem állandó jelleggel nem áll rendelkezésre
9	Fenntartott	
10	A kért VCC és adat szolgáltatás nem áll rendelkezésre	Állandó jelleggel nem áll rendelkezésre
11-13	Kijelöletlen	
14	Egyéb meg nem határozott ok	Ideiglenesen nem áll rendelkezésre
16	AES nincs jogosítva	Állandó jelleggel nem áll rendelkezésre

45. Vételi bit-hiba arány (8 bit)
Ennek a mezőnek a FEC dekódolást megelőzően kell jeleznie a hiba arányt. A kódérték = V, ahol V = a 2560 csatorna-bitenként előforduló hibák átlagos számával.

46. Referencia szám (3 bit az R-csatorna vagy 4 illetve 8 bit a P- és T-csatorna esetében)
Ezen mező értékét az AES-nek kell kijelölnie a levegő-föld adatátvitel és a GES-nek a föld-levegő adatátvitel céljára. A referencia szám érvényességi tartományának a Q számán belül kell lennie (elsőbbség). A referencia számot, a Q számmal egyetemben, a közlemény-szegmens besorolására/összeállítására és az adatkapcsolati szinten ARQ hibaellenőrzésre kell használni.
Minden egyes felhasználói közleménynek egy referencias zámot kell adni az adat-átvitel kezdetekor és azt kell használni a rákövetkező nyugtázási, újbóli adat-átviteli és nyugtázást kérő közlemények esetében a közlemények összetévesztésének/duplikációjának elkerülése érdekében. A referencia számok kijelölését függetlenül kell végrehajtani azon közlemények esetében, amelyeket az R- T- és P-csatornákon keresztül továbbítanak.

47. Jelentés típus (4 bit)
Ennek a mezőnek kell azonosítania a hívási folyamat jel egységének meghatározott típusát.

Kód	Funkció
0	Kijelöletlen
1	Csatorna állapotjelentés
2	Összekapcsolás
3	Ellenőrzés
4	Hívási kisérlet eredménye
5	Csatorna bontás
6–8	Fenntartott
9–15	Kijelöletlen

48. Fenntartott (váltakozó számú bitek)
A FENNTARTOTT jelzésű mezők későbbi felhasználásra vannak fenntartva, mégpedig az AMSS rendszer megvalósítása részére vannak fenntartva.

49. Helyesbítési szám (8 bit)
Ennek a mezőnek az AES rendszer-táblázat helyesbítési számát kell jeleznie. Minden egymást követő helyesbítés alkalmával a szám eggyel növekszik.

50. RFC jelző jel (1 bit)
Ezt a mezőt annak az azonosítására kell használni, hogy egy foglalási (RES) SU-t vagy rövidesen megjelenő foglalási (RFC) SU-t egy hibát jelző RFC LSU vagy TACK LSU megelőzött-e vagy sem.

Kód	Funkció
0	Nem előzi meg a hibát jelző RFC LSU, sem TACK SU készlet
1	Megelőzi a hibát az RFC LSU, vagy TACK SU jelző készlet

51. S (kódolási szabvány) (1 bit)
Ennek a mezőnek kell azonosítania a szabályokat (kódolási szabvány), ami szerint az elhelyezés, ok osztály és ok érték információ elemei kódolásra kerülnek.

Kód	Funkció
0	CCITT Q.931 szabvány kódolás
1	Műholdas hálózat specifikus kódolás

52. Műhold jelző jel (1 bit)

Kód	Funkció
0	Azt jelzi, hogy az SU információt tartalmaz azon műhold számára, amelyen keresztül kisugározzák
1	Azt jelzi, hogy az SU információt tartalmaz egy másik régióban lévő műhold számára

53. Műhold ID (6 bit)
Ennek a mezőnek a műholdnak adott, 6 bitből álló azonosítónak kell lennie.

54. Műhold pálya-elhajlás (3 bit)

Kód	Funkció
0	0-tól 5/8 fokig
1	több mint 5/8-tól 10/8 fokig
2	több mint 10/8-tól 15/8 fokig
3	több mint 15/8-tól 20/8 fokig
4	több mint 20/8-tól 25/8 fokig
5	több mint 25/8-tól 30/8 fokig
6	több mint 30/8-tól 35/8 fokig
7	több mint 35/8-tól 40/8 fokig

55. Műhold hosszúsági foka (8 bit)
Ennek a mezőnek a műhold hosszúsági fok szerinti tartózkodási helyének keleti hosszúságú, bináris kódként való megjelenítésének kell lennie, 1,5 fokos osztási egységenként a Greenwich-i meridiánhoz viszonyítva.

56. Műhold rektaszcenzió /merőleges helyzet / (8 bit)
Ennek a mezőnek a 00:00 UTC-től azt a legközelebbi időpontot kell percekben jeleznie 10 perces osztásokban kifejezve, - ahhoz az időhöz viszonyítva - amikor a műhold Újév napján délről északra keresztezi az egyenlítő síkját /merőleges helyzet/. A műhold emelkedés idejének az év „n” napján „4 x n” perccel korábban kell lennie, mint az Újév napján.

58. Sorrendi szám jelző (4 bit)
Ezt a mezőt csak az R-csatornán a kibővített hosszúságú (azaz 19 oktett) jel egységekben kell használni. A sorrendi számnak azon SU-kból álló sorozaton belüli helyzetét kell jelölnie, amely SU-k egy SU készletet alkotnak. Ugyanakkor meghatározza az SU készletben lévő SU-k teljes számát is.

Kód	SU helyzete	Az SU készletben lévő SU-k száma
0	Kijelöletlen	Kijelöletlen
1	1	1
2	1 (első)	2
3	2 (utolsó)	2
4	1 (első)	3
5	2 (közbenső)	3
6	3 (utolsó)	3
7-15	Kijelöletlen	Kijelöletlen

59. Sorrendi szám (4 vagy 6 bit)
Ezt a mezőt a szabvány hosszúságú (azaz 12 oktett) jel egységekben kell használni az összes csatornán. A mezőt egy SU készlet ISU-jában kell beállítani az SU készlet soronkövetkező jel egységeinek (SSU-k) teljes számához és eggyel csökkenteni minden következő SSU-ban, amíg az SU készlet utolsó SSU-jának értéke 0 nem lesz. A mezőt az AES rendszertáblázat-adás adás-index jel egységében be kell állítani a legnagyobb sorrendi számra (eggyel kevesebb, mint a benne lévő LSU-k száma) az adási LSU-k minden egyes sorozatában. Egy sorozat első LSU-jában a sorrendi számot ugyanarra a számra kell beállítani, mint az index SU-ban, és eggyel kell csökkenteni minden következő LSU-ban, amíg a sorozat utolsó LSU-jának értéke 0 nem lesz. Egy újra-továbbítási jel egység RTX SU fej-részében a mezőt az újra-továbbítási SU készletben lévő SSU-k teljes számával egyenlőnek kell beállítani. Ennek a mezőnek minden újra-továbbított SSU-ban az eredeti SSU sorozati számból az RTX SU sorozati számmezejéből lévő érték levonásával (eltérés érték) kapott értékkel egyenlőnek kell lenni.

60. Sorrendi szám (eltérés érték) (6 bit)
Ezt a mezőt a szabvány hosszúságú (azaz 12 oktett) jel egységekben kell használni az összes csatornán. Az utolsó (legkisebb) SSU hibás sorrendi számot kell jelölnie.

61. Szolgáltatási irány (2 bit)

Kód	Funkció
0	Kijelöletlen
1	Levegő-föld
2	Föld-levegő
3	Kétirányú

62. Szolgáltatás azonosság (4 bit)

Kód	Funkció
0	Kijelöletlen
1	Telefon
2	Áramköri üzemmódú adatok, analóg-összeköttetés
3	Áramköri üzemmódú adatok, digitális-összeköttetés
4–9	Kijelöletlen
10	Közvetlen összeköttetési szolgáltatási közlemény
11	Megbízható összeköttetési szolgáltatási közlemény
12–15	Kijelöletlen

62a. SIN/DOU (1 bit)
Ezt a bitet 0-ra kell állítani, ha a jel egységnél egy csatorna átviteli sebesség és EIRP van meghatározva. Ezt a bitet 1-re kell állítani, ha a jel egységnél két csatorna átviteli sebesség és EIRP van meghatározva.

63. Forrás (2 bit)
Ennek a mezőnek azt a helyet kell azonosítania, ahol a jel egység létrehozásra került.

Kód	Funkció
0	Kijelöletlen
1	AES
2	GES
3	Fenntartott

64. Tartalék (váltakozó számú bitek)
A TARTLÉK-ként megjelölt mezőket végig nullákkal kell kitölteni.

64a. Irányított sugárnyaláb-sorozatok (SBS) (1 bit)
Ennek a mezőnek azt kell jeleznie, hogy a globális sugárnyaláb-sorozat adás-index SU-jában egy irányítotti sugárnyaláb-sorozat jelen van-e vagy nincs. Ezt a mezőt 1-re kell állítani, ha az irányított sugárnyaláb jelen van, máskülönben a mező értékének 0-nak kell lenni.

65. Indító keret-szám (4 bit)
Ennek a mezőnek, közvetlen számként, a kiosztott foglalás kezdő keret-számát kell jelölnie.

66. Induló rés-szám (6 bit)
Ennek a mezőnek, közvetlen digitális számként, az induló keret-számon belüli kiosztott foglalás induló rés-számát kell jelölnie.

67. SU típus (4 bit)
Ennek a mezőnek azt kell jeleznie, hogy a kiterjesztett hosszúságú SU szállít-e jelzés-átviteli alkalmazási információt, vagy felhasználói adatokat. Az utóbbi esetben a mező értékének a kiterjesztett hosszúságú (azaz 19 oktett) SU felhasználói adatmezőben lévő felhasználói adatok oktettjeinek számát kell képviselnie.

Kód	Funkció
0	Kijelöletlen
1-11	Felhasználói adatok oktettjei 1-től 11-ig
12-14	Kijelöletlen
15	Jelzés-átviteli információs SU

68. TDMA MSG (1 bit)
Ennek a mezőnek azt kell jelölnie, hogy a bejelentkezési megerősítő SU-nak van-e társított T-csatorna vezérlési közleménye.

Kód	Funkció
0	Nincs társított T-csatorna vezérlési közlemény
1	Van társított T-csatorna vezérlési közlemény

69. TX csatorna szám (2 bit)

Kód	Funkció
0	0. sz. csatorna
1	1. sz. csatorna
2	2. sz. csatorna
3	3. sz. csatorna

70. Egyeztetett Világ-idő (7 oktett)
Az idő információt az UTC idő-szabvánnyal kell összhangba hozni.

Formátum:	Ezek mindegyike a binárisan kódolt decimális (BCD) formátum alapján kódolt egyszerű oktett mező. Az FF_H kód bármely mezőben használható egy NULLA bejegyzés megjelenítésére.
Évszázad:	Évszázad AD (Anno Domini), CC (2 számjegy): 00-tól 99-ig terjedően
Év:	Év az évszázadon belül, YY (2 számjegy): 00-tól 99-ig terjedően
Hónap:	Hónap az éven belül, MM (2 számjegy): 01-től 12-ig terjedően
Nap:	Nap a hónapon belül, DD (2 számjegy): 01-től 31-ig terjedően
Óra:	Óra a napon belül, hh (2 számjegy): 00-tól 24-ig terjedően
Perc:	Perc az órán belül, mm (2 számjegy): 00-tól 59-ig terjedően
Másodperc:	Másodperc a percen belül, ss (2 számjegy): 00-tól 59-ig terjedően

71. Hangcsatorna jellemzők (6 bit)

Kód	Hangfrekvenciás átviteli sebesség az AES felé	Hangfrekvenciás átviteli sebesség az AES-től	Csatorna átviteli sebesség	FEC arány
0	Kijelöletlen			
1	Fenntartott			
2	600 LPC[1]	9 600 LPC[1]	21 000	1/2
3	800 AMBE[2]	4 800 AMBE[2]	8 400	2/3
4	600 LPC[1] és 4 800 AMBE[2]	9 600 LPC[1] 4 800 AMBE[2]	21 000 8 400	1/2 2/3
5				
6	Kijelöletlen			
7	Fenntartott			
8 - 63				

1. Az LPC megfelel a multi-impulzus gerjesztett lineáris előrejelzett kódoló /LPC/ algoritmusnak a 4.8 szakaszban meghatározottak szerint.
2. Az AMBE megfelel a korszerű több-sávos gerjesztési algoritmusnak, ahogyan a 4.8 szakaszban azonosítva van

KÖZLEMÉNY TÍPUS JEGYZÉK (lásd a 33. bekezdést)

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függeléke)	Q-szám (elsőbbség)
ÁLTALÁNOS ADÁS			
00	Fenntartott		
01	Kitöltő jel egység	A2-42	NA
02	AES rendszer-táblázat sugárzás (GES P_{smc} és R_{smc} csatornák RÉSZLEGES)	A2-31	NA
03	AES rendszer-táblázat sugárzás (sugárnyaláb azonosítás RÉSZLEGES)	A-33	NA
04	AES rendszer-táblázat sugárzás (GES sugárnyaláb alátámasztás RÉSZLEGES)	A2-34/A2-61	NA
05	AES rendszer-táblázat sugárzás (GES P_{smc} és R_{smc} csatornák TELJES)	A2-31	NA
06	AES rendszer-táblázat sugárzás (sugárnyaláb azonosítás TELJES)	A2-33	NA
07	AES rendszer-táblázat sugárzás (GES sugárnyaláb alátámasztás RÉSZLEGES)	A2-34/A2-61	NA
08	Rendszer sugárzás - szelektív bontás	A2-36	13
09	Rendszer sugárzás - Egyeztetett Világ-idő	A2-35	13
0A	AES rendszer-táblázat sugárzás (tárgymutató)	A2-30	NA
0B	AES rendszer-táblázat sugárzás (műhold azonosítás RÉSZLEGES)	A2-32	NA
0C	AES rendszer-táblázat sugárzás (műhold azonosítás TELJES)	A2-32	NA
0D	AES rendszer-táblázat sugárzás (GES P_{smc} és R_{smc} csatornák 2. sorozata TELJES)	A2-31	NA
0E	Fenntartott		

NA = Nem alkalmazott

RENDSZER BEJELENTKEZÉS/KIJELENTKEZÉS

Kód	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
10	Bejelentkezés kérés	A2-2	13
11	Bejelentkezés megerősítése	A2-3	13
12	Napló vezérlés (R-csatorna)-kijelentkezés kérés	A2-50	13
12	Napló vezérlés (P-csatorna)-kijelentkezés kérés	A2-6	13
13	Napló vezérlés (P-csatorna)-bejelentkezés visszautasítás	A2-5	13
13	Napló vezérlés (R-csatorna)-újra-kijelölés visszautasítás	A2-50	13
14	Napló vezérlés(P-csatorna)-bejelentkezés lekérdezés	A2-4	13
15	Bejelentkezés/kijelentkezés nyugtázás (P-csatorna)	A2-25	13
15	Bejelentkezés/kijelentkezés nyugtázás (R-csatorna)	A2-53	13
16	Napló vezérlés (P-csatorna)-bejelentkezés gyors	A2-4	13
17	Napló vezérlés (P-csatorna)-adatcsatorna újra-kijelölés	A2-4	13
17	Napló vezérlés (R csatorna)-újra-kijelölésre kész	A2-50	13
18	Fenntartott		
19	Fenntartott		

HÍVÁS-KEZDEMÉNYEZÉS

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
20	Általános hozzáférési kérés telefon (nem-biztonsági)	A2-45	9
20	Általános hozzáférési kérés telefon (egyéb biztonsági)	A2-45	10
20	Általános hozzáférési kérés telefon (repülésbiztonság)	A2-45	12
20	Általános hozzáférési kérés telefon (vészhelyzet)	A2-45	15
20	Hívás-bejelentés (nem-biztonsági)	A2-8	9
20	Hívás bejelentés (egyéb biztonsági)	A2-8	10
20	Hívás bejelentés (repülésbiztonság)	A2-8	12
20	Hívás bejelentés (vészhelyzet)	A2-8	15
21	Hívást ájékoztatás szolgáltatás cím (ISU)	A2-9	13
22	Hozzáférési kérés adatok (R/T csatorna) (nem-biztonsági)	A2-47/A2-7	9
22	Hozzáférési kérés adatok (R/T csatorna) (repülésbiztonsági és egyéb biztonsági)	A2-47/A2-7	13
22	Hozzáférési kérési adatok (R/T csatorna) (vészhelyzet)	A2-47/A2-7	15
23	Rövidített hozzáférési kérés telefon (egyéb biztonsági)	A2-46	10
23	Rövidített hozzáférési kérés telefon (repülésbiztonság)	A2-46	12
23	Rövidített hozzáférési kérés (vészhelyzet)	A2-46	15

24	Fenntartott		
25	Fenntartott		
26	Fenntartott		
27	Fenntartott		
28	Adat EIRP táblázat adás – teljes sorozat	A2-62	NA
29	Adat EIRP táblázat adás – részleges sorozat	A2-62	NA

HÍVÁSI FOLYAMAT

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
30	Hívási folyamat (P/C-csatorna)	A2-11/A2-12/A2-13/A2-14/A2-15/A2-16	13
30	Hívási folyamat (R-csatorna)	A2-51/A2-52	13
31	C-csatorna kijelölés (Vészhelyzet)	A2-17	15
32	C-csatorna kijelölés (repülésbiztonság)	A2-17	12
33	C-csatorna kijelölés (egyéb biztonsági)	A2-17	10
34	C-csatorna kijelölés (nem-biztonsági)	A2-17	9
35	Fenntartott		
36	Fenntartott		
37	Fenntartott		
38	Fenntartott		
39	Fenntartott		

CSATORNA INFORMÁCIÓ

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
40	P/R csatorna vezérlés (ISU)	A2-18	13
41	T csatorna vezérlés	A2-20	13

TDMA FOGLALÁS

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
50	Nem kért foglalás	A2-22	15
51	T-csatorna kijelölés	A2-23	15
52	Fenntartott		
53	Soronkövetkező foglalás (RFC)	A2-24	15

NYUGTÁZÁS

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
60	Telefon-technikai nyugtázás (P/C csatorna)	A2-26	13
60	Telefon-technikai nyugtázás (R-csatorna)	A2-54	13
61	Nyugtázás kérelem (RQA) (P-csatorna) – vészhelyzeti adatok	A2-27	15
61	Nyugtázás kérelem (RQA) (P-csatorna) – összes egyéb adat	A2-27	13
61	Nyugtázás kérelem (RQA) (P-csatorna) – vészhelyzeti adatok	A2-48	15
61	Nyugtázási kérelem (RQA) (P-csatorna)	A2-48	13
62	Nyugtázás (RACK, TACK) (P-csatorna) – vészhelyzeti adatok	A2-29/A2-28	15
62	Nyugtázás (RACK, TACK) (P-csatorna) – összes egyéb adat	A2-29/A2-28	13
62	Nyugtázás (PACK) (R csatorna) – vészhelyzeti adatok	A2-49	15
62	Nyugtázás (PACK) (R csatorna) – összes egyéb adat	A2-49	13
63	Fenntartott		
64	Fenntartott		
65	Fenntartott		

FELHASZNÁLÓI ADATOK

Kód (HEX)	Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
70	Fenntartott		
71	Felhasználói adatok (ISU) – RLS (P/T csatorna)	A2-37	V(0-3, 5-8, 11, 14)
72	Újra-továbbítási fej-rész (RTX) (P/T csatorna)	A2-41	V(0-3, 5-8, 11, 14)
73	Fenntartott		
74	Felhasználói adatok - (3 oktett LSDU) RLS (P-csatorna)	A2-39	V(0-3, 5-8, 11, 14)
75	Fenntartott		
76	Felhasználói adatok - (4 oktett LSDU) RLS (P-csatorna)	A2-44	V(0-3, 5-8, 11, 14)
N/A	Felhasználói adatok - (ISU/SSU) (R-csatorna)	A2-44	V(0-3, 5-8, 11, 14)
80	Adás foglaltság		
81	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok GES P/R csatorna (részleges)	A2-56/A2-57	NA
82	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok GES sugár alétámasztás (részleges)	A2-60	NA

83	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok GES P/R csatorna (teljes)	A2-56/A2-57	NA
84	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok GES sugár alátámasztás (teljes)	A2-60	NA
85	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok index	A2-55	NA
86	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok műhold/sugárnyaláb ID (részleges)	A2-58/A2-59	NA
87	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok műhold/sugárnyaláb ID (teljes)	A2-58/A2-59	NA
88	AES rendszer-táblázat adás – irányított sugárnyaláb sorozatok GES P/R csatorna második sorozata (teljes)	A2-56/A2-57	NA
89	Fenntartott		

SORONKÖVETKEZŐ JEL EGYSÉGEK: bit 8-7 = 1 1

Funkció	Közlemény formátum szám (hivatkozás 4.Fejezet 2.Függ.)	Q szám (elsőbbség)
Hívás tájékoztatás szolgáltatás cím (SSU)	A2-10	13
P/R csatorna vezérlés (SSU)	A2-19	13
T-csatorna vezérlés (SSU)	A2-21	13
Felhasználói adatok (SSU) – P/T csatorna	A2-38	V(0-3, 5-8, 11, 14)

Az összes többi kód kijelöletlen.
A Q szám jelzésű oszlopban a különféle Q számmal jelölt közlemény típusokat követő zárójelben lévő V az az érték, vagy azok az értékek, amelyek általában használaosak.

4. fejezet 4. függeléke

IDŐ-TÚLLÉPÉS (IDŐZÍTÉS) ÉRTÉKEK

Idő	Érték (másodperc)
tG1	9,3
tG2	5
tG3	18
tG3A	Fenntartott
tG3B	Fenntartott
tG4	2,5
tG5	Fenntartott
tG6	A GES üzemeltető megítélés szerint
tG7	Kijelöletlen
tG8	10
tG9	20-30
tG10	Tch (3. Megjegyzés)
tG11	12
tG12	10
tG13	10
tG14	7
tG15	Kijelöletlen
tG16	10
tG17	10
tG18	7
tG19	10
tG20	120-tól 240-ig
tG21	120-tól 240-ig
tG22	60-tól 120-ig
tG23	10
tG24	10
tG25	2
tG26	25
tG27	12
tG28-tG29	Kijelöletlen
tG30	2
tG31	5 + 5*(P-Ch keret időtartam)
tG32	10
tG33	10
tG34	4
tG35	Tch (3. Megjegyzés)
tG36	2
tA1	20 + (SU-k száma)*Ts (2. Megjegyzés)
tA2	Kijelöletlen
tA3	7,9 + RND $(0,Z_k-1)$*Ts (2., 4. Megjegyzések)
tA4	Kijelöletlen
tA4A	8
tA4B	7,9 + RND $(0,Z_k-1)$*Ts (2., 4. Megjegyzések)
tA5	4
tA6	8
tA7	7,9 + RND $(0,7_k-1)$*Ts (2., 4. Megjegyzések)

tA8(i) (1. Megjegyzés)	(Késleltetés a foglalásig)*8 + 2
tA9	Kijelöletlen
tA10	5 + RND (0,Z_k-1)*Ts (2., 4. Megjegyzések)
tA11	12 + RND (0,Z_k-1)*Ts (2., 4. Megjegyzések)
tA12	10
tA13	10
tA14	10
ta15-tA17	Kijelöletlen
tA18	20-tól 30-ig
tA19	10
tA20	15 + RND (0,Z_k-1)*Ts (2., 4. Megjegyzések)
tA21	Kijelöletlen
tA23-tA24	Kijelöletlen
tA25	5
tA26	Tch (3. Megjegyzés)
tA27	10
tA28	10
tA29	K *Tch, K = 2 (3. Megjegyzés)
tA30	10
tA31	20
tA32	10
tA33	Tch (3. Megjegyzés)
tA34	20
tA35	10
tA36	Tch (3. Megjegyzés)
tA37	5
tA38	(SU-k száma)*Tch (3. Megjegyzés)
tA39	5
tA40	(SU-k száma)*Tch (3. Megjegyzés)
tA41	15
tA42	120-240
tA43–tA49	Kijelöletlen
tA50	4 + 2* (P - CH keret időtartam)

MEGJEGYZÉSEK
1. Igény szerinti többszörös időzítők, az (i) toldalék jelzi.
2. $Z_k = Zo * 2^k$, rendes körülmények között Zo = 4; Ts = R-csatorna rés időtartam és k a próbálkozások száma; k = 0 a kezdő átvitel esetében.
3. Tch = az alsávi C-csatornán 1 SU átviteléhez szükséges idő, pl. 0,167 másodperc a 21 000 bit/s csatorna esetében.
4. RND(x, y) = függvény, amely véletlenszerűen választ ki egy egész számot az [x, y] intervallumból; az intervallumban lévő összes egész szám egyenlő eséllyel fordulhat elő.

4. fejezet 5. függeléke

ÖSSZEDOLGOZÓ TELEFON-TECHNIKAI ESEMÉNY LEKÉPEZÉS

FITE 18	Esemény név: AMS(R)S hívás kezdeményezés (Hívófél kategória jelző, előfizető, elsőbbségi hívás)	
Leképzések ....-ba	AMS(R)S CM-LIDU: Hozzáférés kérés – telefon és hívás tájékoztatás – szolgáltatás cím	Eljárás felhasználás: AES kimenő

Paraméter leképzés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
CPCI (hívófél kategória jelző) Vészhelyzet/Sürgősség Repülésbiztonság Szabályosság	Q szám → 15 → 12 → 10
Hívott fél száma **Földi cím** **(10 számjegyű rögzített hosszúság)**	**Címzés számjegy 0-9 (10 számjegyű rögzített hossz)** → Változó
Hívott fél alcím **Légijármű hangfrekvenciás rendszer csatorna**	**Hívó terminál** → Változó
	Hálózat azonosító 10 (AMS(R)S földi telepítésű beszéd-üzemű csatorna hálózat)
	Szolgáltatás azonosítása 1
	Áramközi adatátviteli sebesség 0
	Hangcsatorna jellemzők 2 or 3
	Forrás 1
	Szolgáltatási irány 3
	Alkalmazási referencia szám Változó
	Közlemény típus 20/23 (hex)
	Útvonal kijelölés R csatorna

Megjegyzések
Ez a paraméter csak a „Hozzáférés kérés – telefon" CM-LIDU-hoz alkalmazható.

A 23-as típusú (hex) közlemény a „Rövidített hozzáférés kérés – telefon" SU-nak felel meg.
A 20-as típusú (hex) közlemény az „Általános hozzáférés kérés - telefon" SU-nak felel meg, és ebben az esetben csak a földi címzés első két számjegyét továbbítják ezzel a CM-LIDU-val.
Hálózat ID = 10 akkor alkalmazható, ha van egy privát AMS(R)S földi telepítésű beszéd-üzemű hálózat.

A5-1a) ábra

FITE 18 *FOLYTATÁS*	Esemény név: **AMS(R)S hívás kezdeményezés** **(Hívófél kategória jelző, előfizető, elsőbbségi hívás)**	
Leképzések ....-ba	AMS(R)S CM-LIDU: **Hozzáférés kérés** **– telefon és hívás tájékoztatás –** **szolgáltatás cím**	Eljárás felhasználás: **AES kimenő**

Paraméter leképzés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Hívott fél száma **Földi cím**	**Címzés számjegy 2-9** → Változó
Hívó fél alcíme **Légijármű hangfrekvenciás rendszer csatorna**	**Hívó terminál** → Változó
	Közlemény típus 21 (hex)
	Útvonal kijelölés **C csatorna alsáv**

Megjegyzések

Ez a paraméter leképezés csak a „Hívástájékoztatás – Szolgáltatás címzés" CM-LIDU-hoz alkalmazható.

A5-1b) ábra

FITE 22	Esemény neve: VÉGJEL	
LEKÉPEZÉS - BA:	AMS(R)S CM-LIDU: HÍVÁSI FOLYAMAT - CSATORNABONTÁS	Művelet : AES Kimenő

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ------>	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ------>	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ------>	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ------>	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés R csatorna vagy C csatorna alsáv

Magyarázat:

1 A kizárólagos esemény belsőleg generálódik az AES kimenő eljárás felé válaszul a magasabb prioritású AMS(R)S hívás beérkezésére. Nem az összedolgozó interfészen keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
1 Elsőbbség a nagyobb elsőbbségű AMS(R)S hívásnak az AES-ben	1	1	1	1
Rendes végjel a hívó előfizető által	0	0	1	0

A5-2. ábra

BITE 5	Esemény neve: Teljes címzés	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ◄	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ◄	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ◄	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ◄	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
A földi hálózattól érkező címzés teljes jel	1	6	0	1

A5-3. ábra

BITE 12	Esemény neve: Sikertelen hívás - Hálózati torlódás	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás vagy Hívási folyamat - Hívási kísérlet eredménye	Művelet: AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5 (Csatornabontás) 4 (Hívási kísérlet eredménye)

Magyarázat:
1 Ez az esemény belsőleg generálódik az AES kimenő eljárás felé. Nem az adatkapcsolati rétegen keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
GES-ben nincs C csatornafrekvencia	1	3	2	1
GES-ben nincs C csatornaegység	1	3	2	2
Torlódás a GES berendezésben	0	2	2	10
Torlódás a földi telepítésű hálózatban	0	4	2	10
1 AES-ben nincs C csatornaegység	1	2	2	2

A5-4. ábra

BITE 14	Esemény neve: Sikertelen hívás - Hiányos címzés	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ←	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ←	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ←	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ←	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Elhelyezkedés	Határosztály	Határérték
Földi hálózat által érzékelt hiányos hívott szám formátuma	0	4	1	12
GES által érzékelt hiányos hívott szám formátuma	1	4	3	2

A5-5. ábra

BITE 15	Esemény neve: Sikertelen hívás - Nem létező hívószám	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Földi hálózat által érzékelt nem létező hívószám	0	4	0	1

A5-6. ábra

BITE 16	Esemény neve: Sikertelen hívás - Hívottoldal foglalt	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Elhelyezkedés	Határosztály	Határérték
Hívott felhasználó foglalt	0	5	1	1
Hívott felhasználó foglalt (Hívott felhasználó figyelmeztetve)	0	5	1	3

A5-7. ábra

BITE 17	Esemény neve: Sikertelen hívás - Vonali meghibásodás	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ◄	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ◄	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ◄	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ◄	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

① A "Nincs válasz a GES-től" eseménytriggert az AES kimenő eljárás belsőleg generálja és az nem kerül leképezésre a vett CM - LIDU-ból.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
C csatorna folyamatossági teszthiba a GES-nél vagy vivőfrekvencia megszakítás	1	3	5	1
Rendeltetési hely meghibásodás	0	5	1	11
① GES-től nincs válasz	1	2	5	1

A5-8. ábra

BITE 20	Esemény neve: Sikertelen hívás - Küldési hibajelzés	
LEKÉPEZÉS - ből:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
GES által nem támogatott megkövetelt hangcsatornás paraméterek	1	3	6	4
Meg nem határozott ok	1	3	7	15
Szolgáltatásra nem jogosított hívóoldali AES	1	3	4	2
Válaszidőzítő lejárata GES-nél	0	4	1	2

A5-9. ábra

BITE 22	Esemény neve: Válasz	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Összekapcsol	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
	Közlemény típusa 30 (hex)
	Jelentés típusa 2
Magyarázat:	

A5-10. ábra

BITE 25	Esemény neve: Hívott bont	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : AES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ←	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ←	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ←	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ←	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

① A kizáró esemény belsőleg generálódik az AES kimenő eljárás felé válaszul a magasabb prioritású AMS(R)S hívás beérkezésére.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Rendes körülmények közötti ellenirányú törlés	0	0	1	0
① Elsőbbség a nagyobb elsőbbségű AMS(R)S hívásnak az AES-ben	1	2	1	1

A5-11. ábra

FITE 18	Esemény neve: AMS(R)S Híváskezdeményezés (Hívófél kategóriajelző, Előfizető, Elsőbbségi hívás)	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU Hívásközlés és C csatorna kijelölés	MŰVELET: AES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS	
CPCI (Hívófél kategóriajelzője)	Q szám	
Vészhelyzet/Sürgősségi helyzet		15
Repülésbiztonság		12
Szabályszerű		10
Hívott fél alcíme	Hívott terminál	
Légijármű hangfrekvenciás rendszerének csatornája		(változó)
Hálózat-specifikus berendezések	Szolgálati azonosító (ID)	
Hangfrekvenciás hívás		1
Felhasználói adatátviteli sebesség	Áramköri adatátviteli sebesség	
Adat üzemmód nem követelmény		0
	Hangcsatorna műszaki jellemzői	2
	Forrás	2
	Szolgálati irány	3
	Közlemény típusa	20 (hex)

Magyarázat:
Ez a paraméter leképezés csak a "Hívásközlés" CM-LIDU esetére vonatkozik.

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS	
	Kezdő EIRP	(változó)
	Vevőcsatorna frekvencia	(változó)
	Adócsatorna frekvencia	(változó)
	Közlemény típusa	31 (hex)

Magyarázat:
Ez a paraméter leképezés csak a "C csatorna kijelölés" CM-LIDU esetére vonatkozik.

A5-12. ábra

FITE 22	Esemény neve: Végjel	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: AES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ←	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ←	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ←	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ←	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

1 A kizáró esemény belsőleg generálódik az AES beérkező eljárás felé válaszul a magasabb prioritású AMS(R)S hívás beérkezésére. Nem a CM-LIDU-n keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Rendes körülmények közötti ellenirányú törlés	0	0	1	0
1 Elsőbbség a nagyobb elsőbbségű AMS(R)S hívásnak az AES-ben	1	1	1	1
Meg nem határozott ok	1	4	7	15
C csatorna folyamatossági teszthiba a nem válaszoló GES/AES-nél, vagy megszakítás a vett AES vivőfrekvenciában	1	3	5	1
(AES által belsőleg generált) Válaszidőzítő lejárata	0	1	1	2
AES által nem vett összeköttetés-nyugtázás (AES belsőleg generálja)	1	2	5	1
Hívás kizárva a GES-nél	1	3	1	1

A5-13. ábra

BITE 12	Esemény neve: Sikertelen hívás - Hálózati torlódás	
LEKÉPEZÉS - BA:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet : AES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
	Útvonal kijelölés R csatorna

Magyarázat:
Ezek az események belsőleg generálódnak az AES beérkező eljárás felé és nem az összedolgozó nterfészen keresztül érkeznek.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Az AES-nél nem használható C csatorna	1	2	2	2
Elsőbbség a nagyobb elsőbbségű AMS(R)S hívásnak az AES-ben	1	1	1	1

A5-14. ábra

BITE 16	Esemény neve: Sikertelen hívás - Hívott fél foglalt	
LEKÉPEZÉS - BA:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet : AES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
	Útvonal kijelölés R csatorna
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Hívott terminál foglalt	1	1	7	1

A5-15. ábra

BITE 17	Esemény neve: Sikertelen hívás - Vonali meghibásodás	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet: AES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
	Útvonal kijelölés R csatorna

Magyarázat:
(1) Ezeket az eseményeket a beérkező AES eljárás belsőleg generálja.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
(1) Folyamatossági teszthiba az AES-nél	1	2	5	1
Hívott terminál meghibásodása	1	1	4	1
(1) Hívásközlési vagy C csatorna kijelölési CM-LIDU nem érkezett a GES felől	1	2	3	2

A5-16. ábra

BITE 22	Esemény neve: Vétel	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Kapcsolat	Művelet: AES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS	
	Közlemény típusa	30 (hex)
	Jelentés típusa	2
	Útvonal kijelölés	C - csatorna alsáv
Magyarázat:		

A5-17. ábra

BITE 25	Esemény neve: Hívott bont	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: AES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés C csatorna alsáv

Magyarázat:

1 Ezek az események belsőleg generálódnak a beérkező AES eljáráshoz.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
1 Elsőbbség a nagyobb elsőbbségű AMS(R)S hívásnak az AES-ben	1	1	1	1
Rendes körülmények közötti ellenirányú törlés	0	0	1	0
1 Vételi időzítő lejárata az AES-nél	0	1	1	2
1 Kapcsolat-nyugtázási időzítő lejárata az AES-nél	1	2	5	1
Meg nem határozott ok	1	2	7	15

A5-18. ábra

FITE 18	Esemény neve: AMS(R)S Híváskezdeményezés (Hívófél kategóriajelző, Előfizető, Elsőbbségi hívás)	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívásközlés és C csatorna kijelölés	Művelet : GES Kimenő

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS	
CPCI (Hívófél kategóriajelzője)	Q szám	
Vészhelyzet/Sürgősségi helyzet	→	15
Repülésbiztonság	→	12
Szabályszerű	→	10
A 10 számjegyből álló cím első 8 számjegye (változó)	AES azonosító (ID) →	(változó)
A 10 számjegyből álló cím utolsó 2 számjegye (változó)	Hívott terminál →	(változó)
	Szolgálati azonosító (ID)	1
	Áramköri adatátviteli sebesség	0
	Hangcsatorna műszaki jellemzői	2
	Forrás	2
	Szolgálati irány	3
	Közlemény típusa	20 (hex)
	Útválasztás	P csatorna

Magyarázat:
Ez a paraméter leképezés csak a "Hívásközlés" CM-LIDU esetére vonatkozik.

Paraméter leképezés:

	Kezdő EIRP	(változó)
	Vevőcsatorna frekvencia	(változó)
	Adócsatorna frekvencia	(változó)
	Közlemény típusa	31 (hex)
	Útválasztás	P csatorna

Magyarázat:
Ez a paraméter leképezés csak a "C csatorna kijelölés" CM-LIDU esetére vonatkozik.

A5-19. ábra

FITE 22	Esemény neve: Végjel	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: GES Kimenő

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv

Magyarázat:

① Ezek az események belsőleg generálódnak a kimenő GES eljáráshoz.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Végjel rendes körülmények közötti továbbítása hívó előfizető által	0	0	1	0
① C cs. folyamatossági teszthiba a nem válaszoló GES/AES-nél	1	3	5	1
① Megszakítás a vett AES vivőfrekvenciában	1	3	5	1
① Hívás kizárva egy magasabb prioritású AMS(R)S hívás által	1	3	1	1
Még nem határozott ok	1	4	7	15

A5-20. ábra

BITE 5	Esemény neve: Címzés teljes	
LEKÉPEZÉS - ből:	AMS(R)S CM-LIDU: Telefontechnikai nyugtázás (A C csatorna folyamatossági ellenőrzése végeztével, amikor a GES veszi)	Művelet : GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
	Közlemény típusa 60 (hex)
	Nyugtázás/negatív nyugtázás Nyugtázás

Magyarázat:

Ezen esemény alkalmával paraméterek nem kerülnek leképezésre. Ugyanakkor, a C csatorna folyamatossági ellenőrzése során vett telefontechnikai nyugtázó CM-LIDU-nak rendelkeznie kell Nyugtázásra állított Nyugtázási/negatív nyugtázási paraméterrel.

A5-21. ábra

BITE 12	Esemény neve: Sikertelen Hívás - Hálózati torlódás	
LEKÉPEZÉS - ből:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet: GES Kimenő

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4

Magyarázat:

(1) Ezek az események belsőleg generálódnak a GES kimenő eljáráshoz.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
(1) GES-nél nem használható C csatorna frekvencia	1	3	2	1
(1) GES-nél nem használható C csatorna egység	1	3	2	2
(1) GES berendezésben torlódás	0	4	2	10
Hívás elsőbbség a magasabb elsőbbségű AMS(R)S hívás részére az AES-nél	1	1	1	1

A5-22. ábra

BITE 16	Esemény neve: Sikertelen hívás - Hívottoldal foglalt	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet: GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ←	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ←	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ←	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ←	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Hívottoldal foglalt	1	1	7	1
A C csatorna egység nem használható az AES-nél	1	2	2	2

A5-23. ábra

BITE 17	Esemény neve: Sikertelen hívás - Vonali meghibásodás	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet: GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4

Magyarázat:

1 Ezt az esemény triggert a GES kimenő eljárás belsőleg generálja a C csatorna folyamatossági teszt meghibásodása esetén a GES-en belül. Nem a CM-LIDU-n keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
C csatorna folyamatossági teszt meghibásodás az AES-nél	1	2	5	1
1 C csat. foly. teszt meghibásodása a nem válaszoló GES/AES-nél	1	3	5	1
A hívott terminál meghibásodása	1	1	4	1
Hívás bejelentés vagy C-csatorna kijelölés CM-LIDU nem került a GES-től vételre	1	2	3	2

A5-24. ábra

BITE 20	Esemény neve: Sikerteken hívás - Küldési hibajelzés	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: (Nincs. Lásd alul.)	Művelet: GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS

Magyarázat:

Ez az esemény belsőleg generálódik a GES kimenő eljáráshoz, amikor egy hívási kísérlet történik egy be nem jelentkezett AES-hez.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Elhelyezkedés	Határosztály	Határérték
Az AES nem jelentkezett be	1	3	7	3

A5-25. ábra

BITE 22	Esemény neve: Válasz	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Kapcsolat	Művelet: GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
	Közlemény típusa 30 (hex)
	Jelentés típusa 2

Magyarázat:

A5-26. ábra

BITE 25	Esemény neve: Hívott bont	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: GES Kimenő

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

1 Ezek az események belsőleg generálódnak az AES beérkező eljárás felé.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Rendes körülmények közötti ellenirányú törlés	0	0	1	0
Elsőbbség a nagyobb elsőbbségű AMS(R)S hívás részére az AES-ben	1	1	1	1
Vételi időzítő lejárata az AES-nél	0	1	1	2
Kapcsolat-nyugtázási időzítő lejárata az AES-nél	1	2	5	1
1 Megszakítás a vett AES vivőfrevenciában	1	3	5	1
1 Kizárt hívás a magasabb prioritású AMS(R)S hívás számára	1	3	1	1
Meg nem határozott ok	1	2	7	15

A5-27. ábra

FITE 18	Esemény neve: AMS(R)S Híváskezdeményezés (Hívófél kategóriajelző, Előfizető, Elsőbbségi hívás)	
LEKÉPEZÉS -ból:	AMS(R)S CM-LIDU: Rövidített hozzáférési kérés - Telefon	Művelet: GES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS	
CPCI (Hívófél kategóriajelzője)	Q szám	
Vészhelyzet/Sürgősségi helyzet		15
Repülésbiztonság		12
Szabályszerű		10
Hívott fél száma Földi címzés (10 számjegy állandó hosszúságú)	Címzési számjegy (10 számjegy állandó hosszúságú)	(változó)
Hívófél címe Légijármű címe (a 10 számjegy első 8 számjegye	AES azonosító (ID)	(változó)
Légijármű címe (a 10 számjegy utolsó 2 számjegye	Hívó terminál	(változó)
Zárt felhasználói csoport információ AMS(R)S földi telepítésű hangcsatornás hálózat	Hálózati azonosító (ID)	10
Hálózat-specifikus berendezések Hangcsatornás hívás	Szolgálati azonosító (ID)	1
Felhasználói adatátviteli sebesség Adat üzemmód nem követelmény	Áramköri adatátviteli sebesség	0
	Hangcsatorna műszaki jellemzői	2
	Forrás	1
	Szolgálati irány	3
	Alkalmazás referenciaszáma	(változó)
	Közlemény típusa	23 (hex)

Magyarázat:

A5-28. ábra

FITE 22	Esemény neve: Végjel	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: GES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul) ←	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul) ←	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul) ←	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul) ←	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5

Magyarázat:

① Ez az esemény belsőleg generálódik a GES beérkező eljáráshoz.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Elsőbbség a magasabb elsőbbségű AMS(R)S hívás részére az AES-ben	1	1	1	1
Végjel rendes körülmények közötti továbbítása hívóoldal által	0	0	1	0
① Megszakítás a vett AES vivőben vagy folytonossági hiba	1	3	5	1

A5-29. ábra

BITE 5	Esemény neve: Teljes címzés	
LEKÉPEZÉS - BÓL:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
	Útvonal kijelölés C csatorna alsáv
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
A földi hálózattól érkező címzés teljes jel	1	6	0	1

A5-30. ábra

BITE 12	Esemény neve: Sikertelen Hívás - Hálózati torlódás	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás vagy Hívási folyamat - Hívási kísérlet eredménye	Művelet: GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5 (csatornabontás) 4 (hívási kísérlet eredménye)
	Útvonal kijelölés P csatorna vagy C csatorna alsáv

Magyarázat:

1 Ez az esemény trigger belsőleg generálódik a GES beérkező eljáráshoz és nem a földi hálózati összedolgozó interfészen keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv	Helyzet	Ok osztálya	Ok értéke
1 GES-nél nem használható C csatorna frekvencia	1	3	2	1
1 GES-nél nem használható C csatorna egység	1	3	2	2
1 GES berendezésben torlódás	0	2	2	10
Földi hálózati torlódás vagy nincs útvonal a rendeltetési helyhez	0	4	2	10

A5-31. ábra

BITE 14	Esemény neve: Sikertelen hívás - Hiányos címzés	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
A földi hálózat által érzékelt hiányos hívott számformátum	0	4	1	12
A földi hálózat által érzékelt érvénytelen hívott számformátum	1	4	3	2

A5-32. ábra

BITE 15	Esemény neve: Sikertelen hívás - Nemlétező szám	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: GES Beérkező

Paraméter leképezés:

FITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Földi hálózat által érzékelt nemlétező hívott szám	0	4	0	1

A5-33. ábra

BITE 16	Esemény neve: Sikertelen hívás -'Hívottoldal foglalt	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv

Magyarázat:

1 A "hívottoldal foglalt (hívottoldal figyelmeztetve)" esemény triggert csak az olyan GES támogatja, amely a földi telepítésű hálózattól érkező esemény vételére van berendezve.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Hívottoldal foglalt	0	5	1	1
1 Hívottoldal foglalt (Hívottoldal figyelmeztetve)	0	5	1	3

A5-34. ábra

BITE 17	Esemény neve: Sikertelen hívás - Vonali meghibásodás	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv

Magyarázat:

1 Ez az esemény belsőleg generálódik a GES beérkező eljáráshoz. Nem az összedolgozó interfészen keresztül érkezik.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
1 C csatorna folyamatossági teszthiba a GES-nél vagy vivő-frekvencia megszakítás	1	3	5	1
Rendeltetési hely meghibásodása	0	5	1	11

A5-35. ábra

BITE 20	Esemény neve: Sikertelen hívás - Küldési hibajelzés	
LEKÉPEZÉS - ból:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet: GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés — P csatorna vagy C csatorna alsáv

Magyarázat:
Ezen BITE részére az összes trigger esemény belsőleg generálódik a GES beérkező eljáráshoz. Nem az összedolgozó interfészen keresztül érkeznek.

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS

Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
GES által nem támogatott megkövetelt hangcsatornás paraméterek	1	3	6	4
Meg nem határozott ok	1	3	7	15
Szolgálatra nem jogosított hívó AES	1	3	4	2
Vételi időzítő lejárata GES-nél	0	4	1	2

A5-36. ábra

BITE 22	Esemény neve: Válasz	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Kapcsolat	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
	Közlemény típusa 30 (hex)
	Jelentés típusa 2
	Útvonal kijelölés C - csatorna alsáv
Magyarázat:	

A5-37. ábra

BITE 25	Esemény neve: Hívott bont	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Rendes körülmények közötti ellenirányú törlés	0	0	1	0

A5-38. ábra

BITE 27	Esemény neve: Küldés befejezve - Beszéd feltételeinek beállítása	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Hívási kísérlet eredménye	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 4
	Útvonal kijelölés C csatorna alsáv

Magyarázat:

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Földi hálózattól vett címzés teljes jel	1	6	0	1

A5-39. ábra

BITE 29	Esemény neve: Beérkező oldal bontása	
LEKÉPEZÉS - ba:	AMS(R)S CM-LIDU: Hívási folyamat - Csatornabontás	Művelet : GES Beérkező

Paraméter leképezés:

BITE PARAMÉTER	LICI PARAMÉTER KÓDOLÁS
Kódolási szabvány (Lásd alul)	S (Kódolási szabvány) (Értékek az alsó táblázatban)
Ok helyzete (Lásd alul)	Helyzet (Oké) (Értékek az alsó táblázatban)
Ok osztálya (Lásd alul)	Ok osztálya (Értékek az alsó táblázatban)
Ok értéke (Lásd alul)	Ok értéke (Értékek az alsó táblázatban)
	Közlemény típusa 30 (hex)
	Jelentés típusa 5
	Útvonal kijelölés P csatorna vagy C csatorna alsáv
Magyarázat:	

AZ ESEMÉNYT JELZŐ SPECIFIKUS CM - LIDU PARAMÉTER KÓDOLÁS				
Esemény indító	Kód. szabv.	Helyzet	Ok osztálya	Ok értéke
Földi hálózattól vett Beérkező oldal bontása esemény (Rendes körülmények közötti ellenirányú törlés)	0	0	1	0

A5-40. ábra

4. Fejezet 6. Függeléke

AMS(R)S KONFIGURÁCIÓS PARAMÉTEREK

A6-1. táblázat: Áramköri üzemmódú konfigurációs paraméterek

Paraméter	Leírás	Érték
nA21	Vészhelyzeti/sürgősségi levegőből származó CM-LIDU sorozatok hosszúsága	4
nA22	Repülésbiztonsági levegőből származó CM-LIDU sorozatok hosszúsága	3
nA23	Szabályszerűségi/meteorológiai, levegőből származó CM-LIDU sorozatok hosszúsága	2

4. Fejezet 7. Függeléke

HANGCSATORNÁS KÓDOLÁSI ALGORITMUS MEGHATÁROZÁSA

1. BEVEZETÉS

A 9,6 kbit/s LPC-t használó AMS(R)S szolgáltatás területén működő berendezések egymásközti üzemeltethetősége csak akkor biztosítható, ha a jelen algoritmus definíciójának összes előírását teljes mértékben betartják.

1. Megjegyzés. – Lásd az algoritmus sematikus ábrázolását az A7-1 ábrán.*

2. Megjegyzés – Az algoritmuson belül az információ áramlását és feldolgozását a Pascal nyelv alkalmazásával biztosítják. Ezen algoritmus egyedi alkalmazásainak nem szükséges ezt a nyelvet használniuk.

3. Megjegyzés – Az összes skaláris változó egyszerűen névvel van jelölve. Az összes vektor változó egyszerű névvel van jelölve, amelyet szögletes zárójel pár ([ ]) követ.

**Az összes ábra ennek a fejezetnek a végén látható.*

2. A NUMERIKUS SZÁMÍTÁSOKKAL SZEMBEN TÁMASZTOTT KÖVETELMÉNYEK

Azon kivétellel, ahol kifejezetten jelzik és az olyan nyilvánvaló egész számok kivételével, mint a vektor-indexek és a ciklus-számlálók, minden változót lebegőpontos értékként kell kifejezni egy jelző bitet magába foglaló 24-bites minimális mantissza pontossággal. A kísérő kitevő érték- tartományának olyannak kell lennie, hogy egy pozitív vagy negatív nem-nulla változó az $5{,}87747^{*}\ {}^{*}10^{-39}$ és a $3{,}40282^{*}10^{38}$ minimális érték-tartományon belül változzon.

Megjegyzés. – Ennek a minimális szám tartománynak való megfelelés fontos, ha a különböző hangkódoló megvalósítások közötti üzemeltethetőséget biztosítani kell.

3. AUDIO BEMENET JELLEMZŐI

3.1 Audio bemenet spektrális jellemzői

Mintavétel és mennyiségi meghatározás előtt a kódoló algoritmussal kezelt beszéd-frekvenciás audionak a következő minimális spektrum jellemzőknek kell megfelelni. Ezeket a jellemzőket a jelátalakítók és audio-csatornák specifikus anti-aliasing szűrőinek és/vagy a természetes spektrum határ jellemzőinek bármely kombinációja kielégítheti:

Megjegyzés. – Minden specifikáció 1 020 Hz-re vonatkozik.

a) 300-3 400 Hz átviteli sávban, +/- 2 dB-nél nem nagyobb teljesítmény-növekedési változás;

b) 4 000-4 600 Hz átviteli sávban, -45 dB vagy kisebb nyereség; és

c) 4 600 Hz és felette, -75 dB vagy kisebb nyereség.

1. Megjegyzés. – A felsorolt spektrum jellemzőkön kívül további szűrést kell biztosítani az egyedi berendezések installációihoz a hangkódoló válasz-jellemzőinek alsó határértékében az energiaforrás által felszedett zaj csillapítása céljából (pl. 400 Hz az AES installációk és 50/60 Hz a GES installációk esetében.)

2. Megjegyzés. – A kódoló algoritmus bemenete a 3.2 pontban került meghatározásra az audio-minták legalább 12 bit felbontású kvantálására. Ennek következtében, a mintavétel helyén minden megkívánt spektrum jellemző ennek figyelembevételével kerül meghatározásra. Az u-törvény vagy A-törvény használatával kompandált audio alkalmazása a csökkentett felbontás (pl. 8 bit) és megfelelően relaxált átviteli sáv, valamint a levágási sáv teljesítmény-nyereségi jellemzők viszonylatában megengedett, feltéve, hogy a kvantált mintákat az algoritmizálás előtt dekompandálják (linearizálják).

3.2 Mintavétel, mennyiségi meghatározás és beosztás

Azt a hangfrekvenciát, ami a 3.1 pontban meghatározott spektrum jellemzőket bemutatja folyamatos 8 kHz-nél kell mintavételezni és a kapott minták sorozatának mennyiségi meghatározását egy egyenértékű, idő-vezérelt lineáris sorozatú (nem tömörített) bináris értékekhez kell meghatározni. Minden egyes mennyiségi meghatározási műveletet legalább 12-bites pontossággal és legalább 10-bites linearitással kell végrehajtani. A sorozat maximális dinamika tartományát fel- vagy le kell kerekíteni olyan nagyságrendűre, amely megfelelő arra, hogy szorosan behatárolja a 4 095,0-től a -4 096,0-ig terjedő lebegő tartományt, anélkül, hogy túllépéné azt. Az eredményként kapott idő-vezérelt beosztott értéket kell a 4.1 pont alatt meghatározott szegmentáló és ablakozó logikába beadni.

Megjegyzés. - A fenti beosztási értékek határ tartománya a 13-bites hosszúságú relatív érték fix pontja. Az idő-vezérelt sorozat leosztása bináris értékekre a jelzett számszerű tartomány abból a célból szükséges, hogy a maximális előny kerüljön elérésre az algoritmus belső numerikus tartományában.

4. KÓDOLÁSI FOLYAMAT MEGHATÁROZÁSA

4.1 Szegmentáció és ablakozás

Az idő-vezérelt beviteli minták áramát *segspch[]*-nek nevezett olyan idő-vezérelt szegmensekre kell felosztani, amelyek mindegyike 256 idő-vezérelt beviteli mintából áll (32 ms). Minden *segspch[]*-t úgy kell összeállítani, hogy a benne lévő első és utolsó 96 minta átfedje a közvetlenül előtte és utána álló *segspch[]*-t. Minden *segspch[]*-t egy Hamming ablakozási vektorral *hamwindow[]*-val kell ablakozni, amit a következők határoznak meg:

*FOR n: = 0 TO 255 DO hamwindow[n]: = 0,54-0,46*COS(2*3,1415927*n/255);*
és egy ablakozási művelet, amit a következő határoz meg:

*FOR n: = 0 TO 255 DO windspch[n]: = segspch[n]*hamwindow[n];*
Egy további, minden *segspch[]* vektor középső 160 mintájának megfelelő idő-vezérelt *spch[]* vektort kell előállítani a következő művelettel:

FOR n: = 0 TO 159 DO spch[]: = segspch[n + 48];

4.2 Autokorreláció

A következő művelet által meghatározva, minden *windspch[]* esetében egy tizenegy elemből álló autokorrelációs vektort *corr[]* kell előállítani:

```
FOR i: = 0 TO 10 DO
BEGIN
dot: = 0;
        FOR n: = 0 TO 255-i DO dot: = dot + windspch[n]* windspch[n + i];
corr[i]: = dot
END;
```

4.3 Durbin rekurzió

Az alábbi művelet által meghatározva, minden *corr[]* esetében elő kell állítani egy parciális korrelációs együttható vektort, *parcor[]*.

```
IF corr[0] = 0 THEN FOR i: = 1 TO 10 DO parcor[i]: = 0;
ELSE
BEGIN
parcor[1]: = corr[1]/corr[0];
taps[1]: = parcor[1];
error: = (1-sqr(parcor[1]))*corr[0];
FOR i: = 1 TO 10 DO
        BEGIN
        FOR j: = 1 TO pred(i) DO alpha[j]: = taps[j];
        parcor[i]: = corr[i];
        FOR j: = 1 TO pred(i) DO parcor(i): = parcor[i]-alpha[j]*corr[i-j];
        parcor[i]: = parcor[i]/error;
        taps[i]: = parcor[i]/
        For j: = 1 TO pred(i) DO taps(j): = alpha[j]-parcor[i]*alpha[i-j];
        error: = (1-sqr(parcor[i]))*error
        END
END;
```

4.4 A parciális korrelációs együtthatók kvantálása

Minden *parcor[]* esetében, amit a következő művelet állít elő, a benne található tíz parciális korrelációs együtthatót a *qparcor[]* vektorban kell kvantálni és tárolni:

```
(Kvantálót inicializáló eljárás)
(Együtthatók kvantálási szintjeinek száma)
plevel[1]: = 64;
plevel[2]: = 64;
plevel[3]: = 32;
plevel[4]: = 32;
plevel[5]: = 16;
plevel[6]: = 16;
plevel[7]: = 8;
plevel[8]: = 8;
plevel[9]: = 4;
plevel[10]: = 4;
```

```
FOR i: = 1 TO 10 DO
FOR j: = 0 TO pred(plevel[i]) DO
        parql[i,j]: = pardl[i, pred(j)] + pardl[i,j]/2;
(Parciális korrelációs együttható kvantáló)
FOR i: = 1 TO 10 DO
BEGIN
j: = 0
        WHILE (parcor[i]>pardl[i,j] and (j<pred(plevel[i])) DO j: = succ(j);
        qparcor[i]: = parql[i, j]
END;
```

*Megjegyzés. – A pardl[] vektor tartalmazza minden egyes parciális korrelációs együttható számára az állandó döntési szinteket, tartalmát az A7-1. táblázat határozza meg.**

4.5 A parciális korrelációs együtthatók vonalkódjai

A *qparcor[]* vektorban lévő minden kvantált parciális korrelációs együtthatónak megfelelő vonalkódot kell az átviteli keretbe elhelyezni. Az összes vonalkódot az alábbiak által meghatározottak szerint, az adatválogató táblázat működésének kell előállítani:

a) qparcor[1] az A7-2. táblázat;
b) qparcor[2] az A7-3. táblázat;
c) qparcor[3] az A7-4. táblázat;
d) qparcor[4] az A7-5. táblázat;
e) qparcor[5] az A7-6. táblázat;
f) qparcor[6] az A7-7. táblázat;
g) qparcor[7] az A7-8. táblázat;
h) qparcor[8] az A7-9. táblázat;
i) qparcor[9] az A7-10. táblázat; és
j) qparcor[10] az A7-11. táblázat.

4.6 LPC szűrő csap fokozása

Minden *qparcor[]* esetében, a *qtaps[]* vektort az alábbi műveletnek megfelelően kell előállítani:

```
qtaps: = qparcor; {a qtaps vektor mind a tíz eleme egyenlőre van állítva a qparcor-ban lévő megfelelő elemekkel}
FOR i = 2 TO 10 DO
BEGIN
        FOR j: = 1 TO pred(i) DO alpha[j]: = qtaps[j];
                FOR j: = 1 TO pred(i) DO qtaps[j]: = alpha[j]-qtaps[i]*alpha[i-j]
END;
```

4.7 Hosszútávú korreláció vizsgálat

4.7.1 LPC INVERZ SZŰRÉS

Minden *spch[]* vektor esetében a *residue[]* vektort az alábbi művelet által meghatározott módon kell előállítani:

```
FOR n: = 0 TO 159 DO
BEGIN
sum: = spch[n];
FOR i: = 1 TO 10 DO sum: = sum-qtaps[i]*spch[n-i];
```

residue[n]: = sum
END;

Megjegyzés. – Minden spch[] *kezdete melletti érték, amelyben az* spch[] *indexe zérónál kisebb, az előző* spch[] *végénél lévő hangmintára vonatkozik. A kódoló által elsőként feldolgozott* spch[] *esetében ezeket az értékeket zérónak kell tekinteni.*

4.7.2 HOSSZÚTÁVÚ KORRELÁCIÓ

Minden *residue[]* esetében, a *gain* és *delay* skalárisokat az alábbi művelettel kell előállítani:

```
max: = 0
FOR lag: = 33 TO 96 DO
        BEGIN
        sum: = 0;
        FOR n: = 0 TO 159 DO sum: -sum + residue[n]* residue[n-lag];
        IF sum>max THEN
        BEGIN
        max: = sum;
        delay: = lag
        END
END;
sum: = 0;
FOR n: = 0 TO 159 DO sum: = sum + sqr(residue[n-delay]);
IF sum = 0 THEN gain: = 0 ELSE gain: = max/sum;
END;
```

* Minden táblázat a fejezet végén található.

1. Megjegyzés. – A delay skaláris egy 16 bites előjeles egész szám.

2. Megjegyzés. – n-lag és n-delay indexek negatív értékei azokra a beviteli értékekre mutatnak a residue[]*-ban, amelyeket a korábbi* spch[] *részére számoltak ki. Az első feldolgozott* spch[] *esetében,* a residue[]*-ban lévő hivatkozott beviteli értékeket zérónak kell tekinteni.*

4.7.3 A GAIN SKALÁRIS KVANTÁLÁSA ÉS VONALKÓDOLÁSA

Minden *gain* esetében, tartalmát kvantálni kell és a *qgain* skalárisban kell tárolni az alábbi művelet által meghatározott módon:

```
IF gain > 0,75 THEN qgain: = 0,9 ELSE
        IF gain > 0,45 THEN qgain: = 0,60 ELSE
                IF gain > 0,2 THEN qgain: = 0,325 ELSE qgain: = 0,1
```

A *qgain*-nek megfelelő 2-bites vonalkódolást kell az átviteli keretbe elhelyezni. A vonalkódot az A7-12. táblázatban meghatározott adatválogató táblázat működése által kell előállítani.

4.7.4 A DELAY SKALÁRIS VONALKÓDOLÁSA

A *delay*-nek megfelelő vonalkódolást az A7-13. táblázatban meghatározott adatválogató táblázat működése által kell előállítani.

4.8 Gerjesztés vizsgálata

1. Megjegyzés. – Az ezen kódolási algoritmus által előállított átviteli keret öt gerjesztő keretet tartalmaz. Az öt gerjesztő keret minden csoportjához ugyanazon hang-keret társul spch[], *amelyből a kurrens átviteli keret parciális korrelációs együtthatóit kiszámolták.*

2. Megjegyzés. – Bármely művelet, amely olyan kimeneti változót állít elő, amely egy gerjesztő keret alkotórésze, a gerjesztő keretek előállításának ütemében kell végrehajtani (vagyis, minden spch[] *esetében öt gerjesztés).*

4.8.1 HIBAJEL DERIVÁLÁS

Minden *delay, qgain, qtaps[], synthspch[]* és *s2[]* esetében az *error[]* vektort az alábbi művelet által meghatározott módon kell előállítani:

```
local_synthspch: = synthspch; {a rövidtávú prediktor memóriaszűrő helyi másolatát készíti el}
local_s2: = s2; {a hosszútávú prediktor memóriaszűrő helyi másolatát készíti el}
FOR n: = b TO b + 31 DO
        BEGIN
        sum: = 0;
        FOR i: = 1 TO 10 DO sum: = sum + qtaps(i)*local_synthspch[n-i];
local_synthspch[n]: = qgain*local_s2[n-delay] + sum;
error[n]: = spch[n]-local_synthspch[n]
END;
```

Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

4.8.2 IMPULZUS-VÁLASZ SZÁMÍTÁS

Minden *qtaps []* esetében, az *iresp[]* és *ipwr[]* vektorokat a következő műveletek által meghatározott módon kell előállítani:

```
iresp[0]: = 1;
ipwr[31]: = 1;
FOR n: = 1 TO 31 DO
        BEGIN
        sum: = 0;
        FOR j: = 1 TO 10 DO IF n > j THEN sum: = sum + qtaps[j]*iresp[n-j];
        iresp[n]: = sum;
        ipwr[32-succ(n)]: = ipwr[32-n] + sqr(sum)
        END;
```

Megjegyzés. – Mivel a delay paraméter legkisebb lehetséges értéke 32, a hosszútávú prediktor nem gyakorol hatást az impulzus-válasz első 32 mintájára.

4.8.3 KERESZT-KORRELÁCIÓS SZÁMÍTÁS

Minden *error[]* és *iresp[]* esetén, az *xcorr[]* vektort a következő művelet által meghatározott módon kell előállítani:

```
FOR n: = 0 TO 31 DO
        BEGIN
        dot: = 0;
                FOR j: = n TO 31 DO dot: = dot + error[b+j]*iresp[j-n];
        xcorr[n]: = dot
        END;
```

1. Megjegyzés. – A „b” skaláris a kurrens hang-keretben lévő kurrens gerjesztő keret kezdetének megfelelő mintaszám. Minden hang-keret első, második, harmadik, negyedik és ötödik gerjesztő kerete esetén b értéke 0, 32, 64, 96 és 128-cal egyenlő.

2. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

4.8.4 IMPULZUS KIVÁLASZTÁS

Minden *xcorr[], ipwr[]* és *iresp[]* esetén, a *posns[]* és *qamp[]* vektorokat a következő művelet által meghatározott módon kell előállítani:

```
FOR pulse: = 1 TO 3 DO
BEGIN
max: = 0;
FOR n: = 0 TO 31 DO
        IF (sqr(xcorr[n])>=max*ipwr[n]) and not (n in posn_set) THEN BEGIN
        max: = sqr(xcorr[n]/ipwr[n];
        pos: = n
END;
posn_set: = posn_set+[pos];
posns[pulse]: = pos;
amp: = xcorr[pos]/ipwr[pos];
qamp[pulse]: = quantamp(amp, pulse);
(A minimalizálandó hibára éppen kiszámított kvantált impulzus hatásának beszámolója)
WHILE pulse<npulse DO
BEGIN
        FOR n: = 0 TO pred(pos) DO
        BEGIN
        dot: = 0;
                FOR j: = 0 TO 31-pos DO dot: = dot + iresp[j]*iresp[j + (n-pos)];
        xcorr[n]: = xcorr[n]-qamp*dot
        END;
        FOR n: = pos TO 31 DO
        BEGIN
        dot: = 0;
                FOR j: = 0 TO 31-n DO dot: = dot + iresp[j]*iresp[j+(n-pos)];
        xcorr[n]: = xcorr[n]-qamp*dot
        END
    END
END;
```

1. Megjegyzés. – A gerjesztő keretekben kiválasztott második és harmadik impulzusok nem foglalhatják el a korábban kiválasztott impulzus által már elfoglalt helyzetet ugyanazon gerjesztő keretben.

2. Megjegyzés. – A quantamp (amp, pulse) *funkció meghatározását a 4.8.4.1 pont tartalmazza.*

3. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

4.8.4.1 IMPULZUSAMPLITÚDÓ KVANTÁLÁS

Amint máshol jelezve van, a *quantamp (amp, pulse)* funkciót, a következő műveletben meghatározott módon, a *qamp* vektor értékeinek előállítására kell használni:

```
(Impulzus amplitúdó kvantáló inicializálása)
gfact_leak: = 1; maxadapt: = false;
adjust[1]: = 1; adjust[2]: = 1,0/0,625; adjust[3]: = 1,0/0,375;
{3-bites kvantáló inicializálása}
adapt[3,0]: = 0,875; adapt[3,1]: = 0,875;
        adapt[3,2]: = 1,0; adapt[3,3]: = 1,5;
quant[3,0]: = 0,5006; quant[3,1]: = 1,050;
```

```
        quant[3,2]: = 1,748;
inv_quant[3,0]: = 0,2451; inv_quant[3,1]: = 0,7560;
        inv_quant[3,2]: = 1,344;
inv_quant[3,3]: = 2,152;
{4-bites kvantáló inicializálása}
adapt[4,0]: = 0,75; adapt[4,1]: = 0,875;
        adapt[4,2]: = 0,875; adapt[4,3]: = 0,875;
adapt[4,4]: = 1,0;
adapt[4,5]: = 1,25; adapt[4,6]: = 1,5; adapt[4,7]: = 2,0;
quant[4,0]: = 0,2582; quant[4,1]: = 0,5224;
        quant[4,2]: = 0,7996;
quant[4,3]: = 1,099; quant[4,4]: = 1,437;
        quant[4,5]: = 1,844; quant[4,6]: = 2,401;
inv_quant[4,0]: = 0,1284; inv_quant[4,1]: = 0,3881;
        inv_quant[4,2]: = 0,6568;
inv_quant[4,3]: = 0,9424; inv_quant[4,4]: = 1,256;
        inv_quant[4,5]: = 1,618; inv_quant[4,6]: = 2,069;
inv_quant[4,7]: = 2,733;
FUNKTION quantamp(lev:real, pulse: integer): real;
VAR     i,qbits   :integer
sgn       :-1..1;
BEGIN
lev: = lev*adjust[pulse]
IF pulse < 3 THEN BEGIN qbits: = 4; qlevels: = 7 END
        ELSE BEGIN qbits: = 3; qlevels: = 3 END;
IF lev > 0 THEN sgn: = 1 ELSE sgn: = -1;
i: = 0;
WHILE (abs(lev) > quant[qbits,i]*gfact_leak) and (i<qlevels) DO i: = succ(i);
quantamp: = inv_quant[qbits,i]*gfact_leak*sgn/adjust[pulse];
gfact_leak: = EXP(0,98*LN(gfact_leak));
IF i= qlevels THEN
        BEGIN
        IF maxadapt THEN gfact_leak: = gfact_leak*adapt[qbits, qlevels];
maxadapt: = true
        END ELSE maxadapt: = false;
gfact_leak: = gfact_leak*adapt[qbits, i];
IF gfact_leak > 512,0 THEN gfact_leak: = 512,0 ELSE
        IF gfact_leak<0,5 THEN gfact_leak: = 0,5
END {of quantamp.};
```

1. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

2. Megjegyzés. – A végső, szivárgás utáni impulzus amplitúdókat, amelyeket a quantampt() *funkcióban alakítottak ki egyenként belső kvantálási küszöb-értékekre alapozva kvantálják és azt követően megfelelő vonalkódokká konvertálják. A funkció kvantálási és vonalkód előállítási aspektusai, valójában egy adatválogató táblázat működése, amely megtekinthető az A7-14. és A7-15. táblázatokban.*

4.8.5 IMPULZUS-HELYZET VONALKÓD ELŐÁLLÍTÁS

Minden gerjesztő keret esetében a *posns[]* tartalmának megfelelő vonalkódot kell az A7-16. táblázatban meghatározott adatválogató táblázat működése által előállítani.

Megjegyzés. – Minden impulzus-helyzetet kódolni kell, tekintettel azon gerjesztő keret kezdetére, amelybe esik. Gerjesztő keretenként 32 lehetséges helyzet van. A gerjesztő keretekben a helyzetek számozása 0-tól 31-ig terjedően történik, ahol a 0 minden keretben az első minta helyének, a 31 pedig az utolsó helyének felel meg.

4.9 Helyi dekódoló

Megjegyzés. – A helyi dekóder logikát egy helyileg származtatott kódolt hangváltozat előállítására használják a 4.8 pontban meghatározott gerjesztő vizsgálati logika számára történő visszacsatolás céljára. A helyi dekódoló logikát ugyancsak felhasználják az 5. Részben lévő dekódolási folyamat meghatározásában.

4.9.1 GERJESZTŐ GENERÁTOR

Minden *posns[]* és *qamp[]* esetében, az *s1[]* vektort a következő művelet által meghatározott módon kell előállítani:

FOR n: = b TO b + 31 DO s1[n]: = 0;
FOR pulse: = 1 TO 3 DO s1[posns[pulse]+b]: = qamp[pulse];
1. Megjegyzés. – A „b” a kurrens gerjesztő keret kezdetének megfelelő skaláris mintaszám a kurrens spch[] keretben, és a posns[] a kurrens gerjesztő kerethez tartozó impulzus-helyzetek vektora. Minden hang-keret első, második, harmadik, negyedik és ötödik gerjesztő kerete esetén b értéke 0, 32, 64, 96 és 128-cal egyenlő.
2. Megjegyzés. – Az s1[] *vektor* a posns[] *helyzetekben lévő* qamp *amplitúdó impulzusokat tartalmazza, amelyek megfelelően kvantált amplitúdóval rendelkeznek,* qamp[].
3. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztők eret esetében végrehajtják.

4.9.2 HOSSZÚTÁVÚ PREDIKTOR

Minden *qgain* és *delay* esetében, valamint egy átviteli kerethez társított mind az öt *s1[]* esetében, az *s2[]* vektort a következő műveletben meghatározottak szerint kell előállítani:
*FOR n: = b TO b + 31 DO s2[n]: = qgain*s2[n-delay] + s1[n];*
1. Megjegyzés. – Az index, n-*delay értékei mindig kisebbek a „b”-nél (a kurrens gerjesztő keret kezdete) és eképpen az index a hosszútávú prediktor memóriában lévő értékekre mutat. Az első feldolgozott* spch[] *keret esetében, az* s2[] *tartalmát zéróra kell beállítani.*
2. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

4.9.3 RÖVIDTÁVÚ PREDIKTOR

Minden *qtaps[]* és mind az öt, átviteli kerethez társított *s2[]* esetében, a *synthspch[]* vektort a következő műveletben meghatározottak szerint kell előállítani.
FOR n: = b TO b + 31 DO
BEGIN
sum: = 0;
*FOR i: = 1 TO 10 DO sum: = sum + qtaps[i]*synthspch[n-i]; synthspch[n]: =*
= s2[n] + sum
END;
1. Megjegyzés. – Az index, n-i *a rövidtávú prediktorban lévő értékekre mutat. Az első feldolgozott* spch[] *keret esetében a* synthspch[] *tartalmát zéróra kell beállítani.*
2. Megjegyzés. – Ezt a műveletet az átviteli keretben lévő mind az öt gerjesztő keret esetében végrehajtják.

4.10 Átviteli keret előállítása

Minden 20 milliszekundumban a 4.10.1 pontban meghatározott szerkezetből álló átviteli keretet kell a hangkódoló folyamat által létrehozni.

4.10.1 ÁTVITELI KERET SZERKEZETE

A 192 bitből álló átviteli keretnek az A7-17. táblázatban meghatározottak szerintinek kell lenni.

4.10.2 ÁTVITEL RENDEZÉS ÉS BEÁLLÍTÁS

Az 1. sz. parciális korrelációs együtthatóval kezdve, az átviteli keretet egy 192 bites szekvenciaként kell kialakítani az A7-17. táblázatban lévő, összes egymást követő vonalkód bit-sorozatba való állításával. A kialakítást úgy kell megvalósítani, hogy a vonalkód legkevésbé szignifikáns bitjét azonnal kövesse a következő vonalkód legszignifikánsabb bitje. Minden 192 bites átviteli keretet be kell állítani és bele kell foglalni egy 192 bites C csatorna elsődleges adatmezőbe a 4. Részben meghatározottak szerint.

4.10.3 HIBAVÉDELEM

Az A7-18. táblázatban aláhúzással jelölt 26 bitet a 4.10.3.1 és 4.10.3.2 pontokban meghatározott hibavédelmi/hibaérzékelő logikával kell védeni.

4.10.3.1 EGY-BITES HIBAVÉDELEM ÉS KÉT-BITES HIBAÉRZÉKELÉS

A 4.10.3 pontban meghatározott védett biteket kell alkalmazni egy 5 bites Hamming kódszó előállítására a következő művelet által meghatározottak szerint:

```
TYPE hamrng = 1..26;
hamword = array [hamrng] of boolean;
FUNCTION hamming (word:hamword):integer;
VAR n, count, ham :integer;
i :hamrng;
BEGIN
n: = 4; count: = 3; ham: = 0;
FOR i: = 1 TO 26 DO
        BEGIN
        IF word[i] THEN ham: = EXOR (ham, count);
        count: = succ(count);
        IF count = n THEN BEGIn n: = n*2;
                count: = succ(count)END
        END
hamming: = ham
END {of hamming.};
```

Elő kell állítani egy hatodik bitet, ami a kódszó páratlan paritását képviseli és a legszignifikánsabb bitként a kódszóhoz kell fűzni. A keletkező 6-bites értéket az átviteli keretbe kell helyezni és be kell nyújtani a 4.10.3.2 pontban meghatározott bithiba érzékelő logikához.

4.10.3.2 BITHIBA ÉRZÉKELÉS

Az A7-18. táblázatban meghatározott 26 védett bitet és a 4.10.3.1 pontban meghatározott Hamming kódszóból származó 6-bites értéket az A7-19. táblázatban meghatározott mátrix szerinti kell elrendezni a „p”-vel és „e”-vel jelölt helyzetekbe.

Minden „b” bitet páros paritásúra kell állítani saját oszlopában. Ezt követően a 8 „b” bitet KIZÁRÓ VAGY-műveletnek kell alávetni a „10101010” bináris maszknál és a keletkező 8 bitet az átviteli keretbe kell helyezni.

5. DEKÓDOLÁSI FOLYAMAT MEGHATÁROZÁSA

Minden átviteli keretet az 5.1 szerint kell dekódolni. A vonalkódokat az 5.2 szerint kell kvantált hangminták előállítására felhasználni.

5.1 Átviteli keret dekódolása

5.1.1 PARCIÁLIS KORRELÁCIÓS EGYÜTTHATÓ DEKÓDOLÁSA

5.1.1.1 *IMPULZUS HIBA ÉRZÉKELÉSE/JAVÍTÁSA*

A 26 védett bitet (A7-18. táblázat), a 6-bites Hamming kódszót és a 8 bithiba érzékelő bitet ki kell vonni az átviteli keretből és az A7-19. táblázat szerinti bithiba érzékelő számítási mátrixba kell rendezni. A bithiba érzékelő biteket ezt követően KIZÁRÓ VAGY-műveletnek kell alávetni a „21212121” bináris maszknál. A keletkező mátrix minden oszlopát meg kell vizsgálni tekintettel a páros paritás lehetséges hiányára. Azt követően a mátrix és a társított oszlop paritási hibatájékoztatást be kell nyújtani az A7-2. ábrán meghatározott hibaérzékelési és javítási folyamathoz. Ha ez a folyamat azt jelzi, hogy a vett együttható vonalkódok kijavított hibaszintje megfelelő, akkor az együtthatókat az 5.1.1.2 szerint dekódolni kell a vonalkódokbó. Ugyanakkor, ha a kijavított hibaszint nem megfelelő, akkor a vonalkódokat érvényteleníteni kell és a dekóder kimenetét az 5.1.3.2 és 5.1.3.2.1 szerinti logika alkalmazásával némítani kell.

Megjegyzés. – A 8 bithiba érzékelő bit célja, hogy őrködjenek azon rendellenes eset felett, amikor egy túlzottan hosszú bithiba-sorozat „0” biteket helyezhet a számítási mátrix mind a 40 helyzetébe. Abban az esetben, a KIZÁRÓ VAGY-művelet a mátrix „b” bitjein a páratlan paritást négy oszlopba készteti, eképpen kényszerítve a hibaérzékelési és javító folyamatot az átviteli keret érvénytelenítésére.

5.1.1.2 *EGYÜTTHATÓ DEKÓDOLÁSA*

Ha a 10 együtthatónak megfelelő vonalkódok kijavított hibaszintje megfelelőnek mutatkozik (5.1.1.1), akkor a 10 együtthatót az A7-2–A7-11. táblázatok szerint kell dekódolni és a keletkező értékeket a *qparcor[]* vektorba kell elhelyezni. Azt követően a *qparcor[]* vektort kell felhasználni a 4.6 pontban meghatározott művelet alkalmazásával a *qtaps[]* vektor előállítására.

5.1.2 HOSSZÚTÁVÚ PREDIKTOR PARAMÉTER DEKÓDOLÁSA

A *qgain* és *delay* hosszútávú prediktor paramétereket az A7-12 éa A7-13. táblázatokban meghatározott adatválogató táblázat művelete révén kapott vonalkódokból kell dekódolni.

5.1.3 GERJESZTŐ PARAMÉTER DEKÓDOLÁSA

5.1.3.1 *IMPULZUS-HELYZET DEKÓDOLÁS*

Minden gerjesztőkeret esetében, a *posns[]* vektort a három impulzushelyzet értékének tartalmából kell előállítani. A tartalmat az A7-16. táblázatban meghatározott adatválogató táblázat művelete révén kapott vonalkódokból kell dekódolni.
5.1.3.2 *IMPULZUS-AMPLITÚDÓ DEKÓDOLÁSA*

Minden gerjesztőkeret esetében, a *qamp[]* vektort a gerjesztő keretben lévő három impulzus-amplitúdó értékének tartalmából kell előállítani. A tartalmat az A7-14–A7-15. táblázatokban meghatározott adatválogató táblázat művelete révén kapott vonalkódokból kell dekódolni.

5.1.3.2.1 Ha a dekóder kimenet némítása van jelezve (5.1.1), akkor a *qamp[1]* és *qamp[2]*-nek megfelelő vonalkódokat „0100”-ra kell kényszeríteni a dekódolást megelőzően. Hasonlóan, a *qamp[3]*-nak megfelelő vonalkódot „010”-ra kell kényszeríteni a dekódolást megelőzően.

Megjegyzés. – A qamp[1], qamp[2], *és* qamp[3] *tartalma képviseli külön-külön a gerjesztőkeret első három impulzusának amplitúdóját.*

5.1.3.3 Az 1. sz. gerjesztőkerettel kezdődően és sorrendben folytatva minden fennmaradó gerjesztőkeret esetében, mind az öt gerjesztőkeretnek megfelelő *qamp[]* vektor tartalmát a következő műveletnek kell módosítani:

Megjegyzés. – Ez a művelet kompenzálja a kódoló impulzus kvantálás (4.8.4.1) alatt végrehajtott amplitúdó normalizációs és nyereség-beállítási folyamatokat.

```
{inicializáció}

gfact_leak: = 0; maxadapt: = false;
adjust[1]: = 1; adjust[2]: = 1,0/0,625; adjust[3]: = 1,0/0,375;
{3-bites inicializáció}
adapt[3,0]: = 0,875; adapt[3,1]: = 0,875;
        adapt[3,2]: = 1,0; adapt[3,3]: = 1,5;
inv_quant[3,0]: = 0,2451; inv_quant[3,1]: = 0,7560;
        inv_quant[3,2]: = 1,344; inv_quant[3,3]: = 2,152;
{4-bites inicializáció}
adapt[4,0]: = 0,75; adapt[4,1]: = 0,875; adapt[4,2]: = 0,875; adapt[4,2]: = 0,875;
        adapt[4,3]: = 0,875; adapt[4,4]: = 1,0;
adapt[4,5]: = 1,25; adapt[4,6]: = 1,5; adapt[4,7]: = 2,0;
inv_quant[4,0]: = 0,1284; inv_quant[4,1]: = 0,3881;
        inv_quant[4,2]: = 0,6568;
inv_quant[4,3]: = 0,9424; inv_quant[4,4]: = 1,256;
        inv_quant[4,5]: = 1,618; inv_quant[4,6]: = 2,069;
inv_quant[4,7]: = 2,733;
VAR i,qbits: integer
sgn     : -1..1;
FOR pulse: = 1 TO 3 DO
BEGIN
IF pulse < 3 THEN BEGIN qbits: = 4; qlevels: = 7 END
        ELSE BEGIN qbits: = 3; qlevels: = 3 END;
i: = 0;
WHILE (abs(qamp[pulse]) > inv_quant[qbits,i] and (i < qleveles) DO i: = succ(i);
qamp[pulse]: = qamp[pulse]*gfact_leak/adjust[pulse];
gfact_leak: = EXP(0,98*LN(gfact_leak));

IF i = qlevels THEN
        BEGIN
        IF maxadapt THEN gfact_leak: = gfact_leak*adapt[qbits, qlevels];
maxadapt: = true
        END ELSE maxadapt: = false;
gfact_leak: = gfact_leak*adapt[qbits,i];
IF gfact_leak > 512,0 THEN gfact_leak: = 512,0 ELSE
        IF gfact_leak < 0,5 THEN gfact_leak: = 0,5
END;
```

5.1.3.3.1 Ha a dekóder kimenet némítása van jelezve (5.1.1), akkor a *qamp[]* tartalmát zéróra kell beállítani a fenti művelet befejezése **után**.

5.2 A dekódolt hang kimenet előállítása

Minden dekódolt átviteli keret esetében, az idő-vezérelt hangmintákat a következő műveletek sorrendben történő elvégzésével kell előállítani:

a) Mind az öt, a kurrens átviteli kerethez társított vektor *posns[]* és *qamp[]* esetében, egy *s1[]* vektort kell előállítani a 4.9.1 pontban meghatározott művelettel;

b) Mind az öt, a kurrens átviteli kerethez társított vektor *s1[]*, és a *qgain* és *delay* skalárisok esetén, egy *s2[]* vektort kell előállítani a 4.9.2 pontban meghatározott művelettel; és azt követőn;

c) Mind az öt, a kurrens átviteli kerethez társított vektor *s2[]*, és *qtaps[]* vektor esetén, egy *synthspch[]* vektort kell előállítani a 4.9.3 pontban meghatározott művelettel.

Megjegyzés. – Az a sebesség, amelyben a synthspch[] *vektort a dekóder (5 vektor/keret 50 keret/s) előállítja és minden* synthspch[] *felőli hangminta sebesség, lehetővé tesz egy összességében 8.0 kHz-es hangminta frekvenciát.*

5.3 Hang kimenet kódkonvertálása

A *synthspch[]* vektorból származó összes hangminta megjeleníti a 2. Részben meghatározott belső lebegőpontos számtartományt. A hangminta-füzér számtartományát megfelelő módon kalibrálni kell bármilyen digitális kódkonvertálás vagy analóg beszédrekonstrukciót megelőzően.

A 7. Függelék táblázatai

A7-1. táblázat: *pardl[]* (a parciális korrelációs együttható kvantáló) döntési szintjei

pardl[1,-1], pardl[1,0], pardl[1,1], pardl[1,2]	-0.7512804,	-0.7269750,	-0.7017226,	-0.6755562
pardl[1,3], pardl[1,4], pardl[1,5], pardl[1,6]	-0.6485097,	-0.6206185,	-0.5919189,	-0.562448[illegible]
. . . .	-0.5322449,	-0.5013483,	-0.4697985,	-0.437636[illegible]
. . . .	-0.4049051,	-0.3716459,	-0.3379026,	-0.3037192
. . . .	-0.2691401,	-0.2342104,	-0.1989756,	-0.1634817
. . . .	-0.1277748,	-0.0919014,	-0.0559084,	-0.0198425
. . . .	0.0162492,	0.0523198,	0.0883222,	0.1241096
. . . .	0.1599351,	0.1954524,	0.2307150,	0.2656771
. . . .	0.3002931,	0.3345180,	0.3683071,	0.401616[illegible]
. . . .	0.4344026,	0.4666229,	0.4982354,	0.5291989
. . . .	0.5594731,	0.5890184,	0.6177965,	0.6457698
. . . .	0.6729020,	0.6991577,	0.7245026,	0.7489037
. . . .	0.7723293,	0.7947488,	0.8161331,	0.836454[illegible]
. . . .	0.8556859,	0.8738029,	0.8907816,	0.906600
. . . .	0.9212375,	0.9346749,	0.9468949,	0.957881[illegible]
pardl[1,59], pardl[1,60], pardl[1,61], pardl[1,62]	0.9676200,	0.9760983,	0.9833051,	0.9892311
pardl[1,63], pardl[2,-1], pardl[2,0], pardl[2,1]	0.9938684,	-0.9687151,	-0.9600082,	-0.9502578
pardl[2,2], pardl[2,3], pardl[2,4], pardl[2,5]	-0.9394747,	-0.9276705,	-0.9148581,	-0.9010514
. . . .	-0.8862653,	-0.8705161,	-0.8538207,	-0.8361974
. . . .	-0.8176653,	-0.7982445,	-0.7779561,	-0.7568223
. . . .	-0.7348658,	-0.7121107,	-0.6885817,	-0.6643043
. . . .	-0.6393048,	-0.6136106,	-0.5872494,	-0.5602500
. . . .	-0.5326418,	-0.5044546,	-0.4757191,	-0.4464666
. . . .	-0.4167289,	-0.3865382,	-0.3559275,	-0.3249299
. . . .	-0.2935792,	-0.2619094,	-0.2299549,	-0.1977505
. . . .	-0.1653312,	-0.1327322,	-0.0999890,	-0.0671371
. . . .	-0.0342122,	-0.0012501,	0.0317133,	0.0646423
. . . .	0.0975010,	0.1302537,	0.1628649,	0.195299[illegible]
. . . .	0.2275210,	0.2594956,	0.2911882,	0.3225643
. . . .	0.3535898,	0.3842311,	0.4144548,	0.4442280
. . . .	0.4735184,	0.5022941,	0.5305240,	0.5581772
. . . .	0.5852238,	0.6116344,	0.6373802,	0.6624333
pardl[2,62], pardl[2,63], pardl[3,-1], pardl[3,0]	0.6867664,	0.7103531,	-0.6209860,	-0.5817980
pardl[3,1], pardl[3,2], [pardl[3,3], pardl[3,4]	-0.5412097,	-0.4993190,	-0.4562265,	-0.4120361
. . . .	-0.3668540,	-0.3207891,	-0.2739522,	-0.2264559
. . . .	-0.1784146,	-0.1299440,	-0.0811606,	-0.0321819
. . . .	0.0168742,	0.0658897,	0.1147467,	0.1633275
. . . .	0.2115152,	0.2591939,	0.3062488,	0.3525667
. . . .	0.3980361,	0.4425475,	0.4859939,	0.5282706
. . . .	0.5692760,	0.6089114,	0.6470813,	0.6836939
pardl[3,29], pardl[3,30], pardl[3,31], pardl[4,-1]	0.7186612,	0.7518988,	0.7833269,	-0.8819578
pardl[4,0], pardl[4,1], pardl[4,2], pardl[4,3]	-0.8576206,	-0.8311930,	-0.8027395,	-0.7723294
. . . .	-0.7400368,	-0.7059404,	-0.6701235,	-0.6326731
. . . .	-0.5936806,	-0.5532411,	-0.5114532,	-0.468418[illegible]
. . . .	-0.4242423,	-0.3790320,	-0.3328978,	-0.285952[illegible]
. . . .	-0.2383097,	-0.1900863,	-0.1413995,	-0.0923682
. . . .	-0.0431116,	0.0062499,	0.0555963,	0.1048072
. . . .	0.1537625,	0.2023432,	0.2504306,	0.2979076
pardl[4,28], pardl[4,29], pardl[4,30], pardl[4,31]	0.3446585,	0.3905694,	0.4355282,	0.4794255
pardl[5,-1], pardl[5,0], pardl[5,1], pardl[5,2]	-0.5728675,	-0.5044545,	-0.4327131,	-0.3581167
. . . .	-0.2811575,	-0.2023432,	-0.1221939,	-0.0412383
. . . .	0.0399893,	0.1209531,	0.2011188,	0.2799576
. . . .	0.3569492,	0.4315858,	0.5033747,	0.5718424
pardl[5,15], pardl[6,-1], pardl[6,0], pardl[6,1]	0.6365371,	-0.7032794,	-0.6508853,	-0.5951883
. . . .	-0.5364712,	-0.4750316,	-0.4111817,	-0.3452452
. . . .	-0.2775567,	-0.2084599,	-0.1383052,	-0.0674487
. . . .	0.0037500,	0.0749297,	0.1457292,	0.2157892
pardl[6,14], pardl[6,15], pardl[7,-1], pardl[7,0]	0.2847542,	0.3522742,	-0.4617792,	-0.3299494
pardl[7,1], pardl[7,2], pardl[7,3],pardl[7,4]	-0.1913133,	-0.0487307,	0.0948572,	0.2364883
pardl[7,5], pardl[7,6], pardl[7,7], pardl[8,-1]	0.3732410,	0.5022942,	0.6209860,	-0.6287930
pardl[8,0], pardl[8,1], pardl[8,2], pardl[8,3]	-0.5098411,	-0.3801884,	-0.2425563,	-0.0998334
pardl[8,4], pardl[8,5], pardl[8,6], pardl[8,7]	0.0449848,	0.1888589,	0.3287691,	0.4617791
pardl[9,-1], pardl[9,0], pardl[9,1], pardl[9,2]	-0.4259395,	-0.1271548,	0.1839465,	0.4772301
pardl[9,3], pardl[10,-1], pardl[10,0], pardl[10,1]	0.7242872,	-0.4968801,	-0.2763557,	-0.0399693
pardl[10,2], pardl[10,3]	0.1986693,	0.4259395		

A7-2. táblázat: Az 1.sz. parciális korrelációs együttható vonalkódjai

KVANTÁLÓ SZINT	VONALKÓD	QUANTIZER LEVEL	LINE CODE
-0.7391278	000000	0.3174056	100000
-0.7143489	000001	0.3514125	100001
-0.6886395	000010	0.3849618	100010
-0.6620330	000011	0.4180095	100011
-0.6345642	000100	0.4505128	100100
-0.6062688	000101	0.4814292	100101
-0.5771836	000110	0.5137172	100110
-0.5473465	000111	0.5443360	100111
-0.5167966	001000	0.5742458	101000
-0.4855734	001001	0.6034074	101001
-0.4537177	001010	0.6317832	101010
-0.4212710	001011	0.6593359	101011
-0.3882755	001100	0.6860299	101100
-0.3547743	001101	0.7118301	101101
-0.3208109	001110	0.7367031	101110
-0.2864296	001111	0.7606165	101111
-0.2516752	010000	0.7835391	110000
-0.2165930	010001	0.8054410	110001
-0.1812287	010010	0.8262937	110010
-0.1456282	010011	0.8460701	110011
-0.1098381	010100	0.8647444	110100
-0.0739049	010101	0.8822923	110101
-0.0378754	010110	0.8986909	110110
-0.0017966	010111	0.9139188	110111
0.0342845	011000	0.9279562	111000
0.0703210	011001	0.9407849	111001
0.1062559	011010	0.9523881	111010
0.1420724	011011	0.9627507	111011
0.1776938	011100	0.9718592	111100
0.2120837	011101	0.9797017	111101
0.2481961	011110	0.9862680	111110
0.2829851	011111	0.9915497	111111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-3. táblázat: A 2. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.9613617	000000	-0.2459321	100000
-0.9551330	000001	-0.2138527	100001
-0.9448663	000010	-0.1815409	100010
-0.9335726	000011	-0.1490317	100011
-0.9212644	000100	-0.1163606	100100
-0.9079548	000101	-0.0835630	100101
-0.8936584	000110	-0.0506746	100110
-0.8783907	000111	-0.0177312	100111
-0.8621684	001000	0.0152316	101000
-0.8450094	001001	0.0481778	101001
-0.8269344	001010	0.0810716	101010
-0.8079550	001011	0.1138773	101011
-0.7881004	001100	0.1465593	101100
-0.7673892	001101	0.1790820	101101
-0.7458441	001110	0.2114103	101110
-0.7234883	001111	0.2435083	101111
-0.7003462	010000	0.2753419	110000
-0.6764430	010001	0.2068763	110001
-0.6518016	010010	0.3380771	110010
-0.6274577	010011	0.3689105	110011
-0.6004300	010100	0.2993429	110100
-0.5737497	010101	0.4293413	110101
-0.5464459	010110	0.4588732	110110
-0.5185482	010111	0.4879062	110111
-0.4900868	011000	0.5164090	111000
-0.4610929	011001	0.5443506	111001
-0.4315977	011010	0.5717005	111010
-0.4016336	011011	0.5984291	111011
-0.3712329	011100	0.6245073	111100
-0.3401287	011101	0.6499068	111101
-0.3092546	011110	0.6745999	111110
-0.2777443	011111	0.6985598	111111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-4. táblázat: A 3. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.6013920	00000	0.1390371	10000
-0.5615038	00001	0.1874214	10001
-0.5202643	00010	0.2353546	10010
-0.4777727	00011	0.2827214	10011
-0.4341313	00100	0.3294078	10100
-0.3894451	00101	0.3753014	10101
-0.3438216	00110	0.4202918	10110
-0.2973706	00111	0.4642707	10111
-0.2502041	01000	0.5071322	11000
-0.2024353	01001	0.5487733	11001
-0.1541793	01010	0.5890937	11010
-0.1055523	01011	0.6279963	11011
-0.0566713	01100	0.6653876	11100
-0.0076539	01101	0.7011775	11101
0.0413820	01110	0.7352800	11110
0.0903182	01111	0.7676129	11111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-5. táblázat: A 4. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.8697892	00000	-0.2621310	10000
-0.8444068	00001	-0.2141980	10001
-0.8169663	00010	-0.1657429	10010
-0.7875345	00011	-0.1168839	10011
-0.7561831	00100	-0.0677399	10100
-0.7229886	00101	-0.0184309	10101
-0.6880320	00110	0.0309231	10110
-0.6513983	00111	0.0802017	10111
-0.6131769	01000	0.1292848	11000
-0.5734009	01001	0.1780529	11001
-0.5323472	01010	0.2263869	11010
-0.4899359	01011	0.2741691	11011
-0.4463305	01100	0.3212830	11100
-0.4016372	01101	0.2676139	11101
-0.3559649	01110	0.4130488	11110
-0.3094251	01111	0.4574769	11111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-6. táblázat: Az 5. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.5386610	0000	0.0804712	1000
-0.4685838	0001	0.1610360	1001
-0.3954149	0010	0.2405382	1010
-0.3196371	0011	0.3184534	1011
-0.2417503	0100	0.2942675	1100
-0.1622685	0101	0.4674802	1101
-0.0817161	0110	0.5376085	1110
-0.0006245	0111	0.6041898	1111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-7. táblázat: A 6. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.6770824	0000	-0.1733826	1000
-0.6230369	0001	-0.1028770	1001
-0.5658298	0010	-0.0318494	1010
-0.5057514	0011	0.0393399	1011
-0.4431067	0100	0.1103295	1100
-0.3782134	0101	0.1807592	1101
-0.3114009	0110	0.2502717	1110
-0.2430083	0111	0.3185142	1111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-8. táblázat: A 7. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.3958643	000	0.1656727	100
-0.2606314	001	0.3048646	101
-0.1200220	010	0.4377676	110
0.0230632	011	0.5616401	111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-9. táblázat: A 8. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.5693170	000	-0.0274243	100
-0.4450148	001	0.1169218	101
-0.3113724	010	0.2588140	110
-0.1711949	011	0.3952741	111

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-10. táblázat: A 9. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.2765472	00	0.3305883	10
0.0283959	01	0.6607586	11

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-11. táblázat: A 10. sz. parciális korrelációs együttható vonalkódjai

QUANTIZER LEVEL	LINE CODE	QUANTIZER LEVEL	LINE CODE
-0.3866179	00	0.0793400	10
-0.1581725	01	0.3123044	11

QUANTIZER LEVEL = KVANTÁLÓ SZINT
LINE CODE = VONALKÓD

A7-12. táblázat: A kvantáló *qgain* hosszútávú prediktor vonalkódolása

qgain	LINE CODE
0.100	00
0.325	01
0.600	10
0.900	11

LINE CODE = VONALKÓD

A7-13. táblázat: A *delay* hosszútávú prediktor vonalkódolása

delay	LINE CODE
32	000000
33	000001
34	000010
35	000011
…	…
63	011111
64	100000
65	100001
66	100010
…	…
92	111100
93	111101
94	111110
95	111111

delay = késés
LINE CODE = VONALKÓD

A7-14. táblázat: A gerjesztő keretek első és második impulzus-amplitúdójának vonalkódjai

DECISION THRESHOLD	CONTENTS OF *QAMP[1]* AND *[2]*	LINE CODE
-2.4010	-2.7330	1111
-1.8440	-2.0690	1110
-1.4370	-1.6180	1101
-1.0990	-1.2560	1100
-0.7996	-0.9424	1011
-0.5224	-0.6568	1010
-0.2582	-0.3881	0110
-0.0000	-0.1284	1000
0.0000	0.1284	0000
0.2582	0.3881	0001
0.5224	0.6568	0010
0.7996	0.9424	0011
1.0990	1.2560	0100
1.4370	1.6180	0101
1.8440	2.0690	0110
2.4010	2.7330	0111

DECISION THRESHOLD = DÖNTÉSI KÜSZÖB
CONTENTS OF *QAMP[1]* AND *QAMP[2]* = A *QAMP[1] és QAMP[2]* tartalma
LINE CODE = VONALKÓD

A7-15. táblázat: A gerjesztő keretek harmadik impulzus-amplitúdójának vonalkódjai

DECISION THRESHOLD	CONTENTS OF *QAMP[3]*	LINE CODE
-1.7480	-2.1520	111
-1.0500	-1.3440	110
-0.5006	-0.7560	101
-0.0000	-0.2451	100
0.0000	0.2451	000
0.5006	0.7560	001
1.0500	1.3440	010
1.7480	2.1520	011

DECISION THRESHOLD = DÖNTÉSI KÜSZÖB
CONTENTS OF *QAMP[3]* = A *QAMP[3]* tartalma
LINE CODE = VONALKÓD

A7-16. táblázat: Az egyes gerjesztő keretekben lévő három impulzus-helyzet vonalkódjai

PULSE POSITION	LINE CODE
0	00000
1	00001
2	00010
3	00011
4	00100
…	…
15	01111
16	10000
…	…
29	11101
30	11110
31	11111

PULSE POSITION = IMPULZUS-HELYZET
LINE CODE = VONALKÓD

A7-17. táblázat: Az átviteli keret szerkezete

FRAME COMPONENT (line code)	REFERENCE	LENGTH (bits)
Partial correlation coefficient No.1	Table A7-2	6
Partial correlation coefficient No.2	Table A7-3	6
Partial correlation coefficient No.3	Table A7-4	5
Partial correlation coefficient No.4	Table A7-5	5
Partial correlation coefficient No.5	Table A7-6	4
Partial correlation coefficient No.6	Table A7-7	4
Partial correlation coefficient No.7	Table A7-8	3
Partial correlation coefficient No.8	Table A7-9	3
Partial correlation coefficient No.9	Table A7-10	2
Partial correlation coefficient No.10	Table A7-11	2
Hamming code word (5 bits plus odd parity)	4.10.3.1	6
Burst error detection	4.10.3.2	8
Long term correlation gain	Table A7-12	2
Long term correlation delay	Table A7-13	6
Excitation frame No. 1 (pulse no. 1 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 1 amplitude)	Table A7-14	4
Excitation frame No. 1 (pulse no. 2 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 2 amplitude)	Table A7-14	4
Excitation frame No. 1 (pulse no. 3 position)	Table A7-16	5
Excitation frame No. 1 (pulse no. 3 amplitude)	Table A7-15	3
Excitation frame No. 2 (identical to No. 1)	-	26
Excitation frame No. 3 (identical to No. 1)	-	26
Excitation frame No. 4 (identical to No. 1)	-	26
Excitation frame No. 5 (identical to No. 1)	-	26

FRAME COMPONENT (line code) = Keret alkotórész (vonalkód)
REFERENCE = Hivatkozás
LENGTH (bits) = Hossz (bitek)
Partial correlation coefficient = Parciális korrelációs együttható
Hamming code word (5 bits plus odd parity) = Hamming kód szó (5 bit plusz páratlan paritás)
Burst error detection = Jelsorozat hiba érzékelés
Long term correlation gain = Hosszú idejű korrelációs nyereség
Long term correlation delay = Hosszú idejű korrelációs késés
Excitation frame = Gerjesztő keret

pulse = impulzus
position = helyzet
amplitude = amplitúdó
identical to No. 1 = azonos az 1 sz.-val

A7-18. táblázat: Védett parciális korrelációs együttható vonalkód bitek

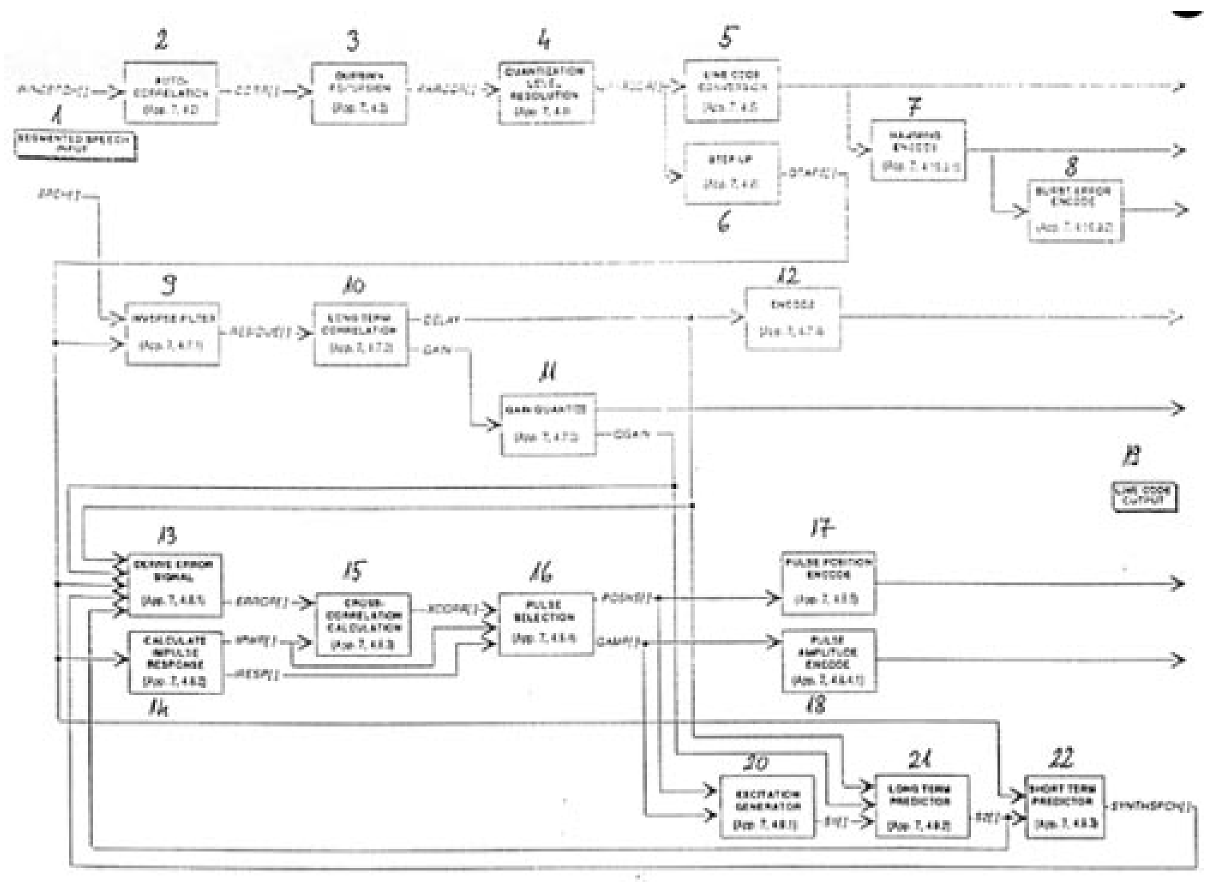
	Parcor coefficient									
	1	2	3	4	5	6	7	8	9	10
Protected bits ()	543210	543210	43210	43210	3210	3210	210	210	10	10

Parcor coefficient = Parciális korrelációs együttható
Protected bits = Védett bitek

A7-19. táblázat: Jelsorozat bit-hiba érzékelés számítási módszer

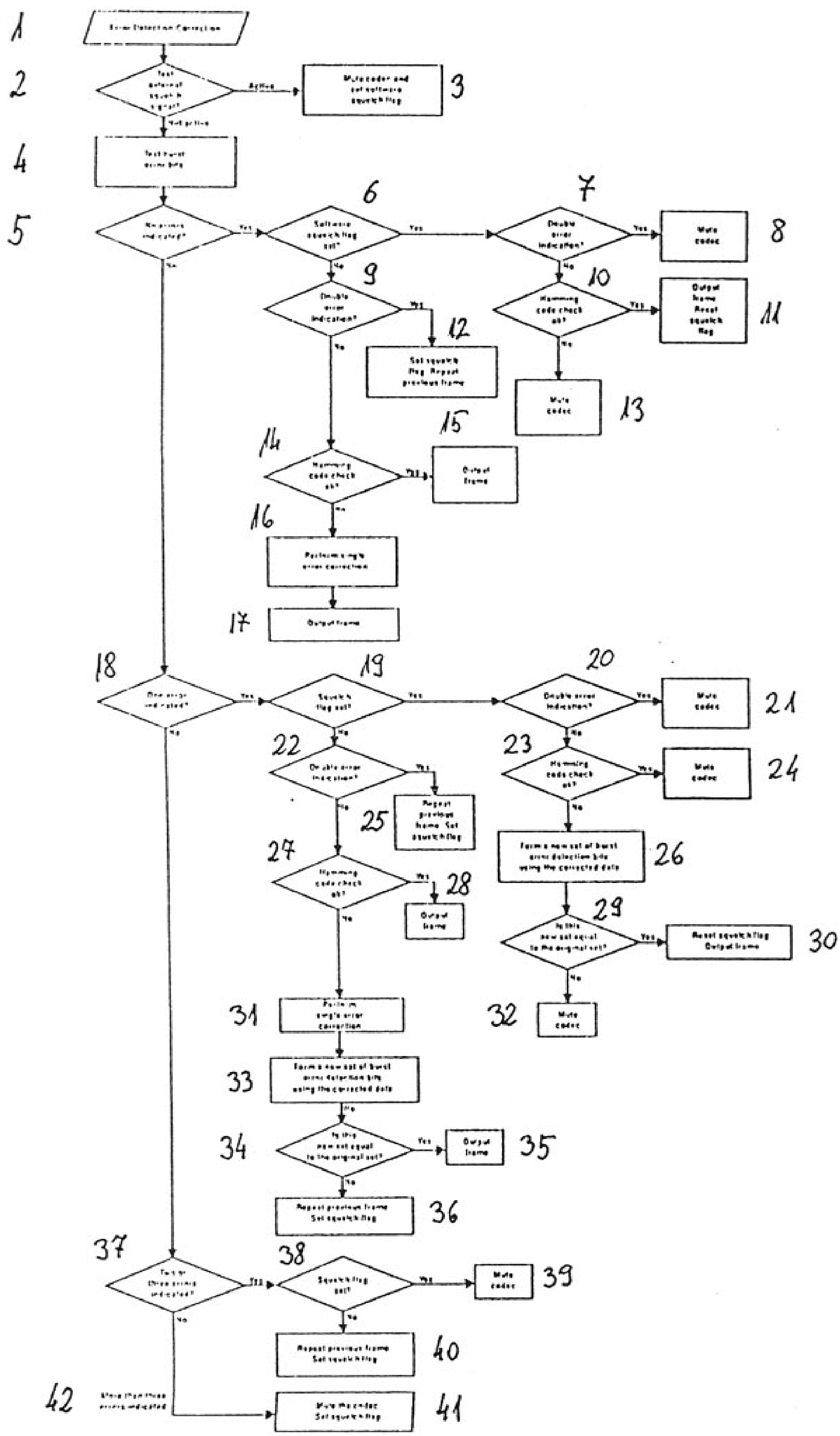
pppppppp
pppppppp
pppppppp
ppeeeeee
bbbbbbbb

A 7. Függelék ábrái



A7 - 1. ábra
AMSS hangkódoló algoritmus

Ábraszöveg az A7-1. ábrához:
1. Szegmentált beszéd bevitel
2. Autokorreláció (7. függelék, 4.2 pont)
3. Durbin rekúrzió (7. függelék, 4.3 pont)
4. Kvantálási szintfelbontás (7. függelék, 4.4 pont)
5. Vonalkód konverzió (7. függelék, 4.5 pont)
6. Fokozás (7. függelék, 4.6 pont)
7. Hamming kódolás (7. függelék, 4.10.3.1 pont)
8. Bithiba kódolás (7. függelék, 4.10.3.2 pont)
9. Inverz szűrő (7. függelék, 4.7.1 pont)
10. Hosszútávú korreláció (7. függelék, 4.7.2 pont)
11. Gain kvantálás (7. függelék, 4.7.3 pont)
12. Kódolás (7. függelék, 4.7.4 pont)
13. Derivált hibajel (7. függelék, 4.8.2 pont)
14. Impulzus válasz kiszámítása (7. függelék, 4.8.2 pont)
15. Kereszt-korreláció számítás (7. függelék, 4.8.3 pont)
16. Impulzus kiválasztás (7. függelék, 4.8.4 pont)
17. Impulzus-helyzet kódolás (7. függelék, 4.8.5 pont)
18. Impulzus-amplitúdó kódolás (7. függelék, 4.8.4.1 pont)
19. Vonalkód kimenet
20. Gerjesztő generátor (7. függelék, 4.9.1 pont)
21. Hosszútávú prediktor (7. függelék, 4.9.2 pont)
22. Rövidtávú prediktor (7. függelék, 4.9.3. pont)



A7-2. ábra
Hibaérzékelés/javítási folyamat

Ábraszöveg az A7-2. ábrához:
1. Hibaérzékelés/javítás
2. Teszt, külső zajvágó jel?
3. Kodek némítás és szoftver zajvágó jel beállítás
4. Teszt, hibajelző bitek
5. Nincs hiba jelezve?
6. Szoftver zajvágó jel beállítva?
7. Kettős hibajelzés?
8. Kodek némítás
9. Kettős hibajelzés?
10. Hamming-kód ellenőrzés OK?
11. Kimenő keret, zajvágó jel reszet
12. Zajvágó jel beállítás, előző keret megismétlése
13. Kodek némítása
14. Hamming-kód ellenőrzés OK?
15. Kimenő keret
16. Egyszeri hibajavítás végrehajtása
17. Kimenő keret
18. Egy hiba van jelezve?
19. Zajvágó jel beállítva?
20. Kettős hibajelzés?
21. Kodek némítása
22. Kettős hibajelzés?
23. Hamming-kód ellenőrzés OK?
24. Kodek némítása
25. Előző keret megismétlése, zajvágó jel beállítása
26. Új bithiba érzékelő bit-készlet kialakítása a kijavított adatok használatával
27. Hamming-kód ellenőrzés OK?
28. Kimenő keret
29. Az új készlet egyenlő-e az eredeti készlettel?
30. Zajvágó jel reszet, kimenő keret
31. Egyszeri hibajavítás végrehajtása
32. Kodek némítása
33. Új bithiba érzékelő bit-készlet kialakítása a kijavított adatok használatával
34. Az új készlet egyenlő-e az eredeti készlettel?
35. Kimenő keret
36. Előző keret megismétlése, zajvágó jel beállítása
37. Kettő vagy három hiba van jelezve?
38. Zajvágó jel beállítva?
39. Kodek némítása
40. Előző keret megismétlése, zajvágó jel beállítása
41. Kodek némítása, zajvágó jel beállítása
42. Több mint három hiba van jelezve

5. FEJEZET: S-MÓDÚ SSR LEVEGŐ-FÖLD ADAT-KAPCSOLAT

Megjegyzés. - Az S-módú SSR levegő-föld adat-kapcsolatra, a Légiforgalmi Távközlési Hálózattal (ATN) összefüggésben, mint S-módú alhálózatra is hivatkoznak.

5.1 AZ S-MÓDÚ AL-HÁLÓZATRA VONATKOZÓ MEGHATÁROZÁSOK

Légi-kezdeményezésű Protokol *(Air-initiated protocol).* Egy légijármű S-módú fedélzeti berendezése által kezdeményezett eljárás, egy szabvány hosszúságú vagy kiterjesztett hosszúságú, a fedélzetről származó közlemény továbbítására a földi berendezés részére.

Légijármű *(Aircraft).* A légijármű kifejezést használhatják hivatkozásként az S-módú sugárzó adó berendezésre, készülékre (azaz légijármű/szállító eszköz), ahol alkalmazható.

Légijármű Hálózati Végponti Berendezés *(ADCE) (Aircraft data circuit-terminating equipment).* Egy, a légijármű fedélzetén található adott hálózati végponti berendezés, amely egy, a fedélzeten található adat-kapcsolat vezérlő egységhez (ADLP) kapcsolódik. Ez egy, az S-módú adat-kapcsolathoz tartozó egyedi protokolt működtet a légijármű és a föld közötti adattovábbítás számára.

Fedélzeti Adat-kapcsolat Vezérlő Egység *(ADLP) (Airborne data link processor).* Egy, a légijárművön található vezérlő egység, amely egyedi az adott levegő-föld adat-kapcsolatban (pl. az S-módú kapcsolatban), és amely a csatorna kezelését biztosítja, valamint a közleményeket továbbítás céljára részekre bontja és/vagy ismét összeállítja azokat. Ez az egyik oldalán a légijármű olyan egységeihez kapcsolódik, melyek valamennyi adat-kapcsolati rendszerben közösek, a másik oldalán pedig magához a levegő-föld kapcsolathoz.

Légijármű Cím *(Aircraft address).* 24 bit egyedi kombinációja, amelyet egy légijárműhöz rendelhetnek, a levegő-föld kommunikáció, a navigáció és a radarfelderítés céljára.

Légijármű/Közlekedési Eszköz *(Aircraft/vehicle).* Használhatják egy gép, vagy egy eszköz meghatározására, amely képes a légkörben repülni, vagy egy közlekedési eszköz a repülőtér mozgási területén található (azaz a futópályák és a gurulóutak).

BDS B-adatátvitel Adat Kiválasztó *(BDS Comm-B Data Selector)* A 8-bites BDS kód meghatározza azt a regisztert, amelynek a tartalmát továbbítani kell a B-adatátvitel válasz MB mezőjében. Ezt két, egyenként 4-bites bitcsoportban ábrázolják, BDS1 (a legmagasabb helyiértékű 4 bit) és BDS2 (a legkisebb helyiértékű 4 bit).

Általános Adás *(Broadcast).* Az S-módú rendszeren belüli protokol, amely lehetővé teszi, hogy a fedésterületen belül lévő összes légijármű számára a fedélzetre irányuló közleményt (uplink message) küldjenek, valamint hogy a fedélzetről leadott közlemény (downlink message) álljon rendelkezésre valamennyi lekérdező állomás (interrogator) számára, amelynek fedésterületén belül található az a légijármű, amely ilyen közleményt kíván küldeni.

Teljesítőképesség Jelentés *(Capability report).* Információ, amely jelzi, hogy a válaszjeladónak van-e olyan adat-kapcsolati teljesítőképessége, ahogy azt a minden állomást hívó adásra, vagy a lekérdezés nélküli válaszjel adásra adott teljesítőképesség mezőjében (CA) jelenti (lásd az "Adat-kapcsolati Képesség Jelentés"-t).

Kizárás *(Close-out).* Az S-módú lekérdező állomásról származó utasítás, amely lezárja az S-módú adat-kapcsolati réteg kommunikáció végrehajtását /tranzakciót/.

A Lekérdező Állomások Csoportja *(Cluster of interrogators).* Két vagy több lekérdező állomás (interrogator), ugyanazzal a lekérdező azonosító kóddal (II), melyek együttműködnek egymással azért, hogy biztosítható legyen a felderítés interferencia-mentessége és valamennyi lekérdező állomás adat-kapcsolati teljesítménye a közös fedésterületen belül.

A-Adatátviteli Csomag *(Comm-A).* Egy 112 bites lekérdezés, ami tartalmazza az 56 bit hosszúságú A-Közlemény mezőt /MA/. Ezt a mezőt a fedélzetre irányuló szabvány hosszúságú közlemények (SLM) és az általános adás protokolok használják.

B-Adatátviteli Csomag *(Comm-B).* Egy 112 bites válasz, ami tartalmazza az 56 bit hosszúságú B-Közlemény mezőt /MB/. Ezt a mezőt a fedélzetről származó szabvány hosszúságú közlemények (SLM) és a földről kezdeményezett, valamint az általános adás protokolok használják.

C-Adatátviteli Csomag *(Comm-C).* Egy 112 bit hosszúságú lekérdezés, amely tartalmazza a 80 bit hosszú C-Közlemény mezőt /MC/. Ezt a mezőt a fedélzetre irányuló kiterjesztett hosszúságú közlemény (ELM) protokol használja.

D-Adatátviteli Csomag *(Comm-D).* Egy 112 bit hosszúságú válasz, amely tartalmazza a 80 bit hosszú D-Közlemény mezőt /MD/. Ezt a mezőt a fedélzetről származó kiterjesztett hosszúságú közlemény (ELM) protokol használja.

Összeköttetés *(Connection).* Logikai kapcsolat egy kommunikációs rendszerben, az egyszintű entitások között.

Adat-kapcsolat Teljesítőképesség Jelentés *(Data link capability report).* Egy B-Adatávitel válaszban megadott információ, amely azonosítja a légijármű fedélzetén lévő berendezés teljes S-módú kommunikációs teljesítő-képességét.

A Fedélzetről Leadott Adattovábbítás *(Downlink).* A fogalom a légijármű fedélzetéről a föld felé továbbított adatokra vonatkozik. Az S-módú levegő-föld jeleket az 1090 MHz-es válasz frekvencia csatornán továbbítják.

Kiterjesztett Hosszúságú Közlemény (ELM) *(Extended length message(ELM)).* Egy sorozat C-adatátviteli /Comm-C/ lekérdezés (a fedélzetre irányuló /uplink/ ELM), melyet a közben érkező válaszok igénye nélkül továbbítanak, vagy egy sorozat D-adatátviteli /Comm-D/ válasz (fedélzetről leadott /downlink/ ELM), melyet a közben beérkező kérdezések igénye nélkül továbbítanak.

A Fedélzetre Irányuló ELM *(UELM) (Uplink ELM).* Ez a fogalom a 112 bit hosszúságú S-módú C-adatátviteli /Comm-C/ lekérdezésekkel megvalósított kiterjesztett hosszúságú, fedélzetre irányuló össze-köttetésre vonatkozik. Valamennyi lekérdezés tartalmazza a 80 bit hosszúságú C-adatátviteli /Comm-C/ közlemény mezőt (MC).

A Fedélzetről Leadott ELM *(DELM) (Downlink ELM).* Ez a fogalom a 112 bit hosszúságú S-módú D-adatátviteli /Comm-D/ válaszokkal megvalósított kiterjesztett hosszúságú, fedélzetről leadott össze-köttetésre vonatkozik. Valamennyi válasz-közlemény tartalmazza a 80 bit hosszúságú D-adatátviteli /Comm-D/ közlemény mezőt (MD).

Keret *(Frame).* Az adatkapcsolati szinten az adatátvitel alapegysége. Az S-módú alhálózat vonatkozásában egy-egy keret 1-től 4-ig terjedően tartalmazhat A-adatátviteli, illetve B-adatátviteli szegmenst, és 2-től 16-ig terjedően C-adatátviteli szegmenst, vagy 1-től 16-ig terjedően D-datátviteli szegmenst.

Általános Formázó/Kezelő *(GFM) (General formatter/manager (GFM)).* A légijármű azon funkciója, amely a válaszjeladó regisztereibe kerülő közlemények összeállításáért felelős. Feladata még az olyan hibajelenségek felderítése és kezelése is, mint a bemenő adatok hiánya.

Földi Hálózati Végponti Berendezés *(GDCE) (Ground data circuit -terminating equipment (GDCE)).* Egy olyan sajátosan földi hálózati végponti berendezés, amely egy földi telepítési rendszerű adat-kapcsolat vezérlő egységéhez (GDLP) kapcsolódik. Ez egy az S-módú adat-kapcsolathoz tartozó egyedi protokolt működtet a légijármű és a föld közötti adat-továbbítás számára.

Földi Telepítési Rendszerű Adat-kapcsolat Vezérlő Egység *(GDLP) (Ground data link processor (GDLP)).* Egy olyan földi telepítési rendszerű vezérlő egység, amely egyedi az adott levegő-föld adatkapcsolatban (pl. az S-módú kapcsolatban), és amely biztosítja a csatorna kezelését, valamint a közleményeket a továbbítás céljára részekre bontja, és/vagy ismét összeállítja. Ez az egyik oldalán (a hálózati végponti berendezés /DCE/ segítségével) a földi berendezés olyan egységeihez kapcsolódik, amelyek valamennyi adat-kapcsolati rendszerben általánosak, a másik oldalon pedig magához a levegő-föld kapcsolathoz.

Földről Kezdeményezett B-adatátvitel *(GICB) (Ground-initiated Comm-B (GICB)).* A földről kezdeményezett B-adatátvitel protokol lehetővé teszi a lekérdező állomás részére azt, hogy a meghatározott forrásból eredő B-közlemény /MB/ mezőben lévő válasz adatokat kiemelje.

Földről Kezdeményezett Protokol *(Ground-initiated protocol).* Egy S-módú, a lekérdező állomás által kezdeményezett eljárás a szabvány hosszúságú, vagy kiterjesztett hosszúságú közleményeknek a légijármű S-módú berendezései részére történő továbbítására.

Légijármű Fedélzetéről Kezdeményezett S-módú B-adatátviteli (AICB) protokol *(Mode S air-initiated Comm-B (AICB) protocol).* Egy S-módú válaszjeladó (transponder) által kezdeményezett eljárás egy egyszeri B-adatátviteli szegmensnek a légijármű fedélzetén található berendezéstől történő továbbítása céljára.

S-módú Általános Adás Protokolok *(Mode S broadcast protocols).* Olyan eljárások, melyek lehetővé teszik szabvány hosszúságú fedélzetre irányuló, vagy a fedélzetről leadott közlemények vételét egynél több válaszjeladóval, illetve földi telepítésű lekérdező állomással külön-külön.

S-módú Földről Kezdeményezett B-adatátviteli (GICB) protokol *(Mode S ground-initiated Comm-B (GICB) protocol).* Egy, a lekérdező állomás által kezdeményezett S-módú eljárás a fedélzeten elhelyezett S-módú berendezéstől származó egyetlen olyan B-adatátviteli szegmens kiemelésére, amely tartalmazza az S-módú válaszjeladón belüli 255 B-adatátviteli regiszter valamelyikének tartalmát.

S-módú Több Helyre Irányított Protokol *(Mode S multisite-directed protocol).* Egy eljárás annak biztosítására, hogy egy fedélzetről leadott szabvány hosszúságú, vagy kiterjesztett hosszúságú közlemény feldolgozását és lezárását (extraction, close-out) csak a légijármű által kiválasztott egyedi S-módú lekérdező állomás befolyásolhassa.

S-módú Csomag *(Mode S packet).* Az S-módú alhálózati szabványnak megfelelő csomag, amely arra szolgál, hogy minimalizálja a levegő-föld kapcsolat által igényelt sávszélességet. Az ISO-8208 csomagokat (packets) S-módú csomagokba lehet transzformálni és viszont.

S-módú Specifikus Protokol *(MSP) (Mode S specific protocol (MSP)).* Olyan protokol, amely korlátozott adatcsomag (datagram) szolgáltatást biztosít az S-módú alhálózaton belül.

S-módú specifikus szolgáltatások *(Mode S specific services).* Az S-módú rendszer által biztosított kommunikációs szolgáltatások olyan készlete, amelyek más levegő-föld alhálózatokból nem elérhetők, ezért nem képesek a kölcsönös együttműködésre.

S-módú specifikus szolgáltatási entitás *(SSE) (Mode S specific services entity (SSE)).* Egy, a Fedélzeti/Földi Adat-kapcsolat Vezérlő Egységen /XDLP/ belül, a rendszerben található entitás, amely lehetővé teszi az S-módú specifikus szolgáltatások elérését.

Csomag *(Packet).* A hálózati rétegen belüli összeköttetési berendezések közötti adat-továbbítás alap egysége (például egy ISO 8208 csomag vagy egy S-módú csomag).

Megkívánt Navigációs Teljesítmény *(RNP) (Required navigation performance (RNP)).* Annak a navigációs teljesítmény pontosságnak a meghatározása amely egy meghatározott légtéren belül szükséges.

Szegmens *(Segment).* Egy közleménynek azon része, amit be lehet illesztetni egy egyedüli A-Közlemény/B-Közlemény /MA/MB/ mezőbe egy szabvány hosszúságú közlemény esetében, vagy egy C-Közlemény/D-Közlemény /MC/MD/ mezőbe egy kiterjesztett hosszúságú közlemény esetében. Ez a kifejezés az ezeket a mezőket magába foglaló S-módú továbbításokra is alkalmazott.

Szabvány Hosszúságú Közlemény *(SLM) (Standard length message (SLM)).* Egy kiválasztottan címzett A-adatátviteli /Comm-A/ lekérdezéseket és/vagy B-adatátviteli /Comm-B/ válaszokat felhasználó digitális adat-csere közlemény (lásd a "Comm-A"-t és "Comm-B"-t).

Al-hálózat *(Subnetwork).* Egy olyan ténylegesen megvalósított adat-hálózat, amely azonos protokolt és címzési tervet alkalmaz, és egy egyedüli hatóság ellenőrzése alatt áll.

Al-hálózat Kezelési Entitás *(SNME) (Subnetwork management entity (SNME)).* Egy Földi telepítési rendszerű adat-kapcsolat vezérlő egységen /GDLP-n/ belüli entitás, amely az alhálózat kezelését végzi, és összeköttetést tart a közbenső vagy végponti rendszerek egyenrangú entitásaival.

Idő-túllépés *(Timeout).* Egy tranzakció törlése az után, hogy a résztvevő entitások egyike egy előre meghatározott időtartamon belül nem biztosította az igényelt választ.

A Fedélzetre Irányuló Közlemény *(Uplink).* Egy fogalom, mely a földről egy légijármű fedélzetére irányuló adatok továbbítására vonatkozik. Az S-módú föld-levegő jeleket az 1 030 MHz-es lekérdező frekvencia csatornán továbbítják.

XDCE *(XDCE).* Általános fogalom, amely egyaránt vonatkozik a Légijármű hálózati végponti berendezésre /ADCE-re/ és a Földi hálózati végponti berendezésre /GDCE-re/.

XDLP *(XDLP).* Általános fogalom, amely egyaránt vonatkozik a Fedélzeti adat-kapcsolat vezérlő egységére /ADLP-re/ és a Földi Telepítési rendszerű adat-kapcsolat vezérlő egységére /GDLP-re/.

5.2 AZ S-MÓDÚ AL-HÁLÓZAT JELLEMZŐI

5.2.1 Általános előírások

1. Megjegyzés. - ISO Referencia dokumentum. Amikor ebben a szabványban az "ISO 8208" dokumentumra hivatkoznak, akkor ez az alábbi ISO szabványt jelenti: "Information technology - Data communications - X.25 Packet Layer Protocol for Data Terminal Equipment, Reference Number ISO/IEC 8208: 1990(E)" - Információtechnológia - Adatösszeköttetések - X.25 csomag réteg a Hálózati Végponti Berendezések számára, Referencia száma: ISO/IEC 8208: 1990(E).

2. Megjegyzés. - Az S-módú alhálózat teljes felépítését a következő oldalon található ábrán mutatjuk be.

3. Megjegyzés. - A feldolgozás három különböző úton folyik. Az első a virtuális kapcsolt adathálózatok feldolgozását (SVC-k), a második az S-módú specifikus szolgáltatások feldolgozását, és a harmadik az alhálózat vezérlési információinak feldolgozását tartalmazza. Az SVC-k az újraformázási folyamatot és a légijármű hálózati végponti berendezések /ADCE/, vagy a földi hálózati végponti berendezések

/GDCE/ funkcióit használják. Az S-módú specifikus szolgáltatások az S-módú specifikus szolgáltatási entitás (SSE) funkcióit használják fel.

5.2.1.1 *A közlemény kategóriák.* Az S-módú alhálózat csak olyan légiforgalmi távközlést szolgálhat, melyeket a repülésbiztonság és a repülés rendszerességének biztosítása kategóriába soroltak, ahogy azt az Annex 10, II. Kötet, 5. Fejezet, 5.1.8.4. és 5.1.8.6 pontjában meghatározták.

5.2.1.2 *Jelek a térben.* Az S-módú alhálózat térbeli-jel jellemzőinek meg kell felelniük az Annex 10, IV. Kötet, 3. Fejezet, 3.1.2 pontjában található előírásoknak.

5.2.1.3 *Kód és bájt függetlenség.* Az S-módú alhálózatnak képesnek kell lennie a digitális adatok kód- és bájt-független továbbítására.

5.2.1.4 *Adatátvitel.* Az S-módú adat-kapcsolaton keresztül az adatokat szegmentálva kell továbbítani, akár a szabvány hosszúságú közlemény (SLM) protokolok, akár a kiterjesztett hosszúságú közlemény (ELM) protokolok felhasználásával, ahogy azt az Annex 10, IV. kötetének, 3.1.2.6.11 és 3.1.2.7 pontjában meghatározták.

1. Megjegyzés. - Egy szabvány hosszúságú közlemény /SLM/ szegmensnek egy 56-bites A-Közlemény /MA/, vagy B-Közlemény /MB/ mező a tartalma. Egy kiterjesztett hosszúságú közlemény /ELM/ szegmensnek egy 80-bites C-Közlemény /MC/, vagy D-Közlemény /MD/ mező a tartalma.

2. Megjegyzés. - Egy szabvány hosszúságú közlemény /SLM/ keretnek maximálisan négy kapcsolt MA, vagy MB mező a tartalma. Egy ELM keretnek 2-től 16-ig terjedő MC, vagy 1-től 16-ig terjedő MD mező a tartalma.

5.2.1.5 *Bitek számozása.* Az adatátviteli mezők leírásában a biteket a továbbításuk sorrendjében kell számozni, az 1-es számú bittel kezdve. A bitek sorszámozását a többszegmensű keretek második és további szegmensein keresztül is folytatni kell. Hacsak nincs másképpen előírva, a bit-csoportokkal (mezőkkel) kódolt numerikus értékeket pozitív bináris számábrázolást használva kell kódolni, és az első továbbított bitnek a legmagasabb helyiértékű bitnek (MSB) kell lennie (az Annex 10, IV. kötet, 3.1.2.3.1.3 pont).

5.2.1.6 *Hozzárendelés nélküli bitek.* Amikor az adatok hossza nem elegendő ahhoz, hogy az a közlemény mezőn, vagy részmezőn belül az összes bitpozíciót elfoglalja, a hozzárendelés nélküli bit pozíciókat 0-ra kell állítani.

5.2.2 Keretek

5.2.2.1 A FEDÉLZETRE IRÁNYULÓ KERETEK

5.2.2.1.1 *Szabvány hosszúságú közlemény (SLM) keretek.* Egy SLM keretet maximálisan négy szelektív módon címzett A-adatátvitel /Comm-A/ szegmensből kell összeállítani.

Megjegyzés. - A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által vett valamennyi A-adatátvitel /Comm-A/ szegmenst (A-Közlemény /MA/ mező), a szegmenst biztosító lekérdezés első 32 bitje kíséri (Annex 10, IV. kötet 3.1.2.10.5.2.1.1 pont). Ezen a 32 biten belül található a 16-bites Speciális Jelölő (SD) mező (Annex 10, IV. kötet 3.1.2.6.1.4 pont).

5.2.2.1.1.1 *Speciális jelölő /SD/ mező.* Amikor a Jelölő azonosító mező (DI) (14-16. bit) tartalma az 1-es, vagy a 7-es kód-érték, akkor az összes A-adatátvitel /Comm-A/ lekérdezés SD (Speciális jelölő) mezőjét (17-32. bit) kell felhasználni, arra hogy a Lekérdező azonosító részmezőt /Interrogator identifier subfield/ (IIS, 17-20. bit), valamint a Kapcsolt A-adatátvitel /Comm-A/ részmezőt /Linked Comm-A subfield/ (LAS, 30-32. bit) beszerezzék. A végrehajtandó művelet a kapott LAS értékétől függ. A LAS és az IIS tartalmát meg kell őrizni, és össze kell kapcsolni az A-adatátvitel /Comm-A/

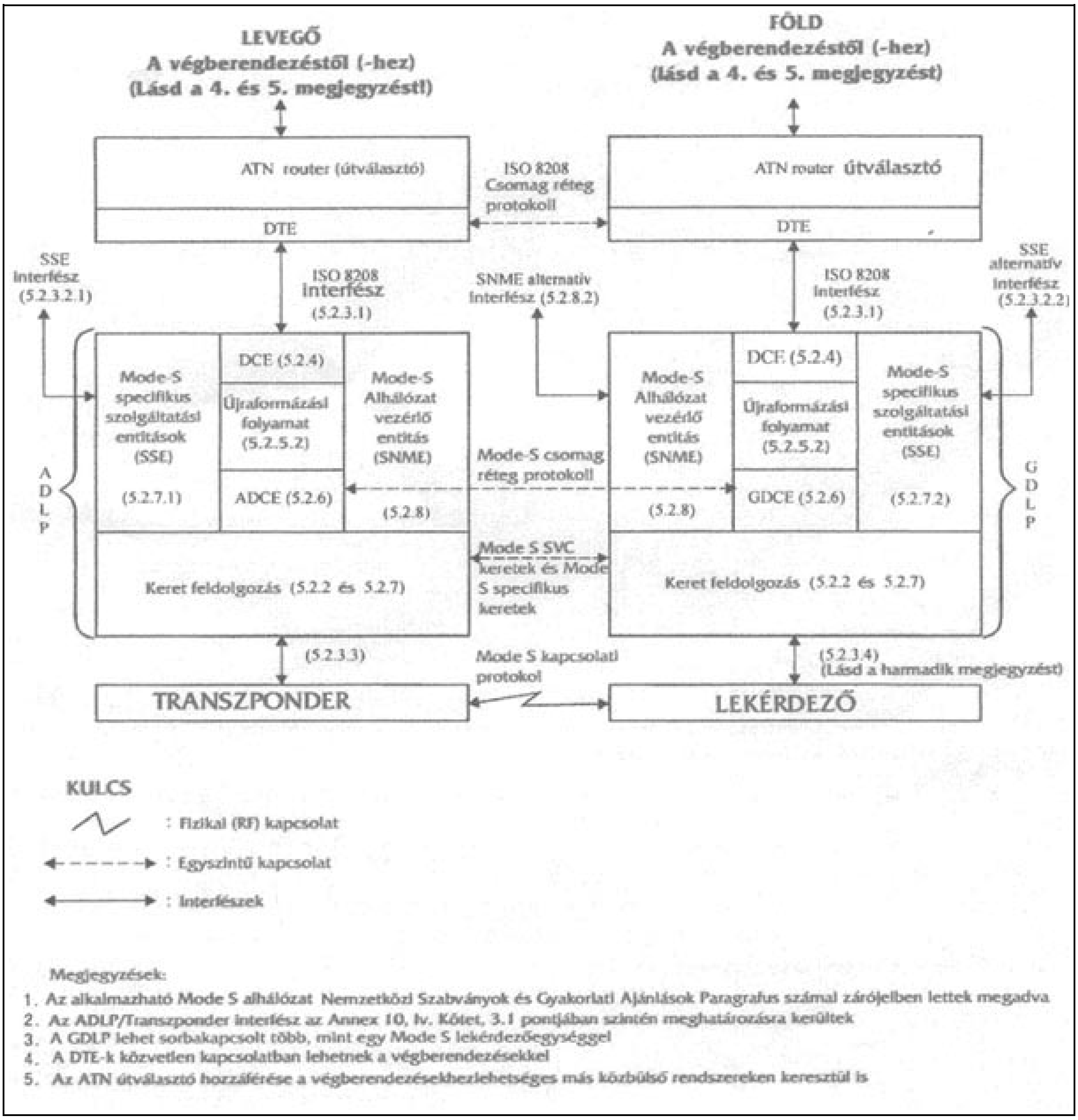
közlemény szegmenssel, hogy a keret összeállításánál használják, az alábbiak szerint. A LAS mezőn kívül az összes többi mezőnek meg kell felelnie az Annex 10, IV. Kötet 3.1.2 pont előírásainak.

Megjegyzés. - A Speciális jelölő /SD/ mező felépítése az 5.1 ábrán látható.*

* Az összes táblázat és ábra ennek a fejezetnek a végén van elhelyezve.

5.2.2.1.1.2 *A Kapcsolt A-adatátvitel részmező /LAS/ kódolása.*
A 3-bites LAS részmezőt az alábbiak szerint kell kódolni:
LAS JELENTÉSE
0 egyetlen szegmens
1 kapcsolt, első szegmens
2 kapcsolt, második, de nem utolsó szegmens
3 kapcsolt, harmadik, de nem utolsó szegmens
4 kapcsolt, negyedik és utolsó szegmens
5 kapcsolt, ötödik és utolsó szegmens
6 kapcsolt, hatodik és utolsó szegmens
7 hozzárendelés nélküli

Az S-módú al-hálózat funkcionális elemei



Kiegészítő ábraszöveg magyarázat:
DTE = Lekérdező adat végponti berendezés
DCE = Hálózati végponti berendezés
ADCE = Légijármű hálózati végponti berendezés
GDCE = Földi hálózati végponti berendezés
TRANSPONDER = Válaszjeladó
ADLP = Fedélzeti adat-kapcsolat vezérlő egység
GDLP = Földi telepítési rendszerű adat-kapcsolat vezérlő egység
ATN = Légiforgalmi távközlési hálózat

5.2.2.1.1.3 *Egyetlen Szabvány hosszúságú közlemény /SLM/ keret szegmens.* Ha a LAS = 0, akkor az A-közlemény /MA/ mezőben található adatot egy teljes keretnek kell tekinteni, és lehetővé kell tenni a további feldolgozását.

5.2.2.1.1.4 *Többszörös Szegmensű Szabvány hosszúságú közlemény /SLM/ keret.* A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ vennie és össze kell állítania a kapcsolt 56-bites A-adatátvitel /Comm-A/ szegmenseket, amelyek kapcsolatban vannak mind a tizenhat lehetséges Lekérdező azonosító (II) kóddal.
Az A-adatátvitel /Comm-A/ szegmensek helyes összekapcsolását annak megkövetelésével lehet biztosítani, hogy az összes A-adatátvitel /Comm-A/ szegmens egyforma Lekérdező azonosító részmező) /IIS/ értékkel rendelkezzen. Ha a Kapcsolt A-adatátvitel részmező /LAS/ értéke 1-től 6-ig terjed, a keretnek kettő - négy A-adatátvitel /Comm-A/ szegmensből kell állnia a következő bekezdésekben leírtak szerint.

5.2.2.1.1.4.1 *Kezdeti szegmens.* Ha a Kapcsolt A-adatátvitel részmező /LAS/ = 1, akkor az A-közlemény /MA/ mezőt a Szabvány hosszúságú /SLM/ keret kezdeti szegmenseként kell összeállítani. A kezdeti szegmenset addig kell tárolni, amíg a keret összes szegmensét nem vették, vagy a keretet nem törölték.

5.2.2.1.1.4.2 *Átmeneti, közbenső szegmens.* Ha a LAS = 2 vagy 3, akkor az A-közlemény /MA/ mezőt szám szerinti sorrendben kell összeállítani, mint az SLM keret egy átmeneti, közbenső szegmensét. Össze kell kapcsolni az ugyanolyan értékű Lekérdező azonosító részmezőt /IIS/ tartalmazó előző szegmensekkel.

5.2.2.1.1.4.3 *Végső szegmens.* Ha a LAS = 4, 5 vagy 6, akkor az A-közlemény /MA/ mezőt az SLM keret végső szegmenseként kell összeállítani. Össze kell kapcsolni az ugyanolyan értékű Lekérdező azonosító részmezőt /IIS/ tartalmazó előző szegmensekkel.

5.2.2.1.1.4.4 *A Keret befejezése.* A keretet teljesnek kell tekinteni, és lehetővé kell tenni további feldolgozását, amint a keret összes szegmensét vették.

5.2.2.1.1.4.5 *A Keret törlése.* Egy nem teljes Szabvány hosszúságú közlemény /SLM/ keretet törölni, érvényteleníteni kell, ha az alábbi körülmények közül egy, vagy több fennáll:

a) Ugyanolyan Lekérdező azonosító részmező /IIS/ értékkel egy új kezdeti szegmenset (LAS = 1) vesznek. Ebben az esetben az új kezdeti szegmenset egy új Szabvány hosszúságú közlemény /SLM/ keret kezdeti szegmenseként kell megtartani;

b) A vett Kapcsolt A-adatátviteli /Comm-A/ /LAS/ részmező kódok sorrendje, (miután a több példányban előforduló kódokat törölték) nem egyezik meg az alábbi listában felsoroltakkal:
1) LAS = 0
2) LAS = 1,5
3) LAS = 1,2,6
4) LAS = 1,6,2
5) LAS = 1,2,3,4
6) LAS = 1,3,2,4
7) LAS = 1,2,4,3
8) LAS = 1,3,4,2
9) LAS = 1,4,2,3
10) LAS = 1,4,3,2

c) *Tc* másodperc eltelt azóta, hogy az utolsó A-adatátvitel /Comm-A/ szegmenset ugyanazzal a Lekérdező azonosító részmező /IIS/ értékkel vették (5-1. Táblázat).

5.2.2.1.1.4.6 *Szegmens törlése.* Egy Szabvány hosszúságú közlemény /SLM/ keret számára vett szegmenset érvénytelennek kell tekinteni, ha az egy közbenső vagy végső szegmens, és még nem vettek ugyanolyan IIS értékű kezdeti szegmenset.

5.2.2.1.1.4.7 *Szegmens ismétlése.* Ha a vett szegmens egy röviddel korábban vett azonos Lekérdező azonosító részmező /IIS/ értékű szegmens megismétlése, akkor az új szegmens le kell, hogy cserélje a korábban vett szegmenset.

Megjegyzés. - Az S-módú hálózati protokolok eljárása az A-adatátvitel /Comm-A/ szegmensek megismételt továbbítását eredményezheti.

5.2.2.1.2 *Kiterjesztett hosszúságú közlemény /ELM/ keret.* Egy uplink fedélzetre irányuló /uplink/ /ELM/
kiterjesztett hosszúságú közlemény /ELM/ keret 20-tól 160-ig terjedő bájtból kell, hogy felépüljön, és az Annex 10, IV. Kötet, 3.1.2.7 pontjában meghatározott protokol felhasználásával kell továbbítani alekérdező állomástól (interrogator) a válaszjeladó (transponder) felé. Valamenyi fedélzetre irányuló ELM szegmens első négy bitjének a C-közlemény /MC mező/ tartalmaznia kell az ELM-et továbbító S-módú lekérdező állomás lekérdező azonosító (II) kódját. A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ ellenőriznie kell egy befejezett fedélzetre irányuló ELM összes szegmense lekérdező azonosító /II/ kódját. Ha az összes szegmens ugyanazt az II kódot tartalmazza, akkor az II kódot minden szegmensben törölni kell, és a további közlemény biteket meg kell őrizni, mint felhasználói adatokat, további feldolgozás céljára. Ha az összes szegmens nem ugyanazt az II kódot tartalmazza, akkor a teljes fedélzetre irányuló ELM-t érvénytelennek kell tekinteni.

Megjegyzés.- Egy fedélzetre irányuló ELM keret 2-től 16-ig terjedő kapcsolt C-adatátvitel /Comm-C/ szegmensből áll, valamennyi 4 bites II kódot tartalmaz. Ily módon a csomag továbbítás kapacitása a fedélzetre irányuló kiterjesztett hosszúságú /ELM/ keretenként 19 - 152 bájt.

5.2.2.2 A FEDÉLZETRŐL LEADOTT (DOWNLINK) KERETEK

5.2.2.2.1 *Szabvány hosszúságú /SLM/ keret.* Egy fedélzetről leadott SLM keret maximálisan 4 B-adatátviteli /Comm-B/ szegmensből állhat. A keret első B-adatátviteli szegmensének B-közlemény /MB/ mezője egy 2-bites kapcsolt B-adatátvitel részmezőt (az LBS, a B-közlemény /MB/ mező 1 és 2 bitje) tartalmaz. Ezt az részmezőt kell felhasználni a maximálisan négy B-adatátviteli /Comm-B/ szegmens összekapcsolásának vezérlésére.

Megjegyzés. - A kapcsolt B-adatátvitel részmező /LBS/ használja az első két-bit pozíciót egy többszörös vagy egyedüli fedélzetről leadott /downlink/ Szabvány hosszúságú /SLM/ keret első szegmensében. Ebből kifolyólag 54 bit áll rendelkezésre az S-módú adatcsomag részére a fedélzetről leadott SLM keret első szegmensében. A fedélzetről leadott SLM keret megmaradó szegmenseinek, ha léteznek, 56 bit áll rendelkezésükre.

5.2.2.2.1.1 *Kapcsolt B-adatátviteli részmező /LBS/ kódolás.* Az összekötést a Szabvány hosszúságú közlemény /SLM/ keret kezdő B-adatátvitel /Comm-B/ szegmensének B-közlemény /MB/ mezője LBS részmezőjének kódolásával jelzik.

A kapcsolt B-adatátvitel részmező /LBS/ kódolása a következő:

LBS JELENTÉSE
0 egyetlen szegmens
1 egy két-szegmenses SLM keret kezdő szegmense
2 egy három-szegmenses SLM keret kezdő szegmense
3 egy négy-szegmenses SLM keret kezdő szegmense

5.2.2.2.1.2 *Az összekapcsolási protokol*

5.2.2.2.1.2.1 A B-adatátvitel /Comm-B/ protokolban a kezdő szegmenset a levegőből kezdeményezett, vagy több helyre irányított protokolok felhasználásával kell továbbítani. A kezdő szegmens LBS mezőjének jelezni kell a földnek a továbbításra kerülő további szegmensek számát (ha van ilyen). A kezdeti szegmensnek a válaszjeladóhoz (transponder) való továbbítását megelőzően az SLM keret megmaradó szegmenseit (ha vannak ilyenek) a válaszjeladóhoz kell továbbítani, a lekérdezőhöz (interrogator) való továbbítás céljából, a földi kezdeményezésű B-adatátviteli protokol felhasználásával. Ezeket a szegmenseket vezérlő kódok kísérik, amelyek ezeknek a szegmenseknek a földi kezdeményezésű B-adatátvitel /Comm-B/ 2., 3., 4. regiszterébe való beillesztését végzik, ennek a számozásnak megfelelően a keret második, harmadik, vagy negyedik szegmenséhez kapcsolódóan.

5.2.2.2.1.2.2 Az olyan, levegőből kezdeményezett szegmens kizárása, amelyet a protokol kezdeményezett, nem mehet végbe addig, amíg az összes szegmens nem került eredményesen továbbításra.

Megjegyzés. - A földi kezdeményezésű B-adatátvitel /Comm-B/ protokol felhasználását magában foglaló összekapcsolási eljárást a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ hajtja végre.

5.2.2.2.1.3 *A Szabvány hosszúságú közlemény /SLM/ keretek irányítása.* Ha az SLM keretnek több helyre irányítottnak kell lennie, akkor az ADLP-nek meg kell határoznia azon S-módú lekérdező, vagy lekérdező csoport lekérdező azonosító (II) kódját (5.2.8.1.3), amelyeknek az SLM keretet vennie kell.

5.2.2.2.2 *KITERJESZTETT HOSSZÚSÁGÚ KÖZLEMÉNY /ELM/ KERET*

Megjegyzés. - Egy fedélzetről leadott ELM egytől tizenhatig terjedő összekapcsolt szegmensből áll.

5.2.2.2.2.1 *Eljárás.* A fedélzetről leadott ELM kereteknek a közlemények továbbításához 28 bájttal egyenlő, vagy annál több bájtot kell felhasználni, és azokat az Annex 10, IV. kötet, 3.1.2.7 pontjában meghatározott protokol felhasználásával kell megformázni.

5.2.2.2.2.2 *ELM keretek irányítása.* Ha az ELM keretnek több helyre irányítottnak kell lennie, akkor az ADLP-nek meg kell határoznia azon S-módú lekérdező vagy lekérdező csoport lekérdező azonosító /II/ kódját (5.2.8.1.3), amelynek az ELM keretet vennie kell.

5.2.2.3 *Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ keret feldolgozás.* Keret feldolgozást minden S-módú csomagon el kell végezni (kivéve az MSP csomagot) az 5.2.2.3-tól az 5.2.2.5-ig terjedő pontokban meghatározottak szerint. Keret feldolgozását S-módú specifikus szolgáltatásoknál az 5.2.7 pontban meghatározottak szerint kell végezni.

5.2.2.3.1 *Csomag hosszúság.* Minden csomagot (beleértve az egy egyedüli keretbe multiplikált csomag csoportot is) egy olyan keretbe kell áthelyezni, amelyet a csomag befogadásához szükséges legkisebb számú szegmens képez. A felhasználói adat mezőnek hosszban a bájtok egy integrál többszörösének kell lenni. Egy 4-bites hossz paramétert (LV) kell biztosítani az S-módú ADAT, HÍVÁS KÉRÉS, HÍVÁS ELFOGADÁS, BONTÁS KÉRÉS és MEGSZAKÍTÁS csomag fej-részekben úgy, hogy a kicsomagolás alatt további bájtokat nem adnak a felhasználói adat mezőhöz. A felhasználói adat hosszúság /LV/ mezőnek kell meghatároznia a keret utolsó szegmensében használt teljes bitek számát. A felhasználói adat hosszúság /LV/ számítások során a 4-bites lekérdező azonosító /II/ kódot a fedélzetre irányuló kiterjesztett hosszúságú közlemény /ELM/ utolsó szegmensében (1) el kell hanyagolni azoknál a fedélzetre irányuló ELM kereteknél, amelyek páratlan számú C-adatátviteli /Comm-C/ szegmenssel rendelkeznek, és (2) számba kell venni a páros számú C-adatátviteli szegmenssel rendelkező fedélzetre irányuló ELM kereteknél. Az LV mezőben lévő értéket figyelmen kívül kell hagyni, ha a csomag multiplikált.

Megjegyzés. - Specifikus hossz mezőt használnak a multiplikált csomag egyes elemei hosszának meghatározására. Ezért a felhasználói adat hosszúság /LV/ mező értéket nem használják. Az LV mező hiba kezelése az 5-16. és 5-19. táblázatban került leírásra.

5.2.2.3.2 *Multiplikálás.* Amikor a multiplikált S-módú csomagokat egy egyedüli Szabvány hosszúságú közleménybe /SLM/ multiplikálják, akkor a Kiterjesztett hosszúságú közlemény /ELM/ keretben a következő eljárásokat kell alkalmazni. A csomagok multiplikálása a Fedélzeti adat-kapcsolat vezérlő egységen /ADLP/ belül nem alkalmazható különböző prioritású kapcsolt virtuális áramkörökhöz /SVC-k/ kapcsolódó csomagokra.

Megjegyzés. - A multiplikálás nem hajtható végre S-módú specifikus protokolú csomagokon.

5.2.2.3.2.1 *A multiplikálás optimalizálása*

Ajánlás. - *Amikor a multiplikált csomagok ugyanahhoz a Fedélzeti/Földi adat-kapcsolat vezérlő egységhez /XDLP/ való átvitelre várnak, akkor ezeket egy egyedüli keretbe kell multiplikálni azért, hogy optimalizálják az átmenő teljesítményt, feltéve, hogy a különböző prioritású kapcsolt virtuális áramkörökhöz kapcsolódó csomagok nincsenek egymással multiplikálva.*

5.2.2.3.2.2 *Szerkezet.* A multiplikált csomagok szerkezetének a következőnek kell lenni:

FEJ-RÉSZ: 6 vagy 8	HOSSZ: 8	1.CSOMAG: v	HOSSZ: 8	2.CSOMAG: v

Megjegyzés. - A mezőben a szám a mezőhosszt jelöli bitekben; a "v" azt jelöli, hogy a mező változó hosszúságú.

5.2.2.3.2.2.1 *Multiplikált fej-rész.* A multiplikált csomagok fej-része a következő:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2

Adat csomag S-módú specifikusprotokol csomag Felügyelő csomag Felügyelő típus 2.Töltő

Ahol:
Adat csomag típus (DP) = 0
S-módú specifikus protokol /MSP/ csomag típus (MP) = 1
Felügyelő csomag (SP) = 3
Felügyelő típus (ST) = 2

Megjegyzés. - A multiplikáló fej-részben használt mező szerkezet meghatározását lásd az 5-23. ábrán.

5.2.2.3.2.2.2 *Hossz*. Ez a mező foglalja magába a következő csomag hosszúságát bájtokban. Egy multiplikált ADAT csomagban lévő bármilyen hiba jelzés, mint például a HOSSZ mezőben jelzett hossz és az ezt a csomagot befogadó keret hossza közötti ellentmondás a csomag kizárását eredményezi, hacsak a hibát nem lehet a HOSSZ mezőre korlátozni, amely esetben a várható Csomag sorrend /PS/ értékű VISSZAUTASÍTÁS csomag küldhető.

Ajánlás. - *A multiplikált csomagokra az az ajánlott, hogy ha a teljes csomagot nem lehet de-multiplikálni /lebontás/, akkor az első összetevő csomagot egy alaki hibaként kell kezelni, és a továbbiakat érvényteleníteni.*

5.2.2.3.2.2.3 *Lezárás.* A multiplikált csomagok egy sorozatát magába foglaló keret végét a következő események egyikével kell meghatározni:

a) a mező hosszúsága mindenhol nulla; vagy

b) kevesebb, mint nyolc bit maradt a keretben.

5.2.2.3.3 S-MÓDÚ CSATORNA SORREND MEGŐRZÉSE

5.2.2.3.3.1 *Alkalmazás.* Abban az esetben, amikor a multiplikált S-módú keretek ugyanabból a Kapcsolt virtuális áramkörből /SVC/ arra várakoznak, hogy ugyanahhoz a Fedélzeti/Földi adat-kapcsolat vezérlő egységhez /XDLP/ továbbítsák őket, a következő eljárást kell alkalmazni.

5.2.2.3.3.2 *Eljárás*

1. Megjegyzés. - A Szabvány hosszúságú közlemény /SLM/ és a Kiterjesztett hosszúságú közlemény /ELM/ tranzakciók függetlenül történhetnek.

2. Megjegyzés. - A fedélzetre irányuló és a fedélzetről leadott tranzakciók függetlenül történhetnek.

5.2.2.3.3.2.1 *Szabvány hosszúságú közlemény /SLM/ keretek.* Az átvitelre váró SLM kereteket a vétel sorrendjében kell továbbítani.

5.2.2.3.3.2.2 *Kiterjesztett hosszúságú közlemény /ELM/ keretek.* Az átvitelre váró ELM kereteket a vétel sorrendjében kell továbbítani.

5.2.2.4 FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ KERET FELDOLGOZÁS

5.2.2.4.1 *ÁLTALÁNOS RENDELKEZÉSEK*

5.2.2.4.1.1 A GDLP-nek meg kell állapítania a felszerelt Fedélzeti adat-kapcsolat vezérlő egység /ADLP//válaszjeladó adat-kapcsolat képességét az adat-kapcsolat teljesítőképesség jelentésből (5.2.9), mielőtt azzal z ADLP-vel bármilyen adat-kapcsolati tevékenységbe kezdene.

5.2.2.4.1.2 A GDLP keret feldolgozásnak a lekérdező számára biztosítania kell az összes olyan adatot a fedélzetre irányuló adat-továbbításhoz, amelyhez a lekérdező nem tud közvetlenül hozzájutni.

5.2.2.4.2 *Kézbesítési állapot.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ keret feldolgozásának egy jelzést kell kapnia a lekérdező funkciótól arról, hogy egy meghatározott fedélzetre irányuló keret, amelyet előzőleg a lekérdezőhöz továbbítottak, eredményesen befejezésre került a föld-levegő kapcsolaton keresztül.

5.2.2.4.3 *Légijármű címzés.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ keret feldolgozásnak a lekérdezőtől vennie kell az egyes fedélzetről leadott adat-továbbítású Szabvány hosszúságú közlemény /SLM/ vagy Kiterjesztett hosszúságú közlemény /ELM/ keretekben lévő adatokkal együtt annak a légijárműnek a 24-bites címét, amely a keretet továbbította. A GDLP keret feldolgozásnak képesnek kell lenni a 24-bites légijármű címzésnek a lekérdezőhöz való továbbítására, amelynek vennie kell egy fedélzetre irányuló SLM vagy ELM keretet.

5.2.2.4.4 *S-módú protokol típus azonosítás.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ keret feldolgozásnak kell jeleznie a lekérdezőnek azt a protokolt, amelyet a keret átviteléhez használni kell: Szabvány hosszúságú közlemény protokol, Kiterjesztett hosszúságú közlemény protokol, vagy Általános adás protokol.

5.2.2.4.5 *Keret meghatározás.* Egy S-módú csomagot (beleértve a multiplikált csomagokat, de kizárva az S-módú specifikus protokol /MSP/ csomagokat), amelyet fedélzetre irányuló csomagként szánnak, és amely kisebb vagy egyenlő 28 bájttal, Szabvány hosszúságú közlemény /SLM/ keretként kell elküldeni. Egy S-módú csomagot, amely nagyobb, mint 28 bájt, fedélzetre irányuló Kiterjesztett hosszúságú közlemény /ELM/ keretként kell elküldeni az ELM képességű válaszjeladónak, M-bites feldolgozást használva, szükség szerint (5.2.5.1.4.1). Ha a transzponder nem rendelkezik ELM képességgel, akkor a

28 bájtnál nagyobb csomagokat M-bites vagy S-bites (5.2.5.1.4.2) összeállítási eljárást alkalmazva, valamint multiplikált SLM kereteket felhasználva kell elküldeni, ahogy szükséges.

Megjegyzés. - Csak az S-módú ADAT, HÍVÁS KÉRÉS, HÍVÁS FOGADÁS, BONTÁS KÉRÉS és MEGSZAKÍTÁS csomagok tartoznak azon S-módú csomagok közé, amelyek M-bites vagy S-bites sorrendet használnak.

5.2.2.5 FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ KERET FELDOLGOZÁS

5.2.2.5.1 *Általános rendelkezések.* Az utolsó 24 bit (címzés/paritás) lehetséges kivételével, az ADLP keret feldolgozásnak a válaszjeladótól mind az 56-bites, mind a 112-bites vett, fedélzetre irányuló továbbítások teljes tartalmát fogadnia kell - az általános hívás és Összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ lekérdezések kivételével. Az ADLP keret feldolgozásnak biztosítania kell az összes olyan adatot is a válaszjeladónak a fedélzetről leadott adat-továbbításhoz, amelyet a válaszjeladó közvetlenül nem szolgáltat (5.2.3.3).

5.2.2.5.2 *Kézbesítési állapot.* A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ keret feldolgozásának egy jelzést kell kapnia a válaszjeladótól arról, hogy egy meghatározott fedélzetről leadott keretnek, amelyet előzőleg a válaszjeladónak továbbítottak, befejezésre került.

5.2.2.5.3 *Lekérdező azonosító /II/.* Az ADLP keret feldolgozásnak a válaszjeladótól vennie kell az egyes fedélzetre irányuló adat-továbbítású Szabvány hosszúságú közleményben /SLM/ és Kiterjesztett hosszúságú közleményben /ELM/ lévő adatokkal együtt a keretet leadó lekérdezőnek a lekérdező azonosító (II) kódját. Az ADLP keret feldolgozásnak továbbítania kell a válaszjeladónak azon lekérdező, vagy lekérdező csoport II kódját, amelynek a több helyre irányított keretet vennie kell.

5.2.2.5.4 *S-módú protokol típus azonosítás.* Az ADLP keret feldolgozásnak jeleznie kell a válaszjeladónak a keret továbbításához használandó protokolt: földi-kezdeményezésű, légi-kezdeményezésű, általános adás, több helyre irányított, szabvány hosszúságú vagy kiterjesztett hosszúságú közlemény.

5.2.2.5.5 *Keret törlés.* A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ keret feldolgozásnak képesnek kell lennie arra, hogy törölje az olyan, fedélzetről leadott kereteket, amelyeket előzőleg a válaszjeladónak továbbításra átadott, de amelyekre befejezést nem jeleztek. Ha több, mint egy keretet tárolnak a válaszjeladón belül, akkor a törlési eljárásnak képesnek kell lenni szelektíven törölni a tárolt kereteket.

5.2.2.5.6 *Keret meghatározás.* Az olyan S-módú csomagokat (beleértve a multiplikált csomagokat, de kizárva az MSP csomagokat), amelyek fedélzetről leadott adat-továbbításra szolgálnak, és 222 bitnél kisebbek, vagy azzal egyenlőek, SLM keretként kell elküldeni. A 222 bitnél nagyobb S-módú csomagokat fedélzetről leadott kiterjesztett hosszúságú közlemény /ELM/ keretként kell elküldeni az ELM képességgel rendelkező transzpondereknek, M-bites feldolgozást használva, ahogyan szükséges (5.2.5.1.4). Amikor az M-bites feldolgozás használatos, akkor az összes M = 1-t magába foglaló kiterjesztett hosszúságú közlemény /ELM/ keretnek tartalmaznia kell az ELM szegmensek számát azért, hogy a válaszjeladó képes legyen a válaszában egy kérő lekérdezésre továbbítani azokat (UF = 24) (5.2.9.1). Ha a válaszjeladó nem rendelkezik ELM képességgel, akkor a 222 bitnél nagyobb csomagokat az M-bites vagy S-bites (5.2.5.1.4.2) összeállítási eljárások felhasználásával a multiplikált SLM keretek alkalmazásával kell elküldeni.

Megjegyzés. - A fedélzetről leadott SLM keret maximális hossza 222 bit. Ez egyenlő 28 bájttal (7 bájt a Comm-B szegmensnek), mínusz a 2-bites kapcsolt Comm-B részmező (5.2.2.2.1.1).

5.2.2.6 ELSŐBBSÉGI /PRIORITÁS/ KEZELÉS

5.2.2.6.1 *Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ elsőbbségi kezelés*. A kereteket az ADLP-től a válaszjeladóhoz kell továbbítani a következő elsőbbségi sorrendben (első a legmagasabb elsőbbségű):

a) S-módú specifikus szolgáltatások;

b) Keresési kérések (5.2.8.1);

c) Csak magas prioritású kapcsolt virtuális áramkör /SVC/ csomagokat tartalmazó keretek; és

d) Csak alacsony prioritású SVC csomagokat tartalmazó keretek.

5.2.2.6.2 *FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ ELSŐBBSÉGI KEZELÉS*

Ajánlás. - *A fedélzetre irányuló kereteket a következő elsőbbségi sorrendben ajánlatos továbbítani (legmagasabb elsőbbségű az első):*

a) S-módú specifikus szolgáltatások;

b) Legalább egy S-módú ÚTVONAL csomagot tartalmazó keretek;

c) Legalább egy magas elsőbbségű kapcsolt virtuális áramkör /SVC/ csomagot tartalmazó keretek; és

d) Csak alacsony elsőbbségű SVC csomagokat tartalmazó keretek.

5.2.3 Adat-csere interfészek

5.2.3.1 A LEKÉRDEZŐ ADAT VÉGPONTI BERENDEZÉS /DTE/ISO 8208 CSATOLÓ EGYSÉG

5.2.3.1.1 *Általános követelmények.* A Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ és a Lekérdező adat végponti berendezések /DTE-k/ közötti csatoló egységnek meg kell felelnie az ISO 8208 csomag réteg protokolnak (PLP). Az XDLP-nek támogatnia kell a DTE eljárásokat úgy, ahogy az az ISO 8208-ban meg van határozva. Mint ilyen, az XDLP-nek tartalmaznia kell egy Hálózati végponti berendezést /DCE/.
(5.2.4).

5.2.3.1.2 *A lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ csatoló egységgel szembeni fizikai és kapcsolati réteg követelmények.* A követelmények a következők:

a) A csatoló egységnek kód- és bájt-függetlennek kell lenni, és nem állapíthat meg korlátozásokat az egy csomagon belül továbbított bitek sorrendjére, utasításaira vagy alakzatára; és

b) A csatoló egységnek alá kell támasztania a változó hosszúságú hálózati réteg csomagok átvitelét.

5.2.3.1.3 *A LEKÉRDEZŐ ADAT VÉGPONTI BERENDEZÉS /DTE/ CÍMZÉSE*

5.2.3.1.3.1 *Földi DTE címzés.* A földi DTE címzés 3, binárisan kódolt decimális (BCD) számjegy hosszúságú a következők szerint:

$X_0X_1X_2$

X_0 a legnagyobb értékű számjegy. Földi DTE címzéseknek decimális számoknak kell lenniük a 0-tól a 255-ig terjedő tartományból BCD-ben kódolva. A DTE címzés kijelölése helyi ügy. A Földi telepítési rendszerű adat-kapcsolat vezérlő egységhez kapcsolt összes DTE, amely átfedő lefedéssel rendelkezik, egyedi címzéssel kell, hogy rendelkezzen. Azokat a GDLP-ket, amelyeknek a fedésterületeik közötti repülési idő kisebb, mint T_r (5-1. táblázat), átfedő lefedéssel rendelkezőnek kell tekinteni.

5.2.3.1.3.2 *Mozgó DTE címzés.* A mozgó DTE címzésnek 10 BCD számjegyű teljes hosszal kell rendelkeznie, a következők szerint:

$X_0X_1X_2X_3X_4X_5X_6X_7X_8X_9$

X_0 a legnagyobb értékű számjegy. Az X_0 - X_7 számjegyek tartalmazzák a BCD-ben kódolt légijármű címzés nyolcjegyű felírását. Az X_8X_9 számjegyeknek egy alcímzést kell azonosítani, a légijármű fedélzetén lévő specifikus DTE-ket. Ennek az alcímzésnek egy decimális számnak kell lenni a 0-tól a 15-ig terjedő tartományban, BCD-ben kódolva. Az alábbi alcímzés kijelöléseket kell használni:

00 Légiforgalmi Távközlési Hálózat /ATN/ irányító
01 - 15 Kijelöletlen

5.2.3.1.3.3 *Szabálytalan DTE címzések.* A meghatározott tartományon kívül eső, vagy az 5.2.3.1.3.1 és 5.2.3.1.3.2 pontokban meghatározott földi és mozgó DTE címzések formátumainak nem megfelelő DTE címzéseket szabálytalan DTE címzésekként kell meghatározni. DTE címzés észlelése Egy HIVÁS KÉRÉS csomagban egy szabálytalan DTE címzés észlelése a hívás visszautasításához vezet, ahogyan ez az 5.2.5.1.5 pontban meghatározásra került.

5.2.3.1.4 *A LEKÉRDEZŐ ADAT VÉGPONTI BERENDEZÉS / HÁLÓZATI VÉGPONTI BERENDEZÉS /DTE/DCE/ CSATOLÓ EGYSÉG CSOMAG RÉTEG PROTOKOL KÖVETELMÉNYEI*

5.2.3.1.4.1 *Teljesítőképességek.* A DTE és a DCE közötti illesztéseknek meg kell felelnie az ISO 8208-nak az alábbi teljesítőképességben:

a) gyorsított adat kézbesítés, azaz a maximálisan 32 bájtos felhasználói adatmezővel rendelkező MEGSZAKITÁS csomagok használata;

b) elsőbbség képesség (két szinttel, 5.2.5.2.1.1.6);

c) gyors kiválasztás (5.2.5.2.1.1.13, 5.2.5.2.1.1.16); és

d) hívott/hívás címzés bővítési lehetőség, ha a helyi körülmények szükségessé teszik (azaz a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ a Lekérdező adat végponti berendezéshez /DTE/ van kapcsolva egy olyan hálózati protokolon keresztül, ami nem képes arra, hogy tartalmazza az S-módú címet, ahogy az meg van határozva).

Egyéb ISO 8208 képességek és a D-bit és a Q-bit nem kerül az átvitel céljából lehívásra az S-módú csomag réteg protokolon át.

5.2.3.1.4.2 *Jellemző értékek.* Az időzítő és számoló jellemzőknek a DTE/DCE illesztéseknek összhangban kell lenniük az alapértelmezési ISO 8208 értékekkel.

5.2.3.2 S-MÓDÚ SPECIFIKUS SZOLGÁLTATÁSI ILLESZTÉS

Megjegyzés. - Az S-módú specifikus szolgáltatások a kisugárzott A-adatátvitel /Comm-A/ és B-adatátvitel /Comm-B/ adatcsomagokból és a Földről kezdeményezett B-adatátvitelből /GICB/, valamint az S-módú specifikus protokolokból /MSP/ állnak.

5.2.3.2.1 ADLP /Fedélzeti adat-kapcsolat vezérlő egység/

5.2.3.2.1.1 *Általános rendelkezések.* Az ADLP-nek alá kell támasztania az S-módú specifikus szolgáltatásokhoz való hozzáférést az erre a célra szolgáló egy vagy több különálló ADLP interfész biztosításával.

5.2.3.2.1.2 *Működési teljesítőképesség.* Az ezen az illesztésen keresztüli közlemény és vezérlés kódolásnak az 5.2.7.1 pontban meghatározott összes teljesítőképességet alá kell támasztani.

5.2.3.2.2 *GDLP /Földi telepítési rendszerű adat-kapcsolat vezérlő egység/*

5.2.3.2.2.1 *Általános követelmények.* A GDLP-nek alá kell támasztania az S-módú specifikus szolgáltatások elérését erre a célra egy külön GDLP illesztés biztosításával, és/vagy ezekhez a szolgáltatásokhoz hozzáférés biztosításával a Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztő egységen keresztül.

5.2.3.2.2.2 *Működési teljesítőképesség.* Az ezen az illesztésen keresztüli közlemény és vezérlés kódolásnak az 5.2.7.2 pontban meghatározott összes teljesítőképességet alá kell támasztania.

5.2.3.3 FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ / VÁLASZJELADÓ ILLESZTÉS

5.2.3.3.1 *VÁLASZJELADÓ AZ ADLP-NEK*

5.2.3.3.1.1 Az ADLP-nek a válaszjeladótól egy, a protokol típusát jelző jelzést kell venni, a válaszjeladótól az ADLP-hez továbbított adatokkal kapcsolatban. Ez a következő típusú protokolokat tartalmazza:

a) Légtér-ellenőrzési lekérdezés;

b) A-adatátvitel /Comm-A/ lekérdezés;

c) A-adatátvitel /Comm-A/ általános adású lekérdezés; és

d) Fedélzetre irányuló Kiterjesztett hosszúságú közlemény /ELM/.

Az ADLP-nek fogadnia kell a Lekérdező azonosító /II/ kódját is, amelyet a légtér-ellenőrzési A-adatátvitelnél /Comm-A/ vagy a fedélzetre irányuló ELM továbbításánál használ.

Megjegyzés. - A válaszjeladók nem adnak általános hívás és Összeütközési veszély jelző fedélzeti rendszer /ACAS/ információkat ezen az illesztésen.

5.2.3.3.1.2 Az ADLP-nek a válaszjeladótól olyan vezérlő információkat kell fogadnia, amelyek jelzik a fedélzetről leadott adat- továbbítások állapotát. Ennek magába kell foglalnia:

a) B-adatátvitel /Comm-B/ befejezést;

b) B-adatátvitel /Comm-B/ sugárzási időhatárát; és

c) A fedélzetről leadott ELM befejezést.

5.2.3.3.1.3 Az ADLP-nek hozzáféréssel kell rendelkeznie azokhoz az aktuális információkhoz, amelyek meghatározzák az S-módú válaszjeladó kommunikáció teljesítőképességét, azt, amellyel az működik. Ezt az információt az adat-kapcsolat teljesítőképesség jelentés létrehozásához használják (5.2.9).

5.2.3.3.2 FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ A VÁLASZJELADÓNAK

5.2.3.3.2.1 Az ADLP-nek egy, a protokol típusa jelző jelzést kell adnia a válaszjeladónak az ADLP-től a transzpondernek továbbított adatokhoz kapcsolódóan. Ez a következő protokol típusokat foglalja magában:

a) földről kezdeményezett B-adatátvitel;

b) levegőből kezdeményezett B-adatátvitel;

c) több helyre irányított B-adatátvitel;

d) általános adású B-adatátvitel;

e) fedélzetről leadott kiterjesztett hosszúságú közlemény /ELM/; és

f) több helyre irányított fedélzetről leadott ELM.

Az ADLP-nek biztosítania kell a Lekérdező azonosító /II/ kódot egy több helyre irányított B-adatátvitel, vagy fedélzetre irányuló ELM és a B-adatátvitel adat kiválasztó (BDS) kód továbbításához (Annex 10, IV. kötet, 3.1.2.6.11.2) a földi kezdeményezésű B-adatátvitelhez.

5.2.3.3.2.2 Az ADLP-nek képesnek kell lennie az 5.2.2.5.5 pontban meghatározottak szerinti keret törlés végrehajtására.

5.2.3.4 FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ S-MÓDÚ LEKÉRDEZŐ ILLESZTÉS

5.2.3.4.1 *LEKÉRDEZŐ A GDPL-NEK*

5.2.3.4.1.1 A GDLP-nek a lekérdezőtől egy protokol típusú jelzést kell fogadnia, a lekérdezőtől a GDLP-hez továbbított adatokhoz kapcsolódóan. Ez a következő protokol típusokat foglalja magába:

a) földi kezdeményezésű B-adaátvitel;

b) levegő kezdeményezésű B-adatátvitel;

c) levegő kezdeményezésű B-adatátvitel általános adás; és

d) fedélzetről leadott kiterjesztett hosszúságú közlemény /ELM/.

A GDLP-nek a B-adatátvitel adat kiválasztás /BDS/ kódot is fogadnia kell, amelyet a földi kezdeményezésű B-adatátviteli szegmens azonosítására használ fel.

5.2.3.4.1.2 A GDLP-nek a lekérdezőtől vezérlő információkat kell fogadnia, amelyek jelzik a fedélzetre irányuló adat átvitelének állapotát és a címzett légijármű S-módú állapotát.

5.2.3.4.2 *GDLP a lekérdezőnek*. A GDLP-nek egy protokol típus jelzést kell biztosítani a lekérdező részére a GDLP-től a lekérdezőhöz továbbított adatokkal kapcsolatban. Ez a következő protokol típusokat foglalja magába:

a) A-adatátvitelű lekérdezés;

b) A-adatátvitelű általános adású lekérdezés;

c) Fedélzetre irányuló kiterjesztett hosszúságú közlemény /ELM/; és

d) Földi kezdeményezésű B-adatátviteli kérés.

A GDLP-nek a B-adatátvitel adat kiválasztó kódokat is biztosítania kell a földi kezdeményezésű B-adatátvitel protokolhoz.

5.2.4 A Hálózati végponti berendezés /DCE/ működése

Megjegyzés. - A DCE feldolgozási folyamata a Fedélzeti/Földi adat-kapcsolat vezérlő egységen /XDLP/ belül mint társ-folyamat működik a lekérdező adat végponti berendezés /DTE/ adatainak feldolgozásában. A DCE támasztja alá a DTE működést azzal a teljesítőképességgel, amely az 5.2.3.1.4 pontban került meghatározásra. A következő követelmények nem határoznak meg formátum előírásokat és forgalom vezérlést a DTE/DCE illesztésen. Ezekre az esetekre az ISO 8208 előírásai és meghatározásai érvényesek.

5.2.4.1 *Állapot átvitelek.* A DCE állapotgépként működik. Egy állapotba kerülve, a DCE végrehajtja az 5-2. táblázatban ismertetett műveleteket. Az állapot átvitelek és kiegészítő művelet(ek) az 5-3.-tól az 5-12.-ig terjedő táblázatokban vannak leírva.

Megjegyzés. - A következő állapot átvitel (ha van ilyen), amely akkor következik be, amikor a Hálózati végponti berendezés /DCE/ egy csomagot fogad a Lekérdező adat végponti berendezéstől /DTE/, az 5-3.-tól az 5-8.-ig terjedő táblázatokban van meghatározva. Ezek a táblázatok az 5-2. ábrán bemutatott hierarchiának megfelelően vannak szervezve. Ugyanezek az átvitelek vannak meghatározva az 5-9.-től az 5-12.-ig terjedő táblázatokban, amikor a DCE egy csomagot fogad a Fedélzeti/Földi hálózati végponti berendezéstől /XDCE/ (az újraformátumozó folyamaton keresztül).

5.2.4.2 A CSOMAGOK KIOSZTÁSA

5.2.4.2.1 Egy csomagnak a Lekérdező adat végponti berendezéstől /DTE/ történő fogadása után a csomagot vagy továbbítani kell vagy nem kell továbbítani a Légijármű/Földi hálózati végponti berendezéshez /XDCE/ (az újra-formátumozó eljáráson keresztül) az 5-3.-tól az 5-8.-ig terjedő táblázatokban megadott zárójeles utasításoknak megfelelően. Ha a zárójeles utasítás nincs feltűntetve, vagy ha a zárójeles utasítás "ne továbbíts" utasítást mutat, akkor a csomagot érvényteleníteni kell.

5.2.4.2.2 Egy csomag fogadása után az XDCE-től az újra-formátumozó folyamaton keresztül a csomagot vagy továbbítani kell vagy nem kell továbbítani a Lekérdező adat végponti berendezéshez /DTE/ az 5-9.-től az 5-12.-ig terjedő táblázatokba foglalt zárójeles utasításoknak megfelelően. Ha zárójeles utasítás nincs feltűntetve, vagy a zárójeles utasítás "ne továbbíts" utasítást mutat, a csomagot érvényteleníteni kell.

5.2.5 S-módú csomag réteg feldolgozás

5.2.5.1 ÁLTALÁNOS KÖVETELMÉNYEK

5.2.5.1.1 *TÁROLÓ /PUFFER/ KÖVETELMÉNYEK*

5.2.5.1.1.1 *A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ tároló követelményei*

5.2.5.1.1.1.1 A következő követelményeket kell alkalmazni a teljes ADLP-re, és úgy kell értelmezni, ahogyan az a fő feldolgozási folyamatok mindegyikénél (Hálózat végponti berendezés /DCE/, újraformátumozás, Légijármű hálózati végponti berendezés /ADCE/, keret feldolgozás és S-módú szolgáltatás entitás /SSE/) szükséges.

5.2.5.1.1.1.2 Az ADLP-nek képesnek kell lenni elegendő tároló teret fenntartani tizenhat Kapcsolt virtuális áramkör /SVC/ részére:

a) Fenn kell tartania elegendő tároló teret tizenöt S-módú alhálózati, egyenként 152 bájtot tartalmazó csomag részére, mindegyik fedélzetre irányuló SVC-nként egy fedélzetre irányuló Kiterjesztett hosszúságú közlemény /ELM/ teljesítőképességű válaszjeladónál, vagy 28 bájtot más esetben;

b) Fenn kell tartania elegendő tároló teret tizenöt S-módú alhálózati, egyenként 160 bájtot tartalmazó csomag tartására, mindegyik fedélzetről leadott irányú közleményre SVC-nként, egy fedélzetről leadott ELM teljesítőképességű válaszjeladónál, vagy 28 bájtot más esetben;

c) Fenn kell tartania elegendő tároló teret két S-módú alhálózati, egyenként 35 bájtot tartalmazó MEGSZAKITÁS csomag számára (felhasználói adat mező plusz vezérlő információ) egyet mindkét irányban, minden egyes SVC-nél;

d) Fenn kell tartania elegendő újra sorba-rendező tároló teret harmincegy, egyenként 152 bájtot tartalmazó S-módú alhálózati csomag tárolására a fedélzetre irányuló közleményekre SVC-nként egy fedélzetre irányuló ELM teljesítőképességgel rendelkező válaszjeladónál, vagy 28 bájtot ettől eltérő esetben; és

e) Fenn kell tartania elegendő tároló teret legalább egy olyan 160 bájtot tartalmazó S-módú csomag átmeneti tárolására, amely M-bit vagy S-bit feldolgozásra kerül, mindkét irányban SVC-nként.

5.2.5.1.1.1.3 A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ képesnek kell lennie 1600 bájtot tartalmazó tároló fenntartására az egyes irányokban megosztva az összes S-módú specifikus protokol /MSP/ között.

5.2.5.1.1.2 A *Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ tároló követelményei*

5.2.5.1.1.2.1 **Ajánlás. -** *A GDLP-nek képesnek kell lenni elegendő tároló tér fenntartására átlagosan 4 Kapcsolt virtuális áramkör /SVC/ részére mindegyik olyan S-módú légijárműre, amely a lekérdezők lefedési területén belül összeköttetésben van vele, feltéve, hogy valamennyi légijármű Kiterjesztett hosszúságú közlemén /ELM/ teljesítőképességgel rendelkezik.*

Megjegyzés. - További tároló tér követelhető meg abban az esetben, ha végrendszerekkel kapcsolódó Lekérdező adat végponti berendezéseket /DTE-k/ biztosítanak.

5.2.5.1.2 *CSATORNA SZÁM ÖSSZESÍTÉSEK*

5.2.5.1.2.1 A Fedélzeti/Földi adat-kapcsolat vezérlő egységnek /XDLP/ fenn kell tartani több SVC csatorna-szám összesítést; a DTE/DCE (ISO 8208) illesztés egy készletet használ fel. Ennek szervezésének, szerkezetének és felhasználásának az ISO 8208 szabványban meghatározottaknak megfelelő kell, hogy legyen. A többi csatorna összesítést a Légijármű hálózati végponti berendezés/Földi hálózati végponti berendezés /ADCE/GDCE/ illesztésnél kell felhasználni.

5.2.5.1.2.2 A Földi telepítési rendszerű adat-kapcsolat vezérlő egységnek /GDLP/ átmeneti csatorna szám összesítést kell kezelnie ott, ahol a számok az 1, 2 és 3 közül kerülnek ki, minden egyes földi Lekérdező adat végponti berendezés/Fedélzeti adat-kapcsolat vezérlő egység /DTE/ADLP/ párnál. A GDLP által generált S-módú HIVÁS KÉRÉS csomagoknak tartalmazniuk kell a földi DTE címzést és egy olyan átmeneti csatorna számot, amely ennek a földi DTE-nek az összesítéséből került kiosztásra. A GDLP nem használhat újra egy olyan átmeneti csatorna számot, amelyet egy Kapcsolt virtuális áramkörnek /SVC/ kiosztottak, és amely még a HÍVÁS KÉRÉS állapotban van.

1. Megjegyzés. - Az átmeneti csatorna számok használata lehetővé teszi a GDLP számára azt, hogy maximálisan három feldolgozásban lévő hívás kéréssel rendelkezzen egyidőben, egyedi földi DTE és ADLP kombinációnál. Ez azt is lehetővé teszi a GDLP vagy az ADLP számára, hogy egy csatornát felszabadítson, mielőtt a folyamatos csatorna szám kijelölésre kerül.

2. Megjegyzés. - Az ADLP érintkezésben lehet multiplikált földi DTE-kkel bármely időszakban. Az összes földi DTE átmeneti csatorna számot használ, amelyek az 1, 2, 3 számok közül kerülnek ki.

5.2.5.1.2.3 A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ a földi Lekérdező adat végponti berendezés /DTE/ címzést kell használni megkülönböztetésül az átmeneti csatorna számoktól, amelyeket a különböző földi DTE-k használnak. Az ADPL-nek végleges csatorna számot kell kijelölni (a 0-tól a 15-ig terjedő tartományból) minden SVC számára és tájékoztatni kell a GDLP-t a kijelölt számról, belefoglalva azt az ADLP által adott S-módú HIVÁS KÉRÉS-be, vagy az ADLP comagokban adott S-módú HIVÁS FOGADÁS-ba. Az átmeneti csatorna számot az ADLP által adott S-módú HIVÁS FOGADÁS-nak kell magába foglalni a végleges csatorna számmal együtt, abból a célból, hogy meghatározásra kerüljön az ezen csatorna számok között meglévő kapcsolat. Az ADLP-nek folytatni kell az átmeneti csatorna szám társítását egy Kapcsolt virtuális áramkör /SVC/ végleges csatorna számával addig, amíg az SVC visszatér a KÉSZ (p1) állapotába, vagy másként, amíg az ADAT ÁTVITEL (p4) állapotban egy olyan, a GDLP csomag által adott S-módú HIVÁS KÉRÉS kerül vételre, amely ugyanazt az átmeneti csatorna számot viseli. Egy, az ADLP által adott nem-nulla átmeneti csatorna szám az S-módú BONTÁS KÉRÉS-ben, a GDLP által adott BONTÁS KÉRÉS-ben, az ADLP csomagban lévő BONTÁS MEGERŐSITÉS-ben jelezni kell azt, hogy a végleges csatorna számot kell használni, és az átmeneti csatorna számot nem kell figyelembe venni. Abban az esetben, ha egy XDLP-t felkérnek ezen csomagok valamelyikének elküldésére végleges csatorna szám hiányában, a végleges csatorna számot nullára kell állítani, amely azt jelzi a társfolyamatú XDLP-nek, hogy az átmeneti csatorna számot kell használni.

Megjegyzés. - Nulla végleges csatorna szám használata lehetővé teszi az ADLP-nek egy SVC törlését akkor, amikor végleges csatorna szám nem áll rendelkezésre, és lehetővé teszi a GDLP-nek, hogy ugyanúgy járjon el, mielőtt a végleges csatorna számról tájékoztatást kap.

5.2.5.1.2.4 A Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztés által használt csatorna számokat és azokat, amelyek a Légijármű hálózati végponti berendezés/Földi hálózati végponti berendezés /ADCE/GDCE/ illesztésnél használatosak, függetlenül kell kijelölni. Az újraformázási folyamatnak egy, a DTE/DCE és az ADCE/GDCE csatorna számok közötti összekapcsolási táblázatot kell fenntartani.

5.2.5.1.3 *Fogadásra kész és fogadásra nem kész állapotok.* Az ISO 8208 interfész és az ADCE/GDCE interfész kezelési eljárásoknak független üzemelésűeknek kell lenni, mivel az egyes rendszereknek képesnek kell lenniük válaszolni elkülönítetten a fogadásra kész és a fogadásra nem kész jelzésekre.

5.2.5.1.4 *M-BITES ÉS S-BITES SOROZATOK FELDOLGOZÁSA*

Megjegyzés. - M-bit feldolgozás az ADAT csomag sorba-rendezéséhez alkalmazott. S-bit feldolgozást S-módú HÍVÁS KÉRÉS, HÍVÁS FOGADÁS, BONTÁS KÉRÉS és MEGSZAKÍTÁS csomagok sorba-rendezéséhez alkalmazott.

5.2.5.1.4.1 Az M-bites feldolgozás

Megjegyzés. - A Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztésnél használt csomag méret eltérő lehet attól, ami a Légijármű hálózati végponti berendezés/Földi hálózati végponti berendezés /ADCE/GDCE/ illesztésnél használatos.

5.2.5.1.4.1.1 M-bit feldolgozást akkor kell használni, amikor az ADAT csomagokat újraformátumozzák (5.2.5.2). Az M-bit feldolgozásnak az ISO 8208 szabványban lévő előírásokat kell felhasználni. Az

M-bit sorozat feldolgozásnak a csatornánkénti alapot kell alkalmazni. Az M-bitnek az 1-re történő beállítása azt jelzi, hogy felhasználói adat mező folytatódik a soronkövetkező ADAT csomagban. Az ezt követő csomagoknak egy M-bit sorozatban ugyanazt a fej- rész formátumot kell felhasználni (azaz a csomag formátum kizárja a felhasználói adat mezőt).

5.2.5.1.4.1.2 Ha a csomag mérete a Légijármű hálózati végponti berendezés/Földi hálózati végponti berendezés /XDCE/ (5.2.6.4.2) illesztésnél nagyobb, mint a Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ használatos illesztése, akkor a csomagokat össze kell tömöríteni az M-bit által megszabott lehetséges mértékig, egy S-módú ADAT csomag továbbításánál. Ha a csomag méret kisebb az XDCE illesztésen, mint ami a DTE/DCE illesztésnél meghatározott, akkor a csomagokat 'tördelni kell' azért, hogy beleilleszkedjenek az M-bites összeállítást felhasználó kisebb S-módú csomagba.

5.2.5.1.4.1.3 A csomagot a rákövetkező kötegekkel össze kell tömöríteni, ha a csomag tele van és az M-bit sorozatban több csomag van (M-bit = 1). Az erre a Kapcsolt virtuális áramkörre /SVC/ meghatározott maximális csomag méretnél kisebb csomag (részleges csomag) csak akkor megengedhető, amikor az M-bit egy M-bit sorozat végét jelzi. Egy olyan vett csomagnak, ami a maximális csomag méretnél kisebb, és az M-bit egyenlő 1-el, egy visszaállítást kell létrehozni, az ISO 8208-ban meghatározottak szerint, és a sorozat további részét érvényteleníteni kell.

5.2.5.1.4.1.4 **Ajánlás. -** *A kézbesítési késés csökkentése érdekében egy M-bit sorozat részleges vételekor az újra-formátumozást kell elvégezni, nem pedig az újra-formátumozást addig késleltetni, amíg a teljes M-bit sorozat vételre nem kerül.*

5.2.5.1.4.2 *S-bit feldolgozás.* S-bit feldolgozást csak S-módú HÍVÁS KÉRÉS, HÍVÁS FOGADÁS, BONTÁS KÉRÉS és MEGSZAKÍTÁS csomagokhoz kell alkalmazni. Ezt a feldolgozást úgy kell végrehajtani, ahogy az M-bit feldolgozáshoz meg van határozva (5.2.5.1.4.1), kivéve, hogy azokat az S-bit sorozathoz társított csomagokat, amelyeknek az újra-összeállítása nem fejeződik be Tq másodperc alatt (5-1. és 5-13. táblázat), érvényteleníteni kell (5.2.6.3.6, 5.2.6.4.5.2 és 5.2.6.9), és egy olyan csomagnak a vételének, amely csomag rövidebb, mint a maximális csomag méret az S = 1-el, azt kell létrehoznia, hogy a teljes S-bit sorozat formátum hibaként legyen kezelve az 5-16. táblázatban foglaltaknak megfelelően.

5.2.5.1.5 *S-MÓDÚ AL-HÁLÓZAT HIBA FELDOLGOZÁS AZ ISO 8208 CSOMAGOKNÁL*

5.2.5.1.5.1 *D-bit.* Ha a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ ADAT csomagot vesz úgy, hogy a D-bit 1-re van állítva, akkor az XDLP-nek egy olyan VISSZAÁLLÍTÁS KÉRELEM csomagot kell elküldeni a csomagot létrehozó Lekérdező adat végponti berendezésnek /DTE/, amely egy okozó kódot (CC) = 133 és egy diagnosztikai kódot (DC) = 166 tartalmaz. Ha a D-bit egy HÍVÁS KÉRÉS csomagban 1-re van állítva, akkor ezt az XDLP-nek figyelmen kívül kell hagyni. A megfelelő HÍVÁS ELFOGADÁS csomag D-bitjét mindig 0-ra kell állítani. A 'CC' használata választható.

5.2.5.1.5.2 *Q-bit.* Ha az XDLP egy olyan ADAT csomagot vesz, amelynél a Q-bit 1-re van állítva, akkor az XDLP-nek egy olyan VISSZAÁLLÍTÁS KÉRÉS-t kell küldenie a csomagot létrehozó DTE-nek, amely magába foglalja a CC = 133-t és DC = 83-t. A 'CC' használata választható.

5.2.5.1.5.3 *Érvénytelen elsőbbség.* Ha az XDLP egy olyan hívás kérést vesz, amelynek egy, a 2-től a 254-ig terjedő értéktartományban van az összekapcsolás elsőbbségi értéke, akkor az XDLP-nek törölnie kell a virtuális áramkört a DC = 66 és CC = 131 felhasználásával. A 'CC' használata választható.

5.2.5.1.5.4 *Biztosítás nélküli szolgáltatás.* Ha az XDLP egy hívás kérést vesz egy olyan szolgáltatás iránti kéréssel, amelyet nem tud alátámasztani, akkor az XDLP-nek törölnie kell a virtuális áramkört a DC = 65 és CC = 131 felhasználásával. A 'CC' használata választható.

5.2.5.1.5.5 *Érvénytelen hívó DTE címzés.* Ha az XDLP érvénytelen hívó DTE címzésű híváskérést vesz (5.2.3.1.3.3), akkor az XDLP-nek törölnie kell a virtuális áramkört a DC = 68 és CC = 141 használatával. A 'CC' felhasználása választható.
5.2.5.1.5.6 *Érvénytelen hívott DTE címzés.* Ha a XDLP érvénytelen hívott DTE címzésű hívás kérést vesz (5.2.3.1.3.3), akkor az XDLP-nek törölnie kell a virtuális áramkört DC = 67 és CC = 141 használatával. A 'CC' felhasználása választható.

5.2.5.2 ÚJRA-FORMÁTUMOZÓ FELDOLGOZÁS

Megjegyzés. - Az újra-formátumozó feldolgozás két részfolyamatra van osztva: a fedélzetre irányuló formátumozásra és a fedélzetről leadott formátumozásra. A Fedélzeti adat-kapcsolat vezérlő egységnél /ADLP/ a fedélzetre irányuló kapcsolt feldolgozás az S-módú csomagokat ISO 8208 csomagokba formátumozza újra, és a fedélzetről leadott kapcsolati feldolgozás az ISO 8208 csomagokat S-módú csomagokba formátumozza újra. A Földi telepítési rendszerű adat-kapcsolat vezérlő egységnél /GDLP/ a fedélzetre irányuló kapcsolati feldolgozás az ISO 8208 csomagokat S-módú csomagokba formátumozza újra, és a fedélzetről leadott kapcsolati feldolgozás az S-módú csomagokat ISO 8208 csomagokba formátumozza újra.

5.2.5.2.1 *A FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ ÁLTAL ADOTT HÍVÁS KÉRÉS*

5.25.2.5.2.1.1 *Átfordítás S-módú csomagokba*

5.2.5.2.1.1.1 *Az átfordított csomag formátuma.* Az egy helyi Hálózati végponti berendezés /DCE/ által vett ISO 8208 HÍVÁS KÉRÉS csomag újra-formátumozási feldolgozása a megfelelő S-módú HÍVÁS KÉRÉS-nek a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ csomag(ok)ban végzett létrehozását eredményezi (ahogyan az az S-bit feldolgozás által meghatározása került (5.2.5.1.4.2)) a következőképpen:

DP: 1 MP: 1 SP: 2 ST: 2 FILL 2: 0 vagy 2 P: 1 FILL: 1 SN: 6 CH: 4 AM: 4 AG: 8 S: 1 FS: 2 F: 1 LV: 4 UD: v

5.2.5.2.1.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.1.1.3 *S-módú specifikus protokol sorozat szám /MSP/ csomag típus (MP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.2.1.1.4 *Felügyelő csomag (SP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.2.1.1.5 *Felügyelő típus (ST)*. Ezt a mezőt 0-ra kell állítani.

5.2.5.2.1.1.6 *Elsőbbség (P)*. Ezt a mezőt 0-ra kell állítani alacsony elsőbbségű Kapcsolt virtuális áramkör /SVC/ esetén és 1-re magas elsőbbségű SVC-nél. Ennek a mezőnek az értékét az ISO 8208 csomag elsőbbségi szolgáltatás adatátviteli mezőjéből kell 'megszerezni', és 0-ra kell állítani akkor, ha az ISO 8208 csomag nem foglal magába elsőbbségi szolgáltatást, vagy ha egy 255-ös elsőbbséget határoznak meg. A többi elsőbbségi szolgáltatás mezőt figyelmen kívül kell hagyni.

5.2.5.2.1.1.7 *Sorozat-szám (SN).* Egy adott SVC-re minden egyes csomagot be kell számozni (5.2.6.9.4).

5.2.5.2.1.1.8 *Csatorna szám (CH).* A csatorna számot a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ rendelkezésére álló Kapcsolt virtuális áramkör /SVC/ csatorna szám készletből kell kiválasztani. A készlet 1-től 15-ig terjedő 15 értékből áll. A legnagyobb rendelkezésre álló csatorna számot kell a készletből kiválasztani. Egy rendelkezésre álló csatornát úgy kell meghatározni, mint egy p1 állapotban lévő csatornát. Az S-módú alhálózat által használt csatorna szám és a Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztés által használt szám közötti megegyezést mindaddig fenn kell tartani, amíg a csatorna aktív.

Megjegyzés. - A csatorna készlet kezeléssel kapcsolatban lásd még az 5.2.5.1.2 pontot.

5.2.5.2.1.1.9 *Címzés, mozgó (AM).* Ennek a címzésnek a mozgó Hálózati végponti berendezés /DTE/ alcímzésnek kell lenni (5.2.3.1.3.2) a 0-tól 15-ig terjedő tartományban. A címzést a hívó DTE címzés azon két legkisebb értékű számjegyéből kell kiválasztani, amelyet az ISO 8208 csomag tartalmaz és binárissá kell átalakítani.

Megjegyzés. - A 24-bites légijármű címzés az S-módú adat-kapcsolat rétegen kerül továbbításra.

5.2.5.2.1.1.10 *Címzés, földi (AG).* Ez a címzés a földi DTE címzésnek kell lenni (5.2.3.1.3.1) a 0-tól 255-ig terjedő tartományban. A címzést abból a hívott DTE címzésből kell kivonni, amelyet az ISO 8208 csomag tartalmaz és binárissá kell átalakítani.

5.2.5.2.1.1.11 *Kitöltő mező.* A kitöltő mezőt arra használják, hogy sorba-állítsák az egymást követő adatmezőket a bájt határokon. Amikor "KITÖLTÉS: n"-ként jelzik, akkor a kitöltő mezőt "n" bit hosszúságúra kell állítani. Amikor "KITÖLTÉS 1: 0 vagy 6"-ként van jelezve, akkor a kitöltés mezőt 6 bit hosszúságúra kell állítani a nem-multiplikált csomagban a Fedélzetről leadott szabvány hosszúságú közlemény /SLM/ keretnél és 0 bitre minden más egyéb esetben. Amikor "KITÖLTÉS 2: 0 vagy 2"-ként van jelezve, a kitöltő mezőt 0 bit hosszúságúra kell állítani egy nem-multiplikált Fedélzetről leadott SLM keretnél vagy multiplikált fejrésszel és 2 bitre az összes többi esetben.

5.2.5.2.1.1.12 *S mező (S).* Az 1 érték azt mutatja, hogy a csomag része egy többcsomagos S-bit sorozatnak a következő sorozatban. A 0 értéknek azt kell jelezni, hogy a sorozat ezzel a csomaggal végződik. Ezt a mezőt úgy kell beállítani, ahogy az az 5.2.5.1.4.2 pontban meghatározásra került.

5.2.5.2.1.1.13 *FS mező (FS).* A 0 értéknek kell jeleznie, hogy a csomag nem foglal magába gyors kiválasztású adatokat. A 2 vagy 3 értéknek kell jeleznie, hogy a csomag gyors kiválasztású adatokat tartalmaz. A 2 érték szabvány gyors kiválasztási műveletet jelez. A 3 értéknek a korlátozott válasszal rendelkező gyors kiválasztást kell jeleznie. Az 1 értékű FS nincs meghatározva.

5.2.5.2.1.1.14 *Első csomag jelző (F).* Ezt a mezőt 0-ra kell állítani egy S-bit sorozat első csomagjában és egy olyan csomagban, amely nem képezi egy S-bit sorozat részét. Más esetekben 1-re kell beállítani.

5.2.5.2.1.1.15 *Felhasználói adat hosszúság (LV).* Ennek a mezőnek azon teljes bájtok számát kell jeleznie, amelyeket az utolsó Szabvány hosszúságú közlemény /SLM/ vagy Kiterjesztett hosszúságú közlemény /ELM/ szegmensben alkalmazottak, ahogyan az az 5.2.2.3.1 pontban meg van határozva.

5.2.5.2.1.1.16 *Felhasználói adatmező (UD).* Ennek a mezőnek csak akkor van kell meglenni, ha a választható HÍVÁS KÉRÉS felhasználói adatot (maximálisan 16 bájt) vagy a gyors kiválasztású felhasználói adatot (maximálisan 128 bájt) az ISO 8208 csomag tartalmazza. A felhasználói adat- mezőt az ISO 8208 csomagból változtatás nélkül kell átfordítani S-bit feldolgozás felhasználásával, ahogyan az 5.2.5.1.4.2 pontban meghatározásra került.

5.2.5.2.1.2 *Átfordítás az ISO 8208 csomagokba*

5.2.5.2.1.2.1 *Átfordítás.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által vett, az S-módú HÍVÁS KÉRÉS-nek a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ csomag (vagy egy, a csomagok S-bit sorrendje) általi újra-formátumozási folyamata a Földi hálózati végponti berendezéstől /GDCE/ egy, az annak megfelelő ISO 8208 HÍVÁS KÉRÉS csomag létrehozását eredményezi a helyi Hálózati végponti berendezéshez /DCE/. Az átfordítás az S-módú csomagból az ISO 8208 csomagba az inverze annak a folyamatnak, amely az 5.2.5.2.1.1 pontban került meghatározásra, azokkal a kivételekkel, amelyek a következő pontokban kerülnek leírásra.

5.2.5.2.1.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE címzés és hosszúság mezők.* A hívó DTE címzését a légijármű címzése és az S-módú köteg Mobil cím /AM/ mezőjében tartalmazott érték kell, hogy képezze, BCD-be alakítva (5.2.3.1.3.2). A hívott DTE címzésnek annak a földi DTE címzésnek kell lenni, amelyet az S-módú csomag Földi cím /AG/ mezője tartalmaz, BCD-be átalakítva. A hossz mezőnek az ISO 8208-ban meghatározottaknak megfelelőnek kell lennie.

5.2.5.2.2 *A FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ ÁLTALI HÍVÁS KÉRÉS*

5.2.5.2.2.1 *Átfordítás S-módú csomagokba*

5.2.5.2.2.1.1 *Általános.* A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 HÍVÁS KÉRÉS csomag GDLP általi újra-formátumozási folyamata a megfelelő S-módú HÍVÁS KÉRÉS csomag(ok) GDLP általi létre-hozását eredményezi (ahogyan az S-bit feldolgozás (5.2.5.1.4.2) meghatározza) a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	FILL: 2	P: 1	FILL: 1	SN: 6	
FILL: 2	TC: 2	AM: 4	AG: 8	S: 1	FS: 2	F: 1	LV: 4	UD: v

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban meghatározásra került.

5.2.5.2.2.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.2.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.2.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.2.1.5 *Felügyelő típus (ST).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.2.1.6 *Ideiglenes csatorna szám mező (TC).* Ezt a mezőt arra kell felhasználni, hogy a rendszer megkülönböztesse a Földi telepítési rendszerű adat-kapcsolat vezérlő egységtől /GDLP/ jövő multiplikált hívás kéréseket. A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ újra-formátumozási folyamatának azután, hogy egy ideiglenes csatorna számot kap, ki kell jelölnie egy csatorna számot azokból, amelyek éppen a KÉSZ állapotban, p1, vannak.

5.2.5.2.2.1.7 *Címzés, földi (AG).* Ez a címzés a földi Lekérdező adat végponti berendezés /DTE/ címzés (5.2.3.1.3.1) a 0-tól 255-ig terjedő tartományban. A címzést az ISO 8208 csomag által tartalmazott hívó DTE címzésből kell venni és binárissá kell átalakítani.

5.2.5.2.2.1.8 *Címzés, mozgó (AM).* Ennek a címzésnek a mozgó DTE alcímzésnek (5.2.3.1.3.2) kell lenni a 0-tól 15-ig terjedő tartományban. A címzést a DTE azon két legkisebb értékű számjegyéből kell kiválasztani, amelyet az ISO 8208 csomag tartalmaz, és binárissá kell átalakítani.

5.2.5.2.2.2 *Átfordítás ISO 8208 csomagokba*

5.2.5.2.2.2.1 *Átfordítás.* A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által vett, az S-módú HÍVÁS KÉRÉS-eknek a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ csomag (vagy egy, a csomagok S-bit sorrendje) általi újra-formátumozási folyamata a Légijármű hálózati végponti berendezéstől /ADCE/ egy, az annak megfelelő ISO 8208 HÍVÁS KÉRÉS csomag létrehozást eredményez a helyi Hálózati végponti berendezéshez /DCE/. Az átfordítás az S-módú csomagból az ISO 8208 csomagba az inverze annak a folyamatnak, amely az 5.2.5.2.2.1 pontban került meghatározásra, azokkal a kivételekkel, amelyek a következő pontokban kerülnek leírásra

5.2.5.2.2.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE címzés és hosszúság mezők*. A hívott DTE címzésnek a légijármű címzésből és az S-módú csomag Mobil cím /AM/ mezőjébe foglalt értékből kell összeállni BCD-be konvertálva (5.2.3.1.3.2). A hívó DTE címzésnek annak a földi DTE címzésnek kell lenni, amelyet az S-módú csomag Földi cím /AG/ mezője foglal magába, BCD-re konvertálva. A hosszúság mező az ISO 8208-ban meghatározottaknak megfelelő kell, hogy legyen.

5.2.5.2.3 A FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ ÁLTALI HÍVÁS FOGADÁS

5.2.5.2.3.1 *Átfordítás S-módú csomagokba*

5.2.5.2.3.1.1 *Átfordított csomag formátum.* A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 HÍVÁS FOGADÁS csomag újra-formátumozási folyamat Fedélzeti adatkapcsolat vezérlő egység /ADLP/ általi vétele a megfelelő S-módú HÍVÁS FOGADÁS csomagnak ADLP csomagok általi létrehozását eredményezi, (ahogyan az S-bit feldolgozás ezt meghatározza (5.2.5.1.4.2)) a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	TC: 2	SN: 6	
CH: 4	AM: 4	AG: 8	S: 1	FILL: 2	F: 1	LV: 4	UD: v

A csomag formátumban bemutatott, de a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban leírásra került.

5.2.5.2.3.1.2 *Adat csomag típus (DP)*. Ezt a mezőt 0-ra kell állítani.

5.2.5.2.3.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.3.1.4 *Felügyelő csomag (SP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.2.3.1.5 *Felügyelő típus (ST)*. Ezt a mezőt 1-re kell állítani.

5.2.5.2.3.1.6 *Ideiglenes csatorna szám (TC).* A TC érték a létrehozó S-módú HÍVÁS KÉRÉS-ben a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ csomaggal visszatér a GDLP-hez a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által kijelölt csatorna számmal (CH) együtt.

5.2.5.2.3.1.7 *Csatorna szám (CH)*. Ezt a mezőt az ADLP által kijelölt csatorna számmal azonos értékre kell állítani, ahogy a HÍVÁS KÉRÉS eljárások során az S-módú kapcsolatnál meghatározásra kerültek.

5.2.5.2.3.1.8 *Címzés, mozgó és címzés, földi.* A Mobil cím /AM/ és Földi cím /AG/ értékek a létrehozó S-módú HÍVÁS KÉRÉS-ben GDLP csomaggal vissza kell, hogy térjenek ezekbe a mezőkbe. Ha jelen vannak, a Lekérdező adat végponti berendezés /DTE/ címzéseket az ISO 8208 HÍVÁS FOGADÁS csomagban figyelmen kívül kell hagyni.

5.2.5.2.3.2 *Átfordítás ISO 8208 csomagokba*

5.2.5.2.3.2.1 *Átfordítás.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által vett, az S-módú HÍVÁS ELFOGADÁS-nak a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ csomag általi (vagy egy, a csomagok S-bit sorrendje általi) újra-formátumozási folyamata a Földi hálózati végponti berendezéstől /GDCE/ egy, az annak megfelelő ISO 8208 HÍVÁS ELFOGADÁS csomag létrehozását eredményezi a helyi Hálózati végponti berendezéshez /DCE/. Az átfordítás az S-módú csomagból az ISO 8208 csomagba az inverze annak a folyamatnak, amely az 5.2.5.2.3.1 pontban került meghatározásra, azokkal a kivételekkel, amelyek a következő pontokban kerülnek leírásra.

5.2.5.2.3.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE címzés és hosszúság mezők.* Ahol ilyen van, ott a hívott DTE címzésnek a légijármű címzésből és az S-módú csomag Mobil cím

/AM/ mezőjében lévő értékekből összeállítottnak kell lenni, BCD-be konvertálva (5.2.3.1.3.2). Ahol ilyen van, ott a hívó DTE címzésnek annak a földi DTE címzésnek kell lenni, amelyet az S-módú csomag Földi cím /AG/ mezője foglal magába BCD-re konvertálva. A hosszúság mezőnek az ISO 8208-ban meghatározottaknak kell megfelelni.

Megjegyzés. - A hívott és hívó DTE címzések szabadon választhatók a hozzátartozó ISO 8208 csomagban és nem követelik meg az S-módú alhálózat korrekt működését.

5.2.5.2.4 *A FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ ÁLTALI HÍVÁS FOGADÁS*

5.2.5.2.4.1 *Átfordítás S-módú csomagokba*

5.2.5.2.4.1.1 *Az átfordított csomag formátuma.* A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 HÍVÁS FOGADÁS csomag újra-formátumozási folyamat Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ általi vétele az annak megfelelő S-módú HÍVÁS FOGADÁS csomagok GDLP csomagok általi létrehozását eredményezi (ahogy azt az S-bit feldolgozás meghatározza (5.2.5.1.4.2)) a következőképpen:

DP: 1	MP: 1	SP: 2	ST: 2	FILL: 2	FILL: 2	SN: 6	CH: 4
AM: 4	AG: 8	S: 1	FILL: 2	F: 1	LV: 4	UD: v	

A csomag formátumban bemutatott, de a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban meghatározásra került.

5.2.5.2.4.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.4.1.3 MSP csomag típus (MP). Ezt a mezőt 1-re kell állítani.

5.2.5.2.4.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.4.1.5 *Felügyelő típus (ST).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.4.1.6 *Címzés, mozgó és címzés, földi.* A Mobil cím /AM/ és Földi cím /AG/ értékek a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ csomag által létrehozott S-módú HÍVÁS KÉRÉS-ben vissza kell, hogy térjenek ezekbe a mezőkbe. Ha jelen vannak, a Lekérdező adat végponti berendezés /DTE/ címzéseket az ISO 8208 HÍVÁS FOGADÁS csomagban figyelmen kívül kell hagyni.

5.2.5.2.4.2 *Átfordítás ISO 8208 csomagokba*

5.2.5.2.4.2.1 *Átfordítás*. A Légijármű hálózati végponti berendezés /ADLP/ által vett, az S-módú HÍVÁS ELFOGADÁS-nak a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ csomag (vagy egy, a csomagok S-bit sorrendje) általi újra-formátumozási folyamata a Légijármű hálózati végponti berendezéstől /ADCE/ egy, az ennek megfelelő ISO 8208 HÍVÁS ELFOGADÁS csomag létrehozását eredményezi a helyi Hálózati végponti berendezéshez /DCE/. Az S-módú csomagból az ISO 8208 csomagba való átfordításnak az 5.2.5.2.4.1 pontban meghatározott folyamat inverzének kell lenni azokkal a kivételekkel, amelyek a következő pontokban kerültek meghatározásra.

5.2.5.2.4.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE címzés és hosszúság mezők.* Ahol ilyen van, ott a hívó DTE címzésnek a légijármű címzésből és az S-módú csomag Mobil cím /AM/ mezőjében lévő értékekből összeállítottnak kell lenni, BCD-be konvertálva (5.2.3.1.3.2). Ahol ilyen van, ott a hívott DTE címzésnek annak a földi DTE címzésnek kell lenni, amelyet az S-módú csomag Földi cím /AG/ mezője foglal magába BCD-re konvertálva. A hosszúság mezőnek az ISO 8208-ban meghatározottaknak kell megfelelni.

Megjegyzés. - A hívott és hívó DTE címzések választhatók a megfelelő ISO 8208 csomagban és nem követelik meg az S-módú al-hálózat helyes működését.

5.2.5.2.5 A FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ ÁLTALI TÖRLÉS KÉRÉS

5.2.5.2.5.1 *Átfordítás S-módú csomagokba*

5.2.5.2.5.1.1 *Átfordított csomag formátum.* A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 TÖRLÉS KÉRÉS csomag újra-formátumozási folyamat Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ általi vétele az annak megfelelő S-módú TÖRLÉS KÉRÉS csomagok ADLP csomag(ok) általi létrehozását eredményezi (ahogy azt az S-bit feldolgozás meghatározza (5.2.5.1.4.2)) a következőképpen:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	TC: 2	SN: 6
CH: 4	AM: 4	AG: 8	CC:8	DC: 8	S: 1	FILL: 2
F: 1	LV: 4	UD: v				

A csomag formátumban bemutatott, de a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 és 5.2.5.2.2 pontban leírásra került.

5.2.5.2.5.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.5.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.5.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.5.1.5 *Csatorna szám (CH).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor a Csatorna számot /CH/ arra az értékre kell beállítani, más esetekben ezt nullára kell állítani.

5.2.5.2.5.1.6 *Ideiglenes csatorna (TC).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor az Ideiglenes csatorna számot /TC/ nullára kell beállítani, más esetben a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által használt HÍVÁS KÉRÉS értékre kell beállítani.

5.2.5.2.5.1.7 *Felügyelő típus (ST).* Ezt a mezőt 2-re kell állítani.

5.2.5.2.5.1.8 *Címzés, földi és címzés, mozgó.* Az AM és AG értékek az ADLP által létrehozott S-módú HÍVÁS KÉRÉS, vagy a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által létrehozott HÍVÁS KÉRÉS csomagoknál visszatérnek ezekbe a mezőkbe. Ha jelen vannak, akkor a DTE címzéseket az ISO 8208 TÖRLÉS KÉRÉS csomagban figyelmen kívül kell hagyni.

5.2.5.2.5.1.9 *Törlést létrehozó (CC) és diagnosztikai kód (DC) mezők.* Ezeket a mezőket módosítás nélkül kell átfordítani az ISO 8208 csomagból az S-módú csomagba, amikor a Lekérdező adat végponti berendezés /DTE/ kezdeményezte a törlési eljárást. Ha a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ kezdeményezte a törlési eljárást, akkor a törlést létrehozó mezőnek és a diagnosztikai mezőnek a Hálózati végponti berendezés /DCE/ és a Fedélzeti/Földi hálózati végponti berendezés /XDCE/ állapot táblázatokban meghatározottaknak kell lenni (lásd még az 5.2.6.3.3 pontot). Ezeknek a mezőknek a kódolása és meghatározása az ISO 8208-ban előírtaknak kell, hogy megfeleljen.

5.2.5.2.5.2 *Átfordítás ISO 8208 csomagokba*

5.2.5.2.5.2.1 *Átfordítás.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egységtől /GDLP/ vett, az S-módú TÖRLÉS KÉRÉS-nek a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ csomag általi újra-formátumozási folyamata a helyi Földi hálózati végponti berendezéstől /GDCE/ az annak megfelelő ISO 8208 TÖRLÉS KÉRÉS csomag létrehozását eredményezi a helyi Hálózati végponti berendezéshez /DCE/. Az S-módú csomagnak az ISO 8208 csomagba történő átfordításának az 5.2.5.2.5.1 pontban meghatározott folyamat inverzének kell lenni, azokkal a kivételekkel, amik a következő pontokban meghatározásra kerülnek.

5.2.5.2.5.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE és hosszúság mezők*. Ezeket a mezőket az ISO 8208 TÖRLÉS KÉRÉS csomagban el kell hagyni.

5.2.5.2.5.2.3 *Törlést létrehozó mező*. Ezt a mezőt az 5.2.6.3.3. pont figyelembevételével kell felállítani.

5.2.5.2.6 *A FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ ÁLTALI TÖRLÉS KÉRÉS*

5.2.5.2.6.1 *Átfordítás S-módú csomagokba*

5.2.5.2.6.1.1 Átfordított csomag formátum. A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 TÖRLÉS KÉRÉS csomag GDLP újra-formátumozási folyamat megfelelő S-módú TÖRLÉS KÉRÉS csomag(ok) GDLP csomagok általi létrehozását eredményezi (ahogy azt az S-bit feldolgozás meghatározza (5.2.5.2.4.2)) a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	FILL: 2	TC: 2	SN: 2	CH: 4	
AM: 4	AG: 8	CC: 8	DC: 8	S: 1	FILL: 2	F: 1	LV: 4	UD: v

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1, 5.2.5.2.2 és 5.2.5.2.5 pontokban leírásra került.

5.2.5.2.6.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.6.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.6.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.6.1.5 *Csatorna szám (CH).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor a Csatorna számot /CH/ arra az értékre kell beállítani, más esetekben ezt nullára kell állítani.

5.2.5.2.6.1.6 *Ideiglenes csatorna (TC).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor az Ideiglenes csatorna számot /TC/ nullára kell beállítani, más esetben a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által használt HÍVÁS KÉRÉS értékre kell beállítani.

5.2.5.2.6.1.7 *Felügyelő típus (ST).* Ezt a mezőt 2-re kell állítani.

5.2.5.2.6.2 *Átfordítás ISO 8208 csomagokba*

5.2.5.2.6.2.1 *Átfordítás.* A Fedélzeti adat-kapcsolat vezérlő egységtől /ADLP/ vett, az S-módú TÖRLÉS KÉRÉS-nek a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ csomag általi (vagy egy, a csomagok S-bit sorrendje általi) újra-formátumozási folyamata a helyi Fedélzeti hálózati végponti berendezéstől /ADCE/ az annak megfelelő ISO 8208 TÖRLÉS KÉRÉS csomag létrehozását eredményezi a helyi Hálózati végponti berendezéshez /DCE/. Az S-módú csomagnak az ISO 8208 csomagba történő átfordításának az 5.2.5.2.6.1 pontban meghatározott folyamat inverzének kell lenni, azokkal a kivételekkel, amik a következő pontokban meghatározásra kerülnek.

5.2.5.2.6.2.2 *Hívott Lekérdező adat végponti berendezés /DTE/, hívó DTE és hosszúság mezők.* Ezeket a mezőket az ISO 8208 TÖRLÉS KÉRÉS csomagban el kell hagyni.
5.2.5.2.7 *ADAT*

5.2.5.2.7.1 *Átfordítás S-módú csomagokba*

5.2.5.2.7.1.1 *Átfordított csomag formátum.* A helyi Hálózati végponti berendezéstől /DCE/ vett ISO 8208 ADAT csomag(ok) újra-formátumozási folyamat Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ általi vétele a megfelelő S-módú ADAT csomag(ok) létrehozását kell, hogy eredményezze, ahogy azt az M-bit feldolgozás meghatározza (5.2.5.1.4.1 pont), a következők szerint:

DP: 1	M: 1	SN: 6	FILL1: 1 vagy 6	PS: 4	PR: 4	CH: 4
LV: 4	UD: v					

5.2.5.2.7.1.2 *Adat csomag típus (DP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.7.1.3 *M Mező (M).* Az 1 értéknek kell jeleznie, hogy a csomag egy M-bit sorozat része, több csomaggal a sorozatban következőkben. A 0 érték azt mutatja, hogy a sorozat ezzel a csomaggal végződik. A megfelelő értéket az S-módú csomag M-bit mezőjében kell elhelyezni.

Megjegyzés. - A teljes magyarázatot lásd az 5.2.5.1.4 pontban és az ISO 8208-ban.

5.2.5.2.7.1.4 *Sorozat szám (SN).* A sorozat szám mezőt úgy kell beállítani, ahogyan az az 5.2.5.2.1.1.7 pontban meghatározásra került.

5.2.5.2.7.1.5 *Csomag küldési sorrend (PS).* A csomag küldési sorrend mezőt úgy kell beállítani, ahogy az az
5.2.6.4.4 pontban van előírva.

5.2.5.2.7.1.6 *Csomag vételi sorrend (PR).* A csomag vételi sorrend mezőt úgy kell beállítani, ahogy az az 5.2.6.4.4 pontban specifikálva van.

5.2.5.2.7.1.7 *Csatorna szám (CH).* A csatorna szám mezőnek tartalmaznia kell azt az S-módú csatorna számot, amely megfelel a bejövő ISO 8208 ADAT csomag csatorna számnak.

5.2.5.2.7.1.8 *Felhasználói adat hossz (LV).* Ennek a mezőnek kell jeleznie az utolsó Szabvány hosszúságú közlemény /SLM/ vagy Kiterjesztett hosszúságú közlemény /ELM/ szegmensben lévő összes bájtok számát, ahogyan az az 5.2.2.3.1 pontban meghatározásra került.

5.2.5.2.7.1.9 *Kitöltés (FILL1).* Ezt a mezőt az 5.2.5.2.1.1.11 pontban meghatározottak szerint kell beállítani.

5.2.5.2.7.1.10 *Felhasználói adat (UD).* A felhasználói adatokat az ISO 8208 csomagból az S-módú csomagba kell átvinni, az M-bit csomag összeállítási folyamatot felhasználva, ahogy az megkövetelt.

5.2.5.2.7.2 *Átfordítás ISO 8208 csomagokba.* A helyi Fedélzeti/Földi hálózati végponti berendezéstől /XDCE/ a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ által vett S-módú ADAT csomag(ok) újra-formátumozási folyamata a megfelelő ISO 8208 ADAT csomag(ok) létrehozását eredményezi a helyi Hálózati végponti berendezés /DCE/ részére. Az S-módú csomag(ok)nak az ISO 8208 csomag(ok)ba történő átfordítása az 5.2.5.2.7.1 pontban meghatározott feldolgozás inverze kell, hogy legyen.

5.2.5.2.8 *MEGSZAKÍTÁS*

5.2.5.2.8.1 *Átfordítás az S-módú csomagokba*

5.2.5.2.8.1.1 *Átfordított csomag formátum.* A helyi DCE-től jövő ISO 8208 MEGSZAKÍTÁS átfordítási folyamatnak az XDLP általi vétele a megfelelő S-módú MEGSZAKÍTÁS csomag(ok) létrehozását eredményezi (ahogy azt az S-bit feldolgozás meghatározza (5.2.5.1.4.2 pont)) a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	FILL 2: 0 vagy 2	S: 1	F: 1
SN: 6	CH: 4	LV: 4	UD: v			

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban meghatározásra került.

5.2.5.2.8.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.8.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.8.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.8.1.5 *Felügyelő típus (ST).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.8.1.6 *Felhasználói adat hossz (LV).* Ezt a mezőt úgy kell beállítani, ahogyan az 5.2.2.3.1 pontban meghatározásra került.

5.2.5.2.8.1.7 *Felhasználói adat (UD).* A felhasználói adatokat az ISO 8208 csomagból az S-módú csomagba az S-bit csomag újra-összeállítási eljárását alkalmazva kell átvinni úgy, ahogy az előírt. A felhasználói adatmező maximális méretének egy MEGSZAKÍTÁS csomagra 32 bájtnak kell lenni.

5.2.5.2.8.2 *Átfordítás ISO 8208 csomagokba.* A helyi Fedélzeti/Földi hálózati végponti berendezéstől /XDCE/ a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ által vett S-módú MEGSZAKÍTÁS csomag(ok) újra-formátumozási folyamata a megfelelő ISO 8208 MEGSZAKÍTÁS csomag létrehozását eredményezi a helyi Hálózati végponti berendezés /DCE/ részére. Az S-módú csomag(ok)nak az ISO 8208 csomag(ok)ba történő átfordítása az 5.2.5.2.8.1 pontban meghatározott feldolgozás inverze kell, hogy legyen.

5.2.5.2.9 *MEGSZAKÍTÁS MEGERŐSÍTÉS*

5.2.5.2.9.1 *Átfordítás S-módú csomagokba*

5.2.5.2.9.1.1 *Átfordított csomag formátum.* A helyi DCE-től jövő ISO 8208 MEGSZAKÍTÁS MEGERŐSÍTÉS átfordítási folyamatnak az XDLP általi vétele a megfelelő S-módú MEGSZAKÍTÁS MEGERŐSÍTÉS csomag létrehozását eredményezi a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	SS:2	FILL 2: 0 vagy 2	SN: 6
CH: 4	FILL: 4					

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban meghatározásra került.

5.2.5.2.9.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.9.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.2.9.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 3-ra kell állítani.

5.2.5.2.9.1.5 *Felügyelő típus (ST).* Ezt a mezőt 3-ra kell állítani.

5.2.5.2.9.1.6 *Felügyelő részhalmaz (SS).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.9.2 *Átfordítás ISO 8208 csomagokba.* A helyi Fedélzeti/Földi hálózati végponti berendezéstől /XDCE/ a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ által vett S-módú MEGSZAKÍTÁS MEGERŐSÍTÉS csomag újra-formátumozási folyamata a megfelelő ISO 8208 MEGSZAKÍTÁS

MEGERŐSÍTÉS csomag létrehozását eredményezi a helyi Hálózati végponti berendezés /DCE/ részére. Az S-módú csomagnak az ISO 8208 csomagba történő átfordítása az 5.2.5.2.9.1 pontban meghatározott feldolgozás inverze kell, hogy legyen.

5.2.5.2.10 *VISSZAÁLLÍTÁS KÉRÉS*

5.2.5.2.10.1 *Átfordítás S-módú csomagokba*

5.2.5.2.10.1.1 *Átfordított csomag formátum.* A helyi Hálózati végponti berendezéstől /DCE/ jövő ISO 8208 VISSZAÁLLÍTÁS KÉRÉS csomag újra-formátumozási folyamat Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ általi vétele a megfelelő S-módú VISSZAÁLLÍTÁS KÉRÉS csomag létrehozását kell, hogy eredményezze a következők szerint:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	FILL: 2	SN: 6
CH: 4	FILL: 4	RC: 8	DC: 8			

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az az 5.2.5.2.1 pontban meghatározásra került.

5.2.5.2.10.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.2.10.1.3 *MSP csomag típus (MP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.2.10.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 2-re kell állítani.

5.2.5.2.10.1.5 *Felügyelő típus (ST).* Ezt a mezőt 2-re kell állítani.

5.2.5.2.10.1.6 *A visszaállítást előidéző kód (RC) és a diagnosztikai kód (DC).* A visszaállítást előidéző és diagnosztikai kódok, amelyek az S-módú VISSZAÁLLÍTÁS KÉRÉS csomagban alkalmazva vannak, az ISO 8208 csomagban előírtaknak megfelelő kódoknak kell lenni akkor, amikor a visszaállítási eljárást a Lekérdező adat végponti berendezés /DTE/ kezdeményezi. Ha a visszaállítási eljárás a Hálózati végponti berendezéstől /DCE/ indul, akkor a DCE állapot táblázatoknak kell meghatározniuk a diagnosztikai mezők kódolását. Ebben az esetben a visszaállítást előidéző mező 8-as bitjét 0-ra kell állítani.

5.2.5.2.10.2 *Átfordítás ISO 8208 csomagokba.* A helyi Fedélzeti/Földi hálózati végponti berendezéstől /XDCE/ a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ által vett S-módú VISSZAÁLLÍTÁS csomag újra-formátumozási folyamata a megfelelő ISO 8208 VISSZAÁLLÍTÁS csomag létrehozását eredményezi a helyi Hálózati végponti berendezés /DCE/ részére. Az S-módú csomagnak ISO 8208 csomagba történő átfordítása az 5.2.5.2.10.1 pontban meghatározott feldolgozás inverze kell, hogy legyen.

5.2.5.2.11 *ISO 8208 ÚJRAINDÍTÁS KÉRÉS az S-módú TÖRLÉS KÉRÉS-hez.* A helyi DCE-ből jövő ISO 8208 ÚJRAINDÍTÁS KÉRÉS vételének az újra-formátumozási folyamatban eredményeznie kell egy, a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által létrehozott S-módú TÖRLÉS KÉRÉS-t, vagy a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által létrehozott S-módú BONTÁS KÉRÉS-t a kérő Lekérdező adat végponti berendezéssel /DTE/ kapcsolódó összes Kapcsolt virtuális áramkörnél /SVC/. Az S-módú TÖRLÉS KÉRÉS csomagokat az 5.2.5.2.5 és 5.2.5.2.6 pontokban meghatározottak szerint kell beállítani.

Megjegyzés. - Az S-módú csomag réteg protokolban nincsenek újraindítási állapotok.

5.2.5.3 CSOMAGOK, HELYI AZ S-MÓDÚ ALHÁLÓZATHOZ

Megjegyzés. - Az ebben a szakaszban meghatározott csomagok nem eredményeznek ISO 8208 csomag létrehozást.

5.2.5.3.1 *S-MÓDÚ FOGADÁSRA KÉSZ*

5.2.5.3.1.1 *Csomag formátum.* Egy Fedélzeti/Földi adat-kapcsolat vezérlő egységtől /XDLP/ érkező S-módú FOGADÁSRA KÉSZ csomag nincs kapcsolatban a Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztés vezérléssel és nem eredményezi ISO 8208 csomag létrehozását. A csomag formátumának a következőnek kell lenni:

DPR: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	FILL: 2	SN: 6
CH: 4	PR: 4					

A csomag formátumban bemutatott és a következő pontokban nem szereplő mezőket az 5.2.5.2.1 pontban meghatározottak szerint kell beállítani. A csomagot az 5.2.6.5 pontban meghatározottak szerint kell feldolgozni.

5.2.5.3.1.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.1.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.1.4 *Felügyelő csomag (SP).* Ezt a mezőt 2-re kell állítani.

5.2.5.3.1.5 *Felügyelő típus (ST).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.1.6 *Csomag vételi sorrend (PR).* Ezt a mezőt az 5.2.6.4.4 pontban meghatározottak szerint kell beállítani.

5.2.5.3.2 S-*MÓDÚ FOGADÁSRA NEM KÉSZ*

5.2.5.3.2.1 *Csomag formátum.* Egy Fedélzeti/Földi adat-kapcsolat vezérlő egységtől /XDLP/ érkező S-módú FOGADÁSRA NEM KÉSZ csomag nincs kapcsolatban a Lekérdező adat végponti berendezés/Hálózati végponti berendezés /DTE/DCE/ illesztés vezérléssel és nem eredményezi ISO 8208 csomag létrehozását. A csomag formátumának a következőnek kell lenni:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	FILL: 2
SN: 6	CH: 4	PR: 4			

A csomag formátumban bemutatott és a következő pontokban nem szereplő mezőket az 5.2.5.2.1 pontban meghatározottak szerint kell beállítani. A csomagot az 5.2.6.5 pontban meghatározottak szerint kell feldolgozni.

5.2.5.3.2.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.2.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.2.4 *Felügyelő csomag (SP).* Ezt a mezőt 2-re kell állítani.

5.2.5.3.2.5 *Felügyelő típus (ST).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.2.6 *Csomag vételi sorrend (PR)*. Ezt a mezőt az 5.2.6.4.4 pontban meghatározottak szerint kell beállítani.

5.2.5.3.3 *S-MÓDÚ IRÁNYÍTÁS*

5.2.5.3.3.1 *Csomag formátum.* A csomag formátumának a következőnek kell lenni:

DP: 1	MP: 1	SP: 2	ST: 2	OF: 1	IN: 1	RTL: 8
RT: v	ODL: 0 vagy 8	OD: v				

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket az 5.2.5.2.1 pontban előírtak szerint kell beállítani. A csomag csak a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által kerül létrehozásra. A csomagot a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ dolgozza fel az 5.2.8.1.2 pontban meghatározottak szerint, és a csomag maximális méretének az 5.2.6.4.2.1 pontban meghatározottaknak kell megfelelni.

5.2.5.3.3.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.3.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.3.4 *Felügyelő csomag (SP).* Ezt a mezőt 3-ra kell állítani.

5.2.5.3.3.5 *Felügyelő típus (ST).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.3.6 *Választható jelzés (OF).* Ennek a mezőnek kell jeleznie a választható adat hossz (ODL) és a választható adat (OD) jelenlétét. A választható jelzést (OF) 1-re kell beállítani akkor, amikor a Választható adat hossz (ODL) és a Választható adat (OD) mezők vannak. Egyéb esetekben 0-ra kell állítani.

5.2.5.3.3.7 *Indulási állapot beállító bit (IN).* Ennek a mezőnek kell jeleznie az alhálózat indulási állapot beállítása iránti igényt. Ezt a GDLP-nek az 5.2.8.1.2 d) pontban meghatározottaknak megfelelően kell beállítani.

Megjegyzés. - Az indulási állapotbeállítás az IRÁNYÍTÁS csomagban lévő Lekérdező adat végponti berendezés /DTE/ címzésekhez kapcsolódó bármely nyitott Kapcsolt virtuális áramkör /SVC/ törlését hozza létre. Ez annak biztosításához szükséges, hogy valamennyi csatorna zárva legyen az adat-gyűjtésnél és egy GDLP meghibásodást követő helyreállítás indulási állapot beállításához.

5.2.5.3.3.8 *I rányítás táblázat hossz (RTL).* Ennek a mezőnek kell jeleznie az irányítás táblázat méretét bájtokban kifejezve.

5.2.5.3.3.9 *Irányítás táblázat (RT)*

5.2.5.3.3.9.1 *Tartalom.* Ennek a táblázatnak kell a változtatható számú belépési címekből állni, azokból, amelyek mindegyike olyan információt tartalmaz, amely meghatározza a belépési címek hozzáadását vagy törlését a Lekérdező azonosító /II/ kód Lekérdező adat végponti berendezés /DTE/ kereszt-hivatkozás táblázatban (5.2.8.1.1).

5.2.5.3.3.9.2 *Belépési címek.* Az irányítás táblázatban minden belépési cím az II kódból áll, maximálisan 8 földi DTE címzés felsorolásból és egy jelzésből, amely azt mutatja meg, hogy a származó II kód - DTE párokat hozzá kell-e adni vagy törölni kell-e az II kód - DTE kereszt-hivatkozási táblázatból. Az irányító táblázat bevitelét a következőképpen kell kódolni:

II: 4	AD: 1	ND: 3	DAL: v

5.2.5.3.3.9.3 *Lekérdező azonosító (II)*. Ez a mező tartalmazza a 4-bites II kódot.

5.2.5.3.3.9.4 *Hozzáadás/törlés jelző (AD).* Ennek a mezőnek azt kell megmutatnia, hogy a II kód - DTE párokat hozzá kell adni (AD = 1) vagy törölni kell-e (AD = 0) az II kód - DTE kereszt-hivatkozás táblázatból.

5.2.5.3.3.9.5 *Lekérdező adat végponti berendezés /DTE/ címzések száma (ND).* Ezt a mezőt a 0-tól 7-ig terjedő tartományban binárisan kell kifejezni, és a DTE címzés jegyzékben /DAL/ jelenlévő DTE címzések számát mindig 1 levonással kell jelezni (azért, hogy lehetővé tegye az 1-től 8-ig terjedő DTE címzéseket).

5.2.5.3.3.9.6 *DTE címzés jegyzék (DAL).* Ennek a jegyzéknek maximálisan 8 DTE címzésből kell állnia 8-bites bináris adat feltűntetéssel.

5.2.5.3.3.10 *Választható adat hossz (ODL).* Ennek a mezőnek kell magába foglalnia a következő Választható adat /OD/ mező bájtokban kifejezett hosszúságát.

5.2.5.3.3.11 *Választható adat (OD).* Ennek a változtatható hosszúságú mezőnek a választható adatokat kell magába foglalni.

5.2.5.3.4 *A FEDÉLZETI ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ ÁLTALI S-MÓDÚ TÖRLÉS MEGERŐSÍTÉS*

5.2.5.3.4.1 *Csomag formátum.* A formátumnak ennél a csomagnál a következőnek kell lenni:
5.2.5.3.4.2

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	TC: 2
SN: 6	CH: 4	AM: 4	AG: 8		

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogy az az 5.2.5.2.1 és 5.2.5.2.5 pontokban meghatározásra került. Ezt a csomagot az 5.2.6.3 pontban előírtaknak megfelelően kell feldolgozni.

5.2.5.3.4.2 *Adat csomag típus (DP)*. Ezt a mezőt 0-ra kell állítani.

5.2.5.3.4.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.4.4 *Felügyelő csomag (SP).* Ezt a mezőt 3-ra kell állítani.

5.2.5.3.4.5 *Csatorna szám (CH).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor a Csatorna számot /CH/ arra az értékre kell beállítani, más esetekben ezt nullára kell állítani.

5.2.5.3.4.6 *Ideiglenes csatorna (TC).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor az Ideiglenes csatorna számot /TC/ nullára kell beállítani, más esetben a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által használt HÍVÁS KÉRÉS értékre kell beállítani.

5.2.5.3.4.7 *Felügyelő típus (ST)*. Ezt a mezőt 3-ra kell állítani.

5.2.5.3.5 *A FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ ÁLTALI S-MÓDÚ TÖRLÉS MEGERŐSÍTÉS*

5.2.5.3.5.1 *Csomag formátum.* Ennek a csomagnak a formátuma a következő:

DP: 1	MP: 1	SP: 2	ST: 2	FILL: 2	TC: 2	SN: 6
CH: 4	AM: 4	AG: 8				

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogy az az 5.2.5.2.1 és 5.2.5.2.6 pontokban meg van határozva. Ezt a csomagot az 5.2.6.3 pontban előírtaknak megfelelően kell feldolgozni.

5.2.5.3.5.2 *Adat csomag típus (DP)*. Ezt a mezőt 0-ra kell állítani.

5.2.5.3.5.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.5.4 *Felügyelő csomag (SP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.3.5.5 *Csatorna szám (CH).* Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor a Csatorna számot /CH/ arra az értékre kell beállítani, más esetekben ezt nullára kell állítani.

5.2.5.3.5.6 *Ideiglenes csatorna (TC)*. Ha a hívás elfogadási időszak során egy csatorna szám kerül kijelölésre, akkor az Ideiglenes csatorna számot /TC/ nullára kell beállítani, más esetben a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által használt HÍVÁS KÉRÉS értékre kell beállítani.

5.2.5.3.4.7 *Felügyelő típus (ST)*. Ezt a mezőt 3-ra kell állítani.

5.2.5.3.6 *S-MÓDÚ VISSZAÁLLÍTÁS MEGERŐSÍTÉS*

5.2.5.3.6.1 *Csomag formátum.* Ennek a csomagnak a formátuma a következő:

DP: 1	MP: 1	SP: 2	ST: 2	FILL2: 0 vagy 2	FILL: 2
SN: 6	CH: 4	FILL: 4			

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogyan az 5.2.5.2.1 pontban előírásra került. Ezt a csomagot az 5-14. táblázatban meghatározottak szerint kell feldolgozni.

5.2.5.3.6.2 *Adat csomag típus (DP)*. Ezt a mezőt 0-ra kell állítani.

5.2.5.3.6.3 *MSP csomag típus (MP).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.6.4 *Felügyelő csomag (SP)*. Ezt a mezőt 2-re kell állítani.

5.2.5.3.6.5 *Felügyelő típus (ST).* Ezt a mezőt 3-ra kell állítani.

5.2.5.3.7 *S-MÓDÚ VISSZAÁLLÍTÁS*

5.2.5.3.7.1 *Csomag formátum.* Ennek a csomagnak a formátuma a következő:

DP: 1	MP: 1	SP: 2	ST: 2	SS:2	FILL 2: 0 vagy 2
SN: 6	CH: 4	PR: 4			

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket úgy kell beállítani, ahogy az az 5.2.5.2.1 pontban meg van határozva. Ezt a csomagot az 5.2.6.8 pontban előírtaknak megfelelően kell feldolgozni.

5.2.5.3.7.2 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.5.3.7.3 *MSP csomag típus (MP)*. Ezt a mezőt 1-re kell állítani.

5.2.5.3.7.4 *Felügyelő csomag (SP).* Ezt a mezőt 3-ra kell állítani.

5.2.5.3.7.5 *Felügyelő típus (ST).* Ezt a mezőt 3-ra kell állítani.

5.2.5.3.7.6 *Felügyelő részhalmaz (SS).* Ezt a mezőt 1-re kell állítani.

5.2.5.3.7.7 *Csomag vételi sorrend (PR)*. Ezt a mezőt az 5.2.6.4.4 pontban meghatározottak szerint kell beállítani.

5.2.6 Légijármű/Földi hálózati végponti berendezés /XDCE/ működése

Megjegyzés. - A Légijármű hálózati végponti berendezés /ADCE/ feldolgozás a Fedélzeti adat-kapcsolat vezérlő egységen /ADLP/ belül úgy működik, mint a Földi hálózati végponti berendezés /GDCE/ feldolgozás a Földi telepítési rendszerű adat-kapcsolat vezérlő egységen /GDLP/ belüli társ-folyamata.

5.2.6.1 *Állapot átvitelek.* Az XDCE állapotgépként működik. Egy állapotba kerülve, az XDCE végrehajtja az 5-14. táblázatban ismertetett műveleteket. Az állapot átvitelek és kiegészítő művelet(ek) az 5-15.-től az 5-22.-ig terjedő táblázatokban vannak leírva.

1. Megjegyzés. - A következő állapot átvitel (ha van ilyen), amely akkor következik be, amikor a Légijármű/Földi hálózati végponti berendezés /XDCE/ egy csomagot fogad a társ XDCE-től, ami az 5-15.-től az 5-19.-ig terjedő táblázatokban van meghatározva. Ugyanezek az átvitelek vannak meghatározva az 5-20.-tól az 5-22.-ig terjedő táblázatokban, amikor a XDCE vesz egy csomagot a Hálózati végponti berendezéstől /DCE/ (az újra-formátumozó folyamaton keresztül).

2. Megjegyzés. - Az XDCE állapot hierarchiája ugyanolyan, mint a DCE-jé, ahogyan azt az 5-2 ábra bemutatja, azzal a kivétellel, hogy az 'r2', ' r3' és 'p5' állapotokat el kell hagyni.

5.2.6.2 A CSOMAGOK KIOSZTÁSA

5.2.6.2.1 Egy csomagnak a társ Légijármű/Földi hálózati végponti berendezéstől /XDCE/ történő fogadása után a csomagot vagy továbbítani kell vagy nem kell továbbítani a Hálózati végponti berendezéshez /DCE/ (az újraformátumozó eljáráson keresztül) az 5-15.-től az 5-19.-ig terjedő táblázatokban megadott zárójeles utasításoknak megfelelően. Ha a zárójeles utasítás nincs feltűntetve, vagy ha a zárójeles utasítás "ne továbbíts" utasítást mutat, akkor a csomagot érvényteleníteni kell.

5.2.6.2.2 Egy csomag fogadása után a DCE-től (az újra-formátumozó folyamaton keresztül) a csomagot vagy továbbítani kell vagy nem kell továbbítani a társ XDCE-hez az 5-20.-tól az 5-22.-ig terjedő táblázatokba foglalt zárójeles utasításoknak megfelelően. Ha zárójeles utasítás nincs feltűntetve, vagy a zárójeles utasítás "ne továbbíts" utasítást mutat, a csomagot érvényteleníteni kell.

5.2.6.3 KAPCSOLT VIRTUÁLIS ÁRAMKÖR /SVC/ HÍVÁS BEÁLLÍTÁSI ÉS TÖRLÉSI ELJÁRÁS

5.2.6.3.1 *Beállítási eljárások.* A Hálózati végponti berendezéstől /DCE/ vagy a társ XDCE-től jövő HÍVÁS KÉRÉS fogadása után a Fedélzeti/Földi adat-kapcsolat vezérlő egységnek /XDLP/ meg kell állapítania azt, hogy van-e elegendő erőforrás az SVC működtetéséhez. Ennek a következőket kell tartalmazni: elegendő tároló tér (a tárolási követelményeket illetően nézzék meg az 5.2.5.1.1 pontot) és egy rendelkezésre álló p1 állapotú SVC. A DCE-től (az újra-formátumozási folyamaton keresztül) érkező HÍVÁS KÉRÉS fogadása után az S-módú HÍVÁS KÉRÉS csomagot továbbítani kell keret feldolgozásra. A társ XDCE-től (a keret feldolgozáson keresztül) érkezett S-módú HÍVÁS KÉRÉS fogadása után az S-módú HÍVÁS KÉRÉS-t el kell küldeni az újra-formátumozó feldolgozáshoz.

5.2.6.3.2 *Egy hívás kérés leállítása*. Ha a Lekérdező adat végponti berendezés /DTE/ és/vagy a társ Légijármű/Földi hálózati végponti berendezés /XDCE/ leállít egy hívást, mielőtt azok egy HÍVÁS ELFOGADÁS csomagot vettek, jelezniük kell ezt a feltételt egy TÖRLÉS KÉRÉS csomag kibocsátásával. Az ezeknek az eseteknek a kezelésére szolgáló eljárásoknak az 5-16. és 5-20. táblázatban megadottaknak kell lenni.

5.2.6.3.3 *VIRTUÁLIS HÍVÁS TÖRLÉS*

5.2.6.3.3.1 Ha az XDCE egy olyan S-módú HÍVÁS KÉRÉS-t vesz az újra-formátumozó feldolgozástól, amelyet nem tud alátámasztani, akkor egy S-módú TÖRLÉS KÉRÉS csomagot kell megindítania, amelyet a DCE-hez továbbít (az újra-formátumozó feldolgozáson keresztül) a DTE-hez való továbbítás céljából (a DCE ilyen módon belép a DCE TÖRLÉS KÉRÉS-be a DTE állapotába, a p7-be).

5.2.6.3.3.2 Ha az XDCE egy olyan S-módú HÍVÁS KÉRÉS csomagot vesz a társ XDCE-től (keret feldolgozáson keresztül), amelyet ez nem tud alátámasztani, akkor be kell lépnie a p7 állapotba.

5.2.6.3.3.3 Módot kell biztosítani ahhoz, hogy a DTE értesítést kapjon arról, hogy egy SVC a társ DTE tevékenysége miatt, vagy magán az alhálózaton belüli probléma miatt került törlésre.

5.2.6.3.3.4 **Ajánlás. -** *Az 5.2.6.3.3.3 pont követelményét a törlést létrehozó mező 8-as bitjének 1-re állításával kell kielégíteni annak jelzésére, hogy a probléma az S-módú alhálózatból ered és nem a DTE-ben keletkezett. A diagnosztikai /DC/ és törlést létrehozó /CC/ kódokat a következőképpen kell beállítani:*

a) csatorna szám nem áll rendelkezésre, DC = 1, CC = 133;

b) tároló tér nem áll rendelkezésre, DC = 71, CC = 133;

c) DTE nem működőképes, DC = 162, CC = 141; és

d) kapcsolat meghibásodás, DC = 225, CC = 137.

5.2.6.3.3.5 Ha a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ egy olyan S-módú IRÁNYÍTÁS csomagot vesz, ahol az Indulási állapot /IN/ bit EGY-re van állítva, az ADLP-nek egy helyi indulási állapot beállítást kell végre- hajtania az IRÁNYÍTÁS csomagban lévő DTE címzésekhez kapcsolódó S-módú SVC-k törlésével. Ha a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ egy keresés kérést (5-23 táblázat) vesz egy ADLP-től, akkor a GDLP-nek végre kell hajtania helyi indulási állapot beállítást az ahhoz az ADLP-hez kapcsolódó S-módú SVC-k törlésével. A helyi indulási állapot beállítást a következőkkel kell végrehajtani:

a) az összes, az ezekhez a Kapcsolt virtuális áramkörökhöz /SVC-k/ kapcsolódó lefoglalt hozzárendelt erőforrások leválasztásával (beleértve az újra sorbarendező tárolókat is);

b) ezeknek a SVC-knek a visszatérése a Légijármű hálózati végponti berendezés /ADCE/ kész állapotba (p1); és

c) S-módú TÖRLÉS KÉRÉS csomagok küldése ezekhez az SVC-khez a Hálózati végponti berendezésnél /DCE/ (az újra-formátumozási folyamaton keresztül) a Lekérdező adat végponti berendezéshez /DTE/ való továbbítás céljából.

Megjegyzés. - Ez a művelet lehetővé fogja tenni azt, hogy az S-módú SVC-khez tartozó összes ISO 8208 SVC-k törlésre kerüljenek, és visszatérjenek a kész állapotba (p1).

5.2.6.3.4 *A törlés megerősítése.* Amikor a Légijármű/Földi hálózati végponti berendezés /XDCE/ egy S-módú TÖRLÉS MEGERŐSÍTÉS csomagot vesz, az SVC kezelésére szolgáló, megmaradó hozzárendelt erő-forrásokat le kell választania (beleértve az újra-sorbarendező tárolókat is) és az SVC-nek vissza kell térnie a p1 állapotba. S-módú TÖRLÉS MEGERŐSÍTÉS csomagot nem kell továbbítani az újra-formátumozó feldolgozáshoz.

5.2.6.3.5 *Törlés ütközés.* A törlés ütközés akkor fordul elő az XDCE-nél, amikor az egy S-módú TÖRLÉS KÉRÉS csomagot vesz a DCE-től (az újra-formátumozási feldolgozáson keresztül), és azután egy S-módú TÖRLÉS KÉRÉS csomagot vesz a társ XDCE-től (vagy fordítva). Ebben az eseményben az XDCE nem számít egy S-módú TÖRLÉS MEGERŐSÍTÉS csomag vételére erre az SVC-re és a törlést teljesnek kell tekintenie.

5.2.6.3.6 *Csomag feldolgozás.* Az XDCE-nek az S-módú HÍVÁS KÉRÉS, HÍVÁS ELFOGADÁS és TÖRLÉS KÉRÉS csomagok S-bit sorozatát egyedi entitásként kell kezelnie.

5.2.6.4 ADATÁTVITELI ÉS MEGSZAKÍTÁSI ELJÁRÁSOK

5.2.6.4.1 *ÁLTALÁNOS ELŐÍRÁSOK*

5.2.6.4.1.1 Adatátviteli és megszakítási eljárásokat minden egyes SVC-hez függetlenül kell alkalmazni. A felhasználói adat mező tartalmát átlátszóan át kell adni a DCE-nek vagy a társ XDCE-nek. Az adatokat olyan sorrendben kell átvinni, amelyet az adat csomagok részére kijelölt sorozat számok diktálnak.

5.2.6.4.1.2 Ahhoz, hogy csomagokat vigyen át, az SVC-nek FORGALOM VEZÉRLÉSRE KÉSZ állapotban (d1) kell lennie.

5.2.6.4.2 *S-MÓDÚ CSOMAG MÉRET*

5.2.6.4.2.1 Az S-módú csomagok maximális méretének 152 bájt-nak kell lenni a fedélzetre irányuló adattovábbítási irányban és 160 bájtnak a fedélzetről leadott adattovábbítási berendezéseknél, amelyek teljes fedélzetre irányuló vagy fedélzetről leadott adattovábbítási Kiterjesztett hosszúságú közlemény /ELM/ teljesítőképességgel rendelkeznek. A maximális fedélzetről leadott csomag méret négy válaszjeladós szintre kevesebb, mint 16 szegmens fedélzetről leadott ELM teljesítőképességgel, egyenlő lesz 10 bájt szorozva a fedélzetről leadott ELM szegmensek maximális számával, ahogy a válaszjeladó meghatározza az adat-kapcsolati teljesítőképesség jelentésében. Ha nincs ELM teljesítőképesség, a maximális S-módú csomag méret 28 bájt.

5.2.6.4.2.2 Az S-módú alhálózat kisebb csomagokat tesz lehetővé, mint a továbbítandó maximális méret.

5.2.6.4.3 FORGALOM VEZÉRLÉS ABLAK MÉRET

5.2.6.4.3.1 Az S-módú alhálózat forgalom vezérlő ablak méretének függetlennek kell lenni attól, ami a DTE/DCE illesztésnél használatos. Az S-módú alhálózat ablak méretének 15 csomagnak kell lenni a fedélzetre irányuló és a fedélzetről leadott adattovábbítás irányban.

5.2.6.4.4. *SVC FORGALOM VEZÉRLÉS*

5.2.6.4.4.1 A forgalom vezérlést egy, a vett csomagokra (PR) alkalmazott sorozat szám segítségével lehet irányítani, és egy másik sorozat szám (PS) segítségével olyan csomagoknál, amelyeket elküldenek. Minden egyes S-módú ADAT csomaghoz, amelyet a Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ hoz létre az egyes Kapcsolt virtuális áramkörre /SVC/, ki kell jelölni egy sorozat számot (PS). Az első S-módú ADAT csomag, amelyet a Légijármű/Földi hálózati végponti berendezés /XDCE/ a keret feldolgozáshoz továbbít, amikor az SVC éppen belépett a forgalom vezérlésre kész állapotba, a nulla számot kell, hogy kapja. Az első S-módú csomag, amelyet a társ XDCE-től vettek, miután egy SVC éppen belépett a forgalom vezérlésre kész állapotba, a nulla számot kell, hogy kapja. A következő csomagokat folyamatosan egymás után következő számokkal kell beszámozni.

5.2.6.4.4.2 Az S-módú ADAT csomagok jelforrása (a Légijármű hálózati végponti berendezés /ADCE/ vagy a Földi hálózati végponti berendezés /GDCE/) nem fog küldeni (a vevőtől jövő engedély nélkül) több S-módú ADAT csomagot annál, mint ami megtöltené a forgalom vezérlési ablakot. A vevőnek kifejezett engedélyt kell adni a többi csomag küldéséhez.

5.2.6.4.4.3 Az engedély információnak a következő várt csomag sorozat szám formájában kell lenni és PR-nek kell jelölni. Ha a vevő fel kívánja frissíteni az ablakot, és van adata a küldőhöz történő továbbításra, S-módú ADAT csomagot kell használnia az információ átadáshoz. Ha az ablakot fel kell frissíteni és nincs elküldendő adat, akkor az S-módú FOGADÁSRA KÉSZ (RR) vagy az S-módú FOGADÁSRA NEM KÉSZ (RNR) csomagot kell küldeni. Ennél a pontnál a "csúszó ablakot" el kell mozgatni ahhoz, hogy az új Csomag sorozat szám /PR/ értéknél kezdjen. Az XDCE most jogosult arra, hogy nyugtázás nélkül, az ablak korlátig további csomagokat továbbítson.

5.2.6.4.4.4 Amikor a továbbítandó következő S-módú ADAT csomag sorozat száma (PS) a PR ? PS ? RR + 14 (modulo 16) tartományban van, akkor a sorozat számot "ablakban lévő"-ként kell meghatározni, és az XDCE-t fel kell jogosítani a csomag továbbítására. Az ettől eltérő esetekben a csomag sorozat számát (PS) "ablakon kívüli"-ként kell meghatározni, és az XDCE nem továbbíthatja a csomagot a társ XDCE-nek.

5.2.6.4.4.5 Amikor a vett csomag sorozat száma (PS) a sorban következő és ablakon belül van, akkor az XDCE-nek el kell fogadnia ezt a csomagot. Egy csomag fogadását olyan PS-el, amely:

a) az ablakon kívül van; vagy

b) a sorozat számon kívül van; vagy

c) nem egyenlő 0-val a FORGALOM VEZÉRLÉSRE KÉSZ állapotba (d1) való belépés utáni első adat csomag esetén;

hibának kell tekinteni.

5.2.6.4.4.6 Egy olyan S-módú ADAT csomag fogadásának - amely érvényes PS számmal rendelkezik (azaz a sorrendben következő PS-el) - létre kell hoznia azt, hogy az ablak alacsonyabb Csomag sorozat szám /PR/ értéke megváltoztatásra kerüljön, az adott PS érték plusz 1-re. A csomag vételi sorozat számát (PR) továbbítani kell a létrehozó Fedélzeti/Földi adat-kapcsolat vezérlő egységnek /XDLP/ az S-módú ADAT, FOGADÁSRA KÉSZ, FOGADÁSRA NEM KÉSZ vagy VISSZAUTASÍTÁS csomaggal. Egy érvényes PR értéket kell továbbítania az XDCE-nek a társ XDCE-hez 8 csomag fogadása után, feltéve, hogy 15 csomag tárolására elegendő tároló tér áll rendelkezésre. A PR és PS mezők növelését a modulo 16 aritmetika alkalmazásával kell végezni.

Megjegyzés. - A PR értéket magába foglaló csomag elvesztése az ADLP/GDLP üzemelés megszűnését okozhatja ennél az SVC-nél.

5.2.6.4.4.7 A csomagok másolatát meg kell őrizni addig, amíg a felhasználói adat eredményesen átvételre nem kerül. Az eredményes átvitelt követően a PS értéket fel kell frissíteni.

5.2.6.4.4.8 A felhasználói adat PR értékét azonnal fel kell frissíteni, amint az ablak részére szükséges tároló tér (a forgalom vezérlés kezelése által meghatározva) a DCE-n belül rendelkezésre áll.

5.2.6.4.4.9 A Hálózati végponti berendezés /DCE/ és a Légijármű/Földi hálózati végponti berendezés /XDCE/ között forgalom vezérlés kezelést kell biztosítani.

5.2.6.4.5 *MEGSZAKÍTÁS ELJÁRÁSOK A KAPCSOLT VIRTUÁLIS ÁRAMKÖRÖKNÉL*

5.2.6.4.5.1 Ha felhasználói adatot küldenek az S-módú alhálózaton keresztül az azt követő forgalom vezérlési eljárások nélkül, akkor a megszakító eljárásokat kell használni. A megszakítási eljárásnak nem lehet hatása a normál adat csomag és a forgalom vezérlési eljárásokra. Egy megszakítás csomagot kell átadni a DTE-nek (vagy a válaszjeladó vagy lekérdező interfésznek) az adat áramlás azon pontjánál vagy pontja előtt, amelynél a megszakítás létrehozásra került. Az S-módú MEGSZAKÍTÁS csomag feldolgozásnak meg kell történnie azonnal, amint azt az XDCE vette.

Megjegyzés. - A törlés, visszaállítás és újraindítás eljárások a megszakítás adatok elvesztését hozhatják létre.

5.2.6.4.5.2 Az XDCE-nek az S-módú MEGSZAKÍTÁS csomagok S-bit sorozatát egyetlen entitásként kell kezelnie.

5.2.6.4.5.3 A megszakítás feldolgozásnak elsőbbsége kell, hogy legyen minden más feldolgozással szemben az SVC-nél a megszakítás folyamata idején.

5.2.6.4.5.4 Egy S-módú MEGSZAKÍTÁS csomag fogadását az előtt, hogy az SVC előző megszakítása megerősítést nyert volna (egy S-módú MEGSZAKÍTÁS MEGERŐSÍTÉS csomag fogadása által), hibaként kell meghatározni. A hiba egy visszaállítást eredményez (lásd az 5-18. táblázatot).

5.2.6.5 A FOGADÁSRA KÉSZ ELJÁRÁS

5.2.6.5.1 Az S-módú FOGADÁSRA KÉSZ csomagot kell elküldeni akkor, ha nem állnak S-módú ADAT csomagok (amelyek szabályszerűen a felfrissített PR értéket tartalmazzák) rendelkezésre továbbításra, és az szükséges, hogy a legutóbbi PR értéke kerüljön továbbításra. Ugyancsak ezt kell elküldeni egy vevő fogadásra nem kész állapota lezárásához is.

5.2.6.5.2 Egy S-módú FOGADÁSRA KÉSZ csomagnak az XDCE általi vétele az XDCE-nél létre kell, hogy hozza a PR érték felfrissítését a kimenő SVC részére. Ezt nem kell olyan csomagok újra átvitele iránti követelménynek venni, amelyek már átvitelre kerültek és még az ablakban vannak.

5.2.6.5.3 Az S-módú FOGADÁSRA KÉSZ csomag vétele után az XDCE-nek át kell lépni az ADLP (GDLP) FOGADÁSRA KÉSZ állapotba (g1).

5.2.6.6 A FOGADÁSRA NEM KÉSZ ELJÁRÁS

5.2.6.6.1 Az S-módú FOGADÁSRA NEM KÉSZ /RNR/ csomagot annak a jelzésére kell felhasználni, hogy a rendszer ideiglenesen nem képes további ADAT csomagokat fogadni egy adott SVC részére. Az S-módú RNR feltételt S-módú FOGADÁSRA KÉSZ /RR/ csomag vagy S-módú VISSZA-UTASÍTÁS csomag vételével kell törölni.

5.2.6.6.2 Amikor az XDCE S-módú FOGADÁSRA NEM KÉSZ csomagot vesz a társ XDCE-től, akkor fel kell frissítenie a Csomag sorozat szám /PR/ értéket az SVC-re, és le kell állítania az S-módú ADAT csomagok továbbítását az SVC-n az XDLP-hez. Az XDCE-nek a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ (Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/) FOGADÁSRA NEM KÉSZ állapotba kell átlépni (g2).

5.2.6.6.3 Az XDCE-nek egy S-módú FOGADÁSRA NEM KÉSZ csomagot kell leadni a társ XDCE-nek akkor, ha az képtelen már több S-módú ADAT csomagot venni a társ XDCE-től a jelzett SVC-n. Ilyen körülmények között az XDCE-nek a Légijármű hálózati végponti berendezés /ADCE/ (Földi hálózati végponti berendezés /GDCE/) FOGADÁSRA NEM KÉSZ állapotba (f2) kell átlépni.

5.2.6.7 ÚJRAÁLLÍTÁS ELJÁRÁS

5.2.6.7.1 Amikor az XDCE S-módú VISSZAÁLLÍTÁS KÉRÉS-t vesz, akár a társ XDCE-től, akár a DCE-től (az újra-formátumozási folyamaton keresztül), vagy egy hiba állapot miatt, akkor elvégzi a saját visszaállítását, a következő műveleteket kell végrehajtásával:

a) azokat az S-módú ADAT csomagokat, amelyeket továbbításra kerültek a társ XDCE-hez, el kell távolítani az ablakból;

b) azokat az S-módú ADAT csomagokat, amelyek nem kerültek továbbításra a társ XDCE-hez, de amelyeket egy olyan M-bit sorozat foglal magába, amelynek részére néhány csomagot már továbbítottak, törölni kell az átvitelre várakozó ADAT csomagok sorából;

c) azokat a társ XDCE-től vett S-módú ADAT csomagokat, amelyek egy nem teljes M-bit sorozat részei, érvényteleníteni kell;

d) az ablak alsó szélét 0-ra kell állítani, és a következő elküldött csomagnak 0 sorozat számot (PS) kell adni;

e) bármely visszatartott S-módú MEGSZAKÍTÁS csomagot, amely az XDCE-től jön vagy oda megy, megerősítetlenül kell hagyni; és

f) minden S-módú MEGSZAKÍTÁS csomagot, amely továbbításra vár, érvényteleníteni kell;

g) a továbbításra váró adat csomagokat nem kell érvényteleníteni (kivéve, ha azok egy részben továbbított M-bit sorozat részét képezik); és

h) a $d1$-nek történő továbbításnak magába kell még foglalnia az $i1, j1, f1$ és $g1$-hez való továbbítást is.

5.2.6.7.2 A visszaállítás eljárást az ADAT ÁTVITEL állapotra (p4) kell alkalmazni. A hiba eljárásnál az 5-16. táblázatban megadottakat kell követni. Bármely más állapotban a visszaállítás eljárást el kell hagyni.

5.2.6.8 A VISSZAUTASÍTÁSI ELJÁRÁS

5.2.6.8.1 Amikor az XDCE egy nem pontos formátumú S-módú ADAT csomagot vesz a társ XDCE-től, vagy olyant, amelynek csomag sorozat száma (PS) nincs a meghatározott ablakon belül (5-19. táblázat) vagy sorrenden kívüli, akkor a vett csomagot érvényteleníteni kell és S-módú VISSZA-UTASÍTÁS csomagot kell elküldeni a társ XDCE-nek a keret feldolgozáson keresztül. Az S-módú

VISSZAUTASÍTÁS csomagnak egy Csomag sorozat szám /PR/ értéket kell jeleznie, azt, amelynél az S-módú ADAT csomagok újratovábbítását el kell kezdeni. Az XDCE-nek érvényteleníténie kell azokat a következő sorozaton kívüli S-módú ADAT csomagokat, amelyek fogadása az alatt történik, amíg az S-módú VISSZAUTASÍTÁS csomag válasz még elintézetlen.

5.2.6.8.2 Amikor az XDCE S-módú VISSZAUTASÍTÁS csomagot vesz a társ XDCE-től, akkor fel kell frissítenie az alsó ablak értékét az új Csomag sorozat szám /PR/ értékkel, és el kell kezdenie a PR sorozat számmal rendelkező csomagok újra-továbbítását.

5.2.6.8.3 A visszautasítás jelzést nem kell a DCE-nek továbbítani. Ha az ISO 8208 illesztés alátámasztja a visszautasítás eljárást, akkor azok a visszautasítás jelzések, amelyek az ISO 8208 interfészen jelennek meg, nem kerülnek átvitelre a DCE és XDCE között.

5.2.6.9 A CSOMAG ÚJ LEFUTÁS-TERVEZÉSE /ÚJRA-SORBARENDEZÉSE/ ÉS A KÉTSZEREZÉS LETILTÁSA

1. Megjegyzés. - Ha egy Kapcsolt virtuális áramkörnél /SVC/ a keretek mindkét típust (Szabvány hosszúságú közlemény /SLM/ és Kiterjesztett hosszúságú közlemény /ELM/) magukba foglalják, az eltérő kézbesítési idők miatt a csomagok sorozata elveszhet. A sorrendiség akkor is elveszhet, ha multiplikált lekérdezőket használnak a keretek kézbesítésére ugyanazon SVC-re egy adott Fedélzeti/Földi adat-kapcsolat vezérlő egységhez /XDLP/. A következő eljárás korlátozottan javítani fogja az új lefutás-tervezés /újra-sorbarendezés/ beállítást.

2. Megjegyzés. - Ez a feldolgozás illesztésként szolgál a keret feldolgozás és a Légijármű/Földi hálózati végponti berendezés /XDCE/ funkció között.

5.2.6.9.1 *Új lefutás-tervezés /újra-sorbarendezés/.* Az új lefutás-tervezést függetlenül kell végrehajtani az S-módú, a fedélzetre irányuló és a fedélzetről leadott adat-továbbításra minden egyes Kapcsolt virtuális áramkörre /SVC/. A következő változókat és paramétereket kell használni:

SNR /Vett adat-csomag sorozat szám/Egy 6-bites változó, amely egy meghatározott SVC vett csomag sorozat számát mutatja. Ezt a csomag Sorozat szám /SN/ mezője tartalmazza (5.2.5.2.1.1.7)

NESN /Következő várt sorozat szám/A következő sorozat szám az egymás után következő sorozat számokat követő szám.

HSNR /A vett adat-csomag sorozat szám legmagasabb értéke/Az SNR legnagyobb értéke az új lefutás-tervező /újra-sorbarendező/ ablakban.

Tq /Új lefutás-tervező időzítők/Azok az új lefutás-tervező /újra-sorbarendező/ időzítők (lásd az 5-1. és 5-13. táblázatot), amelyek a meghatározott SVC-hez kapcsolódnak.

A sorozat számot (SN) magába foglaló összes műveletet a modulo 64 szerint kell végrehajtani.

5.2.6.9.2 *Kétszerező ablak.* A Vett csomag sorozat szám /SNR/ tartomány értékeket a Következő várt sorozat szám, az NESN-32 és az NESN-1 között inkluzív diszjunkcióval /logikai VAGY/ kell kijelölni a kétszerező ablakban.

5.2.6.9.3 *Az új lefutás-tervező /újra-sorbarendező/ ablak.* A Vett csomag sorozat szám /SNR/ tartomány értékeket az NESN+1 és NESN+31 között inkluzív diszjunkcióval kell kijelölni az új lefutás-tervező ablakban. Az ebben a tartományban lévő sorozat számmal rendelkező vett csomagokat az új lefutás-tervező ablakban kell tárolni a sorozat számok sorrendjében.

5.2.6.9.4 *ADATÁTVITELI FUNKCIÓK*

5.2.6.9.4.1 Minden egyes SVC-nél az első csomagnak, amelyet a kapcsolat létrehozásához küldenek el (az első S-módú HÍVÁS KÉRÉS vagy az első S-módú HÍVÁS ELFOGADÁS csomag), a Sorozat szám /SN/ mező értékének nullával történő kezdését kell létrehoznia. Az SN mező értékét minden egyes csomag átvitel (vagy újra-átvitel) után meg kell emelni.

5.2.6.9.4.2 A nyugtázatlan sorozat számok maximális száma 32 egymást követő SN szám lehet. Amennyiben ez az állapot bekövetkezik, akkor azt egy hibaként kell kezelni, és a csatornát törölni kell.

Megjegyzés. - A nyugtázatlan csomagok számának korlátozása azért szükséges, mivel az SN mező hat bit hosszúságú, és ezért maximálisan 64 különböző értéke van, mielőtt az értékek ismétlődnek.

5.2.6.9.5 *VÉTEL FUNKCIÓK*

5.2.6.9.5.1 *Új lefutás-tervezés /újra-sorbarendezés/.* Az új lefutás-tervező algoritmusnak meg kell tartania a A vett adat-csomag sorozat szám legmagasabb értéke /HSNR/ és a Következő várt sorozat szám /NESN/ változókat minden egyes SVC-re. Az NESN-t 0 kezdeti értékre kell állítani az összes SVC-nél és újra 0-ra kell állítani akkor, amikor az SVC újra belép a csatorna szám poolba (5.2.5.1.2).

5.2.6.9.5.2 *A csomagok feldolgozása a kétszerező ablakon belül.* Ha egy csomagot a kétszerező ablakon belüli sorozat szám értékkel vesznek, akkor a csomagot érvényteleníteni kell.

5.2.6.9.5.3 *A csomagok feldolgozása az új lefutás-tervező /újra-sorbarendező/ ablakon belül.* Ha egy csomagot az új lefutás-tervező ablakon belüli sorozat szám értékkel vesznek, akkor ezt érvényteleníteni kell, mint kétszerezettet, ha egy ugyanolyan sorozat számú csomagot már vettek és az újra-sorbarendezési ablakban már tárolták. Egyéb esetben a csomagot az új lefutás-tervezési /újra-sorbarendezési/ ablakban kell tárolni. Azután, ha nincs *Tq* futó óra-regiszter, akkor a *HSNR* értéket az *SNR* értékére kell állítani ennél a csomagnál, és egy *Tq* időzítőt kell indítani ezzel a kezdeti értékével (5-1. és 5-13. táblázat). Ha legalább egy *Tq* óra-regiszter fut, és az *SNR* nincs az *NESN* és *HSNR*+1 inkluzív diszjunkció között, akkor egy új *Tq* időzítőt kell indítani és a *HSNR* értékét fel kell frissíteni. Ha legalább egy *Tq* óra-regiszter működik, és az *SNR* ennél a csomagnál egyenlő *HSNR*+1-el, akkor a *HSNR* értékét fel kell frissíteni.

5.2.6.9.5.4 *A csomagok leválasztása az XDCE részére*. Ha egy csomagot az NESN-el egyenlő sorozat számmal vesznek, akkor a következő eljárást kell alkalmazni:

a) a csomagot és minden, az újra-sorbarendezési ablakban már tárolt csomagokat egészen a következő hiányzó sorozat számig, továbbítani kell az XDCE-nek;

b) az *NESN*-t 1+ értékre az XDCE-hez továbbított utolsó csomag sorozat számának értékére kell állítani; és

c) a felszabadított csomagok mindegyikéhez tartozó *Tq* időzítőt le kell állítani.

5.2.6.9.6 *A Tq időzítő lejárati ideje.* Ha egy *Tq* időzítő lejár, akkor a következő eljárást kell alkalmazni:

a) a Következő várt sorozat számot /*NESN*/ addig kell emelni, amíg a következő hiányzó sorozat szám észlelésre nem kerül azután, hogy a *Tq* időzítőhöz kapcsolt csomag sorozat száma lejárt;

b) minden olyan tárolt csomagot, amelynek a sorozat száma már nincs az újra-sorbarendezési ablakban, továbbítani kell az XDCE-hez, kivéve azt, hogy a nem teljes S-bit sorozatot érvényteleníteni kell; és

c) a leválasztott csomaghoz tartozó *Tq* időzítőt le kell állítani.

5.2.7 S-módú specifikus szolgáltatás feldolgozás

Az S-módú specifikus szolgáltatásokon keresztül továbbított adat formátumoknak és protokoloknak azoknak kell lenniük, amelyek az ehhez a fejezethez kapcsolódó Függelékben meghatározásra kerültek. S-módú specifikus szolgáltatásokat az XDLP-ben lévő entitásnak kell feldolgoznia, amit S-módú specifikus szolgáltatási entitásnak (SSE) neveznek.

1. Megjegyzés. - Ez a szakasz az S-módú specifikus szolgáltatási illesztőtől vett vezérlés és közlemény adat feldolgozásokat írja le.

2. Megjegyzés. - A vezérlő adatok olyan információkból állnak, amelyek lehetővé teszik például a közlemény hosszúság, az egy meghatározott tároló adat formátumához való hozzáféréshez használatos BDS kódot és a légijármű címzés meghatározását.

5.2.7.1 FEDÉLZETI ADAT-KAKPCSOLAT VEZÉRLŐ EGYSÉG /ADLP/ FELDOLGOZÁS

5.2.7.1.1 *A FEDÉLZETRŐL LEADOTT ADAT FELDOLGOZÁSA*

5.2.7.1.1.1 *Specifikus szolgáltatási teljesítőképesség.* Az ADPL-nek képesnek kell lennie vezérlő és közlemény adatok vételére az S-módú specifikus szolgáltatás illesztés(ek)től, és kézbesítési közlemények küldésére ezen interfész részére. A vezérlő adatokat fel kell dolgozni azért, hogy meghatározzák a protokol típust és a közlemény adat hosszt. Amikor ennél az interfésznél a szolgáltatott közlemény vagy vezérlő adatok hibásak (azaz nem teljesek, érvénytelenek vagy ellentmondásosak), akkor az ADLP-nek érvényteleníteni kell a közleményt és hiba jelzést kell kézbesítenie az interfésznél.

Megjegyzés. - A diagnosztika tartalom és hiba jelzési mechanizmus helyi kérdés.

5.2.7.1.1.2 *Az általános adás feldolgozás.* A vezérlő és közlemény adatokat kell felhasználni a B-közleményű /Comm-B/ általános adású közlemények formátumozására, ahogy az az 5.2.7.5 pontban meghatározásra került, és azt kell továbbítani a válaszjeladóhoz.

5.2.7.1.1.3 *A földről kezdeményezett B-adatátvitel /GICB/ feldolgozása.* A 8-bites B-adatátvitel kiválasztás /BDS/ kódot a vezérlő adatokból kell megállapítani. A 7-bites tároló tartalom a vett közlemény adatokból kerül kiválasztásra. A tároló tartalmat a válaszjeladónak kell továbbítani, ami a meghatározott tároló számának jelzésére szolgál. A légi-kezdeményezésű Comm-B tárolók egyikének, vagy az Összeütközési veszélyt jelző fedélzeti rendszer (ACAS) aktív megoldási tanácsadás tároló címzésére vonatkozó kérést érvényteleníteni kell. A tárolók kijelölésének az 5-24. táblázatban meghatározottaknak kell lenni.

5.2.7.1.1.4 *Az S-módú specifikus protokol / MSP/ feldolgozása*

5.2.7.1.1.4.1 Az MSP közlemény hosszát, a csatorna számot (M/CH) (5.2.7.3.1.3) és választhatóan a lekérdező azonosító (II) kódot a vezérlő adatokból kell meghatározni. Az MSP közlemény tartalmat a vett közlemény adatokból kell kivonatolni. Ha a közlemény hossz 26 bájt vagy kevesebb, az S-módú szolgáltatás entitásnak /SSE/ egy légi kezdeményezésű B-adatátvitel /Comm-B/ közleményt kell formálnia (5.2.7.1.1.4.2) a válaszjeladóhoz történő továbbításra a rövid formájú S-módú specifikus protokol /MSP/ csomag felhasználásával (5.2.7.3.1). Ha a közlemény hossza 27 - 159 bájt és a válasz-jeladó rendelkezik az elegendő fedélzetről továbbított Kiterjesztett hosszúságú közlemény /ELM/ adási teljesítőképességgel, akkor az SSE-nek egy ELM közleményt kell formálnia a válaszjeladóhoz történő továbbításra, a rövid formájú MSP csomagot használva. Ha a közlemény hossza 27 - 159 bájt és a válaszjeladónak korlátozott a fedélzetről leadott Kiterjesztett hosszúságú közlemény /ELM/ adási teljesítőképessége, akkor az SSE-nek multiplikált hossz formátumú MSP csomagokat kell formálnia (5.2.7.3.2) az ELM közlemények felhasználásával, ahogy szükséges, az L-bit és az M/SN mezőknek a csomagok társításához való felhasználásával. Ha a közlemény hossza 27 - 159 bájt és a válaszjeladó nem rendelkezik fedélzetről leadott Kiterjesztett hosszúságú közlemény /ELM/ adási teljesítőképességgel, akkor az SSE-nek multiplikált hossz formátumú MSP csomagokat kell formálnia (5.2.7.3.2), a légi kezdeményezésű B-adatátvitel közlemények /Comm-B/ felhasználásával, ahogy szükséges, az L-bit és az M/SN mezőknek a csomagok társításához való felhasználásával. Egymástól különböző keret típusokat sohasem lehet felhasználni az MSP közlemények kézbesítéséhez. A 159 bájtnál hosszabb közleményeket érvényteleníteni kell. A fedélzetről leadott MSP csatorna számokat az 5-25. táblázatban meghatározottak szerint kell kijelölni.

5.2.7.1.1.4.2 Az S-módú specifikus protokolnál /MSP/ az egy csomag küldésére vonatkozó kérésnek létre kell hoznia a lekérdezőhöz való olyan több helyre irányított csomagját, amelynél a Lekérdező azonosító /II/ kód a vezérlés adatban van meghatározva. Ha nincs II kód meghatározva, akkor a csomagot fedélzetről leadott közleményként kell továbbítani a légi kezdeményezésű protokol felhasználásával. Ehhez a csomaghoz egy közlemény kézbesítési figyelmeztetést kell biztosítani az S-módú specifikus interfész részére akkor, amikor a megfelelő lezárás(oka)t a válaszjeladótól vették. {} Ha a lezárást a válaszjeladótól nem vettek Tz másodpercen belül, ahogyan az az 5-1. táblázatban meg van határozva, akkor az MSP csomagot érvényteleníteni kell. Ennek kell magába foglalnia az ehhez a csomaghoz kapcsolódó bármely keret törlését a válaszjeladóban. Ehhez a közleményhez egy kézbesítési meghibásodás figyelmeztetést kell biztosítani az S-módú specifikus szolgáltatás illesztés részére.

5.2.7.1.2 *A FEDÉLZETRE IRÁNYULÓ ADAT FELDOLGOZÁSA*

Megjegyzés. - Ez a szakasz a válaszjeladótól vett S-módú specifikus szolgáltatási közlemények feldolgozását ismerteti.

5.2.7.1.2.1 *Specifikus szolgáltatási teljesítőképesség.* A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ képesnek kell lenni a válaszjeladótól a keret feldolgozáson keresztül érkező S-módú specifikus szolgáltatási közlemények vételére. Az ADLP-nek képesnek kell lenni a közlemények és a hozzájuk tartozó vezérlési adatok kézbesítésére a specifikus szolgáltatás illesztésnél. Amikor az ennél az illesztésnél kiosztott erőforrás hozzárendelések elégtelenek a kimenő adatok befogadására, akkor az ADLP-nek a közleményt érvénytelenítenie kell, és hibajelentést kézbesít ennél az illesztésnél.

Megjegyzés. - A diagnosztikai tartalom és a hiba jelentési mechanizmus helyi kérdés.

5.2.7.1.2.2 *Az általános adás feldolgozása.* Ha a vett közlemény egy általános adású A-adatátviteli /Comm-A/, ahogy azt a válaszjeladó/ADLP illesztésen keresztül érkezett vezérlési adatok jelzik, az általános adás azonosítóját /ID/ és a felhasználói adatokat (5.2.7.5) kell továbbítani az S-módú specifikus szolgáltatás illesztésnek (5.2.3.2.1) a vezérlési adatokkal együtt, amely azonosítja azt, hogy ez egy általános adású közlemény. A fedélzetre irányuló általános adás azonosító számai kijelölésének az 5-23. táblázatban meghatározottaknak megfelelőnek kell lenni.

5.2.7.1.2.3 *Az S-módú specifikus protokol /MSP/ feldolgozása*. Ha a vett közlemény egy MSP, ahogy azt a csomag formátum fejrész jelezte (5.2.7.3), a vett MSP csomag felhasználói adat mezőjét továbbítani kell az S-módú specifikus szolgáltatás illesztéshez (5.2.3.2.1) az MSP csatorna számmal (M/CH) együtt, valamint a Lekérdező azonosító részmezőt /IIS/ (5.2.2.1.1.1) a vezérlés adatokkal együtt, amelyek azonosítják azt, hogy az egy MSP közlemény. Az L-bit feldolgozást úgy kell elvégezni, ahogy az az 5.2.7.4 pontban meghatározásra került. A fedélzetre irányuló MSP csatorna számok kijelölésének az 5-25. táblázatban megadottaknak megfelelőnek kell lenni.

5.2.7.2 A FÖLDI TELEPÍTÉSI RENDSZERŰ ADAT-KAPCSOLAT VEZÉRLŐ EGYSÉG /GDLP/ FELDOLGOZÁS

5.2.7.2.1 *A FEDÉLZETRE IRÁNYULÓ ADAT FELDOLGOZÁSA*

5.2.7.2.1.1 *Specifikus szolgáltatási teljesítőképesség.* A GDLP-nek képesnek kell lennie a vezérlési és a közlemény adatok vételére az S-módú specifikus szolgáltatás illesztés(ek)től (5.2.3.2.2) és kézbesítési értesítések küldésére az illesztés(ek) részére. A vezérlési adatokat fel kell dolgozni a protokol típus és a közlemény adat hossz meghatározásához.

5.2.7.2.1.2 *Az általános adás feldolgozása.* A GDLP-nek meg kell határoznia a lekérdező(ke)t, az általános adás oldalszögeket és a letapogatási időket a vezérlési adatokból és az általános adás közlemény formátumából a lekérdezőhöz történő továbbítás céljából, ahogy az az 5.2.7.5 pontban meghatározásra került.

5.2.7.2.1.3 *A földről kezdeményezett B-adatátvitel /GICB/ feldolgozása.* A GDLP-nek meg kell határoznia a tároló számot és a légijármű címzést a vezérlési adatokból. A légijármű címzést és a B-adatátvitel adat-kiválasztás /BDS/ továbbítania kell a lekérdezőnek egy földi kezdeményezésű B-adatátvitel /Comm-B/ kéréseként.

5.2.7.2.1.4 *S-módú specifikus protokol /MSP/ feldolgozás.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egységnek /GDLP/ a vezérlési adatokból kell kivonatolnia a közlemény hosszt, az MSP csatorna számot (M/CH) és a légijármű címzést, és a közlemény tartalmat a közlemény adatokból kell megkapnia. Ha a közlemény hossz 27 bájt vagy kevesebb, akkor az S-módú szolgáltatás entitásnak /SSE/ egy A-adatátvitel /Comm-A/ közleményt kell formálnia a lekérdezőhöz való továbbításra a rövid formájú MSP csomag felhasználásával (5.2.7.3.1). Ha a közlemény hosszúság 28 és 151 bájt közötti, és a válaszjeladó rendelkezik fedélzetre irányuló Kiterjesztett hosszúságú közlemény /ELM/ teljesítőképességgel, az SSE-nek egy ELM közleményt kell formálnia a lekérdezőhöz való továbbítás céljából a rövid formájú MSP csomag felhasználásával. Ha a közlemény hosszúság 28 és 151 bájt közötti és a válaszjeladó nem rendelkezik fedélzetre irányuló ELM teljesítőképességgel, akkor az SSE-nek multiplikált hosszú formájú MSP csomagokat kell formálnia (5.2.7.3.2), kihasználva az L-bit és az M/SN mezőket a csomagok összekapcsolásához. A 151 bájtnál hosszabb közleményeket érvényteleníteni kell. A lekérdezőnek egy kézbesítési értesítést kell biztosítani az S-módú specifikus szolgáltatási illesztés részére, ezzel jelezve az eredményes vagy eredménytelen kézbesítést minden egyes fedélzetre irányuló adatátviteli csomagnál.

5.2.7.2.2 *A FEDÉLZETRŐL LEADOTT ADAT-FELDOLGOZÁS*

5.2.7.2.2.1 *Specifikus szolgáltatás teljesítőképesség.* A Földi telepítési rendszerű adat-kapcsolat vezérlő egységnek /GDLP/ képesnek kell lennie az S-módú specifikus szolgáltatási közlemények vételére a lekérdezőtől a keret feldolgozáson keresztül.

5.2.7.2.2.2 *Az általános adás feldolgozása.* Ha a vett közlemény egy általános adású B-adatátvitel /Comm-B/, a lekérdező/GDLP illesztése által jelezve, akkor a GDLP-nek:

a) vezérlési adatokat kell létrehoznia, amelyekkel jelzi az általános adású közlemény, valamint annak a légijárműnek a 24-bites légijármű címzése jelenlétét, amelytől a közlemény vételre került;

b) hozzá kell tennie a B-adatátvitelű általános adás 7-bájtos B-adat-átvitelű közlemény /MB/ mezőjét; és

c) továbbítania kell ezeket az adatokat az S-módú specifikus szolgáltatás illesztés(ek)nek (5.2.3.2.2).

5.2.7.2.2.3 *A földről kezdeményezett B-adatátvitel /GICB/ feldolgozása*. Ha a vett közlemény egy GICB, ahogyan a lekérdező/GDLP illesztése azt jelzi, a GDLP-nek

a) vezérlési adatokat kell létrehoznia, amellyel jelzi az általános adású közlemény jelenlétét, a tároló számát és annak a légijárműnek a 24-bites légijármű címzését, amelytől a közlemény vételre került;

b) hozzá kell tennie a GIBC 7-bájtos B-adat-átviteli közlemény /MB/ mezőjét; és

c) továbbítania kell ezeket az adatokat az S-módú specifikus szolgáltatás illesztés(ek)nek (5.2.3.2.2).

5.2.7.2.2.4 *Az S-módú specifikus protokol /MSP/ feldolgozása*. Ha a vett közlemény egy MSP, ahogyan ezt a csomag formátum fejléce jelzi (5.2.7.3), akkor a GDLP-nek

a) vezérlési adatokat kell létrehoznia, amellyel jelzi az MSP adat-továbbítást, a közlemény hosszát és az MSP csatorna számot (M/CH), valamint annak a légijárműnek a 24-bites címét; amelyből a közlemény vételre került;

b) hozzá kell tennie a vett MSP köteg felhasználói adat mezőjét; és

c) továbbítania kell ezeket az adatokat az S-módú specifikus szolgáltatás illesztés(ek)nek (5.2.3.2.2).

Az L-bit feldolgozását az 5.2.7.4 pontban meghatározottak szerint kell végrehajtani.

5.2.7.3 S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/CSOMAG FORMÁTUMOK

5.2.7.3.1 *Rövid formátumú MSP csomag.* A formátumnak ennél a csomagnál a következőnek kell lennie:

DP: 1	MP: 1	M/CM: 6	FILL 1: 0 VAGY 6	UD: v

5.2.7.3.1.1 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.7.3.1.2 *MSP csomag típus (MP).* Ezt a mezőt 0-ra kell állítani.

5.2.7.3.1.3 *MSP csatorna szám (M/CH):* Ezt a mezőt az SSE vezérlési adatokból nyert csatorna számra kell állítani.

5.2.7.3.1.4 *Kitöltés mező (FILL1: 0 vagy 6):* A töltés hossz 6 bit egy fedélzetről leadott Szabvány hosszúságú közlemény /SLM/ keret esetén. Más esetben a töltés hossz 0.

5.2.7.3.1.5 *Felhasználói adatmező (UD)*. A felhasználói adat-mezőnek kell az S-módú specifikus szolgáltatás illesztéstől vett közleményt magába foglalnia (5.2.3.2.2).

5.2.7.3.2 *Hosszú formátumú MSP csomag*. A formátumnak ennél a csomagnál a következőnek kell lenni:

DP: 1	MP: 1	SP: 2	L: 1	M/SN: 3	FILL 2: 0 vagy 2
M/CH: 6	UD: v				

A csomag formátumban bemutatott és a következő pontokban nem meghatározott mezőket az 5.2.5.2.1 pontban előírtak szerint kell beállítani.

5.2.7.3.3 *Adat csomag típus (DP).* Ezt a mezőt 0-ra kell állítani.

5.2.7.3.3.1 *S-módú specifikus protokol sorozat szám (MP).* Ezt a mezőt 1-re kell állítani.

5.2.7.3.3.2 *Felügyelő csomag (SP)*. Ezt a mezőt 0-ra kell állítani.

5.2.7.3.3.3 *L mező (L).* Az 1 értéknek azt kell jeleznie, hogy a csomag részét képezi egy olyan L-bit sorozatnak, amelynek több csomagja az ezután következő sorozatban van. A 0 érték azt jelzi, hogy a sorozat ezzel a csomaggal végződik.

5.2.7.3.3.4 *MSP sorozat szám mező (M/SN)*. Ez a mező az L-bit sorozatok kézbesítésében lévő megkettőződések észlelésére használatos. Az első csomag részére egy L-bit sorozatban a 0 sorozat számot kell kiosztani. A reá következő csomagok számozása a megfelelő sorrendben történik. Egy olyan csomagot, melyet ugyanazon sorozat számmal vesznek, mint az előzőleg vett csomagé, érvényteleníteni kell.

5.2.7.4 *L-bit feldolgozás.* L-bit feldolgozást csak a hosszú formátumú MSP csomagon kell elvégezni és az M-bit feldolgozásnál meghatározottaknak megfelelően kell végrehajtani (5.2.5.1.4.1), kivéve a következő pontokban meghatározott eseteket.

5.2.7.4.1 Egy hosszú formátumú MSP csomag fogadásakor a Fedélzeti/Földi adat-kapcsolat vezérlő egységnek /XDLP/ létre kell hoznia a felhasználói adatmezőt a következők szerint:

a) Megerősítve azt, hogy a csomag sorrend helyes, az M/SN mező felhasználásával (5.2.7.3.2);

b) Elfogadva azt, hogy a felhasználói adatmező az MSP csomagban az integráló bájtok közül a legnagyobb számú, amit a keret magába foglal;

c) Összekapcsol minden egyes felhasználói adatmezőt egy MSP csomagban, amelyet egy előző felhasználói adatmezővel egy MSP olyan csomagban vettek, amelynek 1-es az L-bit értéke; és

Megjegyzés. - A felhasználói adatmező megcsonkítása nincs megengedve, mivel azt egy hiba állapotként kell kezelni.

d) Ha egy MSP csomag feldolgozásnál hibát észlelnek, akkor a csomagot érvényteleníteni kell.

5.2.7.4.2 Egy L-bit sorozat feldolgozásánál az XDLP-nek minden olyan MSP csomagot érvényteleníteni kell, amelynek kétszerezett M/SN értéke van. Az XDLP a teljes L-bit sorozatot érvényteleníteni fogja, ha egy hosszú formátumú MSP csomag úgy kerül meghatározásra, hogy hiányzik az M/SN mező felhasználása.

5.2.7.4.3 Bármely L-bit sorozathoz kapcsolódó olyan csomagot, amelynek újra-összeállítása nem fejeződik be Tm másodpercen belül, (5-1. és 5-13. táblázat) érvényteleníteni kell.

5.2.7.5 *AZ ÁLTALÁNOS ADÁS FORMÁTUMA*

5.2.7.5.1 *A fedélzetre irányuló általános adás.* Az A-adat-átvitelű /Comm-A/ általános adás formátumának a következőnek kell lenni: A 83-bites fedélzetre irányuló általános adást be kell iktatni egy fedélzetre irányuló A-adatátvitel keretbe. Az A-adatátvitel keret MA mezőjének magába kell foglalnia az első 8 bitjében azt az általános adás azonosítót, ami az 5-23. táblázatban került meghatározásra, majd ezt követi az általános adású közlemény első 48 felhasználói adat bitje. Az általános adású közlemény utolsó 27 felhasználói adat bitjét közvetlenül az A-adatátvitel keret UF mezőjét követő 27 bitben kell elhelyezni.

5.2.7.5.2 *Fedélzetről leadott általános adás.* A B-adatátvitelű /Comm-B/ általános adás formátumának a következőnek kell lenni: Az 56-bites fedélzetről leadott általános adást be kell iktatni a B-adatátvitel MB mezőjébe. Az MB mezőnek magába kell foglalnia az első 8 bitjében azt az általános adás azonosítót, ami az 5-23. táblázatban került meghatározásra, majd ezt követi az első 48 felhasználói adat bit.

5.2.8. Az S-módú al-hálózat adat-kapcsolat irányítása

5.2.8.1 LEKÉRDEZŐ ADAT-KAPCSOLAT MEGHATÁROZÁSI FUNKCIÓ

Megjegyzés. - A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ lekérdező adat-kapcsolat meghatározási funkció kiválasztja az S-módú lekérdező lekérdező azonosító /II/ kódját, azt, amelyen keresztül egy S-módú alhálózati csomagot a kívánt földi rendeltetési Lekérdező adat végponti berendezéshez /DTE/ lehet juttatni.

5.2.8.1.1 *Lekérdező azonosító /II/ kód - Lekérdező azonosító végponti berendezés /DTE/ címzés viszonosság.* A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ kell összeállítani és kezelni egy S-módú Lekérdező adat végponti berendezés (DTE) kereszt-referencia táblázatot, amelynek bejegyzései: S-módú lekérdező azonosító (II) kódok és azok a földi DTE címzések, amelyek a földi Légiforgalmi távközlési hálózat /ATN/ útválasztó vagy más földi DTE-kkel kapcsolódnak. A II kód - DTE kereszt-referencia táblázatnak a 4-bites S-módú II kódból és a földi DTE 8-bites bináris beírásából kell állnia.

1. Megjegyzés. - A félreérthetetlen címzés követelménye miatt egy DTE címzés egy Földi telepítési rendszerű adat-kapcsolat vezérlő egységet /GDLP/ is egyértelműen azonosít.

2. Megjegyzés. - Egy ATN útválasztónak több földi DTE címzése is lehet.

5.2.8.1.2 *Protokol.* A következő eljárásokat kell használni:

a) Amikor a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ légijármű jelenlétét először észleli, vagy kapcsolatot észlel egy éppen befogott légijárművel egy lekérdezőn keresztül egy új Lekérdező azonosító /II/ kóddal, akkor az ADAT-KAPCSOLAT TELJESÍTŐKÉPESSÉG jelentés megfelelő mezőitől kell meghatároznia azt, hogy vajon a légijármű rendelkezik-e azzal a teljesítőképességgel, ami az adat-cserében való résztvételéhez szükséges. Az adat-kapcsolat teljesítőképesség pozitív meghatározása után GDLP-nek fel kell küldeni a fedélzetre egy vagy több S-módú ÚTVÁLASZTÓ csomagot úgy, ahogy az az 5.2.5.3.3 pontban meg van határozva. Ennek az információnak az S-módú Lekérdező azonosító /II/ kódra kell vonatkozni azokkal a földi DTE címzésekkel együtt, amelyek ezen a lekérdezőn keresztül érhetők el. A Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ fel kell frissítenie az II kód - DTE kereszt-referencia táblázatot és azután érvénytelenítenie kell az S-módú ÚTVÁLASZTÓ csomag(oka)t;

b) A Lekérdező azonosító /II/ kód - DTE kereszt-referencia táblázat bejegyzését törölni kell akkor, amikor egy S-módú ÚTVÁLASZTÓ csomag erre parancsot ad, vagy amikor az ADLP felismeri, hogy a transzponder még nem került szelektív lekérdezésre egy S-módú lekérdező által egy adott II kóddal Ts másodperc alatt a Lekérdező azonosító almező /IIS/ általi ellenőrzéssel az S-módú légtér-ellenőrzésben, vagy az A-adatátviteli /Comm-A/ lekérdezésekben (5-1 táblázat);

c) Amikor a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ meghatározza azt, hogy módosítás szükséges az S-módú lekérdező kijelölésben, akkor egy vagy több S-módú ÚTVÁLASZTÓ csomagot kell továbbítania a Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/. Az S-módú ÚTVÁLASZTÓ csomagba foglalt felfrissített információt az ADLP-nek a kereszt-referencia táblázat módosítására kell felhasználni. A kiegészítéseket a törlések előtt fel kell dolgozni;

d) Amikor a GDLP az első ÚTVÁLASZTÓ csomagot küldi egy S-módú adat-kapcsolattal ellátott légijármű lekérdezése után, az Induló állapot /IN/ bitet EGY-re kell állítani. Ennek az értéknek létre kell hoznia az ADLP-nél azt, hogy végrehajtsa azokat az eljárásokat, amelyek az 5.2.6.3.3.3 pontban vannak meghatározva. Más esetben az IN bitet NULLA-ra kell állítani;

e) Amikor az ADLP-nél egy alaphelyzet beállítás történik (pl. áram- ellátási eljárás után), akkor az ADLP-nek egy keresés kérést kell leadnia egy B-adatátvitelű általános adás közlemény küldésével az általános adás azonosító 'egyenlő 255' segítségével, (FF16, ahogy az az 5-23. táblázatban meghatározásra került), és a megmaradó 6 bájt felhasználatlan. A keresés kérést fogadva, a GDLP-nek egy vagy több S-módú ÚTVÁLASZTÓ csomaggal kell válaszolnia és törölnie kell az ADLP-hez kapcsolódó összes Kapcsolt virtuális áramkört /SVC/, ahogy az az 5.2.6.3.3 pontban meghatározásra került, és érvényteleníteni kell a keresés kérést. Ennek létre kell hoznia azt, hogy az ADLP alaphelyzetbe állítsa az II kód - DTE kereszt-referencia táblázatot.

f) Egy felfrissítési kérés fogadásában (5-23. táblázat) egy GDLP-nek egy vagy több S-módú ÚTVÁLASZTÓ csomaggal kell válaszolnia, és érvényteleníteni kell a felfrissítés kérést. Ez az ADLP-t az II kód - DTE kereszt-referencia táblázat felfrissítésére kell, hogy késztesse.

Megjegyzés. - A felfrissítés kérést az ADLP kivételes körülmények között (pl. áttérés tartalék egységre) használhatja a Lekérdező azonosító /II/ kód - DTE kereszt-referencia táblázata tartalmának ellenőrzésére.

5.2.8.1.3 *A FEDÉLZETRŐL LEADOTT ELJÁRÁSOK S-MÓDÚ CSOMAGOK ELJÁRÁSAI*

5.2.8.1.3.1 Amikor a Fedélzeti adat-kapcsolat vezérlő egységnek /ADLP/ egy, a fedélzetről leadandó csomagja van, akkor a következő eljárásokat kell alkalmazni:

a) *HÍVÁS KÉRÉS csomag.* Ha a továbbítandó csomag egy S-módú HÍVÁS KÉRÉS, akkor a földi Lekérdező adat végponti berendezés /DTE/ címzés mezőjét meg kell vizsgálni, és össze kell kapcsolni a kapcsolt S-módú lekérdezővel, a Lekérdező azonosító /II/ kód - DTE kereszt-referencia táblázatot felhasználva. A csomagot a fedélzetről továbbítani kell a több helyre irányított protokol felhasználásával. Egy kérés a csomagnak egy olyan DTE címzéshez történő továbbítására, amely nincs a kereszt-referencia táblázatban, az 5.2.6.3.3.1 pontban meghatározott tevékenységet kell, hogy létrehozza.

b) *Egyéb Kapcsolt virtuális áramkör /SVC/ csomagok.* Egy SVC-nél annak a kérésnek, hogy a földi DTE részére egy csomagot küldjön el, azt kell létrehoznia, hogy a csomag egy több helyre irányított csomag legyen ahhoz az utolsó S-módú lekérdezőhöz továbbítva, amely használatos volt (a fedélzetre irányuló vagy fedélzetről leadott) csomagnak az ahhoz a DTE-hez való sikeres továbbításában, feltéve, hogy ez az S-módú lekérdező éppen a Lekérdező azonosító /II/ kód - DTE kereszt-referencia táblázatban van. Egyéb esetekben az SVC csomagot le kell adni a fedélzetről a több helyre irányított protokol felhasználásával bármely olyan más S-módú lekérdező részére, amely kapcsolódik a meghatározott földi DTE címzéshez.

Az 5. szintű válaszjeladók részére megengedett a további lekérdezők használata fedélzetről leadott közlemény átvitelre az II kód - DTE kereszt-referencia táblázatban jelzettek szerint.

5.2.8.1.3.2 Egy fedélzetről leadott keret továbbítást eredményesnek kell meghatározni akkor, ha a B-adatátvitele vagy ELM lezárása a válaszjeladótól Tz másodpercen vételre kerül, ahogyan az az 5-1. táblázatban meg van határozva. Ha a kísérlet nem eredményes és egy SVC csomagot kell elküldeni, akkor az II kód - DTE kereszt-referencia táblázatot meg kell vizsgálni egy másik bejegyzésnél ugyanazzal a hívott földi DTE címzéssel és egy eltérő S-módú II kóddal. Az eljárást újra meg kell kísérelni több helyre irányított protokol felhasználásával az új S-módú lekérdezővel. Ha nincsenek bejegyzések a kívánt hívott DTL-nél, vagy az összes bejegyzés sikertelen kísérletet eredményez, akkor egy kapcsolat hibát kell bejelenteni (5.2.8.3.1).

5.2.8.2 A LEKÉRDEZŐ ADAT VÉGPONTI BERENDEZÉS(EK) /DTE-k/ ALÁTÁMASZTÁSA

5.2.8.2.1 *A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ összekapcsolhatósági jelentése.* A GDLP-nek be kell jelentenie a földi DTE-(k) részére az egy S-módú adat-kapcsolattal ellátott légijármű elérhetőségét ("összekapcsolási eset"). A GDLP-nek azt is be kell jelentenie a földi DTE-k részére, amikor ilyen légijárművel már nem áll fenn a kapcsolat azon a GDLP-n keresztül ("elhagyás eset"). A GDLP-nek értesítést kell küldenie (kérésre) arról az összes S-módú adat-kapcsolattal ellátott légijárműről, amelyik azzal a GDLP-vel kapcsolatban áll. Az értesítésekben meg kell adni a földi Légiforgalmi távközlési hálózat /ATN/ útválasztót a mozgó ATN útválasztó alhálózati csatlakozás pont (SNPA) címzést, a légijármű helyzetével együtt, és a szolgáltatás minőségét, mint választható paramétereket. A mozgó ATN útválasztó SNPA-jának a DTE címzésnek kell lenni, amelyet a légijármű címzés és a 0 alcím alkot (5.2.3.1.3.2).

5.2.8.2.2 *A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ összekapcsolhatósági jelentése.* Az ADLP-nek be kell jelentenie az összes légijármű DTE-t, amikor egy földi DTE utolsó megmaradó bemenete törlésre kerül a Lekérdező azonosító /II/ kód - DTE kereszt-referencia táblázatból (5.2.8.1.1). Ennek az értesítésnek magába kell foglalnia ennek a DTE-nek a címzését.

5.2.8.2.3 *Összeköttetési követelmények.* Az alrendszer össze-kapcsolhatósági változás összeköttetési mechanizmusának egy megerősített szolgáltatásnak kell lenni, például az összekapcsolási elhagyási eseteknél, amelyek engedélyezik az összekapcsolhatósági állapot bejelentését.

5.2.8.3 HIBA ELJÁRÁSOK

5.2.8.3.1 *Kapcsolat meghibásodás*. Egy csomagnak a vonatkozott XDLP-hez való kézbesítésében bekövetkezett hibát azután, hogy valamennyi rendelkezésre álló lekérdezőn keresztül kísérletet tettek ennek a csomagnak a kézbesítésére, kapcsolat szint hibaként kell bejelenteni. Egy Kapcsolt virtuális áramkörnél /SVC/ a Légijármű/Földi hálózati berendezésnek /XDCE/ a p1 állapotba kell belépni, és le kell választania az ehhez a csatornához kapcsolódó összes adatforrást. Ennek magába kell foglalnia az ehhez az SVC-hez kapcsolódó bármelyik válaszjeladójában lévő keret törlését. Egy S-módú TÖRLÉS KÉRÉS csomagot kell elküldeni a Hálózati végponti berendezésnek /DCE/ az újra-formátumozási folyamaton keresztül, és a DCE-nek úgy kell továbbítani azt, mint egy ISO 8208 csomagot a helyi Lekérdező adat végponti berendezés /DTE/ részére, ahogy az az 5.2.6.3.3 pontban leírásra került. A légijármű oldaláról a csatorna nem térhet vissza a Légijármű hálózati végponti berendezés /ADCE/ csatorna pool-ba, azaz nem térhet vissza a p1-be addig, amíg a kapcsolat hiba bejelentése utáni Tr másodperc el nem telik (5-1. táblázat).

5.2.8.3.2 *A FUTÓ CSATORNA MEGHATÁROZÁSA*

5.2.8.3.2.1 *Eljárás a d1 állapothoz*. Az XDLP-nek figyelnie kell az összes olyan SVC működését, amely nincs a KÉSZ állapotban (p1). Ha egy SVC több mint Tx másodpercig az (XDCE) FORGALOM VEZÉRLÉSRE KÉSZ (d1) állapotban van (a futó csatorna időzítő, 5-1. és 5-13. táblázat) anélkül, hogy S-módú FOGADÁSRA KÉSZ /RR/, FOGADÁSRA NEM KÉSZ /RNR/, ADAT vagy VISSZAUTASÍTÁS csomagot küldene, akkor:

a) ha az utolsó elküldött csomag S-módú VISSZAUTASÍTÁS csomag, amelyre válasz nem került vételre, az XDLP-nek ezt a csomagot vissza kell küldeni;

b) más esetben az XDLP-nek egy S-módú RR vagy RNR csomagot kell küldenie a társ XDLP-nek, amelyik a megfelelő.

5.2.8.3.2.2 *Eljárás egyéb állapotok esetén*. Ha egy XDCE SVC a p2, p3, p6, p7, d2 vagy d3 állapotban van több mint Tx másodpercen keresztül, akkor az 5.2.8.3.1 pont szerinti kapcsolat meghibásodási eljárást kell végrehajtania.

5.2.8.3.2.3 Kapcsolat hibát kell bejelenteni akkor, ha a 'maradjon készenlétben' csomagoknál egy késleltetési hiba vagy egy vételi hiba fordul elő. Az ilyen esetekben a csatornát törölni kell.

5.2.9 Az adat-kapcsolat teljesítőképesség jelentés formátuma

5.2.9.1 Ezt a jelentést a földi kezdeményezésű B-adatátvitel /Comm-B/ protokol felhasználásával kell továbbítani az Annex 10, IV. kötet, 3.1.2.6.10.2 pontjában meghatározottaknak megfelelően.

5.2.9.2 *Formátum.* A B-közlemény /MB/ mező formátuma a következő kell, hogy legyen:

Bit	*Tartalom*		
1-8	BDS	=	10_{16} /B-adatátvitel adat kiválasztás/
9	Folytatódás jelzés		
	0	=	Nincs folytatás
	1	=	Folytatódik a következő tárolóban
10-15	Kijelöletlen		
16	ACAS /Összeütközési veszélyt jelző fedélzeti rendszer/ részére fenntartva		
17-23	S-módú alhálózat változat szám		
	0	=	S-módú alhálózat nem áll rendelkezésre
	1	=	1.sz. változat (1996.)
	2	=	2.sz. változat (1998.)
	3	=	3.sz. változat (2002.)
	4-127	=	Kijelöletlen
24	Válaszjeladó szint (Annex 10, IV.kötet, 2.1.5)		
	0	=	2 – 4. szint
	1	=	5. szint
25	S-módú specifikus szolgáltatás teljesítőképesség		
	0	=	Nem áll rendelkezésre
	1	=	Rendelkezésre áll
26-28	Fedélzetre irányuló Kiterjesztett hosszúságú közlemény /UELM/ átlagos átmenő teljesítmény teljesítőképesség		
	0	=	Nincs UELM teljesítőképesség
	1	=	16 UELM szegmens 1 másodperc alatt
	2	=	16 UELM szegmens 500 ms alatt
	3	=	16 UELM szegmens 250 ms alatt
	4	=	16 UELM szegmens 125 ms alatt
	5	=	16 UELM szegmens 60 ms alatt
	6	=	16 UELM szegmens 30 ms alatt
	7	=	Kijelöletlen
29-32	Fedélzetről leadott Kiterjesztett hosszúságú közlemény /DELM/: A fedélzetről leadott azon ELM-ek átmenő teljesítmény teljesítőképessége, amelyek azt a maximális számú ELM szegmenset foglalják magukba, amit a válaszjeladó egy egyedüli kérés lekérdezésre való válaszában teljesíteni tud (UF = 24)		
	0	=	Nincs DELM teljesítőképesség
	1	=	Egy 4-szegmenses DELM másodpercenként
	2	=	Egy 8-szegmenses DELM másodpercenként

	3	=	Egy 16-szegmenses DELM másodpercenként
	4	=	Egy 16-szegmenses DELM 500 ms-onként
	5	=	Egy 16-szegmenses DELM 250 ms-onként
	6	=	Egy 16-szegmenses DELM 125 ms-onként
	7-15	=	Kijelöletlen
33	Légijármű azonosítási képesség (5-24. táblázat)		
	0	=	Nincs légijármű azonosítási képesség
	1	=	Légijármű azonosítási képesség
34	Szkvitter /lekérdezés nélküli válaszjel/ képesség almező		
35	Légtér-ellenőrzés azonosító képesség		
36	Közös alkalmazhatóságú földről kezdeményezett B-adat-átvitel /GICB/ teljesítőképesség jelentés		
37-40	ACAS részére fenntartott		
41-56	Bit tömb, amely a Lekérdező adat végponti berendezés /DTE/ 0 – 15 alcímzése alátámasztási állapotát jelöli		
	0 bit érték	=	A DTE nincs alátámasztva
	1 bit érték	=	A DTE alátámasztott

Megjegyzés. – Az S-módú válaszjeladó felfrissítheti az 1-8, 16 és 37-40-es biteket a Fedélzeti adat-kapcsolat vezérlő egységtől /ADLP/ függetlenül. Az 1-8 biteket a válaszjeladó akkor szolgáltatja, amikor az adat-kapcsolat teljesítő-képesség jelentés egy általános adás, ami az ADLP által jelentett, a válaszjeladó által észlelt teljesítőképesség változás eredménye (Annex 10, IV. kötet, 3.1.2).

5.2.9.3 *Protokol.* Minden esetben az első bitnek kell a legnagyobb értékű bitnek lenni, és elsőként kell átvitelre kerülnie. Az ADLP keret feldolgozásnak legalább másodpercenként egyszer létre kell hoznia az adat-kapcsolat teljesítőképesség jelentést és a válaszjeladóhoz legalább másod-percenként egyszer továbbítania kell.

5.2.10 Rendszer óra-regiszterek /időzítők/

5.2.10.1 Az óra-regiszterek /időzítők/ értékei meg kell, hogy feleljenek az 5-1. és 5-13. táblázatokban megadott értékeknek.

5.2.10.2 A tűrésnek minden időzítőnél plusz vagy mínusz egy százaléknak kell lenni.

5.2.10.3 A felbontóképességnek minden időzítőnél egy másod-percnek kell lenni.

5.2.11 Rendszer követelmények

5.2.11.1 *Adat integritás.* A maximális bit hiba-arány az adatoknál, a Fedélzeti adat-kapcsolat vezérlő egység /ADLP//válaszjeladó illesztésnél vagy a Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP//lekérdező illesztésnél megjelenő adatokra, a helyi Lekérdező adat végponti berendezés /DTE//Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ illesztésnél mérve (és fordítva is), nem haladhatja meg a 10-9-t a felderítetlen hibáknál és 10-7-t az észlelt hibáknál.

Megjegyzés. – A maximális hiba-arány az összes olyan hibát tartalmazza, amelyek az illesztéseken keresztüli adatátvitelekből és az XDLP belső működéséből származnak.

5.2.11.2 IDŐZÍTÉS

5.2.11.2.1 *A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ időzítése.* ADLP műveletek nem tartanak tovább 0,25 másodpercnél az egyenletes forgalomra és 0,125 másodpercnél a megszakított forgalomra. Ezt az intervallumot a következők szerint kell meghatározni:

a) *Válaszjeladók Fedélzetről leadott Kiterjesztett hosszúságú közlemény /ELM/ képességgel.* Az az idő, ami eltelik attól, amikor egy 128 bájtos adat csomag utolsó bitje a Hálózati végponti berendezés /DCE/ részére fedélzetről leadandóként megjelenik, és addig az időpontig tart, amíg az első keretbe zárt végső bit a válasz-jeladóhoz történő továbbításra rendelkezésre áll.

b) Válaszjeladók B-adatátviteli /Comm-B/ képességgel. Az az idő, ami eltelik attól, amikor egy 24 bájtos felhasználói adatmező utolsó bitjét átadják a DCE-nek fedélzetről leadandó továbbításra, addig az időpontig tart, amíg a felhasználói adatokat magába foglaló keretnek a négy B-adatátviteli utolsó szegmense utolsó bitje a válaszjeladóhoz történő kézbesítésre rendelkezésre áll.

c) Válaszjeladók Fedélzetre irányuló Kiterjesztett hosszúságú közlemény /ELM/ képességgel. Az az idő, ami eltelik attól, amikor egy felhasználói adatmezőt magába foglaló 128 bájtos, 14 C-közlemény szegmensű ELM utolsó szegmense befejező bitjének a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ általi vételétől addig az ideig tart, amikor a megfelelő csomag végső bitje a Lekérdező adat végponti berendezéshez /DTE/ történő kézbesítésre rendelkezésre áll.

d) Válaszjeladók A-adatátviteli képességgel. Az az idő, ami eltelik attól, amikor a felhasználói adatmezőt magába foglaló 25 bájtos, négy kapcsolt A-adatátviteli szegmens utolsó szegmensének befejező bitjét a Fedélzeti adat-kapcsolat vezérlő egység /ADLP/

5.2.11.2.2 *Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ IDŐZÍTÉS*

Ajánlás. - *A teljes késési idő a GDLP-n keresztül, az átviteli késést kizárva, nem lehet nagyobb, mint 0,125 másodperc.*

5.2.11.3 *Illesztő egység átviteli teljesítmény.* A Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ és a válaszjeladó közötti illesztő egységnek minimálisan másodpercenkénti 100 kilobit átviteli teljesítménnyel kell rendelkezni.

5.3 HÁLÓZATI VÉGPONTI BERENDEZÉS /DCE/ ÉS LÉGIJÁRMŰ/FÖLDI HÁLÓZATI BERENDEZÉS /XDCE/ ÁLLAPOT TÁBLÁZATOK

5.3.1 *Állapot táblázat követelmények.*

A DCE-nek és az XDCE-nek úgy kell működnie, ahogy az az 5-3.-tól az 5-22.-ig terjedő állapot táblázatokban meghatározásra került. Az 5-15.-től az 5-22.-ig terjedő állapot táblázatokat a következőkre kell alkalmazni:

a) Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ állapot átmenetek azok, amikor az XDCE vagy Fedélzeti/Földi adat-kapcsolat vezérlő egység /XDLP/ zárójelekben lévő tagok elhagyásra kerülnek; és

b) Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ állapot átmenetek azok, amikor a zárójelekben lévő tagokat használják fel, és az ezeket megelőző XDCE vagy XDLP tagok elhagyásra kerülnek.

5.3.2 ***Diagnosztikai és létrehozó kódok.***

A táblázat bejegyzések bizonyos körülményeknél egy diagnosztikai kódot jeleznek, amelyeket a létrehozott csomagnak kell magába foglalnia, amikor belép a jelzett állapotba. A "D =" kifejezés a diagnosztikai kódot határozza meg. Amikor az "A = DIAG" jelenik meg, akkor a végrehajtandó műveletnek egy ISO 8208 DIAGNOSZTIKA csomagot kell létrehoznia, és ezt kell továbbítania a DTE-hez; a jelzett diagnosztikai kódnak kell meghatároznia a csomag diagnosztikai mezőjének beírását. A létrehozó mezőt az 5.2.6.3.3 pontban meghatározottaknak megfelelően kell beállítani. A visszaállítást létrehozó kódot úgy kell beállítani, ahogy az az ISO 8208-ban meg van határozva.

1. Megjegyzés. - Az alábbiakban megadott táblázatok az állapot követelményeket határozzák meg a következő sorrendben:

5-3 Hálózati végponti berendezés /DCE/ speciális esetek

5-4 A Lekérdező adat végponti berendezés /DTE/ hatása a DCE újraindítási állapotokra

5-5 DTE hatása a DCE hívás beállítási és törlési állapotokra

5-6 DTE hatása a DCE visszaállítási állapotokra

5-7 DTE hatása a DCE megszakítás átviteli állapotokra

5-8 DTE hatása a DCE forgalom vezérlés átvitel állapotokra

5-9 Légijármű/Földi hálózati végponti berendezés /XDCE/ hatása a DCE újraindítási állapotokra

5-10 XDCE hatása a DCE hívás beállítási és törlési állapotokra

5-11 XDCE hatása a DCE visszaállítási állapotokra

5-12 XDCE hatása a DCE megszakítás átviteli állapotokra

5-15 A Földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ (Fedélzeti adat-kapcsolat vezérlő egység /ADLP/) hatása a Légijármű hálózati végponti berendezés /ADCE/ (Földi hálózati végponti berendezés /GDCE/) csomag réteg 'kész' állapotokra

5-16 GDLP (ADLP) hatása az ADCE (GDCE) hívás beállítási és törlési állapotokra

5-17 GDLP (ADLP) hatása az ADCE (GDCE) visszaállítási állapotokra

5-18 GDLP (ADLP) hatása az ADCE (GDCE) megszakítás átviteli állapotokra

5-19 GDLP (ADLP) hatása az ADCE (GDCE) forgalom vezérlés átviteli állapotokra

5-20 A Hálózati végponti berendezés /DCE/ hatása az ADCE (GDCE) hívás beállítási és törlési állapotoktra

5.21 DCE hatása az ADCE (GDCE) visszaállítási állapotokra

5-22 DCE hatása az ADCE (GDCE) megszakítás átviteli állapotokra

2. Megjegyzés. - Mindegyik táblázatban mind az ADLP, mind a GDLP műveletek meghatározásra kerültek.

3. Megjegyzés. - Az S-módú alhálózaton belül a p6 és d2 állapotok átmeneti állapotok.

4. Megjegyzés. - A "megjegyzések"-re történő hivatkozások az állapot táblázatokban azokra a táblázat-specifikus megjegyzésekre vonatkoznak, amelyek az egyes állapot táblázatokat követik.

5. Megjegyzés. - Az összes diagnosztikai és létrehozó kód decimális számként van értelmezve.

6. Megjegyzés. - Egy ADCE és egy GDCE közötti SVC-t egy ideiglenes és/vagy állandó csatorna számmal lehet azonosítani, ahogyan az az 5.2.5.1.2 pontban meghatározásra került.

5.4 S-MÓDÚ CSOMAG FORMÁTUMOK

5.4.1 Formátumok

Az S-módú csomag formátumoknak az 5-3.-tól az 5-22.-ig terjedő táblázatokban meghatározottaknak megfelelőknek kell lenniük.

5.4.2 *A vezérlő mezők jelentősége.*

Az S-módú csomagokban használt formátum vezérlő mezők szerkezetének az 5-23. ábrában meghatározottaknak megfelelőnek kell lenniük. Az ezekben a csomag formátumokban használt vezérlő mezők jelentése a következő:

Mező
szimbólum *Meghatározás*
AG Címzés, Földi; a földi Lekérdező adat végponti berendezés /DTE/ címzés 8-bites bináris adat-feltűntetése (5.2.3.1.3.1)
AM Címzés,Mozgó; a mobil DTE címzés utolsó két binárisan kódolt decimális /BDC/ számjegyének 4-bites adat-feltűntetése (5.2.3.1.3.2)
CC Törlés létrehozás az ISO 8208-ban meghatározottak szerint
CH Csatorna szám (0 - 15)
DC Diagnosztikai kód az ISO 8208-ban meghatározottak szerint
DP Adat csomag típus (5-23. ábra)
F S-bit sorozat, első csomag jelző
FILL Kitöltő mező
FILL1 6 bit hosszúságú egy nem-multiplikált csomagra a fedélzetről leadott Szabvány hosszúságú közlemény /SLM/ keretekben;
egyébként 0 bit
FILL2 0 bit hosszúságú egy nem-multiplikált csomagra a fedélzetről leadott Szabvány hosszúságú közlemény /SLM/ keretekben és
a multiplikáló fej-részekre; egyébként 2 bit
ELSŐ CSOMAG A multiplikált csomagok közül az első csomag tartalma
FS Gyors kiválasztás jelenléte
IN Az alaphelyzet beállító bit
L "Több bit" a hosszú formátumú MSP csomagokra az 5.2.7.4 pontban meghatározottak szerint
LAST PACKET A multiplikált csomagokból az utolsó csomag tartalma
LENGTH Egy multiplikált csomag hossza bájtokban egy előjel nélküli bináris számként kifejezve
LV A felhasználói adatmező hossza, a felhasznált bitek száma, ahogy az az 5.2.2.3.1 pontban meghatározásra került
M "Több bit" az SVC ADAT csomagokra, ahogy az az 5.2.5.1.4.1 pontban meghatározásra került
M/CH S-módú specifikus protokol /MSP/ csatorna szám
MP MSP csomag típus (5-23. ábra)

M/SN	Sorozat szám; a hosszú formátumú MSP csomag sorozat száma
OD	Választható adat
ODL	A választható adat hossza
OF	A választhatóság jelzése
P	Elsőbbség mező
PR	Csomag vételi sorozat szám
PS	Csomag küldési sorozat szám
RC	Visszaállítást létrehozó kód az ISO 8208-ban meghatározottak szerint
RT	Irányítási út táblázat az 5.2.5.3.3.8 pontban meghatározottak szerint
RTL	Irányítási út táblázat hosszúság bájtokban kifejezve
S	"Több bit" HÍVÁS KÉRÉS, HÍVÁS ELFOGADÁS, TÖRLÉS KÉRÉS és MEGSZAKÍTÁS csomagokhoz, az 5.2.5.1.4.2 pontban meghatározottak szerint
SN	Sorozat szám; a sorozat szám ehhez a csomag típushoz
SP	Felügyelő csomag (5-23. ábra)
SS	Felügyelő részhalmaz szám (5-23. ábra)
ST	Felügyelő típus (5-23. ábra)
TC	Ideiglenes csatorna szám
UD	Felhasználói adatmező

TÁBLÁZATOK AZ 5. FEJEZETHEZ

5-1. táblázat: Fedélzeti adat-kapcsolat vezérlő egység /ADLP/ S-módú al-hálózati időzítők

Az idõzítõ neve	*Az időzítő ideje*	*Névleges érték*	*Referencia*
Csatorna visszavonás	*Tr*	*600 s*	*5.2.8.3.1*
Futó csatorna – ADLP	*Tx*	*420 s*	*5.2.8.3.2*
Lekérdező lekérdezés	*Ts*	*60 s*	*5.2.8.1.2*
Lekérdező kapcsolat	*Tz*	*30 s*	*5.2.7.1.1.4.2, 5.2.8.1.3.2*
Kapcsolat keret törlés	*Tc*	*60 s*	*5.2.2.1.1.4.5*
L-bit kézbesítés – ADLP	*Tm*	*120 s*	*5.2.7.4.3*
Csomag újra-sorbarendezés és 8-bit kézbesítés	*Tq*	*60 s*	*5.2.6.9*

5-2. táblázat: Hálózati végponti berendezés /DCE/ tevékenység állapot átmenetnél

DCE állapot	*Állapot meghatározás*	*Tevékenység, amelyet az állapotba való belépésnél el kell végezni*
*r*1	CSOMAG SZINT KÉSZ	Az összes Kapcsolt virtuális áramkör /SVCs/ visszatér a *p*1 állapotba (lásd a *p*1 állapot magyarázatot).
*r*2	LEKÉRDEZŐ ADAT VÉGPONTI BERENDEZÉS /DTE/ ÚJRAINDÍTÁS KÉRÉS	Mindegyik SVC visszatér a *p*1 állapotba (lásd a *p*1 állapot magyarázatot). ÚJRAINDÍTÁS MEGERŐSÍTÉS-t kiadni DTE-nek.
*r*3	HÁLÓZATI VÉGPPONTI BERENDEZÉS /DCE/ ÚJRAINDÍTÁS KÉRÉS	ÚJRAINDÍTÁS KÉRÉS-t kiadni a DTE-nek. Hacsak nem az *r*2 állapoton keresztül lépett be, egy ÚJRAINDÍTÁS KÉRÉS-t küldeni az újra-formátumozó feldolgozásnak.

*p*1	KÉSZ	Feloldani az SVC számára kijelölt összes adatforrást. Megszakítani a kapcsolatot a DTE/DCE SVC és a Légijármű hálózati végponti berendezés /ADCE/ / Földi hálózati végponti berendezés /GDCE/ SVC között. (Az ADCE/GDCE SVC még nem lehet *p*1 állapotban.)
*p*2	DTE HÍVÁS KÉRÉS	Meghatározni azt, hogy elegendő „erőforrás” áll-e rendelkezésre a kérés alátámasztására; ha igen, akkor kijelölni az erőforrást és HÍVÁS KÉRÉS csomagot küldeni az újra-formátumozó feldolgozásnak; ha nem, akkor DCE TÖRLÉS KÉRÉS a DTE-hez a (*p*7) állapotba történő lépéshez. Az erőforrások meghatározása és elosztása az ISO 8208-ban meghatározottak szerint történik.
*p*3	DCE HÍVÁS KÉRÉS	Meghatározni azt, hogy elegendő erőforrás áll-e rendelkezésre a kérés alátámasztására; ha igen, akkor kijelölni az erőforrásokat és HÍVÁS KÉRÉS csomagot küldeni a DTE-nek; ha nem, akkor TÖRLÉS KÉRÉS csomagot küldeni az újra-formátumozó feldolgozásnak. Az erőforrások meghatározása és elosztása az ISO 8208-ban meghatározottak szerint történik.
*p*4	ADAT-TOVÁBBÍTÁS	Nincs művelet.
*p*5	HÍVÁS ÜTKÖZÉS	Újra kijelölni a kimenő hívást egy másik SVC-hez (a DTE a hívás ütközés állapotában nem veszi figyelembe a bejövő hívást) és belépni a DCE HÍVÁS KÉRÉS állapotba (*p*3) ennél az új SVC-nél. Belépni a *p*2 állapotba a DTE-től jövő HÍVÁS KÉRÉS feldolgozáshoz.
*p*6	DTE TÖRLÉS KÉRÉS	Feloldani az SVC számára kijelölt összes adatforrást, TÖRLÉS MEGERŐSÍTÉS csomagot küldeni a DTE-nek, és belépni a *p*1 állapotba.
*p*7	DCE TÖRLÉS KÉRÉS A DTE-HEZ	TÖRLÉS KÉRÉS csomagot küldeni a DTE-hez.
*d*1	FORGALOM VEZÉRLÉS KÉSZ	Nincs tevékenység.

*d*2	DTE VISSZAÁLLÍTÁS KÉRÉS	Eltávolítani az ablakból a DTE-hez továbbított ADAT csomagokat; érvényteleníteni azokat az ADAT csomagokat, amelyek a részben átvitt M-bit sorozatokat képviselik, és érvényteleníteni azokat a MEGSZAKÍTÁS csomagokat, amelyek a DTE-hez való továbbításra várnak; az összes ablak számlálót visszaállítani 0-ra; az ADAT és MEGSZAKÍTÁS átvitelre vonatkozó időzítési és újra-továbbítási paramétert az alaphelyzeti értékükre állítani. VISSZAÁLLÍTÁS MEGERŐSÍTÉS csomagot küldeni a DTE-nek. SVC-t visszaállítani a *d*1 állapotba.
*d*3	DCE VISSZAÁLLÍTÁS KÉRÉS A DTE-HEZ	Eltávolítani az ablakból a DTE-hez továbbított ADAT csomagokat; érvényteleníteni minden olyan ADAT csomagot, amelyek a részben átvitt M-bit sorozatokat képviselik és érvényteleníteni azokat a MEGSZAKÍTÁS csomagokat, amelyek a DTE-hez való továbbításra várnak; az összes ablak számlálót visszaállítani 0-ra; az ADAT és MEGSZAKÍTÁS átvitelre vonatkozó időzítési és újra-továbbítási paramétereket az alaphelyzeti értékükre állítani. VISSZAÁLLÍTÁS KÉRÉS csomagot továbbítani a DTE-nek.
*i*1	DTE MEGSZAKÍTÁS KÉSZ	Nincs tevékenység.
*i*2	DTE MEGSZAKÍTÁS KÜLDÉS	A DTE-től vett MEGSZAKÍTÁS csomagot továbbítani az újra-formátumozási feldolgozáshoz.
*j*1	DCE MEGSZAKÍTÁS KÉSZ	Nincs tevékenység.
*j*2	DCE MEGSZAKÍTÁS KÜLDÉS	Az újra-formátumozási folyamatból vett MEGSZAKÍTÁS csomagot továbbítani a DTE-hez.
*f*1	DCE VÉTELRE KÉSZ	Nincs tevékenység.
*f*2	DCE VÉTELRE NEM KÉSZ	Nincs tevékenység.
*g*1	DTE VÉTELRE KÉSZ	Nincs tevékenység.
*g*2	DTE VÉTELRE NEM KÉSZ	Nincs tevékenység.

5-3. táblázat: Hálózati végponti berendezés /DCE/ speciális esetek

A Lekérdező adat végponti berendezéstől vett	*DCE speciális esetek* *Bármely állapot*
Bármely olyan csomagnál, amely kisebb, mint 2 bájt hosszúságban (beleértve az érvényes adat kapcsolat szint keretet, amely nem tartalmaz csomagot)	A = DIAG D = 38
Bármely olyan csomagnál, amely egy érvénytelen általános formátum azonosítóval érkezett	A = DIAG D = 40
Bármely olyan csomagnál, amely egy érvényes általános formátum azonosítóval és egy kijelölt logikai csatorna azonosítóval (beleértve egy ’0’ logikai csatorna azonosítót) érkezett	Lásd az 5-4. táblázatot.

5-4. táblázat: A lekérdező adat végponti berendezés /DTE/ hatása a hálózati végponti berendezés /DCE/
újra-indítási állapotokra

	DCE újra-indítási állapot (lásd az 5.Megj.-t)		
DTE-től vett csomag	CSOMAG SZINT KÉSZ (lásd 1.Megj.-t) *r*1	DTE ÚJRA-INDÍTÁS KÉRÉS *r*2	DCE ÚJRA-INDÍTÁS KÉRÉS *r*3
Csomagok, amelyek 1 bájtnál rövidebb csomag típus azonosítóval rendelkeznek, és a logikai csatorna azonosítójuk nem egyenlő 0-val	Lásd az 5-5. táblázatot	*A* = *HIBA* *S* = *r*3 *D* = 38 (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNYTELENÍTÉS*
Bármely olyan csomag, kivéve az ÚJRA-INDÍTÁS-t és a JELTÁROLÁS-t, amely 0 logikai csatorna azonosítóval érkezett	*A* = *DIAG* *D* = 36	*A* = *DIAG* *D* = 36	*A* = *DIAG* *D* = 36
Csomag, olyan csomag típus azonosítóval, amely nincs meghatározva, vagy a DCE nem támasztja alá	Lásd az 5-5. táblázatot	*A* = *HIBA* *S* = *r*3 *D* = 33 (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNYTELENÍTÉS*
ÚJRA-INDÍTÁS KÉRÉS, ÚJRA-INDÍTÁS MEGERŐSÍTÉS vagy JELTÁROLÁS (ha ilyen van) csomag olyan logikai csatorna azonosítóval, amely nem egyenlő 0-val	Lásd az 5-5. táblázatot	*A* = *HIBA* *S* = *r*3 *D* = 41 (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNYTELENÍTÉS*

ÚJRA-INDÍTÁS KÉRÉS	*A = SZABÁ-LYOS* (továbbítás) *S = r*2	*A = ÉRVÉNY-TELENÍTÉS*	*A = SZABÁ-LYOS* *S = p*1 v. *d*1 (lásd a 2. Meg-jegyzést)
ÚJRA-INDÍTÁS MEGERŐSÍTÉS	*A = HIBA* *S = r*3 *D* = 17 (lásd a 6. Meg-jegyzést)	*A = HIBA* *S = r*3 *D* = 18 (lásd a 4. Meg-jegyzést)	*A = SZABÁ-LYOS* *S = p*1 v. *d*1 (lásd a 2. Meg-jegyzést)
ÚJRA-INDÍTÁS KÉRÉS vagy ÚJRA-INDÍTÁS MEGERŐSÍTÉS csomag formátum hibával	*A = DIAG* *D* = 38, 39, 81 vagy 82	*A = ÉRVÉNY-TELENÍTÉS*	*A = HIBA* *D* = 38, 39, 81 vagy 82
JELTÁROLÁS KÉRÉS vagy JEL-TÁROLÁS MEGERŐSÍTÉS csomagok (lásd a 3.Megjegyzést)	*A = SZABÁ-LYOS*	*A = SZABÁ-LYOS*	*A = SZABÁ-LYOS*
JELTÁROLÁS KÉRÉS vagy JEL-TÁROLÁS MEGERŐSÍTÉS csomagok formátum hibával (lásd a 3.Megjegyzést)	*A = DIAG* *D* = 38, 39, 81 vagy 82	*A = HIBA* *S = r*3 *D* = 38, 39, 81 vagy 82 (lásd a 4. Meg-jegyzést)	*A = HIBA* *D* = 38, 39, 81 vagy 82
Hívás beállítás, hívás törlés, ADAT, megszakítás, forgalom vezérlés, vagy visszaállítás csomag	Lásd az 5-5. táblázatot	*A = HIBA* *S = r*3 *D* = 18	*A = ÉRVÉNY-TELENÍTÉS*

MEGJEGYZÉSEK:

1. Az S-módú alhálózatnak nincsenek újra-indítási állapotai. Egy ÚJRA-INDÍTÁS KÉRÉS vétele a DCE-nél azt idézi elő, hogy egy ÚJRA-INDÍTÁS MEGERŐSÍTÉS-sel válaszoljon. Az ÚJRA-INDÍTÁS KÉRÉS csomag az újra-formátumozó feldolgozáshoz kerül továbbításra, amely törlés kéréseket továbbít a DTE-hez kapcsolódó összes SVC-nek. A DCE csak akkor lép be az *r*3 állapotba, ha hibát észlel a DTE/DCE illesztésen.

2. Az SVC csatornák visszatérnek a *p*1 állapotba, az Állandó virtuális áramkör (PVC) csatornák pedig visszalépnek a *d*1 állapotba.

3. A jeltárolási berendezés felhasználása választható a DTE/DCE illesztésen.

4. Nem hajtanak végre tevékenységet az S-módú alhálózaton belül.

5. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

6. A hiba eljárás az *r*3 állapotba lépésből és az ÚJRA-INDÍTÁS KÉRÉS-nek az újra-formátumozó feldolgozáshoz történő küldéséből áll.

5-5. táblázat: A lekérdező adat végponti berendezés /DTE/ hatása a hálózati végponti berendezés /DCE/ hívás beállítás és törlés állapotokra

	DCE hívás beállítás és törlés állapotok (lásd az 5. Megjegyzést)						
DTE-től vett köteg	KÉSZ p1	DTE HÍVÁS KÉRÉS p2	DCE HÍVÁS KÉRÉS p3	ADAT ÁTVITEL p4	HÍVÁS ÜTKÖZÉS p5 (lásd 1. és 4. megjegyzés)	DTE SZABADDÁ TÉTEL KÉRÉS p6	DTE SZABADDÁ TÉTEL KÉRÉS DTE-hez p7
Csomagok, amelyek 1 bájtnál rövidebb csomag típus azonosítóval rendelkeznek	*A=HIBA* *S* = *p*7 *D* = 38	*A=HIBA* *S* = *p*7 *D* = 38 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 38 (lásd a 2. Megjegyzést)	Lásd az 5-6. Táblázatot	*A=HIBA* *S* = *p*7 *D* = 38 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 38 (lásd a 2. Megjegyzést)	*A=ÉRVÉNYTELENÍTÉS*
Csomag, olyan csomag típus azonosítóval, amely nincs meghatározva, vagy a DCE nem támasztja alá	*A=HIBA* *S* = *p*7 *D* = 33	*A=HIBA* *S* = *p*7 *D* = 33 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 33 (lásd a 2. Megjegyzést)	Lásd az 5-6. Táblázatot	*A=HIBA* *S* = *p*7 *D* = 33 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 33 (lásd a 2. Megjegyzést)	*A=ÉRVÉNYTELENÍTÉS*
ÚJRA-INDÍTÁS KÉRÉS, ÚJRA-INDÍTÁS MEGERŐSÍTÉS vagy JELTÁROLÁS csomag olyan logikai csatorna azonosítóval, amely nem egyenlő 0-val	*A=HIBA* *S* = *p*7 *D* = 41	*A=HIBA* *S* = *p*7 *D* = 41 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 41 (lásd a 2. Megjegyzést)	Lásd az 5-6. Táblázatot	*A=HIBA* *S* = *p*7 *D* = 41 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 41 (lásd a 2. Megjegyzést)	*A=ÉRVÉNYTELENÍTÉS*
HÍVÁS KÉRÉS	*A=SZABÁLYOS* *S* = *p*2 (továbbít)	*A=HIBA* *S* = *p*7 *D* = 21 (lásd a	*A=SZABÁLYOS* *S* = *p*5	*A=HIBA* *S* = *p*7 *D* = 23 (lásd a	*A=HIBA* *S* = *p*7 *D* = 24 (lásd a	*A=HIBA* *S* = *p*7 *D* = 25 (lásd a	*A=ÉRVÉNYTELENÍTÉS*

		2. Megjegyzést)		2. Megjegyzést)	2. Megjegyzést)	2. Megjegyzést)	
HÍVÁS ELFO-GADÁS	*A=HIBA* *S* = *p*7 *D* = 20	*A=HIBA* *S* = *p*7 *D* = 21 (lásd a 2. Megjegyzést)	*A=SZABÁLYOS* *S* = *p*4 (továbbítás) *S* = *p*7 *D* = 42 (lásd a 2. és 3. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 23 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 24 (lásd a 2. és 4.Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 25 (lásd a 2. Megjegyzést)	*A=ÉRVÉNYTELENÍTÉS*
TÖRLÉS KÉRÉS	*A=SZABÁLYOS* *S* = *p*6	*A=SZABÁLYOS* *S* = *p*6 (továbbít)	*A=SZABÁLYOS* *S* = *p*6 (továbbít)	*A=SZABÁLYOS* *S* = *p*6 (továbbít)	*A=SZABÁLYOS* *S* = *p*6 (továbbít)	*A=ÉRVÉNYTELENÍTÉS*	*A=SZABÁLYOS* *S* = *p*1 (nem továbbítható)
TÖRLÉS MEGERŐSÍTÉS	*A=HIBA* *S* = *p*7 *D* = 20	*A=HIBA* *S* = *p*7 *D* = 21 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 22 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 23 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 24 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 25 (lásd a 2. Megjegyzést)	*A=SZABÁLYOS* *S* = *p*1 (nem továbbítható)
ADAT, megszakítás, forgalom vezérlés vagy visszaállítás csomagok	*A=HIBA* *S* = *p*7 *D* = 20	*A=HIBA* *S* = *p*7 *D* = 21 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 22 (lásd a 2. Megjegyzést)	Lásd az 5-6. Táblázaot	*A=HIBA* *S* = *p*7 *D* = 24 (lásd a 2. Megjegyzést)	*A=HIBA* *S* = *p*7 *D* = 25 (lásd a 2. Megjegyzést)	*A=ÉRVÉNYTELENÍTÉS*

MEGJEGYZÉSEK:

1. A *p*5 állapotba belépve a DCE újrajelöli a kimenő hívást a DTE-hez egy másik csatornához (TÖRLÉS KÉRÉS nincs kiadva) és válaszol a bejövő DTE hívásra, ahogy megfelelő TÖRLÉS KÉRÉS vagy TÖRLÉS ELFOGADÁS csomaggal.

2. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *p*7 állapotba való belépésnél (beleértve egy TÖRLÉS KÉRÉS csomag küldését a DTE-nek) és kiegészítőleg egy TÖRLÉS KÉRÉS csomag elküldését az XDCE-nek (az újra-formátumozó folyamaton keresztül).

3. A gyors kiválasztás eszköz alkalmazása egy válasz korlátozással együtt megtiltja a DTE-nek azt, hogy HÍVÁS ELFOGADÁS csomagot küldjön.

4. A DTE-nek egy hívás ütközés esetén érvénytelenítenie kell azt a HÍVÁS KÉRÉS csomagot, amelyet a DCE-től vett.

5. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

5-6. táblázat: A lekérdező adat végponti berendezés /DTE/ hatása a hálózati végponti berendezés /DCE/ visszaállítás állapotokra

	DCE visszaállítási állapotok (lásd a 2. Megjegyzést)		
DTE-től vett csomag	FORGALOM VEZÉRLÉSRE KÉSZ *d*1	VISSZAÁLLÍTÁS KÉRÉS DTE ÁLTAL *d*2	DCE VISSZAÁLLÍTÁS KÉRÉS A DTE-hez *d*3
Csomag 1 bájtnál rövidebb csomag típus azonosítóval	*A = HIBA* *S = d*3 *D* = 38 (lásd az 1. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 38 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
Csomag, olyan csomag típus azonosítóval, amely nincs meghatározva, vagy a DCE nem támasztja alá	*A = HIBA* *S = d*3 *D* = 33 (lásd az 1. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 33 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
ÚJRA-INDÍTÁS KÉRÉS, ÚJRA-INDÍTÁS MEGERŐ-SÍTÉS vagy JELTÁROLÁS (ha ilyen van) csomag, nem 0-val egyenlő logikai csatorna azonosítóval	*A = HIBA* *S = d*3 *D* = 41 (lásd az 1. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 41 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
VISSZAÁLLÍTÁS KÉRÉS	*A = SZABÁLYOS* *S = d*2 (továbbítás)	*A = ÉRVÉNYTELENÍTÉS*	*A = SZABÁLYOS* *S = d*1 (nem továbbítható)
VISSZAÁLLÍTÁS MEG- ERŐSÍTÉS	*A = HIBA* *S = d*3 *D* = 27 (lásd az 1. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 28 (lásd az 1. Megjegyzést)	*A = SZABÁLYOS* *S = d*1 (nem továbbítható)
MEGSZAKÍTÁS csomag	Lásd az 5-7. táblázatot	*A = HIBA* *S = d*3 *D* = 28 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
MEGSZAKÍTÁS MEG-ERŐSÍTÉS csomag	Lásd az 5-7. táblázatot	*A = HIBA* *S = d*3 *D* = 28 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
ADAT vagy forgalom vezérlési csomag	Lásd az 5-8. táblázatot	*A = HIBA* *S = d*3 *D* = 28 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*
VISSZAUTASÍTÁS alátámasztott, de nem ’előfizetett’	*A = HIBA* *S = d*3 *D* = 37 (lásd az 1. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 37 (lásd az 1. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*

MEGJEGYZÉSEK:

1. A hibaeljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag küldését a DTE-hez) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldését az XDCE-nek (a formátumozó feldolgozáson keresztül).

2. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

5-7 táblázat: A Lekérdező adat végponti berendezés /DTE/ hatása a Hálózati végponti berendezés /DCE/ megszakítás továbbítási állapotokra

	DTE/DCE megszakítás továbbítási állapotok (lásd a 2. Megjegyzést)	
DTE-től vett csomag	DTE MEGSZAKÍTÁSRA KÉSZ *i*1	DTE MEGSZAKÍTÁS KÜLDÉS *i*2
MEGSZAKÍTÁS (lásd az 1. Megjegyzést)	*A = SZABÁLYOS* *S* = *i*2 (továbbítás)	*A = HIBA* *S* = *d*3 *D* = 44 (lásd a 3. Megjegyzést)
DTE-től vett csomag	DTE/DCE megszakítás továbbítási állapotok (lásd a 2. Megjegyzést)	
	DCE MEGSZAKÍTÁSRA KÉSZ *j*1	DCE MEGSZAKÍTÁS KÜLDÉS *j*2
MEGSZAKÍTÁS MEG-ERŐSÍTÉS (lásd az 1. Megjegyzést)	*A = HIBA* *S* = *d*3 *D* = 43 (lásd a 3. Megjegyzést)	*A = SZABÁLYOS* *S* = *j*1 (továbbítás)

MEGJEGYZÉSEK:

1. Ha a csomagnak formátum hibája van, akkor a hiba eljárást kell alkalmazni (lásd 3. Megjegyzést). Az olyan megszakítás csomagokat, amelyeknek a felhasználási adata 32 bájtnál több, formátum hibaként kell kezelni.

2. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

3. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag továbbítását a DTE-nek) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldését az XDCE-nek (az újra-formátumozó feldolgozáson keresztül).

5-8. táblázat: A lekérdező adat végponti berendezés /DTE/ hatása a Hálózati végponti berendezés /DCE/ forgalom vezérlés továbbítási állapotokra

	DCE forgalom vezérlés továbbítási állapotok (lásd a 2. és 3. Megjegyzést)	
DTE-től vett csomag	DCE VÉTELRE KÉSZ *f*1	DCE VÉTELRE NEM KÉSZ *f*2
A 4 bájtnál kisebb ADAT csomag, amikor modulo 128 számozást alkalmaznak	*A* = *HIBA* *S* = *d*3 *D* = 38 (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNY-TELENÍTÉS*
ADAT csomag érvénytelen csomag vételi sorrenddel /PR/	*A* = *HIBA* *S* = *d*3 *D* = 2 (lásd a 4. Megjegyzést)	*A* = *HIBA* *S* = *d*3 *D* = 2 (lásd a 4. Megjegyzést)
ADAT csomag érvényes PR-el, de érvénytelen csomag küldési sorrenddel /PS/ vagy helytelen formátumú felhasználói adat-mezővel	*A* = *HIBA* *S* = *d*3 *D* = 1 (érvénytelen PS) *D* = 39 (UD > max. tárgyalt hossz) *D* = 82 (UD kijelöletlen) (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNY-TELENÍTÉS* (a PR adatok feldolgozása)
ADAT csomag érvényes PR-el, M-bit 1-re állítással, amikor a felhasználói adatmező részben kitöltött	*A* = *HIBA* *S* = *d*3 *D* = 165 (lásd a 4. Megjegyzést)	*A* = *ÉRVÉNY-TELENÍTÉS* (a PR adatok feldolgozása)
ADAT csomag érvényes PR-el, PS-el és felhasználói adat-mező formátummal	*A* = *SZABÁLYOS* (továbbítás)	*A* = *ÉRVÉNY-TELENÍTÉS* (a PR adatok feldolgozása)
A Vételre kész /RR/, a Vételre nem kész /RNR/, vagy a VISSZAUTASÍTÁS csomag 3 bájtnál kisebb, amikor modulo 128 számozást alkalmaznak (lásd az 1. Megjegyzést)	*A* = *ÉRVÉNY-TELENÍTÉS*	*A* = *ÉRVÉNY-TELENÍTÉS*
RR, RNR vagy VISSZA-UTASÍTÁS csomag érvény-telen csomag vételi sorrend-del /PR/	*A* = *HIBA* *S* = *d*3 *D* = 2 (lásd a 4. Megjegyzést)	*A* = *HIBA* *S* = *d*3 *D* = 2 (lásd a 4. Megjegyzést)

RR csomag érvényes PR-el	*A = SZABÁLYOS*	*A = SZABÁLYOS* *S* = *g*1
RNR csomag érvényes PR-el	*A = SZABÁLYOS* *S* = *g*2	*A = SZABÁLYOS*
VISSZAUTASÍTÁS csomag érvényes PR-el	*A = SZABÁLYOS*	*A = SZABÁLYOS* *S* = *g*1

MEGJEGYZÉSEK:

1. A Visszautasítási eljárások nem szükségesek.

2. Az RR, RNR és VISSZAUTASÍTÁS eljárások egy helyi DTE/DCE esetén és a megfelelõ csomagok nem kerülnek az XDCE-hez továbbításra.

3. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

4. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag továbbítását a DTE-nek) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldését az XDCE-nek (az újra-formátumozó feldolgozáson keresztül.

5-9 táblázat: Az XDCE hatása a DCE újraindítási állapotokra

	DCE újraindítási állapotok (lásd a Megjegyzést)		
XDCE-től vett csomag	CSOMAG SZINT KÉSZ *r*1	DTE ÚJRA-INDÍTÁS KÉRÉS *r*2	DCE ÚJRA-INDÍTÁS KÉRÉS *r*3
HÍVÁS KÉRÉS	Lásd az 5-10. táblázatot	TÖRLÉS KÉRÉS küldés az újra-formátumozó feldolgozásnak a *D* = 244-el	TÖRLÉS KÉRÉS küldés az újra-formátumozó feldolgozásnak a *D* = 244-el
HÍVÁS ELFOGADÁS, TÖRLÉS KÉRÉS, ADAT, MEGSZAKÍTÁS, MEGSZAKÍTÁS MEGERŐSÍTÉS, VISSZAÁLLÍTÁS KÉRÉS	Lásd az 5-10. táblázatot	*A = ÉRVÉNYTELENÍTÉS*	*A = ÉRVÉNYTELENÍTÉS*

Megjegyzés. – A táblázat bejegyzései a következőképpen kerültek meghatározásra: A = *végrehajtandó tevékenység,* S = *az az állapot, amelybe be kell lépni,* D = *a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az* ÉRVÉNYTELENÍTÉS *azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.*

5-10 táblázat: XDCE hatása a DCE hívás beállítás és törlés állapotokra

XDCE-től vett csomag	DCE hívás beállítás és törlés állapotok (lásd a Megjegyzést)						
	KÉSZ *p*1	DTE HÍVÁS KÉRÉS *p*2	DCE HÍVÁS KÉRÉS *p*3	ADAT ÁT-VITEL *p*4	HÍVÁS ÜTKÖZÉS *p*5	DTE TÖRLÉS KÉRÉS *p*6	DCE TÖRLÉS KÉRÉS A DTE-hez *p*7
HÍVÁS KÉRÉS	*A = SZABÁLYOS S = p*3 (továbbítás)	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN
HÍVÁS ELFOGA-DÁS	*A=ÉRVÉNY-TELENÍTÉS*	*A=SZABÁ-LYOS S = p*4 (továbbítás)	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	*A=ÉR-VÉNY-TELENÍ-TÉS*	*A=ÉRVÉNY-TELENÍTÉS*
TÖRLÉS KÉRÉS	*A=ÉRVÉNY-TELENÍTÉS*	*A=SZABÁ-LYOS S = p*7 (továbbítás)	*A=SZABÁLY OS S = p*7 (továbbítás)	*A=SZABÁLY OS S = p*7 (továbbítás)	ÉR-VÉNY-TELEN	*A=ÉR-VÉNY-TELENÍ-TÉS*	*A=ÉRVÉNY-TELENÍTÉS*
ADAT, MEGSZA-KÍTÁS, MEGSZA-KÍTÁS MEGERŐ-SÍTÉS, vagy VISSZA-ÁLLÍTÁS KÉRÉS	*A=ÉRVÉNY-TELENÍTÉS*	ÉR-VÉNY-TELEN	ÉR-VÉNY-TELEN	Lásd az 5-11. táblázatot.	ÉR-VÉNY-TELEN	*A=ÉR-VÉNY-TELENÍ-TÉS*	*A=ÉRVÉNY-TELENÍTÉS*

Megjegyzés. – A táblázat bejegyzései a következőképpen kerültek meghatározásra: A = *végrehajtandó tevékenység,* S = *az az állapot, amelybe be kell lépni,* D = *a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az* ÉRVÉNYTELENÍTÉS *azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.*

5-11. táblázat: XDCE hatása a DCE visszaállítás állapotokra

XDCE-től vett csomag	DCE visszaállítási állapotok (lásd a Megjegyzést) FORGALOM VEZÉRLÉSRE KÉSZ $d1$	DTE VISSZAÁLLÍTÁS KÉRÉS $d2$	DCE VISSZAÁLLÍTÁS KÉRÉS $d3$
VISSZAÁLLÍTÁS KÉRÉS	*A = SZABÁLYOS* *S* = *d*3 (továbbítás)	*A = SZABÁLYOS* *S* = *d*1 (továbbítás)	*A = ÉRVÉNY-TELENÍTÉS*
MEGSZAKÍTÁS	Lásd az 5-12. táblázatot	*A = ÉRVÉNY-TELENÍTÉS*	*A = ÉRVÉNY-TELENÍTÉS*
MEGSZAKÍTÁS MEGERŐSÍTÉS	Lásd az 5-12. táblázatot	*A = ÉRVÉNY-TELENÍTÉS*	ÉRVÉNYTELEN
ADAT	*A = SZABÁLYOS* (továbbítás)	*A = ÉRVÉNY-TELENÍTÉS*	*A = ÉRVÉNY-TELENÍTÉS*

Megjegyzés. – A táblázat bejegyzései a következőképpen kerültek meghatározásra: A = *végrehajtandó tevékenység,* S = *az az állapot, amelybe be kell lépni,* D = *a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az* ÉRVÉNYTELENÍTÉS *azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.*

5-12. táblázat: XDCE hatása a DCE megszakítás továbbítás állapotokra

XDCE-től vett csomag	DCE megszakítás továbbítási állapotok (lásd a Megjegyzést) DTE MEGSZAKÍTÁSRA KÉSZ $i1$	DTE MEGSZAKÍTÁS KÜLDÉS $i2$
MEGSZAKÍTÁS MEGERŐSÍTÉS	ÉRVÉNYTELEN	*A = Szabályos S* = *i*1 (továbbítás)

XDCE-től vett csomag	DCE megszakítás továbbítási állapotok (lásd a Megjegyzést) DCE MEGSZAKÍTÁSRA KÉSZ $j1$	DCE MEGSZAKÍTÁS KÜLDÉS $j2$
MEGSZAKÍTÁS	*A = Szabályos* *S* = *j*2 (továbbítás)	ÉRVÉNYTELEN

Megjegyzés. – A táblázat bejegyzései a következőképpen kerültek meghatározásra: A = *végrehajtandó tevékenység,* S = *az az állapot, amelybe be kell lépni,* D = *a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az* ÉRVÉNYTELENÍTÉS *azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.*

5-13. táblázat: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ S-módú alhálózat időzítők

Időzítő neve	*Időzítő címke*	*Névl. érték*	*Hivatkozás*
Aktív csatorna – GDLP	*Tx*	300 s	5.2.8.3.2
L-bit kézbesítés – GDLP	*Tm*	120 s	5.2.7.4.3
Csomag újra-sorbarendezés és S-bit kézbesítés	*Tq*	60 s	5.2.6.9

5-14. táblázat: Légijármű/Földi hálózati végponti berendezés /XDCE/ tevékenységek állapot átmenetnél

XDCE állapot	*Állapot meghatározás*	*Tevékenység, amelyet az állapotba való belépésnél el kell végezni*
*r*1	CSOMAG SZINT KÉSZ	Az összes Kapcsolt virtuális áramkör /SVC/ visszatér a *p*1 állapotba.
*p*1	KÉSZ	Feloldani az SVC számára kijelölt összes adatforrást. Megszakítani a kapcsolatot a Légijármű hálózati végponti berendezés /ADCE/ / /Földi hálózati végponti berendezés /GDCE/ SVC és a Lekérdező adat végponti berendezés /DTE/ /Hálózati végponti berendezés /DCE/ SVC között (a DTE/DCE SVC még nem lehet *p*1 állapotban).
*p*2	GDLP(ADLP) HÍVÁS KÉRÉS	Meghatározni azt, hogy elegendő „erőforrás” áll-e rendelkezésre a kérés alátámasztására; ha igen, akkor kijelölni az erőforrásokat és S-módú HÍVÁS KÉRÉS csomagot küldeni az újra- formátumozó feldolgozásnak; ha nem, akkor ADCE(GDCE) TÖRLÉS KÉRÉS a GDLP(ADLP)-hez a (*p*7) állapotba történő lépéshez.
*p*3	ADCE(GDCE) HÍVÁS KÉRÉS	Meghatározni azt, hogy elegendő erőforrás áll-e rendelkezésre a kérés alátámasztására; ha igen, akkor kijelölni az erőforrásokat és egy S-módú HÍVÁS KÉRÉS csomagot továbbítani a keret feldolgozásnak; ha nem, akkor S-módú TÖRLÉS KÉRÉS-t küldeni az újra-formátumozó feldolgozásnak és belépni a *p*1 állapotba. Nem kell S-módú HÍVÁS KÉRÉS-t továbbítani a társ XDCE-nek.
*p*4	ADAT-TOVÁBBÍTÁS	Nincs tevékenység.

*p*6	GDLP(ADLP) TÖRLÉS KÉRÉS	Feloldani az összes erőforrást, egy S-módú TÖRLÉS MEGERŐSÍTÉS csomagot küldeni a társ XDCE-nek, és belépni a *p*1 állapotba.
*p*7	ADCE(GDCE) TÖRLÉS KÉRÉS A GDLP(ADLP)-hez	S-módú TÖRLÉS KÉRÉS csomag továbbítása a társ XDCE-hez a keret feldolgozáson keresztül.
*d*1	FORGALOM VEZÉRLÉSRE KÉSZ	Nincs tevékenység.
*d*2	GDLP(ADLP) VISSZA-ÁLLÍTÁS KÉRÉS	Eltávolítani az ablakból a társ XDCE-nek továbbított S-módú ADAT csomagokat; érvényteleníteni minden olyan ADAT cso-magot, amelyek a részben továbbított M-bit sorozatokat képviselik, és érvényteleníteni azokat az S-módú MEGSZAKÍTÁS csomagokat, amelyek a társ XDCE-hez történő továbbításra várnak; visszaállítani az összes forgalom vezérlő ablak számlálót 0-ra (5.2.6.7.1). S-módú VISSZAÁLLÍTÁS MEGERŐSÍTÉS csomagot küldeni a társ XDCE-nek. SVC-t visszatéríteni *d*1 állapotba. S-módú VISSZAÁLLÍTÁS KÉRÉS csomagot küldeni az újra-formátumozó feldolgozás részére.
*d*3	ADCE(GDCE) VISSZAÁLLÍTÁS KÉRÉS A GDLP(ADLP)-hez	Eltávolítani az ablakból a társ XDCE-nek továbbított S-módú ADAT csomagokat; érvényteleníteni minden olyan ADAT csomagot, amelyek a részben továbbított M-bit sorozatokat képviselik, és érvényteleníteni azokat az S-módú MEGSZAKÍTÁS csomagokat, amelyek a társ XDCE-hez történő továbbításra várnak; visszaállítani az összes forgalom vezérlő ablak számlálót 0-ra (5.2.6.7.1). S-módú VISSZAÁLLÍTÁS KÉRÉS csomagot küldeni a társ XDCE-hez a keret feldolgozáson keresztül.
*i*1	GDLP(ADLP) MEGSZAKÍTÁSRA KÉSZ	Nincs tevékenység.
*i*2	GDLP(ADLP) MEG-SZAKÍTÁS KÜLDÉS	Továbbítani a társ XDCE-től vett S-módú MEGSZAKÍTÁS csomagot az újra-formátumozási feldolgozásnak.

*j*1	ADCE(GDCE) MEG-SZAKÍTÁSRA KÉSZ	Nincs tevékenység.
*j*2	ADCE(GDCE) MEG-SZAKÍTÁS KÜLDÉS	Az újra-formátumozási feldolgozástól vett S-módú MEGSZAKÍTÁS csomag továbbítása.
*f*1	ADCE (GDCE) VÉTELRE KÉSZ	Nincs tevékenység.
*f*2	ADCE(GDCE) VÉTELRE NEM KÉSZ	Nincs tevékenység.
*g*1	GDLP(ADLP) VÉTELRE KÉSZ	Nincs tevékenység.
*g*2	GDLP(ADLP) VÉTELRE NEM KÉSZ	Nincs tevékenység.

5-15. táblázat: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ (fedélzeti adat-kapcsolat vezérlő egység /ADLP/) hatása a légijármű hálózati végponti berendezés /ADCE/ (földi hálózati végponti berendezés /GDCE/) csomag réteg kész állapotokra

GDLP(ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE(GDCE) állapotok (lásd az 1. és 3. Megjegyzést) CSOMAG SZINT KÉSZ *r*1
Csatorna szám /CH/ = 0, nincs ideiglenes csatorna szám /TC/ (lásd a 4. Megjegyzést) vagy CH = 0, egy HÍVÁS ELFOGADÁS az ADLP csomag által	*A = ÉRVÉNYTELENÍTÉS*
Kijelöletlen csomag fejrész	*A = ÉRVÉNYTELENÍTÉS*
Hívás beállítás, hívás törlés, ADAT, megszakítás, forgalom vezérlés vagy visszaállítás	Lásd az 5-16. táblázatot

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. A társ XDLP-től jövő összes csomag ellenőrzésre kerül a megkettőződés szempontjából, mielőtt az ebben a táblázatban bemutatottaknak megfelelően kiértékelésre kerülne.

3. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

4. Ahol a Csatorna szám /CH/ = 0 és egy érvényes ideiglenes csatorna szám /TC/ van az ADLP vagy a GDLP csomag által adott TÖRLÉS KÉRÉS-ben, illetve az ADLP vagy a GDLP csomag által adott TÖRLÉS MGERŐSÍTÉS-ben, ott azt úgy kell kezelni, ahogy az az 5.2.5.1.2.3 pontban és az 5-16. táblázatban leírásra került.

5-16. táblázat: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ (fedélzeti adat-kapcsolat vezérlő egység /ADLP/) hatása a légijármű hálózati végponti berendezés /ADCE/ (földi hálózati végponti berendezés /GDCE/) hívás beállítási és törlési állapotaira

GDLP (ADLP)-től vett csomag	ADCE (GDCE) hívás beállítás és törlés állapotok (lásd az 1., 7. és 8. Megjegyzést)					
	KÉSZ *p*1	GDLP (ADLP) HÍVÁS KÉRÉS *p*2	ADCE (GDCE) HÍVÁS KÉRÉS *p*3	ADAT ÁT-VITEL *p*4	GDLP (ADLP) TÖRLÉS KÉRÉS *p*6	ADCE (GDCE) TÖRLÉS KÉRÉS a GDLP (ADLP)-hez *p*7
Formátum hiba (lásd a 3. Megjegy-zést)	*A = HIBA* (lásd a 10. Megjegyzést) *S = p*7 *D* = 33 (lásd a 9. Megjegy-zést)	*A = HIBA* *S = p*7 *D* = 33 (lásd a 6. Megjegy-zést)	*A = HIBA* *S = p*7 *D* = 33 (lásd a 6. és 9. Megjegy-zést)	Lásd az 5-17. táblázatot	*A = HIBA* *S = p*7 *D* = 25 (lásd a 6. Megjegy-zést)	*A = ÉR-VÉNYTE-LENÍTÉS*
HÍVÁS KÉRÉS	*A=SZABÁ-LYOS* (5.2.6.3.1) *S = p*2 (a kérés továbbítása a DCE-nek)	*A = HIBA* *S = p*7 *D* = 21 (lásd a 6. Megjegy-zést)	Nem alkalmaz-ható (lásd a 4. Megjegy-zést)	Nem alkalmaz-ható (lásd a 4. Megjegy-zést)	*A=HIBA* *S = p*7 *D* = 25 (lásd a 6. Megjegy-zést)	*A = ÉR-VÉNYTE-LENÍTÉS*
HÍVÁS ELFOGA-DÁS	*A = HIBA* *S = p*7 *D* = 20 (lásd a 10. Megjegy-zést)	*A = HIBA* *S = p*7 *D* = 21 (lásd a 6. Megjegy-zést)	*A=SZABÁ-LYOS* (5.2.6.3.1) *S = p*4 (továbbítás a DCE-hez) *A = HIBA* *S = p*7 *D* = 42 (lásd a 6. Megjegy-zést)	*A=HIBA* *S = p*7 *D* = 23 (lásd a 6. Megjegy-zést)	*A=HIBA* *S = p*7 *D* = 25 (lásd a 6. Megjegy-zést)	*A = ÉR-VÉNYTE-LENÍTÉS*

TÖRLÉS KÉRÉS	*A=SZABÁLYOS* (5.2.6.3.3) $S = p6$ (Nem továbbítható)	*A=SZABÁLYOS* (5.2.6.3.3) $S = p6$ (Továbbítani a DCE-hez)	*A=SZABÁLYOS* (5.2.6.3.3) $S = p6$ (Továbbítani a DCE-hez)	*A=SZABÁLYOS* (5.2.6.3.3) $S = p6$ (Továbbítani a DCE-hez)	*A = ÉRVÉNYTELENÍTÉS*	*A=SZABÁLYOS* (5.2.6.3.1) $S = p1$ (Nem továbbítható)
TÖRLÉS MEGERŐSÍTÉS	*A = HIBA* $S = p7$ $D = 20$ (lásd a 10. Megjegyzést)	*A = HIBA* $S = p7$ $D = 21$ (lásd a 6. Megjegyzést)	*A = HIBA* $S = p7$ $D = 22$ (lásd a 6. Megjegyzést)	*A = HIBA* $S = p7$ $D = 23$ (lásd a 6. Megjegyzést)	*A = HIBA* $S = p7$ $D = 25$ (lásd a 6. Megjegyzést)	*A=SZABÁLYOS* (5.2.6.3.1) $S = p1$ (Nem továbbítható)
ADAT, megszakítás, forgalom vezérlés, vagy visszaállítási csomag	*A = HIBA* $S = p7$ $D = 20$ (lásd a 10. Megjegyzést)	*A = HIBA* $S = p7$ $D = 21$ (lásd a 6. és 9. Megjegyzést)	*A = HIBA* $S = p7$ $D = 22$ (lásd az 5. és 6. Megjegyzést)	Lásd az 5-17. táblázatot	*A = HIBA* $S = p7$ $D = 25$ (lásd a 6. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS*

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. A társ XDLP-től jövő összes csomag ellenőrzésre kerül a megkettőződés szempontjából, mielőtt az ebben a táblázatban bemutatottaknak megfelelően kiértékelésre kerülne.

3. Formátum hiba egy olyan S-bit sorozatból keletkezhet, amelynek rövidebb az első vagy közbenső csomagja a maximális hossznál, továbbá egy érvénytelen LV mezőből egy HÍVÁS KÉRÉS, HÍVÁS ELFOGADÁS, TÖRLÉS KÉRÉS vagy MEGSZAKÍTÁS csomagban. Más észlelhető S-módú formátum hiba nincs.

4. Az ADCE minden – az ADLP és GDLP között használatos – csatorna számot kijelöl, ennek következtében hívás ütközés nem lehetséges. Amikor egy GDLP csomag általi olyan HÍVÁS KÉRÉS kerül vételre, amely egy, a *p*4 állapotban lévő SVC-vel kapcsolatos ideiglenes csatorna számot visel, akkor az ideiglenes és állandó csatorna szám közötti kapcsolat megszakad (5.2.5.1.2.3).

5. GDLP-hez nem alkalmazható.

6. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *p*7 állapotba való belépésnél (amely magába foglalja egy TÖRLÉS KÉRÉS csomag továbbítását a társ XDLP-nek) és egy további TÖRLÉS KÉRÉS csomag küldését a DCE-nek (az újra-formátumozó feldolgozáson keresztül).

7. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

8. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

9. Hiba állapot bejelentése és a *p*7 állapotba történő átugrás csak akkor lehetséges, ha a földi DTE címzés egyértelműen ismert. Más esetben a műveletnek a csomagot érvénytelenítenie kell.

10. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *p*7 állapotba való belépésnél (amely magába foglalja egy TÖRLÉS KÉRÉS csomag továbbítását az XDLP-nek), de egy TÖRLÉS KÉRÉS csomagnak a helyi DCE-hez történő elküldése nélkül.

5-17. táblázat: GDLP (ADLP) hatása az ADCE (GDCE) visszaállítási állapotokra

GDLP (ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) visszaállítási állapotok (lásd az 1., 4. és 5. Megjegyzést) FORGALOM VEZÉRLÉSRE KÉSZ *d*1	GDLP (ADLP) VISSZAÁLLÍTÁS KÉRÉS *d*2	ADCE (GDCE) VISSZAÁLLÍTÁS KÉRÉS a GDLP(ADLP)-hez *d*3
VISSZAÁLLÍTÁS KÉRÉS	*A = SZABÁLYOS* (5.2.6.7) *S = d*2 (Továbbítás a DCE-hez)	*A = ÉRVÉNY-TELENÍTÉS*	*A = SZABÁLYOS* (5.2.6.7) *S = d*1 (Nem továbbítandó)
VISSZAÁLLÍTÁS MEGERŐSÍTÉS	*A = HIBA* *S = d*3 *D* = 27 (lásd a 3. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 28 (lásd a 3. Megjegyzést)	*A = ÉRVÉNY-TELENÍTÉS*
MEGSZAKÍTÁS	Lásd az 5-18. táblázatot.	*A = HIBA* *S = d*3 *D* = 28 (lásd a 3. Megjegyzést)	*A = ÉRVÉNY-TELENÍTÉS*
MEGSZAKÍTÁS MEGERŐSÍTÉS	Lásd az 5-18. táblázatot.	*A = HIBA* *S = d*3 *D* = 28 (lásd a 3. Megjegyzést)	*A = ÉRVÉNY-TELENÍTÉS*
ADAT vagy forgalom vezérlés csomag	Lásd az 5-19. táblázatot.	*A = HIBA* *S = d*3 *D* = 28 (lásd a 3. Megjegyzést)	*A = ÉRVÉNY-TELENÍTÉS*
Formátum hiba (lásd a 6. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 33 (lásd a 3. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 33 (lásd a 3. Megjegyzést)	*A = ÉRVÉNY-TELENÍTÉS*

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. A társ XDLP-től jövő összes csomag ellenőrzésre kerül a megkettőződés szempontjából, mielőtt az ebben a táblázatban bemutatottaknak megfelelően kiértékelésre kerülne.

3. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag továbbítását a társ XDLP-nek) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldését a DCE-nek (az újra-formátumozó feldolgozáson keresztül).

4. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

5. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

6. Formátum hiba egy olyan S-bit sorozatból keletkezhet, amelynek rövidebb az első vagy közbenső csomagja a maximális hossznál, továbbá egy érvénytelen LV mezőből egy HÍVÁS KÉRÉS, HÍVÁS ELFOGADÁS, TÖRLÉS KÉRÉS vagy MEGSZAKÍTÁS csomagban. Más észlelhető S-módú formátum hiba nincs.

5-18. táblázat: GDLP (ADLP) hatása az ADCE (GDCE) megszakítás továbbítási állapotokra

GDLP (ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) megszakítás továbbítási állapotok (lásd az 1., 3. és 4. Megjegyzést)	
	GDLP (ADLP) MEGSZAKÍTÁSRA KÉSZ *i*1	GDLP (ADLP) MEGSZAKÍTÁS KÜLDÉS *i*2
MEGSZAKÍTÁS (lásd a 6. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.4.5) *S* = *i*2 (továbbítás a DCE-hez)	*A = HIBA* *S* = *d*3 *D* = 44 (lásd az 5. Megjegyzést)

GDLP (ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) megszakítás továbbítási állapotok (lásd az 1., 3. és 4. Megjegyzést)	
	ADCE (GDCE) MEGSZAKÍTÁSRA KÉSZ *j*1	ADCE (GDCE) MEGSZAKÍTÁS KÜLDÉS *j*2
MEGSZAKÍTÁS MEGERŐSÍTÉS	*A = HIBA* *S* = *d*3 *D* = 43 (lásd az 5. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.4.5) *S* = *j*2 (továbbítás megerősítés a DCE-hez)

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. A társ XDLP-től jövő összes csomag ellenőrzésre kerül a megkettőződés szempontjából, mielőtt az ebben a táblázatban bemutatottaknak megfelelően kiértékelésre kerülne.

3. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

4. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

5. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag továbbítását a társ XDLP-nek) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldése a DCE-hez (az újra-formátumozó feldolgozáson keresztül).

6. A felhasználási adat hossznak a 32 bájtnál nagyobb MEGSZAKÍTÁS csomagokat, vagy egy, a sorrenden kívüli MEGSZAKÍTÁS csomagot hibának kell tekinteni.

5-19. táblázat: GDLP (ADLP) hatása az ADCE (GDCE) forgalom vezérlés átvitel állapotokra

GDLP (ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) forgalom vezérlés átvitel állapotok (lásd az 1., 6. és 7. Megjegyzést) ADCE (GDCE) VÉTELRE KÉSZ *f*1	ADCE (GDCE) VÉTELRE NEM KÉSZ *f*2
ADAT csomag érvénytelen csomag vételi sorrenddel /PR/ (lásd a 3. Megjegyzést)	*A = HIBA* *S* = *d*3 *D* = 2 (lásd a 8. Megjegyzést)	*A = HIBA* *S* = *d*3 *D* = 2 (lásd a 8. Megjegyzést)
ADAT csomag érvényes PR-el, érvénytelen csomag küldési sorrenddel /PS/ vagy felhasználói adathossz /LV/ almezővel (lásd a 4. és 5. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS,* de a PR érték feldolgozása és a várható PS értéket magába foglaló VISSZAUTASÍTÁS csomag elküldése (lásd az 5. Megjegyzést)	*A = ÉRVÉNYTELENÍTÉS,* de a PR érték feldolgozása és a várható PS értéket magába foglaló VISSZAUTASÍTÁS csomag elküldése, amikor a foglalt állapot véget ér
ADAT csomag érvényes PR, PS és LV almezővel	*A = SZABÁLYOS* (5.2.6.4.4) (továbbítás)	*A=FELDOLGOZÁS,* ha lehetséges; vagy *A=ÉRVÉNYTELENÍTÉS,* de a PR érték feldolgozása és a várható PS értéket magába foglaló VISSZAUTASÍTÁS elküldése, amikor a foglalt állapot véget ér

GDLP (ADLP)-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) forgalom vezérlés átvitel állapotok (lásd az 1., 6. és 7. Megjegyzést)	
	GDLP (ADLP) VÉTELRE KÉSZ *g*1	GDLP (ADLP) VÉTELRE NEM KÉSZ *g*2
Fogadásra kész /RR/, Fogadásra nem kész /RNR/, VISSZAUTASÍTÁS csomag érvénytelen csomag vételi sorrenddel /PR/ (lásd a 3. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 2 (lásd a 8. Megjegyzést)	*A = HIBA* *S = d*3 *D* = 2 (lásd a 8. Megjegyzést)
RR érvényes PR mezővel (lásd a 9. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.5)	*A = SZABÁLYOS* (5.2.6.6) *S = g*1
RNR érvényes PR értékkel (lásd a 9. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.5) *S = g*2	*A = SZABÁLYOS* (5.2.6.6)
VISSZAUTASÍTÁS érvényes PR értékkel (lásd a 9. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.5)	*A = SZABÁLYOS* (5.2.6.6) *S = g*1

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. A társ XDLP-től jövő összes csomag ellenőrzésre kerül a megkettőződés szempontjából, mielőtt az ebben a táblázatban bemutatottaknak megfelelően kiértékelésre kerülne.

3. Egy érvénytelen PR érték az, amely kisebb, mint a társ XDLP által küldött utolsó csomag PR értéke (modulo 16), vagy nagyobb, mint az XDLP által továbbításra kerülő következő adat csomag PS értéke.

4. Egy érvénytelen PS érték az, amelyik a PS-re várható következő értéktől eltérő.

5. Egy érvénytelen LV almező az, amely olyan értéket tűntet fel, ami túl nagy a vett szegmens méretéhez. Egy olyan LV mező hiba esetében, amely a csomagban lévő többi mező helyességében való bizalom elvesztéséig növekedhet, a csomagot minden további nélkül érvényteleníteni kell.

6. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

7. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

8. A hiba eljárást meghatározott tevékenységek végrehajtása képezi a *d*3 állapotba való belépésnél (amely magába foglalja egy VISSZAÁLLÍTÁS KÉRÉS csomag továbbítását a társ XDLP-nek) és egy VISSZAÁLLÍTÁS KÉRÉS csomag küldése a DCE-hez (az újra-formátumozó feldolgozáson keresztül).

9. Az RR, RNR és VISSZAUTASÍTÁS csomagok nem rendelkeznek végtől-végig jelentőséggel, és nem kerülnek továbbításra a DCE-hez.

10. Egy olyan csomag vételének, amelynél az M-bit = 1-nél kisebb, mint a maximális csomag méret, elő kell idéznie azt, hogy egy visszaállítás kerüljön létrehozásra, és a sorozat fennmaradó részét érvényteleníteni kell.

5-20. táblázat: A hálózati végponti berendezés /DCE/ hatása a légijármű hálózati végponti berendezés /ADCE/ (földi hálózati végponti berendezés /GDCE/) hívás beállítás és törlési állapotokra

GDLP (ADLP)-től vett csomag (lásd a 2. és 4. Megjegyzést)	ADCE (GDCE) hívás beállítás és törlés állapotok (lásd az 1., 7. és 8. Megjegyzést)					
	KÉSZ *p*1	GDLP (ADLP) HÍVÁS KÉRÉS *p*2	ADCE (GDCE) HÍVÁS KÉRÉS *p*3	ADAT ÁT-VITEL *p*4	GDLP (ADLP) TÖRLÉS KÉRÉS *p*6	ADCE (GDCE) TÖRLÉS KÉRÉS a GDLP (ADLP)-hez *p*7
HÍVÁS KÉRÉS (lásd a 6. Megjegyzést)	*A=SZABÁ-LYOS* (5.2.6.3.1) *S* = *p*3 (továbbítás)	ÉRVÉNY-TELEN (lásd az 5. Meg-jegyzést)	ÉRVÉNY-TELEN (lásd a 3 Meg-jegyzést)	ÉRVÉNY-TELEN (lásd a 3 Meg-jegyzést)	ÉRVÉNY-TELEN (lásd a 3 Meg-jegyzést)	ÉRVÉNY-TELEN (lásd a 3 Meg-jegyzést)
HÍVÁS ELFOGADÁS (lásd a 4. Megjegy-zést)	*A = ÉR-VÉNYTE-LENÍTÉS*	*A=SZABÁ-LYOS* *S* = *p*4 (továbbítás)	ÉRVÉNY-TELEN (lásd a 3. Megj-egyzést)	ÉRVÉNY-TELEN (lásd a 3. Meg-jegyzést)	*A = ÉR-VÉNYTE-LENÍTÉS*	*A = ÉR-VÉNYTE-LENÍTÉS*
TÖRLÉS KÉRÉS (lásd a 4. Megjegy-zést)	*A = ÉR-VÉNYTE-LENÍTÉS*	*A=SZABÁ-LYOS* (5.2.6.3.3) *S* = *p*7 (továbbítás)	*A=SZABÁ-LYOS* (5.2.6.3.3) *S* = *p*7 (továbbítás)	*A=SZABÁ-LYOS* (5.2.6.3.3) *S* = *p*7 (továbbítás)	*A = ÉR-VÉNYTE-LENÍTÉS*	*A = ÉR-VÉNYTE-LENÍTÉS*
ADAT, MEGSZA-KÍTÁS vagy VISSZA-ÁLLÍTÁS csomagok (lásd a 4. Meg-jegyzést)	*A = ÉR-VÉNYTE-LENÍTÉS*	ÉRVÉNY-TELEN (lásd a 3 Megjegy-zést)	ÉRVÉNY-TELEN (lásd a 3. Megjegy-zést)	Lásd az 5-21. táblázatot	*A = ÉR-VÉNYTE-LENÍTÉS*	*A = ÉR-VÉNYTE-LENÍTÉS*

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. Ez az a DTE csomag, amelyet a DCE-n keresztül vesznek, azután, hogy az összes DTE/DCE feldolgozás megtörtént. Eljárások a DTE/DCE illesztésen belül (mint például a Vételre kész /RR/, Vételre nem kész /RNR/ és VISSZAUTASÍTÁS, ha érvényben van) nem hatnak közvetlenül az XDCE-re. Az összes hiba eljárás, ahogyan az az ISO 8208-ban dokumentálva van, végrehajtásra került. Ebből eredően bizonyos csomagokat az illesztés elutasít, és ezek nincsenek ebben a táblázatban feltűntetve.

3. A DCE a protokol műveletében a DTE-vel észleli ezt a hiba körülményt és ennek megfelelően a hibás csomagra azt lehet mondani, hogy sohasem éri el az XDCE-t; lásd még a 2. megjegyzést.

4. A DTE/DCE csatorna számának nem kell szükségszerűen ugyanazon csatorna számnak lennie, mint amely az ADCE/GDCE-nél kerül felhasználásra; egy csomag a DTE-től, amely egy csatorna számot foglal magába, összekapcsolódik egy levegő/föld csatornával a korábban létrehozott kereszt-referencia táblázat által. Ha egyik sincs, akkor a DTE/DCE csatorna meghatározás hivatkozása egy levegő/föld csatornára vonatkozik a *p*1 állapotban.

5. Az ADCE az ADLP és GDLP között használt összes csatorna számot kijelöli; ennek folytán hívás ütközés (*p*5 ISO 8208 jelölés) nem lehetséges; lásd a 4. megjegyzést is.

6. A DTE-től jövő HÍVÁS KÉRÉS sohasem lehet összekapcsolva egy olyan XDCE csatorna számmal, amely nincs *p*1 állapotban.

7. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

8. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

5-21. táblázat: A DCE hatása az ADCE (GDCE) visszaállítás állapotokra

DCE-től vett csomag	ADCE (GDCE) visszaállítási állapotok (lásd az 1., 4. és 5. Megjegyzést)		
	FORGALOM VEZÉRLÉSRE KÉSZ *d*1	GDLP (ADLP) VISSZAÁLLÍTÁS KÉRÉS *d*2	ADCE (GDCE) VISSZAÁLLÍTÁS KÉRÉS a GDLP(ADLP)-hez *d*3
VISSZAÁLLÍTÁS KÉRÉS	*A = SZABÁLYOS* (5.2.6.7) *S = d*3 (Továbbítás)	*A = SZABÁLYOS* (5.2.6.7) *S = d*1 (Továbbítás)	*A = ÉRVÉNY-TELENÍTÉS*
VISSZAÁLLÍTÁS MEGERŐSÍTÉS	ÉRVÉNYTELEN (lásd a 3. Megjegyzést)	ÉRVÉNYTELEN (lásd a 3. Megjegyzést)	ÉRVÉNYTELEN (lásd a 3. Megjegyzést)
MEGSZAKÍTÁS	Lásd az 5-22. táblázatot	*A = ÉRVÉNY-TELENÍTÉS*	A megszakítás visszatartása addig, amíg az S-módú visszaállítás befejezõdik
MEGSZAKÍTÁS MEGERŐSÍTÉS	Lásd az 5-22. táblázatot	*A = ÉRVÉNY-TELENÍTÉS*	ÉRVÉNYTELEN (lásd a 3. Megjegyzést)
ADAT (lásd a 2. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.4) (Továbbítás)	*A = ÉRVÉNY-TELENÍTÉS*	Az adat vissza-tartása addig, amíg az S-módú vissza-állítás befejezõdik

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. Ez az a DTE csomag, amelyet a DCE-n keresztül vesznek, azután, hogy az összes DTE/DCE feldolgozás megtörtént. Eljárások a DTE/DCE illesztésen belül (mint például a Vételre kész /RR/, Vételre nem kész /RNR/ és VISSZAUTASÍTÁS, ha érvényben van) nem hatnak közvetlenül az XDCE-re. Az összes hiba eljárás, ahogyan az az ISO 8208-ban dokumentálva van, végrehajtásra került. Ebből eredően bizonyos csomagokat az illesztés elutasít, és ezek nincsenek ebben a táblázatban feltűntetve.

3. A DCE a protokol mûveletében a DTE-vel észleli ezt a hiba körülményt és ennek megfelelően a hibás csomagra azt lehet mondani, hogy sohasem „éri el” az XDCE-t; lásd még a 2. megjegyzést.

4. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

5. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

5-22. táblázat: DCE hatása az ADCE (GDCE) megszakítás átvitel állapotokra

DCE-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) megszakítás átvitel állapot (lásd az 1., 4. és 5. Megjegyzést)	
	GDLP (ADLP) MEGSZAKÍTÁSRA KÉSZ *i*1	GDLP (ADLP) MEGSZAKÍTÁS KÜLDÉS *i*2
MEGSZAKÍTÁS (lásd a 6. Megjegyzést)	ÉRVÉNYTELEN (Lásd a 3. Megjegyzést)	*A = SZABÁLYOS* (5.2.6.4.5) *S* = *i*1 (továbbítás)

DCE-től vett csomag (lásd a 2. Megjegyzést)	ADCE (GDCE) megszakítás átvitel állapot (lásd az 1., 4. és 5. Megjegyzést)	
	ADCE (GDCE) MEGSZAKÍTÁSRA KÉSZ *j*1	ADCE (GDCE) MEGSZAKÍTÁS KÜLDÉS *j*2
MEGSZAKÍTÁS	*A = SZABÁLYOS* (5.2.6.4.5) *S* = *j*2 (továbbítás)	ÉRVÉNYTELEN (Lásd a 3. Megjegyzést)

MEGJEGYZÉSEK:

1. Az XDCE állapot nem szükségszerűen ugyanaz az állapot, mint a DTE/DCE illesztés.

2. Ez az a DTE csomag, amelyet a DCE-n keresztül vesznek, azután, hogy az összes DTE/DCE feldolgozás megtörtént. Eljárások a DTE/DCE illesztésen belül (mint például a Vételre kész /RR/, Vételre nem kész /RNR/ és VISSZAUTASÍTÁS, ha érvényben van) nem hatnak közvetlenül az XDCE-re. Az összes hiba eljárás, ahogyan az az ISO 8208-ban dokumentálva van, végrehajtásra került. Ebből eredően bizonyos csomagokat az illesztés elutasít, és ezek nincsenek ebben a táblázatban feltűntetve.

3. A DCE a protokol mûveletében a DTE-vel észleli ezt a hiba körülményt és ennek megfelelően a hibás csomagra azt lehet mondani, hogy sohasem „éri el” az XDCE-t; lásd még a 2. megjegyzést.

4. A táblázat bejegyzései a következőképpen kerültek meghatározásra: *A* = végrehajtandó tevékenység, *S* = az az állapot, amelybe be kell lépni, *D* = a diagnosztikai kód, amelyet az ennek a tevékenységnek a következtében létrehozott csomagokon alkalmazni kell, az *ÉRVÉNYTELENÍTÉS* azt jelzi, hogy a vett

csomagot törölni kell az XDLP tárolókból és az ÉRVÉNYTELEN azt jelzi, hogy a csomag/állapot kombináció nem fordulhat elő.

5. A zárójelekben lévő – az *„A = SZABÁLYOS”* táblázati bejegyzés alatti – szám az ebben a dokumentumban lévő pont számát jelenti, azt, amely azt a műveletet határozza meg, amelyet el kell végezni a vett csomagon a normál feldolgozás végrehajtásához. Ha nincs hivatkozott pont szám, akkor a szabályos eljárás a táblázat szövegében van megadva.

5-23. táblázat: Általános adás azonosító szám kijelölések

Fedélzetre irányuló általános adás azonosító	*Kijelölés*
00_{16}	Nem érvényes
01_{16}	Fenntartott (differenciál GNSS korrekció)
30_{16}	Nem érvényes
31_{16}	Fenntartva az ACAS (RA általános adás) (1) részére
32_{16}	Fenntartva az ACAS (ACAS általános adás) részére
Továbbiak	Kijelöletlen
Fedélzetről leadott általános adás azonosító	*Kijelölés*
00_{16}	Nem érvényes
02_{16}	Fenntartott (forgalmi tájékoztató szolgálat)
10_{16}	Adat-kapcsolat teljesítőképesség jelentés
20_{16}	Légijármű azonosítás
FE_{16}	Felfrissítés kérés
FF_{16}	Keresés kérés
Továbbiak	Kijelöletlen

(1) ACAS = Összeütközési veszélyt jelző fedélzeti rendszer;
RA = Megoldási tanácsadás

5-24. táblázat: Tároló szám kijelölések

Tároló szám	*Kijelölés*
00_{16}	Nem érvényes
01_{16}	Kijelöletlen
02_{16}	Kapcsolt B-adatátvitel, 2-es szegmens
03_{16}	Kapcsolt B-adatátvitel, 3-as szegmens
04_{16}	Kapcsolt B-adatátvitel, 4-es szegmens
05_{16}	Kiterjesztett szkvitter repülési helyzet
06_{16}	Kiterjesztett szkvitter földfelszíni helyzet
07_{16}	Kiterjesztett szkvitter állapot
08_{16}	Kiterjesztett szkvitter azonosító és típus
09_{16}	Kiterjesztett szkvitter tényleges önsebesség
$0A_{16}$	Kiterjesztett szkvitter esemény-vezérelt információ
$0B_{16}$	Levegő/levegő információ 1. (légijármű állapot)
$0C_{16}$	Levegő/levegő információ 2. (légijármű szándék)

$0D_{16}$-$0E_{16}$	Fenntartott (egyéb levegő/levegő információ)
$0F_{16}$	Fenntartott (ACAS) /ACAS = Összeütközési veszélyt jelző fedélzeti rendszer/
10_{16}	Adat-kapcsolat teljesítőképesség jelentés
11_{16} –16_{16}	Kiterjesztés az adat-kapcsolat teljesítőképesség jelentéshez
17_{16}	Általános kezelésű GIBC /Földről kezdeményezett B-adat-átvitel/ teljesítőképesség jelentés
18_{16} –$1F_{16}$	S-módú specifikus szolgáltatás teljesítőképesség jelentések
20_{16}	Légijármű azonosító
21_{16}	Légijármű lajstrom szám
22_{16}	Antenna pozíciók
23_{16}	Fenntartott (antenna pozíciók)
24_{16}	Fenntartott (statikus légijármű paraméter)
25_{16}	Légijármű típus
26_{16} –$2F_{16}$	Kijelöletlen
30_{16}	ACAS aktív megoldási tanácsadás (RA)
31_{16} –$3F_{16}$	Kijelöletlen
40_{16}	Légijármű szándék
41_{16}	Következő útvonal-pont azonosító
42_{16}	Következő útvonal-pont helyzet
43_{16}	Következő útvonal-pont tájékoztatás
44_{16}	Meteorológiai rutin légi jelentés
45_{16}	Meteorológiai veszély jelentés
46_{16}	1.módú repülés vezérlő rendszer
47_{16}	2.módú repülés vezérlő rendszer
48_{16}	VHF csatorna jelentés
49_{16} – $4F_{16}$	Kijelöletlen
50_{16}	Útirány és forduló jelentés
51_{16}	Helyzet jelentés, durva
52_{16}	Helyzet jelentés, pontos
53_{16}	Levegő vonatkoztatású állapot-vektor
54_{16}	1. útvonal-pont
55_{16}	2. útvonal-pont
56_{16}	3. útvonal-pont
57_{16} – $5E_{16}$	Kijelöletlen
$5F_{16}$	Kvázi-statikus paraméter figyelés
60_{16}	Mágneses irány és sebesség jelentés
61_{16}	Kiterjesztett szkvitter kényszerhelyzeti/elsőbbségi állapot
62_{16}	Jelenlegi pályagörbe váltási pont
63_{16}	Következő pályagörbe váltási pont
64_{16}	Légijármű üzemeltetési koordinációs közlemény
65_{16}	Légijármű üzemeltetési állapot
66_{16} – $6F_{16}$	Fenntartva a kiterjesztett szkvitter részére

$70_{16} - 75_{16}$	Fenntartva későbbi, fedélzetről leadott paraméterek részére
$76_{16} - E0_{16}$	Kijelöletlen
$E1_{16} - E2_{16}$	Fenntartva az S-módú bájt részére
$E3_{16} - F0_{16}$	Kijelöletlen
$F1_{16} - F2_{16}$	Katonai alkalmazások
$F3_{16} - FF_{16}$	Kijelöletlen

5-25. táblázat: S-módú specifikus protokol /MSP/ csatorna szám kijelölések

Fedélzetre irányuló adás csatorna szám	*Kijelölés*
0	ÉRVÉNYTELEN
1	FENNTARTOTT (SPECIFIKUS SZOLGÁLTATÁS KEZELÉS)
2	FENNTARTOTT (FORGALMI TÁJÉKOZTATÁS SZOLGÁLAT)
3	FENNTARTOTT (FÖLD-LEVEGŐ RIASZTÁS)
4	FENNTARTOTT (FÖLDI SZÁRMAZTATÁSÚ HELYZET)
5	ACAS ÉRZÉKENYSÉGI SZINT SZABÁLYOZÁS
6	FENNTARTOTT (FÖLD-LEVEGŐ SZOLGÁLTATÁS KÉRÉS)
7	FENNTARTOTT (FÖLD-LEVEGŐ SZOLGÁLTATÁS VÁLASZ)
8 – 63	KIJELÖLETLEN

Fedélzetről leadott adás csatorna szám	*Kijelölés*
0	ÉRVÉNYTELEN
1	FENNTARTOTT (SPECIFIKUS SZOLGÁLTATÁS KEZELÉS)
2	KIJELÖLETLEN
3	FENNTARTOTT (ADAT JELZÉS)
4	FENNTARTOTT (HELYZET KÉRÉS)
5	KIJELÖLETLEN
6	FENNTARTOTT (FÖLD-LEVEGŐ SZOLGÁLTATÁS VÁLASZ)
7	FENNTARTOTT (LEVEGŐ-FÖLD SZOLGÁLTATÁS KÉRÉS)
8 – 63	KIJELÖLETLEN

5. FEJEZET ÁBRÁI

Kijelölő azonosító /DI/ = 1

					TMS	
17	21	23	26	27	29	30
IIS	MBS	MES	LOS	RSS	SPARE	LAS
20	22	25		28		32
Lekérdező azonosító részmező					Tartalék	Kapcsolt A-adatátvitel részmező

Kijelölő azonosító /DI/ = 7

					TMS	
17	21	25	26	27	29	30
IIS	RRS	SPARE	LOS	SPARE	SPARE	LAS
20	24			28		32
Lekérdező azonosító részmező		Tartalék		Tartalék	Tartalék	Kapcsolt A-adatátvitel részmező

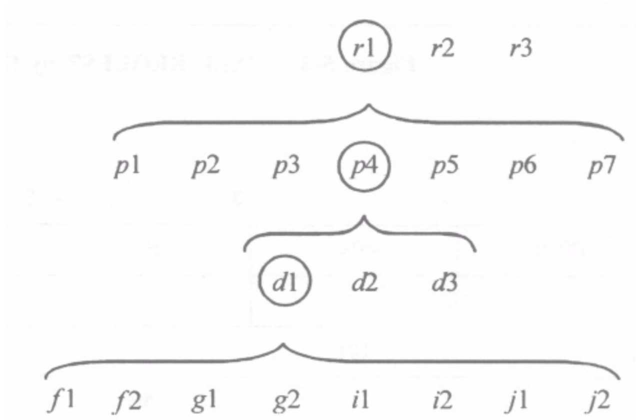
5-1. ábra: A speciális jelölés /SD/ mező szerkezete

Kész és újraindítás állapotok

Hívás beállítás és törlés állapotok

Adatátviteli állapotok

Megszakítás és vezérlés állapotok



Megjegyzés. – Az r1, p4 és d1 állapotok (bekarikázva) azok az állapotok, amelyek hozzáférést biztosítanak a Hálózati végponti berendezés /DCE/ alállapot hierarchia alacsonyabb szintjeihez.

5-2. ábra: Hálózati végponti berendezés /DCE/ alállapot hierarchia

1 2 3 4 5 6 7 8

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</table>

5-3. ábra: A fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által adott HÍVÁS KÉRÉS csomag

1 2 3 4 5 6 7 8

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csomag</td><td colspan="2">LV
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<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-4. ábra: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által adott HÍVÁS KÉRÉS csomag

1 2 3 4 5 6 7 8

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Kitöltés</td><td>F
Első
csomag</td><td colspan="2">LV
Felhasználói adat hossz</td></tr>
<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-5. ábra: A fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által adott HÍVÁS ELFOGADÁS csomag

1 2 3 6 7 8
4

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5-6. ábra: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által adott HÍVÁS ELFOGADÁS csomag

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<tr><td colspan="5">DC
Diagnosztikai kód</td></tr>
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Első
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<tr><td colspan="5">UD
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5-7. ábra: A fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által adott TÖRLÉS KÉRÉS csomag

<table>
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<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-8. ábra: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által adott TÖRLÉS KÉRÉS csomag

<table>
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Csatorna szám</td><td colspan="2">AM
Mobil cím</td></tr>
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Földi cím</td></tr>
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5-9. ábra: A fedélzeti adat-kapcsolat vezérlő egység /ADLP/ által adott TÖRLÉS MEGERŐSÍTÉS csomag

<table>
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Csatorna szám</td><td colspan="2">AM
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Földi cím</td></tr>
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5-10. ábra: A földi telepítési rendszerű adat-kapcsolat vezérlő egység /GDLP/ által adott TÖRLÉS MEGERŐSÍTÉS csomag

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Adatcsomag</td><td>M
Több csomagban</td><td colspan="3">SN
Sorozat-szám</td></tr>
<tr><td colspan="4">FILL1
Kitöltés</td><td></td></tr>
<tr><td colspan="3">PS
Csomag küldési sorrend</td><td colspan="2">PR
Csomag vételi sorrend</td></tr>
<tr><td colspan="3">CH
Csatorna szám</td><td colspan="2">LV
Felhasználói adat hossz</td></tr>
<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-11. ábra: Adat csomag

1	2	3 4	5 6	7 8
DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=3 Felügyelő csomag	ST=1 Felügyelő típus	FILL2 Kitöltés
S Több csomag	F Első csomag	SN Sorozat-szám		
CH Csatorna szám			LV Felhasználói adat hossz	
UD Felhasználói adatmező				

5-12. ábra: MEGSZAKÍTÁS csomag

1	2	3 4	5 6	7 8
DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=3 Felügyelő csomag	ST=3 Felügyelő típus	SS=0 Felügyelő részhalmaz
FILL2 Kitöltés		SN Sorozat-szám		
CH Csatorna szám			FILL Kitöltés	

5-13. ábra: MEGSZAKÍTÁS MEGERŐSÍTÉS csomag

1	2	3 4	5 6	7 8
DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=3 Felügyelő csomag	ST=3 Felügyelő típus	SS=1 Felügyelő részhalmaz
FILL2 Kitöltés		SN Sorozat-szám		
CH Csatorna szám			PR Csomag vételi sorrend	

5-14. ábra: VISSZAUTASÍTÁS csomag

1	2	3 4	5 6	7 8
DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=2 Felügyelő csomag	ST=0 Felügyelő típus	FILL2 Kitöltés
FILL Kitöltés		SN Sorozat-szám		
CH Csatorna szám			PR Csomag vételi sorrend	

5-15. ábra: VÉTELRE KÉSZ csomag

1 2 3 4 5 6 7 8

DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=2 Felügyelő csomag	ST=1 Felügyelő típus	FILL2 Kitöltés
FILL Kitöltés		SN Sorozat-szám		
CH Csatorna szám			PR Csomag vételi sorrend	

5-16. ábra: VÉTELRE NEM KÉSZ csomag

1 2 3 4 5 6 7 8

DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=2 Felügyelő csomag	ST=2 Felügyelő típus	FILL2 Kitöltés
FILL Kitöltés		SN Sorozat-szám		
CH Csatorna szám			FILL Kitöltés	
RC Visszaállítást létrehozó kód				
DC Diagnosztikai kód				

5-17. ábra: VISSZAÁLLÍTÁS KÉRÉS csomag

1 2 3 4 5 6 7 8

DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=2 Felügyelő csomag	ST=3 Felügyelő típus	FILL2 Kitöltés
FILL Kitöltés		SN Sorozat-szám		
CH Csatorna szám			FILL Kitöltés	

5-18. ábra: VISSZAÁLLÍTÁS MEGERŐSÍTÉS csomag

1 2 3 4 5 6 7 8

DP=0 Adatcsomag	MP=1 S-módú spec.protokol	SP=3 Felügyelő csomag	ST=0 Felügyelő típus	OF A választhatóság jelzése	IN Az alaphelyzet beállító bit
RTL Irányítási út táblázat hossz					
RT Irányítási út					
ODL Választható adat hossz					
OD Választható adat					

5-19. ábra: ÚTVONAL csomag

<table>
<tr><td>1</td><td>2</td><td>3 4</td><td>5 6</td><td>7 8</td></tr>
<tr><td>DP=0
Adatcsomag</td><td>MP=1
S-módú spec. protokol</td><td>SP=3
Felügyelő csomag</td><td>ST=2
Felügyelő típus</td><td>FILL2
Kitöltés</td></tr>
<tr><td colspan="5">LENGTH
Hossz</td></tr>
<tr><td colspan="5">FIRST PACKET
Első csomag</td></tr>
<tr><td colspan="5">LENGTH
Hossz</td></tr>
<tr><td colspan="5">LAST PACKET
Utolsó csomag</td></tr>
<tr><td colspan="5">LENGTH = 0
Hossz</td></tr>
</table>

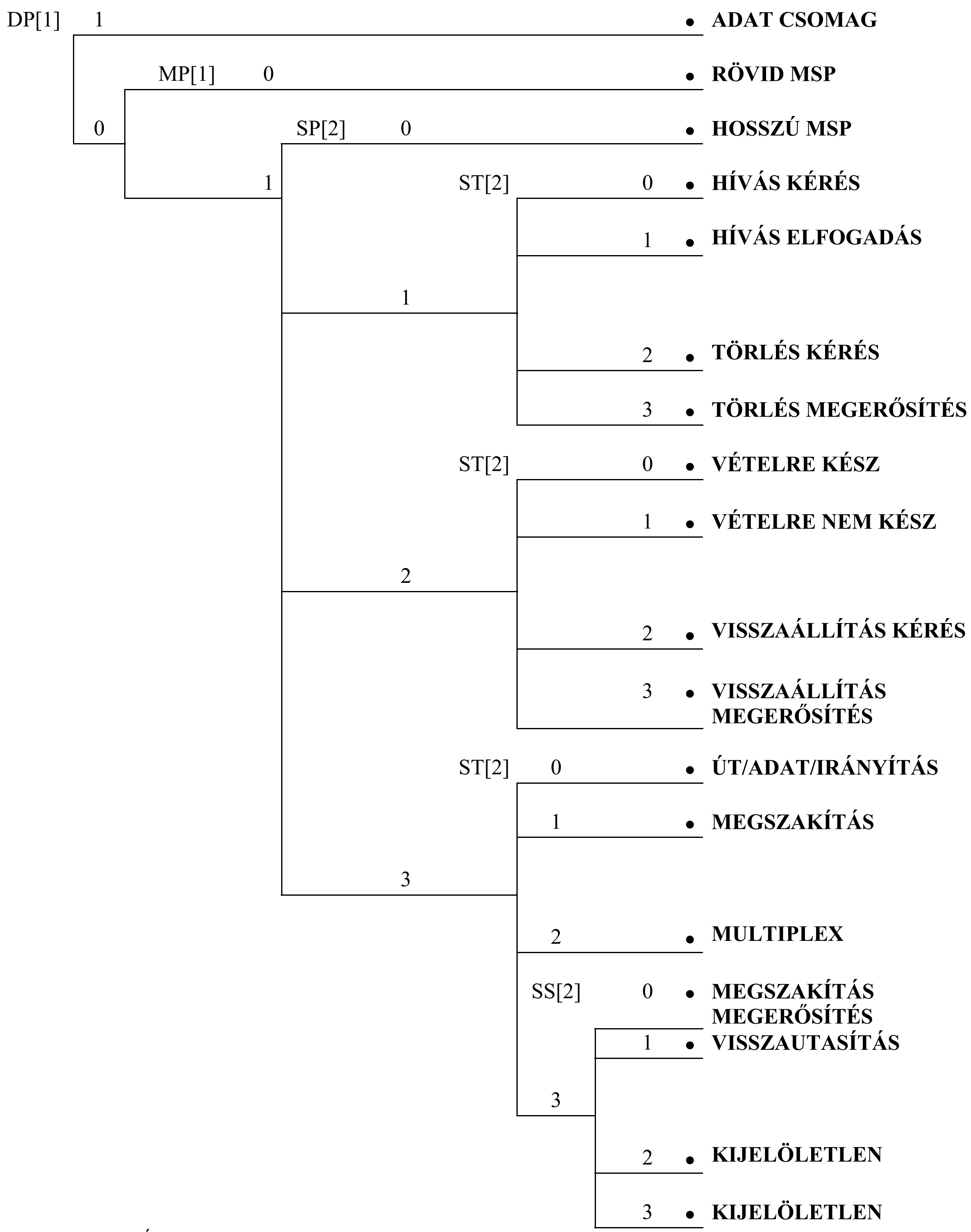
5-20. ábra: MULTIPLEX csomag

<table>
<tr><td>1</td><td>2</td><td>3 4</td><td>5 6</td><td>7 8</td></tr>
<tr><td>DP=0
Adatcsomag</td><td>MP=0
S-módú spec. protokol</td><td colspan="3">M/CH
MSP csatorna szám</td></tr>
<tr><td colspan="4">FILL1
Kitöltés</td><td></td></tr>
<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-21. ábra: RÖVID FORMÁTUMÚ S-módú specifikus protokol /MSP/ csomag

<table>
<tr><td>1</td><td>2</td><td>3 4</td><td>5 6</td><td>7 8</td></tr>
<tr><td>DP=0
Adatcsomag</td><td>MP=1
S-módú spec. protokol</td><td>SP=0
Felügyelő csomag</td><td>L
Hossz</td><td>M/SN
MSP sorozat szám</td></tr>
<tr><td colspan="2">FILL2
Kitöltés</td><td colspan="3">M/CH
MSP csatorna szám</td></tr>
<tr><td colspan="5">UD
Felhasználói adatmező</td></tr>
</table>

5-22. ábra: HOSSZÚ FORMÁTUMÚ S-módú specifikus protokol /MSP/ csomag



JELMAGYARÁZAT:

DP= ADAT csomag típus
MP= MSP csomag típus
SP= FELÜGYELŐ csomag
ST= FELÜGYELŐ típus
SS= FELÜGYELŐ részhalmaz

5-23. ábra: Az S-MÓDÚ csomagokban használt vezérlő mezők

FÜGGELÉK AZ 5. FEJEZETHEZ: AZ S-MÓDÚ SPECIÁLIS SZOLGÁLTATÁSOKON KERESZTÜLI ÖSSZEKÖTTETÉSEK ADAT- FORMÁTUMAI ÉS VEZÉRLŐ PARAMÉTEREI

AZ SSR S-MÓDÚ LEVEGŐ-FÖLD ADAT-KAPCSOLAT TECHNIKAI ALÁTÁMASZTÁSA

Ez a függelék azokat az adat-formátumokat és vezérlő paramétereket határozza meg, amelyeket az S-módú speciális szolgáltatások alkalmazásánál az összeköttetésekre fel kell használni.

A függelék az alábbi módon került elrendezésre:

1. rész A betűszavak jegyzéke

2. rész A válaszjeladó tárolók adat-formátumai

3. rész Az S-módú specifikus protokolok (MSP) formátumai

4. rész Az S-módú általános adások protokoljai

Megjegyzés. – A lehetséges adatforrásokra, a vezérlő paraméterekre és a hozzájuk kapcsolódó protokolokra vonatkozó útmutató anyag Az S-módú Specifikus Szolgáltatások Kézikönyvé*-ben (Doc 9688) van megadva.*

1. A BETŰSZAVAK JEGYZÉKE

ACAS	Összeütközési veszélyt jelző fedélzeti rendszer
ADLP	Fedélzeti adat-kapcsolat vezérlő egység
ADS-B	Automatikus berendezés-függő légtérellenőrző rendszer
ATN	Légiforgalmi távközlési hálózat
ATS	Légiforgalmi szolgálat
A/V	Légijármű/jármű
BDS	B-adatátvitel kiválasztó
CPR	Kompakt helyzet jelentés
ELM	Kiterjesztett hosszúságú közlemény
GDLP	Földi telepítési rendszerű adat-kapcsolat vezérlő egység
GIBC	Földről kezdeményezett B-adatátvitel
GFM	Általános formátumozó/kezelő
GNSS	Globális Navigációs Műhold Rendszer
II	Lekérdező azonosító
MA	A-közlemény
MB	B-közlemény
MC	C-közlemény

MD	D-közlemény
MSP	S-módú specifikus protokol
NUC_P	Navigációs bizonytalansági kategória – helyzet
NUC_R	Navigációs bizonytalansági kategória – sebesség
RNP	Megkívánt navigációs pontosság
SI	Légtérellenőrző azonosító
SLM	Szabvány hosszúságú közlemény
SPI	Speciális helyzet azonosítás
SSR	Másodlagos légtérellenőrző radar
TIS	Forgalmi tájékoztatási szolgáltatás
UTC	Egyeztetett Világ-idő

2. A VÁLASZJELADÓ TÁROLÓINAK ADAT-FORMÁTUMAI

2.1 TÁROLÓ KIJELÖLÉS

Az alkalmazott berendezéseknek a kijelölt tároló számokat az alábbi táblázatban bemutatottaknak megfelelően kell használni:

Tároló szám	*Kijelölés*	*Minimális felfrissítési sebesség*
00_{16}	Nem érvényes	Nem alkalmazható
01_{16}	Kijelöletlen	Nem alkalmazható
02_{16}	Kapcsolt B-adatátvitel, 2-es szegmens	Nem alkalmazható
03_{16}	Kapcsolt B-adatátvitel, 3-as szegmens	Nem alkalmazható
04_{16}	Kapcsolt B-adatátvitel, 4-es szegmens	Nem alkalmazható
05_{16}	Kiterjesztett szkvitter repülési helyzet	0,2 s
06_{16}	Kiterjesztett szkvitter földfelszíni helyzet	0,2 s
07_{16}	Kiterjesztett szkvitter állapot	1,0 s
08_{16}	Kiterjesztett szkvitter azonosító és típus	15,0 s
09_{16}	Kiterjesztett szkvitter tényleges önsebesség	0,2 s
$0A_{16}$	Kiterjesztett szkvitter esemény-vezérelt információ	Változó
$0B_{16}$	Levegő/levegő információ 1. (légijármű állapot)	1,0 s
$0C_{16}$	Levegő/levegő információ 2. (légijármű szándék)	1,0 s
$0D_{16}$-$0E_{16}$	Fenntartott (egyéb levegő/levegő információ)	Meghatározandó
$0F_{16}$	Fenntartott (ACAS) /ACAS = Összeütközési veszélyt jelző fedélzeti rendszer/	Meghatározandó
10_{16}	Adat-kapcsolat teljesítőképesség jelentés	≤4,0 (lásd 2.1.3)
11_{16} $–16_{16}$	Fenntartott a kiterjesztett az adat-kapcsolat teljesítőképesség jelentéshez	5,0 s
17_{16}	Általános kezelésű GIBC /Földről kezdeményezett B-adat-átvitel/ teljesítőképesség jelentés	5,0 s
18_{16} $–1F_{16}$	S-módú specifikus szolgáltatás teljesítőképesség jelentések	5,0 s
20_{16}	Légijármű azonosító	5,0 s

21_{16}	Légijármű lajstrom szám és légitársaság jelzés	15,0 s
22_{16}	Antenna pozíciók	15,0 s
23_{16}	Fenntartott az antenna pozícióhoz	15,0 s
24_{16}	Fenntartott a légijármű paraméterekhez	15,0 s
25_{16}	Légijármű típus	15,0 s
26_{16} –$2F_{16}$	Kijelöletlen	Nem alkalmazható
30_{16}	ACAS aktív megoldási tanácsadás	Lásd ACAS SARPs (4.3.8.4.2.2)
31_{16} –$3F_{16}$	Kijelöletlen	Nem alkalmazható
40_{16}	Légijármű szándék	1,0 s
41_{16}	Következő útvonal-pont azonosító	1,0 s
42_{16}	Következő útvonal-pont helyzet	1,0 s
43_{16}	Következő útvonal-pont tájékoztatás	0,5 s
44_{16}	Meteorológiai rutin légi jelentés	1,0 s
45_{16}	Meteorológiai veszély jelentés	1,0 s
46_{16}	Fenntartott az 1.módú repülés vezérlő rendszerhez	Meghatározandó
47_{16}	Fenntartott a 2.módú repülés vezérlő rendszerhez	Meghatározandó
48_{16}	VHF csatorna jelentés	5,0 s
49_{16} – $4F_{16}$	Kijelöletlen	Nem alkalmazható
50_{16}	Útirány és forduló jelentés	1,0 s
51_{16}	Helyzet jelentés, durva	0,5 s
52_{16}	Helyzet jelentés, pontos	0,5 s
53_{16}	Levegő vonatkoztatású állapot-vektor	0,5 s
54_{16}	1. útvonal-pont	5,0 s
55_{16}	2. útvonal-pont	5,0 s
56_{16}	3. útvonal-pont	5,0 s
57_{16} – $5E_{16}$	Kijelöletlen	Nem alkalmazható
$5F_{16}$	Kvázi-statikus paraméter figyelés	0,5 s
60_{16}	Mágneses irány és sebesség jelentés	1,0 s
61_{16}	Kiterjesztett szkvitter kényszerhelyzeti/ /elsőbbségi állapot	1,0 s
62_{16}	Jelenlegi pályagörbe váltási pont	1,7 s
63_{16}	Következő pályagörbe váltási pont	1,7 s
64_{16}	Légijármű üzemeltetési koordinációs közlemény	2,0 s vagy 5,0 s (2.3.10.1)
65_{16}	Légijármű üzemeltetési állapot	1,7 s
66_{16} – $6F_{16}$	Fenntartva a kiterjesztett szkvitter részére	Nem alkalmazható
70_{16} – 75_{16}	Fenntartva későbbi, fedélzetről leadott paraméterek részére	Nem alkalmazható

76_{16} – $E0_{16}$	Kijelöletlen	Nem alkalmazható
$E1_{16}$ – $E2_{16}$	Fenntartva az S-módú bájt részére	Nem alkalmazható
$E3_{16}$ – $F0_{16}$	Kijelöletlen	Nem alkalmazható
$F1_{16}$ – $F2_{16}$	Katonai alkalmazások	15 s
$F3_{16}$ – FF_{16}	Kijelöletlen	Nem alkalmazható

2.1.1 A kijelölt tárolókba bejegyzett adatok részleteinek az ebben a részben következő oldalakon meghatározottaknak kell lenni. A fenti táblázat meghatározza azt a minimális felfrissítési sebességet, amelynél az alkalmazott válaszjeladó tároló(i)t az érvényes adatokkal újra kell tölteni. Ha a meghatározott felfrissítési sebesség nem tartható, akkor az állapot bitnek (ha ilyen biztosított) kell jeleznie azt, hogy az abban a mezőben lévő adat érvénytelen.

2.1.2 Az azon időpontok közötti időnek, amikor az adat az S-módú szolgáltatás entitásnál /SSE/ rendelkezésre áll, és amikor az adat feldolgozásra kerül, és megjelenik a vonatkozó válaszjeladó tárolóban, kevesebbnek kell lenni a fenti táblázatban meghatározott minimális felfrissítési sebességnél.

2.1.3 **Ajánlás.** – *Az azon időpontok közötti időnek, amikor az adat az S-módú szolgáltatás entitásnál /SSE/ rendelkezésre áll, és amikor az adat feldolgozásra kerül, és megjelenik a vonatkozó válaszjeladó tárolóban, a lehetséges legrövidebbnek kell lenni.*

2.1.4 A tároló számának azonosnak kell lenni a B-adatátvitel adat kiválasztó (BDS) által az annak a tárolónak a címzésére használt értékkel (lásd az Annex 10, IV. Kötete 3.1.2.6.11.2.1 pontját). A $0A_{16}$ tárolót nem lehet felhasználni a Földről kezdeményezett B-adatátvitelhez /GIBC/ vagy az Összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ keresztbe-láncolásos kiolvasásához. Az adat-kapcsolat teljesítőképesség jelentést (tároló szám 10_{16}) az adat változás utáni egy másodpercen belül, és ettől kezdve legalább minden négy másodpercen – belül fel kell frissíteni.

2.2 AZ ADAT FORMÁTUMÁNAK ÁLTALÁNOS SZABÁLYAI

2.2.1 AZ ADATOK ÉRVÉNYESSÉGE

Az 56-bites válaszjeladó tárolókban foglalt bit-mintázatokat csak akkor kell érvényes alkalmazási adatoknak tekinteni, ha:

1) az adat-kapcsolat teljesítőképesség jelentést a 10_{16} számú tároló foglalja magába. ez azt jelzi, hogy a 10_{16} számú tárolóban lévő adat-kapcsolat teljesítőképesség jelentés 25 bitje "EGY"-re van állítva.

2) az alkalmazásnak megfelelő földről kezdeményezett B-adatátvitel /GIBC/ szolgáltatást "támogatott"-ként jelzi az, hogy a GIBC teljesítőképesség jelentés megfelelő bitjei a 17_{16}-tól az $1C_{16}$-ig terjedő számú tárolókban "EGY"-re vannak állítva.

1. Megjegyzés. - A 17_{16} számú tárolóban lévő teljesítőképesség bitek célja az, hogy jelezzék azt, hogy hasznos adatokat foglal magába a megfelelő válaszjeladó tároló. ezen okból egy tároló minden egyes *bitjét törölni kell akkor, ha az adat nem használható (2.5.4.1), és újra be kell állítani akkor, ha a tárolóba az adat behelyezés újra kezdődik.*

2. Megjegyzés. - A 18_{16} tárolónak az $1C_{16}$-ra történő beállítása azt jelzi, hogy az ezt a tárolót felhasználó alkalmazás a légijárművön van elhelyezve. ezeket a biteket nem kell törölni akkor, ha egy alkalmazás valós-idejeinek elvesztését tükrözik, ellentétben azzal, mint ami a 17_{16} számú tárolónál végrehajtásra kerül (2.5.4.2).

3) az adat értéke a kiemelés dőpontjában érvényes. ezt az adat mező állapot bit (ha ilyet biztosítottak) jelzi. amikor ez az állapot bit "EGY"-re van állítva, akkor a következő adat mező(k) egészen a következő állapot bitig érvényesek. amikor ez az állapot bit "NULLA"-ra van állítva, akkor az adat mező(k) érvénytelenek.

2.2.2 A SZÁMSZERŰ ADATOK FELÍRÁSA

A számszerű adatokat a következők szerint kell felírni:

1) A számszerű adatokat bináris számokkal kell felírni. Amikor az érték előjeles, akkor a 2-es alapú komplemens felírást kell használni, és az állapot bitet követő bitnek kell az előjel bitnek lenni.

2) Ha nincs másképpen meghatározva, akkor valahányszor, amikor több bit felbontóképesség áll az adat-forrástól rendelkezésre, mint ami abban az adat mezőben van, amelyre az adatok betáplálásra kerülnek, akkor az adatot kerekíteni kell a legközelebbi azon értékre, amit az adat mezőbe be lehet kódolni.

3) Minden esetben, ahol az állapot bit használatos, azt „EGY"-re kell állítani az ÉRVÉNYES jelzésre, és „NULLA"-ra az ÉRVÉNYTELEN jelzésére.
Megjegyzés. – Ez lehetővé teszi a tárolók részleges betöltését.

4) Amikor biztosított, akkor a kapcsoló bitnek kell jeleznie azt, hogy a két alternatív adat típusból melyik kerül felhasználásra a válaszjeladó tárolójában lévő paraméter felfrissítésére.

5) A B-közlemény mezőben a bitek számozásának az Annex 10 IV. Kötetében (3.1.2.3.1.3) meghatározottaknak kell lenni.

6) Azoknak a tárolóknak, amelyek B-közlemény általános adásra szánt adatot tartalmaznak, az általános adás azonosítót az MB mező nyolc legnagyobb helyiértékű bitjében kell elhelyezni.

Megjegyzés. – A táblázatok ott vannak 2-X táblázatként számozva, ahol az „X" annak a B-adatátvitel kiválasztás kódnak /BDS/ a decimális megfelelője, amelyre a formátumot alkalmazzák.

2.2.3 Fenntartott mezők

Ha ebben az Annex-ben nincs másképpen meghatározva, akkor ezeket a bit mezőket az ICAO által a jövőben történő kijelölésekre kell fenntartani.

2.3 A KITERJESZTETT SZKVITTER FORMÁTUMOK

Ez a rész azokat a formátumokat és kódolást határozza meg, amelyet a kiterjesztett szkvitter az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ közleményekhez kell felhasználni. Amikor a kiterjesztett szkvitter képesség egy kiterjesztett szkvitter/nem-válaszjeladó berendezésként (ES/NT, Annex 10, IV. Kötet 3.1.2.8.7) megvalósításra kerül, akkor a tároló számozási szabályait nem kell alkalmazni. Az adat-tartalomnak és a továbbítási időknek ugyanannak kell lenni, mint ami a válaszjeladó esetére meghatározásra került.

2.3.1 Formátum típus kódok

A formátum típus kódoknak kell szétválasztani az S-módú kiterjesztett szkvitter közleményeket a különböző osztályokba, úgy, ahogy az az alábbi táblázatban meghatározásra került:

„TÍPUS" Almező Kód Meghatározások (DF = 17 vagy 18)					
Típus kód	*Formátum*	*Vízszintes védelmi szint (HPL)*	*95 %-os Behatárolási sugár, μ és v, a vízszintes és függőleges helyzet hibára*	*Magasság (mérés) típus (2.3.2.4)*	*Navigációs Bizonyta-lansági Kategória Helyzet NUC_P*
0	Nincs helyzet információ			Barometrikus magasság vagy nincs magasság információ	0
1	Azonosítás (Kategória D-sorozat)			*Nem alkalmazható*	
2	Azonosítás (Kategória C-sorozat)			*Nem alkalmazható*	
3	Azonosítás (Kategória B-sorozat)			*Nem alkalmazható*	
4	Azonosítás (Kategória A-sorozat)			*Nem alkalmazható*	
5	Földfelszíni helyzet	HPL < 7,5 m	μ < 3 m	Nincs magasság információ	9
6	Földfelszíni helyzet	HPL < 25 m	3 m ≤ μ < 10 m	Nincs magasság információ	8
7	Földfelszíni helyzet	HPL < 185,2 m (0,1 tmf)	10 m ≤ μ < 92,6 m (0,05 tmf)	Nincs magasság információ	7
8	Földfelszíni helyzet	HPL > 185,2 m (0,1 tmf)	(0,05 tmf) 92,6 m ≤ μ	Nincs magasság információ	6
9	Repülési helyzet	HPL < 7,5 m	μ < 3 m	Barometrikus magasság	9
10	Repülési helyzet	7,5 m ≤ HPL < 25 m	3 m ≤ μ < 10 m	Barometrikus magasság	8

11	Repülési helyzet	25 m ≤ HPL < 182,5 m (0,1 tmf)	10 m ≤ μ < 92,6 m (0,05 tmf)	Barometrikus magasság	7
12	Repülési helyzet	185,2 m (0,1 tmf)≤HPL < 370,4 m (0,2 tmf)	92,6 m (0,05 tmf) ≤ μ < 185,2 m (0,1 tmf)	Barometrikus magasság	6
13	Repülési helyzet	380,4 m (0,2 tmf)≤HPL < 92,6 m (0,5 tmf) *	185,2 m (0,1 tmf) ≤ μ < 463 m (0,25 tmf)	Barometrikus magasság	5
14	Repülési helyzet	26 (0,5tmf) ≤ HPL < 185,2 m (1,0 tmf) *	463 m (0,25 tmf) ≤ μ < 92,6 m (0,5 tmf) *	Barometrikus magasság	4
15	Repülési helyzet	185,2 m (1,0 tmf)≤HPL < 370,4 m (2,0 tmf) *	92,6 m (0,5 tmf) ≤ μ < 185,2 m (1,0 tmf) *	Barometrikus magasság	3
16	Repülési helyzet	7,704 km (2,0 tmf) ≤ HPL< 18,52 km (10 tmf) *	1,852 km (1,0 tmf) ≤ μ < 9,26 km (5,0 tmf)	Barometrikus magasság	2
17	Repülési helyzet	18,52 km (10 tmf) ≤ HPL < 37,04 m (20 tmf)	9,26 km (5,0 tmf) ≤ μ < 18,52 km (10,0 tmf)	Barometrikus magasság	1
18	Repülési helyzet	HPL ≥ 37,04 km (20 tmf)	8,52 km (10,0 tmf) ≤ μ *	Barometrikus magasság	0
19	Repülési sebesség /Tényleges önsebesség/	*Nem alkalmazható*	*Nem alkalmazható*	*Különbség a „Barometrikus magasság” és a „GNSS magas- ság (HAE) vagy GNSS közepes tengerszint feletti magas- ság (MSL)” között (2.3.5.7)*	*Nem alkal- mazható*
20	Repülési helyzet	HPL < 7,5 m	μ < 3 m és *v* < 4 m	GNSS magasság (HAE)	9
21	Repülési helyzet	HPL < 25 m	μ < 10 m és *v* < 15 m	GNSS magasság (HAE)	8
22	Repülési helyzet	HPL ≥ 25 m	μ ≥ 10 m vagy *v* ≥ 15 m	GNSS magasság (HAE)	Fenntartott
23	Fenntartott ellenőrzési célokra				
24	Fenntartott a földfelszíni rendszerek állapotára				
25-27	Fenntartott				
28	Kiterjesztett szkvitter légijármű állapot				
29	Jelenlegi/következő repülési görbe váltási pont				
30	Légijármű üzemeltetési koordináció				
31	Légijármű üzemeltetési állapot				

* A jelzett rovatokban az átszámítások hibásnak tűnnek. – A Fordító megjegyzése.

A 95 %-os behatárolási határértéket, a μ-t a vízszintes helyzet hibánál a HFOM-ból (vízszintes jósági tényező) kell levezetni.

Hasonlóképpen, a 95 %-os behatárolási határértéket, a *v*-t a függőleges helyzet hibára a VFOM-ból (függőleges jósági tényező) kell levezetni.
A vízszintes védelmi szintet (HPL) az AHIL-ből (autonom vízszintes sértetlenségi hatáérték) kell levezetni.

Megjegyzés. – Amikor az „általános adás” kifejezést a kiterjesztett szkvitterre alkalmazzák, akkor az a válaszjeladó spontán továbbításaira vonatkozik. Ez a B-adatátvitel általános adás protokoljától eltérő sugárzás.

2.3.2 Repülési helyzet formátum

A repülési helyzet szkvitter formátumát úgy kell összeállítani, ahogy az a B-adatátvitel kiválsztás 0,5 /BDS0,5/ meghatározásában leírásra került. A további részletek a következő pontokban kerültek meghatározásra.

2.3.2.1 *Kompakt helyzet jelentés (CPR) formátum (F)*

Abból a célból, hogy a világméretű félreérthetetlen kódolás megvalósításra kerüljön, a CPR-hez két formátum típust kell használni, amelyek ’páros’- és ’páratlan’-ként ismertek. Ezt az 1-bites mezőt (bit 22) kell felhasználni a CPR formátum típusának meghatározásához. Az F = 0-val kell jelezni a páros formátum kódolást, míg az F = 1 kell, hogy jelezzen egy páratlan formátumú kódolást (2.6.7).

2.3.2.2 *Idő szinkronizálás (T)*

Ennek az 1-bites mezőnek kell jeleznie azt, hogy a közlemény idő felhasználhatósága szinkronizálva van-e az Egyeztetett Világidővel /UTC/, vagy sem. A T = 0-nak kell jeleznie azt, hogy az idő nincs az UTC-hez szinkronizálva. A T = 1 azt jelzi, hogy az idő felhasználhatósága az UTC-hez szinkronizált állapotú. A szinkronizálást csak olyan repülési helyzet közleményeknél kell alkalmazni, amelyek a felső két vízszintes helyzet precíziós kategóriában vannak (formátum típus kód 9, 10, 20 és 21).

Amikor a T = 1, akkor az idő érvényességet a repülési helyzet közlemény formátumban az 1-bites F mezőbe kell kódolni, ami a CPR formátum típushoz kiegészítőleg jelzi a 0,2 másodperces idő ’ketyegést’ a helyzet érvényesség UTC idejében. Az F bitet kell a 0 és az 1 között váltakoztatni, az egymást követő 0,2 másodperces idő ketyegéshez, az F = 0-val kezdve akkor, amikor az alkalmazhatósági idő egy pontos páros számú UTC másodperc.

2.3.2.3 *Földrajzi szélesség/hosszúság*

A repülési helyzet közlemény földrajzi szélesség/hosszúság mezőjének egy 34-bites mezőnek kell lenni, ami magába foglalja a légijármű repülési helyzetének földrajzi szélességét és hosszúságát. A földrajzi szélességnek és hosszúságnak külön-külön 17 bitet kell elfoglalni. A légtérbeli földrajzi szélesség és hosszúság kódolásának magába kell foglalni a 19-bites CPR-kódolt értékek karakter-sorozatának bal szélső /high-order/ 17 bitjét, ahogy a 2.6 pont meghatározza.

Megjegyzés. – A helyi dekódolás egyértelmű távolsága a repülési helyzet közleményekre 666 km (360 tmf). A repülési kompakt helyzet jelentés /CPR/ dekódolás fenntartott helyzet pontossága körülbelül 5,1 m. A földrajzi szélesség/ /hosszúság jelátalakítása ugyancsak a CPR formátum érték (az „F” bit) függvénye, ahogy az a fentiekben leírásra került.

2.3.2.3.1 *A helyzet extrapolálása (amikor T=1)*

Amikor a T egyre van állítva, akkor azoknak a repülési helyzet közleményeknek, amelyeknek a formátum típus kódja 9, 10, 20 és 21, olyan idő alkalmazhatóságuk kell, hogy legyen, amely pontosan 0,2 s UTC időszakos. Az ilyen esetben az F bitnek 0-nak kell lenni akkor, ha az idő alkalmazhatóság egy páros számozású 0,2 s-os UTC időszak, illetve 1-nek akkor, ha az idő alkalmazhatóság egy páratlan számozású 0,2 s-os UTC időszak.

Megjegyzés. – Az ilyen esetben egy „páros számozású 0,2 s-os időszak” egy olyan időszakot jelent, ami egy páros számú 200 ms-os idő intervallummal fordul elő egy páros-számú UTC másodperc után. Egy „páratlan számozású 0,2 s-os időszak” egy olyan időszakot jelent, ami egy páratlan számú 200 ms-os idő intervallummal fordul elő egy páros számozású UTC másodperc után. Példák a páros számozású 0,2 s-os UTC időszakokra a 12,0 s, 12,4 s, 12,8 s, 13,2 s, 13,6 s, stb. Példák a páratlan számozású UTC időszakokra: a 12,2 s, 12,6 s, 13,0 s, 13,4 s, 13,8 s, stb.

A kompakt helyzet jelentés /CPR/ kódolású földrajzi szélesség és hosszúság, ami a repülési helyzet tárolóba került beírásra, magába kell, hogy foglalja a légijármű/jármű (A/V) várható helyzetét annál a földrajzi szélességnél és hosszúságnál, amikor az idő alkalmazható, és ami egy pontos 0,2 s-os UTC időszak. A tárolót be kell tölteni a betöltendő adat alkalmazhatósági ideje előtt 150 ms-nál nem korábban, és nem később, mint 50 ms-al az adat alkalmazhatósági ideje előtt.

Az időzítésnek biztosítania kell azt, hogy a vevő Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ visszanyerhesse a repülési helyzet közlemény adatainak alkalmazhatósági idejét, a következők szerint:

1) Ha F = 0, akkor az alkalmazhatósági időszak a legközelebbi páros-számozású 0,2 s-os UTC időszaka kell, hogy legyen, arra az időpontra, amikor a repülési helyzet közlemény vételre kerül.

2) Ha F = 1, akkor az alkalmazhatósági időszak a legközelebbi páratlan-számozású 0,2 s-os UTC időszaka kell, hogy legyen, arra az időpontra, amikor a repülési helyzet közlemény vételre kerül.

Ajánlás. – *Ha a repülési helyzet tároló a minimális idejében (minden 200 milliszekundum) felfrissítésre kerül, akkor a tárolót fel lehet tölteni 100 ms-al az alkalmazhatósági idő előtt. A tárolót ezután újra kell tölteni azokkal az adatokkal, amelyek a következő egymást követő 0,2 s-os UTC időszakra alkalmazhatóak 100 ms-al a következő egymást követő 0,2 s-os időszak előtt.*

1. Megjegyzés. – Ezen a módon a repülési helyzet közlemény továbbítása sohasem fog 100 ms-nál többel eltérni az abban a közleményben lévő adatok alkalmazhatósági idejétől. A „100 ms ± 50 ms” meghatározással inkább, mint a pontos 100 ms-al bizonyos tolerancia megengedett a különféle megvalósításokra.

2. Megjegyzés. – A helyzetet ki lehet számítani úgy, hogy extrapolálják a helyzetet a pont érvényességi idejétől (a helyzet-pontot is beleértve) és a tárolóban lévő adatok alkalmazhatósági idejét (amely, ha T =1, akkor egy pontos 0,2 s-os UTC idő ketyegés). Ezt egy egyszerű lineáris extrapolációval el lehet végezni a helyzet-pont által biztosított sebességnek, valamint a helyzet-pont érvényességi idő és a továbbított adatok alkalmazhatósági idő közötti idő-különbségnek a felhasználásával. Alternatívaként a helyzet kiszámításához más módszerek, mint például az alfa-béta követő rendszerek vagy a Kalman-szűrők is felhasználhatók.

Minden egyes 200 ms-os időszaknál a helyzet tárolók tartalmát fel kell frissíteni a légijármű/jármű /A/V/ helyzetének a következő egymást követő 0,2 s-os UTC időszakra kiszámított adatokkal. Ezt a folyamatot folytatni kell az új helyzet-pontokkal, amint azok rendelkezésre állóvá válnak a navigációs adatok forrásából.

2.3.2.3.2 *A helyzet extrapolálása (amikor T = 0)*

A T-t nullára kell állítani akkor, ha a helyzet tárolóba betáplált adatok alkalmazhatósági ideje nincs valamilyen meghatározott UTC időszakhoz szinkronizálva. Az ilyen esetben, a helyzet tárolót a helyzet adatokkal olyan időközönként kell újratölteni, amely 200 ms-nál nem hosszabb. A tárolóba betöltött helyzetnek az alkalmazhatósági ideje sohasem tér el többel, mint 200 ms, bármely olyan időponttól, ameddig a tároló azokat az adatokat tartja.

Megjegyzés. – Ezt úgy lehet végrehajtani, hogy a repülési helyzet tárolót olyan időközönként töltik be, átlagban, ami 200 ms-nál nem több, azokkal az adatokkal, amelyeknek az alkalmazhatósági ideje azon időpontok között van, amikor a tároló betöltésre került és újra betöltésre kerül. (A 200 ms-nál rövidebb időhöz megengedett, de nem szükséges.)

Ha T = 0, akkor a vevő Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ berendezésnek úgy kell elfogadnia a repülési helyzet közleményeket, mint amelyek a legfrissebbek a vétel időpontjában. A továbbító ADS-B berendezésnek újra kell tölteni a repülési helyzet tárolót a légijármű/jármű helyzetének számított felújított adataival, a 200 ms-nál nem nagyobb időközönként. A folyamatot az új helyzet jelentésekkel folytatni kell, amint azok rendelkezésre állóvá válnak.

2.3.2.3.3 *Idő-túllépés, amikor új helyzet adatok nem állnak rendelkezésre*

Abban az esetben, ha a navigációs bevitel megszűnik, a 2.3.2.3.1 és 2.3.2.3.2 pontban leírt extrapolációt két másodpercnél nem hosszabb időre kell korlátozni. Ennek a két másodperces idő-túllépésnek a végén a repülési helyzet tároló összes mezőjét – a magasság mező kivételével – törölni kell (nullára kell állítani). Amikor a megfelelő tároló mezők törölt állapotúak, akkor a nulla típusú kód mezőnek kell arra szolgálnia, hogy értesítse az ADS-B vevő berendezést, hogy a földrajzi szélesség és hosszúság mezőkben lévő adatok érvénytelenek.

2.3.2.4 *Magasság*

Ennek a 12-bites mezőnek kell megadnia a légijármű magasságát. A típus kódtól függően, ennek a kódnak magába kell foglalnia vagy:

1) A Barometrikus magasságot 25 vagy 100 láb lépcsőzéssel kódolva (ahogy azt a Q-bit jelzi), vagy

2) A GNSS magasságot az ellipszoid felett (HAE).

A „Barometrikus magasság”-ot barometrikus légköri magasságként kell értelmezni az 1013,25 hektopaszkál (29,92 Hg-ban) szabvány nyomáshoz viszonyítva. Nem lehet barometrikus helyesbítési magasságként alkalmazni.

A 20-tól a 22-ig terjedő formátum típus kódokat fenn kell tartani a GNSS magasság jelzésére (HAE), ami a WGS-84 ellipszoid felülete feletti magasságot jelenti, és akkor lehet használni, amikor a barometrikus magasság nem áll rendelkezésre.

Megjegyzés. – A GNSS magasság (MSL) nem eléggé pontos a helyzet jelentésben való felhasználásra.

2.3.2.5 *Egyetlen antenna jelzés (SAF)*

Ennek az 1-bites mezőnek kell jeleznie annak az antennának a típusát, ami a kiterjesztett szkvitterek továbbítására használatos. A SAF = 1 jelzi az egyetlen adó antennát. A SAF = 0 jelzi a kettős adó antenna rendszert.

Bármely időpontban, amikor a több-utas felépítés nem tudja garantálni azt, hogy mindkét antenna csatorna működjön, az egyetlen antenna mezőt EGY-re kell állítani.

2.3.2.6 *Légtérellenőrző állapot*

A repülési helyzet közlemény formátum légtérellenőrző állapot mezőjébe kell kódolni a légijármű A-módú kódját és a speciális helyzet azonosító állapot jelzését úgy, ahogy az az Annex 10, IV. Kötet, 3.1.2.8.6.3.1.1 pontjában meghatározásra került.

2.3.3 Földfelszíni helyzet formátumok

A földfelszíni helyzet szkvittert úgy kell formátumozni, ahogy az a 06_{16} számú tároló meghatározásában előírásra kerül a következő pontokban.

2.3.3.1 *Mozgás*

Ennek a 7-bites mezőnek kell információt biztosítania a légijármű földi sebességéről. Egy nem-lineáris léptéket kell használni úgy, ahogy az a következő táblázatban meghatározásra kerül, ahol a sebességek km/h-ban és (csomóban /kt/) vannak megadva.

Kódolás	*Jelentés*	*Értékmeghatározás*
0	Nem áll rendelkezésre információ	
1	Légijármű megállítása (földi sebesség < 0,2315 km/h (0,125 kt))	
2-8	0,2315 km/h (0,125 kt) ≤ földi sebesség < 1,852 km/h (1 kt)	(0,2315 km/h (0,125 kt) lépcsőzéssel)
9-12	1,852 km/h (1 kt) ≤ földi sebesség < 3,704 km/h (2 kt)	(0,463 km/h (0,25 kt) lépcsőzéssel)
13-38	3,704 km/h (2 kt) ≤ földi sebesség < 27,78 km/h (15 kt)	(0,926 km/h (0,5 kt) lépcsőzéssel)
39-93	27,78 km/h (15 kt) ≤ földi sebesség < 129,64 km/h (70 kt)	(1,852 km/h (1,0 kt) lépcsőzéssel)
94-108	129,64 km/h (70 kt) ≤ földi sebesség < 185,2 km/h (100 kt)	(3,704 km/h (2,0 kt) lépcsőzéssel)
109-123	185,2 km/h (100 kt) ≤ földi sebesség < 324,1 km/h (175 kt)	(9,26 km/h (5,0 kt) lépcsőzéssel)
124	Földi sebesség ≥ 324,1 km/h (175 kt)	
125	Fenntartva	
126	Fenntartva	
127	Fenntartva	

2.3.3.2 *Földfelszíni irány (földrajzi)*

2.3.3.2.1 *Földfelszíni irány állapot*

Ennek az 1-bites mezőnek kell meghatároznia a földfelszíni irány értékének érvényességét.
Ennek a mezőnek a kódolása a következő: 0 = érvénytelen és 1 = érvényes.

2.3.3.2.2 *Földfelszíni irány érték*

Ennek a 7-bites (14 – 20) mezőnek kell meghatározni a légijármű földi mozgásának irányát (fokokban, a földrajzi északtól az óramutató forgásával megegyező irányban). A földi irányt egy előjel nélküli szöget bezáró súlyozott bináris számként kell kódolni, az MSB-vel a 180 fokot és az LSB-vel a 360/128 fokot úgy, hogy a nulla jelezze a földrajzi északot. A mezőben lévő adatot kerekíteni kell a 360/128 fok legközelebbi többszörösére.

2.3.3.3 *Kompakt helyzet jelentés (CPR) formátum (F)*

Az 1-bites (22) CPR formátum mezőt a földfelszíni helyzet közleményre úgy kell kódolni, ahogy az a repülési helyzet közleményre van meghatározva. Azaz az F = 0-nak kell jelezni a páros formátumú kódolást, míg az F = 1 a páratlan kódolás jelzése (2.6.7).

2.3.3.4 *Idő szinkronizálás (T)*

Ennek az 1-bites mezőnek (21) kell jeleznie azt, hogy a közlemény idő felhasználhatósága szinkronizálva van-e az Egyeztetett Világidővel /UTC/, vagy sem. A T = 0-nak kell jeleznie azt, hogy az idő nincs az UTC-hez szinkronizálva. A T = 1 azt jelzi, hogy az idő felhasználhatósága az UTC-hez szinkronizált állapotú. A szinkronizálást csak olyan földfelszíni helyzet közleményeknél kell alkalmazni, amelyek a felső két vízszintes helyzet precíziós kategóriában vannak (formátum típus kód 5 és 6).

Amikor a T = 1, akkor az idő érvényességet a földfelszíni helyzet közlemény formátumban az 1-bites F mezőbe kell kódolni, ami (a CPR formátum típushoz kiegészítőleg) jelzi a 0,2 másodperces idő ’ketyegést’ a helyzet érvényesség UTC idejében. Az F bitet kell a 0 és az 1 között váltakoztatni, az egymást követő 0,2 másodperces idő ketyegéshez, az F = 0-val kezdve akkor, amikor az alkalmazhatósági idő egy pontos páros számú UTC másodperc.

2.3.3.5 *Földrajzi szélesség/hosszúság*

A földfelszíni helyzet közlemény földrajzi szélesség/hosszúság mezőjének egy 34-bites mezőnek kell lenni, ami magába foglalja a légijármű földfelszíni helyzetének földrajzi szélességét és hosszúságát. A földrajzi szélességnek *(Y)* és hosszúságnak *(X)* külön-külön 17 bitet kell elfoglalni. A földfelszíni földrajzi szélesség és hosszúság kódolásának magába kell foglalni a 19-bites CPR-kódolt értékek karakter-sorozatának jobb szélső /low-order/ 17 bitjét, ahogy a 2.6 pont meghatározza.

Megjegyzés. – A helyi dekódolás egyértelmű távolsága a földfelszíni helyzet közleményekre 166,5 km (90 tmf). A földfelszíni kompakt helyzet jelentés /CPR/ dekódolás fenntartott helyzet pontossága körülbelül 1,25 m. A földrajzi szélesség/hosszúság jelátalakítása ugyancsak a CPR formátum érték (az „F” bit) függvénye, ahogy az a fentiekben leírásra került.

2.3.3.5.1 *A helyzet extrapolálása (amikor a T = 1)*

Ez az extrapoláció megegyezik a 2.3.2.3.1 pontban leírtakkal (helyettesítsék be a „földfelszíni”-t a „repülési” helyére, ahol megfelelő).

2.3.3.5.2 *A helyzet extrapolálása (amikor a T = 0)*

Ez az extrapoláció megegyezik a 2.3.2.3.2 pontban leírtakkal (helyettesítsék be a „földfelszíni”-t a „repülési” helyére, ahol megfelelő).

2.3.3.5.3 *Idő-túllépés, amikor új helyzet adatok nem állnak rendelkezésre*

Ennek az idő-túllépésnek megegyezőnek kell lennie a 2.3.2.3.3 pontban leírtakkal (helyettesítsék be a „földfelszíni”-t a „repülési” helyére, ahol megfelelő).

2.3.4 Azonosítás és kategória formátum

Az azonosító és kategória szkvittert úgy kell formátumozni, ahogy az a BDS 0,8 meghatározásban előírásra került.

2.3.5 Repülési sebesség formátum

A repülési sebesség szkvittert úgy kell formátumozni, ahogy az a 09_{16} tároló szám meghatározásnál és a következő pontokban elő van írva.

2.3.5.1 *Az 1. és 2. altípus*

A repülési sebesség formátum 1. és 2. altípusát kell használni akkor, amikor a közleményt adó légijárművek földfeletti sebessége ismert.

Az 1. altípust kell használni a hangsebesség alatti sebességekre, míg a 2. altípust kell használni akkor, amikor a sebesség meghaladja az 1022 csomót.

Ezt a közleményt nem kell leadni akkor, ha az érvényes adatokat csak a légijármű szándék változás jelzés és az IFR képesség jelzés képezi (2.3.5.3, 2.3.5.4). Az alaphelyzet beállítás után az adást el kell nyomni úgy, hogy a 09_{16} tárolóba legyen betáplálva minden helyen nullával és azután abbahagyni a tároló felfrissítését addig, amíg bemenő adat újra rendelkezésre nem áll.

A sebesség kódolás szuperszónikus változatát akkor kell alkalmazni, ha valamelyik a kelet-nyugati VAGY az észak-déli sebesség meghaladja az 1022 csomót. Egy, a normál sebesség kódolásra történő átkapcsolást kell alkalmazni akkor, ha mindkettő, a kelet-nyugati ÉS az észak-déli sebesség az 1000 csomó alá esik.

2.3.5.2 *A 3. és 4. altípus*

A repülési sebesség formátum 3. és 4. altípusát kell használni akkor, amikor a közleményt adó légijármű földfeletti sebessége nem ismert. Ezek az altípusok helyettesítik a tényleges önsebességet és az irányt a földfeletti sebességre. A 3. altípust kell használni a hangsebesség alatti sebességekre, míg a 4. altípust kell használni akkor, amikor a sebesség meghaladja az 1022 csomót.

Ezt a közleményt nem kell leadni akkor, ha az érvényes adatokat csak a légijármű szándék változás jelzés és az IFR képesség jelzés képezi (2.3.5.3, 2.3.5.4). Az alaphelyzet beállítás után az adást el kell nyomni úgy, hogy a 09_{16} tárolóba legyen betáplálva minden helyen nullával és azután abbahagyni a tároló felfrissítését addig, amíg bemenő adat újra rendelkezésre nem áll.

A sebesség kódolás szuperszónikus változatát akkor kell alkalmazni, ha a sebesség meghaladja az 1022 csomót. Egy, a normál sebesség kódolásra történő átkapcsolást kell alkalmazni akkor, ha a sebesség az 1000 csomó alá esik.

2.3.5.3 *A légijármű szándék változás jelzés a repülési sebesség közleményekben*

Egy légijármű szándék változási eseményt 4 másodperccel annak észlelése után kell indítani, hogy új információ került bevitelre a 4,0-tól 4,2-ig számozott tárolókba. A kódnak a szándék változás utáni 18 ± 1 másodpercig beállítottnak kell maradni.

A szándék változás jelzés kódolása:
0 = nincs szándék változás
1 = szándék változás

1. Megjegyzés. – A 43_{16}-os tároló nem értendő ide, mivel az olyan dinamikus adatokat tartalmaz, amelyek folyamatosan változnak.

2. Megjegyzés. – A négy-másodperces késleltetés a kézi beállítású berendezésektől nyert szándék adatok beállítási idejének biztosításához szükséges.

2.3.5.4 *Az IFR képesség jelzés (IFR) a repülési sebesség közleményekben*

Az IFR képesség jelzésnek egy 1-bites (bit 10) almezőnek kell lenni a repülési sebesség közlemények 1., 2., 3. és 4. altípusaiban. Az IFR = 1-nek kell jeleznie azt, hogy az adattovábbító légijármű rendelkezik az ADS-B A1 osztályú, vagy annál magasabb osztályú képességet megkövetelő berendezéssel. Más esetben az IFR-t 0-ra kell beállítani.

2.3.5.5 *A mágneses irány a repülési sebesség közleményekben*

2.3.5.5.1 *Mágneses irány állapot*

Ennek az 1-bites mezőnek kell megadnia a mágneses irány érték rendelkezésre állását. Ennek a mezőnek a kódolása: 0 = nem áll rendelkezésre, illetve 1 = rendelkezésre áll.

2.3.5.6 *A mágneses irány értéke*

Ennek a 10-bites mezőnek kell magába foglalnia a légijármű mágneses irányát (fokokban, a mágneses északtól az óramutató forgásával megegyező irányban) akkor, amikor a földfeletti sebesség nem áll rendelkezésre. A mágneses irányt egy előjel nélküli szöget bezáró súlyozott bináris számként kell kódolni, az MSB-vel a 180 fokot, és az LSB-vel a 360/1024 fokot úgy, hogy a nulla jelezze a mágneses északot. A mezőben lévő adatokat kerekíteni kell a 360/1024 fok legközelebbi többszörösére.

2.3.5.7 *A barometrikus magasság eltérés a repülési sebesség közleményekben*

Ennek a 8-bites mezőnek kell megadni a barometrikus magasság és a GNSS magasság közötti különbséget. (A mező kódolásának a 2-9.a. és 2-9.b. táblázatokban feltüntetetteknek kell lenni.)

A barometrikus magasság és a GNSS ellipszoid feletti magasság (HAE) közötti különbséget – ha rendelkezésre áll – alkalmazni kell. Ha a GNSS HAE nem áll rendelkezésre, akkor a GNSS magasságot (MSL = közepes tengerszint feletti magasság) kell használni akkor, amikor a repülési helyzet a 11.-től a 18. terjedő formátum típus kódok alkalmazásával közlésre kerül.

Ha a repülési helyzet a 9. vagy 10. formátum típusú kóddal kerül jelentésre, akkor csak a GNSS (HAE)-t kell használni. A 9. vagy 10. formátum típus kódnál, ha a GNSS (HAE) nem áll rendelkezésre, akkor ezeket a mezőket minden helyen 0-val kell kódolni. A barometrikus magasság különbség alapját (vagy a GNSS (HAE)-re, vagy a GNSS magasság MSL-re) következetesen alkalmazni kell a közölt különbségre.

2.3.6 Állapot tároló formátumok

Az állapot tárolót úgy kell formátumozni, ahogy az a 07_{16} számú tároló meghatározásánál előírásra kerül, és ahogy a következő pontok meghatározzák.

2.3.6.1 *RENDELTETÉS*

A többi kiterjesztett szkvitter tárolótól eltérően, ennek a tárolónak a tartalma nem kerül továbbításra. Ennek a tárolónak az a rendeltetése, hogy egy illesztésként szolgáljon a válaszjeladó működés és az általános formátumozó/ /kezelő működése (GFM 2,5) között. Az erre a formátumra meghatározott két mező az átviteli sebesség részmező és a magasság típus részmező.

2.3.6.2 *ÁTVITELI SEBESSÉG RÉSZMEZŐ (TRS)*

Ez a mező csak a válaszjeladónak a kiterjesztett szkvitterrel való feltöltésére használatos.

A TRS arra használatos, hogy értesítse a válaszjeladót a légijármű mozgási állapotáról, miközben az a földfelszínen van. Amikor a légijármű mozog, akkor a földfelszíni helyzet szkvittert másodpercenként kétszer kell kisugározni, és az azonosító szkvittert 5 másodpercenként egyszer. Amikor a légijármű álló helyzetű, akkor a földfelszíni helyzet szkvittert 5 másodpercenként egyszer kell kisugározni és az azonosító szkvittert 10 másodpercenként egyszer.

Egy, a 07_{16} számú tároló meghatározásában előírt algoritmust kell felhasználnia a GFM (2,5)-nek a mozgási állapot meghatározásához, és a megfelelő kódot kell beállítania a TRS részmezőben. A válaszjeladónak kell megvizsgálnia a TRS részmezőt, és meghatároznia azt, hogy melyik átviteli sebességet használja, amikor a földfelszíni szkvittert kisugározza.

2.3.6.3 *MAGASSÁG TÍPUS RÉSZMEZŐ (ATS)*

Ez a mező csak a válaszjeladónak a kiterjesztett szkvitterrel való feltöltésére használatos.
A válaszjeladónak a repülési helyzet szkvitter magasság mezőjét ugyanarról a digitális forrásról kell betáplálni, amely a címzett válaszokhoz használatos.

Megjegyzés. – Ez annak a lehetőségnek a minimalizálására került végrehajtásra, hogy a szkvitterben lévő magasság eltérjen attól a magasságtól, amit a közvetlen lekérdezéssel lehet megszerezni.

Ha az általános formátumozó/kezelő /GFM (2,5)/ a GNSS magasságot (HAE) helyezi be a repülési helyzet szkvitterbe, akkor utasítania kell a válaszjeladót, hogy ne helyezze be a barometrikus magasságot a magasság mezőbe. Az ATS almezőt ebből a célból EGY-re kell állítani.

2.3.7 Esemény-vezérelt protokol

Az esemény-vezérelt protokol tárolónak olyannak kell lenni, ahogy azt a $0A_{16}$ számú tárolóra a 2.5.5 pontban meghatározott előírások és a következő pontokban leírtak megadják.

2.3.7.1 *RENDELTETÉS*

Az esemény-vezérelt protokolt egy rugalmas eszközként kell felhasználni az olyan közlemények sugárzásának alátámasztásához, amelyek kívül esnek azokon, ami a helyzetre, a sebességre és az azonosításra meghatározásra kerültek.

Megjegyzés. – Ezek jellemzően azok a közlemények lesznek, melyek egy esemény előfordulása során annak időtartamán alapulóan szabályozottan sugárzásra kerülnek. Egy példa a kényszerhelyzeti/elsőbbségi állapot sugárzása másodpercenként egy bejelentett légijármű kényszerhelyzet során. A második példa az üzemeltetési körülmények időtartamában a szándék információk sugárzása.

2.3.8 Kényszerhelyzeti/elsőbbségi állapot

A kényszerhelyzeti/elsőbbségi állapot szkvittert úgy kell formátumozni, ahogy az a 61_{16} számú tároló meghatározásában és az alábbi pontokban előírásra került.

2.3.8.1 *Továbbítási gyakoriság*

Ezt a közleményt másodpercenként egyszer kell leadni a kényszerhelyzet időtartama alatt.

2.3.8.2 *Közlemény kézbesítés*

A közlemény kézbesítését az esemény-vezérelt protokol (2.3.7) felhasználásával kell végrehajtani. Ennek a közleménynek a sugárzása elsőbbséget kell, hogy kapjon az esemény-vezérelt protokolban minden más közlemény típussal szemben, ahogy az a 2.5.5.3 pontban meghatározásra került.

2.3.9 Jelenlegi/következő repülési-pálya változási pont (TCP/TCP+1)

A jelenlegi/következő repülési-pálya változási pont (TCP) szkvitert úgy kell formátumozni, ahogy az a 62_{16} és 63_{16} számú tárolók meghatározásaiban és az alábbi pontokban előírásra került.

2.3.9.1 *Továbbítási gyakoriság*

A közleményt az üzemeltetés időtartama alatt 1,7 másodpercenként kell sugározni.

2.3.9.2 *Közlemény kézbesítés*

A közlemény kézbesítését az esemény-vezérelt protokol (2.3.7) felhasználásával kell végrehajtani.

2.3.9.3 *Repülési-pálya pont/szakasz típus*

Ezt a 4-bites (7 – 10) almezőt kell felhasználni annak a TCP típusnak az azonosítására, amelyre az adatok a közleményben biztosításra kerülnek. A TCP típus almezőt a következők szerint kell kódolni:

Kódolás	*Jelentés*
0000	Nincs meghatározott repülési-pálya változási pont leírási információ
0001	„Egyenes” (geodéziai) útirány egy „navigációs pont átrepülési” útvonal-pontra
0010	„Egyenes” (geodéziai) útirány egy „navigációs berendezés át-repülési” útvonal-pontra
0011	„Egyenes” (geodéziai) útirány egy „sebesség változtatás” útvonal-pontra
0100	„Egyenes” (geodéziai) útirány egy „függőleges sebesség változtatás” útvonal-pontra
0101	Íves repülési útirány a „navigációs pont átrepülési” útvonal-pontból
0110	Íves repülési útirány a „navigációs berendezés átrepülési” útvonal-pontból

0111	Íves repülési útirány a „sebesség változtatás” útvonal-pontból
1000	Íves repülési útirány a „függőleges sebesség változtatás” útvonal-pontból
1001	Várakozási eljárás egy várakozási pontra
1010	ELREPÜLÉSI útirány az útvonal-pontból, a ’végződési pont’ ismeretlen
1011	Fenntartva jövőbeli felhasználásra
1100	Fenntartva jövőbeli felhasználásra
1110	Fenntartva jövőbeli felhasználásra
1111	Fenntartva jövőbeli felhasználásra

Ha a repülési-pálya pontot/szakaszt a fenti táblázatban azonosított kategóriákból egynél többel lehet osztályozni, akkor legnagyobb kódolt értékű típust kell használni.

2.3.9.4 *TCP adat érvényesség*

Ezt az 1-bites (11) részmezőt kell felhasználni a TCP/TCP+1 közlemény érvényességének jelzésére. Az EGY-es értékkel az érvényes közleményt kell jelezni. A NULLA értékkel az érvénytelen közleményt kell jelezni.

2.3.9.5 *TCP formátum*

Evvel az 1-bites (12) részmezővel kell jelezni azt, hogy a TCP helyzet- és időként (4D) került-e meghatározásra, vagy csak helyzetként (3D). A NULLA értéknek kell jeleznie a 4D TCP-t. Az EGY érték pedig a 3D TCP-t kell, hogy jelezze. A 3D TCP/TCP+1 formátumot akkor kell használni, ha a távolság a TCP/TCP+1-ig 160 tmf-nél nagyobb a légijármű azon pillanatnyi helyzetétől mérve, amely a TCP/TCP+1 közleményt adja.

2.3.9.6 *TCP/TCP+1 MAGASSÁG*

Ezt a 10-bites részmezőt (13 – 22) kell felhasználni arra, hogy megadja a binárisan kódolt magasságát az aktuális TCP/TCP+1 közleménynek. A magasság részmezőt a következők szerint kell kódolni:

TCP/TCP+1 MAGASSÁG

Kódolás (bináris)	*Kódolás (decimális)*	*Jelentés (TCP magasság lábban megadva)*
00 0000 0000	0	Nincs rendelkezésre álló TCP magasság információ
00 0000 0001	1	A TCP magasság NULLA
00 0000 0010	2	TCP magasság = 128 láb
00 0000 0011	3	TCP magasság > 256 láb
***	***	***
11 1111 1110	1022	TCP magasság = 130 688 láb
11 1111 1111	1023	TCP magasság > 130 752 láb

2.3.9.7 *TCP/TCP+1 FÖLDRAJZI SZÉLESSÉG*

2.3.9.7.1 *4D TCP földrajzi szélesség*

Ezt a 14-bites (23 – 36) részmezőt kell felhasználni arra, hogy megadja a repülési kompakt helyzet jelentés /CPR/ kódolt földrajzi szélességet a 4D TCP vagy TCP+1 közleményre.

A 4D TCP/TCP+1 földrajzi szélesség adatok kódolását úgy kell elvégezni, ahogy az a 2.6.3 pontban meghatározásra került.

2.3.9.7.2 *3D TCP földrajzi szélesség*

Ezt a 17-bites (23 – 39) részmezőt kell felhasználni arra, hogy megadja a szögbeli súlyozott bináris kódolású földrajzi szélességet a 3D TCP vagy TCP+1 közleményre. A földrajzi szélességet egy 17-bites kettes kiegészítő előjeles bináris számként kell kódolni, amelyben az LSB-nek (bit 39) a súlyozása a 2^{-17}–szerese a 360 foknak. Az északi földrajzi szélességnek pozitív előjele és a déli földrajzi szélességnek negatív előjele kell, hogy legyen.

2.3.9.8 TCP/TCP+1 FÖLDRAJZI HOSSZÚSÁG

2.3.9.8.1 *4D TCP/TCP+1 földrajzi hosszúság*

Ezt a 14-bites (37 – 50) részmezőt kell felhasználni arra, hogy megadja a repülési kompakt helyzet jelentés /CPR/ kódolt földrajzi hosszúságát a 4D TCP vagy TCP+1 közleményre.

A 4D TCP/TCP+1 földrajzi hosszúság adatok kódolását úgy kell elvégezni, ahogy az a 2.6.3 pontban meghatározásra került.

2.3.98.2 *3D TCP földrajzi hosszúság*

Ezt a 17-bites (40 – 56) részmezőt kell felhasználni arra, hogy megadja a szögbeli súlyozott bináris kódolású földrajzi hosszúságot a TCP vagy TCP+1 közleményre. A földrajzi hosszúságot egy 17-bites kettes kiegészítő előjeles bináris számként kell kódolni, amelyben az LSB-nek (bit 56) a súlyozása a 2^{-17} –szerese a 360 foknak. Az alap (Greenwich) délkört kell a nulla hosszúságként meghatározni. A Greenwich-től keletre lévő földrajzi hosszúságoknak pozitív értékűnek kell lenni, és azok, amelyek Greenwich-től nyugatra vannak, a negatív értékűek.

2.3.9.9 *TCP/TCP+1 elérési idő (TTG)*

Ezt a 6-bites (51 – 56) részmezőt kell felhasználni a TCP vagy TCP+1 közlemény binárisan kódolt elérési idejének megadásához. A TCP elérési idő részmezőt a következők szerint kell kódolni:

TCP/TCP+1 ELÉRÉSI IDŐ (TTG)		
Kódolás (bináris)	*Kódolás (decimális)*	*Jelentés (TCP/TCP+1 elérési idő percben)*
00 0000	0	Nem áll rendelkezésre TCP elérési idő
00 0001	1	A TCP elérési idő NULLA
00 0010	2	TCP elérési idő = 0,25 perc
00 0011	3	TCP elérési idő = 0,50 perc
***	***	***
11 1110	62	TCP elérési idő = 15,25 perc
11 1111	63	TCP elérési idő > 15,375 perc

2.3.10 Légijármű üzemeltetési koordinációs közlemény

A légijármű üzemeltetési koordinációs közleményt úgy kell formátumozni, ahogy az a 64_{16} számú tároló meghatározásában és az alábbi pontokban előírásra került.

2.3.10.1 *Továbbítási gyakoriság*

A közleményt az üzemeltetés időtartama alatt 5 másodpercenként kell sugározni, kivéve azt, hogy 30 másodpercen keresztül 2 másodpercenként ki kell sugározni akkor, amikor a közlemény tartalma megváltozik.

2.3.10.2 *Közlemény kézbesítés*

A közlemény kézbesítését az esemény-vezérelt protokol (2.3.7) felhasználásával kell végrehajtani.

2.3.10.3 *Páros címzés*

Ezt a 24-bites (9 – 32) részmezőt kell felhasználni arra, hogy a légijármű ICAO 24-bites címét megadja, hogy az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adó légijárműve párosítsa akkor, ha egy másik légijárművel együttes koordinált üzemeltetésben vesz részt.

2.3.10.4 *Futópálya küszöb feletti sebesség*

Ezt az 5-bites részmezőt (33 – 37) kell felhasználni arra, hogy megadja a légijárműnek a futópálya küszöbe feletti sebességét. A részmező kódolása a következő kell, hogy legyen:

FUTÓPÁLYA KÜSZÖB FELETTI SEBESSÉG		
Kódolás (bináris)	*Kódolás (decimális)*	*Jelentés (Futópálya küszöb feletti sebesség, csomó-ban)*
0 0000	0	Futópálya küszöb feletti sebesség információ nem áll rendelkezésre
0 0001	1	Futópálya küszöb feletti sebesség < 100 csomó
0 0010	2	Futópálya küszöb feletti sebesség = 100 csomó
0 0011	3	Futópálya küszöb feletti sebesség = 105csomó
0 0100	4	Futópálya küszöb feletti sebesség = 110 csomó
***	***	***
1 1110	30	Futópálya küszöb feletti sebesség = 240csomó
1 1111	31	Futópálya küszöb feletti sebesség > 242,5 csomó

Megjegyzés. – A táblázatban bemutatott kódolás csak pozitív nagyság-rendű adatot képvisel.

2.3.10.5 *Bedöntési szög jelzés*

Ezt az 1-bites (38) almezőt kell felhasználni arra, hogy megadja a légijármű bedöntési szögének irányát vagy jelzését. Az almező kódolása a következő:

BEDÖNTÉSI SZÖG JELZÉS, BIT	
Kódolás	*Jelentés*
0	A bedöntési szög '+' azaz a jobb szárny van lenn
1	A bedöntési szög '-' azaz a bal szárny van lenn

2.3.10.6 *Bedöntési szög*

Ezt az 5-bites almezőt (39 – 43) kell felhasználni arra, hogy megadja a légijármű bedöntési szögét. Az almező kódolásának a következőnek kell lenni:

BEDÖNTÉSI SZÖG		
Kódolás (bináris)	*Kódolás (decimális)*	*Jelentés (Bedöntési szög, fokokban)*
0 0000	0	Nem áll rendelkezésre bedöntési szög információ
0 0001	1	A bedöntési szög NULLA
0 0010	2	A bedöntési szög = 1,0 fok
0 0011	3	A bedöntési szög = 2,0 fok
***	***	***
1 1110	30	A bedöntési szög = 29,0 fok
1 1111	31	A bedöntési szög > 29,5 fok

Megjegyzés. – A táblázatban bemutatott kódolás csak pozitív nagyság-rendű adatot képvisel. A bedöntés irányát kiegészítőleg a bedöntési szög jelzés bit adja meg.

2.3.10.7 *Megszakított megközelítés*

Ezt a 2-bites (44 – 45) almezőt kell felhasználni annak a helyzetnek a jelzésére, amikor a légijármű egy megszakított megközelítést hajt végre. Az almező kódolása a következő:

MEGSZAKÍTOTT MEGKÖZELÍTÉS ALMEZŐ	
Kódolás	*Jelentés*
0	Nincs információ
1	A légijármű NEM hajt végre megszakított megközelítést
2	A légijármű ’végrehajt’ egy megszakított megközelítést
3	Fenntartott

2.3.10.8 *Hajtómű leállás*

Ezt a 2-bites (46 – 47) almezőt kell felhasználni a légijármű hajtómű leállási állapotának jelzésére. Az almező kódolása a következő kell, hogy legyen:

HAJTÓMŰ LEÁLLÁS ALMEZŐ	
Kódolás	*Jelentés*
0	Nincs információ
1	A légijárművön NINCS hajtómű leállási állapot
2	A légijárművön VAN hajtómű leállási állapot
3	Fenntartott

2.3.11 Légijármű üzemeltetési állapot

A légijármű üzemeltetési állapot közleményt úgy kell formátumozni, ahogy az a 64_{16} számú tároló meghatározásában és az alábbi pontokban előírásra került.

2.3.11.1 *Továbbítási gyakoriság*

A közleményt az üzemeltetés időtartama alatt 1,7 másodpercenként kell sugározni.

2.3.11.2 *Közlemény kézbesítés*

A közlemény kézbesítését az esemény-vezérelt protokol (2.3.7) felhasználásával kell végrehajtani.

2.3.11.3 *Útvonal üzemeltetési teljesítőképességek (CC-4)*

Ezt a 4-bites (9 – 12) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek az útvonal üzemeltetési teljesítőképesség jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

CC-4 kódolás: Útvonal üzemeltetési teljesítőképességek

CC-4 kódolás		
Bit 9, 10	*Bit 11, 12*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.4 *Közelkörzeti üzemeltetési teljesítőképességek (CC-3)*

Ezt a 4-bites (13 – 16) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a közel-körzeti üzemeltetési teljesítőképesség jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

CC-3 kódolás: Közelkörzeti üzemeltetési teljesítőképességek

CC-3 kódolás		
Bit 13, 14	*Bit 15, 16*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*

	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.5 *Megközelítési és leszállási üzemeltetési teljesítőképességek (CC-2)*

Ezt a 4-bites (17 – 20) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a megközelítési és leszállási üzemeltetési teljesítőképesség jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

CC-2 kódolás: Megközelítési és leszállási üzemeltetési teljesítőképességek

CC-2 kódolás		
Bit 17, 18	*Bit 19, 20*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.6 *Földfelszíni üzemeltetési teljesítőképességek (CC-1)*

Ezt a 4-bites (21 – 24) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a földfelszíni üzemeltetési teljesítőképesség jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

CC-1 kódolás: Földfelszíni üzemeltetési teljesítőképességek

CC-1 kódolás		
Bit 21, 22	*Bit 23, 24*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.7 *Útvonal üzemeltetési teljesítőképességi állapot (OM-4)*

Ezt a 4-bites (25 – 28) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek az útvonal üzemeltetési teljesítőképességi állapot jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

OM-4 kódolás: Útvonal üzemeltetési teljesítőképességi állapot

OM-4 kódolás		
Bit 25, 26	*Bit 27, 28*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

1 1	*0 0*	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.8 *Közelkörzeti üzemeltetési teljesítőképesség állapot (OM-3)*

Ezt a 4-bites (29 – 32) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a közel-körzeti üzemeltetési teljesítőképesség állapot jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

OM-3 kódolás: Közelkörzeti üzemeltetési teljesítőképesség állapot

OM-3 kódolás		
Bit 29, 30	*Bit 31, 32*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.9 *Megközelítési és leszállási üzmeltetési teljesítőképesség állapot (OM-2)*

Ezt a 4-bites (33 – 36) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a megközelítési és leszállási üzemeltetési teljesítőképesség állapot jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

OM-2 kódolás: Megközelítési és leszállási üzemeltetési teljesítőképesség állapot

OM-2 kódolás		
Bit 33, 34	*Bit 35, 36*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.3.11.10 *Földfelszíni üzemeltetési teljesítőképesség állapot (OM-1)*

Ezt a 4-bites (37 – 40) almezőt kell felhasználni az Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ adattovábbító rendszernek a földfelszíni üzemeltetési teljesítőképesség állapot jelzésére a többi légijármű részére a következő kódolás által meghatározottan.

OM-1 kódolás: Földfelszíni üzemeltetési teljesítőképesség állapot		
OM-1 kódolás		
Bit 37, 38	*Bit 39, 40*	*Jelentés*
0 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
0 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 0	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*
1 1	0 0	*Fenntartott*
	0 1	*Fenntartott*
	1 0	*Fenntartott*
	1 1	*Fenntartott*

2.4 A KITERJESZTETT SZKVITTER ALAP-HELYZET BEÁLLÍTÁS ÉS IDŐ-TÚLLÉPÉS

A kiterjesztett szkvitter adás alap-helyzet beállítási és idő-túllépési funkcióit a válaszjeladónak kell végrehajtani, és ezek az Annex 10, 3.1.2 pontjában vannak meghatározva.

Megjegyzés. – A következő pontokban bemutatott funkciók leírása referencia anyagként szolgál az Általános formátumozó/kezelő (GFM) részhez (lásd a 2.5 pontot).

2.4.1 A kiterjesztett szkvitter adás alap-helyzet beállítása

A bekapcsolás utáni alap-helyzet beállításnál a válaszjeladónak meg kell kezdenie a működését olyan módon, amelyben csak lekérdező szkvittereket sugároz. A válaszjeladónak a kiterjesztett szkvitter sugárzását a repülési helyzet, földfelszíni helyzet, repülési sebesség és légijármű azonosító sugárzását csak akkor kell megkezdenie, amikor adatok kerülnek a 05_{16}, 06_{16}, 09_{16} és 08_{16} számú tárolókba bevitelre külön-külön. A meghatározást egyedileg kell az egyes szkvitter típusokra alkalmazni. A válaszjeladónak a magasság vagy légtér-ellenőrző állapot adatoknak a 05_{16} számú tárolóba való bevitele nem elégíti ki a repülési helyzet szkvitter sugárzási minimális követelményt.

Megjegyzés. – Ez kizárja a kiterjesztett szkvitter sugárzását az olyan légijárművektől, amelyek nem képesek a helyzet, sebesség vagy azonosító információk jelentésére.

2.4.2 Tároló idő-túllépés

A válaszjeladónak törölnie kell a repülési helyzet tárolóban (05_{16} tároló) lévő adatokat a magasság és a légtérellenőrzési állapot részmezők kivételével és az összes 56 bitet a földfelszíni hlyzet, szkvitter állapot és repülési sebesség tárolókat (06_{16}, 07_{16} és 09_{16} számú tárolók), ha ezek a tárolók nem kerülnek az előző felfrissítéstől számított 2 másodpercen belül. Ezt az idő-túllépést külön kell meghatározni ezen tárolók mindegykére. A magasság vagy a légtérellenőrző állapotoknak az ezekbe a tárolókba való – a válaszjeladó általi – behelyezését nem kell a tároló felfrissítés szempontjából minősíteni az idő-túllépési feltétel céljából.

1. Megjegyzés. – Ezek a tárolók azért kerülnek törlésre, hogy az idejét múlt helyzet, sebesség és szkvitter sugárzási átviteli sebesség adatok kisugárzása megelőzésre kerüljön.

2. Megjegyzés. – Az azonosító tároló, 08_{16}, nem kerül törlésre, mivel olyan adatokat foglal magába, amelyek ritkán változnak a repülés során, és a legkisebb gyakorisággal kerülnek felfrissítésre. Az esemény-vezérelt tároló, a $0A_{16}$, vagy az ennek megfelelő továbbítások tárolóit nem kell törölni, mivel azok tartalma csak egy időben egyszer kerül kisugárzásra, akkor, amikor a tároló feltöltésre kerül (2.5.5).

3. Megjgyzés. – Egy tároló idő-túllépés esemény során a kiterjesztett szkvitter ME mezője magába foglalhat minden helyen nullát, kivéve, ha a válaszjeladó bármilyen adatot helyezett bele.

2.4.3 A kiterjesztet szkvitter sugárzásának lezárása

Ha egy szkvitter típusú tároló adat-bevitele 60 másodpercre leáll, akkor a kiterjesztett szkvitter típus sugárzását félbe kell szakítani addig, amíg az adat-bevitel újra folytatódik. A magasságnak a válaszjeladó általi bevitele kielégíti azt a minimális követelményt, hogy a légijármű helyzet szkvitter sugárzása folytatódjon.

1. Megjegyzés. – Az idő-túllépésig a szkvitter típus magába foglalhat egy, az összes helyen nullára állított ME mezőt.

2. Megjegyzés. – 60 másodperces időtartamú folytatódó adás szükséges ahhoz, hogy a vevő légijármű megtudja azt, hogy a közlemény adat-forrása elveszett.

2.5 ÁLTALÁNOS FORMÁTUMOZÓ/KEZELŐ (GFM)

Az Általános formátumozó/kezelőnek (GFM) kell formátumoznia a válaszjeladó tárolóiba beviendő közleményeket.

Megjegyzés. – Az adat formátumozáshoz kiegészítőleg van még más feladata is, amit ennek a funkciónak végre kell hajtani.

2.5.1 Navigációs adat-forrás kiválasztás

A GFM-nek kell felelősnek lenni a légijármű helyzet és sebesség alap-értelmezési adat-forrásnak az utasított magasság adat-forrás kiválasztásáért és a hozzájuk kapcsolódó helyzet és magasság hibák jelentéséért.

2.5.2 A bemenő adatok elvesztése

A GFM-nek kell felelősnek lenni annak a tárolónak a betöltéséért, amelyre programozva van a megkívánt felfrissítési gyakorisággal. Ha valamilyen okból az adat nem hozzáférhető a felfrissítési időköz kétszeresével egyenlő ideig, vagy 2 másodpercig (amelyik a nagyobb), akkor a GFM-nek nullára kell állítani az elöregedett adatokat (egy mezőnkénti alapon), és be kell írnia az ebből eredő közleményt a megfelelő tárolóba.

A 05_{16} és 06_{16} tárolóknál a helyzet adatok elvesztésének létre kell hoznia azt, hogy a GFM a formátum típus kódot nullára állítsa be, és ennek segítségével jelezze, hogy „nincs helyzet adat”, mivel a földrajzi szélesség/hosszúság mezőkben a minden helyen nulla egy legális értéket jelent.

2.5.3 A formátum típus kód nulla speciális feldolgozása

2.5.3.1 *A formátum típus kód egyenlő nullával kódolás jelentősége*

A formátum típus kód 0-nak kell jeleznie azt, hogy „nincs helyzet információ”. Ezt akkor kell használni, amikor a földrajzi szélesség/hosszúság információ nem áll rendelkezésre vagy érvénytelen, és még megengedett a válaszjeladó által betáplált barometrikus magasság jelentése.

1. Megjegyzés. – Ennek a közleménynek a legfontosabb felhasználása az, hogy biztosítja az ACAS részére azt a képességet, hogy passzívan vegye a magasságot.

2. Megjegyzés. – Különleges kezelést igényelnek a repülési és a földfelszíni helyzet közlemények, mivel a CPR minden helyen nullás értékű kódolása a földrajzi szélesség/hosszúság mezőben egy érvényes érték.

2.3.5.2 *A formátum típus kód egyenlő nullával kódolás sugárzása*

A formátum típus kód 0-t csak az alábbi esetekben lehet beállítani:

1) Egy, a válaszjeladó által ellenőrzött kiterjesztett szkvitter tároló (05_{16}, 06_{16}, 07_{16} és 09_{16} számú tárolók) nem kerül a GFM által betöltésre 2 másodperc alatt. Ebben az esetben a válaszjeladónak törölnie kell annak a tárolónak az összes 56 bitjét, amely idő-túllépéses. Egy repülési helyzet tároló

esetében a magasság részmezőt kell csak nullákra állítani, ha nincs rendelkezésre álló adat. Annak a kiterjesztett szkvitternek az adat-továbbítását, amely az „idő-túllépéses" tárolót sugározza, 60 másodpercen belül kell leállítani. Ennek a kiterjesztett szkvitternek a sugárzását akkor kell helyreállítani, amikor a GFM megkezdi az adatoknak a tárolóba való betöltését.

2) A GFM megállapítja azt, hogy az összes navigációs forrás, amit fel tud használni a kiterjesztett szkvitter repülési vagy földfelszíni helyzet közleményhez, vagy hiányzik, vagy érvénytelen. Ebben az esetben, a GFM-nrk törölnie kell formátum típus kódot és az összes további mezőt a repülési vagy földfelszíni helyzet közleményekben, és be kell vinni a nullázott közleményt a megfelelő tárolóba. Ezt csak egyszer kell elvégezni úgy, hogy a válaszjeladó tudja érzékelni az „elveszett adat" bevitelt, és elnyomja a vonatkozó szkvitter kisugárzását.

Megjegyzés. – A fenti esetek mindegyikében, a formátum típus nulla kódolása magába foglal egy minden helyen nullára állított közleményt. Ez alól a kivétel csak a repülési helyzet formátum, amely magába foglalhatja a barometrikus magasságot és a légtérellenőrzési állapot adatot, ahogy azt a válaszjeladó beállítja. Nincs megegyező helyzet a többi kiterjesztett szkvitter közlemény típusra, mivel a nulla érték az összes többi mezőben azt jelzi, hogy ninc információ.

2.5.3.3 *A formátum típus kód egyenlő nullával szkvitter vétele*

Ha egy olyan szkvitter kerül vételre, amelynek a formátum típus kódja egyenlő nullával, akkor az ellenőrizni kell, és megnézni azt, hogy magasság jelzés van-e benne. Ha nem tartalmaz magasság jelzést, akkor a közleményt érvényteleníteni kell. Egy olyan kiterjesztett szkvittert, amelynek a formátum típus kódja nulla, csak a már követésbe fogott légijármű magasságának a felfrissítésére lehet felhasználni.

2.5.4 Válaszjeladó képesség jelentés

Az Általános formátumozó/kezelőnek /GFM/ kell felelősnek lennie azért, hogy a válaszjeladó képesség tárolókat, a 10_{16}-ot és a 18_{16}-tól az $1C_{16}$-ig terjedő számozásúakat beállítsa. A GFM-nek kell kitörölni a 17_{16} számú tárolóból az egyedi biteket egy adat-forrás vagy egy alkalmazott berendezés elvesztése esetén.

Egy egyedi bitnek kell beállítottnak maradni akkor, ha a megfelelő tároló közleményének legalább egy mezője felújított marad.

2.5.4.1 *Általános felhasználási képesség jelentés (17_{16} számú tároló)*

A 17_{16} számú tárolóban lévő bitet törölni kell akkor, ha a megfelelő bemenő adatok valamelyike elveszik (2.5.2), és be kell állítani, amikor a tárolóba az adat-bevitel visszatér. A 10_{16} tároló 36 bitjét kell „ide-oda" kapcsolni a képesség változás jelzésére.

2.5.4.2 *S-módú specifikus szolgáltatás képesség jelentés (18_{16} -tól az $1C_{16}$ -ig terjedő számú tárolók)*

Ezeknek a tárolóknak valamelyikében egy bit beállításnak kell jelezni azt, hogy a légijárművön biztosított szolgáltatás tölti az azzal a bittel jelzett tárolót. Ebből a szempontból, ezeket a biteket nem kell törölni egy légijármű berendezés valós ideje elvesztésének tükrözésére, mint ahogy az a 17_{16} tárolónál végrehajtásra került.

2.5.4.3 *Válaszjeladó ellenőrzés*

Ahogy azt a 2.4 pont jelezte, ebben a folyamatban a válaszjeladó feladata, hogy egy alátámasztásként szolgáljon a GFM működésének elvesztése esetére. Ebből az okból a válaszjeladónak:

1) Törölnie kell a kiterjesztett szkvitter tárolókat (05_{16}, 06_{16}, 07_{16} és 09_{16}), ha azok nem kerülnek 2 másodpercen belül felfrissítésre.

2) Törölnie kell az összes tárolót, amit a GFM tölt, amikor azt érzékeli, hogy a GFM képessége elveszett (például egy adat-csatorna hibája). Ebben az esetben törölnie kell a 17_{16} számú tárolóban lévő összes bitet, mivel ebben a tárolóban egy bit jelentése az, hogy „a szolgáltatás telepített és működik”.

A válaszjeladónak nem kell törölni a további számozású képesség tárolókat (18_{16}-tól az $1C_{16}$-ig), mert azok célja csak az, hogy jelezzék, miszerint a „szolgáltatás telepített”.

2.5.5 Az esemény-vezérelt protokol kezelése

Az esemény-vezérelt protokol egy általános célú illesztésként szolgál a válaszjeladó funkciójához azokhoz a közleményekhez, amelyek kívül esnek azokon, amelyek rendszeresen és folyamatosan továbbításra kerülnek (feltéve, hogy a bemenő adatok rendelkezésre állnak). Ennek a protokolnak kell úgy működnie, hogy a válaszjeladó egy közleményt sugározzon ki egyszer minden olyan időpontban, amikor az esemény-vezérelt tárolót a GFM betölti.

Megjegyzés. – Ez megadja a GFM-nek a teljes szabadságot ahhoz, hogy beállítsa a kisugárzás felfrissítési gyakoriságát (egészen a maximumig) és az időtartamát az olyan felhasználásokra, mint a kényszerhelyzeti állapot és a szándék jelentés.

A formátumozáson kívül, a GFM-nek kell ellenőriznie a közlemény bevitel időzítését úgy, hogy az a szükséges ál-véletlen időzítés variációt biztosítsa, és hogy ne haladja meg a válaszjeladó maximális sugárzási gyakoriságát egy esemény-vezérelt protokolra.

2.5.5.1 *Az esemény-vezérelt közlemények válaszjeladó általi alátámasztása*

A közleményt a válaszjeladónak csak egyszer kell leadni, minden egyes olyan időpontban, amikor a $0A_{16}$ számú tároló betöltésre került. A sugárzást késleltetni kell, ha a válaszjeladó a bevitel időpontjában foglalt.

1. Megjegyzés. – A késési idő rövid. Általában maximum néhány milliszekundum a leghosszabb válaszjeladó tranzakció esetén is.

A maximális továbbítási gyakoriságot az esemény-vezérelt protokolra a válaszjeladónak másodpercenként kétszeri leadásra kell korlátozni. Ha egy közlemény kerül az eemény-vezérelt tárolóba bevitelre, és nem ehet továbbítani a leadási gyakoriság korlátozása miatt, akkor azt várakoztatni kell, és akkor leadni, amikor a leadási gyakoriság korlátozási állapot törlésre került. Ha egy új közlemény kerül vételre a továbbítás engedélyezése előtt, akkor a korábbi közleményt felül kell írni.

2. Megjegyzés. – A szkvitter leadási gyakoriság és a szkvitter sugárzási időtartam berendezés-függő. A minimális sebességet és a berendezés szükségleteinek megfelelő időtartamot kell választani.

2.5.5.2 *A GFM felhasználása az esemény-vezérelt protokolnál*

Egy ’berendezésnek’, amely az esemény-vezérelt protokolt választja, értesíenie kell a GFM-et a formátum típusáról és a megkívánt felújítási gyakoriságáról. A GFM-nek ezután meg kell határozni az ehhez a formátum típushoz szükséges bemenő adatokat, és meg kell kezdenie az adatok bevitelét a $0A_{16}$ számú tárolóba a megkívánt gyakorisággal. A GFM-nek be kell vinnie ezt a közleményt a tárolóba is ezért a formátum típusért. A tároló tükörképét fenn kell tartani azért, hogy lehetővé váljon ennek az információnak a levegő-föld vagy a levegő-levegő tároló szerinti kiolvasása. Amikor egy formátum típus sugárzása megszűnik, akkor a GFM-nek törölnie kell az erre a közleményre kijelölt megfelelő tárolót.

Az a maximális gyakoriság, amit az esemény-vezérelt protokol által alá kell támasztani, a másodpercenként kétszeri adás egy berendezésre vagy a berendezések egy csoportjára. Minden egyes esemény-vezérelt formátum típusra, amely kisugárzásra került, a GFM-nek meg kel őriznie a $0A_{16}$ számú tárolóba történő utolsó bevitel idejét. A következő bevitelt egy olyan tetszőleges elhelyezésű időközbe kell ütemezni, amelyet egyeztetésen kell elosztani a felfrissítési időközök sorozatában ±0,1 másodperccel (az idő kvantálást felhasználva 15 ms-nál nem nagyobb eltéréssel) az ezen formátum típusnak a $0A_{16}$ számú tárolóba való korábbi beviteléhez viszonyítva.

A GFM-nek ellenőrizni kell a betervezett bevitelek számát minden egyes másodperces időközben. Ha kettőnél több fordulna elő, akkor egy olyan késleltetést kell hozzáadni, ami annak a biztosításához szükséges, hogy a másodpercenként két közleményes határérték legyen észlelhető.

2.5.5.3 *Esemény-vezérelt elsőbbség*

Ha az esemény-vezérelt közlemény továbbítási gyakoriságát le kell csökkenteni abból a célból, hogy ne haladja meg a 2.5.5.2 pontban meghatározott maximális gyakoriságot, akkor a továbbítási elsőbbséget a következők szerint kell kijelölni:

1) Ha a kényszerhelyzeti/elsőbbségi állapot közlemény (2.3.8) aktív, akkor azt le kell adni a ’másodpercenként egyszer’-ként meghatározott gyakorisággal. A további aktív esemény-vezérelt közleményeket a fennmaradó kapacitásban egyenlő elsőbbséggel kell kijelölni.

2) Ha a kényszerhelyzeti/elsőbbségi állapot közlemény nem aktív, akkor a továbbítási elsőbbséget az összes aktív esemény-vezérelt közlemény között egyenlően kell kijelölni.

2.5.6 Az üzemmód mező bitek származtatása a légijármű szándék paraméterekből

A légijármű felépítésére vonatkozóan, ami nincs jelen az Általános formátumozó/kezelőben /GFM/ egy meghatározott állapot szónak (az üzemmód mező meghatározásokat tartalmazva a légijárművek szándék praméterekhez kapcsolódóan) a GFM-nek az állapotot az egyes megfelelő FCC állapot szavakból kell származtatni abból a célból, hogy a megfelelő biteket a 40_{16} számú tároló egyes üzemmód mezőiben beállítsa.

2.6 FÖLDRAJZI SZÉLESSÉG/HOSSZÚSÁG KÓDOLÁS A KOMPAKT HELYZET JELENTÉS (CPR) FELHASZNÁLÁSÁVAL

2.6.1 A CPR algoritmus alapelve

Az S-módú kiterjesztett szkvitterek a kompakt helyzet jelentés (CPR) használják fel a földrajzi szélesség/hosszúságnak a közleményekbe történő hatékony kódolásához.

Megjegyzések. –

1. A létrejövő közlemények abban az értelemben kompaktak, hogy több magasabb rendű bitjük, amelyek általában hosszabb időtartamon keresztül állandóak, nem kerülnek minden közleményben továbbításra. Például a földrajzi szélesség egy közvetlen bináris adat-feltűntetésében egy bit fogja kijelölni azt, hogy a légijármű az északi vagy déli féltekén van-e. Ez a bit hosszú időn keresztül állandó marad, lehetséges, hogy a légijármű teljes élettartama során. Ennek a bitnek a helyzet közleményben történő ismételt sugárzása szakszerűtlen lenne.

2. Mivel a magasabb rendű bitek nem kerülnek továbbításra, ebből következik, hogy a föld több kettőzött helyén ugyanaz a kódolt helyzet jön létre. Amikor csak egy egyedüli helyzet jelentés került vételre, a dekódolás magával hozná azt a kétértelműséget, hogy a kettőzött megoldásból melyik az, amelyeik a *légijármű pontos helyzete. A CPR technika magába foglalja azt az előírást, hogy egy vevő rendszer számára lehetővé kell tenni a légijrámű helyzetének egyértelmű meghatározását. Ez a kódolás két fajta módjával került megoldásra, ami kis mértékben eltér egymástól. A két formátumot páros-formátumnak és páratlan-formátumnak nevezik, és mindegyik az idő 50 százalékában kerül sugárzára. A két típus vételekor egy rövid időn belül (körülbelül 10 másodperc) a vevő rendszer egyértelműen meg tudja határozni a légijármű helyzetét.*

3. Miután ez a feldolgozási folyamat végrehajtásra került, a magasabb rendű bitek a vevő állomás részére ismertté válnak, így az azt követő egyedüli közlemények vétele szolgál a légijármű helyzetének egyértelmű jelzésére, ahogy az mozog.

4. Bizonyos speciális esetekben, az egy egyedüli vételt is lehet pontos helyzetként dekódolni a páros/páratlan pár nélkül. Ez a dekódolás azon a tényen alapszik, hogy a kettőzött helyek legkevesebb 360 tmf-re vannak egymástól. A pontos helyzetekhez kiegészítően, a másik helyek a 360 tmf egészszámú többszörösei távolságban vannak északra és délre, és ugyancsak a 360 tmf-es egészszámú töbszörösei távolságra keletre és nyugatra. Egy speciális esetben, amelyben ismert az, hogy a vétel a 180 tmf-es távolságon túlról lehetetlen, a legközelebbi megoldás a légijármű pontos helyzete.

5. Az előző pontban lévő paraméter értékek (360 és 180 tmf) a légijármű fedélzeti CPR kódolásra alkalmazottak. A földfelszínen lévő légijárműveknél a CPR paraméterek egy 4-es tényezővel kisebbek. Ez a kódolás jobb felbontást eredményez, de csökkenti a kettőzött megoldások térközét.

2.6.2 A kompakt helyzet jelentés /CPR/ algoritmus paraméterei és belső funkciók

A CPR algoritmusnak a következő paramétereket kell felhasználni, amely értékek az S-módú kiterjesztett szkvitter alkalmazásokra a következők szerint vannak beállítva:

a) A helyzet koordináták kódolásához felhasznált bitek száma, *Nb*, a következők szerint van beállítva:

A repülési helyzet kódolására: $Nb = 17$

A földfelszíni helyzet kódolására: $Nb = 19$

A TCP, TCP+1 kódolására: $Nb = 14$

1. Megjegyzés. – Az Nb *paraméter meghatározza a kódolt helyzet pontosságát (körülbelül 5 m a repülési kódolásra; 1,25 m a felszíni kódolásra és 41 m a TCP, TCP+1 kódolásra).*

b) A földrajzi szélességi zónák kódolására az egyenlítő és a sark között, *NZ*-vel jelezve, 15-re van beállítva.

2. Megjegyzés. – Az NZ *paraméter meghatározza az egyértelmű repülési távolság értéket a dekódolásra (360 tmf). A földfelszíni földrajzi szélesség/hosszúság kódolás elhagyja a 2. magasabb rendű bitet a 19-bites CPR kódolásból, így a földfelszíni helyzet jelentésekre a tényleges egyértelmű távolság 90 tmf.*

A CPR algoritmusnak meg kell határoznia a kódolási és a dekódolási feldolgozáshoz használatos belső funkciókat.

c) A **lefelé kerekítés** (x) jelölési mód jelzi az *x* lefelé kerekítését, ami úgy van meghatározva, a *k* értékének legnagyobb egészszámú értéke úgy, mint $k \leq x$.

3. Megjegyzés. – Például a ***lefelé kerekítés*** *(3,8) = 3, míg a* ***lefelé kerekítés*** *(-3,8) = -4.*

d) Az $|x|$ jelölés az x abszolút értékét jelzi, ami úgy van meghatározva, hogy az x értéke akkor, amikor $x \geq 0$ és a $-x$ értéke, amikor $x < 0$.

e) A **MOD**(x, y) jelölés a modulus funkciót jelzi, ami az értékhez való visszatérés meghatározása.

$$\mathrm{MOD}(x, y) = x - y \cdot \left(\frac{x}{y}\right), \quad \text{ahol } y \neq 0.$$

4. Megjegyzés. – Az y *értéke a következő CPR algoritmusok-ban mindig pozitív. Amikor az* x *nem-negatív, akkor a* ***MOD***(x, y) *egyenlő az* x *osztva* y *maradékával. Amikor az* x *egy negatív szöget képvisel, akkor a* ***MOD***(x, y) *kiszámításának egy alternatív módja a visszatérés az* (x+360°) *maradékának az* y*-al való osztására.*

Például, MOD(–40°, 6°) = MOD(320°, 6°) = 2°.

f) Az **NL**(x) jelölés az x földrajzi szélesség szög „a földrajzi hosszúsági zónáinak száma" funkciót jelzi. Az érték az **NL**(x)-el visszaszármaztatva az 1-től az 59-ig tartó tartományba kerül visszakorlátozásra. Az **NL**(x)-et a legtöbb földrajzi szélességre az egyenlítő határozza meg,

$$\mathrm{NL}(lat) = \text{lefele kerekítés} \left(2\pi \cdot \left[\arccos \left(\frac{1 - \cos\left(\frac{\pi}{2 \cdot NZ}\right)}{\cos^2\left(\frac{\pi}{180^\circ} \cdot |lat|\right)} \right) \right]^{-1} \right),$$

ahol a *lat* jelöli a földrajzi szélesség változót fokokban. Azokra a földrajzi szélességekre, amelyek az N /északi/ vagy S /déli/ pólusokon, vagy azok közelében vannak, ahol a fenti képlet vagy meghatározatlan, vagy **NL** (*lat*) = 0-t eredményez, az NL( ) által visszaszármaztatott értéknek 1-nek kell lenni.

Hasonlóképpen, az egyenlítőnél, ahol a fenti képlet NL(*lat*) = 60-t eredményezhet, az értékek az NL( ) funkció által visszaszármaztatottan 59 kell, hogy legyen.

5. Megjegyzés. – Ez az egyenlet az NL( )-re a valós idejű végrehajtásra gyakorlatilag lehetetlen. Az átmeneti földrajzi szélességekre egy táblázatot lehet kiszámítani, az alábbi egyenlet felhasználásával:

$$lat = \frac{180^\circ}{\pi} \cdot \arccos \left(\sqrt{\frac{1 - \cos\left(\frac{\pi}{2 \cdot NZ}\right)}{1 - \cos\left(\frac{2\pi}{NL}\right)}} \right), \quad NL\text{-re} = 2\text{-től } 4\text{-ig} \cdot NZ - 1,$$

és a táblázatból történő kikeresés eljárását alkalmazni az NL( ) értékének visszaszármaztatására. A táblázat értéke NL-re = 1 az 90 fok.

2.6.3 A CPR kódolási folyamat

A CPR kódolási folyamatban ki kell számolni az XZ_i *és* YZ_i kódolt helyzet értékeit mind a levegőben lévő, mind a földön lévő légijárművekre, vagy a TCP, TCP+1 földrajzi szélességi és hosszúsági mezőket a globális helyzet *lat* (földrajzi szélesség fokokban), *lon* (földrajzi hosszúság fokokban) értékekből, és a CPR kódolási típusát i (0 a páros formátumra és 1 a páratlan formátumra) a következő sorrendű számítások végrehajtásával. A CPR-nek a TCP, TCP+1 kódolásánál mindig a páros formátumot (i = 0) kell alkalmazni, ellenben azzal, hogy a repülési és a földfelszíni kódolásnál mindkettőt használni kell, a páros (i= 0) és a páratlan (i = 1) formátumot is.

a) Δlat_i (a földrajzi szélesség zóna mérete az Észak-Dél /N-S/ irányban) a következő egyenletből kerül kiszámításra:

$$\Delta lat_i = \frac{360^{\circ}}{4 \cdot NZ - i}$$

az YZ_i (az Y-koordináta a Zonán belül) ezután a Δlat_i-ből és a *lat*-ból kerül kiszámításra a különálló egyenletek felhasználásával:

A repülési kódolásra:

$$YZ_i = \text{lefele kerekítés}\left(2^{17} \cdot \frac{\mathrm{MOD}\left(lat, \Delta lat_i\right)}{\Delta lat_i} + \frac{1}{2}\right)$$

A földfelszíni kódolásra:

$$YZ_i = \text{lefele kerekítés}\left(2^{19} \cdot \frac{\mathrm{MOD}\left(lat, \Delta lat_i\right)}{\Delta lat_i} + \frac{1}{2}\right)$$

A TCP, TCP+1 kódolásra:

$$YZ_0 = \text{lefele kerekítés}\left(2^{14} \cdot \frac{\mathrm{MOD}\left(lat, \Delta lat_0\right)}{\Delta lat_i} + \frac{1}{2}\right)$$

b) $Rlat_i$ (a földrajzi szélesség, ahogy azt a vevő Automatikus berendezés-függő légtérellenőrző rendszer /ADS-B/ ki fogja emelni a sugárzott közleményből) ezután a *lat,* YZ_i és a Δlat_i-ből kerül kiszámításra a különálló egyenletek alkalmazásával:

A repülési kódolásra:

$$Rlat_i = \Delta lat_i \cdot \left(\frac{YZ_i}{2^{17}} + \text{lefele kerekítés}\left(\frac{lat}{\Delta lat_i}\right)\right)$$

A földfelszíni kódolásra:

$$Rlat_i = \Delta lat_i \cdot \left(\frac{YZ_i}{2^{19}} + \text{lefele kerekítés}\left(\frac{lat}{\Delta lat_i}\right)\right)$$

A TCP, TCP+1 kódolásra:

$$Rlat_0 = \Delta lat_0 \cdot \left(\frac{YZ_i}{2^{14}} + \text{lefele kerekítés}\left(\frac{lat}{\Delta lat_0}\right)\right)$$

c) Δlon_i (a földrajzi hosszúság zóna mérete a kelet-nyugati /E-W/ irányban az $Rlat_i$-ből kerül kiszámításra az egyenlet alkalmazásával:

$$\Delta lon_i = \begin{cases} \dfrac{360^{\circ}}{NL(Rlat_i) - i}, & \text{ahol } NL\left(Rlat_i\right) - i > 0 \\ 360^{\circ}, & \text{ahol } NL\left(Rlat_i\right) - i = 0 \end{cases}$$

d) az XZ_i (az X-koordináta a Zonán belül) ezután kerül kiszámításra *lon* és a Δlon_i-ből a különálló egyenletek alkalmazásával:

A repülési kódolásra:

$$XZ_i = \text{lefele kerekítés}\left(2^{17} \cdot \frac{\text{MOD}(\text{lon}, \Delta\text{lon}_i)}{\Delta\text{lon}_i} + \frac{1}{2}\right)$$

A földfelszíni kódolásra:

$$XZ_i = \text{lefele kerekítés}\left(2^{19} \cdot \frac{\text{MOD}(\text{lon}, \Delta\text{lon}_i)}{\Delta\text{lon}_i} + \frac{1}{2}\right)$$

A TCP, TCP+1 kódolásra:

$$XZ_0 = \text{lefele kerekítés}\left(2^{14} \cdot \frac{\text{MOD}(\text{lon}, \Delta\text{lon}_0)}{\Delta\text{lon}_0} + \frac{1}{2}\right)$$

e) Végül, az XZ_i és az YZ_i értékeinek korlátozása ahhoz, hogy beilleszkedjenek a 17 bites vagy 14 bites az egyes koordinátákra kiosztott mezőkbe:

A repülési kódolásra: $YZ_i = \text{MOD}(YZ_i, 2^{17})$,
$XZ_i = \text{MOD}(XZ_i, 2^{17})$

A földfelszíni kódolásra: $YZ_i = \text{MOD}(YZ_i, 2^{17})$,
$XZ_i = \text{MOD}(XZ_i, 2^{17})$

A TCP, TCP+1 kódolásra: $YZ_0 = \text{MOD}(YZ_0, 2^{14})$,
$XZ_0 = \text{MOD}(XZ_0, 2^{14})$

2.6.4 A helyileg egyértelmű CPR dekódolás

A CPR algoritmusnak úgy kell dekódolnia a földrajzi helyzetet (földrajzi szélesség, $Rlat_i$ és földrajzi hosszúság, $Rlon_i$), hogy az az ismert referencia ponthoz (lat_s, lon_s) viszonyítva helyileg egyértelmű legyen a tényleges repülési helyzetre 180 tmf-ön belül (vagy 45 tmf-ön belül a földfelszíni közleményre).

Megjegyzés. – A referencia pont lehet egy olyan korábban átrepült helyzet, amelyet a globális dekódolás (lásd 2.6.7) megerősített, vagy lehet egy saját-repülőgép helyzet, amit fel lehet használni egy új tervezet helyzet jelentés dekódolásához.

A kódolt helyzet koordinátákat – XZ_i és YZ_i –, valamint a CPR kódolási típust, *i* (0 a páros kódolásra és 1 a páratlan kódolásra), amelyet az S-módú kiterjesztett szkvitter közlemény foglal magába a 2.6.5 pontban a repülési és a TCP, TCP+1 formátum típusra megadott, és a 2.6.6 pontban a földfelszíni formátum típusban megadott számításokkal, azok sorrendje szerint végrehajtva kell dekódolni.

2.6.5 A repülési közlemények és a TCP, TCP+1 közlemények számításai

Az alábbi számításokat kell elvégezni ahhoz, hogy a dekódolt földrajzi szélességet/hosszúságot a repülési helyzetre és hogy a TCP, TCP+1 közlemény formátumokat megkapják. A TCP, TCP+1 formátumra az *i*-t mindig 0-ra kell állítani (páros kódolás), jóllehet, a repülési formátumnál mindkettőt, a páros (i=0) és a páratlan (i=1) kódolást alkalmazni kell. A repülési formátumnál az *Nb*-nek 17-el kell egyenlőnek lenni, és a TCP, TCP+1 formátumnál az *Nb* 14-el egyenlő.

a) Δlat_i a következő egyenletből kerül kiszámításra:

$$\Delta lat_i = \frac{360^{\circ}}{4 \cdot NZ - i}$$

b) A földrajzi szélesség zóna index száma, a j, kerül ezután kiszámításra a lat_s, Δlat_i és az YZ_i értékekből az egyenlet felhasználásával:

$$j = \text{lefele kerekítés}\left(\frac{lat_s}{\Delta lat_i}\right) + \text{lefele kerekítés}\left(\frac{1}{2} + \frac{MOD(lat_s, \Delta lat_i)}{\Delta lat_i} - \frac{YZ_i}{2^{Nb}}\right)$$

c) A dekódolt helyzet földrajzi szélesség, az $Rlat_i$, kerül ezután kiszámításra a j, a Δlat_i és az YZ_i értékeiből az egyenlet alkalmazásával:

$$Rlat_i = \Delta lat_i \cdot \left(j + \frac{YZ_i}{2^{Nb}}\right)$$

d) A Δlon_i (a földrajzi hosszúság zóna mérete a kelet-nyugati /E-W/ irányban) az $Rlat_i$-ből van kiszámítva, az egyenlet felhasználásával:

$$\Delta lon_i = \begin{cases} \dfrac{360^{\circ}}{NL(Rlat_i) - i}, & \text{ahol} \quad NL(Rlat_i) - i > 0 \\ 360^{\circ}, & \text{ahol} \quad NL(Rlat_i) - i = 0 \end{cases}$$

e) Ezután a földrajzi hosszúsági zóna koordinátája kerül kiszámításra a lon_s, Δlon_i és az XZ_i értékekből, az egyenletet alkalmazva:

$$m = \text{lefele kerekítés}\left(\frac{lon_s}{\Delta lon_i}\right) + \text{lefele kerekítés}\left(\frac{1}{2} + \frac{MOD(lon_s, \Delta lon_i)}{\Delta lon_i} - \frac{YZ_i}{2^{Nb}}\right)$$

f) A dekódolt helyzet földrajzi hosszúság, az $Rlon_i$, kerül ezután kiszámításra az m, XZ_i és a Δlon_i értékeiből, az egyenlet felhasználásával:

$$Rlon_i = \Delta lon_i \cdot \left(m + \frac{YZ_i}{2^{Nb}}\right)$$

2.6.6 A földfelszíni közlemények számítása

A földfelszíni helyzet formátum dekódolt földrajzi szélességének és hosszúságának megkapásához a következő számításokat kell elvégezni.

a) A Δlat_i az alábbi egyenletből kerül kiszámításra:

$$\Delta lat_i = \frac{90^{\circ}}{4 \cdot NZ - i}$$

b) A földrajzi szélesség zóna indexe, a j, eztán a lat_s, Δlat_i és az YZ_i értékekből kerül kiszámításra, az egyenletet használva:

$$j = \text{lefele kerekítés}\left(\frac{lat_s}{\Delta lat_i}\right) + \text{lefele kerekítés}\left(\frac{1}{2} + \frac{MOD(lat_s, \Delta lat_i)}{\Delta lat_i} - \frac{YZ}{2^{17}}\right)$$

c) A dekódolt helyzet földrajzi szélesség, az $Rlat_i$ ezután a j, Δlat_i és az YZ_i értékekből kerül kiszámításra, az egyenletet használva:

$$Rlat_i = \Delta lat_i \cdot \left(j + \frac{YZ}{2^{17}}\right)$$

d) Δlon_i (a földrajzi hosszúság zóna mérete a kelet-nyugati /E-W/ irányban) az $Rlat_i$–ből kerül – az egyenlet alkalmazásával – kiszámításra:

$$\Delta lon_i = \begin{cases} \dfrac{90^\circ}{NL(Rlat_i) - i}, & \text{ahol } NL(Rlat_i) - i > 0 \\ 90^\circ, & \text{ahol } NL(Rlat_i) - i = 0 \end{cases}$$

e) A földrajzi hosszúság zóna koordináta, az m, ezután a lon_s, Δlon_i és az XZ_i értékekből kerül kiszámításra ,az egyenletet felhasználva:

$$m = \text{lefele kerekítés}\left(\frac{lon_s}{\Delta lon_i}\right) + \text{lefele kerekítés}\left(\frac{1}{2} + \frac{MOD(lon_s, \Delta lon_i)}{\Delta lon_i} - \frac{YZ_i}{2^{17}}\right)$$

f) A dekódolt helyzet földrajzi hosszúság, az $Rlon_i$, az m, XZ_i és a Δlon_i értékeiből kerül kiszámításra, az egyenletet felhasználva:

$$Rlon_i = \Delta lon_i \cdot \left(m + \frac{YZ_i}{2^{Nb}}\right)$$

2.6.7 Globálisan egyértelmű repülési helyzet dekódolás

A CPR algoritmusnak fel kell használnia egy repülési-kódolású „**páros**” formátum vételét (az XZ_0, YZ_0-ként jelöltet) egy repülési-kódolású „**páratlan**” formátum vételével (az XZ_1, YZ_1-ként jelölttel) együtt a globális földrajzi helyzet földrajzi szélesség, az *Rlat* és földrajzi hosszúság, az *Rlon* regenerálásához. A „**páros**” és a „**páratlan**” formátumú kódolt helyzet jelentés közötti idő nem lehet 10 másodpercnél hosszabb.

1. Megjegyzés. – Ezt az algoritmust fel lehet használni a légijármű globális egyértelmű helyzet jelentéseinek megkapásához az olyan, a földi érzékelők hatósugarán kívül lévő légijárműre is, amelynek a helyzet jelentései műholdas adat-kapcsolaton keresztül jönnek. Még annak a biztosítására is felhasználható, hogy a helyi helyzetek pontosan legyenek dekódolva a vevő érzékelőtől nagy távolságban is.

2. Megjegyzés. – A 10 másodperces idő különbség határérték a páros- és páratlan-formátumú helyzet jelentésekre a 3 tmf-es maximális megengedett elkülönítésből került meghatározásra. A 3 tmf-nél nagyobb távolságú helyzeteket nem lehet felhasználni egy egyértelmű globális helyzet megoldáshoz. Egy olyan légijármű, amely képes az 1 850 km/h

(1 000 csomó) sebességre, körülbelül 5,1 km-t (2,8 tmf) fog 10 másodperc alatt repülni. Ennek megfelelően a CPR algoritmus képes lesz arra, hogy egyértelműen dekódolja a helyzetet, a helyzet jelentések közötti 10 másodperces késéssel.

Adott a 17-bites repülési helyzet a „**páros**” formátumban (XZ_0, YZ_0) kódolva és a másik, a „**páratlan**” formátumban (XZ_1, YZ_1) kódolva, és 10 másodpercnél (= 3 tmf) nem több idővel elválasztva egymástól, a CPR algoritmusnak kell regenerálnia a földrajzi helyzetet a kódolt helyzet jelentésekből, a következő lépések szerint végrehajtva:

a) A Δlat_0 és a Δlat_1 kiszámítása az egyenletből:

$$\Delta lat_i = \frac{360^{\circ}}{4 \cdot NZ - i}$$

b) A földrajzi szélesség index kiszámítása:

$$j = \text{lefele kerekítés}\left(\frac{59 \cdot YZ_0 - 60 \cdot YZ_1}{2^{17}} + \frac{1}{2}\right)$$

c) Az $Rlat_0$ és az $Rlat_1$ értékeinek kiszámítása a következő egyenlettel:

$$Rlat_i = \Delta lat_i \cdot \left(\text{MOD}\,(j, 60 - i) + \frac{YZ_i}{2^{17}}\right)$$

A déli féltekén az $Rlat_i$ értékei a 270°-tól a 360°-ig terjedő tartományba esnek. Vonjanak le 360°-ot azokból az értékekből és az így kapott $Rlat_i$ visszaállítása a –90°-tól a +90°-ig terjedő tartományba esnek.

d) Ha az **NL**($Rlat_0$) /NL: a földrajzi hosszúsági zónák száma/ nem egyenlő az **NL**($Rlat_1$)-el, akkor a két helyzet eltér az átmeneti földrajzi szélességtől, ennek következtében a megoldás a globális földrajzi hosszúságra nem lehetséges. Várjanak arra a helyzetre, ahol ezek egyenlőek lesznek.

e) Ha az **NL**($Rlat_0$) egyenlő az **NL**($Rlat_1$)-el, akkor folytassák a Δlon_i kiszámítását, attól függően, hogy vajon a legutóbbi repülési helyzet közlemény a páros formátumban (i = 0) vagy a páratlan formátumban (i = 1) volt kódolva:

$$\Delta lon_i = \frac{360^{\circ}}{n_i}$$

ahol n_i = nagyobb, mint [NL($Rlat_i$) – i] és 1.

f) Az m, a földrajzi hosszúság index kiszámítása:

$$m = \text{lefele kerekítés}\left(\frac{XZ_0 \cdot (NL - 1) - XZ_1 \cdot NL}{2^{17}} + \frac{1}{2}\right),$$

ahol NL = NL ($Rlat_i$).

g) Az $Rlon_0$ vagy $Rlon_1$ globális földrajzi hosszúság kiszámítása, attól függően, hogy vajon a legutóbbi repülési helyzet közlemény a páros formátumban (i = 0) vagy a páratlan formátumban (i = 1) volt kódolva:

$$Rlon_i = \Delta lon_i \cdot \left(\text{MOD}\,(m, n_i) + \frac{YZ_i}{2^{17}}\right),$$

ahol n_i = nagyobb, mint [NL($Rlat_i$) – i] és 1.

2.6.8 A vett helyzet jelentések CPR dekódolása

2.6.8.1 *Összefoglalás*

Az előző pontokban leírt technikákat (helyi és globális egyértelmű dekódolás) kell együttesen felhasználni a repülési, földfelszíni és TCP vagy TCP+1 helyzet jelentésekben lévő földrajzi szélesség/hosszúság dekódolására. A feldolgozást a globális egyértelmű dekódolással kell kezdeni, ezt egy páros és egy páratlan kódolású szkvitter vételére alapozva. Miután a globális egyértelmű helyzet meghatározásra került, a két megközelítés valamelyikét kell felhasználni a következő, az egy egyedüli helyzet jelentés – akár páros, akár páratlan kódolású – dekódolásának alátámasztására. A két technika a távolság ellenőrzés és a jeladó központú helyi dekódolás.

2.6.8.2 *Távolság ellenőrző helyi dekódolás*

2.6.8.2.1 *A távolság ellenőrző technika*

Ebben a megközelítésben, a repülési formátum (2.6.4) helyi dekódolását a vevő tényleges helyzetére alapozva kell elvégezni. Ennek biztosítania kell azt, hogy az adat-sugárzó légijármű egyértelmű helyzete plusz vagy mínusz 180 tmf legyen.

1. Megjegyzés. – Ha az adat-sugárzó légijármű 180 tmf-ön belül van, akkor a helyi dekódolási technika pontosan fogja a légijármű helyzetet dekódolni.

Az adat-sugárzó légijármű távolságát a befogáskor ellenőrizni kell, és a nyomkövetést csak akkor kell megkezdeni, ha a távolság 180 tmf-nél kevesebb. Miután a nyomkövetés megkezdődött, a követett légijármű távolságot minden egyes felfrissítésnél ellenőrizni kell, és a nyomkövetést meg kell szakítani, ha a távolság a 180 tmf-el azonos, vagy annál nagyobb lesz.

A földfelszíni formátumra ugyanezt az eljárást kell alkalmazni, kivéve azt, hogy az adat-sugárzó légijávműnek 45 tmf-ön belül kell lenni a befogásnál és a nyomkövetésben.

2. Megjegyzés. – A távolság határérték lecsökkentésre került, mivel a földfelszíni helyzet jelentésekre a bizonytalansági határérték az egynegyede annak, mint ami a repülési helyzetre vonatkozik.

2.6.8.2.2 *Távolság ellenőrzési példa*

2.6.8.2.2.1 A repülési helyzet dekódolása

2.6.8.2.2.1.1 *Befogás.* A befogásnál egy globális egyértelmű dekódolást kell végrehajtani. Ha a távolság 160 tmf-nél nagyobb, akkor a befogási kísérletet abba kell hagyni, és a következő információt érvényteleníteni kell. A befogást akkor kell meggondolni, ha a szkvitterek vétele folytatódik. Ha a globálisan dekódolt távolság 160 tmf-nél nagyobb marad, akkor a nyomkövetési információ érvénytelenítését folytatni kell.

Megjegyzés. – Ha a légijármű közeledik, akkor a befogás akkor következik be, amikor a távolság 160 tmf-el egyenlő, vagy annál kisebbre csökken.

2.6.8.2.2.1.2 *Nyomkövetés ellenőrzés.* A befogás után a távolságot minden egyes légtér-ellenőrzési felújítás során ellenőrizni kell. Ha a távolság 170 tmf-nél nagyobb, akkor a nyomkövetést abba kell hagyni.

Megjegyzés. – Az alkalmazott távolság a 160 tmf a befogásra és a 170 tmf a nyomkövetés abbahagyására, egy hiszterézist biztosít annak elkerüléséhez, hogy egy nyomkövetésben újra-befogás jöjjön létre arról a légijárműről, amelynek a nyomkövetése a nagy távolság miatt éppen befejeződött.

Így egy 170 tmf-nél történt nyomkövetés abbahagyás nem kerül újra-befogásra, csak ha a távolsága 160 tmf-re vagy annál kisebb távolságra lecsökken.

2.6.8.2.2.2 *A földfelszíni helyzet dekódolása.* A távolság ellenőrző technika alkalmazásánál a földfelszíni formátumú szkvitterek dekódolására ugyanazt a folyamatot kell felhasználni, ami a fentiekben leírásra került, kivéve azt, hogy a nyomkövetést a 40 tmf-nél kell megkezdeni, és a 42,5 tmf-nél abbahagyni.

2.6.8.2.3 *Jeladó központú helyi dekódolás*

Ennél a megközelítésnél, a jeladó legfrissebb helyzetet kell felhasználni a helyi dekódolás alapjaként.

Megjegyzés. – Ez az eljárás egy egyértelmű dekódolás minden egyes felfrissítésre, mivel az adat-továbbító légijármű nem tud 360 tmf-nél nagyobb távolságot megtenni a helyzet felfrissítések között.

2.6.8.2.4 *A technika alkalmazása*

A távolság ellenőrző technikát csak a 180 tmf-el egyenlő vagy annál kisebb távolságokra lehet használni, például a levegő-levegő alkalmazásokra. A földi állomásokra (azaz a nem a légijárművek fedélzetén elhelyezett berendezésekre), amelyeknél szükséges az, hogy a 180 tmf-et meghaladó távolságokra is működjenek, csak a jeladó központú technika lehet az alkalmazható.

Megjegyzés. – A jeladó központú technikát alkalmazni lehet mind a légijármű fedélzeti vevőkre, mind a földi
állomásokra.

A 2. RÉSZ TÁBLÁZATAI

A táblázatok 2-X-ként kerültek számozásra, ahol az „X” a B-adatátvitel kiválasztó /BDS/ kód decimális megfelelője és az Y,Z – ahol az Y a BDS1 kódot és a Z a BDS2 kódot jelöli – amelyek az egy meghatározott tárolóban lévő adat formátumhoz való hozzáférés biztosítják. A következő táblázatok nem kerültek a felsorolásba:

2-1
2-2-től 2-4-ig (A Kapcsolt B-adatátvitel protokolhoz használatos)
2-13-tól 2-14-ig (A levegő-levegő állapot információ részére fenntartott)
2-15 (Az összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ részére fenntartva)
2-17-től 2-22-ig
2-35 (Az antenna helyzet részére fenntartva)
2-36 (A légijármű paraméterek részére fenntartva)
2-38-tól 2-47-ig
2-49-től 2-63-ig
2-70-től 2-71-ig
2-73-tól 2-79-ig
2-87-től 2-94-ig
2-102-től 2-111-ig (A kiterjesztett szkvitter részére fenntartva)
2-112-től 2-224-ig
2-225-től 2-226-ig (Az S-mód bájt részére fenntartva)
2-227-től 2-240-ig
2-243-tól 2-255-ig

(Az itt következő táblázatok B-közlemény mező baloldali oszlopában az oktettek száma közötti hiányzó vagy felesleges vonalakat, illetve a mellette lévő - a táblázatnak a mezők tartalmi részét ismertető részeit elválasztó vonalakat, azaz a rossz helyre behúzott felesleges, illetve a hiányzó vonalakat a Folio programban nem lehetett javítani. (Folio szerint "A cella-határt nem lehet kitörölni"). Ezért a táblázatok alján megadom ezeket a hibákat.)

2-5. táblázat: B-adatátvitel kiválasztó /BDS/ kód 0,5 — Kiterjesztett szkvitter repülési helyzet

B-közlemény mező

Bit	Mező
1	
2	FORMÁTUM TÍPUS KÓD
3	(2.3.1-ben meghatározva)
4	
5	
6	LÉGTÉR-ELLENŐRZŐ ÁLLAPOT
7	(2.3.2.6-ban meghatározva)
8	EGYETLEN ANTENNA JELZÉS (SAF) (2.3.2.5-ben meghaározva)
9	
10	
11	
12	MAGASSÁG (a formátum típus kód által meghatározva)
13	
14	
15	
16	
17	Ez (1) a magasság kód (AC), ahogy az az
18	Annex 10 IV. Kötete 3.1.2.6.5.4 pontjában Meg van határozva, de az eltávolított M-bit-
19	tel, vagy (2) a GNSS magasság (HAE).
20	
21	IDŐ (T) (a 2.3.2.2-ben meghatározva)
22	Kompakt helyzet jelentés /CPR/ formátum (F) (a 2.3.2.1-ben meghatározva)
23	MSB /legmagasabb helyiértékű bit/
24	
25	
26	
27	
28	

CÉL: Pontos repülési helyzet információ biztosítása

A légtér-ellenőrző állapotot a következők szerint kell kódolni:

0 = Nincs állapot információ
1 = Állandó riasztás (kényszerhelyzeti állapot)
2 = Ideiglenes riasztás (az A-módú azonosító kódnak a kényszerhelyzeti állapottól eltérőre való átváltása)
3 = Speciális helyzet azonosítás /SPI/ állapot

Az 1. és 2. kódnak elsőbbséget kell kapnia a 3. kóddal szemben.

Amikor a vízszintes helyzet információ nem áll rendelkezésre, de magasság információ van, akkor a repülési helyzet közleményt kell leadni olyan formátum típus kóddal, amelynek az 1-5 bitje és a barometrikus nyomás szerinti magassága a 9-től a 20-ig terjedő bitekben nulla. Ha sem a vízszintes helyzet, sem a barometrikus magasság információ nem áll rendelkezésre, akkor a BDS 0,5-nek mind az 56 bitjét nullára kell állítani. A nulla formátum típus kód mezőnek kell jeleznie azt, hogy a földrajzi szélesség és hosszúság információ nem áll rendelkezésre, míg a nulla magasság mezőnek kell jeleznie azt, hogy a magasság információ nem áll rendelkezésre.

2-5. táblázat folytatása:

29	KÓDOLT FÖLDRAJZI SZÉLESSÉG
30	(CPR repülési formátum a 2.6.1-től a 2.6.5-ig terjedő pontokban meghatározva)
31	
32	
33	
34	
35	
36	
37	
38	
39	LSB /legkisebb helyiértékű bit/
40	MSB /legmagasabb helyiértékű bit/
41	
42	
43	
44	
45	
46	KÓDOLT FÖLDRAJZI HOSSZÚSÁG
47	(CPR repülési formátum a 2.6.1-től a 2.6.5-ig terjedő pontokban meghatározva)
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB /legkisebb helyiértékű bit/

2-6. táblázat: BDS kód 0,6 — Kiterjesztett szkvitter földfelszíni helyzet

B-közlemény mező

1	
2	FORMÁTUM TÍPUS KÓD
3	(2.3.1-ben meghatározva)
4	
5	
6	
7	
8	
9	MOZGÁS
10	(a 2.3.3.1-ben meghatározva)
11	
12	
13	A földi nyomkövetés ÁLLAPOTA: 0 = érvénytelen, 1 = érvényes
14	MSB = 180
15	
16	(a 2.3.3.2-ben meghatározva)
17	FÖLDI NYOMKÖVETÉSI IRÁNY (FÖLDRAJZI)
18	
19	
20	LSB = 360/128
21	IDŐ (T) (a 2.3.2.2-ben meghatározva)
22	Kompakt helyzet jelentés /CPR/ formátum (F) (a 2.3.2.1-ben meghatározva)
23	MSB /legmagasabb helyiértékű bit/
24	
25	
26	
27	
28	

CÉL: Pontos földfelszíni helyzet információ biztosítása

2-6. táblázat folytatása:

29	KÓDOLT FÖLDRAJZI SZÉLESSÉG 17 bit
30	(CPR repülési formátum a 2.6.1-től a 2.6.4-ig terjedő és a 2.6.6 pontokban meghatározva)
31	
32	
33	
34	
35	
36	
37	
38	
39	LSB /legkisebb helyiértékű bit/
40	MSB /legmagasabb helyiértékű bit/
41	
42	
43	
44	
45	
46	KÓDOLT FÖLDRAJZI HOSSZÚSÁG 17 bit
47	(a 2.6.1-től a 2.6.4-ig terjedő pontokban és a 2.6.6 pontban meghatározva)
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB /legkisebb helyiértékű bit/

2-7. táblázat: BDS kód 0,7 — Kiterjesztett szkvitter állapot

B-közlemény mező

1	ÁTVITELI SEBESSÉG
2	RÉSZMEZŐ (TRS)
3	MAGASSÁG TÍPUS RÉSZMEZŐ (ATS)
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	FENNTARTOTT
31	

CÉL: Információ biztosítása a válaszjeladó kiterjesztett szkvitter átviteli sebesség állapotáról és teljesítőképességéről.

Az átviteli sebesség részmezőt (TRS) a következők szerint kell kódolni:

0 = Nincs lehetőség a földfelszíni szkvitter átviteli sebesség meghatározására
1 = A magas földfelszíni szkvitter átviteli sebesség van kiválasztva
2 = Az alacsony földfelszíni szkvitter átviteli sebesség van kiválasztva
3 = Fenntartott

A magasság típus részmezőt (ATS) a következők szerint kell kódolni:

0 = Barometrikus magasság
1 = GNSS magasság (HAE)

A földfelszíni szkvitter átviteli sebesség légijármű általi meghatározása:

Azoknak a légijárműveknek, amelyek rendelkeznek azzal a képességgel, hogy automatikusan meghatározzák a földfelszíni szkvitter átviteli sebességüket, a használatos módszernek ahhoz, hogy a magas- és alacsony átviteli sebesség között a rendszer átkapcsoljon, a következőnek kell lenni:

a) Átkapcsolás a magasról az alacsony átviteli sebességre: A légijárműnek akkor kell a magas átviteli sebességről az alacsonyra átkapcsolni, amikor a fedélzeti navigációs berendezés jelzi azt, hogy a légijármű helyzete nem változott 10 méternél többel a 30 másodperces mintavételi időközben. A szkvitter átviteli sebesség vezérlő algorit-

./.

2-7. táblázat folytatása:

32		a) Folytatás: musának meg kell őriznie a légijármű azon pillanatnyi helyzetét, amikor az alacsony sebesség kiválasztásra került.
33		
34		
35		b) Átkapcsolás az alacsonyról a magas átviteli sebességre: A légijárműnek át kell kapcsolni az alacsonyról a magas átviteli sebességre azonnal, amint a légijármű helyzete 10 méterrel vagy többel megváltozott attól az időponttól, amikor az alacsony átviteli sebesség került kiválasztásra.
36		
37		
38		
39		
40		
41		A válaszjeladó alapú berendezéseknél, az automatikusan kiválasztott átviteli sebességnek a földi vezetéstől kapott parancsok által átkapcsolhatónak kell lenni.
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		

2-8. táblázat: BDS kód 0,8 — Kiterjesztett szkvitter légijármű azonosító és kategória

B-közlemény mező

1	FORMÁTUM TÍPUS KÓD (a 2.2.3.1-ben meghatározva)
2	
3	
4	
5	
6	LÉGIJÁRMŰ KATEGÓRIA
7	
8	
9	MSB 1. KARAKTER
10	
11	
12	
13	
14	
15	MSB 2. KARAKTER
16	
17	
18	
19	
20	
21	MSB 3. KARAKTER
22	
23	
24	
25	
26	
27	MSB 4. KARAKTER
28	
29	
30	

CÉL: A légijármű azonosító és kategória biztosítása.

Megjegyzés. – Mivel nincs nemzetközileg elfogadott kategória a légijármű által keltett turbulencia kategorizálásra, így a 4. kódot („A”-ra beállítva) kell úgy értelmezni, hogy az jelzi azt a közepes kategóriájú légijárművet, amely magasabb turbulenciát jelez annál, mint ami egy jellemző keltett turbulencia kategória.

A formátum típust a következők szerint kell kódolni:

1 = Azonosítás, légijármű kategória D-re állítva
2 = Azonosítás, légijármű kategória C-re állítva
3 = Azonosítás, légijármű kategória B-re állítva
4 = Azonosítás, légijármű kategória A-ra állítva

A légijármű/jármű kategóriát a következők szerint kell kódolni:

„A” beállítás

0 = Nincs légijármű kategória információ
1 = Könnyű (<15 500 font vagy 7 031 kg)
2 = Közepes 1. (15 500-tól 75 000 fontig vagy 7 031-től 34 019 kg-ig)
3 = Közepes 2. (75 000-től 300 000 fontig v. 34 019-től 136 078 kg-ig)
4 = Nagy keltett turbulenciájú légijármű
5 = Nehéz (>300 000 font vagy 136 078 kg)
6 = Nagy teljesítményű (>5 g gyorsulás) és nagy sebesség (>400 csomó)
7 = Helikopter

„B” beállítás

0 = Nincs légijármű kategória információ
1 = Vitorlázó/siklórepülőgép
2 = Levegőnél könnyebb
3 = Ejtőernyős/akrobatikus ejtőernyőzés

./.

2-8. táblázat folytatása:

31			4 = Ultrakönnyű/sárkányrepülő/siklóernyő 5 = Fenntartott
32			6 = Személyzet nélküli légijármű
33	MSB		7 = Űr/transzatmoszférikus jármű
34			
35		5. KARAKTER	„C” beállítás
36			0 = Nincs légijármű kategória információ
37			1 = Földi jármű – kényszerhelyzeti jármű
38			2 = Földi jármű – kiszolgáló jármű 3 = Állandó földi vagy kikötött akadály
39	MSB		4 – 7 = Fenntartott
40			
41		6. KARAKTER	„D” beállítás: Fenntartott
42			
43			**A légijármű azonosító kódolásának a**
44			**következőnek kell lenni:**
45	MSB		Ahogy az a 2-32. táblázatban meghatározásra
46			került.
47		7. KARAKTER	
48			
49			
50			
51	MSB		
52			
53		8. KARAKTER	
54			
55			
56			

2-9a. táblázat: BDS kód 0,9 — Kiterjesztett szkvitter repülési sebesség (1. és 2. altípus: földfeletti sebesség)

B-közlemény mező

1	MSB		1		
2			0		
3	FORMÁTUM TÍPUS = = 19		0		
4			1		
5	LSB		1		
6	1. ALTÍPUS	0		2. ALTÍPUS	0
7		0			1
8		1			0
9	SZÁNDÉK VÁLTOZÁS JELZÉS (a 2.3.5.3 pontban meghatározva)				
10	IFR KÉPESSÉG JELZÉS				
11	NAVIGÁCIÓS BIZONYTALNSÁGI				
12	KATEGÓRIA – SEBESSÉG				
13	(NUC_R)				
14	IRÁNY BIT a kelet-nyugati sebességhez: 0 = Kelet, 1 = Nyugat				
15	KELET-NYUGATI SEBESSÉG				
16	Hangsebesség alatti: LSB = 1 csomó			Hangsebesség feletti: LSB = 4 csomó	
17	Minden helyen nulla = nincs sebesség információ			Minden helyen nulla = nincs sebesség információ	
18	Érték	Sebesség		Érték	Sebesség
19	1	0 csomó		1	0 csomó
20	2	1 csomó		2	4 csomó
21	3	2 csomó		3	8 csomó
22	–	–		–	–
23	1 022	1 021 csomó		1 022	4 084 csomó
24	1 023	>1 021,5csomó		1 023	>4 086 csomó
25	IRÁNY BIT az észak-déli sebességhez: 0 = Észak, 1 = Dél				
26	ÉSZAK-DÉLI SEBESSÉG				
27	Hangsebesség alatti: LSB = 1 csomó			Hangsebesség feletti: LSB = 4 csomó	

CÉL: Kiegészítő állapot információk biztosítása a hangsebesség alatti és a hangsebesség feletti repülésre.

Az altípusokat a következők szerint kell kódolni:

Kód	Sebesség	Típus
0	Fenntartott	
1	Földfeletti sebesség	Hangsebesség alatti
2	Földfeletti sebesség	Hangsebesség feletti
3	Tényleges önsebesség	Hangsebesség alatti
4	Tényleges önsebesség	Hangsebesség feletti
5	Fenntartott	
6	Fenntartott	
7	Fenntartott	

Az IFR képességet a következők szerint kell kódolni:

0 = Az adó légijármű nem rendelkezik ADS-B konfliktus érzékeléssel vagy magasabb szintű alkalmazással.

1 = Az adó légijármű ADS-B konfliktus érzékeléssel vagy magasabb szintű alkalmazással rendelkezik.

2-9a. táblázat folytatása:

28	Minden helyen nulla = nincs sebesség információ		Minden helyen nulla = nincs sebesség információ	
29	Érték	Sebesség	Érték	Sebesség
30	1	0 csomó	1	0 csomó
31	2	1 csomó	2	4 csomó
32	3	2 csomó	3	8 csomó
33	–	–	–	–
34	1 022	1 021 csomó	1 022	4 084 csomó
35	1 023	>1 021,5csomó	1 023	>4 086 csomó
36	ADATFORRÁS BIT a függőleges sebességhez: 0 = GNSS, 1 = barometrikus			
37	JELZÉS BIT a függőleges sebességhez: 0 = fel /emelkedés/ 1 = le /süllyedés/			
38	FÜGGŐLEGES SEBESSÉG			
39	Minden helyen nulla = nincs függőleges sebesség információ; LSB = 64 láb/perc			
40	Érték	Függőleges sebesség		
41	1	0 láb/perc		
42	2	64 láb/perc		
43		–		
44	510	32 576 láb/perc		
45	511	>32 608 láb/perc		
46				
47	FENNTARTVA A FORDULÁS JELZÉSRE			
48				
49	GNSS MAGASSÁG JELZŐ BIT: 0 = A barometrikus magasság felett 1 = A barometrikus magasság alatt			
50	A GNSS MAGASSÁG KÜLÖNBSÉGE A BAROMETRIKUS MAGASSÁGHOZ VISZONYÍTVA			
51	Minden helyen nulla = nincs információ; LSB = 25 láb			
52	Érték	Különbség		
53	1	0 láb		
54	2	25 láb		
55	–	–		
56	126 127	3 125 láb >3 137,5 láb		

A Navigációs bizonytalansági kategóriát /NUC/ a következők szerint kell kódolni:

NUC_R	Vízszintes Sebesség Hiba (95%)	Függőleges Sebesség Hiba (95 %)
0	Ismeretlen	Ismeretlen
1	<10 m/s	<15,2 m/s (50 láb/s)
2	<3 m/s	<4,6 m/s (15 láb/s)
3	<1 m/s	<1,5 m/s (5 láb/s)
4	<0,3 m/s	<0,46 m/s (1,5 láb/s)

2-9b. táblázat: BDS kód 0,9 — Kiterjesztett szkvitter repülési sebesség (3. és 4. altípus: tényleges önsebesség és mágneses irány)

B-közlemény mező

1	MSB	1
2		0
3	FORMÁTUM TÍPUS = = 19	0
4		1
5	LSB	1
6	3. ALTÍPUS 0	4. ALTÍPUS 1
7	1	0
8	1	0
9	SZÁNDÉK VÁLTOZÁS JELZÉS (a 2.3.5.3 pontban meghatározva)	
10	IFR KÉPESSÉG JELZÉS	
11	NAVIGÁCIÓS BIZONYTALNSÁGI	
12	KATEGÓRIA – SEBESSÉG	
13	(NUC_R)	
14	IRÁNY BIT – 0 = a mágneses irány nem áll rendelkezésre, 1 = rendelkezésre áll	
15	MSB = 180°	
16		
17		
18	MÁGNESES IRÁNY (a 2.3.5.5 pontban meghatározva)	
19		
20		
21		
22		
23		
24	LSB = 360/1 024°	
25	A SEBESSÉG TÍPUSA: 0 = Műszer szerinti /IAS/, 1 = Tényleges önsebesség /TAS/	
26	SEBESSÉG	
27	Hangsebesség alatti: LSB = 1 csomó	Hangsebesség feletti: LSB = 4 csomó

CÉL: Kiegészítő állapot információk biztosítása a hangsebesség alatti és a hangsebesség feletti repüléshez a tényleges önsebességre és a mágneses irányra alapozva.

Ezt a formátumot csak akkor kell használni, ha a földfeletti sebesség nem áll rendelkezésre.

Az altípusokat a következők szerint kell kódolni:

Kód	Sebesség	Típus
0	Fenntartott	
1	Földfeletti sebesség	Hangsebesség alatti
2	Földfeletti sebesség	Hangsebesség feletti
3	Tényleges önsebesség	Hangsebesség alatti
4	Tényleges önsebesség	Hangsebesség feletti
5	Fenntartott	
6	Fenntartott	
7	Fenntartott	

Az IFR képességet a következők szerint kell kódolni:

0 = Az adó légijármű nem rendelkezik ADS-B konfliktus érzékeléssel vagy magasabb szintű alkalmazással.

1 = Az adó légijármű ADS-B konfliktus érzékeléssel vagy magasabb szintű alkalmazással rendelkezik.

2-9b. táblázat folytatása:

28	Minden helyen nulla = nincs sebesség információ		Minden helyen nulla = nincs sebesség információ	
29	Érték	Sebesség	Érték	Sebesség
30	1	0 csomó	1	0 csomó
31	2	1 csomó	2	4 csomó
32	3	2 csomó	3	8 csomó
33	–	–	–	–
34	1 022	1 021 csomó	1 022	4 084 csomó
35	1 023	>1 021,5csomó	1 023	>4 086 csomó
36	ADATFORRÁS BIT a függőleges sebességhez: 0 = GNSS, 1 = barometrikus			
37	JELZÉS BIT a függőleges sebességhez: 0 = fel /emelkedés/ 1 = le /süllyedés/			
38	FÜGGŐLEGES SEBESSÉG			
39	Minden helyen nulla = nincs függőleges sebesség információ; LSB = 64 láb/perc			
40	Érték		Függőleges sebesség	
41	1		0 láb/perc	
42	2		64 láb/perc	
43	–		–	
44	510		32 576 láb/perc	
45	511		>32 608 láb/perc	
46				
47	FENNTARTVA A FORDULÁS JELZÉSRE			
48				
49	KÜLÖNBSÉG JELÖLŐ BIT: (0 = A barometrikus magasság felett 1 = A barometrikus magasság alatt)			
50	A GEOMETRIKUS MAGASSÁG KÜLÖNBSÉGE A BAROMETRIKUS MAGASSÁGHOZ VISZONYÍTVA			
51	Minden helyen nulla = nincs információ; LSB = 25 láb			
52	Érték		Különbség	
53	1		0 láb	
54	2		25 láb	
55	–		–	
56	126 127		3 125 láb >3 137,5 láb	

2-10. táblázat: BDS kód 0,A — Kiterjesztett szkvitter esemény-vezérelt információ

B-közlemény mező

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CÉL: Egy rugalmas eszköz biztosítása a helyzeten, a sebességen és az azonosításon kívüli egyéb szkvitter körülményekhez.

1) Az ebbe a tárolóba (vagy egy egyenértékű adattovábbító pufferbe bevitt közleményeket a válaszjeladó által azonnal a legkorábbi általános adáskor továbbítani kell.

2) Az ezt a protokolt felhasználó közlemények formátumait a B-adatátvitel kiválasztón /BDS/ a 6,1-től 6,F-ig terjedően kell meghatározni.

3) Az Általános formátumozó/kezelő /GFM/ felelős az ál-véletlen időzítésért és az ezeknek a tárolóknak a másodpercenként kétszeri maximális továbbítási sebessége biztosításáért (2.5.5.1).

./.

2-10. táblázat folytatása:

32		4) Ezeknek a tárolóknak a kiolvasását (ha szükséges) a megfelelő, a 6,1-től a 6,F-ig terjedő BDS tárolók tartalmának kiemelésével kell végrehajtani.
33		
34		
35		
36		
37		
38		*Megjegyzés. – Az ebben a tárolóban lévő adatok nem arra vannak szánva, hogy a GIBC vagy az ACAS kereszt-láncolású protokoljai felhasználásával kiemelésre kerüljenek.*
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2-11. táblázat: BDS kód 0,B — Levegő/levegő információ 1. (légijármű helyzet)

B-közlemény mező

1	ÁLLAPOT
2	MSB = 1 024 csomó
3	
4	
5	
6	TÉNYLEGES ÖNSEBESSÉG
7	
8	
9	Tartomány = [0-,2 047 csomó]
10	
11	
12	LSB = 1,0 csomó
13	ÁTKAPCSOLÁS (0 = Mágneses irány, 1 = Földrajzi irány)
14	HELYZET
15	JELZÉS
16	MSB = 90 fok
17	
18	MÁGNESES IRÁNY
19	
20	
21	Tartomány = [-180, +179]
22	
23	
24	LSB = 360/1 024 FOK
25	HELYZET
26	JELZÉS
27	MSB = 90 fok
28	
29	
30	

CÉL: Jelenteni a fenyegetést jelentő légijármű helyzet információt abból a célból, hogy ez növelje az ACAS képességet a fenyegetés kiértékelésében és a megoldást jelentő manőver kiválasztásában.

./.

2-11. táblázat folytatása:

31	
32	TÉNYLEGES ÚTIRÁNY SZÖG
33	
34	
35	Tartomány = [-180, +179]
36	
37	
38	
39	
40	LSB = 360/32 768 fok
41	MSB = 1 024 csomó
42	
43	
44	
45	
46	FÖLDI SEBESSÉG
47	
48	
49	Tartomány = [0, 2 047]
50	
51	
52	
53	
54	
55	LSB = 1/16 csomó
56	FENNTARTOTT

2-12. táblázat: BDS kód 0,C— Levegő/levegő információ 2. (légijármű szándék)

B-közlemény mező

1	ÁLLAPOT
2	MSB = 51 200 csomó
3	
4	
5	KIEGYENLÍTETT MAGASSÁG
6	
7	Tartomány = [0, 102 375]
8	
9	
10	
11	
12	
13	LSB = 16 láb
14	HELYZET
15	JELZÉS
16	MSB = 90 fok
17	
18	
19	KÖVETKEZŐ ÚTIRÁNY (TÉNYLEGES FÖLDI ÚTIRÁNY)
20	Tartomány = [+179, -180]
21	
22	
23	
24	LSB = 360/1 024 fok
25	HELYZET
26	MSB = 128 másodperc
27	
28	
29	IDŐ A KÖVETKEZŐ ÚTVONAL-PONTIG
30	Minden helyen egyes = az idő meghaladja a 254 másodpercet

CÉL: Biztosítani a fenyegetést jelentő légijármű szándék információt abból a célból, hogy az növelje az ACAS képességet a fenyegetés kiértékelésében és a megoldást jelentő manőver kiválasztásában.

/

2-12. táblázat folytatása:

31	
32	Tartomány = [0, 254]
33	
34	LSB = 1 másodperc
35	HELYZET
36	JELZÉS
37	MSB 8 192 láb/perc
38	
39	FÜGGŐLEGES SEBESSÉG (AZ EMELKEDÉS POZITÍV)
40	
41	
42	Tartomány = [+16 352, -16 352]
43	
44	LSB = 32 láb/perc
45	HELYZET
46	JELZÉS
47	MSB = 45 fok
48	
49	BEDÖNTÉSI SZÖG
50	Tartomány = [+89, -89]
51	
52	
53	LSB = 360/256 fok
54	KATONAI ELFOGÁS BIT (0 = nincs elfogás; 1 = elfogva)
55	
56	FENNTARTOTT

2-16. táblázat: BDS kód 1,0 — Adat-kapcsolat teljesítőképesség jelentés

B-közlemény mező

1	
2	
3	
4	B-adatátvitel kiválasztó /BDS/ kód 1,0
5	
6	
7	
8	
9	Folytatódás jelzés (lásd a 9. pontot)
10	
11	
12	FENNTARTOTT
13	
14	
15	
16	Fenntartott az ACAS részére
17	
18	
19	
20	S-módú alhálózat változat szám
21	
22	
23	
24	Válaszjeladó nagy felbontású protokol jelzés (lásd a 4. pontot)
25	S-módú speciális szolgáltatás képesség (lásd a 2. pontot)
26	
27	Fedélzetre irányuló kiterjesztett hosszúságú közlemény /ELM/ képesség
28	
29	

CÉL: A felszerelt S-módú válaszjeladó/adat-kapcsolat berendezés adatátviteli teljesítőképességének jelentése.

Ennek a tárolónak a kódolás meg kell, hogy egyezzen:

1) Az Annex 10, III. Kötete, 5.2.9 pontjában leírtakkal.

2) Amikor a 25. bit 1-re van állítva, akkor annak azt kell jeleznie, hogy legalább egy S-módú speciális szolgáltatás biztosítva van, és a megfelelő képesség jelentést ellenőrizni kell.

Megjegyzés. – A BDS 0,2; 0,3; 0,4; 1,0; 2,0 és 3,0 kódok által hozzáférhető tárolóknak nincs hatása a 25. bit beállítására.

3) Az MSB-től kiindulóan minden egyes, egymás után következő bit helyzetnek a 0-tól a 15-ig terjedő tartományban lévő DTE alcímeket kell képviselni.

4) A nagy felbontású protokol jelzésnek az 5. Szintű válaszjeladót kell jeleznie, amikor 1-re van állítva és a 2.-tól 4.-ig Szintű válaszjeladót, amikor 0-ra van állítva.

5) A szkvitter képesség részmezőt a következők szerint kell értelmezni:

0 = a szkvitter tároló nincs felfrissítve
1 = a szkvitter tároló fel van frissítve

6) A légtérellenőrző azonosító (SI) bitet a következők szerint kell értelmezni:

0 = nincs légtérellenőrző azonosító kód képesség
1 = légtérellenőrző azonosító kód képesség

2-16. táblázat folytatása:

30	Fedélzetről leadott kiterjesztett hosszúságú közlemény /ELM/ képesség
31	
32	
33	Légijármű azonosítási képesség
34	Szkvitter képesség részmező (SCS) (lásd az 5. pontot)
35	Légtérellenőrző azonosító (SI) (lásd a 6. pontot)
36	Közös felhasználású GIBC képesség jelentés (lásd a 7. pontot)
37	
38	FENNTARTVA AZ ACAS RÉSZÉRE
39	
40	
41	MSB
42	
43	
44	
45	
46	
47	Bit tömb, amely a DTE 0-tól 15-ig terjedő alcímzések alátámasztási állapotát jelzi.
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB

7) A 36. bitet kell ide-oda kapcsolni minden egyes alkalommal, amikor a közös felhasználású GIBC képesség jelentés (BDS kód 1,7) változik. A túl sok képesség jelentés változás létrehozásának elkerülésére a bDS kód 1,7-t körülbelül egy percenként kell mintavételezni a változás ellenőrzés céljából.

8) A fedélzeten lévő DTE pillanatnyi állapotát rendszeres időközönként kell a GDLP-nek jelenteni fedélzeti források által. Mivel az ebben a mezőben történő változás egy képesség jelentést eredményez, az állapot bemeneteit körülbelül egy perces időközönként kell mintavételezni.

9) Abból a célból, hogy az adat-kapcsolat teljesítőképesség bármilyen folytatódási meghosszabbodási mértékét meghatározzák, (azokban a tárolókban, amelyek erre a célra vannak fenntartva: BDS 1,1-től a BDS 1,6-ig) a 9. bitet fenn kell tartani egy 'folytatódási jelzésként', hogy jelezze azt, ha a soronkövetkező tárolót ki kell emelni. Például: a bit9=1-nek a BDS 1,0-ban való észlelésekor a BDS 1,1-t kell kiemelni. Ha a bit9=1 a BDS 1,1-ben, akkor BDS 1,2-t kell kiemelni, és így tovább (egészen a BDS 1,5-ig). Jegyezzék meg azt, hogyha a bit9=1 a BDS 1,6-ban, akkor ezt egy hiba állapotnak kell tekinteni.

2-23. táblázat: BDS kód 1,7 — Közös felhasználású GIBC képesség jelentés

B-közlemény mező

1	0,5 Kiterjesztett szkvitter repülési helyzet
2	0,6 Kiterjesztett szkvitter földi helyzet
3	0,7 Kiterjesztett szkvitter állapot
4	0,8 Kiterjesztett szkvitter típus és aonosító
5	0,9 Kiterjesztett szkvitter repülési sebesség információ
6	0,A Kiterjesztett szkvitter esemény-vezérelt információ
7	2,0 Légijármű azonosítás
8	2,1 Légijármű lajstrom szám
9	4,0 Légijármű szándék
10	4,1 Következő útvonal-pont azonosító
11	4,2 Következő 'kijárat' helyzet
12	4,3 Következő 'kijárat' azonosító
13	4,4 Meteorológiai rutin /légi/jelentés
14	4,5 Meteorológiai veszély jelentés
15	4,8 VHF csatorna jelentés
16	5,0 Útirány és fordulás jelentés
17	5,1 Helyzet jelentés, durva
18	5,2 Helyzet jelentés, pontos
19	5,3 Levegő vonatkoztatású állapot vektor
20	5,4 Útvonal-pont 1.
21	5,5 Útvonal-pont 2.
22	5,6 Útvonal-pont 3.
23	5,F Kvázi-sztatikus paraméter figyelés
24	6,0 Mágneses irány és sebesség jelentés
25	Fenntartott légijármű képesség részére
26	Fenntartott légijármű képesség részére
27	E,1 Fenntartott S-módú bájt részére
28	E,2 Fenntartott S-módú bájt részére
29	

CÉL: Annak a jelzése, hogy a közös felhasználású GIBC szolgáltatás pillanatnyilag alátámasztott.

1) Az egyes bit-pozícióknak azt kell jelezniük, hogy a hozzájuk kapcsolódó BDS rendelkezésre áll a légijármű felszereltségében, amikor 1-re vannak állítva.

2) Az 1,8-tól az 1,C-ig terjedő tárolóknak az 1,7 tárolótól függetleneknek kell lenni.

Az összes tárolót folyamatosan ellenőrizni kell azzal a gyakorisággal, amiaz egyedileg megkívánt felfrissítési gyakoriságuknak felel meg, és a megfelelő képesség bitet csak akkor kell 1-re állítani, amikor érvényes adatok kerülnek bevitelre abba a tárolóba, a megkívánt gyakorisággal, vagy annál gyakrabban.

./.

2-23. táblázat folytatása:

30		A képesség bitet akkor kell 1-re beállítni, ha a tárolóban legalább egy mező érvényes adatokat vesz a megkívánt gyakorisággal; az állapot biteknél, ha az összes mező nem vesz érvényes adatot a megkívánt gyakorisággal, akkor NULLA-ra kell állítani.
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42	FENNTARTOTT	
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A 2-24.-től a 2-28.-ig számozott táblázatok: BDS kódok az 1,8-tól az 1,C-ig — S-módú specifikus szolgáltatás GICB képesség jelentések

B-közlemény mező

1	MSB
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CÉL: Azoknak a GICB szolgáltatásoknak a jelzése, amelyek beépítésre kerültek.

Az egyes bit-pozícióknak azt kell jelezniük, hogy a hozzájuk kapcsolódó BDS rendelkezésre áll a légijármű felszereltségében, amikor 1-re vannak állítva.

Az LSB-től kezdődően az egyes bit-pozícióknak azt a tároló számot kell képviselni, ami a következő táblázattal összhangban van:

A táblázatot lásd a köv. lapon.

2-24. ↔ 2-28. táblázat folytatása:

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53	
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55	
56	LSB

BDS kód	**Képesség beépítve a:**
BDS 1,8	BDS 0,1-től 3,8-ig teljesítésére
BDS 1,9	BDS 3,9-től 7,0-ig teljesítésére
BDS 1,A	BDS 7,1-től A,8-ig teljesítésére
BDS 1,B	BDS A,9-től E,0-ig teljesítésére
BDS 1,C	BDS E,1-től F,F-ig teljesítésére

A BDS 1,C 25 legmagasabb helyiértékű bitjét nem szabad felhasználni.

A 2-29.-től a 2-31.-ig számozott táblázatok: BDS kódok az 1,D-től az 1,F-ig — S-módú specifikus szolgáltatások S-módú specifikus protokol /MSP/ képesség jelentések

B-közlemény mező

1	MSB
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	FEDÉLZETRE IRÁNYULÓ
15	MSP
16	CSATORNÁK
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	LSB
29	MSB

CÉL: Azoknak az MSP szolgáltatásoknak a jelzése, amelyek biztosításra kerültek, és egy szolgáltatást tesznek szükségessé.

Az egyes biteknek kell jelezniük azt, hogy mi az az MSP által képviselt szolgáltatás, ami szükséges akkor, ha a bit 1-re van állítva.

Az MSB-től kiindulóan az egyes bitpozícioknak kell képviselniük a csatorna számot, mind a fedélzetre irányuló, mind a fedélzetről leadott csatorna mezőkre, a következő táblázatnak megfelelően.

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A táblázatot lásd a köv. lapon:

2-29. ↔ 2-31. táblázat folytatása:

30	
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36	
37	
38	
39	
40	
41	FEDÉLZETRŐL LEADOTT
42	MSP
43	CSATORNÁK
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	LSB

BDS kód	**MSP csatornák**
BDS 1,D	1-től 28-ig fel és le
BDS 1,E	29-től 56-ig fel és le
BDS 1,F	57-től 63-ig fel és le

1) A BDS 1,F-ben a legkisebb helyiértékű biteket mind a fedélzetre irányuló, mind a fedélzetről leadott csatorna mezőknél nem kell használni.

2) A képesség bitek beállításának feltételei azok, amelyek a megfelelő szolgáltatásokra meghatározott előírásokban vannak rögzítve, lásd a 3. részt.

2-32. táblázat: BDS kód 2,0 — Légijármű azonosítás

B-közlemény mező

1	
2	
3	
4	BDS kód 2,0
5	
6	
7	
8	
9	MSB
10	
11	1. KARAKTER
12	
13	
14	LSB
15	MSB
16	
17	2. KARAKTER
18	
19	
20	LSB
21	MSB
22	
23	3. KARAKTER
24	
25	
26	LSB
27	MSB
28	
29	

CÉL: A légijármű azonosítójának jelzése a föld részére.

1) Annex 10, IV. Kötet, 3.1.2.9.

2) A használandó karakter kódolásnak azonosnak kell lenni azzal, ami az Annex 10 IV. Kötete 3. Fejezetének 3-6. táblázatában van meghatározva.

3) Ez az adat más forrásból is bevihető a válaszjeladóba, nem csak az S-módú Fedélzeti adatkapcsolat vezérlő egységből /ADLP/.

4) Ezt a formátumot kell felhasználni a kiterjesztett szkvitter alkalmazások által.

Folyt. a köv. lapon.

./.

2-32. táblázat folytatása:

30		4. KARAKTER
31		
32	LSB	
33	MSB	
34		
35		5. KARAKTER
36		
37		
38	LSB	
39	MSB	
40		
41		6. KARAKTER
42		
43		
44	LSB	
45	MSB	
46		
47		7. KARAKTER
48		
49		
50	LSB	
51	MSB	
52		
53		8. KARAKTER
54		
55		
56	LSB	

5) Ezen tároló alátámasztási képességét a BDS 1,0-ban a 33. bit beállításával és a BDS 1,7- és 1,8-ban a vonatkozó bitek beállításával kell jelezni.

6) A légijármű azonosítójának annak kell lenni, amit a repülési tervben alkalmaztak /kitöltötték/. Amikor repülési terv nem áll rendelkezésre, akkor a légijármű lajstromszámát kell használni.

2-33. táblázat: BDS kód 2,1 — Légijármű és légitársaság lajstrom szám

B-közlemény mező

1	ÁLLAPOT	
2	MSB	
3		
4	1. KARAKTER	
5		
6		
7	LSB	
8	MSB	
9		
10	2. KARAKTER	
11		
12		
13	LSB	
14	MSB	
15		
16	3. KARAKTER	
17		
18		
19	LSB	
20	MSB	
21		
22	4. KARAKTER	LÉGIJÁRMŰ
23		LAJSTROM
24		SZÁM
25	LSB	
26	MSB	
27		
28	5. KARAKTER	
29		

CÉL: A földi rendszerek részére lehetővé tenni azt, hogy azonosítsák a légijárművet a folyamatosan felfrissített adatbankkal történő egyeztetés szükségességének fenntartása nélkül.

A karakterek kódolásának az Annex 10, IV. Kötete 3. Fejezetének 3-6. számú táblázatában meghatározottaknak kell lenni.

2-33. táblázat folytatása:

30		
31	LSB	
32	MSB	
33		
34	6. KARAKTER	
35		
36		
37	LSB	
38	MSB	
39		
40	7. KARAKTER	
41		
42		
43	LSB	
44	ÁLLAPOT	
45	MSB	
46		
47	1. KARAKTER	
48		
49		
50	LSB	ICAO LÉGITÁRSASÁGI LAJSTROM SZÁM
51	MSB	
52		
53	2. KARAKTER	
54		
55		
56	LSB	

2-34. táblázat: BDS kód 2,2 — Antenna helyzetek

B-közlemény mező

1		
2	ANTENNA TÍPUS	
3		
4	MSB = 32 m	
5		
6	X HELYZET	
7	Tartomány = [1,63]	1. ANTENNA
8		
9	LSB = 1 m	
10	MSB = 16 m	
11		
12	Z HELYZET	
13	Tartomány = [1,31]	
14	LSB = 1 m	
15		
16	ANTENNA TÍPUS	
17		
18	MSB = 32 m	
19		
20	X HELYZET	
21	Tartomány = [1,63]	2. ANTENNA
22		
23	LSB = 1 m	
24	MSB = 16 m	
25		
26	Z HELYZET	
27	Tartomány = [1,31]	
28	LSB = 1 m	
29		

CÉL: Az S-módú és a GNSS antennáknak a légijárművön történő elhelyezésére vonatkozó információk biztosítása abból a célból, hogy nagyon pontos méréseket végezzenek a légijármű lehetséges helyzetére.

1) Az antenna típus mezőt a következők szerint kell értelmezni:

0	=	Érvénytelen
1	=	S-módú alsó antenna
2	=	S-módú felső antenna
3	=	GNSS antenna
4-től 7-ig	=	Fenntartott

2) Az X helyzet mezőben kell lenni a légijármű középvonala mentén, az annak orrától mért távolságnak, méterben megadva. A mezőt úgy kell értelmezni, hogy a 0 érték az érvénytelen, és a 63 értéknek kell azt jelezni, hogy az antenna helyzete 63 méter, vagy annál több, a légijármű orrától mérve.

./.

2-34. táblázat folytatása:

30	ANTENNA TÍPUS	
31		
32	MSB = 32 m	
33		
34	X HELYZET	
35	Tartomány = [1,63]	3. ANTENNA
36		
37	LSB = 1 m	
38	MSB = 16 m	
39		
40	Z HELYZET	
41	Tartomány = [1,31]	
42	LSB = 1 m	
43		
44	ANTENNA TÍPUS	
45		
46	MSB = 32 m	
47		
48	X HELYZET	
49	Tartomány = [1,63]	4. ANTENNA
50		
51	LSB = 1 m	
52	MSB = 16 m	
53		
54	Z HELYZET	
55	Tartomány = [1,31]	
56	LSB = 1 m	

3) A Z helyzet mezőben kell lenni az antennának a földtől mért távolságának, méterben megadva úgy, hogy a légijárművön nincs terhelés és a földön van. A mezőt úgy kell értelmezni, hogy az érvénytelen, ha az érték 0, és hogy a 31-nek kell jelentenie azt, hogyha az antenna helyzete 31 méter, vagy annál több, a földtől mérve.

2-37. táblázat: BDS kód 2,5 — Légijármű típus

B-közlemény mező

1	MSB	
2		
3		LÉGIJÁRMŰ TÍPUS
4		
5		
6	LSB	
7	MSB	
8		HAJTÓMŰVEK SZÁMA
9	LSB	
10	MSB	
11		
12		HAJTÓMŰ TÍPUS
13		
14		
15	LSB	
16	MSB	
17		
18		1. KARAKTER
19		
20		
21	LSB	
22	MSB	
23		
24		2. KARAKTER
25		
26		
27	LSB	
28	MSB	
29		

CÉL: A légijármű típus információ biztosítása.

1) Részmező kódolás

A kódolásnak olyannak kell lenni, ami a Doc 8643 – *Légijármű Típus Jelzés*-ben megtalálható. Az összes részmezőt, amely a karaktereket magába foglalja, az 1A-5 részhalmaz 6. bitjét felhasználva kell kódolni, ahogy az az Annex 10, IV. Kötete 3-6. táblázatában meghatározásra került.

2) Model meghatározás

A kódolásnak négy karakterből kell állnia, ahogy azt a Doc 8643 meghatározza. Az ötödik karaktert fenn kel tartani a jövőbeli bővítésre, és minden helyen nullát kell magába foglalnia, amíg meghatározásra nem kerül.
A 2222 az első négy karakterben azt jelenti, hogy a jelzések nincsenek meghatározva.

./.

2-37. táblázat folytatása:

30	3. KARAKTER	MODEL MEGHATÁROZÁS	3) A hajtóművek száma Ezt a részmezőt bináris számként kell kódolni, ahol a 7 szám azt jelenti, hogy 7 vagy több hajtómű /Fordító: ???????/.
31			
32			
33	LSB		
34	MSB		
35			
36			
37	4. KARAKTER		
38			
39	LSB		
40	MSB		
41			
42	5. KARAKTER		
43			
44			
45	LSB		
46	MSB		
47			
48	KELTETT TURBULENCIA KATEGÓRIA		
49			
50			
51			
52			
53			
54	FENNTARTOTT		
55			
56			

2-48. táblázat: BDS kód 3,0 — Összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ aktív megoldási tanácsadás

B-közlemény mező

1	
2	
3	
4	B-adatátvitel adat kiválasztó /BDS/ kód 3,0
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	AKTÍV MEGOLDÁSI TANÁCSADÁSOK
16	
17	
18	
19	
20	
21	
22	
23	
24	Megoldási tanácsadás kiegészítések /RACs/ RÖGZÍTÉSE
25	
26	
27	Megoldási tanácsadás /RA/ BEFEJEZŐDÖTT
28	TÖBBSZÖRÖS VESZÉLY ELŐFORDULÁS
29	VESZÉLY TÍPUS JELZÉS
30	

CÉL: Az ACAS berendezés által létrehozott megoldási tanácsadások (Ras) jelentése. Ennek a tárolónak a kódolása meg kell, hogy feleljen:

1) az Annex 10, IV. Kötete 4.3.8.4.2.2 pontjában leírtaknak.

2) A Bit 27, amikor 1-re van állítva, azt fogja jelenteni, hogy a megoldási tanácsadás /RA/ befejeződött.

2-48. táblázat folytatása:

31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	VESZÉLY AZONOSÍTÓ ADAT
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	

2-64. táblázat: BDS kód 4,0 — Kiválasztott függőleges szándék

B-közlemény mező

1	ÁLLAPOT
2	MSB = 32 768 láb
3	
4	Üzemmód vezérlő panel /MCP/ / Repülés vezérlő egység /FCU/ által kiválasztott MAGASSÁG
5	
6	
7	
8	Tartomány = 0-tól 65 520 lábig (Felbontás)
9	
10	
11	
12	
13	LSB = 16 láb (Felbontás)
14	ÁLLAPOT
15	MSB = 32 768 láb
16	
17	Repülés vezérlő rendszer /FMS/ által KIVÁLASZTOTT MAGASSÁG
18	
19	
20	
21	Tartomány = 0-tól 65 520-ig
22	
23	
24	
25	
26	LSB = 16 láb (Felbontás)
27	ÁLLAPOT
28	MSB = 204,8 mb
29	

CÉL: Kész hozzáférés biztosítása a légijármű vezető pillanatnyi függőleges repülési szándékainak információihoz, abból a célból, hogy növekedjék a konfliktus kutatás hatékonysága, és további taktikai információkat biztosítsanak az irányítók részére.

1) A cél /elérendő/ magasságnak egy rövid-távú szándék értéknek kell lenni, amelynél a légijármű magasság-tartó repülésbe fog átmenni (vagy már magasság-tartással repül) az adott manőver végén. Azt az adat-forrást, amelyet a légijármű pillanatnyila használ a cél magasság meghatározásához, magasság adat-forrás bitekben kell jelezni (54-től 56-ig), ahogy az az alábbiakban részletezésre került.

Megjegyzés. – Ezt az információt, ami a valós „légijármű szándékot" képviseli – ha rendelkezésre áll – a magasság ellenőrző panel által kiválasztott magasság, a repülés vezérlő rendszer által kiválasztott magasság, vagy a pillanatnyi légijármű magasság jelenti a légijármű repülési üzemmódjától függően (lehet, hogy a szándék nem állhat rendelkezésre mindig akkor, ha a légijármű vezető vezeti /kézi vezérlés/ a légijárművet).

2) Az 1-től a 13-ig tartó bitekbe bevitt adatokat az üzemmód vezérlő panel/a repülés vezérlő egység, vagy az ezeknek megfelelő berendezéstől kell származtatni. A riasztó rendszert is fel lehet használni az adatok biztosításához, ha azok a „vezérlő" rendszertől nem állnak rendelkezésre. A kapcsolódó üzemmód biteknek erre a mezőre (48-tól 51-ig) az alábbiakban részletezettnek kell lenni.

2-64. táblázat folytatása:

30		
31		
32		
33		
34	Tartomány = 0-tól 409,5 mb-ig	
35		
36		
37		
38		
39		BAROMETRIKUS NYOMÁS BE-ÁLLÍTÁS MÍNUSZ 800 mb
40	LSB = 0,1 mb (Felbontás)	
41		
42		
43		
44	FENNTARTOTT	
45		
46		
47		
48	AZ MCP/FCU ÜZEMMÓD BITEK ÁLLAPOTA	
49	FÜGGŐLEGES NAVIGÁCIÓ MÓD	
50	MAGASSÁG-TARTÁS MÓD	
51	MEGKÖZELÍTÉS MÓD	
52	FENNTARTOTT	
53		
54	A CÉL /ELÉRENDŐ/ MAGASSÁG ADAT-FORRÁS BITJEINEK ÁLLAPOTA	
55	A CÉL MAGASSÁG ADAT-FORRÁSA	
56	A CÉL MAGASSÁG ADAT-FORRÁSA	

3) A 14-től a 26-ig terjedő bitekbe bevitt adatokat a repülés vezérlő rendszertől kell származtatni, vagy olyan megegyező berendezéstől, ami a légijármű függőleges repülési profilját szabályozza.

4) Az aktuális barometrikus nyomás beállítást abból az értékből kell kiszámítani, amit a mező (28-tól 39-ig terjedő bitek) tartalmaz, plusz 800 mb.
Amikor a barometrikus beállítás 800 mb-nál kevesebb, vagy 1 209,5 mb-nál több, akkor ennek a mezőnek az állapot bitjét (bit 27) az érvénytelen adat jelzésre kell beállítani.

5) A 48-tól az 56-ig terjedő biteknek kell jelezniük az 1-től a 26-ig terjedő bitek által biztosított értékek állapotát a következők szerint:
A bit 48-nak kell jeleznie azt, hogy a mód bitek (49, 50 és 51) hatékonyan vannak-e 'telepítve':
0 = Nincs mód információ biztosítva
1 = Mód információ kifejezetten biztosítva van.
Bit 49, 50 és 51:
0 = Nem aktív
1 = Aktív
A bit 54-nek kell jeleznie azt, hogy a cél /elérendő/ magasság adat-forrás bitek (55 és 56) hatékonyan vannak 'telepítve'.
0 = Nincs adat-forrás információ biztosítva
1 = Az adat-forrás informció kifejezetten biztosítva van.
A bit 55 és 56-nak kell jeleznie a cél /elérendő/ magasság adat-forrását:
00 = Ismeretlen
01 = Légijármű magasság
10 = FCU/MCP kiválasztású magasság
11 = FMS kiválasztású magasság

A 2-65.-től a 2-67.-ig számozott táblázatok: BDS kód 4,1-től 4,3-ig — A következő útvonal-pont részletei

CÉL: Kész hozzáférés biztosítása a légijármű útvonalán lévő következő útvonal-pont részleteihez, annak a szükségessége nélkül, hogy egy adat-kapcsolati összeköttetést hoznának létre a repülés vezető rendszerrel. Ez elő fogja segíteni a rövid- és a közepes távú taktikai irányítást. A BDS kód 4,1 tárolója foglalja magába a 9 karaktert, ami a tömörített 6-bites karakter formában megadja az útvonal-pont nevét.

	BDS kód 4,1 B-közlemény mező		BDS kód 4,2 B-közlemény mező		BDS kód 4,3 B-közlemény mező
1	ÁLLAPOT	1	ÁLLAPOT	1	ÁLLAPOT
2	MSB	2	JELZÉS	2	JELZÉS
3		3	MSB = 90 fok	3	MSB = 90 fok
4	1.KARAKTER	4		4	IRÁNYMÉRÉS AZ ÚTVONAL-PONTRA
5		5		5	
6		6		6	
7	LSB	7		7	
8	MSB	8	ÚTVONAL-PONT	8	
9		9	FÖLDRAJZI SZÉLESSÉG	9	
10	2. KARAKTER	10		10	Tartomány = [-180,+180]
11		11		11	
12		12		12	LSB = 360/2 048 fok
13	LSB	13		13	ÁLLAPOT
14	MSB	14	Tartomány = [-180,+180]	14	MSB = 204,8 perc
15		15		15	
16	3 KARAKTER	16		16	
17		17		17	
18		18		18	REPÜLÉSI IDŐ/a pontig/
19	LSB	19		19	
20	MSB	20	LSB = 90/131 072 fok	20	
21		21	ÁLLAPOT	21	
22	4. KARAKTER	22	JELZÉS	22	
23		23	MSB = 90 fok	23	Tartomány = [0, 409,6]

2-65. ↔ 2-67. táblázat folytatása:

24		24		24	
25	LSB	25		25	LSB = 0,1 perc
26	MSB	26		26	ÁLLAPOT
27		27		27	MSB = 3 276,8 tmf
28	5. KARAKTER	28	ÚTVONAL-PONT	28	
29		29	FÖLDRAJZI HOSSZÚSÁG	29	
30		30		30	
31	LSB	31		31	
32	MSB	32		32	
33		33		33	MEGTEENDŐ TÁVOLSÁG
34	6. KARAKTER	34		34	
35		35		35	
36		36	Tartomány = [-180,+180]	36	
37	LSB	37		37	
38	MSB	38		38	Tartomány = [0, 6 553,6]
39		39		39	
40	7. KARAKTER	40	LSB = 90/131 072 fok	40	
41		41	ÁLLAPOT	41	
42		42	JELZÉS	42	LSB = 0,1 tmf
43	LSB	43	MSB = 65 536 láb	43	
44	MSB	44		44	
45		45		45	
46	8. KARAKTER	46	ÚTVONAL-PONT	46	
47		47	KERESZTEZÉSI	47	
48		48	MAGASSÁG	48	
49	LSB	49		49	
50	MSB	50		50	FENNTARTVA
51		51		51	
52	9. KARAKTER	52	Tartomány= [0, 131 068]	52	
53		53		53	
54		54		54	
55	LSB	55		55	
56	FENNTARTVA	56	LSB = 8 láb	56	

2-68. táblázat: BDS kód 4,4 — Meteorológiai rutin légi jelentés

B-közlemény mező

1	
2	FOM / ADAT-FORRÁS
3	
4	
5	ÁLLAPOT (szélsebesség és irány)
6	MSB = 256 csomó
7	
8	
9	SZÉLSEBESSÉG
10	
11	
12	Tartomány = [0, 512]
13	
14	LSB = 1 csomó
15	JELZÉS
16	MSB = 90 fok
17	
18	SZÉLIRÁNY (Földrajzi irány)
19	
20	
21	Tartomány = [-180, +180]
22	
23	LSB = 180/256 fok
24	ÁLLAPOT
25	JELZÉS
26	MSB = 64°C
27	
28	
29	STATIKUS LEVEGŐ HŐMÉRSÉKLET
30	

CÉL: Lehetővé tenni a földi rendszerek részére a meteorológiai adatok összegyűjtését.

FOM/Adat-forrás kódolás:

A binárisan kódolt (jósági tényező) FOM/Adat-forrás paramétzer decimális értékeit a következők szerint kell értelmezni:

0 = Érvénytelen
1 = INS
2 = GNSS
3 = DME/DME
4 = VOR/DME
5 ÷ 15 = Fenntartott

1) A TURBULENCIA-ra kijelölt 2 bit értelmezésének BDS kód 4,5-re megadott táblázatban bemutatottnak kell lenni.

Megjegyzés. – Az átlagos statikus nyomás nem követelmény az ICAO Annex 3 szerint.

2-68. táblázat folytatása:

31	
32	Tartomány = [-128, +128]
33	
34	LSB = 0,25°
35	ÁLLAPOT
36	MSB = 1 024 hPa
37	
38	
39	
40	ÁTLAGOS STATIKUS NYOMÁS
41	
42	
43	Tartomány = [0, 2 048]
44	
45	
46	LSB = 1 hPa
47	ÁLLAPOT
48	TURBULENCIA (lásd az 1. pontot)
49	
50	ÁLLAPOT
51	MSB = 100 %
52	
53	Tartomány = [0, 100]
54	PÁRATARTALOM
55	
56	LSB = 100/64 %

2-69. táblázat: BDS kód 4,5 — Meteorológiai veszély jelentés

B-közlemény mező

1	ÁLLAPOT
2	TURBULENCIA
3	
4	ÁLLAPOT
5	SZÉLNYÍRÁS
6	
7	ÁLLAPOT
8	KONVEKTÍV LEÁRAMLÁS
9	
10	ÁLLAPOT
11	JEGESEDÉS
12	
13	ÁLLAPOT
14	ÖRVÉNYÁRAMLÁSI NYOMVONAL
15	
16	ÁLLAPOT
17	JELZÉS
18	MSB = 64°C
19	STATIKUS LEVEGŐ HŐMÉRSÉKLET
20	
21	
22	Tartomány = [-128, +128]
23	
24	
25	
26	LSB = 0,25°C
27	ÁLLAPOT
28	MSB = 1 024 hPa
29	
30	

CÉL: A meteorológiai veszélyek súlyosságáról – különösen az alacsony magasságú repüléseket érintően – szóló jelentések biztosítása.

A veszély kódolása:

Az egyes veszélyes helyzetek jelzésére kijelölt két bit értelmezésének az alábbi táblázatban megadottaknak kell lenni:

Bit 1	Bit 2	
0	0	NINCS
0	1	GYENGE
1	0	KÖZEPES
1	1	ERŐS

A GYENGE, KÖZEPES és ERŐS kifejezések meghatározása az, ami a PANS-ATM (Doc 4444)-ben meghatározásra került, ahogy alkalmazható.

2-69. táblázat folytatása:

31	
32	ÁTLAGOS STATIKUS NYOMÁS
33	
34	
35	
36	Tartomány = [0, 2 048]
37	
38	LSB = 1 hPa
39	ÁLLAPOT
40	MSB = 32 768 láb
41	
42	
43	RÁDIÓMAGASSÁGMÉRŐ MAGASSÁG
44	
45	
46	
47	Tartomány = [0, 65 528]
48	
49	
50	
51	LSB = 16 láb
52	
53	
54	FENNTARTVA
55	
56	

2-72. táblázat: BDS kód 4,8 — VHF csatorna jelentés

B-közlemény mező

Bit	Mező
1	VHF 1
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	ÁLLAPOT
17	VHF 1 HANGFREKVENCIÁS ÁLLAPOT
18	
19	VHF 2
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	

CÉL: Lehetővé tenni az ATC rendszer részére a VHF összeköttetési csatornák beállításának ellenőrzését, és meghatározni annak a módját, amelylyel az egyes csatornákat a légijármű személyzete ellenőrzi.

A csatorna jelentés kódolása:
Az egyes VHF összeköttetési csatornákat a 15-bites pozitív bináris számból kell meghatározni, az N-ből, kHz-ben, a következő képlet szerint:

Csatorna (MHz) = Alap + N × 0,001 (MHz),
ahol az Alap = 118,000 MHz

Megjegyzések. –

1) *A csatornák meghatározásához a bináris számok használata mgnöveli a kódolás hatékonyságát.*
2) *Ez a kódolás kompatibilis 25 kHz-es analóg csatornákkal, a 8,33 kHz-es csatornatávolsággal és VHF digitális kapcsolattal, ahogy az az alábbiakban leírásra kerül.*
3) *A VHF digitális kapcsolatnak /VDL/ teljes négy bit került kiosztásra azért, hogy a négy multiplex csatornájának minden egyes bitje megállapítható legyen.*

25 kHz VDL: 3 Mód

Bit	
16	Állapot
15	MSB (12 800 kHz)
...	Tartomány 118,000-tól 143,575-ig 136,975 (katonai felh.)
6	LSB (25 kHz)
5	4 × csatorna aktív jelzések
4	
3	
2	
1	VDL jelző = 1

2-72. táblázat folytatása:

31	
32	
33	
34	ÁLLAPOT
35	VHF 2
36	HANGFREKVENCIÁS ÁLLAPOT
37	
38	
39	
40	
41	
42	
43	VHF 3
44	
45	
46	
47	
48	
49	
50	
51	
52	ÁLLAPOT
53	VHF 3
54	HANGFREKVENCIÁS ÁLLAPOT
55	121,5 MHz
56	HANGFREKVENCIÁS ÁLLAPOT

25 kHz-es analóg

Bit	
16	Állapot
15	MSB (12 800 kHz)
…	Tartomány 118,000-tól 143,575-ig 136,975 (katonai felh.)
6	LSB (25 kHz)
5	Nem használatos
4	Nem használatos
3	Nem használatos
2	8,33 jelző = 1
1	VDL jelző = 0

8,33 kHz-es analóg

Bit	
16	Állapot
15	MSB (17 066 kHz)
…	Tartomány 118,000-tól 152,112-ig 136,975 (katonai felh.)
4	LSB (17 066/2 048 kHz)
3	Nem használatos
2	8,33 jelző = 1
1	VDL jelző = 0

Hangfrekvenciás állapot kódolás

A hangfrekvenciás állapot bitek egyes párjai használatosak arra, hogy a hangfrekvenciás csatornának a légijármű személyzete általi ellenőrzését leírják a következő táblázatnak megfelelően:

Bit 1	Bit 2	
0	0	ISMERETLEN
0	1	SENKI
1	0	CSAK FEJHALLGATÓ
1	1	HANGSZÓRÓ

2-80. táblázat: BDS kód 5,0 — Útirány és fordulás jelentés

B-közlemény mező

1	ÁLLAPOT
2	JEL 1 = Balra (a bal szárny lenn)
3	MSB = 45 fok
4	
5	BEDÖNTÉSI SZÖG
6	
7	
8	Tartomány = [-90, +90]
9	
10	
11	LSB = 45/256 fok
12	ÁLLAPOT
13	JEL 1 = Nyugat (pl. 315° = –45°)
14	MSB = 90 fok
15	
16	
17	FÖLDRAJZI ÚTIRÁNY-SZÖG
18	
19	
20	Tartomány = [-180, +180]
21	
22	
23	LSB = 90/512 fok
24	ÁLLAPOT
25	MSB = 1 024 csomó
26	
27	
28	FÖLDFELETTI SEBESSÉG
29	
30	

CÉL: Az útirány és forduló adatok biztosítása a földi rendszerek részére.

1) A maximális elfogadható adat elöregedésnek – a földre történő továbbítás pillanatában – az összes paraméterre 1 másodpercnek kell lenni.

2) A tároló felfrissítési gyakoriságának elegendőnek kell lennie annak biztosításához, hogy az összes paraméter maximális elfogadható adat elöregedését ne haladja meg a szabályos üzemeltetés során.

3) Ha a maximális elfogadható adat elöregedés bármely paraméterre túllépésre kerül, akkor annak a paraméternek az állapot bitjét az Általános formátumozó/kezelőnek /GFM/ ténylegesen 0-ra kell állítania.

Megjegyzés. – Ez akkor alkalmazandó, ha bármelyik paraméter, szabálytalan üzemeltetés miatt használhatatlanná válik.

4) Ha az adat-forrástól eredő paraméter értéke meghaladja a tároló meghatározásában megengedhető tartomány értékét, akkor a maximális megengedhető értéket – a megfelelő pozitív vagy negatív értelemben – kell felhasználni helyette.

Megjegyzés. – Ez szükségessé teszi a GFM aktív beavatkozását.

5) Az ezekbe a tárolókba bevitt adatokat – amikor csak lehetséges – a légijármű vezérlési adat-forrásaiból kell származtatni.

./.

2-80. táblázat folytatása:

31	Tartomány = [0, 2 046]
32	
33	
34	LSB = 1 024/512 csomó
35	ÁLLAPOT
36	JEL 1 = Mínusz
37	MSB = 8 fok/másodperc
38	
39	ÚTIRÁNY-SZÖG SEBESSÉG
40	
41	
42	Tartomány = [-16, +16]
43	
44	
45	LSB = 8/256 fok/másodperc
46	ÁLLAPOT
47	MSB = 1 024 csomó
48	
49	TÉNYLEGES ÖNSEBESSÉG
50	
51	
52	Tartomány = [0, 2 046]
53	
54	
55	
56	LSB = 1 023/512 csomó

6) Ha egy légijárművön valamely paraméter nem áll rendelkezésre, akkor a paraméternek megfelelő összes bitet a B-adatátvitel adat kiválasztó /BDS/ kiszolgáló feldolgozása által ténylegesen 0-ra kell beállítani.

7) Az összes mező LSB-t kerekített értékkel kell megkapni.

2-81. táblázat: BDS kód 5,1 — Helyzet jelentés, durva

B-közlemény mező

1	ÁLLAPOT (lásd 1.)
2	JELZÉS
3	MSB = 90 fok
4	
5	
6	
7	
8	
9	FÖLDRAJZI SZÉLESSÉG
10	
11	
12	
13	
14	Tartomány = [-180, +180]
15	(lásd 2.)
16	
17	
18	
19	
20	
21	LSB = 360/1 048 576 fok
22	JELZÉS
23	MSB = 90 fok
24	
25	
26	
27	
28	FÖLDRAJZI HOSSZÚSÁG
29	
30	

CÉL: Három dimenziós jelentés biztosítása a légijármű helyzetéről.

1) Az egyedüli állapot bitet (bit 1) 0-ra kell állítani, ha a három paraméter valamelyike érvénytelen, és ha megegyezik a BDS 5,2-ben lévő állapot bittel.

2) A földrajzi szélességre megkívánt érvényes tartomány a +90 foktól a –90 fokig tartó, de a paramétert egy MSB 90 fokkal kell kódolni azért, hogy lehetséges legyen ugyanazon kódolási algoritmus alkalmazása, mint ami a földrajzi hosszúságra használatos.

3) Az ebben a tárolóban lévő információ forrásnak ugyanannak kell lenni, mint ami a BDS 5,2 Jósági tényező /FOM/ / Adat-forrás /SOURCE/ mezőjében van jelezve.

2-81. táblázat folytatása:

31	
32	
33	
34	Tartomány = [-180, +180]
35	
36	
37	
38	
39	
40	
41	LSB = 360/ 1 048 576 fok
42	JELZÉS
43	MSB = 65 536 láb
44	
45	
46	
47	NYOMÁS-
48	MAGASSÁG
49	
50	Tartomány = [-1 000, +126 752]
51	
52	
53	
54	
55	
56	LSB = 8 láb

2-82. táblázat: BDS kód 5,2 — Helyzet jelentés, pontos

B-közlemény mező

1	ÁLLAPOT (lásd 1.)
2	JÓSÁGI TÉNYEZŐ /FOM/ /ADAT-FORRÁS
3	
4	
5	
6	MSB = 90/128 fok
7	
8	
9	
10	
11	FÖLDRAJZI SZÉLESSÉG, PONTOS
12	
13	
14	
15	
16	Tartomány = [0, 180/128]
17	
18	
19	
20	
21	
22	
23	LSB = 90/16 777 216 fok
24	MSB = 90/128 fok
25	
26	
27	
28	FÖLDRAJZI HOSSZÚSÁG, PONTOS
29	
30	

CÉL: Nagy-pontosságú három dimenziós jelentés biztosítása a légijármű helyzetéről, amikor a BDS 5,1-el együtt kerül alkalmazásra. Az adat-forrásra vonatkozó információt is tartalmazza.

A Jósági tényező/Adat-forrás /FOM/SOURCE/ kódolása:

A binárisan kódolt (jósági tényező) FOM/SOURCE paraméter decimális értékét a következők szerint kell értelmezni:

0	= A navigációs képesség elvesztése
1	= Előírt navigációs pontosság /RNP/ RNP 20 (pl. Inerciális Navigációs Rendszer /INS/ adatok) nyomás-magasság
2	= RNP 5 (pl. VOR/DME) nyomás-magasság
3	= RNP 1 (pl. DME/DME vagy GNSS) nyomás-magasság
4	= Fenntartva a differenciál Globális Műholdas Navigációs Rendszerre /GNSS/ (körkörös helyzet hiba (CPE) 10 m) nyomás-magasság
5	= Fenntartva a differenciál GNSS helyzetre (CPE 2,5 m) nyomás-magasság
6 – 10	= Fenntartvaí
11	= RNP 1 (pl. DME/ME vagy GNSS) GNSS magasság
12	= Fenntartva a differenciál GNSS (CPE 10 m) magasság részére
13	= Fenntartva a differenciál GNSS (CPE 2,5 m) magasság részére
14 – 15	= Fenntartva

Megjegyzés. – Az RNP az Előírt Navigációs Pontosságot jelenti. Az 1 alatti értékekre megfelelő RNP kategóriák nincsenek még meghatározva; ennek megfelelően a körkörös helyzet hiba /CPE/ használatos.

./.

2-82. táblázat folytatása:

31	Tartomány = [0, 180/128]
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	LSB = 90/16 777 216 fok
42	JELZÉS
43	MSB = 65 536 láb
44	
45	
46	
47	NYOMÁS-MAGASSÁG
48	
49	vagy
50	GNSS MAGASSÁG (HAE)
51	Tartomány = [–1 000, 126 752]
52	
53	
54	
55	
56	LSB = 8 láb

1) *Az egyedüli állapot bitet (bit 1) 0-ra kell állítani, ha a három para-méter valamelyike érvénytelen, és ha megegyezik a BDS 5,1-ben lévő állapot bittel.*

2) *A FÖLDRAJZI SZÉLESSÉG (pontos) és a FÖLDRAJZI HOSSZÚSÁG (pontos) para-méterek 2-es komplemens kódolásúak, úgy, hogy azokat a BD 5,1-ben lévő megfelelő paraméterekkel együtt kell értelmezni.*

Megjegyzés. – Amikor a 42-től az 56-ig terjedő bitek a GNSS magasságot foglalják ma-gukba, akkor a nyomás-magasságot a BDS 5,1-ből lehet megkapni.

2-83. táblázat: BDS kód 5,3 — Levegő vonatkoztatású állapot vektor

B-közlemény mező

1	ÁLLAPOT
2	JELZÉS
3	MSB = 90 fok
4	
5	MÁGNESES IRÁNY
6	
7	
8	Tartomány = [-180, +180]
9	
10	
11	
12	LSB = 90/512 fok
13	ÁLLAPOT
14	MSB = 512 csomó
15	
16	
17	MŰSZER SZERINTI SEBESSÉG (IAS)
18	
19	
20	Tartomány = [0, 1 024]
21	
22	
23	LSB = 1 csomó
24	ÁLLAPOT
25	MSB = Mach 2,048
26	
27	MACH SZÁM
28	
29	
30	Tartomány = [0, 4,096]

CÉL: Biztosítani az ATC rendszer részére a mágneses irány, IAS/Mach /sebesség/, magasság, a magasságváltás mértéke és a TAS pillanatnyi mért értékeit.

2-83. táblázat folytatása:

31	
32	
33	LSB = Mach 0,008
34	ÁLLAPOT
35	MSB = 1 024 csomó
36	
37	
38	
39	TÉNYLEGES ÖNSEBESSÉG (TAS)
40	
41	
42	
43	Tartomány = [0, 2,048]
44	
45	
46	LSB = 0,5 csomó
47	ÁLLAPOT
48	JELZÉS
49	MSB = 8 192 láb/perc
50	MAGASSÁG-VÁLTÁS MÉRTÉKE
51	
52	
53	Tartomány = [-16 384, +16 384]
54	
55	
56	LSB = 64 láb/perc

A 2-84.-től a 2-86.-ig számozott táblázatok: BDS kód 5,4-től 5,6-ig — Útvonal-pontok 1, 2 és 3

B-közlemény mező

1	ÁLLAPOT (lásd 1.)
2	MSB
3	
4	1. KARAKTER
5	
6	
7	LSB
8	MSB
9	
10	2. KARAKTER
11	
12	
13	LSB
14	MSB
15	
16	3. KARAKTER
17	
18	
19	LSB
20	MSB
21	
22	4. KARAKTER
23	
24	
25	LSB
26	MSB
27	
28	5. KARAKTER
29	
30	

CÉL: Információ biztosítása a három következő útvonal-pontról. A BDS 5,4 foglalja magába a következő útvonal-pont részleteit; a BDS 5,5 foglalja magába a következő plusz 1 útvonal-pont részleteit; a BDS 5,6 pedig a következő plusz 2 útvonal-pont részleteit.

1) Az egyedül álló állapot bitet (bit 1) 0-ra kell állítani, ha a három paraméter bármelyike érvénytelen.

2) A számított időt vagy repülési szintet a Repülés Vezérlő Rendszer /FMS/ által betervezett repülési pályagörbéből kell kiszámítani.

Megjegyzés. – A következő útvonal-pontra vonatkozó jóval részletesebb információk a BDS 4,1-től 4,3-ig számozott pontokban van megadva.

3) Amikor az útvonal-pont azonosító csak három karakterből áll, akkor azt két megelőző 0 karakterrel kell kiegészíteni (például a CDN-ből 00CDN lesz).

4) A számított idő percekben kerül megadásra, és a minden helyen egyes értéket kell használni annak jelzésére, hogy a jelzett útvonal-pont egy óránál nagyobb távolságra van.

2-84. ↔ 2-86. táblázat folytatása:

31	LSB
32	MSB = 30 perc
33	
34	
35	SZÁMÍTOTT ÉRKEZÉSI IDŐ
36	(SZABÁLYOS ÚTVONAL REPÜLÉS)
37	
38	Tartomány = [0, 59]
39	
40	LSB = 60/512 perc
41	MSB = 320
42	
43	SZÁMÍTOTT REPÜLÉSI SZINT
44	(SZABÁLYOS ÚTVONAL REPÜLÉS)
45	Tartomány = [0, 640]
46	LSB = 10
47	MSB = 30 perc
48	
49	
50	REPÜLÉSI IDŐ A PONTIG
51	(KÖZVETLEN /DIRECT/ ÚTVONAL)
52	
53	Tartomány = [0, 59]
54	
55	LSB = 60/512 perc
56	FENNTARTOTT

2-95. táblázat: BDS kód 5,F — Kvázi-sztatikus jellemzők figyelése

B-közlemény mező

1	KIVÁLASZTOTT MAGASSÁG
2	
3	KIVÁLASZTOTT MÁGNESES IRÁNY
4	
5	KIVÁLASZTOTT SEBESSÉG
6	
7	KIVÁLASZTOTT MACH SZÁM
8	
9	KIVÁLASZTOTT MAGASSÁG-VÁLTÁSI SZINT
10	
11	KIVÁLASZTOTT REPÜLÉSI PÁLYA SZÖG
12	
13	KÖVETKEZŐ ÚTVONAL-PONT
14	
15	REPÜLÉS VEZÉRLŐ RENDSZER /FMS/ VÍZSZINTES MÓD
16	
17	REPÜLÉS VEZÉRLŐ RENDSZER /FMS/ FÜGGŐLEGES MÓD
18	
19	VHF CSATORNA JELENTÉS
20	
21	METEOROLÓGIAI VESZÉLYEK
22	
23	CÉL /ELÉRENDŐ/ MAGASSÁG
24	
25	
26	
27	
28	
29	

CÉL: Azon paraméterek változásai figyelésének lehetővé tétele, amelyek általában nem nagy gyakorisággal változnak, azaz azoké, amelyek várhatóan 5 percig vagy annál hosszabb ideig állandóak maradnak az egy egyedüli tároló általi hozzáféréssel.

A jellemzők figyelésének kódolása:

Az egyes jellemzők változását 2 bit figyelésével kell végrehajtani. A 00 értéknek azt kell jeleznie, hogy nincs rendelkezésre álló érvényes adat ennél a paraméternél. Ennek a 2 bites mezőnek a decimális értékét ciklikusan léptetni kell az 1., 2. és 3.-on keresztül és mindegyik lépés a figyelt paraméter egy változását jelzi.

A meteorológiai veszély részmezőnek jeleznie kell a turbulenciát, a szélnyírást, az örvényáramlási nyomvonalat, a jegesedést és a konvektív leáramlást, ahogy az a 45_{16} számú tárolóban van.

2-95. táblázat folytatása:

30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	FENNTARTOTT
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	

2-96. táblázat: BDS kód 6,0 — Mágneses irány és sebesség jelentés

B-közlemény mező

1	ÁLLAPOT
2	JELZÉS 1 = Nyugat (pl. 315°= –45°)
3	MSB = 90 fok
4	
5	
6	MÁGNESES IRÁNY
7	
8	
9	Tartomány = [-180, +180]
10	
11	
12	LSB = 90/512 fok
13	ÁLLAPOT
14	MSB = 512 csomó
15	
16	
17	MŰSZER SZERINTI SEBESSÉG
18	
19	
20	Tartomány = [0, 1 023]
21	
22	
23	LSB = 512/512 = 1csomó
24	ÁLLAPOT
25	MSB = 2,048
26	
27	MACH /szám/
28	
29	

CÉL: Mágneses irány és sebesség adatok biztosítása a földi rendszerek részére.

1) A maximális elfogadható adat elöregedésnek – a földre történő továbbítás pillanatában – az összes paraméterre 1 másodpercnek kell lenni.

2) A tároló felfrissítési gyakoriságának elegendőnek kell lennie annak biztosításához, hogy az összes paraméter maximális elfogadható adat elöregedését ne haladja meg a szabályos üzemeltetés során.

3) Ha a maximális elfogadható adat elöregedés bármely paraméterre túllépésre kerül, akkor annak a paraméternek az állapot bitjét az Általános formátumozó/kezelőnek /GFM/ ténylegesen 0-ra kell állítania.

4) Ha az adat-forrástól eredő paraméter értéke meghaladja a tároló meghatározásában megengedhető tartomány értékét, akkor a maximális megengedhető értéket – a megfelelő pozitív vagy negatív értelemben – kell felhasználni helyette.

Megjegyzés. – Ez szükségessé teszi a GFM aktív beavatkozását.

5) Az ezekbe a tárolókba bevitt adatokat – amikor csak lehetséges – a légijármű vezérlési adat-forrásaiból kell származtatni.

./.

2-96. táblázat folytatása:

30	Tartomány = [0, 4,096]
31	
32	
33	
34	LSB = 2,048/512
35	ÁLLAPOT
36	JELZÉS 1 = Alatt
37	MSB = 8 192 láb/perc
38	
39	BAROMETRIKUS MAGASSÁG-VÁLTOZÁS
40	
41	
42	Tartomány = [-16 384, +16 352]
43	
44	
45	LSB = 8 192/256 = 32 láb/perc
46	ÁLLAPOT
47	JELZÉS 1 = Alatt
48	MSB = 8 192 láb/perc
49	
50	INERCIÁLIS FÜGGŐLEGES SEBESSÉG
51	
52	
53	Tartomány = [-16 384, +16 352]
54	
55	
56	LSB = 8 192/256 = 32 láb/perc

6) Az összes paraméterre szükség van az inerciális függőleges sebesség kivételével, amelyet a légijárműnek csak akkor kell szolgáltatnia, ha fel van szerelve egy megfelelő inerciális adat-forrással. Ha az inerciális függőleges sebesség nem áll rendelkezésre, akkor a 46-tól az 56-ig terjedő biteket – ezeket is beleértve – az Általános formátumozó/kezelőnek /GFM/ ténylegesen 0-ra kell beállítani.

7) Az összes mező LSB-t kerekített értékkel kell megkapni.

2-97. táblázat: BDS kód 6,1 — Kényszerhelyzeti/elsőbbségi állapot

B-közlemény mező

Bit	Mező
1	
2	
3	FORMÁTUM TÍPUS KÓD = 28
4	
5	
6	
7	ALTÍPUS KÓD = 1
8	
9	KÉNYSZERHELYZETI/ELSŐBBSÉGI ÁLLAPOT
10	
11	
12	
13	
14	
15	
16	
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19	
20	
21	
22	
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CÉL: Kiegészítő információ biztosítása a légijármű állapotáról.

Az altípust a következők szerint kell kódolni:

0	=	Nincs információ
1	=	Kényszerhelyzeti/elsőbbségi állapot
2-től 7-ig	=	Fenntartott

A kényszerhelyzeti/elsőbbségi állapotot a következők szerint kell kódolni:

Érték	Jelentés
0	Nincs kényszerhelyzet
1	Általános kényszerhelyzet
2	Mentő/Egészségügyi
3	Minimális üzemanyag
4	Nincs összeköttetés
5	Jogtalan beavatkozás
6	Fenntartott
7	Fenntartott

1) A közlemény kézbesítést másodpercenként egyszer kell végrehajtani az esemény-vezérelt protokol felhasználásával.

./.

./.

2-97. táblázat folytatása:

30		2) A kényszerhelyzeti állapot befejeződését a repülési helyzet közlemény légtér-ellenőrzési állapot mezőjének kódolásával kell meghatározni.
31		
32		
33	FENNTARTOTT	
34		
35		
36		
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2-98/99. táblázat: BDS kód 6,2/6,3 — Jelenlegi/következő pályagörbe váltási pont (TCP/TCP+1)

B-közlemény mező

1	FORMÁTUM TÍPUS KÓD = 29	
2		
3		
4		
5		
6	TCP típus (0 = jelenlegi, 1 = következő)	
7	PÁLYAGÖRBE PONT / SZAKASZ TÍPUS	
8		
9	(Lásd a 2.3.9.3 pontot)	
10		
11	TCP ADAT ÉRVÉNYESSÉG (0 = érvénytelen, 1 = érvényes)	
12	TCP Formátum (0 = 4D TCP)	TCP Formátum (1 = 3D TCP)
13	MSB	MSB
14	TCP/TCP+1	TCP/TCP+1
15	MAGASSÁG	MAGASSÁG
16		
17	(Lásd a 2.3.9.6 pontot)	(Lásd a 2.3.9.6 pontot)
18		
19		
20		
21		
22	LSB	LSB
23	MSB = 180 fok	MSB = 180 fok
24	TCP/TCP+1	TCP/TCP+1
25	FÖLDRAJZI SZÉLESSÉG	FÖLDRAJZI SZÉLESSÉG
26	(Kompakt helyzet jelentés /CPR/ páros kódolással)	(Szögbeli súlyozott bináris kódolás)
27	(Lásd a 2.3.9.7.1 pontot)	(Lásd a 2.3.9.7.2 pontot)

CÉL: A légijármű szándékának megadása, ahogy azt a jelenlegi vagy következő pályagörbe váltási pont meghatározza.

1) A közlemény kézbesítését az esemény-vezérelt protokol felhasználásával kell végrehajtani.

2-98/99. táblázat folytatása:

28		
29		
30		
31		
32		
33		
34		
35		
36	LSB	
37	MSB	
38	TCP/TCP+1	
39	FÖLDRAJZI HOSSZÚSÁG	LSB = $2^{-17} \times 360$ fok
40	(Kompakt helyzet jelentés /CPR/ páros kódolással)	MSB = 180 fok
41		TCP/TCP+1
42	(Lásd a 2.3.9.8.1 pontot)	FÖLDRAJZI HOSSZÚSÁG
43		(Szögbeli súlyozott bináris kódolás)
44		(Lásd a 2.3.9.8.2 pontot)
45		
46		
47		
48		
49		
50	LSB	
51	MSB	
52	TCP/TCP+1	
53	REPÜLENDŐ IDŐ (TTG)	
54		
55	(Lásd a 2.3.9.9 pontot)	
56	LSB	LSB = $2^{-17} \times 360$ fok

2-100. táblázat: BDS kód 6,4 — Légijármű üzemeltetési koordinációs közlemény

B-közlemény mező

1	FORMÁTUM TÍPUS KÓD = 30
2	
3	
4	
5	
6	ALTÍPUS KÓD = 0
7	
8	
9	MSB PÁROS CÍMZÉS (a 2.3.10.3 pontban meghatározva)
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
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25	
26	
27	
28	
29	

CÉL: Azon különböző légijárművek paraméterei pillanatnyi állapotának biztosítása, amelyek az üzemeltetési alkalmazásokhoz szükségesek, különösen azokhoz, amelyek összepárosított légijárműveket foglalnak magukba.

1) A közlemény kézbesítést az esemény-vezérelt protokol felhasználásával kell végrehajtani.

2-100. táblázat folytatása:

30	
31	
32	LSB
33	MSB
34	FUTÓPÁLYA KÜSZÖB FELETTI SEBESSÉG
35	
36	(a 2.3.10.4 pontban meghatározva)
37	LSB
38	BEDÖNTÉSI SZÖG JELÖLŐ BIT (a 2.3.10.5 pontban meghatározva)
39	MSB
40	BEDÖNTÉSI SZÖG
41	(a 2.3.10.6 pontban meghatározva)
42	
43	LSB
44	MEGSZAKÍTOTT MEGKÖZELÍTÉS (a 2.3.10.7 pontban meghatározva)
45	
46	HAJTÓMŰ LEÁLLÁS (a 2.3.10.8 pont-ban meghatározva)
47	
48	
49	
50	FENNTARTOTT
51	
52	
53	
54	
55	
56	

2-101. táblázat: BDS kód 6,5 — Légijármű üzemeltetési állapot

B-közlemény mező

1	MSB
2	
3	FORMÁTUM TÍPUS KÓD = 31
4	
5	LSB
6	MSB
7	ALTÍPUS KÓD = 0
8	LSB
9	MSB
10	ÚTVONALI ÜZEMELTETÉSI TELJSÍTŐKÉPESSÉG (CC-4)
11	(a 2.3.11.3 pontban meghatározva)
12	LSB
13	MSB
14	KÖZELKÖRZETI ÜZEMELTETÉSI TELJESÍTŐKÉPESSÉG (CC-3)
15	(a 2.3.11.4 pontban meghatározva)
16	LSB
17	MSB
18	MEGKÖZELÍTÉSI/LESZÁLLÁSI ÜZEMELTETÉSI TELJESÍTŐ-KÉPESSÉG (CC-2)
19	(a 2.3.11.5 pontban meghatározva)
20	LSB
21	MSB
22	FÖLDFELSZÍNI ÜZEMELTETÉSI TELJESÍTŐKÉPESSÉG (CC-1)
23	(a 2.3.11.6 pontban meghatározva)
24	LSB
25	MSB
26	ÚTVONALI ÜZEMELTETÉSI TELJESÍTŐKÉPESSÉGI ÁLLAPOT (OM-4)
27	(a 2.3.11.7 pontban meghatározva)
28	LSB

CÉL: A légijármű fedélzetén lévő ATC-vonatkozású berendezések teljesítő-képességi osztályának és pillanatnyi üzemeltetési módjának megadása.

1) A közlemény kézbesítését az esemény-vezérelt protokol alkalmazásával kell elvégezni.

2-101. táblázat folytatása:

29	MSB
30	KÖZELKÖRZETI ÜZEMELTETÉSI TELJESÍTŐKÉPESSÉGI ÁLLAPOT (OM-3)
31	(a 2.3.11.8 pontban meghatározva)
32	LSB
33	MSB
34	MEGKÖZELÍTÉSI/LESZÁLLÁSI ÜZEMELTETÉSI TELJESÍTŐ-KÉPESSÉGI ÁLLAPOT (OM-2)
35	(a 2.3.11.9 pontban meghatározva)
36	LSB
37	MSB
38	FÖLDFELSZÍNI ÜZEMELTETÉSI TELJESÍTŐKÉPESSÉGI ÁLLAPOT (OM-1)
39	(a 2.3.11.10 pontban meghatározva)
40	LSB
41	
42	
43	
44	
45	
46	
47	FENNTARTOTT
48	
49	
50	
51	
52	
53	
54	
55	
56	

2-241. táblázat: BDS kód F,1 — Katonai alkalmazások

B-közlemény mező

1	ÁLLAPOT	
2	Karakter mező (lásd 1.)	
3	C1	1. MÓDÚ KÓD
4	A1	
5	C2	
6	A2	
7	C4	
8	A4	
9	X	
10	B1	
11	D1	
12	B2	
13	D2	
14	B4	
15	D4	
16	ÁLLAPOT	
17	C1	2. MÓDÚ KÓD
18	A1	
19	C2	
20	A2	
21	C4	
22	A4	
23	X	
24	B1	
25	D1	
26	B2	
27	D2	
28	B4	
29	D4	

CÉL: A katonai alkalmazások alátámasztására szolgáló adatok biztosítása.

1) A karakter mezőt annak jelzésére kell felhasználni, hogy az 1. módú kódban 2 karakter vagy 4 karakter használatos.
A logikának a következőnek kell lennie:

0 = 2 nyolcas számrendszerű kód
(A1-A4 és B1-B4)

1 = 4 nyolcas számrendszerű kód
(A1-A4, B1-B4, C1-C4 és D1-D4)

./.

2-241. táblázat folytatása:

30	FENNTARTOTT
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
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51	
52	
53	
54	
55	
56	

2) Az állapot mezőt annak jelzésére kell felhasználni, hogy az adat rendelkezésre áll-e, vagy nem áll rendelkezésre. A logika a következő:

0 = Nem áll rendelkezésre
1 = Rendelkezésre áll.

2-242. táblázat: BDS kód F,2 — Katonai alkalmazások

B-közlemény mező

1		
2		
3	TÍPPUS KÓD = 0	
4		
5		
6	ÁLLAPOT	
7	Karakter mező (lásd 1.)	
8	C1	
9	A1	
10	C2	
11	A2	
12	C4	
13	A4	
14	X	1.MÓDÚ KÓD
15	B1	
16	D1	
17	B2	
18	D2	
19	B4	
20	D4	
21	ÁLLAPOT	
22	C1	
23	A1	
24	C2	
25	A2	
26	C4	
27	A4	
28	X	2.MÓDÚ KÓD
29	B1	
30	D1	

CÉL: Ez a tároló – a DF = 19-t is beleértve – a katonai alkalmazásokra használatos. Ennek a célja az, hogy biztosítsa a katonai alkalmazásokat alátámasztó adatokat.

A 'TÍPUS KÓD'-ot a következők szerint kell kódolni:

0 = Mód kód információ
1 – 31 = Kijelöletlen

1) A karakter mezőt annak jelzésére kell felhasználni, hogy az 1. módú kódban 2 karakter vagy 4 karakter használatos. A logikának a következőnek kell lennie:

0 = 2 nyolcas számrendszerű kód (A1-A4 és B1-B4)

1 = 4 nyolcas számrendszerű kód (A1-A4, B1-B4, C1-C4 és D1-D4)

./.

2-242.táblázat folytatása:

31	B2	
32	D2	
33	B4	
34	D4	
35	ÁLLAPOT	2) Az állapot mezőt annak jelzésére kell felhasználni, hogy az adat ren-delkezésre áll-e, vagy nem áll rendelkezésre. A logika a következő: 0 = Nem áll rendelkezésre 1 = Rendelkezésre áll.
36	C1	A. MÓDÚ KÓD
37	A1	
38	C2	
39	A2	
40	C4	
41	A4	
42	X	
43	B1	
44	D1	
45	B2	
46	D2	
47	B4	
48	D4	
49		FENNTARTOTT
50		
51		
52		
53		
54		
55		
56		

3. AZ S-MÓDÚ SPECIFIKUS PROTOKOLOK (MSP) FORMÁTUMAI

3.1 AZ S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ CSATORNA SZÁM KIJELÖLÉSEK

A protokoloknak és az adat-továbbítások részleteinek a következő pontokban meghatározottaknak kell lenni.

Megjegyzés. - Néhány MSP csatorna szám már kijelölésre került (lásd az 5. fejezet 5-25. táblázatot).

3.2 A FEDÉLZETRE IRÁNYULÓ MSP CSATORNÁK

A következő részek 3.2.X-ként kerültek számozásra, ahol az 'X' a fedélzetre irányuló MSP csatorna szám decimális megfelelője. Ez azért van így, mivel lehetővé kell tenni az ezidáig még nem meghatározott formátumok beillesztését anélkül, hogy az hatással lenne a pontok számozására.
Az MSP csomag formátumokra az 5. Fejezet vonatkozik.
.

3.2.1 FEDÉLZETRE IRÁNYULÓ MSP 1.CSATORNA

(Speciális szolgáltatás kezelésre fenntartva.)

Ennek a csatornának a leírása még nem került kidolgozásra.

3.2.2 FEDÉLZETRE IRÁNYULÓ MSP 2. CSATORNA

(FORGALMI TÁJÉKOZTATÁSI SZOLGÁLTATÁS (TIS)).

3.2.2.1 *CÉL*

A forgalmi tájékoztatási szolgáltatásnak /TIS/ rendelkeznie kell azzal a képességgel, hogy létrehozzon egy riasztási információt minden olyan légijárművön, amely rendelkezik egy (A/C Módú vagy S-Módú) működő válaszjeladóval, vagy olyan légijárműről, amely az SSR rendszerrel integrált radar nyomkövetés alatt áll.

Megjegyzés. - A forgalmi tájékoztató szolgálatnak (TIS) az a célja, hogy növelje a "látni és elkerülni" repülés biztonságát és a hatékonyságot avval, hogy biztosítja a légijárművezető részére a közeli forgalom kijelzését, és figyelmeztetéseket ad minden lehetséges fenyegető forgalmi körülményről. A TIS működésileg megegyezik az ACAS I.-el, biztosítja a forgalmi tanácsadást, de nem ad megoldási tanácsadási információt. Az S-Módú földi lekérdezők által fenntartott légtérellenőrzési adatbázis és azok adat-kapcsolata felhasználásával a TIS biztositani tudja a légijármű fedélzeti forgalmi riasztást a minimális légijármű fedélzeti berendezés követelménnyel. A TIS mindennemű légiforgalmi irányítási /ATC/ közreműködés nélkül kerül biztosításra.

3.2.2.2 *A TIS FEDÉLZETRE IRÁNYULÓ KÖZLEMÉNY FORMÁTUMAI*

A TIS fedélzetre irányuló közleményt úgy kell megszerkeszteni, ahogy az alábbiakban bemutatásra kerül. Az egyes TIS fedélzetre iráynuló közleményeknek 56 bitből kell állniuk. A TIS forgalmi adat közleményeknek egy vagy több rövid-formátumú S-Módú specifikus protokol /MSP/ csomagból kell állni.

Három típusú TIS fedélzetre irányuló közlemény van, a következők szerint:

1) „Készenlétben”

2) „Búcsú”

3) „Forgalmi adat”

FEJRÉSZ	*KÖZLEMÉNY TÍPUS*	*FORGALOM BLOKK 1.*	*FORGALOM BLOKK 2.*
8 BIT	6 BIT	21 BIT	21 BIT

MEGJEGYZÉS. – A TIS fedélzetről leadott közlemények formátumát ennek a Függeléknek a 4. Része határozza meg a 02_{16} általános adás azonosító alatt.

3.2.2.2.1 *Közlemény fej-rész*

A 8-bites fej-résznek az összes TIS közleményben meg kell lenni. A TIS közlemény fej-rész értékének 02-nek (hexadecimális) kell lenni, mivel az összes TIS közlemény a rövid-formátumú MSP protokolt használja fel, és a TIS az MSP 2. csatornára van kijelölve.

3.2.2.2.2 *Közlemény típus*

A 6-bites közlemény típus mezőt kell felhasználni a különböző típusú, fedélzetre irányuló közlemények közötti különbség-tételre:

Közlemény típus érték	*Fedélzetre irányuló TIS közlemény típus*
0-tól 59-ig	Forgalmi adat, első szegmens (saját-irány)
60	Forgalmi adat, közbenső szegmens(ek)
61	Forgalmi adat, utolsó szegmens
62	Búcsú
63	Készenlétben

Egy "első szegmens" forgalmi adat közlemény esetében a 6-bites közlemény típus mezőnek magába kell foglalnia a TIS közleményt vevő légijármű S-módú lekérdezőtől-származtatott nyomkövetett saját-irányát. A mágneses irányt 6 fokos növekedéssel kell kvantálni, és a lekérdezőtől meghatározott mágneses északhoz viszonyítottan kell kifejezni. A forgalmi adat közleményekben a saját-irány értéket azért kell biztosítani, hogy lehetővé tegye a TIS-el felszerelt - repülési irány érzékelőt felhasználó - légijármű fedézetén a kijelzett irány helyesbítését.

Megjegyzés. - Az ilyen irány helyesbítés akkor lehet szükséges, amikor a légijármű manővereket hajt végre vagy a szél miatt 'kígyózó útiránnyal' repül.

Mivel több TIS forgalmi adat közleményt vehet egy adott légijármű, egy adott letapogatás alatt, a TIS feldolgozásnak képesnek kell lennie arra, hogy pontosan összecsoportosítsa a fedélzetre irányuló TIS forgalmi adatokat. Az "első", "közbenső" és "utolsó" szegmens típusú értékeknek biztosítaniuk kell az ennek a csoportosítási folyamatnak a végrehajtásához szükséges információkat. Az ehhez szükséges mechanizmusnak az alábbiakban meghatározottaknak kell lenni. Legalább 4 TIS forgalmi adat közlemény részére (nyolc légijármű) tároló helyet kell biztosítani.

3.2.2.2.2.1 Készenlétben közlemény

A TIS készenlétben közleménynek tartalmaznia kell a közlemény fej-részt és a közlemény típus mezőket, ahogy az előzőekben leírásra került. A közlemény típus mezőt 63 decimális értékre kell beállítani. A közlemény fennmaradó bitjeit nem kell használni.

3.2.2.2.2.2 Búcsú közlemény

A TIS búcsú közleménynek tartalmaznia kell a közlemény fej-részt és a közlemény típus mezőket, ahogy az előzőekben leírásra került. A közlemény típus mezőt 62 decimális értékre kell beállítani. A közlemény fennmaradó bitjeit nem kell használni.

3.2.2.2.3 *Forgalmi tájékoztatási blokk*

Az egyes TIS forgalmi adat közleményeknek magukba kell foglalniuk két 21-bites forgalmi tájékoztatási blokkot, amelyeknek a felépítése az alábbiakban kerül bemutatásra. A forgalmi tájékoztatási blokkban lévő hat mezőnek kell leírnia az egy TIS riasztási helyzetű légijárművet. Egy TIS forgalmi adat közleménynek képesnek kell lenni egy vagy két riasztási helyzetű légijármű meghatározására.

Megjegyzés. - A TIS forgalmi adat közleménynek egy 'n' számot lehet a fedélzetre továbbítani egy adott letapogatás során azért, hogy továbbítsa az információt, hogy '2n' riasztási helyzetű légijármű van.

A forgalom iránya	A forgalom távolsága	Relatív magasság	Magasság-változás mértéke	A forgalom mágneses iránya	Forgalmi helyzet
6 bit	4 bit	5 bit	2 bit	3 bit	1 bit

3.2.2.2.3.1 Forgalom iránya

A 6-bites forgalom iránya mezőnek tartalmaznia kell a saját légijármű mágneses iránytól a riasztási helyzetű légijárműhöz mért irányszöget 6 fokos növekedéssel kvantálva. A forgalom iránya mező érvényes tartományának a 0-tól az 59-ig-nek kell lenni (az alábbiakban leírt kivétellel).

Megjegyzés. - Mivel ezt az irányszöget a TIS határozta meg, az általa mért saját-légijármű irányhoz vonatkoztatva, alkalmazni lehet a fedélzeti iránymérési forrásból eredő helyesbítéseket.

Ha csak egy riasztási helyzetű légijármű van egy adott TIS forgalmi adat közleményben, akkor a nem használt forgalmi tájékoztatási blokk forgalom iránya mezőjét a 63 értékre (az irányszög 360 foknál nagyobb) kell állítani, és a forgalmi tájékoztatási blokk fennmaradó bitjeit figyelmen kívül kell hagyni. Ezt egy "nulla riasztás" blokknak kell nevezni.

3.2.2.2.3.2 A forgalom távolsága

A 4-bites fogalom távolság mezőnek kell magába foglalnia a saját-légijármű és a riasztási helyzetű légijármű közötti távolságot. Egy nem-lineáris távolság kódolást kell használni az ehhez a mezőhöz szükséges bitek számának minimálisra való csökkentése érdekében a következők szerint:

A forgalom távolságának értéke (r)	Távolság (230 m-es (0,125 tmf) növekménnyel)
0	$0 \leq r \leq 1$
1	$1 < r \leq 3$
2	$3 < r \leq 5$
3	$5 < r \leq 7$

4	$7 < r \leq 9$
5	$9 < r \leq 11$
6	$11 < r \leq 13$
7	$13 < r \leq 15$
8	$15 < r \leq 18$
9	$18 < r \leq 22$
10	$22 < r \leq 28$
11	$28 < r \leq 36$
12	$36 < r \leq 44$
13	$44 < r \leq 52$
14	$52 < r \leq 56$
15	$r > 56$

3.2.2.2.3.3 Relatív magasság

Az 5-bites relatív magasság mezőnek kell tartalmaznia a saját-légijármű és a riasztási helyzetű légijármű közötti magasság-különbséget. Egy nem-lineáris kódolást kell alkalmazni az ehhez a mezőhöz szükséges bitek számának minimálisra történő csökkentéséhez. Egy speciális kódolási értéket kell használni annak jelzésére, hogy a riasztási helyzetű légijárműnek nincs jelentett magassága. Megállapodás szerint a relatív magasság mező pozitív értékének azt kell jelezni, hogy a riasztási helyzetű légijármű a saját-légijármű felett van.

A relatív magasságot a következőkkel kell megadni:

$$\text{Relatív magasság} = \text{Magasság}_{\text{Riasztási helyzetű légijármű}} - \text{Magasság}_{\text{Saját-légijármű}}$$

ahol a magasságok láb-ban kerülnek jelzésre.

A TIS relatív magasság kódolásának a következőnek kell lenni:

Relatív magasság érték (alt)	*Relatív magasság (láb)*
0	$0 \leq alt \leq +100$
1	$+100 < alt \leq +200$
2	$+200 < alt \leq +300$
3	$+300 < alt \leq +400$
4	$+400 < alt \leq +500$
5	$+500 < alt \leq +600$
6	$+600 < alt \leq +700$
7	$+700 < alt \leq +800$
8	$+800 < alt \leq +900$
9	$+900 < alt \leq +1\,000$
10	$+1\,000 < alt \leq +1\,500$
11	$+1\,500 < alt \leq +2\,000$
12	$+2\,000 < alt \leq +2\,500$
13	$+2\,500 < alt \leq +3\,000$
14	$+3\,000 < alt \leq +3\,500$
15	$+3\,500 < alt$
16	Nincs jelentett magasság
17	$-100 \leq alt < 0$

18	−200 ≤ alt < −100
19	−300 ≤ alt < −200
20	−400 ≤ alt < −300
21	−500 ≤ alt < −400
22	−600 ≤ alt < −500
23	−700 ≤ alt < −600
24	−800 ≤ alt < −700
25	−900 ≤ alt < −800
26	−1 000 ≤ alt < −900
27	−1 500 ≤ alt < −1 000
28	−2 000 ≤ alt < −1 500
29	−2 500 ≤ alt < −2 000
30	−3 000 ≤ alt < −2 500
31	Magasság < −3 000

3.2.2.2.3.4 A magasság-váltás mértéke

A 2-bites magasság-változás mértéke mezőnek kell jeleznie azt, hogy a riasztási helyzetben lévő légijármű emelkedik-e, süllyed-e, vagy szint-repülésben van. Küszöb-értékként egy 500 láb/perc magasság-változási mértéket kell alkalmazni. A TIS magasság-változás mérték mező kódolása a következő:

Magasság-változás mérték mező érték	*Magasság-változási mérték*
0	Nem használatos
1	Emelkedés (>500 láb/perc)
2	Süllyedés (>500 láb/perc)
3	Szint-repülés

3.2.2.2.3.5 Forgalom mágneses iránya

A 3-bites forgalom mágneses iránya mezőnek kell magába foglalnia a riasztási helyzetben lévő légijármű mágneses irányát 45 fokos növekménnyel kvantálva. Ezt az irányt a riasztási helyzetben lévő légijármű S-Módú lekérdező nyomkövetésére kell alapozni.

Megjegyzés. – A fogalom mágneses irányának durva kvantálása elegendő segítséget ad a TIS riasztási közleményt vevő légijármű vezetőjének arra, hogy látással „befogja” a forgalmi riasztási helyzetű légijárművet.

3.2.2.2.3.6 Forgalmi helyzet

Az 1-bites forgalmi helyzet mezőnek kell azonosítania a forgalmi tájékoztatási blokkban megjelenített riasztás típusát. A „NULLA” helyzet értéknek kell a „közelségi” riasztást jelezni és az „EGY” helyzet értéknek kell a „fenyegető” riasztást jelezni.

3.2.2.2.4 *A többszörös TIS riasztások kezelése*

Ahogy a korábbiakban leírásra került, egy adott letapogatás forgalmi adat tájékoztatás magába fog foglalni egy vagy több TIS forgalmi adat közleményt. Ennek a letapogatásnak az utolsó TIS fedélzetre irányuló közleménye utolsó forgalmi tájékoztatási blokkjának egy nulla-riasztás blokknak kell lenni akkor, ha páratlan számú riasztási légijármű van ebben a közleményben. A nulla-riasztás helyzetet a forgalmi tájékoztatási blokk forgalom iránya mezőben a 63 decimális értékkel kell jelezni.

3.2.2.2.4.1 Egy adott TIS forgalmi adat közleményen belül a TIS forgalmi tájékoztatási blokkokat úgy kell elrendezni, hogy a legnagyobb elsőbbségű riasztások legyenek az elsők. Az összes „fenyegetés" helyzetű forgalmi tájékoztatási blokknak meg kell előznie a „közelségi" helyzetű forgalmi tájékoztatási blokkokat. A helyzet osztályozásán belül, a forgalmi tájékoztatási blokkokat a növekvő forgalom sorrendjében kell elhelyezni.

Megjegyzés. – Ez a sorrendbe állítás biztosítja azt, hogy a legkritikusabb forgalmi riasztások kerülnek a lista elejére a forgalmi tájékoztatási blokkokban. Ennek megfelelően a TIS a leglényegesebb légijárművet fogja 'jelenteni' az egy letapogatás alatt továbbítható számú közlemények határértékén belül.

3.2.2.3 *A T IS FORGALMI ADAT KÖZLEMÉNYEK CSOPORTOSÍTÁSI MECHANIZMUSA*

3.2.2.3.1 Egy adott letapogatásra a TIS forgalmi adat közlemények csoportosítási mechanizmust az egyes közlemények közlemény típus mezőire kell alapozni, ahogy az a 3.2.2.2 pontban leírásra került.

3.2.2.3.2 Mivel az S-Módú A-adatátviteli protokol többszörös másolatot tud kézbesíteni ugyanarról a közleményről, ezért a közlemény csoportosítása kiinduló lépésének a közlemények duplázása kiküszöbölésének ellenőrzése kell, hogy legyen. Ezt az egymást követően vett közlemények azonos közlemény típusának bit összehasonlításával lehet megvalósítani.

3.2.2.3.3 A duplikálás kiküszöbölése után az egy adott csoportosításnál a TIS forgalmi adatoknak mindig az „első" szegmens közleménnyel kell kezdődniük. Ennek a mezőnek kell magába foglalnia a csoportra a saját-irány értéket. A további TIS forgalmi adat közleményeket a csoportosításban (ha ilyen van) az alábbi táblázatban megadottak szerint kell szerkeszteni:

A forgalmi légijárművek száma	*A csoport szerkesztése*
1	Első
2	Első
3	Első és utolsó
4	Első és utolsó
5	Első, 1 közbenső és utolsó
6	Első, 1 közbenső és utolsó
7	Első, 2 közbenső és utolsó
8	Első, 2 közbenső és utolsó
Stb.	Első, közbensők és utolsó

3.2.2.3.4 Az „első" szegmens vételének a közlemény csoport kialakítását kell megkezdeni. Az ezután következő – fedélzetre irányuló – TIS forgalmi adat közleményeket hozzá kell adni a csoporthoz addig, amíg a következő helyzetek valamelyike be nem következik:

a) egy fedélzetre irányuló TIS „utolsó" típusú közlemény kerül vételre (a csoport végső része);

b) egy, a fedélzetre irányuló TIS „első" szakasz, „készenlétben" vagy „búcsú" típusú közlemény kerül vételre; vagy

c) több, mint 6 másodperc telt el a csoport vételének kezdete óta.

3.2.2.3.5 A TIS forgalmi adat közlemény csoport összes forgalmi blokkjának (az 1-től az n-ig) a megfelelő időben megjelenőnek kell lenni. Ezután egy új csoportot kell elkezdeni, egy másik fedélzetre irányuló TIS forgalmi adat „első” szegmensű közleményének vételekor. A fedélzetre irányuló TIS forgalmi adat közleményekből a „közbenső” vagy „utolsó” típusú közleményeket figyelmen kívül kell hagyni, ha egy új csoport nem egy „első” szakasz vételével kezdődik.

3.2.2.4 *A Forgalmi tájékoztatási szolgáltatás /TIS/ kapcsolat létrehozási / bontási protokolok*

Azt a feldolgozást, ami ahhoz szükséges, hogy a TIS kapcsolat az S-Módú földi lekérdezővel létrejöjjön / bontásra kerüljön akkor, amikor a fedésterület határvonalát a légijármű keresztezi, arra az információra kell alapozni, amit a légijármű S-Módú válaszjeladójának teljesítőképesség tárolója foglal magába, valamint két, a fedélzetre irányuló speciális TIS közleményre.

3.2.2.4.1 *S-Módú teljesítőképesség jelentés*

Az S-Módú válaszjeladóban a 10_{16} válaszjeladó tárolónak kell tartalmaznia azokat a biteket, amelyek a légijárműnek az S-Módú funkciókra vonatkozó teljesítőképességi szintjét jelzik. Ezt a tárolót minden egyes olyan S-Módú földi lekérdezőnek ki kell olvasni, amely a légijárművet befogja. Ennek a tárolónak a 25. bitjét „EGY”-re kell beállítani akkor, ha a légijármű rendelkezik valamilyen S-Módú specifikus protokol /MSP/ adat-kapcsolat szolgáltatással (azaz TIS-el).

Megjegyzés. – Ez a bit csak az MSP adat-kapcsolat jelenlétet jelzi a légijármű fedélzeten, és NEM jelzi azt, hogy ezeknek a szolgáltatásoknak bármelyikét a légijármű személyzete egy adott időpontban használja is.

3.2.2.4.2 *S-Módú specifikus protokol /MSP/ teljesítőképesség jelentés*

Az S-Módú válaszjeladón belül az $1D_{16}$-tól az $1F_{16}$-ig számozott válaszjeladó tárolók foglalják magukba azokat a biteket, amelyek jelzik a légijármű fedélzetén bizonyos MSP adat-szolgáltatások dinamikus állapotát (ahol az alkalmazott berendezésekben meghatározott, pl. TIS). Ezeket a tárolókat minden egyes olyan S-Módú földi lekérdezőnek ki kell olvasni, amely a légijárművet befogja akkor, ha az S-Módú teljesítőképesség jelentés azt jelzi, hogy a légijármű rendelkezik az MSP adat-kapcsolati szolgáltatással. Az $1D_{16}$-os MSP teljesítőképesség jelentés tároló 2. bitjét „EGY”-re kell állítani akkor, ha a TIS alátámasztás megkívánt; máskülönben a bitet „NULLA”-ra kell állítani. Ennek a bitnek a beállítását és törlését a TIS „szolgáltatás kapcsolat kérés” (TSCR) és a „szolgáltatás bontás kérés” (TSDR) létrehozásával együtt kell megadni a fedélzetről leadott közleményekben, ahogy ez a 4. részben a fedélzetről leadott általános adás azonosítónál a 02_{16}-nál meghatározásra került.

3.2.2.4.3 *A készenlétben időzítő*

TIS forgalmi adat közlemények hiánya esetén, a TIS készenlétben közleményeket kell az S-módú földi lekérdezővel a fedélzetre továbbítani. A légijármű fedélzeti feldolgozó egységének egy olyan időzítőt kell fenntartani, ami méri a fedélzetre továbbított és vett TIS közlemények közötti időközöket. Az időzítőnek vissza kell állni minden egyes olyan időponthoz, amikor a rendszer egy fedélzetre irányuló TIS közleményt vett. Ha ez a „készenlétben” időzítő eléri a 60 másodpercet (a „készenlétben” időzítő paramétere a TIS közleményekre), akkor a TIS föld-levegő szolgáltatást sikertelennek kell nyilvánítani, és a TIS alátámasztás a továbbiakban nem áll rendelkezésre az S-módú földi lekérdezőtől.

Megjegyzés. – A TIS-t feldolgozó adat-kapcsolat szolgáltatásnak periódikus fedélzetre irányuló közleményeket kell venni az S-módú földi lekérdezőtől abból a célból, hogy biztosítva legyen a föld-levegő kapcsolat fenntartása, és hogy a földi TIS alátámasztás folytatódjon.

3.2.2.4.4 *A TIS fő lekérdező azonosító (II) kód protokolja*

Az egyes fedélzetre irányuló TIS közlemények velejárója egy 4-bites lekérdező azonosító (II) kód, ami azonosítja azt, hogy melyik S-módú földi lekérdező (vagy lekérdező csoport) hozta létre a közleményt. Minden egyes adott pillanatban csak egy S-módú földi lekérdezőt kell „fő lekérdezőnek” (PI) nyilvánítani. Az olyan területeken, ahol a lekérdező általi átfedő S-módú fedésterület van eltérő II-kódokkal egy „tartalék lekérdezőt” (AI) is ki kell jelölni. Az II-kódokat kezelő TIS protokolnak az alábbiakban meghatározottnak kell lenni.

Megjegyzés. – Az S-módú lekérdezők részére az II-kódok oly módon vannak kijelölve, hogy az átfedő légtérellenőrző fedésterületű lekérdezők nincsenek átcsoportosítva, és nem lehet azonos II-kódjuk.

3.2.2.4.5 *A TIS kijelzés létrehozása*

Amikor TIS közlemények kerülnek egyidőben egynél több lekérdezőtől vételre, akkor csak azokat a TIS közleményeket kell kijelezni a légijárművezető részére, amelyek a pillanatnyilag kijelölt fő lekérdezőtől /PI/ jönnek. A nem a fő lekérdezőtől /PI/, hanem más lekérdezőktől kapott TIS közleményeket érvényteleníteni kell, kivéve az alábbiakban a tartalék lekérdező /AI/ feldolgozásra leírtakat.

3.2.2.4.6 *Tartalék lekérdező (AI) azonosítás*

A nem a fő lekérdezőtől /PI/ érkező legfrissebben vett TIS közlemények II-kódját tartalék lekérdező azonosítóként /AI/ meg kell őrizni. Abban az esetben, amikor nem a fő lekérdezőtől /PI/ eredő, hanem más lekérdezőktől származó TIS közlemények sem kerülnek vételre (ahogy az alábbiakban leírásra kerül) nincs pillanatnyi tartalék lekérdező /AI/ sem kijelölve. A tartalék lekérdező meghatározását a „semmilyen állapotban” kell megkezdeni, amikor a TIS engedélyezett (TIS szolgáltatás kapcsolat kérés /TSCR/) vagy letiltott (TIS szolgáltatás bontás kérés /TSDR/) a légijárművezető által.

3.2.2.4.7 *A Fő lekérdező (PI) azonosítója*

Az az első, az S-Módú földi lekérdező által adott válaszban lévő lekérdező azonosító /II/ kód, amelyet a légijármű a fedélzetről továbbított TIS szolgáltatás kapcsolat kérésre /TSCR/ válaszként egy TIS fedélzetre továbbított közleményben kap, lesz a Fő lekérdező /PI/ kód. A Fő lekérdezőt /PI/ fenn kell tartani addig, amíg vagy:

a) A Fő lekérdező /PI/ egy fedélzetre irányuló TIS „búcsú” közleményt nem továbbít; vagy

b) Bekövetkezik a TIS „készenlétben” idő-túllépés a PI-re.

Bármelyik esetben, a tartalék lekérdezőt /AI/ (ha ilyen van) kell előléptetni PI-vé, és most annak a TIS közleményeit kell kijelezni. Ekkor egy új tartalék lekérdezőt /AI/ kell azonosítani. Ha nem volt rendelkezésre álló tartalék lekérdező /AI/ és semmilyen főlekérdező /PI/ most nem áll rendelkezésre, akkor a légijármű fedélzeti TIS feldolgozó egységnek a „nincs TIS alátámasztás” állapotban kell lenni. Ennek az állapotnak addig kell folytatódnia, amíg egy TIS közlemény (vagy forgalmi, vagy készenlétben) kerül vételre az S-módú földi lekérdezőtől. Amikor az ilyen fedélzetre irányuló közlemény vételre kerül, akkor a közleményben lévő II-kód lesz a PI, és a légijármű fedélzeti feldolgozásnak vissza kell térni TIS kijelzésére. A PI meghatározását a „semmilyen” állapotban kell alaphelyzetbe állítani akkor, amikor a légijármű vezetője a TIS-t engedélyezi (TIS szolgáltatás kapcsolat kérés /TSCR/) vagy letiltja (TIS szolgáltatás bontás kérés /TSDR/).

3.2.3 A FEDÉLZETRE IRÁNYULÓ S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ 3. CSATORNA

(Fenntartva a föld-levegő riasztásra).

Ennek a csatornának a leírása még nem került kidolgozásra.

3.2.4 MSP 4. CSATORNA

(Fenntartva a földi származtatású helyzetre).

Ennek a csatornának a leírása még nem került kidolgozásra.

3.2.5 MSP 5. CSATORNA

(Összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ érzékenységi szint szabályozás).
Ennek a csatornának a leírása még nem került kidolgozásra.

3.2.6 MSP 6. CSATORNA

(Föld-levegő kérés).

3.2.6.1 *CÉL*

Ennek a szolgáltatásnak eszközt kell biztosítani a légijármű által alátámasztott szolgáltatásokhoz történő hozzáférés kérésére. Amikor a lehetőség biztosított, akkor a BDS kód 1,D-vel hozzáférhető tároló 6.bitjét 1-re kell állítani.

3.2.6.2 *FORMÁTUM*

A kérést egy fedélzetre irányuló S-módú specifikus protokol /MSP/ csomagban kell továbbítani úgy, hogy a csatorna szám 6-ra van állítva, egy hosszú formátumú MSP csomag esetén a Felügyelő csomagot /SP/ „NULLA"-ra állítva. A felhasználói adat mezőjének kell magába foglalnia a szolgáltatás kérés (SR) fejrészt. A szolgáltatás kérés tartalmát és formátumát az alkalmazás határozza meg.

3.2.6.3 *A SZOLGÁLTATÁS KÉRÉS /SR/ FEJ-RÉSZ KIJELÖLÉSEK*

A szolgáltatás kérés /SR/ decimális értéke	
0	Kijelöletlen
1	Dataflash
2	Helyi rendszer kezelés
3-tól 255-ig	Kijelöletlen

3.2.6.3.1 *Dataflash*

3.2.6.3.1.1 Dataflash kérés formátum

A felhasználói adat mezőnek a 3-1. táblázatban meghatározottnak kell lenni. A kérő S-módú specifikus protokol /MSP/ csomag felhasználói adat mezőjének magába kell foglalnia egy decimális értékű „EGY"-et az első bájtban (Szolgáltatás kérés /SR/ fej-rész), amelyet egy vagy több dataflash szolgáltatás kérés követ. Minden egyes kérésnek magába kell foglalni egy 2-bájtos dataflash kérés fejrészt (DH), amelyet egy 1-bájtos mező követ a jelentések közötti minimális megengedett időköz meghatározására (MT mező), egy 4-bites mező az esemény kritérium meghatározására (EC mező), egy 4-bites mező a stabil idő meghatározására (ST mező), és ha az esemény kritériumban jelzésre kerül, akkor a változás kvantum mező (CQ) és a változási küszöb (CT) mező. A 4-bites stabil idő /ST/ mezőnek kell jeleznie másodpercek tizedes értékében azt, hogy a megváltozott adatok mennyi ideje voltak stabilok, mielőtt a közleményt meg kellett kezdeni. A dataflash fejrészben (DH) a minden helyen nullának azt kell jeleznie, hogy nincs több dataflash kérés az adatcsomagban. Amikor egy S-módú specifikus protokol /MSP/ csomag teljes egészében fel van töltve dataflash kérésekkel, vagy amikor a csomagban nincs elegendő hely további dataflash kérés fejrészek részére, el kell fogadni azt, hogy a dataflash kérés sorozat teljes.

3.2.6.3.1.1.1 Az összes légijármű fedélzeti dataflash berendezésnek és felszerelésnek alá kell támasztani 16 dataflash kapcsolatot. A 2001. január 1. után az első alkalmassági engedélyeket megkapó légijárművek berendezéseinek és felszereléseinek alá kell támasztani 64 dataflash kapcsolatot.

1. Megjegyzés. – Egy egyedüli dataflash kapcsolat egy egyedüli kapcsolat számra vonatkozik (lásd a 3.2.6.3.1.2.1 pontot)egy egyedüli tárolóra egy adott lekérdező azonosító (II) kódra. Ennek megfelelően a dataflash szolgáltatás az egyes lekérdező azonosító (II) kódokra különböző dataflash fejrész /DH/ értékkel egyidejűleg létrehozható ugyanazon légijárművel. Ezeket egymástól függetlenül lehet módosítani vagy megszüntetni.

3.2.6.3.1.1.2 **Ajánlás. –** *Amikor a légijármű rendszere elfogadott egy kérést, akkor a dataflash választ azonnal indítani kell a küszöböktől vagy az esemény kritériumtól függetlenül. Ha 30 másodpercen belül nem kerül válasz vételre, akkor ellenőrizni kell azt, hogy a légijármű még sorrendi lekérdezéssel elérhető-e, és ha így van, akkor egy új kérést kell létrehozniuk. Annak az elkerülése, hogy az olyan megismételt dataflash kérések létrehozásra kerüljenek, amelyek nem hoznak létre választ, az ilyen kérések számát (N) korlátozni kell (N = 3).*

3.2.6.3.1.1.3 Amikor egy kapcsolat kérés kerül vételre egy olyan kapcsolatra, amely már megvan, akkor az 'öreg' kapcsolatot meg kell szakítani, és azonnal be kell helyettesíteni a legutolsóval.

3.2.6.3.1.2 Dataflash fej-rész (DH) 16 bit

A 16-bites DH mező 3 fenntartott bittel elválasztott négy részmezőre van felosztva (14-től 16-ig), lásd a 3-1. táblázatot.

3.2.6.3.1.2.1 Kapcsolat szám részmező (CNS), 4 bit

(A fedélzetre továbbított S-módú specifikus protokol /MSP/ csomag 6. csatorna, felhasználói adat mezőjének 9.-től 12.-ig terjedő bitjei, ha a szolgáltatás kérés /SR/ = 1.)

Ezt a részmezőt úgy kell értelmezni, mint egy olyan kapcsolat számot, ami lehetővé teszi azt, hogy 16 különböző kapcsolat kerüljön társításra a B-adatátvitel kiválasztás 1. /BDS1/ és B-adatátvitel kiválasztás 2. /BDS2/ által meghatározott tárolókból erre a kapcsolat kérésre. A rendelkezésre álló kapcsolat számot a 0-tól 15-ig terjedően a kapcsolat kérés lekérdező azonosító kódjához /II/ kell társítani.

3.2.6.3.1.2.2 Adat kérési részmező (RDS), 1 bit

(A fedélzetre továbbított S-módú specifikus protokol /MSP/ csomag 6. csatorna, felhasználói adat mezőjének 13. bitje, ha a szolgáltatás kérés /SR/ = 1.)

Ez a részmező fogja jelezni azt, hogy a kért kapcsolat által ellenőrzött tároló tartalmát el kell-e küldeni a fedélzetről leadott S-módú specifikus protokol /MSP/ csomag 3. csatornájába, ahonnan minden egyes alkalommal továbbításra kerül akkor, ha a kapcsolatra vonatkozó kritériumok kielégítésre kerülnek. A részmezőt a következők szerint kell értelmezni:

RDS = 0	A felhasználói adatmezőnek csak az 1-től a 40-ig számozott bitjeinek elküldése a fedélzetről leadott MSP 3-ban, amikor a kapcsolat kritériumok kielégítésre kerülnek.
RDS = 1	A felhasználói adatmező 1-től 96-ig számozott bitjeinek elküldése a fedélzetről leadott MSP 3-ban, amikor a kapcsolat kritériumok kielégítésre kerülnek.

Megjegyzés. – Az RDS csak a fedélzetről leadott MSP 3. közlemény felhasználói adat mezőjének hosszát jelzi akkor, amikor a kapcsolat információ /CI/ mezőben nulla értékkel válaszol (lásd a 3.3.3.4.3.1 pontot).

3.2.6.3.1.2.3 B-adatátvitel kiválasztó 1. /BDS1/ és B-adatávitel kiválasztó 2. /BDS2/ kódok, 8 bit

(A fedélzetre továbbított S-Módú specifikus protokol /MSP/ csomag 6. csatorna, felhasználói adat mezőjének 17.-től 24.-ig terjedő bitjei).

A tároló azon BDS1 és BDS2 kódjai, amire a kapcsolat szükséges, az Annex 10, IV. Kötetében kerültek meghatározásra.

3.2.6.3.1.3 Minimális időköz (MT), 8 bit.

A 8-bites MT mező decimális értéke azt a másodpercben megadott minimális időközt fogja képviselni, ami azután fog eltelni, hogy egy jelentés ’esemény indítás’ után a válaszjeladóba továbbításra került, addig az időpontig, mielőtt egy új jelentést kezdeményezni lehet. A válaszjeladóba továbbított jelentés mindig a rendelkezésre álló legfrissebb adat kell, hogy legyen.

3.2.6.3.1.4 Esemény indítás

Az esemény indítást a két következő mezővel kell vezérelni.

3.2.6.3.1.4.1 Esemény kritérium részmező (EC), 4 bit

Az EC mezőnek a minimális időköz /MT/ mezőt követő négy legnagyobb helyiértékű bitjeinek kell lenni. Ha a dataflash kapcsolat által ellenőrzöttek közül egy egyedülálló tárolóban többszörös események fordulnak elő (azaz, ha egynél több paraméter jelez jelentés változást), akkor csak egy közleményt kell indítani. Az EC mező decimális értékét a következők szerint kell értelmezni:

0	Nincs jelentésre szükség, a dataflash fejrész /DH/ mezőben meghatározott kapcsolat szolgáltatás megszakítása.
1	Bármilyen változás jelentése.
2	Az 56-bites változás mezőt (CQ) a Stabil idő /ST/ követi. Csak azon a bitek változásának jelentése, amelyeket a CQ mező „EGY”-re állítása közöl.
3	Az 56-bites CQ-t az ST követi. Minden egyes paraméter jelentés az összes adat változásról és az összes olyan paraméter változásról, amely nagyobb annál a kvantum értéknél, amely a CQ mezőben az ugyanazon paraméter egységére vagy a felbontásra jelzett. A CQ mezőben a nulla annak felel meg, hogy a paraméterek azt jelzik, hogy nincs jelentésre szükség.
4	A CQ 112 bitje plusz a Változási küszöb /CT/, amelyeket az ST követ. Az első 56 bit az, ami a fenti EC 3-ban lévő értékre vonatkozik. A második 56 bit a Változási küszöb /CT/ mező, ami a mezőben lévő paraméternek megfelelő küszöb-értéket jelzi. Jelenteni kell minden olyan változást, ami a küszöb-érték felett van, ott, ahol a CQ-ban lévő érték adja a változás kvantumot.
5	A CQ 112 bitje plusz a CT, amelyet az ST követ. Ugyanaz, mint a fenti 4.-ben lévő EC, kivéve azt, hogy jelenteni kell minden, a küszöb alatt lévő változást.
6	A CQ 112 bitje plusz a CT, amelyet az ST követ. Ugyanaz, mint a fenti 4. és 5.-ben lévő EC értékek, kivéve, hogy csak akkor kell jelenteni, ha a küszöb átlépésre került (mindkét irányban).

7-től 14-ig	Nincs kijelölve.
15	Az összes kapcsolat törlése az ebben a kérésben lévő II-kódra.

3.2.6.3.1.4.2 Stabil idő mező (ST), 4 bit

Az ST mezőnek az EC mezőt követő 4 bitnek kell lenni. Az ST decimális értékének azt kell jeleznie – másodpercben megadva –, hogy a megváltozott adat mennyi idő óta stabil a CQ mezőben meghatározott változás kvantumon belül, az előtt, hogy a közlemény megkezdésre került. Ebben a mezőben a „NULLA” érték azt fogja jelezni, hogy nincs minimális stabil idő, és bármilyen változás azonnal indítja a közleményt. Az ST fontossága attól függő lesz, hogy melyik EC mód kerül alkalmazásra. A 4. és 5. EC módra a stabilitásra vonatkozóan, akár a küszöb alatt/felett van, ha a paraméter értéke felette/alatta van a meghatározott küszöbnek az ST időnél hosszabb ideig, akkor a dataflash közleményt létre kell hozni még akkor is, ha az érték nem marad stabil egy kvantumon belül. Az ezt követő olyan kvantum változásoknak, amelyek az ST időnél hosszabb ideig stabilak, további dataflash közleményeket kell létrehozni addig, amíg az érték a küszöb alá csökken /fölé emelkedik.

3.2.6.3.1.5 Változás mezők – változás kvantum (CQ) és változás küszöb (CT)

Ezek a mezők akkor lesznek jelen a közleményben, ha azt az EC jelzi. Egy válaszjeladó tároló szolgáltatásra (azaz a B-adatátvitel kiválasztás /BDS/, a BDS1-re és a BDS2-re az 1-től a 255-ig, ezeket is beleértve) a CQ-t az S-Módú specifikus protokol /MSP/ 6. felhasználói adat mezőjének 41-től 96-ig terjedő bitjei foglalják magukba. A CT-t, amikor szükséges, az MSP 6. felhasználói adat mezőjének 97-től 152-ig terjedő bitjei foglalják magukba. A CQ mezőben lévő kvantum értéket ugyanazokkal az egységekkel és felbontással kell meghatározni, mint ahogy az az ellenőrzött tárolóra meghatározásra került. Ennek meg kell határoznia azt a mennyiséget, amennyivel a paraméternek változnia kell attól az értéktől, ami a kapcsolat kezdőérték beállítása volt, és ezután attól az értéktől, amelyet egy dataflash válasz utoljára jelentett, abból a célból, hogy egy új dataflash választ indítson a fedélzetről leadott MSP 3. csatornán (lásd a 3-1. táblázatot).

3.2.6.3.2 *Helyi rendszer kezelés*

A helyi rendszer kezelés célja az, hogy biztosítson egy egyedi föld-levegő szolgáltatás kérést, amit helyileg lehet meghatározni ahhoz, hogy egy egyedi követelmény kielégítésre kerüljön (mint például a földi állomásra a távol-téri ellenőrző berendezés paramétereinek „távbeállítása”).

3.2.7 Fedélzetre irányuló MSP 7. csatorna

(A levegő-föld szolgáltatás kérésre való válasz részére fenntartva.)

Ennek a csatornának a meghatározása még nem került kidolgozásra.

3.2.8 Fedélzetre irányuló MSP 8. csatorna

(A repülési pálya tárgyalására fenntartva.)

Ennek a csatornának a meghatározása még nem került kidolgozásra.

3.2.9 Fedélzetre irányuló MSP 9.-től 63.-ig számozott csatornák

Ezek a csatornák még nincsenek kijelölve.

3.3 A FEDÉLZETRŐL LEADOTT S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ CSATORNÁK

A következő csatornák 3.3.X jelöléssel kerültek számozásra, ahol az „X” az a decimális szám, amely megfelel a fedélzetről leadott MSP csatorna számának. Ez azért került így végrehajtásra, hogy lehetővé tegye azt, hogy az azidáig nem meghatározott formátumok meghatározásai beillesztésre kerülhessenek, anélkül, hogy a szakaszok számozását érintenék.

3.3.1 Fedélzetről leadott MSP 1. csatorna

(A speciális szolgáltatások kezelésére fenntartva.)

Ennek a csatornának a meghatározása még nem került kidolgozásra.

3.3.2 Fedélzetről leadott MSP 2. csatorna

Ez a csatorna még nincs kijelölve.

3.3.3 Fedélzetről leadott MSP 3. csatorna

3.3.3.1 *Cél*

A dataflash egy olyan szolgáltatás, amely ’bejelenti’ az információknak a levegőből-földre esemény-indítású alapon történő továbbítási alkalmasságot. Amikor biztosításra kerül, akkor a B-adatátvitel kiválasztó /BDS/ kód 1,D-vel hozzáférhető tároló 31 bitjét kell 1-re állítani.

Megjegyzés. – Ez egy hatékony eszköz az olyan információknak a fedélzetről történő leadásához, amelyek alkalmilag és nem előre jelzetten változnak.

3.3.3.2 *A SZOLGÁLTATÁS MEGKEZDÉSE ÉS BEFEJEZÉSE*

3.3.3.2.1 A dataflash szolgáltatás egy szolgáltatás kérésre kerül megkezdésre vagy beszűntetésre, és ez a fedélzetre irányuló S-Módú specifikus protokol /MSP/ 6. csatornáján kerül vételre úgy, hogy a felhasználói adat mező első bájtjában lévő ’szolgáltatás kérés’ (SR) fej-rész egy decimális értékű EGY-re van állítva. Egy ilyen kérés vételekor a kéréshez kapcsolódó tárolóból a dataflash közleményt azonnal hozzáférhetővé kell tenni, és a földre továbbítani az ’adat kérési részmező’ /RDS/ mezőnek a kapcsolat kérésben való beállításától és minden esemény kritériumtól függetlenül. A válasznak a következőnek kell lenni.

3.3.3.2.2 Amikor a kért tároló működik, akkor a kapcsolatot létre kell hozni, és egy, a 3-2. táblázatban meghatározottaknak megfelelő S-Módú specifikus protokol /MSP/ közleményt kell az MSP 3. csatornán a földre közölni. A kapcsolat információ /CI/ mezőt az 1 értékre kell állítani. A közleményt a földi rendszer fogja felhasználni annak megerősítésére, hogy a szolgáltatás megkezdődött.

3.3.3.2.3 Ha a kért tároló nem működik, akkor a kapcsolat nem kerül létrehozásra. Ezt egy olyan, a fedélzetről leadott MSP 3. csatornájú közleménnyel kell bejelenteni, amely csak a 3-2. táblázatban meghatározott – 1-től 40-ig számozott – biteket foglalja magába, és a CI mezőben egy 2-es érték van.

3.3.3.2.4 Amikor a maximális számú alátámasztható kapcsolat létrehozásra kerül, akkor az új kapcsolatot vissza kell utasítani. Ezt a föld részére a fedélzetről leadott olyan MSP 3. csatornájú közleménnyel kell bejelenteni, amely a 3-2. táblázatban van meghatározva, és a CI mezőben egy 3-as értékkel.

3.3.3.2.5 Egy olyan, a földről érkező kérés esetében, hogy egy meghatározott tároló szolgáltatása kerüljön befejezésre, a szolgáltatás leállítását a földi berendezés felé egy fedélzetről leadott MSP 3. csatornájú közleménnyel kell nyugtázni, ahogy az a 3-2. táblázatban bemutatásra került, és a CI mezőben egy 4-es értékkel.

3.3.3.2.6 Egy olyan, a földről érkező kérés esetében, hogy egy meghatározott Lekérdező azonosító /II/ kódra a szolgáltatás az összes kapcsolatra fejeződjön be, a szolgáltatás leállítását a földi berendezés felé egy fedélzetről leadott MSP 3. csatornájú közleménnyel kell nyugtázni, ahogy az a 3-2. táblázatban bemutatásra került, és a CI mezőben egy 5-ös értékkel.

3.3.3.2.7 Amikor a válaszjeladó tárolójának szolgáltatása egy létrehozott kapcsolatra meghibásodik, akkor a kapcsolatot a fedélzeti berendezésnek be kell fejezni. Ezt egy olyan, a fedélzetről leadott MSP 3. csatornájú közleménnyel kell bejelenteni, ahogy az a 3-2. táblázatban bemutatásra került, és a CI mezőben egy 7-es értékkel. A válaszjeladó tárolójának szolgáltatását akkor kell meghibásodottnak ítélni, amikor a kapcsolat általi forgalom ellenőrzött előírt paraméterei nem kerülnek felfrissítésre a meghatározott minimális gyakorisággal.

3.3.3.2.8 Amikor a kapcsolat kérés esemény kritérium /EC/ mezőjében lévő érvénytelen érték miatt visszautasításra kerül, akkor ezt egy olyan, a fedélzetről leadott MSP 3. csatornájú közleménnyel kell bejelenteni, ahogy az a 3-2. táblázatban bemutatásra került, és a CI mezőben egy 15-ös értékkel.

3.3.3.2.9 Ha a földi lekérdező 30 másodpercen belül semmilyen közleményt nem vesz ki a válaszjeladótól, akkor a légijármű alhálózatának törölnie kell a közleményt, és létre kell hoznia egy kézbesítési hiba értesítést (azaz a T_Z időzítő lejár), amit továbbítania kell a légijármű MSP szolgáltatás biztosítója részére. Amikor a kézbesítési hiba értesítés vételre kerül, akkor a szolgáltatás automatikusan megszünteti a dataflash funkciót anélkül, hogy jelezné a földi rendszer részére.

Megjegyzés. – Ez annak a megelőzése céljából történik, hogy a közlemény sor akadályozva legyen akkor, amikor a földi lekérdező leállítja a közlemény kivonási szolgáltatás beszerzését, vagy egy hiba, vagy a fedés elvesztése miatt. A földi berendezés felelőssége az, hogy a dataflash szolgáltatást ellenőrizze, ezt is figyelembe véve.

3.3.3.2.10 Amikor a válaszjeladó nem kerül az S-módú lekérdező által egy meghatározott Lekérdező azonosító /II/ kóddal 60 másodpercen belül szelektíven lekérdezésre (az összes elfogadott S-módú lekérdezésre a Lekérdező azonosító részmező /IIS/ által ellenőrzötten meghatározva), akkor az összes dataflash kapcsolatot, amely arra a Lekérdező azonosító /II/ kódra vonatkozik, törölni kell anélkül, hogy ezt a válaszjeladó a földi rendszer részére jelezné.

3.3.3.3 *SZOLGÁLTATÁSI ELŐÍRÁSOK*

A dataflash kérés vételekor a kért paramétereket ellenőrizni és továbbítani kell a földnek az S-módú levegő-kezdeményezésű protokolt felhasználva annak a Lekérdező azonosító /II/ kódnak továbbítva, amit a kérő lekérdezés foglalt magába. A válaszjeladónak a dataflash közleményekkel történő elárasztása megelőzésének céljából ezért felső határként egy hat-másodperces időtartamban tíz közlemény került előírásra. Amikor a hat-másodperces időtartamonkénti tíz közleményes határérték elérésre került, akkor a további közleményeket sorba kell állítani addig, amíg továbbíthatóak lesznek. Az ily módon sorbaállított közlemények egy 6-os értékű kapcsolat-információ /CI/ mezővel fognak válaszolni. Ha ezután elkezdődik a dataflash közleményeknek a földre történő továbbítása, akkor a változtatási kritérium jelentkezik újra, azelőtt, hogy a közlemény a válaszjeladóban közlésre bevitelre kerülne, azaz a közlemény elöregedettnek tekintetté válik, és le kell cserélni a legfrissebb, legújabb információkkal.

3.3.3.4 *A FEDÉLZETRŐL LEADOTT KÖZLEMÉNY SZERKEZETE*

Az információt egy olyan fedélzetről leadott S-módú specifikus protokol /MSP/ csomagban kell átadni, amelynek a csatorna száma M/CH = 3. A formátumot a 3-2. táblázat mutatja be. A felhasználói adat (UD) mező első két bájtjának kell magába foglalnia azt a dataflash fej-részt (DH), amely meg kell, hogy egyezzen a szolgáltatás kérésben lévő DH mezővel.

3.3.3.4.1 A felhasználói adat /UD/ mező 17.-től 31.-ig terjedő bitjei képezik a Lekérdező azonosító /II/ kód kapcsolat jelentés (CR) mezőjét, amelyben az egyes bitek valamelyikének jeleznie kell azt, hogy van legalább egy aktív kapcsolat az II-kóddal – az, amelyet a bit képvisel akkor, ha EGY-re van állítva –, egyébként nincs aktív kapcsolat az II-kóddal.

3.3.3.4.2 Az UD mező 32.-től 36.-ig tartó bitjei nincsenek kijelölve.

3.3.3.4.3 A Felhasználói adat /UD/ mező 37.-től 40.-ig számozott bitjei képezik a kapcsolat információ (CI) mezőt, amit a következők szerint kell értelmezni:

CI mező értéke	*Jelentés*
0	Válasz meglévő kapcsolatra
1	Új kapcsolat létrehozása
2	Új kapcsolat nem elfogadott, vagy meglévő kapcsolat befejezésre került, mivel nincs válaszjeladó tároló adat szolgáltatás
3	Új kapcsolat nem elfogadott, mivel a kapcsolatok már maximális számban kiszolgálás alatt állnak
4	Az ebben a válaszban lévő dataflash fejrészre a kapcsolat befejezésre került a földről jövő kérésre
5	Az ezt a választ kérő II-kódra, amelynek az MSP csomagja egy 15-ös értékű Esemény kritériummal /EC/ került kézbesítésre, az összes kapcsolat befejezésre került.
6	A válasz a várakozási sorba került a tíz-másodperces időtartam alatti hat dataflash közlemény határérték miatt
7	A kapcsolat befejezésre került a tároló adat-szolgáltatási hibája miatt
8-tól 14-ig	Kijelöletlen
15	Új kapcsolat nem elfogadott a fedélzetre irányuló kért MSP csomag Esemény kritérium /EC/ mezőjében lévő érvénytelen szám miatt

3.3.3.4.3.1 Amikor a kapcsolat információ /CI/ mező nullával egyenlő, akkor a válasznak a kapcsolat dataflash fejrésze Adat kérési részmezője /RDS/ által kértnek kell lenni (lásd a 3.2.6.3.1.2.2). Amikor a CI mező nem egyenlő nullával, akkor a válasznak a fedélzetről leadott MSP 3. felhasználói adat mezőjének 1.-től 40.-ig terjedő bitjeit kell magába foglalnia (lásd a 3-2. táblázatot).

3.3.3.5 *AZ S-MÓDÚ FÖLDI ÁLLOMÁSOK ÁLTALI ADAT KIVONÁS*

A dataflash tranzakciót egy fedélzetről leadott kertként kell közölni az UF 4, 5, 20 vagy 21 lekérdezésekre adott válaszként. A közölt tranzakciónak vagy egy egyedüli szegmensű B-adatátviteli /Comm-B/ keretnek vagy egy két-szegmensű Comm-B keretnek kell lenni, ahogy azt a kapcsolat egyezteti. A levegőből irányított B-adatátviteli első szegmensnek magába kell foglalnia az MSP fejrészt, a dataflash fejrészt és az adat-kapcsolatot vezérlő információit. Egy egyedüli szegmensű válasz kapcsolat esetében, ha az adat szükséges, akkor azt közvetlenül szerzi meg a földi állomás a kérdéses tárolóból történő adat kivonással.

3.3.4 FEDÉLZETRŐL LEADOTT S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ 4. CSATORNA

(A helyzet kérés részére fenntartva.)

Ennek a csatornának a leírása még nem került kidolgozásra.

3.3.5 FEDÉLZEETRŐL LEADOTT MSP 5. CSATORNA

Ez a csatorna még nincsen kijelölve.

3.3.6 FEDÉLZETRŐL LEADOTT MSP 6. CSATORNA

(A föld-levegő szolgáltatás kérésre adott válasz részére fenntartva.) (Lásd a 3-3. táblázatot.)

A Fedélzetről leadott MSP 6. csatornában a felhasználói adat (UD) mező első bájtját kell felhasználni a válasz típus (RT) mező meghatározására, a következők szerint:

RT = 0	Kijelöletlen
RT = 1	(Fenntartott)
RT = 2	Helyi rendszer kezelés
RT = 3-tól 255-ig	Kijelöletlen

Amikor alkalmazásra kerül, akkor az $1D_{16}$ tároló 34. bitjét 1-re kell állítani.

Megjegyzés. – A föld-levegő szolgáltatás kérésre adott választ lehet felhasználni az egy ilyen szolgáltatásból eredő információ továbbítására.

3.3.7 FEDÉLZETRŐL LEADOTT MSP 7. CSATORNA

(A levegő-föld kérés részére fenntartva.)

Ennek a csatornának a leírása még nem került kidolgozásra.

3.3.8 FEDÉLZETRŐL LEADOTT MSP 8. CSATORNA

(A repülési pálya megtárgyalására fenntartva.)

Ennek a csatornának a leírása még nem került kidolgozásra.

3.3.9 FEDÉLZETRŐL LEADOTT MSP 9.-től 63.-ig SZÁMOZOTT CSATORNÁK

Ezek a csatornák még nincsenek kijelölve.

A 3. RÉSZ TÁBLÁZATAI:

3-1. táblázat: Dataflash ellenőrző szolgáltatás kérés

S-módú Szabvány hosszúságú közlemény /SLM/ keret, amely magába foglalja a fedélzetre továbbított S-Módú specifikus protokol /MSP/ csomagot a 6.csatornán, amikor a Szolgáltatás kérés /SR/ = 1

MSP 6 FELHASZNÁLÓI ADAT MEZŐ

Bitek 1.-től 40.-ig

	Adat csomag típus /DP/ = 0 (1 bit)	FEDÉLZETRE IRÁNYULÓ S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ FEJRÉSZ (1 bájt)
	MSP sorozat szám /MP/ = 0 (1 bit)	
	Csatorna szám /M/CH/ = 6 (6 bit)	
1	SZOLGÁLTATÁS KÉRÉS (SR) = 1	
2		
3		
4		
5		
6		
7		
8		
9	KAPCSOLAT SZÁM RÉSZMEZŐ (CNS)	DATAFLASH FEJRÉSZ (DH)
10		
11		
12		
13	ADAT KÉRÉSI RÉSZMEZŐ (RDS)	
14	FENNTARTOTT	
15		
16		

Bitek 41.-től 96.-ig (ha szükséges)

41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	VÁLTOZÁS KVANTUM MEZŐ (CQ)
58	
59	
60	
61	
62	
63	
64	

Bitek 97.-től 152.-ig (ha szükséges)

97	
98	
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111	
112	
113	VÁLTOZÁS KÜSZÖB MEZŐ (CT)
114	
115	
116	
117	
118	
119	
120	

3-1. táblázat folytatása:

17	B-ADATÁTVITEL ADAT KIVÁLASZTÁS 1 /BDS1/ KÓD	DATAFLASH FEJRÉSZ (DH)	65	VÁLTOZÁS KVANTUM MEZŐ (CQ)	121	VÁLTOZÁS KÜSZÖB MEZŐ (CT)
18			66		122	
19			67		123	
20			68		124	
21	B-ADATÁTVITEL ADAT KIVÁLASZTÁS 2 /BDS2/ KÓD		69		125	
22			70		126	
23			71		127	
24			72		128	
25	MINIMÁLIS IDŐKÖZ (MT)		73		129	
26			74		130	
27			75		131	
28			76		132	
29			77		133	
30			78		134	
31			79		135	
32	LBS = 1 másodperc		80		136	
33	ESEMÉNY KRITÉRIUM (EC)		81		137	
34			82		138	
35			83		139	
36			84		140	
37	STABIL IDŐ (ST)		85		141	
38			86		142	
39			87		143	
40	LBS = 1 másodperc		88		144	
			89		145	
			90		146	
			91		147	
			92		148	
			93		149	
			94		150	
			95		151	
			96		152	

Az utolsó A-közlemény /MA/ mező utolsó bájtjának mindig kijelöletlennek kell lenni.

3-2. táblázat: Dataflash a tároló ellenőrző szolgáltatásra

S-módú keret, amely magába foglalja a fedélzetről leadott S-módú specifikus protokol /MSP/ csomagot a 3. csatornán

MSP3 FELHASZNÁLÓI ADAT MEZŐ

Bitek 1.-től 40.-ig			Bitek 41.-től 96.-ig	
	KAPCSOLT B-ADATÁTVITELI RÉSZMEZŐ (LBS) (2 bit)		41	Lásd az 5.2.7.3 pontot az MSP csomagok előírásaira vonatkozóan
			42	
	ADAT CSOMAG TÍPUS /DP/ = 0 (1 bit)	S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ FEJRÉSZ	43	
	MSP SOROZAT SZÁM /MP/ = 0 (1 bit)		44	
	CSATORNA SZÁM /M/CH/ = 3 (6 bit)		45	
			46	
			47	
			48	
			49	
			50	
	KITÖLTÉS 1 = 0 (6 bit)		51	
			52	
			53	
			54	
			55	
			56	
1	KAPCSOLAT SZÁM RÉSZMEZŐ (CNS)	DATAFLASH FEJRÉSZ (DH) ./.	57	
2			58	
3			59	
4			60	
5	ADAT KÉRÉSI RÉSZMEZŐ (RDS)		61	
6	FENNTARTOTT		62	TÁROLÓ
7			63	KÖZLEMÉNY
8			64	TARTALOM

./.

3-2. táblázat folytatása:

9	B-ADATÁTVITEL ADAT KIVÁLASZTÁS 1 /BDS1/ KÓD	./. DATAFLASH FEJRÉSZ (DH)	65	TÁROLÓ KÖZLEMÉNY TARTALOM
10			66	
11			67	
12			68	
13	B-ADATÁTVITEL ADAT KIVÁLASZTÁS 2 /BDS2/ KÓD		69	
14			70	
15			71	
16			72	
17	II = 1	LEKÉRDEZŐ AZONOSÍTÓ /II/ KÓD KAPCSOLAT JELENTÉS (CR)	73	
18	II = 2		74	
19	II = 3		75	
20	II = 4		76	
21	II = 5		77	
22	II = 6		78	
23	II = 7		79	
24	II = 8		80	
25	II = 9		81	
26	II = 10		82	
27	II = 11		83	
28	II = 12		84	
29	II = 13		85	
30	II = 14		86	
31	II = 15		87	
32	NINCS KIJELÖLVE		88	
33			89	
34			90	
35			91	
36			92	
37	KAPCSOLAT INFORMÁCIÓ (CI)		93	
38			94	
39			95	
40			96	

3-3. táblázat: Válasz a föld-levegő szolgáltatás kérésre

S-Módú keret, amely magába foglalja a fedélzetről leadott S-Módú specifikus protokol /MSP/ csomagot a 6. csatornán

MSP 6 FELHASZNÁLÓI ADAT MEZŐ

Bitek 1.-től 40.-ig

Bit	Mező	
	KAPCSOLT B-ADATÁTVITELI RÉSZMEZŐ (LBS) (2 bit)	
	ADAT CSOMAG TÍPUS /DP/ = 0 (1 bit)	S-MÓDÚ SPECIFIKUS PROTOKOL /MSP/ FEJRÉSZ
	MSP SOROZAT SZÁM /MP/ = 0 (1 bit)	
	CSATORNA SZÁM /M/CH/ = 6 (6 bit)	
	KITÖLTÉS 1 = 0 (6 bit)	
1		
2		
3		
4		
5		
6		
7		
8	VÁLASZ	
9	TÍPUS	
10		
11		

Bitek 41.-től 96.-ig

Bit	Mező
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
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59	
60	
61	
62	
63	
64	TÁROLÓ
65	KÖZLEMÉNY
66	TARTALOM
67	./.

Ezt a csomagot mindig egy kapcsolt B-adatátvitelként /Comm-B/ kell elküldeni. A második szegmens a vonatkozó tároló egy közvetlen másolata.

3-3. táblázat folytatása:

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25	
26	
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28	
29	FELHASZNÁLÓI
30	MEGHATÁROZÁSÚ
31	
32	
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68	./.
69	TÁROLÓ
70	KÖZLEMÉNY
71	TARTALOM
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4. S-MÓDÚ ÁLTALÁNOS ADÁS PROTOKOLOK

4.1 AZ ÁLTALÁNOS ADÁS CSATORNA SZÁM KIOSZTÁSA

Az általános adás azonosítókat egy két-számjegyű hexadecimális számként, például: „XX_{16}” kell beállítani.

Megjegyzés. – 255 általános adás azonosító áll rendelkezésre mind a fedélzetre irányuló, mind a fedélzetről leadott közleményekre. Az általános adás azonosító számok már néhány alkalmazásra kijelölésre kerültek (lásd az 5. Fejezet, 5-23. táblázatot).

Az adat-kapcsolat teljesítőképesség jelentés és a légijármű azonosító adat formátumai az általános adás azonosítókkal együtt külön-külön meg kell, hogy feleljenek az Annex 10, III. és IV. Kötetében meghatározottaknak.

4.2 A FEDÉLZETRE IRÁNYULÓ ÁLTALÁNOS ADÁS AZONOSÍTÓK

A következő részek /szakaszok/ számozása 4.2.X, ahol az „X” a fedélzetre irányuló általános adás azonosító számának decimális megfelelője. Ez azért került így számozásra, hogy az ezideig meg nem határozott formátumok majd beillesztésre kerüljenek anélkül, hogy a szakaszok számozását érintené.

4.2.1 Fedélzetre irányuló általános adás azonosító 01_{16}

(Fenntartva a diferenciális GNSS helyesbítésre)

Ennek az azonosítónak a leírása még nem került kidolgozásra.

4.2.2-től a 4.2.47-ig számozott: Fedélzetre irányuló általános adás azonosítók 02_{16}-tól $2F_{16}$-ig

Ezek az azonosítók még nincsenek kijelölve.

4.2.48 Fedélzetre irányuló általános adás azonosító 30_{16}

(Nem érvényes).

4.2.49 Fedélzetre irányuló általános adás azonosító 31_{16}

(Az RA általános adás részére fenntartva (lásd az Annex 10, IV. Kötet, 4.3.8.4.2.3.4 pontot)).

4.2.50 Fedélzetre irányuló általános adás azonosító 32_{16}

(Az Összeütközési veszélyt jelző fedélzeti rendszer /ACAS/ részére fenntartva (lásd az Annex 10, IV. Kötete, 4.3.8.4.2.3.3 pontját)).

4.2.51-től a 4.2.255-ig számozott: Fedélzetre irányuló általános adás azonosítók 33_{16}-tól FF_{6}-ig

Ezek az azonosítók még nincsenek kijelölve.

4.3 A FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓ

A következő részek /szakaszok/ számozása 4.3.X, ahol az „X” a fedélzetről leadott általános adás azonosító számának decimális megfelelője. Ez azért került így számozásra, hogy az ezideig meg nem határozott formátumok majd beillesztésre kerüljenek anélkül, hogy a szakaszok számozását érintené.

4.3.1 Fedélzetről leadott általános adás azonosító 01_{16}

Ez az azonosító még nincsen kijelölve.

4.3.2 Fedélzetről leadott általános adás azonosító 02_{16}

(Forgalmi tájékoztatás szolgáltatás.)

4.3.2.1 *BEVEZETÉS*

A forgalmi tájékoztatás szolgáltatást az S-Módú lekérdező által a fedélzetre irányuló S-Módú specifikus protokol /MSP/ 2. csatornán felsugárzott azon közlemények biztosítják, amelyek információkat adnak azokról a közelségben lévő légijárművekről, amelyeknek fontossága lehet a saját-légijárműre.

Megjegyzés. – A szolgáltatás és a fedélzetre irányuló közlemény a 3.2.2 pontban „A Fedélzetre irányuló MSP 2. csatorna” alatt van meghatározva.

Lehetővé kell tenni a légijármű részére, hogy kérje azt, hogy a Forgalmi tájékoztatási szolgáltatásra /TIS/ rákapcsolódjon, vagy arról lekapcsolódjon. Ezeket a kéréseket az S-Módú általános adás protokol alkalmazásával a 02_{16} általános adás azonosító felhasználásával kell végrehajtani.

4.3.2.2 *TIS FEDÉLZETRŐL LEADOTT KÖZLEMÉNYEK*

A TIS fedélzeti adat-kapcsolat szolgáltatásnak képesnek kell lennie arra, hogy két típusú S-módú fedélzetről leadott közleményt hozzon létre:

a) TIS szolgáltatás kapcsolat kérést (TSCR); és

b) TIS szolgáltatás kapcsolat bontás kérést (TSDR).

Mindkettőt, a TSCR-t és a TSDR-t B-adatátviteli /Comm-B/ általános adású közleményként kell elküldeni a 02_{16} általános adás azonosítót használva.

Megjegyzés. – Az alkalmazott S-Módú B-adatátviteli általános adás protokol foglalkozik azon átfedő fedésterületek többszörös S-Módú lekérdezőinek az esetével, amelyek egyidejűleg kapcsolatban vannak egy adott TIS légijárművel.

A fedélzetről leadott TIS közlemények formátumának (mind a TSCR-nek, mind a TSDR-nek) az alábbiakban megadottnak kell lenni:

Fej-rész	DIN 1	DIN 2	DIN 3	DIN 4	DIN 5	DIN 6
8 bit	8 bit	8 bit	8 bit	8 bit	8 bit	8 bit

/DIN = adat-kapcsolat szolgáltatás azonosító szám/

A közlemény fej-részének a TIS-re egy szabvány közlemény fej-résznek kell lenni, ahogy az a fedélzetre irányuló MSP 2. csatornára le van írva (lásd a 3.2.2 pontot, a fedélzetre irányuló MSP csatornákról). A 8-bites adat-kapcsolat szolgáltatás azonosító számot (DIN) a TSCR-ből vagy a TSDR közleményből sorrendi hozzáféréssel kell kiolvasni és feldolgozni addig, amíg valamelyik:

a) A DIN i = 0; vagy

b) A fedélzetről leadott közlemény összes bitje feldolgozásra kerül.

1. Megjegyzés. – A fedélzetről leadott MSP szolgáltatás szerkezete és protokolja szükségessé teszi a jövőbeli bővítés figyelembevételét és más MSP adat-kapcsolati szolgáltatások alkalmazhatóságát.

2. Megjegyzés. – A TIS feldolgozásban lévő első és tartalék TIS lekérdező azonosító kódok (lásd a 3.2.2 pontot, a fedélzetre irányuló MSP 2. csatornát) „nincs” helyzetűre vannak állítva, akár a TSCR, akár a TSDR létrehozása során.

4.3.2.2.1 *TIS szolgáltatás kapcsolat kérés /TSCR/ formátum*

A TIS fedélzetről leadott B-adatátvitel közleményt /Comm-B/ akkor kell létrehozni, amikor a légijármű vezetője kéri a TIS szolgáltatás indítását. A TSCR közlemény abban a pillanatban kerül létrehozásra, amikor az MSP képesség jelentés bit a TIS-re „EGY”-re kerül beállításra. A TSCR-t egy DIN 1 értékkel kell azonosítani. A TSCR-t egy B-adatátviteli általános adású közleményként kell meghatározni úgy, hogy bármelyik olyan S-módú földi lekérdező, amely képes a TIS alátámasztására, válaszolni tudjon annak.

4.3.2.2.2 *TIS szolgáltatás kapcsolat bontás kérés /TSDR/ formátum*
A TIS fedélzetről leadott B-adatátvitel közleményt /Comm-B/ akkor kell létrehozni, amikor a légijármű vezetője kéri a TIS szolgáltatás befejezését. A TSDR közlemény abban a pillanatban kerül létrehozásra, amikor az MSP képesség jelentés bit a TIS-re „NULLA”-ra kerül beállításra. A TSDR-t egy DIN 2 értékkel kell azonosítani. A TSDR-t egy B-adatátviteli általános adású közleményként kell meghatározni úgy, hogy bármelyik olyan S-módú földi lekérdező, amely képes a TIS alátámasztására, válaszolni tudjon annak.

A 4.3.3-tól a 4.3.15-ig számozott FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓK a 03_{16}-tól a $0F_{16}$-ig

Ezek az azonosítók még nincsenek kijelölve.

4.3.16 FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓ 10_{16}

(Adat-kapcsolat teljesítőképesség jelentés)

Lásd a 2-16. táblázatot.

A 4.3.17-től a 4.3.31-ig számozott FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓK a 11_{16}-tól az $1F_{16}$-ig

Ezek az azonosítók még nincsenek kijelölve.

4.3.32 FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓ 20_{16}

(Légijármű azonosító)

Lásd a 2-32. táblázatot.

A 4.3.33-tól a 4.3.253-ig számozott FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓK a 21_{16}-tól az FD_{16}-ig

Ezek az azonosítók még nincsenek kijelölve.

4.3.254 FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓ FE_{16}

(Fenntartva a felfrissítés kérés részére)

Lásd az 5. Fejezetet.

4.3.255 FEDÉLZETRŐL LEADOTT ÁLTALÁNOS ADÁS AZONOSÍTÓ FE_{16}

(A keresés kérés részére fenntartva)

Lásd az 5. Fejezetet.

6. FEJEZET: VHF LEVEGŐ-FÖLD DIGITÁLIS ADAT-KAPCSOLAT (VDL)

6.1 MEGHATÁROZÁSOK ÉS RENDSZER MŰSZAKI JELLEMZŐK

1. Megjegyzés. – Az ultrarövidhullámú (VHF) digitális adat-kapcsolat (VDL) 2. üzemmódja adatszolgáltatási képesség jelet biztosít. A VDL 3. üzemmód két – mind az előszavas, mind az adatszolgáltatási – képességgel rendelkezik. Az adatátviteli képesség a Légiforgalmi Távközlési Hálózatnak (ATN) egy al-hálózati mozgó alkotó-része. Ezenkívül a VHF adat-kapcsolat egy nem-ATN funkciót is képes biztosítani. A VHF digitális adat-kapcsolat /VDL/ Szabványok és Ajánlott Gyakorlatok (SARPs) meghatározásai és hivatkozásai az alábbiakban találhatók.

2. Megjegyzés. – A VHF digitális adat-kapcsolatra /VDL/ vonatkozó kiegészítő információkat foglal magába a VDL 2. üzemmód, a VDL 3. üzemmód és a VDL 4. üzemmód Műszaki Előírásainak kiadványa.

3. Megjegyzés. – A 6.1.2-től a 6.8.2-ig terjedő szakaszok foglalják magukba a VHF adat-kapcsolat 2. és 3. üzemmódjaira vonatkozó Szabványokat és Ajánlott Gyakorlatokat. A 6.9 szakasz tartalmazza a VHF adat-kapcsolat 4. üzemmód Szabványait és Ajánlott Gyakorlatait.

6.1.1 Meghatározások

Automatikus berendezés-függő légtér-ellenőrző általános adás (ADS-B) *(Automatic dependent surveillance-broadcast (ADS-B)).* Egy olyan légtér-ellenőrző technika, amelyben a légijármű automatikusan biztosítja – az általános adás módú adat-kapcsolaton keresztül – a fedélzeti navigációs helymeghatározási rendszeréből származtatott adatokat, a légijármű azonosítóját, a négy-dimenziós helyzetet, és – ahogy szüksges – a kiegészítő adatokat is biztosítja.

Általános adás *(Broadcast).* A léginavigációra vonatkozó információk olyan továbbítása, amely nem egy meghatározott állomásnak vagy állomásoknak címzett adás.

Impulzus köteg *(Burst).* Egy vagy több idő által meghatározott, egymással összefüggésben álló elemi jel csatlakozó sorozata, amely felhasználói informciót, jelzés-átvitelt és bármilyen szükséges bekezdő jelszakaszt tud továbbítani.

Adatáramlási rés *(Current slot).* Az a rés, amelyben a vett adás megkezdődik.

Hálózati végponti berendezés (DCE) *(Data circuit-terminating equipment (DCE)).* A DCE egy hálózat biztosító berendezés, amely a felhasználói végberendezések /DTE-k/ közötti összeköttetés lehetővé tételére használatos.

Adat-kapcsolat entitás (DLE) *(Data link entity (DLE)).* Protokol állapotú berendezés, amely képes egyedül álló adat-kapcsolat létesítésére és kezelésére.

Adat-kapcsolat szolgáltatás (DLS) al-réteg *(Data link service (DLS) sublayer).* Az az al-réteg, amely az adathordozó hozzáférés vezérlő /MAC/ al-réteg felett helyezkedik el. A VHF adat-kapcsolat /VDL/ 4. üzemmódnak a DLS al-réteg az UHF specifikus szolgáltatás /VSS/ al-réteg felsett helyezkedik el. Az adat-kapcsolat szolgáltatás /DLS/ al-réteg kezeli az adatátvitel sorba-állítást, létrehozza és megsemmisíti az adat-kapcsolat entitásokat /DLE-k/ a kapcsolat-orientált összeköttetéseknél, és lehetővé teszi a kapcsolat-kezelő entitás /LME/ részére az adat-kapcsolat szolgáltatás /DLS/ kezelését, és lehetőséget biztosít a kapcsolat nélküli adatátvitelre.

Felhasználói végberendezés (DTE) *(Data terminal equipment (DTE)).* A DTE egy al-hálózati összeköttetés végpontja.

Kiterjesztett Golay kód *(Extended Golay Code).* Többszörös bit-hiba javítására képes hibajavító kód.

Keret *(Frame).* A címek egy sorozatából, a vezérlésből, az állomány-kezelő rendszerből /FCS/ és az információs mezőkből tevődik össze. A VHF adat-kapcsolat /VDL/ 2. üzemmódjánál ezek a mezők vannak összekapcsolva a nyitó és záró jelzés sorrenddel, és a keret magába foglalhat vagy nem foglalhat magába egy változó hosszúságú információs mezőt.

Gauss szűrésű frekvencia-billentyűzés (GFSK) *(Gaussian filtered frequency shift keying (GFSK)).* Egy folyamatos fázisú, frekvencia-billentyűzési technika, amely két hangot és egy Gauss impulzus-formáló szűrőt használ fel.

Globális jel csatorna (GSC) *(Global signalling channel (GSC)).* Egy világméretű alapon rendelkezésre álló csatorna, amely adatátvitel vezérlést biztosít.

Kapcsolat *(Link).* Egy kapcsolat, amely összeköti a légijármű fedélzeti adat-kapcsolat entitást /DLE/ valamint a földi DLE-t, és amelyet egyértelműen meghatároz a légijármű fedélzeti adat-kapcsolat szolgáltatás /DLS/ címének és a földi DLS címének kombinációja. Különböző al-hálózati entitások vannak jelen az egyes kapcsolat végpontok felett.

Kapcsolat réteg *(Link layer).* Az a réteg, ami közvetlenül a fizikai réteg felett található a Nyílt Rendszerek Összekapcsolása protokol modelben. A kapcsolat réteg biztosítja az információk megbízható átvitelét a fizikai adathordozók között. Ez két részre van osztva: az adat-kapcsolat al-rétegre és az adathordozó hozzáférés-vezérlő al-rétegre.

Kapcsolat kezelő entitás (LME) *(Link management entity (LME)).* Egy protokol állapot gépi kód, amely képes egy egyedülálló egyenrangú rendszerrel a kapcsolatot 'megszerezni', létrehozni és fenntartani. Egy LME létrehozza az adat-kapcsolatot, és az al-hálózati összeköttetéseket, „kézbesíti" ezeket a kapcsolatokat, és kezeli az adathordozó hozzáférés vezérlő al-réteget és a fizikai réteget. Egy légijármű kapcsolat kezelő entitás /LME/ nyomon követi azt, hogy milyen jól tud kommunikálni az egyedi földi rendszer földi állomásaival. Egy légijármű VHF adat-kapcsolat kezelő entitás /VME/ 'bemutat' egy LME-t minden egye olyan földi állomásnak, amelyet ellenőriz. Hasonlóképpen, a földi VME 'bemutat' egy LME-t minden egyes légijárműnek, amit ellenőriz. Egy LME akkor kerül törlésre, amikor az összeköttetés a társ rendszerre a későbbiekben nem megvalósítható.

M impulzus-köteg *(M burst).* A VHF adat-kapcsolat 3. üzemmódjában használatos bitekből álló kezelő csatorna adat-blokk. Ez az impulzus-köteg magába foglalja azokat a jelzési információkat, amelyek az adathordozóhoz való hozzáféréshez és a kapcsolat állapot ellenőrzéshez szükségesek.

Adathordozó hozzáférés vezérlés (MAC) *(Media access control (MAC)).* Az az alréteg, amely befogja az adat-utat és vezérli a bitek mozgását az adat-úton keresztül.

2-es üzemmód – *(Mode 2).* Csak-adat VDL üzemmód, amely D8PSK modulációt és vivőfrekvencia érzékelő többszörös hozzáférés (CSMA) vezérlési sémát használ.

3-as üzemmód – *(Mode 3).* Hang és adat VDL üzemmód, amely D8PSK modulációt és TDMA közeg hozzáférés vezérlési sémát használ.

4-es üzemmód – *(Mode 4).* Csak adat VDL üzemmód, amely GFSK modulációs sémát és önszervező időosztásos többszörös hozzáférést használ.

Fizikai réteg – *(Physical layer).* A legalsó szintű réteg a Nyílt Rendszerek Összekapcsolása protokol modelben. A fizikai réteg információ fizikai közegen való továbbítását végzi (pl.: VHF rádió).

***Szolgáltatás minősége** – (Quality of service).* Az adat átviteli jellemzőkre vonatkozó információ, amelyet különböző kommunikáció protokollok használnak különböző teljesítményszintek elérésére a hálózat használói részére.

***Reed-Solomon kód** – (Reed-Solomon code).* Szimbólum hibák javítására alkalmas hibajavító kód. Mivel a szimbólum-hibák bitek gyűjteményei, ezek a kódok jó impulzusköteg hiba javító képességet szolgáltatnak.

***Önszervező idő-osztásos többszörös hozzáférés (STDMA)** – (Self-organizing time division multiple access).* Rádiófrekvenciás (RF) csatorna időosztásos használatán alapuló többszörös hozzáférés séma, amely a következőket alkalmazza: (1) diszkrét szomszédos időrések, mint alapvető felosztás-forrás; és (2) működő protokollok egy készlete, amely lehetővé teszi a felhasználók számára a közvetett hozzáférést ezekhez az időrésekhez vezér-állomás igénybevétele nélkül.

***Rés** – (Slot).* Egyenlő időtartamú egymást követő időintervallumok sorozatának egyik tagja. Minden impulzusköteg átvitel egy rés kezdeténél indul.

***Al-hálózat összeköttetés** – (Subnetwork connection).* Hosszútávú összeköttetés egy légijármű DTE és egy földi DTE között egymást követő virtuális hívások felhasználásával az összeköttetés fenntartására kapcsolat levételen keresztül.

***Al-hálózat függő konvergencia funkció (SNDCF)** – (Subnetwork dependent convergence facility (SNDCF)).* Egy olyan adottság, amely egy adott alhálózat jellemzőit és szolgáltatásait hozzáilleszti a belső hálózati adottság által megkövetelt jellemzőkhöz és szolgáltatásokhoz.

***Al-hálózat entitás** – (Subnetwork entity).* Ebben a dokumentumban a „földi DCE" fogalmát egy légijárművel kommunikáló, földi állomáson lévő alhálózat entitásnál fogjuk használni; a „földi DTE" fogalmát egy légijármű fedélzeti állomással kommunikáló földi útvonalazóban lévő alhálózat entitásnál használjuk, és a „légijármű DTE" fogalmát a földdel kommunikáló, egy légijárművön elhelyezett alhálózat entitásnál használjuk. Egy alhálózat entitás egy köteg réteg entitás, ahogyan az az ISO 8208-ban definiálva van.

***Al-hálózat réteg** – (Subnetwork layer).* Az a réteg, amely létrehoz, menedzsel és befejez összekapcsolásokat egy alhálózaton keresztül.

***Rendszer** – (System).* Egy VDL-képességű entitás. Egy rendszer egy vagy több állomásból és a hozzátartozó VDL management entitásból áll. Egy rendszer lehet egy légijármú rendszer vagy egy földi rendszer.

***Idő-osztásos többszörös hozzáférés (TDMA)** – (Time division multiple access (TDMA)).* RF csatorna idő-osztásos használatán alapuló többszörös hozzáérés séma, amely a következőket alkalmazza: (1) diszkrét szomszédos időrések, mint alapvető felosztás-forrás; és (2) működő protokollok egy készlete, amely lehetővé teszi a felhasználók számára az interaktív együttműködést a vezér-állomással a csatorna közvetett eléréséhez.

***Felhasználói csoport** – (User group).* Földi és/vagy légijármű fedélzeti telepítésű állomások egy csoportja, amely csoportok hang és/vagy adat összeköttetést osztanak meg. Beszéd-kommunikációnál a felhasználói csoport minden tagja minden kommunikációhoz hozzáférhet. Adatok esetében a kommunikáció pont-pont összeköttetést foglal magában levegő-föld közleményeknél, és pont-pont és rádió összeköttetést föld-levegő közleményeknél.

***VDL management entitás** – (VDL management entity).* VDL-specifikus entitás, amely az ATN-meghatározású SN-SME által megkívánt szolgáltatás minőségét biztosítja. A VME az LME-ket használja (amelyeket ez létrehoz és szétrombol) a pár rendszerektől rendelkezésre álló szolgáltatás minőség megvizsgálására.

***VDL 4-es üzemmódú impulzusköteg** – (VDL Mode 4 burst).* Egy VHF digitális kapcsolat (VDL) 4-es üzemmódú impulzusköteg forráscímek sorozatából, impulzusköteg ID-ből, információkból, rés rezerválásból és keretellenőrzési sorozat (FCS) mezőkből áll össze, amelyet nyitó és záró jelzés sorozat fog össze.

Megjegyzés. – Egy impulzusköteg indítása csak kvantált időintervallumoknál jelenhet meg, és ez a korlátozás lehetővé teszi, hogy a továbbítás és a vétel közötti terjedés eltolódást le lehessen vezetni.

***VDL 4-es üzemmód DLS rendszer** – (VDL Mode 4 DLS system).* VLL rendszer, amely megvalósítja a VDL 4-es üzemmód DLS és az alhálózati protokollok ATN kötegek és más kötegek hordozását.

***VDL 4-es üzemmód specifikus szolgáltatási (VSS) alréteg** – (VDL Mode 4 specific services (VSS) sublayer).* Az az alréteg, amely a MAC alréteg felett helyezkedik el, és VDL 4-es üzemmód specifikus hozzáférés protokollokat szolgáltat, amelyek fenntartott, véletlen és rögzített protokollokat foglalnak magukban.

***VDL állomás** – (VDL station).* Légijármű-alapú vagy földi-alapú fizikai entitás, VDL 2-es, 3-as vagy 4-es képességgel.

Megjegyzés. – Ennek a fejezetnek a szövegében a VDL állomás „állomás”-ként is szerepel.

***Vokóder** – (Vocoder).* Kis bit-sebességű hang-kódoló/dekódoló.

***Hang egység** – (Voice unit).* Berendezés, amely szimplex hang- és jelzés összekapcsolást szolgáltat a felhasználó és a VDL között.

***VSS felhasználó** – (VSS user).* A VDL 4-es üzemmód speciális szolgáltatásának felhasználója. A VSS felhasználó lehet magasabb réteg a VDL 4-es üzemmód SARP-okban, vagy VDL 4-es módot használó külső alkalmazás.

6.1.2 Rádió csatornák és funkcionális csatornák

6.1.2.1 *Légijármű fedélzeti állomás rádió frekvencia intervallum.* A légijármű állomásnak képesnek kell lenni a 6.1.4.1 pontban meghaározott tartományon belüli bármelyik csatorna lehangolására egy önműködő lehangolási utasítás vétele utáni 100 miliszekundumon belül. Ezenkívül egy VDL 3. üzemmódú légijármű fedélzeti állomásnak képesnek kell lenni a 6.1.4.1 pontban meghatározott tartományon belüli bármely frekvencia lehangolására egy hangolási parancs vétele utáni 100 milliszekundumon belül.

6.1.2.2 *Földi állomás rádiófrekvencia tartomány.* A földi állomásnak képesnek kell a kijelölt csatornáján való üzemelésre a 6.1.2.1 pontban részletezett rádiófrekvencia tartományán belül.

6.1.2.3 *Közös jelzés csatorna*. A 136,975 MHz-es csatornát fenn kell tartani egy világméretű közös jelzés csatornaként (CSC) VDL 2-es üzemmód részére.

6.1.3 Rendszer képességek

6.1.3.1 *Adat átláthatóság.* A VDL rendszernek kódtól független, bájttól független adatátvitelt kell biztosítania.

6.1.3.2 *Rádióadás.* A VDL rendszernek kapcsolat réteg adat rádióadás szolgáltatást (2-es üzemmód) és/vagy hang és adat rádióadás szolgáltatást (3-as üzemmód) kell nyújtania. VDL 3-as üzemmódnál az adat rádióadás szolgáltatásnak a földtől származó hálózat többszörözés képességet kell alátámasztania.

6.1.3.3 *Kapcsolat kezelés.* A VDL rendszernek megbízható kommunikációs útvonalat kell létesítenie és fenntartania a légijármű fedélzeti és földi rendszer között, megengedve, de nem megkövetelve kézi beavatkozást.

Megjegyzés. – Ebben a szöveg-összefüggésben a „megbízható" fogalmát a 6.3.5.1 pontban specifikált BER követelmény határozza meg.

6.1.3.4 *Földi hálózat átvitel.* Egy VDL-el felszerelt légijárműnek - ha a körülmények így kívánják - egy földi állomástól egy másik földi állomáshoz továbbítást kell végeznie.

6.1.3.5 *Beszéd-üzem képesség.* A VDL 3-as üzemmód rendszernek egy „Hallgass be, mielőtt a beszédhez indítasz" csatorna hozzáférésen alapuló, átlátható szimplex beszéd-üzemű üzemelést kell fenntartania.

6.1.4 Levegő-föld VHF digitális adatkapcsolati összeköttetési rendszer jellemzők

6.1.4.1 A felhasznált rádiófrekvenciákat a 117,975-137 MHz sávban lévő frekvenciák közül kell kiválasztani. A legalacsonyabb kijelölhető frekvencia 118,000 MHz és a legmagasabb kijelölhető frekvencia 136,975 MHz. A kijelölt frekvenciák közötti szétválasztás (csatorna elkülönítés) 25 kHz.

Megjegyzés. – Az V. kötet határozza meg azt, hogy a 136,9-136,975 MHz-es frekvencia-blokk - ahol a határoló értékekek a blokkhoz tartoznak - a VHF levegő-föld digitális kommunikáció részére van fenntartva.

6.1.4.2 A sugárzás tervezési polarizációjának függőlegesnek kell lenni.

6.2 A FÖLDI TELEPÍTÉS RENDSZER JELLEMZŐI

6.2.1 Földi állomás átviteli funkciója

6.2.1.1 *Frekvencia stabilitás.* A VDL földi állomás berendezés működési rádiófrekvenciája a kijelölt frekvenciától nem térhet el a plusz vagy mínusz 0,0002 százaléknál (2 rész per millió) nagyobb mértékben.

Megjegyzés. – A DSB-AM modulációt használó VDL földi állomások frekvencia stabilitása a III. kötet, II. rész, 2. Fejezetben van meghatározva 25 kHz-es csatorna elosztásra.

6.2.2 Teljesítmény

Ajánlás. – *A kisugárzott teljesítménynek olyannak kell lenni, hogy egy legalább 75 mikrovolt per méter (mínusz 109 dBW/m^2) térerősséget szolgáltasson az üzemeltetési fedésterületen belül a szabadtéri terjedés alapján.*

6.2.3 A zavaró sugárzások

6.2.3.1 A zavaró sugázásokat a technika jelenlegi állapota és a szolgáltatás jellege által lehetővé tett legkisebb értéken kell tartani.

Megjegyzés. – A Rádió-Szabályzat S3. Függeléke tartalmazza azokat a zavaró sugárzási szinteket, amelyeknek az adó- berendezéseknek meg kell felelniük.

6.2.4 Szomszéd csatorna sugárzások

6.2.4.1 A VDL földi adótól jövő teljesítmény nagysága minden üzemeltetési körülmény esetén - amikor az első szomszéd csatorna 25 kHz-es csatorna sávszélessége felett mérik - nem haladhatja meg a 0 dBm-t.

6.2.4.1.1. A 2002. január 1. után újonnan felszerelt VDL földi adótól jövő teljesítmény minden üzemeltetési körülmény esetén - az első szomszéd csatorna 25 kHz-es csatorna sávszélessége fölött mérve - nem haladhatja meg a 2 dBm-et.

6.2.4.2 A VDL földi adóberendezéstől jövő teljesítmény nagyságának minden üzemeltetési körülmény esetén, amikor a második szomszéd csatorna 25 kHz-es csatorna sávszélessége felett mérik, kevesebbnek kell lennie mínusz 25 dBm-nél, és innen 5 dB per oktáv minimális mértékkel monotonan csökkenni kell a mínusz 52 dBm maximális értékig.

6.2.4.2.1 2002. január 1. után újonnan felszerelt VDL földi adótól jövő teljesítménynek bármilyen üzemeltetési körülmény esetén - a második szomszéd csatorna 25 kHz-es csatorna sávszélessége fölött mérve - kevesebbnek kell lenni, mint mínusz 28 dBm.

6.2.4.2.2 2002. január 1. után újonnan felszerelt VDL földi adótól jövő teljesítménynek bármilyen üzemeltetési körülmény esetén - a negyedik szomszéd csatorna 25 kHz-es csatorna sávszélessége fölött mérve - kevesebbnek kell lenni, mint mínusz 38 dBm, és innen monoton csökkennie kell 5 dB per oktáv minimális ütemben egy mínusz 53 dBm-es maximális értékre.

6.2.4.3 A VDL földi adótól jövő teljesítmény nagysága bármilyen üzemeltetési körülmény esetén - amikor az első szomszéd csatornán központosuló 16 kHz-es csatorna sávszélesség felett mérik - nem haladhatja meg a mínusz 20 dBm-et.

6.2.4.3.1 2002. január 1. után újonnan felszerelt VDL földi adótól jövő teljesítmény bármilyen üzemeltetési körülmény esetén - az első szomszédos csatornán központosuló 16 kHz-es csatorna sávszélesség fölött mérve - nem haladhatja meg a mínusz 18 dBm-et.

6.2.4.4 2005. január 1. után az összes VDL földi adónak ki kell elégítenie a 6.2.4.1.1, 6.2.4.2.1, 6.2.4.2.2 és 6.2.4.3.1 pont előírásait, a 6.2.4.5 pont feltételei szerint.

6.2.4.5 A 6.2.4.4 pont előírásai kötelező kielégítésének követelményeit olyan körzeti léginavigációs egyezmények alapján kell meghatározni, amelyek előírják az üzemelés légterét és a megvalósítás ütemtervezését. Az egyezményeknek tartalmazniuk kell a földi rendszereknek való kötelező megfelelés legalább két évre szóló előzetes értesítését is.

6.3 A LÉGIJÁRMŰ FEDÉLZETI TELEPÍTÉS RENDSZER JELLEMZŐI

6.3.1 *Frekvencia stabilitás.*

A VDL légijármű fedélzeti berendezés rádiófrekvenciája a kijelölt frekvenciától nem térhet el plusz vagy mínusz 0,0005 százaléknál (5 rész per millió) nagyobb értékkel.

6.3.2 Teljesítmény.

A kisugárzott teljesítménynek olyannak kell lenni, hogy egy legalább 20 mikro- volt per méter (mínusz 120 dBW/m^2) mínusz 87 dBm térerősséget biztosítson a szabadtéri terjedés alapján olyan távolságokon és magasságokon, amelyek megfelelnek azoknak az üzemelési feltételeknek, amelyek azokhoz a területekhez tartoznak, amelyek felett a légijármű üzemel.

6.3.3 Zavaró sugárzások

6.3.3.1 A zavaró sugárzásokat a technika jelenlegi állapota és a szolgáltatás jellege által lehetővé tett legkisebb értéken kell tartani.

Megjegyzés. – A Rádió-Szabályzat S3 Függeléke határozza meg a zavaró sugárzások azon szintjeit, amelyeknek az adóknak meg kell felelniük.

6.3.4 Szomszédos csatorna kibocsátások

6.3.4.1 A VDL légijármű fedélzeti adóberendezéséből jövő teljesítmény nagysága bármilyen üzemeltetési körülmény esetén - amikor az első szomszéd csatorna 25 kHz-es csatorna sáv- szélessége felett mérik - nem haladhatja meg a 0 dBm-et.

6.3.4.1.1 2002. január 1. után minden új felszerelésű VDL fedélzeti adóberendezéstől jövő teljesítmény - minden üzemeltetési körülmény esetén - az első szomszédos csatorna 25 kHz-es csatorna sávszélessége felett mérve, nem haladhatja meg a 2 dBm-et.

6.3.4.2 A VDL légijármű fedélzeti adóberendezésétől jövő teljesítmény nagyságának - minden üzemeltetési körülmény esetén - amikor a második szomszédos csatorna 25 kHz-es csatorna sávszélessége felett mérik, kevesebbnek kell lennie mínusz 25 dBm-nél, és innen 5 dB per oktáv minimális mértékkel monoton csökkenie kell a mínusz 52 dBm maximális értékig.

6.3.4.2.1 2002. január 1. után újonnan felszerelt VDL légijármű fedélzeti adótól jövő teljesítmény- nek - minden üzemeltetési körülmény esetén - a második szomszédos csatorna 25 kHz-es csatorna sávszélessége fölött mérve, kevesebbnek kell lenni, mint mínusz 28 dBm.

6.3.4.2.2 2002. január 1. után újonnan felszerelt VDL légijármű fedélzeti adótól jövő teljesítménynek - minden üzemeltetési körülmény esetén - a negyedik szomszédos csatorna 25 kHz-es csatorna sávszélessége fölött mérve, kevesebbnek kell lenni, mint mínusz 38 dBm, és innen monoton csökkennie kell 5 dB per oktáv minimális ütemben egy mínusz 53 dBm-es maximális értékre.

6.3.4.3 A VDL légijármű fedélzeti adóberendezéstől jövő teljesítmény nagysága - minden üzemeltetési körülmény esetén - amikor az első szomszédos csatornán lévő központosuló 16 kHz-es csatorna felett mérik, nem haladhatja meg a mínusz 20 dBm-t.

6.3.4.3.1 2002. január 1. után újonnan felszerelt VDL légijármű fedélzeti adótól jövő teljesítmény - minden üzemeltetési körülmény esetén - az első szomszédos csatornán központosuló 16 kHz-es csatorna sávszélesség fölött mérve, nem haladhatja meg a mínusz 18 dBm-et.

6.3.4.4 2005. január 1. után az összes VDL légijármű fedélzeti adónak ki kell elégíteni a 6.3.4.1.1, 6.3.4.2.1, 6.3.4.2.2 és 6.3.4.3.1 pont előírásait, a 6.3.4.5 pont feltételei szerint.

6.3.4.5 A 6.3.4.4 pont előírásai kötelező kielégítésének követelményeit olyan körzeti léginavigációs egyezmények alapján kell megalkotni, amelyek meghatározzák az üzemelés légterét és a megvalósítás ütemtervét. Az egyezményeknek tartalmazniuk kell a légijármű fedélzeti rendszereknek való kötelező megfelelés legalább két évre szóló előzetes értesítését is.

.6.3.5 Vételi funkció

6.3.5.1 *A meghatározott hiba-arány*. A meghatározott hiba-aránynak 2-es üzemmódnál az 1 a 10^4-hez maximális helyesbített bit hiba-aránynak (BER) kell lennie. A meghatározott hiba-aránynak 3-as üzemmódnál az 1 a 10^3-hoz maximális helyesbítetlen BER-nek kell lennie. A meghatározott hiba-aránynak 4-es üzemmódnál az 1 a 10^4-hez maximális helyesbítetlen BER-nek kell lennie.

Megjegyzés. – A fenti fizikai réteg BER követelmények az ATN által az al-hálózat interfésznél a BER-re meghatározot követelményekből erednek.

6.3.5.2 *Érzékenység.* – A vételi funkciónak ki kell elégítenie a meghatározott hiba-arányt egy nem nagyobb, mint 20 mikrovolt per méter (mínusz 120 dBW/m^2) megkívánt jel-erősséggel.

Megjegyzés. – A megkívánt jel-erősség a szolgáltatási terület határán figyelembe veszi a rendszeren belüli rendszer- és jel-veszteségek követelményeit és beszámítja a környezeti zajforrásokat is.

6.3.5.3 *Sávon kívüli érzéketlenségi teljesítmény*. A vételi funkciónak ki kell elégítenie a meghatározott hiba-arányt egy nem nagyobb, mint 40 mikrovolt per méter (mínusz 114 dBW/m^2) megkívánt jel térerősséggel és egy nem-kívánt DSB-AM D8PSK vagy GFSK jellel a szomszédos vagy bármely más olyan kijelölhető csatornán, amely legalább 40 dB-el magasabb, mint a megkívánt jel.

6.3.5.3.1 2002. január 1-je után a vételi funkciónak ki kell elégítenie a meghatározott hiba-arányt is egy nem nagyobb, mint 40 mikrovolt per méter (-114 dBW/m^2) megkívánt jel térerősséggel és egy nem-kívánt VHF DSB-AM, D8PSK vagy GFSK jellel bármely más kijelölhető csatornán, amely legalább 60 dB-el erősebb, mint a megkívánt jel bármely kijelölhető csatornán, amely 100 kHz-re vagy távolabbra van a kívánt jel kijelölt csatornájától.

Megjegyzés. – Az interferencia érzéketlenségi teljesítménynek ez a szintje a VDL RF spectrum maszk hatásával konzisztens vevő teljesítményt biztosít, ahogyan a III. Kötet, I. Rész, 6.3.4 szakaszában egy 69 dB-es adó/vevő elkülönítés effektív elkülönítésével meg van határozva. A mérési eljárásra vonatkozó útmutató anyagot az Annex 10, V. Kötet, "A"- Melléklet, 7. szakasza tartalmazza.

6.3.5.3.2 2005. január 1. után az összes VDL telepítés vételi funkciójának ki kell elégíteni a 6.3.5.3.1 pont előírásait, a 6.3.5.3.3 pont feltételeinek megfelelően.

6.3.5.3.3 A 6.3.5.3.2 pont előírásai kötelező kielégítésének követelményeit olyan körzeti léginavigációs egyezmények alapján kell meghatározni, amelyek előírják az üzemelés légterét és a megvalósítás ütemtervezését. Az egyezményeknek tartalmazniuk kell a légijármű fedélzeti rendszereknek való kötelező megfelelés legalább két évre szóló előzetes értesítését is.

6.3.5.4 INTERFERENCIA ÉRZÉKETLENSÉGI TELJESÍTMÉNY

6.3.5.4.1 A vételi funkciónak ki kell elégítenie az előírt hiba-arányt egy nem nagyobb, mint 40 mikrovolt per méteres megkívánt térerősséggel és egy vagy több sávon kívüli jellel, kivéve az olyan VHF FM rádióadás jeleket, amelyek teljes szinttel rendelkeznek a vevő bemeneténél mínusz 33 dBm-el.

Megjegyzés. – Azokon a területeken, ahol szomszédos erősebb sáv jel interferencia meghaladja ezt a specifikációt, erősebb immunitási követelményt alkalmaznak.

6.3.5.4.2 A vételi funkciónak ki kell elégítenie a meghatározott hiba-arányt egy nem nagyobb, mint 40 mikrovolt per méteres megkívánt térerősséggel és egy vagy több VHF FM rádióadás jelekkel, amelyek teljes szinttel rendelkeznek a vevő bemeneténél mínusz 5 dBm-el.

6.4 FIZIKAI RÉTEG PROTOKOLOK ÉS SZOLGÁLTATÁSOK

A légijármű fedélzeti és földi állomásoknak hozzá kell férniük a fizikai adathordozókhoz szimplex üzemmódban működve..

6.4.1 Funkciók

6.4.1.1 A fizikai rétegnek a következő funkciókat kell biztosítani:

a) adó és vevő frekvencia szabályozás;

b) digitális vétel a vevővel;

c) digitális továbbítás az adóval; és

d) értesítési szolgáltatás.

6.4.1.1.1 *Adó/vevő frekvencia szabályozás*. A VDL fizikai réteg az adó vagy vevő frekvenciát a kapcsolat kezelési entitás (LME) utasítása szerint állítja be.

Megjegyzés. – Az LME egy kapcsolat réteg entitás a VDL 2-es üzemmód, VDL 3-as üzemmód műszaki specifikáció kézikönyvben tartalmazottak szerint.

6.4.1.1.2 *Digitális vétel a vevővel*. A vevőnek dekódolni kell a bejövő jeleket, és feldolgozásra továbbítani kell azokat a magasabb rétegeknek.

6.4.1.1.3 *Digitális adat-átvitel*. A VDL fizikai rétegnek megfelelően kódolnia kell az adat-kapcsolat rétegtől vett adatokat és továbbítania kell azokat a RF csatornán.

6.4.2 A 2-es és 3-as üzemmódú közös fizikai réteg

6.4.2.1 *Modulációs séma*. A 2-es és 3-as üzemmódoknak differenciálisan kódolt 8 fázis- billentyűzést (D8PSK) kell használnia, felhasználva egy $\alpha = 0,6$ (névleges értékű) emelt cosinus szűrőt. Az átviendő információt eltérően kell kódolni 3 bit per szimbolummal (baud), amelyet inkább fázis-változásként, mint abszolút fázisként visznek át. Az átviendő adat-folyamot 3, egymást követő adat-bitek csoportjára kell szétosztani, a legkisebb értékű bit az első. Nullákkal kell kitölteni az átvitel végét, amennyiben ez a befejező csatorna szimbolum számára szükséges.

6.4.2.1.1 *Adat kódolás*. Egy differenciál adat kódolóba belépő bináris adat folyamot X, Y és Z, három külön-választott bináris folyamba kell konvertálni úgy, hogy a 3n bitek képezik az X-et, a 3n+1 bitek képezik az Y-t és a 3n + 2 bitek képezik a Z-t. A tripletet $k(x_k Y_k Z_k)$ időpontnál egy fázis- változásra konvertálják, ahogyan azt a 6-1.* táblázat mutatja, és az abszolút fázis, a φ_k, a $\Delta\varphi_k$ összegzett sorozata, ami:

$$\phi_k = \phi_{k-1} + \Delta\phi_k$$

* Minden táblázat ennek a fejezetnek a végén van elhelyezve.

6.4.2.1.2 *Átvitt jel forma.* A fázismodulált alapsáv jelnek, ahogyan a 6.4.2.1.1 pontban az meg van határozva, az impulzus alak szűrőt kell gerjeszteni.

$$S(t) = \sum_{k=-\infty}^{+\infty} h\,(\Phi_k),\ t - kT_S)$$

Ahol:

h az impulzus alak szűrő komplex impulzus válasza;
k a 6.4.2.1.1 pontban van meghatározva;
ϕ a 6.4.2.1.1 pontban lévő egyenlet által definiált;
t az idő;
T_S az egyes szimbolumok időtartama.

Az impulzus alak szűrő kimenetének (az idő függvénye) és az impulzus-formáló szűrőnek (s(t)) kell a vivőfrekvenciát modulálnia. Az impulzus alak szűrőnek egy névleges α = 0,6-es emelt-cosinus összegzett frekvencia jelleggörbéjének kell lennie.

6.4.2.2 *Moduláció sebesség.* A szimbólum sebesség 10500 szimbólum/másodp., amely 31500 bit/s névleges bit-sebességet eredményez. A 2-es és 3-as üzemmódokra vonatkozó moduláció stabilitási előírások a 6-2. táblázatban vannak feltüntetve.

6.4.3 A 2-es üzemmódú specifikus fizikai réteg

Megjegyzés. – A 2-es üzemmódú specifikus réteg előírásai magukba foglalják a 2-es üzemmód szabályzó sorozatát, a vevő-oldali hibajavítást (FEC), a jelsorozat szétbontás-összeállítás műveletét, bit rejtjelezést, csatorna érzékelési és fizikai réteg rendszer-paraméterek ismertetését.

6.4.3.1 A keretek egy sorozatának a továbbításához egy állomásnak be kell illesztenie a bit számokat és jelzéseket (a 2-es üzemmód adat-kapcsolat szolgáltatás leírása szerint, ahogyan azt a VDL 2-es Üzemmód Műszaki Előírásai Kézikönyv tartalmazza), ki kell számítania a FEC-t (6.4.3.1.2 pont szerint), össze kell rendeznie (6.4.3.1.3 pont szerint), elkészíteni az előkészítő jel-sorozatot (6.4.3.1.1 pont szerint), elvégezni a bit rejtjelezést (6.4.3.1.4 pont szerint), és végül kódolni és modulálni az RF jelet (6.4.2.1 pont szerint).

6.4.3.1.1 *Előkészítő jel-sorozat.* Az adat-továbbítás egy demodulátor előkészítő jelsorozattal kezdődik, amely öt szegmensből áll:

a) adó felfutás és teljesítmény stabilizáció;

b) szinkronizáció és hibás beolvasásos felbontás;

c) fenntartott szimbolum;

d) átviteli hossz; és

e) fej-rész FEC.

Megjegyzés. – Közvetlenül ezeket a szegmenseket követően egy, a VDL 2-es üzemmód műszaki előírások kézikönyvben lévő adat-kapcsolat szolgáltatás leírásban meghatározott formátum szerinti AVLC keret követi.

6.4.3.1.1.1 *Adó felfutás és teljesítmény stabilizáció.* Az előkészítő jel-sorozat első szegmensének, amit a felfutásnak nevezenek, az a célja, hogy egy adó teljesítmény stabilizációt és egy vevő automatikus erősítés-szabályozás /AGC/ befejezést biztosítson, és ennek közvetlenül meg kell előznie az egyedi szó első jelét. A felfutás idejének öt szimbólum időtartamúnk kell lenni. Az idő referencia pont (t) a következő előírásban az első egyedi szó szimbólumainak közepe, az a pont, ami egy fél-szimbólum időtartammal a felfutás vége után következik be. Kölcsönösen megállapítva. a felfutás kezdete t = -5,5 szimbólum időtartamnál kezdődik. A kisugárzott teljesítménynek -40 dBc-nél kevesebbnek kell lenni a t = -5,5 szimbólum időtartamot megelőzően. A felfutásnak biztosítania kell azt, hogy a t = -3,0 szimbólum időtartam időpontjában a kisugárzott teljesítmény a gyártó által meghatározott teljesítménynek 90 százaléka, vagy annál nagyobb legyen (lásd a 6-1.* ábrát). Az emelt-cosinus szűrő (vagy a levágás) alkalmazott módszerétől függetlenül az adó kimenetén a t = -3,0 és a t = -0,5 közötti időben ez úgy fog jelentkezni, mintha '000' szimbólum került volna kisugárzásra a felfutási idő időtartama alatt.

1. Megjegyzés. - A 3-as üzemmódnál az időzítési referencia pont megegyezik a teljesítmény referencia ponttal.

2. Megjegyzés. - Kívánatos az, hogy maximalizálják az automatikus erősítés-szabályozás /AGC/ beállítási idő megengedett időtartamát. "Erőfeszítéseket kell tenni" arra, hogy a teljesítmény a névleges kimeneti teljesítmény 90 százaléka felett legyen a t - 3,5 szimbólum időtartam időpontjában.

* Minden ábra ennek a fejezetnek a végén van elhelyezve

6.4.3.1.1.2 *Szinkronizáció és hibás beolvasás felbontás*. Az előkészítő jelsororozat második szegmense az egyedi szóból áll:

000 010 011 110 000 001 101 110 001 100 011 111 101 111 100 010
és balról jobbra haladva kell leadni.

6.4.3.1.1.3 *Fenntartott szimbolum*. Az előkészítő jelsorozat harmadik szegmense egyetlen szimbolumból áll, amelyet a 000 képvisel.

Megjegyzés. – Ez a mező jövőbeli meghatározás részére van fenntartva.

6.4.3.1.1.4 *Átviteli hossz*. Azért, hogy lehetővé váljon a vevő számára a végső Reed-Solomon blokk hosszának meghatározása, az adónak egy 17-bites szót kell elküldeni - a legkisebb értékű bittel (lsb) kezdve, a legmagasabb értékű bitig (msb) - jelezve az adat-bitek teljes számát, amelyek a fej-rész FEC-t követik.

Megjegyzés. – A hossz nem tartalmazza azokat a biteket, amelyeket a következők miatt kell továbbítani: a Reed-Solomon FEC-hez, beillesztett extra bitek annak biztosítására, hogy az összerendező 8-bites szavak integrál számát generálja, vagy extra hely-kitöltő bitek kerülnek beillesztésre, annak biztosítására, hogy az adat kódoló 3-bites szimbólumok integrál számát hozza létre.

6.4.3.1.1.5 *Fej-rész FEC*. A fej-részben lévő bit-hibák helyesbítéséhez egy (25, 20) blokk kódot kell számítani a fenntartott szimbólum és az átvitel hosszúság szegmensek felett. A blokk kódot ötödik szegmensként kell leadni. A kódolónak kell fogadnia a fej-részt a bit sorozatban, amely éppen átvitelre kerül. Az öt paritás bitet az átvitelhez a következő egyenlet felhasználásával kell generálni:

$$[P_1,...,P_5] = [R_1,...,R_3, TL_1,...,TL_{17}]\, H^T$$

ahol:

P a paritás szimbólum (P_l-et kell először leadni);
R a fenntartott szimbólum;
TL az átviteli hosszúság szimbólum;

T a mátrix transzponáló funkció; és
H az alább definiált paritás mátrix:

H = 00000000111111111111
00111111000011111111
11000111001100001111
11011011010100110011
01101001111001010101

6.4.3.1.1.6 *Bit átviteli sorrend*. Az eredő vektor termék öt paritás bitjét az első baloldali bitjével kezdve kell leadni.

6.4.3.1.2 *Vevő-oldali hibajavítás*.A tényleges csatorna áteresztőképesség javítása céljából a megkívánt újra-átvitelek számának csökkentéséhez FEC-t kell alkalmazni az előkészítő jelsorozat után, tekintet nélkül a keret határokra.

6.4.3.1.2.1 *A vevő-oldali hibajavítás (FEC) számítása*. A FEC kódolást egy szisztematikus rögzített hosszúságú Reed-Solomon (RS) (255,249)2^8-as kóddal kell végezni.

1. Megjegyzés. – Ez a kód maximálisan három oktett korrigálására képes 249 oktettes (1992 bit) adat blokknál. Hosszabb átviteleket 1992 bites átvitelekre kell felosztani, a rövidebb átviteleket virtuális, nullát képviselő kitöltőkkel kell kiterjeszteni. Hat RS-ellenőrzés oktettet kell használni egy 255 oktettes teljes blokkhoz.

A mező, amely a kód primitív polinomiját meghatározza a következők szerint:

$$p(x) = (x^8 + x^7 + x^2 + x + 1)$$

A generáló polinom a következő:

$$\prod_{i=120}^{125} (x - \alpha^i)$$

ahol:

α a GF(256) primitív eleme;
GF(256) a 256-os méretű Galois mező (GF).

2. Megjegyzés. – A Reed-Solomon kódokat az Űr-technológiai Adat-átviteli Rendszer Szabványok: Távmérési Csatorna Kódolás tartalmazza, amelyet az Űr-technológiai Adat-átviteli Rendszerek Konzultatív Bizottsága adott ki (lásd Függelék).

6.4.3.1.2.2 *Blokk hosszúságok*. A hat RS-ellenőrzés oktettet 249 oktettes blokkra kell számolni. Hosszabb átvitelt 249 oktettes blokkokra kell felosztani a 6.4.3.1.3 pont szerint. A rövidebb blokkokat 249 oktettre kell kiegészíteni nullát jelző virtuális kitöltésű előkészítő jelsorozattal.. A virtuális kitöltést nem kell továbbítani. A blokkokat a 6.4.3.1.2.3 – 6.4.3.1.2.3.3 pontoknak megfelelően kell kódolni.

6.4.3.1.2.3 *Nincs hiba korrekció*. 2 vagy ennél kisebb nem-kitöltés oktettekkel rendelkező blokkoknál nem kell hibajavítást végezni.

6.4.3.1.2.3.1 *Egy-bájtos hiba korrekció*. 3-tól 30-ig terjedő nem-kitöltő oktettel rendelkező blokkoknál mind a hat RS-ellenőrzési oktettet generálni kell, de csak az első kettőt kell továbbítani. Az utolsó négy RS-ellenőrzés oktettet érvénytelenîeni kell a dekódolónál.

6.4.3.1.2.3.2 *Két-bájtos hiba korrekció*. A 31-től a 67-ig terjedő nem-kitöltő oktettel rendelkező blokkoknál mind a hat RS-ellenőrzési oktettet generálni kell, de csak az első négyet kell továbbítani. Az utolsó két RS ellenőrzés oktettet érvényteleníteni kell a dekódolónál.

6.4.3.1.2.3.3 *Három-bájtos hiba korrekció*. A 68 vagy annál több nem-kitöltő oktettel rendelkező blokkoknál mind a hat RS-ellenőrzés oktettet generálni és továbbítani kell .

6.4.3.1.3 *Összerendezés*. A FEC teljesítmények javítása érdekében egy oktett alapú táblázat-indíttatású összerendezőt kell használni. Az összerendező egy olyan táblázatot hoz létre, amelynek soronként 255 oktettje és C-sorai vannak, ahol

$$c = \frac{\textit{átviteli hosszúság (bit)}}{\textit{1992 bit}}$$

ahol:

a) az átviteli hosszúság, ahogy az a 6.4.3.1.5 pontban meghatározásra került; és

b) c = a legkisebb egész szám, amely a tört értéknél nagyobb vagy azzal egyenlő.

Az adatoknak az 1992 bit páros-számú többszörösére való kiterjesztése után az összerendezőnek kell beírnia az átviteli folyamatot az egyes sorok első 249 oktettjébe, minden egymásutáni 8-bites csoportot véve, és tárolva őket az első oszloptól a 249-edikig. A 8-bites csoportok mindegyikében az első bitet a nyolcadik bit pozícióban kell tárolni; az első 1992-bites csoportot az első sorban kell tárolni, a második 1992-bites csoportot a második sorban, stb. Miután a FEC-et minden sorra kiszámították, a FEC adatok (vagy törlések) tárolásra kerülnek a 250-255. oszlopokban. Az összerendezőnek ezután továbbítania kell az adatokat a rejtjelzőhöz oszlopról-oszlopra történő kiolvasással, kihagyva minden olyan oktettet, amely érvénytelenítést tartalmaz, vagy az teljes egészében töltő biteket foglal magában. Az egy oktettben lévő összes bitet le kell adni a 8-as bittől az egyesig.

A vételnél a kibontó kiszámítja a sorok számát az utolsó (potenciálisan parciális) sor méretét a fej-részben lévő hosszúság mezőtől. Csak érvényes adat bájtokat továbbít a magasabb rétegnek.

6.4.3.1.4 *Bit rejtjelzés*. Az óra-jel helyreállítás segítésére és az átvitt spektrum alakjának stabilizálására bit rejtjelzést kell alkalmazni. A pseudo zaj (PN) jelsorozat egy 15-fokozatú generátor (lásd 6-2.ábra), a következő karakterisztikus polinommal:

$$X^{15} + X + 1$$

A PN jelsorozatnak a keret szinkronzációs jel után kell indulni a 1101 0010 1011 001 kezdeti értékkel a bal szélső bittel a regiszter első fokozatában, a 6-2. ábra szerint. Az egyes bitek feldolgozása után a regisztert egy bittel jobbra kell tolni. A lehetséges rejtjelzéshez a jövőben ezt a kezdeti értéket programozni fogják. A sorozatot hozzáadják (modulo 2) az adatokhoz az átviteli oldalon (rejtjelzés), és a rejtjelzett adatokhoz a vételi oldalon (rejtjel feloldás) a 6-3. táblázat szerint.

Megjegyzés. – A PN rejtjelző koncepció magyarázata az ITU-R Recommendation S. 446-4, I. Függelék 4.3.1 Szakasz I. Módszer alatt található (lásd ennek a Fejezetnek a Függelékét).

6.4.3.2 A 2-ES ÜZEMMÓDÚ CSATORNA ÉRZÉKELÉS

6.4.3.2.1 *Csatorna foglaltság-inaktív állapot érzékelése.* Amikor egy állomás legalább 5 milliszekundumon keresztül legalább -87 dBm-es csatorna teljesítményt vesz, akkor:

a) 0,9 valószínűséggel a csatornát továbbra is foglaltnak kell tekinteni, ha a jelszint -92 dBm alá csillapodik
1 milliszekundumnál rövidebb idő alatt; és

b) 0,9 valószínűséggel a csatornát nem-foglaltnak kell tekinteni, ha a jelszint -92 dBm alá csillapodik legalább 1,5 milliszekundum alatt.

Megjegyzés. – A maximális kapcsolat áteresztőképesség, amely az összes felhasználó részére rendelkezésre áll, igen érzékeny az RF csatorna érzékelés-késésre (attól az időponttól, amikor a csatorna ténylegesen állapotot vált addig az időpontig, amíg egy állomás érzékeli és válaszol erre a változásra) és az RF csatorna foglaltság-késésre (attól az időponttól, amikor az állomás elhatározza a továbbítást addig az időpontig, amikor az adó elegendően felfut ahhoz, hogy kizárja a többi állomást). Ennek megfelelően nagyfontosságú az, hogy minden erőfeszítést megtegyenek ezeknek az időknek a csökkentésére, amennyire ezt a technika jelenlegi állása lehetővé teszi.

6.4.3.2.2 *Csatorna inaktív-foglaltság állapot érzékelése*. Legalább 0,9 valószínűséggel egy állomásnak a csatornát foglaltnak kell tekinteni 1 milliszekundumon belül azután, hogy a csatornán a teljesítmény legalább -90 dBm-re emelkedik.

6.4.3.2.3 **Ajánlás. –** *Egy foglalt csatorna észlelésének 0,5 milliszekundumon belül kell megjelenni.*

Megjegyzés. – Nagyobb valószínűségű hamis riasztás fogadható el a foglaltság-inaktív állapot érzékelése esetén, mint a csatorna inaktív-foglaltság állapot érzékelése esetén a két különböző hiba hatás miatt.

6.4.3.3 A 2-ES ÜZEMMÓDÚ VEVŐ/ADÓ KÖLCSÖNHATÁS

6.4.3.3.1 *Vevő-adó átfutási idő*. Egy állomásnak az előkészítő jelsorozatot úgy kell leadni, hogy az egyedi szó első szimbólumának a közepét 1,25 milliszekundumon belül vigye át attól számítva, hogy a hozzáférési kísérlet sikerrel jár (Lásd 6-3 ábra). Az egyedi szó átvitele során a teljes frekvencia-változásnak 10 Hz-nél kisebbnek kell lenni. Az egyedi szó átvitele után a fázis- gyorsulásnak 500 Hz per másodpercnél kisebbnek kell lenni.

6.4.3.3.2 *Adótól-vevőig átfutási idő*. Az adó teljesítménynek -20 dBc-nek kell lennie az impulzus- köteg végső szimbóluma közepének 2,5 szimbólum periódusain belül. Az adó teljesítmény szivárgásnak, amikor az adó „ki” állapotban van, kevesebbnek kell lennie, mint -83 dBm. Az állomásnak képesnek kell lennie venni és demodulálni névleges teljesítménnyel egy bejövő jelet a végső információs szimbólum továbbítása után 1,5 milliszekundumon belül.

Megjegyzés. – Hivatkozás DO-160D 21. Szakasz, H kategória antenna sugárzású jelekre.

6.4.3.4 2-ES ÜZEMMÓDÚ FIZIKAI RÉTEG RENDSZER PARAMÉTEREK

6.4.3.4.1 A fizikai rétegnek a 6-4. táblázatban meghatározottak szerint kell megvalósítania a rendszer paramétereket.

6.4.3.4.1.1 *P1 paraméter (minimális átviteli hossz).* A P1 paraméter azt a minimális átviteli hosszt definiálja, melyet egy vevő demodulálni képes a BER leromlása nélkül.

6.4.4 A 3-as üzemmódú speciális fizikai réteg

Megjegyzés. – A 3-as módozatú speciális fizikai réteg műszaki leírása magába foglalja a 3-as üzemmód kezelés (M) impulzus-köteg és a levétel ellenőrzés közlemény (H) impulzus-köteg felfelé kapcsolatot, az M impulzus-köteg lefelé kapcsolatot, a hang/adat (V/D) impulzus- köteget és a bit rejtjelezést.

6.4.4.1 *Kezelés (M) impulzus-köteg és levétel ellenőrzés közlemény (H) impulzus-köteg felfelé kapcsolat*. Az M felfelé kapcsolat impulzus-kötegnek (ahogyan az a VDL 3-as Üzemmód Műszaki Előírások Kézikönyvben ismertetésre kerül) három szegmensből kell állnia, az előkészítő jelsorozatból, amelyet a rendszer adatok és az adó lefutás követ. A H felfelé kapcsolat impulzus-kötegnek (ahogyan azt a VDL 3-as Üzemmód Műszaki Előírások Kézikönyve ismerteti) három szegmensből kell állnia, az előkészítő jelsorozatból, amelyet a levétel ellenőrzés közlemény és az adó lefutás követ.

6.4.4.1.1 *Előkészítő jelsorozat*. A felfelé M impulzus-köteg és a H impulzus-köteg előkészítő jelsorozatoknak két összetevőből kell állniuk, a következők szerint:

a) adó felfutás és teljesítmény stabilizáció; és

b) szinkronizáció és félreérthetőség feloldás.

6.4.4.1.1.1 *Adó felfutás és teljesítmény stabilizáció*. Ennek a 6.4.3.1.1.1 szakaszban meghatá- rozottal megegyezőnek kell lennie.

6.4.4.1.1.2 *Szinkronizáció és félreérthetőség feloldás.* Az előkészítő jelsorozat második össze-tevőjének az
S_2*-ként ismert szinkronizációs sorozatból kell állnia, a következők szerint:

000 001 101 100 110 010 111 100 010 011 101 000 111 000 011 001

és balról jobbra haladva kell továbbítani.

Megjegyzés. – Az S_2 jelsorozat nagyon közeli kapcsolatban van az S_2 jelsorozattal (6.4.4.3.1.2 szakasz). Az S_2* 16 szimbóluma közötti 15 fázis-változás mindegyike pontosan 180°-on kívül van az S_2-höz kapcsolódó 15 fázis-változáshoz viszonyítva. Ez a kapcsolat felhasználható a két sorozat egyidejű keresési folyamatának egyszerűsítéséhez.*

6.4.4.1.2 *Rendszer adat és levétel ellenőrzés közlemény.* A nem-3T konfiguráció (ahogyan azt a VDL 3-as Üzemmód Műszaki Előírások Kézikönyv tartalmazza) rendszer adatának 32 továbbított szimbólumból kell állniuk. A 96 továbbított bitnek 4 Golay (24, 12) kód-szóként generált, 48 információ bitet és 48 paritás bitet kell tartalmaznia. A 3T konfigurációnak, ahogyan az a VDL 3-as Üzemmód Műszaki Előírások Kézikönyvben le van írva, 128 továbbított szimbólumból kell állnia. A 384 továbbított bitnek 16 Golay (24, 12) kód-szóként generált, 192 információ bitet és 192 paritás bitet kell tartalmaznia. A 3T konfiguráció levétel ellenőrzés közleménynek 40 átvitt szimbólumból kell állnia. A 120 továbbított bitnek 5 Golay (24, 12) kód-szóként generált, 60 információ bitet és 60 paritás bitet kell tartalmaznia.
A Golay kódoló speciális definíciójának a következők szerintinek kell lennie:

Ha a 12 bites input bit sorozatot **x** sor-vektorként írják fel, akkor a 24 bites output sorozat **y** sor-vektorként írható fel, ahol **y = x** és a **G** mátrixot a következőképpen kell megadni:

G =

110101110001100000000000
011111001001010000000000
111010010101001000000000
011000111011000100000000
111001101100000010000000
101100110110000001000000
100110011011000000100000
010110111100000000010000
001011011110000000001000
000101101111000000000100
110111000110000000000010
101011100011000000000001

Megjegyzés. – A kiterjesztett Golay kód lehetővé teszi bármilyen 3 vagy ennél kevesebb bit-hibából álló együttes korrekcióját, és bármely 4 bit-hibás együttes detektálását.

6.4.4.1.3 *Adó lefutás.* Az adó teljesítménynek -20 dBc-nek kell lennie az impulzus-köteg végső szimbóluma közepének 2,5 szimbólum periódusain belül. Az adó teljesítmény-szivárgásnak az adó „ki" állapotában -83dBm-nél kisebbnek kell lennie.

Megjegyzés. – Hivatkozás: RTCA/DO -160D 21 szakasz, H kategória antenna sugárzású jeleknél.

6.4.4.2 *Kezelés (M) impulzus-köteg lefutás*. Az M lefutás impulzus-kötegnek (ahogyan azt a VDL 3-as Üzemmód Műszaki Előírások Kézikönyv tartalmazza) három szegmensből kell állnia, az előkészítő jelsorozatból, amelyet a rendszer adat és az adó lefutás követ.

6.4.4.2.1 *Az előkészítő jelsorozat*. A lefelé menő M impulzus-köteg bevezető sorozatoknak két összetevőből kell állniuk, a következők szerint:

a) adó felfutás és teljesítmény stabilizáció; és

b) szinkronizáció és félreérthetőség feloldás.

6.4.4.2.1.1 *Adó felfutás és teljesítmény stabilizáció*. Ennek meg kell felelni a 6.4.3.1.1.1 szakaszban meghatározottaknak.

6.4.4.2.1.2 *Szinkronizáció és félreérthetőség megoldás*. Ennél az impulzus-köteg típusnál három külön szinkronizáció sorozatot kell használni. Az S_1-ként ismert szabvány sorozatnak a következőnek kell lennie:

000 111 001 001 010 110 000 011 100 110 011 111 010 101 100 101

és balról jobbra haladva kell továbbítani. A speciális sorozatnak, amelyet a válaszok azonosítására használnak, a 6.4.4.1.1.2 szakaszban leírtaknak megfelelőnek kell lennie.

A hálózatba lépés kérések (S_1*) azonosítására használt speciális sorozatnak a következő sorozatot kell használni:

000 001 111 111 100 000 110 101 010 000 101 001 100 011 010 011

és balról jobbra haladva kell továbbítani.

Megjegyzés. – Az S_1 sorozat nagyon közeli kapcsolatban van az S_1 sorozattal (6.4.4.3.1.2 szakasz). Az S_1* 16 szimbóluma közötti 15 fázis-változás mindegyike pontosan 180° van kívül az S_1-hez kapcsolódó 15 fázis-változástól. Ez a kapcsolat felhasználható a két sorozat egyidejű keresési folyamatának egyszerűsítéséhez.*

6.4.4.2.2 *Rendszer adat*. Rendszer adat szegmensnek 16 átvitt szimbólumból kell állnia. A 48 átvitt bitet 24 rendszer adatként és 24 paritás bitként kell, kódolni amely két egymást követő (24, 12) Golay kód szóként van generálva. A (24, 12) Golay kód szavaknak a 6.4.4.1.2 szakaszban meghatározottak szerintinek kell lenniük.

6.4.4.2.3 *Adó lefutás*. Ennek a 6.4.4.1.3 pontban meghatározottaknak megfelelőnek kell lennie.

6.4.4.3 *Hang vagy adat (V/D) impulzus-köteg*. A V/D impulzus-kötegnek (ahogyan azt a VDL 3-as Üzemmód Műszaki Előírások Kézikönyv tartalmazza) négy szegmensből kell állnia: az előkészítő jelsorozatból, amelyet a fej-rész, a felhasználói információ szegmens és az adó lefutás követ. Ugyanazt a V/D impulzus-köteg formátumot kell használni mind a felfelé kapcsolatnál, mind a lefelé kapcsolatnál.

6.4.4.3.1 *Előkészítő jelsorozat.* A V/D impulzusköteg előkészítő jelsorozatoknak két összetevőből kell állniuk, a következők szerint:

a) adó felfutás és teljesítmény stabilizáció; és

b) szinkronizáció és félreérthetőség feloldás.

6.4.4.3.1.1 *Adó felfutás és teljesítmény stabilizáció*. Ennek a 6.4.4.1.1.1 szakaszban meghatározottaknak megfelelőnek kell lennie.

6.4.4.3.1.2 *Szinkronizáció és félreérthetőség feloldás*. Ennél az impulzus-köteg típusnál három külön szinkronizáció sorozatot kell használni. Az S_2-ként ismert szabvány sorozatnak a következőnek kell lennie:

000 111 011 010 000 100 001 010 100 101 011 110 001 110 101 111

és balról jobbra haladva kell továbbítani.

6.4.4.3.2 *Fej-rész*. A fej-rész szegmensnek 8 átvitt szimbólumból kell állnia. A 24 átvitt bitet 12 rendszer adatként és 12 paritás bitként kell kódolni, amely két egymást követő (24, 12) Golay kód szóként van generálva. A (24, 12) Golay kód szavaknak a 6.4.4.1.2 szakaszban meghatározottaknak megfelelőnek kell lenniük.

6.4.4.3.3 *Felhasználói információ*. A felhasználói információ szegmensnek 192 3-bites szimbólumból kell állnia. Hang átvitelnél a FEC-t kell alkalmazni a 6.8 szakaszban meghatározott vokódoló output analíziséhez. A vokódolónak kielégítően kell működnie 10^{-3}BER környezetben (10^{-2} tervezési célkitűzéssel). A *FEC-t tartalmazó* vokodoló teljes bit sebessége 4800 bit/s (kivéve a csonkolt módban, amikor a bit-sebesség 4000 bit/s).

6.4.4.3.3.1 Amikor felhasználói adatot visznek át, az 576 bitet egyetlen Reed-Solomon (72, 62) 2^8-rendű kód-szóként kell kódolni. A 496 bitnél kisebb hosszúságú Reed-Solomon kódoló felhasználói input adatánál ezt zérusokkal kell kitölteni a végénél, amíg el nem éri a 496 bit hosszúságot. A mezőnek, amelyet a kód primitív polinomja definiál, a 6.4.3.1.2.1 szakaszban leírtnak kell lennie. A generátor polinomnak a következőnek kell lenni:

$$\prod_{i=120}^{129} (x - \alpha^i)$$

Megjegyzés. – A Reed-Solomon (72, 62) kód képes maximum öt 2^8-rendű (kód-szó) szimbólum hiba javítására a vett szóban.

6.4.4.3.4 *Adó lefutás.* Ennek a 6.4.4.1.3 szakaszban meghatározottnak megfelelőnek kell lennie.

6.4.4.4 *Összerendezés.* Nem lehet összerendezés a 3-as üzemmódú üzemelésben.

6.4.4.5 *Bit rejtjelezés.* A 3-as üzemmódú működés alatt a bit rejtjelezést - ahogyan az a 6.4.3.1.4 szakaszban az meg van határozva - az előkészítő jelsorozat után kezdve minden impulzus-kötegen el kell végezni. A rejtjelező sorozatot újra kell inicializálni minden impulzus-kötegen, hatékonyan állandó lefedést biztosítva a 3-as üzemmódú rögzített hosszúságú impulzus-kötegek mindegyikének.

6.4.4.6 *Adó/vevő kölcsönhatás.* A kapcsolási időt ebben az al-szakaszban, az egyik impulzus-köteg utolsó információ szimbólumának közepe és a következő impulzus-köteg szinkronizációs sorozata első szimbólumának közepe közötti időként határozták meg.

Megjegyzés. – Ezt a névleges időt lerövidítik olyan meggondolások alapján, mint például az egyes szimbólumok Nyquist szűrése miatti véges szélesség és a felfutás és teljesítmény stabilizáció. Az ilyen alternatív definíciók a kapcsolási időket maximálisan 8 szimbólum periódussal rövidíthetik le.

6.4.4.6.1 *Vevő-adó átkapcsolási idő.* Egy légijármű rádiónak képesnek kell lennie 17 szimbólum perióduson belül vételről adásra átkapcsolni. Ez az idő 33 szimbólum periódusra növekedhet az olyan légijármű adóknál, amelyek nem teljesítenek diszkrét címzést kívánó funkciókat.

1. Megjegyzés. – A legrövidebb vevő/adó átkapcsolási idő akkor fordul elő, amikor egy felfelé kapcsolati M-csatorna adás-vételét egy V/D átvitel követi ugyanabban az időrésben. Bizonyos esetekben, amikor a légijármű rádiók nem teljesítenek diszkrét címzést kívánó funkciókat, a vevő/adó átkapcsolási idő megnövelhető, mivel a felfelé kapcsolati M-csatorna adás utolsó két Golay szavát nem kell leolvasni.

2. Megjegyzés. – A minimális átfutási idő feltételezi, hogy a 3V1D, 2V1D és 3T konfigurációjú (ahogyan azt a VDL 3-as Üzemmód Műszaki Előírásai Kézikönyv tartalmazza) légijárművek olyan szoftverrel vannak ellátva, amelyek megvédik őket egy lefelé kapcsolati M-csatorna közlés továbbításától egy olyan időrésben, amely egy másik légijárműtől hosszú időkéséssel érkező hangközlés vételét követi.

6.4.4.6.2 *Adó-vevő átkapcsolási idő.* Egy légijármű rádiónak képesnek kell lennie 32 szimbólum perióduson belül adásról vételre átkapcsolni.
Megjegyzés. – Az adó/vevő átkapcsolási idő legrosszabb esete egy légijármű rádió számára akkor jelenik meg, amikor egy lefelé kapcsolati M-csatorna közlést továbbít, és egy V/D közleményt vesz ugyanabban a időrésben.

6.4.4.7 *Fedésterület határ jelzés.*
6.4.4.7.1 **Ajánlás.** *– A VDL 3-as üzemmódú légijárművek részére ajánlott a fedésterületi határ közelség jelzés szolgáltatása.*

6.5 KAPCSOLAT RÉTEG PROTOKOLOK ÉS SZOLGÁLTATÁSOK

6.5.1 Általános információk

6.5.1.1. *Funkcionalitás*. A VDL kapcsolat rétegnek a következő al-réteg funkciókat kell szolgáltatnia:

a) adathordozó elérési irányítás (MAC) al-réteg, amely megkívánja a vivőhullám érzékelő többszörös hozzáférés (CSMA) algoritmus használatát a 2-es üzemmódnál vagy a TDMA használatát a 3-as üzemmódnál;

b) adat-kapcsolat szolgáltatás (DLS) al-réteg:

1) a 2-es üzemmódnál a DLS al-réteg összekapcsolás-orientált pont-pont kapcsolatokat szolgáltat az adat.kapcsolat entitások (DLE) felhasználásával, és összekapcsolás-mentes rádiókapcsolatot a MAC al-réteg felett; és

2) a 3-as üzemmódnál a DLS al-réteg nyugtázott, összekapcsolás-mentes pont-pont és pont-több-pont kapcsolatokat szolgáltat egy MAC al-réteg felett, amely szekvenciálást garantál; és

c) a VDL kezelés entitás (VME), amely DLE-ket létesít és fenntartja a légijárművek és a földi telepítésű rendszerek közötti kapcsolat kezelési entitásokat (LME).

6.5.1.2 SZOLGÁLTATÁS

6.5.1.2.1 *Kapcsolat-orientált*. A VDL kapcsolat réteg megbízható ponttól-pontig szolgáltatást nyújt kapcsolat-orientált DLS alréteg felhasználásával.

6.5.1.2.2 *Kapcsolat-nélküli*. A 2-es és a 3-as üzemmódú VDL kapcsolat réteg nem-nyugtázott rádió-adás szolgáltatást nyújt kapcsolat-nélküli DLS alréteg felhasználásával.

6.5.1.2.3 *Nyugtázott kapcsolat-nélküli eljárás.* A 3-as üzemmódú kapcsolat rétegnek biztosítania kell egy pont-pont szolgáltatást egy olyan kapcsolat-nélküli DLS al-réteg felhasználásával, amely a sorrendiség garantálására a MAC al-rétegen alapszik.

6.5.2 MAC al-réteg

6.5.2.1 Az Adathordozó Hozzáférés Vezérlés /MAC/ al-rétegnek a megosztott kommunikációs útvonalon átlátható adatgyűjtést kell szolgáltatni. Ez láthatatlanná teszi azt a módot a DLS al-réteg számára, amelyben eléréséhez fenntartó kommunikációs forrásokat használnak ennek eléréséhez.

Megjegyzés. – A speciális MAC szolgáltatásokat és eljárásokat a VDL 2-es és 3-as üzemmódhoz a VDL 2-es üzemmód és VDL 3-as üzemmód Műszaki Előírásai Kézikönyv tartalmazza.

6.5.3 Adat-kapcsolat szolgáltatás al-réteg

6.5.3.1 A 2-es üzemmódnál az adat-kapcsolat szolgáltatás al-rétegnek alá kell támasztania a bit- orientált szimplex levegő-föld összeköttetéseket a légiforgalmi VHF kapcsolat vezérlési (AVLC) protokolt felhasználva.

Megjegyzés. - A VDL 2-es üzemmód speciális adat-kapcsolati szolgáltatásait, paramétereit és protokol meghatározásait a VDL 2-es Üzemmód Műszaki Előírások Kézikönyve foglalja magába.

6.5.3.2 A 3-as üzemmódnál a DLS-nek alá kell támasztani a bit-oritentált elsőbbségi alapú szimplex levegő-föld összeköttetéseket a nyugtázott kapcsolat-nélküli adat-kapcsolat (A-CLDL) protokolt felhasználva.

Megjegyzés. - A VDL 3-as üzemmód speciális adat-kapcsolati szolgáltatásait, paramétereit és protokol meghatározásait a VDL -as Üzemmód Műszaki Előírások Kézikönyve foglalja magába.

6.5.4 VDL kezelési entitás (VME)

6.5.4.1 *Szolgáltatások.* A VDL kezelési entitásnak biztosítania kell a kapcsolat létrehozását, fenntartását és a szolgáltatás megszűntetését, valamint a paraméter módosítások alátámasztását. A speciális VME paraméter formátumok és eljárások a 2-es és 3-as üzemmódú szolgáltatások a VDL 2-es üzemmód és 3-as üzemmód Műszaki Előírásai Kézikönyvben találhatók.

6.6 AL-HÁLÓZAT RÉTEG PROTOKOLOK ÉS SZOLGÁLTATÁSOK

6.6.1 A 2-es üzemmód felépítése

6.6.1.1 Az al-hálózat réteg protokolt, amelyet a VHF levegő-föld al-hálózaton keresztül használnak a VDL 2-es üzemmódhoz, és amit formálisan al-hálózat hozzáférés protokolnak (SNAcP) neveznek, meg kell, hogy feleljen az ISO 8208 szabványnak, kivéve azokat, ami A VDL 2-es Üzemmód Műszaki Előírások Kézikönyvben találhatók. Az SNAcP, ami A VDL 2-es Üzemmód Műszaki Előírások Kézikönyvben található, az al-hálózati protokol. Ha A VDL 2-es Üzemmód Műszaki Előírások Kézikönyve és az idézett előírások között különbségek vannak, akkor A VDL 2-es Üzemmód Műszaki Előarásoknak van elsőbbsége. A levegő-föld interfészen a légijármű al-rendszer entitás DTE-ként működik, a földi al-hálózat entitásnak pedig DCE-ként kell működnie.

Megjegyzés. – A speciális al-réteg protokol hozzáférési pontokat, szolgáltatásokat, paramétereket és eljárásokat a VDL 2-es üzemmódhoz A VDL 2-es Üzemmód Műszaki Előírások Kézikönyve foglalja magába.

6.6.2 A 3-as üzemmód felépítése

6.6.2.1 A VHF levegő-föld al-hálózaton keresztül használt al-hálózatnak a VDL 3-as üzemmód biztosítja a flexibilitást a többszörös al-hálózati protokolok egyidejű fenntartásához. A jelenleg meghatározott opciók: az ISO 8473 kapcsolás-nélküli hálózat protokol fenntartása és az ISO 8208 fenntartása, mindkettőnél úgy, ahogyan azok A VDL 3-as Üzemmód Műszaki Előírások Kézikönyvben találhatók. A VDL 3-as Üzemmód Műszaki Előírások Kézikönyvnek elsőbbségének kell lennie az idézett előírásoktól való bármely eltérés esetén. Az ISO 8208 interfésznél a légi és a földi al-hálózat entitások egyaránt DCE-ként működnek.

Megjegyzés. – A speciális al-réteg protokol hozzáférési pontokat, szolgáltatásokat. paramétereket és eljárásokat a VDL 3-as üzemmódhoz A VDL 3-as Üzemmód Műszaki Előírások Kézikönyve foglalja magába.

6.7. A VDL MOZGÓ SZOLGÁLATI AL-HÁLÓZAT FÜGGŐ KONVERGENCIA FUNKCIÓ (SNDCF)

6.7.1 A VDL 2-es üzemmódú SNDCF

6.7.1.1 *Bevezetés.* A szabvány mozgó szolgálati SNDCF szerepét a VDL 2-es üzemmódú mozgó szolgálati SNDCF- nek kell betöltenie.

6.7.1.2 *Új funkció.* A VDL 2-es üzemmódú mozgó szolgálati SNDCF-nek kell alátámasztani az összefüggés fenntartását (pl. tömörítés táblázatok) az al-hálózati hívásokon keresztül. Az SNDCF-nek ugyanazon szöveg-összefüggést (pl. tömörítés táblázatok) kell használnia az összes vele kapcsolatban lévő SVC-n keresztül a DTE szöveg-összefüggéssel, amikor ugyanazokkal a paraméterekkel tartják a kapcsolatot. Az SNDCF-nek legalább két, egy szöveg-összefüggést megosztó SVC-t kell alátámasztania.

1. Megjegyzés. – Mivel a vételek várhatóan átrendezik a kötegeket, bizonyos tömörítési algoritmusok nem alkalmasak a VDL 2-es üzemmódban való használatra. Továbbá az operandus-táblázat tömörítési algoritmusok szerkesztőinek kell kényesen vigyázniuk a vagy a régi, vagy az újonnan létesített híváson érkező felfrissítések problémájával szemben.

2. Megjegyzés. – A Hívás Felhasználói Adatmező kódolása a Doc 9705-ben van leírva, kivéve a VDL 2-es Üzemmód Műszaki Előírások Kézikönyvben található módosításokat.

6.7.2 A VHF adatkapcsolat /VDL/ 3-as üzemmód al-hálózat berendezés-függő konvergencia szolgáltatása /SNDCF/

6.7.2.1 A VDL 3-as üzemódnak alá kell támasztania a meghatározott SNDCF egyikét, vagy azokból többet. Az első a szabvány ISO 8208 SNCF, ahogy az a Doc 9705-ben meghatározásra került. Ez egy kapcsolat-irányított SNDCF. A VDL 3-as üzemmóddal alátámasztott SNDCF második típusa keret-alapú SNDCF-ként került megjelölésre. Ennek a kapcsolat-nélküli irányítottságú SNDCF-nek a részletezését a VHF adat-kapcsolat 3-as Üzemmód Műszaki Előírása Kézikönyv foglalja magába, ami tartalmazza még a hálózati réteg interfészt, alátámasztja az általános adású és irányított adású hálózati csomagokat, és a Légiforgalmi Távközlési Hálózat /ATN/ közlemény továbbítás biztosítását.

Megjegyzés. – A keret-alapú SNDCF azért van így megnevezve, mivel a VDL 3. üzemmódú kereteket használja anélkül, hogy szüksége lenne egy kiegészítő protokolra (úgymint az ISO 208 SNDCF) a hálózati csomagok továbbításához. A keret-alapú SNDCF a hálózati protokoltól való függetlenséget azzal éri el, hogy azonosítja az egyes keretek 'hasznos terhelését'. Egy keret vételekor a hasznos terhelés kerül megvizsgálásra, és a vezérlés az azonosított protokolhoz kerül átadásra.

6.8 HANGFREKVENCIÁS EGYSÉG A 3-AS ÜZEMMÓDHOZ

6.8.1 Szolgáltatások

6.8.1.1 A hangfrekvenciás egységnek biztosítania kell egy egyszerű „nyomó-gombos – beszéd-indítás”-ú funkciót és jelzés átviteli interfészt a felhasználó és a VHF adat-kapcsolat /VDL/ között. Két különálló, egymást kölcsönösen kizáró beszéd-üzemű csatorna áramkör típust kell alátámasztani:

a) Célra rendelt áramköröket: Ennek egy speciális felhasználói csoport részére kell szolgáltatást biztosítani – kizárásos alapon – az áramkört a csoporton kívülálló más felhasználókkal nem megosztottan. A hozzáférést a „hallgasson be” figyelemmel biztosítva, mielőtt a nyomógombbal indítana.

b) Igény szerinti kijelölésű áramköröket: Ennek egy olyan beszéd-üzemű csatorna áramkör hozzáférést kell biztosítani, amelyet a földi állomás dönt el a légijármű fedélzeti állomástól vett hozzáférési kérésre válaszolva. Az üzemeltetés ilyen típusának meg kell engedni a csatorna forrás növekvő hatékonyságú dinamikus megosztását.

6.8.1.2 *Elsőbbég hozzáférés.* A hangfrekvenciás egység működésének biztosítania kell az elsőbbségi megszakításos hozzáférést az arra feljogosított földi felhasználó részére.

6.8.1.3 *Közlemény forrás azonosítás.* A hangfrekvenciás egység működésének biztosítania kell azt, hogy egy vett közlemény forrásáról értesítse a felhasználót (azaz azt, hogy a közlemény a levegőből vagy egy földi állomástól ered-e).

6.8.1.4 *Kódolt zajzár.* A hangfrekvenciás egység működésének biztosítania kell egy kódolt zajzár működést, amely bizonyos értékű csillapítást ad a nem-kívánt közös csatornájú hangfrekvenciás közleményekre a beérkezési impulzus idejében.

6.8.2 Élőszavas kódolás, paraméterek és eljárások

6.8.2.1 A VHF adat-kapcsolat 3-as üzemmódjának a korszerű több-soros aktíválású (AMBE) 4,8 kbit/s kódolási/dekódolási algoritmust kell használni, a változat száma: AMBE-ATC-10, amit a Digitális Beszéd Rendszerek Részvénytársaság (DVSI) fejlesztett ki a beszéd-üzemű átvitelhez.

1. Megjegyzés. – A 4,8 kbit/s AMBE algoritmusok műszaki jellemzőire vonatkozó tájékoztatásokat az AMBE-ATC-10 Alacsony Jelszintű Leírása foglalja magába, és a DVSI-től szerezhető be.

2. Megjegyzés. – A dokumentumban leírt 4,8 kbit/s AMBE kódolás/dekódolás technológia a DVSI szabadalmi joga és szerzői joga alatt áll. A gyártóknak egy liszensz megállapodást kell kötniük a DVSI-vel azt megelőzően, hogy az algoritmusról egy részletes leírást kapjanak, mielőtt beépítenék azt a VDL 3-as üzemmódú szolgáltatást nyújtóan működő berendezéseikbe. Az ICAO-nak címzett 1999. október 29-i dátumú levélben a DVSI megerősítette azon kötelezettség-vállalását, hogy engedélyezi a gyártóknak a technológia felhasználását, és a légiforgalmi berendezésekben való eladását diszkrimináció nélküli alapon megtárgyalt kikötések és feltételek mellett.

6.8.2.2 Az élőszavas kódolás meghatározását, a hangfrekvenciás egység paramétereinek és eljárásainak leírását a VDL 3-as üzemmódú beszéd-üzemű üzemeltetéséhez a VDL 3-as Üzemmódú Műszaki Előírások Kézikönyve foglalja magába.

6.9 A VHF ADAT-KAPCSOLAT /VDL/ 4-ES ÜZEMMÓD

6.9.1 Egy 4-es üzemmódú állomás meg kell, hogy feleljen a 6.1.2.3, 6.l.4.2, 6.2.1.1, 6.2.3.1, 6.2.4, 6.3.1, 6.3.3.1, 6.3.4, 6.3.5.1, 6.3.5.2, 6.3.5.3, 6.3.5.4.1 és 6.9 szakaszokban meghatározott követelményeknek.

6.9.2 A VHF adat-kapcsolat 4-es üzemmódjának rádió csatornái

6.9.2.1 A VHF ADAT-KAPCSOLAT /VDL/ 4-es ÜZEMMÓDÚ ÁLLOMÁSAINAK FREKVENCIA TARTOMÁNYA

6.9.2.1.1 *Az adó/vevő hangolási tartomány.* Egy VHF adat-kapcsolat 4. üzemmódú adó/vevőnek képesnek kell lennie arra, hogy a 117,975 MHz-től a 137 MHz-ig terjedő tartományban bármelyik 25 kHz-es csatornára lehangolható legyen. Az adónak a lehangolási tartományra rendelkeznie kell egy olyan eszközzel, ami korlátozza a szűkebb sávra történő hangolást.

Megjegyzés. – Az üzemeltetési körülmények vagy bizonyos alkalmazások szükségessé tehetik azt, hogy a berendezés szűkebb frekvencia tartományban kerüljön üzemeltetésre.

6.9.2.1.2 **Ajánlás. -** *Egy VHF adat-kapcsolat 4-es üzemmódú adó/vevőnek képesnek kell lennie arra, hogy a108 MHz-től a 117,975 MHz-ig terjedő tartományban bármelyik 25 kHz-es csatornára lehangolható legyen.*

Megjegyzés. – A 108 – 117,975 MHz-es sávot a Nemzetközi Távközlési Unió /ITU/ Nemzetközi Rádió-Szabályzatának vonatkozó előírásaival összhangban lehet felhasználni.

6.9.2.1.3 *Szimultán vétel*. Egy 4-es üzemmódú állomásnak képesnek kell lennie két csatorna egyidejű vételére.

6.9.2.1.4 **Ajánlás.** *– Egy VDL 4-es üzemmódú állomás legyen képes további csatornák egyidejű vételére, amennyiben ezt az üzemeltetési szolgáltatás megkívánja.*

6.9.2.2 GLOBÁLIS JELZŐ CSATORNA

6.9.2.2.1 Egy 4-es üzemmódú állomásnak két kijelölt frekvenciát kell használni globális jelző csatornaként (GSC), a felhasználói kommunikáció és kapcsolat kezelés funkciók fenntartására.

Megjegyzés. – Kiegészítő csatornákat meg lehet határozni egy helyi tartományban és rádión értesíteni a mobil felhasználókat a földi állomásoktól a fent definiált GSC-kről.

6.9.3 Rendszer képességek

6.9.3.1 *ATN kompatibilitás.* A VDL 4-es üzemmódú rendszernek alá kell támasztania az ATN-kiszolgáló al-hálózati szolgáltatást a légtér-ellenőrzési alkalmazásokhoz.

6.9.3.2 *Adat átláthatóság*. A VDL 4-es üzemmódú rendszernek kód-független és bájt-független adat-átvitelt kell biztosítania.

6.9.3.3 *Sugárzás*. A VDL 4-es üzemmódú rendszernek kapcsolat réteg sugárzási szolgáltatást kell nyújtania.

6.9.3.4 *Ponttól-pontig*. A VDL 4-es üzemmódú rendszernek ponttól-pontig szolgáltatást kell nyújtania.

6.9.3.5 *Levegő-levegő összeköttetések*. A VDL 4-es üzemmódú rendszernek levegő-levegő összeköttetést kell biztosítania, földi támogatás nélkül, valamint biztosítania kell a levegő-föld kommunikációt is.

6.9.3.6 *Kapcsolat kezelés.* A levegő-föld üzemelés alátámasztásánál a VDL 4-es üzemmódú rendszernek megbízható összeköttetési útvonalat kell létesítenie és fenntartani a légijármű és a föld között, megengedve, de nem megkövetelve, a kézi beavatkozást.

6.9.3.7 *Földi hálózati átvitel*. Egy mozgó VDL 4-es üzemmódú DLS állomásnak az egyik VDL 4-es módozatú DLS földi állomástól egy másikra szükség esetén át kell térnie.

6.9.3.8 *Származtatott idő-képesség*. VDL 4-es üzemmódnak a vett VDL 4-es üzemmódú átvitelek érkezési idejének méréséből való idő-leszármaztatás képességét kell biztosítani, amikor kívülről leszármaztatott időbecslések nem állnak rendelkezésre.

6.9.3.9 *Szimplex üzemeltetés*. A mozgó és földi VDL 4-es üzemmódú állomásoknak hozzá kell férniük a szimplex módban működő fizikai adathordozóhoz.

6.9.4 Csatorna használat koordinálása

6.9.4.1 Körzeti alapon az átviteleket UTC szerint kell ütemezni a megosztott csatornák hatékony felhasználása és nem-szándékos időrés újra-felhasználás elkerülése érdekében.

6.9.5 Fizikai réteg protokolok és szolgáltatások

Megjegyzés. – Ha nincs másképpen meghatározva, az ebben a szakaszban meghatározott előírások mind a mozgó, mind a földi állomásokon érvényesek.

6.9.5.1 FUNKCIÓK

6.9.5.1.1 ÁTVITT TELJESÍTMÉNY

6.9.5.1.1.1 *Légijármű fedélzeti telepítés*. A kisugárzott teljesítménynek olyannak kell lenni, hogy egy legalább 35 mikrovolt per méter (mínusz 114,5 dBW/m^2) térerősséget szolgáltasson a szabad-térbeli terjedés alapján, olyan távolságokban és magasságokon, amelyek megfelelnek az azon területekhez tartozó feltételeknek, amelyek felett a légijármű üzemelést végez.

6.9.5.1.1.2 *Földi telepítés*.

Ajánlás. – *A kisugárzott teljesítmény olyan legyen, hogy egy legalább 75 mikrovolt per méter (mínusz 109 dBW/m^2) térerősséget szolgáltasson a létesítmény meghatározott üzemelési fedésterületén belül a szabad-térbeli terjedés alapján.*

6.9.5.1.2 AZ ADÓ ÉS VEVŐ FREKVENCIA SZABÁLYOZÁSA

6.9.5.1.2.1 A VDL 4-es üzemmód fizikai rétegnek az adó vagy vevő frekvenciát a kapcsolat kezelő entitás (LME) utasításának megfelelően kell beállítania. A csatorna kiválasztási időnek kisebbnek kell lenni, mint 13 ms, egy VSS felhasználótól jövő utasítást követően.

6.9.5.1.3 A VEVŐ ÁLTALI ADAT-VÉTEL

6.9.5.1.3.1 A vevőnek a bemenő jelet dekódolnia és továbbítania kell a magasabb rétegekhez feldolgozás céljából.

6.9.5.1.4 AZ ADÓ ÁLTALI ADAT-TOVÁBBÍTÁS

6.9.5.1.4.1 *Adat kódolás és átvitel*. A fizikai rétegnek az adat-kapcsolati rétegtől vett adatokat kódolnia és továbbítania kell az RF csatornán. Az RF-továbbítás csak akkor mehet végbe, ha az adathordozó hozzáférés vezérlés /MAC/ engedélyezte.

6.9.5.1.4.2 *Továbbítási sorrend*. A továbbításnak a következő fokozatokból, a következő sorrendben kell állnia:

a) adó teljesítmény stabilizálás;

b) bit szinkronizáció;

c) félreérthetőség feloldása és adat-továbbítás; és

d) adó csillapítás.

Megjegyzés. – A fokozatok meghatározásait a 6.9.5.2.3.1-től a 6.9.5.2.3.4-ig terjedő szakaszok tartalmazzák.

6.9.5.1.4.3 *Automatikus adó kikapcsolás*. A VDL 4-es üzemmódú állomásnak le kell kapcsolnia a végfokozat erősítőhöz menő teljesítményt abban az esetben, ha az ettől a végfokozat erősítőtől jövő kimenet több mint egy másodpercig meghaladja a -30 dBm-et. Az érintett erősítő üzemelési módba történő visszaállítását kézi művelettel kell végezni.

Megjegyzés. – Ennek az a célja, hogy megvédje az elosztott csatorna forrást az úgynevezett „beragadt adóktól”.

6.9.5.1.5 ÉRTESÍTÉS SZOLGÁLTATÁS

6.9.5.1.5.1 *Jelminőség*. A berendezések működési paramétereit a fizikai rétegnél kell ellenőrizni. A jelminőség elemzést a demodulációs folyamatban és a vételi folyamatban kell végezni.

Megjegyzés. – A demodulátorban értékelhető folyamatokat a bit hiba-arány (BER), a jel/zaj arány (SNR) és az időzítő vibrálás képezik. A vevőben értékelhető folyamatok vett jelszintet és a csoport késést tartalmazzák.

6.9.5.1.5.2 *Érkezési idő*. Minden vett átvitel érkezési idejét 5 mikroszekundumos két-szigma hibával kell mérni.

6.9.5.1.5.3 **Ajánlás.** – *A vevő legyen képes az érkezési idő 1 mikroszekundomos két-szigma hibán belüli mérésre*.

6.9.5.2 A GAUSS SZŰRÉSŰ FREKVENCIA-BILLENTYŰZÉS /GFSK/ PROTOKOL MEGHATÁROZÁSA

6.9.5.2.1 *Modulációs séma*. A modulációs sémának a GFSK-nak kell lennie. Az első átvitt bitnek (az előkészítő jelsorozatban) magas hangnak kell lennie, és a továbbított hangot billentyűzni kell, mielőtt a 0 továbbításra kerülne (azaz nullára nem-visszatérő, invertált kódolás).

6.9.5.2.2 *Modulációs sebesség*. Bináris egyeseket és bináris nullákat kell generálni 0,25 ± 0,03 BT index-szel és 0,28 ± 0,03 BT termékkel, amely 19200 bit/s ± 50 ppm sebességű adatátvitelt biztosít.

6.9.5.2.3 AZ ÁTVITEL FOKOZATAI

6.9.5.2.3.1 *Adó teljesítmény stabilizáció*. Az előkészítő jelsorozat első szegmense az adó teljesítmény stabilizáció, amelynek 16 szimbólum időtartamának kell lennie. Az adó teljesítmény-szint az állandó állapotú teljesítmény-szint 90 százalékánál kisebb nem lehet az adó teljesítmény stabilizációs szakasz végénél.

6.9.5.2.3.2 *Bit szinkronizálás*. Az előkészítő jelsorozat második szegmensének a 24-bites 0101 0101 0101 0101 0101 0101 sorozatnak kell lennie, amelyet balról jobbra haladva, közvetlenül az adat-szegmens kezdete előtt kell továbbítani.

6.9.5.2.3.3 *Félreérthetőség feloldás és adat-átvitel*. Az adatok első bitjének továbbítását 40-bites intervallumokkal (közelítőleg 2083,3 mikroszekundum ±1 mikroszekundum) az átvitel névleges megkezdése után kell elkezdeni.

1. Megjegyzés. – Ez az antenna kimenetén lévő sugárzásra vonatkozik.

2. Megjegyzés. – A félreérthetőség feloldását a kapcsolat réteg hajtja végre.

6.9.5.2.3.4 *Adó csillapítás*. Az átvitt teljesítménynek legalább 20 dB-el kell csillapodni 300 mikroszekundumon belül az átvitel befejezése után. Az adó teljesítmény-szintnek az átvitel befejezése után 832 mikroszekundumon belül kisebbnek kell lennie, mint -90 dBm.

6.9.5.3 CSATORNA ÉRZÉKENYSÉG

6.9.5.3.1 *Zaj alapszint becslés*. Egy VDL 4-es üzemmódú állomásnak meg kell becsülnie a zaj alapszintet, a csatorna teljesítmény mérésének alapján, amikor érvényes bevezető sorozatot nem észlel.

6.9.5.3.2 A zaj alapszint kiszámításához használt algoritmusnak olyannak kell lenni, hogy a kiszámított zaj alapszint alacsonyabb legyen annál a maximum teljesítmény-szintnél, amelyet a csatornán az elmúlt azon percben mértek, amikor a csatornát inaktívként vették figyelembe.

Megjegyzés. – A VHF adat-kapcsolat /VDL/ 4. üzemmódú vevő egy energia-érzékelő algoritmust használ fel a csatorna állapotának (inaktív vagy aktív) meghatározási eszközeként. Egy algoritmus, amit fel lehet használni a zaj alapszint kiszámításához, a VDL 4-es Üzemmód Műszaki Előírásai Kézikönyvben került leírásra.

6.9.5.3.3 *A csatorna inaktív – aktív állapotának meghatározása.* A VHF adat-kapcsolat /VDL/ 4. üzemmódú állomásnak a következő eszközöket kell alkalmazni a csatornának a fizikai rétegnél történő inaktív – aktív átmenetének meghatározásához.

6.9.5.3.3.1 *Előkészítő jelsorozatok észlelése.* A csatornát akkor kell aktívnak nyilvánítani, amikor egy VDL 4. üzemmódú állomás egy érvényes előkészítő jelsorozatot és egy azt követő keret jelzést észlel.

6.9.5.3.3.2 *A csatorna teljesítmény mérése.* A demodulátor azon képességétől függetlenül, hogy képes egy érvényes előkészítő jelsorozat észlelésére, a VDL 4-es üzemmódú állomásnak tekintetbe kell venni egy csatorna foglaltságot 95 százalékos valószínűséggel – 1 ms-on belül azután, hogy a csatornán belüli teljesítmény a számított zaj alapszintnek legalább a négyszeresére emelkedik – legalább 0,5 milliszekundumon keresztül.

6.9.5.3.4 *A csatorna aktív – inaktív átmenetének észlelése*

6.9.5.3.4.1 Egy VHF adat-kapcsolat /VDL/ 4. üzemmódú állomásnak a következő eszközöket kell alkalmazni a csatorna aktív – inaktív átmenetének észleléséhez.

6.9.5.3.4.2 *Az adás hosszának mérése.* Amikor az előkészítő jelsorozat észlelésre kerül, a csatorna aktív állapotot fenn kell tartani azon időtartamon keresztül, ami legalább 5 milliszekundumig tart, és ezt követően engedélyezett a csatorna teljesítmény mérésen alapuló inaktív állapotba történő átmenet.

6.9.5.3.4.3 *A csatorna teljesítmény mérése.* Amikor a csatorna aktív állapot nem másképpen kerül fenntartásra, akkor a VDL -es. üzemmódú állomásnak a csatornát inaktívnak kell tekinteni legalább 95 százalékos valószínűséggel – ha a csatornán belüli teljesítmény a számított zaj alapszintnek a kétszeresével egyenlő, legalább 0,9 milliszekundumon keresztül.

6.9.5.4 VEVŐ/ADÓ KÖLCSÖNHATÁS

6.9.5.4.1 *Vevő – adó átfutási idő.* Egy VHF adat-kapcsolat /VDL/ 4-es üzemmódú állomásnak képesnek kell lennie az adó teljesítmény stabilizáló jelsorozat adásának megkezdésére, a vevő funkció befejezése utáni 16 mikroszekundumon belül.

6.9.5.4.2 *Frekvencia-váltás az adás során.* A vivőhullám fázis felgyorsulási idejének a szinkronizáló jelsorozat kezdetétől az adat vége jelzésig másodpercenként 300 Hz-nél kevesebbnek kell lenni.
6.9.5.4.3 *Adó – vevő átfutási idő.* Egy VHF adat-kapcsolat /VDL/ 4-es üzemmódú állomásnak képesnek kell lennie egy bejövő jel névleges teljesítménnyel való vételére és demodulására egy adás befejezése után 1 ms-on belül.

Megjegyzés. – A névleges teljesítmény egy 10^{-4} értékű bit hiba-gyakoriságként (BER) van meghatározva.

6.9.5.5 FIZIKAI RÉTEG RENDSZER PARAMÉTEREK

6.9.5.5.1 *P1 paraméter (minimális átviteli hossz)*

6.9.5.5.1.1 A vevőnek képesnek kell lenni a P1 minimális hosszúságú átvitelnek a bit hibagyakoriság /BER/ csökkenése nélküli demodulálására.

6.9.5.5.1.2 A P1 értékének 19 200 bit-nek kell lenni.

6.9.5.5.2 *P2 paraméter (névleges közös-csatornájú interferencia teljesítmény)*

6.9.5.5.2.1 A P2 paraméternek annak a névleges közös-csatornájú interferencia értéknek kell lenni, amelynél a vevő bit hiba-gyakoriság /BER/ csökkenése nélkül képes a demodulálásra.

6.9.5.5.2.2 A P2 értékének 12 dB-nek kell lennie.

6.9.5.6 A FREKVENCIA-MODULÁCIÓS /FM/ ÁLTALÁNOS-ADÁS INTERFERENCIA VÉDETTSÉGI TELJESÍTMÉNY A VHF ADAT-KAPCSOLAT /VDL/ 4-es ÜZEMMÓDÚ VEVŐ RENDSZEREKRE

6.9.5.6.1 Egy VDL 4-es üzemmódú állomásnak – amikor az a 117,975 – 137 MHz-es sávban üzemel – meg kell felelnie a 6.3.5.4 pontban meghatározott követelményeknek.

6.9.5.6.2 Egy VDL 4-es üzemmódú állomásnak – amikor az a 108 – 117,975 MHz-es sávban üzemel – meg kell felelnie az alábbiakban meghatározott követelményeknek.

6.9.5.6.2.1 Egy VDL 4-es üzemmódú vevő rendszernek meg kell felelni a 6.3.5.1 pontban meghatározott követelményeknek, amikor az olyan két-jel, harmadrendű kereszt-modulációs termékek jelenlétében üzemel, amelyeket azok az ultrarövidhullámú /VHF/ frekvencia-modulált /FM/ általános-adások jelei okoznak, melyeknek a jel szintjei a következőknek felelnek meg:

$$2N_1 + N_2 + 72 \le 0$$

a VHF FM hangfrekvenciás általános-adású jelekre a 107,7 – 108,0 MHz-es tartományban, és

$$2N_1 + N_2 + 3\left\{24 - 20\log\frac{\Delta f}{0,4}\right\} \le 0$$

a VHF FM hangfrekvenciás általános-adású jelekre a 107,7 MHz alatt, ahol a két VHF FM hangfrekveciás általános-adású jelek frekvenciája létrehozza a vevőn belül a két-jel, harmadrendű kereszt-modulációs terméket a megkívánt VDL 4-es üzemmódú frekvencián.

Az N_1 és az N_2 a jel szintjei (dBm) a két VHF FM hangfrekvenciás általános-adású jelnek a VDL 4-es üzemmódú vevő bemenetén. Egyik szint sem haladhatja meg a 6.9.5.6.2.2 pontban lefektetett érzékenység-csökkentési követelményt.

$\Delta f = 108{,}1 - f1$, ahol az f1 az *N1* frekvenciája, a 108,1 MHz-hez közelebbi VHF FM hangfrekvenciás általános-adású jel.

Megjegyzés. – A frekvencia-moduláció /FM/ kereszt-modulációs védettségi követelmények nincsenek alkalmazva a 108,1 MHz alatt üzemelő VDL 4-es üzemmódú csatornára, és ennélfogva a 108,1 MHz alatti frekvenciák általános kijelölése nincs tervezve.

6.9.5.6.2.2 A VDL 4-es üzemmódú vevő rendszernél nem kell az érzékenység csökkentést alkalmazni a 6-5. és 6-6. táblázatoknak megfelelő szintű VHF FM általános-adású jelek jelenlétében.

6.9.6 Kapcsolati réteg

Megjegyzés. – A kapcsolati réteg funkciókról a VHF adat-kapcsolat /VDL/ 4-es Üzemmód Műszaki Előírásai Kézikönyv foglal magába részletes leírást.

6.9.7 Al-hálózati réteg és az Al-hálózat Berendezés-függő Konvergencia Szolgáltatás /SNDCF/

Megjegyzés. – Az al-hálózati réteg funkciókról és az SNDCF-ről részleteket a VHF adat-kapcsolat /VDL/ 4. Üzemmód Műszaki Előírási Kézikönyv tartalmaz.

6.9.8 Automatikus Berendezés-függő Légtér-ellenőrző Általános-adás /ADS-B/ alkalmazások

Megjegyzés. – Az ADS-B alkalmazási funkciókról a VHF adat-kapcsolat /VDL/ 4-es Üzemmód Műszaki ElőírásaiKézikönyv tartalmaz részletes leírást.

A 6. FEJEZET TÁBLÁZATAI

6-1. táblázat: A 2-es és 3-as üzemmód adatok kódolása

X_k	Y_k	Z_k	$\Delta\phi_k$
0	0	0	$0\,\pi / 4$
0	0	1	$1\,\pi / 4$
0	1	1	$2\,\pi / 4$
0	1	0	$3\,\pi / 4$
1	1	0	$4\,\pi / 4$
1	1	1	$5\,\pi / 4$
1	0	1	$6\,\pi / 4$
1	0	0	$7\,\pi / 4$

6-2. táblázat: 2. és 3. üzemmód stabilitás

VDL üzemmód	Légijármű moduláció stabilitás	Földi moduláció stabilitás
2-es üzemmód	± 0,0050 százalék	± 0,0050 százalék
3-as üzemmód	± 0,0005 százalék	± 0,0002 százalék

6-3. táblázat: Rejtjelező funkciók

Funkció	Bemenő adat	Kimenő adat
Rejtjelezés	"Tiszta adat"	Rejtjelezett adat
Rejtjel feloldás	Rejtjelezett adat	"Tiszta adat"

6-4. táblázat: Fizikai szolgáltatások rendszer paraméterei

Szimbólum	Paraméter neve	2-es üzemmód érték
P1	Minimális átvitel hossz	131 071 bit

6-5. táblázat: A 108,0 – 111,975 MHz közötti frekvencián üzemelő VHF adat-kapcsolat /VDL/ 4-es üzemmódú rendszerek

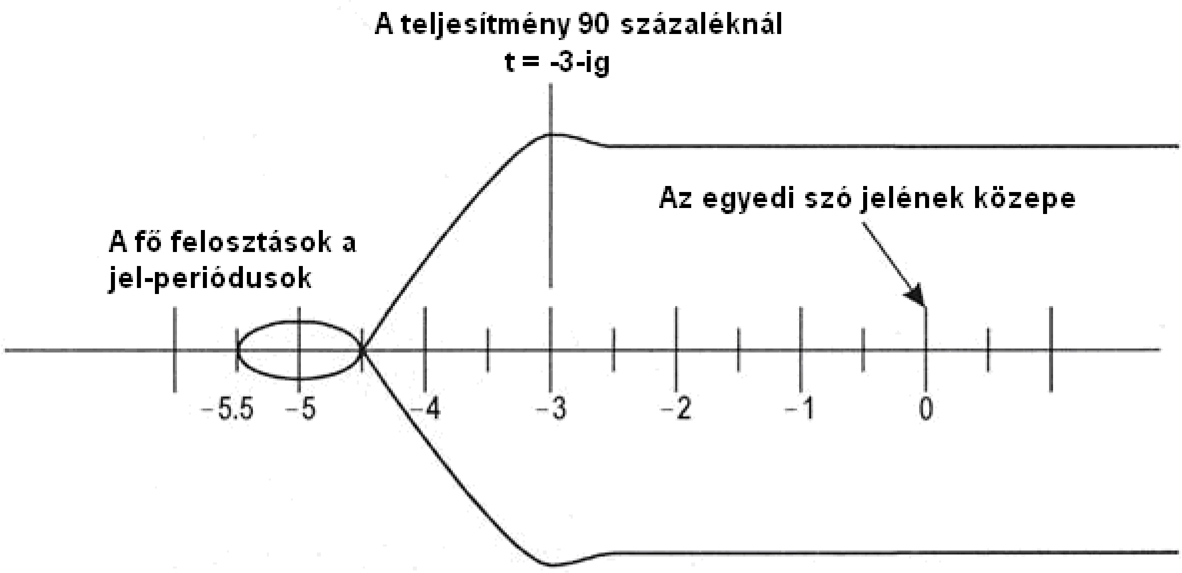
Frekvencia (MHz)	A nem-kívánt jel maximális szintje a vevő bemeneten (dBm)
88 – 102	+ 15
104	+ 10
106	+ 5
107,9	- 10

6-6. táblázat: A 112,0 – 117,975 MHz közötti frekvencián üzemelő VHF adat-kapcsolat /VDL/ 4-es üzemmódú rendszerek

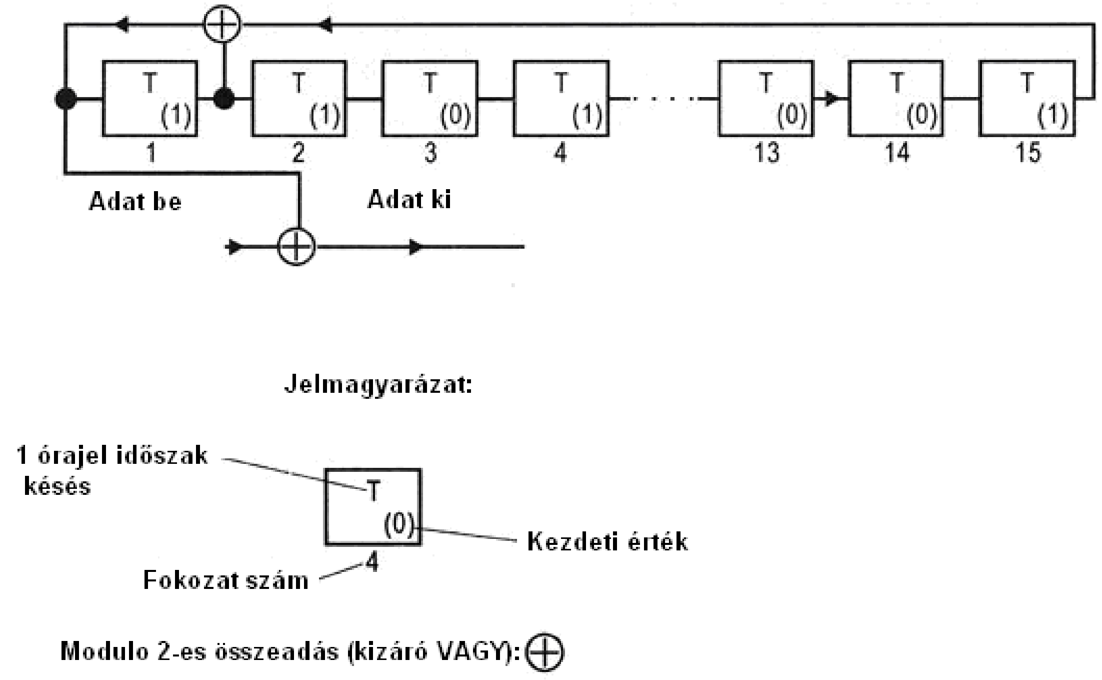
Frekvencia (MHz)	A nem-kívánt jel maximális szintje a vevő bemeneten (dBm)
88 – 104	+ 15
106	+ 10
107	+ 5
107,9	0

Megjegyzés. – A fenti frekvenciák által kijelölt szomszédos pontok között az összefüggés lineáris.

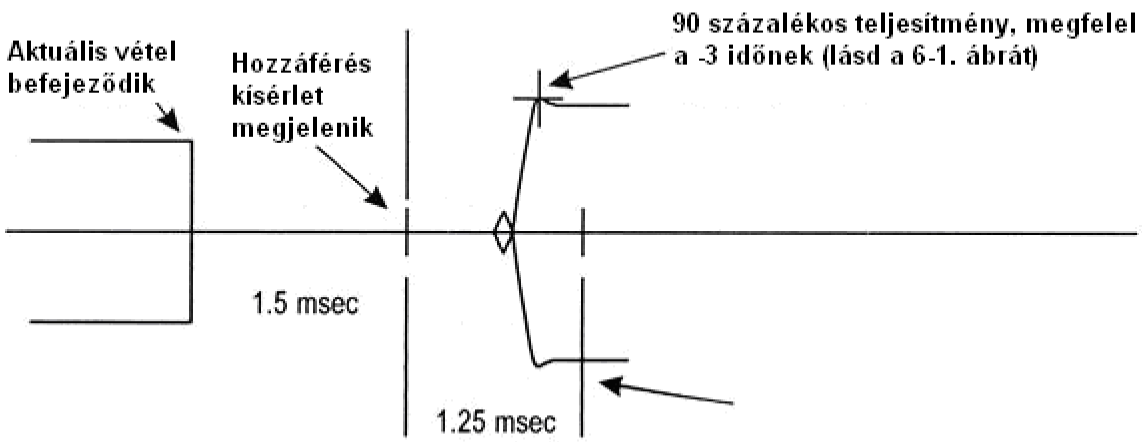
ÁBRÁK A 6. FEJEZETHEZ



6-1. ábra: Adó teljesítmény stabilizálás



6-2. ábra: PN generátor a r bit rejtjelező jelsorozathoz



6-3. ábra: Vétel – Adás átfutási idő

Függelék a 6. Fejezethez HIVATKOZÁSOK

1. HIVATKOZÁSOK

A Nemzetközi Szabványügyi Szervezet (ISO) szabványaira való hivatkozások az alábbiakban felsorolt szabványok (a kiadás dátumát is magába foglalóan). Ezek az ISO szabványok a Szabványok és Ajánlott Gyakorlatokban /SARPs/ meghatározott mértékben alkalmazandók.

2. IRÁNYADÓ HIVATKOZÁSOK

Ezek a Szabványok és Ajánlott Gyakorlatok /SARPs/ a Nemzetközi Szabványügyi Szervezet /ISO/ következő dokumentumaira hivatkoznak:

ISO	*Cím*	*Kiadás dátuma*
646	*Információ technológia – az ISO 7-bites kódolású információ-csere karakter készlete*	12/91
3309	*Magas szintű adat-kapcsolat vezérlési /HLDC/ eljárások – Keret szerkezet,* 3. Módosított kiadvány	12/93
4335	*HLDC eljárás elemek,* 3. Módosított kiadvány	12/93
7498	*A Nyílt Rendszerek Összekapcsolásának /OSI/ alap hivatkozási modelje,* 1. Kiadvány	11/94
7809	*HLDC eljárások – Az eljárások osztályozásának megerősítése,* 1. Kiadvány	12/93
8208	*Információ Feldolgozó Rendszerek – Adat-összeköttetés – X. 25 Csomag Szint Protokol az Adat-felhasználói Végberendezésekhez*	3/90 2.Kiadás
8885	*HDLC Eljárások – Az Általános Célú XID Keret Információs Mező Tartalma és Formátuma,* [1] Kiadvány	12/93
8886.3	*Az OSI Adat-kapcsolat Szolgáltatás Meghatározása,* 3. Kiadvány	6/92
10039	*Helyi Területi Hálózat – az Adathordozó Hozzáférés Vezérlési /MAC/ Szolgáltatás Meghatározása,* 1. Kiadvány	6/91

3. HÁTTÉR HIVATKOZÁSOK

Szerző	*Cím*	*Kiadás dátuma*
Nemzetközi Távközlési Unió /ITU-R/	S.446.4 Ajánlás az 1. Függelékhez	
Műholdas Adat-átviteli Rendszerek Konzultatív Bizottsága /CCSDS/	*Távolságmérési Csatorna Kódolás, Ajánlás a Műholdas Adat-átviteli Rendszer Szabványokhoz,* Műholdas Adat-átviteli Rendszerek Konzultatív Bizottsága /CCSDS/ 101.0-B-3, Kék Könyv	5/92

7. FEJEZET. AL-HÁLÓZATOK ÖSSZEKAPCSOLÁSA

(Kidolgozás alatt)

8. FEJEZET. AFTN HÁLÓZAT

8.1 MEGHATÁROZÁSOK

Data signalling rate. Adat jeladási sebesség. Az adat jeladási sebesség az idő- egység alatt átmenő információ egységekre vonatkozik és bit/másodperc-ben kerül kifejezésre. Az adat jeladási sebességet a következő képlet adja meg:

$$\sum_{i=1}^{i=m} \frac{1}{T_i} \log_2 n_i$$

ahol m a párhuzamos csatornák száma, T_i a minimális időtartam az i-edik csatornánál másodpercben kifejezve, az n_i a moduláció jellemző állapota, az i-edik csatornában.

1. Megjegyzés. –

a) Az egy csatornánál (soros átvitel) ez (1/T)$\log_2 n$-re csökken; a két-állapotú modulációval (n=2) ez 1/T lesz.

b) A párhuzamos átvitelnél egyenlő minimális intervallumokkal és mindegyik csatornánál azonos jellemző állapottal ez m(1/T)$\log_2 n$ (m(1/T) két-állapotú moduláció esetén).

2. Megjegyzés. – A fenti meghatározásban a "párhuzamos csatorna" fogalmat a következő módon kell értelmezni: csatornák, amelyek mindegyike egy információs egység egy részét viszi át, például az egy karaktert képező bitek párhuzamos átvitele. Az olyan áramkör esetén, amelyek több olyan csatornából állnak, amelyek mindegyike "függetlenül" viszi az információt, egyedül a forgalom kezelési kapacitás növelésének céljával, ezek a csatornák nem tekinthetők párhuzamos csatornáknak ennek a meghaítározásnak az értelmében.

Degree of standardized test distortion. Szabványosított torzítási ellenőrzési mérték. A torzítási helyreállítás mértéke, amelyet meghatározott időtartam alatt mérnek, akkor, amikor a moduláció tökéletes és megfelel egy speciális szövegnek.

Effective margin. Üzemi vétel határ. Egy egyedi berendezés teljesítőképesség határa, amelyet tényleges üzemelési körülmények között mérnek.

Low modulation rates. Alacsony modulációs sebességek. Modulációs sebességek maximálisan 300 baud értékig, azt is magába foglalóan.

Margin. Eltérési érték. Az áramkör maximális mértékű torzítása azon a végen, ahol az a berendezés elhelyezkedik, amely kompatíbilis az összes olyan jel átvitelével, amelynek vételére képes lehet.

Medium modulation rates. Közepes modulációs sebességek. Modulációs sebességek 300 baudnál nagyobb és maximálisan 3000 baud értékig, azt is magába foglalóan.

Modulation rate. Modulációs sebesség. Az elemi időköz másodpercekben mért reciproka. Ezt a sebességet baudokban fejezik ki.

Megjegyzés. – A távirati jeleket olyan időintervallumokkal jellemzik, amelyek hossza egyenlő vagy nagyobb, mint a legrövidebb elemi időköz. A modulációs sebességet (azelőtt telegrafikus sebesség) ezért ennek az egység időtartamnak az inverzeként fejezik ki. Ha például az elemi időköz 20 milliszekundum, akkor a modulációs sebesség 50 baud.

Synchronous operation. Szinkron működés. Olyan működés, amelyben a kód- egységek közötti időintervallum állandó.

8.2 AZ AFTN-BEN HASZNÁLATOS TÁVGÉPÍRÓ KÉSZÜLÉKEKRE ÉS ÁRAMKÖRÖKRE VONATKOZÓ MŰSZAKI ELŐÍRÁSOK

8.2.1. Az AFTN nemzetközi távgépíró áramkörökben használt 5-egységes kódot, a 2.számú Nemzetközi Távíró ABC-t (International Telegraph Alphabet No.2) (lásd a 8-1. táblázatot) csak a II. kötet, 4.1.2 pontjában leírt mértékig kell használni.

8.2.2 **Ajánlás.** – *A modulációs sebességet az illetékes szervek közötti kétoldalú vagy többoldalú egyezmény alapján kell meghatározni, elsődlegesen a forgalom nagyságának figyelembevételével.*

8.2.3 **Ajánlás.** – *Az átviteli ciklus névleges időtartamának legalább 7,4 egységnek kell lenni (ajánlatos érték 7,5), a stop elem legalább 1,4 egységen át tartson (ajánlott érték 1,5).*

8.2.3.1 **Ajánlás.** – *A vevőnek képesnek kell lenni üzem közben helyesen továbbítani az adótól jövő jeleket 7-egységes névleges átviteli ciklus mellett.*

8.2.4 **Ajánlás.** – *Üzemben lévő készüléket úgy kell karbantartani és beállítani, hogy a használatos üzemi vétel határa soha ne legyen 35 százaléknál kevesebb.*

8.2.5 **Ajánlás.** – *Az oldal-nyomtató készülék egy szövegsora által tartalmazható karakterek számát 69-ben kell rögzíteni.*

8.2.6. **Ajánlás.** – *Az automatikus idő-késleltető kapcsolóval felszerelt start-stop készülékekben a motor áramellátását csak az utolsó jel vétele után eltelt legalább 45 másodperces kihagyás után szabad megszakítani.*

8.2.7 **Ajánlás.** – *Lépéseket kell tenni annak érdekében, hogy elkerülésre kerüljön a jel-lyukvesztés a továbbított közlemények fej-részénél és a start-stop vételénél az újra-lyukasztó berendezéseknél.*

8.2.7.1 Ha az újra-lyukasztó készülék el van látva helyi eszközökkel a papír-tápláláshoz, akkor egynél több csonkolt üzenetet nem tolerálhat.

8.2.8 **Ajánlás.** – *A teljes áramköröket úgy kell műszakilag kezelni és karbantartani, hogy a szabványosított torzítási ellenőrzési mérték torzulása ne haladja meg a szabványosított szövegben a 28 százalékot:*

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG* /Magyar jelentése: A gyors barna róka átugorja a lusta kutyát./
vagy
VOYEZ LE BRICK GEANT QUE JEXAMINE PRES DU WHARF

8.2.9 **Ajánlás.** – *Az izochron torzulás mértéke egy teljes áramkör részei mindegyikének szabványosított szövegében a lehető legkisebb legyen és semmi esetre sem haladhatja meg a 10 százalékot.*

8.2.10 **Ajánlás.** – *A teljes torzítás a távgépíró csatornákban használt átviteli berendezésekben nem haladhatja meg az 5 százalékot.*

8.2.11 **Ajánlás.** – *Az AFTN áramköröket a csatorna állapotot folytonosan ellenőrző rendszerrel kell felszerelni. Ezenkívül ellenőrzött áramköri protokolokat kell alkalmazni.*

8-1. táblázat. A 2. és 3. számú Nemzetközi Távíró ABC

A jel száma	Betű állás	Szám állás (jel)	Impulzusok 5-egységes kód Start	12345	Stop
				A 2. számú nemzetközi kód	
1	A	—	A	ZZAAA	Z
2	B	?	A	ZAAZZ	Z
3	C	:	A	AZZZA	Z
4	D	1. Megjegyzés	A	ZAAZA	Z
5	E	3	A	ZAAAA	Z
6	F		A	ZAZZA	Z
7	G		A	AZAZZ	Z
8	H		A	AAZAZ	Z
9	I	8	A	AZZAA	Z
10	J	Figyelmeztetés jel	A	ZZAZA	Z
11	K	(	A	ZZZZA	Z
12	L	)	A	AZAAZ	Z
13	M	.	A	AAZZZ	Z
14	N	,	A	AAZZA	Z
15	O	9	A	AAAZZ	Z
16	P	0	A	AZZAZ	Z
17	Q	1	A	ZZZAZ	Z
18	R	4	A	AZAZA	Z
19	S	'	A	ZAZAA	Z
20	T	5	A	AAAAZ	Z
21	U	7	A	ZZZAA	Z
22	V	=	A	AZZZZ	Z
23	W	2	A	ZZAAZ	Z
24	X	/	A	ZAZZZ	Z
25	Y	6	A	ZAZAZ	Z
26	Z	+	A	ZAAAZ	Z
27	Kocsi vissza		A	AAAZA	Z
28	Sor táplálás		A	AZAAA	Z
29	Betűk		A	ZZZZZ	Z
30	Számok		A	ZZAZZ	Z
31	Köz		A	AAZAA	Z
32	Perforálatlan szalag		A	AAAAA	Z
33	Jel ismétlés				
34	α jel				
35	β jel				

Jel	Zárt áramkör	Kettős áramú
A	Nincs áram	Negatív áram
Z	Pozitív áram	Pozitív áram

1. Megjegyzés. Válasz-vissza berendezésnél használatos

8.3 A 2,5 – 30 MHz-es SÁVBAN MŰKÖDŐ LÉGIFORGALMI RÁDIÓ-TÁVGÉPÍRÓ CSATORNÁKHOZ KAPCSOLÓDÓ VÉG-BERENDEZÉSEK

8.3.1 Moduláció és kód típus kiválasztása

8.3.1.1 **Ajánlás.** – *A frekvencia-eltolás modulációt (FIB) kell alkalmazni a légiforgalmi állandó-helyű szolgálatokban (AFS) használt rádió-távgépíró rendszerekben, kivéve ott, ahol a független oldalsáv (ISB) operációs módszer jellemzői előnyöket jelentenek.*

Megjegyzés. – A FIB típusú modulációt a rádiófrekvenciás vivőhullámnak a két frekvenciája közötti eltolásával valósítják meg, a start-stop 5-egységes távíró kóddal, az "A helyzet"-et jelentő (start jel) polaritással és a "Z helyzet"-et jelentő (stop jel) polaritással.

8.3.2 Rendszer jellemzők

8.3.2.1 **Ajánlás.** – *Az FIB modulációt használó rádió-távgépíró adótól jövő jelek jellemzői a következők:*

a) Frekvencia-eltolás: *a legkisebb lehetséges érték*

b) Frekvencia-eltolás tűrés: *a frekvencia eltolás névleges értékének plusz vagy mínusz 3 százalékán belül.*

c) Polaritás: egy-csatornás áramkörök: *a magasabb frekvencia felel meg az "A helyzet"-nek (start jel polaritás).*

8.3.2.2 **Ajánlás.** – *Az "A helyzet"-et és "Z helyzet"-et reprezentáló rádió frekvenciák közötti középérték változása semmilyen két-órás periódus alatt sem haladhatja meg a 100 Hz-et.*

8.3.2.3 **Ajánlás.** – *A távgépíró jel teljes torzulása, ahogyan a rádió adó kimeneténél vagy közvetlen szomszédságában ellenőzik, nem haladhatja meg a 10 százalékot.*

Megjegyzés. – Az ilyen torzulás az elemek közötti átmenetek idejében a helyes pozíciójuktól való elmozdulásokat jelenti az egység elem-idő százalékában kifejezve.

8.3.2.4 **Ajánlás.** – *FIB modulációs rádió-távgépíró vevőknek képeseknek kell lenniök olyan jelekkel való kielégítő működésre, amelyek a korábbi 8.3.2.1 és 8.3.2.2 pontokban ismertetett jellemzőkkel rendelkeznek.*

8.3.2.5 **Ajánlás.** – *Távgépíró jelek rádió áramkörön keresztüli több-csatornás átviteli jellemzőit az érintett hivatalos szerveknek egyezmények alapján kell meghatározniuk.*

8.4 AZ INTERREGIONÁLIS LÉGIFORGALMI ÁLLANDÓ-HELYŰ SZOLGÁLATOK /AFS/ ÁRAMKÖREINEK JELLEMZŐI

8.4.1 Ajánlás. – *A megvalósításra vagy tökéletesítésre kerülő interregionális AFS áramköröknek kiváló minőségű távközlési szolgáltatást kell alkalmazniuk. A modulációs sebességnél figyelembe kell venni a szabályos és a kitérő útvonal feltételek között várható forgalom nagyságát.*

8.5 A LÉGIFORGALMI SZOLGÁLATI /ATS/ KÖZLEMÉNYEK ÁTVITELÉRE VONATKOZÓ MŰSZAKI ELŐÍRÁSOK

8.5.1. Közvetlen vagy gyűjtő csatornák – alacsony modulációs sebességek – 5-egységű kódok.

Megjegyzés. – Lásd az alábbi 8.6 pontban a közepes modulációs sebességeket.

8.5.1.1 **Ajánlás.** – *Az AFTN eljárásokat (lásd a fenti 8.2 pontot) kell használni.*

8.6 A KÖZEPES ÉS MAGASABB JELADÁSI SEBESSÉGGEL TÖRTÉNŐ NEMZETKÖZI FÖLD-FÖLD KÖZÖTTI ADATCSERÉRE VONATKOZÓ MŰSZAKI ELŐÍRÁSOK

Megjegyzés. – Ebben a szakaszban a kódolt karakter készletekre vonatkozó szövegekben az "egység" fogalom a szelektív információs egységet jelenti, és lényegében egyenlő a "bit" fogalmával.

8.6.1 Általános rész

8.6.1.1 **Ajánlás.** – *A karakterek nemzetközi adatcseréjénél a 128-karakteres repertoárt szolgáló 7-egységes kódolású karakter- készletet kell használni, amelyet Nemzetközi Távíró ABC 5.számú (IA-5) (International Telegraph Alphabet No.5) (IA-5) jelzéssel jelöltek. A Nemzetközi Távíó ABC 2.sz. (ITA-2) (International Telegraph Alphabet No.2 (ITA-2)) 5-egységes kódolású karakter- készletével való kompatibilitást - ahol megvalósítható - biztosítani kell.*

8.6.1.2 Amikor a fenti 8.6.1.1 pont előírásait alkalmazzák, akkor a 8-2. táblázatban lévő *Nemzetközi Távíró ABC 5.számú* (International Alphabet No.5) (IA-5)-öt kell használni.

8.6.1.2.1 Az IA-5 egy egyedi karakterére szorítkozó egységek soros átvitelénél a jobb szélső egység (b_1) átvitelét kell elsőnek végrehajtani.

8.6.1.2.2 **Ajánlás.** – *Az IA-5 használata esetén mindegyik karakternek egy, a paritásra vonatkozó további egységet kell tartalmaznia a nyolcadik szint helyzetben.*

8.6.1.2.3 Amikor a fenti 8.6.1.2.2 pont előírásait alkalmazzák, akkor a karakter paritás bitnek páros paritást kell adnia azokban a kapcsolatokban, amelyek a start-stop alapelven működnek, és páratlan paritást azoknál a kapcsolatoknál, amelyek végponttól-végpontig szinkron üzemelést alkalmaznak.

8.6.1.2.4 A karakter-karakter átalakítás meg kell, hogy feleljen a 8-3. és a 8-4. táblázatban megadottaknak az összes karakterre, amely az AFTN formátumban az AFS átvitelre elő van írva az IA-5-ben és az ITA-2-ben egyaránt.

8.6.1.2.5 Azok a karakterek, amelyek csak egy kód-készletben jelennek meg, vagy amelyek nincsenek átvitelre engedélyezve az AFS-n, a kód átalakítási táblázatoknak megfelelően megrajzoltaknak kell lenniük..

8.6.2 Adat átviteli jellemzők

8.6.2.1 **Ajánlás. -** *Az adat jeladási sebességet az alábbiak közül kell kiválasztani:*
600 bit/s
1200 bit/s
2400 bit/s
4800 bit/s
9600 bit/s

8.6.2.2 **Ajánlás.** – *Az átvitel típusát az egyes adat jelzési sebességekhez a következők szerint kell kiválasztani:*

Adat jeladási sebesség	Az átvitel típusa
600 bit/s	*Szinkron vagy aszinkron soros átvitel*
1200 bit/s	*Szinkron vagy aszinkron soros átvitel*
2400 bit/s	*Szinkron soros átvitel*
4800 bit/s	*Szinkron soros átvitel*
9600 bit/s	*Szinkron soros átvitel*

8.6.2.3 **Ajánlás.** – *A moduláció típusát az egyes adatjeladási sebességekhez a következők szerint kell kiválasztani:*

Adat jeladási sebesség	A moduláció típusa
600 bit/s	*Frekvencia*
1200 bit/s	*Frekvencia*
2400 bit/s	*Fázis*
4800 bit/s	*Fázis*
9600 bit/s	*Fázis-amplitúdó*

Megjegyzés. – Ez az ajánlás nem feltétlen érvényes a kizárólag levegő-föld adatok átvitelére használt levegő-föld kapcsolatok föld-föld kierjesztésére, mivel az ilyen áramkörök a levegő-föld kapcsolat részének tekinthetők.

8.6.2.4 AZ ADAT-KAPCSOLATOK KARAKTER SZERKEZETE

8.6.2.4.1 Karakter paritást hibaellenőrzésre a CIDIN kapcsolatokon nem használnak. Az IA-5 kódolt karakterekbe illesztett paritást, a fentebbi 8.6.1.2.2 pont szerint a CIDIN-be való bevitel előtt figyelmen kívül kell hagyni. A CIDIN-ből kilépő közleményeknél a paritást a 8.6.1.2.3 pontnak megfelelően kell létrehozni.

8.6.2.4.2 A hosszúságban nyolc bitnél kisebb karaktereket nyolc bit hosszúságra kell kiegészíteni, mielőtt valamilyen oktett bázisú vagy bit-orientált kommunikációs hálózaton keresztül továbbítanák őket. A kitöltő bitek az oktett magasabb értékű végét foglalják el, azaz a 8-as bitet, 7-es bitet, ahogyan szükséges és 0 bináris értékkel rendelkeznek.

8.6.2.5 Amikor a CIDIN kapcsolatokon az adatok cseréjéhez bit-orientált eljárásokat használnak, a belépési központ címzés a kilépési központ címzések és a rendeltetési hely címzések a "Transport and CIDIN Packet Headers"-ben a 8-2. táblázatban lévő IA-5 karakter-készletben találhatóknak megfelelők kell, hogy legyenek.

8.6.2.6 **Ajánlás.** – *Amikor CIDIN kapcsolatokon keresztül AFTN formátumban bit-orientált eljárást használva továbbítanak közleményeket, akkor a közleményeknek a 8-2. táblázatban található IA-5 karakter-készletben lévő karaktereknek kell megfelelniük.*

8-2. táblázat: Nemzetközi ABC 5.sz. (IA-5) /International Alphabet No. 5 (IA-5)/
(nemzetközi referencia változat)

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_4	b_3	b_2	b_1		0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC_7 (DLE)	SP	0	@	P	\`	p
0	0	0	1	1	TC_1 (SOH)	DC_1	!	1	A	Q	a	q
0	0	1	0	2	TC_2 (STX)	DC_2	" ④	2	B	R	b	r
0	0	1	1	3	TC_3 (ETX)	DC_3	#	3	C	S	c	s
0	1	0	0	4	TC_4 (EOT)	DC_4	¤ ②	4	D	T	d	t
0	1	0	1	5	TC_5 (ENQ)	TC_8 (NAK)	%	5	E	U	e	u
0	1	1	0	6	TC_6 (ACK)	TC_9 (SYN)	&	6	F	V	f	v
0	1	1	1	7	BEL	TC_{10} (ETB)	' ④	7	G	W	g	w
1	0	0	0	8	FE_0 (BS)	CAN	(	8	H	X	h	x
1	0	0	1	9	FE_1 (HT)	EM	)	9	I	Y	i	y
1	0	1	0	10	FE_2 ① (LF)	SUB	*	:	J	Z	j	z
1	0	1	1	11	FE_3 (VT)	ESC	+	;	K	[	k	{
1	1	0	0	12	FE_4 (FF)	IS_4 (FS)	, ④	<	L	\	l	|
1	1	0	1	13	FE_5 ① (CR)	IS_3 (GS)	–	=	M	]	m	}
1	1	1	0	14	SO	IS_2 (RS)	.	>	N	^ ④	n	‾ ③
1	1	1	1	15	SI	IS_1 (US)	/	?	O	_	o	DEL

MEGJEGYZÉSEK

1. Megjegyzés. – A formátum vezérlők azoknál a berendezéseknél való használatra szolgálnak, amelyekben vízszintes és függőleges mozgások elkülönítetten működnek. Ha a berendezés KOCSI VISSZA műveletet kér egy függőleges mozgással kombinálva, a formátum vezérlőt ennél a függőleges mozgásnál a kombinált mozgás működtetésére lehet felhasználni. Az FE2 (formátum vezérlő) használata egy összekapcsolt CR- (kocsi vissza) és LF -(sor-emelés) műveltre az AFS hálózaban a nemzetközi átvitelnél nem megengedett.

2. Megjegyzés. – A ¤ szimbólum nem egy adott ország valutáját jelöli.

3. Megjegyzés. – A 7/14 pozíciót grafikus karakterekhez (FELÜL VONÁS) használják, amelynek grafikus reprezentációja a nemzeti használatnak megfelelően változhat, képviselhet (ISMÉTLŐ JELET) vagy más diakritikus jelet, feltéve, hogy nincs kockázata annak, hogy egy másik, a táblázat által tartalmazott grafikus karakterrel összetévesztésre kerül.

4. Megjegyzés. – A 2/2, 2/7, 2/12 és 5/14 pozíciókban lévő grafikus karakterek az IDÉZŐJEL, APOSZTROF (hiány-jel), VESSZŐ, FELFELÉ MUTATÓ NYÍLHEGY jelentéssel bírnak; azonban ezek a karakterek az BETŰ FELETTI KÉT PONT, HEGYES ÉKEZET, a CEDILLE és a KÚPOS ÉKEZET diakritikus jeleket is hordozhatják, ha ezeket a VISSZALÉPÉA karakter megelőzi vagy követi (0/8).

5. Megjegyzés. – Ha az IA-5 vezérlő karaktereinek grafikus reprezentációjára szükség van, akkor lehetőség van a Nemzetközi Szabványügyi Szervezet (ISO) 2047-1975 számú szabványában meghatározott szimbólumok használatára.

A 8-2. táblázat folytatása:

VEZÉRLŐ KARAKTEREK

Rövidítés	Jelentés	Pozíció a kód táblázatban
ACK	Nyugtázás	0/5
BEL	Csengetés	0/7
BS	Visszalépés	0/8
CAN	Törlés /teljes törlés/	1/8
CR	Kocsi vissza*[1]	0/13
DC	Berendezés vezérlő	-
DEL	Törlés /részleges törlés/	7/15
DLE	Adat-kapcsolat átkapcsolás	1/0
EM	Adathordozó vége	1/9
ENQ	Kérdezés	0/5
EOT	Adatátvitel vége	0/4
ESC	Átkapcsolás	1/11
ETB	Átviteli blokk vége	1/7
ETX	Szöveg vége	0/3
FE	Formátum vezérlő	-
FF	Lap-emelés	0/12
FS	Állomány elválasztó	1/12
GS	Csoport elválasztó	1/13
HT	Vízszintes tabulálás	0/9
IS	Információ elválasztó	-
LF	Sor-emelés*	0/10
NAK	Negatív-nyugtázás	1/5
NUL	Nulla	0/0
RS	Rekord elválasztó	1/14
SI	Kód visszaváltás	0/15
SO	Kód-váltás	0/14
SOH	Fej-rész kezdete	0/1
SP	Szóköz	2/0
STX	Szöveg indításai	0/2
SUB	Helyettesítő karakter	1/10
SYN	Szinkronizáló	1/6
TC	Adatátvitel vezérlés	-
US	Egység kiválasztó	1/15
VT	Függőleges tabulálás	0/11

GRAFIKUS KARAKTEREK

Grafika	Megjegyzés	Megnevezés	Pozíció a kódtáblázatban
(space)		Térköz (lásd 7.2)	2/0
!		Felkiáltójel	2/1
”	4.	Idézőjel, dierézis	2/1
#		Szám jel	2/3
¤	2.	Időszerűség jel	2/4
%		Százalék jel	2/5

[1]* Lásd 1. megjegyzés

<table>
<tr><td>&</td><td></td><td>És jel</td><td>2/6</td></tr>
<tr><td>'</td><td>4.</td><td>Aposztróf, hegyes ékezet</td><td>2/7</td></tr>
<tr><td>(</td><td></td><td>Baloldali zárójel</td><td>2/8</td></tr>
<tr><td>)</td><td></td><td>Jobboldali zárójel</td><td>2/9</td></tr>
<tr><td>*</td><td></td><td>Csillag</td><td>2/10</td></tr>
<tr><td>+</td><td></td><td>Plusz jel</td><td>2/11</td></tr>
<tr><td>,</td><td>4.</td><td>Vessző, cédille</td><td>2/12</td></tr>
<tr><td>-</td><td></td><td>Kötőjel, mínusz jel</td><td>2/13</td></tr>
<tr><td>.</td><td></td><td>Pont (írás jel)</td><td>2/14</td></tr>
<tr><td>/</td><td></td><td>Per-jel (ferde választó vonal)</td><td>2/15</td></tr>
<tr><td>:</td><td></td><td>Kettőspont</td><td>3/10</td></tr>
<tr><td>;</td><td></td><td>Pontosvessző</td><td>3/11</td></tr>
<tr><td><</td><td></td><td>Kisebb-mint jel</td><td>3/12</td></tr>
<tr><td>=</td><td></td><td>Egyenlőség jel</td><td>3/13</td></tr>
<tr><td>></td><td></td><td>Nagyobb-mint jel</td><td>3/14</td></tr>
<tr><td>?</td><td></td><td>Kérdőjel</td><td>3/15</td></tr>
<tr><td>@</td><td></td><td>Kereskedelmi “-nál”</td><td>4/0</td></tr>
<tr><td>[</td><td></td><td>Baloldali szögletes zárójel</td><td>5/11</td></tr>
<tr><td>\</td><td></td><td>Fordított per-jel (ferde választó vonal)</td><td>5/12</td></tr>
<tr><td>]</td><td></td><td>Jobboldali szögletes zárójel</td><td>5/13</td></tr>
<tr><td>^</td><td></td><td>Felfelé nyílhegy; hajtottkúpos ékezet</td><td>5/14</td></tr>
<tr><td>_</td><td>4.</td><td>Aláhúzás</td><td></td></tr>
<tr><td></td><td></td><td>Lejtő hangsúly/tompa ékezet</td><td>5/15</td></tr>
<tr><td>`</td><td></td><td>Baloldali kapcsos zárójel</td><td>6/0</td></tr>
<tr><td>{</td><td></td><td>Függőleges vonal</td><td>7/11</td></tr>
<tr><td>|</td><td></td><td>Jobboldali kapcsos zárójel</td><td>7/12</td></tr>
<tr><td>}</td><td></td><td>Felülhúzás, ismétlő jel</td><td>7/13</td></tr>
<tr><td>‾</td><td></td><td></td><td>7/14</td></tr>
<tr><td></td><td>3.</td><td></td><td></td></tr>
</table>

* Lásd az 1. Megjegyzést.

DIAKRITIKUS JELEK

A karakter-készletben néhány nyomtatási szimbólum kijelölhető arra, hogy használata megengedett legyen hangsúlyozott betűk összeállításának használatára, amikor az az általános információ cseréhez szükséges. Három karakter, amely magába foglal egy betűt, a VISSZALÉPÉS-t és ezen szimbólumok egyikét, egy ilyen össszeállítshoz, ekkor a szimbólum diakritikus jelként jelenik meg. Meg kell jegyezni, hogy ezek a szimbólumok csak akkor hozzák diakritikus jelentésüket, ha a VISSZALÉPÉS karakter előzi meg, vagy követi őket, például a 2/7 kombinációs (') általában APOSZTROF jelentéssel bír, de a diakritikus ÉLES ÉKEZET jelét veszi fel, ha a VISSZAVÁLTÁS karakter előzi meg vagy követi.

GRAFIKUS KARAKTEREK MEGNEVEZÉSEI, JELENTÉSEI ÉS BETŰTÍPUSAI

Mindegyik grafikus karakter jelölésére legalább egy megnevezés kerül kijelölésre. Ezek az elnevezések igyekeznek visszatükrözni a grafikus karakterek szokásos jelentéseit és nem törekednek ezek definiálására vagy leszűkítésére. Nincs meghatározva valamilyen stílus vagy betűtípus a grafikus karakterekhez.

A KARAKTEREK ELOSZTÁS EGYÉRTELMŰSÉGE

Egy karaktert, amelynek részére a táblázatban egy pozíciót kijelöltek, a táblázatban máshol nem lehet elhelyezni.

A SZABÁLYOZÓ KARAKTEREKRE VONATKOZÓ FUNKCIONÁLIS JELLEMZŐK

Az alábbiakban megadott néhány meghatározás általános fogalmakkal került kifejezésre és a használat kifejezettebb meghatározásai a kód táblázat specifikus alkalmazását igényelhetik a rögzítési adathordozón, vagy továbbítási csatornákon. Ezek az kifejezettebb meghatározások és ezeknek a karaktereknek a használata az ISO kiadványok tárgyát képezik.

A vezérlő karakterek általános meghatározásai

A vezérlő karakterek általános jelöléséhez specifikus osztály megnevezést alkalmaznak, amelyet egy alsó index-szám követ.

Ezek a következőképpen vannak meghatározva:

TC – *Adatátvitel vezérlő karakterek* – Vezérlő karakterek, amelyek a távközlési csatornákon keresztüli információ továb-
bításának szabályozására vagy elősegítésére szolgálnak.
A TC karaktereknek az általános távközlési hálózatokon való használatas az ISO kiadványok tárgyát képezi.
Az adatátvitel vezérlő karakterek a következők:
ACK, DLE, ENQ, EOT, ETB, ETX, NAK, SOH, STX és SYN

FE – *Formátum vezérlők* – Vezérlő karakterek, amelyek főleg a nyomtató és/vagy kijelző berendezéseken az információk el-
rendezésének és elhelyezkedésének vezérlésére szolgálnak. A specifikus formátum vezérlők meghatározásában bármely
nyomtató berendezésre vonatkozó hivatkozást úgy kell érteni, hogy az a kijelző berendezéseket is magában foglalja. A
formátum vezérlők meghatározásai a következő fogalmakat használják:
a) egy oldal karakterek sorainak bizonyos számából áll össze;
b) a sort kialakító karakterek bizonyos számú pozíciót foglalnak el, amelyeket karakter pozíciónak neveznek;
c) az aktív pozíció az a karakter pozíció, amelyben a feldolgozásra kerülő karakter akkor jelenne meg, ha nyomtatásra
kerülne. Az aktív pozíció általában egyszerre egy karakter pozíciót lép előre.
A formátum vezérlő karakterek a következők:
BS, CR, FF, HT, LF és VT (lásd még a 8-2. táblázat 1. megjegyzését).

DC – *Berendezés vezérlő karakterek* – Vezérlő karakterek azoknak a helyi vagy távoli kisegítő berendezéseknek,vagy segéd-
berendezéseknek a szabályozására szolgálnak, amelyek az adatfeldolgozó és/vagy távközlési rendszerekhez kapcsolódnak.
Ezek a vezérlő karakterek nem szolgálnak az összeköttetési rendszerek szabályozására; ezt a TC-k használatával kell elérni.
Az egyedi berendezés vezérlő karakterek bizonyos előnyben részesített felhasználásait az alábbiakban, a Speciális vezérlő
karakterek cím alatt vannak megadva.

IS – *Információ elválasztók* – Vezérlő karakterek, amelyeket az adatok logikai elválasztására és minősítésére használnak. Négy
ilyen karakter van. Ezek akár rangsor-szerinti, akár nem-rangsor-szerinti sorrendben használhatók, az utóbbi esetben ezeknek
a speciális jelentése az alkalmazásuktól függ.
Amikor rangsor szerint kerülnek felhasználásra, akkor az emelkedő sorrend a következő: US, RS, GS, FS.
Ebben az esetben a szabályszerűen adott elválasztó által körülhatárolt adatokat a magasabb-rendű elválasztó nem tudja
felosztani, de úgy tekinthetők, hogy azok a magasabb-rendű elválasztók által körülhatároltak.

Speciális vezérlő karakterek
A vezérlő karakterek osztályainak egyedi tagjai néha rövidített osztály-megnevezésük és alsó index-számuk alapján kerülnek
megnevezésre (pl. TC_5), néha pedig a felhasználására utaló speciális megnevezésükkel (pl. ENQ /Kérdezés/).
Különböző, de vonatkoztatott jelentés kapcsolható néhány vezérlő karakterhez, de az adatok cseréjénél ez általában a feladó és a fogadó közötti megállapodást tesz szükségessé.

ACK – *Nyugtázás* – Adatátvitel szabályozási karakter, amelyet a vevő továbbít megerősítő válaszként a feladónak.

BEL – *Csengetés* – Vezérlő karakter, amelyet akkor használnak, amikor figyelem felhívásra van szükség; ez riasztó vagy
figyelmeztető berendezéseket vezérelhet.

BS – *Visszalépés* – Formátum vezérlő, amely az aktív pozíciót egy karakter pozícióval visszafelé mozdíttja ugyanazon soron belül.

CAN – *Törlés* – Egy karakter, vagy egy jelsorozat első karaktere, amely azt jelzi, hogy az őt megelőző adatok hibásak. Eredményként ezeket az adatokat
figyelmen kívül kell hagyni. Ennek a karakternek a speciális jelentését minden alkalmazásnál és/vagy a küldő és fogadó között kell meghatározni.

CR – *Kocsi vissza* – Formátum vezérlő, amely az aktív pozíciót ugyanazon sor első karakter pozíciójához mozgatja vissza..

Berendezés vezérlők

DC_1 – Berendezés vezérlő karakter, amely elsődlegesen egy segédberendezés bekapcsolására vagy indítására szolgál. Ha erre a célra nem szükséges,
fel lehet használni egy berendezés alap üzemmódra való visszaállítására (lásd még DC_2 és DC_3), vagy bármilyen más, a többi DC által nem szolgál-
tatott berendezés vezérlő funkcióhoz.

DC_2 – Berendezés vezérlő karakter, amely elsődlegesen egy segédberendezés bekapcsolására vagy indítására szolgál. Ha erre a célra nem szükséges,
akkor fel lehet használni egy berendezésnek egy meghatározott üzemmódra való beállítására (amely esetben DC_1-et a berendezés alap üzemmódra
való visszaállítására használják), vagy bármilyen más, a többi DC által nem szolgáltatott berendezés vezérlő funkcióhoz.

DC_3 – Berendezés vezérlő karakter, amely elsődlegesen egy segédberendezés kikapcsolására vagy megállítására szolgál. Ez a funkció lehet egy másod-
lagos szintű megállítás, azaz várakozás, szünet, tartalék, állj (amely esetben a DC_1-et a berendezés alap üzemmódra való visszaállítására használják).
Ha erre a célra nem szükséges, bármely más, a többi DC által nem szolgáltatott berendezés vezérlő funkcióhoz felhasználható.

DC_4 – Berendezés vezérlő karakter, amely elsődlegesen egy segédberendezés kikapcsolására, megállítására vagy működés megszakítására szolgál. Ha
erre a célra nem szükséges, bármely más, a többi DC által nem szolgáltatott berendezés vezérlő funkcióhoz felhasználható.

Példák berendezés vezérlők használatára:

1) Egy kapcsolás

	be – DC_2	ki – DC_4

2) Két független kapcsolás

Első	be – DC_2	ki – DC_4
Második	be – DC_1	ki – DC_3

3) Két függő kapcsolás

Általános	be – DC_2	ki – DC_4
Speciális	be – DC_1	ki – DC_3

4) Bemenet és kimenet kapcsolás

Kimenet	be – DC_2	ki – DC_4
Bemenet	be – DC_1	ki – DC_3

DEL – *Törlés* – Karakter, amelyet elsődlegesen egy hibás vagy nem kívánt karakter kitörlésére vagy kihúzására használnak lyukszalagnál. A DEL karakterek adathordozó kitöltésre vagy idő kitöltésre is szolgálhatnak. Be lehet helyezni őket egy adatfolyamba vagy kivehetők onnan anélkül, hogy ennek az adat-áramnak az információ tartalmát befolyásolnák, de ugyanakkor ezeknek a karaktereknek a hozzáadása vagy eltávolítása befolyásolhatja az információ elhelyezkedését és/vagy a berendezés szabályozását.

DLE – *Adatkapcsolat átkapcsolás* – Átviteli vezérlő karakter, amely megváltoztatja egymást szorosan követő korlátozott számú karakter jelentését. Kizárólag kiegészítő adatátvitel vezérlési funkciókat lát el. Csak grafikus karakterek és átviteli vezérlési karakterek használhatók a DLE sorozatokban.

EM – *Adathordozó vége* – Vezérlő karakter, amely arra használható, hogy azonosítsa az adathordozó fizikai végét, vagy az adathordozó felhasznált végét, vagy az adathordozón rögzített adatok kívánt részének a végét. Ennek a karakternek a pozíciója nem szükségképpen az adathordozó fizikai végénél kell, hogy legyen.

ENQ – *Kérdezés* – Átviteli vezérlő karakter, amelyet kérésként használnak egy távoli állomásról jövő válasz iránt – a válasz tartalmazhat állomás azonosítást és/vagy állomás működési állapotot. Amikor “ki vagy?” funkciót igényelnek általánosan kapcsolt átviteli hálózaton, akkor az ENQ első, az összeköttetés létrehozása utáni használatának lesz a “ki vagy?” a jelentése (állomás azonosítás). Az ENQ egymás utáni használata tartalmazhatja, vagy nem tartalmazhatja a “ki vagy?” funkciót, ahogyan ez egyezmény által meg van határozva.

EOT – *Adatátvitel vége* – Adatátvitel vezérlő karakter, amelyet egy vagy több szövegrész átvitelének befejezése jelzésére használnak.

ESC – *Átkapcsolás* – Vezérlő karakter, amelyet kiegészítő vezérlő funkció szolgáltatására használnak. Ez megváltoztatja az egymást szorosan követő, korlátozott számú bit-kombináció jelentését, amelyek az átkapcsolás sorozatot alkotják. Az átkapcsolás sorozatokat olyan kiegészítő funkciók megszerzésére használják, amelyek például egyebek között grafikus készleteket szolgáltatnak a szabvány készleten kívül. Az ilyen vezérlő funkciókat kiegészítő adatátvitel vezérlésként nem szabad használni.
Az ESC karakter és az átkapcsolás sorozatok használata a kiterjesztési eljárásokkal összekapcsolva egy ISO szabvány tárgyát képezi.

ETB – *Átviteli blokk vége* – Adatátviteli vezérlő karakter, amely az adatátviteli blokk végét jelöli, ahol az adatok ilyen blokkokba vannak szétosztva az átvitel céljából.

ETX – *Szöveg vége* – Adatátvitel vezérlés karakter, amely egy szöveget befejez.

FF – *Lap-emelés* – Formátum vezérlő, amely előre viszi az aktív helyzetet ugyanahhoz a karakter pozícióhoz a következő forma vagy oldal egy előre meghatározott sorába.

HT – *Vízszintes tabulálás* – Formátum vezérlő, amely előre viszi az aktív pozíciót a sorban a következő előre meghatározott helyhez.

Információ elválasztók

IS_1 (US) – Egy vezérlő karakter (egység elválasztó), amely az adatok logikai elválasztására és minősítésére használatos; egyedi jelentését minden egyes alkalmazáshoz meg kell határozni. Ha ezt a karaktert az IS általános meghatározásában leírt hierarchikus sorrendben használják, akkor ez egy EGYSÉG /UNIT/ adat tételt határol körül.

IS_2 (RS) – Vezérlő karakter (rekord elválasztó), amely az adatok logikai elválasztására és

minősítésére használatos; egyedi jelentését minden egyes alkalmazás
hoz meg kell határozni. Ha ezt a karaktert az IS általános meghatározásában leírt hierarchikus sorrendben használják, akkor ez egy RECORD adat-
tételt határol körül.

IS_3 (GS) – Vezérlő karakter (csoport elválasztó), amely az adatok logikai elválasztására és minősítésére használatos; egyedi jelentését minden egyes alkalmazás
hoz meg kell határozni. Ha ezt a karaktert az IS általános meghatározásában leírt hierarchikus sorrendben használják, akkor ez egy CSOPORT
/GROUP/ adat-tételt határol körül.

IS_4 (FS) – Vezérlő karakter (állomány), amely az adatok logikai elválasztására és minősítésére használatos; egyedi jelentését minden egyes alkalmazáshoz meg kell határozni. Ha ezt a karaktert az IS általános meghatározásában leírt hierarchikus sorrendben használják, akkor ez egy ÁLLOMÁNY /FILE/ adat-
tételt határol körül.

LF – *Sor-emelés* – Formátum vezérlő, amely az aktív pozíciót előre viszi a következő sor ugyanazon karakter pozíciójához.

NAK – *Negatív nyugtázás* – Adatátvitel vezérlési karakter, amelyet a vevő fél negatív válaszként továbbít a küldőhöz.

NUL – *Nulla* – Vezérlő karakter, amelyet az adathordozó vagy az idő-kitöltés végrehajtására használnak. A Nul karakterek behelyezhetők egy adatáramba.
vagy kivehetők onnan anélkül, hogy ennek az adatáramnak az információ-tartalmát befolyásolnák, de ugyanakkor ezeknek a karaktereknek a hozzáadása
vagy eltávolítása befolyásolhatja az információ helyzetét és/vagy a berendezés vezérlését.

SI – *Kód visszaváltás* – Vezérlő karakter, amelyet a KÓDVÁLTÁS-sal és az ÁTKAPCSOLÁS-sal összekapcsolva használnak a kód grafikus karakter- készletének kiterjesztésére. Visszaállíthatja a karaktert követő bit-kombinációk szabvány jelentéseit. Ennek a karakternek a hatása, amikor ezt a kód kiterjesztési eljárásokra használják, ISO szabványban van leírva.

SO – *Kódváltás* – Vezérlő karakter, amelyet a KÓD VISSZAVÁLTÁS-sal és az ÁTKAPCSOLÁS-sal összekapcsolva használnak a kód grafikus
karakter- készletének a kiterjesztésére. Ez megváltoztathatja a 2-7. oszlopok
bit-kombinációinak a jelentését, amelyet addig követnek, amíg egy
KÓD VISSZAVÁLTÁS karaktert nem kapnak. Azonban a TÉRKÖZ (2/0) és TÖRLÉS (7/15) karakterekre a KÓD VISSZAVÁLTÁS nincs hatással.
Ennek a karakternek a hatása, amikor kód kiterjesztési eljárást használnak, egy ISO szabványban van leírva.

SOH – *Fej-rész kezdete* – Adatátvitel vezérlési karakter, amelyet egy információs közlemény fej-részének első karaktereként használnak.

SP – *Szóköz* – Karakter, amely az aktív pozíciót egy karakter pozícióval előbbre viszi ugyanazon sorban. Ez a karakter is nem-nyomtató grafikának
tekintendő.

STX – *Szöveg indítása* – Átvitel vezérlési karakter, amely egy szöveg előtt van, és amelyet a fej-rész befejezésére használnak.

SUB – *Helyettesítő karakter* – Vezérlő karakter, amelyet egy olyan karakter helyén használnak, amelyet érvénytelennek vagy hibásnak találtak. A helyettesítő
karaktert automatikus eszközök felhasználásával szándékoznak alkalmazni.

SYN – *Szinkronizáló karakter* – Adatátvitel vezérlő karakter, amelyet a szinkron átvitelű rendszer használ bármely más karakter hiánya esetén (üres állapot)
egy jel szolgáltatására, amellyel szinkronizálás érhető el vagy tartható meg adat végponti berendezések között.

VT – *Függőleges tabulálás* – Formátum vezérlő, amely az aktív pozíciót ugyanahhoz a karakter pozícióhoz viszi a következő előre meghatározott sorban.

8-3. táblázat. Átalakítás a 2. számú Nemzetközi Távíró ABC-ből (ITA-2) az 5. számú Nemzetközi ABC-be (IA-5)

ITA-2 betű jel száma		IA-5 oszlop/sor		ITA-2 számjel jel száma		IA-5 oszlop/sor	
1	A	4/1	A	1	–	2/13	–
2	B	4/2	B	2	?	3/15	?
3	C	4/3	C	3	:	3/10	:
4	D	4/4	D	4		3/15	?
5	E	4/5	E	5	3	3/3	3
6	F	4/6	F	6		3/15	?
7	G	4/7	G	7		3/15	?
8	H	4/8	H	8		3/15	?
9	I	4/9	I	9	8	3/8	8
10	J	4/10	J	10	Figyelmeztető jel (3. megjegyzés)	0/7	Bel
11	K	4/11	K	11	(	2/8	(
12	L	4/12	L	12	)	2/9	)
13	M	4/13	M	13	.	2/14	.
14	N	4/14	N	14	,	2/12	,
15	O	4/15	O	15	9	3/9	9
16	P	5/0	P	16	0	3/0	0
17	Q	5/1	Q	17	1	3/1	1
18	R	5/2	R	18	4	3/4	4
19	S	5/3	S	19	'	2/7	'
20	T	5/4	T	20	5	3/5	5
21	U	5/5	U	21	7	3/7	7
22	V	5/6	V	22	=	3/13	=
23	W	5/7	W	23	2	3/2	2
24	X	5/8	X	24	/	2/15	/
25	Y	5/9	Y	25	6	3/6	6
26	Z	5/10	Z	26	+	2/11	+
27	CR	0/13	CR	27	CR	0/13	CR
28	LF	0/10	LF	28	LF	0/10	LF
29	LTRS	*		29	LTRS	*	
30	FIGS	*		30	FIGS	*	
31	SP	2/0	SP	31	SP	2/0	SP
32		*		32		*	

* Nem lehet átalakítást végezni ezeknél a pozícióknál és a jelet/karaktert az adatokból el kell távolítani.

8-3. táblázat szövege:

– Az NNNN közlemény vége jelet (betű és szám esetben) ETX (0/3)-ra kell átalakítani.

1. Megjegyzés

2. A ZCZC közlemény indulás jelet (betű és szám esetben) SOH (0/1)-re kell átalakítani. Megjegyzés.

3. Megjegyzés. *A 10. számú jel számok esetét csak az AFTN elsőbbségi figyelmeztetés jelzés vétele után kell átalakítani, amelyet a BEL (0/7) ötszöri leadására kell átalakítani.*

4. Megjegyzés. *ITA-2-ből való átalakításánál egy STX (0/2) karaktert kell behelyezni, miután a következő sorban a CR LF-t vagy LF CR-t észlelik az Eredeti Sor végén.*

5. Megjegyzés. *A hét 28-as jel (LF) sorozatát egy VT (0/11) karakterre kell átalakítani.*

8-4. táblázat. Átalakítás 5. számú az Nemzetközi Távíró ABC-ből (IA-5) 2. számú Nemzetközi ABC-be (ITA-2)

Oszlop / Sor	0	1	2	3	4	5	6	7
0	•	•	31FL	16F	2F	16L	2F	16L
1	5. megjegyzés	•	2F	17F	1L	17L	1L	17L
2	•	•	2F	23F	2L	18L	2L	18L
3	1. megjegyzés	•	2F	5F	3L	19L	3L	19L
4	•	•	2F	18F	4L	20L	4L	20L
5	•	•	2F	20F	5L	21L	5L	21L
6	•	•	2F	25F	6L	22L	6L	22L
7	2. megjegyzés	•	19F	21F	7L	23L	7L	23L
8	•	•	11F	9F	8L	24L	8L	24L
9	•	•	12F	15F	9L	25L	9L	25L
10	28FL	•	2F	3F	10L	26L	10L	26L
11	3. megjegyzés	•	26F	2F	11L	2F	11L	2F
12	•	•	14F	2F	12L	2F	12L	2F
13	27FL	•	1F	22F	13L	2F	13L	2F
14	•	•	13F	2F	14L	2F	14L	2F
15	•	•	24F	2F	15L	2F	15L	•

* Nem lehet átalakítást végezni ezeknél a pozícióknál, és a jel/karaktert az adatokból el kell távolítani.

Példa: *Annak az ITA-2 jelnek a megtalálásához, amelyre az IA-5 3/6 karakterét át kell alakítani, nézzék meg a 3. oszlop 6. sorát.*
25F jelenti a 25. számú jel számjegyét.
(L = betű helyzet, FL = valamelyik helyzet kijelölés).

1. Megjegyzés. *– A 0/3 (ETX) karaktert át kell alakítani ITA-2 jel sorozattá, azaz 14L, 14 L, 14 L, 14L-é (NNNN) .*

2. Megjegyzés. *– A 0/7 (BEL) jelet csak akkor kell konvertálni, amikor 5-előfordulású sorozatot észlelnek, amelyet a 30, 10F, 10 F, 10 F,*

10 F, 10 F, 29 ITA-2 jelsorozattá kell átalakítani.

3. Megjegyzés. *– A CR CR LF VT (0/11) ETX (0/3) karakter jelsorozatot a 29, 27, 27, 28, 28, 28, 28, 28, 28, 28, 28, 14 L, 14 L, 14 L, 14 L*

ITA-2 jelsorozatra kell átalakítani.

4. Megjegyzés. – *A szám- és betű karakterek felesleges generálásának megelőzése érdekében az ITA-2-ben, amikor az IA-5-ből konvertál át,*

nem kell kijelölni az ITA-2-ben nem-nyomtatási funkciókat (27, 28, 29, 30, 31 számú jelek).

5. Megjegyzés. – *A 0/1 (SOH) karaktert az ITA-2-ben a 26L, 3L, 26L, 3L (ZCZC) jelsorozattá kell átalakítani.*

8.6.3 Föld-föld karakter-orientált adat-kapcsolat vezérlő eljárások

Megjegyzés. – Ennek a szakasznak az előírásai a föld-föld adat-csere alkalmazásokhoz tartoznak, amelyek a fentebbi 8.6.1 pont által leírt IA-5 konvertálást használják és amely a tíz átviteli szabályozási karaktert (SOH, STX, ETX, EOT, ENQ, ACK, DLE, NAK, SYN és ETB) alkalmazza az adat-kapcsolat szabályozásra, szinkron vagy aszinkron adatátviteli berendezés felett.

8.6.3.1 *Meghatározások.* A következő meghatározásokat kell használni az ebben a szakaszban szereplő adat-kapcsolat alkalmazásokhoz:

a) Vezér-állomás az az állomás, amely adott pillanatban adatkapcsolati vezérléssel rendelkezik.

b) Mellék-állomás az, amely arra került kiválasztásra, hogy vegye a vezér-állomástól jövő továbbítást.

c) Vezérlő állomás az az egyedüli állomás egy többpontos kapcsolatban, amelynek megengedett a vezérlő állomás helyzet felvétele és a közlemények továbbítása egy vagy több egyedileg kiválasztott (nem-vezérlő) alárendelt állomásnak, vagy megengedett részére az, hogy vezér-állomás állapotot jelöljön ki azi alárendelt állomás bármelyikének.

8.6.3.2 KÖZLEMÉNY ÖSSZEÁLLÍTÁSA

a) Az adat-átvitelnek az IA-5 karakterekből kell állni, amelyeket a korábbi 8.6.1.2.2 pontnak megfelelően továbbítanak, és az vagy egy információs közlemény vagy egy ellenőrző jelsorozat.

b) Egy információs közlemény, amelyet adatcseréhez használnak, a következő formák egyikét veszi fel:

	S				E	B	(STX = a szöveg indulása)			
1)	T	- - -	SZÖVEG	- - -	T	C	(ETX = a szöveg vége)			
	X				X	C	(BCC = blokk ellenőrző karakter)			
							(ETB = az átviteli blokk vége)			
	S				E	B	(SOH = a fejrész kezdete)			
2)	T	- - -	SZÖVEG	- - -	T	C				
	X				B	C				
	S				S				E	B
3)	O	- - -	FEJ-RÉSZ	- - -	T	- - -	SZÖVEG	- - -	T	C
	H				X				X	C
	S				S				E	B
4)	O	- - -	FEJ-RÉSZ	- - -	T	- - -	SZÖVEG	- - -	T	C
	H				X				B	C
	S				E	B				
5)	O	- - -	FEJ-RÉSZ	- - -	T	C				
	H				B	C				

B
1. Megjegyzés. – A C egy blokk ellenőrző karakter (BCC).
C

2. Megjegyzés. – A fenti 2), 4) és 5) formátumokban, amelyek ETB-vel végződnek, bizonyos folytatás szükséges.

c) Az ellenőrző sorozatot vagy egyedi átviteli vezérlő karakterekből kell összeállítani (EOT, ENQ, ACK vagy NAK), vagy egy egyedül álló átvitel vezérlő képezi (ENQ), amelyet egy maximum 15 nem-vezérlő karakterből álló előtag előz meg, vagy a DLE karakter, amelyet más grafikus vagy vezérlő karakterrel együttesen használnak, és vezérlő karakterek, amelyek kiegészítő adatátvitel vezérlő funkciókat látnak el.

8.6.3.3 Három rendszer kategóriát határoztak meg a megoldandó feladataiknak megfelelően, áramköri jellemzőik, végberendezés konfigurációik és közlemény átviteli eljárásaik szerint, mégpedig a következőket:

"A" rendszer kategória: két-irányú több-pontos, amely lehetővé tesz akár centralizált, akár nem-centralizált üzemelést és egyedüli vagy többszörös, közlemény- orientált információ átviteleket válasz nélkül (de kézbesítési megerősítéssel).

"B" rendszer kategória: két-irányú egyidejű áramkörű, ponttól-pontig alkalmazású közlemény-összerendelésű blokkolással és modulo 8 blokk számozással és nyugtázással.

"C" rendszer kategória: két-irányú alternatív, több pont közötti, amely csak centralizált (számítógép-terminál) üzemelést, egyedi vagy többszörös közlemény- továbbításokat válasszal tesz lehetővé.

8.6.3.3.1 Azokon a jellemzőkön kívül, amelyek mindkét, az "A" és "B" rendszer kategóriákat követő pontokban vannak előírva, más paraméterek is vannak, amelyeket figyelembe kell venni ahhoz, hogy biztosítsák a használható, megbízhatóan üzemelő összeköttetést, ezek a következők:

a) A szinkronizáció létrehozásához és fenntartásához szükséges SYN karakterek száma;

Megjegyzés. – Általában a továbbító állomás három egymást követő SYN karaktert küld és a vevő állomás legalább kettőt vesz, mielőtt bármilyen tevékenységet végrehajtana.

b) A rendszer szünetelések értékei olyan funkcióknál, mint a “szabad vonal” és a “nincs válasz”, valamint az automatikus újra-keresések száma, ahányszor ezt meg kell kísérelni a manuális beavatkozás jelzése előtt;

c) Az előtagok kompozíciója maximum 15 karakteren belül.

Megjegyzés. – Az illetékes hatóságok közötti megegyezés alapján megengedhető az ellenőrző jeleknél az, hogy állomás azonosító előtagot foglaljanak magukba az IA-5-nek a 4-7. oszlopaiból választott karakterek felhasználásával.

8.6.3.3.2 **Ajánlás.** – *A több-pont alkalmazásoknál, amelyeknél csak a centralizált (számítógép-terminál) üzemelés a megengedett, a 8.6.3.7 pont rendelkezéseit kell alkalmazni.*

8.6.3.4 BLOKK ELLENŐRZŐ KARAKTER

8.6.3.4.1 Mind az "A", mind a "B" rendszer kategóriának blokk ellenőrző karaktert kell használni egy átvitel érvényességének a meghatározásához.

8.6.3.4.2 A blokk ellenőrzéső karaktert 7 bit plusz egy paritás bit együttese alkotja.

8.6.3.4.3 A blokk ellenőrzéső karakter első 7 bitjének mindegyike modulo 2 bináris összege az átvitt blokk egymást követő karakterei ugyanazon 1-es bit-től 7-es bitig terjedő oszlopában lévő elemeknek.

8.6.3.4.4 A blokk egyes oszlopai hosszirányú paritás ellenőrzésének, beleértve a blokk ellenőrző karaktert is, párosnak kell lenni.

8.6.3.4.5 A blokk ellenőrzéső karakter paritás bitjénekugyanaz az értelme, mint ami az információs karaktereknél van (lásd a korábbi 8.6.1.2.3. pontot).

8.6.3.4.6 *ÖSSZEGEZÉS*

8.6.3.4.6.1 A blokk ellenőrzéső karakter megkapását célzó összegezés vagy a SOH (a fej-rész elkezdése) vagy a STX (a szöveg elkezdése) első megjelenésénél kezdődik.

8.6.3.4.6.2 Az indulási karaktert az összegezés nem tartalmazhatja.

8.6.3.4.6.3 Ha egy STX karakter azután jelenik meg, hogy az összegezést a SOH elindította, akkor az STX karaktert az összegezésnek úgy kell tartalmaznia, mintha szöveg-karakter lenne.

8.6.3.4.6.4 A SYN (szinkronizáló karakter) kivételével az összes karaktert, amelyet a blokk ellenőrzés összegezés után továbbítottak, az összegezésnek tartalmazna kell, beleértve az ETB (átvitel/blokk vége) vagy az ETX (szöveg vége) vezérlő karaktert is, amelyek jelzik, hogy a következő karakter a blokk ellenőrző karaktere lesz.

8.6.3.4.7 Semmilyen karaktert, SYN-t vagy mást, nem lehet az ETB vagy ETX karakter és a blokk ellenőrző karakter közé beilleszteni.

8.6.3.5 *Az "A" rendszer kategória leírása.* Az "A" rendszer kategória olyan rendszer kategória, amelyben számos állomás egy több-pont kapcsolással van összekötve és egy állomás folyamatos vezérlő állomásnak van kijelölve, amely a kapcsolatot figyeli azért, hogy a rendszer üzemelést biztosítsa.

8.6.3.5.1 *KAPCSOLAT LÉTREHOZÁSI ELJÁRÁS*

8.6.3.5.1.1 Ahhoz, hogy a kapcsolatot az átvitelhez létrehozzák, a vezérlő állomás vagy

a) kiválasztja az alárendelt állomások egyikét ahhoz, hogy vezér-állomásként jelölje ki azt; vagy

b) felveszi a vezérlő állomás szerepét, és kiválaszt egy vagy több alárendelt állomást (mellék-állomás) az átvitel vételére.

8.6.3.5.1.2 A lekérdezést úgy kell elvégezni a vezérlő állomásnak, hogy egy lekérdező ellenőrző jelsorozatot küld, amely az egyedi mellék állomást azonosító előtagból áll és ENQ-ban végződik.

8.6.3.5.1.3 Az alárendelt állomásnak, amely észleli a lekérdező ellenőrző jelsorozatot, fel kell vennie a vezér-állomás állapotot, és a az alábbi két mód egyikével kell válaszolnia:

a) ha az állomásnak közleménye van továbbítás céljára, akkor kiválasztási ellenőrző jelsorozatot kezdeményez, ahogyan az a 8.6.3.5.1.5 pontban az alábbikban leírásra kerül;

b) ha az állomásnak nincs közleménye továbbítás céljára, akkor egy EOT-t (adatátvitel vége) küld, és a vezér-állomás helyzet visszaáll a vezérlő állomásra.

8.6.3.5.1.4 Ha a vezérlő állomás érvénytelen választ észlel vagy nem észlel választ a lekérdezésére, akkor egy EOT küldésével zár, mielőtt a lekérdezésre vagy a kiválasztásra visszatérne.

8.6.3.5.1.5 A kiválasztást a kijelölt vezér-állomásnak kell végrehajtania egy kiválasztási ellenőrző jelsorozat küldésével, amely egy egyedi állomás azonosítójából és az ENQ-ból áll.

8.6.3.5.1.6 Egy állomás, amely kijelölő kiválasztó ellenőrző jelsorozatát észlel, mellék-állomás állapotot vesz fel és az alábbi két válasz egyikét küldi:

a) ha az állomás vételre kész, egy előtagot küld, amelyet az ACK követ. E válasz észlelése utána a vezér állomásnak vagy egy másik állomás kell kiválasztania, vagy a közlemény továbbításával folytatnia.

b) ha az állomás vételre nem kész, egy előtagot küld, amelyet a NAK követ és ezáltal feladja a mellék-állomás kiszolgáló helyzetét. Ha a vezér-állomás veszi a NAK-ot, vagy ha nincs válasz, akkor vagy egy másik állomást vagy ugyanazt az "A" alárendelt állomást választja ki, vagy lezár.

c) N-újra-próbálkozás $(N \geq 0)$ engedélyezhető egy állomás részére, hogy egy olyan állomást válasszon, amelytől NAK /negytív nyugtázás/ érvénytelen válasz vétele történt, vagy semmilyen választ nem vettek.

8.6.3.5.1.7 Ha egy vagy több állomást választottak ki, és helyesen választottak az ACK-val, akkor a vezér-állomás a közlemény átvitellel folytatja.

8.6.3.5.2 *KÖZLEMÉNY ÁTVITELI ELJÁRÁS*

8.6.3.5.2.1 A vezér-állomás közleményt vagy közlemény-sorozatot küld fej-résszel vagy anélkül a kiválasztott mellék- állomás(ok)nak.

8.6.3.5.2.2 A közlemény átvitele:

a) kezdődik:

- SOH-el, ha a közlemény fej-résszel rendelkezik;

- STX-el, ha a közlemény nem rendelkezik fej-résszel;

b) folytatódik, és ETX-el végződik, amelyet közvetlenül egy blokk ellenőrző karakter (BCC)követ.

8.6.3.5.2.3 Egy vagy több közlemény továbbítása után a vezér-állomásnak ellenőriznie kell a sikeres kézbesítést mindegyik kiválasztott mellék-állomásnál.

8.6.3.5.3 *KÉZBESÍTÉSI ELLENŐRZÉSI ELJÁRÁS*

8.6.3.5.3.1 A vezér-állomásnak egy kézbesítési ellenőrzési jelsorozatot kell küldenie, amely az egyedi mellék-állomás azonosító jeléből és az ENQ-ból áll.

8.6.3.5.3.2 Egy mellék-állomás, amely észleli a kézbesítési ellenőrzési jelsorozatot, az alábbi két válasz közül az egyiket küldi:

a) ha a mellék-állomás helyesen vette az összes átvitelt, egy tetszőlegesen választott előtagot küld, amelyet az ACK követ;

b) ha a mellék-állomás nem vette helyesen az összes átvitelt, egy tetszőlegesen választott előtagot küld, amelyet a NAK követ.

8.6.3.5.3.3 Ha a vezér-állomás nem vesz választ, vagy érvénytelen választ vesz, ismétlést kell kérnie ugyanattól vagy egy másik mellék-állomástól addig, amíg az összes kiválasztott állomás helyesen "összeszámolásra nem kerül".

8.6.3.5.3.4 Ha a vezér-állomás negatív választ (NAK) vesz, vagy $(N \geq 0)$ ismételt kísérlet után nincs válasz, akkor ezt a lekérdezést a megfelelő mellék- állomásoktól egy későbbi alkalommal meg kell ismételnie.

8.6.3.5.3.5 Azután, hogy az összes közleményt elküldték, és a kézbesítést igazolták, a vezér-állomásnak le kell zárnia a kapcsolatot.

8.6.3.5.4 *KAPCSOLAT LEZÁRÁS ELJÁRÁS*

8.6.3.5.4.1 A lezárás funkciót, tagadva az összes állomás vezér- vagy mellék-állomás helyzetét, visszaadva a vezér helyzetet a vezérlő állomásnak, a vezér- állomás végzi el az EOT továbbításával.

8.6.3.6 *A "B" rendszer kategória leírása.* A "B" rendszer kategória olyan kategória, amelyben két állomás ponttól-pontig duplex kapcsolatban van, és mindegyik állomásnak megvan a képessége, hogy párhuzamosan fenntartson vezér- és mellék-állomás állapotot, azaz vezér helyzetet a továbbító oldalán és mellék állapotot a vevő oldalán, és mindkét állomás egyidőben tud továbbítani.

8.6.3.6.1 *KAPCSOLAT LÉTREHOZÁSI ELJÁRÁS*

8.6.3.6.1.1 A kapcsolat létrehozása közlemény továbbításokhoz (a hívó állomástól a hívott állomáshoz), a hívó állomásnak kérni kell a hívott állomás azonosítását egy azonosító ellenőrző jelsorozat küldésével, amely egy DLE-ből, egy kettőspont karakterből, egy tetszőlegesen választható előtagból és az ENQ-ból áll.

8.6.3.6.1.2 A hívott állomásnak, miután az ENQ-t észlelt, az alábbi két válasz egyikét kell elküldenie:

a) ha vételre kész, akkor egy jelsorozatot küld, amely egy DLE-ből, egy azt követő kettőspontból, egy előtagból, amely az azonosítást végzi és az ACK0-ból áll (lásd az alábbi 8.6.3.6.2.5 pontot). Ez létrehozza a kapcsolatot a közleménynek a hívó állomástól a hívott állomáshoz történő átviteléhez;

b) ha vételre nem kész, a fenti sorozatot küldi az ACK0-t helyettesítő NAK-al.

8.6.3.6.1.3 A kapcsolat létrehozását a közlemény átvitelekhez az ellenkező irányban, az áramköri kapcsolást követő bármely időpontban, hasonló módon kell kezdeményezni, mint ahogy az a fentiekben le van írva.

8.6.3.6.2 *KÖZLEMÉNY ÁTVITELI ELJÁRÁS*

8.6.3.6.2.1 A "B" rendszer kategória közlemény-továbbítás hosszúsági ellenőrzéssel összekapcsolt blokkolást és modulo 8 számozású nyugtázásokat szolgáltat a közlemény részére.

8.6.3.6.2.2 Az átviteli blokk egy teljes üzenet, vagy egy üzene-rész is lehet. A küldő állomásnak az átvitelt az SOTB N-el kell kezdeményezni, amelyet az alábbiak követnek:

a) SOH, ha ez egy olyan közlemény kezdete, amely fej-részt tartalmaz;

b) STX, ha ez egy olyan közlemény kezdete, amelynek nincs fej-része;

c) SOH, ha ez egy közbenső blokk, amely egy fej-részt folytat;

d) STX, ha ez egy közbenső blokk, amely szöveget folytat.

Megjegyzés. – Az SOTB N a két-karakteres átviteli vezérlési sorozat DLE = (1/0 és 3/13 karakterek), amelyet az N blokkszám követ, ahol N az IA-5 karakterek egyike 0,1 . . ., 7 (3/0, 3/1, … 3/7 karakterek) .

8.6.3.6.2.3 Egy olyan blokkot, amely egy közleményen belüli közbenső pontban végződik, ETB-vel kell befejezni; egy blokkot, amely a közlemény végénél fejeződik be, ETX-el kell befejezni.

8.6.3.6.2.4 Minden állomásnak részére megengedett az, hogy kezdeményezze vagy folytassa a közlemény küldését a másiknak, párhuzamosan, a következő sorrendnek megfelelően:

a) A küldő állomás részére (vezér-állomás) megengedett az, hogy közleményeket vagy közlemény-részeket blokkok formájában folyamatosan küldje a vevő állomásnak (mellék-állomás) anélkül, hogy válaszra várna.

b) A válaszok részére megengedett az, hogy mellék-állomás válaszok formájában továbbítson vevő-állomás, miközben a küldő állomás küldi az egymás után következő blokkokat.

Megjegyzés. – A blokkok és válaszok modulo 8 számozásának használatával megengedhető a küldő állomásnak még hét blokk küldése is a vett válaszok előtt, mielőtt megkövetelnék a továbbítás leállítását addig, amíg hat vagy kevesebb blokk marad meg.

c) Ha negatív választ vesznek, akkor a küldő állomásnak (vezér-állomás) meg kell kezdenie az utolsó blokkot követő blokkal az újra-átvitelt, attól a blokktól kezdődően, amelynél a helyes pozitív nyugtázást vette.

8.6.3.6.2.5 A mellék-állomás válaszoknak a következők valamelyikének kell lenni:

a) ha az átviteli blokkot hiba nélkül veszik és az állomás egy másik blokk vételére kész, akkor egy DLE-t kell küldenie, egy kettőspontot, egy tetszőleges előtagot és a megfelelő ACKN nyugtázást (hivatkozva az SOTB N-el kezdődő vett blokkra, pl. ACK0-t, amelyet DLE0-ként visznek át, a SOTB0, DLE1 számozású blokkra adott pozitív válaszként használnak az SOTB1-nél stb.);

b) ha egy átviteli blokk nem elfogadható, akkor a vevő állomás DLE-t, kettőspontot, tetszőleges előtagot és a NAK-ot fogja elküldeni.

8.6.3.6.2.6 **Ajánlás.** *– A mellék-állomás válaszokat a közlemény blokkok közé kell beiktatni és a lehető legkorábbi időben továbbítani.*

8.6.3.6.3 *KAPCSOLAT BEFEJEZÉSI ELJÁRÁS*

8.6.3.6.3.1 Ha a kapcsolatot létrehozták a közlemény átvitelekhez az egyik vagy mindkét irányban, az EOT egy állomás általi küldése a közlemény továbbítások befejezését jelzi abban az irányban. Az EOT elküldése után a közlemény továbbítás folytatásához a kapcsolatot abban az irányban újra létre kell hozni.

8.6.3.6.3.2 Az EOT-t egy állomás csak az összes hátralévő mellék-állomási válaszok vétele, vagy más módú figyelembevétele után továbbítja.

8.6.3.6.4 *AZ ÁRAMKÖR SZÉTKAPCSOLÁSA*

8.6.3.6.4.1 A kapcsolt összeköttetéseknél az adat-kapcsolatokat mindkét irányban be kell fejezni, mielőtt az összeköttetés szétkapcsolásrra kerülne. Ezenkívül az összeköttetés törlését kezdeményező állomás jelenti be először ilyen irányú szándékát a két-karakteres DLE EOT sorozat átvitelével, amelyet bármilyen más, az összeköttetés törlést igénylő jelzés követ.

8.6.3.7 *A "C" (központosított) rendszer kategória leírása.* "C" (központosított) rendszer kategória olyan kategória (hasonlóan az "A" rendszer kategóriához), amelyben bizonyos számú állomás több-pontos kapcsolaton keresztül össze van kötve, és az egyik állomás vezérlő állomásnak van kijelölve, de (eltérően az "A" rendszer kategóriától) csak központosított (számítógéptől-terminálhoz) üzemelést szolgáltat, ahol a közlemény-cserét (válaszokkal) csak a vezérlő és a kiválasztott mellék-állomás közötti esetre korlátozzák.

8.6.3.7.1 *KAPCSOLAT LÉTREHOZÁSI ELJÁRÁS*

8.6.3.7.1.1 Az adat-átviteli kapcsolat létrehozásához a vezérlő állomás vagy:

a) kiválasztja az egyik mellék-állomást vezér állomás helyzettel való felhatalmazásra, vagy

b) felveszi a vezér-állomás helyzetet és kiválaszt egy mellék-állomást mellék-állomás helyzet felvételére, és az alább előírt két kiválasztási eljárás valamelyikének megfelelően vesz egy közleményt.

1) Kiválasztás válasszal (lásd az alábbi 8.6.3.7.1.5 pontot); vagy

2) gyors-kiválasztással (lásd az alábbi 8.6.3.7.1.7 pontot).

8.6.3.7.1.2 A lekérdezést a vezérlő állomás végzi egy lekérdező ellenőrző jelsorozat küldésével, amely az egyedi alárendelt állomás azonosító jeléből és az ENQ előtagból áll.

8.6.3.7.1.3 Az az alárendelt állomás, amelyik észleli a kijelölt lekérdező ellenőrző jelsorozatot, felveszi a vezér-állomás helyzetet, és az alábbi két mód egyikével válaszol:

a) ha az állomásnak van továbbítandó közleménye, akkor a közlemény továbbítását kezdeményezi. A vezérlő állomás mellék-állomás állapotot vesz fel;

b) ha az állomásnak nincs továbbítandó közleménye, egy EOT-t küld és a vezér-állomás visszatér a vezérlő- állomás állapotba.

8.6.3.7.1.4 Ha a vezérlő állomás a lekérdezésből eredően érvénytelen választ észlel, vagy nem észlel választ, akkor az EOT küldésével lezárást hajt végre, mielőtt folytatná a lekérdezést vagy a kiválasztást.

8.6.3.7.1.5 A kiválasztás válasszal-t a vezérlő állomás hajtja végre a vezér-állomás helyzetet felvéve és ezt egy kiválasztást ellenőrző jelsorozatot küldve hajtja végre, amely az ellenőrző jelsorozat egy olyan előtagot tartalmaz, amely az egyedi alárendelt állomást azonosítja és ENQ-val végződik.

8.6.3.7.1.6 Egy alárendelt állomásnak, amely a kijelölt kiválasztási ellenőrző jelsorozatot észleli, mellék-állomás helyzetet kell felvennie, és az alábbi két válasz egyikét elküldenie:

a) ha az állomás vételre kész, egy tetszőleges előtagot küld, amelyet az ACK követ. Ennek a válasznak a vétele után, a vezér-állomásnak a közlemény továbbítással kell folytatnia;

b) ha az állomás vételre nem kész, egy tetszőleges előtagot küld, amelyet a NAK követ. A NAK észlelése után a vezér-állomásnak megengedhető, hogy újra megkísérelje ugyanazon alárendelt állomás kiválasztását, vagy a lezárás kezdeményezését az EOT küldésével.

Megjegyzés. – Ha a vezérlő állomás érvénytelen választ vesz, vagy egyáltalán nem vesz választ, megengedett az, hogy újra megkísérelje ugyanazon alárendelt állomás kiválasztását, vagy N *próbálkozás után* $(N \geq 0)$ *vagy kilép egy visszaállítási eljáráshoz, vagy befejezést kezdeményez az EOT küldésével.*

8.6.3.7.1.7 A gyors kiválasztás végrehajtását a vezérlő állomás vezér-állomás helyzetet felvéve és a kiválasztási ellenőrző jelsorozatot elküldve végzi, és ennek az átvitelnek az ENQ-val való befejezése nélkül vagy anélkül, hogy várna arra, hogy a kiválasztott alárendelt állomás válaszoljon, közvetlenül a közlemény továbbításával folytatja a tevékenységét.

8.6.3.7.2 *KÖZLEMÉNY ÁTVITELI ELJÁRÁS*

8.6.3.7.2.1 A vezér-állomás egy egyedi közleményt küld a mellék-állomásnak és várja a választ.

8.6.3.7.2.2 A közlemény átvitel

a) kezdődik:

- SOH-val, ha a közleménynek van fej-része;

- STX-szel, ha a közleménynek nincs fej-része;
és

b) folytatódik az ETX-szel végződve, amelyet közvetlenül a BCC követ.

8.6.3.7.2.3 A mellék-állomásnak, miután észlelte az ETX-et, amelyet a BCC követ, el kell az alábbi két válasz egyikét kell elküldenie:

a) ha a közleményt fogadták, és a mellék-állomás kész egy másik közlemény fogadására, akkor egy tetszőleges előtagot küld, amelyet egy ACK követ. A vezér-állomásnak, miután észlelte az ACK-t, részére megengedetté válik a következő közlemény elküldése, vagy a lezárás kezdeményezése;

b) ha közleményt nem vettek és a mellék-állomás kész egy másik közlemény vételére, egy tetszőleges előtagot küld, amelyet a NAK követ. A vezér-állomás, miután észlelte a NAK-t, vagy továbbít egy másik közleményt, vagy lezárást kezdeményez. A NAK választ követően a következő átvitt közleménynek nem szükséges egy olyan közlemény újra-átvitelének lennie, amelyet nem fogadtak.

8.6.3.7.2.4 Ha a vezér-állomás érvénytelen közleményt vesz, vagy egyáltalán nem vesz közleményt, akkor megengedett számára egy továbbítási ellenőrző jelsorozat küldése, amely egy tetszőleges előtagból és az azt követő ENQ-ból áll. A továbbítási ellenőrző jelsorozat vétele után a mellék-állomás megismétli az utolsó válaszát.

8.6.3.7.2.5 A vezér-állomás N újra-próbálkozást végezhet, hogy érvényes mellék-állomás választ kapjon. Ha az N újra-próbálkozás után válasz nem érkezik, a vezér-állomás kilép egy visszaállítási folyamathoz.

8.6.3.7.3 KAPCSOLAT BEFEJEZÉSI ELJÁRÁS

8.6.3.7.3.1 A vezér-állomásnak egy EOT-t kell küldenie annak jelzésére, hogy nincs több továbbítandó közleménye. Az EOT-nek kell negálnia mindkét állomás vezér-/mellék-állomás állapotát, és visszakapja a vezérlő állomás helyzetet..

8.6.4 Föld-föld bit-orientált adat kapcsolat vezérlés eljárás

Megjegyzés. – Ennek a szakasznak az előírásai a föld-föld adatcsere alkalmazásokhoz tartoznak, amelyek bit-orientált adat-kapcsolat eljárásokat használnak átlátható, szinkron átvitelt téve lehetővé, *amely bármilyen kódolástól független; az adat-kapcsolat irányítás funkciókat a keretben kijelölt bit-pozíciók értelmezésével hajtják végre.*

8.6.4.1 A következő leírásokat fogjuk alkalmazni az ebben a szakaszban tartalmazott adat-kapcsolat alkalmazásokhoz:

a) A bit-orientált adat-kapcsolat vezérlési eljárások átlátható átvitelt tesznek lehetővé, amelyek bármilyen kódolástól függetlenek.

b) Az adat-kapcsolat két egymással összekötött állomás logikai összekapcsolása, beleértve az összekapcsolt állomások összeköttetés vezérlési képességét is.

c) Egy állomás logikai elemek konfigurációja, amelytől vagy amelyhez az adat-kapcsolaton keresztül közleményeket továbbítanak, beleértve azokat az elemeket is, amelyek a közlemények áramlását a kapcsolaton, az összeköttetés vezérlési eljárásokon keresztül szabályozzák.

d) Egy kombinált állomás mind utasításokat, mind válaszokat küld és vesz, és felelős az adat-kapcsolat szabályozásáért.

e) Az adatátviteli összeköttetési vezérlő eljárások képezik azokat az eszközöket, amelyeket az állomások között az adat-kapcsolaton lebonyolódó szabályos információ-csere irányítására és védelmére használnak.

f) Egy összetevőt úgy határoztak meg, mint egy sorozaton belül előírt sorrendben lévő bitek számát az adat-kapcsolat vezérlésére és felügyeletére.

g) Egy oktett nyolc egymás utáni bitből álló csoport.

h) Egy sorozat egy vagy több összetevő előírt sorrendben, amely az oktettek integrál számát tartalmazza.

i) Egy mező meghatározott számú bit, vagy meghatározott maximális számú bit sorozata, amely adat-kapcsolati vagy összeköttetés vezérlési funkciót lát el, vagy az átvitelhez adatokat képez.

j) Egy keret az adat-kapcsolaton továbbításra kerülő adatok egy egysége, amely egy vagy több mezőt foglal magába előírt sorrendben.

k) A közös ICAO adat-csere hálózat (CIDIN) kapcsoló-központ egy automatikus AFTN kapcsolóközpontnak az a része, amely belépési, közvetítési és kilépési funkciókat lát el bit-orientált kapcsolati és CIDIN hálózati eljárásokat használva, amelyek ebben a szakaszban kerültek meghatározásra, és magába foglalja a megfelelő interfész(eke)t az AFTN más részeivel és más hálózatokkal is.

8.6.4.2 BIT-ORIENTÁLT ADAT-KAPCSOLAT ELJÁRÁSOK A SZINKRON ÁTVITELI BERENDEZÉSEKET ALKALMAZÓ PONTTÓL-PONTIG, FÖLD-FÖLD ADATCSERÉHEZ

Megjegyzés. – A következő adat-kapcsolati szint eljárások ugyanazok, mint azok LAPB adat-kapcsolati eljárások, amelyek az ITU CCITT X.25 Ajánlás, 2. szakasz, Sárga Könyv-ben /ITU CCITT Recommendation X.25 Section 2, Yellow Book/ (1981-es kiadás) találhatók. Az X.25 Ajánlások későbbi változatai akkor kerülnek figyelembevételre, amikor tisztázódik, hogy elfogadásra kerül, vagy sem.

8.6.4.2.1 *Keret formátum.* A keretek nem tartalmazhatnak 32-nél kevesebb bitet, kivéve a nyitó és záró jelző biteket, és a következő formátumnak kell megfelelniük:

JELZŐ BITEK	CÍMZÉS	VEZÉRLÉS	INFORMÁCIÓ	FCS	JELZŐ BITEK
F	A	C	I		F

8.6.4.2.1.1 Egy keretnek tartalmaznia kell: a nyitó jelző biteket (F), egy címzés mezőt (A), egy vezérlési mezőt (C), egy választható információs mezőt (I), egy keret ellenőrző sorozatot (FCS) és a záró jelző biteket (F), és a keretet ebben a sorrendben kell átvinni.

Megjegyzés. – A CIDIN vonatkozásában a nyitó jelző bitek, az A és a C mező, az FCS és a záró jelző bitek (F) együttesen alkotják az Adat-Kapcsolat Vezérlő Mezőt (DLCF). Az I mezőt Adat-Kapcsolati Mezőként (LDF) jelölik.

8.6.4.2.1.1.1 A jelző biteknek (F) a 8-bites 01111110 sorozatnak kell lenniük, amelyek mindegyik keret elejét és végét határolják.. Megengedett az, hogy a keretet lezáró jelző bitek a következő keret nyitó jelző bitjeiként is szolgáljanak.

8.6.4.2.1.1.2 A címzés (A) mezőnek egy oktettből kell állnia, kivéve a 0 biteket, amelyeket azért adnak hozzá, hogy átlátható átvitelt érjenek el, amelynek tartalmaznia kell a kombinált állomás kapcsolati címzést.

8.6.4.2.1.1.3 A vezérlési (C) mezőnek egy oktettből kell állnia, kivéve a 0 biteket, amelyeket azért adnak hozzá, hogy átlátható átvitelt érjenek el, és az adat-kapcsolat szabályozáshoz tartalmazniuk kell az utasításokat, a válaszokat és keret sorszám összetevőket az adat-kapcsolat vezérléséhez.

8.6.4.2.1.1.4 Az információs (I) mezőnek kell magába foglalnia a digitális adatokat, amelyek bármely kódban vagy sorozatban jelen lehetnek, de nem haladhatják meg a 259 oktettes maximális értéket, kivéve a 0 biteket, amelyeket azért adnak hozzá, hogy átlátható átvitelt érjenek el. Az I mező hosszban mindig a 8 bit többszöröse.

8.6.4.2.1.1.5 A keret ellenőrző sorozatnak (FCS) két oktettből kell állnia, kivéve a 0 biteket, amelyeket azért adnak hozzá, hogy átlátható átvitelt érjenek el, és tartalmazzák a hiba-észlelő biteket is.

8.6.4.2.2 Egy keret ellenőrzési sorozatot (FCS) mindegyik keretbe be kell építeni a hiba ellenőrzése céljából.

8.6.4.2.2.1 A hiba ellenőrző algoritmus egy ciklikus redundancia ellenőrzés (CRC).

8.6.4.2.2.2 A CRC polinom (P(x)) a következő:

$x^{16} + x^{12} + x^5 + 1$

8.6.4.2.2.3 Az FCS egy 16-bites sorozat. Ez az FCS az R(x) maradék kiegészítője, amely maradékot az x^{16} [G(x)] + x^K ($x^{15} + x^{14} + x^{13} + \ldots + x^2 + x^1 + 1$)-nek a P(x) CRC polinommal való modulo 2 osztásával nyerjük.

A G(x)-nek a keret tartalmának kell lenni, de nem foglalja magába a nyitó jelző bit utolsó bitjét, sem az FCS első bitjét, és kizárja azokat a biteket, amelyeket az átlátható átvitel kedvéért illesztettek be.
K-nak a G(x) hosszának kell lenni (bitek száma).

8.6.4.2.2.4 Az FCS összegyűjtésének és ellenőrzésének generálása a következőkből áll:

a) az átvivő állomás kezdeményezi az FCS össszegyűjtést a címzés (A) mező első (legkisebb helyiértékű) bitjével és magába kell, hogy foglalja az összes bitet az FCS sorozatot megelőző utolsó bitig, ezt is tartalmazva, de az összes 0 bitje (ha van) kivételével, amelyeket az átlátható átvitel érdekében illesztettek be;

b) az összegyűjtés elvégzése után az FCS továbbításra kerül a b1 bittel (a legmagasabb helyiértékű együttható) kezdve és a sorozatban továbbhaladva a b16 bittel (legalacsonyabb helyiértékű együttható), ahogyan az alább bemutatásra kerül:

				Az első átvitt bit		↓
b16	b15	b14	- - - -	b3	b2	b1
x^0	x^1	x^2		x^{13}	x^{14}	x^{15}

c) a vevő állomás hajtja végre a ciklikus rendundancia ellenőrzést (CRC) a keret tartalmán, kezdve az első bittel, amelyet a nyitó jelző biteket követően vettek, és beleértve az összes bitet a záró jelző bitet megelőző utolsó bitig, azt is magába foglalva, de kizárva az összes 0 bitet (ha van), amelyeket az átlátszóság elérése szabályainak megfelelően töröltek;

d) az FCS összegyűjtésének elvégzése után a vevő állomásnak meg kell vizsgálnia a maradékot. Ha átviteli hiba nincs, a maradék 1111000010111000 lesz (x^0-tól – x^{15}-ig külön-külön).

8.6.4.2.3 *Az átláthatóság elérése.* A keret formátumnak (A, C, kapcsolati adat mező és FCS) képesnek kell lenni bármely bit konfiguráció magába foglalására.

8.6.4.2.3.1 A következő szabályokat kell alkalmazni az összes keret tartalomhoz, kivéve a jelző bit sorozatokat:

a) a továbbító állomásnak kell megvizsgálnia a keret tartalmat az átvitel előtt, és beilleszteni egy 0 bitet, közvetlenül minden 5 egymást követő 1-es bitből álló sorozat után;

b) a vevő állomásnak kell megvizsgálnia a vett keretek tartalmát az 5 egymást követő 1-bitből és az azt közvetlenül követő egy (vagy több) 0 bit(ek)ből álló sémák szerint, és el kell távolítani azokat a 0 biteket, amelyek az 5 egymás utáni 1-es biteket közvetlenül követik.

8.6.4.2.4 *Speciális átviteli sorozatok és vonatkozó kapcsolati állapotok.* Az adatcsere és vezérlő információk irányítását szolgáló utasítások és válaszok repertoárján kívül az állomások a következő hagyományos eljárásokat alkalmazzák az közölt körülmények jelzésére:

a) *Megszakítás* az az eljárás, amellyel az állomás egy keret küldésének folyamatánál a keretet nem a szokásos módon fejezi be úgy, hogy a keretet vevő állomásnak figyelmen kívül kell hagyni azt. A hagyományos eljárások egy keret megszakításához a következők:

1) legalább hét, de tizenötnél kevesebb egyes bit továbbítása (közbeiktatott nullák nélkül);

2) hét egyes bit vétele;

b) *Aktív kapcsolat állapot.* Egy kapcsolat aktív állapotban van akkor, amikor egy keretet, egy megszakítás sorozatot, vagy keretközi idő-kitöltést továbbít. Amikor a kapcsolat aktív állapotban van, a továbbító állomás részére fenn kell tartani a továbbítás folytatásának jogát.

c) *Keretközi idő-kitöltés.* Keretközi idő-kitöltést a keretek közötti folyamatos jelző bitek továbbításával kell végrehajtani. Nincs időkitöltés a kereten belül.

d) *Inaktív kapcsolat állapot.* A kapcsolat inaktív állapotban van akkor, amikor olyan folyamatos egyes helyzetet észlelnek, amely 15 bit vagy ennél hosszabb időn át tart. Az inaktív állapot időkitöltésnek egy folyamatos egyes állapotnak kell lenni a kapcsolaton.

e) *Érvénytelen keret.* Az érvénytelen keret egy olyan keret, amelyet nem megfelelően határol két jelző bit, vagy olyan keret, amelynél a jelző bitek közötti bitek száma kevesebb, mint 32.

8-5. táblázat. Vezérlő mező formátumok

Vezérlő mező formátum	Vezérlő mező bitek							
	1	2	3	4	5	6	7	8
Információ átvitel (I keret)	0		*N(S)*		*P*		*N(R)*	
Ellenőrző utasítások/válaszok (S keret)	1	0	*S*	*S*	*P/F*		*N(R)*	
Számozatlan utasítások /válaszok	1	1	*M*	*M*	*P/F*	*M*	*M*	*M*

ahol:

N(S) = elküldött sorozat számlálás (2-es bit = legkisebb helyiértékű bit)
N(R) = vett sorozat számlálás (6-os bit = legkisebb helyiértékű bit)
S = ellenőrző funkció bitek
M = módosító funkció bitek
P = lekérdező bit (utasításokban)
F = záró bit (válaszokban)

8.6.4.2.5 *ÜZEMMÓDOK*

8.6.4.2.5.1 *Működési üzemmód.* A működési üzemmódnak aszinkron szimmetrikus üzemmódnak (ABM) kell lenni.

8.6.4.2.5.1.1 Aszinkron szimmetrikus üzemmódban lévő kombinált állomás részére megengedett kell, hogy legyen az átvitel, a hozzátartozó állomástól jövő meghívás nélkül.

8.6.4.2.5.1.2 Az ABM üzemmódban lévő kombinált állomás részére megengedett kell, hogy legyen, hogy bármilyen utasítás vagy válasz típusú keretet továbbítson a DM kivételével.

8.6.4.2.5.2 *Működésen kívüli üzemmód.* A működésen kívüli üzemmód az aszinkron szétkapcsolt üzemmód (ADM), amelyben egy kombinált állomás logikailag le van kapcsolva az adat-kapcsolatról.

8.6.4.2.5.2.1 Az ADM üzemmódban lévő kombinált állomás részére megengedhető kell, hogy legyen az átvitel, a hozzátartozó állomástól jövő meghívás nélkül.

8.6.4.2.5.2.2 Az ADM üzemmódban lévő kombinált állomás csak SABM, DISC, UA és DM kereteket továbbíthat. (Lásd az alábbiakban a 8.6.4.2.7 pontban azoknak az utasításoknak és válaszoknak a leírását, amelyek ezekre a keret típusokra vonatkoznak.)

8.6.4.2.5.2.3 Az ADM üzemmódban lévő kombinált állomásnak DM-et kell továbbítania, ha DISC-t vesz, és minden más vett utasítás keretet érvényteleníteni kell az SABM kivételével. Ha egy érvénytelenített utasítás keret a P-bitet “1”-re állította, akkor a kombinált állomásnak “1”-re állított F-bites DM-et kell továbbítania.

8.6.4.2.6 *Vezérlő mező funkciók és paraméterek.* A vezérlő mezők utasítást vagy választ és sorszámokat tartalmaznak, ahol alkalmazható. Három típusú vezérlő mezőt kell használni a következők végrehajtásához:

a) számozott információ átadás (I-keretek);

b) számozott ellenőrző funkciók (S-keretek); és

c) számozatlan vetlrkő funkciók (U-keretek).

A vezérlő mező formátumok a 8-5. táblázatban megadottaknak kell lenniük. A funkcionális keret kijelölés, amely az egyes típusú vezérlő mezőkkel, valamint az ezeknek a funkcióknak az ellátásában alkalmazott vezérlő mező paraméterekkel kapcsolatosak, a következő pontokban kerülnek leírásra.

8.6.4.2.6.1 Az I-keret típust az információ továbbítások teljesítésére használják. Néhány speciális eset kivételével ez az egyetlen formátum, amelynek részére engedélyezett, hogy egy információs mezőt tartalmazzon.

8.6.4.2.6.2 Az S-keret típust ellenőrző utasításokhoz és válaszokhoz használják, azokhoz, amelyek olyan kapcsolat ellenőrző szabályozási funkciókat teljesítenek, mint az információ keretek nyugtázása, az információs keretek átvitelének és újra-átvitelének kérése, valamint az I-keretek átvitelének az ideiglenes felfüggesztési kérésre. Az S-keret nem tartalmazhat információs mezőt.

8.6.4.2.6.3 Az U-keret típust számozatlan utasítások és válaszok esetében használják, azokban, amelyek kiegészítő kapcsolat vezérlési funkciókat látnak el. Az U-keret válaszok egyike, a keret visszautasítás (FRMR) válasz információs mezőt tartalmaz; az U-keret típus összes többi kerete információs mezőt nem tartalmazhat.

8.6.4.2.6.4 A három vezérlő mező típushoz kapcsolódó állomás paraméterek a következők:

a) *Tényező.* Mindegyik I-keretet sorszámmal látnak el N(S) sorszám küldésével, ami 0 értékkel bír a mínusz egy tényezőn keresztül (ahol a tényező a sorszám tényezője). A tényezőnek 8-nak kell lenni. A sorrend szerint számozott azon I-keretek maximális száma, amellyel egy állomás bármely adott időpontban elintézetlenül (azaz visszaigazolatlanul) rendelkezik, soha nem haladhatja meg egynél kevesebbel a sorszámok tényezőjét. Az elintézetlen keretek számának ez a korlátozása azért szükséges, hogy megakadályozzon bármely félreérthetőséget az átviteli kereteknek a sorszámokhoz való kapcsolódásánál a normál működés és/vagy a hiba kijavítása során.

b) A küldés állapot változó V(S) jelöli ki a soronkövetkező, átvitelre kerülő I-keret sorszámát.

1) A küldés állapot változó felveszi a 0 értéket a modulusz mínusz egy tényezőn keresztül (a tényező a sorszámozás és a teljes intervallumon keresztüli számciklusok tényezője).

2) A V(S) értéke minden egymást követő sorrendi I-keret átvitellel eggyel növekszik, de nem haladhatja meg többel, az N(R) értéket, mint az elintézetlen I-keretek maximálisan megengedett száma (k), amelyet az utolsó vett keret tartalmaz. Lásd a k meghatározását az alábbi i) pontban.

c) A sorra következő I-keret átvitelét megelőzően az N(S) értékét fel kell frissíteni, hogy egyenlő legyen V(S) értékével.

d) A vételi állapot változó, V(R) jelöli ki a vételre sorban következő I-keret sorszámát.

1) A V(R)-nek fel kell venni a 0 értéket a modulusz mínusz egyen keresztül.

2) A V(R) értéket eggyel növelik egy hibamentes, sorozatban lévő I-keret vétele után, ahol az I-keret N(S) küldési sorszáma V(R)-el egyenlő.

e) Az összes I-keretnek és S-keretnek tartalmaznia kell az N(R)-t, a soronkövetkező vett keret várható sorszámát. Egy I vagy S típusú keret továbbítása előtt az N(R) értéket fel kell frissíteni úgy, hogy egyenlő legyen a vételi állapot változó aktuális értékével. Az N(R) jelzi azt, hogy az N(R)-t átvivő állomás megfelelően vette az összes I-keretet, amely (N(R)-1)-ig van számozva, beleértve az N(R)-1 számút is.

f) Mindegyik állomás fenntart egy független küldés állapot változót V(S) és egy vétel állapot változót V(R) az I-kereten, amelyen küld és vesz. Azaz mindegyik kombinált állomásnak egy V(S) számot kell fenntartani az I-kereteken, amelyeket továbbít, és egy V(R) számot az I-kereteken, amelyeket megfelelően vett a távoli kombinált állomástól.

g) A lekérdező (P/F) bitet a kombinált állomás használja egy válasz, vagy egy válasz-sorozat kérésére (nyomatékosan kér) a távoli kombinált állomástól.

h) A záró (P/F) bitet a távoli kombinált állomás használja egy lekérés (lehívás) utasítás eredményeként továbbított válasz keret jelzésére.

i) Azon sorszámozott I-keretek maximális száma (k), amelyeket egy állomás elintézetlenül (nyugtázatlanul) birtokolhat egy adott, tetszőleges időpontban, egy állomás paraméter, amely a tényezőt soha sem haladhatja meg.

Megjegyzés. – A k-t az állomás tárolási korlátai határozzák meg, és az áramkör létrehozása idején kötött kétoldalú egyezmények tárgyát kell, hogy képezze.

8.6.4.2.7 *Utasítások és válaszok.* A kombinált állomás részére megengedett kell, hogy legyen az, hogy akár utasításokat, akár válaszokat hozzon létre. Az utasításnak a távoli állomás címzését, míg a válasznak a küldő állomás címzését kell tartalmaznia. Az összes utasítással és válasszal kapcsolatos emlékeztető az, amely a három keret típus (I, S és U) mindegyikére elő van írva és a vezérlési mező hozzátartozó kódolásának a 8-6. táblázatban megadottnak kell lenni.

8.6.4.2.7.1 Az I-keret utasítás szolgáltatja az eszközt a sorszámmal ellátott keretek átviteléhez, amelyek mindegyikének megengedett kell, hogy legyen az, hogy egy információ mezőt tartalmazzon.

8.6.4.2.7.2 Az S-keret utasításokat és válaszokat a számozott ellenőrző funkciók teljesítésére kell használni (mint például nyugtázás, lekérdezés, az információ továbbítás átmeneti felfüggesztése, vagy hibajavítás).

8.6.4.2.7.2.1 A vételre kész utasítást vagy választ (RR) az állomás a következőkre használja:

a) jelzi, hogy kész egy I-keret vételére;

b) visszaigazolja az előzőleg vett, számozott I-kereteket N(R)-1-ig, ez utóbbit is beleértve;

c) törli a foglalt állapotot, amelyet az RNR átvitele kezdeményezett.

Megjegyzés. – Egy kombinált állomás részére megengedett az RR utasítás használata egy olyan távoli kombinált állomástól való válasz kérésére, amelynek a lekérdező bitje "1"-re van beállítva.

8.6.4.2.7.2.2 Megengedettnek kell lenni egy visszautasító parancs vagy válasz (REJ) utasítás kiadására az N(R) számozású I-kerettel kezdődő keretek újra-továbbítás kérésére, ahol:

a) N(R)-1 és az ez alatti számozású I-kereteket nyugtázták;

b) a további kezdeti átvitelre váró I-kereteket az újra átvitt I-keret(ek)et követően kell továbbítani;

c) csak egy REJ mentességi feltétel állapotot lehet létrehozni egyik adott állomástól egy másik állomáshoz, bármely adott időpontban; másik REJ nem adható ki addig, amíg az első REJ mentességi feltételt nem szabadították fel;

d) a REJ mentességi állapotot törlik (visszaállítják) egy olyan I-keret fogadása után, amelynek száma egyenlő a REJ utasítás/válasz N(R)-jével.

8-6. táblázat. Utasítások és válaszok

Típus	Utasítások		Válaszok		C-mező kódolás							
1	2	3	4	5	6	7	8					
Információ átvitel	I	(információ)			0		N(S)		P		N(R)	
Ellenőrzés	RR	(vételre kész)	RR	(vételre kész)	1	0	0	0	P/F		N(R)	
	RNR	(vételre nem kész)	RNR	(vételre nem kész)	1	0	1	0	P/F		N(R)	
	REJ	(visszautasítás)	REJ	(visszautasítás)	1	0	0	1	P/F		N(R)	
Számozatlan			DM	(szétkapcsolt mód)	1	1	1	1	P/F	0	0	0
	SABM	(beállítás aszinkron szimmetrikus mód)			1	1	1	1	P	1	0	0
	DISC	(szétkapcsolás)			1	1	0	0	P	0	1	0
			UA	(számozatlan nyugtázás)	1	1	0	0	F	1	1	0
			FRMR	(keret visszautasítás)	1	1	1	0	F	0	0	1

8.6.4.2.7.2.3 A vételre nem kész utasítást vagy választ (RNR) egy foglalt állapot jelzésére használják, azaz további bejövő I-keretek átmeneti fogadásképtelenségének jelzésére ott, ahol:

a) a kereteket, amelyek N(R)-1-ig, az utóbbit is beleszámítva, vannak számozva, nyugtázták;

b) az N(R) keret és bármely azt követő vett I-keret, ha van ilyen, nem került nyugtázásra (ezeknek a kereteknek a fogadási helyzetét a következő összeköttetésekben kell jelezni);

c) a foglalt állapot törlését egy RR-, REJ-, SABM- vagy UA "I"-re állított P/F bittel vagy anélkül történő továbbítása jelzi.

8.6.4.2.7.2.3.1 **Ajánlás.** –

a) Egy RNR keretet az átviteli folyamatban vevő állomásnak az I-keretek továbbítását a lehető leghamarabble kell állítania.

b) Bármely REJ utasítást vagy választ, amelyet az RNR előtt vettek, be kell indítani az átvitel befejezése előtt.

c) Kombinált állomás számára megengedett az "I"-re állított lekérdező bites RNR utasítás használata azért, hogy "I"-re állított záró bites ellenőrző keretet kapjanak a távoli kombinált állomástól.

8.6.4.2.7.2.4 Megengedhetőnek kell lenni annak, hogy a szelektív elutasítás parancs vagy válasz (SREJ) felhasználható legyen egy N(R) számozású egyedüli I-keret újra-továbbítási kérésére akkor, amikor:

a) az N(R-1)-ig számozott keretek nyugtázottak; N(R) keretet nem fogadtak; csak azokat az I-kereteket fogadják el, amelyeket megfelelően vettek és sorrendben a kért I-keretet követik; a továbbításra kerülő specifikus I-keretet az N(R) jelzi a SREJ utasítás/válaszban;

b) az SREJ kivétel állapotot törlik (újra-állítják), amint olyan I-keretet vesznek, amelynél egy N(S) szám egyenlő az SREJ N(R)-jével;

c) azután, hogy az állomás egy SREJ-t továbbít, nem megengedett az SREJ vagy az REJ továbbítása egy további sorozat hibánál addig, amíg az első SREJ hiba körülmény nem került törlésre;

d) azok az I-keretek, amelyeket az SREJ által jelzett I-keretet követően továbbításra engedélyeztek, nem kerülnek újra-továbbításra egy SREJ vétele eredményeként; és

e) megengedett további I-kereteknek a kezdeti átvitel alatt az, hogy az SREJ által kért specifikus I-keret újra-átvitelét követően továbbításra kerüljenek.

8.6.4.2.7.3 Az U-keret utasításokat és válaszokat a vezérlő funkciók számának kiterjesztésére használják. A továbbított U-keretek nem növelik a sorszámot sem a leadó, sem a vételi állomáson.

a) Az U-keret a mód-beállító utasításokat (SABM és DISC) a címzett állomásnak a megfelelő válaszmódba való (ABM vagy ADM) beállítására kell használni, ahol:

1) az utasítás elfogadása után a vevő-állomás elküld egy vételi állapot változót, V(S) és V(R), amelyek nullára vannak állítva;

2) a címzett állomás megerősíti az elfogadást a lehető leghamarabbi időpontban egyetlen, számozatlan UA nyugtázás küldésével;

3) az előzőleg továbbított keretek, amelyek az utasítás elküldése idején nyugtázatlanok, megmaradnak nyugtázatlanoknak;

4) a DISC utasítást egy logikai szétkapcsolás végrehajtására használják, azaz a címzett kombinált állomás informálására arról, hogy a továbbító kombinált állomás szünetelteti a működését. A DISC utasításhoz kapcsolódó információs mező nincs megengedve.

b) A számozatlan nyugtázási választ (UA) a kombinált állomásnak kell felhasználnia egy számozatlan utasítás vételének és elfogadásának visszaigazolására. A vett számozatlan utasítások nem aktivizálódnak addig, amíg az UA választ nem továbbítják. Az UA válaszhoz kapcsolódóan információ nem megengedett.

c) A keret visszautasító választ (FRMR), amely az alábbiakban ismertetett információs mezőt alkalmazza, egy kombinált állomás üzemelési módban (ABM) kell alkalmazni, hogy egy FCS hiba nélküli keret vételéből az alábbi körülmények egyike következett be:

1) utasítás/válasz, amely érvénytelen vagy nem megvalósított;

2) keret információs mezővel, amely meghaladja a rendelkezésre álló tároló méretét;

3) érvénytelen N(R) számmal rendelkező keret.

Megjegyzés. – Az érvénytelen N(R) egy olyan szám, amely olyan I-keretre utal, amelyet előzőleg már továbbítottak és visszaigazoltak, vagy olyan I-keretre, amelyet még nem továbbítottak és nem az a következő átvitelre kerülő I-keret.

d) A szétkapcsolt módú választ (DM) egy nem-üzemelő státusz jelentésére kell használni akkor, amikor az állomás logikailag szét van kapcsolva az összeköttetéstől. A DM válaszhoz kapcsolódóan információs mező nem engedélyezett.

Megjegyzés. – A DM választ azért küldik, hogy kérjék a távoli kombinált állomást, hogy adjon ki egy mód-beállítás utasítást, vagy ha küldött egy mód-beállítás utasítás vételére adott választ, akkor a távoli kombinált állomás tájékoztatására arról, hogy az átvivő állomás még mindig ADM-ben van és nem tudja a mód-beállítás utasítást aktivizálni.

8.6.4.3 *Kihagyási helyzet jelentés és helyreállítás.* Ez a szakasz azokat az eljárásokat határozzaí meg, amelyeket egy kihagyási helyzet észlelését vagy megjelenését követő helyreállítás végrehajtásához alkalmaznak a kapcsolat szinten. A kihagyási helyzetek azok a szituációk, amelyek átviteli hibák, állomás meghibásodás vagy üzemelési helyzetek eredményeként lépnek fel.

8.6.4.3.1 *Foglaltság állapot.* A foglaltság állapot akkor lép fel, amikor egy állomás átmenetileg nem tud I-kereteket venni, vagy nem tudja folytatni a vételüket belső kényszer, pl. tárolási korlátok miatt. A foglaltság állapotot a távoli kombinált állomásnak a következőnek várt I-keret N(R) számával rendelkező RNR keret továbbításával kell jelezni. Megengedhető az, hogy a foglalt állomás egy forgalom felfüggesztési adást továbbítson az RNR-t megelőzően vagy azt követően.

Megjegyzés. – A foglaltság állapot folytatódó fennállását jelenteni kell az RNR ismételt leadásával mindegyik P/F keret cserénél.

8.6.4.3.1.1 Egy RNR fogadása után egy kombinált állomásnak ABM-ben a lehető legrövidebb időn belül meg kell szünteti az I-keretek továbbítását a folyamatban lévő keretet befejezve vagy leállítva. Egy RNR-t vevő kombinált állomásnak végre kell hajtania az idő-túllépési üzemeltetést, mielőtt folytatja az I-keretek aszinkron átvitelét, kivéve, ha a foglaltság állapotot nem jelenti töröltként a távoli kombinált állomás. Ha az RNR-t "1"-re állított P-bites utasításként vették, akkor a vevő állomásnak egy "1"-re állított F bites S-kerettel kell válaszolnia.

8.6.4.3.1.2 A foglaltság állapotot törölni kell annál az állomásnál, amelyik az RNR-t továbbította, amikor a belső kényszers megszünik.. A foglalt állapot törlését egy RR, REJ, SABM vagy UA keret ("1"-re állított P/F bittel vagy anélküli) továbbításával kell jelenteni.

FRMR INFORMÁCIÓS MEZŐ BITEK ALAP (SABM) ÜZEMELÉSNÉL

Az első
továbbí-
tott bit

1 8	9	10 12	13	14 16	17	18	19	20	21 24
Visszautasított alap vezérlési mező	0	V(S)	v	V(R)	w	x	y	z	Beállítás nullára

ahol:

a visszautasított alap vezérlési mező annak annak a vett keretnek a vezérlési mezője, amely a keret elutasítását hozta létre;

a *V(S)* a küldés állapot változó aktuális értéke annál a távoli kombinált állomásnál, amely a hiba állapotot jelenti (10-es bit = legkisebb helyiértékű bit);

a *V(R)* a vétel állapot változó aktuális értéke annál atávoli kombinált állomásnál, amely a hiba állapotot jelenti (14-es bit = legkisebb bit);

az “1”-re állított *v* azt jelzi, hogy a vett keret, amely a visszautasítást okozta, egy válasz volt;

az “1”-re állított *w* azt jelzi, hogy a vett és visszaküldött vezérlési mező az 1-től 8-ig terjedő bitjei érvénytelenek vagy nem feltöltöttek voltak;

az “1”-re állított *x* azt jelzi, hogy a vett és visszaküldött vezérlési mezőt az 1-től 8-ig terjedő biteknél érvénytelennek tekintették, mert a keret egy információs mezőt tartalmazott, amely ezzel az utasítással nem megengedett. A *w* bitet ezzel összekapcsoltan “1”-re kell beállítani;

az “1”-re állított *y* az jelzi, hogy a vett információs mező meghaladta azt a maximális információs mező hosszt, amelyet a hiba körülményt jelentő állomás még be tud fogadni. Ez a bit a fenti *w* és *x* bitekkel kölcsönösen kizárják egymást;

az “1”-re állított *z* azt jelzi, hogy a vett és visszaküldött vezérlés mező az 1–8 intervallumban lévő biteknél érvénytelen N(R) számot tartalmaz. Ez a bit a *w* bittel kölcsönösen kizárják egymást.

8.6.4.3.2 *N(S) sorszám hiba.* Egy N(S) sorszám elhagyásl jön létre a vevő állomáson akkor, ha egy I-keret, amelyet hibamentesen vettek (nincs FCS hiba), egy olyan N(S) sorszámot tartalmaz, amely nem egyenlő a V(R) vételi változóval a vevő állomáson. A vevő állomás nem nyugtázza le a keretet (nem növelheti a V(R) vételi változóját), amely a sorszám hibát okozza ,vagy semelyik I-keretet sem, amely követheti, amíg egy helyes N(S) számú I-keretet nem vesz. Egy állomásnak- amely egy vagy több olyan I-keretet vesz, amely sorszám hibával rendelkezik, de amelyek egyébként hibamentesek- el kell, hogy fogadja az N(R) mezőben és a P/F bitben lévő információkat, hogy teljesítse a kapcsolat vezérlési funkciókat, azaz, hogy vegye az előzőleg továbbított I-keretek nyugtását, az N(R)-en keresztül, hogy válaszra késztesse az álloműst (p bit “1”-re állítva).

8.6.4.3.2.1 Az alábbi 8.6.4.3.2.1.1 és 8.6.4.3.2.1.2 pontokban meghatározott körülmények egy sorszám hiba előfordulást követő, elveszett vagy elhibázott I-keretek újra-továbbításának kezdeményezésére szolgálnak.

8.6.4.3.2.1.1 Ahol a REJ utasítás/válasz-t használják egy kihagyási helyreállítás kezdeményezésére egy sorszám hiba észlelését követően, ott csak egy “küldött REJ” kihagyási állapot jöhet létre egyidőben az egyik állomástól a másik állomáshoz. Egy “küldött REJ” kihagyás akkor szabadul fel, amikor a kért I-keretet veszik. A REJ-t vevő állomás az I-keretek egymás utáni (újra)továbbítását kezdeményezi a REJ keret által tartalmazott N(R) által jelölt I-kerettel indulva.

8.6.4.3.2.1.2 Abban az esetben, ha a vevő állomás átviteli hiba miatt nem fogad (vagy fogad és érvénytelenít) egy egyedülálló I-keretet, vagy az utolsó I-keret(ek)et az I-keretek egy sorozatában, nem kell, hogy egy sorozaton kívüli kihaígyást észleljen, és ennek folytán nem kell REJ-t továbbítania. Az állomás, amely a nyugtázatlan I-keret(ek)et továbbította, egy rendszer-specifikus szünetelés befejezését követően megfelelő helyreállítási műveletet végez, hogy meghatározza a sorszámot, amelynél az újra-továbbítást meg kell kezdeni.

8.6.4.3.2.1.3 **Ajánlás.** – *Egy szünetelő kombinált állomás, amely válaszra vár, nem továbbíthatja újra az összes nyugtázatlan keretet azonnal. Az állomás érdeklődhet az állapot felől az ellenőrző kerettel.*

1. Megjegyzés. – Ha egy állomás újra-továbbítja az összes nyugtázatlan I-keretet egy szünet után, akkor az állomásnak elő kell készülnie egy utána következő olyan REJ keret vételére, amelynél az N(R) nagyobb, mint a V(S) küldési változó.

2. Megjegyzés. – Mivel verseny léphet fel a kétféle alternatív kommunikáció esetében - az ABM-ben vagy ADM-ben, -az egyik kombinált állomás által alkalmazott szünet időtartamnak nagyobbnak kell lennie, mint a másik kombinált állomás által alkalmazottének, ezáltal a verseny megoldása lehetségessé válik.

8.6.4.3.3 *FCS hiba.* Semmilyen FCS hibás keretet nem fogadhat el a vevő állomás és az ilyeneket érvényteleníteni kell. A vevő állomás ilyen keret hatására semmilyen műveletet nem végez.

8.6.4.3.4 *Keret visszautasítás kihagyás állapot.* A keret visszautasítás kihagyás állapot egy hibamentes keret elfogadásánál lép fel, amely keret egy érvénytelen vagy nem megvalósított vezérlési mezőt, érvénytelen N(R)-t, vagy egy olyan információs mezőt tartalmaz, amely meghaladja a létrehozott tároló kapacitás maximumát. Ha keret visszautasítás kivhagyás állapot lép fel egy kombinált állomáson, akkor az állomásnak vagy:

a) visszaállítási műveletet kell végeznie anélkül, hogy jelentené az állapotot a távoli kombinált állomásnak; vagy

b) jelenti az állapotot a távoli kombinált állomásnak egy FRMR válasszal. A távoli állomástól ekkor elvárják, hogy végezze el a helyreállítási műveletet ha bizonyos idő kivárása után nem jelenik meg a helyreállítási művelet végrehajtása, akkor a kombinált állomás, amely jelenti a keret visszautasítás kihagyási állapotot, végrehajtja a helyreállítási műveletet.

A helyreállítási művelet a szimmetrikus üzemelésnél magába foglalja egy megvalósított mód-beállítási utasítás átvitelét. Magasabb szintű funkciók ugyancsak résztvehetnek a helyreállításban.

8.6.4.3.5 *Mód-beállítási verseny.* Egy mód-beállítási verseny szituáció akkor lép fel, amikor egy kombinált állomás egy mód-beállítási utasítást ad ki és a megfelelő válasz (UA vagy DM) vétele előtt egy mód-beállítás utasítást vesz a távoli kombinált állomástól. A verseny helyzeteket a következő módon kell megoldani:

a) amikor a küldés és vétel mód-beállítás utasítások ugyanazok, mindegyik kombinált állomásnak egy UA választ kell küldenie a válasz küldésre adódó legelső alkalomkor. Az egyes kombinált állomások vagy belépnek a jelzett módba azonnal, vagy késleltetik a belépéslt a jelzett módba addig, amíg egy UA választ nem vesznek. Ez utóbbi esetben, ha az UA választ nem kerül vételre:

1) a módot beléptetik akkor, amikor a válasz időzítés lejár; vagy

2) a mód-beállítás utasítást újra kiadják;

b) ha a mód-beállítási utasítások különbözőek, mindegyik kombinált állomásnak be kell lépnie az ADM-be és egy DM választ kell kiadnia a válasz küldésére adódó legelső alkalomkor. DISC verseny esetében egy eltérő mód-beállítási utasítással további műveletre nincs szükség.

8.6.4.3.6 *Idő-túllépés funkciók.* Az idő-túllépés funkciókat annak észlelésére használják, amikor egy kívánt vagy elvárt visszaigazolási műveletet vagy választ egy előzőleg továbbított kerettr még nem vettek. Az idő-túllépési funkció lejártának megfelelő műveleteket el kell indítani, pl. a hibaelhárítás a P bit újra-kiadására. A következő idő-túllépési funkciók ideje rendszer-függő és kétoldalú egyezmény tárgyát képezi:

a) kombinált állomásoknak idő-túllépési funkciót kell biztosítani annak megállapítására, hogy egy "1"-re állított P-bites utasítás keret részére adott "1"-re állított F-bites válasz keret nem került-e vételre. Az idő-túllépési funkció automatikusan megszünik azl "1"-re állított F-bites érvényes keret vétele után;

b) egy kombinált állomás, amelynek nincs elintézetlen P-bitje és amely egy vagy több keretet továbbított, amelyre válasz várható, idő-túllépés funkciót indít ahhoz, hogy észlelje a válasz nélküli állapotot. Az idő-túllépési funkció megszűnik, amikor egy I- vagy S-keret kerül vételre, ahol az N(R) nagyobb, mint az utoljára vett N(R) (ténylegesen egy vagy több I-keret nyugtázás).

8.6.5 Közös ICAO adatcsere hálózat (CIDIN)

8.6.5.1 BEVEZETÉS

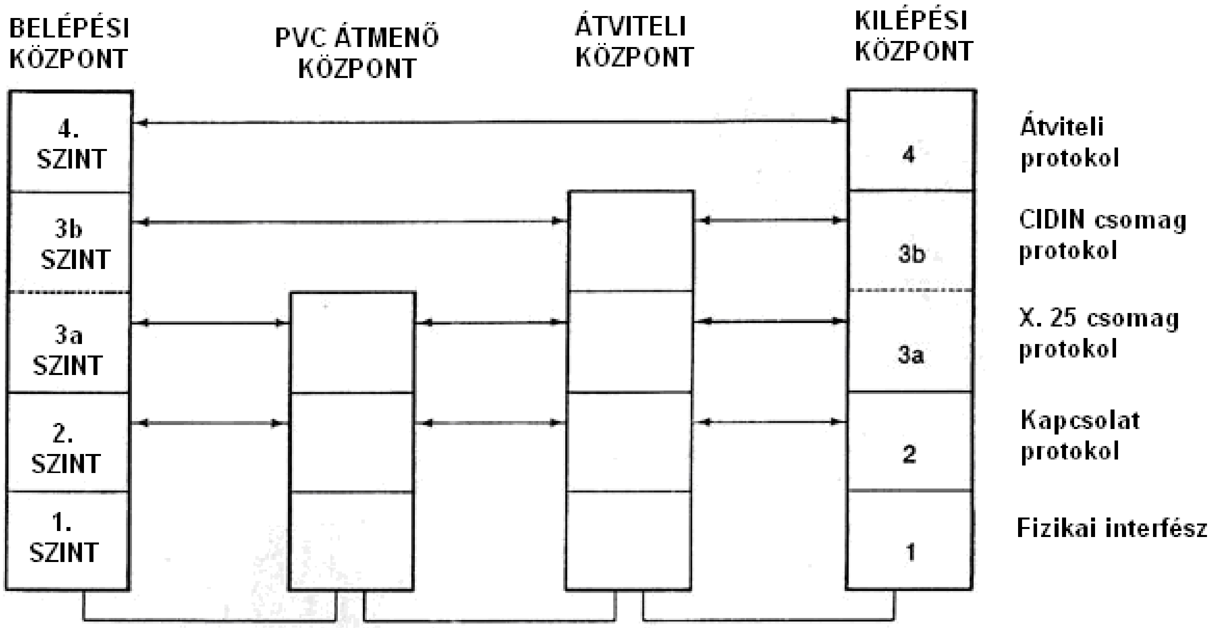
1. Megjegyzés. - A közös ICAO adatcsere hálózat (CIDIN) A Légiforgalmi Állandóhelyű Szolgálat (AFS) egy eleme, amely bit-orientált eljárásokat, tárolási és továbbítási technikákat és csomag kapcsolatú technikát használ és a CCITT X.25. Ajánlásán alapulóan továbbítja a közleményeket az AFS meghatározott alkalmazásaihoz, mint például az AFTN részére és a repülés-üzemi meteorológiai tájékoztatásokhoz (OPMET).

2. Megjegyzés. - A CIDIN egy megbízható közös hálózati szolgáltatást biztosít a felhasználói közlemények továbbításához, a légiforgalmi szolgálatokat biztosítók és a légijármű üzemeltető ügynökségek /vállalatok/ részére.

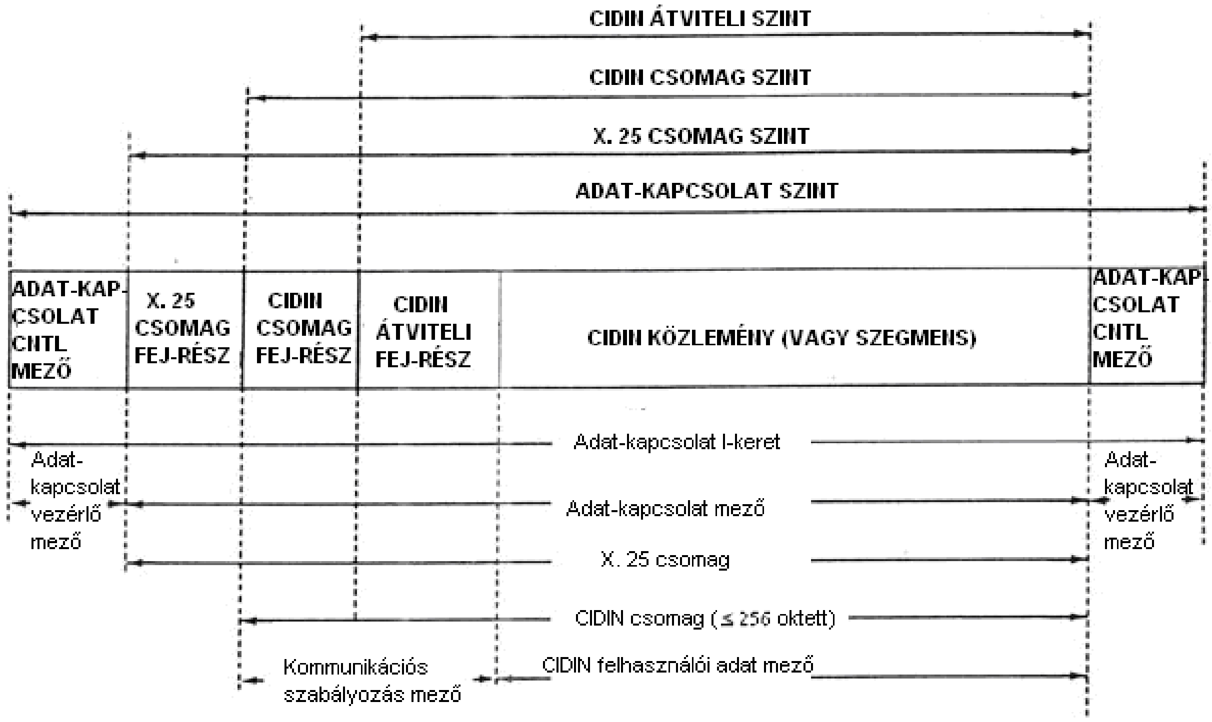
8.6.5.1.1 CIDIN belépési és kilépési központokat vagy állomásokat kell biztosítani a CIDIN alkalmazási entitásokhoz történő csatlakozásokhoz.

Megjegyzés. - A CIDIN és az alkalmazási entitások közötti interfész helyi kivitelezések tárgyát képezi.

8.6.5.1.2 A CIDIN közvetítő központokat az olyan CIDIN belépési és kilépési központok közötti csomagok továbbítására kell használni, amelyek nincsenek közvetlenül kapcsolva.



8-1. ábra. CIDIN protokol szintek



8-2 ábra. CIDIN terminológia

8.6.5.2 ÁLTALÁNOS

8.6.5.2.1 Négy protokol szintet kell meghatározni a CIDIN kapcsoló-központok közötti adatátvitel vezérléséhez.

- Az adat-kapcsolat protokol szintet,
- az X.25 csomag protokol szintet,
- a CIDIN csomag protokol szintet,
- a CIDIN átviteli protokol szintet.

1. Megjegyzés. - Az alkalmazott szakkifejezések közötti összefüggéseket a 8-1. és 8-2. ábra mutatja be.

2. Megjegyzés. - A CIDIN összeköttetési eljárások és rendszer előírások részletes leírása - ahogy az Európában megvalósításra került - az EUR CIDIN Kézikönyvben került megadásra (EUR Doc 005).

8.6.5.2.2 *AZ ADAT-KAPCSOLATI PROTOKOL SZINT*

8.6.5.2.2.1 Az X.25 csomagot, amely továbbításra kerül két CIDIN kapcsoló-központ vagy egy CIDIN kapcsoló-központ és egy csomag-kapcsolt adatátviteli hálózat között, adat-kapcsolati keretekbe kell formattálni.

8.6.5.2.2.2 Az egyes adat-kapcsolati kereteknek magukba kell foglalni egy adat-kapcsolat vezérlő mezőt, esetlegesen egy kapcsolat adatmezővel folytatva és jelző bitekkel kell befejezni azokat (ezek a DLCF második részét képezik). Ha van kapcsolat adatmező, akkor a keretet információs keretként kell megjelölni.

8.6.5.2.2.3 Az X.25 csomagokat az információs mezők kapcsolat adatmezőin belül kell továbbítani. A kapcsolat adatmező csak egy csomagot foglalhat magába.

8.6.5.2.3 *AZ X.25 CSOMAG PROTOKOL SZINT*

8.6.5.2.3.1 Minden egyes, a CIDIN kapcsoló-központok között, a CIDIN-áramkörökön továbbított CIDIN csomagnak egy X.25 csomagba formattált csomagnak kell lenni. Amikor egy csomag-kapcsolt adatátviteli hálózat használatos, akkor megengedhetőnek kell lenni annak, hogy a CIDIN keret egynél több csomagba kerüljön formattálásra.

8.6.5.2.3.2 Az egyes CIDIN csomagok integritását a CIDIN csomagnak kell megőriznie az egyes CIDIN csomagoknak egy teljes X.25 keret sorozatba való leképezésével, ahogy azt a CCITT X.25 Ajánlása meghatározza.

8.6.5.2.3.3 Az egyes X.25 csomagoknak maguba kell foglalniuk az X.25 csomag fej-részt, amit esetlegesen a felhasználói adatmező (UDF) követ.

8.6.5.2.3.4 Az X.25 csomag protokol a virtuális áramköri eljárások alkalmazásán alapszik. Egy virtuális áramkört úgy kell meghatározni, hogy az egy logikai út két CIDIN kapcsoló-központ között. Ha csomag- kapcsolt adatátviteli hálózatot használnak, a CIDIN kapcsoló-központok közötti összekapcslódáshoz, akkor biztosítani kell a teljes kompatibilitást azokkal az eljárásokkal, amit a CCITT X.25 Ajánlása szerint a virtuális áramkörök megkövetelnek.

8.6.5.2.4 *A CIDIN CSOMAG PROTOKOL SZINT*

8.6.5.2.4.1 Minden egyes átviteli fej-részt és a hozzá kapcsolódó szegmenst egy CIDIN csomag fej-résznek kell megelőzni. A CIDIN közlemény semmilyen további szegmentálására nincs szükség az átviteli protokol szint és a CIDIN csomag protokol szint között. Ennek megfelelően mindkét fej-részt összekapcsolva fel kell használni. Együtt ezeket összeköttetési vezérlő mezőnek (CCF) nevezik. A közlemény szegmenssel együtt ezek képezik azokat a CIDIN csomagokat, amelyeket a belépési központtól a kilépési központ(ok)ig továbbítani kell, amikor szükséges, egy vagy több közvetítő központon keresztül egy entitásként.

8.6.5.2.4.2 Egy CIDIN közlemény CIDIN csomagjait önállóan kell továbbítani a hálózat előre kijelölt útvonalain keresztül, ami ezáltal lehetővé teszi az alternatív továbbítási útvonalakat a CIDIN csomag alapján, ahogy szükséges.

8.6.5.2.4.3 A CIDIN csomag fej-résznek tartalmaznia kell azt az információt, ami lehetővé teszi a közvetítő központoknak a CIDIN csomagok elsőbbség szerinti kezelését, a CIDIN csomagoknak a megfelelő kimeneti áramkör(ök)ön való továbbítását és a CIDIN csomagok duplikálását, vagy megtöbbszörözését, amikor ez a többszörös elosztás céljából szükséges. Az információnak kielégítőnek kell lenni ahhoz, hogy a kilépő címzettnél alkalmazzák a címzés szerinti leválasztást, valamint az AFTN-formátumnál a közlemények a címzett indikátorának meghatározását.

8.6.5.2.5 *ÁTVITELI PROTOKOL SZINT*

8.6.5.2.5.1 A CIDIN /hálózaton/ cserélt információkat CIDIN-közleményekként kell továbbítani.

8.6.5.2.5.2 A CIDIN közlemény hosszát a CIDIN csomag sorozat szám (CPSN) határozza meg. A maximális megengedhető hossz 2^{15} csomag, ami valójában nem eredményez gyakorlati korlátozást.

8.6.5.2.5.3 Ha a CIDIN közlemény és annak átviteli és csomag fej-részeinek a hossza (ahogy az az alábbiakban meghatározásra kerül) meghaladja a 256 oktettet, akkor a közleményt szegmensekre kell osztani, és a CIDIN csomagokat a CIDIN felhasználói adatmezőjébe kell behelyezni. Minden egyes szegmenst meg kell, hogy előzzön egy olyan átviteli fej-rész, amely elegendő információt tartalmaz ahhoz, hogy a kilépő állomás(ok) az egyedileg vett szegmensekből újra összeállítsák a CIDIN közleményt, és meghatározzák a vett teljes CIDIN közlemény további kezelését.

8.6.5.2.5.4 A CIDIN közlemény összes szegmensének a továbbítási fej-részben ugyanazon közlemény azonosító információval ellátottnak kell lenni. Csak a CSPN és az utolsó CIDIN csomag (FCP) jelzése lehet eltérő.

8.6.5.2.5.5 A közlemények helyreállítását az átviteli szinten kell elvégezni.

9. FEJEZET. LÉGIJÁRMŰ CÍMZÉSI RENDSZER

9.1 A légijármű címzéseknek a 16777214 huszonnégy-bites légijármű címzések egyikének kell lenni, amelyet az ICAO osztott ki a lajstromozó Államoknak vagy az Európai Gazdasági Közösség lajstromozó hatóságainak, és az ehhez a fejezethez tartozó Függelékben leírtaknak megfelelően van kijelölve.

FÜGGELÉK A 9. FEJEZETHEZ. VILÁGMÉRETŰ SÉMA A LÉGIJÁRMŰ CÍMZÉSEK KIOSZTÁSÁHOZ, KIJELÖLÉSÉHEZ ÉS ALKALMAZÁSÁHOZ

1. Általános

1.1 Világméretű kommunikációs, navigációs és légtér-ellenőrzési rendszerek 24 bitből álló egyedi légijármű címzést használnak. Egy címzést egy időben csak egy légijárműnek jelölhetnek ki. A légijármű címzések kijelölése átfogó sémát igényel, amely világméretekben alkalmazható, kiegyensúlyozott és kiterjeszthető légijármű címzés elosztást szolgáltat.

2. A séma leírása

2.1 A 9-1 táblázat tartalmazza az Államok részére a légijármű kijelöléshez rendelkezésre álló, egymásután következő címzések blokkjait. Mindegyik blokkot a 24-bites címzés első 4, 6, 9, 12 vagy 14 bitjének rögzített sémája definiálja. Így különböző méretű blokkok (1048576, 262144, 32768, 4096 és 1024 egymást követő címzések) állnak rendelkezésre.

3. A séma kezelése

3.1 A Nemzetközi Polgári Repülési Szervezetnek (ICAO) a sémát úgy kell adminisztrálnia, hogy a légijármű címzések megfelelő nemzetközi elosztása fenntartható legyen.

4. Légijármű címzések kiosztása

4.1 A légijármű címzés blokkokat az ICAO kiosztja a Lajstromozó Államnak vagy az Európai Gazdasági Közösség lajstromozó hatóságainak. A címzések kiosztását az Államok között a 9-1 táblázat mutatja be.

4.2 A Lajstromozó Államnak vagy az Európai Gazdasági Közösség lajstromozó hatóságainak közölnie kell az ICAO-val, ha a címzések egy további blokkjának kiosztása válik szükségessé részére, a légijárműveknek való kijelölése céljából.

4.3 A séma jövőbeni kezelésében előnyben kell részesíteni azokat a légijármű címzés blokkokat, amelyek még nem kerültek kiosztásra. Ezeket a tartalék blokkokat a vonatkozó ICAO régiók bázisán kell szétosztani.

00100 bit kombinációval kezdődő címzések: AFI régió
00101 bit kombinációval kezdődő címzések: SAM régió
0101 bit kombinációval kezdődő címzések: EUR és NAT régió
01100 bit kombinációval kezdődő címzések: MID régió
01101 bit kombinációval kezdődő címzések: SEA régió
1001 bit kombinációval kezdődő címzések: NAM és PAC régió
111011 bit kombinációval kezdődő címzések: CAR régió

Ezeken kívül a 1011, 1101 és 1111 bit kombinációkkal kezdődő légijármű címzéseket jövőbeni alkalmazásokra tartják fenn.

4.4 További légijármű címzésre vonatkozó bármely jövőbeli igényt az ICAO és lajstromozó államok vagy az Európai Gazdasági Közösség regisztráló hatóságai közötti együttműködés keretében kell benyújtani. További légijármű címzések iránti kérést a lajstromozó hatóság csak akkor nyújthat be, ha e lajstromozó hatóság részére kiosztott címzések számának legalább 75 százalékát már kijelölték légijárművek részére.

4.5 Az ICAO kérésükre légijármű címzés blokkokat a nem-tagállamok részére is kioszt.

5. Légijármű címzések kijelölése

5.1 Ha megfelelően felszerelt nemzeti vagy nemzetközi regiszterbe felvett légijármű használatra igényelte, a lajstromozó állam vagy az Európai Gazdasági Közösség regisztráló hatósága az egyes blokkokból egyéni légijármű címzést jelöl ki a légijármű részére.

5.2 A légijármű címzéseket a következő alapelveknek megfelelően kell a légijárművek részére kijelölni:

a) egyidőben egy címzés csak egy légijármű részére jelölhető ki;

b) egy légijármű számára csak egy címzés jelölhető ki, tekintet nélkül a légijármű fedélzeten lévő berendezés kompozíciókra;

c) a címzést változtatni nem lehet, különleges körülményektől eltekintve, és repülés alatt nem változtatható;

d) amikor egy légijármű megváltoztatja lajstromozó államát, az előzőleg kijelölt címzést le kell adni és az új lajstromozó hatóságnak egy új címzést kell részére kijelölni;

e) a címzés kizárólag technikai szerepet tölt be a légijármű címzésében és azonosításában, és semmilyen specifikus információ továbbítására nem használható; és

f) a 24 NULLA-ból vagy 24 EGY-esből összeállított címzéseket nem lehet légijárművek részére kijelölni.

6. Légijármű címzések alkalmazása

6.1 A légijármű címzéseket olyan alkalmazásokban lehet felhasználni, amelyek információ irányítást igényelnek az egyes, alkalmasan felszerelt légijárművek részére vagy részéről.

1. Megjegyzés. - Ilyen alkalmazásokra példák a légiforgalmi távközlési hálózat (ATN), S-módú másodlagos légtérellenőrző radar és az összeütközési veszélyt jelző fedélzeti rendszer (ACAS).

2. Megjegyzés. - Ez a Szabvány nem zárja ki légijármű címzések kijelölését az olyan speciális alkalmazásokra, amelyek az általános alkalmazásokhoz kapcsolódnak, és abban meghatározottak. Példák az ilyen alkalmazásokra a 24-bites címzés felhasználása a pszeudo-légiforgalmi földi állomásnál a légiforgalmi mozgó-műholdas szolgálat földi telepítésű földi állomásának ellenőrzésére, és az állandó-helyű S-módú válaszjeladóknál való alkalmazás (a "földön" állapot jelzésére, ahogy az az Annex 10, IV. Kötete 3.1.2.6.10.1.2 pontjában meghatározásra került) az S-módú földi állomás működésének ellenőrzésére. A speciális alkalmazások címzés kijelölését az Állam által a 24-bites légijármű címzések kijelölésére meghatározott eljárásnak megfelelően kell elvégezni.

6.2 A 24 NULLA-ból álló címzés semmilyen alkalmazásnál nem használható fel.

7. Az ideiglenes légijármű címzések kijelölésének intézése

7.1 Egy légijármű részére ideiglenes cím kivételes körülmények esetén kerül kijelölésre, mint például akkor, ha az üzemeltetők nem képesek a címzést beszerezni a saját Államuk Lajstromozó Hatóságától, vagy az Európai Gazdasági Közösség lajstromozó hatóságától a kellő időben történő módon. Az ICAO-nak az ideiglenes címzést a 9-1. táblázatban bemutatott ICAO blokkból kell kijelölni.

7.2 Az ideiglenes címzés kérésekor a légijármű üzemeltetőjének meg kell adni az ICAO-nak: a légijármű azonosító jelét, a típusát és a légijármű gyártóját, az üzemeltető nevét és címét, valamint a kérés okának magyarázatát.

7.2.1 Az ideiglenes címzésnek a légijármű járatói részére történő kiadásakor az ICAO tájékoztatni fogja a Lajstromozó Államot az ideiglenes címzés kiadásáról, az okáról és érvényességi idejéről.

7.3 A légijármű üzemeltetője:

a) Tájékoztatni fogja a Lajstromozó Államot az ideiglenes kijelölésről és megismétli az állandó címzés iránti kérését; és

b) Tájékoztatja a légijármű gyártóját.

7.4 Amikor a légijármű a Lajstromozó Hatóságától az állandó címzést megkapja, akkor az üzemeltetőnek:

a) Késedelem nélkül tájékoztatnia kell az ICAO-t;

b) Le kell mondania az ideiglenes címzésről; és

c) Elrendeznie az érvényes egyedi címzésnek a bekódolását 180 naptári napon belül.

7.5 Ha az állandó címet egy éven belül nem kapja meg, akkor a légijármű üzemeltetőjének újra kérnie kell egy új ideiglenes légijármű címzést. Semmilyen esetben sem használhat egy ideiglenes légijármű címzést a légijármű üzemeltetője egy évnél tovább.

9-1. táblázat. Légijármű címzések kiosztása az Államoknak

Megjegyzés. – A 24 bites címzés sémák baloldali oszlopa a címzés legmagasabb helyiértékű bitjét (MSB) reprezentálja.

Állam	Címzések száma a blokkban					A címzés blokkok kiosztása (egy vonás egy 0-val vagy 1-gyel egyenlő bit értéket képvisel)
	1024	4096	32768	262144	1048576	
Afganisztán		+				0111 00 000 000 -- ----------
Albánia	+					0101 00 000 001 00 ----------
Algéria			+			0000 10 100 --- -- ----------
Angola		+				0000 10 010 000 -- ----------
Antigua és Barbuda	+					0000 11 001 010 00 ----------
Argentína				+		1110 00 --- --- -- ----------
Örményország	+					0110 00 000 000 00 ----------
Ausztrália				+		0111 11 --- --- -- ----------
Ausztria			+			0100 01 000 --- -- ----------
Azerbajdzsán	+					0110 00 000 000 10 ----------
Bahamas		+				0000 10 101 000 -- ----------
Bahrain		+				1000 10 010 100 -- ----------
Banglades		+				0111 00 000 010 -- ----------
Barbados	+					0000 10 101 010 00 ----------
Belorusszia	+					0101 00 010 000 00 ----------
Belgium			+			0100 01 001 --- -- ----------
Belize	+					0000 10 101 011 00 ----------
Benin	+					0000 10 010 100 00 ----------
Bhutan	+					0110 10 000 000 00 ----------
Bolívia		+				1110 10 010 100 -- ----------
Bosznia-Hercegovina	+					0101 00 010 011 00 ----------

Botswana	+				0000	00	110	000	00	- - - - - - - - - -
Brazília				+	1110	01	- - -	- - -	- -	- - - - - - - - - -
Brunei Darussalam	+				1000	10	010	101	00	- - - - - - - - - -
Bulgária		+			0100	01	010	- - -	- -	- - - - - - - - - -
Burkina Faso		+			0000	10	011	100	- -	- - - - - - - - - -
Burundi		+			0000	00	110	010	- -	- - - - - - - - - -
Kambodzsa		+			0111	00	001	110	- -	- - - - - - - - - -
Kamerun		+			0000	00	110	100	- -	- - - - - - - - - -
Kanada				+	1100	00	- - -	- - -	- -	- - - - - - - - - -
Cape Verde	+				0000	10	010	110	00	- - - - - - - - - -
Közép-Afrikai Köztársaság		+			0000	01	101	100	- -	- - - - - - - - - -
Csád		+			0000	10	000	100	- -	- - - - - - - - - -
Chile		+			1110	10	000	000	- -	- - - - - - - - - -
Kína				+	0111	10	- - -	- - -	- -	- - - - - - - - - -
Kolumbia		+			0000	10	101	100	- -	- - - - - - - - - -
Comoros	+				0000	00	110	101	00	- - - - - - - - - -
Kongó		+			0000	00	110	110	- -	- - - - - - - - - -
Cook-szigetek	+				1001	00	000	001	00	- - - - - - - - - -
Costa Rica		+			0000	10	101	110	- -	- - - - - - - - - -
Cote D'Ivoire		+			0000	00	111	000	- -	- - - - - - - - - -
Horvátország	+				0101	00	000	001	11	- - - - - - - - - -
Kuba		+			0000	10	110	000	- -	- - - - - - - - - -
Ciprus	+				0100	11	001	000	00	- - - - - - - - - -
Cseh Köztársaság			+		0100	10	0011	- - -	- -	- - - - - - - - - -

Koreai NDK			+		0111	00	100	- - -	- -	- - - - - - - - - -
Kongói Demokratikus Köztársaság		+			0000	10	001	100	- -	- - - - - - - - - -
Dánia			+		0100	01	011	- - -	- -	- - - - - - - - - -
Diibouti	+				0000	10	011	000	00	- - - - - - - - - -
Dominikai Köztársaság		+			0000	11	000	100	- -	- - - - - - - - - -
Ecuador		+			1110	10	000	100	- -	- - - - - - - - - -
Egyiptom			+		0000	00	010	- - -	- -	- - - - - - - - - -
El Salvador		+			0000	10	110	010	- -	- - - - - - - - - -
Egyenlítői Guinea		+			0000	01	000	010	- -	- - - - - - - - - -
Eritrea	+				0010	00	000	010	00	- - - - - - - - - -
Észtország	+				0101	00	010	001	00	- - - - - - - - - -
Etiópia		+			0000	01	000	000	- -	- - - - - - - - - -
Fizsi szigetek		+			1100	10	001	000	- -	- - - - - - - - - -
Finnország			+		0100	01	100	- - -	- -	- - - - - - - - - -
Franciaország				+	0011	10	- - -	- - -	- -	- - - - - - - - - -
Gabon		+			0000	00	111	110	- -	- - - - - - - - - -
Gambia		+			0000	10	011	010	- -	- - - - - - - - - -
Grúzia	+				0101	00	010	100	00	- - - - - - - - - -
Németország				+	0011	11	- - -	- - -	- -	- - - - - - - - - -
Ghana		+			0000	01	000	100	- -	- - - - - - - - - -
Görögország			+		0100	01	101	- - -	- -	- - - - - - - - - -
Grenada	+				0000	11	001	100	00	- - - - - - - - - -
Guatemala		+			0000	10	110	100	- -	- - - - - - - - - -
Guinea		+			0000	01	000	110	- -	- - - - - - - - - -

Guinea-Bissau	+				0000	010	001	000	00	----------
Guyana		+			0000	10	110	110	--	----------
Haiti		+			0000	10	111	000	--	----------
Honduras		+			0000	10	111	010	--	----------
Magyarország			+		0100	01	110	---	--	----------
Izland		+			0100	11	001	100	--	----------
India				+	1000	00	---	---	--	----------
Indonézia			+		1000	10	100	---	--	----------
Irán, Iszlám Köztársaság			+		0111	00	110	---	--	----------
Irak			+		0111	00	101	---	--	----------
Írország		+			0100	11	001	010	--	----------
Izrael			+		0111	00	111	---	--	----------
Olaszország				+	0011	00	---	---	--	----------
Jamaica		+			0000	10	111	110	--	----------
Japán				+	1000	01	---	---	--	----------
Jordánia			+		0111	01	000	---	--	----------
Kazahsztán	+				0110	10	000	011	00	----------
Kenya		+			0000	01	001	100	--	----------
Kiribati	+				1100	10	001	110	00	----------
Kuwait		+			0111	00	000	110	--	----------
Kirgízia	+				0110	00	000	001	00	----------
Laosz Népi Demokratikus Köztársaság		+			0111	00	001	000	--	----------
Lettország	+				0101	00	000	010	11	----------

Libanon			+	0111	01	001	- - -	- -	- - - - - - - - - -
Lesotho	+			0000	01	001	010	00	- - - - - - - - - -
Liberia		+		0000	01	010	000	- -	- - - - - - - - - -
Líbia			+	0000	00	011	- - -	- -	- - - - - - - - - -
Litvánia	+			0101	00	000	011	11	- - - - - - - - - -
Luxemburg	+			0100	11	010	000	00	- - - - - - - - - -
Madagaskar		+		0000	01	010	100	- -	- - - - - - - - - -
Malawi		+		0000	01	011	000	- -	- - - - - - - - - -
Malaysia			+	0111	01	010	- - -	- -	- - - - - - - - - -
Maldiv szigetek	+			0000	01	011	010	00	- - - - - - - - - -
Mali		+		0000	01	011	100	- -	- - - - - - - - - -
Malta	+			0100	11	010	010	00	- - - - - - - - - -
Marshall szigetek	+			0110	00	000	000	00	- - - - - - - - - -
Mauritania	+			0000	01	011	110	00	- - - - - - - - - -
Mauritius	+			0000	01	100	000	00	- - - - - - - - - -
Mexico		+		0000	11	010	- - -	- -	- - - - - - - - - -
Micronesia	+			0110	10	000	001	00	- - - - - - - - - -
Monaco	+			0100	11	010	100	00	- - - - - - - - - -
Mongólia	+			0110	10	000	010	00	- - - - - - - - - -
Marokkó			+	0000	00	100	- - -	- -	- - - - - - - - - -
Mozambik		+		0000	00	000	110	- -	- - - - - - - - - -
Myanmar		+		0111	00	000	100	- -	- - - - - - - - - -
Namíbia	+			0010	00	000	001	00	- - - - - - - - - -
Nauru	+			1100	10	001	010	00	- - - - - - - - - -

Nepal		+			0111	00	001	010	- -	- - - - - - - - - -
Hollandia			+		0100	10	000	- - -	- -	- - - - - - - - - -
Új-Zéland			+		1100	10	000	- - -	- -	- - - - - - - - - -
Nicaragua			+		0000	11	000	000	- -	- - - - - - - - - -
Niger		+			0000	01	100	010	- -	- - - - - - - - - -
Nigéria		+			0000	01	100	100	- -	- - - - - - - - - -
Norvégia			+		0100	01	111	- - -	- -	- - - - - - - - - -
Oman	+				0111	00	001	100	00	- - - - - - - - - -
Pakisztán			+		0111	01	100	- - -	- -	- - - - - - - - - -
Palau	+				0110	10	000	100	00	- - - - - - - - - -
Panama		+			0000	11	000	010	- -	- - - - - - - - - -
Pápua Új-Guinea		+			1000	10	011	000	- -	- - - - - - - - - -
Paraguay		+			1110	10	001	000	- -	- - - - - - - - - -
Peru		+			1110	10	001	100	- -	- - - - - - - - - -
Fülöp-szigetek			+		0111	01	011	- - -	- -	- - - - - - - - - -
Lengyelország			+		0100	10	001	- - -	- -	- - - - - - - - - -
Portugália			+		0100	10	010	- - -	- -	- - - - - - - - - -
Qatar	+				0000	01	101	010	00	- - - - - - - - - -
Koreai Köztársaság			+		0111	00	011	- - -	- -	- - - - - - - - - -
Moldova	+				0101	00	000	100	11	- - - - - - - - - -
Románia			+		0100	10	100	- - -	- -	- - - - - - - - - -
Oroszország				+	0001	- -	- - -	- - -	- -	- - - - - - - - - -
Ruanda		+			0000	01	101	110	- -	- - - - - - - - - -
Saint Lucia	+				1100	10	001	100	00	- - - - - - - - - -

Saint Vincent és Grenadines	+				0000	10	111	100	00	- - - - - - - - - -
Samoa	+				1001	00	000	010	00	- - - - - - - - - -
San Marino	+				0101	00	000	000	00	- - - - - - - - - -
Sao Tome és Principe	+				0000	10	011	110	00	- - - - - - - - - -
Szaud Arábia			+		0111	00	010	- - -	- -	- - - - - - - - - -
Szenegál		+			0000	01	110	000	- -	- - - - - - - - - -
Seychelles	+				0000	01	110	100	00	- - - - - - - - - -
Sierra Leone	+				0000	01	110	110	00	- - - - - - - - - -
Szingapur			+		0111	01	101	- - -	- -	- - - - - - - - - -
Szlovákia	+				0101	00	000	101	11	- - - - - - - - - -
Szlovénia	+				0101	00	000	110	11	- - - - - - - - - -
Salamon szigetek	+				1000	10	010	111	00	- - - - - - - - - -
Románia		+			0000	01	111	000	- -	- - - - - - - - - -
Dél-Afrika			+		0000	00	001	- - -	- -	- - - - - - - - - -
Spanyolország				+	0011	01	- - -	- - -	- -	- - - - - - - - - -
Sri Lanka			+		0111	01	110	- - -	- -	- - - - - - - - - -
Szudán		+			0000	01	111	100	- -	- - - - - - - - - -
Suriname		+			0000	11	001	000	- -	- - - - - - - - - -
Swaziland	+				0000	01	111	010	00	- - - - - - - - - -
Svédország			+		0100	10	101	- - -	- -	- - - - - - - - - -
Svájc			+		0100	10	110	- - -	- -	- - - - - - - - - -
Szíriai Köztársaság			+		0111	01	111	- - -	- -	- - - - - - - - - -
Tadzsikisztán	+				0101	00	010	101	00	- - - - - - - - - -
Thaiföld			+		1000	10	000	- - -	- -	- - - - - - - - - -

Előző Jugoszlávia Macedónia	+					0101	00	010	010	00	- - - - - - - - - -
Togó		+				0000	10	001	000	- -	- - - - - - - - - -
Tonga	+					1100	10	001	101	00	- - - - - - - - - -
Trinidad és Tobago		+				0000	11	000	110	- -	- - - - - - - - - -
Tunézia			+			0000	00	101	- - -	- -	- - - - - - - - - -
Törökország			+			0100	10	111	- - -	- -	- - - - - - - - - -
Türkménia	+					0110	00	000	001	10	- - - - - - - - - -
Uganda		+				0000	01	101	000	- -	- - - - - - - - - -
Ukrajna			+			0101	00	001	- - -	- -	- - - - - - - - - -
Egyesült Arab Emirátusok		+				1000	10	010	110	- -	- - - - - - - - - -
Egyesült Királyság				+		0100	00	- - -	- - -	- -	- - - - - - - - - -
Tanzánia		+				0000	10	000	000	- -	- - - - - - - - - -
Egyesült Államok					+	1010	- -	- - -	- - -	- -	- - - - - - - - - -
Uruguay		+				1110	10	010	000	- -	- - - - - - - - - -
Üzbegisztán	+					0101	00	000	111	11	- - - - - - - - - -
Vanuatu	+					1100	10	010	000	00	- - - - - - - - - -
Venezuela			+			0000	11	011	- - -	- -	- - - - - - - - - -
Vietnam			+			1000	10	001	- - -	- -	- - - - - - - - - -
Jemen		+				1000	10	010	000	- -	- - - - - - - - - -
Zambia		+				0000	10	001	010	- -	- - - - - - - - - -
Zimbabwe	+					0000	00	000	100	00	- - - - - - - - - -
Nem szerződő államok											- - - - - - - - - -
Jugoszlávia			+			0100	11	000	- - -	- -	- - - - - - - - - -
ICAO[1]			+			1111	00	000	- - -	- -	- - - - - - - - - -

ICAO[2]	+	1000	10	011	001	00	----------
ICAO[2]	+	1111	00	001	001	00	----------

1. Ezt a blokkot az ICAO kezeli az ideiglenes légijármű címzések kijelölésére, ahogy az a 7. részben leírásra került.

2. Repülésbiztonság érdekében speciális felhasználásra kiosztott blokk.

10. FEJEZET. PONTBÓL-TÖBB-PONTBA KOMMUNIKÁCIÓ

10.1 REPÜLÉSI INFORMÁCIÓK MŰHOLDON KERESZTÜLI TERJESZTÉSÉT VÉGZŐ SZOLGÁLTATÁS

10.1.1 A Pontból-Több-pontba műholdon keresztüli távközlési szolgáltatás a repülési információk terjesztésének elősegítésére szünet nélküli, nem előre lefoglalható, védett szolgáltatáson alapszik a vonatkozó CCITT Ajánlásokban definiáltaknak megfelelően.

10.2 A TERÜLETI ELŐREJELZŐ VILÁGRENDSZER /WAFS/ ELŐREJELZÉSEK MŰHOLDON KERESZTÜLI TERJESZTÉSÉT VÉGZŐ SZOLGÁLTATÁS

10.2.1 **Ajánlás.** – *Rendszer jellemzők a következőket foglalják magukba:*

a) frekvencia – C-sáv, földtől-műholdhoz, 6 GHz-es sáv, műholdtól-földre, 4 GHz-es sáv;

b) kapacitás nem kisebb, mint 9600 bit/s tényleges jelsebességgel;

c) bit hiba-arány – jobb mint 1 a 10^7 *esetben;*

d) vevő-oldali hibajavítás; és

e) 99,95 százalékos rendelkezésre állás.

11. FEJEZET. RÖVIDHULLÁMÚ /HF/ ADAT-KAPCSOLAT

11.1 MEGHATÁROZÁSOK ÉS RENDSZER TELJESÍTŐKÉPESSÉGEK

Megjegyzés. – A következő Szabványok és Ajánlott Gyakorlatok a Rövidhullámú adat-kapcsolatra (HFDL) jellemzőek, és kiegészítésként szolgálnak a Nemzetközi Távközlési Unió /ITU/ Nemzetközi Rádió-Szabályzatában (27. Függelék) meghatározott követelményekhez. A Rövidhullámú adat-kapcsolat /HFDL/ a Légiforgalmi Távközlési Hálózat (ATN) egy lényeges mozgó al-hálózata és a légiforgalmi mozgó szolgálat (R) rövidhullámú frekvenciasávjaiban működik. Ezenkívül még a HFDL nem-légiforgalmi távközlési hálózati ATN funkciókat is tud biztosítani, például a közvetlen kapcsolat szolgáltatást (DLS). A HFDL rendszernek lehetővé kell tenni a légijármű adat-seréjét a földi bázisú felhasználókkal.

11.1.1 Meghatározások

Kódolt chip *(Coded chip).* Az ½ vagy ¼ mértékű konvolúciós kód kódolónak az „1” vagy a „0” kimenete.

A kijelölt üzemeltetési fedésterület (DOC) területe *(Designated operational coverage (DOC) area).* Az a terület, amelyen belül egy adott szolgáltatást biztosítanak, és amelyen belül a szolgáltatásra frekvencia védelem biztosított.

Megjegyzés. – Ez a terület a megfelelő koordinációjú frekvencia védelem biztosítása után kiterjedhet a Nemzetközi Rádió-Szabályzat 27. Függelékében található kijelölési területen túlra.

Közvetlen kapcsolat szolgáltatás (DLS) *(Direct link service (DLS).* Adatátviteli mód, amely nem próbálja automatikusan kijavítani az észlelt vagy nem-észlelt hibákat, a levegő-föld adatátviteli irányú kapcsolat rétegénél. (A hiba ellenőrzést a vég-felhasználói rendszerek hajtják végre.)

Rövidhullámú hálózati protokol adat egység (HFNPDU) *High frequency network protocol data unit (HFNPDU).* A felhasználói adat csomag.

Kapcsolat protokol adat egység (LPDU) *(Link protocol data unit (LPDU)).* Adat egység, amely a HFNPDU egy szegmensét zárja magába.

Adathordozó hozzáférési protokol adat egység (MPDU) *(Media access protocol data unit (MPDU).* Adat egység, amely egy vagy több kapcsolat protokol adat egységet zár magába.

M-együtthatójú digitális fázis-billentyűzéses (M-PSK) moduláció *(M-ary phase shift keying (M-PSK) modulation).* Digitális fázis-moduláció, amely létrehozza azt, hogy a vivőhullám hullám-formájának fázisa az M-érték-sorozat valamelyikét felvegye.

M-PSK jel *(M-PSK symbol).* Az M-PSK modulációs vivőhullám lehetséges 'M' fázis-eltolásának egyike, ami a $\log_2$ M kódolt chip-ek csoportját jelképezi.

Modulációs csúcs-teljesítmény (PEP) *(Peak envelope power (PEP)).* Az adó által az antenna tápvonalába betáplált modulált jel csúcs-teljesítménye.

Fizikai réteg protokol adat egység (PPDU) *(Physical layer protocol data unit (PPDU)).* A fizikai réteghez leadásra továbbított vagy a vétel után a fizikai réteg által dekódolt adat egység.

A szolgáltatás minősége (QOS) *(Quality of service (QOS)).* Az adatátviteli jellemzőkre vonatkozó azon információ, amelyet a különféle összeköttetési protokolok által a hálózat felhasználók részére biztosított teljesítmény különböző szintjének eléréséhez használnak.

Megbízható kapcsolat szolgáltatás (RLS) *(Reliable link service (RLS)).* Az al-hálózat által nyújtott olyan adat-csere szolgáltatás, amely az összeköttetéseire automatikusan biztosítja a hiba-ellenőrzést, a hiba érzékelésével és a hibásnak talált elemi jelek kért adás-ismétlésével.

Szkvitter protokol adat egység (SPDU) *(Squitter protocol data unit (SPDU)).* A rövidhullámú adat-kapcsolat (HFDL) földi állomásai által minden egyes üzemelési frekvenciájukon 32 másodpercenként kisugárzott azon adat egység, amely a kapcsolat kezelési információkat foglalja magába.

11.2 A RÖVDHULLÁMÚ /HF/ ADAT-KAPCSOLAT RENDSZER

11.2.1 A rendszer felépítése

A rövidhullámú adat-kapcsolat /HFDL/ rendszernek egy vagy több olyan földi és légijármű fedélzeti al-rendszerből kell állni, amelyek rendelkeznek a HFDL protokollal (lásd a 11.3 pontot). A HFDL rendszernek magába kell foglalnia egy földi kezelő al-rendszert is (lásd a 11.4 pontot).

11.2.1.1 A LÉGIJÁRMŰ FEDÉLZETI ÉS FÖLDI ÁLLOMÁSOK AL-RENDSZEREI

A rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti állomások al-rendszereinek és a HFDL földi állomások al-rendszereinek a következő funkciókat kell magukba foglalniuk:

a) Rövidhullámú /HF/ adás és vétel;

b) Adat moduláció és demoduláció; és

c) A HFDL protokollal és a frekvencia választással való rendelkezés.

11.2.2 Üzemeltetési fedésterület

A rövidhullámú adat-kapcsolat /HFDL/ frekvencia kijelöléseknek a kijelölt üzemeltetési fedésterületek /DOC/ teljes egészében védettnek kell lenni.

1. Megjegyzés. – A kijelölt üzemeltetési fedésterületek (DOC) területei eltérőek lehetnek az ITU Nemzetközi Rádió- Szabályzatának S27 Függelékében meghatározott jelenlegi MWARA /a Világ Fő Légiútvonalainak Területe/ vagy RDARA /Körzeti és Belföldi Légiútvonalak Területe/ kijelölt területektől.

2. Megjegyzés. – Kiegészítő koordinációra van szükség az ITU-val az olyan esetekben, amikor a DOC területek nincsenek összhangban az ITU Nemzetközi Rádió-Szabályzatának meghatározottan felosztott területekkel.

11.2.3 A rövidhullámú adat-kapcsolat /HFDL/ berendezésekkel való felszereltségi követelmény

A rövidhullámú adat-kapcsolati /HFDL/ berendezésekkel való kötelező felszereltség követelményt a körzeti léginavigációs egyezmények alapján kell előírni, amelyek meghatározzák az üzemeltetés légterét és a bevezetés idő-rendjét.

11.2.3.1 ÉRTESÍTÉS

A fenti egyezményeknek legkevesebb két éves előzetes értesítést kell biztosítani a légijármű fedélzeti rendszerek kötelező felszereléséhez.

11.2.4 A földi állomások hálózatba szervezése

11.2.4.1 **Ajánlás.** – *A rövidhullámú adat-kapcsolat /HFDL/ földi állomások al-rendszereit egy közös földi kezelő al-rendszeren keresztül össze lehet kapcsolni.*

Megjegyzés. – Ez egy elosztott al-hálózatot biztosít egy al-hálózat csatlakozási ponttal (SNPA) a megvalósítás módjától függően, ami lehetővé teszi a virtuális áramköri kapcsolatoknak légijármű *állomásokként való fenntartását a kijelölt üzemeltetési fedésterületek közötti átmenetnél. Az elosztás lehet körzetek közötti vagy világméretű.*

11.2.5 A földi állomások szinkronizálása

A rövidhullámú adat-kapcsolat /HFDL/ földi állomás al-rendszerek szinkronizálásának az UTC-hez viszonyítottan ±25 ms-on belül kell lenni. Bármely olyan állomásról, amely nem az UTC-hez viszonyított ±25 ms-on belül működik, a megfelelő figyelmeztetést kell kiadni az összes légijármű és földi állomás al-rendszer részére, hogy a folyamatos rendszer működés lehetséges legyen.

11.2.6 A szolgáltatás minősége

11.2.6.1 CSOMAG MARADÉK-HIBA ARÁNY

A felderítetlen hiba aránynak egy olyan hálózati felhasználói csomagnál, amely a felhasználói adat 1. és 128. közötti oktettjét foglalja magába, az 1 a 10^6-nál kevesebbnek vagy azzal egyenlőnek kell lenni.

11.2.6.2 A SZOLGÁLATÁS SEBESSÉGE

A hálózati felhasználói csomagoknál (128 oktett) az átviteli és továbbítási késések az I. Kötet, 4. Fejezetének 4-26. táblázatában a 7.-től a 14.-ig terjedő közlemény elsőbbségekre meghatározott elsőbbség nem haladhatja meg a 11-1. táblázatban megadott értékeket.

11-1. táblázat. Továbbítási késések

	Irány	*Elsőbbség*	*Késés*
Átviteli késés	A légijárműhöz	7-től 14-ig	45 s
	A légijárműtől	7 -től 14-ig	60 s
Továbbítási késés (95 százalékos)	A légijárműhöz	11-től 14-ig 7-től 10-ig	90 s 120 s
	A légijárműtől	11-től 14-ig 7 -től 10-ig	150 s 250 s

11.3 RÖVIDHULLÁMÚ ADAT-KAPCSOLAT /HFDL/ PROTOKOL

A rövidhullámú adat-kapcsolat /HFDL/ protokolnak egy fizikai rétegből, egy kapcsolat rétegből és egy al-hálózat rétegből kell állnia az alábbiak szerint.

Megjegyzés. – A rövidhullámú adat-kapcsolat /HFDL/ protokol egy rétegelt protokol, és kompatibilis a nyílt rendszerek összekapcsolása (OSI) referencia modellel. Ez lehetővé teszi a HFDL részére azt, hogy a légiforgalmi távközlési hálózat (ATN) kompatibilis al-hálózataként működjön. A protokol részletes leírását a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv *(Doc 9741) tartalmazza.*

11.3.1 A fizikai réteg rádiófrekvenciás /RF/ jellemzői

A légijármű fedélzeti és a földi állomások a fizikai adathordozó működéséhez szimplex módon férnek hozzá.

11.3.1.1 FREKVENCIA SÁVOK

A rövidhullámú adat-kapcsolati /HFDL/ berendezéseknek képeseknek kell lenniük arra, hogy bármelyik olyan Egy-oldalsávos (SSB) vivőhullám (referencia) frekvencián működjenek, amely a légiforgalmi mozgó (R) szolgálat részére áll rendelkezésre a 2,8-tól a 22 MHz-ig terjedő sávcsoportban, és megfelel a Nemzetközi Rádió-Szabályzat vonatkozó előírásainak.

11.3.1.2 CSATORNÁK

A csatorna felhasználásnak összhangban kell lenni az ITU Nemzetközi Rádió-Szabályzat S27 Függelékében lévő vivőhullám /referencia/ frekvencia táblázattal.

11.3.1.3 HANGOLÁS

A berendezéseknek képesnek kell lenniük arra, hogy az 1 kHz egészszámú többszörösén működjenek.

11.3.1.4 OLDALSÁV

Az átvitelre használt oldalsávnak a vivőhullám (referencia) frekvencia magasabb oldalán kell lenni.

11.3.1.5 MODULÁCIÓ

A rövidhullámú adat-kapcsolatnak /HFDL/ az M-együtthatójú digitális fázis-eltolásos módot (M-PSK) kell alkalmazni a kijelölt frekvencia rádiófrekvenciás vivőhullámának modulálására. A jel-sebességnek másodpercenként 1800 jelnek kell lenni ± 10 rész per millió résszel /ppm/ (azaz 0,018 jel másodpercenként).

Az M értéke és az információs adat sebessége a 11-2. táblázatban meghatározott lesz.

11-2. táblázat. M értéke és az információs adat sebesség

M	*Információs adat-sebesség (bit másodpercenként)*
2	300 vagy 600
4	1 200
8	1 800

Megjegyzés. – Ha az M egyenlő a 2 értékkel, akkor az adat-sebesség másodpercenként 300 vagy 600 bit lehet, ahogy azt a csatorna kódolási sebessége meghatározza. Az M értéke az egyik adat-átvitelről a másikra megváltozhat a kiválasztott adat-sebességtől függően. A csatorna kódolási sebesség a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv*-ben (Doc 9741) került leírásra.*

11.3.1.5.1 *M-PSK VIVŐHULLÁM*

Az M-PSK vivőhullámot matematikailag kifejezve a következők szerint kell meghatározni:
$s(t) = A\Sigma(p(t\text{-}kT)\cos[2\pi f_0 t + \varphi(k)])$, $k = 0, 1 \ldots, N\text{-}1$

ahol:

N = Az M-PSK jelek száma a továbbított fizikai réteg protokol adat egységben (PPDU)
s (t) = Az analóg hullámforma vagy jel a 't' időben
A = Csúcs amplitúdó
f_0 = Az SSB vivőhullám (referencia) + 1 440 Hz
T = M-PSK jel periódus (1/1 800 s)
φ (k) = A k-ik M-PSK jel fázisa
p (t-kT) = A k-ik M-PSK jel impulzus alakja a 't' időben

Megjegyzés. – Az elküldött jelek száma, az N, határozza meg a fizikai réteg protokol adat egység /PPDU/ hosszát (időtartam = NT másodperc). Ezek a paraméterek a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv*-ben (Doc 9741) kerültek meghatározásra.*

11.3.1.5.2 *IMPULZUS ALAK*

Az impulzus alak, p(t), fogja meghatározni a kisugárzott jel spektrális eloszlását. Az impulzus alak Fourier transzformáltját, a P(f)-t, a következők szerint kell meghatározni:

$P(f) = 1$,	ha $0 < \lvert f \rvert < (1 - b)/2T$
$P(f) = \cos\{\pi(2\lvert f\rvert T - 1 + b)/4b\}$,	ha $(1 - b)/2T < \lvert f \rvert < (1 + b)/2T$
$P(f) = 0$,	ha $\lvert f \rvert > (1 + b)/2T$

Ahol a spektrális határ paraméter, a b = 0,31, úgy került kiválasztásra, hogy a jel -20 dB-es pontjai az SSB vivőhullám (referencia) +290 Hz-es és az SSB vivőhullám (referencia) +2590 Hz-es értékeinél vannak, és a hullámforma csúcs - átlagos teljesítmény viszonya kisebb, mint 5 dB.

11.3.1.6 ADÓ STABILITÁS

Az adási funkció alap frekvenciája stabilitásának jobbnak kell lenni, mint:

a) ±20 Hz a rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti állomás al-rendszereknél; és

b) ±10 Hz a HFDL földi állomás al-rendszereknél.

11.3.1.7 VEVŐ STABILITÁS

A vevő funkció alap frekvencia stabilitásának olyannak kell lenni, hogy a 11.3.1.6 pontban meghatározott adási funkció stabilitással együtt a földi és a légijármű fedélzeti funkciók között elért teljes frekvencia-különbség a szolgáltatásban ne haladja meg a 70 Hz-et.

11.3.1.8 VÉDELEM

A rövidhullámú adat-kapcsolatnál /HFDL/ az azonos csatorna védelemre 15 dB-es megkívánt – nem-kívánt (D/U) jel-arányt kell alkalmazni a következők szerint:

a) Adat adat ellen;

b) Adat hang ellen; és

c) Hang adat ellen.

11.3.1.9 EMISSZIÓ OSZTÁLY

Az emisszió osztálynak a 2K80J2DEN-nek kell lenni.

11.3.1.10 KIJELÖLT FREKVENCIA

A HFDL-nél a kijelölt frekvenciának 1 400 Hz-el magasabbnak kell lennie az SSB vivőhullám (referencia) frekvenciánál.

Megjegyzés. – Egyezményesen a rövidhullámú adat-kapcsolat /HFDL/ kijelölt frekvenciája 1 400 Hz-el el van tolva az SSB vivőhullám (referencia) frekvenciától. A HFDL M-PSK digitális modulációs vivőhulláma 1 440 Hz-el van eltolva az SSB vivőhullám (referencia) frekvenciától. A digitális modulációt teljes egészében magába foglalja az azonos teljes csatorna sávszélesség ugyanúgy, mint a hang jelet, és kielégíti az ITU Nemzetközi Rádió-Szabályzatok S27 Függelékének előírásait.

11.3.1.11 EMISSZIÓ HATÁRÉRTÉKEK

A Rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti és földi állomások adói modulációs csúcsteljesítményének (Pp) bármely emisszióra és bármely diszkrét frekvenciára kevesebbnek kell lenni, mint az adó modulációs csúcs-teljesítményének (Pp), a következőknek megfelelően (lásd a 11-1. ábrát):

a) Bármilyen frekvencián a kijelölt HFDL frekvenciától az 1,5 kHz és a 4,5 kHz közötti tartománnyal alacsonyabb, és bármely frekvencián a kijelölt HFDL frekvenciától az 1,5 kHz és a 4,5 kHz közötti tartománnyal magasabb frekvencián: legalább 30 dB-el;

b) Bármilyen frekvencián a kijelölt HFDL frekvenciától a 4,5 kHz és a 7,5 kHz közötti tartománnyal alacsonyabb, és bármely frekvencián a kijelölt HFDL frekvenciától a 4,5 kHz és a 7,5 kHz közötti tartománnyal magasabb frekvencián: legalább 38 dB-el;

c) Bármely olyan frekvencián, ami a HFDL kijelölt frekvencia alatt 7,5 kHz-nél alacsonyabb frekvencia, és bármely olyan frekvencián, ami a HFDL kijelölt frekvencia felett 7,5 kHz-nél magasabb frekvencia:

1) A HFDL légijármű fedélzeti állomás adóira: 43 dB;

2) A HFDL földi állomás adóira az 50 W-ig, azt is beleértve:

$[43 + 10 \log_{10} P_p \text{ (W)}]$ dB; és

3) A HFDL földi állomás adóira, amelyek 50 W-nál nagyobb teljesítményűek: 60 dB.

11.3.1.12 TELJESÍTMÉNY

11.3.1.12.1 *A Földi állomás berendezései.* Az antenna tápvonalába betáplált modulációs csúcs-teljesítmény (Pp) nem haladhatja meg a 6 kW-os maximális értéket a Nemzetközi Rádió-Szabályzat S27 Függelékében megadottaknak megfelelően.
11.3.1.12.2 *Légijármű fedélzeti állomás berendezések.* Az antenna tápvonalába betáplált modulációs csúcs-teljesítmény (Pp) nem haladhatja meg a 400 W-os maximális értéket, kivéve azt, ami a Nemzetközi Rádió-Szabályzat S27/62 Függelékében megadásra került.

11.3.1.13 A NEM-KÍVÁNT JEL KISZŰRÉSE

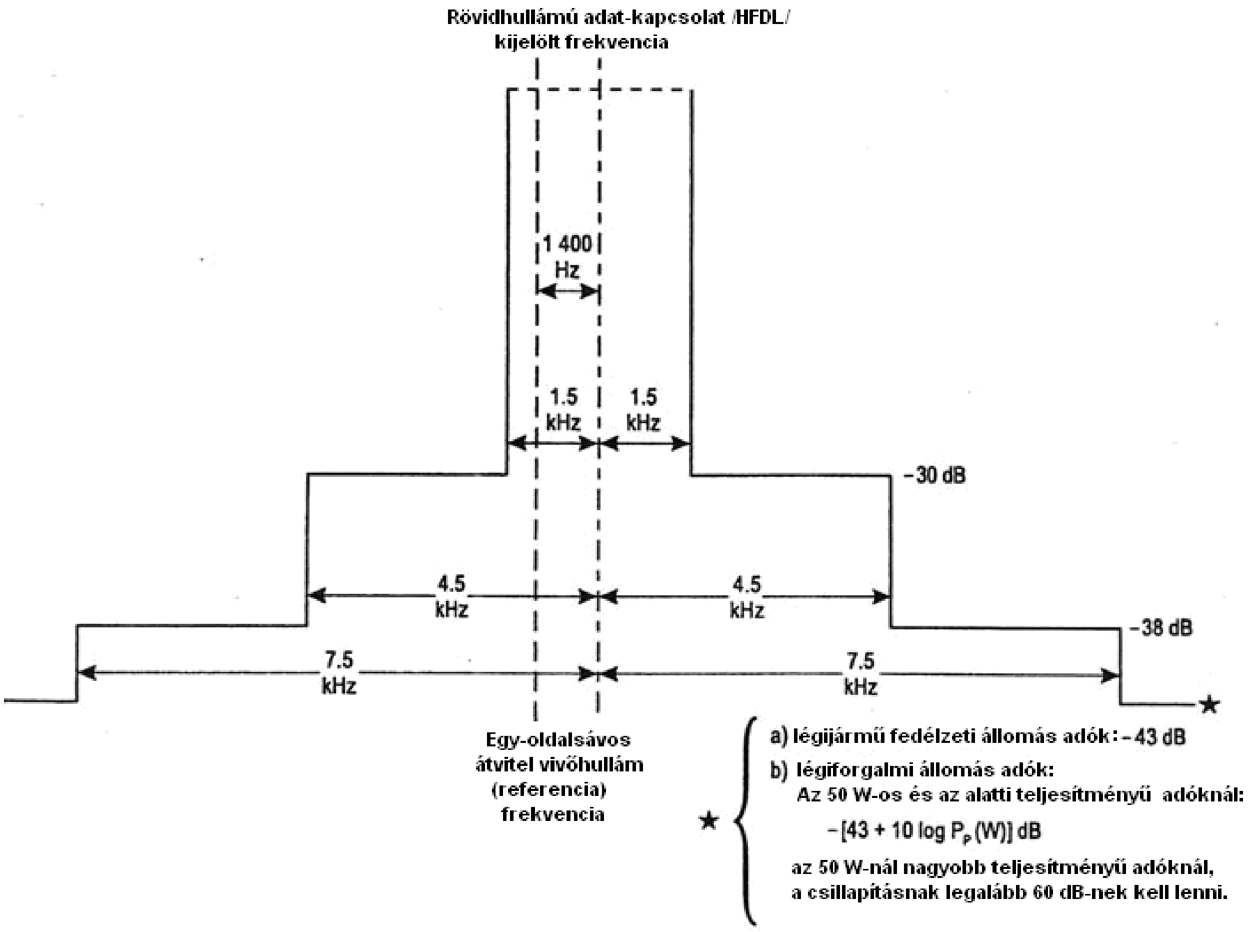
A Rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti és földi állomásainak vevőinél, a nem-kívánt bemenő jeleket a következőknek megfelelően kell csillapítani:

a) Az f_c és (f_c - 300 Hz) közötti, vagy az (f_c + 2 900 Hz) és az (f_c+3300 Hz) közötti bármely frekvencián: legalább 35 dB-el a kívánt jelszint csúcs alá; és

b) Bármely frekvencián az (f_c - 300 Hz) alatt, vagy az (f_c+3300 Hz) felett: legalább 60 dB-el a kívánt jelszint csúcs alá, ahol az f_c a vivőhullám (referencia) frekvencia.

11.3.1.14 A VEVŐ ÉRZÉKENYSÉGE A TRANZIENSEKRE

Ajánlás. – *A vételi funkciónak egy, az antenna végpontjánál fellépő 60 dB-es pillanatnyi rádiófrekvenciás teljesítmény növekedésből 10 milliszekundumon belül fel kell éledni. A vételi funkciónak egy, az antenna végpontjánál fellépő 60 dB-es pillanatnyi rádiófrekvenciás teljesítmény csökkenésből 25 milliszekundumon belül fel kell éledni.*



11-1. ábra: A Rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti és földi állomásai adóira megkívánt spektrum határértékek (csúcs-teljesítményben kifejezve).

11.3.2 Fizikai réteg funkciók

11.3.2.1 FUNKCIÓK

A fizikai réteg által biztosított funkcióknak a következőket kell magukba foglalni:

a) Adó és vevő vezérlés;

b) Adat-továbbítás; és

c) Adat vétel.

11.3.2.2 ADÓ ÉS VEVŐ VEZÉRLÉS

A Rövidhullámú adat-kapcsolat /HFDL/ fizikai rétegének kell elvégezni az adó/vevő kapcsolást és a frekvencia hangolást úgy, ahogy azt a kapcsolat réteg utasítja. A fizikai rétegnek kell végrehajtania a kapcsolat rétegből eredő kérésre az adó billentyűzését a csomag továbbításához.

11.3.2.2.1 *ADÓ - VEVŐ ÁTFUTÁSI IDŐ*

A továbbítási teljesítmény szintnek az adás befejezése után 100 milliszekundumon belül legalább 10 dB-el le kell csengenie. Egy HFDL állomás al-rendszernek képesnek kell lenni a névleges teljesítményével venni és demodulálni egy bejövő jelet a következő vételi rés megkezdése előtti 200 milliszekundumon belül.

11.3.2.2.2 *VEVŐ - ADÓ ÁTFUTÁSI IDŐ*

Egy HFDL állomás al-rendszernek plusz vagy mínusz 1 dB-en belül biztosítania kell a névleges kimenő teljesítményét az antenna tápvonalába, az adási rés kezdetétől 200 milliszekundumon belül.

11.3.2.3 ADAT-ÁTVITEL

Az adat-átvitelt Időosztásos többszörös elérésű (TDMA) technikával kell végrehajtani. A HFDL adat-kapcsolat földi állomás al-rendszereinek fenn kell tartaniuk a TDMA keret és rés szinkronizálást a HFDL rendszer részére. Annak biztosítására, hogy a szinkronizálás fennmaradjon, az egyes HF adat-kapcsolat modulátoroknak az adatok adását egy elő-billentyűző szegmenssel kell megkezdeni a rés-idő kezdeténél plusz vagy mínusz 10 milliszekundumon belül.

11.3.2.3.1 *A TDMA SZERKEZETE*

Minden egyes TDMA keretnek 32 másodpercesnek kell lenni. Az egyes TDMA kereteket tizenhárom egyenlő időtartamú résre kell felosztani, a következők szerint:

a) Az egyes TDMA keretek első rését fenn kell tartani a HFDL földi állomás al-rendszerek általi, a Szkvitter protokol adat egység /SPDU/ csomagokban lévő kapcsolat kezelési adatok sugárzása részére; és

b) A fennmaradó réseket ki kell jelölni egyrészt, mint fedélzetre irányuló adás réseket, másrészt, mint meghatározott HFDL légijármű fedélzeti állomások részére fenntartott, fedélzetről továbbított adat réseket, vagy mint fedélzetről leadott közvetlen hozzáférésű adat réseket az összes HFDL légijármű fedélzeti állomás al-rendszerek általi felhasználásra, versenyhelyzeti alapon. Ezeket a TDMA réseket dinamikus alapon kell kijelölni a fenntartás, a lekérdezés és a tetszőleges hozzáférés kijelölési kombinációval.

11.3.2.3.2 *ADÁS*

A HFDL földi állomás al-rendszerének egy Szkvitter protokol adat egységet /SPDU/ kell sugározni 32 másodpercenként minden egyes üzemelési frekvenciáján.

Megjegyzés. – A TDMA keret és rés szerkezetének, az elő-billentyűző szegmensének, továbbá az adat szerkezetének – az SPDU-t is beleértve – a részletezését a Rövidhullámú Adat-kapcsolat (HFDL) Kézikönyv *(Doc 9741) tartalmazza.*

11.3.2.4 AZ ADATOK VÉTELE

11.3.2.4.1 *FREKVENCIA KERESÉS*

Minden egyes HFDL légijármű fedélzeti állomásnak automatikusan keresnie kell a kijelölt frekvenciákat addig, amíg egy működési frekvenciát nem talál.

11.3.2.4.2 *A FIZIKAI RÉTEG PROTOKOL ADAT EGYSÉGEK /PPDU-k/ VÉTELE*

A HF adat-kapcsolat vevőnek kell biztosítania azoknak a PPDU-knak a detektálását, szinkronizálását, demodulálását és dekódolását, amelyek a 11.3.1.5 pontban meghatározott hullámforma szerint moduláltak, a következő torzításokon belül:

a) Az 1440 Hz-es hangfrekvenciás vivőhullám eltolásnál plusz vagy mínusz 70 Hz-el;

b) A nem folytonos és/vagy szórt több-utas torzításnál 5 ms-os több-utas szóródásig;

c) A több-utas amplitúdó elhalkulásnál /fading/ maximum 2 Hz-es két-oldalú RMS Doppler szóródásig és Rayleigh statisztikai szóródásig; és

d) Összetevődő Gauss eloszlású és széles-sávú gerjesztő zajt változó amplitúdóval és véletlenszerű érkezési idővel.

Megjegyzés. - Referencia a CCIR 549-2 Jelentés.

11.3.2.4.3 *A FIZIKAI RÉTEG PROTOKOL ADAT EGYSÉGEK /PPDU-k/ DEKÓDOLÁSA*

A bevezető szegmens vétele után a vevőnek kell:

a) Meghatározni az adat-sorozat kezdetét;

b) Megmérni és helyesbíteni az adó és a vevő közötti Doppler eltolódást és az adó/vevő frekvencia-eltolódásokat;

c) Meghatározni az adat sebességet és az adat demoduláció során használatos összesorolási beállításokat,

d) Végrehajtani az M-PSK jel szinkronizációt; és

e) Irányítani a kiegyenlítő kört.

11.3.2.4.4 *SZINKRONIZÁCIÓ*

Minden egyes HFDL légijármű fedélzeti állomás al-rendszernek szinkronizálnia kell a rés időzítését a megfelelő földi állomás rés-idejéhez az utolsó vett SPDU vételi idejéhez vonatkoztatva.

11.3.2.4.5 *A MEGHATÁROZOTT CSOMAG HIBA GYAKORISÁGI TELJESÍTMÉNY*

Azoknak a HFDL adathordozó hozzáférési protokol adat egységeknek (MPDU) a száma, amelyek egy vagy több bit hibával kerülnek vételre, nem haladhatja meg az összes vett MPDU számának 5 százalékát akkor, ha az 1,8 másodperces összesorolás használatos, és a térbeli-jel körülmények megfelelnek a 11-3. táblázatban bemutatottaknak.

Ajánlás. – *Azoknak a HFDL adathordozó hozzáférési protokol adat egységeknek (MPDU) a száma, amelyek egy vagy több bit hibával kerülnek vételre, nem haladhatja meg az összes vett MPDU számának 5 százalékát akkor, ha az 1,8 másodperces összesorolás használatos, és a térbeli-jel körülmények megfelelnek a 11-3a. táblázatban bemutatottaknak.*

11.3.3 Kapcsolat réteg

Megjegyzés. - A kapcsolat réteg funkcióinak részleteit a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv *(Doc 9741) tartalmazza.*

A kapcsolat rétegnek kell biztosítania a fizikai réteg, a kapcsolat kezelés és az adat szolgáltatási protokol részére a vezérlő funkciókat.

11.3.3.1 VEZÉRLŐ FUNKCIÓK

A kapcsolat rétegnek kell a frekvencia hangolási, az adó billentyűzési és az adó/vevő kapcsolási parancsokat továbbítani a fizikai réteg részére.

11.3.3.2 KAPCSOLAT KEZELÉS

A kapcsolat rétegnek kell kezelnie a TDMA rés kijelöléseket, a bejelentkezési és kijelentkezési eljárásokat, a földi állomás és a légijármű fedélzeti állomás TDMA szinkronizálást és az egyéb szükséges funkciókat, figyelembe véve a közlemény elsőbbségeket az összeköttetés létrehozásához és fenntartásához.

11.3.3.3 ADAT SZOLGÁLTATÁSI PROTOKOLOK

A kapcsolat rétegnek alá kell támasztani egy megbízható kapcsolat szogáltatás (RLS) protokolt és egy közvetlen kapcsolat szolgáltatás (DLS) protokolt.

11.3.3.3.1 *Megbízható kapcsolat szolgáltatás /RLS/*

Az RLS protokolt kell felhasználni a nyugtázott felhasználói adat csomagoknak a légijármű és a földi társ-kapcsolat rétegek közötti adatcserére.

11.3.3.3.2 *Közvetlen kapcsolat szolgáltatás /DLS/*

A DLS protokolt kell felhasználni a nem-szegmentált fedélzetre irányuló rövidhullámú hálózati protokol adat egységek (HFNPDU-k) sugárzására és a többi olyan HFNPDU-k továbbítására, amelyek nem igénylik a kapcsolat réteg automatikus adás-ismétlését.

11.3.4 Al-hálózat réteg

Megjegyzés. - Az al-hálózat réteg protokolok és szolgáltatások részletes leírását a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv *(Doc 9741) foglalja magába.*

11.3.4.1 ADAT CSOMAG

A Rövidhullámú adat-kapcsolat /HFDL/ légijármű fedélzeti állomás al-rendszerében és a HFDL földi állomás al-rendszereiben a HFDL al-hálózat réteg biztosítja az al-hálózati szolgáltatás felhasználók közötti al-hálózati kapcsolat létrehozásával az összeköttetés-irányított adat csomag szolgáltatást.

11.3.4.2 ÖSSZEKAPCSOLHATÓSÁGI ÉRTESÍTÉS SZOLGÁLTATÁS

A HFDL légijármű fedélzeti al-rendszerben lévő HFDL al-hálózat réteg biztosítja a kiegészítő összekapcsolhatósági értesítés szolgáltatást, azáltal, hogy elküldi az összekapcsolhatósági értesítés esemény közleményt a kapcsolt Légiforgalmi távközlési hálózat /ATN/ útvonal kijelölés részére.

11.3.4.2.1 *ÖSSZEKAPCSOLHATÓSÁGI ÉRTESÍTÉS ESEMÉNY KÖZLEMÉNYEK*

Az összekapcsolhatósági értesítés szolgáltatás küldi el az összekapcsolhatósági értesítés esemény közleményt a kapcsolt ATN útvonal kijelölés részére, az al-hálózati hozzáférési funkción keresztül.

11.3.4.3 HFDL AL-HÁLÓZAT RÉTEG FUNKCIÓK

A Rövidhullámú adat-kapcsolat /HFDL/ al-hálózati rétegnek mind a HFDL légijármű fedélzeti állomás al-rendszerben, mind a HFDL földi állomás al-rendszerben a következő három funkciót kell magába foglalnia:

a) A HFDL al-hálózat-függő (HFSND) funkciót;

b) Az al-hálózat hozzáférési funkciót; és

c) Az összedolgozói funkciót.

11.3.4.3.1 *RÖVIDHULLÁMÚ ADAT-KAPCSOLAT AL-HÁLÓZAT-FÜGGŐ FUNKCIÓ /HFSND/*

A HFSND funkciónak kell végrehajtania a HFSND protokolt a HFDL adat egységek cseréjével, az egyes HFDL légijármű állomás al-rendszerek és a HFDL földi állomás al-rendszerpárok között. Ez fogja végrehajtani a HFSND protokol légijármű fedélzeti funkciót a HFDL légijármű fedélzeti állomás al-rendszerben és a HFSND protokol földi funkciót a HFDL földi állomás al-rendszerben.

11.3.4.3.2 *AL-HÁLÓZAT HOZZÁFÉRÉSI FUNKCIÓ*

Az al-hálózat hozzáférési funkciót az ISO 8208 protokol fogja végrehajtani a HFDL légijármű fedélzeti állomás al-rendszer vagy a HFDL földi állomás al-rendszer és a kapcsolt útvonal kijelölések között az ISO 8208 csomagok cseréjével. Ennek kell elvégezni az ISO 8208 Hálózati végponti berendezés /DCE/ funkciót a HFDL légijármű fedélzeti állomás al-rendszerben és a HFDL födi állomás al-rendszerben.

11.3.4.3.3 *EGYÜTTMŰKÖDÉSI FUNKCIÓ*

Az együttműködési funkciónak kell biztosítani a HFSND, az al-hálózat hozzáférés és az összekapcsolhatósági értesítés funkciók között szükséges harmonizációt.

11.4 A FÖLDI KEZELŐ AL-RENDSZER

Megjegyzés. - A földi kezelő al-rendszer funkcióiról és illesztéseiről a Rövidhullámú /HF/ Adat-kapcsolat Kézikönyv *(Doc 9741) tartalmaz részletes leírást.*

11.4.1 Kezelési funkciók

A földi kezelő al-rendszernek kell végrehajtania azokat a funkciókat, amelyek a HFDL földi és légijármű fedélzeti al-rendszerei közötti összeköttetési csatornák létrehozásához és fenntartásához szükségesek.

11.4.2 Kezelési/vezérlési információ csere

A földi kezelő al-rendszernek kell az illesztést biztosítani a földi állomás al-rendszerrel abból a célból, hogy a frekvencia kezeléshez, a rendszer táblázat kezeléshez, a napló állapot kezeléshez, a csatorna kezeléshez és az adatgyűjtési szolgáltatás minőségéhez (QOS) szükséges vezérlő információk cseréje megtörténjen.

11-3. táblázat. HF térbeli-jel feltételek

Adatsebesség (bit per mperc)	Csatorna utak száma	Több-utas terjedés (milliszekundum)	Elhalkulási sávszélesség (Hz) a CCIR 549-2 jelentés szerint	Frekvencia-eltolás (Hz)	Jel/zaj arány (dB) a 3 kHz-es sávszélességben	MPDU méret (oktett)
1200	1 állandó	–	–	40	4	256
1800	2 elhalkuló	2	1	40	16	400
1200	2 elhalkuló	2	1	40	11	256
600	2 elhalkuló	2	1	40	8	128
300	2 elhalkuló	2	1	40	5	64

11-3a .táblázat. HF jel-térközben feltételek

Adatsebesség (bit per mperc)	Csatorna utak száma	Többutas terjedés (milliszekundum)	Elhalkulási sávszélesség (Hz) a CCIR 549-2 jelentés szerint	Frekvencia eltolás (Hz)	Jel/zaj arány (dB) a 3KHz-es sávszélességben	MPDU méret (oktett)
1200	2 elhalkuló	4	1	40	13	256
1200	2 elhalkuló	2	2	40	11,5	256

II. RÉSZ – BESZÉD-ÜZEMŰ ÖSSZEKÖTTETÉSI RENDSZEREK

1. FEJEZET. DEFINÍCIÓK

Megjegyzés. – A másodlagos energiaellátásról szóló anyag és az összeköttetési rendszerek megbízhatóságával és rendelkezésre állásával foglalkozó útmutató anyag a 10. Annex, I. kötet 2.9 szakaszban és az I. kötet F mellékletben találhatók.

2. FEJEZET. LÉGIFORGALMI MOZGÓ SZOLGÁLAT

2.1 A LEVEGŐ-FÖLD VHF ÖSSZEKÖTTETÉSI RENDSZER JELLEMZŐK

Megjegyzés. – Az itt következő szövegben a 8,33 kHz-es csatorna kijelölések csatorna távolságai úgy vannak meghatározva, mint 25 kHz osztva 3-mal, amely 8,3333...-al egyenlő.

2.1.1 A nemzetközi légiforgalmi mozgó szolgálatban használt levegő-föld VHF összeköttetési rendszer jellemzőinek meg kell felelniük a következő előírásoknak:

2.1.1.1 A rádiótelefon sugárzásoknak két-oldalsávos (DSB) amplitúdó-modulált (AM) vivőhullámnak kell lenniük.

2.1.1.2 A hamis sugárzást a technikai fejlődés jelenlegi állapota és a szolgáltatás jellege által lehetővé tett legalacsonyabb értéken kell tartani.

Megjegyzés. – Az ITU Rádió-Szabályzat S3 Függeléke tartalmazza a hamis sugárzások szintjeire vonatkozó tűréseket, azokat, amelyeknek az adók meg kell, hogy feleljenek.

2.1.1.3 A felhasznált rádiófrekvenciákat a 117,975–137 MHz-es sávokból kell kiválasztani. A kijelölhető frekvenciák közötti távolságoknak (csatorna-távolság) a rendszer elemekre alkalmazható frekvencia tűréseknek az V. kötetben meghatározottaknak kell lenniük.

Megjegyzés. - A 117,975 - 137 MHz-es sávot a Légiforgalmi Mozgó (R) Szolgálatnak az ITU Rádió-Szabályzat 1947-ben osztotta ki. Az ITU adminisztratív Rádió Világ-Konferenciák egymást követő sorozatos módosításai a 132 - 136 MHz-es sávot is hozzáadták az R-kiosztásokhoz, olyan feltételek mellett, amelyek különböznek az ITU régióktól, illetve meghatározott országoknak, ország-csoportoknak (lásd RRs S5.203-at, S5.203A-t, S5.203B-t, mint a 136 - 137 MHz-es sáv kiegészítő kijelölését, és S5.201-et a 132 - 136 Hz-es sávra).

2.1.1.4 A sugárzások tervezési polarizációjának függőlegesnek kell lenni.

2.2 A FÖLDI BERENDEZÉSEK RENDSZER JELLEMZŐI

2.2.1 Adás funkció

2.2.1.1 *Frekvencia stabilitás.* Az üzemi rádiófrekvencia nem térhet el a kijelölt frekvenciától plusz vagy mínusz 0,005 százaléknál nagyobb mértékben. Ahol az V. Kötet előírásainak megfelelően 25 kHz-es csatorna-távolságot alkalmaznak, ott az üzemi rádiófrekvencia nem térhet el a kijelölt frekvenciától plusz vagy mínusz 0,002 százaléknál nagyobb mértékben. Ahol az V.Kötet előírásainak megfelelően 8,33 kHz-es csatorna-távolságot vezetnek be, ott az üzemi rádiófrekvencia nem térhet el a kijelölt frekvenciától plusz vagy mínusz 0,0001 százaléknál nagyobb mértékben.

Megjegyzés. – A fenti tűrések nem lesznek megfelelők az eltolt vivőhullámú rendszerekre.

2.2.1.1.1 Eltolt vivőhullámú rendszerek 25 kHz-es, 50 kHz-es és 100 kHz-es csatorna-távolságú környezetben. Az eltolt vivőhullámú rendszerekben az egyes vivők stabilitásának olyannak kell lenni, hogy megakadályozza a 4 kHz-nél kisebb elsőrendű heterodin frekvenciákat, és ezenkívül a külső vivőhullám frekvenciák maximális frekvencia eltérése a kijelölt vivő frekvenciától ne haladja meg a 8 kHz-et. Az eltolt vivőhullámú rendszerek a 8,33 kHz-es csatorna-távolságú frekvenciákon nem használhatók.

Megjegyzés. – Az eltolt vivőhullámú rendszerek egyes vivőinek megkívánt stabilitására a II. rész "A" Mellékletében találhatók példák.

2.2.1.2. TELJESÍTMÉNY

Ajánlás. – *Az esetek magas százalékában a kisugárzott teljesítménynek olyannak kell lenni, hogy legalább 75 mikrovolt per méter (mínusz 109 dBW/m^2) térerősséget szolgáltasson a létesítmény meghatározott működési fedésterületén belül szabad térbeli terjedés alapján.*

2.2.1.3 *Moduláció.* A modulációs csúcs-teljesítménynek legalább a 0,85-öt elérőnek kell lenni.

2.2.1.4 **Ajánlás. -** *Eszközöket kell biztosítani ahhoz, hogy az átlagos modulációs tényezőt a gyakorlatilag lehetséges legnagyobb értéken tartsák túlmodulálás nélkül.*

2.2.2 Vételi funkció

2.2.2.1 *Frekvencia stabilitás.* Ahol az V.Kötet előírásainak megfelelően 8,33 kHz-es csatorna-távolságot vezettek be, ott az üzemi rádiófrekvencia nem térhet el a kijelölt frekvenciától plusz vagy mínusz 0,0001 százaléknál nagyobb mértékben.

2.2.2.2 *Érzékenység.* Miután tekintetbe vették a tápvonal veszteséget és az antenna polár diagram változást, a vételi funkció érzékenységének olyannak kell lennie, hogy az esetek nagy százalékában egy 15 dB megkívánt/nem-kívánt arányú audio kimenő jelet szolgáltasson 50 százalékos amplitúdó-modulált (A3E) rádiójellel, amely 20 mikrovolt per méter (mínusz 120 dBW/m^2) vagy nagyobb térerősséggel rendelkezik.

2.2.2.3 *Effektív vételi sávszélesség.* Amikor 25 kHz-es, 50 kHz-es vagy 100 kHz-es szélességgel bíró csatornára van hangolva, a vevő rendszernek egy kielégítő és hallható audio kimenetet kell szolgáltatnia, amikor a fenti 2.2.2.2 pontban meghatározott jelnek a kijelölt frekvencia értékekkel plusz vagy mínusz 0,005 százalékon belül megegyező vivőfrekvenciája van. Amikor 8,33 kHz-es szélességű csatornára van hangolva, a vevő rendszernek egy kielégítő és hallható audio kimenetet kell szolgáltatnia, amikor a fenti 2.2.2.2 pontban meghatározott jelnek a kijelölt frekvencia értékkel plusz vagy mínusz 0,0005 százalékon belül megegyező vivőfrekvenciája van. Az effektív vételi sávszélességről további információkat a II. Rész "A" Melléklete tartalmaz.

Megjegyzés. – Az effektív vételi sávszélesség a Doppler eltolódást is magában foglalja.

2.2.2.4 *Szomszédos csatorna elnyomás.* A vevő rendszernek biztosítani kell 60 dB-es vagy annál nagyobb tényleges elnyomást a mellette lévő kijelölhető csatornán.

Megjegyzés. – A szomszédos kijelölhető frekvencia általában plusz vagy mínusz 50 kHz. Ahol ez a csatorna-távolság nem kielégítő, ott a szomszédos kijelölhető frekvencia plusz vagy mínusz 25 kHz vagy plusz vagy mínusz 8,33 kHz az V. Kötetben lévő előírásoknak megfelelően. Megengedett az, hogy a föld néhány területén a 25 kHz-es, 50 kHz-es vagy 100 kHz-es csatorna-távolságra tervezett vevők továbbra is használatban maradjanak.

2.3 A FEDÉLZETI BERENDEZÉS RENDSZER JELLEMZŐI

2.3.1 Adás funkció

2.3.1.1 *Frekvencia stabilitás.* Az üzemelési rádiófrekvencia a kijelölt frekvenciától nem térhet el plusz vagy mínusz 0,005 százalék értéknél nagyobb mértékben. Ahol 25 kHz-es csatorna-távolságot alkalmaznak, ott az üzemelési rádiófrekvencia a kijelölt frekvenciától nem térhet el plusz vagy mínusz 0,003 százaléknál nagyobb mértékben. Ahol 8,33 kHz-es csatorna-távolságot alkalmaznak, ott az üzemelési rádiófrekvencia a kijelölt frekvenciától nem térhet el 0,0005 százaléknál nagyobb mértékben.

2.3.1.2 *Teljesítmény.* Az esetek nagy százalékában a kisugárzott teljesítménynek olyannak kell lenni, hogy legalább 20 mikrovolt per méter (mínusz 120 dBW/m^2) térerősséget szolgáltasson a szabad térbeli terjedés alapján olyan távolságokon és magasságokon, amelyek megfelelnek azoknak az üzemelési feltételeknek, amelyeket azokra a területekre engedélyezettek, amelyek felett a légijármű üzemel.

2.3.1.3 *Szomszéd csatorna teljesítmény.* Egy 8,33 kHz-es fedélzeti adótól bármely üzemelési feltételek esetén a kisugárzott teljesítmény, az első 8,33 kHz-es szomszédos csatorna középvonalától szimmetrikusan elhelyezkedő 7 kHz-es sávszélesség felett mérve, nem lépheti túl az adó vivő-teljesítménye alatti -45 dB-es szintet. A fenti szomszéd csatorna teljesítménynek számításba kell venni a jellemző beszéd-üzemi spektrumot.

Megjegyzés. – A beszéd-üzemi spektrumot állandó szintűnek feltételezik 300 és 800 Hz között és oktávonként 10 dB-lel csillapítottnak a 800 Hz felett.

2.3.1.4 *Moduláció.* A legalább 0,85-ös csúcs modulációs tényezőnek elérhetőnek kell lenni.

2.3.1.5 **Ajánlás.** – *Eszközöket kell biztosítani ahhoz, hogy az átlagos modulációs tényezőt a gyakorlatilag lehetséges legnagyobb értéken tartsák túlmodulálás nélkül.*

2.3.2 Vételi funkció

2.3.2.1 *Frekvencia stabilitás.* Ahol 8,33 kHz-es csatorna-távolságot vezettek be az V. Kötetnek megfelelően, ott az üzemi frekvencia nem térhet el a kijelölt frekvenciától plusz vagy mínusz 0,0005 százaléknál nagyobb értékkel

2.3.2.2 ÉRZÉKENYSÉG

2.3.2.2.1 **Ajánlás.** – *Miután tekintetbe vették a légijármű tápvonal illesztési hibáit, a csillapítási veszteséget és az antenna polár diagram változást, a vételi funkció érzékenységének olyannak kell lenni,* *hogy az esetek nagy százalékában egy 15 dB megkívánt/nem-kívánt arányú audió kimenet jelet szolgáltasson 50 százalékos amplitúdó-modulált (A3E) rádió jellel, amely 75 mikrovolt per méter (mínusz 105 dBW/m^2) térerőséggel rendelkezik.*

Megjegyzés. – Kiterjesztett hatótávolságú VHF berendezések tervezésénél 30 mikrovolt per méter fedélzeti vételi funkció érzékenység feltételezhető.

2.3.2.3 *Effektív vételi sávszélesség a 100 kHz, 50 kHz és 25 kHz-es csatorna-távolságú vevő berendezéseknél.* Amikor a vevő berendezés az V. Kötetben kijelölt 25 kHz, 50 kHz vagy 100 kHz-es csatorna-távolságra van hangolva, a vételi funkciónak tényleges vételi sávszélességet kell biztosítani a következők szerint:

a) azokon a területeken, ahol eltolt vivő rendszereket alkalmaznak, a vételi funkciónak kieklégítő audio kimenetet kell szolgáltatnia akkor, amikor a fenti 2.3.2.2 pontban meghatározott vivő frekvencia eltérése a kijelölt frekvenciától 8 kHz-en belül van;

b) azokon a területeken, ahol eltolt vivő rendszereket nem alkalmaznak, a vételi funkciónak kielégítő hangfrekvenciás kimenetet kell szolgáltatnia akkor, amikor a fenti 2.3.2.2 pontban meghatározott vivőfrekvenciájának eltérése a kijelölt frekvenciától plusz vagy mínusz 0,005 százalék.

2.3.2.4 *Effektív vételi sávszélesség a 8,33 kHz-es csatorna-távolságú vevő berendezéseknél.* Amikor aí vevő az V.Kötetben kijelölt 8,33 kHz-es sávszélességű csatornára van hangolva, a vételi funkciónak egy kieklégítő hangfrekvenciás kimenetet kell szolgáltatnia akkor, amikor a fenti 2.3.2.2 pontban meghatározott jel vivőfrekvenciájának eltérése a kijelölt frekvenciától plusz vagy mínusz 0,0005 százalék. Az effektív vételi sávszélességről bővebb információt a II. Rész "A" Melléklete tartalmaz.

Megjegyzés. – Az effektív vételi sávszélesség a Doppler eltolódást is magában foglalja.

2.3.2.5 *Szomszédos csatorna elnyomás.* A vételi funkció tényleges szomszédos csatorna elnyomást biztosít a következők szerint:

a) *8,33 kHz-es csatornák:* 60 dB vagy több a plusz vagy mínusz 8,33 kHz-nél a kijelölt frekvenciára vonatkoztatva, és 40 dB vagy több a plusz vagy mínusz 6,5 kHz-nél:

Megjegyzés. – A vevő helyi oszcillátora fázis-zajának elegendően kicsinek kell lenni ahhoz, hogy elkerüljék a vevő teljesítőképességének leromlását a vivőhullám jelek leválasztására. Egy mínusz 99 dBc/Hz-nél jobb fázis zajszint szükséges a 8,33 kHz-es távolságoknál ahhoz, hogy kielégítsék a 45 dB-es szomszédos csatorna elnyomás követelményét az összes üzemelési feltétel mellett.

b) A *25 kHz-es csatorna-távolságú környezetnél:* 50 dB vagy több a plusz vagy mínusz 25 kHz-nél a kijelölt frekvenciára vonatkoztatva, és 40 dB vagy több a plusz vagy mínusz 17 kHz-nél;

c) *Az 50 kHz-es csatorna-távolságú környezetnél:* 50 dB vagy több a plusz vagy mínusz 50 kHz-nél a kijelölt frekvenciára vonatkoztatva, és 40 dB vagy több a plusz vagy mínusz 35 kHz-nél;

d) *A 100 kHz-es csatorna-távolságú környezetnél:* 50 dB vagy több a plusz vagy mínusz 100 kHz-nél a kijelölt frekvenciára vonatkoztatva..

2.3.2.6 **Ajánlás.** – *Amikor csak megvalósítható, a vevő rendszernek biztosítani kell egy 60 dB-es vagy több effektív szomszédos csatorna elnyomási jellemzőt a plusz vagy mínusz 25 kHz-nél, 50 kHz-nél vagy 100 kHz-nél a kijelölt frekvenciától mérve a vételi rendszerek működésének biztosítására a 25 kHz-es, 50 kHz-es vagy 100 kHz-es csatorna-távolságú környezetben, a két felsorolás sorrendjének megfelelő összerendezésben.*

Megjegyzés. – A frekvencia tervezés általában azon az alapfeltételen nyugszik, hogy a 60 dB-es vagy több tényleges szomszédos csatorna elnyomási jellemző biztosítva van a 25 kHz-re, 50 kHz-re vagy 100 kHz-re kijelölt frekvenciáktól, ahogy az megfelelő a csatorna-távolsági környezetnek.

2.3.2.7 **Ajánlás.** – *Abban az esetben, amikor a vevők megfelelnek a fenti 2.3.2.3 pontnak, amelyet azokon a területeken használnak, ahol az eltolt vivőrendszerek használatban vannak, a vevő jellemzőknek a következők szerintieknek kell lenniök:*

a) a hangfrekvenciás csillapítás technika kizárja a két vagy több eltolt vivőfrekvencia vételéből eredő audio heterodinek káros szintjeit;

b) a vevő zajzár áramkörei, ha ilyeneket alkalmaznak, kielégítően működnek a két- vagy több eltolt vivőfrekvencia vételéből eredő audio heterodinek jelenléte esetén.

2.3.2.8 *VDL-INTERFERENCIA ÉRZÉKETLENSÉGI TELJESÍTMÉNY*

2.3.2.8.1 Azoknál a berendezéseknél, amelyeket ugyanazon légijármű fedélzetén DSB-AM és VDL technológiát alkalmazó szolgáltatásokat független üzemeltetésű használatra szántak, a vevő funkciónak kielégítő és jól érthető hangkimenetet kell szolgáltatnia egy nem több, mint 150 mikrovolt per méter (mínusz 102 dBW/m^2) megkívánt térerővel és egy legalább 50 dB-es nem-kívánt VDL jel térerősséggel a megkívánt térerősség felett bármely kijelölt csatornán 100 kHz-re vagy nagyobb távolságra a kívánt jel kijelölt csatornájától.

Megjegyzés. – A VDL-interferencia érzéketlenségi teljesítmény ezen szintje olyan vevő teljesítményt szolgáltat, amely megfelel a VDL RF spektrum maszk befolyásának, ahogy az a III. Kötet I. Rész 6.3.4 pontjában ismertetve van, egy tényleges 68 dB-es adó/vevő elkülönítéssel. Jobb adó és vevő teljesítmény kisebb megkívánt elkülönítést eredményezhet.

2.3.2.8.2 Minden 2002. január 1. után újonnan felszerelt ugyanazon légijármű fedélzetén lévő DSB-AM és VDL technológiát alkalmazó szolgáltatások független üzemeltetésénél való felhasználására szánt berendezés vétel funkciójának ki kell elégítenie a 2.3.2.8.1 pont előírásait.

2.3.2.8.3 Minden 2005. január 1. után felszerelt, ugyanazon légijármű fedélzetén DSB-AM és VDL technológiát alkalmazó szolgáltatások független üzemeltetésénél való felhasználására szánt berendezés vétel funkciójának ki kell elégítenie a 2.3.2.8.1 pont előírásait a 2.3.2.8.4 pont feltételei mellett.

2.3.2.8.4 A 2.3.2.8.3 pont előírásainak kötelező teljesítésére vonatkozó követelményeket az olyan körzeti léginavigációs egyezmények alapján kell megszabni, amelyek az üzemelési légteret és a megvalósítási időrendjét határozzák meg.

2.3.2.8.4.1 A 2.3.2.8.4 pontban jelzett egyezménynek a fedélzeti rendszerek kötelező teljesítésére legalább kétéves előzetes bejelentést kell biztosítania.

2.3.3 Interferencia érzéketlenségi teljesítmény

2.3.3.1 1998. január 1-je után a VHF kommunikációs vételi rendszereknek kielégítő teljesítményt kell nyújtaniuk azon két jel harmadrendű intermodulációs termékek jelenléte esetén, amely termékek a mínusz 5 dBm vevő bemeneti szintekkel bíró VHF FM rádióadás jelek következtében jönnek létre.

2.3.3.2 1998. január 1-je után a VHF kommunikációs vételi rendszereket nem kell érzéketleníteni a VHF FM rádióadás jelek jelenléte esetén, ahol a rádióadás jelek mínusz 5 dBm-es vételi bemeneti szintekkel rendelkeznek.

Megjegyzés. – A fenti 2.3.3.1 és 2.3.3.2 pontokban idézett teljesítményhez használt érzéketlenítési kritériumokra vonatkozó útmutató anyagot a II. Rész "A" Mellékletének 1.3 pontja tartalmazza.

2.3.3.3 1995 január 1-je utána a fedélzeti VHF kommunikációs vételi rendszerek minden új felszerelésű berendezésének ki kell elégítenie a fenti 2.3.3.1 és 2.3.3.2 pontok előírásait.

2.3.3.4 **Ajánlás.** – *A fenti 2.3.3.1 és 2.3.3.2 alatti érzéketlenségi teljesítmény előírásokat kielégítő fedélzeti VHF kommunikációs vételi rendszereket a lehető legrövidebb időn belül üzembe kell helyezni.*

2.4 EGY-OLDALSÁVOS (SSB) HF ÖSSZEKÖTTETÉSI RENDSZER JELLEMZŐK A LÉGIFORGALMI MOZGÓ SZOLGÁLATOKNÁL TÖRTÉNŐ FELHASZNÁLÁSNÁL

2.4.1 A levegő-föld HF SSB rendszer jellemzőinek, ahol a légiforgalmi mozgó szolgálatoknál felhasználásra kerülnek, a következő előírásoknak kell megfelelniük.

2.4.1.1 FREKVENCIA TARTOMÁNY

2.4.1.1.1 A HF SSB berendezéseknek alkalmasaknak kell lenniük bármely SSB vivő (referencia) frekvenciánál, amely a légiforgalmi mozgó (R) szolgáltatás részére rendelkezésre áll a 2,8 MHz-től a 22 MHz-ig terjedő sávban, és szükségszerű az, hogy kielégítsék a körzet(ek) részére jóváhagyott kijelölési tervet, valamint összhangban legyenek a Rádió-Szabályzat vonatkozó előírásaival.

1. Megjegyzés. – Lásd a Bevezetést az V. Kötet 3.Fejezetéhez és a 2-1. és 2-2. ábrákat.

2. Megjegyzés. – Az ITU Világ Adminisztrációs Rádió Konferencia, Légiforgalmi Mozgó (R) Szolgálat, Genf, 1978. (ITU World Administrative Radio Conference, Aeronautical Mobile (R) Service, Geneva, 1978.) egy új kiosztási tervet hozott létre (Allotment Plan) az Aer Rádió-Szabályzatok 27. Függelékéhez (Appendix 27, Aer to the Radio Regulations), amely az egy-oldalsávos üzemelésre van alapozva, a korábbi két-oldalsávos kijelöléssel szemben. A Világ Rádió-Összeköttetési Konferencia (World Radiocommunication Conference) 1995-ben ezt S.27 Függelékként jelölte ki újra. Kisebb szerkesztői változtatásokat hajtott végre a Világ Rádió-Összeköttetési Konferencia 1997-ben.

2.4.1.1.2 A berendezéseknek alkalmasnak kell lenniük az 1 kHz integral többszörösein való üzemelésre.

2.4.1.2 OLDALSÁV KIVÁLASZTÁS

2.4.1.2.1 Az átvitt oldalsávnak a vivő- (referencia) frekvencia nagyobb frekvenciájú oldalán lévőnek kell lennie.

2.4.1.3. VIVŐ (REFERENCIA) FREKVENCIA

2.4.1.3.1 A csatorna felhasználásnak összhangban kell lenni az S27 Függelék 27/16-os és a Kijelölési Terv 27/186-tól 27/207-ig terjedő, azt is magában foglaló vivőhullám (referencia) frekvencia táblázatokkal (vagy a 27/21 alapján megállapított frekvenciákkal).

Megjegyzés. - Az a cél, hogy csak a vivő- (referencia) frekvencia kerüljön közzétételre a Körzeti Tervekben, vagy a Légiforgalmi Tájékoztató Kiadványokban.

2.4.1.4 SUGÁRZÁSI OSZTÁLYOK ÉS VIVŐFREKVENCIA ELNYOMÁS

2.4.1.4.1 A rendszernek fel kell hasznnálnia a J3E elnyomott vivőfrekvencia osztályú sugárzást (lehet J7B és J9B is, ha alkalmas). Amikor SELCAL-t alkalmaznak a II. Rész 3. Fejezet által ismertetett előírások szerint, akkor a berendezésnek a H2B sugárzást kell felhasználnia.

2.4.1.4.2 1982. február 1-jéig a légiforgalmi állomásoknak és a légijármű fedélzeti állomásoknak be kell vezetniük a fenti 2.4.1.4.1 pontban előírt megfelelő sugárzási osztály(oka)t. Ettől a dátumtól kezdve az A3E sugárzási osztályt meg kell szűntetni, kivéve az alábbi 2.4.1.4.4 pontban megadott előírásokat.

2.4.1.4.3 1982. február 1-jéig az egy-oldalsávos működéshez felszerelt légiforgalmi állomásokat és légijármű fedélzeti állomásokat is fel kell szerelni a H3E sugárzási osztály átviteléhez, ahol megkövetelt, hogy kompatíbilis legyen a két-oldalsávos berendezésekkel a vételhez. Ettől a dátumtól kezdve a H3E kibocsátási osztályt meg kell szűntetni, kivéve az alábbi 2.4.1.4.4 pontban szereplő előírásokat.

2.4.1.4.4 **Ajánlás.** – *A koordinált kutatási és mentési műveletekben közvetlenül résztvevő állomások, amelyek a 3023 kHz-es és az 5680 kHz-es frekvenciákat használják, a J3E sugárzási osztályt használják; azonban mivel a tengeri mozgó szolgálat és szárazföldi mozgó szolgálat is résztvehet a tevékenységben, az A3E és H3E sugárzási osztályok is használhatók.*

2.4.1.4.5 1981. április 1-je után új DSB berendezések nem szerelhetők fel.

2.4.1.4.6 A légijármű fedélzeti állomási adó-berendezéseknek képeseknek kell lenni legalább 26 dB-es vivő-elnyomásra a modulációs csúcs-teljesítményre (P_p) vonatkoztatva a J3E, J7B vagy J9B sugárzási osztályoknál.

2.4.1.4.7 A légiforgalmi állomások adóinak képeseknek kell lenni 40 dB-es vivő-elnyomásra a modulációs csúcs- teljesítményre (P_p) vonatkoztatva a J3E, J7B vagy J9B sugárzási osztályoknál.

2.4.1.5 HANGFREKVENCIÁS SÁVSZÉLESSÉG

2.4.1.5.1 A rádiótelefon sugárzásoknál a hangfrekvenciákat 300 és 2700 Hz közé kell korlátozni és a más, szabályozott sugárzások által elfoglalt sávszélesség nem haladhatja meg a J3E sugárzások felső határát. Ezeknek a határértékeknek a meghatározásánál azonban kiterjedésükben nem lehet korlátozásokat alkalmazni a J3E sugárzástól eltérő sugárzás esetében, feltéve, hogy a nem-kívánt sugárzásokra vonatkozó korlátozások teljesülnek (lásd az alábbi 2.4.1.7 pontot).

Megjegyzés. – Azokra a légijármű fedélzeti és légiforgalmi állomási adó típusokra, amelyeket először 1983. február 1-je előtt szereltek fel, a hangfrekvenciák 3000 Hz-re lesznek korlátozva.

2.4.1.5.2 Más engedélyezett sugárzási osztályoknál a modulációs frekvenciáknak olyannak kell lenniük, hogy az alábbi 2.4.1.7 pontban ismertetett, megkövetelt spektrum korlátozásokat kielégítsék.

2.4.1.6 FREKVENCIA TŰRÉS

2.4.1.6.1 Az adási funkció alapfrekvencia stabilitásának a J3E, J7B vagy J9B sugárzási osztályoknál olyannak kell lenni, hogy az adás tényleges vivő- frekvenciája és a vivő- (referencia) frekvencia közötti különbség ne haladja meg:

- a 20 Hz-et a fedélzeti telepítéseknél; és

- a 10 Hz-et a földi telepítéseknél.

2.4.1.6.2 A vételi funkció frekvencia stabilitásának olyannak kell lenni, hogy a fenti 2.4.1.6.1 pontban meghatározott sugárzási funkció stabilitásokkal, a szolgáltatásban elért és a Doppler-eltolódást is tartalmazó földi és fedélzeti funkció közötti teljes frekvencia-különbség ne haladja meg a 45 Hz-et. Azonban a szuperszónikus repülőgépek esetén ennél nagyobb frekvencia-különbség is megengedhető.

2.4.1.7 SPEKTRUM HATÁRÉRTÉKEK

2.4.1.7.1 Azoknál a légijármű fedélzeti állomás adó típusoknál és légiforgalmii állomás adóknál, amelyek 1983. február 1-je előtt kerültek először felszerelésre és a H2B, H3E, J3E, J7B vagy J9B sugárzások egy-oldalsávos osztályait használják, bármely sugárzás közepes teljesítményének, bármely önálló frekvencián kisebbnek kell lennie az adó közepes teljesítményénél (P_m), a következőknek megfelelően:

- bármely frekvencián 2 kHz-es vagy nagyobb értékű, maximálisan 6 kHz-es távolságban a kijelölt frekvenciától: legalább 25 dB;

- bármely frekvencián 6 kHz-es vagy naígyobb értékű, maximálisan 10 kHz-es távolságban a kijelölt frekvenciától: legalább 35 dB;

- bármely frekvencián 10 kHz-esl vagy nagyobb távolságban a kijelölt frekvenciától:

a) a légijármű fedélzeti állomás adójának: 40 dB;

b) a légiforgalmi állomás adójának:

$[43+10 \log_{10} P_m (W)]$ dB

2.4.1.7.2 Az 1983 február 1-je után először felszerelt légijármű fedélzeti adóknál, és az 1983. február 1-je óta használatban lévő és a H2B, H3E, J3E, J7B vagy J9B sugárzási egy-oldalsávos osztályait használó légiforgalmi állomás adóknál bármely modulációs csúcs-teljesítményének (P_p) bármely önálló frekvencián kisebbnek kell lennie, mint az adó modulációs csúcs-teljesítményének (P_p), a következőknek megfelelően:

- bármely frekvencián 1,5 kHz-es vagy nagyobb értékű, maximálisan 4,5 kHz-es távolságban a kijelölt frekvenciától: legalább 30 dB;

- bármely frekvencián 4,5 kHz-es vagy nagyobb értékű, maximálisan 7,5 kHz-es távolságban a kijelölt frekvenciától: legalább 38 dB;

- bármely frekvencián 7,5 kHz-es vagy nagyobb távolságban a kijelölt frekvenciától:

a) a légijármű fedélzeti állomás adójának: 43 dB;

b) a légiforgalmi állomások adóinak: a maximálisan 50 W teljesítményű adónál.
$[43+10 \log_{10} P_m (W)]$ dB

az 50 W-nál nagyobb teljesítményű adóknál: 60 dB.

Megjegyzés. – Lásd a 2-1. és a 2-2 ábrát.

2.4.1.8 TELJESÍTMÉNY

2.4.1.8.1 *Légiforgalmi állomási berendezések.* Kivéve az ITU Rádió-Szabályzat S27 Függelékének előírásai által engedélyezetteket, az a modulációs csúcs-teljesítmény, amely az antenna tápvonalat látja el a H2B, H3E, J3E, J7B vagy J9B sugárzási osztályoknál, nem haladhatja meg a 6 kW-os maximális értéket.

2.4.1.8.2 *Légijármű fedélzeti állomások.* Az antenna tápvonalhoz szolgáltatott modulációs csúcs-teljesítmény a H2B, H3E, J3E, J7B vagy J9B sugárzási osztályoknál nem haladhatja meg a 400 W-ot, kivéve a Rádió-Szabályzat S27. Függelékében előírtakat a következők szerint:

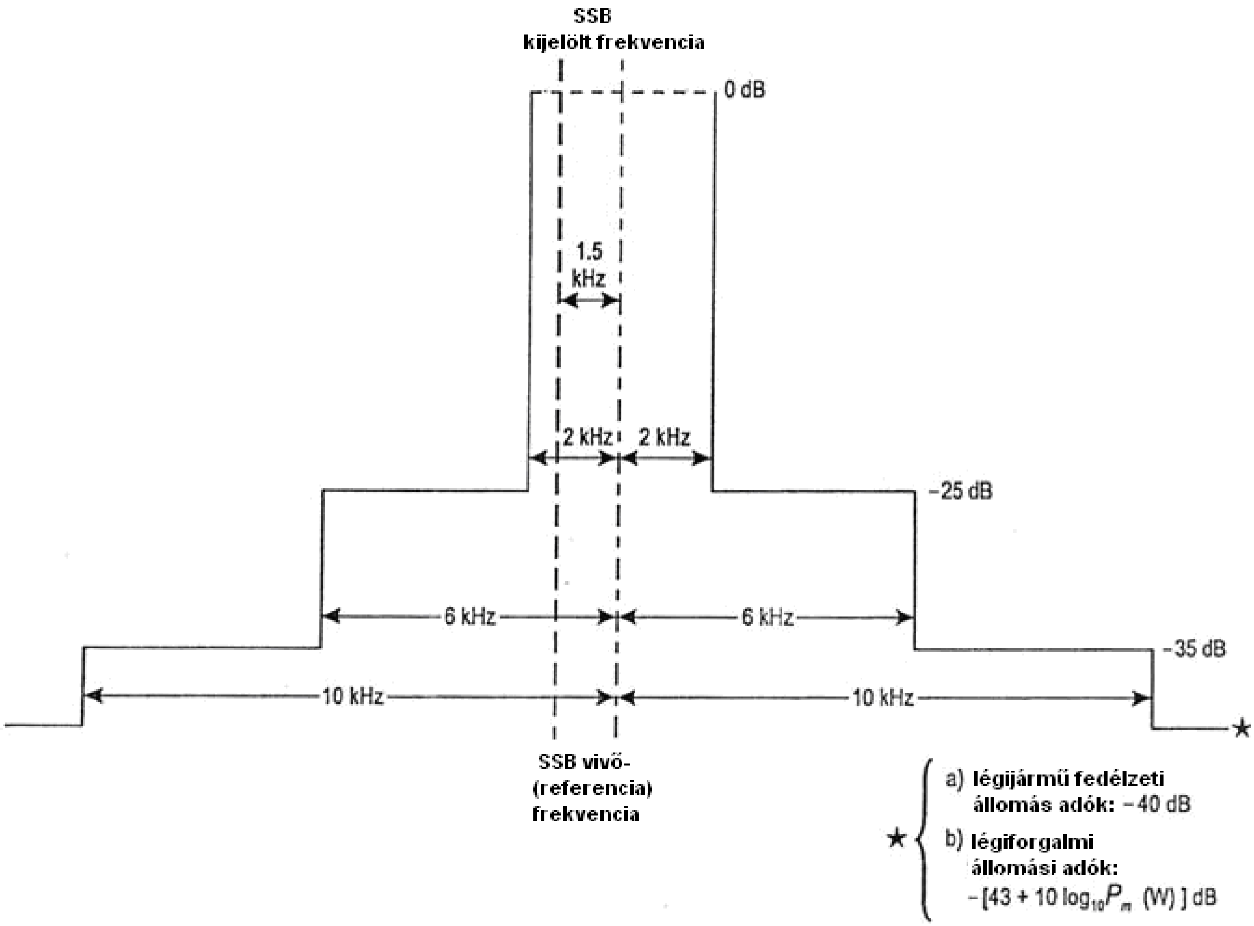
S27/68 Elfogadott az, hogy a légijármű adók által alkalmazott teljesítmény meghaladhatja a 27/60-ban meghatározott korlátokat. Azonban az ilyen megnövelt teljesítmény (amely általában nem haladhatja meg a 600 W P_p-t) használata nem okozhat káros interferenciát az azon műszaki elvekkel összhangban működő állomásoknál, amely elveken a frekvencia kiosztási terv alapul.

S27/60 Ha ennek a II. Résznek a Függelékében nincsen másképpen meghatározva, a modulációs csúcs-teljesítménynek, amely az antenna tápvonalában bevitelre kerül, nem haladhatja meg az alábbi táblázatban jelzett maximális értékeket; a megfelelő tényleges kisugárzott csúcs-teljesítményekről elfogadott az, hogy az alábbi értékek kétharmadával egyenlőek:

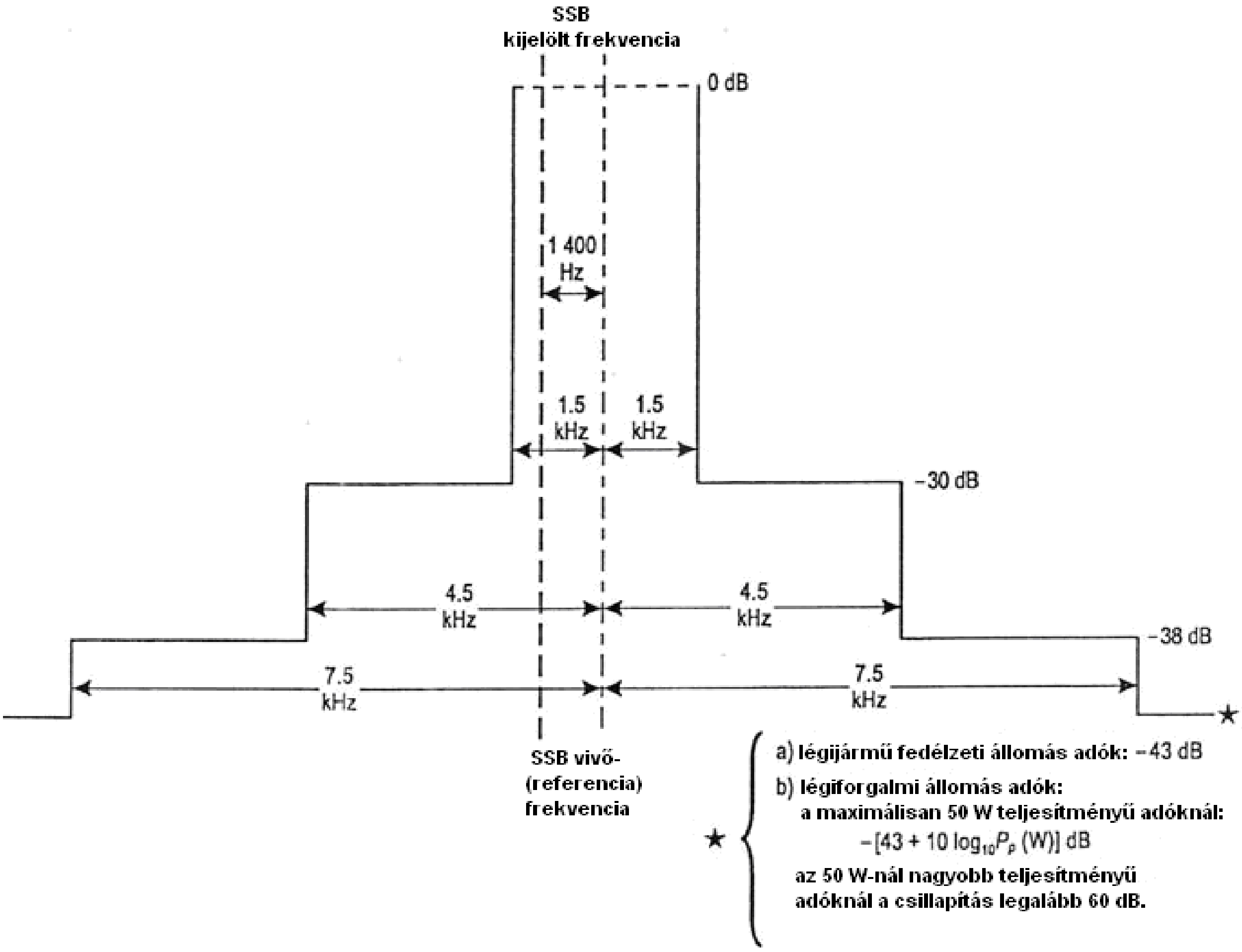
Sugárzási osztály	Állomások	Maximális modulációs csúcs-teljesítmény (P_p)
H2B, J3E, J7B, J9B	Légiforgalmi állomások	6 kW
J9B, A3E*, H3E* (100% moduláció)	Légijármű fedélzeti állomások	400 W
Egyéb sugárzás mint például A1A, F1B	Légiforgalmi állomások Légijármű fedélzeti állomások	1,5 kW 100 W

*Az A3E és H3E csak 3023 kHz-en és 5680 kHz-en használhatók.

2.4.1.9 *Üzemmód.* Egy-csatornás szimplex sugárzást kell alkalmazni.



2-1. ábra. Megkívánt spektrum korlátok (közepes teljesítményben kifejezve) a légijármű fedélzeti adó típusoknál és azoknál a légiforgalmi állomások adóinál, amelyeket először 1983. február 1-je előtt szereltek fel.



2-2. ábra. Megkívánt spektrum korlátok (a csúcs-teljesítményben kifejezve) az először az 1983. február 1-je után felszerelt légijármű fedélzeti állomásoknál és az 1983. február 1-je után használatban lévő légiforgalmi állomási adóknál.

3. FEJEZET: SELCAL RENDSZER

3.1 **Ajánlás.** – *Ahol SELCAL rendszert telepítenek, a következő rendszer jellemzőket kell alkalmazni:*

a) Kisugárzott kód. *Mindegyik kisugárzott kódnak két egymást követő hang-impulzusból kell állnia, mindegyik impulzus két szimultán módon átvitt hangot tartalmaz. Az impulzusok 1,0 plusz vagy mínusz 0,25 másodperc idő hosszúságúak, melyeket 0,2 plusz vagy mínusz 0,1 másodperc hosszúságú időközök választanak el.*

b) Stabilitás. *Az átvitt hangok frekvenciáját plusz vagy mínusz 15 százalék tűrésen belül kell tartani a fedélzeti dekóder helyes működésének biztosítása érdekében.*

c) Torzítás. *A teljes hangfrekvenciás torzítás az átvitt RF jelen nem haladhatja meg a 15 százalékot.*

d) Százalékos moduláció. *A földi rádióállomás által kisugárzott RF jelnek 3 dB-en belül egyenlő nagyságú, két moduláló hangot kell tartalmaznia. A hangok kombinációja egy modulációs* *burkológörbét eredményez, amely a lehető legmagasabb névleges modulációs százalékkal bír, és semmi esetre sem kisebb, mint 60 százalék.*

e) Kisugárzott hangok. *A hang-kódok a következő táblázatban felsorolt hangok különböző kombinációiból állnak, és színnel és betűvel vannak jelölve.*

Jelölés	*Frekvencia (Hz)*
Piros A	*312,6*
Piros B	*346,7*
Piros C	*384,6*
Piros D	*426,6*
Piros E	*473,2*
Piros F	*524,8*
Piros G	*582,1*
Piros H	*645,7*
Piros J	*716,1*
Piros K	*794,3*
Piros L	*881,0*
Piros M	*977,2*
Piros P	*1083,9*
Piros Q	*1202,3*
Piros R	*1333,5*
Piros S	*1479,1*

1. Megjegyzés. – Meg kell jegyezni, hogy a hangok $Log^{-1}0{,}045$-tel vannak elválasztva harmonikus kombinációk lehetőségének elkerülése céljából.

2. Megjegyzés. – Az Összeköttetési Részleg Hatodik Ülése által kifejlesztett alkalmazási elveknek megfelelően, jelenleg nemzetközi használatra csak a piros csoportból választottak kódokat.

3. Megjegyzés. – A SELCAL rendszerek használatára vonatkozó útmutató anyagot a II. Rész "A" Melléklete tartalmazza.

4. Megjegyzés. – A Piros P, Piros Q, Piros R és Piros S hangok 1985. szeptember 1-je után alkalmazhatók, az alábbi 3.2 pontnak megfelelően.

3.2 Mivel 1985. szeptember 1-jétől a légiforgalmi állomásokat, amelyektől megkövetelik a kommunikációt a SELCAL-lal felszerelt légijárművekkel, fel kell szerelni SELCAL kódokkal a piros csoportnak megfelelően a fenti 3.1 pontban feltüntetett hangfrekvencia táblázatnak megfelelően. 1985. szeptember 1-je után a Piros P, Piros Q, Piros R és Piros S SELCAL kódokat használatra ki lehet jelölni.

4. FEJEZET: LÉGIFORGALMI BESZÉD-ÁTVITELI ÁRAMKÖRÖK

4.1 A FÖLD-FÖLD KÖZÖTTI ALKALMAZÁSÚ NEMZETKÖZI LÉGIFORGALMI BESZÉD-ÁTVITELI ÁRAMKÖRÖK KAPCSOLÁSAINAK ÉS JELZÉSEINEK TECHNIKAI ELŐÍRÁSAI

Megjegyzés. - A föld - föld közötti alkalmazású nemzetközi légiforgalmi beszéd-átviteli áramkörök kapcsolásainak és jelzéseinek kivitelezésére vonatkozó útmutató anyagot a Légiforgalmi Szolgálatok (ATS) Föld - Föld Közötti Beszéd-átviteli Kapcsolások és Jelzések Kézikönyve (Doc 9804) tartalmazza. Az anyag magába foglalja a szakkifejezések magyarázatát, a teljesítmény paramétereket, útmutatást ad az alapvető hívás típusokról és a kiegészítő funkciókról, utal a megfelelő ISO/IEC nemzetközi szabványokra és az ITU-T ajánlásokra, útmutatásokat ad a jelzési rendszerek használatáról, részletezi az ajánlott számozási tervezeteket és útmutatásokat ad a jövőbeli tervezetekről.

4.1.1 A nem külön-vonallal összekapcsolt Légiforgalmi Szolgálatoknál a kapcsolás és jelzés felhasználásával biztosított beszéd-átviteli áramkörök alkalmazása az illetékes Hatóságok közötti megállapodás tárgya.

4.1.2 A légiforgalmi beszéd-átviteli áramkörök kapcsolási és jelzési rendszereinek alkalmazását a körzeti léginavigációs egyezmények alapján kell megvalósítani.

4.1.3. **Ajánlás.** – *Az Annex 11, 6.2 Részében meghatározott Légiforgalmi Irányítási összeköttetési követelményeket a következő alap hívás típus közül egynek vagy többnek a megvalósításával kell kielégíteni:*

a) Azonnali hozzáférés;

b) Közvetlen hozzáférés; és

c) Közvetett hozzáférés.

4.1.4 **Ajánlás.** – *A telefon-hívások létrehozásának alap képességéhez kiegészítőleg a következő funkciókat kell biztosítani ahhoz, hogy az Annex 11-ben lefektetett követelmények kielégítésre kerüljenek:*

a) Hívó/hívott fél azonosításának jelzésére szolgáló eszköz;

b) Sürgős/elsőbbségi hívások kezdeményezésére szolgáló eszköz; és

c) Konferencia-beszélgetés képesség.

4.1.5 **Ajánlás.** – *A légiforgalmi beszéd-átviteli áramkörök kapcsolási és jelzési rendszerben használt áramkörök jellemzőinek meg kell felelniük a megfelelő ISO/IEC nemzetközi szabványoknak és az ITU-T ajánlásoknak.*

4.1.6 **Ajánlás.** – *Digitális jelző rendszereket kell felhasználni, amikor a következő tényezők valamelyikénél azok használata indokolható:*

a) A szolgáltatás jobb minősége;

b) Javított minőségű felhasználói berendezések; vagy

c) Csökkentett költségek ott, ahol a szolgáltatás minősége fennmarad.

4.1.7 **Ajánlás.** – *A felhasználandó ellenőrző hangjelzések jellemzői (mint például csengetés, foglaltság, nem-kapcsolható-szám) meg kell, hogy feleljenek a vonatkozó ITU-T ajánlásoknak.*

4.1.8 **Ajánlás.** - *A körzeti és nemzeti légiforgalmi beszéd-átviteli hálózatok összekapcsolási előnyeinek kihasználása érdekében a nemzetközi légiforgalmi telefon-hálózati számozási rendszert kell használni.*

5. FEJEZET: KÉNYSZERHELYZETI HELYJELADÓ (ELT) A KUTATÁSHOZ ÉS MENTÉSHEZ

5.1 ÁLTALÁNOS RÉSZ

5.1.1 2005. január 1-ig a kényszerhelyzeti helyjeladó adó-berendezéseknek vagy mindkét, a 406 MHz-es és a 121,5 MHz-es frekvencián, vagy a 121,5 MHz frekvencián kell üzemelniük.

Megjegyzés. – 2000. január 1-jétől a 121,5 MHz-en üzemelő kényszerhelyzeti helyjeladókkal szemben követelmény az, hogy megfeleljenek az 5.2.1.8 pontban leírt tökéletesített technikai jellemzőknek.

5.1.2 Az összes, 406 MHz-en üzemelő kényszerhelyzeti helyjeladó adó-berendezésnek meg kell felelnie az 5.3 pont előírásainak.

5.1.3 Az összes, 121,5 MHz-en üzemelő kényszerhelyzeti helyjeladó adó-berendezésnek meg kell felelnie az 5.2 pont előírásainak.

5.1.4 2005. január 1-jétől a kényszerhelyzeti helyjeladók adó-berendezéseinek egyidejűleg kell működniük a 406 MHz-en és a 121,5 MHz-en.

5.1.5 A 2002. január 1. után felszerelt összes kényszerhelyzeti helyjeladó adó-berendezésnek egyidejűleg a 406 MHz-en és a 121,5 MHz-en kell üzemelniük.

5.1.6 Egy integrált kényszerhelyzeti helyjeladó berendezés 406 MHz-es részének a technikai jellemzői meg kell, hogy feleljenek az 5.3 pontban leírtaknak.

5.1.7 Egy integrált kényszerhelyzeti helyjeladó berendezés 121,5 MHz-es részének a technikai jellemzői meg kell, hogy feleljenek az 5.2 pontban leírtaknak.

5.1.8 Az Államoknak egyezményt kell kötniük egy 406 MHz-es ELT jegyzék elkészítéséről. A kényszerhelyzeti helyjeladóra vonatkozó jegyzék információit - amint rendelkezésre állnak - azonnal a kutató és mentő hatóságok rendelkezésére kell bocsájtani. Az Államoknak biztosítaniuk kell, hogy amikor az szükséges, a jegyzék felfrissítésre kerüljön.

5.1.9 Az ELT jegyzék információinak a következőket kell magába foglalniuk:

a) Az adó azonosítóját (15 hexadecimális karakterből álló alfanumerikus kód formájában kifejezve);

b) Az adó gyártóját, modeljét és - amikor rendelkezésre áll - a gyártási sorozat számát;

c) A COSPAS-SARSAT típus engedélyezési számot;

COSPAS = A vészhelyzetben lévő hajók kutatási műholdas rendszere;

SARSAT = Kutatási és mentési műholdas automatikus pályakövetés.

d) A tulajdonos és járató nevét, címét (postai és e-mail) és kényszerhelyzeti telefonszámát;

e) Az olyan más kényszerhelyzeti kapcsolatok (kettő, ha lehetséges) nevét, címét (postai és e-mail) és telefonszámát, akiket a tulajdonos vagy az üzemeltető ismer;

f) A légijármű gyártóját és típusát; és

g) A légijármű színét.

1. Megjegyzés. - Különféle kódolási protokolok állnak az Államok rendelkezésére. Az elfogadott protokoloktól függően az Államok, saját belátásuk szerint beépíthetik az alábbiak egyikét, mint nyilvántartásba vett, kiegészítő azonosító információt:

a) A légijármű üzemeltető 'ügynökség' megnevezése és az üzemeltetők sorozat száma; vagy

b) A légijármű 24-bites címzése; vagy

c) A légijármű 'nemzetisége' és lajstromozási jelzése.

A légijármű üzemeltető 'ügynökségének' megjelölését az üzemeltető részére az ICAO jelöli ki az Állam hatóságán keresztül és az üzemeltetők sorozat számát az üzemeltető foglalja le a 0001-től a 4096-ig terjedő blokkból.

2. Megjegyzés. - Az Államok a saját belátásuk szerint az érvényben lévő megállapodásoktól függően beépíthetnek olyan nyilvántartásba veendő egyéb lényeges információkat is, mint például a lajstromozás utolsó dátuma, az akkumulátor 'lejárati dátuma' és az ELT elhelyezése a légijárművön (például: "elsődleges ELT" vagy "1.számú mentőtutaj").

5.2 A KUTATÓ ÉS MENTŐ KÉNYSZERHELYZETI HELYJELADÓ ADÓ-BERENDEZÉSEK (ELT) 121,5 MHz-ES RÉSZÉNEK ELŐÍRÁSAI

1. Megjegyzés. - A 121,5 MHz-es kényszerhelyzeti helyjeladók /ELT/ műszaki jellemzőire és üzemeltetési teljesítményére vonatkozó tájékoztatásokat az RTCA Dokumentum DO-183 és a Polgári Repülési Berendezések Európai Szervezete (EUROCAE) Dokumentum ED.62 tartalmazza.

2. Megjegyzés. - A 121,5 MHz-en üzemelő kényszerhelyzeti helyjeladó adó-berendezések műszaki jellemzőit a Nemzetközi Távközlési Unió - Ajánlás M.690-1 /ITU-R Recommendation M.690-1/ foglalja magába. Egy kényszerhelyzeti helyjeladó /ELT/ ITU-meghatározása a Kényszerhelyzeti Helyzet - Jelző Rádió Helyjeladó (EPIRB).

5.2.1 Műszaki jellemzők

5.2.1.1 A kényszerhelyzeti helyjeladó adó-berendezéseknek (ELT) a 121,5 MHz-es frekvencián kell üzemelni. A frekvencia tűrés nem haladhatja meg a plusz vagy mínusz 0,005 százalékot.

5.2.1.2 Egy ELT sugárzásának szabvány körülmények közötti és helyzetű antenna mellett függőlegesen polarizáltnak és a vízszintes síkban alapvetően körsugárzónak kell lenni.

5.2.1.3 48 órás folyamatos működési időtartam alatt és mínusz 20°C üzemelési hőmérséklet mellett a csúcs kisugárzott teljesítmény semmilyen esetben nem lehet 50 mW-nál kevesebb.

5.2.1.4 A sugárzás típusának A3X-nek kell lenni. Bármilyen más típusú modulációt, amely megfelel az alábbi 5.2.1.5, 5.2.1.6 és 5.2.1.7 pont követelményeinek, fel lehet használni, feltéve, hogy az nem fogja károsan befolyásolni a helyjeladónak a célkereső berendezés általi pontos hely-meghatározását.

Megjegyzés. – Néhány ELT fel van szerelve egy választható beszéd-átviteli képességgel (A3E) az A3X sugárzáshoz kiegészítőleg.

5.2.1.5 A vivőhullámnak amplitúdó-moduláltnak kell lenni, legalább 0,85-os modulációs tényezővel.

5.2.1.6 A vivőhullámra alkalmazott modulációnak minimum 33 százalékos kitöltési tényezővel kell rendelkezni.

5.2.1.7 A sugárzásnak megkülönböztető hangfrekvenciás jellemzővel kell rendelkezni, amelyet a vivőhullámnak az 1600 Hz - 300 Hz közötti tartományon belül nem kisebb, mint 700 Hz-es tartomány felett lefelé eltérített 2 Hz és 4 Hz közötti eltérítés ismétlési gyakoriságú hangfrekvenciás amplitúdó-moduláció valósít meg.

5.2.1.8 2000. január 1. után a sugárzásnak egy világosan meghatározott, a modulációs oldalsáv összetevőktől eltérő frekvencia- különbséget kell tartalmazni; nevezetesen, a teljesítménynek legalább a 30 százalékát kell ennek tartalmaznia, mindenkor a vivő- hullám plusz vagy mínusz 30 Hz-en belül a 121,5 MHz-en.

5.3 A KUTATÓ ÉS MENTŐ KÉNYSZERHELYZETI HELYJELADÓ ADÓ-BERENDEZÉSEK (ELT)

406 MHz-ES RÉSZÉNEK ELŐÍRÁSAI

5.3.1 Műszaki jellemzők

1. Megjegyzés. – A 406 MHz-es kényszerhelyzeti helyjeladó adó-berendezések sugárzási jellemzőit az ITU-R M.633 tartalmazza.

2. Megjegyzés. – A 406 MHz-es kényszerhelyzeti helyjeladók /ELT/ műszaki jellemzőire és üzemeltetési teljesítményére vonatkozó tájékoztatásokat az RTCA Dokumentum DO-204 és a Polgári Repülési Berendezések Európai Szervezete (EUROCAE) Dokumentum ED.62 tartalmazza.

5.3.1.1 A kényszerhelyzeti helyjeladó adó-berendezéseknek a 406,0 - 406,1 MHz-es frekvencia-sávban való használatra kijelölt frekvencia csatornák egyikén kell üzemelni.

Megjegyzés. - A COSPAS-SARSAT 406 MHz-es csatorna kijelölési tervet a COSPAS-SARSAT Dokumentum C/S T.012 tartalmazza.

5.3.1.2 Az adások közötti időtartamnak 50 másodperc plusz/mínusz 5 százaléknak kell lenni.

5.3.1.3 Egy 24 órás folyamatos működési időtartam alatt -20°C-os üzemelési hőmérséklet mellett az adó kimenő teljesítményének az 5 W plusz vagy mínusz 2 dB-es határértékeken belül kell lenni.

5.3.1.4 A 406 MHz-es ELT-nek képesnek kell lenni egy digitális közlemény továbbítására.

5.3.2 Adó azonosító kódolás

5.3.2.1 A 406 MHz-en üzemelő kényszerhelyzeti helyjeladó adó-berendezésének kijelölt egyedülálló kóddal kell rendelkezni az adónak vagy annak a légijárműnek az azonosításához, amelyre fel van szerelve.

5.3.2.2 A kényszerhelyzeti helyjeladó adó-berendezést vagy a légiközlekedési felhasználói protokolnak megfelelően, vagy egy, az ennek a fejezetnek az 1. Függelékében leírt soros műveletű felhasználói kódnak megfelelően kell kódolni, és az illetékes hatósággal „lajstromoztatni” kell.

AZ 5. FEJEZET 1. FÜGGELÉKE: KÉNYSZERHELYZETI HELYJELADÓ ADÓ-BERENDEZÉS KÓDOLÁS

(lásd az 5. Fejezet 5.3.2 pontját)

Megjegyzés. – A helyjeladó kódolásának részletes leírását a COSPAS-SARSAT 406 MHz-es Veszélyhelyzeti Helyjeladók (C/S T.001.) Előírásai foglalják magukba. A következő információk a légiközlekedésben jellemzően használatos kényszerhelyzeti helyjeladó adóberendezésekre vonatkoznak.

1. ÁLTALÁNOS

1.1 A 406 MHz-en üzemelő kényszerhelyzeti helyjeladó adó-berendezésnek (ELT) rendelkeznie kell azzal a képességgel, hogy egy olyan programozott digitális közleményt sugározzon, amely az ELT-re és/vagy arra a légijárműre vonatkozik, amelyre fel van szerelve.

1.2 Az ELT-nek az alábbi 1.3 pontban megadottaknak megfelelően egyedileg kódoltnak és az illetékes hatóság által ’lajstromozott’-nak kell lenni.

1.3 Az ELT digitális közleményének tartalmaznia kell vagy az adóberendezés sorozat-számát, vagy a következő információ elemek egyikét:

a) A légijármű üzemeltető ’ügynökség’ megnevezése és a berendezés sorozat-száma;
b) A 24-bites légijármű címzés;
c) A légijármű ’nemzetisége’ és lajstromozási jelzések.

1.4 Az összes kényszerhelyzeti helyjeladó adóberendezésnek a COSPAS-SARSAT rendszerrel együttműködő rendszerűnek és típus-engedélyezettnek kell lenni.

COSPAS = A vészhelyzetben lévő hajók kutatási műholdas rendszere;
SARSAT = Kutatási és mentési műholdas automatikus pályakövetés.

Megjegyzés. – Az ELT jel sugárzási jellemzőit a gyártásnál felhasznált COSPAS-SARSAT Típus Alkalmassági Szabvánnyal (C/S T.007) lehet hitelesíteni.

2. A KÉNYSZERHELYZETI HELYJELADÓ ADÓ-BERENDEZÉS /ELT/ KÓDOLÁSA

2.1 Az ELT digitális közlemény tartalmaznia kell a közlemény formátumra, a kódolási protokolra, az ország kódra és az azonosító adatokra és a telepítési adatokra vonatkozó információkat, amelyik a megfelelő.

2.2 Azoknál az ELT-knél, amelyek nem biztosítanak navigációs adatokat, a C/S T.001 rövid közlemény formátumot kell alkalmazni, az 1.-től a 112.-ig terjedő bitek felhasználásával. A navigációs adatokat biztosító ELT-kre – ha biztosítva van – a hosszú formátumú közleményt kell alkalmazni, az 1.-től a 144.-ig terjedő bitek felhasználásával.

2.3. Védett adat mező

2.3.1 A védett adat mezőt, ami a 25.bittől a 85.bitig tart, egy hiba-javító kóddal kell védeni, és ez annak a közleménynek a része kell, hogy legyen, ami minden egyes vészhelyzeti ELT-ben egyedi.

2.3.2 A közlemény formátum jelzést, amelyet a 25.bit mutat, „0"-ra kell állítani a rövid közlemény formátum jelzésére, vagy „1"-re az olyan hosszú formátumú ELT-k jelzésére, amelyek képesek a helyzet adat biztosítására.

2.3.3 A protokol jelzést a 26.bittel kell jelezni, és „1"-re kell állítani a felhasználói és felhasználói telepítési protokoloknál, „0"-ra pedig a telepítési protokoloknál.

2.3.4 Az ország kódot, ami azt az Államot jelzi, ahol kiegészítő adatok állnak rendelkezésre arról a légijárműről, amely az ELT-vel el van látva, a 27.-től a 36.-ig terjedő biteknek kell magukba foglalni, ezek adják meg a három-számjegyű decimális ország kód számot bináris számrendszerben kifejezve.

Megjegyzés. – Az ország kódok a Nemzetközi Távközlési Unió (ITU) ország kódjai, azok, amelyek az ITU Hívójelek és Számjegyes Azonosítók Jegyzéke I. Kötete I. Részének 4. táblázatában kerültek megadásra.

2.3.5 A 37.-től a 39.-ig terjedő biteknek (felhasználói és felhasználói telepítési protokolok), vagy a 37.-től a 40.-ig terjedő biteknek (telepítési protokolok) kell jelezniük azoknak a protokoloknak az egyikét, amelyek értéke „001" és „011" vagy „0011" , „0100", „0101" éa „1000", és a légiközlekedésben használatosak, ahogy azt az ebben a függelékben található példák bemutatják.

2.3.6 Az ELT digitális közleménynek magába kell foglalnia vagy az adó sorozat-számát, vagy a légijármű, illetve a járató azonosítóját, ahogy az az alábbiakban bemutatásra kerül.

2.3.7 A soros felhasználói és a soros felhasználói telepítési protokolban (amit a bit 26=1 és a 37.-től a 39.-ig terjedő bitek „011"-re állítása jelez) a soros azonosító adatokat bináris számrendszerben kell kódolni a legkisebb helyiértékű bitnek a jobb oldalán. A 40.-től a 42.-ig terjedő biteknek kell jelezniük az ELT típus soros azonosító adatait úgy kódolva, hogy:

– *A „000" jelzi az ELT sorozat-számát (bináris számrendszerben) a 44.-től a 63.-ig terjedő bitekbe kódolva;*
– *A „001" jelzi a légijármű üzemeltetőjét (3-betűs kódolással, az 5-1. táblázatban bemutatott módosított Baudot-kkódot felhasználva) és egy sorozat-számot (bináris számrendszerben) a 44.-től a 61.-ig és a 62.-től a 73.-ig terjedő bitekbe kódolva különkülön;*
– *A „011" azt jelzi, hogy a 24-bites légijármű címzés a 44.-től a 67.-ig terjedő bitekbe van kódolva, és az ugyanazon a légijárművön lévő további ELT-k száma (bináris számrendszerben) a 68.-tól a 73.-ig terjedő bitekben kódolt.*

Megjegyzés. – Az Államoknak kell biztosítani azt, hogy egy adatbázisban egyedileg legyenek kódolva és lajstromozva az egyes olyan helyjeladók, amelyek az Állam ország kódjával vannak kódolva. A sorosan kódolt helyjeladók egyedi kódolását elő lehet segíteni azzal, hogy a COSPAS-SARSAT Típus Alkalmassági Bizonyítvány számát építik be az ELT közlemény részeként, ami egy, a COSPAS-SARSAT által kijelölt egyedi szám minden egyes jóváhagyott ELT modelre.

2.3.8 A légiközlekedési felhasználói vagy felhasználói telepítési protokolban (amit a bit 26=1 és a 37.-től a 39.-ig terjedő bitek „001”-re állítása jelez) a légijármű ’nemzetiségi’ és lajstromozási jelét kell kódolni a 40.-től a 81.-ig terjedő bitekbe, az 5-1. táblázatban bemutatott módosított Baudot kódot használva, hét alfanumerikus karakterrel kódolva. Ezt az adatot pontosan kell szabatosítani úgy, hogy a módosított Baudot ’szóköz’ /üres jel/ („100100”) kerüljön alkalmazásra ott, ahol nincs karakter.

2.3.9 A 84. és 85. bitnek (felhasználói vagy felhasználói telepítési protokol), vagy a 112. bitnek (telepítési protokol) kell jeleznie bármilyen ’célra repülési’ /rávezető/ adó meglétét, ami a kényszerhelyzeti helyjeladó adóberendezésbe beépítésre kerülhetett.

2.3.10 A szabvány és a ’nemzeti’ telepítési protokolokban az összes azonosító és telepítési adatot bináris számrendszerben kell kódolni a legkisebb helyiértékű bittel a jobb oldalon szabatosítva. A légijármű üzemeltetőjének jelzését (3-betűs kód) 15 bitbe kell kódolni, a módosított Baudot-kódot (5-1. táblázat) úgy felhasználva, hogy betűnként csak az 5 jobb oldali helyzetű bit kerüljön felhasználásra, a bal oldali helyzetű bit pedig, aminek az értéke a betűknél „1”, maradjon ki.

5-1. táblázat. Módosított Baudot kód

Betű	Kód MSB LSB	Szám	Kód MSB LSB
A	111000	(-)*	011000
B	110011		
C	101110		
D	110010		
E	110000	3	010000
F	110110		
G	101011		
H	100101		
I	101100		
J	111010	8	001100
K	111110		
L	101001		
M	100111		
N	100110		
O	100011	9	000011
P	101101	0	001101
Q	111101	1	011101
R	101010	4	001010
S	110100		
T	100001	5	000001
U	111100	7	011100
V	101111		
W	111001	2	011001
X	110111	/	010111

Y	110101	6	010101
Z	110001		
( )**	100100		

MSB = Legnagyobb helyiértékű bit
LSB = Legkisebb helyiértékű bit
* = Kötőjel
** = Szóköz /üres jel/

KÓDOLÁSI PÉLDÁK

Kényszerhelyzeti helyjeladó adóberendezés /ELT/ sorozat-szám

25		27 36	37			40				44 63	64 73	74 83		85
F	1	ORSZÁG	0	1	1	T	T	T	C	SORSZÁM ADAT (21 BIT)	LÁSD AZ 1. MEGJEGYZÉST	LÁSD A 2. MEGJEGYZÉST	A	A

Légijármű címzés

25		27 36	37			40				44 67	68 73	74 83		85
F	1	ORSZÁG	0	1	1	T	T	T	C	24-BITES LÉGIJÁRMŰ CÍMZÉS (24 BIT)	LÁSD A 3. MEGJEGY-ZÉST	LÁSD A 2. MEGJEGYZÉST	A	A

Légijármű üzemeltető jelölő és sorszám

25		27 36	37			40				44 61	62 73	74 83		85
F	1	ORSZÁG	0	1	1	T	T	T	C	3-BETŰS ÜZEMELTETŐ JELÖLŐ	SORSZÁM 1–4096	LÁSD A 2. MEGJEGYZÉST	A	A

Légijármű lajstrom szám

25		27 36	37			40 81		83		85
F	1	ORSZÁG	0	0	1	LÉGIJÁRMŰ LAJSTROMJEL (MAXIMÁLISAN 7 ALFANUMERIKUS KARAKTER) (42 BIT)	0	0	A	A

T = Helyjeladó típus TTT = 000 jelzi, a kódolt ELT sorszámot
= 001 jelzi, a kódolt üzemeltető ügynökséget és sorszámot
= 011 jelzi, a kódolt 24-bites légijármű címzést
C = Bizonyítvány jelző bit: 1 = annak jelzésére, hogy a COSPAS-SARSAT Típus Alkalmassági Bizonyítvány szám kódolva a 74–83 bitben és
0 = másképpen
F = Formátum jelző: 0 = rövid közlemény
1 = hosszú közlemény
A = Rádió-helymeghatározó segédberendezés:
00 = nincs rádió-helymeghaítározó segédberendezés
01 = 121,5 MHz
11 = más rádió-helymeghatározó eszköz

1. Megjegyzés. – 10 bit, mind 0 vagy ország szerinti felhasználás.

2. Megjegyzés. – COSPAS-SARSAT Típus Alkalmassági Bizonyítvány szám bináris számokban, a legkisebb helyiértékű bittel a jobb oldalon vagy ország szerinti felhasználás.

3. Megjegyzés. – Sorszám, bináris számjegyekben, a legkisebb helyiértékű bittel a jobb oldalon, további ELT-k ugyanazon légijárművön, vagy 0-k, amikor csak egy ELT van felszerelve.

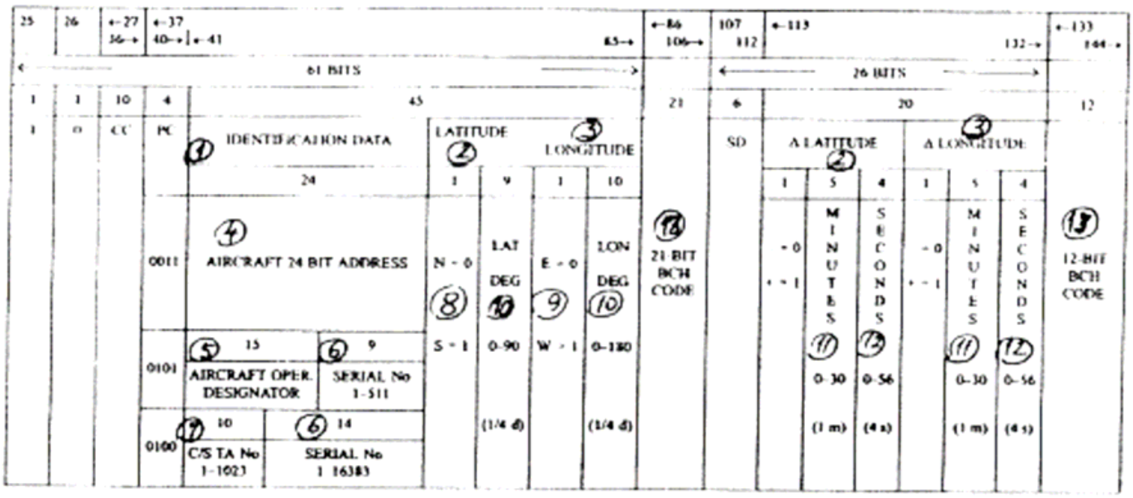
KÓDOLÁSI PÉLDA (FELHASZNÁLÓI TELEPÍTÉSI PROTOKOL)

25	26	← 27 … 36 →	← 37 … 39 →	← 40 … 83 →	85 →	← 86 … 106 →	← 107 … 112 →	← 113					132 →	← 133 … 144 →
1	1	10	3	44	2	21	1	12			13			12
1	1	CC	T	IDENTIFICATION DATA (AS IN ANY OF USER PROTOCOLS ABOVE)	A	21 BIT BCH ERROR CORRECTING CODE	E	LATITUDE			LONGITUDE			12 BIT BCH ERROR CORRECTING CODE
								1	7	4	1	8	4	
								N / S	DEG 0-90 (1 d)	MIN 0-56 (4 m)	E / W	DEG 0-180 (1 d)	MIN 0-56 (4 m)	

1 – Azonosító adatok (ahogy a fenti bármelyik felhasználói protokolban található;
2 – 21 bites / 12 bites / BCH hibajavító kód;
3 – Földrajzi szélesség; N/S = Észak/Dél; deg/min = fok/perc;
4 – Földrajzi hosszúság; S/W = Kelet/Nyugat;

BCH = Bose-Chaudhuri kód;
CC = Ország kód;
E = A kódolt helyzet adat forrása 1 = Belső navigációs berendezés
2 = Külső navigációs berendezés

KÓDOLÁSI PÉLDA (SZABVÁNY TELEPÍTÉSI PROTOKOL)



1 – Azonosító adatok;
2 – Földrajzi szélesség;
3 – Földrajzi hosszúság;
4 – A légijármű 24 bites címzése;
5 – A légijármű üzemeltetőjének jelzése;
6 – Sorozat-szám;
7 – COSPAS/SARSAT Típus Alkalmassági Szabvány;
8 – N = Észak, S = Dél;
9 – E = Kelet, W = Nyugat;
10 – Földrajzi szélesség/hosszúság, fok;
11 – Perc;
12 – Másodperc;
13 – 21 bites / 12 bites / BCH kód;

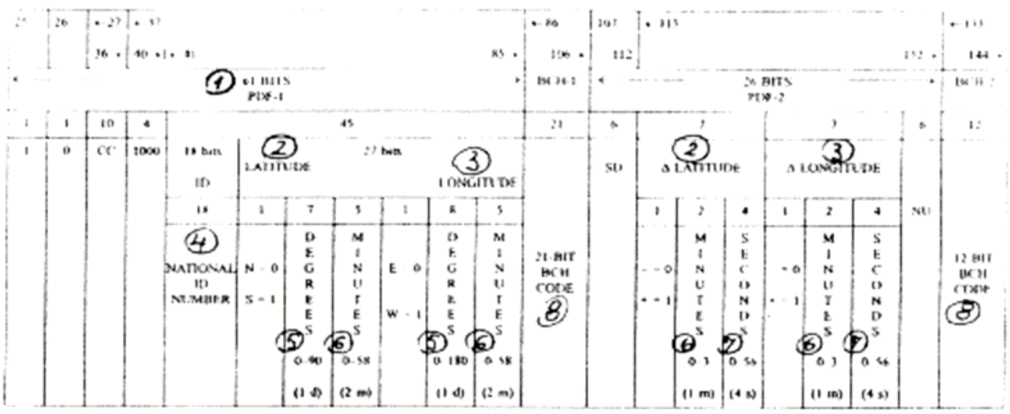
BCH = Bose-Chaudhuri kód;
CC = Ország kód;
PC = Protokol kód 0011 jelzi, hogy a 24 bites légijármű címzés kódolva van;
0101 jelzi, hogy a légijármű üzemeltetője (ügynökség) és sorszáma kódolva van;
0100 jelzi, hogy az ELT sorozat-száma kódolva van;
SD = Kiegészítő Adat Bitek 107 – 110 = 1101
Bit 111 = Kódolt helyzet adat forrás (1 = belső, 0 = külső);
Bit 112 1 = 121,5 MHz kiegészítő rádió helyzetmeghatározó berendezés;
0 = egyéb, vagy nincs kiegészítő rádió helyzetmeghatározó berendezés;

1. Megjegyzés. – A protokol kódolásra vonatkozó további részleteket a COSPAS-SARSAT 406MHz-es Vészhelyzeti Helyjeladók (C/S T.001.) Előírásai-ban találhatók.

2. Megjegyzés. – Az összes azonosító és telepítési adatot bináris kifejezésként kell kódolni, a legkisebb helyiértékű bittel a jobb oldalon, kivéve a légijármű üzemeltetőjének jelzését (3-betűs kód).

3. Megjegyzés. – A BCH hibajavító kód részleteit lásd a COSPAS-SARSAT 406MHz-es Vészhelyzeti Helyjeladók (C/S T.001.) Előírásai-ban.

KÓDOLÁSI PÉLDA ('NEMZETI' TELEPÍTÉSI PROTOKOL)



1 – 61 bit; PDF = védett adatmező;
2 – Földrajzi szélesség;
3 – Földrajzi hosszúság;
4 – Nemzeti azonosító szám;
5, 6 – N = Észak, S = Dél, E = Kelet, W =Nyugat, Fokok, Percek;
6, 7 – Percek, Másodpercek;
8- 21 bites /12 bites BCH kód;
BCH = Bose-Chaudhuri kód;
CC = Ország kód;
ID = Azonosító adatok = A 8 bites azonosító adatokat az illetékes nemzeti hatóság által kijelölt sorszám képezi.
SD = Kiegészítő Adatok, bit 107 – 109 = 110;
Bit 110 = A Kiegészítő Adat Jelzés írja le a 113-tól a 132-ig terjedő bitek felhasználását
1 = Delta helyzet, 0 = Nemzeti kijelölésre;
Bit 111 = Kódolt helyzet adatforrás
(1 = belső, 0 = külső);
Bit 112 = 1 = 121,5 MHz kiegészítő rádió helyzetmeghatározó berendezés;
0 = egyéb, vagy nincs kiegészítő rádió helyzetmeghatározó berendezés;
NU = Nemzeti felhasználásra = 6 bit van fenntartva a nemzeti felhasználásra (kiegészítőleg helyjeladó típus azonosítás, vagy egyébb felhasználások).

1. Megjegyzés. – A protokol kódolásra vonatkozó további részleteket a COSPAS-SARSAT 406MHz-es Vészhelyzeti Helyjeladók (C/S T.001.) Előírásai-ban találhatók.

2. Megjegyzés. – Az összes azonosító és telepítési adatot bináris kifejezésként kell kódolni, a legkisebb helyiértékű bittel a jobb oldalon.

3. Megjegyzés. – A BCH hibajavító kód részleteit lásd a COSPAS-SARSAT 406MHz-es Vészhelyzeti Helyjeladók (C/S T.001.) Előírásai-ban.

„A” Melléklet az I. Részhez: ÚTMUTATÓ ANYAG A LÉGIFORGALMI MOZGÓ MŰHOLDAS SZOLGÁLATHOZ

1. BEVEZETÉS

Megjegyzés. – A hivatkozott Légiforgalmi Mozgó Műholdas Szolgálat (AMSS) Szabványok és Ajánlott Gyakorlatok (SARPs) az Annex 10, III. Kötet, I. Rész, 4. Fejezetében találhatók.

1.1 Áttekintés

1.1.1 A Légiforgalmi Mozgó Műholdas Szolgálat (AMSS) főbb elemei: az űrbeli rész (a műholdak és az azokat irányító földi állomások); földi telepítésű földi állomások (GES), amelyek kapcsolatot szolgáltatnak a műhold és a földi állandóhelyú beszéd-üzemű és adat-hálózatok között; és a légijármű fedélzetén elhelyezett földi állomások (AES), amelyek a légijármű fedélzetén lévő repülés-elektronikai és antenna rendszereket foglalják magukban.

Megjegyzés. – Az AMS(R)S több üzemeltetője független, de kompatíbilis műholdas hálózatokat működtethet. A különböző üzemeltetőknek együtt kell működniük, hogy az AES-ek zökkenőmentesen mozogjanak a különböző hálózatok között.

1.1.2 A rendszer felépítés képes kielégíteni egy sor kommunikációs követelményt, amelyek az ATS-t, az AOC-t, az AAC-t és az APC-t foglalhatják magukba. Ugyanazt a rendszer felépítést használják a különböző szolgáltatási szinteken, az alap alacsony adat-sebesség szolgáltatástól a több-csatornás nagy adat-sebességű szolgáltatásig.

1.1.3 Az AMSS rendszer képességi szintjét úgy lehet megválasztani, hogy megfeleljen az alkalmazás által megkívánt működésnek.

1. Megjegyzés. – A szolgáltatás teljesítményét a GES, az űrbeli rész és az AES láncolatban rendelkezésre álló legalacsonyabb szintű képesség határozza meg.

2. Megjegyzés. – Míg egy alacsony képesség szintű szolgálatnak kisebb a beruházási költsége, magasabb lehet a használati díjtétele ugyanazon adat-áramlásnál.

1.1.4 A képességeket jelen útmutató anyag A-1 táblázata* foglalja össze.

1.1.5 Az ebben a szakaszban megadott teljesítmény példák csak arra szolgálnak, hogy gyors bepillantást adjanak a teljes rendszer működésébe. Ha pontos számszerű értékekre van szükség, ezekkel a . Annex 10, III. Kötet, I. Rész, 4. Fejezet idevonatkozó paragrafusai szolgálnak.

Rendszer képességek: Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.1.3 pont

Adat csomag teljesítmény: Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.7.2 pont

1.1.6 ÁRAMKÖRI ÜZEMMÓDÚ BESZÉD-ÜZEMI TELJESÍTMÉNY

Feltéve, hogy az AES egy GES-hez van bejelentkezve, az AMSS-nek a következő időre van szüksége egy híváshoz:

* Az összes táblázatot ennek a mellékletnek a végén helyeztük el.

légijárműtől:

- rövidített hozzáférés kérés SU használata: 10–14 másodperc (átlag)

- általános hozzáférés kérés SU használata: kevesebb mint 17 másodperc (átlag)

légijárműhöz: 9–11 másodperc (átlag)

Megjegyzés. – A hívás létrehozási idejét befolyásolhatja a kapcsolódó földi hálózat teljesítménye.

1.2 Képességi szintek

1.2.1 A légijármű fedélzeti földi állomás (AES) és a földi telepítésű földi állomás (GES) különböző képességi szintjei, amelyeket az Annex 10, III. Kötet, I. Rész, 4.Fejezet, 4.1.3 pontja határoz meg, különböző képességeket tesz lehetővé, amelyek különböző teljesítmény jellemzőkkel rendelkeznek. Az 1. szintű képesség az a legkisebb képesség, amely alap adat csomag összeköttetést szolgáltató légiforgalmi mozgó műholdas (útvonal) szolgáltatás (AMS(R)S) igényel. A 3. szintet szükséges minimumként követelik meg akkor, amikor a csomag összeköttetés mellett áramköri beszéd-üzemű összeköttetés szükséges. Mindegyik képesség szint megköveteli, hogy az AES pozitív irányítás alatt álljon, vagy egy P-csatorna jel vételével, vagy a C-csatorna alsávon keresztül. Az alábbiakban a jelzett csatorna átviteli sebességek közül csak egytől követelik meg, hogy egy adott időben működjön.

1.2.2 Az 1. szintű képesség alap adat csomag kommunikációt szolgáltat egy AES-től megkövetelve, hogy vegyen és feldolgozzon egy 0,6 és 1,2 kbit/s csatorna átviteli sebességekkel működő P-csatorna jelet. Ugyancsak megkövetelik az AES-től, hogy képes legyen továbbítani egy R-csatornán vagy egy T-csatornán ezekkel a csatorna sebességekkel. Mind az R-, mind a T-csatorna képesség megkövetelt. Az alkalmazott csatorna átviteli sebesség a kapcsolat minőségtől függ, amelyet a bit hiba-arány (BER) GES-mérésével vagy ennek a BER-nek a kiszámításával határoznak meg. A csatorna átviteli sebességet meghatározó főbb tényezők: a műhold és az AES antenna nyeresége és a műhold és az AES RF teljesítmény kimenete. Az 1. szint egy továbbító csatornát igényel (R- vagy T-csatornának) és egy vételi csatornát (P-csatornának).

1.2.3 A 2. képesség szint 0,6 és 10,5 kbit/s csatorna átviteli sebességet szolgáltat a P-csatornának; és 0,6 és 10,5 kbit/s csatorna átviteli sebességet az R-csatornának és a T-csatornának. A fő tényező, amely meghatározza azt, hogy mikor kell ezeket a csatorna átviteli sebességeket használni, az AES antenna nyereség, amelynek legalább 12 dBic értékűnek kell lenni, amikor „globális” sugarú műholddal működik. Ez a képesség nagyobb adat-összeköttetési átvitelt, gyorsabb közlemény-átvitelt szolgáltat és csökkentheti az üzemelési költségeket. A 2. szint egy átviteli csatornát és egy vételi csatornát igényel ugyanúgy, mint az 1. szint.

1.2.4 A 3. szint képesség a 2. szint adat csomag összeköttetéshez hozzáad egy áramköri képességet a beszéd-üzemre vagy a kommunikációs adásra és a vételre a C-csatornát használja. Ezek a C-csatornák 10,5 vagy 21,0 kbit/s csatorna átviteli sebességgel képesek működni 9,6 kbit/s-os kódolók alátámasztására a beszéd-üzemű kommunikációnál. A C-csatorna áramkör üzemmódú adat-összeköttetést is tud szolgáltatni, de ezt nem tekintik a biztonsági szolgáltatás részének. Az alkalmazott C-csatorna átviteli sebesség a vevő-oldali hibajavítás (FEC) az 1/2 átviteli teljesítményű kódolástól függ (az 1/2 sebesség kódolás 21,0 kbit/s-ot igényel). Előkészületeket tettek kisebb kódoló sebességek használatának lehetővé tételére, amelyek 5,25 vagy 6,0 kbit/s csatorna átviteli sebességgel tudnak működni. A 3. szint egy továbbító csatornát (R-, T- vagy C-csatorna) és két vevő csatornát (P-csatorna és C-csatorna) igényel. Kétoldalú csomag és áramköri összeköttetési szimultán működés nem lehetséges, de közel-szimultán működés az átviteli csatorna típusok közötti kapcsolással lehetővé válik.

1.2.5 A 4. szintű képesség a 3. szint képességhez további átviteli csatorna képességet ad hozzá a kétoldalú adat csomag és áramköri összeköttetés szimultán működésének biztosítására. A 4. szint képesség két vagy több átviteli csatornát (R- vagy T- és C-csatorna) és két vagy több vételi csatornát (P-csatorna és C-csatorna), minden csatorna hordozóhoz teljesítmény szabályozót és egy lineáris teljesítmény erősítőt igényel. A csatorna átviteli sebességek ugyanazok, mint a 3. szintnél. Mind az R-, mind a T-csatorna képességet átviteli csatornára igénylik, de nem szimultán módon.

1.2.6 Az AMS(R)S az első olyan repülési biztonsági kommunikációs szolgálat, amely integrálja mind a beszéd-üzemű, mind az adat-, valamint a nem- biztonsági szolgálatot. A szolgálatoknak ez az integrációja tekintettel kell, hogy legyen a közlemény elsőbbségre. Egy adat-közleménynek egy másik, magasabb elsőbbségű adat által történő megelőzése könnyen kezelhető a rendszeren belül, információ vesztés nélkül. Egy beszéd-üzemű hívásnak egy magasabb elsőbbségű adathívás általi megelőzése, vagy vice versa, általában nem szükséges egy olyan AES-ben, amelynek két adója van. Azonban 3. szintű AES-ben, amelynek csak egy adója van, ilyen elsőbbség esetenként szükséges lehet.

1.2.7 Bár a 4. szintű AES-től nem követelik meg a szimultán adat csomag átvitelt egynél több GES-sel, de az ilyen képesség nincs kizárva.

2. SZÉLESSÁVÚ RF JELLEMZŐK

2.1 Az AMS(R)S sávok használata

2.1.1 *Közlemény kategóriák.* A továbbítási sorrendet valamely légijármű fedélzetén telepített földi állomáson (AES) vagy földi telepítésű állomáson (GES) egy adott elsőbbségi séma szerint kell elrendezni. Az al-hálózat AMSS-hez való csatlakozásnál az adat-csomag elsőbbségi séma az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4-26. táblázatában leírtaknak megfelelő. Az AMSS-en belül ezt a külső elsőbbségi sémát megnövelik a különböző jeladási és beszéd-üzemi vonatkozású funkciókhoz kijelölt belső prioritások. A kapcsolati rétegnél ez a megnövelt prioritási séma Q-elsőbbségi számként szerepel és az így nyert belső prioritási séma ezen útmutató anyag A-3. táblázatában van megadva. Ez a „Q-elsőbbségi" szám felsorolás megegyeszik az Annex 10 elsőbbségekkel, amelyeket viszont az ITU Rádió-Szabályzat 51. cikkelyéből származtattak le. Az egyedi Q-elsőbbségi felsorolás tartalmazza a beszéd-üzemű adatforgalmat és tartalmazza a jelzést is, amely a beszéd és adat integrálásához szükséges. A jelképzéshez kapcsolódó Q-elsőbbségi számokat választották a teljes rendszer működés és integritás optimalizálásához.

2.1.2 *Vételi frekvencia sáv.* Történelmi okokból a legtöbb AES képes a kívánt 1544-1555 MHz-esnél nagyobb sáv vételére, de nem képes az ajánlások által javasolt teljes sávra. Ezek tipikusan az 1530–1559 MHz-es frekvencia sávot fedik le, és nem tudják lefedni az 1525–1530 MHz-es sávot.

2.2 Frekvencia pontosság és kompenzáció

2.2.1 *Frekvencia pontosság.* Az Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.2.2 pontja által tartalmazott szabvány a GES által vett jelre vonatkozó követelményt tükrözi. A GES-nél megfigyelt frekvencia hibának több hozzájáruló tényezője van, ezek: a műhold oszcillátor miatti hiba, a légijármű és a műhold közötti relatív mozgás miatti hiba, a GES helyi oszcillátora (a zárt hurkú kompenzációs rendszerhez) miatti hiba, és az AES helyi oszcillátora miatti hiba. Erőfeszítéseket tesznek az első kettő által okozott hiba csökkentésére az alábbiakban ismertetett módon. A fent említett szabvány a frekvencia hibának azt a részét jellemzi, amely az AES és a légijármű műholdhoz képesti relatív mozgása miatt lép fel. Következésképpen a helyes koordináta rendszer az átviteli frekvencia méréséhez a műholdhoz rögzített koordináta rendszer. Ennek a követelménynek a gyakorlati vizsgája lehet az AES-hez rögzített koordináta rendszer használata és a megfelelő értéket a műholdhoz rögzített koordináta rendszerben a légijármű helyzete és sebessége, valamint a műhold helyzete alapján kellene számolni.

2.2.2 *GES általi frekvencia kompenzáció*. A műhold oszcillátorok miatti hiba csökkentése érdekében a GES-nek figyelnie kell a kijelölt GES által (C-sávban) továbbított L-sáv pilot frekvenciát és korrigálnia kell az átviteli frekvenciáját, hogy minimalizálják a frekvencia hibát az L-sávnál. A repülőgép felőli irányban egy kijelölt GES egy L-sávú pilot frekvenciát továbbít, amelyet minden GES a C-sávban figyel, és ennek megfelelően állítják be a vevőjük helyi oszcillátorait. Ez a megközelítés nem lehetne lehetséges a műhold irányított sugárnyaláb esetén akkor, amikor a GES nincs a szóban forgó irányított sugárnyaláb földi metszés- pontjában.

2.2.3 *Az AES általi Doppler-eltolódás kompenzáció.* A Doppler-eltolódás kompenzációjának megvalósítására legalább két módszer van. Az egyik megközelítés a légijármű navigációs berendezések felhasználása a légijármű műhold irányába mutató sebességének meghatározására és ebből a Doppler-eltolódás kiszámítása. A másik megközelítés a Doppler-eltolódás meghatározása a vett P-csatorna vagy C-csatorna frekvencia-eltolódás mérésének útján. Ez utóbbi megközelítésnél a földi telepítésű földi állomásra való bármely továbbítás frekvenciája ekkor az alap csatorna frekvenciának a vevő frekvencia általi eltolása, ellenkező előjelű eltolódás és egy közelítőleg 1,07 nagyságú méret-tényező. Ez közelítően korrigálja a légijármű mozgás miatti (Doppler-eltolódás) frekvencia hiba-összetevőt, de nem korrigálja a hibákat az AES helyi oszcillátorban.

2.2.4 *Frekvencia hiba halmaz.* A frekvencia hiba halmazok, amelyeket a GES-AES kapcsolatra vonatkozó pontossági követelményekhez való eljutásban használnak fel, ennek az útmutató anyagnak az A-4. és A-5. táblázataiban kerülnek bemutatásra. Érdemes megjegyezni, hogy az A-4. táblázat nem tartalmazza a légijármű mozgása miatti Doppler-eltolódást és az A-5. táblázatban feltételezzük, hogy ez kompenzálva van.

2.3 Légijármű fedélzetén elhelyezett földi állomás antenna jellemzői

2.3.1 *Antennák és képesség szint.* Az Annex 10, III. Kötet, I. Rész, 4. Fejezete által tartalmazott szabványok nagy-, közepes- és kis-nyereségű antenna rendszereket határoznak meg, de meg kell jegyezni, hogy ezek nem kapcsolódnak közvetlenül az AES képesség szinthez. Egy nagy-nyereségű antenna, a fenntartó elektronikával egy 2., 3. vagy 4. szintű AES telepítést jelent, és a kis- és közepes nyereségű antenna, a fenntartó repülés-elektronikával mindig legalább 1. szintű AES telepítéshez vezet. A jövőben a különböző rendszer jellemzők képesek lesznek 2. szintű vagy magasabb szintű szolgáltatásra. Például a műhold irányított sugárnyaláb antennák és a közepes nyereségű légijármű antennák kombinációja képes 2. szintű, vagy ennél magasabb szintű szolgáltatás biztosítására. A légijármű részére biztosított szolgáltatás szintje nemcsak annak a képességeitől, hanem ezen szolgáltatást nyújtók képességeitől is függ.

2.3.2 A nagy-nyereségű jövőbeli műholdak a légijármű fedélzeti állomást (AES-t) alacsonyabb nyereség-zaj hőmérsékleti viszonnyal (G/T) és EIRP-vel tudják kiszolgálni, de ennek a hatása az, hogy potenciálisan nagyobb a szervíz költség és lecsökkenhet a rendszer kapacitás. A 12 dBic-nél kisebb nyereségű AES- antennákat hasonlóképpen üzemeltetésileg alacsony-nyereségű antennának lehet tekinteni, azért, mert túl széles a sugárnyalábjuk ahhoz, hogy elkülönítésük legyen a műholdak interferenciájával szemben.

2.4 A vevővel szembeni követelmények

2.4.1 *Nyereség-zaj hőmérsékleti viszony*. A légijármű fedélzeti vevő rendszer nyereség-zaj hőmérsékleti viszonyt (G/T) a következő tényezők befolyásolják:

a) klimatikus feltételek;

b) az antenna magassági szöge a műholdhoz;

c) a maradó antennabeállítási hibák (beleértve azokat a hibákat, amelyek az antenna sugárnyaláb irányító
rendszerrel kerültek be);

d) a vevő alacsony zajú erősítőjének zaj járuléka a működési hőmérsékleten;

e) az adó teljesítmény erősítő kimeneti szintje;

f) az antennaburkolat csillapítási és zaj hőmérséklet járuléka, ahol antenna burkolat van felszerelve; és

g) az RF környezeti feltételek, amelyben a légijármű fedélzeti földi állomás működését tervezik.

2.4.2 *Tipikus kapcsolati vivőfrekvencia-zaj sűrűség.* Ennek az útmutató anyagnak az A-6., A-7. és A-8. táblázatai a tipikus vivőfrekvencia-zaj spektrum sűrűség arányokat (C/N_0) mutatnak be a P-, R-, T- és C-csatorna szolgáltatásokra. Ezekben a táblázatokban a modem beépítési veszteségek a modem gyakorlati beépítési veszteségei az ideálishoz viszonyítva. Ez tartalmazza a nem-ideális szűrés miatti, az időbeli vagy frekvencia szerinti nem-ideális szinkronizáció miatti, a nem-ideális moduláció miatti és a fel- és lefelé átalakító láncban lévő nem-linearitás miatti hatásokat. Az RF összeköttetés analízise jelen útmutató anyag függelékében található.

2.4.3 *Vevő linearitás*. Tervezés alatt állnak a többszörös műholdas rendszerek, amelyek 58 dBW maximális L-sáv EIRP-vel rendelkeznek az antenna sugárnyaláb közepén. A legrosszabb esetet tekintve, amikor két ilyen műholdas rendszer antenna sugárnyalábjai átlapolják egymást, a vevőnek -100 dBW/m^2 teljes, sávon belüli teljesítmény-áramlási sűrűséget kell tolerálnia. Ez a kombinált két-műholdas EIRP (62 dBW), mínusz egy 162 dBW-os terjedési veszteségből származik.

2.4.4 *A vevő sávon-kívüli teljesítménye.* A vevő működését potenciálisan veszélyeztetik a felszíni mobil kommunikációs rendszerek és a nagy-teljesítményű források, köztük a megawatt tartományban lévő EIRP-vel rendelkező televíziós adók és légtérellenőrző radarok, amelyek természetesen a repülőtereken vannak elhelyezve és a repülési útvonalak mentén is megtalálhatók.

2.4.4.1 Rádió környezeti feltételek között, ahol nagy-teljesítményű, sávon kívüli jelek lehetnek a repülési pálya mentén, a vevő RF szűrőjének védelmet kell nyújtani a vevő telítődés ellen, amely csökkentheti a nyereséget és leronthatja a működést. Ezenkívül a működés eredményességét befolyásolhatják az ilyen források a vevő tükör-impedancia és hamis válaszok miatt. Példaként említjük, hogy a +3 dBW teljesítmény fluxus sűrűség az AES antennánál előfordulhat egy kilométeres távolságban egy több megawattos adótól, mint például a televíziós adó részére megengedett 470-től közel 800 MHz-ig terjedő frekvenciákon. A telítődéstől való megvédéshez az RF szűrőnek minimum 75 dB-t kell kiszűrnie. A tükör-impedancia és ahamis válaszok miatti teljesítmény-csökkenés elleni védelmet a vevő tervezésénél meg kell határozni.

2.4.4.2 Az 500 kW csúcsteljesítményű, 34 dB antennairány nyereségű radarnál a teljesítményszintek elérhetik a 100 dBW-t a fő sugárban. Kiszámították, hogy egy repülőtérre telepített időjárás radartól 500 méterre lévő AES-nél a fluxus-sűrűség még 30 dBW/m^2 is lehet az 1459 MHz alatt, és 38 dBW/m^2 az

1675-től a 18000 MHz-ig. Nem szükséges ezeken a szinteken üzemelni, de a berendezéseknek ezt sérülés nélkül kell megúszniuk.

2.4.5 *Vett fázis-zaj.* A fázis-zajt, amelyet az AES vevőnek az AMSS SARP-on belüli működése során tolerálni kell, jelen útmutató anyag A-1 ábrája* illusztrálja. Ez a maszk az adó és a műhold fázis-zaj járulékát tartalmazza. A gyakorlatban a vevőnek képesnek kell lenni ennél nagyobb fázis-zaj mennyiség tolerálására, amely a vett jel elhalkulása miatt lép fel.

2.5 Az adóval szembeni követelmények

2.5.1 *EIRP határértékek.* Az AES-nek, amely 13,5 dBW EIRP képességű, mindig képesnek kell lenni a 0,6 kbit/s-os R- és T- csatorna használatára akkor, amikor a műhold magassági szöge meghaladja az 5 fokot. Az AES-nek, amely 25,5 dBW EIRP képességű és rendelkezik az alátámasztó repülés-elektronikával, képesnek kell lenni a 2., 3. és 4. szintű szolgáltatásra a 3. és 4. szintű szolgáltatás részeivel. A gyakorlatban az átvitt teljesítmény ezektől a beállításoktól egy bizonyos, a rendszer konfigurációtól függő mennyiséggel visszaesik.

2.5.1.1 A „maximálisan megengedhető működési EIRP” egy olyan határértéken alapszik, amelyet a HPA IM (aktív) és IM passzív komponens együttes hatásaiból hoztak létre.

2.5.2 *EIRP vezérlés.* Az AES EIRP GES általi vezérlése követelményeinek két oka van. Az első ok a C-csatorna dinamikus teljesítmény vezérlése a rendszer kapacitás optimalizáláshoz. A második ok a jövőbeli irányított sugárnyalábú műholdas rendszerek optimális felhasználásának elérése.

2.5.2.1 A kezdeti AMSS üzemelésnél a globális sugárlefedéses műholdakat 16 dB-es AES EIRP szabályozó intervallum szükségességgel tervezték mind a C-osztályú (1–3. szintek), mind az A-osztályú (4. szintű többcsatornás) nagy-teljesítményű erősítőkkel a szelektálható csatorna átviteli sebességek és az AES antenna nyereség változók lefedése érdekében. A C-csatorna működésben az AES EIRP-t szintén gyakran állítják be a GES által mért bit hiba mértéknek megfelelően. Ezért a 4. szintű AES-ekhez egy további 16 dB-es vezérlés jelenleg is szükséges.

2.5.2.2 A jövőbeli rendszerekben a műholdas szolgálatok üzemeltetőit kielégítő EIRP intervallumon belüli AES továbbítás egy eltérő szabályozási intervallumot igényel. Például a jövő irányított sugárnyalábos műholdjainak magasabb G/T-je kisebb AES EIRP-t igényelhet, amely nagyobb szabályozási intervallum szükségességéhez vezet. A tartományt nem lehet pontosan előre meghatározni, mert az irányított sugárnyaláb méret, amely befolyásolja a műhold G/T-t, a jövő üzemeltetőinek tervezési választása által kerül meghatározásra.

2.5.3 *Sávon kívüli EIRP spektrum sűrűség.* A sávon kívüli EIRP, amely diszkrét hamis, harmonikus, intermodulációs termékeket és az AES által sugárzott zajt tartalmaz, nem okozhat káros interferenciát más rádió üzemeléseknek. Különösen nem zavarhatnak más légiforgalmi összeköttetési/rádiónavigációs szolgáltatásokat, mint például a globális helymeghatározó rendszert (GPS), amely 1559–1585 MHz-en működik, a globális orbitális műholdas rendszert (GLONASS), amely az 1598–1610 MHz-en (2005. után az 1597–1605 MHz-en) üzemel, az AMSS vételi sáv az 1525–1559 MHz-es sávban és a 108–137 MHz-es VHF sávban.

Az intermodulációs termék szinteket az 1598-tól az 1610 MHz-ig terjedő tartományban ellenőrizni kell, amikor ebben a sávban ugyanazon a repülőgépen műholdas navigációs vevő van tervezve. Frekvencia kezelést kiegészítő szűrést vagy növelt antenna szétválasztást (40 dB-nél nagyobb izolációval) követelhetnek meg ugyanazon a légijármű fedélzetén, ha van lehetséges interferencia a navigációs berendezéseknél.

* Az összes ábra ennek a mellékletnek a végén található.

2.5.3.1 Az Annex 10, III. Kötet, I. Rész, 4. Fejezetben lévő 4-3. táblázat egy -155 dBc/1 MHz-es maximális EIRP sűrűséget tartalmaz az 1559–1855 MHz-es sávban, amely védi a GPS vevő üzemelést ugyanazon a légijárművön, mint amelyen az AMSS működik, és a GPS üzemelést a közelben lévő légijárműveken is.

2.5.3.2 Az Annex 10, III. Kötet, I. Rész, 4. Fejezetben lévő 4-3. táblázat azt is mutatja, hogy a maximális EIRP spektrum sűrűségnek -143 dBc/1 MHz-nek kell lenni 1585–1605 MHz-es sávban és -117 dBc/1 MHz-nek az 1605–1610 MHz-es sávban. Ezek a korlátozások biztosítják a GLONASS vevő üzemelés védelmét ugyanazon légijárművön, mint a minimálisan 40 dB antenna izolációt feltételező AMSS-t a légijármű közelében. A 40 dB-es izolációt az AMSS antenna csonktól a GLONASS antenna csonkig kell mérni a GLONASS frekvenciákon, a GLONASS antennával maximális összekapcsolásra irányított AMSS antennával. Ez hordja a GPS antennát is.

2.5.4 *Intermodulációs (IM) termékek.* Az AES-ből jövő nem kívánt sugárzások szabályozása fontos a rendszer üzemelés számára, hogy elkerülhető legyen a csatornák blokkolása és a szükséges spektrum csökkenése. Az intermoduláció a több vivőfrekvenciás (4. szint) működés során fordul elő kiszámítható frekvenciákon a megkívánt jelekre vonatkozóan a nem-linearis összetevők miatt. Potenciális forrás sok van, de ellenőrzés alatt tarthatók. Az IM hatások minimalizálását az AES-nek a szabályokat kielégítő linearitásra való tervezésével és az üzemeltetésével valósítják meg.

2.5.4.1 Azok az intermoduláris termékek (IM), amelyeket a 4. szintű AES sugároz a több vivőfrekvenciás üzemelésben, a nagy-teljesítményű erősítőből és más passzív összetevőkből keletkezhetnek, amelyek magas AES RF teljesítmény-szintnek vannak kitéve. Az IM-et okozó passzív komponensek tartalmazhatnak csatlakozókat, főleg ha korróziónak vagy lazulásnak vannak kitéve; és a fázis elrendezésű antennákban használt diódákat. A GES frekvenciák és szintek megválasztásától függően, az ilyen IM megjelenhet az AES vevő frekvenciáknál és a szinteknél, amely lerontja a BER-t, lehetetlenné teszi a vételt, vagy kihatással van más légijármű berendezések jel vételére.

2.5.4.2 Az AES által továbbított IM blokkolhatja a GES vevőket. A HPA egy elsődleges IM forrás, mert linearitását korlátozza a technológia és a hő disszipáció.

2.5.4.3 Rendszerközi hatások keletkezhetnek a 4. szintű AES-ektől, amelyek IM-et sugározhatnak. A globális sugarnyalábú műholddal működő AES-nek nagyobb EIRP-t kell átvinnie, mint az érzékenyebb irányított sugárnyalábú műholddal működő AES-nek. Ezért ezt a magasabb szintű IM-et az irányított sugárnyalábos műhold könnyebben veszi a hozzátartozó GES-hez való továbbításra, amivel ennek a csatornának a vételét károsan befolyásolhatja. Még akkor is, ha a két műhold a frekvencia sáv két különálló részét használja, és ennek folytán nem tudja felhasználni ugyanazokat a kijelölt csatorna frekvenciákat, a globális sugár AES adó IM-je, amely a kijelölt csatornákon kívül van, beleeshet az irányított sugarú műhold sávjába. Az összes GES frekvencia és EIRP szint kijelölésnek ezt a lehetőséget figyelembe kell vennie.

2.5.4.4 Frekvencia kezelési eljárásokat használnak az 1610 MHz alatti harmad- és ötöd-rendű termékek kiküszöbölésére, ahogyan a 4.2.3.5.7 pontban le van írva. Ha ugyanabba a légijárműbe, mint amiben AMSS van, kell GLONASS-t beszerelni, szükség lehet frekvencia kezelési eljárások vagy más módszerek használatára annak biztosításához, hogy az AMSS heted- és magasabb-rendű intermodulációs produktumai ne okozzanak káros zavarást a GLONASS üzemeltetésnek.

2.5.5 *Frekvencia kezelés.* Gondos frekvencia kezelés szükséges, mivel:

a) az AMSS biztonsági szolgáltatásokat tartalmaz;

b) gond van a megfelelő AMSS spektrum és a megfelelő kapacitás rendelkezésre állásával az AMSS biztonsági szolgáltatás részére; és

c) a mobil műhold hálózatban koordinációs nehézségek vannak a mobil állomások antennáinak gyenge megkülönböztetési jellemzői miatt.

Az irányelvek, amelyeket a frekvencia tervek koordinálásánál a belső és egymásközti interferencia minimalizálása érdekében figyelembe kell venni, a következőket foglalják magukba:

a) a vonatkozó ITU Rádió-Szabályzat előírásainak teljesítése;

b) minden szolgáltatónak szolgáltatnia kell ellenőrző berendezéseket az AMS(R)S és a nem-AMS(R)S összeköttetések tényleges használatának azonosításához;

c) a globális és irányított sugárnyalábú AMSS rendszerekben üzemeltetési intézkedéseket kell tenni az alkalmazott globális sávszélesség nagyságának minimalizálására és a sugárnyaláb használatának maximalizálásra;

d) az ITU-R M.1089 és M.1233 Ajánlásainak a műszaki koordináció módszerére vonatkozó felhasználása, ahol az csak lehetséges;

e) hatékony spektrum felhasználás, a következőket beleértve:

1) más rendszer szolgáltatók műholdas adói elemi őrző sávjainak felhasználása;

2) a frekvencia kijelölés használata a légijármű helyzetekben;

3) a légijármű fedélzeti földi állomás antenna mellékhurok megkülönböztetés tökéletesítéseinek kihasználása;

4) az eltolt és átlapolt vivőhullámok használata;

5) műhold irányított formált sugárnyalábok használata;

6) a műhold antenna mellékhurok szintjének csökkentése;

7) a rendszer interferencia ellenállóságának növelése;

8) a földi állomás teljesítmény-szabályozás használata;

9) műholdas adó szabályozható nyereség beállításának használata;

10) az üzemelési menetrendek ismeretének felhasználása az időzóna különbségek kihasználására;

11) megfelelően csoportosított vivőfrekvenciák;

12) a műholdak újra-pozícionálása; és

13) nagy-nyereségű AES antennák és a létrejövő kis vivő teljesítmények alkalmazási képességének kihasználása.

2.5.6 *Átvitt fázis-zaj.* A fázis zaj maszk, amelynek az AES adónak meg kell felelnie, ezen útmutató anyag A-2. ábráján kerül bemutatásra. Ennek a maszknak a célja az AES adó fázis-zajnak a GES működés lerontásához való hozzájárulásának minimalizálása.

2.6 Interferencia

2.6.1 *Rendszeren belüli interferencia.* Rendszeren belüli interferencia az AMS(R)S szolgáltatások közötti interferenciára vonatkozik. Néhány példa lehet: a társ-csatorna, a szomszédos csatorna interferencia és az intermodulációs zaj. Az eltérő műholdas rendszer tervezések miatt nincs egyedüli előírás a rendszeren belüli interferenciára. Mindegyik műholdas rendszer üzemeltetőnek képesnek kell lenni megmutatni, hogy a rendszeren belüli interferencia AMS(R)S szolgáltatásoknál, amikor más zajforrásokkal van kombinálva, az az adót a kapcsolatban nem rontja le az elért C/N_0 kapcsolatban a megkövetelt C/N_0 teljesítmény alá.

2.6.2 *Rendszerek közötti interferencia.* A rendszerek közötti interferencia egy AMS(R)S szolgáltatásnak egy más rendszertől - legyen az egy AMS(R)S, vagy bármilyen más rendszer - származó zavarására vonatkozik. A kívánt teljesítményt fenn kell tartani a zavarás bármely szintjén, amelyet működőképesnek fogadnak el, az adott műholdas rendszer üzemeltetők közötti koordináción keresztül. Minimumként az AMSS műholdas rendszernek megfelelő teljesítményt kell nyújtania egy-belépésű zavarás jelenléte esetén, amely 6-százalékos $\Delta T / T$ eredményeképpen jön létre, ahogyan azt a WARC-ORB-88 elfogadja a műholdas rendszerek között megkívánt koordináció küszöb-értékeként. Az összes forrás miatti együttes interferenciának - beleértve a rendszeren belüli interferenciát is - a javasolt kritériuma a 20 százalékos $\Delta T / T$.

3. RÁDIÓFREKVENCIÁS /RF/ CSATORNA JELLEMZŐK

3.1 Modulációs jellemzők

3.1.1 *Moduláció fajták.* Két moduláció fajtát használnak a légiforgalmi mozgó műholdas szolgálatban (AMSS), és mindegyik egy-egy rendszer előnyt biztosít. A bináris fázis-billentyűzéses moduláció (BPSK) formát használnak a maximálisan 2,4 kbit/s csatorna átviteli sebességeknél, amely 'erőteljességet' biztosít a légijármű fedélzetén telepített földi állomáson (AES), a műholdon és a földi telepítésű földi állomáson (GES) történő frekvencia átalakítási folyamatokban generált fázis-zaj ellen. A 2,4 kbit/s felett a fázis-zaj hatások a demodulációs folyamatra elhalkulást adnak, és a sávszélesség megőrzés válik fontossá ezeknél a nagyobb csatorna-átviteli sebességeknél. Ezért egy nagyobb sávszélesség-hatékonyságú moduláció fajtát, a kvaterner fázis-billentyűzéses modulációt (QPSK) használnak.

3.1.2 *Repülési BPSK.* A repülési BPSK egy fázis-eltolásos modulációs forma, formált szűrőkkel, amelyek különösen elfogadottak az elhalkulásnak kitett RF környezetben való működésnél. Ennek négy lehetséges fázis állapota van, amelyek közül egy szimbólum periódus alatt csak kettő engedhető meg. A modulációs eljárás a bináris „0”-kat -90°-os fázis-eltolásra és a bináris „1”-eket +90°-os fázis-eltolásra képezi le. Ez az átvitt adatok eltérő kódolását eredményezi és azt vonja maga után, hogy bármely szimbólum periódus alatt egymástól 180°-kal elválasztott két döntés lehetséges, és hogy ez a két döntés 90°-kal el van forgatva az előző szimbólum periódusban lévő lehetséges döntésektől. Ezt a modulációs stratégiát fogalmilag ábrázolja ezen útmutató anyag A-3. és A-4. ábrája. Következésképpen a repülési BPSK majdnem azonos a minimális fázis-billentyűzési modulációval (MSK), kivéve azt, hogy az impulzus alaknak 40 százalékos koszinuszos spektrum formában kiemelkedő töve van a szinuszos súlyozással szemben. Az amplitúdó és fázis maszkok, amelyeknek ezt az impulzus formálási szűrést ki kell elégíteni, ezen útmutató A-5. és A-7. ábráján vannak megadva. Ezek megfelelnek a repülési BPSK definíciójában megadott átviteli szűrő követelményeknek. Ezeket a követelményeket alkalmazzák az átvitt jelre, mielőtt az nem-lineáris erősítésen menne keresztül; ezeknek célja a nem-lináris erősítés általi torzítás és az ehhez tartozó teljesítmény romlás korlátozása és szabályozása. A repülési BPSK egy lineáris moduláció majdnem állandó burkológörbével. Következésképpen ez egy „C”-osztályú erősítőn keresztül kis spektrum szórással és teljesítmény-romlással átvihető.

3.1.3 *Repülési QPSK.* A repülési QPSK egy eltolt QPSK modulációs forma, amelyet a 2,4 kbit/s adatsebesség felett használnak és amelyeket ezen útmutató anyag A-3. és A-4. ábrája fogalmilag ábrázol. A repülési QPSK adat kódolót egy bináris adat sorozat (a_i) hajtja meg 2/T bit sebességgel. A „páros" bitek az I vonalra vannak kapcsolva és a „páratlan" bitek a Q vonalra, két 1/T sebességű adatáramlást hozva létre. Az S szinkron minták 1/T sebességgel üzemelnek és ideális pozitív és negatív impulzusokat generálnak attól függően, hogy az adat bit „1" vagy „0". Az impulzus formáló szűrőknek mindegyik csatornában 100 százalékos, koszinusz spektrum formáló gyöke van, kivéve a 8400 bit/s-os C-csatornát, amelynek 60 százalékos a koszinusz spektrum formáló gyöke. Az I és Q impulzus formáló szűrő kimenetek ugyanazt a vivőfrekvenciát modulálják kvadratúrában és lineárisan kapcsolódnak. Az amplitúdó és fázis maszkok, amelyeknek 100 százalékos koszinusz spektrum formáló szűrője van, ki kell elégítenie ezen útmutató anyagnak az A-6. és A-7. ábráján bemutatottakat, míg azokat, amelyek a 60 százalékos koszinusz spektrum fomáló szűrőket használják, az A-23. és AÍ-24. ábra mutatja be. Ezek megfelelnek a repülési QPSK definíciójában megadott követelményeknek. A követelmények érvényesek a továbbított jelre, mielőtt azt valamilyen nem-lineáris erősítésnek vetik alá; ezeknek célja a nem-lineáris erősítés általi torzítás és az ehhez tartozó teljesítmény romlás korlátozása és szabályozása. A tényleges modulátoroknál nincs követelmény ilyen módú végrehajtásra, amennyiben a modulált RF jel megkülönböztethetetlen attól, amelyet egy ideális modulátor generál.

3.2 A kisugárzott teljesítmény spektrum sűrűség határok

3.2.1 *Spektrum maszkok.* Ezek a spektrum maszkok figyelembe veszik az ideális Nyquist modelltől való teljesítmény-csökkenést, amely a nem-ideális rendszer karakterisztika miatt jelenik meg, például telítődés az erősítő láncban.

3.2.2 *Légijárműtől.* A spektrum maszk, amelyet bármely, a légijárműtől irányban továbbított légijármű BPSK-nak ki kell elégíteni, ezen útmutató anyag A-8. ábráján látható. Ez a maszk alkalmazható a koszinusz spektrum formáló gyökkel rendelkező 100 százalékos szűréshez. Ezt annak a feltételezésével származtatták, hogy nem-lineáris erősítőt (C-osztály) használnak a fedélzeten az AES-nél, de ez éppen úgy használható az A-osztályú lineáris erősítőhöz is. Ugyanaz a spektrum maszk (A-8. ábra) érvényes a repülési QPSK-hoz. Az A-QPSK 60 százalékos koszinusz spektrum formáló gyökének megfelelő spektum maszkot az A-22. ábra mutatja be.

3.2.3 *Légijárműhöz.* A spektrum maszkot, amelyet a légijárműhöz irányban a légijármű BPSK-nak ki kell elégítenie, ezen útmutató anyag A-9. ábrája mutatja. Ezt azzal a feltételezéssel származtatták, hogy a légijárműhöz való továbbítási útvonalon lévő összes erősítő lineárisan működik. A hozzátartozó spektrum maszk a légijármű QPSK-ra ezen útmutató anyag A-10. ábráján látható.

3.3 Demodulátor teljesítmény

3.3.1 A szabványokban előírt teljesítményt koherens detektálás és 3 bit lágy döntéses Viterbi dekódoló használatával lehet elérni. Az R- és T-csatorna demodulátoroknak nagyobb E_b/N_0-t tesznek lehetővé ahhoz, hogy a 10^{-5}-es bit hiba-arány elérhető legyen ezen csatornákon keresztüli kommunikáció rövid impulzus-köteg jellege miatt.Az A-QPSK teoretikus teljesítménye a kapcsolódó fehér Gauss-zajban jobb, mint az A-BPSK-é, mivel a bitek nincsenek differenciálisan kódolva. Azonban az A-QPSK modulációhoz nagyobb határérték van beépítve (az elméletihez viszonyítva) az elhalkuló csatornák gyengébb teljesítménye miatt.

3.3.2 A légijármű és a műhold relatív mozgása azt jelenti, hogy a légijármű szárnyairól vagy farokfelületéről, vagy az alatta lévő tengertől vagy talajtól származó jel-visszaverődések időben változó többszörös több-utas terjedésben nyilvánulnak meg. Ez részben az AES antenna meglehetősen nagy sugárszélessége miatt van. Ennek a több-utas teljesítménynek a jellemzői egy sor összetevőtől függnek, köztük a légijármű sebességétől, a műholdaknak a légijárműre vonatkozó látásszögétől és a visszaverő felület elhajlásától. Ezeknek a változóknak az aránya (Doppler sávszélesség) a légijármű sebességgel és a műhold magassági szögével növekszik. Azonban a több-utas terjedési intenzitás a légijármű sebességgel és a műhold magassági szögével fordítottan arányos. Következésképpen elsődlegesen a 20 fok alatti magassági szögek azok, ahol a több-utas terjedés lényeges problémát jelent. Az 5–20 fok közötti szögeknél a Doppler sávszélesség 20 és 100 Hz között vagy ennél nagyobb mértékben változik, és a több-utas terjedési teljesítmény a -7 dB-t is elérheti a közvetlen útvonalú jelhez képest.

3.4 Jel-vételi késés

Ez a késés követelmény egy magas szintű előírás, amelyet számos összetevő alkor a különböző al-rendszerek miatt, beleértve a műhold jel-vételt, a frekvenciát, a bit 'jel-vételt' és a keret szinkronizációt. A 16 másodperces teljes késés a legrosszabb esetben megengedett késés. Ez az idő, amely akkortól, hogy először utasítják az AES-t a műhold megkeresésre addig az időpontig tart, amikor az AES kísérletet tud tenni a bejelentkezésre. Ha egyszer a bejelentkezés megtörtént, a jellemző idő egy beszéd-hívás megvalósítására vagy egy adat csomag közlés továbbításra ennél jóval kisebb lesz.

4. CSATORNA FORMÁTUM TÍPUSOK ÉS ADAT SEBESSÉGEK

4.1 Általános

4.1.1 *Rendszer időmérés.* A különböző átviteli csatornák összes időmérését a P-csatornától származtatják. Ha szükséges, mindegyik földi telepítésű földi állomás (GES) P-csatorna szinkronizációja az Egyeztetett Világ-idővel (UTC) történik, és ez az egyik módja a világméretű idő referencia biztosításának minden olyan légijármű részére, amely légiforgalmi mozgó műholdas szolgáltatást (AMSS) használ. Az összes P-csatornának az UTC-vel való szinkronizálása jelenleg nincs megkövetelve, mert nem azonosítottak egy olyan alkalmazást, amely eléggé előnyös lenne a megnövekedett költségek igazolásához.

4.1.2 *Csatorna-távolságok.* Ennek az útmutató anyagnak az A-9. táblázatában szereplő csatorna-távolságok kielégítő elválasztást biztosítanak a szomszédos csatorna interferencia csökkentéséhez és a helyes csatorna hangolás biztosítására, még a Doppler- eltolódás megléte esetén is. A legkisebb bit sebességű csatornák esetében a lehetséges térközök a légijármű felé irányban (P-csatornák) és a légijármű felől irányokban (R- és T-csatornák) különbözőek. Ez a nem korrigált Doppler-eltolódás miatt van a légijármű felé irányú csatornákon, és az automatikus frekvencia szabályozás (AFC) használata miatt a Doppler-eltolódás minimalizálásra a légijármű felöli irányban. Meg kell jegyezni, hogy a légijármű fedélzeti földi állomás (AES) iránti azon követelmény, hogy képes legyen 2,5 kHz-es lépésekben való hangolásra, az összes alant felsorolt potenciális csatorna-távolság megállapításnak helyt ad és lehetővé teszi csatornák beillesztését a szomszédos műhold irányított sugárnyalábok közé.

4.1.3 *A P-csatorna szinkronizáció/veszteség/teljesítmény-csökkenés.* Az AES kezelés által eszközölt tevékenységek a P-csatorna jelminőség jelzéseitől függenek. Ezek tartalmaznak egy jelzést, amikor az AES-t a P-csatornához szinkronizálják, és amikor ez lecsökken és/vagy elvész. Az AES-nek szinkronban kell lenni a P-csatornával, mielőtt venni tudná a P-csatorna jel egységeit vagy továbbítani tudná az R- vagy T-csatornán. Egy lecsökkent teljesítményű/elveszett P-csatorna csökkent üzemeltetési teljesítmény jelzés rendszerint annak a jele, hogy egy kapcsolási művelet, például a műhold vagy az irányított sugárnyaláb átadás végrehajtása szükséges.

4.1.3.1 Ezek a jelminőség jelzők általában egy küszöböt meghaladó fizikai méréseken alapulnak. Azonban az alkalmazott mérések és a küszöb beállítások az AES megvalósításától függenek. A P-csatorna szinkronizálása mindannyiszor bejelentésre kerül, amikor a P-csatorna egyedi szavát megbízhatóan észlelik. A szinkronizáció elvész, valahányszor az egyedi szó nem megbízhatóan észlelhető.

4.1.3.2 Két körülmény bármelyike a P-csatorna degradációjának/elvesztésének bejelentését okozza. Az első feltételnek, ami a „degradált" P-csatornának felel meg és két esete van: 1) Ha a bit hiba-arány a 10^{-4} értéket egy háromperces átlagoló periódus alatt meghaladja, és 2) ha a szinkronizáció tízszer vagy ennél többször elvész egy háromperces időtartam alatt. Ez a háromperces átlagoló periódus biztosítékul szolgál arra, hogy a teljesítmény-csökkenés átmeneti jelenség, pl. egy légijármű manővere következtében. A második feltétel egy „elveszett" P-csatornának felel meg, amelyet akkor állapítanak meg, ha a szinkronizáció tíz másodpercen keresztül folyamatosan elveszett volt. Egyetlen indikátor van ezen feltételek mindegyikére és ebből eredően az AES kezelő tevékenysége mindkét esetre ugyanaz.

4.2 P-csatorna

4.2.1 *Általános.* Legalább egy P-csatornát folyamatosan továbbít mindegyik GES, amely az AMSS szolgáltatás részét képezi. Mindegyik AES-nek folyamatosan figyelnie kell azt a GES által továbbított P-csatornát, amelyhez bejelentkezett. A P-csatorna egy időosztásos multiplex stratégiát valósít meg, kis információs csomagokat küldve az őt figyelő AES-nek.

Mindegyik P-csatorna GES végén lévő funkcionális egységek a következők:

a) adat rejtjelező;

b) vevő-oldali hibajavítás (FEC) kódoló;

c) összerendező;

d) idő-jel beillesztő (egyedi szó); és

e) modulátor.

A P-csatorna vételi végén lévő funkcionális blokkok az adási végen levőknek a kiegészítői. A funkcionális blokkok teljes sorozatát az adási végtől a vételi végig ennek az útmutató anyagnak az A-11. ábrája mutatja be.

4.2.2 FUNKCIONÁLIS BLOKKOK

4.2.2.1 *Adat rejtjelezők.* Az adat rejtjelező egy logikai berendezés, amely az adat sorozatot egy ismert pseudo véletlenszerűségi sorozattal megszorozza. Az adat rejtjelezetlen (kibontott) lesz a vevőnél a véletlenszerű bitek ugyanazon sorozatával való szorzása után. Ennek nincsen közvetlen hatása az összeköttetésben a bit hiba-arány teljesítményre. Azonban megakadályozza az 1-esek vagy 0-k hosszú sorozatának továbbítását az összeköttetésen keresztül. Ez utóbbi káros hatással lehet a jel-vételi és az azt követő áramkörök működésére.

4.2.2.2 *A vevő-oldali hibajavítás kódolása.* A műholdas összeköttetés általában teljesítmény-korlátozott a műholdon lévő korlátozott források miatt. A kommunikációhoz szükséges teljesítmény nagyságát csökkenteni lehet a vevő-oldali hibajavítás kódolás bevezetésével, amely "többletet" ad hozzá a továbbított jelhez, nagyobb sávszélességi igény árán. A vevőnél a "többletet" egy dekódoló használja fel azoknak a hibáknak a kijavítására, amelyek normál körülmények között az alacsony teljesítményű átvitelnél megjelennének.

4.2.2.3 *Összerendezés.* A mobil összeköttetések általában elhalkulásnak vannak kitéve a közeli objektumokról eredő visszaverődések miatt. Az elhalkulás összefüggésben van az idővel és amikor megjelenik, a vevőnél a detektált adatokban lévő korrelált hibák sorozatát okozhatja. Ezek a hibák vevő-oldali hibajavítási kódolással helyesbíthetőek. Azonban a legtöbb dekódoló nem-korrelált hibákkal működik a legjobban. A (továbbítási) összerendező és inverze, a (vételi) visszarendező véletlenszerűsíti a csatorna részére szolgáltatott bitek sorrendjét a dekódoló részére szolgáltatottak sorrendjéhez képest, ezáltal csökkentve azon hibák közötti korrelációt, amelyeket a csatorna okozhat.

4.2.2.4 *Idő-jelzés.* Egy egyedi szót illesztenek be, minden adat-áramba, periódikusan ismétlődő intervallumokkal azért, hogy a vevő részére idő-jelzési információt szolgáltasson. Ez az idő-jelzési információ azért szükséges, hogy helyesen szinkronizálják a rejtjelezés feloldót, a dekódolót és a visszarendezőt a továbbító oldalon lévő ellenpárjaikkal. Ez lehetővé teszi ennek a szinkronizációnak a helyreállítását is, ha a jel történetesen pillanatnyilag elvész.

4.2.3 *P-csatorna keret időtartam.* A keret időtartam vagy 500 milliszekundum (2,4 kbit/s és ennél nagyobb csatorna sebességnél) vagy az 500 milliszekundum valamilyen többszöröse, hogy egyszerű szuper-keret leszármaztatást biztosítson, amelyet az R- csatorna réselésnél és a TDMA T-csatorna fenntartásánál használnak. Rejtjelezést és 1/2 arányú FEC kódolást használnak minden P-csatornára. Az FEC kódoló nincs újra-állítva a keretek között, hanem új keretet kezd az előző keretből eredő állapotban. A 0,6 kbit/s átviteli sebességű P-csatorna kivételével az összerendező időtartam 500 milliszekundum. A 0,6 kbit/s-nál ez az időtartam 384 bit, ami megfelel 2/3 másodpercnek.

4.2.4 *P-csatorna keret formátum.* Az összes P-csatorna keret formátum tartalmaz egy 16-bites mezőt (kódolatlan) formátum azonosítóként és a szuper-keret levezetéséhez, amelynek 8 másodperces időtartama van. A formátum azonosító egy 4-bites mező és mindig 0001 értékre van beállítva, amikor a csatorna egy P-csatorna. A mező megmaradó 12 bitjét szuper-keret számlálóként használják. Ennek elérése érdekében a mezőt még három 4-bites almezőre osztják, amelyek közül az elsőt egy új szuper-keret indulásának jelzésére használják fel, míg a megmaradó kettő a keret szám jelzésére szolgál. Az AES megvalósításánál tanácsos mind a 12 bit használata ahhoz, hogy megbízható szuper-keret szinkronizációt lehessen elérni bit hibák jelenléte esetén.

4.2.5 A 4,8 és 10,5 kbit/s átviteli sebességű P-csatornák esetében a keretben, közvetlenül a keretet létrehozó bitek után több „üres” bit van. Ez az összerendező bitjeinek a számát igazítja ahhoz a bit számhoz, amelyet a csatornán a követelmény szerint továbbítani kell.

4.2.6 Ahoz, hogy megkönnyítsék egy AES újra-szinkronizálását, amely AES az egyik P-csatornáról egy másikra továbbít ugyanazon a GES-en, az összes P-csatorna, amelyet ugyanaz a GES továbbít, szinkronizálva van.

4.3 R-csatorna

4.3.1 *Általános.* Az AES az összes AMSS-hez való bejelentkezését azon R-csatorna használatával végzi, amelyet erre a célra az AES részére a szolgáltatási területen kijelöltek. Ennek a bejelentkezés periódusnak az időtartama alatt egy AES egy vagy több R- csatornára van kijelölve (a megfelelő csatorna átviteli sebességgel). Ezeken az R-csatornákon keresztük az AES jeleket, rövid adat csomagokat továbbíthat és kiegészítő kapacitást kér a T-csatornán. Az impulzus-köteg módú adat csatorna jellemzőket az R- csatornánál az AMSS SARP-ban határozták meg, mint rés-idő szerkezetet, amelyet rés-idős ALOHA véletlen hozzáférésű protokoljához használnak. A funkcionális blokkok mindegyik csatorna továbbítási (AES) végén a következők:

a) adat rejtjelező;

b) FEC kódoló;

c) összerendező;

d) bevezető jelszakasz és egyedi szó generátor; és

e) modulátor.

A funkcionális blokkok mindegyik R-csatorna vételi végénél kiegészítői az átviteli végen lévő funkcionális blokkoknak. A funkcionális blokkok teljes sorozatát az átviteli végtől a vételi végig ezen útmutató anyag A-12.ábrája mutatja be.

4.3.2 *R-csatorna adás időzítés.* Az R-csatorna a P-csatorna szuper-keretéből származtatott rés-időben továbbít. Az R-csatorna rés-idő hossza a csatorna bit átviteli sebességének megfelelően változik. Bármely adott R-csatorna rés-idő kezdete a P-csatorna formátum azonosító mezőben lévő első bit elülső élére van vonatkoztatva. Egy R-csatorna impulzusköteg egy egész számú rés-idő időtartamnál kezdődhet ez idő után. Az R-csatornára a bevezető jelszakasz első bitjének névleges kezdő pillanata a rés-idők kezdete.

4.4. T-csatorna

4.4.1 *Általános.* A bejelentkezésének időtartama alatt egy AES-t egy vagy több csatorna frekvenciára jelölnek ki (a megfelelő csatorna átviteli sebességnél). Ezek a csatornák igény-kijelölés alapján fel vannak osztva több AES között. Azaz ezek a csatornák konfliktusmentes alapon a GES által vannak kijelölve az egyes individuális AES-ekhez rövid időperiódusokra. T-csatorna kapacitás iránti igények az R-csatornán keresztül adhatók meg, vagy a T-csatornán keresztül, ha a kapacitást már kijelölték. Az impulzus- köteg módozatú adat csatorna jellemzők a T-csatornára a SARP-ban vannak meghatározlva, ahogyan a rés-idő szerkezet, amelyet TDMA protokol fenntartására használnak. A funkcionális blokkok az egyes csatornák továbbítási (AES) végén a következők:

a) adat rejtjelező;

b) FEC kódoló;

c) összerendező;

d) bevezető jelszakasz és egyedi szó generátor; és

e) modulátor.

A funkcionális blokk mindegyik R-csatorna vételi végén kiegészítője az adatátviteli végen lévő funkcionális blokknak. A funkcionális blokkok teljes sorozatát az átviteli végtől a vételi végig ezen útmutató anyag A-12. ábrája mutatja be.

4.4.2 *T-csatorna formátum.* A csatorna impulzus-köteg hossza 2-től 31 jel egységig változhat. Az összerendezőben használt oszlopok száma az átviteli bit arányok és az AMSS SARP-nak megfelelő impulzus-köteg hosszal változik. Minden egyes impulzus- köteg egy speciális rövid jel egységet, az impulzus-köteg azonosítót tartalmazza, amely biztosítja azt, hogy a kiinduló AES és a rendeltetési GES mindig ismert legyen. Ha a GES egy olyan impulzus-köteget vesz, amelyben az impulzus-köteg azonosító elveszett, hiányzik vagy egy eltérő GES-t jelez, akkor a GES érvényteleníti az impulzus-köteget.

4.4.3 *T-csatorna adás időzítés.* A T-csatorna ugyancsak szinkronizálva van a P-csatorna szuper-keretéhez, de ebben az esetben a szuper-keret fel van osztva 1024, közelítőleg 7,8 milliszekundumos rés-időre. A legrövidebb elválasztó idő a két különböző AES impulzus-kötege között a vevő GES vezérlése alatt áll, és közelítőleg 39 milliszekundumra (5 rés-idő) van állítva.

4.5 C-csatorna

4.5.1 *Általános.* A C-csatorna áramkör módozatú csatorna, amelyet digitális beszéd-üzemre vagy adat-összeköttetésekre használnak. C-csatornát egy AES az R-csatornán keresztül igényelhet és a GES által a P-csatornán keresztül kerül kijelölésrei. A funkcionális blokkok az egyes C-csatorna átviteli végeknél a következők:

a) interfészek az elsődleges (pl. beszéd) és alsáv csatornához;

b) elsődleges csatorna/alsáv csatorna adat multiplexer;

c) adat rejtjelező;

d) FEC kódoló (kivéve, ha ezt nem használnak);

e) összerendező (kivéve, ha FEC-t nem használnak);

f) bevezető jelszakasz és egyedi szó generátor; és

g) modulátor.

A funkcionális blokk mindegyik R-csatorna vételi végén kiegészítője az átviteli végen lévő funkcionális blokknak. A funkcionális blokk teljes sorozatát az átviteli végtől a vételi végig ezen útmutató anyag A-13. ábrája mutatja be.

4.5.1.1 A C-csatornát számos különböző csatorna átviteli sebességre határozták meg, 5,25; 6,0; 8,4; 10,5 és 21,0 kbit/s-ra. Az alapvető indok lehetővé tenni a rendszer fejlesztést kisebb csatorna átviteli sebességekre, ahogyan a hang feldolgozási technológia tökéletesedik. A csatorna átviteli sebességek közül kettő, az 5,25 és a 10,5 kbit/s-os nem tartalmaz kódolást. Ezek között a kódolatlan potenciális alkalmazások között van a 4,8 és a 9,6 kbit/s-es hangkódolt beszéd a műholdas rendszerben, amelynek korlátozott spektruma van, de nem teljesítmény-korlátozott. Az alternatív alkalmazások között lehet a hangkódolók használata, amelyek tartalmazzák saját kódolásukat, amely jobban védi a fontos biteket, mint a többieket; ez szükségtelenné teszi a kódolást a csatorna modemben.

4.5.2 *C-csatorna keret.* A keret időtartam minden csatorna átviteli sebességnél 500 milliszekundum. A beszéd indításon alapuló vivőfrekvencia indítást (impulzus-köteg mód) használják a légijárműhöz irányban. Mindegyik indításnál egy bevezető és egyedi szó kerül továbbításra az impulzus-köteg kezdetéhez és attól kezdve további egyedi szavak jelennek meg minden 500 milli- szekundumnál. Így az egyedi szó fázis-képzés attól a pillanattól függ, amikor az indítás elkezdődik. Egy befejező jelszakaszt küldenek, amikor az összerendező blokkban nincs beszéd tartalom.

4.5.3 *Hangra bekapcsolás.* A légijárműhöz irányban a vivőfrekvencia indítást egy elektromos jel szabályozza a C-csatorna interfésznél. Amikor a C-csatornát a hanghoz használják, akkor ezt a jelet a hangkódoló vezérli. A hangkódoló kapcsolja a jelet, mihelyt hangot észlel, de bizonyos idejű késleltetést alkalmaz a jel kikapcsolása előtt azért, hogy elkerüljék a szótagok/szavak közötti kikapcsolásokat. Ezen felül a továbbító vivőfrekvenciát megkívánt esetben az alsáv csatorna jelzés is indíthatja.

4.5.3.1 A csatorna egység új impulzus-köteget kezd rögtön azután, hogy az „aktív” állapot jelzése megtörtént. Amikor „nem-aktív” állapot jelzés van, a csatorna egység folytatja a továbbítást egy ideig, azután "ejti" a vivőfrekvenciát. A FEC és az összerendező csatornák esetében a csatorna egység végrehajtja az aktuális összerendezés blokk plusz egy másik teljes összerendezés blokk továbbítását, amely befejező jelszakasszal végződik, hogy befejezze a C-csatorna vivőfrekvencia impulzus-kötegét. A FEC vagy összerendező nélküli csatorna egység 20 milliszekundumig folytatja a továbbítást. Mindkét esetben ezen periódus alatt a megkívánt biteket mint általában, "leveszik"raz elsődleges csatorna interfészről.

4.5.3.2 Ugyanezek az időzítési szabályok érvényesek az alsáv jelzés csatorna berendezéstől jövő megfelelő szabályozó jelre.

4.5.3.3 A légijárműtől irányban a vivőfrekvenciát folyamatosan továbbítják a hívás alatt, tekintet nélkül a beszéd aktivitására. Az átvitelkezdete ugyanaz, mint az előre irány esetén, egy bevezető és egyedi szó továbbításával az elején, amelyet 500 milli- szekundumos intervallumokkal további egyedi szavak követnek.

4.5.4 *Adat aktiválás.* A C-csatornának a hangkódolt beszédtől eltérő adatokhoz való felhasználatási képességére nincsenek megkövetelve biztonsági alkalmazások. Azonban a C-csatorna használható nem-biztonsági szolgáltatási adatátvitelre, ennek a működésnek a részleteit az alábbiak tartalmazzák. A légijárműhöz irányban az átviteli vivőfrekvencia impulzus-köteg módban működik az áramköri módozatú adatátvitelnél. A 109-es Áramkör (CF), ahogyan a CCITT V.24 Ajánlásában meg van határozva (DCD-nek elnevezve az EIA RS-232C-ben), a GES hang-sáv modemtől vezérli a C-csatorna indító interfészét. Az interfész indítása akkor kezdődik, amikor a hívás adat módba belép, amelyet a 109-es Áramkör BE (ON) állapotba való átmenete jelez. Az interfész normál esetben indított marad addig, amíg az AES az adat módot le nem kapcsolja. Ha a 109-es Áramkör KI (OFF) állapotra változik, amely jelzi a távolabbi vég modemtől vett vivőfrekvencia elvesztését, az átviteli áramköri módozatú interfész egység befejezi a pleziochron tárolór tartalmának küldését és azután átvált a „nem-aktív”-ra. A C-csatorna aktiválási interfész ismét reaktivizálódik, amikor (ha) a 109-es Áramkör az BE (ON) állapotra változik.

4.5.5 *Összerendező méret.* Egy adattovábbító rendszerben, ahol az összerendezést a hibák véletlenszerűsítése miatt követelik meg, az összerendező mérete mindig egy kiegyenlítő az elszenvedett késés és a hatékonysága között, a hibák véletlenszerűsítéséhez. Az összerendezési blokkméret a 21 kbit/s-os C-csatornánál 384 bit, amely megfelel 192 információ bitnek. Ez a 192 bit a keretméret (20 milliszekundum) a legtöbb 9,6 kbit/s-os hangkódolónak. Ez a közvetlen leképzés a hangkódoló keretek és összerendező tárolók között minimalizálja a késést, amelyet az összerendezés és ennek a beszéd-kommunikációra kifejtett hatása okoz. A létrejövő teljes továbbítási késés 30 milliszekundum körül van (amely 50 milliszekundumra nőhet a legkisebb csatorna átviteli sebességnél). Ahhoz, hogy az összerendező bitek száma illeszkedjen a csatorna bitek megkívánt számához, a keret kis számú „hamis” bitet tartalmaz közvetlenül a "keretező" bitek után.

4.5.5.1 Az adónál a késés, amely az összerendezőtől keletkezik, a hangkeret és az összerendező mérete közötti viszonytól függ. A 20 milliszekundum körüli teljes összerendezés bontási késés a vevő-oldali végen lép fel.

4.5.6 *Hang csatorna késés.* A hang áramkör minősége fenntartása érdekében a CCITT azt javasolja, hogy a végtől–végig késést 440 milliszekundumra vagy ennél kisebb értékre kell korlátozni. A névleges műhold késést 270 milliszekundumként véve, a hang-feldolgozó rendszer késés nem haladhatja meg a 65 milliszekundumot. Ez feltételezi, hogy a földi hálózatra 40 milliszekundum késés jut, és a modem és RF alrendszerek a késésből 65 milliszekundummal részesednek. Meg kell jegyezni, hogy a jelenlegi feldolgozó algoritmusokkal a feldolgozási késés növekszik a hangkódoló sebesség csökkenésével. Következésképpen ezt a végtől–végig késési célt nehezen lehet teljesíteni a kis sebességű, pl. 2,4 és 4,8 kbit/s sebességű hangkódolókkal.

4.5.7 *Az alsáv C-csatorna.* Az alsáv C-csatorna által átvitt adatok között vannak a C-csatorna hívás szabályozás és jelképzés, a folyamatosság ellenőrzések és a teljesítmény-szabályozás. Mindegyik keretben az alsáv C-csatorna első 24 fél oktettje kombinálva van, hogy 96 bit szabvány hosszúságú egységet képezzen. A 24 fél-oktettek egymást követő csoportjait ugyanolyan módon kombinálják, ha ezek rendelkezésre állnak. Az utolsó hang/adat blokk keretjének 25. adatmezejét elhagyják. Amikor a C-csatornát aktiválják és nincs több elküldeni való jel egység, akkor kitöltő jel egységeket küldenek.

5. KAPCSOLAT RÉTEG P-CSATORNA ÉS R-CSATORNA PROTOKOLOK

5.1 Általános

A P- és R-csatornákat jelzésre és adatösszeköttetésre használják a légijármű felé, illetve a légijármű felől irányokban. Az R- csatornában az adatátvitel rövid közleményekre korlátozódik (kevesebb, mint 33 oktett adat-kapcsolati szolgáltatási egység (LSDU-k)). Az útmutató anyagnak ez a szakasza az R- és P-csatorna kapcsolási réteg protokolokra vonatkozó dolgokat ismerteti.

5.2 SU készlet generálás

5.2.1 Sem a légijármű fedélzeti földi állomás (AES), sem a földi telepítésű földi állomás (GES) kapcsolat rétegeiben a SU készlet nem generálható egy vett LIDU-ból, ahogyan azt az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.5.3.2.3 pontja leírja, amíg ehhez nincs referencia szám kijelölve, kivéve, amikor a rendszer táblázat közvetítési LIDU-k és az áramköri módozatú szolgáltatásból vett LIDU-k továbbítását kell végezni akár az R-csatornán az AES-nél, akár a P-csatornában a GES-nél. A rendszer táblázat közvetítési LIDU-k nem kívánnak referencia számokat. Az áramköri módozatú szolgáltatási LIDU-k az áramkör módozatú szolgáltatás tételek által ki vannak jelölve referencia számok alkalmazására az AES-nél és a GES-nél, ennek folytán egy SU készlet generálódik a LIDU vétele után. Semmilyen, az AES-nél vagy a GES-nél lévő kapcsolati réget és bármelyik, a szolgáltatását felhasználó között cserélődő LIDU-nál nincsen formátum specializálva a SARP-ban. Az ilyen formátumok megvalósítás függőek.

5.2.2 Ha egy, az al-hálózat rétegből vett LIDU egy referencia szám kijelöléssel rendelkezik, akkor a LIDU LSDU-ja egy P-csatorna SU készlet (ISU vagy ISU/SSU) adatmezejében, vagy egy R-csatorna SU készlet SU-jainak adatmezejében van kódolva. Az SU készletben szükséges SU-k száma az LSDU hosszától függ. Mindegyik SU, az utolsó kivételével, a felhasználó adat oktettjei maximálisan engedélyezett számát tartalmazza. A felhasználói adat oktettek száma az utolsó SU-ban, amely a készlethez tartozik, a maximális hossznál kisebb lehet. Egy P-csatorna SU készletben az oktettek száma a végső SU-ban (ISU vagy SSU) az ISU „Az oktettek száma a végső SSU-ban” mezejében van kódolva. A R-csatornán az utolsó SU-ban lévő oktettek száma az SU „SU típus” mezejében van kódolva. (Annex 10, III. Kötet, I. Rész, 3. Függelék a 4. Fejezethez, 67 tétel).

5.3 Az elsőbbségnek megfelelő SU átvitel

Az AES-nél és a GES-nél ahhoz, hogy kielégítsék az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.5.8.2.3 pont követelményeit, az R- és P-csatorna protokol alkalmazhat néhány "első-be-első-ki" (FIFO) sort, egy sort egy érvényes Q számhoz azért, hogy az SU-t a továbbítás előtt tárolják. Az R-csatornánál egy SU készlet SU-jai a sorozat jelzőik növekvő sorrendjének megfelelően állnak sorban (Annex 10, III. Kötet, I. Rész, 3. Függelék a 4. Fejezethez, 58. tétel). A P-csatornánál egy SU készlet SU-jai az ISU-val vagy az RTX SU-val állnak sorban egy újra-továbbítási készletnél az SSU-k által követve az SSU sorozat számok csökkenő sorrendjének megfelelően. Az átvitel pillanatában egy SU kerül kiválasztásra a legmagasabb elsőbbségű sorból, benne egy vagy több SU-val.

5.4 P-csatorna protokol

5.4.1 A P-csatorna kapcsolati réteg protokolt a légijármű felé irányban a következő átviteleknél használják:

1) a GES kezeléstől vett LIDU-k, 2) az áramkör módozatú szolgáltatástól vett LIDU-k útválasztási paraméterekkel, amelyek a P-csatornán való átvitelt jelzik és 3) az összes, az al-hálózattól vett LIDU. A P-csatorna protokol megbízható kapcsolat szolgáltatást (RLS) csak az al-hálózat rétegből vett LIDU-k átviteléníl használják. Az összes többi LIDU átvitel a P-csatorna protokol közvetlen összeköttetési szolgáltatásának (DLS) megfelelően történik. A P-csatorna még a következő kapcsolat réteg jelzés SU-k átvitelére is használható:

a) a T-csatorna fenntartás (RES) és a T-csatorna fenntartáás protokolhoz tartozó rövidesen megjelenő foglalási (RFC) SU-k (Annex 10, III. Kötet, I.Rész, 4. Fejezet, 4.6 pont);

b) T-csatorna nyugtázás (TACK) SU; és

c) R-csatorna nyugtázás (RACK) SU.

A fenti SU-kat a P-csatorna protokol közvetlen összeköttetési szolgáltatásoknak (DLS) megfelelően továbbítják.

5.4.2 Adott időben a P-csatorna protokol számos LSDU átvitelt dolgozhat fel (referencia számot jelöltek ki és SU-t generáltak mindegyik LIDU-ból, hogy továbbítsák az LSDU-t). Az RLS-nél azonban mindegyik Q számnál ugyanahhoz az AES-hez irányított LSDU-k közül csak egy LSDU engedélyezett az átviteli folyamatban való részvételre. A többi, ugyanazon Q számú és ugyanazon AES-hez rendelt RLS LSDU tárolásra kerül, amíg az ennél a Q számnál az aktuális LSDU továbbítása meg nem történt, akár eredményesen, akár eredménytelenül. Ily módon az AES-nél csak egy RLS SU készlet per Q szám lehet az újra-összeállítási folyamatban egy adott időben, és az AES a nem-kész RLS SU készletet érvényteleníti, ha elkezd venni egy másik ugyanazon Q számú és eltérő referencia számú RLS SU készletet. Egy SU készlet eredményes vagy eredménytelen továbbítása után a GES kapcsolat felszabadítja az összes, az ehhez az SU készlethez kapcsolódó kapcsolati réteg forrást, azaz a kijelölt referencia számot, aktivált időzítőt, memória szétosztást stb.

5.4.3 Az RLS-nél a P-csatorna egy szelektív-ismétlő-ARQ sémát valósít meg a hiba-ellenőrzéshez. Ennek megfelelően, egy SU készletet továbbítva a GES várhatóan egy P-csatorna visszaigazolás (PACK) SU-t vesz az AES-től. A PACK SU az SU készlet teljes vagy nem teljes vételét jelezheti a visszaigazolás vezérlő mezőjének felhasználásával. Az utóbbi esetben ez a mező azt is jelzi, hogy az SU készlet teljes vagy részleges újra-továbbítása szükséges-e. Részleges újra-továbbítás késésre ez a mező, amely mindegyik PACK SU-ban jelen van, tovább jelzi a PACK SU számát, amely azonosítja az SU készlet hiányzó SSU-kból álló maradékát; mindegyik PACK SU azonosítani tud a legjobb esetben három hiányzó SSU-t. Egy részleges átvitelt a GES-től az AES valósít meg, mint más SU készletnél; azonban egy SU készlet újra-továbbítását inkább egy RTX SU, mint egy ISU irányítja, és az újra-továbbított SSU-k sorozat számai az Annex10, III. Kötet, I. Rész, 4. Fejezethez tartozó 3. Függelék 59. tételében leírtaknak megfelelőek. Az AES-től jövő visszaigazolás meghiúsulása azt idézi elő, hogy a GES ilyen visszaigazolásért "folyamodik" a visszaigazolás kérés (RQA) SU elküldésével ehhez az AES-hez. Az AES nyomon követi annak az RLS SU készletnek az állapotát, amelyet az AES éppen feldolgoz egy adott Q számnál, hogy helyesen válaszoljon az RQA-ra.

5.4.4 Egy eredeti vagy újra-továbbított SU készletben csak az ISU vagy az RTX SU azonosítja az AES ID rendeltetési helyet. Abból a célból, hogy elkerüljék a P-csatorna átviteli jellegéből adódó téves feldolgozást, az AES érvényteleníti az SSU-t, ha azt a megfelelő (ugyanolyan referencia számú) ISU vagy RTX SU előzetes vétele nélkül vette.

5.5 R-csatorna protokol

5.5.1 Az R-csatorna kapcsolat réteg protokolt légijármű felől irányban a következő átviteli feldolgozásokhoz használják: 1) az AES kezeléstől vett LIDU-k, 2) az R-csatornán való átvitelt jelző útvonal-kijelölési paraméteres, áramköri módozatú szolgáltatásból vett LIDU-k, és 3) a 33 vagy kevesebb oktettű LSDU-kat vivő néhány LIDU feldolgozása, amelyet az al-hálózati rétegtől vettek. Az R-csatorna protokol megbízható összeköttetési szolgáltatást (RLS) csak az al-hálózattól vett LIDU-k továbbítási folyamatánál használják. Az összes többi LIDU továbbítást az R-csatorna protokol közvetlen összeköttetési szolgáltatásának (DLS) megfelelően végzik.

5.5.2 Az R-csatornát a következő kapcsolat réteg jelzési SU-k átvitelére is fel lehet használni:

a) P-csatorna nyugtázások (PACK);

b) T-csatorna nyugtázás kérés (RQA); és

c) T-csatorna foglalás kérés (REQ).

A fenti SU-kat az R-csatorna protokol közvetlen összeköttetési szolgáltatásának (DLS) megfelelően kell továbbítani.

5.5.3 Adott időben az R-csatorna protokol számos LSDU átvitelt dolgozhat fel az AES-nél (referencia szám van kijelölve és egy SU készlet van létrehozva mindegyik LIDU-ból az LSDU továbbítása érdekében). Az RLS-nél azonban mindegyik Q számnál csak egy LSDU-t engedélyeznek egyidőben a GES-hez való továbbítási folyamatban való részvételre. Ugyanazon Q számú más RLS LSDU-kat az AES-ban tárolnak addig, amíg ennél a Q számnál az aktuális RLS LSDU átvitele akár sikeresen, akár sikertelenül meg nem történik. Ily módon a GES-nél csak egy RLS SU készlet per Q szám per AES lehet az újra-összeállítási folyamatban egy adott időben és a GES érvényteleníti a nem-kész RLS SU készletet, ha egy másik, ugyanolyan Q számú RLS SU készletet kezd el venni ugyanattól az AES-től. Egy SU készlet eredményes vagy eredménytelen átvitele után az AES kapcsolati réteg felszabadítja az összes, az ehhez az SU készlethez kapcsolódó kapcsolati réteg forrást, azaz a kijelölt referencia számot, aktivált időzítőket, memória elosztásokat stb.

5.5.4 Az RLS-nél R-csatorna protokol egy szelektív-ismétlődő ARQ sémát valósít meg a hiba-ellenőrzéshez. Ennek megfelelően az SU készlet továbbítása után az AES várja, hogy egy R-csatorna visszaigazolást, (RACK) SU-t vegyen a GES-től. A RACK SU teljes vagy nem teljes vételt jelezhet a visszaigazolási vezérlői mezőjének felhasználásával. Az utóbbi esetben a RACK SU az SU készlet hiányzó SU-jait is jelzi a sorrend jelzéseinek azonosításával. Az AES továbbítja a jelzett hiányzó SU-kat tartalmuk bármilyen megváltoztatása nélkül. A legnagyobb SU készlet az R-csatornán három SU-t tartalmazhat, ily módon a GES legfeljebb két hiányzó SU-t azonosíthat egy RACK SU-ban, a készlet egy SU-ját helyesen kell venni a GES-nél, abból a célból, hogy észleljék egy SU készlet átvitelének megkísérlését.

5.5.5 Az R-csatorna egy többszörös hozzáférésű csatorna, ezért a GES egyidejűleg veszi az SU-kat az R-csatorna frekvenciák egy készletéhez kijelölt AES-ektől. Mindegyik vett SU tartalmazza a forrás AES ID-t. Így a vett SU-kat először az AES ID-k szerint kiválasztják, azután függetlenül feldolgozzák. Az Annex 10, III. Kötet, I. Rész, 4.5.8.3 pontja tartalmazza az adott AES-ből származó SU-k feldolgozásának megfelelő R-csatorna protokol követelményeket.

6. KAPCSOLAT RÉTEG T-CSATORNA ÉS ALSÁV C-CSATORNA PROTOKOL

6.1 Általános

Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.6 paragrafusában meghatározott kapcsolati réteg T-csatornát az adat-kapcsolat szolgáltatás egységekhez (LSDU) alkalmazzák a légijármű felőli irányból, és ez nem továbbítható az R-csatornán keresztül (pl. azért, mert a hossza meghaladja a 33 oktettet). Két T-csatorna protokol van: egy a T-csatorna kapacitás kérésére, és a másik az SU-k átvitelére a kijelölt kapacitással. Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.6 pontjában meghatározott kapcsolati réteg alsáv C-csatorna protokolt a jelző SU-k átvitelére használják, amely jelzések megfelelnek az áramköri módozatú szolgáltatásnak a légijárműhöz és a légijárműtől irányokban.

6.2 SU készlet generálás

A vett LIDU-ból SU készletet nem lehet generálni, ahogy az az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.6.4.2.1 pontjában le van írva addig, amíg részére a T-csatorna foglalási protokolja egy referencia számot ki nem jelöl. Az LSDU-t (felhasznált adatok) egy T-csatorna SU készlet ISU/SSU-jának felhasználási adat mezőjében kódolják. Az SU-knak az SU készletben szükséges száma az LSDU hosszától függ. Mindegyik SU, az utolsó kivételével, a megengedett maximális számú felhasználói adat oktettet fogja tartalmazni. A készlethez tartozó utolsó SU felhasználói adat oktettek száma kisebb lehet, mint a maximális hossz, és a nem használt oktetteket üres bitekkel töltik ki. Az oktettek számát a végső SSU-ban az ISU-nak „A végső SSU-ban lévő oktettek száma" mezőjében kódolják.

6.3 T-csatorna átviteli protokol

6.3.1 ÁLTALÁNOS

6.3.1.1 A T-csatorna átvitel protokolt akkor használják, amikor átvitelre váró LSDU-k vannak a T-csatornán, és az AES vett egy kért T-csatorna impulzus-köteg foglalást. A T-csatorna átviteli protokol megbízható összeköttetési szolgáltatást (RLS) határoz meg az adatátvitelhez.

6.3.2. LÉGIJÁRMŰ FEDÉLZETÉN TELEPÍTETT FÖLDI ÁLLOMÁS (AES)

6.3.2.1 A légijármű fedélzetén telepített földi állomás (AES) a T-csatorna átviteli protokol átviteli vége. Először az SU-k közül a legrégebbit, a legnagyobb Q számút továbbítják. Ha egy SU készlet átvitelre vár egy elosztott impulzus-köteg foglalásban, és egy nagyobb elsőbbségű SU készletet nyújtanak be továbbításra, akkor a nagyobb elsőbbségű SU-k lépnek az alacsonyabb elsőbbségű SU-k helyébe. Így egy impulzus-köteg foglalás inkább hordozhat az LSDU-nak megfelelő SU-kat, mint az, amelyik a foglalás iránti eredeti kérést kezdeményezte.

6.3.2.2 Az AES, miután az SU készletet továbbította a földi telepítésű földi állomásnak (GES), várja a T-csatorna nyugtázás (TACK) SU-kat a GES-től. A TACK SU-kat az AES-nél a P-csatorna protokol vételi végénél veszik, amely azután továbbítja ezeket a T-csatorna átviteli protokoljához. Az AES egynél több TACK SU-t tud venni, amelyek az SU készlet SU-jainak hiányát jelzik a GES-nél. Mindegyik TACK SU maximum három hiányzó SU-t tud azonosítani. A TACK SU készlet egy, a hiányzó SU-kat azonosító TACK SU-jának a vétele egy tA5 időzítőt indít be az AES-en és jelzi a várt további TACK SU-k számát. Ha a tA5 időzítő lejár, mielőtt a TACK SU készlet egy másik TACK SU-ját vennék, az AES továbbítja az addig vett TACK SU-kban azonosított hiányzó SU-kat. Ha a megfelelő tA5 időzítő lejárta után vesznek TACK SU(ka)t, és az AES még nem továbbította a már vett TACK SU(k)ban azonosított újra-átviteli SU készletet, akkor a vett TACK SU(ka)t az AES érvényteleníti.

6.3.2.3 Az AES kiszámítja az újra-továbbításhoz szükséges, várt foglalás hosszát, amely számítás a TACK SU készlet vett TACK SU-jaiban jelzett hiányzó SU-k számán alapul. Ez a hossz a tA8 időzítővel kapcsolódik, amelyet a T-csatorna foglalási protokolja indít be, hogy az újra-átvitelhez való foglalás vételét felügyelje. Ez a hossz kisebb lehet, mint a foglalás hossza, amely ténylegesen ki van jelölve GES általi újra-átvitelre, ha például a TACK SU készlet néhány TACK SU-ját az AES még nem vette.

6.3.2.4 Az AES megőrzi az SU készlet egy példányát újra-átvitel céljára. Miután továbbította a LIDU átviteli állapot jelzést az al-hálózati rétegnek az eredményességet vagy eredménytelenséget jelezve, az AES a megőrzött példányt megsemmisíti.

6.3.2.5 Ha többszöri kísérlet után egy várt foglalást a GES-től nem sikerül venni, az AES érvényteleníti legalább azoknak az SU-knak a számát, amelyekre a foglalást kérték. Az érvénytelenített SU-k nem lehetnek azok, amelyek a foglalás iránti eredeti kérést kezdeményezték azon tény miatt, hogy az SU-k átvitele az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.6.4.2.2 pontjában leírt elsőbbségen alapul, de egyenlő vagy kisebb elsőbbségűek lesznek. Ha egy ISU van az AES-nél érvénytelenített SU-k között, az érvénytelnített ISU által fej-résszel ellátott teljes SU készlet érvénytelnítésre kerül. Ez több SU érvénytelenítését eredményezi, mint amennyi szükséges. Ha az érvénytelnítettt SU egy REQ SU, akkor az AES újra-továbbítja a REQ SU-t vagy a T- vagy az R- csatornán. Ha az érvénytelenített SU egy SU készlet utolsó SU-ja, akkor az AES egy időzítőt indít a TACK SU(k) ellenőrzésére ennél az SU készletnél.

6.3.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

6.3.3.1 Ez a T-csatorna átviteli protokol vételi vége. A GES, egy SU készletet véve, újra-összeállítja azt egy LIDU-ba. Az SU készlet újra-összeállítása előtt a GES ellenőrzi azt, hogy az SU készlet összes SU-ját vették-e vagy sem. Ha az SU készlet nem teljes azután, hogy az SU készletbőll további SU-k már nem várhatók (az AMSS SARP kritérium által meghatározott), a GES a hiányzó SU-k újra-továbbítását kéri a megfelelő számú TACK SU hibajelző átvitelével a P-csatornán az AES-hez.

6.3.3.2 Ha amíg AES-től való újra-átvitelre várva a GES ugyanazon AES ID és Q számú ISU-t vesz, mint a befejezésre váró SU készlet, és az ISU referencia száma egy olyan párhoz tartozik, amelynek másik tagja a befejezésre váró SU referencia száma, a GES érvénytelníti a befejezésre váró SU készletet és egy új SU készlethez kezd. A fentebb ismertetett paraméterekkel rendelkező ISU vétele azt mutatja, hogy az AES abbahagyta az előző SU készlet átvitelét és felszabadította a referencia számot, így a pár második tagjának kijelölésére rendelkezésre bocsátotta.

6.3.3.3 A GES egy RQA SU-t az AES-től a következő körülmények között vehet:

a) kezdeti SU készlet elvesztés (azaz legkevesebb az ISU elvesztése): az RQA SU nem vonatkozik olyan SU készletre, amelyet éppen megelőzőleg dolgoztak fel;

b) negatív visszaigazolás elvesztés vagy újra-átvitel elvesztés: az RQA SU egy helyesbítés alatt álló SU készletre vonatkozik; és

c) pozitív visszaigazolás elvesztés: az RQA SU olyan SU készletre vonatkozik, amelyet éppen megelőzőleg dolgoztak fel.

Amikor egy kezdeti SU készlet elveszett, a GES az RQA SU-ban lévő közlési hossz paraméterből meghatározza a kezdeti SU készlet hosszát a tárolás és a korrekt T-csatorna kapacitás a teljes újra-átvitel iránti kéréssel együtt való elküldése érdekében.

6.4 T-csatorna foglalás protokol

6.4.1 ÁLTALÁNOS

A T-csatorna foglalás protokolt a T-csatornán való adatátvitel foglalások kérésére használják.

6.4.2 LÉGIJÁRMŰ FEDÉLZETÉN TELEPÍTETT FÖLDI ÁLLOMÁS (AES)

6.4.2.1 A T-csatorna foglslás protokol az AES-ben referencia számokat jelöl ki a LIDU-khoz, amelyeket az al-hálózat rétegtől vettek a T-csatornán történő átvitelre. A referencia számokat olyan módon jelölik ki, hogy két egymást követő, ugyanazon Q számú, az AES-től a GES-hez továbbított LIDU-nak ne legyen ugyanazon referencia száma. Egy LSDU-nak kijelölt referencia számot a T-csatorna foglalási protokol használja a foglalási (REQ) SU kérésre, továbbá használja az összes kapcsolódó jelképzés és a T-csatorna átviteli protokol az adott SU-kban, és a kapcsolódó nyugtázásokban és a nyugtázás SU-k iránti kérelmekben.

6.4.2.2 A REQ SU-t a T-csatornán vagy az R-csatornán keresztül továbbítják a GES-hez. Valahányszor a REQ SU-t továbbítják a T-csatornán, a REQ SU megkövetelt hosszát eggyel megnövelik, azért, hogy figyelembe vegyék a csatorna REQ SU átviteli kapacitását.

6.4.2.3 A tA8 időzítőt az AES-ben a várt T-csatorna foglalási (RES) SU-k vételének ellenőrzésére használják, amelyek vagy az előzetes vett foglslás előtti (RFC) SU-kkal vagy a vett TACK SU-kkal kapcsolódnak. Az SU készletek átvitel elsőbbségi sémája miatt, amely abban nyilvánul meg, hogy a magasabb elsőbbségű SU készletek potenciálisan elfoglalják a foglalási kijelöléseket az alacsonyabb elsőbbségű SU készletekkel szemben, ezért lesznek olyan időpillanatok, amikor többszörös tA8 időzítőket - amelyek ugyanazon SU készlehez kapcsolódnak - indíthatnak be az AES-nél. Miután egy várt RES SU-t vettek ennél az SU készletnél, az AES-nek meg kell állítania a megfelelő tA8 időzítőt (Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.6.5.2.6 és 4.6.5.2.7 pont). Azonban mivel az egy az egyben leképezés a tA8 időzítő és a vett RES SU között nem garantált, ki kell választani a legalkalmasabb tA8 időzítőt. Az ilyen kiválasztás megvalósítás-függő. Például a kiválasztást végre lehet hajtani az összes elintézetlen tA8 időzítő értékétől függően, úgy, hogy a legrövidebb idejű időzítésű kerül kiválasztásra, a vett RES SU-k foglalási méretétől függetlenül. Ebben az esetben a megvalósításnál ügyelni kell arra, hogy foglalást kell kérni minden, egy AES-nél lévő SU készlethez kapcsolódó elintézetlen foglalás teljes méretében az akkor létrejövő hiánynál, amikor az összes tA8 időzítő leállt. Egyéb kiválasztási kritériumokat is lehet alkalmazni. Azonban azt a megkötést, hogy legalább az összes elintézetlen foglalás teljes méretét - amely bármely adott SU készlettel kapcsolatos - venni kell, mielőtt az ehhez az SU készlethez kijelölt referencia számot felszabadítják, mindig be kell tartani.

6.4.2.4 A foglalásokat nem lehet időrendi sorrendben venni. Két különböző T-csatornán lévő két foglalás közötti minimális foglalási rést elegendővé teszik az AES-nél a frekvencia (T-csatorna) kapcsolás lehetővé tételére. Egy foglalási (RES) SU egy vagy több impulzus-köteg felhasználást tesz lehetővé a T-csatornán. A kezdeti impulzus-köteg induló keretszámát a RES SU-n belül kódolják, és ez úgy ismert, mint ami a RES SU vételét követő tizenhat keret egyikéhez tartozó időablak. Ezek után a további foglslások (ha vannak ilyenek) minden 2BI keretnél jelennek meg, amíg a foglalt impulzus-kötegek számát elérik. A BI a RES SU-n belüli impulzus-köteg intervallum információs elem kódolása. Az AES kiszámolja az induló keretet mindegyik foglalt impulzus-köteghez, mind a kezdő impulzus-köteg induló keretszámát, mind az impulzus-köteg intervallum információt felhasználva. Ha egy foglalt impulzus-köteg elfogyott, akkor az AES törli az idő-tervéből.

6.4.3 FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES)

6.4.3.1 A GESfoglalásokat jelöl ki a hozzátartozó AES-ektől érkező, foglalás iránti kérésekre válaszolva. A GES ugyancsak foglalásokat jelöl ki az AES által továbbított SU készlet hiányzó SU-jainak újra-továbbítására. Így valahányszor a T-csatorna átviteli protokol a GES-nél egy TACK SU készletet továbbít, - amely egy vagy több, hibát jelző TACK SU-t tartalmaz - a T-csatorna foglalás protokol a GES-nél foglalást eszközöl az újra-továbbítások részére..

6.4.3.2 A GES foglalásokat jelöl ki egy AES-hez a négy T-csatorna bármelyikére, amelyeket az AES-nek jelöltek ki a bejelentkezés idején. A GES jelzi azt a T-csatornát, amelyen a foglalást végezték az AES-nek a RES SU-ban. Egy T-csatornának az AES részére a bejelentkezés idején kijelölt lehetséges négy közüli kiválasztási eljárása végrehajtás-függő. A T-csatorna kiválasztására a következő módszerek alkalmazhatók:

a) egy adott AES részére rendelkezésre álló összes T-csatornát figyelembe veszik. Bármely T-csatornához kijelölhetnek foglalást, amelyen a minimálisan megengedhető foglalási késés érhető el, vagy ahhoz a csatornához, amely a legkisebb foglalási késést ígéri, ha nem T-csatorna ígéri a minimális megengedhető foglalási késést;

b) mindegyik T-csatorna, amely egy adott AES-hez van kijelölve, egy vagy több közlemény elsőbbséghez kapcsolódik. Egy T- csatornát a REQ SU-ban azonosított közlemény elsőbbségnek megfelelően választanak ki; és

c) az összes nem-biztonsági közlemény részére a foglalást egy egyedülálló T-csatornán végzik, az összes biztonsági közlemény foglalást azon a T-csatornán végzik, amely a legkisebb foglalási késést ígéri.

6.4.3.3 A GES az RES SU-t továbbítja az AES-hez valahányszor a foglalás indulása az aktuális idő szerinti nyolc másodpercen belül van. Ezt azért csinálják, hogy elkerüljék a foglalás indulási idejének félreértését az AES-nél. A foglalás indulási idő az RES SU-ban egy szuper-kereten belüli indulási keret fogalmában van meghatározva. A szuper-keret számot nem határozzák meg. Így ha az AES nem veszi az RES SU-t azon a szuper-kereten belül, amely az indulási keret számot ténylegesen tartalmazza, az AES az információt helytelenül fogja alkalmazni a szuper-keretre, amelyen belül az RES SU-t az AES veszi. Ha az ebben a szupe-keretben lévő kereteken egy másik AES-hez jelölték ki, akkor a két AES-ből jövő T-csatorna átvitelek összeütközése fordulhat elő. Azon tény miatt, hogy az RES SU-t az AES-nek a helyes szuper-kereten belül kell vennie, az RES SU-t 15-re állítják, hogy minimalizálják a P-csatorna sorba állítási késéseit, amelyeket egyébként az RES SU érzékelhet.

6.4.3.4 Ha az impulzus-köteg foglalás indulása a foglalás végrehajtásának időpontjától számított nyolc másodperces idő-ablakon kívül van, a GES egy rövidesen megjelenő foglalás (RFC) SU-t továbbít az AES-nek, hogy megakadályozzák egy szünet kialakulását, amely egy másik foglalás iránti kérelemben jöhet létre. Az RFC SU egy felső korlátot szab az impulzus-köteg foglalás megkezdésében fellépő késésre a szuper-keretek egész számában (8 másodperc) megadva. Az időterv a GES-nél hosszúságban korlátozott. Mindannyiszor, amikor a GES nem képes egy foglalás kijelölésére az aktuális időtervén belül, késéssel küldi az RFC SU-t a RES-nek, amely maximális időterv hosszúságára van beállítva és megőrzi a kérést későbbi kijelölésre. Ezek után, amikor a GES képes a kérést kiszolgálni, a GES egy további RFC SU-t küld, amely megadja az akkor ismert foglalási kérését. A GES időterv mérete megvalósítás-függő és nincs meghatározva az AMSS SARP-ban.

6.4.3.5 A TACK SU-k átvitelének mindig meg kell előznie a hozzákapcsolódó T-csatorna foglalást. Mivel egy RES SU elsőbbségi szintje magasabb, mint a TACK SU-é, a GES-nek meg kell várnia, amíg az összes TACK SU ténylegessen átvitelre kerül, mielőtt az újra-továbbítási foglalást kijelölné. A T-csatorna átviteli protokol által az AES-nek továbbított TACK SU-k a GES-ben tartalmaznak egy késésre vonatkozó becslést, mielőtt a GES az RES SU-t az AES-hez továbbítja, ez a becslés a T-csatorna(k) terhelésének a függvénye. Ezek után, ha a foglalást nem lehet kijelölni a TACK SU-ban várható becsült késésen belül, a GES egy RFC SU-t továbbít a tényleges késéssel, vagy a maximális késési értékkel, amely megfelel az időterv hosszának, ha az nem tudott foglalást kijelölni az éppen aktuális időtervén belül. Az utóbbi esetben a GES addig fogja késleltetni a T-csatorna impulzus-köteg kijelölést, amíg kapacitása nem lesz. Az újra-továbbítási foglalás hossza a hiányzó SU-kat a GES-nél a TACK SU készlet által azonosított hiányzó SU-k száma, plusz egy.

6.4.3.6 A GES úgy jelöli ki a foglalásokat, hogy két AES ne kerüljön ugyanazon a T-csatornán továbbításra. ugyanabban az időben. A foglalás hossza olyan, hogy az AES mindig képes legalább egy REQ SU küldésre azokon az SU-kon kívül, amelyekre a foglalást végezték. Ez megelőzi egy REQ SU továbbításának a késését, amikor ennek az elsőbbségsi szintje alacsonyabb, mint a továbbításra váró SU-k elsőbbségi szintje, vagy megakadályozza a teljes SU készlet késését, amikor egyedülálló REQ SU szakítja meg. Hosszú LSDU-kat impulzus-köteg foglalású, egyenlő hosszúságú, többszörös impulzus-kötegekben jelölnek ki, mindegyik impulzus-köteget az előtte lévőtől egy rögzített impulzus-köteg intervallum választja el. Az impulzus-kötegek közötti intervallumokat az AES-eknek átvitelre vagy újra-átvitelre lehet kijelölni. Két impulzus-köteg közötti impulzus-köteg intervallum és ugyanazon LSDU-nak megfelelő mindegyik impulzus-köteg hossza úgy van létrehozva, hogy az átviteli késés a teljes LSDU-ra kielégítse az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.7 szakaszban meghatározott működési követelményeket. Mivel az adó az AES-ben meg lehet osztva az R- és a T-csatornák között, és a vevő T-csatorna módja nagyobb elsőbbséggel rendelkezik, mint az R-csatorna módja, a foglalások kijelölése a T-csatornán befolyásolni fogja az R-csatorna átviteleket. A foglalások a T-csatornára oly módon vannak kijelölve, hogy a legtöbb az idő legnagyobb részében legalább egy R-csatorna impulzus-köteg legyen minden nyolc másodperc során mindegyik, a foglalást kijelölő GES-hez bejelentkezett AES-től. Az impulzus-köteg hossz és az impulzus-köteg intervallum nincs specifikálva az AMSS SARP-ban; ezek megvalósítás-függőek.

6.4.3.7 Az egyedi impulzus-köteg hosszának tipikus értékei a következők:

a) 18 SU 600 bit/s sebességgel működő T-csatorna esetén;

b) 17 SU 1200 bit/s sebességgel működő T-csatorna esetén;

c) 31 SU 2400 bit/s sebességgel működő T-csatorna esetén;

d) 31 SU 10500 bit/s sebességgel működő T-csatorna esetén.

Az impulzus-köteg intervallum tipikus értékei a következők:

a) 16 keret 600 bit/s sebességgel működő T-csatorna esetén;

b) 8 keret 1200 bit/s sebességgel működő T-csatorna esetén;

c) 4 keret 2400 bit/s sebességgel működő T-csatorna esetén;

d) 1 keret 10500 bit/s sebességgel működő T-csatorna esetén.

6.4.3.8 A legkorábbi indítási idő, amikor a GES egy foglalást végez, olyan kell, hogy legyen, hogy az AES idejében tudja venni a foglalást ahhoz, hogy a kijelölt foglalás kezdetére továbbítson. Ez az idő figyelembe veszi a feldolgozási időt mind a GES-nél, mind az AES-nél, valamint a kódolási és dekódolási késést. A legkorábbi indítási idő megvalósítás-függő és az alább megadott formula szerint számítható:

Foglalás indítás minimális késése = P-csatorna egység késés + GES feldolgozás késés + P-csatorna sorbaállítási késés + R-résidő tartam + 0,2 másodperc (*) + terjedési késés idő + AES feldolgozási késés.

(*) A 0,2 másodperc az R/T csatorna átkapcsolási idő.

A rendszer megvalósítója az A-10. táblázatban bemutatott jellemző értékeket mutatta ki az összetevők egy részére. A GES feldolgozási késés tipikus értéke 200 milliszekundum nagyságrendű.

6.4.3.9 A GES, vagy egy másik GES-hez való bejelentkezés vételekor, vagy egy AES-tőlvaló kijelentkezéskor, amely hozzá volt bejelentkezve, a kijelentkezési információ vételekor, érvényteleníthetí az AES-hez kijelölt foglalásokat, és lehetővé teszi, hogy a rendelkezésére álló résidőket, hozzá bejelentkezett AES-ek részére.

6.5 Alsáv C-csatorna légijárműhöz és légijárműtől protokol

6.5.1 ÁLTALÁNOS

Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.6 pontja által meghatározott AMSS SARP-ban definiált alsáv C-csatorna protokol közvetlen kapcsolat szolgáltatást (DLS) határoz meg a jelző SU-khoz. Az alsáv C-csatorna jelzést hordoz az áramköri módozatú szolgáltatáshoz, a C-csatorna felállításához, feldolgozásához, fenntartásához vagy bontásához.

7. MŰHOLDAS AL-HÁLÓZAT RÉTEG

7.1 Általános rendelkezések

7.1.1 FELÉPÍTÉS

Ahhoz, hogy megkönnyítsék az egymásközti működőképességi eljárások kifejlesztését, az al-hálózat réteget funkcionális területekre osztották. Ennek a funkcionális felosztásnak nem az a célja, hogy eleve kizárja az olyan módosításokat, amelyek más módon kapcsolódnak össze, amennyiben az al-hálózat réteg légi és földi megvalósításai úgy működnek (a külső szemlélő számára), hogy azok megfelelnek az ebben a szakaszban leírt rendelkezéseknek.

7.1.1.1 *SSND funkció*

Mindegyik SSNDPX funkció egy vagy több SSNDPX entitást tartalmaz. Mindegyik entitás összeköttetést tart a pár SSNDPX entitással az SSNDP felhasználásával.

7.1.1.2 *SNAc funkció*

Mindegyik SNAc funkció egy vagy több ISO 8208 DCE entitást tartalmaz. Mindegyik ISO 8208 DCE entitás összeköttetést tart a pár ISO 8208 felhasználói végberendezés (DTE) entitással a kapcsolódó légiforgalmi távközlési hálózat (ATN) hívás irányítóval, felhasználva az ISO 8208 protokolt.

7.1.1.3 (Fenntartott)

7.1.1.4 *IW funkció*

Mindegyik IW funkció egy IW entitást tartalmaz. Az IW funkciók teremtik meg az SSND, SNAc és CN funkciók közötti szükséges harmonizációt. Ezek továbbítják az ISO 8208 csomagokat az ISO 8208 DCE és az SSNDPX entitások között.

7.1.2 HÁTTÉR AZ ISO 8208 ÉS A HOZZÁKAPCSOLÓDÓ AL-HÁLÓZAT- FÜGGŐ PROTOKOL HASZNÁLATÁHOZ

A műholdas al-hálózatban az adatok vehetők sorrenden kívül vagy duplikálva. Az al-hálózat függő konvergencia funkció (SNDCF) az ATN hívás irányítóban, amely a műholdas al-hálózat által nyújtott szolgáltatást használja, felvesz egy alapvető kapcsolat-módú szolgáltatást, amely az adatok sorba-állított továbbítását végzi. Az SNDCF nem lát el hibajavítási feladatot, amikor az adat duplikációt és a sorozaton kívül vett adatokat kezeli. Ezért ez megbízható kapcsolat-módú szolgáltatást igényel, amelyet az ISO 8208 ésaz SSND protokolok nyújtanak. Továbbá, a műholdas al-hálózat esetében ezeknek a kapcsolódási protokoloknak a használata jóval hatékonyabb. Végülis az ISO 8208 a legérettebb kapcsolat-módú protokol, amely jelenleg rendelkezésre áll.

7.1.3 SZOLGÁLTATÁSOK

7.1.3.1 A csomag adat interfész lehetővé teszi az AMSS-nek, hogy az ATN műholdas al-hálózatként működjön. A műholdas al-hálózat továbbítja az adat csomagokat a levegőből a földre és a földtől a levegőbe. A csomag adat-átviteleket kapcsolat-módú szolgáltatás formában végzik, az ISO 8208-at al-hálózat hozzáférési protokolként használva (lásd ezen útmutató anyag A-14. ábráját).

7.1.3.2 Az al-hálózat felhasználónak meg kell kezdeni minden egyes kapcsolat felállítását egy ISO 8208 HÍVÁS KÉRÉS csomag küldésével. Normális üzemben ez az akció egy kapcsolt virtuális áramkör (SVC) létrehozását eredményezi a hívó aláhálózat használója és a hívott al-hálózat használója között. Az SVC-ket bonthatja vagy az al-hálózat használója (amikor a kapcsolatra már nincs szüksége), vagy az al-hálózat (amikor a kapcsolat már nem tartható fenn).

7.1.3.3 Egy légijárművön lévő egy vagy több al-hálózat felhasználó egy vagy több földön lévő felhasználóval lehet összekapcsolva, de az összes földi felhasználó normál körülmények között, bármely adott időben egyetlen földi telepítésű földi állomáson (GES) keresztül kapcsolódik egymáshoz. Egyik GES-től egy másiknak való átadás a szolgáltatás átmeneti megszakadását eredményezheti.

7.1.3.4 Egy HÍVÁS KÉRÉS csomag feladója normál körülmények között mind a hívott, mind a hívó al-hálózat felhasználót azonosítja. A feladó azonosíthatja a szolgáltatás követelmények minőségét is a megfelelő ISO 8208 berendezések segítségével.

7.1.3.5 A műholdas al-hálózat megvalósítások normál körülmények között tartalmaznak olyan elemeket, amelyeket az ICAO nem szabványosított. Ezen elemek közül az egyik egy csomag kapcsolás, amely értelmezi a DTE címzéseket, és a csomagot a megfelelő DTE-hez juttatja. Az AMSS SARP megengedi (de nem követeli meg) a többszörös DTE-k összekapcsolását egy légijármű fedélzeti földi állomással (AES), vagy egy GES-sel, vagy mindkettővel. Az AMSS SARP is megengedi bármilyen DTE címzés formátum használatát az ISO 8208 korlátozásoknak alávetve. Az al-hálózat felhasználók felelősek a DTE címzés formátumok (és cím tömörítési sémák, ha ilyet használnak) levegő - föld közötti koordinálásáért.

7.1.3.6 A műholdas al-hálózat összekapcsolhatósági esemény közleményeket szolgáltat a hozzátartozó ATN hívás irányítóknak. Mivel CN esemény közleményeket nem továbbítanak az al-hálózaton keresztül, ezekhez a közleményekhez a formátumok és az adathordozók szabványosítása helyi kérdésnek tekintendő.

7.1.4 HIBA KEZELÉS AZ ÖSSZEKÖTETÉSEK MEGSZAKADÁSAINÁL

Ha egy AES és egy GES között az összeköttetés váratlanul hirtelen véget ér (pl. a fizikai kapcsolat elvesztése folytán), az al-hálózat réteg számára lehetőség van utolsó állapotának megtartására, amíg a kapcsolatokat a felhasználó tisztázza. A GES al-hálózat réteg különösen érzékeny, mivel előfordulhat, hogy nnincs értresítés azonnal a kommunikáció megszakadásáról. A felhasználók és/vagy kivitelezők kiegészítő eszközöket alkalmazhatnak az ilyen körülmények észlelésére és javítására.

7.2 Csomag adat teljesítmény

7.2.1 ÁLTALÁNOS

7.2.1.1 *Az ICAO teljesítmény előírások szükségessége*

7.2.1.1.1 Az AMSS minimális rendszer teljesítmény szintek egy földrajzi fedési terület felett érvényesek, amelyet minden AMSS szolgáltatónak azonosítani kell. Általánosságban a minimális rendszer teljesítménynek mindegyik, a kijelölt fedési területen belül lévő AES részére folyamatosan rendelkezésre kell állnia. Az AES antennáktól azonban nem követelik meg, hogy minden irányban teljes fedést szolgáltassanak, többszörös antennák és/vagy több műhold válhat szükségessé ahhoz, hogy elérjék a minimális rendszer teljesítményt.

7.2.1.1.2 Az AMSS minimális rendszer teljesítmény szintek nem reprezentálják a rendszer teljesítmény alapvető korlátait. Szerencsés körülmények között az elérhető AMSS rendszer teljesítmény sokkal jobb lehet, mint az AMSS SARP-ban tükrözött minimum szabványok. Az Államok részére nincs megyakadályozva az, hogy keressék az olyan AMSS szolgáltatási elrendezéseket, amelyek olyan rendszer teljesítményeket biztosítanak, ami meghaladja az AMSS SARP-ok minimum követelményeit. Azonban az ilyen elrendezéseknek figyelembe kell venniük a minimális AES konfigurációkat és az AMSS SARP minimális AES teljesítmény követelményeket.

7.2.1.2 *Fizikai réteg.* Az alap teljesítmény szint a fizikai rétegnél a maximális bit hiba-arány, amely 10^{-3} értékben van előírva a digitális hang és 10^{-5}-ként az adat csomagnál és a hozzá kapcsolódó jelzésnél. Ezek a rendszer meghatározások szükségtelenné teszik a részletezett műholdas kapcsolat együttes specifikációt, így a műhold és a GES architektúrák széles változatát teszik lehetővé.

7.2.1.3. *Adat csomag al-hálózat réteg*

7.2.1.3.1 Az alhálózat szolgáltatási teljesítmény meghatározása lehetővé teszi a GES-ek tervezésének és üzemeltetésének rugalmasságát, ugyanakkor egy egységes minimális teljesítményszintet biztosít az adat comag felhasználó részére. Általában az al-hálózati teljesítmény paraméterek az ISO 8348 10. szakaszában, Információ feldolgozó rendszerek - Adat-összeköttetés - Hálózati szolgáltatás meghatározás(ok)-on, 1987. (Information processing systems – Data communications – Network service definition, 1987.) alapulnak, amelyek referenciaként beépülnek az AMSS SARP-ba. A csomagok és az al-hálózat elsődleges szolgáltatásai közötti leképezés az ISO 8878 Információ feldolgozó rendszerek - Adat-összeköttetés - Az X. 25 felhasználása az OSI kapcsolás módú hálózati szolgáltatás nyújtására (Information processing systems – Data communications – Use of X.25 to provide the OSI connection mode network service) című kiadványban van meghatározva.

7.2.1.3.2 Az „al-hálózati szolgáltatás” fogalma az adat csomag teljesítmény összefüggésben arra a szolgáltatásra vonatkozik, amelyet az a-lhálózat által a magasabb réteg felhasználónak nyújtanak. A „szolgáltatást nyújtó” fogalma ugyanebben az összefüggésben a műholdas al-hálózatokon belüli protokolokra és működésük tényleges hatására vonatkozik. Ezeket a fogalmakat nem szabad összekeverni a műholdas összeköttetést biztosítók szolgáltatásaival vagy a GES üzemeltető szolgáltatásaival. A adat csomag szolgáltatás a rendszer összes elemétől függ az AES-től, a műholdtól, a GES-től és a közöttük lévő fizikai útvonalaktól.

7.2.1.3.3 Az AMSS SARP-ban lévő teljesítmény paraméterek értékeit úgy tervezik, hogy gazdaságos és spektrum-hatékony működést tegyenek lehetővé. Ezeket a névlegesen legrosszabb körülményekre számítják, beleértve a fizikailag maximális hiba-arányt és a csúcsidei forgalom terhelését. A szolgáltatás teljesítmény javított sebessége (a specifikált értékekhez viszonyítva) egy adott forgalom terhelés kiszolgálására használt fizikai csatornák számának növelésével érhető el, ami által a forgalom csatornánkénti terhelése csökken. Ezt az eljárást használva, a kiszolgálás költségének növekedése várható (és a spektrum-hatékonyság várhatóan csökken), ahogyan a kiszolgálási sebesség javul.

7.2.1.3.4 Az AMSS al-hálózat teljesítmény nem tartalmazza más kapcsolatok hatásait a végtől–végig adat pályán. Az al-hálózat teljesítmény tartalmazza az összes üzemelés hatását, kezdve az ISO 8208 DCE protokoltól a műholdas al-hálózat küldő végénél és végezve az ISO 8208 DCE üzemelésnél a műholdas al-hálózat vevő végénél, magába foglalva a következőket:

a) a műholdas al-hálózat belső működési funkcióit;

b) a műhold al-hálózat függő protokolljait;

c) a műhold adat-kapcsolat rétegeket; és

d) a műhold fizikai rétegeket.

A DTE-hez kapcsolódó ISO 8208 üzemelések nem részei a műholdas al-hálózatnak és ki vanvak zárva az AMSS adat cscomag teljesítmény előírásokból is, úgy, mint az adat-kapcsolat réteg és fizikai réteg üzemelés a DCE és a DTE között.

7.2.2 A SZOLGÁLTATÁS SEBESSÉGE

7.2.2.1 A szolgáltatás sebességét számos tényező határozza meg, közöttük:

a) a rendszer felépítés;

b) a használatos csatorna átviteli sebesség(ek);

c) a forgalom elsőbbsége, amelynél a szolgáltatás sebességét mérik;

d) a közlemények hossza, amelynél a szolgáltatás sebességét mérik, a rendszert terhelő forgalom; és

e) adat feldolgozás késések.

Végül a szolgáltatás tényleges sebessége a légijárműtől irányban függ az egyes légijárművektől továbbított forgalom mennyiségétől és fajtájától oly mértékben, ahogy a csomagok késleltetve lehetnek a légijárművön, míg más csomagok továbbításra kerülnek a GES-hez.

7.2.2.2 A jelenlegi ipari gyakorlattal összhangban a szolgáltatás sebességét az al-hálózat felhasználói adatok 128 oktettjét tartalmazó csomagok fogalmában határozták meg.

7.2.2.3 Nincs előírás arra a maximális forgalom mennyiségre, amelyet a P- vagy a T-csatornákon kezelnek. Azonban a szolgáltatás sebesség teljesítmény előírások (az elméleti kapacitás) közelítőleg a maximális kihasználtság 70 százalékán alapulnak ezeknél a csatorna típusoknál. Magasabb fokú kihasználtság engedélyezett, feltéve, hogy az összes alkalmazható teljesítmény előírás ki van elégítve. Például egy GES, amely több T-csatornát üzemeltet egy megfelelő több kiszolgálási konfigurációban, képes 80 százalékos vagy ennél nagyobb T-csatorna kihasználási tényező elérésére a szolgáltatás sebességi követelményei által képzett korlátozásokon belül. A P-csatornák akkor üzemeltethetők 70 százaléknál nagyobb kihasználási tényezővel, ha a teljes P-csatorna forgalom általi kihasználtság a repülés biztonsága és menetrendszerűségével kapcsolatos legkisebb elsőbbségnél és e felett nem haladja meg a 70 százalékot.

7.2.2.4 Egy GES-t, amely arra van szánva, hogy kisegítőként szolgáljon egy másik GES-hez, alkalmasan kell méretezni ahhoz, hogy a megkívánt teljesítményt szolgáltassa az elsődleges GES meghibásodása esetén.

7.2.2.5 A „legnagyobb elsőbbségű szolgáltatás” fogalma a 14-es prioritás szolgáltatást jelöli, amelyet a veszély, a vészhelyzet és bizonyos nem gyakori hálózati/rendszer kezelési közlések részére tartanak fenn. A „legkisebb elsőbbségű szolgáltatás” fogalom a repülés biztonsága és menetrendszerűsége részére a csúcsidejű forgalom terhelés alatt használt legkisebb elsőbbséget jelöli. A teljesítmény olyan elsőbbségi szinteknél, amelyeket nem használnak a repülés biztonságához vagy menetrendszerűségéhez, nincs meghatározva.

7.2.2.6 *Tranzit késés és 95 százalékos adat továbbítási késés*

7.2.2.6.1 A tranzit késés egy szabvány szolgáltatási sebesség teljesítmény mérés az egyedüli ADAT csomagoknál; a tranzit késést átlagos értékként határozzák meg. Mivel a polgári repülési szakmai közösség tipikusan nem bízik az átlag-értékekben, a legkritikusabb teljesítmény méréseket, a 95 százalékos adat továbbítás késéseket is meghatározzák. Tényleges üzemelési körülmények között a kapcsolat az átlagos és a 95 százalékos késési érték között nincs rögzítve, de a forgalom eloszlástól függhet. A légijármű felé késések egy tipikus statisztikai eloszlását - tervezett csúcs-forgalmi terhelés alatt és a legkisebb P-csatorna átviteli sebességnél - mutatja be ezen útmutató anyag A-15. ábrája az adatok legmagasabb és legalacsonyabb elsőbbségénél. A légijármű felől késések egy tipikus statisztikai eloszlását hasonló körülmények között ezen útmutató anyag A-16. ábrája mutatja be. A légijármű felől késések függetlenek az elsőbbségtől, hacsak két vagy több légijármű felőli csomag nem "versenyzik" a forrásokért egy bizonyos AES-en belül. Az a mérték, ameddig az ilyen belső versengés előfordulhat egy bizonyos AES-en belül, a légijármű repülés-elektronikai felépítésétől függő, amellyel a légijárművön az AES-t felszerelték.

7.2.2.6.2 A tranzit késést és a 95 százalékos adat átvitel késést egy szabvány referencia ADAT csomag alapján határozzák meg, amely az al-hálózat felhasználói adatainak 128 oktettjét tartalmazza. A tényleges késések rövidebb csomagoknál csökkenhetnek, de nem feltétlenül a csomag hosszával arányosan. Az al-hálózat felhasználó adataihoz tartozó 128 oktettnél rövidebb ADAT csomagokhoz kapcsolódó késési paraméterek nem haladhatják meg a 128 oktettes ADAT csomagoknak megfelelő paramétereket.

7.2.2.7 *Átmenő teljesítmény.* Az átmenő teljesítmény szolgáltatás paraméter szabvány sebesség a többszörös ADAT csomag átvitelére. A jelenlegi ipari gyakorlatnak megfelelően, az átmenő teljesítményt az al-hálózat használó adatok 128 oktettjét tartalmazó szabvány referencia ADAT ccsomag alapján számolják. Az átmenő teljesítményt többszörös független csomagok átvitelére számolják. Az átmenő teljesítmény az M-bit sorozatok átvitelénél lényegesen magasabb lehet. Az al-hálózatnak kell az A-11. táblázatban bemutatott minimális átmenő teljesítmény értékeket fenntartani.

7.2.2.8 *Kapcsolat létesítés késés, kapcsolat bontás késés*

7.2.2.8.1 *Kapcsolat létesítés késés.* A maximális kapcsolat létesítés késés a legalacsonyabb elsőbbségű kapcsolat kérésen alapszik, amely a DTE címzés információ teljes 15 oktettjét és a berendezés mezők és a választható adatok 42 oktettjét tartalmazzák. Mindegyik csatorna átviteli sebességre meghatározott értékek érvényesek a GES-től eredő kérések és az AES-től eredő kérések egyenlő arányú keverékére. A maximális kapcsolat létesítési késés szolgáltatási előírás sebessége a kapcsolat létesítési fázisnál; ennek nem az a célja, hogy valamilyen szmpontból korlátozva legyen a felhasználói adat mezők vagy címzés mezők jövőbeni használata.

7.2.2.8.2 *Kapcsolat bontás késés.* A maximális kapcsolat bontás késés egy kapcsolat bontási késésen alapszik, a legalacsonyabb prioritásnál, amely nem tartalmaz felhasználói adatokat, nem hív le választható berendezéseket, és nem hordoz címzés információkat. Mindegyik csatorna átviteli sebességre meghatározott értékek érvényesek a GES-től eredő kérések és az AES-től eredő kérések egyenlő arányú keverékén, amikor a kapcsolat bontását nem késlelteti csomagok jelenléte az átviteli kapcsolatban. A maximális kapcsolat bontás késés a szolgáltatás szabvány meghatározású sebessége a kapcsolat bontási fázisnál; ennek nem az a célja, hogy bármilyen szempontból korlátozva legyenek a felhasználói vagy címzés mezők.

7.2.3 A SZOLGÁLTATÁS MEGBÍZHATÓSÁGA

7.2.3.1 A szolgáltatás megbízhatóságát a rendszer felépítés, a fizikai réteg bit hiba-aránya és az R-csatornán az átlagos „összeütközési" arány határozza meg. Nincs előírás az R-csatorna összeütközési arányra. Azonban a rendszer teljesítmény előírások, mind a szolgáltatás sebességére, mind a szolgáltatás megbízhatóságára, egy átlagos R-csatorna foglaltság tényezőn (azaz a foglalt R-csatorna rés-idők aránya az R-csatorna rés-idők teljes számához egy adott intervallumban), amelynek értéke közelítőleg 0,15, alapszik. Nagyobb mértékű csatorna foglaltság is engedélyezett, feltéve, hogy a rendelkezésre álló összes teljesítmény előírás ki van elégítve.

7.2.3.2 Egy egyedi ADAT csomag átvitelhez tartozó előírt megbízhatóság megmaradó-hiba valószínűsége, az, amely annak a valószínűsége, hogy egy próbálkozás egy egyedi ADAT csomag átvitelére nem jár teljes sikerrel. Ez egy szabványos referencia ADAT csomagon alapszik, amely az al-hálózat felhasználói adatok 128 oktettjét tartalmazza. A nem-detektált hiba valószínűség AMSS csomag adat szolgáltatásnál várhatóan kisebb, mint $3x10^{-7}$ a szabványos referencia ADAT csomagoknál, amelyek az al-hálózat felhasználói adatok 128 oktettjét tartalmazzák. A nem-detektált hiba valószínűség rövidebb csomagoknál a csomag hosszával közel arányosan csökken.

7.2.3.3 A szolgáltatás más megbízhatósági paraméterei, a virtuális áramkör vagy logikai csatorna hibatűrése az újra-állítás és bontás vonatkozásában, azaz annak valószínűsége, hogy az al-hálózat szolgáltató valamilyen időperiódus alatt újra-beállításhoz vagy feloldáshoz folyamodik. Az újra-beállítási vagy bontási műveletek a felhasználói adatok elvesztését eredményezhetik, akár az al-hálózat használója, akár az al-hálózat szolgáltató folyamodik ezekhez.

7.3 Műholdas al-hálózat függő protokol szolgáltatások és üzemeltetés

7.3.1 LOGIKAI CSATORNÁK

A logikai csatorna számok kiválasztásával szembeni követelmények a hívás ütközések megelőzését szolgálják.

7.3.2 A KAPCSOLAT LÉTREHOZÁSA

7.3.2.1 Az alábbiak egy normál kapcsolat létesítést írnak le két SNS felhasználó között.

7.3.2.2 Amikor az SNS felhasználók egyike al-hálózat kapcsolatot kezdeményez, egy ISO 8208 DCE entitás a műholdas al-hálózatban egy ISO 8208 HÍVÁS KÉRÉS csomagot vesz az ISO 8208 DTE-től. Ez a csomag az IWF-hez kerül továbbításra. Az IWF ezt a csomagot a megfelelő SSNDPX entitásnak továbbítja. Ez az SSNDPX entitás ezt a csomagot KAPCSOLAT KÉRÉS SNPDU-ként továbbítja a távoli SSNDPX-nek. Amikor a távoli SSNDPX veszi ezt az SNDPU-t, egy ISO 8208 BEJÖVŐ HÍVÁS csomagként továbbítja az IWF-nek. Az IWF ezt a csomagot a megfelelő ISO 8208 DCE entitásnak továbbítja. Az ISO 8208 DCE entitás ezt a csomagot az ISO 8208 DTE társ-entitásnak továbbítja. Az

ISO 8208 DTE ezt a kapcsolat kérést továbbítja a vevő SNS felhasználóhoz. Miután a vevő SNS felhasználó vette ezt a kapcsolat kérést, az ISO 8208 DTE entitás egy ISO 8208 VETT HÍVÁS csomagot továbbít az ISO 8208 DCE entitásnak. Az ISO 8208 DCE entitás továbbítja ezt a csomagot az IWF-nek. Az IWF ezt a csomagot a megfelelő SSNDPX entitáshoz továbbítja. Ez SSNDPX entitás ezt a csomagot KAPCSOLAT MEGERŐSÍTÉS SNPDU-ként az SSNDPX társ-entitáshoz juttatja. Amikor a távoli SSNDPX entitás ezt az SNPDU-t veszi, ezt ISO 8208 KAPCSOLT HÍVÁS csomagként továbbítja az IWF-hez. Az IWF ezt a csomagot a megfelelő ISO 8208 DCE entitáshoz továbbítja. Ez az ISO 8208 DCE entitás ezt a csomagot az ISO 8208 DTE entitás párhoz továbbítja. Amikor az ISO 8208 DTE entitás veszi ezt a csomagot, informálja az eredeti SNS felhasználót a távoli SNS felhasználóval való kapcsolat létrejöttéről.

7.3.2.3 A két SNS felhasználó közötti kapcsolat a logikai csatornák egy sorozatából áll. Mindegyik csatornát a vevő entitás által felállított szabály alapján választják ki. Ezért ezeknek a logikai csatornáknak nem lehet azonos számuk. Ennek az útmutató anyagnak az A-17. ábrája egy példát mutat három SNS felhasználó pár közötti kapcsolat létrehozásáról.

7.3.2.4 *Átmenő teljesítmény tárgyalás*

Mivel a GES-nek tudomása van a rendelkezésre álló átmenő teljesítményről, azoknak az átmenő teljesítményeknek az alapján, amelyek a meglévő al-hálózat kapcsolatokhoz (SNC) vannak kijelölve, neki kell kijelölni az átmenő teljesítmény osztályokat az adatátvitel mindegyik irányában. A GES által javasolt akciók ennek az útmutató anyagnak a 7.3.6.1 és 7.3.7.1 pontjában vannak megadva.

7.3.3 KAPCSOLAT BONTÁS

7.3.3.1 *SSNDPX*

Azért, hogy elkerüljék azokat a szükségtelen bontásokat az SSNDPG-nél, amelyeket az SSNDPA-tól származó maradék ADAT/MEGSZAKÍTÁS SNDP-k okoznak, az SSNDPA vár, amíg az összes továbbításban lévő és az ehhez a kapcsolathoz tartozó ADAT/MEGSZAKÍTÁS SNDPU továbbításra nem került, mielőtt egy BONTOTT KAPCSOLAT vagy egy KAPCSOLAT BONTÁS VÉGREHAJTVA SNPDU-t továbbít az SSNDPG-nek. Az SSNDPA-nak nem kell kölcsönös viszonyba hoznia az egyes ADAT/MEGSZAKÍTÁS SNPDU átviteli állapotát az adat kapcsolat rétegtől jövő átvitel állapot jelzésekkel. Azonban az SSNDPA vár, amíg az összes kintlévő ADAT/MEGSZAKÍTÁS SNPDU-t a kapcsolat réteg nyugtázza (eredményes/eredménytelen LIDU) mielőtt egy BONTOTT KAPCSOLAT vagy KAPCSOLAT BONTÁS VÉGREHAJTVA SNPDU-t elküld. Mivel a légijármű felé az SNPDU-kat a kapcsolat réteg helyes sorrendben szállítja, az SSNDPG BONTOTT KAPCSOLAT vagy KAPCSOLAT BONTÁS BEFEJEZŐDÖTT SNPDU-t küldhet anélkül, hogy megvárná az előzőleg elküldött ADAT/MEGSZAKÍTÁS SNPDU-k nyugtázását.

7.3.4 ADAT ÁTVITEL

7.3.4.1 *IWF*

Az IWF-nek kell továbbítani az ADAT csomagokat a megfelelő SSNDPX és ISO 8208 DCE entitások között, és ezeket az entitásokat elegendő információval kell ellátnia ahhoz, hogy a megfelelő logikai csatornát azonosítani lehessen.

7.3.4.2 *SSNDPG*

Mivel az ADAT SNPDU-kat az AES-től vagy az R- vagy a T-csatornán keresztül küldik, ezeket a GES sorrenden kívül veheti. Ezért az SSNDPG-nek elegendő tárolási lehetőséggel kell rendelkeznie, hogy rögzíteni tudja a sorozaton kívüli ADAT SNPDU-kat, mielőtt ezekben az SNPDU-kban lévő adatokat az IWF-hez továbbítja.

7.3.4.3 *Forgalom vezérlési eljárás*

7.3.4.3.1 A memória kezelési mechanizmusok megvalósítás-függőek. A memória túlfolyás lehetőségének és az ennek következtében fellépő adatvesztés minimalizálásának az érdekében a műholdas al-hálózat réteg forgalom vezérlést biztosít, amelyhez az AES, a GES, vagy az al-hálózat használó folyamodhat. Az SSNDPX START-STOP forgalom vezérlést használ, amíg a DCE ISO 8208 az ablak forgalom vezérlést használja. Az ISO 8208 VÉTELRE KÉSZ és VÉTELRE NEM KÉSZ csomagok helyben kerülnek létrehozásra, ezeket sohasem továbbítják az al-hálózaton keresztül. Ha az SSNDPX 60 másodpercig „forgalom vezérlésre nem kész" állapotban marad, akkor az al-hálózat a kapcsolat újra-beállítását kezdeményezi függetlenül attól, hogy a forgalom vezérlést az al-hálózat vagy az al-hálózat felhasználója függesztette fel. Az időzítő (tN7) a vételi SSNDPX-szel van összekötve, azzal az SSNDPX-el, amely a FORGALOM VEZÉRLÉS FELFÜGGESZTÉS SNPDU-t küldte.

7.3.4.3.2 A rendszer tervezésnek minimalizálni kell annak lehetőségét, hogy a forgalom vezérlésért a 14-es elsőbbségű kapcsolatokhoz forduljanak, azaz dinamikus memória elosztás által, vagy kiegészítő rögzített memória elosztás biztosításával a 14-es elsőbbségű kapcsolatoknál. A dinamikus memória elosztási eljárásoknak, ha használják őket, a kapcsolati elsőbbséget számításba kell venniük.

7.3.4.3.3 *SSNDPX*

7.4.4.3.3.1 Amikor az SSNDPX meghalad egy tárolási küszöböt, vagy egy FORGALOM VEZÉRLÉS (felfüggesztés) SNPDU-t vesz a távoli SSNDPX-től, értesítenie kell az IWF-et erről a körülményről.

7.4.4.3.3.2 Ha az SSNDPX egy tárolási küszöb alá esik, vagy egy FORGALOM VEZÉRLÉS (folytatás) SNPDU-t vesz a távoli SSNDPX-től, miután informálta az IWF-et a forgalom vezérlés felfüggesztési állapotról, tájékoztatnia kell az IWF-et erről a körülményről.

7.3.4.3.3.3 Amikor az SSNDPX meghalad egy tárolási küszöböt, vagy forgalom vezérlés felfüggesztés információt vesz az IWF-től, egy FORGALOM VEZÉRLÉS (felfüggesztés) SNPDU-t kell küldeni a távoli SSNDPX-hez, amikor a következő ADAT SNDPU-t vették ezen a VC-n, olyan szituációt hozva létre, amelyet addig még nem tisztáztak.

7.3.4.3.3.4 Ha az SSNDPX egy tárolási küszöb alá esik, vagy forgalom vezérlés folytatás információt vesz az IWF-től, azután, hogy a FORGALOM VEZÉRLÉS (felfüggesztés) SNPDU-t továbbított a távoli SSNDPX-nek, akkor egy FORALOM VEZÉRLÉS (folytatás) SNPDU-t kell továbbítani a távoli SSNDPX-nek.

7.3.4.3.4 *ISO 8208 DCE*

7.3.4.3.4.1 Amikor az ISO 8208 DCE túllép egy tárolási küszöböt, vagy forgalom vezérlés felfüggesztés információt vesz az IWF-től, akkor fel kell függesztenie a helyi DTE ablak alsó szélének felfrissítését, vagy egy VÉTELRE NEM-KÉSZ csomagot kell küldenie a helyi DTE-nek.

7.3.4.3.4.2 Ha az ISO 8208 egy tárolási küszöb alá esik, vagy forgalom vezérlés folytatás információt kap az IWF-től, miután felfüggesztette a helyi DTE ablak alsó szélének felfrissításá.t vagy egy VÉTELRE NEM-KÉSZ csomagot továbbított, folytatnia kell a helyi DTE ablak alsó szélének felfrissítését, vagy egy VÉTELRE KÉSZ csomagot kell továbbítania a helyi DTE-nek.

7.3.4.3.4.3 Amikor az ISO 8208 DCE túlhalad egy tárolási küszöböt, vagy egy VÉTELRE NEM-KÉSZ csomagot vesz a helyi DTE-től, értesítenie kell az IWF-et erről az állapotról.

7.3.4.3.4.4 Ha az ISO 8208 DCE egy tárolási küszöb alá esik, vagy egy VÉTELRE KÉSZ csomagot vesz a helyi DTE-től, miután informálta az IWF-et a forgalom vezérlés szüneteltetés állapotról, az IWF-et értesítenie kell erről az állapotról.

7.3.4.4 *Adat elvesztés*

7.3.4.4.1 Kapcsolat bontásnál vagy kapcsolat újra-beállításnál az ennél a kapcsolatnál meglévő ADAT SNPDU-k és ISO 8208 ADAT csomagok elveszhetnek. A végfelhasználói adatok végtől–végig szállításának garantálása érdekében egy szállítás protokol által nyújtott megerősített szolgáltatást lehet alkalmazni.

7.3.4.4.2 A rendszer tervezésnek minimalizálnia kell annak lehetőségét, hogy forgalom vezérlésért folyamodjanak 14-es prioritású kapcsolatokon, azaz a dinamikus memória kiosztás által, vagy a kiegészítő rögzített memória kiosztás által 14-es prioritású kapcsolatoknál. A dinamikus memória kiosztási eljárásoknak, ha használják őket, számításba kell venniük a kapcsolat elsőbbdág3t.

7.3.4.5 *Gyorsított adat továbbítás*

7.3.4.5.1 Várható, hogy az ANT nem fog gyorsított adat továbbítás szolgáltatást kérni. Azonban a gyorsított adat továbbítás szolgáltatás részére az ISO 8208-nak megfelelően alátámasztást biztositanak.

7.3.4.5.2 Mindegyik logikai csatornánál a gyorsított adatátvitel lehetővé teszi egy megszakítási SNPDU csomag küldését adott irányban, amíg az adat továbbítás ebben az irányban fel van függesztve. Ezt a megszakítási SNPDU-t vagy az adat SNPDU elejére vagy azon megszakítási csomag elé teszik, amely fel van függesztve.

7.3.4.6 *Kapcsolat visszaállítás*

7.3.4.6.1 SSNDPX. Azért, hogy elkerüljék az SSNDPA-ból jövő maradék ADAT/MEGSZAKÍTÁS SNPDU-knak által okozott újra-beállításokat az SSNDPG-nél, az SSNDPA várakozik addig, amíg az összes ADAT/MEGSZAKÍTÁS SNDPU-k - amelyek továbbítás alatt vannak és ehhez a kapcsolathoz tartoznak és továbbításra kerülnek - mielőtt VISSZAÁLLÍTÁS vagy VISSZÁLLÍTÁS MEGERŐSÍTÉS SNPDU-kat továbbítana az SSNDPG-hez. Az SSNDPA-nak nem kell összefüggésbe hoznia az egyes ADAT/MEGSZAKÍTÁS SNDPU-k átviteli állapotát az adott kapcsolat rétegtől kapott átviteli állapot jelzésekkel. Azonban az SSNDPA várakozik addig, amíg az összes rendezetlen ADAT/MEGSZAKÍTÁS SNPDU-t a kapcsolat réteg visszaigazolja (eredményes/eredménytelen LIDU), mielőtt egy VISSZAÁLLÍTÁS SNPDU-t küldene. Mivel a légijármű felé SNPDU-kat mindig helyes sorrendben továbbítja a kapcsolat réteg, az SSNDPG küldhet VISSZAÁLLÍTÁS SNDPU-t anélkül, hogy az előzőleg elküldött ADAT/MEGSZAKÍTÁS SNPDU-k nyugtázására várnia kellene.

7.3.5 SNPDU FORMÁTUMOK

7.3.5.1 *Gyors kiválasztás képesség*
A „használat nem engedélyezett" paraméter beállítású gyors kiválasztás képességet a KAPCSOLAT KÉRÉS SNPDU tartalmazhatja, hogy határozottan jelezze azt, hogy nem lehet felhasználói adatot továbbítani a KAPCSOLAT MEGERŐSÍTÉS és KAPCSOLAT BONTÁS SNPDU-kban. Ha ez a képesség nincs benne a KAPCSOLAT KÉRÉS SNPDU-ban, akkor a felhasználói adat maximálisan 128 oktettje továbbítható a KAPCSOLAT MEGERŐSÍTÉS és a KAPCSOLAT BONTÁS SNPDU-kban.

7.3.6 CSOMAG SNPDU-BA VALÓ LEKÉPEZÉSÉNEK SZABÁLYAI

7.3.6.1 *GES műveletek.*

7.3.6.1.1 A HÍVÁS ELFOGADÁS csomagban a kiválasztott áteresztő teljesítmény osztályt a TCN értékhez a KAPCSOLAT MEGERŐSÍTÉS SNPDU-ban kell továbbítani.

7.3.6.1.2 Ha az áteresztő teljesítmény osztály a HÍVÁS KÉRÉS csomagban kisebb,a számított rendelkezésre álló értéknél vagy egyenlő vele, akkor az áteresztő teljesítmény osztályt a TCN értékhez a KAPCSOLAT KÉRÉS SNPDU-ban kell továbbítani, ettől eltérő esetben a számított rendelkezésre álló áteresztő teljesítményt a legközelebbi szabvány értékre lekerekítve kell a TCN értékhez továbbítani.

7.3.7 SNPDU CSOMAGBA VALÓ LEKÉPEZÉSÉNEK SZABÁLYAI

7.3.7.1 *GES műveletek.*

7.3.7.1.1 Ha az áteresztő teljesítmény osztály meghatározás (TCN) érték a KAPCSOLAT KÉRÉS SNPDU-ban kisebb, mint a számított rendelkezésre álló érték, vagy vele egyenlő, akkor az áteresztő teljesítmény osztályt a BEJÖVŐ HÍVÁS csomagban a TCN-nel egyenlő értékre kell beállítani; ettől eltérő esetben az áteresztő teljesítmény osztályt a BEJÖVŐ HÍVÁS csomagban számított rendelkezésre álló áteresztő teljesítmények a legközelebbi szabvány értékre lekerekített értékére kell beállítani.

7.3.7.1.2 A kiválasztott áteresztő teljesítmény osztályt a HÍVÁS KAPCSOLVA csomagban a TCN értékről továbbítani kell a KAPCSOLAT MEGERŐSÍTÉS SNPDU-ban.

7.4 ISO 8208 DCE protokol üzemelések

7.4.1 ÖSSZEHANGOLÁSI KÖVETELMÉNYEK

Azok a képességek, amelyeknél az ISO 8208 DCE fenntartása nincs megkövetelve, a következőkből állnak:

a) modulo 128 csomag sorozat;

b) a 2-nél nagyobb méretű alapértelmezési ablak; és

c) vagy a D-bit használata, vagy lehetséges mechanizmus a D-bit használat, vagy nem-használat kérdésének "leküzdésére", mivel ezeket a képességeket az al-hálózat felhasználók nem követelik meg.

Megjegyzés. – A D-bit használata, vagy a lehetséges mechanizmus a D-bit használatának, vagy nem-használata kérdésének "leküzdésére" szigorúan ellenzett.

7.5 Kezelési interfész

7.5.1 AES KEZELÉSI INTERFÉSZ

Amikor egy AES kijelentkezik vagy más módon megszakítja az összeköttetést egy GES-sel, akkor az SSNL felbontja az összes kapcsolatot és SVC-t, amely ehhez a GES-hez kapcsolódik. Ennek megvalósítása úgy történhet, hogy TÖRLÉS JELZÉS csomagot küld mindegyik ISO 8208 DCE logikai csatornához, amelyek ezekhez a kapcsolódásokhoz kötődnek, és a logikai csatornák részére a források bontásával a hozzájuk tartozó SSNDPA entitásokban.

7.5.1.1 (Fenntartott)

7.5.2 GES KEZELÉSI INTERFÉSZ

Amikor egy AES kijelentkezik egy GES-től, az SSNL-nek kell törölnie a kapcsolatokat az SNS használó(k) és a kijelentkezett AES között. Egy úgy végezhető el, hogy mindegyik ISO 8208 DCE logikai csatornához, amelyek ezekkel a kapcsolásokkal vannak összekötve, egy TÖRLÉS JELZÉS csomagot küldenek, és úgy, hogy a hozzákapcsolódó SSNDPG entitásokban a logikai csatornák forrásait felszabadítják.

8. ÁRAMKÖR-MÓDÚ SZOLGÁLATOK

8.1 Áramkör-módú jelzés protokolok

8.1.1 *Általános.* Az áramkör-módú logikai folyamatok, amelyek az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.8 pontjában vannak meghatározva, képviselik azt a minimális protokol kölcsönhatás beállítást, amely ahhoz szükséges, hogy biztosítsa a biztonsági szolgáltatásban üzemelő légijármű fedélzetén telepített földi állomások (AES) és a földi telepítésű földi állomások (GES) közötti együttműködést. A protokol kölcsönhatásokat, amelyek az AES-hez, illetve a GES-hez érkező levegő és földi kezdeményezésű hívások fenntartásához szükségesek, különböző jelképző eljárásokon keresztül határozzák meg.

8.1.2 ***Logika a légi kezdeményezéseknél.***

Az AES és a GES légi kezdeményezésű jelzés eljárások az érvényes légiforgalmi mozgó műholdas szolgáltatásnál (AMSS) és a légiforgalmi mozgó műholdas (útvonal) szolgáltatásnál (AMS(R)S) ugyanazok. Előírások készültek rövidített hívás létrehozási eljárások kidolgozására, speciálisan a beszéd hívásokra a biztonsági prioritásoknál (azaz sürgősségi/vészhelyzeti, repülésbiztonsági és repülés-menetrendszerűségi/meteorológia).

8.1.3 ***Kapcsolat réteg szolgáltatások.***

Az áramkör-módú szolgáltatások az R-, P- és C-csatorna alsáv adat-kapcsolati réteg protokolokat használják, amelyek az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.5 és 4.6 pontjaiban vannak meghatározva az összes hívás jelzés információhoz, amelyek az AES és a GES között cserélődnek. Ezeket az információkat a kapcsolati réteggel az áramkör-módú adat-kapcsolati réteg adat egységeken (CM-LIDU) keresztül cserélik.

A kapcsolat réteg szolgáltatások átalakításokat hoznak létre a CM-LIDU-k és a megfelelő AMS(R)S áramkör-módú jelzés egységek (SU) között. Az összes esetben csak a közvetlen összeköttetési szolgáltatást (DLS) használják, mivel az áramkör-módú szolgáltatások feladata a hiányzó SU-kból a helyreállítás.

8.1.4 LÉGI KEZDEMÉNYEZÉSŰ ELJÁRÁSOK

8.1.4.1 *Légijármű fedélzetén telepített földi állomás (AES) eljárás*

8.1.4.1.1 *Hívás kezdeményezés*

8.1.4.1.1.1 *Az általános hívás létrehozása.* Az AES a légi kezdeményezést egy „hozzáférés kérés” CM-LIDU-nak a GES-hez való továbbításával kezdi el. Az AES ekkor a GES-től egy C-csatorna CM-LIDU kijelölés vételére tA50 másodperces perióduson át várakozik. Ezt a sorozatot négyszer megismétlik, mielőtt a hívással való próbálkozást abbahagynák. Az AES által ilyen módon megszakított hívásokat a felhasználónak újra meg kell kísérelnie.

8.1.4.1.1.2 *Rövidített hívás létrehozás.* Az AES egy légi kezdeményezést egy négy, három vagy két összefüggő „hozzáférés kérés” CM-LIDU sorozatnak a GES-hez történő továbbításával kezdi el. A sorozat hosszát az határozza meg, hogy a hívás elsőbbsége vészhelyzeti/sürgősségi, repülésbiztonsági vagy menetrendszerűségi/meteorológiai, ebben a sorrendben. A többszörös továbbítás célja csökkenteni az SU-knak az R-csatorna ütközései miatti elvesztésének hatásait. Az AES ekkor a GES-től egy C-csatorna CM-LIDU kijelölés vételére tA50 másodperces perióduson át várakozik. Ezt a sorozatot négyszer ismétlik meg, mielőtt a hívással való próbálkozást abbahagynák. Az AES által ily módon megszakított hívásokat a felhasználónak újra meg kell kísérelni.

8.1.4.1.2 Ha abban a pillanatban, amikor a hívás kezdeményezés elkezdődik, nem áll rendelkezésre elegendő AES forrás a híváshoz az AES-nek egy alacsonyabb eksőbbségű hívásnak tulajdonítható foglaltsága miatt, akkor az AES késleltetni fogja ezeknek a forrásoknak az előjegyzését és a 8.1.4.1.1 szerint folytatja, addig, amíg a C-csatorna a kijelölést nem veszi a GES-től. Ez lehetővé teszi az AES-nek, hogy helyes előjegyzési döntést végezzen a GES általi pontos EIRP kijelölés alapján. A C-csatorna kijelölés vétele után az összes kért AES C-csatorna forrásnak (azaz csatorna egység és AES EIRP) elsőbbsége van egy alacsonyabb elsőbbségű hívással szemben (ha szükséges) és ha ki van osztva a hívások részére. Ezt rögtön további jelzés és folytonosság ellenőrzések követik a C-csatorna alsávon, amíg a GES a földi rendeltetési hely kapcsolásának befejezésével van elfoglalva.

Megjegyzés. – Egy másodlagos előny az, hogy az AES előjegyzi a "kisajátítási kérést", mialatt a C-csatorna kijelölést veszik, és megkönnyíti egy alternatív eljárás jövőbeni kifejlesztését egybeépítve egy meglévő C-csatorna újra-felhasználással.

8.1.4.1.3 *Címzési számjegyek*

8.1.4.1.3.1 *Általános hívás létesítés*. A „hozzáférés kérés” CM-LIDU tartalmazza az AMS(R)S földi cím első két számjegyét. A megmaradó számjegyek a C-csatorna alsávon „hívás információ - szolgáltatás címzés” CM-LIDU-ként szolgálnak, amelyek a C- csatorna folytonosság ellenőrzési eljárás alapját képezik.

8.1.4.1.3.2 *Rövidített hívás létesítés.* A „hozzáférés kérés” CM-LIDU tartalmazza a fix hosszúságú 10 számjegyű AMS(R)S földi cím összes számjegyét. Ennek az információnak a szolgáltatása, megegyezően a hozzáférési kéréssel, lehetővé teszi a GES számára, hogy elkezdje elküldeni a hívást a földi hálózaton keresztül, és ezzel egy időben folytatja a C-csatorna létrehozását. Ezeket a címzés számjegyeket ismétlik a C-csatorna alsávon, mint „hívás információ - szolgáltatás címzés” CM-LIDU-kat, amelyek a C-csatorna folytonosság ellenőrzési eljárás alapjául szolgálnak. Azonban ezek jelenléte ezekben a CM-LIDU-kban nem szolgál más célt az AMS(R)S levegő kezdeményezési eljárásnál, minthogy lehetővé tegye az AES számára az együttműködést azzal a GES-sel, amely túlnyomórészt a nem-biztonsági AMSS áramkör-módú eljárásokat tartja fenn inkább, mint a SARP-specifikus eljárásokat.

8.1.4.2 *Földi telepítésű földi állomás (GES) eljárás*.

8.1.4.2.1 *A hívás kezdeményezés feldolgozása.*

8.1.4.2.1.1 *Általános hívás létesítés.* Egy „hozzáférési kérés” CM-LIDU AES-től való vétele után a GES rögtön kiosztja a C- csatorna forrásokat és egy C-csatorna kijelölés CM-LIDU-val válaszol. Ezzel egyidőben a GES elemzi a hálózat ID-t, amelyet a „hozzáférés kérés” tartalmaz, és várakozik a szolgáltatás címzés vételének befejezésére. Az előrehaladó hívás létrehozása a földi hálózaton keresztül ekkor befejeződik.

8.1.4.2.1.2 *Rövidített hívás létesítés.* Egy „hozzáférési kérés” CM-LIDU-nak egy AES-től való vétele után a GES rögtön kiosztja a C-csatorna forrásokat és egy „C-csatorna kijelölés” CM-LIDU-val válaszol. Ezzel egyidőben a GES elemzi a hálózat ID-t, amelyet a hozzáférési kérés tartalmaz és elkezdi előrehaladó hívást végrehajtani a kiválasztott földi hálózaton keresztül.

8.1.4.2.2 A GES áramkör-módú eljárás figyeli a légijármű felöl a C-csatorna vivőfrekvencia állapotát a híváson keresztül. A vivőfrekvencia elvesztése tG13 másodpercnél hosszabb időre a hívásnak a GES részéről történő befejezését eredményezi. Amikor ez történik, a GES hat „hívás folyamat – csatorna felszabadítás” CM-LIDU-t küld ez alatt a fázis alatt annak érdekében, hogy biztosítsa, hogy az AES hívás állapota szabad legyen. Ha az AES vivőt újra meg kellene jelentetni (a hívás folyamatosságát gátló rendellenes terjedési állapot lehetséges jelzése) akkor a GES megkísérli újra lehetővé tenni az AES hívást hat további „hívás folyamat – csatorna felszabadítás” CM-LIDU-nak a C-csatorna alsávon és egynek a P-csatornán való elküldésével.

8.1.4.2.3 Amikor a GES továbbítja az előrehaladó hívás kezdeményezést a kiválasztott földi hálózat részére, továbbítania kell a hívás elsőbbséget és az összeállító terminál AES-t és ID-ket is. Ez biztosítja azt, hogy a földi hálózat érzékeny maradhasson a hívás elsőbbség iránt az útvonal-irányítás során; és hogy a földi felhasználó mindig tájékozott legyen a kezdeményező azonosságáról, hogy megkönnyítse a visszahívást a légijárműhöz, amelyről az irányítónak másképpen nem lehet tudomása. Azokban az esetekben, amelyeknél a hívás - foglalt állapot miatt - blokkolva van a földi rendeltetési helynél, a GES a következőket teheti: (1) specifikus ellenirányú jelet értelmezhet a földi hálózattól, amely jelzi, hogy a hívás kísérletet rögzítették a földi rendeltetési helyen, és azután (2) megfelelő CM-LIDU-t továbbít az AES részére. Ez a „hívás folyamat – csatorna felszabadítás” CM-LIDU-ban és a külső légijármű és földi hálózatok együttműködési interfészénél a BITE 16 telefon-technikai eseményben lévő ok kódok speciális kombinációja által megy végbe. Egy légijármű személyzetének figyelmeztetését szolgálja arról, hogy a földi felhasználót figyelmeztették az eredménytelen hívá-skísérlet fennállásáról, és arról, hogy ellátták a visszahívás egy későbbi időben való kezdeményezéséhez szükséges információkkal.

8.1.5 FÖLDI KEZDEMÉNYEZÉSŰ ELJÁRÁSOK

8.1.5.1 *Földi telepítésű földi állomás (GES) eljárás*

8.1.5.1.1 Egy földi hálózattól jövő hívás kezdeményezés vétele utána a GES belekezd egy földi kezdeményezésbe a GES források kiosztásával a hívás részére és azután a P-csatornán keresztül az AES-nek egy „hívás bejelentés” CM-LIDU küldésével, amelyet egy „C-csatorna kijelölés” CM-LIDU követ. A GES ezután várakozik a légijármű felőli C-csatorna vivőhullám vételre, mielőtt folytonossági vizsgálatot végezne a C-csatorna alsávon. Az AES egy „hívás folyamat - ellenőrzés" CM-LIDU küldésével fogja kezdeményezni a folytonosság vizsgálatot, amelyre a GES „hívás folyamat - ellenőrzés” CM-LIDU-val válaszol minden tG35 másodpercben, amíg a hívás vagy befejeződik a légijármű rendeltetési helyen, vagy eredménytelenül fejeződik be (például a rendeltetési hely foglalt, hívás törlés stb.) Az AES nyugtázza a „hívás folyamat - ellenőrzés" CM-LIDU vételét, ezáltal végrehajtva a folytonosság vizsgálatot, vagy egy pozitív „telefon nyugtázás” CM-LIDU-val, vagy egy „hívás folyamat – kapcsolás” CM-LIDU-val. (Az utóbbit akkor küldik az előbbi helyett, ha a légijármű "felhasználó" a hívásra a folytonosság vizsgálat után azonnal válaszol.) A GES az egyik CM-LIDU-ra reagál egy „címzés komplett” BITE továbbítással a földi hálózathoz, és az utóbbi CM-LIDU esetében még egy „válasz” BITE-vel. Ennél a pontnál a hívás beszéd fázisa folytatható.

8.1.5.1.2 A GES a C-csatorna állapotát fogja figyelni a hívás alatt. Ha ez alatt a fázis alatt és a folytonosság vizsgálati fázis befejezését követően, egy „hívás folyamat - kapcsolás” CM-LIDU érkezik, a GES egy „válasz” BITE-ot továbbít a földi hálózatnak és fenntartja a C-csatornát. A GES figyeli a légijármű felől a csatorna vivőfrekvencia állapotát a híváson keresztül. A vivőfrekvencia tG19 másodpercnél hosszabb ideig tartó elvesztése a hívás GES részéről történő befejezését eredményezi. Amikor ez történik, a GES hat „hívás folytamat – csatorna felszabadítás” CM-LIDU-t küld ez alatt a fázis alatt, hogy meggyőződjön, hogy az AES hívás állapota felszabadított. Ha az AES vivőfrekvenciát újra elő kellene hívni (egy használható hívást gátló rendellenes terjedési állapot lehetséges jelzése), a GES mégegyszer kipróbálja az AES hívás lehetőségét tizenkét további „hívás folyamat – csatorna felszabadítás” CM-LIDU küldésével a C-csatorna alsávon és eggyel a P-csatornán.

8.1.5.1.3 Ha a GES egy „hívás folyamat – csatorna felszabadítás” CM-LIDU-val válaszol (jelezve, hogy a légijármű "felhasználó" befejezte a hívást), a GES egy „hívott bont” BITE-t továbbít a földi hálózatnak és befejezi a hívást. Hasonlóan, ha a GES egy „törlés vége” FITE-t vesz a földi hálózattól (jelezve, hogy a földi használó a hívást befejezte), a GES hat „hívás folyamat – csatorna felszabadítás” CM-LIDU-t küld a C-csatorna alsávon és azután figyeli az AES-t, hogy meggyőződjön arról, hogy az befejezte a légijármű felőli C-csatorna vivőfrekvenciájának adását..

8.1.5.1.4 Az olyan esetek, mint az eredménytelen folytonosság ellenőrzés és hívás törlés, az AES-től történő C-csatorna továbbítás végleges befejezését eredményezik. Amíg ezek a különböző befejezési események előrehaladnak, a GES figyeli a légijármű felőli vivőfrekvenciát, hogy meggyőződjön arról, hogy az AES hasonló befejezési tevékenységet végez. Ha a légijármű felől a vivőfrekvencia adása nem fejeződik be tG17 másodpercen belül a „hívás folyamat – csatorna felszabadítás" egy kezdeti sorozatának továbbítása után, a GES ezekből a CM-LIDU-kból további tizenkettőt fog elküldeni a C-csatorna alsávon keresztül és egy tizenharmadikat a P-csatornán keresztül. Ha ezek a továbbítások eredménytelenek maradnak, ahhoz, hogy az AES-nél a C- csatornáján keresztüli átviteli tevékenységének az utolsó továbbítás tG18 másodpercen belüli befejezését eredményeznék, a GES az összes hívási tevékenységét egyoldalúan megszünteti.

8.1.5.2 *Légijármű fedélzetén elhelyezett földi állomás (AES) eljárás*

8.1.5.2.1 Az AES-hez bejövő hívás a „hívás bejelentés" és „C-csatorna kijelölés" CM-LIDU-k vételével történik meg. Mivel ezeket közvetlen kapcsolati szolgáltatások küldik, az áramkör-módú szolgáltatások egy hiba-helyreállítási eljárást valósítanak meg, amely által az AES következtetni tud arra, hogy ezeknek a CM-LIDU-knak az egyike hiányzik (pl. a P-csatornán lévő bit hibák miatt), és kérni tudja, hogy ezeket a GES ismételje meg. Az AES a kérést egy alkalmasan kódolt „telefon nyugtázás" CM-LIDU-nak az R- csatornán keresztüli továbbításával kezdeményezi. Amikor egy AES egy „hívás bejelentés" CM-LIDU-t és a hozzátartozó „C- csatorna kijelölés" CM-LIDU-t vette, először ellenőrizni fogja azt, hogy a hívott terminál rendelkezésre áll-e, és hogy elegendő C-csatorna (azaz csatorna egység és AES EIRP) áll-e rendelkezésre állnak vagy elő vannak-e jegyezve. Ha a később ismertetésre kerülő követelmények nincsenek mind kielégítve, az AES egy alkalmasan kódolt „hívás folyamat – hívás kísérlet eredmény" CM-LIDU-t küld az R-csatornán keresztül, és azután minden hívással kapcsolatos tevékenységet befejez. Másik esetben aktiválja a C-csatorna egységet a kijelölt C-csatorna frekvencia páron és megkezdi a C-csatorna folytonosság vizsgálati eljárást egy „hívás folyamat - ellenőrzés" CM-LIDU küldésével a C-csatorna alsávon keresztül.

8.1.5.2.2 Az AES minden tA26 másodpercben egy kiegészítő „hívás folyamat - ellenőrzés" CM-LIDU-t fog küldeni tA41 másodpercig, amíg egy azonos CM-LIDU-t nem vesz a GES-től. Ez egy eredményes folytonossági ellenőrzést hoz létre, és az AES-t azonnal a következőkre készteti: (1) lehetővé teszi a beszéd áramkört a légijármű hangcsatorna és a C-csatorna egység között, (2) egy „hívás kezdeményezés" FITE-t továbbít a légijármű rendeltetési helyére, és (3) egy „telefon-technikai nyugtázás" CM-LIDU-t küld a C-csatorna alsávon keresztül a GES-hez. Az AES ekkor tA42 másodpercet várakozik, hogy a légijármű rendeltetési helye válaszoljon a hívásra. Ha a hívásra nem jön válasz ezen időperióduson belül, az AES szabaddá teszi a hívást a légijármű rendeltetési hely felé, küld hat „hívás folyamat – csatorna felszabadítás" CM-LIDU-t a GES-nek és azután befejezi a hívást. Egyéb esetekben, ha a légijármű "rendeltetési hely" ezen időkorláton belül válaszol, az AES egy „hívás folyamat – kapcsolás" CM-LIDU-t küld a GES-nek és a C-csatornát fenntartja ja hívás beszédfázisa alatt.

8.1.5.2.3 Amikor a „hívás folyamat – kapcsolás" CM-LIDU-t elküldik, az AES hiba helyreállítási eljárást kezdeményez, hogy biztosítsa vételét a GES-nél. (A beszéd-üzem fázis ez alatt folyik.) A tA26 időzítőt használják egy továbbítási ismétlési ciklus végrehajtására ezen a CM-LIDU-hoz, amelynek egy „telefóniai nyugtázás" CM-LIDU vételét kell eredményezni az AES-nél az eredeti továbbítás tA30 másodpercén belül. A nyugtázás a tA30 másodpercen belüli vételének elmaradása azt eredményezi, hogy az AES befejezi a hívást.

8.2 Áramkör-módú szolgáltatások együttműködése más beszéd-üzemű hálózatokkal

8.2.1 ***Az AMS(R)S áramkör-módú eljárások.***
Az áramkör-módú eljárások szabványosított rendszere az AES és a GES-en belül megvalósítja az AMS(R)S áramkör-módú protokolokat és specifikus interfészeket szolgáltat a nem-AMS(R)S telefóniai együttműködési eljárásokkal. Az AMS(R)S áramkör-módú eljárások megfelelnek a specifikus AES és GES áramkör-módú folyamatoknak és az AMS SARP által tartalmazott funkcionalitás legmagasabb szintjét képviselik. Az együttműködési folyamatok, bár fizikailag az AES és a GES berendezéseken belül vannak, a funkcionalitás kezdeti „rétegét” képviselik, ezek közvetlenül szomszédosak és kívül fekszenek az AMS(R)S áramkör-módú eljárásokon. Az együttműködő eljárások azt a funkcionális területet képviselik, ahol az AMS(R)S áramkör-módú eljárások és a felhasználó vagy a szolgáltatást nyújtó meghatározott jelzés rendszerű berendezések között specifikus átalakulások mennek végbe. Az AMS(R)S áramköri módú eljárások és az összedolgozó eljárások az összedolgozó telefóniai események szabvány sorozatának alkalmazásával vannak meghatározva.

8.2.2 ***Együttműködés külső telefon rendszerekkel.***
Az együttműködés a jelképző információk szabályozott átvitele a különböző jelzési rendszerek közötti interfészen keresztül, ahol az információk lényege azonos vagy ahol a lényeget meghatározott módon átültetve továbbítják.

8.2.2.1 *Együttműködési protokol alap.* Az együttműködési protokolt az előre-irányú és az ellen-irányú összedolgozó telefóniai események (FITE és BITE) használatán keresztül valósítják meg. Az együttműködési telefon események, amelyeket az itteniek során az összedolgozó protokol definiálására használunk, a CCITT Ajánlások Q.608-as Ajánlásban lévő szabványosított definíciókból származtatott alkalmazások. Az együttműködési protokolok definiálása a FITE-k és BITE-k alapján összhangban van a szabványos telefon-rendszer gyakorlattal. Meg kell jegyezn azt, hogy a FITE-k és BITE-k használata csupán egy kényelmes nomenklatúra, és semmiképpen sem jelent függőséget speciális berendezés megvalósításától.

8.2.2.1.1 *FITE.* A FITE egy olyan esemény, ahol a telefon jelzési információt előre-irányban továbbítják egy bejövő jelzési rendszerből egy kimenő jelzési rendszerbe. A FITE „előre” iránya azt a tényt jelenti, hogy a FITE olyan irányban halad, amely a hívás keletkezés végétől távolodik. Bizonyos FITE-k hordozhatnak kötelező és választott információ elemeket is, amelyek az eseményhez tartoznak (pl. címzés számjegyeket).

8.2.2.1.2 *BITE.* Egy olyan esemény, ahol a telefon jelzés információt ellentétes irányban továbbítják, egy kimenő jelzési rendszerből egy bejövő jelzési rendszerbe. A BITE ellen-irányú irányítottsága arra a tényre van vonatkoztatva, hogy abban az irányban halad, ami a hívás keletkezési vége felé tartó. Bizonyos BITE-k hordozhatnak kötelező és választott információ elemeket is, amelyek az eseményhez tartoznak (pl. hívás kísérlet eredménye).

8.2.3 AES TELEFON EGYÜTTMŰKÖDÉS

8.2.3.1 *Az AES jelzés rendszerek összefüggése.* Ennek az útmutató anyagnak az A-18. ábrája az AES áramkör-módú eljárásokat, a megfelelő összedolgozó eljárásokat és a légijármű specifikus telefon jelzési megvalósítások közötti összefüggést mutatja. Közelebbről a hivatkozott ábra definiálja a „bejövő” és „kimenő” eljárást a hívást kezdeményező fél szempontjából és az AES áramforrás módú eljárások külső interfészét.

8.2.3.2 *AES együttműködés telefóniai esemény meghatározása.* Az AES áramkör-módú eljárások együttműködnek a légijármű telefon jelzési rendszerekkel az előre-irányú és ellen-irányú együttműködési telefon eseményeken keresztül, amelyek a Szabványokban vannak meghatározva. Az AES áramkör-módú eljárásoknak specifikus együttműködési telefon eseményeket kell leképezni specifikus protokol kölcsönhatásokra az AES áramkör-módú logikai eljárásokban, ahogy a kölcsönhatások egy légijármű jelzési rendszerrel megkövetelik. Ennek a leképezésnek paraméter leképezést is kell tartalmaznia, ahol a Szabványokban jelezve van.

8.2.3.3 *Légijármű telefon együttműködés.* Egy légijármű fedélzeti telefon hálózattól nem kell megkövetelni a fizikai hálózat megvalósítás semmilyen fajtájának vagy módjának létrehozását. Bármely konkrét megvalósítás a légijármű üzemeltető választásától függ, amennyire ezt a megvalósítást együttműködtetjük az AES áramkör-módú eljárás együttműködési protokoljával.

1) Megjegyzés. – Egy légijármű üzemeltető választhatja azt, hogy nem valósít meg egy diszkrét légijármű telefon jelzési hálózatot az AES berendezéseken kívül. Belátásuk szerint, egy „hívás ellenőrző közeg" funkció integrálható lehet az AES berendezéseken belül olyan módon, hogy megszünteti egy külön légijármű jelzési hálózat szükségességét.

2) Megjegyzés. – Azokban az esetekben, amikor az AES úgy van konfigurálva, hogy egynél több szimultán ATS hívást tart fenn, a légijármű hívott terminál címeit egy vagy több alkalmas „kereső csoportokba" kell konfigurálni. Ez csökkenti az olyan földi eredetű hívások előfordulását, amelyek egy specifikus hívott terminál felé irányulnak, amely terminál foglalt állapot miatt blokkolva van, amikor egy ugyanúgy megfelelő hívott terminál rendelkezésre áll.

8.2.4 GES TELEFON EGYÜTTMŰKÖDÉS

8.2.4.1 *A GES jelzési rendszerek közötti összefüggés.* Ennek az útmutató anyagnak az A-19. ábrája mutatja be a GES áramkör-módú eljárásokat, a megfelelő összedolgozó eljárásokat és a föld-specifikus telefon - jelzési megvalósítások közötti összefüggéseket. Nevezetesen, a hivatkozott ábra definiálja a „bejövő" és a „kimenő" eljárásokat a hívást kezdeményező hívó fél és a GES áramkör-módú eljárások összedolgozó interfészei szempontjából.

8.2.4.2 *A GES együttműködési telefon esemény meghatározása.* Az AES áramkör-módú eljárások együttműködnek a földi hálózat telefon jelzési rendszerekkel az előre-irányú és az ellen-irányú együttműködési telefon eseményeken keresztül, amelyek a Szabványokban vannak meghatározva. Az GES áramkör-módú eljárásoknak a specifikus együttműködési telefon eseményeket le kell képezniük specifikus protokol együttműködéssé a GES áramkör-módú logikai eljárásokban, ahol az együttműködés a földi hálózati jelzési rendszerrel megkövetelt. Ennek a leképezésnek paraméter leképezést is kell tartalmaznia, ahol a Szabványokban ez jelezve van.

8.3 Műholdas beszéd-üzem megvalósítás az ATS környezetben

8.3.1 *Áttekintés.*

Az AMS(R)S beszéd-üzem szolgáltatásnak alap üzemelési sajátosságai vannak, amelyek alapvetően eltérnek az uralkodó ultrarövidhullámú (VHF) és rövidhullámú (HF) beszéd-üzemektől. Ez szigorúbb figyelmet igényel olyan szempontból, hogy hogyan valósul meg a műholdas beszéd egy adat-kapcsolat orientált ATS környezetben. Ezek a különbségek magukban foglalnak egy statisztikai késést a beszéd-csatorna létesítésénél, egy érzékelhető késést a beszéd terjedésében, áramkör kapcsolású műveletet, teljes duplex műveletet és a légijárművek azon képtelenségét, hogx a föld és más légijárművek közötti összeköttetést figyelésje. Ezenfelül az AMS(R)S beszéd szolgáltatás funkcionális követelményekkel lép fel a GES-en kívüli földi berendezésekkel szemben (pl.: földi hálózatok és ACF automata berendezések), hogy maximalizálja kihasználtságát.

8.3.2 ***Csatorna kapcsolat létesítés késés.***

A hívás kezdeményezés után mindegyik felhasználónak meg kell adnia az illetékes AES-ének vagy GES-ének a kívánt rendeltetési hely telefonszámát és azután várakoznia kell, amíg a rendszer beszéd -csatornát hoz létre. Ez éles ellentétben van a hagyományos rádió üzemeltetéssel, ahol tipikusan az egyes felhasználók folytonos rádió-figyelést tartanak fenn egy rádió-csatornán. Ezenkívül a csatorna létrehozás késés statisztikai jellegű és az AMSS rendszer teljes forgalom-terhelésétől függ.

8.3.3 ***Hívás bejelentés.***

Előrelátható, hogy a légijármű üzemeltetők a műholdas bdeszéd-üzemű berendezéseiket integrálni fogják más légijármű rendszerekkel, teljesen hasonlóan a jelenlegi VHF és HF rádió-berendezésekhez. Ez minimális inkonzisztenciához vezet abban, hogy a különböző légijárműveken a beszéd hívásokat hogyan kezelik. Például műholdas berendezések összekötése légijármű audio irányító panelekkel elkerülhetetlenül fél-duplex üzemeléshez vezet bizonyos légijárműveken, még akkor is, ha az összes közbenső csatorna teljes duplex. Bejövő, levegőből kezdeményezett hívásokat sok esetben SELCAL hang-jelzés sorozaton keresztül és más hallható jelzéssel jelentenek be a repülőszemélyzeteknek és kérik a személyzet válaszát a hívásra. Ez azt jelenti, hogy a földi felhasználónak pozitív válasz jelzésre kell várnia (pl. a személyzet szóbeli válasza), mielőtt a beszélgetés megkezdődne. Egyéb esetben a földi felhasználó nem volna meggyőződve arról, hogy a hívás hallható a személyzet részére. Ez a speciális szempont nagyon fontos, amiből az alábbiak bekövetkezése várható:

a) a műholdas beszéd-üzemű hívás nagyon ritka lesz adat-kapcsolat orientált környezetben; és

b) a repülőszemélyzet képtelensége más légijárművekhez tartozó műholdas beszéd-kommunikáció figyelésére eleve kizárja a pozitív, rutinszerű megbizonyosodást afelől, hogy teljes légijármű hangpanel kiválasztásokat végeztek.

8.3.4 ***Légijármű hívás kezelés.***

A légijármű repülés vezérlő számítógépes rendszerek hasznosak lehetnek a beszéd-hívás kezelés szempontjából a repülőszemélyzet részére. Például földi szám-címjegyzéket és kiválasztási menüket lehet ezekkel a rendszerekkel szolgáltatni, úgy, hogy a repülőszemélyzet olyan irányú szükséglete, hogy külön telefon számokat kérjen le egy ellenőrző/kijelző készüléken, a minimumra csökkenhet. Ezek a rendszerek korrelálhatnak információtárral a kapcsolódó adat-összeköttetés végrendszer cím információiról, vagy a légijármű pozícióról, hogy alkalmas földi címet javasoljanak egy ATC hívásban való felhasználásra. Azonban meg kell jegyezni, hogy a személyzeteknek képesnek kell lennie kiválasztani, vagy más módon alkalmazni egy hívás kísérlet megfelelő elsőbbségét a kezdeményezés előtt.

8.3.5 ***Légi kezdeményezésű hívás információ.***

Amikor a GES egy légi kezdeményezésű hívást továbbít a földi telepítésű hálózatnak, a hívás jelzés, a kívánt földi címen túlmenően, tartalmazni fogja a hívás elsőbbségét és az AES-ID-t, valamint a híváshoz kapcsolódó hívó terminál ID-t. (Annex, 10, III. Kötet, I. Rész, 4. Fejezet 5. Függeléke, A5–28. ábra.) A hívás elsőbbséget a földi hálózat felhasználhatja egy potenciális előfoglalás megkönnyítésére a hálózaton belül, és a földi rendeltetési hely értesítésére a hívás elsőbbségéről azokban az esetekben, amikor a földi használó éppen más hívásokat szolgáltat. Az AES és a végberendezés ID információkat úgy szolgáltatják, hogy megkönnyítsék a hívás korrelált irányítását (8.3.6) (ACF-el vagy más eszközzel) a helyes rendeltetési helyre ezen az eszközön belül, ahogyan a légijárműre vonatkozó létesítmény információ ezt meghatározza.

8.3.6 ***Korrelált hívás irányítás.***

Egy berendezés hívás irányítási funkciójának képesnek kell lenni a helyes belső rendeltetési hely meghatározására, amelyhez a hívást a berendezés éppen aktuális, a légijárműhöz tartozó adatai alapján irányítani kell. Ez megköveteli, hogy a berendezés korrelálja a kezdeményező légijármű AES-ID-jét (lásd 8.3.5) azokkal az információkkal, amelyekkel rendelkezhet a légijárművet illetően, és ezután irányítja a hívást a megfelelő földi felhasználóhoz. Figyelembe kell venni egy általános közvetítő kód létrehozását az AMS(R)S földi számozási tervben (pl. „000”), amelynek ismertnek kell lenni minden berendezésnél a repülőszemélyzet általi kérés megvalósításához, azért, hogy a korreláció funkcióját szolgáltathassa. A megmaradó 999 kód érték az ügynökségi kód mezőben a diszkrét földi felhasználó címek részére marad meg a berendezésen belül.

8.3.7 ***Berendezés bejövő hívás kezelés.***

A földi használó részére több választási lehetőségnek kell rendelkezésre állnia azokban az esetekben, amikor egy levegőből kezdeményezett hívás érkezik, mialatt egy korábban meglévő hívást bonyolít egy másik légijárművel. A földi használónak képesnek kell lenni bármely ésszerű számú műholdas beszéd hívást egy megbeszélésbe kombinálni úgy, hogy a kommunikációs szolgáltatást a VHF rádió-csatornához hasonló módon lehessen kezelni, ha a földi használó így választ. Ez egy hagyományos telefon konferencia-híddal valósítható meg, amely a földi felhasználó és a földi beszéd-üzemi hálózat között helyezkedik el. Ezenkívül a földi használónak meg kell kapnia a 8.3.5 pontban felsorolt hívás információk azonnali "bemutatását" minden beérkező hívásra a helyes hívás kezelési döntéshozatal megkönnyítése érdekében. A két lehetséges üzemelési módra a példák az alábbiak:

a) *Beavatkozó.* Egy adott rendeltetési hely részére érkező összes hívást egy automatikus funkció a földi használó nevében automatikusan megválaszolja; és egy több-oldalú konferencia-rendszerbe helyezi el, amely a földi használóból és a meglévő hívásokból áll. Ez lényegében a működés legegyszerűbb módja, amelyben lehetővé válik minden használó részér aíz, hogy azonnal "versenyezzen" a földi felhasználó figyelméért, bármilyen aktív beszélgetés hallgatására pontosan úgy, mint a VHF rádióban. A beavatkozás egy aktív beszélgetésbe azonban megkívánja, hogy a hívó lekössön egy C-csatorna forrást, mialatt várakozik, amíg az előző beszélgetés véget ér.

b) *Soros hozzáférés elsőbbségi megszakítással.* Egy adott rendeltetési hely részére érkező hívást a földi használó nevében egy automatikus funkció automatikusan megválaszol. Bármely további, a meglévő hívással egyenlő, vagy annál alacsonyabb elsőbbségű hívás „foglalt” jelzést kap, és automatikusan törlődik. Bármely további, a meglévő hívásnál magasabb elsőbbségű hívás automatikus megválaszolást nyer, és csatlakozik bármilyen híváshoz, amelyet egy földi használó éppen végrehajt. Ez csak a magasabb prioritású hívások számára teszi lehetővé a „behatolást” a meglévő hívásokba. Ez ugyancsak lehetővé teszi a hívó repülőszemélyzet részére (magasabb elsőbbségnél) a földi felhasználó figyelmének felhívását egy meglévő, alacsonyabb elsőbbségű hívás szükségtelen befejezése nélkül.

8.3.8 ***Légijármű mikrofon 'nyomd le és beszélj' (PTT) üzeme.***

Az AMSS hang-csatorna kétoldalú audio összeköttetést szolgáltat, amely magától értetődően teljes duplex. Azonban nagyon ajánlatos, hogy a hagyományos (azaz VHF-szerű) fél-duplex beszélgetés benyomás (PTT) üzemet fenntartsák az összes légijármű berendezésben – de csak olyan mértékig, ameddig a repülőszemélyzetnek egy PTT nyomógombot működtetni kell, hogy a földi felhasználó hallja őt. Más szóval a légijármű felé audionak mindig elhalkulás nélkül hallhatónak kell lenni a fejhallgatóban, amikor a PTT nyomógombott működtetik. (A tervezőknek figyelmet kell szentelniük a pilótafülke hangszóró elhalkulására, amikor mikrofon van bekapcsolva.) Ez lehetővé teszi a személyzet számára, hogy kezelje a műholdas hang átalakítást más párhuzamos fedélzeti működés figyelembevétele mellett. Ezenkívül, a kényszerített PTT üzemelés segít biztosítani azt, hogy az audio konferencia-összekötetés jövőbeni használati lehetősége a földi használói állomásnál ne romoljon le a szabályozatlan, pilótafülke ambiens zaj által (azaz „forró” mikrofonok miatt) azokban az esetekben, amikor az irányítónak több műholdas beszéd-hívást kell egyidőben üzemeltetnie.

8.3.8.1 A repülőszemélyzetnek képesnek kell lenni a kényszerített fél-duplex üzemelés hatáytalanítására, hogy a teljes duplex hang-csatornát érvényre tudja juttatni, amikor az üzemelési szituáció indokolja (pl.: repülés közbeni orvosi vészhelyzetek).

8.4 A földi beszéd-üzemű hálózatra vonatkozó meggondolások

8.4.1 *Áttekintés.*

Az AMSS SARP egy megosztott, közös használói földi beszéd-üzemű hálózatot biztosít, amely mindegyik GES-t egy vagy több földi berendezéssel köti össze kifejezetten repülésbiztonsági kommunikációkhoz. Ez a hálózat egy vagy több, tandem módon működő al-hálózatból áll, hogy egyetlen összetartozó hálózati szolgáltatás megjelenését nyújtsa a GES-ek és a külső földi berendezések között (pl.: ACF, légijármű jelentés stb.). Ennek a hálózatnak elválasztottnak és különállónak kell lenni más hálózatoktól, amelyek egy nem-biztonsági célú GES-hez kötődnek (pl.: nyilvános kapcsolású telefon hálózat).

8.4.2 *Hozzáférés irányítás.*

A légi kezdeményezésű hívásoknál a hozzáférést a földi biztonsági hálózathoz úgy érik el, hogy az AES kódolja a hozzáférési kérés jelzést egy „10" hálózat – ID értékkel. Ez az érték fogja jelezni a GES-nek, hogy a hívást a földi biztonsági hálózathoz kell irányítani, és hogy az összes specifikus jelzés információnak benne kell lennie a hívás jelzésben. Az AES megvalósításoknál engedélyeztetni kell olyan előírásokat, amelyek biztosítják, hogy nem-biztonsági használók egy légijárművön nem tudnak hozzáférni a földi biztonsági hálózathoz.

8.4.3 *Irányítás analízis.*

A légi kezdeményezésű hívásoknál a GES nem fogja analizálni a földi cím információt, amelyet egy hozzáférési kérés magában foglal, amely nem a hálózat – ID érték értelmezésére vonatkozik, a helyes földi hálózat kiválasztásához (azaz „10”). A GES-től jövő hívás jelzés vétele után a földi biztonsági hálózatnak értelmeznie kell az ország és a berendezés kód mezőket, amelyeket a hívás információ tartalmaz, és a hívást a kérésnek megfelelően a kívánt berendezéshez kell irányítani. A földi kezdeményezésű hívások esetén a kezdeményező berendezésnek a földi hálózatot el kell látnia a kívánt GES ID-jével, a többi hívás információval (azaz az AES-ID, terminál ID és hívás elsőbbség) együtt, amikor a hívás jelzést átadják a hálózatnak.

8.4.4 *Hívás irányítási funkciók.*
A GES-en kívüli hívás irányítási funkciók kategorizálhatók úgy, mint vagy magas-szintű irányítás a GES-ek és a földi berendezések között, illetve alacsony-szintű irányítás egy berendezésen belül.

8.4.4.1 *Magas-szintű irányítás.* Légi eredetű hívások esetén a magas-szintű irányítás a földi biztonsági hálózatból - amely az országot értelmezi - és a berendezés kódokból - amelyeket a földi cím tartalmaz -, és a hívást a hálózat végpontján a megfelelő berendezéshez való továbbításból áll. Földi eredetű hívásoknál a maga-szintű irányítás a földi biztonsági hálózatból - amely értelmezi a GES-ID-t, amelyet a hívás információban vettek, amely információ a kezdeményező berendezéstől jött- és a hívást a hálózat végpontján a megfelelő GES-hez való továbbításból áll.

8.4.4.2 *Alacsony-szintű irányítás*. Amikor egy légi eredetű hívás eléri a kívánt berendezést a földi biztonsági hálózaton keresztül, egy alacsony-szintű irányítás funkciónak a berendezésen belül értelmeznie kell az 'ügynökség' kódot, amelyet a hívás információ magában tartalmaz, és azután a hívást a jelzett földi használóhoz kell irányítania. Meg kell jegyezni, hogy ha az 'ügynökség' kód értéke azt jelzi, hogy a hívásnak korrelálni kell más légijármű információkkal együtt a berendezésnél, akkor az alacsony-szintű irányítás funkciónak az AES-ID-t is értelmeznie kell, amelyet a hívás információ magában foglal, és azután a hívást a berendezésen belül irányítani kell a korrelációs eredmények alapján.

8.4.5 ***Földi hálózat megvalósítási lehetőségek.***

Partikuláris kapcsolási hálózat felépítések nem előírtak a földi biztonsági hálózat számára. Például AMSS szolgáltatás nyújtók és vagy az adminisztrációs hivatalok, vagy a légijármű üzemeltetők közötti egyezmények néhány, vagy az összes magas-szintű irányítási funkció GES berendezésekbe való integrációját szolgáltathatják. Ez akkor megkövetelné, hogy a GES ellássa a 8.4.4.1 pontban részletezett feladatokat, és irányítania kellene a hívásokat az egyes berendezésekhez a kijelölt GES-berendezés távolsági összeköttetési csoportokon keresztül .

8.4.6 ***Előjegyzés.***

A földi biztonsági hálózattól és/vagy ennek egyedi tandem-elrendezésű al-hálózataitól megkövetelt, hogy előjegyezzenek és újra-elosszanak bármely forrást, amely egy létező híváshoz van hozzárendelve, amikor ez a hívás blokkolja egy magasabb elsőbbségű hívási kísérlet végrehajtását. Az előjegyzett hívások előfordulását minimalizálni lehet egy vagy több csatorna foglalásával az egész beszéd-üzemű távolsági összeköttetési csoporton belül a magas elsőbbségű hívásoknál (pl. veszély/sürgősség).

8.5 A csoportos hívás/általános adás funkciók megvalósítása

8.5.1 ***Áttekintés.***

Bizonyos körülmények között egy földi használó szeretne egy földi kezdeményezésű konferencia-hívást (csoportos hívást) létrehozni több légijárművel egyszerre. Hasonlóan, lehetnek alkalmak, amikor szükség mutatkozik egyoldalú általános adás létrehozására a légijárművek egy csoportjához (csoportos rádióhívás). Bár a csoportos hívás és csoportos általános adás funkciók nincsenek az AMS(R) rendszer protokolban határozott módon szolgáltatva,, ekvivalens funkciók lehetnek, több alap hívás funkció végrehajtásával a berendezés automatizálási rendszerben.

8.5.2 ***Csoportos hívás.***

A csoportos hívás funkció befolyásolható azzal a követelménnyel, hogy a földi használó (vagy egy hozzá kapcsolódó automatikus szolgáltatás) független hívásokat küld mindegyik, a használó által csoportos hívásban vagy „konferenciában" való részvételre kijelölt légijárműnek. Különálló, párhuzamos, a földi hálózaton és az AMSS műholdas szolgáltatáson keresztüli hívásokat létesítenek azután mindegyik légijárművel, amely a konferenciában van. Az egyéni beszédhívások használata, minden, a csoportban lévő légijárművel könnyen megvalósítható és megkönnyíti a légijármű konferenciába való belépésének és abból való kilépésének a felhasználó általi központi irányítását. A berendezés automatizálási funkciók és a használt kiszolgáló alacsony-szintű hang kapcsoló berendezés kivételével semmilyen más beavatkozó tandem hálózat (földi vagy AMSS) nem igényel semmiféle hívás feldolgozást egy csoportos hívás létrehozásához.

8.5.2.1 A földi használónak a közvetlen szomszédságában lévő földi hálózati berendezés részére egy audio konferencia funkciót kell, hogy szolgáltasson a használó nevében, amely által minden légijármű, amely konferenciában van, hallja a beszédhangot, amelyet a másik légijármű, valamint a földi használó hoz létre. Ez passzív eszközt szolgáltat a földi felhasználó elérésének sorrendbe állítására, amely azonos a VHF rádióéval, kivéve a műholdas késési hatásokat. Azonkívül a berendezés automatizálási funkciónak kezelni kell a csoportban lévő légijárművek „listáját" is, hogy a földi felhasználó folyamatosan tudatában lehessen minden csoportban lévő légijármű hívás meglétének vagy hiányának.

8.5.2.2 A csoport hívás kezdeményezés során a csoportos hívásban lévő egyedi légijármű beszéd csatornáktól nem várható az, hogy egyidőben kezdjenek működni. Ez azért van, mert: (1) a P-csatornán érkező hívás bejelentés nem érkezik egyidőben az összes csoportos hívásban lévő légijárműhöz, (2) ezen jelzés vétele utáni C-csatorna létesítés késés változó, és (3) a csoportban lévő összes repülőszemélyzet nem tud egyidőben válaszolni a bejövő hívásra, mivel elsősorban a repüléssel kapcsolatos teendők kötik le a figyelmüket. Ez utóbbi emberi tényező dolgoknak megvan az esélyük, hogy jelentős zavart okozzanak, ahogyan a különböző repülőszemélyzetek válaszolnak a hívásra és belépnek a csoport konferenciába, különösen, ha a repülőszemélyzet nincs tudatában annak, hogy a bejövő hívás csoporthívás. Ennek a zavarnak a kockázata lecsökken, ha a repülőszemélyzetet értesítik arról, hogy a bejövő hívás történetesen egy csoportos hívás, úgy, hogy az áramkörön csöndben tud maradni, amíg a földi használó beszélni kezd. Ennek a megvalósításának egyik módja a berendezés automatikai funkciója által egy ismétlődő hang figyelmeztető jelsorozat, vagy rögzített szóbeli értesítés átvitele, amíg az összes légijármű nem válaszolt a hívásra és nem kész a konferenciában való részvételre.

8.5.3 ***Csoportos általános adás.***

A csoportos általános adás azonos lehet a csoportos hívás eljárásokkal, kivéve, hogy a berendezés által szolgáltatott konferencia funkció nem adhat át vagy továbbíthat semmilyen levegő-föld audiót, amely elkerülhetetlenül megérkezhet a rádióadás csoportban lévő légijárműtől. Miként a csoportos hívás esetén van, emberi tényezői meggondolások megkövetelhetik, hogy legyen valamilyen mód egyoldalú csoport általános adás jelzésére a repülőszemélyzet részére.

8.6 A hívás regisztrálási funkció megvalósítása

8.6.1 ***Általános.***

Normál körülmények között egy ATS szakembernek, akinek egy AMS(R)S beszéd-üzdemű összköttetési szolgáltatás áll rendelkezésére, képesnek kell lennie ésszerű számú légijárműtől jövő párhuzamos, légi kezdeményezésű hívások vételére és fenntartására. (A 8.3 paragrafus további útmutatást szolgáltat arról, hogy hogyan lehet ezt megvalósítani.) Azonban lehetnek olyan üzemeltetési szituációk, amikor az ATS szakember vagy el akar zárni bejövő hívásokat, vagy ki akar szolgálni érkező hívásokat, egyet egy időben – más szavakkal „foglalt" jelzést küldeni vissza a hívó légijárműnek. Ezekben az esetekben a jó üzemeltetési gyakorlatnak tartalmaznia kell mind a hívás kísérlet automatikus rögzítését az ATS szakember részére („hívás regisztrálás"), mind a repülőszemélyzet értesítését arról, hogy meghiúsult hívás kísérletüket regisztrálták. Ez az értesítés a repülőszemélyzet részére egy természetes szándékot jelent, hogy az ATS szakember részéről egy rákövetkező visszahívás kezdeményezést fog kapni a légijárműve részére az első adandó alkalommal

Megjegyzés. – A 8.3.5 pont leírja azokat a levegő eredetű hívás információ elemeket, amelyeket a földi berendezések fel tudnak használni a hívás regisztrálás végrehajtásában. A GES és a földi hálózati berendezésektől megkövetelik, hogy ezt az információt továbbítsák a földi használó berendezéshez.

8.6.2 ***A hívás regisztrálási esemény jelzése.***

Az AMSS SARP-ok megkövetelik, hogy egy hívás kísérletet egy foglalt rendeltetési helyre eredménytelennek tekintsenek, és hogy egy „eredménytelen hívás – hívott fél foglalt" esemény (BITE 16) legyen generálva a végfelhasználó hálózat berendezései által. Közbelépő telefon jelző rendszerek - beleértve azokat, amelyek az AMS(R)S al-hálózat részei - közvetítik ezt az eseményt a légijármű személyzetének. A hívás regisztrációs eseményt a BITE 16 esemény-variációjának tekintik, és ezt az AMS(R)S a-hálózaton keresztül továbbítja, az egyedi kód értéke az AMS(R)S „hívás folyamat – csatorna felszabadítás" LIDU ok érték paraméterben (Annex 10, III. Kötet, I. Rész, 5. Függelék a 4.

Fejezethez, A5–7. és A5–34. ábra). Mind a földi hálózati berendezéseknek, mind a hálózat specifikus telefon együttműködési logikának a GES-en belül fenn kell tartania ennek az ellen-irányú jelnek az átadását a GES légi kezdeményezésű logikai eljárásának, ha a javasolt hívás regisztrálási berendezés megvalósításra kerül.

8.7 Megjegyzések a rövidített légi kezdeményezésű eljáráshoz

8.7.1 ***Általános.***

A légi kezdeményezésű hívásokra vonatkozó AMSS SARP-ok a légi kezdeményezésű hívásokra egy általános hívás létrehozást és egy rövidített hívás létrehozást tesznek lehetővé. A rövidített hívás eljárások viszonylag rövidebbek, és jóval ellentmondás mentesebb hozzáférési kérési teljesítményűek.

8.7.2 HOZZÁFÉRÉSI KÉRÉS FÁZIS

8.7.2.1 *Rövidített hozzáférés kérés SU.* Egy „rövidített hozzáférés kérés" SU-t az AMS(R)S eljárásokban használnak mint eszközt az összes hívás információnak (azaz földi cím és hívó terminál ID) a GES-hez való továbbításához, egyidejűleg az R-csatornás hozzáférés kéréssel. Ez szükségtelenné teszi a GES számára, hogy várakozzon ennek az információnak a vételére a C-csatorna alsávon, mint ahogyan ez a nem-AMS(R)S eljárások esetében uralkodó.

8.7.2.2 *Redundáns hozzáférés kérések soros átvitele.* Azért, hogy csökkentsék az R-csatorna ütközések hatását az áramkör-módú hozzáférési késés teljesítményre, az AES az azonos rövidített hozzáférés kérés SU-k egy rövid sorozatát küldi mind a kezdeti hozzáférési kísérletre, mind pedig a négy egymást követő kísérlet mindegyikére (amelyet a tA50 időzítő eljárása indít el), a teljes öt kísérlet alatt. Annak valószínűségét, hogy legalább egy rövidített hozzáférési kérés SU-t vegyenek a GES-nél az öt kísérlet mindegyikére egy 15 százalékosan terhelt R-csatornán keresztül, jelen útmutató anyag A-12. táblázata tünteti fel. (A táblázat két eset ábrázolásával felöleli a várható teljesítményt, amelynél az egész ütközésbe kerülő R-csatorna forgalom a többi AES-től vagy 1-SU impulzus- kötegre vagy 3-SU impulzus-kötegekre vonatkozik.)

8.7.3 ***Az áramkör szegmensek GES általi szimultán felállítása.***

A megnövelt továbbítási megbízhatóságon kívül a rövidített hozzáférési kérés SU-nál, ahogyan a 8.7.2.2 pontban le van írva a végtől–végig hozzáférési késés teljesítményt a GES tovább segíti, kezdve a hívás küldés kezdeményezéssel a földi hálózaton keresztül ugyanabban a pillanatban, mint amikor a GES elosztja a C-csatorna forrásokat és elkezdi a C-csatorna létrehozását az ellen-irányú irányban. A hívás elkezdésének azonnali indítása azért lehetséges, mert az AMS(R)S rövidített hozzáférési kérés SU **minden** szükséges hívás információt tartalmaz, ahogyan az a 8.7.2.1 pontban az részletezve van. A végtől–végig hívás műholdas és földi szegmenseinek párhuzamos létrehozásával a korlátozó tényező a végtől-végig hozzáférési késésben (a rövidített hozzáférés kérés SU vétele után) a földi hálózati hívás elkezdés késés **vagy** a C-csatorna létrehozás késés közül a nagyobb – de nem a két késés teljes összege, mint ami tipikus lenne a nem-AMS(R)S eljárás esetén.

8.7.4 ***AES együttműködés a nem-szolgáltatás-kész GES-sel.***

Lehetnek bizonyos AMS(R)S szolgáltatás területek, ahol a GES-ek nincsenek úgy felszerelve, hogy fenntartsák a rövidített levegő kezdeményezésű eljárást (pl. a kötelező ICAO végrehajtási dátum előtt). A rövidített eljárás, ahogyan az az AES-nél definiálva van, ezt úgy oldja meg, hogy eleve kompatíbilis mind a felszerelt, mind a nem-felszerelt GES-sel (üzemmód kapcsolásra vagy személyzeti beavatkozásra nincs szükség). Sajátos tulajdonságai a rövidített légi kezdeményezésű eljárásnak az, amely lehetővé teszi egy felszerelt AES-nek, hogy mindkét fajtájú GES-sel együttműködjön, a következők:

a) a rövidített hozzáférés kérés SU formátum azonos amegfelelő nem-AMS(R)S hozzáférés kérés formátumával, azzal a különbséggel, hogy az 2–9-ik számjegy és a rendeltetési ID-mezők fenntartottként vannak kijelölve az utóbbi SU-ban. Ez lehetővé teszi egy nem-felszerelt GES számára, hogy a hívási kísérletet úgy értelmezze, mintha az egy általános hívásnál lenne (azaz az SU-ból kivonatolt információ ugyanaz, mint ami egy általános hívásé);

b) a felszerelt vagy nem-felszerelt GES-ek a hozzáférés kérés SU minden redundáns példányát érvénytelenítik. Ezért a rövidített hozzáférés kérés SU többszörös példányainak a GES általi vétele nem eredményez hívás feldolgozás logikai hibákat (többszörös vétel előfordulhat az R-csatorna ütközések hiányában, vagy ha a tA50 időzítő lejárt, mielőtt az AES egy C-csatorna kijelölés SU-t vett volna); és

c) a C-csatorna alsáv jelzés és folytonosság vizsgálati logika a felszerelt és a nem-felszerelt AES-eknél és GES-eknél azonosak. Különös figyelmet érdemel az a tény, hogy egy felszerelt AES ismételni fogja a 2–9-ik számjegyet és a rendeltetési ID mezőket (a rövidített hozzáférés kérés SU-tól) a C-csatorna alsávon olyan módon, amely azonos a nem-felszerelt AES-ével. Az AMS(R)S eljárásnak ez a speciális szempontja a kulcs egy felszerelt AES azon képességéhez, hogy együtt tud működni bármilyen GES-sel.

Megjegyzés. – A végtől–végig hozzáférési késés teljesítmény egy nem-felszerelt GES-en keresztül nem felel meg annak a késés teljesítménynek, amely egy felszerelt GES használata esetén megvalósul.

8.8 Áramkör módú hozzáférés késés teljesítmény

Megjegyzés. – Kivéve, amikor jelölve van, a végponttól–végpontig áramkör-módú hozzáférés késés teljesítményre kiemelt adatok a 10500 bit/s csatorna sebességgel működő R- és P-csatornákon alapulnak.

8.8.1 ***Légi kezdeményezésű hívások.***

A 8.7.2 és 8.7.3 pontok ismertetik a rövidített légi kezdeményezésű eljárás speciális tulajdonságait, amelyek megnövelt hozzáférési késés teljesítményt eredményeznek a biztonsági felhasználónál a nem-biztonsági felhasználóhoz képest. Tekintettel a C-csatorna és a földi hálózat források párhuzamos felállítására (8.7.3 pont), ennek a javított eljárásnak az előnyei legszembetűnőbbek akkor, amikor a hozzáférési késés komponens a földi hálózaton belül nem nagyobb, mint amely a C-csatorna létesítésből fakad. Referencia szempontjából meg kell jegyezni, hogy a GES minimálisan hat másodpercet (látencia) igényel egy C-csatorna létrehozására – attól az időtől számítva, amikor a C-csatorna kijelölés SU-t a P-csatorna szolgáltatáshoz besorolják. Ez maga után vonja azt, hogy a feljavított levegő-kezdeményezésű eljárásokból a maximális haszon származzon, a földi hálózati létesítményeknek nem több, mint egy ekvivalens késési komponenst át kell adniuk a végponttóll–végpontig hozzáférés késéséhez – beleértve a válasz indítási időt az ellen-irányú áramlásra.

8.8.1.1 *GES C-csatorna demodulátor adatgyűjtési késés.* Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.3.4.4 pont három másodpercet (99%) ad a GES C-csatorna demodulátornak arra, hogy helyreállítsa a vett hordozót és elérje a keret zárást (ezt tartalmazza az előzőleg említett hat másodperces minimum a GES részére C-csatorna létrehozására azután, hogy egy kérést vett). Az AMSS SARP továbbá ajánlja, hogy a megvalósítók rövidebb adatgyűjtési időket érjenek el. Ennek a késésnek közvetlen hatása van a minimálisan elérhető végponttól–végipontg késésre azokban az esetekben, amikor a földi hálózat hat másodpercnél rövidebb hozzáférési késés produkálására képes (8.8.1 pont).

8.8.1.2 *Végponttól–végpontig hozzáférési kérés a légi kezdeményezésnél.* Ha feltételezni lehet, hogy a késési komponens, amely a földi hálózati berendezéseknek tulajdonítható, úgy korlátozható, hogy ne legyen nagyobb, mint a C-csatorna létrehozásának tulajdonítható komponens, akkor a végponttól–végpontig hozzáférési kérés, bármely jelentősebb ellenirányú P-csatorna forgalom hiányában nyolc másodperc (95%) "rövidséget" érhet el a légi kezdeményezésnél. Ha a GES C-csatorna olyan demodulátorokkal van ellátva, amelyek az AES jelkészlet üzemelési módjához hasonló adatgyűjtési jelleget mutatnak, akkor egy öt másodperces (95%) végponttól–végpontig hozzáférési késési érték lehetséges, feltéve, hogy a földi hálózati berendezések ezekkel ekvivalens javulást tudnak szolgáltatni.

8.8.2 ***Földi kezdeményezésű hívások.***

Az AES és GES logikai eljárások földi kezdeményezésű AMS(R)S hívásokhoz lényegében azonosak az általánosabb nem-biztonsági AMSS hívások eljárásaival. Az elvárt hozzáférési késés komponens, amely az AMS(R)S al-hálózatnak tulajdonítható, bármely jelentősebb ellen-irányú P-csatorna forgalom hiányában, hat másodpercre van tervezve (95%). (Beleértve a GES csatorna demodulátor jel-vételi három másodpercét.) A földi hálózati berendezések négy-hat másodperces késési komponense 10–12 másodperces (95%) várható végponttól–végpontig hozzáférési késést eredményez. A földi hálózati GES modulátor javulása egyenértékű javulást hoz létre a végponttól–végpontig késésnél.

8.8.3 ***AMS(R)S al-hálózat hívás létrehozási késés adatok.***

Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.8.4.1 pontjában a hívás feldolgozás késések az AMS(R)S hívás létrehozási késésnek csak azokat a komponenseit határozzák meg, amelyek az AES és a GES berendezéseknek tulajdoníthatók. Ezek a teljesítmény paraméterek, bár nem teljesen meghatározóak, nem valószínű, hogy jelentősebb statisztikai változást mutatnának. Ez azért van, mert a paramétereket maximális belső feldolgozási késésként határozták meg, kivéve az átviteli késéseket vagy sorbaállítási késéseket a kapcsolati réteg szolgáltatásnál, olyanoknál, mint amilyeneket a telefon jelzési CM-LIDU-nál lehet tapasztalni, amely P-csatorna átvitelre vár. Azonban a teljes AMS(R)S alhálózati késés, hogy létrehozzon egy levegő- vagy földi eredetű hívást, amely a kapcsolati réteg statisztikai működésének **lesz** alávetve, valószínűleg a rendszer tervezők számára bír jelentőséggel. Szimulációs vizsgálatok alapján, felhasználva egy forgalom modellt, amely identikus azzal a modellel, amelyet az Annex 10, III.Kötet, 4. Fejezet, 4.7 pontjában található csomag módú működési követelmények meghatározására használtak, az AMS(R)S alhálózat hívás létrehozási késés teljesítményt a légi- és földi kezdeményezésű hívásoknál úgy tervezik, hogy olyan legyen, ahogyan jelen útmutató anyag A-13. táblázatában fel van tüntetve.

Megjegyzés. – Mindegyik teljesítmény paraméter az összes AMS(R)S prioritásra alkalmazható, kivéve azokat a paramétereket, amelyek az értékek egy intervallumaként vannak kifejezve a legmagasabbtól a legalacsonyabb elsőbbségig.

8.8.4 *A PSTN végponttól–végpontig hívás létrehozás késés.* A végponttól–végpontig hívás létrehozás késés több lehet akkor, ha az AMS(R)S al-hálózat össze van kötve a PSTN-nel, hacsak nincs speciális működés meghatározva a PSTN részére.

8.9 Szubjektív hangminőség értékelés

8.9.1 BT LABORATORIES 9,6 KBIT/S LPC KODEK

8.9.1.1 A 7. Függelékben leírt algoritmust alkalmazó vokodereket értékelte, többek között, a BT Research Laboratories (BTRL) és az U.K. C.A.A. Ezeknek az értékeléseknek az eredményeit használták fel a három versenyben maradt közül ennek az algoritmusnak a kiválasztására.

8.9.1.2 ***Érthetőség.***

A BTRL értékelés a közepes vélemény pontozásos (MOS) értékelést használta. A BTRL értékelésben egy körülbelül 3,1-es MOS-t nyertek optimalizált bemeneti és hallgatási szint körülményei között, csatornaz-aj és környező légijármű zaj nélkül. Amikor 0,001 vagy ennél nagyobb csatorna bit hiba-arány (BER) került beadásra, és légijármű környezeti zajt adtak hozzá, akkor a MOS rangsorolás leértékelődött.

8.9.1.3 Az U.K. CAA értékelések speciálisan konstruált vizsgálati körülményeket alkalmaztak, amelyben a vizsgálat alanyát, egy irányítót egy szimulált munkakörülménybe helyezték bele. Egy „pseudo pilóta” tipikus légiforgalmi irányítási közleményeket juttatott az irányítónak és reagált az irányító kérdéseire és utasításaira. Különböző szintű csatorna bit hiba-arányokat vezettek be. A minőségi következtetés az volt, hogy a vokoder kissűrűségű légtérben, mint például az óceáni, elfogadható volt.

8.9.2. DVSI 4,8 KBIT/S AMBE KODEK

8.9.2.1 A DVSI Kodeket, mint alkalmas alternatíva elfogadhatóságát értékelték - összehasonlító vizsgálatokkal - a BTRL 9,6 kbit/s LPC kodekkel szembeállítva. Ezeket az összehasonlító vizsgálatokat a Comsat Laboratories végezte az RTCA Special Committee 165 követelményei szerint és azzal a céllal, hogy megállapítsa, hogy a kodek teljesítménye egyenértékű vagy jobb-e, mint a BTRL kodeké. Diagnosztikai cím vizsgálatot (DRT) és MOS-t használtak ehhez azt értékeléshez.

8.9.2.2 Az összehasonlító vizsgálatok ahhoz a következtetéshez vezettek, hogy a DVSI kodek a legtöbb körülmények esetén statisztikailag egyenértékű volt a BTRL kodekkel, és hogy ugyanazon körülmények közötti, például óceáni légtérben való üzemeltetésnél, vele összehasonlítható volt.

Megjegyzés. – A vizsgálati eredmények azt is megmutatták, hogy zajcsökkentés vagy valamilyen letiltási eljárások ajánlatosak a nagy légcsavar háttér-zajjal való üzemelés esetén.

9. LÉGIJÁRMŰ FEDÉLZETÉN TELEPÍTETT FÖLDI ÁLLOMÁS (AES) KEZELÉS

9.1 Általános

Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.9 pontja határozza meg azoknak a követelményeknek a minimális együttesét, amelyet az AES kezelésnek ki kell elégítenie ahhoz, hogy az együttműködés képességét biztosítsa. Az útmutató anyagnak ez a fejezete az AES kezelésnek a SARP-ra vonatkozó részeit írja le.

9.2. AES kezelés interfészek

Az AMSS SARP-okban az AES kezelés olyan entitásként van leírva, amely illeszkedik más AES entitásokhoz, olyanokhoz, mint például a kapcsolati és al-hálózati rétegek. Az interfészek az AES kezelés és ezen más entitások között cserélt információk fogalmaiban vannak meghatározva és ezen útmutató anyag A-20. ábrája mutatja be azokat. A információ-cserének semmilyen formátuma nincsen az AMSS SARP-okban előírva. Ezeket a formátumokat megvalósítás-függőnek tekintik.

9.3 AES kezelési funkciók

9.3.1 AES TÁBLÁZAT KEZELÉS

9.3.1.1 Az AES-nek az információk két sorozatát kell fenntartani. Ezek az információ együttesek az AMSS SARP-ben táblázatok formájában vannak megadva, mégpedig rendszer táblázat és bejelentkezés megerősítés táblázat formájában. Ezeknek az információknak az AES-ben való tárolását az AMSS SARP nem szabályozza, ezek megvalósítás-függőek.

9.3.1.2 A „rendszer táblázat” alatt felsorolt információkat a GES szolgáltatja. Ezek az információk tartalmazzák a szükséges kereső frekvenciákat, hogy képessé tegyék az AES részére egy műhold, egy sugárnyaláb és egy GES kiválasztását a bejelentkezési eljárás végrehajtása érdekében. Így kötelező az , hogy ezek az információk aktuálisak legyenek az AES-ben a bejelentkezés előtt. A rendszer táblázat információk frissességét az AES-nél a GES által kisugárzott rendszer táblázat adás sorozat figyelésével tartják fenn, ahogyan az az Annex, 10, III. Kötet, I. Rész, 4. Fejezet 4.9.3.2.3.1 pontjában ismertetve van.

9.3.2 AES BEJELENTKEZÉS ÁLLAPOT KEZELÉS

9.3.2.1 *Műhold, sugárnyaláb és GES kiválasztás.*

9.3.2.1.1 A légijármű földrajzi helyzetétől függően az AES-nek több választási lehetősége lehet a műhold, sugárnyaláb és a GES kiválasztására. Az AMSS SARP-ok biztosítják a rugalmasságot, amely lehetővé teszi az AES számára az adott időpontban a legmegfelelőbb kombináció kiválasztását. A kiválasztásra ható egyetlen követelmény az AES képessége az adekvát jel vételére a kiválasztott GES P_{smc} csatornán.

9.3.2.1.2 Az AES kezelés által a kiválasztás végzéséhez használt információkat az AES rendszer táblázat tartalmazza. A GES-t egyedülállóan azonosítja a P_{smc} csatornájának frekvenciája, amelyet egy adott műhold szolgáltatás területében lévő specifikus sugárnyalábon belül továbbítanak. Egy műholdat egyedülállóan azonosít a műhold/sugárnyaláb-azonosító P_{smc} csatorna-frekvenciák egy vagy több együttese. Mindegyik együttes legalább két frekvenciát tartalmaz és a sugárnyaláb ID-jével kapcsolódik, amelyen belül a kapcsolódó P-csatornákat átviszik. Ha a műhold azonosítást a globális sugárnyalábon (sugárnyaláb ID = 0) belül végzik, az AES kezelés tovább kísérletezik egy irányított sugárnyaláb kiválasztásával, ha ilyen van. A csak irányított sugárnyalábbal rendelkező műholdas szolgáltatásnál a műhold kiválasztást irányított sugárnyalábon keresztül végzik, így a műhold és az irányított sugárnyaláb kiválasztása párhuzamosan történik.

9.3.2.1.3 Az AES-eknek általában programozható saját preferencia táblázata van, amivel bizonyos rendszerek, műholdak és/vagy GES-ek és kommunikációs követelmények között preferenciális szelekció végezhető. Van néhány kritérium, amellyel bejelentkezési preferenciális kiválasztás végezhető, például szolgáltatást nyújtó azonosítás, költség, szolgáltatás választék kritériumok. Ha ezt a képességet rosszul használják fel (például bizonyos rendszerek, műholdak vagy GES-es kizárására, a biztonság az alternatív/kitérő kommunikációs utak korlátozott rendelkezésre állása miatt leromolhat. Ha egy AES saját preferencia táblázatában a kizárás engedélyezett, felül kell vizsgálni azt, hogy a biztonsági kommunikációs rendelkezésre állási követelmények ennél a légijármű felszerelésnél ki vannak-e elégítve.

9.3.2.2 *Bejelentkezési eljárás.*

9.3.2.2.1 *Bejelentkezés kezdet.* Ahogyan azt az AES kezelés AMSS SARP leírja, a bejelentkezési eljárást egy bejelentkezési utasítás vétele kezdeményezheti. A bejelentkezési utasítás határozhatja meg a GES-t és/vagy a műholdat, a bejelentkezésre való kiválasztáshoz. Ezek az AMSS SARP-ok az ilyen utasításoknak sem a forrását, sem a formátumát nem írják elő. A forrás lehet egy külső forrás az AES-hez, amely az utasítást az AES kezelés részére egy speciális interfészen keresztül közvetíti. A formátum megvalósítás-függő.

9.3.2.2.2 *A bejelentkezés visszautasítása.* Több okot azonosítottak egy AES bejelentkezési kérelem GES általi visszautasításának esetére. Ezeknek az okoknak a felsorolását az Annex 10, III. Kkötet, 4. Ffejezetéhez tartozó 3. Függelék tartalmazza. Az AMSS SARP-ben nincsenek megadva a meghatározott visszautasítási okokhoz tartozó specifikus AES válaszok. Az ilyen válaszok megvalósítás-függőek. Azonban az AMSS SARP a visszautasítási okokat tovább bontja három kategóriába: a rendelkezésre állóság folyamatos hiányára; a rendelkezésre állóság átmeneti hiányára és az érvénytelen paraméterekre. Az AES kezelés válasza egy visszautasítási okra - a visszautasítási ok kategóriájának megfelelően - a következő módon határozható meg:

A rendelkezésre állóság folyamatos hiánya: megszakítja a további bejelentkezési kísérleteket ugyanazon GES-hez;

A rendelkezésre állóság átmeneti hiánya: ismételt bejelentkezési kísérlet ugyanazon GES-hez, csak egy megfelelő időtartam eltelte után, vagy más, megfelelő GES-het történt bejelentkezési kísérlet után;

Érvénytelen paraméterek: ismételt bejelentkezési kísérlet ugyanazon GES-hez, csak eltérő paraméterekkel.

9.3.2.3 *Egységes idő sugárzás*

A légijárművön néhány alkalmazást szinkronizálni kell a földi alkalmazás párjával. Az AMSS SARP ajánlásokat tartalmaz az idős-zinkronizációs berendezés fenntartására az AES-nél és a GES-nél. Így együttműködési megfontolásból egy univerzális időjel egység (Annex 10, III. Kötet, I. Rész, a 4. Fejezet 2. Függeléke A2-35. ábra) szükséges, amely az aktuális időt tartalmazza a legközelebbi másodpercre kerekítve, az Egyeztetett Világ-idő /UTC/ szabványhoz van szinkronizálva, az AMSS SARP-ban meghatározottak szerint. Egy univerzális idő SU-nak a GES-től való vétele után az AES szolgáltathatja a vett idő információt a légijárművön lévő megfelelő alkalmazások részére. Az AES által ennek az idő információnak egy alkalmazáshoz való továbbítására kiválasztott módszer megvalósítás-függő.

9.3.2.4 *Felhasználói utasítások*

9.3.2.4.1 Az AMSS SARP előírja az AES válaszokat az utasítások egy minimális sorozatára, amelyek az AES műveletek némelyikének a befolyásolását szolgálja. Az ilyen utasításokat vagy az AES bejelentkezése előtt (Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.9.3.3.3.1 pont) vagy után (Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.9.3.3.3.2 pont) lehet kezdeményezni. Az ilyen utasításoknak sem a forrásai, sem a formátumai nincsenek az AMSS SARP-ban meghatározva. Az ilyen források belsőek vagy külsőek lehetnek az AES-nél és néhány hatás- kritériumnak megfelelően működnek, azért, hogy kielégítsenek egy speciális felhasználói követelményt, mint például a szolgáltatás folytonossága. Például az a hatás-kritérium, hogy lehívjon egy sugárnyaláb–sugárnyaláb átadást, egy adott műhold és a légijármű helyzete és irányszöge sugárnyaláb-sémájának ismeretén alapulhat. Az átadás utasítások formátumai megvalósítás-függőek.

9.3.2.4.2 *Átadás utasítások.* Az átadás utasítások, amelyek az AMSS SARP-ban vannak specifikálva, arra a célra szolgálnak, hogy képessé tegyék az AES használót, hogy különböző módokon változtassa az AES bejelentkezési feltételeket, ahogyan azt a felhasználó alkalmasnak ítéli.

9.3.2.4.2.1 A GES-GES átadási utasítást az AES használó a következők érdekében adhatja ki:

a) megújítani a bejelentkezést ugyanazon GES-hez, de egy másik irányított sugárnyalábon keresztül;

b) átkapcsolni a bejelentkezést egy ugyanazon műholdas kiszolgálási területen lévő másik GES-hez vagy ugyanazon, vagy egy másik irányított sugárnyalábon keresztül.

IAz iyen utasításnak lehet, hogy meg kell határoznia a GES ID-t és az irányított sugárnyaláb ID-t, amikor ezen ID-k különböznek a fennálló értékektől. Áramkör módú hívásokat a 4. szintű AES-ben (többszörös továbbítási és vételi csatorna egységek) nem befolyásolja ezeknek az utasításoknak a végrehajtása. A 3. szintű AES üzemelés az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.9.3.3.4.1 b) pontban leírtaknak megfelelő szint.

9.3.2.4.2.2 Egy műhold–műhold átadás utasítást az AES felhasználó tud kiadni, hogy az AES bejelentkezést egy másik műhold kiszolgálási területén belüli új GES-re kapcsolja át. Bármely, az éppen aktuális műholdon keresztül létrehozott áramkör módú hívást egy rögzített időperiódus után határozottan be kell fejezni, mielőtt az új műholdra térnek át. Az AMSS SARP-okban ez az időtartam 3 percre van beállítva. Ha az AES nem tudott áthangolni az új műhold felsorolt műhold/sugárnyaláb-azonosító P_{smc} csatorna valamelyikére, az AES visszatérhet az előző műholdhoz, vagy bármely más látható műholdhoz.

9.3.2.5 *P-csatorna vesztés/teljesítőképesség csökkenés*

9.3.2.5.1 A P-csatorna vesztés/teljesítőképesség csökkenés bejelentést az AES kezelés részére az AES fizikai rétegtől (P-csatorna vevő) jövő jelzés formájában kell átadni. A kritériumok, amelyeken aíz ilyen bejelentés alapszik, az Annex 10, III. Kötet, I. Rész, 4. Fejezethez tartozó "A"-Függelékben van megadva. Ha a P-csatorna vesztést vagy teljesítőképesség csökkenést a légijárműnek a kiválasztott sugárnyaláb fedésből való kirepülése okozta, a P-csatorna vesztés/teljesítőképesség csökkenést az AES kezelés ugyanazon vagy másik műhold szolgáltatási területén belül új GES keresésére és az ahhoz való bejelentkezésre készteti. Azonban a P-csatorna vesztés/teljesíőképesség csökkenés egy nem-kívánatos szakadást hozna létre, mind az adat, mind a beszéd szolgáltatásnál. Ezért ilyen eljárás használata nem tanácsolható az AES átadás lehívása eszközeként. Az Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.9.3.3.4.2 b) és c) pontokban leírt átadási utasítások jobban szabályozott eszközt szolgáltatnak az AES átadások lehívására.

9.3.2.5.2 Mivel az összes R- és T-csatorna átvitel szinkronizálva van a P-csatorna keretképző formátumához, és hogy az AES GES általi pozitív szabályozása biztosítva legyen, az ilyen átviteleket meg kell szakítani a P-csatorna vesztésével.

9.3.3 AES CSATORNA KEZELÉS

9.3.3.1 *Beszéd-üzemű – beszéd-üzemű előjegyzés*

9.3.3.1.1 Több áramkör-módú hívás versenyezhet a korlátozott forrásokért az AES-ben. Az ilyen esetekben az áramkör-módú hívás létrehozását és folyamatosságát az Annex 10, III. Kötet, I. Rész, 4. Fejezet elsőbbségi és előjegyzési követelménye szabályozza a hívásokat vivő C-csatorna részére kijelölt C-csatorna Q-szám elsőbbségének megfelelően. A C-csatorna Q-szám kijelölése a különböző beszéd-üzemű tranzakció kategóriákhoz az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4-43. táblázatában van megadva.

9.3.3.1.2 Az AMSS SARP különböző követelményeket tartalmaz ahhoz, hogy érvényesítsék az Annex 10, III. Kötet, I. Rész, 4. fFjezet, 4.8.3.2 pontjának elsőbbségi és előjegyzési utasításait az AES-ben. Ebben a vonatkozásban az áramkör-módú szolgáltatások akkor és csak akkor fogják csak az adás/vételi csatorna egység-pár kijelölését kérni az AES kezeléstől, ha elegendő rendelkezésre álló forrás van, vagy a folyamatban lévő áramkör-módú hívások közül legalább egynek szigorúan kisebb Q-száma van, mint a létrehozás alatt lévő hívás Q-száma. Az utóbbi esetben az AES kezelés rendelkezésre fogja bocsátani a folyamatban lévő hívás által használt csatorna egységeket a létrehozandó hívás fenntartására.

9.3.3.2. *3. szintű AES beszéd-üzem/adatátvitel döntés*

Egy 3. szintű AES-ben egy egyedülálló átviteli csatorna egység van megosztva az R-, T- és C-csatornák között. Az R-csatorna és a T-csatorna közötti választási döntést az AMSS SARP-ban olyan megoldással hozzák létre, hogy a T-csatorna jel egység (SU) átvitelek - tekintet nélkül az SU-k Q-számára - elsőbbséggel rendelkeznek az SU-k R-csatornán való átvitelével szemben. Azonban a „rések” minimális száma szükséges a T-csatorna rés-idő foglalásában egy adott légijárműhöz annak biztosítására, hogy az

R-csatorna átvitelt nem blokkolják le teljesen (Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.6.5.3.3 pont). A C-csatorna és az R- vagy T-csatorna közötti választási döntést az ezeken a csatornákon bonyolítandó "tranzakciók" elsőbbségének megfelelően hozzák. Az ilyen döntésre vonatkozó speciális követelményeket az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.9.3.4.1.4 pontja tartalmazza. Meg kell jegyezni, hogy az AMSS SARP nem követeli meg azt, hogy egy létrehozott beszéd-üzemű hívást befejezzenek akkor, ha egy magasabb fokú elsőbbséget élvező adat-közlés igénye merül fel, az ilyen akció inkább választási lehetőséggel bír. Az AMSS SARP által lehetővé tett alternatív sémának kell megszakítania az átvitelt a C-csatornán elég hosszan ahhoz, hogy bármely magasabb fokú elsőbbséggel rendelkező jel egység továbbításra kerüljön az AES kapcsolat rétegben és azután az átviteli csatorna egységet újra kijelölik a C-csatornához.

10. FÖLDI TELEPÍTÉSŰ FÖLDI ÁLLOMÁS (GES) KEZELÉS

10.1 Általános

10.1.1 Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.10 pontjában ismertetett földi telepítésű földi állomás (GES) kezelési funkciók kötelezően előírtak minden GES megvalósításnál. A GES kezelés magában foglalja: az AES-nek a GES-hez való bejelentkezése kezelésének, a P-, R- és T-csatornák adat és jelzés átviteléhez való kijelölése szabályozásának, egy csatorna túlterhelés bejelentésekor az új csatorna kijelölésének, a kijelölt C-csatornák teljesítmény szabályozásának, valamint a rendszer táblázatnak és idő információ az AES-ben való felfrissítésének és a hozzá bejelentkezett AES-ek üzemelési állapota ellenőrzésének funkcióját.

10.2 GES kezelés felépítés

10.2.1 MŰHOLD SZOLGÁLTATÁSI TERÜLET

Egy műhold szolgáltatási területét a következőképpen határozzák meg: a műhold fedési területe, amelyen belül a műhold szolgáltató a szolgáltatást nyújtja. Különböző műholdaknak egymást átlapoló műholdas szolgáltatási területük lehet.

10.2.2 MŰHOLDAS RENDSZER KONFIGURÁCIÓK

A három műholdas rendszer konfiguráció a következő:

a) *Csak globális sugárnyalábbal rendelkező műhold.* Ebben a konfigurációban műholdanként csak egy sugárnyaláb van. Ezt a sugárnyalábot globális sugárnyalábnak nevezik. Ebben a konfigurációban műholdanként két GES követelhető meg egy műhold szolgáltatási területén, tekintettel a műhold azonosítására szolgáló két műhold azonosító P_{smc} -csatornára.

b) *Globális sugárnyalábbal és irányított sugárnyalábbal rendelkező műhold.* Ebben a konfigurációban egy műhold több sugárnyalábot tart fenn, ahol több sugárnyaláb egy másik sugárnyalábba van bezáródva. Egy sugárnyalábon belül bezárt sugárnyalábokat irányított sugárnyaláboknak nevezik és a bezáró sugárnyalábot globális sugárnyalábnak. Ebben a konfigurációban műholdanként két GES követelhető meg egy műhold szolgáltatási területen, tekintettel a műhold azonosítására szolgáló két műhold azonosító P_{smc} csatornára. A műhold azonosításra szolgáló műhold azonosító P_{smc} csatornákat ebben a konfigurációban globális sugárnyalábbal továbbítják.

c) *Csak irányított sugárnyalábbal rendelkező műhold.* Ebben a konfigurációban a műhold csak irányított sugárnyalábokat tart fenn, globális sugárnyaláb nélkül. Azért, hogy egy műhold/sugárnyaláb azonosító P_{smc} csatorna egy műhold szolgáltatási területen keresztül műhold és sugárnyaláb azonosítás céljára rendelkezésre álljon, legalább az egyik P_{smc} csatorna frekvenciákat továbbítani kell mindegyik irányított sugárnyalábban a műhold szolgáltatás területén. A GES a műhold szolgáltatási területen több irányított sugárnyalábot tarthat fenn egyedülálló frekvencia sorozat továbbításával vagy vételével, mindegyik irányított sugárnyalábban.

10.2.3 GES KÉPESSÉG

Minimumként a GES-nek képesnek kell lenni egy térbeli szegmensen keresztül egy 4. szintű AES-sel üzemelni. Ez magában foglalja azt, hogy a GES-nek beszéd-üzemű csatornákat kell fenntartania ATC és AOC szolgáltatásokhoz, és kapcsolódnia kell nyilvános kapcsolású telefon hálózatokhoz vagy bérelt áramkörökhöz a GES üzemeltető választásánál. A GES-nek szolgáltatni kell továbbá a legnagyobb specializált sebességű adat-csatornákat és kapcsolódnia kell a magán nyilvános kapcsolású hálózatokkal a GES üzemeltető választásával. A GES által fenntartható AES-ek száma függ a csatorna terheléstől és a GES részére kiosztott csatorna frekvenciáktól. A csatorna terhelésnek olyannak kell lennie, hogy a csomag módozatú adatátvitelt kielégítse az Annex 10, III. Kötet, I. Rész, 4. Fejezet, 4.7 pontjában meghatározott teljesítmény követelményeket.

10.2.4 GES–GES KOMMUNIKÁCIÓ

A GES–GES kommunikációs kapcsolatot az AES-ek ugyanazon műhold szolgáltatási területen lévő más GES-ekhez bejelentkezett AES-ek állapotára vonatkozó információk továbbítására használják. Ezt a C-csatorna hozzáférési kérések és a C-csatorna hívás bejelentkezések/C- csatorna kijelölések a bejelentkező GES és az egyes hívásokat kezelő GES közötti átvitelére is használják.

10.3 GES kezelési interfészek

10.3.1 A GES kezelés más GES entitásokhoz való interfészeinek meghatározását az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.10 pontja tartalmazza az ezen interfészeken keresztül kicserélt információk fogalmaival. A cserélt információk formátuma nincs meghatározva, ez megvalósítás-függő.

10.3.2 A GES kezelés illeszkedik a kapcsolat rétegekhez, hogy felhasználja a szolgáltatásait a kezelési LIDU-k továbbítására az AES-ben lévő párjához. A GES kezelés összeköttetésben van az al-hálózat réteggel, hogy informálja az al-hálózat rétegeit az AES kapcsolatokról. A GES kezelés illeszkedik az áramkör-módú szolgáltatásokkal, hogy továbbítsa a C-csatorna frekvenciákat és csatorna egységeket, amelyek áramkör-módú hívásra vannak kijelölve. A GES kezelés illeszkedik a fizikai réteghez, hogy szabályozza az adó és vevő csatornák frekvenciáját és teljesítményét, és előjegyezze a csatorna egységeket a magasabb fokú elsőbbségű hangfrekvenciás vagy adat hívásoknak.

10.4 GES kezelési funkciók

10.4.1 GES TÁBLÁZAT KEZELÉS

10.4.1.1 A „táblázat” fogalom a GES-nél tárolt rendszer információt takarja. A bejelentkezési GES-nél tárolt információk tartalmazzák a bejelentkezett AES-ek állapotát és más, ugyanazon műhold szolgáltatási területen belüli GES-ekhez bejelentkezett AES-ek állapotát. Információkat tartalmaznak továbbá a műholdról – annak azonosító frekvenciáit, elhelyezkedését, a műhold által fenntartott sugárnyalábokat, a műhold szolgáltatás területén belüli GES-eket és a műhold szolgáltatás területén belüli egyes GES-ek által fenntartott P_{smc}/R_{smc} csatornák frekvenciáit és bit sebességeit. Az információhoz szolgáló formátum és tároló kapacitás nincsen előírva az AMSS SARP-ben, ez alkalmazás-függő.

10.4.1.2 Az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.10 paontjában megadott AES rendszer táblázat bármelyik műhold konfigurációnál felhasználható. A csak irányított sugárnyalábokkal rendelkező műhold által kiszolgált műhold szolgáltatási terület kezdeti keresési adatai két vagy több műhold/sugárnyaláb azonosító P_{smc} csatorna frekvenciát tartalmazhatnak műholdanként plusz egy irányított sugárnyaláb térképet, amely e műhold sugárnyalábjainak földrajzilag lefedett területeit mutatja. Globális sugárnyalábbal rendelkező műhold által kiszolgált műhold kiszolgálási területhez tartozó AES rendszer táblázatai a regionális adatatokat tartalmazzák,. az irányított sugárnyaláb azonosító P-csatornát mindegyik, a műhold által fenntartott egyes irányított sugárnyalábhoz, a GES ID-t mindegyik, a műhold kiszolgálási területén belül lévő GES-nél és mindegyik GES által fenntartott P_{smc} és R_{msc} csatorna frekvenciákat a globális sugárnyalábban, valamint az egyes irányított sugárnyalábokat fenntartó összes GES-nél a GES ID-ket.

10.4.1.3 *Az AES bejelentkezési állapot táblázat*

A bejelentkezési GES-től eltérő GES által fenntartott AES bejelentkezési állapot táblázat információkat tartalmaz bármely, ugyanazon műhold kiszolgálási területen belüli GES-hez bejelentkezett mindegyik AES-ről. Ezeket az információkat a GES hívás irányítási célokra tudja felhasználni, például visszautasítani egy földi kezdeményezésű hívás kérést, amely olyan AES-hez irányul, amelyik a műhold szolgáltatási területén lévő egyetlen GES-hez sem jelentkezik be, vagy továbbítani a hívás kérést a GES-nek, amelyhez a
kérést kezdeményező bejelentkezett.

10.4.1.4 Az egyes GES-ek egy meghatalmazási táblázatot is fenntartanak. Ez a táblázat tartalmazza az összes légijármű címzést azoknál az AES-eknél, amelyek üzemeltetői sikeresen teljesítették az adminisztratív előírásokat, amelyek szükségesek ahhoz, hogy az AES-t alkalmassá tegyék az AMS(R)S rendszeren belüli üzemelésre. Ezek az adminisztratív lépések tartalmazzák - de nem szorítkozva csak ezekre - a következőket: annak megerősítése, hogy a légijármű címzése korrekt és egy alkalmas testület adta ki, az AES berendezés sikeresen átment az egység ellenőrzésen, és az AES üzemeltető kapcsolatai és számlái rendben vannak.

10.4.2. GES BEJELENTKEZÉSI ÁLLAPOT KEZELÉS

10.4.2.1 *GES átadási funkciók*

10.4.2.1.1 A bejelentkezési GES, miután egy másik, ugyanazon műhold által kiszolgált műhold kiszolgálási területen lévő GES-től, mint a bejelentkezési GES egyik kiszolgálója, AES bejelentkezés információt kap, minden adat tranzakciót felfüggeszt, amely az AES-sel folyamatban van, ha ez az AES előzőleg nála volt bejelentkezve. Az előző bejelentkezési GES-en keresztül folyamatban lévő beszéd-üzemű hívásokat nem kell leállítani, mivel az AES létre tud hozni hívásokat a bejelentkezési GES-en kívüli, más GES-en keresztül. Az előző bejelentkezési GES nem jelzi az AES-t az AES bejelentkezési állapot táblázatában saját bejelentkezett AES-eként, azonban az AES-ről az igényelt információt visszatartja.

10.4.2.1.2 Ha egy AES-ről szóló bejelentkezési információ egy eltérő műhold kiszolgálási területen lévő GES-től érkezik, akkor a vevő GES felfüggeszti az adat tranzakciókat és az AES-sel folyamatban lévő hívásait megszakítja, ha ez az AES előzőleg nála volt bejelentkezve, és azután az AES-t véglegesen törli az AES bejelentkezési állapot táblázatából. A régi bejelentkezési GES azután kijelentkezés információt küld a saját műhold szolgáltatás területén lévő többi GES-nek.

10.4.2.2 *Bejelentkezés ellenőrzés*

10.4.2.2.1 Az AMSS SARP a GES kezelésnél két módszert ismertet egy AES üzemelési állapotának ellenőrzésére. A közvetlen ellenőrzési módszert a GES akkor használja, ha a bejelentkezési ellenőrzési

(LDV) bitet a bejelentkezés kérés LIDU-ban az AES nullára állítja be, más esetben a közvetett ellenőrzési módszert használják.

10.4.2.2.2 A bejelentkezés ellenőrzés célja a források optimalizálása az AES-ek között. Ha egy AES nincs aktiválva egy, az AMSS SARP-ban előírt időperiódus alatt (azaz nem továbbít adatokat, vagy nincs hang hívás indítása a bejelentkezési GES-hez vagy bármely más, ugyanazon műhold szolgáltatási területhez tartozó GES-hez), a bejelentkezési GES kijelenti az AES-t; ha az AES nem válaszol a bejelentkezés lekérdezésre (követlen bejelentkezés ellenőrzés), vagy inaktív marad 12 órán keresztül (közvetett bejelentkezés ellenőrzés). A felszabadított forrásokat így más AES-ek rendelkezésére lehet bocsátani, amelyek próbálnak bejelentkezni, de a GES-nél lévő forrás-hiány miatt ez nem sikerül nekik.

10.4.2.2.3 Annak az oka, hogy egy GES-hez bejelentkezett AES inaktív az, hogy az AES vagy kijelentkezés nélkül leszállt, vagy műholdat váltott. Ilyen körülmények között helyénvaló, hogy a bejelentkezési GES az AES-t kijelenti.

10.4.2.3 *Azonnali bejelentkezés*

Az azonnali bejelentkezés berendezést a GES-nél az AES azonnali bejelentkezésére használják, akkor, amikor a GES kapcsolati réteg egy jel egységet (SU) vesz egy AES-től egy R_d csatornán, és az AES nincs a GES AES bejelentkezési állapot táblázatában. Ez a helyzet akkor fordul elő, ha a GES nem frissíti az AES bejelentkezési állapot táblázatát a kezdeti bejelentkezés után. A GES az azonnali bejelentkezés LIDU-t az AES-hez, az összes P-csatorna frekvencián továbbítja.

10.4.2.4 *Az adat-csatornák kijelölése*

A GES kezelés adat-csatornákat jelöl ki (P-, R- és T-csatornák) azzal a legnagyobb bit sebességgel, amelyet a GES és az AES szolgáltat, és egy használatban lévő műhold és az AES szintje együttesen tart fenn. A döntést arról, hogy mely csatornához és milyen EIRP-vel kerüljön kijelölésre, a GES kezelés a következő információk alapján hozza:

a) a használatban lévő műhold (visszakapcsolási érzékenység); és

b) az AES szint.

A GES kezelés maximálisan nyolc R-csatornát és maximálisan négy T-csatornát tud kijelölni a bejelentkezés időpontjában.

10.4.3 GES CSATORNA KEZELÉS

10.4.3.1 *C-csatorna frekvencia kezelés*

Az ismert/tervezett/számított forgalom kapacitás követelmények alapján a GES több SCPC frekvenciát jelölhet ki előre-irányú és ellen-irányú C-csatornaként. Az ugyanazon műhold szolgáltatás területen belüli GES számára kijelölt frekvenciák teljes száma általában kevesebb, mint a műhold részére üzemelésben rendelkezésre álló teljes kapacitás. Igény esetén mindegyik GES kijelöli a frekvenciákat az áramkör-módú hívás részére a saját készletéből. Azonban frekvencia hiánya a GES csatornánál frekvencia újra-kijelölési kérelem kezdeményezést kell, hogy eredményezzen attól a központi hatóságtól, amely a kezdeti elő-kijelölést végezte. A központi hatóság ekkor egy frekvencia-kijelölést végez a GES számára, azokból a frekvenciákból, amelyeket közös állományban tartanak.

10.4.3.2 *C-csatorna teljesítmény kezelés*

10.4.3.2.1 A GES a C-csatorna kezdeti EIRP-jét a legrosszabb eset kapcsolat együtteséből származtatott értéknek megfelelően számítja ki.

10.4.3.2.2 A GES-eknek kijelölhetnek teljesítmény előirányzatokat, amelyek megegyeznek a műholdhoz üzemelő csatornák teljesítmény igényeivel. Ha ezt a teljesítmény együttest már teljesen felhasználták, a GES kezelés visszautasítja a további csatorna/hívás kéréseket, amíg elegendő teljesítmény szabadul fel új kérésekhez való kijelöléshez, vagy amíg a bejelentkezési kérés LIDU nem jelez veszélyben lévő AES-t. A C-csatorna teljesítményt például a következő teljesítmény-szabályozás döntési táblázatnak megfelelően lehet szabályozni:

21000 bit/s, 1/2 arányú FEC csatorna esetén, ha az átlagos bit hiba-arány per 2560 csatorna bit (dekódolás előtt):

nagyobb, mint 172: az EIRP-t növeli 2 dB-lel
119 és 172 között : az EIRP-t növeli 1 dB-lel
76 és 119 között: az EIRP-t változatlanul hagyja
44 és 76 között: az EIRP-t csökkenti 1 dB-lel
kisebb, mint 44: az EIRP-t csökkenti 2 dB-lel

Megjegyzés. – Ezek az értékek megfelelnek a bemenő bit hiba-aránynak egy 1/2 Viterbi dekódolóhoz, ahogy az a C-csatornánál meg van határozva, amely egy 10^{-3}*-tól (névlegesen)* 10^{-4}*-ig 1 dB-el a névleges felett, nagyságú kimenő hiba-arányt szolgáltat 1,5 dB-es határértékkel.*

10.4.4 GES ELŐFOGLALÁSI KEZELÉS

10.4.4.1 *Beszéd-üzemű előfoglalás beszéd-üzemmel szemben*

A GES-nél lévő ezen képesség célja forrásokat előteremteni magasabb elsőbbséggel rendelkező beszéd-üzemű hívások részére, ha további források nem állnak rendelkezésre a GES-nél, ha az alacsonyabb elsőbbségű beszéd-üzemű hívások ki vannak szolgálva. A GES kezelés, miután kérést kapott az áramkör-módú szolgáltatásoktól egy csatorna egységre egy beszéd-üzemű hívás részére, ellenőrzi azt, hogy az új beszéd-üzemű hívás felállítási kérelem elsőbbségi foka magasabb-e, mint a már folyamatban lévő valamelyik hívásé. Ha az új hívás kérés elsőbbségi foka magasabb, mint bármelyik folyamatban lévő hívásé, a GES kezelés akkor könyörtelenül előfoglalásba teszi a legkisebb elsőbbségi fokú, folyamatban lévő hívást, hogy rendelkezésre álló forrást teremtsen a magasabb elsőbbségi fokú hívásnak. Ha egynél több legkisebb elsőbbségi hívás van folyamatban egy adott időpontban, akkor a GES üzemeltető saját belátása szerint egy hívást előfoglalásba tesz. Egyik választás lehet azt a hívást tenni előfoglalásba, amelyik a leghosszabb idő óta van folyamatban.

10.4.4.2 *Adatátvitel a beszéd-üzemű előfoglalással szemben*

A GES-nél ezen képesség célja forrásokat előteremteni egy további P-csatorna felállításához a magasabb elsőbbségű adat-áramlás részére, amikor a GES-nél további források nem állnak rendelkezésre egy további P-csatorna felállításához, és alacsonyabb elsőbbségű beszéd-üzemű hívások kerülnek szolgáltatásra és a további adatforgalom az átvitelt a már működő P-csatornákon veszélyeztetné, az Annex 10, III. Kötet, I. Rész, 4. Fejezet 4.7 pontjában előírt adatátviteli késési követelmények teljesítését. Azonban a magasabb elsőbbségű beszéd-üzemű hívás nem tesz előfoglalásbya egy működő P-csatornát a rendelkezésre álló források előteremtésére egy magasabb elsőbbséggel rendelkező beszéd-üzemű hívás felállításához, mivel így káros hatás lépne fel az AES-től eredő adat-áramlással szemben.

10.4.5 GES RENDSZER ADÁS

10.4.5.1 *Rendszer táblázat adás*

10.4.5.1.1 Ez a berendezés a GES-nél lehetővé teszi az AES-ben tárolt rendszer táblázat információk felfrissítését. A rendszer táblázat felfrissítéseket teljes vagy részleges sorozatként továbbítják az AES-hez.

10.4.5.1.2 A kezdeti kereső adatok a rendszer táblázatban a műhold/sugárnyaláb azonosító P_{smc} csatorna-frekvenciákat tartalmazzák az összes műholdra. A rendszer táblázatban bármilyen változtatást központilag a műholdas rendszer szolgáltató végez és az összes, a műholdas rendszer szolgáltató valamennyi műholdas szolgáltatási területéhez tartozó GES-nek eljuttatja, kívánság szerint. A rendszer táblázat felfrissítési száma egyedi mindegyik műhold szolgáltatási területnél.

10.4.5.1.3 A kijelölt GES a teljes sorozatot átviszi a műhold/sugárnyaláb azonosító P_{smc} csatornán keresztül és magában foglalja az adás index LIDU fej-résszel az összes adás LIDU-t. A részleges sorozat egy adás index LIDU fej-résszel ellátott egy vagy több adás LIDU-ból áll. A részleges sorozat csak a legújabb adat felfrissítéseket tartalmazza. Az adás index LIDU az egyedi LIDU sorozat jelenlétét azonosítja mind a teljes, mind a részleges sorozaton belül. Mindegyik GES egy részleges sorozatot közvetít az összes működő P-csatornáján. Mindegyik műhold szolgáltatásnak saját rendszer táblázata és irányított sugárnyaláb térkép adás információja van.

10.4.5.1.4 A teljes rendszer táblázat és a részleges sorozat adási sebesség lecsökkenthető a P-csatorna nagy terhelése miatt. Ez késleltetheti a bejelentkezési eljárások megkezdését az AES-nél. Az az ajánlott, hogy az ilyen adási sebességeket a GES kezelés ellenőrizze, és egy további P-csatorna kapacitást biztosítson ezeknek a sebességeknek az elfogadható szintű fenntartásához.

10.4.5.1.5 A rendszer táblázat a következőkből áll:

a) rendszer táblázat adás index SU (Annex 10, III. Kötet, 4. Fejezet A2-30. ábra);

b) rendszer táblázat adás műhold/sugárnyaláb azonosító csatorna értesítés SU (Annex 10, III. Kötet, 4. Fejezet, A2-32 ábra);

c) rendszer táblázat adás GES P/R csatorna értesítés SU (Annex 10, III. Kötet, 4. Fejezet, A2-31. ábra);

d) rendszer táblázat adás GES sugárnyaláb alátámasztás értesítés SU (Annex 10, III. Kötet, 4. Fejezet A2-34. és A2-61. ábra); és

e) rendszer táblázat adás adat-csatorna EIRP SU (Annex 10, III. Kötet, 4. Fejezet, A2-62. ábra).

Az adat-csatorna EIRP SU rendszer táblázatot az AES használja, az Annex 10, III. Kötet, 4.10.4.4.3.1.1 pontjával összhangban.

10.4.5.1.6 Ahol egy műhold irányított sugárnyaláb szolgáltatást tart fenn, a GES továbbítja az irányított sugárnyaláb térkép sorozatot, amely az SU-kat tartalmazza, ahogyan azt ennek az útmutató anyagnak az A-21. ábrája mutatja be. Ez a sorozat független a rendszer táblázat adás sorozattól és az irányított sugárnyaláb fedési területeit és az irányított sugárnyaláboknál a GES szolgáltatások fenntartását határozza meg. Az AES, miután vette a teljes sorozatot, tudni fogja milyen irányított sugárnyaláb(ok) van(nak) jelenleg, és megismeri az ezekhez rendelkezésre álló szolgáltatásokat. Az AES ezeket az információkat felhasználhatja annak meghatározására, hogy melyik GES állomáshoz jelentkezzen be.

Az irányított sugárnyaláb térkép sorozat közlemény típusai a következők:

18 irányított sugárnyaláb térkép adás – teljes sorozat – kezdeti SU
19 irányított sugárnyaláb térkép adás – teljes sorozat – SSU
26 irányított sugárnyaláb térkép adás rész-sorozat – kezdeti SU
27 irányított sugárnyaláb térkép adás rész-sorozat – SSU

10.5 GES szolgáltatásokra vonatkozó megfontolások

10.5.1 Az AMSS rendszer, amely az ICAO kommunikációs, navigációs és légtérellenőrzés/légiforgalom szervezési (CONS/ATM) rendszer koncepció részét képezi világméretű alapon nyújt kommunikációs szolgáltatást. Az AMSS rendszer felépítés számos műholdból és korlátozott számú GES-ből áll. Minden államnak/kormánynak teljes hozzáférése lehet az AMSS-hez, de közülük a legtöbbnek nincs szüksége saját GES birtoklására, inkább a szolgáltatást nyújtón keresztül kapcsolódnak a hálózathoz.

10.5.2 Bár egy adott földrajzi területen belül kis számú GES elegendő lenne az AMSS-hez, néhány állam vagy kormány úgy érezheti, saját GES felállítása és üzemeltetése szükséges,olyan okokból kifolyólag, mint:

a) tartalékolás – a GES meghibásodás hatásának csökkentése;

b) kisebb függőség a többi államtól (amelyek GES-t üzemeltetnek) és a szolgáltatás nyújtótól; és

c) felügyelet és irányítás gyakorlása a saját légterében.

10.5.3 Azonban a GES-ek elterjedése olyan problémákhoz vezethet, mint:

a) megnövekedett spektrum igények a rendelkezésre álló spektrumok kis részekre való felosztásával bevitt hatékonyság romlás miatt;

b) leromlott csomag adat teljesítmény, mivel az AES-ek több bejelentkezés/kijelentkezés ciklusnak vannak alávetve, ahogyan a különböző repülés-tájékoztató körzetek (FIR) között átlépnek, amelyek saját GES-eket működtetnek;

c) a repülő személyzet megnövekedett munkaterhelése (vagy az AES költsége és komplexitása), mivel ezek különböző FIR-ek között végeznek átvitelt, amelyek saját GES-eket működtetnek.

10.5.4 További tényezők, amelyek a GES-ek számát befolyásolják, a következők:

a) a rendelkezésre álló műhold teljesítmény korlátozza a 600 bit/s P-csatornák számát, azaz a GES-eket, amelyeket műholdanként fenn lehet tartani; és

b) a GES felszerelési és üzemelési költség nem gazdaságos a legtöbb kormány számára.

Ilyen körülmények között néhány államot nyugtalaníthat a függősége más államoktól vagy szolgáltatás nyújtóktól a GES szolgáltatásoknál. Ez az aggodalom néhány meggondolással enyhíthető:

a) A csomag szolgáltatásoknál az ATN lehetővé teszi a GES nélküli államoknak, hogy egy sor különböző állam vagy szolgáltatás nyújtó közül válasszon, hogy GES szolgáltatásokhoz jusson.

b) Azokban az államokban, ahol az ATN kevésbé fejlett, a GES és a légiforgalmi irányítási központ közötti rögzített műholdas kapcsolatok a földi telepítésű kapcsolatoknak egy alternatíváját nyújtják. Ez a megközelítés forrása lehet mind a költség versenyképességnek, mind a redundanciának. Ha helyesen van tervezve, akkor egy második műhold kapcsolat által behozott plusz késleltetés elhanyagolható hatással lesz a csomag adat teljesítményre. Egy második műhold kapcsolat nem lehet elegendő a hangfrekvenciás kommunikációnál, legalábbis normál átalakítási módon nem. Azonban hatását az olyan szóbeli cserére, amely tipikusan ATC alkalmazás, még em vizsgálták.

c) Az államoknak megfelelő intézményes megegyezésekket kell rendelkezniük a szolgáltatás nyújtókkal, az ICAO AMSS-re vonatkozó irányelvei alapján.

AZ „A” MELLÉKLET TÁBLÁZATAI

A-1. táblázat. Jellemző megvalósítás a képesség szinthez viszonyítva:

Képesség szint	Csomag adat szolgáltatás (kbit/s)	Áramkör módú szolgáltatás (kbit/s)	Csatornák száma	AES antenna nyereség	Megjegyzések
1	0,6 1,2	Nem áll rendelkezésre	1 adás 1 vétel	0 dB	
2	0,6 4,8 10,5	Nem áll rendelkezésre	1 adásl 1 vétel	12 dB vagy 6 dB (a 6 dB nem támasztja alá a 10,5 kbit/s adat-csatornákat)	Nagyobb adat-csomag sebesség
3	0,6 4,8 10,5	Beszéd-üzem 21,0 és/vagy 8,4	1 adás 2 vétel	12 dB v. 6 dB (a 6 dB nem támasztja alá a 21,0 kbit/s beszéd-üzemet vagy a 10,5 kbit/s adat-csatornákat)	Digitalizált beszéd-üzemet és adat-csomag átitelt biztosít, de nem egyidőben.
4	0,6 4,8 10,5	Beszéd-üzem 21,0	2 vagy több adás 2 vagy több vétel	12 dB v. 6 dB (a 6 dB nem támasztja alá a 21,0 kbit/s beszéd-üzemet vagy a 10,5 kbit/s adat-csatornákat)	Egyidejű két-utas csomag és beszéd-üzem átvitel; lineáris erősítő és teljesítmény-szabályozás szükséges minden egyes vivőhullámnak.

MEGJEGYZÉSEK:

1. Néhány megvalósított berendezéssel alá lehet támasztani az áramkör-módú adat-szolgáltatást, de ezek nincsenek az AMSS SARP-okban meghatározva.

2. A 4,8 kbit/s csatorna csak a P-csatornára van alkalmazva.

A-2. táblázat. A legrosszabb eseti adat teljesítmény a csatorna átviteli sebességhez viszonyítva:

Minimális csatorna átviteli sebesség az AES általi használat-ban (bit/s)	Maximális kapcsolat létrehozási késés (95 százalék) (másod-perc)	Adat-továbbítási késés (átlagos) (másodperc)			Adatátviteli késés (95-ik százalékos) (másodperc)		
		Légijármű felé		Légijármű felől	Légijármű felé		Légijármű felől
		Legmaga-sabb elsőbbség	Legalacso-nyabb elsőbbség	Legmaga-sabb elsőbbség	Legmaga-sabb elsőbbség	Legalacso-nyabb elsőbbség	Legmagasabb elsőbbség
600	70	12	40	40	15	110	80
1200	45	8	25	30	9	60	65
2400	25	5	12	15	6	30	35
4800	25	4	7	13	5	20	30
10500	25	4	5	13	4	10	30

Maradék hiba-arány:
légijármű felőli irányból: 10^{-4} SNSDU-nként (maximum)
légijármű felé irányban: 10^{-6} SNSDU-nként (maximum)

1. Bármely adott AES-ben az alacsonyabb elsőbbségű légijármű felőli forgalom további késésnek lehet kitéve a légijármű felőli forgalmi terhelés mennyiségétől és mértékétől függően.

2. Az adási késések értékei 128 oktettes csomag méreten alapulnak.

A-3. táblázat. Q elsőbbségi szerkezet az AMSS továbbításokhoz

AMSS Q-szám	Funkció
15	Veszély/sürgősség beszéd; jelzés
14	Veszély/sürgősség adat közlemények
13	Fenntartva jelzés részére
12	Repülésbiztonság beszéd; jelzés
11	Repülésbiztonsági adat közlemények; irány-mérésre vonatkozó összeköttetések
10	Meteorológiai és repülés menetrendszerűségi beszéd; jelzés
9	Fenntartva jelzés részére
8	Meteorológiai adat közlemények
7	Repülés menetrendszerűségi adat közlemények
6	Légiforgalmi Tájékoztató Szolgálati Közlemények
5	Légiforgalmi adminisztratív adat közlemények, hálózat/rendszerek adminisztratív adat közlemények
4	Rutin pilótafülke és utastér hang; jelzés
3- 0	Különféle AAC és APC kategóriák; egyéb

A-4. táblázat: Frekvencia hiba halmaz a P-csatorna vételére

	Előírás	Szabvány eltérés
GES adási referencia hiba	$\pm 100\ Hz$	57,7 Hz
AFC ellenőrző adás hiba	$\pm 100\ Hz$	57,7 Hz
GES AFC hiba	$\pm 100\ Hz$	57,7 Hz
AES vevő referencia hiba	$\pm 155\ Hz$	89,5 Hz
Az oszcillátorra vonatkozó hibák az AES-nél		
- szabvány eltérés		134,2 Hz
- 99 százalékos határvonal		$\pm 345{,}6\ Hz$

MEGJEGYZÉSEK:

1. Elfogadott az, hogy az oszcillátor előírásai egy egységes hiba-megoszlást határoznak meg.

2. Az oszcillátorok számának hozzájárulása a teljes hibához a négyzetes középérték alapján került becslésre.

A-5. táblázat: AES - GES frekvencia hiba-halmaz egy P-csatorna referenciával

	Előírás (Hz)	Szabvány eltérés (Hz)
AES vevő referencia hiba × 1,07[1]		107
AES adás/vétel referencia hiba	(165 + 155) = 320	184,8
AES AFC hiba	100	57,5
AFC ellenőrző adás frekvencia-hiba[2]	75	43,3
GES AFC hiba[2]	100	57,7
Frekvencia-hiba a GES demodulátornál		
- szabvány eltérés		232,6
- 99 százalékos határvonal[3]		± 600

1. Ez az első három hozzájáruló tényezője a P-csatorna teljes frekvencia-hibájának . Az 1,07 tényező az adó és vevő frekvenciák megközelítőleges aránya.
2. A GES AFC hiba és az AFC ellenőrző adási hiba kombinációja hozza létre a műhold transzlációs oszcillátorának frekvencia-hibáját a visszatérő kapcsolaton.
3. Ez a GES demodulátor előírása.

A-6. táblázat. A megkívánt jellemző C-csatorna vivőfrekvencia-zaj sűrűségek

	Légijármű felé kapcsolat C-csatornák (beszéd-üzem)		Légijármű felől kapcsolat C-csatornák (beszéd-üzem)	
Magassági szög a műhold felé (fok)	5	20	5	20
Objektív FEC dekódoló kimenet BER	10^{-3}	10^{-3}	10^{-3}	10^{-3}
AES minimális antenna nyereség (dB)	12	12	12	12
Vivőhullám/több-utas viszony (dB)	10	12	10	12
Több-utas fading sávszélesség (Hz)	20–100	20–100	20–100	20–100
FEC kódolási sebesség	1/2	1/2	1/2	1/2
Moduláció mód	A-QPSK	A-QPSK	A-QPSK	A-QPSK
Elméletileg megkövetelt E_s/N_o (dB)	1,2	0,6	1,2	0,6
Modem kivitelezési veszteség (dB)	1,1	0,9	1,1	0,9
Tökéletlen beillesztési veszteség (dB)	3,0	1,2	3,0	1,2
Szomszéd csatorna interferencia veszteség (dB)	0,1	0,1	0,8	0,8
Modem E_0/N_0 (dB) megkívánt	5,4	2,8	6,1	3,5
MEGKÍVÁNT C/N_o (dBHz) 21,0 kbit/s	48,6	46,0	49,3	46,7

A-7. táblázat. A megkívánt jellemző P-csatorna vivőfrekvencia-zaj sűrűségek

	Légijármű felé kapcsolat P-csatornák (alacsony sebességű adat)		Légijármű felékapcsolat P-csatorna (nagy-sebességű adat)	
Maagassági szög a műholdhoz (fok)	5	20	5	20
Objektív FEC dekódoló kimenet BER	10^{-5}	10^{-5}	10^{-5}	10^{-5}
AES minimális antenna nyereség (dB)	0	0	12	12
Vivőhullám/több-utas viszony (dB)	7	12	10	12
Többutas fading sávszélesség (Hz)	20–100	20–100	20–100	20–100
FEC kódolási sebesség	1/2	1/2	1/2	1/2
Moduláció mód	A-BPSK	A-BPSK	A-QPSK	A-QPSK
Elméletileg megkövetelt E_s/N_o (dB)	5,0	3,5	2,8	2,4
Modem kivitelezési veszteség (dB)	1,2	1,1	1,5	1,1
Tökéletlen beillesztési veszteség (dB)	1,0	0,5	1,0	0,5
Szomszédos csatorna interferencia veszteség (dB)[1]	0,1	0,1	0,1	0,1

Modem E_s/N_o (dB) megkívánt	7,3	5,2	5,4	4,1
MEGKÍVÁNT C/N_o (dBHz)				
0,6 kbit/s	35,0	32,9		
1,2 kbit/s	38,1	36,0		
2,4 kbit/s	41,1	39,0		
4,8 kbit/s			42,2	40,9
10,5 kbit/s			45,6	44,3

MEGJEGYZÉSEK:

1. A szomszéd csatorna interferencia veszteség a csatorna elkülönítés függvénye. A példa veszteségek 2,4 illetve 10,5 kbit/s csatorna átviteli sebességeknél A-BPSK illetve A-QPSK. A veszteségek nem lehetnek nagyobbak a többi csatorna átviteli sebességek esetén, mivel a csatorna elkülönítés a csatorna átviteli sebességhez viszonyítva nagyobb lesz.

2. Az alacsony adat sebességek (A-BPSK) ugyancsak használhatók nagy antenna nyereséggel, potenciálisan kisebb megkívánt C/N_o-val.

A-8. táblázat. A megkívánt jellemző R/T-csatorna vivőfrekvencia-zaj sűrűségek

	Légijármű felől kapcsolat R/T-csatorna (alacsony sebességű adat)		Légijármű felől kapcsolat R/T-csatorna (nagy-sebességű adat)	
Magassági szög a műhold felé (fok)	5	20	5	20
Objektív FEC dekódoló kimenet BER	10^{-5}	10^{-5}	10^{-5}	10^{-5}
AES minimális antenna nyereség (dB)	0	0	12	12
Vivőhullám/több-utas viszony (dB)	7	12	10	12
Több-utas fading sávszélesség (Hz)	20–100	20–100	20–100	20–100
FEC kódolási sebesség	1/2	1/2	1/2	1/2
Moduláció mód	A-BPSK	A-BPSK	A-QPSK	A-QPSK
Elméletileg megkövetelt E_s/N_o (dB)	5,0	3,5	2,8	2,4
Modem kivitelezési veszteség (dB)	1,2	1,1	1,5	1,1
Tökéletlen beillesztési veszteség (dB)[1]	1,2	0,6	1,0	0,5
Szomszéd csatorna interferencia veszteség (dB)[2]	0,1	0,1	0,4	0,4
Modem E_s/N_o (dB) megkívánt	7,5	5,3	5,7	4,4
MEGKÍVÁNT C/N_o (dBHz)				
0,6 kbit/s	35,0	32,9		
1,2 kbit/s	38,1	36,0		
2,4 kbit/s	41,3	39,1		
4,8 kbit/s			42,5	41,2
10,5 kbit/s			45,9	44,6

MEGJEGYZÉSEK:

1. A beillesztési veszteség a csatorna átviteli sebesség függvénye, a példa veszteségek 2,4 illetve 10,5 kbit/s csatorna átviteli sebességeknél A-BPSK-ra illetve A-QPSK-ra vonatkoznak.

2. A szomszéd csatorna interferencia veszteség a csatorna elkülönítés függvénye. A példa veszteségek 2,4 illetve 10,5 kbit/s csatorna átviteli sebességeknél A-BPSK-ra, illetve A-QPSK-ra vonatkoznak. A veszteségek nem lehetnek nagyobbak a többi csatorna átviteli sebességek esetén, mivel a csatorna elkülönítés a csatorna átviteli sebességhez viszonyítva nagyobb lesz.

3. Az alacsony adat sebességek (A-BPSK) ugyancsak használhatók nagy antenna nyereséggel potenciálisan kisebb megkövetelt C/N_o-val.

A-9. táblázat. Csatorna távolságok

Csatorna átviteli sebesség (kbit/s)	Csatorna távolság (kHz)	Moduláció
21,0	17,5	A-QPSK
10,5	10,0/7,5[1]	A-QPSK
8,4	7,5	A-QPSK
6,0	5,0	A-QPSK
5,25	5,0	A-QPSK
4,8	5,0	A-QPSK
2,4	5,0	A-BPSK
1,2	5,0/2,5[2]	A-BPSK
0,6	5,0/2,5[2]	A-BPSK

MEGJEGYZÉSEK:

1. A csatorna távolságok a 10,5 kbit/s-os csatornáknál 10,0 vagy 7,5 kHz lehet, a működő műholdon a teljesítmény és sávszélesség relatív rendelkezésre állásának megfelelően.

2. Az 5,0 kHz csatorna távolság érvényes a P-csatornára és 2,5 kHz érvényes az R- és T-csatornára.

A-10. táblázat. Jellemző értékek a legkorábbi indulási idők számításához

P-csatorna bit sebesség bit/s	P-csatorna egység késés(ek)	Sorbaállítási késés(ek)	AES feldolgozás késés(ek)
600	3,0	0,7	1,8
1200	2,0	0,5	1,2
≥ 1200	1,5	0,5	1,0

A-11. táblázat. Minimális átmenő teljesítmény értékek
(minimálisan elérhető átmenő teljesítmény egy al-hálózat összekapcsoláson, bitek/s, 128 oktettes csomagokkal)

Minimális csatorna átviteli sebesség az AES általi használatban (bit/s)	Légijármű felé		Légijármű felől	
	Legmagasabb elsőbbségű szolgáltatás	Legalacsonyabb elsőbbségű szolgáltatás	Legmagasabb elsőbbségű szolgáltatás	Legalacsonyabb elsőbbségű szolgáltatás
600	70	35	35	30
1200	130	70	100	80
2400	150	90	300	275
4800	160	110	500	475
10500	165	115	500	475

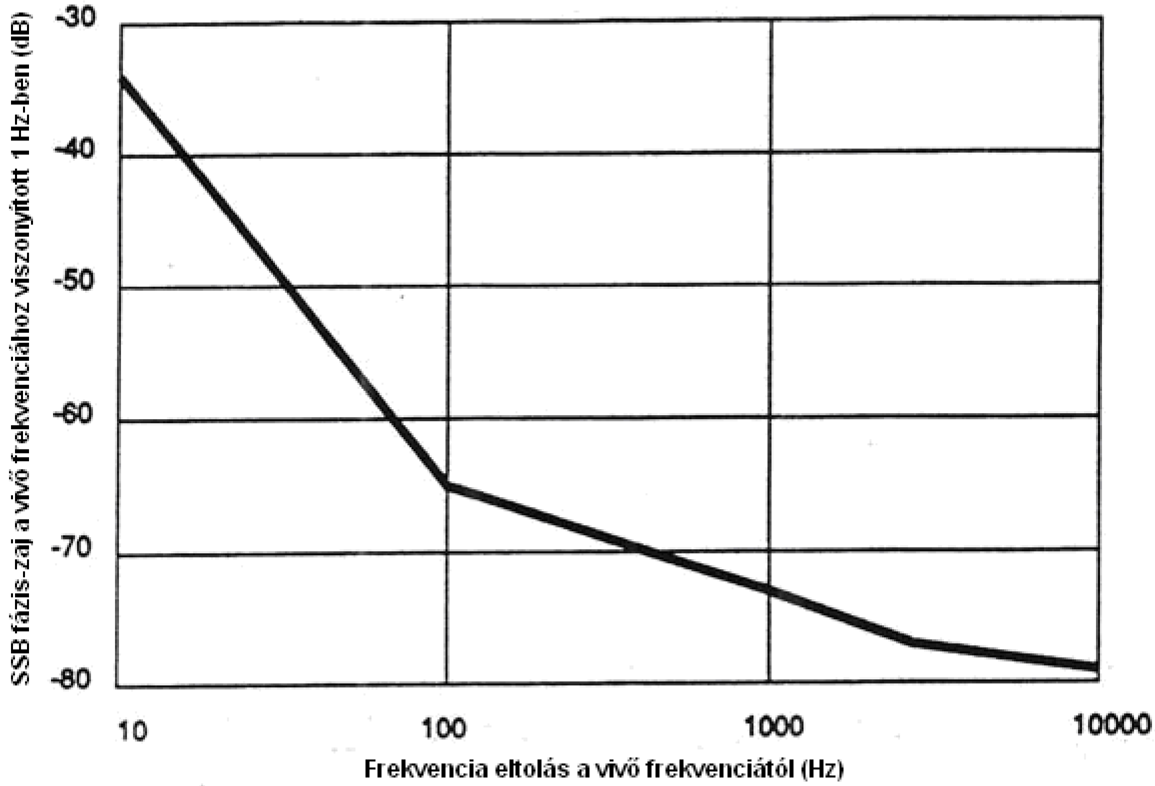
A-12. táblázat. Legalább egy rövidített hozzáférési kérés SU kézbesítésének valószínűsége (százalék)

Hívás elsőbbség (sorozat hossz)	1-SU impulzus-kötegekből álló ellentétes forgalom	3-SU impulzuskötegekből álló ellentétes forgalom
Veszély/sürgősség (4)	99,99	97,9
Repülésbiztonság (3)	99,7	93,7
Menetrendszerűség/Meteorológia (2)	97,5	89,2

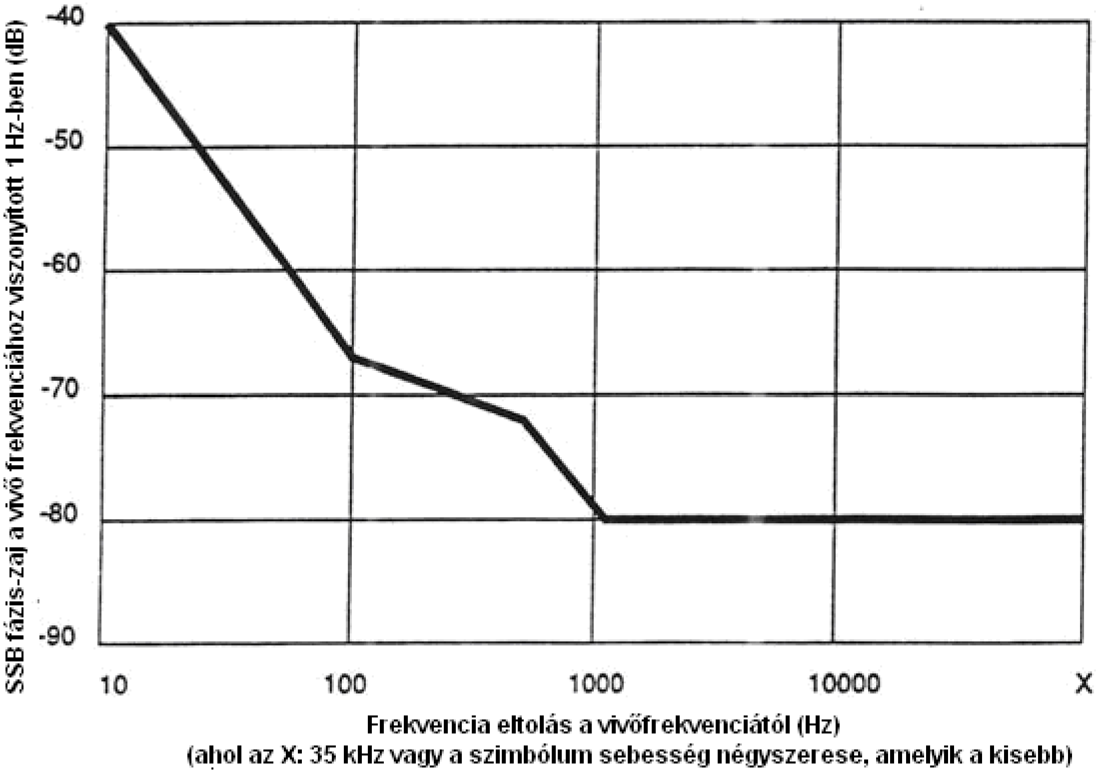
A-13. táblázat. Tervezett AMS(R)S al-hálózat rövidített hívás létesítés késés teljesítmény (másodperc)
(600 és 10500 bit/s átviteli sebességgel működő R- és P-csatornák)

		Átlagos	**95 százalékos**
LÉGI KEZDEMÉNYE-ZÉSEK	**AMS(R)S al-hálózat jelzés továbbítási késés** (A különbség azon időpont - amelynél egy légi kezdeményezésű hívás kérést (bejövő FITE 18) vesznek az AES összedolgozó interfésznél - és azon időpont között, amikor a GES továbbítja az ebből származó hívás jelzést (kimenő FITE 18) a földi telepítésű hálózathoz.)	4 [@ 600 bit/s] 3 [@ 10 500 bit/s]	6-tól 11-ig [@ 600 bit/s] 3-tól 7-ig [@ 10 500 bit/s]
	Hívás beállítás késés (Különbség azon időpont - amelynél egy légi kezdeményezésű hívás kérést (bejövő FITE 18) vesznek az AES összedolgozó interfésznél - és azon időpont között, amikor a C-csatorna készen áll a beszéd-üzemre.)	12-től 14-ig [@ 600 bit/s] 10-től 11-ig [@ 10 500 bit/s]	14-től 23-ig [@ 600 bit/s] 11-től 14-ig [@ 10 500 bit/s]
FÖLDI KEZDEMÉNYE-ZÉSESEK	**Hívás beállítás késés** (Különbség azon időpont - amelynél egy földi hívás kérést (bejövő FITE 18) vesznek a GES összedolgozó interfésznél - és azon időpont között, amikor a C-csatorna készen áll a beszéd-üzemre és az AES továbbítja az ebből származó hívás jelzést (kimenő FITE 18) az AES összedolgozó interfészhez.)	9-től 11-ig [@ 600 bit/s] 9 [@ 10 500 bit/s]	10-től 17-ig [@ 600 bit/s] 10 [@ 10 500 bit/s]

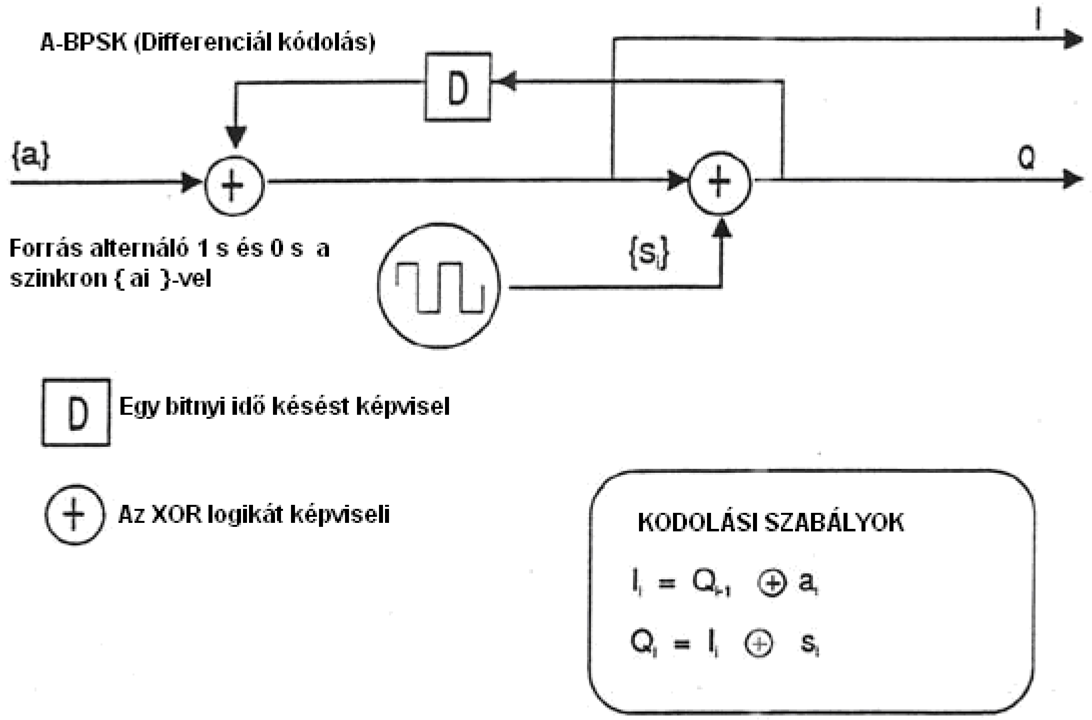
AZ „A” MELLÉKLET ÁBRÁI

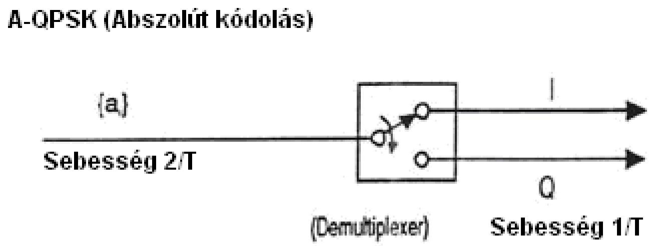


A-1. ábra: Az AES által vett L-sáv jelek fázis-zaja

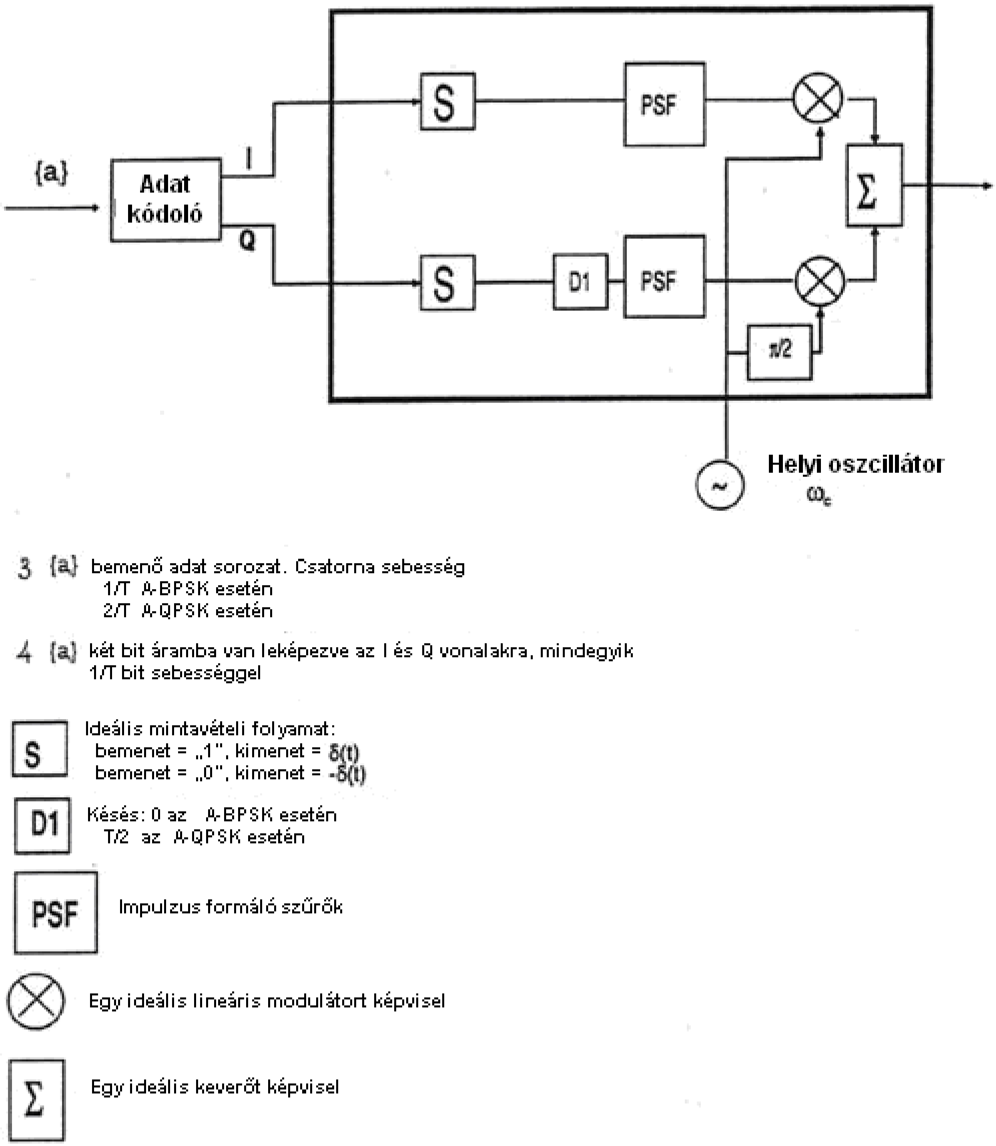


A-2. ábra: AES adás fázis-zaj maszk

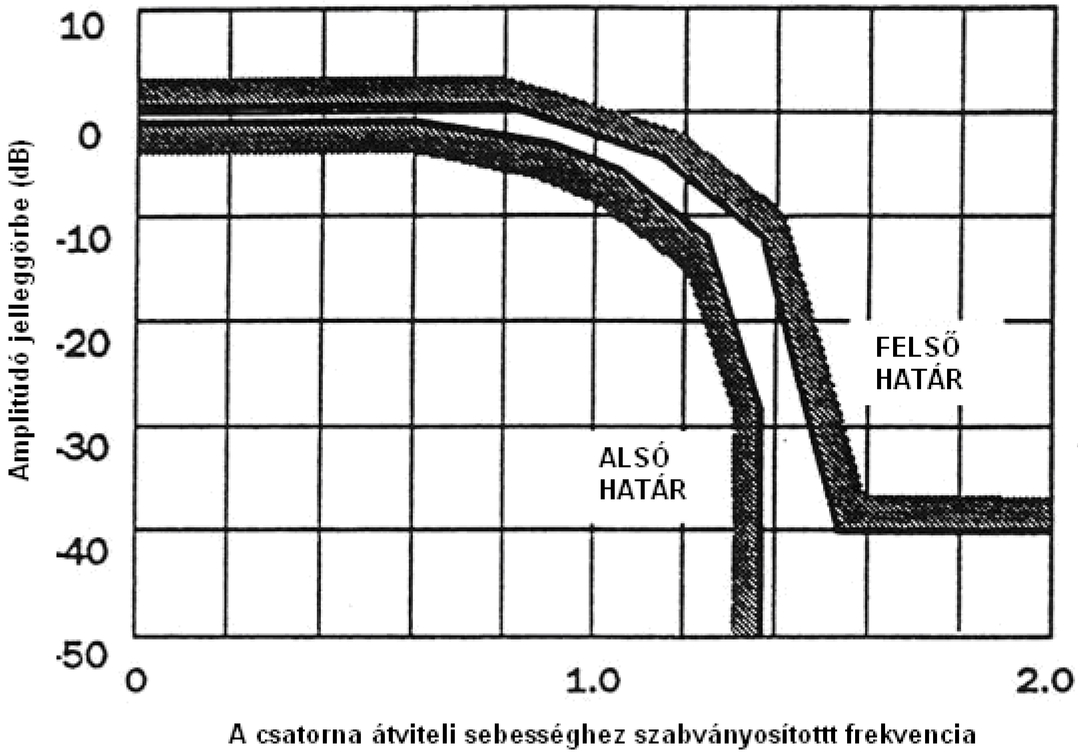




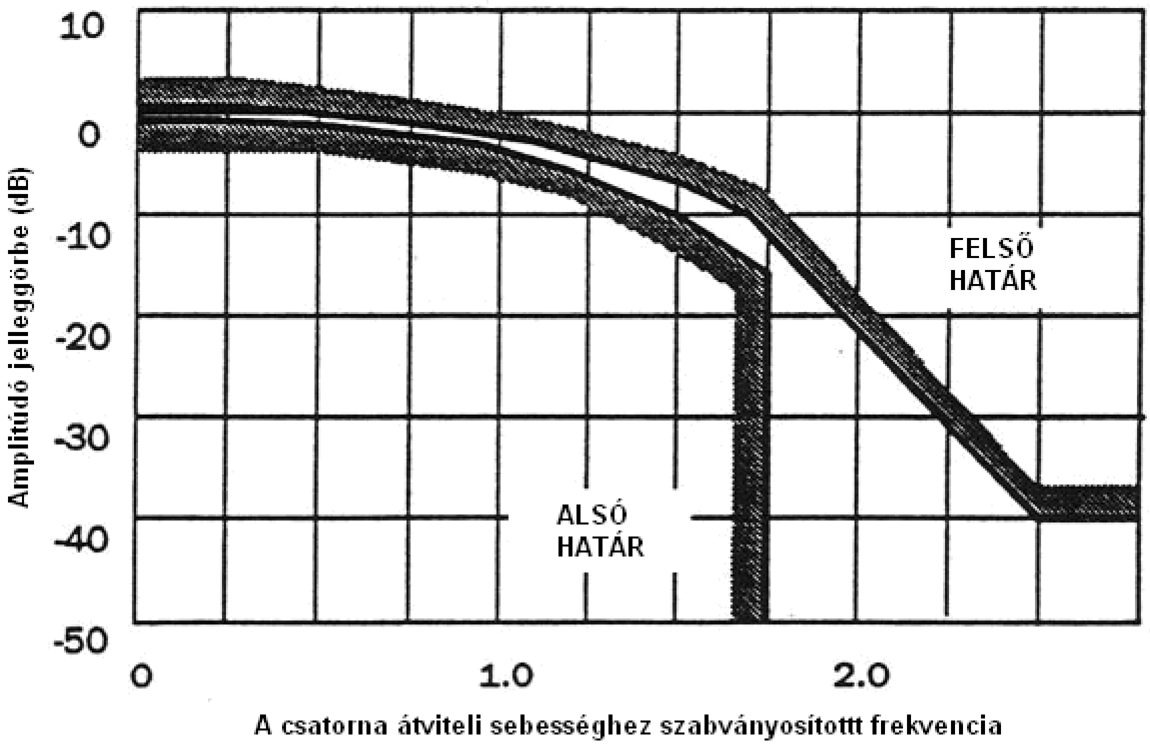
A-3. ábra: Adat kódolók a modulátor modellhez



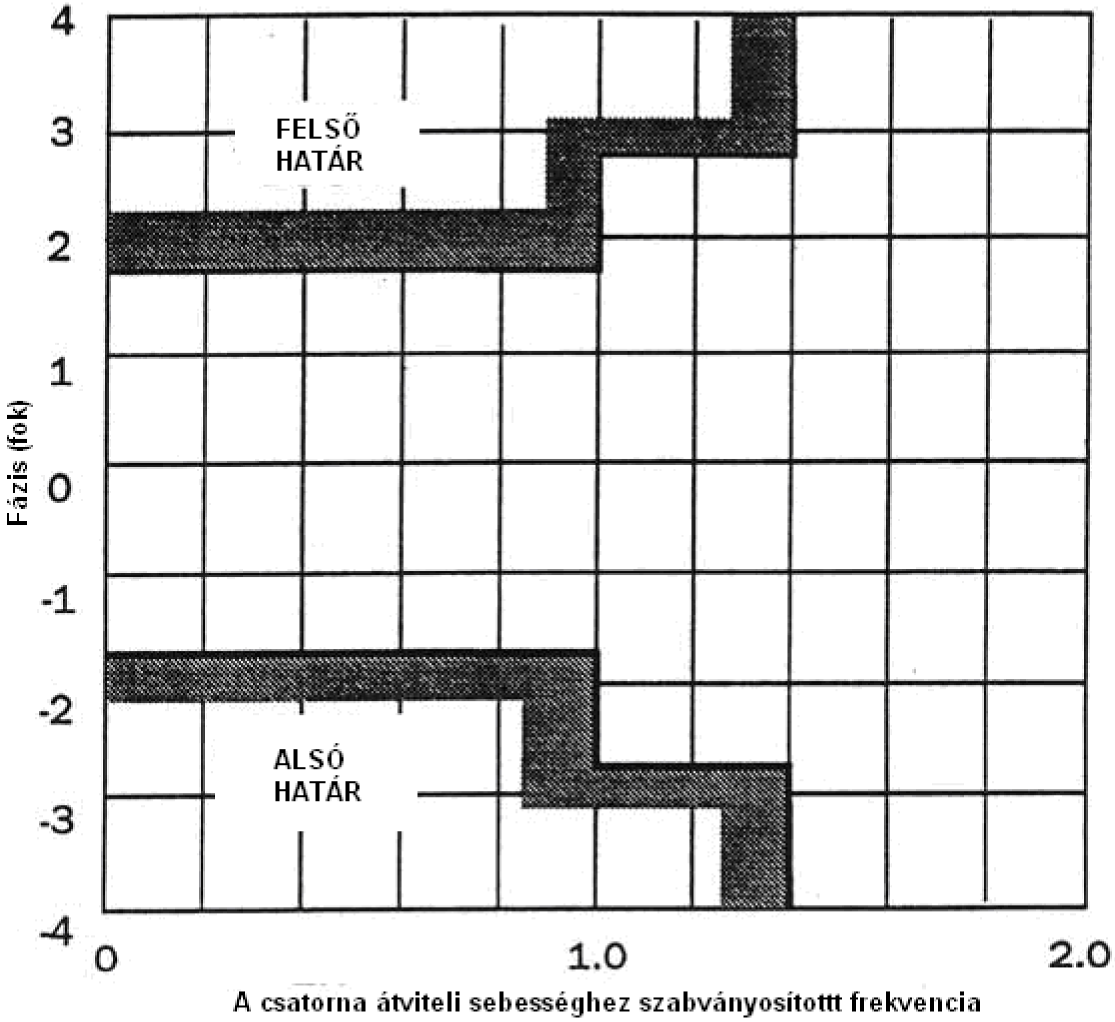
A-4. ábra: Ideális modulátor (A-BPSK és A-QPSK)



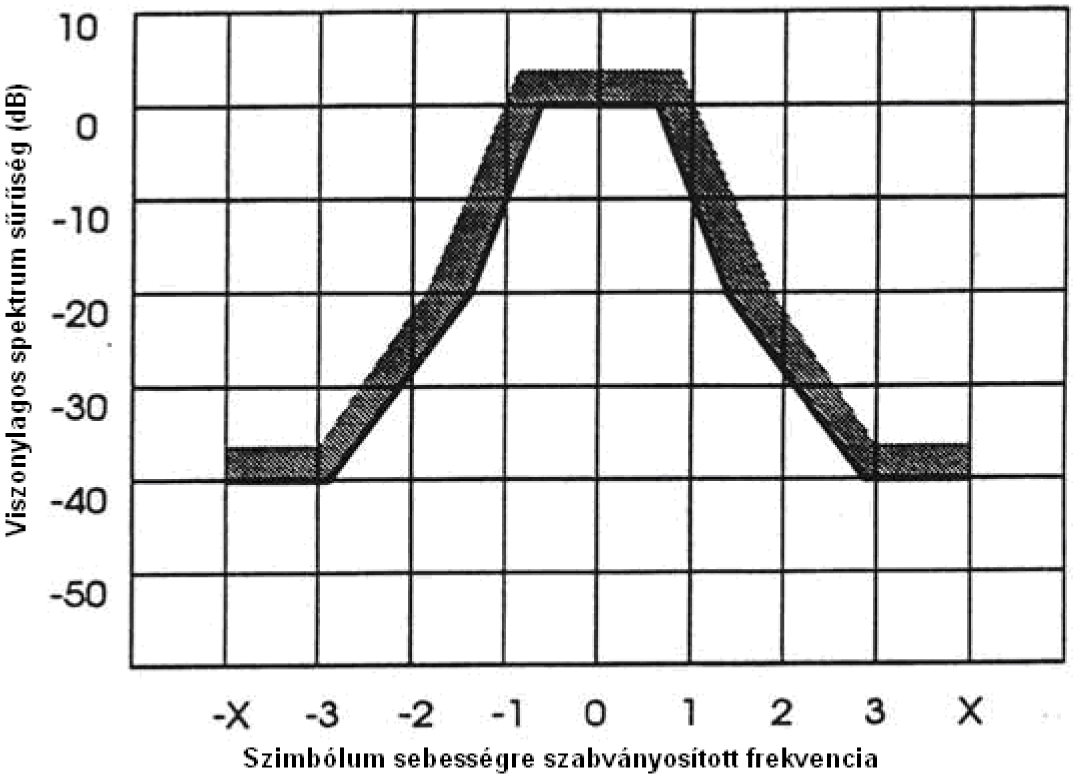
A-5. ábra: AES A-BPSK átviteli szűrő jelleggörbe maszk



A-6. ábra: AES A-QPSK átviteli szűrő jelleggörbe maszk 100 százalékos határértékkel



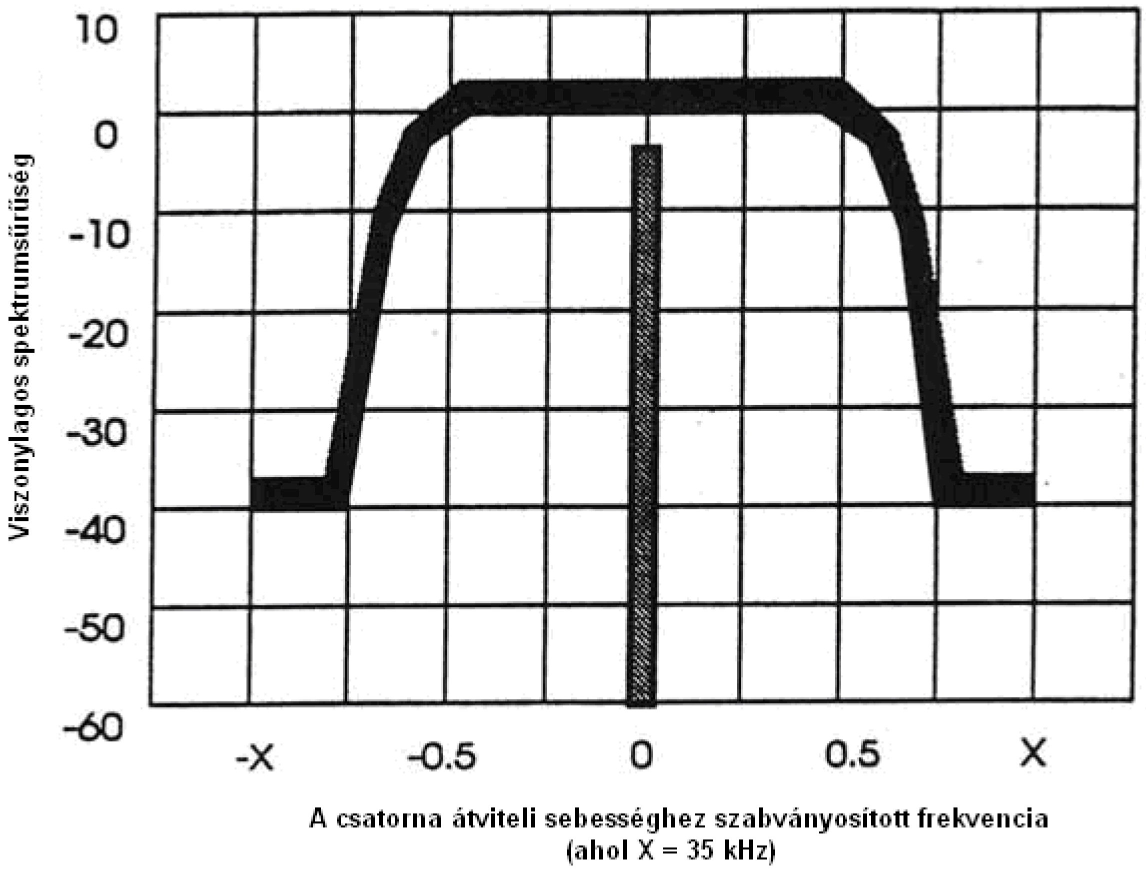
A-7. ábra: Fázis-eltérés tűrés A-BPSK és A-QPSK adás szűrő jelleggörbe maszk, 100 százalékos határértékkel



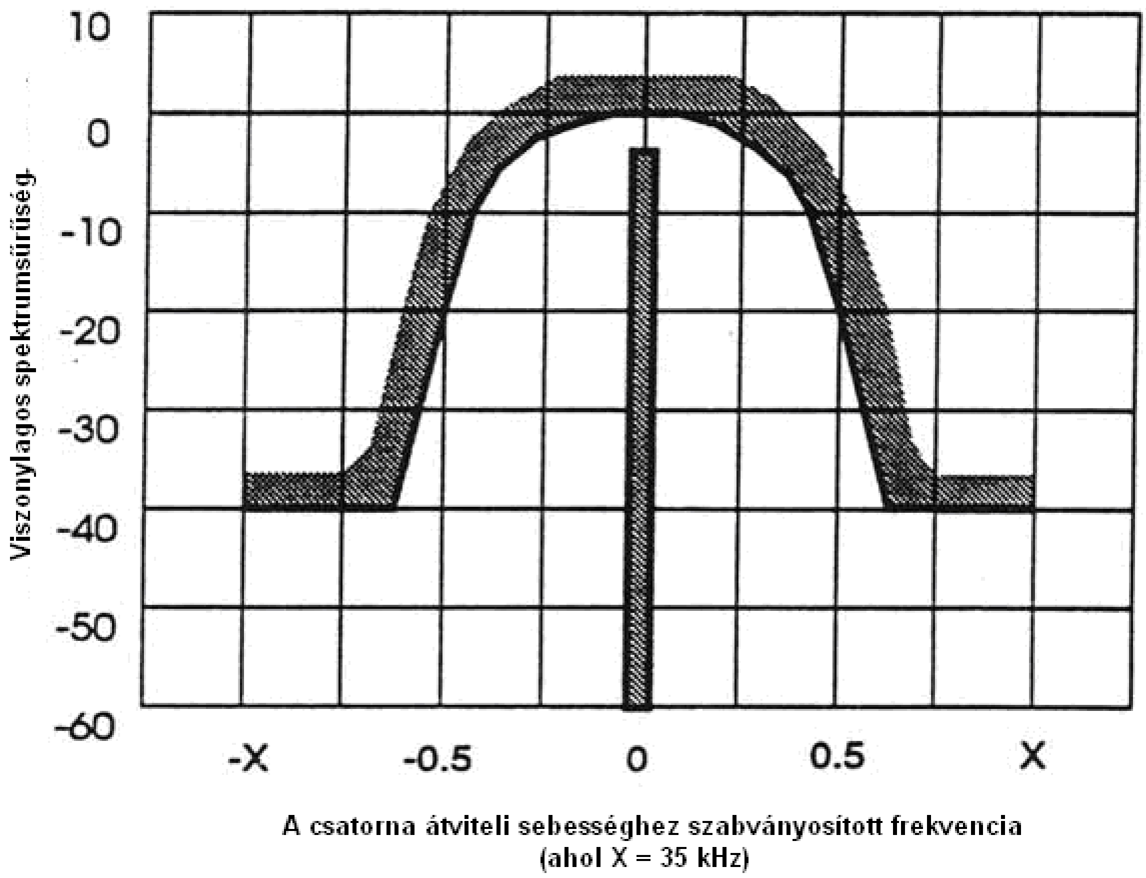
MEGJEGYZÉSEK:

1. A szimbólum sebesség egyenlő a csatorna átviteli sebesség az A-BPSK-nál és a csatorna átviteli sebesség fele az A-QPSK-nál.
2. Az X frekvencia 35 kHz.

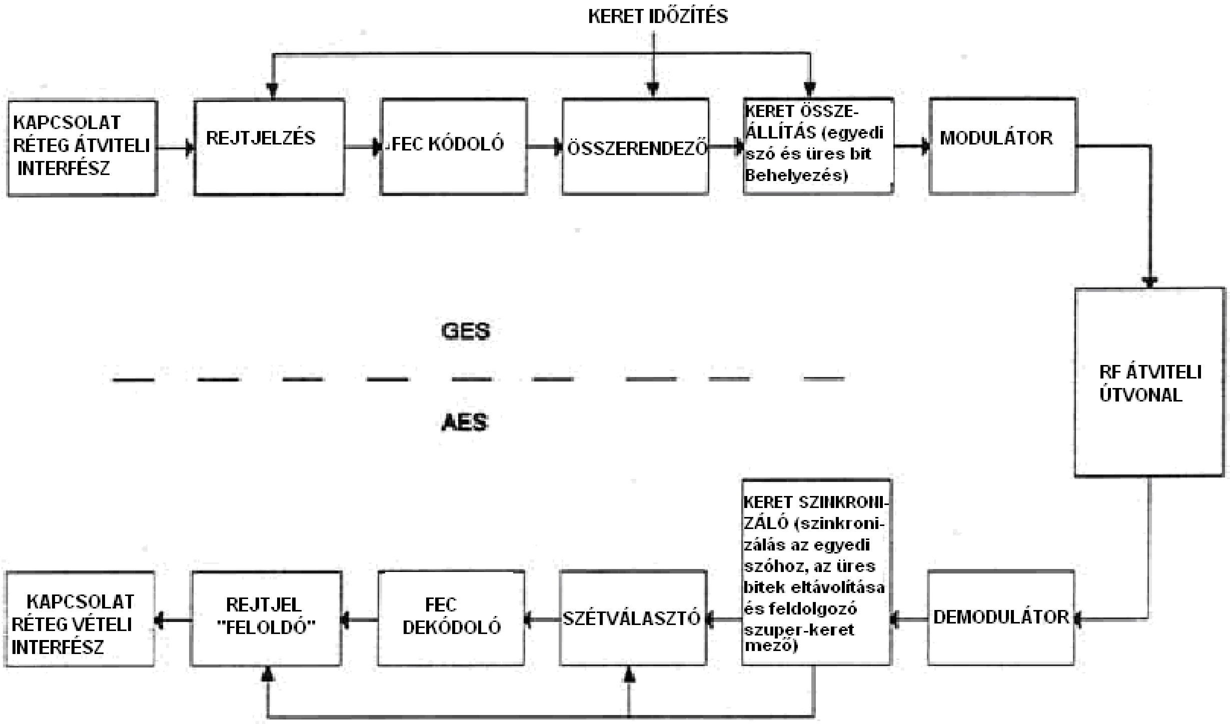
A-8. ábra: Megkívánt spektrális határértékek az AES átviteleknél 100 százalékos határértékkel



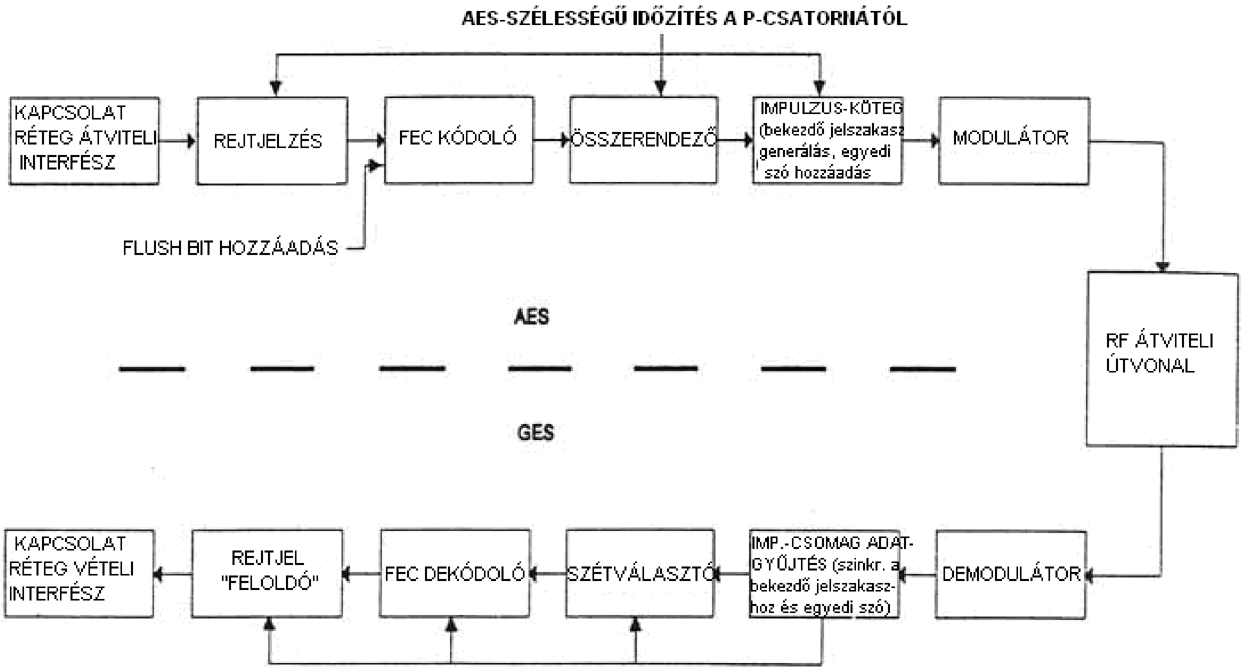
A-9. ábra: Az AES által vett A-BPSK spektrális maszkja



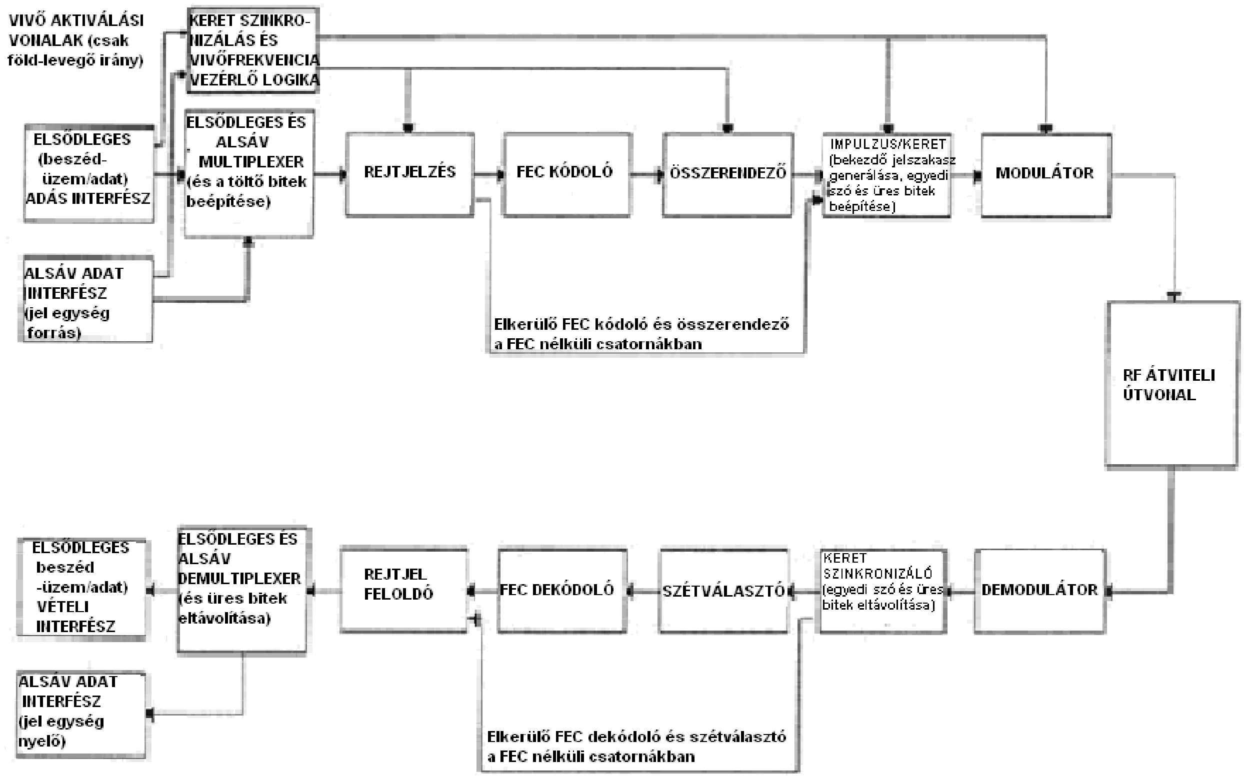
A-10. ábra: Az AES által vett A-QPSK spektrális maszkja



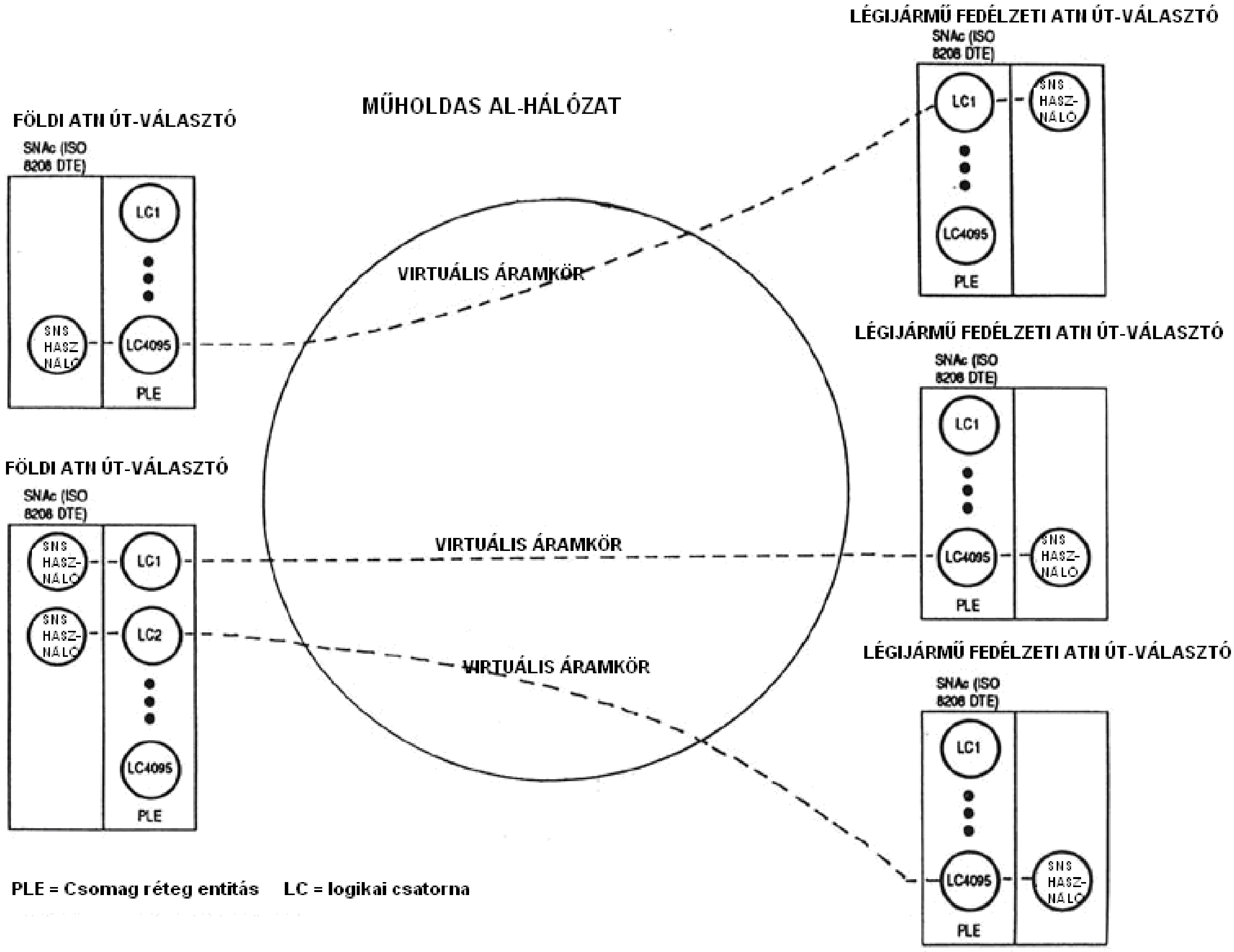
A-11. ábra: P-csatorna funkcionális blokkvázlat



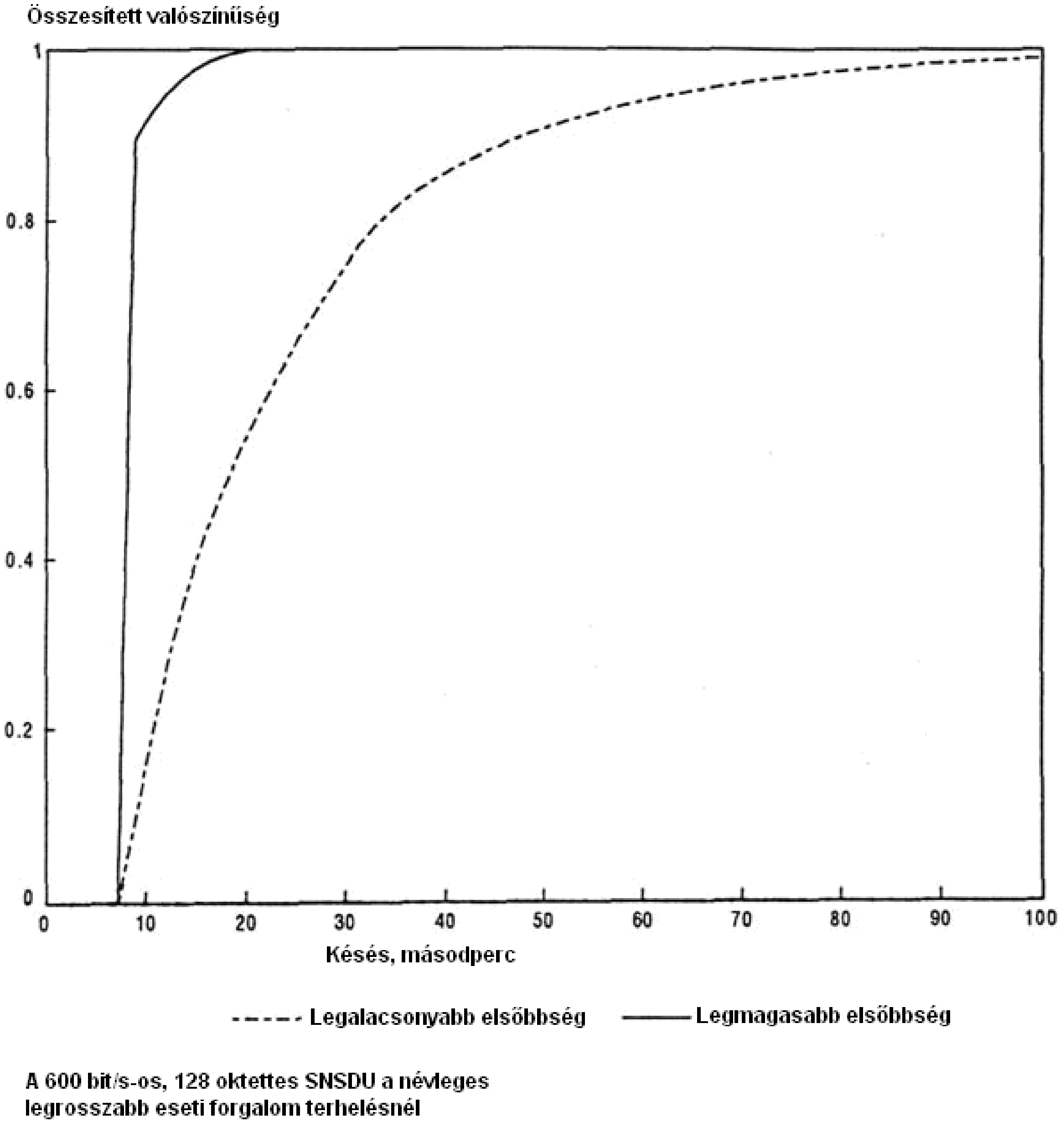
A-12. ábra: Az R- és T -csatorna funkcionális blokkvázlata



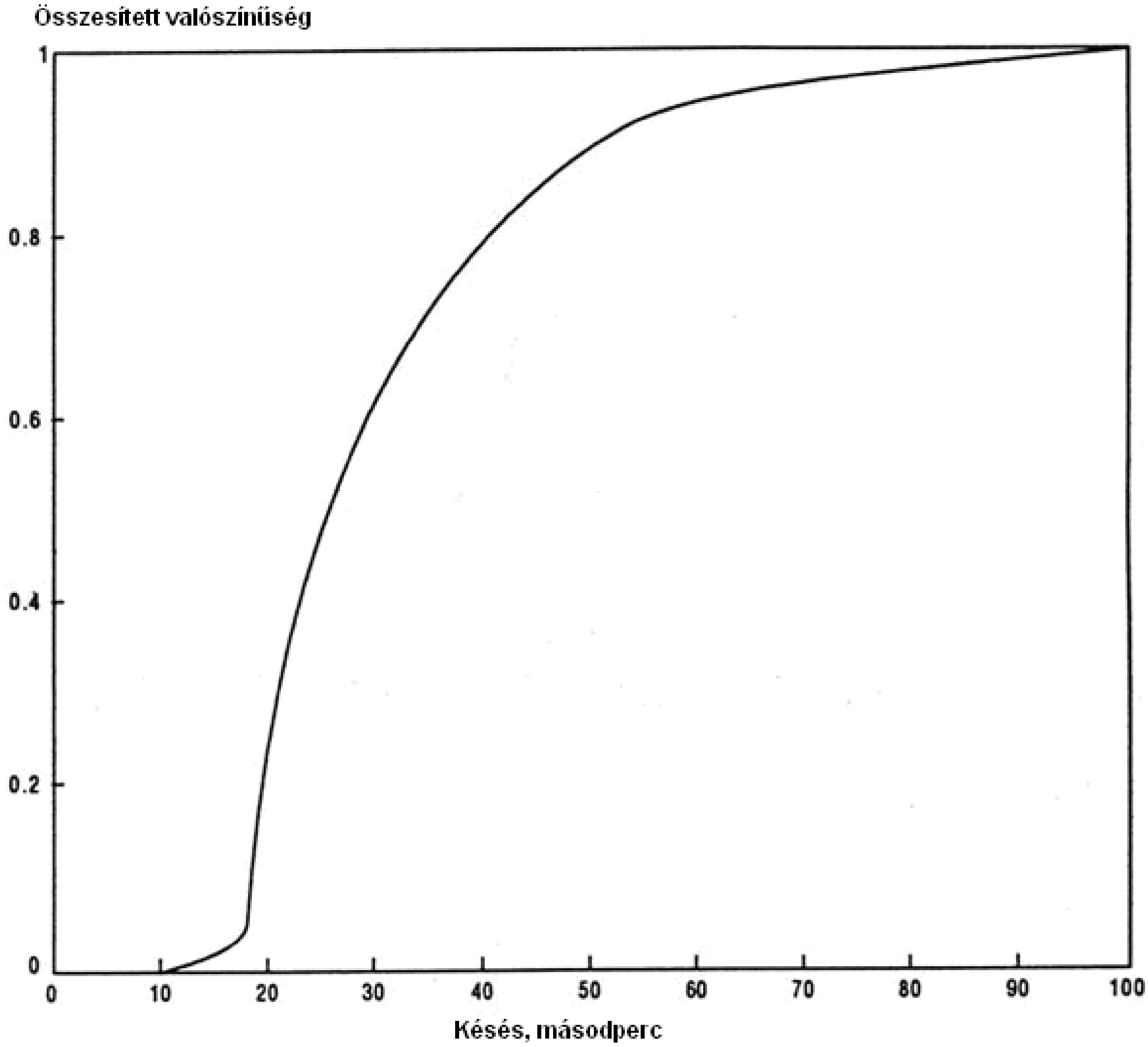
A-13. ábra: C-csatorna funkcionális blokkvázlat



A-14. ábra: Műholdas al-hálózat kapcsolat-orientált csomag adat szolgáltatás

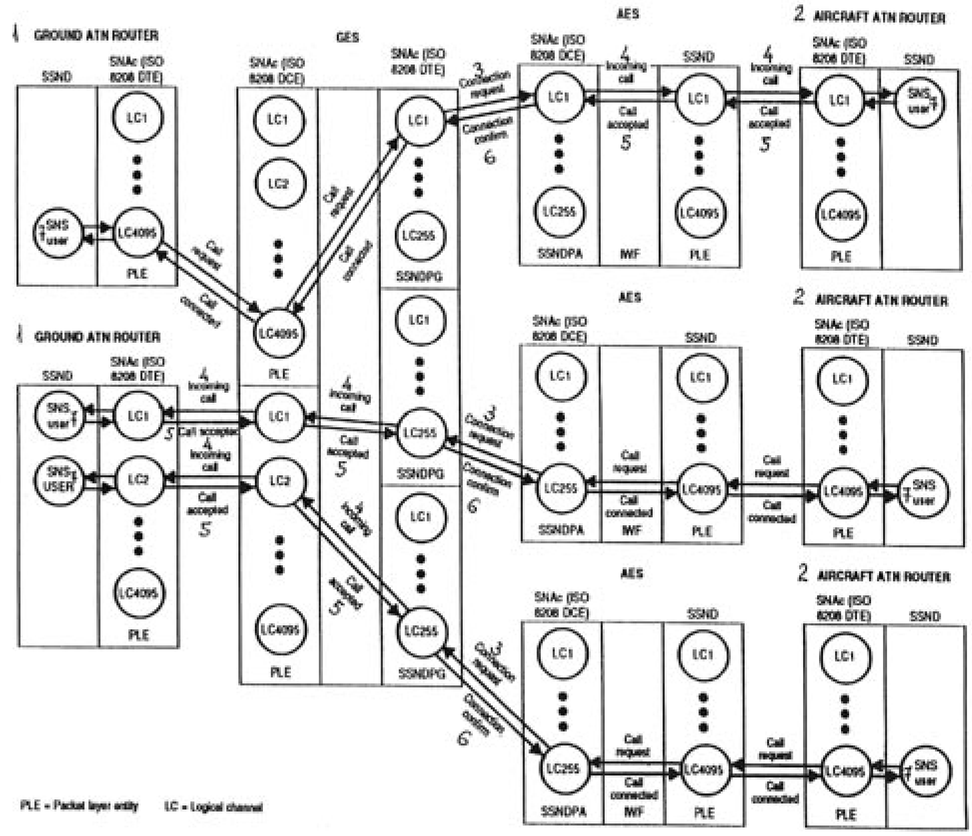


A-15. ábra: Jellemző légijármű felé késés eloszlások



A 600 bit/s-os, 128 oktettes SNSDU a névleges legrosszabb eseti forgalom terhelésnél, legmagasabb elsőbbség szolgáltatás

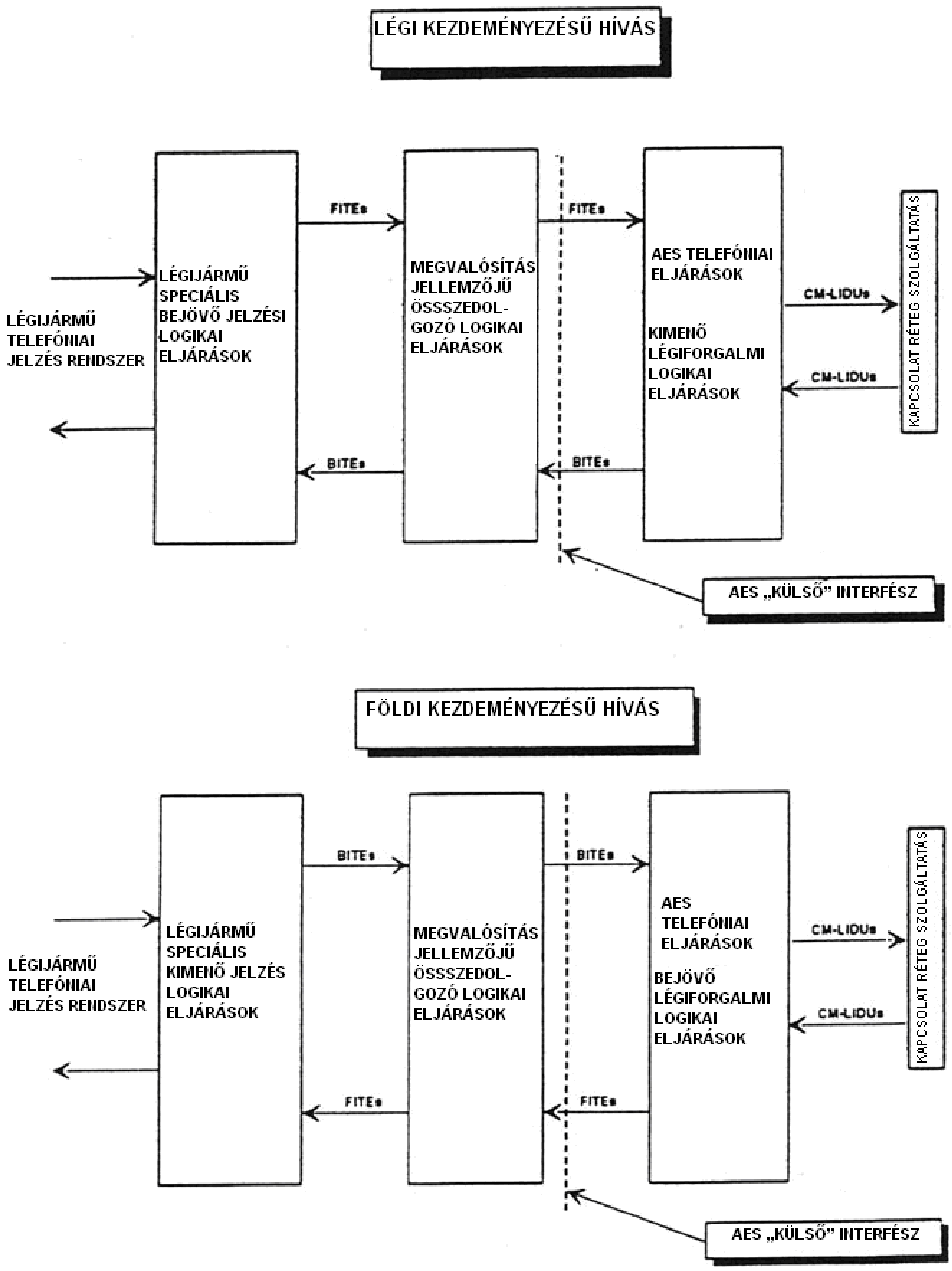
A-16. ábra: Jellemző légijármű felől késés eloszlások



A-17. ábra: Műholdas al-hálózat protokol entitás és virtuális áramkör létesítés

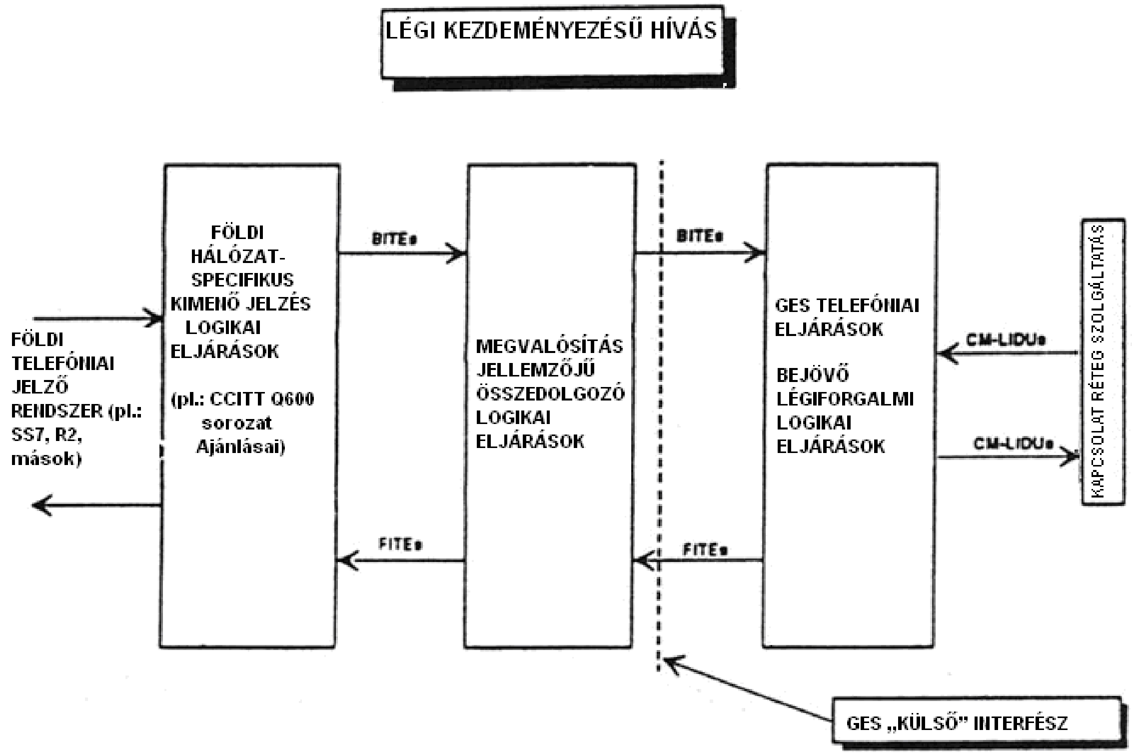
A-17 ábra szövegei:
1 FÖLDI ATN ÚT-VÁLASZTÓ
2 LÉGIJÁRMŰ FEDÉLZETI ÚT-VÁLASZTÓ
3 KAPCSOLAT KÉRÉS
4 BEJÖVŐ HÍVÁS
5 HÍVÁS FOGADÁS
6 KAPCSOLAT MEGERŐSÍTÉS
7 SNS FELHASZNÁLÓ /MŰHOLD SZOLGÁLTATÁS FELHASZNÁLÓ/
PLE = Csomag réteg entitás
LC = Logikai csatorna

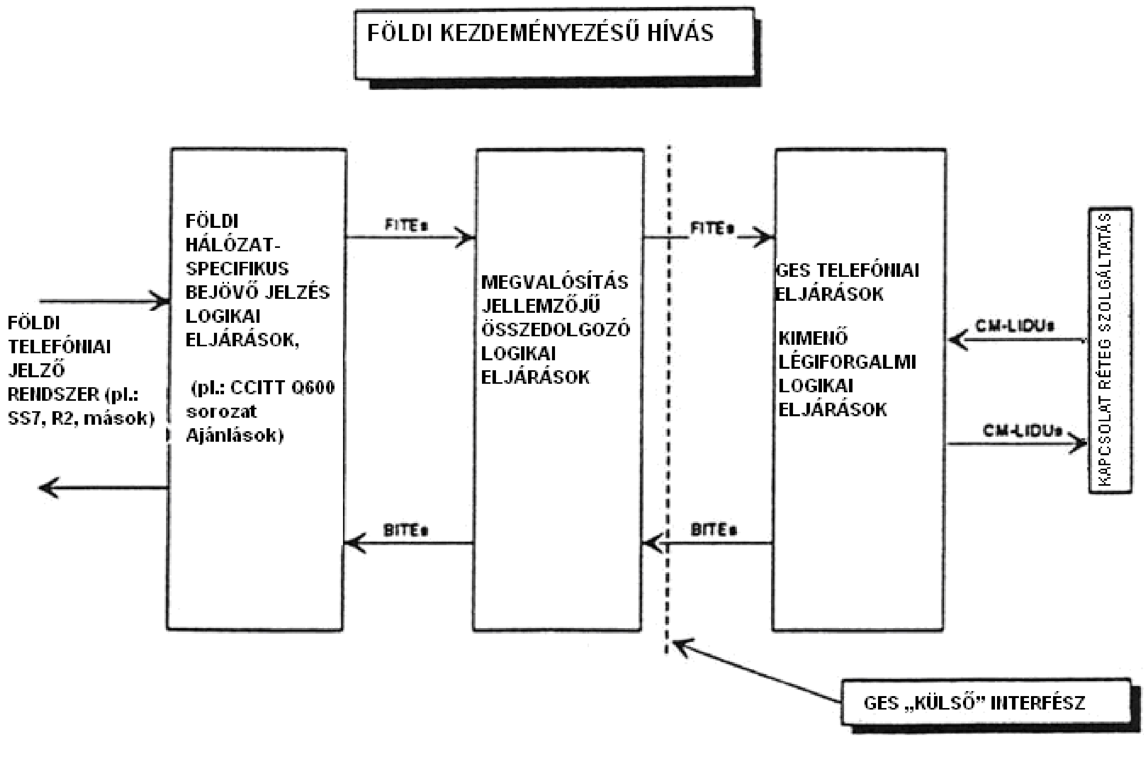
AES TELEFÓNIAI ÖSSZEDOLGOZÓ FUNKCIONÁLIS BLOKK-VÁZLAT



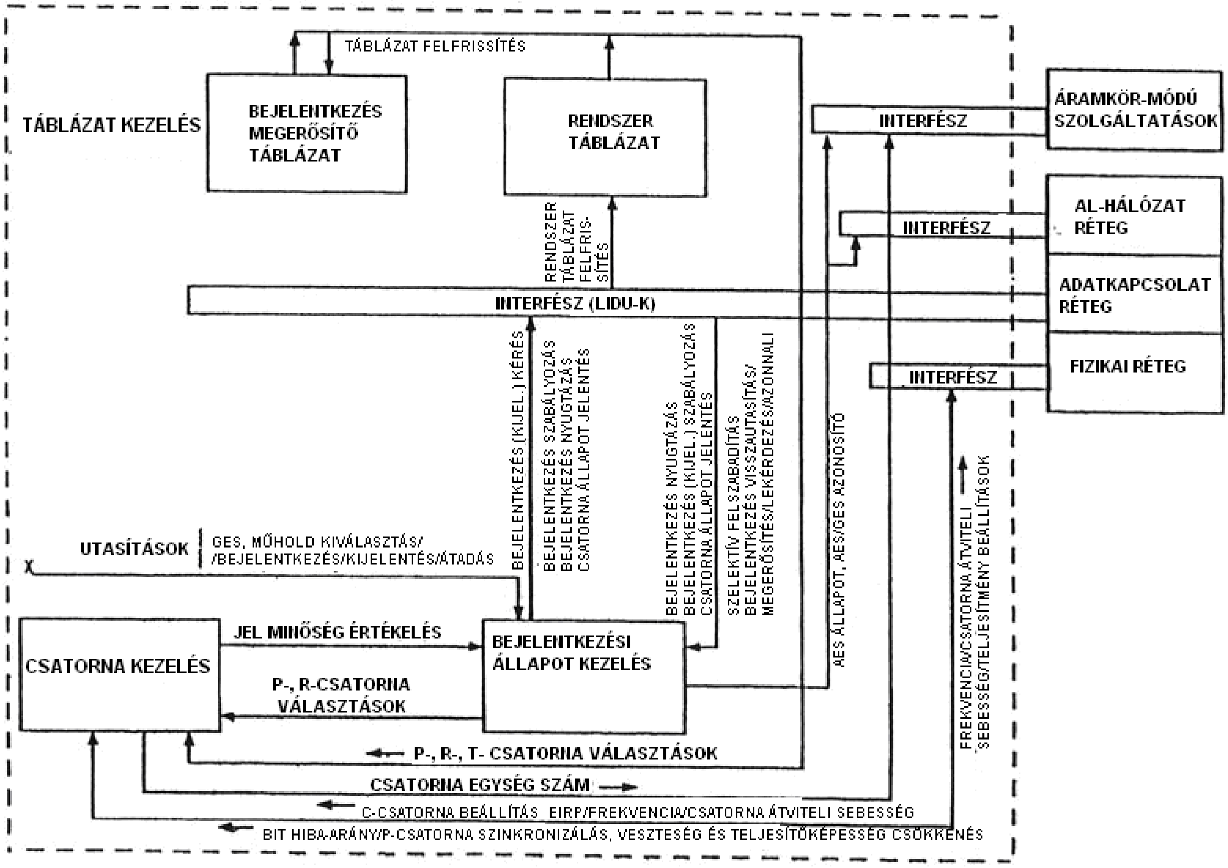
A-18. ábra: AES telefóniai összedolgozó blokk-vázlat

GES TELEFÓNIAI ÖSSZEDOLGOZÓ FUNKCIONÁLIS BLOKK-VÁZLAT

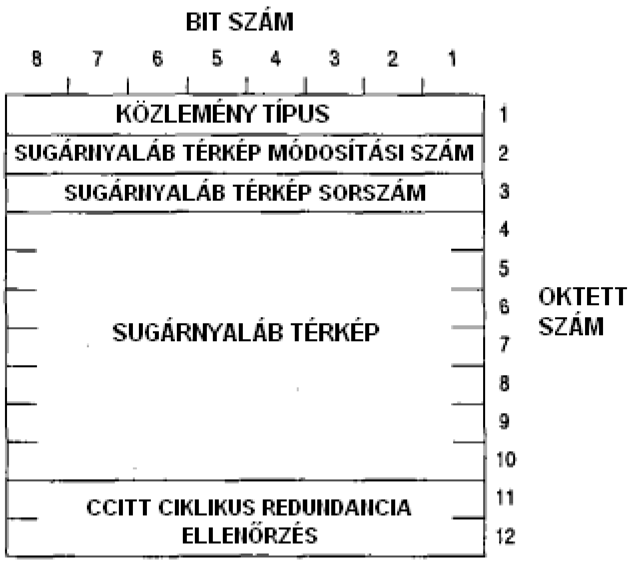




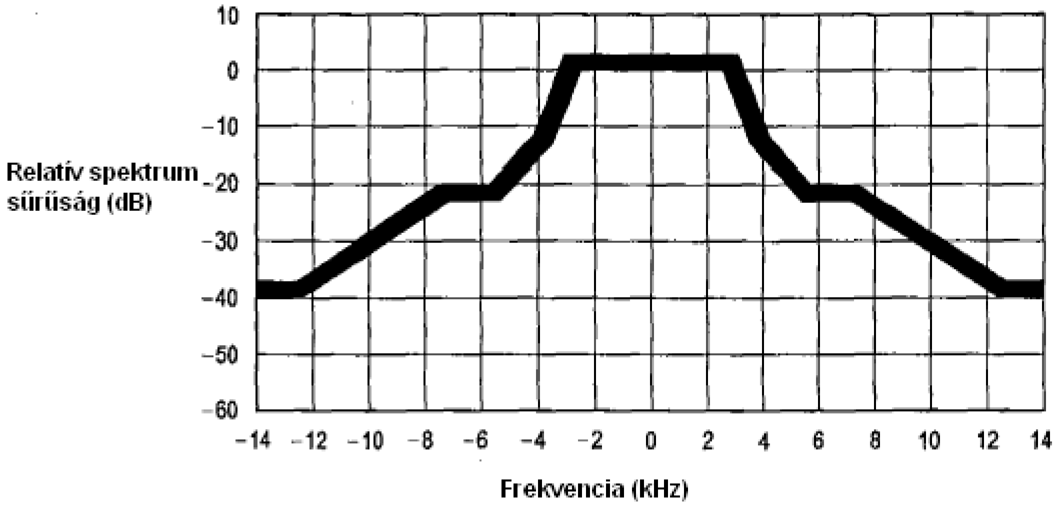
A-19. ábra: GES telefóniai összedolgozó blokk-vázlat



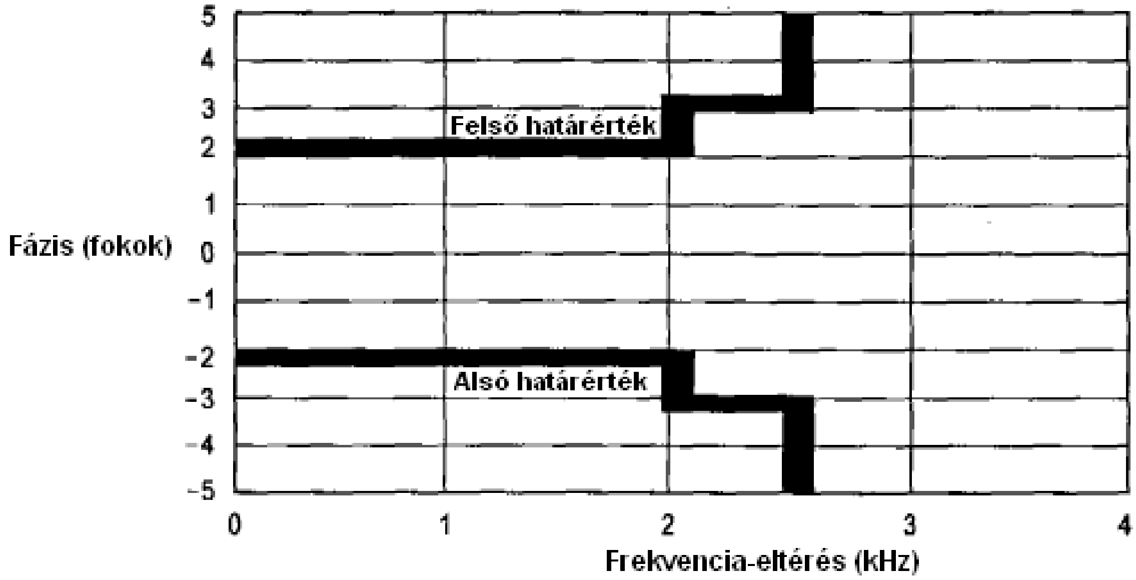
A-20. ábra: AES kezelés és interfészek



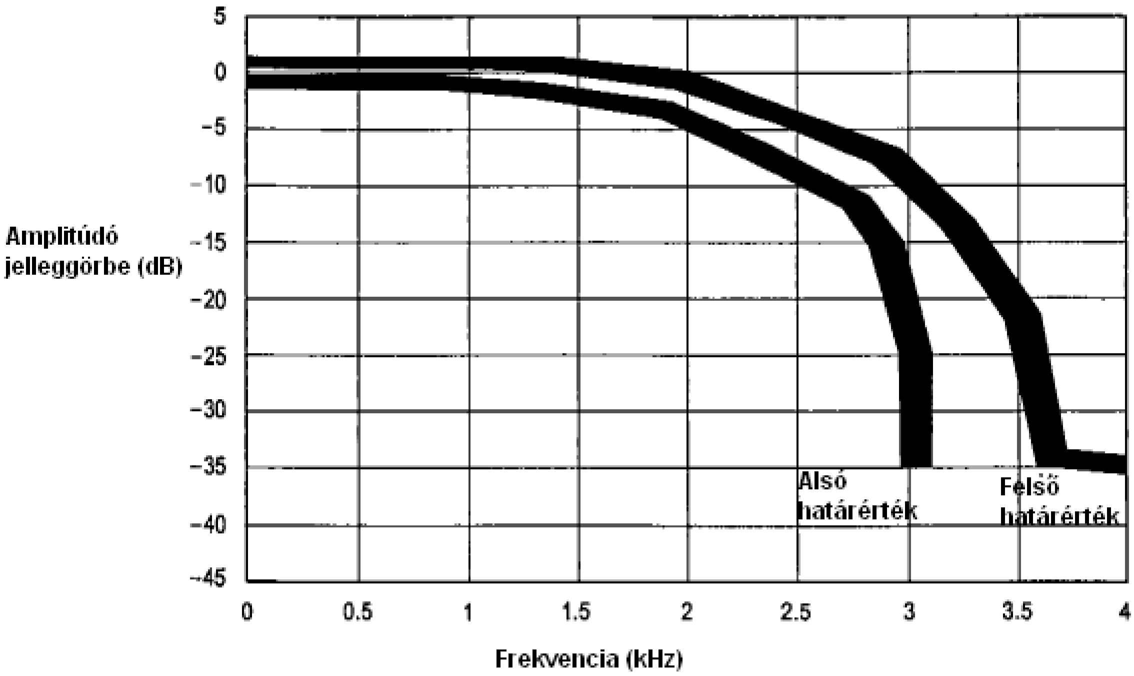
A-21. ábra: Sugárnyaláb térkép sugárzás



A-22. ábra: A megkívánt spektrális határértékek az AES átvitelekre, 60 százalékos határértékkel



A-23. ábra: Fázis-eltérés tűrés az A-QPSK átviteli szűrő jelleggörbe maszkra, 60 százalékos határértékkel



A-24. ábra: AES A-QPSK átviteli szűrő jelleggörbe maszkra, 60 százalékos határértékkel

Az „A” Melléklet Függeléke

TELJESÍTMÉNY ANALÍZIS

A1. RF kapcsolat analízis

Az RF kapcsolat teljesítményének mérésére tipikusan alkalmas az átlagos bit hiba-arány (BER). A műholdas al-hálózat végponttól-végpontig teljesítményét egy megkövetelt átlagos BER által az RF kapcsolat teljesítményére vonatkoztatják. Egy csatorna BER és az elért vivőfrekvencia-zaj sűrűség teljesítmény közötti összefüggés a modulációs eljárástól és a csatorna állapotoktól függ. Ideális lineáris modulációs eljárás és egy additív fehér Gauss zajcsatorna esetén ez az összefüggés analitikusan levezethető. A véletlen elhalkuló csatorna esetén ez az összefüggés szimulációval vezethető le, vagy azt a legrosszabb eseti feltételezést felhasználva, hogy az összes több-utas energia ekvivalens a zajjal.

A digitális RF összeköttetési kapcsolat kielégítő átlagos BER teljesítménye biztosított akkor, ha az elért vivőfrekvencia-zaj teljesítmény sűrűség arány nagyobb vagy egyenlő azzal a vivőfrekvencia-zaj teljesítmény sűrűség aránnyal, amelyet a megkívánt átlagos BER-nél való összeköttetésnél igényelnek:

$$\left(\frac{C}{N_o}\right)_{ELÉRT} \geq \left(\frac{C}{N_o}\right)_{MEGK.} \qquad [A.1]$$

ahol:

$\left(\frac{C}{N_o}\right)_{MEGK.}$	A minimálisan megkövetelt vivőfrekvencia-zaj sűrűség arány a megkívánt átlagos BER szerinti összeköttetéshez.
$\left(\frac{C}{N_o}\right)_{ELÉRT}$	A vivőfrekvencia-zaj sűrűség arány, amelyet a végponttól-végpontig kapcsolattal elérnek.

A megkívánt vivőfrekvencia-zaj sűrűség arányt a használt egyedi jelzési hullámforma, a csatorna-zaj és a terjedési jellemzők határozzák meg. Statisztikai módszerek használhatók ennek a minimálisan megkövetelt vivőfrekvencia-zaj aránynak a meghatározásához, amely szükséges a működés biztosításához az átlagos BER-nél. Statisztikai módszerek arra is használhatók, hogy a magukba foglalják a terjedési környezet hatását és más véletlen veszteségek hatásait.

Ebből kifolyólag a megkívánt átlagos BER melletti üzemelésnél a következő összefüggésnek kell érvényben lenni:

$$M_p \times \left(\frac{C}{N_o}\right)_{MEGK.} \leq \left(\frac{C}{N_o}\right)_{ELÉRT} \qquad [A.2]$$

ahol M_p a kapcsolat tartalék, amelyet a terjedési környezet és a különböző véletlen RF paraméter változások követelnek meg.

A vivőfrekvencia-zaj teljesítmény méréseket az RF kapcsolat különböző részei között kell szétosztani, amelynek tárgyalására az alábbiakban kerül sor.

A1.1 Légijármű felé kapcsolat elemzés

Az elért vivőfrekvencia-zaj sűrűség viszonyt az előre-irányú kapcsolaton az RF kapcsolatban lévő számos zajforrás határozza meg. Egyszerű frekvencia átvivő adó-rendszerekkel az elért jel(vivőfrekvencia)-zaj teljesítmény viszony a következő kifejezésből számítható:

$$\left(\frac{C}{N_o\ ELÉRT}\right)^{-1} = \left(\frac{C}{N_{UF}}\right)^{-1} + \left(\frac{C}{N_D}\right)^{-1} + \left(\frac{C}{I_M}\right)^{-1} + \left(\frac{C}{I_{IS}}\right)^{-1} + \left(\frac{C}{I_{OD}}\right)^{-1} + \left(\frac{C}{I_{OUF}}\right)^{-1} \quad (A3)$$

[A.3]

ahol:

N_{UF} = a felfelé irányú kapcsolati tápvonal kapcsolat termikus zaj teljesítmény sűrűség

N_D = az L-sáv lefelé irányú kapcsolat termikus zaj teljesítmény sűrűsége

I_M = a műhold adója miatti intermodulációs teljesítmény sűrűség az L-sáv lefelé kapcsolaton

I_{IS} = a rendszeren belüli interferencia teljesítmény sűrűség

I_{OD} = a lefelé irányú kapcsolati L-sáv rendszeren belüli interferencia teljesítmény sűrűség a vevőnél

I_{OUF} = a rendszeren belüli interferencia teljesítmény sűrűség az összeköttetési tápvonal felfelé irányú kapcsolaton

Az (A.3) egyenlet egy fontos feltételezést hord magában. A feltétel az, hogy egy egyedi csatorna szélességben az összes zajforrás jellegében „fehér Gauss”zajnak tekinthető.

A1.2 Légijármű felől kapcsolat elemzés

Hasonló módon, mint az előre-irányú kapcsolatnál, az elért vivőfrekvencia-zaj sűrűség viszonyt az ellen-irányú kapcsolatban lévő számos zajforrás határozza meg. Az elért vivőfrekvencia-zaj teljesítmény sűrűség viszony a következő összefüggésből kapható meg:

$$\left(\frac{C}{N_o\ ELÉRT}\right)^{-1} = \left(\frac{C}{N_{DF}}\right)^{-1} + \left(\frac{C}{N_U}\right)^{-1} + \left(\frac{C}{I_{M\ AES}}\right)^{-1} + \left(\frac{C}{I_{ISR}}\right)^{-1} + \left(\frac{C}{I_{OU}}\right)^{-1} + \left(\frac{C}{I_{ODF}}\right)^{-1} \quad (A4)$$

[A.4]

ahol:

N_{DF} = a lefelé irányú kapcsolati tápvonal-kapcsolat termikus zaj teljesítmény sűrűség

N_U = az L-sáv felfelé irányú kapcsolat termikus zaj teljesítmény sűrűsége

$I_{M\ AES}$ = a minimális működőképes intermodulációs teljesítmény sűrűség, amely az l-sáv felfelé irányú kapcsolaton várható az AES nagyteljesítményű erősítők több-vivőfrekvenciás üzemelésétől

I_{ISR} = a rendszeren belüli interferencia teljesítmény sűrűség

I_{OU} = a rendszeren belüli interferencia teljesítmény sűrűség az L-sávnál, amely a felfelé irányú kapcsolaton várható

I_{ODF} = a rendszerek közötti interferencia teljesítmény sűrűség az összeköttetési tápvonal lefelé irányú kapcsolaton

A1.3 Terjedési anomáliák és a megkövetelt tartalékok

Egy idealizált RF kapcsolatot kedvezőtlenül befolyásolhatja számos tényező, amelyek két alap osztályba oszthatók: meghatározó és nem-meghatározó. A meghatározó tényezők, amelyek az RF kapcsolat tűrés követelményeket befolyásolják, a terjedési pályától függnek, amelyet a légijármű, a műhold és a föld egymáshoz viszonyított helyzete hoz létre adott helyzetben. Más meghatározó tényezők a rendszer tervezés által rögzítettek, ilyenek például az információs bit átviteli teljesítmény, összerendezési keverések, kódolási sémák stb.

A nem-meghatározó tényezők, amelyek az RF kapcsolat követelményeket befolyásolják, a rendszer tervezés és üzemeltetési elemek, amelyeket a szolgáltatást nyújtó, az interferencia és más, terjedéssel kapcsolatos véletlen veszteségek miatti leromlások határoznak meg..
Sok tényezőt, amelyek az RF kapcsolat követelményeket befolyásolják, veszteségnek lehet tekinteni, amelyek csökkentik a rendelkezésre álló átvitel teljesítményt és lerontják a kapcsolat teljesítményt. Ezen tényezők közül néhánynak a részletes tárgyalását tartalmazzák a következő szakaszok:

A1.3.1 TÖBB-UTAS ELHALKULÁS

A „több-utas" fogalom arra az állapotra vonatkozik, amelyben a távközlési rendszer vevőjét egynél több úton éri el energia. Több-utas terjedést föld- és víz felületektől és ember által létesített építményekről való visszaverődés eredményezhet. Több-utas üzemelés általában nem-kívánatos, mivel a különböző utak felett érkező jelek változó relatív fázissal érkeznek, ami azt eredményezi, hogy ezek alternálóan hol konstruktív, hol destruktív módon adódnak a térben. Ennélfogva a teljes vett jelet az elhalkulás jellemzi, amelyből olyan ismételt minimumok adódnak, ami miatt az elfogadható kommunikációs teljesítmény a szükséges jelszint alá eshet. A elhalkulás ugyancsak jelentősen nagyobb víz felett a szárazföldhöz képest. Továbbá a különböző pályákon keresztül érkező jeleknek különböző idejű késéseik vannak és a digitális rendszerekben interszimbólikus interferencia adódhat.

A kutatók egy sora vizsgálta a több-utas elhalkulás hatásait a repülési műholdas összeköttetésekre. A több-utas elhalkulás statisztikus jellege a légiforgalmi csatornák esetén ennélfogva jól ismert. Az elhalkulás amplitúdója köztudottan Rician eloszlású. Továbbá a vivőhullám - több-utas terjedés arányról ismert, hogy a műholdhoz viszonyított magassági szög függvénye és várhatóan kisebb lesz, mint 10 dB a 10 foknál kisebb magassági szögeknél.

A vivőhullám-zaj viszonyt egy csatornánál a több-utas terjedés, a moduláció és a kódolás adott formája befolyásolja. Inkább az a helyes, ha a több-utas terjedés hatásait a vivőfrekvencia-zaj követelmény beállítása tartalmazza, és nem egy különálló tűrés; egy hagyományos megközelítés a több-utas energiát az additív Gauss zajjal ekvivalensként kezelni, és azután egy kódolt rendszerben hozzáadni a kiegészítő tűrést a nem-tökéletes összerendezésnél.

A1.3.2 SZCINTILLÁCIÓ /felvillanás/

Az ionoszférikus szcintilláció egy olyan jelenség, amely a nap és a föld mágneses terének hatását viseli magában, és amely véletlen változásokat hoz létre az ionoszférában terjedő elektromágneses hullámokban. A jelenség a műhold-földi állomás RF- kapcsolatokban „szcintilláció elhalkulásként" nyilvánul meg, a pozitív és negatív (veszteség) változások a vett jel amplitúdójában jelentősek lehetnek a műhold - AES kapcsolathoz használt L-sáv frekvenciáknál. Még 27 dB nagyságú értékeket is megfigyeltek erős szcintillációs események rövid időszakai során; a várt érték azonban lényegesen kisebb. A fázis-eltolás is kapcsolódhat a szcintillációs elhalkuláshoz, amelynek hatásai tovább ronthatják az RF kapcsolat teljesítményt.

Mivel a műhold RF kapcsolat teljesítmény-tűréshatárok gazdaságossági okokból kifolyólag általában kicsik, a szcintillációs ekhalkulás miatti veszteség még olyan alacsony érték esetén is, mint 3 dB, jelentős lehet. A szcintillációs veszteség nagymértékben összefüggésben van a légijármű pozíciójával és helyi idejével, így a fő gond a repülés bizonyos útvonalain és idején jön létre. A szcintillációs események szezonális hatást is mutatnak, ez az őszi és tavaszi napéj-egyenlőség során tetőzik. Jelentős szcintillációs veszteség várható, ha a légijármű a geomágneses egyenlítő közelében (az északi és déli 15 fokos földrajzi szélesség között) van légijármű helyi idő szerinti 21.30 és 02.30 óra között, és a sarkvidéki régiókban (±65 foknál nagyobb szélességi körök között, bár a geo-szinkron műholdak általi fedés a 80 fokos vagy ennél kisebb szélességi körökre korlátozódik) a nap bármely időszakában. A rendelkezésre álló adatok azt mutatják, hogy a szcintillációs elhalkulás körülbelül kétszeres intenzitású az egyenlítői régióban a sarki régiókhoz képest. Helyhez kötött földi állomásnál az egyenlítői régió elhalkulásainak 1 százaléka meghaladja a 20 dB-t és 15 dB fölött marad néhány másodpercen át. Az ionoszféra 50–200 méter/másodperc sebességgel való kelet felé mozgása tipikusan látszik, amely 10–100 méteres távolság korrelációt tartalmaz. Lehetséges lehetne egy kelet felé irányuló mozgású légijármű sebességénél a „szinkronizálttá” válás, amely lényegesen hosszabb elhalkulási periódusokat eredményezne.

Az elhalkulás a sarki régiókban kevésbé intenzív (körülbelül 10 dB egy helyhez kötött földi állomásnál) összehasonlítva az egyenlítői régióval. A sarki ionoszféra sebessége is tipikusan nagyobb és erősebben változó, 100–1000 méter/másodperces intervallumban.

A mozgásban lévő földi állomásokra gyakorolt szcintillációs hatásokra vonatkozó adatok – különösen az AMSS által használt térbeli-jelnél – jelenleg korlátozottak. Továbbá, annak valószínűsége, hogy egy légijármű jelentős szcintillációs hatással találkozik, érzékenyen függ repüléseinek útvonalától és időpontjától. Következésképpen a szcintillációs elhalkulási hatásokat itt nem vesszük számításba.

A1.3.3 POLARIZÁCIÓS VESZTESÉG

Két antenna közötti, a nem-tökéletes cirkuláris polarizáció miatti átviteli veszteség a következő összefüggés alapján számítható ki:

$$L_{POL} = 10\,LOG\left(\frac{(R_1^2+1)(R_2^2+1)}{(R_1 R_2+1)^2\cos^2(\theta)+(R_1+R_2)^2\sin^2(\theta)}\right) \qquad [A.5]$$

ahol elfogadott az, hogy az antennák ugyanolyan érzékenységűek (pl. jobbforgóan körkörösek) és ahol:
R_i = az i-edik antenna feszültség axiális viszonya

θ = az egyes antennák valamelyikéből kisugárzott két elliptikus polarizált hullám főtengelyei által bezárt szög.

A polarizációs veszteséget az axiális arányok és főtengelyeik relatív iránya teljesen meghatározza. A legrosszabb eseti szituáció az, amikor a főtengelyek merőlegesek egymásra, azaz θ = 90°. Az (A.5) egyenlet különböző formái lehetségesek, a referencia antennára vonatkoztatott előfeltételektől függően. A kapcsolati számításoknál tipikusan a legrosszabb esethez tartozó műhold antenna orientáció és az AES antenna orientáció hatásainak statisztikai becslése vehető figyelembe.

A1.3.4 ÚTVONAL VESZTESÉG

A térbeli útvonal veszteség csak a frekvencia és a távolság függvénye. Az útvonal veszteség az alábbi összefüggésből könnyen kiszámítható:

$$L = \left(\frac{4\pi r}{\lambda}\right)^2 \qquad [A.6]$$

ahol:
r = az AES távolsága a műholdtól méterben
λ = a hullámhossz méterben

Általában a távolság a műholdhoz, r, az AES földrajzi helyzetének a függvénye. A kényelem kedvéért a műholdhoz való távolság egyszerűen a műholdhoz való megfigyelt magassági szög függvénye, a következőképpen van megadva:

$$r = \sqrt{R^2 + (R + h)^2 - 2R(R + h)\cos\beta} \qquad [A.7]$$

ahol:
R = a Föld közepes sugara ≅ 6378 km

h = a geoszinkron magasság = 35.786 km (a föld felülettől az al-műhold pontnál).

$$\beta = \cos^{-1}\left[\frac{R\cos\theta}{R + h}\right] - \theta$$

θ = a műhold repülési magasságához viszonyított magassági szög.

A közvetlen az állomások /légi/földi/ feletti műholdnál az útvonal veszteség 1545 MHz-nél 187,3 dB. Az 5°-os magassági szögnél az útvonal veszteség 188,5 dB. Ezért az útvonal veszteség egy olyan légijárműnél, amely a műholdhoz 5°-os magassági szöggel üzemel, 1,2 dB-el nagyobb lesz, mint annál a légijárműnél, amelyiknél a műhold közvetlen felette van. A gyakorlatban az útvonal veszteséget a műholdhoz viszonyított specifikus magassági szögnél számítják.

A1.3.5 CSAPADÉK MIATTI VESZTESÉG

Az esőcseppek a rádióhullámok csillapítását az elnyelés és a szétszórás által okozzák. A csillapítás nagysága a frekvencia, az átlagos vízcsepp méret, a légijármű földrajzi szélessége, magassági szöge és az esőzési "mennyiségtől" függ. Ezek között a tényezők közötti összefüggéseket éveken át folytatott kutatás és kísérleti mérések alapján megbízhatóan meghatározták, ezzel lehetővé téve a teljesítmény nagy megbízhatóságú meghatározását.

Általában az esőzés miatti csillapítás nem jelentős az AMSS kapcsolatokhoz használt L-sáv frekvenciáknál. Azonban az AMSS szolgáltatások tápvonal kapcsolatai jóval nagyobb frekvencián működnek, ahol az eső okozta csillapítás nagyon jelentős lehet. A tápvonal kapcsolat tervezésnek figyelembe kell vennie a várható esőzési mennyiséget a földi telepítésű földi állomás helyén, különösen a kapcsolat rendelkezésre állását illetően.

Az eső okozta csillapításnak a tápvonal kapcsolatra kifejtett hatása előre irányban /adás irány/ kompenzálható a GES teljesítmény-szabályozás által. A GES teljesítményt úgy növelik, hogy a jel megtartja a megkívánt szintet, amikor a műholdnál vételre kerül. Ennek a teljesítmény növekedésnek az egyik következménye lehet a GES kezdeményezésű intermodulációs termékek növekedése. A kapcsolatot úgy kell tervezni, hogy ez a további interferencia ne rontsa a teljes elért vivőhullám-zaj teljesítményt a megkövetelt szint alá.

Az ellen-irányban /vételi irány/az eső csillapítás leszállítja a vivő teljesítményt a termál zaj viszonyra a tápvonal kapcsolatnál. Ez a további interferencia nem ronthatja a teljes elért vivőhullám-zaj teljesítményt a megkövetelt szint alá.

Nincs specifikus kiosztás a megkövetelt tűrésre, ami magyarázná az eső miatti elhalkulás hatásait. A műhold rendszer tervező feladata biztosítani azt, hogy a műhold és a GES tervezés olyan legyen, hogy a teljes kapcsolat vivőhullám-zaj viszony tartható legyen a várható esőzési viszonyok között a fedési területen.

„B” Melléklet az I. Részhez: ÚTMUTATÓ ANYAG A VHF DIGITÁLIS KAPCSOLATOKHOZ (VDL)

1. ÚTMUTATÓ ANYAG A VHF DIGITÁLIS KAPCSOLATOKHOZ (VDL)

Megjegyzés. – A hivatkozott Szabványok és Ajánlott Gyakorlatokat (SARPs) az Annex 10, III. Kötet, I. Rész, 6. Fejezete tartalmazza.

2. RENDSZER LEÍRÁS

2.1 A VDL rendszer levegő-föld adat-összeköttetési kapcsolatot szolgáltat a Légiforgalmi Távközlési Hálózaton (ATN) belül. A VDL párhuzamosan üzemel a többi ATN levegő-föld alhálózatokkal.

2.2 A VDL földi állomások egy VHF rádióból és a VDL protokolt a fedési területen belül kezelni képes számítógépből áll. A VDL állomások összekapcsolhatósági lehetőséget nyújtanak egy földi telepítésű távközlési hálózaton keresztül (pl. X. 25 alapon) az ATN közbenső rendszerekkel, amelyek hozzáférést biztosítanak a földi telepítésű ATN végrendszerekhez.

2.3 A VDL földi állomásokkal való kommunikálás érdekében megkövetelt az, hogy a légijármű fel legyen szerelve VDL repülés-elektronikával, amely egy VHF rádiót és a VDL protokol kezelésére képes számítógépet tartalmaz. A levegő-föld kommunikáció 25 kHz-es csatornákat használ a VHF légiforgalmi mozgó (útvonal) szolgáltatás sávban.

3. VDL alapelvek

3.1 Összeköttetési átviteli alapelvek

3.1.1 Az összekapcsolhatóságot az ATN végrendszerekben (ES) lévő alkalmazások között, amelyek a levegő-föld összeköttetéshez az ATN-t és ennek al-rendszereit használják, beleértve a VDL-t is, az ezekben a végrendszerekben lévő átviteli réteg entitások szolgáltatják. A légijármű fedélzeti és földi végrendszerek közötti adat-továbbítási kapcsolatokat az ezeket szolgáltató precíz ATN közbenső rendszerek (IS) és VDL hálózati elemek vezérelt átalakításain keresztül tartják fenn.

3.1.2 Az ATN ES közötti adat-átviteli összeköttetések nincsenek egy meghatározott al-rendszerhez hozzákötve és az ISO 8473 al-hálózati protokol adat egységek, amelyeket egy ES továbbít, bármely levegő-föld ATN kompatíbilis al-hálózaton átvihetők (olyanokon, mint például a légiforgalmi mozgó műholdas szolgáltatás (AMSS) adat-kapcsolat, SSR S-módú adat-kapcsolat vagy VDL), amelyek kielégítik a szolgáltatás minőségi (QOS) követelményeit. Egy légijármű ES és egy földi ES közötti adat-átviteli összeköttetést addig kell fenntartani, amíg a légijármű IS és a földi IS között legalább egy olyan levegő-föld al-rendszeri összekapcsollhatóság van, amelynek összeköttetése van a földi ES-sel. Az al-hálózati összekapcsolhatósáég maximalizálása érdekében a légijárművektől elvárják, hogy levegő-föld al-hálózati összeköttetéseket tartsanak fel bármely al-hálózaton (AMSS, S-mód vagy VDL) keresztül, amelyekkel kapcsolat réteg összekapcsolhatóság létesíthető.

3.1.3 A VDL al-hálózat összekapcsolhatóságot biztosít a kapcsolt virtuális áramkör formájában a légijármű ISO 8208 adat terminál berendezés (DTE) entitások és a földi bázisú ATN közbenső rendszerek között. Azon tény következtében, hogy a VHF jelek csak rálátás vonali terjedéssel rendelkeznek, a repülést végrehajtó légijárműnek meg szükséges az, hogy rendszeresen kapcsolati összeköttetést létesítsen az új VDL földi állomásokkal, hogy a VHF fedésterületet fenntartsa. Egy légijármű DTE és egy földi DTE között létrehozott VDL virtuális áramkört olyan földi állomási vezérelt adatcserén keresztül tartják fenn, amelyen keresztül a földi DTE elérhető.

3.1.4 A VDL virtuális áramkörök felszabadíthatók, amikor a légijármű vagy földi IS olyan döntési helyzetet azonosít, amikor a virtuális áramkör a földi DTE-hez már nem szükséges, de ez csak akkor következhet be, ha egy másik VDL virtuális áramkör nyitva marad. A döntési helyzet olyan helyzet, ahol a lefedettségen kívül más megfontolások is befolyásolják az összeköttetés létrehozására vonatkozó döntést. Ilyen szituáció lehet például az, amikor egy légijármű különböző üzemeltetők által üzemeltetett földi állomások kijelölt üzemelési területén belül van és döntést kell hozni, hogy melyik üzemeltetővel létesítsen kapcsolatot. Az az eset, amikor egy légijármű két ország közötti határt keresztez, különös figyelmet igényel. Egy légijárműnek virtuális áramköri kapcsolatot kell létesítenie annak az államnak az IS-ében lévő DTE-hez, amelybe belép, mielőtt felszabadítaná az elhagyott ország IS-ében lévő DTE-vel létesített virtuális áramkört.

3.1.5 Az al-hálózat kapcsolat fenntartás forgatókönyveit a B-1. ábra* mutatja be. Ha az államhatár egyes oldalain lévő földi állomások nem nyújtanak ISO 8208 összekapcsolhatósági lehetőséget a két államban lévő IS-ek DTE-inek, a határt keresztező légijárműnek kapcsolati összeköttetést kell létesíteni annak az országnak a területén lévő földi állomással, amelybe belép, mielőtt képes lenne ennek az államnak az IS-éhez virtuális áramkört létrehozni. Csak az új kapcsolati összeköttetés és a virtuális áramkör létrehozása után fogja a légijármű felszabadítani a virtuális áramkört az elhagyott ország IS-ének DTE-jével azon a kapcsolaton keresztül, amely hozzáférést biztosít ahhoz az IS-hez. Ha a VDL légiforgalmi állomások az államhatár mindkét oldalán összeköttetést nyújtanak a mindkét államban lévő IS-hez, a virtuális áramkörök cseréje ugyanazon kapcsolati összeköttetésen keresztül kell hogy végbemenjen.

* Minden ábra jelen melléklet végén van elhelyezve.

3.2 VDL szolgáltatás minőség ATN útvonal kijelöléssel

3.2.1 A VDL rendszer levegő-föld kommunikációhoz való felhasználása a légijármű és a földi bázisú ATN közbenső rendszerek (IS) útvonal kijelölési döntéseitől függ. Ezek az IS-ek határozzák meg azokat a pályákat, amelyeket a levegő-föld kommunikációhoz használnak az átviteli végberendezések (ES) által kért szolgáltatás minőség értékek alapján.

3.2.2 A levegő-föld összeköttetések egyes végein lévő IS-eknek értelmezniük kell a kívánt QOS értéket és el kell dönteniük, hogy a rendelkezésre álló összeköttetések közül melyiket lehet a legjobban felhasználni. Nagyon fontos, hogy a QOS szint, amely a VDL kapcsolatot szolgáltatásnak érzékeli, olyan szintre beállított legyen, amely a valódi teljesítményének felel meg.

3.2.3 Azokban az esetekben, amelyekben a VDL az egyetlen adat-kapcsolat, amellyel a légijármű el van látva, az összes kommunikációt VDL összekapcsoláson keresztül kell lebonyolítani és a QOS értékek, amelyeket az összeköttetés szolgáltat, nem zárhatják le a kommunikációt.

3.2.4 Más esetekben, amikor a légijármű más levegő-föld adat-kapcsolatokkal is fel van szerelve (mint például AMSS és SSR S-mód), lehetséges a több egyidejű párhuzamos összekapcsolás többszörös al-hálózaton keresztül. Ezekben az esetekben az egyes al-hálózatok által szolgáltatott QOS értékeket úgy kell beállítani, hogy biztosítsák azt, hogy a VDL kapcsolatot a megfelelő helyen alkalmazzák.

3.2.5 Szükséges az, hogy koordináció történjen a légijármű üzemeltetők, a földi állomás üzemeltetők és a földi rendszer üzemeltetők között annak biztosítása érdekében, hogy a különböző al-hálózatok között helyes egyensúly álljon be.

4. VDL FÖLDI ÁLLOMÁS HÁLÓZAT KONCEPCIÓ

4.1 Hozzáférés

4.1.1 A VDL földi állomás hozzáférést biztosít a légijárműnek a földi ATN IS-hez, felhasználva a VDL protokolt egy VHF csatornán keresztül.

4.2 A VDL földi állomás hálózat üzemeltetők intézményi ügyeit érintő általános kérdések

4.2.1 Egy ATS szolgáltatónak, amely a VDL-t légiforgalmi szolgálati (ATS) összeköttetésekre kívánja használni, biztosítania kell, hogy a VDL szolgáltatás rendelkezésre álljon. Az ATS szolgáltató vagy magát, a VDL földi állomás hálózatot tudja üzemeltetni, vagy gondoskodik arról, hogy a VDL állomásokat (vagy a VDL hálózatot) egy távközlési szolgáltatást nyújtó üzemeltesse. Valószínűnek látszik, hogy az egyes országok különféle intézkedéseket tesznek a VDL szolgáltatás biztosítására a légijárművek részére. A VDL üzemeltetést és megvalósítást körzeti szinten kell koordinálni, hogy a nemzetközi útvonalakon elfogadható üzemelést biztosítsanak.

4.2.2 A VDL földi állomás hálózat az ATS szolgáltatóhoz külső entitás általi használata az ATS szolgáltató és a távközlési szolgáltatást nyújtó közötti szolgáltatási egyezmények tárgya. Ezek a szerződések rögzítik a két fél kötelezettségeit és különösen fontos, hogy meg legyen határozva benne a nyújtott szolgáltatások minősége, valamint a felhasználói interfész.

4.2.3 Valószínűnek látszik, hogy néhány VDL földi állomás hálózat üzemeltető használati díjat fog kivetni. A fizetésre kötelezettek vagy a légijármű üzemeltetők és/vagy az ATS szolgáltatók lesznek. Biztosítani kell azt, hogy a VDL használata megvalósítható legyen azoknak a légijármű üzemeltetőknek a számára, amelyek a VDL-t az ATS/AOC kommunikációkhoz akarják felhasználni.

4.3 VDL földi állomás berendezés

4.3.1 A VDL földi állomás egy VHF rádióból és egy számítógépből áll, amely egy különálló, vagy vele integrált számítógép lehet. A VHF rádióberendezés VHF-el kapcsolatos funkciója hasonló a légijárművekre felszereltekével.

4.3.2 A hálózati állapot figyelés előírása fontos elem a lehetséges legnagyobb mértékű rendelkezésre állás fenntartásában.

4.4 Földi állomás telepítése

4.4.1 A VHF terjedés rálátási egyenes vonalának korlátozása fontos tényező a földi állomások telepítésénél. Biztosítani kell, hogy a földi állomásokat olyan módon telepítsék, hogy fedést szolgáltassanak a kijelölt üzemelési fedésterület (DOC) felett.

4.4.2 A VDL-el szembeni fedési követelmények függnek azoktól az alkalmazásoktól, amelyekre a VDL üzemeltetést szánják. Ezek az alkalmazások például akkor funkcionálhatnak, amikor a légijármű útvonal-utazási magasságon, a közel-körzeti területen, vagy egy repülőtéren a földön van.

4.4.3 Az útvonali fedést biztosítani lehet kis számú, nagy DOC-val rendelkező földi állomás felhasználásával (például a VHF jel hatótávolsága egy tengerszinten lévő állomástól egy 37000 láb magasságon lévő légijárműhöz közelítőleg 200 tengeri mérföld). Ebből következően valóban kívánatos az, hogy a lehető legkisebb számú földi állomást használják útvonali lefedésre, azért, hogy minimalizálják az egyidejű felfelé irányú kapcsolati átviteleket a földi állomásoktól, amelyek közlemény ütközést okozhatnak a VHF csatornán. Az útvonali lefedést korlátozó tényezők a terep rendelkezésre állás és egy földi állomástól más földi rendszerekhez vezető összeköttetési kapcsolat rendelkezésre állása.

4.4.4 A közel-körzeti terület fedés általában megköveteli földi állomások felszerelését minden olyan repülőtéren, ahol VDL operáció szükséges ahhoz, hogy a közel-körzeti területen fedést biztosítsanak.

4.4.5 Repülőtér felszíni kommunikációs fedést kell szolgáltatni egy földi állomás által a repülőtéren, azonban a repülőtér fizikai felépítése miatt lehetséges az, hogy nem lehet a teljes terület lefedését egyetlen állomással garantálni.

4.5 Földi állomás frekvencia technikai kezelése

4.5.1 Annak a VHF csatornának a megválasztása, amelyen egy földi állomás üzemelni fog, attól a fedéstől függ, amelyen a szolgáltatást a földi állomástól megkövetelik. A fedést egy adott csatornán az ezen a csatornán üzemelő földi állomások egy együttese szolgáltatja és az ezen a csatornán zajló kommunikáció lefoglalja a csatornát a fedési területen lévő összes földi állomás részére.

4.5.2 A VHF beszéd kommunikációtól eltérően, a VDL kommunikációt nem lehet terjedésben csak országokon belülre korlátozni és az államok között koordináció szükséges a VDL frekvenciák elosztásában. A protokol jellege viszont lehetővé teszi a frekvencia újra-felhasználását több, ugyanazon fedési területen belüli földi állomás részére, és ebből eredően a frekvencia kijelölésre vonatkozó szabályok nem ugyanazok, mint amik a beszéd-üzemű összeköttetésekre vonatkozók.

4.5.3 A vivőhullám érzékelő idő-osztásos hozzáférésű (CSMA) és az adathordozó hozzáférési vezérlő (MAC) protokol réteg, amelyet a VDL-nél használnak, nem tudják kizárni a közlemény ütközéseket, ha egy frekvencia-csatornát használó állomások nem tudják venni más állomások továbbításait, ez a helyzet "rejtett adó" helyzetként ismert. A rejtett adók egyidejű átvitelekhez vezetnek, amelyek olyan jelenséget idézhetnek elő, hogy az egyik vagy mindkét átvitel megcélzott vevője a vett jelet nem tudja dekódolni.

4.5.4 Egy frekvenciát jelölnek ki az útvonal fedés biztosítására, és az összes útvonali állomást ezen a frekvencián való üzemelésre állítják be. Ahhoz, hogy minimalizálják a rejtett adók általi, CSMA környezetben történő szimultán átvitelek valószínűségét a csatornán, ezt a csatornát lehetőleg nem használják a közel-körzeti vagy a repülőtéri felszíni kommunikációkhoz, kivéve a nagyon kis csatorna terhelésű területeket.

4.5.5 A VDL-re vonatkozó SARP előírja egy közös jelzés csatorna (CSC) biztosítását, amelyen a hozzáférés a VDL szolgáltatáshoz garantált az összes területen, ahol a VDL 2-módú szolgáltatás rendelkezésre áll. Ez különösen fontos azoknál a repülőtereknél és a VDL útvonalefedési zónák peremén, ahol a légijármű minden valószínűség szerint "kezdeti" VDL összekapcsolást hoz létre. Mivel az 1.-módú és a 2.-módú rádiófrekvenciás átvitel jellemzői nem kompatibilisek, a CSC nem használható 1.-módú kommunikációhoz. Nincs követelmény a CSC-re 1.-módú VDL-nél.

4.6 A földi állomás összeköttetése közbenső rendszerekkel

4.6.1 Ahhoz, hogy hozzáférést biztosítson azokhoz a földi rendszerekhez, amelyek össze vannak kötve a légiforgalmi távközlési hálózattal, a VDL földi állomásnak összekapcsolva kell lennie egy vagy több

ATN IS-el. A VDL földi állomás rendeltetésse az, hogy összekösse a légijárműveket a földi bázisú ATN-el, amelyen keresztül a kommunikáció a felszíni ATN ES-ekkel történik.

4.6.2 A földi bázisú ATN IS társítva lehet elhelyezve a VDL földi állomás számítógépben, amely esetben a VDL al-hálózati virtuális áramkör ebben a számítógépben végződik. Ennek a felépítésnek hatása van arra a megkívánt cserére, amikor a légijármű VDL kapcsolatot hoz létre egy új földi állomással. Az egzakt csere attól függ, hogy a földi állomások külön IS-t tartalmaznak, vagy ugyanannak az elosztott közbenső rendszernek az elemei.

4.6.3 Ha az IS-t a VDL földi állomás nem tartalmazza, akkor azt a következő eszközök egyikével kapcsolják a földi állomáshoz:

a) széles területi hálózat (WAN);

b) helyi területi hálózat (LAN); és

c) célra rendelt összeköttetési vonal.

4.6.4 Mindegyik esetben annak érdekében, hogy összhangban legyen a Légiforgalmi Távközlési Hálózati Kézikönyv (ATN) (*Manual of the Aeronautical Telecommunication Network (ATN)*) (Doc 9578) kiadvánnyal, egy Nyílt Rendszerek Összekapcsolása (OSI) szolgáltatást biztosítson, amely kompatíbilis kapcsolat-orientált al-hálózat szolgáltatás,a légijármű IS és a földi bázisú IS között, a VDL földi állomás számítógéptől megkövetelik, hogy terjessze ki a VDL virtuális áramkört a felszíni hálózaton vagy kapcsolaton keresztül.

4.6.5 Azért, hogy szimultán virtuális áramköröket szolgáltasson több felszíni IS-nek, a VDL földi állomás számítógépnek tartalmaznia kell egy VDL al-hálózat entitást, amely képes a VDL al-hálózat hibás kérésekben lévő címzéseket a földi bázisú hálózatban lévő címzésekbe konvertálni.

5. VDL LÉGIJÁRMŰ FEDÉLZETI ÜZEMELÉSI KONCEPCIÓ

5.1 Repülés-elektronika

5.1.1 *VDL repülés-elektronika.* Ahhoz, hogy egy VDL hálózatban üzemelni tudjon, a légijárműnek egy olyan repülés-elektronikai rendszerrel felszereltnek kell lennie, amely a VDL al-hálózat felhasználói (ISO 8208 DTE) funkciót szolgáltatja. A rendszer, amely ezt a funkciót szolgáltatja, az al-hálózat felhasználói funkciókat a többi levegő-föld ATN kompatíbilis al-hálózatnak is szolgáltatja azt, és a légijármű ATN közbenső rendszer funkció és következésképpen annak fejlesztése szükséges ahhoz, hogy ATN kommunikációt szolgáltasson a többszörös vég-rendszereknek vagy többszörös levegő-föld al-hálózatokon keresztül.

5.2 VDL repülés-elektronikai alkalmassági bizonyítvány

5.2.1 A VHF digitális rádió ugyancsak szolgáltathat két-oldalsávos amplitúdó-modulációs (DSB-AM) beszéd-üzemű képességet kényszerhelyzeti alátámasztásra a VHF rádióknak, amelyeket a beszéd-összeköttetésre használnak. Ebben az esetben szükség lenne demonstrálni, hogy a VDL VDR-funkcionalitása nem interferál a DSB-AM beszéd-funkcionalitással.

5.2.2 A VDL funkció a VHF digitális rádióban egy levegő-föld adat-kapcsolat szolgáltatást nyújt a légijármű ATN közbenső rendszer VDL al-hálózat felhasználó entitásnak. Ha a VHF al-hálózat szolgáltatás nyújtását egy ATN közbenső rendszer részére lényeges szolgáltatásnak tekintik, akkor egy adott telepítésnél, a VDL VDR-funkcionalitását lényeges funkciónak kell elismerni. A VDL használata az ATS kommunikációra azonban nem igényli két légijármű-rádió egyidejű üzemelését a VDL üzemmódban.

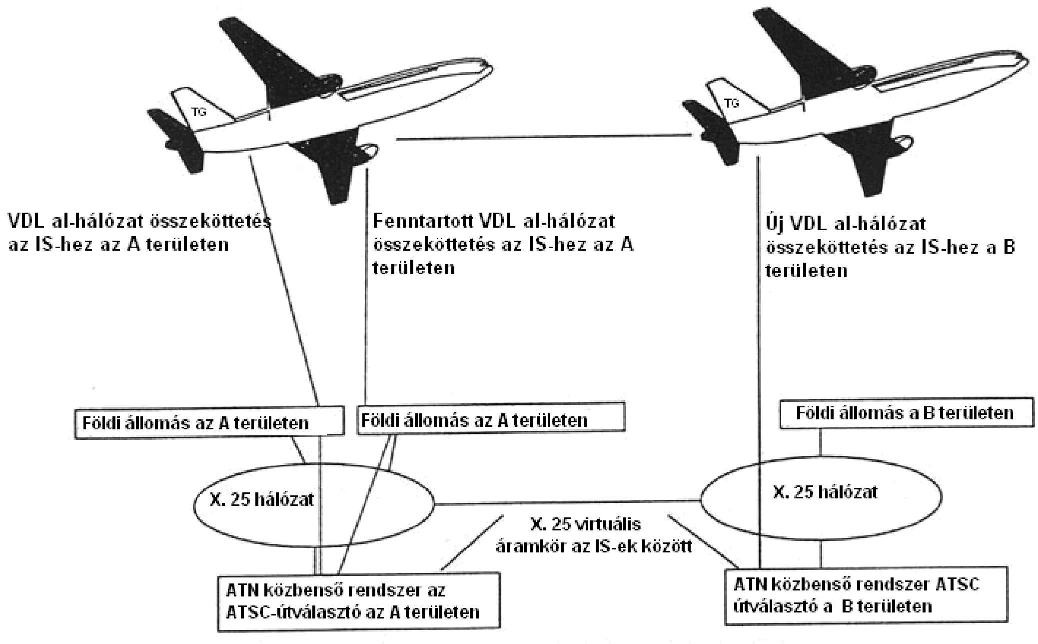
5.3 Légijármű regisztráció a VDL hálózat üzemeltetőknél

5.3.1 Normál összeköttetési szolgáltatásnál elvárható, hogy a légijármű üzemeltetőktől megköveteljék a légijárműveik regisztráltatását a hálózat üzemeltetőkkel. Vészhelyzetben, vagy "alátámasztási /tartalék/ szituációkban" bármely VDL-el felszerelt légijárműnek lehetőségének kell lennie kapcsolatot létrehozni bármely VDL földi állomás hálózaton keresztül.

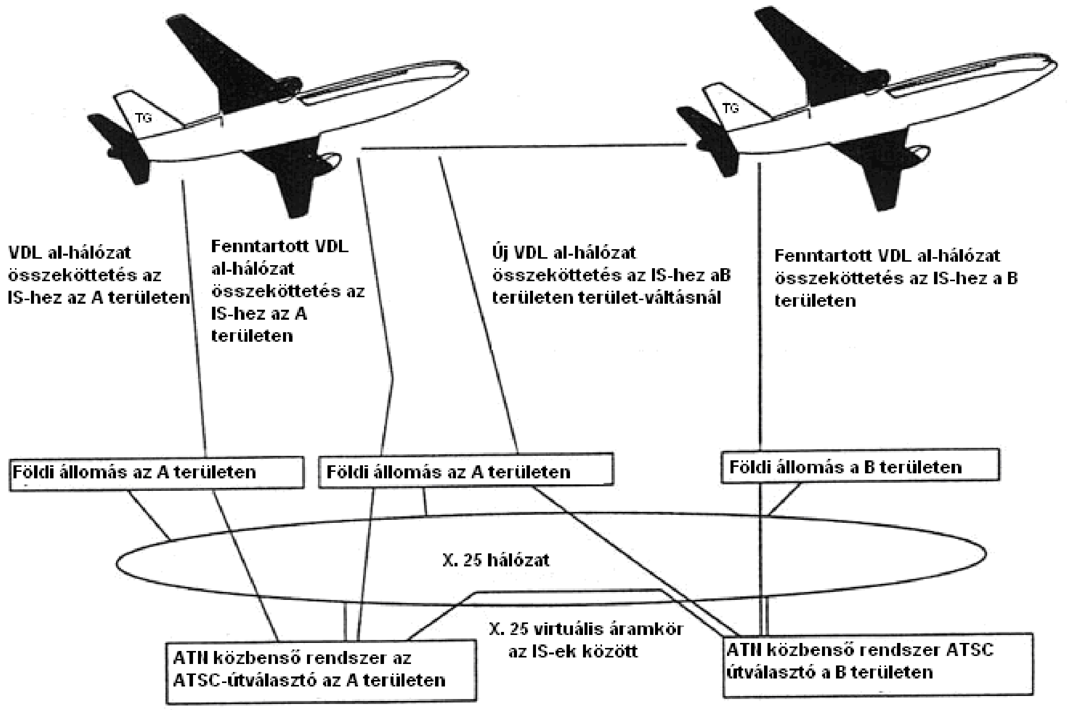
5.3.2 A légijármű VDL állomások regisztráltatása VDL hálózat üzemeltetőkkel kívánatos a hálózat kezeléshez, mivel például egy hálózat üzemeltető felismerhet egy átmeneti meghibásodást a légijárműtől eredő kommunikációban, és érintkezésbe kívánna lépni a légijármű üzemeltetővel, hogy a hibát megoldják. A légijármű regisztráció hasznos a megkívánt állomás hálózat kapacitás megtervezésénél is. Egy VDL földi állomás hálózat üzemeltetővel való regisztráltatás nem szükségszerűen vonja maga után azt, hogy a légijármű üzemeltetőnek a VDL földi állomás hálózat használatáért fizetnie kell.

A „B" MELLÉKLET ÁBRÁJA

B-1 ábra.



Forgatókönyv, ahol határállomások hozzáférést szolgáltatnak egy egyedülálló IS-hez



Forgatókönyv, ahol határállomások hozzáférést szolgáltatnak az IS-hez két útvonal-vezetésű területen

B-1 ábra.

„A” Melléklet a II. Részhez: Útmutató anyag az összeköttetési rendszerekhez

1. VHF ÖSSZEKÖTTETÉS

1.1 A VHF összeköttetési berendezések hangfrekvenciás jellemzői

1.1.1 A légiforgalmi rádiótelefon szolgáltatások a rádiótelefon alkalmazásoknak egy speciális esetét képezik, amelyben a közlemény átvitelének követelménye oly módon érvényesül, hogy a hullámforma torzításmentessége másodrendű fontosságú, a hangsúly az alapértelem torzításmentességén van. Ez azt jelenti, hogy nem szükséges a hullámformának azokat a részeit átvinni, amelyek csupán az egyediséget, a hangsúlyozást és a kiemelést érintik.

1.1.2 A tényleges megengedhető sávszélességtől a 8,33 kHz-es berendezésnél megkövetelt, hogy legalább plusz / mínusz 3462 Hz legyen. Ez az érték általános esetre, azaz a levegő-föld összeköttetésekre vonatkozik, és a következőkből áll: a 2500 Hz-es hang- frekvenciás sávszélességből, a 685 Hz-es légijármű adó insabilitásból - egy 5 rész per millió - és a 137 Hz-es földi vevő instabilitásbó1- 1 rész per millió -, valamint a Doppler eltolódás miatti 140 Hz-ből (II. Rész 2.2.2.4 és 2.3.2.6 pont).

1.2 Frekvencia eltolásos vivőhullám rendszer

A következők példák azokra az eltolt vivőhullámú rendszerekre vonatkoznak, amelyek kielégítik a II. Rész, 2.2.1.1.1 pont követelményeit.

a) *Két-vivőhullámos rendszer.* A vivőhullámot plusz és mínusz 5 kHz-nél kell elhelyezni. Ez plusz vagy mínusz 2 kHz-es frekvencia stabilitást követel meg (15,3 rész per millió 130 MHz-nél).

b) *Három-vivőhullámos rendszer.* A vivőhullámokat a nullánál és a plusz és a mínusz 7,3 kHz-nél kell elhelyezni. Ez egy plusz vagy mínusz 0,65 kHz-es frekvencia stabilitást követel meg (5 rész per millió 130 MHz-nél).

A következő példák a négy-vivőhullámú és öt-vivőhullámú rendszerekre vonatkoznak, amelyek kielégítik a II. Rész, 2.2.1.1.1 pont követelményeit.

c) *Négy-vivőhullámos rendszer.* A vivőhullámokat a plusz és a mínusz 2,5 kHz-nél, valamint a plusz és a mínusz 7,5 kHz-nél kell elhelyezni. Ez plusz vagy mínusz 0,5 kHz-es frekvencia stabilitást követel meg (3,8 rész per millió 130 MHz-nél).

d) *Öt-vivőhullámos rendszer.* A vivőhullámokat a nullánál, a plusz és a mínusz 4 kHz-nél, valamint a plusz és a mínusz 8 kHz-nél kell elhelyezni. Egy plusz vagy mínusz 40 Hz-es nagyságrendű frekvencia stabilitás (0,3 rész per millió 130 MHz-nél) a követelményeknek egy elérhető és megvalósítható interpretációja ebben az esetben.

1. Megjegyzés. – A fentiekben hivatkozott vivőfrekvencia távolságok a kijelölt csatorna frekvenciára vonatkoznak.

2. Megjegyzés. – Azokban a légijármű vevőkben, amelyek vett vivőhullám-zaj viszony mérést alkalmaznak a zaj-zár működtetésére, a két vagy több eltolású vivőfrekvencia vétele által okozott audio heterodineket zajként lehet értelmezni, és azt eredményezik, hogy az audio kimeneten a zaj-zár működését idézik elő még akkor is, amikor kielégítő megkívánt jel van. Annak érdekében, hogy a *fedélzeti vevő rendszer megfeleljen a II. Rész 2.3.2.2 pontjába foglalt érzékenységre vonatkozó ajánlásoknak, a vevők tervezésénél szükség lehet annak biztosítására, hogy érzékenységüket magas szinten tartsák, amikor eltolt vivőfrekvenciás átviteleket vesznek. A vivő szint elnyomás nem kielégítő megoldás ennél a követelménynél, hanem ahol ez alkalmazható, az elnyomási szintnek a lehető legalacsonyabb szintre állítása feljavíthatja a problémát.*

1.3 A COM vevő rendszerek érzéketlenségi teljesítménye a VHF FM rádióadás interferencia jelenlétében

1.3.1 Hivatkozással a II. Rész 2.3.3.2 pontjának Megjegyzésére, a meghatározott érzéketlenségi teljesítményt a vevő rendszer normál teljesítmény romlásának egyezményes mérésévek szemben kell mérni, a megkívánt bemenő jel jelenléte esetén és szabványos feltételek között. Ez annak biztosításához szükséges, hogy a vevő állomás berendezéseinek ellenőrzését a próbapadi vizsgálaton a feltételek ismételhető beállításával lehessen végezni, és megkönnyítsék ezek jóváhagyását. Megfelelő immunitási teljesítmény mérés nyerhető egy mínusz 87 dBm-es megkívánt jel használatával a vevőberendezésekhez és egy 1 kHz-es hang-frekvenciával modulált hanggal 30 százalékos modulációs mélységnél. A jel-zaj viszony nem eshet 6 dB alá akkot, amikor a II. Rész 2.3.3.1 és 2.3.3.2 pontjában meghatározott interferáló jeleket alkalmazzák. A kisugárzott jeleket a 87,5 és a 107,9 MHz közötti intervallumban lévő frekvenciákból kell kiválasztani és egy reprezentatív rádióadás jellemző jellel kell modulálni.

1. Megjegyzés. – A mínusz 87 dBm-es jelszint kombinált antennát és 0 dB tápvonal nyereséget feltételez.

2. Megjegyzés. – A jel-zaj viszony fent idézett csökkentése a szabványosítás célját szolgálja, amikor azt ellenőrzik, hogy a vevő állomás berendezés a próbapadi méréseken kielégíti-e a megkövetelt érzéketlenséget. A frekvenciák tervezésében és az FM rádióadás interferenciától való védelem becslésében egy ennél nem kisebb, és sok esetben nagyobb értéket kell választani, amely függ az üzemelési körülményektől egyedi esetekben az interferencia becslések alapjaként

.

2. SELCAL RENDSZER

2.1 Ennek az anyagnak az a célja, hogy a SELCAL rendszer működésére vonatkozó információt és útmutatást szolgáltasson. Ez kapcsolódik a II. Rész, 3. Fejezet által tartalmazott Ajánlott Gyakorlatokhoz.

1) *Funkció.* A SELCAL rendszer célja lehetővé tenni az egyes légijárművek szelektív hívását a földi állomást a légijárművel összekötő rádiótelefon csatornákon keresztül, és az a célja, hogy az útvonal-frekvenciákon üzemeljen a meglévő HF és VHF föld-levegő kommunikációs adókkal és vevőkkel, minimális elektromos és mechanikai módosítással. A föld-levegő kommunikációs kapcsolat normális működésének érintetlennek kell maradnia, kivéve az olyan időszakokat, mint például amikor a szelektív hívási funkciót kialakítják.

2) *Üzemelési alapelvek.* A szelektív hívást a földi adó kódolója hajtja végre, amely kódolt hang-impulzusok egy csoportját küldi a légijármű vevőnek és dekódolónak. A fedélzeti vevő és dekódoló berendezés egy indikátor segítségével képes a helyes kód vételére és értelmezésére, és az összes többi kód elutasítására véletlen zaj és interferencia jelenlétében. A kódoló berendezés földi része (földi szelektív hívó egység) szállítja a kódolt információt a föld-levegő adónak. A fedélzeti szelektív hívó egység az a speciális fedélzeti berendezés, amely a légijárművön meglévő kommunikációs vevővel üzemel, lehetővé téve a föld-levegő jelek dekódolását a jel indikátoron lévő kijelző számára. A jel indikátor típusnál úgy lehet választani, hogy illeszkedjen a felhasználó üzemelési követelményeihez és egy lámpából, egy csengőből, egy "harangból" vagy ilyen jelző berendezések tetszőleges kombinációjából állhat.

ANNEX 10/IV.

Légiforgalmi távközlés: Ellenőrző radar és összeütközés elhárító rendszerek

IV. kötet 3. kiadás – 2002. július
81. módosítással

A jelen kiadvány magába foglalja a Tanács által 2002. február 28. előtt elfogadott minden módosítást, és 2002. november 28-tól hatálytalanítja a 10. Annex IV. kötetének összes korábbi kiadásait.

A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót.

Nemzetközi Polgári Repülési Szervezet

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK BEJEGYZÉSE

MÓDOSÍTÁSOK					JAVÍTÁSOK			
Szám	Alkalmaz-hatóság dátuma	Beírás dátuma	Beírta:		Szám	Kiadás dátuma	Beírás dátuma	Beírta:
70-81	Ebbe a kiadásba beépítve							

Előszó

Történelmi háttér

A repülési távközlésre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (1944. Chicago) 37. cikkelyének rendelkezései alapján 1949 május 30-án fogadta el és foglalta a 10. számú Annex-be. Az előírások 1950 március 1-én léptek hatályba. A nemzetközi előírások és ajánlott gyakorlati eljárások az Távközlési Részleg 1949 januári harmadik ülésének ajánlásain alapszanak.

A 10. Annex Hetedik Kiadását és az ezt megelőző kiadásokat egy kötetben adták ki, amely négy részt tartalmazott a hozzátartozó mellékletekkel együtt: I. Rész – Berendezések és rendszerek, II. Rész – Rádió frekvenciák, III. Rész – Eljárások, és IV. Rész – Kódok és rövidítések.

A 42. Módosítással a IV. Részt törölték az Annexből; az ebben a Részben szereplő kódokat és rövidítéseket egy új dokumentumba, a Doc 8400-ba vitték át.

A 44. Módosítás 1965 május 31-i elfogadásával a 10. Annex Hetedik Kiadását két kötettel helyettesítették: I. Kötet (Első Kiadás), amely az I. Rész – Berendezések és rendszerek és a II. Rész – Rádió frekvenciák részeket tartalmazza, és a II. Kötet (Első Kiadás), amely az Összeköttetési eljárásokat tartalmazza.

A 70. Módosítás 1995 március 20-i elfogadásával a 10. Annex-et öt kötetből állóra szerkesztették át: I. Kötet – Rádiónavigációs segédeszközök; II. Kötet – Összeköttetési eljárások; III. Kötet – Összeköttetési rendszerek; IV. Kötet – Felderítő radar és összeütközés elkerülését biztosító rendszerek; és V. Kötet – Repülési rádió frekvencia spektrum felhasználása. A 70. Módosítás alapján a III. és IV. Köteteket 1995-ben adták ki, és az V. Kötet kiadását a 71. Módosítással tervezték.

Az A. táblázat a vonatkozó fontosabb témakörök felsorolásával bemutatja a 10. Annex, IV. Kötet módosításait a 70. Módosítást követően és megadja azokat a dátumokat, amelyeken az Annexet és a módosításokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

A Szerződő Államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex szövegének felhasználása a nemzeti szabályozásokban.

A Tanács 1948. április 13-án elfogadott egy határozatot, amely felhívja a Szerződő Államok figyelmét arra, hogy kívánatos saját nemzeti szabályozásaikban, amennyiben lehetséges, azoknak az ICAO előírásoknak a pontos nyelvezetét használni, amelyek szabályozó jellegűek; továbbá, hogy kívánatos a nemzetközi előírásoktól való eltérések közlése, beleértve bármely pótlólagos nemzeti szabályozásról adott tájékoztatást, amely fontos a légiközlekedés biztonsága és rendszeressége szempontjából. Ahol csak lehetséges volt, jelen Annex rendelkezései olyan módon íródtak, hogy megkönnyítsék a nemzeti rendelkezésekbe nagyobb szöveg változtatás nélküli beillesztését.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben. Az egyes részek jogállása a következő:

1.— Az Annex anyaga:

a) *Nemzetközi előírások és ajánlott gyakorlati eljárások*, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) *Függelék:* A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) *Meghatározások:* A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) *Táblázatok és ábrák:* Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

2.— A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) *Előszó:* Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) *Bevezető:* Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) *Megjegyzések:* Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) *Mellékletek:* A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Felelősség elhárítás szabadalmakra vonatkozóan

Felhívjuk a figyelmet arra a lehetőségre, hogy ebben az Annexben a nemzetközi előírások és ajánlott gyakorlati eljárások bizonyos elemei szabadalmak vagy más szellemi tulajdonjog tárgyát képezik. Az ICAO-t nem lehet felelőssé tenni, ha ilyen jogokat nem ismer fel. Az ICAO nem foglal állást bejelentett szabadalmak vagy más szellemi tulajdonjog létezése, érvényessége, hatásköre vagy alkalmazhatósága vonatkozásában és nem vállal felelősséget ebben a vonatkozásban.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et négy nyelven — angol, francia, orosz és spanyol nyelven fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***"Ajánlás"*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a "*Megjegyzés :* " felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall - kell" kifejezéssel és az ajánlott gyakorlati eljárásokat “should - szükséges" kifejezéssel jelezzük. Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával. A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel - vonatkozik az adott rész minden egyes pontjára is.

A. táblázat — A 10. Annex IV. kötetének módosításai

módosítás	*forrás*	*tárgy*	*elfogadva/ hatályos/ alkalmazható*
70	Léginavigációs Bizottság Másodlagos Felderítő Radar Tökéletesítési és Összeütközés elkerülését biztosító rendszerek Munkacsoport ötödik ülése	A IV. Kötet megalkotása, és a nemzetközi előírások vagy ajánlott gyakorlati eljárások és a vonatkozó útmutató anyagok bevezetése az összeütközés elkerülését biztosító fedélzeti rendszerre (ACAS) vonatkozóan.	1995. március 20. 1995. július 24. 1995. november 9.
71	Léginavigációs Bizottság Másodlagos Felderítő Radar Tökéletesítési és Összeütközés elkerülését biztosító rendszerek Munkacsoport (SICASP) negyedik és ötödik ülése	Az SSR S-módú levegő-föld adatkapcsolati rendszerre és az SSR válaszjeladók szállítására vonatkozó anyagok változásai.	1996. március12. 1996. július 15. 1996. november 7.
72	—	Nincs változás	—
73 **(2. kiadás)**	Léginavigációs Bizottság Másodlagos Felderítő Radar Tökéletesítési és Összeütközés elkerülését biztosító rendszerek Munkacsoport (SICASP) hatodik ülése	Specifikációkkal való kiegészítés az SSR S-módú rendszerekhez; az összeütközés elkerülését biztosító logika működésére vonatkozó anyag bevezetése; az összeütközés elkerülését biztosító fedélzeti rendszerre vonatkozó útmutató változásai; az Emberi Tényezőkre vonatkozó anyag bevezetése.	1998. március 19. 1998. július 15. 1998. november 5.
74	Léginavigációs Bizottság	Megjegyzés az S-módú kiterjesztett squitter eljárás szabadalmi jogairól való lemondásra vonatkozóan	1999. március 18. 1999. március 18.
75	—	Nincs változás	—
76	Légiforgalmi Mobil Összeköttetési Munkacsoport (AMCP) hetedik ülése	Az ITU Rádió Szabályozásokra hivatkozások frissítésére vonatkozó megjegyzés	2001. március 12. 2001. március 12. -
77 **(3. kiadás)**	Másodlagos Felderítő Radar Tökéletesítési és Összeütközés elkerülését biztosító rendszerek Munkacsoport (SICASP) hetedik ülése	SSR S-mód (2. és 3. fejezet); és ACAS (1. és 4. fejezet)	2002 február 27. 2002. július 15. 2002. november 28.
78-81	—	Nincs változás	—

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

1. fejezet Meghatározások

1. Megjegyzés.— A "Nemzetközi Rádiószabályzat"-ra vonatkozó minden hivatkozás a Nemzetközi Távközlési Egyesület (ITU) által közzétett Nemzetközi Rádiószabályzatra vonatkozik. A Nemzetközi Rádiószabályzat újra és újra módosításra kerül az általában két vagy három évenként megrendezésre kerülő Rádiótávközlési Világ-Konferenciák záróközleményeiben kifejezett döntéseknek megfelelően. A Nemzetközi Távközlési Egyesület /ITU/ eljárásainak azon részeit, amelyek a légiforgalmi rádió-rendszerek frekvenciáinak felhasználására vonatkozó további információkat tartalmazzák, a Polgári Légiközlekedés Rádió Frekvencia Spektrum Követelmények kézikönyve foglalja össze, amely egyúttal a jóváhagyott ICAO elvek ismertetését is magába foglalja *(Doc 9718).*

2 .Megjegyzés: .— Az S-módú kiterjesztett squitter rendszer a Massachusetts Institute of Technology (MIT) Lincoln Laboratory által bejegyzett szabadalom. A MIT Lincoln Laboratory 1966. augusztus 22-én közleményt adott ki a Commerce Daily-ben (CBD), az Egyesült Államok Kormányának egyik kiadványában, amely szerint nem kívánja szabadalom tulajdonosi jogát érvényesíteni senki ellen a szabvány kereskedelmi vagy nem-kereskedelmi használatánál annak érdekében, hogy elősegítse az S-módú kiterjesztett squitter technológia lehető legszélesebb felhasználását. Továbbá az ICAO-hoz írott 1998. augusztus 27-én kelt levelében a MIT Lincoln Laboratory megerősítette, hogy a CBD közlemény kielégíti a nemzetközi előírásokban és ajánlott gyakorlati eljárásokban leírt, a szabadalmi jogra vonatkozó nyilatkozattal szembeni ICAO követelményeket, és hogy a szabadalom tulajdonosai ezt az eljárást díjmentesen felajánlják bármilyen célú felhasználásra.

Összeütközés elkerülését biztosító fedélzeti rendszer — Airborne collision avoidance system (ACAS)
A másodlagos felderítő radar (SSR) válaszjeladó egysége jeleinek segítségével működő fedélzeti rendszer, amely a földi berendezésektől függetlenül tájékoztatja a légijármű vezetőjét az SSR válaszjeladóval felszerelt, összeütközési veszélyt jelentő egyéb légijárművekről.
Megjegyzés. - A fent hivatkozottak azok az SSR válaszjeladók, amelyek C-módban vagy S-módban működnek.

Légijármű címzés – Aircraft address
Huszonnégy bit egyedi kombinációja, amely egy légijármű jelölésére áll rendelkezésre levegő-föld kommunikáció, navigáció és légtér ellenőrzés céljára.

Összeütközés elkerülési logika - Collision avoidance logic
Az ACAS részének alrendszere, amely analizálja a megközelítő- és a saját légijárműre vonatkozó adatokat, eldönti, hogy a tanácsadás alkalmas-e vagy nem, ha igen, akkor a tanácsadásokat generálja. A következő feladatokat látja el: távolság- és tengerszint feletti magasság követés, veszély érzékelés és megoldási tanácsadás (bólintási utasítás) létrehozás. Nem tartalmazza a felderítést.

Emberi tényező alapelvek - Human Factors principles
A légiközlekedés tervezés, jogosítás, kiképzés, üzemeltetés és karbantartás vonatkozó alapelvei, amelyek célja az emberi teljesítmény és teljesítőképesség tényezőinek átfogó és teljes mértékű figyelembevételével biztonságos kapcsolat kialakítása a személyek és a rendszer egyes (műszaki) elemei között.

Másodlagos felderítő radar - Secondary surveillance radar (SSR)
Felderítő radar rendszer, amely adó/vevőket (lekérdezőket) és válaszjeladókat használ.

Megjegyzés. - A lekérdezőkkel és válaszjeladókkal szembeni követelményeket a 3. fejezet tartalmazza.

Felderítő radar - Surveillance radar
A légijármű, távolság és azimut szerinti helyzetének meghatározására használatos radarberendezés.

2. fejezet Általános ismertetés

2.1 Másodlagos felderítő radar (SSR)

2.1.1 Amikor légiforgalmi szolgálatok berendezéseként egy másodlagos felderítő radart felállítanak és üzemelés közben karbantartanak, ennek a 3.1 pont szerinti rendelkezésekkel összhangban kell lennie, hacsak a jelen 2.1 pontban nincs másképpen előírva.

Megjegyzés. – Ahogyan a jelen Annexben említést nyert, az A/C módú válaszjeladók azok, amelyek a 3.1.1 pontban leírt jellemzőknek megfelelnek. Az S-módú válaszjeladók azok, amelyek a 3.1.2 pontban leírt jellemzőknek megfelelnek. Az A/C-módú válaszjeladók funkcionális képességei az S-módú válaszjeladók funkcionális képességeinek integrált részét képezik.

2.1.2 Lekérdezési módok (föld-levegő)

2.1.2.1 A lekérdezést a légiforgalmi szolgálatoknál a 3.1.1.4.3 vagy 3.1.2 pontban leírt módokban kell végrehajtani. Az egyes módok használata a következő:

1) *A-mód* – a válaszjeladót válaszra késztetni azonosítására és felderítésére.
2) *C-mód* – a válaszjeladót válaszra késztetni automatikus nyomásmagasság átvitelére és felderítésére.
3) *Inter (köztes) mód –*

a) *A/C/S all-call mód:* válaszokat generálni az A/C-módú válaszjeladók felderítésére és az S-módú válaszjeladók megszerzésére.

b) *Csak A/C all-call mód*: válaszokat generálni az A/C válaszjeladók ellenőrzésére. Az S-módú válaszjeladók nem reagálnak.

4) *S-mód –*

a) *Csak S all-call mód:* válaszokat generálni S-módú válaszjeladók megszerzésére.
b) *Közvetítés:* információkat továbbítani az összes S-módú válaszjeladóhoz. Válaszokat nem generálnak.
c) *Szelektív:* az egyedi S-módú válaszjeladók felderítésére és az egyedi S-módú válaszjeladókkal való összeköttetésre. Az egyes lekérdezésekhez választ csak a lekérdezés által egyedileg megcímzett válaszjeladók generálnak.

1. Megjegyzés. – Az A/C-módú válaszjeladókat az S-módú lekérdezések elnyomják és ezek nem válaszolnak.

2. Megjegyzés. – 25 lehetséges lekérdezési (fedélzetről leadott adattovábbítás) formátum és 25 lehetséges S-módú válasz (fedélzetről leadott adattovábbítás) formátum van. A formátum jelöléseket lásd a 3.1.2.3.2 pont, 3-7 és 3-8 ábrákon.

2.1.2.1.1 **Ajánlás. –** *Az ügyintézést a megfelelő nemzeti és nemzetközi hatóságokkal kell koordinálni a másodlagos felderítő radarrendszer azon végrehajtási szempontjait illetően, amelyek lehetővé teszik annak optimális használatát.*

Megjegyzés. – Hogy lehetővé tegyék azoknak a földi berendezéseknek a hatékony működését, amelyeket az egymással határos kérdező berendezéseknek a légijármű válaszjeladó által adott nem-kívánt válaszaiból adódó zavarok kiküszöbölésére szántak (aszinkron impulzus jelek elnyomására szolgáló berendezések), az Államoknak szükséges lehet koordinált tervek kialakítására az impulzus-ismétlődési frekvenciák (PRF) jelöléséhez a másodlagos felderítő radar lekérdezésekhez.

2.1.2.1.2 Azon lekérdező azonosító (II) kódoknak a kijelölése, amelyek a repülési információs körzetek nemzetközi határain keresztül átlapoló lefedési területeken szükségesek, regionális léginavigációs egyezmények tárgyai.

2.1.2.1.3 Azon felderítő azonosító (SI) kódoknak a kijelölése, melyek az átlapoló lefedési területeken szükségesek, regionális léginavigációs egyezmények tárgyai.

Megjegyzés. – Az SI kizárási eszköz nem használható, hacsak a fedési távolságon belül az összes S-módú válaszjeladó nincs erre a célra felműszerezve.

2.1.2.2 A-módú és C-módú lekérdezéseket szolgáltatni kell.

Megjegyzés. – Ezt a követelményt kielégíthetik azok a közös módú lekérdezések, amelyek A-módú és C-módú válaszokat váltanak ki A/C-módú válaszjeladóktól.

2.1.2.3 **Ajánlás. –** *Azokon a területeken, ahol a Légiforgalmi irányítási rendszer hatékonyságának növeléséhez korszerűsített légijármű azonosítás szükséges, az S-módú lehetőséggel bíró másodlagos felderítő radar földi berendezéseknek légijármű azonosító képességgel kell rendelkezniük.*

Megjegyzés. – Az S-módú adatkapcsolaton keresztül történő légijármű azonosításnak biztosítania kell az alkalmasan felszerelt légijármű egyértelmű azonosítását.

2.1.2.4 Oldalszirom elnyomását irányító lekérdezés

2.1.2.4.1 Oldalszirom elnyomást a 3.1.1.4 és 3.1.1.5 pontok rendelkezéseivel összhangban kell szolgáltatni minden A-módú, C-módú és közös módú lekérdezésnél.

2.1.2.4.2 Oldalszirom elnyomást a 3.1.2.1.5.1 pont rendelkezéseivel összhangban kell szolgáltatni minden S-módú all-call lekérdezésnél.

2.1.3 Válaszjeladó válasz módok (levegő-föld)

2.1.3.1 A válaszjeladók az A-módú lekérdezésekre a 3.1.1.7.12.1 pont rendelkezéseinek megfelelően, a C-módú lekérdezésekre a 3.1.1.7.12.2 pont rendelkezéseinek megfelelően válaszolnak.

Megjegyzés. – Ha nyomásmagasság információ nem áll rendelkezésre, a válaszjeladók a C-módú lekérdezésekre csak keretimpulzusokkal válaszolnak.

2.1.3.1.1 Az S-módú válaszokban foglalt nyomásmagasság jelentéseket a 3.1.1.7.12.2 pontban meghatározottak szerint kell származtatni.

Megjegyzés. – A 3.1.7.12.2 a C-módú válaszokra és meghatározásokra vonatkoznak, többek között, *hogy a C-módú nyomásmagasság jelentéseket az 1013,25 hektopascal szabványos nyomásbeállításra vonatkoztassák. A 2.1.3.1.1 pont szándékozik biztosítani, hogy ne csak a C-módú válaszjeladó, hanem az összes válaszjeladó korrigálatlan nyomásmagasságot jelentsen.*

2.1.3.2 Ahol C-módú automatikus nyomásmagasság továbbítási képesség igénye egy megadott légtéren belülre van meghatározva, a válaszjeladók, amikor a szóbanforgó légtéren belül kerülnek használatra, a C-módú lekérdezésekre nyomásmagasság kódolással reagálnak az információ impulzusokban.

2.1.3.2.1 1999. Január 1-jétől minden válaszjeladó tekintet nélkül a légtérre, amelyben használni fogják, a C-módú lekérdezésekre nyomásmagasság információval reagál.

Megjegyzés. – Az összeütközés elkerülését biztosító fedélzeti rendszer (ACAS) működése a veszélyeztető légijármű C-módú válaszaiban foglalt nyomásmagasság közlésétől függ.

2.1.3.2.2 **Ajánlás.** – *A 7,62 m (25 láb) vagy ennél jobb nyomásmagasság forrású légijárműveknél az S-módú válaszjeladók által a szelektív lekérdezésekre adott válaszban (azaz az AC mezőben, 3.1.2.6.5.4 pont) szolgáltatott nyomásmagasság információt 7,62 m (25 láb) növekményekben kell jelenteni.*

Megjegyzés. – Az ACAS teljesítménye jelentősen megnövekszik, ha egy veszélyeztető légijármű 7,62 m 25 láb) növekményekben nyomásmagasságot jelent.

2.1.3.2.3 Minden 1992. január 1-jén vagy azután felszerelt A/C-módú válaszjeladónak a nyomásmagasságot C-módú válaszokban, az információ impulzusokban kódolva kell jelentenie.

2.1.3.2.4 Minden 1992. január 1-jén vagy azután felszerelt S-módú válaszjeladó a nyomásmagasságot C-módú válaszoknál az információ impulzusokban kódolva, és az S-módú válaszok AC mezejében közli.

2.1.3.2.5 Az összes 7,62 m (25 láb) vagy ennél jobb nyomásmagasság forrásokkal rendelkező, S-módú válaszjeladóval felszerelt légijármű nyomásmagasságát 7,62 m (25 láb) növekményekbe kódolva, az S-módú válaszok AC mezejében kell jelenteni 2005 január 1-jétől.

2.1.3.2.6 Amikor egy S-módú válaszjeladó 7,62 m (25 láb) növekményekben jelent, a jelentett magasság értéknek a légijármű nem-korrigált nyomásmagassága mért értékének 7,62 m (25 láb) növekményekben való kifejezéséből nyert értéknek kell lenni.

Megjegyzés. – Ez az előírás az S-módú válaszjeladó beépítésére és használatára vonatkozik. A cél annak biztosítása, hogy egy 30,48 m (100 láb) növekmény forrásból nyert magasság adatokat ne jelentsék a 7,62 m (25 láb) kifejezésű adatokhoz szolgáló formátumok felhasználásával.

2.1.3.3 Azon válaszjeladók, amelyeket azon légtéren belül használnak, amelyre S-módú fedélzeti kapacitás szükségességét állapították meg, szintén reagáljanak az inter módú és S-módú lekérdezésekre a 3.1.2 pont alkalmazható rendelkezéseivel összhangban.

2.1.3.3.1 Másodlagos felderítő radar S-módú válaszjeladók kötelező szállítására vonatkozó követelménynek regionális léginavigációs egyezményeken kell alapulnia, amelyek meghatározzák a légtérhez és a fedélzethez kapcsolódó megvalósítás időléptékét.

2.1.3.3.2 **Ajánlás.** – *A 2.1.3.3.1 pontban jelzett egyezmények legalább öt éves felmondásúak legyenek.*

2.1.4 A-módú válasz kódok (információ impulzusok)

2.1.4.1 Minden válaszjeladó legyen képes 4096, a 3.1.1.6.2 pontban megadott jellemzők szerinti válasz kód generálására.

2.1.4.1.1 **Ajánlás** – *A légiforgalmi szolgálati hatóságai hozzák létre a másodlagos felderítő radar kódok kijelölési eljárásait a regionális léginavigációs egyezményeknek megfelelően, figyelembe véve a rendszer többi felhasználóit is.*

Megjegyzés. – A másodlagos felderítő radar kódok szétosztásának alapelvei a Doc 4444, 8. fejezetében találhatók.

2.1.4.2 Különleges célokra az alábbi A-módú kódokat fenn kell tartani:

2.1.4.2.1 A 7700-as kódot a vészhelyzetben lévő légijármű felismeréséhez.

2.1.4.2.2 A 7600-as kódot rádiókommunikáció meghibásodással rendelkező légijármű felismeréséhez.

2.1.4.2.3 A 7500-as kódot a jogellenes beavatkozás alatt lévő légijármű felismeréséhez.

2.1.4.3 A földi dekódoló berendezéseket megfelelően fel kell szerelni annak biztosítására, hogy az A-módú 7500-as, 7600-as és 7700-as kódokat azonnal felismerjék.

2.1.4.4 **Ajánlás**. – *Az A-módú 0000 kódot fenn kell tartani a regionális egyezményekhez általános célú kódként*.

2.1.4.5 Az A-módú 2000-es kódot fenn kell tartani olyan légijármű felismeréséhez, amely a légiforgalmi irányító egységtől nem kapott utasítást a válaszjeladó működtetésére.

2.1.5 Az S-módú fedélzeti berendezés képességei

2.1.5.1 Minden S-módú válaszjeladó az alábbi öt szint egyikének feleljen meg:

2.1.5.1.1 Szint 1 – az 1. szintű válaszjeladók rendelkezzenek a következőkhöz előírt képességekkel:

a) A-módú azonosság és C-módú nyomásmagasság közlés (3.1.1 pont);

b) inter módú és S-módú all-call tranzakciók (3.1.2.5 pont);

c) címzett felderítési magasság és azonossági tranzakciók (3.1.2.6.1, 3.1.2.6.3, 3.1.2.6.5 és 3.1.2.6.7 pontok);

d) kizárás protokollok (3.1.2.6.9 pont);

e) bázis adat protokollok, kivéve az adatkapcsolat képesség közlés (3.1.2.6.10 pont); és

f) levegő-levegő squitter tranzakciók (3.1.2.8 pont).

Megjegyzés. – Az 1. szint lehetővé teszi a másodlagos felderítő radarral történő felderítést, a nyomásmagasság közlés és az A-módú azonosítási kód alapján. Másodlagos felderítő radar S-módú környezetben a műszaki működés az A/C-módú válaszjeladóhoz képest tökéletesített, az S-módú szelektív légijármű lekérdezés miatt.

2.1.5.1.2 Szint 2 – a 2. szintű válaszjeladók rendelkezzenek a 2.1.5.1.1 pont szerinti képességekkel, és rendelkezzenek a következőkhöz előírt képességekkel is:

a) szabványos hosszúságú kommunikáció (Comm-A és Comm-B) (3.1.2.6.2, 3.1.2.6.4, 3.1.2.6.6, 3.1.2.6.8 és 3.1.2.6.11 pontok);

b) adatkapcsolat képességének közlése (3.1.2.6.10.2.2 pont); és

c) légijármű azonosítás közlés (3.1.2.9 pont).

Megjegyzés. – A 2. szint lehetővé teszi a légijármű azonosítás közlést és más szabványos hosszúságú adatkapcsolat kommunikációját földről a levegőbe és levegőből a földre. A légijármű azonosítás közlés képesség egy illesztő egységet és megfelelő bemeneti berendezést igényel.

2.1.5.1.3 Szint 3 – A 3. szintű válaszjeladók rendelkezzenek a 2.1.5.1.2 pont szerinti képességekkel, és rendelkezzenek azokkal is, amelyek föld-levegő kiterjesztett hosszúságú közlemény (ELM) kommunikációjához vannak előírva (3.1.2.7.1-től 3.1.2.7.5-ig pontok).

Megjegyzés. – A 3. szint lehetővé teszi a kiterjesztett hosszúságú adatkapcsolat kommunikációt a földről a levegőbe és így visszakeresést biztosíthat földi adatbázisokból, és lehetővé teszi más légiforgalmi szolgáltatások fogadását, amelyek a 2. szintű válaszjeladóknál nem állnak rendelkezésre.

2.1.5.1.4 Szint 4 – a 4. szintű válaszjeladók rendelkezzenek a 2.1.5.1.3 pont szerinti képességekkel, és rendelkezzenek azokkal is, amelyek levegő-föld kiterjesztett hosszúságú közlemény (ELM) kommunikációjához vannak előírva (3.1.2.7.7 és 3.1.2.7.8 pontok).

Megjegyzés. – A 4. szint lehetővé teszi a kiterjesztett hosszúságú adat kapcsolat kommunikációt a levegőből a földre és így hozzáférést biztosíthat a földről a fedélzeti adatforrásokhoz és más adatok átviteléhez, amelyeket a légiforgalmi szolgálatok igényelnek és amelyek a 2. szintű válaszjeladóknál nem állnak rendelkezésre.

2.1.5.1.5 Szint 5 – az 5. szintű válaszjeladók rendelkezzenek a 2.1.5.1.4 pont szerinti képességekkel, és azokkal is, amelyek megnövelt Comm-B és kiterjesztett hosszúságú (ELM) kommunikációhoz vannak előírva (3.1.2.6.11.3.4, 3.1.2.7.6 és 3.1.2.7.9 pontok).

Megjegyzés. – Az 5. szint lehetővé teszi Comm-B és kiterjesztett hosszúságú adatkapcsolat kommunikációt többszörös lekérdezőkkel anélkül, hogy többszörös helyigénylése lenne. Az ilyen szintű válaszjeladó magasabb adatkapcsolati kapacitás minimummal rendelkezik, mint más válaszjeladó szintek.

2.1.5.1.6 *Kiterjesztett squitter* – Kiterjesztett squitter válaszjeladók a 2.1.5.1.2, 2.1.5.1.3, 2.1.5.1.4 vagy 2.1.5.1.5 pontokban ismertetett, valamint a kiterjesztett squitter üzemeléshez előírt (3.1.2.8.6) képességekkel rendelkezzenek. Az ilyen képességgel rendelkező válaszjeladókat az "e" utótaggal kell megjelölni.

Megjegyzés. – Például egy kiterjesztett squitter képességgel rendelkező 4. szintű válaszjeladót "4.e szint"-tel kell jelölni.

2.1.5.1.7 *SI képesség* – SI kódok feldolgozására képes válaszjeladóknak a 2.1.5.1.2, 2.1.5.1.3, 2.1.5.1.4 vagy 2.1.5.1.5 pontokban ismertetett, valamint az SI kód üzemelésre előírt (3.1.2.3.2.1.4, 3.1.2.5.2.1, 3.1.2.6.1.3, 3.1.2.6.1.4.1, 3.1.2.6.9.1.1 és 3.1.2.6.9.2) képességekkel kell rendelkezniük. Az ilyen képességgel rendelkező válaszjeladókat az "s" utótaggal kell megjelölni.

Megjegyzés. – Például egy kiterjesztett squitter képességgel és SI képességgel rendelkező 4. szintű válaszjeladót "4.es szint"-tel kell jelölni.

2.1.5.1.7.1 SI kód képességgel kell ellátni a 2.1.5.1.7 pont előírásainak megfelelően az összes 2003 január 1-jén vagy azután felszerelt S-módú válaszjeladót, és 2005 január 1-jéig az összes S-módú válaszjeladót.

Megjegyzés. – Egyes Államok mandátumai az alkalmazhatóságot ennél a dátumnál előbb megkövetelhetik.

2.1.5.1.8 *Kiterjesztett squitter nem-válaszjeladó készülékek.* Azok a készülékek, amelyek olyan kiterjesztett squitter-ek közvetítésére képesek, amelyek nem részei egy S-módú válaszjeladónak, feleljenek meg az összes 1090 MHz RF jelek térbeli követelményeinek, amelyek egy S-módú válaszjeladóra vannak megadva.

2.1.5.2 Minden, a nemzetközi polgári légiforgalom által használt S-módú válaszjeladó feleljen meg legalább a 2.1.5.1.2 pontban előírt 2. szint követelményeinek.

1. Megjegyzés. – Az 1. szint használata megengedett lehet valamelyik Államon belül vagy egy regionális léginavigációs egyezmény kitételein belül. Az S-módú 1. szintű válaszjeladó a tulajdonságok minimális együttesére szorítkozik az S-módú válaszjeladók másodlagos felderítő radar S-módú lekérdezőkkel megegyező működésénél. Ez a meghatározás azért szükséges, hogy megakadályozzák a 2. szint alatti válaszjeladó típusok elszaporodását, amelyek nem illeszthetők a másodlagos felderítő radar S-módú lekérdezőihez.

2. Megjegyzés. – A 2. szint képességével szembeni követelmények szándéka az, hogy biztosítsa egy ICAO szabvány szerinti válaszjeladó képesség széleskörű felhasználását, ami lehetővé teszi az S-módú földi berendezések és szolgálatok tervezését világszerte. A követelmény azonkívül visszatartó erőt képvisel az 1. szintű válaszjeladók kezdetiként történő felszerelésével szemben, amelyeket elavulttá tesznek bizonyos légtérre vonatkozó követelmények, amelyek ott kötelezően 2. szintű képességekkel bíró válaszjeladók felszerelését írják elő.

2.1.5.3 Az 5700 kg bruttó tömeget meghaladó, vagy a 324 km/óra (175 csomó) sebességet meghaladó utazósebesség kapacitású légijárművekre szerelt S-módú válaszjeladóknak a 3.1.2.10.4 pontban előírtaknak megfelelő antenna eltéréssel kell működniük, ha:

a) a légijármű egyedi légialkalmassági bizonyítványát elsőízben 1990. január 1-jén vagy azután adták ki; vagy
b) S-módú válaszjeladó fedélzeti elhelyezését regionális léginavigációs egyezmény alapján a 2.1.3.3.1 és 2.1.3.3.2 pontoknak megfelelően követelik meg.

Megjegyzés. – 324 km/h (175 csomó) sebességet meghaladó maximális tényleges utazósebességű légijárművek számára előírják, hogy 21,0 dBW-nél nem kisebb csúcsteljesítménnyel üzemeljen, ahogyan azt a 3.1.210.2 c) pontban meghatározták

2.1.5.4 Képesség közlés S-módú squitter-ek esetén

1.5.4.1 Képesség közlést S-módú kiválasztott squitter-ben (kérés nélküli fedélzetről leadott adattovábbításnál) a 3.1.2.8.4.1 pont rendelkezéseivel összhangban kell szolgáltatni minden 1995. január 1-jén vagy ezután felszerelt S-módú válaszjeladóknál.

2.1.5.4.2 **Ajánlás. –** *Kiterjesztett squitter üzemeléssel felszerelt válaszjeladók rendelkezzenek olyan eszközzel, amely alkalmas a kiválasztott squitter-ek üzemen kívül helyezésére, amikor a kiterjesztett squitter-ek sugárzás alá kerülnek.*

Megjegyzés. – Ez megkönnyíti a kiválasztott squitter-ek elnyomását, ha az összes ACAS egységet átalakították a kiterjesztett squitter vételére.

2.1.5.5 Megnövelt hosszúságú közlemény (ELM) átviteli teljesítménye

Annak érdekében, hogy megkönnyítsék a meglévő S-módú válaszjeladók átalakítását teljes S-mód képesség magában foglalására, az eredetileg 1999 január 1-je előtt gyártott válaszjeladóknak lehetővé kell tenni a 16 ELM szegmensű köteg átvitelét 20 dBW minimális teljesítmény szinten.

Megjegyzés. – Ez 1 dB csillapítást jelent a 3.1.2.10.2 pontban megadott teljesítmény előíráshoz képest.

2.1.6 SSR S-módú címzés (légijármű címzés)

A másodlagos felderítő radar S-módú címzése a 16 777 214 huszonnégy-bites légijármű címek egyike, amelyet az ICAO a Lajstromozó Államnak, vagy a közös jel regisztráló hatóságnak osztott ki és a 3.1.2.4.1.2.3.1.1 pontban és a 10. Annex III. kötet, I. rész, 9. fejezet Függelékében leírtaknak megfelelően kijelölt.

2.2 Emberi tényezőkre vonatkozó meggondolások

Ajánlás. – *Az emberi tényezők alapelveit a felderítő radar és ütközés elkerülését biztosító rendszerek tervezésénél figyelembe kell venni.*
Megjegyzés. – Az emberi tényezők alapelvekre vonatkozó útmutató anyag a Doc 9683-ban, Emberi tényezők oktatási kézikönyv (Human Factors Training Manual) *és a Circular 249-ben* (Emberi tényezőkre vonatkozó tömör kivonat 11. szám – Emberi tényezők a CNS/ATM rendszerekben) (Human Factors Digest No. 11 – Human Factors in CNS/ATM Systems) *kiadványokban található.*

3. fejezet Felderítő radarrendszerek

3.1 Másodlagos felderítő radar (SSR) rendszer Jellemzők

1. Megjegyzés. – A 3.1.1 szakasz csak azoknak a másodlagos radar rendszereknek a műszaki jellemzőit írja elő, amelyek A-módú és C-módú képességekkel rendelkeznek. Az S-módú képességekkel rendelkező rendszer jellemzőit a 3.1.2 szakasz írja elő.

2 Megjegyzés. – S-módú képességeket használó rendszereket általában légiforgalmi irányítási ellenőrző rendszereknél használnak. Ezenkívül, bizonyos ATC alkalmazások használhatnak S-módú kisugárzókat, pl. jármű felület felderítésére, vagy rögzített céltárgy észlelésére alkalmas felderítő rendszereken. Ilyen különleges feltételek között a "légijármű" fogalom alatt "légijármű vagy jármű (A/V)" érthető. Míg ezek az alkalmazások az adatok korlátolt halmazára használhatók, a szabványos fizikai jellemzőktől való eltéréseket az illetékes hatóságoknak nagyon óvatosan kell kezelniük. Nemcsak a saját felderítési (SSR) környezetüket kell figyelembe venniük, hanem más rendszerekre, mint például az ACAS, gyakorolt lehetséges hatásokat is.

3. Megjegyzés. – A szabványostól eltérő nemzetközi alternatív egységeket az 5. Annex, 3. fejezet, 3.2.2 paragrafusban engedélyezettek szerint használják.

3.1.1 Csak A-módú és C-módú képességekkel rendelkező rendszerek

1. Megjegyzés. – Ebben a szakaszban a másodlagos felderítő radar üzemmódokat A és C betűkkel jelöljük. Az indexszel ellátott betűket, pl. A_2, C_4, a levegő-föld impulzus együttesekben lévő egyes impulzusok jelölésére használják. A betűknek ezt a közös használatát nem úgy kell értelmezni, mint módok és kódok valamilyen részleges összetársítását.

2. Megjegyzés. – A radar adatok rögzítésére és megőrzésére vonatkozó rendelkezéseket a 11. Annex 6. fejezete tartalmazza.

3.1.1.1 Lekérdezési és vezérlési (lekérdezési oldalszirom elnyomás) rádió frekvenciák (föld-levegő)

3.1.1.1.1 A lekérdezési és vezérlési átviteli vivőfrekvencia 1030 MHz.

3.1.1.1.2 A frekvencia tűrés plusz vagy mínusz 0,2 MHz legyen.

3.1.1.1.3 A vezérlési átvitel és a lekérdezési impulzus átvitelek vivő frekvenciái egymástól nem különbözhetnek 0,2 MHz-nél nagyobb értékkel.

3.1.1.2 Válasz vivő frekvencia (levegő-föld)

3.1.1.2.1 A válasz átvitel vivő frekvenciája 1090 MHz legyen.

3.1.1.2.2 A frekvencia tűrés plusz vagy mínusz 3 MHz legyen.

3.1.1.3 Irányítottság

3.1.1.3.1 A lekérdezés, vezérlés és válasz átvitelek iránya túlnyomóan függőleges.

3.1.1.4 Lekérdezési módok (térbeli jelek)

3.1.1.4.1 A lekérdezés két, P_1 és P_3-al jelölt, továbbított impulzusból áll. Az első P_1 lekérdezési impulzust követően egy P_2 vezérlő impulzust kell átvinni.

3.1.1.4.2 Az A- és C-módú lekérdezés a 3.1.1.4.3 pontban meghatározottaknak feleljen meg.

3.1.1.4.3 A P_1 és P_2 közötti időköz határozza meg a lekérdezési módot a következők szerint:

A-mód	± 0,2 mikromásodperc
C-mód	21 ± 0,2 mikromásodperc

3.1.1.4.4 A P_1 és P_2 közötti időköz 2,0 plusz, vagy mínusz 0,15 mikromásodperc legyen.

3.1.1.4.5 A P_1 és P_3 impulzusok időtartama 0,8 plusz vagy mínusz 0,1 mikromásodperc legyen.

3.1.1.4.6 A P_1, P_2 és P_3 impulzusok emelkedési ideje 0,05 és 0,1 mikromásodperc között legyen.

1. Megjegyzés. – A meghatározásokat a 3-1 ábra "Másodlagos felderítő radar hullámforma alakjainak, időközeinek és az érzékenységi és teljesítmény referencia pontjainak meghatározása" tartalmazza.

2. Megjegyzés. – Az emelkedési idő alsó korlátjának (0,05 mikromásodperc) szerepe az oldalsáv sugárzás csökkentése. A berendezések akkor teljesítik ezt a követelményt, ha az oldalsáv sugárzás nem nagyobb, mint az, amelyet egy megállapított növekedési idővel rendelkező, trapezoid formájú hullám elméletileg létrehozna.

3.1.1.4.7 A P_1, P_2 és P_3 impulzus lefutási ideje 0,05 és 0,2 mikromásodperc között legyen.

Megjegyzés. – A lefutási idő alsó korlátjának (0,05 mikromásodperc) szándéka az oldalsáv sugárzás csökkentése. A berendezések kielégítik ezt a követelményt, ha az oldalsáv sugárzás nem nagyobb, mint az, amelyet egy megállapított növekedési idővel rendelkező trapezoid formájú hullám elméletileg létrehozna.

3.1.1.5 Lekérdező és vezérlő átviteli jellemzők (Lekérdezés oldalszirom elnyomás – Térbeli jelek)

3.1.1.5.1 A P_2 sugárzott amplitúdója a válaszjeladó antennánál legyen:

a) egyenlő vagy nagyobb mint a P_1 sugárzott amplitúdója a P_1-et sugárzó antenna oldalszárny átviteleitől; és
b) a P_1 sugárzott amplitúdója alatt 9 dB-el alacsonyabb szinten a lekérdezés kívánt körívén belül.

3.1.1.5.2 Az irány-lekérdezés (főszárny) kívánt sugárnyaláb szélességén belül a P_3 sugárzott amplitúdójának a P_1 sugárzott amplitúdója 1 dB-jén belül kell lennie.

3.1.1.6 Válasz átviteli jellemzők (Térbeli jelek)

3.1.1.6.1 Kerete impulzusok. A válasz függvény két keret impulzust magában foglaló jelzést alkalmaz, amelyek 20,3 mikromásodpercet töltenek be, mint a legtöbb elemi kód.

3.1.1.6.2 Információ impulzusok. Az információ impulzusokat 1,45 mikromásodperces növekményekkel kell elválasztani az első keret impulzustól. Ezeknek az információ impulzusoknak a jelölése és helyzete a következő:

Impulzusok	Helyzet (mikromásodperc)
C_1	1,45
A_1	2,90
C_2	4,35

A_2	5,80
C_4	7,25
A_4	8,70
X	10,15
B_1	11,60
D_1	13,05
B_2	14,50
D_2	15,95
B_4	17,40
D_4	18,85

Megjegyzés. – Ezeknek az impulzusoknak a használatára vonatkozó Szabvány a 2.1.4.1 pontban van megadva. Azonban az "X" impulzus helyzete csak műszaki szabványként van specifikálva a lehetséges jövőbeni használat megóvása érdekében.

3.1.1.6.3 *Különleges helyzetazonosítási impulzus (SPI).* A szolgáltatott információ impulzusokon kívül egy különleges helyzetazonosítási impulzust is továbbítani kell, de csak manuális (repülőgépvezetői) kiválasztás eredményeként. Amikor továbbították, egy 4,35 mikromásodperces időközzel kell elválasztani, amely csak az A-módú válaszok utolsó keret impulzusát követi.

3.1.1.6.4 *Válasz impulzus alakok.* Minden válasz impulzusnak 0,45 plusz vagy mínusz 0,1mikromásodperc hosszúságú impulzussal, 0,05 és 0,1 mikromásodperc közötti impulzus felfutási idővel, és 0,05 és 0,2 mikromásodperc közötti lefutási idővel kell rendelkeznie. Az impulzus egy impulzus amplitúdó változása a válaszsorozatban lévő bármely más impulzushoz képest, nem haladhatja meg az 1 dB-t.

Megjegyzés. – A felfutási és lefutási idők alsó korlátja (0,05 mikromásodperc) rendeltetése az oldalsáv sugárzás csökkentése. A berendezés kielégíti ezt a követelményt, ha az oldalsáv sugárzás nem nagyobb, mint az, amelyet elméletileg az adott felfutási és lefutási idővel rendelkező trapezoid hullám állítana elő.

3.1.1.6.5 *Válasz impulzus helyzet tűrései.* Az impulzus elválasztási tűrésének az egyes impulzusoknál (beleértve az utolsó keret impulzust) a válasz csoport első keret impulzusához viszonyítva plusz vagy mínusz 0,10 mikromásodperc legyen. A különleges helyzetazonosítási impulzus impulzus-tűrésének a válasz csoport utolsó keret impulzusához viszonyítva plusz vagy mínusz 0,10 mikromásodperc legyen. A válaszcsoportban lévő bármely impulzus választóköz tűrése bármely más impulzushoz viszonyítva (kivéve az első keret impulzust) nem haladhatja meg a plusz vagy mínusz 0,15 mikromásodpercet.

3.1.1.6.6 *Kód nomenklatúra.* A kód jelölés 0 és 7 közötti, a határokat is beleértve, számjegyeket tartalmazzon, és a fenti 3.1.1.6.2 pontban adott impulzus számok indexeinek összegéből álljon, a következők szerint alkalmazva:

Számjegy	*Impulzus csoport*
Első (legnagyobb helyértékű)	A
Második	B
Harmadik	C
Negyedik	D

3.1.1.7 Csak A-mód és C-mód képességgel rendelkező válaszjeladók műszaki jellemzői

3.1.1.7.1 *Válasz.*
A válaszjeladó válaszoljon (nem kisebb, mint 90 százalékos inditással), ha az összes alábbi feltétel fennáll:

a) a P_3 vett amplitúdója meghaladja a P_1 vett amplitúdójánál 1 dB-el lejjebb lévő szintet, de nem nagyobb, mint a P_1 vett amplitúdója plusz 3 dB;

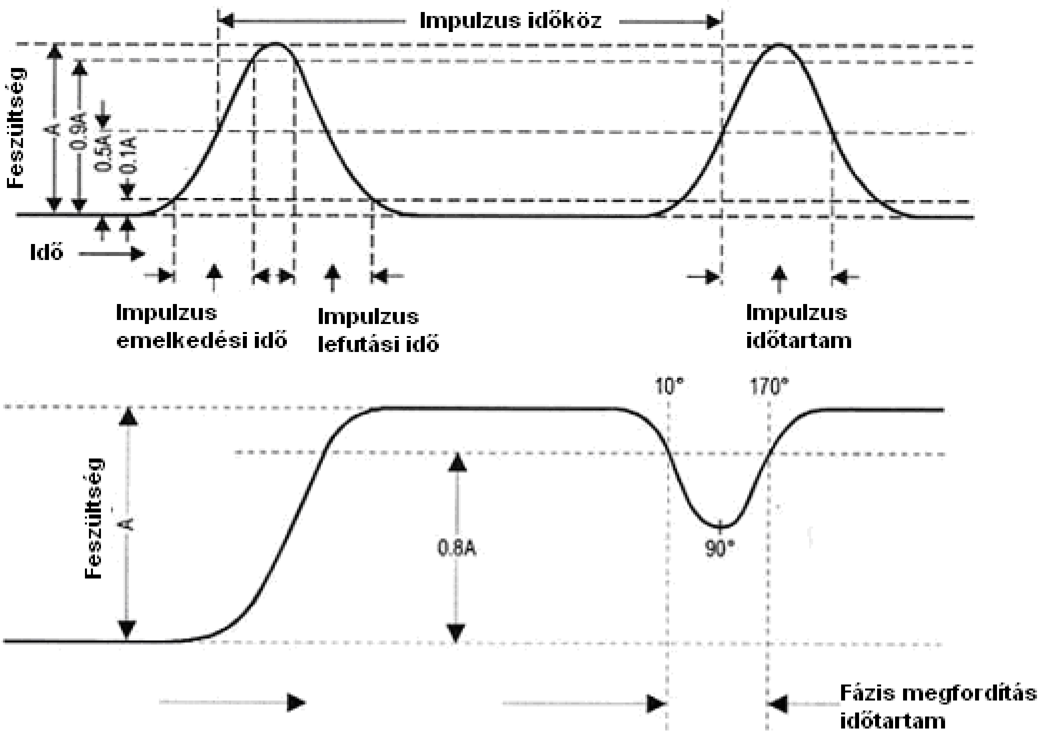
b) vagy nem vesznek impulzust a P1 utáni 1,3 mikromásodperc és 2,7 mikromásodperc közti időközben, vagy a P_1 több mint 9 dB-el meghalad bármely ebben az időközben vett impulzust;

c) egy megfelelő lekérdezés vett amplitúdója több mint 10 dB-el fölötte van a véletlen impulzusok vett amplitúdójának, ahol az utóbbiakat az olyan válaszjeladó, mint a P_1, P_2 vagy P_3 nem nyugtázza.

3.1.1.7.2 *A válaszjeladó ne válaszoljon az alábbi körülmények között:*

a) lekérdezésekre, amikor a P_1 és P_2 közötti időköz több mint plusz vagy mínusz 1,0 mikromásodperccel különbözik a 3.1.1.4.3 pontban megadott időközöktól;

b) bármely egyedülálló impulzus vétele után, amelynek nincsenek normál lekérdezési körülményeket megközelítő amplitúdó változásai.



3.1. ábra. Másodlagos felderítő radar hullámforma alakjainak, időközeinek és az érzékenységi és teljesítmény referencia pontjainak meghatározása

Meghatározások

Fázis megfordítás. A rádiófrekvencia hordozó fázisában 180 fokos váltás.
Fázis megfordítás időtartam. A fázis megfordítás 10 fokhoz és 170 fokhoz tartozó pontjai közötti idő.

Impulzus amplitúdó. Az impulzus burkológörbe csúcs feszültségi amplitúdó.
Impulzus késési idő. Az impulzus burkoló görbe lefutó élén lévő 0,9A és 0,1A közötti idő.
Impulzus időtartam. Az impulzus burkoló görbe felfutó és lefutó éle 0,5A pontjai közötti időintervallum.
Impulzus időköz. Az első impulzus felfutó élén lévő 0,5A pontja és a második impulzus felfutó élén lévő 0,5A pont közötti időköz.

Impulzus emelkedési idő. Az impulzus burkoló görbe felfutó élén a 0,1A és 0,9A pontok közötti idő.
Időközök. Az időközök a következőkre vonatkoznak:

a) 0,5 A pont az impulzus felfutó élén;
b) 0,5 A pont az impulzus lefutó élén; vagy
c) a fázis megfordítás 90 fokos pontján.

Válaszjeladó érzékenység és teljesítmény referencia pont. A válaszjeladó átviteli vonalának antenna vége.
Megjegyzés. – A fázis megfordítás 90 fokos pontja közelíthető a fázis megfordítással kapcsolódó amplitúdó tranziens burkológörbén lévő minimális amplitúdó tranziens burkológörbén lévő 0,8A pontok közötti idővel

3.1.1.7.3 *Holtidő.*

Egy megfelelő lekérdezés nyugtázása után a válaszjeladó nem válaszolhat semmilyen más lekérdezésre, legalább a válasz impulzus sorozat időtartama alatti ideig. Ennek a holtidőnek véget kell érnie nem később, mint 125 mikromásodperccel a csoport utolsó válasz impulzusának továbbítása után.

3.1.1.7.4 *Elnyomás*

Megjegyzés. – Ezt a jellemzőt a lekérdező antenna oldal szirmain keresztül vett lekérdezések megválaszolásának megakadályozására használják, és hogy megóvják az A/C-módú válaszjeladókat az S-módú lekérdezések megválaszolásától.

3.1.1.7.4.1 A válaszjeladót el kell nyomni, ha a P_2 vett amplitúdója egyenlő vagy nagyobb, mint a P_1 vett amplitúdója, és 2,0 plusz vagy mínusz 0,15 mikromásodperc elválasztással rendelkezik. A P_3 észlelését nem követelik meg előfeltételként az elnyomási művelet kezdeményezésénél.

3.1.1.7.4.2 A válaszjeladó elnyomás 35 plusz vagy mínusz 10 mikromásodperc időperiódusig tartson.

3.1.1.7.4.2.1 Az elnyomás a teljes időtartam alatt bármely elnyomási időperiódus befejeződése után 2 mikromásodpercen belül újra indulhat.

3.1.1.7.5 *Vevő érzékenység és dinamikus tartomány*

3.1.1.7.5.1 A válaszjeladó minimális beindítási szintjének olyannak kell lenni, hogy válaszokat generáljon a lekérdezési jeleknek legalább a 90 százalékára, amikor:

a) a P_1 és P_3 impulzusok, amelyek lekérdezést létesítenek, egyenlő amplitúdójúak és a P_2 -t nem érzékelik; és

b) ezeknek a jeleknek az amplitúdója névlegesen 71 dB 1 mW alatt 69 dB és 77 dB közötti korlátokkal 1 mW alatt.

3.1.1.7.5.2 A válasz és elnyomás jellemzők a P_1 vett amplitúdója feletti minimális indító szint és 50 dB-el a szint felett közötti értékeken érvényesek.

3.1.1.7.5.3 A minimális indító szint változása az üzemmódok között nem haladhatja meg az 1 dB-t névleges impulzus hosszúság és impulzus szélesség esetén.

3.1.1.7.6 *Impulzus időtartam.*

A minimális indítási szint és a 6 dB-el e fölötti szint között vett amplitúdó jelei, és amelyek időtartama kevesebb, mint 0,3 mikromásodperc, nem válthatják ki a válaszjeladó kezdeményezését válasz vagy elnyomás akcióra. Egy lekérdezést közelítő amplitúdó változásokkal bíró egyedülálló impulzusok kivételével, bármely 1,5 mikromásodperccel hosszabb időtartamú egyedülálló impulzus nem válthatja ki a válaszjeladó kezdeményezését válasz vagy elnyomás akcióra a minimális indító szinttől (MTL) az e fölött 50 dB-ig terjedő időköz jel amplitúdó felett.

3.1.1.7.7 *Visszhang elnyomás és visszaállítás.*

A válaszjeladónak visszhang elnyomó eszközt kell tartalmaznia, ami arra szolgál, hogy lehetővé tegye a normális üzemelést térbeli jelek visszhangjainak jelenléte esetén. Ennek az eszköznek a szolgáltatása kompatíbilis legyen az oldalszirmok elnyomásának 3.1.1.7.4.1 pontban megadott előírásaival.

3.1.1.7.7.1 *Túlérzékenység megszüntetése.* Bármely 0,7 mikromásodpercnél hosszabb időtartamú impulzus fogadása után a vevő túlérzékenységét olyan értékkel kell csökkenteni, ahol a túlérzékenységet megszüntető impulzus amplitúdója legalább 9 dB értéken belül van, de időben nem haladja meg a túlérzékenységet megszüntető impulzus amplitúdóját, kivéve a túlérzékenységet megszüntető impulzust követő első mikromásodperc alatti túllépés lehetőségét.

Megjegyzés. – 0,7 mikromásodpercnél kisebb időtartamú egyedülálló impulzusokkal szemben nem követelmény, hogy létrehozzák a megadott túlérzékenység csökkentést, semhogy a 3.1.1.7.7.1 és 3.1.1.7.7.2 által megengedettnél nagyobb időtartamú túlérzékenység csökkentést okozzanak.

3.1.1.7.7.2 *Helyreállítás.* Túlérzékenység csökkentést követően, a vevőnek helyre kell állítani az érzékelést (a minimális indító szint 3dB értékén belül) 15 mikromásodpercen belül egy túlérzékenységet csökkentő impulzus vétele után, amely a minimális indító szint felett maximálisan 50 dB-el erősségű jellel rendelkezik. A helyreállításnak 4,0 dB per mikromásodpercet nem meghaladó átlagsebességgel kell megvalósulnia.

3.1.1.7.8 *Véletlen indítási sebesség.*

Érvényes lekérdezési jelek hiányában az A/C-módú válaszjeladók nem generálhatnak több mint 30 nem-várt A-módú vagy C-módú választ, másodpercenként integrálva egy tartomány felett, amely ekvivalens legkevesebb 300 véletlen indítással vagy 30 másodperccel, amelyik a kisebb. Ezt a véletlen indítási sebességet nem múlhatják felül, ha az összes lehetséges, ugyanarra a légijárműre telepített bevatkozó berendezés maximális beavatkozási szinten üzemel.

3.1.1.7.9 *Válasz sebesség*

3.1.1.7.9.1 A válaszjeladó másodpercenként legyen képes legalább 1200 válaszra egy 15-impulzusú kódolt válasznál, kivéve, hogy kizárólag 4500m (15000 láb) alatt, vagy az illetékes hatóság vagy regionális léginavigációs egyezmény által megállapított kisebb magasság alatt használt válaszjeladó beépítéseknél engedélyezzék, hogy a 15-impuzusú kódolt válasznál, a válaszjeladóknak másodpercenként legalább 1000 válaszra legyenek képesek.

3.1.1.7.9.2 *Válasz sebesség korlát szabályozás.* Hogy a rendszert megvédjék a gyengébb jelekre adott megelőző válasz általi válaszjeladó túl-lekérdezése hatásaitól amikor egy előre meghatározott válasz sebességet elért, egy érzékenység csökkentés típusú válasz korlát szabályozást kell beépíteni a berendezésbe. Ezen szabályozás értéktartománya minimum tegye lehetővé a beállítást, bármely 500 és 2000 válasz per másodperc közötti értékre, vagy a maximális válasz sebesség képességre, ha a válasz kevesebb, mint 2000 válasz másodpercenként, tekintet nélkül az egyes válaszokban lévő impulzusok számára. Érzékenység csökkenésnek 3 dB-t meghaladóan nem lehet hatása, amíg a kiválasztott érték 90 százalékát nem haladja meg. Az érzékenység csökkenésnek legalább 30 dB-nek kell lenni a kiválasztott érték 150 százalékát meghaladó sebességeknél.

3.1.1.7.9.3 **Ajánlás**. – *A válasz sebesség korlátot 1200 válasz per másodpercre kell beállítani, vagy 1200 per másodperc alatt a maximális értékre, amelyre a válaszjeladó képes.*

3.1.1.7.10 *Válasz késés és vibrálás*

Az időbeli késés a P_3 felfutó élének válaszjeladó vevőhöz érkezése és a válasz első impulzus felfutó éle átvitele között 3 plusz vagy mínusz 0,5 mikromásodperc legyen. A válasz impulzus kódcsoport teljes vibrálása a P_3-ra vonatkoztatva nem haladhatja meg a 0,1 mikromásodpercet a vevő bemenet szinteknél 3 dB és 50 dB között a minimális indító szint felett. A késés változások azon üzemmódok között, amelyeken a válaszjeladó válaszra képes, nem haladhatják meg a 0,2 mikromásodpercet.

3.1.1.7.11 *Válaszjeladó teljesítmény kimenet és terhelési ciklus*

3.1.1.7.11.1 A válaszjeladó átviteli vonala antenna-végén rendelkezésre álló csúcs impulzus teljesítmény legalább 21 dB és 1W felett nem többnek, mint 27 dB legyen, kivéve azokat a válaszjeladó berendezéseket, amelyeket kizárólag 4500 m (15000 láb) alatti magasságokon, vagy a megfelelő hatóság vagy regionális léginavigációs egyezmény által létrehozott kisebb magasságokon használnak, a válaszjeladó átviteli vonalának antenna-végén rendelkezésre álló csúcs impulzus teljesítményét legalább 18,5 dB és 1 W felett nem több, mint 27 dB-t kell megengedni.

3.1.1.7.11.2 **Ajánlás.** – *A 3.1.1.7.11.1 pontban megadott csúcs impulzus teljesítményt fenn kell tartani abban az értéktartományban, a 400 válasz per másodperc sebességnél a 0000 kódtól, az 1200 válasz per másodperc sebességnél egy maximális impulzus tartalomig, vagy egy maximális értéknél, amelyre a válaszjeladó 1200 válasz per másodperc alatt képes.*

3.1.1.7.12 *Válasz kódok*

3.1.1.7.12.1 *Azonosítás.* Egy A-módú lekérdezésre adott választ a 3.1.1.6.1 pontban meghatározott két keret impulzusnak a 3.1.1.6.2 pontban meghatározott információ impulzussal együttesen kell alkotniuk.

Megjegyzés. – Az A-mód kód jelölés egy négy-számjegyű sorozat a 3.1.1.6.6 ponttal összhangban.

3.1.1.7.12.1.1 Az A-mód kódot manuálisan kell kiválasztani a rendelkezésre álló 4096 kódból.

3.1.1.7.12.2 *Nyomásmagaság továbbítás.* A C-módú lekérdezésre adott válasznak a fenti 3.1.1.6.1 pontban megadott két keret impulzusból kell állnia. Ha digitalizált nyomásmagaság információ rendelkezésre áll, a 3.1.1.6.2 pontban megadott információ impulzust is továbbítani kell.

3.1.1.7.12.2.1 A válaszjeladókat el kell látni az információ impulzusok eltávolítására, de a keret impulzusok megtartására szolgáló eszközzel arra az esetre, amikor a lentebbi 3.1.1.7.12.2.4 pont előírásai nem teljesülnek a C-módú lekérdezésre adott válaszban.

3.1.1.7.12.2.2 Az információ impulzusokat automatikusan kell kiválasztani egy analóg – digitális átalakító segítségével, amely a légijárművön lévő, az 1013,25 hektopascal szabványos nyomásbeállításra vonatkoztatott. nyomásmagasság adatforráshoz kapcsolódik.

Megjegyzés. – Az 1013,25 hektopascal nyomás beállítás 29,92 higany-inch értékkel egyenlő.

3.1.1.7.12.2.3 A nyomásmagasságot 100-láb növekményekben kell jelenteni, az impulzusok jelen fejezethez tartozó Függelékben bemutatott kiválasztásával.

3.1.1.7.12.2.4 A kiválasztott digitalizáló kódnak plusz vagy mínusz 38,1 m (125 láb) értéken belüli eltéréssel, 95 százalékos valószínűségi alapon meg kell egyeznie a légijármű fedélzetén használt és a kijelölt repülési profilhoz illesztett nyomásmagasság információval (az 1013,25 hektopascal szabványos magasság beállításra vonatkoztatva).

3.1.1.7.13 *Különleges helyzetazonosítási (SPI) impulzus továbbítása.* Ha előírt, ezt az impulzust a 3.1.1.6.3 pontban meghatározottaknak megfelelően az A-módú válaszokkal kell továbbítani, 15 és 30 másodperc közötti időszakon keresztül.

3.1.1.7.14 *Antenna*

3.1.1.7.14.1 A válaszjeladó antennarendszernek, ha légijárműre szerelik, olyan sugárzási diagrammal kell rendelkeznie, amely lényegében teljes körirányú a vízszintes síkban.

3.1.1.7.14.2 **Ajánlás.** – *A függőleges sugárzási diagram legyen névlegesen azonos egy antenna ellensúlyon elhelyezett négyhullámú aszimmetrikus oszcillátor sugárzási diagramjával.*

3.1.1.8 Csak A-módú és C-módú képességekkel rendelkező földi lekérdezők műszaki jellemzői

3.1.1.8.1 *Lekérdezés ismétlési gyakoriság*

A maximális lekérdezés ismétlési gyakoriság 450 lekérdezés per másodperc lehet.

3.1.1.8.1.1 **Ajánlás.** – *A szükségtelen válaszjeladó indítás és az ebből eredő nagysűrűségű kölcsönös interferencia minimalizálása érdekében a lehető legalacsonyabb lekérdező ismétlési gyakoriságot kell használni, amely konzisztens a kijelzési jellemzőkkel, a lekérdező antenna sugárszélességgel, és az alkalmazott antenna forgási sebességgel.*

3.1.1.8.2 *Sugárzási teljesítmény*

Ajánlás. – *A rendszer interferencia minimalizálása érdekében a lekérdezők effektív sugárzási teljesítményét arra a legkisebb értékre kell csökkenteni, amely konzisztens az egyes egyedi lekérdező helyek üzemelés szempontjából megkívánt távolságával.*

3.1.1.8.3 **Ajánlás.** – *Ha az átmeneti magasságszintek alatt repülő légijárműtől származó C-módú információt kell felhasználni, a magasságmérő nyomás hivatkozási adatot figyelembe kell venni.*

Megjegyzés. – Az átmeneti szintek alatt C-módú használat összhangban van azzal a filozófiával, hogy a C-mód hasznosan alkalmazható minden környezetben.

3.1.1.9 A lekérdező sugárzási területének diagramja

Ajánlás- – *A P_3-at sugárzó irányított lekérdező antenna sugárnyaláb szélessége nem lehet nagyobb, mint az üzemeltetés szempontjából megkívánt. Az irányított antenna oldal- és hátszirom sugárzása legalább 24 dB-el alatta legyen a fő szirom sugárzás csúcsértékének.*

3.1.1.10 A lekérdező berendezés megfigyelése

3.1.1.10.1 A földi lekérdező berendezés távolság és azimut pontosságát elegendően gyakori időközönként figyelni kell a rendszer integritásának biztosítása érdekében.

Megjegyzés. – Azok a lekérdező berendezések, amelyek elsődleges radarral kapcsolódnak és ezzel összekapcsolva működnek, az elsődleges radart figyelő eszközként használhatják, ellenben elektronikus távolság és azimut pontosság figyelés szükséges.

3.1.1.10.2 **Ajánlás**. – *A távolság és azimut figyelésen felül folyamatosan figyelni kell a földi lekérdező berendezés többi kritikus paraméterét is a megengedett rendszer tűrést meghaladó teljesítmény romlás szempontjából, és jelzést kell szolgáltatni, ha ilyen eset előfordul.*

3.1.1.11 Parazita sugárzások és parazita válaszok

3.1.1.11.1 *Parazita sugárzás*

Ajánlás. – *A CW sugárzás nem haladhatja meg a 76 dB-t 1 W alatt a lekérdező berendezésnél, és 70 dB-t 1W alatt a válaszjeladónál.*

3.1.1.11.2 *Parazita válaszok*

Ajánlás. – *Mind a fedélzeti, mind a földi berendezések reagálása az olyan jelekre, amelyek nem a vevő áteresztő sávján belülre esnek, legalább 60 dB-el a normál érzékenység alatt legyen.*

3.1.2 S-módú képességekkel rendelkező rendszerek

3.1.2.1 Lekérdezés térközi jel jellemzők.

A jelen bekezdés pontjai a térközi jeleket úgy írják le, ahogyan azok várhatóan a válaszjeladó antennánál megjelennek.

Megjegyzés. – Mivel a jelek a terjedés során leromolhatnak, bizonyos lekérdezési impulzus időtartam, impulzus kiterjedés és impulzus amplitúdó tűrések a lekérdezőknél szigorúbbak, ahogyan az a 3.1.2.11.4 pontban le van írva.

3.1.2.1.1 *Lekérdezési vivőfrekvencia.* Minden S-módú képességgel rendelkező földi berendezéstől jövő lekérdezés és vivőfrekvenciája (fedélzetre irányuló közlemény továbbítás) 1030 plusz vagy mínusz 0,01 MHz kell legyen.

3.1.2.1.2 *Lekérdezési spektrum.* Az S-módú vivőfrekvencia lekérdezési spektruma nem lépheti túl a 3-2 ábrán megadott határokat.

Megjegyzés. – Az S-módú lekérdezési spektrum adatfüggő. A legszélesebb spektrumot olyan lekérdezés generálja, amely az összes bináris EGY-et tartalmazza.

3.1.2.1.3 *Polarizáció.* A lekérdező és vezérlő átvitelek polarizációja névlegesen függőleges legyen.

3.1.2.1.4 *Moduláció.* S-módú lekérdezéseknél a vivőfrekvencia impulzus-modulált. Ezenkívül a P_6 adat-impulzus belső fázismodulációval is rendelkezik.

3.1.2.1.4.1 *Impulzus moduláció.* Az inter-módú és S-módú lekérdezések az impulzusok egy sorozatát tartalmazzák. Azokat az impulzusokat, amelyeket specifikus lekérdezések megformálására lehet használni, P_1, P_2 , P_3, P_4 , P_5, és P_6 szimbólumokkal jelölik. Az impulzus alakok a 3-1 táblázatban definiáltaknak megfelelőek. Az összes érték mikromásodpercben van megadva.

Megjegyzés. – Az inter módú és S-módú lekérdezésekben használt 0,8 mikromásodperces impulzusok alakban azonosak azokkal, amelyeket az A- és C-módban használnak úgy, ahogyan azt a 3.1.1.4 pont meghatározza.

3.1.2.1.4.2 *Fázis moduláció.* A 3.1.2.1.4.1 alpont rövid (16,25 mikromásodperces) és a hosszú (30,25 mikromásodperces) P_6 impulzusai belső bináris differenciál fázis modulációval rendelkeznek, amely a vivő 180 fokos fázis megfordításaiból állnak 4 megabit per másodperc sebességnél.

3.1.2.1.4.2.1 *Fázis megfordítás időtartam.* A fázis megfordítás időtartama kisebb, mint 0,08 mikromásodperc és a fázis folyamatosan halad (vagy lemarad) az átmeneti területen keresztül. A fázis átmenet során amplitúdó modulációt nem alkalmaznak.

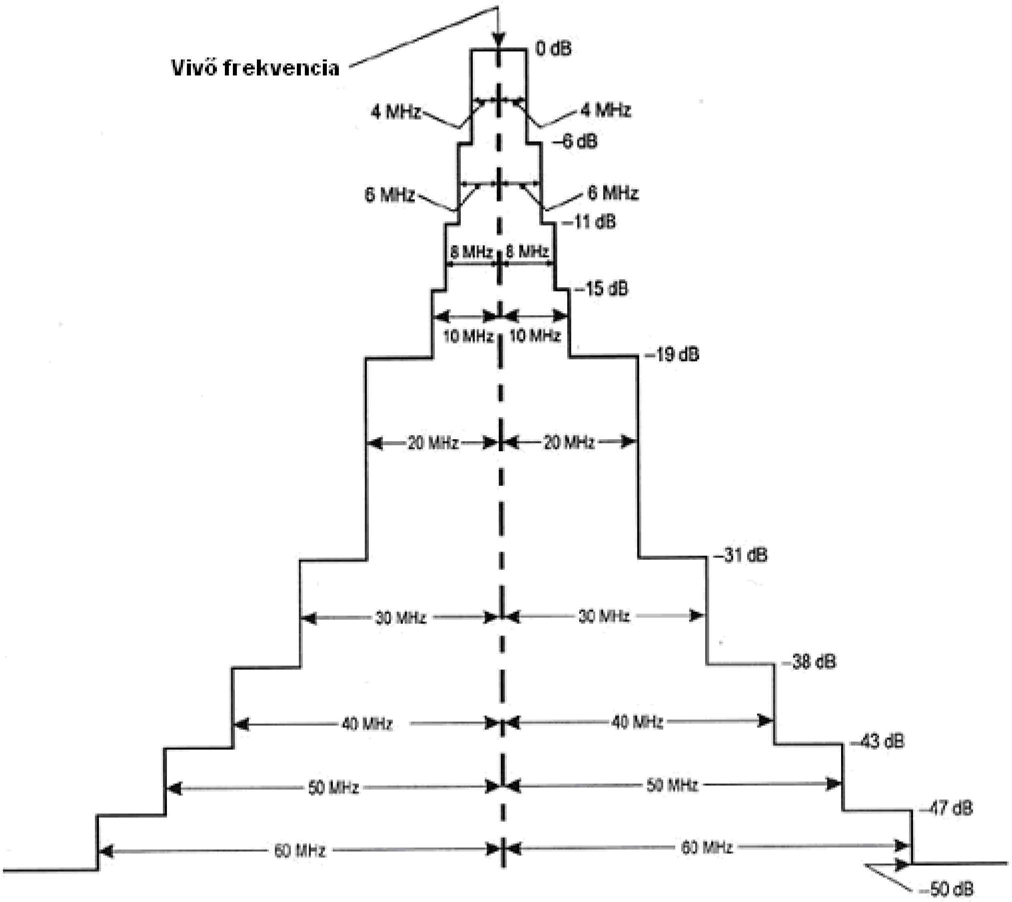
Megjegyzés. – A fázis megfordítás minimális időtartama nincs meghatározva. Mindazonáltal a 3.1.2.1.2 pont spektrum követelményeit ki kell elégíteni.

3.1.2.1.4.2.2 *Fázis összefüggés*. A tűrés a 0 és 180 fok fázis összefüggésre az egymásután következő chipek között és a szinkronizáló fázis megfordításra (3.1.2.1.5.2.2 pont) a P_6 impulzuson belül plusz vagy mínusz 5 fok.

Megjegyzés. – S-módban egy "chip" a 0,25 mikromásodperces vivő időköz a lehetséges adat fázis megfordítások között.

3-1 táblázat. Impulzus alakok, S-módú és inter módú lekérdezések

Impulzus	*Időtartam*	*Időtartam tűrés*	*(Emelkedés idő)*		*(Lefutási idő)*	
			Min.	*Max.*	*Min.*	*Max.*
P_1, P_2, P_3, P_5	0,8	±0,1	0,05	0,1	0,05	0,2
P_4 (rövid)	0,8	±0,01	0,05	0,1	0,05	0,2
P_4 (hosszú)	1,6	±0,1	0,05	0,1	0,05	0,2
P_6 (rövid)	16,25	±0,25	0,05	0,1	0,05	0,2
P_6 (hosszú)	30,25	±0,25	0,05	0.1	0,05	0,2



3-2 ábra. Az előírt spektrum határok a lekérdező adóberendezéshez

3.1.2.1.5 *Impulzus és fázis megfordítás sorozatok.* Az impulzusok vagy fázis megfordítások specifikus sorozatai, amelyek a 3.1.2.1.4 pontban vannak leírva, lekérdezéseket hoznak létre.

3.1.2.1.5.1 Inter *módú lekérdezés*

3.1.2.1.5.1.1 *A/C/S-módú all-call lekérdezés.* Ez a lekérdezés három impulzust tartalmaz: P_1-et, P_3-at és a hosszú P_4-et, ahogyan azt a 3-3 ábra mutatja. Egy vagy két szabályozó impulzust (P_2 egyedül, vagy P_1 és P_2) továbbítanak, egy külön antenna diagrammot használva a légijárműtől jövő reagálások elnyomására a lekérdező antenna oldalszirmokban.

Megjegyzés. – Az A/C/S-módú all-call lekérdezés egy A-módú vagy C-módú választ vált ki (a P_1-P_3 impulzus elhelyezésétől függően) egy A/C-módú válaszjeladóból, mivel ez a P_4 impulzust nem ismeri el. Egy S-módú válaszjeladó elismeri a hosszú P_4 impulzust és S-üzemmóddal válaszol. Ezt a lekérdezést eredetileg izolált vagy kötegelt lekérdezők számára tervezték. A kizárás ennél a lekérdezőnél II=0 használatán alapszik. Az S-módú alhálózat fejlesztése most egy zérustól különböző II kód használatát diktálja kommunikációs célokra. Ezen okból kifolyólag II egyenlő 0-t fenntartják az S-módú elfogás formájának támogatási használatára, amely sztochasztikus/kizárásos felülírást használ (3.1.2.5.2.1.4 és 3.1.2.5.2.1.5 pontok). Az A/C/S all-call mód nem használható teljes S-módú művelethez, mivel II egyenlő 0 csak rövid időperiódusra zárható ki (3.1.2.5.2.1.5.2.1 pont). Ezt a *lekérdezést nem lehet sztochasztikus/kizárás felülírással használni, mivel a válasz valószínűségét nem lehet megadni.*

3.1.2.1.5.1.2 *Csak A/C-módú all-call lekérdezés.* Ez a lekérdezés azonos az A/C/S-módú all-call lekérdezéssel, azzal az eltéréssel, hogy a rövid P_4 impulzust használja.

Megjegyzés. – A csak A/C-módú all-call lekérdezés A-módú vagy C-módú válaszra készteti az A/C-módú válaszjeladót. Az S-módú válaszjeladó felismeri a rövid P_4 impulzust és nem válaszol erre a lekérdezésre.

3.1.2.1.5.1.4 *Impulzus amplitúdók.* A P_1, P_2 és P_3 impulzusok közötti relatív amplitúdók összhangban vannak a 3.1.1.5 pontban leírtakkal. A P_4 amplitúdójának eltérése a P_3 amplitúdójától 1 dB-en belül van.

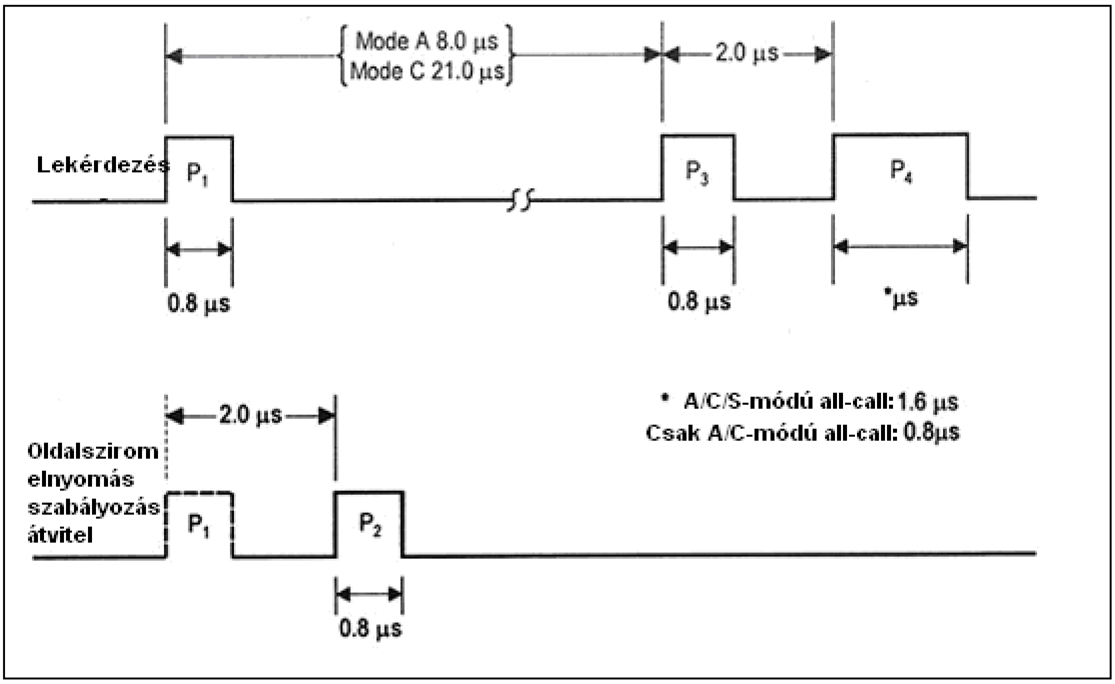
3.1.2.1.5.2 *S-módú lekérdezés*. Az S-módú lekérdezés három impulzusból áll: , $P_{1,}$ P_2 és P_6, ahogyan azt a 3-4 ábra mutatja.
Megjegyzés. – A P_6-ot megelőzi a P_1 - P_2 pár, amely elnyomja az A/C válaszjeladóktól jövő válaszokat, hogy elkerüljék az S-módú lekérdezés által keltett véletlen indítás miatti szinkron csonkítást. A P_6-on belüli szinkronizáló fázis megfordítás az időjel a 0,25 mikromásodperc időtartamú időközök (chipek) sorozatának demodulációjához. A chipeknek ez a sorozata a szinkronizáló fázis után 0,5 mikromásodperccel kezdődik és a P_6 lefutó éle előtt 0,5 mikromásodperccel végződik. Egy fázis megfordítás megelőzheti, vagy nem kell, hogy megelőzze az egyes chipeket a bináris információs érték kódolásához.

3.1.2.1.5.2.1 *S-módú oldal-szirom elnyomás*. A P_5 impulzust a csak S-módú all-call lekérdezéssel használják (UF=11 lásd 3.1.2.5.2 pont), hogy megakadályozzák a válaszokat a légijárműtől az antenna oldal- és hátsó szirmában (3.1.2.1.5.2.5 pont). Amikor használják, P_5-öt külön antenna diagramm felhasználásával továbbítják.

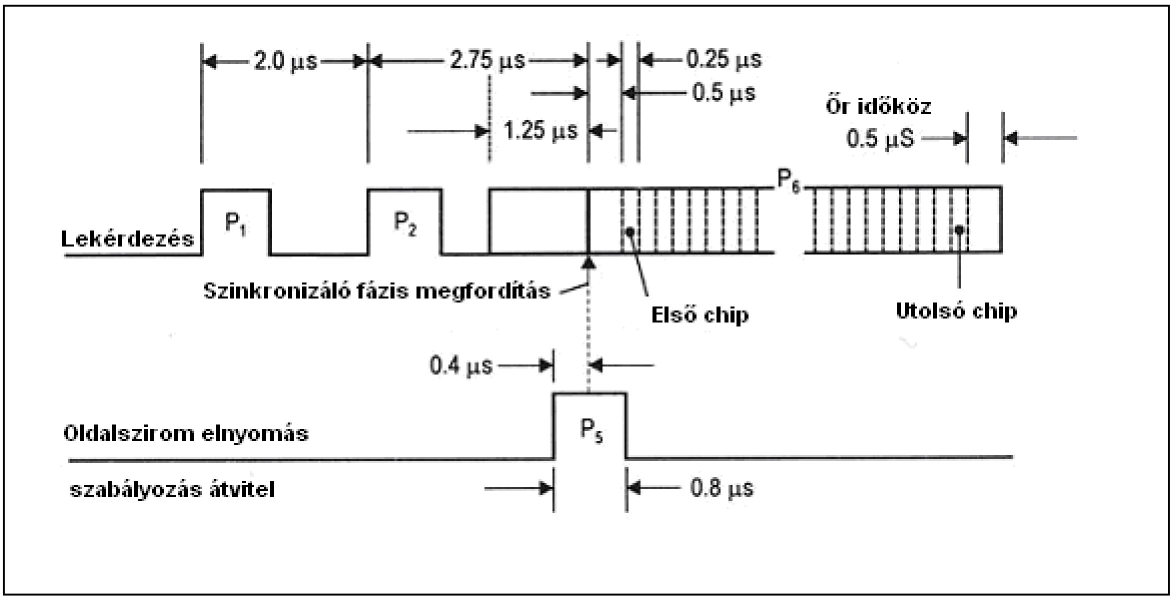
1. Megjegyzés. – A P_5 beavatkozása automatikus. Ennek jelenléte, ha kielégítő amplitúdójú a vevő helyén, eltakarja a P_6 szinkronizáló fázis megfordítását.

2. Megjegyzés. – A P_5 impulzus más S-módú lekérdezésekkel is használható.

3.1.2.1.5.2.2 *Szinkronizáló fázis megfordítás*. Az első fázis megfordítás a P_6 impulzusban a szinkronizáló fázis megfordítás. Ez legyen az idő referencia a lekérdezésre vonatkozó egymást követő válaszjeladó működésekre.



3-3 ábra. Inter módú lekérdezés impulzus sorozat



3-4 ábra. S-módú lekérdezés impulzus sorozat

3.1.2.1.5.2.3 *Adat fázis megfordítások.* Mindegyik adat fázis megfordítás csak egy (N-szer 0,25) plusz vagy mínusz 0,02 mikromásodperc (N egyenlő vagy nagyobb mint 1) időközzel a szinkronizáló fázis megfordítás után jelenik meg. A 16,25 mikromásodperces P_6 impulzus legfeljebb 56 adat fázis megfordítást tartalmazhat. A 30,25 mikromásodperces P_6 impulzus legfeljebb 112 adat fázis megfordítást tartalmazhat. Az utolsó chipet, vagyis a 1,25 mikromásodperces időközt, amely az utolsó adat fázis megfordítási pozíciót követi, egy 0,5 mikromásodperces őr időköz követi.

Megjegyzés. – A 0,5 mikromásodperces őr időköz, amely az utolsó chipet követi, megakadályozza, hogy a demodulációs folyamattal a P_6 lefutó ága interferáljon.

3.1.2.1.5.2.4 *Időközök.* A P_1 és P_2 közötti impulzus időköz 2 plusz vagy mínusz 0,05 mikromásodperc. A P_2 közötti impulzus időköz 2 plusz vagy mínusz 0,05 mikromásodperc. A P_2 felfutó éle és a P_6 szinkronizáló fázis megfordítás közötti időköz 2,75 plusz vagy mínusz 0,05 mikromásodperc. A P_6 felfutó éle 1,25 plusz vagy mínusz 0,05 mikromásodperccel a szinkronizáló fázis megfordítás előtt jelenik meg. A P_5, ha továbbításra kerül, a szinkronizáló fázis megfordítása fölött legyen központosítva; a P_5 felfutó éle 0,4 plusz vagy mínusz 0,05 mikromásodperccel a szinkronizáló fázis megfordítása előtt jelenik meg.

3.1.2.1.5.2.5 *Impulzus amplitúdók.* A P_2 amplitúdója és a P_6 első mikromásodpercének amplitúdója nagyobb, mint a P_1 amplitúdója mínusz 0,25 dB. Nem számítva a fázis megfordítással kapcsolódó amplitúdó tranzienseket, a P_6 amplitúdó változása kisebb, mint 1 dB, és a P_6-ban az egymást követő chipek közötti amplitúdó kisebb, mint 0,25 dB. A P_5 sugárzott amplitúdója a válaszjeladó antennájánál:

a) egyenlő vagy nagyobb, mint a P_6 sugárzott amplitúdója, amely a P_6-ot sugárzó antenna oldalszirom átviteleitől érkezik; és

b) olyan szinten, amely a P_6 sugárzott amplitúdója alatt 9 dB-nél alacsonyabban helyezkedik el, a lekérdezés kívánt ívén belül.

3.1.2.2 Válasz térbeli jelek jellemzői

3.1.2.2.1 *Válasz vivő frekvenciája*. Az S-módú képességgel rendelkező válaszjeladóktól jövő (fedélzetről leadott adattovábbítás) összes válasz vivő frekvenciája 1090 plusz vagy mínusz 1 MHz.

3.1.2.2.2 *Válasz spektrum.* Az S-módú válasz spektrum a vivő frekvenciánál nem haladhatja meg a 3-5 ábrán megadott határokat.

3.1.2.2.3 *Polarizáció.* A válasz továbbítások polarizációja névlegesen függőleges legyen.

3.1.2.2.4 *Moduláció.* Az S-módú válasz egy bevezetőből és egy adat blokkból áll. A bevezető egy 4-impulzusos sorozat, és az adatblokk bináris impulzus-pozíció modulált 1 megabit per másodperc adat sebességgel.

3.1.2.2.4.1 *Impulzus alakok.* Az impulzus alakok a 3-2 táblázatban előírtaknak feleljenek meg. Az összes érték mikromásodpercben van megadva.

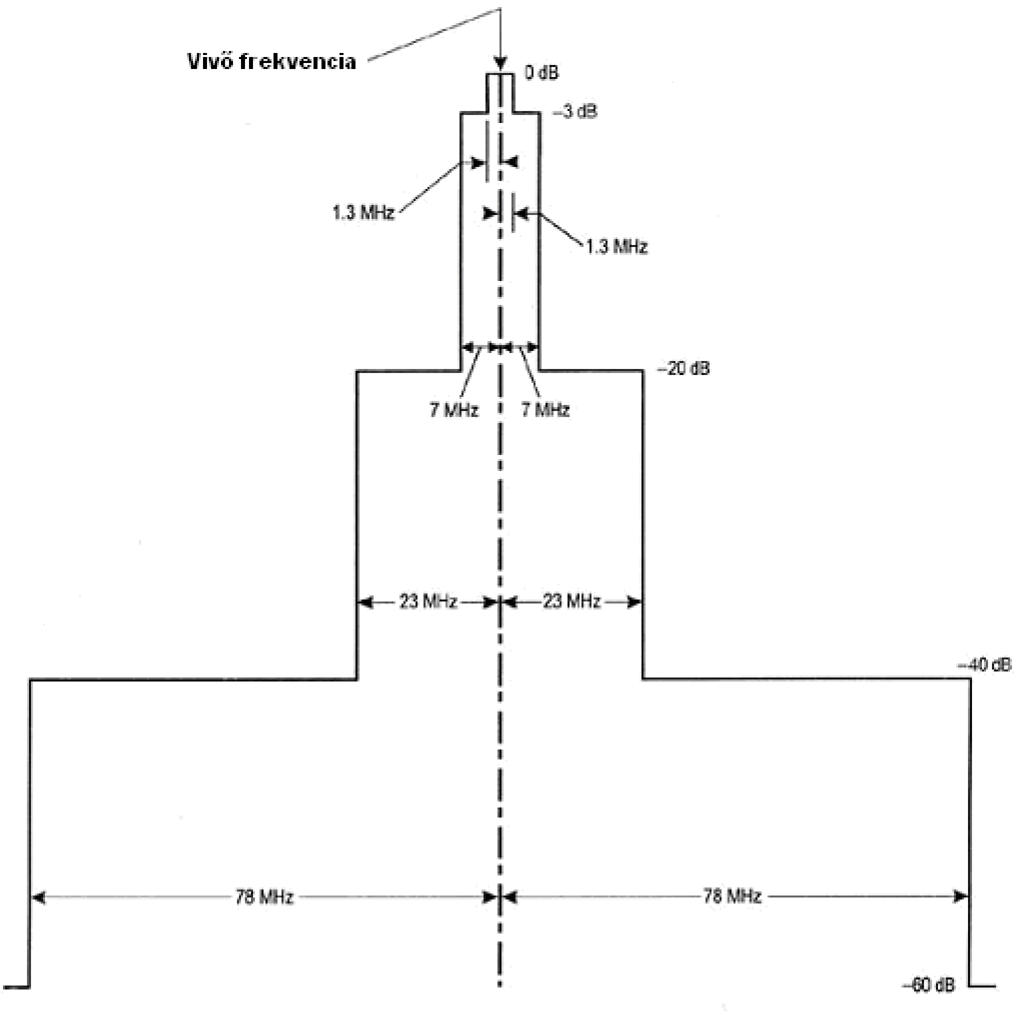
3.1.2.2.5 *S-módú válasz.* Az S-módú válasz a 3-6 ábrán bemutatottnak megfelelő. Az adatblokk S-módú válaszokban vagy 56 vagy 112 információs bitből áll.

3.1.2.2.5.1 *Impulzus időközök*. Minden válasz impulzus a 0,5 mikromásodperc meghatározott többszöröseinél kezdődik az első továbbított impulzustól számítva. A tűrés minden esetben plusz vagy mínusz 0,05 mikromásodperc.

3.1.2.2.5.1.1 *Válasz bevezetés*. A bevezetés négy impulzusból áll, egyenként 0,5 mikromásodperc időtartammal. Az impulzus időközöknek az első továbbított impulzustól a második, harmadik és negyedik átvitt impulzusig 1, 3,5 és 4,5 mikromásodpercnek kell lenniük, a felsorolás egyező sorrendjében.

3.1.2.2.5.1.2 *Válasz adat impulzusok.* A válasz adatblokk 8 mikromásodperccel az első továbbított impulzus felfutó éle után kezdődik. Az egyes továbbításokhoz vagy 56, vagy 110 mikromásodperces bit intervallumokat jelölnek ki. Egy 0,5 mikromásodperces impulzust továbbítanak az egyes intervallumok első vagy második felében. Amikor az impulzust, amelyet az egyik tartomány második felében továbbítanak, egy másik, a következő időköz első felében továbbított impulzus követi, a két impulzus egyesül és egy-mikromásodperces impulzust kell továbbítani.

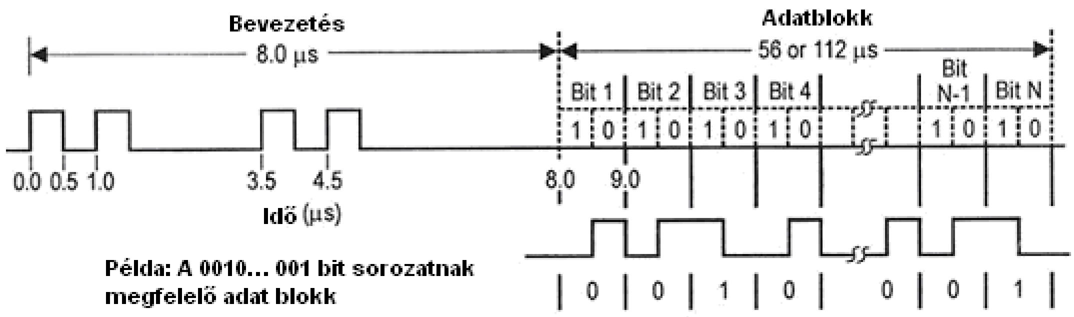
3.1.2.2.5.2 *Impulzus amplitúdók.* Az egyik impulzus és egy másik impulzus közötti impulzus amplitúdó változás S-módú válaszban nem haladhatja meg a 2 dB-t.



3-5 ábra. Válaszjeladó adó-berendezésétől elvárt spektrum korlátok

3-2 táblázat. Impulzus formák, S-módú válaszok

Impulzus időtartam	*Időtartam tűrés*	*(Emelkedés idő)*		*(Lefutási idő)*	
		Min.	*Max.*	*Min.*	*Max.*
0,5	±0,05	0,05	0,1	0,05	0,2
1,0	±0,05	0,05	0,1	0,05	0,2



3-6 ábra. S-módú válasz

3.1.2.3 S-mód adatszerkezete

3.1.2.3.1 *Adatkódolás*

3.1.2.3.1.1 *Lekérdezési adat.* A lekérdezési adatblokkot egy 56 vagy 112 adat chipből álló sorozat alkotja, amely a P_6 impulzuson belül, az adatfázis megfordítások után helyezkedik el (3.1.2.1.5.2.3 pont). Egy chipet megelőző 180 fokos hordozó fázis megfordítás az adott chip-et bináris EGY-ként jellemzi. A megelőző fázis megfordítás hiánya egy bináris ZÉRO-t jelez.

3.1.2.3.1.2 *Válasz adatok.* A válasz adatblokk 56 vagy 112 adat bitből áll, amelyet a válasz adat bináris impulzus pozíció modulációval alakítanak ki a 3.1.2.2.5.1.2 pontban leírtak szerint. Az időköz első felében továbbított impulzus egy bináris EGY-et jelent, míg a második felében továbbított impulzus egy bináris ZÉRO-t jelent.

3.1.2.3.1.3 *Bit számozás.* A biteket továbbításuk sorrendjének megfelelően kell számozni az 1-es bittel kezdve. Ha nincs másképpen elrendelve, a bit csoportokkal (mezők) kódolt numerikus értékek kódolása pozitív bináris jelek felhasználásával történik, és az első továbbított bit a legjelentősebb bit (MSB). Az információkat olyan mezőkben kell kódolni, amelyek legalább egy bitből állnak.

Megjegyzés. – Az S-módú formátumok leírásában a bit sorozatok által egy mezőn belül kialakított bináris kód decimális megfelelőjét, mező funkció vagy utasítás jelölőjeként használják.

3.1.2.3.2 *S-módú lekérdezések és válaszok formátumai*

Megjegyzés. – Minden S-módú lekérdezési és válasz formátum összesítve a 3-7 és 3-8 ábrákon látható. A fedélzetre irányuló és a fedélzetről leadott adattovábbítás formátumokban megjelenő összes mező összegezését a 3-3 táblázat mutatja, és az összes almező összegezését a 3-4 táblázat tartalmazza.

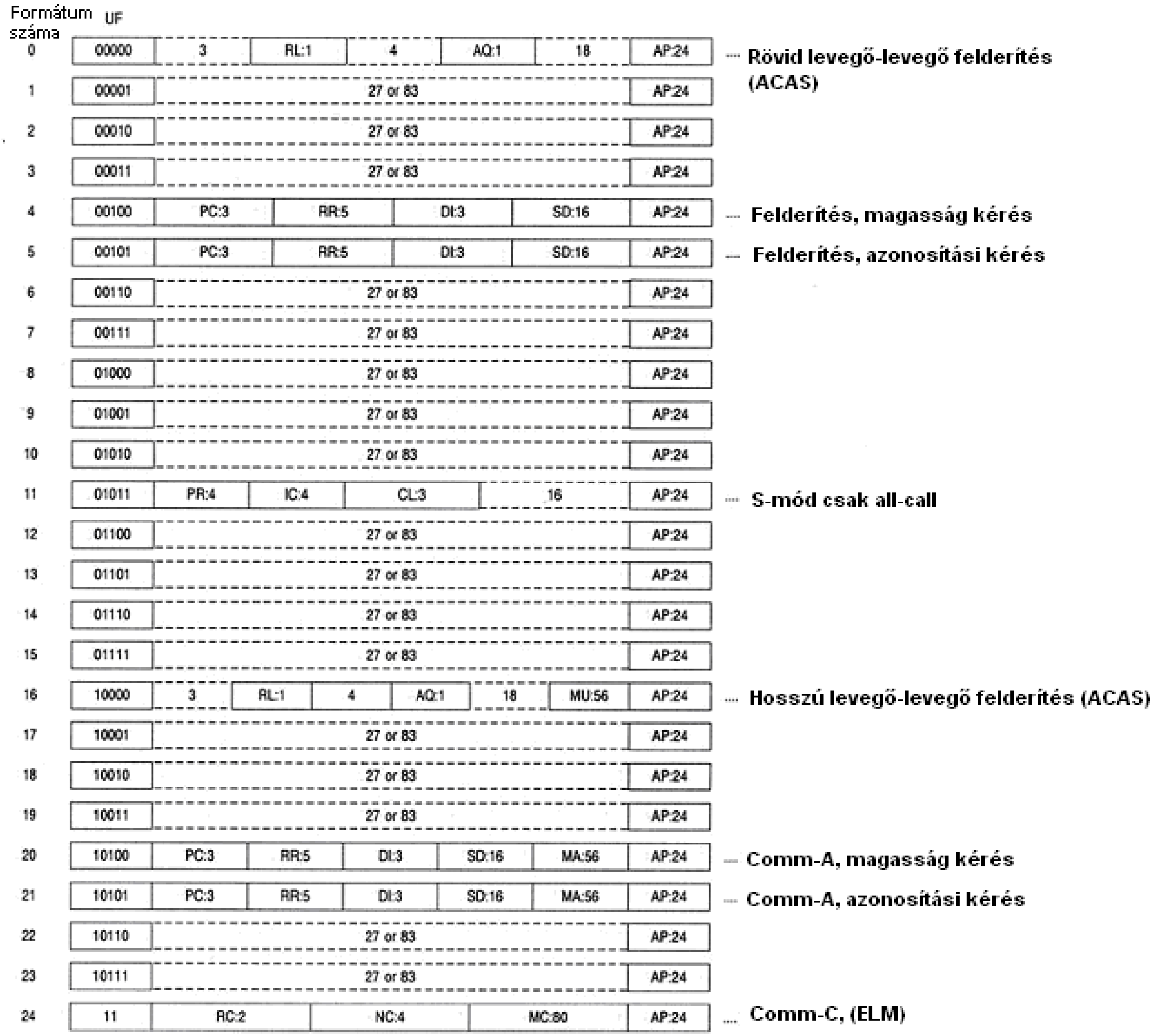
3.1.2.3.2.1 *Lényeges mezők.* Minden S-módú továbbítás két lényeges mezőt tartalmaz. Az egyik egy olyan kulcs-szó (deszkriptor), amely egyértelműen meghatározza a továbbítás formátumát. Ez minden formátumnál a továbbítás elején jelenik meg. A deszkriptorokat az UF (fedélzetre irányuló adattovábbítási formátum) vagy DF (fedélzetről leadott adattovábbítás formátum) mezőt jelölik. A második lényeges mező egy 24-bites mező, amely az egyes továbbítások végén jelenik meg és paritás információkat tartalmaz. Minden fedélzetre irányuló adattovábbítási formátumban és a folyamatosan meghatározott fedélzetről leadott adattovábbítás formátumban a paritás információ rákerül vagy a légijármű címzésre (3.1.2.4.1.2.3.1 pont) vagy a lekérdező azonosítóra a 3.1.2.3.3.2 pontnak megfelelően. A megjelölések AP (cím/paritás) vagy P_1 (paritás/lekérdező azonosító).

Megjegyzés. – A megmaradó kódolási helyeket a missziós mezők továbbítására használják. Különleges feladatokra a missziós mezők különleges halmazát írják elő. Az S-módú missziós mezőknek kétbetűs jelzésük van. Az almezők a missziós mezőkön belül jelenhetnek meg. Az S-módú almezők hárombetűs jelöléssel vannak címkézve.

3.1.2.3.2.1.1 *UF: fedélzetre irányuló adattovábbítási formátum*- Ez a fedélzetre irányuló adattovábbítási formátum mező (5 bit hosszúságú, kivéve a 24 számú formátumot, ahol ez 2 bit hosszúságú) fedélzetre irányuló adattovábbítási formátum kulcs-szóként (deszkriptorként) szolgál minden S-módú lekérdezésben, és a 3-7 ábrának megfelelően kell kódolni.

3.1.2.3.2.1.2 *DF: fedélzetről leadott adattovábbítási formátum.* Ez a fedélzetről leadott adattovábbítás formátum mező (5 bit hosszúságú, kivéve a 24 számú formátumban, ahol ez 2 bit hosszúságú) fedélzetről leadott adattovábbítás kapcsolat formátum kulcs-szóként (deszkriptorként) szolgál minden S-módú válaszban, és a 3-8 ábrának megfelelően kell kódolni.

3.1.2.3.2.1.3 *AP: címzés/paritás*. Ez a 24-bites (33-56 vagy 89-112) mező minden fedélzetre irányuló adattovábbítási és jelenleg meghatározott fedélzetről leadott adattovábbítási formátumban megjelenik, kivéve a csak S-módú all-call választ, a DF = 11-el. A mező paritást tartalmaz, amely rákerül a légijármű címzésre a 3.1.2.3.3.2 pontnak megfelelően.



3-7. ábra. S-módú lekérdezés vagy fedélzetre irányuló adattovábbítási formátumainak összessége

MEGJEGYZÉSEK

1. XX: M - egy “XX” jelölésű mezőt jelöl, amelyet M bit jelöl ki.

2. N - kijelöletlen kódolási térközt jelöl, N rendelkezésre álló bittel. Ezeket ZÉRO-val kell kódolni a továbbításhoz.

3. A 0-tól 23-ig formátum-számú fedélzetre irányuló adattovábbítási formátumoknál (UF) a formátum szám a lekérdezés első öt bitjében lévő bináris kódhoz tartozik. A 24. számú formátum olyan formátumként lett meghatározva, amely az első két bit pozícióban “11”-el kezdődik, míg a következő három bit a lekérdezés tartalmával változik.

4. A teljesség kedvéért az összes formátum bemutatásra kerül, bár közülük számosat nem használnak. Azok a formátumok, amelyekre jelenleg nincs felhasználás meghatározva, hosszban meghatározás

nélkül maradnak. A jövőben kijelöléstől függően, ezek rövid (56 bit) vagy hosszú (112 bit) formátumok lehetnek. Az S-módú képességi szintekhez kapcsolódó különleges formátumok a későbbi pontokban kerülnek leírásra.

3.1.2.3.2.1.4 *PI: paritás/lekérdező azonosító.* Ez a 24-bites (33-56) fedélzetről leadott adattovábbítási mező rendelkezzen paritással, amely rákerül a lekérdező azonosítási kódjára a 3.1.2.3.3.2 pontnak megfelelően, és az S-módú all-call válaszban jelenjen meg, DF = 11-el és a kiterjesztett squitterben DF = 17-el vagy DF = 18-al. Ha a választ egy A/C/S all-call-ra, egy S-módú CL mező (3.1.2.5.2.1.3 pont) és IC mező (3.1.2.5.2.1.2 pont) egyenlők 0-val esetekre való reagálásnál adják, vagy egy kiválasztásnál vagy kiterjesztett szkvitternél (3.1.2.8.5, 3.1.2.8.6 pontok), akkor a II és az SI kódok O értékűek legyenek.

3.1.2.3.2.2 *Kijelöletlen kódolási térköz.* A kijelöletlen kódolási térköz tartalmazza az összes ZÉRO-t, mint a lekérdező berendezések és a válaszjeladók által továbbított értékeket.

Megjegyzés: – Bizonyos kódolási térköz, amely ebben a szakaszban kijelöletlennek van jelezve, más alkalmazásokra, mint például ACAS, adat kapcsolat, stb. van fenntartva.

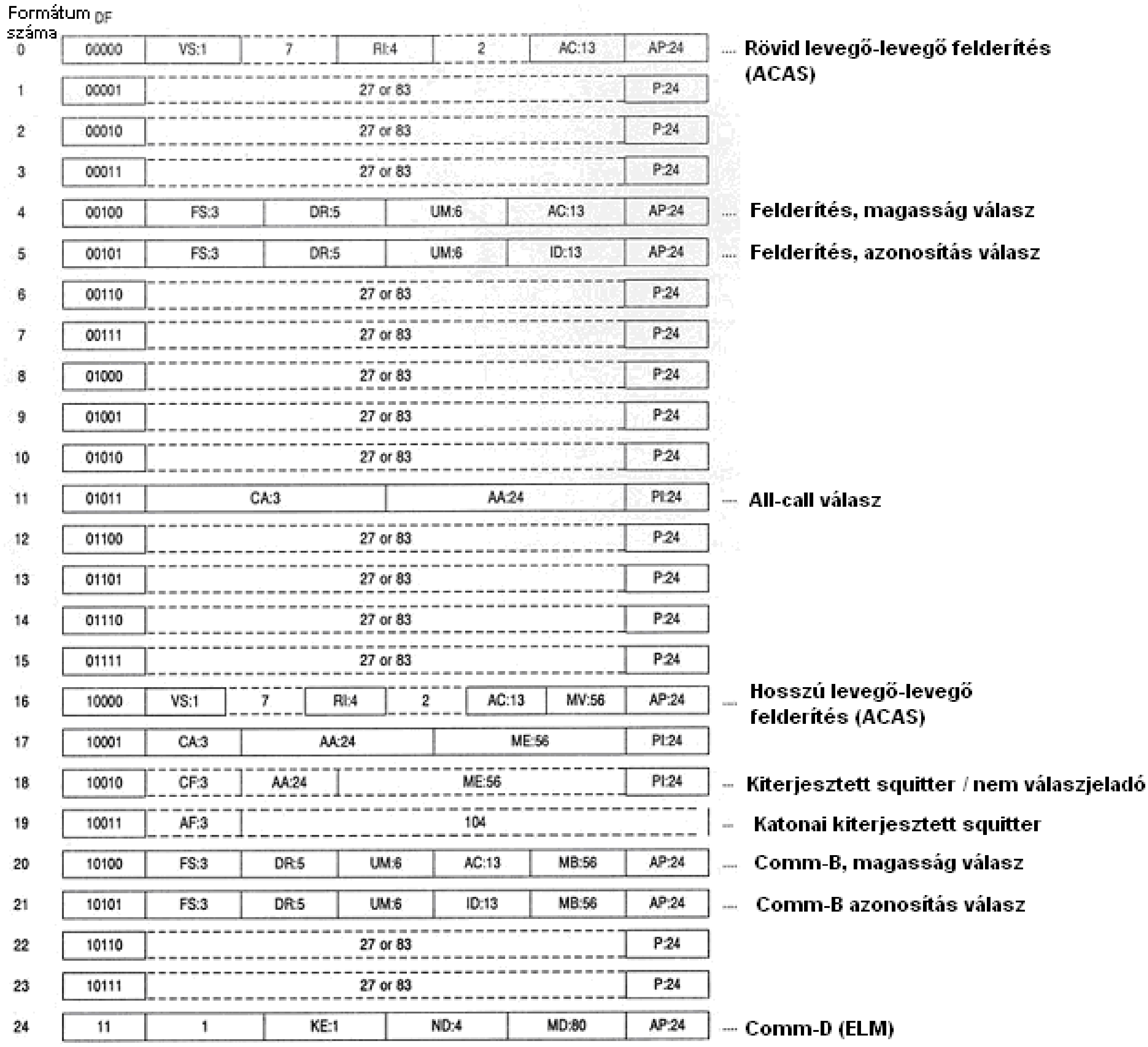
3.1.2.3.2.3 *Nulla és kijelöletlen kódok.* A nulla kód kijelölés minden meghatározott mezőben azt jelöli, hogy a mező nem igényel beavatkozást. Ezenkívül, a mezőkön belüli kijelöletlen kódok azt jelzik, hogy nincs igény beavatkozásra.

Megjegyzés. – A 3.1.2.3.2.2 és 3.1.2.3.2.3 pontok rendelkezési biztosítják, hogy az előzőleg kijelöletlen kódolási térköz jövőbeli kijelölései nem okoznak kétértelműséget. Azaz, az S-módú berendezés, amelyben az új kódolás nincs megvalósítva, tisztán fogja jelezni, hogy nincs továbbított információ az újonnan kijelölt kódolási térközben.

3.1.2.3.3 *Hiba védelem*

3.1.2.3.3.1 *Eljárás*. Paritás ellenőrző kódolást használnak az S-módú lekérdezéseken és válaszokon belül, hogy védelmet nyújtsanak hibák előfordulása ellen.

3.1.2.3.3.1.1 *Paritás ellenőrzési sorozat*. A 3.1.2.3.3.1.2 pontban leírt szabály egy 24 paritás ellenőrzési bitből álló sorozatot generál és ez beépítésre kerül az összes S-módú továbbítás utolsó 24 bitje által formált mezőbe. A 24 paritás ellenőrzés bitet vagy a címzés kódolóval, vagy a lekérdező azonosító kóddal kombinálják, a 3.1.2.3.3.2 pontban leírtak szerint. A létrejövő kombináció akkor vagy az AP (címzés/paritás, 3.1.2.3.2.1.3 pont) mezőt, vagy a PI (paritás/lekérdező azonosító, 3.1.2.3.2.1.4 pont) mezőt alakítja ki.



3-8 ábra. S-módú lekérdezés vagy fedélzetről leadott adattovábbítás formátumainak összessége

MEGJEGYZÉSEK

1. XX: M - egy “XX” jelölésű mezőt jelöl, amelyet M bit jelöl ki.

P: 24 - egy 24-bites mezőt jelöl, amely paritás információ részére van fenntartva.

2. N kijelöletlen kódolási térközt jelöl N rendelkezésre álló bittel. Ezeket ZÉRO-ként kell kódolni a továbbításhoz.

3. A 0-tól 23-ig számozású fedélzetről leadott adattovábbítás formátumoknál (DF) a formátum szám megfelel a válasz első öt bitjében lévő bináris kódnak. A 24 számú formátum az első két bit pozícióban “11”-el kezdődő formátumként lett meghatározva, míg a következő három bit a válasz tartalmával változhat.

4. A teljesség kedvéért az összes formátum bemutatásra kerül, bár közülük számosat nem használnak. Azok a formátumok, amelyekre jelenleg nincs felhasználás meghatározva, hosszban meghatározatlanok maradnak. A jövőben kijelöléstől függően, ezek rövid (56 bit), vagy hosszú (112 bit) formátumok lehetnek. Az S-módú képességi szintekhez kapcsolódó különleges formátumok a későbbi paragrafusokban kerülnek leírásra.

3.3 táblázat. Mező definíció

Mező		*Formátum*		*Hivatkozás*
Jelölés	*Feladat*	*UF*	*DF*	
AA	Címzés közlése		11, 17, 18	3.1.2.5.2.2.2
AC	Magasság kód		4, 20	3.1.2.6.5.4
AF	Alkalmazás mező		19	3.1.2.8.8.2
AP	Címzés/paritás	Mind	0, 4, 5, 16, 20, 21, 24	3.1.2.3.2.1.3
AQ	Célelfogás	0		3.1.2.8.1.1
CA	Képesség		11, 17	3.1.2.5.2.2.1
CC	Keresztkapcsolat képesség		0	3.1.2.8.2.3
CF	Irányítás mező		18	3.1.2.8.7.2
CL	Kódcímke	11		3.1.2.5.2.1.3
DF	Fedélzetről leadott adattovábbítási formátum		Mind	3.1.2.3.2.1.2
DI	Jelölő azonosítás	4, 5, 20, 21		3.1.2.6.1.3
DR	Fedélzetről leadott adattovábbítás kérése		4, 5, 20, 21	3.1.2.6.5.2
DS	Adatkiválasztó	0		3.1.2.8.1.3
FS	Repülési állapot		4, 5, 20, 21	3.1.2.6.5.1
IC	Lekérdező kód	11		3.1.2.5.2.1.2
ID	Azonosság		5, 21	3.1.2.6.7.1
KE	Szabályozás, ELM		24	3.1.2.7.3.1
MA	Közlés, Comm-A	20, 21		3.1.2.6.2.1
MB	Közlés, Comm-B		20, 21	3.1.2.6.6.1
MC	Közlés, Comm-C	24		3.1.2.7.1.3
MD	Közlés, Comm-D		24	3.1.2.7.3.3
ME	Közlés, kiterjesztett squitter		17, 18	3.1.2.8.6.2
MU	Közlés, ACAS	16		4.3.8.4.2.3
MV	Közlés, ACAS		16	3.1.2.8.3.1, 4.3.8.4.2.4
NC	C-szegmens száma	24		3.1.2.7.1.2
ND	D-szegmens száma		24	3.1.2.7.3.2
PC	Protokoll	4, 5, 20, 21		3.1.2.6.1.1
PI	Paritás/lekérdező azonosító		11, 17, 18	3.1.2.3.2.1.4
PR	Válasz valószínűsége	11		3.1.2.5.2.1.1
RC	Válasz szabályozás	24		3.1.2.7.1.1
RI	Válasz információ		0	3.1.2.8.2.2
RL	Válasz hossz	0		3.1.2.8.1.2
RR	Válasz kérés	4, 5, 20, 21		3.1.2.6.1.2
SD	Különleges jelölő	4, 5, 20, 21		3.1.2.6.1.4

UF	Fedélzetre irányuló adattovábbítási formátum	mind		3.1.2.3.2.1.1
UM	Felhasználás közlés		4, 5, 20,21	3.1.2.6.5.3
VS	Függőleges állapot		0	3.1.2.8.2.1

3-4 táblázat. Almező definíciók

Almező		*Mező*	*Hivatkozás*
Jelölés	*Funkció*		
ACS	Tengerszint feletti magasság	ME	3.1.2.8.6.3.1.2
AIS	Légijármű azonosítás almező	MB	3.1.2.9.1.1
ATS	Tengerszint feletti magasság típus	MB	3.1.2.8.6.8.2
BDS1	Comm-B adat szelektor 1. almező	MB	3.1.2.6.11.2.1
BDS2	Comm-B adat szelektor 2. almező	MB	3.1.2.6.5.3.1
IDS	Azonosító jelölő almező	UM	3.1.2.6.5.3.1
IIS	Lekérdező azonosító almező	SD UM	3.1.2.6.1.4.1a) 3.1.2.6.5.3.1
LOS	Kizárás almező	SD	3.1.2.6.1.4.1d)
LSS	Kizárás felderítés almező	SD	3.1.2.6.1.4.1g)
MBS	Többhelyes, Comm-B almező	SD	3.1.2.6.1.4.1c)
MES	Többhelyes, ELM almező	SD	3.1.2.6.1.4.1c)
RCS	Sebesség vezérlés almező	SD	3.1.2.6.1.4.1f)
RRS	Válaszkérés almező	SD	3.1.2.6.1.4.1e) és g)
RRS	Tartalék állapot almező	SD	3.1.2.6.1.4.1c)
SAS	Földi antenna almező	SD	3.1.2.6.1.4.1f)
SCS	Squitter képesség almező	MB	3.1.2.6.10.2.2.1
SIC	Felderítés azonosító képesség	MB	3.1.2.6.10.2.2.1
SIS	Felderítés azonosító almező	SD	3.1.2.6.1.4.1g)
SRS	Szegmens kérés almező	MC	3.1.2.7.7.2.1
SSS	Felderítési állapot almező	ME	3.1.2.8.6.3.1.1
TAS	Továbbítást nyugtázó almező	MD	3.1.2.7.4.2.6
TCS	Tipus vezérlés almező	SD	3.1.2.6.1.4.1f)
TMS	Taktikai közlemény almező	SD	3.1.2.6.1.4.1d)
TRS	Továbbítási sebesség almező	MB	3.1.2.8.6.8.1

3.1.2.3.3.1.2 *Paritás ellenőrzés sorozat generálás.* A (p_1, p_2 ..., p_{24}) 24 paritás bitből álló sorozat az (m_1 , m_2 , ..., m_k) információs bitek sorozatából generálódik, ahol k értéke 32-vel vagy 88-al egyenlő, rövid vagy hosszú átviteleknél. Ezt a következő többtagú kifejezéssel (polinommal) generált kód segítségével készítik:

$$G(x) = 1 + x^3 + x^{10} + x^{12} + x^{13} + x^{14} + x^{15} + x^{16} + x^{17} + x^{18} + x^{19} + x^{20} + x^{21} + x^{22} + x^{23} + x^{24}$$

Amikor a bináris polinom algebra alkalmazásával, x^{24} [*M(x)*]-et elosztjuk *G(x)*-el, ahol *M*(*x*) információ sorozat a következő kifejezéssel egyenlő:

$$m_k + m_{k-1}x + m_{k-2}x^2 + \ldots + m_1x^{k-1},$$

akkor az eredmény egy hányados és egy 24-nél alacsonyabb fokú R(x) maradék. E maradék által formált bit sorozat a paritás ellenőrzés sorozatot képviseli. A p_i paritás bit bármely i értékre az 1-től 24-ig terjedő kitevők esetén , az x^{24-i} együtthatójaként jelenik meg az *R(x)*-ben.

Megjegyzés. – Az M(x) és az x^{24} *szorzásának eredményeként 24 ZÉRUS bitet kell csatolni a sorozat végéhez.*

3.1.2.3.3.2 *AP és PI mező generálás.* A fedélzetre irányuló- és fedélzetről leadott adattovábbításhoz különböző címzés paritás sorozatokat használnak.

Megjegyzés. – A fedélzetre irányuló adattovábbítási sorozat elegendő egy válaszjeladó dekódoló megvalósításhoz. A fedélzetről leadott adattovábbítás sorozat a hiba korrekció alkalmazását teszi lehetővé a fedélzetről leadott adattovábbítás dekódolásban.

A fedélzetre irányuló adattovábbítási AP mező generálásában használt kódot az alább ismertetett módon vagy a légijármű címzésből (3.1.2.4.1.2.3.1.1 pont), vagy az all-call címzésből (3.1.2.4.1.2.3.1.2 pont), vagy az adási címzésből (3.1.2.4.1.2.3.1.3) kell képezni.

A fedélzetről leadott adattovábbítás AP mező generálásában használt kódot közvetlenül az ($a_1, a_2, \ldots, a_{24}$) 24 S-módú címzés bit sorozatból képezik, ahol az a_i az i-edik bit, amelyet egy all-call válasz légijármű címzés (AA) mezejében továbbítanak (3.1.2.5.2.2.2 pont).

A fedélzetről leadott adattovábbítás PI mező generálásában használt kódot az ($a_1, a_2, \ldots, a_{24}$) 24 bites sorozatból képezik, ahol az első 17 bit ZÉRO, a következő három bit a kód cimke (CL) mezőre adott válasz (3.1.2.5.2.2.2), és az utolsó négy bit válasz a lekérdező azonosító (IC) mezőre (3.1.2.5.2.1.2 pont).
Megjegyzés. – A PI kódot fedélzetre irányuló közlemények átvitelében nem használják.

Egy ($b_1, b_2, \ldots, b_{24}$) módosított sorozatot használnak a fedélzetre irányuló adattovábbítási AP mező generálásnál. A b_i bit az x^{48-i} együtthatója a *G(x)A(x)* többtagú kifejezésben, ahol

$$A(x) = a_1x^{23} + a_2x^{22} + \ldots + a_{24}$$

és
G(x) a 3.1.2.3.3.1.2 pontban megfogalmazottnak megfelelő.

A légijármű címzésben a_i az i-edik bit, amelyet egy all-call válasz AA mezőjében továbbítanak. Az all-call és adási címzésekben $a_i = 1$, az i minden értékénél.

3.1.2.3.3.2.1 *Fedélzetre irányuló közlemények átviteli sorrendje.* A föld-légijármű kapcsolati AP-ben átvitt bit sorozat:

$$t_{k+1},+ t_{k+2}, \ldots, t_{k+24}$$

ahol a bitek k+1-el kezdődően az átvitel sorrendje szerint vannak számozva.

Fedélzetre irányuló közlemények átvitelében:

$$t_{k+1} = b_i + p_i$$

ahol a ”+” modulo-2 összeadást jelöl: i = 1 az első, az AP mezőben átvitt bit.

3.1.2.3.3.2.2 *Fedélzetről leadott adattovábbítás átviteli sorrend.* A fedélzetről leadott adattovábbítási AP és PI mezőkben átvitt bit sorozat:

$$t_{k+1}, t_{k+2}, \ldots, t_{k+24}$$

ahol a bitek k+1-el kezdődően az átvitel sorrendje szerint vannak számozva. Fedélzetről leadott adattovábbítási átvitelekben:

$$t_{k+1} = a_i + p_i$$

ahol a ”+” moduló-2 összeadást jelöl: i = 1 az első az AP vagy PI mezőben átvitt bit.

3.1.2.4 Általános lekérdezés – válasz protokoll

3.1.2.4.1 *Válaszjeladó tranzakció ciklus.* A válaszjeladó tranzakció ciklus akkor kezdődik, amikor a másodlagos felderítő radar S-módú válaszjeladója egy lekérdezést felismer. A válaszjeladó ezután értékeli a lekérdezést és megállapítja, hogy azt fogadja-e. Ha igen, akkor a kapott lekérdezést feldolgozza és választ generál, ha az a megfelelő. A tranzakció ciklus akkor fejeződik be, ha:

a) a vételhez szükséges feltételek valamelyike nincs kielégítve, vagy

b) egy lekérdezést vettek és a válaszjeladó vagy

1) a vett lekérdezés feldolgozását befejezte és válaszra nincs igény, vagy

2) a válasz továbbítását befejezte.

Új válaszjeladó tranzakció ciklus nem kezdődik el, amíg az előző ciklus nem fejeződik be.

3.1.2.4.1.1 *Lekérdezés felismerés.* A másodlagos felderítő radar S-módú válaszjeladója a lekérdezések következő különböző típusait képes megkülönböztetni:

a) A- és C-módú
b) inter módú; és
c) S-módú.

Megjegyzés. – A felismerési folyamat a jel bemeneti szinttől és az előírt dinamikus távolságtól függ (3.1.2.10.1 pont).

3.1.2.4.1.1.1 *A-módú és C-módú lekérdezés nyugtázás.* A-módú vagy C-módú lekérdezést akkor kerüljön visszaigazolásra, ha egy, a 3.1.1.4 pont követelményeit kielégítő P_1-P_3 impulzus pár vétele megtörtént és a P_3 amplitúdójánál 6 dB-el lejjebb lévő szintnél nagyobb amplitúdó P_4 impulzus felfutó éle nem érkezik be a P_3 felfutó élét követő, 1,7-től 2,3 mikromásodpercig terjedő időközön belül.

Ha egy P_1–P_2 elnyomás pár és egy A-módú leképezés egyidőben kerül felismerésre, a válaszjeladó kerüljön elnyomásra. Egy lekérdezés ne kerüljön elismerésre mint A-módú vagy C-módú, ha a válaszjeladó elnyomásban van (3.1.2.4.2 pont). Ha egy A-módú és egy C-módú lekérdezés egyidejűleg elismerésre kerül, a válaszjeladó a tranzakció ciklust úgy hajtsa végre, mintha csak C-módú lekérdezést ismert volna el.

3.1.2.4.1.1.2 *Inter (köztes) módú lekérdezés elismerés.* Inter (köztes) módú lekérdezést ismer el, amikor egy, a 3.1.2.1.5.1 pont követelményeit kielégítő P_1–P_3–P_4 impulzus hármast vesz. Egy lekérdezést nem ismer el inter (köztes) módú lekérdezésként, ha:

a) a P_4 pozícióban lévő impulzus vett amplitúdója kisebb, mint a P_3 amplitúdójánál 6 dB-el lejjebb lévő szint; vagy

b) a P_3 és P_4 között lévő impulzus időköz nagyobb, mint 2,3 mikromásodperc, vagy kisebb, mint 1,7 mikromásodperc; vagy

c) P_1 és P_3 impulzusa a minimális indító szint és -45 dBm között van és P_1 vagy P_3 impulzus időtartama kisebb, mint 0,3 mikromásodperc; vagy

d) a válaszjeladó elnyomásban van (3.1.2.4.2 pont)

Ha a P_1 – P_2 elnyomás pár és egy A-módú vagy C-módú inter módú lekérdezést egyidőben ismer el, a válaszjeladót el kell nyomni.

3.1.2.4.1.1.3 *S-módú lekérdezés elismerés*. Egy S-módú lekérdezést el kell ismerni, ha egy P_6 impulzus egy szinkronizáló fázis megfordítással P_6 felfutó élét követő, 1,20-tól - 1,30 mikromásodpercig terjedő időközön belül kerül vételre. Egy S-módú lekérdezés ne legyen elismerve, ha egy szinkronizáló fázis megfordítás a P_6 felfutó élét követő, 1,05-től – 1,45 ezredmásodpercig terjedő intervallumon belül nem kerül vételre.

3.1.2.4.1.2 *Lekérdezés vétel*. A 3.1.2.4.1 pontnak megfelelő felismerés előfeltétele bármely lekérdezés vételének.

3.1.2.4.1.2.1 *A-módú és C-módú lekérdezés vétele*. A-módú és C-módú lekérdezéseket fogadni kell, ha felismerik őket (3.1.2.4.1.1.1 pont).

3.1.2.4.1.2.2 *Inter módú lekérdezés vétel.*

3.1.2.4.1.2.2.1 *A/C/S-módú all-call lekérdezés vétel.* A/C/S-módú all-call lekérdezést vesznek, ha a P_4 lefutó élét a P_3 felfutó élét követően 3,45-3,75 mikromásodpercen belül veszik és a vételt kizárási feltételek (3.1.2.6.9 pont) nem akadályozzák. A/C/S-módú all-call lekérdezést nem vesznek, ha P_4 lefutó élét a P_3 felfutó élét követő 3,3 mikromásodpercnél korábban és 4,2 mikromásodpercnél később veszik, vagy ha a vételt kizárási feltétel (3.1.2.6.9 pont) akadályozza.

3.1.2.4.1.2.2.2 *Csak A/C-módú all-call lekérdezés vétel.* Csak A/C-módú all-call lekérdezést S-módú válaszjeladó nem vesz.

Megjegyzés. – Csak A/C-módú all-call nem-vételének műszaki feltételét az előző alpont tartalmazza azon követelményen keresztül, amely egy olyan impulzusos inter módú lekérdezés elvetését írja elő, ahol a P_4 impulzus lefutó éle a P_3 felfutó élét 3,3 mikromásodpercnél rövidebb időn belül követi.

3.1.2.4.1.2.3 *S-módú lekérdezés vétele.* S-módú lekérdezés csak akkor kerüljön vételre, ha:

a) a válaszjeladó képes a lekérdezés fedélzetre irányuló adattovábbítási formátumának (UF) feldolgozására (3.1.2.3.2.1.1);

b) a lekérdezés címzése a címzések egyikéhez illeszkedik a 3.1.2.4.1.2.3.1 pontban előírtak szerint, amely magában foglalja, hogy a paritás létrejött, ahogyan a 3.1.2.3.3 pontban előírták;

c) nincs all-call kizárás feltétel érvényben, ahogy a 3.1.2.6.9 pontban előírásra került; és

d) a válaszjeladó képes a fedélzetre irányuló adatok feldolgozására és bemutatására egy kimeneti csatlakozó felületnél, ahogyan azt a 3.1.2.10.5.2.2.1 alpont előírja.

3.1.2.4.1.2.3.1 *Címzések.* Az S-módú lekérdezések tartalmazzák vagy

a) a légijármű címzést; vagy
b) az all-call címzést
c) az adás címzést.

3.1.2.4.1.2.3.1.1 *Légijármű címzés*. Ha a légijármű címzés azonos egy, a 3.1.2.3.3.2 és 3.1.2.3.3.2.1 pontok szerinti eljárással összhangban vett lekérdezésből kivont címzéssel, akkor a kivont címzést korrektnek kell tekinteni az S-módú lekérdezés vételének céljára.

3.1.2.4.1.2.3.1.2 *All-call címzés.* Egy csak S-módú all-call lekérdezés (fedélzetre irányuló adattovábbítási formátum UF = 1) egy all-call címzéssel jelölt címzést tartalmaz, amely huszonnégy egymást követő EGY-et tartalmaz. Ha az all-call címzést egy UF = 11 formátumú vett lekérdezésből a 3.1.2.3.3.2 és a 3.1.2.3.3.2.1 pontok eljárása szerint nyerték, a címzést megfelelőnek kell tekinteni a csak S-módú all-call lekérdezés vételéhez.

3.1.2.4.1.3.1.3 *Adási címzés*. Egy közlés továbbításához minden S-módú válaszjeladóhoz a lekérdezési sugárnyalábon belül 20-as vagy 21-es számú S-módú lekérdezési fedélzetre irányuló adattovábbítási formátumot használnak és egy huszonnégy egymást követő EGY-ből álló címzés helyettesíti a légijármű címzést. Ha az UF kód 20-as vagy 21-es, és ezt az adási címzést egy vett lekérdezésből a 3.1.2.3.3.2 és 3.1.2.3.3.2.1 pontok szerinti eljárás alapján nyerték, a címzést S-módú adási lekérdezés vételére alkalmasnak kell tekinteni.

Megjegyzés. – Összeütközés elkerülését biztosító fedélzeti rendszerekhez kötődő válaszjeladók szintén fogadnak UF = 16 adásokat.

3.1.2.4.1.3 *Válaszjeladó válaszok.* Az S-módú válaszjeladók a következő válasz típusokat továbbítják:

a) A-módú és C-módú válaszok; és

b) S-módú válaszok.

3.1.2.4.1.3.1 *A-módú és C-módú válaszok.* A-módú (C-módú) választ kell továbbítani a 3.1.1.6 pontban meghatározott módon, ha A-módú (C-módú) lekérdezést vettek.

3.1.2.4.1.3.2 *S-módú válaszok.* Az A-módú és C-módú lekérdezésektől eltérő lekérdezésekre a válaszok S-üzemmódúak.

3.1.2.4.1.3.2.1 *Válaszok inter módú lekérdezésekre.* Fedélzetről leadott adattovábbítási 11-es formátumú S-módú választ a 3.1.2.5.2.2 alpont rendelkezéseivel összhangban kell továbbítani, ha A/C/S-módú all-call lekérdezést vettek.

Megjegyzés. – Mivel S-módú válaszjeladók nem vesznek csak A/C-módú lekérdezéseket, választ nem generálnak.

3.1.2.4.1.3.2.2 *Válaszok S-módú lekérdezésekre*. Az S-módú választ tartalmazó információk azokat a körülményeket tartalmazzák, amelyek a válaszjeladókban az ezt a választ kiváltó lekérdezés teljes feldolgozásának befejezése után fennállnak. A fedélzetre irányuló- és fedélzetről leadott adattovábbítás formátumok közötti megfelelés a 3-5 táblázatban összegezetteknek feleljen meg.

Megjegyzés. – Az S-módú válaszok négy kategóriáját lehet átvinni az S-módú lekérdezésekre adott válaszokban:

a) S-módú all-call válaszok (DF = 11)

b) felderítési és szabványos hosszúságú kommunikációs válaszok (DF = 4, 5, 20 és 21);

c) kiterjesztett hosszúságú kommunikációs válaszok (DF = 24

d) levegő-levegő felderítési válaszok (DF = O és 16)

3.1.2.4.1.3.2.2.1 *Válaszok a másodlagos felderítő radar csak S-módú all-call lekérdezésekre.* Egy csak S-módú all-call lekérdezésre adott válasz (ha igényelt) fedélzetről leadott adattovábbítási formátuma DF = 11 legyen. A válasz tartalom és a szabályok a válasz megkövetelésének meghatározásához a 3.1.2.5 pontban előírtaknak feleljen meg.

Megjegyzés. – Egy S-módú választ, vagy továbbítanak, vagy nem továbbítanak, ha egy S-módú lekérdezést UF = 11-el vettek.

3.1.2.4.1.3.2.2.2 *Válaszok felderítési és szabványos hosszúságú lekérdezésekre*. S-módú választ akkor kell továbbítani, ha S-módú lekérdezést UF = 4, 5, 20 vagy 21-el vettek és egy légijármű címzés elfogadásra került. Ezeknek a lekérdezéseknek és válaszoknak a tartalma a 3.1.2.6 pontban előírtaknak feleljen meg.

Megjegyzés. – Ha egy S-módú lekérdezést UF = 20 vagy 21-el és egy adás címzést vesznek, választ nem továbbítanak (3.1.2.4.1.2.3.1.3 alpont).

3.1.2.4.1.3.2.2.3 *Válaszok kiterjesztett hosszúságú kommunikációs lekérdezésekre.* Egy értéktartományon belül 0-tól - 16-ig terjedő S-módú válasz sorozatot kell továbbítani, ha egy S-módú lekérdezést UF = 24-el vettek. A válasz (ha van) fedélzetről leadott adattovábbítási formája DF = 24. A válasz számát és tartalmát meghatározó protokollok a 3.1.2.7 pontban előírtaknak feleljenek meg.

3.1.2.4.1.3.2.2.4 *Válaszok a levegő-levegő felderítési lekérdezésekre.* S-módú választ kell továbbítani, ha egy S-módú lekérdezést UF = 0-val, és egy légijármű címzést vettek. Ezeknek a lekérdezéseknek és válaszoknak a tartalma a 3.1.2.8 pontban előírtaknak feleljen meg.

3.1.2.4.2 *Elnyomás*

3.1.2.4.2.1 *Az elnyomás hatásai.* Elnyomásban lévő válaszjeladó (3.1.1.7.4 pont) nem ismer el A-módú, C-módú vagy inter-módú lekérdezéseket, ha a lekérdezés a P_1 impulzusát akár egyedül, akár a P_1 és P_3 impulzusát együtt vette az elnyomási időköz során. Az elnyomás nincsen hatással az S-módú lekérdezések felismerésére, vételére vagy a reá adott válaszokra.

3.1.2.4.2.2 *Elnyomás párok.* A 3.1.7.4.1 pontban meghatározott két-impulzusú A/C elnyomás pár elnyomást kezdeményez az S-módú válaszjeladóban, tekintet nélkül az impulzus párnak az impulzus csoportban elfoglalt pozíciójára, feltéve, hogy a válaszjeladó nem került már elnyomásba, vagy nincs átviteli ciklusban.

Megjegyzés. – A csak A/C-módú lekérdezés P_3 - P_4 párja megakadályozza a választ, és elnyomást indít el. Hasonlóan, az S-módú lekérdezés P_1 - P_2 bevezetője elnyomást indít be, függetlenül az őt követő hullámformától.

3-5 táblázat. Lekérdezés-válasz protokoll összegzése

Lekérdezés UF	*Különleges feltételek*	*Válasz DF*
0	RL (3.1.2.8.1.2) egyenlő 0	0
	RL (3.1.2.8.1.2) egyenlő 1	16
4	RR (3.1.2.6.1.2) kisebb mint 16	4
	RR (3.1.2.6.1.2) egyenlő vagy nagyobb mint 16	20
5	RR (3.1.2.6.1.2) kisebb mint 16	5
	RR (3.2.2.6.1.2) egyenlő vagy nagyobb mint 16	21
11	Válaszjeladó kizárva az IC lekérdező	Nincs válasz
	kódhoz (3.1.2.5.2.1.2)	Nincs válasz
	Sztochasztikus válasz teszt hibák (3.1.2.5.4)	11
	Egyébként	
		4
20	RR (3.1.2.6.1.2) kisebb mint 16	20
	RR (3.1.2.6.1.2) egyenlő vagy nagyobb mint 16	Nincs válasz
	AP adási címzést tartalmaz (3.1.2.4.1.2.3.1.3)	
		5
21	RR (3.1.2.6.1.2) kisebb mint 16	21
	RR (3.1.2.6.1.2) egyenlő vagy nagyobb mint 16	Nincs válasz
	AP adás címzést tartalmaz (3.1.2.4.1.2.3.1.3)	
		Nincs válasz
	RC (3.1.2.7.1.1) egyenlő 0 vagy 1	24
24	RC (3.1.2.7.1.1) egyenlő 2 vagy 3	

3.1.2.5 Inter (köztes) módú és S-módú all-call tranzakciók

3.1.2.5.1 *Inter módú tranzakciók*

Megjegyzés. – Az inter módú tranzakciók lehetővé teszik csak A/C-módú légijárművek felderítését és S-módú légijárművek kiválasztását. Az A/C/S-módú all-call lekérdezések lehetővé teszik, hogy ugyanazok az átvitelek kérdezzék le a csak A/C-módú és S-módú válaszjeladókat. A csak A/C-módú all-call lekérdezés kizárólag A/C-módú válaszjeladók válaszra késztetését teszi lehetővé. Többhelyes körülmények között a lekérdezőnek az azonosító kódját továbbítania kell csak S-módú all-call lekérdezésben. Igy egy csak S-módú és egy csak A/C-módú all-call pár lekérdezést használnak. Az inter módú lekérdezéseket a 3.1.2.1.5.1 alpont írja elő és a hozzátartozó lekérdezés-válasz protokollok a 3.1.2.4 pontban vannak meghatározva.

3.1.2.5.2 *Csak S-módú all-call* tranzakciók

Megjegyzés. – Ezek a tranzakciók lehetővé teszik, hogy a föld elérje az S-módú légijárművet az összes S-üzemmóddal ellátott légijárműnek címzett lekérdezés alkalmazásával. A válasz 11-es fedélzetről leadott adattovábbítási formátumon keresztüli, amely visszaküldi a légijármű címzést. A lekérdezés-válasz protokollok a 3.1.2.4 pontban lettek meghatározva.

3.1.2.5.2.1 *Csak S-módú all-call lekérdezés*, 11-es fedélzetre irányuló adattovábbítási formátum

1	6	10	14	17	33	
UF	PR	IC	CL		AP	
5	9	13	16	32		56

Ennek a lekérdezésnek a formátuma az alábbi mezőkből áll:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
PR a válasz valószínűsége	3.1.2.5.2.1.1
IC lekérdező kód	3.1.2.5.2.1.2
CL kód címke tartalék - 16 bit	3.1.2.5.2.1.3
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.5.2.1.1 *PR: válasz valószínűsége*. Ez a 4-bites (6-9) fedélzetre irányuló adattovábbítási mező utasításokat tartalmaz a válaszjeladó részére, amelyek meghatározzák a lekérdezésre adott válasz valószínűségét. A kódok a következők:

0	1 valószínűséggel rendelkező választ jelent
1	1/2 valószínűséggel rendelkező választ jelent
2	1/4 valószínűséggel rendelkező választ jelent
3	1/8 valószínűséggel rendelkező választ jelent
4	1/16 valószínűséggel rendelkező választ jelent
5, 6, 7	nincs kijelölve
8	elhanyagolási kizárást, 1 valószínűséggel rendelkező választ jelent
9	elhanyagolási kizárást, 1/2 valószínűséggel rendelkező választ jelent
10	elhanyagolási kizárást, 1/4 valószínűséggel rendelkező választ jelent
11	elhanyagolási kizárást, 1/8 valószínűséggel rendelkező választ jelent
12	elhanyagolási kizárást, 1/16 valószínűséggel rendelkező választ jelent
13, 14, 15	nincs kijelölve

3.1.2.5.2.1.2 *IC: Lekérdező kód.* Ez a 4-bites (10-13) fedélzetre irányuló adattovábbítási mező vagy egy 4-bites érték vagy lekérdező azonosító kódot (3.1.2.5.2.1.2.1 alpont) vagy a 6-bites ellenőrzés azonosító kód alsó 4-bitjét (3.1.2.5.2.1.2.2 alpont) tartalmazza a CL mező értékétől függően (3.1.2.5.2.1.3 pont).

3.1.2.5.2.1.2.1 **Ajánlás.** – Ajánlott, hogy amikor lehetséges, a lekérdező egyetlen lekérdező kódot használjon.

3.1.2.5.2.1.2.2 *Többszörös lekérdező kód egy lekérdező berendezés általi használata.* Egy lekérdező berendezés több mint egy lekérdező kódot használhat, és különböző lekérdező kódokat alkalmazhat különböző lekérdező berendezésekben. Egy lekérdező berendezés szektor alapon csak többszörös lekérdező kódot használjon és ne használjon két lekérdező kódnál többet.

3.1.2.5.2.1.2.3. *II. Lekérdező azonosító.* Ez a 4-bites érték egy lekérdező azonosító (II) kódot határoz meg. Ezeket az II kódokat a lekérdezőknek a 0-tól 15-ig terjedő értéktartományban jelölik ki. A 0 értékű II kódot csak a kizárás hatálytalanításon alapuló kiválasztással kapcsolatban használják (3.1.2.5.2.1.4 és 3.1.2.5.2.1.5 pontok). Amikor két II kód csak egy lekérdezőhöz van kijelölve, az egyik kódot teljes adatkapcsolati célokra kell használni. Korlátozott adatkapcsolati tevékenységet, amely egyetlen szegmens Comm-A szegmenst, fedélzetre irányuló adattovábbítási és fedélzetről leadott adattovábbítás adási protokollokat és GICB kivonatot tartalmaz, mindkét II kód végezhet.

3.1.2.5.2.1.2.4 *SI: Felderítési azonosító.* Ez a 6-bites érték egy ellenőrzés azonosító (SI) kódot határoz meg. Ezeket az SI kódokat a lekérdezőkhöz az 1-től 63-ig terjedő értéktartományban jelölik ki. A 0 értékű SI kódot nem használják. Az SI kódokat többhelyes kizárás protokollokkal használják (3.1.2.6.9.1). Az SI kódokat többhelyes kommunikációs protokollokkal nem használják. (3.1.2.6.11.3.2, 3.1.2.7.4 vagy 3.1.2.7.7 pontok).

3.1.2.5.2.1.3 *CL: Kód címke.* Ez a 3-bites (14-16) fedélzetre irányuló adattovábbítási mező az IC mező tartalmát határozza meg.

Kódolás (bináris)

000	jelöli, hogy az IC mező a II kódot tartalmazza
001	jelöli, hogy az IC mező az SI kódokat 1-től 15-ig tartalmazza
010	jelöli, hogy az IC mező az SI kódokat 16-tól 31-ig tartalmazza
011	jelöli, hogy az IC mező az SI kódokat 32-től 47-ig tartalmazza
100	jelöli, hogy az IC mező az SI kódokat 48-tól 63-ig tartalmazza

A CL mező többi értékét nem használják.

3.1.2.5.2.1.3.1 *Felderítés azonosító (SI) kód képesség jelentés*. Azon válaszjeladók, amelyek feldolgozzák az SI kódokat (3.1.2.5.2.1.2.2 pont), ezt a képességet a 35-ös bit 1-re állításával jelentik az adatkapcsolat képesség jelentés (3.1.2.6.10.2.2 pont) MB mezője felderítés azonosító képesség (SIC) almezőjében.

3.1.2.5.2.1.4 *Kizárás hatálytalanításon alapuló működés lekérdező kód kijelölés nélküli lekérdezővel.*

Megjegyzés. – A csak S-mód all-call tudja biztosítani az alapot az S-módú légijármű kiválasztásának a lekérdezők számára, amelyeknek szükségük van az S-üzemmódon keresztül rendelkezésre álló identitás információkra, de nem képesek a teljes S-módú működésre kijelölt II kód birtoklására.

3.1.2.5.2.1.4.1 *Maximális csak S-módú all-call lekérdezési sebesség.* Egy kizárás hatálytalanításon alapuló kiválasztást felhasználó lekérdező által végzett csak S-módú all-call lekérdezések maximális sebessége a válaszolási valószínűségtől függ az alábbiak szerint:

a) 1,0-el egyenlő válaszadási valószínűségnél:
a 3 lekérdezés per 3 dB-es sugárszünet vagy 30 lekérdezés per másodperc közül a kisebbik;

b) 0,5-el egyenlő válaszadási valószínűségnél:
az 5 lekérdezés per 3 dB-es sugárszünet vagy 60 lekérdezés per másodperc közül a kisebb; és

c) 0,25-el vagy kevesebbel egyenlő válaszadási valószínűségnél:
a 10 lekérdezés per 3 dB-es sugárszünet vagy 125 lekérdezés per másodperc közül a kisebb.

3.1.2.5.2.1.4.2 *Szelektív módon címzett lekérdezés mező tartalma.* A kizárás hatálytalanítást használó kiválasztással kapcsolatban használt szelektív módon címzett lekérdezések korlátozott tartalmú lekérdezési mezővel rendelkeznek a következők szerint:

UF = 4, 5, 20 vagy 21
PC = 0
RR ≠ 16, ha RRS = 0
DI = 7
IIS = 0
LOS = 0, kivéve a 3.1.2.5.2.1.5 pontban előírtakat
TMS = 0

Megjegyzés. – Ezek a korlátozások az ellenőrzési és GICB tranzakciókat lehetővé teszik, de megakadályozzák a lekérdezést a válaszjeladó többhelyes kizárást vagy kommunikáció protokoll állapot változást előidézőktől.

3.1.2.5.2.1.5 *O-val egyenlő lekérdező azonosítót (II) használó kiegészítő megszerzés*

Megjegyzés. – A 3.1.2.5.2.1.4 pontban meghatározott befogási eljárás gyors befogást nyújt a legtöbb légijármű számára. A folyamat valószínűségi jellege miatt ez sok lekérdezést végezhet, hogy egy nagy légijármű együttesből az utolsó légijárművet befogja ugyanazon sugárszünetben és majdnem ugyanazon távolságban (helyi csonkítás zónának nevezik). A befogási teljesítmény nagymértékben javul ezeknek a légijárműveknek a befogásával a 0-val egyenlő befogási azonosítót használó korlátolt szelektív kizárás alkalmazása által.

3.1.2.5.2.1.5.1 *Kizárás egy sugárszüneten belül*

3.1.2.5.2.1.5.1.1 **Ajánlás.** – *Amikor II egyenlő 0 kizárást használnak a 3.1.2.5.2.1.4 pontban ismertetett akvizíciós eljárás kiegészítésére, az akvizíció alá vont légijármű sugárszünetén belüli összes légijárművet utasítani kell az II egyenlő 0 kizárásra, nemcsak azokat, amelyek a csonkítás zónán belül vannak.*

Megjegyzés. – A sugárszüneten belül lévő összes légijármű kizárása lecsökkenti az II egyenlő 0 all-call lekérdezésekre generált all-call válaszok mennyiségét.

3.1.2.5.2.1.5.2 *Kizárás időtartama*

1. Megjegyzés. – Kiegészítő akvizíció a II = 0-hoz légijármű akvizíció kizárás, amelyet a csak S-módú all-call lekérdezéses akvizíciók követnek II egyenlő 0-val.

2. Megjegyzés. – A kizárási idő minimálása csökkenti egy szomszédos lekérdező akvizíciós tevékenységével való konfliktus valószínűségét, ahol a szomszéd lekérdező ugyancsak II egyenlő 0-t használ kiegészítő akvizícióhoz.

3.1.2.5.2.1.5.2.1 **Ajánlás**. – *Kiegészítő adatbeszerzést teljesítő, II egyenlő 0-t használó lekérdezőknek (a 3.1.2.5.2.1.4 pontban ismertetett eljárással kapcsolatban) az adatbeszerzést egy kizárás utasítás továbbításával kell végrehajtani nem több, mint egyetlen pásztázással a megszerzett légijármű mindegyikéhez a csonkítás zónát tartalmazó sugárszünetben.*

3.1.2.5.2.1.5.2.2 **Ajánlás**. – *Csak S-módú all-call lekérdezések II = 0 beállítással kiegészítési adatbeszerzés céljából kettőnél nem több egymást követő pásztázás során mennek végbe.*

3.1.2.5.2.2 *All-call válasz, 11-es fedélzetről leadott adattovábbítási formátum:*

1	6	9	33
DF	CA	AA	PI
5	8	32	56

A válasz a csak S-módú all-call vagy A/C/S-módú all-call lekérdezésekre az S-módú all-call, 11-es fedélzetről leadott adattovábbítás formátum. Ennek a válasznak a formátuma a következő mezőkből áll.

Mező	Hivatkozás
DF fedélzetről leadott adattovábbítás formátum	3.1.2.3.2.1.2
CA képesség	3.1.2.5.11.1
AA közölt cím	3.1.2.5.2.2.2
PI paritás/lekérdezés azonosító	3.1.2.3.2.1.4

3.1.2.5.2.2.1 *CA: képesség*. Ez a 3-bites (6-8) fedélzetről leadott adattovábbítási mező a válaszjeladó kommunikációs képességének kódolt meghatározását tartalmazza és az all-call válasz formátum (DF= 11) kerül felhasználásra.

Kódolás

0 jelöli, hogy nincs kommunikációs képesség (csak ellenőrzés), és nincs képesség a CA 7 kód beállításra, és vagy fedélzeti vagy földi

1 fenntartott

2 fenntartott

3 fenntartott

4 legalább Comm-A és Comm-B képességet és CA 7 kód beállítás képességét jelenti, és a földön

5 legalább Comm-A és Comm-B képességet és CA-7 kód beállítás képességét jelenti, és a fedélzeten

6 legalább Comm-A és Comm-B képességet a CA 7 kód beállítás képességét jelenti, és vagy a fedélzeten vagy a földön

7 jelöli, hogy a DR mező nem egyenlő 0-val és az FS mező egyenlő 2, 3, 4 vagy 5-el, és vagy a fedélzeten vagy a földön.

Amikor a CA 7 kódhoz tartozó feltételek nincsenek kielégítve, azok a felszerelések, amelyek kommunikációs képességgel rendelkeznek, de nincsenek automatikus eszközeik földi feltétel beállítására, CA 6 kódot használnak. Automatikus földi meghatározású légijárművek CA 4 vagy 5 kódot használnak. Adatkapcsolat képesség közlések (3.1.2.6.10.2.2 pont) olyan légijármű felszerelésekből állnak rendelkezésre, amelyek CA 4, 5, 6 vagy 7 kódot állítanak be.

Megjegyzés. – A CA 1-től 3-ig kódok S-módú válaszjeladók részére vannak fenntartva, amelyeknek nincs képességük CA 7 kód beállítására. Az ilyen kódokkal rendelkező válaszjeladók adatkapcsolat képességet jelentenek (3.1.2.6.10.2.2). Más adatkapcsolati tranzakciót, mint légijármű azonosítást tartalmazó GICB kinyerés, ACAS RA (ACAS megoldási tanácsadás) kinyerés és fedélzetről leadott adattovábbítási rádióadás kinyerés, nem lehet megkísérelni ezekkel a válaszjeladókkal.

3.1.2.5.2.2.2 *AA: közölt cím.* Ez a 24-bites (9-32) fedélzetről leadott adattovábbítási mező tartalmazza a légijármű címzést, amely a légijármű egyértelmű azonosítását biztosítja.

3.1.2.5.3 *Kizárás protokoll.* A 3.1.2.6.9 pontban meghatározott all-call protokollt a lekérdező használja egy légijárműre vonatkozóan, amely légijármű címzést egy lekérdező már megkapta.

Megjegyzés. – A kiválasztást követően egy válaszjeladót különállóan címzett lekérdezések kérdeznek le, ahogyan 3.1.2.6, 3.1.2.7 és 3.1.2.8 pontokban elő van írva, és az all-call kizárási protokollt a további all-call lekérdezések megakadályozására használják.

3.1.2.5.4 *Sztochasztikus all-call protokoll.* A válaszjeladó véletlen folyamatot hajt végre egy csak S-módú all-call vételén, amelynek kódja egyenlő 1-től 4-ig vagy 9-től 12-ig. A választásra vonatkozó döntést a lekérdezésben előírt valószínűséggel hozzák. A válaszjeladó nem válaszol, ha 5, 6, 7, 13, 14 vagy 15-el egyenlő PR kód került vételre (3.1.2.5.2.1.1 alpont).

Megjegyzés. – A válaszok véletlen előfordulása lehetővé teszi a lekérdező számára, hogy kapcsolatot találjon közelben tartózkodó légijárművekkel, amelyektől a válaszok más esetben szinkron módon csonkítanák egymást.

3.1.2.6 Címzett felderítés és szabványos hosszúságú kommunikációs tranzakciók

1. Megjegyzés. – Az ebben a szakaszban leírt lekérdezések meghatározott légijárműveknek vannak címezve. Két lekérdezési és válasz típus van, rövid és hosszú. A rövid lekérdezések és válaszok UF 4 és 5, míg a hosszú lekérdezések és válaszok UF 20 és 21 és DF 20 és 21.

2. Megjegyzés. – A kommunikációs protokollokat a 3.1.2.6.11 alpont tartalmazza. Ezek a protokollok az adatcsere szabályozást írják elő.

3.1.2.6.1 *Felderítés, magasság kérés, 4-es* fedélzetre irányuló adattovábbítási *formátum*

1	6	9	14	17	33
UF	PC	RR	DI	SD	AP
5	8	13	16	32	56

Ennek a lekérdezésnek a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
UF felfelé kapcsolat formátum	3.1.2.3.2.1.1
PC protokoll	3.1.2.6.1.1
RR válasz kérés	3.1.2.6.1.2
DI jelölő azonosító	3.1.2.6.1.3
SD különleges jelölő	3.1.2.6.1.4
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.1.1 *PC protokoll.* Ez a 3-bites (6-8) fedélzetre irányuló adattovábbítási mező működési utasításokat tartalmaz a válaszjeladó számára. A PC mezőt elhanyagolják a felderítés vagy DI=3-at tartalmazó Comm-A lekérdezések feldolgozásánál (3.1.2.6.1.4.1).

Kódolás

0	jelöli, hogy nincs beavatkozás
1	nem-szelektív all-call kizárást jelent (3.1.2.6.9.2 pont)
2	nincs kijelölve
3	nincs kijelölve
4	Comm-B kizárást jelent (3.1.2.6.11.3.2.3 pont)
5	fedélzetre irányuló ELM kizárást jelent (3.1.2.7.4.2.8 pont)
6	fedélzetről leadott ELM kizárást jelent (3.1.2.7.7.3 pont)
7	nincs kijelölve

3.1.2.6.1.2 *RR: válasz kérés.* Ez az 5-bites (9-13) fedélzetre irányuló adattovábbítási mező a kért válasz hosszúságára és tartalmára ad utasítást.

Az 5-bites RR kód utolsó négy bitje átalakítva a decimális megfelelőjévé, kijelöli az igényelt Comm-B közlés BDS1 kódját (3.1.2.6.11.2 vagy 3.1.2.6.11.3 pont), ha az RR kód legkifejezőbb bitje 1 (RR egyenlő vagy nagyobb mint 16).

Kódolás

RR =	0-15 felderítés formátumú (DF = 4 vagy 5) válasz kérésére használatos;
RR =	16-31 Comm-B formátumú (DF = 20 vagy 21) válasz kérésére használatos;
RR =	16 levegőből kezdeményezett 3.1.2.6.11.3 alpont szerinti Comm-B továbbítás kérésére használatos;
RR =	17 a 3.1.2.6.10.2.2 alpont szerinti adatkapcsolat képességi közlés kérésére használatos;
RR =	18 a 3.1.2.9 pontnak megfelelő légijármű azonosítás kérésére használatos;
19-31	nincs kijelölve a 3.1 szakaszban.

Megjegyzés. – A 19-31 kódok olyan alkalmazásokra vannak fenntartva, mint például adat kapcsolat kommunikáció, összeütközés elkerülését biztosító fedélzeti rendszer (ACAS), stb.

3.1.2.6.1.3 *DI: jelölő azonosító.* Ez a 3-bites (14-16) fedélzetre irányuló adattovábbítási mező azonosítja az SD mező struktúráját (3.1.2.6.1.4 pont).

Kódolás

0	nem kijelölt SD-t jelent kivéve IIS esetét
1	többhelyes és kommunikáció szabályozási információt tartalmazó SD-t jelent
2	jelöli, hogy az SD irányítás adatokat tartalmaz kiterjesztett squitter számára
3	jelöli, hogy az SD SI többoldalú kizárási, rádióadási és GICB irányítás információkat tartalmaz
4-6	nem kijelölt SD-t jelent
7	jelöli, hogy az SD kiterjesztett adat kiolvasás kérést, többhelyes és kommunikáció szabályozási információt tartalmaz

3.1.2.6.1.4 *SD: különleges jelölő.* Ez a 16-bites (17-32) fedélzetre irányuló adattovábbítási mező szabályozási kódokat tartalmaz, melyek a DI mezőben való kódolástól függnek.

Megjegyzés. – A különleges jelölő (SD) mező többhelyes, kizárási és kommunikációs szabályozási információk földi állomástól a válaszjeladóig továbbítására szolgál.

DI KÓD *SD MEZŐ STRUKTÚRA*

17 21

0	IIS		

20 32

17 21 23 26 27 29

1	IIS	MBS	MES	LOS	RSS	TMS	

20 22 25 28 32

17 21 24 27 29

2		TCS	RCS	SAS		

20 23 26 28 32

17 23 24 28

3	SIS	LSS	RRS		

22 27 32

17 21 25 26 27 29

7	IIS	RRS		LOS		TMS	

20 24 28 32

3.1.2.6.1.4.1 *Almezők az SD-ben.* Az SD mező a következő információkat tartalmazza:

a) Ha DI = 0, 1 vagy 7:
Az IIS, a 4 bites (17-20) lekérdező azonosító almező a lekérdező kijelölt azonosító kódját tartalmazza (3.1.2.5.2.1.2 pont)

b) Ha DI = 0
21-32 bitek nincsenek kijelölve

c) Ha DI = 1
Az MBS, a 2-bites (21-22) többhelyes Comm-B almező a következő kódokkal rendelkezik:
0 jelenti, hogy nincs Comm-B akció
1 levegőből kezdeményezett Comm-B helyfoglalás kérést jelent (3.1.2.6-11.3.1 pont)
2 Comm-B kizárást (3.1.2.6.11.3.2.3 pont) jelent
3 nincs kijelölve

A MES, a 3-bites (23-25) többhelyes ELM almező tartalékolási és kizárási utasításokat tartalmaz az ELM részére
a következők szerint:
0 jelenti, hogy nincs ELM beavatkozás
1 fedélzetre irányuló ELM helyfoglalás kérést jelent (3.1.2.7.4.1 pont)
2 fedélzetre irányuló ELM kizárást jelent (3.1.2.7.4.2.8 pont)
3 fedélzetről leadott ELM helyfoglalás kérést jelent (3.1.2.7.7.1.1 pont)
4 fedélzetről leadott ELM kizárást jelent (3.1.2.7.7.3 pont)
5 fedélzetre irányuló- ELM helyfoglalás kérést és fedélzetről leadott ELM kizárást jelent
6 fedélzetre irányuló ELM kizárást és fedélzetről leadott adattovábbítási helyfoglalás kérést jelent
7 fedélzetre irányuló ELM és fedélzetről leadott ELM kizárások.

Az RSS a 2-bites (27, 28) helyfoglalási állapot almező a válaszjeladótól közlést kér tartalékolási állapotáról az UM mezőben. A következő kódok vannak jelölve:

0 jelenti, hogy nincs kérés
1 Comm-B tartalékolási állapot UM-ben közlést jelent
2 fedélzetre irányuló ELM foglalási állapot közlést jelent
3 fedélzetről leadott ELM foglalási állapot közlést jelent

d) Ha DI = 1 vagy 7:

A LOS, az 1-bites (26) kizárás almező egy többhelyes kizárási utasítást jelöl az IIS-ben jelzett lekérdezőtől. A LOS 0-ra állítását annak jelölésére használják, hogy nincs utasítás a kizárás állapot megváltoztatására.

A TMS, a 4-bites (29-32) taktikai közlemény almező az adat kapcsolati repüléselektronika által használt kommunikáció szabályozás információkat tartalmaz.

e) Ha DI = 7:

Az RRS, a 4-bites (21-24) válasz kérési almező SD-ben megadja a kért Comm-B válasz BDS2 kódját.

A 25, 27 és 28-s bitek nincsenek kijelölve.

f) Ha DI = 2:

TCS, a 3-bites (21-23) típus irányítás almező SD-ben irányítja a válaszjeladó által használt pozíció típust. A következő kódok vannak kijelölve

0 jelöli, hogy nincs helyzet típusú utasítás
1 földi helyzet típus használatát jelöli a következő 15 másodpercben
2 földi helyzet típus használatát jelöli a következő 60 másodpercben
3 földi típusú utasítás törlését jelöli
4-7 nincs kijelölve

RCS, a 3-bites sebesség szabályozás almező SD-ben szabályozza a válaszjeladó squitter sebességét, amikor az a földi formátumot jelenti. Ennek az almezőnek nincs hatása a válaszjeladó squitter sebességére, amikor az a levegőben lévő helyzet típust jelenti. A következő kódok vannak kijelölve:

0 jelöli, hogy nincs felület squitter sebesség utasítás
1 nagy felületi squitter sebesség jelentés 60 másodpercig
1 kis felületi squitter sebesség jelentés 60 másodpercig
3 az összes felületi squitter elnyomása 60 másodpercig
4 az összes felületi squitter elnyomás 120 másodpercig
5-7 nincs kijelölve

Megjegyzés. – Nagy- és kissebességű squitter sebesség meghatározását a 3.1.2.8.6.4.3 pont tartalmazza.

SAS, a 2-bites (27-28) felületi antenna almező SD-ben irányítja a válaszjeladó eltérés antennát, amelyet a kiterjesztett squitter-hez használnak, amikor az a felületi formátumot közli. Ez az almező nincs hatással a válaszjeladó eltérés antenna megszerzésére, amikor az a fedélzeti pozíció típust közli. A következő kódok vannak kijelölve:

0 jelöli, hogy nincs antenna utasítás
1 egymást felváltó felső és alsó antennákat jelöli 120 másodpercig
2 alsó antennát jelöli 120 másodpercig
3 visszatérést jelöl a hibához.

Megjegyzés. – A felső (tető) antenna az alapértelmezett állapot (3.1.2.8.6.5 pont).

g) Ha DI = 3

SIS a 6-bites (17-22) felderítés azonosító almező az SD-ben, amelynek tartalmaznia kell a lekérdező kijelölt felderítési azonosító kódját.

LSS, az 1-bites (23) kizárás felderítés almező, ha 1-re állítják, egy többhelyes kizárás utasítást jelöl a SIS-ben jelzett lekérdezőtől. Ha 0-ra állítják, LSS azt jelöli, hogy nincs változás, a kizárás állapotban utasítás van.

RRS, a 4-bites (24-27) válasz kérés almező SD-ben a kért GICB regiszter BDS2 kódot tartalmazza.

3.1.2.6.1.5 *PC és SD mező feldolgozás*. Amikor DI = 1, a PC mező feldolgozás az SD mező feldolgozás előtt befejeződik.

3.1.2.6.2 *Comm-A magasság kérés, fedélzetre irányuló 20-as adattovábbítási formátum*

1	6	9	14	17	33	89
UF	PC	RR	DI	SD	MA	AP
5	8	13	16	32	88	112

Ennek a lekérdezésnek a formátuma a következő mezőkből tevődik össze:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
PC protokoll	3.1.2.6.1.1
RR válasz kérés	3.1.2.6.1.2
DI jelölő azonosítás	3.1.2.6.1.3
SD különleges jelölő	3.1.2.6.1.4
MA közlemény, Comm-A	3.1.2.6.2.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.2 1 *MA: Közlemény, Comm-A.* Ez az 56-bites (33-88) mező egy adat kapcsolat közleményt tartalmaz a légijárműhöz.

3.1.2.6.3 *Felderítési azonosság kérés, fedélzetre irányuló 5-ös adattovábbítási formátum*

1	6	9	14	17	33
UF	PC	RR	DI	SD	AP
5	8	13	16	32	56

Ennek a lekérdezésnek a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
PC protokoll	3.1.2.6.1.1
RR válasz kérés	3.1.2.6.1.2
DI jelölő azonosítás	3.1.2.6.1.3
SD különleges jelölő	3.1.2.6.1.4
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.4 *Comm-A azonosság kérés, fedélzetre irányuló 21-es adattovábbítási formátum*

1	6	9	14	17	33	89
UF	PC	RR	DI	SD	MA	AP
5	8	13	16	32	88	112

Ennek a lekérdezésnek a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
PC protokoll	3.1.2.6.1.1
RR válasz kérés	3.1.2.6.1.2
DI jelölő azonosítás	3.1.2.6.1.3
SD különleges kijelölő	3.1.2.6.1.4
MA közlemény, Comm-A	3.1.2.6.2.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.5 *Felderítési magasság válasz, fedélzetről leadott 4-es adattovábbítási formátum*

1	6	9	14	20	33
DF	FS	DR	UM	AC	AP
5	8	13	19	32	56

Ez a válasz egy 16-nál kisebb értékű RR mezőjű UF4 vagy 20 lekérdezésre történő reagálásban generálódik. Ennek a válasznak a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
FS repülési állapot	3.1.2.6.5.1
DR fedélzetről leadott adattovábbítás kérés	3.1.2.6.5.2
UM közlemény	3.1.2.6.5.3
AC magasság kód	3.1.2.6.5.4
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.5.1 *FS: repülési állapot.* Ez a 3-bites (6-8) fedélzetről leadott adattovábbítási mező a következő információkat tartalmazza:

Kódolás

0	azt jelenti, hogy nincs figyelmeztetés és nincs SPI, a légijármű a levegőben van
1	azt jelenti, hogy nincs figyelmeztetés és nincs SPI, a légijármű a földön van
2	azt jelenti, hogy figyelmeztetés van, nincs SPI, a légijármű a levegőben van
3	azt jelenti, hogy figyelmeztetés van, nincs SPI, a légijármű a földön van
4	azt jelenti, hogy figyelmeztetés és SPI van, a légijármű a levegőben vagy a földön van
5	azt jelenti, hogy nincs figyelmeztetés és SPI, a légijármű a levegőben vagy a földön van
6	fenntartott

7 nincs kijelölve

Megjegyzés. – Azok a feltételek, amelyek figyelmeztetést váltanak ki, a 3.1.2.6.10.1.1 pontban találhatók.

3.1.2.6.5.2 *DR: fedélzetről leadott adattovábbítási kérés.* Ez az 5-bites (9-13) fedélzetről leadott adattovábbítás mező fedélzetről leadott adattovábbítási információ kéréseket tartalmaz.

Kódolás

0	azt jelenti, hogy nincs fedélzetről leadott adattovábbítási kérés
1	Comm-B közlemény küldése iránti kérést jelent
2	ACAS részére fenntartva
3	ACAS részére fenntartva
4	azt jelenti, hogy Comm-B adás közlemény 1 rendelkezésre áll
5	azt jelenti, hogy Comm-B adás közlemény 2 rendelkezésre áll
6	ACAS részére fenntartva
7	ACAS részére fenntartva
8-15	nincs kijelölve
16-31	lásd fedélzetről leadott ELM protokoll (3.1.2.7.7.1 pont)

Az 1-15 kódok elsőbbséget élveznek a 16-31 kódokkal szemben.

Megjegyzés. – Az 1-15 kódoknak adott elsőbbség lehetővé teszi egy Comm-B közlemény számára, hogy egy fedélzetről leadott ELM bejelentést félbeszakítson. Ez prioritást ad a rövidebb közlemény közzétételének.

3.1.2.6.5.3 *UM: Végső közlemény.* Ez a 6-bites (14-19) fedélzetről leadott adattovábbítási mező válaszjeladó kommunikáció állapot információt tartalmaz a 3.1.2.6.1.4.1 és 3.1.2.6.5.3.1 pontokban előírtak szerint.

3.1.2.6.5.3.1 Almezők UM-ben többhelyes protokollok számára

UM mező struktúra

14		18	
IIS		IDS	
	17		19

A válaszjeladó a következő almezőket illeszti be a válasz UM mezejébe, ha egy ellenőrzés vagy Comm-A lekérdezés (UF egyenlő 4, 5, 20, 21) DI = 1 és RSS 0-tól különböző értéket tartalmaz:

IIS: A 4-bites (14-17) lekérdezés azonosító almező a lekérdező azonosítót közli, amely többhelyes kommunikáció részére van fenntartva.

IDS: A 2-bites (18-29) azonosító jelölő közli a IIS-ben azonosított lekérdező által eszközölt helyfoglalás típusát.

A kijelölt kódolás:

0 jelenti, hogy nincs információ
1 jelenti, hogy az IIS Comm-B II kódot tartalmaz
2 jelenti, hogy az IIS Comm-C II kódot tartalmaz

3 jelenti, hogy az IIS Comm-D II kódot tartalmaz

3.1.2.6.5.3.2 *Többhelyes tartalékolási állapot*. A földi állomás lekérdező azonosítója, amelyet a többhelyes Comm-B szállítás részére (3.1.2.6.11.3.1 pont) éppen tartalékoltak, az IIS almezőben kerül továbbításra az 1-es kóddal együtt az IDS almezőben, ha az UM tartalma nincs a lekérdezés által előírva (ha DI = 0 vagy 7, vagy amikor DI = 1 és RSS = 0).

A földi állomás lekérdező azonosítója, amely jelenleg tartalékolva van a fedélzetről leadott ELM továbbítás (3.1.2.7.6.1 pont) részére, ha van, az IIS almezőben a 3-as kóddal együtt az IDS almezőben kerül továbbításra, ha az UM tartalmát a lekérdezés nem határozza meg és nincs éppen Comm-B helyfoglalás.

3.1.2.6.5.4 *AC: magasság kód*. Ez a 13-bites (20-32) mező a magasságot tartalmazza, amely a következők szerint van kódolva:

a) A 26-os bit M bit-ként van jelölve és 0, ha a magasság értékét lábban közlik. M egyenlő 1 értéket fenntartják arra az esetre, ha a magasság közlése metrikus egységekben történik.

b) Ha M egyenlő 0, akkor a 28-as bit Q bit-ként van jelölve. Q egyenlő 0-t annak jelölésére használják, hogy a magasságot 100-lábas növekményekben közöljék. A Q egyenlő 1-et annak jelzésére használják, hogy a magasságot 25-lábas növekményekben közöljék.

c) Ha az M bit (26-os bit) és a Q bit (28-as bit) egyenlő 0, a magasságot a 3.1.1.7.12.2.3 pont C-módú válaszai sémájának megfelelően kell kódolni. A 20-as bit-tel kezdve a sorozat C1, A1, C2, A2, C4, A4, ZÉRO, B1, ZÉRO, B2, D2, B4, D4 lesz.

d) Ha az M bit egyenlő 0, és a Q bit egyenlő 1, a 20-tól-25-ig, 27 és 29-től 32 bit-ek által képviselt mező a 25 láb legkisebb jelentésű bit-hez (LSB) tartozó bináris kódolású mezőt reprezentál. "N" pozitív decimális egész szám bináris értékét kódolni kell a nyomásmagasság ((25 N-1000) plusz vagy mínusz 12,5 láb) tartományban való közlésére. A 3.1.2.6.5.4c pontnak megfelelő kódolást az 50 187,5 láb feletti nyomásmagasság közlésére használják.

1. Megjegyzés. – Ez a kódolási módszer csak mínusz 1000 láb és plusz 50 175 láb közötti értékek szolgáltatására képes.

2. Megjegyzés. – Ennek a mezőnek a legjelentősebb bitje (MSB) a 20-as bit, ahogyan azt a 3.1.2.3.1.3 pont megköveteli.

e) Ha az M bit egyenlő 1-el, a 20-tól - 25-ig és a 27-től - 31-ig bit-ek által reprezentált 12 bit-es mezőt a magasság metrikus egységekben történő kódolására tartják fenn.

f) 0-t az AC mező 13 bit-jének mindegyikében át kell vinni, ha magassági információ nem áll rendelkezésre, vagy a magasság értékét érvénytelenül határozták meg..

3.1.2.6.6 *Comm-B magasság válasz, fedélzetről leadott 20-as adattovábbítási formátum*

1	6	9	14	20	33	89
DF	FS	DR	UM	AC	MB	AP
5	8	13	19	32	88	112

Ez a válasz egy UF 4 vagy 20 lekérdezésre generálódik 15-nél nagyobb értékű RR mezővel. Ennek a válasznak a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítás formátum	3.1.2.3.2.1.2
FS repülési állapot	3.1.2.6.5.1
DR fedélzetről leadott adattovábbítás kérés	3.1.2.6.5.2
UM közlemény	3.1.2.6.5.3
AC magasság kód	3.1.2.6.5.4
MB közlemény, Comm-B	3.1.2.6.6.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.6.1 *MB: közlemény, Comm-B.* Ezt az 56 bit-es (33-88) fedélzetről leadott adattovábbítási mezőt adatkapcsolati közleményeknek a földre való továbbítására használják.

3.1.2.6.7 *Felderítési azonosítási válasz, fedélzetről leadott 5-ös adattovábbítási formátum*

1	6	9	14	20	33
DF	FS	DR	UM	ID	AP
5	8	13	19	32	56

Ez a válasz egy UF 5 vagy 21 lekérdezésre való reagálásban generálódik egy 16-nál kisebb értékű RR mezővel. Ennek a válasznak a formátuma a következő mezőkből áll:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítás formátum	3.1.2.3.2.1.2
FS repülési állapot	3.1.2.6.5.1
DR fedélzetről leadott adattovábbítás kérés	3.1.2.6.5.2
UM közlemény	3.1.2.6.5.3
ID azonosság	3.1.2.6.7.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.7.1 *ID: azonosság (A-módú kód).* Ez a 13 bit-es (20-32) mező légijármű azonossági kódot tartalmaz a 3.1.1.6 pontban lévő A-módú válaszok sémájának megfelelően. A 20-as bittel kezdve a sorozat C1, A1, C2, A2, C4, A4, ZÉRO, B1, D1, B2, D2, B4, D4 lesz.

3.1.2.6.8 *Comm-B azonosság válasz, 21-es fedélzetről leadott adattovábbítási formátum*

1	6	9	14	20	33	89
DF	FS	DR	UM	ID	MB	AP
5	8	13	19	32	88	112

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítás formátum	3.1.2.3.2.1.2
FS repülési állapot	3.1.2.6.5.1

DR fedélzetről leadott adattovábbítás kérés	3.1.2.6.5.2
UM közlemény	3.1.2.6.5.3
ID azonosság	3.1.2.6.7.1
MB közlemény, Comm-B	3.1.2.6.6.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.6.9 *Kizárás protokollok*

3.1.2.6.9.1 *Többhelyes all-call kizárás*

Megjegyzés. – A többhelyes kizárás protokoll megakadályozza, hogy egy válaszjeladó *kiválasztást egy földi állomás letiltson egy olyan szomszédos földi állomástól jövő letiltási utasítással, amely földi állomás átlapoló lefedéssel rendelkezik.*

3.1.2.6.9.1.1 A többhelyes kizárási utasítást az SD mezőben (3.1.2.6.1.4.1 pont) továbbítják. Egy kizárás utasítást egy II kód számára egy SD-ben továbbítják DI = 1, vagy DI = 7 mellett. Egy kizárás utasítást egy SI kód számára egy DI = 3 beállítású SD-ben továbbítanak. SI kizárást LSS egyenlő 1 és egy nem zérus lekérdezés azonosító az SD SIS almezőjében, egy nem-zérus lekérdező azonosító jelenléte jelzi. Egy II kizárás utasítást LOS kód egyenlő 1-el jelzik és egy nem-zérus lekérdező azonosító jelenlétével az SD IIS almezőjében. Miután egy válaszjeladó egy többhelyes kizárási utasítást tartalmazó lekérdezést vesz, ez a válaszjeladó elkezdi bármely csak S-módú all-call lekérdezés kizárását (azaz nem-vételét), amely tartalmazza a lekérdező azonosítóját, amely a kizárás utasítást adta. A kizárás a többhelyes kizárás utasítást tartalmazó lekérdezés utolsó vétele utáni T_L időközön keresztül tart (3.1.2.10.3.9 pont). Többhelyes kizárás nem akadályozza meg egy PR 8-tól 12-ig kódokat tartalmazó, csak S-módú all-call lekérdezés vételét. Ha egy kizárás utasítást (LOS (1) IIS = 0-val együtt vesz, ezt nem-szelektív all-call kizárásként kell értelmezni (3.1.2.6.9.2 pont).

1. Megjegyzés. – Tizenöt lekérdező tud független többhelyes kizárás utasítást küldeni. Ezeknek az utasításoknak mindegyikét külön kell időzíteni.

2. Megjegyzés. – Többhelyes kizárás (amely csak nem-zérus II kódokat használ) nem befolyásolja a válaszjeladó *reagálását II egyenlő 0-t tartalmazó, csak S-módú all-call lekérdezésekre vagy A/C/S-módú lekérdezésekre.*

3.1.2.6.9.2 *Nem szelektív all-call kizárás*

1. Megjegyzés. – Azokban az esetekben, ahol a többhelyes kizárás protokollt nem igénylik (pl. nincs átlapoló lefedés, vagy földi állomás koordináció van föld-föld kommunikáción keresztül), a nem-szelektív kizárás protokoll használható.

Egy 1-es kódot a PC mezőben tartalmazó lekérdezés vétele után a válaszjeladó kizárást indít (azaz nem vesz) az all-call lekérdezés két típusánál:

a) csak S-módú all-call (UF = 1) 11 egyenlő 0 mellett; és

b) a 3.1.2.1.5.1.1 pont szerinti A/C/S-mód mellett.

Ez a kizárás állapot egy T_D időközön keresztül tart (3.1.2.10.3.9 alpont) az utasítás utolsó vétele után. Nem-szelektív kizárás nem akadályozza meg PR 8-tól 12-ig kódokat tartalmazó, csak S-módú all-call lekérdezés vételét.

2. Megjegyzés. – Nem szelektív kizárás nem befolyásolja a válaszjeladó reagálását a II nem egyenlő 0-t tartalmazó, csak S-módú all-call lekérdezésekre.

3.1.2.6.10 *Bázis adat protokollok*

3.1.2.6.10.1 *Repülési állapot protokoll.* Repülési állapotot az FS mezőben kell jelenteni (3.1.2.6.5.1 alpont).

3.1.2.6.10.1.1 *Figyelmeztetés.* Figyelmeztetés állapotot az FS mezőben kell közölni, ha A-módú válaszokban és DF egyenlő 5 és DF egyenlő 21 fedélzetről leadott adattovábbítási formátumokban átvitt azonosítás kódot a pilóta megváltoztatja.

3.1.2.6.10.1.1.1 *Permanens figyelmeztetés állapot.* A figyelmeztetés állapot fennmarad, ha az A-módú azonosítás kódot 7500-ra, 7600-ra vagy 7700-ra változtatják.

3.1.2.6.10.1.1.2 *Átmeneti figyelmeztetés állapot.* A figyelmeztetés állapot átmeneti és megszünteti magát T_c másodperc múlva, ha az A-módú azonosítás kódot a 3.1.2.6.10.1.1.1 pontban felsoroltaktól különböző értékűre változtatják.

Megjegyzés. – A T_c értéket a 3.1.2.10.3.9 alpont tartalmazza.

3.1.2.6.10.1.1.3 *A permanens figyelmeztetés állapot befejeződése.* A permanens figyelmeztetés állapotot be kell fejezni és átmeneti figyelmeztetés állapottal kell helyettesíteni, amikor az A-módú azonosítás kódot 7500, 7600 vagy 7700-tól eltérő értékre állítják.

3.1.2.6.10.1.2 *Földi közlés.* A légijármű földi állapotát az FS mezőben és a VS mezőében (3.1.2.8.2.1 alpont) és a CA mezőben (3.1.2.8.1.1) kell jelenteni Ha a földi állapotot (azaz a kerekeket vagy a futómű támaszokat terhelő súly) automatikusan jelző eszköz rendelkezésre áll a válaszjeladó adat csatoló felületnél, akkor ezt alapként kell használni a függőleges állapot jelentéséhez. Ha a válaszjeladó adat csatoló felületénél nem áll rendelkezésre eszköz a földi állapot automatikus jelzésére (3.1.2.10.5.1.3 alpont), az FS és VS kódoknak jelezniük kell, hogy a légijármű a levegőben van, és a CA mezőnek jeleznie kell, hogy a légijármű vagy a levegőben, vagy a földön van (CA=6).

3.1.2.6.10.1.3 *Különleges pozíció azonosítás (SPI).* Az SPI impulzus egyenértékű jelét az S-módú válaszjeladókkal az FS mezőben kell továbbítani, és a felderítési állapot almezőben (SSS) kell továbbítani, amikor manuálisan aktivizálják. Ezt az impulzust a megkezdés után T_1 másodpercig továbbítják (3.1.1.6.3, 3.1.1.7.13 és 3.1.2.8.6.3.1.1 pontok).

Megjegyzés. – A T_1 értékét a 3.1.2.10.3.9 pont tartalmazza.

3.1.2.6.10.2 *Képesség közlés protokoll.*

Megjegyzés. – A légijármű képességet különleges mezőkben kell közölni, a következő pontokban megfogalmazottaknak megfelelően.

3.1.2.6.10.2.1 *Képesség közlés.* A 3-bites CA mező, amelyet az all-call válasz foglal magában DF egyenlő 11 mellett, az S-módú válaszjeladó alap-képességét közli a 3.1.2.5.2.2.1 pontban leírtaknak megfelelően.

3.1.2.6.10.2.2 *Adatkapcsolat képesség közlés.* Az adatkapcsolat közlés a lekérdezőt az S-módú szerelvény adatkapcsolat képességének leírásával látja el. A közlést egy földi kezdeményezésű Comm-B válasz által nyerik, amely egy RR egyenlő 17 és DI nem egyenlő 7, vagy DI egyenlő 7 és RRS egyenlő 0-t tartalmazó lekérdezésre való reagálásban van (3.1.2.6.11.2 pont).

3.1.2.6.10.2.2.1 *Almezők MB-ben adatkapcsolat képességi közlésben.* Az összes adatkapcsolat képesség közlés MB mezőjén belüli almezők a következők (3.1.2.6.11.2.1 pont);

BDS1 Egy 1 értéket illesztenek bele ebbe a 4-bites (33-36) almezőbe a Comm-B adatszelektor (BDS) kód első részeként

BDS2 Egy 0 értéket illesztenek bele ebbe a 4-bites (37-40) almezőbe a Comm-B adatszelektor (BDS) kód első részeként.

SCS Ez az 1-bites (66) squitter képesség almező jelenti válaszjeladó képességét kiterjesztett squitter pozíció jelentések továbbítására. Ezt 1-re állítják, ha a BDS 05 és 0/6 HEX regisztereket felfrissítették az utolsó tíz plusz vagy mínusz egy másodpercen belül. Más esetben 0-ra kell állítani.

Megjegyzés. – A BDS 05, illetve 06 HEX regisztereket a kiterjesztett squitter levegőbeli, illetve földi pozíció jelentéseknél használják.

SIC Ez az 1-bites (67) ellenőrzés azonosító képesség almező jelenti válaszjeladó képességét az ellenőrzés azonosító (SI) kódok fenntartására.

3.1.2.6.10.2.2.2 *Az adatkapcsolat képesség közlés felfrissítése.* A válaszjeladó négy másodpercet nem meghaladó időközönként az éppen aktuális adatkapcsolat képesség állapotot összehasonlítja az utoljára közölttel, és ha különbséget észlel, javított adatkapcsolat képesség közlést kezdeményez Comm-B adással (3.1.2.6.11.4 pont) BDS0 = 1 (33-36) és BDS 2 = 0 (37-40) esetére. A válaszjeladó kezdeményezi, generálja és továbbítja a módosított képesség közlést még akkor is, ha a légijármű adatkapcsolat képesség lecsökkent vagy meg is szűnt. A válaszjeladó beállítja a BDS almezőt az adatkapcsolat képesség közléshez.

Megjegyzés. – A BDS kód válaszjeladó általi beállítása biztosítja, hogy a képesség közlés adás változása tartalmazni fogja a BDS kódot az adatkapcsolat meghibásodás minden esetére (pl. a válaszjeladó adatkapcsolat csatlakozó felületének elvesztése).

3.1.2.6.10.3 *Bejelentett földi telepítésű állomás érvényesítése*

Megjegyzés. – A függőleges állapot meghatározásához automatikus eszközökkel rendelkező légijárműveknél a CA mező jelenti, hogy a légijármű a levegőben van-e vagy a földön. Az ACAS II rövid vagy kiterjesztett squittert használó légijárművet igényel ahol mindkettő tartalmazza a CA mezőt. Ha a légijármű földön tartózkodási állapotot jelent, az ACAS II ezt a légijárművet nem fogja lekérdezni annak érdekében, hogy csökkentsék a szükségtelen lekérdezési aktivitást. Ha a légijármű kiterjesztett squitter közlemények jelentésére alkalmas felszereléssel el van látva, a funkció, amely ezeket a közléseket megformázza, rendelkezhet információval, amely rendelkezésre áll annak érvényesítésére, hogy egy "földön"-t jelentő légijármű ténylegesen a levegőben van.

3.1.2.6.10.3.1 A földön tartózkodási feltétel meghatározására szolgáló automatikus eszközökkel felszerelt légijárműveknek, amelyek el vannak látva kiterjesztett squitter közlemények megformázására szolgáló eszközökkel, a következő érvényességi ellenőrzéseket kell elvégezniük:

Ha az automatikusan meghatározott levegő/föld állapot nem áll rendelkezésre vagy "levegőben" állapotú, érvényesítés nem végezhető. Ha az automatikusan meghatározott levegő/föld állapot rendelkezésre áll, és "a földön" állapotot jelentenek, a levegő/föld állapotot felülírja és "levegőben"-re változtatja, ha a jármű kategóriára a 3-6 táblázatban adott feltételek teljesülnek.

Megjegyzés. – Bár ezt a vizsgálatot csak olyan légijárműtől követelik meg, amely kiterjesztett squitter közlemények megformázására fel vannak szerelve, ez minden légijármű számára kívánatos lenne.

3.1.2.6.11 *Szabványos hosszúságú kommunikáció protokollok*

1. Megjegyzés. – A szabványos hosszúságú kommunikációs protokollok a Comm-A és a Comm-B; az ezeket a protokollokat használó közleményeket a lekérdező irányítása alatt továbbítják. A Comm-A közleményeket közvetlenül a válaszjeladónak küldik, és egy tranzakción belül befejezik. A Comm-B közleményt levegőből a földre történő információ továbbításhoz használják és vagy a lekérdező, vagy a válaszjeladó kezdeményezi ezt. A földi kezdeményezésű Comm-B átadások esetében a lekérdező adatokat kér a válaszjeladótól, amely a közleményt ugyanabban a tranzakcióban szállítja. Levegő kezdeményezésű Comm-B átadások esetében a válaszjeladó közli a közlemény átadásának szándékát; egy ezt követő tranzakcióban egy lekérdező kivonatolja a közleményt.

2. Megjegyzés. – Nem-szelektív levegőből történő kezdeményezésű Comm-B protokollban minden szükséges tranzakciót bármelyik lekérdező irányíthatja.

3. Megjegyzés. – Az átlapoló lekérdezési lefedés néhány területén lehet, hogy nincsenek eszközök lekérdezési tevékenységek összehangolására földi kommunikáción keresztül. Levegőből történő kezdeményezésű Comm-B kommunikációs protokollok egynél több tranzakciót igényelnek a végrehajtáshoz. Gondoskodás történik annak biztosításáról, hogy egy Comm-B közleményt csak olyan lekérdező zárhasson ki, amely ténylegesen átviszi a közleményt. Ezt a többhelyes Comm-B kommunikációs protokollok használatán keresztül, vagy a megnövelt Comm-B kommunikációs protokollok használatán keresztül lehet megvalósítani.

4. Megjegyzés. – A többhelyes és a nem-szelektív kommunikációs protokollok nem használhatók egyidejűleg átlapoló lekérdező lefedésű régióban, hacsak a lekérdezőik nem koordinálják kommunikációs tevékenységüket a földi kommunikáción keresztül.

5. Megjegyzés. – A többhelyes kommunikációs protokoll független a többhelyes kizárási protokolltól. Azaz a többhelyes kommunikációs protokoll nem-szelektív kizárás protokollal használható és fordítva. A használatra kerülő kizárás és kommunikáció protokollok kiválasztása a felhasznált hálózati management eljárástól függ.

6. Megjegyzés. – A Comm-B protokoll rádióadása egy közlemény készítésére használható, amely minden aktív lekérdező rendelkezésére áll.

3.1.2.6.11.1 *Comm-A.* A lekérdező egy Comm-A közleményt szállít egy lekérdezés MA mezejében UF = 20 vagy 21 lekérdezés esetében.

3.1.2.6.11.1.1 *Comm-A műszaki nyugtázása.* Egy Comm-A lekérdezést egy válaszjeladó automatikusan műszakilag nyugtáz a kívánt válasz továbbításával (3.1.2.10.5.2.2.1 pont).

Megjegyzés. – Egy, a válaszjeladótól érkező, a 3.1.2.4.1.2.3d) és 3.1.2.4.1.3.2.2.2 pontok szabályainak megfelelő válasz annak elismerését jelenti a lekérdező részére, hogy a közlést megkapta és a válaszjeladó tárolta. Ha vagy a föld-légijármű *kapcsolat, vagy fedélzetről leadott adattovábbítás hiányzik, ez a válasz is hiányozni fog, és a lekérdező normálisan a közleményt újra elküldi. A* *fedélzetről leadott adattovábbítás hiányának esetében a válaszjeladó a választ többször is megkaphatja.*

3-6 táblázat. "A földön" állapot érvényesítése

	Levegőbeni állapot meghatározása		
A/V kategória	*Földhöz viszonyított sebesség*	*Levegőhöz viszonyított sebesség*	*Rádió magasság*
Nincs információ	Nincs földi állapot változás		
Súly < 15500 font (7031 kg)	Nincs földi állapot változás		
Súly ≥ 15500 font (7031 kg)	>100 csomó, vagy	>100 csomó, vagy	>50 láb
Nagy teljesítmény (>5g gyorsulás és >400 láb)	>100 csomó, vagy	>100 csomó, vagy	>50 láb
Helikopter	Nincs földi állapot változás		

3.1.2.6.11.1.2 *Comm-A adás.* Ha egy Comm-A lekérdezési adás érkezik (3.1.2.4.1.2.3.1.3 alpont), az információ továbbítást a 3.1.2.10.5.2.1.1 pontnak megfelelően kezelik, de más válaszjeladó funkciót nem befolyásol és válasz továbbítás nem történik.

1. Megjegyzés. – Nincs műszaki nyugtázás egy Comm-A rádióadás közlemény számára.

2. Megjegyzés. – Mivel a válaszjeladó nem dolgozza fel a Comm-A rádióadás lekérdezés szabályozási mezejét, az UF mezőt követő 27 bit is a felhasználói adatok rendelkezésére áll.

3.1.2.6.11.2 *Földi kezdeményezésű Comm-B*

3.1.2.6.11.2.1 *Comm-B adat szelektor, BDS.* A 8-bites BDS kód határozza meg a regisztert, amelynek tartalmát a Comm-B válasz MB mezejében továbbítják. Ezt két, egyenként 4-bites csoportban fejezik ki: BDS1 (legjelentősebb 4 bit) és BDS2 (legkisebb jelentőségű 4 bit).

1. Megjegyzés. – A válaszjeladó regiszter szétosztás a 10. Annex, III. kötet, I. rész, 5. Fejezet 5-24 táblázatban kerül ismertetésre.

2. Megjegyzés. – Az ebben a szakaszban meghatározott regiszterek csak azok, amelyek légijármű azonosítására (3.1.2.9.1.2 pont), adatkapcsolat képesség közlésére (3.1.2.6.10.2.2 pont), kiterjesztett squitter (3.1.2.8.6.2 pont) és fedélzetről leadott adattovábbításban légijármű paraméterek (DAPs) (3.1.2.10.5.2.3 pont) céljaira szolgálnak.

3.1.2.6.11.2.2 *BDS1 kód.* A BDS1 kód az ellenőrzés vagy a Comm-A lekérdezés RR mezejében meghatározottaknak megfelelő.

3.1.2.6.11.2.3 *BDS2 kód.* A BDS2 kód az SD mező RRS almezejében (3.1.2.6.1.4.1 alpont) előírtaknak felel meg, amikor DI = 7. Ha nincs BDS2 kód meghatározva (azaz DI nem egyenlő 7), ez azt jelenti, hogy BDS2 = 0.

3.1.2.6.11.2.4 *Protokoll*. Ilyen kérés vétele esetén, a válaszadás MB mezőjének tartalmaznia kell a kért, földről történő kezdeményezésű Comm-B regiszter tartalmát.

3.1.2.6.11.3 *Levegőből történő kezdeményezésű Comm-B.*

3.1.2.6.11.3.1 *Általános protokoll.* A válaszjeladó közli egy levegőből történő kezdeményezésű Comm-B közlemény meglétét az 1-es kódnak a DR mezőbe való beillesztésével. Egy levegőből történő kezdeményezésű Comm-B közlemény kivonásához a lekérdező egy Comm-B közlés válasz iránti igényt továbbít egy sorra következő lekérdezésben, RR egyenlő 16 segítségével, és, ha DI egyenlő 7, RRS-nek egyenlőnek kell lenni 0-val. (3.1.2.6.11.3.2.1 és 3.1.2.6.11.3.3.1 pontok). Ennek a kérés kódnak a vétele a válaszjeladót egy levegőből történő kezdeményezésű Comm-B közlemény átvitelére készteti. Ha egy levegőből történő kezdeményezésű Comm-B közlemény továbbítására vonatkozó parancsot vesz, míg nincsen továbbításra váró közlemény, a válasz MB mezőben lévő összes ZÉRO-t tartalmazza.

A közleményt szállító válasz továbbra is az 1-es kódot tartalmazza a DR mezőben. Miután egy Comm-B kizárást valósítanak meg, a közleményt törlik és az ehhez a közleményhez tartozó DR kódot azonnal eltávolítják. Ha egy másik levegőből történő kezdeményezésű Comm-B közlemény vár továbbításra, a válaszjeladó a DR kódot 1-re állítja, úgyhogy a válasz ennek a következő közleménynek a bejelentését tartalmazza.

Megjegyzés. – A közlési és törlési protokoll biztosítja, hogy egy légi kezdeményezésű közlemény nem vész el a fedélzetre irányuló- *vagy fedélzetről leadott adattovábbítás meghibásodása miatt, amely a kézbesítési folyamat során fordul elő.*

3.1.2.6.11.3.2 *Kiegészítő protokoll a többhelyes levegőből történő kezdeményezésű Comm-B-hez.*

Megjegyzés. – Egy légi kezdeményezésű, továbbításra váró Comm-B közlemény bejelentését egy többhelyes foglalási állapot közlemény kísérheti az UM mezőben (3.1.2.6.5.3.2 alpont).

Ajánlás. – *Egy lekérdező ne kísérelje meg egy közlemény kinyerését, ha megállapította, hogy az nem a fenntartott hely.*

3.1.2.6.11.3.2.1 *Közlemény továbbítás.* Egy lekérdező egy Comm-B helyfoglalást és egy légi kezdeményezésű Comm-B közlemény kinyerését egy ellenőrzési vagy Comm-A lekérdezés UF egyenlő 4, 5, 20 vagy 21 továbbításával kérheti, amely a következőket tartalmazza:

RR = 16
DI = 1
IIS = kijelölt lekérdező azonosító
MBS = 1 (Comm-B helyfoglalás kérés)

Megjegyzés. – Egy Comm-B többhelyes helyfoglalási kérést normál módon egy Comm-B helyfoglalási állapot kérés kísér (RRS = 1). Ez azt idézi elő, hogy a fenntartott helyű lekérdező azonosítót a válasz UM mezejébe illesztik be.

3.1.2.6.11.3.2.1.1 Az erre a lekérdezésre reagáló protokoll eljárás a B-időzítő állapotától függ, amely azt jelzi, hogy a Comm-B helyfoglalás működik-e. Ez az időzítő T_R másodpercig fut.

1. Megjegyzés. – A T_R értéke a 3.1.2.10.3.9 pontban található.

a) Ha a B-időzítő nem működik, a válaszjeladó a következők által biztosít helyfenntartást a kérő lekérdezőnek:

1) a lekérdezés IIS-ének tárolása mint a Comm-B II; és

2) a B-időzítő indításával.

Többhelyes Comm-B tartalékolást a válaszjeladó nem tud szolgáltatni, hacsak egy levegőből történő kezdeményezésű Comm-B közlemény nem vár továbbításra és a kérő lekérdezés RR egyenlő 16, DI egyenlő 1, MBS egyenlő 1 és IIS nem egyenlő 0.

b) Ha a B-időzítő működik és a lekérdezés IIS-e egyenlő a Comm-B II-vel, a válaszjeladó újra indítja B-időzítőt.

c) Ha a B-időzítő működik és a lekérdezés IIS-e nem egyenlő a Comm-B II-vel, akkor nincs változás a Comm-B II-nél vagy a B-időzítőnél.

2. Megjegyzés. – A c) esetében a helyfoglalás kérést megtagadták.

3.1.2.6.11.3.2.1.2 Mindegyik esetben a válaszjeladó Comm-B közleménnyel válaszol az MB mezőben.

3.1.2.6.11.3.2.1.3 Egy lekérdező az UM mezőben való kódoláson keresztül meghatározza, hogy ennek a közleménynek ez egy fenntartott helye-e. Ha ez a fenntartott hely, törekedni fog a közlemény kizárására a következő lekérdezésben. Ha az nem a fenntartott hely, akkor nem fogja megkísérelni a közlemény kizárását.

3.1.2.6.11.3.2.2 *Többhelyes irányított Comm-B átvitelek.* Egy levegőből történő kezdeményezésű Comm-B közleménynek egy meghatározott lekérdezőhöz való irányítására a többhelyes Comm-B protokollt használják. Ha a B-időzítő nem működik, a kívánt rendeltetési hely leképező azonosítóját, mint Comm-B II-t kell tárolni. Ezzel egyidőben a B-időzítőt indítani kell és a DR-kódot 1-esre kell állítani. Többhelyes irányított Comm-B közleménynél a B-időzítő nem fog automatikusan kiidőzíteni, hanem folytatja a működését, amíg:

a) a tárolt hely az üzenetet olvassa és kizárja; vagy

b) az adatkapcsolat repüléselektronika a közleményt törli (3.1.2.10.5.4 alpont)

Megjegyzés. – A 3.1.2.6.5.3 és 3.1.2.6.11.3.2.1 pontok protokolljai a közleménynek a fenntartott helyre való juttatását fogják eredményezni. Az adatkapcsolati repüléselektronika a közleményt törölheti, ha a fenntartott helyre való juttatást nem lehet megvalósítani.

3.1.2.6.11.3.2.3 *Többhelyes Comm-B kizárás.* A lekérdező egy többhelyes levegőből történő kezdeményezésű Comm-Bt vagy egy ellenőrzési, vagy egy Comm-A lekérdezéssel zár ki, amely tartalmazza:

vagy DI =
IIS = kijelölt lekérdező azonosító
MBS = 2 (Comm-B kizárás)

vagy DI = 0, 1, vagy 7
IIS = kijelölt lekérdező azonosító
PC = 4 (Comm-B kizárás)

A válaszjeladó összehasonlítja a lekérdező IIS-ét a Comm-B II-vel és ha a lekérdező azonosítók nem illeszkednek, a közlemény nem kerül törlésre, a Comm-B II, a B-időzítő és a DR kód változatlan marad. Ha a lekérdező azonosítók illeszkednek, a válaszjeladó a Comm-B II-t 0-ra állítja, visszaállítja a B-időzítőt, törli a DR kódot ehhez a közleményhez és törli magát a közleményt is. A válaszjeladó nem zár ki többhelyes levegő kezdeményezésű Comm-B közleményt, hacsak ezt nem olvasta le legalább egyszer a fenntartott hely.

3.1.2.6.11.3.2.4 *A Comm-B helyfoglalás automatikus megszűnése.* Ha a B-időzítő periódus lejár, mielőtt a többhelyes kizárás végbemegy, a Comm-B II-t 0-ra állítják és a B-időzítőt visszaállítják. A Comm-B közleményt és a DR mezőt a válaszjeladó nem törli.

Megjegyzés. – Ez lehetővé teszi egy másik hely számára ennek a közleménynek a leolvasását és törlését.

3.1.2.6.11.3.3 *Kiegészítő protokoll nem-szelektív levegőből történő kezdeményezésű Comm-B-hez.*

Megjegyzés. – Azokban az esetekben, amikor nem igényelnek többhelyes protokollt (azaz nincs átlapoló lefedés vagy érzékelő koordináció a föld-föld kommunikáción keresztül), a nem-szelektív levegő kezdeményezésű Comm-B protokoll használható.

3.1.2.6.11.3.3.1 *Közlemény továbbítás*. A lekérdező a közleményt vagy RR egyenlő 16 és DI nem egyenlő 7, vagy RR egyenlő 16, DI egyenlő 7 és RRS egyenlő 0 továbbításával nyeri ki egy ellenőrzési vagy Comm-A lekérdezésben.

3.1.2.6.11.3.3.2 *Comm-B kizárás.* A lekérdező a PC egyenlő 4 továbbításával kizár egy nem-szelektív, levegőből történő kezdeményezésű Comm-B közleményt (Comm-B kizárás). Ennek az utasításnak a vétele nyomán a válaszjeladó kizárást végez, hacsak a B-időzítő nem működik. Ha a B-időzítő működik, jelezve azt, hogy többhelyes helyfoglalás van érvényben, kizárás megy végbe a 3.1.2.6.11.3.2.3 pontnak megfelelően. A válaszjeladó nem zár ki nem-szelektív levegő kezdeményezésű Comm-B közleményt, hacsak azt egy lekérdezés, nem-szelektív protokollt használva, nem olvasta le legalább egyszer.

3.1.2.6.11.3.4 *Megnövelt, levegőből történő kezdeményezésű Comm-B protokoll.*

Megjegyzés. – A megnövelt, levegőből történő kezdeményezésű Comm-B protokoll nagyobb adatkapcsolat kapacitást szolgáltat levegőből történő kezdeményezésű Comm-B közlemények párhuzamos továbbításának lehetővé tételével maximálisan tizenhat lekérdező által mindegyik II kódnál egyet. Többhelyes Comm-B helyfoglalás szükségessége nélküli működés átlapolásos lefedési régiókban lehetséges olyan lekérdezők számára, amelyek a megnövelt levegőből történő kezdeményezésű Comm-B protokollal fel vannak szerelve. A protokoll teljesen megegyezik a szabványos többhelyes protokollal és így kompatíbilis azokkal a lekérdezőkkel, amelyek nincsenek felszerelve a megnövelt protokollal.

3.1.2.6.11.3.4.1 A válaszjeladó képes a tizenhat II kód mindegyikének tárolására: (1) levegőből történő kezdeményezésű vagy többhelyes-irányított Comm-B közlemény és (2) GICB 2-4 regiszterek tartalma.

Megjegyzés. – 2-4 GICB regisztereket a SARP S-módú alhálózatban meghatározott Comm-B kapcsolati protokollhoz használják (10. Annex, III. kötet, I. rész, 5. Fejezet).

3.1.2.6.11.3.4.2 *Megnövelt többhelyes levegőből történő kezdeményezésű Comm-B protokoll.*

3.1.2.6.11.3.4.2.1 *Kezdeményezés*. Levegő kezdeményezésű Comm-B közlemény belépést a válaszjeladóba a II = 0-nak kijelölt regiszterekben tárolják.

3.1.2.6.11.3.4.2.2 *Bejelentés és kinyerés*. Várakozási levegőből történő kezdeményezésű Comm-B közlemény bevitelt a válasz DR mezőjében bejelentik minden lekérdezőnek, amely részére többhelyes irányított Comm-B közlemény nem várakozik. A bejelentés válasz UM mezője mutatja, hogy a közlemény nincs fenntartva semmilyen II kód részére, azaz az IIS almező 0-ra van állítva. Ha ennek a közleménynek az olvasására vonatkozó utasítás érkezik egy adott lekérdezőtől, a közleményt tartalmazó válasz IIS almező tartalmat foglal magában, amely jelzi, hogy a közlemény az II kód részére van fenntartva, amely attól a lekérdezőtől származó lekérdezésben szerepel. A kiolvasás után és a kizárásig a közlemény továbbra is ennek a II kódnak van kijelölve. Ha egy közlemény egy II kód részére egyszer ki van jelölve, ennek a közleménynek a bejelentését már nem lehet más II kódú lekérdezőknek adott válaszokban megtenni. Ha a közleményt a kijelölt lekérdező nem zárja ki a B-időzítő periódusa alatt, a közlemény visszatér a többhelyes levegőből történő kezdeményezés állapothoz, és a folyamat megismétlődik. Egyidőben csak egy többhelyes levegőből történő kezdeményezésű Comm-B közleményt lehet feldolgozni.

3.1.2.6.11.3.4.2.3 *Kizárás*. Többhelyes levegőből történő kezdeményezésű közlemény kizárása csak olyan lekérdezőtől vehető, amelyik akkor ki van jelölve a közlemény továbbítására.

3.1.2.6.11.3.4.2.4 *A következő közlemény várakozásának bejelentése. A DR mező egy Comm-B kizárást tartalmazó lekérdezésre adott válaszban várakozó közleményt jelez, ha egy kijelöletlen levegőből történő kezdeményezésű közlemény várakozik, és nincs kijelölve egy II kódnak, vagy egy többhelyes irányított közlemény várakozik erre az II kódra (3.1.2.6.11.3.4.3 pont)*

3.1.2.6.11.3.4.3 *Megnövelt többhelyes irányított Comm-B protokoll.*

3.1.2.6.11.3.4.3.1 *Kezdeményezés.* Ha egy többhelyes irányított közlemény a válaszjeladó bemeneteként szerepel, akkor azt a közlemény részére meghatározott II-kód részére kijelölt Comm-B regiszterekbe helyezik el. Hogyha ennek az II-kódnak a regiszterei már foglaltak, (azaz a többhelyes irányított kód már feldolgozásban van ehhez az II-kódhoz) az új közleménynek sorba kell állnia, amíg ennek az II-kódnak a folyó tranzakciója ki nem záródik.

3.1.2.6.11.3.4.3.2 *Bejelentés.* A továbbításra váró Comm-B közlemény bejelentését a 3.1.2.6.5.2 pontban meghatározott DR mező felhasználásával lehet eszközölni a rendeltetési hely lekérdező II-kódjával, amelyet az IIS almező tartalmaz, ahogyan azt a 3.1.2.6.5.3.2 pontban meghatározták. A DR mező és az IIS almező tartalmát meghatározva annak a lekérdezőnak a részére kell beállítani, amelynek a választ fogadnia kell. A várakozó többhelyes irányított közleményt csak a szándékozott lekérdezőnek adott válaszokban lehet bejelenteni. Nem lehet bejelentést eszközölni más lekérdezőknek adott válaszokban.

1. Megjegyzés. – Ha egy többhelyes irányított közlemény II = 2-re vár, ennek a lekérdezőnek adott ellenőrzési válaszok DR = 1 és IIS = 2 tartalmuk lesz. Ha ez az egyetlen közlemény áll feldolgozás alatt, az összes többi lekérdezőnek adott válasz azt fogja jelölni, hogy nincs várakozó közlemény.

2. Megjegyzés. – A párhuzamos működés engedélyezésén felül a bejelentésnek ez a formája a fedélzetről leadott ELM-ek bejelentésének magasabb fokát teszi lehetővé. A fedélzetről leadott ELM és a Comm-B bejelentések felosztják a DR mezőt. A kódolási korlátozások miatt egyidőben csak egy bejelentés mehet végbe. Abban az esetben, ha egy Comm-B és egy fedélzetről leadott ELM várakozik, a Comm-B-nek van bejelentés elsőbbsége. A fenti példában, ha egy levegőből irányított Comm-B várt II = 1-re, és egy többhelyes irányítású fedélzetről leadott ELM várt II = 6-ra, mindkét lekérdező az első pásztában keresi a bejelentést, mivel nem volt Comm-B bejelentés II = 6-ra, amely blokkolná a várakozó fedélzetről leadott ELM-et.

3.1.2.6.11.3.4.3.3 *Kizárás*. Kizárás végrehajtása a 3.1.2.6.11.3.2.3 pontban meghatározottak szerint történik.

3.1.2.6.11.3.4.3.4 *A következő várakozó közlemény bejelentése.* A DR mező egy Comm-B kizárást tartalmazó lekérdezésre adott válaszban várakozó közleményt jelez, ha egy másik többhelyes irányítású közlemény várakozik erre a II kódra, vagy ha egy levegő kezdeményezésű közlemény várakozik és nem lett kijelölve II kód részére (lásd 3.1.2.6.11.3.4.4.2 alpont).

3.1.2.6.11.3.4.4 *Megnövelt nem-szelektív Comm-B protokoll.* Egy nem-szelektív Comm-B közlemény rendelkezésre állását minden lekérdezőnek bejelentik. Más esetben a protokoll a 3.1.2.6.11.3.3 pontban meghatározottaknak megfelelő.

3.1.2.6.11.4 *Comm-B közvetítés.*

1. Megjegyzés. – Comm-B közvetítés az értéktartományon belül lévő valamennyi aktív lekérdező számára közvetíthető. A közleményeket váltogatva 1 és 2 számjegyekkel látják el és 18 másodperc után maguktól törlődnek. Lekérdezők semmiképpen sem törölhetnek Comm-B közvetítéses üzeneteket.

2. Megjegyzés. – A Comm-B közvetítés használata olyan információk továbbítására korlátozódik, amelyek nem igényelnek rákövetkező földi kezdeményezésű fedélzetre irányuló adattovábbítási reagálást.

3. Megjegyzés. – A Comm-B közvetítés ciklushoz használt időzítő ugyanaz, mint amit a Comm-B többhelyes protokollhoz használnak.

3.1.2.6.11.4.1 *Kezdeményezés.* Comm-B közvetítést nem kezdeményeznek, ha egy légi kezdeményezésű Comm-B továbbításra vár. A Comm-B közvetítés ciklus a következőkkel kezdődhet:

a) a DR 4-es vagy 5-ös kód (3.1.2.6.5.2 pont) behelyezése a válaszokba DF4, 5, 20 vagy 21-el; és

b) a B-számláló indításával.

3.1.2.6.11.4.2 *Kinyerés.* A közvetítés közlemény kinyeréséhez egy lekérdező RR egyenlő 16 és DI nem egyenlő 7 vagy RR egyenlő 16 és DI egyenlő 7, RRS egyenlő 0 továbbítást végez egy következő lekérdezésben.

3.1.2.6.11.4.3 *Megszűnés.* Amikor a B-időzítő periódus letelik, a válaszjeladó törli a DR kódot ehhez a közleményhez, félreteszi az éppen ott lévő közvetítési közleményt és megváltoztatja a közvetítési közlemény számozását (1-ről 2-re vagy 2-ről 1-re) a következő Comm-B közvetítés előkészítésében.

3.1.2.6.11.4.4 *Megszakítás.* Hogy megakadályozzuk a Comm-B közvetítés ciklust a légi kezdeményezésű Comm-B közlemény továbbításának elhalasztásában, gondoskodni kell, hogy egy légi kezdeményezésű Comm-B megszakítsa a közvetítési ciklust. Ha egy közvetítési ciklust megszakítanak, a B-időzítőt visszaállítják, a megszakított közvetítési közleményt visszatartják, és a közlemény számozást nem változtatják meg. A megszakított közvetítési közlemény továbbítása akkor kezdődik el, amikor nincs érvényben légi kezdeményezésű Comm-B tranzakció. A közlemény közvetítése akkor a B-időzítő teljes időtartama alatt folyik.

3.1.2.6.11.4.5 *Megnövelt közvetítési Comm-B protokoll.* Közvetítési Comm-B közleményt minden II kódot használó lekérdezőnek be kell jelenteni. A közlemény aktív marad a B-időzítő periódusa alatt minden II kód számára. A közvetítés nem közvetítési Comm-B által történő megszakításáról való gondoskodást a 3.1.2.6.11.4.4 alpont szerint minden egyes II kódra biztosítani kell. Amikor a B-időzítő az összes II kódot elérte, a közvetítési közlemény automatikusan törlődik a 3.1.2.6.11.4.3

alpont szerint. Új közvetítési közleményt nem kezdeményeznek, amíg a meglévő közvetítést nem szabadítják fel.

Megjegyzés. – Annak következtében, hogy a közvetítési közlemény megszakítás mindegyik II kódtól függetlenül történik, lehetséges, hogy a közvetítési közlemény szünet különböző II kódoknál különböző időben jelenik meg.

3.1.2.6.11.4.6 A Comm-B adat formátumoknak a 10. Annex, III. Kötet, I. Rész, 5. fejezetének 1. Függelékében leírtak szerinti legyen.

3.1.2.7 Kiterjesztett hosszúságú kommunikációs tranzakció

1. Megjegyzés. – Hosszú közleményeket akár fedélzetre irányuló-, akár fedélzetről leadott adattovábbításon kiterjesztett hosszúságú közlemény (ELM) protokollal lehet továbbítani Comm-C (UF = 24) és Comm-D (DF = 24) formátumok felhasználásával. A kiterjesztett hosszúságú közlemény fedélzetre irányuló adattovábbítási *protokoll maximum tizenhat 80-bites közlemény szegmens továbbításáról gondoskodik a fedélzetre irányuló kapcsolaton, mielőtt válasz kérés érkezne a válaszjeladótól. Ezek lehetővé teszik a megfelelő eljárást a fedélzetről leadott adattovábbításon is.*

2. Megjegyzés. – Az átlapolási lekérdező lefedés bizonyos területein semmiképpen sem lehet koordináló lekérdező tevékenység a földi kommunikáción keresztül. Azonban az ELM kommunikációs protokollok egynél több tranzakciót igényelnek a végrehajtáshoz; koordináció ily módon ahhoz szükséges, hogy biztosítsák a különböző közleményektől származó szegmensek átlapolódásának megakadályozását, és hogy a nem odatartozó lekérdező ne zárja ki elkerülhetetlenül ezt a tranzakciót. Ezt vagy a többhelyes kommunikációs protokollok használatával, vagy megnövelt kiterjesztett hosszúságú közlemény protokollok használatával lehet megvalósítani.

3. Megjegyzés. – Fedélzetről leadott kiterjesztett hosszúságú közleményeket csak a lekérdező engedély adása után továbbítanak. A továbbításra kerülő szegmenseket a Comm-D válaszok tartalmazzák. Mint a légi kezdeményezésű Comm-B közleményeknél, a fedélzetről leadott adattovábbítás kiterjesztett hosszúságú közleményeket vagy az összes lekérdezőnek bejelentik, vagy csak egy meghatározott lekérdezőhöz irányítják. Az előző esetben egy egyedi lekérdező használhatja a többhelyes protokollt, hogy fenntartsa magának a lehetőséget a fedélzetről leadott adattovábbítás kiterjesztett hosszúságú közlemény tranzakciójára. A válaszjeladót utasítani lehet a lekérdező azonosítására, amelyik lefoglalta a válaszjeladót egy kiterjesztett hosszúságú közlemény tranzakcióhoz. Csak ez a lekérdező zárhatja ki a kiterjesztett hosszúságú közlemény tranzakciót és tartalékolást.

4. Megjegyzés. – A többhelyes protokollt és a nem-szelektív protokollt nem lehet egyidejűleg felhasználni átlapoló lekérdező átfedéses régióban, hacsak a lekérdezők nem koordinálják kommunikációs tevékenységüket egy földi kommunikáción keresztül.

3.1.2.7.1 *Comm-C, 24-es fedélzetről leadott adattovábbítási formátum*

1	3	5	9	89
UF	RC	NC	MC	AP
2	4	8	88	112

Ennek a lekérdezőnek a formátuma a következő mezőket tartalmazza:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
RC válasz szabályozás	3.1.2.7.1.1
NC C szegmens száma	3.1.2.7.1.2
MC közlemény, Comm-C	3.1.2.7.1.3
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.7.1.1 *RC: válasz szabályozás.* Ez a 2-bites (3 - 4) föld-légijármű kapcsolati mező jelöli ki a szegmens fontosságát és a válasz döntést.

Kódolás

RC	=	0 jelöli a fedélzetre irányuló ELM kezdeti szegmenset MC-ben
	=	1 jelöli a fedélzetre irányuló ELM közbenső szegmenset MC-ben
	=	2 jelöli a fedélzetre irányuló ELM végső szegmenset MC-ben
	=	3 fedélzetről leadott ELM küldés iránti kérést jelöl

3.1.2.7.1.2 *NC: C szegmens száma.* Ez a 4-bites (5 - 8) fedélzetre irányuló adattovábbítási mező az MC által tartalmazott közlemény számát jelöli ki (3.1.2.7.4.2.1 pont). Az NC-t bináris számként kódolják.

3.1.2.7.1.3 *MC: közlemény, Comm-C.* Ez a 80-bites (9 - 88) fedélzetre irányuló adattovábbítási mező tartalmazza:

a) a 4-bites (9 - 12) IIS almezőt tartalmazó válaszjeladóhoz tartozó fedélzetre irányuló ELM átvitelére használt sorozat egyik szegmensét;

b) a fedélzetről leadott ELM, a 16-bites (9-24) SRS almező (3.1.2.7.7.2.1 alpont) és a 4-bites (25-28) IIS altér szabályozó kódját.

Megjegyzés. – A közlemény tartalmát és a kódokat ez a fejezet nem tartalmazza, kivéve a 3.1.2.7.7.2.1 pontot.

3.1.2.7.2 *Lekérdező-válasz protokoll UF-24-nél*

Megjegyzés. – Lekérdezés-válasz koordináció a fenti formátumnál a 3-5 táblázatban körvonalazott protokollt követi (3.1.2.4.1.3.2.2 alpont).

3.1.2.7.3 *Comm-D, 24-es fedélzetről leadott adattovábbítási formátum*

1		4	5	9	89
DF		KE	ND	MD	AP
2			8	88	112

A jelen válasz formátuma tartalmazza ezeket a mezőket:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
tartalék - 1 bit	
KE szabályozás, ELM	3.1.2.7.3.1
ND D-szegmens száma	3.1.2.7.3.2
MD közlemény, Comm-D	3.1.2.7.3.3
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.7.3.1 *KE: Szabályozás, ELM.* Ez az 1-bites (4) fedélzetről leadott adattovábbítás mező az ND és MD mezők tartalmát határozza meg.

Kódolás

KE = 0 jelöli a fedélzetről leadott ELM továbbítást
1 jelöli a fedélzetre irányuló ELM elismerést

3.1.2.7.3.2 *ND: D-szegmens száma.* Ez a 4-bites (5-8) fedélzetről leadott adattovábbítási mező az MD által tartalmazott közlemény szegmens számát jelöli ki (3.1.2.7.7.2 alpont). Az ND-t bináris számként kódolják.

3.1.2.7.3.3 *MD: Közlemény, Comm-D.* Ez a 80-bites (9-88) fedélzetről leadott adattovábbítási mező tartalmazza:

a) a lekérdezőhöz tartozó fedélzetről leadott ELM továbbítására használt sorozat egyik szegmensét, vagy
b) fedélzetre irányuló ELM szabályozó kódját.

3.1.2.7.4 *Többhelyes fedélzetre irányuló ELM protokoll*

DI …= 1
IIS = kijelölt lekérdező azonosító
MES = 1 vagy 5 (fedélzetre irányuló ELM helyfoglalás kérés)

Megjegyzés. – Többhelyes fedélzetre irányuló ELM helyfoglalás kérést általában egy fedélzetre irányuló ELM helyfoglalási állapot kérés kísér (RSS = 2). Ez azt idézi elő, hogy a lefoglalt hely lekérdező azonosítóját behelyezik a válasz UM mezőjébe.

3.1.2.7.4.1.1 Protokoll eljárás erre a lekérdezésre való reagálásban a C-időzítő állapotától függ, amely jelzi, ha egy felé kapcsolati ELM helyfoglalás aktív. Ez az időzítő T_R másodpercen át fut.

1. Megjegyzés. – A T_R értéket a 3.1.2.10.3.9 alpont tartalmazza..

a) ha a C-időzítő nem jár, a válaszjeladó helyfoglalás a lekérdező kezdeményező számára a következők által nyújt:
1) a lekérdező IIS tárolása, minta Comm-C II és
2) a C-időzítő elindítása
b) Ha a C-időzítő jár és a lekérdező IIS-e egyenlő a Comm-C II-vel, a válaszjeladó a C-időzítőt újraindítja

c) Ha a C-időzítő jár és a lekérdező IIS-e nem egyenlő a Comm-CII-vel, a Comm-CII vagy a CS-időzítő változatlan marad.

2. Megjegyzés. – A c) esetben a helyfoglalási kérést megtagadták.

3.1.2.7.4.1.2 Lekérdező nem indít ELM aktivitást, hacsak, ugyanazon pászta során, miután fedélzetre irányuló ELM állapot közlést kért, nem a saját lekérdező azonosítóját kapta helyfoglalási lekérdezőként a fedélzetre irányuló ELM-nél az UM mezőben.

Megjegyzés. – Ha ELM tevékenység nem indul ugyanazon pásztában, mint a helyfoglalás, a következő pászta során új helyfoglalás kérést lehet csinálni.

3.1.2.7.4.1.3 Ha a fedélzetre irányuló ELM továbbítása nem fejeződik be az éppen folyó pászta során, a lekérdezőnek biztosítani kell, hogy az még rendelkezzen helyfoglalás, mielőtt további szegmenseket továbbítanak a következő pászta során.

3.1.2.7.4.2 *Többhelyes fedélzetre irányuló ELM továbbítás.* A fedélzetre irányuló ELM minimális hossza 2 szegmens, a maximális hossz 16 szegmens.

3.1.2.7.4.2.1 *Kezdeti szegmens átvitel.* A lekérdező az ELM fedélzetre irányuló adat továbbítást egy n-szegmensű közlemény (NC a 1-tól n-ig terjedő értékeket veszi fel) részére egy RC egyenlő 0-t tartalmazó Comm-C átvitelével kezdi. Az MC mezőben továbbított közlemény szegmens a közlemény utolsó szegmense és NC egyenlő n-1 értéket hordoz.

Egy szegmens kezdet beállítás (RC = 0) vétele után a válaszjeladó létrehoz egy "felállítást", amely a következőképpen lett meghatározva:

a) az előző szegmens tárolási regiszterek és a hozzájuk tartozó TAS mező számának és tartalmának felszabadítása;
b) tároló térköz kijelölése ennek a lekérdezésnek az NC-jében bejelentett szegmensek száma részére; és
c) a vett szegmens MC mezejének tárolása.

A válaszjeladó erre a lekérdezésre nem válaszolhat.

Egy másik kezdeti szegmens vétele egy új felállítást eredményez a válaszjeladón belül.

3.1.2.7.4.2.2 *Továbbítás nyugtázás.* A válaszjeladó a TAS almezőt egy fedélzetre irányuló ELM sorozatban addig vett szegmensek közlésére használja. A TAS almező által tartalmazott információkat a válaszjeladó folyamatosan felfrissíti, ahogyan a szegmensek érkeznek.

Megjegyzés. – A fedélzetre irányuló átvitelben elvesztett szegmenseket a TAS közlésben lévő hiányukkal jelzi, és a lekérdező újra továbbítja őket, amely aztán végső szegmenseket küld tovább a közlemény terjedelmének értékelése céljából.

3.1.2.7.4.2.2.1 *TAS, továbbítás nyugtázás almező MD-ben.* Ez a 16-bites (17-32) fedélzetről leadott adattovábbítás almező MD-ben közli a fedélzetre irányuló ELM sorozatban addig vett szegmensek számait. A 17-es bittel kezdve, amely a 0 számú szegmenset jelöli, az ezt követő bitek mindegyikét EGY-re állítják, ha a sorozat megfelelő szegmensét már vették. A TAS megjelenik az MD-n, ha KE egyenlő 1 ugyanabban a válaszban.

3.1.2.7.4.2.3 *Közbenső szegmens továbbítása.* A lekérdezőnek közbenső szegmenseket RC egyenlő 1 Comm-C lekérdezések átvitelével kell továbbítania. A válaszjeladó csak akkor tárolja a szegmenseket és frissíti fel a TAS-t, ha a 3.1.2.7.4.2.1 alpont felállítása érvényben van, és ha a vett NC kisebb, mint a kezdeti szegmens vételénél tárolt érték. Nem generálódik válasz közbenső szegmens vitelére.

Megjegyzés. – Közbenső szegmensek bármilyen sorrendben továbbíthatók.

3.1.2.7.4.2.4 *Végső szegmens továbbítása.* A lekérdező végső szegmenset Comm-C lekérdezés egyenlő 2 melletti továbbítással visz át. Ez a lekérdezés bármely közlemény szegmenst tartalmazhat. A válaszjeladó tárolja az MC mező tartalmát és felfrissíti a TAS-t, ha a 3.1.2.7.4.2.1 alpont felállítása érvényben van., és ha a vett NC kisebb mint a kezdeti NC szegmens értéke. A válaszjeladó minden körülmények között válaszol a 3.1.2.7.4.2.5 alpont szerint.

Megjegyzés. – RC egyenlő 2 bármikor továbbításra kerül, amikor a lekérdező a válaszban fogadni akarja a TAS almezőt. Ezért egynél több "végső" szegmens továbbítható egy felső kapcsolati ELM szállítása alatt.

3.1.2.7.4.2.5 *Nyugtázási válasz.* Végső szegmens vétele után a válaszjeladó Comm-D választ (DF=24) továbbít KE egyenlő 1 mellett és az MD mezőben lévő TAS almező mellett. Ezt a választ 128 mikromásodperc plusz vagy mínusz 0,25 mikromásodperc idővel a végső szegmenset szállító lekérdezés szinkronizáló fázis megfordítást követően továbbítják.

3.1.2.7.4.2.6 *Befejezett közlemény*. A válaszjeladó a közleményt befejezettnek ítéli, ha az NC által a kezdeti szegmensben bejelentett összes szegmenst vették. Ha a közlemény teljesen készen van, a küldemény tartalmát kívülre szállítják a 3.1.2.10.5.2.1.3 pont szerinti ELM csatoló felületen keresztül és törlik. Semmilyen ezután érkező szegmenst nem tárolnak. A TAS tartalom változatlan marad, amíg vagy egy új felállítás igénye jelentkezik (3.1.2.7.4.2.1 pont) vagy a kizárásig (3.1.2.7.4.2.8 pont).

3.1.2.7.4.2.7 *C-időzítő újraindítás.* A C-időzítőt újraindítják mindannyiszor, amikor egy vett szegmenst tárolnak és a Comm-C II nem 0.

Megjegyzés. – A Comm-C II nem zérus követelmény megakadályozza, hogy a C-időzítőt újraindítsák egy nem szelektív fedélzetre irányuló ELM tranzakció alatt.

3.1.2.7.4.2.8 *Többhelyes fedélzetre irányuló ELM kizárás.* A lekérdező kizár egy többhelyes fedélzetre irányuló ELM-et vagy egy ellenőrző, vagy egy Comm-A lekérdezés továbbításával, amely tartalmazza a következőket:

vagy DI = 1
IIS = kijelölt lekérdező azonosító
MES= 2,6 vagy 7 (fedélzetre irányuló ELM kizárás)

Vagy DI = 0, 1, vagy 7
IIS = kijelölt lekérdező azonosító
PC = 5 (fedélzetre irányuló ELM kizárás)

A válaszjeladó összehasonlítja a lekérdezés IIS-ét a Comm-C II-vel, és ha a lekérdező azonosítók nem illeszkednek, az ELM fedélzetre irányuló adattovábbítási folyamatának állapotában nem eszközölnek változást.

Ha a lekérdező azonosítók illeszkednek, a válaszjeladó a Comm-C II-t 0-ra állítja, visszaállítja a C-időzítőt, törli a tárolt TAS-t és a befejezetlen közlemények tárolt szegmenseit félrerakja.

3.1.2.7.4.2.9 *Automatikus többhelyes fedélzetre irányuló ELM kizárás.* Ha a C-időzítő periódus lejár, mielőtt egy többhelyes kizárás végbement volna, a 3.1.2.7.4.2.8 pontban leírt kizárási akciókat a válaszjeladó automatikusan kezdeményezi.

3.1.2.7.5 *Nem szelektív* fedélzetre irányuló *ELM*

Megjegyzés. – Azokban az esetekben, amikor a többhelyes protokollokat nem igénylik (például nincs átlapoló lefedés vagy érzékelő koordináció a föld-föld kommunikáción keresztül), a nem-szelektív fedélzetre irányuló *ELM protokoll használható.*

A nem-szelektív fedélzetre irányuló ELM továbbítás úgy történik, ahogyan az a többhelyes fedélzetre irányuló ELM-ekre a 3.1.2.7.4.2 pontban le van írva. A lekérdező a fedélzetre irányuló ELM-et a PC egyenlő 5 továbbításával (fedélzetre irányuló ELM kizárás) zárja ki egy ellenőrzési vagy Comm-A lekérdezésben. Ennek az utasításnak a vétele után a válaszjeladó kizárást hajt végre, hacsak a C-időzítő nem működik, amely azt mutatja, hogy egy többhelyes helyfoglalás van érvényben, a kizárás a 3.1.2.7.4.2.8 pont szerint megy végbe. A befejezetlen közlemény, amely a kizárást vételekor van jelen, törlésre kerül.

3.1.2.7.6 *Megnövelt fedélzetre irányuló ELM protokoll*

Megjegyzés. – A megnövelt fedélzetre irányuló ELM protokoll nagyobb adatösszeköttetési kapacitást nyújt a fedélzetre irányuló ELM közlemények párhuzamos szállításának lehetővé tételével, maximálisan tizenhat lekérdezővel, minden II kódnak egyet. Többhelyes fedélzetre irányuló ELM, helyfoglalás igénye nélküli működés átlapolásos lefedésű régiókban lehetséges a megnövelt fedélzetre irányuló ELM protokollhoz felszerelt lekérdezők számára. A protokoll teljes mértékben megegyezik a szabványos többhelyes protokollal, és így csereszabatos azokkal a lekérdezőkkel, amelyek nincsenek ellátva megnövelt protokollal.

3.1.2.7.6.1 *Általános*

3.1.2.7.6.1.1 A lekérdező megállapítja az adatkapcsolati képesség közlésből, hogy a válaszjeladó alátámasztja-e a megnövelt protokollokat. Ha a megnövelt protokollok alátámasztottak, a többhelyes protokollok felhasználásával szállított fedélzetre irányuló ELM-ek előzetes helyfoglalás nélkül szállíthatók. Ha a megnövelt protokollokat sem a lekérdező, sem a válaszjeladó nem támasztja alá, a 3.1.2.7.4.1 pontban részletezett többhelyes helyfoglalási protokollt kell használni.

3.1.2.7.6.1.2 ***Ajánlás****. – Ha a válaszjeladó és a lekérdező megnövelt protokollhoz fel van szerelve, a lekérdező használja a megnövelt fedélzetre irányuló adattovábbítási protokollt.*

3.1.2.7.6.1.3 A válaszjeladó tizenhat szegmenses közlemény tárolására képes a tizenhat II kód mindegyikéhez.

3.1.2.7.6.2 *Helyfoglalási eljárás*. A válaszjeladó támogatja a helyfoglalási eljárást mindegyik II kódhoz, ahogyan azt a 3.1.2.7.4.1 pontban meghatározták.

1. *Megjegyzés. – Helyfoglalási eljárást kérnek azon lekérdezők részére, amelyek nem támogatják a megnövelt protokollt.*

2. Megjegyzés. – Mivel a válaszjeladó szimultán képes feldolgozni fedélzetre irányuló ELM-eket mind a tizenhat II kódra, helyfoglalást mindig szolgáltatnak.

3.1.2.7.6.3 *Megnövelt fedélzetre irányuló ELM továbbítás és kizárás.* A válaszjeladó a vett szegmenseket külön-külön dolgozza fel a II kóddal. Az II kód mindegyik értékére fedélzetre irányuló ELM továbbítást és kizárást hajt végre, ahogyan azt a 3.1.2.7.4.2 alpont meghatározza, kivéve hogy a technikai elismerés átvitelére használt MD mező a 4-bites (33-36) IS almezőt is tartalmazza.

Megjegyzés. – A lekérdező az II-kódot, amelyet a technikai elismerés tartalmaz, használhatja annak megerősítésére, hogy a helyes technikai visszaigazolást vette.

3.1.2.7.7 *Többhelyes fedélzetről leadott ELM protokoll*

3.1.2.7.7.1 *Indulóhelyzetbe hozás.* A válaszjeladó az n szegmensből álló fedélzetről leadott adattovábbítás LM meglétét a 15+n decimális értékhez tartozó bináris kód képzésével jelentheti be, amely egy ellenőrzési, vagy Comm-B válasz DR mezőbe való beillesztéshez rendelkezésre áll, DF egyenlő 4, 5, 20, 21. Ez a bejelentés aktív mard, amíg az ELM-et ki nem zárják (3.1.2.7.7.3, 3.1.2.7.8 pontok).

3.1.2.7.7.1.1 *Többhelyes fedélzetről leadott ELM helyfoglalás.* A lekérdezőnek helyfoglalást kell kérnie egy fedélzetről leadott adattovábbítás ELM kinyeréséhez egy ellenőrzési, vagy Comm-A lekérdezés továbbításával, amely a következőket tartalmazza:

DI = 1
IIS = kijelölt lekérdező azonosító
MES = 3 vagy 6 (fedélzetről leadott adattovábbítás ELM helyfoglalás kérés)

Megjegyzés. – A többhelyes fedélzetről leadott ELM helyfoglalási kérést általában egy fedélzetről leadott adattovábbítás helyfoglalási állapotkérés (RSS = 3) kísér. Ez a fenntartott lekérdező azonosítójának a válasz UM mezőjébe való beillesztését eredményezi.

3.1.2.7.7.1.1.1 A protokoll eljárás erre a lekérdezésre történő reagálásban a D-időzítő állapotától függ, amely jelzi, ha egy fedélzetről leadott ELM helyfoglalás még aktív. Ez az időzítő T_R másodpercig működik.

1. Megjegyzés. – A T_R értékét a 3.1.2.10.3.9 alpont határozza meg.

a) ha a D-időzítő nem működik, a válaszjeladónak a kérő lekérdező számára helyfoglalást kell szolgáltatnia a következőképpen:
   1) A lekérdezés IIS tárolása mint Comm-DII; és
   2) A D-időzítő indítása
   Többhelyes fedélzetről leadott ELM helyfoglalást a válaszjeladó nem szolgáltathat, hacsak egy fedélzetről leadott ELM nem vár továbbításra.
b) ha a D-időzítő működik, és a lekérdezés IIS egyenlő a Comm-DII-vel, a válaszjeladónak újra kell indítania a D-időzítőt; és
c) ha a D-időzítő működik és a lekérdező IIS nem egyenlő a Comm-DII-vel, akkor a Comm-DII vagy D-időzítőnek változatlannak kell maradnia.

2. Megjegyzés. – c) esetben a helyfoglalási kérést elutasították.

3.1.2.7.7.1.1.2 A lekérdező megállapítja, hogy van-e lefoglalt hely a kódoláson keresztül az UM mezőben, és ha igen, akkor folytatódhat a fedélzetről leadott ELM kérés továbbítása, ellenkező esetben az ELM működése nem kezdődik meg ezalatt a pásztázás alatt, és a következő pásztázás során új helyfogalási kérést kell készíteni.

3.1.2.7.7.1.1.3 Ha a fedélzetről leadott ELM működése az éppen folyó pásztázás során nem fejeződik be, a lekérdezőnek meg kell győződni, hogy van-e még egy helyfoglalás, mielőtt további szegmenseket kérne a következő pásztázásra.

3.1.2.7.7.1.2 *Többhelyes irányítású fedélzetről leadott ELM átvitele.* A fedélzetről leadott ELM közlemény egy adott lekérdezőhöz történő irányításához a többhelyes fedélzetről leadott adattovábbítás ELM protokollt kell használni. Amikor a D-időzítő nem működik, a kívánt rendeltetési hely lekérdező azonosítóját Comm-D II-ként kell tárolni. Ezzel egyidőben a D-időzítőt indítani kell és a DR-kódot (3.1.2.7.7.1 alpont) be kell állítani. Többhelyes irányított fedélzetről leadott ELM-nél a D-időzítő nem járhat le automatikusan, hanem működését addig kell folytatnia, amíg:

a) a fenntartott hely a közleményt elolvassa és kizárja; vagy
b) a közleményt az adatkapcsolati repüléselektronika törli (3.1.2.10.5.4 alpont).

Megjegyzés. – A 3.1.2.7.7.1 alpont protokolljai ekkor a közleménynek a lefoglalt helyre való továbbítását eredményezik. Az adatkapcsolati repüléselektronika a közleményt törölheti, ha a lefoglalt helyre való továbbítást nem lehet végrehajtani.

3.1.2.7.7.2 *A fedélzetről leadott adat ELM-ek továbbítása.* A lekérdező a fedélzetről leadott ELM-et egy Comm-C lekérdezés továbbításával vonja ki az RC egyenlő 3 segítségével. Ez a lekérdezés a SRS almezőt hordozza, amely a továbbításra kerülő szegmenseket határozza meg. Ennek a kérésnek a vétele után a válaszjeladó továbbítja a kért szegmenseket a Comm-D válaszok segítségével KE egyenlő 0 és az MD-ben lévő szegmensek számának megfelelő ND esetén. Az első szegmenst 128 mikromásodperc + vagy -0,25 mikromásodperc idő után a továbbítást kérő lekérdezés szinkronizáló fázis megfordítását követően viszi át, és a következő szegmenseket egyenként minden 136 mikromásodperc + vagy -1 mikromásodperc sebességgel továbbítja. Ha fedélzetről leadott ELM szegmensek továbbítására vonatkozó kérés érkezik és közlemény nem várakozik, minden válasz szegmense az összes ZÉRO-t tartalmazza az MD mezőben.

1. Megjegyzés. – A kért szegmenseket bármilyen sorrendben lehet továbbítani.

2. Megjegyzés. – A fedélzetről leadott adattovábbításoknál elveszett szegmenseket a lekérdező újra kéri egy következő lekérdezésben, amely az SRS almezőt hordozza. Ez a folyamat addig ismételhető, amíg az összes szegmenst nem továbbították.

3.1.2.7.7.2.1 *SRS, szegmenskérő almező MC-ben.* Ez a 16-bites (9-24) fedélzetről leadott adattovábbítási almező MC-ben kéri a válaszjeladót fedélzetről leadott ELM szegmensek továbbítására. A 9-es bittel kezdve, amely a 0 számú szegmenset jelöli, a következő bitek mindegyikét EGY-re kell állítani, ha a megfelelő szegmens továbbítását kérik. SRS az MC-ben jelenik meg, ha RC egyenlő 3 ugyanabban a lekérdezésben.

3.1.2.7.7.2.2 *D-időzítő újraindítása.* A D-időzítőt újra kell indítani mindannyiszor, amikor Comm-D szegmensek iránti kérelem érkezik, ha a Comm-D II nem zérus.

Megjegyzés. – Az a követelmény, hogy a Comm-D II zérustól különböző legyen, megakadályozza, hogy a D-időzítőt újra indítsák nem szelektív fedélzetről leadott ELM tranzakció alatt.

3.1.2.7.7.3 *Többhelyes fedélzetről leadott ELM kizárás.* A lekérdező a többhelyes fedélzetről leadott ELM-et vagy egy ellenőrzési vagy egy Comm-A lekérdezés továbbításával zárja ki. Az ellenőrzési, illetve Comm-A lekérdezés a következőket tartalmazza:

vagy DI = 1
IIS = kijelölt lekérdező azonosító
MS = 4, 5, vagy 7 (fedélzetről leadott ELM kizárás)

vagy DI = 0, 1, vagy 7
IIS = kijelölt lekérdező azonosító
PC = 6 (fedélzetről leadott ELM-kizárás)

A válaszjeladó összehasonlítja a lekérdező IIS-ét a Comm-D II-vel és ha a lekérdező azonosítók nem illeszkednek, a fedélzetről leadott adattovábbítási folyamat állapota változatlan marad.

Ha a lekérdező azonosítók illeszkednek és a továbbítás iránti kérelem legalább egyszer teljesül, a válaszjeladó a Comm-D II-t 0-ra állítja, a D-időzítőt visszaállítja, törli a DR kódot ehhez a közleményhez és törli magát a követelményt.

Ha egy fedélzetről leadott ELM továbbításra vár, a válaszjeladó a DR-kódot (ha a Comm-B üzenet nem vár továbbításra) úgy állítja be, hogy a válasz tartalmazza a következő közlemény bejelentését.

3.1.2.7.7.4 *Fedélzetről leadott adattovábbítás ELM helyfoglalás automatikus lejárta.* Ha a D-időzítő periódus lejár, mielőtt egy többhelyes kizárás lezajlik, a Comm-D II-t 0-ra állítják, és a D-időzítőt visszaállítják. A közleményt és a DR-kódot nem törlik.

Megjegyzés. – Ez lehetővé teszi egy másik hely számára ennek a közleménynek az elolvasását és szabaddá tételét.

3.1.2.7.8 *Nem szelektív fedélzetről leadott ELM*

Megjegyzés. – Azokban az esetekben, amikor a többhelyes protokollokat nem igénylik (azaz nincs átlapoló lefedés vagy érzékelő koordináció a föld-föld kommunikáción keresztül), a nem-szelektív fedélzetről leadott adattovábbítás ELM protokoll használható.

Nem-szelektív fedélzetről leadott ELM továbbítás úgy történik, ahogyan a 3.1.2.7.7.2 pontban meghatározták.

3.1.2.7.8.1 *Nem-szelektív fedélzetről leadott ELM kizárás*. A lekérdező egy nem-szelektív fedélzetről leadott ELM-et PC egyenlő 6 (fedélzetről leadott ELM kizárás) átvitelével zár ki egy ellenőrzési vagy Comm-A lekérdezésben. Ennek az utasításnak a vétele után és ha továbbítás iránti kérelemnek már legalább egyszer eleget tett, a válaszjeladó kizárást hajt végre, hacsak a D-időzítő nincs működésben. Ha a D-időzítő működésben van, jelezve, hogy többhelyes foglalás van érvényben, a kizárást a 3.1.2.7.7.3 alpont szerint kell végrehajtani.

3.1.2.7.9 *Megnövelt fedélzetről leadott ELM protokoll*

Megjegyzés. – A megnövelt fedélzetről leadott adattovábbítási protokoll nagyobb adatkapcsolat kapacitást szolgáltat azáltal, hogy megengedi fedélzetről leadott ELM közlemények párhuzamos továbbítását maximálisan tizenhat lekérdező által, mindegyik II kódhoz egyet. Többhelyes fedélzetről leadott adattovábbítási helyfoglalások szükségessége nélküli működés átlapolási lefedési régiókban lehetséges a megnövelt fedélzetről leadott ELM protokollhoz felszerelt lekérdezők számára. A protokoll teljesen megegyezik a szabványos többhelyes protokollal és így csereszabatos azokkal a lekérdezőkkel, amelyek nincsenek megnövelt protokollhoz felszerelve.

3.1.2.7.9.1 *Általános.*

3.1.2.7.9.1.1 A lekérdező az adatkapcsolati képesség közlésből megállapítja, hogy a válaszjeladó támogatja-e a megnövelt protokollokat. Hogyha a megnövelt protokollok támogatva vannak, a többhelyes irányított protokoll felhasználásával továbbított fedélzetről leadott ELM-eket előzetes helyfoglalás nélkül lehet továbbítani. Ha a megnövelt protokollokat sem a lekérdező, sem a válaszjeladó nem támogatja, a 3.1.2.6.1.1 pontban előírt többhelyes helyfoglalási protokollokat kell felhasználni a többhelyes és a többhelyes irányítású fedélzetről leadott adattovábbítású ELM-ekhez.

3.1.2.7.9.1.2 **Ajánlás.** – *Ha a válaszjeladó és a lekérdező megnövelt protokollhoz fel van szerelve, a lekérdező használja a megnövelt fedélzetről leadott adattovábbítási protokollt.*

3.1.2.7.9.2 *Megnövelt többhelyes fedélzetről leadott ELM protokoll.*

3.1.2.7.9.2.1 A válaszjeladó tizenhat szegmensű közlemény tárolására képes, a tizenhat II kódok mindegyikéhez.

3.1.2.7.9.2.2 *Indulóhelyzetbe hozás*. A válaszjeladóba belépő többhelyes közleményt az II = 0-hoz kijelölt regiszterekben tárolják.

3.1.2.7.9.2.3 Bejelentés és kinyerés. Többhelyes fedélzetről leadott ELM közlemény várakozását a válaszok DR mezejében jelentik be az összes lekérdezőnek, amelyek részére többhelyes irányított fedélzetről leadott ELM közlemény nem várakozik. A bejelentési válasz UM mezője jelzi, hogy a közleményt nem foglalták le egyetlen II-kód részére sem, azaz az IIS 0-ára van állítva. Ha ennek a közleménynek a helyfoglalására vonatkozó utasítás érkezik egy adott lekérdezőtől, a közleményt az II kód számára lefoglalják, amely kódot a lekérdezőtől érkező lekérdezés tartalmazza. A kiolvasás után és kizárólag a közlemény továbbra is ennek a II kódnk a részére lesz kijelölve. Ha egy közlemény egyszer egy meghatározott II kód számára ki van jelölve, ennek a közleménynek a bejelentését már nem eszközlik a lekérdezőnek adott válaszban más II-kódokkal. Ha a közleményt a kapcsolódó lekérdező nem zárja ki a D-időzítő periódusa alatt, a közlemény visszatér a többhelyes állapotba és a folyamat megismétlődik. Egyidőben csak egy többhelyes fedélzetről leadott ELM közlemény lehet folyamatban.

3.1.2.7.9.2.4 *Kizárás.* Többhelyes közlemény kizárását csak olyan lekérdezőtől vehetik, amelyet a közlemény továbbítására legutoljára kijelöltek.

3.1.2.7.9.2.5 *A következő közlemény várásának bejelentése*. A DL mező jelzi egy fedélzetről leadott ELM kizárást tartalmazó lekérdezésre adott válaszban várakozó közleményt, ha egy kijelöletlen többhelyes fedélzetről leadott ELM várakozik, vagy ha egy többhelyes irányított közlemény várakozik erre az II-kódra (3.1.2.7.9.2 alpont).

3.1.2.7.9.3 Megnövelt többhelyes irányított fedélzetről leadott ELM protokoll.

3.1.2.7.9.3.1 *Indulóhelyzetbe hozás.* Ha egy többhelyes irányított közlemény a válaszjeladó bemenetét képezi, akkor abba a fedélzetről leadott ELM regiszterekbe helyezik el, amelyet a közlemény részére meghatározott II-kódnak jelölnek ki. Ha ennek az II-kódnak a regiszterei már használatban vannak (azaz a többhelyes irányított fedélzetről leadott ELM közlemény már feldolgozásban van ennek az II-kódnak a részére), az új közlemény sorban fog állni, amíg az éppen folyó tranzakciót ezzel az II-kóddal kizárják.

3.1.2.7.9.3.2 *Bejelentés.* Továbbításra váró fedélzetről leadott ELM közlemény bejelentését a DR mező felhasználásával végzik a 3.1.2.7.7.1 pontban meghatározottak szerint az IIS almező által tartalmazott, a 3.1.2.6.5.3.2 pontban meghatározottak szerinti rendeltetési lekérdező II-kóddal. A DR-mező és az IIS almező tartalmát meghatározva annak a lekérdezőnek a részére állítják be, amelynek a választ venni kell. Egy várakozó többhelyes irányított közleményt csak a szándékolt lekérdező részére szolgáltatott válaszokban kell bejelenteni. Nem kell bejelenteni más lekérdezők részére adott válaszokban.

3.1.2.7.9.3.3. *Továbbítás.* Egy lekérdező az UM mező kódolásán keresztül megállapítja, hogy az a fenntartott hely-e, és ha így van, hozzáfoghat a fedélzetről leadott ELM továbbításának kéréséhez. A továbbítást a 3.1.2.7.7.2 pontban meghatározottaknak megfelelően végzik. A válaszjeladó továbbítja a pufferben lévő közleményt, amely puffer a II-kódhoz kapcsolódik, amelyet viszont a lekérdezés kérési szegmens IIS almező határoz meg.

3.1.2.7.9.3.4 *Kizárás.* Kizárást a 3.1.2.7.7.3 pontban előírtak szerint kell végrehajtani, kivéve, amikor a közlemény kizárást csak az II-kóddal rendelkező lekérdezőtől veszik, amely kód egyenlő azzal, amelyet a közlemény továbbított.

3.1.2.7.9.3.5 *Következő közlemény várakozásának bejelentése.* A DR mező jelzi egy fedélzetről leadott ELM kizárást tartalmazó lekérdezésre adott válaszban várakozó közleményt, ha egy másik többhelyes irányított közlemény várakozik erre az II-kódra, vagy ha egy fedélzetről leadott adattovábbítási közlemény várakozik, amely nem lett kijelölve a II-kódnak (3.1.2.7.9.2 alpont).

3.1.2.7.9.4 *Megnövelt nem-szelektív fedélzetről leadott ELM protokoll.* Egy nem-szelektív kapcsolati ELM közlemény rendelkezésre állását az összes lekérdező részére be kell jelenteni. Más esetben a protokoll a 3.1.2.7.7 pontban meghatározottnak fog megfelelni.

3.1.2.8 Levegő-levegő forgalom és squitter tranzakció

Megjegyzés. – Az összeütközés elkerülését biztosító fedélzeti rendszer (ACAS) berendezés az UF vagy DF egyenlő 0 formátumokat használja levegő-levegő felderítésre.

3.1.2.8.1 *Rövid levegő-levegő forgalom, fedélzetre irányuló 0-s adattovábbítási formátum*

1		9		14	15		33
UF		RL		AQ	DS		AP
5					22		56

E lekérdezés formátuma ezekből a mezőkből áll:

Mező	*Hivatkozás*
UF fedélzetre irányuló adattovábbítási formátum	3.1.2.3.2.1.1
tartalék - 3 bit	
RL válaszhossz	3.1.2.8.1.2
tartalék - 4 bit	
AQ elfogás	3.1.2.8.1.1
DS adat választó	3.1.2.8.1.3
tartalék - 10 bit	
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.8.1.1 *AQ: Megszerzés* Ez az egy-bites (14) fedélzetre irányuló adattovábbítási mező olyan kódot tartalmaz, amely szabályozza az RI mező tartalmát.

3.1.2.8.1.2 *RL: Válasz hosszúság.* Ez az 1-bites (9) fedélzetre irányuló adattovábbítási mező ad utasítást a válaszhoz használt formátumra.

Kódolás

0 Jelöli a DF = 0 választ

1 jelöli, hogy nincs válasz

Megjegyzés. – Az összeütközés elkerülését biztosító fedélzeti rendszerrel kapcsolt válaszjeladó DF egyenlő 16 válasszal reagál egy RL egyenlő 1 lekérdezésre.

3.1.2.8.1.3 *DS: Adat Kiválasztó.* Ez a 8 bites (15-22) fedélzetre irányuló adattovábbítási mező a GICB adattároló BDS kódját (3.1.2.6.11.2.1 alpont) tartalmazza, amelynek tartalmát vissza kell küldeni a megfelelő, DF = 16 értékű válasz részére.

3.1.2.8.2 *Rövid levegő-levegő felderítés, 0 értékű fedélzetről leadott adattovábbítási formátum*

1	6	7		14		20	33
DF	VS	CC		RI		AC	AP
5				17		32	56

Ezt a választ egy UF egyenlő 0 és RL egyenlő 0 lekérdezésre történő reagálásban küldik el. Ennek a válasznak a formátuma a következő mezőkből áll:

Mező		*Hivatkozás*
DF	fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
VS	függőleges állapot	3.1.2.8.2.1
CC	kereszt-kapcsolati képesség tartalék	3.1.2.8.2.3
tartalék - 6 bit		
RI	válasz információ	3.1.2.8.2.2
tartalék - 2 bit		
AC	magasság kód	3.1.2.6.5.4
AP	címzés/paritás	3.1.2.3.2.1.3

3.1.2.8.2.1 *VS: függőleges állapot.* Ez az 1-bites (6) kapcsolati mező a légijármű állapotát jelzi (3.1.2.6.10.1.2 alpont).

Kódolás

0 Jelöli, hogy a légijármű a levegőben van.

1 Jelöli, hogy a légijármű a földön van.

3.1.2.8.2.2 *RI: válaszinformáció, levegő-levegő*. Ez a 4-bites (14-17) fedélzetről leadott adattovábbítási mező közli a légijármű maximális valódi utazási légsebesség képességét és a lekérdező légijárműnek adott válasz típusát. A kódolás a következők szerint történik:

0 egy levegő-levegő lekérdezésre adott választ jelöl, UF = 0, AQ = 0, nincs működő ACAS

1-7 ACAS részére fenntartott

8-15 egy levegő-levegő lekérdezésre adott választ jelöl, ahol UF = 0, AQ = 1 és azt, hogy a maximális légsebesség a következő:

8	maximális légsebesség adat nem áll rendelkezésre	
9	maximális légsebesség .	.KE.140 kilométer/h (75 csomó)
10	maximális légsebesség	.NM.140 és .KE.28O km/h (75 és 150 csomó)
11	maximális légsebesség	.NM.280 és .KE. 560 km/h (150 és 300 csomó)
12	maximális légsebesség	.NM. 560 és .KE. 100 km/h (300 és 600 csomó)
13	maximális légsebesség	.NM. 1100 és .KE. 2200 km/h (600 és 1200 csomó)
14	maximális légsebesség nagyobb, mint 2200 km/h (1200 csomó)	
15	nincs kijelölve.	

Megjegyzés. – “.KE.” azt jelenti, hogy “kisebb vagy egyenlő” és “.NM.” jelenti: “nagyobb, mint”

3.1.2.8.2.3 *CC: Kereszt-kapcsolat képesség.* Ez az 1-bites (7) fedélzetről leadott adattovábbítási mező a válaszjeladónak azt a képességét jelzi, hogy keresztkapcsolat képességet tud fenntartani, azaz dekódolja a DS mező tartalmát UF egyenlő 0 lekérdezésben és válaszol a specifikus GICB regiszter tartalmával a DF egyenlő 16 megfelelő válaszban.

Kódolás

0 jelöli, hogy a válaszjeladó nem tudja a keresztkapcsolat képességet fenntartani

1 jelöli, hogy a válaszjeladó fenntartja a kereszt-kapcsolat képességet

3.1.2.8.3 *Hosszú levegő-levegő felderítés, fedélzetről leadott 16-os adattovábbítási formátum*

1	6		14		20	33	89
DF	VS		RI		AC	MV	AP
5			17		32	88	112

Ezt a választ egy VB egyenlő 0 és RL egyenlő 1 lekérdezésre adott válaszban küldik el. Ennek a válasznak a formátuma a következő mezőket tartalmazza:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
VS függőleges állapot	3.1.2.8.2.1
tartalék – 7 bit	
RI válasz információ	3.1.2.8.2.2
tartalék – 2 bit	
AC magasság kód	3.1.2.6.5.4
MV közlemény, ACAS	3.1.2.8.3.1
AP címzés/paritás	3.1.2.3.2.1.3

3.1.2.8.3.1 *MV: Közlemény, ACAS.* Ez az 56-bites (33-88) fedélzetről leadott adattovábbítási mező, amely a kérés szerint GICB információt tartalmazza az UF lekérdezés DS mezejében, amely lekérdezés a választ kiváltotta.

Megjegyzés. – Az MV mezőt az ACAS is használja levegő-levegő koordinációhoz (4.3.8.4.2.4 alpont)

3.1.2.8.4 Levegő-levegő tranzakció protokoll

Megjegyzés. – Lekérdezés-válasz koordináció a levegő-levegő formátumoknál a 3-5 táblázatban körvonalazott protokollt követi (3.1.2.4.1.3.2.2 alpont).

Egy levegő-levegő válasz RI mezőjének a legjelentősebb bitje (14-es bit) megismétli az AQ mező értékét (14-es bit), amely egy UF egyenlő 0 lekérdezésben érkezett.

Ha AQ egyenlő 0 a lekérdezésben, a válasz RI mezője tartalmazni fogja a 0-kódot.

AQ egyenlő 1 a lekérdezésben, a válsz RI mezője a légijármű maximális valódi utazó légsebesség képességét tartalmazza, ahogyan azt 3.1.2.8.2.2 alpont meghatározza.

Az UF = 0-ra, az RL = 1 és DS nem egyenlő 0 esetén való válaszban a válaszjeladó egy DF = 16 válasszal felel, amelyben az MV mező a DS értékkel jelölt GICB regiszter tartalmát tartalmazza. Az UF = 0-ra, az RL = 1 és DS = 0 esetén adott válaszban a válaszjeladó egy mindenütt zérus mezőjű DF = 16-tal felel. UF = 0 vételéhez DS = 0, de RL = 0 esetén nem tartozik ACAS kereszt-kapcsolás akció és a válaszjeladó a 3.1.2.8.2.2 pontban leírtak szerint válaszol.

3.1.2.8.5 *Adatbeszerzési squitter*

Megjegyzés. – Másodlagos felderítő radar S-módú válaszjeladók adatbeszerzési squittereket továbbítanak (nem-kért fedélzetről leadott közlemények), hogy lehetővé tegye a széles antenna sugarakkal rendelkező lekérdezők passzív befogását, ahol az aktív befogást az all-call szinkron csonkítás akadályozhatja. Ilyen lekérdezőkre példák az összeütközést elkerülő fedélzeti rendszer és egy repülőtéri földi felderítő rendszer.

3.1.2.8.5.1 *Adatbeszerzési squitter formátum.* Az adatbeszerzési squitter átvitelekhez használt formátum az all-call válasz lesz (DF = 11) II = 0 beállítással.

3.1.2.8.5.2 *Adatbeszerzési squitter sebesség.* Az adatbeszerzési squitter átvitelek véletlen időközönként kerülnek kisugárzásra, amelyek egyenletesen vannak elosztva a 0,8-tól 1,2 másodperc tartomány felett, az első squitterhez viszonyítva, a következő kivételekkel:

a) az időütemezett adatbeszerzési squittert késleltetni kell, ha a válaszjeladó tranzakciós ciklusban van (3.1.2.4.1 alpont).
b) az időütemezett adatbeszerzési squittert késleltetni kell, ha kiterjesztett squitter folyamatban van;
c) az időütemezett adatbeszerzési squittert késleltetni kell, ha egy közös elnyomás csatoló felület működésben van (lásd az alábbi 1. megjegyzést); vagy
d) adatbeszerzési squitter-eket csak akkor sugároznak ki a földön, ha a válaszjeladó nem jelenti az S-módú kiterjesztett squitter földi elhelyezésének típusát.

Az adatbeszerzési squittert nem szakíthatják meg kapcsolati tranzakciók, vagy közös elnyomás működés azután, hogy a squitter átvitel elkezdődött.

1. Megjegyzés. – Közös elnyomási rendszer használható az ugyanazon frekvenciasávban működő fedélzeti berendezések összekapcsolására, hogy a közös interferenciát megakadályozza. Az adatbeszerzési squitter tevékenység folytatódik egy közös elnyomási időköz után.

2. Megjegyzés. – A földi jelentés típust vagy a légijármű, vagy egy squitter földi állomástól jövő utasítások automatikusan választják ki (3.1.2.8.6.7 pont).

3.1.2.8.5.3 *Befogó squitter antenna kiválasztás*. Eltérő antenákkal működő válaszjeladók (3.1.2.10.4 pont) a squittereket a következők szerint viszik át:

a) a levegőben tartózkodáskor (3.1.2.8.6.7 pont), a válaszjeladó adatbeszerzési squittert továbbít felváltva a két antennától¸és

b) a földön tartózkodáskor (3.1.2.8.6.7 pont), a válaszjeladó adatbeszerzési squittert továbbít SAS irányítása alatt (3.1.2.6.1.4.1f) al pont). SAS utasítás elmaradása esetén, a felső antenna alkalmazása csak alapértelmezett módon történhet.

Megjegyzés. – Adatbeszerzési squittereket nem késztetik kisugárzásra a földön, ha a válaszjeladó a kiterjesztett squitter földi típusát jelenti (3.1.2.8.6.4.3 alpont).

3.1.2.8.6 *Kiterjesztett squitter*, *fedélzetről leadott 17-es adattovábbítási formátum*

1	6	9	33	89
DF	CA	AA	ME	PI
5	8	32	88	112

Megjegyzés. – SSR S-módú válaszjeladók kiterjesztett squittereket továbbítanak, hogy fenntartsák a légijármű származtatású helyzet rádióadást légtér-ellenőrzési célokból. Az ilyen típusú információ rádióközlése az automatikus légtérfelderítés (ADS) egy formája, amely ADS rádióadásként (ADS-B) ismert.

3.1.2.8.6.1 *Kiterjesztett squitter formátum.* A kiterjesztett squitterhez használt formátum egy 112-bites fedélzetről leadott adattovábbítási formátum (DF = 17), amely a következő mezőket tartalmazza:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítás formátum	3.1.2.3.2.1.2
CA képesség	3.1.2.5.2.2.1
AA címzés, bejelentett	3.1.2.5.2.2.2
ME közlemény, kiterjesztett squitter	3.1.2.8.6.2
PI paritás/lekérdező azonosító	3.1.2.3.2.1.4

A PI mezőt II egyenlő 0-ként kell kódolni.

3.1.2.8.6.2 *ME: Közlemény, kiterjesztett squitter*. Ez az 56-bites (33-88) fedélzetről leadott adattovábbítási mezőt DF = 17-ben rádióadás közlemények továbbításához használják. A kiterjesztett squitter támogatására használt regiszterek formátumainak és felfrissítési rátáinak (BDS 0,5; BDS 0,6; BDS0,7; BDS 0,8; BDS 0,9; BDS 0,A) a 10. Annex, III. kötet, I.rész, 5. fejezet 1. Függelékében leírtaknak kell megfelelniük.

*Megjegyzés. – A válaszjeladó regiszter formátumokról és az adatforrásokról útmutató anyagot az S-*módú különleges szolgáltatási kézikönyv (Manual on Mode-S Specific Services) *(Doc 9688) tartalmaz.*

3.1.2.8.6.3 *Kiterjesztett squitter fajták*

3.1.2.8.6.3.1 *Levegőbeni helyzet squitter*. A levegőbeni helyzet kiterjesztett squitter típus DF = 17 formátumot használ az ME mezőbe beillesztett GICB 05 {HEX} regiszter tartalmával.

Megjegyzés. – Egy GICB kérés (3.1.2.6.11.2 pont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 5 idézi elő az eredményezett választ, amely tartalmazza a levegőbeni helyzet jelentést az MB mezőjében.

3.1.2.8.6.3.1.1 *SSS, légtérellenőrzés állapot almező ME-ben*. A válaszjeladó jelenti a válaszjeladó légtérellenőrzés állapotát az ME-nek ebben a 2-bites (38-39) almezőjében, ha ME egy levegőbeni helyzet squitter jelentést tartalmaz.

Kódolás

0 jelzi, hogy nincs állapot információ
1 jelzi, hogy a válaszjeladó folyamatos riasztás körülményeket jelent (3.1.2.6.10.1.1.1 pont)
2 jelzi, hogy a válaszjeladó átmeneti riasztás körülményeket jelent (3.1.2.6.10.1.1.2 pont)
3 jelzi, hogy a válaszjeladó SPI körülményeket jelent (3.1.2.6.10.1.3 pont)

Az 1. és 2. kód elsőbbséget élvez a 3. kóddal szemben.

3.1.2.8.6.3.1.2 *ACS, magasság kód almező ME-ben.* ATS irányítás alatt (3.1.2.8.6.3.1.3 pont) a válaszjeladó a barometrikus magasság kódot jelenti ebben a 12-bites (41-52) ME almezőben, amikor ME egy levegőbeni helyzet jelentést tartalmaz. Az ACS tartalma olyan, ahogyan a 13-bites AC mezőnél meghatározásra került (3.1.2.6.5.4 pont), kivéve, hogy az M-bit (26-os bit) elhagyásra kerül.

3.1.2.8.6.3.1.3 *ACS jelentésadás irányítása.* A magassági adatok válaszjeladóval történő jelentése akkor kerül adásba, amikor az 1-bites magasság típusú almező (ATS) (3.1.2.8.6.8.2 pont) 0 értékű. A válaszjeladó magassági adat jelentés adását ACS-ben megakadályozzák, amikor ATS 1-es értékű.

3.1.2.8.6.3.2 *Földi helyzet squitter*. A földi helyzet kiterjesztett squitter típus a DF = 17 formátumot használja az ME mezőbe beillesztett 06 {HEX} GICB regiszter tartalmával.

Megjegyzés. – Egy GICB kérés (3.1.2.6.11.2 pont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 6, idézi elő az eredményezett választ, amely tartalmazza a földi helyzet jelentést az MB mezőjében.

3.1.2.8.6.3.3 *Légijármű azonosítás squitter.* A légijármű azonosítás kiterjesztett squitter típus a DF = 17 formátumot használja az ME mezőbe beillesztett 08 {HEX} GICB regiszter tartalmával.

Megjegyzés. – Egy GICB kérés (3.1.2.6.11.2 pont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 8 idézi elő az eredményezett választ, amely tartalmazza a légijármű azonosítás jelentést az MB mezőjében.

3.1.2.8.6.3.4 *Levegőbeni sebesség squitter.* A levegőbeni sebesség kiterjesztett squitter típus a DF = 17 formátumot használja az ME mezőjébe beillesztett 09 {HEX} GICB regiszter tartalmával.

Megjegyzés. – Egy GICB kérés (3.1.2.6.11.2 pont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 9 idézi elő a légijármű azonosítás jelentést az MB mezőjében tartalmazó választ.

3.1.2.8.6.3.5 *Esemény-működtetett squitter.* Az esemény-működtetett kiterjesztett squitter típus a DF = 17 formátumot használja az ME mezőbe beillesztett QA {HEX} GICB regiszter tartalmával.

Megjegyzés. – Egy GICB kérés (3.1.2.6.11.2 pont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 10, idézi elő az eredményezett választ, amely tartalmazza az esemény-működtetett jelentést az MB mezőjében.

3.1.2.8.6.4 *Kiterjesztett squitter sebesség*

3.1.2.8.6.4.1 *Indulóhelyzetbe hozás.* Bekapcsoláskor bekövetkező indulóhelyzetbe hozáskor a válaszjeladó abban az üzemmódban kezdi a működését, amelyben csak befogási squittereket tud sugározni (3.1.2.8.5 pont). A válaszjeladó elindítja a kiterjesztett squitterek sugárzását levegőbeni helyzetre, földi helyzetre, levegőbeni sebességre és légijármű azonosításra, amikor az adatok a 0,5 , 0,6, 09 és 08 {HEX} GICB regiszterekbe be vannak illesztve, a két felsorolás összeillő sorrendjében. Ezt a meghatározást egyedenként mindegyik típusra meg kell csinálni. Amikor kiterjesztett squittereket közvetítenek, a továbbítási sebességeknek a következő pontokban jelzettnek megfelelőnek kell lenniük. A kiterjesztett squittereken kívül befogási squittereket is jelentenek, hacsak a befogási squitter nincs gátolva (2.1.5.4). Befogási squittereket mindig jelenteni kell, amennyiben kiterjesztett helyzet vagy sebesség squittereket nem jelentenek.

1. Megjegyzés. – Ez elnyomja a légijárműtől jövő hosszú squittereket, a légijármű nem tud helyzetet, sebességet vagy azonosítást jelenteni. Ha egy squitter típusú regiszter inputja 60 másodpercig áll, akkor ennek a kiterjesztett squitter típusnak az adása szünetel addig, amíg az adat bevitel újra nem kezdődik.
2. Megjegyzés. – Rövid szünet után (3.1.2.8.6.6.) ez a squitter típus egy mindenütt zérus ME mezőt tartalmazhat.

3.1.2.8.6.4.2 *Levegőbeni helyzet squitter sebesség*. Levegőbeni helyzet squitter továbbításokat akkor sugároznak, amikor a légijármű a levegőben van (3.1.2.8.6.7 alpont), véletlenszerű időközökkel, amelyek egyenletesen oszlanak el a 0,4-től 0,6 másodpercig nagyságú értéktartományok felett, amelyeket az előző levegőbeni helyzet squitterhez viszonyítanak, a 3.1.2.8.6.4.7 pontban ismertetett kivételekkel.

3.1.2.8.6.4.3 *Földi helyzet squitter sebesség.* Földi helyzet squitter közleményeket akkor sugároznak, amikor a légijármű a földön tartózkodik (3.1.2.8.6.7 pont), egy vagy két sebességet használva attól függően, hogy kis vagy nagy squitter sebességet választottak ki (3.1.2.8.6.9 pont). Amikor a nagy squitter sebességet választották ki, a földi helyzet squittereket véletlenszerű időközökkel sugározzák, amelyek egyenletesen oszlanak el a 0,4-től 0,6 másodpercig nagyságú értéktartományok felett, az előző földi helyzethez viszonyítva (ezt nevezzük nagy sebességnek). Ha a kis squitter sebességet választották ki, a földi helyzet squittereket véletlenszerű időközökkel sugározzák, amelyek 4,8-tól 5,2 másodpercig nagyságú értéktartományok felett egyenletesen oszlanak el, az előző földi helyzet squitterhez viszonyítva (ezt nevezik kis sebességnek). Ezekhez a továbbítási sebességekhez viszonyított kivételek a 3.1.2.8.6.4.7 pontban kerülnek ismertetésre.

3.1.2.8.6.4.4 *Légijármű azonosítás squitter sebesség.* Légijármű squitter közleményt véletlenszerű időközökkel sugároznak, amelyek egyenletesen oszlanak el a 4,8-tól 5,2 másodpercig nagyságú értéktartományok felett az előző azonosítási squitterhez viszonyítva, amikor a légijármű a levegőbeni helyzet squitter típusú jelentését végzi, vagy amikor a légijármű a földi helyzet squitter típusú jelentését adja le, és a nagy földi squitter sebességet választották ki. Amikor a földi helyzet squitter típust kis földi sebességgel jelentik, a légijármű azonosítási squitter véletlenszerű időközökkel sugározzák, amelyek egyenletesen oszlanak el a 9,6-tól 10,4 másodpercig tartó értéktartományok felett az előző azonosítási squitterhez viszonyítva. Kivételek ezektől az átviteli sebességektől a 3.1.2.8.6.4.7 pontban találhatók.

3.1.2.8.6.4.5 *Levegőbeni sebesség squitter sebesség.* Levegőbeni sebesség squitter továbbításokat akkor sugároznak, amikor a légijármű a levegőben van (3.1.2.8.6.7 alpont), véletlenszerű időközökkel, amelyek egyenletesen oszlanak el a 0,4-től 0,6 másodpercig tartó értéktartományok felett, olyan idő kvantálást használva, amely nem nagyobb, mint 15 ezredmásodperc.

3.1.2.8.6.4.6 *Esemény-működtetett squitter sebesség.* Esemény-működtetett squittert egyszer továbbítanak, mindig akkor, amikor az OA {HEX} GICB regiszter le van terhelve, mialatt a 3.1.2.8.6.4.7 pontban ismertetett késleltetés körülményeket figyelik. Az esemény-működtetett squitternél a maximális átviteli sebességet a válaszjeladó másodpercenkénti kétszeres értékben korlátozza. Ha egy közlemény az esemény-működtetett regiszterbe be van illesztve, és a sebesség korlátozás miatt nem lehet továbbítani, azt meg kell tartani és akkor kell továbbítani, amikor a sebesség korlátozás feloldódott. Ha az átvitel engedélyezése előtt új közleményt vesznek, ez a korábbi közleményt felülírja.

Megjegyzés. – A squitter átviteli sebesség és a squitter átvitelek időtartama alkalmazás-függő. Az egyes alkalmazásoknál végrehajtott választásoknak figyelemmel kell lenniük az interferencia meggondolásokra. (Manual of the Secondary Surveillance Radar (SSR) Systems (Másodlagos Felderítő Radar (SSR) rendszerek kézikönyve) *(Doc 9684. 8. fejezet hivatkozások).*

3.1.2.8.6.4.7 *Késleltetett továbbítások.* Kiterjesztett squitter átvitelt az alábbi körülmények között kell késleltetni:

a) ha a válaszjeladó tranzakció ciklusban van (3.1.2.4.1 alpont);
b) ha egy adatbeszerzési vagy más típusú kiterjesztett squitter feldolgozás alatt van; vagy
c) vagy közös elnyomás csatoló elem van működésben.

A késleltetett squittert azonnal továbbítani kell, mihelyt a válaszjeladó működésre kész.

3.1.2.8.6.5 *Kiterjesztett squitter antenna kiválasztás.* Antenna eltéréssel működő válaszjeladók (3.1.2.10.4 alpont) a következők szerint továbbítanak kiterjesztett squittereket:

a) a levegőben (3.1.2.8.6.7 alpont), a válaszjeladó az összes típusú kiterjesztett squittert felváltva továbbítja a két antennáról; és

b) a földön (3.1.2.8.6.7 alpont), a válaszjeladó a SAS irányítása alatt (3.1.2.6.1.4.1f) továbbít kiterjesztett squittereket.

SAS utasítások hiányában a tető antenna használata az alaphelyzet..

3.1.2.8.6.6 *Regiszter üzemszünet.* A válaszjeladó felszabadítja a levegőbeni helyzet, a földi helyzet, a squitter állapot és a levegőbeni sebesség információ 05, 06, 07 és 09 {HEX} GICB regiszterek mind az 56 bitjét, ha ezeket a regisztereket az előző felfrissítéshez viszonyított két másodpercen belül nem frissítik fel. Ezt az üzemszünetet ezeknek a regisztereknek mindegyikére külön-külön kell meghatározni. A kiterjesztett squitter rádióadások befejezése a 10. Annex, III. Kötet, I. rész szerinti legyen.

Megjegyzés. – Ezeket a regisztereket azért szabadítják fel, hogy megakadályozzák idejétmúlt helyzet, sebesség és squitter sebesség információk jelentését.

3.1.2.8.6.7 *Levegőbeni/földi állapot meghatározás.* A földi feltételek meghatározásának automatikus eszközével rendelkező légijárművek ezt a bemenetet annak kiválasztására használják, hogy levegőbeni vagy földi közlemény típust jelentsen. Ilyen eszközzel nem rendelkező légijármű a levegőbeni típusú közleményeket jelenti. Ilyen automatikus földi meghatározással rendelkező vagy nem rendelkező légijárművek a TCS-beli irányítási kódok által meghatározott utasítás szerinti helyzet közlemény típusokat használnak (3.1.2.6.1.4.1f) alpont). A TCS utasítás szünetelése után a levegőbeni/földi meghatározás a fent leírt eszközre száll vissza.

Megjegyzés. – Kiterjesztett squitter földi állomások a légijármű levegőbeni vagy földi állapotát a légijármű helyzet, magasság és földfeletti sebesség figyelésével határozzák meg. A légijárműveket, amelyekről megállapították, hogy a földön vannak, és amelyek nem jelentik a földi helyzet közlemény típust, utasítják, hogy jelentsék a földi formátumot TCS-n keresztül (3.1.2.6.1.4.1f) alpont). A normál visszatérés a levegőbeni helyzet közlemény típusra egy földi utasításon keresztül történik, amely a levegőbeni közlemény jelentésére utasít. A kommunikáció felszállás utáni elvesztése elleni védelemként utasítást ad, hogy jelentse a földi helyzet közlemény típus automatikus üzem szüneteltetését.

3.1.2.8.6.8 S*quitter állapot jelentés.* Egy GICB kérés (3.1.2.6.11.2 alpont), amely RR egyenlő 16 és DI egyenlő 7 és RRS egyenlő 7 tartalommal bír, előidézi, hogy az eredményezett válasz squitter állapot jelentést tartalmazza az MB mezőjében.

3.1.2.8.6.8.1 *TRS, átviteli sebesség almező MB-ben.* A válaszjeladónak jelentenie kell a légijármű képességét a földi squitter sebességének automatikus megállapítására és a fennálló squitter sebességet az MB-nek ebben a 2-bites (33, 34) almezőjében.

Kódolás

0 jelöli, hogy nincs automatikus földi squitter sebesség meghatározás képesség
1 jelöli, hogy nagy földi squitter sebességet választottak ki
2 jelöli, hogy kis földi squitter sebességet választottak ki
3 kijelöletlen

1. Megjegyzés. – Nagy és kis squitter sebességet a légijármű fedélzetén határozzák meg.

2. Megjegyzés. – A kis sebességet akkor használják, amikor a légijármű nem mozog, és a nagy sebesség akkor használatos, amikor a légijármű mozog.

3.1.2.8.6.8.2 *ATS, magasság típusú almező MB-ben.* A válaszjeladó jelenti a magasság típusát, amelyet az MB-nek ebben az 1-bites (35) almezőjében lévő levegőbeni kiterjesztett squitterben szolgáltatnak, amikor a válasz a 07 {HEX} GICB regiszter tartalmát magában foglalja.

Kódolás

0 jelöli, hogy a barometrikus magasságot a 05 {HEX} válaszjeladó regiszter ACS-ben (3.1.2.8.6.3.1.2 pont) kell jelenteni.

1 jelöli, hogy a navigációból származtatott magasságot a 05 {HEX} válaszjeladó regiszter ACS-ben (3.1.2.8.6.3.1.2 pont) kell jelenteni.

Megjegyzés. – A 05 {HEX} és a 07 {HEX} válaszjeladó regiszterek tartalmának részleteiről lásd a 10. Annex, III. Kötet, I. Rész, 5. fejezet 1. Függelékét.

3.1.2.8.6.9 *Földi squitter sebesség irányítás.* A földi squitter sebességet a következők szerint határozzák meg:

a) másodpercenként egyszer leolvassák a TRS tartalmát. Ha a TRS értéke 0 vagy 1, a válaszjeladó a földi squittereket nagy sebességgel továbbítja. Ha a TRS értéke 2, a válaszjeladó a földi squittereket kis sebességgel továbbítja;

b) a TRS-en keresztül meghatározott squitter az RCS-en keresztül vett utasítások általi felülbírálatra kerül (3.1.2.6.1.4.1f) pont). Az RCS 1 kód a válaszjeladót 60 másodpercen keresztül nagysebességű squitterelésre készteti. Az RCS 2 kód a válaszjeladót 60 másodpercen át kis sebességű squitterelésre készteti. Ezek az utasítások felfrissítésre képesek egy új 60 másodperces periódus alatt az előző periódus üzemszünetét megelőzően; és

c) az üzemszünet után és az RCS 1 és 2 kódok hiányában az irányítás visszatér a TRS-hez.

3.1.2.8.6.10 *Hosszúság/szélesség kódolás kompakt helyzet-jelentés (CPR) felhasználásával.* S-módú kiterjesztett squitter kompakt helyzet jelentést (CPR) használ a szélesség és hosszúság hatékony kódolására a közleményekben. A CPR kódolásra/dekódolásra használt módszernek ki kell elégítenie a 10. Annex, III. Kötet, I. Rész, 5. fejezet 1. Függelékében lévő egyenleteket.

3.1.2.8.7 Kiterjesztett squitter/*nem* válaszjeladó *(ES/NT), fedélzetről leadott 18-as formátum*

10010	CF:3	AA:24	ME:56	PI:24

Megjegyzés. – Ez a formátum a kiterjesztett squitter ADS-B közlések nem-válaszjeladó készülékekkel való rádióadását támogatja, azaz ezek nincsenek S-módú válaszjeladóba beépítve. Egy különálló formátumot használnak ennek a nem-válaszjeladó esetnek az azonosítására, hogy megóvják az ACAS II-t vagy a kiterjesztett squitter földi állomásokat ezen berendezések lekérdezésének megkísérelésétől.

3.1.2.8.7.1 *ES/NT formátum.* Az ES/NT-hez használt formátumnak egy 112-bites fedélzetről leadott adattovábbítási formátumnak (DF=18) kell lennie, amely a következő mezőket tartalmazza:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
CF irányítás mező	3.1.2.8.7.2
AA címzés, bejelentett	3.1.2.5.2.2.2
ME közlemény, kiterjesztett squitter	3.1.2.8.6.2
PI paritás/lekérdező azonosító	3.1.2.3.2.1.4

A PI mezőt II vagy SI egyenlő zérussal kell kódolni.

3.1.2.8.7.2 *Irányítás mező.* Ezt a 3-bites (6-8) fedélzetről leadott adattovábbítási mezőt DF=18-ban a 112-bites átvitel formátumának meghatározására kell használni.

0 kód = ADS-B
1 – 7 kód = Fenntartott

3.1.8.7.3 *ES/NT squitter típusok.*

3.1.2.8.7.3.1 *Levegőbeni helyzet squitter.* Az ES/NT levegőbeni helyzet típusnak DF=18 formátumot kell használnia a 05 {HEX} regiszter formátummal, a 3.1.2.8.6.2 pontban meghatározottak szerint az ME mezőbe behelyezve.

3.1.2.8.7.3.2 *Földi helyzet squitter.* Az ES/NT földi helyzet típusnak DF=18 formátumot kell használnia a 06 {HEX} regiszter formátummal, a 3.1.2.8.6.2 pontban meghatározottak szerint az ME mezőbe behelyezve.

3.1.2.8.7.3.3 *Légijármű azonosító squitter.* Az ES/NT légijármű azonosító típusnak DF=18 formátumot kell használnia a 08 {HEX} regiszter formátummal, a 3.1.2.8.6.2 pontban meghatározottak szerint az ME mezőbe behelyezve.

3.1.2.8.7.3.4 *Levegőbeni sebesség squitter.* Az ES/NT levegőbeni sebesség típusnak DF=18 formátumot kell használnia a 09 {HEX} regiszter formátummal, a 3.1.2.8.6.2 pontban meghatározottak szerint az ME mezőbe behelyezve.

3.1.2.8.7.3.5 *Esemény-működtetésű squitter.* Az ES/NT esemény működtetésű típusnak DF=18 formátumot kell használnia a 0A {HEX} regiszter formátummal, a 3.1.2.8.6.2 pontban meghatározottak szerint az ME mezőbe behelyezve.

3.1.2.8.7.4 *ES/NT squitter sebesség*

3.1.2.8.7.4.1 *Indulóhelyzetbe hozás.* A bekapcsolást követő beindításnál a nem-válaszjeladó készüléknek olyan üzemmódban kell a működését megkezdenie, amelyben az nem közvetít squittert. A nem-válaszjeladó készüléknek az ES/NT squitterek közvetítését levegőbeni helyzetre, földi helyzetre, levegőbeni sebességre és légijármű azonosításra akkor kell megkezdenie, amikor az adatok rendelkezésre állnak ezeknek a squitter típusoknak az ME mezejébe való behelyezésére. Ennek megállapítását egyedenként kell végezni mindegyik squitter típusra. Amikor ES/NT squittereket közvetítenek, az átviteli sebességek értéke feleljen meg a 3.1.2.8.6.4.2 – 3.1.2.8.6.4.6 pontokban előírtaknak.

1. Megjegyzés. – Ez elnyomja a légijárműtől jövő kiterjesztett squitter*ek átvitelét, amelyek nem képesek helyzetet, sebességet vagy azonosítást jelenteni. Ha a bemenet a squitter típusú regiszterekhez 60 másodpercig áll, a rádióadás ehhez a kiterjesztett squitter típushoz szünetelni fog, amíg az adat behelyezés újra nem folytatódik.*

2. Megjegyzés. – Szünetelés után (3.1.2.8.7.6) ez a squitter típus egy csupa zérusból álló ME mezőt tartalmazhat.

3.1.2.8.7.4.2 *Késleltetett átvitel.* ES/NT squitter átvitelt késleltetni kell, ha a nem-válaszjeladó készülék más squitter típusok valamelyikét éppen közvetíti.

3.1.2.8.7.4.2.1 A késleltetett squittert azonnal továbbítani kell, mihelyt a nem-válaszjeladó készülék újra rendelkezésre áll.

3.1.2.7.5 *ES/NT antenna kiválasztás.* Eltérő antennákkal működő nem-válaszjeladó készülékeknek (3.1.2.10.4) ES/NT squittereket a következők szerint kell átvinniük:

a) amikor a levegőben van (3.2.8.6.7), a nem-válaszjeladó készüléknek mindegyik típusú ES/NT squitter típust a két antennától felváltva továbbítania kell; és

b) amikor a földön van (3.2.8.6.7), a nem-válaszjeladó készüléknek az ES/NT squittereket a tetőantenna használatával kell továbbítania.

3.1.2.8.7.6 *Regiszter szünetelés.* A nem-válaszjeladó készüléknek törölni kell a levegőbeni helyzet, a földi helyzet és sebesség közlésére használatos regiszterek mind az 56 bitjét, ha ezeket a regisztereket az előző felfrissítés után két másodpercen belül nem frissítik fel. Ezt a szünetelést ezen regiszterek mindegyikére külön állapítják meg. A kiterjesztett squitter rádióadásnak a 10. Annex, III. Kötet, I. Rész, 5. fejezet 1. Függeléke 2.4.3 pontjában leírtaknak megfelelőeknek kell lennie.

Megjegyzés. – Ezeket a regisztereket azért kell törölni, hogy megakadályozzák idejétmúlt helyzet és sebesség információk jelentését.

3.1.2.8.7.7 *Levegőbeni/földi állapot meghatározása***.** A földi körülmények meghatározásának automatikus eszközeivel ellátott légijárműveknek ezt a bemenetet annak kiválasztására kell használniuk, hogy levegőbeni vagy földi típusú közlést adjanak-e. Ilyen eszközzel nem rendelkező légijárművek levegőbeni típusú közlést adnak le.

3.1.2.8.7.8 *Földi squitter sebesség szabályozás.* A 10. Annex, III. Kötet, I. Rész, 5. fejezet 1. Függeléke 2-7 táblázatában meghatározott légijármű mozgás algoritmust másodpercenként egyszer végrehajtják. A földi squitter sebességet ezen algoritmus eredményeinek megfelelően állítják be.

3.1.2.8.8 *Kiterjesztett squitter katonai alkalmazása, fedélzetről leadott 19-es adattovábbítási formátum*

10010	AF:3	

Megjegyzés. – Ez a formátum támogatja a kiterjesztett squitter ADS-B közlemények rádióadását katonai alkalmazások támogatásában. Külön formátumot használnak ezeknek a kiterjesztett squittereknek a megkülönböztetésére a szabványos ADS-B közlés együttes rádióadásoktól, amelyek DF = 17 vagy 18-at használnak.

3.1.2.8.8.1 *Katonai formátum.* A DF = 19-hez használt formátumnak egy 112-bites fedélzetről leadott adattovábbítási formátumnak kell lenni, amely a következő mezőket tartalmazza:

Mező	*Hivatkozás*
DF fedélzetről leadott adattovábbítási formátum	3.1.2.3.2.1.2
AF irányítás mező	3.1.2.8.8.2

3.1.2.8.8.2 *Alkalmazás mező.* Ez a 3-bites (6 – 8) fedélzetről leadott adattovábbítási mezőt DF = 19-ben a 112-bites átvitel formátumának meghatározásához kell használni.

0 – 7 kód = Fenntartott

3.1.2.8.9 *Kiterjesztett squitter maximális átviteli sebesség*

Egy kiterjesztett squitter telepítés által sugárzott kiterjesztett squitterek (DF = 17, 18 vagy 19) maximális teljes száma nem haladhatja meg a 6,2 per másodpercet.

3.1.2.9 Légijármű azonosítási protokoll

3.1.2.9.1 *Légijármű azonosítás jelentés.* Egy földi kezdeményezésű Comm-B kérés (3.1.2.6.11.2 pont), amely RR egyenlő 18 és vagy DI nem egyenlő 7, vagy DI egyenlő 7 és RRS egyenlő 0 megfeleléseket tartalmaz, előidézi, hogy az eredményezett válasz a légijármű azonosítását tartalmazza az MB mezőjében.

3.1.2.9.1.1 *AIS, légijármű azonosítási almező MB-ben.* A válaszjeladó a légijármű azonosítását a 48-bites (41-88) AIS MB almezőben jelenti. Az átvitt légijármű azonosítás lesz az, ami a repülési tervben alkalmazásra kerül. Hogyha repülési terv nem áll rendelkezésre, a légijármű lajstromjele kerül beillesztésre ebbe az almezőbe.

Megjegyzés. – Ha a légijármű lajstromjelét használják, ezt “rögzített közvetlen adatként” minősítik (3.1.2.10.5.1.1 pont). Ha egy másik légijármű azonosítási fajtát használnak, ezt “változó közvetlen adatként” minősítik (3.1.2.10.5.1.3 pont).

3.1.2.9.1.2 *AIS almező kódolása.* Az AIS almezőt a következőképpen kódolják:

33	41	47	53	59	65	71	77	83
BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8.
40	46	52	58	64	70	76	82	88

Megjegyzés. – Légijármű azonosítás kódolás maximum 8 karaktert szolgáltat.

A légijármű azonosítási közleményhez használt BDS kód legyen: BDS1 egyenlő 2 (33-36) és BDS2 egyenlő 0 (37-40).

Minden karaktert az 5. számú Nemzetközi Betűrend Sorszám (IA-5) 6-bites almezőjeként kódolnak, ahogyan a 3-6 táblázatban fel van tüntetve.A karakter kódot először a magasabbrendű egységével (b_6) kell továbbítani, és a közölt légijármű azonosítást a balszélső karakterrel kell kezdeni. A karaktereket egymás után, SPACE kód közbeiktatása nélkül kell kódolni. Bármely nem használt karakter az almező szélén egy SPACE karakter kódot tartalmaz.

3.1.2.9.1.3 *Légijármű azonosítási képesség jelentés.* A válaszjeladók, amelyek egy földi kezdeményezésű légijármű azonosításra vonatkozó kérésre reagálnak, ezt a képességet az adatkapcsolati képesség közlésben (3.1.2.6.10.2.2.2 alpont) jelentik a MB almező 33-as bitjének 1 értékre állításával.

3.1.2.9.1.4 *Légijármű azonosítás változás.* Ha az AIS almezőben közölt légijármű azonosítás repülés közben változik, a válaszjeladó közli a földdel az új azonosítást a Comm-B adás közlemény protokoll felhasználásával, amely a 3.1.2.6.11.4 pontban szerepel.

3.1.2.10 A másodlagos felderítő radar S-módú válaszjeladójának lényeges rendszer jellemzői

3.1.2.10.1 V*álaszjeladó érzékenység és dinamikus tartomány.* A válaszjeladó érzékenységét egy adott lekérdezési jel bemeneti szintjének és a hozzátartozó válaszok adott százalékának fogalmával határozzák meg. Csak a vett lekérdezéshez tartozó kért bit-sémát tartalmazó helyes válaszok jönnek számításba. Egy adott lekérdezésnél, amely a 3.1.2.4 pontnak megfelelő választ igényel, a minimális indító szintet, MTL-t, a 90 %-os válasz-lekérdezés arányhoz tartozó minimális bemenő teljesítmény szintként határozzák meg. A MTL értéke -74 dBm ±3 dB. Egy S-módú válaszjeladó válasz-lekérdezés aránya a következő:

a) legalább 99 % a 3 dB-el MTL fölött és a -21 dBm közötti jel bemeneti szinteknél; és

b) nem több, mint 10 % -81 dBm alatti jel bemeneti szinteknél.

Megjegyzés. – A válaszjeladó érzékenység és kimenő teljesítmény ebben a szakaszban az antenna terminálóknál lévő jelszint fogalmában van leírva. Ez szabadságot ad a tervezőnek a beszerelés elrendezéséhez a kábelhossz optimalizálására és a vevő-adó tervezéshez és nem zárja el a vevő és/vagy adó alkatrészeket attól a lehetőségtől, hogy az antenna alszerelvény integrált részévé váljanak.

3.1.2.10.1.1 *Válasz-arány interferencia jelenlétében.*

Megjegyzés.– A következő pontok az S-módú válaszjeladó teljesítmény mérését mutatják be interferáló C-módú lekérdezés impulzusok jelenlétében.

3.1.2.10.1.1.1 *Válasz-arány interferáló impulzus jelenlétében.* Megadva egy S-módú lekérdezést, amely választ igényel (3.1.2.4 alpont), a válaszjeladó válasz aránya legalább 95 % egy zavaró A/C-módú lekérdezés impulzus jelenlétében, ha a zavaró impulzus szintje 6 dB-vel vagy ennél nagyobb értékkel a -68 dBm és -21 dBm közötti S-módú input jel jelszintje alatt van és az interferáló impulzus S-módú lekérdezés P_6 impulzusát átlapolja, bárhol a szinkronizáló fázis megfordítás után.

Ugyanazon feltételek mellett a válasz arány legalább 50 százalék, ha az interferencia impulzus szint 3 dB-el vagy ennél többel a jelszint alatt van.

3.1.2.10.1.1.2 *Válasz-arány impulzus pár interferencia jelenlétében.* Ha adott egy lekérdezés, amely választ igényel (3.1.2.4 alpont), a válaszjeladó válaszaránya legalább 90 százalék egy P_1 és P_2 impulzus pár jelenlétében, ha az interferáló impulzus pár 9 dB-el vagy többel a jelszint alatt van - 68 dBm és -21 dBm közötti bemeneti jel szinteknél, és az interferáló pár P_1 impulzusa nem előbb jelenik meg, mint az S-módú jel P_1 impulzusa.

3.1.2.10.1.1.3 *Válasz-arány alacsonyszintű aszinkron interferencia jelenlétében.* Az összes, -65 dBm és -21 dBm közötti vett jelnél és megadva egy S-módú lekérdezést, amely a 3.1.2.4 pontnak megfelelő választ kér, és ha nincs kizárási feltétel érvényben, a válaszjeladó legalább 95 százalékos válaszaránnyal helyesen válaszol aszinkron interferencia jelenlétében. Az aszinkron interferenciát egyetlen A/C-módú lekérdezési impulzusnak vesszük, amely maximálisan 10000 Hz-es ismétlési sebességgel fordul elő 12 dB-el vagy többel az S-módú jel szintje alatt.

Megjegyzés. – Az ilyen impulzusokat kombinálni lehet az S-módú lekérdezés P_1 és P_2 impulzusaival egy érvényes, csak A/C módú all-call lekérdezés kialakításához. Az S-módú válaszjeladó *nem reagál a csak A/C-módú all-call lekérdezésekre. Az előző impulzus ugyancsak kombinálható az S-módú lekérdezés P_2-jével egy érvényes A-módú vagy C-módú lekérdezés kialakítására. Azonban az S-módú bevezetés P_1 és P_2 párja elsőbbséget élvez (3.1.2.4.1.1.1 alpont). Az S-módú dekódolási eljárás független az A-módú/C-módú dekódoló eljárástól és a vett S-módú lekérdezéstől.*

3.7 táblázat Karakter kódolás légijármű azonosítás adatkapcsolati átviteléhez (IA-5 alhalmaz - lásd 3.1.2.9.1.2 pont)

				b_6	0	0	1	1
				b_5	0	1	0	1
b_4	b_3	b_2	b_1					
0	0	0	0			P	SP	0
0	0	0	1		A	Q		1
0	0	1	0		B	R		2
0	0	1	1		C	S		3
0	1	0	0		D	T		4
0	1	0	1		E	U		5
0	1	1	0		F	V		6
0	1	1	1		G	W		7
1	0	0	0		H	X		8
1	0	0	1		I	Y		9
1	0	1	0		J	Z		
1	0	1	1		K			
1	1	0	0		L			
1	1	0	1		M			
1	1	1	0		N			
1	1	1	1		O			

3.1.2.10.1.1.4 *Hamis reagálás*

Ajánlás. – A nem a vevő sáváteresztőjén belüli jelekre való reagálásnak legalább 60 dB-el a normál érzékenység alatt kell lennie.

3.1.2.10.2 V*álaszjeladó csúcs impulzus teljesítmény.* Egy válasz mindegyik impulzusának csúcsteljesítménye a következők szerinti:

a) nem kisebb, mint 18,5 dBW olyan légijárműveknél, amelyek 4570 m (15000 láb) feletti magasságokon nem tudnak üzemelni;

b) nem kisebb, mint 21,0 dBW olyan légijárműveknél, amelyek 4570 m (15000 láb) feletti magasságokon képesek üzemelni;

c) nem kisebb, mint 21,0 dBW olyan légijárműveknél, amelyek maximális utazó sebessége meghaladja 324 km/h-t (175 csomó); és

d) nem haladja meg a 27,0 dBW-t.

3.1.2.10.2.1 *Inaktív állapotú válaszjeladó kimenő teljesítmény.* Amikor a válaszjeladó inaktív állapotban van, a csúcs impulzus teljesítmény 1090 MHz plusz vagy mínusz 3 MHz-nél nem haladja meg a -50 dBm-et. Az inaktív állapot úgy lett meghatározva, hogy benne van az első átviteli impulzus megelőző és az utolsót követő 10 mikromásodpercnél kisebb átviteli periódusú átvitelek közötti teljes periódusban.

Megjegyzés. – Inaktív állapotú válaszjeladó teljesítmény ily módon arra szorítkozik, hogy egy légijármű számára biztosítsa, hogy amikor nagyon közel, 185 m-re (0,1 NM) van egy A/C-módú vagy S-módú lekérdezőhöz, ne okozzon a válaszjeladónál interferenciát. Az S-mód bizonyos alkalmazásainál, például az összeütközés elkerülését biztosító fedélzeti rendszernél, ahol 1090 MHz-es adó és vevő van ugyanazon a légijárművön, az inaktív állapotú válaszjeladó teljesítmény további korlátozására lehet szükség.

3.1.2.10.2.2 *Hamis emisszió sugárzás*

Ajánlás – *CW sugárzás nem haladhatja meg a 70 dB-t 1 Watt alatt.*

3..1.2.10.3 *Különleges jellemzők*

3.1.2.10.3.1 *S-módú oldalszárny elnyomás*

Megjegyzés. – Oldalszárny elnyomás S-módú formátumoknál akkor fordul elő, amikor a P_5 impulzus rákerül a P_6 szinkronizáló fázis megfordítás elhelyezésre, amelynek az a következménye, hogy a válaszjeladó nem nyugtázza a lekérdezést (3.1.2.4.1.1.3 alpont).

Megadva egy S-módú lekérdezést, amely választ igényel, a válaszjeladónak:

a) minden MTL +3 dB és -21 dBm közötti jelszintnél 10 százaléknál kisebb válasz aránya lesz, ha a P_5 vett amplitúdó 3 dB-el vagy többel meghaladja a P_6 vett amplitúdót;

b) minden MTL +3 dB és -21 dBm közötti jelszintnél legalább 99 százalékos válasz aránya lesz, ha a vett P_6 amplitúdó 12 dB-el vagy többel meghaladja a P_5 vett amplitúdót.

3.1.2.10.3.2 *S-módú holtidő*. A holtidő olyan időközként lett meghatározva, amely egy válasz továbbítás végénél kezdődik, és akkor végződik, amikor a válaszjeladó visszanyeri az érzékenységét az MTL 3 dB-én belül. S-módú válaszjeladónak nem lehet 125 mikromásodpercnél hosszabb holtideje.

3.1.2.10.3.3 *S-módú vevő érzékenység csökkentés*. A válaszjeladó vevőjének érzékenységét a 3.1.1.7.7.1 pontnak megfelelően csökkentik a 0,7 mikromásodpercnél hosszabban tartó impulzusok vételével szemben.

3.1.2.10.3.3.1 *Helyreállítás érzékenység csökkentésből*. Az érzékenység csökkentésből történő helyreállítás a vett jel mindegyik impulzusának a lefutó élénél kezdődik, és a 3.1.1.7.7.2 pontban előírt sebességgel folyik le, feltéve, hogy nincs válasz- vagy adatátvitel a vett jelre való reagálás keretében.

3.1.2.10.3.4 *Helyreállítás olyan S-módú lekérdezések után, amelyek nem váltanak ki választ.*

3.1.2.10.3.4.1 Helyreállítás egyedüli S-módú lekérdezés után.

3.1.2.10.3.4.1.1 A válaszjeladó helyreállítja az MTL 3 dB-jén belüli érzékenységét nem később, mint 128 mikromásodperccel a szinkronizáló fázis megfordítás vétele után, amely egy S-módú lekérdezést követ, amelyet nem vesznek (3.1.2.4.1.2 alpont), vagy amelyet vesznek, de nem igényel választ.

3.1.2.10.3.4.1.2 **Ajánlás**. – *A válaszjeladónak az MTL 3 dB-jén belüli érzékenységét helyre kell állítani nem később, mint 45 mikromásodperccel a szinkronizáló fázis megfordítás vétele után, amely* *egy olyan S-módú lekérdezést követ, amit nem vesznek (3.1.2.4.1.2 alpont), vagy amelyet vesznek, de választ nem igényel.*

3.1.2.10.3.4.1.3 Minden S-módú válaszjeladónak, melyet 1999. Január 1-jén vagy azután szerelnek fel, az MTL 3 dB-jén belüli érzékenységét helyre kell állítani nem később, mint 45 mikromásodperccel a szinkronizáló fázis megfordítás vétele után, amely olyan S-módú lekérdezést követ, amelyet nem vesznek (3.1.2.4.1.2 alpont), vagy amelyet vesznek, de nem igényel választ.

3.1.2.10.3.4.2 *Helyreállítás S-módú Comm-C lekérdezés után.* Comm-C képességgel rendelkező S-módú válaszjeladó visszaállítja az MTL 3 dB-je belüli érzékenységét nem később, mint 45 mikromásodperccel a szinkronizáló fázis megfordítás vétele után, amely olyan Comm-C lekérdezés vételét követi, amelynek részére nincs válasz igény.

3.1.2.10.3.5 *Nem-kívánt S-módú válaszok.* Az S-módú válaszjeladók nem generálhatnak gyakrabban nem-kívánt S-módú válaszokat, mint 10 másodpercenként egyszer. A légijárműben a felszerelést úgy kell elvégezni, hogy ezt a szintet elérjék, amikor az összes lehetséges interferáló berendezés, amelyet ugyanarra a gépre felszereltek, maximális interferencia szinten működik.

3.1.2.10.3.6 *Válasz sebesség korlátozás*

Megjegyzés. – A válasz sebesség korlátozás külön van előírva A és C-módra és S-módra.

3.1.2.10.3.6.1 *S-módú válasz sebesség korlátozás*. Válasz sebesség korlátozást egy válaszjeladó S-módú formátumainál nem kívánnak meg. Ha ilyen korlátozó az áramkör védelem céljából be van építve, ez a 3.1.2.10.3.7.2 és 3.1.2.10.2.7.3 pontokban megkövetelt minimális lekérdezési sebességet teszi lehetővé.

3.1.2.10.3.6.2 *A- és C-módú válasz sebesség korlátozás.* A válasz sebesség korlátozás A- és C-módnál a 3.1.1.7.9.1 pontnak megfelelően érvényesül. Az előírt érzékenység csökkentés (3.1.1.7.9.2 alpont) nem befolyásolja a válaszjeladó S-módú teljesítményét.

3.1.2.10.3.7 *Minimális válasz sebesség képesség, A-, C- és S-módok.*

3.1.2.10.3.7.1 A 3.1.2.10.3.7 pontban meghatározott összes válasz-sebesség hozzáadódik bármely squitter továbbításhoz, amelynek megvalósítását a válaszjeladó megköveteli.

3.1.2.10.3.7.2 *Minimális válasz sebesség képesség, A- és C-módok.* A minimális válasz sebesség képesség A- és C-módnál a 3.1.1.7.9. pontnak megfelelő legyen.

3.1.2.10.3.7.3 *Minimális válasz sebesség képesség, S-mód.* A csak rövid S-módú válaszok továbbítására képes válaszjeladó a következő sebességekkel képes válaszokat generálni.

50 S-módú válasz egy 1-másodperces időközben
18 S-módú válasz egy 100 ezredmásodperces időközben
8 S-módú válasz egy 25 ezredmásodperces időközben
4 S-módú válasz egy 1,6 ezredmásodperces időközben

A fedélzetről leadott ELM továbbításokon kívül, egy 2-es, 3-as, vagy 4-es szintű válaszjeladó hosszú válaszokként képes generálni legalább az alábbiaknak megfelelő számban:

16 az 50 S-módú válaszból egy 1 másodperces időközben
6 a 18 S-módú válaszból egy 100 ezredmásodperces időközben
4 a 8 S-módú válaszból egy 25 ezredmásodperces időközben
2 a 4 S-módú válaszból egy 1,6 ezredmásodperces időközben

A fedélzetről leadott ELM továbbításokon kívül egy 5-ös szintű válaszjeladó hosszú válaszokként képes generálni legalább az alábbiaknak megfelelően:
24 az 50 S-módú válaszból egy 1-másodperces időközben
9 a 18 S-módú válaszból egy 100 ezredmásodperces időközben
6 a 8 S-módú válaszból egy 25 ezredmásodperces időközben
2 a 4 S-módú válaszból egy 1,6 ezredmásodperces időközben

Ezenkívül egy ACAS berendezésen belüli válaszjeladó ACAS koordinációs válaszként képes legalább 3-at generálni az 50 S-módú válaszból 1-másodperces időközben.

3.1.2.10.3.7.4 *Minimális S-módú ELM csúcs válasz sebesség*

1. Megjegyzés. – Amikor egy fedélzetről leadott ELM kezdeményezése történik (3.1.2.7.7.1 alpont), az S-módú válaszjeladó közli a várakozó közlemény hosszát (szegmensekben). A válaszjeladó legyen képes ilyen számú szegmens, plusz a hiányzó válaszok pótlására még egy ráhagyás átvitelére a földi lekérdező sugárzási szünete alatt.

Minden másodpercben legalább egyszer, a fedélzetről leadott ELM továbbítás üzemelésére kialakított S-módú válaszjeladó képes egy 25-ezredmásodperces időközben legalább 25 százalékkal több szegmenst továbbítani, mint amennyit a kezdeményezésben közölt (3.1.2.7.7.1 alpont). A fedélzetről leadott minimális hosszúságú ELM továbbítási képesség 4-es és 5-ös szintű válaszjeladóknál a 3.1.2.10.5.2.2 pontban meghatározottaknak felel meg.

2. Megjegyzés. – A fedélzetről leadott, maximális hosszúságú ELM továbbítás (16 szegmens) feldolgozására képes válaszjeladótól ezért megkövetelik, hogy képes legyen a fenti körülmények között 20-as hosszúságú válaszok átvitelére. A 4-es szintű válaszjeladók épülhetnek arra a folyamatra, amelynek hosszúsága kisebb, mint a maximális közlemény hossz. Ezek a válaszjeladók nem tudnak olyan közlemény hosszt kezdeményezni, amely meghaladja az adattovábbítási-képességeket. Pl. egy válaszjeladó, amely legfeljebb 10-es hosszúságú válaszokat tud átvinni, a fenti feltételek mellett soha nem tud bejelenteni egy 8 szegmensnél hosszabb közleményt.

3.1.2.10.3.8 *Válaszkésés és vibrálás*

Megjegyzés. – Miután egy lekérdezést vettek és amennyiben választ kérnek rá, ez a válasz továbbítás egy rögzített késés után kezdődik, amely késés a protokollok kivitele miatt szükséges. Ehhez a késéshez különböző értékek vannak kijelölve az A- és C-módú, S-módú és A/C/S-módú all-call válaszoknál.

3.1.2.10.3.8.1 *Válaszkésés és vibrálás A- és C-módoknál.* A válaszkésés és vibrálás az A- és C-módú tranzakcióknál a 3.1.1.7.10 pontban előírtaknak feleljen meg.

3.1.2.10.3.8.2 *Válaszkésés és vibrálás S- és C-módnál.* Az MTL és -21 dBm közötti összes bemeneti jel szintnél a válasz első bevezető impulzusának felfutó éle (3.1.2.1.5.2.2 alpont) 128 plusz vagy mínusz 0,25 mikromásodperccel a vett P_6 impulzus fordított szinkronizáló fázisában (3.1.2.1.5.2.2 alpont) jelenik meg. A válaszkésés vibrálása nem haladhatja meg a 0,08 mikromásodpercet csúcs (99,9 %-os).

3.1.2.10.3.8.3 *Válaszkésés és vibrálás A/C/S all-call módnál.* MTL jellel +3 dB és -21 dBm közötti összes bemeneti jelszintnél a válasz első bevezető impulzusának felfutó éle (3.1.2.2.5.1.1) 128 plusz vagy mínusz 0,5 mikromásodperccel a lekérdezés P_4 impulzusának lefutó éle után jelenik meg (3.1.2.1.5.1.1 alpont). A vibrálás nem haladhatja meg a 0,1 mikromásodpercet, csúcs (99,9 %-os).

Megjegyzés. – Egy 0,1 mikromásodperces csúcs vibrálás megegyezik a 3.1.1.7.10 pontban előírt vibrálással.

3.1.2.10.3.9 *Időzítő.* Az időzítők időtartama és sajátosságai a 3-7 táblázatban találhatók.

Minden időzítő legyen képes az újraindulásra. Valamilyen indítási utasítás vételére saját előírt idejükig fognak futni. Ez végbemegy függetlenül attól, hogy az indítási utasítás vételének idején működő vagy nem működő állapotban vannak. Az időzítő újraállítására vonatkozó utasítás az időzítő működését megállítja és visszaviszi a kezdeti állapotába egy következő indítási utasítás előkészítéseként.

3.1.2.10.3.10 *Válaszok gátlása.* Az A/C/S all-call-módú és csak S all-call-módú lekérdezésekre adott válaszokat mindig gátolni kell, ha a légijármű a földön van. Nincs lehetőség külön címzett S-módú lekérdezésekre adott válaszok gátlására, függetlenül attól, hogy a légijármű a levegőben vagy a földön van.

3.1.2.10.3.10.1 **Ajánlás.** – *A légijárműnek eszközzel kell rendelkeznie a földön tartózkodás megállapítására, és ennek az információnak a válaszjeladóhoz továbbítására.*

3.1.2.10.3 10.2 **Ajánlás.** – *Az A/C-módú válaszokat gátolni kell amikor a légijármű a földön van, hogy megakadályozzák az interferenciát, amikor szoros közelségben van egy lekérdezőhöz, vagy egy másik légijárműhöz.*

Megjegyzés. – Az S-módú külön címzett lekérdezések nem keltenek ilyen interferenciát, és igényelhetnek adatkapcsolati kommunikációt a repülőtéren lévő légijárművekkel. Adatbeszerzési squitter közlemények használhatók repülőtéren lévő légijárművek passzív felderítésére.

3-8 táblázat. Időzítő jellemzők

Időzítő		Hivatkozás	Szimbólum	Időtartam s	Tűrés s	Visszaállítható
Név	Szám					
Nem-szelektív kizárás	1	3.1.2.6.9.2	T_D	18	±1	Nem
Ideiglenes figyelmeztetés	1	3.1.2.6.10.1.1.2	T_C	18	±1	Nem
SPI	1	3.1.2.6.10.1.3	T_1	18	±1	Nem
B, C, D helyfoglalás	3*	3.1.2.6.11.3.1	T_R	18	±1	Igen
Többhelyes kizárás	78	3.1.2.6.9.1	T_L	18	±1	Nem
*Ahogy kívánt						

3.1.2.10.3.10.3 *Squitter adatátvitelek gátlása.* Nem lehet kiterjesztett squitter adatátviteleket gátolni, kivéve a 3.1.2.8.6 pontban ismertetetteket, és nem lehet adatbeszerzési squitter közleményeket gátolni, kivéve a 3.1.2.8.5 pontban leírtakat, függetlenül attól, hogy a légijármű a levegőben vagy a földön van.

Megjegyzés. – A squitter gátlására vonatkozóan további információkhoz lásd Másodlagos felderítő radar (SSR) rendszerek kézikönyve (Manual of Secondary Surveillance Radar (SSR) Systems) *(Doc 9684).*

3.1.2.10.4 *Válaszjeladó antenna rendszer és széttelepített üzemelés.* A széttelepített működésre felszerelt S-módú válaszjeladóknak két RF csatlakozási pontjuk van a két antennával való üzemeléshez, az egyik antenna a légijármű törzsének tetején, a másik az alján van elhelyezve. Az antennák egyikéről vett jelet a vételhez választják ki és a választ csak a kiválasztott antennáról továbbítják.

3.1.2.10.4.1 *Sugárzási séma.* Egy légijárműre szerelt S-módú antenna sugárzási sémája névlegesen ekvivalens egy negyedhullámú aszimmetrikus dipólus sugárzási sémájú antennáéval a föld felületén elhelyezve.

Megjegyzés. – Az olyan válaszjeladó antennák, amelyek a függőleges sugárnyaláb szélességnél való nyereség növelésére szolgálnak, nem kívánatosak, az elfordulásuk alatti alacsony teljesítményük miatt.

3.1.2.10.4.2 *Antenna elhelyezés.* A légijármű tetején és alján elhelyezett antennákat a törzs középvonalhoz a lehető legközelebb kell felszerelni. Az antennákat úgy kell elhelyezni, hogy minimalizálják a vízszintes síkban lévő mezőjük akadályozását.

3.1.2.10.4.2.1 **Ajánlás**. – A törzs tetején és alján elhelyezett antennák közötti vízszintes távolság nem lehet nagyobb, mint 7,6 m (25 láb).

Megjegyzés. – Ez az ajánlás arra szolgál, hogy fenntartsa bármely széttelepített válaszjeladó (a kábeleket is beleértve) működését bármilyen széttelepített antenna felszereléssel és még kielégítse a 3.1.2.10.4.5 alpont követelményeit.

3.1.2.10.4.3 *Antenna kiválasztás.* A széttelepített működésre felszerelt S-módú válaszjeladók rendelkeznek azzal a képességgel, hogy értékeljenek egy, a két antenna csatornára egyidőben érkező impulzus sorozatot, hogy egyenként meghatározzák mindkét antennára, hogy az S-módú lekérdezési bevezetés P_1 impulzusa és P_2 impulzusa kielégíti-e az S-módú lekérdezésre a 3.1.2.1 pontban előírt követelményeket és hogy az A-módú, és C-módú lekérdezések 3.1.1 pontban előírt követelményeit.

Megjegyzés. – A széttelepített működésre felszerelt válaszjeladók nem kötelezően rendelkezhetnek azzal a kéréssel, hogy a lekérdezések vett impulzusainak további jellemzőit értékeljék a széttelepített csatorna kiválasztások végrehajtásánál. A válaszjeladó opcióként értékelhet egy teljes S-módú lekérdezést, amelyet mindkét csatornán egyidőben vett, hogy egyenként megállapítsa az egyes csatornáknál, hogy a lekérdezés kielégíti-e a 3.1.2.4.1.2.3 pontban meghatározott, az S-módú lekérdezés vételére vonatkozó követelményeket.

3.1.2.10.4.3.1 Ha a két csatorna egyidőben veszi legalább a $P_1 – P_2$ impulzus párt, amely kielégíti az S-módú lekérdezésre vonatkozó követelményeket, vagy egy P_1-P_3 impulzus párt, amely kielégíti az A-módú vagy C-módú lekérdezésre vonatkozó követelményeket, vagy ha a két csatorna szimultán vesz egy komplett lekérdezést, akkor azt az antennát választja ki a megmaradó lekérdezés (ha van ilyen) vételére és a válasz továbbítására, amelyiknél a jelerősség nagyobb.

3.1.2.10.4.3.2 Ha csak egy csatorna vesz egy olyan impulzus párt, amely kielégíti a lekérdezéssel szembeni követelményeket, vagy ha csak egy csatorna vesz egy lekérdezést, az ezzel összekötött antennát választja ki, tekintet nélkül a vett jel erősségére.

3.1.2.10.4.3.3 *Kiválasztási küszöb.* Ha az antenna kiválasztás jelszinten alapul, ezt az összes MTL és -21 dBm között lévő szintre elvégzik.

Megjegyzés. – A kettő közül bármelyik antenna választható, ha a különbség a jelszintben kisebb, mint 3 dB.

3.1.2.10.4.3.4 *Vett csatorna késés tűrés.* Ha az egyik antennánál egy lekérdezést 0,125 mikromásodperccel, vagy ennél kisebb idővel vesz előbb, mint a másik antennánál lezajló vétel, a lekérdezéseket szimultán lekérdezéseknek tekinti, és a fenti antenna kiválasztást alkalmazza. Ha egy vett lekérdezést az egyik antennánál a másik antenna vétele előtt 0,375 mikromásodperccel vagy ennél nagyobb időértékkel előbb vesz, akkor azt az antennát választja ki a válaszadásra, amelyik a korábbi lekérdezést vette. Ha a vételek közötti időkülönbség 0,125 és 0,375mikromásodperc között van, a válaszjeladó az antennát a válaszadásra vagy a szimultán lekérdezés alapján, vagy a korábbi érkezési idő alapján választja ki.

3.1.2.10.4.4 *Széttelepített átviteli csatorna elkülönítése.* A kiválasztott antennáról átvitt csúcs RF teljesítmény legalább 20 dB-el haladja meg a nem kiválasztott antennáról továbbított teljesítményt.

3.1.2.10.4.5 *Széttelepített válaszjeladók válaszkésése.* A két antenna csatorna (beleértve a válaszjeladótól az antennáig vezető kábeleket is), a két antenna közötti, a repülőgép tengely mentén mért vízszintes távolság által okozott különböző késést is, közötti közepes válaszkésés teljes különbsége nem haladhatja meg a 0,13 mikromásodpercet egyenlő amplitudójú lekérdezéseknél. Ez a követelmény fennáll MTL +3 dB és 21 dBm közötti lekérdezési jel erősségekre. A vibrálási követelmények mindegyik csatornára megmaradnak úgy, ahogy a nem széttelepített válaszjeladóra azt előírták.

Megjegyzés. – Ez a követelmény korlátozza az antenna bekapcsolás és a kábelkésés különbségek okozta látszólagos vibrálást.

3.1.2.10.5 *Adatfeldolgozás és csatolóegységek*

3.1.2.10.5.1 *Közvetlen adatok.* Közvetlen adatok azok, amelyeket az S-módú rendszer felderítési protokollja igényel.

3.1.2.10.5.1.1 *Rögzített közvetlen adatok.* Rögzített közvetlen adatok azok a légijárművektől érkező adatok, amelyek repülés közben nem változnak és ezek a következők:

a) a légijármű címzés (3.1.2.4.1.2.3.1.1 és 3.1.2.5.2.2.2 pontok);
b) a maximális levegőhöz viszonyított sebesség (3.1.2.8.2.2 pont); és
c) a lajstromozási jel, ha repülési azonosításra használják (3.1.2.9.1.1 pont).

3.1.2.10.5.1.2 *Rögzített közvetlen adatok csatolóegységei*

Ajánlás. – *A válaszjeladó és a légijármű közötti csatolóegységeket úgy kell tervezni, hogy a rögzített közvetlen adat értékek inkább a légijármű telepítés függvényévé, mint a válaszjeladó összeállításának függvényévé váljanak.*

Megjegyzés. – Ennek az ajánlásnak a célja, hogy olyan csatolóegység eljárást bátorítson, amely lehetővé teszi a válaszjeladó cseréjét a válaszjeladó befolyásolása nélkül, a rögzített közvetlen adat beállításánál.

3.1.2.10.5.1.3 *Változó közvetlen adatok.* A változó közvetlen adatok azok a légijárműtől jövő adatok, amelyek repülés közben változhatnak és ide sorolhatók:

a) a C-módú magasság kód (3.1.2.6.5.4 alpont);
b) A-módú azonosítás kód (3.1.2.6.7.1 alpont);
c) a földön levő állapot (3.1.2.6.5.1 és 3.1.2.8.2.1 pontok);
d) a légijármű azonosítás, ha az nem a lajstrom jel (3.1.2.9.1.1 alpont); és
e) az SPI feltétel (3.1.2.6.10.1.3 pont).

3.1.2.10.5.1.4 *Változó közvetlen adatok csatolóegységei.* Egy eszközt kell alkalmazni az A-módú azonosítási kódhoz, az SPI állapothoz és a 2-es és e feletti szintű válaszjeladókhoz, és a repülőgép azonosítás pilóta által történő a változó adat csatolóegységen keresztül történő beállításához.

Csatolóegységeket kell alkalmazni a nyomásmagasság és a földön tartózkodás kódolásának elfogadásához.

Megjegyzés. – A változó közvetlen adatokhoz nincsen specifikus csatolóegység kialakítás előírva.

3.1.2.10.5.2 *Közvetett adatok.*

Megjegyzés. – Közvetett (indirekt) adatok azok, amelyek valamilyen irányban keresztül haladnak a válaszjeladón, de nincsenek hatással a felderítési feladatra.

Ha a közvetett adatok eredete és/vagy rendeltetési helye nincs a válaszjeladó bezárt részén belül, a szükséges kapcsolatokhoz csatolóegységeket kell használni.

3.1.2.10.5.2.1 *A csatolóegységek feladata*

Megjegyzés. – A közvetett adat csatolóegységek a szabványos tranzakcióknál olyan lekérdezéseket szolgálnak ki, amelyek választ és általános adási feladatot igényelnek. A közvetett adat csatolóegységek ELM-nél ezt a rendszert szolgálják ki és pufferolást és protokoll áramkört igényelnek a válaszjeladón belül. A csatolóegységek csatlakozó pontjait az egyes irányok és az egyes kiszolgálások szerint el lehet különíteni, vagy bármilyen módon kombinálni lehet őket.

3.1.2.10.5.2.1.1 *Fedélzetre irányuló szabványos hosszúságú tranzakció csatolóegységek.* A fedélzetre irányuló szabványos hosszúságú tranzakció csatolóegység a vett lekérdezések összes bitjét átviszi (az AP mező lehetséges kivételével) kivéve UF = 0, 11, vagy 16.

Megjegyzés. – AP szinten átvihető az integritás megvalósításának elősegítésére.

3.1.2.10.5.2.1.2 *Fedélzetről leadott szabványos hosszúságú tranzakció csatolóegység.* Egy válaszjeladó, amely perifériális berendezéstől származó információkat továbbít, képes bitek, vagy bit sémák vételére az átvitelen belüli megfelelő elhelyezésnél való beillesztéshez. Ezek az elhelyezések sem a válasz AP mezőjét, sem azokat, amelyekbe a válaszjeladó által belsőleg generált bit sémákat illesztenek bele, nem tartalmazzák.

Egy válaszjeladó amely a Comm-B formátum felhasználásával információkat továbbít, azonnali hozzáféréssel rendelkezik a kért adatokhoz olyan értelemben, hogy a válaszjeladó egy lekérdezésre a lekérdezés által kért adatokkal válaszol.

Megjegyzés. – Ez a követelmény két módon elégíthető ki:

a) a válaszjeladó el lehet látva belső adat- és protokoll pufferrel;

b) a válaszjeladó "valós idejű" ("real time") csatolóegységet alkalmazhat, amely úgy működik, hogy a fedélzetre irányuló adatok elhagyják a válaszjeladót, mielőtt a megfelelő válasz generálódik és a fedélzetről leadott adatok időben lépnek be a válaszjeladóba, hogy a válaszba beépüljenek.

3.1.2.10.5.2.1.3 *Kiterjesztett hosszúságú közlemény csatolóegység.*

Megjegyzés. – Az ELM csatolóegység kinyeri a válaszjeladóból és beviszi a válaszjeladóba a levegő és föld között cserélődő adatokat az ELM protokoll segítségével (3.1.2.7 alpont).

3.1.2.10.5.2.2 *Közvetett adat tranzakció sebességek*

3.1.2.10.5.2.2.1 Szabványos *hosszúságú tranzakciók.* Egy válaszjeladó, amely fel van szerelve információ külső berendezésekből és külső berendezésekbe való átviteléhez, legalább annyi adat feldolgozására képes, ahány válasz elő van írva minimális válasz sebességnek a 3.1.2.10.3.7.2 pontban és a lekérdezésekből származó fedélzetre irányuló adatok továbbítása legalább az alábbi sebességgel történik:

50 hosszú lekérdezés minden 1-másodperces időközben
18 hosszú lekérdezés 100-ezredmásodperces időközben
8 hosszú lekérdezés 25-ezredmásodperces időközben
4 hosszú lekérdezés 1,6-ezredmásodperces időközben.

1. Megjegyzés. – Egy válaszjeladónak, amely a 3.1.2.10.3.7.2 pont szerinti minimálisnál nagyobb válasz sebességre képes, nem kell hosszú lekérdezéseket vennie azután, hogy elérte a fenti fedélzetre irányuló adatok feldolgozási korlátokat.

2. Megjegyzés. – Az S-módú válasz az egyetlen eszköz egy S-módú lekérdezés adat tartalma vételének elismerésére. Igy, ha a válaszjeladó képes egy lekérdezésre válaszolni, az S-módú kialakításnak képesnek kell lennie az ebben a lekérdezésben tartalmazott adatok vételére, tekintet nélkül ez és más vett lekérdezések közötti időütemezésre. Néhány lekérdező átlapoló S-módú sugárnyalábjai jelentős mennyiségű adatfeldolgozás és pufferolás igényléshez vezethetnek. Az itt leírt minimum egy realisztikus szintre csökkenti az adatfeldolgozást és nem-vételi kikötés bejelentést szolgáltat a lekérdezőnek, hogy az adatokat átmenetileg nem veszi.

3.1.2.10.5.2.2.2 *Kiterjesztett hosszúságú tranzakciók.* A 3-as szintű (2.1.5.1.3 pont) és a 4-es szintű (2.1.5.1.4 pont) válaszjeladók képesek adatokat átadni legalább négy komplett tizenhat-szegmenses fedélzetre irányuló ELM-ektől (3.1.2.7.4 pont) négymásodperces időtartományban. Egy 5-szintes válaszjeladó (2.1.5.1.5 pont) képes adatok átvitelére legalább négy komplett tizenhat-szegmenses fedélzetre irányuló ELM-ből bármely egy-másodperces időközben, és képes legalább két komplett tizenhat-szegmenses fedélzetre irányuló ELM vételére ugyanazon II kóddal egy 250-ezredmásodperces időközben. Egy 4-es szintű válaszjeladó képes átvinni legalább egy négyszegmenses fedélzetre irányuló ELM-et (3.1.2.7.7 és 3.1.2.10.3.7.3 pontok) egy-másodperces időközben. Egy 5-ös szintű válaszjeladó képes átvinni legalább egy tizenhat-szegmensű fedélzetről leadott ELM-et bármely egymásodperces időközben.

3.1.2.10.5.2.2.2.1 **Ajánlás**. – *3-as szintű és 6-os szintű válaszjeladóknak képeseknek kell lenniük legalább két komplett tizenhat-szegmenses fedélzetre irányuló ELM vételére egy 250-ezredmásodperces időközben.*

3.1.2.10.5.2.3 *Adat formátumok fedélzetről leadott légijármű paraméter (DAP) szabványos hosszúságú tranzakcióihoz.* A fedélzetről leadott szabványos hosszúságú tranzakció csatolóegységet a fedélzetről leadott légijármű paraméterek (DAP) válaszjeladóhoz való továbbítására használják, amely ezeket a föld számára rendelkezésre állóvá teszi. Mindegyik DAP a Comm-B formátumban ('MB') van kötegelve, és vagy a földi kezdeményezésű Comm-B (GICB) protokoll felhasználásával, vagy MSP fedélzetről leadott adattovábbítás 3-as csatorna felhasználásával dataflash felhasználáson keresztül lehet kiszedni őket (ahogyan a 10. Annex, III. Kötet, I Rész, 5. fejezet 1. Függelékében meg lett határozva). A DAP-ok támogatására használt regiszterek formátumainak és felfrissítési sebességének (BDS 1,7; BDS 1,8 - 1,C-ig BDS1,D - 1,F-ig; BDF 4,0; BDS 5,0; BDS 6,0) a 10. Annex III. Kötet, I Rész, 5. fejezet 1. Függelékében előírtaknak kell megfelelniük.

Megjegyzés. – Útmutató anyagot a válaszjeladó regiszter formátumokról és adatforrásokról az S-módú különleges szolgáltatási kézikönyv (Manual on Mode S Specific Services) *(Doc 9688) tartalmaz.*

3.1.2.10.5.3 *Adat tartalom átvitel integritása.* Egy válaszjeladó, amely adat csatolóegységeket alkalmaz, elegendő védelmet tartalmazzon ahhoz, hogy kisebb hiba rátát biztosítson mint egy hiba minden 10^3 közleményben és kevesebb, mint egy nem-észlelt hibát 10^7 112-bites átvitelben az antenna és a minden csatolóegység bekötési pontjai között mindkét irányban.

3.1.2.10.5.4 *Közlemény törlés*. A fedélzetről leadott szabványos hosszúságú tranzakció csatolóegység és a kiterjesztett hosszúságú közlemény csatolóegység magában foglalja azt a képességet, hogy töröljön egy közleményt, amelyet a válaszjeladónak küldtek a földre továbbítás céljából, de amelynek továbbítási ciklusa még nem fejeződött be (azaz a kizárást földi lekérdező nem hajtotta végre.)

Megjegyzés. – Egy példa ennek a képességnek a szükségességére egy közlemény törlése, ha szállítást kísérel meg, amikor a légijármű nincs S-módú földi állomás lefedésén belül. A közleményt ekkor törlik, hogy megakadályozzák, annak leolvasását, és éppen aktuális közleményként értelmezzék, amikor a légijármű visszatér az S-módú légtérbe.

3.1.2.10.5.5 *Légi-irányítású közlemények.* Az ilyen fajtájú közlemény az összes 3.1.2.10.5.4 pontban jelzett tevékenységet igényli plusz a továbbítást a hely lekérdező azonosítójának válaszjeladójához, amelynek a közleményt vennie kell.

3.1.2.11 A földi lekérdező lényeges rendszer jellemzői

Megjegyzés. – Annak biztosítására, hogy az S-módú lekérdező akció ne legyen káros az A/C-módú lekérdezőkre, az S-módú lekérdezőkre teljesítmény korlátok léteznek.

3.1.2.11.1 *Lekérdezés ismétlési sebességek*. Az S-módú lekérdezők a legkisebb megvalósítható lekérdezési ismétlési sebességet használják az összes lekérdezési módra.

Megjegyzés. – Kis lekérdezés ismétlési sebességeknél, pontos azimut adatok monoimpulzus eljárással nyerhetők.

3.1.2.11.1.1 *All-call lekérdezés ismétlési sebesség.* A lekérdezési ismétlési sebesség A/C/S-módú all-call esetén, amelyet befogásnál használnak, legyen kisebb, mint 250 per másodperc. Ez a sebesség érvényes a párosított csak S-módú és csak A/C-módú all-call lekérdezésekre, amelyeket többhelyes módban történő befogásra használnak.

3.1.2.11.1.2 *Lekérdezési ismétlési sebesség egyedülálló légijárműnél*.

3.1.2.11.1.2.1 *Választ igénylő lekérdezések.* Választ igénylő S-módú lekérdezéseket nem továbbítanak egyetlen légijárműhöz 400 mikromásodpercnél rövidebb időközöknél.

3.1.2.11.1.2.2 *Fedélzetre irányuló ELM lekérdezések.* Az egymást követő Comm-C lekérdezések kezdete közötti minimális idő 50 mikromásodperc.

3.1.2.11.1.3 *Átviteli sebesség szelektív lekérdezéseknél.*

3.1.2.11.1.3.1 Minden S-módú lekérdezőnél az átviteli sebesség szelektív lekérdezéseknél a következő:

a) kisebb, mint 2400 per másodperc egy 40-ezredmásodperces időköz felett átlagolva; és
b) kisebb, mint 480 bármely 3-fokos szektorban egy 1-másodperces időköz felett.

3.1.2.11.1.3.2 Kiegészítőleg, egy S-módú lekérdezőnél, amelynek átlapoló lefedése van bármely más S-módú lekérdező oldalszirmaival, az átviteli sebesség szelektív lekérdezéseknél a következő lesz:

a) kisebb, mint 1200 per másodperc egy 4-másodperces időköz felett átlagolva
b) kisebb 1800 per másodperc egy egy-másodperces időköz felett átlagolva.

Megjegyzés. – A lekérdezők között oldalszirom elválasztását biztosító tipikus minimális távolság 35 km.

3.1.2.11.2 *Lekérdező-effektív sugárzott teljesítmény*

Ajánlás. – *Az összes lekérdezési impulzus effektív sugárzott teljesítményét a 3.1.1.8.2 pontban leírtak szerint kell minimalizálni.*

3.1.2.11.3 *Inaktív állapotú lekérdező kimenő teljesítmény.* Amikor a lekérdező adó berendezés nem továbbít lekérdezést, a kimenet nem haladhatja meg a -5 dBm effektív sugárzott teljesítményt, bármely 960 MHz és 1215 MHz közötti frekvenciánál.

Megjegyzés. – Ez a korlátozás biztosítja, hogy a lekérdező közelében repülő légijárművek 1,85 km (1 NM) közelségben nem vesznek interferenciát, amely megvédi őket attól, hogy egy másik lekérdező által követve legyenek. Bizonyos esetekben még kisebb lekérdező-légijármű távolságok bírnak jelentőséggel, pl. ha S-módú felderítést repülőtéri felszínen használnak. Ilyen esetekben az inaktív állapotú lekérdező kimenő teljesítményre további korlátozás válhat szükségessé.

3.1.2.11.3.1 *Hamis emisszió sugárzás*

Ajánlás. – *A CW-sugárzás nem haladhatja meg a 76 dB-t egy Watt alatt.*

3.1.2.11.4 *Továbbított jelek tűrései.* Hogy a térközi jelet a válaszjeladó a 3.1.2.1 pontban leírtaknak megfelelően venni tudja, a továbbított jel-tűréseknek a 3-8 táblázatban összegezettek szerintieknek kell lenniük.

3.1.2.11.5. *Hamis reagálás*

Ajánlás. – *A nem sáváteresztőn belüli jelekre való reagálásnak legalább 60 dB-el a normál érzékenység alatt kell lennie.*

3.1.2.11.6 *Kizárás koordináció.* Egy S-módú lekérdező nem üzemel all-call kizárást alkalmazva, amíg nem érték el az együttműködést az összes többi működő S-módú lekérdezőkkel, amelyek átlapoló lefedés térfogattal rendelkeznek, azért, hogy biztosítsák, hogy ne lehessen a lekérdezőtől megtagadni az S-móddal felszerelt légijármű befogását.

Megjegyzés. – Ezt a koordinációt földi hálózaton keresztül vagy a lekérdező azonosító (II) kódokon keresztül lehet megvalósítani, és regionális megegyezések szükségesek, ahol a lefedés nemzetközi határokat lapol át.

3.1.2.11.7 *Mobil lekérdezők*

3.1.2.11.7.1 **Ajánlás** – *Mobil lekérdezők S-módú légijárműveket, ahol csak lehet, squitterek vételén keresztül fogjanak be.*

Megjegyzés. – Passzív squitter megszerzés csökkenti a csatorna terhelést és koordináció szükségessége nélkül végrehajtható.

3-9 táblázat. Átvitt jel tűrések

Hivatkozás	*Feladat*	*Tűrés*
3.1.2.1.4.1	Impulzus időtartam P_1, P_2, P_3,	±0,09 mikromásodperc
	Impulzus időtartam P_6	±0,20 mikromásodperc
3.1.1.4	Impulzus időtartam P_1 - P	±0,18 mikromásodperc
	Impulzus időtartam P_1 - P_2	±0,10 mikromásodperc
3.1.2.1.5.1.3	Impulzus időtartam P_3 - P_4	±0,04 mikromásodperc
3..1.2.1.5.2.4	Impulzus időtartam P_1 -P_2	±0,04 mikromásodperc
	Impulzus időtartam P_2 - szinkron fázismegfordítás	±0,04 mikromásodperc
	Impulzus időtartam P_6 - szinkron fázismegfordítás	±0,04 mikromásodperc
	Impulzus időtartam P_5 - szinkron fázismegfordítás	±0,05 mikromásodperc
3.1.1.5	Impulzus amplitúdó P_3	P_1 ± 0,5 dB
3.1.2.1.5.1.4	Impulzus amplitúdó P_4	P_3 ± 0,5 dB
3.1.2.1.5.2.5	Impulzus amplitúdó P_6	Egyenlő vagy nagyobb, mint P_2 - 0,25 dB
3.1.2.1.4.1	Impulzus növekedés idő Impulzus lefutási idő	0,05 mikromásodperc minimum 0,1 mikromásodperc maximum 0,05 mikromásodperc minimum 0,2 mikromásodperc maximum

Függelék a 3. fejezethez

SSR automatikus nyomásmagasság átviteli kód
(impulzus pozíció kijelölés)

TARTOMÁNY		IMPULZUS POZÍCIÓ (0 vagy 1 az impulzus pozícióban egy impulzus hiányát vagy meglétét jelöli)										
NÖVEKMÉNY (láb)		D_2	D_4	A_1	A_2	A_4	B_1	B_2	B_4	C_1	C_2	C_4
-1000	-950	0	0	0	0	0	0	0	0	0	1	0
-950	-850	0	0	0	0	0	0	0	0	1	1	0
-850	-750	0	0	0	0	0	0	0	0	1	0	0
-750	-650	0	0	0	0	0	0	0	1	1	0	0
-650	-550	0	0	0	0	0	0	0	1	1	1	1
-550	-450	0	0	0	0	0	0	0	1	0	1	0
-450	-350	0	0	0	0	0	0	0	1	0	1	1
-350	-250	0	0	0	0	0	0	0	1	0	0	1
-250	-150	0	0	0	0	0	0	1	1	0	0	1
-150	-50	0	0	0	0	0	0	1	1	0	1	1
-50	50	0	0	0	0	0	0	1	1	0	1	0
50	150	0	0	0	0	0	0	1	1	1	1	0
150	250	0	0	0	0	0	0	1	1	1	0	0
250	350	0	0	0	0	0	0	1	0	1	0	0
350	450	0	0	0	0	0	0	1	0	1	1	0
450	550	0	0	0	0	0	0	1	0	0	1	0
550	650	0	0	0	0	0	0	1	0	0	1	1
650	750	0	0	0	0	0	0	1	0	0	0	1
750	850	0	0	0	0	0	1	1	0	0	0	1
850	950	0	0	0	0	0	1	1	0	0	1	1
950	1050	0	0	0	0	0	1	1	0	0	1	0
1050	1150	0	0	0	0	0	1	1	0	1	1	0
1150	1250	0	0	0	0	0	1	1	0	1	0	0
1250	1350	0	0	0	0	0	1	1	1	1	0	0
1350	1450	0	0	0	0	0	1	1	1	1	1	0
1450	1550	0	0	0	0	0	1	1	1	0	1	0
1550	1650	0	0	0	0	0	1	1	1	0	1	1
1650	1750	0	0	0	0	0	1	1	1	0	0	1
1750	1850	0	0	0	0	0	1	0	1	0	0	1
1850	1950	0	0	0	0	0	1	0	1	0	1	1
1950	2050	0	0	0	0	0	1	0	1	0	1	0
2050	2150	0	0	0	0	0	1	0	1	1	1	0
2150	2250	0	0	0	0	0	1	0	1	1	0	0
2250	2350	0	0	0	0	0	1	0	0	1	0	0
2350	2450	0	0	0	0	0	1	0	0	1	1	0
2450	2550	0	0	0	0	0	1	0	0	0	1	0
2550	2650	0	0	0	0	0	1	0	0	0	1	1
2650	2750	0	0	0	0	0	1	0	0	0	0	1
2750	2850	0	0	0	0	1	1	1	0	0	0	1

2850	2950	0	0	0	0	1	1	0	0	0	1	1
2950	3050	0	0	0	0	1	1	0	0	0	1	0
3050	3150	0	0	0	0	1	1	0	0	1	1	0
3150	3250	0	0	0	0	1	1	0	0	1	0	0
3250	3350	0	0	0	0	1	1	0	1	1	0	0
3350	3450	0	0	0	0	1	1	0	1	1	1	0
3450	3550	0	0	0	0	1	1	0	1	0	1	0
3550	3650	0	0	0	0	1	1	0	1	0	1	1
3650	3750	0	0	0	0	1	1	0	1	0	0	1
3750	3850	0	0	0	0	1	1	1	1	0	0	1
3850	3950	0	0	0	0	1	1	1	1	0	1	1
3950	4050	0	0	0	0	1	1	1	1	0	1	0
4050	4150	0	0	0	0	1	1	1	1	1	1	0
4150	4250	0	0	0	0	1	1	1	1	1	0	0
4250	4350	0	0	0	0	1	1	1	0	1	0	0
4350	4450	0	0	0	0	1	1	1	0	1	1	0
4450	4550	0	0	0	0	1	1	1	0	0	1	0
4550	4650	0	0	0	0	1	1	1	0	0	1	1
4650	4750	0	0	0	0	1	1	1	0	0	0	1
4750	4850	0	0	0	0	1	0	1	0	0	0	1
4850	4950	0	0	0	0	1	0	1	0	0	1	1
4950	5050	0	0	0	0	1	0	1	0	0	1	0
5050	5150	0	0	0	0	1	0	1	0	1	1	0
5150	5250	0	0	0	0	1	0	1	0	1	0	0
5250	5350	0	0	0	0	1	0	1	1	1	0	0
5350	5450	0	0	0	0	1	0	1	1	1	1	0
5450	5550	0	0	0	0	1	0	1	1	0	1	0
5550	5650	0	0	0	0	1	0	1	1	0	1	1
5650	5750	0	0	0	0	1	0	1	1	0	0	1
5750	5850	0	0	0	0	1	0	0	1	0	0	1
5850	5950	0	0	0	0	1	0	0	1	0	1	1
5950	6050	0	0	0	0	1	0	0	1	0	1	0
6050	6150	0	0	0	0	1	0	0	1	1	1	0
6150	6250	0	0	0	0	1	0	0	1	1	0	0
6250	6350	0	0	0	0	1	0	0	0	1	0	0
6350	6450	0	0	0	0	1	0	0	0	1	1	0
6450	6550	0	0	0	0	1	0	0	0	0	1	0
6550	6650	0	0	0	0	1	0	0	0	0	1	1
6650	6750	0	0	0	0	1	0	0	0	0	0	1
6750	6850	0	0	0	1	1	0	0	0	0	0	1
6850	6950	0	0	0	1	1	0	0	0	0	1	1
6950	7050	0	0	0	1	1	0	0	0	0	1	0
7050	7150	0	0	0	1	1	0	0	0	1	1	0
7150	7250	0	0	0	1	1	0	0	0	1	0	0
7250	7350	0	0	0	1	1	0	0	1	1	0	0
7350	7450	0	0	0	1	1	0	0	1	1	1	0
7450	7550	0	0	0	1	1	0	0	1	0	1	0
7550	7650	0	0	0	1	1	0	0	1	0	1	1
7650	7750	0	0	0	1	1	0	0	1	0	0	1

7750	7850	0	0	0	1	1	0	1	1	0	0	1
7850	7950	0	0	0	1	1	0	1	1	0	1	1
7950	8050	0	0	0	1	1	0	1	1	0	1	0
8050	8150	0	0	0	1	1	0	1	1	1	1	0
8150	8250	0	0	0	1	1	0	1	1	1	0	0
8250	8350	0	0	0	1	1	0	1	0	1	0	0
8350	8450	0	0	0	1	1	0	1	0	1	1	0
8450	8550	0	0	0	1	1	0	1	0	0	1	0
8550	8650	0	0	0	1	1	0	1	0	0	1	1
8650	8750	0	0	0	1	1	0	1	0	0	0	1
8750	8850	0	0	0	1	1	1	1	0	0	0	1
8850	8950	0	0	0	1	1	1	1	0	0	1	1
8950	9050	0	0	0	1	1	1	1	0	0	1	0
9050	9150	0	0	0	1	1	1	1	0	1	1	0
9150	9250	0	0	0	1	1	1	1	0	1	0	0
9250	9350	0	0	0	1	1	1	1	1	1	0	0
9350	9450	0	0	0	1	1	1	1	1	1	1	0
9450	9550	0	0	0	1	1	1	1	1	0	1	0
9550	9650	0	0	0	1	1	1	1	1	0	1	1
9650	9750	0	0	0	1	1	1	1	1	0	0	1
9750	9850	0	0	0	1	1	1	0	1	0	0	1
9850	9950	0	0	0	1	1	1	0	1	0	1	1
9950	10050	0	0	0	1	1	1	0	1	0	1	0
10050	10150	0	0	0	1	1	1	0	1	1	1	0
10150	10250	0	0	0	1	1	1	0	1	1	0	0
10250	10350	0	0	0	1	1	1	0	0	1	0	0
10350	10450	0	0	0	1	1	1	0	0	1	1	0
10450	10550	0	0	0	1	1	1	0	0	0	1	0
10550	10650	0	0	0	1	1	1	0	0	0	1	1
10650	10750	0	0	0	1	1	1	0	0	0	0	1
10750	10850	0	0	0	1	0	1	0	0	0	0	1
10850	10950	0	0	0	1	0	1	0	0	0	1	1
10950	11050	0	0	0	1	0	1	0	0	0	1	0
11050	11150	0	0	0	1	0	1	0	0	1	1	0
11150	11250	0	0	0	1	0	1	0	0	1	0	0
11250	11350	0	0	0	1	0	1	0	1	1	0	0
11350	11450	0	0	0	1	0	1	0	1	1	1	0
11450	11550	0	0	0	1	0	1	0	1	0	1	0
11550	11650	0	0	0	1	0	1	0	1	0	1	1
11650	11750	0	0	0	1	0	1	0	1	0	0	1
11750	11850	0	0	0	1	0	1	1	1	0	0	1
11850	11950	0	0	0	1	0	1	1	1	0	1	1
11950	12050	0	0	0	1	0	1	1	1	0	1	0
12050	12150	0	0	0	1	0	1	1	1	1	1	0
12150	12250	0	0	0	1	0	1	1	1	1	0	0
12250	12350	0	0	0	1	0	1	1	0	1	0	0
12350	12450	0	0	0	1	0	1	1	0	1	1	0
12450	12550	0	0	0	1	0	1	1	0	0	1	0
12550	12650	0	0	0	1	0	1	1	0	0	1	1

12650	12750	0	0	0	1	0	1	1	0	0	0	1
12750	12850	0	0	0	1	0	0	1	0	0	0	1
12850	12950	0	0	0	1	0	0	1	0	0	1	1
12950	13050	0	0	0	1	0	0	1	0	0	1	0
13050	13150	0	0	0	1	0	0	1	0	1	1	0
13150	13250	0	0	0	1	0	0	1	0	1	0	0
13250	13350	0	0	0	1	0	0	1	1	1	0	0
13350	13450	0	0	0	1	0	0	1	1	1	1	0
13450	13550	0	0	0	1	0	0	1	1	0	1	0
13550	13650	0	0	0	1	0	0	1	1	0	1	1
13650	13750	0	0	0	1	0	0	1	1	0	0	1
13750	13850	0	0	0	1	0	0	0	1	0	0	1
13850	13950	0	0	0	1	0	0	0	1	0	1	1
13950	14050	0	0	0	1	0	0	0	1	0	1	0
14050	14150	0	0	0	1	0	0	0	1	1	1	0
14150	14250	0	0	0	1	0	0	0	1	1	0	0
14250	14350	0	0	0	1	0	0	0	0	1	0	0
14350	14450	0	0	0	1	0	0	0	0	1	1	0
14450	14550	0	0	0	1	0	0	0	0	0	1	0
14550	14650	0	0	0	1	0	0	0	0	0	1	1
14650	14750	0	0	0	1	0	0	0	0	0	0	1
14750	14850	0	0	1	1	0	0	0	0	0	0	1
14850	14950	0	0	1	1	0	0	0	0	0	1	1
14950	15050	0	0	1	1	0	0	0	0	0	1	0
15050	15150	0	0	1	1	0	0	0	0	1	1	0
15150	15250	0	0	1	1	0	0	0	0	1	0	0
15250	15350	0	0	1	1	0	0	0	1	1	0	0
15350	15450	0	0	1	1	0	0	0	1	1	1	0
15450	15550	0	0	1	1	0	0	0	1	0	1	0
15550	15650	0	0	1	1	0	0	0	1	0	1	1
15650	15750	0	0	1	1	0	0	0	1	0	0	1
15750	15850	0	0	1	1	0	0	1	1	0	0	1
15850	15950	0	0	1	1	0	0	1	1	0	1	1
15950	16050	0	0	1	1	0	0	1	1	0	1	0
16050	16150	0	0	1	1	0	0	1	1	1	1	0
16150	16250	0	0	1	1	0	0	1	1	1	0	0
16250	16350	0	0	1	1	0	0	1	0	1	0	0
16350	16450	0	0	1	1	0	0	1	0	1	1	0
16450	16550	0	0	1	1	0	0	1	0	0	1	0
16550	16650	0	0	1	1	0	0	1	0	0	1	1
16650	16750	0	0	1	1	0	0	1	0	0	0	1
16750	16850	0	0	1	1	0	1	1	0	0	0	1
16850	16950	0	0	1	1	0	1	1	0	0	1	1
16950	17050	0	0	1	1	0	1	1	0	0	1	0
17050	17150	0	0	1	1	0	1	1	0	1	1	0
17150	17250	0	0	1	1	0	1	1	0	1	0	0
17250	17350	0	0	1	1	0	1	1	1	1	0	0
17350	17450	0	0	1	1	0	1	1	1	1	1	0
17450	17550	0	0	1	1	0	1	1	1	0	1	0

17550	17650	0	0	1	1	0	1	1	1	0	1	1
17650	17750	0	0	1	1	0	1	1	1	0	0	1
17750	17850	0	0	1	1	0	1	0	1	0	0	1
17850	17950	0	0	1	1	0	1	0	1	0	1	1
17950	18050	0	0	1	1	0	1	0	1	0	1	0
18050	18150	0	0	1	1	0	1	0	1	1	1	0
18150	18250	0	0	1	1	0	1	0	1	1	0	0
18250	18350	0	0	1	1	0	1	0	0	1	0	0
18350	18450	0	0	1	1	0	1	0	0	1	1	0
18450	18550	0	0	1	1	0	1	0	0	0	1	0
18550	18650	0	0	1	1	0	1	0	0	0	1	1
18650	18750	0	0	1	1	0	1	0	0	0	0	1
18750	18850	0	0	1	1	1	1	0	0	0	0	1
18850	18950	0	0	1	1	1	1	0	0	0	1	1
18950	19050	0	0	1	1	1	1	0	0	0	1	0
19050	19150	0	0	1	1	1	1	0	0	1	1	0
19150	19250	0	0	1	1	1	1	0	0	1	0	0
19250	19350	0	0	1	1	1	1	0	1	1	0	0
19350	19450	0	0	1	1	1	1	0	1	1	1	0
19450	19550	0	0	1	1	1	1	0	1	0	1	0
19550	19650	0	0	1	1	1	1	0	1	0	1	1
19650	19750	0	0	1	1	1	1	0	1	0	0	1
19750	19850	0	0	1	1	1	1	1	1	0	0	1
19850	19950	0	0	1	1	1	1	1	1	0	1	1
19950	20050	0	0	1	1	1	1	1	1	0	1	0
20050	20150	0	0	1	1	1	1	1	1	1	1	0
20150	20250	0	0	1	1	1	1	1	1	1	0	0
20250	20350	0	0	1	1	1	1	1	0	1	0	0
20350	20450	0	0	1	1	1	1	1	0	1	1	0
20450	20550	0	0	1	1	1	1	1	0	0	1	0
20550	20650	0	0	1	1	1	1	1	0	0	1	1
20650	20750	0	0	1	1	1	1	1	0	0	0	1
20750	20850	0	0	1	1	1	0	1	0	0	0	1
20850	20950	0	0	1	1	1	0	1	0	0	1	1
20950	21050	0	0	1	1	1	0	1	0	0	1	0
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21150	21250	0	0	1	1	1	0	1	0	1	0	0
21250	21350	0	0	1	1	1	0	1	1	1	0	0
21350	21450	0	0	1	1	1	0	1	1	1	1	0
21450	21550	0	0	1	1	1	0	1	1	0	1	0
21550	21650	0	0	1	1	1	0	1	1	0	1	1
21650	21750	0	0	1	1	1	0	1	1	0	0	1
21750	21850	0	0	1	1	1	0	0	1	0	0	1
21850	21950	0	0	1	1	1	0	0	1	0	1	1
21950	22050	0	0	1	1	1	0	0	1	0	1	0
22050	22150	0	0	1	1	1	0	0	1	1	1	0
22150	22250	0	0	1	1	1	0	0	1	1	0	0
22250	22350	0	0	1	1	1	0	0	0	1	0	0
22350	22450	0	0	1	1	1	0	0	0	1	1	0

22450	22550	0	0	1	1	1	0	0	0	0	1	0
22550	22650	0	0	1	1	1	0	0	0	0	1	1
22650	22750	0	0	1	1	1	0	0	0	0	0	1
22750	22850	0	0	1	0	1	0	0	0	0	0	1
22850	22950	0	0	1	0	1	0	0	0	0	1	1
22950	23050	0	0	1	0	1	0	0	0	0	1	0
23050	23150	0	0	1	0	1	0	0	0	1	1	0
23150	23250	0	0	1	0	1	0	0	0	1	0	0
23250	23350	0	0	1	0	1	0	0	1	1	0	0
23350	23450	0	0	1	0	1	0	0	1	1	1	0
23450	23550	0	0	1	0	1	0	0	1	0	1	0
23550	23650	0	0	1	0	1	0	0	1	0	1	1
23650	23750	0	0	1	0	1	0	0	1	0	0	1
23750	23850	0	0	1	0	1	0	1	1	0	0	1
23850	23950	0	0	1	0	1	0	1	1	0	1	1
23950	24050	0	0	1	0	1	0	1	1	0	1	0
24050	24150	0	0	1	0	1	0	1	1	1	1	0
24150	24250	0	0	1	0	1	0	1	1	1	0	0
24250	24350	0	0	1	0	1	0	1	0	1	0	0
24350	24450	0	0	1	0	1	0	1	0	1	1	0
24450	24550	0	0	1	0	1	0	1	0	0	1	0
24550	24650	0	0	1	0	1	0	1	0	0	1	1
24650	24750	0	0	1	0	1	0	1	0	0	0	1
24750	24850	0	0	1	0	1	1	1	0	0	0	1
24850	24950	0	0	1	0	1	1	1	0	0	1	1
24950	25050	0	0	1	0	1	1	1	0	0	1	0
25050	25150	0	0	1	0	1	1	1	0	1	1	0
25150	25250	0	0	1	0	1	1	1	0	1	0	0
25250	25350	0	0	1	0	1	1	1	1	1	0	0
25350	25450	0	0	1	0	1	1	1	1	1	1	0
25450	25550	0	0	1	0	1	1	1	1	0	1	0
25550	25650	0	0	1	0	1	1	1	1	0	1	1
25650	25750	0	0	1	0	1	1	1	1	0	0	1
25750	25850	0	0	1	0	1	1	0	1	0	0	1
25850	25950	0	0	1	0	1	1	0	1	0	1	1
25950	26050	0	0	1	0	1	1	0	1	0	1	0
26050	26150	0	0	1	0	1	1	0	1	1	1	0
26150	26250	0	0	1	0	1	1	0	1	1	0	0
26250	26350	0	0	1	0	1	1	0	0	1	0	0
26350	26450	0	0	1	0	1	1	0	0	1	1	0
26450	26550	0	0	1	0	1	1	0	0	0	1	0
26550	26650	0	0	1	0	1	1	0	0	0	1	1
26650	26750	0	0	1	0	1	1	0	0	0	0	1
26750	26850	0	0	1	0	0	1	0	0	0	0	1
26850	26950	0	0	1	0	0	1	0	0	0	1	1
26950	27050	0	0	1	0	0	1	0	0	0	1	0
27050	27150	0	0	1	0	0	1	0	0	1	1	0
27150	27250	0	0	1	0	0	1	0	0	1	0	0
27250	27350	0	0	1	0	0	1	0	1	1	0	0

27350	27450	0	0	1	0	0	1	0	1	1	1	0
27450	27550	0	0	1	0	0	1	0	1	0	1	0
27550	27650	0	0	1	0	0	1	0	1	0	1	1
27650	27750	0	0	1	0	0	1	0	1	0	0	1
27750	27850	0	0	1	0	0	1	1	1	0	0	1
27850	27950	0	0	1	0	0	1	1	1	0	1	1
27950	28050	0	0	1	0	0	1	1	1	0	1	0
28050	28150	0	0	1	0	0	1	1	1	1	1	0
28150	28250	0	0	1	0	0	1	1	1	1	0	0
28250	28350	0	0	1	0	0	1	1	0	1	0	0
28350	28450	0	0	1	0	0	1	1	0	1	1	0
28450	28550	0	0	1	0	0	1	1	0	0	1	0
28550	28650	0	0	1	0	0	1	1	0	0	1	1
28650	28750	0	0	1	0	0	1	1	0	0	0	1
28750	28850	0	0	1	0	0	0	1	0	0	0	1
28850	28950	0	0	1	0	0	0	1	0	0	1	1
28950	29050	0	0	1	0	0	0	1	0	0	1	0
29050	29150	0	0	1	0	0	0	1	0	1	1	0
29150	29250	0	0	1	0	0	0	1	0	1	0	0
29250	29350	0	0	1	0	0	0	1	1	1	0	0
29350	29450	0	0	1	0	0	0	1	1	1	1	0
29450	29550	0	0	1	0	0	0	1	1	0	1	0
29550	29650	0	0	1	0	0	0	1	1	0	1	1
29650	29750	0	0	1	0	0	0	1	1	0	0	1
29750	29850	0	0	1	0	0	0	0	1	0	0	1
29850	29950	0	0	1	0	0	0	0	1	0	1	1
29950	30050	0	0	1	0	0	0	0	1	0	1	0
30050	30150	0	0	1	0	0	0	0	1	1	1	0
30150	30250	0	0	1	0	0	0	0	1	1	0	0
30250	30350	0	0	1	0	0	0	0	0	1	0	0
30350	30450	0	0	1	0	0	0	0	0	1	1	0
30450	30550	0	0	1	0	0	0	0	0	0	1	0
30550	30650	0	0	1	0	0	0	0	0	0	1	1
30650	30750	0	0	1	0	0	0	0	0	0	0	1
30750	30850	0	1	1	0	0	0	0	0	0	0	1
30850	30950	0	1	1	0	0	0	0	0	0	1	1
30950	31050	0	1	1	0	0	0	0	0	0	1	0
31050	31150	0	1	1	0	0	0	0	0	1	1	0
31150	31250	0	1	1	0	0	0	0	0	1	0	0
31250	31350	0	1	1	0	0	0	0	1	1	0	0
31350	31450	0	1	1	0	0	0	0	1	1	1	0
31450	31550	0	1	1	0	0	0	0	1	0	1	0
31550	31650	0	1	1	0	0	0	0	1	0	1	1
31650	31750	0	1	1	0	0	0	0	1	0	0	1
31750	31850	0	1	1	0	0	0	1	1	0	0	1
31850	31950	0	1	1	0	0	0	1	1	0	1	1
31950	32050	0	1	1	0	0	0	1	1	0	1	0
32050	32150	0	1	1	0	0	0	1	1	1	1	0
32150	32250	0	1	1	0	0	0	1	1	1	0	0

32250	32350	0	1	1	0	0	0	1	0	1	0	0
32350	32450	0	1	1	0	0	0	1	0	1	1	0
32450	32550	0	1	1	0	0	0	1	0	0	1	0
32550	32650	0	1	1	0	0	0	1	0	0	1	1
32650	32750	0	1	1	0	0	0	1	0	0	0	1
32750	32850	0	1	1	0	0	1	1	0	0	0	1
32850	32950	0	1	1	0	0	1	1	0	0	1	1
32950	33050	0	1	1	0	0	1	1	0	0	1	0
33050	33150	0	1	1	0	0	1	1	0	1	1	0
33150	33250	0	1	1	0	0	1	1	0	1	0	0
33250	33350	0	1	1	0	0	1	1	1	1	0	0
33350	33450	0	1	1	0	0	1	1	1	1	1	0
33450	33550	0	1	1	0	0	1	1	1	0	1	0
33550	33650	0	1	1	0	0	1	1	1	0	1	1
33650	33750	0	1	1	0	0	1	1	1	0	0	1
33750	33850	0	1	1	0	0	1	0	1	0	0	1
33850	33950	0	1	1	0	0	1	0	1	0	1	1
33950	34050	0	1	1	0	0	1	0	1	0	1	0
34050	34150	0	1	1	0	0	1	0	1	1	1	0
34150	34250	0	1	1	0	0	1	0	1	1	0	0
34250	34350	0	1	1	0	0	1	0	0	1	0	0
34350	34450	0	1	1	0	0	1	0	0	1	1	0
34450	34550	0	1	1	0	0	1	0	0	0	1	0
34550	34650	0	1	1	0	0	1	0	0	0	1	1
34650	34750	0	1	1	0	0	1	0	0	0	0	1
34750	34850	0	1	1	0	1	1	0	0	0	0	1
34850	34950	0	1	1	0	1	1	0	0	0	1	1
34950	35050	0	1	1	0	1	1	0	0	0	1	0
35050	35150	0	1	1	0	1	1	0	0	1	1	0
35150	35250	0	1	1	0	1	1	0	0	1	0	0
35250	35350	0	1	1	0	1	1	0	1	1	0	0
35350	35450	0	1	1	0	1	1	0	1	1	1	0
35450	35550	0	1	1	0	1	1	0	1	0	1	0
35550	35650	0	1	1	0	1	1	0	1	0	1	1
35650	35750	0	1	1	0	1	1	0	1	0	0	1
35750	35850	0	1	1	0	1	1	1	1	0	0	1
35850	35950	0	1	1	0	1	1	1	1	0	1	1
35950	36050	0	1	1	0	1	1	1	1	0	1	0
36050	36150	0	1	1	0	1	1	1	1	1	1	0
36150	36250	0	1	1	0	1	1	1	1	1	0	0
36250	36350	0	1	1	0	1	1	1	0	1	0	0
36350	36450	0	1	1	0	1	1	1	0	1	1	0
36450	36550	0	1	1	0	1	1	1	0	0	1	0
36550	36650	0	1	1	0	1	1	1	0	0	1	1
36650	36750	0	1	1	0	1	1	1	0	0	0	1
36750	36850	0	1	1	0	1	0	1	0	0	0	1
36850	36950	0	1	1	0	1	0	1	0	0	1	1
36950	37050	0	1	1	0	1	0	1	0	0	1	0
37050	37150	0	1	1	0	1	0	1	0	1	1	0

37150	37250	0	1	1	0	1	0	1	0	1	0	0
37250	37350	0	1	1	0	1	0	1	1	1	0	0
37350	37450	0	1	1	0	1	0	1	1	1	1	0
37450	37550	0	1	1	0	1	0	1	1	0	1	0
37550	37650	0	1	1	0	1	0	1	1	0	1	1
37650	37750	0	1	1	0	1	0	1	1	0	0	1
37750	37850	0	1	1	0	1	0	0	1	0	0	1
37850	37950	0	1	1	0	1	0	0	1	0	1	1
37950	38050	0	1	1	0	1	0	0	1	0	1	0
38050	38150	0	1	1	0	1	0	0	1	1	1	0
38150	38250	0	1	1	0	1	0	0	1	1	0	0
38250	38350	0	1	1	0	1	0	0	0	1	0	0
38350	38450	0	1	1	0	1	0	0	0	1	1	0
38450	38550	0	1	1	0	1	0	0	0	0	1	1
38550	38650	0	1	1	0	1	0	0	0	0	1	1
38650	38750	0	1	1	0	1	0	0	0	0	0	1
38750	38850	0	1	1	1	1	0	0	0	0	0	1
38850	38950	0	1	1	1	1	0	0	0	0	1	1
38950	39050	0	1	1	1	1	0	0	0	0	1	0
39050	39150	0	1	1	1	1	0	0	0	1	1	0
39150	39250	0	1	1	1	1	0	0	0	1	0	0
39250	39350	0	1	1	1	1	0	0	1	1	0	0
39350	39450	0	1	1	1	1	0	0	1	1	1	0
39450	39550	0	1	1	1	1	0	0	1	0	1	0
39550	39650	0	1	1	1	1	0	0	1	0	1	1
39650	39750	0	1	1	1	1	0	0	1	0	0	1
39750	39850	0	1	1	1	1	0	1	1	0	0	1
39850	39950	0	1	1	1	1	0	1	1	0	1	1
39950	40050	0	1	1	1	1	0	1	1	0	1	0
40050	40150	0	1	1	1	1	0	1	1	1	1	0
40150	40250	0	1	1	1	1	0	1	1	1	0	0
40250	40350	0	1	1	1	1	0	1	0	1	0	0
40350	40450	0	1	1	1	1	0	1	0	1	1	0
40450	40550	0	1	1	1	1	0	1	0	0	1	0
40550	40650	0	1	1	1	1	0	1	0	0	1	1
40650	40750	0	1	1	1	1	0	1	0	0	0	1
40750	40850	0	1	1	1	1	1	1	0	0	0	1
40850	40950	0	1	1	1	1	1	1	0	0	1	1
40950	41050	0	1	1	1	1	1	1	0	0	1	0
41050	41150	0	1	1	1	1	1	1	0	1	1	0
41150	41250	0	1	1	1	1	1	1	0	1	0	0
41250	41350	0	1	1	1	1	1	1	1	1	0	0
41350	41450	0	1	1	1	1	1	1	1	1	1	0
41450	41550	0	1	1	1	1	1	1	1	0	1	0
41550	41650	0	1	1	1	1	1	1	1	0	1	1
41650	41750	0	1	1	1	1	1	1	1	0	0	1
41750	41850	0	1	1	1	1	1	0	1	0	0	1
41850	41950	0	1	1	1	1	1	0	1	0	1	1
41950	42050	0	1	1	1	1	1	0	1	0	1	0

42050	42150	0	1	1	1	1	1	0	1	1	1	0
42150	42250	0	1	1	1	1	1	0	1	1	0	0
42250	42350	0	1	1	1	1	1	0	0	1	0	0
42350	42450	0	1	1	1	1	1	0	0	1	1	0
42450	42550	0	1	1	1	1	1	0	0	0	1	0
42550	42650	0	1	1	1	1	1	0	0	0	1	1
42650	42750	0	1	1	1	1	1	0	0	0	0	1
42750	42850	0	1	1	1	0	1	0	0	0	0	1
42850	42950	0	1	1	1	0	1	0	0	0	1	1
42950	43050	0	1	1	1	0	1	0	0	0	1	0
43050	43150	0	1	1	1	0	1	0	0	1	1	0
43150	43250	0	1	1	1	0	1	0	0	1	0	0
43250	43350	0	1	1	1	0	1	0	1	1	0	0
43350	43450	0	1	1	1	0	1	0	1	1	1	0
43450	43550	0	1	1	1	0	1	0	1	0	1	0
43550	43650	0	1	1	1	0	1	0	1	0	1	1
43650	43750	0	1	1	1	0	1	0	1	0	0	1
43750	43850	0	1	1	1	0	1	1	1	0	0	1
43850	43950	0	1	1	1	0	1	1	1	0	1	1
43950	44050	0	1	1	1	0	1	1	1	0	1	0
44050	44150	0	1	1	1	0	1	1	1	1	1	0
44150	44250	0	1	1	1	0	1	1	1	1	0	0
44250	44350	0	1	1	1	0	1	1	0	1	0	0
44350	44450	0	1	1	1	0	1	1	0	1	1	0
44450	44550	0	1	1	1	0	1	1	0	0	1	0
44550	44650	0	1	1	1	0	1	1	0	0	1	1
44650	44750	0	1	1	1	0	1	1	0	0	0	1
44750	44850	0	1	1	1	0	0	1	0	0	0	1
44850	44950	0	1	1	1	0	0	1	0	0	1	1
44950	45050	0	1	1	1	0	0	1	0	0	1	0
45050	45150	0	1	1	1	0	0	1	0	1	1	0
45150	45250	0	1	1	1	0	0	1	0	1	0	0
45250	45350	0	1	1	1	0	0	1	1	1	0	0
45350	45450	0	1	1	1	0	0	1	1	1	1	0
45450	45550	0	1	1	1	0	0	1	1	0	1	0
45550	45650	0	1	1	1	0	0	1	1	0	1	1
45650	45750	0	1	1	1	0	0	1	1	0	0	1
45750	45850	0	1	1	1	0	0	0	1	0	0	1
45850	45950	0	1	1	1	0	0	0	1	0	1	1
45950	46050	0	1	1	1	0	0	0	1	0	1	0
46050	46150	0	1	1	1	0	0	0	1	1	1	0
46150	46250	0	1	1	1	0	0	0	1	1	0	0
46250	46350	0	1	1	1	0	0	0	0	1	0	0
46350	46450	0	1	1	1	0	0	0	0	1	1	0
46450	46550	0	1	1	1	0	0	0	0	0	1	0
46550	46650	0	1	1	1	0	0	0	0	0	1	1
46650	46750	0	1	1	1	0	0	0	0	0	0	1
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46850	46950	0	1	0	1	0	0	0	0	0	1	1

46950	47050	0	1	0	1	0	0	0	0	0	1	0
47050	47150	0	1	0	1	0	0	0	0	1	1	0
47150	47250	0	1	0	1	0	0	0	0	1	0	0
47250	47350	0	1	0	1	0	0	0	1	1	0	0
47350	47450	0	1	0	1	0	0	0	1	1	1	0
47450	47550	0	1	0	1	0	0	0	1	0	1	0
47550	47650	0	1	0	1	0	0	0	1	0	1	1
47650	47750	0	1	0	1	0	0	0	1	0	0	1
47750	47850	0	1	0	1	0	0	1	1	0	0	1
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47950	48050	0	1	0	1	0	0	1	1	0	1	0
48050	48150	0	1	0	1	0	0	1	1	1	1	0
48150	48250	0	1	0	1	0	0	1	1	1	0	0
48250	48350	0	1	0	1	0	0	1	0	1	0	0
48350	48450	0	1	0	1	0	0	1	0	1	1	0
48450	48550	0	1	0	1	0	0	1	0	0	1	0
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48650	48750	0	1	0	1	0	0	1	0	0	0	1
48750	48850	0	1	0	1	0	1	1	0	0	0	1
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49050	49150	0	1	0	1	0	1	1	0	1	1	0
49150	49250	0	1	0	1	0	1	1	0	1	0	0
49250	49350	0	1	0	1	0	1	1	1	1	0	0
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49450	49550	0	1	0	1	0	1	1	1	0	1	0
49550	49650	0	1	0	1	0	1	1	1	0	1	1
49650	49750	0	1	0	1	0	1	1	1	0	0	1
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49950	50050	0	1	0	1	0	1	0	1	0	1	0
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50250	50350	0	1	0	1	0	1	0	0	1	0	0
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50650	50750	0	1	0	1	0	1	0	0	0	0	1
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52050	52150	0	1	0	1	1	1	1	1	1	1	0
52150	52250	0	1	0	1	1	1	1	1	1	0	0
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53150	53250	0	1	0	1	1	0	1	0	1	0	0
53250	53350	0	1	0	1	1	0	1	1	1	0	0
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54150	54250	0	1	0	1	1	0	0	1	1	0	0
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55050	55150	0	1	0	0	1	0	0	0	1	1	0
55150	55250	0	1	0	0	1	0	0	0	1	0	0
55250	55350	0	1	0	0	1	0	0	1	1	0	0
55350	55450	0	1	0	0	1	0	0	1	1	1	0
55450	55550	0	1	0	0	1	0	0	1	0	1	0
55550	55650	0	1	0	0	1	0	0	1	0	1	1
55650	55750	0	1	0	0	1	0	0	1	0	0	1
55750	55850	0	1	0	0	1	0	1	1	0	0	1
55850	55950	0	1	0	0	1	0	1	1	0	1	1
55950	56050	0	1	0	0	1	0	1	1	0	1	0
56050	56150	0	1	0	0	1	0	1	1	1	1	0
56150	56250	0	1	0	0	1	0	1	1	1	0	0
56250	56350	0	1	0	0	1	0	1	0	1	0	0
56350	56450	0	1	0	0	1	0	1	0	1	1	0
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56950	57050	0	1	0	0	1	1	1	0	0	1	0
57050	57150	0	1	0	0	1	1	1	0	1	1	0
57150	57250	0	1	0	0	1	1	1	0	1	0	0
57250	57350	0	1	0	0	1	1	1	1	1	0	0
57350	57450	0	1	0	0	1	1	1	1	1	1	0
57450	57550	0	1	0	0	1	1	1	1	0	1	0
57550	57650	0	1	0	0	1	1	1	1	0	1	1
57650	57750	0	1	0	0	1	1	1	1	0	0	1
57750	57850	0	1	0	0	1	1	0	1	0	0	1
57850	57950	0	1	0	0	1	1	0	1	0	1	1
57950	58050	0	1	0	0	1	1	0	1	0	1	0
58050	58150	0	1	0	0	1	1	0	1	1	1	0
58150	58250	0	1	0	0	1	1	0	1	1	0	0
58250	58350	0	1	0	0	1	1	0	0	1	0	0
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59150	59250	0	1	0	0	0	1	0	0	1	0	0
59250	59350	0	1	0	0	0	1	0	1	1	0	0
59350	59450	0	1	0	0	0	1	0	1	1	1	0
59450	59550	0	1	0	0	0	1	0	1	0	1	0
59550	59650	0	1	0	0	0	1	0	1	0	1	1
59650	59750	0	1	0	0	0	1	0	1	0	0	1
59750	59850	0	1	0	0	0	1	1	1	0	0	1
59850	59950	0	1	0	0	0	1	1	1	0	1	1
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60150	60250	0	1	0	0	0	1	1	1	1	0	0
60250	60350	0	1	0	0	0	1	1	0	1	0	0
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60650	60750	0	1	0	0	0	1	1	0	0	0	1
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61950	62050	0	1	0	0	0	0	0	1	0	1	0
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62150	62250	0	1	0	0	0	0	0	1	1	0	0
62250	62350	0	1	0	0	0	0	0	0	1	0	0
62350	62450	0	1	0	0	0	0	0	0	1	1	0
62450	62550	0	1	0	0	0	0	0	0	0	1	0
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62650	62750	0	1	0	0	0	0	0	0	0	0	1
62750	62850	1	1	0	0	0	0	0	0	0	0	1
62850	62950	1	1	0	0	0	0	0	0	0	1	1
62950	63050	1	1	0	0	0	0	0	0	0	1	0
63050	63150	1	1	0	0	0	0	0	0	1	1	0
63150	63250	1	1	0	0	0	0	0	0	1	0	0
63250	63350	1	1	0	0	0	0	0	1	1	0	0
63350	63450	1	1	0	0	0	0	0	1	1	1	0
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63750	63850	1	1	0	0	0	0	1	1	0	0	1
63850	63950	1	1	0	0	0	0	1	1	0	1	1
63950	64050	1	1	0	0	0	0	1	1	0	1	0
64050	64150	1	1	0	0	0	0	1	1	1	1	0
64150	64250	1	1	0	0	0	0	1	1	1	0	0
64250	64350	1	1	0	0	0	0	1	0	1	0	0
64350	64450	1	1	0	0	0	0	1	0	1	1	0
64450	64550	1	1	0	0	0	0	1	0	0	1	0
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64650	64750	1	1	0	0	0	0	1	0	0	0	1
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64950	65050	1	1	0	0	0	1	1	0	0	1	0
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65150	65250	1	1	0	0	0	1	1	0	1	0	0
65250	65350	1	1	0	0	0	1	1	1	1	0	0
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65650	65750	1	1	0	0	0	1	1	1	0	0	1
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66150	66250	1	1	0	0	0	1	0	1	1	0	0
66250	66350	1	1	0	0	0	1	0	0	1	0	0
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67050	67150	1	1	0	0	1	1	0	0	1	1	0
67150	67250	1	1	0	0	1	1	0	0	1	0	0
67250	67350	1	1	0	0	1	1	0	1	1	0	0
67350	67450	1	1	0	0	1	1	0	1	1	1	0
67450	67550	1	1	0	0	1	1	0	1	0	1	0
67550	67650	1	1	0	0	1	1	0	1	0	1	1
67650	67750	1	1	0	0	1	1	0	1	0	0	1
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67850	67950	1	1	0	0	1	1	1	1	0	1	1
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68150	68250	1	1	0	0	1	1	1	1	1	0	0
68250	68350	1	1	0	0	1	1	1	0	1	0	0
68350	68450	1	1	0	0	1	1	1	0	1	1	0
68450	68550	1	1	0	0	1	1	1	0	0	1	0
68550	68650	1	1	0	0	1	1	1	0	0	1	1
68650	68750	1	1	0	0	1	1	1	0	0	0	1
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68950	69050	1	1	0	0	1	0	1	0	0	1	0
69050	69150	1	1	0	0	1	0	1	0	1	1	0
69150	69250	1	1	0	0	1	0	1	0	1	0	0
69250	69350	1	1	0	0	1	0	1	1	1	0	0
69350	69450	1	1	0	0	1	0	1	1	1	1	0
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69650	69750	1	1	0	0	1	0	1	1	0	0	1
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69850	69950	1	1	0	0	1	0	0	1	0	1	1
69950	70050	1	1	0	0	1	0	0	1	0	1	0
70050	70150	1	1	0	0	1	0	0	1	1	1	0
70150	70250	1	1	0	0	1	0	0	1	1	0	0
70250	70350	1	1	0	0	1	0	0	0	1	0	0
70350	70450	1	1	0	0	1	0	0	0	1	1	0
70450	70550	1	1	0	0	1	0	0	0	0	1	0
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70650	70750	1	1	0	0	1	0	0	0	0	0	1
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71850	71950	1	1	0	1	1	0	1	1	0	1	1
71950	72050	1	1	0	1	1	0	1	1	0	1	0
72050	72150	1	1	0	1	1	0	1	1	1	1	0
72150	72250	1	1	0	1	1	0	1	1	1	0	0
72250	72350	1	1	0	1	1	0	1	0	1	0	0
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72650	72750	1	1	0	1	1	0	1	0	0	0	1
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72850	72950	1	1	0	1	1	1	1	0	0	1	1
72950	73050	1	1	0	1	1	1	1	0	0	1	0
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73150	73250	1	1	0	1	1	1	1	0	1	0	0
73250	73350	1	1	0	1	1	1	1	1	1	0	0
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73950	74050	1	1	0	1	1	1	0	1	0	1	0
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74150	74250	1	1	0	1	1	1	0	1	1	0	0
74250	74350	1	1	0	1	1	1	0	0	1	0	0
74350	74450	1	1	0	1	1	1	0	0	1	1	0
74450	74550	1	1	0	1	1	1	0	0	0	1	0
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74650	74750	1	1	0	1	1	1	0	0	0	0	1
74750	74850	1	1	0	1	0	1	0	0	0	0	1
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74950	75050	1	1	0	1	0	1	0	0	0	1	0
75050	75150	1	1	0	1	0	1	0	0	1	1	0
75150	75250	1	1	0	1	0	1	0	0	1	0	0
75250	75350	1	1	0	1	0	1	0	1	1	0	0
75350	75450	1	1	0	1	0	1	0	1	1	1	0
75450	7550	1	1	0	1	0	1	0	1	0	1	0
75550	75650	1	1	0	1	0	1	0	1	0	1	1
75650	75750	1	1	0	1	0	1	0	1	0	0	1
75750	75850	1	1	0	1	0	1	1	1	0	0	1
75850	75950	1	1	0	1	0	1	1	1	0	1	1
75950	76050	1	1	0	1	0	1	1	1	0	1	0
76050	76150	1	1	0	1	0	1	1	1	1	1	0
76150	76250	1	1	0	1	0	1	1	1	1	0	0
76250	76350	1	1	0	1	0	1	1	0	1	0	0

76350	76450	1	1	0	1	0	1	1	0	1	1	0
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76550	76650	1	1	0	1	0	1	1	0	0	1	1
76650	76750	1	1	0	1	0	1	1	0	0	0	1
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76850	76950	1	1	0	1	0	0	1	0	0	1	1
76950	77050	1	1	0	1	0	0	1	0	0	1	0
77050	77150	1	1	0	1	0	0	1	0	1	1	0
77150	77250	1	1	0	1	0	0	1	0	1	0	0
77250	77350	1	1	0	1	0	0	1	1	1	0	0
77350	77450	1	1	0	1	0	0	1	1	1	1	0
77450	77550	1	1	0	1	0	0	1	1	0	1	0
77550	77650	1	1	0	1	0	0	1	1	0	1	1
77650	77750	1	1	0	1	0	0	1	1	0	0	1
77750	77850	1	1	0	1	0	0	0	1	0	0	1
77850	77950	1	1	0	1	0	0	0	1	0	1	1
77950	78050	1	1	0	1	0	0	0	1	0	1	0
78050	78150	1	1	0	1	0	0	0	1	1	1	0
78150	78250	1	1	0	1	0	0	0	1	1	0	0
78250	78350	1	1	0	1	0	0	0	0	1	0	0
78350	78450	1	1	0	1	0	0	0	0	1	1	0
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78550	78650	1	1	0	1	0	0	0	0	0	1	1
78650	78750	1	1	0	1	0	0	0	0	0	0	0
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78950	79050	1	1	1	1	0	0	0	0	0	1	0
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79150	79250	1	1	1	1	0	0	0	0	1	0	0
79250	79350	1	1	1	1	0	0	0	1	1	0	0
79350	79450	1	1	1	1	0	0	0	1	1	1	0
79450	79550	1	1	1	1	0	0	0	1	0	1	0
79550	79650	1	1	1	1	0	0	0	1	0	1	1
79650	79750	1	1	1	1	0	0	0	1	0	0	1
79750	79850	1	1	1	1	0	0	1	1	0	0	1
79850	79950	1	1	1	1	0	0	1	1	0	1	1
79950	80050	1	1	1	1	0	0	1	1	0	1	0
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80250	80350	1	1	1	1	0	0	1	0	1	0	0
80350	80450	1	1	1	1	0	0	1	0	1	1	0
80450	80550	1	1	1	1	0	0	1	0	0	1	0
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80650	80750	1	1	1	1	0	0	1	0	0	0	1
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80850	80950	1	1	1	1	0	1	1	0	0	1	1
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81050	81150	1	1	1	1	0	1	1	0	1	1	0
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81450	81550	1	1	1	1	0	1	1	1	0	1	0
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81650	81750	1	1	1	1	0	1	1	1	0	0	1
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81850	81950	1	1	1	1	0	1	0	1	0	1	1
81950	82050	1	1	1	1	0	1	0	1	0	1	0
82050	82150	1	1	1	1	0	1	0	1	1	1	0
82150	82250	1	1	1	1	0	1	0	1	1	0	0
82250	82350	1	1	1	1	0	1	0	0	1	0	0
82350	82450	1	1	1	1	0	1	0	0	1	1	0
82450	82550	1	1	1	1	0	1	0	0	0	1	0
82550	82650	1	1	1	1	0	1	0	0	0	1	1
82650	82750	1	1	1	1	0	1	0	0	0	0	1
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82950	83050	1	1	1	1	1	1	0	0	0	1	0
83050	83150	1	1	1	1	1	1	0	0	1	1	0
83150	83250	1	1	1	1	1	1	0	0	1	0	0
83250	83350	1	1	1	1	1	1	0	1	1	0	0
83350	83450	1	1	1	1	1	1	0	1	1	1	0
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83550	83650	1	1	1	1	1	1	0	1	0	1	1
83650	83750	1	1	1	1	1	1	0	1	0	0	1
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83850	83950	1	1	1	1	1	1	1	1	0	1	1
83950	84050	1	1	1	1	1	1	1	1	0	1	0
84050	84150	1	1	1	1	1	1	1	1	1	1	0
84150	84250	1	1	1	1	1	1	1	1	1	0	0
84250	84350	1	1	1	1	1	1	1	0	1	0	0
84350	84450	1	1	1	1	1	1	1	0	1	1	0
84450	84550	1	1	1	1	1	1	1	0	0	1	0
84550	84650	1	1	1	1	1	1	1	0	0	1	1
84650	84750	1	1	1	1	1	1	1	0	0	0	1
84750	84850	1	1	1	1	1	0	1	0	0	0	1
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84950	85050	1	1	1	1	1	0	1	0	0	1	0
85050	85150	1	1	1	1	1	0	1	0	1	1	0
85150	85250	1	1	1	1	1	0	1	0	1	0	0
85250	85350	1	1	1	1	1	0	1	1	1	0	0
85350	85450	1	1	1	1	1	0	1	1	1	1	0
85450	85550	1	1	1	1	1	0	1	1	0	1	0
85550	85650	1	1	1	1	1	0	1	1	0	1	1
85650	85750	1	1	1	1	1	0	1	1	0	0	1
85750	85850	1	1	1	1	1	0	0	1	0	0	1
85850	85950	1	1	1	1	1	0	0	1	0	1	1
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86050	86150	1	1	1	1	1	0	0	1	1	1	0

86150	86250	1	1	1	1	1	0	0	1	1	0	0
86250	86350	1	1	1	1	1	0	0	0	1	0	0
86350	86450	1	1	1	1	1	0	0	0	1	1	0
86450	86550	1	1	1	1	1	0	0	0	0	1	0
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86650	86750	1	1	1	1	1	0	0	0	0	0	1
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86850	86950	1	1	1	0	1	0	0	0	0	1	1
86950	87050	1	1	1	0	1	0	0	0	0	1	0
87050	87150	1	1	1	0	1	0	0	0	1	1	0
87150	87250	1	1	1	0	1	0	0	0	1	0	0
87250	87350	1	1	1	0	1	0	0	1	1	0	0
87350	87450	1	1	1	0	1	0	0	1	1	1	0
87450	87550	1	1	1	0	1	0	0	1	0	1	0
87550	87650	1	1	1	0	1	0	0	1	0	1	1
87650	87750	1	1	1	0	1	0	0	1	0	0	1
87750	87850	1	1	1	0	1	0	1	1	0	0	1
87850	87950	1	1	1	0	1	0	1	1	0	1	1
87950	88050	1	1	1	0	1	0	1	1	0	1	0
88050	88150	1	1	1	0	1	0	1	1	1	1	0
88150	88250	1	1	1	0	1	0	1	1	1	0	0
88250	88350	1	1	1	0	1	0	1	0	1	0	0
88350	88450	1	1	1	0	1	0	1	0	1	1	0
88450	88550	1	1	1	0	1	0	1	0	0	1	0
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88650	88750	1	1	1	0	1	0	1	0	0	0	1
88750	88850	1	1	1	0	1	1	1	0	0	0	1
88850	88950	1	1	1	0	1	1	1	0	0	1	1
88950	89050	1	1	1	0	1	1	1	0	0	1	0
88050	89150	1	1	1	0	1	1	1	0	1	1	0
89150	89250	1	1	1	0	1	1	1	0	1	0	0
89250	89350	1	1	1	0	1	1	1	1	1	0	0
89350	89450	1	1	1	0	1	1	1	1	1	1	0
89450	89550	1	1	1	0	1	1	1	1	0	1	0
89550	89650	1	1	1	0	1	1	1	1	0	1	1
89650	89750	1	1	1	0	1	1	1	1	0	0	1
89750	89850	1	1	1	0	1	1	0	1	0	0	1
89850	89950	1	1	1	0	1	1	0	1	0	1	1
89950	90050	1	1	1	0	1	1	0	1	0	1	0
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90150	90250	1	1	1	0	1	1	0	1	1	0	0
90250	90350	1	1	1	0	1	1	0	0	1	0	0
90350	90450	1	1	1	0	1	1	0	0	1	1	0
90450	90550	1	1	1	0	1	1	0	0	0	1	0
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90650	90750	1	1	1	0	1	1	0	0	0	0	1
90750	90850	1	1	1	0	0	1	0	0	0	0	1
90850	90950	1	1	1	0	0	1	0	0	0	1	1
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91250	91350	1	1	1	0	0	1	0	1	1	0	0
91350	91450	1	1	1	0	0	1	0	1	1	1	0
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95650	91750	1	1	1	0	0	1	0	1	0	0	1
91750	91850	1	1	1	0	0	1	1	1	0	0	1
91850	91950	1	1	1	0	0	1	1	1	0	1	1
91950	92050	1	1	1	0	0	1	1	1	0	1	0
92050	92150	1	1	1	0	0	1	1	1	1	1	0
92150	92250	1	1	1	0	0	1	1	1	1	0	0
92250	92350	1	1	1	0	0	1	1	0	1	0	0
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92650	92750	1	1	1	0	0	1	1	0	0	0	1
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92850	92950	1	1	1	0	0	0	1	0	0	1	1
92950	93050	1	1	1	0	0	0	1	0	0	1	0
93050	93150	1	1	1	0	0	0	1	0	1	1	0
93150	93250	1	1	1	0	0	0	1	0	1	0	0
93250	93350	1	1	1	0	0	0	1	1	1	0	0
93350	93450	1	1	1	0	0	0	1	1	1	1	0
93450	93550	1	1	1	0	0	0	1	1	0	1	0
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94250	94350	1	1	1	0	0	0	0	0	1	0	0
94350	94450	1	1	1	0	0	0	0	0	1	1	0
94450	94550	1	1	1	0	0	0	0	0	0	1	0
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94650	94750	1	1	1	0	0	0	0	0	0	0	1
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94950	95050	1	0	1	0	0	0	0	0	0	1	0
95050	95150	1	0	1	0	0	0	0	0	1	1	0
95150	95250	1	0	1	0	0	0	0	0	1	0	0
95250	95350	1	0	1	0	0	0	0	1	1	0	0
95350	95450	1	0	1	0	0	0	0	1	1	1	0
95450	95550	1	0	1	0	0	0	0	1	0	1	0
95550	95650	1	0	1	0	0	0	0	1	0	1	1
95650	95750	1	0	1	0	0	0	0	1	0	0	1
95750	95850	1	0	1	0	0	0	1	1	0	0	1
95850	95950	1	0	1	0	0	0	1	1	0	1	1

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96050	96150	1	0	1	0	0	0	1	1	1	1	0
96150	96250	1	0	1	0	0	0	1	1	1	0	0
96250	96350	1	0	1	0	0	0	1	0	1	0	0
96350	96450	1	0	1	0	0	0	1	0	1	1	0
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96950	97050	1	0	1	0	0	1	1	0	0	1	0
97050	97150	1	0	1	0	0	1	1	0	1	1	0
97150	97250	1	0	1	0	0	1	1	0	1	0	0
97250	97350	1	0	1	0	0	1	1	1	1	0	0
97350	97450	1	0	1	0	0	1	1	1	1	1	0
97450	97550	1	0	1	0	0	1	1	1	0	1	0
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97650	97750	1	0	1	0	0	1	1	1	0	0	1
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97950	98050	1	0	1	0	0	1	0	1	0	1	0
98050	98150	1	0	1	0	0	1	0	1	1	1	0
98150	98250	1	0	1	0	0	1	0	1	1	0	0
98250	98350	1	0	1	0	0	1	0	0	1	0	0
98350	98450	1	0	1	0	0	1	0	0	1	1	0
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98950	99050	1	0	1	0	1	1	0	0	0	1	0
99050	99150	1	0	1	0	1	1	0	0	1	1	0
99150	99250	1	0	1	0	1	1	0	0	1	0	0
99250	99350	1	0	1	0	1	1	0	1	1	0	0
99350	99450	1	0	1	0	1	1	0	1	1	1	0
99450	99550	1	0	1	0	1	1	0	1	0	1	0
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99650	99750	1	0	1	0	1	1	0	1	0	0	1
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99850	99950	1	0	1	0	1	1	1	1	0	1	1
99950	100050	1	0	1	0	1	1	1	1	0	1	0
100050	100150	1	0	1	0	1	1	1	1	1	1	0
100150	100250	1	0	1	0	1	1	1	1	1	0	0
100250	100350	1	0	1	0	1	1	1	0	1	0	0
100350	100450	1	0	1	0	1	1	1	0	1	1	0
100450	100550	1	0	1	0	1	1	1	0	0	1	0
100550	100650	1	0	1	0	1	1	1	0	0	1	1
100650	100750	1	0	1	0	1	1	1	0	0	0	1
100750	100850	1	0	1	0	1	0	1	0	0	0	1

100850	100950	1	0	1	0	1	0	1	0	0	1	1
100950	101050	1	0	1	0	1	0	1	0	0	1	0
101050	101150	1	0	1	0	1	0	1	0	1	1	0
101150	101250	1	0	1	0	1	0	1	0	1	0	0
101250	101350	1	0	1	0	1	0	1	1	1	0	0
101350	101450	1	0	1	0	1	0	1	1	1	1	0
101450	101550	1	0	1	0	1	0	1	1	0	1	0
101550	101650	1	0	1	0	1	0	1	1	0	1	1
101650	101750	1	0	1	0	1	0	1	1	0	0	1
101750	101850	1	0	1	0	1	0	0	1	0	0	1
101850	101950	1	0	1	0	1	0	0	1	0	1	1
101950	102050	1	0	1	0	1	0	0	1	0	1	0
102050	102150	1	0	1	0	1	0	0	1	1	1	0
102150	102250	1	0	1	0	1	0	0	1	1	0	0
102250	102350	1	0	1	0	1	0	0	0	1	0	0
102350	102450	1	0	1	0	1	0	0	0	1	1	0
102450	102550	1	0	1	0	1	0	0	0	0	1	0
102550	102650	1	0	1	0	1	0	0	0	0	1	1
102650	102750	1	0	1	0	1	0	0	0	0	0	1
102750	102850	1	0	1	1	1	0	0	0	0	0	1
102850	102950	1	0	1	1	1	0	0	0	0	1	1
102950	103050	1	0	1	1	1	0	0	0	0	1	0
103050	103150	1	0	1	1	1	0	0	0	1	1	0
103150	103250	1	0	1	1	1	0	0	0	1	0	0
103250	103350	1	0	1	1	1	0	0	1	1	0	0
103350	103450	1	0	1	1	1	0	0	1	1	1	0
103450	103550	1	0	1	1	1	0	0	1	0	1	0
103550	103650	1	0	1	1	1	0	0	1	0	1	1
103650	103750	1	0	1	1	1	0	0	1	0	0	1
103750	103850	1	0	1	1	1	0	1	1	0	0	1
103850	103950	1	0	1	1	1	0	1	1	0	1	1
103950	104050	1	0	1	1	1	0	1	1	0	1	0
104050	104150	1	0	1	1	1	0	1	1	1	1	0
104150	104250	1	0	1	1	1	0	1	1	1	0	0
104250	104350	1	0	1	1	1	0	1	0	1	0	0
104350	104450	1	0	1	1	1	0	1	0	1	1	0
104450	104550	1	0	1	1	1	0	1	0	0	1	0
104550	104650	1	0	1	1	1	0	1	0	0	1	1
104650	104750	1	0	1	1	1	0	1	0	0	0	1
104750	104850	1	0	1	1	1	1	1	0	0	0	1
104850	104950	1	0	1	1	1	1	1	0	0	1	1
104950	105050	1	0	1	1	1	1	1	0	0	1	0
105050	105150	1	0	1	1	1	1	1	0	1	1	0
105150	105250	1	0	1	1	1	1	1	0	1	0	0
105250	105350	1	0	1	1	1	1	1	1	1	0	0
105350	105450	1	0	1	1	1	1	1	1	1	1	0
105450	105550	1	0	1	1	1	1	1	1	0	1	0
105550	105650	1	0	1	1	1	1	1	1	0	1	1
105650	105750	1	0	1	1	1	1	1	1	0	0	1

105750	105850	1	0	1	1	1	1	0	1	0	0	1
105850	105950	1	0	1	1	1	1	0	1	0	1	1
105950	105050	1	0	1	1	1	1	0	1	0	1	0
106050	106150	1	0	1	1	1	1	0	1	1	1	0
106150	106250	1	0	1	1	1	1	0	1	1	0	0
106250	106350	1	0	1	1	1	1	0	0	1	0	0
106350	106450	1	0	1	1	1	1	0	0	1	1	0
106450	106550	1	0	1	1	1	1	0	0	0	1	0
106550	106650	1	0	1	1	1	1	0	0	0	1	1
106650	106750	1	0	1	1	1	1	0	0	0	0	1
106750	106850	1	0	1	1	0	1	0	0	0	0	1
106850	106950	1	0	1	1	0	1	0	0	0	1	1
106950	107050	1	0	1	1	0	1	0	0	0	1	0
107050	107150	1	0	1	1	0	1	0	0	1	1	0
107150	107250	1	0	1	1	0	1	0	0	1	0	0
107250	107350	1	0	1	1	0	1	0	1	1	0	0
107350	107450	1	0	1	1	0	1	0	1	1	1	0
107450	107550	1	0	1	1	0	1	0	1	0	1	0
107550	107650	1	0	1	1	0	1	0	1	0	1	1
107650	107750	1	0	1	1	0	1	0	1	0	0	1
107750	107850	1	0	1	1	0	1	1	1	0	0	1
107850	107950	1	0	1	1	0	1	1	1	0	1	1
107950	108050	1	0	1	1	0	1	1	1	0	1	0
108050	108150	1	0	1	1	0	1	1	1	1	1	0
108150	108250	1	0	1	1	0	1	1	1	1	0	0
108250	108350	1	0	1	1	0	1	1	0	1	0	0
108350	108450	1	0	1	1	0	1	1	0	1	1	0
108450	108550	1	0	1	1	0	1	1	0	0	1	0
108550	108650	1	0	1	1	0	1	1	0	0	1	1
108650	108750	1	0	1	1	0	1	1	0	0	0	1
108750	108850	1	0	1	1	0	0	1	0	0	0	1
108850	108950	1	0	1	1	0	0	1	0	0	1	1
108950	109050	1	0	1	1	0	0	1	0	0	1	0
109050	109150	1	0	1	1	0	0	1	0	1	1	0
109150	109250	1	0	1	1	0	0	1	0	1	0	0
109250	109350	1	0	1	1	0	0	1	1	1	0	0
109350	109450	1	0	1	1	0	0	1	1	1	1	0
109450	109550	1	0	1	1	0	0	1	1	0	1	0
109550	109650	1	0	1	1	0	0	1	1	0	1	1
109650	109750	1	0	1	1	0	0	1	1	0	0	1
109750	109850	1	0	1	1	0	0	0	1	0	0	1
109850	109950	1	0	1	1	0	0	0	1	0	1	1
109950	110050	1	0	1	1	0	0	0	1	0	1	0
110050	110150	1	0	1	1	0	0	0	1	1	1	0
110150	110250	1	0	1	1	0	0	0	1	1	0	0
110250	110350	1	0	1	1	0	0	0	0	1	0	0
110350	110450	1	0	1	1	0	0	0	0	1	1	0
110450	110550	1	0	1	1	0	0	0	0	0	1	0
110550	110650	1	0	1	1	0	0	0	0	0	1	1

110650	110750	1	0	1	1	0	0	0	0	0	0	1
110750	110850	1	0	0	1	0	0	0	0	0	0	1
110850	110950	1	0	0	1	0	0	0	0	0	1	1
110950	111050	1	0	0	1	0	0	0	0	0	1	0
111050	111150	1	0	0	1	0	0	0	0	1	1	0
111150	111250	1	0	0	1	0	0	0	0	1	0	0
111250	111350	1	0	0	1	0	0	0	1	1	0	0
111350	111450	1	0	0	1	0	0	0	1	1	1	0
111450	111550	1	0	0	1	0	0	0	1	0	1	0
111550	111650	1	0	0	1	0	0	0	1	0	1	1
111650	111750	1	0	0	1	0	0	0	1	0	0	1
111750	111850	1	0	0	1	0	0	1	1	0	0	1
111850	111950	1	0	0	1	0	0	1	1	0	1	1
111950	112050	1	0	0	1	0	0	1	1	0	1	0
112050	112150	1	0	0	1	0	0	1	1	1	1	0
112150	112250	1	0	0	1	0	0	1	1	1	0	0
112250	112350	1	0	0	1	0	0	1	0	1	0	0
112350	112450	1	0	0	1	0	0	1	0	1	1	0
112450	112550	1	0	0	1	0	0	1	0	0	1	0
112550	112650	1	0	0	1	0	0	1	0	0	1	1
112650	112750	1	0	0	1	0	0	1	0	0	0	1
112750	112850	1	0	0	1	0	1	1	0	0	0	1
112850	112950	1	0	0	1	0	1	1	0	0	1	1
112950	113050	1	0	0	1	0	1	1	0	0	1	0
113050	113150	1	0	0	1	0	1	1	0	1	1	0
113150	113250	1	0	0	1	0	1	1	0	1	0	0
113250	113350	1	0	0	1	0	1	1	1	1	0	0
113350	113450	1	0	0	1	0	1	1	1	1	1	0
113450	113550	1	0	0	1	0	1	1	1	0	1	0
113550	113650	1	0	0	1	0	1	1	1	0	1	1
113650	113750	1	0	0	1	0	1	1	1	0	0	1
113750	113850	1	0	0	1	0	1	0	1	0	0	1
113850	113950	1	0	0	1	0	1	0	1	0	1	1
113950	114050	1	0	0	1	0	1	0	1	0	1	0
114050	114150	1	0	0	1	0	1	0	1	1	1	0
114150	114250	1	0	0	1	0	1	0	1	1	0	0
114250	114350	1	0	0	1	0	1	0	0	1	0	0
114350	114450	1	0	0	1	0	1	0	0	1	1	0
114450	114550	1	0	0	1	0	1	0	0	0	1	0
114550	114650	1	0	0	1	0	1	0	0	0	1	1
114650	114750	1	0	0	1	0	1	0	0	0	0	1
114750	114850	1	0	0	1	1	1	0	0	0	0	1
114850	114950	1	0	0	1	1	1	0	0	0	1	1
114950	115050	1	0	0	1	1	1	0	0	0	1	0
115050	115150	1	0	0	1	1	1	0	0	1	1	0
115150	115250	1	0	0	1	1	1	0	0	1	0	0
115250	115350	1	0	0	1	1	1	0	1	1	0	0
115350	115450	1	0	0	1	1	1	0	1	1	1	0
115450	115550	1	0	0	1	1	1	0	1	0	1	0

115550	115650	1	0	0	1	1	1	0	1	0	1	1
115650	115750	1	0	0	1	1	1	0	1	0	0	1
115750	115850	1	0	0	1	1	1	1	1	0	0	1
115850	115950	1	0	0	1	1	1	1	1	0	1	1
115950	116050	1	0	0	1	1	1	1	1	0	1	0
116050	116150	1	0	0	1	1	1	1	1	1	1	0
116150	116250	1	0	0	1	1	1	1	1	1	0	0
116250	116350	1	0	0	1	1	1	1	0	1	0	0
116350	116450	1	0	0	1	1	1	1	0	1	1	0
116450	116550	1	0	0	1	1	1	1	0	0	1	0
116550	116650	1	0	0	1	1	1	1	0	0	1	1
116650	116750	1	0	0	1	1	1	1	0	0	0	1
116750	116850	1	0	0	1	1	0	1	0	0	0	1
116850	116950	1	0	0	1	1	0	1	0	0	1	1
116950	117050	1	0	0	1	1	0	1	0	0	1	0
117050	117150	1	0	0	1	1	0	1	0	1	1	0
117150	117250	1	0	0	1	1	0	1	0	1	0	0
117250	117350	1	0	0	1	1	0	1	1	1	0	0
117350	117450	1	0	0	1	1	0	1	1	1	1	0
117450	117550	1	0	0	1	1	0	1	1	0	1	0
117550	117650	1	0	0	1	1	0	1	1	0	1	1
117650	117750	1	0	0	1	1	0	1	1	0	0	1
117750	117850	1	0	0	1	1	0	0	1	0	0	1
117850	117950	1	0	0	1	1	0	0	1	0	1	1
117950	118050	1	0	0	1	1	0	0	1	0	1	0
118050	118150	1	0	0	1	1	0	0	1	1	1	0
118150	118250	1	0	0	1	1	0	0	1	1	0	0
118250	118350	1	0	0	1	1	0	0	0	1	0	0
118350	118450	1	0	0	1	1	0	0	0	1	1	0
118450	118550	1	0	0	1	1	0	0	0	0	1	0
118550	118650	1	0	0	1	1	0	0	0	0	1	1
118650	118750	1	0	0	1	1	0	0	0	0	0	1
118750	118850	1	0	0	0	1	0	0	0	0	0	1
118850	118950	1	0	0	0	1	0	0	0	0	1	1
118950	119050	1	0	0	0	1	0	0	0	0	1	0
119050	119150	1	0	0	0	1	0	0	0	1	1	0
119150	119250	1	0	0	0	1	0	0	0	1	0	0
119250	119350	1	0	0	0	1	0	0	1	1	0	0
119350	119450	1	0	0	0	1	0	0	1	1	1	0
119450	119550	1	0	0	0	1	0	0	1	0	1	0
119550	119650	1	0	0	0	1	0	0	1	0	1	1
119650	119750	1	0	0	0	1	0	0	1	0	0	1
119750	119850	1	0	0	0	1	0	1	1	0	0	1
119850	119950	1	0	0	0	1	0	1	1	0	1	1
119950	120050	1	0	0	0	1	0	1	1	0	1	0
120050	120150	1	0	0	0	1	0	1	1	1	1	0
120150	120250	1	0	0	0	1	0	1	1	1	0	0
120250	120350	1	0	0	0	1	0	1	0	1	0	0
120350	120450	1	0	0	0	1	0	1	0	1	1	0

120450	120550	1	0	0	0	1	0	1	0	0	1	0
120550	120650	1	0	0	0	1	0	1	0	0	1	1
120650	120750	1	0	0	0	1	0	1	0	0	0	1
120750	120850	1	0	0	0	1	1	1	0	0	0	1
120850	120950	1	0	0	0	1	1	1	0	0	1	1
120950	121050	1	0	0	0	1	1	1	0	0	1	0
121050	121150	1	0	0	0	1	1	1	0	1	1	0
121150	121250	1	0	0	0	1	1	1	0	1	0	0
121250	121350	1	0	0	0	1	1	1	1	1	0	0
121350	121450	1	0	0	0	1	1	1	1	1	1	0
121450	121550	1	0	0	0	1	1	1	1	0	1	0
121550	121650	1	0	0	0	1	1	1	1	0	1	1
121650	121750	1	0	0	0	1	1	1	1	0	0	1
121750	121850	1	0	0	0	1	1	0	1	0	0	1
121850	121950	1	0	0	0	1	1	0	1	0	1	1
121950	122050	1	0	0	0	1	1	0	1	0	1	0
122050	122150	1	0	0	0	1	1	0	1	1	1	0
122150	122250	1	0	0	0	1	1	0	1	1	0	0
122250	122350	1	0	0	0	1	1	0	0	1	0	0
122350	122450	1	0	0	0	1	1	0	0	1	1	0
122450	122550	1	0	0	0	1	1	0	0	0	1	0
122550	122650	1	0	0	0	1	1	0	0	0	1	1
122650	122750	1	0	0	0	1	1	0	0	0	0	1
122750	122850	1	0	0	0	0	1	0	0	0	0	1
122850	122950	1	0	0	0	0	1	0	0	0	1	1
122950	123050	1	0	0	0	0	1	0	0	0	1	0
123050	123150	1	0	0	0	0	1	0	0	1	1	0
123150	123250	1	0	0	0	0	1	0	0	1	0	0
123250	123350	1	0	0	0	0	1	0	1	1	0	0
123350	123450	1	0	0	0	0	1	0	1	1	1	0
123450	123550	1	0	0	0	0	1	0	1	0	1	0
123550	123650	1	0	0	0	0	1	0	1	0	1	1
123650	123750	1	0	0	0	0	1	0	1	0	0	1
123750	123850	1	0	0	0	0	1	1	1	0	0	1
123850	123950	1	0	0	0	0	1	1	1	0	1	1
123950	124050	1	0	0	0	0	1	1	1	0	1	0
124050	124150	1	0	0	0	0	1	1	1	1	1	0
124150	124250	1	0	0	0	0	1	1	1	1	0	0
124250	124350	1	0	0	0	0	1	1	0	1	0	0
124350	124450	1	0	0	0	0	1	1	0	1	1	0
124450	124550	1	0	0	0	0	1	1	0	0	1	0
124550	124650	1	0	0	0	0	1	1	0	0	1	1
124650	124750	1	0	0	0	0	1	1	0	0	0	1
124750	124850	1	0	0	0	0	0	1	0	0	0	1
124850	124950	1	0	0	0	0	0	1	0	0	1	1
124950	125050	1	0	0	0	0	0	1	0	0	1	0
125050	125150	1	0	0	0	0	0	1	0	1	1	0
125150	125250	1	0	0	0	0	0	1	0	1	0	0
125250	125350	1	0	0	0	0	0	1	1	1	0	0

125350	125450	1	0	0	0	0	0	1	1	1	1	0
125450	125550	1	0	0	0	0	0	1	1	0	1	0
125550	125650	1	0	0	0	0	0	1	1	0	1	1
125650	125750	1	0	0	0	0	0	1	1	0	0	1
125750	125850	1	0	0	0	0	0	0	1	0	0	1
125850	125950	1	0	0	0	0	0	0	1	0	1	1
125950	126050	1	0	0	0	0	0	0	1	0	1	0
126050	126150	1	0	0	0	0	0	0	1	1	1	0
126150	126250	1	0	0	0	0	0	0	1	1	0	0
126250	126350	1	0	0	0	0	0	0	0	1	0	0
126350	126450	1	0	0	0	0	0	0	0	1	1	0
126450	126550	1	0	0	0	0	0	0	0	0	1	0
126550	126650	1	0	0	0	0	0	0	0	0	1	1
126650	126750	1	0	0	0	0	0	0	0	0	0	1

4. fejezet Összeütközés elkerülését biztosító fedélzeti rendszer

1. *Megjegyzés. – Az összeütközés elkerülését biztosító fedélzeti rendszerre vonatkozó útmutató anyagot az A melléklet tartalmazza.*

2. Megjegyzés. – Nem-SI alternatív mértékegységek az 5. Annex, 3. fejezet, 3.2.2 pontja által megengedett módon kerülnek használatra. Korlátozott esetekben, a következetesség biztosítása céljából - a logikai számítások szintjén - olyan mértékegységek kerülnek felhasználásra, mint láb/s, NM/s és kt/s.

4.1 Az összeütközés elkerülését biztosító fedélzeti rendszerekre vonatkozó meghatározások

ACAS I

Egy olyan ACAS, amely "lásd és kerüld el" cselekvést elősegítő információt állít elő, de nincs megoldási tanácsadás (RA) generáló képessége.

Megjegyzés. – Az ICAO nem törekszik az ACAS I. nemzetközi bevezetésére és szabványosítására. Ezért az ACAS I. jellemzőitől csupán más ACAS konfigurációkkal összeegyeztethető működés biztosítását és interferencia korlátozást követelnek meg a 4.2 pontban meghatározottak szerint.

ACAS II

Egy olyan ACAS, amely a forgalmi tanácsadás (TA) mellett függőleges megoldási javaslatot (RA) is szolgáltat.

ACAS III

Egy olyan ACAS, amely a forgalomi tanácsadás (TA) mellett függőleges és vízszintes megoldás javaslatot (RA) is szolgáltat.

ACAS rádióadás – ACAS broadcast

Hosszú S-módú levegő-levegő felderítési lekérdezés (UF = 16) a rádióadás címekkel.

Aktív RAC – Active RAC
A RAC aktív, ha folyamatosan korlátozza az RA szelektálását. RAC-ok, amelyeket az utolsó hat másodpercen belül vettek, és nincsenek félreérthetetlenül törölve, aktívak.

Magasság keresztezési megoldási tanácsadás – Altitude crossing RA
A magasság keresztezésére szolgáló megoldási tanácsadás, ha a saját ACAS légijármű jelenleg legalább 30 m-el (100 láb) van a fenyegető légijármű felett vagy alatt, megfelelőképpen lefelé- vagy felfelé irányuló mozgásra szóló javaslatként.

Emelkedési megoldási tanácsadás– Climb RA
Pozitív megoldási tanácsadás, amely emelkedést, de nem egy fokozott emelkedést tanácsol.

Legszorosabb megközelítés – Closest approach
A saját ACAS légijármű és a megközelítő légijármű közötti minimális távolság bekövetkezése. Így a legszorosabb megközelítés tartománya a két légijármű közötti legkisebb távolság, és a legszorosabb megközelítés ideje az az időpont, amelynél ez bekövetkezik.

Koordináció – Coordination
Az a folyamat, amelynek során két ACAS-al felszerelt légijármű összeegyeztethető megoldási javaslatokat (RA) választanak a megoldási javaslatok kiegészítésének (RAC) cseréje útján.

Koordinációs lekérdezés – Coordination interrogation
ACAS II vagy III által sugárzott S-módú lekérdezés (fedélzetre irányuló adattovábbítás), amely megoldási közleményt tartalmaz.

Koordinációs válasz – Coordination reply
Az ACAS II vagy III kialakítású rendszer részét képező S-módú válaszjeladónak, a koordinációs lekérdezés fogadását visszaigazoló S-módú válasza (fedélzetről leadott adattovábbítás).

Korrekciós megoldási tanácsadás – Corrective RA
Megoldás tanácsadás, amely azt tanácsolja a légijárművezetőnek, hogy térjen le a jelenlegi repülési pályáról.

Ciklus – Cycle
Az ebben a fejezetben használt "ciklus" fogalom egy teljes áthaladást jelent az ACAS II vagy ACAS III által végrehajtott feladatok sorozatán, névlegesen egyszer egy másodperc alatt.

Süllyedés megoldási tanácsadás – Descend RA
Pozitív megoldási javaslat, amely süllyedést, de nem fokozott süllyedést tanácsol.

Létrehozott nyomvonal – Established track
ACAS levegő-levegő felderítés által generált nyomvonal, melyet tényleges légijármű nyomvonalként kezelnek.

Megnövelt mértékű megoldási tanácsadás – Increased rate RA
Megoldási javaslat, amely azt tanácsolja, hogy a magasságváltozási sebességet az előző emelkedési vagy süllyedési javaslatot meghaladó mértékben növeljék.

Megközelítő légijármű – Intruder
SSR válaszjeladóval felszerelt légijármű az ACAS felderítési távolságán belül, amelyre az ACAS-nek létrehozott nyomvonala van.

Saját légijármű – Own aircraft
A tárgybani ACAS-al felszerelt légijármű, amely ACAS a lehetséges összeütközés elleni védelemre szól, és amely légijármű manőverezésbe kezdhet egy ACAS kijelzésre válaszolva.

Pozitív megoldási tanácsadás – Positive RA
Megoldás javaslat, amely a légijárművezetőnek vagy emelkedést vagy süllyedés végrehajtását tanácsolja (ACAS II). Pozitív tanácsadás lehet helyesbítésre (corrective), vagy megelőzésre (preventive) lehetőséget adó.

Potenciális veszélyeztető légijármű – Potential threat
Egy megközelítő légijármű, amely különleges figyelmet érdemel vagy a saját légijárműhöz valós szoros közelsége miatt, vagy mert az egymást követő távolság és magasság mérések azt jelzik, hogy összeütközésbe vagy összeütközés közelségbe kerülhet a saját repülőgéppel. A figyelmeztetési idő, amelyet egy potenciális veszélyeztetéssel szemben biztosítanak, elegendően kicsi, hogy egy forgalmi javaslatot (TA) indokoljon, de nem annyira kicsi, hogy megoldás javaslatot (RA) indokolna.

Megelőző megoldási tanácsadás – Preventive RA
Megoldás javaslat, amely azt tanácsolja a repülőgépvezetőnek, hogy kerüljön el bizonyos eltéréseket a jelenlegi repülési pályától, de nem kíván semmilyen változást a jelenlegi repülési pályában.

Megoldási tanácsadás értelme – RA sense
Egy ACAS II megoldási tanácsadás “felfelé irányuló” (upward) értelmű, ha emelkedést, vagy süllyedési sebesség korlátozást igényel, és “lefelé irányuló” (downward) értelmű, ha süllyedést, vagy emelkedési sebesség korlátozást igényel. Úgy a felfelé irányuló mint a lefelé irányuló mozgás is megjelenhet egyidőben, ha a függőleges sebességet meghatározott értéktartományon belül kell tartani.

Megjegyzés. – A megoldás tanácsadás értelme mind felfelé, mind lefelé irányulhat egyszerre, amikor egyidőben több veszélyeztetés lép fel, és az ACAS olyan megoldási javaslatot generál, amely valamely veszélyeztető(k) alatt és valamely másik veszélyeztető(k) felett megfelelő elkülönítés biztosítását célozza.

Megoldási tanácsadás – Resolution advisory (RA)
A repülőszemélyzet részére adott kijelzés, amely javaslatot ad:

a) egy manőverre, amely minden veszélyeztetőtől való elkülönítés biztosítását célozza; vagy
b) manőver korlátozására, amely a meglévő elkülönítés fenntartására törekszik.

Megoldási tanácsadás kiegészítés – Resolution advisory complement (RAC)
Egy ACAS által a másiknak egy S-módú lekérdezésen keresztüli információ szolgáltatása annak érdekében, hogy RAC-t fogadó ACAS részére rendelkezésre álló manőverek választékának korlátozásával biztosítsák a kiegészítő manővereket.

Megoldási tanácsadás kiegészítéseinek rögzítése – Resolution advisory complements record (RAC record)

Az összes jelenleg aktív függőleges RAC (VRC) és vízszintes RAC (HRC) együttese, amelyet az ACAS vett. Ezeket az információkat egyik ACAS szolgáltatja egy másik ACAS-nak, vagy egy S-módú földi állomásnak, S-módú válaszon keresztül.

Megoldási tanácsadás erőssége – Resolution advisory strength
Az RA által jelzett manőver nagysága. Egy RA több egymás utáni erősséget is felvehet, mielőtt törlésre kerül. Amikor új RA erősség kerül kiadásra, az előző automatikusan érvényét veszti.

Megoldási közlemény – Resolution message
A megoldás tanácsadás kiegészítését (RAC) tartalmazó közlés.

Fordított értelmű megoldási tanácsadás – Reversed sense RA
Megoldási tanácsadás amelynek értelme megfordult.

Érzékenységi szint – Sensitivity level (S)
Egy egész szám, amely a paraméterek egy halmazát definiálja, amelyeket a forgalmi tanácsadás (TA) és összeütközés elkerülését biztosító algoritmusok használnak fel a figyelmeztetési idő szabályozására, amelyet a potenciális veszélyeztető és a veszélyeztető észlelési logika szolgáltat, valamint meghatározza az RA kiválasztási logika szempontjából releváns paraméterek értékeit.

Veszélyeztető légijármű – Threat
Egy megközelítő légijármű, amely különös figyelemre szolgál vagy a saját légijárműhöz való szoros közelsége miatt, vagy mert egymás utáni távolság és magasság mérések jelzik, hogy összeütközési vagy majdnem ütközési útvonalon lehet a saját légijárművel. A veszéllyel szemben rendelkezésre álló figyelmeztetési idő elegendően kicsi ahhoz, hogy egy RA-t indokoljon.

Nyomvonal – Track
Legalább három egymás utáni mérés, amely olyan pozíciókat mutat, amelyet egy légijármű ésszerűen elfoglalhat.

Forgalmi tanácsadás – Traffic advisory (TA)
A repülő személyzet részére adott jelzés arról, hogy bizonyos megközelítő légijármű egy potenciális veszélyt jelent.

Függőleges sebességhatár megoldási tanácsadás – Vertical speed limit (VSL) RA
Megoldás tanácsadás, amely azt tanácsolja a légijármű vezetőnek, hogy kerüljön bizonyos adott emelkedési sebesség tartományokat. A függőleges sebességhatár megoldási tanácsadás vagy helyesbítésre (corrective), vagy megelőzésre (preventive) ad lehetőséget.

Figyelmeztetési idő – Warning time
A potenciális veszélyeztető légijármű vagy a veszélyeztető légijármű észlelése és a legszorosabb megközelítés közötti időtartam, ha egyik légijármű sem gyorsul.

4.2 ACAS I általános előírások és jellemzők

4.2.1 *Funkcionális követelmények.* Az ACAS I-nek a következő feladatokat kell ellátnia:

a) a közelben lévő SSR válaszjeladóval felszerelt légijármű felderítése; és
b) jelzések szolgáltatása a repülő személyzet részére, amely azonosítja a közelben lévő légijármű megközelítési pozícióját a vizuális észlelés segítéseként.

Megjegyzés. – Az ACAS I csak A/C-módú lekérdezésre van szánva. Továbbá nem koordinál másik ACAS berendezéssel. Ennek folytán az ACAS I telepítésének részeként S-módú válaszjeladót nem igényel.

4.2.2 *Jel formátum.* Minden ACAS I jel RF jellemzőjének összhangban kell lennie a 3. fejezet 3.1.1.1-től – 3.1.1.6-ig és 3.1.2.1-től – 3.1.2.4-ig terjedő pontjainak rendelkezéseivel.

4.2.3 Interferencia szabályozás

4.2.3.1 *Maximális sugárzott RF teljesítmény.* Az ACAS I adattovábbítás effektív sugárzott teljesítménye a légijármű hosszanti tengelyéhez viszonyított nulla fokos látóhatár fölötti szögmagasságánál (elevációs szögnél) nem haladhatja meg a 24 dBW értéket.

4.2.3.2 *Nem-kívánt sugárzott teljesítmény.* Amikor az ACAS I nem továbbít lekérdezést, az effektív sugárzott teljesítmény egyik irányban sem haladhatja meg a -70 dBm-et.

Megjegyzés. – Ennek a követelménynek kell biztosítania, hogy amikor nem továbbít lekérdezést, az ACAS I ne sugározzon RF teljesítményt, amely interferálhatna másik közelben lévő légijárművön vagy földi létesítményben elhelyezett SSR válaszjeladóval vagy rádió berendezéssel, vagy csökkentené azok érzékenységét.

4.2.3.3 *Interferencia lehatárolás.* Mindegyik ACAS I lekérdezőnek szabályoznia kell lekérdezési sebességét vagy teljesítményét vagy mindkettőt az összes SSR módokban, hogy minimumra csökkentse az interferencia hatásokat (4.2.3.3.3 és 4.2.3.3.4).

Megjegyzés. – Ezek a korlátok annak biztosításának az eszközei, hogy az összes interferencia hatás, amely ezekből a lekérdezésekből származik, együtt a közelben lévő többi ACAS I, ACAS II és ACS III lekérdezőktől származókkal, alacsony szinten maradjon.

4.2.3.3.1 *Saját válaszjeladó válasz sebesség meghatározás.* Az ACAS I-nek figyelnie kell a sebességet, amellyel a saját válaszjeladója válaszol a lekérdezésekre, hogy biztosítsa a 4.2.3.3.3 pont rendelkezéseinek kielégítését.

4.2.3.3.2 *Az ACAS II és ACAS III lekérdezők számának meghatározása.* Az ACAS I-nek számolnia kell a közelben lévő ACAS II és ACAS III lekérdezők számát, hogy a 4.2.3.3.3, illetve 4.2.3.3.4 pontban lévő rendelkezéseket kielégítsék. Ezt a számlálást az ACAS adások (UF = 16) figyelemmel kisérésével lehet megszervezni (4.3.7.1.2.4) és fel kell frissíteni, a különböző S-módú ACAS címzések számával, amelyeket a megelőző 20 másodperces periódus során a legalább 1 Hz-es névleges frekvenciánál vettek.

4.2.3.3.3 *A/C ACAS I interferencia korlátok.* A lekérdezési teljesítmény nem haladhatja meg a következő korlátokat:

n_a	Felső határ $\{\sum_{k=1}^{k_1} P_a(k)\}$ esetén	
	Ha $f_r \leq$ vagy = 240	Ha $f_r > 240$
0	250	118
1	250	113
2	250	108
3	250	103
4	250	98
5	250	94
6	250	89
7	250	84
8	250	79
9	250	74
10	245	70
11	228	65
12	210	60
13	193	55
14	175	50
15	158	45
16	144	41
17	126	36
18	109	31
19	91	26
20	74	21
21	60	17
$\geq$ 22	42	12

ahol:

n_a = ACAS II-vel és ACAS III-mal felszerelt, a saját légijármű közelében repülő légijárművek száma (egy -74 dBm küszöbű válaszjeladó vevővel vett ACAS adásokra alapozva);

{ } = a zárójeleken belüli kifejezésnek az utolsó 8 lekérdezési ciklusra vonatkozó átlagértéke;

$P_a(k)$ = csúcsteljesítmény, amelyet az antenna sugároz annak az impulzusnak az összes irányában, amely a legnagyobb amplitúdóval rendelkezik abban az impulzus csoportban, amelyben az impulzusok egyetlen lekérdezést tartalmaznak egy 1 másodperces lekérdezési ciklusban a k-adik A/C-módú lekérdezés során, W;

k = A/C- módú lekérdezések index száma, $k = 1, 2.., k_t$;

k_t = egy 1 másodperces lekérdezési ciklusban továbbított A/C-módú lekérdezések s záma;

f_r = saját válaszjeladó A/C-módú válasz sebessége.

4.2.3.3.4 *S-módú ACAS I interferencia korlátok.* Egy ACAS I, amely S-módú lekérdezéseket használ, nem okozhat nagyobb interferencia hatásokat, mint egy csupán A/C-módú lekérdezéseket használó ACAS I.

4.3 ACAS II-re és ACAS III-ra vonatkozó általános előírások

1. Megjegyzés. – Ebben a szakaszban az ACAS II és az ACAS III jelölésére az CAS betűszót használjuk.

2. Megjegyzés. – Jelenleg nincsen ICAO rendelkezés, amely az ACAS berendezések kötelező megvalósításával foglalkozna.

3. Megjegyzés. – A "felszerelt veszélyeztető" fogalmát ebben a szakaszban ACAS II-vel vagy ACAS III-mal felszerelt veszélyeztető megjelölésére használjuk.

4.3.1 Funkcionális követelmények

4.3.1.1 *ACAS tevékenységek.* Az ACAS-nak a következő feladatokat kell ellátnia:

a) ellenőrzés;
b) forgalom tanácsadások generálása;
c) veszélyeztetés észlelés;
d) megoldás tanácsadások generálása;
e) kommunikáció földi állomásokkal.

A berendezéseknek a b) - e) feladatokat mindegyik működési ciklusban végre kell hajtani.

Megjegyzés. – A fenti tevékenységek bizonyos jellemzőinek szabványosítottaknak kell lenniük annak érdekében, hogy az ACAS egységek kielégítően kooperáljanak más ACAS egységekkel, S-módú földi állomásokkal és a légiforgalmi irányítási rendszerekkel. Az egyes szabványosított jellemzőket az alábbiakban tárgyaljuk Más jellemzőket ajánlásként ismertetünk.

4.3.1.1.1 Egy ciklus időtartama nem haladhatja meg az 1, 2 másodpercet.

4.3.2 Ellenőrzés végrehajtási követelmények

4.3.2.1 *Általános ellenőrzési követelmények.* Az ACAS-nak le kell kérdeznie más légijárműveken lévő SSR A/C-módú és S-módú válaszjeladókat és észlelnie kell a válaszjeladó válaszokat. Az ACAS-nak mérnie kell a válaszoló légijármű távolságát és viszonylagos helyzetét. Ezen mérések eredményeit és a válaszjeladó válaszok által szolgáltatott információkat felhasználva, az ACAS-nak meg kell becsülnie az egyes válaszoló légijárművek pozícióját. Az ACAS-nak tartalmazni kell rendelkezéseket ilyen pozíció meghatározás megvalósítására földi visszaverődések, interferencia és jel erősség változások megléte esetén.

4.3.2.1.1 N*yomvonal létrehozásának valószínűsége.* Az ACAS-nak olyan létrehozott nyomvonalat kell generálnia, amely legalább 0,90-es valószínűséggel rendelkezik arra vonatkoztatva, hogy a nyomvonal, a válaszjeladóval felszerelt légijárművek esetén, 30 másodperccel a legszorosabb megközelítés előtt létrejön, ha az alábbi feltételek mindegyike teljesül:

a) ezeknek a légijárműveknek a látóhatár fölötti szögmagasságai (elevációs szögei) az ACAS légijármű bólintási síkjához viszonyítva ±10 fokon belül vannak;

b) ezeknek a légijárműveknek a magasság változási sebesség mértéke kisebb vagy egyenlő 51 m/s-al (10 000 láb/perc);

c) ezeknek a légijárműveknek a válaszjeladói és antennái kielégítik a 3. fejezet 3.1.1 és 3.1.2 pontjában megadott szabványok előírásait;

d) ezeknek a légijárműveknek a közeledési sebességei és irányai, az SSR válaszjeladóval felszerelt légijárművek helyi sűrűsége, más ACAS lekérdezők száma a szomszédos környezetben (ahogyan az ACAS rádióadások figyelése által meg vannak határozva a 4.3.7.1.2 pont szerint) kielégítik a 4-1 táblázatban megadott feltételeket; és

e) a minimális ferde távolság egyenlő vagy nagyobb, mint 300 m (1000 láb).

4.3.2.1.1.1 Az ACAS-nak folytatnia kell a légtér ellenőrzést a nyomvonal létrejöveteli valószínűségének hirtelen leromlása nélkül, ha a 4.3.2.1.1 pontban meghatározott feltétel határok bármelyikét a valóságos értékek meghaladják.

4-1 táblázat

Feltételek									*Teljesítmény*
Kvadráns						*Maximális forgalom sűrűség*		*56 km-en (30 NM) belül lévő más ACAS-ok max.. száma*	*Sikeresség valószínűsége*
Előre		*Oldalt*		*Hátra*					
Maximális közeledési sebesség									
m/s	*csomó*	*m/s*	*csomó*	*m/s*	*csomó*	*ljmű/km^2*	*ljmű/km^2*		
250	500	150	300	93	180	0,087	0,30	30	0,90
620	1200	390	750	220	430	0,017	0,06	30	0,90

4.3.2.1.1.2 Az ACAS nem követi azokat az S-módú légijárműveket, amelyek jelentik, hogy a földön vannak.

Megjegyzés. – Egy S-módú légijármű azt, hogy a földön van, a képesség (CA) mezőben DF=11 vagy DF=17 kódolás továbbítással (3. fejezet, 3.1.2.5.2.2.1 pont), vagy a függőleges állapot (VS) mezőben DF=0 kódolás továbbításával jelentheti (3. fejezet, 3.1.2.8.2.1 pont). Megfordítva, ha a légijármű S-módú földi ellenőrzés alatt áll, a földön lévősége a repülés-állapot (FS) mező figyelésével fedélzetről leadott adattovábbítási DF= 4, 5, 20 vagy 21 formátumokban állapítható meg (3. fejezet, 3.1.2.6.5.1 pont).

4.3.2.1.1.3 **Ajánlás** – *Az ACAS akkor éri el a kívánt követési teljesítményt, amikor az A/C-módú SSR átlagos aszinkron válasz sebesség az ACAS légijármű környezetében lévő válaszjeladóktól, 240 válasz per másodperc, és amikor a csúcs lekérdezési sebesség az egyes válaszjeladóktól ellenőrzések alatt 500 per másodperc.*

Megjegyzés. – A fent említett csúcs lekérdezési sebesség az összes forrásból származó lekérdezést tartalmazza.

4.3.2.1.2 *Téves nyomvonal valószínűsége.* Annak valószínűsége, hogy egy létrehozott A/C-módú nyomvonal távolságban és magasságban nem felel meg, ha jelentették, egy tényleges légijárműnek, kisebb kell legyen mint 10^{-2}. Egy megvalósított S-módú útvonalnál ennek a valószínűségnek kisebbnek kell lenni, mint 10^{-6}. Ezeket a határokat semmilyen forgalmi környezetben sem lehet túllépni.

4.3.2.1.3 *Távolság és irányhelyzet pontosság*

4.3.2.1.3.1 A távolságot 14,5 m (1/128 NM) vagy ennél jobb felbontással kell mérni.

4.3.2.1.3.2 **Ajánlás.** – *A megközelítők becsült helyzeteinek viszonylagos hibái nem haladhatják meg a 10 fokos négyzetes középhibát.*

Megjegyzés. – A megközelítő légijárművek viszonyított irányhelyzeteinek ez a pontossága alkalmazható és kielégítő a potenciális veszélyeztetés vizuális észlelésének eszközeként. Ezen felül, az ilyen viszonyított irányhelyzet információt hasznosnak találták a veszélyeztetés észlelésében, ahol ez azt mutatja, hogy egy megközelítő légijármű a veszélyeztetés oka. Azonban ez a pontosság nem kielégítő mint bázis a vízszintes megoldási javaslatokhoz ,és nem kielégítő a vízszintes távolság hiba megbízható becsléséhez sem.

4.3.2.2 Interferencia szabályozás

4.3.2.2.1 *Maximális sugárzott RF teljesítmény* Egy ACAS átvitel effektív sugárzott teljesítménye a légijármű hossztengelyéhez viszonyított zérus értékű látóhatár fölötti szögmagasságnál (elevációs szögénél) nem haladhatja meg a 27 dBW értéket.

4.3.2.2.1.1 *Nem-kívánt sugárzott teljesítmény.* Amikor az ACAS nem továbbít lekérdezést, az effektív sugárzott teljesítmény semmilyen irányban sem haladhatja meg a -70 dBm értéket.

4.3.2.2.2 *Interferencia lehatárolás.* Mindegyik ACAS lekérdezőnek, amelyik 5490 m (18000 láb) nyomásmagasság alatt repül, ellenőriznie kell a lekérdezési sebességét vagy teljesítményét, vagy mindkettőt, hogy összeegyeztethető legyen specifikus egyenlőtlenségekkel (4.3.2.2.2.2 pont).

4.3.2.2.2.1 *Más ACAS-ok számának meghatározása.* Az ACAS megállapítja a környezetében lévő más ACAS II és III lekérdezők számát, hogy biztosítsa az interferencia korlátozások kielégítését. Ezt a számot az ACAS adások figyelésével nyerik (UF=16), (4.3.7.1.2.4 pont). Mindegyik ACAS-nak figyelnie kell az ilyen rádióadásos lekérdezéseket, hogy meghatározzák az észlelési távolságon belül lévő többi ACAS-ok számát.

4.3.2.2.2.2 *ACAS interferencia határoló egyenlőtlenségek.* Az ACAS-nak úgy kell beállítani a lekérdezési sebességét és lekérdezési teljesítményét, hogy a következő három egyenlőtlenség igaz maradjon, kivéve a 4.3.2.2.2.1 pontbeli előírások szerintieket.

$$\{ \sum_{i=1}^{i_1} \left[\frac{p(i)}{250}\right]^{\alpha} \} < minimum \left[\frac{280}{1+n_a}, \frac{11}{\alpha^2}\right] \qquad (1)$$

$$\{ \sum_{i=1}^{i_1} m(i) \} < 0.01 \qquad (2)$$

$$\{ \frac{1}{B} \sum_{k=1}^{k_1} \frac{P_a(k)}{250} \} < minimum \left[\frac{80}{1+n_a}, 3\right] \qquad (3)$$

Az ezekben az egyenlőtlenségekben szereplő változók meghatározásai a következők:

i_t = az 1 másodperces lekérdezési ciklusban továbbított lekérdezések (A/C-módú és S-módú) száma;

i = A/C-módú és S-módú lekérdezések indexszáma, i=1, 2, ...,i_t;

α = az α_1 minimuma, amelyet 1/4[n_b/n_c]-ként számítanak, a lentebb megadott különleges körülményeknek van kitéve, és alfa$_2$ Log$_{10}$[n_a/n_b]Log$_{10}$25-ként számított, ahol n_b és n_c úgy van definiálva, mint ACAS II és ACAS III rendszerekkel felszerelt üzemelő légijárművek száma (a levegőben vagy a földön), 11,2 km (6 NM) és 5,6 km (3NM) távolságon belül a saját ACAS-ra számítva (ACAS ellenőrzésre alapozva). A 610 m (2000 láb) föld feletti rádiómagasságon vagy az alatt üzemelő ACAS légijárműveknek mind a földön, mind a levegőben tartalmazni kell ACAS II és ACAS III légijárművet n_b és n_c számban. Egyébként az ACAS-nak csak levegőben lévő ACAS II és ACAS III légijárműveket n_b és n_c értékben. Az α értéke tovább korlátozódik 0,5 minimumra és 1,0 maximumra.

Továbbá:

HA [(n_b<1) VAGY (n_b>4n_c) VAGY (n_b<4 ÉS n_c < 2 ÉS n_a>25)] AKKOR α_1=1,0

HA [(n_c>2) ÉS (n_b>2n_c) ÉS (n_a<40)] AKKOR α_1=0,5

p(i) = csúcsteljesítmény, amelyet az antenna sugároz annak az impulzusnak az összes irányában, amely a legnagyobb amplitúdóval rendelkezik abban az impulzus csoportban, amelyben az impulzusok egyetlen lekérdezést tartalmaznak egy 1-másodperces ciklusban az *i*-edik lekérdezés során, W;

m(i) = a kölcsönös elnyomási tartomány a saját válaszjeladónál, amely egy 1-másodperces lekérdezési ciklusban az *i*-edik lekérdezéshez kapcsolódik, s;

B = sugárnyaláb élezési tényező (3dB-es sugárszélesség aránya a lekérdezési mellékirány elnyomásból eredő sugárszélességhez). Olyan lekérdezőknél, amelyek adóberendezés oldalszirom elnyomást (SLS), alkalmaznak az alkalmas sugárszélesség egy válaszjeladóból jövő A/C-módú válaszok azimut szögének kiterjedése lesz, az SLS által limitálva, a válaszjeladó populáció felett átlagolva.

{ } lásd 4.2.3.3.3

$P_a(k)$ "

k "

k_t "

n_a "

Megjegyzés. – Az RA és ACAS adások (4.3.6.2.1 és 4.3.7.1.2.4 pontok) lekérdezések.

4.3.2.2.2.2.1 *Adattovábbítások megoldás javaslatok alatt.*. Az összes levegő-levegő koordinációs lekérdezéseket és megoldási javaslatot és ACAS adásokat teljes teljesítménnyel kell továbbítani és ezeket a lekérdezéseket ki kell hagyni az S-módú lekérdezések összegezéséből az (1) és (2) egyenlőtlenség baloldali tagjaiban a 4.3.2.2.2.2 pontban az RA tartama alatt.

4.3.2.2.2.2.2 *Adattovábbítások ACAS egységektől a földön.* Amikor az ACAS légijármű jelzi, hogy a földön van, az ACAS lekérdezéseket korlátozni kell a többi ACAS II és III légijárművek számának (n_a) beállításával, amelyeket az interferencia határoló egyenlőtlenségbe számítanak be egy olyan értékig, amely háromszorosa annak az értéknek, amelyet egy -74 dBm-es válaszjeladó vevő küszöbbel vett ACAS rádióadás alapján nyertek. Amikor az A/C lekérdezési teljesítményt az interferencia korlátozás miatt lecsökkentik, először az előremenő sugárban kell csökkenteni az A/C-módú lekérdezési teljesítményt, amíg az előreirányuló sorozat nem illeszkedik a jobb és bal sorozatokhoz. Az előreirányuló, jobb és bal lekérdezési teljesítményeket akkor egymásután addig kell csökkenteni, amíg nem illeszkednek a hátsó lekérdezési teljesítményhez. Az A/C-módú teljesítmény további csökkentését az előremenő, az oldal és hátsó lekérdezési teljesítmények egymás utáni csökkentésével kell végrehajtani.

4.3.2.2.2.2.3 *Adatátvitelek 5490 m (18000 láb) tengerszint feletti magasság feletti ACAS egységektől.* Mindegyik ACAS lekérdező, amely 5490 m (18000 láb) nyomásmagasság felett repül, úgy kell szabályoznia a lekérdezési sebességet vagy teljesítményt vagy mindkettőt, hogy a 4.3.2.2.2.2 pont (1) és (3) egyenlőtlensége igaz maradjon, amikor n_a és α egyenlő 1, kivéve a 4.3.2.2.2.2.1 pontban leírtakat.

4.3.3 Forgalmi tanácsadások (TA)

4.3.3.1 *Forgalmi tanácsadás funkció.* Az ACAS forgalmi tanácsadást szolgáltat, hogy figyelmeztesse a repülő személyzetet a potenciális veszélyeztetésre. Az ilyen forgalmi tanácsadásokat a potenciális veszélyeztetés közelítőleg viszonylagos pozíciójának jelzése kell, hogy kísérje.

4.3.3.2 *Közeli forgalom kijelzése*

***Ajánlás.** – Míg bármely megoldási tanácsadás és/vagy forgalmi tanácsadás kijelzésre kerül, a 11 km (6 NM) távolságon belüli közeli forgalmat és, ha magasságot jelentenek, ±370 m (1200 láb) magasságot ki kell jelezni. Ezt a közeli forgalmat meg kell különböztetni (például színnel vagy szimbólum típussal) a veszélyeztetőtől és potenciális veszélyeztetőtől, amelyeket szembetűnő módon kell jelezni.*

4.3.3.3 *Forgalmi tanácsadások, mint megoldási javaslatok előzményei.* A forgalmi tanácsadás kritériumai olyanok, hogy ezek a megoldási tanácsadás kritériumai előtt teljesülnek.

4.3.3.3.1 *Forgalmi tanácsadás figyelmeztetési idő.* A megközelítő légijárművek magasság jelentéseinél, a névleges forgalmi tanácsadás figyelmeztetési idő nem lehet nagyobb, mint (T+20 s), ahol T a névleges figyelmeztetési idő a megoldási tanácsadás generálásához.

Megjegyzés. – Ideálisan a megoldási javaslatot a forgalmi tanácsadás mindig megelőzné, de ez nem mindig lehetséges, pl. a megoldási tanácsadás kritériumok már teljesülhetnek, amikor egy nyomvonal először létrejön, vagy a megközelítő légijármű egy hirtelen és éles manővere előidézheti, hogy a forgalmi tanácsadás vezetési ideje kisebb lesz, mint egy ciklus.

4.3.4 Veszélyeztetés észlelése

4.3.4.1 *Veszélyeztetés deklarálása.* Az ACAS-nak értékelnie kell az egyes megközelítő légijárművek jellemzőit, hogy megállapítsa, hogy az veszélyeztetést jelent-e vagy nem.

4.3.4.1.1 *A megközelítő légijárművek jellemzői.* Minimumként egy megközelítő légijármű jellemzői között, amelyeket a veszélyeztetés azonosításhoz felhasználnak, szerepelnie kell a következőknek:

a) követett magasság;
b) a követett magasság változás sebessége;
c) követett ferde távolság;
d) ferde távolság változásának követési sebessége; és
e) a megközelítő légijármű ACAS-ának érzékenységi szintje, S_i

Egy megközelítő légijárműnél, amely nincs ACAS II-vel vagy ACAS III-mal felszerelve, S_i-t 1-re kell beállítani.

4.3.4.1.2 *Saját légijármű jellemzők.* Minimumként a veszélyeztető légijármű felismeréséhez használt saját légijármű jellemzői között az alábbiaknak kell szerepelni:
a) magasság
b) magasság változtatás sebessége; és
c) saját ACAS érzékenységi szintje (4.3.4.3 pont)

4.3.4.2 *Érzékenységi szintek.* Az ACAS-nak működőképesnek kell lennie bármely érzékenységi szint számnál. Ezeknek tartalmazniuk kell a következőket:

a) S = 1 "tartalék" mód, amelyben a többi légijármű lekérdezése és az összes tanácsadás tiltott;
b) S = 2, "csak TA" mód, amelyben a megoldási javaslatok tiltottak; és
c) S = 3-7, további szintek, amelyek képesek a forgalmi tanácsadások és megoldási javaslatok kiadására, amelyek a 4-2 táblázatban feltüntetett figyelmeztetési időket, valamint a forgalmi tanácsadásokat szolgáltatják.

4-2 táblázat

Érzékenységi szint	*2*	*3*	*4*	*5*	*6*	*7*
Névleges figyelmeztetési idő	nincs RA	15s	20s	25s	30s	35s

4.3.4.3 *Saját érzékenységi szint (S_o) megválaszolása.* A saját ACAS érzékenységi szint megválasztását az érzékenységi szint szabályozó (SLC) utasítások határozzák meg, amelyeket egy sor, az alábbiakban felsorolt forrásból kapnak:

a) SLC utasítás, amelyet az ACAS automatikusan generál a magasság sávra vagy más külső tényezőkre alapozva;
b) SLC utasítás pilóta inputból; és
c) SLC utasítás S-módú földi állomásoktól.

4.3.4.3.1 *Engedélyezett SLC utasítás kódok.* Minimumként az elfogadható SLC utasítás kódoknak tartalmazniuk kell a következőket:

	Kódolás
Magasság sávon alapuló SLC-re	2-7
Repülőgépvezetőtől	0, 1, 2
S-módú földi állomásoktól	0, 2 - 6

4.3.4.3.2 *Magasság-sáv SLC utasítás.* Ahol az ACAS magasságon alapuló SLC utasítást választ, a névleges magasság küszöbhöz olyan hiszterézist kell alkalmazni, amelynél a következők szerinti SLC utasítás értékváltozást követelnek meg: emelkedő ACAS légijárműnél az SLC utasításnak növekedni kell a megfelelő magasság küszöb plusz a hiszterézis értéknél; süllyedő ACAS légijárműnél az SLC utasításnak csökkenni kell a megfelelő magasság küszöb mínusz hiszterézis értéknél.

4.3.4.3.3 *Repülőgépvezető SLC utasítás.* Az SLC utasítás repülőgépvezető általi 0 értékre állítása az "automatikus" mód választását jelöli, amelynél az érzékenységi szint kiválasztás a többi utasításon alapszik.

4.3.4.3.4 *S-módú földi állomás SLC utasítás.* S-módú földi állomásokon keresztül továbbított SLC utasításoknál (4.3.8.4.2.2.1 pont) a 0 érték azt jelzi, hogy a szóbanforgó állomás nem ad ki SLC utasítást és hogy az érzékenységi szint kiválasztása a többi utasításon alapszik, köztük más S-módú földi állomásoktól jövő nem 0 utasításokon. Az ACAS nem dolgoz fel 1-értékű fedélzetre irányuló adattovábbítási SLC utasítást.

4.3.4.3.4.1 *SLC utasítás kód ATS kiválasztása.* ATS hatóságoknak biztosítaniuk kell, hogy eljárások legyenek a repülőgépvezető informálására bármely, a 0-tól eltérő ATS kiválasztású SLC utasításról (4.3.4.3.1 pont).

4.3.4.3.5 *Kiválasztási szabály.* A saját ACAS érzékenységi szintet a legkisebb, nem-0 SLC utasításra kell beállítani, amely utasítás a 4.3.4.3 pontban felsorolt bármely forrástól jöhetett.

4.3.4.4 *Paraméter értékek kiválasztása RA generálásához.* Ha a saját ACAS érzékenységi szintje 3 vagy ennél nagyobb, az RA generálására használt paraméter értékeknek, amelyek érzékenységi szinttől függnek, az S_0 saját ACAS érzékenységi szint és a megközelítő ACAS S_i érzékenységi szintje közül a nagyobbikon kell alapulniuk.

4.3.4.5 *Paraméter értékek kiválasztása TA generálásához.* A forgalmi tanácsadás generálásához használt paraméter értékeket, amelyek az érzékenységi szinttől függnek, ugyanazon az alapon kell kiválasztani, mint a megoldási javaslatnál (4.3.4.4 pont), kivéve, amikor egy 2 értékű ("csak TA" mód) SLC utasítás érkezett vagy a légijárművezetőtől vagy egy S-módú földi állomástól. Ebben az esetben a paraméter értékek a forgalmi tanácsadás generálásához azok az értékek maradnak, amelyeket azok a légijárművezetőtől vagy az S-módú földi állomástól felvettek volna érkező SLC utasítás hiányában.

4.3.5 Megoldási tanácsadás (RA)

4.3.5.1 *RA generálás*. Minden veszélyeztetésre az ACAS egy megoldási javaslatot generál, kivéve, ahol nem lehetséges kiválasztani egy olyan megoldást, amelytől adekvát elkülönítés várható vagy a megközelítő légijármű repülési pályájának diagnózisában lévő bizonytalanság miatt, vagy mert nagy a kockázata annak, hogy veszélyeztető légijármű által végrehajtott manőver érvényteleníteni fogja a megoldási javaslatot, amely esetben tanácsadást nem továbbítanak.

4.3.5.1.1 *RA törlés.* Ha egy vagy több veszélyeztetés ellen egy megoldási javaslatot egyszer már generáltak, azt fenn kell tartani, vagy módosítani kell, amíg vizsgálatok, amelyek kevésbé szigorúak, mint a veszélyeztető észlelési vizsgálatok, két egymás utáni cikluson keresztül nem jelzik, hogy a megoldási tanácsadás törölhető, amikor is azt törölni kell.

4.3.5.2 *Az RA kiválasztása.* Az ACAS-nak azt a megoldási javaslatot kell generálnia, amely várhatóan adekvát elkülönítést szolgáltat az összes veszélyeztetéstől, és amelynek a legkisebb hatása van az ACAS légijármű repülési útvonalára, megfelelve az ebben a fejezetben leírt többi rendelkezésnek.

4.3.5.3 *RA hatékonyság.* Az ACAS nem generál vagy nem folytatja a kijelzését olyan megoldási javaslatnak, amely megfontolva a veszélyeztető légijármű valószínű pályáit, valószínűbb, hogy csökkenti az elkülönítést, mint hogy növelje azt a legszorosabb megközelítés előrejelzett időpontjában, a 4.3.5.5.1.1 és 4.3.5.6 pontokban leírt rendelkezésnek megfelelően.

Megjegyzés. – Lásd a 4.3.5.8 pontot is.

4.3.5.4 *Légijármű képesség.* Az ACAS által generált megoldási javaslatnak összhangban kell lenni a légijármű teljesítőképességével.

4.3.5.4.1 *Földközelség.* Süllyedési megoldási javaslatokat nem generálnak vagy tartanak fenn, amikor a saját légijármű 300 m (1000 láb) föld feletti magasság alatt van.

4.3.5.4.2 ACAS nem működhet 3-7 érzékenységi szinteken, amikor a saját légijármű 300 m (1000 láb) földfeletti magasság alatt van.

4.3.5.5. *Az értelem megfordítása.* Az ACAS nem fordíthatja meg egy megoldási tanácsadás értelmét egyik ciklustól a következőig, kivéve a 4.3.5.5.1 pontban engedélyezettet koordináció biztosításához, vagy amikor az előrejelzett elkülönítés a legszorosabb megközelítésnél a meglévő értelemnél nem adekvát.

4.3.5.5.1 *Értelem megfordítások felszerelt veszélyeztető légijárművekkel szemben.* Ha egy felszerelt veszélyeztető légijárműtől kapott megoldási tanácsadás kiegészítés nem összeegyeztethető a meglévő megoldási tanácsadás értelmével, az ACAS-nak módosítania kell a megoldási tanácsadás értelmét, hogy összhangban legyen a vett megoldási tanácsadás kiegészítéssel, ha a saját légijármű S-módú címzése értékben magasabb, mint a veszélyeztetőé.

Megjegyzés. – A 4.3.6.1.3 pont megkívánja, hogy a saját megoldási tanácsadás kiegészítés a veszélyeztető részére szintén megfordításra kerüljön.

4.3.5.5.1.1 Az ACAS nem módosíthatja a megoldási tanácsadás értelmét olyan módon, amely azt összeférhetetlenné teszi egy felszerelt veszélyeztető légijárműtől kapott megoldási tanácsadás kiegészítéssel, ha a saját légijármű S-módú címzése értékben nagyobb, mint a veszélyeztetőé.

4.3.5.6 *RA erősség fenntartás.* Annak a követelménynek alávetve, hogy egy süllyedési megoldási tanácsadás ne kerüljön generálásra kis magasságon (4.3.5.4.1 pont), megoldási javaslatot nem szabad módosítani, ha a legszorosabb megközelítésig az idő túl rövid ahhoz, hogy szignifikáns reagálást lehessen elérni, vagy ha a veszélyeztető távolságban irányát megváltoztatja.

4.3.5.7 *RA gyengítés.* Megoldási tanácsadás nem gyengíthető, ha valószínű, hogy a későbbiekben erősíteni kell.

4.3.5.8 *ACAS-al felszerelt veszélyeztetők.* A megoldási javaslatnak összeegyeztethetőnek kell lennie a veszélyeztető légijárműveknek közvetített összes megoldási tanácsadás kiegészítéssel. Ha egy veszélyeztető légijárműtől egy megoldási tanácsadás kiegészítés előbb érkezik, mint hogy a saját ACAS a veszélyeztető számára megoldási tanácsadás kiegészítést generál, a generált megoldási javaslatnak összeegyeztethetőnek kell lenni a vett megoldási tanácsadás kiegészítéssel, hacsak egy ilyen megoldás nem nagyobb valószínűséggel csökkenti az elkülönítést, mint növeli azt, és a saját S-módú címzés értékben alacsonyabb, mint a veszélyeztetésé.

Megjegyzés. – Egynél több veszélyeztető légijárművel való találkozásnál, amikor néhány veszélyeztető felett és más veszélyeztetők alatt kell elhaladni, ezt az előírást úgy lehet értelmezni, mint a megoldási tanácsadás teljes időtartamára vonatkozót. Speciálisan, megengedhető egy megoldási javaslatot egy veszélyeztető fölé emelkedést (süllyedést) tartalmazó megoldási tanácsadás megtartása, amely veszélyeztető légijármű a saját légijármű felett (alatt) van, feltéve, hogy van egy számított törekvés megfelelő elkülönítésre az összes veszélyeztető légijárműtől a rákövetkező vízszintes kirepülés által.

4.3.5.9 *ARA almező kódolás.* Mindegyik ciklust, a megoldási tanácsadás értelmet, erősséget és jellegzetességeket kódolni kell az aktív megoldás tanácsadás (ARA) almezőben (4.3.8.4.2.2.1.1 pont). Ha az ARA almezőt nem frissítették fel egy 6 másodperces időtartam alatt, azt 0-ra kell állítani az MTE almezővel együtt ugyanabban a közleményben (4.3.8.4.2.2.1.3 pont).

4.3.5.10 *Rendszer válaszidő.* A rendszer késés a releváns SSR válasz vételétől egy megoldási tanácsadás értelem és erősség szolgáltatásig a repülőgépvezető számára a lehető legrövidebb legyen és nem haladhatja meg az 1,5 másodpercet.

4.3.6 Koordináció és kommunikáció

4.3.6.1 Az ACAS-al felszerelt veszélyeztető légijárművekkel való koordinációra vonatkozó előírások

4.3.6.1.1 *Több légijárművel való koordináció.* Több-légijárműves szituációban az ACAS-nak minden felszerelt veszélyeztető légijárművel egyedenként kell együttműködnie.

4.3.6.1.2 *Adatvédelem a koordináció során.* Az ACAS-nak meg kell akadályoznia párhuzamos folyamatoknál a tárolt adatokhoz való egyidejű hozzáférést az ACAS-on belül, különösen megoldás közlemény feldolgozás alatt.

4.3.6.1.3 *Koordináció lekérdezés.* Az ACAS-nak minden ciklusban koordináció lekérdezést kell továbbítani minden egyes felszerelt veszélyeztető légijárműnek, hacsak a megoldási tanácsadás generálásnak nincs késleltetése amiatt, hogy nincs lehetőség olyan megoldási tanácsadás kiválasztására, amelyről előre látható, hogy adekvát elkülönítést tud szolgáltatni (4.3.5.1 pont). A veszélyeztető légijárműnek továbbított közlemény egy, a veszélyeztető számára kiválasztott megoldási tanácsadás kiegészítést tartalmaz. Ha a veszélyeztető légijárműtől a megoldási tanácsadás kiegészítés előbb érkezne, mint ahogy az ACAS a veszélyeztető részére egy megoldási tanácsadás kiegészítést kiválasztana, a kiválasztott megoldási tanácsadás kiegészítőnek összeegyeztethetőnek kell lennie a vett megoldási tanácsadás kiegészítővel, hacsak háromnál nem több ciklus múlt el azóta, amióta a megoldási tanácsadás kiegészítést vették, a megoldási tanácsadás kiegészítés magasságkeresztező, és a saját légijármű címzés értékben kisebb, mint a veszélyeztetőé, amely esetben az ACAS a megoldási javaslatot függetlenül választja ki. Ha egy felszerelt veszélyeztető légijárműtől kapott megoldási tanácsadás kiegészítés összeegyeztethetetlen a megoldási tanácsadás kiegészítéssel, amelyet a saját ACAS választott ki ennek a veszélyeztetőnek a részére, az ACAS-nak módosítania kell a kiválasztott megoldási tanácsadás kiegészítést, ha a saját légijármű címzése értékben nagyobb, mint a veszélyeztető.

Megjegyzés. – A megoldási közlemény által tartalmazott megoldási tanácsadás kiegészítés függőleges tanácsadás kiegészítés (VRC) formában van az ACAS II esetében (4.3.8.4.2.3.2.2 pont) és/vagy vízszintes megoldási tanácsadás kiegészítés (HRC) formában ACAS III. esetén.

4.3.6.1.3.1 *Koordináció befejezés.* Egy olyan cikluson belül, amikor egy megközelítő légijármű megszűnik megoldási tanácsadás fenntartás okának lenni, az ACAS megoldási közleményt küld ennek a megközelítő légijárműnek egy koordinációs lekérdezés segítségével. A megoldási közleménynek tartalmaznia kell a törlési kódját az utolsó megoldási tanácsadás kiegészítésnek, amelyet ennek a megközelítő légijárműnek küldtek, amíg oka volt a megoldási tanácsadás fenntartásának.

Megjegyzés. Egy egyedülálló veszélyeztetővel való találkozás során a veszélyeztető megszűnik megoldási tanácsadás okának lenni, ha a megoldási tanácsadás törlésének feltételei teljesülnek. Több veszélyeztetővel való találkozás során a veszélyeztető megszűnik megoldási tanácsadás okának lenni, ha a megoldási tanácsadás törlésének feltételei erre a veszélyeztetőre vonatkozóan fennállnak, még akkor is, ha a megoldási javaslatot esetleg a többi veszélyeztető miatt fenn kell tartani.

4.3.6.1.3.2 Az ACAS-nak koordináció lekérdezéseket kell továbbítania, amig nem kap koordinációs választ a veszélyeztető légijárműtől egy nem kevesebb, mint hat, és nem több, mint tizenkét maximális számú kísérletezésig. Az egymást követő lekérdezéseknek névlegesen egyenlő időközökkel kell követniük egymást egy 100 ± 5 ms-os periódus alatt. Ha a maximális számú kísérletezést elvégezték, és válasz nem érkezett, az ACAS-nak szabályos feldolgozási sorrendjét kell folytatnia.

4.3.6.1.3.3 Az ACAS-nak paritásos védelmet kell nyújtani (4.3.8.4.2.3.2.6 és 4.3.8.4.2.3.2.7 pontok) mindegyik mező számára a koordináció lekérdezésében, amely megoldási tanácsadás kiegészítési információt szolgáltat.

Megjegyzés. – Ez tartalmazza a függőleges megoldási tanácsadás kiegészítést (VRC), a függőleges megoldási tanácsadás kiegészítés törlését (CVC), a vízszintes megoldási tanácsadás kiegészítést (HRC), és a vízszintes megoldási tanácsadás kiegészítés törlését (CHC).

4.3.6.1.3.4 Valahányszor a saját ACAS megfordítja az értelmét egy felszerelt veszélyeztetővel szemben, a megoldás közlésnek, amelyet az éppen folyó és a rákövetkező ciklusban küldenek ennek a veszélyeztetőnek, mind az újonnan kiválasztott megoldási tanácsadás kiegészítést, mind a megfordítás előtt küldött megoldási tanácsadás kiegészítés törlési kódját tartalmaznia kell.

4.3.6.1.3.5 Amikor egy függőleges megoldási tanácsadást kiválasztanak, a függőleges megoldási tanácsadás kiegészítés VRC) (4.3.8.4.2.3.2.2 pont), amelyet saját ACAS egy, a veszélyeztetőnek szóló tanácsadás közlésben tartalmaz, a következő lesz:

a) “ne haladj el felül”, amikor a megoldási tanácsadás a veszélyeztető légijármű feletti elkülönítést szándékozik biztosítani;
b) “ne haladj el alul”, amikor a megoldási tanácsadás a veszélyeztető légijármű alatti elkülönítést szándékozik biztosítani.

4.3.6.1.4 *Megoldási közlemény feldolgozás.* Megoldási közleményeket a vétel sorrendjében dolgozzák fel, és olyan késleltetéssel, amelyet a tárolt adatokhoz való párhuzamos hozzáférés lehetőségének megakadályozása és az előzőleg vett megoldási közlemények feldolgozása miatti késések limitálnak. A késleltetés alatt álló közlemények átmenetileg sorban állnak a közlemények esetleges elvesztésének megelőzése céljából. A megoldási közlemény feldolgozásnak magában kell foglalnia a közlemény dekódolását és a megfelelő adatszerkezetek felfrissítését a közleményből kivonatolt információkkal.

Megjegyzés. – A 4.3.6.1.2 pontnak megfelelően a megoldási közlemény feldolgozásnak nem szabad olyan adathoz jutnia, amelynek felhasználása nincs védve a koordináció zárlat állapot által.

4.3.6.1.4.1 Egy másik ACAS-tól kapott megoldási tanácsadás törlést el kell utasítani, ha a kódolt értelem bitek paritás hiba fennállását mutatják, vagy ha megfogalmazatlan értékeket észleltek a megoldási közleményben. Egy megoldási tanácsadás kiegészítést, vagy megoldási tanácsadás kiegészítés törlést, amelyet paritás hibáktól és megfogalmazatlan megoldási közlemény értékektől mentesen vesznek, érvényesnek kell tekinteni.

4.3.6.1.4.2 *RAC tárolás.* Egy másik ACAS-tól érkező érvényes megoldási javaslatot el kell tárolni vagy ahhoz az ACAS-hoz tartozó előzőleg eltárolt RAC felfrissítésére kell használni. Egy érvényes megoldási tanácsadás kiegészítés törlés előidézi az előzőleg eltárolt RAC törlését. Ha az eltárolt RAC 6 mp időtartam alatt sem került frissítésre, akkor azt ki kell törölni.

4.3.6.1.4.3 *Rögzített RAC-ok frissítése.* Ha egy másik ACAS-ról kapott RAC törlés, vagy érvényes RAC a RAC rögzítések frissítését kell, hogy szolgálják. Ha bármely veszélyeztető légijármű által a rögzített megoldási tanácsadás kiegészítésében (RAC) egy bit nem kerül frissítésre 6 mp időtartamon belül, akkor ezt a bitet 0-ra kell beállítani.

4.3.6.2 Az ACAS földi állomásokkal való kommunikációjára vonatkozó előírások

4.3.6.2.1 *ACAS megoldási javaslatok légi kezdeményezésű fedélzetről leadott kapcsolata.* Ha egy ACAS megoldási tanácsadás, az ACAS:

a) adjon át S-módú válaszjeladójának egy megoldási tanácsadás jelentést a földre történő továbbításra egy Comm-B válaszban (4.3.11.4.1 pont) és
b) továbbítson periodikus megoldási tanácsadás közvetítéseket (4.3.7.3.2 pont).

4.3.6.2.2 *Érzékenységi szint szabályozás (SLC) utasítás.* Az ACAS-nak tárolni kell az S-módú földi állomásoktól jövő szintszabályozás utasításokat. Az S-módú földi állomástól kapott érzékenységi szint-szabályozás utasítás érvényben marad, amíg nem lép helyébe ugyanazon állomástól jövő érzékenységi szint-szabályozás utasítás, ahogyan azt a lekérdezési IIS almezőben lévő helyszín szám jelzi. Ha egy S-módú földi állomástól származó tárolt utasítást 4 percen belül nem frissítenek fel, vagy ha a kapott érzékenységi szint szabályozási utasítás 15-ös értékű (4.3.8.4.2.1.1 pont), a tárolt érzékenységi szint szabályozási utasítást ezen S-módú földi állomás részére 0-ra kell beállítani.

4.3.6.3 Az ACAS és S-módú válaszjeladója közötti adatátvitelre vonatkozó előírások

4.3.6.3.1 *Adatátvitel az ACAS-tól az S-módú válaszjeladóhoz:*

a) az ACAS-nak megoldási tanácsadás információt kell átadni az S-módú válaszjeladójának egy megoldási tanácsadás jelentésben (4.3.8.4.2.2.1 pont) és a koordinációs válaszban (4.3.8.4.2.4.2 pont) való továbbítására;
b) az ACAS-nak az aktuális érzékenységi szintet továbbítania kell az S-módú válaszjeladójának egy érzékenységi szint jelentésben (4.3.8.4.2.5) való továbbítás céljából; és
c) az ACAS-nak képességi információt kell átadni az S-módú válaszjeladójának egy adat kapcsolati képesség jelentésben (4.3.8.4.2.2.2 pont) való továbbítás céljából.

4.3.6.3.2 *Adatátvitel az S-módú válaszjeladótól a hozzátartozó ACAS-hoz:*

a) az ACAS-nak az S-módú válaszjeladójától kapnia kell az S-módú földi állomások által továbbított érzékenységi szint szabályozási utasításokat (4.3.8.4.2.1.1 pont);
b) az ACAS-nak az S-módú válaszjeladójától kapnia kell más ACAS által továbbított ACAS közléseket (4.3.8.4.2.3.3 pont); és
c) az ACAS-nak az S-módú válaszjeladójától kapnia kell más ACAS által továbbított megoldási közleményeket (4.3.8.4.2.3.2 pont) levegő-levegő koordinációs célokra.

4.3.7 ACAS protokollok

4.3.7.1 Felderítési protokollok

4.3.7.1.1 *A/C-módú válaszjeladók felderítése.* Az ACAS a C-módot csak all-call lekérdezés (3. Fejezet 3.1.2.1.5.1.2 pont) A/C-módú válaszjeladókkal felszerelt légijárművek felderítésére használják.

4.3.7.1.2 *S-módú* válaszjeladók *felderítése*

4.3.7.1.2.1 *Detektálás.* Az ACAS-nak figyelnie kell az 1090 MHz-et az S-módú befogó squitterek céljából (DF = 11). Az ACAS-nak észlelnie kell az S-móddal felszerelt légijárműveket, és meg kell határoznia a címzésüket S-módú befogó squitterek (DF = 11) vagy kiterjesztett squitterek (DF = 17) használatával.

1. Megjegyzés. – Elfogadható egyedi légijármű megszerzése vagy beszerző vagy kiterjesztett squitterek (DF = 11 vagy DF = 17) felhasználásával. Azonban az ACAS-nak figyelnie kell a beszerző squittert, mivel nem fogja bármely időben az összes légijármű a kiterjesztett squittert továbbítani.

2. Megjegyzés. – Ha a jövőben a légijárművek számára megengedetté válik, hogy ne továbbítsák a beszerző squittert, hanem, helyette a kiterjesztett squitter folyamatos továbbítására támaszkodjanak, az összes ACAS egység számára lényegesé válik mind a megszerzési, mind a kiterjesztett squitter figyelése.

4.3.7.1.2.2 *Felderítési lekérdezések.* Miután először vettek egy 24-bites légijármű címzést egy légijárműtől, amelyről megállapították, hogy a vétel megbízhatóságon alapuló, az ACAS megbízható felderítési távolságon belül van és a saját légijármű felett és alatt elhelyezkedő 3050 m (10000 láb) sávon belül van, az ACAS egy rövid levegő-levegő lekérdezést továbbít (UF=0) a távolsági adat beszerzéséhez. A felderítési lekérdezéseket minden öt ciklusban legalább egyszer továbbítani kell, amikor ez a magasság feltétel ki van elégítve. Felderítési lekérdezéseket minden ciklusban továbbítani kell, ha az észlelt légijármű távolsága kisebb, mint 5,6 km (3 NM), vagy a számított idő a legszorosabb megközelítésig kevesebb, mint 60 másodperc, feltéve, hogy mind az észlelt, mind a saját légijármű a meglévő pozíciójából gyorsulás nélküli mozgással halad, és hogy a távolság a legszorosabb megközelítésnél egyenlő 5,6 km (3 NM). A felderítési lekérdezést 5 ciklusos perióduson át fel kell függeszteni, ha:

a) egy választ sikeresen vettek; és
b) a saját légijármű a megközelítő légijármű 5490 m (18000 láb) nyomásmagasság alatt repül; és
c) az észlelt légijármű távolsága nagyobb, mint 5,6 km (3 NM) és a számított idő a legszorosabb megközelítésig meghaladja a 60 másodpercet, feltéve, hogy mind az észlelt,

mind a saját légijármű a meglévő pozíciójából gyorsulás nélküli mozgással halad, és hogy a távolság a legszorosabb megközelítésnél 5,6 km-el (3 NM) egyenlő.

4.3.7.1.2.2.1 *Távolság beszerzési lekérdezések.* Az ACAS-nak rövid levegő-levegő felderítési formátumot (UF = 0) kell használni a távolság beszerzéséhez. Az ACAS-t AQ = 1 (3. fejezet, 3.1.2.8.1.1 pont) és RL = 0 (3. fejezet, 3.1.2.8.1.2 pont) értékekre kell beállítani a beszerzési lekérdezéshez.

1. Megjegyzés. – AQ = 1 beállítás az RL mező 14-es bitje egyenlő 1 válaszát eredményezi és segédeszközként szolgál a saját lekérdezésre érkezett válasznak más ACAS egységektől kapott válaszoktól való megkülönböztetésre (4.3.7.1.2.2.2 pont).

2. Megjegyzés. – A beszerzési lekérdezésben RL 0-ra van beállítva rövid beszerzési válasz utasításhoz (DF = 0).

4.3.7.1.2.2.2 *Követési lekérdezés* ACAS-nak követési lekérdezésekhez rövid levegő-levegő ellenőrzési formátumot (UF = 0) RL = 0 és AQ = 0 beállításokkal kell alkalmaznia.

4.3.7.1.2.3 *Felderítési válaszok.* Ezeket a protokollokat a 4.3.11.3.1 pont írja le.

4.3.7.1.2.4 *ACAS adás.* Névlegesen minden 8-10 másodpercben sugározni kell egy ACAS adást a tető antennából. Az irányantennát használó berendezéseknek úgy kell működniük, hogy névlegesen minden 8-10 másodpercben egy teljes kör lefedést szolgáltassanak.

Megjegyzés. – Egy adás más S-módú válaszjeladónál a lekérdezés vételét idézi elő és azt, hogy az MU mező által tartalmazott lekérdezés tartalmát szolgáltatja a válaszjeladó kimenő adat csatolóegységnél. Az UDS1 = 3, UDS2 = 2 kombináció az adatokat ACAS adásként azonosítja, amely a lekérdező ACAS légijármű diszkrét címzését tartalmazza. Ez mindegyik ACAS-nak eszközt szolgáltat az észlelési távolságon belül lévő többi ACAS számának megállapítására az interferencia korlátozásához. Az MU mező formátuma a 4.3.8.4.2.3 pontban kerül leírásra.

4.3.7.2 Levegő-levegő koordinációs protokollok

4.3.7.2.1 *Koordinációs lekérdezések.* Az ACAS UF=16 lekérdezéseket továbbít (3. Fejezet 3.1.2.3.2 pont, 3,7 ábra) AQ = 0 és RL = 1 beállításokkal, amikor RI = 3 vagy 4-et jelentő másik légijárművet veszélyeztetésnek nyilvánítanak (4.3.4 alpont). Az MU mező tartalmazza a megoldási közleményt a 4.3.8.4.2.3.2 pontban ismertetett almezőkben.

1. Megjegyzés. – Az UF 16 lekérdezés AQ = 0 és RL = 1-el arra van szánva, hogy egy DF=16 választ váltson ki a másik légijárműtől.

2. Megjegyzés. – Egy RI = 3 illetve RI = 4-et jelentő légijármű egy működő ACAS-al felszerelt légijármű, amelynek csak függőleges, illetve függőleges és vízszintes megoldási képessége van.

4.3.7.2.2 *Koordinációs válasz.* Ezek a protokollok a 4.3.11.3.2 pontban kerülnek ismertetésre.

4.3.7.3 Protokollok ACAS földi állomásokkal folytatott kommunikációhoz

4.3.7.3.1 *RA jelentések S-módú földi állomásoknak.* Ezeket a protokollokat a 4.3.11.4.1 pont tartalmazza.

4.3.7.3.2 *RA adások.* Megoldási javaslatokat teljes teljesítménnyel a fenék antennától kell továbbítani vibráló, névlegesen 8 másodperces időközöknél azokban az időszakokban, amikor a megoldási javaslatot jelzik. A megoldási tanácsadás közvetítésének tartalmaznia kell az MU-mezőt, ahogyan azt a 4.3.8.4.2.3.4 pont ismerteti. A megoldási javaslatnak ismertetnie kell a legutóbbi megoldási javaslatot, amely a megelőző 8 másodperces időszakban állt fenn. Irány antennát használó berendezéseknek úgy kell működniük, hogy névlegesen minden 8 másodpercben teljes körkörös lefedést biztosító tanácsadási értelmet és erősséget közvetítsenek.

4.3.7.3.3 *Adat kapcsolat képesség jelentés.* Ezeket a protokollokat a 4.3.11.4.2 pont tartalmazza.

4.3.7.3.4 *ACAS érzékenységi szint szabályozás.* Az ACAS akkor és csak akkor hajt végre érzékenységi szint utasítást, ha a TMS (3. fejezet, 3.1.2.6.1.4.1 pont) 0 értékű és DI vagy 1 vagy 7 ugyanabban a lekérdezésben.

4.3.8 Jel formátumok

4.3.8.1 Az összes ACAS jel RF jellemzői feleljenek meg a 3. fejezet 3.1.1.1 – 3.1.1.6, 3.1.2.1 – 3.1.2.3, 3.1.2.5 és 3.1.2.8 pontok előírásainak.

4.3.8.2 Kapcsolat az ACAS és S-módú jelformátumok között

Megjegyzés. – Az ACAS S-módú továbbításokat használ ellenőrzésre és kommunikációhoz. Az ACAS levegő-levegő kommunikációk lehetővé teszik a megoldási tanácsadás döntések koordinációját az ACAS-al felszerelt veszélyeztetők légijárművekkel. Az ACAS föld-levegő kommunikációs tevékenységek lehetővé teszik a megoldási javaslatok jelentését a földi állomásoknak, és az utasítások továbbítását az ACAS-al felszerelt légijárművekhez az összeütközés elkerülését biztosító algoritmusok paramétereinek szabályozására.

4.3.8.3 *Jel formátum szabályok.* Valamennyi ACAS jel adat kódolásának egyezzen meg a 3. fejezet 3.1.2.3 pontjának előírásaival.

Megjegyzés. – Az ACAS által használt levegő-levegő továbbításokban az 1030 MHz-en továbbított lekérdezéseket "fedélzetre irányuló kapcsolási" (uplink) továbbításnak nevezik és fedélzetre irányuló kapcsolási formátum (UF) kódokat tartalmaznak. Az 1090 MHz-en vett válaszokat "fedélzetről leadott kapcsolási" (downlink) továbbításnak nevezik és fedélzetről leadott kapcsolási formátum(DF) kódokat tartalmaznak.

4.3.8.4 Mező leírás

1. Megjegyzés. – A levegő-levegő ellenőrzési és kommunikációs formátumok, amelyeket az ACAS használ, de a 3. Fejezet, 3.1.2 pontjában nincsenek teljes mértékben ismertetve, a 4-1 ábrán vannak megadva.

Uplink: fedélzetre irányuló adattovábbítás

UF=0	0000	3	RL:1	4	AQ:1	18	AP:24

UF=16	10000	3	RL:1	4	AQ:1	18	MU:56	AP:24

Dowlink: fedélzetről leadott adattovábbítás

DF=0	00000	VS:1	2	SL:3	2	RI:4	2	AC:13	AP:24

DF=16	10000	VS:1	2	SL:3	2	RI:4	2	AC:13	MV:56	AP:24

4-1 ábra. Az ACAS által használt ellenőrzési és kommunikációs formátumok

2. Megjegyzés. – Ez a szakasz azokat az S-módú mezőket (és azok almezőit) definiálja, amelyeket az ACAS feldolgoz, hogy az ACAS feladatokat teljesítse. Az ACAS mezők közül néhány (azok is, amelyet más SSR S-módú tevékenységhez használnak) kijelöletlen ACAS kódokkal vannak leírva 3. fejezet, 3.1.2.6 pontjában. Ilyen kódok a 4.3.8.4.1 pontban vannak kijelölve. A csak ACAS berendezések által használt mezők és almezők a 4.3.8.4.2 pontban kerülnek kijelölésre.

3. Megjegyzés. – A 4.3.8.4 pontban használt bit számozási szokás inkább a teljes fedélzetre irányuló vagy fedélzetről leadott kapcsolati formátumon belüli bit számozást tükrözi, semmint az egyedi mezőkön, illetve almezőkön belüli biteket.

4.3.8.4.1 *A 3. fejezet, 3.1.2 pontban bevezetett mezők és almezők*

Megjegyzés. – A 3. fejezet, 3.1.2 pontjában "ACAS részére fenntartott" jelölésű missziós mezők és almezők kódjai kerülnek leírásra.

4.3.8.4.1.1 *DR (fedélzetről leadott adattovábbítási igény).* A fedélzetről leadott adattovábbítási igény mező kódolásának jelentése a következő:

Kódolás
0 - 1 Lásd 3. fejezet 3.1.2.6.5.2 pont
2 ACAS üzenet rendelkezésre áll
3 Comm-B közlés rendelkezésre áll és ACAS közlés rendelkezésre áll
4-5 Lásd 3. fejezet 3.1.2.6.5.2 pont
6 Comm-B adás közlemény 1 rendelkezésre áll és ACAS közlés rendelkezésre áll
7 Comm-B adás közlemény 2 rendelkezésre áll és ACAS közlés rendelkezésre áll
8-31 Lásd 3. fejezet, 3.1.2.6.5.2 pont

4.3.8.4.1.2 *RI (levegő-levegő válaszinformáció).* A kódolás jelentése az RI mezőben a következő:

Kódolás
0 Nem működő ACAS
1 Nem kijelölt
2 ACAS gátolt megoldás képessége
3 ACAS csak függőleges megoldás képességgel
4 ACAS függőleges és vízszintes megoldás képességgel
5-7 Nem kijelölt
8-15 Lásd 3. fejezet, 3.1.2.8.2.2 pont

A válasz formátum 14 bitje, amely ezt a mezőt tartalmazza, válaszol a lekérdezés AQ bitjére. Az RI mező "nem működő ACAS" szöveget jelent (RI=0), ha az ACAS egység meghibásodott, vagy tartalékban van. Az RI mező ACAS gátolt megoldás képességgel (RI = 2) szöveget jelent, ha az érzékenységi mező 2 vagy TA az egyetlen kiválasztott üzemmód.

Megjegyzés. – A 0-7 kód az RI mezőn azt jelzi, hogy a válasz egy követési válasz, és a lekérdezett légijármű ACAS képességét is adja. A 8-15 kódok azt jelzik, hogy a válasz egy beszerzési válasz, és a lekérdezett légijármű maximális valódi képességét jelenti.

4.3.8.4.1.3 *RR (válasz kérés).* A kódolás jelentése a válasz igény mezőben a következő:

Kódolás:

0-18 Lásd 3. fejezet, 3.1.2.6.1.2 pont
19 Megoldási tanácsadás jelentést továbbítani
20-31 Lásd 3. fejezet, 3.1.2.6.1.2 pont

4.3.8.4.2 *ACAS mezők és almezők*

Megjegyzés. – A következő pontok azoknak a mezőknek és almezőknek az elhelyezkedését és kódolását írják le, amelyeket a 3. fejezet, 3.1.2 pontjában nem határoztak meg, de az ACAS-al felszerelt légijárművek használnak.

4.3.8.4.2.1 *Almező MA-ban*

4.3.8.4.2.1.1 *ADS (A-definíciós almező*) Ez a 8-mezős (33-40) almező az MA megmaradó részét írja le.

Megjegyzés. – A kényelmes kódolás kedvéért két, egyenként négy bitből álló csoportban van kifejezve: ADS1 és ADS2.

4.3.8.4.2.1.2 Amikor ADS1 = 0 és ADS2 = 5, MA a következő almezőt tartalmazza:

4.3.8.4.2.1.3 *SLC (ACAS érzékenységi szint szabályozás (SLC) utasítás).* Ez a bit 4-es (41-44) almező egy érzékenységi szint utasítást jelöl a saját ACAS részére.

Kódolás

0 Nincs utasítás kiadva
1 Nincs kijelölve
2 ACAS érzékenységi szintet 2-re állítani
3 ACAS érzékenységi szintet 3-ra állítani
4 ACAS érzékenységi szintet 4-re állítani
5 ACAS érzékenységi szintet 5-re állítani
6 ACAS érzékenységi szintet 6-ra állítani
7-14 Nincs kijelölve
15 Az ettől a földi állomástól jövő előző SLC utasítást törölni.

Megjegyzés. – Az MA szerkezete érzékenységi szint utasításnál:

33	37	41	45
ADS1=0	ADS2=5	SLC	44
36	40	44	88

4.3.8.4.2.2 *Almezők MB-ben*

4.3.8.4.2.2.1 *Almezők MB-ben RA jelentés részére.* Amikor BDS1=3 és BDS2=0, az alább jelzett almezőket az MB-nek tartalmaznia kell. Egy megoldási tanácsadás végét követő 18 ±1 másodpercig a megoldási javaslatban szereplő összes MB almezőnek az 59-es bit (megoldási tanácsadás befejezését kijelző) kivételével meg kell tartania azokat az információkat, amelyeket azalatt közöltek, amikor a megoldási tanácsadás utoljára aktív volt.

4.3.8.4.2.2.1.1 *ARA (aktív RA-k).* Ez a 14 bites (41-54) almező jelzi a megoldási tanácsadás jellemzőket, ha van megoldási tanácsadás, amelyet az almezőt továbbító válaszjeladóval kapcsolatos ACAS generál (4.3.6.2.1 a)) pont). Az aktív megoldási javaslatnál lévő bitek jelentését az MTE almező (4.3.8.4.2.2.1 pont) értéke határozza meg és függőleges megoldási javaslatnál az aktív megoldási tanácsadás 41-es bitjének értéke. Az aktív megoldási tanácsadás 41-es bitjének jelentése a következő:

Kódolás

0 Egynél több veszélyeztető légijármű van és a megoldási tanácsadás elkülönítés létrehozására törekszik veszélyeztető(k) alatt és más veszélyeztető(k) felett, vagy nem történt megoldási tanácsadás generálás (amikor MTE = 0)

1 Vagy csak egy veszélyeztető van, vagy a megoldási tanácsadás minden veszélyeztetőnél ugyanolyan irányban törekszik elkülönítés biztosítására.

Amikor az aktív megoldási tanácsadás 41-es bitje = 1 és MTE = 0 vagy 1, a 42-47-es biteknek a következő jelentésük van:

Bit	*Kódolás*	
42	0	Megoldási tanácsadás preventív
	1	Megoldási tanácsadás helyesbítő
43	0	Felfelé értelmű elmozdulásra szóló megoldási tanácsadás került generálásra
	1	Lefelé értelmű elmozdulásra szóló megoldási tanácsadás került generálásra
44	0	Megoldási tanácsadás nem növelt sebesség
45	0	Megoldási tanácsadás nem az értelem megfordítása
	1	Megoldási tanácsadás az értelem megfordítása
46	0	Megoldási tanácsadás nem magasság keresztezés
	1	Megoldási tanácsadás magasság keresztezés
47	0	Megoldási tanácsadás függőleges sebességkorlátozás
	1	Megoldási tanácsadás pozitív
48-54		ACAS III. részére fenntartott

Amikor az aktív megoldási tanácsadás 41-es bitje = 0 és MTE = 1, a 42-47-es bitek jelentése a következő:

Bit	*Kódolás*	
42	0	Megoldási tanácsadás nem kíván helyesbítést a felfelé értelmű elmozdulásnál
	1	Megoldási tanácsadás helyesbítést kíván a lefelé értelmű elmozdulásnál
43	0	Megoldási tanácsadás nem kíván határozott emelkedést
	1	Megoldási tanácsadás határozott emelkedést kíván
44	0	Megoldási tanácsadás nem kíván helyesbítést a lefelé értelmű elmozdulásnál
	1	Megoldási tanácsadás helyesbítést kíván a lefelé értelmű elmozdulásnál
45	0	Megoldási tanácsadás nem kíván határozott süllyedést
	1	Megoldási tanácsadás határozott süllyedést kíván
46	0	Megoldási tanácsadás nem kíván keresztezést
	1	Megoldási tanácsadás keresztezést kíván

47	0	Megoldási tanácsadás nem az értelem megfordítása
	1	Megoldási tanácsadás az értelem megfordítása
48-54		ACAS III. részére fenntartott

Megjegyzés. – Ha az aktív megoldás tanácsadás 41-es bitje = 0 és MTE = 0, függőleges megoldási tanácsadás nem került generálásra.

4.3.8.4.2.2.1.2 *RAC (RAC-k rögzítése).* Ez a 4-bites (55-58) almező jelzi az összes éppen aktív megoldási tanácsadás kiegészítést, ha van, amelyeket másik ACAS légijárműtől kaptak. A megoldási tanácsadás kiegészítésben lévő biteknek a következő jelentésük van:

Bit	*Megoldási tanácsadás kiegészítés*
55	Ne haladj el alul
56	Ne haladj el felül
57	Ne fordulj balra
58	Ne fordulj jobbra

Egy bit az 1 állásban azt jelzi, hogy a kapcsolódó megoldási tanácsadás kiegészítés aktív. Egy bit 0 állásban azt jelzi, hogy a kapcsolódó megoldási tanácsadás kiegészítés inaktív.

4.3.8.4.2.2.1.3 *RAT (RA befejezését kijelző).* Ez az 1-bites (59) almező akkor jelez, ha az ACAS által előzőleg generált megoldási tanácsadás generálása megszűnik.

Kódolás

0 Az aktív megoldási tanácsadás almező által jelzett megoldási tanácsadás jelenleg aktív
1 Az aktív megoldási tanácsadás almező által jelzett megoldási tanácsadás megszűnt (4.3.11.4.1 pont).

1. Megjegyzés. – Azután, hogy az ACAS a megoldási javaslatot megszüntette, még megkívánt, hogy 18 ± 1 másodpercig az S-módú válaszjeladó jelentse azt (4.3.11.4.1 pont). A megoldási tanácsadás befejezését kijelző használható például egy megoldási tanácsadás jelzés egy légiforgalmi irányító kijelzőjéről való időleges eltávolításának engedélyezésére vagy megoldási tanácsadás időtartam értékelésére egy adott légtéren belül.

2. Megjegyzés. – A megoldási tanácsadás számos okból megszűnhet; normálisan, ha a konfliktus megoldódott és a veszélyeztető légijármű távolodik; vagy amikor a veszélyeztető légijármű S-módú válaszjeladója valamilyen ok miatt szünetelteti a magasság jelentését a konfliktus alatt. A megoldási tanácsadás befejezését kijelző arra használatos, hogy kimutassa, hogy a megoldási tanácsadás ezen esetek egyikében megszűnt.

4.3.8.4.2.2.1.4 *MTE (többszörös veszélyeztető légijármű előfordulás).* Ez az 1-bites (60) almező jelzi, hogy két vagy több egyidejű veszélyeztető légijármű éppen feldolgozás alatt áll az ACAS veszélyeztető megoldási logikája által.

Kódolás

0 A megoldás logika éppen az egyik veszélyeztetőt dolgozza fel (amikor az aktív megoldás tanácsadás 41-es bitje = 1); vagy a veszélyeztető nem áll megoldási logika által történő feldolgozás alatt.
1 Két vagy több egyidejű veszélyeztető megoldási logika által történő feldolgozás alatt áll.

4.3.8.4.2.2.1.5 *TTI (veszélyeztető légijármű típusát kijelző almező).* Ez a 2-bites almező (61-62) határozza meg a TID almező által tartalmazott azonosítási adatok típusát.

Kódolás

0	Nincs azonosítási adat a TID-ben
1	A TID egy S-módú válaszjeladó címzést tartalmaz
2	A TID magassági, távolsági és irány adatokat tartalmaz
3	Nincs kijelölve

4.3.8.4.2.2.1.6 *TID (veszélyeztető légijármű azonosítás adat almező).* Ez a 26-bites almező (63-88) tartalmazza a veszélyeztető légijármű S-módú címzését, vagy magasságát, távolságát és irányhelyzetét, ha a veszélyeztető nincs S-móddal felszerelve. Ha az ACAS megoldási logika két vagy több veszélyeztetőt dolgoz fel egyidőben, a TID a legutoljára bejelentett veszélyeztető légijármű azonosítási vagy pozíciós adatait tartalmazza. Ha TTI = 1, a TID a 63-86 bitekben az S-módú címzést tartalmazza és a 87- és 88-as biteket 0-ra kell állítani. Ha TTI = 2, a TID a következő három almezőt tartalmazza:

4.3.8.4.2.2.1.6.1 *TIDA (veszélyeztető légijármű azonosítási adat magassági almező).* Ez a 13-bites almező (63-75) a veszélyeztető légijármű legutoljára jelentett C-módú magassági kódját tartalmazza.
Kódolás

Bit	63	64	65	66	67	68	69	70	71	72	73	74	75
C-mód	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

4.3.8.4.2.2.1.6.2 *TIDR (veszélyeztető légijármű azonosítási adat távolság almező).* Ez a 7-bites almező (76-82) a veszélyeztető légijármű ACAS által legutoljára becsült távolságát tartalmazza.

Kódolás (n)

n	*Becsült távolság (NM)*
0	Távolság becslés nem áll rendelkezésre
1	Kisebb, mint 0,05
2-126	*(n-1)/10 ± 0,05*
127	Nagyobb, mint 12,55

4.3.8.4.2.2.1.6.3 *TIDB (veszélyeztető légijármű azonosítás adat irányhelyzet almező).* Ez a 6-bites almező (83-88) a veszélyeztető légijármű legutolsó becsült iránytartását az ACAS légijármű iránytengelyéhez viszonyítva tartalmazza.

Kódolás (n)

n	*Becsült iránytartás (fok*
0	Irány becslés nem áll rendelkezésre
1-60	6(*n*-1) és 6*n* között
61-63	Nem kijelölt

Megjegyzés. – Az MB szerkezete megoldási tanácsadás jelentéshez:

33	37	41	55	59	60	61	63
BDS1=3	BDS2=0	ARA	RAC	RAT	MTE	TTI = 1	TID
36	40	54	58	59	60	62	88

33	37	41	55	59	60	61	63	76	83
BDS1=3	BDS2=0	ARA	RAC	RAT	MTE	TTI = 2	TIDA	TIDR	TIDB
36	40	54	58	59	60	62	75	82	88

4.3.8.4.2.2.2 *Almezők az MB-ben az adatkapcsolat képesség jelentésére.* Amikor BDS1 = 1 és BDS2 = 0, a következő bit sémákat kell szolgáltatni a válaszjeladóhoz annak adatkapcsolati képességi jelentéséhez:

Bit	*Kódolás*
48	0 ACAS meghibásodott vagy tartalékon van
	1 ACAS működik
69	0 ACAS II
	1 ACAS III
70	0 ACAS csak TA-kat generál
	1 ACAS TA-kat és RA-kat generál71
	0 ACAS-al nincs ellátva
	1 ACAS-al ellátott
72	0 Hibrid felderítés nincs felszerelve

1. Megjegyzés. – Az adat kapcsolati képesség jelentés szerkezet MB altereinek összefoglalása 3. fejezet 3.1.2.6.10.2.2 pontjában található.

2. Megjegyzés. – Az ACAS aktív lekérdezéseket limitáló hibrid felderítés használatát a 4.5.1 szakasz írja le. Csak a DF = 17 kiterjesztett squitter közlemények dekódolása támogatásának képessége nem elegendő a 72-es bit beállításához.

4.3.8.4.2.3 *MU mező.* A hosszantartó levegő-levegő ellenőrzési lekérdezésnek (4-1 ábra) ezt az 56-bites (33-88) mezejét megoldás közlések, ACAS adások és megoldási tanácsadás közvetítések továbbítására használják.

4.3.8.4.2.3.1 *UDS (U-definíciós almező).* Ez a 8-bites (33-40) almező az MU maradék részét határozza meg.

Megjegyzés. – A kódolás kényelmesebbé tételének kedvéért az UDS-t két, egyenként négy bitből álló csoportban fejezik ki; UDS1 és UDS2.

4.3.8.4.2.3.2 *Almezők MU-ban megoldás közlés részére.* Amikor UDS1 = 3 és UDS2 = 0, az MU a következő almezőket tartalmazza:

4.3.8.4.2.3.2.1 *MTB (többszörös veszélyeztető légijármű bit).* Ez az 1-bites (42) almező többszörös veszélyeztető légijármű jelenlétét vagy hiányát jelöli.

Kódolás
0 Lekérdező ACAS-nak egy veszélyeztetője van
1 Lekérdező ACAS-nak egynél több veszélyeztetője van

4.3.8.4.2.3.2.2 *VRC (függőleges RAC).* Ez a 2-bites (45-46) a címzett légijárműre vonatkozó függőleges megoldási tanácsadás kiegészítését jelöli.
Kódolás
0 Nem küldtek függőleges megoldási tanácsadás kiegészítést
1 Ne haladjon el alul
2 Ne haladjon el felül
3 Nem kijelölt

4.3.8.4.2.3.2.3 *CVC (függőleges RAC törlés).* Ez a 2-bites (43-44) almező a címzett légijárműnek előzőleg küldött függőleges megoldás tanácsadás kiegészítés törlését jelöli. Ezt az almezőt 0-ra kell állítani új veszélyeztetőnél.

Kódolás
0 Nincs törlés
1 Törölni az előzőleg küldött "Ne haladjon el alul" függőleges megoldási tanácsadás kiegészítést.
2 Törölni az előzőleg küldött "Ne haladjon el felül" függőleges megoldási tanácsadás kiegészítést.
3 Nem kijelölt

4.3.8.4.2.3.2.4 *HRC (vízszintes RAC).* Ez a 8-bites (50-52) almező a címzett légijárműre vonatkozó vízszintes megoldási tanácsadás kiegészítést jelöl.

Kódolás
0 Nincs vízszintes megoldási tanácsadás kiegészítés vagy nincs vízszintes megoldási tanácsadás
1 Másik ACAS-nak forduljon balra értelme van; ne forduljon balra
2 Másik ACAS-nak forduljon balra értelme van; ne forduljon jobbra
3 Nem kijelölt
4 Nem kijelölt
5 Másik ACAS-nak forduljon jobbra értelme van; ne forduljon balra;
6 Másik ACAS-nak forduljon jobbra értelme van; ne forduljon jobbra
7 Nem kijelölt

4.3.8.4.2.3.2.5 *CHC (vízszintes RAC törlés).* Ez a 3-bites (47-49) almező a címzett légijárműnek előzőleg küldött vízszintes megoldási tanácsadás kiegészítés törlését jelöli. Ezt az almezőt 0-ra kell állítani új veszélyeztetőnél.

Kódolás
0 Nincs törlés vagy nincs vízszintes megoldási képesség
1 Előzőleg küldött "Ne forduljon balra" törlése
2 Előzőleg küldött "Ne forduljon jobbra" törlése
3-7 Nem kijelölt

4.3.8.4.2.3.2.6 *VSB (függőleges értelmű bit almező).* Ez a 4-bites (61-64) almezőt a CVC és VRC almezőkben lévő adatok védelmére használják. A 43-46 bitek 16 lehetséges kombinációhoz a következő VSB kódokat kell továbbítani:

	CVC		VRC		VSB			
Kódolás	43	44	45	46	61	62	63	64
0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	1	1	0
2	0	0	1	0	0	1	0	1
3	0	0	1	1	1	0	0	1
4	0	1	0	0	1	0	1	1
5	0	1	0	1	0	1	0	1
6	0	1	1	0	1	1	0	0
7	0	1	1	1	0	0	1	0
8	1	0	0	0	1	1	0	1
9	1	0	0	1	0	0	1	1
10	1	0	1	0	1	0	1	0
11	1	0	1	1	0	1	0	0
12	1	1	0	0	0	1	1	0
13	1	1	0	1	1	0	0	0
14	1	1	1	0	0	0	0	1
15	1	1	1	1	1	1	1	

Megjegyzés. – A szabály, amelyet a VSB almező bit beállításra használnak, egy 3 Hamming kód távolság, megnövelve egy paritás bittel, amely az érzékelés képességét produkálja három hibáig a nyolc továbbított bitben.

4.3.8.4.2.3.2.7 *HSB (vízszintes értelmű bit almező).* Ezt az 5-bites (56-60) almezőt a CHC és HRC almezőkben lévő adatok védelmére használják. A 47-52 bitek 64 lehetséges kombinációihoz a következő HSB kódokat kell továbbítani.

	CHC			HRC			HSB				
Kódolás	47	48	49	50	51	52	56	57	58	59	60
0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	0	1	0	1	1
2	0	0	0	0	1	0	1	0	0	1	1
3	0	0	0	0	1	1	1	1	0	0	0
4	0	0	0	1	0	0	1	1	1	0	0
5	0	0	0	1	0	1	1	0	1	1	1
6	0	0	0	1	1	0	0	1	1	1	1
7	0	0	0	1	1	1	0	0	1	0	0
8	0	0	1	0	0	0	0	1	1	0	1
9	0	0	1	0	0	1	0	0	1	1	0
10	0	0	1	0	1	0	1	1	1	1	0
11	0	0	1	0	1	1	1	0	1	0	1
12	0	0	1	1	0	0	1	0	0	0	1
13	0	0	1	1	0	1	1	1	0	1	0
14	0	0	1	1	1	0	0	0	0	1	0
15	0	0	1	1	1	1	0	1	0	0	1
16	0	1	0	0	0	0	1	0	1	0	1

17	0	1	0	0	0	1	1	1	1	1	0
18	0	1	0	0	1	0	0	0	1	1	0
19	0	1	0	0	1	1	0	1	1	0	1
20	0	1	0	1	0	0	0	1	0	0	1
21	0	1	0	1	0	1	0	0	0	1	0
22	0	1	0	1	1	0	1	1	0	1	0
23	0	1	0	1	1	1	1	0	0	0	1
24	0	1	1	0	0	0	1	1	0	0	0
25	0	1	1	0	0	1	1	0	0	1	1
26	0	1	1	0	1	0	0	1	0	1	1
27	0	1	1	0	1	1	0	0	0	0	0
28	0	1	1	1	0	0	0	0	1	0	0
29	0	1	1	1	0	1	0	1	1	1	1
30	0	1	1	1	1	0	1	0	1	1	1
31	0	1	1	1	1	1	1	1	1	0	0
32	1	0	0	0	0	0	1	1	0	0	1
33	1	0	0	0	0	1	1	0	0	1	0
34	1	0	0	0	1	0	0	1	0	1	0
35	1	0	0	0	1	1	0	0	0	0	1
36	1	0	0	1	0	0	0	0	1	0	1
37	1	0	0	1	0	1	0	1	1	1	0
38	1	0	0	1	1	0	1	0	1	1	0
39	1	0	0	1	1	1	1	1	1	0	1
40	1	0	1	0	0	0	1	0	1	0	0
41	1	0	1	0	0	1	1	1	1	1	1
42	1	0	1	0	1	0	0	0	1	1	1
43	1	0	1	0	1	1	0	1	1	0	0
44	1	0	1	1	0	0	0	1	0	0	0
45	1	0	1	1	0	1	0	0	0	1	1
46	1	0	1	1	1	0	1	1	0	1	1
47	1	0	1	1	1	1	1	0	0	0	0
48	1	1	0	0	0	0	0	1	1	0	0
49	1	1	0	0	0	1	0	0	1	1	1
50	1	1	0	0	1	0	1	1	1	1	1
51	1	1	0	0	1	1	1	0	1	0	0
52	1	1	0	1	0	0	1	0	0	0	0
53	1	1	0	1	0	1	1	1	0	1	1
54	1	1	0	1	1	0	0	0	0	1	1
55	1	1	0	1	1	1	0	1	0	0	0
56	1	1	1	0	0	0	0	0	0	0	1
57	1	1	1	0	0	1	0	1	0	1	0
58	1	1	1	0	1	0	1	0	0	1	0
59	1	1	1	0	1	1	1	1	0	0	1
60	1	1	1	1	0	0	1	1	1	0	1
61	1	1	1	1	0	1	1	0	1	1	0
62	1	1	1	1	1	0	0	1	1	1	0
63	1	1	1	1	1	1	0	0	1	0	1

Megjegyzés. – A szabály, amelyet a HSB almező bit beállításra használnak, egy 3 Hamming kód távolság, megnövelve egy paritás bittel, amely a detektálás képességét produkálja három hibáig nyolc továbbított bitben.

4.3.8.4.2.3.2.8 *MID (Légijármű címzés.).* Ez a 24-bites (65-88) almező a lekérdező ACAS légijármű 24-bites légijármű címzését tartalmazza.

Megjegyzés. – MU szerkezete megoldás közlésnél:

33	37	41	42	43	45	47	50	53	56	61	65
UDS1=3	UDS2=0	-1-	MTB	CVC	VRC	CHC	HRC	-3-	HSB	VSB	MID
36	40	41	42	44	46	49	52	55	60	64	88

4.3.8.4.2.3.3 *Almező MU-ban ACAS adásnál.* Amikor UDS1 = 3 és UDS2 = 2, az MU a következő almezőt tartalmazza:

4.3.8.4.2.3.3.1 *MID (Légijármű címzés).* Ez a 24-bites (65-88) almező a lekérdező ACAS légijármű 24-bites légijármű címzését tartalmazza.

Megjegyzés. – MU szerkezete ACAS adásnál:

33	37	41	65
UDS1=3	UDS2=2	24	MID
36	40	64	88

4.3.8.4.2.3.4 *Almezők MU-ban RA adásnál.* Amikor UDS1 = 3 és UDS2 = 1, az MU a következő almezőket tartalmazza:

4.3.8.4.2.3.4.1 *ARA (aktív RA-k).* Ezt a 14-bites (41-54) almezőt a 4.3.8.4.2.2.1.1 pontban meghatározott módon kell kódolni.

4.3.8.4.2.3.4.2 *RAC (RAC rekord).* Ez a 4 bites (55-58) almezőt a 4.3.8.4.2.2.1.2 pontban meghatározottak szerint kell kódolni.

4.3.8.4.2.3.4.3 *RAT (RA befejezését kijelző).* Ezt az 1-bites (59) almezőt a 4.3.8.4.2.2.1.3 pontban meghatározott módon kell kódolni.

4.3.8.4.2.3.4.4 *MTE (többszörös veszélyeztető előfordulás).* Ezt az 1-bites (60) almezőt a 4.3.8.4.2.2.1.4 pontban meghatározott módon kell kódolni.

4.3.8.4.2.3.4.5 *AID (A-módú azonosítási kód).* Ez a 13-bites (63-75) almező a jelentő légijármű A-módú azonosítási kódját jelöli.

Kódolás

Bit	63	64	65	66	67	68	69	70	71	72	73	74	75
A-módú kód bit	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

4.3.8.4.2.3.4.6 *CAC (C-módú magasság kód).* Ez a 13-bites (76-88) almező a jelentő légijármű C-módú azonosítási kódját jelöli.

Kódolás

Bit	76	77	78	79	80	81	82	83	84	85	86	87	88
C-módú kód	C_1	A_1	C_2	A_2	C_4	A_4	0	B_1	D_1	B_2	D_2	B_4	D_4

Megjegyzés. – Az MU szerkezete megoldási tanácsadás közvetítésnél.

33–36	37–40	41–54	55–58	59	60	61–62	63–75	76–88
UDS1=3	DS2=1	ARA	RAC	RAT	MTE	-2-	AID	CAC

4.3.8.4.2.4 *MV mező.* A hosszú levegő-levegő ellenőrző válaszoknak (4-1 ára) 56-bites (33-88) mezőjét levegő-levegő koordinációs válasz közlések továbbítására használják.

4.3.8.4.2.4.1 *VDS (V-definíciós almező).* Ez a 8-bites (33-40) almező az MV megmaradó részét határozza meg.
Megjegyzés. – A kódolás megkönnyítése érdekében a VDS-t két, egyenként négy bitből álló csoportban fejezik ki: VDS1 és VDS2.

4.3.8.4.2.4.2 *Almezők MV-ben koordinációs válaszhoz.* Amikor VDS1 = 3 és VDS2 = 0, az MV a következő altereket tartalmazza:

4.3.8.4.2.4.2.1 *ARA (aktív RA-k).* Ezt a 14-bites (41-54) almezőt a 4.3.8.4.2.2.1.1 pontban meghatározott módon kell kódolni.

4.3.8.4.2.4.2.2. *RAC (RAC-k rögzítése).* Ezt a 4-bites (55-58) almezőt a 4.3.8.4.2.2.1.2 pontban meghatározott módon kell kódolni.

4.3.8.4.2.4.2.3 *RAT (RA befejezését kijelző).* Ezt az 1-bites (59) almezőt a 4.3.8.4.2.2.1.3 pontban meghatározott módon kell kódolni.

4.3.8.4.2.4.2.4 *MTE (többszörös veszélyeztető előfordulás).* Ezt az 1-bites (60) almezőt a 4.3.8.4.2.2.1.4 pontban meghatározott módon kell kódolni.

Megjegyzés. – Az MV szerkezete koordinációs válasznál:

33–36	37–40	41–54	55–58	59	60	61–88
VDS1 = 3	VDS2 = 0	ARA	RAC	RAT	MTE	-28-

4.3.8.4.2.5 *SL (érzékenységi szint jelentés).* Ezt a 3-bites (9-11) fedélzetről leadott adattovábbítási almezőt mind rövid, mind hosszú levegő-levegő válasz formátumok (DF = 0 és 161) tartalmazzák. Ez a mező jelöli azt az érzékenységi szintet, amelynél az ACAS éppen működik.

Kódolás

0 ACAS nem működik
1 ACAS 1-es érzékenységi szinten működik
2 ACAS 2-es érzékenységi szinten működik

3	ACAS 3-as érzékenységi szinten működik
4	ACAS 4-es érzékenységi szinten működik
5	ACAS 5-ös érzékenységi szinten működik
6	ACAS 6-ös érzékenységi szinten működik
7	ACAS 7-es érzékenységi szinten működik

4.3.9 ACAS berendezés jellemzők

4.3.9.1 *Csatolóegységek.* Az ACAS részére minimálisan a következő bemenő adatokat kell szolgáltatni:

a) égijármű címzés kód;
b) S-módú levegő-levegő és föld-levegő továbbítások, amelyeket S-módú válaszjeladó vesz ACAS általi felhasználásra (4.3.6.3.2 pont);
c) saját légijármű maximális valós, levegőhöz viszonyított sebesség képessége (3. Fejezet, 3.1.2.8.2.2 pont);
d) nyomásmagasság; és
e) rádiómagasság

Megjegyzés. – Az ACAS II és ACAS III bemeneteire vonatkozó különleges követelmények alább, a megfelelő szakaszokban kerülnek felsorolásra.

4.3.9.2 *Légijármű antenna rendszer.* Az ACAS két antennán keresztül továbbít lekérdezéseket és veszi a válaszokat, egyik a légijármű tetejére, másik a légijármű aljára van szerelve. A tetőre szerelt antenna irányantenna és iránykeresésre lehet használni.

4.3.9.2.1 *Polarizáció.* Az ACAS adatátvitel polarizációja névlegesen függőleges.

4.3.9.2.2 *Sugárzási séma*. A sugárzási sémának az egyes antennák látóhatár fölötti szögmagasságánál (elevációs szögénél), amikor légijárműre szerelik fel, névlegesen azonosnak kell lennie egy negyedhullámú aszimmetrikus dipólus által sugárzottal a föld síkjában.

4.3.9.2.3 *Antenna kiválasztás*

4.3.9.2.3.1 *Squitter vétel.* Az ACAS-nak képesnek kell lenni squitterek vételére a tető és alsó antennán keresztül.

4.3.9.2.3.2 *Lekérdezések.* ACAS lekérdezéseket nem lehet egyidőben mindkét antennán keresztül továbbítani.

4.3.9.3 *Nyomásmagasság forrás.* Az ACAS részére szolgáltatott saját légijárműre vonatkozó magasság adatokat abból a forrásból kell venni, amely a saját C-módú vagy S-módú jelentések alapjául szolgál a rendelkezésre álló legfinomabb kvantálásnál.

4.3.9.3.1 **Ajánlás.** – *Olyan forrást kell használni, amely 7,62 m-nél (25 láb) finomabb felbontást szolgáltat.*

4.3.9.3.2 Ha 7,62 m-nél (25 láb) finomabb felbontást szolgáltató forrás nem áll rendelkezésre, és csak a saját légijármű részére rendelkezésre álló magassági adatok Gilham kódolásúak, legalább két független forrást kell használni és ezeket folyamatosan összehasonlítani, hogy a kódolási hibákat észrevegyék.

4.3.9.3.3 **Ajánlás.** – *Két magassági adatforrást kell használni és összehasonlítani, hogy a hibákat észleljék az ACAS részére történő szolgáltatás előtt.*

4.3.9.3.4 A 4.3.10.3 pont előírásait kell alkalmazni, amikor a két magassági adat összehasonlítása azt jelzi, hogy a források közül az egyik hibás.

4.3.10 Figyelés

4.3.10.1 Figyelési *funkció.* Az ACAS-nak folyamatosan figyelési feladatokat kell teljesítenie, hogy figyelmeztetést adjon ki, ha a következő feltételek közül legalább valamelyik teljesül:

a) nincsen lekérdezés teljesítmény korlátozás interferencia szabályozás miatt (4.3.2.2.2 pont) és a maximális sugárzott teljesítmény kisebbre csökken, mint ami a 4.3.2 pontban részletezett felderítési követelmények kielégítéséhez szükséges; vagy
b) a berendezésben észlelt bármely más meghibásodás, amely a forgalmi tanácsadás vagy megoldási tanácsadás szolgáltatási képességet csökkenti; vagy
c) külső források nem szolgáltatják az ACAS működéséhez elengedhetetlenül szükséges adatokat, vagy a szolgáltatott adatok nem hitelesek.

4.3.10.2 *Hatás az ACAS működésére.* Az ACAS felügyeleti tevékenysége nem befolyásolhatja károsan a többi ACAS funkciót.

4.3.10.3 *Figyelési reagálás.* Amikor a figyelési funkció meghibásodást észlel (4.3.10.1 pont), az ACAS:

a) jelzi a repülőszemélyzetnek, hogy rendellenes körülmények állnak fenn;
b) megakadályozza a további ACAS lekérdezéseket; és
c) S-módú adattovábbítást hoz létre, amely a saját légijármű megoldási képességét tartalmazza jelezve, hogy az ACAS nem működik.

4.3.11 ACAS-al együtt használt S-módú válaszjeladóval szembeni követelmények

4.3.11.1 V*álaszjeladó képességek.* A 3. fejezet 3.1 pontjában meghatározott minimális válaszjeladó képességeken kívül az ACAS-al együtt használt S-módú válaszjeladónak a következő képességekkel kell rendelkeznie:

a) a következő formátumok kezelésének képessége:

Formátum szám	*Formátum név*
UF = 16	Hosszú levegő-levegő felderítési lekérdezés
DF = 16	Hosszú levegő-levegő felderítési válasz

b) képesség hosszú S-módú lekérdezések (UF = 16) vételére és hosszú S-módú válaszok (DF = 16) generálására 16,6 ms (60 per másodperc) folytonos sebességgel;
c) eszközök az ACAS berendezésekhez címzett összes vett lekérdezés adat tartalmának továbbítására
d) antenna széttelepítés (ahogyan azt a 3. fejezet, 3.1.2.10.4 pontja meghatározza);
e) kölcsönös elnyomó képesség; és
f) inaktív állapotú válaszjeladó kimenő teljesítmény korlátozás.

Amikor az S-módú válaszjeladó adó inaktív állapotban van, a csúcs impulzus teljesítmény 1090 MHz ±-nél az S-módú válaszjeladó antenna kimeneténél nem haladhatja meg a -70 dBm-et.

4.3.11.2 Adatátvitel az ACAS és S-módú válaszjeladója között

4.3.11.2.1 *Adat átvitel az ACAS-tól az S-módú válaszjeladójához*

a) Az S-módú válaszjeladó az ACAS-tól megoldási tanácsadás információkat kap, egy megoldási tanácsadás jelentésben (4.3.8.4.2.2.1 pont) és koordinációs válaszban 4.3.8.4.2.4.2 pont) való továbbítás céljából:
b) az S-módú válaszjeladó megkapja az ACAS-ától az aktuális érzékenységi szintet egy érzékenységi szint jelentésben való (4.3.8.4.2.5 pont) továbbítás céljából; és
c) az S-módú válaszjeladó képességi információkat kap az ACAS-ától adatkapcsolati képesség jelentésben (4.3.8.4.2.2.2 pont) való továbbítás céljából és DF = 0 és DF = 16 levegő-levegő fedélzetről leadott kapcsolati formátumok RI mezejében való (4.3.8.4.1.2 pont) továbbítás céljából.
d) az S-módú válaszjeladó jelzést vesz az ACAS-ától, hogy a megoldási javaslatok képtelenek vagy gátoltak a 0 és 16 fedélzetről leadott kapcsolati formátumok RI mezőjében való továbbításra.

4.3.11.2.2 *Adatátvitel az S-módú válaszjeladótól az ACAS-ához:*

a) az S-módú válaszjeladó átadja az ACAS-ának a vett érzékenységi szint szabályozás utasításokat (4.3.8.4.2.1.1 pont), amelyeket az S-módú állomások továbbítanak;
b) az S-módú válaszjeladó átadja ACAS-ának más ACAS-ok által továbbított ACAS közvetítési közleményeket (4.3.8.4.2.3.3 pont); és
c) az S-módú válaszjeladó átadja ACAS-ának más ACAS-ok által levegő-levegő koordinációs célokra továbbított megoldási közleményeket (4.3.8.4.2.3.2 pont)
d) az S-módú válaszjeladó átadja ACAS-ának saját légijármű A-módú azonosítás adatait egy megoldási tanácsadás rádióadásban való továbbítása céljából (4.3.8.4.2.3.4.5 pont).

4.3.11.3 Az ACAS információ kommunikálása más ACAS részére

4.3.11.3.1 *Ellenőrzési válasz.* Az ACAS S-módú válaszjeladónak a rövid (DF = 0) vagy hosszú (DF = 16) ellenőrzési formátumot kell használnia az ACAS ellenőrzési lekérdezésekre adott válaszokhoz. Az ellenőrzési válasznak tartalmaznia kell a VS mezőt, ahogyan azt a 3. fejezet 3.1.2.8.2 pontjában meghatározták, az RI mezőt, ahogyan azt a 3.1.2.8.2 pontban és 4.3.8.4.1.2 pontban meghatározták, és az SL mezőt, ahogyan azt a 4.3.8.4.2.5 pontban meghatározták.

4.3.11.3.2 *Koordinációs válasz.* Az ACAS S-módú válaszjeladójának koordinációs választ kell továbbítania egy felszerelt veszélyeztetőt légijárműtől vett koordinációs lekérdezésre, alávetve a 4.3.11.3.2.1 pont feltételeinek. A koordinációs válaszhoz a DF = 16 hosszú levegő-levegő ellenőrzési válasz formulát kell használni a VS mezővel, ahogyan az a 3. fejezet 3.1.2.8.2 pontban elő lett írva, az RI mezőt, ahogyan az a 3. fejezet 3.1.2.8.2 és 4.3.8.4.1.2 pontjában meg lett határozva, az SL mezőt, ahogyan az a 4.3.8.4.2.5 pontban megtalálható; és az MV mezőt, ahogyan azt a 4.3.8.4.2.4 pont előírja. Koordinációs válaszokat még akkor is továbbítani kell, ha a válaszjeladó minimális válaszsebesség korlátait (3. fejezet, 3.1.2.10.3.7.2 pont) túllépik.

4.3.11.3.2.1 Az ACAS S-módú válaszjeladójának egy másik ACAS-tól kapott koordinációs lekérdezésre akkor és csak akkor kell koordinációs válasszal válaszolni, ha a válaszjeladó képes a lekérdezés ACAS adat tartalmát a válaszjeladóhoz tartozó ACAS-nak továbbítani.

4.3.11.4 Az ACAS információ kommunikálása földi állomások részére

4.3.11.4.1 *RA jelentések S-módú földi állomásoknak.* A megoldási tanácsadás időszaka alatt és a megoldási tanácsadás végét követő 18 ±1 másodperc során az ACAS S-módú válaszjeladó a megfelelő DR mező kód beállítással jelzi, hogy megoldási tanácsadás jelentése van az S-módú érzékelőnek adott válaszokban, ahogyan azt a 4.3.8.4.1.1 pont ismerteti. A megoldási tanácsadás jelentés leírja a legújabb megoldási javaslatot, amely a megelőző 18 ±1 másodperces időszak alatt fennállt.

Megjegyzés. – DR = 2, 3, 6 vagy 7 válasz vétele után egy S-módú földi állomás a megoldási tanácsadás jelentés fedélzetről leadott kapcsolását kérheti RR = 19 beállítással, és vagy DI nem egyenlő 7 vagy DI = 7 és RRS = 0 beállítással az ACAS légijármű egy ellenőrzésében vagy Comm-A lekérdezésében. Amikor ezt a lekérdezést veszi, a válaszjeladó Comm-B válasszal válaszol, amelynek MB mezeje tartalmazza a megoldási tanácsadás jelentést.

4.3.12 Jelzések a repülő személyzetnek

4.3.12.1 Helyesbítő és megelőző RA-k

Ajánlás. – *A repülő személyzetnek szóló jelzések között megkülönböztetünk megelőző és helyesbítő megoldási javaslatot.*

4.3.12.2 Magasság keresztezési RA-k

Ajánlás. – Ha az ACAS magasság keresztezési megoldási javaslatot generál, specifikus jelzést kell adni a repülő személyzet részére, hogy keresztezés megy végbe.

4.4 ACAS II összeütközés elkerülését biztosító logika működése

Megjegyzés. – Óvatossággal kell eljárni, amikor az A mellékletben közölt útmutató anyag 4. Részében az ACAS II rendszer hivatkozásaival kapcsolatban potenciális javításokat fontolgatunk, mivel a változások a rendszer teljesítmény több aspektusára is kihatással lehetnek. Lényeges, hogy alternatív elgondolás ne rontsa le a másik elgondolás működését és hogy az ilyen összeegyeztethetőség nagyfokú magabiztossággal legyen demonstrálva.

4.4.1 Az összeütközés elkerülését biztosító logika működésére vonatkozó meghatározások

Megjegyzés . – A [t_1, t_2] jelölést a t_1 és t_2 közötti időtartam jelölésére használják.

Tengerszint feletti magasság réteg – Altitude layer
Minden találkozást a következő tengerszint feletti magasság réteg egyike jellemez:

Réteg	1	2	3	4	5	6
from		2 300 ft	5 000 ft	10 000 ft	20 000 ft	41 000 ft
to	2 300 ft	5 000 ft	10 000 ft	20 000 ft	41 000 ft	

A találkozás tengerszint feletti magasság rétegét a két légijárműnek a legszorosabb megközelítésnél lévő átlagos tengerszint feletti magassága határozza meg.

Megjegyzés. – Az összeütközés elkerülését biztosító logika működésének meghatározása céljából nincs szükség a magasságmérés vagy a talajszint és a magasság közötti összefüggés fizikai alapjának megadására.

Megközelítési szög –Approach angle
A két légijárműnek a legszorosabb megközelítésnél a földi irányszögek szerinti különbsége, 180 fokkal leírva a szembenirányokat, és 0 fokkal leírva a párhuzamos irányokat.

Keresztező találkozás – Crossing encounter
Egy olyan találkozás, amelynél a két légijármű magasság elkülönítése a találkozási ablak kezdetén és végén meghaladja a 100 lábat, és a két légijármű egymáshoz viszonyított függőleges helyzete a találkozási ablak végén fordítottja a találkozási ablak elejéhez tartozó helyzetnek.

Találkozás – Encounter
Az ütközés elkerülés logika működésének meghatározása céljából egy találkozás két szinlelt légijármű repülési pályából áll. A légijármű vízszintes koordinátái a légijármű elfoglalt helyzeteit mutatják, míg a függőleges koordináta a tengerszint feletti magasság magasságmérővel mért értékét képviseli.

Találkozási osztály – Encounter class
A találkozásokat aszerint osztályozzák, hogy a légijármű átmenőben van-e a találkozási ablak kezdeténél és végénél és hogy a találkozás keresztező-e vagy nem.

Találkozási ablak - Encounter window.
A [*tca* - 40s, *tca* + 10s] időköz

Vízszintes eltérési távolság – Horizontal miss distance (hmd)
Egy találkozásnál megfigyelt minimális vízszintes elkülönítés.

Szintbeli légijármű – Level aircraft
Légijármű, amely nem átmenő.

Eredeti repülési pálya – Original trajectory
Egy ACAS-al felszerelt légijármű eredeti repülési pályája az, amelyet a légijármű követne ugyanannál a találkozásnál, ha nem lenne ACAS-al felszerelve.

Eredeti függőleges sebesség – Original rate
Egy ACAS-al felszerelt légijármű eredeti sebessége bármely időpontban a légijármű azon magasságváltozási sebessége, amely ugyanabban az időpontban akkor lépne fel, ha az eredeti repülési pályát követné.

Megkívánt függőleges sebesség – Required rate
A szabvány repülőgépvezető modellnél a megkívánt sebesség az, amely a megoldási javaslattal összhangban az eredeti sebességhez legközelebb esik.

Tca
Névlegesen a legszorosabb megközelítés időpontja. A szabványos találkozási modellben (4.4.2.6 pont) lévő találkozásoknál referencia időpont a találkozás létrehozásához, amelynél különböző paraméterek, közöttük a függőleges és vízszintes elkülönítés (vmd és hmd) meg vannak adva.

Megjegyzés. – A szabványos találkozási modellben (4.4.2.6 pont) lévő találkozásokat a két légijármű repülési pályáinak a tca*-nál kezdve, kifelé történő felépítésével konstruálják meg. Amikor a folyamat készen van, a* tca *lehetséges, hogy nem lesz pontosan a legszorosabb megközelítés időpontja, és néhány másodperces eltérés elfogadható.*

Átmenő légijármű – Transitioning aircraft
Egy olyan légijármű, amely 400 láb per perc (láb/p) nagyságot meghaladó, valamilyen alkalmas periódus alatt mért átlagos függőleges sebességgel rendelkezik.

Forduló mértéke – Turn extent
Oly módon meghatározott irányszög különbség, amely a légijármű forduló végén mért földi irányszögéből és mínusz a forduló elején mért földi irányszögéből áll.

Függőleges eltérési távolság – Vertical miss distance (vmd)
Fogalmilag a függőleges elkülönítés a legszorosabb megközelítésnél. A szabványos találkozási modellben lévő találkozásoknál (4.4.2.6 pont) a *tca* időpontban a függőleges elkülönítés létrehozásával.

4.4.2 Feltételek, amelyek között a követelmények érvényesek

4.4.2.1 A következő feltételeknek kell teljesülniük a 4.4.3 és 4.4.4 pontokban ismertetett működési követelményeknél:

a) távolság és irány mérések és magasság jelentés áll rendelkezésre a megközelítő légijármű egyes ciklusaira, amennyiben a 14 NM-en belül van, de akkor nem, ha a távolság meghaladja a 14 NM-t;

b) a távolság és irány mérések hibái összhangban vannak a szabványos távolság és irány hiba modellekkel (4.4.2.2 és 4.4.2.3 pontok);

c) a megközelítő légijármű magasság jelentései, amelyek annak C-módú válaszai, 100 lábas kvantumokban vannak kifejezve;

d) egy magasságmérés, amelyet nem kvantáltak és 1 láb vagy nagyobb pontossággal van kifejezve, a saját légijárműre rendelkezésre áll;

e) mindkét légijárműre vonatkozó magasságmérések hibái állandóak bármely adott előfordulás során;

f) mindkét légijárműre vonatkozó magasságmérések hibái összhangban vannak a szabványos magasságmérési hiba modellel (4.4.2.4 pont);

g) a megoldás tanácsadásokra adott repülőgépvezető válaszok összhangban vannak a szabványos repülőgépvezető modellel (4.4.2.5 pont);

h) a légijárművek olyan légtérben repülnek, amelyben szoros találkozások, köztük azok is, amelyeknél az ACAS egy megoldási javaslatot generál, összhangban vannak a szabványos találkozás modellel (4.4.2.6 pont);

i) ACAS-al felszerelt légijárművek képességeikben nem korlátozottak a megoldási javaslataik által megkövetelt manőverek végrehajtásában; és

j) ahogyan 4.4.2.7-ben ismertetve van:

   1) az egyes találkozásokban résztvevő megközelítő légijármű nem felszerelt (4.4.2.7 a) pont); vagy

   2) a megközelítő légijármű ACAS-al felszerelt, de olyan repülési pályát követ, amely azonos a nem felszerelt találkozásban levőével (4.4.2.7b) pont); vagy

   3) a megközelítő légijármű ACAS-al van felszerelve, amely a saját ACAS-al azonos összeütközés elkerülését biztosító logikával rendelkezik.

Megjegyzés. – A “magasságmérés” fogalom egy magasságmérővel a kvantálást megelőzően végzett mérésekre vonatkozik.

4.4.2.1.1 Az összeütközés elkerülését biztosító logika működése nem romlik le hirtelen a magasság hibák statisztikai eloszlásának, vagy a szabványos találkozási modellt jellemző különböző paraméterek statisztikai eloszlásának változásával, vagy ha a repülőgépvezetőnek a tanácsadásokra adott válasza változik, amikor a felderítési jelentések nem állnak rendelkezésre minden ciklusban, vagy amikor a megközelítő légijárműre vonatkozó magasságmérések kvantálása változik, vagy a saját légijárműre vonatkozó magasságméréseket kvantálják.

4.4.2.2 Szabványos távolság hiba modell

4.4.2.2.1 A szinlelt távolságmérések hibáit normál eloszlásból 0 láb középpel és 50 láb szabványos eltéréssel veszik.

4.4.2.3 Szabványos irányszög hiba modell

4.4.2.3.1 A szinlelt irányszög mérések hibáit normál eloszlásból 0,0 fokos középpel és 10,0 fok szabványos eltéréssel veszik.

4.4.2.4 Szabványos magassági hiba modell

4.4.2.4.1 A szinlelt magasság mérések hibáiról felteszik, hogy Laplace eloszlásúak zérus középpel, amelynek valószínűségi sűrűségfüggvénye

$$p(e) = \frac{1}{2\lambda}\exp\left(-\frac{|e|}{\lambda}\right)$$

4.4.2.4.2 A λ paramıter, amely a magasságmérő hiba statisztikai eloszlásának definíciójához szükséges, a λ_1 és λ_2 értéke közül mindegyik légijárműre az egyiket veszi fel, amely a találkozási réteg magasságától függ a következők szerint:

Réteg	*1*		*2*		*3*		*4*		*5*		*6*	
	m	*láb*	*m*	*láb*	*m*	*láb*	*m*	*láb*	*m*	*láb*	*m*	*láb*
λ_1	10	35	11	38	13	43	17	58	22	72	28	94
λ_2	18	60	18	60	21	69	26	87	30	101	30	101

4.4.2.4.3 ACAS-al felszerelt légijárműnél a λ értéke λ_1 lesz.

4.4.2.4.4 ACAS-al nem felszerelt légijárműnél λ értékét véletlenszerűen választják ki a következő valószínűségek felhasználásával:

Réteg	*1*	*2*	*3*	*4*	*5*	*6*
Valószín.(λ_1)	0,391	0,320	0,345	0.610	0.610	0.610
Valószín.(λ_2)	0,609	0,680	0,655	0,390	0,390	0.390

4.4.2.5 Szabványos repülőgépvezető modell

4.4.2.5.1 A szabványos repülőgépvezető modell, amit az összeütközés elkerülését biztosító logika működésének az értékelésére használnak, a következő lesz:

a) bármely megoldási tanácsadás teljesül a megkívánt függőleges sebességre gyorsítás által (ha szükséges) egy alkalmas késleltetés után;
b) amikor a légijármű fennálló függőleges sebessége ugyanaz, mint az eredeti és az eredeti függőleges sebesség eleget tesz a megoldási javaslatnak, a légijármű eredeti függőleges sebességét folytatja, amely nem feltétlenül állandó a gyorsulás lehetősége miatt az eredeti repülési pályán,
c) amikor a légijármű eleget tesz a megoldási javaslatnak, a meglévő függőleges sebessége ugyanaz, mint az eredeti függőleges sebesség és az eredeti függőleges sebesség változik, és következésképpen ellentmondásba kerül a megoldási javaslattal, a légijármű továbbra is a megoldási javaslatnak tesz eleget.
d) amikor egy kezdeti megoldási tanácsadás a magasságváltozási sebesség módosítását kívánja, a légijármű egy 0,25 g-s gyorsulással reagál egy 5 másodperces késleltetés után a megoldási tanácsadás kijelzésétől számítva;
e) amikor a megoldási tanácsadás módosul és az eredeti függőleges sebesség eleget tesz a módosított megoldási javaslatnak, a légijármű visszatér eredeti függőleges sebességéhez (ha szükséges) a g) pontban ismertetett gyorsulással a h) pontban meghatározott késleltetés után;

f) amikor a megoldási tanácsadás módosul és az eredeti függőleges sebesség nem tesz eleget a módosított javaslatnak, a légijármű a megoldási tanácsadás g) pontban meghatározott gyorsulással való teljesítésével reagál a h) pontban ismertetett késleltetés után;

g) a megoldási tanácsadás módosulásakor alkalmazott gyorsítás értéke 0,25 g, hacsak a módosított megoldási tanácsadás nem egy fordított értelmű megoldási tanácsadás vagy egy megnövelt függőleges sebességű megoldási tanácsadás, amely esetben a gyorsulás 0,35 g;

h) egy megoldási tanácsadás módosulásánál alkalmazott késleltetés 2,5 s, hacsak ez azt nem eredményezi, hogy a gyorsulás korábban kezdődik, mint 5 másodperc a kezdeti megoldási javaslattól számítva, amely esetben a gyorsulás a kezdeti megoldástól számítva 5 másodpercre kezdődik; és

i) ha a megoldási javaslatot törlik, a légijármű visszatér az eredeti függőleges sebességéhez (ha szükséges) 0,25 g gyorsulással 2,5 másodperces késleltetés után.

4.4.2.6 Szabványos találkozási modell

4.4.2.6.1 *A szabványos találkozási modell elemei*

4.4.2.6.1.1 Hogy számítani tudják az ACAS hatását az összeütközés kockázatára (4.4.3 paragrafus) és az ACAS-nak a légiforgalom menedzsmenttel (ATM) (4.4.4 paragrafus) való összeegyeztethetősége érdekében a találkozások együtteseit hozzák létre az alábbiak mindegyikére:

a) a két légijármű címzés elrendezése;
b) a hat magasság réteg;
c) tizenkilenc találkozás osztály; és
d) kilenc vagy tíz *vmd* befoglaló a 4.4.2.6.4 pontban ismertetettek szerint.

Az eredményeket ezeknél az együtteseknél kombinálni kell a 4.4.2.6.2 pontban megadott viszonylagos súlyozások felhasználásával.

4.4.2.6.1.1.1 A találkozás együttesek mindegyike legalább 500 független véletlenszerűen generált előfordulást tartalmaz.

4.4.2.6.1.2 A két légijármű repülési pályáját mindegyik találkozásnál a következő, véletlenszerűen kiválasztott jellemzőkkel szerkesztik meg:

a) a függőleges síkban
1) *vmd* a megfelelő *vmd* befoglaló belsejéből;
2) függőleges sebesség mindegyik légijárműnél a találkozás ablak kezdeténél, $\dot{z}_1$, és a találkozás ablak végénél, $\dot{z}_2$;
3) függőleges gyorsulás; és
4) a függőleges gyorsulás kezdeti időpontja; és

b) a vízszintes síkban pedig:
1) *hmd;*
2) megközelítési szög;
3) az egyes légijárművek sebessége a legszorosabb megközelítésnél;
4) döntés, hogy az egyes légijárművek fordulóban vannak-e vagy nem;
5) a forduló terjedelme; a bedőlési szög; és a forduló végének időpontja;
6) döntés mindegyik légijárműről, hogy változtatja-e a sebességet vagy nem;
7) a sebességváltozás nagysága

Megjegyzés. – Egy találkozás különböző jellemzőire végzett kiválasztásoknál lehetséges, hogy ellentmondások lesznek. Amikor ez előfordul, a problémát vagy egy adott jellemző kiválasztásának, vagy a teljes találkozás félretételével lehet megoldani, ahogyan a legalkalmasabb.

4.4.2.6.1.3 A *hmd* statisztikai eloszlására két modellt használnak (4.4.2.6.4.1 pont). Az ACAS-nak az összeütközés kockázatára gyakorolt hatása számításánál (4.4.3 paragrafus) a *hmd* kevesebb, mint 500 lábra korlátozódik. Az ACAS ATM-el való összegyeztethetőségének számításánál (4.4.4 paragrafus), a *hmd*-t az értékek nagyobb tartományából választják ki (4.4.2.6.4.1.2 pont).

Megjegyzés. – A 4.4.2.6.2 és 4.4.2.6.3 pontok függőleges jellemzőket határoznak meg a légijármű repülési pályákra vonatkoztatva a szabványos előfordulási modellben, amelyek függnek attól, hogy a hmd *kicsinyre szűkül össze (“kockázati arány számításához”), vagy nagyobb értékeket képes felvenni (“ATM kompatibilitásnál”). Más esetben az előfordulások jellemzői a függőleges és vízszintes síkban függetlenek.*

4.4.2.6.2 *Találkozási osztályok és súlyok*

4.4.2.6.2.1 *Légijármű címzés.* Mindegyik légijármű egyenlő valószínűséggel kapja a magasabb légijármű címet.

4.4.2.6.2.2 *Magasság rétegek.* A magasságrétegek viszonylagos súlyai a következők:

Réteg	*1*	*2*	*3*	*4*	*5*	*6*
Valószín.(réteg)	0.13	0,25	0,32	0,22	0,07	0,01

4.4.2.6.3 *Találkozás osztályok*

4.4.2.6.2.3.1 A találkozásokat aszerint osztályozzák, hogy a légijárművek a függőleges sebesség szempontjából vízszintes repülést végzők (L) vagy átmenők (T) találkozás ablak kezdeténél (*tca* előtt) és a végénél (*tca* után) és a találkozás keresztező-e vagy nem.

Osztály	*1.sz. légijármű*		*2.sz. légijármű*		*Keresztezés*
	tca *előtt*	tca *után*	tca *előtt*	tca *után*	
1	L	L	T	T	Igen
2	L	L	L	T	Igen
3	L	L	T	L	Igen
4	T	T	T	T	Igen
5	L	T	T	T	Igen
6	T	T	T	L	Igen
7	L	T	L	T	Igen
8	L	T	T	L	Igen
9	T	L	T	L	Igen
10	L	L	L	L	Nem
11	L	L	T	T	Nem
12	L	L	L	T	Nem
13	L	L	T	L	Nem
14	T	T	T	T	Nem

15	L	T	T	T	Nem
16	T	T	T	L	Nem
17	L	T	L	T	Nem
18	L	T	T	L	Nem
19	T	L	T	L	Nem

4.4.2.6.2.3.2 A találkozási osztályok viszonylagos súlyai a következőképpen függnek a rétegtől:

Osztály	*a kockázat arány számításnál*		*ATM kompatibilitásnálS*	
	1-3 rétegek	*4-6 rétegek*	*1-3 rétegek*	*4-6 rétegek*
1	0,00502	0,00319	0,06789	0,07802
2	0,00030	0,00018	0,00408	0,00440
3	0,00049	0,00009	0,00664	0,00220
4	0,00355	0,00270	0,04798	0,06593
5	0,00059	0,00022	0,00791	0,00549
6	0,00074	0,00018	0,00995	0,00440
7	0,00002	0,00003	0,00026	0,00082
8	0,00006	0,00003	0,00077	0,00082
9	0,00006	0,00003	0,00077	0,00082
10	0,36846	0,10693	0,31801	0,09011
11	0,26939	0,41990	0,23252	0,35386
12	0,06476	0,02217	0,05590	0,01868
13	0,07127	0,22038	0,06151	0,18571
14	0,13219	0,08476	0,11409	0,07143
15	0,02750	0,02869	0,02374	0,02418
16	0,03578	0,06781	0,03088	0,05714
17	0,00296	0,00098	0,00255	0,00082
18	0,00503	0,00502	0,00434	0,00440
19	0,01183	0,03651	0,01021	0,03077

4.4.2.6.2.4 vmd *befoglalók*

4.4.2.6.2.4.1 Mindegyik előfordulás *vmd*-jét a nem-keresztező találkozási osztályok tíz *vmd* befoglalójának egyikéből és a keresztező találkozási osztályok kilenc vagy tíz *vmd* befoglalójának egyikéből veszik. Mindegyik *vmd* befoglalójának 100 láb kiterjedése van a kockázat számításnál vagy 200 láb kiterjedése az ATM-el való kompatibilitás számításnál. A maximális vmd 1000 láb a kockázati arány számításnál és 2000 láb egyébként.

4.4.2.6.2.4.2 Nem-keresztező találkozási osztályoknál a vmd befoglaló viszonylagos súlyai a következők lesznek:

vmd *befoglaló*	*Kockázati arány számításához*	*ATM egyezőséghez*
1	0 ,013	0,128
2	0,026	0,135
3	0,035	0,209
4	0,065	0,171
5	0,100	0,160
6	0,161	0,092

7	0,113	0,043
8	0,091	0,025
9	0,104	0,014
10	0,091	0,009

Megjegyzés. – A vmd *befoglaló súlyainak összege nem adja ki az 1,0-t. A specifikus súlyok a légiforgalmi irányítási földi radar adatokban felfogott találkozások analízisén alapulnak. A hiányzó részek azt a tényt tükrözik, hogy az észlelt találkozások néhány olyan* vmd-*t tartalmaznak, amelyek meghaladják a modellben lévő maximális* vmd-*ket.*

4.4.2.6.2.4.3 A keresztező osztályoknál a vmd befoglalók viszonylagos súlyai a következők lesznek:

vmd *befoglaló*	*kockázati arány számításához*	*ATM egyezőséghez*
1	0.0	0.064
2	0.026	0.144
3	0.036	0,224
4	0,066	0,183
5	0,102	0,171
6	0,164	0,098
7	0,115	0,046
8	0,093	0,027
9	0,106	0,015
10	0,093	0,010

Megjegyzés. – A keresztező osztályoknál a vmd-*nek meg kell haladnia 100 lábat, hogy a találkozás keresztező találkozásnak minősüljön. Így a kockázati arány számításánál nincs 1-es* vmd *befoglaló, és az ATM-el való kompatibilitás számításainál az 1-es* vmd *100 láb, 200 láb-ra korlátozódik.*

4.4.2.6.3 *Légijármű repülési pályák jellemzői függőleges síkban*

4.4.2.6.3.1 *vmd.* A vmd-t minden találkozásnál véletlenszerűen kell kiválasztani az eloszlásból, amely egyenletes a megfelelő vmd befoglaló által lefedett sávban.

4.4.2.6.3.2 *Függőleges sebesség*

4.4.2.6.3.2.1 Mindegyik légijárműnél az egyes találkozásokban vagy a függőleges sebesség állandó ($\dot{z}$), vagy a repülési pályát úgy kell megszerkeszteni, hogy a függőleges sebesség *tca* - 35s-nél $\dot{z}_1$ legyen és a függőleges sebesség *tca* + 5-s-nél $\dot{z}_2$ legyen. Az egyes $\dot{z}$, $\dot{z}_1$ vagy $\dot{z}_2$ függőleges sebességeket úgy kell meghatározni, hogy először véletlenszerűen kiválasztanak egy tartományt, amelyen belül az fekszik, azután kiválasztják a pontos értéket egy eloszlásból, amely egyenletes a kiválasztott tartomány felett.

4.4.2.6.3.2.2 A sávok, amelyeken belül a függőleges sebességek fekszenek, függnek attól, hogy a légijármű szintbeli, azaz a 4.4.2.6.2.3.1 pontban “L”-el van jelölve, vagy átmenő, azaz a 4.4.2.6.2.3.1 pontban “T”-vel van jelölve, és a következők lesznek:

L	*T*
[240 láb/perc, 400 láb/perc]	[3200 láb/perc, 6000 láb/perc]
[80 láb/perc, 240 láb/perc]	[400 láb/perc, 3200 láb/perc]
[-80 láb/perc, 80 láb/perc]	[-400 láb/perc, 400 láb/perc]
[-240 láb/perc, -80 láb/perc]	[-3200 láb/perc, -400 láb/perc]
[-400 láb/perc, -240 láb/perc]	[-6000 láb/perc, -3200 láb/perc]

4.4.2.6.3.2.3 Azoknál a légijárműveknél, amelyek a teljes találkozási ablak felett egyenletesek, a $\dot{z}$ függőleges sebesség állandó. A sávok valószínűségei, amelyeken belül a $\dot{z}$ fekszik, a következők lesznek:

$\dot{z}$ *(láb/perc)*	*prob* ($\dot{z}$)
[240 láb/perc, 400 láb/perc]	0,0382
[80 láb/perc, 240 láb/perc]	0,0989
[-80 láb/perc, 80 láb/perc]	0,7040
[-240 láb/perc, -80 láb/perc]	0,1198
[-400 láb/perc, -240 láb/perc]	0,0391

4.4.2.6.3.2.4 Azoknál a légijárműveknél, amelyek nem vízszintes repülést végeznek, a teljes találkozási ablak felett az időközöket a $\dot{z}_1$*-re és* $\dot{z}_2$-re közösen kell véletlenszerű kiválasztással meghatározni, közös valószínűségeket használva, amelyek a magassági rétegtől és attól függnek, hogy a légijármű átmenő-e a találkozási ablak kezdeténél (sebesség-egyenletes), a találkozás ablak végénél (egyenletes-sebesség), vagy mind az elején, mind a végén (sebesség-sebesség). A közös valószínűségek a függőleges sebesség sávokra a következők lesznek.

Sebesség-egyenletes repülési pályával rendelkező légijárművekre az 1-3 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartomány közös valószínűsége*				
[240 láb/perc, 400 láb/perc]	0,0019	0,0169	0,0131	0,1554	0,0000
[80 láb/perc, 240 láb/perc]	0,0000	0.0187	0,0019	0,1086	0,0000
[-80 láb/perc, 80 láb(perc]	0,0037	0,1684	0,0094	0,1124	0,0075
[-240 láb/perc, -80 láb/perc]	0,0037	0,1461	0,0094	0,0243	0,0037
[-400 láb/perc, -240 láb/perc]	0,0000	0,1742	0,0094	0,0094	0,0019

-6000 láb/perc -3200 láb/perc -400 láb/perc 400 láb/perc 3200 láb/perc 6000 láb/perc $\dot{z}_1$

Sebesség-egyenletes repülési pályával rendelkező légijárművekre a 4-6 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartományok közös valószínűsége*				
[240 láb/perc, 400 láb/perc]	0,0105	0,0035	0,0000	0,1010	0,0105
[80 láb/perc, 240 láb/perc]	0,0035	0.0418	0,0035	0,1776	0,0279
[-80 láb/perc, 80 láb(perc]	0,0279	0,1219	0,0000	0,2403	0,0139

[-240 láb/perc, -80 láb/perc]	0,0035	0,0767	0,0000	0,0488	0,0105
[-400 láb/perc, -240 láb/perc]	0,0105	0,0453	0,0035	0,0174	0,0000

-6000 láb/perc -3200 láb/perc -400 láb/perc 400 láb/perc 3200 láb/perc 6000 láb/perc $\dot{z}_1$

Egyenletes-sebesség repülési pályával rendelkező légijárművekre az 1-3 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartományok közös valószínűsége*				
[3200 láb/perc, 6000 láb/perc]	0,0000	0,0000	0,0000	0,0000	0,0000
[400 láb/perc, 3200 láb/perc]	0,0074	0.0273	0,0645	0,0720	01538
[-400 láb/perc, 400 láb(perc]	0,0000	0,0000	0,0000	0,0000	0,0000
[-3200 láb/perc, -400 láb/perc]	0,2978	0,2084	0,1365	0,0273	0,0050
[-6000 láb/perc, -3200 láb/perc]	0,0000	0,0000	0,0000	0,0000	0,0000

-6000 láb/perc -3200 láb/perc -400 láb/perc 400 láb/perc 3200 láb/perc 6000 láb/perc $\dot{z}_1$

Egyenletes - sebesség repülési pályával rendelkező légijárművekre a 4-6 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartományok közös valószínűsége*				
[3200 láb/perc, 6000 láb/perc]	0,0000	0,0000	0,0000	0,0000	0,0192
[400 láb/perc, 3200 láb/perc]	0,0000	0.0000	0,0962	0,0577	0,1154
[-400 láb/perc, 400 láb(perc]	0,0000	0,0000	0,0000	0,0000	0,0000
[-3200 láb/perc, -400 láb/perc]	0,1346	0,2692	0,2308	0,0577	0,0192
[-6000 láb/perc, -3200 láb/perc]	0,0000	0,0000	0,0000	0,0000	0,0000

-400 láb/perc -240 láb/perc -80 láb/perc 80 láb/perc 240 láb/perc 400 láb/perc $\dot{z}_1$

Sebesség-sebesség repülési pályával rendelkező légijárművekre a 1-3 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartományok közös valószínűsége*				
[3200 láb/perc, 6000 láb/perc]	0,0000	0,0000	0,0007	0,0095	0,0018
[400 láb/perc, 3200 láb/perc]	0,0000	0.0018	0,0249	0,2882	0,0066
[-400 láb/perc, 400 láb(perc]	0,0000	0,0000	0,0000	0,0000	0,0000
[-3200 láb/perc, -400 láb/perc]	0,0048	0,5970	0,0600	0,0029	0,0011
[-6000 láb/perc, -3200 láb/perc]	0,0000	0,0007	0,0000	0,0000	0,0000

-6000 láb/perc -3200 láb/perc -400 láb/perc 400 láb/perc 3200 láb/perc 6000 láb/perc $\dot{z}_1$

Sebesség - sebesség repülési pályával rendelkező légijárművekre az 4-6 rétegekben,

$\dot{z}_2$ *tartomány*	$\dot{z}_1$ *és* $\dot{z}_2$ *tartományok közös valószínűsége*				
[3200 láb/perc, 6000 láb/perc]	0,0014	0,0000	0,0028	0,0110	0,0069
[400 láb/perc, 3200 láb/perc]	0,0028	0.0028	0,0179	0,4889	0,0523
[-400 láb/perc, 400 láb(perc]	0,0000	0,0000	0,0000	0,0000	0,0000

[-3200 láb/perc, -400 láb/perc]	0,0317	0,3029	0,0262	0,0152	0,0028
[-6000 láb/perc, -3200 láb/perc]	0,0110	0,0220	0,0014	0,0000	0,0000

-6000 láb/perc -3240 láb/perc -400 láb/perc 400 láb/perc 3200 láb/perc 6000 láb/perc $\dot{z}_1$

4.4.2.6.3.2.5 Sebesség-sebesség nyomvonal esetén, ha $|\dot{z}_2 - \dot{z}_1| < 566$ láb/perc, akkor az nyomvonalat állandó értékű, $\dot{z}_1$-el egyenlő sebességgel kell létrehozni.

4.4.2.6.3.3 *Függőleges gyorsulás*

4.4.2.6.3.3.1 A 4.4.2.6.3.2.5 pontnak megfelelő esetben, amikor a légijárművek nem egyenletesek az egész találkozási ablak felett, a függőleges sebesség állandó és $\dot{z}_1$-al egyenlő legalább a [*tca* - 40 s*, tca* - 35 s] tartomány felett a találkozási ablak kezdeténél, és állandó és egyenlő $\dot{z}_2$-al legalább a [*tca* + 5s*, tca* + 10 s] a találkozási ablak végénél. A függőleges gyorsulás állandó a közbenső időszakban.

4.4.2.6.3.3.2 A függőleges gyorsulást ($\ddot{z}$) a következőképpen kell modellezni:

$$\ddot{z} = (A\dot{z}_2 - \dot{z}_1) + \varepsilon$$

ahol az A paraméter esetfüggő az alábbiak szerint:

Eset	*A(s^{-1})* *1-3 rétegek*	*4-6 rétegek*
Sebesség-egyenletes	0,071	0,059
Egyenletes-sebesség	0,089	0,075
Sebesség-sebesség	0,083	0,072

És az ε hibát véletlenszerűen választják ki, a következő valószínűségi sűrűséget használva

$$p(\varepsilon) = \frac{1}{2\mu}\exp\left(-\frac{|\varepsilon|}{\mu}\right)$$

ahol $\mu = 0{,}3$ lαb s^{-2}

Megjegyzés. - A $\ddot{z}$ *gyorsulás előjelét a* $\dot{z}_1$ *és* $\dot{z}_2$ *határozza meg. Egy* ε, *hibát, amely ezt az előjelet megváltoztatja, el kell vetni, és a hibát újra kell választani.*

4.4.2.6.3.4 Gyorsulás kezdetének időpontja egyenletesen oszlik el a [*tca* - 35 s, *tca -5 s*] sávban, és olyannak kell lennie, hogy a $\dot{z}_2$ elérése *tca* + 5 s-nál ne későbben következzék be.

4.4.2.6.4 *A légijármű repülési pályáinak jellemzői vizszintes sikban*

4.4.2.6.4.1 *Vízszintes eltérés távolság*

4.4.2.6.4.1.1 Az ACAS-nak az összeütközés kockázatára gyakorolt hatásának számításánál (4.4.3 alpont), a *hmd* egyenletes eloszlású a [0,500 láb] sávban.

4.4.2.6.4.1.2 Az ACAS ATM-el való összeegyeztethetőségére vonatkozó számításoknál (4.4.4 alpont), *hmd* eloszlása olyan legyen, hogy a *hmd* értékei a következő kumulatív valószínűségekkel rendelkezzenek:

hmd (láb)	*kumulatív valószínűség*	
	1-3 rétegek	*4-6 rétegek*
0	0,000	0,000
1215	0,152	0,125
2430	0,306	0,195
3646	0,482	0,260
4860	0,631	0,322
6067	0,754	0,398
7921	0,859	0,469
8506	0,919	0,558
9722	0,954	0,624
10937	0,972	0,692
12152	0,982	0,753
13367	0,993	0,801
14582	0,998	0,821
15798	0,999	0,848
17013	0,999	0,868
18228	1,000	0,897
19443		0,916
20659		0,927
21874		0,939
23089		0,946
24304		0,952
25520		0,965
26735		0,983
27950		0,993
29165		0,996
30381		0,999
31596		1,000

4.4.2.6.4.2 *Megközelítési szög.* A kumulatív eloszlás a vízszintes megközelítési szögnél a következők szerinti lesz:

Megközelítési szög (fok)	*Kumulatív valószínűség*	
	1-3 rétegek	*4-6 rétegek*
0	0,00	0,00
10	0,14	0,05
20	0,17	0,06
30	0,18	0,08
40	0,19	0,08

50	0,21	0,10
60	0,23	0,13
70	0,25	0,14
80	0,28	0,19
90	0,32	0,22
100	0,38	0,28
110	0,43	0,31
120	0,49	0,35
130	0,55	0,43
140	0,62	0,50
150	0,71	0,59
160	0,79	0,66
170	0,88	0,79
180	1,00	1,00

4.4.2.6.4.3 *Légijármű sebesség.* A kumulatív eloszlás az egyes légijármű vízszintes földfeletti sebességekre a legszorosabb megközelítésnél a következők szerinti lesz:

Földfeletti sebesség (csomó)	*Halmozott valószínűség*	
	1-3 rétegek	*4-6 rétegek*
45	0,000	
50	0,005	
75	0,024	0,000
100	0,139	0,005
125	0,314	0,034
150	0,486	0,064
175	0,616	0,116
200	0,700	0,071
225	0,758	0,211
250	0,821	0,294
275	0,895	0,361
300	0,949	0,427
325	0,977	0,528
350	0,988	0,602
375	0,997	0,692
400	0,998	0,813
425	0,999	0,883
450	1,000	0,940
475		0,972
500		0,987
525		0,993
550		0,998
575		0,999
600		1,000

4.4.2.6.4.4 *Vízszintes manőver valószínűségek.* Az egyes légijárművekre az egyes találkozásoknál egy forduló valószínűsége az adott fordulóhoz tartozó sebességváltozás valószínűsége és a forduló nélküli adott sebességváltozás valószínűsége a következő lesz:

Réteg	*Prob (forduló)*	*Prob (sebességváltozás) fordulóval*	*Prob (sebességváltozás) forduló nélkül*
1	0,31	0,20	0,50
2	0,29	0,20	0,25
3	0,22	0,10	0,15
4, 5, 6	0,16	0,05	0,10

4.4.2.6.4.4.1 Egy adott sebességváltozásnál a sebesség növekedésének valószínűsége 0,5, a sebesség csökkenésének valószínűsége 0,5.

4.4.2.6.4.5 *Forduló terjedelem.* Bármely forduló terjedelmének kumulatív eloszlása a következő:

Forduló terjedelem(fok)	*Kumulatív valószínűség*	
	1-3 rétegek	*4-6 rétegek*
15	0,00	0,00
30	0,43	0,58
60	0,75	0,90
90	0,88	0,97
120	0,95	0,99
150	0,98	1,00
180	0,99	
210	1,00	

4.4.2.6.4.5.1 A forduló iránya véletlenszerű, 0,5-ös balforduló valószínűséggel és 0,5-ös jobbforduló valószínűséggel.

4.4.2.6.4.6 *Bedőlési szög.* A légijármű forduló alatti bedőlési szöge nem lehet 15 foknál kisebb. Annak valószínűsége, hogy 15 fokkal lesz egyenlő, 0,79 az 1-3 rétegekben, és 0,54 és 4-5 rétegekben. Az összesített eloszlás nagyobb bedőlési szögeknél a következő:

Bedőlési szög (fok)	*Összesített valószínűség*	
	1-3 rétegek	*4-6 rétegek*
15	0,79	0,54
25	0,96	0,82
35	0,99	0,98
50	1,00	1,00

4.4.2.6.4.7 *Forduló befejezési időpont.* Az egyes légijármű fordulók befejezési időpontjának összesített eloszlása a következő:

Forduló befejezése időpont (másodperc tca előtt)	*Összesített valószínűség*	
	1-3 rétegek	*4-6 rétegek*
0	0,42	0,28
5	0,64	0,65

10	0,77	0,76
15	0,86	0,85
20	0,92	0,94
25	0,98	0,99
30	1,00	1,00

4.4.2.6.4.8 *Sebesség változás.* Állandó gyorsulás vagy lassulás véletlenszerűen kerül kiválasztásra minden légijárműnél, amely sebességváltoztatást hajt végre egy adott találkozásnál, és a találkozás időtartama alatt ez kerül alkalmazásra. A gyorsulások 2 csomó/s és 6 csomó/s között egyenletes eloszlásúak. A lassulások 1 csomó/s és 3 csomó/s között egyenletes eloszlást mutatnak.

4.4.2.7 Megközelítő légijármű ACAS-al való felszerelése

A 4.4.3 és 4.4.4 pontokban ismertetett teljesítmény követelmények három különböző szituációra érvényesek, amelyekben a megközelítő légijármű ACAS-ára és repülési pályájára vonatkozó alábbi feltételek érvényesek:

a) ahol az egyes találkozásokban résztvevő megközelítő légijármű nincs felszerelve (4.4.2.1 j) 1) pont); és olyan repülési pályát követ, amely azonos azzal, amit akkor követ, amikor a saját légijármű nincs felszerelve;
b) ahol a megközelítő légijármű ACAS-al rendelkezik, de olyan repülési pályát követ, amely azonos a nem felszerelt találkozásban levőével (4.4.2.1 j) 2) pont);

1) az azonos repülési pályát követi függetlenül attól, hogy van megoldási tanácsadás, vagy nincs;
2) a megközelítő légijármű ACAS-a megoldási javaslatot generál és megoldási tanácsadás kiegészítést továbbít, amelyet azonnal vesznek azután, hogy valamilyen megoldási javaslatot először közöltek a saját légijármű vezetőjével;
3) a megközelítő ACAS-a által generált és a saját légijárműnek továbbított megoldási tanácsadás kiegészítés értelme ellentétes a saját légijármű által kiválasztott és a megközelítő légijárműnek továbbított első megoldási tanácsadás kiegészítés értelmével (4.3.6.1.3 pont);
4) a megközelítő légijármű által továbbított megoldási javaslatot a saját légijármű veszi; és
5) a követelmények érvényesek akkor is, amikor a saját légijárműnek van az alacsonyabb légijármű címzése, és akkor is, amikor a megközelítő légijárműnek van az alacsonyabb légijármű címzése; és

c) ahol a megközelítő légijármű olyan ACAS-al van felszerelve, amely a saját ACAS összeütközés elkerülését biztosító logikájával azonos összeütközés elkerülését biztosító logikával rendelkezik (4.4.2.1.j) 3) pont)

1) a saját légijármű ACAS és repülőgépvezető működésére vonatkozó feltételek egyenlően érvényesek a megközelítő légijárműre, ACAS-ra és légijárművezetőre;
2) az egyik légijármű által továbbított megoldási tanácsadás kiegészítéseket a másik veszi; és
3) a követelmények egyaránt érvényesek akkor is, ha a saját légijárműnek van alacsonyabb légijármű címzése, és akkor is, ha a megközelítő légijárműnek van alacsonyabb légijármű címzése.

4.4.2.8 Összeegyeztethetőség a különböző összeütközés elkerülését biztosító logikák tervezése között

Ajánlás. – *Alternatív összeütközés elkerülését biztosító logikai tervezéseket illetően a vizsgáztató hatóságoknak a következőket kell megvizsgálniuk:*

a) az alternatív tervezés működési formái elfogadhatóak-e azoknál a találkozásoknál, amelyekben olyan ACAS egységek vesznek részt, amelyek meglévő tervezéseket használnak; és
b) a meglévő tervezések működését nem rontja-e le az alternatív tervezés használata.

Megjegyzés. – A különböző összeütközés elkerülését biztosító logikák tervezése közötti összhangot illetően, a 4.4.2.7 b) pontban leírt feltételek a legszigorúbbak, ami ebben a vonatkozásban elképzelhető.

4.4.3 Az összeütközés kockázatának csökkentése

A 4.4.2 paragrafus feltételei között az összeütközés elkerülését biztosító logika olyan, hogy az összeütközések várható száma az ACAS hiányában várt szám következő arányaira redukálódik:

a) amikor a megközelítő légijármű nincs ACAS-al felszerelve 0,18;
b) amikor a megközelítő légijármű felszerelt, de nem válaszol 0,32¸és
c) amikor a megközelítő légijármű felszerelt és válaszol 0,04.

4.4.4 Összeegyeztethetőség a légiforgalom menedzsmenttel (ATM)

4.4.4.1 Zavarásos riasztási arány

4.4.4.1.1 A 4.4.2 alpont feltételei között az összeütközés elkerülését biztosító logika olyan, hogy azoknak a megoldási javaslatoknak a száma, amelyek "zavarások" (4.4.4.1.2 pont) nem haladhatja meg a 6 %-ot, amikor a saját légijármű függőleges sebessége a megoldási tanácsadás első ízben történő kiadásának időpontjában kisebb, mint 400 láb/perc; vagy 8 %-ot, amikor a saját légijármű függőleges sebessége a megoldási tanácsadás első ízben történő kiadásának időpontjában meghaladja a 400 láb/percet.

Megjegyzés. – Ezt a követelményt a megközelítő légijármű ACAS felszerelése nem elégíti ki (4.4.2.7 pont), mivel ennek elhanyagolható hatása van a találkozásra és a zavarásos megoldási javaslatok gyakoriságára.

4.4.4.1.2 Egy megoldási javaslatot "zavarás"-nak kell tekinteni a 4.4.4.1.1 pont szerinti célból, hacsak ACAS hiányában a találkozás valamely pontjában a vízszintes elkülönítés és a függőleges elkülönítés nem lesz kisebb a következő értékeknél:

	Vízszintes elkülönítés	*Függőleges elkülönítés*
FL 100 felett	2,0 NM	750 láb
FL 100 alatt	1,2 NM	750 láb

4.4.4.2 Összeegyeztethető értelem választás

A 4.4.2 alpont feltételei között az összeütközés elkerülését biztosító logikának olyannak kell lenni, hogy azoknak a találkozásoknak az aránya, amelyekben a megoldási javaslatot követően ez a legszorosabb megközelítésnél ellenkező előjelű magassági elkülönítést eredményez, mint ami az ACAS hiányában következik be, nem haladhatja meg a következő értékeket:

a) amikor a megközelítő légijármű nincs ACAS-al felszerelve .08;
b) amikor a megközelítő légijármű fel van szerelve, de nem válaszol .08; és
c) amikor a megközelítő légijármű fel van szerelve, és válaszol , .12.

4.4.4.3 Az ACAS által okozott eltérések

4.4.4.3.1 A 4.4.2 alpont feltételei között az összeütközés elkerülését biztosító logikának olyannak kell lenni, hogy a jelzett értékeknél nagyobb "eltéréseket" eredményező megoldási javaslatok száma ne haladja meg a megoldási javaslatok teljes számához viszonyított következő arányokat:

	Amikor a saját légijármű függőleges sebessége a RA első kiadásának időpontjában	
	kisebb, mint 400 láb/perc	*nagyobb mint 400 láb/perc*
amikor a megközelítő légijármű nincs ACAS-al felszerelve,		
eltérés 300 láb esetén, vagy afölött	*,15*	*,23*
eltérés 600 láb esetén, vagy afölött	*,04*	*,13*
eltérés 1000 láb esetén, vagy afölött	*,01*	*,07*
amikor a megközelítő légijármű fel van szerelve, de nem válaszol,		
eltérés 300 láb esetén, vagy afölött	,23	,35
eltérés 600 láb esetén, vagy afölött	,06	,16
eltérés 1000 láb esetén, vagy afölött	,02	,07
amikor a megközelítő légijármű fel van szerelve és válaszol,		
eltérés 300 láb esetén, vagy afölött	,11	,23
eltérés 600 láb esetén, vagy afölött	,02	,12
eltérés 1000 láb esetén, vagy afölött	,01	,06

4.4.4.3.2 A 4.4.4.3.1 alpont céljainak megfelelően, a felszerelt légijármű "eltérések"-et az eredeti repülési pályától abban az időtartományban kell mérni, amely attól az időponttól, amelynél a megoldási tanácsadás első ízben kiadásra kerül, addig az időpontig terjed, amelynél a megoldási tanácsadás törlését követően, a felszerelt légijármű visszaállítja eredeti magasság változtatási sebességét. Az eltérést úgy kell számítani, mint ebben az időtartományban felvett legnagyobb magasság különbséget a felszerelt légijármű által eredetileg követett repülési pálya és a megoldási tanácsadás hatására létrejött repülési pálya között.

4.4.5 Konfliktusban álló célpontok viszonylagos értéke

Ajánlás. – *Az összeütközés elkerülését biztosító logikának olyannak kell lenni, hogy amennyire megvalósítható, csökkentse az összeütközés kockázatát (a 4.4.3 pontban meghatározottak szerint mérve) és amennyire megvalósítható, korlátoznia kell a széttagolást az ATM-nél (a 4.4.4 pontban meghatározottak szerint mérve.)*

4.5 Kiterjesztett squitter jelentések ACAS használata

4.5.1 ACAS hibrid (légtér)felderítés kiterjesztett squitter helyzetadatok felhasználásával

Megjegyzés. – Hibrid (légtér)felderítés az az eljárás, amelyet az ACAS használ a kiterjesztett squitteren keresztül rendelkezésre álló passzív helyzetinformáció lehetőségének kihasználására. A hibrid (légtér)felderítés felhasználásával az ACAS érvényesíti a kiterjesztett squitter által a közvetlen aktív távolságmérésen keresztül szolgáltatott helyzetet. A kezdeti érvényesítést a nyomvonal kezdeténél végzik. Újraérvényesítést 10 másodpercenként egyszer végeznek, ha a megközelítő légijármű egy majdnem veszélyeztetővé válik magasság vagy távolság szerint. Végezetül rendszeres aktív felderítést végeznek másodpercenként egyszer azoknál a megközelítő légijárműveknél, amelyek mind magasság, mind távolság szerint majdnem veszélyeztetővé válnak. Ilyen módon passzív felderítést (egyszer érvényesített) alkalmaznak nem veszélyeztető megközelítő légijárműveknél, így lassítva az ACAS lekérdezési gyakoriságot. Aktív felderítést akkor használnak, amikor egy megközelítő légijármű majdnem veszélyeztetővé válik, hogy megőrizzék az ACAS függetlenségét független biztonsági figyelőként.

4.5.1.1 Meghatározások

Aktív felderítés – Active surveillance
Egy megközelítő légijármű nyomonkövetésének folyamata a saját légijármű lekérdezéseire adott válaszokból nyert információk felhasználásával.

Aktív nyomvonal – Active track
Aktív lekérdezéssel nyert mérések által kialakított nyomvonal.

Hibrid ellenőrzés – Hybrid surveillance
Aktív felderítés használatának folyamata más légijárművek érvényesítésére és figyelésére, amely légijárműveket alapvetően passzív felderítés felhasználásával követik, hogy megőrizzék az ACAS függetlenségét.

Kezdeti megszerzés – Initial aquisition
Új nyomvonal kialakítás elkezdésének folyamata S-módú légijárműtől származó squitter vétele után, amely légijárműre vonatkozóan nincs aktív lekérdezés alapján kialakított nyomvonal.

Kezdeti érvényesítés – Initial validation
Új nyomvonal viszonylagos helyzetének verifikálási folyamata passzív információk felhasználásával az aktív lekérdezéssel nyert viszonylagos helyzettel való összehasonlítása útján.

Passzív felderítés – Passive surveillance
Egy másik légijármű követése annak lekérdezése nélkül, a másik légijármű kiterjesztett squittereinek felhasználásával. Az ACAS a passzív nyomvonalakban tartalmazott információkat az aktív ellenőrzés szükségletének figyelésére, de semmilyen más célra nem használja.

Passzív nyomvonal – Passive track
A kezdeti megszerzés után, aktív lekérdezés nélkül, kiterjesztett squitterekben tartalmazott információ felhasználásával fenntartott nyomvonal.

4.5.1.2 Kiterjesztett squitter helyzet jelentések vételére felszerelt ACAS, nem-veszélyeztető légijármű passzív felderítésénél ezen passzív információkat a következő módon hasznosítja:

4.5.1.3 Passzív felderítés

4.5.1.3.1 *Kezdeti érvényesítés.* Egy kiterjesztett squitter információkat jelentő légijármű kezdeti adatbeszerzésénél az ACAS meghatározza a viszonylagos távolságot és tengely irányszöget, ahogyan a saját légijármű helyzetéből és a megközelítő légijárműnek a kiterjesztett squitterben jelentett helyzetéből kiszámították. Ezt a leszármaztatott távolságot és tengely irányszöget és a squitterben jelentett magasságot kell összehasonlítani a légijármű aktív ACAS lekérdezéséből megállapított távolsággal, tengelyirányszöggel és magassággal. A leszármaztatott és mért távolság és tengelyirányszög, és a squitter és squitter és válasz magasság közötti különbségeket ki kell számítani és felhasználni a vizsgálatoknál, melyet annak megállapítására végeznek, hogy a kiterjesztett squitter adatok érvényesek-e. Ha ezek a vizsgálatok kielégítőek, a passzív helyzetet érvényesítettnek kell tekinteni, és a nyomvonalat passzív adaton kell fenntartani. Ha a fenti vizsgálatok bármelyike hibás eredményű, a nyomvonalat aktív nyomvonalnak kell tekinteni, és az ettől a nyomvonaltól vett egymás utáni passzív ellenőrzési adatokat nem használják tovább.

4.5.1.3.2 **Ajánlás**. – *A kiterjesztett squitter közleményben jelentett helyzet érvényesítésére a következő vizsgálatokat kell alkalmazni:*

|*ferde távolság különbség*| ≤ 200 m;

irányszög különbség | ≤ 45 fok; és
|*magasság különbség*| ≤ 100 láb.

4.5.1.3.3 *Kiegészítő aktív lekérdezések.* Annak biztosítása érdekében, hogy egy megközelítő légijármű nyomvonalát legalább olyan gyakran felfrissítsék, amilyen kiterjesztett squitter adatok hiányában megkövetelt (4.3.7.1.2.2 pont), egyes időpontokban egy adatot felfrissítenek squitter információk felhasználásával, az időpontot, amelynél egy következő aktív lekérdezésnek kell sorra kerülni, ki kell számítani. Aktív lekérdezést kell végezni ebben az időpontban, ha előtte még nem vették az esedékes lekérdezést.

4.5.1.4 Újraérvényesítés és figyelés. Ha a következő feltétel teljesül egy nyomvonalnál, amelyet passzív ellenőrzési adatok felhasználásával felfrissítettek:

a) $|a| \leq 10000$ láb és vagy;

b) $|a| \leq 3000$ láb vagy $|a - 3000 \text{ láb}| / |a| \leq 60$ s; vagy

c) $r \leq 3$ NM vagy $(r - 3 \text{ NM}) / |\dot{r}| \leq 60$ s

ahol:

a = a megközelítő légijármű magassági elkülönítése, láb
$\dot{a}$ = becsült magasságváltoztatási sebesség, láb/s
r = a megközelítő légijármű ferde távolsága, NM
$\dot{r}$ = becsült távolságváltozási sebesség, NM/s

aktív lekérdezést kell végezni minden 10 másodpercben, hogy folyamatosan újraérvényesítsék és figyeljék a kiterjesztett squitter adatokat, ameddig a fenti feltétel teljesül. A 4.5.1.3.1 pontban megkövetelt vizsgálatokat mindegyik aktív ellenőrzésnél végre kell hajtani. Ha e vizsgálatok közül valamelyik hibás eredményt mutat, a nyomvonalat aktív nyomvonalnak deklarálják.

4.5.1.5 *Teljes aktív felderítés.* Ha a következő feltétel teljesül egy passzív felderítési adatokon keresztül felfrissített nyomvonalra:

a) $|a| \leq 10000$ láb és mindkettő

b) $|a| \leq 3000$ láb vagy $|a - 3000 \text{ láb}| / |\dot{a}| \leq 60$ s; vagy

c) $r \leq 3$ NM vagy $(r - 3 \text{ NM}) / |\dot{r}| \leq 60$ s

ahol:

a	=	*a megközelítő légijármű magassági elkülönítése, láb*
$\dot{a}$	=	*becsült magasságváltoztatási sebesség, láb/s*
r	=	*a megközelítő légijármű ferde távolsága, NM*
$\dot{r}$	=	*becsült távolságváltozási sebesség, NM/s*ni és fel kell frissíteni aktív távolság méréseken másodpercenként egyszer, amíg a fenti feltétel teljesül.

4.5.2 ACAS művelet tökéletesített MTL vevővel

Megjegyzés. – A kiterjesztett squitter alkalmazások, amelyek az ACAS-tól függetlenek, (a kényelem kedvéért) az ACAS használatával valósíthatók meg. Tökéletesített vevő minimális beindítási szint (MTL) használata lehetővé teszi kiterjesztett squitterek vételét maximálisan 60 NM-ről és azon túlról ilyen alkalmazások fenntartásánál.

4.5.2.1 ACAS, amely egy -74 dBm-nél nagyobb érzékenységű vevővel működik, megvalósítja a következő paragrafusokban ismertetett képességeket.

4.5.2.2 *Duális minimális beindítási szintek.* Az ACAS vevő képes beállítani egy kijelzést minden squitter vételhez, mintha a választ egy hagyományos MTL-el (-74 dBm) működő ACAS észlelte volna. A hagyományos MTL-nél vett squitter vételeket továbbítani kell az ACAS felderítési tevékenységének további feldolgozásra. Azok a squitter vételek, amelyek ezt a feltételt nem elégítik ki, nem továbbíthatók az ACAS felderítési tevékenységének.

1. Megjegyzés. – Helyzet jelentés információkat tartalmazó kiterjesztett squittereket terjeszteni fogják kijelzésre egy kiterjesztett squitter alkalmazással kapcsolatosan.

2. Megjegyzés. – A hagyományos MTL használata az ACAS felderítési tevékenységénél megőrzi az ACAS folyó felderítési műveletvégzését, amikor tökéletesített MTL-es vevővel működik.

4.5.2.3 *Duális vagy újrabeindításra képes válasz processzor.* Az ACAS S-módú válasz feldolgozási tevékenysége a következő használati módokat foglalja magában:

a) különálló válaszprocesszorok használata S-módú válasz formátumokhoz, amelyeket a hagyományos MTL-nél vagy afölött vesznek és külön válasz processzor az S-módú válasz formátumokhoz, amelyeket a hagyományos MTL alatt vesznek; vagy

b) S-módú válasz processzor használata, amely újraindítja, ha S-módú bevezetőt észlel, amely 2-3 dB-el erősebb, mint az a válasz, amelynek feldolgozása éppen folyamatban van.

Megjegyzés. – Figyelmet kell fordítani annak biztosítására, hogy az alacsonyszintű squitterek (azaz a hagyományos MTL alattiak) ne interferáljanak az ACAS beszerzési squitterek feldolgozásával. Ez akkor következhet be, ha az alacsonyszintű squitternek lehetősége van a válasz processzor befogására. Ez megelőzhető, ha minden egyes tevékenységhez külön válasz processzort használnak, vagy annak megkövetelésével, hogy a válasz processzor egy magasabb szintű squitter által beindítható legyen.

MELLÉKLET A IV. KÖTETHEZ

Összeütközés elkerülését biztosító fedélzeti rendszerre (ACAS) vonatkozó útmutató anyag

1. Megjegyzés. – A következő anyag útmutatást kíván adni a függőleges megoldási képességgel rendelkező összeütközés elkerülését biztosító fedélzeti rendszer (ACAS II) műszaki jellemzőiről. Az ACAS SARP-okat a 4. fejezet tartalmazza.

2. Megjegyzés. – A nem-SI alternatív egységek használata az 5. Annex, 3. fejezet 3.2.2 szakaszában engedélyezett módon történik. Korlátozott számú esetben a logikai számítások szintjén a következetesség biztosítása érdekében olyan mértékegységek használata is előfordul, mint láb/s, NM/s és csomó/s.

1. Berendezések, feladatok és képességek

1.1 ACAS berendezés jellemzők

1.1.1 Az ACAS berendezés tartalmaz egy ACAS feldolgozó egységet, S-módú válaszjeladót, szabályozó egységet, megfelelő antennákat és tanácsadás szolgáltató eszközöket.

1.1.2 A légijárművön lévő ACAS berendezés lekérdezi a környezetében tartózkodó más légijárműveken lévő SSR válaszjeladókat és meghallgatja a válaszjeladó válaszokat. Ezeknek a válaszoknak a számítógépes elemzésével az ACAS berendezés megállapítja, hogy mely légijárművek jelentenek potenciális összeütközés veszélyt és megfelelő jelzéseket (tanácsadásokat) szolgáltat a személyzetnek az összeütközés elkerülése érdekében.

1.1.3 Az ACAS berendezés kétféle tanácsadás szolgáltatásának képességével rendelkezik. Forgalmi tanácsadás (TA) jelzi a veszélyeztető légijárművek közelítő pozícióit, amely légijárművek később megoldás tanácsadásokat kényszerítenek ki. Megoldási tanácsadás (RA) függőleges manővereket javasol, amelyek várhatóan növelik, vagy fenntartják az elkülönítést a veszélyeztető légijárműtől.

1.2 Szolgáltatott tanácsadások

1.2.1 FORGALMI TANÁCSADÁSOK

A forgalmi tanácsadások jelzik a veszélyeztető légijárműnek a saját légijárműhöz viszonyított távolságát, távolság változási sebességét, magasságát, magasság változási sebességét és iránytengelyét. Magasság információ nélküli forgalmi tanácsadás is szolgáltatható C-módú vagy S-módú felszereltségű légijárművön, amely nem rendelkezik automatikus jelentő képességgel. Az információ, amelyet az ACAS forgalmi tanácsadásban szolgáltat, azt a célt szolgálja, hogy segítse a repülő-személyzetet a közeli forgalom figyelésében.

1.2.2 MEGOLDÁSI TANÁCSADÁS

1.2.2.1 Ha a veszélyeztetés észlelési logika az ACAS számítógépben megállapítja, hogy a találkozás egy közelben lévő légijárművel majdnem összeütközéshez vagy összeütközéshez vezethet, a számítógép veszélyeztetés megoldási logikája megfelelő függőleges manővert határoz meg, amely az ACAS légijármű biztonságos függőleges elkülönítését fogja biztosítani. A kiválasztott manőver megfelelő függőleges elkülönítést olyan korlátokon belül biztosít, amelyeket az ACAS légijármű emelkedő képessége és a földhöz való közelsége határoz meg.

1.2.2.2 A repülőgépvezető részére szolgáltatott megoldási tanácsadások két kategóriába sorolhatók: helyesbítési (corrective) tanácsadások, amelyek a légijárművezetőt a követett repülési pályáról való letérésre utasítják (pl. "EMELKEDJ", amikor a légijármű vízszintes repülést végez); és megelőzési (preventive) tanácsadás, amely a légijárművezetőnek bizonyos függőleges sebességek megtartását vagy elkerülését tanácsolja (pl. "NE EMELKEDJ", amikor a légijármű vízszintes repülést végez).

1.2.2.3 Normál körülmények között az ACAS csak egy megoldási tanácsadást ad ki egy vagy több megközelítő légijárművel való találkozás esetén. A megoldási tanácsadást akkor, vagy röviden azután adja ki, amikor a (az első) megközelítő légijármű veszélyeztetővé válik, és addig marad érvényben, amíg a (valamelyik) megközelítő légijármű veszélyeztető marad, és akkor kerül törlésre, amikor a (az utolsó) megközelítő légijármű megszűnik veszélyeztető lenni. Azonban a repülőszemélyzet részére a megoldási tanácsadás részeként kiadott jelzés módosulhat. Megerősítést nyerhet, vagy még ellenkezőjére is változhat, ha a veszélyeztető légijármű módosítja magasság profilját, vagy amikor a második vagy harmadik veszélyeztető légijármű észlelése megváltoztatja a találkozó kezdeti értékelését. Gyengülhet is, amikor megfelelő elkülönítés megtörtént, de a (bármelyik) megközelítő légijármű átmenetileg veszélyeztető marad.

1.2.3 FIGYELMEZTETÉSI IDŐK

Ha veszélyeztető légijárművet észlelnek, az ACAS berendezés bizonyos idővel a légijármű legszorosabb megközelítése előtt megoldási tanácsadást generál. A figyelmeztetési idő nagysága függ az ACAS rendszer számára használatra kiválasztott védett tér nagyságától. Az ACAS által használt, a legszorosabb megközelítés előtti névleges megoldási tanácsadási idő 15 és 35 másodperc között változik. Forgalmi tanácsadás névlegesen 5-20 másodperc közötti idővel előzi meg a megoldási tanácsadás kiadását. A figyelmeztetési idők függnek az érzékenységi szinttől, ahogyan az a 3.5.12 pontban ismertetésre került.

1.2.4 MEGOLDÁSI TANÁCSADÁSOK LEVEGŐ-LEVEGŐ KOORDINÁCIÓJA

1.2.4.1 Ha az ACAS berendezés által észlelt légijármű csak A/C-módú válaszjeladóval és automatikus nyomásmagasság jelentő berendezéssel rendelkezik, akkor a légijármű pilótája nem lesz tudatában annak, hogy az ACAS berendezéssel felszerelt légijármű figyelemmel követi őt. Ha az ACAS légijármű pilótája egy ilyen légijárművel való találkozáskor megoldási tanácsadást kap, és a tanácsolt manővert végrehajtja, az ACAS légijármű képes lesz a megközelítő légijárművet elkerülni, feltéve, hogy a megközelítő légijármű nem gyorsul fel olyan módon, hogy az ACAS légijármű manőverének hatását lerontja, vagy semmissé teszi.

1.2.4.2 Ha a megközelítő légijármű fel van szerelve ACAS berendezéssel, akkor koordinációs eljárást alkalmaznak a levegő-levegő S-módú adat kapcsolaton keresztül annak biztosítása érdekében, hogy az ACAS megoldási tanácsadások összeegyeztethetők legyenek.

1.2.5 LEVEGŐ-FÖLD KOMMUNIKÁCIÓ

1.2.5.1 Az ACAS az S-módú levegő-föld adatösszeköttetés felhasználásával kommunikálni tud földi állomásokkal. A kommunikáció egyik formája az érzékenységi szint szabályozási utasítás S-módú földi állomások általi továbbítása az ACAS berendezéshez. Ez a tulajdonság lehetővé teszi egy S-módú földi állomás számára, hogy a megoldási tanácsadás figyelmeztetési időt a helyi forgalmi körülményekhez adaptálja, amikor egy ACAS légijármű áthalad az állomás által lefedett körzeten. Ezáltal hatékony összhang jön létre az összeütközés figyelmeztetési idő és a riasztás gyorsasága között.

1.2.5.2 Az S-módú levegő-föld adat-összeköttetés felhasználható az ACAS megoldási tanácsadások S-módú földi állomásokhoz való továbbítására is. Ezeket az információkat azután a légiforgalmi szolgálatok felhasználhatják az ACAS megoldási tanácsadások figyelésére az érdekelt légteren belül.

1.2.6 AZ ACAS ÁLTAL VÉGZETT FELADATOK

1.2.6.1 Az ACAS által végzett feladatokat az A-1 ábra illusztrálja. Az ábrázolás leegyszerűsítése érdekében a “saját légijármű követés” és a “megközelítő légijármű követés” feladatokat egyszerre képviseli a “felderítés” feladat az A-1 ábrán. Azonban a követők, amelyeket az összeütközés elkerülését biztosító feladat fenntartására szánnak, lehet, hogy nem alkalmasak a felderítés feladatának fenntartására. Különálló követési feladatok válhatnak szükségessé mind az összeütközés elkerülés, mind a felderítési feladatok megfelelő támogatására.

1.2.6.2 Felderítést normál körülmények között ciklusonként egyszer hajtanak végre; azonban bizonyos megközelítő légijárműveknél ezt gyakrabban vagy ritkábban lehet végezni. Például felderítést ritkábban lehet végrehajtani néhány nem veszélyeztető megközelítőnél, tekintetbe véve az interferencia korlátozási egyenlőtlenségeket, vagy gyakrabban lehet végrehajtani más megközelítőknél az azimut becslés javítása érdekében.

1.2.6.3 Az ACAS feladatok megvalósításánál használt paramétereket automatikusan vagy manuálisan állítják be, hogy a normál légiforgalmi irányítás (ATC) műveletek legkisebb mértékű zavarásával tartsák fenn az összeütközés elkerülés megőrzését.

1.3 Veszélyeztető légijármű jellemzői

1.3.1 A VESZÉLYEZTETŐ LÉGIJÁRMŰ VÁLASZJELADÓ FELSZERELÉSE

Az ACAS megoldási tanácsadásokat szolgáltat magasság jelentő A/C-módú vagy S-módú válaszjeladókkal felszerelt légijárműveken. Néhány légijármű SSR válaszjeladóval van felszerelve, de nincs magasság kódolója. Az ACAS nem tud megoldási tanácsadásokat generálni ilyen légijárművekkel való konfliktus esetén, mert magasság információ nélkül az összeütközés veszélyeztetés becslését nem lehet elvégezni. Az ACAS berendezés ilyen légijárműveken csak forgalmi tanácsadást tud generálni, jellemezve távolságukat, távolság változási sebességüket és iránytengelyüket. Azokat a légijárműveket, amelyek csak A-módú válaszjeladóval vannak felszerelve és nincsenek felszerelve A/C-módú vagy S-módú válaszjeladóval, vagy azok nem működnek, az ACAS nem tudja követni.

1.3.2 A VESZÉLYEZTETŐ LÉGIJÁRMŰ KÖZELÍTŐ SEBESSÉGE ÉS A FORGALOM SŰRŰSÉGE

1.3.2.1 Nagy forgalom sűrűségű légtérben való üzemeltetésre tervezett ACAS berendezés képes a veszélyeztető légijárművekre vonatkozó átfogó felderítési teljesítményt nyújtani a 4. fejezet 4.3.2 pontban és a 4-1 táblázatban meghatározottaknak megfelelően.

1.3.2.2 A 4-1 táblázatban felsorolt körülményeket, amely táblázat két sűrűségi régiót határoz meg a többdimenziós feltétel térben, amely az ACAS teljesítményt befolyásolja, egy tipikus ACAS teljesítményének fedélzeti méréseiből extrapolálták. A fedélzeti mérési adatok azt mutatták, hogy a nyomvonal létrejöttének valószínűsége nem zuhan hirtelen, amikor a feltétel határok egyikét átlépik.

1.3.2.3 A teljesítményt az illető cél követési valószínűségének fogalmával fejezik ki egy maximális közelítési sebességnél adott forgalom sűrűségnél legalább 30 másodperccel a legszorosabb megközelítés előtt. A két sűrűségi régióhoz (egyenként) tartozó maximális forgalomsűrűség definíciója a következő:

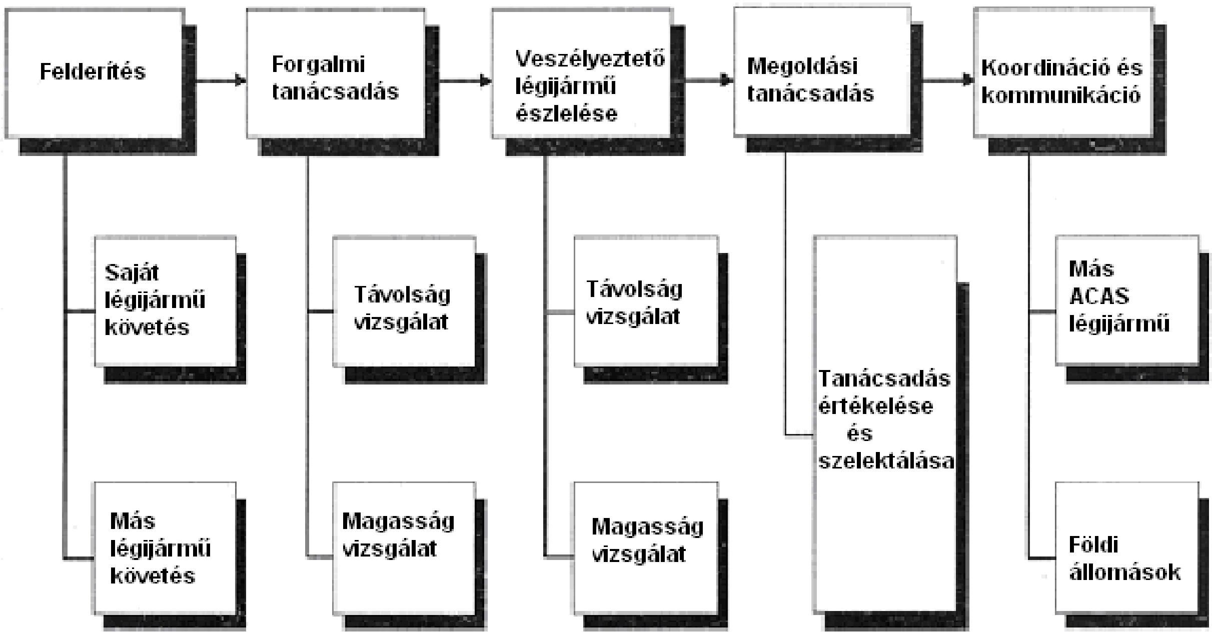
$$\zeta = n(r)/\pi r^2$$

ahol n*(r)* az SSR válaszjeladóval felszerelt légijárművek maximálisan 30 másodperc időre vett átlagos száma (a saját légijárművet nem számítva) az ACAS légijármű földi pozíciója feletti *r*-sugarú kör területe felett. A levegőben történő méréseknél a rádiuszok különbözőek voltak a két sűrűségi régiónál. A nagy sűrűség értékű méréseknél a rádiusz 9,3 km (5 NM) volt. A kis sűrűség értékű méréseknél a rádiusz 19 km (10 NM) volt. A forgalom sűrűségről az állandó sűrűségű kör terület határain kívül feltételezhető, hogy a távolsággal fordított arányban csökken, így a légijárművek számát

az

$$n(r) = n(r_0)r/r_0$$

összefüggés adja meg, ahol r_0 az állandó sűrűségű régió sugara.



A-1. ábra ACAS feladatok ábrázolása

1.3.2.4 Amikor a sűrűség nagyobb, mint 0,017 légijármű km^2 (0,06 légijármű/NM^2), az egyenletes sűrűség névleges rádiuszát 9,3 km-nek (5 NM) vesszük. Ha a sűrűség egyenlő vagy kisebb a fenti jelzettnél, r_0 névlegesen 18,5 km (5 NM).

1.3.2.5 A táblázat azon a kiegészítő feltételezésen alapszik, hogy a legnagyobb sűrűségű, 0,087 légijármű/km^2 (0,3 légijármű/NM^2) légtérben a válaszjeladóval felszerelt összes légijármű legalább 25 százaléka S-móddal felszerelt. Ha 5 százaléknál kevesebb van S-móddal felszerelve, a követési valószínűség A/C-módú légijárművek esetében a megnövelt szinkron csonkítás miatt kisebb, mint 0,90. Ha r_0-on belül a forgalom sűrűség meghaladja a táblázatban megadott határokat, vagy ha a forgalom számossága az r_0-on kívül folytatódóan gyorsabban nő, mint r, a tényleges nyomvonal megállapítás valószínűsége A/C-módú légijárműveknél ugyancsak kisebb lesz, mint 0,90, a megnövekedett szinkron csonkítás miatt. Ha a közeledési sebesség meghaladja a megadott határokat, a követés az A/C-módú és az S-módú légijárműveknél későn jöhet létre. Ha a más ACAS-ok száma a területen belül meghaladja a táblázatban megadott határokat, a 4. fejezet 4.3.2.2 pontjában szereplő interferencia korlátozó követelmények megkövetelik, hogy az ACAS adattovábbítási teljesítmény és a vevő érzékenység tovább csökkenjen, és ezáltal egy később létrehozott időt eredményez. Mindazonáltal a követési valószínűség várhatóan fokozatosan csökken, ahogyan ezeknek a korlátoknak valamelyikét túlhaladják.

1.3.2.6 A táblázat tükrözi azt a tényt, hogy az ACAS követés teljesítésében a közelítési sebesség és a forgalom sűrűség közötti kompromisszum jut szerephez. Bár előfordulhat, hogy nem lehet fenntartani a nyomvonal nagy valószínűség értékét, amikor a forgalom sűrűség és a megközelítő légijármű közeledési sebessége egyaránt nagy, az ACAS-nak megvan a megbízható nyomvonal létrehozásának képessége nagysebességű megközelítők légijárművekre viszonylag kis sűrűségű útvonali légtérben (amelyeket tipikusan jellemez a 0,017 légijármű/km^2, azaz 0,06 légijármű/NM^2 értéknél kisebb sűrűség), vagy amikor nagyobb sűrűségű, kismagasságú terminál légtérben üzemel, ahol a közlekedési sebességek üzemelési okok miatt tipikusan 260 m/s (500 csomó) alatt vannak.

1.3.2.7 A táblázat arról a tényről is tanúskodik, hogy nagyobb közeledési sebességek inkább az előre tartó irányhoz kapcsolódnak, mint az oldalsó vagy hátrafelé tartó irányhoz, úgy, hogy az ACAS felderítési kialakítás nem kíván megbízható észlelést a legnagyobb közelítési sebességekre oldal vagy hátrafelé irányokban.

1.3.3 RENDSZER TÁVOLSÁGI KORLÁTOZÁSOK

Az ACAS megkövetelt névleges követés hatótávolsága 26 km (14 NM). Azonban amikor nagy sűrűségben üzemel, az interferencia korlátozási sajátosság a rendszer hatótávolságát közelítően 9,3 km-re (5 NM) csökkentheti. A 9,3 km-es (5 NM) távolság megfelel egy 260 m/s-os (500 csomó) találkozás elleni védelem létrehozásának.

1.4 Az elektromágneses környezet zavarásának szabályai

1.4.1 Az ACAS berendezés minden forgalom sűrűségben működőképes az elektromágneses környezet lerontása nélkül. Mindegyik ACAS berendezés ismeri a helyi légtérben működő többi ACAS egység számát. Ezt az ismeretet használják fel annak biztosítására, hogy ACAS működés ne nyomja el az idő 2 százalékánál hosszabb ideig a válaszjeladó működését, és annak biztosítására, hogy az ACAS ne járuljon hozzá egy elfogadhatatlanul magas működési sebesség előidézéséhez, amely leronthatná a földi SSR felderítési teljesítményét. Több ACAS egység egymás közelében együttműködően limitálja a saját továbbításait. Ahogyan az ilyen ACAS egységek száma növekszik, mindegyikük lekérdezési kiosztása úgy csökken. Így mindegyik ACAS egység figyeli az észlelési távolságon belül lévő többi ACAS egység számát. Ezt az információt azután saját lekérdezési sebességük és teljesítményük limitálására használják szükség szerint. Amikor ez a korlátozás teljes érvényű, az ACAS egységek hatásos távolsága lehetséges, hogy nem megfelelő elfogadható figyelmeztetési idők szolgáltatására 260 m/s (500 csomó) meghaladása esetén. Ez a körülmény általában kismagasságon fordul elő, ahol ez a közeledési sebesség képesség kielégítő. Amikor az ACAS légijármű a földön van, az ACAS automatikusan limitálja lekérdezésének teljesítményét. Ezt a korlátozást az ACAS számának (n_a) az interferencia korlátozó egyenlőtlenségekben a mért érték háromszoros értékére történő állításával végzik. Ezt az értéket úgy választják, hogy biztosítsa, hogy az ACAS egység a földön ne járuljon hozzá több interferenciával az elektromágneses környezethez, mint ami elkerülhetetlen. Ez az érték egy közelítőleg 5,6 km-es (3 NM) felderítési távolságot szolgáltat a legnagyobb sűrűségű terminál területeken a helyi légiforgalom megbízható földi ACAS felderítés fenntartására, és 26 km-es (14 NM) távolságot nagyon kis sűrűségű légtérben széles területű felderítés biztosítására SSR hiányában.

1.4.2 Egy ACAS egység jelenlétét a többi ACAS egységnek egy ACAS lekérdezés periódikus továbbítása közli, amely az ACAS légijármű címzését megadó közleményt tartalmaz. Ezt a továbbítást névlegesen minden 8-10 másodpercben küldik S-módú közvetítés címzés felhasználásával. Az S-módú válaszjeladók úgy vannak kiképezve, hogy közlési adatokat a közvetítési lekérdezéstől válasz nélkül vegyék. Az ACAS légijármű S-módú válaszjeladója által vett bejelentés közléseket az interferencia korlátozási algoritmus figyeli, hogy a környezetében lévő ACAS egységek számának a becslését kialakítsa.

2. Rendszer teljesítményt befolyásoló tényezők

2.1 Szinkron csonkítás

Amikor egy C-módú lekérdezést továbbítanak, az összes válaszjeladó, amely észleli azt, válaszol. Mivel a válasz időtartama 21 mikromásodperc, azok a légijárművek, amelyek távolsága az ACAS-tól körülbelül 2,8 km-en (1,5 NM) belül van, egymásnak generálnak válaszokat, amelyek a lekérdező légijárműveknél folytonosan és szinkron átfedik egymást. Az egymást átfedő válaszok száma arányos a légijármű sűrűséggel és az ACAS-tól való távolságukkal. Tíz vagy több átfedő választ lehet venni mérsékelten sűrű terminál légtérben. Megbízhatóan dekódolni csak körülbelül három átfedő választ lehet. Ennélfogva redukálni kell az egyes lekérdezésekre válaszoló válaszjeladók számát. Suttogás-kiabálás és irány átvitel eljárások állnak rendelkezésre az ilyen szinkron csonkítások szabályozására (lásd 3.2 és 3.3 pontok). Mindkettő szükséges a legnagyobb forgalomsűrűségben üzemelő ACAS-okhoz.

2.2 Többszörös nyomvonal terep visszaverődésektől

2.2.1 Az SSR válaszjeladók a légijármű aljára szerelt negyed-hullámú antennákat használnak. Ennek a fajtának a végantennája a vízszintes sík alatt 20-30 fok közötti szögeknél csúcs látóhatár fölötti szögmagasság (elevációs szög) nyereséggel rendelkezik. Ez megfelel a föld-levegő felderítés számára, de a közvetlen levegő-levegő felderítési nyomvonal kedvezőtlen vonatkozásban működhet a föld visszaverődési pályához, különösen víz felett.

2.2.2 Ha az ACAS egység alulra szerelt antennát használ, akkor vannak geometriák, amelyeknél a visszavert jel következetesen erősebb, mint a közvetlen jel. Azonban amikor tetőre szerelt antennát használnak lekérdezéshez, csúcsnyeresége jelenik meg egy pozitív látóhatár fölötti szögmagasságnál (elevációs szögnél), és a jel-többszörös nyomvonal arány javul. Így, amikor az ACAS a tetőre szerelt antennáról továbbít adást, a többszörös nyomvonal hatásai jelentősen csökkennek. De még akkor is, amikor tetőre szerelt antennát használnak, a többszörös nyomvonal esetenként meghaladja a vevő küszöböt. Így szükség van alacsonyszintű többszörös nyomvonal kiküszöbölésére. Ezt az ACAS változó vevő küszöb segítségével éri el (lásd 3.4 alpont).

2.3 Magasságmérési adatok minősége

2.3.1 MÉRÉSI HIBÁK

2.3.1.1 Két konfliktusban lévő légijármű közötti függőleges elkülönítést a saját magasság és a megközelítő légijármű magassága közötti különbségként mérik a C-módú vagy S-módú válaszában közöltek alapján. Ha az ACAS légijármű egy szállító-repülőgép, akkor ez általában pontos magasságméréssel rendelkezik; a megközelítő légijármű kevésbé pontos magasságméréssel rendelkezhet.

2.3.1.2 A magasságmérés hibája kétféle hatást okozhat: először is, ha a légijármű majdnem összeütközési útvonalon repül, a hibák biztonságos elhaladást jelezhetnek, és a fenyegető légi majdnem-összeütközést az ACAS nem háríthatja el; másodszor, ha a légijárművek majdnem-összeütközés útvonalon repülnek, de magasság szerint elkülönítettek, a hibák rossz irányban végrehajtott ACAS manőverekhez vezetnek, amely egy még szorosabb találkozást eredményezhet.

2.3.1.3 Az ACAS a jelentett magasság alapján a legszorosabb megközelítésnél a légijárművek között legalább 90 m-es (300 láb) különbség elérésére törekszik. Így, ha a megközelítő légijármű és az ACAS magasságmérési hibájának kombinációja a 90 m-t (300 láb) megközelíti, az ACAS jelenléte ellenére véges kockázata lenne egy nem megfelelő függőleges elkülönítésnek. A tengerszinttől a 400-as repülési szintig terjedő magasságokban repülő ACAS és nem-ACAS légijárművek várható magasságmérési hibáinak vizsgálata ahhoz a következtetéshez vezetett, hogy a kockázat lényegében elhanyagolható, ha mindkét légijármű nagypontosságú magasságmérő rendszerrel van ellátva, amelyek közelítőleg 15 m-es (50 láb) négyzetes középhiba (RRS) elérésére képesek. Az a következtetés is adódott, hogy ha nagypontosságú magasságmérővel ellátott tipikusan általános célú ACAS légijárműveket tartalmazó légtérben repül (amelyeknek négyzetes középhibája közelítőleg 30 m (100 láb) és normális eloszlású), akkor a magasságmérési hibák alkalmanként nem megfelelő ACAS megoldási tanácsadásokhoz vezetnek. Azonban ez nem fordul elő olyan gyakran, hogy a rendszer hatásosságát komoly mértékben zavarná. A működés nem-megfelelőnek tekinthető akkor, ha mindkét találkozó légijárműnek kispontosságú magasságmérő rendszere van. Ez vezetett ahhoz a követelményhez, hogy az ACAS nagypontosságú rendszerrel rendelkezzen.

2.3.2 MAGASSÁG BIT MEGHIBÁSODÁS

Ha a megközelítő légijárműtől kapott C-módú vagy S-módú magasság jelentések bit hibát tartalmaznak, az ACAS a megközelítő légijármű hibás függőleges helyzet és/vagy hibás sebesség értékelését alakíthatja ki. Ezeknek a hibáknak hasonló hatásuk lehet, mint a mérési hibáknak. Az ilyen hibák a legnagyobb valószínűséggel akkor fordulnak elő, amikor a magassági adat forrás egy Gilham kódoló, és a Gilham kódolású adatok használatának saját légijármű magasságra súlyosan káros következményei lehetnek. Amikor nincs más forrás, mint Gilham kódolású adatok, két kódolót kell használni, és egy összehasonlítási funkciót az S-módú válaszjeladónál, amelyet a magassági adatok hibáinak észleléséhez használnak, mielőtt azokat az ACAS részére szolgáltatják.

2.3.3 SAJÁT LÉGIJÁRMŰ MAGASSÁG HITELESSÉGE

A saját légijármű összes magassági adat forrását meg kell vizsgálni hitelesség szempontjából, beleértve a finom magasság adatokat (amelyek különböző forrásokból származhatnak: giroszkóp, légjel számítógép, stb.) és radar magasság adatokat.

2.4 Annak veszélye, hogy földi SSR helyszíni monitorok (PARROT-ok) hamis forgalmi és megoldási tanácsadásokat váltanak ki

Az ACAS a hatótávolságába eső összes SSR válaszjeladót lekérdezi, beleértve a földi elhelyezésű válaszjeladó telepítéseket, amelyeket földi radarrendszerek működésének figyelésére használnak, vagy a vizsgálati válaszjeladókat is. Ha ezek a földi elhelyezésű válaszjeladók hamis magassági adatokkal válaszolnak, fennáll a potenciális veszélye annak, hogy az ACAS hamis forgalmi tanácsadást vagy megoldási tanácsadást generál. Ennek a problémának a megelőzéséhez a *Másodlagos felderítő radarrendszerek kézikönyve (Manuel on Secondary Surveillance Radar (SSR) Systems)* (Doc 9684) információkat szolgáltat a pozíció szerint beállítható távolság referencia orientációs válaszjeladó (PARROT) működéséről és a válaszjeladó vizsgálati berendezésekről.

2.5 SSR S-módú címzések kiosztása és kijelölése

A biztonságos üzemelés érdekében a rendszer megkívánja, hogy az összes S-móddal felszerelt légijármű egyéni címzéssel rendelkezzen. Több légijármű ugyanazon címzéssel vagy légijármű olyan címzéssel, amely nem felel meg a 10. Annex, III. Kötet I. Rész 9. fejezetének, károsan befolyásolhatja a felderítési és koordinációs funkciót.

2.6 ACAS II működésének TCAS I rendszerek általi befolyásolásának lehetősége

Megjegyzés. – Ebben az anyagban a TCAS I úgy lett meghatározva, mint olyan rendszer, amely SSR lekérdezéseket használ a repülőszemélyzet forgalom riasztás figyelmeztető információkkal való ellátására a “láss és kerülj” alapelv kiegészítéseként.

Néhány TCAS I rendszer elnyomott megoldási tanácsadású ACAS II interferencia korlátozó eljárást alkalmaz. Ezek a rendszerek nem elégítik ki az ACAS I Szabványok és Ajánlott Eljárások-at. Mivel az ACAS II interferencia korlátozó más ACAS II légijárművekkel való közvetlen kölcsönhatáson nyugszik (ACAS rádióadást és S-módú válaszjeladó válaszokat használva), ilyen TCAS I légijárművek jelenléte közvetlenül befolyásolhatja a közelben lévő ACAS II légijárművek felderítési működését. Ha a légijárművekre ilyen TCAS I rendszerek vannak felszerelve, amely légijárművekről tudott, hogy egymáshoz szoros közelségben repülnek (pl. helikopterek vagy vitorlázó repülőgépek), akkor a hatás csökkentheti más ACAS II légijárművek ellenőrzési távolságát és késleltetheti az összeütközés elkerülését biztosító figyelmeztetéseket. Ezeknek a gondoknak a fényében, a TCAS I rendszereket (amelyek ACAS II interferencia korlátozó eljárást alkalmaznak), nem szabad alkalmazni olyan légijárműveknél, amelyekről tudott, hogy egy hosszabb időszakon keresztül egymáshoz szoros közelségben üzemelnek. Gondos figyelmet kell fordítani annak biztosítására, hogy a hatás az SSR elektromágneses környezetére elfogadható legyen, mivel ilyen TCAS I egységek nagyon nagy számban lehetnek felszerelve.

3. Megfontolások a műszaki megvalósításról

3.1 Rendszer működés

3.1.1 VESZÉLYEZTETŐ LÉGIJÁRMŰVEK FELDERÍTÉSE

3.1.1.1 Az alábbiakban ismertetett felderítési eljárások fő célja, hogy helyzet jelentéseket szerezzenek be és ezeket korrelációba (összefüggésbe) hozzák útirányok kialakításához. Ez magában foglalja a célkövetők használatát és megkívánja a sebességek becslését.

3.1.1.2 Az ACAS egység névlegesen másodpercenként egy lekérdezés sorozatot továbbít. A lekérdezéseket +54 +2 dBm névleges effektív sugárzott teljesítménnyel továbbítják, amelyet a légijármű hossztengelyéhez viszonyítva zérus fok látóhatár fölötti szögmagasságnál (elevációs szögnél) mérnek. Amikor az A/C-módú és S-módú magasság jelentő válaszjeladók ezeket a lekérdezéseket veszik, a válaszjeladók válaszokat továbbítanak, amelyek közlik a magasságukat. Az ACAS egység kiszámítja mindegyik megközelítő légijármű távolságát a lekérdezés továbbítás és a válasz vétele között eltelt idő felhasználásával. A magasság és távolság változás mértékét a válasz információk követésével határozzák meg.

3.1.1.3 Ha nincsenek zavarás, túlterhelés, interferencia-korlátozó feltételek, vagy más rontó hatások, a berendezés nominálisan képes felderítés ellátására 26 km-es (14 NM) távolságon belüli A/C-módú és S-módú célok esetében. Azonban, mivel a felderítés megbízhatósága csökken a távolság növekedésével, a berendezés csak azokat a célokat értékeli lehetséges összeütközés veszélyeztetőként, amelyek egy maximálisan 22 km-es (12 NM) távolságon belül vannak. Ezen a távolságon kívül eső cél nem lehet alkalmas megoldási tanácsadás generálás előidézésére. Azonban az ACAS képes 56 km-es (30 NM) névleges távolságon belüli ACAS-szal felszerelt légijárműtől származó ACAS rádióközvetítésű lekérdezések észlelésére.

3.1.1.4 A berendezésnek képesnek kell lennie A/C-módú vagy S-módú célok bármely kombinációinak ellenőrzésére maximálisan 30 légijárműből álló teljes csúcs kapacitásig. Az ACAS berendezés névlegesen képes nagy közeledési sebességű célok megbízható felderítésére maximálisan 0,017 légijármű per négyzetkilométer (0,06 légijármű per négyzet-NM) csúcs forgalom-sűrűségben, vagy közelítőleg 27 légijármű felderítésére 26 km-es (14 NM) rádiuszon belül.

3.1.1.5 Ha az átlagos forgalom-sűrűség meghaladja a fenti értéket, a megbízható felderítési távolság csökken. Az ACAS berendezés csak maximálisan 260 m/s (500 csomó) közeledési sebességű járműnél tud megbízható ellenőrzést szolgáltatni 0,087 légijármű per négyzetkilométer (0,3 légijármű per négyzet NM) átlagos forgalom sűrűségnél. A 260 m/s (500 csomó) közeledési sebességű céloknál megkövetelt felderítési távolság körülbelül 9,3 km (5 NM). Lehetséges 9,3 km-es (5NM) felderítést szolgáltatni egy rövid idejű 0,087 légijármű/km^2 (0,3 légijármű/NM2) vagy nagyobb csúcs forgalom-sűrűségben 30-as teljes cél kapacitás túllépése nélkül. Ha a teljes cél szám meghaladja 30-at bármely 26 km-es (14 NM) maximális távolságnál, a nagytávolságú célokat mindig elhagyhatják a kisebb sebességű célok megbízható felderítési képességének csorbítása nélkül. Így a 30 célhoz tartozó képesség csúcs (az A/C-módú és S-módú bármely kombinációja) megfelel az ACAS-nak, és ha a felderítés alatt álló A/C-módú plusz S-módú célok száma meghaladja a 30-at, az ezen felüli célokat törölni kell a csökkenő távolság sorrendjében, tekintet nélkül a cél típusára.

3.1.2 A/C-MÓDÚ VÁLASZJELADÓKKAL ELLÁTOTT MEGKÖZELÍTŐ LÉGIJÁRMŰVEK FELDERÍTÉSE

3.1.2.1 A/C-módú válaszjeladók felderítési tevékenységét egy csak C-módú all-call (inter-mód) lekérdezés periodikus továbbításával valósítja meg (3. fejezet, 3.1.2.1.5.1.2 pont). Ez válaszokra készteti az A/C-módú válaszjeladókat, de az S-módú válaszjeladókat nem, így megakadályozzák, hogy az S-módú válaszjeladók válaszai szinkron csonkulást szenvedjenek az A/C-módú válaszjeladók válaszaitól. A szinkron csonkulás egyéb eljárásai a következők: (1) irány antennák használata, hogy csak egy azimut szögtartományban lévő légijárműveket kérdezzen le, és (2) teljesítmény elnyomások és lekérdezések egymásutánisága sorozatának alkalmazása (“suttogás-kiabálás”-ként (“whispers-shout”) ismert), amely csak azokat a légijárműveket kérdezi le, amelyek hasonló kapcsolat tartalékkal rendelkeznek (lásd 3.2.2 alpont). E két eljárás együttes használata hatékony eszközt szolgáltat a szinkron csonkulás hatásainak leküzdéséhez.

3.1.2.2 A suttogás-kiabálás lekérdezések sorozatát alkalmazza különböző teljesítmény szinten, amelyet az egyes felderítési felfrissítés idején továbbítanak. A lekérdezések mindegyikét a sorozatban, a legkisebb teljesítményhez tartozó kivételével, egy elnyomás továbbítás előz meg, ahol a lekérdezés első impulzusa az elnyomás továbbítás második impulzusaként szolgál. Az elnyomás továbbítási impulzus a lekérdezés első impulzusa előtt 2 mikromásodperccel kezdődik. Az elnyomás impulzust alacsonyabb teljesítmény szinten továbbítják, mint az azt kísérő lekérdezést, úgy, hogy a válaszjeladók, amelyek erre válaszolnak, csak olyanok lehetnek, amelyek a lekérdezést észlelik, de az elnyomást nem. Hogy védekezzenek annak lehetősége ellen, hogy bizonyos válaszjeladók nem válaszolnak a lekérdezésekre a sorozatban, az elnyomás impulzus továbbítás valamivel alacsonyabb teljesítmény szinten történik, mint a következő alacsony lekérdezés teljesítmény szintje. Az egymást követő lekérdezések közötti időközöknek legalább 1 ezredmásodpercnek kell lenni. Ez biztosítja azt, hogy a nagy távolságban lévő válaszjeladóktól érkező válaszokat nem tévesztik össze a rákövetkező lekérdezésre adott válaszokkal. Minden lekérdezést a sorozatban egyetlen felderítés felfrissítési időközön belül továbbítanak.

3.1.2.3. Az egyes csak C-módú all-call lekérdezésekre adott válaszokat feldolgozzák, hogy meghatározzák az egyes válaszok távolsági és magassági kódját. A magasság kódokat maximálisan három átfedő válasznál lehet meghatározni, ha kellő figyelmet fordítanak a vett impulzusok mindegyike helyének azonosítására.

3.1.2.4 Az összes válasz vétele után, amelyek a suttogás/kiabálás sorozatra való reagálásként érkeztek, a megkettőzött válaszokat egyesíteni kell úgy, hogy mindegyik észlelt légijárműnél csak egy “jelentést” állítsanak elő. A jelentések távolságban és magasságban korrelációba (összefüggésbe) hozhatók az ismert megközelítő légijárművek előrejelzett pozícióival (azaz a meglévő nyomvonalakkal). Mivel a megközelítő légijárműveket nagy gyakorisággal kérdezik le (névlegesen másodpercenként egyszer), szoros korrelációt érnek el a távolság és magasság felhasználásával. A-módú kód nem igényel korrelációt. A jelentéseket, amelyek korrelációban állnak egymással, felhasználják a hozzájuk tartozó nyomvonalak kiterjesztésére. Azok a jelentések, amelyek nem hozhatók korrelációba a meglévő nyomvonalakkal, összehasonlíthatók az előzőleg korrelációba nem hozott jelentésekkel új nyomvonalak indítása érdekében. Új nyomvonal indítása előtt a válaszokat, amelyek a nyomvonal indításához vezetnek, meg lehet vizsgálni annak biztosítására, hogy ezek megegyezzenek az összes jelentősebb magassági kód bitekkel. Geometriai számításokat lehet végezni a terepről való többszörös pálya visszaverődések által okozott visszavert hamis célok azonosítására és kiszűrésére.

3.1.2.5 A megindítandó nyomvonalak megvizsgálhatók nyomvonal érvényességi kritériumok szempontjából, mielőtt beviszik az összeütközés elkerülését biztosító algoritmusba. Ezeknek a vizsgálatoknak a célja a csonkulások és többszörös repülési pálya által létrehívott hamis nyomvonalak kiselejtezése. A hamis útirányokat általában rövid élettartam jellemzi.

3.1.2.6 Azokat a légijárműveket, amelyek nem jelentenek magasságot a C-módú válaszokban, a C-módú válasz keret impulzusok felhasználásával észlelik. Ezeket a légijárműveket a távolság, mint korrelációs kritérium felhasználásával követik. Az iránytengely kiegészítő felhasználása a korreláció céljából, segít csökkenteni a hamis nem C-módú nyomvonalak számát.

3.1.2.7 *Válasz egyesítés.* Többszörös választ generálhat az A/C-módú cél, amely egynél több suttogás-kiabálás lekérdezésre válaszol az egyes suttogás-kiabálás sorozatok során, vagy az a cél, amely a lekérdezésekre a felső és alsó antennáról egyaránt válaszol. A berendezéstől elvárható, hogy egynél több pozíció jelentést nem generál bármely cél esetén, még ha az a cél egynél több lekérdezésre válaszol az egyes felderítés felfrissítési időközök alatt.

3.1.2.8 *A/C-módú felderítés indítás.* A berendezés csak akkor viszi be a kezdeti pozíció jelentéseket az összeütközés elkerülését biztosító algoritmusba, ha az alábbi a)-ban és b)-ben közölt feltételek teljesülnek:

a) kezdetben C-módú válasz érkezik a céltól a három egymás utáni ellenőrzés felfrissítési periódus mindegyikében, és
   1) a válaszok nincsenek kölcsönös összefüggésben a felderítési válaszokkal, amelyek más nyomvonalakkal kapcsolódnak;
   2) a két legutolsó válasz által jelzett távolság változási sebesség kisebb, mint 620 m/s (1200 csomó);
   3) a legrégebbi válasz megegyező a fenti távolság változás sebességgel abban az értelemben, hogy a távolsága 95,3 m-en (312,5 láb) belül van egy olyan egyenes vonalon, amely a két legutolsó válaszon megy keresztül;
   4) a válaszok korrelációban állnak egymással a magasság kód bitjeikben;
b) egy negyedik összefüggő válasz érkezik öt felderítés felfrissítési időközön belül, amely a három fenti a)-beli három egymás utáni válasz közül a harmadikat követi, és az a)4) fenti pontban meghatározott előrejelzett magasság kód becslés ±60 m-en (±200 láb) belül van.

3.1.2.8.1 Az itt következő példa a szabályok elfogadható együttesére a válasz kód bitek korrelációinak értékeléséhez és a kezdeti magasság nyomvonal kód meghatározásához, amelyek egy célt értékelnek. Három válasz csak akkor kerül összefüggésbe, ha:

a) mind a nyolc D, A és B kód impulzusaik megegyezők, vagy
b) a D, A és B kód impulzusaik közül hét és legalább egy C kód impulzus megegyező.

3.1.2.8.2 A három válasz közötti kód megegyezés vizsgálatát egyedileg végzik a válasz impulzus pozíciók mindegyikére. Ez a vizsgálat egyedül kód impulzusok jelenlétén alapszik; egyezés akkor van egy adott válasz impulzus pozíciónál, ha mind a három választ EGY-el észlelik a pozícióban, vagy mind a három választ ZÉRUS-sal észlelik ebben a pozícióban. Az ezekkel az impulzus észlelésekkel kapcsolatos megbízhatóság az egyezést nem befolyásolja.

3.1.2.8.3 A megbízhatósági jelző egy válaszimpulzus pozíciónál "alacsonyra" állított, ha létezik egy másik vett válasz (akár valódi, akár fantom), amelynek ugyanazon pozícióihoz tartozó ±0,121 mikromásodpercen belül egy impulzusa lehetett volna. Egyéb esetben a megbízhatósági jelző "magasra" van beállítva.

3.1.2.8.4 Ha a három válasz között egy adott válasz impulzus pozíciónál nincs egyezés, a kezdeti nyomvonal impulzus kód becslés erre a pozícióra az egyedi impulzus kódok értékein alapul és ezekkel az impulzus kódokkal három válaszban kapcsolódó megbízhatósági zászló értékeken.

3.1.2.8.5 Amikor a megegyezés egy adott impulzus pozíciónál hiányzik, a kezdeti nyomvonal becslés szabályai ennél a pozíciónál azon az elven alapulnak, hogy "alacsony" megbízhatósági EGY-ek gyanúsak. A szabályok a következők:

a) Ha a legfrissebb (harmadik) válaszban az észlelt kód egy adott impulzus pozícióban "magas" megbízhatóságú vagy ZÉRUS, a kezdeti nyomvonal impulzus kód becslés ennél a pozíciónál ugyanaz, mint az ebben a pozícióban a legfrissebb válaszban észlelt kód.
b) Ha a legfrissebb válaszban az észlelt kód egy adott impulzus pozícióban "alacsony" megbízhatóságú EGY, a kezdeti nyomvonal impulzus kód becslés a pozíciónál ugyanaz, mint az ebben a pozícióban a második válaszban megfigyelt kód, amely nem volt szintén "alacsony" megbízhatóságú EGY. Ha a második szinten egy "alacsony" megbízhatóságú EGY, a kezdeti nyomvonal impulzus kód becslés ugyanaz, mint az a kód, amelyet ebben a pozícióban az első válaszban észleltek.

3.1.2.9 *A/C-MÓDÚ FELDERÍTÉS KITERJESZTÉSE*

3.1.2.9.1 *Általános.* A berendezés csak akkor folytatja egy célra vonatkozó helyzet jelentések bevitelét az összeütközés elkerülési algoritmusba, ha:

a) a nyomvonalat nem azonosították képként (lásd 3.1.2.9.6 pont); és

b) a válasz magasságok egy ±60 m-es (200 láb) magasság ablakon fordulnak elő, amely a válasz előzményeiből előrejelzett magasságon központosul; és

c) az összes válasz, amelyet a veszélyeztető légijármű értékelésére használnak, a kezdeti eljárás után egy távolság ablakban helyezkedik el, amely a válasz előzményeiből előrejelzett távolságon központosul.

3.1.2.9.2 *Távolság korreláció* Az itt következő egy példa a szabályok egy elfogadható együttesére a távolság ablak méreteinek meghatározásához:

a) A nyomvonalakat egyedenként dolgozzák fel növekvő távolság szerinti sorrendben legalább 15 m-es (50 láb) input távolság pontossággal és legalább 1,8 m-es (6 láb) számítási pontossággal. A távolság becslését rekurzív (alfa-béta) célkövetővel végzik, és 0,67-es alfával és 0,25-ös bétával előrejelzik.

b) Mindegyik felderítési felfrissítés után új távolságmérési eredmény áll rendelkezésre mindegyik célra. Mivel a mérés hibákat tartalmaz, ki kell igazítani az előző mérések alapján, hogy az éppen aktuális cél helyzetére és sebességére javított becsléseket nyerjenek. A távolság és távolság változási sebesség becslési egyenletei a következők:

$r(t)$ becslés = $r(t)$ előrejelzés + [alfa x ($r(t)$ mérés - $r(t)$ előrejelzés)]

$\dot{r}(t)$ becslés = $\dot{r}(t - T_p)$ becslés + [(beta /T_p) x ($r(t)$ mérés - $r(t)$ előrejelzés)],

ahol T_p az éppen folyó és az előző mérés közötti időkülönbség.

c) A növekedések, alfa és beta meghatározzák a megbízhatóság viszonylagos fokát az éppen folyó és a megelőző mérésre vonatkozóan; az egység növekedései teljesen megbízhatóak az éppen folyó mérést illetően, és nincs szükség kiigazításra.

d) A fenti egyenletekből nyert becsléseket ezt követően felhasználják a következő mérés időpontjában fennálló távolság előrejelzésére a következőképpen:

$$r(t+T_n) \text{ előrejelzés} = r(t) \text{ becslés} + [\dot{r}(t) \text{ becslés x } T_n],$$

ahol T_n az éppen folyamatban lévő és a következő mérés közötti időkülönbség.

e) A távolság korreláció ablak az előrejelzett távolságnál központosul, és fél-ablak szélessége van a következők szerint:

760 láb, ha érintetlen utolsó időköz 570 láb, ha felfrissített utolsó időköz	+	**ha nyomvonalat nem hoztak létre:** 0 **ha nyomvonalat létrehoztak:** 2000 láb, ha 0,00 NM <= r<0,16 NM 1000 láb, ha 0,17 NM <= r<0,33 NM 600 láb, ha 0,33 NM <= r<1,00 NM 240 láb, ha 1,00 NM <= r<1,50 NM 0 láb, ha 1,50 NM <= r

f) Ha a nyomvonal 3050 m (10000 láb) felett van, a második zárójelben lévő tagokat néggyel meg kell szorozni.

3.1.2.9.3 *Magasság korreláció.* A magasság korreláció céljából a magasságot egy 0,28-as alfájú és 0,06-os bétájú alfa-béta követővel becsülik és előrejelzik. A követő 30 m (100 láb) osztva 16-al pontossággal rendelkezik. A magasság előrejelzést a legközelebbi 30 m-re (100 láb) kikerekítik és a szürke kódjait is kiszámítják. A hosszabb távú magasság előrejelzések, amelyeket veszélyeztető észlelési logikával végeznek, pontosabb magasság követési eljárást igényelnek (lásd 3.5.3 alpont). A távolság korrelációs ablakban fekvő válasz(oka)t növekvő távolsági sorrendben vizsgálják magassági korreláció szempontjából. A nyomvonalat első válasszal felfrissítik, amely pontosan megegyezik (minden bitben) a fentiek szerint számolt három szürke kód bármelyikével. Ha a válasz nem illeszthető, két további szürke kódot számolnak ki, és az eljárást újra megpróbálják. A két kód lesz az előrejelzett magasság ±60 m (200 láb).

3.1.2.9.4 *Nyomvonal felfrissítés – létrehozás.* A felfrissítő válasz (ha van) más nyomvonalak felfrissítésénél a további megfontolásoknál, vagy a nyomvonal kezdési folyamatokban kizárásra kerül. Ha nincs felfrissítő válasz, a távolság és magasság becsléseket egyenlővé teszik a megfelelő előrejelzett értékkel. Ha ez a hatodik egymásután következő időköz, amelynek nincs felfrissítő válasza, a nyomvonalat elvetik. Ha felfrissítő válasz esete áll fenn, és a nyomvonalat nem képként azonosították (lásd 3.1.2.9.6 alpont), a nyomvonal létrehozottnak tekinthető, azaz veszélyeztető észlelés logikai felhasználásra rendelkezésre áll. Ha egyszer létrejött, egy nyomvonal megalapozott marad, amíg el nem vetik, még ha sorozatosan egy képi nyomvonal feltételeit elégíti is ki.

3.1.2.9.5 *Nyomvonal szakadások vizsgálata.* Amikor az összes nyomvonalat feldolgozták, ezeket összekombinálják azokkal a nyomvonalakkal, amelyeket az éppen folyamatban lévő pásztázás során újonnan indítottak, azután az összes nyomvonalat párként vizsgálják annak megállapítására, hogy egy adott nyomvonal-pár nagy valószínűséggel ugyanazt a megközelítőt képviseli-e. Ha:

a) a távolságok legalább 150 m-rel (500 láb) eltérnek
b) a távolság változási sebességek legfeljebb 4,6 m/s-al (8,9 csomó) különböznek, vagy
c) vagy

1) a magasságok legfeljebb 30 m-el (10 láb) különböznek, vagy
2) a magasság változási sebességek legfeljebb 3 m/s-al (10 láb/s) különböznek és mindkét nyomvonal ugyanazon pásztázás során indult,

akkor csak az egyik nyomvonalat tartják meg, és annak a nyomvonalnak van preferenciája, amely a válaszok nagyobb számát mutatja fel az indulás óta.

3.1.2.9.6 *Képi nyomvonal feldolgozás.* Azokat a nyomvonalakat, amelyeket a földről tükörszerűen visszavert válaszok alakíthattak volna ki, képi nyomvonalnak nevezzük. Egy nyomvonalat képinek azonosítunk, ha létezik egy nyomvonal a rövidebb távolságnál (valódi nyomvonalnak nevezik) úgy, hogy:

a) a különbség a valódi magasság és a képi magasság között kisebb vagy egyenlő 60 m (200 láb) magasság-jelentő céloknál, vagy mind a képi nyomvonal, mind a valódi nyomvonal nem-magasság-jelentő; és

b) a különbség a mért képi távolság változási sebesség és az $\dot{r}_i$ számított képi távolság változási sebesség között kisebb vagy egyenlő 21 m/s (40 csomó), ahol a számított képi távolság változási sebesség vagy (egyetlen visszaverődés esetére):

$$\dot{r}_i = \left(\frac{1}{2}\right)\left[\dot{r} + \left(\frac{1}{2r_i - r}\right)\left[\left((2r_i - r)^2 - r^2 + (Z_0 - Z)^2\right)^{\frac{1}{2}}(\dot{Z}_0 + \dot{Z}) + r\dot{r} - (Z_0 - Z)(\dot{Z}_0 - \dot{Z})\right]\right]$$

vagy (kettős-visszaverődés esetére):

$$\dot{r}_i = \left(\frac{1}{r_i}\right)\left[\left(r_i^2 - r^2 + (Z_0 - Z)^2\right)^{\frac{1}{2}}(\dot{Z}_0 + \dot{Z}) + r\dot{r} - (Z_0 - Z)\ (\dot{Z}_0 - \dot{Z})\right]$$

ahol:
r_i a képi távolság,
r a valódi távolság,
Z a valódi magasság magasságjelentés célok esetében, vagy Z a saját magasságra van beállítva nem-magasság jelentés célok esetén, és
Z_0 a saját magasság

Ha egy nyomvonalat képi nyomvonalként azonosítanak, az megtartható, de nem tekinthető létrehozottnak veszélyeztetés észlelési logika általi felhasználáshoz.

3.1.2.10 *A/C-módú jelentések hiánya.* A berendezés az előrejelzett pozíció jelentések továbbítását A/C-módú céloknál az összeütközés elkerülési algoritmushoz az utolsó érvényes korrelációs választ követő hat ellenőrzés felfrissítési intervallumon keresztül folytatja, hacsak a cél újra ki nem elégíti a 3.1.2.8 alpont ellenőrzés indítási kritériumait.

3.1.3 AZ S-MÓDÚ VÁLASZJELADÓVAL FELSZERELT MEGKÖZELÍTŐ LÉGIJÁRMŰVEK ELLENŐRZÉSE

3.1.3.1 Hatékony levegő-levegő ellenőrzési eljárásokat fejlesztettek ki S-módú válaszjeladóval felszerelt megközelítő légijárművekre. Az S-módú szelektív címzés miatt nincs az S-módú válaszjeladók felderítésével kapcsolatos szinkron csonkulás. Azonban a többszörös nyomvonallal foglalkozni kell és az S-módú válaszjeladók felderítését a lehető legkevesebb lekérdezéssel kell végezni a zavarás minimalizálás érdekében.

3.1.3.2 Az S-módú modulációs formátumok jellegüknél fogva inkább többszörös nyomvonal állóak, mint az A/C-módú modulációs formátumok. Azonban az S-módú átvitelek nagyobb hossza valószínűbbé teszi a többszörös nyomvonal általi átlapolást. A felső szerelésű antennák és változó vevő küszöbök használata (az S-módú válasz bevezetés védelmére) elfogadható szintre növeli a többszörös nyomvonal állóságot megbízható levegő-levegő ellenőrzéshez. Széttelepített antennájú válaszjeladók használata ACAS légijárműveken további megbízhatósági tartalékot szolgáltat a konfliktusban lévő ACAS légijármű párok közötti koordinációhoz.

3.1.3.3 Az S-módú lekérdezés gyakoriságokat alacsony szinten tartják a válaszjeladó átvitelek passzív észlelésével és azáltal, hogy csak azokat a megközelítő légijárműveket kérdezik le másodpercenként egyszer, amelyek rövid időn belül veszélyeztetőkké válhatnak. Azokat a megközelítő légijárműveket, amelyek nem valószínű, hogy rövid időn belül veszélyeztetőkké válnak, kisebb gyakorisággal (azaz minden 5 másodpercben egyszer) kell lekérdezni. A passzív címzésre vonatkozó adatbeszerzés megakadályozza az SSR és ACAS rendszer többi elemével való szükségtelen interferenciát. Az ACAS lehallgatja az S-módú all-call válaszokat (DF=11, beszerzéses squitter adások, 3. fejezet, 3.1.2.8.5.1 pont, vagy DF=17, kiterjesztett squitter átvitelek, 3. fejezet, 3.1.2.8.6.1 pont). Ezek az S-módú földi állomások all-call lekérdezéseire adott válaszban vagy spontán adattovábbításokban (ezeket nevezzük squitter-nek) jelennek meg, 0,8-1,2 másodperces időközökben. A squitterek vétele váltakozhat a felső és alsó antenna között. Ha vételt kapcsolnak, a kapcsolási idők szabályozása szükséges, a széttelepített antennával rendelkező S-módú válaszjeladók által továbbított squiterekkel való nemkívánatos egyidejűség elkerülése érdekében.

3.1.3.4 A 24-bites légijármű címzést a squitterben hiba kódolás védi, hogy a helyes címzés kinyerését nagy valószínűségét biztosítsák. Mivel a squitter továbbítás nem tartalmaz magassági információt, az ACAS a magasság beszerzését passzív módon, az S-módú válaszokból próbálja megoldani, amely válaszokat a földi lekérdezésekre, vagy más ACAS légijárművektől eredő lekérdezésekre generálták. Ha a magasságot nem veszik röviddel a címzés észlelése után, az S-módú légijárművet aktívan lekérdezik a magasság megszerzése céljából.

3.1.3.5 Miután az ACAS meghatározta egy észlelt S-módú légijármű magasságát, ennek a légijárműnek a magasságát összehasonlítja a saját magasságával. A magasság összehasonlításnak az a célja, hogy meg lehessen határozni a cél elhanyagolhatóságát, vagy azt, hogy a célt le kell-e kérdezni a cél távolságának és sebességének meghatározása érdekében. Ha a mért távolság és a létrehozott sebesség azt jelzi, hogy összeütközés veszélyeztetése áll fenn (vagy hamarosan bekövetkezhet), a megközelítő légijárművet másodpercenként egyszer le kell kérdezni, és az eredményezett nyomvonal adatokat be kell táplálni az összeütközés elkerülését biztosító algoritmusokba. Egy nagyobb távolságban lévő légijárművet csak olyan gyakran kell lekérdezni, amely a nyomvonal fenntartásához szükséges, és biztosítja, hogy másodpercenként egyszer a légijárművet lekérdezzék, mielőtt összeütközés veszélyeztetővé válna.

3.1.3.6 Passzív észlelés használata magasság összehasonlítással kombinálva és a nem-veszélyeztető megközelítő légijármű kevésbé gyakori lekérdezése automatikusan csökkenti az S-módú lekérdezési sebességet, amikor a többi ACAS légijármű helyi sűrűsége nagyon nagy. Ezért egy magasabb lekérdezési teljesítmény szint áll rendelkezésre az ellenőrzési teljesítmény növelésére.

3.1.3.7 AZ *S-MÓDÚ FELDERÍTÉS KEZDEMÉNYEZÉSE*

3.1.3.7.1 A berendezést S-módú felderítés minimális S-módú lekérdezéssel való megvalósítására tervezték. Az S-módú célok identitását a DF=11 vagy DF=17 értékekkel vett passzív figyelési adatátvitelekkel határozzák meg. A vett squitterekhez hiba észlelést és helyesbítést alkalmaznak, hogy csökkentsék a feldolgozandó címzések számát. Az S-módú célok magassága, amelyektől squittert kaptak, a DF = 0-val (rövid levegő-levegő ellenőrző válaszok, 3. fejezet, 3.1.2.8.2 alpont) vagy DF = 4-el (ellenőrző magasság válaszok, 3. fejezet 3.1.2.6.5 alpont) vett figyelő adásokkal határozzák meg. A berendezés figyeli a squittert és a magasság válaszokat, amikor ez nem továbbít vagy vesz S-módú vagy C-módú lekérdezésekre küldött válaszokat. Minden vett választ megvizsgálnak, a további elvégzendő műveletek szempontjából.

3.1.3.7.2 Hogy csökkentsék a szükségtelen lekérdezések számát, egy squitter célt nem kérdeznek le, ha olyan kevés squittert és magasság választ kaptak tőle, hogy ez nem jelez veszélyeztető légijárművet. A célokat, amelyek veszélyeztetők lehetnek, érvényes céloknak nevezik. A berendezés úgy van kialakítva, hogy egy célt nem kérdez le, csak ha a magasság információ azt jelzi, hogy a cél a saját magassághoz képest 3050 m-en (10000 láb) belül van. Az ACAS légijármű lekérdezi azokat a célokat, amelyektől nem kap magasság információt, de folyamatosan kap hibamentes squittereket. Azokat a célokat, amelyek magassága túl van a saját 3050 m-es (10000 láb) magasságon, önkéntes DF = 0 vagy DF = 4 válaszok felhasználásával figyelik, vagy ilyen válaszok hiányában periodikusan lekérdezik egy DF = 0 válasz kiváltásával, hogy megvalósítsák azoknak a céloknak az időben történő megszerzését, amelyek áthaladnak a 3050 m-es (10000 láb) relatív magassági határon,

3.1.3.7.3 A következőkben leírtak példát szolgáltatnak squitterek és magasság válaszok feldolgozásának egyik elfogadható módjára a szükségtelen lekérdezések csökkentéséhez.

a) Amikor egy érvényes squittert először vesznek, egy 0-ról indított futó összeg kapcsolódik hozzá. Mindegyik egymást követő ellenőrzési felfrissítési időköz alatt az összeg 1-el csökken, ha squitterek vagy magasság válaszok egy adott címzéssel nem érkeznek és az összeg 16-al emelkedik egy squitter vagy magasság válasz vételénél. A folyamat addig folytatódik, amíg az összeg egyenlő vagy nagyobb nem lesz 20-nál. Amikor az összeg kisebb vagy egyenlő lesz -20-al, a címet kivonják a rendszerből. Amikor ez egyenlő 20-al vagy nagyobb, mint 20, a célt érvényesnek nyilvánítják.

b) Amikor a célt érvényesnek nyilvánították, akkor lekérdezik, hacsak a magassága az ACAS magasságtól nem különbözik több mint 3050 m-el (10000 láb). Egyéb esetben a magasságát DF = 0 vagy DF= 4 válaszokkal figyelik, vagy ilyen válaszok hiányában minden 10 másodpercben egy lekérdezéssel DF = 0 válasz kiváltásával.

c) Amikor e feltételek közül valamelyik teljesül, a futó összeg folytatja emelkedését vagy csökkenését, még akkor is, ha értéke meghaladja 20-at.

3.1.3.8 *S-MÓDÚ TÁVOLSÁGI ADAT BESZERZÉSE*

3.1.3.8.1 A berendezésnek adatbeszerzési lekérdezést kell továbbítania (UF = 0, AQ = 1, 3. fejezet, 3.1.2.8.1.1 alpont), hogy meghatározzák az egyes érvényes célok viszonylagos távolságát, amelyek a fent előírt magassággal rendelkeznek, vagy amelyektől nem-megfelelő magasság információt kaptak.

3.1.3.8.2 Ha egy adatbeszerzési lekérdezésre nem sikerül érvényes választ kapni, további lekérdezéseket kell továbbítani. Egy célnak címzett adatbeszerzési lekérdezések teljes száma egy ellenőrzési felfrissítési perióduson belül, nem haladhatja meg a hármat. Az első adatbeszerzési lekérdezést a felső antenna használatával kell továbbítani. Ha két adatbeszerzési lekérdezésnek egy céltól nem sikerül érvényes választ kiváltani, a következő két adatbeszerzési lekérdezést ehhez a célhoz az alsó antenna használatával kell továbbítani. Ha az adatbeszerzési kísérletnél az első felderítés felfrissítés periódusban érvényes válaszok nem érkeznek, az ACAS kilenc adatbeszerzési lekérdezést továbbít, elosztva az első hat egymást követő felderítés felfrissítési periódus között. Ha az adatbeszerzési lekérdezéseknek nem sikerül választ kiváltani hat ellenőrzés felfrissítési perióduson belül, az adatbeszerzési folyamatot meg kell szakítani, amíg elegendő kiegészítő squittert nem sikerül venni, ami jelzi, hogy sikeres adatbeszerzés valószínű. Egyik eszköz ennek megvalósítására egymás utáni squitterek feldolgozása, ahogyan az a 3.1.3.7 pontban ismertetésre került, de a 16-os növekmény 8-cal helyettesítendő. Ha az adatbeszerzés második sikertelensége fordul elő, a feldolgozást egy 4-es növekménnyel megismétlik. Bármely ezután bekövetkezett egymást követő sikertelenség esetén 2-es növekményt használnak.

3.1.3.8.3 Ha további kísérletek történnek a cél adatainak beszerzésére, ezek megegyeznek a fent leírt sémával, kivéve:

a) A második és harmadik kísérletben csak egy kísérletet kell tenni egyetlen ellenőrzési felfrissítési időtartományban; és érvényes válasz hiányában hat lekérdezést kell továbbítani az első hat ellenőrzési felfrissítési időköz során.
b) Bármely további kísérlet a teljes hat felfrissítési időköz során egyetlen lekérdezésből áll.

3.1.3.8.4 Amikor érvényes adatbeszerzési választ vesznek, a VS mezőt a válaszban megvizsgálják, hogy megállapítsák a cél függőleges állapotát. Ha egy céltárgyat a földön meghatároztak, függőleges állapotát periodikusan figyelik olyan gyakoriságú lekérdezésekkel, amely az idejében történő adatbeszerzéshez szükséges, amikor az a levegőben van. Amikor érvényes adatbeszerzési választ vesznek egy levegőben lévő céltól, egy vagy több lekérdezést kell továbbítani a célhoz két felderítési felfrissítési intervallumon belül, hogy megerősítést nyerjen a magassági adat és a magasság kvantálás bit. Ha két választ kaptak egy levegőben lévő céltól, melyiknek magassági értékei egymástól 150 m-en (500 láb) belülre esnek és 3050 m-en (10000 láb) belüli saját magassággal rendelkezik, és azonos kvantálási bit értékük van, periodikus felderítési lekérdezéseket ("követő" lekérdezésnek nevezik) kell indítani ennél a céltárgynál.

3.1.3.8.5 A cél távolságát a becsült távolság változási sebességével használják a potenciális veszélyeztető légijármű meghatározásához az ACAS-felé. Ha a cél nem egy azonnali veszélyeztető légijármű, akkor kisebb gyakorisággal kérdezhető le, mintha potenciális veszélyeztető lenne, amelynek részére igen nagy valószínűséggel tanácsadást adnának ki. Mindegyik 1-másodperces felderítés felfrissítési időtartományban a cél potenciális veszélyeztetési szintjét (*TAU)* a következőképpen számolják ki.

$$TAU = -- (r - \mathrm{SMOD2}/r)/\acute{r}$$

ahol *r* a követett távolság, *ŕ* a becsült viszonylagos távolságváltozási sebesség és SMOD egy felderítés távolság modifikátor, amely 5,6 km-el (3 NM) egyezik meg. Ha a becsült távolsági sebesség vagy -6 csomónál kisebb negatív érték, vagy pozitív (vagy egy lassú összetartás, vagy a légijárművek egymástól széttartanak), a *TAU* számításához használt érték -6 csomó. Egy 5,6 km-es *SMOD* érték biztosítja, hogy az ACAS mindig a névleges 1-másodperces lekérdezési ciklust használja olyan szituációkban, ahol a *TAU* értéke gyorsan változhat úgy, mint párhuzamos megközelítésben. Egy 60 másodperces vagy ennél kisebb *TAU* értékkel rendelkező célt másodpercenként 1 névleges gyakorisággal kérdeznek le. Egy 60 másodperces *TAU* értékkel rendelkező célt 5 másodpercenként egyszeres gyakorisággal kérdeznek le, ha a cél és a saját légijármű magassága egyaránt kisebb, mint 5490 m (18000 láb), és legalább öt-másodpercenként egyszer, ha a cél vagy a saját légijármű magassága nagyobb, mint 5490 m (18000 láb).

3.1.3.9 *S-MÓDÚ ELLENŐRZÉS KITERJESZTÉS*

3.1.3.9.1 A berendezés csak akkor továbbít helyzet jelentéseket egy S-módú cél részére az ütközés elkerülési algoritmusokhoz, ha a kezdeti távolságra vonatkozó adatbeszerzés után a veszélyeztető értékelésére használt összes válasz egy, a megelőző válaszokból előrejelzett távolság és magasság középpontú távolság- és magasság-ablakon belül jelenik meg, a magasság kvantálási bit illeszkedik az előző értékhez, és a VS mező a rövid különleges ellenőrzési válaszban jelzi, hogy a cél az előző három felfrissítési ciklus során legalább egyszer a levegőben volt. A távolság- és magasság-ablak ugyanaz, mint a 3.1.2.9.2 pontban leírt, az A/C-módú követésre használt távolság-ablak.

3.1.3.9.2 Ha egy követési lekérdezés nem vált ki érvényes választ, további lekérdezéseket továbbítanak Egyetlen célnak címzett követő lekérdezések teljes száma várhatóan nem haladja meg az ötöt egyetlen felderítési felfrissítési periódus során, vagy tizenhatot hat egymást követő felfrissítési periódus felett elosztva. Az első követő lekérdezést annak az antennának a felhasználásával továbbítják, amelyet ennek a célnak az utolsó sikeres lekérdezésénél használtak. Ha két egymás utáni követési lekérdezés nem vált ki egy céltól érvényes válaszokat, a következő két lekérdezést ehhez a célhoz a másik antenna felhasználásával kell továbbítani.

3.1.3.10 *S-módú válaszok elmaradása.* A berendezés folytatja az előrejelzett helyzet jelentések továbbítását az összeütközés elkerülési algoritmusokhoz az S-módú célok részére hat ellenőrzési felfrissítési időközön keresztül, amelyek egy követő lekérdezésre adott utolsó érvényes válasz vételét követik, ha a célt minden másodpercben egyszer kérdezik le, vagy tizenegy 1-másodperces felderítés felfrissítési időköz alatt, amelyek egy követő lekérdezésre adott utolsó érvényes válasz vételét követik, ha a célt minden öt másodpercben egyszer kérdezik le. A berendezés nem továbbít helyzet jelentést S-módú céloknál hatnál több felderítés felfrissítés időköz alatt, amelyek egy követő lekérdezésre adott utolsó választ követik, amely lekérdezés sebessége másodpercenként egy, vagy több mint tizenegy 1-másodperces felderítés felfrissítési időköz alatt, amelyek egy követő lekérdezésre adott utolsó érvényes válasz vételét követik, amely lekérdezés sebessége minden öt másodpercben egy, hacsak a cél újra ki nem elégíti a 3.1.3.7 pont távolsági adatok beszerzési kritériumait. Egy elvetett nyomvonal S-módú címzését négy további másodpercig fenntartják az ismételt adatbeszerzési folyamat lerövidítése érdekében, ha squitterek vétele történik.

3.1.3.11 *S-mód túlterhelés.* A berendezés pozíció jelentéseket továbbít az összes S-módú cél részére, tekintet nélkül a célok távolság szerinti eloszlására, feltéve, hogy a teljes csúcs célszám nem haladja meg a 30-at.

3.1.3.12 *S-módú teljesítmény programozás.* A célok részére közvetített S-módú követő lekérdezés átviteli teljesítmény szintjét (kivéve a levegő-levegő koordinációs lekérdezéseket), automatikusan csökkenteni kell a 18,5 km-en (10 NM) belül lévő célok távolságának függvényében az alábbiak szerint.

$$P_T = P_{\max} + 20 \log \frac{r}{10}$$

ahol P_T a beállított teljesítmény szint, P_{max} a névleges teljesítmény szint (tipikusan 250 W), amelyet 18,5 km (10 NM) vagy nagyobb távolságban lévő célok részére továbbítanak, és r a cél előrejelzett távolsága. A ténylegesen továbbított teljesítmény a P_T és a 4. fejezet 4.3.2.2.2.2 alpont szerinti interferencia korlátozó egyenlőtlenségek által megszabott korlát közül a kisebbik.

3.1.3.13 *S-módú nyomvonal kapacitás.* Amikor a légijármű sűrűség névlegesen 0,087 S-módú légijármű per km^2 (0,3 légijármű per NM^2) az ACAS légijármű környezetében, akkor az ACAS légijárműtől 9,3 km (5 NM) távolságon belül körülbelül 24 légijármű, 56 km (30 NM) távolságon belül pedig körülbelül 142 légijármű van. Így az ACAS berendezésnek várhatóan legalább 150 S-módú címzés kapacitással kell rendelkeznie.

3.1.3.14 *IRÁNYSZÖGBECSLÉSEK HASZNÁLATA S-MÓDÚ FELDERÍTÉSNÉL*

3.1.3.14.1 Nagysűrűségű S-módú ellenőrzésnél az irányszög becslés képességet nem követelik meg. Azonban ha irányszög becslések rendelkezésre állnak, látható, hogy irányításos S-módú leképezések használata jelentősen csökkenti a berendezés megkívánt teljesítményét. Az irányításos S-módú lekérdezések irányszög információk hiányában is használhatók, feltéve, hogy az interferencia limiteket nem lépik túl.

3.1.3.14.2 Irányszög becslések a saját sebesség ismeretével összekapcsolva ugyancsak használhatók az általános S-módú leképezési sebesség csökkentésekre. A következőkben az ilyen csökkentésnek egyik lehetséges módját írjuk le.

3.1.3.14.3 Az "idő-a-veszélyeztetésig" számítás helyett, amely azon a konzervatív feltételezésen alapul, hogy két légijármű frontális összeütközési nyomvonalon halad, az "idő-a-veszélyeztetésig" növelhető a veszélyeztető légijármű irányszöge és a saját légijármű korlátozott fordulási sebessége figyelembevételével, és annak az időnek a megengedésével, amely a saját légijárműnek a veszélyeztető légijármű irányába fordulásához szükséges. Egy ilyen számításnál továbbra is fel kell tenni, hogy a cél légijármű a jelentett maximális képességének megfelelő sebességgel repül közvetlenül az összeütközési pont felé.

3.2 Adóállomás

3.2.1 TELJESÍTMÉNY SZINTEK

3.2.1.1 Interferenciamentes esetben és amikor olyan antennát használnak, amelynek sémája azonos a negyedhullámú aszimmetrikus dipóluséval a föld síkja felett, akkor 54 dBm (250 W) névleges effektív sugárzási teljesítmény használatával a válaszjeladók megbízható levegő-levegő felderítését lehet biztosítani 26 km (14 NM) távolságoknál.

3.2.1.2 Az adóállomás kimenő teljesítményt gondosan korlátozni kell az adattovábbítások között, mivel bármilyen átvezetés komolyan befolyásolja az ACAS légijármű fedélzetén lévő S-módú válaszjeladó teljesítményét. Az átvezetési teljesítmény a válaszjeladóhoz 1030 mHz-nél általában -90 dBm szint alatt kell hogy maradjon. Ha a válaszjeladó antenna és az ACAS antenna közötti fizikai elválasztódás nem kevesebb, mint 50 cm, a két antenna közötti csatolási vesztesége meghaladja a 20 dB-t. Így ha az RF teljesítmény 1030 MHz-nél az ACAS antenna csatlakozó pontjánál nem haladja meg a -70 dBm-et az inaktív állapotban, és ha egy 50 cm-es minimális antenna távköz tartozik hozzá, az ACAS antennától származó válaszjeladó antenna zavarás nem haladja meg a -90 dBm-et. Ez a követelmény hivatott biztosítani, hogy – amikor nem továbbít lekérdezést – az ACAS nem sugároz RF energiát, amely az SSR válaszjeladót vagy más rádió berendezést zavarhatná, vagy érzékenységét csökkentené a légijármű vagy földi létesítmény közelében.

3.2.1.3 Intézkedéseket kell tenni annak biztosítására, hogy a közvetlen 1030 MHz-es átvezetés az ACAS borítástól a válaszjeladó borításhoz kisebb legyen, mint -110 dBm, amikor a két egység egymás mellé van szerelve egy légijárműre történő tipikus szerelésnél.

3.2.1.4 Várható, hogy az ACAS berendezés az ekvivalens osztályozású S-módú válaszjeladókkal egymás mellett kerül vizsgálatra annak biztosítására, hogy mindegyik egység kielégítse a saját érzékenységi követelményeit a másiktól jövő adattovábbítási átvezetés megléte esetén.

3.2.2 SZINKRON INTERFERENCIA SUTTOGÁS-KIABÁLÁS ÁLTALI SZABÁLYOZÁSA

3.2.2.1 Az A/C-módú szinkron interferencia szabályozása, és nagyobb forgalomsűrűségű légtérben történő ACAS üzemelés megkönnyítése érdekében egy lekérdezés sorozatot lehet különböző energiaszinteken továbbítani minden egyes felderítés felfrissítési periódus alatt. A sorozatban lévő minden egyes lekérdezést az egy, legkisebb teljesítményű kivételével, egy elnyomási impulzus előz meg (S_1 -el jelölve) 2 mikromásodperccel megelőzve a P_1 impulzust. Az S_1 és P_1 kombinációja elnyomás átvitelként szolgál. S_1 -et a P_1-énél alacsonyabb teljesítményszinten viszik át. Az egymás utáni lekérdezések közötti minimális időnek 1 ezredmásodpercnek kell lenni. A sorozatban lévő összes lekérdezést egyetlen felderítés felfrissítési időtartamon belül kell továbbítani.

3.2.2.2 Mivel az elnyomási átvitel mindegyik lépésben mindig alacsonyabb teljesítményszinten van, mint a következő lekérdezés, ezt az eljárást suttogás-kiabálásnak nevezik. A szándékolt mechanizmus az, hogy az egyes légijárművek egy sorozatban csak egy vagy két lekérdezésre válaszolnak. Az A/C-módú válaszjeladók bármely adott távolságon nagy effektív érzékenységi terjedelemmel rendelkezhetnek a vevők változása, a kábel-veszteségek és antenna árnyékolása miatt. Ideálisan minden egyes válaszjeladó a populációban két lekérdezésre válaszol a sorozatban és a sorozatban lévő magasabb teljesítményű lekérdezéseket kísérő nagyobb teljesítményű elnyomási átvitelek kikapcsolják ezeket. Egy adott szituációnál, amelyben több légijármű elég közel van egymáshoz, hogy válaszoljanak a szinkron zavarásra, nagyon valószínűtlen, hogy mindnyájan ugyanarra a lekérdezésre válaszoljanak és ennek eredményeként a szinkron zavarás erőssége csökken. A suttogás-kiabálás használata szintén csökkenti a leképezési kapcsolatban lévő többszörös út hatások erősségét.

3.2.2.3 Az A-2a ábra egy suttogás-kiabálás sorozatot határoz meg, amely illeszkedik a nagysűrűségű A/C-módú ellenőrzési követelményekhez, az A-2b ábra pedig olyan suttogás-kiabálás sorozatot jelöl, amely a kissűrűségű A/C-módú felderítési követelményekhez illeszkedik. Öt különböző sorozat lett meghatározva: a felsőszerelésű antenna négy sugarának mindegyikéhez egy, és egy az alsó szerelésű körsugárzó antennához. A lekérdezések bármilyen sorrendben továbbíthatók. Amikor az A-2a ábra nagysűrűségű sorozatát a zavarás lecsonkítása érdekében korlátozzák, a lépéseket a Zavarás korlátozás prioritás oszlopában bemutatott sorrendben ejtik el. Amikor az A-2b ábra kissűrűségű sorozatát teljesítményben csökkentik, a zavarás limitálása érdekében, mindegyik lekérdezés és a vonatkozó MTL értéke, ahogy az utolsó oszlopban látszik, 1 dB-el csökken abban a sorrendben, ahogyan a Zavarás korlátozás prioritás oszlopában fel van tüntetve. A legkisebb számozású lépéseket vetik el elsőként. Az Egyedi impulzusok vagy lépcsők időzítését a sorozatban az A-3 ábra mutatja, amely a legalsó három legkisebb teljesítmény lépcsőt illusztrálja a belső előre irányuló antenna sorozatban. A lekérdezés első impulzusa az elnyomás második impulzusaként szolgál.

3.2.2.4 Az A-2a és az A-2b ábrán tabellázott minimális beindítási szint (MTL) értékek azon a feltételezésen alapulnak, hogy az összes lekérdezésre adott választ körsugárzásosan veszik. Ha irány-vevő antennát használnak, az MTL értékkel be kell állítani, hogy az antenna nyereséget figyelembe vegyék. Például egy hálózat antenna 3 dB-es nyereségéhez a táblázatban lévő összes MTL értéket 3 dB-el növelik, és a MTL az 1.sz. lépésnél inkább -71 dBm, mint -74 dBm.

LÉPÉSSZÁM	FELSŐ ANTENNA ELŐRE IRÁNY	MINIMÁLIS EFFEKTÍV SUGÁRZOTT TELJESÍTMÉNY (dBm)	INTERFERENCIA KORLÁTOZÁSI PRIORITÁS	MTL (-dBm)
1	S..I	52	1	74
2	S.I	51	5	74
3	S..I	50	9	74
4	S.I	49	13	74
5	S..I	48	17	74
6	S.I	47	21	74
7	S..I	46	25	74
8	S.I	45	29	73
9	S..I	44	33	72
10	S.I	43	37	71
11	S..I	42	41	70
12	S.I	41	45	69
13	S..I	40	49	68
14	S.I	39	53	67
15	S..I	38	57	66
16	S.I	37	61	65
17	S..I	36	64	64
18	S.I	35	67	63
19	S..I	34	70	62
20	S.I	33	73	61
21	S..I	32	76	60
22	S.I	31	77	59
23	S..I	30	78	58
24	...I	29	79	57

27 37 47 57

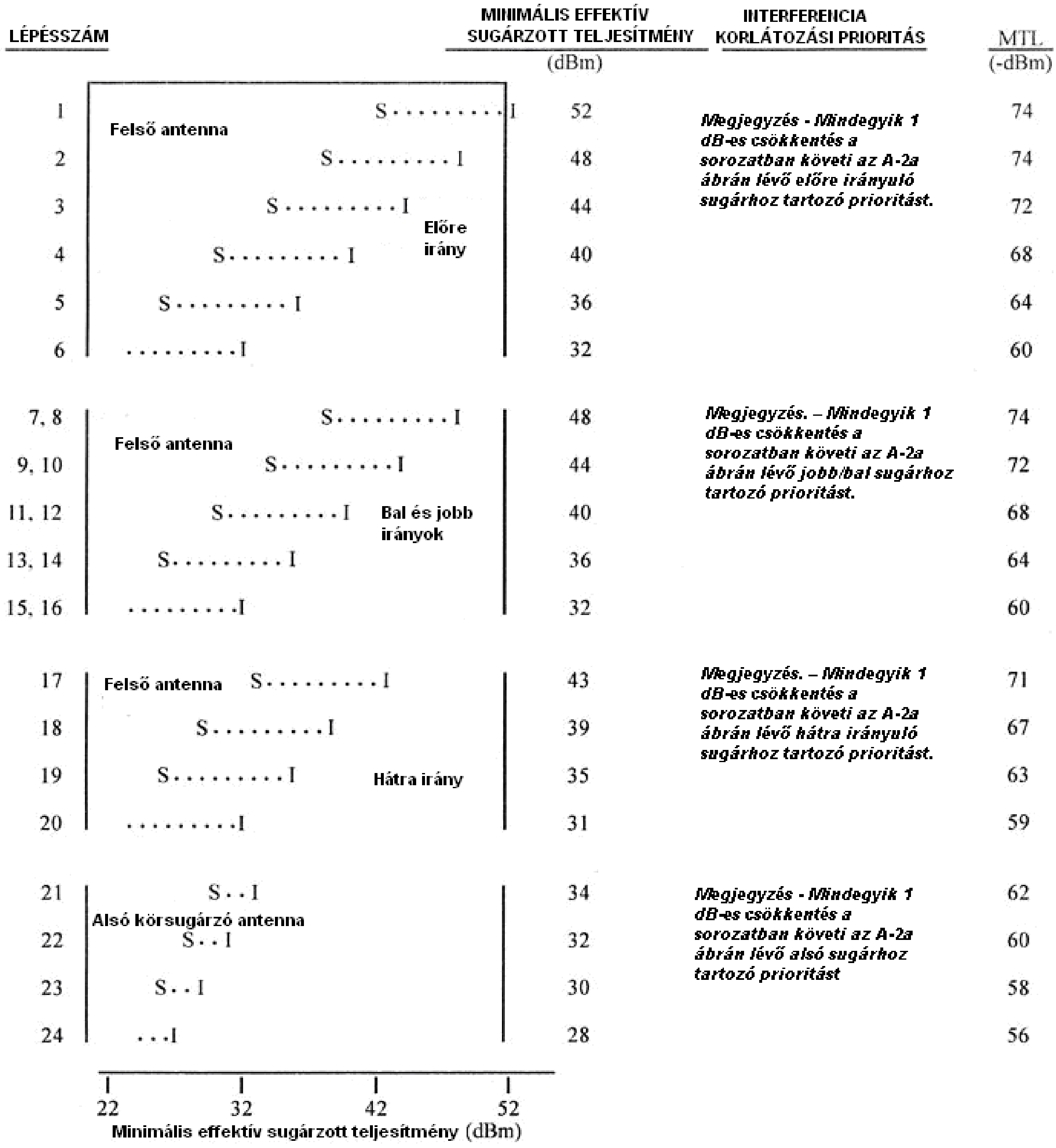
Effektív sugárzott teljesítmény (dBm)

MEGJEGYZÉSEK.
"I" jelöli a P1, P3 és P4 lekérdezési impulzusok effektív sugárzott teljesítményét.
"S" jelöli az SI elnyomó impulzus effektív sugárzott teljesítményét.
"S.I" azt jelenti, hogy az SI effektív sugárzott teljesítmény 2dB-el kisebb, mint a lekérdezés SI effektív sugárzott teljesítmény.
"S..I" azt jelenti, hogy az SI effektív sugárzott teljesítmény 3dB-el kisebb, mint a lekérdezés SI effektív sugárzott teljesítmény.
A 24., 63., 64., 79. és 83. lépésekben SI impulzusokat nem továbbítanak.

LÉPÉSSZÁM		MINIMÁLIS EFFEKTÍV SUGÁRZOTT TELJESÍTMÉNY (dBm)	INTERFERENCIA KORLÁTOZÁSI PRIORITÁS	MTL (-dBm)
	FELSŐ ANTENNA BAL ÉS JOBB IRÁNYOK			
25, 26	S..I	48	2, 3	74
27, 28	S.I	47	6, 7	74
29, 30	S..I	46	10, 11	74
31, 32	S.I	45	14, 15	73
33, 34	S..I	44	18, 19	72
35, 36	S.I	43	22, 23	71
37, 38	S..I	42	26, 27	70
39, 40	S.I	41	30, 31	69
41, 42	S..I	40	34, 35	68
43, 44	S.I	39	38, 39	67
45, 46	S..I	38	42, 43	66
47, 48	S.I	37	46, 47	65
49, 50	S..I	36	50, 51	64
51, 52	S.I	35	54, 55	63
53, 54	S..I	34	58, 59	62
55, 56	S.I	33	62, 63	61
57, 58	S..I	32	65, 66	60
59, 60	S.I	31	68, 69	59
61, 62	S..I	30	71, 72	58
63, 64	I	29	74, 75	57
	FELSŐ ANTENNA HÁTRA IRÁNY			
65	S.I	43	4	71
66	S..I	42	8	70
67	S.I	41	12	69
68	S..I	40	16	68
69	S.I	39	20	67
70	S..I	38	24	66
71	S.I	37	28	65
72	S..I	36	32	64
73	S.I	35	36	63
74	S..I	34	40	62
75	S.I	33	44	61
76	S..I	32	48	60
77	S.I	31	52	59
78	S..I	30	56	58
79	I	29	60	57
	ALSÓ KÖRSUGÁRZÓ ANTENNA			
80	S..I	34	80	62
81	S..I	32	81	60
82	S..I	30	82	58
83	..I	28	83	56

27 37 47 57
EFFEKTÍV SUGÁRZOTT TELJESÍTMÉNY (dBm)

A-2a ábra. Példa nagysűrűségű suttogás-kiabálás sorozatra



A-2b ábra. Példa kissűrűségű suttogás-kiabálás sorozatra

3.2.2.5 A teljesítményt, effektív sugárzott teljesítményként határozzák meg a lekérdezéshez. Minden teljesítményszintnek a névleges ±2 dB-en belül kell lennie. A lépésnövekmény tűrésének ±1/2 dB-nek kell lennie, a növekményeknek monotonnak kell lenniük a sorozat teljes teljesítmény tartományában.

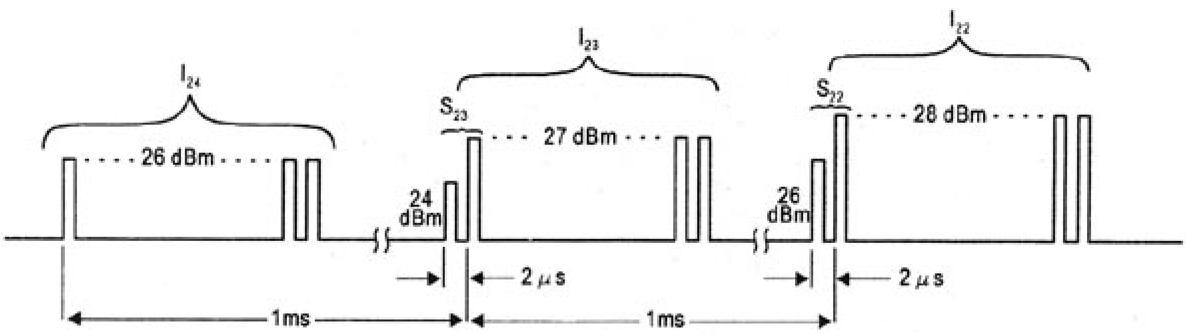
3.2.2.6 A legtöbb lekérdezést a felső antennától továbbítják, mivel ez kevésbé érzékeny a földről jövő többutas interferenciára.

3.2.2.7 A megfelelő suttogás-kiabálás sorozat kiválasztása egy adott antennasugárhoz mindegyik lekérdezés ciklusnál az ebben a sugárban jelenlévő A/C-módú szinkron csonkítás éppen aktuális vagy előrelátható szintjén alapul, ahogyan az ACAS felderítés meghatározza. A nagysűrűségű suttogás-kiabálás sorozatot akkor választják ki egy antenna sugárhoz, amikor szinkron csonkítás van jelen ebben a sugárban, ahogyan ez evidens a legalább egy kis megbízhatóságú magasság kód bit létezéséből két egymás utáni S-módú válaszban. A 6-szintű suttogás-kiabálás sorozatot egy antennasugárhoz akkor választanak ki, ha vagy:

a) egy egyedülálló A/C-módú légijármű van ennek a sugárnak a felderítési távolságán belül és szinkron csonkítás nincs jelen; vagy
b) szinkron csonkítás nincs jelen, A/C-módú célok nincsenek egymás csonkítási távolságán belül, és az A/C-módú légijármű sűrűség a megbízható felderítési távolságon belül egyenlő vagy kisebb, mint 0,23 légijármű/km (0,43 légijármű/NM). Amikor forgalmi tanácsadás generálódik egy adott antenna sugáron belüli veszélyeztető légijárműre, a magasszintű sorozatot használják ehhez a sugárhoz a tanácsadás ideje alatt. Amikor megoldási tanácsadás generálódik, a magasszintű sorozatot használják az összes antennasugárhoz a tanácsadás ideje alatt.

3.2.2.8 Ha sem létrehozott A/C-módú felderítési nyomvonal, sem semmilyen jelölt nyomvonal, amely három korreláló C-módú adatbeszerzési választ tartalmaz, nincsen egy antennasugár felderítési távolságán belül, az ACAS egyedüli C-módú lekérdezést továbbít ebben a sugárban. Az egyedüli lekérdezés szintje és a hozzá kapcsolódó MTL mindegyik sugárnál megegyezik a hozzá tartozó alacsonyszintű suttogás-kiabálás sorozat legmagasabb rendelkezésre álló teljesítmény szintjével, ahogyan azt a zavarás limitálás meghatározza. Egyedüli C-módú lekérdezések érzékenyek a több út miatti fedélzetre irányuló kapcsolati mód váltásra és egy A-módú és C-módú válasz keverékét eredményezi egy megközelítő légijárműtől, amely válaszok 13 mikromásodpercre vannak elválasztva. Az ACAS ennélfogva az alacsonyszintű suttogás-kiabálás sorozatot választja ki egy sugárhoz megbízható felderítési adatbeszerzéshez és követéshez valahányszor:

a) az egyedüli lekérdezés ebben a sugárban egy A/C-módú választ eredményez, amely egy 1525 m-es (5000 láb) távolság ablakon belül jelenik meg, amely ablak középpontja vagy az előző felderítés felfrissítés időközében vett A/C-módú válasz mért távolságnál, vagy az előző válasz távolságtól ±13 mikromásodperccel való távolság-eltérésnél van; vagy
b) egy létrehozott C-módú nyomvonal vagy egy C-módú nyomvonal, amely az ebbe a sugárba a másik sugárból átmenő adatbeszerzési átmenetek folyamatában van. Az ACAS visszakapcsol az egyedi lekérdezéshez tíz felderítési felfrissítés időköz után, amelyekben két egymásra ható adatbeszerzési választ nem vettek.



A-3 ábra. A legalacsonyabb teljesítmény lépcsők időábrája körsugárzó suttogás-kiabálás sorozatban

3.2.3 INTERFERENCIA KORLÁTOZÁS

3.2.3.1 Az ACAS berendezés összhangban van három különleges egyenlőtlenségből álló egyenlőtlenség-rendszerrel (4. fejezet, 4.3.2.2.2.2 alpont) az interferencia hatások szabályozása érdekében. A három egyenlőtlenség a következő fizikai mechanizmushoz kapcsolódik: (1) az ACAS lekérdezések által kiváltott más válaszjeladók működési idejének csökkentése, (2) a lekérdezések átvitele alatt kölcsönös elnyomás által létrehozott, saját válaszjeladó működés idejének csökkentése, és (3) ACAS A/C-módú lekérdezések által kiváltott A/C-módú termék. Az n_a 1-re állítása az (1) és (3) egyenlőtlenségben az 5490 m (18000 láb) nyomásmagasság felett üzemelő ACAS-nál megóvja az egyedüli ACAS-t korlátlan teljesítmény továbbításától egy felső korlát biztosításával az ACAS egy másodperces lekérdezés teljesítmény/sebesség szorzatára.

3.2.3.2 Az (1) egyenlőtlenség biztosítja, hogy egy "áldozat" válaszjeladó soha nem észlel 280-nál több olyan ACAS lekérdezést egy egymásodperces időszakon belül, amelyek az összes 56 km-en (30 NM) belül lévő ACAS lekérdezőtől származnak, bármely ACAS eloszlásnál, amely körülveszi az "áldozat" válaszjeladót a távolság szerint egyenletestől a terület szerint egyenletesig terjedő korlátokon belül. Az egyenlőtlenség baloldala lehetővé teszi az ACAS egység számára a lekérdezés gyakoriságának növelését, ha 250 W-nél kisebb teljesítménnyel végzi az átvitelt, mivel kisebb teljesítményű átvitelt kevesebb válaszjeladó észlel. Mindegyik normalizált teljesítmény érték ezen egyenlőtlenség baloldalán az összegezésen belül egy kitevőt tartalmaz, amely az egyenlőtlenségnek a lokalizált ACAS elosztáshoz való hozzáigazítását szolgálja. Az α értéke a helyi ACAS légijármű eloszlási görbét definiálja és az eloszlás saját ACAS mérésből az 56 km (30 NM) távolságon belül lévő többi ACAS számából származtatják le. Mivel az ACAS eloszlás a terület szerint egyenletestől (α = 1) a távolság szerinti egyenletesig (α = 0,5) változik, az ACAS légijármű sűrűség és ennek következtében az elektromágneses behatásuk az "áldozat" válaszjeladó közelében megnő. Az ACAS interferenciának ez a megnövekedett potenciálját eltéríti az interferencia korlátozás magasabb foka, amely az egyenlőtlenség normalizált értékében egy 1-nél kisebb kitevőhasználatából ered. Ennek az egyenlőtlenségnek a jobboldalán lévő első tagnak a nevezője a környezetben lévő többi ACAS lekérdezőkre és arra a tényre vezethető vissza, hogy minden ACAS egységnek hasonló módon kell korlátoznia a lekérdezési sebességét és teljesítményét úgy, hogy ahogyan a régióban az ACAS egységek száma növekszik, azok mindegyikétől jövő lekérdezési gyakoriság és teljesítmény úgy csökken, és a teljes ACAS lekérdezési gyakoriság bármely válaszjeladónál kisebb marad, mint 280 per másodperc.

3.2.3.3 Egy légtéren belül, amelyben az ACAS légijárművek távolság szerint egyenletes-től a terület szerint egyenletes-ig terjedő korlátok között oszlanak el, és feltételezve, hogy az "áldozatot" 35 mikromásodperces perióduson keresztüli elnyomással vagy válasz holtidővel kiiktatják, valahányszor egy ACAS lekérdezést vesz, a teljes kikapcsolt idő, amelyet ACAS lekérdezések okoztak, nem fogja meghaladni az 1 százalékot. Mérések és szimulációs vizsgálatok azt mutatták, hogy a teljes kikapcsolt idő nagysűrűségű terminál körzeteken belül 1 százaléknál nagyobb is lehet az ACAS légijármű eloszlások miatt, amely a terület szerint egyenletestől a távolság szerint egyenletesig terjedően meghatározott régión túl vannak és bizonyos lekérdezésekhez tartozó S-módú válaszjeladó visszaállási idő miatt, amely várhatóan nagyobb, mint 35 mikromásodperc lehet. Ennek az egyenlőtlenségnek a jobboldalán a második tag korlátozza az ACAS II részére a lekérdezési teljesítmény-sebesség szorzatot tekintet nélkül az n_a-ra, hogy lehetővé tegye a teljes interferencia korlátozás egy részének ACAS I általi felhasználását. A tag, amelyet az α nevezυben lévő értéke illeszt az ACAS eloszláshoz, biztosítja, hogy egy egyedi ACAS II egység sohasem továbbít nagyobb átlagos teljesítményt, mint ha közelítőleg 26 másik ACAS II lenne közvetlen közelben terület szerint egyenletes eloszlásban, vagy közel 6 másik ACAS II a közelben, távolság szerint közel egyenletes eloszlásban.

3.2.3.3.1 A nagysűrűségű terminál körzetek nagyobb terheléstől fognak szenvedni az 1 százalék becslés megsértés miatt, a földetérési ponttól közelítőleg 14,8 - 18,5 km-ig (8 - 10 NM) terjedő nagyobb terhelésből kifolyólag. Hogy kielégítő felderítési teljesítményt biztosítsanak mind az ACAS, mind földi felderítő rendszerek számára az ilyen területeken, a 610 m (2000 láb) föld feletti magasság alatt repülő ACAS földön üzemelő ACAS II-t és ACAS III-t is tartalmaz n_b és n_c számításánál. Ezt az értéket a következő gyakorlati okokból választották:

a) a rádió magasságmérő használata elegendő mérési pontosságot tesz lehetővé 610 m-en (2000 láb) és ez alatt; és
b) feltételezi, hogy a légijárművek egy ILS siklópályán végeznek megközelítést. Ebben az esetben 610 m (2000 láb) föld feletti magasság megfelel egy repülőtértől való közelítőleg 11,2 km (6 NM) távolságnak.

Új megközelítési eljárások (pl. MLS-en vagy GNSS-en alapuló) további meggondolásokat igényelhetnek az interferencia csökkentésére. És még ILS megközelítésnél is ajánlatos olyan eljárásokat létrehozni, amelyek "tartalékra" ("stand-by"-ra) kapcsolják az ACAS II-t és ACAS III-at, amíg a légijármű nincsen aktív futópályán.

3.2.3.4 A (2) egyenlőtlenség biztosítja, hogy az ACAS légijármű fedélzetén lévő válaszjeladót ne kapcsolják ki az ACAS egységtől jövő kölcsönös elnyomási jelek ugyanazon légijárművön az idő több mint 1 százalékát kitevő ideig.

3.2.3.5 A (3) egyenlőtlenség biztosítja, hogy az "áldozat" A/C-módú választ egymásodperces periódus során nem fog 40-nél több A/C-módú választ generálni, az észlelési távolságán belül lévő összes ACAS lekérdezőtől jövő lekérdezésekre reagálva. Akárcsak az (1) egyenlőtlenség, ez is tartalmaz tagokat csökkentett átviteli teljesítmény, és a környezetben lévő többi ACAS lekérdező tekintetbe vételére, és egy egyedülálló ACAS egység teljesítményének korlátozására. 40 A/C-módú válasz másodpercenként közelítőleg 20 százaléka a válasz sebességnek olyan válaszjeladónál, amely ACAS nélkül működik többszörös A/C-módú földi érzékelő lefedéses forgalmas területen.

3.2.3.6 *PÉLDA INTERFERENCIA KORLÁTOZÁSRA*

3.2.3.6.1 Példaként, amikor a lekérdezési korlátozás nincs megidézve, az irányított ACAS egység általános A/C-módú és S-módú lekérdezési gyakoriságok tipikusan a következők: az A/C módú lekérdezési k_t gyakoriság tipikusan konstans 83 suttogás-kiabálás lekérdezés per másodpercnél. Tegyük fel, hogy a normalizált suttogás-kiabálás teljesítmények összege, azaz az A/C-módú hozzájárulás az (1) egyenlőtlenség baloldalához közelítőleg 3. Az S-módú lekérdezési gyakoriság függ a környezetben lévő S-módú légijárművek számától. Az útvonalhoz tartozó légtérben a tipikus érték körülbelül 0,08 leképezés per másodperces átlag minden S-módú légijárműnél 56 km-en (30 NM) belül. Egyenletes 0,006 légijármű per négyzetkilométer (0,02 légijármű per négyzet-NM) légijármű sűrűségnél 56 km-en (30 NM) belül a légijárművek száma 57. Ha ezeknek 20 százaléka ACAS-al felszerelt, n_a=12, és a változó tag az egyenlőtlenség jobboldalán 21,5. Ha az ACAS légijárművek száma a területen nem haladja meg a 15-öt, az állandó tag folytatja a szabályozást, és korlátozás nem jelenik meg, amíg nem lesz közelítőleg 100 S-módú légijármű 56 km-en (30 NM) belül.

3.2.3.6.2 Hasonló meggondolások érvényesek a (2) és (3) egyenlőtlenségekre is. A (2) egyenlőtlenségben a kölcsönös elnyomási időköz, amely az összes felső antenna lekérdezésekkel kapcsolatos, 70 mikromásodperc. Az alsó antenna kölcsönös elnyomási időköze 90 mikromásodperc. Igy az A/C-mód hozzájárulása a (2) egyenlőtlenség baloldalához 0,0059, és az S-módú lekérdezési gyakoriság elérheti még az 59 felső antenna lekérdezés per másodperc értéket is, mielőtt korlát átlépést kockáztatna. Tipikus suttogás-kiabálás sorozattal a (3) egyenlőtlenség baloldala közelítőleg 3. Az ACAS légijárművek száma 56 km-en (30 NM) belül elérheti a 26-ot is, a (3) egyenlőtlenség megsértése nélkül.

3.2.6.3 Ha a lekérdezési sebesség vagy a sűrűség egy olyan pontig növekszik, amelynél a korlátozások egyikét megszegik, akkor vagy az A/C-módú, vagy az S-módú normalizált lekérdezési sebességet, vagy mindkettőt csökkenteni kell, hogy az egyenlőtlenség feltételei teljesüljenek. Ha a sűrűség elérné a 0,029 légijármű per km^2-t (0,1 légijármű per NM^2) egyenletesen 56 km-re (30 NM) kiterjedően, akkor az 56 km (30 NM) sugarú körön belül 283 légijármű tartózkodna. Ha ezeknek 10 százaléka

ACAS-al van felszerelve, akkor n_a=28. Az (1) és (3) egyenlőtlenségek jobboldali korlátjai akkor 9,66 és 2,76 megfelelőképpen. Ezeknek az alsó korlátoknak a kielégítéséhez az A/C-módú és S-módú járulékokat az (1) egyenlőtlenség baloldalához egyaránt csökkenteni kell. Ennek eredményeként mind az A/C-módú, mind az S-módú célok felderítési távolsága kisebb lesz.

3.2.3.6.4 Az (1) egyenlőtlenség egy kitevőt tartalmaz, amely az egyenlőtlenségnek a specifikus helyi ACAS légijármű sűrűséghez való illesztését szolgálja úgy, hogy egy "áldozat" válaszjeladó, amely olyan ACAS-ok közelében működik, amelyek a terület szerint egyenletestől a távolság szerint egyenletesig terjedő határokon belül oszlanak meg, sohasem észlel 280-nál több ACAS lekérdezést egy másodperces periódus alatt.

A helyi ACAS eloszlási jellemzőjét a saját ACAS környezeten belül az α értéke határozza meg.

Ez az 56 km-en (30 NM) belül, 11,2 km-en (6 NM) belül, 5,6km-en (3 NM) belül lévő ACAS-ok viszonylagos számain alapszik, ahogyan azokat az ACAS rádióadás lekérdezésekből és ACAS felderítésekből leszármaztatják. Az α értéke a következőknek a minimuma:

a) az 56 km-en (30 NM) belül található ACAS légijárművek n_a számának a 11,2 km-en (6 MN) belül található ACAS légijárművek n_b számához viszonyított arányának a logaritmusa osztva 25 logaritmusával; és
b) a 11,2 km-en (6 MN) belül található ACAS légijárművek n_b számának az 5,6 km-en belül található ACAS légijárművek n_c számához viszonyított arányának az egynegyede.

Az 56 km-en belüli ACAS légijárművek terület szerinti egyenletes eloszlása 1,0 értékű α-t eredményez, és a távolság szerinti egyenletes eloszlása 0,5-ös α értéket eredményez. Mivel α csökkenő értékei növekvő teljesítmény csökkenést, és ennek folytán rövidebb felderítési távolságokat eredményeznek, α minimαlis értéke 0,5-re zsugorodik, hogy megőrizze adekvát felderítési távolságát a legnagyobb sűrűségű terminál területeken. Az α_1 értékét tovább szűkítik, hogy figyelembe vegyék a különleges helyzeteket, amelyeknél a mért helyi ACAS eloszlás:

1) annyira kis számokon alapszik, hogy azok nem meggyőzőek (n_b=1), amely esetben α_1 egynek megfelelő értékre zsugorodik;
2) ellentmondásos egy viszonylag nagy teljes ACAS számmal ($n_b \leq 4$, $n_c \leq 2$, $n_a > 25$), amely esetben α_1 egynek megfelelő értékre zsugorodik;
3) ellentmondásos egy viszonylag kis teljes ACAS számmal ($n_c > 2$, $n_b > 2\ n_c$, $n_a < 40$) amely esetben α_1 0,5-nek megfelelő értékre zsugorodik.

3.2.3.7 *INTERFERENCIA KORLÁTOZÓ ELJÁRÁSOK*

3.2.3.7.1 Mindegyik felderítés felfrissítési időköz kezdetén, ahogy fentebb mutattuk, n_a-t, n_b-t és n_c-t meg kell határozni. n_a-t ezután az (1) és (3) egyenlőtlenség éppen aktuális jobboldali korlátjainak értékelésére használják. Az S-módú változók kiegyenlített értékeit az egyenlőtlenségekben szintén ki kell számítani.

n_b-t és n_c-t az α_1 értékének kiszámítására használják a következő kifejezésnek megfelelően:

$$\alpha_1 = 1/4\ [n_b/\ n_c]$$

n_a-t és n_b-t az α_2 értékének kiszámítására használják a következő kifejezésnek megfelelően:

$$\alpha_2 = \frac{Log_{10}[n_a/n_b]}{Log_{10}25}$$

Továbbá:

HA [($n_b \leq 1$) VAGY ($n_b > n_c$) VAGY ($n_b \leq 4$ ÉS $n_c \leq 2$ ÉS $n_a > 25$)] AKKOR $\alpha_1 = 1{,}0$;

HA [($n_b < 2n_c$ VAGY (($n_c > 2$) ÉS ($n_b > 2n_c$) ÉS ($n_a < 40$))] AKKOR $\alpha_1 = 0{,}5$;

HA ($n_a > 25n_b$) AKKOR $\alpha_2 = 1{,}0$;

HA ($n_a < 5n_b$) AKKOR $\alpha_2 = 0{,}5$;

α értéke az α_1 és α_2 minimuma.

3.2.3.7.2 Az összes levegő-levegő koordinációs lekérdezés és megoldási tanácsadás és ACAS rádiós lekérdezések továbbítása teljes teljesítménnyel történik. Levegő-levegő koordinációs lekérdezéseket és megoldási tanácsadást és ACAS rádiós lekérdezéseket nem tartalmazzák az S-módú lekérdezések összegei ezeknek az egyenlőtlenségeknek a baloldalán lévő tagjaiban. Valahányszor egy megoldási tanácsadást elküldenek, felderítési lekérdezéseket ehhez a megközelítő légijárműhöz teljes teljesítménnyel lehet továbbítani a maximális kapcsolat megbízhatóság lehetővé tétele érdekében. Mivel a megoldási tanácsadások frekvenciája nagyon alacsony, ezek a továbbítások nem eredményezik az interferencia mérhető növekedését.

3.2.3.7.3 Ha akár az (1), akár a (2) egyenlőtlenség baloldalának kiegyenlített értéke egyenlő vagy meghaladja az éppen aktuális korlátot, és a saját ACAS légijármű 5490 m (18000 láb) nyomásmagasság alatt repül, akkor mind az S-módú, mind az A/C-módú elderítési paramétereket módosítani kell, hogy kielégítsék az egyenlőtlenségeket. Ha a (3) egyenlőtlenség baloldala meghaladja az éppen aktuális korlátot, és a saját ACAS légijármű 5490 m (18000 láb) nyomásmagasság alatt repül, akkor mind az S-módú, mind az A/C-módú felderítési paramétereket módosítani kell, hogy kielégítsék az egyenlőtlenségeket.

3.2.3.7.4 Az A/C-módú felderítést úgy lehet módosítani, hogy a 3.2.2 szakaszban leírt suttogás-kiabálás sorozat lépéseit egymás után figyelmen kivül hagyják. Mindegyik suttogás-kiabálás lépés egyedileg kapcsolódik egy vevő minimális beindulási szint (MTL) beállításához. Így a vevő érzékenység A/C-módú felderítési periódusokban automatikusan hozzá igazításra kerül, az említett teljesítmény csökkentésekhez való illeszkedés érdekében.

3.2.3.7.5 Az általános felderítési érzékenységet S-módú céloknál a lekérdezési teljesítmény csökkentésével és a vevő minimális beindítási szintjének növelésével lehet csökkenteni az összes S-módú squitter lehallgató periódus alatt. Ez közvetve csökkenti az S-módú lekérdezés sebességét a cél szám csökkentésével. Sok S-módú lekérdezés olyan adatbeszerző lekérdezés, amelyeket ismeretlen távolságú célokhoz továbbítanak. Így ez nem szabályozza az S-módú lekérdezési sebességet egyszerűen a nagy-távolságú célok törlésével a nyomvonal fájlból.

3.2.3.7.6 A levegőben lévő ACAS-nál az A/C-módú és S-módú felderítési teljesítmény csökkentését úgy kell végrehajtani, hogy a felderítési távolságok közötti egyenlőség S-módú és A/C-módú céloknál fennálljanak az előre irányuló sugárban. Hogy egy megbízható 11,2 km (6 NM) távolságot biztosítsanak minden irányban n_b esetén, a maximális megengedett interferencia, amely limitálja a teljesítmény csökkenést bármely irányban, egy levegőben lévő ACAS egységnél 10 dB S-módnál és 7 dB A/C-módnál. Az A/C-módú felderítési teljesítmény és érzékenység csökkentéseket úgy kell végrehajtani, hogy egyenlő suttogás-kiabálás képességet érjenek el minden irányban. Ez megkívánja, hogy az A/C-módú teljesítmény és érzékenység csökkentést addig végezzék, az előre irányuló sugárban, amíg az megegyező lesz az oldalsugarakkal, és azután az előre irányuló és oldalsugarakban, amíg a hátsó sugárral megegyezőek lesznek. Hogy egy megbízható 5,6 km-es (3 NM) ellenőrzési távolságot biztosítsanak minden irányban az indulás előtti ellenőrzéshez, a maximális megengedett interferencia korlátozó teljesítmény csökkentés egy a földön lévő ACAS-nál a következők szerinti:

a) előre irányuló sugár: 13 dB S-módnál, és 10 dB A/C-módnál;
b) oldalsugár: 13 dB S-módnál, és 6 dB A/C-módnál; és
c) hátsó sugár: 13 dB S-módnál, és 6 dB A/C-módnál.

Továbbá az A/C-módú és S-módú felderítési érzékenység csökkentéseket úgy kell végrehajtani, hogy az ACAS berendezés ne legyen idő előtt korlátozott, és képes legyen a három korlátozó egyenlőtlenségben részletezett lehetőség legalább 75 százalékának kihasználására az összes cél-típus összetételnél, és a rendszer maximális sűrűség kapacitásáig minden sűrűségnél. Ha a kiegyenlített korlátok közül valamelyiknek az értékét átlépik, megfelelő akció szükséges az interferencia korlátozására egy felderítés felfrissítési időközön belül. Eszközöknek kell rendelkezésre állniuk a felderítési érzékenység helyreállítására, amikor a környezet eléggé javul ahhoz, hogy az interferencia korlátok feloldhatók legyenek.

3.2.3.7.7 ACAS kereszt-kapcsolat lekérdezéseket az S-módú lekérdezések összege tartalmazza az interferencia korlátozó egyenlőtlenségek baloldalának tagjaiban.

3.2.3.8 *TIPIKUS INTERFERENCIA KORLÁTOZÓ ELJÁRÁS MEGVALÓSÍTÁSA*

3.2.3.8.1 Az alábbiakban következő ismertetés egy interferencia korlátozó eljárás egyik lehetséges megvalósítása. Ez az (1), (2) és (3) egyenlőtlenségekben megjelenő rendszer paramétereket változtatja, hogy maximálja és fenntartsa a közelítő egyenlőséget a számított felderítési távolságok között az S-módú és A/C-módú céloknál. Ezeknek az egyenlőtlenségeknek az értékelésében az S-módú paraméterek 8 másodperces átlagát használják és az A/C-módú paraméterek aktuális vagy várható értékeit használják. Az eljárást az A-4 ábrán lévő folyamat ábra illusztrálja.

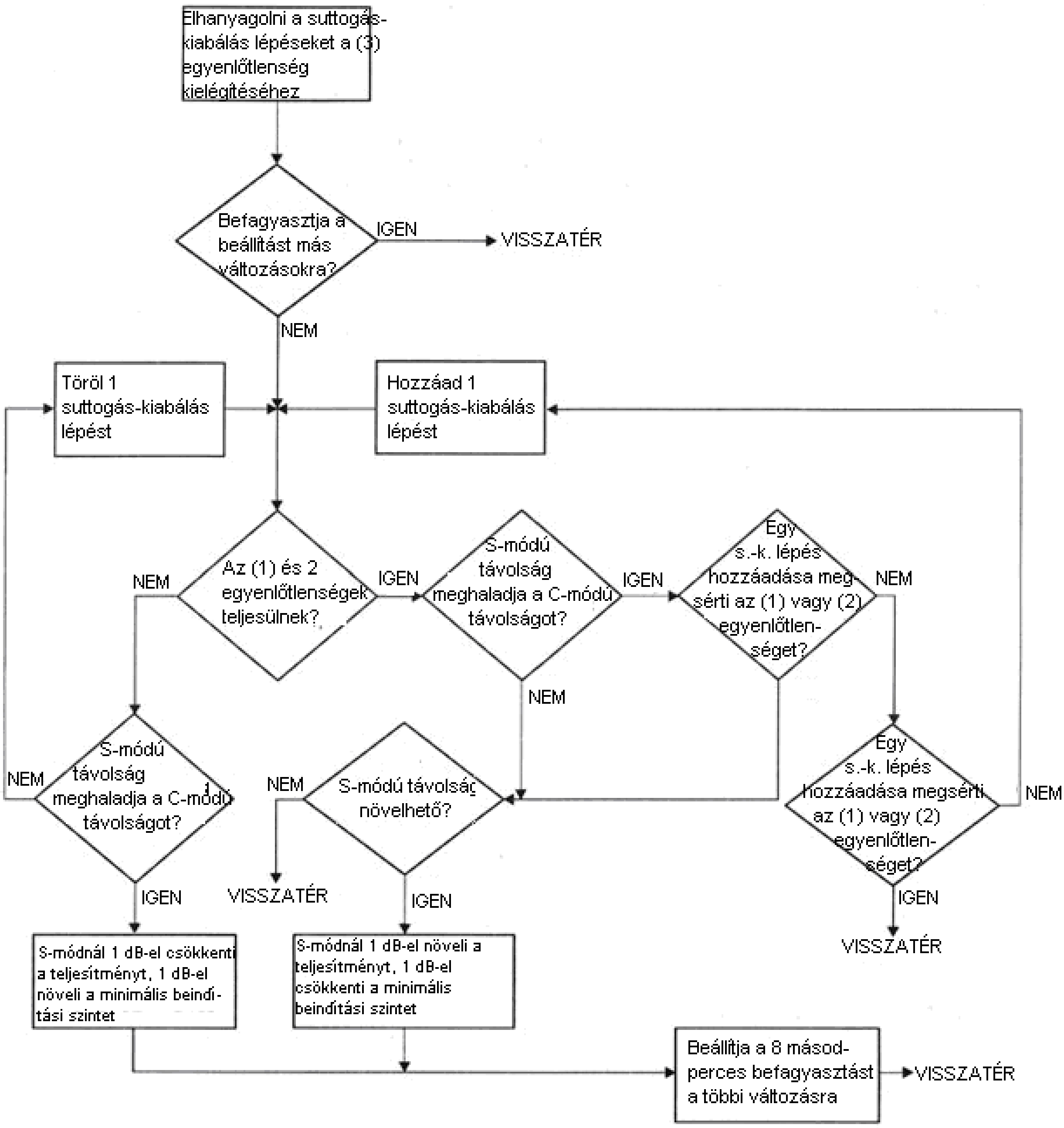
3.2.3.8.2 *1. lépés.* Az első lépés a szabályozási folyamatban a használatra próbaképpen ütemezett suttogás-kiabálás lépések számának csökkentése az aktuális pásztázás során, ha:

a) a (3) egyenlőtlenséget megszegik; vagy
b) az (1) vagy (2) egyenlőtlenséget megszegik, és az utolsó pásztázás S-módú ellenőrzési távolsága nem haladja meg az A/C-módú felderítési távolságot, amelyet az ütemezett suttogás-kiabálás sorozat használata eredményez.

Suttogás-kiabálás lépéseket az A/C-módú processzor tervezése által diktált sorrendben elhagyják, és az elhagyott lépések száma éppen elég nagy annak biztosítására, hogy a fenti feltételek egyike se álljon fenn. A felhasználásra kísérleti jelleggel ütemezett suttogás-kibálás lépések számának értéke az utolsó pásztázásnál használt számnál kezdődik.

Az S-módú és A/C-módú felderítési távolságok relatív nagyságát a becsült effektív sugárzási teljesítményből (ERP) határozzák meg, amelyet az ACAS légijárműnek közvetlen az elején található S-módú és A/C-módú válaszjeladókkal ellátott célok látnak. Az ERP-t egy adott irányban az antenna teljesítmény bement és az ezirányú antenna séma nyereség szorzata határozza meg. Ha a válaszjeladó érzékenységek azonosak lennének, az S-módú távolság nagyobb vagy kisebb lenne, mint az A/C-módú távolság, attól függően, hogy az S-módú továbbított teljesítmény nagyobb vagy kisebb, mint az A/C-módú továbbított teljesítmény. Mivel az A/C-módú válaszjeladónak valamivel kisebb érzékenysége lehet, mint az S-módú válaszjeladónak, az A/C-módú távolságról felteszik, hogy akkor és csak akkor nagyobb, mint az S-módú távolság, ha az A/C-módú teljesítmény 3 dB-el meghaladja az S-módú teljesítményt.

3.2.3.8.3 *2. lépés.* A második lépés a szabályozási folyamatban az S-módú adatlekérdezési teljesítmény 1dB-el való csökkentése, és az MTL növelése az S-módú squitter lehallgatásához, 1 dB-el az utoljára használt értékekről, ha az (1) vagy (2) egyenlőtlenség megszegése következik be, és az utolsó pásztázás S-módú felderítési távolsága meghaladja az A/C-módú felderítési távolságot, amelyet az ütemezett suttogás-kiabálás sorozat eredményezne.



A-4 ábra. Interferencia határolás folyamat ábra

Ha egyszer egy ilyen változtatást végrehajtottak, az ezt követő 8 másodperc alatt az egyetlen megengedett változtatás a suttogás-kiabálás lépések számának csökkentése, ha ez szükséges a (3) egyenlőtlenség kielégítéséhez. Ez a 8-másodperces befagyasztás lehetővé teszi az S-módú változtatások hatásának láthatóvá válását, mivel a 8-másodperces átlagokat, amelyeket az (1) és (2) egyenlőtlenségekben használnak, azután a rendszereknek a változtatás pillanata utáni viselkedése fogja meghatározni.

3.2.3.8.4 *3. lépés.* A 3. lépés arra szolgál, hogy hozzá lehessen adni egy suttogás-kiabálás lépést ahhoz a próbaképpen előirányzotthoz, ha ez nem akadályozza meg egy 8-másodperces befagyasztást, és a következő feltételek teljesülnek:

a) az (1), (2) és (3) egyenlőtlenségek teljesülnek, és a lépés hozzáadása után továbbra is teljesülnek; és
b) az utolsó pásztázás S-módú felderítési távolsága meghaladja az A/C-módú felderítési távolságot, amely az ütemezett sorozat használatából ered; és annyi lépést adnak hozzá, amennyit a fenti a) vagy b) megsértése nélkül lehet.

3.2.3.8.5 *4. lépés* Végül, ha a fenti 3.2.3.8.4 alpont a) feltétele teljesül, de a b) feltétel nem teljesül, akkor számítást végeznek az adatbeszerzési S-módú lekérdezési teljesítmény 1 dB-el való növelése, és az S-módú squitterek MTL-jének 1 dB-el való csökkentésének hatásaira vonatkozóan. Ha a számítás azt mutatja, hogy az (1) és (2) egyenlőtlenségek már nem teljesülnek, az 1 dB-es változtatást nem végzik el. Ha a számítás azt eredményezi, hogy ezek továbbra is teljesülnek, az 1 dB-es változtatást elvégzik, és a következő 8 másodpercben sem az A/C-módú, sem az S-módú paramétereket nem változtatják meg, kivéve a fenti 3.2.3.8.3 pontban ismertetetteket.

3.2.4 LEKÉRDEZÉSI VIBRÁLÁS

Az ACAS berendezéstől jövő A/C-módú lekérdezések szándékosan vibráltatásra kerülnek, hogy elkerüljék a más földi és fedélzeti lekérdezőkkel való szinkron interferencia lehetőségét. Az S-módú felderítések lekérdezéseit nem szükséges vibráltatni az S-módú lekérdezés ütemezési folyamatának megnövekedett véletlenszerű jellege miatt.

3.3 Antennák

3.3.1 IRÁNYÍTOTT LEKÉRDEZÉS HASZNÁLATA

3.3.1.1 Irányantenna ajánlott A/C-módú célok megbízható ellenőrzésére 0,087 légijármű per négyzetkilométer (0,3 per négyzetmérföld) légijármű sűrűségig. Az ajánlott antenna rendszer egy négysugaras, a légijármű tetejére szerelt antennából és a légijármű aljára szerelt körsugárzó antennából áll. Egy irányantenna is lehet használatos a légijármű aljára szerelt körsugárzó antenna helyett. Az irányantenna sorozatosan generál sugarakat, amelyek előre, hátra, balra és jobbra irányulnak. Ezek együttesen ellenőrzési fedést szolgáltatnak minden azimut szögnél anélkül, hogy közbenső beállítási szögre lenne szükség.

3.3.1.2 Az irány antennának tipikusan 3 dB-es sugárszélessége (BW) van 90 ± 10 fokos azimutban +20 fok és -15 fok közötti összes elevációs szögnél. A lekérdezési sugárszélességet egy mellékhurok elnyomási impulzus korlátozza, amely az egyes P_1 lekérdezési impulzusokat 2 mikromásodperccel követi. A P_2 impulzust egy különálló irányító sémán (amely körsugárzó lehet) továbbítják.

3.3.1.3 Időnként szükség van a kis közeledési sebességgel fentről vagy lentről közelítő légijárművek detektálására is. Az ilyen légijárművek észlelése kielégítő antenna nyereséget tesz szükségessé az ACAS légijármű bólintási síkjához képesti ± 10 fokos elevációs szögön (látóhatár fölötti szögmagasság) belül. Az ACAS irányantennának tipikusan 3 dB névleges függőleges, 30 fokos sugárszélessége van.

3.3.1.4 Az irányantenna sémák formáját és a P_2 adatátvitelek relatív amplitúdóját úgy szabályozzák , hogy a) bármely 0 és 360 fok közötti azimut szögnél és +20 és -15 fok közötti elevációs szögnél elhelyezett maximális elnyomással rendelkező válaszjeladó válaszoljon a négy iránysugár közül legalább az egyikre, és b) egy minimális elnyomással rendelkező válaszjeladó nem több, mint két szomszédos iránysugárból jövő lekérdezésre válaszoljon. A maximális elnyomással rendelkező válaszjeladót úgy határozták meg, mint olyan válaszjeladót, amely csak akkor válaszol, ha a vett P_1/P_2 arány meghaladja a 3 dB-t. A minimális elnyomással rendelkező válaszjeladót úgy határozták meg, mint olyan válaszjeladót, amely csak akkor válaszol, ha a vett P_1/P_2 arány meghaladja a 0 dB-t.

3.3.1.5 Az egyes antenna sugaraktól (előre, balra, jobbra, hátra, körbe) származó effektív sugárzott teljesítmény (ERP) várhatóan a megfelelő névleges ±2 dB értéken belül marad, ahogyan azt az A-2 ábra mutatja.

3.3.1.6 Egy előreirányuló átvitelnek, amelyre TRP = 49 dBm és BW = 90^0, teljesítmény nyeresége van a sugár középen, amely közelítőleg

$$PG = \frac{TRP}{BW/360^o} = 55 \text{ dBm}$$

Ez 1 dB-el nagyobb, mint a névleges, és megfelelő lefedést tesz lehetővé az iránysugarak keresztezési pontjainál. Az oldalsó és hátsó sugarakat csökkentik az elülső sugárhoz képest, hogy figyelembe vegyék a kisebb közeledési sebességeket, amelyek akkor jelennek meg, amikor a légijárművek ezekből az irányokból közelednek. Az A/C-módú ellenőrzés teljesítménye általában javul, ahogyan az irányultság (és ezáltal a sugarak száma) növekszik a tetőre szerelt antennánál. Azonban az alsó irány antenna használata csak marginális javulást eredményezne az észlelőképességben, és ha teljes teljesítménnyel használják, lerontja a berendezés általános teljesítményét a hamis nyomvonal ráta növelésével a földről visszaverődő többszörös nyomvonal miatt.

3.3.2 IRÁNYKERESÉS

A válaszoló válaszjeladóktól jövő átvitelek érkezési szögét 10-fokos RMS pontosságnál nagyobb pontossággal lehet meghatározni néhány egyszerű és praktikus iránykereső eljárással. Ezek az eljárások tipikusan négy vagy öt egypólusú sugárzó elem együttest alkalmaznak, amelyek a légijármű felületén negyed hullámközökkel négyszögekben vannak felszerelve. Az ezektől az elemektől jövő jelek kombinálhatók úgy, hogy 2-4 különálló sugarat generáljanak, amelyek fázisban vagy amplitúdóban egybevethetők, hogy a vett jel érkezési irányának számítását produkálják. Az iránykeresés pontossági szintje kielégítő a repülőgépvezető forgalmi tanácsadással való ellátásával, hogy hatékonyan segítse a megközelítő légijármű vizuális befogását.

3.3.3 IRÁNYÍTOTT ÁTVITEL SZINKRON CSONKÍTÁS SZABÁLYOZÁSHOZ

3.3.3.1 Az irányított lekérdezés használata az egyik eljárási mód a szinkron csonkítás csökkentésére. Az irányított lekérdezés csökkenteni képes a lekérdezési régió méretét. Lefedést az összes irányban biztosítani kell. Ebből kifolyólag többszörös sugarakat használnak válaszok kiváltására az ACAS-al felszerelt légijárművek környezetében lévő összes légijárműtől. Figyelmet kell fordítani arra, hogy a sugarak között átfedés legyen, hogy ne keletkezzen lefedetlen rész közöttük.

3.3.3.2 Az antennának viszonylag egyszerű elrendezési képességgel kell rendelkeznie tipikusan négy vagy nyolc pozícióba való kapcsoláshoz. Négy sugár pozíció esetén az antenna sugár szélessége várhatóan 100^0 körüli. Az effektív antenna sugár szélességét A/C-módú válaszjeladó lekérdezéseknél 3dB-nél keskenyebbre lehet leszűkíteni az adóberendezés oldalszirom elnyomásával.

3.3.4 ANTENNA ELHELYEZÉS

A légijármű tetejére szerelt irány antennát a légijármű középvonalában, amennyire csak lehet, előre kell helyezni. Az ACAS antennákat és az S-módú válaszjeladó antennákat egymástól a lehető legtávolabb kell felszerelni a légijármű sárkányszerkezeten, hogy minimalizálják az energia átvezetést egyik egységről a másikra. A közök soha nem lehetnek 0,5 m-nél (1,5 láb) kisebbek, mivel ez a térköz elrendezés legalább 20 dB kapcsolási veszteséget eredményez.

3.4 Vevő és processzor

3.4.1 ÉRZÉKENYSÉG

Egy S-módú válaszjeladó érzékenységével (-74 dBm minimális beindítási szintű) ekvivalens érzékenység elegendő kapcsolat tartalékot szolgáltat, hogy közel azonos magasságban vízszintes repülést végző 26 km (14 NM) távolságban lévő légijárművek megbízható észlelését szolgáltassa azoknak a légijárműveknek, amelyek maguk is névleges átviteli teljesítményű válaszjeladókkal vannak felszerelve.

3.4.2 VEVŐ KÜSZÖB SZABÁLYOZÁS

3.4.2.1 ACAS vevők egy változó (dinamikus) küszöböt használnak a többutas hatások szabályozására. Amikor a válasz első impulzusát veszik, a változó vevőküszöb eljárás a vevőküszöböt a minimális beindítási szintről (MTL) a vett impulzuscsúcs szintje alatt rögzített mennyiséggel (pl. 9 dB-el) lejjebb lévő szintre emeli. A vevő küszöböt ezen a szinten tartják az A/C-módú válasz ideje alatt, ami után ez visszatér az MTL-hez. Amikor a többutas visszaverődések gyengék a közvetlen nyomvonal válaszokhoz képest, a közvetlen nyomvonal válasz első impulzusa a vevő küszöböt elegendően megnöveli ahhoz, hogy a többutas visszaverődéseket ne észleljék.

3.4.2.2 A változó küszöbű vevőket történelmileg mellőzték az A/C módú válasz processzoroknál, mivel az ilyen jellegű küszöbök a gyenge válaszok elleni megkülönböztetéssel élnek. Bár, amennyiben a suttogás-kiabálás jellegű lekérdezéssel együtt használják, akkor az előnyös tulajdonságaik kerekednek felül. A lekérdezési sorrend bármely meghatározott lépésénél lehetőség nyilik a küszöb megemelése érdekében egy erős válaszra és lehetővé válik a gyengébb átfedő válasz visszautasítása. Bár, a suttogás-kiabálás jellegű lekérdezésnél, megközelítőleg azonos amplitudójú átfedő válasz érkezik az összes lekérdezésre, mivel a suttogás-kiabálás módszer a célokat a jel erősség szerinti csoportba sorolja be.

3.4.2.3 Az összes suttogás-kiabálás jellegű lekérdezést követő válasz lehallgatási periódusban használt ACAS vevő minimum beindítási szint (MTL) az előírt módon kapcsolódik a lekérdezési teljesítményhez. Nevezetesen, alacsonyabb lekérdezési teljesítményeknél minél kisebb minimum beindítási szintet használnak, hogy az A/C-módú aszinkron impulzus zavarások sebességének szabályozásával az ACAS vevőben amíg csak lehet egyensúlyt teremtsenek a lekérdezési- és a válasz adatvonalak között, hogy az összes felszínre hozott választ észlelni lehessen.

3.4.3 IMPULZUS FELDOLGOZÁS

3.4.3.1 Egy viszonylag széles dinamikus távolság vevő hűen reprodukálja a vett impulzusokat. Gondoskodás történhet a vett impulzus szélek pontos elhelyezéséről és a hamis keret impulzusok elhagyásáról, amelyeket kód impulzusok szintetizálnak a valós válaszokból. A processzor képes impulzusok feldolgozására olyan szituációkban, ahol átfedett impulzus szélek tisztán megkülönböztethetőek. Megvan a képessége arra is, hogy a rejtett impulzusok pozícióit rekonstruálja, amikor közel azonos amplitúdójú átfedő impulzusok okozzák a következő impulzusok elrejtését. A válasz processzornak megvan a képessége legalább három átlapoló válasz kezelésére és korrekt dekódolására. Megfelelő eszközök gondoskodnak a sávon kívüli jelek elvetéséről, és a 0,5 mikromásodperc emelkedési idejű impulzusok (tipikusan DME impulzusok) elvetéséről.

3.4.3.2 Ha egy S-módú válasz egy C-módú lehallgatási priódus alatt érkezik, egy hamis C-módú válasz-lánc generálódhat. Az ACAS berendezéstől elvárható, hogy ezeket a hamis válaszokat kiselejtezze.

3.4.4 HIBA ÉSZLELÉS ÉS KORREKCIÓ

3.4.4.1 Az ACAS elektronika, amely a 260 m/s-nál (500 csomó) nagyobb közeledési sebességgel, és négyzet kilométerenként 0,009 légijárműnél (négyzet tengeri mérföldenként 0,03 légijárműnél) nagyobb sűrűséggel, vagy 260 m/s-nél (1500 csomó) kisebb közeledési sebességgel és négyzet kilométerenként 0,04 légijárműnél (négyzet tengeri mérföldenként 014 légijárműnél) nagyobb sűrűséggel jellemzett légtérben való használatra szántak, S-módú válasz hibakorrekciót igényel. Ezekben a nagysűrűségekben hibakorrekció szükséges, hogy felülmúlja az A/C-módú hatásokat. S-módú hibakorrekció lehetővé teszi az S-módú válaszok sikeres vételét egy átlapoló A/C-módú válasz jelenlétében.

3.4.4.2 Hibakorrekció dekódolást használnak a következő válaszoknál: DF = 11 all-call válaszok, DF = 0 rövid levegő-levegő ellenőrzési válaszok, és DF = 16 hosszú levegő-levegő ellenőrzési válaszok (adatbeszerzési és nem adatbeszerzési egyaránt).

3.4.4.3 Ha kettő vagy több olyan adatbeszerzési választ vesznek, amely hibakorrekciót kíván az S-módú távolság adat beszerzési ablakon belül, gyakorlatiatlan lehet az első vett válaszon kívül további hibakorrekciót alkalmazni. Adatlekérdezési válaszokat az elsőn kívül nem kell korrigálni, amikor ez megjelenik.

3.4.5 VEVŐ OLDALSZIROM ELNYOMÁS

Az irányítottan lekérdező ACAS berendezés vevő oldalszirom elnyomási eljárást alkalmazhatnak a lekérdezett szektoron kívül lévő közeli légijárművek által generált válaszok elhanyagolására. Ez csökkenti az ellenőrzési felfrissítési periódus alatt feldolgozott válaszok számát.

3.4.6 KETTŐS MINIMÁLIS BEINDÍTÓ SZINTEK

Ha az ACAS által használt vevő minimális beindítási szintjét (MTL) lejjebb veszik, hogy nagyobb távolságú működést nyerjenek kiterjesztett squitterrel, intézkedni kell a squitter vételek címkézésére, amelyeket hagyományos MTL-nél vettek, és amelyeket egy módosítás nélküli ACAS vevő használt volna fel. Squitter vételeket, amelyeket hagyományos MTL-nél vagy magasabban vesznek, az ACAS felderítési tevékenységhez táplálják. Squitter vételeket, amelyeket hagyományos MTL alatt vesznek, nem használnak ACAS felderítésre, de közvetlenül a kiterjesztett squitter alkalmazáshoz irányítják. Ez az MTL általi szűrés szükséges ahhoz, hogy megóvják az ACAS-t attól, hogy olyan légijármű lekérdezést kíséreljen meg, amely túl van az aktív elderítési képességen. Ez megnöveli az ACAS lekérdezési sebességét minden tökéletesített teljesítmény szolgáltatás nélkül. A hagyományos MTL használata az ACAS felderítési tevékenységéhez megőrzi az ACAS éppen zajló felderítési műveletét, amikor egy feljavított MTL-elt használó vevővel üzemel.

3.5 Ütközés elkerülését biztosító algoritmus

Megjegyzés. – Az ACAS II összeütközés elkerülését biztosító logikájáról szóló útmutató anyag két szakaszba van szervezve. Ez a szakasz az ACAS SARP-okban lévő szabványokkal foglalkozik, és fontos koncepciókat fejt ki, az ACAS logika egy specifikus megvalósításának tervezési sajátságait felhasználva példaként. A 4. Szakasz további részletekkel szolgál ezen adott ACAS alkalmazás által használt algoritmusokról és paraméterekről. Ennek az elrendezésnek a következményeként az ebben a Szakaszban lévő pontok gyakran hivatkoznak a következő Szakaszban lévő pontokra.

3.5.1 ÁLTALÁNOS ISMERTETÉS

3.5.1.1 Az ACAS algoritmus névlegesen másodpercenként egyszer ismétlődő ciklusban működik. A ciklus elején a felderítési közléseket az összes megközelítő légijármű nyomvonalainak felfrissítésére, és ha szükséges, új nyomvonalak beindítására használják. Mindegyik megközelítő légijárművet azután távolságának, távolságváltozási sebességének, magasságának, magasság változási sebességének és esetlegesen iránytengelyének éppen folyó számítása képviseli. A saját légijármű magasságának és magasság változásának számításait is fel kell frissíteni.

3.5.1.2 Miután a nyomvonalakat felfrissítették, a megközelítő légijármű észlelési algoritmusokat annak meghatározására használják, hogy mely megközelítő légijárművek jelentenek potenciális összeütközési veszélyt. Két veszélyeztető szintet határoznak meg: potenciális veszélyeztető és veszélyeztető. Potenciális veszélyeztetők forgalmi tanácsadást indokolnak, míg a veszélyeztetők megoldási tanácsadást indokolnak.

3.5.1.3 A megoldási algoritmusok egy megoldási tanácsadást generálnak, az összes veszélyeztető légijárműtől való függőleges elkülönítés végett, amelyeket a veszélyeztető észlelési algoritmusok azonosítanak. Az egyes felszerelt veszélyeztetőkkel való koordináció a megoldási tanácsadás kiválasztási folyamatának részeként jelenik meg. Páronkénti koordináció az egyes felszerelt veszélyeztetőkkel szükséges ahhoz, hogy megállapítsák, melyik légijárműnek kell a másik felett elhaladnia, és így garantálni olyan elkerülő manővereket, amelyek összeegyeztethetőek.

3.5.2 VESZÉLYEZTETÖ LÉGIJÁRMŰ ÉSZLELÉSE

3.5.2.1 Az összeütközési veszély észlelése a távolságban és magasságban való egyidejű közelségen alapszik. Az ACAS távolság változási és magasság változási adatokat használ a veszélyeztető és a saját légijármű helyzetének extrapolálására. Ha rövid időtartamon belül (pl. 25 másodperc) a megközelítő légijármű távolsága várhatoan “kicsi”, és a magasság elkülönülés várhatoan “kicsi”, a megközelítő légijárművet veszélyeztetőnek nyilvánítják. Megfordítva, a veszélyeztető légijármű deklarálás azon aktuális távolság és magasság elkülönülésen alapulhat, amelyek “kicsik”. Az algoritmus paramétereket, amelyek megállapítják, hogy a jövőbeli helyzeteket milyen mértékben extrapolálják, és amelyek megállapítják a küszöböket annak meghatározásához, hogy az elkülönülések mikor “kicsik”, a veszélyeztető észlelési algoritmus működési érzékenységi szintjével összhangban választják ki.

3.5.2.2 Mindegyik érzékelési szint az algoritmusok által felhasznált észlelési paraméterekhez egy különleges értékkészletet határoz meg. Ezek tartalmazzák a küszöbértékeket a legszorosabb megközelítés számított időpontjára, a minimális ferde távolságra és a függőleges elkülönítésre vonatkozóan. Az érzékenységi szint szabályozás folyamatán keresztül ezeknek a paramétereknek különböző értékeket adnak a kisebb légijármű elkülönítések figyelembe vételével, amelyek sűrű terminál légtérben fordulnak elő. Az érzékenységi szintet automatikusan, a saját légijármű magasságának felhasználásával, vagy egy S-módú földi állomástól, vagy egy repülőgépvezető kézi kapcsolástól jövő utasítás által lehet kiválasztani (lásd 3.5.12 Szakasz).

3.5.2.3 A veszélyeztető észlelés paraméterekhez használt értékek nem lehetnek optimálisak minden szituációra vonatkozóan, mivel az ACAS hátrányt szenved a megközelítő légijármű szándéka ismeretének hiánya miatt. Az eredmény az, hogy egyensúlyt kell teremteni annak szükséglete, hogy elégséges figyelmeztetést adjanak egy fenyegető összeütközésről és a lehetséges felesleges figyelmeztetések generálása között. Ez utóbbi olyan találkozásokból ered, amelyet a megközelítő légijármű manőverekkel az utolsó pillanatban old meg. Az ACAS egyik tulajdonsága, amely ebben a vonatkozásban segít, a légtér védett térfogatának a változtathatósága. Ez a térfogat méretben automatikusan kapcsolódik a két légijármű közötti viszonylagos sebességhez, és automatikusan a relatív sebességvektorral párhuzamos irányba áll be. A tengelyirány nem játszik szerepet ebben a folyamatban. Mindegyik találkozás növeli a védett térfogatot, amely ehhez a találkozáshoz van szabva. Egy több-légijárműves szituációban egyéni védett térfogat van az ACAS légijármű számára, amely az egyes veszélyeztetőkkel párosul.

3.5.3 VÉDETT TÉRFOGAT

Egy megközelítő légijármű akkor válik veszélyeztetővé, amikor behatol a saját légijárművet körülvevő védett térfogatba. A védett térfogatot távolság vizsgálattal (csak távolság adatot felhasználva) és magasság vizsgálattal (magassági és távolsági adatokat felhasználva) határozzák meg. Ezeknek a vizsgálatoknak az elvégzése pozitív vagy negatív értéket szolgáltat (attól függően, hogy a veszélyeztető légijármű a védett térfogat megfelelő részén kívül vagy belül van). Egy megközelítő légijárművet veszélyeztetőnek nyilvánítanak, ha mindkét vizsgálat pozitív eredményt szolgáltat.

3.5.3.1 *A VÉDETT TÉRFOGAT FOGALMAINAK ISMERTETÉSE*

Összeütközési sík - Collision plane. A távolság vektort és a megközelítő légijárműtől kiinduló pillanatnyi relatív sebesség vektort magában foglaló sík.

Kritikus keresztmetszet terület - Critical cross-sectional area. A védett térfogatnak a főtengelyre merőleges síkban fekvő maximális keresztmetszeti területe.

Pillanatnyi relatív sebesség(ek) - Instantaneous relative velocity(ies). A relatív sebesség aktuális értékének a modulusza

Lineáris hiányzó távolság (m_a) - Linear miss distance (m_a). Az a minimális érték, amelyet a távolság fel fog venni azon feltételezés mellett, hogy mind a megközelítő, mind a saját légijármű az éppen elfoglalt helyzetéből kiindulva, gyorsulás nélkül mozog.

Lineáris idő a legszorosabb megközelítésig (t_a) - Linear time to closest approach (t_a). Az az idő, amely a legszorosabb megközelítésig telne el, ha mind a megközelítő, mind a saját légijármű az éppen elfoglalt helyzetéből kiindulva, gyorsulás nélkül mozogna.

Feltéve, hogy az ACAS részére a távolság számítások készítéséhez csak a távolság és a távolság változási sebesség becslési információ áll rendelkezésre, mind a lineáris hiányzó távolság, mind a lineáris idő a legszorosabb megközelítésig észlelhetetlen mennyiségek.

Az észlelhetetlen mennyiségek, a lineáris hiányzó távolság és a lineáris idő a legszorosabb megközelítésig, valamint az észlelhető mennyiségek, az r távolság, és az $\dot{r}$ távolság változási sebesség közötti összefüggést a következő egyenlőség fejezi ki:

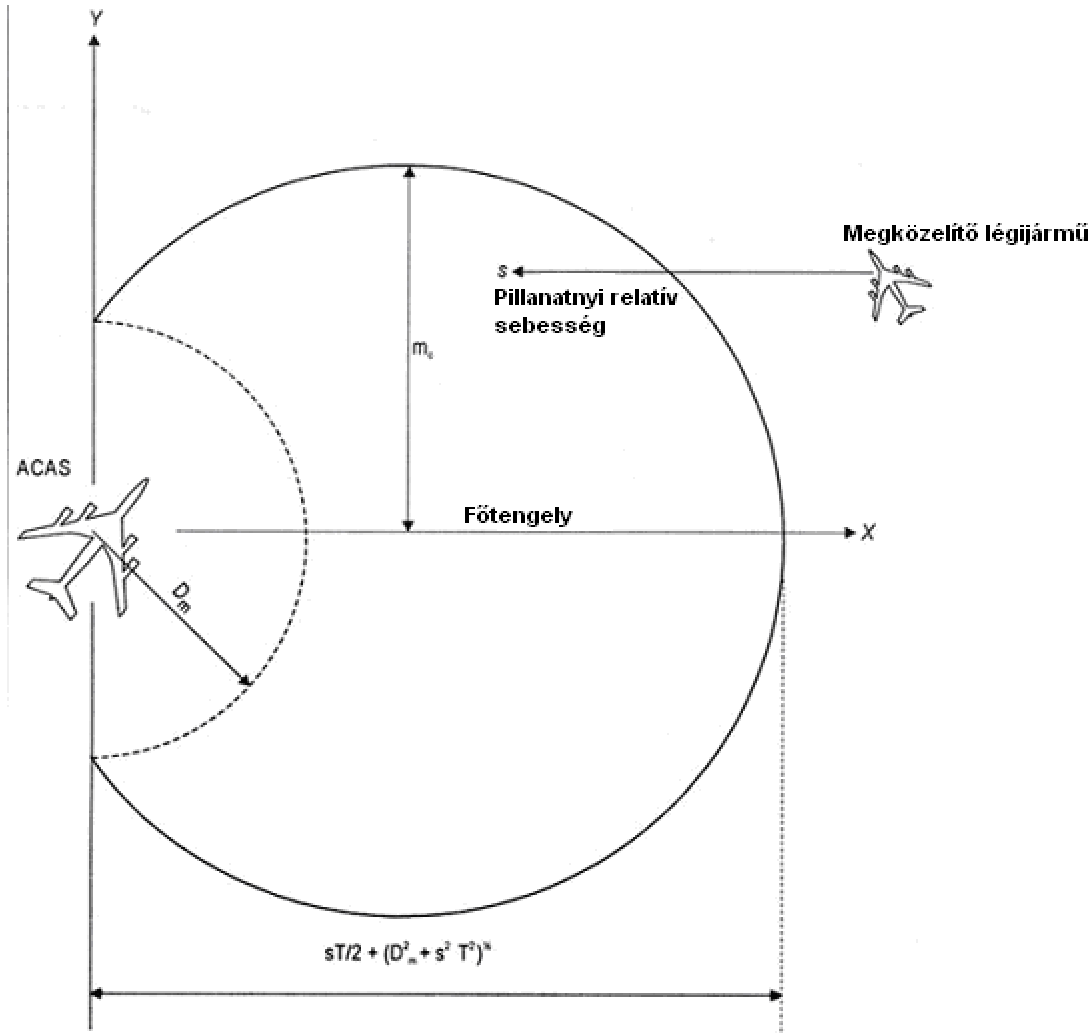
$$t_a = \frac{(r^2 - m_a{}^2)}{(-r\dot{r})}$$

Főtengely. A védett térfogathoz kapcsolódó, az ACAS II légijárművön keresztül haladó vonal, amely párhuzamos a pillanatnyi relatív sebesség vektorral.

Távolság konvergencia. Egy légijárművet távolságban egymáshoz közeledőnek (konvergálónak) tartanak, ha a távolság változási sebesség kisebb vagy egyenlő zérus.

3.5.4 TÁVOLSÁG VIZSGÁLAT

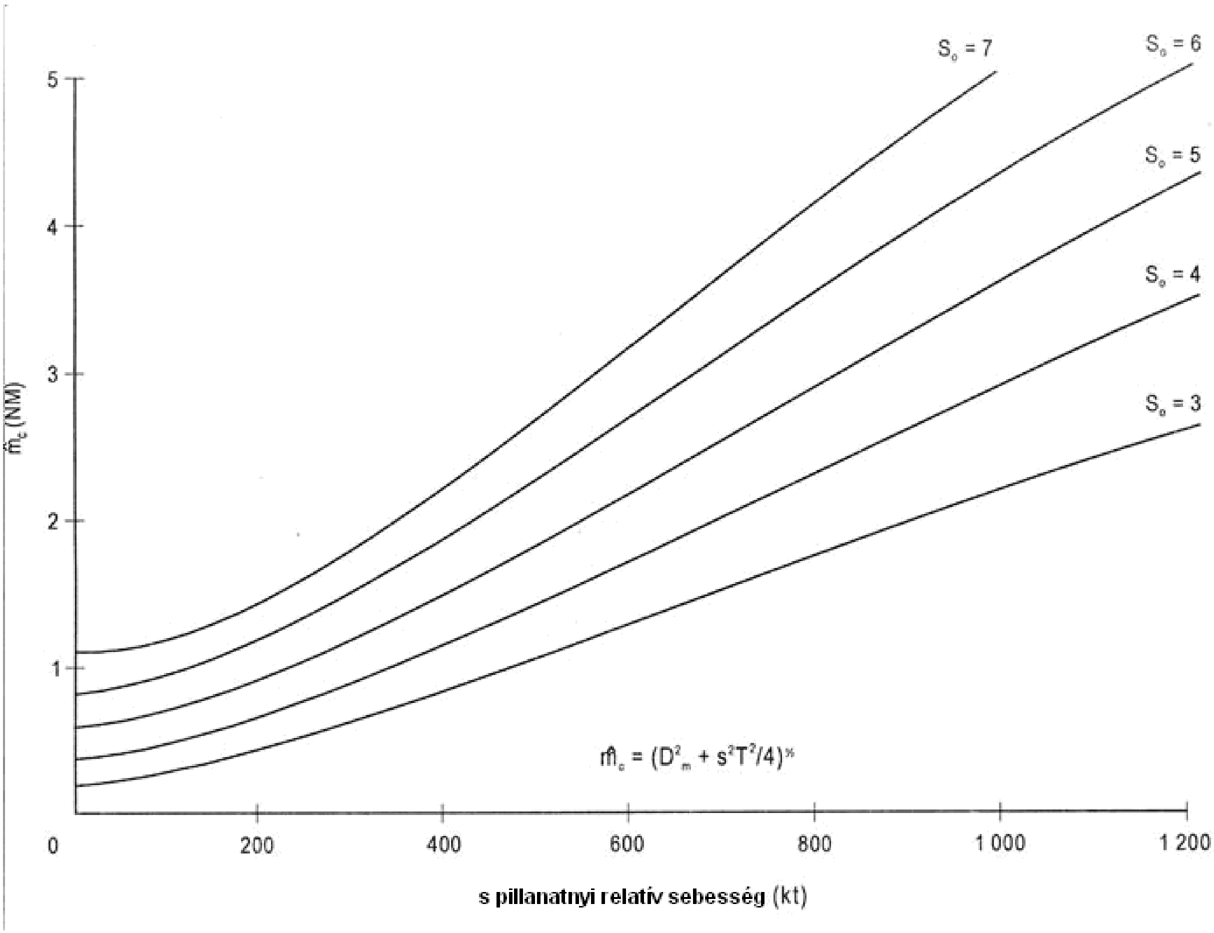
3.5.4.1 A távolság vizsgálatból adódó védett térfogatot, amelyet az ACAS 4. Szakaszban leírt megvalósításában használnak, az A-5 ábrán illusztrált vizsgálat realizálható megvalósításának maximális méretei fogalmaiban határozzák meg. Ez egy védett térfogaton átmenő metszetet mutat, amelyet a távolság vizsgálat a légijárművet és a pillanatnyi relatív sebességet magában foglaló síkban generál. A védett térfogat a folyamatos vonallal ábrázolt görbének az *x* tengely körüli forgatásával keletkezik. Érdemes megjegyezni, hogy a főtengely hossza az *s* relatív sebesség függvénye. A realizálható távolság vizsgálatánál a pillanatnyi relatív sebesség vektorra merőleges síkban lévő, a védett térfogaton átmenő maximális keresztmetszet sugara az m_c Ez a maximális hiányzó távolságot mutatja, amelynél figyelmeztetés generálódhat, ha a védett térfogatba belépés idején a meglévő sebesség a legszorosabb megközelítésig fennmarad. A főtengely hossza az az alapvető sajátosság, amely a figyelmeztetési időpontot meghatározza, míg m_c a tervezett hiányzó távolságot szabályozza, amely valószínűleg figyelmeztetést generál. Ideális esetben a figyelmeztetési idő *T* másodperc lenne, és m_c pedig olyan, hogy csak azok a megközelítő légijárművek minősülnének figyelmeztetés kiadását kiváltónak, amelyek a tervezet szerint D_m-nél (a szaggatott vonallal rajzolt kör az A-5 ábrán) kisebb hiányzó távolsággal bírnak. A D_m jelentése az, hogy amikor mint a 4. Szakaszban leírt ACAS megvalósításban lévőt specifikálják, jó megközelítéssel azt a hosszanti elmozdulást képviseli, amelyet egy légijármű a *T*. idő után tapasztal, amikor konstans *g*/3 gyorsulással (bedöntési szög = 18°) fordulót hajt végre. Így D_m előretervezett hiányzó távolság esetén, amikor az idő a legszorosabb megközelítésig *T*, összeütközés következhet be, ha a két légijármű közül az egyik egy *g*/3 gyorsulásos manővert hajt végre. Megfelelő iránytengely változási sebesség és távolság változás sebesség adatok híján az ACAS nem tudja az ideális esetet elérni Az A-6 ábra m_c maximális megengedett értékét mutatja (azaz m_c-t, mint a relatív sebesség és az érzékenységi szint függvényét). Amikor a relatív sebesség nagyon kicsi, ami egy hátulról való közeledés esetén fordulhat elő, a távolság vizsgálat által előállított védett térfogat egy D_m sugarú gömb lesz, amelynek középpontja az ACAS légijármű.



A-5 ábra. A védett térfogaton keresztüli metszet a pillanatnyi összeütközési síkban

3.5.4.2 Lényegében a távolság vizsgálat pozitív eredményt ad, ha közelítőleg T másodperc marad a legszorosabb megközelítés előtt, a relatív sebesség vektort úgy lehet előre tervezni, hogy áthaladjon egy m_c sugarú körön, amelynek középpontja az ACAS légijárművön van, és a relatív sebesség vektorra merőleges síkban helyezkedik el. Mivel m_c értéke a megfelelő függőleges elkülönülés értékéhez képest nagyon nagy, a vizsgálat önmagában nagyszámú felesleges figyelmeztetést generál. Ezért a távolság vizsgálati védett térfogatot szerényebb arányban kell kiszabni, magassági adatok felhasználásával. Ez elkerülhetetlenül csökkenti a függőleges síkban végrehajtott manőverektől való immunitást.

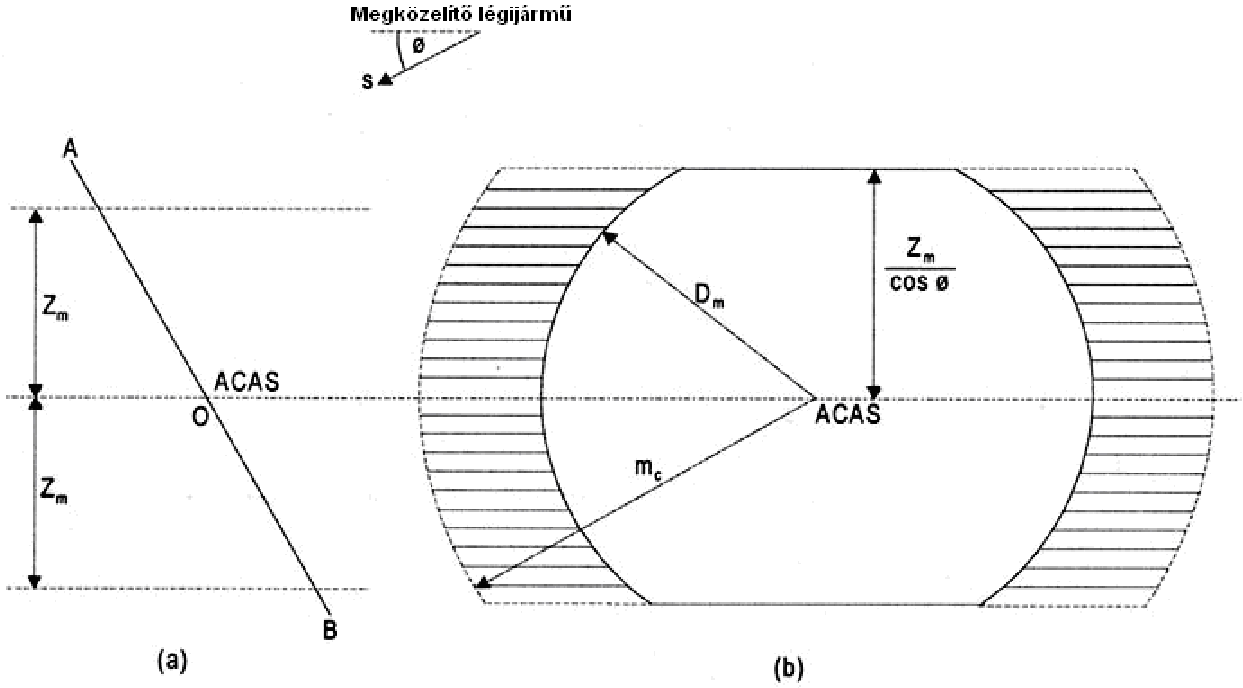
3.5.4.3 A távolság vizsgálatra vonatkozó korlátozásokat úgy tervezik meg, hogy T másodperc névleges figyelmeztetési időt adjon, amely a relatív sebesség vektorra merőleges D_m elmozdulást létrehozó manővert tesz lehetővé. Ezt demonstrálja az, hogy egy elegendően nagy relatív sebességgel történő találkozásnál a fordulót végző légijármű által létrehozott gyorsulás közel merőleges a relatív sebesség vektorra. Kis relatív sebességnél jelentős, a relatív sebesség vektor irányába mutató gyorsulás komponens léphet fel. A figyelmeztetési idő e komponens miatti erózióját a védett térfogat főtengelyének minimális hossza kompenzálja, amely nagyobb, mint sT.



A-6 ábra. Kritikus hiányzó távolság

3.5.5 MAGASSÁG VIZSGÁLAT

3.5.5.1 A magasság vizsgálat célja kiszűrni azokat a megközelítő légijárműveket, amelyek pozitív eredményt adnak a távolság vizsgálatnál, de nincsenek megfelelően elkülönítve a függőleges méretekben. A magassági vizsgálatot a figyelmeztetés mértékének csökkentésére használják annak ismeretében, hogy a szabványos függőleges elkülönítési távolságok a légijárműveknél általában sokkal kisebbek, mint a szabványos vízszintes elkülönítési távolságok. Elkerülhetetlen eredmény az, hogy a gyorsulás védelem, amelyet névlegesen a távolság vizsgálat az összes síkban szolgáltat, nagymértékben korlátozott a vízszintes síkban. Továbbá, még relatív gyorsulás nélkül is, a magasság vizsgálat késleltetheti a figyelmeztetések kiadását, ha valamilyen függőleges elkülönülés létezése a legszorosabb megközelítésnél előrejelzett. Két légijármű relatív mozgásának elevációs (látóhatár fölötti szögmagasság szerinti) nézetét mutatja az A-7 ábra. AOB egy olyan síkot képvisel, amely merőleges a relatív sebesség vektorra és az ACAS légijárművet tartalmazza. A megközelítő légijármű vízszintesen elmozdulhat az ACAS-tól, így nincs szükségszerűen az ábra síkjában. A magasság vizsgálat lényeges tulajdonsága, hogy pozitív eredmény hozását célozza, ha az előretervezett függőleges hiányzó távolság kisebb, mint Z_m. A 4. Szakaszban ismertetett ACAS megvalósításban Z_m 180 m-től (600 láb) 240 m-ig (800 láb) terjedő lépcsőkben változik a magassággal .



A-7 ábra. Kritikus terület ideális magasság vizsgálatnál

3.5.5.2 Mivel a fő érdeklődés a D_m-nél kisebb előretervezett hiányzó távolságú megközelítő légijárművek felé irányul, egy ideális magasság vizsgálat (kombinálva egy ideális távolság vizsgálattal) pozitív eredményt szolgáltat, ha *többek között,* a viszonylagos sebesség vektor úgy tervezett, hogy keresztül halad az A-7 ábrán folytonos vonallal feltüntetett kritikus területen. A gyakorlatban a 3.5.1.2 pontban felvázolt távolsági vizsgálat és a magassági vizsgált teljesül, ha a vektor keresztül halad a szaggatott vonallal meghatározott nagyobb területen. Azok a megközelítő légijárművek, amelyek a vonal közötti területeken haladnak át, valószínűleg növelik a szükségtelen figyelmeztetések számát.

3.5.5.3 A magasság vizsgálat nem eredményesebb a legszorosabb megközelítés idejének előrejelzése szempontjából, mint a távolság vizsgálat. Ez azt jelenti, hogy ha más feltételek nem állnak fenn, a távolság vizsgálat meghatározza a figyelmeztetés idejét. Azonban a 4. Szakaszban leírt ACAS megvalósítás magasság vizsgálatának egy további sajátossága annak a lehetőségnek ellenében törekszik hatni, hogy a légijárművek egyike a másiknál kisebb vagy nagyobb magassági szintre kerüljön, így elkerüljenek egy szoros találkozást. A találkozások két típusa ismeretes: az első, amelyben az éppen meglévő függőleges elkülönülés kisebb, mint $Z_{t,}$ (lásd 4.3.4.2 alpont) és egy másik, amelyben a meglévő elkülönülés nagyobb, mint $Z_{t,}$ és a légijárművek magasságban összetartanak (konvergálnak). Az első típusnál az ACAS magasság vizsgálat csak azt igényli, hogy a kritikus terület úgy legyen előre tervezve, hogy abba behatolás történjen. A másodiknál egy pótlólagos feltétel, hogy a közös magasság szint elérési ideje kisebb vagy egyenlő legyen egy időküszöbbel, amely néha kisebb, mint *T,* a névleges figyelmeztetési idő. A hatás az, hogy a figyelmeztetési időt a távolság vizsgálat szabályozza azoknál a megközelítő légijárműveknél, amelyekre magasság kereszteződés van előretervezve a legszorosabb megközelítés előtt, míg későbbi figyelmeztetéseket adnak a legszorosabb megközelítés utáni magasságkereszteződéseknél.

3.5.6 MEGALAPOZOTT VESZÉLYEZTETÉSEK

3.5.6.1 Megalapozott veszélyeztető egy olyan megközelítő légijármű, amelyet veszélyeztetőnek minősítettek és még kiérdemli a megoldási tanácsadást.

3.5.6.2 A követelmény, hogy mind a távolság vizsgálat, mind a magasság vizsgálat ugyanazon működési ciklusban pozitív eredményt adjon, mielőtt egy megközelítő légijárművet veszélyeztetőnek nyilvánítanának (3.5.2.1 alpont), csak új veszélyeztetőkre érvényes. Következésképpen csak a távolság vizsgálatot alkalmazzák, és pozitív eredménynek az a hatása, hogy a veszélyeztető státusz fennmarad. A magasság vizsgálat elhagyásának az oka az, hogy egy gyors repülőgépvezető reagálás, vagy az a tény, hogy a megközelítő légijármű kezdetben még éppen kielégíti a magassági kritériumokat, a veszélyeztető státusz törlését okozhatja a legszorosabb megközelítés elérése előtt.

3.5.7 FIGYELMEZTETÉSI RÁTA

3.5.7.1 A figyelmeztetési rátát szabályozó alapvető változók: a relatív sebesség, a hiányzó távolság és a környező légijármű sűrűség. A figyelmeztetési rátát befolyásoló alapvető ACAS paraméterek: *T,* D_m *és* Z_m*.* A figyelmeztetés rátát állandó sebességű véletlen forgalom esetére lehet számítani, de a látod-és-elkerülöd hatások és a légiforgalmi irányítás az ilyen számításokat a valódi forgalomra nagyon bonyolulttá teszik. Az A-6 ábra némi iránymutatást ad egy előfordulás néhány sajátosságáról, amely figyelmeztetés kiadását idézheti elő, bár nem ad segítséget a magasság vizsgálat eredményének meggondolásához. Például látható, hogy 5-ös érzékenységi szintnél (50-es és 100-as repülési magasságszint között) nem lehet figyelmeztetés, ha a vízszintes elkülönülés nagyobb, mint 5,5 km (3 NM) és a relatív sebesség kisebb, mint körülbelül 440 m/s (850 csomó).

3.5.7.2. Földi radar felderítési adatokat felhasználó szimulációk és az ACAS berendezésekkel nyert kezdeti tapasztalatok azt mutatták, hogy a figyelmeztetési ráta értéke tipikus sűrűségű légtérben 30 repült órában kapott 1 értékű arányszámtól, az 50 repült órában kapott 1 értékű arányszámig terjedő tartományban helyezkedik el.

3.5.8 VESZÉLYEZTETŐ MEGOLDÁS

3.5.8.1 *KOORDINÁCIÓ*

Ha a veszélyeztető státuszú légijármű ACAS II-vel vagy ACAS III-mal van felszerelve, a saját ACAS-tól megkövetelt, hogy koordináljon a veszélyeztető státuszú légijármű ACAS-ával az S-módú adatkapcsolaton keresztül, hogy biztosítsa összeegyeztethető megoldási tanácsadások kiválasztását. A kiválasztott tanácsadás jellegét befolyásolja az a tény, hogy a veszélyeztető ACAS-al felszerelt.

3.5.8.2 *MEGOLDÁSI TANÁCSADÁSOK OSZTÁLYOZÁSA*

3.5.8.2.1 Az ACAS elkerülési manőverek a függőleges síkra korlátozódnak és az értelem (fel vagy le) és az erősség jellemzi őket. Egy felfelé történő elmozdulás értelmű megoldási tanácsadás célja biztosítani, hogy a saját légijármű biztonságosan haladjon el a veszélyeztető felett. Egy lefelé történő elmozdulás értelmű megoldási tanácsadás célja biztosítani, hogy a saját légijármű biztonságosan haladjon el a veszélyeztető alatt. A felfelé történő elmozdulás értelmű megoldási tanácsadás erősségekre példák: "korlátozni a függőleges sebességet" (meghatározott célnak süllyedési sebesség), “nem süllyedni” vagy “emelkedni”. Lefelé irányúló értelmű azonos megoldási tanácsadás erősségre példák: “korlátozni a függőleges sebességet” (meghatározott célnak emelkedési sebesség), “nem emelkedni” vagy “süllyedni”. A megoldási tanácsadásoknak két típusa van: “pozitív”, egy kívánságot jelent bizonyos sebességgel történő emelkedésre vagy süllyedésre; és “függőleges sebesség korlátozás” azt jelenti, hogy a függőleges sebesség előírt tartományát kerülni kell. Bármely tanácsadás lehet “helyesbítési” vagy “megelőző”. Helyesbítési tanácsadás a saját légijármű fennálló függőleges sebességének változtatását kívánja, míg a megelőző tanácsadás nem kívánja.

3.5.8.2.2 Elvárás, hogy a generált megoldási tanácsadás ellentmondásmentes legyen a repülési pálya korlátozásokkal bizonyos repülési üzemmódokban a repülési burkológörbe korlátozások és az emelkedő képességet csökkentő légijármű konfigurációk miatt. Elvárható, hogy a légijármű manőver korlátozási kijelzései, amelyek az ACAS részére rendelkezésre állnak, a tényleges légijármű teljesítőképesség konzervatív értékelését ajánlják. Ez különösen igaz az emelkedés gátlására. Abban a ritka és sürgős esetben, amikor egy nagymagasságú lefelé irányuló értelmű megoldási tanácsadást emelkedésbe fordítanak át, várható, hogy nagyon gyakran a légijármű teljesítőképessége, amelyet összhangba kell hozni a megoldás tanácsadással, rendelkezésre fog állni az emelkedés korlátozás dacára. Amikor ilyen képességek nem állnak rendelkezésre, várható, hogy legalább részben a repülőgépvezető mindig képes lesz eleget tenni az irányváltásnak egy azonnali vízszintes repülésbe való átmenettel.

3.5.8.3 *MAGASSÁGI ELKÜLÖNÍTÉSI CÉL*

3.5.8.3.1 Hogy biztosan elkerüljük az összeütközést, az ACAS-nak valódi magassági elkülönítést kell szolgáltatnia a legszorosabb megközelítésnél, amely a légijármű méreteihez és a legrosszabb esethez tartozó iránybeállításához igazodik. Mivel csak mért adatok állnak rendelkezésre, megfelelően figyelembe kell venni a magassági hibákat mindkét légijárműnél. Továbbá, az elkerülési műveletet a legszorosabb megközelítés előtt meg kell kezdeni, így lehetséges, hogy ez a művelet a legszorosabb megközelítésnél előrejelzett magassági elkülönítésen alapul, amely további hibaforrást visz be. Ezek a tényezők egy olyan követelményhez vezetnek, hogy a repülőgépvezető részére szolgáltatott megoldási tanácsadásnak olyannak kell lenni, hogy a kívánt magassági elkülönítést a legszorosabb megközelítésnél a rendelkezésre álló idő alatt elérje. Ez az A_1 magassági elkülönítési cél, a magasságmérési hibák megfelelő kompenzálása érdekében a magasság függvényében kell, hogy változzon. A 4. Szakaszban ismertetett ACAS megvalósításnál A_1 90 m-től (300 láb) 210 m-ig (700 láb) változik.

3.5.8.3.2 A legszorosabb megközelítés időpontját nem lehet pontosan számítani, mivel a hiányzó távolság nem ismert, a veszélyeztető légijármű manővert hajthat végre és a távolság megfigyelések nem tökéletesek. Azonban a hasznosnak és elfogadhatónak talált korlátozások nem mások, mint azok a idők a legszorosabb megközelítésig, feltételezve, hogy a hiányzó távolság felveszi a legnagyobb értéket (D_m) és a zérus értéket és minden más hibaforrás elhanyagolásra került. Ez a tartomány kritikus azoknál a találkozásoknál, amelyeknél a távolság változási sebesség nagyon kis értékeket vesz fel. A magasság szerinti elkülönítés értéknek a teljes időköz alatti fenntartásával a megoldási tanácsadás kiválasztása közömbössé van téve a minimális távolsági idő számításában fellépő potenciálisan nagy hibákkal szemben. Ilyen hibák a távolság változási sebesség számításában fellépő kis abszolút hibákból származnak. Megelőző megoldási tanácsadásoknál a megoldási tanácsadás által ajánlott korláthoz való arány azonnali megváltozásának feltételezése azt fogja eredményezni, hogy a számítás egy határt szolgáltat (felsőt lefelé irányuló értelmű megoldási tanácsadás esetén, alsót felfelé irányuló értelmű megoldási tanácsadás esetén) a saját légijármű magasságára a legszorosabb megközelítésnél.

3.5.8.4. *MINIMÁLIS SZAKADÁS*

3.5.8.4.1 Elvileg a nagyobb megkívánt magasság elkülönítéseket élénkebb elkerülési manőverrel el lehet érni, de akadályt jelent az utaskényelem, légijármű képességei és a légiforgalmi irányítás engedélyétől való eltérés. Az alább következő 4. Szakaszban leírt ACAS paraméterek azon a számításon alapulnak, hogy a tipikus magasságváltoztatási sebesség, ami egy összeütközés elkerüléshez szükséges, 1500 láb/perc.

3.5.8.4.2 A tanácsadás irányának és erősségének kezdeti megválasztása, az alább ismertetett kivételektől eltekintve, arra irányul, hogy az ACS légijármű függőleges repülési pályájában a lehető legkisebb változtatást igényelje. És a tanácsadástól elvárják, hogy ha lehetséges, a találkozás későbbi stádiumában megfelelő mértékben legyengített legyen és végképpen megszünjön, amikor a kívánt elkülönítést a legszorosabb megközelítésnél elérte. Elsődleges szempont a légiforgalmi irányítás engedélyezéseitől való eltérés minimalizálása.

3.5.8.5 *REPÜLŐGÉPVEZETŐ REAGÁLÁS*

Mivel a repülőgépvezető döntő befolyást gyakorol a rendszer hatékonyságára, az ACAS-nál bizonyos feltételezéseket kell tenni a repülőgépvezető reagálására vonatkozóan. A 4. Szakaszban leírt ACAS megvalósítás 5 másodperc reakció időt használ egy új tanácsadásnál, és *g/4* gyorsulást az elkerülési sebesség létrehozásánál. A reakció idő 2,5 másodpercre csökken az ezt követő tanácsadás változásoknál. Az ACAS nem szolgáltathat megfelelő függőleges elkülönítést, ha a repülőgépvezető reakció késése meghaladja a tervezet által feltételezett repülőgépvezető reagálási késést.

3.5.8.6 *VÍZSZINTES REPÜLÉST VÉGZŐ MEGKÖZELÍTŐ LÉGIJÁRMŰVEK*

3.5.8.6.1 A figyelmeztetés idején vízszintes repülést végző és ezt azután is folytató megközelítő légijárművek kevés problémát okoznak az ACAS számára. Ha a saját légijármű is vízszintes repülést végez, nem áll fenn számítási probléma. Amit az összes ACAS légijárműnek csinálni kell az az, hogy abban az irányban kell mozognia, amely növeli a céltól való elkülönülés meglévő értékét. Ennek az egyszerű logikának olyan akadályai lehetnek, hogy az ACAS légijármű esetleg nem képes emelkedni, vagy túl közel lehet a földhöz ahhoz, hogy biztonságosan süllyedni tudna.

3.5.8.6.2 A manőverezés korlátozottsági problémák nagyrészt eltünnek, amikor az ACAS légijármű emelkedést vagy süllyedést hajt végre, mivel az elkülönítést gyakran el lehet érni a vízszintes repülésbe való átmenettel. És a számítási probléma valószínűleg igen csekély lesz, ha az ACAS-ba nagy feloldású, saját magasságra vonatkozó adatok vannak betáplálva.

3.5.8.7 *EMELKEDÉST/SÜLLYEDÉST VÉGZŐ MEGKÖZELÍTŐ LÉGIJÁRMŰVEK*

Emelkedést, vagy süllyedést végrehajtó megközelítő légijárművek több nehézséget okoznak, mint a vízszintes repülést végzők. Gyakran jelent problémát magasságváltozási sebességük megállapítása. Az is nyilvánvaló, hogy egy emelkedést vagy süllyedést végrehajtó veszélyeztető, amely a számítások szerint a saját légijárműhöz közel fog elhaladni, nagyobb valószínűséggel vízszintes repülésbe megy át, mint hogy megtartja megfigyelt magasság változtatási sebességét, így kerülve el a szoros találkozást. Ezért az ACAS-nak a megoldási tanácsadás kiválasztásnál figyelembe kell venni azt a lehetőséget, hogy a veszélyeztetők vízszintes repülésbe mehetnek át, pl. a légiforgalmi irányítás utasítására reagálva. A veszélyeztető légijármű nyomon követett magasság változási sebességének alacsony megbízhatósága azt okozhatja, hogy a megoldási tanácsadás generálás e sebességnek egy jobb becslésére várva késedelmet szenved.

3.5.8.8 *MAGASSÁG KERESZTEZÉS MEGOLDÁS TANÁCSADÁSOK*

3.5.8.8.1 Megközelítő légijárművek, amelyeknél egy ACAS légijármű repülési magasságának keresztezése tervezett, egy teljesen hatékony ACAS tervezését rendkívüli mértékben megnehezíti, mivel az ilyen megközelítő légijárművek vízszintes repülésbe mehetnek át. Néhány magasság keresztező megoldási tanácsadást a repülőgépvezetők intuició ellenesnek találnak. Valóban, az ilyen megoldási tanácsadások kezdetben a repülőgépvezetőtől olyan manővert igényelnek, amely a megközelítő légijármű felé irányul, átmenetileg csökkentve a magasság szerinti elkülönülést. Mindazonáltal megfigyeltek olyan eseteket, amelyekben magasság keresztezési megoldási tanácsadások nyilvánvalóan megfelelőek, és még nem demonstrálták, hogy ezeket kívánatos, vagy lehetséges teljesen elkerülni. A magasság keresztezés megoldási tanácsadások gyakorisága valószínűleg függ a légijármű vezetésétől és viselkedésétől. Ismert, hogy a nagy sebességgel emelkedő, vagy süllyedő légijármű gyakrabban vált ki megoldási tanácsadást, közöttük magasság keresztező megoldás tanácsadást, mint más légijármű. Egy engedélyezett repülési magassághoz nagy sebességgel közeledő és azután egy másik légijármű közelében vízszintes repülésbe átmenő légijármű hatását lentebb ismertetjük. Ezeknek a hatásoknak a mérséklésére szolgáló intézkedéseket a 3.5.8.9 alpont írja le.

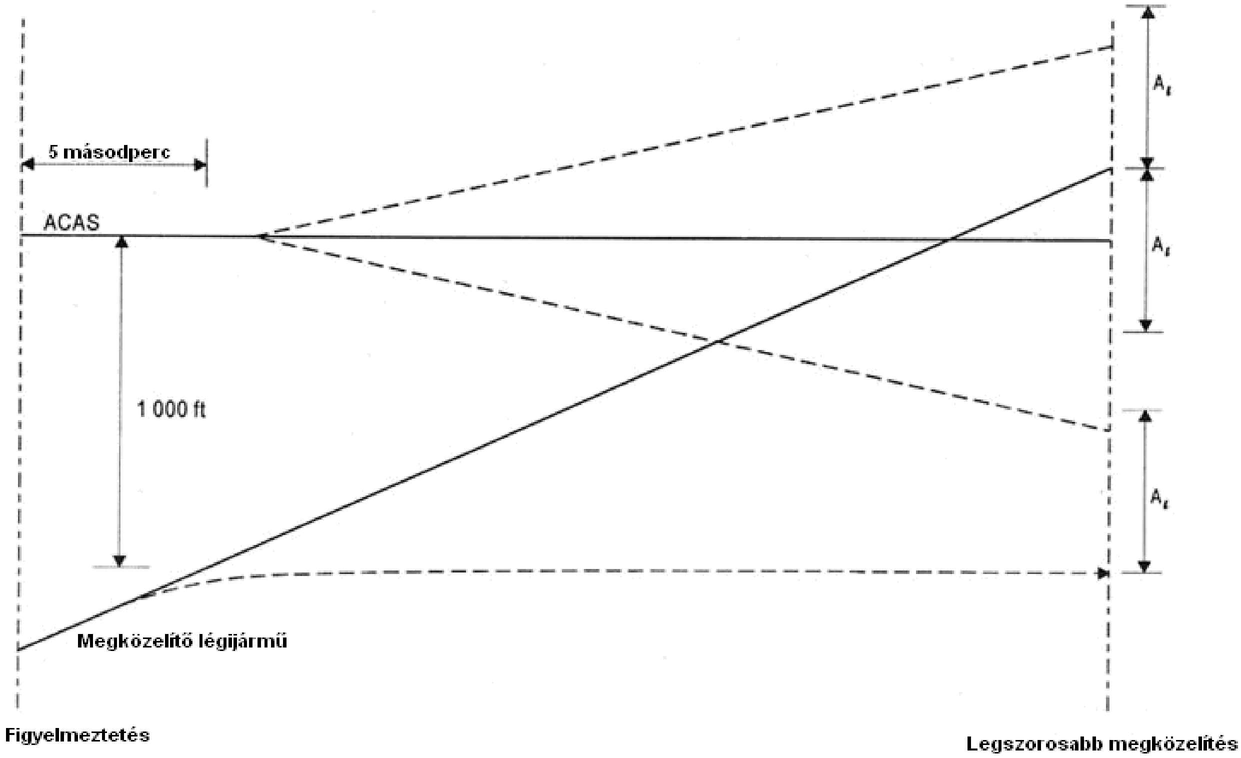
3.5.8.8.2 Az A-8 ábrán illusztrált helyzetnél feltesszük, hogy a figyelmeztetés akkor következik be, amikor a megközelítő légijármű emelkedő repülést végez a vízszintes repülést végző ACAS légijármű irányába. Adottnak vesszük, hogy az emelkedés folytatódik, akkor a legjobb elkerülő stratégia a saját légijármű részére süllyedés a veszélyeztető légijármű felé, amely a veszélyeztető magasságának keresztezésével jár. Egy elemelkedés esetleg szolgáltathat elegendő függőleges távolságot, de ugyanazon elkerülési sebesség mellett a süllyedés nagyobb távolságot biztosít a veszélyeztetőtől. Ha a saját légijármű süllyed, látható, hogy veszélyes helyzet alakulhat ki, ha a veszélyeztető vízszintes repülésbe megy át kardinális repülési szinten a saját légijármű alatt. Az ilyen manőverek megszokottak bizonyos ellenőrzött légterekben, mivel ezeket a légiforgalmi irányítók arra használják, hogy a légijárműveket biztonságosan átvigyék a megkívánt függőleges elkülönítésbe olyan helyzetek esetén, amikor a vízszintes elkülönítés kicsi. Az ACAS tervezés, amely az értelem olyan választásán alapszik, amely valószínűleg a legnagyobb magasság szerinti elkülönítést adja, szoros találkozást hozhat létre, amikor ilyen egyébként nem jönne létre. Egy ACAS tervnek intézkedéseket kell tartalmaznia, hogy azt a lehető legnagyobb mértékben immunenssé tegye az ilyen eseményekkel szemben.

3.5.8.9. *Gondoskodás az indukált szoros találkozások elkerüléséről.* A veszélyeztető légijármű szándékaira vonatkozó ismeretek teljes hiányában az ACAS jellege olyan, hogy azt feltételezi, hogy a veszélyeztető légijármű fenn fogja tartani meglévő magasság változtatási sebességét, de olyan megoldási tanácsadást választ, amely csökkenti a veszélyeztető légijármű valószínű manőverének hatását. Egyéb tulajdonságok gondoskodnak annak lehetőségéről, hogy a veszélyeztető légijármű következő manőverét észleljék. Például a 4. Szakaszban ismertetett megvalósítás az alább közölt logikát használja.

3.5.8.9.1 *Az értelem választás eltérítés*. Ha egy pozitív nem-magasság-keresztezési tanácsadásnál előrejelzik, hogy legalább elegendő magasság elkülönítést ad a legszorosabb megközelítésnél (A_l), akkor előnyben részesül az az értelem, amely megakadályozza, hogy a légijármű a legszorosabb megközelítés előtt keresztezze a magasságot, ha a veszélyeztető légijármű nem megy át vízszintes repülésbe. Nyilvánvaló, hogy bizonyos körülmények között a magasság keresztező megoldási tanácsadás rosszabb lehet, mint a nem magasság keresztező megoldás tanácsadás.

3.5.8.9.2 *Növelt sebességű megoldási tanácsadás*. Ha az értelem választása a 3.5.8.9.1 pontban leírt eljárás eredményeképpen valósult meg, azt eredményezi, hogy a saját légijármű eltávolodik a veszélyeztetőtől, a találkozás még nincs megoldva, ha a veszélyeztető légijármű megnöveli a magasság változtatási sebességét. Ilyen esetben az ACAS légijármű repülőgépvezetője arra van késztetve, hogy növelje saját magasság változtatási sebességét abban a törekvésében, hogy megszökjön a veszélyeztető elől.

3.5.8.9.3 *Magassági elkülönítés vizsgálat.* Az értelem választás eltérítés nem mindig eredményez olyan tanácsadást, hogy távolodjon el a veszélyeztetőtől, és magasság szerinti elkülönítési vizsgálatot is végeznek, hogy tovább csökkentsék egy indukált szoros találkozás esélyét, amely amiatt jönne létre, mert a veszélyeztető légijármű vízszintes repülésbe megy át, vagy csökkenti magasság változtatási sebességét. A vizsgálat a megoldási tanácsadás kiadásának a késleltetését idézi elő, amíg a veszélyeztető szándékának nagyobb biztonságú kikövetkeztetését el lehet érni. Ez nem mentes attól a kockázattól, hogy az ACAS nem lesz képes a találkozást megoldani. A 4. Szakaszban ismertetett ACAS megvalósítás kiegyenlíti ezeket a konfliktusos kockázatokat az alább ismertetett logikával.



A-8 ábra. Indukált szoros találkozás

3.5.8.9.3.1 Az A-8 ábrán bemutatott típusú helyzetnél, amely egy jelentős magasságváltoztatási sebességgel rendelkező veszélyeztető légijárművet ábrázol, a figyelmeztetés késleltetés nélkül akkor kerülne kiadásra, amikor a légijárművek magasság szerint még jól elkülönültek. Például, amikor a figyelmeztetési idő 5 másodperc és a magasság változási sebesség 900 m/perc (3000 láb/perc), a kezdeti elkülönülés 380 m (1250 láb). Ha a helyzet olyan, hogy egy magasság keresztezési megoldási tanácsadást igényel, azaz az eltérő értelem választás hatástalan, az ACAS késlelteti a tanácsadás kiadását, amíg a meglévő magassági elkülönülés egy küszöb (A_c) alá esik, azaz kisebb, mint a szabványos IFR elkülönítés. Ha a veszélyeztető légijármű ténylegesen átmegy vízszintes repülésbe valamilyen magasságban, mielőtt átlépi ezt a küszöböt, ami nagyon valószínű, a figyelmeztetést vagy törlik (Z_m-en kívül történő vízszintes repülésbe való átmenetnél), vagy nem magasság keresztezési tanácsadás kerül generálásra. Más esetben, eltekintve attól a lehetőségtől, hogy a veszélyeztető légijármű éppen túllépte az engedélyezett magasságot, minden jele megvan, hogy folytatja a magasság változtató repülést a saját légijármű repülési szintjéig vagy azon túl, és a magasság keresztezési tanácsadás nagyobb megbízhatósággal adható ki. Ha a helyzet olyan, hogy nem magasság keresztező tanácsadást igényel, csökkentett időküszöböt (T_v) használnak a magassági vizsgálathoz. Ez a függőleges küszöb vizsgálat (VTT) azt a célt szolgálja, hogy visszatartsa a megoldási tanácsadást annyi időre, ami éppen elég ahhoz, hogy a megközelítő légijármű által indított vízszintes repülésbe való átmenet észlelhető legyen.

3.5.8.9.3.2 A magasság szerinti elkülönítés vizsgálat alapvetően azt a célt szolgálja, hogy enyhítse a problémákat, amelyeket műszer szerinti repülésnek megfelelő forgalmi környezetben tapasztalnak. Kívánatosnak tűnhet az A_c érték olyan megválasztása, hogy magasság túlhaladások, vagy még a nem-műszeres repülési szabályok szerinti elkülönítés is lefedett legyen. Azonban az ACAS kockázatát, hogy nem képes a találkozásokat megoldani, gondosan meg kell fontolni.

3.5.8.9.3.3 A vizsgálat két felszerelt légijármű közötti kooperáció előnyét hordozza azáltal, hogy a vízszintes repülést végző légijárművön lévő ACAS-t arra készteti, hogy késleltesse a megoldási tanácsadás kiválasztását, amíg megoldás közlést kap a felszerelt megközelítőtől. Ez utóbbin lévő ACAS-nak csaknem biztosan a magasság változtatási sebességének csökkentését kell választania, és a koordinációs folyamat azt fogja eredményezni, hogy a vízszintes repülést végző légijármű képes fenntartani vízszintes repülési állapotát. A gyakorlatban a késleltetés a találkozás megoldás megkezdésében kicsi lesz, de a kockázat a megoldás elszalasztására kevésbé érzékeny a késleltetésre, mert mindkét légijármű elkerülési műveletet végez. A késleltetés 3 másodpercre van korlátozva, amely normálisan elegendő a veszélyeztető légijárműnek, hogy koordinációt kezdeményezzen.

3.5.8.9.4 *Értelem megfordítás*. Az elővigyázatosság ellenére, amelyet a fent ismertetett indukált szoros találkozások elkerülésére tesznek, még mindig vannak olyan helyzetek, amelyek nincsenek lefedve. Például látás szerinti repülés szabályai szerinti forgalmat tartalmazó légtérben egy veszélyeztető légijármű vízszintes repülésbe való átmenete fordulhat elő 150 m-es (500 láb) névleges elkülönítés mellett. A magassági elkülönítés vizsgálat ilyen körülmények között kevésbé hatékony lehet. Amikor az ACAS megállapítja, hogy a veszélyeztető légijármű manővere semmissé teszi a megoldási tanácsadás kezdeti választását, a tanácsadás értelmét meg lehet fordítani. Azt a követelményt, hogy elérjék a cél magassági elkülönítését a legszorosabb megközelítésnél, fel lehet oldani, amikor ezt a művelet folyamatot végrehajtják.

3.5.8.10 *INDUKÁLT SZOROS TALÁLKOZÁSOK EGYÉB OKAI*

3.5.8.10.1 *Magasságmérési hibák*. Az A_1 elkülönítési célt reprezentáló magasság szerinti elkülönítési paraméternek tartalmaznia kell olyan magasságmérési hiba figyelembe vételét, amely elegendő ahhoz, hogy nagy valószínűségét szolgáltassa annak, hogy nem készteti az ACAS-al felszerelt légijárművet arra, hogy szoros találkozást provokáljon ki, ahol ez reálisan nem áll fenn. Durva magasságmérési hiba esetén azonban kis valószínűsége marad annak, hogy szoros találkozás indukálódik, amikor az eredeti elkülönülés megfelelő. Hasonlóan, kicsi valószínűsége van annak, hogy az ACAS nem lesz képes megoldani egy szoros találkozást magasságmérési hiba miatt.

3.5.8.10.1.1 A Gilham-kódolt adatok használata bármelyik légijárműnél a magasságjelentésben fellépő hibák egy sajátos példája, ami veszélyes közelségeket eredményezett. A saját légijármű esetében az ilyen jellegű hibák megelőzhetők, ha olyan magasságforrást alkalmazunk, amely nem Gilham-kódolt.

3.5.8.10.2 *C-módú hibák*

3.5.8.10.2.1 A veszélyeztető légijármű magasságának a C-módú adatszolgáltatását célzó kódolásban lévő hibák, ha elegendően nagyok, szoros találkozásokat indukálhatnak, nagyjából ugyanolyan módon, mint a durva magasságmérési hibánál. Ilyen találkozások előfordulásának gyakorisága nagyon kicsi olyan légterekben, ahol a légiforgalmi irányítás lépéseket tesz, hogy közölje a repülőgépvezetővel, hogy a légijármű jelentett magassága nem helyes.

3.5.8.10.2.2 A C-módú hiba komolyabb formája akkor fordul elő, amikor a hiba a C-bitekre szorítkozik. Ezeket a légiforgalmi irányítás nem ellenőrzi, amely általában megelégszik azzal, hogy úgy találja, hogy a légijármű a jelentett magasságának előírt tűrésértékén belül van. Egy elakadt vagy hiányzó C bit csak 30 m-es (100 láb) hibát tud létrehozni. Azonban egy ilyen hibának komolyabb hatása lehet a megközelítő légijármű magasság változási sebességének ACAS általi érzékelésére és emiatt indukált szoros megközelítés jöhet létre, vagy elmaradhat a szoros találkozás megoldása.

3.5.8.10.3 *Ellentétes repülőgépvezető reagálás.* A megoldási tanácsadás értelmével ellentétes manőverek a függőleges elkülönülést a veszélyeztető státuszú légijárműtől csökkenthetik, ezért ezeket kerülni kell. Ez különösen igaz egy ACAS-ACAS koordinált találkozás esetén.

3.5.8.11 *TÖBB-LÉGIJÁRMŰVES TALÁLKOZÁSOK*

3.5.8.11.1 Az ACAS számításba veszi három vagy több légijármű szoros közelségbe kerülésének lehetőségét és ez megköveteli egy általános megoldási tanácsadás létrehozásának szükségességét, amely ellentmondásmentes a tanácsadások mindegyikével, amelyet az egyes követett veszélyeztető légijárművekkel szemben individuális alapon adnának ki. Ilyen körülmények között nem várható mindig, hogy az ACAS légijármű A_l magassági elkülönítést érjen el az összes veszélyeztetőre vonatkozóan.

3.5.8.11.2 Rögzített földi radar felderítési adatokon alapuló szimulációk és az ACAS berendezésekkel nyert kezdeti tapasztalatok azt mutatták, hogy többszörös légijármű konfliktusok előfordulása ritka. Ugyancsak nincs bizonyíték “domino” hatásra, amelynél az ACAS légijármű egy veszélyeztető lkerülésére irányuló manővere azt egy harmadik, felszerelt légijárművel hozza.

3.5.9 FÜGGŐLEGES SEBESSÉG BECSLÉS

3.5.9.1 Az ACAS függőleges követő algoritmusnak képesnek kell lennie 25 vagy 100 láb kvantált magasságnövekmény információk használatára a légijármű függőleges sebesség becslések végzése céljából. Ennek a követőnek el kell kerülnie a függőleges sebesség fölébecslését, amikor a jelentett magasságban ugrás következik be, mivel egy légijármű kis függőleges sebességgel az egyik kvantált magasság szintről egy másikra emelkedik. De reagálási korlátozás nem érhető el pusztán a követő kiegyenlítettségének növelésével, mivel a követő akkor lassú lenne a tényleges sebesség változásokra való reagálásoknál, 100 lábra kvantált magasság jelentéseknél a magasság követő (4. Szakaszban) különleges nyomvonal adat-felfrissítési eljárásokat használ, amelyek elnyomják egy izolált magasság átmenetre való reagálást (magasság jelentést, amely különbözik a megelőző magasság jelentéstől) a gyorsulásra való reagálás feláldozása nélkül. A követő szintén tartalmaz néhány olyan tulajdonságot, amely hozzájárul a megbízhatósághoz.

3.5.9.2 A függőleges követő algoritmus néhány kulcsfontosságú tulajdonsága a következő:

a) Mielőtt valamilyen magasság jelentést vesznek az adat felfrissítési rutinok általi felhasználás céljára, vizsgálatokat végeznek annak megállapítására, hogy a jelentés elfogadhatónak tűnik-e, feltéve, hogy a jelentés-sorozatot előzőleg vették. Ha a jelentés elfogadhatatlannak tűnik, félreteszik, bár később felhasználásra kerülhet későbbi jelentések hitelességének ellenőrzésénél.
b) A referencia követő által használt algoritmus rekurzíve átlagolja az időt, inkább a magasság átmenetek között, mint a magasság jelentések között.
c) A követő szigorúan az izolált magasság átmenetekre (azaz azokra az átmenetekre, amelyek nem részei valamilyen magassági trendnek) korlátozza a reagálást. Az izolált magasság átmenet a sebesség becslés megkezdését eredményezi egy meghatározott mérsékelt sebességre az átmenet irányában. A sebesség becslése zérus felé tendál minden egymást követő magasság átmenet nélküli pásztázásnál.
d) Amikor egy átmenetről megfigyelték, hogy irányban ellentmondásmentes az előző átmenettel, akkor azt trendnek nyilvánítják. A magasság változtatási sebesség kezdeti értéke ellentmondásmentes két átmenet közötti idővel.
e) A kvantálási hatások miatti sebesség ingadozások elnyomódnak, amikor trend vagy szint követés kinyilvánítása történik. Trend periódus alatt a magasság átmenetet nem jelző jelentéseket megvizsgálja, annak megállapítása érdekében, hogy az átmenet hiánya összhangban van-e irány és idő szerint az előzőleg számított sebességgel. Ha nincs ellentmondás mentesség ezekkel, akkor a sebességet egy alacsonyabb értékre állítják vissza. Ha ellentmondás mentesség áll fenn, a sebesség változatlan marad.
f) Ha trend kinyilvánítás történik és átmenet figyelhető meg, akkor vizsgálatot végez, hogy megnézze, hogy az átmenet irány és időzítés szempontjából ellentmondásmentes-e az előzőleg számított sebességgel. Ha nem ellentmondásmentes a sebességgel, újra beállítják. Ha ellentmondásmentes, a sebességet kiegyenlítéssel felfrissítik. Az átmenet ingadozás miatti lehet, és a valóságban a trend folytatódhat.
g) Minden egyes pásztázás alatt a követő egy nyomvonal megbízhatósági indexet szolgáltat, amely a megbízhatósági fokot jelzi, amelyet a magasság változtatási sebesség számításba lehet

behelyezni. “Nagy” megbízhatóságot jelent, ha az utolsó jelentések ellentmondásmentesek a követő által számított magasság és magasság változtatási sebesség számításokkal. “Kicsi” megbízhatóságot jelent, ha a magasság jelentések nem ellentmondásmentesek, egy lehetséges függőleges gyorsulást sejttetve, vagy amikor a magasság jelentések két vagy több cikluson keresztül hiányoznak. A “kicsi” megbízhatóság késleltetést indokolhat a megoldási tanácsadás generálásában.

h) A követő felső és alsó határokat szolgáltat, amelyeken belül fekszik várhatóan a valódi magasság. A magasság változtatási sebesség határokat annak megállapítására használják, hogy késleltetni kell-e a megoldási tanácsadás generálását és egy értelem megfordítás szükségességének értékelésében, ha a magasság változtatási sebesség megbízhatósága “kicsi”.

3.5.10 LEVEGŐ-LEVEGŐ KOORDINÁCIÓ

3.5.10.1 *Koordinációs lekérdezések.* Amikor az ACAS egy hasonlóan felszerelt megközelítő légijárművet veszélyeztetőnek nyílvánít, az utóbbihoz lekérdezéseket továbbít az S-módú adatkapcsolaton keresztül megoldási tanácsadási koordinációhoz. Ezeket a lekérdezéseket, amelyek megoldási közléseket tartalmaznak, feldolgozási ciklusonként egyszer végzik addig, amíg a megközelítő veszélyeztető mard. A felszerelt veszélyeztető koordinációs válasz küldésével mindig visszaigazolja a megoldás közlés vételét.

3.5.10.2 *KOORDINÁCIÓ LEKÉRDEZÉS FELDOLGOZÁS*

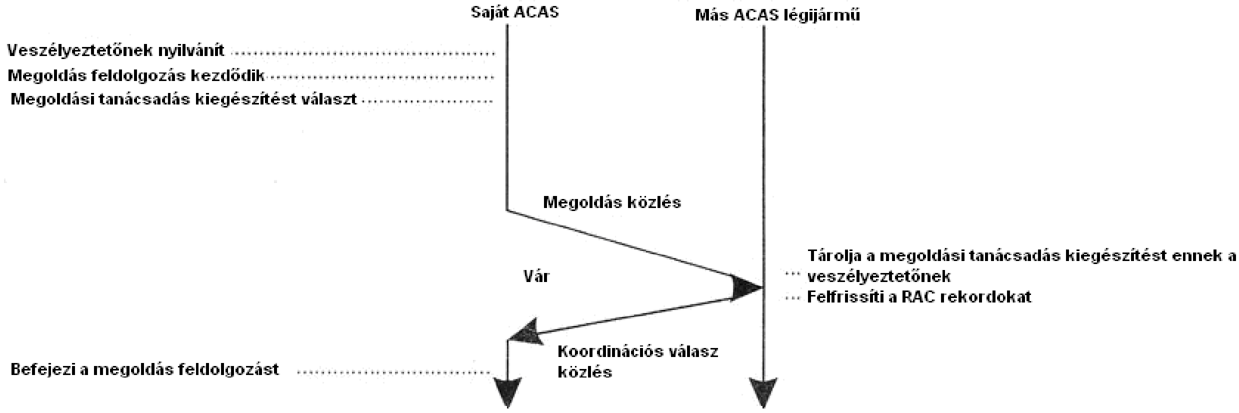
3.5.10.2.1 Az ACAS egy másik ACAS-al felszerelt megközelítő légijárműtől kapott megoldás közlést a megoldási tanácsadás kiegészítésnek a megközelítő részére történő tárolásával és a megoldási tanácsadás kiegészítés rögzítés felfrissítésével dolgozza fel.

3.5.10.2.2 A megoldási tanácsadás egy általános fogalom, amely függőleges megoldási tanácsadás kiegészítést (VRC) és/vagy vízszintes megoldási tanácsadás kiegészítést (HRC) jelent, ahogy éppen megfelel. Speciálisan az S-módú lekérdezésben szolgáltatott információ az ACAS II részére VRC, az ACAS III részére pedig a VRC és/vagy a HRC.

3.5.10.2.3 A megoldás tanácsadás kiegészítés (HRC) rekord az összes éppen aktív megoldás tanácsadás kiegészítések (VRC-k és/vagy HRC-k) együttese, amelyet az ACAS vett. A négy bit a megoldási tanácsadás kiegészítés rekordban megfelel a két VRC értéknek (“ne haladj el alul” és “ne haladj el felül”), amelyet a két HRC érték (“ ne fordulj balra” és “ne fordulj jobbra”) követ. Ha a RAC rekordban egy bit beállítás történik, az azt jelenti, hogy a megfelelő megoldási tanácsadás kiegészítést egy vagy több ACAS-tól vették. Amikor egy megoldási tanácsadás kiegészítést vesznek egy másik ACAS-tól, a megfelelő bit(ek) beállítása a RAC rekordban megtörténik. Minden alkalommal, amikor egy másik ACAS-tól egy megoldási tanácsadás törlését veszik, a megfelelő bit(ek) törlésre kerül(nek), amíg egy másik ACAS nem idézi elő a bit(ek) beállítását.

3.5.10.3 *KOORDINÁCIÓS SOROZAT*

A koordinációs üzenetek sorozatát és a hozzátartozó feldolgozást az A-9 ábra illusztrálja. A koordináció megvalósításának elmulasztása a veszélyeztető légijármű által nem összeegyeztethető megoldási tanácsadás értelem kiválasztást eredményezhet.



A-9 ábra. Koordinációs sorozat

3.5.10.4 *KOORDINÁCIÓ PROTOKOLL*

3.5.10.4.1 Miután egy felszerelt megközelítő légijárművet veszélyeztetőnek nyilvánítottak, az ACAS először ellenőrzi, hogy érkezett-e megoldási tanácsadás ettől a veszélyeztetőtől. Ha igen, akkor az ACAS választ egy megoldási tanácsadást, amely összeegyeztethető a veszélyeztető függőleges értelmével. Ha nem érkezett megoldási tanácsadás, akkor az ACAS a találkozás geometriájára alapozva kiválaszt egy megoldási tanácsadást (3.5.2 Szakasz). Bármelyik esetben az ACAS elkezdi a függőleges értelemre vonatkozó információ továbbítását a veszélyeztetőnek, pásztázásonként egyszer, megoldási tanácsadás kiegészítés formájában, egy megoldási tanácsban. A megoldási tanácsadás kiegészítés "ne haladj felül", ha az ACAS a veszélyeztető feletti elhaladást választotta, "ne haladj alul", ha az ACAS a veszélyeztető alatti elhaladást választotta.

3.5.10.4.2 miután az ACAS veszélyeztető légijárművet észlel, a veszélyeztető összehasonlítási folyamaton megy keresztül. Ha valamilyen oknál fogva a két légijármű ugyanazt az (nem összeegyeztethető) elkülönítési értelmet választja, a magasabb 24-bites légijármű címzéssel rendelkező légijármű megfordítja az értelmet. Ez akkor következhet be, ha a két légijármű egyidejűleg veszélyeztetőnek észleli egymást, vagy egy átmeneti kapcsolat hiány megakadályozza a sikeres kommunikációt.

3.5.10.5 *KOORDINÁCIÓS ADATVÉDELEM*

Az ACAS tárolja az éppen aktuális megoldási tanácsadást és más ACAS-al felszerelt légijármű(vek)től vett aktív megoldás tanácsadás kiegészítés(ek)t, amelyek a saját légijárművet veszélyeztetőnek érzékeli. Annak érdekében, hogy a tárolt információ ne kerüljön módosításra egy vagy több ACAS-ra való reagálásban, amíg azt a saját ACAS általi megoldási tanácsadás kiválasztásra használják, az adatokat védik úgy, hogy azok csak egy ACAS részére álljanak rendelkezésre, vagy csak egy ACAS-ra való reagálásban lehessen módosítani egyidőben. Ezt például koordinációs zárlat állapotba való bemenettel hajtják végre, amikor az adattár a saját ACAS által hozzáférhető, vagy egy veszélyeztető ACAS új adatokat nyújt. Ha megoldás közlés érkezik, mialatt a koordinációs zárlat állapot fennáll, az adatokat megtartják, amíg a fennálló koordináció zárlat állapot véget nem ér. Az adatok különböző folyamatok általi szimultán elérésének lehetősége az ACAS-on belül fennáll, mert a bejövő veszélyeztető megoldási közlések aszinkron módon érkeznek az ACAS adatfeldolgozáshoz, ténylegesen megszakítva ezt a feldolgozást.

3.5.11 FÖLDI KOMMUNIKÁCIÓ

3.5.11.1 *ACAS megoldási tanácsadások jelentése a földnek.* Amikor megoldási tanácsadás létezik, az ACAS jelzi a légijármű S-módú válaszjeladójának, hogy megoldási tanácsadással rendelkezik az S-módú földi állomás számára. Ez a válaszjeladót arra készteti, hogy jelzést állítson be, amely mutatja, hogy egy közlés a földhöz való továbbításra vár. E jelzés vétele után egy S-módú érzékelő kérheti a megoldási tanácsadás továbbítását. Amikor ezt a kérést veszi, a saját S-módú válaszjeladó az üzenetet Comm-B válasz formátumban szolgáltatja. Ezenkívül az ACAS periódikus rádióadásokat generál 8 másodperces időközökben azalatt az idő alatt, amíg a repülőgépvezető részére megoldási tanácsadás jelzés van. A rádióadás megoldási tanácsadás paraméterek utolsó értékeit jelenti, amelyeket az előző 8 másodperces periódusban felvesznek, még ha a tanácsadás be is fejeződött. Ez lehetővé teszi az ACAS megoldási tanácsadás tevékenységének figyelését azokon a területeken, amelyeket földi különleges megoldási tanácsadás rádióadás jel vevők segítségével az S-módú földi állomás felderítése nem fed le,. A megoldási tanácsadás rádióadásokat általában földi berendezéseknek sugározzák, de fedélzetre irányuló adattovábbításnak jellemzik őket.

3.5.11.2 *Veszélyeztető észlelési paraméterek szabályozása földi állomás által.* Veszélyeztető észlelési paramétereket egy vagy több S-módú földi állomás szabályozhatja az ACAS légijárműnek küldött érzékenység szint szabályozó (SLC) utasítást tartalmazó lekérdezések továbbításával. Miután egy adott S-módú földi állomástól jövő SLC utasítás közlést vett, az ACAS tárolja az SLC utasítás értéket a földi állomás számának indexével ellátva. Az ACAS a vett legkisebb értékeket használja fel, ha egynél több földi állomás küld ilyen közlést. Az ACAS idő szerint külön értékeli mindegyik hely SLC utasítását és törli azt, ha ugyanerről a helyről egy másik közlés 4 percen belül nem frissíti fel. Az ACAS ugyancsak azonnal töröl egy SLC utasítást, ha ettől az állomástól specifikus törlési kódot kap. SLC utasítások nem használhatók fel kapcsolt Comm-A lekérdezéseken belül.

3.5.12 ÉRZÉKENYSÉGI SZINT SZABÁLYOZÁS

Az ACAS veszélyeztető észlelés paraméterek szabályozását a következők által szolgáltatott SLC utasítások segítségével végzik:

a) magasság sávon alapuló belsőleg generált érték;
b) S-módú földi állomástól (lásd 3.5.11.2 alpont); és
c) repülőgépvezető által működtetett kapcsolóról.

Az ACAS által használt érzékenységi szintet ezen három forrás által szolgáltatott legkisebb nem zérus SLC utasítás állítja be. Amikor egy S-módú földi állomás vagy a repülőgépvezető számára nem különösebben érdekes az érzékenységi szint beállítás, akkor ettől a forrástól az ACAS részére zérus értéket kapja és ezt nem veszik figyelembe a kiválasztási folyamatban. Az érzékenységi szintet általában a magasság sávon alapuló belsőleg generált értékek állítják be. A magasság küszöbök körül hiszterézist alkalmaznak, hogy megakadályozza az SLC utasítás értékben az ingadozást, amikor az ACAS légijármű egy magasság küszöb környezetében marad.

3.6 Összeegyeztethetőség fedélzeti S-módú válaszjeladókkal

3.6.1 Az ACAS és az S-módú válaszjeladó összeegyeztethető működését tevékenységüknek a repüléselektronikai elnyomás buszon keresztüli összehangolásával érik el. Az S-módú válaszjeladót az ACAS továbbítás alatt és röviddel utána nyomják el. A tipikus elnyomási periódusok: a) 70 mikromásodperc a felső antennáról és b) 90 mikromásodperc az alsó antennáról. Ezek az elnyomás periódusok megakadályozzák, hogy az ACAS lekérdezés által okozott több-nyomvonal SSR választ provokáljon ki az S-módú válaszjeladótól.

3.6.2 Nem-kívánt teljesítmény korlátozás egy ACAS-al összekapcsolt S-módú válaszjeladónál szigorúbb, mint a 3. fejezet, 3.1.2.10.2.1 pontjában, hogy biztosítsa azt, hogy az S-módú válaszjeladó ne akadályozza meg az ACAS-t vele szemben támasztott követelmények teljesítésében. Egy -70 dBm nem kívánt sugárzási teljesítmény szintű válaszjeladót (4. fejezet, 4.3.11.1 alpont) és egy -20 dBm válaszjeladó ACAS antenna elszigetelést feltételezve, az eredő interferencia szint az ACAS RF portnál -90 dBm alatt lesz.

3.6.3 További összeegyeztethetőségi követelmény, hogy az ACAS adóberendezés átvezetési teljesítményt alacsony szinten kell tartani (lásd 3.2.1 alpont).

3.7 Kijelzések a repülő személyzetnek

3.7.1 VIZUÁLIS KIJELZÉS

3.7.1.1 Az ACAS megvalósítások a megoldás tanácsadási információkat tipikusan egy vagy két vizuális megjelenítőn jelzik ki. A forgalmi tanácsadás kijelzés ellátja a repülőgépvezetőt a közeli forgalomra vonatkozó terv információval. A megoldási tanácsadás kijelzés megismerteti a személyzetet a végrehajtandó vagy elkerülendő manőverekről függőleges síkban. A forgalmi tanácsadás kijelzés és a megoldási tanácsadás kijelzés különálló kijelzőket vagy műszereket használhat az információ átadására a repülőgépvezető felé, vagy a két feladatot egyetlen kijelzőn össze lehet vonni. A kijelzett megoldási tanácsadás információkat vagy integrálni lehet a fedélzeten rendelkezésre álló meglévő kijelzőkkel, vagy egy erre célra szolgáló külön kijelzőn lehet megjeleníteni.

3.7.1.2 *FORGALMI TANÁCSADÁSOK*

3.7.1.2.1 A forgalmi tanácsadás kijelzés képet nyújt a repülőszemélyzetnek a környező forgalomról. Az így nyújtott információ arra szolgál, hogy segítse a repülőszemélyzetet a környező forgalom áttekintésében. Szimulációs vizsgálatok azt mutatták, hogy a forgalom táblázatos, alfanumerikus kijelzését bonyolult a repülőszemélyzetnek leolvasni és összehasonlítani, és a kijelzésnek ez a típusa a forgalmi információ elsődleges kijelzésének használatára nem ajánlott. A forgalmi tanácsadás kijelzés a megközelítő légijárművek vonatkozásában a következő információk kijelzésének képességét szolgáltatja:

a) helyzet (távolság és iránytengely);
b) magasság (relatív vagy abszolút, ha a megközelítő légijármű magasságot jelent); és
c) magasság változtatási sebesség magasságot jelentő megközelítő légijárműnek, (emelkedés vagy süllyedés).

3.7.1.2.2 A forgalmi tanácsadás kijelzés alakokat és színeket használhat az egyes kijelzett megközelítő légijárművek veszélyeztetési szintjének, azaz megoldási tanácsadások, forgalmi tanácsadások és közeli forgalom jelzésére. A forgalmi tanácsadás generálás vizsgálatok és a veszélyeztető észlelés vizsgálatok közötti lényeges különbség a nagyobb figyelmeztetési idő értékek használatában van.

3.7.1.2.3 A közeli forgalom folyamatos kijelzése nem megkövetelt összetevője az ACAS-nak. Azonban a repülőgépvezetőknek szükségük van a közeli forgalommal, valamint a potenciális veszélyeztetésekkel kapcsolatos útmutatásra, hogy helyesen azonosítsák a potenciális veszélyeztetést jelentő légijárműveket. A “display - vizuális kijelzés” szó nem azt jelenti, hogy a vizuális kijelzés az egyetlen elfogadható a megközelítő légijárművek helyzetének a jelzésére.

3.7.1.2.4 Ideális esetben egy megoldási tanácsadást mindig megelőz egy forgalmi tanácsadás, de ez nem mindig lehetséges, pl. a megoldási tanácsadás kritériumok már lehet, hogy ki vannak elégítve, amikor egy nyomvonalat először létrehoznak, vagy a megközelítő légijármű hirtelen és éles manővere előidézheti, hogy a forgalmi tanácsadás vezetési ideje egy ciklusnál kisebb lesz.

3.7.1.3 *MEGOLDÁSI TANÁCSADÁSOK*

A megoldási tanácsadás vizuális kijelzése tájékoztatást ad a repülőszemélyzet részére a függőleges sebességről, amelyet el kell érni, vagy el kell kerülni. A megoldási tanácsadás kijelzést be lehet építeni a pillanatnyi függőleges sebességjelző műszerbe (IVSI) vagy az elsődleges repülési képernyőbe (PFD). A megoldási tanácsadás kijelzője eszközt szolgáltathat a megelőző és a helyesbítő megoldási tanácsadás megkülönböztetésére.

3.7.2 HALLHATÓ ÉS BESZÉDHANG FIGYELMEZTETÉSEK

Hallható figyelmeztetéseket használnak a repülőszemélyzet részére arról, hogy egy forgalmi tanácsadás vagy megoldási tanácsadás kiadásra került. Amikor kiválasztják a szókészletet, amelyet megoldási tanácsadás bejelentésére használnak, figyelmet kell fordítani arra, hogy olyan frázisokat válasszanak, amelyek minimalizálják a félreértett utasítás valószínűségét. Egy hallható bejelentést is kell szolgáltatni a repülőszemélyzet részére annak jelzésére, hogy az ACAS légijármű konfliktusmentes az összes veszélyeztetést jelentő légijárművel.

3.8 Repülőszemélyzet kezelési feladatai

Minimumként elvárják, hogy a repülőszemélyzet tevékenysége által lehetőség nyíljon vagy egy "AUTOMATIKUS" üzemmód kiválasztására, amelynél az érzékenységi szintek más bemeneteken alapulnak, vagy egy olyan üzemmód kiválasztására, amelyben csak forgalmi tanácsadásokat lehet kiadni, vagy olyan különleges érzékenységi szintek kiválasztására, amelyek legalább az 1-es érzékenységi szintet tartalmazzák. Amikor az 1-es érzékenységi szintet választják, az ACAS berendezés lényegében "tartalék" körülmények között van. A TARTALÉK fogalmat ennek a választásnak a jelölésére lehet használni. A meglévő ACAS érzékenységi szint különbözhet attól, amit a repülőszemélyzet választ. Intézkedéseket kell tenni, hogy a repülőszemélyzet jelzést kapjon arról, hogy az ACAS éppen TARTALÉK állapotban van, vagy amikor csak forgalmi tanácsadást adnak ki. Az ACAS kezelését integrálni lehet az S-módú válaszjeladó kezelésével, vagy a két rendszernek különböző kezelése is lehet. Ha az ACAS és az S-módú kezelések integrálva vannak, olyan eszközt kell biztosítani, amely lehetővé teszi a repülő személyzet számára a kizárólagosan válaszjeladó működési mód kiválasztását.

3.9 Működés figyelése

Az ACAS berendezéstől elvárható, hogy automatikus működés figyelési tevékenységet is foglaljon magában, hogy az összes kritikus ACAS tevékenység műszaki állapotát egy folyamatos bázison meghatározhassa a berendezés normális működésének megzavarása vagy esetleges megszakítása nélkül. Gondoskodni kell arról, hogy a repülő személyzet jelzést kapjon abnormális körülmények fennállásáról, amint ez a figyelési tevékenység ezt meghatározza.

4. Veszélyeztető légijármű észlelésére szolgáló paraméterek és tipikus algoritmusok és tanácsadások generálása

1. *Megjegyzés. – A jellemzők, amelyeket az alábbiakban adunk meg, az ACAS II összeütközés elkerülését biztosító logikájának egy referencia tervezését írják le. Ez a leírás azonban nem zárja ki egyenlő vagy jobb működés alternatív terveinek használatát.*

2. *Megjegyzés. – Nyomtatott kisbetűs matematikai szimbólumokat használnak változók jelölésére ebben a fejezetben. Nagybetűs szimbólumokat a paraméterek jelölésére használják. A pontozás jelölés, amelyet néhány paraméternél használtak, nem azt mutatja, hogy azok derivált*

mennyiségek, hanem, hogy a jelölés által meghatározott dimenziója van, pl. távolság/idő a sebesség paraméternél.

4.1 Követési teljesítmény jellemzők

4.1.1 TÁVOLSÁGI KÖVETÉS

4.1.1.1 Távolság, távolságváltozási sebesség és távolságváltozási gyorsulás, (r, $\dot{r}$, $\ddot{r}$) becslése adaptív α-ß-γ követő segítségével történik, az α, ß és γ tényezőinél olyan értékek felhasználásával, amelyek az összes egymást követő távolság méréseknél folyamatosan csökkennek, amíg megfelelőképpen el nem érik a saját 0,40, 0,10 és 0,01 minimumaikat. A távolság változás gyorsulás becslést az *m* várt hiányzó távolság számítására használják a legszorosabb megközelítésnél, a következő formula felhasználásával:

$$m^2 = r^2 - \frac{r^2}{1 + r\ddot{r}/\dot{r}^2}$$

Ezt a becslést nem számolják ki akkor, amikor további számítások azt jelzik, hogy ez nem lehet megbízható, vagy a becslési hibák nagysága miatt, vagy a légijárművek egyike által a vízszintes síkban végrehajtható manőver lehetősége miatt. Az utóbbi számítások a követés eddigi időszakán, az egymás utáni távolság előrejelzések megfigyelt pontosságán, a távolság változás gyorsulás számítások észlelt azonosságán, az előzőleg számított távolsággal megegyező, linearizált repülési pályán alapuló második távolság követésen, és a durva-iránytengely követés megfigyelt azonosságán nyugszanak.

4.1.2 MAGASSÁG KÖVETÉS

4.1.2.1 *Magassági adatforrások.* A megközelítő légijármű magasságát a megközelítő légijármű C-módú vagy S-módú jelentéseiből nyerik. A saját légijármű magasságát abból a forrásból nyerik, amely a saját C-módú vagy S-módú jelentések alapjául szolgál és a legfinomabb elérhető kvantálásra használják fel.

4.1.2.1.1 *Magasság jelentés hitelesség.* Mielőtt bármilyen magasság jelentés vételére sor kerül, vizsgálatot végeznek annak eldöntésére, hogy a jelentés hiteles-e. Egy hitelességi ablakot számolnak ki az előzőekben számított magasság és magasság változási sebesség alapján. A magasság jelentést félreteszik, és a magasság követést felfrissítik, mintha a jelentés hiányozna (4.1.2.3.7 alpont), ha a jelentés kívül esik a hitelességi ablakon.

4.1.2.2 *Saját magasság változási sebesség.* A saját ACAS légijármű magasság változási sebességét olyan forrásból nyerik, amely a lehető legkisebb hibákkal rendelkezik és semmilyen esetben sem nagyobb, mint a 4.1.2.3.6 pontban leírt követő sebesség kimenetének a hibája.

4.1.2.3 *A MEGKÖZELÍTŐ LÉGIJÁRMŰ MAGASSÁGÁNAK KÖVETÉSE*

4.1.2.3.1 *Magasság követés fogalmainak leírása*

Megalapozott sebesség nyomvonal - Established rate track. Egy magasság nyomvonal, amelynél a megközelítő légijárműtől kapott utolsó néhány magassági jelentés sémája arra enged következtetni, hogy ez a megközelítő állandó, zérustól különböző magasság változási sebességgel emelkedik vagy süllyed.

Vízszintes repülési nyomvonal - Level track. Egy magasság nyomvonal, amelynél a megközelítő légijárműtől kapott utolsó néhány jelentés sémája arra enged következtetni, hogy a megközelítő vízszintes repülést végez.

Új nyomvonal - New track. Egy újonnan kezdett magasság nyomvonal.

Ingadozó nyomvonal - Oscillating track. Egy magasság nyomvonal, amelynél a megközelítő légijárműtől kapott utolsó néhány jelentés sémája két vagy több érték között olyan módon ingadozik, amely arra enged következtetni, hogy a megközelítő vízszintes repülést végez.

Átmenet - Transition. Egy nyomvonalra vonatkozó magasság jelentés, amely különbözik az erre a nyomvonalra vonatkozó utolsó hiteles magasság jelentéstől.

Trend. Trend áll fenn a magasság változás sebességére vonatkozóan, ha két legutolsó magasság szint átmenet ugyanabban az irányban ment végbe.

Nem-megerősített nyomvonal - Unconfirmed rate track. Egy magasság nyomvonal, amelynél a megközelítő légijárműtől kapott utolsó néhány magasság jelentés sémája a nyomvonal más módon történő minősítését nem teszi lehetővé.

4.1.2.3.1.1 Bármely követési ciklusra fennáll, hogy mindegyik nyomvonal egy és csakis egy nyomvonal minősítéssel rendelkezik.

4.1.2.3.1.2 Bármely nyomvonal besorolás létrejöhet, amíg más nyomvonal besorolásra vonatkozó feltételeket nem igazolják.

4.1.2.3.2 Az ACAS II követi a megközelítő légijárművek magasságát. A követés a válaszjeladóiktól kapott automatikus nyomásmagasság jelentéseken alapszik, magasság jelentéseket használva fel, amelyeket átvettként kvantálnak. Minden megközelítőről minden ciklusban a követő magasság és magasság változtatási sebesség számításokat szolgáltat.

Megjegyzés. – A C-módú magassági adatokat a nyomvonalakkal összekapcsoló függvényt a 4. fejezet 4.3.2.1 pontja írja le. Az alábbiakban ismertetett magasság követő feltételezi, hogy ez a függvény már működött, mielőtt a követő alkalmazására sor került.

4.1.2.3.2.1 A referencia magasság követő tervezés feltételezi, hogy minden nyomvonalra magasság jelentéseket vesznek egy magasság jelentés per másodperc névleges sebességgel. Azonban ez figyelembe veszi a hiányzó jelentéseket, más szóval azokat az eseteket, amikor nem vettek magasság jelentéseket egy adott nyomvonalra egy követő ciklus előtt.

4.1.2.3.2.2 Egy vagy két fajta megközelítő nyomvonalat hoznak létre és tartanak fenn. Úgynevezett 100-lábas nyomvonalakat nyernek akkor, amikor a magassági jelentéseket 100-lábnak megfelelő egységekben szolgáltatják. Az ilyen nyomvonalakat egy erre a célra szolgáló követővel frissítik fel, amelyet 100-lábas magassági követőnek neveznek. Úgynevezett 25-lábas nyomvonalakat nyernek, amikor a magasság jelentéseket 25-lábas egységekben szolgáltatják. Az ilyen nyomvonalakat egy erre a célra szolgáló követővel frissítik fel, amelyet 25-lábas magasság követőnek neveznek.

4.1.2.3.2.3 Különleges logika automatikusan kapcsolja a megközelítő légijármű magassági nyomvonalait a 100-lábas magasság követő és a 25-lábas magasság követő között az egységekben egy megerősítő változást követve, amely egységekben a magasság jelentéseket szolgáltatják. Egy ilyen változást megerősítettnek tekintenek, ha három egymást követő érvényes magasság jelentést ugyanazon egységben vettek.

4.1.2.3.2.4 Amikor magasság jelentés egység változást észleltek, de még nincs megerősítve, a meglévő nyomvonalat lebegtetik és a magasság jelentést átmenetileg tárolják. Amikor az egységváltozást megerősítik, a nyomvonalat újraindítják az utolsó magasságváltozási sebesség becslést használva, amelyet a változás, valamint az összes ideiglenesen tárolt magasság jelentés előtt számoltak.

4.1.2.3.2.5 A 25-lábas követő egy adaptív alfa-béta követő. Ez a 4.1.2.3.5 pontban kerül rövid ismertetésre.

4.1.2.3.2.6 A 100-lábas követő tervezését az motiválja, hogy szükség van egy stabil magasság változási sebesség becslésre, amikor a veszélyes megközelítő légijármű valódi magasság változási sebessége kisebb, mint 100 láb/s, más szóval, kisebb, mint egy kvantálási köz per követő ciklus. Ez a követő közvetve számítja a magasság változási sebességet az időnek a számításával, amelyet egy kvantálási szint keresztezése igényel. Ennek a tervnek további részleteivel szolgál a 4.1.2.3.6 alpont.

4.1.2.3.3 *Magasság változtatási sebességi megbízhatóság.* Minden megközelítő légijárműre vonatkozóan, minden ciklusban a követő vagy “nagy” vagy “kicsi” megbízhatósági jelzőt szolgáltat a magasság változtatási sebesség becslésben (4.1.3.3.6.9 és 4.1.3.3.6.10 pontok).

4.1.2.3.4 *Magasság változtatási sebesség indokoltság.* A követés “legjobb becslésű” magasság változtatási sebesség becslést és felső és alsó határokat szolgáltat ehhez a magasság változtatási sebességhez, amely összhangban áll a vett jelentés sorozattal.

4.1.2.3.5 *25-lábas kvantálási jelentések*

4.1.2.3.5.1 A 25-lábas növekményekre kvantált magassági jelentéseknél egy adaptív α-ß kφvetőt használnak. Ez a követő adaptív abban az értelemben, hogy az α ιs ß ιrtékek három együttese között választ, amelyek az előrejelzett szabályoktól függnek, azaz az előrejelzett magasság és a jelentett magasság közötti különbségtől, valamint a sebesség becslés nagyságától. Ezek az α és ß értékek a következők:

- α = 0,4 és ß = 0,100, amikor a fennálló magasság változás becslés értéke kisebb, mint 7,0 láb/s; egyébként,
- α = 0,5 és ß 0 0,167, amikor az elυrejelzett hiba kisebb, mint 22,5 láb; és egyébként,
- α = 0,6 és ß = 0,257

4.1.2.3.5.2 A követő két különálló magasság és magasság változás sebesség együttest tart fenn. Az elsőt közvetlenül a standard α-ß simulαsi egyenletekből származtatják. Ez az együttes tisztán belső a követőkhöz viszonyítva. A második együttes tartalmazza a számításokat, amelyek az összeütközés elkerülési logikához illenek. Ez az első együttesből a következőkben különbözik. A logikának juttatott magasság számítás a jelentett magasság kvantálási tartomány egyik felének belsejére korlátozódik (±12,5 láb). A logikának juttatott magasság változás sebesség számítás a zérussal egyenlő együttes, amikor a belső számítás abszolút értékben 2,5 láb/s alá csökken és zérussal egyenlő értékben marad, amíg a belső számítás 5,0 láb/s fölé emelkedik abszolút értékben.

4.1.2.3.5.3 A követő csak az előzőleg definiált két nyomvonal osztályozást használja, vízszintes repülési nyomvonal és megalapozott sebesség nyomvonal (4.1.2.3.1 pont). Egy nyomvonalat vízszintes repülési nyomvonalnak jelentenek, ha legalább két követő ciklus elmúlt az utolsó magasság átmenet óta (4.1.2.3.1 pont). A belső sebesség számítást akkor zérusra állítják vissza. Nyomvonalat megalapozott sebesség nyomvonalnak jelentenek, ha a következő két elegendően szorosan elhelyezkedő magasság átmenetet követően a belső sebesség számítás (és így a logikának átadott sebesség számítás is) 5,0 láb/s fölé emelkedik.

4.1.2.3.5.4 A számítások megbízhatóságát “nagynak” jelentik, amikor a nyomvonal legalább négy követő cikluson keresztül fennállt és az előrejelzési hiba nem volt nagyobb, mint 22,5 láb legalább két egymást követő követési ciklusban. “Kicsire” állítják, ha az előrejelzési hiba nagyobb, mint 22,5 láb. Ugyancsak “kicsire” állítják, ha a magassági jelentés két egymást követő ciklusban hiányzott.

4.1.2.3.6 *100 láb növekmény kvantálási jelentések.* 100 láb növekményekre kvantált magasság jelentéseknél a magasság követő teljesítménye minden vonatkozásban egyenlő, vagy jobb, mint egy referencia követőé, amely úgy állítja be a magasság változtatás sebesség számítást, hogy megfelelő előjele legyen és a nagysága az ebben a paragrafusban ismertetetteknek feleljen meg.

4.1.2.3.6.1 *Követő változók.* A referencia követő a következő változókat használja:

$\dot{z}$ magasság változtatás sebesség becslés m/s (láb/s);
$\dot{Z}_{gu}$ lásd 4.1.3.6.5.1 alpont;
Δz a jelenlegi jelentés és a legutóbbi hiteles jelentés közötti magasság különbség;
T_n 1 s
Q 30,5 m (100 láb)
t_r a legutolsó hiteles jelentés óta eltelt idő, *s;*
t_p a két legutolsó magasságszint átmenet közötti idő, vagy egy cikluson belüli többszörös átmenet esetén, ezen átmenetek közötti átlagos idő*, s;*
t_b becsült szint elfoglalási idő a legutóbbi átmenet után, *s*
t_{bm} a szint elfoglalási idő számított alsó határa, *s;*
β számított kiegyenlítési együttható t_b-re;
β_l β korlαtja t_b alapján;
b_t a két legutóbbi magasság szint átmenet között keresztezett magasság szintek száma;
$b_{\dot{z}}$ a legutóbbi sebességgel keresztezett magassági szintek száma;
ε a t_b számítás kiegyenlített hibája, *s;*
d_t a legutóbbi magasság átmenet előjele (=+1 magasság növekedés esetén, = -1 csökkenés esetén); és
x^* valamely *x* változó értéke mielőtt egy magasság szint átmenetet követően felfrissítésre kerül

4.1.2.3.6.2 *Jelentés hitelesség.* Egy magasság jelentés hitelesnek tekinthető, ha a következő feltételek egyike teljesül:

a) $\Delta z = 0$
b) $|\Delta z - \dot{z} t_r| - Q\, t_r / T_n - \dot{Z}_{gu}\, t_r \leq 0$

4.1.2.3.6.3 *Nyomvonal minősítési séma*

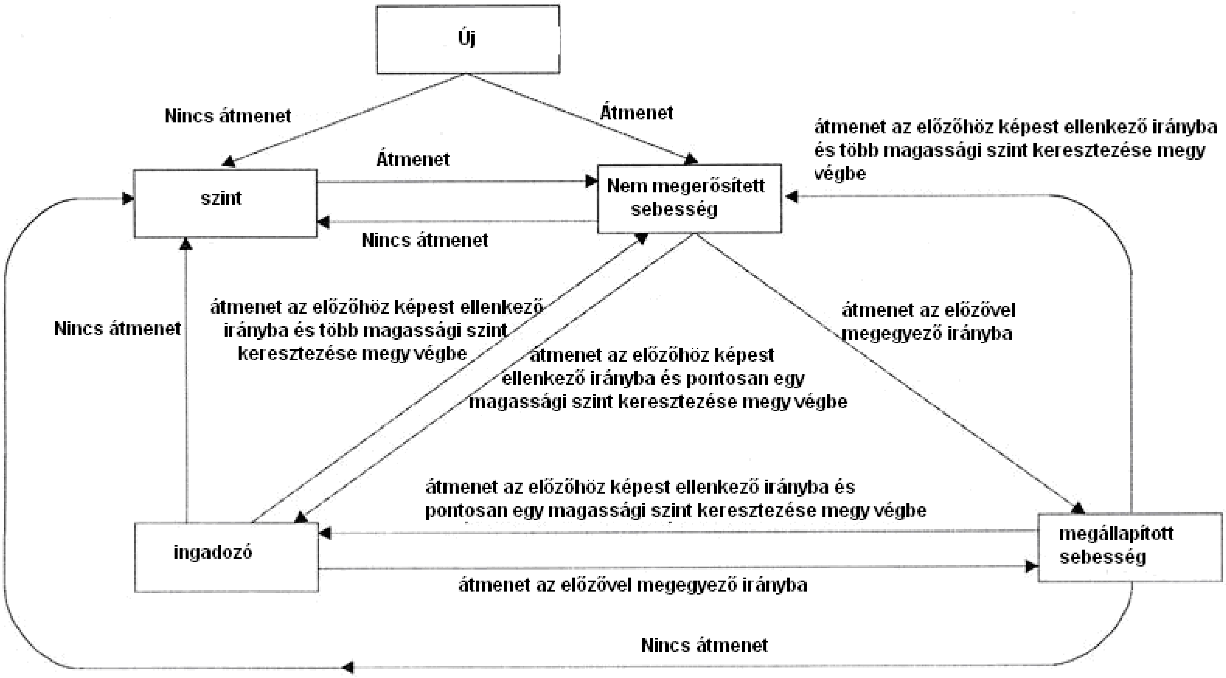
Megalapozott sebesség nyomvonal. Egy magasság nyomvonalat megalapozott sebesség nyomvonalnak minősítenek, ha két vagy több egymást követő átmenetet észlelnek ugyanabban az irányban és a két átmenet közötti időtartam elegendően rövid ahhoz, hogy a nyomvonal minősítés ne változzon vízszintes repülési nyomvonallá ezalatt az időtartam alatt (lásd vízszintes repülési nyomvonal meghatározását), vagy ha egy észlelt átmenet egy meglévő irányzattal ellentétes irányú és az előző átmenet óta eltelt idő "váratlanul kicsi" (4.1.2.3.6.8.1 alpont).

Vízszintes repülési nyomvonal. Egy magassági nyomvonalat vízszintes repülési nyomvonalnak minősítenek, ha azon idő után, amikor a következő átmenet várható, ha ilyen várható, T_1-nél hosszabb időn keresztül ugyanazon magasságszintet jelző jelentések érkeznek, vagy ha több mint T_2 időn keresztül történik ugyanez, függetlenül attól, hogy egy átmenet várható vagy nem várható (4.1.2.3.6.3.1 alpont).

Új nyomvonal. Egy nyomvonalat újnak minősítenek az első magasság jelentés és az első átmenet közötti időben, vagy pedig T_2 idő elmúlásával (4.1.2.3.6.3.1 pont).

Ingadozó nyomvonal. Egy magasság nyomvonal ingadozó nyomvonalnak minősül, ha a közvetlen megelőző átmenethez képest ellenkező irányú átmenet jelenik meg, csak egy szint keresztezés megy végbe, a két átmenet közötti időköz elegendően rövid ahhoz, hogy a nyomvonal minősítés ne változzon át vízszintes repülési nyomvonallá ezen időtartam alatt (lásd a vízszintes repülési nyomvonal meghatározását, és ha a nyomvonalat megalapozott sebesség nyomvonalnak minősítették, az ezen átmenet óta eltelt idő nem "váratlanul kicsi" (4.1.3.3.6.8.1 alpont).

Nem megerősített sebesség nyomvonal. Egy magasság nyomvonalat nem-megerősített sebesség nyomvonalnak minősítenek, ha egy új vagy egy vízszintes repülési nyomvonalnál átmenet jelenik meg, vagy ha az előző átmenettel ellenkező irányú átmenet jelenik meg és egynél több szint keresztezése ment végbe egy megalapozott, ingadozó vagy nem megerősített sebesség nyomvonalnál.



A-10. ábra Átmenetek a repülési nyomvonal osztályozások között

4.1.2.3.6.3.1 A következő értékeket használják:

$T_1 = 4{,}0$ s

$T_2 = 20$ s

4.1.2.3.6.3.2 Ha egy nyomvonalat már nem megerősített sebesség nyomvonalként minősítettek, és az előző átmenettel ellenkező irányú átmenet jelenik meg, és egynél több szint keresztezése ment végbe, a magasság változtatás sebességét úgy határozzák meg, mintha a nyomvonal éppen most nyert volna nem megerősített sebesség nyomvonal minősítést (4.1.3.3.6.5 alpont).

4.1.2.3.6.3.3 A nyomvonalakat osztályozzák (4.1.2.3.6.3 alpont) és a nyomvonalak közötti átmenetek osztályait az A-10 ábra mutatja. A nyomvonalakat azért osztályozzák, hogy meghatározzák, hogy milyen új méréseket kell használni a magasság változtatási sebesség becslés megújításához.

4.1.2.3.6.4 A sebesség nagyságát zérusra kell állítani, ha a nyomvonal új, vízszintes repülési vagy ingadozó.

4.1.2.3.6.4.1 Az ε és $b_{\dot{z}}$ mennyiségeket zérusra és a t_b-t 100 s-re kell állítani.

4.1.2.3.6.4.2 Amikor egy nyomvonalat vízszintes repülésinek minősítenek, az összes előző átmenetet és bármilyen meglévő trendet figyelmen kívül kell hagyni.

4.1.2.3.6.5 A sebesség nagyságát $\dot{Z}_{gu}$-ra kell állítani, amikor a nyomvonal először válik nem megerősített sebesség nyomvonallá és utána lefutóvá mindegyik ciklusban az előző ciklus által megállapított értéktől, amíg egy másik átmenetet nem észlelnek.

4.1.2.3.6.5.1 A $\dot{Z}_{gu}$ értéke 2,4 m/s (480 láb/perc) és a lefutási állandó 0,9.

4.1.2.3.6.5.2 Az ε és $b_{\dot{z}}$ mennyiségeket zérusra és t_b -t $Q/|\dot{z}|$-ra kell állítani.

4.1.2.3.6.6 Megalapozott sebesség nyomvonalaknál a sebességet a számított szint elfoglalási idő által elosztott kvantálási intervallumra kell állítani. A szint elfoglalási időt az átvitelek vétele alapján számítják a trend irányában és állandónak tartják, amíg a következő átmenet vagy megjelenik, vagy érvénytelenné válik (4.1.2.3.6.7 pont).

4.1.2.3.6.6.1 Amikor egy nyomvonalat először hoznak létre, az ε, $b_{\dot{z}}$ és t_b mennyiségeket a következők szerint állítják be:

$\varepsilon = 0$, $b_{\dot{z}} = 1$ és t_b = maximum (t_p , 1,4 s)

4.1.2.3.6.6.2 Hacsak az átmenet nem korai vagy késői (4.1.2.3.6.6.3 alpont), az ε, $b_{\dot{z}}$ és t_b mennyiségeket számítják ki a harmadik és következő átvitelek rekurzív átlagolásával a következők szerint:

$\varepsilon' = 0{,}8\, \varepsilon^* + (t_{tp} - t_b^*)$

$\beta_\text{j} = (t_b^* - T_n)^2 / [(t_b^*)^2 + 64\, T_n^2]$

$b_{\dot{z}} = b_{\dot{z}}^* + b_t$ és

β = maximum ($b_t / b_{\dot{z}}, \beta_\text{j}$) és

$\varepsilon = \varepsilon'$
$|\varepsilon| \leq 1{,}35$ (vagy 2,85, ha a legutσbbi átmenetet egy vagy több elmaradt jelentést követően észlelték) esetén;

$b_{\dot{z}} = 3$ és
ß = 0,5 és
$\varepsilon = 0{,}3\varepsilon'$ egyébként
és mindkét esetben: $t_b = t_b^* + \beta\, (t_p - t_b)$

4.1.2.3.6.6.3 *Korai vagy késői átmenetek*

Ha $|t_p - t_b^*| > 1{,}5$ s (vagy 3,0 s, ha a legutóbbi átmenetet egy vagy több elmaradt jelentést követően észlelték), vagy b_t a $(t_r/t_b^* + 1{,}1) \geq b_t \geq (t_r/t_b^*$ - 1,1) tartományon kívül esik, akkor ε, $b_{\dot{z}}$ és t_b értékeket a következőképpen állítják be:
$b_{\dot{z}} = 1$
$\varepsilon = 0$

t_{bm}= minimum $((0{,}7t_p + 0{,}3t_b^*),\ 1{,}4\ s)$
t_b = maximum $(t_p, , t_{bm})$

A sebességet a következőképpen számolják ki: $\dot{z} = d_tQ/ t_b$

4.1.2.3.6.7 *Elévült átmenet.* A sebesség nagysága elhal mindegyik ciklusban az előző ciklusban nyert értéktől, ha ugyanazon szintről érkeznek jelentések legalább T_3 ideig a következő várható továbbítás időpontja után (vagy T_4 ideig, ha a legutóbbi átvitelt egy vagy több elmaradt jelentést követően észlelték. A t_b értéke ilyen körülmények között nem változik.

4.1.2.3.6.7.1 A következő értékeket használják:

T_3 = 1,5 s
T_4 = 3,0 s
A következő képletet a sebesség lefutáshoz használják:
$\dot{z} = d_tQ/[t_b + (0{,}3\ t_b + 0{,}5\ T_n)(0{,}7 + (t_l - t_b) / T_n)^2]$
ahol t_l = a legutóbbi átmenet óta eltelt idő, s.

4.1.2.3.6.7.2 A $b_{\dot{z}}$ mennyiséget a maximum (2, $b_{\dot{z}}^*$ – 1) -re állítják be.

4.1.2.3.6.8 *Vibrálás miatti átmenetek.* A sebesség nagyságát az előző ciklusban nyert értékre állítják be, ha a trend irányával ellentétes irányú átmenetet észleltek, a közvetlenül megelőző átmenet követte a trendet, csak egy szint keresztezése ment végbe, a közvetlen megelőző átmenet óta eltelt idő "váratlanul kicsi". Az ilyen átmenetet következésképpen mint hiányzót kell kezelni, kivéve a 4.1.2.3.4 és 4.1.2.3.6.10e) pontokban szereplő követelményeknek megfelelő esetek.

4.1.2.3.6.8.1 A közvetlen megelőző átmenet óta eltelt időt "váratlanul kicsi"-nek deklarálják, amikor $t_p \le 0{,}24\ t_b^*$.

4.1.2.3.6.8.2 Az ε, $b_{\dot{z}}$ és t_b mennyiségek nem változnak.

4.1.2.3.6.9 *Nyomvonal nagy megbízhatóság deklarálása.* "Nagy megbízhatóságot nyilvánítnak a követett sebességnél, ha az éppen aktuális magasság jelentés hiteles, és a következő feltételek közül egy vagy több teljesül:

a) Új nyomvonalat észleltek T_5-nél hosszabb időn keresztül (4.1.2.3.6.9.1 pont) magasság átmenet nélkül; vagy
b) nem megerősített nyomvonalat észleltek T_6-nál hosszabb időn keresztül (4.1.2.3.6.9.1 pont) magasság átmenet nélkül; vagy
c) a nyomvonalat vízszintes repülésnek jelentik; vagy
d) a nyomvonalat először megalapozott sebesség nyomvonalnak minősítik; vagy
e) megalapozott sebesség nyomvonalnál, amikor átmenet jelent meg, a megfigyelt átmenet idejének a várt átmenet időhöz viszonyított aránya (felfrissítés előtti) R_1 és R_2 közé esik (4.1.2.3.6.9.1 pont); vagy az ezek az idők közötti különbség abszolút értéke kisebb, mint T_8; vagy a legutóbb észlelt és az előző átmenet közötti időkülönbség nagyobb, mint T_8 (4.1.2.3.6.9.1 pont); vagy
f) megalapozott sebesség nyomvonalnál, amikor átmenet fordult elő, az előző jelentés hiányzott,

$$|t_p - t_b^*| \ge T_7,\ t_p/t_b^* \ge 1 \text{ és } -t_p - T_9 \le (t_b - t_p)\ b_l \le T_9 \text{ vagy}$$

g) a nyomvonalat ingadozónak minősítik; vagy

h) megbízhatóságot előzőleg “nagy”-ra állították be, miután az utolsó hiteles magasság jelentést feldolgozták, és az a)-e) feltételek a 4.1.2.3.6.10 pontban “kicsi” megbízhatóság jelentéshez nem teljesülnek.

4.1.2.3.6.9.1 A következő értékek kerülnek felhasználásra

$T_5 = 9$ s

$T_6 = 9$ s

$T_7 = 1{,}1$ s

$T_8 = 8{,}5$ s

$T_9 = 1{,}25$ s

$R_1 = 2/3$

$R_2 = 3/2$

4.1.2.3.6.10 Kis megbízhatóságú nyomvonal bejelentés. A követett sebességnél “kis” megbízhatóságot jelentenek, ha a következő feltételek közül egy vagy több teljesül:

a) új nyomvonalnál, amíg a 4.1.2.3.6.9 pont a) feltétele teljesül; vagy
b) nem megerősített sebesség nyomvonalnál, amíg a 4.1.2.3.6.9 pont b) feltétele teljesül; vagy
c) amikor egy észlelt átmenet ideje egy megalapozott sebesség nyomvonalnál nem elégíti ki a 4.1.2.3.6.9 pont e) feltételét vagy f) feltételét; vagy
d) amikor egy várt átmenet több mint T_{10} időt (4.1.2.3.6.10 pont) késik;
e) megalapozott sebesség nyomvonalnál, amikor a 4.1.2.3.6.8 pont feltétele teljesül; vagy
f) a megbízhatóság előzőleg “kicsi” volt és a feltételek a “nagy” megbízhatóság jelentéséhez nem teljesültek (4.1.2.3.6.9 pont)

4.1.3.3.6.10.1 A $T_{10} = 0{,}25$ s értéket alkalmazzák.

4.1.2.3.7 Hiányzó magasság jelentések. Amikor magasság-jelentések hiányoznak:

a) a magasság változtatás sebesség számítás előző értékét fenntartják; és
b) a megbízhatóságot a követett sebességnél “kicsi”-nek jelentik, amikor a magasság jelentések két vagy több egymást követő cikluson keresztül hiányoznak.

4.2 Forgalmi tanácsadások (TA)

4.2.1 TA GENERÁLÁS

4.2.1.1 Forgalmi tanácsadást generálnak egy C-módú magasságot jelentő megközelítő légijármű részére, amikor mind a távolság vizsgálat (4.2.3 pont), mind a magasság vizsgálat (4.2.4 pont) alkalmazása pozitív eredményt szolgáltat ugyanazon működési ciklusban.

4.2.1.2 Forgalmi tanácsadást generálnak egy nem-magasság-jelentő válaszjeladóval felszerelt megközelítő légijármű részére, amikor egy távolság vizsgálat eredménye (4.2.3 pont) pozitív.

4.2.2 TA FIGYELMEZTETÉSI IDŐ

Magasságot jelentő megközelítő légijárműveknél a távolság vizsgálat a forgalmi tanácsadásoknál a következők szerint adja a figyelmeztetési időt:

S	2	3	4	5	6	7
TA figyelmeztetési idő	T + 10	T + 10	T + 10	T + 15	T + 15	T + 13

ahol S = érzékenységi szint

4.2.2.1 A 3-7 érzékenységi szintekhez tartozó értékek *T*-hez azok, amelyek a 4.3.3.3.1 pontban lettek megadva. Az érték *T*-hez a 2-es érzékenységi szintnél 10 s.

4.2.3 TA TÁVOLSÁG VIZSGÁLAT

A forgalmi tanácsadásokhoz tartozó távolság vizsgálatnak ugyanolyan formája van, mint amit a veszélyeztető légijármű észlelésnél használnak (4.3.3 pont). A D_m-hez a 3-7 érzékenységi szinteknél használt értékek azok, amelyek a 4.3.3.1.1 pontban vannak megadva, megnövelve $g(T_w\text{-}T)^2/6$ értékével, ahol T_w a kívánt forgalmi tanácsadás figyelmeztetési idő. A 2-es érzékenységi szintnél a D_m alapértékéhez 0,19 km (0,10 NM) tartozik.

4.2.4 TA MAGASSÁG VIZSGÁLAT

A magasság vizsgálat pozitív eredményt ad, ha a következő feltételek közül valamelyik teljesül:

a) az éppen aktuális magassági elkülönülés “kicsi”; vagy
b) a légijárművek magasság szerint összetartanak és az egy magasságba kerülésig az idő “kicsi”.

Ezek a fogalmak és feltételek a 4.3.4.1, 4.3.4.2, 4.3.4.3 és 4.3.4.5 pontokban vannak definiálva. Az időküszöb az egymagasságba kerülésig a forgalom tanácsadás figyelmeztetési idő lesz (4.2.2 pont) és a Z_t -nél használt értékek a következők:

z_0 repülési magasságszint	300 alatt	300 felett
Z_t m	260	370
(Z_t láb	850	1200)

4.3 Veszélyeztető légijármű meghatározása

4.3.1 VESZÉLYEZTETŐ LÉGIJÁRMŰ ÉSZLELÉSI JELLEMZŐI

4.3.1.1 *Megközelítő légijármű jellemzői.* Egy megközelítő légijármű jellemzői, amelyeket a veszélyeztető meghatározásához használnak a következők:

a) követett magasság: z_1
b) követett magasság változtatási sebesség: $\dot{z}_1$
c) követett ferde távolság: *r*
d) követett ferde távolság változás sebesség: $\dot{r}$
e) megközelítő légijármű ACAS-ának érzékenységi szintje: S_i

Egy megközelítő légijárműnél, amely nincs ACAS II-vel vagy ACAS III-mal felszerelve, az S_i-t 1-esre kell állítani.

4.3.1.2 *Saját légijármű jellemzők.* Minimumként a saját légijármű következő jellemzőit használják a veszélyeztető meghatározásánál:

a) magasság: z_0
b) magasság változtatási sebesség: $\dot{z}_0$
c) saját ACAS érzékenységi szint (4. fejezet 4.3.4.3 alpont): S_0

4.3.1.3 *Magasság-tartomány SLC utasítás.* A referencia logika az SLC utasítást a magasság tartomány alapján az A-1 táblázatban bemutatottak szerint választja ki.

4.3.2 VESZÉLYEZTETŐ LÉGIJÁRMŰVÉ NYILVÁNÍTÁS KRITÉRIUMAI

Egy megközelítő légijármű veszélyeztetővé válik akkor és csakis akkor, ha mindkét alábbi feltétel érvényes ugyanabban a ciklusban:

a) a távolság vizsgálat pozitív eredményt szolgáltat; és
b) vagy
1) a magasság vizsgálat pozitív eredményt szolgáltat; vagy
2) magasság keresztezés megoldási javaslat kiegészítést (RAC) vesznek a veszélyeztetőtől.

4.3.2.1 *Létrejött veszélyeztető.* Egy létrejött veszélyeztetőnek a veszélyeztető-státusza a következő ciklusokban fennmarad, ha minimum a távolság vizsgálat pozitív eredményt szolgáltat.

4.3.3 TÁVOLSÁG VIZSGÁLAT

4.3.3.1 *Távolság összetartás (konvergencia).* Légijárműveket távolságban összetartónak tekintjük, ha a számított távolság változtatási sebesség kisebb, mint $\dot{R}_t$. Ebben az esetben a távolság változtatási sebesség számítási eredmény, amelyet a távolság vizsgáltban használnak, a számított távolság változtatás és $-\dot{R}_t$ közül a kisebbik.

4.3.3.1.1 $\dot{R}_t$-hez a 3 m/s (6 csomó) értéket használják.

4.3.3.2 *Távolság széttartás (divergencia).* Azok a légijárművek, amelyeket nem tekintenek távolságban összetartónak (konvergálónak), távolságban széttartónak (divergálónak) számítanak. A távolság széttartása “lassú”, ha a számított távolság és a számított távolság változás sebesség szorzata kisebb, mint $\dot{P}_m$

4.3.3.2.1 P_m-re a következő értékeket használják:

S	*3*	*4-6*	*7*
$\dot{P}_m$ km^2/s	0,0069	0,096	0,0137
($\dot{P}_m$ NM^2/s	0,0020	0,0028	0,0040

4.3.3.3 *Távolság vizsgálat kritériumai.* A távolság vizsgálat akkor ad pozitív eredményt, amikor a következő feltételek valamelyike teljesül:

a) együttesen:
1) a légijárművek távolságban összetartanak; és
2) teljesül a következő egyenlőtlenség:

$$(r-D_m^2/r)/|\dot{r}'| < T;$$

ahol $\dot{r}$ ' = minimum ($\dot{r}$, - $\dot{R}_t$)

b) a légijárművek távolságban széttartanak, de a távolság kisebb, mint D_m és a távolság széttartás "lassú"; vagy

c) nem lehetett egy hiányzó távolságot számítani az éppen aktuális ciklusra, vagy a számított hiányzó távolság kisebb, mint H_m

és az összes többi feltételnél a vizsgálat eredménye negatív.

Megjegyzés. – A fenti a) 2) tételben szereplő képlet gyakorlati szöveget szolgáltat a következő feltételhez: a távolság és távolság változási sebesség számítások azt mutatják, hogy az előfordulás olyan lehet, hogy a lineáris hiányzó távolság kisebb vagy egyenlő D_m-el, és a lineáris idő a legszorosabb megközelítésig kisebb, mint T.

A-1 táblázat

Névleges magasság tartomány	*SLC utasítás*	*Magasságküszöb, amelynél az érzékenységi szint értéke változik*	*Hiszterézis értékek*
0-tól 1000 láb földfeletti magasság	2	1000 láb földfeletti magasság	±100 láb
1000 lábtól 2350 láb földfeletti magasság	3	2350 láb földfeletti magasság	±200 láb
2350 láb földfeletti magasságtól 50-es repülési szintig	4	50-es repülési szint	±500 láb
50-es repülési szinttől 100-as repülési szintig	5	100-as repülési szint	±500 láb
100-as repülési szinttől 200-as repülési szintig	6	200-as repülési szint	±500 láb
200-as repülési szint felett	7		

4.3.3.3.1 A *T, D_m* és *H_m* paraméterek értékei a következők:

S	*3*	*4*	*5*	*6*	*7*
T s	15	20	25	30	35
D_m (km)	0,37	0,65	1,0	1,5	2,0
(D_m (NM)	0,20	0,35	0,55	0,8	1,1)
H_m (m)	382	648	1019	1483	2083
(H_m (láb)	1251	2126	3342	4861	6683)

4.3.4 MAGASSÁG VIZSGÁLAT

4.3.4.1 *MAGASSÁG VIZSGÁLATI FOGALMAK ISMERTETÉSE*

Magasság széttartási sebesség ($\dot{a}$) - Altitude divergence rate ($\dot{a}$). Az *a* változásának sebessége.
*Meglévő magassági elkülönítés (*a*) - Current altitude separation (a).* Az éppen követett, a saját légijármű és a megközelítő légijármű közötti magassági elkülönítési modulus.

Idők a legszorosabb megközelítésig (τ_μ, τ_m) - Times to closest approach (τ_μ, τ_m). A minimális távolság eléréséhez elvileg szükséges számított idő. τ_μ a maximális érték (egyenesvonalú relatív mozgást és zérus hiányzó távolságot feltételezve), és $\boldsymbol{\tau}_m$ a minimális érték (egyenesvonalú relatív mozgást és a maximális D_m távolságot feltételezve).

Idő az egymagasságba kerülésig ($\boldsymbol{\tau}_V$) - *Time to co-altitude* ($\boldsymbol{\tau}_V$). Az a számított idő, amely az egymagasságba kerülés eléréséhez szükséges.

Függőleges hiányzó távolság (v_m) - *Vertical miss distance* (v_m). Számított alsó határ a tervezett magasság szerinti elkülönítésnél a legszorosabb megközelítés számított időpontjában.

4.3.4.2 *Meglévő magasság szerinti elkülönítés*. Meglévő magasság szerinti elkülönítést "kicsinek" jeleznek, ha $a < Z_t$, ahol Z_t a Z_m-el egyenlő értékre van beállítva (4.3.4.4.2 alpont) a referencia logikánál.

4.3.4.3 *MAGASSÁGI ÖSSZETARTÁS*

4.3.4.3.1 Az $\dot{a}$ -t a következők szerint számítják:

$\dot{a} = \dot{z}_o - \dot{z}_i$ $\quad z_o - z_i \geq 0$ esetén

$\dot{a} = \dot{z}_i - \dot{z}_o$ $\quad z_o - z_i < 0$ esetén.

4.3.4.3.2 A légijárműveket magasság szerint összetartónak minősítik, ha $\dot{a} < -\dot{Z}_c$

4.3.4.3.3 A $\dot{Z}_c$ értéke pozitív és nem nagyobb, mint 0,3 m/s (60 láb/perc)

4.3.4.4 *FÜGGŐLEGES HIÁNYZÓ TÁVOLSÁG*

4.3.4.4.1 Amikor a légijárművek távolságban összetartanak ($\mathbf{r} \leq 0$), az időt a legszorosabb megközelítésig és, a függőleges hiányzó távolságot a következők szerint számolják:

$\dot{r}' = \text{minimum}\ (\dot{r}, -\dot{R}_t)$

$\tau_\mu = \text{minimum}\ (|r / \dot{r}|, T)$

$\tau_m = |(r - D_m^2/r) / \dot{r}'|$

$r \geq D_m$ esetén

$= 0$ az $r < D_m$ esetén

$v_{m1} = (z_o - z_i) + (\dot{z}_o - \dot{z}_i)\ \tau_u$

$v_{m2} = (z_o - z_i) + (\dot{z}_o - \dot{z}_i)\ \tau_m$

$v_m = 0$ a $v_{m1}\ v_{m2} \leq 0$ esetén, egyébként

$v_m = \text{minimum}\ (v_{m1}, v_{m2})$ a $v_{m1} > 0$ esetén

$= \text{maximum}\ (v_{m1}, v_{m2})$ a $v_{m1} < 0$ esetén

4.3.4.4.2 A függőleges hiányzó távolságot "kicsinek" jelzik, ha $|v_m| < Z_m$. A Z_m maximális értékei a következők szerint adódnak:

z_o *repülési szint*	*200 alatt*	*200-300*	*300 felett*
Z_m (m)	183	213	244
(Z_m (láb)	600	700	800)

4.3.4.5 *AZONOS MAGASSÁGRA KERÜLÉSIG TERJEDŐ IDŐ*

4.3.4.5.1 Az $\dot{a}$ esetén, az azonos magasságra kerülésig terjedő idő kisebb, mint $-Z_c$ esetén és a következőképpen számolják:

$\tau_v = - a/\dot{a}$

Megjegyzés. – A τ_v *-t nem használják, ha a légijárművek magasságban és távolságban nem tartanak össze.*

4.3.4.5.2 A τ_v -t “kicsinek” jelzik, ha $\tau_v < T_v$ olyan találkozásoknál, amikor a saját légijármű függőleges sebessége nem nagyobb, mint 600 láb/perc, vagy a saját légijármű függőleges sebességének ugyanolyan előjele van, mint a veszélyeztető légijármű függőleges sebességének, de a nagysága kisebb. Minden más találkozásnál a τ_v -t “kicsinek” jelzik, ha $\tau_v < T$. A T_v paraméter értékei a következők:

S	*3*	*4*	*5*	*6*	*7*
T_vs	15	18	20	22	25

4.3.4.6 *Magasság vizsgálati kritériumok.* A referencia logika magasság vizsgálata pozitív eredményt ad, ha az alábbi három feltétel közül valamelyik teljesül:

a) a légijárművek távolságban összetartanak, a meglévő magassági elkülönítés “kicsi”, és a függőleges hiányzó távolság “kicsi”; vagy
b) a légijárművek távolságban és magasságban összetartanak, az idő az azonos magasság eléréséig és a függőleges hiányzó távolság egyaránt “kicsi”, vagy az azonos magasságra kerülést a legszorosabb megközelítés előttre jelzik ($\tau_v < \tau_u$); vagy
c) a légijárművek távolságban széttartanak, és a meglévő magasság szerinti elkülönítés “kicsi”;

és minden más feltételnél a magasság vizsgálat eredménye negatív.

4.4 Megoldási tanácsadások (RA) generálása

4.4.1 A megoldási tanácsadások fajtáinak meghatározását a 4. fejezet 4.1 Szakasza tartalmazza.

4.4.2 KÉSÉS AZ RA GENERÁLÁSÁBAN

Megjegyzés. – Megoldási tanácsadást minden veszélyeztető légijárműre, kivéve az itt leírt körülményeket, vagy koordinációs célokra generálnak.

A referencia logika nem generál megoldási tanácsadást, vagy módosít egy meglévő megoldási tanácsadást egy új veszélyeztető részére, ha a következő feltételek valamelyike teljesül:

a) egy magasság-keresztezési megoldási tanácsadás kiegészítés nem érkezett a veszélyeztetőtől; és
b) vagy
   1) a magassági elkülönítés vizsgálat (4.4.2.1 alpont) negatív eredményt ad;
   2) a megközelítő légijármű követett magasság változtatási sebességénél a meggyőződés “alacsony”, és nincs megoldási manőver, amely legalább A_t előrejelzett elkülönítést

szolgáltatna (4.4.2.2 alpont), függetlenűl attól, hogy a veszélyeztető légijárműnek akár a felső magasság változtatási sebesség határral, akár az alsó magasság változtatási sebesség határral egyenlő magasság változtatási sebessége, akár e két határ közötti tetszőleges értékkel egyenlő magasság változtatási sebessége van (4.1.2.3.4 alpont); vagy

3) "alacsony" meggyőződés áll fenn a veszélyeztető követett magasság változtatási sebességénél, a fennálló elkülönülés nagyobb, mint 46 m (150 láb), és a generált megoldási tanácsadás, amelyet a veszélyeztetővel szemben választanának, ha a többi lehetséges veszélyeztetőtől különállónak tekintenék, magasság keresztező.

4.4.2.1 *MAGASSÁGI ELKÜLÖNÍTÉS VIZSGÁLAT*

4.4.2.1.1 A saját ACAS II légijármű magasság változtatási sebességét "kicsinek" nyilvánítják, ha $|\dot{z}_o| \leq \dot{Z}_l$

4.4.2.1.2 A $\dot{Z}_l$ -ra a 3,0 m/s (600 láb/perc) értéket alkalmazzák

4.4.2.1.3 A veszélyeztetővé nyilvánítás késését "elfogadhatónak" tekintik, ha ez kisebb, mint 3,0 s.

4.4.2.1.4 A maximális magasság szerinti A_c elkülönítési küszöb 260 m (850 láb) értékre adódik, amikor a saját és a veszélyeztető légijármű függőleges sebessége ellentétes irányú és egyikük sem "kicsi", és 183 m (600 láb) értékű egyébként.

4.4.2.1.5 A magasság szerinti elkülönítést "minimálisnak" deklarálják, ha 100 lábbal egyenlő.

4.4.2.1.6 Egy találkozást "lassan közeledőnek" nyilvánítanak, ha a távolság változás sebessége nagyobb, mint D_m/T.

4.4.2.1.7 Vizsgálati feltételek. A magassági elkülönítés negatív eredményt ad, ha a veszélyeztető légijármű egy új veszélyeztető, és a megoldási tanácsadás, amelyet a többi lehetséges egyidejű veszélyeztetőtől elkülönítve tekintenek, a következő lehet, vagy:

a) magasság keresztező és vagy:
   1) a fennálló magasság szerinti elkülönítés meghaladja az A_c-t; vagy
   2) a veszélyeztető légijármű felszerelt, érvényes megoldási tanácsadás kiegészítést nem kaptak még tőle, a saját légijármű magasság változtatási sebessége "kicsi", a veszélyeztető nem "kicsi", és a késleltetés egy megoldási tanácsadás kiadásában, vagy a fennálló megoldási tanácsadás módosításában "elfogadható"; vagy
b) képtelen legalább "minimális" elkülönítést generálni a kritikus tartomány felett, ha a találkozás nem "lassú közelítő"; vagy
c) képtelen legalább "minimális" elkülönítést generálni a legszorosabb megközelítésnél (τ_u), ha a találkozás "lassan közelítő" és vagy a távolság kisebb, mint D_m, vagy az idő a D_m, τ_m távolsághoz kisebb, mint 5 s.

Egyéb esetben a magasság szerinti elkülönítés vizsgálat eredménye pozitív.

4.4.2.2 Az A_t-re a következő értékeket használják:

z_o	A_t m	(A_t láb)
kisebb, mint a 100-as repülési szint	61	(200)
100-astól a 200-as repülési szintig	73	(240)
201-estől a 420-as repülési szintig	122	(400)

420-as repülési szint felett 146 (480)

4.4.2.2.1 ±500 lábas hiszterézist alkalmaznak a szomszédos magasság rétegek közötti határokhoz.

4.4.3 *Magasság szerinti elkülönítési cél.* A megoldási tanácsadás kezdeti erősségét úgy választják, hogy teljesítse a legszorosabb megközelítésnél legalább A_1 magasság szerinti elkülönítés célkitűzését, kivéve a 4.4.3.2 pontban leírt körülmények fennállásának esetét.

z_o	A_t m	(A_t láb)
kisebb, mint az 50-es repülési szint	91	(300)
-estől a 100-as repülési szintig	107	(350)
100-astól a 200-as repülési szintig	122	(400)
201-estől a 420-as repülési szintig	183	(600)
420-as repülési szint felett	213	(700)

4.4.3.1.1 ±500 lábas hiszterézist alkalmaznak a szomszédos magasság rétegek közötti határokhoz.

4.4.3.2 *Nem megfelelő függőleges elkülönítés*. Ha a megoldás tanácsadásokra vonatkozó korlátozások (4.fejezet, 4.3.5 és 4.4.4 pontok alább) eleve kizárják egy megoldási tanácsadás generálását, amely várhatóan legalább A_1 magasság szerinti elkülönítést szolgáltat a legszorosabb megközelítésnél, a megoldás tanácsadás az, amely várhatóan a legszorosabb megközelítésnél a legnagyobb magasság szerinti elkülönítést szolgáltatja, amely összhangban van az ebben a fejezetben leírt többi előírással.

4.4.3.3 *Kritikus tartomány.* Előrejelzések a legszorosabb megközelítésre vonatkozóan arra az időtartamra szólnak, amely alatt összeütközés következhet be.

4.4.3.3.1 A kritikus tartomány az a $\tau_{m\ell}$ és $\tau_{u\ell}$ közötti idő, amelynél:

$\dot{r}' = \text{minimum}\ (\dot{r}, -\dot{R}_t)$

$\tau_{ul} = \text{minimum}\ (\tau^*_{u\ell}, |r / \dot{r}'|, T_e)$

$\tau_{ml} = \text{minimum}\ (\tau^*_{m\ell}, |r - D_m^2|/r) / \dot{r}'|)$

$r \geq D_m$ esetén

$T_{m1} = 0$, $r < D_m$ esetén

ahol $\tau^*_{u\ell}$ és $\tau^*_{m\ell}$ egyaránt T_e-vel egyenlő egy olyan veszélyeztetőnél, amely újonnan esett át a távolság vizsgálaton (4.3.3 Szakasz), máskülönben a τ_{ul} és τ_{ml} előző ciklusbeli értékeit veszi fel.

4.4.3.3.1.1 A következő paraméter értékeket használják:

S	*3*	*4*	*5*	*6*	*7*
T_e, s	25	30	30	35	40

4.4.3.4 *A veszélyeztető légijármű repülési pályája.* A megoldási tanácsadás arra szolgál, hogy olyan magassági elkülönítést szolgáltasson, amely elegendő ahhoz, hogy a veszélyeztető légijárművekkel az összeütközést elkerüljék, amikor is a veszélyeztetők:

a) megtartják meglévő magasságváltoztatási sebességüket; vagy

b) emelkednek vagy süllyednek, amikor először válnak veszélyeztetőkké, és csökkentik magasságváltoztatási sebességüket, vagy vízszintes repülésbe manővereznek át.

4.4.3.4.1 Az előrejelzett magassági elkülönítés azon a feltevésen alapszik, hogy a veszélyeztető légijármű fenntartja meglévő magasság változtatási sebességét, kivéve a 4.4.4.4 pontban az ACAS-al felszerelt veszélyeztető légijárművekre vonatkozóan leírtakat.

4.4.3.5 *Saját légijármű repülési pályája.* Az előrejelzett magassági elkülönítés a legszorosabb megközelítésnél a következő feltételezéseken alapul, amelyek az ACAS II légijárműnek a megoldási tanácsadásra való reagálásával kapcsolatosak:

a) megelőző megoldási tanácsadásoknál a saját légijármű magasság változtatási sebessége a megoldási tanácsadás által előírt határokon belül marad;
b) helyesbítési megoldási tanácsadásoknál a saját légijármű repülési pályája a következőkből áll: gyorsulás nélküli repülés a meglévő sebességgel $T_p + T_S$ időn keresztül, ezt követi egy állandó gyorsulás ($\ddot{Z}_g$) a függőleges síkban, amíg eléri a választott magasság változtatási sebességet ($\dot{Z}_g$) és ezután gyorsulás nélküli mozgás ezzel a sebességgel.

Megjegyzés. – Az előrejelzett idő a legszorosabb megközelítésig olyan rövid lehet, hogy a kiválasztott $\dot{Z}_g$ sebességet nem tudja elérni.

4.4.3.5.1 A T_p paraméter, amely a repülőgépvezető reakció idejét jelenti, az 5 s értéket veszi fel a kezdeti megoldási tanácsadás erősségnél, vagy 2,5 s bármely következő megoldási tanácsadás erősségnél.

4.4.3.5.2 A T_S paraméter értékét úgy választják meg, hogy a rendszer késését modellezi a releváns SSR válasz fogadásától a megoldási tanácsadásnak a repülőgépvezető részére történő bemutatásáig (4. fejezet, 4.3.5.10 alpont).

4.4.3.5.3 A $\ddot{Z}_g$ paraméter a 0,35 g értéket veszi fel egy fordított értelmű megoldási tanácsadás, vagy 0,25 g értéket más esetekben.

4.4.3.5.4 Ha a $\dot{Z}_g$ választott magasság változtatási sebesség meghaladja a légijármű teljesítőképességét, a légijárműnek megfelelő értékkel helyettesítik.

4.4.4 MEGOLDÁSI TANÁCSADÁSOKRA VONATKOZÓ KORLÁTOZÁSOK

4.4.4.1 *A rendelkezésre álló RA erősségek.* A referencia logikának megvan az a képessége, hogy legalább a függőleges megoldási tanácsadás erősség A-2 táblázat szerinti választási lehetőségét nyújtsa a találkozási megoldásoknál.

4.4.4.1.1 *Megnövelt sebesség RA-k.* A referencia logika nem veszi figyelembe a növekedés emelkedés, növekedés süllyedés erősséget, amikor kiválasztja a megoldási tanácsadás kezdő erősségét. Ezeket a megoldási tanácsadásokat csak akkor használják, amikor az előrejelzett elkülönítés a meglévő megoldási tanácsadásnál nem megfelelő, és a megoldási tanácsadás értelmének megfordítása nem elfogadható választás. Ezek a megoldási tanácsadás erősségek arra szolgálnak, hogy átadjanak egy megnövelt sürgetés értelmet a repülőgépvezetőnek. Ezek megfelelnek a $\dot{Z}_g$ kiválasztott magasság változtatási sebesség $\dot{Z}_{clm}$ vagy $\dot{Z}_{des}$ fölé növekedésének, amelyik a megfelelő.

4.4.4.1.1.1 A választott magasság változtatási sebesség 13 m/s-re (2500 láb/perc) növelését generálják, amikor a következő feltételek mindegyike teljesül:

a) ugyanolyan értelmű pozitív megoldási tanácsadás kijelzés van és volt egynél több cikluson keresztül, és vagy
   1) ha a veszélyeztető légijármű felszerelt, vagy a meglévő megoldási tanácsadás nem magasság keresztező, a veszélyeztető követett magasság változtatási sebességének

bizonyossága "nagy" (4.1.2.3.6.9 alpont), és a meglévő megoldási tanácsadás erőssége várhatóan 61 m-nél (200 láb) kisebb magasság szerinti elkülönítést hoz a legszorosabb megközelítésnél; vagy

2) a veszélyeztető légijármű nem felszerelt és a meglévő megoldási tanácsadás magasság keresztező és a legszorosabb megközelítésig 10 s vagy kevesebb maradt, és a veszélyeztető magassága a legszorosabb megközelítésnél előreláthatólag kevesebb, mint 61 m-el (200 ft) a saját légijármű felett, illetve alatt lesz süllyedési, illetve emelkedési megoldási tanácsadás esetén;

b) a legszorosabb megközelítésig hátramaradt idő kevesebb, mint T_{ir} és nagyobb, mint 4 s;

c) saját légijármű vagy süllyed és 1450 láb föld feletti magasság felett van, vagy emelkedik és 1650 láb földfeletti magasság felett van és növekvő emelkedési tanácsadásokat nem akadályozzák a légijármű teljesítmény korlátjai és

d) a Tau_u értéke (4.3.4.4.1 alpont) már nem növekszik, vagy ha van, a veszélyeztető légijárműtől való távolság kisebb, mint 3,2 km (1,7 NM).

T_{ir}-re a következő értékeket használják)

S	*3*	*4*	*5*	*6*	*7*
T_{ir}, *s*	13	18	20	24	26

1. Megjegyzés. – A fenti a) 2) feltétel lehetővé teszi megnövelt sebesség megoldási tanácsadás használatát a vízszintes repülésbe való átmenetet végző nem-felszerelt veszélyeztető légijárművel szemben egy magasság keresztező találkozásban, amely nem teszi képessé értelem felcserélésére (4.4.4.3.1 alpont). Ez a helyzet előállhat, mivel a veszélyeztető légijármű kismértékű lassulással megy át vízszintes repülésbe úgy, hogy várható magassága a legszorosabb megközelítési pontban követi az ACAS II légijármű meglévő magasságát mindegyik rákövetkező ciklusban. Növelt sebesség megoldási tanácsadás további magasság szerinti elkülönítést generálhat.

2. Megjegyzés. – A c) állapot megakadályozza a nem kívánatos együttműködést az összeütközés megelőzését biztosító logika és a földközelségre figyelmeztető rendszer (GPWS) között.

A-2 táblázat. RA erősség választék

Korlátozás	Típus	$\dot{Z}_g$
Felfelé irányuló értelmű RA		
Megnövelt emelkedés	Pozitív	$>\dot{Z}_{clm}$
Emelkedés	Pozitív	$\dot{Z}_{clm}$
Ne süllyedj	VSL	0
Ne süllyedj gyorsabban, mint 2,5 m/s	VSL	-2,5 m/s (-5000 láb/perc)
Ne süllyedj gyorsabban, mint 5,1 m/s	VSL	-5,1 m/s (-1000 láb/perc)
Ne süllyedj gyorsabban, mint 10 m/s	VSL	-10 m/s (-2000 láb/perc)
Lefelé irányuló értelmű RA		
Megnövelt emelkedés	Pozitív	$< \dot{Z}_{des}$
Süllyedés	Pozitív	$\dot{Z}_{des}$
Ne emelkedj	VSL	0
Ne emelkedj gyorsabban mint 2,5 m/s	VSL	+2,5 m/s(+500 láb/perc)
Ne emelkedj gyorsabban, mint 5,1 m/s	VSL	+5,1 m/s(+1000 láb/perc)
Ne emelkedj gyorsabban mint 10 m/s	VSL	+10 m/s (+200 láb/perc)

4.4.4.1.2 Az alapértelmezett értékek Z_{clm}-re és Z_{des}-re 7,6 m/s (1600 láb/perc) és -7,6 m/s (-1500 láb/perc). Ha 7,6 m/s (1500 láb/perc) meghaladja a légijármű emelkedő képességét, alkalmas érték helyettesítésével lehet lehetővé tenni emelkedési megoldás tanácsadások generálását. Ha az emelkedés vagy süllyedés tényleges sebessége meghaladja az alapértelmezett sebességet, a tényleges sebességet helyettesítik be, ha az kisebb, mint a 4400 láb/perc maximális sebesség; más esetben a maximális 4400 láb/perc sebesség használatos.

Megjegyzés. – Emelkedéseket akadályozhatja diszkrét jelzésekre való reagálásban pl. az, hogy a légijármű csúcsmagasságon van. Azonban lehetséges, hogy bizonyos légijárműveknek olyan korlátozott emelkedőképessége lesz, hogy a megoldási tanácsadásokat 7,6 m/s (1500 láb/perc) sebességű emelkedésre folyamatosan korlátozni kell, hogy összhangban legyen a 4. fejezet, 4.3.5.4 pontjával.

4.4.4.1.3. *RA megtartás.* Kielégítve azt a követelményt, hogy süllyedő megoldási tanácsadást nem generálnak kis magasságokon (4. fejezet, 4.3.5.4.1 pont), a megoldási tanácsadást nem módosítják (4. fejezet, 4.3.5.6 alpont), ha a következők közül valamelyik érvényes:

a) a távolság vizsgálat negatív eredményt szolgáltat, de a megközelítő légijármű veszélyeztető marad (4.3.5.1.1 pont); vagy
b) 2,5 s-nál kevesebb marad a legszorosabb megközelítésig: vagy
c) a megközelítő légijármű távolságban széttartó, de a megoldási tanácsadást nem törölték (4.3.5.1.1 pont).

4.4.4.1.4 *Gyengülő RA-k.* Kielégítve azt a követelményt, hogy süllyedési megoldási tanácsadást kis magasságon nem generálnak, (4. fejezet, 4.3.5.4.1 pont), egy megoldási tanácsadás nem gyengül (4. fejezet, 4.3.5.7 pont), ha a következő feltételek közül valamelyik érvényes;

a) pozitív és a meglévő magasság szerinti elkülönülés kisebb, mint $A_{l;}$
b) (bármilyen erősségű is) kevesebb, mint 10 s, vagy megcserélt értelmű megoldási tanácsadás esetén, 5 s volt kijelezve;
c) a veszélyeztető követett magasság változtatási sebessége "kis" bizonyosságú;
d) a megoldási tanácsadás egy függőleges sebesség határ megoldási tanácsadás.

Továbbá pozitív megoldás tanácsadások nem gyengülnek egy megoldási tanácsadás erősségen túl, amely lehetővé teszi a visszatérést a vízszintes repüléshez ("ne emelkedj" egy a lefelé irányuló megoldási tanácsadásnál; "ne süllyedj" egy felfelé irányuló megoldási tanácsadásnál).

Megjegyzés. – A gyengülő megoldási tanácsadásnak ez a korlátozása nem érvényes egy légijármű olyanná nyilvánítására, hogy az nem veszélyeztető (4. fejezet, 4.3.5.1.1 alpont).

4.4.4.2 *Kezdeti ellenállás a magasság keresztezéssel szemben.* Újonnan generált megoldási tanácsadás nem-keresztező, feltéve, ha:

a) egy nem-keresztező megoldási tanácsadás várhatóan egy legalább A_l nagyságú magasság szerinti elkülönítést szolgáltat a legszorosabb megközelítésnél; és
b) egy nem-keresztező megoldási tanácsadásra szabványos válasszal való reagálás (4.4.3.5 pont) van előrejelezve, hogy megőrizzék legalább a "minimális" függőleges elkülönítést (4.4.2.1 pont) a legszorosabb megközelítésig terjedő teljes időtartományban.

4.4.4.3 *Értelem megfordulás megalapozott veszélyeztetőnél.* Értelem megfordításokat generálnak, amikor a következő feltételek érvényesek:

a) a nem felszerelt veszélyeztető légijármű, vagy a felszerelt veszélyeztető légijármű, magasabb légijármű címzéssel rendelkezik, és legalább 9 s telt el azóta, mióta veszélyeztetővé vált, és a saját ACAS előzőleg nem fordította meg megoldási tanácsadásának értelmét; és

b) több mint 4 s maradt a legszorosabb megközelítésig;

c) a τ_u érték (4.3.4.4.1 pont) már nem emelkedett addig az ideig, amíg a veszélyeztető légijárműtől való távolság 3,2 km (1,7 NM) volt; és

d) vagy:

i) a meglévő megoldási tanácsadás keresztező; és

ii) a meglévő magasság szerinti elkülönítés legalább 61 m (200 láb), vagy 30 m (100 láb), ha több

mint 10 s marad a legszorosabb megközelítés előtt;

iii) vagy

- a megoldási tanácsadás generálásának idején azt jelezték előre, hogy a veszélyeztető légijármű keresztezi a saját légijármű kezdeti magasságát, de jelenleg emelkedésnél a veszélyeztető légijármű magasságát a legszorosabb megközelítésnél, a saját légijármű jelenlegi magassága fölé, illetve süllyedés esetén alá jelzik előre; vagy

- a megoldási tanácsadás generálásának idején nem volt előrejelzés arról, hogy a veszélyeztető légijármű keresztezi a saját légijármű kezdeti magasságát, de az emelkedés és süllyedés megoldási tanácsadásoknál a legszorosabb megközelítésnél elérhetőnek jelzett elkülönítésre vonatkozó jelenlegi számítások azt mutatják, hogy fordított értelmű megoldási tanácsadás esetén nagyobb elkülönítést nyernek; és

iv) a legszorosabb megközelítés elérésének idejéig a saját légijármű felcserélt értelemmel képes lesz meghaladni a veszélyeztető magasságának maximum-határát a legszorosabb megközelítésnél (tervezett a maximum magasság változtatási sebesség határ használata (4.1.3.3.4 pont)); vagy

2) i) a meglévő megoldási tanácsadás nem magasság keresztező, és

ii) a következők közül legalább az egyik:

- a veszélyeztető légijármű keresztezte a saját légijármű magasságát legalább 30 m-el (100 láb) a megoldási tanácsadás értelmének irányában; vagy

- a veszélyeztető légijármű nem felszerelt és a saját légijármű még nem keresztezte a veszélyeztető légijármű magasságát, de függőleges sebessége ellenkező a megoldási tanácsadással, és a megoldási tanácsadás végrehajtására irányuló azonnali manőver nem akadályozná meg a legszorosabb megközelítés előtti magasság keresztezését; vagy

- a veszélyeztető légijármű nem felszerelt és a meglévő elkülönítés nem haladja meg az A_c-t (4.4.2.1.4 alpont), a saját és a veszélyeztető légijármű függőleges sebessége meghaladja az 1000 láb/perc értéket ugyanabban az irányban, a megoldási tanácsadás pozitív volt legalább 9 másodpercen keresztül, a veszélyeztető követett sebességének a bizonyossága nagy, és vagy a legszorosabb megközelítés előtti magasság kereszteződést jeleztek előre, vagy a függőleges elkülönülés a legszorosabb megközelítésnél 30 m-nél (100 láb) kisebbre van előrejelezve.

Megjegyzés. – A megoldási tanácsadás értelme egy megalapozott veszélyeztető légijárműnél nem fordítható meg, kivéve a koordinációs célok esetét, vagy ha az előrelátható elkülönítés a legszorosabb megközelítésnél a meglévő értelemnél nem kielégítő (4. fejezet, 4.3.5.5 alpont).

4.4.4.3.1 Emelkedés megoldási tanácsadások, amelyek lefelé irányuló értelmű megoldási tanácsadások megfordítottjaiként jelennek meg, kiadásra kerülnek, tekintet nélkül a manőver korlátozási jelzésekre.

4.4.4.4 *Erős kiválasztás nem-keresztező megoldási tanácsadásoknál ACAS-al felszerelt veszélyeztető légijárművekkel szemben.* Egy ACAS-al felszerelt veszélyeztetővel való konfliktusban, amelyben a referencia logika általában egy nem-keresztező emelkedés vagy süllyedés megoldási tanácsadást generálna, amely ellentétes irányú a saját légijármű fennálló függőleges sebességével, helyette olyan megoldási tanácsadást generál, amely a függőleges sebességet 0 láb/percre limitálja, amennyiben teljesülnek a következő feltételek:

a) a saját légijármű és a veszélyeztető függőlegesen összetartanak;
b) a saját légijármű függőleges sebessége meghaladja a $\dot{Z}_{lo}$-t;
c) a veszélyeztető légijármű függőleges sebessége kisebb, mint $\dot{Z}_{lo}$
d) és a függőleges elkülönítés, amelyet a legszorosabb megközelítésnél érnének el, ha mindkét légijármű vízszintes repülésbe megy át, meghaladva Z_{losep}-t.

4.4.4.4.1 A függőleges sebesség 0 láb/perc limitjét, amelyet a megoldási tanácsadás generál a 4.4.4.4 pontnak megfelelően, megtartják, ha egyik légijármű sem gyorsul függőlegesen a másik felé olyan sebességváltozással, amely meghaladja a $\dot{Z}_{l}$-t. Ettől eltérő esetben a referencia logika azonnal emelkedés vagy süllyedés megoldási tanácsadást generál, ahogy a megoldási tanácsadás értelmének megfelel.

4.4.4.4.2 A $\dot{Z}_{lo}$ számára 6 m/s (1000 láb/perc) értéket használnak, a Z_{losep}-nél pedig 244 m (800 láb) értéket.

5. Hibrid (légtér)felderítési eljárások ACAS II használata

5.1 Áttekintés

5.1.1 A hibrid (légtér)felderítés az eljárás, amelyet az ACAS a kiterjesztett squitteren keresztül rendelkezésre álló passzív helyzet információk előnyeinek kihasználására alkalmaz. A hibrid (légtér)felderítést felhasználva az ACAS érvényesíti a kiterjesztett squitter által közvetlen aktív távolságméréssel szolgáltatott helyzetet. A kezdeti érvényesítést a nyomvonal indításnál végzik. Újraérvényesítést 10 másodpercenként egyszer végeznek, ha a megközelítő légijármű majdnem veszélyeztetővé válik magasság vagy távolság szerint. Végül rendszeres, másodpercenként-egyszer értékű aktív felderítést végeznek a megközelítő légijárműveken, amelyek majdnem-veszélyeztetővé válnak mind magasság, mind távolság szerint. Ilyen módon passzív felderítést (egyszer érvényesített) használnak nem-veszélyeztető megközelítő légijárművekkel szemben, így csökkentve az ACAS lekérdezési gyakoriságot. Aktív felderítést használnak akkor, amikor egy közelítő légijármű majdnem veszélyeztetővé válik, hogy megőrizze az ACAS, mint független biztonsági figyelő rendszer, függetlenségét. A hibrid ellenőrzési algoritmus blokk diagramját az A-11 ábra mutatja be.

5.1.2 A kiterjesztett squitter helyzet jelentésben jelentett magasság az S-módú válaszjeladón belül ugyanazon forrásból táplálkozik, mint amit az ACAS lekérdezésre adott válaszban jelentett magasság szolgáltatásához használnak. A kiterjesztett squitter helyzet jelentésben jelentett magasságot ezért egy aktív felderítés alatt álló nyomvonal magasságának felfrissítésére is lehet használni abban az esetben, amikor a válaszjeladó nem válaszol az aktív lekérdezésekre.

5.2 Hibrid felderítési berendezés jellemzői

5.2.1 KEZDETI ÉRVÉNYESÍTÉS

5.2.1.1 Passzív nyomvonalat egy 24-bites címzésű kiterjesztett squitter vétele indít el, amely nincsen a nyomvonal fájlban és nem is kapcsolódik felderítés alatt álló nyomvonallal. Ez utóbbi eset akkor fordulhat elő, ha az aktív nyomvonalat létrehozott rövid squittert helyzet jelentéseket tartalmazó kiterjesztett squitter előtt veszik.

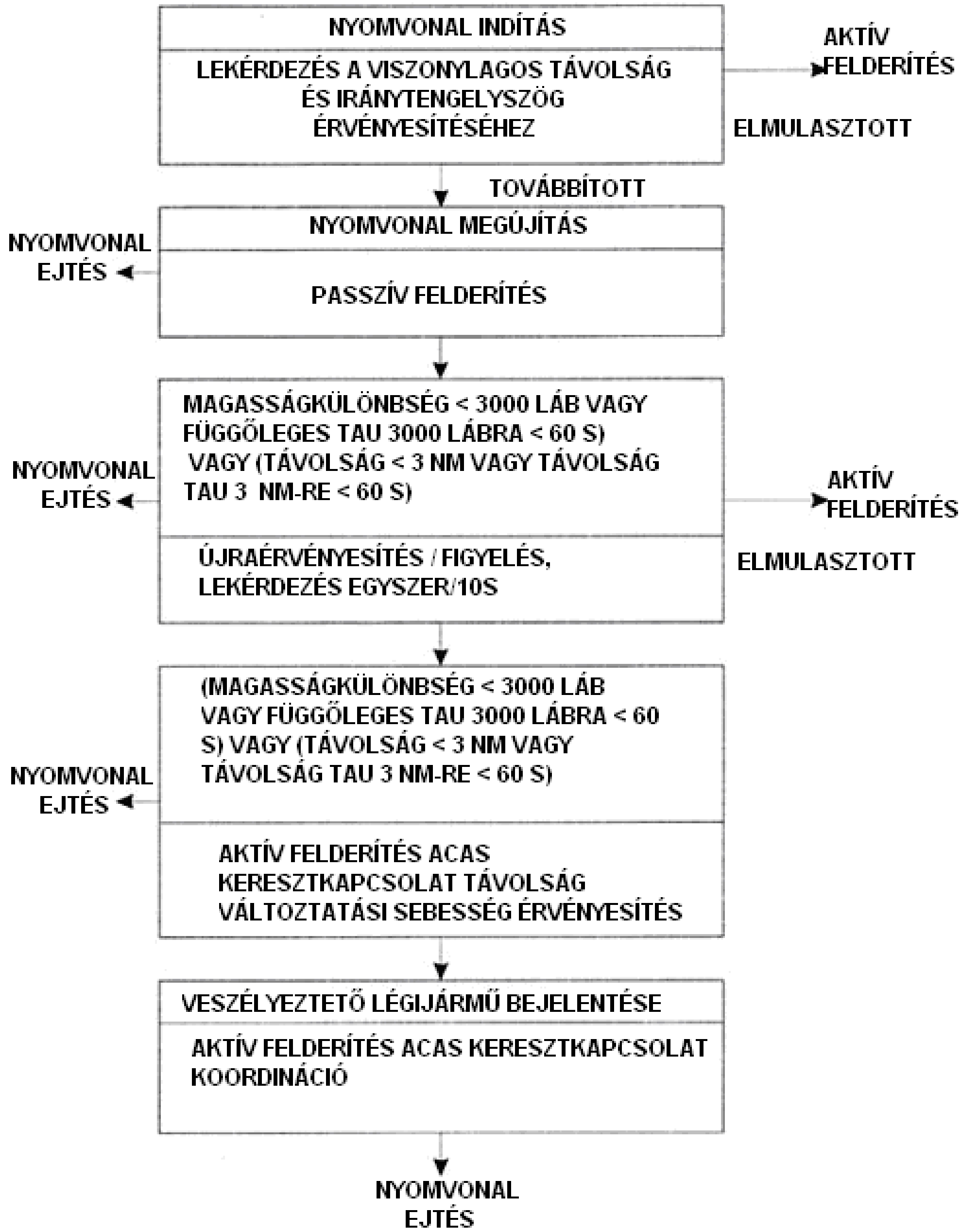
5.2.1.2 Az ACAS a kiterjesztett squitter adatbeszerzést ugyanazon a módon kezeli, mint a rövid squitter adatbeszerzést. Az igényelt squitter vétele után az ACAS MTL-nél (ugyanazon számút, mint amely a rövid squitterekre van előírva a 3. fejezet, 3.1.2.8.5 pontban), kísérletet tesznek aktív felderítésre előírt számú időpontokban. Sikeres válasz nyomvonal adatbeszerzésekhez vezet. Sikertelen kísérlet az adatbeszerzés félretevéséhez vezet ennél a légijármű címzésnél, mivel az ADS adatokat nem lehet érvényesíteni. Kiterjesztett squitterek vételének folytatása egy rákövetkező adatbeszerzési kísérlethez vezet.

5.2.1.3 Kiterjesztett squitter információkat szolgáltató légijármű esetében egy sikeres adatbeszerzési válasz alkalmat szolgáltat az információk érvényesítésére. De bármelyik esetben (rövid vagy hosszú squitter), ugyanazok a nyomvonal adatbeszerzésre vonatkozó kritériumok következnek, a korrelációban lévő megkövetelt squitterek számának, és a végrehajtott lekérdezési kísérletek számának fogalmában kifejezve.

5.2.1.4 Kezdeti ADS információ érvényesítést végeznek passzív nyomvonal indításnál annak megállapítására, hogy a nyomvonal fenntartható-e passzív adatokon. Aktív (légtér)felderítés mérést végeznek egy rövid címzett lekérdezés felhasználásával, amely egy ACAS keresztkapcsolat utasítást hordoz a 05{HEX} regiszter tartalmának szolgáltatására (kiterjesztett squitter levegőbeni helyzet) a válaszban. A válasz erre a lekérdezésre a légijármű sebesség képességét és a jelentett barometrikus magasságot is szolgáltatja az ADS-B levegőbeni helyzet jelentésen kívül. A saját és megközelítő légijármű jelentett helyzetéből számított viszonylagos távolságot és irányszöget összehasonlítják az aktív lekérdezésből nyert magassággal. Ha a jelentett információk nem egyeznek meg a 4. fejezet 4.5.1.3.2 pontban ajánlott határokon belül az aktív lekérdezés által nyert távolsággal, irányszöggel vagy magassággal, a nyomvonalat aktív nyomvonalnak nyilvánítják és a jövőbeni kiterjesztett squittereket az ACAS elhanyagolja.

5.2.2 ÚJRAÉRVÉNYESÍTÉS ÉS FIGYELÉS

Ha egy relatív magasság $\leq$ 10000 láb feltételt kielégítő légijárműnél a következő feltételek teljesülnek:
(A megközelítő légijármű magasságkülönbsége $\leq$ 3000 láb VAGY függőleges TAU 3000 lábra $\leq$ 60 másodperc) VAGY
(Távolság különbség $\leq$ 3 NM VAGY távolság TAU 3 NM-re $\leq$ 60 másodperc)
egy aktív lekérdezést végeznek minden 10 másodpercben, hogy folyamatosan újraérvényesítsék és figyeljék a helyzet jelentéseket.
Bármely észlelt különbség azt eredményezi, hogy a légijárművet aktív nyomvonalnak nyilvánítsák.



A-11 ábra. ACAS hibrid felderítés algoritmusa

5.2.3 AKTÍV (LÉGTÉR)FELDERÍTÉS

5.2.3.1 Ha egy relatív magasság ≤ 10000 láb feltételt kielégítő légijárműnél, a következő feltételek teljesülnek:

(A megközelítő légijármű magasság különbsége ≤ 3000 láb VAGY függőleges TAU 3000 lábra ≤ 60 másodperc) VAGY

(Távolság különbség ≤ 3 NM VAGY távolság TAU 3 NM-re ≤ 60 másodperc)

a légijárművet aktív trekknek nyilvánítják, és másodpercenként egyszer aktív távolságmérések alapján frissítik.

5.2.4 VESZÉLYEZTETŐ LÉGIJÁRMŰ ÉRTÉKELÉSÉNEK BEJELENTÉSE

Ha a megközelítő légijárművet veszélyeztetőnek, vagy potenciális veszélyeztetőnek nyilvánítanak, az aktív távolságmérés folytatódik.

6. Az összeütközés elkerülését biztosító logika működése

6.1 A működési követelmények célja

6.1.1 Az ACAS összeütközés elkerülését biztosító logika az ACAS része, amely az azonosított megközelítő légijárművekre (azaz bármely légijárműre, amelyre az ACAS nyomvonalat hozott létre) vonatkozó információkat vesz és ezeknek az információknak az alapján ütközés elkerülési tanácsadásokat generál. Mindegyik ACAS berendezésben egy mikroprocesszorba szoftvert telepítenek és ez a szoftver matematikai algoritmusok együttesét valósítja meg. Ezek az algoritmusok ACAS-ra különbözőek lehetnek, és az ütközés elkerülését biztosító logikával szembeni követelmények célja biztosítani azt, hogy a matematikai algoritmusok működése elfogadható legyen.

6.1.2 Az összeütközés elkerülését biztosító algoritmusok kialakítását és szoftverként való megvalósítását különálló folyamatnak gondolják, és ezek a szabványok az algoritmusokra vonatkoznak, mégis a gyakorlatban a szoftver szokta demonstrálni, hogy az algoritmusok, amelyek kielégítőek, szorosan vonatkoznak arra az ACAS-ra, amellyel telepítik. Az összeütközés elkerülés logikával szemben támasztott működési követelmények nem törekszenek annak garantálására, hogy az összeütközés elkerülés szoftver szoftverként kielégítő legyen, bár ezek egy ilyen garanciának lényeges alkotóelemei. A szoftver kielégítő működését megfelelő szoftver-kezelési gyakorlattal kell elérni, amely biztosítja, hogy az algoritmusokat megbízhatóan megvalósítsák.

6.1.3 Az összeütközés elkerülését biztosító logikák interoperabilitását bármely két berendezésben annak biztosításával érik el, hogy megoldás tanácsadásaik összefüggenek és hogy bármelyik megoldási tanácsadás egyedül is elegendő a rendszer, mint egész célkitűzéséhez. A konzisztenciát a koordinációra vonatkozó követelmények biztosítják. (4. fejezet 4.3.5.5.1, 4.3.5.8 és 4.3.6.1.3 pontok). Hogy a kettő közül az egyik megoldási tanácsadás elegendő, azt az összeütközés elkerülését biztosító logika működési követelményei garantálják és különösen az elegendő teljesítmény követelménye, amikor a másik légijármű ACAS-al felszerelt, de nem kooperál (4. fejezet 4.4.2.1 j) 2) alpont.

6.1.4 A működési követelmények arra szolgálnak, hogy teljes garanciát nyújtsanak arra vonatkozóan, hogy a szóbanforgó ACAS logikának általános teljesítménye van, amely egyenrangú vele, vagy felülmúlja a többi ACAS logika teljesítményét. Ezek nem írják le a logika működését semelyik adott légtérben. Több okból kifolyólag a legjobb módszer egy ACAS logikának egy adott légtérben való működésének meghatározására vagy tanulmányozására légiforgalmi irányítási földi radar adatokon alapuló szimulációk végzése. Ennek lehetőségét tárgyalja tovább a 6.4.4 alpont.

6.2 Feltételek, amelyek mellett a követelmények érvényesek

6.2.1 KOMMENTÁR

A 4. fejezet, 4.4.2 pontjában adott feltételek úgy lettek meghatározva, hogy megfogalmazzák a rákövetkező követelményeket, de kielégítő működést követelnek meg az összes normál működési feltételnél. Ezt kell alátámasztania a feltételek változásának, amelyben a teljesítmény mértékét számolják olyan módon, amely a várható normál változatokat tükrözi, és biztosítva azt, hogy a számított teljesítmény mértékek robusztusak, azaz nem romlanak le hirtelen, amikor romlanak a feltételek.

6.2.2 FELDERÍTÉSI HIBÁK

6.2.2.1 A felderítési hibák számos formát ölthetnek:

a) nem képződik nyomvonal a megközelítő légijárműre;
b) a nyomvonal későn képződik;
c) a nyomvonalat idő előtt ejtik;
d) nyomvonal képződik, de nem állnak rendelkezésre jelentések mindegyik ciklusra; és
e) a jelentések pl. a távolságról, mérési hibákkal terheltek.

6.2.2.2 Bár az ACAS, mint egész, hatékonysága értékelésének figyelembe kell vennie a nyomvonalak képzésének az a) tétel szerinti elmulasztását, nincs szükség annak bizonyítására, hogy a logika hatékony, amikor nincs adata.

6.2.2.3 A b) tétel szerinti késői nyomvonal képződés késleltetheti a megoldási tanácsadások generálását (talán amiatt, hogy a különböző követők a logikában nem azonos irányba hatnak és a megoldási tanácsadást a kis megbízhatóság késlelteti), vagy nem megfelelő kezdeti megoldási tanácsadást eredményez (esetleg azért, mert a követők kimenetét felhasználták, mielőtt az azonos hatott volna). A legjobb megoldás lenne meghatározni a késői nyomvonal kialakulás gyakoriságát a meglévő felderítési rendszernél, amit a vizsgálatra kerülő logikával használnak.

6.2.2.4 Amikor nyomvonal alakul ki, a hiányzó jelentések leronthatják a nyomvonal pontosságát, vagy a nyomvonal kis megbízhatóságát okozhatják, ezek mindegyike késleltetheti a kezdeti megoldási tanácsadást, nem megfelelő megoldási tanácsadást eredményezhet, vagy késleltetheti a változtatásokat a megoldási tanácsadásban, ha azt már generálták. A legjobb megoldás lenne meghatározni a hiányzó jelentések gyakoriságát a meglévő felderítési rendszernél, amelyet a vizsgálatra kerülő logikánál használnak. Annak valószínűsége, hogy egy jelentés valamely adott ciklusban hiányzik, a megközelítő légijármű távolságának, magasságának és annak a függvénye, hogy egy jelentés az előző ciklusban hiányzott vagy nem.

6.2.2.5 Tényleges iránytengely mérések hibái nagymértékben függnek a légijármű szerkezettől és az ACAS antenna és a többi antenna elhelyezésétől és az ugyanazon légijármű szerkezeten elhelyezett akadálytárgyaktól. Az iránytengely mérések tipikusan annyira gyengék, hogy a korai ACAS tervezések nem használták azokat az összeütközés elkerülését biztosító logikában. Egy későbbi tervezés, amely tartalmazott egy, a megoldási tanácsadásokat gátoló szűrőt, amikor a távolságmérések sorozata jelentős vízszintes hiányzó távolságot jelzett, felhasználta az iránytengelyre és iránytengely változásának sebességére vonatkozó méréseket annak igazolására, hogy egyik légijármű sem gyorsul; a szűrő alkalmatlan, ha az iránytengelyre vonatkozó mérések nem állnak összhangban a diagnosztizált hiányzó távolsággal. A 4. fejezet 4.4.2 pontjában ismertetett feltételek szolgálnak arra, hogy lefedjék a logikának ezt a fajta tulajdonságát.

6.2.2.6 Nagyon valószínűtlen, hogy valamely ACAS felszerelés olyan iránytengely méréseket szolgáltasson, amelyek elegendő pontosságúak, hogy elsődleges alapként szolgáljanak egy hiányzó távolság szűrőnek, vagy az ütközés elkerülését biztosító logika bármely más aspektusának.

6.2.2.7 Távolság és iránytengely méréseket a megközelítő légijármű viszonylagos helyzetének meghatározására is használják a forgalmi kijelzésben való felhasználáshoz. Ennek a felhasználásnak a követelményei sokkal kevésbé szigorúak, mint az összeütközés elkerülését biztosító logika követelményei és a 4. fejezet 4.4.2.2 és 4.4.2.3 pontjában ismertetett modelleknek nincs ilyen iránytengely felhasználása.

6.2.3 MAGASSÁG KVANTÁLÁS

6.2.3.1 A megközelítő légijármű magassága vagy C-módú vagy S-módú jelentésként és így 100 láb vagy 25 láb kvantumokban kifejezve állhat rendelkezésre. A 4. fejezet, 4.4.2.1 c) pont határozza meg, hogy a 100 lábas kvantum hordozza annak megerősítési célját, hogy a működési követelmények teljesülnek. Az összeütközés elkerülését biztosító logika működésének javulása várható, amikor a megközelítő légijármű magassága 25 lábas kvantumokban áll rendelkezésre, és kívánatos megerősíteni, hogy ez az eset áll fenn.

6.2.3.2 A legtöbb esetben a saját légijármű magassága az ACAS részére C-módú vagy S-módú jelentés megformálása előtti mérés formájában áll rendelkezésre és a 4. fejezet 4.4.4.2.1 d) pont határozza meg, hogy ez feltételezés. Olyan felszereléseknél, ahol nem lehetséges az eredeti magasságmérés szolgáltatása az ACAS részére, az összeütközés elkerülés biztosító logikának a saját légijármű által készített C-módú vagy S-módú jelentéseket kell használni. Ez várhatóan lerontja a logika működési eredményességét, de a 4. fejezet 4.4.2.1.1 pontja megköveteli, hogy ez a romlás még elfogadható legyen. A logika várhatóan nem elégíti ki a működési követelményeket, ha magasság jelentéseket (mint a mérésekkel szembenállókat) saját légijárműnél használják fel. A próba az, hogy a mérési eredményeket elfogadhatónak ítélik-e, amikor ezek olyan telepítésből származnak, ahol szükség volt teljesítmény kompromisszumra olyan bemenet használatának formájában, amely nem illeszkedik a normál szabványokhoz, és hogy ezek jelzik-e, hogy a logika túlzottan érzékeny a saját légijárműre vonatkozó magasság adatok kvantálásával szemben.

6.2.4 SZABVÁNYOS MAGASSÁGMÉRÉSI HIBA MODELL

6.2.4.1 A szabványos magasságmérési hiba modell az ACAS-nak az összeütközés kockázatára gyakorolt hatása számításához szükséges (6.3.2 alpont). Bár ez az üzemelő magasságmérők megfigyelt működésén alapszik, nincs olyan törekvés, hogy a modellt ennek a működésnek a referencia rögzítésére használják. Még kevésbé áll fenn olyan rejtett követelmény a magasságmérővel szemben, hogy illeszkedjen a modellben leírt működéshez, akár felhasználják az ACAS-al kapcsolatban, akár nem. A modellt csupán azon feltételek meghatározási céljára használják, amelyek között az összeütközés elkerülését biztosító logika működésére vonatkozó követelmények érvényesek.

6.2.4.2 A modell leírja a magasságmérések feltételezett hibaeloszlását. Ez kizárja a kvantálás hatását, amely kvantálás C-módú és S-módú jelentések létrehozásához szükséges. Mindazonáltal az ACAS-nak az összeütközés kockázatára kifejtett hatása számításánál teljes mértékben figyelembe kell venni ezt a kvantálást, és ezt a szimulált magasságmérések kvantálásával kell elérni, és ebből fakadóan szimulált jelentések kialakításával, amelyeket a szimulált ACAS logikának szolgáltatnak.

6.2.4.3 Az ACAS hatásának szimulációi magukban foglalják a légijárművek mért magasságainak ismeretét. A tényleges magasságaik nem ismertek sem a légiforgalmi irányításnál, sem a légijárműnél; ezek a szimulált mérés és a véletlen magasságmérő hiba összegeként adódnak. Minden előfordulásnál, ahol a vízszintes hiányzó távolság nagyon kicsi, van valamilyen kockázata az összeütközésnek és ez egyenlő annak valószínűségével, hogy a két légijármű magasságának tényleges különbsége elég kicsi az összeütközés létrejöttéhez. Így az ACAS-nak az összeütközés kockázatára kifejtett hatásának a számolása (6.3.2 alpont) részt vesz a két légijármű mért magasságkülönbsége hibájára vonatkozó statisztikus eloszlás kialakításában: a két statisztikai eloszlás konvolúciója (spirálmenete), mindegyik légijárműhöz egy.

6.2.4.4 A 4. fejezet, 4.4.2.4 pontjában leírt szabványos magasságmérési hiba modellnél annak valószínűsége, hogy a tényleges függőleges elkülönítés kisebb, mint egy h küszöbérték, (amelyet a 6.3.2 pontban 100 lábnak vettek), a következő lesz:

for $\lambda_1 = \lambda_2$ and $a \geq h$

$$Prob(|d| \leq h) =$$

$$\frac{1}{4\lambda}\exp\left(\frac{-(a+h)}{\lambda}\right)\left[\exp\left(\frac{2h}{\lambda}\right)(2\lambda + a - h) - (2\lambda + a + h)\right]$$

for $\lambda_1 = \lambda_2$ and $a < h$

$$Prob(|d| \leq h) =$$

$$1 - \frac{1}{4\lambda}\exp\left(\frac{-(a+h)}{\lambda}\right)\left[\exp\left(\frac{2a}{\lambda}\right)(2\lambda - a + h) + (2\lambda + a + h)\right]$$

for $\lambda_1 \neq \lambda_2$ and $a \geq h$

$$Prob(|d| \leq h) =$$

$$\frac{\lambda_1^2\exp\left(\frac{-a}{\lambda_1}\right)\sinh\left(\frac{h}{\lambda_1}\right) - \lambda_2^2\exp\left(\frac{-a}{\lambda_2}\right)\sinh\left(\frac{h}{\lambda_2}\right)}{\lambda_1^2 - \lambda_2^2}$$

and for $\lambda_1 \neq \lambda_2$ and $a < h$

$$Prob(|d| \leq h) =$$

$$\frac{\lambda_1^2\left[1-\exp\left(\frac{-h}{\lambda_1}\right)\cosh\left(\frac{a}{\lambda_1}\right)\right] - \lambda_2^2\left[1-\exp\left(\frac{-h}{\lambda_2}\right)\cosh\left(\frac{a}{\lambda_2}\right)\right]}{\lambda_1^2 - \lambda_2^2}$$

ahol λ_1 és λ_2 a λ értékei a két légijárműnél és a a látszólagos függőleges elkülönítés, mint a 6.3.2 pontban, azaz a függőleges elkülönítés a két légijárművön elhelyezett magasságmérő mérése szerint.

6.2.5 SZABVÁNYOS REPÜLŐGÉPVEZETŐ MODELL

6.2.5.1 A szabványos repülőgépvezető modell a repülőgépvezető megoldási tanácsadásokra való elfogadható reagálását képviseli. Azonban nem fogja át a potenciális reagálások teljes tartományát, például a lassú reagálásokat, amelyek veszélyeztetik az összeütközés elkerülést és a túlságosan heves reakciókat, amelyek az engedélyezettől való nagy eltéréseket okoznak. Néhány reagálásnál, például a reagálás elmulasztása, vagy döntés a következő repülési magasságszintre való átmenetről egy emelkedési megoldási tanácsadásra való reagálásban, nem megfelelő alkalom a logika működésének vizsgálatára, de a szabványos modell következő módosításai jelzést szolgáltatnak, hogy a logika nem függ-e túlságosan a repülőgépvezető pontos reagálásától.

6.2.5.2 A 4. fejezet, 4.4.3 pontjával összefüggésben, az összeütközés kockázatának csökkentése, egy feltételezett hibás repülőgépvezető reagálás:

a) a repülőgépvezető lassan reagál, nevezetesen 8 s-ra rá egy kezdeti megoldási tanácsadásra és 5 s-ra rá egy megváltoztatott megoldási tanácsadásra; és

b) a repülőgépvezető nem megfelelő sebességet valósít meg, nevezetesen 200 láb/perc értékkel kevesebbet, mint a megkívánt sebesség.

6.2.5.3 A 4. fejezet, 4.4.4 pontjával összefüggésben, az ACAS hatása a légiforgalom menedzsmentjére (ATM), egy feltételezett reagálás:

a) a repülőgépvezető gyorsan reagál, nevezetesen 3 s-re rá egy kezdeti megoldás tanácsadásra és 1 s-ra rá egy megváltoztatott megoldási tanácsadásra;

b) a repülőgépvezető túlzott sebességet valósít meg, nevezetesen 500 láb/perc értékkel nagyobbat, mint a megkívánt sebesség; és

c) a repülőgépvezető elmulaszt reagálni a gyengülő megoldási tanácsadásokra.

6.2.5.4 A logikától nem várják el, hogy kielégítse a működési követelményeket, amikor a repülőgépvezető a fentiek szerint reagál, de a teljesítmény mértékek számítása, amely ezeket a nem szabványos repülőgépvezető reagálásokat használja, némi betekintést nyújt a logika a repülőgépvezető reagálásra való érzékenységébe. A próba az, hogy a mértékváltozásokat elfogadhatónak ítélik, amikor ezek egy pontatlan reagálásból erednek, és hogy ezek jelzik-e, hogy a logika túlzottan érzékeny a repülőgépvezető feltételezett reagálására.

6.2.6 SZABVÁNYOS TALÁLKOZÁSI MODELL

6.2.6.1 Ténylegesen két találkozásI modell van, egyik a kockázati arány számításaiban való felhasználásra (ahol a vízszintes hiányzó távolság kicsi), és a másikat akkor használják, amikor a logika tervezésének ATM-el való összeegyeztethetőségét értékelik (ahol a vízszintes hiányzó távolság közel egyezést mutat a légiforgalmi irányítási vízszintes elkülönítési minimummal). Ez felülkerekedik egy más esetben elfogadhatatlan egyszerűsítésen: mindkét modell a találkozás vízszintes és függőleges jellemzőit egymástól függetlenül kezeli.

6.2.6.2 A szabványos modell két Államban gyűjtött nagy mennyiségű földi radar-adat analízisének az eredménye. Ez azt jelenti, hogy elvárható, hogy ennek a modellnek a segítségével számított teljesítmény mértékek az üzemelés realitására vannak vonatkoztatva még akkor is, ha a számításoknak nem ez a célja. Az analizált adatok nagyon figyelemreméltó változatosságot tártak fel a légtér jellemzőkben, amely a találkozás modellnek az adatokat szolgáltató radar földrajzi helyétől való függőségében fejeződött ki. A két Államtól származó adatok jellemzői radikális különbséget mutattak. Ez azt jelenti, hogy egy szabványos találkozás modell nem tud olyan előrejelzéseket szolgáltatni, amelyek bármely adott földrajzi helyre érvényesek. Azonban, elfogadva, hogy egy szabványos modell a szabványos működés meghatározásához lényeges, a szabványosított modellt elegendően komplexnek és reprezentatívnak tekintik.

6.2.6.3 A szabványos találkozás modell paramétereinek meghatározásához (4. fejezet, 4.4.2.6 alpont), például a találkozás osztályok viszonylagos súlyának meghatározásához, a találkozásokat rekonstruálták a földi radar adatokból. Ez a találkozások aspektusainak újraértelmezését kívánta, amelyekre példák lentebb következnek.

6.2.6.3.1 A szabványos találkozás modellhez adott “Magasság réteg” meghatározása (4. fejezet, 4.4.1 alpont) egyszerű, mert ezt csupán az összeütközés elkerülés logika szabványosítása céljára csinálják. Amikor a földi radar adatokban észlelt valós találkozásoknál a talajszint nem felelt meg a 0 láb nyomásmagasságnak, szükséges volt különbséget tenni a földfeletti magasság és a közepes tengerszintre vonatkoztatott nyomásmagasság között. A módszer, amelyet magasság réteg meghatározására használnak, a valós radar adatokban észlelt találkozást az 1 rétegben helyezi el, ha ez 2300 láb földfeletti magasság (AGL) alatt történik, és a közepes tengerszintre MSL vonatkoztatott magasságot használja minden más esetben. Nagy magasságú elhelyezéseknél egy vagy több réteg néha hiányzik.

6.2.6.3.2 Egy légijármű függőleges sebessége egy találkozás elején és végén, $\dot{z}_1$, $\dot{z}_2$ a szabványos találkozás modellben, precíz időpontban fellépő értékek, azaz tca - 35 s-nál és tca + 50 s-nál. Amikor az adatokat a földi radar adatokban megfigyelt valódi találkozásoknál dolgozzák fel, a $\dot{z}_1$ és $\dot{z}_2$ pontoknál használt értékek a találkozó első 10 másodperce feletti azaz [*tca - 40 s, tca - 30s*] feletti, és az utolsó 10 s azaz [*tca, tca + 10*] feletti átlagértékek.

6.2.6.3.3 Hasonló módon, a valóságos találkozásoknál *tca* volt a legszorosabb megközelítés tényleges időpontja és *hmd* volt a tényleges vízszintes elkülönítés a legszorosabb megközelítésnél. A függőleges hiányzó távolság, *vmd* vagy a függőleges elkülönítés a legszorosabb megközelítésnél, olyan találkozásoknál, amelyeknél *hmd* $\geq$ 500 láb, vagy a minimális függőleges elkülönítés az alatt az időperiódus alatt, amelyben a két légijármű vízszintes elkülönítése 500 lábnál kisebb volt.

6.2.6.3.4 A szabványos találkozás modell néhány aspektusa, például a sebességváltozások nagysága a találkozás alatt, nem határozható meg a földi radar adatokból (az adatok jellege miatt) és a légijármű dinamika általános ismeretének felhasználásával kellett ezeket jellemezni.

6.2.6.3.5 Hogy a modell találkozások és a radar megfigyelési adatokból nyert találkozások közötti precíz összefüggés hiányát figyelembe vegyék, nem szabad megfeledkezni arról, hogy a szabványos találkozás modell célja az összeütközés elkerülését biztosító logika működésének szabványosítása. Míg természetesen minden lehetséges erőfeszítést megtettek annak biztosítására, hogy a modell a lehető leghűbben tükrözze az üzemelés valóságát, a pontos hűség nincs megkövetelve és nem is sikerült elérni. Ez nem ad okot egy másik modell használatára, az egyetlen modell, amely az összeütközés elkerülését biztosító logika működésének értékelésére érvényes, az itt ismertetett követelmények alapján az a modell, amely erre a célra itt került ismertetésre.

6.2.6.4 A szabványos találkozás modell bármilyen konstrukciója, amelyről bizonyítható, hogy ekvivalens a 4. fejezet 4.4.2.6 pontban ismertetettel, elfogadható. Két ilyen alternatív modellre az alábbiakban adunk két példát.

6.2.6.4.1 A 4. fejezet, 4.4.2.6.1 pontja írja elő, hogy a teljesítmény mértékeket a jellemzők széles körével meghatározott találkozások együttesének létrehozásával lehet kiszámolni (speciálisan: a légijármű címzések rendezése; a magasság réteg; a találkozás osztály; és a függőleges hiányzó távolság közelítő értéke) és az ezektől az együttesektől kapott eredmények kombinálásával, felhasználva a 4. fejezet 4.4.2.6.2 pontjában előírt súlyozásokat. Ez a viszonylag ritka fajtájú szimulációkból, pl. keresztező találkozások, annyit von be, mint amennyit a gyakoribb fajtájú találkozások szimulációiból, pl. nem-keresztező találkozások. Ez a megközelítés biztosítja, hogy az egyes együtteseken belül a lehetőségek teljes skálája megfelelően meg legyen vizsgálva. Azonban ugyanoda lehet jutni bizonyos számú találkozás megalkotásával mindegyik együttesnél, amelyek arányosak a fajlagos súlyukkal és az összes találkozást egyetlen nagyobb készletbe való összekombinálásával. Az egyetlen kifogás ezen alternatív megközelítés ellen az lehet, hogy a találkozások teljes számának elég nagynak kell lennie ahhoz, hogy biztosítsa, hogy a legkisebb együttestől származó eredmények, amelyet elszigetelten vesznek figyelembe, statisztikailag megbízható legyen.

6.2.6.4.2 Minden egyes függőleges sebességhez tartozó statisztikai eloszlást azzal a követelménnyel határoztak meg, hogy először kiválasztanak egy tartományt, amelyen belül kell esnie a végső értéknek és azután választják ki a végső értéket egy olyan eloszlás felhasználásával, amely a tartományon belül egyenletes. Ez csupán egy eszköz, amelyet a 4. fejezet, 4.4.2.6.3.2.4 pontjában lévő táblázatok világos bemutatása kedvéért fogadtak el. Ez ekvivalens azzal a módszerrel, amikor az értéket közvetlenül a tartományokon belül lineáris statisztikai eloszlás felhasználásával választják ki, és amelyekre a kumulatív valószínűség mindegyik tartományon keresztül az erre a tartományra meghatározott valószínűséggel egyenlő mennyiséggel növekszik.

6.2.6.5 A szabványos találkozás modellben lévő találkozásokat egy képzeletbeli legszorosabb megközelítésből kifelé konstruálják. Ennek az elképzelt legszorosabb megközelítésnek az időpontja rögzített és *"tca"*-ként van leírva a 4. fejezet, 4.4.2.6 pontban. A függőleges síkban kiválasztják a *tca* előtt 35 s-hoz és a *tca* után 5 s-hoz tartozó függőleges sebességeket és ha szükséges, gyorsulási periódussal egyesítik őket, és azután a magasságokat rögzítik a repülési pályán azzal a követelménnyel, hogy a függőleges elkülönítés *tca*-nál egyenlő a *hmd*-re választott értékkel. A vízszintes síkban a *"hmd"*-re választott érték, a megközelítési szög és a légijármű sebességek meghatározzák a két légijármű viszonylagos repülési pályáit a *tca* időpontban. A légijármű fordulók és sebesség változások módosítják a repülési pályákat *tca* előtt és után. Ennek a folyamatnak a következményeként a legszorosabb megközelítés időpontja csak megközelíti a *tca*-t.

6.2.7 A MEGKÖZELÍTŐ LÉGIJÁRMŰ ACAS FELSZERELÉSE

6.2.7.1 A szabványok a megközelítő felszerelésével foglalkozó feltételek három együttesét határozzák meg és a megközelítő légijármű következő viselkedési módját feltételezik:

a) az egyes találkozásokban résztvevő másik légijármű nem-felszerelt;

b) a másik légijármű fel van szerelve ACAS-al, de egy olyan repülési pályát követ, amely azonos a nem-felszerelt találkozásban követettel; és

c) a másik légijármű fel van szerelve ACAS-al, amely a saját ACAS-ával megegyező összeütközés elkerülését biztosító logikával rendelkezik.

6.2.7.2 Az a) körülmény biztosítja, hogy a logika kielégítően működik felszereletlen megközelítő légijárművel történő találkozásoknál. A másik két körülmény az összeütközés elkerülését biztosító logikát vizsgálja, amikor a másik légijármű felszerelt, de ezt különböző szempontból végzi. A b) körülmény biztosítja, hogy a logika kifogástalanul működik a koordinációs folyamat korlátozásai közepette, míg a c) körülmény biztosítja, hogy kihasználják annak előnyeit, ami elvárt akkor, amikor mindkét légijármű felszerelt.

6.2.7.3 A b) körülmények között érvényes feltételek arra szolgálnak, hogy lehetővé tegyék a saját ACAS részére kezdeti megoldási tanácsadás kiválasztását, de azután a legpesszimistább elfogadható feltételezéseket kell alkalmazni a saját ACAS logika működésére vonatkozó koordinálás szükségességének hatásáról. Amikor a saját légijárműnek alacsonyabb légijármű címzése van, a vizsgálat feltételei magukban foglalják, hogy a megoldási tanácsadás értelmét nem lehet megfordítani. Továbbá, a megközelítő légijármű nem generál sem megoldási tanácsadást, sem megoldási tanácsadás kiegészítést, amíg a saját ACAS megoldási tanácsadás be van jelentve, mert egy korai terv egy kezdeti koordináció késleltetést tartalmaz (amelynek célja az volt, hogy lehetővé tegye a koordináció elvégzését és elkerülje, hogy a repülőgépvezető gyors változásokat észleljen a megoldási tanácsadásokban); a követelmény arra szolgál, hogy a teljesítmény kielégítő voltát biztosítsák, bármiféle késleltetés káros hatása ellenére.

6.2.7.4 A c) körülmények azt követelik meg, hogy a két légijármű viselkedése teljes mértékben együttműködő legyen, de az a tény, hogy mindkét ACAS tárgyi logikát használja, biztosítja, hogy a teljesítmény mérték a tárgyi logikára vonatkozzon, és a tárgyi logika hatékony legyen.

6.2.7.5 A fenti okfejtésnek megfelelően, a működési specifikációk arra szolgálnak, hogy a logika kielégítő működését biztosítsák és nem a rendszernek, mint egésznek a működését. Olyan kiterjesztéshez, hogy ezek a rendszerek, mint egész előnyeinek szélesebb értelmezésére legyenek alkalmasak üzemelési körülmények között, a c) körülményről elgondolható, hogy hitelesebb teljesítmény mértéket szolgáltat ACAS-ACAS találkozásoknál. A logika részletezett teljesítménye a b) körülménynél rosszabb, mint amikor a megközelítő légijármű nincs felszerelve, mert a b) körülmény csak a koordináció általi korlátozásokat tartalmazza. Azonban az a tény, hogy egy megközelítő légijármű együttműködése nem garantálható, és hogy egyes repülőgépvezetők néha elmulasztják a reagálást a megoldási tanácsadásokra, azt jelenti, hogy mindhárom mértéknek üzemelési relevanciája van.

6.3 Az összeütközés kockázatának csökkentése

6.3.1 A LOGIKAI KOCKÁZATI ARÁNY STÁTUSZA

6.3.1.1 A 4. fejezet, 4.4.3 alpont céljaira számított kockázati arány a logika teljesítményének mértéke és nem az ACAS-é, mint egészé. Például az ACAS megakadályozhat egy összeütközést a repülőgépvezető ösztönzésével a megközelítő légijármű egy sikeres vizuális keresésének kivitelezésére és ez elmaradhat, mert nem létesült nyomvonal, vagy a repülőgépvezető figyelmen kívül hagyja a megoldási tanácsadást; ezek a teljes rendszer szempontjai, amelyek nem tükröződnek a 4. fejezet 4.4.3 pontjában megkövetelt számításokban.

6.3.1.2 A "logikai kockázati arány" helytállósága a 4. fejezet 4.4.3 pontja szerint számolt számainak az üzemelési vagy stratégiai döntésekhez való figyelembevételénél hasznos lehet ezeket csupán megbízhatóságnak tekinteni, amelyet a megoldási tanácsadásokhoz illesztenek. Ezek azt a hatást fejezik ki, amely egy megoldási tanácsadást követően az összeütközés közvetlen kockázatára kifejtődik, ha a kiadás időpontjában a repülőgépvezetőnek nincs más információja, mint a megoldási tanácsadás, amire azt a döntését alapozná, hogy kövesse vagy figyelmen kívül hagyja a megoldási tanácsadást. Durva iránymutatásként, az ACAS által létrehozott összeütközés kockázat a megoldási tanácsadás követéséből ered, így a logikai kockázati arány eltúlozza ezt az "indukált" kockázati arányt; másrészt pedig eltúlozza az ACAS-nak a képességét az összeütközések megelőzésére a teljes rendszerben lévő sok más hibázási mód miatt.

6.3.1.3 A 4. fejezet 4.4.3 paragrafusának céljaira kiszámolt számok nem alkalmazhatók meggondolási iránymutatókként az ACAS-nak az összeütközés teljes kockázatára kifejtett hatását illetően egy légtérben, vagy mint olyan kockázatra vonatkozóan, amellyel egy légijárműnek kell szembenéznie.

6.3.2 A LOGIKAI KOCKÁZATI ARÁNY SZÁMÍTÁSA

6.3.2.1 Az R kockázati arány a következőképpen írható fel:

$$R = \frac{\sum \textit{probability of a collision with ACAS}}{\sum \textit{probability of a collision without ACAS}}$$

ahol az összegezés az összes találkozásra vonatkozik, vagy gyakorlatiasabban, az összes olyan találkozásra, amely hozzájárul az összeütközés teljes kockázatához ACAS-al vagy anélkül. Ami a találkozások jellemzőihez és statisztikájához az üzemelési realitások reprezentálásához szükséges, a 4. fejezet, 4.4.2.6 pontjában lett szabványosítva és a 6.2.6 pontban került tárgyalásra.

6.3.2.2 Az összeütközés becsült kockázata az "összeütközés" szó értelmezésétől függ. Míg ezt a problémát messze elkerüli az összeütközési kockázat ACAS-al és ACAS nélkül közötti arány fogalmaiban kifejezett követelmény, nagyon fontos, hogy reálisan veszi figyelembe a legnagyobb légijármű méretét. Ésszerű lenne a két légijármű középpontja közötti 100 lábnál kisebb függőleges elkülönülést úgy kezelni, mint amely elegendő egy összeütközés lehetővé válásához. Nem lenne tanácsos jelentősen hiányzó távolságokat használni összeütközések közelítéseként, mert azt találnák, hogy a számított kockázati arány érzékeny az “összeütközés” definíciójára még akkor is, ha ez egy arány.

6.3.2.3 Ha azt a közelítést tesszük, hogy egy összeütközés akkor következik be, amikor $|d| < 100$ láb, ahol d a tényleges függőleges elkülönítés, akkor:

$$R = \frac{\sum \text{prob}(|d| < \mathit{100\ ft\ with\ ACAS})}{\sum \text{prob}(|d| < \mathit{100\ ft\ without\ ACAS})}$$

ahol most az összegezés az összes zérus vagy extremálisan kicsi vízszintes hiányzó távolságú találkozásra terjed ki.

6.3.2.4 Most vezessük be e-t, a magasságmérő hibáját, és a t-t, a látszólagos függőleges elkülönítést, és jegyezzük meg, hogy

$$a = d + e$$

a konceptuálisan a magasság szerinti elkülönítés, ahogyan a magasságmérő méri. Nincs szükség kvantálási hibákra vonatkozó megfontolásokra, mert a modellezett magasságmérő leolvasások tetszőleges pontossággal ismertek lehetnek a számítógépes szimulációban. Ezek kvantálva vannak, mielőtt az ACAS számára szolgáltatják őket modellezett C-módú jelentésekként, amelyek ACAS nyomvonalak. Ez az, amiért a 4. fejezet, 4.4.2 pontjának szabványa kizárja a kvantálási hatásokat.

6.3.2.5 Fogadjuk el, hogy az a_{with} a nyilvánvaló függőleges elkülönítés ACAS megléte esetén, és az $a_{without}$ a nyilvánvaló függőleges elkülönítés ACAS megléte nélkül. Ekkor

$|d| < 100$ láb ACAS-al
akkor és csakis akkor, ha $|a_{with} - e| < 100$ láb
azaz a_{with} -100 láb $< e < a_{with}$ + 100 láb
és hasonlóan
$|d| <$ 100láb ACAS nélkül
akkor és csakis akkor, ha $a_{without}$ -100 láb $< e < a_{without}$ + 100 láb

6.3.2.6 A kockázati arányra így a következőképpen adódik:

$$R = \frac{\sum \text{prob}(a_{with} - 100\ ft < e < a_{with} + 100\ ft)}{\sum \text{prob}(a_{without} - 100\ ft < e < a_{without} + 100\ ft)}$$

Hogy ez a képlet használható legyen a kockázati arány számításához a_{with} és $a_{without}$ értékeket meg kell határozni a találkozások egy olyan együttesénél, amely teljes mértékben képviseli az összes potenciális tényleges találkozást, amelyekben jelen van az összeütközési kockázat ACAS nélkül és a kockázat, hogy az ACAS fog indukálni egy összeütközést. Amikor ezek a hipotetikusan mért magasság szerinti elkülönítések ismertek, a magasság mérési hibák ismerete teljessé teszi a számításokat.

6.3.3 INDUKÁLT ÉS MEGOLDATLAN KOCKÁZAT

6.3.3.1 Nem elegendő demonstrálni, hogy az ACAS megelőzi az összeütközéseket, amelyek nélküle bekövetkezhetnek. A kockázatot, hogy az ACAS logika összeütközéseket okozhat egyébként biztonságos körülmények között, teljesen végig kell gondolni, nem kis mértékben azért, mert ellenőrzött légtérben azoknak a találkozásoknak a száma, amelyek potenciálisan egy indukált kockázatot viselnek, jelentősen felülmúlják a majdnem összeütközések számát.

6.3.3.2 A 4. fejezet, 4.4.3 pontnál szabványosított logikai kockázati arány felső határa ténylegesen egy felső határt helyez el az ACAS indukált összeütközési kockázaton. Bár néhány más hibázás késztetheti az ACAS-t összeütközés indukálására, pl. repülőgépvezetők manőverezése egy forgalmi tanácsadásra vagy megoldási tanácsadásra, amely a légijárművet egy nem látható harmadik fél repülési pályájára irányítja, az indukált kockázat nagymértékben tulajdonítható a következő megoldási tanácsadásoknak. Üzemi feltételek között egy megoldási tanácsadás létrehozásának vagy követelésének az elmulasztása csökkenti egy indukált összeütközés kockázatát (még ha növeli is az abszolút kockázatot).

6.3.3.3 Követelmény az, hogy a logikát az összeütközés kockázat csökkentésére tervezzék és ne legyen különbségtétel a logika által indukált kockázat és a megoldásképtelen kockázat között. Lehetséges ilyen különbségi határt meghúzni és még fel is lehet osztani a kockázatot magasságmérő hiba miatti és a logika nem megfelelő működése miatti kockázatra, de számításba kell venni, hogy ennek a gyakorlatnak nincs nagy értéke a logika tervezése szempontjából.

6.3.4 FÖLDI RADAR ADATOK FELHASZNÁLÁSA KOCKÁZATI ARÁNY SZÁMÍTÁSHOZ

6.3.4.1 Lehetőség van földi radar adatokban észlelt találkozások felhasználására a 6.3.2 pontban leírt biztonsági számítások alapjaként. Azonban nehéz az eredményeket értelmezni, mert a számítás rendkívülien ritka eseményekkel foglalkozik még akkor is, ha több hónapon át gyűjtött adatokat használ fel, a repülési pályákat módosítani kell, hogy bekerüljön olyan összeütközési kockázat, amely hiányzott a tényleges találkozásokból. Sokkal ésszerűbb a radar adatokat a súlyozások választásához információként felhasználni, amely súlyozásokat a különböző találkozási osztályoknak tulajdonítanak a találkozási modellben és így létrehozzák az idealizált találkozási modellnek egy változatát, amely jóval reprezentatívabb a szóbanforgó légtérre vonatkozóan, mint az itt bemutatott modell.

6.4 Összeegyeztethetőség az ATM-mel

6.4.1 ZAVARÓ FIGYELMEZTETÉSI RÁTA

6.4.1.1 Az ACAS-tól megkövetelik a fenyegető összeütközés diagnosztizálását hiányos információk alapján. Továbbá, ezeknek az információknak függetleneknek kell lenniük azoktól, amelyek a légijármű elkülönítés elsődleges alapját szolgáltatják. Ebből következően figyelmeztetések fordulnak majd elő a találkozásoknál, ahol üzemelési szempontból nézve úgy tűnik, hogy nincs összeütközési kockázat. A 4. fejezet, 4.4.4.1 pontjában közölt szabvány megköveteli, hogy ezek a zavaró figyelmeztetések a lehető legritkábban forduljanak elő.

6.4.1.2 A zavaró megoldási tanácsadás 4. fejezet, 4.4.4.1.2 pontjában megadott előírásait olyan szempontból készítették el, hogy egy megoldási tanácsadás akkor zavaró, ha a szokásos szabvány elkülönítés nincs tisztán elveszítve. Ezen kívül ez azt szolgálja, hogy a vízszintes elkülönítési küszöb elegendően szigorú legyen ahhoz, hogy vízszintes hiányzó távolság szűrő használatát követelje meg. A vízszintes elkülönítési küszöböt a szokásos elkülönítés 40 százalékára állították be, és a függőleges elkülönítési küszöböt az engedélyezett magasságtól 200 láb eltérésnek megfelelő légiforgalmi irányítási tűrésen alapuló számra állították be.

6.4.2 ÖSSZEEGYEZTETHETŐ ÉRTELEM KIVÁLASZTÁS

6.4.2.1 A 4. fejezet, 4.4.4.2 pontnál leírt követelmény nem szándékozik korlátozni a módot, amelyben veszélyes találkozásokat oldanak meg, hanem inkább annak méltánylásán alapul, hogy a megoldási tanácsadások többségét valószínűleg olyan találkozásoknál generálják, ahol összeütközés veszélye nem áll fenn. Ez statisztikai korlátot képez a gyakoriságra, amellyel az ACAS megszakítja a légiforgalmi irányítást vagy a légijármű normál üzemelését a két légijármű függőleges elkülönítésének megfordításával.

6.4.3 AZ ACAS ÁLTAL OKOZOTT ELTÉRÉSEK

6.4.3.1 Az eltérések korlátai, amelyeket a 4. fejezet, 4.4.4.3 pontja szerinti megoldási tanácsadások követése okozhat, limitálják a normál légijármű üzemeltetés, valamint a légiforgalmi irányítás megszakítását. Míg a magasság engedélyektől való eltérések a legnyilvánvalóbb megszakításai a légiforgalmi irányításnak, más eltéréseket, mint például azokat, amit az emelkedésre szóló megoldási tanácsadás okoz, amikor a légijármű éppen süllyed, a légiforgalmi irányítás éppen olyan súlyosnak tekint.

6.4.4 A FÖLDI RADAR ADATOK VAGY A SZABVÁNYOS TALÁLKOZÁS MODELL HASZNÁLATA

6.4.4.1 Az ATM-el való összeegyeztethetőség követelményének betartását legkényelmesebben a légiforgalmi irányítási földi radarok lefedésén belül előforduló tényleges üzemelési találkozások rekonstruálásán alapuló szimulációk felhasználásával lehet vizsgálni, feltéve, hogy az így megfigyelt légijárműveknek csak kis hányada van ACAS-al felszerelve. Azonban a tényleges adatokon alapuló ilyen szimulációk a légtér (vagy légterek) egyedi tulajdonságait tükrözik, amely(ek)ben ezeket az adatokat gyűjtötték, és amennyire az ütközés elkerülési logika ezeket az adatokat felhasználta. Így jelentős gyakorlati nehézségek lépnek fel valóságos találkozási adatok felhasználásával összeütközés elkerülési logika érvényesítésére, és a 4. fejezet, 4.4.4 pontjában közölt rendelkezések feltételezik a 4. fejezet, 4.4.4.2.6 pontjában ismertetett szabványos találkozási modellen alapuló mesterséges találkozások felhasználását.

6.4.4.2 A szabványos találkozási modell használata az összeütközés elkerülési logika működését leíró teljesítmény mértékek nyeréséhez csak közvetett bizonyítékot szolgáltat, amely valamely adott légtérben való üzemelésre vonatkozik. Azoknak a hatóságoknak, amelyeknek hozzáférésük van a földi radar adatokhoz és meg akarják ismerni az ACAS kölcsönhatását a helyi légiforgalmi irányítási gyakorlattal, azt tanácsolják, hogy inkább a földi radar adatain alapuló szimulációkat használják, mint a szabványos találkozási modellt. Így cselekedve, meg kell jegyezniük, hogy az eredmények fordítottak lehetnek, ha a megfigyelt légijárművek már ACAS-al felszereltek. Arra is szükség lesz, hogy elegendő adatokat gyűjtsenek össze annak biztosításához, hogy ezen adatokból származtatott megoldás tanácsadások statisztikailag reprezentatívak legyenek; például nagyon kevés példát tartalmaznának a megoldási tanácsadás néhány típusára.

6.5 Konfliktusba kerülő célok relatív értéke

6.5.1 Az ACAS összeütközés elkerülést biztosító logika tervezésének egy üzemelési szempontból elfogadható egyensúlyt kell teremteni az összeütközés kockázatának csökkentése és az ACAS figyelmeztetések által okozott megszakítások között. Az összeütközési kockázatra (4. fejezet, 4.4.3 pont) és a légiforgalmi irányítás megszakítására (4. fejezet, 4.4.4 pont) vonatkozó követelmények minimális előírások, amelyek mint elérhetők ismertek egy prototípus rendszerrel végzett működtetésből. Más tervezések csak akkor elfogadhatók, ha bemutatható, hogy az összeütközés kockázata és a légiforgalmi irányítás megszakítása egyaránt minimalizált, amennyire megvalósítható a másik minimalizálásnak szükségessége vonatkozásában.

ANNEX 10/V.
Légiforgalmi távközlés: Légiforgalmi rádió frekvencia spektrum használata

V. kötet 2. kiadás – 2001. július
81. módosítással
A jelen kiadvány magába foglalja a 10. Annex V. kötetének 2001 március 13. előtt elfogadott összes módosításait és 2001 november 1-től hatálytalanítja a 10. Annex V. kötetének összes korábbi kiadásait.
A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót.
I C A O

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette
Első kiadás (A Tanács 1996 március 12-én fogadta el)	1996 július 15.	1996 november 7.	
Második kiadás 71.- 76. módosítás (A Tanács 1996 március 12-én fogadta el)	2001 július 16.	2001 november 1.	
77. módosítás (A Tanács 2002 február 27-én fogadta el)	2002 július 15.	2002 november 28.	
78-81. módosításban	nincs változás		
Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

10. Annex — V. kötet

Előszó

Történeti háttér

A légiforgalmi távközlésre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944) 37. cikkelyének rendelkezései alapján a Tanács először 1949 május 30-án fogadta el és foglalta a 10. számú Annex-be. Az előírások 1950 március 1-én léptek hatályba. A nemzetközi előírások és ajánlott gyakorlati eljárások a Távközlési Bizottság 1949 januári harmadik ülésének javaslatai alapján kerültek kidolgozásra. A hetedik kiadásáig bezárólag a négy részt és a mellékleteket tartalmazó 10. Annex-et egy kötetben adták ki a következők szerint:

I. rész	Berendezések és rendszerek.
II. rész	Rádió frekvenciák.
III. rész	Eljárások.
IV. rész	Kódok és rövidítések.

A 42. számú módosítással a IV. részt törölték az Annexből; a fenti részben levő kódokat és rövidítéseket a Doc 8400 jelzésű új kiadványban helyezték el. A 44. számú módosítás 1965 május 31-i elfogadása után a 10. Annex hetedik kiadása már két kötetben jelent meg:

I. kötet (Első kiadás)	I. rész - Berendezések és rendszerek
	II. rész - Rádió frekvenciák
II. kötet (Első kiadás)	Távközlési eljárások

A 70. számú módosítás 1965 március 20-i elfogadása után a 10. Annex-et öt kötetre szerkesztették át. Ezek a következők:

I. kötet	Rádiónavigációs berendezések
II. kötet	Távközlési eljárások
III. kötet	Távközlési rendszerek
IV. kötet	Felderítő radar és összeütközés elkerülését biztosító rendszerek
V. kötet	Légiforgalmi rádió frekvencia tartomány felhasználás

A 70. számú módosítás alapján a III. és IV. kötetet 1995-ben és a 71. számú módosítás alapján az V. kötetet 1996-ben adták ki.
Az A. táblázat a 10. Annex V. kötetének a 71. számú módosítást követő módosításait jelzi a fontosabb témakörök felsorolásával és az időpontok megjelölésével együttesen, amely időpontokban azokat a Tanács elfogadta, érvénybe léptek illetve alkalmazhatóvá váltak.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadását követően minden szerződő államnak levelet küldünk majd el, melyben kérjük az eltérésekről szóló tájékoztatást.
Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex szövegének felhasználása a nemzeti előírásokban

A Tanács 1948 április 13-án elfogadott határozatában felhívja a szerződő államok figyelmét arra, hogy kívánatos a szabályozó jellegű ICAO előírások pontos nyelvezetének lehető legnagyobb mértékű alkalmazása saját országos (nemzeti) előírásaikban valamint a nemzetközi előírásoktól való eltérések jelentése, beleértve bármely további nemzeti előírást, amely a nemzetközi légiforgalom biztonsága vagy rendszeressége szempontjából lényeges lehet. Ahol lehetséges, a jelen Annex előírásait úgy fogalmaztuk meg, hogy ez lényeges szövegbeni módosítások nélkül megkönnyítse a nemzeti előírásokba történő felvételt.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben.

Az egyes részek jogállása a következő:

1.— *Az Annex anyaga:*

a) *Nemzetközi előírások és ajánlott gyakorlati eljárások*, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) *Függelék:* A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) *Meghatározások:* A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) *Táblázatok és ábrák:* Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

2.— *A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok*:

a) *Előszó:* Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) *Bevezető:* Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) *Megjegyzések:* Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) *Mellékletek:* A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Szabványok és szerzői jogok felmondása

Felhívjuk a figyelmet annak a lehetőségére, hogy a jelen Annex nemzetközi előírásainak és ajánlott gyakorlati eljárásainak egyes részei szabványok vagy más egyéni szerzői jogok védelme alá tartozhatnak. Az ICAO nincs abban a helyzetben, hogy figyelembe vegye a szabványok és szerzői jogok létezését, érvényességét, körét vagy alkalmazhatóságát. Ezért a Szervezet nem vállal felelősséget és nem veszi figyelembe a szabványokra és szerzői jogokra vonatkozó esetleges igényeket.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et négy nyelven — angolul, franciául, spanyolul és oroszul — fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***"Ajánlás"*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a "*Megjegyzés:* " felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall - kell" kifejezéssel és az ajánlott gyakorlati eljárásokat “should - szükséges" kifejezéssel jelezzük. Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás — akár számmal, akár címmel vagy pedig mindkettővel — vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat — A 10. Annex V. kötetének módosításai
(módosítás — forrás — tárgy — elfogadva/ hatályos/ alkalmazható)

Módosítás	*Forrás*	*Tárgy*	*Elfogadva/ hatályos/ alkalmazható*
71	Léginavigációs Bizottság tanulmányai; SP COM/OPS/95 Területi ülése; Légiforgalmi Mozgó Távközlési Munka-csoport harmadik ülése (AMCP)	Új V. kötet kiadása, amely tartalmazza a meglevő Annex anyagait továbbá előírásokat tartalmaz a frekvencia csatornák közötti 8.33 kHz-es csatorna hullámsáv felosztás távolság különbségről (elkülönítés) és az URH hullámsávban működő levegő-föld távközlési összeköttetések védelméről.	1996 március 12. 1996 július 15. 1996 november 7.
72	Léginavigációs Bizottság; A Légiforgalmi Mozgó Távközlési Munka-csoport (AMCP) negyedik ülése	URH digitális adat-összeköttetés meghatározás; a 4-1. (b) táblázat módosítása.	1997 március 12. 1997 július 21. 1997 november 6.
73		Nincs változás.	
74	Léginavigációs Bizottság	a) repülőgépvezetők közötti levegő-levegő távközlési csatorna bevezetése; b) a vészhelyzeti helyjeladó berendezésre vonatkozó előírások változása.	1999 március 18. 1999 július 19. 1999 november 4.
75	Léginavigációs Bizottság; A légiforgalmi mozgó távközlési szolgálatok munkabizottságának (AMCP) hatodik ülése	A VDL interferencia védettség mértékére vonatkozó tájékoztató anyag tisztázása	2000 március 13. 2000 július 17. 2000 november 2.

Módosítás	*Forrás*	*Tárgy*	*Elfogadva/ hatályos/ alkalmazható*
76 (Második kiadás)	A légiforgalmi mozgó távközlési szolgálatok munkabizottságának (AMCP) hetedik ülése	Az integrált hang és adatátviteli rendszer (VDL Mode 3); a légtér-felderítési alkalmazásoknak megfelelő adatátvitel (VDL Mode 4); az ITU rádió szabályzatot érintő részek felülvizsgálata.	2001 március 12. 2001 július 16. 2001 november 1.
77	Titkárság	A 108 — 117.975 MHz frekvencia tartomány GBAS adattovábbításra történő felhasználására vonatkozó GNSS nemzetközi előírások és ajánlott gyakorlati eljárások módosítása miatt szükséges változtatások.	2002 február 27. 2002 július 15. 2002 november 28.
78	--	Nincs változás.	
79	--	Nincs változás.	

Nemzetközi előírások és ajánlott gyakorlati eljárások

1. fejezet
Meghatározások

Megjegyzés: A "Rádióösszeköttetési Szabályzatra" vonatkozó összes utalás a Nemzetközi Távközlési Unió (ITU) által közzétett rádióösszeköttetési előírásokra vonatkozik, amelyet a Rádiótávközlési Világkonferencia általában két vagy három évenként megtartott üléseinek végső határozatai alapján időről időre rendszeresen módosítanak. A légiforgalmi rádió rendszerek frekvencia felhasználását érintő ITU eljárások további tájékoztatóit az elfogadott ICAO feladatokat is tartalmazó Rádió Frekvencia Tartomány Előírások a Polgári Légiközlekedés részére *című kézikönyv tartalmazza (Doc 9718).*

Amennyiben az Annex jelen kötetében a következő kifejezéseket alkalmazzák, azok az alábbi jelentéssel rendelkeznek:

Az összeköttetés alternatív módszere — Alternative means of communication Az elsődlegesen használt módszer mellett alkalmazott, azonos műszaki jellemzőkkel rendelkező összeköttetés.

Két csatornás egy-irányú összeköttetés — Double channel simplex Egyszerű, szimplex összeköttetési módszer, amely minden irányba egy-egy frekvencia csatornát használ.

Megjegyzés: Ezt a módszer néha kereszt-hullámsáv módszernek is nevezik.

Párhuzamos összeköttetés — Duplex Két állomás közötti összeköttetési módszer, amelynél a távközlés mindkét irányba egyidejűleg bonyolódhat.

Frekvencia csatorna — Frequency channel A frekvencia hullámsáv tartomány folyamatos szakasza, amely egy meghatározott adás-osztályt alkalmazó távközlési összeköttetésre alkalmas.

Megjegyzés: Az adások osztályozását és az adott távközlési összeköttetésnek megfelelő frekvencia hullámsáv egységekre vonatkozó tájékoztatásokat a Rádióösszeköttetési Előírások S2. cikkelye valamint S1. Függeléke határozza meg

.

Eltolt frekvencia sávval rendelkező egyszerű összeköttetés — Offset frequency simplex Az egyszerű, szimplex összeköttetési módszer olyan változata, amely a két állomás között mindegyik irányba egy-egy, frekvenciában kissé eltérő, azonban az üzemeltetésre kijelölt azonos frekvencia tartományba tartozó csatornát használ.

Repülésüzem irányítási összeköttetések — Operational control communication Felügyelet gyakorlásához szükséges távközlési összeköttetés valamely repülési feladat megkezdésére, folytatására, befejezésére vagy kitérő repülőtérre történő irányítására a légjármű biztonsága valamint a repülés menetrendszerű, hatékony és gazdaságos végrehajtása érdekében.

Megjegyzés: Ezek az összeköttetések általában a légjármű és a légijárművet üzemeltető szervezetek közötti üzenetváltáshoz szükségesek.

Elsődleges összeköttetési módszer — Primary means of communication A légjármű és a földi állomások közötti összeköttetés fenntartására elsősorban alkalmazott módszer ott, ahol más alternatív módszer igénybe vételére is van lehetőség.

Egy-irányú összeköttetés — Simplex Egyszerű, szimplex távközlési összeköttetési módszer, amelynél a két állomás között egyszerre csak egy irányú összeköttetés van.

Megjegyzés: A légiforgalmi mozgó szolgálatok esetében ez a módszer az alábbi részekre osztható fel:

a) egy csatornás szimplex
b) két csatornás szimplex
c) eltolt frekvenciájú szimplex.

Egy csatornás egy-irányú összeköttetés — Single channel simplex Egyszerű, szimplex összeköttetési módszer, amely minden irányba azonos frekvencia csatornát használ.

Ultrarövidhullámú (VHF) frekvencián üzemelő digitális összeköttetés — VHF digital link (VDL) A légiforgalmi távközlési hálózat (ATN) részét képező mozgó alhálózat, amely a légiforgalmi mozgó állomások URH frekvencia sávjában működik. A digitális adatátviteli összeköttetés ezen kívül nem-légiforgalmi távközlési hálózati feladatok, mint például a digitális hang-átvitel végrehajtására is alkalmazható.

2. Fejezet
Vészhelyzeti frekvenciák

Bevezető

Megjegyzés: — Az összes mozgó szolgálatok vészhelyzeti és biztonsági távközlésére vonatkozó általános feltételeket az ITU Rádióösszeköttetési Szabályzat S30 cikkelye tartalmazza. Az S13 Függelék kijelöli az ilyen helyzetekre alkalmazható frekvenciákat. A Függelék A1 részének 1. szakasza engedélyezi, hogy a légiforgalmi mozgó szolgálatok esetében a kormányok egyéb kölcsönös megállapodást kössenek. Az ICAO Annexek ilyen megállapodásnak minősülnek.

A vészhelyzeti távközlésre kijelölt rádió frekvenciákra vonatkozó nemzetközi előírások és ajánlott gyakorlati eljárások figyelembe vesznek bizonyos eljárásokat, amelyeket az ICAO elfogadott és bizonyos előírásokat, amelyek az ITU Rádióösszeköttetési Szabályzatában szerepelnek.

A 10. Annex II. kötete előírja, hogy a levegőben kényszerhelyzetben levő légijármű azt a rádió frekvenciát használja, amelyen az adott időpontban összeköttetést tart fenn a légiforgalmi állomásokkal. Mindazonáltal elismert tény, hogy szükség van egy adott frekvencia vagy frekvencia tartomány kijelölésére, amelyet a légijármű balesete vagy kényszerleszállása után használhat és amelyet az egész világon egységesen alkalmaznak úgy, hogy azon a lehető legtöbb állomás — beleértve az iránymérő állomásokat valamint a tengeri mozgó szolgálati állomásokat is — figyelést tarthasson.

A 2182 kHz-es frekvencia is biztosítja a távközlési összeköttetés lehetőségét a légijármű és a tengeri mozgó szolgálati állomások között. Az ITU Rádióösszeköttetési Szabályzat az S13 Függelék A2 részében előírja, hogy a 2182 kHz-es frekvencia az 1605 kHz és 4000 kHz közötti tartományban üzemelésre jogosított hajó, légijármű és mentőtutaj állomások számára kijelölt nemzetközi rádiótávbeszélő vészfrekvencia, amelyen segítséget kérhetnek a tengeri szolgálatoktól.

A műhold segítségével felderíthető és lokalizálható vészhelyzeti helyjeladó berendezésekkel (ELT) kapcsolatosan a Rádióösszeköttetési Szabályzat engedélyezi az ilyen berendezések használatát, amelyeket az ITU műholdas vészhelyzeti helyjeladó rádió-berendezéseknek (EIPRB) nevez. A Rádióösszeköttetési Szabályzat S13 Függelék A2 részében meghatározza, hogy a 406 — 406.1 MHz-es hullámsávot kizárólag az ilyen, a földről az világűr felé sugárzó műholdas vészhelyzeti helyjeladó rádióberendezések használhatják.

Az ITU engedélyezi a 4125 kHz-es frekvencia használatát is, hogy lehetővé tegyék a tengeri mozgó és a légijármű állomások közötti összeköttetés fenntartását vészhelyzet esetében. A jelenleg érvényes ITU Rádióösszeköttetési Szabályzat (RR S5.130 és S13 Függelék) engedélyezi, hogy a 4125 kHz-es vivő-frekvenciát a légi-jármű állomások a tengeri mozgó szolgálattal való vészhelyzeti és biztonsági összeköttetés céljára használhatják. Az RR S5.115 alapján a 3023 kHz és 5680 kHz légiforgalmi mozgó szolgálati (R) frekvenciák a tengeri mozgó szolgálatokkal együtt végzett kutató és mentő tevékenységre felhasználhatók.

Ehhez hasonlóan 500 kHz-es (RR S5.83) nemzetközi Morse rádiótávíró vészfrekvenciát használják a 415 kHz és 535 kHz közötti tartományban üzemelésre jogosított hajó, légijármű és mentőtutaj állomások, amikor azok segítséget kérnek a tengeri szolgálatoktól (RR S13 Függelék 2A. rész).
A mentőtutaj állomások vonatkozásában a Rádióösszeköttetési Szabályzat a következő frekvenciák használatát engedélyezik, amennyiben a mentőtutaj állomás az alábbi üzemi frekvencia tartományokban vagy ezek közül bármelyikben működik (RR S13 Függelék 2A. rész):

Üzemi frekvencia tartomány	*Kijelölt vészfrekvencia*
415 — 535 kHz	*500 kHz*
4000 — 27500 kHz	*8364 kHz*
1605 — 2850 kHz	*2182 kHz*
117.975 — 137 MHz	*121.5 MHz*
235 — 328.6 MHz	*243 MHz*

2.1 A vészhelyzeti helyjeladó berendezések kutatás és mentés céljaira kijelölt frekvenciái

2.1.1 2005 január 1-ig a 6. Annex I., II. és III. részeiben található előírások alapján a légijármű fedélzetén szállított vészhelyzeti helyjeladó berendezések a 406 MHz és a 121.5 MHz frekvenciák egyikén (121.5 MHz) vagy mindkettőn üzemeljenek.

2.1.2 A 6. Annex I., II. és III. részeiben található előírások alapján 2002 január 1-én vagy ezt követően felszerelt és a légijármű fedélzetén szállított vészhelyzeti helyjeladó berendezések úgy a 406 MHz mint a 121.5 MHz frekvenciákon üzemeljenek.

2.1.3 2005 január 1-ét követően a 6. Annex I., II. és III. részeiben található előírások alapján a légijármű fedélzetén szállított vészhelyzeti helyjeladó berendezések úgy a 406 MHz mint a 121.5 MHz frekvenciákon üzemeljenek.

1. Megjegyzés: Az ITU Rádióösszeköttetési Szabályzat (S5.256 és "13 Függelék) a fentiek mellett biztosítja a 243 Mhz-es frekvencia használatát is.

2. Megjegyzés: A vészhelyzeti helyjeladó berendezésekre vonatkozó előírások a 10. Annex III. kötet II. rész 5. fejezetében találhatók.

2.2 Kutatás és mentés frekvenciái

2.2.1 Ahol a kutató és mentő tevékenységeknek helyszíni egyeztetése érdekében a rövidhullámú frekvenciák használata szükséges, a 3023 kHz-es valamint az 5680 kHz-es frekvenciákat alkalmazzák.

2.2.2 ***Ajánlás*** *— Ahol a mentést koordináló központok valamint a kutatás és mentésben résztvevő légijármű közötti összeköttetéshez meghatározott külön frekvenciák szükségesek, ezeket a kutató és mentő légijármű által végzett tevékenységet figyelembe véve az adott területen a légiforgalmi mozgó szolgálatok rendelkezésre álló frekvencia tartományokból válasszák ki.*

Megjegyzés: Ahol a kutatásban és mentésben polgári kereskedelmi légijármű vesz részt, az általában a megfelelő légi útvonal rádió-frekvencia csatornán tart kapcsolatot az érintett mentést koordináló központtal együttműködő repüléstájékoztató központtal.

3. fejezet
A 30 MHz alatti frekvenciák felhasználása

Bevezető

Az ITU Rádióösszeköttetési Szabályzat S5. cikkelyében a légiforgalmi mozgó (R) szolgálatok részére a 2.8 MHz és 22 MHz közötti frekvencia tartományok kerültek kijelölésre. Ezeket a frekvencia tartományokat a Rádióösszeköttetési Szabályzat vonatkozó rendelkezései alapján kell igénybe venni. 1979 szeptember 1. előtt a rendelkezéseket az ITU Rádió Konferencia Záradékai (1966 Genf) tartalmazták. 1979 szeptember 1-én életbe léptek a módosított előírások, amelynek részleteit a következő kiadványok tartalmazzák: A Légiforgalmi Mozgó Szolgálati (R) Rádió Világkonferencia Záradéka (1978 Genf); Rádióösszeköttetési Szabályzat 27. Függelék Aer2 pontja (kivéve a Frekvencia kiosztási tervet, amely 1983 február 1-én 00:01 UTC-ben lépett hatályba). A Rádióösszeköttetési Szabályzat 1998 évi változatában az S27. Függelékbe a Légiforgalmi Mozgó Szolgálati (R) Rádió Világkonferencia rendelkezési szerint (1987) felvették az Aer2 szerkesztői módosításait. Ezen frekvencia tartományok alkalmazásánál felhívják az államok figyelmét a nem légiforgalmi forrásokból származó káros rádió frekvencia interferencia lehetőségére valamint az ebből adódó hatások csökkentését célzó intézkedések szükségességére.

3.1 Az üzemeltetés módszere

3.1.1 A légiforgalmi mozgó szolgálatnál a rádiótávbeszélő összeköttetéshez kizárólag a légiforgalmi mozgó szolgálat (R) céljaira kijelölt 30 MHz alatti frekvencia tartományban üzemelő egy csatornás egy-irányú szimplex összeköttetést használjanak.

3.1.2 Az egyszerű, egy oldalsávú csatornák kijelölése

3.1.2.1 Az egyszerű, egy oldalsávú csatornákat a III. kötet 2. fejezet 2.4 pontja alapján jelöljék ki.

3.1.2.2 Az érintett csatornák üzemszerű használatával kapcsolatosan az érintett szervek vegyék figyelembe az ITU Rádióösszeköttetési Szabályzat S27. Függelékében található S27/19 előírásokat.

3.1.2.3 ***Ajánlás*** *— A 30 MHz alatti frekvenciák nemzetközi igénybevétele esetében a légiforgalmi mozgó frekvenciák (R) használatát az ITU Rádióösszeköttetési Szabályzat S27. Függeléke szerint egyeztessék:*
S27/19 Az ICAO (Nemzetközi Polgári Légiközlekedési Szervezet) egyezteti a légiforgalmi mozgó szolgálat (R) rádiótávbeszélő összeköttetéseit a nemzetközi légiközlekedés területén és a Tervben szereplő frekvenciák gyakorlati igénybevételének minden esetében ez a szervezet illetékes.

3.1.2.4 ***Ajánlás*** *— Ahol a (HF) rövidhullámú összeköttetésekre vonatkozó nemzetközi üzemeltetési igényeket a Rádióösszeköttetési szabályzat S27. Függelék 2. rész Frekvencia Kiosztási Terve alapján nem lehet teljesíteni, jelöljenek ki megfelelő frekvenciát az S27. Függelék következő előírásának alkalmazásával:*

S27/20 Elismert tény, hogy a jelen Függelékben található Kiosztási Terv nem merítette ki teljes mértékben a frekvencia megosztásban rejlő lehetőségeket. Ezért az adott üzemeltetési követelmények és igények teljesítése érdekében, amelyek a jelen Kiosztási Terv keretein belül nem teljesíthetők, az egyes szervezetek hozzájárulhatnak más, a Tervben meghatározottól eltérő frekvenciák kijelöléséhez a légiforgalmi mozgó szolgálati (R) hullámsáv tartományból. Mindazonáltal az így kijelölt frekvenciák használata nem csökkentheti ugyanezen frekvenciák védelmét olyan területeken, ahol ezeket a Terv a jelen Függelék I. rész, II/B szakaszában található eljárások alkalmazásával határozták meg.

Megjegyzés: Az S27. Függelék I. rész II/B szakasz az interferencia határérték görbékre vonatkozik és az eljárások alkalmazása 15 dB értékű védelmet biztosít.

S27/21 Ha a nemzetközi légi üzemeltetés igényeinek kielégítéséhez erre szükség van, az egyes szervek módosíthatják a légiforgalmi mozgó szolgálati (R) frekvenciákra vonatkozó kijelölési eljárást, amely ebben az esetben az érintett szervek közötti előzetes egyeztetés és megállapodás tárgya lesz.

S27/22 Az S27/21 pontban ismertetett együttműködést ott hajtsák vége, ahol ez a kérdéses frekvenciák hatásos igénybevétele érdekében szükséges és kívánatos valamint különösen ha az S27/19 pontban jelzett eljárások nem kielégítők.

3.1.2.5 A J7B és J9B üzemmód osztályozás használata az S27. Függelék következő előírásai alapján történjen:

S27/12 A rádiótávbeszélő összeköttetések esetében az audió frekvenciákat a 300 és 2700 Hz hullámhosszok közé korlátozzák és a más engedélyezett sugárzás hullámsáv szélessége ne haladja meg a J3E üzemmód felső határértékét. Ezen határértékek megállapításánál mindazonáltal a J3E-től eltérő üzemmód esetében nincs korlátozás, feltéve, hogy a nem kívánatos sugárzási módokra vonatkozó S27/73 és S27/74 feltételeket teljesítik.

S27/14 Az interferencia lehetőségének figyelembe vétele miatt egy adott csatornát azonos kijelölési területen belül rádiótávbeszélő összeköttetésre és adatátvitelre együttesen nem használják.

S27/15 Az S27/18 pontban jelzett frekvenciákon működő csatornáknak a J3E és H2B üzemmódtól eltérő sugárzási mód használata az érintett szervek külön megállapodásának tárgya és függvénye annak érdekében, hogy elkerüljék azt a káros interferenciát, amely ugyanazon csatorna különböző üzemmód osztályokban történő egyidejű felhasználásából származik.

3.1.3 A repülésüzemi irányítási összeköttetésekre szolgáló frekvenciák kijelölése

3.1.3.1 Az egész világra kiterjedően szükséges a repülésüzemi irányítási összeköttetésekre szolgáló frekvenciák kijelölése, hogy a légijármű üzemeltető szervezetek számára lehetővé tegyék a 6. Annex I. részében előírtak teljesítését. Ezeknek a frekvenciáknak kijelölése a 27. Függelék következő előírásai alapján történjen:

S27/9 Az egész világra terjedő kijelölési terület az, ahol a kijelölt frekvenciák hosszú-távú összeköttetést biztosítanak a kijelölési területen belül elhelyezkedő légiforgalmi állomás és a világ bármely pontján működő légijármű között.

Megjegyzés: A fenti 27/9 pontban ismertetett összeköttetés típusát az egyes hatóságok határozhatják meg.

S27/217 Az S27/213 valamint az S27/218 — S27/231 számú táblázatokban található, az egész világra kiterjedő frekvencia kiosztás, a 3023 kHz és 5680 kHz-es referencia vivő frekvenciák kivételével, azon hatóságok rendelkezésére van fenntartva, akik a fennhatóságuk alatt működő egy vagy több légijárművet üzemeltető szervek részére azokat az üzemeltetés céljára kijelölik. Az ilyen kijelölt frekvenciák célja, hogy a légjármű biztonsága valamint a repülés menetrendszerű és gazdaságos lebonyolítása érdekében hosszú-távú összeköttetést biztosítanak az illetékes légiforgalmi állomás és a világ bármely pontján működő légi-jármű között. Az egész világra kiosztott frekvenciákat az MWARA, RDARA és VOLMET célokra ne jelöljék ki. Ahol a légijármű üzemeltetési területe teljes mértékben a RDARA határokon vagy al-határokon belül helyezkedik el, ott ezeket az RDARA frekvenciákat használják.

1. Megjegyzés: A Rádióösszeköttetési Szabályzat S27. Függelék S27/213 valamint az S27/218 — S27/231 számú táblázatai a Frekvencia Kijelölési Terv területek szerinti frekvenciák felsorolását valamint a frekvenciák számszerű felsorolását tartalmazzák.

2. Megjegyzés: Az egész világra kiterjedő frekvencia kiosztással kapcsolatos útmutató a C. Mellékletben található.

3.2 NDB frekvenciák alkalmazása

3.2.1 ***Ajánlás** — Az NDB frekvenciák kiosztása alkalmával a következőket vegyék figyelembe:*

a) a fedésterület határán előírt interferencia védelem;

b) az általános ADF berendezések alkalmazási illetve üzemeltetési jellemzői;

c) az egyes berendezések közötti földrajzi távolságok és a megfelelő fedésterületek;

d) a nem légiforgalmi forrásból származó rendszertelen sugárzási interferencia lehetősége (például elektromos távvezetékek és szolgálatok, elektromos távközlési rendszerek, üzemi elektromos sugárzások, stb.).

1. Megjegyzés: Fentiek alkalmazásával kapcsolatos útmutató a B. Mellékletben található.

2. Megjegyzés: Felhívjuk a figyelmet arra, hogy a léginavigációs adóberendezések rendelkezésére álló hullámsávok egyes részeit más szolgálatok is igénybe veszik.

3.2.2 ***Ajánlás** — A frekvencia zsúfoltságból adódó zavarok csökkentése érdekében olyan területeken, ahol egy futópálya két megközelítési végén két külön ILS berendezés üzemel, engedélyezhető mindkét* *külső helyjeladó (marker) számára azonos frekvencia kijelölése valamint engedélyezhető mindkét belső helyjeladó számára azonos frekvencia kijelölése, amennyiben:*

a) ezt az üzemeltetési körülmények lehetővé teszik;

b) minden egyes helyjeladó külön azonosító jellel rendelkezik;

c) megfelelő intézkedések történtek annak biztosítására, hogy az azonos frekvenciát használó helyjeladók egyszerre nem sugározhatnak.

Megjegyzés: Az I. kötet 3.4.4.4 pontjának előírásai meghatározzák a végrehajtandó intézkedéseket.

4. fejezet
A 30 MHz feletti frekvenciák felhasználása

4.1 A 117.975 — 137 MHz közötti frekvencia tartomány felhasználása

Bevezető

A 118 — 132 MHz közötti hullámsáv tartományt a légiforgalmi mozgó szolgálatok (R) részére először 1947-ben az Atlantic City-ben tartott ITU Rádió Konferencia, majd pedig 1959-ben a genfi konferencia jelölte ki, ekkor azonban kiterjesztette a 117.975 MHz frekvenciáig.

Az 1947 utáni további ITU Rádió Konferenciák is hoztak rendelkezéseket a 132 — 136 MHz közötti frekvencia tartomány légiforgalmi mozgó szolgálatok (R) részéről történő felhasználásról olyan helyi körülményeknek megfelelően, amelyek a különböző ITU területeken, országokban illetve ország csoportokban változhatnak. Ezen frekvencia tartomány felhasználását a jelen fejezet frekvencia kijelölési táblázata tartalmazza. Az ITU Rádió Világkonferenciája (1979) előírásokat hozott a 132 — 136 MHz közötti tartomány légiforgalmi mozgó szolgálatok (R) részéről történő felhasználásról a Rádióösszeköttetési Szabályzat S5.203, S5.203A valamint S5.203B pontjaiban található feltételek alapján. A 136 — 137 MHz közötti tartomány frekvenciáinak alkalmazásánál figyelembe kell venni azokat a feltételeket, amelyek a táblázat megjegyzésében találhatók. Ezen frekvencia sávok használatánál felhívják az államok figyelmét a nem légiforgalmi forrásból származó rendszertelen sugárzási interferencia lehetőségére és ezen hatások lehető legkisebb mértékűre történő csökkentésének szükségességére.

A 10. Annex jelen fejezete ezen frekvencia tartománnyal kapcsolatos nemzetközi előírásokkal és ajánlott gyakorlati eljárásokkal foglalkozik, beleértve az egyes frekvenciák különböző léginavigációs célokra történő kijelölését is. Ezeket az előírásokat a következő előszóban tekintjük át, amelyben ismertetjük azokat az alapelveket, amelyek szerint a gazdaságossági szempontok alapján megterveztük az ultrarövid hullámú (VHF) frekvenciák felhasználását.

Előszó

Az ultrarövid hullámú (VHF) frekvenciák egész világra kiterjedő felhasználásához egy olyan terv szükséges, amelyben figyelembe veszik a gazdaságossági és gyakorlati kérdéseket:

a) az üzemeltetés állandó fejlődésének illetve korszerűsítésének valamint az egész világra kiterjedő szabványosítás szükségességét;

b) a rendelkezésre áll frekvenciák jelenlegi felhasználásról az optimális felhasználásra történő gazdaságos és fokozatos áttérés kívánatosságát, figyelembe véve a jelenleg alkalmazott berendezések lehető legjobb kihasználását;

c) a nemzetközi és országos felhasználás egyeztetésének szükségességét az interferenciával szembeni közös védelem érdekében;

d) a helyi tervek kidolgozásához szükséges átfogó alapok elkészítésének szükségességét;

e) bármely frekvencia csoport felvételének kívánatosságát azok közé a frekvenciák közé, amelyeket jelenleg a nemzetközi légiforgalom szolgálatai használnak;

f) annak szükségességét, hogy a frekvenciák teljes száma és csoportosításuk megfelelő összhangban legyen
a nemzetközi légiközlekedésben széles körben használt légijármű berendezésekkel;

g) egy olyan külön frekvencia biztosításának igénye, amely vészhelyzeti célokra az egész világon egységesen használható lehet továbbá egy másik frekvencia biztosításának szükségessége, amely bizonyos területeken különleges célokra szolgáló közös frekvenciaként működik; és

h) megfelelő rugalmasság a helyi körülmények miatt szükséges eltérések biztosításához.

4.1.1 A 117.975 — 137 MHz közötti frekvencia tartomány általános kiosztása

Megjegyzés: A terv az általános Frekvencia Kiosztási Táblázatot tartalmazza, amely alcsoportokra osztja fel a teljes 117.975 — 137 MHz közötti frekvencia tartományt; a fő alcsoportok a nemzetközi és országos szolgálatok valamint az országos szolgálatok számára kijelölt frekvencia sávokat tartalmazzák. Az általános felosztás figyelembevétele a lehető legkisebbre csökkenti az országos és nemzetközi felhasználás egyeztetésének szükségességét.

4.1.1.1 A 117.975 MHz — 137 MHz közötti frekvencia tartomány általános kiosztása a 4-1. táblázatban található.

4.1.1.2 ***Ajánlás** — A 136 — 137 MHz frekvencia tartományok nemzetközi felhasználásáról még nem született megállapodás és így ezeket a frekvenciákat a helyi igények alapján és azoknak megfelelő módszer szerint használhatják.*

4.1.2 A frekvenciák közötti felosztás távolság (elkülönítés) és a kijelölhető frekvenciák határai

Megjegyzés: A következő szövegben a 8.33 kHz-es csatorna kiosztás csatornák közötti hullámsáv felosztás távolság 25 kHz érték hárommal történő osztásának hányadosa, azaz 8.333…kHz.

4.1.2.1 A légiforgalmi mozgó szolgálatok (R) részére kijelölhető frekvenciák közötti minimális hullámsáv elkülönítés, azaz a csatorna felosztás távolsága 8.33 kHz legyen.

Megjegyzés: Elismert tény, hogy bizonyos körzetekben vagy területeken a 100 kHz, 50 kHz vagy 25 kHz csatorna hullámsáv különbség megfelelő számú frekvenciát biztosít a nemzetközi és országos légiforgalom szolgálatai számára és az ilyen, 100 kHz, 50 kHz vagy 25 kHz csatorna hullámsáv távolsággal történő üzemeltetésre tervezett berendezések alkalmasak az ilyen körzetekben vagy területeken történő felhasználásra. Elismert tény továbbá az is, hogy a 25 kHz-es és a 8.33 kHz-es csatorna elkülönítés alapján történt kiosztás egy adott körzeten vagy területen belül továbbra is fennmarad egymás mellett.

4.1.2.2 Legalább 2005 január 1-ig a 25 kHz-es csatorna felosztás távolságra tervezett DSB-AM berendezést a légiforgalmi mozgó szolgálat (R) céljaira történő alkalmazhatóságának biztosítása érdekében megfelelő módon védjék, kivéve azokat a körzeteket vagy területeket, amelyeken a helyi körzeti egyezmények levegő-föld közötti beszédüzemű összeköttetésekhez lehetővé teszik a 8.33 kHz csatorna elkülönítési távolságra vagy a Mode 3 digitális adatátviteli összeköttetéshez (VDL) külön tervezett berendezés használatát.

4-1. táblázat

Frekvencia kiosztás táblázata

Kiosztott frekvencia csoportok (MHz)		Megjegyzések	
a)	118 — 121,4 bezárólag	nemzetközi és országos légiforgalmi mozgó szolgálatok	A különleges nemzetközi kiosztást a helyi körzeti egyezmények alapján fogják meghatározni. Az országos kiosztást a későbbiekben ismertetett 4.1.5.9 alpont szerint végzik.
b)	121,5	vészfrekvencia	A légiközlekedési vészfrekvencia hullámsáv védelme érdekében a 121,5 MHz vészfrekvencia mellett a legközelebbi kijelölhető frekvencia a 121,4 MHz valamint a 121,6 MHz, azonban ha a helyi körzeti egyezmény alapján így határoznak, ez a kijelölhető frekvencia 121,3 MHz és 121,7 MHz is lehet.
c)	121,6 — 121,9917 bezárólag	nemzetközi és országos repülőtéri irányító szolgálatok	Földi mozgás irányítására, a repülés végrehajtása előtti ellenőrzésre, a légiforgalmi szolgálati engedélyekre és a fentiekkel kapcsolatos üzemeltetésre fenntartva.
d)	122 — 123,05 bezárólag	országos légiforgalmi mozgó szolgálatok	Az országos kijelölésre fenntartva.
e)	123,1	kiegészítő kutató és mentő szolgálati frekvencia	Lásd a későbbiekben ismertetett 4.1.4.1 pontot.
f)	123,15 — 123,6917 bezárólag	országos légiforgalmi mozgó szolgálatok	Az országos kijelölésre fenntartva. Kivételt képez a 123,45 MHz frekvencia, amely az egész világon levegő-levegő távközlési csatornaként használatos (lásd a g.) pont).
g)	123,45	levegő-levegő távközlés	Használatra kijelölve a 4.1.3.2.1 pont előírásai szerint.
h)	123,7 — 129,6917 bezárólag	nemzetközi és országos légiforgalmi mozgó szolgálatok	A különleges nemzetközi kiosztást a helyi körzeti egyezmények alapján fogják meghatározni. Az országos kiosztást a későbbiekben ismertetett 4.1.5.9 alpont szerint végzik.
i)	129,7 — 130,8917 bezárólag	országos légiforgalmi mozgó szolgálatok	Az országos igényeknek fenntartva, azonban a helyi körzeti egyezmények alapján részben vagy egészben felhasználható a későbbiekben ismertetett 4.1.8.1.3 alpont előírásainak teljesítésére.
j)	130,9 — 136,875 bezárólag	nemzetközi és országos légiforgalmi mozgó szolgálatok	A különleges nemzetközi kiosztást a helyi körzeti egyezmények alapján fogják meghatározni. Az országos kiosztást a későbbiekben ismertetett 4.1.5.9 alpont szerint végzik. (Lásd a 4.1 pont bevezetőjét a 132 — 137 MHz tartomány felhasználásáról).
k)	136,9 — 136,975 bezárólag	nemzetközi és országos légiforgalmi mozgó szolgálatok	Ultrarövidhullámú (VHF) digitális levegő-föld adathálózati összeköttetés céljaira fenntartva.

4.1.2.2.1 A 8.33 kHz csatorna elkülönítési távolságra külön tervezett berendezés kötelező használatára (a légijármű fedélzetén történő szállítására) vonatkozó előírásokat a helyi körzeti léginavigációs egyezmények alapján alkalmazzák, amelyben meghatározzák az üzemeltetés légterét valamint az ilyen berendezés alkalmazásának határidejét, amely megfelelő átmeneti bevezetési időszakot is tartalmaz.

Megjegyzés: Nem lesz szükség változtatásokra az olyan légijármű és földi rendszerek vonatkozásában, amelyek kizárólag olyan körzetekben üzemelnek, ahol a 8.33 kHz csatorna felosztási távolságot nem alkalmazzák.

4.1.2.2.2 A 8.33 kHz-es csatorna felosztási távolságra tervezett berendezést legalább 2005 január 1-ig megfelelő módon védjék a légiforgalmi mozgó szolgálat (R) céljaira történő alkalmasság biztosítása érdekében.

4.1.2.2.3 A Mode 3 és Mode 4 digitális adatátviteli összeköttetésekre (VDL) külön tervezett berendezés kötelező használatára (a légijármű fedélzetén történő szállítására) vonatkozó előírásokat a helyi körzeti léginavigációs egyezmények alapján alkalmazzák, amelyben meghatározzák az üzemeltetés légterét valamint az ilyen berendezés alkalmazásának határidejét, amely megfelelő átmeneti bevezetési időszakot is tartalmaz.

4.1.2.2.3.1 A fenti 4.1.2.2.3 pontban jelzett egyezmény legalább két éves átmeneti időszakot tartalmazzon a fedélzeti rendszerek kötelező alkalmazásáig.

4.1.2.2.4 A Mode 3 VDL és Mode 4 VDL üzemre külön tervezett berendezést legalább 2010 január 1-ig megfelelő módon védjék a légiforgalmi mozgó szolgálat (R) céljaira történő alkalmasság biztosítása érdekében.

4.1.2.3 A 117.975 MHz — 137 MHz közötti frekvencia tartományban a legalacsonyabb kijelölhető frekvencia 118 MHz és a legmagasabb 136.975 MHz.

4.1.2.4 Olyan körzetekben, amelyekben a 25 kHz (DSB-AM és URH adatátvitel) és a DSB-AM 8.33 kHz csatorna felosztás távolságokat is alkalmazzák, a kijelölt üzemeltetési frekvenciák feleljenek meg a 4-1. — (b) táblázat előírásainak.

Megjegyzés: A 4-1. — (b) táblázat olyan frekvencia csatorna párosítást tartalmaz, amely fenntartja a 25 kHz-es DSB-AM kijelölést és lehetővé teszi a 25 kHz-es VDL és a 8.33 kHz-es csatornák egyedi azonosítását.

4.1.3 Meghatározott feladatokra felhasznált frekvenciák

4.1.3.1 Vészfrekvencia

4.1.3.1.1 A 121.5 MHz vészfrekvencia csatornát kizárólag vészhelyzeti célokra, a következőkben általánosan meghatározottak szerint használják fel:

a) terheletlen, használatra alkalmas frekvencia csatorna biztosítása a kényszerhelyzetben vagy vészhelyzetben levő légijármű és a földi állomás közötti közleményváltásra abban az esetben, ha az általánosan alkalmazott frekvenciát más légjármű használja;

b) a vésszhelyzeti körülmények bekövetkezése esetén ultrarövidhullámú (VHF) távközlési csatorna biztosítása a légijármű és a repülőterek közötti közleményváltásra, amely csatornát a nemzetközi légiközlekedés általában nem használja;

c) közös ultrarövidhullámú (VHF) távközlési csatorna biztosítása az együttes kutató és mentő tevékenységben résztvevő polgári és katonai légijárművek, az ilyen légijárművek és a földi létesítmények között a megfelelő frekvenciára történő szükség szerinti átkapcsolás végrehajtása előtt;

d) levegő — föld összeköttetés biztosítása a légijárművel, amikor a légijármű berendezések meghibásodása megakadályozza az általánosan használt frekvenciák igénybevételét;

e) távközlési csatorna biztosítása a vészhelyzeti helyjeladók (ELT) üzemeltetéséhez és összeköttetés a mentőtutajok valamint a kutató és mentő tevékenységben résztvevő légijármű között;

f) a polgári légijármű elfogása esetében közös ultrarövidhullámú (VHF) távközlési csatorna biztosítása a polgári légijármű és az elfogó légijármű vagy az elfogást irányító egység közötti összeköttetéshez valamint a polgári és katonai légijárművek továbbá a légiforgalmi szolgálati egységek között.

1. Megjegyzés: Kerüljék a 121,5 MHz frekvencia használatát a fenti c) alpontban jelzett körülmények között, ha az bármely módon nehezíti vagy akadályozza a vészhelyzeti forgalom hatékony kezelését.

2. Megjegyzés: A jelenleg érvényes Rádióösszeköttetési Szabályzat biztosítja, hogy a 121,5 MHz nemzetközi légiforgalmi vészfrekvenciát használhatják a tengeri mozgó szolgálatok mozgó állomásai is az A3E adásformában annak érdekében, hogy biztonsági okokból összeköttetést tartsanak fenn a légiforgalmi mozgó szolgálatok állomásaival (RR S5.200 és S13 Függelék A2 rész).

4.1.3.1.2 A 121,5 MHz frekvenciát a következő helyeken biztosítsák:

a) az összes körzeti irányító központ és repüléstájékoztató központ;

b) a nemzetközi repülőtereken és nemzetközi kitérő repülőtereken létesített repülőtéri irányító tornyok és bevezető irányító egységek; és

c) bármely további olyan hely, amelyet erre az illetékes légiforgalmi szolgálati hatóság kijelöl, ahol ezen frekvencia biztosítását a segélyhívások azonnali vétele vagy a fenti 4.1.3.1.1 pontban meghatározott célok végrehajtása érdekében szükségesnek ítélik.

Megjegyzés: Ahol két vagy több fent jelzett létesítményt együttesen helyeztek el, ez az előírás a 121.5 MHz frekvenciának az egyik létesítménynél történő biztosításával teljesíthető.

4.1.3.1.3 A 121.5 MHz frekvencia álljon rendelkezésre az elfogást irányító egységnél, ha ezt a 4.1.3.1.1 f) alpont céljának teljesítése érdekében szükségesnek ítélik.

4.1.3.1.4 A vészfrekvenciát folyamatosan figyeljék azon szolgálati egységek teljes működési ideje alatt, amelyekhez azt telepítették.

4.1.3.1.5 A vészfrekvencia védelmét egy csatornás szimplex üzemmód alkalmazásával biztosítsák.

4.1.3.1.6 A vészfrekvencia csatorna csak a 10. Annex II. rész 2. fejezetében található jellemzőknek megfelelően álljon rendelkezésre.

4.1.3.2 Levegő — levegő távközlési összeköttetési frekvencia

4.1.3.2.1 A 123,45 MHz levegő — levegő ultrarövidhullámú (VHF) távközlési csatornát jelöljék ki annak érdekében, hogy a lakatlan és tengeri (vízfelszíni) területek felett az ultrarövidhullámú (VHF) földi adóállomások hatótávolságán kívül repülő légijárművek kicserélhessék egymással a szükséges üzemeltetési tájékoztatásokat és megkönnyítsék az üzemeltetési problémák megoldását.

4-1. — (b) táblázat
Csatorna / Frekvencia párosítás

Frekvencia (MHz)	VDL Mode 3 időfelosztás[i]*	Csatorna felosztás távolság (kHz)	Csatorna
118,0000		25	118,000
118,0000	A	25	118,001
118,0000	B	25	118,002
118,0000	C	25	118,003
118,0000	D	25	118,004
118,0000		8,33	118,005
118,0083		8,33	118,010
118,0167		8,33	118,015
118,0250	A	25	118,021
118,0250	B	25	118,022
118,0250	C	25	118,023
118,0250	D	25	118,024
118,0250		25	118,025
118,0250		8,33	118,030
118,0333		8,33	118,035
118,0417		8,33	118,040
118,0500		25	118,050
118,0500	A	25	118,051
118,0500	B	25	118,052
118,0500	C	25	118,053
118,0500	D	25	118,054
118,0500		8,33	118,055
118,0583		8,33	118,060
118,0667		8,33	118,065
118,0750	A	25	118,071
118,0750	B	25	118,072
118,0750	C	25	118,073
118,0750	D	25	118,074
118,0750		25	118,075
118,0750		8,33	118,080
118,0833		8,33	118,085
118,0917		8,33	118,090
118,1000		25	118,100

Megjegyzés: A levegő — levegő ultrarövidhullámú (VHF) távközlési összeköttetési csatorna használata interferenciát okozhat a frekvenciát levegő — föld összeköttetéshez igénybe vevő egyéb légijárműveknél.

4.1.3.2.2 Az ultrarövidhullámú földi állomások hatótávolságán kívül eső lakatlan szárazföldi vagy tengeri területeken a levegő — levegő összeköttetéshez használt 123,45 MHz frekvencia csatorna csak a 10. Annex II. rész 2. fejezetében található jellemzőknek megfelelően álljon rendelkezésre.

4.1.3.3 *Közös jeladó frekvencia* — A 136,975 MHz frekvenciát az egész világon az ultrarövidhullámú (VHF) digitális adatátvitelhez (VDL) szükséges közös jeladó csatorna (CSC) céljaira tartják fenn. Ez a CSC VDL 2. modulációs üzemmódot és CSMA (carrier sense multiple access) vivőrendszert alkalmaz.

4.1.4 A kutatás és mentés céljaira szolgáló kiegészítő frekvenciák

4.1.4.1 Ahol a 121,5 MHz vészfrekvencia mellett a fenti 4.1.3.1.1 c) alpont alapján kiegészítő frekvencia használatát is előírják, erre a 123,1 MHz frekvenciát alkalmazzák.

4.1.4.2 A kiegészítő kutató és mentő csatorna (123,1 MHz) csak a 10. Annex II. rész 2. fejezetében található jellemzőknek megfelelően álljon rendelkezésre.

4.1.5 Az ultrarövidhullámú (VHF) frekvencia üzemeltetésével valamint a káros interferencia kiküszöbölésével kapcsolatos előírások

4.1.5.1 Azon ultrarövidhullámú (VHF) létesítmények esetében, amelyek a rádiósugárzási horizontig működnek, az azonos frekvencián működő létesítmények között hozzanak létre földrajzi elkülönítést azaz tartsanak fenn megfelelő távolságot, kivéve ha gyakorlati szempontból szükség van a közös frekvenciák felhasználására a létesítmény csoportokon belül. A földrajzi elkülönítés olyan legyen, hogy a védett magassági pontokon és az egyes létesítmények üzemelési határvonalán a távolság ne legyen kevesebb, mint amennyi a 14 dB értékű kívánatos jel-zaj arány biztosításához szükséges. Az előírást a helyi körzeti léginavigációs egyezmények alapján teljesítsék. Azokon a területeken, ahol a frekvencia kijelölés nem sűrű vagy várhatóan nem lesz ilyen, 20 dB értékű kívánatos jel-zaj arány (10 : 1 távolság arány) vagy egyenes irányú rádió hatótávolságon túli elkülönítés (RLOS) — amelyik a kisebb érték — alkalmazható.

Megjegyzés: A 14 dB kívánatos jel-zaj arány alapján meghatározott legkisebb elkülönítési távolsággal kapcsolatos útmutató az A. Melléklet tartalmazza.

4.1.5.2 Azon ultrarövidhullámú (VHF) létesítmények esetében, amelyek a rádiósugárzási horizonton túl működnek, a párhuzamos frekvencia felhasználást úgy tervezzék meg, hogy a földrajzi elkülönítés a védett magassági pontokon és az egyes létesítmények üzemelési határvonalán ne legyen kevesebb, mint az egyes pontoktól a vele összefüggő rádiósugárzási horizontig mért távolságok összege, kivéve ha gyakorlati szempontból szükség van a közös frekvenciák felhasználására a létesítmény csoportokon belül.

1. Megjegyzés: A légijármű fedélzetén levő állomás és a rádiósugárzási horizont közötti távolságot rendszerint az alább matematikai egyenletből számíthatják ki.

$$D = K \sqrt{h}$$

ahol

D	*= távolság tengeri mérföldben;*
h	*= a légijármű állomás földfelszín feletti magassága;*
K	*= (a földgömb sugarának megfelelő érték, a tényleges sugár 4/3-a); azaz*
	= 2.22 ha a "h" értéket méterben fejezik ki; és
	= 1.23 ha a "h" értéket lábban fejezik ki.

2. Megjegyzés: A földi állomás és a légijármű fedélzetén levő állomás közötti egyenes irányú rádió ható-távolságon túli elkülönítési (RLOS) távolság kiszámításánál a légijármű állomás rádió horizontjától az 1. Melléklet alapján mért távolságot hozzá kell adni a földi állomás rádió horizontjától mért távolsághoz. Az utóbbi számításához alkalmazzák ugyanezt az egyenletet, amelyben a "h" érték a földi állomás adóantennájának magassága lesz.

3. Megjegyzés: A fenti 4.1.5.2 pontban meghatározottak alkalmazhatók az ultrarövidhullámú (VHF) frekvencián működő létesítmények földrajzi elkülönítésére abból a célból, hogy elkerüljék a levegő — levegő csatornák közös használatát. A földi állomások és a légijármű közötti távolsági elkülönítéssel valamint a földi állomások közös frekvencia csatorna felhasználással kapcsolatos útmutató az A.

Melléklet 3. részében található. A szomszédos frekvencia csatornák alkalmazásával kapcsolatos útmutató az A. Melléklet 2. része tartalmazza.

4. Megjegyzés: A fenti 4.1.5.1 és 4.1.5.2 pontok értelmezésével kapcsolatos útmutató az A. Melléklet tartalmazza.

4.1.5.3 A szomszédos csatornákon működő berendezések közötti földrajzi távolság olyan nagy legyen amely az egyes berendezések védelmi magasság pontjain és hatótávjának határán káros interferenciától mentes üzemelést biztosít.

Megjegyzés: A földrajzi elkülönítési távolságokkal és a vonatkozó rendszer jellemzőkkel kapcsolatos tájékoztatót az A. Melléklet tartalmazza.

4.1.5.4 A védelmi magasság az adott berendezéshez meghatározott alapadat feletti olyan magasság legyen, amelyen a káros interferencia bekövetkezése valószínűtlen.

4.1.5.5 Az egyes létesítményekhez, feladatokhoz vagy berendezésekhez alkalmazandó védelmi magasságot a következő tényezők figyelembe vétele mellett a helyi jellemzők alapján határozzák meg:
a) a biztosítandó szolgálat természete;

b) az érintett légiforgalom típusa és működése;

c) a távközlési forgalom (rádió forgalmazás) megoszlása;

d) a légijármű berendezések rendelkezésre álló frekvencia tartományai illetve csatornái; és

e) a várható jövőbeni fejlesztések.

4.1.5.6 ***Ajánlás** — Ahol a meghatározott védelmi magasságok kisebbek, mint ami üzemeltetési szempontból kívánatos, az azonos frekvencián működő berendezések közötti távolság ne legyen kisebb, mint ami ahhoz szükséges, hogy egy légijármű üzemeltetési hatótávjának határán és egy berendezés üzemeltetési szempontból kívánatos védelmi magasságán nem repül a szomszédos berendezések rádió horizontja fölé.*

Megjegyzés: A fenti ajánlás hatása egy olyan földrajzi elkülönítési távolság megállapítása, amelyen belül a káros interferencia kialakulása valószínű.

4.1.5.7 Az ultrarövidhullámú (VHF) VOLMET állomások közötti földrajzi távolságot a helyi jellemzők alapján határozzák meg és az általánosságban olyan legyen, hogy az érintett területen a légijármű által igénybe vett legnagyobb repülési magasságon is biztosítsa a káros interferenciától mentes üzemeltetést.

Megjegyzés: A fenti 4.1.5.7 pont értelmezésével kapcsolatos tájékoztatót az A. Melléklet tartalmazza.

4.1.5.8 Az országos szolgálatok által használt ultrarövidhullámú (VHF) légiforgalmi mozgó állomások frekvencia tartományait, az egész világon vagy egy körzetben erre az adott célra kiosztottak kivételével úgy jelöljék ki, hogy a lehető legkevesebb interferenciát okozzák a nemzetközi légiforgalom ebben a frekvencia tartományban működő berendezéseinél.

4.1.5.9 ***Ajánlás** — Az egész világon vagy egy körzetben a nemzeti szolgálatok részére kiosztott frekvenciák országok közötti interferenciáját érintő problémák megoldását az érintett szervezetek közötti megbeszélések segítségével végezzék.*

4.1.5.10 Az ultrarövidhullámú (VHF) frekvencián működő földi adók hatótávolságát más állomások zavarása azaz a káros interferencia elkerülése érdekében a feladat elvégzéséhez szükséges követelmények figyelembe vétele mellett minimális szinten tartsák.

4.1.5.11 ***Ajánlás*** *— A rádió horizonton túl sugárzó földi ultrarövidhullámú (VHF) berendezések esetében a kijelölt vivőfrekvencián túl (plusz vagy mínusz) ± 250 kHz hullámsávban a tényleges sugárzási energia bármely oldalszög irányába ne haladja meg az 1 mW értéket.*

4.1.6 Berendezésekre vonatkozó követelmények

1. Megjegyzés: A légiforgalmi mozgó szolgálati hullámsávban (117,975 — 137 MHz) működő állomásokra vonatkozó frekvencia határértékek meg kell feleljenek a Rádióösszeköttetési Szabályzat 3. Függelékében található rendelkezéseknek.

A légiforgalmi szolgálatoknál alkalmazott adóbrendezések tűréseit a jelen Annex nem tatalmazza, azokat az esetket kivéve, amikor Rádióösszeköttetési Szabályzatben elíratknál szigorúbb tűrések alkalmazása szükséges (például: a III Kötetben közölt berendezés meghatározások számos hasonló előírást közölnek).

2. Megjegyzés: A több vivőfrekvenciával működő vagy hasonló rendszer egyes alkotórészeire alkalmazható frekvencia határértékeket az adott rendszer jellemzői alapján határozzák meg.

4.1.6.1 ***Ajánlás*** *— Egy megnövelt hatótávolságú URH berendezés antenna nyeresége lehetőleg olyan legyen, hogy a besugárzott terület Φ szögtartományának középvonalán ± 2 Φ határon túl ne haladja meg a 3 dB értéket. Az antenna nyereség azonban minden esetben biztosítsa a káros interferenciától mentes üzemeltetést.*

1. Megjegyzés: A tényleges oldalszög, a besugárzott terület szögtartomány szélessége és a tényleges sugárzási energia értékeket minden egyes esetben külön vegyék figyelembe.

2. Megjegyzés: A fenti 4.1.6.1 pont értelmezésével kapcsolatos tájékoztatót az A. Melléklet tartalmazza.

4.1.7 Az üzemeltetés módszere

4.1.7.1 A nemzetközi légiközlekedésben résztvevő légijármű számára szolgálatot biztosító összes állomás egy csatornás szimplex üzemmódban, a 117,975 — 137 MHz ultrarövidhullámú (VHF) frekvencia tartományban üzemeljen.

4.1.7.2 A fentiek mellett, a helyi körzeti megállapodás alapján távközlési vagy rádióadás célokra a szabványos ICAO rádiónavigációs berendezéssel együtt üzemelő föld — levegő beszédüzemű csatorna is felhasználható.

4.1.8 A nemzetközi légiforgalmi mozgó szolgálat számára használatra kijelölhető ultrarövidhullámú (VHF) rádió frekvenciák kijelölési terve

Bevezető

Ez a terv tartalmazza a rendelkezésre álló frekvenciák felsorolását, a légiforgalmi mozgó (R) szolgálat számára kijelölt 25 kHz csatorna hullámsáv különbséggel rendelkező összes frekvencia valamint — amennyiben ilyen frekvenciát elegendő számban használnak ahhoz, hogy ez megfeleljen az üzemeltetési követelményeknek — az A. csoportba tartozó 8.33 kHz csatorna szélességgel és elkülönítéssel rendelkező összes frekvencia használatára vonatkozó előírásokat.

A terv biztosítja, hogy a szükséges frekvenciák számát bármely körzetben a helyi körülmények alapján külön — külön határozzák meg. Ennek az az eredménye, hogy egy adott körzetben kijelölhető frekvenciákat a következőkben körvonalazott módon a felsorolásban ismertetett számra korlátozzák.
Annak érdekben, hogy a kijelölhető frekvenciákat az egyes körzetek között a gyakorlati szempontból lehető legnagyobb mértékben egyeztessék, a terv előírja, hogy amennyiben az alábbi 4.1.8.1.2 pont A. csoportjába tartozó frekvenciák száma elegendő egy körzet igényeinek kielégítésére, a 118 MHz -el kezdődően ezen csoportba tartozó frekvenciákat használják. Ez biztosítja, hogy az összes körzetben az adott körzeten belül a lehető legkevesebb számú frekvenciát használnak és bármely két körzet esetében a nagyobb számú frekvenciát igénybe vevő körzet a másik által használt összes frekvenciát is igénybe veszi.
Az A. csoport frekvencia felosztás tervezésénél a frekvenciák között 100 kHz csatorna felosztási távolság van.

Az alábbi 4.1.8.1.2 pont B. csoportjának felsorolása a 117,975 — 132 MHz hullámsáv tartományban tartozó, 50 kHz -el végződő frekvenciákat tartalmazza. Az A. csoportba tartozó frekvenciákkal együtt ezek 50 kHz csatorna felosztási távolsággal rendelkeznek. A C. csoportban a 132 — 137 MHz közötti frekvenciák kerülnek felsorolásra, amelyeknél a csatorna felosztási távolság 50 kHz. A D. csoport felsorolása a 132 — 137 MHz hullámsáv tartományban tartozó, 25 kHz -el végződő frekvenciákat, az E. csoport pedig ehhez hasonlóan a 117,975 — 132 MHz hullámsáv tartományban tartozó frekvencia csatornákat ismerteti. A B, C, D és E csoportok csatornáinak használatát az alábbiakban magyarázzuk meg.

A 4.1.8.1.2 pont F. csoportjának felsorolása a 117,975 — 137 MHz hullámsáv tartományban tartozó, 8.33 kHz csatorna szélességű frekvenciákat tartalmazza, amelynek használatát az alábbiakban magyarázzuk meg.

Ahol egy adott körzetben szükséges frekvenciák száma meghaladja az A. csoportba tartozók számát, a 25 kHz -es felosztási távolsággal rendelkező csatornák használatára vonatkozó 4.1.8.1 pont valamint a 132 — 137 MHz frekvencia tartomány esetében a Rádióösszeköttetési Előírások figyelembevételével (lásd a fenti 4.1 pontot) másik csoportba tartozókat is ki lehet választani. Bár a B, C, D és E csoportok felsorolása nem jelez kívánatos kiválasztási sorrendet, a helyi körülmények alapján végzett tervezés szükségessé teheti az ezen csoportokban tartozó egyes frekvenciák kiválasztását is. Ez különösen a légijármű fedélzetén elhelyezett berendezések és/vagy a légiforgalmi mozgó (R) szolgálat rendelkezésére álló egyes frekvencia csatornák miatt a 132 — 137 MHz frekvencia tartományba tartozó frekvenciák felhasználására érvényes. Egy adott körzeten belül lehetséges az is, hogy először, a C, D vagy E csoportok előtt kívánatos a B. csoportba tartozó frekvenciák közül választani.

Ahol a 4.1.8.1.2 pont A, B, C, D és E csoportjaiba tartozó összes csatornák száma nem elegendő a körzet igényeinek kielégítésére, a hullámsáv tartomány egy része vagy részei kijelölhetők a 8.33 kHz szélességű csatornákhoz vagy a VDL Mode 3. alkalmazásra. A 8.33 kHz szélességű csatornákat tartalmazó hullámsáv tartomány vonatkozásában a 4.1.8.1.1.1 és 4.1.8.1.2 pontoknak megfelelően az F. csoportba tartozó frekvenciákat használják fel. Megjegyzendő, hogy az F. csoport frekvencia kijelölése eltér az A — E csoportokétól és az eltérés elsősorban a csatorna szélességet érinti. A VDL Mode 3. alkalmazásra kijelölt tartományok esetében az A, B, C, D és E csoportokba tartozó frekvenciákat időmegosztással alkalmazzák. Egy frekvencia megfelelő időmegosztással vagy időtartam korlátozással több csatornát szolgál ki, amit a 4-1. (b) táblázat VDL Mode 3. alkalmazásra vonatkozó oszlopában ismertetünk.

Bár az F. csoport felsorolása nem jelez kívánatos kiválasztási sorrendet, a helyi körülmények alapján végzett tervezés szükségessé teheti az ebbe a csoportba tartozó egyes frekvenciák kiválasztását is.

Számos körzetben és területen egyes külön frekvenciákat már adott feladatok, mint például a repülőtéri vagy a bevezető irányítás ellátásához jelölték ki. A terv a különleges vészhelyzeti csatorna és a földi kiszolgáló frekvenciák kivételével ilyen kijelölést nem tartalmaz. Ezt szükség szerint, a helyi körülmények figyelembe vétele mellett végrehajthatják.

4.1.8.1 A légiforgalmi mozgó (R) szolgálat számára felhasználandó frekvenciákat a 117,975 — 137 MHz hullámsáv tartományból a 4.1.8.1.2 pontban levő felsorolásból válasszák ki.

4.1.8.1.1 Amikor egy adott körzetben szükséges frekvenciák száma nem haladja meg a 4.1.8.1.2 pont A. csoportjába tartozó frekvenciák számát, a felhasználandó frekvenciákat a lehetőség szerint sorrendben a 4.1.8.1.2 pont A. csoportjába találhatók közül válasszák ki.

4.1.8.1.1.1 Ahol egy adott körzetben szükséges frekvenciák száma meghaladja a 4.1.8.1.2 pont A — E csoportjaiban rendelkezésre álló frekvenciák számát, a 8.33 kHz szélességű (hang) csatornákat tartalmazó vagy VDL Mode 3. digitális adatátvitelt biztosító hullámsáv tartomány egy része is kijelölhető. A 4.1.8.1.2 pont F. csoportjából válasszanak ki megfelelő frekvenciákat a 8.33 kHz csatorna kijelöléshez vagy az A — E csoportjaiba tartozó frekvenciák közül a 4-1. (b) táblázat alapján az időmegosztásnak megfelelően a VDL Mode 3. digitális adatátvitelhez. A hullámsáv megmaradt részét továbbra is az A — E csoportok megfelelő részeiből kiválasztott 25 kHz szélességű csatornákhoz használják.

1. Megjegyzés: A következő frekvencia tartományok nem állnak rendelkezésre a 25 kHz-nél keskenyebb csatornák kijelölése alkalmával:

121,425 — 121,575 MHz bezárólag; 123,075 — 123,125 MHz bezárólag; 136,500 — 136,975 MHz bezárólag.

2. Megjegyzés: A 25 kHz-es kiosztásban üzemelő szolgálatok védelmet élveznek a 8.33 kHz csatorna felosztási távolsággal működő körzetekben.

4.1.8.1.2 *A kijelölhető frekvenciák felsorolása*

A kijelölhető frekvenciák felsorolását a jelen fejezet függeléke tartalmazza.

4.1.8.1.3 ***Ajánlás*** *— A légijármű üzemeltető szervezetek számára a 6. Annex I. részében előírtak teljesítése érdekében szükség lehet repülésüzemi irányítási összeköttetésekre szolgáló frekvenciák kijelölésére, amely esetben azokat a 128,825 — 132,025 MHz frekvencia tartományból, lehetőleg a tartomány felső frekvenciái közül sorrendben válasszák ki.*

Megjegyzés: Elismert tény, hogy az ilyen frekvenciák kijelölése és a kapcsolatos berendezések üzemeltetésének engedélyezése nemzeti (országos) jellegű feladat. Mindazonáltal azokon a területeken, ahol a repülésüzemi irányítás frekvenciáinak kijelölése nehézséget okoz, hasznos lehet, hogy az államok még a körzeti egyezményt kidolgozó találkozók előtt egyeztetik a légijármű üzemeltető szervezetek igényeit.

4.1.8.2 A légiforgalmi mozgó (R) szolgálat számára kijelölhető frekvenciák számát egy adott körzeten belül olyan meghatározott számra korlátozzák, amely a körzet gyakorlati igényeinek kielégítésére szükséges.

Megjegyzés: Egy adott körzeten belül szükséges frekvenciák számát rendszerint a Tanács a Körzeti Léginavigációs Konferencia ajánlása alapján határozza meg. Az eljárás során figyelembe veszik a körzetben széles körben alkalmazott ultrarövidhullámú (VHF) frekvenciákon működő légijármű berendezések üzemeltetési képességeit is.

4.2 A 108 — 117.975 MHz közötti frekvencia tartomány felhasználása

4.2.1 A 108 — 117,975 MHz frekvencia tartomány csoport kiosztása a következő legyen:

• *108 — 111,975 MHz tartomány:*

a) ILS az 4.2.2 pont és a 10. Annex I. kötet 3.1.3 pont előírásai szerint;

b) VOR, feltéve hogy:

1) nem okoz káros interferenciát a szomszédos ILS berendezéseknél;

2) csak *páros tized* vagy *páros tized + egy/huszad* megahertz-el végződő frekvenciákat használnak.

c) GNSS földi erősítő rendszer (GBAS) a 10. Annex I. kötet 3.7.3.5 pont előírása szerint, feltéve hogy nem okoz káros interferenciát a szomszédos ILS és VOR berendezéseknél.

Megjegyzés: Az ILS/GBAS földrajzi elkülönítési követelményeket valamint a 118 — 137 MHz hullámsávban üzemelő GBAS és URH távközlési szolgálatok közötti területi elkülönítési előírásokat jelenleg dolgozzák ki. Amíg ezeket megállapítják és a körzeti egyezményekben közzéteszik, a GBAS célokra lehetőleg a 112,050 — 117,900 MHz közötti tartományt használják fel.

• *111,975 — 117,975 MHz tartomány:*

a) VOR;

b) GNSS földi erősítő rendszer (GBAS) a 10. Annex I. kötet 3.7.3.5 pont előírása szerint, feltéve hogy nem okoz káros interferenciát a szomszédos VOR berendezéseknél.

1. Megjegyzés: A 108 — 111,975 MHz frekvenciákon működő ILS és VOR berendezések közötti káros interferencia megelőzéséhez szükséges távolsági elkülönítésre vonatkozó útmutató a 10. Annex I. kötet C. Mellékletének 3. részében található.

2. Megjegyzés: A 112,050 — 117,900 MHz frekvenciákon működő GBAS és VOR berendezések közötti káros interferencia megelőzéséhez szükséges távolsági elkülönítésre vonatkozó útmutató a 10. Annex I. kötet D. Mellékletének 7.2.1 részében található.

4.2.2 A körzeti frekvencia kiosztás tervezésénél az ILS berendezések frekvencia kiválasztását a következő sorrendben végezzék el:

a) páratlan tized megahertz-el végződő iránysáv adó és az ehhez csatlakozó siklópálya adó frekvencia csatornái;

b) páratlan tized + egy/huszad megahertz-el végződő iránysáv adó és az ehhez csatlakozó siklópálya adó frekvencia csatornái.

4.2.2.1 A 108 — 111,975 MHz tartományban a *páratlan tized + egy/huszad* megahertz-el végződő iránysáv adó frekvenciával azonosított ILS berendezés üzemeltetését a helyi körzeti egyezmény alapján engedélyezhetik, amikor ezek a következőknek megfelelően alkalmazhatók:

a) korlátozott felhasználásra 1973 január 1-el kezdődően;

b) általános felhasználásra 1976 január 1-én vagy ezt követően.

Megjegyzés: Lásd a 4.2.3.1 pont megjegyzését.

4.2.3 A körzeti frekvencia kiosztás tervezésénél a VOR berendezések frekvencia kiválasztását a következő sorrendben végezzék el:

a) a 111,975 — 117,975 MHz frekvencia tartományban *páratlan tized* megahertz-el végződő frekvenciák;

b) a 111,975 — 117,975 MHz frekvencia tartományban *páros tized* megahertz-el végződő frekvenciák;

c) a 108 — 111,975 MHz frekvencia tartományban *páros tized* megahertz-el végződő frekvenciák;

d) a 111,975 — 117,975 MHz frekvencia tartományban *50 kHz-el* végződő frekvenciák, kivéve az alábbi 4.2.3.1 pont előírását;

e) a 108 — 111,975 MHz frekvencia tartományban *páros tized + egy/huszad* megahertz-el végződő frekvenciák, kivéve az alábbi 4.2.3.1 pont előírását.

4.2.3.1 A 108 — 111,975 MHz frekvencia tartományban *páros tized + egy/huszad* megahertz-el végződő VOR berendezés frekvenciák valamint a 111,975 — 117,975 MHz frekvencia tartományban minden *50 kHz-el* végződő frekvencia felhasználását a helyi körzeti egyezmény alapján engedélyezhetik, amikor ezek a következőknek megfelelően alkalmazhatók:

a) a 111,975 — 117,975 MHz frekvencia tartományban korlátozott felhasználásra;

b) a 111,975 — 117,975 MHz frekvencia tartományban általános felhasználásra a Tanács által meghatározott, de a vonatkozó körzeti egyezmény elfogadása utáni legalább egy évvel későbbi időponttól;

c) a 108 — 111,975 MHz frekvencia tartományban általános felhasználásra a Tanács által meghatározott, de a vonatkozó körzeti egyezmény elfogadása utáni legalább kettő vagy több évvel későbbi időponttól.

Megjegyzés: Ahol a 4.2.2.1 a) és 4.2.3.1 a) pontokban a "korlátozott felhasználásra" kifejezést használjuk, ez a frekvencia olyan megfelelő módon felszerelt légijármű által történő korlátozott igénybevételére vonatkozik és olyan módon, hogy:

a) az ilyen frekvenciákon üzemelni nem képes ILS vagy VOR fedélzeti berendezések védve vannak a káros interferenciával szemben;

b) nem vezetnek be általános előírást az ilyen frekvenciákon üzemelni képes ILS vagy VOR fedélzeti berendezések kötelező szállítására vonatkozóan; és

c) a 100 kHz -es fedélzeti berendezéseket használó nemzetközi üzemeltetőknek biztosított üzemi szolgálat színvonala nem csökken.

4.2.4 Az 50 kHz-es csatorna felosztási távolságot alkalmazó VOR berendezések bevezetésének kezdeti szakaszában a légijármű fedélzeti berendezések üzemeltetésének védelme érdekében olyan területeken, ahol a meglevő berendezések esetleg nem tesznek teljes mértékben eleget az I. kötet 3. fejezet nemzetközi előírásainak, az 50 kHz-es csatorna felosztási távolságot alkalmazó berendezés interferencia körzetében levő összes meglevő VOR állomást az I. kötet 3.3.5.7 pont előírásai szerint módosítsák (állítsák be).

4.2.5 *Frekvencia kiosztás*

Az azonos vagy szomszédos frekvenciákon üzemelő berendezések közötti földrajzi elkülönítést egyedi körzetekként, a következő alapelvek szerint a határozzák meg:

a) a berendezés szükséges gyakorlati hatótávolsága;

b) a berendezést igénybe vevő légijármű legnagyobb repülési magassága;

c) az igény, hogy a minimális IFR repülési magasság olyan alacsony legyen, amelyet a terep lehetővé teszi.

Megjegyzés: A témakörrel kapcsolatos tájékoztatót a jelen Annex Mellékletei tartalmazzák.

4.2.6 ***Ajánlás** — A frekvencia zsúfoltságból adódó zavarok csökkentése érdekében olyan területeken, ahol egy futópálya két megközelítési végén vagy egy repülőtér különböző futópályáin két külön ILS berendezés üzemel, engedélyezhető az azonos frekvencia pár kijelölése az ILS számára, amennyiben:*

a) ezt az üzemeltetési körülmények lehetővé teszik;

b) minden egyes iránysáv adó külön azonosító jellel rendelkezik; és

c) megfelelő intézkedések történtek annak biztosítására, hogy az azonos frekvenciát használó iránysáv és siklópálya adók egyszerre nem sugározhatnak.

Megjegyzés: A 10. Annex I. kötet 3.1.2.7.2 és 3.1.3.9 pontjának előírásai meghatározzák a berendezésekre vonatkozó intézkedéseket.

4.3 A 960 — 1215 MHz közötti frekvencia tartomány felhasználása a DME berendezésekhez

Megjegyzés: A DME rendszerek számára kiosztandó csatornák tervezésével kapcsolatos útmutató a 10. Annex I. kötet C. Melléklet 7. részében található.

4.3.1 Általánosan korlátozás nélkül a 10. Annex I. kötet 3. fejezet A. táblázatában található "X" vagy "Y" előjelzéssel ellátott DME üzemeltetési csatornákat választják ki.

Megjegyzés: A csatorna párosítás biztosítja, hogy bizonyos "Y" előjelzéssel ellátott csatornákat VOR vagy MLS berendezésekkel lehet felhasználni. A 10. Annex I. kötet C. Melléklet 7. részében található útmutató bizonyos tájékoztatásokat tartalmaz arra az esetre, ha, azonos területen belül mindkét rendszernél ugyanazt vagy a szomszédos frekvencia csatornát használják.

4.3.2 A helyi körzeti egyezmény alapján a 10. Annex I. kötet 3. fejezet A. táblázatában található "W" vagy "Z" előjelzéssel ellátott DME üzemeltetési csatornákat válasszák ki, amikor ezek a következőknek megfelelően alkalmazhatók:

a) korlátozott helyi felhasználásra — amelyik a későbbi időpont:

1) 1989 január 1-én vagy ezt követően; vagy

2) a Tanács által meghatározott, de a vonatkozó körzeti egyezmény elfogadása utáni legalább kettő vagy több évvel későbbi időponttól kezdődően.

b) általános felhasználásra — amelyik a későbbi időpont:

1) 1995 január 1-én vagy ezt követően; vagy

2) a Tanács által meghatározott, de a vonatkozó körzeti egyezmény elfogadása utáni legalább kettő vagy több évvel későbbi időponttól kezdődően.

Megjegyzés: A "korlátozott felhasználásra" kifejezés a frekvencia olyan megfelelő módon felszerelt légijármű által történő korlátozott igénybevételére vonatkozik és olyan módon, hogy:

a) az ilyen többszörös frekvencia csatornákon üzemelni nem képes meglevő VOR fedélzeti berendezések védve lesznek a káros interferenciával szemben;

b) nem vezetnek be általános előírást az ilyen többszörös frekvencia csatornákon üzemelni képes VOR fedélzeti berendezések kötelező szállítására vonatkozóan; és
c) az ilyen többszörös frekvencia csatornákon üzemelni nem képes meglevő VOR fedélzeti berendezéseket használó nemzetközi üzemeltetőknek biztosított üzemi szolgálat színvonala nem csökken.

4.3.3 A helyi frekvencia kijelölés tervezéséhez az MLS berendezésekhez párosított DME csatornákat a 4-2. táblázatból válasszák ki.

4.3.3.1 *1 — 5 csoport*

Általában ezeknek a DME csatornáknak engedélyezik a használatát. A kijelölés céljaira történő csatorna kiválasztás esetében a következő szabályok érvényesek:

a) amikor egy MLS/DME berendezést az ILS-el ellátott futópályán kívánják üzemeltetni, a DME csatornát — amennyiben lehetséges — az 1 vagy 2 csoportból válasszák ki és a 10. Annex I. kötet 3. fejezet A. táblázatában (DME csatorna és párosítás) található ILS frekvenciával párosítsák. Abban az esetben, ha az összetett frekvencia védelmet mindhárom egység vonatkozásában nem lehet kielégítően megvalósítani, az MLS csatorna a 3, 4 vagy 5 csoportból is kiválasztható;

b) amikor az MLS/DME berendezést a futópályán ILS rendszer együttes telepítése nélkül kívánják üzemeltetni, a felhasznált DME csatornát lehetőleg a 3, 4 vagy 5 csoportból válasszák ki.

4.3.3.2 6 — 10 csoport

Ezeknek a DME csatornáknak használatát a helyi körzeti egyezmény alapján engedélyezik, amikor ezek a fenti 4.3.2 pont előírásainak megfelelően alkalmazhatóvá váltak.

4.3.4 ***Ajánlás*** *— A körzeti DME csatornák kijelölésének egyeztetését az ICAO szervezetének segítségével végezzék.*

4.4 Az 5030.4 — 5051.0 MHz frekvencia tartomány felhasználása

1. Megjegyzés: Az MLS berendezések frekvencia védelmének tervezésével kapcsolatos tájékoztatót a 10. Annex I. kötet G. Melléklet tartalmazza.

2. Megjegyzés: Az MLS létesítmények és a föld felett nem állandó helyű mozgó műhold állomás adattovábbító összeköttetéseit tápláló földi állomások közötti földrajzi elkülönítési távolság meghatározásához szükséges útmutató az ITU-R S.1342 Ajánlásban található.

4.4.1 Az MLS csatornákat a 10. Annex I. kötet 3. fejezet A. táblázatából válasszák ki.

4.4.2 A körzeti kiosztás tervezésénél az MLS csatornák kiválasztását a 4.3.3 pontban a közösen telepített DME berendezésre vonatkozó előírásoknak megfelelő végezzék.

4.4.3 A csatorna kijelölést 4.4.1 pontban meghatározottak mellett, az 5030.4 — 5150.0 MHz al-hullámsáv tartományban úgy végezzék, hogy ezzel a jövő léginavigációs igényeinek is eleget tegyenek.

4 - 2. táblázat

Csoport	*DME csatorna*	*Párosított URH csatorna*	*Megjegyzések*	*Kijelölési eljárás*
1	PÁROS 18X — 56X	ILS 100 kHz felosztási távolság	Rendszerint akkor használják, ha egy DME berendezés ILS vagy MLS részeként üzemel	általános (lásd 4.3.1)
2	PÁROS 18Y — 56Y	ILS 50 kHz felosztási távolság		általános (lásd 4.3.1)
3	PÁROS 80Y — 118Y	VOR 50 kHz felosztási távolság, páratlan tized MHz		általános (lásd 4.3.1)
4	PÁRATLAN 17Y — 55Y	VOR 50 kHz felosztási távolság		általános (lásd 4.3.1)
5	PÁRATLAN 81Y — 119Y	VOR 50 kHz felosztási távolság, páros tized MHz		általános (lásd 4.3.1)
6	PÁROS 18W — 56W	Nincs párosított URH csatorna		későbbi (lásd 4.3.2)
7	PÁROS 18Z — 56Z	Nincs párosított URH csatorna		későbbi (lásd 4.3.2)
8	PÁROS 80Z — 118Z	Nincs párosított URH csatorna		későbbi (lásd 4.3.2)
9	PÁRATLAN 17Z — 55Z	Nincs párosított URH csatorna		későbbi (lásd 4.3.2)
10	PÁRATLAN 81Z — 119Z	Nincs párosított URH csatorna		későbbi (lásd 4.3.2)

Megjegyzés: Az 1 és 2 csoportokba tartozó DME csatornák felhasználhatók ILS és/vagy MLS berendezésekkel. A 3, 4 és 5 csoportokba tartozó DME csatornák felhasználhatók VOR vagy MLS berendezésekkel.

A 4. fejezet függeléke

A kijelölhető rádiófrekvenciák jegyzéke

Frekvencia (MHz)	Felhasználás	Frekvencia (MHz)	Felhasználás
121,5	Vészfrekvencia	121,95	Repülőtéri földi forgalmi összeköttetések céljára fenntartva (lásd 4-1. táblázat c. /alpont)
123,1	Kiegészítő vészfrekvencia a kutatás és mentés céljaira	121,625	
121.60	Repülőtéri földi forgalmi összeköttetések céljára fenntartva (lásd 4-1. táblázat c. /alpont)	121,675	
121,65		121,725	
121,70		121,775	
121,75		121,825	
121,80		121,875	
121,85		121,925	
121,90		121,975	

A csoport frekvenciái (MHz)											
118,00	118,90	119,80	120,70	123,80	124,70	125,60	126,50	127,40	128,30	129,20	131,20
118,10	119,00	119,90	120,80	123,90	124,80	125,70	126,60	127,50	128,40	129,30	131,30
118,20	119,10	120,00	120,90	124,00	124,90	125,80	126,70	127,60	128,50	129,40	131,40
118,30	119,20	120,10	121,00	124,10	125,00	125,90	126,80	127,70	128,60	129,50	131,50
118,40	119,30	120,20	121,10	124,20	125,10	126,00	126,90	127,80	128,70	129,60	131,60
118,50	119,40	120,30	121,20	124,30	125,20	126,10	127,00	127,90	128,80	130,90	131,70
118,60	119,50	120,40	121,30	124,40	125,30	126,20	127,10	128,00	128,90	131,00	131,80
118,70	119,60	120,50	121,40	124,50	125,40	126,30	127,20	128,10	129,00	131,10	131,90
118,80	119,70	120,60	123,70	124,60	125,50	126,40	127,30	128,20	129,10		

B csoport frekvenciái (MHz)											
118,05	118,95	119,85	120,75	123,95	124,85	125,75	126,65	127,55	128,45	129,25	131,25
118,15	119,05	119,95	120,85	124,05	124,95	125,85	126,75	127,65	128,55	129,35	131,35
118,25	119,15	120,05	120,95	124,15	125,05	125,95	126,85	127,75	128,65	129,45	131,45
118,35	119,25	120,15	121,05	124,25	125,15	126,05	126,95	127,85	128,75	129,55	131,55
118,45	119,35	120,25	121,15	124,35	125,25	126,15	127,05	127,95	128,85	129,65	131,65
118,55	119,45	120,35	121,25	124,45	125,35	126,25	127,15	128,05	128,95	130,95	131,75
118,65	119,55	120,45	121,35	124,55	125,45	126,35	127,25	128,15	129,05	131,05	131,85
118,75	119,65	120,55	123,75	124,65	125,55	126,45	127,35	128,25	129,15	131,15	131,95
118,85	119,75	120,65	123,85	124,75	125,65	126,55	127,45	128,35			

C csoport frekvenciái (MHz)											
132,00	132,35	132,70	133,05	133,40	133,75	134,10	134,45	134,80	135,10	135,40	135,70
132,05	132,40	132,75	133,10	133,45	133,80	134,15	134,50	134,85	135,15	135,45	135,75
132,10	132,45	132,80	133,15	133,50	133,85	134,20	134,55	134,90	135,20	135,50	135,80
132,15	132,50	132,85	133,20	133,55	133,90	134,25	134,60	134,95	135,25	135,55	135,85
132,20	132,55	132,90	133,25	133,60	133,95	134,30	134,65	135,00	135,30	135,60	135,90
132,25	132,60	132,95	133,30	133,65	134,00	134,35	134,70	135,05	135,35	135,65	135,95
132,30	132,65	133,00	133,35	133,70	134,05	134,40	134,75				

D csoport frekvenciái (MHz)											
132,025	132,525	133,025	133,525	134,525	135,025	135,525	136,000	136,250	136,500	136,750	
132,075	132,575	133,075	133,575	134,575	135,075	135,575	136,025	136,275	136,525	136,775	
132,125	132,625	133,125	133,625	134,625	135,125	135,625	136,500	136,300	136,550	136,800	
132,175	132,675	133,175	133,675	134,675	135,175	135,675	136,750	136,325	136,575	136,825	
132,225	132,725	133,225	133,725	134,725	135,225	135,725	136,100	136,350	136,600	136,850	
132,275	132,775	133,275	133,775	134,775	135,275	135,775	136,125	136,375	136,625	136,875	
132,325	132,825	133,325	133,825	134,825	135,325	135,825	136,150	136,400	136,650	136,900	
132,375	132,875	133,375	133,875	134,875	135,375	135,875	136,175	136,425	136,675	136,925	
132,425	132,925	133,425	133,925	134,925	135,425	135,925	136,200	136,450	136,700	136,950	
132,475	132,975	133,475	133,975	134,975	135,475	135,975	136,225	136,475	136,725	136,975	

E csoport frekvenciái (MHz)											
118,025	118,925	119,825	120,725	123,925	124,825	125,725	126,575	127,425	128,275	129,125	131,175
118,075	118,975	119,875	120,775	123,975	124,875	125,775	126,625	127,475	128,325	129,175	131,225
118,125	119,025	119,925	120,825	124,025	124,925	125,825	126,675	127,525	128,375	129,225	131,275
118,175	119,075	119,975	120,875	124,075	124,975	125,875	126,725	127,575	128,425	129,275	131,325
118,225	119,125	120,025	120,925	124,125	125,025	125,925	126,775	127,625	128,475	129,325	131,375
118,275	119,175	120,075	120,975	124,175	125,075	125,975	126,825	127,675	128,525	129,375	131,425
118,325	119,225	120,125	121,025	124,225	125,125	126,025	126,875	127,725	128,575	129,425	131,475
118,375	119,275	120,175	121,075	124,275	125,175	126,075	126,925	127,775	128,625	129,475	131,525
118,425	119,325	120,225	121,125	124,325	125,225	126,125	126,975	127,825	128,675	129,525	131,575
118,475	119,375	120,275	121,175	124,375	125,275	126,175	127,025	127,875	128,725	129,575	131,625
118,525	119,425	120,325	121,225	124,425	125,325	126,225	127,075	127,925	128,775	129,625	131,675
118,575	119,475	120,375	121,275	124,475	125,375	126,275	127,125	127,975	128,825	129,675	131,725
118,625	119,525	120,425	121,325	124,525	125,425	126,325	127,175	128,025	128,875	130,925	131,775
118,675	119,575	120,475	121,375	124,575	125,475	126,375	127,225	128,075	128,925	130,975	131,825
118,725	119,625	120,525	123,725	124,625	125,525	126,425	127,275	128,125	128,975	131,025	131,875
118,775	119,675	120,575	123,775	124,675	125,575	126,475	127,325	128,175	129,025	131,075	131,925
118,825	119,725	120,625	123,825	124,725	125,625	126,525	127,375	128,225	129,075	131,125	131,975
118,875	119,775	120,675	123,875	124,775	125,675						

F csoport frekvenciái (MHz)
(lásd még a 4-1 b./ táblázatot)
118,000 — 121,400 / 8.33 kHz-es osztásokkal
121,600 — 123,050 / 8.33 kHz-es osztásokkal
123,150 — 136,475 / 8.33 kHz-es osztásokkal

A. Melléklet
Az ultrarövidhullámú (VHF) távközlési frekvenciák kijelölését érintő jelentős tényezők

Bevezető

A 4.1.5.2 és 4.1.5.3 pontok meghatározzák a légiforgalmi mozgó szolgálat ultrarövidhullámú (VHF) frekvencián működő berendezéseinek egy csatornán történő párhuzamos üzemeltetéshez szükséges földrajzi távolságot azaz elkülönítést. Az A-1. ábrán látható A/B távolság azt az elkülönítést mutatja be, amelyre a berendezések között szükség van annak érdekében, hogy a védelmi magasságokon valamint az A és B állomások gyakorlati hatótávolságnak határán üzemelő “a” és “b” légijármű káros interferenciát ne tapasztaljon.

A 4.1.6.1 pont ajánlást tartalmaz a legnagyobb antenna nyereség nagyságára a rádió horizonton túl sugárzó berendezés fő sugárzási területén kívül. Az A-2. ábra a védendő szögtartományt ábrázolja valamint a számítási módszert mutatja be. A jelen ábrán 30 fokosnál kisebb sugár szögtartományokkal nem számoltak.

Megjegyzés: A "fő sugárzási terület"-be tartozik az összes olyan oldalszög, ahol az antenna nyeresége a dipól felett meghaladja a 3 dB értéket.

1. Az ultrarövidhullámú (VHF) frekvencián működő berendezések egy csatornán történő párhuzamos üzemeltetéshez a földi állomások között szükséges földrajzi (elkülönítési) távolság meghatározásánál alkalmazott követelmények olyan berendezések esetében amelyek sugárzási területe a rádió horizontig terjed

1.1 A 14 dB (5:1 távolság arány, amint az alábbiakban látható) egy csatornán történő párhuzamos üzemeltetési interferencia védelem biztosítása érdekében a kívánatos és nem-kívánatos jel arány (D/U), a szabad térbeli veszteség (FSL) számítás használandó úgy a kívánatos jel (FSL_D) mint a nem-kívánatos jel (FSL_U) kiszámításához.

FSL (dB értékben) = 32,4 + 20 log f + 20 log d
ahol $\boldsymbol{f}$ = a frekvencia MHz értékben és $\boldsymbol{d}$ = távolság km értékben.
Összehasonlítva az FSL_D értékét az FSL_U értékkel, a következő egyenletet kapjuk:

$FSL_U - FSL_D = 20 \log dU - 20 \log dD$
$= 20 \log dU/dD$
Ha az $FSL_U - FSL_D = 14\ dB$,

akkor — log dU/dD = 14/20 = 0,7 tehát dU/dD = 5,01.

Megjegyzés: Szükséges továbbá figyelembe venni azt is, hogy az adóállomások tényleges sugárzási teljesítménye esetleg nem egyenlő.

1.2 A kívánatos távolság (dD) a kívánatos földi berendezés és annak gyakorlati üzemi hatótávolsága közötti távolság (lásd az A-3. ábrát).

Megjegyzés: Amikor a 14 dB értékű D/U jel aránnyal végzik a kijelölést, vegyék figyelembe az egy csatornán történő párhuzamos üzemeltetésből származó nagy távközlési terhelés interferencia hatásait.

1.3 A nem-kívánatos távolság (dU) a kívánatos valamint a nem-kívánatos földi berendezések gyakorlati üzemi hatótávolság határai közötti távolság (azaz a légijármű helyzetek közötti távolság gyakorlati üzemi hatótávolság határok szélén). Lásd az A-1. ábrát.

1.4 Ezért a kívánatos és nem-kívánatos berendezések közötti szükséges földrajzi távolság a $dD + dU$ valamint a nem-kívánatos berendezés hatótávolságának összege (lásd az A-1. ábrát).

1.5 Amennyiben a számított dU meghaladja az RLOS értéket a légijármű távolságnál, a szolgálati területek határai között akár az RLOS-nak megfelelő csekély távolság is használható.

2. A szomszédos frekvencia csatorna kijelölés meghatározásánál alkalmazott követelmények a vevőberendezés vételi szűrése és más rendszer jellemzők alapján

2.1 Az 50 kHz -es frekvencia felosztási távolság és egy $50/10^6$ azaz ±0.005 % földi állomás frekvencia tűrés mellett történő üzemeltetésre tervezett légijármű vevőberendezések esetében 60 dB értékű vagy jobb hatásos szomszédos csatorna szűrési jellemzőt tételezünk fel. Ennek alapján a két berendezés legközelebbi gyakorlati hatótávolság határai között legalább 5.6 km (3 NM) földrajzi távolság szükséges.

2.2 A 25 kHz -es frekvencia felosztási távolság és ±0.002 % földi állomás frekvencia tűrés mellett történő üzemeltetésre tervezett valamint 8.33 MHz-es frekvencia felosztási távolság és ±0.001 % földi állomás frekvencia tűrés mellett történő üzemeltetésre tervezett légijármű vevőberendezések esetében 60 dB értékű vagy jobb hatásos szomszédos csatorna szűrési jellemzőt tételezünk fel. Ennek alapján a két 25 kHz -es vagy 8.33 MHz-es frekvencia felosztási távolsággal üzemelő berendezés legközelebbi gyakorlati hatótávolság határai között legalább 5.6 km (3 NM) földrajzi távolság szükséges.

2.3 A fenti követelmény a vevőberendezés vételi veszteségének csökkentését célzó elmélet alapján került kidolgozásra. Kivételt képeznek a körzeti irányítási és repüléstájékoztató (FIR) körzeti csatornák, amelyeknél a kívánt és nem-kívánt jel-arány biztosítása érdekében minimális térerő is meghatározásra kerül.

2.4 A követelmény kidolgozásánál a következő további feltételezéseket alkalmaztuk:

1) *Terjedés* — szabad térbeni terjedés a légijárművek között. A föld-levegő térerő kiszámításához a 100 MHz-es földfelszín feletti függőleges polarizáció ITU-R íveit és 20 méter (65 láb) antenna magasságot feltételeztünk.

2) *Legkisebb térerő az üzemi hatótávolság határán* — A körzeti irányítási és repüléstájékoztató (FIR) körzeti csatornák esetében 3000 méter (10000 láb) magasságban 1 μV/m térerő felett 45 dB.

Megjegyzés: A fenti követelmény teljesítéséhez a 20 méter (65 láb) antenna magasságból 100 W energiával sugárzó adóállomás üzemi hatótávolsága határától 185 km-nél (100 NM) ne legyen távolabb.

3) *Tényleges sugárzási teljesítmény (ERP)* — A földi és légijármű állomások legnagyobb tényleges sugárzási teljesítménye 20 W, kivéve a repüléstájékoztató és körzeti irányító szolgálatok távközlését biztosító földi állomásokat, amelyeknél minimálisan 100 W ERP-t kellett feltételezni.

4) *Fedélzeti antenna polarizációs tűrés* — A teljes tűrési érték, azaz a változás ne haladja meg a 10 dB értéket. Mivel feltételeztük a legnagyobb tényleges sugárzási teljesítményt és ezért az összes eltérés ettől lefelé — csökkenő — mutató, a fedélzeti adóberendezés polarizációjával kapcsolatosan tűrési jellemző figyelembevételére nem volt szükség.

5) *Kívánt és nem-kívánt jel arány* — A vevőberendezés kimenetén 20 dB.

6) *Vevőberendezés veszteségi jellemzői* — A veszteségi küszöb érték megfelel az 5 μV/m vételi térerőnek.

2.5 A következő követelmény a fenti 2.4 pontban jelzett feltételezések alapján került kidolgozásra. A szomszédos csatorna interferenciára vonatkozóan külön-külön két esetet vizsgáltunk meg:

a) a vevőberendezés vételi veszteségének növekedését; és

b) kívánatos és nem-kívánatos jel arányt.

Ezek az esetek különböző tervezési követelmények figyelembevételét tehetik szükségessé.

2.5.1 Ahol a helyi körülmények miatt olyan vevőberendezéseket szükséges figyelembe venni, amelyeket nem a 8.33 kHz-es körülményekre terveztek, a következő jellemzőket feltételezzük:

a) a 8.33 kHz-es csatorna, amelyik 8.33 kHz távolságra van a 25 kHz-es csatorna kijelölt frekvenciájától, párhuzamosan üzemel azzal;

b) a 8.33 kHz-es csatorna, amelyik ±16.67 kHz távolságra van a 25 kHz-es csatorna kijelölt frekvenciájától, minden üzemeltetési körülmények között (beleértve a Doppler elmozdulást és az összes többi instabilitást is) a következő szomszédos csatorna szűrési aránnyal rendelkezik:

i) 23 dB légijármű — földi eltolt vivőfrekvenciájú rendszerek esetében;

ii) 30 dB légijármű — földi nem-eltolt vivőfrekvenciájú rendszerek esetében;

iii) 27 dB légijármű — légijármű rendszerek esetében.

A tervezésnél a vegyes 8.33 és 25 kHz rendszerekre vonatkozó legrosszabb körülményeket vettük figyelembe.

c) a 8.33 kHz-es csatorna, amelyik 25 kHz távolságra van a 25 kHz-es csatorna kijelölt frekvenciájától, legalább 60 dB tényleges szomszédos csatorna szűrési jellemzővel rendelkezik.

2.5.2 Ahol 8.33 kHz csatorna felosztási távolságot alkalmazó ultrarövidhullámú (VHF) állomásokat kell figyelembe venni olyan körzeten belül, ahol általában a 25 kHz-es felosztást használják, a 2.5.1 a) — c) pontjainak feltételezései a következők:

a) ahol a 8.33 kHz-es szolgálatok ±8.33 kHz távolságra vannak a 25 kHz-es csatorna kijelölt frekvenciájától, a helyi megállapodás szerint a tervezési és kijelölési követelmények esetében vagy a rádió horizont módszert (legalább 20 dB D/U) vagy pedig a 14 dB kívánatos és nem-kívánatos jel arányt alkalmazzák;

b) a 8.33 kHz-es csatorna, amelyik ±16.67 kHz távolságra van a 25 kHz-es csatorna kijelölt frekvenciájától, a következő követelményt alkalmazzák:

i) Vevőberendezés vételi veszteség növekedése.

A vevőberendezés vételi vesztesége növekedésének megelőzéséhez szükséges legkisebb távolság:
187 tengeri mérföld légijármű —eltolt vivőfrekvenciájú földi rendszerek esetében;
84 tengeri mérföld légijármű —nem-eltolt vivőfrekvenciájú földi rendszerek esetében;
118 tengeri mérföld légijármű — légijármű rendszerek esetében.

ii) kívánatos és nem-kívánatos jel arány.

A megfelelő szomszédos csatorna védelem biztosításához szükséges legkisebb távolság a D/U aránytól függ, feltételezve azonos EIRP értéket a kívánt és nem-kívánat jelek esetére. A távolság a kívánt jel legnagyobb tényleges hatótávolságának alapján számítható ki:

Dadj = tényleges hatótávolság/ *(10 (ACR - D/U) / 20)*

Dadj = a szomszédos csatornán üzemelő két állomás hatótávolságnak határai között szükséges távolság

ACR = szomszédos csatorna szűrés

A *Dadj* és a *hatótávolság* azonos mértékegységben van kifejezve.

Az alkalmazott D/U általában a helyi megállapodásokban rögzített tervezési követelményektől függ.

Megjegyzés: A 14 dB értékű tervezési követelmény alkalmazása feltételezi, hogy nagyon valószínűtlen az, hogy két légijármű egy időben ezen működési határterületük szélén és a két terület közötti legkeskenyebb résznél repül.

c) a 8.33 kHz-es csatornák esetében, amelyek 25 kHz távolságra vannak a 25 kHz-es csatorna kijelölt frekvenciájától, a tervezést a fenti 2.2 pont alapján végezzék.

3. A szomszédos frekvencia csatorna kijelölés meghatározásánál alkalmazott követelmények azon ultrarövidhullámú (VHF) frekvencián működő berendezések esetében, amelyek sugárzási hatótávolsága a rádió horizonton túl terjed

A frekvenciák leggazdaságosabb felhasználása valamint az interferencia kiküszöbölése érdekében a tervezést az alkalmazott berendezések pontos ismeretével kell elvégezni. Amikor a berendezés jellemzői és térerő ívek (vagy a csillapítás) rendelkezésre állnak, általánosságban könnyebb a berendezések között szükséges földrajzi távolság meghatározása. Ha a fentieket nem ismerik, a 4.1.6.1 pontban jelzett legnagyobb megengedett antenna nyereséget tételezik fel és számos tényezőt kell számításba venni valamint összehasonlítani a megfelelő földrajzi távolság megállapításánál. Az összehasonlítandó tényezők a következők:

1) a földi berendezés és a légjármű között;

2) a légjármű és a földi berendezés között;

3) légijármű és légijármű között;

4) földi berendezés és földi berendezés között.

1. eset — Az *A* légijármű védelme a földi berendezés irányából (lásd A-4. ábra): A. Határozza meg üzemi hatótávolság sugarának szélén, a védelmi magasságon a kívánatos állomástól vett *S* jel-szintet (dB rel. 1 μV/m).

B. Jelölje ki a légijármű vevőberendezés szükséges *P* (dB) kívánatos védelmi arány értékét.

C. A vevőberendezés szomszédos csatorna szűrést az *A* (dB) jelöli meg és ez után a vevőberendezés antennájánál elfogadható *L* szint (dB rel. 1 μV/m) az alábbiakban határozható meg:

$$L = S - P + A$$

D. A védelmi ponttól a nem-kívánatos berendezésig mért, a fenti C. szerint meghatározott *d* távolság (km) megtalálható az *L* megfelelő ívre történő felvetítésével.

1. Megjegyzés: Az A-8. — A-15. ábrák az átlagos hőmérsékleti viszonyoknak megfelelő szárazföld és vízfelszín feletti térerő íveket mutatják be, amelyek felhasználhatók a földrajzi (elkülönítési) távolságok meghatározásához azokban az esetekben, amikor ezek a térerő értékek az adásidő 5 %-nál nagyobb mértékben nem változnak. A térerő íveket az Egyesült Államok Távközlési Tudományos Intézetében állapították meg.

2. Megjegyzés: Az 1 kW értéktől eltérő teljesítmény szintek esetében a C. pontban jelzett korrekciókat szükséges elvégezni, például 5 kW ERP értékhez (mínusz) - 7 dB korrekció szükséges.

E. A (földi) berendezések közötti földrajzi távolság D értéke a d (km) és az üzemi hatótávolság sugarának (km) összege.

2. eset — Az *A* légijármű védelme a földi berendezés irányába (lásd A-4. ábra):
A. Határozza meg a földi berendezés vevőantennájának *Sg* jel szintjét a rendszer megfelelő működéséhez.
B. Végezze ez a számítást az 1. esethez hasonlóan, ahol

$$L = Sg - P + A$$

C. A két földi berendezés közötti távolságot szintén az 1. esethez hasonlóan számítsa ki (*D = d + hatótávolság sugár*).

Megjegyzés: Ahol a földi berendezés vevőinek érzékenysége kevesebb mint 50 Ω/1 μV, minden valószínűség szerint a 2. esetben ismertetett földrajzi távolságot kell használni.

3. eset — Az (A) légjármű és a (B) légjármű között (lásd A-5. ábra):
A. Határozza meg az üzemi hatótávolságot valamint a megfelelő állomás védelmi magasságát (lásd A légijármű az A-5. ábrán).

B. Határozza meg az A légijárműhöz legközelebb eső azon pontot, amelyen a B légijármű a földi berendezés irányába adást végez valamint a magasságot, amelyen ez történik.

C. Végezze ez a számítást az 1. esethez hasonlóan és a B légijárművet használja fel nem-kívánatos jel(forrás)ként.

D. Ez után: $L = S - P + A$

E. Az ívekből a B légijárműhöz megállapított (nem-kívánatos) *d* távolság valamint a védendő berendezés üzemi hatótávolsága határozza meg a B légijármű és a fenti berendezés közötti távolságot.

F. A két földi berendezés közötti földrajzi (elkülönítési) távolságot ezt követően grafikus vagy trigonometrikus módszerrel lehet kiszámítani.

4. eset — Földi berendezés és földi berendezés között (lásd A-5. ábra).

A. Határozza meg az egyik földi berendezés vevőantennájánál elfogadható *Sg* jel szintjét

$L = Sg - P + A$ (lásd az 1. eset).

B. A földi berendezések közötti földrajzi távolság ilyen körülmények között közvetlenül (az adóteljesítmények megfelelő korrekciója után, ha azok 1 kW értéktől eltérnek) az ívekről leolvasható.

C. Amennyiben a két földi berendezés különböző (működési) jellemzőkkel rendelkezik, ismételje meg a fenti "A" és "B" eljárást mindkét berendezés vonatkozásában.

D. A kiszámított két távolságból az összehasonlításhoz használja a nagyobb értékűt.

Megjegyzés: A legtöbb esetben megállapítható, hogy nem a berendezések közötti jellemzők határozzák meg elsősorban a földrajzi (elkülönítési) távolságot.

A berendezések közötti földrajzi (elkülönítési) távolság a 1. — 4. esetekben meghatározott legnagyobb távolság lesz.

4. Az ultrarövidhullámú (VHF) frekvencián működő berendezések egy csatornán történő párhuzamos üzemeltetéséhez a földi állomások valamint a légijármű és a földi állomások között szükséges földrajzi (szétválasztási) távolság meghatározásánál alkalmazott követelmények olyan berendezések esetében amelyek sugárzási területe a rádió horizonton túl terjed

Az egy csatornán párhuzamosan üzemeltetett berendezések között szükséges földrajzi távolságot a fenti 2. módszerrel lehet kiszámítani, azonban a szomszédos csatorna szűrés (A) a számításból elhagyható.

5. A párhuzamos frekvencia csatorna kijelölés meghatározásánál alkalmazott követelmények az ultrarövidhullámú (VHF) frekvencián működő VOLMET berendezések esetében

Az ultrarövidhullámú (VHF) frekvencián működő VOLMET szolgálatok vonatkozásában a párhuzamos csatornán üzemelő állomások közötti földrajzi távolság legalább 55.6 km (30 NM) valamint az érintett területen belül a legnagyobb repülési magasságon repülő légijárműtől a rádió horizontig mért távolság kétszerese legyen (lásd A-6. ábra).

Megjegyzés: A rádió horizonton túl 27.9 km (15 NM) távolságban a 100 W teljesítménnyel (ERP) sugárzó adó térereje 13500 méter (45 000 láb) magasságban körülbelül a vevő vételi veszteség szintjén ***5µV/m*** *lesz.*

6. A szomszédos frekvencia csatorna kijelölés meghatározásánál alkalmazott követelmények az ultrarövidhullámú (VHF) frekvencián működő VOLMET berendezések esetében

6.1 A 25 kHz-es csatorna felosztási távolsággal történő üzemeltetésre tervezett légijármű vevőberendezések esetében a 60 dB értékű vagy jobb tényleges szomszédos csatorna szűrést tételezünk fel. Ennek alapján az ultrarövidhullámú (VHF) frekvencián működő földi VOLMET adóberendezések közötti földrajzi (szétválasztás) távolság (D) a következő (a tengeri mérföld behelyettesíthető kilométerrel):

$$D = (d_1 + d_2)\ km$$

ahol

d_1 = a légijármű és a kívánt földi állomás közötti távolság;
= a rádió horizont + 27.8 km (15 NM), valamint

d_2 = a légijármű és a nem-kívánt földi állomás közötti távolság;
= 24.1 km (13 NM).
(lásd az A-7. ábra)

6.2 Ahol a helyi körülmények miatt olyan vevőberendezéseket szükséges figyelembe venni, amelyeket nem a 25 kHz-es körülményekre terveztek, azonban azokat a 25 kHz-es körülmények között használják, 40 dB értékű tényleges szomszédos csatorna szűrést tételezünk fel. Ennek alapján az ultrarövidhullámú (VHF) frekvencián működő földi VOLMET adóberendezések közötti legkisebb földrajzi (szétválasztás) távolság (*D*) a következő:

$$D = (d_1 + d_2)\ km$$

ahol
d_1 = a légijármű és a kívánt földi állomás közötti távolság;

= rádió horizont + 27.8 km (15 NM)

d_2 = a légijármű és a nem-kívánt földi állomás közötti távolság;
= 240.9 km (130 NM).

6.3 A fenti követelmények alkalmazásának eredménye 13 500 méter (45 000 láb) valamint 20 000 méter (66 000 láb) légijármű repülési magasság esetében a következő szétválasztási távolság lesz:

repülési magasság	***vevőberendezés szűrési jellemző***	***d_1 km (NM)***	***d_2 km (NM)***	***D km (NM)***
13500 m (45000 láb)	60 dB	491 (265)	24.1 (13)	515 (278)
13500 m (45000 láb)	40 dB	491 (265)	241 (130)	732 (395)
20000 m (66000 láb)	60 dB	619 (334)	24.1 (13)	643 (347)
20000 m (66000 láb)	40 dB	619 (334)	241 (130)	860 (464)

6.4 A fenti követelményrendszer a következő további feltételezésekre épül:

1) *Tényleges sugárzási teljesítmény (ERP)* — A földi állomások legnagyobb tényleges sugárzási teljesítménye 100 W.

Megjegyzés: Ha a földi állomások legnagyobb tényleges sugárzási teljesítménye 20 W, ez a következő földrajzi távolságokat teszi szükségessé:

repülési magasság	***vevőberendezés szomszédos csatorna szűrési jellemző***	***D km (NM)***
13500 m (45000 láb)	60 dB	472 km (255 NM)
13500 m (45000 láb)	40 dB	572 km (309 NM)

2) *Interferencia jel erőssége* — Amennyiben a vett jel erőssége meghaladja a szabad térbeli terjedés értékét, a legnagyobb érték az egész föld átlagában azt 5 dB-nél nagyobb mértékben ne haladja meg. Ez a feltétel teljesülhet, ha 20 W vagy nagyobb ERP-vel rendelkező adókat használnak olyan vevőberendezésekkel, amelyeknek szomszédos csatorna szűrése nem kevesebb mint 35 dB. Így a minimális d_2 távolság megállapítható a vevőberendezés vételi veszteségének, a szomszédos csatorna szűrésének és az adóberendezés tényleges sugárzási teljesítményének adataiból.

7. RF — A digitális ultrarövidhullámú (VHF) rendszerek interferencia védettség jellemzői

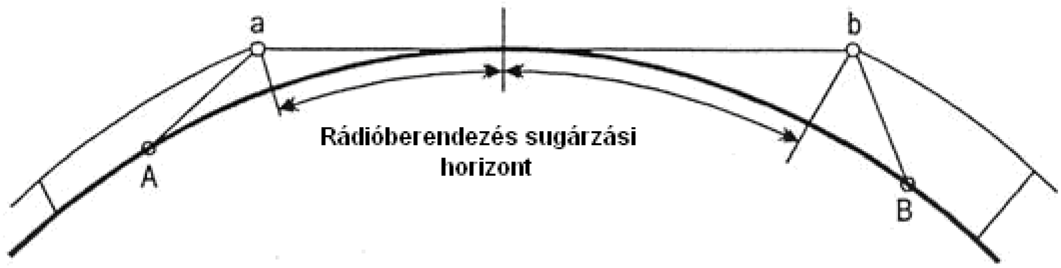
7.1 *Vevőfunkció — interferencia védettség mértéke azaz nem-kívánatos jel szűrés* — A digitális rendszerek szabványos mérési módszere biztosítja a kívánatos jel térerő megkettőzését valamint a nem-kívánatos (interferencia) jel növekedését mindaddig, amíg a csatorna teljesítmény — azaz a meghatározott hiba arány — a vételi érzékenységre meghatározott értéknek megfelelő szintre csökken.

Az ultrarövidhullámú digitális adatátviteli összeköttetés (VDL) vonatkozásában a mérési módszer hatása az, hogy a kívánatos jel szint 20 μV/m értékről 40 μV/m értékre növekszik. Ekkor a szomszédos vagy bármely más kijelölhető csatornán a nem-kívánatos jel is addig növekszik, amíg meghaladja a meghatározott hiba arány értékét.

Gondoskodjanak arról, hogy a csatorna zaj teljesítményt a nem-kívánatos jel mérésénél figyelmen kívül hagyják.

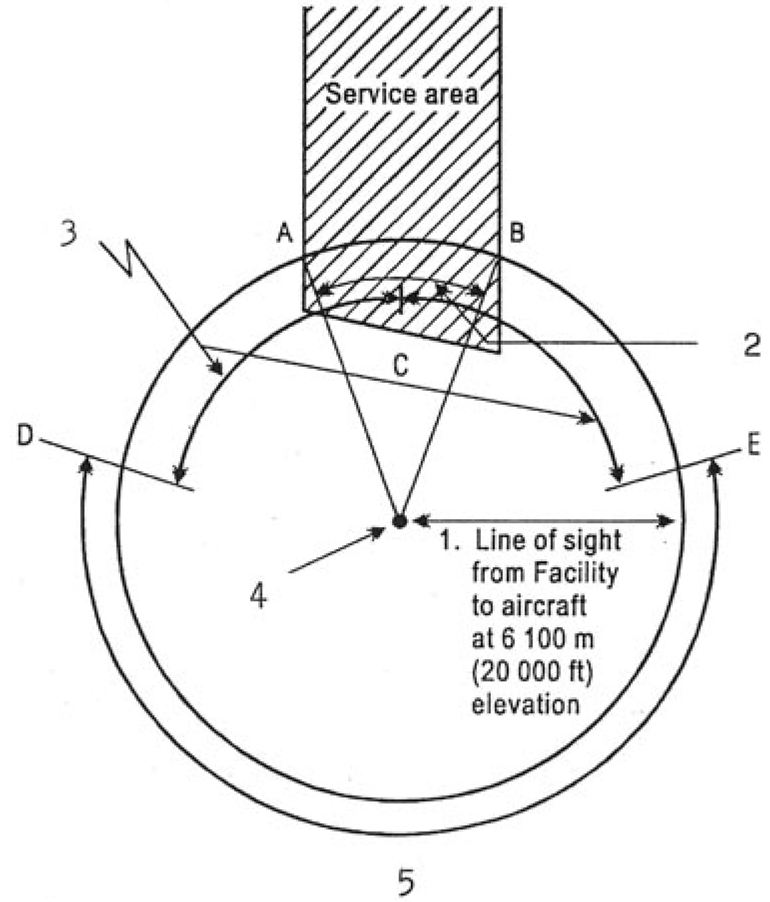
7.2 *Kijelölési követelmények* — Az ultrarövidhullámú (VHF) digitális adatátvitel összeköttetési frekvenciák kijelölésénél a párhuzamos és szomszédos csatornák káros interferenciájának kiküszöbölése valamint a helyi és országos frekvencia felhasználási megállapodások betartása érdekében vegyék figyelembe a VDL RF rendszerek jellemzőit.

Az A. Melléklet ábrái és az ábrák magyarázata (A-1. — A-7. ábrák)



A-1. ábra

Az ultrarövidhullámú (VHF) frekvencián működő berendezések egy csatornán történő párhuzamos üzemeltetéséhez a földi állomások között szükséges földrajzi (elkülönítési) távolság
Radio horizon — Rádióberendezés sugárzási horizont

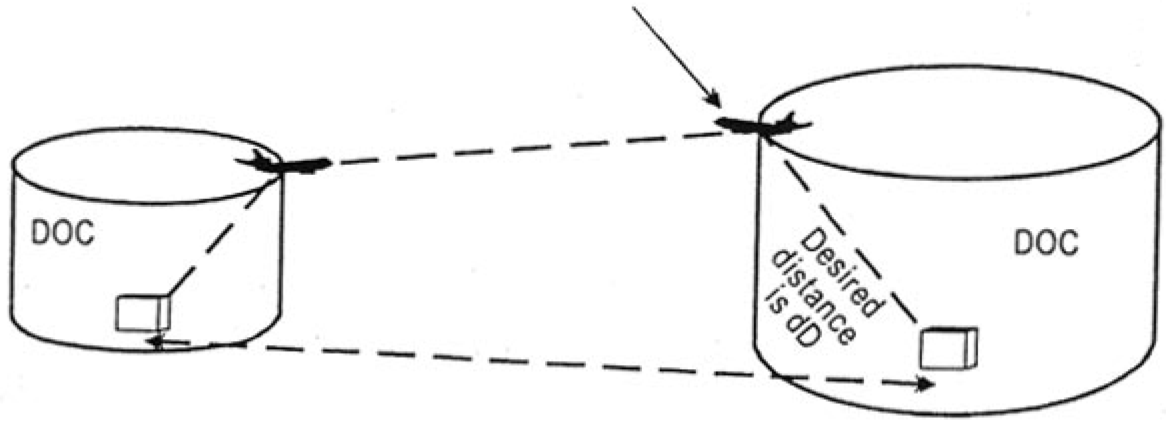


A-2. ábra
Az oldalszög védelem határa azon ultrarövidhullámú (VHF) frekvencián sugárzó berendezések esetében, amelyek a rádió horizonton túl üzemelnek

A-2. ábra (magyarázat)
Az oldalszög védelem határa azon ultrarövidhullámú (VHF) frekvencián sugárzó berendezések esetében, amelyek a rádió horizonton túl üzemelnek

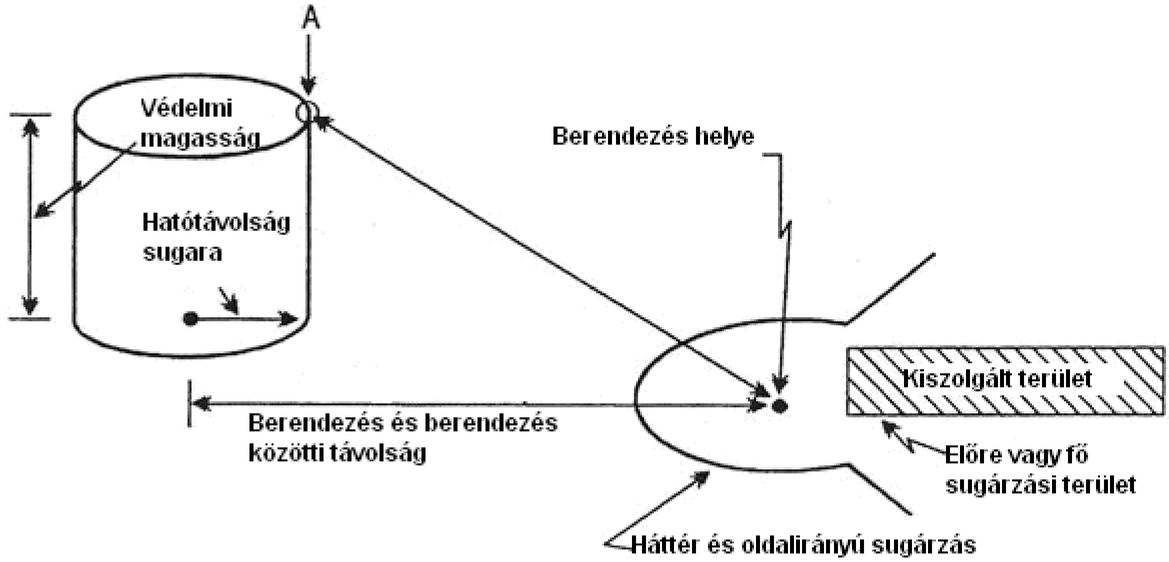
2)	Kiszolgált terület oldalszöge ∅	5)	Oldalszög az antenna felett lehetőleg 3 dB-re korlátozva
3)	Oldalszög 2∅	Service area	Kiszolgált terület
4)	A rádió horizonton túl üzemelő URH berendezés	Line of sight	Sugárzás azaz egyenes a létesítmény és a légijármű között

Feladatok:
1. Határozza meg a sugárzást, azaz a tengelyvonalat a létesítmény és a légijármű között
2.Határozza meg az oldalszög értékét, majd mérje ki annak kétszeresét (C-D és C-E)
3.Határozza meg az oldalszöget lehetőleg 3 dB-re korlátozva az antenna felett (D-E)



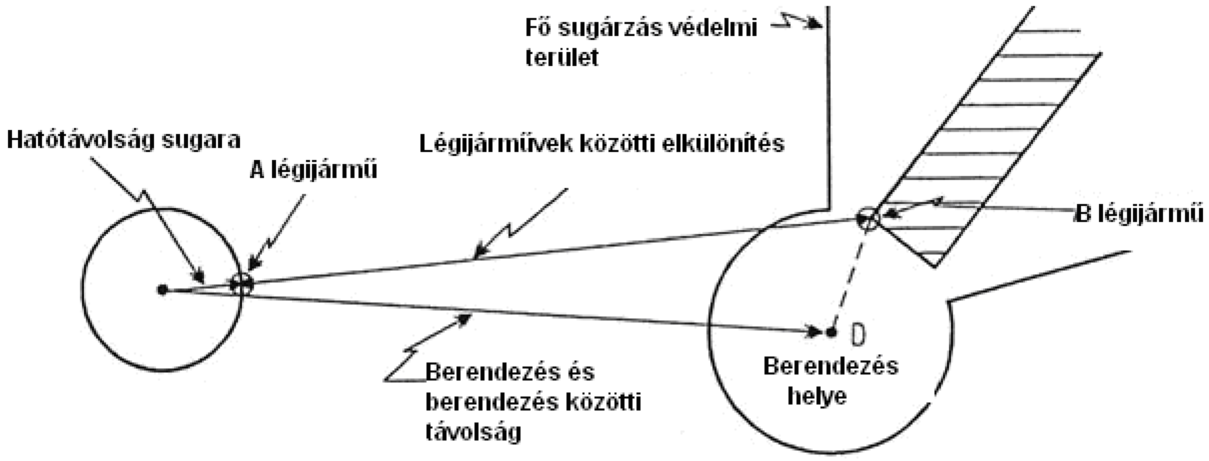
A-3. ábra

Párhuzamos csatorna elrendezés a kívánatos és nem-kívánatos távolság arányhoz
A-3. ábra (magyarázat)
Légijármű a kívánatos berendezés hatótávján és védett magasságán (DOC)
Nem-kívánatos távolság (dU)
Berendezések közötti földrajzi (elkülönítési) távolság
Kívánatos és nem-kívánatos berendezés hatótávja — Kívánatos távolság (dD)

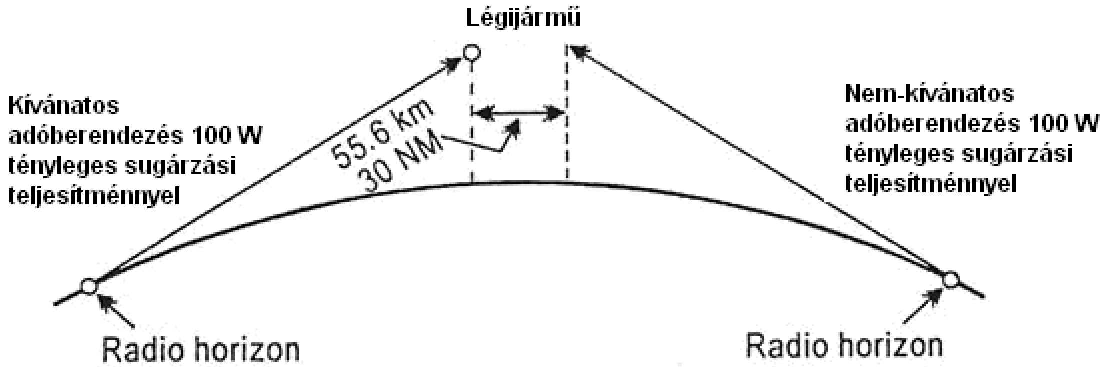


A-4. ábra

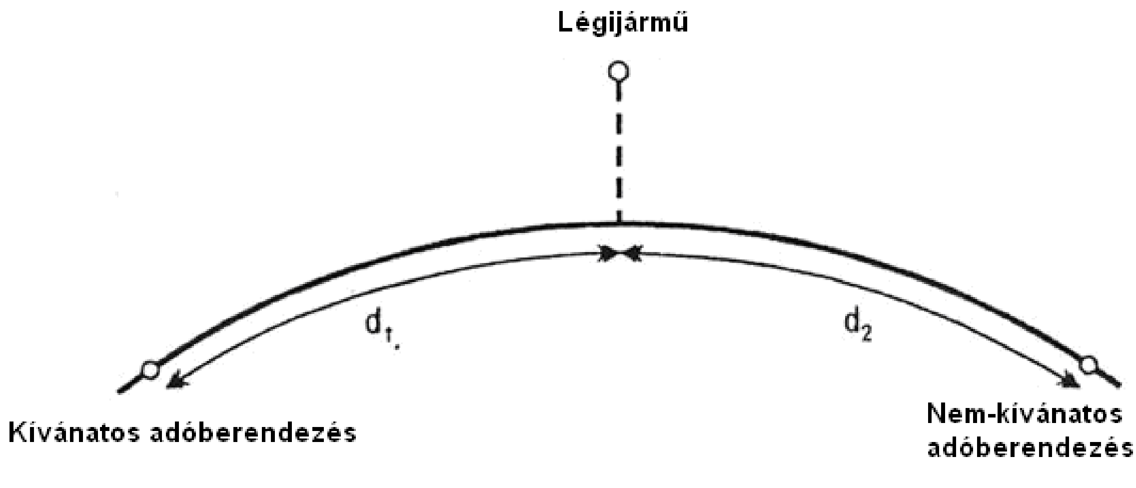
Levegő — föld (berendezés "A"-tól) valamint föld — levegő ("A" berendezéstől)



A-5. ábra
Berendezések közötti földrajzi távolság
levegő — levegő (A — B) és föld — föld (C — D)



A-6. ábra
VOLMET berendezés tervezése (párhuzamos csatorna védelem)

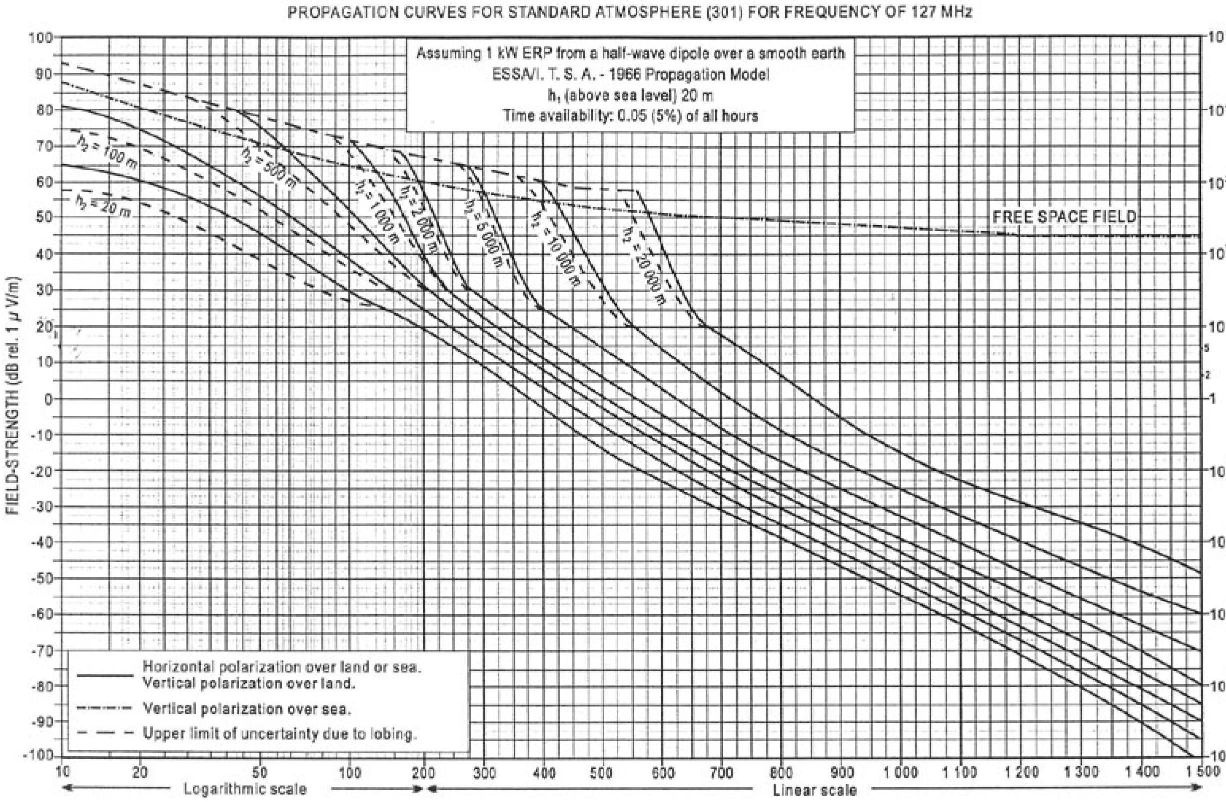


A-7. ábra
VOLMET berendezés tervezése (szomszédos csatorna védelem)

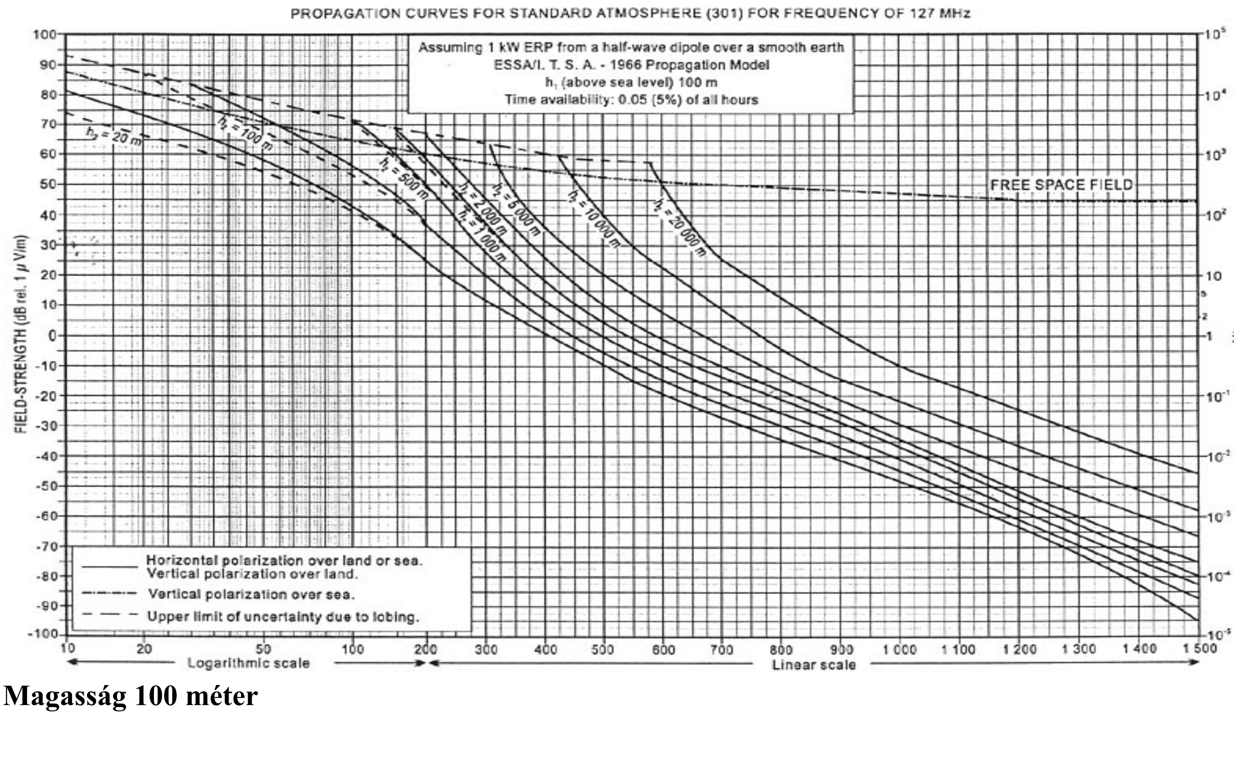
A-8. — A-15. ábrák A 127 MHz frekvencia terjedési ívei szabványos (301) légkörben

ESSA/I.T.S.A. — 1966 évi terjedési modell Ezek a "rendelkezésre álló idő 5 % -a" című ívek csak statisztikailag várható értékeket jelentenek, azaz 0.05 valószínűsége van annak, hogy egy adott helyzetben a meghatározott térerő vagy ennél nagyobb alakul ki a sugárzási idő 5 %-a alatt. Az ívek kidolgozásához alkalmazott jellemzők a következők: 1) 127 MHz frekvencia; 2) vízszintes vagy függőleges polarizáció; 3) sík talaj vagy vízfelszín; 4) egységes nagyságrendű visszaverődési együttható; 5) szabványos légkör (301) felületi visszaverődés; 6) szárazföldi hőmérsékleti viszonyok; 7) Nakagami-Rice statisztika a horizonton belüli rádióhullám periodikus gyengülésre vonatkozóan; 8) 1 kW bemenő értéknek megfelelő tényleges sugárzási teljesítmény (ERP) a veszteség-biztos félhullámú antennán.

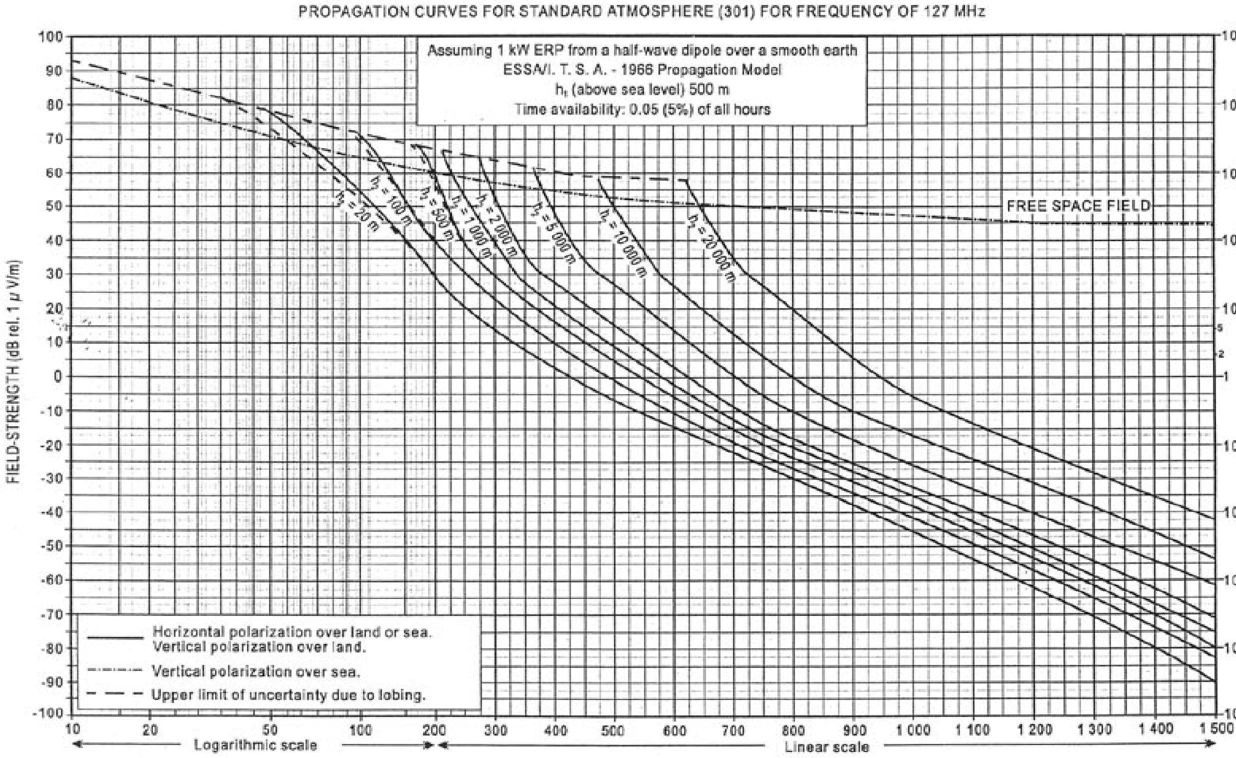
——	= Vízszintes polarizáció talaj vagy vízfelszín felett valamint függőleges polarizáció talajfelszín felett.
-- --	= Függőleges polarizáció vízfelszín felett.
- - - -	= Hullámzás miatt bekövetkező bizonytalanság felső határa.
FSF	= Szabad térbeli terjedés (mező)
FS	= Térerő érték (dB rel. 1 μV/m)
D	= Logaritmikus és lineáris távolságok kilométerben
h_1	= Tengerszint feletti magasság méterben



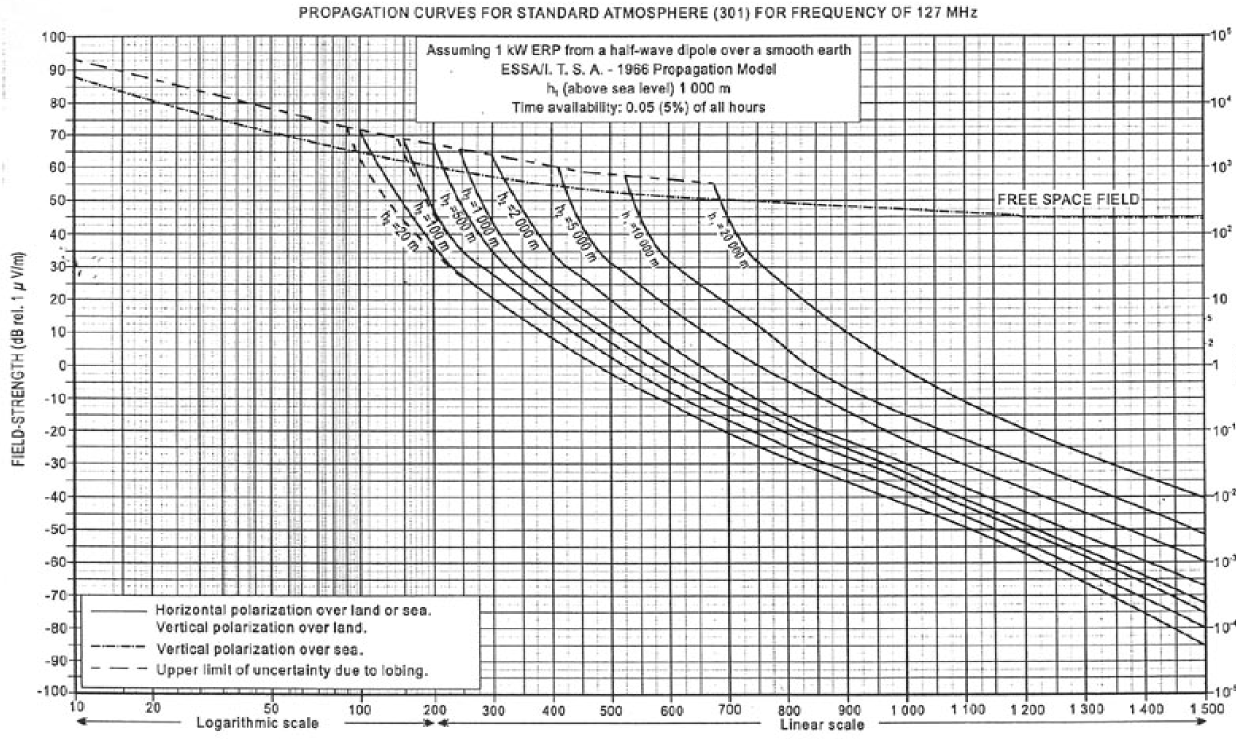
Magasság 20 méter



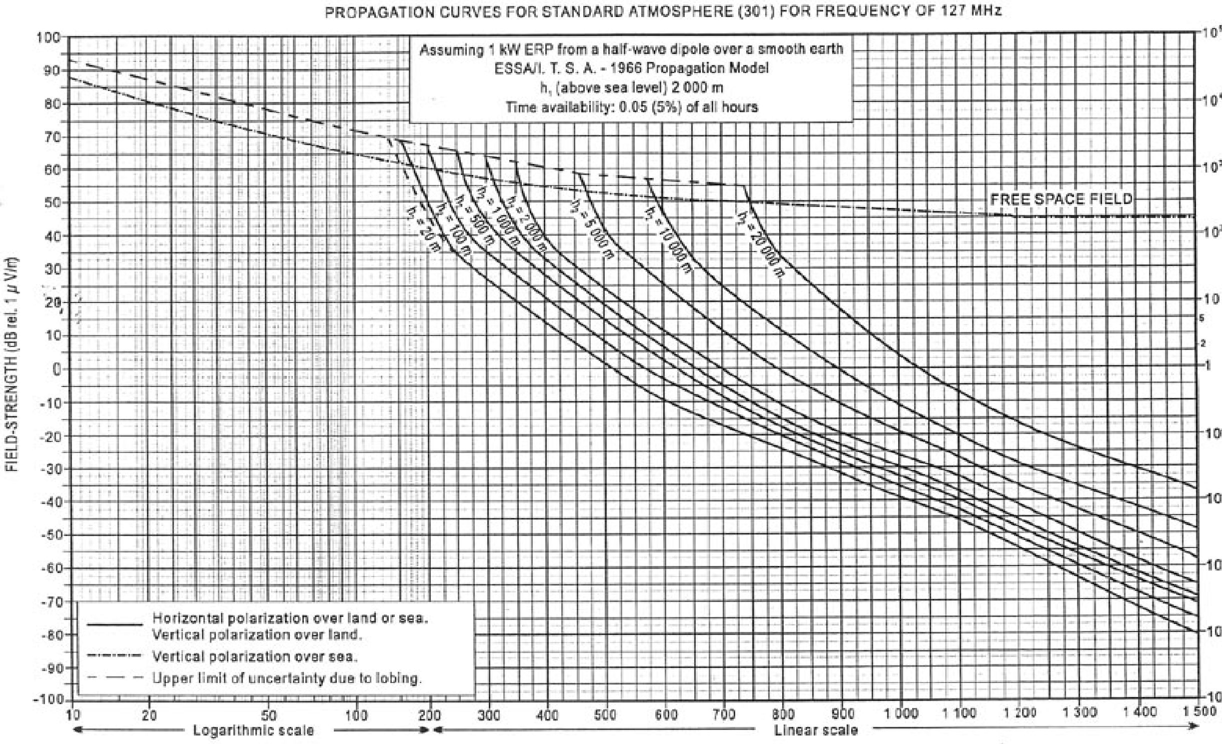
Magasság 100 méter



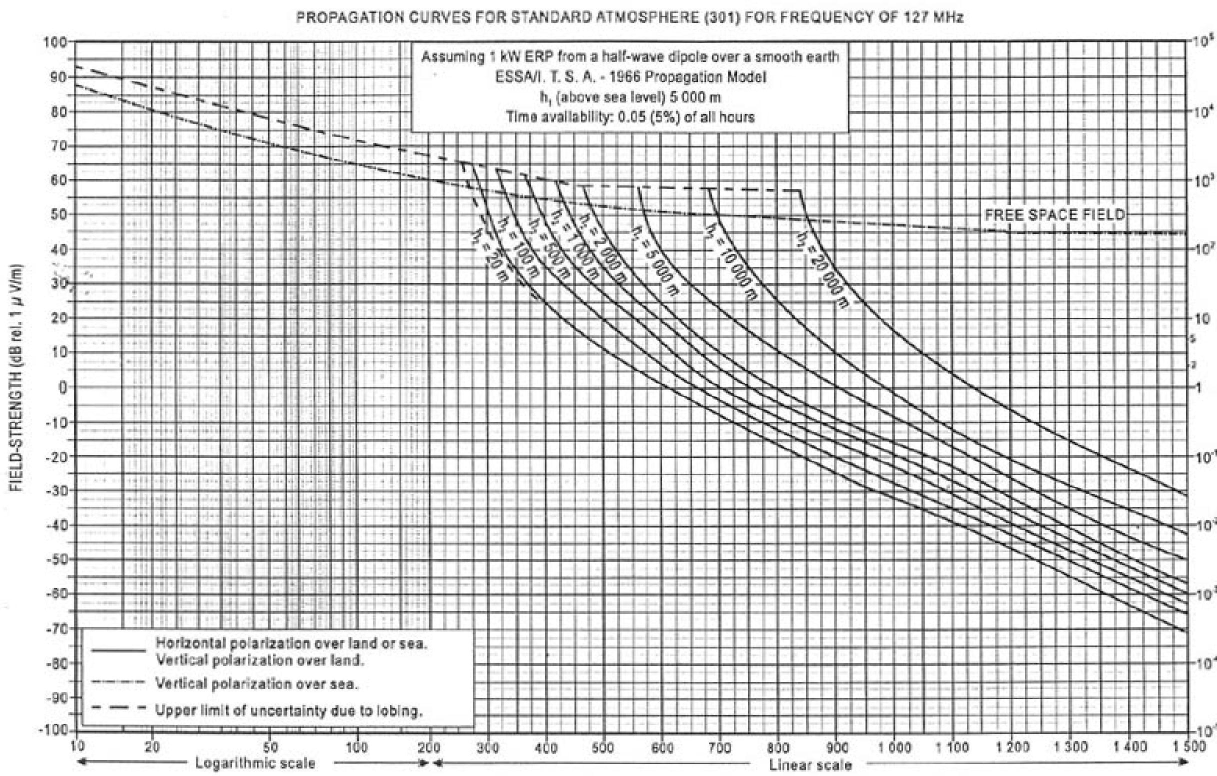
Magasság 500 méter



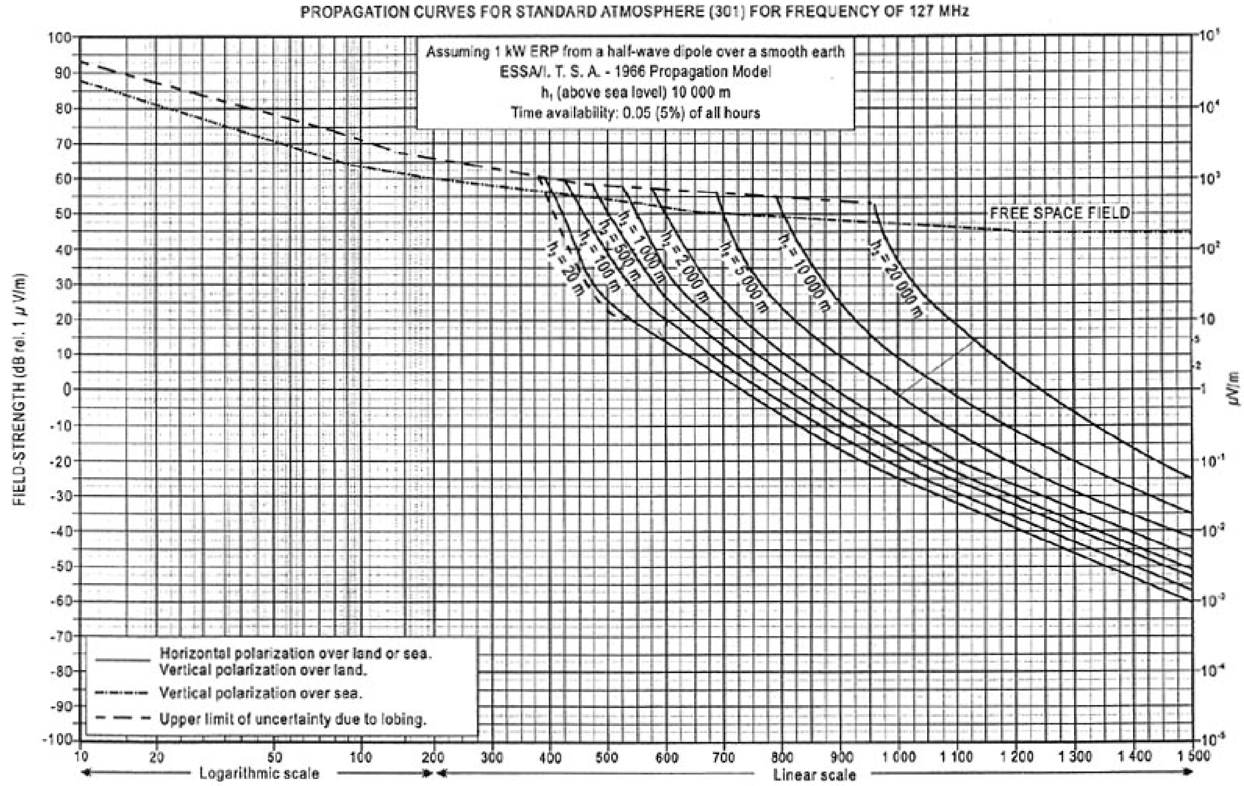
Magasság 1000 méter



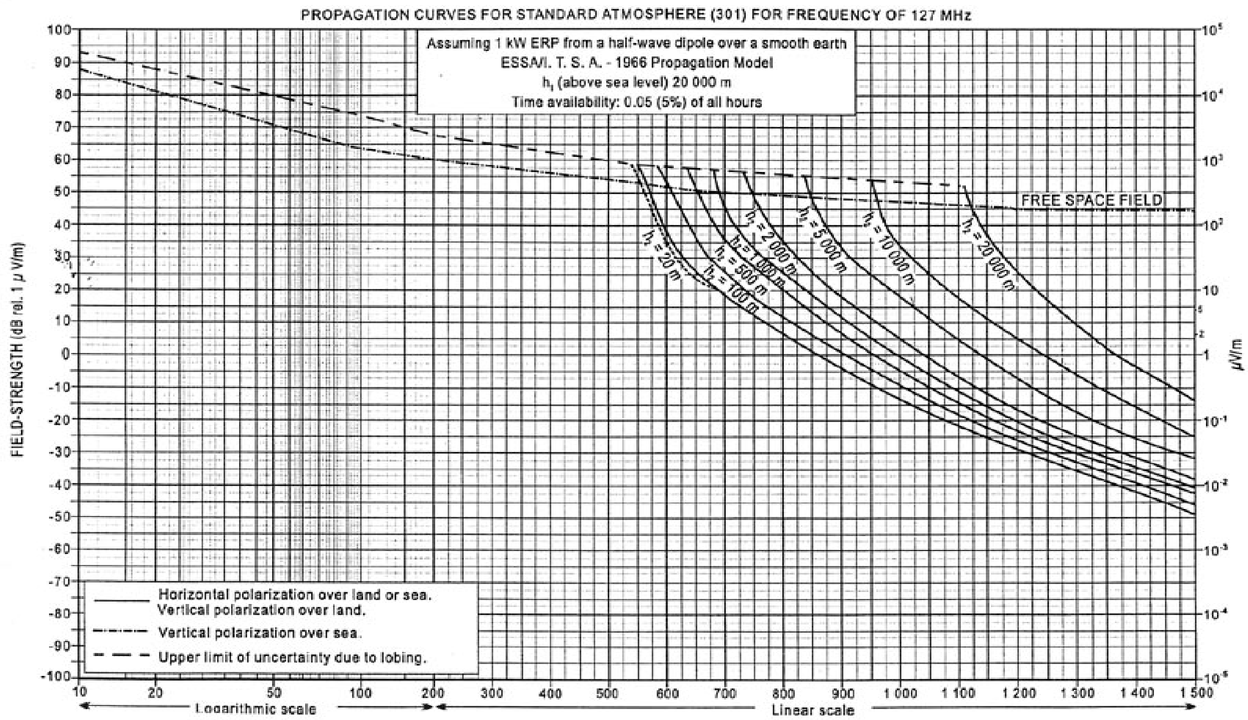
Magasság 2000 méter



Magasság 5000 méter



Magasság 10000 méter



Magasság 20000 méter

B. Melléklet
A hosszúhullámú és középhullámú (LF/MF) távközlési frekvenciák kijelölését valamint a káros interferencia

kiküszöbölését érintő jelentős tényezők

1. Elismert tény, hogy elsősorban azokon a területeken, amelyeken sűrűn helyezkednek el NDB adóberendezések, a hatásos és gondos tervezés nélkülözhetetlen a következők érdekében:

a) az automatikus iránymérő (ADF) berendezések kielégítő működésének ; és

b) az NDB berendezések részére rendelkezésére álló korlátozott frekvencia tartomány leggazdaságosabb felhasználásának biztosítása.

Magától értetődő, hogy a körzeti értekezleteken úgy tervezik meg a létesítményeket, hogy biztosítsák minden egyes berendezés lehető legjobb védelmét a káros interferencia hatásaival szemben. Mindazonáltal bizonyos körzetekben a berendezések olyan nagy számban fordulnak elő és olyan zavart okozhatnak, hogy a körzeti értekezletekre bizonyos *minimális* védelmi szint megállapítása vált szükségessé.

A körzeti értekezleteken a tervezés során többek között a következő tényezőket veszik figyelembe:

a) a szükséges NDB adóberendezések számának a rendszerek tervezése során végzett egyeztetés alapján lehetséges csökkentése;

b) a hatótávolság csökkentésének lehetősége ott, ahol alacsonyabb hatótávolság is elfogadható, mint amit a berendezések tényleges hatótávolsága biztosítani tud;

c) a használatban levő automatikus iránymérő (ADF) berendezések jellemzői;

d) az érintett területnek megfelelő légköri zajviszonyok;

e) a talaj (elektromágneses) vezetőképessége;

f) a meghatározott hatótávolság határán szükséges interferencia védelem.

A fentiek közül a műszaki szempontból leginkább fejleszthető a használatban levő automatikus iránymérő (ADF) berendezések jellemzői.

2. Az 1979 évi Rádió Világkonferencia előírásokat fogadott el a hosszúhullámú és középhullámú (LF/MF) frekvencia sávban működő légiforgalmi rádióadó berendezésekkel kapcsolatosan. A frekvencia kijelölési terv alapjaként a 15 dB (kívánt és nem-kívánt jel arány) minimális védelmi arányt alkalmazzanak (S12. Függelék RR). Az EUR körzetben használt automatikus iránymérő (ADF) berendezések csillapítási jellemzőit érintő következő adatokat használták fel a frekvencia kijelölési eljárás elősegítésére:

Frekvencia különbség (kHz)	*Csillapítás (db)*	*Frekvencia különbség (kHz)*	*Csillapítás (db)*
0	0	3,6	30
1	1	4,3	40
2	6	5	50
2,4	10	6	65
3	20	7	80

A fenti értékek (vagy az ezekből meghatározott távolsági követelmények) más körzetekben is alkalmazhatók a legkisebb védelmi szint meghatározása során.

Ahol a fedésterület szélén ±5 fokos (irány)mérési pontosság szükséges, az LF/MF csatorna kijelölési terv alapjául legalább 15 dB-es nappali minimális védelmi szintet alkalmazzanak.

3. Tekintettel arra, hogy számos körzetben szükséges a tervezési követelmények továbbfejlesztése, elismerték, hogy a fejlesztés legfőbb lehetősége a fentiekben megadottnál magasabb csillapítási értékek alkalmazásban rejlik. Ezért a körzeti értekezletek részére azt tanácsoljuk, hogy amennyiben a zsúfoltság már olyan nagy, hogy a fenti értékek alkalmazása már nem teszi lehetővé a rendelkezése álló LF/MF frekvencia tartomány megfelelő és gazdaságos tervezését, a műszaki szempontból legalkalmasabb következő adatokat használják fel a berendezések közötti távolság meghatározásához:

Frekvencia különbség (kHz)	*Csillapítás (db)*	*Frekvencia különbség (kHz)*	*Csillapítás (db)*
0	0	5	65
1	6	6	80
3	35		

A fenti értékek alkalmazása során megjegyzendő, hogy a korszerű automatikus iránymérő berendezések RF szelektivitása általában jobb, mint a fenti értékek és bár a régebbi berendezéseké általában nem jobb, a régebbi berendezések dinamikus jellemzői jobbnak bizonyulnak. Ezért feltételezhető, hogy az új adatok alapján végzett frekvencia tartomány tervezés jelentős mértékben növeli a korszerű berendezések felhasználóinak nyújtott szolgáltatás színvonalát és ugyanakkor jelentős mértékben nem csökkenti ezt azon légijármű esetében, amelyek régebbi berendezésekkel rendelkeznek. Mindazonáltal a körzeti értekezleteken a tervezés során ezt a kérdést a legnagyobb gondossággal elemezzék.

4. Bizonyos körzetekben számos NDB berendezést hangfrekvenciás csatornákkal együtt üzemeltetnek és ez összhangban van az I. kötet 3.4.6 pont bevezető megjegyzésével. Várható, hogy a helyi körzeti értekezleteken a frekvencia tartomány tervezésénél ezt a tényt is figyelembe veszik.

C. Melléklet
A nagytávolságú repülésüzemi irányítási összeköttetések alapelvei

Megjegyzés: Az alábbi pontok számozása nem jelent fontossági sorrendet.

1. Engedélyezzék a légiforgalmi repülésüzemi irányítási (AOC) rövidhullámú (HF) állomások működését abban az esetben, ha más módszer nem áll rendelkezésre a nagytávolságú repülésüzemi irányítás biztosítására vagy ha a repülések biztonságos és rendszeres lebonyolításához rendelkezésre álló általános távközlési szolgálatok használata nem megfelelő vagy lehetséges.

2. Az összes földi állomás számát az egész világon a gazdaságosság és a gyakorlati hatásosság figyelembevétele mellett a lehető legkisebbre korlátozzák és ezért:

a) államonként általában ne legyen egynél több ilyen állomás; és

b) ahol a szomszédos államokban közösen megállapított érdek és szándék van, megfelelő egyezmény alapján a szomszédok között egy állomás használható fel az adott államokban működő összes légijármű üzemeltető szervezet igényeinek kielégítésére.

3. Az állam vagy államok nemzeti politikájától függően a légiforgalmi állomásokat egy vagy több légijármű üzemeltető szervezet megbízásából fenntarthatják az államok, feltéve hogy teljesíteni tudják ezen szervezetek rugalmasságra vonatkozó igényeit és azok légijárműveikkel szükség szerint közvetlen kapcsolatot tudnak felvenni. Ezen kívül a légiforgalmi állomásokat egy vagy több légijármű üzemeltető szervezet megbízásából és az érintett állam vagy államok engedélye alapján egy légijármű üzemeltető vagy távközlési szolgáltató szervezet is fenntarthatja.

4. Az engedélyeket rendszeresen megújítandó formában Rádióösszeköttetési Szabályzat a vonatkozó RR S4.11 alapján és az RR S43.4-nek megfelelően adják ki, megtiltva bennük a "nyilvános adás-vétel" továbbá a nem repülésüzemi irányítási célokat szolgáló közleményváltások, a két pont közötti levelezés vagy más nem a fenti célú rádió távközlés lehetőségét.

5. Amennyiben a légijármű az illetékes ultrarövidhullámú (VHF) állomás hatókörzetén belül tartózkodik, ezt az ultrarövidhullámú frekvenciát (általános célú vagy repülésüzemi irányítási csatornák) és ne a rövidhullámú frekvenciát használják.

Megjegyzés: A légiforgalmi mozgó szolgálati (R) csatornákon engedélyezett közleményváltások kategóriáit a 10. Annex II. kötet 5. fejezet 5.1.8 pontja tartalmazza. Ugyanez a fejezet határozza meg a szolgálatok számára előírt szabványos közleményváltási eljárást, beleértve a rádiófigyeléssel kapcsolatos, a 10. Annex II. kötet 5. fejezet 5.2.2 pontjában található előírásokat is. Az ITU Rádióösszeköttetési Szabályzat RR S18.6 alapján a kiadott engedélyek határozzák meg a légiforgalmi repülésüzemi irányítási állomás engedélyezett tevékenységét a 6. Annex I. része valamint annak általános jellemzőit a Rádióösszeköttetési Szabályzat S27. Függeléke szerint.

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[i]* Időfelosztás jelzés a VDL Mode 3 csatornákhoz. Lásd a 10. Annex III. kötet I. rész 6 fejezet üzemi jellemzőit.

ANNEX 11.
Légiforgalmi szolgálatok

13. kiadás – 2001. július
44. módosítással

Légiforgalmi Irányító Szolgálat
Repüléstájékoztató Szolgálat
Riasztó Szolgálat

A jelen kiadvány magába foglalja a 11. Annex 2006. március 14.-e előtt elfogadott összes módosításait és 2006. november 23.-tól hatálytalanítja a 11. Annex összes korábbi kiadásait.
A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót.

Módosítások

A módosítások kiadásáról az ICAO Journal valamint az egyéb ICAO kiadványok és audiovizuális képzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. A fenti kiadványok figyelemmel kísérendők, a módosítások az alábbi rovatokba bevezetendők:

Módosítás			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette
Tizenharmadik kiadás (1 - 40. módosítás)	2001. július 16.	2001. november 1.	
41. módosítás (a Tanács 2002. február 21.-én fogadta el)	2002. július 15.	2002. november 28.	
42. módosítás (a Tanács 2003. március 7.-én fogadta el)	2003. július 14.	2003. november 27.	
43. módosítás (a Tanács 2005 március 2.-án fogadta el)	2005. július 11.	2005. november 24.	
44. módosítás (a Tanács 2006. március 14.-én fogadta el)	2006. július 17.	2006. november 23.	

Kiegészítés			
száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

Előszó

Történeti háttér

A Repülési és Légiforgalmi Irányítási Szabályok (RAC) munkacsoport első ülésszakán, 1945 októberében, ajánlásokat tett a légiforgalmi irányító szolgálatok előírásaira és ajánlott gyakorlati eljárásaira. Ezeket az akkor működő Léginavigációs Bizottság áttanulmányozta, majd 1946. február 25.-én a Tanács jóváhagyta a nemzetközi előírásokat és ajánlott gyakorlati eljárásokat. Ezeket az 1946. februárjában kiadott Doc 2010. kiadvány második részében *"Előírások és ajánlott gyakorlati Eljárások — Légiforgalmi Irányítás"* címen tették közzé.

A Repülési és Légiforgalmi Irányítási Szabályok (RAC) munkacsoport második ülésszakán -- 1946. decemberétől 1947. januárjáig -- felülvizsgálta a Doc. 2010-et és javaslatokat tett a légiforgalmi irányítás nemzetközi előírásaira és ajánlott gyakorlati eljárásaira. Nem tűnt azonban lehetségesnek, hogy ezek a szabályok véglegesíthetők legyenek, mielőtt a munkacsoport kidolgozza az alapelveket a vonatkozó szolgálatok megszervezésére.

1948. április-májusban a harmadik ülésszakon azután kidolgozták az alapelveket, majd az Annex tervezetét benyújtották az Államok részére. A 11. Annex — „Nemzetközi *előírások és ajánlott gyakorlati eljárások — Légiforgalmi Szolgálatok”* — szövegét a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago, 1944.) 37. cikkelyének rendelkezései alapján 1950. május 18.-án fogadta el. Az előírások 1950. október 1.-én léptek hatályba. A nemzetközi előírások és ajánlott gyakorlati eljárások így megkülönböztetett új címét, azaz a *Légiforgalmi Szolgálatok* kifejezést a *Légiforgalmi Irányítás* kifejezéssel szemben azért részesítették előnyben, hogy világosan jelezzék: a 11. Annexben ismertetett szolgálatoknak csak egy része a légiforgalmi irányító szolgálat, a kiadvány vonatkozik a repüléstájékoztató, valamint a riasztó szolgálatokra is.
Az A. táblázat a vonatkozó fontosabb témakörök felsorolásával és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek valamint alkalmazhatóvá váltak.

Alkalmazhatóság

A 11. Annexben található nemzetközi előírások és ajánlott gyakorlati eljárások a 2. Annex rendelkezéseivel együttesen szabályozzák a *Légiközlekedési Szolgálatok Eljárásai — Légiforgalmi szolgáltatás szervezés* (Doc. 4444, PANS-ATM) valamint a Doc 7030 kiadványban található *Körzeti Kiegészítő Eljárások* — Repülési szabályok és Légiforgalmi szolgálatok alkalmazását, amely utóbbi kiadványban a körzeti alkalmazáshoz szükséges kiegészítő eljárásokat teszik közzé.

A 11. Annex azoknak a légtereknek, egységeknek és szolgálatoknak a kijelölésével foglalkozik, amelyek a légiforgalom gyors, rendezett és biztonságos áramlásának elősegítéséhez szükségesek. Világos különbséget tesz a légiforgalmi irányító szolgálat, a repüléstájékoztató szolgálat valamint a riasztó szolgálat között azzal a céllal, hogy a nemzetközi légi útvonalakon a 2. Annex-el együttesen biztosítsa a repülések olyan, egységes körülmények között történő végrehajtását, amelyek a légiüzemeltetés biztonságának és hatékonyságának fenntartása és növelése érdekében szükségesek.

A 11. Annex nemzetközi előírásai és ajánlott gyakorlati eljárásai érvényesek a szerződő Állam fennhatósága alá tartozó azon légtérszakaszokra, amelyekben légiforgalmi szolgálatokat létesítettek, továbbá olyan nemzetközi nyílt vizek felett illetve nem meghatározott állami hovatartozású légterekben, amelyeknél a szerződő Állam elfogadja és vállalja a légiforgalmi szolgálatok biztosításának felelősségét. Az a szerződő Állam, amely elfogadja és vállalja ezt a felelősséget, a nemzetközi előírásokat és ajánlott gyakorlati eljárásokat ezen légterekben a fennhatósága alá tartozó saját légterekhez hasonló formában alkalmazhatja.

A szerződő Államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő Államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő Állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között fennáll. Felkérjük továbbá a szerződő Államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésekre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érintik, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő Államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő Államnak.

Felhívjuk a szerződő Államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk, valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex szövegének alkalmazása a nemzeti előírásokban
A Tanács 1948. április 13.-án elfogadta azt a határozatot, amelyben felhívják a szerződő Államok figyelmét saját országos, nemzeti előírásaikban a szabályozó jellegű ICAO előírások pontos nyelvezetének lehetőség szerint **azonos** alkalmazásának kívánatosságára, továbbá hogy az Államok jelezzék a nemzetközi előírásoktól és ajánlott gyakorlati eljárásoktól való eltéréseket, ismertetve azokat a nemzeti előírásokat, amelyek a légiközlekedés biztonsága és rendezettsége szempontjából fontosak. Ahol ez lehetséges, a jelen Annex előírásait úgy fogalmaztuk meg és tettük közzé, hogy ezzel megkönnyítsük az országos jogszabályokba lényeges szövegi módosítás nélkül történő átvételüket.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annexben.

Az egyes részek jogállása a következő:

1.— Az Annex anyaga:

a) *Nemzetközi előírások és ajánlott gyakorlati eljárások*, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében szükségesnek tartják és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) *Függelék:* A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) *Meghatározások:* A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) *Táblázatok és ábrák:* Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

Megjegyzendő, hogy a jelen Annex egyes előírásai olyan követelményeket is tartalmaznak, melyek jogállása ajánlott gyakorlati eljárás. Az ilyen esetekben a Szerződő Államok az Egyezmény értelmében törekszenek ezek alkalmazására .

2.— A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok :

a) Előszó: Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az Államok kötelezettségeit, illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására, az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) Bevezető: Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez, illetve alkalmazásához.

c) Megjegyzések: Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) Mellékletek: A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et hat nyelven — angolul, arabul, franciául, kínaiul, oroszul és spanyolul — fogadták el. Minden egyes szerződő Államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés végrehajtására akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A nemzetközi előírásokat vékony álló, az *ajánlott gyakorlati eljárásokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***"Ajánlás"*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a "*Megjegyzés :* " felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall - kell" kifejezéssel és az ajánlott gyakorlati eljárásokat “should - szükséges" kifejezéssel jelezzük. Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység-fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával. A jelen kiadvány bármelyik részére történő hivatkozás -- akár számmal, akár címmel vagy mindkettővel - vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat — A 11. Annex módosításai

(módosítás — forrás — tárgy — elfogadva/ hatályos/ alkalmazható)

Első kiadás

Repülési és Légiforgalmi Irányítási Szabályok (RAC) munkacsoport 3. ülése (1948.)
Nemzetközi előírások és ajánlott gyakorlati eljárások — Légiforgalmi Szolgálatok

1950. május 18. 1950. október 1. 1951. június 1.

1-6) — Második kiadás — Repülési és Légiforgalmi Irányítási Szabályok (RAC) munkacsoport 4. ülése (1950.)

Repülőtéri forgalom; irányítás átadása; engedély tartalma; kényszerhelyzeti állapot; összeköttetési előírások és követelmények; magaslégtéri repüléstájékoztató körzetek és magaslégtéri irányítási körzetek; függőleges elkülönítés.

1951. november 27. 1952. április 1. 1952. szeptember 1.

7) — Léginavigációs Bizottság

Az ATS egységeknek szóló tájékoztatások szétosztására vonatkozó útmutató anyag törlése.
1956. február 22.

8) — Harmadik kiadás — Második Léginavigációs Konferencia (1955.)

Meghatározások; illetékesség meghatározása; légterek megjelölése; légijárművek elkülönítése; összeköttetési előírások; meteorológiai tájékoztatásokra vonatkozó előírások; ellenőrzött légterek meghatározása és kijelölése; összeköttetési diagrammok.

1956. május 11. 1956. szeptember 15. 1956. december 1.

9) — Negyedik kiadás — Repülési és Légiforgalmi Irányítási Szabályok (RAC) valamint a Kutatás és Mentés (SAR) munkacsoportok (1958.)

Meghatározások; légiforgalmi szolgálatok feladatai; légterek és ellenőrzött repülőterek kijelölése; légtér meghatározások; légiforgalmi irányító szolgálat; összeköttetési követelmények; ellenőrzött légterek meghatározása és kijelölése; jelentőpontok elnevezése; légiforgalmi irányítás automatizálása.

1959. december 8. 1960. május 1. 1960. augusztus 1.

10) — A repülési műveletekre vonatkozó tájékoztatások egyeztetett kiadásával kapcsolatos szakbizottsági ülés (1959.)

SIGMET tájékoztatás; repüléstájékoztató szolgálat alkalmazása és annak átruházása; meteorológiai tájékoztatásokra vonatkozó előírások.

1960. december 2. 1961. április 1 1961. július 1.

11) — Léginavigációs Bizottság

A légiforgalmi szolgálatok tájékoztató térképeire vonatkozó útmutató anyag törlése.

1961. június 26.

12) — Léginavigációs Bizottság

Az ellenőrzött légtérben létesített útvonalak megjelölésének kiválasztására vonatkozó útmutató anyag kiadása.

1961. december 15.

13) — Léginavigációs Bizottság

A mentést koordináló központok értesítése a bizonytalanság, a riasztás és a vészhelyzet állapotokban.

1962 április 13. 1962 augusztus 1. 1962 november 1.

14) — Léginavigációs Bizottság

A kényszerhelyzetben levő légijármű közelében tartózkodó egyéb légijárművek értesítésének szükségessége a kényszerhelyzet típusáról.
1964. június 19. 1964. november 1. 1965. február 1.

15) — Ötödik kiadás — Repülési szabályok és Légiforgalmi szolgálatok munkacsoport ülés (1963.)

Függőleges elkülönítés alkalmazása a FL290 feletti repülések esetében; légiforgalmi irányító szolgálat biztosítása VFR repülések számára; légtérhatárok kijelölése; repüléstájékoztató körzetek felső határa; légiforgalmi szolgálati útvonalak és jelentőpontok megjelölése; együttműködés a járatókkal; elkülönítések típusai; összeköttetési követelmények; az ellenőrzött légtér létesítésére és meghatározására vonatkozó útmutató anyag kiadása.

1965. március 17. 1966. március 29. 1966. augusztus 25.

16) — Légiforgalmi irányítás automatizálása munkacsoport 5. ülése (1966.)

Az irányítás átadásának felelőssége; a légiforgalom áramlásának szabályzása.

1967. június 7. 1967. október 5. 1968. február 8.

17) — Ötödik Léginavigációs Konferencia (1967.)

Légiforgalmi szolgálatok bejelentő irodája és összeköttetési követelmények; engedélyek és elkülönítés; repüléstájékoztató szolgálat működési területe; a repülőtér területén működő járművek irányítására használatos összeköttetések; a légiforgalmi irányító szolgálatok követelményei a meteorológiai tájékoztatásokra vonatkozóan; tájékoztatások a repülőtér állapotáról és a navigációs segédeszközök működéséről.

1969. január 23. 1969. május 23. 1969. szeptember 18.

18) — Hatodik kiadás — Hatodik Léginavigációs Konferencia (1969.) — Léginavigációs Bizottság

Meghatározások; ellenőrzött légterek meghatározásának kifejezései; légiforgalmi szolgálati légterek függőleges határai; legalacsonyabb repülési magasságok; elkülönítési minimumok meghatározása és alkalmazása; engedélyek és elkülönítés; szabvány indulási és érkezési útvonalak kijelölése és azonosítása; repüléstájékoztató szolgálat biztosítása IFR repülések számára nyílt vizek felett; levegő-föld összeköttetés létesítése ATS célokra.

1970. május 25. 1970. szeptember 25. 1971. február 4.

19) —Léginavigációs Bizottság

Nemzetközi vizek felett üzemelő légijárművek felügyelete; SIGMET tájékoztatások.

1972. november 15. 1973. március 15. 1973. augusztus 16.

20) — Hetedik Léginavigációs Konferencia (1972)

Meghatározások; területi navigáció (RNAV); ATS útvonalak és jelentőpontok elnevezése.

1973. március 23. 1973. július 30. 1974. május 23.

21) — A Tanács határozata az A17/10 és A18/10 ajánlások bevezetésére

A jogellenes beavatkozás alatt álló légijárművel kapcsolatosan követendő eljárások a légiforgalmi szolgálati egységek számára.

1973. április 7. 1973. december 7. 1974. május 23.

22) — Hangsebesség feletti légi-szállítási munkacsoport (SSTP) 4. ülése (1973) — Léginavigációs Bizottság

Hangsebesség feletti repülések hangsebességre történő gyorsítására és lassítására vonatkozó engedélyek; együttműködés a katonai hatóságok és a légiforgalmi szolgálatok között; összeköttetésekre vonatkozó követelmények.

1975. február 4. 1975. június 4. 1975. október 9.

23) — Léginavigációs Bizottság

A 7500-as másodlagos radar-kód használata jogellenes beavatkozás esetén; a légiforgalmi szolgálati egységek és a meteorológiai hivatalok közötti összeköttetésekre vonatkozó követelmények.

1975. december 12. 1976. április 12. 1976. augusztus 12.

24) — Léginavigációs Bizottság

Meghatározások; az időmérés pontossága.

1976. április 7. 1976. augusztus 7. 1976. december 30.

25) — Hetedik kiadás — Léginavigációs Bizottság

Meghatározások; VOR átkapcsolási pontok; ATS útvonalak megjelölése; fontos pontok kijelölése és megjelölése; repüléstájékoztató szolgálat; a légiforgalmi szolgálatok tájékoztatási követelményei.

1977. december 7. 1978. április 7. 1978. augusztus 10.

26) — Léginavigációs Bizottság

Szabvány érkezési és indulási útvonalak megjelölése.

1979. december 3. 1980. április 3. 1980. november 27.

27) — Léginavigációs Bizottság

A polgári légijárművek repülésére tényleges veszélyt jelentő műveletek egyeztetése; személyzet nélküli szabad léggömbök.

1981. március 4. 1981. július 4. 1981. november 26.

28) — Léginavigációs Bizottság

A légiforgalmi szolgálati egységek és a katonai szervek közötti kapcsolattartásra vonatkozó előírások.

1981. április 1. 1981. augusztus 1. 1981. november 26.

29) — Léginavigációs Bizottság — Repüléstájékoztató szolgálat üzemeltetési munkacsoport (OPIS) második ülése (1980.) — Elkülönítési munkacsoport általános elveinek felülvizsgálatával foglalkozó negyedik ülés (1980.)

AIS/ATS/MET és egyéb vonatkozó tájékoztatások repülés közben levő légijármű részére történő továbbítása; összetett elkülönítés; radar adatok automatikus rögzítése; légijármű által adott forgalmi tájékoztatás.

1982. április 2. 1982. augusztus 2. 1982. november 25.

30) — Léginavigációs Bizottság — Légiforgalmi szolgálatok adattovábbítási és adat-feldolgozási munkacsoport (ADAPT) harmadik ülése (1981.) — AGA részleg ülés (1981.)

Az összeköttetésekre vonatkozó ATS előírások; a felszíni szélkijelzők jelölése; földi mozgás irányító és ellenőrző rendszerek; mértékegységek; meghatározások.

1983. március 16. 1983. július 29. 1983. november 24.

31) — Tanács — Léginavigációs Bizottság

Polgári és katonai együttműködés; repülés közben bekövetkező, az eltévedt vagy azonosítatlan légijárművekre és/vagy polgári légijárművek elfogására vonatkozó különleges helyzetek és intézkedések; összeköttetési előírások; légijármű által adott forgalmi tájékoztatás.

1986. március 12. 1986. július 27. 1986. november 20.

32) — Nyolcadik kiadás — Elkülönítési munkacsoport általános elveinek felülvizsgálatával foglalkozó ötödik ülés (1985.) — Léginavigációs Bizottság

Meghatározások; Egyetemes egyeztetett világidő (UTC); vulkáni hamuról szóló figyelmeztetések; VOR berendezéssel kijelölt és meghatározott légiforgalmi szolgálati útvonalak; az alábbi Mellékletek törlése: A B C D F és G.

1987. március 18. 1987. július 27. 1987. november 19.

33) — Kilencedik kiadás — Titkárság — VFR üzemelési munkacsoport harmadik ülése (1986.) — Léginavigációs Bizottság: módosítások a 6. Annex módosításainak elfogadása miatt

Légijármű látvarepülési és műszerrepülési szabályok szerint történő vegyes üzemeltetése; a NOTAM kiadványok kiadásával kapcsolatos légiforgalmi szolgálati előírások; földi mozgás irányító és ellenőrző rendszerek; a légiforgalmi szolgálat felelőssége a jogtalan beavatkozás eseteiben.

1990. március 12. 1990. július 30. 1991. november 14.

34) — A Másodlagos radarberendezések továbbfejlesztésével, valamint az Összeütközés elkerülését biztosító rendszerekkel foglalkozó munkacsoportok negyedik ülése (SICASP/4)

Meghatározások; a légiforgalmi szolgálatok a fedélzeti összeütközés-elkerülő rendszerek (ACAS) működésétől független biztosítása.

1993. február 26. 1993. július 26. 1993. november 11.

35) — Elkülönítési munkacsoport (RGCSP) általános elméletének módosítását célzó hatodik, hetedik és nyolcadik ülés (1988., 1990., 1993.) — Automatikus légtérfelderítési munkacsoport (ADSP) második ülése (1992.) — Léginavigációs Bizottság

Meghatározások; 1000 láb (300 méter) csökkentett függőleges elkülönítési minimum FL 290 felett; a forgószárnyas légijármű forgalom beillesztése a hagyományos légijármű forgalomba; a VOR berendezéssel kijelölt, valamint RNAV berendezéssel felszerelt légijárművek által használható ATS útvonalak; előírt navigációs teljesítmény; automatikus légtérfelderítés; az egész világon egységesen alkalmazható földrajzi hely megjelölési rendszer (WGS-84) alapadat bevezetésével kapcsolatos előírások; tájékoztatások továbbítása légijárművek részére radioaktív anyagokról és mérgező kémiai felhőkről.

1994. március 18. 1994. július 25. 1994. november 10.

36) — Másodlagos radarberendezések továbbfejlesztésével. valamint az Összeütközés elkerülését biztosító rendszerekkel foglalkozó munkacsoportok negyedik ülése (SICASP/4) — Időjárási körülmények alapján történő üzemeltetés (AWOP) munkacsoportjának tizenharmadik és tizennegyedik ülése; Akadály korlátozási munkacsoport tizedik ülése

A nyomásmagasság-adó másodlagos válaszjeladók; mikrohullámú leszállító rendszer; útvonal akadály korlátozási követelmények.

1996. március 8. 1996. július 15. 1996. november 7.

37) — Léginavigációs Bizottság — A 3. Annex 70. módosítása

Léginavigációs adatbázisok; AIRMET tájékoztatások, szélnyírás.

1997. március 20. 1997. július 21. 1997. november 6.

38) — Automatikus légtérfelderítés munkacsoport negyedik ülése (1996.), Az elkülönítés általános elméletével foglalkozó munkacsoport kilencedik ülése (1996.), a 3. Annex 71. módosítása; Léginavigációs Bizottság.

Meghatározások; automatikus légtér-felderítési rendszerek és eljárások; automatizált légiforgalmi szolgálati rendszerek közötti adatcsere; levegő-föld adatösszeköttetés alkalmazása az ATS területén; légijárművek elkülönítése; RNP és RNAV az útvonal-repülés végrehajtása során; az OPMET tájékoztatás továbbítása a levegőben repülő légijármű részére; vulkáni hamuval kapcsolatos tanácsadás; emberi tényezők.

1998. március 19. 1998. július 20. 1998. november 5.

39) — Léginavigációs Bizottság

ATS légiforgalmi szolgálati légterek osztályozása; látás utáni időjárási körülmények (VMC); legalacsonyabb biztonságos tengerszint feletti magasság figyelmeztető jelzés

1999. március 10. 1999. július 19. 1999. november 4.

40) — Tizenharmadik kiadás — Léginavigációs Bizottság — Automatikus légtérfelderítés munkacsoport ötödik ülése (ASDP/5) — Európai Léginavigációs Tervező Munkacsoport 39. ülése (EANPG/39)— Akadálymentességi Munkacsoport 12. ülése (OCP/12) — a 6. Annex I/25, II/20 és III/7 módosításainak elfogadása miatt szükséges változások — Titkárság

Meghatározások; légiforgalmi szolgálatok biztonságszervezési rendszere; légijármű kényszerhelyzet jelzése az automatikus légtér-felderítési rendszerben; a légtér rugalmas felhasználása; legalacsonyabb repülési magasságok; biztonságos elkülönítés a talajfelszíntől radar irányítás (irányvezetés) alkalmával; előzetes engedély továbbítási rendszer; az irányítási felelősség átadása; a légiforgalmi irányítói engedélyek visszaolvasása; légiforgalmi áramlásszervezés; automatikus közelkörzeti tájékoztató szolgálat; VOLMET; D-VOLMET; RVR értékek kijelzői és azok előírásai az ATS egységeknél; szerkesztői változtatások.

2001. március 12. 2001. július 16. 2001. november 1.

41) — Az elkülönítés általános elméletével foglalkozó munkacsoport tizedik ülése (RGCPS/10); Veszélyes áruk munkacsoport tizenhetedik ülése (DGP/17).

Párhuzamos területi navigációs útvonalak közötti elkülönítési távolság; a veszélyes árukról szóló tájékoztatások továbbítása a mentést koordináló központok (RCC) felé.

2002. február 21. 2002. július 15. 2002. november 28.

42) — Lézersugár kibocsátás és Repülésbiztonsági munkacsoport; Titkárság; Általános angol nyelvismereti munkacsoport; Léginavigációs Bizottság

Lézersugár kibocsátás; Idegen nyelvismeretre vonatkozó előírások; Légiforgalmi szükség-intézkedések.

2003. március 7. 2003. július 14. 2003. november 27.

Nemzetközi előírások és ajánlott gyakorlati eljárások
43) – Titkárság; Légiforgalmi Tájékoztató Szolgálatok / Légiforgalmi Térképek (AIS/MAP) munkacsoport ülése (1998)

Meghatározások; gurítóradar használata; ATS kommunikációs követelmények; meteorológiai információk; a légijárművek magasság-tartási teljesítménye; ATS biztonságirányítás; elektronikus domborzati és akadály-adatok; szerkesztői kiegészítések.

2005. március 2. 2005. július 11. 2005. november 24.

44) – Az ICAO Közgyűlés 35. Ülése; Tizenegyedik Léginavigációs Konferencia; Léginavigációs Bizottság

ATS Repülésbiztonság-irányítás; felvevő berendezések

2006. március 14. 2006. július 17. 2006. november 23.

1. fejezet
Meghatározások

1. Megjegyzés: A jelen Annex szövegében a "szolgálat" kifejezés mindvégig a feladatkörök vagy biztosított szolgáltatások megjelölésre vonatkozó elvont fogalom, míg az "egység" kifejezés egy szolgálatot ellátó kollektív testület megjelölésére szolgál.

2. Megjegyzés: A meghatározásokban szereplő (RR) jelzés azt jelenti, hogy a kifejezést a Nemzetközi Távközlési Szervezet (ITU) Rádiószabályzatából vettük át. (lásd *Rádió Frekvencia Tartomány Előírások a Polgári Légiközlekedés Részére, az ICAO előírások jóváhagyásával* — Doc 9718)

A jelen Annex szövegében a nemzetközi előírások és ajánlott gyakorlati eljárások esetében használt kifejezések jelentése a következő:

Adat — Datum
Bármilyen mennyiség, vagy mennyiségek halmaza, mely más mennyiségek kiszámításának referenciájaként vagy alapjául szolgál (ISO 19104[*]).

Adat minőség — Data quality
Megbízhatósági fok vagy szint, amely azt mutatja, hogy a megadott adat pontosság, felbontás és megbízhatóság[1] Szerk. Megjegyzés: A léginavigációs adat és értékei megbízhatóságának és pontosságának foka, amely jelzi, hogy az a meghatározás vagy az elfogadott módosítás óta nem változik vagy veszik el.

1 szempontjából megfelel az adatfelhasználó igényeinek.

Adathálózati összeköttetések — Data link communications
Távközlési összeköttetés, amely a közleményeket adathálózaton keresztül továbbítja.

AIRMET tájékoztatás — AIRMET information
A meteorológiai hivatal figyelő szolgálata által kiadott tájékoztatás azon időjárási jelenségek várható vagy tényleges bekövetkezéséről, amelyek befolyásolhatják az alacsony repülési magasságon üzemelő légijárművek biztonságát és amelyeket az érintett repüléstájékoztató körzetre vagy ennek részterületére kiadott alacsony repülési magasságra vonatkozó előrejelzés nem tartalmaz.

Akadály — Obstacle
Minden olyan (időlegesen vagy tartósan) rögzített vagy mozgó tárgy, vagy annak részei, melyek a légijárművek földi mozgására szolgáló területen találhatók, vagy amelyek a légijárművek repülés közbeni védelme érdekében meghatározott felület fölé nyúlnak.

Alapforduló — Base turn
Az a forduló, amit a légijármű a kezdeti megközelítés során a kirepülési útirány vége és a közbenső vagy végső megközelítési útirány kezdete között hajt végre. Az útirányok nem reciprok irányok.

Megjegyzés: Az alapforduló az adott egyedi eljárásnak megfelelő módon szinttartással vagy süllyedés közben is kijelölhető.

ALERFA
A "riasztás állapota" megjelölésére használt kód-név.

[*] Valamennyi ISO szabvány a fejezet végén kerül felsorolásra.

Állomás mágneses elhajlás — Station declination
Egy VOR állomás nulla fokos radiálja és a földrajzi észak közötti, a VOR állomás kalibrálásának időpontjában meghatározott iránykülönbség.

Átadó egység — Transferring unit
Az a légiforgalmi irányító szolgálati egység, amely a légijármű irányításával kapcsolatos felelősségét a repülés útvonala mentén soron következő légiforgalmi irányító szolgálati egységnek adja át.

Átkapcsolási pont — Change over point
Az a pont, ahol a VOR berendezéssel kijelölt ATS útvonalszakaszon üzemelő légijárműtől elvárják, hogy a már átrepült berendezés — mint elsődleges navigációs referencia hely — követéséről átálljon az előtte levő berendezés követésére.

Megjegyzés: Az átkapcsolási pontokat azért jelölik ki, hogy a jelek erőssége és minősége a legmegfelelőbb egyensúlyban legyen a navigációs berendezések között minden használatos szinten, továbbá hogy azonos berendezéstől származó irányszög vezetést biztosítsanak az azonos útvonalszakaszon üzemelő összes légijármű számára.

Átvevő egység — Accepting Unit
Egy légijármű irányításának átvételére következő légiforgalmi irányító szolgálati egység.

Automatikus közelkörzeti tájékoztató szolgálat — Automatic terminal information service (ATIS)
Az érkező és induló légijárművek számára napi 24 órán vagy meghatározott részidőtartamon keresztül az érvényes és az állandó jellegű tájékoztatások automatikus biztosítása:

Adathálózati automatikus közelkörzeti tájékoztató szolgálat —Data link automatic terminal information service (D-ATIS)
Adathálózaton keresztül továbbított tájékoztatás.

Beszéd-üzemű automatikus közelkörzeti tájékoztató szolgálat — Voice-automatic terminal information service (Voice-ATIS)
Folyamatos és ismétlődő szóbeli rádióközleménnyel továbbított tájékoztatás.

Automatikus légtérfelderítés — Automatic dependent surveillance (ADS)
Egy olyan, a légijárműtől származó adatok alapján működő automatikus légtér-felderítési módszer, amely során a légijármű fedélzeti navigációs és helyzet-meghatározó rendszereiből egy adathálózati összeköttetési rendszer segítségével automatikusan továbbít adatokat, amelyek közé tartozik a légijármű azonosítója, négydimenziós helyzete és egyéb szükséges tájékoztatások.

Baleset — Accident
A légijármű üzemeltetésével összefüggő esemény, amely azon időtartamon belül következik be, amikor bármely személy repülés végrehajtása céljából beszáll a légijárműbe egészen addig, amikor az összes ilyen személy kiszállt a légijárműből és amelynek során:

a) egy személy súlyos vagy halálos sérülést szenved az alábbiak miatt;

• a légijárműben tartózkodik; vagy

• közvetlen kapcsolatba kerül a légijármű bármely részével, beleértve a légijárműről levált alkatrészeket is; vagy

• közvetlen kiáramló hajtómű gázsugár éri,
kivéve, ha a sérülések természeti, saját vagy harmadik személy által keltett okokra vezethetők vissza vagy ha a sérülések azért következtek be, mert a sérült az utasok és a hajózószemélyzet számára általában nem elérhető helyen tartózkodott; vagy

b) a légijármű károsodást vagy szerkezeti meghibásodást szenved, amely:

• hátrányosan befolyásolja a légijármű szerkezeti egységét, üzemi teherbíró-képességét, teljesítményét vagy repülési jellemzőit; és

• rendszerint az érintett szerkezeti elem jelentős javítását vagy cseréjét teszi szükségessé, *kivéve,* a hajtómű meghibásodás vagy sérülés esetét, amikor az kizárólag a hajtóműre, annak burkolatára vagy részegységeire korlátozódik; vagy amikor a sérülések légcsavarokra, szárnyvégekre, antennákra, futókra, fékekre, egyéb borításokra, a légijármű sárkányszerkezetén kisebb horpadásokra vagy lyukakra korlátozódnak; vagy

c) a légijármű elveszett vagy teljesen hozzáférhetetlen.

1. Megjegyzés: Kizárólag a statisztikai egyezés érdekében a baleset után harminc napon belül a sérülés miatt bekövetkező elhalálozás az ICAO osztályozásnál halálos balesetnek számít.

2. Megjegyzés: A légijármű akkor tekintendő elveszettnek, amikor a kutatást hivatalosan befejezik és a roncsot nem találták meg.

Bevezető irányító egység — Approach control unit
Egy vagy több repülőtér érkező vagy induló ellenőrzött forgalma számára történő légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Bevezető irányító szolgálat — Approach control service
Az érkező vagy induló ellenőrzött repülések irányítására létesített légiforgalmi irányító szolgálat.

Bizonytalanság állapota — Uncertainty phase
Olyan helyzet, amelyben egy légijármű és annak fedélzetén tartózkodó személyek biztonságával kapcsolatosan bizonytalanság áll fenn.

CRC matematikai képlet ellenőrzés Szerk. Megjegyzés: A teljes adatblokkra kiterjedő rendszeres időszaki paritás ellenőrzés a rendszerben a küldő és fogadó állomáson — ellenőrző adat összevetése és paritásos felülvizsgálata (adatvesztéssel és adatváltozással szemben) illetve az eredetileg meghatározott adat és a felhasznált adat azonosságának biztosítása.

Ciklikus Redundancia Ellenőrzés — Cyclic Redundancy check (CRC)
Az adatok digitális kifejezéséhez használt matematikai algoritmus, amely megfelelő biztonsági szintet nyújt az adat vesztéssel vagy változással szemben.

DETRESFA
A "veszély állapot" megjelölésére használt kód-név.

Ellenőrzött légtér — Controlled airspace
Meghatározott kiterjedésű légtér, amelyen belül a légtér osztályozásnak megfelelő légiforgalmi irányító szolgálatot biztosítanak.

Megjegyzés: Az ellenőrzött légtér olyan gyűjtőfogalom, amelybe beletartoznak a 2.6 pontban ismertetett A, B, C, D valamint E osztályú légiforgalmi szolgálati légterek.

Ellenőrzött repülés — Controlled flight
Bármely repülés, amely légiforgalmi irányítói engedély függvénye.

Ellenőrzött repülőtér — Controlled aerodrome
Olyan repülőtér, amelyen a repülőtéri forgalom számára légiforgalmi irányító szolgálatot biztosítanak.

Megjegyzés: Az "ellenőrzött repülőtér" kifejezés azt jelzi, hogy a repülőtéri forgalom számára légiforgalmi irányító szolgálatot biztosítanak, azonban ez nem jelenti szükségszerűen azt, hogy ott repülőtéri irányítói körzet is van.

Előírt navigációs pontosság — Required navigation performance (RNP)
Egy meghatározott légtérben történő repülés-végrehajtáshoz szükséges navigációs teljesítmény pontossági szintje.

Megjegyzés: A navigációs pontosság és teljesítmény előírásokat egy adott RNP típus és/vagy feladat-végrehajtás vonatkozásában határozzák meg.

Előírt navigációs pontosság / teljesítmény szint típus — Required navigation performance type (RNP type)
Tengeri mérföldben kifejezett távolság érték, azaz pontossági határérték. A repülés-végrehajtás során a repülőgép tervezett repülési helyzetéhez viszonyítva a repülési idő legalább 95 %-ában ezen határértéken belül repüljön.

Például: RNP 4 olyan navigációs pontosság határértéket jelent, amelynek alapján az adott repülőgép repülési idejének legalább 95 %-ában mindenkori tervezett repülési helyzetéhez viszonyítva plusz/minusz 4 tengeri mérföld (7.4 km) távolságon belül repül.

Előrejelzés — Forecast
Várható időjárási körülmények megállapítása meghatározott időpontra vagy időtartamra valamint meghatározott területre vagy légtér szakaszra.

Előzetes engedély — Downstream clearance
A légijármű részére olyan légiforgalmi irányító szolgálati egység részéről kiadott engedély, amely nem azonos a légijárművet jelenleg irányító egységgel.

Emberi teljesítmény és teljesítőképesség — Human performance
Az emberi egyéni képességek és korlátozó tényezők, amelyek hatással vannak a légiközlekedés üzemeltetésének biztonságára és hatékonyságára.

Emberi tényezők alapelvei — Human Factors principles
A légiközlekedési tervezés, jogosítás, kiképzés, üzemeltetés és karbantartás vonatkozó alapelvei, amelyek célja az emberi teljesítmény és teljesítőképesség tényezőinek teljes mértékű figyelembevételével biztonságos kapcsolat kialakítása a személyek és a rendszer egyes (műszaki) egységei között.

Engedélyhatár — Clearance limit
Az a pont, ameddig a légijármű részére légiforgalmi irányítói engedélyt adtak ki.

Esemény — Incident
A légijármű üzemeltetésével összefüggő, nem baleset kategóriába tartozó esemény, amely hatással van vagy lehet az üzemeltetés biztonságára.

Megjegyzés: Az ICAO baleset megelőzési tanulmányai szempontjából legfontosabb esemény típusok felsorolása a *Baleset és Esemény Jelentési Kézikönyv*ben (Doc 9156) található.

Fontos pont — Significant point
Meghatározott földrajzi hely, amelyet valamely légiforgalmi szolgálati útvonal vagy egy légijármű repülési útvonalának meghatározására, valamint egyéb navigációs és légiforgalmi szolgálati célokra használnak.

Forgalmi előtér — Apron
A szárazföldi repülőtéren kijelölt terület, amely az utasok, posta vagy teherárú küldemények be- és kirakodására, valamint a légijármű üzemanyaggal történő feltöltésére, parkírozására vagy karbantartására szolgál.

Forgalmi előtér ügyeleti szolgálat — Apron management service
A forgalmi előtér légijármű és gépjármű forgalmának szabályzására és ellenőrzésére biztosított szolgálat.

Forgalmi tájékoztatás — Traffic information
A légiforgalmi szolgálati egységtől származó, az adott légijármű közelében vagy annak tervezett útvonalán előforduló ismert vagy észlelt légi forgalomról szóló tájékoztatás, annak érdekében, hogy a repülőgépvezető figyelmének felkeltésével segítséget nyújtson számára az összeütközés elkerüléséhez.

Forgalom elkerülésére adott tanács — Traffic avoidance advice
Repülési műveletek végrehajtására vonatkozó tanács a légiforgalmi szolgálati egységtől annak érdekében, hogy segítséget nyújtson a repülőgépvezető számára az összeütközés elkerülésére.

Földmérési alapadat — Geodetic datum
A területi vonatkozási rendszer helyének és irányának meghatározásához szükséges jellemző adatok legkisebb mennyisége a földi vonatkozási rendszer (hálózat) alapján.

Futópálya — Runway
Egy szárazföldi repülőtéren meghatározott négyszögletű terület, amelyet a légijármű le és felszállására alakítottak ki.

Futópályamenti látástávolság — Runway visual range (RVR)
Az a távolság, ameddig a futópálya középvonalán álló légijármű vezetője látja a futópálya felületi jelöléseket vagy a futópálya szélét kijelölő illetve középvonalát azonosító fényeket.

Gergely-naptár — Gregorian calendar
Az általánosan használt naptár, melyet először 1582-ben vezettek be annak érdekében, hogy meghatározzanak egy olyan évet, amely a Juliánus-naptárnál jobban megközelíti a tropikus évet (ISO 19108[*]).
Megjegyzés – A Gergely-naptárban egy általános évben 365 nap található, míg egy szökőév 366 napot tartalmaz, az év pedig tizenkettő egymást követő hónapra oszlik.

Gurulás — Taxiing
A légijármű mozgása a repülőtér területén saját hajtóművei segítségével, a fel és leszállás eseteit kivéve.

Hajózószemélyzeti tag — Flight crew member
Szakszolgálati engedéllyel rendelkező személyzeti tag, akinek munkája a repülési szolgálati időtartam alatt nélkülözhetetlen a légijármű üzemeltetéséhez.

[*] Valamennyi ISO szabvány a fejezet végén kerül felsorolásra.

IFR — Instrument Flight Rules
A műszerrepülési szabályok jelzésére alkalmazott rövidítés.

IFR repülés — IFR flight
A műszerrepülési szabályok szerint végrehajtott repülés.

Illetékes légiforgalmi szolgálati hatóság — Appropriate ATS authority
Az adott légtérben a légiforgalmi szolgálatok biztosításáért felelős, az állam által kijelölt megfelelő hatóság.

IMC — Instrument Meteorological Conditions
A műszeres időjárási körülmények jelzésére alkalmazott rövidítés.

INCERFA
A "bizonytalanság állapota" megjelölésére használt kód-név.

Irányítás átadási pont — Transfer of control point
A légijármű repülési útvonalán levő azon meghatározott pont, amelynél a légijármű részére biztosított légiforgalmi irányító szolgálat ellátásának felelősségét az egyik irányítói egységtől vagy irányítói munkahelytől átadják a következőnek.

Irányítói terület — Control area
A földfelszín felett meghatározott határtól felfelé terjedő ellenőrzött légtér.

Irányítói körzet — Control zone
A földfelszíntől egy meghatározott felső magasság határig terjedő ellenőrzött légtér.

Járató — Operator
Valamely személy, szervezet vagy vállalat, amely légijárműveket üzemeltet vagy ilyen tevékenység végzésére jelentkezik.

Jelentőpont — Reporting point
Meghatározott földrajzi hely, amelyhez viszonyítva egy légijármű helyzete jelenthető.

Kényszerhelyzet (állapot) — Emergency phase
Általános kifejezés, amely bizonytalanság, riasztás vagy veszély állapotokat jelenthet.

Kitérő repülőtér — Alternate aerodrome
Olyan repülőtér, amelyre a légijármű abban az esetben folytathatja az útját, ha a tervezett célállomás repülőtere felé történő repülés folytatása vagy az oda történő leszállás végrehajtása lehetetlenné válik vagy nem tanácsos. A kitérő repülőterek köze tartoznak az alábbiak:

Felszálló kitérő — Take-off alternate
Olyan kitérő repülőtér, amelyen a légijármű leszállhat, ha ez röviddel a felszállás után szükségessé válik és erre az indulási repülőtér nem használható.

Útvonal kitérő — En-route alternate
Olyan kitérő repülőtér, amelyen egy légijármű leszállhat, ha az útvonal-repülés közben a hajózószemélyzet rendkívüli vagy kényszerhelyzetet tapasztal.

Megnövelt hatótávolságú üzemeltetés útvonal kitérő — ETOPS en-route alternate
Olyan alkalmas és megfelelő kitérő repülőtér, amelyen egy légijármű leszállhat, ha a megnövelt hatótávolságú üzemeltetés közben egy hajtómű leáll vagy a hajózószemélyzet egyéb rendkívüli vagy kényszerhelyzetet tapasztal.

Célállomás kitérő — Destination alternate
Olyan kitérő repülőtér, amely felé a légijármű folytathatja az útját, ha a tervezett célállomás repülőterén történő leszállás végrehajtása lehetetlenné válik vagy nem tanácsos.

Megjegyzés: Az a repülőtér, amelyről a járat elindult, az adott járat számára útvonal vagy célállomás kitérőként is megjelölhető.

Konferencia összeköttetés — Conference communications
Olyan távközlési létesítmények, amelyek segítségével közvetlen szóbeli közleményváltás folytatható egyidejűleg három vagy több hely között.

Körzeti irányító központ — Area control centre
Az illetékessége alá tartozó irányítói területeken üzemelő ellenőrzött forgalom számára légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Körzeti irányító szolgálat — Area control service
Az irányítói körzetekben üzemelő ellenőrzött repülések számára létesített légiforgalmi irányító szolgálat.

Közelkörzet — Terminal control area
Egy vagy több nagyobb repülőtér közelében, rendszerint a légiforgalmi szolgálati útvonalak találkozási pontjánál létesített irányítói terület.

Közzétett kapacitás — Declared capacity
Légiforgalmi irányító rendszer, annak bármely alrendszere vagy munkahelye által légijárművek részére nyújtott szolgáltatás képességének mértéke általános üzemeltetési körülmények között. Ezt a mértéket egy adott légtérbe egy meghatározott időszakon belül belépő légijárművek számával fejezik ki, figyelembe véve az időjárási körülményeket, a légiforgalmi irányító szolgálati egység aktuális elrendezését, a rendelkezésre álló személyzetet és berendezéseket, valamint bármely olyan tényezőt, amely befolyásolhatja a légtérért felelős légiforgalmi irányító munkaterhelését.

Különleges VFR repülés — Special VFR flight
A repülőtéri irányítói körzeten belül, a látási meteorológiai körülményeknél rosszabb időjárási helyzetben a légiforgalmi irányító szolgálat által engedélyezett VFR repülés.

Látás utáni időjárási körülmények — Visual meteorological conditions (VMC)
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények, ha azok a látás utáni időjárási körülményekre meghatározott minimum értékeknél jobbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex tartalmazza.

Levegő-föld összeköttetés — Air-ground communication
A légijárművek valamint a földi állomások vagy létesítmények közötti kétirányú összeköttetés.

Légi gurulás — Air-taxiing
A forgószárnyas vagy VTOL légijármű mozgása a repülőtér felszíne felett, rendszerint földpárna-hatás mellett és 37 km/h (20 csomó) értéknél kisebb földfelszín feletti sebességgel.

Megjegyzés: A tényleges magasság változhat, valamint bizonyos forgószárnyas légijárművek a földpárna-hatás turbulencia csökkentése vagy felfüggesztett teherárú rakományok védelme érdekében 25 lábnál (8 méter) AGL nagyobb magasságot igényelhetnek.

Légi útvonal — Airway
Folyosó formájában kijelölt irányítói terület vagy ennek egy része.

Légiforgalmi állandó helyű szolgálat — Aeronautical fixed service (AFS)
Meghatározott állandó helyek között létesített távközlési szolgálat, amelyet elsősorban a léginavigáció biztonsága illetve a légiforgalom rendezett, hatékony és gazdaságos működésének elősegítése érdekében létesítettek.

Légiforgalmi állomás — Aeronautical station (RR S1.81)
A légiforgalmi mozgó szolgálat földi állomása. Bizonyos esetekben a légiforgalmi állomás például hajó fedélzetén vagy vízfelszínen létesített építményen is elhelyezhető.

Légiforgalmi áramlásszervezés — Air traffic flow management (ATFM)
A légiforgalom biztonságos, rendezett és folyamatos áramlásának elősegítésére létrehozott szolgálat, amely biztosítja a rendelkezésre álló légiforgalmi irányítói kapacitás lehető legnagyobb mértékű kihasználását valamint azt, hogy a forgalom nagysága megfeleljen az illetékes ATS hatóság részéről közzétett kapacitás értékeknek.

Légiforgalmi irányító és légijármű-vezető közötti adatcsere — Controller - pilot data link communications (CPDLC)
A légiforgalmi irányító és a légijármű-vezető közötti távközlési módszer, amely az légiforgalmi irányítói szolgálati közleményeket adatátviteli összeköttetéssel továbbítja.

Légiforgalmi irányító szolgálat — Air traffic control service
A következő célokra létesített szolgálat:

a) összeütközés megelőzése:

1) a légijárművek között;

2) a mozgási területen üzemelő légijárművek és az akadályok között;

b) a légiforgalom rendezett és folyamatos áramlásának elősegítése.

Légiforgalmi irányító szolgálati egység — Air traffic control unit
Különböző, körzeti irányító, közelkörzeti irányító vagy repülőtéri irányító egységeket magába foglaló gyűjtőfogalom.

Légiforgalmi irányítói engedély — Air traffic control clearance
Felhatalmazás a légijármű részére ahhoz, hogy valamely légiforgalmi irányító szolgálati egység által meghatározott feltételek szerint üzemeljen.

1. Megjegyzés: A légiforgalmi irányítói engedély kifejezést, megfelelő szövegkörnyezetben gyakran engedélyre rövidítik.

2. Megjegyzés: A rövidített engedély kifejezést gyakran megelőzhetik a következő — "gurulási", "felszállási", "indulási", "útvonal", "megközelítési" vagy "leszállási" — szavak, amelyek a repülés azon szakaszát jelzik, amelyre az engedély vonatkozik.

Légiforgalmi mozgó szolgálat — Aeronautical mobile service (RR S1.33)
Légiforgalmi állomások és légijármű állomások illetve légijármű állomások közötti mozgó-szolgálat, amelyek közé tartozhatnak mentőtutajok is. A szolgálathoz sorolhatók továbbá a kijelölt segélykérő és kényszerhelyzeti frekvenciákon üzemelő kényszerhelyzeti helyzetjeladó állomások is.

Légiforgalmi szolgálat — Air traffic service
Különböző, repüléstájékoztató, riasztó, tanácsadó és légiforgalmi irányító (körzeti irányító, közelkörzeti irányító vagy repülőtéri irányító) szolgálatokat magába foglaló gyűjtőfogalom.

Légiforgalmi szolgálati egység — Air traffic services unit
Különböző, légiforgalmi irányító egységet, repüléstájékoztató központot vagy a légiforgalmi szolgálatok bejelentő irodáját magába foglaló gyűjtőfogalom.

Légiforgalmi szolgálati légterek — Air traffic services airspace
Meghatározott kiterjedésű, az ABC betűivel azonosított légterek, amelyeken belül adott típusú repülések üzemelhetnek és amelyek számára légiforgalmi szolgálatokat, valamint üzemeltetési előírásokat jelöltek ki.

Megjegyzés: Az A — G osztályokba tartozó légiforgalmi szolgálati légterek a 2.6 pontban találhatók.

Légiforgalmi szolgálati útvonal — ATS route
A légiforgalmi szolgálatok biztosítására, a forgalom áramlásának megfelelő szabályozására kijelölt repülési útvonal.

1. Megjegyzés: A "légiforgalmi szolgálati (ATS) útvonal" kifejezés általános megnevezés, amely többek között légiútvonal, tanácsadói, ellenőrzött vagy nem ellenőrzött, érkezési vagy indulási útvonalat is jelenthet.

2. Megjegyzés: A légiforgalmi szolgálati (ATS) útvonalat útvonal leírással határozzák meg, amely tartalmazza az ATS útvonal jelzést, a jelentős pontok (útvonal pontok) közötti rárepülési vagy kirepülési irányszöget, a helyzetjelentési előírásokat valamint, az illetékes légiforgalmi szolgálati hatóság által megállapított legalacsonyabb biztonságos tengerszint feletti repülési magasságot.

Légiforgalmi szolgálatok bejelentő irodája — Air traffic services reporting office
A légiforgalmi szolgálatokat érintő jelentések, valamint az indulás előtt a légiforgalmi szolgálati egységeknek benyújtott repülési tervek átvételére létesített egység.

Megjegyzés: A légiforgalmi szolgálatok bejelentő irodája különálló vagy egy már meglevővel — mint például egy másik légiforgalmi szolgálati egység vagy a légiforgalmi tájékoztató szolgálat irodája — együtt kialakított egység is lehet.

Légiforgalmi tájékoztató Kiadvány — Aeronautical Information Publication (AIP)
A léginavigáció szempontjából fontos és tartós jellegű légiforgalmi tájékoztatásokat tartalmazó kiadvány, amelyet az érintett Állam vagy annak megbízott szervezete tesz közzé.

Légiforgalmi tanácsadó szolgálat — Air traffic advisory service
A tanácsadói légtéren belül nyújtott szolgálat, amely a lehetséges mértékben elkülönítést biztosít IFR repülési tervek szerint üzemelő légijárművek között.

Légiforgalmi távközlési állomás — Aeronautical telecommunication station
A légiforgalmi távközlési szolgálat állomása.

Légiforgalom — Air traffic
A levegőben levő valamint a repülőtér munkaterületén üzemelő légijárművek összessége.

Légijármű — Aircraft
Minden olyan szerkezet, amelynek levegőben maradását olyan aerodinamikai reakcióerők biztosítják, amelyek nem azonosak a földfelszínre ható aerodinamikai reakcióerőkkel.

Légijármű parancsnoka — Pilot-in-command
A repülés biztonságos végrehajtásáért felelős, a járató vagy az általános célú légiközlekedés esetében a légijármű tulajdonosa részéről parancsnoknak kijelölt repülőgépvezető.

Magasság - Height
Egy pontként értelmezett szint, tárgy vagy pont valamint egy meghatározott vonatkozási alap (alapadat) közötti függőleges távolság.

Megbízhatóság — Integrity (aeronautical data)
A léginavigációs adat és értékei megbízhatóságának és pontosságának foka amely jelzi, hogy az a meghatározás vagy az elfogadott módosítás óta nem változik vagy nem veszik el.

Mentést koordináló központ — Rescue Co-ordination Centre
Egy kutatási és mentési körzeten belül a kutató és mentő szolgálat hatékony megszervezésére valamint a kutató és mentő tevékenység elősegítésére és egyeztetésére létesített egység.

Meteorológiai hivatal — Meteorological office
A nemzetközi légiközlekedés részére meteorológiai szolgálat nyújtására kijelölt hivatal.

Mozgási terület — Movement area
Egy repülőtérnek a légijárművek fel és leszállására valamint gurulására használandó része amely a munkaterületet és a forgalmi előtere(ke)t foglalja magába.

Munkaterület — Manoeuvring area
Egy repülőtérnek a légijárművek fel és leszállására valamint gurulására használandó része a forgalmi előterek kivételével.

Műszeres időjárási körülmények — Instrument meteorological conditions (IMC)
Látástávolsággal, felhőzettől mért távolsággal és felhőalappal kifejezett időjárási körülmények, amelyek a látás utáni időjárási körülményekre meghatározott minimum értékeknél alacsonyabbak.

Megjegyzés: A látás utáni időjárási körülményekre meghatározott minimum értékeket a 2. Annex tartalmazza.

Naptár — Calendar
Egyedi időbeli referenciarendszer, amely az időpont-meghatározás alapjául szolgál, egynapos léptékben (ISO 19108[*]).

Nemzetközi NOTAM iroda — International NOTAM office
Egy Állam által a NOTAM értesítések nemzetközi cseréjére kijelölt iroda.

NOTAM
Bármely légiforgalmi berendezés, szolgálat, eljárás állapotáról, változásáról, létrehozásáról vagy veszély fennállásáról szóló távközléssel közzétett értesítés, amelynek időben való ismerete a légijármű üzemeltetésével foglalkozó személyek részére alapvetően szükséges.

Nyomtatott formájú közleményváltás — Printed communications
Olyan közleményváltás, ahol a rendszerbe tartozó egységek mindegyik termináljén automatikus nyomtatott feljegyzés készül a rendszeren áthaladó összes közleményről.

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[*] Valamennyi ISO szabvány a fejezet végén kerül felsorolásra.

Összeütközés elkerülését biztosító fedélzeti rendszer — Airborne collision avoidance system (ACAS)
A másodlagos légtérfelderítő radar berendezés válaszjeladó egysége jeleinek alapján működő fedélzeti rendszer, amely a földi berendezésektől függetlenül működve tájékoztatja a légijármű vezetőjét az SSR válaszjeladóval felszerelt, összeütközési veszélyt jelentő egyéb légijárművekről.

Pontosság — Accuracy
A számított vagy mért, valamint a tényleges érték egyezésének mértéke.

Megjegyzés: A mért helyzetadatok esetében a pontosságot általában a jelzett helyzethez viszonyított távolság értékben fejezik ki és a tényleges helyzet meghatározott valószínűséggel ezen belülre esik.

Rádió-távbeszélés — Radiotelephony
Olyan rádió-távközlési módszer, amelynek során a tájékoztatás csere elsősorban szóbeli közleményváltással történik.

Repülésbiztonsági program. – Safety programme
A repülésbiztonság javítását célzó szabályozások és tevékenységek integrált halmaza.

Repülésbiztonság-irányítási rendszer. – Safety management system
A repülésbiztonság irányításának szisztematikus szemléletmódja, amelybe beletartoznak a szükséges szervezeti struktúrák, felelősségek, irányelvek és eljárások.

Repülési szint — Flight level
Meghatározott 1013.2 hectopascal (hPa) alap-nyomás értékhez viszonyított állandó atmoszférikus légnyomású felület, amely más ilyen felületektől meghatározott légnyomáskülönbséggel különül el.

1. Megjegyzés: Az egyezményes nemzetközi műlégkörnek megfelelően kalibrált nyomásmagasság-mérő:

a) QNH beállításra állítva tengerszint feletti magasság;

b) QFE beállításra állítva a QFE földfelszín feletti magasság;

c) 1013.2 hectopascal (hPa) beállításra állítva a repülési szint (FL) kijelzésére használható.

2. Megjegyzés: A fenti 1. megjegyzésben használt tengerszint és földfelszín feletti magasság kifejezések inkább barometrikus, azaz nyomásmagasságot, mint geometrikus, azaz földméréssel számított terepmagasságot jelentenek.

Repülési terv — Flight plan
A légiforgalmi szolgálati egységek rendelkezésére bocsátott, a légijármű tervezett repülésére vagy a repülés egy szakaszára vonatkozó meghatározott tájékoztatás.

Megjegyzés: A repülési tervre vonatkozó előírások a 2. Annexben találhatók. A "repülési terv űrlap" kifejezés a PANS-ATM 2. Függelékében található repülési terv mintát jelzi.

Repüléstájékoztató körzet — Flight information region
Meghatározott kiterjedésű légtér, amelyen belül repüléstájékoztató és riasztó szolgálatot biztosítanak.

Repüléstájékoztató központ — Flight information centre
Repüléstájékoztató és riasztó szolgálat biztosítására létrehozott egység.

Repüléstájékoztató szolgálat — Flight information service
A repülések biztonságos és eredményes végrehajtásához hasznos tanácsok és tájékoztatások nyújtása céljából biztosított szolgálat.

Repülőtér — Aerodrome
Szárazföldön vagy vízfelszínen kijelölt terület (beleértve bármely épületet, létesítményt és berendezést), amelyet egészében vagy részben a légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Repülőtéri forgalom — Aerodrome traffic
A repülőtér munkaterületén üzemelő összes légijármű és egyéb járművek valamint a repülőtér körzetében repülő összes légijármű forgalma.

Megjegyzés: A repülőtér körzetében repülő légijárművökön a repülőtér forgalmi körén működő, az oda besoroló és az onnan kilépő légijárművek értendők.

Repülőtéri irányító szolgálat — Aerodrome control service
A repülőtéri forgalom számára létesített légiforgalmi irányító szolgálat.

Repülőtéri irányító torony — Aerodrome control tower
A repülőtéri forgalom számára légiforgalmi irányító szolgálat biztosítása céljából létesített egység.

Riasztás állapota — Alert phase
Olyan helyzet, amelyben egy légijármű és annak fedélzetén tartózkodó személyek biztonságával kapcsolatosan kétség áll fenn.

Riasztó szolgálat — Alerting service
A kutatásra és mentésre szoruló légijárművek vonatkozásában a megfelelő szervek értesítésére és szükség esetén az ezekkel történő együttműködésre létesített szolgálat.

SIGMET tájékoztatás — SIGMET information
A meteorológiai hivatal figyelő szolgálata által kiadott olyan meghatározott, az útvonalon várható vagy ténylegesen előforduló időjárási jelenségekről szóló tájékoztatás, amelyek befolyásolhatják a légijárművek üzemeltetésének biztonságát.

Szint — Level
A levegőben levő légijármű függőleges helyzetére vonatkozó általános kifejezés, amely jelenthet földfelszín feletti vagy tengerszinthez viszonyított magasságot, illetve repülési szintet.

Tanácsadói légtér — Advisory airspace
Meghatározott kiterjedésű légtér vagy kijelölt útvonal, amelyen belül légiforgalmi tanácsadói szolgálat áll rendelkezésre.

Tanácsadói útvonal — Advisory route
Kijelölt légiútvonal, amelyen légiforgalmi tanácsadói szolgálat áll rendelkezésre.

Tengerszint feletti magasság — Altitude
Egy szint, egy pont vagy egy tárgy a közepes tengerszinthez viszonyított függőleges magassága.

Területi navigáció — Area navigation (RNAV)
Olyan navigációs módszer, amely lehetővé teszi, hogy a légijármű a földi állomásokon alapuló navigációs berendezések fedésterületén belül vagy saját önálló navigációs eszközei lehetőségeinek határain belül illetve ezek kombinációjával bármely kívánt repülési pályát kövessen.

Területi navigációs útvonal — Area navigation route
Területi navigáció végrehajtására képes légijárművek részére kijelölt légiforgalmi szolgálati útvonal.

Utazómagasság — Cruising level
Az a repülési szint, amelyet a légijármű a repülés jelentős szakasza során tart.

Útirány — Track
A légijármű repülési útvonalának vetülete a föld felületén, amelynek földrajzi irányát bármely adott pontban általában északhoz (földrajzi, mágneses vagy földrajzi hálózati) viszonyítva határozzák meg.

Útvonal pont — Way-point
Meghatározott földrajzi hely, amelyet valamely területi navigációs útvonal vagy egy területi navigációt alkalmazó légijármű repülési útvonalának meghatározására használnak. Az útvonal pont lehet:

Oldalirányú érintésű útvonal pont (fly-by way-point) — Olyan útvonal pont, ahol a következő útvonal vagy eljárás szakasz érintő menti eléréséhez előzetesen számított forduló szükséges.

Ténylegesen átrepült útvonal pont (flyover way-point) — Olyan útvonal pont, amelynél a következő útvonal vagy eljárás szakasz eléréséhez fordulót kezdenek.

Végső megközelítés — Final approach
A műszeres megközelítési eljárás azon szakasza, amely a kijelölt végső megközelítési pontnál, vagy ahol ilyen pontot nem jelöltek ki:

a) az utolsó eljárás-forduló, az alap forduló vagy a lóversenypálya alakú várakozási eljárás rárepülési fordulójának végén, ha ilyet kijelöltek; vagy

b) a megközelítési eljárásban meghatározott utolsó földrajzi útirány elérési pontjánál kezdődik; és a repülőtér közelében ott ér véget, ahonnan:

1) a leszállás végrehajtható; vagy

2) megszakított megközelítési eljárás kezdeményezhető.

Veszély állapota — Distress phase
Olyan tényleges helyzet, amelyben okkal feltételezhető, hogy egy légijárművet és annak fedélzetén tartózkodó személyeket súlyos és közvetlen veszély fenyegeti vagy azonnali segítségre szorul(nak).

VFR
A látvarepülési szabályok szerint történő üzemeltetés jelzésére használt rövidítés.

VFR repülés — VFR flight
A látvarepülési szabályok szerint végrehajtott repülés.

VMC — Visual Meteorological Conditions
A látás utáni időjárási körülmények jelzésére alkalmazott rövidítés.

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* ISO szabványok
19104 – *Földrajzi tájékoztatás – Terminológia*
19108 – *Földrajzi tájékoztatás – Időbeli minták*

2. Fejezet
Általános rész

2.1 Az illetékesség meghatározása

2.1.1 A szerződő Államok a jelen Annex előírásai alapján és a joghatóságuk alá tartozó területekre vonatkozóan határozzák meg azokat a légtérszakaszokat és azokat a repülőtereket, ahol légiforgalmi szolgálatokat biztosítanak. Ezt követően a jelen Annex előírásainak megfelelően intézkedjenek ezen szolgálatok létesítéséről és fenntartásáról, hacsak közös megegyezés alapján az egyik Állam a másik Államra át nem ruházza a légiforgalmi szolgálatok létesítésének és biztosításának felelősségét azokban a repüléstájékoztató körzetekben, irányítói körzetekben vagy repülőtéri irányítói körzetekben, amelyek a saját felségterülete felett helyezkednek el.

Megjegyzés: Ha egy Állam saját területe felett egy másik Államra ruházza át a légiforgalmi szolgálatok biztosításának felelősségét, azt a saját nemzeti szuverenitásának megsértése nélkül teszi. Hasonlóképpen, a légiforgalmi szolgálatokat biztosító Állam felelőssége műszaki és üzemeltetési szempontokra korlátózódik, és nem terjed túl az érintett légteret használó légijárművek biztonságának és hatékony működésének biztosításán. Továbbá, a légiforgalmi szolgálatokat biztosító Államnak ezen szolgálatok ellátásakor a felelősséget átruházó Állam területén érvényes követelményeknek megfelelően kell eljárnia és az átruházó Államtól elvárják, hogy olyan berendezéseket és szolgáltatásokat biztosítson a légiforgalmi szolgálatokat ellátó ország számára, amelyek szükségességében kölcsönösen megegyeztek. Ezeken felül, azt is elvárják, hogy a felelősséget átruházó Állam ne vonja meg, szüntesse be vagy ne módosítsa ezeket a berendezéseket és szolgáltatásokat a szolgáltatásokat biztosító Állammal történő előzetes egyeztetés nélkül. Mind a felelősséget átruházó, mind a légiforgalmi szolgálatokat biztosító ország bármikor felbonthatja a kettőjük közötti megállapodást.

2.1.2.1 A nyílt tengerek feletti légterek vagy a nem meghatározott állami hovatartozású légterek azon részeit, ahol légiforgalmi szolgálatokat biztosítanak, a körzeti légiközlekedési egyezmények alapján határozzák meg. A légterek ilyen részein a légiforgalmi szolgálatok biztosításának felelősségét elfogadó szerződő Állam a szolgálatok létesítéséről és biztosításáról a jelen Annex előírásai szerint intézkedjen.

1. Megjegyzés: A "körzeti légiközlekedési egyezmények" kifejezés azokra az egyezményekre utal, amelyeket az ICAO Tanácsa rendszerint a Körzeti Légiközlekedési Értekezletek javaslatára fogad el.

2. Megjegyzés: A jelen Annex előszavának elfogadása alkalmával a Tanács jelezte, hogy az a szerződő Állam, amely a nyílt tengerek, vagy :meg nem határozott állami hovatartozású légterek felett a légiforgalmi szolgálatok biztosításának felelősségét elfogadta, a nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a saját illetékességi területe feletti légtérnél elfogadottakkal megegyezően alkalmazhatja.

2.1.3 Amennyiben úgy határoztak, hogy légiforgalmi szolgálatokat biztosítanak, az érintett államok jelöljék ki az ilyen szolgálatok biztosításáért felelős hatóságot.

1. Megjegyzés: A szolgálatok létesítéséért és üzemeltetéséért felelős hatóság lehet állami szervezet vagy erre alkalmas vállalat is.

2. Megjegyzés: Azok a lehetőségek, amelyek egy nemzetközi repülés egy részére vagy teljes egészére vonatkozóan a légiforgalmi szolgálatok létesítésére és üzemeltetésére vonatkoznak, a következők:

Első lehetőség: *Az útvonal vagy útvonalszakasz olyan Állam fennhatósága alá tartozó légtéren belül van, amelyen belül az saját légiforgalmi szolgálatokat alakít ki és tart fenn.*

Második lehetőség: *Az útvonal vagy útvonalszakasz olyan Állam fennhatósága alá tartozó légtéren belül van, amelyen belül ez az Állam közös megegyezés alapján egy másik Államnak adta át a légiforgalmi szolgálatok kialakításának és fenntartásának felelősségét.*

Harmadik lehetőség: *Az útvonalszakasz nyílt tenger vagy olyan meg nem határozott nemzeti hovatartozású légtéren belül van, amelyre vonatkozóan egy Állam elfogadta a légiforgalmi szolgálatok kialakításának és fenntartásának felelősségét.*

A jelen Annex céljainak megfelelően az Állam, amely kijelöli a légiforgalmi szolgálatok létesítéséért és biztosításáért felelős hatóságot:

— *az* első esetben *az az Állam, amely fennhatósággal rendelkezik adott légtérszakasz felett;*

— *a* második esetben *az az Állam, amelyre a légiforgalmi szolgálatok létesítésének és biztosításának felelősségét átruházták;*

— *a* harmadik esetben *az az Állam, amely elfogadta a légiforgalmi szolgálatok létesítésének és biztosításának felelősségét.*

2.1.4 Ahol légiforgalmi szolgálatokat létesítettek, erről szükség szerint tegyenek közzé tájékoztatást, hogy lehetővé tegyék a szolgálatok igénybevételét.

2.2 A légiforgalmi szolgálatok céljai

A légiforgalmi szolgálatok céljai a következők:

a) összeütközések megelőzése a légijárművek között;

b) összeütközések megelőzése munkaterületeken a légijárművek valamint az ott található akadályok között;

c) a légiforgalom rendezett áramlásának elősegítése és fenntartása;

d) a repülések biztonságos és hatékony lebonyolításához hasznos tanácsok és tájékoztatások adása;

e) az illetékes szervezetek értesítése a kutatási és mentési segítségre szoruló légijárműről, továbbá szükség szerint segítség-nyújtás ezen szervezetek számára.

2.3 A légiforgalmi szolgálatok felosztása

A légiforgalmi szolgálatok a következő három szolgálatot foglalják magukba:

2.3.1 A *légiforgalmi irányító szolgálat* a 2.2 pont a), b) és c) alpontjában ismertetett feladatok ellátására amely a következő három egységre tagolódik;

a) Körzeti irányító szolgálat

ellenőrzött repülések részére légiforgalmi irányítás nyújtása céljából létesített szolgálat a 2.2 pont a) és c) feladatainak ellátására, kivéve ezeknek a repüléseknek az alábbi b) és c) alpontokban meghatározott szakaszait;

b) Bevezető irányító szolgálat

ellenőrzött repülések érkezési és indulási szakaszaiban légiforgalmi irányítás nyújtása céljából létesített szolgálat a 2.2 pont a) és c) feladatainak ellátására,

c) Repülőtéri irányító szolgálat

repülőtéri forgalom részére légiforgalmi irányítás nyújtása céljából létesített szolgálat, a 2.2 pont a), b) és c) feladatainak ellátására, a fenti 2.3.1 b) alpontban ismertetett repülési szakaszok kivételével.

2.3.2 *Repüléstájékoztató szolgálat* a 2.2 pont d) alpontjában ismertetett feladatok ellátására.

2.3.3 *Riasztó szolgálat* a 2. 2 pont e) alpont ismertetett feladatok ellátására.

2.4 Légiforgalmi szolgálatok szükségességének meghatározása

2.4.1 A légiforgalmi szolgálatok biztosításának szükségességét az alábbiak figyelembevételével határozzák meg:

a) a terület felett üzemelő légiforgalom típusai;

b) a légiforgalom sűrűsége;

c) az időjárási körülmények;

d) egyéb, lényeges tényezők.

Megjegyzés: A figyelembe veendő tényezők nagy száma miatt a légiforgalmi szolgálatok egy adott területen vagy helyen történő biztosításának szükségességére vonatkozóan általánosan meghatározott adatokat megállapítani nem lehetséges. Például:

a) a különböző típusokkal üzemelő légiforgalom összetétele, különböző repülési sebességű légijárművek (hagyományos, sugárhajtású, stb.), szükségessé tehetik a légiforgalmi szolgálatok biztosítását ott, ahol egy viszonylag nagyobb sűrűségű, azonban csak egy üzemeltetési típusú forgalom ezt nem tenné szükségessé;

b) az időjárási körülmények hatása nagy jelentőségű lehet olyan területeken, ahol a légiforgalom áramlása állandó jellegű (például menetrendszerű forgalom), míg hasonló vagy rosszabb meteorológiai körülmények viszonylag kevésbé lehetnek fontosak olyan területen, ahol a repülés ilyen körülmények között megszakítható (például helyi VFR repülések);

c) a nagy kiterjedésű vízfelületek, hegyes, lakatlan vagy sivatagos területek szükségessé tehetik légiforgalmi szolgálatok biztosítását még akkor is, ha repülések gyakorisága rendkívül ritka.

2.4.2 Egy adott területen belül a légiforgalmi szolgálatok szükségességének meghatározása alkalmával nem lehet tényezőként figyelembe venni a légijárművek összeütközés elkerülését biztosító fedélzeti rendszerrel (ACAS) történő felszerelését.

2.5 Azon légtérszakaszok és ellenőrzött repülőterek minősítése, amelyekben légiforgalmi szolgálatokat biztosítanak

2.5.1 A légtér adott szakaszaiban vagy egyes repülőtereken légiforgalmi szolgálat biztosításáról szóló döntés meghozatala után, a légterek ezen szakaszait vagy a repülőtereket a létesítendő légiforgalmi szolgálatoknak megfelelően minősíteni kell.

2.5.2 A légtér meghatározott szakaszait vagy az adott repülőtereket a következők alapján minősítsék:

2.5.2.1 *Repüléstájékoztató körzetek* — A légtér azon szakaszait, amelyekben repüléstájékoztató és riasztó szolgálat biztosítását határozták el, repüléstájékoztató körzetnek minősítsék.

2.5.2.2 *Ellenőrzött légterek és irányító körzetek*

2.5.2.2.1 A légtér azon szakaszait, amelyekben a műszerrepülési szabályok szerint üzemeltetett légijárművek részére légiforgalmi irányító szolgálat biztosítását határozták el, irányítói területnek vagy körzetnek minősítsék.

Megjegyzés: Az irányítói területek és (repülőtéri irányító) körzetek közötti különbséget a 2.9 pontban ismertetjük.

2.5.2.2.1.1 Az ellenőrzött légtér azon szakaszait, amelyekben a látvarepülési szabályok szerint üzemeltetett légijárművek részére is elhatározták a légiforgalmi irányító szolgálat biztosítását, "B", "C" vagy "D" osztályú légtérnek minősítsék.

2.5.2.2.2 Egy repüléstájékoztató körzeten belül kijelölt ellenőrzött légterek és irányító körzetek ennek a repüléstájékoztató körzetnek a részét képezzék.

2.5.2.3 *Ellenőrzött repülőterek* — Azokat a repülőtereket, amelyeken a repülőtéri forgalom részére légiforgalmi irányító szolgálat biztosítását határozták el, ellenőrzött repülőtérnek minősítsék.

2.6 A légterek osztályozása

2.6.1 Az légiforgalmi szolgálat légtereit az alábbiak szerint osztályozzák és jelöljék ki:

A. osztály — A légtérben csak IFR repüléseket engedélyeznek, az összes légijármű részére légiforgalmi irányító szolgálatot biztosítanak és az összes légijárművet elkülönítik egymástól.

B. osztály — A légtérben IFR és VFR repüléseket engedélyeznek, az összes légijármű részére légiforgalmi irányító szolgálatot biztosítanak és az összes légijárművet elkülönítik egymástól.

C. osztály — A légtérben IFR és VFR repüléseket engedélyeznek, az összes légijármű részére légiforgalmi irányító szolgálatot biztosítanak és az IFR légijárműveket elkülönítik egymástól valamint a VFR légijárművektől; a VFR légijárműveket elkülönítik az IFR légijárművektől továbbá a VFR légijárművek tájékoztatást kapnak a többi VFR légijárműről.

D. osztály — A légtérben IFR és VFR repüléseket engedélyeznek, az összes légijármű részére légiforgalmi irányító szolgálatot biztosítanak. Az IFR légijárműveket elkülönítik egymástól és azok tájékoztatást kapnak a VFR légijárművekről. A VFR légijárművek tájékoztatást kapnak az összes egyéb légijárműről.

E. osztály — A légtérben IFR és VFR repüléseket engedélyeznek, az IFR légijárművek részére légiforgalmi irányító szolgálatot biztosítanak és elkülönítik azokat a többi IFR légijárműtől. Amennyire ez gyakorlati szempontból lehetséges, minden légijármű forgalmi tájékoztatást kap. A repülőtéri irányítói körzetek esetében az E osztály nem használható.

F. osztály — A légtérben IFR és VFR repüléseket engedélyeznek, minden IFR légijármű részére légiforgalmi tanácsadói szolgálatot és kérésre minden légijármű részére repüléstájékoztató szolgálatot biztosítanak.

Megjegyzés: Ahol légiforgalmi tanácsadó szolgálatot létesítenek, ezt általában a légiforgalmi irányító szolgálattal történő felváltásig csak ideiglenes intézkedésnek tekintik. (Lásd még PANS-ATM 9. fejezet).

G. osztály — A légtérben IFR és VFR repüléseket engedélyeznek és kérésre minden légijármű részére repüléstájékoztató szolgálatot biztosítanak.

2.6.2 Az Államok válasszanak ki igényeiknek megfelelő osztályú légtereket.

2.6.3 Az egyes légtérosztályokban történő repülésekre vonatkozó előírásokat a 4. Függelékben található táblázatban mutatjuk be.

Megjegyzés: Ahol az ajánlott ATS légterek egymás felett helyezkednek el, a közös magasságon végrehajtott repülések a kevésbé szigorú légtérosztály követelményeinek tegyenek eleget és részükre a kevésbé szigorú légtérben nyújtott szolgálatot biztosítsák. Így ezen követelmények alkalmazásakor a B osztályú légteret kevésbé szigorúnak tekintik az A osztályúhoz viszonyítva; a C osztályú légteret kevésbé szigorúnak tekintik a B osztályúhoz viszonyítva és így tovább.

2.7 Előírt navigációs teljesítmény (RNP) útvonalrepülésnél

2.7.1 Az RNP típusokat az Államok maguk határozzák meg. Amikor lehetséges, a kijelölt területek, földrajzi útirányok vagy légiforgalmi szolgálati útvonalak RNP típusait a körzeti légiközlekedési egyezmények alapján írják elő.

2.7.2 ***Ajánlás*** *— A repülés útvonalrepülési szakaszára az RNP1, RNP4, RNP 10, RNP12.6 valamint az RNP20 típusok a lehető legrövidebb időn belül kerüljenek bevezetésre.*

2.7.3 Az előírt navigációs teljesítmény (RNP) típusa feleljen meg az érintett légtérben biztosított távközlési, léginavigációs és légiforgalmi szolgálatok színvonalának.

Megjegyzés: Az alkalmazható RNP típusok és a hozzájuk kapcsolódó eljárások az *Előírt Navigációs Teljesítmény (RNP) Kézikönyv*ben (Doc 9613) találhatók.

2.8 A légiforgalmi szolgálatokat biztosító egységek létesítése és kijelölése

A légiforgalmi szolgálatokat a következők alapján létrehozott és kijelölt egységek biztosítják:

2.8.1 A repüléstájékoztató körzeteken belül a repüléstájékoztató és riasztó feladatok ellátására létesítsenek repüléstájékoztató központokat, kivéve ha egy repüléstájékoztató körzetben ezen szolgálatok ellátásának felelősségét egy olyan légiforgalmi irányító szolgálati egységre ruházták át, amely az ilyen feladatok ellátására megfelelő felszereltséggel rendelkezik.

Megjegyzés: Ez nem zárja ki annak lehetőségét, hogy a repüléstájékoztató szolgálat bizonyos feladatainak ellátását más egységeknek adják át.

2.8.2 Az ellenőrzött légtereken és irányító körzeteken belül, továbbá az ellenőrzött repülőtereken a légiforgalmi irányítói, a repüléstájékoztató és riasztó szolgálatok ellátására létesítsenek légiforgalmi irányító egységeket .

Megjegyzés A különböző légiforgalmi irányító egységek által biztosított szolgálatokat a 3.2 pontban ismertetjük.

2.9 Repüléstájékoztató körzetekre, ellenőrzött légterekre és repülőtéri irányító körzetekre vonatkozó előírások

2.9.1 ***Ajánlás*** *— Azon légtér határainak kijelölése, amelyben légiforgalmi szolgálatokat biztosítanak, inkább az útvonalszerkezet természete és a hatékony szolgálat biztosításának követelményei, mint a nemzeti (ország) határok szerint történjen.*

1. Megjegyzés: Amennyiben ez a légiforgalmi szolgálatok biztosítását megkönnyíti, tanácsos olyan egyezményeket kötni, amelyek tartalma lehetővé teszi egy légtér nemzeti határokon átnyúló kijelölését (lásd 2.1.1). Azon egyezmények például, amelyek lehetővé teszik a légtérhatárok egyenes vonallal történő meghúzását, nagyon kedvezőek az adatfeldolgozási módszereket alkalmazó légiforgalmi szolgálati egységek esetében.

2. Megjegyzés: Ahol a légtér határainak kijelölése az országhatárok szerint történik, szükség van megfelelő helyen levő átadási pontok közös megegyezéssel történő meghatározására is.

2.9.2 Repüléstájékoztató körzetek

2.9.2.1 A repüléstájékoztató körzeteket úgy jelöljék ki, hogy azok fedjék az ilyen körzetek által meghatározott teljes útvonalszerkezetet.

2.9.2.2 A repüléstájékoztató körzet a magaslégtéri repüléstájékoztató körzet kivételével oldalsó határain belül az egész légteret foglalja magába.

2.9.2.3 Ahol a repüléstájékoztató körzetet magaslégtéri repüléstájékoztató körzet határolja, a magaslégtéri repüléstájékoztató körzet alsó határa legyen azonos a repüléstájékoztató körzet felső függőleges határával és essen egybe a 2. Annex 3. Függelék táblázataiban ismertetett VFR utazómagasságok egyikével.

Megjegyzés: Azokban az esetekben, amikor magaslégtéri repüléstájékoztató körzetet létesítettek, az ott alkalmazandó eljárásoknak nem szükséges azonosnak lenniük magaslégtéri repüléstájékoztató körzet alatt elhelyezkedő repüléstájékoztató körzetben alkalmazandó eljárásokkal.

2.9.3 Irányító körzetek

2.9.3.1 A *többek között* útvonalakat, valamint közelkörzeteket magukba foglaló irányító körzetek határait úgy jelöljék ki, hogy azok olyan megfelelő nagyságú légtérrel rendelkezzenek, amelyek magukba foglalják azokat a műszerrepülési szabályok szerint végrehajtott repülések számára kijelölt útvonalakat vagy útvonal szakaszokat, melyek a területen általában alkalmazott navigációs berendezések lehetőségeit figyelembe véve, a légiforgalmi irányító szolgálatok megfelelő egységeinek működéséhez kívánatosak.

Megjegyzés: Abban az irányító körzetben, amelyet nem útvonalrendszer alapján alakítottak ki, létesíthetnek olyan útvonalrendszert, amely megkönnyíti a légiforgalmi irányító szolgálat biztosítását.

2.9.3.2 Az irányító körzet alsó határát talaj vagy vízfelszín felett legalább 200 méter (700 láb) magasság felett jelöljék ki.

Megjegyzés: Ez nem jelenti azt, hogy egy adott irányító körzeten belül az alsó határt egységesen kell kijelölni (lásd a *Légiforgalmi Szolgálatok Tervezési Kézikönyve* (Doc 9426) I. Rész, 2. Kötet, 3. Fejezet: A-5 ábra).

2.9.3.2.1 ***Ajánlás** — Amikor lehetséges és kívánatos, hogy az irányító körzet alatt a VFR repülések számára szabad működést biztosítsanak, az ellenőrzött légtér alsó határát a 2.9.3.2 pontban meghatározott minimumnál magasabban jelöljék ki.*

2.9.3.2.2 ***Ajánlás** — Amikor az irányító körzet alsó határa 900 m (3000 láb) közepes tengerszint feletti magasság felett van, akkor az a 2. Annex 3. Függelékben ismertetett VFR utazómagasságok egyikével essen egybe.*

Megjegyzés: Ebből következik, hogy olyan VFR utazómagasságot válasszanak ki, amelynél a várható helyi atmoszférikus nyomásváltozások ne okozzák ennek a magasságnak talaj vagy vízfelszín felett 200 méter (700 láb) értéknek alacsonyabbra történő csökkenését.

2.9.3.3 Az irányító körzet felső határát akkor határozzák meg, ha:

a) ezen felső határ felett légiforgalmi irányító szolgálatot nem biztosítanak; vagy

b) az ellenőrzött légtér magaslégtéri ellenőrzött légtér alatt helyezkedik el, amely esetben a felső határ essen egybe a magaslégtéri irányító körzet alsó határával.

Amennyiben ilyen felső határt jelöltek ki, az essen egybe a 2. Annex 3. Függelékben ismertetett VFR utazómagasságok egyikével.

2.9.4 Magaslégtéri repüléstájékoztató vagy irányító körzetek

***Ajánlás** —Ahol kívánatos azon repüléstájékoztató körzetek vagy irányítói körzetek számának korlátozása, amelyeken a nagyobb repülési magasságon üzemelő légijárműveknek egyébként át kellene repülniük, a repüléstájékoztató körzet vagy irányítói körzet határát úgy jelöljék ki, hogy az több, alatta elhelyezkedő repüléstájékoztató körzetet vagy irányítói körzetet fedjen.*

2.9.5 Repülőtéri irányítói körzetek

2.9.5.1 A repülőtéri irányítói körzetek oldalsó határai foglalják magukba legalább a légtér nem irányító körzeten belül eső azon szakaszait, amelyek fedik a repülőtéren műszeres időjárási körülmények között műszerrepülési szabályok szerint üzemeltetett érkező és induló légijárművek repülési pályáját.

Megjegyzés: A repülőterek közelében várakozó légijárművek érkezőnek tekintendők.

2.9.5.2 A repülőtéri irányító körzetek oldalsó határai az adott repülőtér vagy repülőterek középpontjától legalább 9.3 km (5 tmf) távolságra terjedjenek azokba az irányokba, amelyekből a megközelítések végrehajthatók.

Megjegyzés: A repülőtéri irányító körzet két vagy több, egymáshoz közel elhelyezkedő repülőteret is magába foglalhat.

2.9.5.3 Ha a repülőtéri irányító körzetet az irányító körzet oldalsó határain belül létesítették, akkor az függőlegesen a talaj szintjétől legalább az irányító körzet alsó határáig terjedjen.

Megjegyzés: Amennyiben ez kívánatos, a repülőtéri irányító körzet alsó határa a felette elhelyezkedő irányító körzet alsó határánál magasabban is kijelölhető.

2.9.5.4 ***Ajánlás*** *— Ha a repülőtéri irányító körzet az irányító körzet oldalsó határain kívül helyezkedik el, jelöljenek ki felső határt.*

2.9.5.5 ***Ajánlás*** *— Amennyiben kívánatos, hogy a repülőtéri irányító körzet felső határát magasabban jelöljék ki, mint a felette elhelyezkedő irányító körzet alsó határa, vagy ha a repülőtéri irányító körzet az irányító körzet oldalsó határán kívül fekszik, annak felső határát úgy határozzák meg, hogy az a repülőgépvezetők részéről jól azonosítható legyen. Ha ez a határ 900 m (3000 láb) közepes tengerszint feletti magasság felett van, akkor lehetőleg essen egybe a 2. Annex 3. Függelékben ismertetett VFR utazómagasságok egyikével.*

Megjegyzés: Ezen pont alkalmazása esetén olyan VFR utazómagasságot válasszanak, amelynél a várható helyi atmoszférikus nyomásváltozások ne eredményezzék ennek a magasságnak talaj vagy vízfelszín felett 200 méter (700 láb) értéknek alacsonyabbra történő csökkenését.

2.10 A légiforgalmi szolgálat egységek és légterek elnevezése

2.10.1 ***Ajánlás*** *— A körzeti irányító központot vagy repüléstájékoztató központot arról a városról vagy földrajzi jellegzetességről nevezzék el, amelynek közelében létesítették.*

2.10.2 ***Ajánlás*** *— A repülőtéri irányítótornyot vagy bevezető irányító egységet arról a repülőtérről nevezzék el, ahol azt létesítették.*

2.10.3 ***Ajánlás*** *— A repülőtéri irányító körzetet, az irányító vagy repüléstájékoztató körzetet az adott légtér felett felügyeletet gyakorló egység nevével azonosítsák.*

2.11 A légiforgalmi szolgálati útvonalak létesítése és elnevezése

2.11.1 Amikor légiforgalmi szolgálati útvonalakat jelölnek ki, minden egyes ATS útvonal mentén határozzanak meg védett (biztonsági) légtereket és biztosítsák a szomszédos ATS útvonalak közötti megfelelő elkülönítést.

2.11.2 ***Ajánlás*** *— Amikor a légiforgalom sűrűsége, összetettsége vagy természete indokolja, az alacsony repülési magasságon üzemelő forgalom részére — beleértve a nyílt vizeken létesített helikopter leszállóhelyekre/ről üzemelő forgószárnyas légijárműveket is — jelöljenek ki különleges útvonalakat. Az ilyen útvonalak közötti oldalirányú távolság meghatározása alkalmával vegyék figyelembe a forgószárnyas légijármű fedélzetén elhelyezett és rendelkezésre álló navigációs berendezéseket is.*

2.11.3 Az ATS útvonalakat elnevezéssel azonosítsák.

2.11.4 Az ATS útvonalak elnevezését a szabvány indulási és érkezési útvonalak kivételével az 1. Függelék alapelvei szerint határozzák meg.

2.11.5 A szabvány indulási és érkezési útvonalakat valamint az azokkal kapcsolatos eljárásokat a 3. Függelék alapelvei szerint azonosítsák.

1. Megjegyzés: A légiforgalmi szolgálati útvonalak létesítésével kapcsolatos útmutató a *Légiforgalmi Szolgálati Tervezési Kézikönyvben* (Doc 9426) található.

2. Megjegyzés: A VOR berendezéssel meghatározott ATS útvonalak létesítésével kapcsolatos útmutató az A. Mellékletben található.

3. Megjegyzés: Az olyan párhuzamos útirányok vagy ATS útvonal középvonalak közötti oldaltávolság, amelyeknél előírt navigációs teljesítmény típus kijelölése szükséges, a meghatározott RNP típustól függ. A területi navigációs berendezéssel (RNAV) felszerelt légijármű számára kijelölt ATS útvonalakra valamint az RNP típus alapján meghatározott útvonalak közötti elkülönítésre vonatkozó tájékoztató anyag a B. Mellékletben található.

2.12 Átkapcsolási pontok kijelölése

2.12.1 ***Ajánlás*** *—Azokon a VOR berendezésekkel kijelölt légiforgalmi szolgálati útvonal szakaszokon, ahol ez az adott útvonal szakasz mentén segítheti a pontos navigációt, jelöljenek ki átkapcsolási pontokat. Az átkapcsolási pontok kijelölését kívánatos 110 km-es (60 tmf) vagy ennél hosszabb útvonalszakaszokra korlátozni, kivéve ha az ATS útvonalak bonyolultsága, a navigációs berendezések sűrűsége vagy más műszaki illetve üzemeltetési szempontok az átkapcsolási pontok rövidebb útvonalszakaszokon történő kijelölését is indokolják.*

2.12.2 ***Ajánlás*** *— Amennyiben a navigációs berendezések teljesítménye vagy a rádió frekvencia tartományok védelme mást nem tesz szükségessé, az útvonalszakaszon az átkapcsolási pontot a két berendezés között egyenes útvonalszakasznál félúton, illetve olyan VOR radiálok esetében, ahol az útvonal iránya megváltozik, azok kereszteződésénél jelöljék ki.*

Megjegyzés: Az átkapcsolási pontok kijelölésével kapcsolatos tájékoztatót az A. Melléklet tartalmazza.

2.13 Fontos pontok kijelölése és elnevezése

2.13.1 A légiforgalmi szolgálati útvonalak meghatározására és/vagy a légiforgalmi szolgálatok azon igényeinek kielégítésére, hogy azok a levegőben levő légijármű mozgásáról megfelelő tájékoztatásokat szerezhessenek be, jelöljenek ki fontos pontokat.

2.13.2 A fontos pontokat elnevezéssel azonosítsák.

2.13.3 A fontos pontokat 2. Függelék alapelvei szerint jelöljék ki és nevezzék el.

2.14 Szabvány útvonalak kijelölése és elnevezése guruló légijármvekű számára

2.14.1 ***Ajánlás*** *— Ahol ez egy repülőtéren a futópályák, a forgalmi előterek és a karbantartási területek között szükséges, a guruló légijárművek részére szabvány útvonalakat határozzanak meg. Ezek az útvonalak legyenek közvetlenek és egyszerűek, továbbá amennyiben lehetséges, ezeket úgy jelöljék ki, hogy a forgalmi konfliktusokat elkerüljék.*

2.14.2 ***Ajánlás*** *— A gurulást végző légijárművek részére meghatározott szabvány útvonalakat olyan azonosítóval lássák el, amelyek jól megkülönböztethetők a futópályák és a légiforgalmi szolgálati útvonalak megnevezéseitől.*

2.15 Együttműködés a járató és a légiforgalmi szolgálatok között

2.15.1 A légiforgalmi szolgálati egységek saját feladataik ellátása mellett vegyék figyelembe a járatónak a 6. Annex-ben meghatározott kötelezettségeiből származó igényeit és kérésre a járató vagy kijelölt képviselője számára adják meg azokat a rendelkezésre álló tájékoztatásokat, amelyek lehetővé teszik ezen kötelezettségeik teljesítését.

2.15.2 Amennyiben a járató ezt kéri, a légiforgalmi szolgálati egységek az elfogadott helyi együttműködési eljárás alapján, a gyakorlati lehetőségek határain belül azonnal adják meg a járató vagy kijelölt képviselője számára azon légijármű üzemeltetésére vonatkozóan vett tájékoztatásokat (beleértve a helyzetjelentéseket is), amelynek a járató repülésüzemi irányítást biztosít.

2.16 Együttműködés a katonai hatóságok és a légiforgalmi szolgálatok között

2.16.1 A légiforgalmi szolgálatok hatóságai alakítsanak ki és tartsanak fenn szoros együttműködést azokért a tevékenységekért felelős katonai hatóságokkal, amelyek befolyásolhatják a polgári légijárművek repülését.

2.16.2 A polgári légijárművekre gyakorlati veszélyt jelentő tevékenységek egyeztetését a 2.17 pontban előírtaknak megfelelően végezzék.

2.16.3 Foganatosítsanak intézkedéseket annak érdekében, hogy a légiforgalmi szolgálati és az illetékes katonai egységek között azonnal kicserélhessék a polgári légijármű repülésének biztonságos és hatékony lebonyolításához szükséges vonatkozó információkat.

2.16.3.1 A légiforgalmi szolgálati egységek, az elfogadott helyi együttműködési eljárásoknak megfelelően, a szokásos munkamenet részeként, vagy kérésre adják meg az illetékes katonai egységek számára a polgári légijárművek repülésére vonatkozó repülési terv- és egyéb adatokat. A polgári légijárművek elfogása szükségességének csökkentése vagy kiküszöbölése érdekében a légiforgalmi szolgálati hatóságok jelöljék ki azokat a területeket vagy útvonalakat, amelyeken a 2. Annex repülési tervekre, kétirányú rádió-összeköttetés fenntartásra valamint a helyzetjelentésekre vonatkozó előírásai minden repülésre vonatkoznak, hogy a polgári légijármű azonosítása érdekében minden szükséges adat az illetékes légiforgalmi szolgálati egységek rendelkezésére álljon.

2.16.3.2 Vezessenek be különleges eljárásokat annak biztosítására, hogy:

a) a légiforgalmi szolgálati egységek kapjanak tájékoztatást arról, ha a katonai egység olyan ténylegesen vagy valószínűsíthetően polgári légijárművet figyel meg, amely egy olyan légteret közelít meg vagy lép be oda, amelyben elfogás válhat szükségessé;

b) tegyenek meg minden lehetséges intézkedést a kérdéses légijármű azonosítására és adják meg számára az elfogás elkerüléséhez szükséges összes navigációs tájékoztatást.

2.17 A polgári légijárművekre gyakorlati veszélyt jelentő tevékenységek egyeztetése

2.17.1 A polgári légijárművekre gyakorlati veszélyt jelentő tevékenységre vonatkozó intézkedéseket — függetlenül attól, hogy azok egy Állam területe vagy nyílt vizek felett történnek-e — egyeztessék az illetékes légiforgalmi szolgálati hatósággal. Az egyeztetést időben végezzék el ahhoz, hogy a vonatkozó tájékoztatásokat a 15. Annex előírásainak megfelelően időben közzétehessék.

2.17.1.1 ***Ajánlás** — Ha az illetékes légiforgalmi szolgálati hatóság nem annak az Államnak hatósága, ahol a tevékenységet tervező szervezet van, az előzetes egyeztetést azon légiforgalmi szolgálati hatóság útján végezzék el, amely azért a légtérért felelős, ahol a szervezet működik.*

2.17.2 Az egyeztetés célja a lehatásosabb intézkedések végrehajtása, amelyekkel elkerülhető a polgári légijármű veszélyeztetése és biztosítható az ilyen légijármű általános jellegű üzemeltetésének lehető legkisebb mértékű megzavarása illetve korlátozása.

2.17.2.1 ***Ajánlás*** *— Az ilyen intézkedések meghatározásánál a következőket hajtsák végre, illetve vegyék figyelembe:*

a) a tevékenység helyszíne(i) vagy területe(i), időpontjai valamint időtartama, amelyeket úgy válasszanak meg, hogy elkerüljék a légiforgalmi szolgálati útvonalak lezárását vagy átirányítását, a leginkább használatos repülési szintek használatának korlátozását vagy a menetrendszerű légiforgalom késleltetését, kivéve ha más lehetőség nincs;

b) a tevékenység végrehajtására kijelölt légtér méretét korlátozzák a lehető legkisebbre;

c) létesítsenek közvetlen összeköttetést az illetékes légiforgalmi szolgálati hatóság vagy egység valamint a tevékenységet végrehajtó szervezet vagy egység között arra az esetre, ha polgári légijárművek kényszerhelyzete vagy más, előre nem látható események miatt a tevékenység(ek) megszakítása válik szükségessé.

2.17.3 Az illetékes légiforgalmi szolgálati hatóságok felelősek a veszélyt jelentő tevékenységekkel kapcsolatos tájékoztatások közzétételeléért.

2.17.4 ***Ajánlás*** *— Amennyiben a polgári légijárművekre tényleges veszélyt jelentő tevékenységek rendszeresek vagy folyamatosan ismétlődnek, szükség szerint hozzanak létre külön bizottságokat annak érdekében, hogy az együttműködés az összes érdekelt fél igényeinek megfelelően biztosítható legyen.*

2.17.5 *Foganatosítsanak megfelelő intézkedéseket a repülési üzemeltetést hátrányosan befolyásoló lézersugár kibocsátás megelőzésére.*

1. Megjegyzés: A repülési üzemeltetést hátrányosan befolyásoló lézersugár kibocsátásra vonatkozó tájékoztató anyag a Lézersugár Kibocsátás és Repülésbiztonság Kézikönyv-ben (Doc 9815) található.

2. Megjegyzés: Lásd továbbá 14. Annex — Repülőterek, I. kötet — Repülőtér tervezés és üzemeltetés 5. fejezetét.

2.17.6 **Ajánlás** — *A légtérkapacitás növelése, valamint a légijármű üzemeltetés hatékonyságának és rugalmasságának biztosítása érdekében az Államok dolgozzanak ki eljárásokat a katonai vagy más különleges tevékenységekre fenntartott légterek rugalmas felhasználására. Az eljárások tegyék lehetővé az összes légtérfelhasználó biztonságos belépését az ilyen fenntartott légtérbe.*

2.18 Léginavigációs adatok

2.18.1 A légiforgalmi szolgálatokra vonatkozó léginavigációs adat meghatározását és közzétételét az 5. Függelék 1. — 5. táblázataiban található pontossági és megbízhatósági előírások szerint, a kidolgozott minőségbiztosítási eljárások figyelembevételével végezzék. A léginavigációs adatok pontossága 95 %-os megbízhatósági szintű legyen és ebben a vonatkozásban három típusú helyzetadatot azonosítsanak az alábbiak szerint;

földméréssel felmért pontok (pl. a navigációs berendezések helyzete); számított pontok (a térben felmért pontok alapján matematikai számítással meghatározott állandó pontok); kijelölt és közzétett pontok (pl. repüléstájékoztató körzet határpontok).

Megjegyzés: A minőség-biztosítási rendszerre vonatkozó előírások a 15. Annex 3. fejezetében találhatók.

2.18.2 A szerződő államok biztosítsák, hogy a léginavigációs adatok megbízhatósága az adatfeldolgozás során, a felméréstől vagy első számítástól a várható felhasználóig folyamatosan állandó legyen. A léginavigációs adatok megbízhatósági követelményeit az adat felhasználás során bekövetkező, lehetséges változását valamint az adatra vonatkozó felhasználói igényeket jelző kockázati tényező alapján határozzák meg. Ennek megfelelően a következő osztályozás és adat megbízhatósági szint alkalmazandó:

a) kritikus adat — megbízhatósági szint 1×10^{-8}: a hibás vagy pontatlan kritikus adat felhasználásánál nagy valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása nagyon veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

b) alapvető adat — megbízhatósági szint 1×10^{-5}: a hibás vagy pontatlan alapvető adat felhasználásánál csekély valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása igen veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

c) általános felhasználású adat — megbízhatósági szint 1×10^{-3}: a hibás vagy pontatlan általános adat felhasználásánál nagyon csekély valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is.

2.18.3 Az elektronikus léginavigációs adat tárolása és átvitele alkalmával azt teljes egészében rendszeres időszakos felülvizsgálattal (CRC1) ellenőrizzék. A fenti 2.18.2 pont szerint osztályozott kritikus és alapvető léginavigációs adatok megbízhatóságának a védelméhez 32 illetve 24 bites CRC algoritmust használjanak.

2.18.4 ***Ajánlás** — A fenti 2.18.2 pont szerint osztályozott általános felhasználású léginavigációs adatok megbízhatóságának a védelméhez 16 bites CRC algoritmust használjanak.*

Megjegyzés: A léginavigációs adat minőségi követelményeket (pontosság, felbontás, megbízhatóság, adatvédelem és eredetvizsgálat) az *Egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) Kézikönyv*" (Doc 9674) tartalmazza. Az 5. Függelék a léginavigációs adatok pontossági és megbízhatósági előírásaira vonatkozó kiegészítő tájékoztatás az RTCA DO-201A és az európai polgári légiközlekedési berendezések EUROCAE ED-77 *A Léginavigációs Tájékoztatás Ipari Előírásai* kiadványokban található.

2.18.5 A szélességi és hosszúsági fokokat jelző földrajzi koordinátákat az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (World Geodetic System — WGS-84) alapadat formátumban határozzák meg és jelentsék a légiforgalmi tájékoztató szolgálat hatósága számára, külön megjelölve azokat a földrajzi koordinátákat, amelyeket matematikai módszerrel a fenti WGS-84 alap-adattá számoltak át és amelyeknél az eredeti földmérési adatok nem felelnek meg az 5. Függelék 1. táblázat előírásainak.

2.18.6 A tényleges földmérési munka, valamint az ebből meghatározott és számított adatok pontossága olyan legyen, hogy a kapott üzemeltetési navigációs adatok legnagyobb eltérései a repülés végrehajtásának szakaszaiban az adott koordináta rendszer jellegét figyelembe véve az 5. Függelék táblázataiban jelzett értékeken belül legyenek.

1. Megjegyzés: A megfelelő alkalmas koordináta rendszer az, amely lehetővé teszi az adott hely minden szükséges földrajzi adatának WGS-84 alapján történő felmérését.

2. Megjegyzés: A WGS-84 koordináta rendszer alapján meghatározott koordináták közzétételével kapcsolatos előírásokat a 4. Annex 2. fejezete valamint a 15. Annex 3. fejezete tartalmazza.

3. Megjegyzés: A kettős célt szolgáló helyek vagy pontok, mint például a várakozási pont és megszakított megközelítés pontja esetében a nagyobb pontossági értéket alkalmazzák.

2.19 Együttműködés a meteorológiai és a légiforgalmi szolgálati hatóságok között

2.19.1 Annak érdekében, hogy a légijármű az üzemeltetéséhez szükséges legfrissebb időjárási tájékoztatásokat kapja, szükség szerint hozzanak intézkedéseket a meteorológiai és a légiforgalmi szolgálati hatóságok között, hogy a légiforgalmi szolgálatok személyzete:

a) a kijelző műszerek használatán túlmenően, a megállapodásoknak megfelelően jelentse a légiforgalmi szolgálati egységek személyzete által megfigyelt vagy a légijárműtől kapott tájékoztatás alapján tudomására jutott időjárási tényezőket (elemeket);

b) a lehető a lehető legrövidebb időn belül jelentse a társított meteorológiai hivatalnak a légiforgalmi szolgálati egység személyzete által megfigyelt vagy a légijármű által jelentett, az üzemeltetés szempontjából lényeges időjárás-jelenségeket, amelyek a repülőtéri időjárás jelentésbe nem kerültek be;

c) a lehető legrövidebb időn belül jelentse a társított meteorológiai hivatalnak a vulkán kitörés bekövetkezésére utaló előjeleket, a vulkán kitöréseket valamint a vulkánikus hamufelhőre vonatkozó tájékoztatásokat. Ezen kívül a körzeti irányító valamint a repüléstájékoztató központok továbbítsák a tájékoztatást a társított időjárás észlelő hivatalnak és a vulkáni tevékenység (hamu) tanácsadói központoknak (VAAC) is.

1. Megjegyzés: A vulkáni tevékenység (hamu) tanácsadói központokat (VAAC) a 3. Annex 3.5.1 pontja alapján a körzeti légiközlekedési egyezményekben jelölik ki.

2. Megjegyzés: A rendkívüli légi jelentések továbbítására vonatkozóan lásd a 4.2.3 pontot.

2.19.2 Tartsanak fenn szoros együttműködést a körzeti irányító központok, a repüléstájékoztató központok valamint a társított időjárás észlelő hivatalok között annak biztosítása érdekében, hogy a NOTAM és SIGMET közleményekben jelzett vulkáni hamuról szóló tájékoztatások pontosak és időszerűek legyenek.

2.20 Együttműködés a légiforgalmi tájékoztató szolgálatok és a légiforgalmi szolgálati hatóságok között

2.20.1 Annak érdekében, hogy a légiforgalmi tájékoztató szolgálati egységek beszerezzék azokat a tájékoztatásokat, amelyek lehetővé teszik, hogy a légijármű számára megadják a legfrissebb repülés előtti tájékoztatásokat és kielégítsék a repülés közbeni tájékoztatásokra vonatkozó igényeket is, szükség szerint hozzanak intézkedéseket a légiforgalmi tájékoztató szolgálatok és a légiforgalmi szolgálati hatóságok között, hogy a légiforgalmi szolgálatok személyzete a felelős légiforgalmi tájékoztató szolgálati egységnek a lehető legkisebb késéssel jelentse:

a) a repülőtér állapotára vonatkozó tájékoztatásokat;

b) az illetékességi területükön elhelyezett navigációs berendezések, létesítmények és szolgálatok működésével kapcsolatos tájékoztatásokat illetve változásokat;

c) a légiforgalmi szolgálati egység személyzete által megfigyelt vagy a légijármű által jelentett vulkáni tevékenységet; és

d) bármely más, az üzemeltetés szempontjából lényegesnek ítélt tájékoztatást.

2.20.2 A léginavigációs rendszer megváltoztatásának bevezetése előtt az ilyen változtatásért felelős szolgálatok vegyék figyelembe azt az időtartamot, amely a légiforgalmi tájékoztató szolgálatnak a tájékoztató anyagok kidolgozásához, elkészítéséhez és kiadásához szükséges. Ezért az érintett szervezetek szoros együttműködése szükséges annak biztosítása érdekében, hogy a légiforgalmi tájékoztató szolgálat a vonatkozó tájékoztatásokat időben megkapja.

2.20.3 Különösen fontosak azok a térképeket és/vagy a számítógépes navigációs rendszereket érintő léginavigációs tájékoztatások, amelyek változásáról a 15. Annex 6. fejezete és 4. Függeléke előírásai szerint az AIRAC — léginavigációs tájékoztató szabályozó és ellenőrző rendszer — tájékoztatást kell, hogy biztosítson. A felelős légiforgalmi szolgálatok a légiforgalmi tájékoztató szolgálat számára benyújtandó tájékoztató anyagok és adatok továbbításánál a meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontokat a 14 napos postai átfutási idővel együtt vegyék figyelembe.

2.20.4 A légiforgalmi tájékoztató szolgálatok számára szükséges tájékoztató anyagok és adatok biztosításáért felelős légiforgalmi szolgálatok a jelen Annex 5. Függelékében meghatározott léginavigációs adatpontossági és -megbízhatósági követelmények figyelembevételével végezzék ezt a feladatot.

1. Megjegyzés: A NOTAM, SNOWTAM és ASHTAM kiadására vonatkozó előírások a 15. Annex 5. fejezetében találhatók.

2. Megjegyzés: A vulkáni tevékenységre vonatkozó jelentés a 3. Annex 4. fejezetében részletesen ismertetett tájékoztatásokból álljon.

3. Megjegyzés: Az AIRAC tájékoztatást a légiforgalmi tájékoztató szolgálat legalább 42 nappal az AIRAC hatálybalépési időpontja előtt ossza szét azzal a céllal, hogy az anyag legalább a hatálybalépés előtt 28 nappal eljusson az érintettekhez (címzettekhez).

4. *Megjegyzés: A meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontok tervezett 28 napos beosztását, beleértve 1997 november 6-át és az AIRAC felhasználásra vonatkozó tájékoztatót az* AIS Légiforgalmi Tájékoztató Szolgálati Kézikönyv *(Doc 8126, 2. fejezet 2.6 pont) tartalmazza.*

2.21 Legalacsonyabb repülési magasságok

Minden szerződő Állam jelölje ki és tegye közzé a legalacsonyabb repülési magasságokat minden egyes olyan légiforgalmi szolgálati útvonalon, amely területe felett vezet. A meghatározott legalacsonyabb repülési magasságok tartsanak biztonságos elkülönítést az érintett területen levő mérvadó akadály felett.
Megjegyzés: A legalacsonyabb repülési magasságok meghatározására és közzétételére vonatkozó előírásokat a 15. Annex 1. Függeléke tartalmazza. Az akadálymentességi előírások részletezése a PANS-POS (Doc 8168) kiadvány I. kötet VI. részében és a II. kötet III. illetve VI. részében található.

2.22 Kényszerhelyzetben levő légijármű részére biztosított szolgálat

2.22.1 Egy ismerten vagy feltételezetten kényszerhelyzetben levő légijármű számára — beleértve a jogellenes beavatkozás esetét is — az adott körülmények figyelembevételével más légijárművekkel szemben a legnagyobb figyelmet, segítséget és elsőbbséget kell biztosítani.

Megjegyzés: A megfelelő adathálózati összeköttetési egységgel és/vagy másodlagos radar válaszjeladóval felszerelt légijármű a kényszerhelyzet állapotának jelzésére berendezését a következők szerint üzemeltetheti:

a) A módban 7700-as kód; vagy

b) A módban 7500-as kód annak külön jelzésére, hogy jogellenes beavatkozás alatt áll; vagy

c) ADS egységét a megfelelő kényszerhelyzeti és/vagy sürgősségi üzemmódba kapcsolja; vagy

d) a légiforgalmi irányító és repülőgépvezető közötti adat-távközlési összeköttetésen (CPDLC) keresztül megfelelő kényszerhelyzeti közleményt ad.

2.22.1.1 ***Ajánlás*** *— Kényszerhelyzet esetén a légiforgalmi szolgálati egység és a légijármű közötti közleményváltásoknál az Emberi Tényezők Alapelveit vegyék figyelembe.*

Megjegyzés: Az Emberi Tényezők Alapelveivel kapcsolatos útmutatás az *Emberi Tényezők Kiképzési Kézikönyv*ben (Doc 9683) található.

2.22.2 Amennyiben ismert vagy feltételezett, hogy egy légijármű jogellenes beavatkozás alatt áll, a légiforgalmi szolgálati egységek azonnal vegyék figyelembe a légijármű kéréseit. Folytassák a repülés biztonságos lebonyolításához kívánatos lényeges tájékoztatások megadását és hajtsák végre azokat a szükséges intézkedéseket, amelyekkel a repülés egyes szakaszait — különös tekintettel a légijármű biztonságos leszállására — meggyorsíthatják.

2.23 Repülés közben bekövetkező váratlan események

2.23.1 Útvonalától eltért vagy azonosítatlan légijármű

1. Megjegyzés: A jelen pontban az "útvonalától eltért" és az "azonosítatlan" légijármű kifejezések az alábbi jelentéssel rendelkeznek:

Útvonalától eltért légijármű: Olyan légijármű, amely tervezett útvonalától jelentősen eltért vagy jelentette, hogy eltévedt.

Azonosítatlan légijármű: Olyan légijármű, amelynek működését egy adott légtéren belül megfigyelték vagy ezt jelentették, azonban azonosságát nem állapították meg.

2. Megjegyzés: Ugyanabban az időben ugyanazt a légijárművet az egyik egység "útvonalától eltért légijárműként" míg egy másik egység "azonosítatlan légijárműként" tekinthet.

2.23.1.1 Amint egy légiforgalmi szolgálati egység egy útvonalától eltért légijárműről szerez tudomást, a légijármű segítése és repülésének biztosítása érdekében hajtsa végre a 2.23.1.1.1 és 2.23.1.1.2 alpontokban előírt összes szükséges intézkedést.

Megjegyzés: Különösen fontos a légiforgalmi szolgálati egység részéről nyújtott navigációs segítség abban az esetben, ha az egység olyan légijárműről szerez tudomást, amely egy olyan légtérbe tévedt be vagy nagy valószínűséggel be fog tévedni, ahol fennáll az elfogás lehetősége vagy a légijármű biztonsága más okból veszélybe kerülhet.

2.23.1.1.1 Amennyiben a légijármű helyzete nem ismert, a légiforgalmi szolgálati egység:

a) kíséreljen meg kétirányú rádió-összeköttetést létesíteni a légijárművel, kivéve ha az ez összeköttetés már fennáll;

b) minden rendelkezésre álló eszközt és módszert használjon fel a légijármű helyzetének meghatározására;

c) tájékoztassa azokat a légiforgalmi szolgálati egységeket, amelyek területére a légijármű betévedt vagy betévedhet, figyelembe véve mindazokat a tényezőket, amelyek a légijármű navigációját az adott körülmények között befolyásolhatják;

d) az elfogadott helyi együttműködési eljárásoknak megfelelően tájékoztassa az illetékes katonai egységeket és adja meg részükre a repülési terv vonatkozó adatait, valamint az útvonalától eltért légijárművet érintő más tájékoztatást;

e) kérje fel a c) és d) alpontokban jelzett egységeket valamint a levegőben levő többi légijárművet, hogy adjanak meg minden segítséget a légijárművel történő összeköttetés felvételére és helyzetének meghatározására.

Megjegyzés: A d) és e) alpontok előírásai a c) alpont szerint értesített légiforgalmi szolgálati egységekre is vonatkoznak.

2.23.1.1.2 Amikor a légijármű helyzetét megállapították, a légiforgalmi szolgálati egységek:

a) a légijárművet tájékoztassák helyzetéről és a szükséges végrehajtandó tevékenységről; valamint

b) a többi légiforgalmi szolgálati és katonai egységnek szükség szerint adják meg az útvonalától eltért légijárműre vonatkozó tájékoztatásokat és a légijármű részére adott bármely tanácsot.

2.23.1.2 Amint egy légiforgalmi szolgálati egység tudomást szerez egy, a területén levő azonosítatlan légijárműről, kísérelje meg a légijármű azonosságát megállapítani, ha ez a légiforgalmi szolgálat ellátásához szükséges vagy ezt az illetékes katonai hatóságok az elfogadott helyi együttműködési eljárás alapján kérik. Ennek érdekében a légiforgalmi szolgálati egység, a körülmények figyelembevételével:

a) kíséreljen meg kétirányú rádió-összeköttetést létesíteni a légijárművel, kivéve ha ez az összeköttetés már fennáll;

b) a repüléstájékoztató körzeten belül levő többi légiforgalmi szolgálati egységnél érdeklődjön a légijárműről és kérje segítségüket a légijárművel történő kétirányú rádió-összeköttetést létesítésére;

c) a szomszédos repüléstájékoztató körzetekben levő légiforgalmi szolgálati egységeknél érdeklődjön a légijárműről és kérje segítségüket a légijárművel történő kétirányú rádió-összeköttetést létesítésére;

d) kíséreljen meg tájékoztatást beszerezni a területén üzemelő többi légijárműtől.

2.23.1.2.1 A légiforgalmi szolgálati egység szükség szerint tájékoztassa az illetékes katonai egységet, amint a légijármű azonosságát megállapították.

2.23.2 Polgári légijármű elfogása

2.23.2.1 Amint egy légiforgalmi szolgálati egység tudomást szerez arról, hogy illetőségi területén belül egy légijárművet elfogtak, a körülményeknek megfelelően foganatosítsa az alábbi intézkedéseket:

a) kíséreljen meg kétirányú rádió-összeköttetést létesíteni a légijárművel minden rendelkezésre álló rádió frekvencián , beleértve a 121.1 Mhz-es kényszerhelyzeti frekvenciát is kivéve, ha az ez összeköttetés már fennáll;

b) tájékoztassa az elfogott légijármű vezetőjét az elfogásról;

c) vegye fel az összeköttetést az elfogó légijárművel kétirányú rádió-összeköttetést fenntartó irányító egységgel és adja meg részére a légijárműre vonatkozó összes rendelkezésére álló információt;

d) szükség szerint közvetítse a közleményeket az elfogó légijármű vagy az elfogást irányító egység és az elfogott légijármű között;

e) az elfogást irányító egységgel szorosan együttműködve tegyen meg minden szükséges intézkedést az elfogott légijármű biztonsága érdekében;

f) amennyiben úgy látszik, hogy a légijármű a szomszédos repüléstájékoztató körzetekből tévedt be, az elfogásról tájékoztassa a szomszédos repüléstájékoztató körzetek légiforgalmi szolgálati egységeit.

2.23.2.2 Amint egy légiforgalmi szolgálati egység tudomást szerez arról, hogy felelősségi területén kívül egy légijárművet elfogtak, a körülményeknek megfelelően alábbi intézkedéseket foganatosítsa:

a) tájékoztassa azt a légiforgalmi szolgálati egységet, amelynek területén az elfogás megtörtént, megadva részére azokat a rendelkezésére álló tájékoztatásokat, amelyek segíthetik a légijármű azonosítását és kérje fel azt a 2.23.2.1 pontban foglaltak végrehajtására;

b) szükség szerint közvetítse a közleményeket az elfogott légijármű valamint az illetékes légiforgalmi szolgálati egység, az elfogást irányító egység vagy az elfogó légijármű között.

2.24 Óra idő a légiforgalmi szolgálatoknál

2.24.1 A légiforgalmi szolgálati egységek az éjféllel kezdődő 24-órás nap órában, percben és szükség szerint másodpercben történő kifejezésére az Egyetemes Egyeztetett Világidőt (UTC) használják.

2.24.2 A légiforgalmi szolgálati egységeket olyan órával lássák el, amely az időt az érintett egység minden egyes munkahelyről jól látható módon órában, percben és másodpercben jelzi.

2.24.3 A légiforgalmi szolgálati egységek óráit és egyéb időrögzítő berendezéseit szükség szerint ellenőrizzék annak biztosítása érdekében, hogy azok mindenkor az UTC idő plusz/minusz 30 másodperces határértékén belül működjenek. Ahol egy légiforgalmi szolgálati egység adatátviteli összeköttetést alkalmaz, óráikat és egyéb időrögzítő berendezéseit szükség szerint ellenőrizzék, hogy ezek pontossága 1 másodperc UTC értéken belül legyen.

2.24.4 A pontos időt szabványos időjelző állomástól vagy ha ez nem lehetséges, más olyan egységtől szerezzék be, amely a pontos időt ilyen állomástól kapta.

2.24.5 A légijármű felszálláshoz történő nekifutása előtt a repülőtéri irányító torony a repülőgépvezető részére adja meg a pontos időt kivéve, ha más intézkedések révén a repülőgépvezető azt egyéb forrásból megkapja. A légiforgalmi szolgálati egységek a légijármű részére kérésre ezen kívül is adják meg a pontos időt. A pontos időt a legközelebbi fél percre kerekítve adják meg. Amint egy légiforgalmi szolgálati egység tudomást szerez arról, hogy felelősségi területén belül egy légijárművet elfogtak, a körülményeknek megfelelően 2.23.2 pontban megfogalmazott intézkedéseket foganatosítsa

2.25 A nyomásmagasság-adó másodlagos radar válaszjeladók szállítására és üzemeltetésére vonatkozó előírások kidolgozása és kiadása

Az Államok vezessenek be előírásokat a nyomásmagasság-adó másodlagos radar válaszjeladóknak a légtér meghatározott szakaszain illetve területein belül történő szállítására és üzemeltetésére.

Megjegyzés: Ennek az előírásnak célja a légiforgalmi szolgálatok hatékonyságának valamint az összeütközést elkerülő fedélzeti rendszerek működésének fejlesztése.

2.26 Repülésbiztonság-irányítás

2.26.1 Annak érdekében, hogy elérjenek egy elfogadható repülésbiztonsági szintet az ATS nyújtásában, az Államok kötelesek repülésbiztonsági programot létrehozni.

2.26.2 Az elérendő elfogadható repülésbiztonsági szintet a szóban forgó Állam(ok) határozzák meg.

Megjegyzés. – A repülésbiztonsági programokra és az elfogadható repülésbiztonsági szintek meghatározására vonatkozó irányelvek az E Mellékletben és a Repülésbiztonság-irányítási kézikönyvben (Safety Management Manual, SMM) (Doc 9859) találhatók.

2.26.3 Az Államok repülésbiztonsági programjuk részeként kötelesek megkövetelni, hogy egy légiforgalmi szolgáltató olyan, az Állam számára elfogadható repülésbiztonság-irányítási rendszert vezessen be, amely legalább az alábbiakat tartalmazza:

a) kimutatja a repülésbiztonsági kockázatokat;

b) biztosítja, hogy az elfogadható repülésbiztonsági szint fenntartásához szükséges javító intézkedések bevezetésre kerülnek;

c) lehetővé teszi az elért repülésbiztonsági szint folyamatos figyelemmel kísérését és rendszeres értékelését; valamint

d) az általános repülésbiztonsági szint folyamatos javítására törekszik.

2.26.4 A repülésbiztonság-irányítási rendszer világosan határozzon meg a légiforgalmi szolgáltatón belül közvetlen repülésbiztonsági felelősségi viszonyokat, beleértve a felső vezetés közvetlen felelősségét a repülésbiztonság iránt.

Megjegyzés. – A repülésbiztonság-irányítási rendszerekre vonatkozó irányelvek a Repülésbiztonság-irányítási Kézikönyvben (Safety Management Manual, SMM) (Doc 9859), a kapcsolódó eljárások a PANS-ATM dokumentumban találhatók (Doc 4444).

2.26.5 A légiforgalmi irányító rendszer bármely biztonságot érintő jelentősebb változását, beleértve a csökkentett függőleges elkülönítési minimum vagy egy új eljárás bevezetését csak azt követően hajtsák végre, hogy a biztonsági felülvizsgálat bizonyította az elfogadható biztonsági szint fenntartásának lehetőségét továbbá megfelelő tanácskozásokat folytattak a légtérfelhasználókkal. A felelős hatóság amikor ez lehetséges biztosítsa, hogy megfelelő intézkedések történnek a bevezetést követő ellenőrzésre annak igazolása céljából, hogy a megállapított biztonsági szint továbbra is fennmarad.

1. Megjegyzés: Amikor a változás természete miatt az elfogadható biztonsági szint mennyiségi mértékben nem fejezhető ki, a biztonsági felülvizsgálat csak az üzemszerű megfigyelés és értékelés alapján történhet.

2.27 Közös referencia-rendszerek

2.27.1 Vízszintes referencia-rendszer

A légiközlekedésben a World Geodetic System – 1984 (WGS-84) alkalmazandó vízszintes referencia-rendszerként. A bejelentett légiforgalmi földrajzi koordinátákat (a szélesség és hosszúság megjelölésével) a WGS-84 referencia-adatai alapján kell megadni.

Megjegyzés – A WGS – 84-re vonatkozó átfogó útmutató a World Geodetic System – 1984 (WGS – 84) Kézikönyvben (Doc 9674) található.

2.27.2 Függőleges referencia-rendszer

A légiközlekedés függőleges referencia-rendszere a közép-tengerszinten kell, hogy alapuljon, mellyel meghatározható a gravitáción alapuló magasság (tengerszint feletti magasság) a geoidként ismert felülethez mért viszonya.

Megjegyzés: A geoid globálisan leginkább a közép-tengerszintet követi. A közép-tengerszint meghatározása egy olyan, egyenlő feszültségű felület a Föld gravitációs mezejében, amely egybeesik a közép-tengerszintnek a szárazföldekre kiterjesztett felületével.

2.27.3 Időbeli referencia-rendszer

2.27.3.1A légiközlekedés időbeli referencia-rendszereként a Gergely-naptár és az Egyeztetett Világidő (UTC) alkalmazandó.

2.27.3.2Amennyiben ettől eltérő referencia-rendszert alkalmaznak, az a Légiforgalmi Tájékoztató Kiadvány (AIP) GEN 2.1.2 részében feltüntetendő.

2.28 Nyelvismeret ellenőrzése

2.28.1 A légiforgalmi szolgálatot ellátó szervezet ellenőrizze és biztosítsa, hogy alkalmazott légiforgalmi irányítói értsék és beszéljék a rádió-távbeszélő összeköttetéseknél használt nyelve(ke)t.

2.28.2 A légiforgalmi irányító egységek közötti összeköttetések esetében egyéb nyelvre vonatkozó közös megállapodás hiányában az angol nyelvet használják.

2.29 Légiforgalmi szükségintézkedések

A légiforgalmi szolgálati hatóságok dolgozzanak ki és tegyenek közzé megfelelő szükség-intézkedési terveket a légforgalmi szolgálatok és az ezekhez szükséges kiegészítő szolgáltatások tényleges illetve lehetséges megszakadása esetére azon légterek vonatkozásában, amelyekben a szolgáltatások biztosításáért felelősek. Az intézkedési terveket szükség szerint az ICAO segítségével, a szomszédos légterekében légiforgalmi szolgálatok biztosításáért felelős hatóságokkal valamint az érintett légtér-felhasználókkal szoros együttműködésben dolgozzák ki.

1. Megjegyzés: A szükség-intézkedési tervek kidolgozására, közzétételére és bevezetésére vonatkozó útmutató a D. mellékletben található.

2. Megjegyzés: A szükség-intézkedési tervek tartalmazhatnak ideiglenes eltéréseket az elfogadott helyi körzeti légiközlekedési előírásoktól; ezeket az eltéréseket szükség szerint a Tanács nevében az ICAO Tanácsának elnöke hagyja jóvá.

3. fejezet
Légiforgalmi irányító szolgálat

3.1 Alkalmazás

Légiforgalmi irányító szolgálat biztosítandó:

a) az A, B, C, D és E osztályú légterekben valamennyi műszerrepülési szabályok (IFR) szerint végrehajtott repülés részére;

b) a B, C és D osztályú légterekben valamennyi látvarepülési szabályok (VFR) szerint végrehajtott repülés részére;

c) valamennyi különleges VFR repülés részére;

d) az ellenőrzött repülőtéren a teljes repülőtéri forgalom részére.

3.2 A légiforgalmi irányító szolgálat biztosítása

A 2.3.1 pontban ismertetett légiforgalmi irányító szolgálat egyes részeit az alábbiakban ismertetett különböző egységek lássák el:

a) *Körzeti irányító szolgálatot:*

1) egy körzeti irányító központ; vagy

2) ahol körzeti irányító központot nem létesítettek, a repülőtéri irányítói körzetben vagy egy elsődlegesen bevezető irányító szolgálat ellátására kijelölt korlátozott kiterjedésű irányító körzetben a bevezető irányító szolgálatot ellátó egység;

b) *Bevezető irányító szolgálatot:*

1) a repülőtéri irányító torony vagy a körzeti irányító központ, ha szükséges vagy kívánatos a bevezető irányító szolgálatnak egy egység felelősségi körbe történő összevonása a repülőtéri irányító torony vagy a körzeti irányító központ feladataival;

2) a bevezető irányító szolgálat, ha szükséges vagy kívánatos egy különálló egység kijelölése;

c) *Repülőtéri irányító szolgálatot:* a repülőtéri irányító torony.

Megjegyzés: A forgalmi előtéren meghatározott szolgálatok ellátására, azaz a forgalmi előtér ügyeleti szolgálat feladataira kijelölhető a repülőtéri irányító torony vagy egy másik önálló egység.

3.3 Légiforgalmi irányító szolgálat működése

3.3.1 A légiforgalmi irányító szolgálat ellátása érdekében egy légiforgalmi irányító egység:

a) kapja meg minden egyes légijármű tervezett mozgására vagy az ezektől való eltérésekre valamint az egyes légijárművek tényleges haladására vonatkozó tájékoztatásokat;

b) a kapott tájékoztatások segítségével határozza meg az ismert légijárművek egymáshoz viszonyított helyzetét;

c) az irányítása alatt álló légijárművek közötti összeütközések megelőzése valamint a légiforgalom rendezett áramlásának elősegítése és fenntartása érdekében adjon ki légiforgalmi irányítói engedélyeket és tájékoztatásokat;

d) az engedélyeket szükség szerint egyeztesse a többi egységgel:

1) amennyiben egy légijármű ennek hiányában konfliktushelyzetbe kerülhet más ilyen egység irányítása alatt álló forgalommal;

2) a légijármű irányításának más egység számára történő átadása előtt.

3.3.2 A légijárművek mozgására vonatkozó tájékoztatásokat valamint a légijárművek számára kiadott légiforgalmi irányítói engedélyeket úgy tartsák nyilván és jelenítsék meg, hogy ez lehetővé tegye a forgalmi helyzet azonnali áttekintését annak érdekében, hogy a légijárművek közötti megfelelő elkülönítések segítségével fenntartsák a forgalom áramlását.

3.3.3 **Ajánlás.** – *A légiforgalmi irányító egységeket szereljék fel olyan eszközökkel, amelyek a légiforgalmi irányító munkahelyeken felveszik a háttérben zajló kommunikációt és a hallható környezetet, és amelyek képesek legalább a működés utolsó huszonnégy órájában felvett információ tárolására.*

Megjegyzés. – A légiforgalmi irányító egységeknél készült felvételek és ezen felvételek átiratainak titkosítására vonatkozó rendelkezések a 13. Annex 5.12 szakaszában találhatók.

3.3.4 A légiforgalmi irányító egységek által kiadott engedélyek biztosítsanak elkülönítést:

a) az A és B osztályú légterekben üzemelő valamennyi repülés között;
b) a C, D és E osztályú légterekben a műszerrepülési szabályok (IFR) szerint végrehajtott repülések között;
c) a C osztályú légterekben a műszerrepülési szabályok (IFR) és a látvarepülési szabályok (VFR) szerint végrehajtott repülések között;
d) a műszerrepülési szabályok (IFR) és a különleges VFR szerint végrehajtott repülések között;
e) a különleges VFR szerint végrehajtott repülések között, amennyiben az illetékes légiforgalmi szolgálati hatóság így rendelkezik;

kivéve, amikor a fenti b) alpontban jelzett D. és E. osztályú légterek esetében egy légijármű kéri és ha az illetékes légiforgalmi szolgálati hatóság így írja elő, a repülést egy meghatározott, látás utáni időjárási körülmények között végrehajtandó szakaszon elkülönítés fenntartása nélkül is engedélyezhetik.

Megjegyzés: Az összetett függőleges és oldalirányú elkülönítés bevezetésével kapcsolatos tájékoztató anyagot a *Légiforgalmi Szolgálatok Tervezési Kézikönyve* (Doc 9426) tartalmazza.

3.3.4.1 Minden olyan légtérben, ahol FL 290 és FL 410 (ezen szinteket is beleértve) között 300 m (1000 láb) csökkentett függőleges elkülönítési minimumot alkalmaznak, regionális program indítandó az ezen repülési szinteken üzemelő légijárművek magasság-tartási képességének figyelemmel követésére annak biztosítása érdekében, hogy az ezen függőleges elkülönítési minimum bevezetése és folyamatos alkalmazása megfelel a biztonsági célkitűzéseknek. Az ezen program keretében alkalmazott magasságfigyelő berendezések hatósugara lehetővé kell, hogy tegye az RVSM légtérben működő valamennyi járató érintett légijárműveinek megfigyelését.

Megjegyzés: A különálló megfigyelő programok száma a régióban elvárt szolgáltatások hatékony ellátásához szükséges minimumra korlátozandó.

3.3.4.2 Nemzetközi megállapodások formájában lehetővé kell tenni a megfigyelő programokból származó adatok régiók közötti cseréjét.

Megjegyzés: A függőleges elkülönítéssel és a magasság-tartási képességekkel kapcsolatos tájékoztatót a 300 méter (1000 láb) Csökkentett Függőleges Elkülönítési Minimum FL290 és FL410 Között Bevezetési Kézikönyv *(Doc 9574) tartalmazza.*

3.3.5 A légiforgalmi irányító egység az elkülönítést legalább a következők egyikével biztosítsa:

a) függőleges elkülönítés a különböző repülési szintek kijelölésével:
   1) a 2. Annex 3. Függelékében található utazómagasság táblázatokból; vagy
   2) a módosított utazómagasság táblázatból, amennyiben a FL 410 feletti repülés esetében a 2. Annex 3. Függelékének megfelelően így írják elő;

kivéve, ha a fentiekben jelzett repülési szintek nem az útirányszögnek megfelelően alkalmazandók és ezt a vonatkozó légiközlekedési tájékoztató kiadványokban vagy a légiforgalmi irányítói engedélyben jelzik;
Megjegyzés: A függőleges elkülönítéssel kapcsolatos tájékoztatót a 300 méter (1000 láb) Csökkentett Függőleges Elkülönítési Minimum FL290 és FL410 Között Bevezetési Kézikönyv *(Doc 9574) tartalmazza.*

b) vízszintes elkülönítés, amely:
   1) időben vagy távolságban kifejezett térköz tartásával hosszirányú elkülönítést biztosít az azonos, összetartó vagy szembetartó útirányon haladó légijárművek között;
   2) a légijárművek különböző útvonalakon vagy földrajzi területeken történő tartásával oldalirányú elkülönítést biztosít azok között;

c) összetett elkülönítés, amely a függőleges valamint a fenti b) alpontban jelzett egyéb elkülönítési változatok kombinációjával biztosít elkülönítést a légijárművek között úgy, hogy felhasználja minden egyes minimumot, azonban ez nem lehet kevesebb, mint az egyedileg alkalmazott elkülönítés változatok minimumának fele. Az összetett elkülönítést csak a helyi körzeti légiközlekedési egyezmények alapján lehet alkalmazni.

Megjegyzés: Az összetett függőleges és oldalirányú elkülönítés bevezetésével kapcsolatos tájékoztató anyagot a Légiforgalmi Szolgálatok Tervezési Kézikönyve (Doc 9426) tartalmazza.

3.3.5.1 Minden olyan légtérben, ahol FL 290 és FL 410 (ezen szinteket is beleértve) között 300 m (1000 láb) csökkentett függőleges elkülönítési minimumot alkalmaznak, regionális program indítandó az ezen repülési szinteken üzemelő légijárművek magasság-tartási képességének figyelemmel követésére annak biztosítása érdekében, hogy az ezen függőleges elkülönítési minimum bevezetése és folyamatos alkalmazása megfelel a biztonsági célkitűzéseknek. Az ezen program keretében alkalmazott magasságfigyelő berendezések hatósugara lehetővé kell, hogy tegye az RVSM légtérben működő valamennyi járató érintett légijárműveinek megfigyelését.

Megjegyzés: A különálló megfigyelő programok száma a régióban elvárt szolgáltatások hatékony ellátásához szükséges minimumra korlátozandó.

3.3.5.2 Nemzetközi megállapodások formájában lehetővé kell tenni a megfigyelő programokból származó adatok régiók közötti cseréjét.

Megjegyzés: A függőleges elkülönítéssel és a magasság-tartási képességekkel kapcsolatos tájékoztatót a 300 méter (1000 láb) Csökkentett Függőleges Elkülönítési Minimum FL290 és FL410 Között Bevezetési Kézikönyv *(Doc 9574) tartalmazza.*

3.4 Elkülönítési minimumok

3.4.1 Egy adott légtérszakaszban alkalmazott elkülönítési minimum kiválasztása az alábbiak szerint történjen:

a) az elkülönítési minimumot a PANS-ATM és a helyi *Körzeti Kiegészítő Eljárások* előírásaiban meghatározottakból, a helyi uralkodó körülmények alapján válasszák ki, kivéve ha olyan berendezéseket használnak vagy olyan körülmények uralkodnak, amelyekre a jelenleg érvényes ICAO előírások nem terjednek ki, mert ezekben az esetekben az alábbiak szükség szerint más elkülönítési minimumot határozzanak meg:

1) az illetékes légiforgalmi szolgálati hatóság, a járatókkal történő egyeztető megbeszélések után az állam fennhatósága alá tartozó útvonalakra vagy útvonalszakaszokra;

2) helyi körzeti légiközlekedési egyezményben, a nyílt vizek feletti vagy nem meghatározott állami fennhatóság alá tartozó útvonalakra vagy útvonal szakaszokra.

Megjegyzés: A jelenleg érvényes ICAO elkülönítési minimumok részletes ismertetését a PANS-ATM (Doc 4444) valamint a *Helyi Kiegészítő Eljárások* (Doc 7030) 1. része című kiadványok tartalmazzák.

b) az elkülönítési minimumot a szomszédos légterekben légiforgalmi szolgálatok biztosításáért felelős illetékes légiforgalmi szolgálati hatóságok közötti egyeztetéssel válasszák ki, amennyiben:

1) a forgalom két szomszédos légtér egyikéből a másikba lép be;

2) az útvonalak közelebb vannak a szomszédos légterek közös határához, mint az adott körülmények között alkalmazható elkülönítési minimum.

Megjegyzés: Ezen rendelkezés célja annak biztosítása, hogy először: a forgalom átadása mindkét fél szempontjából egyeztethető legyen és másodszor: kielégítő elkülönítést biztosítsanak a közös határ két oldalán üzemelő légijárművek között.

3.4.2 A választott elkülönítési minimumról és alkalmazási területéről adjanak részletes tájékoztatást:

a) az érintett légiforgalmi szolgálati egységeknek; és

b) a légiforgalmi tájékoztató kiadványok segítségével a légijármű-vezetőknek és járatóknak ott, ahol az elkülönítést a légijármű meghatározott navigációs berendezéseinek felhasználása vagy bizonyos navigációs módszerek alkalmazása alapján biztosítják.

3.5 Az irányítás felelőssége

3.5.1 Az egyes repülések irányításának felelőssége

Egy ellenőrzött repülés egy időben csak egy légiforgalmi irányító egység irányítása alatt állhat.

3.5.2 Egy adott légtérszakaszon belüli irányítás felelőssége

Egy adott légtérszakaszon belül az összes légijármű irányításának felelősségét egyetlen légiforgalmi irányító egységre ruházzák. Mindazonáltal egy légijármű vagy légijármű csoport irányítását átadhatják más légiforgalmi irányító egység számára, feltéve hogy biztosítják a koordinációt az összes érintett légiforgalmi irányító egység között.

3.6 Az irányítás felelősségének átadása

3.6.1 Az átadás helye vagy időpontja

A légijármű irányításának felelősségét az egyik légiforgalmi irányító egységtől a másiknak a következők szerint adják át:

3.6.1.1 *Két körzeti irányító szolgálatot ellátó egység között* — A légijármű irányításának felelősségét az egyik irányító körzetben körzeti irányító szolgálatot ellátó egységtől a szomszédos irányító körzetben körzeti irányító szolgálatot ellátó egységnek abban az időpontban adják át, amikorra a légijárművet irányító körzeti irányító központ a közös irányító körzethatár átlépését számítja illetve más olyan helyen vagy időpontban, amelyben a két egység megegyezett.

3.6.1.2 *Körzeti irányító szolgálatot és bevezető irányító szolgálatot ellátó egységek között* — A légijármű irányításának felelősségét a körzeti irányító szolgálatot ellátó egységtől a bevezető irányító szolgálatot ellátó egységnek és viszont olyan helyen illetve időpontban adják át, amelyben a két egység megegyezett.

3.6.1.3 *Bevezető irányító szolgálatot ellátó egység és a repülőtéri irányító torony között*

3.6.1.3.1 *Érkező légijármű* — A leszálláshoz közeledő légijármű irányításának felelősségét a bevezető irányító szolgálatot ellátó egység akkor adja át a repülőtéri irányító toronynak, amikor:

a) a légijármű a repülőtér közelében van és:

1) úgy ítélik meg, hogy a megközelítést és leszállást föld-látással végre tudja hajtani; vagy

2) folyamatos látás utáni időjárási körülmények közé került; vagy

b) elér az együttműködési megállapodásban vagy a légiforgalmi szolgálati egység utasításaiban meghatározott helyet vagy magasságot; vagy

c) leszállt.

Megjegyzés: Bizonyos repülések irányítását közvetlenül át lehet adni a körzeti irányító központtól a repülőtéri irányító toronynak és viszont még akkor is, ha bevezető irányítást létesítettek, amennyiben az érintett egységek olyan előzetes megállapodást kötöttek, hogy a bevezető irányító szolgálat megfelelő részét a körzeti irányító központ illetve a repülőtéri irányító torony ellátja.

3.6.1.3.2 *Induló légijármű* — Az induló légijármű irányításának felelősségét a repülőtéri irányító torony akkor adja át a bevezető irányító szolgálatot ellátó egységnek, amikor:

a) *mikor a repülőtér környékén látás utáni időjárási körülmények uralkodnak:*

1) mielőtt a légijármű elhagyja a repülőtér környékét; vagy

2) mielőtt a légijármű műszeres időjárási körülmények közé kerül; vagy

3) a légijármű elér egy meghatározott helyet vagy magasságot;

az együttműködési megállapodásban vagy a légiforgalmi szolgálati egység utasításaiban előírtak szerint;

b) *mikor a repülőtér környékén műszeres időjárási körülmények uralkodnak:*

1) közvetlenül a légijármű felszállása után; vagy

2) a légijármű elér egy meghatározott helyet vagy magasságot;

az együttműködési megállapodásban vagy a légiforgalmi szolgálati egység utasításaiban előírtak szerint.

Megjegyzés: Lásd a 3.6.1.3.1 pont után következő megjegyzést.

3.6.1.4 *Azonos légiforgalmi irányító egységen belüli irányító szektorok vagy munkahelyek között*

A légijármű irányításának felelősségét az azonos légiforgalmi irányító egységen belüli irányító szektorok vagy munkahelyek között a légiforgalmi szolgálati egység utasításaiban előírtak szerint egy adott helyen, magasságon vagy időpontban adják át.

3.6.2 Az átadás egyeztetése

3.6.2.1 Egy légijármű irányításának felelősségét az egyik légiforgalmi irányító egység a másiknak ne adja át az átvevő irányító egység beleegyezése nélkül, amelyet a 3.6.2.2, 3.6.2.2.1, 3.6.2.2.2 és 3.6.2.3 pontok előírásainak megfelelően szerezzen be.

3.6.2.2 Az átadó irányító egység tájékoztassa az átvevő irányító egységet az érvényes repülési terv vonatkozó részleteiről és adjon meg minden, az átadásra vonatkozó kért irányítói tájékoztatást.

3.6.2.2.1 Ahol az irányítás átadását radar adatok felhasználásával hajtják végre, az átadásra vonatkozó irányítói tájékoztatás tartalmazza a légijármű közvetlenül az átadás előtt radaron megfigyelt helyzetét valamint kérés alapján annak repülési útirányát és sebességét is.

3.6.2.2.2 Ahol az irányítás átadását automatikus légtérfelderítési (ADS) adatok felhasználásával hajtják végre, az átadásra vonatkozó irányítói tájékoztatás tartalmazza a légijármű négydimenziós helyzetét és szükség szerint más tájékoztatásokat is.

3.6.2.3 Az átvevő irányító egység:

a) jelezze, ha az átadó irányító egység feltételei szerint képes a légijármű irányításának elfogadására, kivéve ha a két érintett egység közötti előzetes megállapodás alapján az ilyen jelzés elmaradását úgy értelmezik, hogy elfogadják a megadott feltételeket vagy jelzik a bármely szükséges vonatkozó módosítást; és

b) közölje a repülés következő szakaszára vonatkozó bármely egyéb tájékoztatást vagy légiforgalmi irányító engedélyt, amelyet a légijárműnek az átadás időpontjában ismernie kell.

3.6.2.4 Az átvevő irányító egység tájékoztassa az átadó irányító egységet, ha kétirányú beszéd-üzemű és/vagy adathálózati összeköttetést létesített az érintett légijárművel és átvette annak irányítását, kivéve ha a két érintett egység közötti megállapodás mást ír elő.

3.6.2.5 Az alkalmazható egyeztetési eljárásokat, beleértve az irányítás átadási pontokat, az együttműködési megállapodás vagy a légiforgalmi szolgálati egység utasításai tartalmazzák.

3.7 Légiforgalmi irányító engedélyek

A légiforgalmi irányító engedélyek kizárólag a légiforgalmi irányító szolgálat biztosításának követelményein alapulnak.

3.7.1 A légiforgalmi irányító engedélyek tartalma

3.7.1.1 Egy légiforgalmi irányító engedély a következőket tartalmazza:

a) a légijármű repülési tervében meghatározott azonosító jele;

b) az engedély határa;

c) a repülés útvonala;

d) a repülés teljes útvonalára vagy annak egy szakaszára engedélyezett repülési szint(ek) és ha szükséges, ennek változásai;

Megjegyzés: Ha ez 2. Annex 3.6.5.2.2 a) alpont előírása értelmében szükséges és a repülési szintekre vonatkozó engedély az útvonalnak csak egy részére érvényes, fontos, hogy a légiforgalmi irányító egység meghatározza azt a pontot, ameddig a légiforgalmi irányító engedély repülési szintekre vonatkozó része érvényes.

e) bármely olyan egyéb szükséges utasítás vagy tájékoztatás, amely a megközelítési vagy indulási eljárásokra és repülési műveletekre, rádióösszeköttetésekre, valamint az engedély lejárati idejére vonatkozhat.

Megjegyzés: Az engedély lejárati ideje azt az időpontot jelzi, amely után az engedély automatikusan érvényét veszti, ha a repülést még nem kezdték meg.

3.7.1.2 ***Ajánlás** — Dolgozzanak ki szabvány érkezési és indulási útvonalakat és kapcsolatos eljárásokat, amikor a következők elősegítésére van szükség:*

a) a légiforgalom biztonságos, rendezett és gyors áramlása;

b) a légiforgalmi irányító engedélyekben kiadott útvonalak és eljárások ismertetése.

Megjegyzés: A szabvány érkezési és indulási útvonalak és eljárások kidolgozásával kapcsolatos útmutató a *Légiforgalmi Szolgálati Tervezési Kézikönyvben* (Doc 9426), a tervezéssel kapcsolatos követelmények a PANS-OPS II. kötetben (Doc 8168) található.

3.7.2 Engedélyek hangsebességgel történő repülések részére

3.7.2.1 A szuperszonikus repülés hangsebességet elérő gyorsítási szakaszára vonatkozó légiforgalmi irányító engedély legalább ezen szakasz végéig terjedjen.

3.7.2.2 ***Ajánlás*** *— A szuperszonikus légijármű hangsebesség alatti sebességre történő lassulására, valamint a szuperszonikus utazó repülésről hangsebesség alatti repülésre történő süllyedésére vonatkozó légiforgalmi irányító engedély legalább a hangsebesség alatti repülési szakaszig biztosítson folyamatos süllyedést.*

3.7.3 Az engedélyek visszaolvasása és a repülésbiztonságot érintő tájékoztatások

3.7.3.1 A hajózószemélyzet olvassa vissza a légiforgalmi irányítótól szóban kapott ATC engedély és utasítás azon részét, amely közvetlenül a repülésbiztonságot érinti. A következő elemeket mindig vissza kell olvasni:

a) légiforgalmi irányító útvonal engedélyek;

b) engedélyek és utasítások bármely futópályára történő belépésre, leszállásra, felszállásra, futópálya keresztezésre és közeli várakozásra valamint a futópályán történő visszagurulásra; valamint

c) használatos futópálya, magasságmérő beállítási értékek, másodlagos válaszjeladó kódok, repülési szint és magasság utasítások, repülési irány és sebesség utasítások valamint az átváltási szint, amikor azt a légiforgalmi irányító közli vagy a légiforgalmi irányítás ATIS közleménye tartalmazza.

3.7.3.1.1 Az egyéb engedélyeket vagy utasításokat, beleértve a feltételes engedélyeket úgy olvassák vissza vagy nyugtázzák, hogy ezzel egyértelműen jelezzék azok megértését és végrehajtásának szándékát.

3.7.3.1.2 A légiforgalmi irányító hallgassa meg a visszaolvasást, hogy megbizonyosodjon arról, hogy a légiforgalmi irányító engedélyt vagy utasítást a hajózószemélyzet helyesen olvasta vissza és a visszaolvasás alkalmával tapasztalt eltérések és ellentmondások tisztázása érdekében azonnal intézkedjen.

3.7.3.2 Amennyiben az illetékes ATS hatóság másképpen nem rendelkezik, a CPDLC közlemények szóbeli visszaolvasása nem szükséges.

Megjegyzés: A légiforgalmi irányító és repülőgépvezető közötti digitális adatösszeköttetési (CPDLC) közleményekre vonatkozó eljárásokat és előírásokat a 10. Annex II. kötete és a PANS-ATM 14. fejezete tartalmazza.

3.7.4 Az engedélyek koordinálása

A légiforgalmi irányító szolgálati egységek egymás között a légijármű egész repülési útvonalára vagy annak meghatározott részére vonatkozó légiforgalmi irányító engedélyt az alábbiak szerint egyeztessék.

3.7.4.1 Egy légijármű részére engedélyezzék a tervezett első leszállási (célállomás) repülőtérig tartó repülést, amennyiben:

a) még az indulás előtt lehetséges volt az engedély egyeztetése valamennyi olyan egységgel, amely a légijárművet irányítani fogja; vagy

b) megfelelő biztosíték van arra, hogy az előzetes egyeztetés megvalósítható azon egységek között, amelyek a légijárművet egymást követően irányítani fogják.

Megjegyzés: Amikor a légiforgalmi irányító engedélyt az induló forgalom gyorsítása érdekében csak a repülés kezdeti szakaszára adják ki, az ezt követő útvonal engedélyt a fentiekben meghatározottak szerint adják ki még akkor is, ha az első tervezett leszállási repülőtér nem az útvonal engedélyt kiadó körzeti irányító központ illetékessége alá tartozik.

3.7.4.2 Amennyiben a 3.7.4.1 pontban meghatározott egyeztetés nem történt meg vagy nem várható, a légijárműnek az engedély csak addig a pontig adható ki, ameddig a koordináció biztosított. Ezen pont elérése előtt vagy ezen pont elérésekor a légijármű a helyzetnek megfelelő további engedélyt vagy várakozási utasításokat kap.

3.7.4.2.1 Amikor az illetékes légiforgalmi szolgálati hatóság ezt írja elő, a légijármű az irányítás átadási pont elérése előtt az előzetes engedély beszerzése érdekében vegye fel a kapcsolatot a repülési útvonalán következő légiforgalmi irányító egységgel.

3.7.4.2.1.1 A légijármű az előzetes engedély beszerzése során tartsa fenn a szükséges kétoldalú rádiókapcsolatot az irányítást végző légiforgalmi irányító egységgel.

3.7.4.2.1.2 Az előzetes engedélyként kiadott légiforgalmi irányító engedély mint olyan a repülőgépvezető számára pontosan azonosítható legyen.

3.7.4.2.1.3 A megfelelő egyeztetés esetét kivéve az előzetes engedély csak abban a légtérben érintse a légijármű eredeti repülési útvonalát és magasságát, amelyért az ilyen engedélyt kiadó légiforgalmi irányító egység felelős.

Megjegyzés: Az előzetes engedély kiadásával, továbbításával és alkalmazásával kapcsolatos előírásokat a 10. Annex II kötet, a tájékoztató anyagot a *Légiforgalmi Szolgálatok Adathálózati Összeköttetéseinek Alkalmazása Kézikönyv* (Doc 9694) tartalmazza.

3.7.4.2.1.4 ***Ajánlás** — Ahol ez gyakorlati szempontból alkalmazható és ahol az előzetes engedély továbbításának megkönnyítésére adathálózati összeköttetést használnak, a repülőgépvezető és az előzetes engedélyt kiadó légiforgalmi irányító egység között álljon kétoldalú beszédüzemű összeköttetés rendelkezésre.*

3.7.4.3 Amikor egy légijármű az egyik irányító körzeten levő olyan repülőtérről kíván indulni, amely egy másik irányító körzethez 30 perc vagy az érintett körzeti irányító központok által közösen elfogadott más repülési időtartamon belül van, a következő körzeti irányító központtal való egyeztetés még az indulási engedély kiadása előtt történjen meg.

3.7.4.4 Amikor egy légijármű irányító körzetből nem ellenőrzött légtérbe kíván kilépni és ezt követően ugyanabba vagy egy másik irányító körzetbe tér vissza, az engedély az indulási repülőtértől az első tervezett leszállási helyig kiadható. Az ilyen engedély vagy annak módosítása csak a repülés azon szakaszaira vonatkozik, amelyet ellenőrzött légtérben hajtanak végre.

3.7.5 A légiforgalom áramlásának szervezése

3.7.5.1 Az olyan légtér esetében, ahol a légiforgalom időnként meghaladja vagy várhatóan meghaladja az érintett légiforgalmi irányító szolgálatok közzétett kapacitását, létesítsenek légiforgalmi áramlásszervező (ATFM) szolgálatot.

Megjegyzés: Az érintett légiforgalmi irányító szolgálatok kapacitását rendszerint az illetékes légiforgalmi szolgálati hatóság határozza meg és teszi közzé.

3.7.5.2 ***Ajánlás** — Az ATFM szolgálatot a helyi körzeti légiközlekedési egyezmények vagy esetenként többoldalú megállapodások alapján létesítik. Az ilyen egyezmények tartalmazzanak megfelelő közös eljárásokat és módszereket a kapacitás megállapítására is.*

3.7.5.3 Amikor egy légiforgalmi irányító szolgálati egység számára nyilvánvalóvá válik, hogy a már elfogadotton kívül egy adott helyen vagy meghatározott területen a meghatározott időperióduson belül további forgalmat nem tud vagy csak bizonyos ütemben képes elfogadni, az egység erről értesítse az ATFM egységet -- ha ilyet létrehoztak -- valamint szükség szerint a többi érintett légiforgalmi szolgálati egységet. Értesítsék az adott helyre vagy területre tartó légijárművek parancsnokait és az érdekelt járatókat a várható késésekről vagy az alkalmazott korlátozásokról.

Megjegyzés: Ahol lehetséges, az érintett járatókat általában előre értesítsék a légiforgalmi áramlásszervező (ATFM) szolgálat által életbe léptetett korlátozásokról, ahol ilyen szolgálatot létesítettek.

3.8 Személyek és járművek mozgásának irányítása repülőtéren

3.8.1 A repülőtéri irányító torony szükség szerint irányítsa a személyek vagy járművek — beleértve a vontatott légijárműveket is — mozgását a repülőtér munkaterületén annak érdekében, hogy azok ne kerüljenek veszélyhelyzetbe és elkerüljék a leszálló, guruló vagy felszálló légijárművek veszélyeztetését is.

3.8.2 Amikor a repülőtéren rossz látási körülmények között történő üzemeltetésre kidolgozott eljárásokat alkalmaznak:

a) a személyek és járművek működését a repülőtér munkaterületén korlátozzák a lehető legkisebbre és II. vagy III. kategóriás precíziós műszeres üzemeltetés esetén különösen ügyeljenek az ILS/MLS érzékeny területek védelmére vonatkozó előírások betartására;

b) a 3.8.3 pont előírásai alapján, a járművek és a guruló légijármű közötti minimális elkülönítés feleljen meg az illetékes légiforgalmi szolgálati hatóság által a rendelkezésre álló berendezések jellemzői alapján meghatározott előírásainak;

c) amennyiben ugyanazon a futópályán folyamatosan vegyes II. vagy III. kategóriás ILS és MLS precíziós műszeres üzemeltetés történik, a szigorúbb feltételek szerinti ILS vagy MLS kritikus és érzékeny területek védelme biztosítandó.

Megjegyzés: A rossz látási körülményekre kidolgozott eljárások alkalmazásának időszakát a légiforgalmi szolgálati egységek utasításainak megfelelően határozzák meg. A repülőtér rossz látási körülmények között történő üzemeltetésére vonatkozó útmutatást a *Felszíni Mozgás Ellenőrzése és Irányítása (SMGCS) Kézikönyv* (Doc 9476) tartalmazza.

3.8.3 A kényszerhelyzetben levő légijármű segítségére siető mentő járművek számára biztosítsanak elsőbbséget minden egyéb földi forgalommal szemben .

3.8.4 A fenti 3.8.3 pont előírása mellett a munkaterületen működő járművek tartsák be a következő előírásokat:

a) a járművek és légijárművet vontató járművek adjanak elsőbbséget a leszálló, felszálló vagy guruló légijárműveknek;

b) a járművek adjanak elsőbbséget a légijárművet vontató másik járműveknek;

c) a járművek a légiforgalmi szolgálati egység utasításai alapján adjanak elsőbbséget másik járműveknek;

d) a fenti a), b) és c) alpontoktól függetlenül a járművek és légijárművet vontató járművek tartsák be a repülőtéri irányító torony utasításait.

3.9 Radarberendezés biztosítása

Ajánlás *— A radarrendszerek tegyék lehetővé a biztonsági riasztások és figyelmeztető jelzések, közöttük a konfliktus keresés és riasztás, a legalacsonyabb biztonságos tengerszint feletti magasság megsértése valamint a nem szándékos másodlagos radar válaszjeladó (SSR) kódkiosztás kettőzés jelzések megfelelő megjelenítését.*

3.10 Gurítóradar (SMR) használata

Ajánlás *– Amennyiben a munkaterület egésze vagy egy része vizuálisan nem megfigyelhető, illetve a vizuális megfigyelések kiegészítése érdekében a 14. Annex, I. kötetében meghatározott gurítóradar (Surface Movement Radar, SMR), illetve egyéb megfelelő megfigyelő-berendezés alkalmazható az alábbi célokra:*

a) légijárművek és egyéb járművek mozgásának megfigyelése a munkaterületen;

b) szükség esetén helyzettájékoztatás nyújtása a pilóták és járművezetők részére;

c) tanácsadás és segítségnyújtás a légijárműveknek és a járműveknek a munkaterületen történő biztonságos és hatékony mozgásának biztosítása érdekében.

Megjegyzés: A gurítóradar (SMR) használatáról szóló információért lásd a Gurító Tanácsadó- és Irányító Rendszerek Kézikönyvet (Surface Movement Guidance and Control Systems, SMGCS) (Doc 9476)*, a* Fejlesztett Gurító Tanácsadó- és Irányító Rendszerek (A-SMCGS) Kézikönyvet (Doc 9830)*, valamint a* Légiforgalmi Szolgálatok Tervezési Kézikönyvét (Doc 9426).

4. fejezet
Repüléstájékoztató szolgálat

4.1 Alkalmazás

4.1.1 Repüléstájékoztató szolgálat biztosítandó minden légijárműnek, amelyet a tájékoztatás valószínűleg érinthet és amely:

a) számára légiforgalmi irányító szolgálatot nyújtanak; vagy

b) az illetékes légiforgalmi szolgálati egységek által egyéb módon ismert.

Megjegyzés: A repüléstájékoztató szolgálat biztosítása nem mentesíti a légijármű parancsnokát semmiféle felelősség alól és a repülési terv bármely javasolt módosítására vonatkozó végső döntést a légijármű parancsnokának kell meghoznia.

4.1.2 Ahol a légiforgalmi szolgálati egységek a repüléstájékoztató valamint a légiforgalmi irányító szolgálatot egyaránt ellátják, a légiforgalmi irányító szolgálat biztosítása, amennyiben ezt a légiforgalmi irányító szolgálat feladatainak ellátása így kívánja, a repüléstájékoztató szolgálati tevékenységgel szemben elsőbbséget élvez.

Megjegyzés: Elismert tény, hogy a végső megközelítést végző, le és felszálló valamint emelkedő légijárművek bizonyos körülmények között a légiforgalmi irányító szolgálat ellátásának körén kívül eső alapvető tájékoztatások késedelem nélkül történő megadását igényelhetik.

4.2 A repüléstájékoztató szolgálat tevékenységi köre

4.2.1 A repüléstájékoztató szolgálat terjedjen ki a következő érvényes tájékoztatások biztosítására:

a) SIGMET és AIRMET jelentések;

b) a kitörés előtti vulkán tevékenységről, a vulkán kitörésekről és vulkáni hamu felhőkről szóló tájékoztatások;

c) a radioaktív anyagoknak vagy mérgező vegyi anyagoknak a légkörbe kerüléséről szóló tájékoztatások;

d) a navigációs berendezések működésében beállt változásokról szóló tájékoztatások;

e) a repülőterek és repülőtéri berendezések állapotáról szóló tájékoztatások, beleértve a repülőtér mozgási területeinek állapotáról szóló jelentéseket, amennyiben azokon hó, jég vagy jelentős mélységű víz található;

f) a személyzet nélküli szabad léggömbökről szóló tájékoztatások; továbbá bármely más, a biztonságot valószínűleg befolyásoló tájékoztatás.

4.2.2 A repülések számára nyújtott repüléstájékoztató szolgálat a 4.2.1 pontban felsoroltakon kívül terjedjen ki a következőket érintő tájékoztatásokra is:

a) az indulási, érkezési vagy kitérő repülőtereken jelentett vagy előrejelzett időjárási körülmények;

b) összeütközési veszély jelzése a C, D, E, F és G osztályú légterekben üzemelő légijárművek számára;

c) a vízfelszín feletti repülés esetén a lehetőségek határain belül vagy a repülőgépvezető kérésére bármely rendelkezésre álló egyéb tájékoztatás — mint például a területen működő hajók rádió hívójele, helyzete, tényleges útiránya és sebessége, stb.

1. Megjegyzés: A b) alpontban jelzett tájékoztatás, amely csak a tájékoztatott légijármű részére összeütközési veszélyt jelentő ismert légijármű forgalomra terjed ki, esetenként nem teljes és a légiforgalmi szolgálatok nem vállalhatják a felelősséget annak minden alkalommal történő és pontos megadásáért.

2. Megjegyzés: Amikor szükség van a b) alpontban jelzett, összeütközési veszélyről szóló tájékoztatás kiegészítésére vagy amikor a repüléstájékoztató szolgálat működését ideiglenesen felfüggesztik, a kijelölt légterekben a légijárművek által nyújtott forgalmi tájékoztató rádióadásokat is alkalmazhatják. A légijárművek által nyújtott tájékoztató rádióadások és az ezekre vonatkozó üzemeltetési eljárások a C. Mellékletben találhatók.

4.2.3 ***Ajánlás*** *— A légiforgalmi szolgálati egységek a különleges légijelentéseket a lehető legrövidebb időn belül továbbítsák a többi érintett légijárműnek, a társult meteorológiai hivatalnak és a többi érintett ATS egységnek. A légijárműveknek szóló adást az érintett meteorológiai és légiforgalmi szolgálati hatóságok közötti egyezményben meghatározott ideig folytassák.*

4.2.4 A látvarepülési szabályok szerint végrehajtott repülések számára biztosított repüléstájékoztató szolgálat a 4.2.1 pontban felsoroltakon kívül terjedjen ki a repülés útvonalára vonatkozó forgalmi és olyan időjárási körülményekre, amelyek valószínűleg lehetetlenné teszik a látvarepülési szabályok mellett történő üzemelést.

4.3 Üzemeltetési repüléstájékoztató szolgálati rádióadások

4.3.1 Alkalmazás

4.3.1.1 A repüléstájékoztató szolgálat során biztosított időjárási valamint a navigációs berendezések és repülőterek üzemi állapotára vonatkozó tájékoztatásokat a lehetőségek szerint az üzemeltetési szempontból előnyös, összetett formátumban továbbítsák.

4.3.1.2 ***Ajánlás*** *— Ahol a légijárművek számára összetett üzemeltetési repüléstájékoztató közleményeket továbbítanak, ott ezek a meghatározott tartalommal és -- ahol így írták elő -- a repülés különböző szakaszaira meghatározott sorrendben kerüljenek adásra.*

4.3.1.3 ***Ajánlás*** *— Amennyiben üzemeltetési repüléstájékoztató szolgálati rádióadásokat biztosítanak, ezek a repülés különböző szakaszaira vonatkozó kiválasztott üzemeltetési és időjárási elemeket tartalmazzák. Ezek a rádióadások három fő típusúak, rövidhullámú (HF), ultrarövidhullámú (UHF) és ATIS adások legyenek.*

4.3.1.4 OFIS üzenetek használata irányított kérés/válaszadás közleményekben

Amennyiben azt a pilóta kéri, a vonatkozó OFIS közleményt a megfelelő ATS egység köteles továbbítani.

4.3.2 Rövidhullámú (HF) üzemeltetési repüléstájékoztató szolgálati rádióadások (OFIS)

4.3.2.1 ***Ajánlás*** *— Biztosítsanak rövidhullámú (HF) üzemeltetési repüléstájékoztató szolgálati rádióadásokat, amennyiben a körzeti légiközlekedési egyezmény szerint erre szükség van.*

4.3.2.2 ***Ajánlás*** *— Amennyiben ilyen rádióadást biztosítanak:*

a) a tájékoztatás a körzeti légiközlekedési egyezmény alapján lehetőség szerint legyen összhangban a 4.3.2.5 ponttal;

b) a körzeti légiközlekedési egyezmény alapján határozzák meg azokat a repülőtereket, amelyekre vonatkozóan időjárás-jelentéseket és előrejelzéseket vesznek fel az adásba;

c) a körzeti légiközlekedési egyezmény alapján határozzák meg a rádióadásban szereplő állomások időbeli sorrendjét;

d) a rövidhullámú OFIS közlemény kidolgozása alkalmával vegyék figyelembe az emberi teljesítmény tényezőket. A rádióadásban kiadott közlemény hossza ne haladja meg a körzeti légiközlekedési egyezményben kijelölt időtartamot, de fordítsanak gondot arra, hogy az adás sebessége ne csökkentse a közlemény érthetőségét;

Megjegyzés: Az emberi teljesítményt érintő útmutatás az Emberi Tényezők Kiképzési Kézikönyv*ben (Doc 9683) található;*

e) az egyes repülőterekre vonatkozó közleményeket annak a repülőtérnek megnevezésével azonosítsák, amelyre a tájékoztatás vonatkozik;

f) amennyiben a rádióadás céljára kellő időben nem érkezik meg a tájékoztatás, továbbítsák a legutolsó rendelkezésre álló tájékoztatást, jelezve az észlelés időpontját;

g) amennyiben ez a rádióállomásnak kiosztott időtartamon belül lehetséges, ismételjék meg a teljes rádióadást;

h) a rádióadással biztosított tájékoztatást azonnal módosítsák, ha jelentős változás következik be; valamint

i) a rövidhullámú OFIS közleményeket az Állam által kijelölt legalkalmasabb egység vagy egységek állítsák össze és továbbítsák.

4.3.2.3 ***Ajánlás** — Egy a jelenleginél alkalmasabb, a légiközlekedési rádió-távbeszélő összeköttetésben használható egyetemes beszédforma kifejlesztéséig és elfogadásáig a nemzetközi légiforgalom számára összeállított, repülőterekre vonatkozó rövidhullámú OFIS rádióadásokat angol nyelven továbbítsák.*

4.3.2.4 ***Ajánlás** — Ahol a rövidhullámú OFIS rádióadásokat egynél több nyelven továbbítják, minden egyes nyelvhez külön sugárzási csatornát használjanak.*

4.3.2.5 ***Ajánlás** — A rövidhullámú (HF) üzemeltetési repüléstájékoztató szolgálati rádióadások a következő tájékoztatásokat tartalmazzák, az alább jelzett vagy a körzeti légiközlekedési egyezményben meghatározott sorrendben:*

a) Útvonalra vonatkozó időjárás tájékoztatás (Az útvonalon előforduló jelentős időjárási jelenségekre vonatkozó tájékoztatást a 3. Annex előírásai alapján SIGMET formában készítsék el).

b) A repülőtérre vonatkozó tájékoztatás, amely a következőket tartalmazza:

1) a repülőtér megnevezése;

2) az észlelés időpontja;

3) alapvető légijármű üzemeltetési tájékoztatások;

4) talajszél iránya és sebessége — ha szükséges a legnagyobb szélsebesség;

*5) * látástávolság — ha szükséges a futópályamenti látástávolság érték (RVR);*

*6) * jelenlegi időjárás;*

*7) * 1500 méter (5000 láb) vagy a legmagasabb minimális szektor magasság alatti felhőzet — amelyik a nagyobb érték; cumulonimbus felhő; ha a felhőzet zárt, függőleges látástávolság — ha rendelkezésre áll; és*

8) repülőtéri előrejelzés.

Megjegyzés: A *-al jelölt elemek a CAVOK kifejezéssel helyettesíthetők, ha a PANS-ATM (Doc 4444) 11. fejezetében jelzett időjárási körülmények fennállnak.

4.3.3 Ultrarövidhullámú (VHF) légijármű üzemeltetési repüléstájékoztató szolgálati rádióadások

4.3.3.1 ***Ajánlás** — Biztosítsanak ultrarövidhullámú (VHF) üzemeltetési repüléstájékoztató szolgálati rádióadásokat a körzeti légiközlekedési egyezmény előírásainak megfelelően.*

4.3.3.2 ***Ajánlás*** *— Amennyiben ilyen rádióadást biztosítanak:*

a) a körzeti légiközlekedési egyezmény alapján határozzák meg azokat a repülőtereket, amelyekre vonatkozóan időjárás-jelentéseket és előrejelzéseket vesznek fel az adásba;

b) az egyes repülőterekre vonatkozó közleményeket annak a repülőtérnek megnevezésével azonosítsák, amelyre a tájékoztatás vonatkozik;

c) amennyiben a rádióadás céljára kellő időben nem érkezik meg a tájékoztatás, továbbítsák a legutolsó rendelkezésre álló tájékoztatást, jelezve az észlelés időpontját;

d) a rádióadás folyamatos és ismétlődő legyen;

e) az ultrarövidhullámú OFIS közlemény kidolgozása alkalmával vegyék figyelembe az emberi teljesítmény tényezőket. A rádióadásban kiadott közlemény hossza lehetőleg ne haladja meg az öt percet, de fordítsanak gondot arra, hogy az adás sebessége ne csökkentse a közlemény érthetőségét; Megjegyzés: Az emberi teljesítményt érintő útmutatás az Emberi Tényezők Kiképzési Kézikönyv*ben (Doc 9683) található;*

f) a rádióadásban kiadott közleményt a körzeti légiközlekedési egyezmény előírásainak megfelelően rendszeres időközönként a legújabb adatokkal módosítsák, továbbá azonnal módosítsák, ha jelentős változás következik be; valamint

g) az ultrarövidhullámú OFIS közleményeket az Állam által kijelölt legalkalmasabb egység vagy egységek állítsák össze és továbbítsák.

4.3.3.3 ***Ajánlás*** *— Egy a jelenleginél alkalmasabb, a légiközlekedési rádió-távbeszélő összeköttetésben használható egyetemes beszédforma kifejlesztéséig és elfogadásáig nemzetközi légiforgalom számára összeállított, repülőterekre vonatkozó ultrarövidhullámú OFIS rádióadásokat angol nyelven továbbítsák.*

4.3.3.4 ***Ajánlás*** *— Ahol az ultrarövidhullámú OFIS rádióadásokat több mint egy nyelven továbbítják, minden egyes nyelvhez külön sugárzási csatornát használjanak.*

4.3.3.5 ***Ajánlás*** *— Az ultrarövidhullámú (VHF) üzemeltetési repüléstájékoztató szolgálati rádióadások a következő tájékoztatásokat tartalmazzák az alábbi jelzett sorrendben:*

a) a repülőtér megnevezése;

b) az észlelés időpontja;

c) leszállásra használt futópálya;

d) a futópálya felületi állapotának jelentős jellemzői és szükség esetén a fékhatás;

e) szükség szerint a navigációs berendezések és segédeszközök üzemi állapotának változásai;

f) várakozásos késleltetés — szükség szerint;

g) talajszél iránya és sebessége — ha szükséges a legnagyobb szélsebesség;

*h) * látástávolság — ha szükséges, a futópályamenti látástávolság érték (RVR);*

*i) * jelenlegi időjárás;*

*j) * 1500 méter (5000 láb) vagy a legmagasabb minimális szektor magasság alatti felhőzet — amelyik a nagyobb érték; cumulonimbus felhő; ha a felhőzet zárt, függőleges látástávolság — amikor rendelkezésre áll;*

k) # levegő hőmérséklete;

l) # harmatpont hőmérséklete;

m) # QNH magasságmérő beállítási érték;

n) a jelenlegi időjárás üzemeltetést befolyásoló jellemzőiről és szükség szerint a szélnyírásról szóló kiegészítő tájékoztatások;

o) "trend-type" típusú leszállási előrejelzés — ha rendelkezésre áll; és

p) az érvényes SIGMET tájékoztatások jelzése.

Megjegyzés: A *-al jelölt elemek a CAVOK kifejezéssel helyettesíthetők, ha a PANS-RAC (Doc 4444) IX. rész 4.3.2.3.9 pontban jelzett időjárási körülmények fennállnak.
A # -el jelölt elemek a körzeti légiközlekedési egyezmény előírásai alapján szerepelnek.

4.3.4 Automatikus beszéd-üzemű közelkörzeti tájékoztató szolgálat (Voice-ATIS)

4.3.4.1 Automatikus beszéd-üzemű közelkörzeti tájékoztató szolgálati (Voice-ATIS) rádióadások biztosítandók azokon a repülőtereken, amelyeken a légiforgalmi szolgálatok ultrarövidhullámú (VHF) föld-levegő távközlési csatornái terhelésének, a közleményváltások számának csökkentésére van szükség.

Amennyiben ilyen rádióadásokat biztosítanak, azok az alábbiak lehetnek:

a) egy rádióadás az érkező légijárművek számára; vagy

b) egy rádióadás az induló légijárművek számára; vagy

c) egy közös rádióadás az érkező és induló légijárművek számára; vagy

d) egy-egy rádióadás az érkező és induló légijárművek számára azokon a repülőtereken, amelyeken az érkező és induló légijárművek számára összeállított közös rádióadás túlságosan hosszú lenne.

4.3.4.2 Ahol gyakorlatilag lehetséges, a beszédüzemű ATIS rádióadások számára külön ultrarövidhullámú (VHF) frekvenciát használjanak. Amennyiben ez nem áll rendelkezésre, az adást a legalkalmasabb közelkörzeti navigációs berendezés, lehetőleg VOR irányadó hangcsatornáján sugározzák, feltéve hogy a berendezés hatótávolsága és az érthetőség megfelelő, valamint a navigációs berendezés azonosítója úgy kerül sugárzásra a közleménnyel felváltva, hogy az nem teszi ez utóbbit érthetetlenné.

4.3.4.3 A beszéd-üzemű ATIS rádióadást ne sugározzák az ILS leszállító berendezés hangcsatornáján.

4.3.4.4 Amennyiben beszéd-üzemű ATIS rádióadást biztosítanak, az folyamatos és ismétlődő legyen.

4.3.4.5 Az érvényes adás tartalmát azonnal közöljék a megközelítésre, leszállásra és felszállásra vonatkozó tájékoztatások megadásáért felelős érintett légiforgalmi szolgálati egységekkel, amennyiben az adást nem ezek állították össze.

Megjegyzés: Az ATIS biztosítására vonatkozó előírások úgy a beszéd-üzemű mint a D-ATIS esetére az alábbi 4.3.6 pontban találhatók.

4.3.4.6 A nemzetközi légitársaságok általi használatra kijelölt repülőtereken üzemeltetett Beszédüzemű Automatikus közelkörzeti tájékoztató szolgálat (Voice-ATIS) minimálisan angol nyelven nyújtandó.

4.3.4.7 ***Ajánlás** — Ahol a beszédüzemű ATIS rádióadásokat egynél több nyelven továbbítják, minden egyes nyelvhez külön sugárzási csatornát használjanak.*

4.3.4.8 ***Ajánlás** — A beszédüzemű ATIS rádióadás közlemény hossza lehetőség szerint ne haladja meg a 30 másodpercet de fordítsanak gondot arra, hogy az adás sebessége vagy az ATIS rádióadás sugárzására használt navigációs berendezés azonosító jele ne csökkentse az ATIS közlemény érthetőségét; Az ATIS rádióadás kidolgozása alkalmával vegyék figyelembe az emberi teljesítmény tényezőket.*

Megjegyzés: Az emberi teljesítményt érintő útmutatás az Emberi Tényezők Kiképzési Kézikönyv*ben (Doc 9683) található.*

4.3.5 Automatikus távközlési adathálózati közelkörzeti tájékoztató szolgálat (D-ATIS)

4.3.5.1 Ahol a meglevő beszéd-üzemű ATIS mellett kiegészítésképpen automatikus távközlési adathálózati közelkörzeti tájékoztatást is biztosítanak, az adások úgy tartalomban mint formátumban legyenek egymással azonosak.

4.3.5.1.1 Ahol az adások valós idejű és érvényes időjárás tájékoztatásokat is tartalmaznak, azonban az adatok a jelentős időjárás változás határértékein belül maradnak, az adások tartalma az azonosító jelzés fenntartása mellett azonosnak tekinthető.

Megjegyzés: A jelentős időjárás változás határértékeit az 3. Annex, 3. Függelék 2.3.2 pontjában határoztuk meg.

4.3.5.2 Ahol a meglevő beszédüzemű ATIS mellett kiegészítésképpen D-ATIS tájékoztatást is biztosítanak és az ATIS adást a legújabb adatok miatt módosítani kell, mindkét adást egyszerre frissítsék.

Megjegyzés: A D-ATIS adással kapcsolatos tájékoztatót a *Légiforgalmi Szolgálatok Adathálózati Összeköttetéseinek Alkalmazása Kézikönyv* (Doc 9694) tartalmazza. A D-ATIS műszaki előírásait a 10. Annex III. kötet I. rész 3. fejezete tartalmazza.

4.3.6 Automatikus közelkörzeti tájékoztató szolgálat (beszédüzemű és/vagy adathálózati)

4.3.6.1 Amennyiben beszédüzemű és/vagy adathálózati ATIS adást biztosítanak:

a) a tájékoztató közlemény csak egy repülőtérre vonatkozzon;

b) a kiadott tájékoztatást azonnal módosítsák, ha jelentős változás következik be;

c) az ATIS közlemény összeállításáért és továbbításáért a légiforgalmi szolgálat felelős;

d) az egyes ATIS közleményeket az ICAO betűzési ABC egyik betűjéből álló jelzéssel azonosítsák. Az egymást követő ATIS azonosító jelzések az ABC sorrendjében következzenek;

e) a légijármű a bevezető irányító szolgálatot vagy repülőtéri irányító szolgálatot ellátó ATS egységgel történő kapcsolatfelvétel alkalmával nyugtázza a tájékoztató közlemény vételét;

f) az illetékes légiforgalmi szolgálati egység a fenti e) alpontban jelzett közleményre adott válaszában vagy érkező légijármű esetében az illetékes légiforgalmi szolgálati hatóság előírása szerint adja meg a légijármű számára az aktuális magasságmérő beállítási értéket és

g) az időjárási tájékoztatásokat a repülőtéren kiadott helyi időjárás-jelentésből adják meg.

Megjegyzés: A 3. Annex 4.5 és 4.7 szakaszainak megfelelően a talajszél irányát és sebességét 2 perces, míg a futópályamenti látástávolság értéket (RVR) 1 perces időtartamra átlagolják; a szél tájékoztatás az induló légijármű esetében a futópálya menti, az érkező légijármű esetében pedig a földetérési területen észlelt szélre vonatkozzon. A helyi időjárás jelentés minta, amely tartalmazza az egyes elemek értéktartományát és pontosságát, a 3. Annex 3.. Függelékében található. A helyi időjárás-jelentésre vonatkozó további előírásokat a 3. Annex 4. fejezete, valamint D. Melléklete tartalmazza.

4.3.6.2 Amikor a gyorsan változó időjárási körülmények miatt nem célszerű az időjárás-jelentésnek az ATIS adásba történő felvétele, a kiadott ATIS közlemény jelezze, hogy az aktuális időjárásra vonatkozó tájékoztatást az illetékes légiforgalmi szolgálati egységgel történő első kapcsolatfelvétel alkalmával adják meg.

4.3.6.3 Az érvényes, az érintett légijármű által vett és nyugtázott ATIS adásban megadott tájékoztatásokat a 4.3.6.1 f) alpont előírása szerinti magasságmérő beállítási érték kivételével a légijármű számára a közvetlen rádióösszeköttetés során nem szükséges megadni.

4.3.6.4 Amennyiben egy légijármű olyan ATIS adás vételét nyugtázza, amely már nem érvényes, késedelem nélkül adják meg számára a tájékoztatás minden, időközben módosult elemét.

4.3.6.5 ***Ajánlás** — Az ATIS adás tartalma a lehető legrövidebb legyen. A 4.3.7 — 4.3.9 pontokban ismertetett tájékoztatások mellett, például a légiforgalmi tájékoztató kiadványokban (AIP) vagy NOTAM formában már rendelkezésre álló tájékoztatásokat csak akkor vegyék fel az ATIS közleménybe, ha ezt különleges körülmények indokolják.*

4.3.7 ATIS adások az érkező és induló légijármű részére

A közös érkezési és indulási tájékoztatásokat tartalmazó ATIS adás a megadott sorrendben a következő elemekből álljon:

a) repülőtér megnevezése;

b) érkezés és/vagy indulás jelzése;

c) automatikus távközlési adathálózati közelkörzeti D-ATIS összeköttetés esetén a jelentés típusa;

d) azonosító jelzés;

e) az észlelés időpontja — ha szükséges;

f) a megközelítés(ek) várható típusa;

g) a használatos futópálya vagy futópályák; a tényleges veszélyt jelentő légijármű megállító rendszer állapota — ha ilyet telepítettek;

h) a futópálya felületi állapotának jelentős jellemzői és a fékhatás — ha szükséges;

i) várakozásos késleltetés — ha szükséges;

j) átváltási szint — ha alkalmazható;

k) egyéb alapvető fontosságú légijármű üzemeltetési tájékoztatás;

l) talajszél iránya és sebessége, beleértve ennek jelentős változásait is, valamint ha a használatos futópálya egyes szakaszaira külön talajszél mérőket telepítettek és a járatók ezt a tájékoztatást igénylik, a futópálya jelzése és azon szakasz meghatározása, amelyre a tájékoztatás vonatkozik;

m) * látástávolság és amikor szükséges, a futópályamenti látástávolság érték (RVR);

n) * jelenlegi időjárás;

o) * 1500 méter (5000 láb) vagy a legmagasabb minimális szektor magasság alatti felhőzet — amelyik a nagyobb érték; cumulonimbus felhő; ha a felhőzet zárt, függőleges látástávolság — ha rendelkezésre áll;

p) levegő hőmérséklete;

q) # harmatpont hőmérséklete;

r) QNH magasságmérő beállítási érték;

s) a megközelítési, felszállási és emelkedési területeken tapasztalt szignifikáns időjárásról szóló bármely rendelkezésre álló tájékoztatás -- beleértve a szélnyírást is -- valamint a jelenlegi időjárás üzemeltetést befolyásoló jellemzőiről szóló kiegészítő tájékoztatások;

t) "trend-type" típusú leszállási előrejelzés; valamint

u) különleges ATIS utasítások.

4.3.8 ATIS adások érkező légijárművek részére

A csak érkezési tájékoztatásokat tartalmazó ATIS adás a megadott sorrendben a következő elemekből álljon:

a) a repülőtér megnevezése;

b) érkezés jelzése;

c) automatikus távközlési adathálózati közelkörzeti D-ATIS összeköttetés esetén a jelentés típusa;

d) azonosító jelzés;

e) az észlelés időpontja — ha szükséges;

f) a megközelítés várható típusa;

g) a leszállásra használatos fő futópálya vagy futópályák; a tényleges veszélyt jelentő légijármű megállító rendszer állapota — ha ilyet telepítettek;

h) a futópálya felületi állapotának jelentős jellemzői és a fékhatás — ha szükséges;

i) várakozásos késleltetés — ha szükséges;

j) átváltási szint — ha alkalmazható;

k) egyéb alapvető fontosságú légijármű üzemeltetési tájékoztatás;

l) talajszél iránya és sebessége, beleértve ennek jelentős változásait is, valamint ha a használatos futópálya egyes szakaszaira külön talajszél mérőket telepítettek és a járatók ezt a tájékoztatást igénylik, a futópálya jelzése és azon szakasz meghatározása, amelyre a tájékoztatás vonatkozik;

m) * látástávolság és amikor szükséges, a futópályamenti látástávolság érték (RVR);

n) * jelenlegi időjárás;

o) * 1500 méter (5000 láb) vagy a legmagasabb minimális szektor magasság alatti felhőzet — amelyik a nagyobb érték; cumulonimbus felhő; ha a felhőzet zárt, függőleges látástávolság — ha rendelkezésre áll;

p) levegő hőmérséklete;

q) # harmatpont hőmérséklete;

r) QNH magasságmérő beállítási érték;

s) a megközelítési területen tapasztalt szignifikáns időjárásról szóló bármely rendelkezésre álló tájékoztatás -- beleértve a szélnyírást is -- valamint a jelenlegi időjárás üzemeltetést befolyásoló jellemzőiről szóló kiegészítő tájékoztatások;

t) "trend-type" típusú leszállási előrejelzés; valamint

u) különleges ATIS utasítások.

4.3.9 ATIS adások induló légijárművek részére

A csak indulási tájékoztatásokat tartalmazó ATIS adás a megadott sorrendben a következő elemekből álljon:

a) a repülőtér megnevezése;

b) indulás jelzése;

c) automatikus távközlési adathálózati közelkörzeti D-ATIS összeköttetés esetén a jelentés típusa;

d) ATIS azonosító jelzés;

e) az észlelés időpontja — ha szükséges;

f) a felszállásra használatos futópálya vagy futópályák; a tényleges veszélyt jelentő légijármű megállító rendszer állapota ha ilyet telepítettek;

g) a felszállásra használatos futópálya felületi állapotának jelentős jellemzői és a fékhatás — ha szükséges;
h) indulási késleltetés — ha szükséges;

i) átváltási szint — ha alkalmazható;

j) egyéb alapvető fontosságú légijármű üzemeltetési tájékoztatás;

k) talajszél iránya és sebessége, beleértve ennek jelentős változásait is, valamint ha a használatos futópálya egyes szakaszaira külön talajszél mérőket telepítettek és a járatók ezt a tájékoztatást igénylik, a futópálya jelzése és azon szakasz meghatározása, amelyre a tájékoztatás vonatkozik;

l) * látástávolság és amikor szükséges, a futópályamenti látástávolság érték (RVR);

m) * jelenlegi időjárás;

n) * 1500 méter (5000 láb) vagy a legmagasabb minimális szektor magasság alatti felhőzet — amelyik a nagyobb érték; cumulonimbus felhő; ha a felhőzet zárt, függőleges látástávolság — ha rendelkezésre áll;

o) a levegő hőmérséklete;

p) # harmatpont hőmérséklete;

q) QNH magasságmérő beállítási érték;

r) a felszállási és emelkedési területeken tapasztalt szignifikáns időjárásról szóló bármely rendelkezésre álló tájékoztatás -- beleértve a szélnyírást is -- valamint a jelenlegi időjárás üzemeltetést befolyásoló jellemzőiről szóló kiegészítő tájékoztatások;

s) "trend-type" típusú felszállási előrejelzés; valamint

t) különleges ATIS utasítások.

Megjegyzés: A 4.3.7 — 4.3.9 pontokban * -al jelölt elemek a CAVOK kifejezéssel helyettesíthetők, ha a PANS-RAC (Doc 4444) IX. rész 4.3.2.3.9 pontban jelzett időjárási körülmények fennállnak; A 4.3.5 — 4.3.7 pontokban # -al jelölt elemek a körzeti légiközlekedési egyezmény előírásai alapján szerepelnek. *Szolgálatok Együttműködése Kézikönyv (Doc 9377) 1. Függelékében található.*

4.4 VOLMET rádióadások és D-VOLMET szolgálat

4.4.1 ***Ajánlás** — Biztosítsanak rövidhullámú (HF) és/vagy ultrarövidhullámú (VHF) VOLMET rádióadásokat és D-VOLMET szolgálatot, ha erre helyi körzeti légiközlekedési egyezmények szerint szükség van.*

Megjegyzés: A VOLMET rádióadások és D-VOLMET szolgálat részleteit a 3. Annex 11.5 és 11.6 pontjai tartalmazza.

4.4.2 ***Ajánlás** — A VOLMET rádióadásoknál a szabványos rádió-távbeszélő kifejezéseket használják.*

Megjegyzés: A VOLMET rádióadásoknál használandó szabványos rádió-távbeszélő kifejezésekre vonatkozó útmutatás a *Légiforgalmi Szolgálatok, Légiforgalmi Tájékoztató Szolgálatok és Légiforgalmi Meteorológiai Szolgálatok Együttműködése Kézikönyv* (Doc 9377) 1. Függelékében található.

5. fejezet
Riasztó szolgálat

5.1 Alkalmazás

5.1.1 Riasztó szolgálat biztosítandó:

a) minden légijárműnek, amelynek légiforgalmi irányító szolgálatot nyújtanak;

b) a gyakorlati lehetőségek határain belül minden egyéb légijárműnek, amely repülési tervet töltött ki vagy amely a légiforgalmi szolgálati egységek által egyéb módon ismert; valamint

c) bármely légijárműnek, amelyről ismert vagy feltételezett, hogy jogellenes beavatkozás alatt áll.

5.1.2 A repüléstájékoztató vagy körzeti irányító központok az érintett repüléstájékoztató vagy irányító körzeten belül üzemelő kényszerhelyzetben levő légijárművekre vonatkozó összes tájékoztatás központi gyűjtő helyeként szolgálnak és továbbítják ezeket a tájékoztatásokat az illetékes mentést koordináló központ felé.

5.1.3 Amennyiben a kényszerhelyzet akkor következik be, amikor egy légijármű a repülőtér irányító torony vagy a bevezető irányító egység irányítása alatt áll, ez az egység azonnal tájékoztassa a felelős repüléstájékoztató vagy körzeti irányító központot, amely viszont a mentést koordináló központot értesíti, kivéve ha a kényszerhelyzet természete miatt a repüléstájékoztató vagy körzeti irányító központ illetve a mentést koordináló központ értesítése felesleges.

5.1.4 Ennek ellenére, ha a helyzet sürgőssége ezt követeli, a felelős repülőtéri irányító torony vagy a bevezető irányító egység először hajtsa végre a riasztást és tegye meg a szükséges egyéb intézkedéseket azoknak az illetékes helyi kutató és kényszerhelyzeti (mentő) szervezeteknek mozgósítására, amelyek meg tudják adni a szükséges azonnali segítséget.

5.2 A mentést koordináló központok értesítése

5.2.1 A légiforgalmi szolgálati egységek minden más, az értesítést tanácsossá tevő körülmény mérlegelése nélkül, az 5.5.1 pontban előírtak kivételével azonnal értesítsék a mentést koordináló központot, ha úgy ítélik meg, hogy egy légijármű a következők szerint kényszerhelyzetben van:

a) *Bizonytalanság állapota*, amikor:

1) a légijárműtől semmiféle közlemény nem érkezett harminc percen belül azon időponttól számítva, amikor attól közleményt kellett volna kapni vagy attól az időponttól számítva, amikor az első sikertelen kísérletet tették kapcsolat felvételére a légijárművel — amelyik a korábbi időpont ; vagy amikor

2) a légijármű a légiforgalmi szolgálati egységek felé utoljára megadott vagy ezek által számított érkezési idő

után harminc percen belül nem érkezik meg — amelyik a korábbi időpont; kivéve ha a légijármű és a fedélzetén tartózkodó személyek biztonságát illetően semmiféle kétség nincs.

b) *Riasztás állapota,* amikor:

1) a bizonytalanság állapotát követően a légijárművel való összeköttetés felvételére irányuló ismételt kísérletek sikertelenek maradtak vagy a többi illetékes forráshoz intézett kérdésekre sem kaptak új híreket a légijárműről; vagy amikor

2) a légijármű részére engedélyezték a leszállást, azonban az nem szállt le a számított leszállás időpontját követő öt percen belül és a légijárművel nem sikerült az összeköttetést ismét felvenni; vagy amikor

3) olyan tájékoztatás érkezett, amely szerint a légijármű működőképessége csökkent, azonban nem olyan mértékben, hogy kényszerleszállás valószínű;

kivéve ha megfelelő biztosíték van arra nézve, hogy légijármű és a fedélzetén tartózkodó személyek biztonsága nincs veszélyben; vagy amikor

4) a légijárműről ismert vagy feltételezett, hogy jogellenes beavatkozás alatt áll.

c) *Veszély állapota,* amikor:

1) a riasztás állapotát követően a légijárművel való összeköttetés felvételére irányuló további kísérletek sikertelenek maradtak és a szélesebb körben végzett sikertelen tájékoztatás kérés annak valószínűségét jelzi, hogy a légijármű veszélyben van; vagy amikor

2) a fedélzeten levő üzemanyag valószínűleg elfogyott vagy nem elegendő a légijármű biztonságos leszállásának végrehajtására; vagy amikor

3) olyan tájékoztatás érkezett, amely szerint a légijármű működőképessége olyan mértékben csökkent, hogy kényszerleszállás valószínű; vagy amikor

4) tájékoztatás érkezett arról vagy okkal feltételezhető, hogy a légijármű kényszerleszállásra készül vagy ezt végrehajtotta;

kivéve ha joggal biztosnak tekinthető, hogy a légijármű és a fedélzetén tartózkodó személyek biztonságát nem fenyegeti súlyos és közvetlen veszély valamint nincs szüksége azonnali segítségre.

5.2.2 Az értesítés a következő rendelkezésre álló tájékoztatásokat tartalmazza a megadott sorrendben;

a) INCERFA, ALERFA vagy DETRESFA kifejezés a kényszerhelyzet állapotától függően;

b) a hívó szerv és személy neve;

c) a kényszerhelyzet természete;

d) a repülési terv lényeges adatai;

e) azon egység megnevezése, amely utoljára volt kapcsolatban a légijárművel, az összeköttetés időpontja és az alkalmazott módszer;

f) az utolsó helyzetjelentés és meghatározásának módja;

g) a légijármű színe és megkülönböztető jelzései;

h) a légijármű fedélzetén teheráruként szállított veszélyes áruk;

i) a kényszerhelyzetet jelentő egység által végrehajtott intézkedések;

j) egyéb vonatkozó tájékoztatás.

5.2.2.1 ***Ajánlás*** *— Az 5.2.2 pontban meghatározott tájékoztatás azon részét, amely a mentést koordináló központ értesítésének időpontjában nem állt rendelkezésre, a légiforgalmi szolgálati egység a kkényszerhelyzeti állapot bejelentése előtt kísérelje meg beszerezni, ha joggal feltételezhető, hogy ez az állapot bekövetkezik.*

5.2.3 Az 5.2.1 pontban meghatározott értesítésen túl a mentést koordináló központ számára késedelem nélkül adjanak meg:

a) bármely további hasznos tájékoztatást, különös tekintettel a kényszerhelyzet egymást követő állapotainak alakulására; vagy

b) azt a tájékoztatást, hogy a kényszerhelyzet megszűnt.

Megjegyzés: A mentést koordináló központ által kezdeményezett tevékenységek leállítása ezen központ felelőssége.

5.3 A távközlési berendezések felhasználása

A légiforgalmi szolgálati egységek szükség szerint használják fel az összes rendelkezésre álló távközlési berendezést a kényszerhelyzetben levő légijárművel történő kapcsolatfelvétel megkísérlésére és fenntartásra, továbbá a légijárműről szóló tájékoztatások (hírek) kérésére.

5.4 A kényszerhelyzetben levő légijármű útvonalának követése

Amikor feltételezhetően kényszerhelyzet áll fenn, az érintett légijármű repülését a légijármű valószínű jövőbeni helyzetének és utolsó ismert helyzetétől számított legnagyobb lehetséges működési területének meghatározása érdekében térképen kövessék. Az érintett légijármű közelében működő többi ismert légijármű repülését is kövessék figyelemmel, hogy azok valószínű jövőbeni helyzetét és maximális üzemanyag készletüket meghatározhassák.

5.5 A járató tájékoztatása

5.5.1 Amikor egy körzeti irányító vagy repüléstájékoztató központ úgy ítéli meg, hogy egy légijármű a bizonytalanság vagy riasztás állapotában van, a mentést koordináló központ értesítése előtt lehetőség szerint értesítse a járatót.

Megjegyzés: Amennyiben egy légijármű veszély állapotában van, az 5.2.1 pontnak megfelelően azonnal értesítsék a mentést koordináló központot.

5.5.2 A körzeti irányító vagy repüléstájékoztató központ által a mentést koordináló központnak továbbított minden tájékoztatást lehetőség szerint késedelem nélkül adjanak meg a járatónak is.

5.6 Kényszerhelyzetben levő légijármű közelében üzemelő légijármű tájékoztatása

5.6.1 Amikor egy légiforgalmi szolgálati egység megállapította, hogy egy légijármű kényszerhelyzetben van, az érintett légijármű közelében működő többi ismert légijárművet az 5.6.2 pont előírása kivételével a lehető legrövidebb időn belül értesítsék a kényszerhelyzet természetéről.

5.6.2 Amikor egy illetékes légiforgalmi szolgálati egység tudja vagy feltételezi, hogy egy légijármű jogellenes beavatkozás alatt áll, az ATS levegő-föld közleményváltások során ne utaljon a kényszerhelyzet természetére, kivéve ha ezt az érintett légijármű jelezte elsőként ezen összeköttetések alkalmával és bizonyos, hogy egy ilyen utalás nem fogja súlyosbítani a helyzetet.

6. fejezet A légiforgalmi szolgálatok távközlési követelményei

6.1 Légiforgalmi mozgó szolgálat (levegő-föld összeköttetések)

6.1.1 Általános rész

6.1.1.1 A légiforgalmi szolgálatok céljaira használt levegő-föld összeköttetések esetében közvetlen rádió-távbeszélőt és/vagy digitális adathálózati összeköttetés alkalmazandó.

Megjegyzés: A légiforgalmi szolgálati egységek vészhelyzeti 121.5 MHz frekvencia csatornával történő felszerelésére és ezen frekvencia állandó figyelésének fenntartására vonatkozó előírás a 10. Annex II. és V. köteteiben található.

6.1.1.2 Amikor a légiforgalmi irányító szolgálat biztosítására közvetlen, a repülőgépvezető és a légiforgalmi irányító közötti kétirányú rádiótávbeszélőt és/vagy digitális adathálózati összeköttetést alkalmaznak, az összes ilyen levegő-föld távközlési csatornát adatrögzítő berendezéssel lássanak el.

Megjegyzés: Valamennyi, a légiforgalmi irányítás közleményeiről automatikusan készült felvétel tárolásának körülményeit a 10. Annex, II. kötet 3.5.1.5 pont részletezi.

6.1.1.3 A 6.1.1.2 pontban előírt kommunikációs csatornákon folytatott közleményváltásról készített felvételek legalább harminc napos időtartamig megőrzendők.

6.1.2 A repüléstájékoztató szolgálat esetében

6.1.2.1 A levegő-föld távközlési berendezés tegyen lehetővé kétirányú összeköttetést a repüléstájékoztató szolgálatot ellátó egység és a repüléstájékoztató körzetben bárhol repülő, megfelelően felszerelt légijárművek között.

6.1.2.2 ***Ajánlás** — A repüléstájékoztató szolgálat rendelkezésére álló levegő-föld távközlési berendezések lehetőség szerint közvetlen, gyors, folyamatos és légköri rádiózavar mentes kétirányú összeköttetést tegyenek lehetővé.*

6.1.3 Körzeti irányító szolgálat esetében

6.1.3.1 A levegő-föld távközlési berendezés tegyen lehetővé kétirányú összeköttetést a körzeti irányító szolgálatot ellátó egység és az irányítói terület(ek)en belül bárhol repülő, megfelelően felszerelt légijárművek között.

6.1.3.2 ***Ajánlás*** *— A körzeti irányító szolgálat rendelkezésre álló levegő-föld távközlési berendezések lehetőség szerint közvetlen, gyors, folyamatos és légköri rádiózavar mentes kétirányú összeköttetést tegyenek lehetővé.*

6.1.3.3 ***Ajánlás*** *— Ahol a körzeti irányító szolgálat céljaira levegő-föld beszédüzemű távközlési csatornákat használnak és ezeket rádiótávbeszélő kezelők üzemeltetik, hozzanak megfelelő intézkedéseket arra, hogy amikor és ahogy ez szükséges, közvetlen légijármű vezető — légiforgalmi irányító közötti összeköttetés alakulhasson ki.*

6.1.4 Bevezető irányító szolgálat esetében

6.1.4.1 A levegő-föld távközlési berendezés tegyen lehetővé közvetlen, gyors, folyamatos és légköri rádiózavar mentes kétirányú összeköttetést a bevezető irányító szolgálatot ellátó egység és az irányítása alatt álló, megfelelően felszerelt légijárművek között.

6.1.4.2 Ahol a bevezető irányító szolgálatot ellátó egység különállóan működik, a levegő-föld távközlési összeköttetést kizárólag ezen egység használatára biztosított távközlési csatornákon tartsák fenn.

6.1.5 Repülőtéri irányító szolgálat esetében

6.1.5.1 A levegő-föld távközlési berendezés tegyen lehetővé közvetlen, gyors, folyamatos és légköri rádiózavar-mentes kétirányú összeköttetést a repülőtéri irányító torony és az érintett repülőtér 45 km-es (25 tmf) körzetén belül bárhol üzemelő, megfelelően felszerelt légijárművek között.

6.1.5.2 ***Ajánlás*** *— Ahol a körülmények ezt indokolják, a repülőtér munkaterületein működő forgalom irányítására biztosítsanak külön távközlési csatornát.*

6.2 Légiforgalmi állandóhelyű szolgálat (föld-föld összeköttetések)

6.2.1 Általános rész

6.1.1.1 A légiforgalmi szolgálatok céljaira használt föld-föld összeköttetések esetében közvetlen beszéd-üzemű és/vagy digitális adathálózati összeköttetés alkalmazandó.

1, Megjegyzés: Az összeköttetés létrehozásának sebességére utaló jelzés a távközlési szolgálatok számára elsősorban a szükséges távközlési összeköttetés jellegének meghatározása céljából adott útmutatás; például az "azonnali" minősítés olyan összeköttetésre vonatkozik, amely biztosítja az azonnali kapcsolatfelvételt a légiforgalmi irányítók között; a "tizenöt másodperc" azt jelzi, hogy elfogadható a hívó-kulcsos üzem; míg az "öt perc" olyan összeköttetést jelez, amely magába foglalja a visszahívást is.

2. Megjegyzés: Valamennyi, a légiforgalmi irányítás közleményeiről automatikusan készült felvétel tárolásának körülményeit a 10. Annex, II. kötet 3.5.1.5 pont részletezi.

6.2.2 Összeköttetés a repüléstájékoztató körzeten belül

6.2.2.1 *Összeköttetés a légiforgalmi szolgálati egységek között*

6.2.2.1.1 A repüléstájékoztató központ rendelkezzen berendezésekkel az illetékességi területén belül szolgálatot ellátó következő egységekkel történő összeköttetéshez:

a) körzeti irányító központ, ha azzal nem közös elhelyezésű;

b) bevezető irányító egységek;

c) repülőtéri irányítótornyok.

6.2.2.1.2 A körzeti irányító központ a repüléstájékoztató központtal való, a 6.2.2.1.1 pontban előírt összeköttetés mellett rendelkezzen berendezésekkel az illetékességi területén belül szolgálatot ellátó következő egységekkel történő összeköttetéshez:

a) bevezető irányító egységek;

b) repülőtéri irányítótornyok;

c) légiforgalmi szolgálatok bejelentő irodája, ha ilyet külön létesítettek.

6.2.2.1.3 A bevezető irányító egység a repüléstájékoztató valamint a körzeti irányító központtal való, a 6.2.2.1.1 és 6.2.2.1.2 pontokban előírt összeköttetés mellett rendelkezzen berendezésekkel a vele együttműködő repülőtéri irányítótoronnyal vagy -tornyokkal, továbbá ha ilyet külön létesítettek, a légiforgalmi szolgálatok bejelentő irodájával történő összeköttetéshez.

6.2.2.1.4 A repülőtéri irányítótorony a repüléstájékoztató valamint a körzeti irányító központtal és a bevezető irányító egységgel való, a 6.2.2.1.1, 6.2.2.1.2 és 6.2.2.1.3 pontokban előírt összeköttetés mellett rendelkezzen berendezésekkel a légiforgalmi szolgálatok bejelentő irodájával történő összeköttetéshez, ha ilyet külön létesítettek.

6.2.2.2 Összeköttetés a légiforgalmi szolgálati egységek és más egységek között

6.2.2.2.1 A repüléstájékoztató és a körzeti irányító központ rendelkezzen berendezésekkel a saját illetékességi területén belül szolgálatot ellátó következő egységekkel történő összeköttetéshez:

a) az illetékes katonai egységek;

b) a központot kiszolgáló meteorológiai hivatal;

c) a központot kiszolgáló légiforgalmi távközlési állomás;

d) a megfelelő járatók hivatalai;

e) a mentést koordináló központ, vagy ennek hiányában bármely más megfelelő mentőszolgálat;

f) a központot kiszolgáló nemzetközi NOTAM iroda.

6.2.2.2.2 A bevezető irányító egység és a repülőtéri irányítótorony rendelkezzen berendezésekkel a saját illetékességi területén belül szolgálatot ellátó következő egységekkel történő összeköttetéshez:

a) az illetékes katonai egységek;

b) a kutató és mentő szolgálatok (beleértve a mentőszolgálatot, tűzoltóságot, stb.);

c) az érintett egységet kiszolgáló meteorológiai hivatal;

d) az érintett egységet kiszolgáló légiforgalmi távközlési állomás;

e) a forgalmi előtér-ügyeleti szolgálatot ellátó egység, ha ilyet külön létesítettek.

6.2.2.2.3 A 6.2.2.2.1 a) és 6.2.2.2.2 a) alpontokban előírt távközlési berendezések biztosítsanak gyors és megbízható összeköttetést az érintett légiforgalmi szolgálati egység és a légiforgalmi szolgálati egység felelősségi területén belül az elfogás irányításáért felelős katonai szervek között.

6.2.2.3 Az összeköttetési berendezések ismertetése

6.2.2.3.1 A 6.2.2.1, 6.2.2.2.1 a) és 6.2.2.2.2 a), b) és c) alpontokban előírt távközlési berendezések biztosítsanak:

a) közvetlen beszédüzemű összeköttetést vagy összetett beszédüzemű és digitális adathálózati összeköttetést ott, ahol a radarirányítás átadásának céljából szükséges összeköttetést azonnal, míg az egyéb célokból szükséges összeköttetést általában tizenöt másodpercen belül lehet létrehozni; és

b) nyomtatott formájú közleményváltásra szolgáló összeköttetést, ahol az írott szövegek tárolása szükséges; a közlemények továbbítási ideje öt percnél hosszabb ne legyen.

6.2.2.3.3 Minden olyan esetben, amikor a légiforgalmi szolgálatok számítógépeire és/vagy számítógépeiről származó automatikus adattovábbítás szükséges, megfelelő berendezés biztosítandó az automatikus adatrögzítésre.

6.2.2.3.2 ***Ajánlás*** *— A 6.2.2.3.1 pontban nem jelzett összes többi esetben a távközlési berendezések biztosítsanak:*

a) közvetlen beszédüzemű vagy összetett beszédüzemű és digitális adathálózati összeköttetést ott, ahol az összeköttetést általában tizenöt másodpercen belül lehet létrehozni; és

b) nyomtatott formájú közleményváltásra szolgáló összeköttetést, ahol az írott szövegek tárolása szükséges; a közlemények továbbítási ideje öt percnél hosszabb ne legyen.

6.2.2.3.3 ***Ajánlás*** *— Minden olyan esetben, amikor a légiforgalmi szolgálatok számítógépei felé és/vagy a számítógépeitől származó automatikus adattovábbítás szükséges, biztosítsanak megfelelő berendezést az automatikus adatrögzítésre.*

6.2.2.3.4 ***Ajánlás*** *— A 6.2.2.1 és 6.2.2.2 pontokban előírt összeköttetést — ahogyan és ahol szükséges — egyéb vizuális vagy audio-összeköttetést biztosító berendezéssel, például zárt láncú televíziós hálózattal vagy külön információ-feldolgozó rendszerrel egészítsék ki.*

6.2.2.3.5 A 6.2.2.2.2 a), b) és c) alpontokban előírt távközlési berendezések biztosítsák a közvetlen beszédüzemű konferencia összeköttetés lehetőségét.

6.2.2.3.6 ***Ajánlás*** *— A 6.2.2.2.2 d) alpontban előírt távközlési berendezések biztosítsák a közvetlen beszédüzemű konferencia összeköttetés lehetőségét, ahol az összeköttetést általában tizenöt másodpercen belül lehet létrehozni.*

6.2.2.3.7 A légiforgalmi szolgálati egységek valamint a légiforgalmi szolgálati egységek és az illetékes katonai szervek (egységek) közötti összes közvetlen beszédüzemű összeköttetést vagy digitális adathálózati összeköttetést megfelelő automatikus rögzítő berendezéssel lássák el.

6.2.2.3.8 A 6.2.2.3.3. és a 6.2.2.3.7 pontban előírt adat- és közvetlen beszédüzemű közleményváltásól készített automatikus felvételek legalább harminc napos időtartamig megőrzendők.

6.2.3 Összeköttetés a repüléstájékoztató körzetek között

6.2.3.1 A repüléstájékoztató központok és a körzeti irányító központok rendelkezzenek berendezésekkel az összes szomszédos repüléstájékoztató és a körzeti irányító központtal történő összeköttetéshez.

6.2.3.1.1 Ezek az összeköttetési berendezések megőrzés céljából minden esetben tegyék lehetővé a közlemények megfelelő formában történő rögzítését, továbbá a közlemények továbbítási ideje feleljen meg a körzeti légiközlekedési egyezményekben előírtaknak.

6.2.3.1.2 Ha a körzeti légiközlekedési egyezmények alapján mást nem írnak elő, a szomszédos irányítói területeket kiszolgáló körzeti irányító központok közötti összeköttetési berendezések a fentieken túl biztosítsák a közvetlen beszédüzemű és -- ahol ez alkalmazható -- a digitális adathálózati összeköttetést, amellyel a radar- vagy az automatikus légtérfelderítési adatok segítségével történő irányítás átadásának céljából szükséges összeköttetést azonnal, míg az egyéb célokból szükséges összeköttetést általában tizenöt másodpercen belül lehet létrehozni, valamint ennek automatikus rögzítését.

6.2.3.1.3 Amikor a kijelölt útvonaltól való eltérés esetében az elfogás szükségességének kiküszöbölése vagy csökkentése érdekében az érintett Államok közötti megállapodás így írja elő, a 6.2.3.1.2 pontban nem jelzett egyéb szomszédos repüléstájékoztató vagy körzeti irányító központok közötti összeköttetési berendezések közvetlen beszédüzemű összeköttetést vagy összetett beszédüzemű és digitális adathálózati összeköttetést tegyenek lehetővé. A berendezéseket megfelelő automatikus rögzítő egységgel lássák el.

6.2.3.1.4 ***Ajánlás** — A 6.2.3.1.3 pontban jelzett összeköttetési berendezések általában tizenöt másodpercen belül tegyék lehetővé az összeköttetés létrehozását.*

6.2.3.2 ***Ajánlás** — A szomszédos ATS egységek között minden olyan esetben alakítsanak ki összeköttetést, amikor különleges körülmények állnak fenn.*

Megjegyzés: A különleges körülményeket a forgalom sűrűsége, az üzemelő légijárművek típusai és/vagy a légtér szervezésének módjai okozhatják és ezek akkor is fennállhatnak, ha az ellenőrzött légterek és/vagy irányító körzetek nem közvetlenül határosak vagy (még) nem kerültek kijelölésre.

6.2.3.3 ***Ajánlás** — Ahol a helyi körülmények olyanok, hogy egy légijármű belépési engedélyét a szomszédos irányító körzetbe az indulás előtt kell megadni, a bevezető irányító egységet és/vagy a repülőtéri irányító tornyot kössék össze a szomszédos területet kiszolgáló körzeti irányító központtal.*

6.2.3.4 ***Ajánlás** — A 6.2.3.2 és 6.2.3.3 pontokban jelzett összeköttetési berendezések biztosítsák a közvetlen beszédüzemű vagy összetett beszédüzemű és digitális adathálózati összeköttetést, amellyel a radar- vagy ADS-adatok segítségével történő irányítás átadásának céljából szükséges összeköttetést azonnal, míg az egyéb célokból szükséges összeköttetést általában tizenöt másodpercen belül lehet létrehozni, valamint annak automatikus rögzítését.*

6.2.3.5 Minden olyan esetben, amikor a légiforgalmi szolgálatok számítógépei között automatikus adatcsere szükséges, megfelelő berendezés biztosítandó az automatikus adatrögzítésre.

6.2.3.6 A 6.2.3.5 pontban előírt adat- és egyéb közleményváltásól készített automatikus felvételek legalább harminc napos időtartamig megőrzendők.

6.2.4 Eljárások a közvetlen beszédüzemű összeköttetésekre

***Ajánlás** — Olyan eljárásokat dolgozzanak ki közvetlen beszédüzemű összeköttetésre, amelyek a légijármű biztonságát érintő nagyon sürgős hívások esetén lehetővé teszik az azonnali kapcsolatfelvételt és -- ha szükséges -- az éppen folyó kevésbé fontos (beszédüzemű) kapcsolatok megszakítását.*

6.3 Földi mozgást irányító szolgálat

6.3.1 Az ellenőrzött repülőterek munkaterületein üzemelő járművek irányítására — a légjárművek kivételével — alkalmazott összeköttetések

6.3.1.1 A repülőtéri irányító szolgálat számára biztosítsanak kétirányú rádió-távbeszélő berendezés(eke)t a munkaterületen üzemelő járművek irányítására, kivéve ahol a látjelek útján tartott összeköttetést elégségesnek ítélik.

.3.1.2 Ahol ezt a körülmények indokolják, a munkaterületen üzemelő járművek irányítására külön távközlési csatornák alkalmazandók. Minden ilyen csatornát automatikus hangrögzítő berendezéssel kell ellátni.
6.3.1.3 A 6.3.1.2 pontban előírt közleményváltásról készített automatikus felvételek legalább harminc napos időtartamig megőrzendők.

Megjegyzés: Lásd még 10. Annex, II. Kötet, 3.5.1.5 pont.

6.4 Légiközlekedési rádiónavigációs szolgálat

6.4.1 A légtér-felderítési adatok automatikus rögzítése

.4.1.1 Az elsődleges és másodlagos radarberendezésekből származó vagy az automatikus légtérfelderítés (ADS) útján beszerzett és a légiforgalmi szolgálatok céljaira használt légtér-felderítési adatokat a baleset és esemény kivizsgálás, kutató és mentő feladatok, légiforgalmi szolgálat és légtér-felderítési rendszer értékelése valamint kiképzés céljaira automatikusan rögzíteni kell.

6.4.1.2 Az automatikusan rögzített adatok legalább harminc napos időtartamig megőrzendők. Amennyiben a rögzített adatok a baleset és esemény kivizsgáláshoz szükségesek, azok hosszabb ideig megőrzendők, egészen addig, amíg nyilvánvalóvá nem válik, hogy azokra a továbbiakban nem lesz szükség.

7. fejezet
A légiforgalmi szolgálatok tájékoztatásokra vonatkozó előírásai

7.1 Időjárásról szóló tájékoztatás

7.1.1 Általános rész

7.1.1.1 A légiforgalmi szolgálati egységeket feladataik ellátásához szükséges mértékben lássák el az észlelt tényleges és előrejelzett időjárási körülményekről szóló tájékoztatással, amelyet olyan formában adjanak meg, amely a légiforgalmi szolgálatok személyzete részéről a lehető legkevesebb értelmezést (dekódolást) igényli és olyan gyakorisággal, amely kielégíti az érintett légiforgalmi szolgálati egységek igényeit.

7.1.1.2 ***Ajánlás** — A meteorológiai hivatalt úgy helyezzék el, hogy megkönnyítsék a személyes kapcsolattartást és egyeztetést a meteorológiai hivatal valamint a légiforgalmi szolgálatot biztosító egység* *személyzete között. Ahol a két egység közös elhelyezése nem lehetséges, a szükséges kapcsolattartást más módon biztosítsák.*

7.1.1.3 ***Ajánlás** — A légiforgalmi szolgálati egységek számára adják meg a repülőtér közelében, különösen az emelkedési és megközelítési területeken tapasztalható, a légijármű üzemeltetés szempontjából veszélyt jelentő időjárási jelenségek elhelyezkedéséről, függőleges kiterjedéséről, haladási irányáról és mozgási sebességéről szóló részletes tájékoztatásokat.*

Megjegyzés: Az ilyen időjárási jelenségek felsorolása a 3. Annex 4. fejezet 4.6.8.1 pontjában található.

7.1.1.4 ***Ajánlás** — Amikor a számítógéppel feldolgozott magaslégtéri időjárási adatokat a légiforgalmi szolgálati egységek számítógépeivel történő felhasználás céljából digitális formátumban a légiforgalmi szolgálati egységek rendelkezésére bocsátják, azok tartalma, formátuma és az adattovábbítás módja a meteorológiai és az illetékes légiforgalmi szolgálati hatóság közötti megállapodásnak megfelelő legyen.*

7.1.2 Repüléstájékoztató és körzeti irányító központok

7.1.2.1 A repüléstájékoztató és körzeti irányító központokat a lehető leghamarabb lássák el SIGMET, AIRMET tájékoztatásokkal, különleges légi jelentésekkel, érvényes és előrejelzett időjárás jelentésekkel, külön hangsúlyozva az időjárás romlás várható vagy tényleges bekövetkezését. Ezek a jelentések és előrejelzések terjedjenek ki a repüléstájékoztató vagy irányító körzetre, továbbá minden más légtérre, amelyet a körzeti légiközlekedési egyezmények alapján meghatároztak.

Megjegyzés: Ezen előírás teljesítése céljából bizonyos időjárás-változásokat időjárás-romlásnak értelmeznek annak ellenére, hogy ezek rendes körülmények között nem így értékelendők. A hőmérséklet növekedése például kedvezőtlenül befolyásolhatja bizonyos légijármű-típusok üzemeltetését.

7.1.2.2 A repüléstájékoztató és körzeti irányító központok számára megfelelő rendszeres időközönként adják meg a magasságmérő beállítás céljára szolgáló, az érintett repüléstájékoztató és körzeti irányító központok által meghatározott helyekre vonatkozó érvényes légnyomás adatokat.

7.1.3 Bevezető irányító szolgálatot ellátó egységek

7.1.3.1 A bevezető irányító szolgálatot ellátó egységeket lássák el az illetékességük alá tartozó légterekre és repülőterekre vonatkozó észlelt tényleges valamint az előrejelzett időjárási körülményekről szóló tájékoztatással. A különleges jelentéseket valamint az időjárás előrejelzések módosításait a lehető legrövidebb időn belül adják meg a bevezető irányító szolgálatot ellátó egységek számára, akkor, amikor azok a meghatározott előírások szerint szükségessé válnak és ne várják meg a következő időjárás jelentés vagy előrejelzés rendes időpontját. Ahol egyszerre több érzékelőt alkalmaznak, azok kijelzőjén azonosítás céljából egyértelműen jelöljék meg, hogy az adott érzékelő melyik futópályára és futópálya szakaszra vonatkozik.

Megjegyzés: Lásd a 7.1.2.1 pontot követő megjegyzést.

7.1.3.2 A bevezető irányító szolgálatot ellátó egységek számára adják meg a magasságmérő beállítás céljára szolgáló, az érintett bevezető irányító szolgálatot ellátó egység által meghatározott helyekre vonatkozó érvényes légnyomás adatokat.

7.1.3.3 A végső megközelítés, leszállás és felszállás során bevezető irányító szolgálatot ellátó egységeket talajszél kijelzővel (kijelzőkkel) kell felszerelni. A kijelző (kijelzők) a repülőtéri irányító torony –és ha ilyet létesítettek – a meteorológiai állomás hasonló kijelzőivel együtt ugyanarról a talajszél érzékelőről (érzékelőkről) működjön (működjenek).

7.1.3.4 Azokon a repülőtereken, amelyeken a futópályamenti látástávolság értékeket műszerekkel mérik, a végső megközelítés, leszállás és felszállás során bevezető irányító szolgálatot ellátó egységeket szereljék fel kijelző berendezéssel, amely lehetővé teszi az aktuális futópályamenti látástávolság értékek leolvasását. A kijelző (kijelzők) a repülőtéri irányító torony –és ha ilyet létesítettek – a meteorológiai állomás hasonló kijelzőivel együtt ugyanarról az érzékelőről (érzékelőkről) működjön (működjenek).

*7.1.3.5 **Ajánlás** – Az olyan egységeket, amik a végső megközelítés, leszállás és felszállás során bevezető irányító szolgálatot nyújtanak olyan repülőtéren, ahol a felhőalap magasságát műszeres módszerekkel mérik, el kell látni olyan kijelzővel (kijelzőkkel), amelyek lehetővé teszik az aktuális felhőalap érték(ek) leolvasását. A kijelző (kijelzők) a repülőtéri irányító torony –és ha ilyet létesítettek – a meteorológiai állomás hasonló kijelzőivel együtt ugyanarról az érzékelőről (érzékelőkről) működjön (működjenek).*

7.1.3.6 A végső megközelítés, leszállás és felszállás során bevezető irányító szolgálatot ellátó egységeket el kell látni a megközelítési és felszállási útvonalakon közlekedő vagy a körözéses megközelítést végző légijárművek működését hátrányosan befolyásoló szélnyírásra vonatkozó tájékoztatással.

Megjegyzés: A szélnyírás figyelmeztetés kiadására valamint a meteorológiai tájékoztatásokra vonatkozó ATS előírásokat a 3. Annex 7. és 10. fejezete, valamint 6. Függeléke tartalmazza.

7.1.4 Repülőtéri irányító torony

7.1.4.1 A repülőtéri irányító tornyokat lássák el az illetékességük alá tartozó repülőtérre vonatkozó észlelt tényleges valamint az előrejelzett időjárási körülményekről szóló tájékoztatással. A különleges jelentéseket valamint az időjárás előrejelzések módosításait a lehető legrövidebb időn belül adják meg a repülőtéri irányító tornyok számára, akkor, amikor azok a meghatározott előírások szerint szükségessé válnak és ne várják meg a következő időjárás jelentés vagy előrejelzés rendes időpontját.

Megjegyzés: Lásd a 7.1.2.1 pontot követő megjegyzést.

7.1.4.2 A repülőtéri irányító tornyok számára adják meg a magasságmérő beállítás céljára szolgáló, az adott repülőtérre vonatkozó érvényes légnyomás adatokat.

7.1.4.3 A repülőtéri irányító tornyokat talajszél kijelző berendezéssel szereljék fel. A kijelző (kijelzők) a repülőtéri irányító torony –és ha ilyet létesítettek – a meteorológiai állomás hasonló kijelzőivel együtt ugyanarról a talajszél érzékelőről (érzékelőkről) működjön (működjenek). Ahol egyszerre több érzékelőt alkalmaznak, azok kijelzőjén azonosítás céljából egyértelműen jelöljék meg, hogy az adott szélmérő melyik futópályára és futópálya szakaszra vonatkozik.

*7.1.4.4 **Ajánlás** — Azokon a repülőtereken, amelyeken a futópályamenti látástávolság értékeket műszerekkel mérik, a repülőtéri irányító tornyokat szereljék fel kijelzővel (kijelzőkkel), amely lehetővé teszi az aktuális futópályamenti látástávolság értékek leolvasását. A kijelző (kijelzők) (berendezések) a meteorológiai állomás — ha ilyet létesítettek — hasonló kijelzőjével (kijelzőivel) együtt ugyanarról a futópályamenti látástávolság érték kijelzőről (kijelzőkről) működjön (működjenek).*

*7.1.4.5 **Ajánlás** – A repülőtéri irányítótornyot olyan repülőtéren, ahol a felhőalap magasságát műszeres módszerekkel mérik, el kell látni olyan kijelzővel (kijelzőkkel), amelyek lehetővé teszik az aktuális felhőalap érték(ek) leolvasását. A kijelző (kijelzők) a meteorológiai állomás – ha ilyet létesítettek – hasonló kijelzőivel együtt ugyanarról az érzékelőről (érzékelőkről) működjön (működjenek).*

7.1.4.6 A repülőtéri irányító tornyokat el kell látni a megközelítési és felszállási útvonalakon közlekedő vagy a körözéses megközelítést, valamint a futópályán felszálláshoz történő nekifutást illetve leszállás utáni kigurulást végző légijárművek működését hátrányosan befolyásoló szélnyírásra vonatkozó tájékoztatással.

*7.1.4.6 **Ajánlás** — A repülőtéri irányító tornyokat és/vagy más illetékes egységeket lássák el repülőtéri figyelmeztetésekkel.*

Megjegyzés: A repülőtéri figyelmeztetést kiváltó meteorológiai körülmények felsorolása a 3. Annex 6. Függelék 5.1.2 pontjában található.

7.1.5 Távközlési állomások

Ahol ez a repüléstájékoztatás céljai érdekében szükséges, a távközlési állomásokat lássák el az észlelt tényleges valamint az előrejelzett időjárási körülményekről szóló tájékoztatással. A tájékoztatás egy példányát továbbítsák a repüléstájékoztató vagy a körzeti irányító központnak.

7.2 A repülőtér állapotára valamint a berendezések működésére vonatkozó tájékoztatás

A repülőtéri irányítótornyokat és a bevezető irányító szolgálatot ellátó egységeket rendszeresen tájékoztassák a repülőtér mozgási területének az üzemeltetés szempontjából lényeges állapotáról, beleértve az időszakos veszélyeket is. Adjanak továbbá rendszeres tájékoztatást a repülőteret kiszolgáló bármely berendezés üzemi állapotáról.

7.3 A navigációs berendezések működésére vonatkozó tájékoztatás

7.3.1 A légiforgalmi szolgálati egységeket rendszeresen tájékoztassák a felelősségi területükön belül található nem látás utáni navigációs berendezések, a felszállási, indulási, megközelítési és leszállási eljárásokhoz nélkülözhetetlen látás utáni segédeszközök, továbbá a felszíni mozgáshoz szükséges látás utáni és nem látás utáni berendezések üzemi állapotáról.

7.3.2 ***Ajánlás** — A 7.3.1 pontban jelzett látás utáni és nem látás utáni berendezések üzemi állapotáról és ennek változásáról szóló tájékoztatásokat az illetékes légiforgalmi szolgálati egység(ek) megfelelő időben kapja(k) meg, az érintett berendezés igénybevételéhez szükséges idő figyelembevételével.*

Megjegyzés: Az ATS egységeknek a látás utáni és nem látás utáni berendezésekről szóló tájékoztatásával kapcsolatos útmutatót a *Légiforgalmi Szolgálati Tervezési Kézikönyv* (Doc 9426), a látás utáni segédeszközök ellenőrzésére vonatkozó előírásokat a 14. Annex I. kötete, a kiegészítő útmutatót a *Repülőtér Tervezési Kézikönyv* 5. része (Doc 9157) tartalmazza. A nem látás utáni berendezések ellenőrzésére vonatkozó előírásokat a 10. Annex I. kötete tartalmazza.

7.4 Személyzet nélküli szabad léggömbökről szóló tájékoztatás

A személyzet nélküli szabad léggömbök üzemeltetői a 2. Annex előírásainak megfelelően folyamatosan tájékoztassák az illetékes légiforgalmi szolgálati egységeket a személyzet nélküli szabad léggömbök repülésének részleteiről.

7.5 A vulkáni tevékenységről szóló tájékoztatás

7.5.1 A légiforgalmi szolgálati egységeket a helyi megállapodásoknak megfelelően tájékoztassák a vulkánkitörés előtti vulkáni tevékenységről, a vulkánkitörésről és a vulkáni hamufelhőről, amelyek hatással lehetnek a felelősségi területükön belül a légijárművek által igénybe vett légtérre.

7.5.2 A körzeti irányító és repüléstájékoztató központokat lássák el a társított vulkáni tevékenység tanácsadó központok (VAAC) által kiadott vulkáni hamuról szóló tanácsadói tájékoztatásokkal.

Megjegyzés: A vulkáni tevékenység (hamu) tanácsadó központokat (VAAC) a 3. Annex 3.5.1 pontja alapján a körzeti légiközlekedési egyezményben jelölik ki.

7.6 A radióaktív anyagokról és mérgező kémiai "felhőkről" szóló tájékoztatás

A légiforgalmi szolgálati egységeket a helyi megállapodásoknak megfelelően tájékoztassák a légtérbe jutott radioaktív vagy mérgező kémiai anyagokról, amelyek hatással lehetnek a felelősségi területükön belül a légijárművek által igénybe vett légtérre.

1. Függelék
Az előírt navigációs teljesítmény (RNP) típusai azonosításának, valamint a légiforgalmi szolgálati útvonalak elnevezésének alapelvei, a szabvány indulási és érkezési útvonalak kivételével

(A 2. fejezet 2.7 és 2.11 ponthoz)

Megjegyzés: A szabvány indulási és érkezési útvonalak azonosítására és a megfelelő eljárásokra vonatkozóan lásd a 3. Függeléket. Az ezen útvonalak és eljárások jelölésével kapcsolatos útmutatót a *Légiforgalmi Szolgálatok Tervezési Kézikönyve* (Doc 9426) tartalmazza.

1. ATS útvonalak és RNP típusok elnevezése

1.1 A meghatározott légiforgalmi szolgálati útvonal szakaszokra, útvonalakra vagy légterekre alkalmazható útvonal megnevezés és előírt navigációs teljesítmény típus meghatározás rendszerének célja, hogy az automatizálás követelményeinek figyelembe vétele mellett a repülőgépvezető és a légiforgalmi szolgálatok:

a) egyértelműen hivatkozhassanak bármely légiforgalmi szolgálati útvonalra anélkül, hogy annak leírásához földrajzi koordinátákat vagy más módszert kellene igénybe venniük;

b) egy légiforgalmi szolgálati útvonalat szükség szerint a légtér meghatározott függőleges szerkezetére vonatkoztassák;

c) a légiforgalmi szolgálati útvonal mentén vagy egy meghatározott légtérben történő üzemelés esetén jelezzék a navigációs pontosság előírt szintjét; és

d) jelezzék, hogy az útvonalat elsősorban vagy kizárólagosan bizonyos légijármű típusok veszik igénybe.

1. Megjegyzés: Az előírt navigációs teljesítmény (RNP) egész világra kiterjedő általános bevezetése előtt a jelen függelékben található, az RNP-re vonatkozó összes utalás a területi navigációs (RNAV) útvonalakra is érvényes, ahol navigációs teljesítmény pontossági előírást is meghatároztak.

2. Megjegyzés: Az RNP típusok közzétételére vonatkozó előírások a 4. Annex 7. fejezetében és a 15. Annex l. Függelékében találhatók.

3. Megjegyzés: Az előírt navigációs teljesítmény szint (RNP) típus a jelen függelék vonatkozásában valamint repülés tervezési célokra nem tekintendő az ATS útvonal megnevezés szerves részének.

1.2 A fenti célok elérése érdekében a megnevezési rendszer:

a) tegye lehetővé bármely légiforgalmi szolgálati útvonal egyszerű és egyedi azonosítását;

b) kerülje a felesleges elemeket;

c) legyen használható úgy a földi, mint a fedélzeti automatikus berendezések számára;

d) a gyakorlati alkalmazás során legyen a lehető legtömörebb; és

e) biztosítsa a bővítés megfelelő lehetőségét, hogy az alapvető változtatások szükségessége nélkül megfeleljen a jövőbeli követelményeknek.

1.3 Az ellenőrzött, tanácsadói és nem ellenőrzött ATS útvonalakat a szabványos műszeres indulási és érkezési útvonalak kivételével a következőkben ismertetett eljárás alapján azonosítsák.

2. Az útvonal megnevezés összeállítása

2.1 A légiforgalmi szolgálati útvonal megnevezés egy alapjelzésből áll, amelyet szükség szerint a következők egészítenek ki:

a) egy előtag a 2.3 pont előírása szerint; és

b) egy további betű a 2.4 pont előírása szerint.

2.1.1 A megnevezés összeállításhoz szükséges tagok száma ne haladja meg a hatot.

2.1.2 A megnevezés összeállításhoz szükséges tagok számát lehetőség szerint legfeljebb ötre korlátozzák.

2.2 Az alap megnevezés az ABC egy betűjéből álljon, amelyet 1 és 999 között egy szám követ.
2.2.1 Az alkalmazott betűt az alábbiak szerint válasszák ki:

a) A, B, G, R olyan útvonalak esetén, amelyek a helyi körzeti légiforgalmi szolgálati útvonalak részét képező nem területi navigációs útvonalak;

b) L, M, N, P olyan útvonalak esetén, amelyek a helyi körzeti légiforgalmi szolgálati útvonalak részét képező területi navigációs útvonalak;

c) H, J, V, W olyan útvonalak esetén, amelyek a nem helyi körzeti légiforgalmi szolgálati útvonalak részét képező és nem területi navigációs útvonalak;

d) Q, T, Y, Z olyan területi navigációs útvonalak esetén, amelyek nem képezik a helyi körzeti légiforgalmi szolgálati útvonalak részét.

2.3 Ahol ez alkalmazható, az alap megnevezést a következőknek megfelelően előtagként egy betűvel egészítsék ki:

a) K az elsősorban forgószárnyas légijárművek számára létesített alacsony repülési magasságú útvonal jelölésére;

b) U annak jelölésére, hogy az útvonalat vagy annak egy szakaszát a magaslégtérben létesítették;

c) S annak jelölésére, hogy az útvonalak kizárólag szuperszonikus légijárművek gyorsítására, lassítására valamint hangsebesség feletti repülésére létesítették.

2.4 Amennyiben az illetékes légiforgalmi szolgálati hatóság vagy a körzeti légiközlekedési egyezmény úgy írja elő, a kérdéses ATS útvonal alap megnevezés után a következőknek megfelelően egy kiegészítő betű alkalmazható az adott ATS útvonalon biztosított szolgálat típusának vagy az útvonalon szükséges forduló teljesítmény meghatározásának jelzésére:

a) az RNP 1 útvonalak esetén, FL 200 repülési szinten vagy felette a "Y" betű jelzi, hogy az útvonalon az összes 30 és 90 fok közötti fordulót az egyenes szakaszok között 22.5 tmf sugárral meghatározott érintő ív engedélyezett RNP tűrési határértékén belül kell végrehajtani (például: A123Y{1});

b) az RNP 1 útvonalak esetén, FL 190 repülési szinten vagy alatta a "Z" betű jelzi, hogy az útvonalon az összes 30 és 90 fok közötti fordulót az egyenes szakaszok között 15 tmf sugárral meghatározott érintő ív engedélyezett RNP tűrési határértékén belül kell végrehajtani (például: G246Z{1});

c) az "F" betű azt jelzi, hogy az útvonalon vagy annak egy szakaszán csak tanácsadó szolgálatot biztosítanak;

d) a "G" betű azt jelzi, hogy az útvonalon vagy annak egy szakaszán csak repüléstájékoztató szolgálatot biztosítanak.

1. Megjegyzés: A légijármű fedélzetén elhelyezett megjelenítő berendezések korlátozásai miatt a "F", "G", "Y" vagy "Z" betűk a repülőgépvezető számára esetleg nem jeleníthetők meg.

2. Megjegyzés: A 4. és a 15. Annex előírásainak megfelelően kidolgozott és közzétett repülési térképek és légiforgalmi tájékoztató kiadványok jelzik, hogy az útvonal vagy annak egy szakasza ellenőrzött, tanácsadói vagy repüléstájékoztató útvonal.

3 Megjegyzés: Azokat a feltételeket, amelyek alapján az Államok a 2.4 a) és b) alpontokban ismertetett ellenőrzött forduló teljesítményt meghatározhatják, az *Előírt Navigációs Teljesítmény Kézikönyv*ben (Doc 9613) tárgyaljuk.

3. Az alap megnevezések kidolgozása

3.1 A légiforgalmi szolgálati útvonal alap megnevezéseket a következő alapelvek szerint dolgozzák ki.

3.1.1 Egy fő távolsági útvonal teljes hosszában, függetlenül az átrepült közelkörzeti irányító légterektől, körzetektől vagy Államoktól, ugyanazt az alap megnevezést alkalmazzák.

Megjegyzés: Ez különösen fontos ott, ahol automatikus ATS adatfeldolgozást és számítógépes fedélzeti navigációs berendezéseket illetve számítógépes navigációs rendszert használnak.

3.1.2 Ahol két vagy több távolsági útvonal közös szakasszal rendelkezik, a kérdéses szakaszt lássák el mindkét érintett útvonal megnevezésével, kivéve ha ez a légiforgalmi szolgálat biztosításánál nehézséget okoz, amely esetben közös megegyezés alapján csak egy megnevezést alkalmazzanak.

3.1.3 Egy útvonalhoz már felhasznált alap megnevezés másik útvonalnál nem alkalmazható.

3.1.4 Az Államok az útvonal megnevezésére vonatkozó igényeiket egyeztetés céljából nyújtsák be az ICAO körzeti irodáinak.

4. A megnevezések használata közleményváltásokban

4.1 A nyomtatott formájú összeköttetések esetében a megnevezést minden esetben legalább kettő, de nem több mint hat taggal adják meg.

4.2 A szóbeli összeköttetések esetében a megnevezés alapbetűjét az ICAO kiejtési ABC szerint mondják ki.

4.3 Ahol a 2.3 pontban meghatározott K, U vagy S előtagokat használják, azokat a szóbeli összeköttetések esetében a következők szerint mondják ki:

K — KOPTER

U — UPPER

S — SUPERSONIC

A "kopter" szó kiejtése mint a "helicopter"-nél, az "upper" és "supersonic" szavak kiejtése az angol nyelvi kiejtés szerint történik.

4.4 Amennyiben a 2.4 pontban meghatározott "F", "G", "Y" vagy "Z" előtagokat használják, nem lehet elvárás, hogy azokat a hajózószemélyzet tagjai a szóbeli összeköttetések esetében használják.

2. Függelék
Fontos pontok kijelölésének és elnevezésének alapelvei

(A 2. fejezet 2.13 ponthoz)

1. Fontos pontok kijelölése

1.1 A fontos pontokat -- amikor csak lehetséges -- földi rádiónavigációs berendezésekre, lehetőleg URH vagy magasabb frekvencián üzemelő berendezésekre vonatkoztatva jelöljék ki.

1.2 Ahol ilyen földi rádiónavigációs berendezések nem állnak rendelkezésre, a fontos pontokat olyan helyeken jelöljék ki, amelyek önálló fedélzeti navigációs berendezéssel vagy -- ahol földi látjelek útján történő navigációt alkalmaznak -- talajfelszín látással meghatározhatók illetve azonosíthatók. Egyes egyedi pontok az érintett szomszédos légiforgalmi irányító szolgálati egységek vagy irányítói munkahelyek közötti megállapodás alapján "irányítás átadási pont"-ként jelölhetők ki.

2. A rádiónavigációs berendezés helyével kijelölt fontos pontok elnevezése

2.1 A rádiónavigációs berendezés helyével kijelölt fontos pontok nyílt nyelven történő megnevezése

2.1.1 Amikor az lehetséges, a fontos pontokat azonosítható és lehetőleg jellegzetes földrajzi helyre vonatkoztatva nevezzék el.

2.1.2 A fontos pontok megnevezése alkalmával gondoskodjanak a következő feltételek teljesítéséről:

a) a név kiejtése ne jelentsen nehézséget a repülőgépvezetők vagy a légiforgalmi szolgálatok személyzete számára, amikor azok az ATS összeköttetésekben használatos nyelvet alkalmazzák. Ahol a jelentős pont elnevezésére kiválasztott földrajzi hely neve az adott nemzeti nyelven kiejtési nehézségeket okoz, a megnevezés rövidített vagy összevont változatát válasszák ki, amely a lehető legnagyobb mértékben megtartja az eredeti földrajzi név jelentését;

Például: FUERSTENFELDBRUCK = FURSTY

b) a szóbeli összeköttetések alkalmával a megnevezés legyen könnyen felismerhető és ne legyen összetéveszthető az azonos területen levő más fontos pontok neveivel. Ezen felül a név a légiforgalmi szolgálatok és a repülőgépvezetők közötti egyéb közleményváltások alkalmával se okozzon zavart;

c) a megnevezés lehetőség szerint legalább hat betűből és kettő, de lehetőleg nem több mint három szótagból álljon;

d) a fontos pont és az azt jelölő rádiónavigációs berendezés kiválasztott neve legyen azonos.

2.2 A rádiónavigációs berendezés helyével kijelölt fontos pontok kódolt megnevezésének összeállítása

2.2.1 A fontos pont kódolt megnevezése és az azt jelölő rádiónavigációs berendezés rádió azonosítója legyen azonos. Ha lehetséges, azt úgy állítsák össze, hogy megkönnyítse a nyílt nyelvű megnevezéssel történő vonatkoztatást.

2.2.2 Az érintett rádiónavigációs berendezés elhelyezkedésének 1100 km-es (600 tengeri mérföldes) körzetén belül a kódolt megnevezés — az alábbi eset kivételével — ne ismétlődjön.

Megjegyzés: Amikor két rádiónavigációs berendezés azonos telepítési hellyel rendelkezik, azonban eltérő frekvencia-sávban üzemelnek, rádióazonosító jelük általában azonos.

2.3 A kódolt megnevezésre vonatkozó állami igényeket egyeztetés céljából nyújtsák be az ICAO körzeti irodáknak.

3. A nem rádiónavigációs berendezés helyével kijelölt fontos pontok megnevezése

3.1 Ahol a fontos pont kijelölésére olyan helyen van szükség, amelyet rádiónavigációs berendezés nem jelöl, a fontos pontot kiejthető, egyedi összeállítású "név-kód"-dal jelöljék meg. Ezt követően a név-kód lesz a fontos pont megnevezése valamint annak kódolt jelölése is.

3.2 Ezt a név-kód megnevezést úgy válasszák ki, hogy elkerüljék kiejtési nehézségeket a repülőgépvezetők vagy a légiforgalmi szolgálatok személyzete számára, amikor azok az ATS összeköttetésekben használatos nyelvet alkalmazzák.

Például: ADOLA, KODAP

3.3 A szóbeli összeköttetések alkalmával a név-kód megnevezés legyen könnyen felismerhető és ne legyen összetéveszthető az azonos területen levő más fontos pontok név-kódjaival.

3.4 A fontos pont név-kód megnevezését ne adják ki más fontos pontnak.

3.5 A név-kód megnevezésre vonatkozó állami igényeket egyeztetés céljából nyújtsák be az ICAO körzeti irodáknak.

3.6 Olyan területeken, amelyeken állandó útvonal rendszert nem határoztak meg vagy ahol a légijármű által követett útvonalak az üzemeltetési szempontok alapján nagy mértékben változnak, a fontos pontokat az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) koordinátáival jelöljék ki és így tegyék közzé, kivéve az ilyen területek be és/vagy kilépési pontjaként szolgáló állandó fontos pontokat, amelyeket a 2. vagy 3. szakasz megfelelő előírásai szerint jelöljék ki.

4. Megnevezések alkalmazása közleményváltásokban

4.1 A szóbeli összeköttetések alkalmával általában a 2. vagy 3. szakasz alapján kiválasztott nevet használják a fontos pont megjelölésére. Ha egy rádiónavigációs berendezéssel jelölt fontos pont 2.1 pont szerint meghatározott nyílt nyelvű megnevezését nem használják, azt kódolt névvel helyettesítsék, amelyet a szóbeli összeköttetések alkalmával az ICAO betűzési előírásnak megfelelő módon ejtsenek ki.

4.2 A nyomtatott vagy kódolt összeköttetések esetében csak a kódolt megnevezést vagy a kiválasztott kód-nevet alkalmazzák a fontos pont megjelölésére.

5. A fontos pontok felhasználása jelentési célokra

5.1 Annak érdekében, hogy a légiforgalmi szolgálatok tájékoztatásokat szerezhessenek be a légijárművek repülésének előrehaladásáról, szükséges lehet a kiválasztott fontos pontok jelentő-pontnak történő kijelölése.

5.2 Az ilyen pontok kijelölésnél a következő tényezőket vegyék figyelembe:

a) a biztosított légiforgalmi szolgálat típusa;

b) az általában várható forgalom nagyságrendje;

c) az a pontosság, amellyel a légijárművek be tudják tartani az érvényes repülési tervet;

d) a légijármű sebessége;

e) az alkalmazott elkülönítési minimumok;

f) a légtérszerkezet összetettsége;

g) az alkalmazott irányítási módszer(ek);

h) egy repülés fontos szakaszainak kezdete vagy vége (emelkedés, süllyedés, irányváltoztatás, stb.);

i) irányítás-átadási eljárások;

j) biztonsági valamint kutatás-mentési szempontok;

k) légijármű fedélzeti és a levegő-föld közötti összeköttetés leterheltsége.

5.3 A jelentőpontokat "kötelező" vagy "kérésre" típusúként jelöljék meg.

5.4 A "kötelező" jelentőpontok kijelölésénél a következő alapelveket alkalmazzák:

a) a kötelező jelentőpontok számát a légiforgalmi szolgálati egységeknek a levegőben lévő légijárművek előrehaladásáról szóló tájékoztatás igényével összhangban a lehető legkisebbre korlátozzák, szem előtt tartva a fedélzeti és légiforgalmi irányítói munkaterhelés valamint a levegő-föld közleményváltások számának lehető legalacsonyabb szinten tartásának szükségességét;

b) egy adott helyen rendelkezésre álló rádiónavigációs berendezés nem teszi alapvetően szükségessé annak kötelező jelentőpontként történő kijelölését;

c) a repüléstájékoztató vagy irányító körzet határain nem kell szükségszerűen kötelező jelentőpontokat kijelölni.

5.5 A "kérésre" típusú jelentőpontokat a légiforgalmi szolgálatok kiegészítő helyzetjelentések iránti igényei alapján jelölhetik ki, amennyiben ezt a forgalmi körülmények szükségessé teszik.

5.6 A "kötelező" valamint "kérésre" típusú jelentőpontokat a légiforgalmi szolgálatok hatékony működéséhez szükséges helyzetjelentések számának minimális szinten tartására vonatkozó követelmény figyelembevételével rendszeresen vizsgálják felül.

5.7 A "kötelező" jelentő-pontok jelentését ne tegyék minden repülés számára minden körülmények között kötelezővé. Ezen alapelv alkalmazása során fordítsanak különös figyelmet a következőkre:

a) a nagy sebességgel és nagy repülési magasságon üzemelő légijárműveket ne utasítsák rendszeres helyzetjelentések adására minden olyan jelentőpontnál, amely a kis sebességű és alacsony repülési magasságon üzemelő légijárművek számára kötelező;

b) a közelkörzeten átrepülő légijárműveket ne utasítsák rendszeres helyzetjelentések adására olyan gyakran, mint az érkező és induló légijárműveket.

5.8 Olyan területeken, ahol a jelentőpontok kijelölésére a fenti alapelvek gyakorlati szempontokból nem alkalmazhatók, olyan jelentési rendszert lehet kialakítani, amelynek alapját az egész fokokban kifejezett földrajzi hosszúsági vagy szélességi körök képezik.

3. Függelék
A szabvány indulási és érkezési útvonalak kijelölésének és elnevezésének alapelvei valamint az azokkal kapcsolatos eljárások

(lásd 2. fejezet 2.11.3 pont)

Megjegyzés: A szabványos indulási és érkezési útvonalak kijelölésének és elnevezésének alapelveire, valamint az azokkal kapcsolatos eljárásokra vonatkozó útmutató a *Légiforgalmi Szolgálati Tervezési Kézikönyv*ben (Doc 9426) található.

1. A szabvány indulási és érkezési útvonalak, valamint az azokkal kapcsolatos eljárások megnevezése

Megjegyzés: A következő szövegben az "útvonal és a kapcsolatos eljárások"-ra az "útvonal" szót alkalmazzuk.

1.1 A megnevezés rendszere:

a) egyszerűen és egyértelműen tegye lehetővé minden egyes útvonal azonosítását;

b) világosan különböztesse meg egymástól:

— az indulási és érkezési útvonalakat;

— az indulási vagy érkezési valamint más légiforgalmi szolgálati útvonalakat;

— azokat az útvonalakat, amelyeken a navigációhoz földi rádióberendezésekre vagy önálló fedélzeti berendezésekre van szükség, valamint azokat, amelyeken a navigáció földlátással történik;

c) feleljen meg a légiforgalmi szolgálatok és a légijárművek adat-feldolgozási és adat-megjelenítési követelményeinek;

d) a gyakorlati alkalmazás során a lehető legtömörebb legyen;

e) kerülje a felesleges elemeket;

f) biztosítsa a bővítés lehetőségét, hogy a rendszer a későbbi bővítés igényeinek alapvető változtatás nélkül megfeleljen.

1.2 Minden egyes útvonalat nyílt nyelvű megnevezéssel és megfelelő kód jelzéssel azonosítsanak.

1.3 A szóbeli összeköttetés során könnyen felismerhető legyen, hogy a megnevezés melyik szabványos indulási és érkezési útvonalra vonatkozik, továbbá a kiejtése ne okozzon nehézséget a repülőgépvezetők és a légiforgalmi szolgálatok személyzete számára.

2. Megnevezések összeállítása

2.1 Nyílt nyelvű megnevezés

2.1.1 A szabvány indulási vagy érkezési útvonal nyílt nyelvű megnevezése a következőkből álljon:

a) alap-azonosító; amit követ

b) az érvényességi jelzés; amit követ

c) az útvonal jelzés, ahol szükséges; amit követ

d) az indulás "departure" vagy érkezés "arrival" kifejezések; amit követ

e) a látás utáni "visual" kifejezés, amennyiben az útvonaatl a látvarepülési szabályok szerint üzemeltetett légijárművek részére jelölték ki.

2.1.2 Az alap-azonosító annak a fontos pontnak neve vagy név-kódja legyen, amelynél a szabvány indulási útvonal véget ér vagy amelytől a szabvány érkezési útvonal kezdődik.

2.1.3 Az érvényességi jelzés 1 — 9 közötti szám legyen.

2.1.4 Az útvonal jelzés az ABC egy betűje legyen, azonban az "I" és "O" betűk nem alkalmazhatók.

2.2 Kódolt megjelölés

A műszeres vagy látás utáni szabvány indulási vagy érkezési útvonal kódolt jelölése a következőkből álljon:
a) a fontos pont kód jelzése vagy név-kódja a 2.1.1 a) alpont szerint; amit követ

b) az érvényességi jelzés a 2.1.1 b) alpont szerint; amit követ

c) az útvonal jelzés a 2.1.1 c) alpont szerint, ahol ez szükséges.

Megjegyzés: Ha a jelölés öt betűből álló név-kód, például KODAP, a légijármű fedélzetén levő megjelenítő berendezés korlátozott lehetőségei miatt szükséges lehet az alap-azonosító jelzés rövidítése. Az ilyen jelölés rövidítésének módját és formáját a járatók határozzák meg.

3. Megnevezések kiosztása

3.1 Minden egyes útvonalra külön megnevezést jelöljenek ki.

3.2 Ugyanarra a fontos pontra vonatkozó két vagy több útvonal megkülönböztetése érdekében (ahol így az alap-azonosító ugyanaz) minden egyes útvonalra a 2.1.4 alpont szerint külön útvonal jelzést osszanak ki.

4. Érvényességi jelzések kiosztása

4.1 Minden egyes útvonalra osszanak ki érvényességi jelzést annak megjelölése érdekében, hogy az útvonal jelenleg érvényben van-e.

4.2 A kiosztott első érvényességi jelzés az "1" szám legyen.

4.3 Amennyiben az útvonalat módosították, a következő érvényességi jelzés a sorrendben következő nagyobb szám legyen. A "9" szám után ismét az "1" szám következik.

5. Példák a nyílt nyelvű megnevezésre és a kódolt jelölésre

5.1 1. példa

Szabvány műszeres indulási útvonal

a) Nyílt nyelvű megnevezés: BRECON ONE DEPARTURE

b) Kódolt jelölés: BCN 1

5.1.1 *Értelmezés*

A megnevezés olyan szabvány műszeres indulási útvonalat azonosít, amely a BRECON (alap-azonosító) elnevezésű fontos pontnál végződik. BRECON egy rádiónavigációs berendezés, amelynek azonosítója BCN (a kódolt jelölés alap-azonosítója). Az érvényességi jelzés ONE azaz egyes (a kódolt jelölésben "1"), amely azt jelzi, hogy az útvonal eredeti változata van érvényben vagy változás történt az előző NINE azaz kilences változathoz képest és most az új ONE azaz egyes jelzésű változat van érvényben (lásd 4.3). Az útvonal jelzés hiánya (lásd 2.1.4 és 3.2) azt jelzi, hogy a BRECON rádiónavigációs berendezésre csak egy útvonalat, a jelen esetben egy indulási útvonalat dolgoztak ki.

5.2 2. példa

Szabvány műszeres érkezési útvonal

a) Nyílt nyelvű megnevezés: KODAP TWO ALPHA

b) Kódolt jelölés: KODAP 2 A

5.2.1 *Értelmezés*

A megnevezés olyan szabvány műszeres érkezési útvonalat azonosít, amely a KODAP (alap-azonosító) elnevezésű fontos pontnál kezdődik. KODAP egy rádiónavigációs berendezés helyével nem kijelölt fontos pont és ezért a 11. Annex 2. Függeléke alapján meghatározott öt-betűs név-kóddal rendelkezik. Az érvényességi jelzés TWO, azaz kettes, amely azt jelzi, hogy változás történt az előző ONE, azaz egyes változathoz képest és most az új TWO, azaz kettes jelzésű változat van érvényben. Az ALPHA (A) útvonal jelzés a KODAP fontos ponthoz kidolgozott több útvonal változat közül az egyiket jelzi, mint az ahhoz megállapított külön egyedi jelzés.

5.3 3. példa

Szabvány látás utáni indulási útvonal

a) Nyílt nyelvű megnevezés: ADOLA FIVE BRAVO DEPARTURE VISUAL

b) Kódolt jelölés: ADOLA 5 B

5.3.1 *Értelmezés*

A megnevezés az ellenőrzött VFR repülések számára kidolgozott olyan szabvány látás utáni indulási útvonalat azonosít, amely az ADOLA (alap-azonosító) elnevezésű fontos pontnál végződik, amely rádiónavigációs berendezés helyével nem kijelölt fontos pont. Az érvényességi jelzés FIVE, azaz ötös, amely azt jelzi, hogy változás történt az előző FOUR, azaz négyes változathoz képest és most az új FIVE, azaz ötös jelzésű változata van érvényben. A BRAVO (B) útvonal jelzés az ADOLA fontos ponthoz kidolgozott több útvonal változat közül az egyiket jelzi, mint az ahhoz megállapított külön egyedi jelzés.

6. MLS/RNAV megközelítési eljárások megnevezéseinek összeállítása

6.1 Nyílt nyelvű megnevezés

6.1.1 Az MLS/RNAV megközelítési eljárások nyílt nyelvű megnevezése a következőkből álljon:

a) "MLS" betűk; amit követ

b) alap-azonosító; amit követ

c) az érvényességi jelzés; amit követ

d) az útvonal jelzés; amit követ

e) az "approach", azaz megközelítés kifejezés; amit követ

f) a futópálya azonosítója, amelyre az eljárást tervezték.

6.1.2 Az alap-azonosító annak a fontos pontnak neve vagy név-kódja legyen, amelynél a megközelítési eljárás kezdődik.
6.1.3 Az érvényességi jelzés 1 — 9 közötti szám legyen.

6.1.4 Az útvonal jelzés az ABC egy betűje legyen, azonban az "I" és "O" betűket ne alkalmazzák.

6.1.5 A futópálya azonosítóját a 14. Annex I. kötet 5.2.2 pontja alapján határozzák meg.

6.2 Kódolt jelölés

6.2.1 Az MLS/RNAV megközelítési eljárás kódolt jelölése a következőkből álljon:

a) "MLS" betűk; amit követ

b) a fontos pont kód jelzése vagy név-kódja a 6.1.1 b) alpont szerint; amelyet követ

c) az érvényességi jelzés a 6.1.1 c) alpont szerint; amelyet követ

d) az útvonal jelzés a 6.1.1 d) alpont szerint; amelyet követ

e) a futópálya azonosító a 6.1.1 f) alpont szerint.

6.3 A megnevezések kiosztása

6.3.1 Az MLS/RNAV megközelítési eljárások megnevezéseinek kiosztását a 3. szakasszal összhangban végezzék el. Az azonos repülési útvonalat követő, azonban egymástól eltérő repülési pályával rendelkező eljárásokat külön útvonal jelöléssel azonosítsák.

6.3.2 Az MLS/RNAV megközelítési eljárás jelölésének betűje egy adott repülőtéren minden megközelítésre legyen egyedi egészen addig, amíg az összes betűt felhasználják. Az útvonal jelölésének betűjét csak ezt követően ismételjék. Azonos MLS földi berendezést felhasználó két útvonal esetében ugyanazon útvonaljelzés használata tilos.

6.3.3 A megközelítési eljárás érvényességi jelzését a 4. ponttal összhangban végezzék el.

6.4 Példa a nyílt nyelvű megnevezésre és a kódolt jelölésekre

6.4.1 *Példa*

a) Nyílt nyelvű megnevezés: MLS HAPPY ONE ALPHA APPROACH RUNWAY ONE EIGHT LEFT

b) Kódolt jelölés: MLS HAPPY 1 A 18L

6.4.2 Értelmezés

A megnevezés olyan MLS/RNAV megközelítési eljárást azonosít, amely a HAPPY (alap-azonosító) elnevezésű fontos pontnál kezdődik. HAPPY egy rádiónavigációs berendezéssel nem kijelölt fontos pont és ezért a 11. Annex 2. Függeléke alapján meghatározott ötbetűs névkóddal rendelkezik. Az érvényességi jelzés ONE azaz egyes, amely azt jelzi, hogy az útvonal eredeti változata van érvényben vagy változás történt az előző NINE azaz kilences változathoz képest és most az új ONE azaz egyes jelzésű változata van érvényben. Az ALPHA (A) útvonal jelzés a HAPPY fontos ponthoz kidolgozott több útvonal változat közül az egyiket jelzi, mint az ehhez megállapított külön egyedi jelzés.

7. A megnevezések használata közleményváltásokban

7.1 A szóbeli közleményváltások alkalmával csak a nyílt nyelvű megnevezést használják.

Megjegyzés: Az útvonalak azonosítása céljából a 2.1.1 d) és 2.1.1 e) alpontokban ismertetett indulási (departure), érkezési (arrival) valamint látás utáni (visual) kifejezések a nyílt nyelvű megnevezések elválaszthatatlan részét képezik.

7.2 A nyomtatott vagy kódolt összeköttetéseknél csak a kódolt jelölést használják.

8. Az útvonalak és eljárások szemléltetése a légiforgalmi irányító szolgálat számára

8.1 Azokon a munkahelyeken, amelyeken a légijárművek számára a légiforgalmi irányítói engedély részeként ilyen útvonalakat vagy eljárásokat adnak ki vagy azok bármely más kapcsolatban vannak a légiforgalmi irányító szolgálat biztosításával, helyezzék el minden egyes érvényes szabványos indulási és/vagy érkezési és/vagy megközelítési eljárás részletes leírását, beleértve annak nyílt nyelvű megnevezését, valamint kódolt jelölését is.

8.2 Amikor lehetséges, a munkahelyeken helyezzék el az útvonalak vagy eljárások grafikus (térképes) ismertetését is.

4. Függelék
A légiforgalmi szolgálatok légtereinek osztályozása

Biztosított szolgálatok és repülés végrehajtási előírások
(lásd 2. Fejezet — 2.6 pont)

A légiforgalmi szolgálatok légtereinek osztályozása

Légtér osztály	*Repülések típusa*	*Biztosított elkülönítés*	*Biztosított szolgálat*	*Sebesség korlátozás*[1]	*Rádió összeköttetésre vonatkozó előírások*	*ATC engedély szükséges*
A	csak IFR	minden légijármű között	Légiforgalmi irányító szolgálat	nem alkalmazható	folyamatos kétoldalú	igen
B	IFR	minden légijármű között	Légiforgalmi irányító szolgálat	nem alkalmazható	folyamatos kétoldalú	Igen
	VFR	minden légijármű között	Légiforgalmi irányító szolgálat	nem alkalmazható	folyamatos kétoldalú	Igen
C	IFR	IFR-t az IFR-től IFR-t a VFR-től	Légiforgalmi irányító szolgálat	nem alkalmazható	folyamatos kétoldalú	Igen
	VFR	VFR-t az IFR-től	1) Légiforgalmi irányító szolgálat: elkülönítés az IFR-től; 2) VFR/VFR forgalmi tájékoztatás (és kérésére tanácsadás a forgalom elkerülésére)	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	igen
D	IFR	IFR-t az IFR-től	Légiforgalmi irányító szolgálat beleértve a VFR repülésekről szóló forgalmi tájékoztatást is (és kérésre tanácsadás a forgalom elkerülésére)	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	igen
	VFR	nincs	IFR/VFR és VFR/VFR forgalmi tájékoztatás (és kérésre tanácsadás a forgalom elkerülésére)	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	igen
E	IFR	IFR-t az IFR-től	Légiforgalmi irányító szolgálat és forgalmi tájékoztatás a VFR repülésekről a lehetőségek határain belül	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	Igen
	VFR	nincs	Forgalmi tájékoztatás a lehetőségek határain belül	250 kts IAS 3050 m (10000 láb) AMSL alatt	nincs	nem
F	IFR	IFR-t az IFR-től a lehetőségek határain belül	Légiforgalmi tanácsadó szolgálat; Repüléstájékoztató szolgálat	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	nem
	VFR	nincs	Repüléstájékoztató szolgálat	250 kts IAS 3050 m (10000 láb) AMSL alatt	nincs	nem
G	IFR	nincs	Repüléstájékoztató szolgálat	250 kts IAS 3050 m (10000 láb) AMSL alatt	folyamatos kétoldalú	nem
	VFR	nincs	Repüléstájékoztató szolgálat	250 kts IAS 3050 m (10000 láb) AMSL alatt	nincs	nem

Megjegyzés:

AMSL *közepes tengerszint feletti magasság felett*
IAS *műszer szerinti repülési sebesség*
IFR *műszerrepülési szabályok*
VFR *látvarepülési szabályok*

[1] Amennyiben az átváltási magasság 3050 méter (1000 láb) AMSL alatt van, a 10000 láb magasság helyett FL 100 alkalmazandó.

5. Függelék
A léginavigációs adatok minőségi előírásai

1. Táblázat Földrajzi szélesség és hosszúság

Szélesség és hosszúság	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Repüléstájékoztató körzet határpontjai	2 km (1 tmf) közzétett	általános 1×10^{-3}
P, R, D területek határpontjai (CTA/CTZ határokon kívül)	2 km (1 tmf) közzétett	általános 1×10^{-3}
P, R, D területek határpontjai (CTA/CTZ határon belül)	100 méter számított	alapvető 1×10^{-5}
CTA/CTZ határpontjai	100 méter számított	alapvető 1×10^{-5}
Útvonal navigációs berendezések és pontok, várakozási helyek, STAR/SID pontok	100 méter földmérési/ számított	alapvető 1×10^{-5}
Akadályok az 1. körzetben (az Állam teljes területén)	50 méter földmérési	általános 1×10^{-3}
Akadályok a 2. körzetben (a repülőtér/helikopter-leszállóhely határán kívüli részen)	5 méter földmérési	alapvető 1×10^{-5}
Végső megközelítési pontok és helyek, műszeres megközelítési eljáráshoz tartozó egyéb alapvető fontosságú pontok és helyek	3 méter földmérési/ számított	alapvető 1×10^{-5}

1. Megjegyzés: Az akadályokra vonatkozó adatgyűjtési felületek grafikai illusztrációit és az akadályok azonosítási kritériumait a meghatározott területen a 15. Annex 8. Függléke tartalmazza.

2. Megjegyzés: A 2. körzet azon részein, ahol nagyon magas terep vagy egyéb helyi korlátozások és/vagy előírások miatt tilos a repülés, az akadályadatok az 1. körzetre vonatkozó számszerű követelmények szerint gyűjtendők, az Annex 15. 8. Függelék A8-2 táblázat meghatározásai alapján.

3. Megjegyzés: A 15. Annex 10.6.1.1 és 10.6.1.2 pontjaiban meghatározott rendelkezések – az 1. és 2. körzet szerint meghatározott akadálypontok 2008. november 20. és 2010. november 18. utáni hozzáférhetőségéről – bevezetését a vonatkozó adatok begyűjtésének és feldolgozásának előre megtervezett folyamata teszi lehetővé.

2. Táblázat Tengerszint és földfelszín feletti magasság

tengerszint feletti magasság és földfelszín feletti magasság	*Pontosság Adat típus*	*Osztályzás Megbízhatóság*
Futópálya küszöb földfelszín feletti átrepülési magassága precíziós megközelítéseknél	0.5 méter vagy 1 láb számított	kritikus 1×10^{-8}
Akadálymentes tengerszint feletti magasság akadálymentes földfelszín feletti magasság (OCA/H)	PANS-OPS (Doc 8168) szerint	alapvető 1×10^{-5}
Akadályok az 1. körzetben (az Állam teljes területén), tengerszint feletti magasságok	30 méter földmérési	általános 1×10^{-3}
Akadályok a 2. körzetben (a repülőtér/helikopter-leszállóhely határán kívüli részen)	3 méter földmérési	alapvető 1×10^{-5}
DME távolságmérő berendezés, tengerszint feletti magasság	30 méter vagy 100 láb földmérési	alapvető 1×10^{-5}
Műszeres megközelítési eljárás tengerszint feletti magassága	PANS-OPS (Doc 8168) szerint	alapvető 1×10^{-5}
Legalacsonyabb tengerszint feletti repülési magasságok	50 méter vagy 100 láb számított	általános 1×10^{-3}

1. Megjegyzés: Az akadályokra vonatkozó adatgyűjtési felületek grafikai illusztrációit és az akadályok azonosítási kritériumait a meghatározott területen a 15. Annex 8. Függeléke tartalmazza.

2. Megjegyzés: A 2. körzet azon részein, ahol nagyon magas terep vagy egyéb helyi korlátozások és/vagy előírások miatt tilos a repülés, az akadályadatok az 1. körzetre vonatkozó számszerű követelmények szerint gyűjtendők, az Annex 15. 8. Függelék A8-2 táblázat meghatározásai alapján.

3. Megjegyzés: A 15. Annex 10.6.1.1 és 10.6.1.2 pontjaiban meghatározott rendelkezések – az 1. és 2. körzet szerint meghatározott akadálypontok 2008. november 20. és 2010. november 18. utáni hozzáférhetőségéről – bevezetését a vonatkozó adatok begyűjtésének és feldolgozásának előre megtervezett folyamata teszi lehetővé.

3. Táblázat Mágneses elhajlás és mágneses változás

Elhajlás és változás	*Pontosság Adat típus*	*Osztályzás Megbízhatóság*
Műszaki beméréshez használt URH rádiónavigációs berendezés állomás elhajlás	1 fok földmérési	alapvető 1×10^{-5}
NDB rádiónavigációs berendezés mágneses elhajlás	1 fok földmérési	általános 1×10^{-3}

4. Táblázat Irányszög

Irányszög	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Légiútvonal szakasz	1/10 fok számított	általános 1×10^{-3}
Útvonal és közelkörzeti pont csoportok kijelölése	1/10 fok számított	általános 1×10^{-3}
Közelkörzeti érkezési és indulási útvonal szakaszok	1/10 fok számított	általános 1×10^{-3}
Műszeres megközelítési eljárás pont csoportok kijelölése	1/100 fok számított	alapvető 1×10^{-5}

5. Táblázat Hosszúság — Távolság — Méretek

Hosszúság — Távolság — Méretek	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Légiútvonal szakasz hossza	1/10 km vagy 1/10 tmf számított	általános 1×10^{-3}
Útvonal és közelkörzeti pont csoportok távolsága	1/10 km vagy 1/10 tmf számított	általános 1×10^{-3}
Közelkörzeti érkezési és indulási útvonal szakaszok hossza	1/100 km vagy 1/100 tmf számított	alapvető 1×10^{-5}
Közelkörzeti és műszeres megközelítési eljárás pont csoportok távolsága	1/100 km vagy 1/100 tmf számított	alapvető 1×10^{-5}

Nemzetközi előírások és ajánlott gyakorlati eljárások

A. Melléklet

VOR berendezéssel kijelölt ATS útvonalak meghatározásának módszereire vonatkozó útmutató
(Lásd 2.7.1 pont és 2.11 szakasz)

1. Bevezető

1.1 A jelen mellékletben található útmutató anyag az 1972-ben Európában és 1978-ban az Egyesült Államokban elvégzett átfogó vizsgálatok alapján készült, melyek megállapításai általánosságban egymással azonosak.

Megjegyzés: Az európai vizsgálat részleteit a 120. számú ICAO körlevél — *A légiforgalmi szolgálati útvonal hálózatokban kijelölt egymással párhuzamos repülési útvonalak közötti elkülönítési távolság minimum számítási eljárása* — tartalmazza.

1.2 Az útmutató 3. és 4. pontjában található tájékoztató alkalmazásakor vegyék figyelembe, hogy a felhasznált adatok olyan VOR berendezés segítségével végrehajtott navigáción alapulnak, amelyek teljes mértékben megfelelnek a Doc 8071 — *Rádiónavigációs Berendezések Ellenőrzési Kézikönyve* — I. kötet előírásainak. Vegyenek továbbá figyelembe olyan tényezőket is, mint például a légijárművek útvonal-keresztezésének gyakorisága különleges üzemeltetési körülmények között vagy a rendelkezésre álló tájékoztatás a légijármű tényleges útirány tartási képességéről bizonyos légtérszakaszokon belül.

1.3 Felhívjuk a figyelmet a 4.2 pontban levő alapfeltételezésre valamint arra a tényre, hogy a 4.1 pontban megadott értékek hagyományos és óvatos számítási módszer alapján kerültek meghatározásra. Ezért ezek alkalmazása előtt vegyék figyelembe a kérdéses légtérre vonatkozó bármely gyakorlati tapasztalatot valamint a légijármű általános navigációs teljesítménye fejlődésének lehetőségét.

1.4 Felkérjük az államokat, hogy részletesen tájékoztassák az ICAO-t a jelen útmutató anyag alkalmazásának eredményeiről.

2. A VOR rendszer teljesítmény értékeinek meghatározása

A teljes VOR rendszert alkotó egyes tényezőkkel kapcsolatos értékek valószínű nagyfokú változékonysága, valamint mindezen hatások egyedi és a kívánt pontossággal történő méréséhez rendelkezésre álló jelenlegi korlátozott módszerek arra a következtetésre vezetnek, hogy a VOR rendszer teljesítmény értékeinek meghatározása céljából valószerűbb módszer a teljes rendszer hiba előzetes figyelembevétele. Az útmutató 3. és 4. pontjában található tájékoztatót csak a 120. számú ICAO körlevél megfelelő tanulmányozása után és a helyi környezeti körülmények fokozott figyelembevételével alkalmazzák.

Megjegyzés: A teljes VOR rendszer pontosságával kapcsolatos tájékoztatót a 10. Annex I. kötet C. Melléklete tartalmazza.

3. A VOR berendezéssel kijelölt útvonalak mentén elhelyezkedő védett légtér meghatározása

1. Megjegyzés: A jelen rész anyagát nem az összeütközési veszély kockázati — kívánatos repülésbiztonsági szint módszer alapján készítettük el.

2. Megjegyzés: A "védettség mértéke" kifejezés a jelen részben azt kívánja jelezni, hogy a forgalom a teljes igénybevételi idő (azaz az összes légijármű teljes repülési ideje) 95 %-ában a kérdéses útvonal mentén kialakított védett légtéren belül fog működni. Például ahol 95 %-os védettséget biztosítanak, feltételezzük, hogy a forgalom a teljes igénybevételi idő 5 %-ában a védett légtéren *kívül* repül majd. Ilyen forgalom vonatkozásában nem lehetséges pontos távolsággal meghatározni, hogy ez a forgalom milyen mértékben repül ki a védett légtérből.

3.1 Az alábbi útmutatást azokra a VOR berendezéssel meghatározott útvonalakra vonatkozóan adjuk meg, amelyeken nem használnak radarberendezést annak elősegítésére, hogy a légijármű a védett légtérben maradjon. Mindazonáltal amikor a légijármű oldalirányú eltéréseit radar légtérfigyelés segítségével ellenőrzik, a gyakorlati tapasztalatok szerint az adott légtér vonatkozásában szükséges védett légtér mérete csökkenthető.

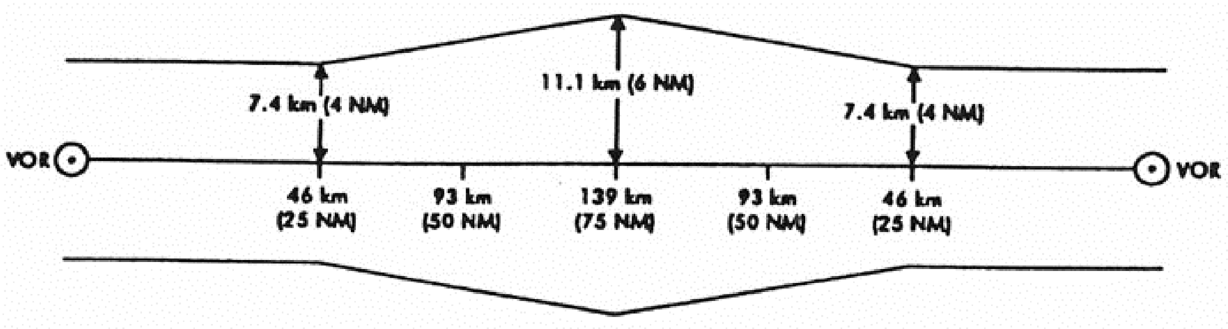
3.2 Az útvonalak melletti légtérben folyó műveletektől legalább 95 %-os védettséget biztosítsanak.

3.3 A 120. számú ICAO körlevélben található anyag szerint a VOR rendszer teljesítménye 95 %-os védettségi mérték mellett az útvonal középvonala mentén a lehetséges eltérések miatt a következő védett légterek kialakítását teszi szükségessé:

• Olyan VOR útvonalakon, amelyeken a VOR berendezések közötti távolság 93 km (50 tmf) vagy kevesebb: ± 7.4 km (4 tmf)

• Olyan VOR útvonalakon, amelyeken a VOR berendezések közötti távolság legfeljebb 278 km (150 tmf): a VOR berendezéstől számított 46 km (25 tmf) távolságig ± 7.4 km (4 tmf); ezt követően a védett légtér a VOR berendezéstől számított 139 km (75 tmf) távolságig legfeljebb ± 11.1 km-re (6 tmf) szélesedik ki.

A-1. ábra



VOR berendezések közötti távolság legfeljebb 278 km (150 tmf)

3.4 Amennyiben az illetékes légiforgalmi szolgálati hatóság véleménye szerint, például a tiltott, korlátozott vagy veszélyes légterek közelsége, a katonai légijárművek emelkedési és süllyedési repülési útvonalai vagy egyéb okok miatt ennél nagyobb védelem szükséges, magasabb szintű védettség biztosítását határozhatja el. A védett légtér kijelölésére ebben az esetben a következő értékeket alkalmazzák:

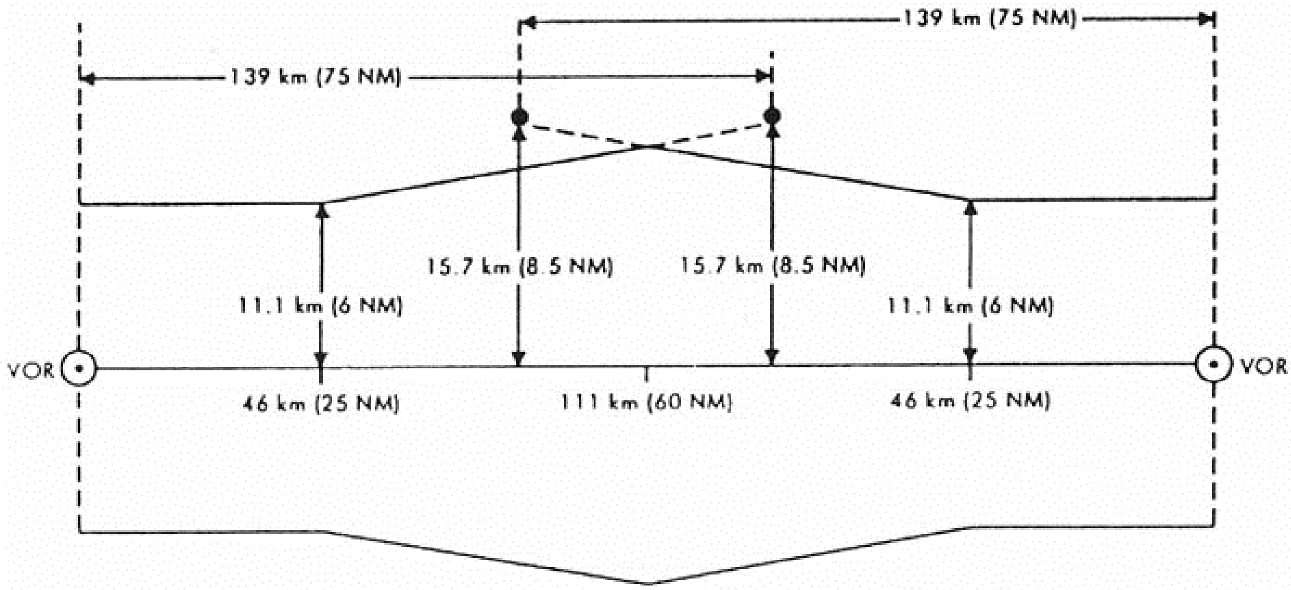
• Olyan útvonalszakaszok esetében, amelyeken a VOR berendezések közötti távolság 93 km (50 tmf) vagy kevesebb, az alábbi táblázat "A" sorában levő értékeket használják;

• Olyan útvonalszakaszok esetében, amelyeken a VOR berendezések közötti távolság több mint 93 km (50 tmf) de legfeljebb 278 km (150 tmf), a VOR berendezéstől számított 46 km (25 tmf) távolságig a táblázat "A" sorában levő értékeket, ez után a VOR berendezéstől számított 139 km (75 tmf) távolságig a táblázat "B" sorában levő, folyamatosan növekvő értékeket használják.

Védettség százalékos értéke (%)						
	95	*96*	*97*	*98*	*99*	*99.5*
A (km)	± 7.4	± 7.4	± 8.3	± 9.3	± 10.2	± 11.1
A (tmf)	± 4.0	± 4.0	± 4.5	± 5.0	± 5.5	± 6.0
B (km)	± 11.1	± 11.1	± 12.0	± 12.0	± 13.0	± 15.7
B (tmf)	± 6.0	± 6.0	± 6.5	± 6.5	± 7.0	± 8.5

Egy olyan útvonal esetében például, amelyen a VOR berendezések közötti távolság 222 km (120 tmf) és a szükséges védelem mértéke 99.5 %, az útvonal alakja az A-2. ábrának megfelelő lesz.

A-2. ábra



Az ábrázolt VOR berendezések közötti távolság 2 x 111 km (60 tmf)

3.5 Amennyiben egy VOR berendezéssel kijelölt légiforgalmi szolgálati útvonal két szakasza több mint 25 fokos szöget zár be egymással, a forduló külső és szükség szerint belső oldalán is további védett légtér alakítandó ki. Ez a további légtér védőterületként szolgál a légijármű repülési irány 25 fokot meghaladó megváltoztatásakor a gyakorlatban megfigyelt megnövekedett oldalirányú eltérés számára. A kiegészítő légtér nagysága a forduló szögével változik, azaz minél nagyobb a forduló szöge, annál nagyobb a kiegészítő légtér is. Az útmutató a legfeljebb 90 fokos fordulókhoz szükséges védett légtérre vonatkozik. Azokban a különleges esetekben, amikor az ATS útvonalon 90 fokosnál nagyobb forduló szükséges, az Államok biztosítsák a megfelelő védett légtér kijelölését az ilyen forduló úgy belső, mint külső oldalán is.

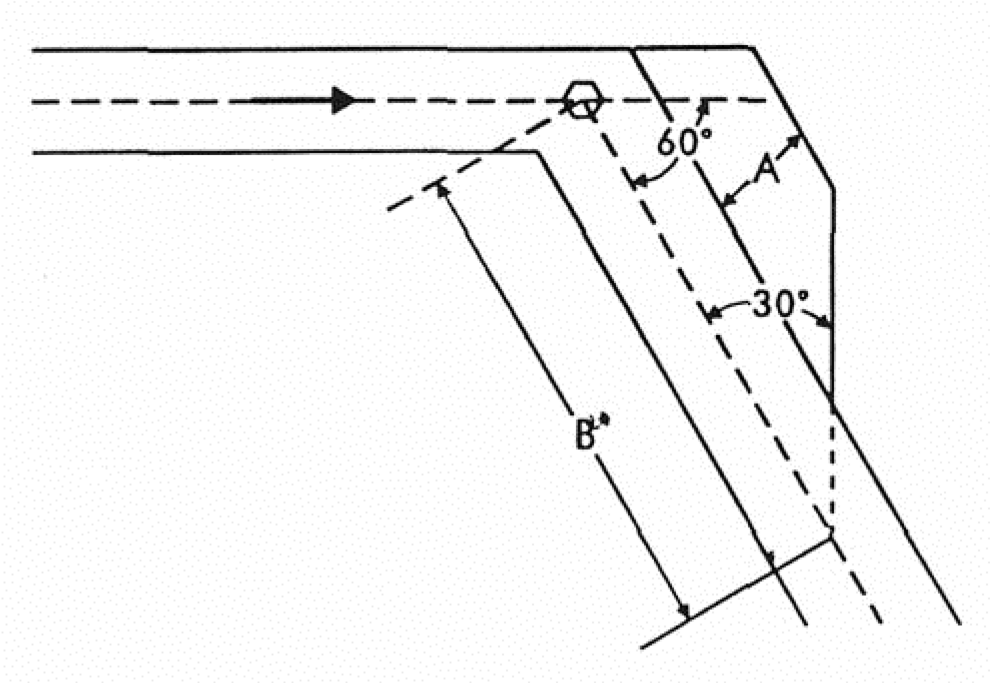
3.6 A következő példák két olyan Állam gyakorlatának összegzéséből származnak, amelyek a tervezéshez a légtér kijelölés felvázolására rajz-mintákat használnak.

A forduló terület minta megtervezésekor olyan tényezőket vettek figyelembe, mint a légijármű sebessége, a forduló bedöntési szöge, a valószínű szélsebesség, a helyzet-megállapítás pontatlansága, a repülőgépvezető cselekvési késése és egy legalább 30 fokos közelítő irány felvétele az új repülési pálya elérése előtt. A rajz-minták legalább 95 %-os védettséget biztosítanak.

3.7 Azon kiegészítő légtér meghatározása érdekében, amely a 30, 45, 60, 75 és 90 fokos fordulót végrehajtó légijármű számára a forduló külső oldalán a védettség fenntartásához szükséges, rajzmintát használtak. Az egyszerűsített ábrák a légtér külső határát legömbölyítés nélkül jelzik és ezzel lehetővé teszik az egyszerű megrajzolást. A kiegészítő légtér minden esetben a nyíllal jelzett irányba repülő légijármű részére került megállapításra. Ahol az útvonalat mindkét irányba használják, a másik irány külső oldalán is jelöljék ki ugyanazt a kiegészítő légteret.

3.8 Az A-3. ábra a VOR berendezés felett egymáshoz 60 fokos szögben csatlakozó útvonal szakaszokat ábrázol.

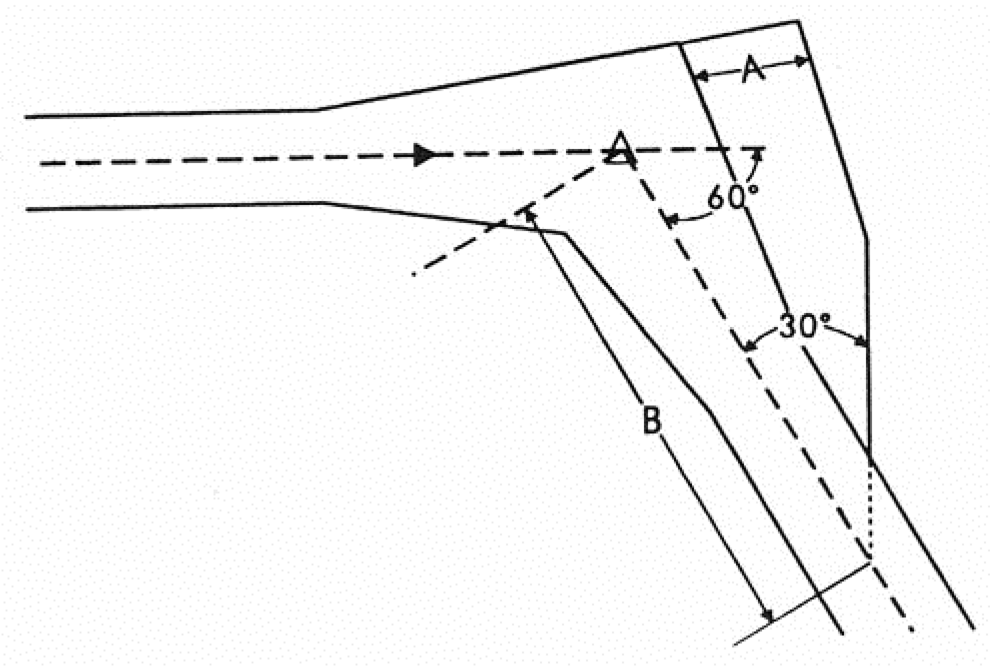
A-3. ábra



Az irányváltoztatás szöge 60 fok, a repülési irányt a nyíl jelzi

3.9 Az A-4. ábra a VOR berendezés felett olyan, egymáshoz 60 fokos szögben csatlakozó útvonalszakaszokat ábrázol, amelynél a légtér határát a 3.3 pont és az A-1. ábra előírásainak megfelelően ki kellett szélesíteni.

A-4. ábra



3.10 A következő táblázat a példákban szereplő esetekben alkalmazandó távolság értékeket ismerteti, amikor FL 450 repülési szinten vagy ez alatt a VOR berendezés felett vagy az egyes VOR berendezésektől számított legfeljebb 139 km (75 tmf) távolságban a csatlakozó útvonal szakaszokhoz kiegészítő védett légtér kijelölése szükséges.

Megjegyzés: Lásd az A-3. és A-4. ábrákat.

Az útvonalak csatlakozási szöge	*30°*	*45°*	*60°*	*75°*	*90°*
VOR berendezés					
"A" távolság * (km)	5	9	13	17	21
"A" távolság * (tmf)	3	5	7	9	11
"B" távolság * (km)	46	62	73	86	92
"B" távolság * (tmf)	25	34	40	46	50
Csatlakozás					
"A" távolság * (km)	7	11	17	23	29
"A" távolság * (tmf)	4	6	9	13	16
"B" távolság * (km)	66	76	88	103	111
"B" távolság * (tmf)	36	41	48	56	60

** = a távolságok a következő egész km vagy tmf értékre felkerekítve.*

Megjegyzés: A fordulóban levő légijárművek üzemelésére vonatkozóan lásd a 120. számú ICAO körlevél 4.4 pontját.

3.11 Az A-5. ábra egy olyan módszert mutat be, amelynek segítségével a 90 fokos vagy ennél kisebb mértékű forduló belső ívén szükséges kiegészítő védett légtér szerkeszthető meg:

A repülési útvonal középvonalán jelöljenek ki egy pontot, amelynek a névleges forduló pont előtti távolsága megegyezik a forduló sugár és az útvonal menti tűrési határértékek összegével.

Ettől a ponttól húzzanak merőleges egyenest, amely a forduló belső oldalánál keresztezi a repülési útvonal szélét.

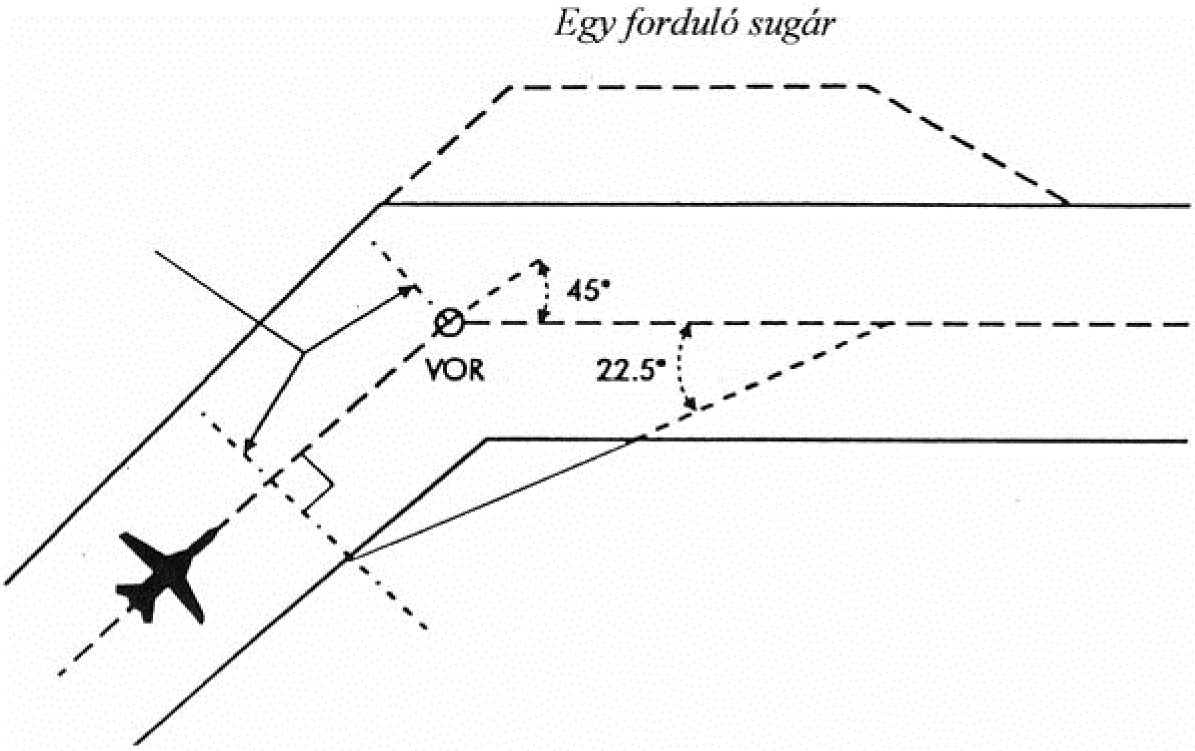
A repülési útvonal belső szélén így kijelölt pontból húzzanak egyenest, amely a forduló után a forduló szög érték felének megfelelő szögben metszi az útvonal középvonalát.

A szerkesztés eredményeképpen kapott háromszög a forduló belső oldalán lesz az irányváltáshoz szükséges kiegészítő védett légtér. Minden 90 fokos vagy ennél kisebb mértékű forduló esetén a belső oldalon elhelyezkedő kiegészítő légtér megfelelő lesz mindkét irányból a fordulóhoz érkező légijármű számára.

1. Megjegyzés: Az útvonal mentén szükséges tűrési határérték kiszámításra vonatkozó követelmények a *Léginavigációs Szolgálatok Eljárásai* — Légijármű üzemeltetés — (PANS-OPS Doc 8168) II. kötet III. rész 31. fejezet Függelékében található.

2. Megjegyzés: A forduló sugár kiszámításhoz szükséges útmutató a 7. részben található.

A-5. ábra

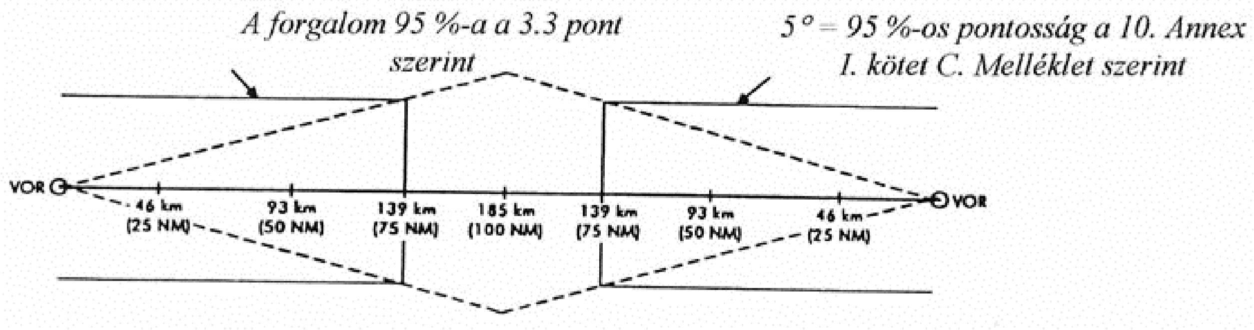


Egy forduló sugár

3.12 A VOR berendezés csatlakozásnál végrehajtott fordulók esetében a forduló belső szélén elhelyezkedő kiegészítő védett légtér kialakításához a 3.11 pont alapelvei alkalmazhatók. Az egyik vagy mindkét VOR berendezés és a csatlakozási pont közötti távolságtól függően az egyik vagy mindkét repülési útvonal megfelelő területe kiszélesedhet. Az adott helyzet alapján a kiegészítő légtér a 95 %-os védettségen belül, részben belül vagy ezen kívül helyezkedhet el. Amennyiben az útvonalat mindkét irányba használják, a légtér kialakítást külön végezzék el mindkét irányba.

3.13 A VOR berendezések között 278 km-nél (150 tmf) hosszabb repülési útvonalakra vonatkozóan mért adatok még nem állnak rendelkezésre. A VOR berendezéstől 139 km-nél (75 tmf) távolabbra elhelyezkedő védett légtér kidolgozásához a valószínű rendszer teljesítményt jelző 5 fok körüli szögérték látszik alkalmazhatónak. Az A-6. ábra ezt a módszert mutatja be.

A-6. ábra



4. A VOR berendezésekkel kijelölt párhuzamos útvonalak közötti távolság

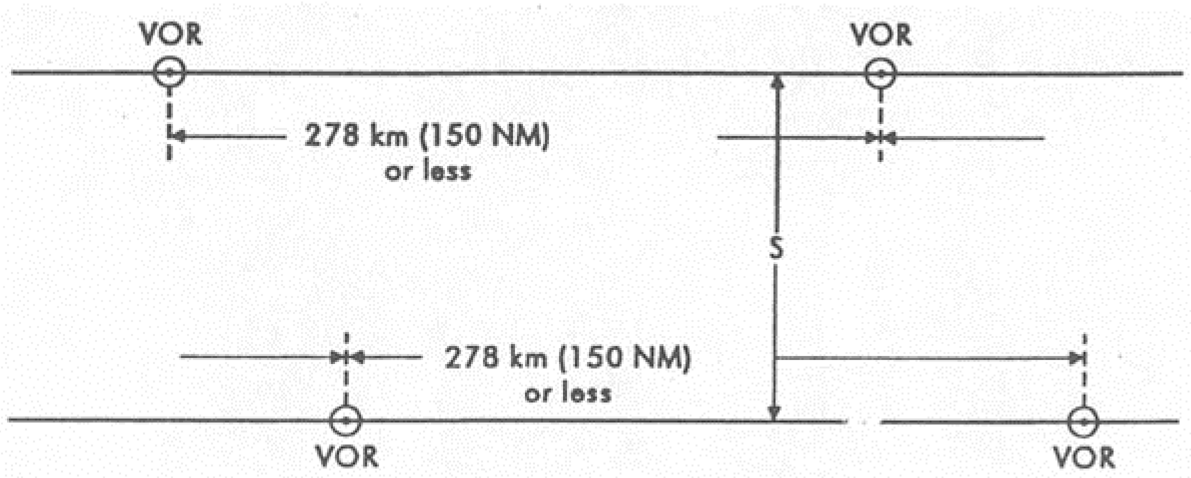
Megjegyzés: A jelen rész anyagát az összeütközési veszély kockázati — kívánatos repülésbiztonsági szint módszer felhasználásával kapott mért adatok alapján készítettük el.

4.1 Az 1.1 pontban jelzett európai vizsgálat adataival végzett összeütközési veszély kockázati — kívánatos repülésbiztonsági szint számítás a vizsgált körülmények között azt az eredményt adta, hogy az útvonalak középvonalai közötti távolság (az A-7. ábrán **"S"**) általában legalább az alábbi érték legyen:

a) azokon a párhuzamos útvonalakon, amelyeken a légijárművek egymással ellentétes irányba repülnek, 33.3 km (18 tmf); és

b) azokon a párhuzamos útvonalakon, amelyeken a légijárművek ugyanabba az irányba repülnek, 30.6 km (16.5 tmf).

A-7. ábra



Megjegyzés: Két repülési útvonal szakasz akkor tekintendő párhuzamosnak, ha:

⇒ *irányuk körülbelül azonos, azaz a közöttük levő irányszög különbség nem haladja meg a 10 fokot;*

⇒ *egymást nem keresztezik, azaz a csatlakozástól vagy keresztezéstől meghatározott távolságban más fajta elkülönítésnek kell fennállnia;*

⇒ *az egyik légiútvonal forgalma független a másiktól, azaz az egyik forgalom nem vezet a másik korlátozásához.*

4.2 A párhuzamos útvonalak közötti ilyen távolság feltételezi, hogy:

a) a légijárművek a két útvonalon az emelkedés, a süllyedés vagy a szinttartó repülés közben ugyanazon a repülési szinten lehetnek;

b) a forgalom sűrűsége egy nagy forgalmú két hónapos időszak alatt 25 - 50 ezer járat között van;

c) az ICAO Doc 8071 — *Rádiónavigációs Berendezések Ellenőrzési Kézikönyve* — I. kötet előírásai alapján rendszeres légi ellenőrzéssel vizsgált VOR adások az adott útvonalon meghatározott navigációs eljárásoknak megfelelően működnek; és

d) az oldalirányú eltéréseket radar-figyeléssel vagy egyéb módon nem ellenőrzik.

VOR berendezések közötti távolság 278 km (150 tmf) vagy kevesebb

4.3 Az előzetes vizsgálatok azt jelzik, hogy az alábbi a) — c) alpontokban ismertetett körülmények között az útvonalak közötti legkisebb távolság lecsökkenthető. Mindazonáltal a megadott értékeket nem pontosan számították ki és az egyedi körülmények részletes vizsgálatára minden esetben szükség van:

a) amennyiben a szomszédos repülési útvonalakon működő légijárművek részére nem adják ki ugyanazt a repülési szintet, az útvonalak közötti távolság lecsökkenthető; a csökkentés mértéke a szomszédos útvonalakon működő légijárművek közötti függőleges elkülönítéstől, valamint az emelkedő és süllyedő légijárművek százalékos arányától függ, azonban nem valószínű, hogy ez meghaladja az 5.6 km (3 tmf) értéket;

b) amennyiben a forgalom jellemzői jelentős mértékben eltérnek a 120. számú ICAO körlevélben közöltektől, a 4.1 pontban ismertetett minimum módosításra szorulhat. Például ha a forgalom sűrűsége a nagy forgalmú két hónapos időszak alatt tízezer járat körül van, 900 méter és 1850 méter (0.5 — 1.0 tmf) közötti távolság csökkentés lehetséges;

c) a két repülési útvonalat kijelölő VOR berendezések elhelyezkedése és az azok közötti távolság befolyásolja az útvonalak közötti távolságot, azonban ennek mértékét nem határoztuk meg.

4.4 A radarellenőrzés alkalmazása és a légijármű oldalirányú eltéréseinek ellenőrzése az útvonalak közötti megengedhető legkisebb távolságot nagy mértékben befolyásolhatja. A radarellenőrzés hatásaival foglalkozó vizsgálatok azt mutatják, hogy:

⇒ a teljes mértékben megfelelő matematikai modell kidolgozásához további vizsgálatok szükségesek;

⇒ az elkülönítési távolság bármely csökkentése szoros összefüggésben van a következőkkel:

∗ a forgalom (mennyisége és jellemzői);

∗ a radar lefedettség és adatfeldolgozás, az automatikus riasztás lehetősége;

∗ a radarellenőrzés (légtérfigyelés) folyamatossága;

∗ a szektor terhelése; valamint

∗ a rádiótávbeszélő működésének minősége.

Ezen vizsgálatok szerint, továbbá figyelembe véve egyes Államoknak a párhuzamos útvonal rendszerek folyamatos radar ellenőrzése és irányítása során szerzett több éves gyakorlati tapasztalatait, 15 — 18.5 km (8 — 10 tmf) nagyságrendű csökkentés feltételezhető, azonban ez minden valószínűség szerint nem lesz 13 km-nél (7 tmf) kevesebb feltéve, hogy a radarellenőrzéssel járó munkaterhelés a csökkentés következtében nem növekszik jelentős mértékben. Az ilyen csökkentett oldalirányú távolsági elkülönítéssel rendelkező rendszerek tényleges alkalmazásával szerzett tapasztalatok azt jelzik, hogy:

⇒ nagyon fontos az átkapcsolási pontok meghatározása és közzététele (lásd még a 6. pont);

⇒ lehetőség szerint kerüljék a nagyobb mértékű fordulókat; valamint

⇒ ahol ezeket a nagyobb fordulókat nem lehet elkerülni, a 20 fokosnál nagyobb fordulók esetében határozzák meg az előírt forduló profilt.

Még abban az esetben is gondoljanak a teljes radarberendezés meghibásodása esetén alkalmazandó eljárásokra, ha ennek a valószínűsége nagyon csekély.

5. A VOR berendezésekkel kijelölt szomszédos, nem párhuzamos útvonalak közötti távolság

1. Megjegyzés: Ezen rész anyagának célja útmutatás biztosítása olyan esetekre, ahol a VOR berendezésekkel kijelölt, egymást nem keresztező, nem párhuzamos szomszédos útvonalak irányszög különbsége a 10 fokot meghaladja.

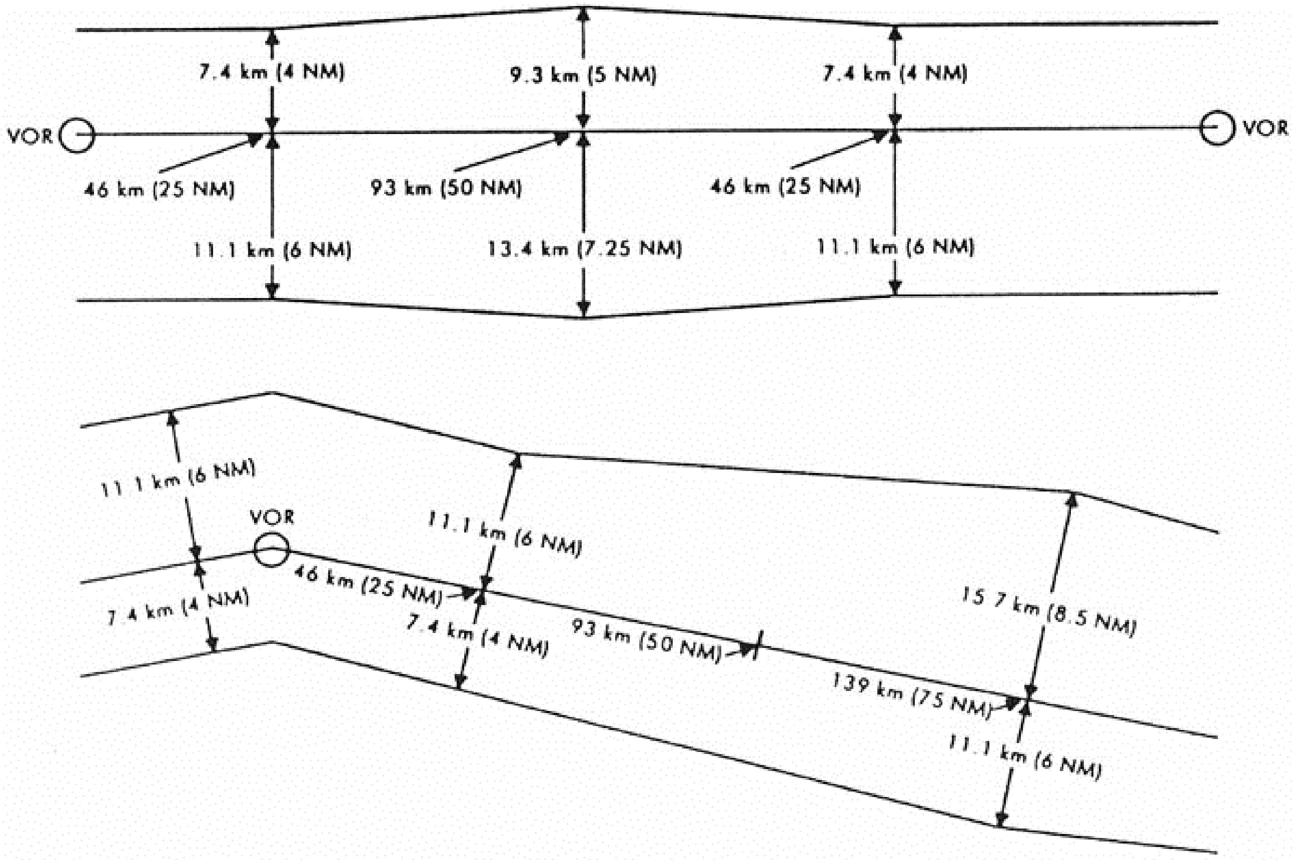
2. Megjegyzés: A jelen rész anyagát nem az összeütközési veszély kockázati — kívánatos repülésbiztonsági szint módszer felhasználásával készítettük el.

5.1 Az összeütközési veszély kockázati — kívánatos repülésbiztonsági szint modell jelen fejlettségi állapotában a VOR berendezésekkel kijelölt, egymást nem keresztező, nem párhuzamos szomszédos útvonalak esetére nem teljesen megfelelő. Ezért alkalmazzák a 3. szakaszban ismertetett anyagot.

5.2 Az ilyen útvonalak között levő védett légtér ne legyen kisebb, mint amely átfedés nélkül biztosítja a 3.4 pont táblázatában szereplő 99.5 %-os védettség mértéket (lásd az A-8. ábra példáját).

5.3 Ahol az útvonal szakaszok közötti irányszög különbség több, mint 25 fok, a 3.5 — 3.10 pontok szerint további kiegészítő védett légtér biztosítandó.

A-8. ábra



Egymás mellett elhelyezkedő nem párhuzamos repülési útvonalak

6. VOR berendezések átkapcsolási pontjai

6.1 A VOR berendezéssel kijelölt légiforgalmi szolgálati útvonalak átkapcsolási pontjai kijelölésének tervezésekor, ahol a légijármű az elsődleges navigációs irányvezetés biztosításához az egyik VOR berendezésről a másikra kapcsol át, az Államok a következőket vegyék figyelembe:

a) az átkapcsolási pontok kijelölése az érintett VOR állomások teljesítménye alapján történjen, beleértve az interferencia védelemre vonatkozó előírások értékelését is. Az eljárást repülőgépes légi ellenőrzéssel is erősítsék meg (lásd Doc 8071, I. kötet, II. rész);

b) ahol a frekvenciasáv védelme igen lényeges tényező, a légi ellenőrzést azon a legnagyobb repülési magasságon végezzék, amelyen az adott berendezés frekvencia védelmet élvez.

6.2 A 6.1 pont tartalmából semmi sem értelmezendő úgy, hogy a 10. Annex I. kötet 3.3 szakasz előírásainak megfelelő VOR létesítmény üzemi hatótávolságát azok korlátoznák.

7. A forduló sugár kiszámítása

7.1 A forduló sugár kiszámításának módszere és az alábbiakban jelzett forduló sugár érték állandó forduló értéket tartó légijárművekre alkalmazható. Az anyagot az RNP1 ATS útvonal forduló sugár teljesítmény előírásra dolgozták ki és ez használható a forduló belső oldalán szükséges kiegészítő védett légtér megtervezéséhez a nem VOR berendezéssel kijelölt ATS útvonalak esetében is.

7.2 A forduló teljesítmény két tényezőtől, a légijármű földhöz viszonyított sebességétől és a bedöntéstől függ. Az állandó sugarú forduló során a repülési irányszög változása következtében fellépő szélirány összetevő változás miatt a földhöz viszonyított sebesség és ezzel együtt a bedöntés szöge is változni fog. Mindazonáltal a körülbelül 90 fokosnál nem nagyobb fordulók valamint az alábbiakban vizsgált sebesség értékek esetében az elérhető állandó forduló sugár érték számításához a következő képlet alkalmazható, amelyben a légijármű földhöz viszonyított sebessége a tényleges repülési sebesség és a szélsebesség összege:

$$\textit{Forduló sugár} = \frac{(\textit{földhöz viszonyított sebesség})^2}{\textit{"G" állandó} * \textit{TAN (bedöntés szöge)}}$$

7.3 Minél nagyobb a légijármű földhöz viszonyított sebessége, annál nagyobb lesz a szükséges bedöntés mértéke. Annak biztositása érdekében, hogy a forduló sugár minden előre látható körülmény esetére jellemző legyen, szélsőséges értékeket szükséges figyelembe venni.

A magasabb repülési szinteken valószínűleg előforduló legnagyobb tényleges (levegőhöz viszonyított) repülési sebesség 1020 km/h (550 csomó). Ez a közepes és magas repülési szinteken várható 370 km/h (200 csomó) legnagyobb szélsebességgel {99.5 százalékos érték a meteorológiai adatok alapján} együtt maximálisan 1400 km/h (750 csomó) földhöz viszonyított sebességnek felel meg.

A legnagyobb bedöntési szög értéke elsősorban a légijármű egyedi repülési tulajdonságaitól függ. A nagy szárny-terhelésű, a legmagasabb engedélyezett repülési szintjén vagy ehhez közeli magasságon repülő légijármű a nagy bedöntéseket rendkívül rosszul viseli.

A legtöbb szállító légijármű légialkalmassági bizonyítványa alapján a kormányművek bármely beállítása mellett nem repülhet átesési sebességének 1.3-szeresénél alacsonyabb sebességgel. Mivel az átesési sebesség a bedöntési szöggel (TAN) növekszik, számos járató törekszik arra, hogy a széllökések és a turbulencia elleni védelem érdekében a légijármű utazósebessége ne legyen alacsonyabb, mint az átesési sebesség 1.4-szerese. Ugyanebből az okból a legtöbb szállító légijármű utazó repülés közben csökkentett maximális forduló bedöntést alkalmaz. A fentiek alapján feltételezhetjük, hogy az összes légijármű típus részéről elfogadható legnagyobb bedöntési szög érték 20 fok körül van.

7.4 A számítás szerint az 1400 km/h (750 csomó) földhöz viszonyított sebességgel repülő, 20 fokos bedöntést alkalmazó légijármű forduló sugara 22.51 tmf (41.69 km). A célszerűség érdekében ezt az értéket 22.5 tmf-re (41.6 km) csökkentettük.

Az alacsony légtér esetében ugyanezt a logikát követve megállapították, hogy FL 200 (6100 m) repülési szintig a várható tényleges repülési sebesség 740 km/h (400 csomó) és a hátszél értéke 370 km/h (200 csomó). Ha a legnagyobb bedöntési szög értékét 20 fokon tartják és ugyanezt a számítást végzik el, a forduló 14.45 tmf (26.76 km) forduló sugárral határozható meg. A célszerűség érdekében ez az érték 15 tmf-re (27.8 km) kerekíthető fel.

7.5 A fentiek alapján a két földhöz viszonyított repülési sebesség jellemző legvalószínűbb választó pontja FL 190 (5800 m) és FL 200 (6100 m) között van. Annak érdekében, hogy a jelenleg alkalmazott repülésvezérlő rendszerekben (FMS) használt forduló-számítási képletek minden előre látható körülményre érvényesek legyenek, FL 200 repülési szinten és felette 22.5 tmf (41.6 km) illetve FL 190 repülési szinten és alatta 15 tmf (27.8 km) forduló sugarat határozzanak meg.

B. Melléklet
A területi navigációs (RNAV) berendezéssel felszerelt légijárművek általi használatra kijelölt ATS útvonalak meghatározásának módszere

(Lásd 2.7.1 pont és 2.11 szakasz)

1. Bevezető

1.1 A jelen mellékletben található útmutató anyag több országban elvégzett átfogó vizsgálatok eredményei alapján készült. Az anyag tükrözi továbbá a számos Államban már régóta létező és alkalmazott RNAV követelményrendszert is. Meg kell jegyeznünk, hogy a jelen részben található egyes értékeket nem az összeütközési veszély kockázati — kívánatos repülésbiztonsági szint módszer alapján számítottuk ki. Ezt a megfelelő helyen külön jelezzük.

1.2 Felkérjük az Államokat, hogy részletesen tájékoztassák az ICAO-t a jelen útmutató anyag alkalmazásának eredményeiről.

2. Az RNP 4. alapján kialakított területi navigációs útvonalak gyakorlati felhasználása

2.1 Általános rész

2.1.1 Ez az útmutató anyag olyan területi navigációs útvonalakhoz történő felhasználásra készült, amelyek földi elektronikus navigációs berendezések fedésterületén belül kerültek kialakításra és ezek a berendezések teszik lehetővé a szükséges felülvizsgálati ellenőrzések végrehajtását, így megfelelő védelmet biztosítanak az RNAV helymeghatározási hibákkal szemben.

2.1.2 A jelen anyaggal összhangban kialakított RNAV útvonalakon csak azoknak a légijárműveknek nyújtanak légiforgalmi szolgálatot, amelyek számára a légialkalmassági bizonyítványt — üzemeltetési engedélyt az *Előírt Navigációs Teljesítmény (RNP) Kézikönyv* (Doc. 9613) 5.5 és 5.6 szakaszainak megfelelően adták ki.

2.1.3 A VOR berendezéssel kijelölt légiforgalmi szolgálati útvonalakon történő navigációhoz engedélyezzék a területi navigációs berendezések használatát. Ezen kívül ott, ahol ez gyakorlati szempontból szükséges és az RNAV lehetőséget igénybe vevő légijárművek száma indokolja, ilyen területi navigációs útvonalakat is kijelölhetnek. Ezek az útvonalak lehetnek:

a) állandó RNAV útvonalak;

b) feltételes, szükség szerint igénybe vehető RNAV útvonalak; és

c) eseti jelleggel igénybe vehető RNAV útvonal szakaszok.

2.1.4 Az ilyen RNAV berendezésre előírt navigációs teljesítmény az útvonal repülés esetében olyan navigációs pontossági szintet jelöl meg, amely alapján a területi navigációs berendezést használó minden légijármű útirány tartási pontossága a repülési idejének legalább 99.5 %-ában ± 11.1 km (6 tmf) vagy jobb. Ez a fajta navigációs teljesítmény várhatóan olyan pontosságnak felel meg, mely alapján a területi navigációs berendezést használó minden légijármű útirány repülési pálya tartási pontossága a repülési idejének legalább 95 %-ában ± 7.4 km (4 tmf). Ez a pontossági teljesítmény szint azonos azzal, amit az a területi navigációs képességgel nem rendelkező légijármű képes tartani, amelyik meglevő VOR vagy VOR/DME berendezésekkel kijelölt olyan útvonalon repül, ahol a VOR berendezések közötti távolság kevesebb mint 93 km (50 tmf).

2.2 Az RNP 4. alapján kialakított RNAV ATS útvonalak védett légtere

2.2.1 Az RNAV légiforgalmi szolgálati útvonalak esetében biztosítsanak legalább 11.1 km (6 tmf) védett légteret a tervezett repülési pálya mindkét oldalán, amelyen belül a területi navigációs (RNAV) berendezéssel felszerelt légijármű a repülési idejének legalább 99.5 %-ában várhatóan repülni fog. Mielőtt az ebből az elméletből származó értékeket alkalmaznák, vegyenek figyelembe a kérdéses légtérre vonatkozó minden gyakorlati tapasztalatot, valamint a légijárművek általános navigációs teljesítménye fejlődésének lehetőségét is. Ebben az összefüggésben, amennyiben a területi navigációs útvonaltól történő oldalirányú eltéréseket radar-berendezés segítségével ellenőrzik, a szükséges védett légtér a következők szerint lecsökkenthető:

Védettség százalékos értéke (%)						
	95	*96*	*97*	*98*	*99*	*99.5*
km	± 7.4	± 7.4	± 8.3	± 9.3	± 10.2	± 11.1
tmf	± 4.0	± 4.0	± 4.5	± 5.0	± 5.5	± 6.0

2.2.2 A radarberendezéssel végrehajtott légtérellenőrzést érintő vizsgálatok azt jelezték, hogy a védett légtér bármely tervezett és lehetséges csökkentése szoros összefüggésben van a forgalom jellemzőivel, a légiforgalmi irányító számára rendelkezésre álló tájékoztatásokkal és az irányítói szektor munkaterhelésével. Végül érdemes azon elgondolkodni, hogy néhány európai Államban elvégzett, a útvonaltartás mértékében kifejezett RNAV pontossági elemzés azt mutatta, hogy a területi navigációra képes járatok RNAV pontossága a repülési idő 99.5 %-ában az útvonal középvonalától számított 5 tmf értéken belül volt *(hiv.: EUR Doc 001, RNAV/4)*. Amennyiben az illetékes légiforgalmi szolgálati hatóság véleménye szerint, például a tiltott, korlátozott vagy veszélyes légterek közelsége, a katonai légijárművek emelkedési és süllyedési repülési útvonalai vagy egyéb okok miatt ennél nagyobb védelem szükséges, további biztonsági védő légtereket alakíthatnak ki.

2.2.3 Amennyiben két útvonalszakasz között a repülési irányszög különbség több mint 25 fok, az A. Melléklet 3.5 — 3.12 pontjainak valamint 7. részének megfelelően további védett légtér biztosítandó.

Megjegyzés: Az RNAV berendezésekkel felszerelt légijárművek üzemeltetésére az Államok különböző navigációs pontossági szintet írhatnak elő. A jelen útmutató ezekkel az előírásokkal nem foglalkozik, azonban ezek a védett biztonsági légterekre vonatkozó követelmények bizonyos változtatásait tehetik szükségessé.

2.3 Az RNP4 alapján kialakított párhuzamos RNAV útvonalak közötti távolság

Amikor a 2.2 pont alapján kialakított védett légteret alkalmazzák, az útvonal középvonalak úgy helyezkedjenek el, hogy a 99.5 %-os útvonaltartás értéken belül elhelyezkedő légterek egymást ne fedjék. Amikor olyan oldaltávolságot alkalmaznak, amely kevesebb, mint a fenti 99.5 %-os útvonaltartási értéknek megfelelő távolság, a forgalom radar ellenőrzése szükséges.

3. A párhuzamos útvonal szakaszok vagy RNAV útvonal középvonalak közötti távolság az RNP típus alapján

3.1 Meg kell jegyeznünk, hogy az alábbiakban ismertetett oldaltávolságok ott, ahol ezt jeleztük, egy adott útvonalszakasz vagy útvonalhálózat egyedi repülésbiztonsági értékelése alapján kerültek meghatározásra.

Ennek megfelelően az értékelt forgalmi jellemzők esetleg az adott útvonalhálózat vonatkozásában egyediek lehetnek. Ezek közé tartozik például a forgalom sűrűsége, az alkalmazható legkisebb elkülönítéssel átrepülő légijárművek száma, illetve az ilyen elkülönítések gyakorisága, a távközlési és légtérfelderítési berendezések és létesítmények. A biztonsági felmérésre és értékelésre vonatkozó további tájékoztató a *Légtér Tervezési Módszer az Elkülönítési Minimumok Meghatározásához Kézikönyv*ben (Doc. 9689) található.

3.2 Amikor a párhuzamos útvonal szakaszok vagy ATS útvonalak (a továbbiakban rendszer) közötti oldaltávolságot határozzák meg, az előzetes repülésbiztonsági értékelést a legalacsonyabb elfogadható repülésbiztonsági szinthez viszonyítva a fenti 3.1 pontban jelzettekhez hasonló jellemzők vizsgálatával végezzék el.

3.2.1 Ahol a "végzetes balesetek számát repülési óránként" megfelelő értékelési egységnek tekintik, a 2000. év után üzembe állítandó jövőbeni útvonalrendszer elfogadhatóságának megállapítására $\mathbf{5 \times 10^{-9}}$ számú végzetes baleset értéket alkalmazzák kívánatos biztonsági szintként (TLS). A fenti időpont előtt repült óránként $\mathbf{2 \times 10^{-8}}$ számú végzetes baleset érték alkalmazható TLS szintként.

3.2.2 Mindazonáltal, ahol a "végzetes balesetek számát repülési óránként" nem tekintik megfelelő értékelési egységnek, olyan megfelelő módon indokolható és igazolható értékelési módot és érték egységet használjanak, amely az Állam légterében elfogadható biztonsági szintet nyújt és amit a körzeti légiközlekedési egyezményekbe szükség szerint fel lehet venni.

3.3 Ha a rendszer kialakításának és üzembe állásának időpontjában vagy bármely későbbi repülésbiztonsági értékelés alkalmával megállapítják, hogy a rendszer nem elégíti ki az értékelési mód alapján meghatározott megfelelő biztonsági szintet, vegyék fontolóra az ismételt ellenőrzés és értékelés végrehajtását, amelyet a Doc. 9689-al összhangban végezzenek el annak megállapítása érdekében, hogy tartani tudják-e a legalacsonyabb vagy ennél magasabb elfogadható repülésbiztonsági szintet.

3.4 Az alábbiakban az RNP típus alapján példákkal mutatjuk be az egyes meghatározott légterek vagy körzetekútvonal rendszerei közötti biztonsági távolságot. Ahol ezek egy adott légtér vagy körzet egyedi jellemzői alapján kerültek meghatározásra, más Államok vagy körzetek saját rendszereiket ennek megfelelő módon vizsgálják felül.

3.4.1 Eljárás-irányítási körülmények között:

a) **RNP 20**

Oldaltávolság: 185 km (100 tmf);

Értékelés alapja: Régóta fennálló, hosszú időszak alatt beszerzett gyakorlati üzemeltetési tapasztalatok alapján használatos rendszer; valamint

Minimális ATS követelmények:
NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen RNP 20 jogosítással;

COM — Közvetett, harmadik félen keresztül fenntartott beszédüzemű összeköttetés;

SUR —Repülőgépvezető helyzetjelentés az eljárások szerint.

b) **RNP 12.6**

Oldaltávolság: 110 km (60 tmf);

Értékelés alapja: Összeütközési veszély kockázati modell a NAT repülési útvonalhálózathoz (*Jelentés az Észak-atlanti Körzeti Légiközlekedési Értekezlet Számára (1976)* Doc. 9182); valamint

Minimális ATS követelmények:

NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen RNP 12.6 jogosítással;

COM — Közvetett, harmadik félen keresztül fenntartott beszédüzemű összeköttetés;

SUR — Repülőgépvezető helyzetjelentés az eljárások szerint.

Egyéb — A rendszer biztonságát időszakosan felül kell vizsgálni.

Megjegyzés: Bizonyos, mint például ismert kedvezőtlen időjárású légterekben közvetlen légiforgalmi irányító és repülőgépvezető összeköttetés lehet kívánatos.

c) **RNP 10**

Oldaltávolság: 93 km (50 tmf);

Értékelés alapja: Az Egyesült Államok Szövetségi Légügyi Igazgatóságának az észak-atlanti útvonalhálózatra (annak jellemzői alapján) elvégzett összeütközési veszély kockázati — repülésbiztonsági szint modellje; valamint

Minimális ATS követelmények:

NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen RNP 10 jogosítással;

COM — Közvetett, harmadik félen keresztül fenntartott beszédüzemű összeköttetés;

SUR — Repülőgépvezető helyzetjelentés az eljárások szerint.

Egyéb — A rendszer biztonságát időszakosan felül kell vizsgálni.

Megjegyzés: Bizonyos, mint például ismert kedvezőtlen időjárású légterekben közvetlen légiforgalmi irányító és repülőgépvezető összeköttetés lehet kívánatos.

d) **RNP 5 (vagy RNP 4 vagy jobb)**

Oldaltávolság: egyirányú rendszer esetében 30.6 km (16.5 tmf); kétirányú rendszer esetében 33.3 km (18 tmf);

Értékelés alapja: Nagy forgalomsűrűségű szárazföldi rendszerrel (VOR alapján kialakított oldaltávolság) történő összevetés az A. Melléklet szerint; valamint

Minimális ATS követelmények:

NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen RNP 5 jogosítással és az ilyen üzemeltetéshez szükséges megfelelő léginavigációs berendezéseket és létesítményeket kell biztosítani;

COM — Közvetlen légiforgalmi irányító és repülőgépvezető közötti ultrarövidhullámú (VHF) beszédüzemű összeköttetés;

SUR — Repülőgépvezető helyzetjelentés az eljárások szerint.

1. Megjegyzés: Az RNP 5 felhasználásra vonatkozó útmutató anyag az *Előírt Navigációs Teljesítmény (RNP) Kézikönyv*ben (Doc. 9613) található.

2. Megjegyzés: Ezt az oldaltávolságot nem a lakott területektől távol eső és/vagy óceáni légterekre dolgozták ki, ahol a megfelelő VOR rendszer nem áll rendelkezésre.

e) **RNP 4**

Oldaltávolság: 55.5 km (30 tmf);

Értékelés 1. alapja: Az Egyesült Államok Szövetségi Légügyi Igazgatóságának az 55.5 km (30 tmf) oldaltávolságú párhuzamos útvonal rendszer általános oldalirányú eltérés hibák jellemzői alapján, a repült óránként $\mathbf{5 \times 10^{-9}}$ számú végzetes baleset kívánatos repülésbiztonsági szint (TLS) érték fenntartásával elvégzett biztonsági vizsgálata;

Értékelés 2. alapja: Az alábbiakban felsorolt minimális távközlési és légtér-felderítési előírások, amelyek gyakorlati szempontból szükségesek az 55.5 km (30 tmf) oldaltávolságú útvonal rendszer sürgősségi és kényszerhelyzeti eseményeinek kezeléséhez.

Minimális ATS követelmények:

NAV — A kijelölt területekre, útvonalakra vagy légiforgalmi szolgálati útvonal szakaszokra RNP 4 jogosítást írjanak elő;

COM — Közvetlen légiforgalmi irányító és repülőgépvezető közötti ultrarövidhullámú (VHF) beszédüzemű vagy légiforgalmi irányító és repülőgépvezető közötti adatátviteli (CPDLC) összeköttetés;

SUR — Olyan ADS rendszer, amelynek rendelkeznie kell megfelelő jelző és riasztó képességgel arra az esetre, ha az útvonal középvonaltól történő eltérés meghaladja a 9.3 km (5 tmf) távolságot.

Egyéb — A bevezetés előtt végezzék el a rendszer időbeni és fizikai sértetlenségének vizsgálatát annak bizonyítására, hogy a 27.8 km (15 tmf) vagy nagyobb mértékű oldalirányú eltérések legnagyobb elfogadható aránya nem haladja meg a B-1. táblázatban található értékeket, valamint a rendszer eleget tesz az üzemeltetési és műszaki követelményeknek. A bizonyító vizsgálatot a fenti minimális navigációs, távközlési és légtérfigyelési előírások teljesítése után végezzék.

A bevezetés után rendszer-felügyeleti programot kell fenntartani annak időszakonkénti rendszeres ellenőrzésére, hogy a 27.8 km (15 tmf) vagy nagyobb mértékű oldalirányú eltérések tényleges legnagyobb elfogadható aránya nem haladja meg a B-1. táblázatban található értékeket. A repülésbiztonsági rendszer-felügyeletre vonatkozó további tájékoztató a *Légtér Tervezési Módszer az Elkülönítési Minimumok Meghatározásához Kézikönyv*ben (Doc. 9689) található.

1. Megjegyzés: A légtértervező először állapítsa meg, hogy a kérdéses légtérre a négy rendszerleírás közül melyik alkalmazható. Amennyiben a B-1. táblázatban található négy eset közül egyik sem vonatkozik az adott rendszerre, a légtértervező azt a két esetet válassza k,i amelyik kettő a leginkább hasonlít a rendszerhez és az alacsonyabb oldalirányú eltérési arányt használja fel. Ezt követően az első oszlopból válassza azt az oldalirányú útvonaltartási értéket, amelyet a rendszer a tervezéshez figyelembe vett időtartamon belül várhatóan nem lépi túl. A táblázat megfelelő sorának és oszlopának leolvasásával a légtér tervező ezután megkapja azt az oldalirányú eltérési arány értéket, amellyel a rendszer a repült óránként 5 x 10^{-9} számú végzetes baleset kívánatos repülésbiztonsági szint (TLS) értéket nem haladja meg.

2. Megjegyzés: A rendszer biztonságának értékelése céljából figyelembe vett oldalirányú eltérések az útvonal középvonaltól számított bármely 27.8 km (15 tmf) vagy nagyobb mértékű eltérések, amelyek nem kapcsolódnak a jóváhagyott kkényszerhelyzeti eljárásokhoz.

3. Megjegyzés: Az ADS és CPDLC használatára vonatkozó eljárásokat a (Doc 4444) PANS-ATM 13. és 14. fejezet tartalmazza, a követelmény-rendszert pedig a megfelelő biztonsági vizsgálat alapján dolgozzák ki. A biztonsági vizsgálatra vonatkozó tájékoztató a *Légtér Tervezési Módszer az Elkülönítési Minimumok Meghatározásához Kézikönyv*ben (Doc. 9689) található.

4. Megjegyzés: Ezt az oldaltávolságot a lakott területektől távol eső és/vagy óceáni légtérhez dolgozták ki, ahol a megfelelő VOR rendszer nem áll rendelkezésre.

5. Megjegyzés: A jelen anyagban az oldalirányú útvonaltartás a légijárművek teljes számának valamint az oldalirányban egymást mellett elhaladó légijármű párok számának hányadosát vagy ennek kétszeresét jelenti.

oldalirányban egymást mellett elhaladó légijármű párok szám a (1x vagy 2x)
a légtérben üzemelő légijárművek teljes száma

Az összeütközési veszély kockázati — kívánatosrepülés biztonsági szint modell esetére használt kifejezések részletes magyarázata a Légiforgalmi Szolgálat Tervezési Kézikönyv (Doc 9426) II. rész, 4. fejezet A és C. függelékében található.

3.4.2 Radarirányítási körülmények között:

a) **RNP 4**

Oldaltávolság: 14.8 — 22.2 km (8 —12 tmf);

Értékelés alapja: a referencia-rendszerrel történő összevetés (a fenti 2.2.1 pont szerint meghatározott biztonsági területek nem fedik egymást); valamint

Minimális ATS követelmények:

NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen legalább

RNP 4 jogosítással és az ilyen üzemeltetéshez szükséges megfelelő léginavigációs berendezéseket és létesítményeket kell biztosítani;

COM — Közvetlen légiforgalmi irányító és repülőgépvezető közötti ultrarövidhullámú (VHF) beszédüzemű összeköttetés;

SUR — Az előírásoknak megfelelő radarberendezés;

Egyéb — Ki kell értékelni a rendszer biztonságát, beleértve a légiforgalmi irányító munkaterhelését is.

b) **RNP 5**

Oldaltávolság: 18.5 — 27.8 km (10 —15 tmf);

Értékelés alapja: a referencia-rendszerrel történő összevetés (a biztonsági területek a fenti 2.2.1 pont alapján az RNP 5 igényeinek megfelelően nem fedik egymást); valamint

Minimális ATS követelmények:

NAV — A lerepülendő útvonalakra vagy útvonal szakaszokra minden légijármű rendelkezzen legalább

RNP 5 jogosítással és az ilyen üzemeltetéshez szükséges megfelelő léginavigációs berendezéseket és létesítményeket kell biztosítani;

COM — Közvetlen légiforgalmi irányító és repülőgépvezető közötti ultrarövidhullámú (VHF) beszédüzemű összeköttetés;

SUR — Az előírásoknak megfelelő radarberendezés;

Egyéb — Ki kell értékelni a rendszer biztonságát, beleértve a légiforgalmi irányító munkaterhelését is.

B-1. táblázat A 27.8 km (15 tmf) vagy nagyobb mértékű oldalirányú eltérések legnagyobb elfogadható aránya

Útvonal rendszer legnagyobb várható útvonal-tartási értéke	*Kettő azonos irányú útvonal*	*Négy azonos irányú útvonal*	*Hét azonos irányú útvonal*	*Kettő ellentétes irányú útvonal*
0.1	1.99×10^{-4}	1.75×10^{-4}	1.52×10^{-4}	3.14×10^{-5}
0.2	1.06×10^{-4}	9.39×10^{-5}	8.27×10^{-5}	2.23×10^{-5}
0.3	7.50×10^{-5}	6.70×10^{-5}	5.95×10^{-5}	1.92×10^{-5}
0.4	5.95×10^{-5}	5.35×10^{-5}	4.79×10^{-5}	1.77×10^{-5}
0.5	5.03×10^{-5}	4.55×10^{-5}	4.10×10^{-5}	1.68×10^{-5}
0.6	4.41×10^{-5}	4.01×10^{-5}	3.64×10^{-5}	1.62×10^{-5}
0.7	3.97×10^{-5}	3.62×10^{-5}	3.30×10^{-5}	1.58×10^{-5}
0.8	3.64×10^{-5}	3.34×10^{-5}	3.06×10^{-5}	1.55×10^{-5}
0.9	3.38×10^{-5}	3.11×10^{-5}	2.86×10^{-5}	1.52×10^{-5}
1.0	3.17×10^{-5}	2.93×10^{-5}	2.71×10^{-5}	1.50×10^{-5}
1.1	3.00×10^{-5}	2.79×10^{-5}	2.58×10^{-5}	1.48×10^{-5}
1.2	2.86×10^{-5}	2.66×10^{-5}	2.48×10^{-5}	1.47×10^{-5}
1.3	2.74×10^{-5}	2.56×10^{-5}	2.39×10^{-5}	1.46×10^{-5}

Útvonal rendszer legnagyobb várható útvonal-tartási értéke	*Kettő azonos irányú útvonal*	*Négy azonos irányú útvonal*	*Hét azonos irányú útvonal*	*Kettő ellentétes irányú útvonal*
1.4	2.64×10^{-5}	2.47×10^{-5}	2.31×10^{-5}	1.45×10^{-5}
1.5	2.55×10^{-5}	2.39×10^{-5}	2.25×10^{-5}	1.44×10^{-5}
1.6	2.48×10^{-5}	2.33×10^{-5}	2.19×10^{-5}	1.43×10^{-5}
1.7	2.41×10^{-5}	2.27×10^{-5}	2.14×10^{-5}	1.42×10^{-5}
1.8	2.35×10^{-5}	2.22×10^{-5}	2.09×10^{-5}	1.42×10^{-5}
1.9	2.29×10^{-5}	2.17×10^{-5}	2.05×10^{-5}	1.41×10^{-5}
2.0	2.24×10^{-5}	2.13×10^{-5}	2.01×10^{-5}	1.41×10^{-5}

C. Melléklet
A légijárművek által adott forgalmi tájékoztató rádióadások (TIBA) és az ezekkel kapcsolatos gyakorlati eljárások

(Lásd 4. fejezet 4.2.2 pont 2. Megjegyzést)

1. Bevezető és a tájékoztató rádióadások alkalmazhatósága

1.1 A légijárművek által rádión adott forgalmi tájékoztatások célja, hogy a repülőgépvezetők számára lehetővé tegye a tájékoztató jellegű jelentések és az ezekkel kapcsolatos kiegészítő tájékoztatások rádióberendezés segítségével történő megadását a közelben tartózkodó más légijárművek repülőgépvezetőinek tájékoztatására egy kijelölt ultrarövidhullámú rádió-távbeszélő (VHF - RTF) frekvencián.

1.2 A légijármű részéről adott forgalmi tájékoztató rádióadások (TIBA) csak szükség esetén és ideiglenes intézkedésként alkalmazhatók.

1.3 A tájékoztató rádióadás eljárások olyan kijelölt légtérben alkalmazhatók, ahol:

a) az ellenőrzött légtéren kívül a légiforgalmi szolgálatok részéről az összeütközési veszélyről megadott tájékoztatások kiegészítésére van szükség; vagy

b) a rendszeres légiforgalmi szolgálatban ideiglenes jellegű fennakadás van.

1.4 Az ilyen légtereket az adott légtéren belül légiforgalmi szolgálat biztosításáért felelős Állam -- szükség esetén az ICAO helyi irodájával együtt -- jelölje ki és a légiforgalmi tájékoztató kiadványaiban vagy NOTAM-ban tegye közzé. Ebben jelölje meg az ultrarövidhullámú rádiótávbeszélő frekvenciát (VHF - RTF), a közlemény formátumot valamint az alkalmazandó eljárásokat is. Ahol az 1.3 a) pont esetében egynél több Állam érintett, a légteret a körzeti légiközlekedési egyezmény alapján határozzák meg és a Doc. 7030 előírásainak megfelelő módon tegyék közzé.

1.5 Amennyiben ilyen kijelölt légteret alakítanak ki, az illetékes légiforgalmi szolgálati hatóságok állapodjanak meg a légtér alkalmazhatóságának felülvizsgálati időpontjában, azonban ez a 12 hónap időtartamot ne haladja meg.

2. Az adások részletei

2.1 Használandó ultrarövidhullámú rádiótávbeszélő (VHF - RTF) frekvencia

2.1.1 A használandó ultrarövidhullámú rádiótávbeszélő (VHF - RTF) frekvenciát a helyi körülményeknek megfelelően jelöljék ki és tegyék közzé. Mindazonáltal az ellenőrzött légtérben bekövetkező ideiglenes zavar esetében a felelős államok — az adott légtér határain belül igénybe veendő ultrarövidhullámú rádiótávbeszélő (VHF - RTF) frekvenciaként — közzétehetnek egy olyan rádió frekvenciát, amelyet általában ezen a légtéren belül a légiforgalmi irányító szolgálat biztosítására használnak.

2.1.2 Ahol a légiforgalmi szolgálattal történő kapcsolattartásra a levegő-föld összeköttetések során ultrarövidhullámú (VHF) frekvenciát használnak és egy légijármű csak két üzemképes URH készülékkel rendelkezik, az egyiket a megfelelő ATS frekvenciára, a másikat pedig a TIBA frekvenciára állítsák be.

2.2 Rádió-figyelés

A TIBA frekvencián a kijelölt légtérbe történő belépést megelőző tíz perctől ezen légtér elhagyásáig tartsanak fenn rádió-figyelést. Egy olyan légijármű, amely a kijelölt légtér oldalhatárain belül elhelyezkedő repülőtérről száll fel, a rádió-figyelést a felszállás után a lehető legrövidebb időn belül kezdje meg és a légtér elhagyásáig tartsa fenn.

2.3 A rádióadások időpontja

Az adás kezdeményezendő:

a) kijelölt légtérbe történő belépés előtt tíz perccel vagy egy olyan repülőgépvezető esetében, aki a kijelölt légtér oldalhatárain belül elhelyezkedő repülőtérről száll fel, a felszállás után a lehető legrövidebb időn belül;

b) tíz perccel a jelentőpont átrepülése előtt;

c) tíz perccel az légiforgalmi szolgálati útvonal keresztezése vagy az arra történő belépés előtt;

d) az egymástól távol elhelyezkedő jelentő pontok között 20 perces időközönként;

e) ahol lehetséges, a repülési szint megváltoztatásának megkezdése előtt 2 — 5 perccel;

f) a repülési szint megváltoztatásának időpontjában; és

g) bármely más időpontban, amikor a repülőgépvezető ezt szükségesnek ítéli.

2.4 A rádióadás formátuma

2.4.1 A repülési szint megváltoztatását jelző adások kivételével a 2.3 a), b), c), d) és g) alpontokban jelzett rádióadások esetén a következő formátumot alkalmazzák:

ALL STATIONS — ÁLTALÁNOS ADÁS (a forgalmi tájékoztató rádióadás meghatározása szükséges)
(a légijármű hívójele)

FLIGHT LEVEL — REPÜLÉSI SZINT (szám) vagy

CLIMBING * A 2.3 a) alpontban jelzett adás esetén, ha a légijármű a kijelölt légtér oldalhatárain belül elhelyezkedő repülőtérről száll fel.

* TO FLIGHT LEVEL (szám) — EMELKEDEK

* A (szám) REPÜLÉSI SZINTRE

(a légijármű repülési iránya)

(ATS útvonal) vagy (DIRECT FROM/TO — KÖZVETLENÜL -TÓL/-IG)

POSITION — HELYZET (helyzet meghatározás ** Olyan adások esetén, amikor a légijármű nincs kijelölt ATS jelentőpont közelében, a repülési helyzetét a lehető legpontosabban, minden esetben legalább a legközelebbi 30 szélességi és hosszúsági fok-perc pontossággal adja meg.

**) AT — IDŐ (időpont)

ESTIMATING — VÁRHATÓ (következő jelentőpont vagy a kijelölt légiforgalmi szolgálati útvonal keresztezésének vagy elérésének időpontja) AT — IDŐ (időpont)
(a légijármű hívóneve)

FLIGHT LEVEL — REPÜLÉSI SZINT (szám)
Elméleti példa:

"ALL STATIONS WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND DIRECT FROM PUNTA SAGA TO PAMPA POSITION 5040 SOUTH 2010 EAST AT 2358 ESTIMATING CROSSING ROUTE LIMA THREE ONE AT 4930 SOUTH 1920 EAST AT 0012 WINDAR 671 FLIGHT LEVEL 350 NORTHWEST BOUND OUT"

2.4.2 A repülési szint megváltoztatása előtt a 2.3 e) alpontban jelzett rádióadás esetén a következő formátumot alkalmazzák:

ALL STATIONS — ÁLTALÁNOS ADÁS
(a légijármű hívójele)
(a légijármű repülési iránya)
(ATS útvonal) vagy (DIRECT FROM/TO — KÖZVETLENÜL -TÓL/-IG)

LEAVING FLIGHT LEVEL (szám) FOR FLIGHT LEVEL (szám) — ELHAGYOM A (szám) REPÜLÉSI SZINTET A (szám) REPÜLÉSI SZINTRE

2.4.3 A 2.4.4 pont előírása kivételével a repülési szint megváltoztatásának időpontjában a 2.3 f) alpontban jelzett rádióadás esetén a következő formátumot alkalmazzák:

ALL STATIONS — ÁLTALÁNOS ADÁS
(a légijármű hívójele)
(a légijármű repülési iránya)
(ATS útvonal) vagy (DIRECT FROM/TO — KÖZVETLENÜL -TÓL/-IG)

LEAVING FLIGHT LEVEL (szám) NOW FOR FLIGHT LEVEL (szám) — MOST ELHAGYOM (szám) A REPÜLÉSI SZINTET A (szám) REPÜLÉSI SZINTRE majd ezt követően:

ALL STATIONS — ÁLTALÁNOS ADÁS
(a légijármű hívójele)

MAINTAINING FLIGHT LEVEL (szám) — TARTOM A (szám) REPÜLÉSI SZINTET

2.4.4 A közvetlen összeütközési veszély elhárítása céljából végrehajtott ideiglenes repülési szint változtatást bejelentő rádióadás esetén a következő formátumot alkalmazzák:

ALL STATIONS — ÁLTALÁNOS ADÁS
(a légijármű hívójele)
(a légijármű repülési iránya)

LEAVING FLIGHT LEVEL NOW (szám) FOR FLIGHT LEVEL (szám) — MOST ELHAGYOM A (szám) REPÜLÉSI SZINTET A (szám) REPÜLÉSI SZINTRE
majd ezt követően a lehető legrövidebb időn belül:

ALL STATIONS — ÁLTALÁNOS ADÁS
(a légijármű hívójele)

RETURNING TO FLIGHT LEVEL (szám) NOW — MOST VISSZATÉREK A (szám) REPÜLÉSI SZINTRE

2.5 A rádióadások nyugtázása

Az általános adásokat nem szükséges nyugtázni, hacsak nincs közvetlen összeütközési veszély.

3. Az adásokkal kapcsolatos gyakorlati eljárások

3.1 Az utazómagasság megváltoztatása

3.1.1 A kijelölt légtéren belül ne változtassák az utazómagasságot, kivéve ha ezt a repülőgépvezetők a forgalmi konfliktusok elkerülése, időjárási képződmények kikerülése vagy egyéb tényleges légijármű-üzemeltetési okok érdekében szükségesnek ítélik.

3.1.2 Amikor az utazómagasság megváltoztatása elkerülhetetlen, a magasságváltás idejére kapcsolják be a légijármű láthatóságát növelő összes rendelkezésre álló fényt.

3.2 Az összeütközés elkerülése

Amennyiben egy másik légijármű által adott forgalmi tájékoztatás vételét követően a repülőgépvezető a közvetlen összeütközési veszély elkerülése érdekében azonnali intézkedést ítél szükségesnek és ezt nem lehet a 2. Annex útirány jogra vonatkozó előírása szerint végrehajtani, a repülőgépvezető:

a) kivéve ha más repülési művelet végrehajtása célszerűbbnek látszik, azonnal süllyedjen 150 métert (500 láb) vagy ha FL 290 felett repül olyan légtérben, ahol 600 méteres (2000 láb) függőleges elkülönítési minimumot alkalmaznak, 300 métert (1000 láb);

b) kapcsolja be a légijármű láthatóságát növelő összes rendelkezésre álló fényt;

c) a lehető legrövidebb időn belül válaszoljon a rádióadásra, tájékoztatást adva a végrehajtott repülési műveletről;

d) a megfelelő légiforgalmi szolgálati frekvencián közölje a végrehajtott repülési műveletet; valamint

e) amint lehetséges, térjen vissza az eredeti repülési szintre és a megfelelő légiforgalmi szolgálati frekvencián adjon tájékoztatást a végrehajtott repülési műveletről.

3.3 Általános helyzetjelentési eljárások

Minden esetben folytassák a rendszeres helyzetjelentések adását függetlenül attól, hogy az általános forgalmi tájékoztató adás kezdeményezésére vagy nyugtázására bármilyen intézkedés történt.

D. Melléklet
Útmutató a légiforgalmi szükségintézkedések tervezéséhez

(Lásd 2.28 pont)

1. Bevezető

1.1 A légiforgalmi szolgálatok és a kiegészítő szolgáltatások megszakadása esetén foganatosítandó szükség-intézkedésekre vonatkozó irányelveket a Léginavigációs Bizottság tanulmánya után, az érintett Államokkal és szervezetekkel folytatott megbeszéléseket követően, a határozati előírásoknak megfelelően a Tanács először 1984. június 27.-én kelt A23-12 Közgyűlési Határozatával fogadta el. Az irányelveket azután a világ különböző részein és különböző körülmények között a szükségintézkedések alkalmazása során szerzett gyakorlati tapasztalatok alapján felülvizsgálták és módosították.

1.2 Az irányelvek és útmutató anyagok célja a nemzetközi légiforgalom biztonságos és rendezett áramlásának fenntartása a légiforgalmi szolgálatok és a kiegészítő szolgáltatások megszakadása esetén, ilyen körülmények között is biztosítva a világ fő légiközlekedési útvonalainak igénybevételét, illetve ennek lehetőségét.

1.3 Az irányelvek annak a ténynek figyelembevételével kerültek kidolgozásra, hogy a nemzetközi légiközlekedés számára biztosított szolgáltatások megszakadását előidéző események előtt és alatt a körülmények igen változatosak lehetnek és a szükségintézkedéseket, beleértve a kijelölt repülőterek humanitárius célra történő igénybevételének biztosítását is, az egyedi eseményekhez és körülményekhez kell alkalmazni. A szükségintézkedések tervezése, valamint az ilyen tervek alkalmazásának kidolgozása és megvalósítása során szükséges intézkedések meghatározásának felelősségét meg kell osztani az Államok és az ICAO között.

1.4 Az irányelveket a tapasztalatok alapján dolgoztuk ki, amelyek a többek között azt jelezték, hogy a szolgáltatások megszakadása egy adott légtéren belül valószínűleg jelentős mértékben befolyásolják majd a szomszédos légtérben biztosított szolgáltatásokat is. Ezért nemzetközi együttműködésre van szükség, esetenként az ICAO közreműködésével, így az irányelvek és útmutató elkészítésénél a szükségintézkedések kidolgozása és egyeztetése területén vázoltuk az ICAO szerepét is. Az irányelvek azt a gyakorlati tapasztalatot is tükrözik, hogy az ICAO szerepe a légiközlekedési rendszerbe tartozó fő légiútvonalak fenntartása érdekében elvégzendő szükségintézkedési tervek kidolgozása alkalmával az egész világra kiterjedő kell, hogy legyen, nem korlátozódhat kizárólag a nyílt vizek és a nem meghatározott felségterületű területek feletti légterekre. Végül az irányelvek az érintett nemzetközi szervezetek közreműködését is tükrözik, amelyek -- mint a IATA[1] és az IFALPA[2] -- értékes tanácsokkal járultak hozzá a tervek valamint azok egyes elemeinek gyakorlati kidolgozásához.

2. A szükségintézkedési tervek jogi helyzete

A szükségintézkedési tervek célja alternatív szolgáltatások és berendezések biztosítása a körzeti léginavigációs tervben előírt szolgálatok helyett, amikor azok ideiglenesen nem állnak rendelkezésre. Ezért a szükségintézkedések ideiglenes természetűek és csak addig érvényesek, ameddig a körzeti léginavigációs tervben biztosított szolgálatok és berendezések ismét rendelkezésre nem állnak. Ennek megfelelően a szükségintézkedések nem jelentik a körzeti terv kiegészítését vagy módosítását, amelynél a „Jóváhagyott Körzeti Tervek Módosításának Előírásai” szerint kell eljárni. Azokban az esetekben, amikor a szükségintézkedési terv ideiglenesen eltér a jóváhagyott körzeti léginavigációs tervektől, az eltéréseket szükség szerint a Tanács részéről az ICAO Tanács elnökének kell jóváhagyni.

3. A szükségintézkedési tervek kidolgozásának, közzétételének és alkalmazásának felelőssége

3.1 Egy meghatározott légtérben a légiforgalmi szolgálatok és a kiegészítő szolgáltatások biztosításáért felelős Állam(ok) azért is felelősséggel tartoznak, hogy ezen szolgálatok működésének, illetve a szolgáltatások megszakadása vagy ennek lehetőségének esetére kidolgozott intézkedésekkel fenntartsák a nemzetközi polgári légiközlekedés biztonságát, továbbá amennyiben ez lehetséges, alternatív szolgáltatásokat nyújtsanak. Ezért az Állam(ok) dolgozzanak ki, tegyenek közzé és vezessenek be megfelelő szükségintézkedési terveket. Amennyiben a szolgáltatások megszakadása hatással lehet a szomszédos légtérben biztosított szolgáltatásokra, a terveket az érintett Államokkal és légtérfelhasználókkal, valamint szükség szerint az ICAO-val végzett egyeztetés alapján dolgozzák ki.

3.2 A nyílt vizek feletti légtereket érintő megfelelő szükségintézkedések vonatkozásában a felelősség továbbra is azokra az Államokra hárul, amelyek a légtér eléréséig biztosították a szolgáltatásokat, kivéve ha a felelősséget ideiglenesen az ICAO egy másik Államra vagy Államokra hárítja át.

3.3 Ehhez hasonlóan egy olyan légtér vonatkozásában, amelyben a szolgáltatás biztosításának felelősségét egy másik Államra hárították, a megfelelő szükségintézkedések iránti felelősség továbbra is erre az államra hárul, ameddig a felelősséget áthárító Állam ezt ideiglenesen vagy véglegesen vissza nem veszi. Ezt követően az áthárító Állam veszi át a szükségintézkedések kidolgozásának és végrehajtásának felelősségét.

3.4 Az ICAO kezdeményezi és egyezteti a nemzetközi polgári légiközlekedést érintő légiforgalmi szolgálatok működésének és a kiegészítő szolgáltatások biztosításának megszakadása alkalmával szükséges intézkedéseket, amennyiben az Állam, illetve hatósága valamilyen okból nem tudja teljesíteni a 3.1 pontban ismertetett felelősségét. Ezekben az esetekben az ICAO együttműködik a szomszédos légterekért felelős Államokkal és az érintett nemzetközi szervezetekkel. Az ICAO az Államok kérésére is kezdeményezi és egyezteti a megfelelő szükségintézkedéseket .

4. Előkészítő tevékenység

4.1 A szükségintézkedések tervezésénél az idő alapvető fontosságú tényező, amennyiben a légiközlekedést érintő kockázatok az intézkedésekkel megelőzhetők. A szükségintézkedések időben történő bevezetéséhez határozott kezdeményezés és végrehajtás szükséges, amelynek alapján kidolgozzák, az érintett felek jóváhagyják és megfelelő módon és időben közzéteszik a szükségintézkedési terveket, mielőtt bekövetkezik az az esemény, amely a végrehajtást szükségessé teszi.

4.2 A fenti 4.1 pontban ismertetett okból az Államok szükség szerint végezzék el az előkészítést, hogy ezzel megkönnyítsék a szükségintézkedések időben történő közzétételét. Az előkészítés feladatai közé tartoznak az alábbiak:

a) az általános szükségintézkedési tervek elkészítése a légiforgalmi szolgálatok és/vagy a kiegészítő szolgáltatások biztosítását érintő előrelátható eseményekre, mint például érdekvédelmi (szakszervezeti) megmozdulások, munkabeszüntetések. Elfogadva azt a tényt, hogy a világ légiközlekedési közössége nem résztvevő fél az ilyen esetekben, a nyílt vizek és nem meghatározott felségterületű területek feletti légterekben szolgáltatásokat biztosító Államok hozzanak megfelelő intézkedéseket annak érdekében, hogy a nemzetközi polgári légiközlekedés számára a felségjoggal nem rendelkező légtérben továbbra is megfelelő légiforgalmi szolgálatot nyújtsanak. Ugyanebből az okból a saját felségterületek feletti vagy számukra más állam(ok) részéről átadott légtérben légiforgalmi szolgálatot nyújtó államok is hozzanak megfelelő intézkedéseket a légiforgalmi szolgálatok biztosítására a nemzetközi polgári légiközlekedés számára, amely azonban nem vonatkozik érdekvédelmi (szakszervezeti) megmozdulásokban érintett Állam(ok) területén történő le és felszállások végrehajtására;

b) mérjék fel a harci cselekmények vagy a polgári légiközlekedést érintő jogellenes beavatkozások kockázati tényezőit a polgári légiforgalom vonatkozásában, valamint a természeti katasztrófák valószínűségét és lehetséges hatásait is. Az előkészítés terjedjen ki a természeti katasztrófák, harci cselekmények vagy a polgári légiközlekedést érintő jogellenes beavatkozások miatti különleges szükségintézkedések előzetes kidolgozására, amely események valószínűleg befolyásolni fogják a polgári légijárművek üzemeltetésére rendelkezésre álló légteret, a légiforgalmi szolgálatok és/vagy kiegészítő szolgáltatások biztosítását. Vegyék figyelembe, hogy egy adott légtér előzetes értesítés nélkül történő azonnali elkerülése különleges feladatok elé állítja a szomszédos légterekért vagy légtérszakaszokért felelős Államokat és nemzetközi légijármű-üzemeltetőket, mivel alternatív útvonalakat és szolgáltatásokat kell tervezniük. Ezért az Államok légiforgalmi szolgálati hatóságai a lehetőségek szerint előre mérjék fel az ilyen alternatív tevékenységek szükségességének lehetőségét és valószínűségét;

c) kísérjék figyelemmel mindazokat a fejleményeket, amelyek a szükségintézkedések foganatosítását megkövetelő eseményekhez vezetnek. Az Államok gondolják át az ilyen feladathoz, valamint szükség szerint a hatékony intézkedések megkezdéséhez megfelelő személy vagy szervezeti egység kijelölésének lehetőségét; valamint

d) egy központi szervezet kijelölése vagy kialakítása, amely a légiforgalmi szolgálatok megszakadása és a szükségintézkedések bevezetése esetén éjjel-nappal pontos tájékoztatást tud nyújtani a kialakult helyzetről és a vonatkozó szükségintézkedésekről egészen addig, amíg a rendszer rendes működése helyreáll. A központi szervezeten belül vagy e mellett a szolgáltatások megszakadása alkalmával szükséges tevékenységek összehangolására jelöljenek ki egyeztető munkacsoportot.

4.3 Az ICAO rendelkezésre áll mindazon fejlemények figyelemmel kísérésére, amelyek a szükségintézkedések kidolgozását és foganatosítását megkövetelő eseményekhez vezetnek, továbbá szükség szerint segítséget nyújt az intézkedések kidolgozásához. A tényleges kényszerhelyzet esetén az érintett körzeti irodá(k)ban és az ICAO montreáli székhelyén egyeztető csoportot alakítanak és intézkednek, hogy éjjel-nappal szakértő személyzet álljon rendelkezésre vagy legyen elérhető. A csoportok feladata a bármely forrásból származó tájékoztatások folyamatos értékelése, az állami légiforgalmi tájékoztató szolgálat állandó és rendszeres tájékoztatása, az érintett nemzetközi szervezetekkel és helyi szerveivel történő kapcsolattartás, az érintett, valamint a szükségintézkedésekben résztvevő valamennyi Állammal történő közvetlen, aktuális és naprakész információ-csere. A rendelkezésre álló összes adat elemzése alapján a körülményeknek megfelelő tevékenység vagy intézkedés kezdeményezésének jogát a csoport beszerzi az érintett Állam(ok)tól.

5. Egyeztetés

5.1 A szükségintézkedési terv legyen egyaránt elfogadható a szolgálatokat biztosítók és igénybevevők részére, azaz a szolgáltatók legyenek képesek végrehajtani a részükre kijelölt feladatokat, ugyanakkor a körülményeknek megfelelően biztosítani lehessen az üzemeltetés biztonságát valamint a tervben jelzett forgalom kapacitást is.

5.2 Ezért azok az Államok, amelyek feltételezik vagy tapasztalják a légiforgalmi szolgálatok és/vagy a kiegészítő szolgáltatások megszakadását, a lehető leghamarabb tájékoztassák az illetékes ICAO körzeti irodát és azokat az Államokat, amelyek szolgálatait az esemény érintheti. A tájékoztatás tartalmazza a szükségintézkedéseket vagy segítség kérést a szükségintézkedési terv kialakításához.

5.3 Az egyeztetésre vonatkozó részletes követelményeket a fentiek alapján az Államok és/vagy az ICAO határozza meg. Abban az esetben, ha a szükségintézkedések érdemben nem érintik a légtér-felhasználókat vagy az érintett Állam saját légterén kívül szolgáltatást biztosító szervezeteket, természetesen nincs vagy alig van szükség ilyen egyeztetésre, azonban a vélemények szerint az ilyen eset igen ritka.

5.4 Több országot érintő kockázat esetén a szükségintézkedési terv végső kialakításához vezető részletes egyeztetésre van szükség minden egyes érintett állam között. A részletes egyeztetés terjedjen ki azokra az Államokra, amelyek szolgálatait a terv -- például a forgalom átirányítása miatt -- jelentős mértékben érintheti, valamint az érintett nemzetközi szervezetekre is, amelyek komoly üzemeltetési tapasztalatokkal és ismeretekkel rendelkeznek.

5.5 Amikor a szükségintézkedések szabályos és zökkenőmentes alkalmazásához erre szükség van, a fentiekben ismertetett egyeztetés terjedjen ki az általános és pontos NOTAM szövegre is, amelyet a közösen megállapított hatálybalépési időpontban tesznek közzé.

6. A szükségintézkedési tervek kidolgozása, közzététele és alkalmazása

6.1 A teljes értékű szükségintézkedési terv az egyedi körülményektől függ, melyek közé tartozik az is, hogy a korlátozó körülmények érintenek-e a nemzetközi polgári légiközlekedés számára rendelkezésre álló légteret vagy sem. Független légteret csak az érintett Államok hatóságainak kezdeményezése alapján vagy megállapodásban rögzített engedélyével lehet használni. Ellenkező esetben a szükségintézkedéseknek ki kell terjedniük az adott légtér elkerülésére és az intézkedéseket a szomszédos államokkal vagy ezek részéről az ICAO-val történő együttműködéssel dolgozzák ki. A nyílt vizek és a nem meghatározott felségterületek feletti légtér vonatkozásában a szükségintézkedési terv a körülményektől függően, többek között az alternatív szolgáltatások minőségi csökkenésének megfelelően tartalmazhatja az ICAO részéről a légiforgalmi szolgálatok biztosítása felelősségének ideiglenes áthárítását az érintett légtérben.

6.2 A szükségintézkedési terv feltételezi, hogy a lehető legtöbb tájékoztatás áll rendelkezésre a következőkről:

jelenleg rendelkezésre álló és alternatív útvonalak; a légijármű navigációs képessége; a földi berendezések segítségével teljes mértékben vagy részlegesen rendelkezésre álló navigációs irányvezetés; a szomszédos légiforgalmi szolgálati egységek légtérfelderítési és távközlési berendezései vagy képességei; a kiszolgált légijárművek típusai, mérete és a forgalom nagyságrendje; a légiforgalmi szolgálatok, távközlési, meteorológiai és légiközlekedési tájékoztató szolgálatok tényleges üzemi állapota.

Az alábbiakban ismertetjük a szükség-intézkedések tervezésénél a körülményektől függően figyelembe veendő fő tényezőket:

a) a forgalom átirányítása az érintett légtér teljes vagy részleges elkerülése érdekében, általában a kiegészítő útvonalak vagy útvonalszakaszok kijelölésével és használatuk feltételeivel;

b) amennyiben lehetséges, egyszerűsített útvonalhálózat kialakítása az érintett légtérben, az oldalirányú és függőleges elkülönítést biztosító repülési szint kiosztási rendszerrel együtt, továbbá olyan eljárás, amellyel a szomszédos területek irányító központjai a belépési pontokra létrehozzák és a légtérben fenntartják a hosszirányú elkülönítést;

c) a légiforgalmi szolgálatok biztosítása felelősségének átadása a nyílt vizek feletti vagy az erre átadott légtérben;

d) a megfelelő levegő-föld távközlési, AFTN és közvetlen légiforgalmi szolgálati beszédüzemű összeköttetések biztosítása és fenntartása, beleértve az időjárási tájékoztatás valamint a navigációs berendezések üzemi állapotáról szóló információk biztosítására vonatkozó felelősség átadását a szomszédos Államoknak;

e) különleges intézkedések a légijárműtől származó, repülés közbeni és repülés utáni jelentések összegyűjtésére és szétosztására;

f) előírás a légijármű számára a folyamatos rádiófigyelés fenntartására a meghatározott repülőgépvezető-repülőgépvezető közötti URH frekvencián olyan kijelölt légterekben, ahol a levegő-föld összeköttetés bizonytalan vagy ilyen összeköttetés nem létezik; továbbá a tényleges és számított helyzet-információk továbbítása lehetőleg angol nyelven, beleértve az emelkedés valamint süllyedés megkezdését és befejezését;

g) előírás minden légijármű számára, hogy a kijelölt légterekben mindig üzemeltessék az összes navigációs és összeütközés elleni fényeiket;

h) előírás és eljárás a légijárművek számára, hogy azonos utazómagasságon közlekedő légijárművek között nagyobb hosszirányú elkülönítést tartson;

i)előírás a légijárművek számára, hogy az emelkedést és a süllyedést a külön azonosított légiútvonal középvonalától jóval jobbra hajtsa végre;

j) a szükségintézkedések által érintett légtérbe történő belépés szabályozását célzó intézkedések, hogy elkerüljék a szükségintézkedési rendszer túlterhelését; valamint

k) előírás a szükségintézkedés légterében működő összes forgalom számára, hogy IFR szabályok szerint üzemeljen, beleértve a terület légiforgalmi szolgálati útvonalaihoz az IFR repülési szintek kijelölését a 2. Annex 3. Függelék megfelelő utazómagasság táblázataiból.

6.3 A légiforgalmi szolgálatok és/vagy a kiegészítő szolgáltatások várható vagy tényleges megszakadásáról szóló NOTAM tájékoztatást a gyakorlati szempontból lehető leghamarabb továbbítsák a léginavigációs szolgálatok illetve szolgáltatások felhasználói számára. A NOTAM tartalmazza a megfelelő szükségintézkedéseket is. Az előre várható szolgáltatás megszakadás esetében az előzetes értesítés semmi esetre se legyen később, mint 48 órával a várható esemény előtt.

6.4 A szükségintézkedések megszüntetéséről és a szolgálatok illetve szolgáltatások eredeti, a körzeti léginavigációs tervben megállapított szintjének visszaállításáról szóló NOTAM közleményt a lehető leghamarabb továbbítsák az érintettek részére, biztosítva ezzel a szükségintézkedésekről a rendes üzemi körülményekre történő átállás folyamatosságát és rendezettségét.

E. Melléklet

Elfogadható repülésbiztonsági szint

1. Bevezetés

1.1 Az elfogadható repülésbiztonsági szint fogalmának bevezetése azon igényre válaszol, hogy a jelenleg uralkodó, a szabályozónak történő megfelelésen alapuló repülésbiztonság-irányítási szemlélet egy, az általános repülésbiztonsági szint folyamatos javulását célzó, teljesítmény-alapú szemlélettel egészüljön ki.

1.2 Az elfogadható repülésbiztonsági szint egy felügyelő hatóság, egy járató vagy egy szolgáltató repülésbiztonsági céljait fejezi ki. A felügyelő hatóság és a járatók/szolgáltatók közötti viszony szemszögéből kijelöli a járatók/szolgáltatók elsődleges üzleti tevékenységük végzése közben elérendő, a felügyelő hatóság által még elfogadható minimum repülésbiztonsági cél(oka)t. Ez egy olyan vonatkozási pont, ami alapján a felügyelő hatóság mérni képes a repülésbiztonsági teljesítményt.

1.3 Az elfogadható repülésbiztonsági szint(ek) a repülésbiztonsági program céljából történő meghatározása nem helyettesíti a törvényi, szabályozói vagy egyéb fennálló követelményeket, valamint nem menti fel az Államokat a Nemzetközi Polgári Légiközlekedési Egyezményben és kapcsolódó rendelkezéseiben foglalt kötelezettségeik alól.

1.4 Az elfogadható repülésbiztonsági szint(ek) a repülésbiztonság-irányítási rendszer céljából történő meghatározása nem menti fel a járatókat/szolgáltatókat a vonatkozó nemzeti szabályozások és a Nemzetközi Polgári Légiközlekedési Egyezmény általi kötelezettségeik alól.

2. Hatály

2.1 Az egyes Államokban a felügyelő hatóság és az egyes járatók/szolgáltatók részére különböző elfogadható repülésbiztonsági szintek állapíthatók meg.

2.2 Az egyes meghatározott repülésbiztonsági szintek legyenek arányosak az egyes járatók/szolgáltatók üzemelési körülményeinek összetettségével, valamint azzal a szinttel, ameddig a repülésbiztonsági hiányosságok tolerálhatók és azokra reálisan fel lehet készülni.

3. Végrehajtás

3.1 Az elfogadható repülésbiztonsági szint fogalmát repülésbiztonsági teljesítmény-mutatókban és repülésbiztonsági teljesítménycélokban határozzák meg és repülésbiztonsági követelmények útján hajtják végre.

3.2 Az elfogadható repülésbiztonsági szint, repülésbiztonsági teljesítmény-mutatók, repülésbiztonsági teljesítménycélok és repülésbiztonsági követelmények közötti összefüggések az alábbiak: az elfogadható repülésbiztonsági szint az átfogó fogalom; a repülésbiztonsági teljesítmény-mutatók azok a mérőeszközök vagy mértékek, amelyekkel meghatározható, hogy elérték-e az elfogadható repülésbiztonsági szintet, a repülésbiztonsági teljesítménycélok az elfogadható repülésbiztonsági szintre vonatkozó minősített célkitűzések, míg a repülésbiztonsági követelmények a repülésbiztonsági teljesítmény-mutatók eléréséhez szükséges eszközök vagy erőforrások.

3.3 Egy elfogadható repülésbiztonsági szint repülésbiztonsági teljesítmény-mutatói lehetőleg legyenek egyszerűek és kapcsolódjanak egy Állam repülésbiztonsági programjának vagy egy járató/szolgáltató repülésbiztonság-irányítási rendszerének (SMS) főbb alkotóelemeihez. A repülésbiztonsági teljesítmény-mutatókat általában számokkal fejezik ki.

3.4 Egy elfogadható repülésbiztonsági szint repülésbiztonsági teljesítménycéljait lehetőleg annak felmérése után határozzák meg, hogy mi kívánatos és mi reálisan elvárható az egyes járatóktól/szolgáltatóktól. A repülésbiztonsági teljesítménycélok lehetőleg legyenek mérhetők, az érintett felek számára elfogadhatók, valamint az elfogadható repülésbiztonsági szinttel megegyezők.

3.5 Az elfogadható repülésbiztonsági szint repülésbiztonsági teljesítménycéljainak eléréséhez szükséges repülésbiztonsági követelményeket lehetőleg operatív eljárásokban, technológiában és rendszerekben, programokban, előre nem látott eseményekre kidolgozott intézkedésekben, stb. fejezzék ki, amelyekhez hozzáadhatók a megbízhatóságra, rendelkezésre-állásra és/vagy pontosságra vonatkozó mértékek.

3.6 Egy elfogadható repülésbiztonsági szintet lehetőleg több kisebb repülésbiztonsági teljesítmény-mutatóval fejezzenek ki és több repülésbiztonsági teljesítménycélra fordítsanak le, ne egy nagyobb fogalomra.

-- -- VÉGE -- --

ANNEX 12.
Kutatás és mentés

Nyolcadik Kiadás – 2004. Július
17. módosítással
A jelen kiadás magába foglalja a Tanács által 2004. február 24. előtt elfogadott összes módosítást, és 2004. november 25-én hatálytalanítja a 12. Annex összes korábbi kiadását.
A szabványok és ajánlott gyakorlatok alkalmazhatóságára vonatkozó tájékoztatást lásd az Előszóban.
Nemzetközi Polgári Repülési Szervezet
KISÉRŐ JEGYZET
A Nemzetközi Polgári Repülésről Szóló Egyezmény Annexeinek új kiadásai
Tudomásunkra jutott, hogy új Annex kiadás közzétételekor a használók az Annex előző kiadásával együtt kidobják a korábbi kiadáshoz tartozó Kiegészítő (Supplement) részeket is.
Kérjük jegyezzék meg, hogy az előző kiadás Kiegészítő (Supplement) részét mindaddig meg kell őrizni, amíg új Kiegészítő részt teszünk közzé.

MÓDOSÍTÁSOK

A módosítások kiadását az ICAO Bulletin és az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusának havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel.
Az alábbi táblázat a módosítások nyilvántartására szolgál.

A MÓDOSÍTÁSOK ÉS HELYESBÍTÉSEK NYILVÁNTARTÁSA

Módosítások				Helyesbítések			
Sor szám	Alkalmazhatóság dátuma	Bevezetés dátuma	Bevezette	Sor szám	Kiadási dátum	Bevezetés dátuma	Bevezette
1-17	A jelen kiadásba bedolgozva						

ELŐSZÓ

Történeti háttér

1946 decemberében, a Kutatási és Mentési Osztály a második ülésén a kutatás és mentési szabványokra és ajánlott gyakorlatokra vonatkozó eljárásokra tett javaslatokat. Ezeket a Titkárság és az akkori Légi-navigációs Bizottság dolgozta ki, és megfelelő módon a Tanács elé terjesztette. A Tanács a benyújtott formában nem fogadta el a javaslatokat és 1948 április 20-án visszautalta a Légi-navigációs Bizottsághoz további megfontolás céljából.

Ezután újabb Annex tervezetet dolgoztak ki a Körzeti Légi-navigációs Értekezletek tapasztalatának figyelembevételével és ezt a Légi-navigációs Bizottság végül is elvben jóváhagyta és köröztette az államok között véleményezés céljából. Ezt a Légi-navigációs Bizottság az államok véleménye alapján továbbfejlesztette és az így készült ajánlásokat 1950 május 25-én a Tanács elfogadta és a nemzetközi polgári repülésről szóló egyezmény 12. Annex-ének nevezték el. 1950 december 1-én lépett hatályba és 1951 március 1-én vált kötelező érvényűvé.

Az A Táblázat a soronkövetkező módosítások eredetét mutatja az érintett fő témák jegyzékével együtt, és azokat az időpontokat, amikor a Tanács az Annexet, illetve módosításait elfogadta, illetve amikor hatályba léptek, valamint amikortól alkalmazandókká váltak.

Alkalmazhatóság

Az e dokumentumban lévő szabványok és ajánlott gyakorlatok a Doc 7030-ban tartalmazott Körzeti Kiegészítő Eljárások - Kutatás és Mentés - alkalmazását szabályozzák, amely dokumentumban a körzeti alkalmazás kiegészítő eljárásai találhatók.

A 12. Annex alkalmazandó a kutató és mentő szolgálatok létesítéséhez, fenntartásához és működéséhez a szerződő államok területén, valamint a nyílt vizeken, illetve e szolgálatok államok közötti összehangolásához.

A szerződő államok kötelezettségei

Eltérések jelentése. Felhívjuk a szerződő állam figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségére, mely értelmében a Szerződő Állam köteles a szervezet számára bejelenteni minden olyan eltérést, amely nemzeti szabályai és gyakorlatai, illetve a jelen Annexben szereplő Nemzetközi szabványok, illetve ezek bármiféle módosítása között fennállnak. Felkérjük a szerződő államot arra, hogy tegyen ilyen bejelentést minden olyan eltéréssel kapcsolatban is, amely a jelen Annexben és bármely módosításában szereplő ajánlott gyakorlat között fennáll, amennyiben az utóbbi eltérésekre vonatkozó bejelentés lényeges a Légi-navigáció biztonsága szempontjából.
Felkérjük továbbá a szerződő államot arra, hogy folyamatosan tájékoztassa a Szervezetet a jövőben esetleg keletkező minden eltérésről, illetve a korábban már bejelentett bármely eltérés megszűnéséről. A szerződő államhoz a jelen Annex módosításainak elfogadását követően az eltérések bejelentéséhez külön felszólítást juttatunk el.

Az állam figyelmét felhívjuk a 15. Annex rendelkezésére is, miszerint az Egyezmény 38. cikkelyéből fakadó kötelezettségén felül a nemzeti szabályzat és gyakorlat, illetve a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket Légiforgalmi Tájékoztató Szolgálata révén közzé kell tenni.

A Tájékoztatás közzététele. A jelen Annexben meghatározott szabványok és ajánlott gyakorlatok szerint létesített, légijárművek üzemeltetését befolyásoló berendezések, szolgálatok és eljárások bevezetéséről, megszüntetéséről, vagy megváltoztatásáról szóló tájékoztatást a 15. Annexnek megfelelően kell közölni és életbe léptetni.

Az Annex szövegének használata a nemzeti szabályozásban. A Tanács 1948. április 13-án elfogadott egyik határozatában felhívja a szerződő állam figyelmét annak szükségességére, hogy saját nemzeti szabályzataiban a megoldható legteljesebb mértékben használja a szabályozó jellegű ICAO szabványok szabatos nyelvezetét, továbbá annak szükségességére, hogy jelezze a szabványoktól való eltéréseket, beleértve mindazon kiegészítő nemzeti előírást, amely a Légi-navigáció biztonságára és rendszerességére nézve lényeges. Jelen Annex előírásainak megszövegezése a lehető legteljesebb mértékben olyan, hogy a nemzeti szabályokba átültetésük szövegbeli lényegesebb változtatás nélkül váljék lehetővé.

Az Annex részeinek jogállása

Egy Annex a következő összetevő részekből áll, de nem szükségszerű, hogy mindegyikük mindegyik Annexben megtatálható legyen. Ezen összetevők a következő jogállás bírnak:

1. Az Annex alapjait képező anyag:

a) Szabvány és ajánlott eljárás, melyet az Egyezmény rendelkezése szerint a Tanács fogad el. Ezek meghatározása a következő:

Szabvány (standard): A szabvány fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó bármely követelmény, amelynek egységes alkalmazása szükséges a nemzetközi légi-közlekedés biztonsága, vagy menetrendszerűsége érdekében és amelyet a szerződő állam az Egyezmény értelmében betart; ha nem tartható be, akkor a 38. cikkely értelmében erről a Tanácsot köteles értesíteni.

Ajánlott eljárás (recommended practice): bármely fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó olyan előírás, amely egységes alkalmazása a nemzetközi légi-közlekedés biztonsága, menetrendszerűsége, vagy hatékonysága szempontjából kívánatos és amely alkalmazására a szerződő állam az Egyezmény értelmében törekszik.

b) *Függelék (Appendices):* A célszerűség érdekében külön csoportosított, de a Tanács által elfogadott szabványok és ajánlott eljárások szerves részét képező szöveg.

c) *Meghatározás (Definitons)*. A szabványokban és ajánlott eljárásokban alkalmazott, önmagát elfogadott saját szótári jelentés híján nem magyarázó kifejezés meghatározása. A meghatározás külön jogállással nem rendelkezik, de lényeges része minden szabványnak és ajánlott eljárásnak, amelyben előfordul, tekintve, hogy a meghatározás értelmének megváltoztatása az előírás tartalmát befolyásolhatja.

2. A Tanács által a szabványokkal és ajánlott eljárásokkal kapcsolatban közzétételre jóváhagyott anyag

a) *Előszó (Foreword).* A Tanács ténykedésére alapozott történeti és magyarázó anyagot foglal magába, ismerteti, magyarázza a szabványok és ajánlott eljárások alkalmazásával kapcsolatban az állam mindazon kötelességét, amely az Egyezményből és az Elfogadó határozatból ered.

b) *Bevezető rész (Introduction).* Az Annex részei, fejezetei, vagy szakaszai előtt található, a szöveg alkalmazásának megértését segítő magyarázó anyag.

c) *Megjegyzés (Notes).* Ez a szükséges helyeken a kérdéses szabványra, vagy ajánlott eljárásra vonatkozó tényszerű információt, vagy hivatkozást tartalmaz, de a szabvány, vagy ajánlott eljárás részét nem képezi.

d) *Melléklet (Attachments)*. A szabványt és ajánlott eljárást kiegészítő anyagot tartalmaz, vagy azok alkalmazásához nyújt útmutatást.

Nyelv kiválasztás

Ezt az Annexet hat nyelven fogadták el - angolul, arabul, kínaiul, franciául, oroszul és spanyolul. Felkérjük a szerződő államot, hogy a nemzeti bevezetés céljára, illetve az egyezményben előírt egyéb feladatok megvalósítására ezek közül egyet válasszon ki közvetlen használatra, vagy a nemzeti nyelvére történő lefordítás alapjául és, hogy a szervezetet ennek megfelelően értesítse.

Szerkesztői gyakorlat

Annak érdekében, hogy mindegyik kijelentés jogállása első pillantásra felismerhető legyen, a következő gyakorlatot alkalmaztuk. A *szabványokat* vékony álló betűkkel nyomtattuk; az *Ajánlott* *gyakorlatokat* vékony dőlt betűkkel szedtük, jogállásukat félkövér **Recommendation** kitétellel jeleztük; a *Megjegyzés*eket vékony dőlt betűkkel nyomtattuk, jogállásukat a *Megjegyzés* kitétel mutatja.

Megjegyzendő, hogy az angol szövegben a követelmények leírásánál az alábbi szerkesztői gyakorlatot követtük: a szabványok esetében a kell (shall), és az ajánlott eljárásokban pedig a szükséges (should) szavakat alkalmaztuk.

E dokumentumban végig

a) a mértékegységek metrikus rendszerben szerepelnek, melyeket zárójelben követ a megfelelő láb-font rendszerben kifejezett érték

b) az alkalmazott hímnemű személyes névmást úgy kell tekinteni, mint amely egyaránt vonatkozik a nőnemű és a hímnemű személyekre is.

Jelen dokumentum bármelyik részére számmal és/vagy címmel való hivatkozás magába foglalja az adott rész valamennyi alpontját is.

"A" táblázat - a 12. Annex módosításai

Módosítás	Forrása(i)	Tárgya(i)	Jóváhagyva Hatályba lépés Alkalmazandó
1. Kiadás	Kutatás és Mentés Osztály második (1946) ülése, Légi-navigációs Bizottság	Nemzetközi szabványok és ajánlott gyakorlatok - Kutató és Mentő Szolgálatok	1950.máj.25. 1950.dec.1. 1951.márc.1.
1 (2. Kiadás)	Kutatás és Mentő Osztály, harmadik (1951) ülés	Kutató és Mentő szervezet; kommunikáció; a kutató és mentő tevékenység értékelése; kutató és mentő eljárások; levegő-föld jelzések;	1952.márc.31. 1952.szept.1. 1953.jan.1.
2 (3. Kiadás)	Második Léginavigációs Konferencia (1955)	Mentő alközpontok; Más szerződő állam mentő egységeinek kiszolgálása és tüzelőanyaggal történő ellátása.	1956.máj.8. 1956.szept.1. 1956.dec.1.
3	Harmadik Léginavigációs Konferencia (1956). A 6. Annex 6. Fejezetének 140. módosítása	A törzs átvágásra alkalmas területeinek megjelölése	1957.jun.13. 1957.okt.1. 1957.dec.1.
4 4. Kiadás)	Légiforgalmi szabályok, Légiforgalmi Szolgálatok és Kutatás és Mentés Osztály (1958)	államok közötti együttműködés; vész helyzetekre vonatkozó tájékoztatások; a mentés koordináló központok eljárásai.	1959.dec.8. 1960.máj.1. 1960.aug.1.
5.	A 11. Annex 13. módosítása	A mentést kordináló központok értesítése a légiforgalmi szolgálati egységek részéről	1962.ápr.13. - 1962.nov.1.
6	9. Annex 4. módosítása	Más szerződő államok mentőegységeinek ideiglenes belépése	1964.júl.1

Módosítás	Forrása(i)	Tárgya(i)	Jóváhagyva Hatályba lépés Alkalmazandó
7	11. Annex 5. Fejezetének 14. módosítása	Felszíni vízi járművek és úton lévő légijárművek riasztása veszélyben lévő légijárműnek nyújtandó segítség érdekében	1964.jún.19. 1964.nov.1. 1965.febr.1.
8	Életbiztonság a tengeren tárgyú nemzetközi egyezmény A 11. Annex 15. módosítása	Az utalások naprakésszé tétele; riasztószolgálat.	1965.dec.10. 1966.aug.25.
9 (5. kiadás)	A Körzeti Kiegészítő Eljárások Légi-navigációs Bizottság általi felülvizsgálata	A szerződő államok közötti együttműködés; Más szerződő államok mentő egységeinek kiszolgálása és üzemanyag pótlása; kutató és mentő hírközlő létesítmények próbája; további egységek, vagy szolgálatok segítség nyújtása a kutató és mentő tevékenység során.	1970.máj.25. 1970.szept.25. 1971.febr.4.
10	Légi-navigációs Bizottság	Nemzetközi jelkulcs rendszeresítése a kutató és mentő légijárműveken; kutató és mentő légijárművek felszerelése 2182 kHz frekvenciájú berendezéssel; kereskedelmi hajók tartózkodási helyéről nyújtott tájékoztatás	1972.dec.11. 1973.ápr.11. 1973.aug.16.
11 (6. kiadás)	Az Annex teljes felülvizsgálata a Légi-navigációs Bizottság által	Új jelzések felszíni járművek számára; 24 órás kutató és mentő szolgálat biztosítása; kereskedelmi hajók tartózkodási helyéről nyújtott tájékoztatás szétosztása; kutató és mentő műveletek értékelése; a szomszédos államok közötti együttműködés javítása; mentőegységek felszerelése; a légiforgalmi szolgálati egységekről szóló információhoz való hozzáférés; ledobható létfenntartó eszközök elhelyezése; eljárások veszélyben lévő és vízre szállni kényszerülő légijármű segítésére, hogy felszíni vízi járművel találkozzon; segítség nyújtási eljárások kutató és mentő, vagy más légijárműveknek abból a célból, hogy ezek a kényszerhelyzetben lévő	1974.nov.25. 1975.márc.25. 1975.okt.9.

Módosítás	Forrása(i)	Tárgya(i)	Jóváhagyva Hatályba lépés Alkalmazandó
		légijárművel találkozzanak.	
12	A 3. Annex 60. módosítása	Meteorológiai állomások és kutató mentő egységek közötti kiegészítő hírközlő berendezések	1975.dec.8. 1976.ápr.8. 1976.aug.12.
13	Légi-navigációs Bizottság	Túlélők által használt föld-levegő látjelek	1980.dec.15. 1981.ápr.15. 1981.nov.26.
14	Légi-navigációs Bizottság	A mentést koordináló központ (RCC) előkészítő intézkedésekkel kapcsolatos felelőssége a jogellenes cselekmény tárgyát képező légijármű esetében.	1990.márc.12. 1990.júl.30. 1990.nov.15.
15	Légi-navigációs Bizottság	A kutató mentő légijármű meghatározása; a mentés koordináló központokra (RCC) vonatkozó kommunikációs követelmények és a kutató mentő (SAR) légijárművek felszerelései; SAR kapcsolat pont (SPOC).	1993.márc.12. 1993.júli.26. 1993.nov.11.
16 (7. Kiadás)	A 6. Annex I., II. és III. Részeinek 25., 20. és 7. módosítása -a sorrendnek megfelelően-; Légi-navigációs Bizottság	A "parancsnok pilóta" meghatárorozás módosítása; szerkesztői módosítások.	2001.márc.12. 2001.jul.16. 2001.nov.01.
17	ICAO Titkárság/Légi Navigációs Bizottság	Naprakésszé tétel, hogy a rendelkezések a gyakorlatilag lehetséges mértékben kerüljenek összhangba az IMO Alapokmánnyal; A légiforgalmi és a tengerészeti kutató-mentő dokumentumok fogalmainak összehangolása; a SAR rendszer létrehozásának körzeti alapú megközelítése; Irányelv megállapodás az államok között és a légiforgalmi, illetve a tengerészeti kutató-mentő szolgálatok operatív együttműködése; lényeges adatok azonnali elérhetősége a kutató-mentő központ részéről.	2004.feb.23 2004.jul.12 2004.nov.25

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

Megjegyzés.- Ez az Annex kiegészült a Nemzetközi Légiforgalmi és Tengeri Kutató-Mentő (IAMSAR) Kézikönyv I. kötetével – Szervezés és Vezetés, a II. kötetével – Művelet összehangolás és a III. kötetével - Mobil Létesítmények (Doc 9731). A kiegészítés célja az államok segítése kutatás és mentési (SAR) igényeik teljesítésében, illetve a Nemzetközi Polgási Repülési Egyezmény értelmében vállalt kötelmeik teljesítésében. Eme – a kutató és mentő szolgálat biztosításával összefüggő – kötelmek a jelen Annexben szabványok és ajánlott eljárások formájában lettek előírva. Az IAMSAR Kézikönyv három kötete a kutató és mentő szolgálatok megszervezésének és biztosításának közös, repülési és tengerészeti megközelítéséhez szolgál útmutatóul. Az államokat bátorítjuk, hogy a kézikönyv használatával alakítsák ki, illetve javítsák kutató és mentő szolgálataikat, illetve, hogy a szomszédos államokkal működjenek együtt.

1. FEJEZET - MEGHATÁROZÁSOK

Ahol a kutatás és mentésre vonatkozó szabványokban és ajánlott gyakorlatokban az alábbi kifejezések szerepelnek, ott azok jelentése a következő:

Riasztó állomás (Alerting post) Bármely létesítmény, amelynek célja közvetítőként szolgálni a vészhelyzetet jelentő személy és a mentés koordináló központ, vagy alközpont között.

Riasztási állapot (Alert phase) Az az állapot, amikor valamely légijármű, vagy a fedélzetén tartózkodó személyek biztonságával kapcsolatban kétség merül fel.

Veszély állapot (Distress phase) Az az állapot, amikor ésszerű bizonyossággal feltételezhető, hogy a légijárművet és a fedélzeten tartózkodó személyeket súlyos és közvetlen veszély fenyegeti vagy, hogy azonnali segítségre szorulnak.

Vízre szállás (Ditching) Légijármű vízre végzett kényszerleszállása.

Kényszer állapot (Emergency phase) általános kifejezés, amely az esettől függően felváltva a bizonytalanság, a riasztás, vagy a veszély állapotát jelenti.

Közös mentést koordináló központ (Joint Rescue coordination Centre – JRCC) Mind a légiforgalmi, mind a tengerészeti kutató és mentő tevékenység összehangolásáért felelős mentés koordináló központ.

Üzemeltető (Operator) Légijárművek üzemeltetésével foglalkozó, vagy arra vállalkozó személy, szervezet, vagy vállalkozás.

Parancsnok-pilóta (Pilot-in-command) Az üzemeltető által, vagy az általános célú repülés esetében a tulajdonos által a repülési idő tartamára parancsnoklásra és a repülés biztonságos teljesítéséért felelősség viselésére kijelölt repülőgép vezető.

Mentés koordináló központ (Rescue co-ordination centre - RCC) Hatékony kutató-mentő szolgálat megszervezéséért, valamint egy kijelölt kutatási és mentési területen belül a kutató és mentő munka összehangolt irányításáért felelős egység.

Mentési alközpont (Rescue subcentre - RSC) A felelős hatóságok külön rendelkezései szerint a mentés koordináló egységnek alárendelt olyan egység, amelyet azért létesítettek, hogy a kutató és mentő körzet meghatározott részében a központ tevékenységét kiegészítse.

Kutatás (Search) Rendszerint a mentés koordináló központ, vagy a mentési alközpont által a rendelkezésére álló személyzet és létesítmények alkalmazásával végzett tevékenység a veszélyben lévő személyek felkutatására.

Kutató mentő Légijármű (Search and rescue aircraft) Kutató-mentő művelet hatékony végrehajtásához alkalmas különleges eszközökkel felszerelt légijármű.

Kutató mentő létesítmény (Search and rescue facility) Kutató és mentő tevékenység végrehajtására használatos bármiféle mobilis erőforrás, beleértve a kijelölt kutató és mentő egységeket is.

Kutató mentőszolgálat (Serchand rescue service) az alábbiak biztosítása, ellátása: vészhelyzet figyelés, kommunikáció, a kutató és mentő feladatok összehangolása, kezdeti orvosi (első)segítségnyújtás, vagy orvosi mentés nyilvános és magán erőforrások használatával, beleértve az együttműködő légijárműveket, hajókat, illetve egyéb járműveket és létesítményeket.

Kutató-mentő körzet (Serch and rescue region - SRR) Meghatározott kiterjedtségű és adott mentés koordináló központhoz társított kutatásterület, melyen belül kutató mentőszolgálat működik.

Kutató mentőegység (Search and Rescue unit) A kutatás és mentés eredményes végrehajtásához megfelelő berendezésekkel ellátott és gyakorlott személyzetből álló mobil erőforrás egység.

Lajstromozó állam (State of registry) Az az állam, amelynek lajstromába a légijárművet bejegyezték.

Bizonytalansági állapot (Uncertainty phase) Olyan helyzet, amikor bizonytalanság áll fenn valamely légijármű és a fedélzeten tartózkodó személyek biztonságával kapcsolatban.

2. FEJEZET - SZERVEZET

2. 1. - Kutató-mentő szolgálatok

2.1.1 a szerződő állam intézkedjen területén belül kutató-mentő szolgálatok egyénileg, vagy más államokkal együttműködésben történő létesítéséről és azonnali rendelkezésre állásukról, biztosítva, hogy a veszélyben lévő személyek segítségben részesüljenek. Az ilyen szolgálatokat napi 24 órás alapon kell biztosítani.

2.1.1.1 Nyílt vizek, vagy meghatározatlan felségjogú területek azon részeit, amelyeken kutató-mentő szolgálatokat létesítenek, körzeti légi-navigációs egyezmény alapján kell kijelölni. Az ilyen területeken kutató-mentő szolgálatok fenntartására felelősséget vállaló szerződő állam a felelősségvállalást követően intézkedni köteles, hogy az egyénileg, avagy más államokkal együttműködésben létrehozott szolgálatok létesítése és fenntartása a jelen Annex rendelkezéseivel egyezésben történjen.

Megjegyzés. - A Körzeti Légi-navigációs Egyezmény kifejezés az ICAO Tanácsa által - rendszerint a Körzeti Légi-navigációs Értekezletek javaslatára - elfogadott egyezményeket jelenti.

2.1.1.2 A kutató mentő szolgálatok alap elemei közé a következők tartoznak: jogi szabályozó keret, felelős hatóság, szervezetten rendelkezésre álló erőforrások, kommunikációs létesítmények és az együttműködési és operatív feladatokban jártas munkaerő.

2.1.1.3 A kutató mentő szolgálatok kötelesek olyan folyamatokat kialakítani, amely révén a nyújtott szolgáltatás javítható, ideértve a tervezés, a belföldi és a nemzetközi együttműködés kialakítás és a kiképzés vonatkozásait.

2.1.2 A szerződő államok a veszélyben lévő légijárműnek és a légijármű balesetek túlélőinek nyújtandó segítséget az ilyen légijármű, illetve a túlélők nemzetiségi hovatartozására és státuszára, illetve azon körülményekre tekintet nélkül kötelesek nyújtani, amely körülmények között az illető személyt fellelték.

2.1.3 A kutató mentőszolgálat biztosításának felelősségét vállaló szerződő állam köteles a kutató mentőszolgálat egységeit és egyéb rendelkezésére álló létesítményeit használni bármiféle olyan légijármű, illetve a fedélzetén tartózkodó személyek segítésére amely/akik veszély állapotban lévőnek tűnnek, avagy abban vannak.

2.1.4 Ahol ugyanazt a térséget különálló légiforgalmi és tengerészeti mentés koordináló központ szolgálja ki, az állam a gyakorlatilag lehetséges legszorosabb együttműködésről gondoskodjon a két központ között.

2.1.5 **Ajánlás.** – *A szerződő állam mozdítsa elő a légiforgalmi és a tengerészeti kutató mentő szolgálatai közötti egységesség és együttműködés megvalósulását.*
2.1.6 **Ajánlás.** – *A szerződő állam – ahol lehetséges – légiforgalmi és tengerészeti kutató mentő műveleteinek összehangolásához közös mentés koordináló központot hozzon létre.*

2. 2. - Kutató-mentő körzetek

2.2.1 A szerződő állam felségterületén belül köteles kijelölni azon a kutató-mentő körzetek határait, amelyekben kutató-mentő szolgálatot biztosít. A körzetek egymást ne fedjék át, de határaik a szomszédos körzet határokkal folyamatosan érintkezzenek.

1. Megjegyzés. – Kutató és mentő körzeteket azért létesítenek, hogy megfelelő kommunikációs háttér létesítmény, hatékony vészhelyzeti riasztási lánc és megfelelő műveleti összehangolás legyen biztosított a kutató mentő szolgálatok hatékony támogatása céljából. Egy adott SAR körzetben a kutató mentő szolgálatok biztosítása érdekében a szomszédos államok együttműködhetnek.

2. Megjegyzés. – A kutató mentő körzetek határvonalait műszaki és műveleti megfontolások alapján jelölik ki és nem az államok között húzódó határvonalak szerint.

2.2.1.1 **Ajánlás**. - *A kutató-mentő körzetek határai - amennyire lehetséges - egyezzenek meg a megfelelő repülés tájékoztató körzetek határaival és a nyílt vizek feletti térségekre vonatkozóan, a tengerészeti kutató mentő körzet határaival.*

2.3. - Kutatást koordináló központok és mentő alközpontok

2.3.1 A szerződő állam minden kutató mentő körzetében köteles mentést koordináló központot létesíteni.

Megjegyzés. – A szerződő állam – a körzeti légi-navigációs egyezménnyel egyezésben – létrehozhat olyan kutató mentő körzethez kapcsolódó mentést koordináló központot, amelynek területi határai saját szuverén légterének határain túlnyúlnak.

2.3.2 **Ajánlás**. - *Ha a szerződő állam légterének egésze, vagy annak egy része egy másik államhoz tartozó mentést koordináló központhoz társított kutató mentő körzetbe tartozik, akkor az elsőként említett állam létesítsen a mentést koordináló központ alá rendelt mentő alközpontot, ha az felségterületén belül a kutató-mentő szolgálatok hatékonyságát fokozza.*

2.3.3 Minden mentés koordináló központ – és ahol létezik – a mentő alközpont napi 24 órában legyen képzett és a rádió távközlésben alkalmazott nyelv használatában jártas személyzettel ellátva.

2.3.4 **Ajánlás**. – *A rádió távközlés végrehajtásában résztvevő Mentést Koordináló Központ személyzet az angol nyelv használatában legyen jártas.*

2.3.5 **Ajánlás**. - *Olyan területeken, ahol nyilvános távközlési berendezés nem teszi lehetővé a vészhelyzetben lévő légijárművet észlelő személy számára, hogy erről a mentést koordináló központot azonnal és közvetlenül értesíthesse, a szerződő államnak megfelelő, közcélú, vagy magán berendezést kell kijelölnie riasztási őrhelyként.*

2.4. - Kutató-mentő kommunikáció

2.4.1 Minden mentés koordináló központ rendelkezzen az alábbiakkal gyors és megbízható kétoldalú összeköttetést biztosító eszközökkel:

a) a kapcsolódó légiforgalmi szolgálati egységgel;

b) a kapcsolódó mentő alközpontokkal;

c) a körzetben lévő megfelelő iránymérő-, és helyzet meghatározó állomásokkal;

d) ahol szükséges, azokkal a parti rádióállomásokkal, amelyek képesek a felszíni hajókat riasztani és velük összeköttetésbe lépni.

e) a körzetben lévő mentő egységek parancsnokságával;

f) a körzetben lévő minden tengerészeti mentést koordináló központtal és a szomszédos körzetek légiforgalmi, tengerészeti, vagy közös koordináló központjaival;

g) egy kijelölt meteorológiai központtal, vagy egy meteorológiai megfigyelő állomással;

h) a kutató és mentő egységekkel;

i) a riasztói állomásokkal; és

j) a Kutató mentő körzetet kiszolgáló COSPAS-SARSAT műveletirányító központtal.

Megjegyzés. – A tengerészeti mentés koordináló központokat a Nemzetközi Tengerészeti Szervezet megfelelő dokumentumai azonosítják.

2.4.2 A mentő alközpont rendelkezzen az alábbiakkal gyors és megbízható kétoldalú összeköttetést biztosító eszközzel:

a) a szomszédos mentő alközpontokkal;

b) egy meteorológiai központtal, vagy egy meteorológiai megfigyelő állomással;

c) a kutató mentő egységekkel;

d) a riasztó állomásokkal;

2.5. - Kutató mentő egységek

2.5.1 A szerződő állam a kutató és mentő egység elemeiként a kutató mentő műveletekhez megfelelő elhelyezkedésű és felszereltségű köz-, vagy magánszolgálatokat jelöljön ki.

Megjegyzés. - A kutató-mentő körzeten belüli kutatás és mentés ellátásához minimálisan szükséges egységeket és ezek felszereltségét a körzeti légi-navigációs egyezmények állapítják meg, és pontos leírásukat a megfelelő Légi-navigációs Terv (Air Navigation Plan), illetve a Létesítmény és Szolgálat Létesítési Dokumentum (Facilities and Services Implementation Document) kiadványok tartalmazzák.

2.5.2 A szerződő állam a kutató mentő műveleti terv részeként jelölje ki azokat a köz-, vagy magánszolgálati egységeket, amelyek kutató-mentő egységnek ugyan nem minősülnek, de képesek részt venni a kutató-mentő műveletekben.

2.6. - Kutató mentő felszerelés

2.6.1 A mentőegységeket a baleset helyszínének azonnali meghatározására és a helyszínen megfelelő segítség nyújthatására alkalmas eszközökkel és felszerelésekkel kell ellátni.

2.6.2 **Ajánlás**. - *Minden kutató mentőegység rendelkezzen az ugyanabban a műveletben résztvevő más egységekkel, vagy alakulatokkal gyors és megbízható kétoldalú kommunikációt biztosító eszközzel.*

2.6.3 Minden kutató-mentő légijármű rendelkezzen a légi-közlekedés vészfrekvenciáin és a kutatás-mentés helyszíni frekvenciáin, valamint minden egyéb esetleg előírt frekvenciákon kummunikálási lehetőséget biztosító eszközökkel.

2.6.4 Minden kutató mentő légijármű rendelkezzen a vészhelyzeti frekvenciákon rávezetést biztosító készülékkel.

1. Megjegyzés.- A baleseti helyazonosító rádióadók (ELT - Emergency locator transmitter) rendszeresítésére vonatkozó követelményeket a 6. Annex I, II és III Részei tartalmazzák.

2. Megjegyzés.- A baleseti helyazonosító rádióadók (ELT - Emergency locator transmitter) műszaki jellemzőit a 10. Annex III. Kötete tartalmazza.

2.6.5 A tengeri körzetekben kutatás - mentésben alkalmazott kutató mentő légijárművek rendelkezzenek a kereskedelmi hajókkal való kommunikálást lehetővé tévő berendezésekkel.

Megjegyzés. – Számos hajó képes a légijárművekkel kommunikálni a 2182 kHz, a 4125 kHz és a 121.5 MHz-n. Ezeket a frekvenciákat és különösen a 121.5 MHz-t azonban a hajók nem biztos, hogy folyamatosan figyelemmel kísérik.

2.6.6 A tengeri körzetekben kutatás és mentésben résztvevő minden kutató-mentő légijármű fedélzetén legyen ott a Jelzések Nemzetközi Kódjának (International Code of Signals) egy példánya a nyelvi nehézségek leküzdésére, amely ilyen hajókkal történő összeköttetés létesítésekor előfordulhat.

Megjegyzés. – A Jelzések Nemzetközi Kódját a Nemzetközi Tenghajózási Szervezet angolul, franciául és spanyolul, mint 1994E, 1995F és 1996S dokumentum, teszi közzé.

2.6.7 **Ajánlás**. - *A kutatás-mentésben résztvevő legalább egyik légijármű vigyen magával ledobható túlélési felszereléseket, kivéve, ha bizonyossá vált, miszerint a túlélők levegőből történő ellátására nincs szükség.*

2.6.8 **Ajánlás**. - *Az államok a megfelelő repülőtereket lássák el a légijárműről ledobásra alkalmas csomagolású túlélési felszerelésekkel.*

3. FEJEZET - EGYÜTTMŰKÖDÉS

3.1. Államok közötti együttműködés

3.1.1. A szerződő állam kutató és mentő szervezeteit hangolják össze a szomszédos szerződő államok kutató és mentő szervezeteivel.

3.1.2. **Ajánlás**. - *A szerződő állam kutató és mentő tevékenységét - amikor csak szükséges - hangolja össze a szomszédos államok kutató és mentő tevékenységével, különösen akkor, ha e műveletek a szomszédos kutató mentő körzetek közelében zajlanak.*

3.1.2.1 **Ajánlás**. - *A szomszédos államokkal a kutató és mentő tevékenység összehangolásának előmozdítása érdekében a szerződő államok - a lehetséges mértékig - közös kutató és mentő terveket és eljárásokat fejlesszenek ki.*

3.1.3 A saját hatóságok által esetleg kikötött feltételekkel, a szerződő állam saját területére engedélyezze más szerződő állam mentőegységeinek a repülőbaleseti helyszín felkutatása és a baleset túlélőinek mentése céljából történő azonnali belépését.

3.1.4 Mentőegységeit kutatási és mentési célból egy másik szerződő állam területére léptetni kívánó szerződő állam az érintett állam mentés koordináló központja, vagy az illető állam által kijelölt más, ilyen hatósága számára nyújtsa be tervezett akcióját teljes részletességgel tárgyaló és a belépés szükségességét megindokoló kérelmét.
3.1.4.1 A szerződő állam hatóságainak:
- azonnal nyugtázniuk kell a kérelem vételét, és
- amilyen gyorsan csak lehet, közölni kell a feltételeket - ha vannak ilyenek - amelyek figyelembevételével a tervezett akció végrehajtható.

3.1.5 **Ajánlás. -** *A kutató mentő együttműködés és összehangoltság erősítése érdekében a szerződő államok törekedjenek a szomszédos államokkal előzetesen megállapodást kötni mentőegységeiknek a másik fél meghatározott területére való belépése feltételeiről. E megállapodásokban rendelkezni kell az ilyen egységek gyors és a lehető legkevesebb formalitással járó belépésének elősegítéséről.*

3.1.6 **Ajánlás**. - *Mentés koordináló központját a szerződő állam hatalmazza fel arra, hogy:*

a) Más mentés koordináló központok segítségét kérhesse, beleértve légijárműveiket, hajóikat, személyzeteiket, vagy felszereléseiket, ahogy a szükség kívánja;

b) a területre történő belépéshez szükséges minden engedélyt kiadhasson ezen légijárművek, hajók, személyzetek, vagy felszerelések részére; és

c) az ilyen jellegű belépések meggyorsítása céljából a vámügyi, bevándorlási és egyéb hatóságokkal a megfelelő intézkedéseket alakítson ki.

3.1.7 **Ajánlás. -** *Mentés korrdináló központját a szerződő állam hatalmazza fel, hogy kérésre segítséget nyújtson más mentés koordináló központoknak, beleértve a légijármű, hajó, személyzet, vagy felszerelés formájában nyújtott segítséget.*

3.1.8 **Ajánlás**. - *A kutatási és mentési hatékonyság fokozása céljából a szerződő állam intézkedjenek, hogy kutató és mentő egységeik más államok kutató és mentő egységeivel és üzemeltetőivel közös kiképző gyakorlatokat hajtsanak végre.*

3.1.9 **Ajánlás. -** *A szerződő államok intézkedjenek, hogy saját mentés koordináló központjainak és alközpontjainak személyi állománya a szomszédos államok központjaiban rendszeresen kapcsolattartó látogatást tegyenek.*

3.2. - Más szolgálatokkal való együttműködés

3.2.1 A szerződő állam kötelesek intézkedni, hogy a kutató mentő szervezet részét nem képező minden légijármű, hajó és helyi szolgálat, valamint létesítmény a kutatás mentésben és a repülőbalesetek túlélői részére nyújtható segítség kiterjesztésében a kutató mentő szervezettel teljes mértékben együttműködjön.

3.2.2 **Ajánlás**. - *A leghatásosabb és leghatékonyabb kutató mentő szolgálat biztosítása érdekében a szerződő állam a gyakorlatban lehetséges legszorosabb együttműködésről gondoskodjon az érdekelt légiforgalmi és tengerészeti hatóságok között.*

3.2.3 A szerződő állam gondoskodjon róla, hogy kutató-mentő szolgálata a balesetek kivizsgálásáért felelős szolgálatokkal és a balesetet szenvedettekről való gondoskodásért felelősekkel együttműködjön.

3.2.4 **Ajánlás**. - *A baleset kivizsgálásának elősegítése érdekében a mentőegységek - amikor ez megvalósítható - a repülő balesetek kivizsgálására képesített személyekkel kiegészítve működjenek.*

3.2.5 A COSPAS-SARSAT kényszerhelyzeti adatok vételére az állam köteles kutatás-mentés összeköttetési pontot kijelölni.

3.3. Információ átadás

3.3.1 A szerződő állam köteles közreadni és szétküldeni az állam területére más államok mentőegységeinek belépéséhez szükséges információkat, avagy alternatívaképp, eme információt a kutató mentő szolgálati megállapodásba foglalja be.

3.3.2 **Ajánlás**. – *A szerződő állam - mentés koordináló központján, vagy egyéb ügynökségein keresztül – tegye hozzáférhetővé a kutató és mentő műveleti tervére vonatkozó információkat, ha az ilyen tájékoztatás haszonnal járhat valamely kutató mentő szolgálat biztosításában.*

3.3.3 **Ajánlás**. – *A szerződő állam, a kívánatos és lehetséges mértékig, tájékoztassa a nyilvánosságot és a katasztrófa elhárító hatóságot az általános vészhelyzeti reagálást igénylő, avagy az olyan körülmények között megteendő lépésekről, amikor megalapozottan gyanítható, hogy egy légijármű vészhelyzet a közvélemény aggodalmát válthatja ki.*

4. FEJEZET - ELŐKÉSZÍTŐ INTÉZKEDÉSEK

4.1 Információ igény

4.1.1 Minden mentés koordináló központ, minden időpontban rendelkezzen a kutató mentő körzetére vonatkozó, alábbiakkal kapcsolatos naprakész információkkal:

a) mentőegységek, mentési alközpontok és riasztó állomások;

b) légiforgalmi szolgálati egységek;

c) a kutató és mentési műveleteknél felhasználható összeköttetést biztosító eszközök;

d) a körzetben működő minden üzemeltető, vagy kijelölt képviselőik címe és telefonszáma;

e) bármely más, köz- és magán segélyforrás, beleértve azokat az orvosi és szállítási eszközöket, amelyek a kutatás és mentés során minden valószínűség szerint hasznosak lehetnek.

4.1.2 **Ajánlás**. - *Minden mentés koordináló központ rendelkezzen minden egyéb, a kutatás és mentés szempontjából hasznos információval, beleértve az alábbiakra vonatkozókat is:*

a) minden olyan rádióállomás helye, hívójele, figyelési ideje és frekvenciája, amelyet valószínűleg felhasználnak a kutatás és mentés során;

b) azon szolgálatok helye és figyelési ideje, amelyek figyelést tartanak és, hogy mely frekvenciákon tartanak figyelést;

c) a ledobható vésztartalékok és mentőfelszerelések tárolási pontjai;

d) ismert olyan tárgyak, amelyek - különösen a levegőből nézve - be nem jelentett, vagy fel nem lelt ronccsal összetéveszthetők.

4.1.3 **Ajánlás**. - *A tengerre is kiterjedő kutató-mentő területtel rendelkező minden mentés koordináló központnak, álljon módjában egyszerűen hozzáférni az ezen területen belül tartózkodó és vészhelyzetben lévő légijárműnek segítséget nyújtani képes hajók helyzetét, tényleges útvonalát, sebességét és hívójelét tartalmazó információkhoz.*

Megjegyzés. - Ezeket az információkat vagy a mentés koordináló központban kell tárolni, vagy közvetlen hozzáférést kell biztosítani.

4.1.4 **Ajánlás**. - *A tengereken végzett kutató mentő műveletek támogatása érdekében a szerződő állam önállóan, vagy más államokkal együttműködve és a tengerészeti hatóságokkal kooperálva hozzanak létre hajókövető rendszert, avagy intézkedjenek az Amver, illetve a körzeti hajókövető rendszerhez kommunikációs (adat) kapcsolat létrehozásáról.*

Megjegyzés. – Az Amver egy világfedéssel rendelkező és a létező összes mentés koordináló központ által lekérdezhető együttműködéses nemzetközi hajókövető rendszer. Számos szerződő állam ugyancsak üzemeltet hajókövető körzeti rendszereket.

4.2 Műveleti terv

4.2.1 Minden mentés koordináló központ készítsen részletes tervet a kutató és mentő körzetén belüli kutató és mentő műveletek végrehajtására.

4.2.2 **Ajánlás.** - *A kutató mentő műveleti terveket az üzemeltetők és egyéb olyan közszolgálati-, vagy magán szolgálatok képviselőivel közösen kell kidolgozni, amelyek a kutató mentő szolgáltatás biztosításában segíthetnek, vagy amelyek révén előnyök szerezhetők, tekintetbe véve, hogy a túlélők száma magas is lehet.*

4.2.3 A műveleti tervnek pontos intézkedéseket kell tartalmaznia - a lehetséges mértékig - a kutatásban és mentésben alkalmazandó légijárművek, hajók, gépjárművek kiszolgálására, üzemanyaggal való utántöltésére vonatkozóan, beleértve a más államok által rendelkezésre bocsátott eszközöket is.

4.2.4 **Ajánlás.** - *A kutatás mentés műveleti terv tartalmazza részletesen a kutatásban és mentésben résztvevők feladatait, beleértve:*

a) a kutató és mentő körzeten belüli kutató és mentő munkák végrehajtásának módját;

b) a rendelkezésre álló hírközlési rendszerek és létesítmények használatát;

c) a szomszédos mentés koordináló központokkal közösen végrehajtandó tevékenységeket;

d) az úton lévő légijárművek és tengeren lévő hajók riasztásának módját;

e) a kutatásra és mentésre kijelölt személyzet kötelességeit és kiváltságait;

f) a berendezések lehetséges átcsoportosítását, amelyet meteorológiai, vagy más körülmények tehetnek szükségessé;

g) a kutató és mentő műveletekkel kapcsolatos lényeges információkhoz - úgy mint, az időjárási jelentésekhez és előrejelzésekhez, a vonatkozó NOTAM-okhoz stb. - való hozzájutás módszerét;

h) a többi mentő központtól való, esetlegesen szükségessé váló segítség kérésének módját - beleértve a légijárműveket, hajókat, személyzetet, vagy felszerelést;

i) segítség nyújtási módszerek a vészhelyzetben lévő és vízre szállásra kényszerülő légijárműnek a felszíni vízi járművel való találkozáshoz;

j) segítség nyújtási módszerek a kutatást és mentést végző, vagy más légijárműnek, hogy a vészhelyzetben lévő légijárművel találkozzon;

k) a légiforgalmi szolgálati egységekkel és egyéb érdekelt hatóságokkal együttműködésben teendők a tudottan, vagy feltételezetten jogellenes cselekmény tárgyát képező légijármű segítésére.

4.2.5 **Ajánlás.** – A *kutató mentő műveleti terveket össze kell hangolni a repülőtéri vészhelyzeti tervekkel, hogy a kutató mentő szolgáltatás biztosított legyen a repülőterek környezetében, beleértve a parti repülőtereket és a vízzel borított területeket is.*

4.3 Kutató mentőegységek

4.3.1 Minden kutató-mentőegység:

a) ismerje a 4.2 pontban leírt műveleti terv saját feladata eredményes végrehajtásához szükséges minden részletét;

b) készenléti szintjéről tartsa a kutatást koordináló központot naprakészen;

4.3.2 A szerződő állam

a) köteles a szükséges számú kutató mentő létesítményt készenlétben tartani; és

b) köteles megfelelő mennyiségű élelmiszeradagot, gyógyszer készletet, jelzőeszközök és egyéb más túlélési és mentő felszerelést ellátmányként tárolni;

4.4 Kiképzés és gyakorlatozások

A kutatás és mentés legmagasabb fokú hatékonyságának elérése és fenntartása céljából a szerződő állam kutató és mentő személyzeteit részesítse rendszeres kiképzésben és tartasson megfelelő kutató és mentő gyakorlatokat.

4.5 A repülőgép roncs

Ajánlás. - *Minden szerződő állam gondoskodni köteles róla, hogy a területén belül, vagy a felelőssége alá tartozó kutatási és mentési körzetekben a nyílt tengeren, vagy a meg nem határozott felségjogú területeken bekövetkezett repülőbalesetekből származó roncsokat a baleset kivizsgálását követően eltávolítsák, vagy megsemmisítsék, illetőleg térképen feltüntessék, ha jelenléte veszélyes, vagy a későbbi kutató mentő műveletekben zavart okozhat.*

5. FEJEZET - MŰKÖDÉSI ELJÁRÁSOK

5.1 - Tájékoztatás vészhelyzetről

5.1.1 Bármely hatóság, vagy a kutató és mentő szervezet bármely egysége, ha okkal gyanítja, hogy egy légijármű vészhelyzetben van, akkor köteles a rendelkezésére álló összes információt azonnal az illetékes mentés koordináló központnak átadni.

5.1.2 A mentés koordináló központ a kényszerhelyzetben lévő légijárműről szóló tájékoztatás vétele után azonnal értékelje az információt és határozza meg a szükséges műveletek méreteit.

5.1.3 Amikor vészhelyzetben lévő légijárműről szóló tájékoztatás nem a légiforgalmi szolgálati egységektől, hanem más forrásból származik, a mentés koordináló központ határozza meg, hogy a helyzet melyik kényszerhelyzeti fázisnak felel meg, és a továbbiakban ennek az állapotnak megfelelő eljárásokat kell alkalmaznia.

5.2 A mentés koordináló központok eljárásai vészhelyzeti fázisokban

5.2.1 Bizonytalansági állapot

Bizonytalansági állapotban a beérkező jelentések gyors értékelhetősége érdekében a mentés koordináló központok a legteljesebb mértékig működjenek együtt a légiforgalmi szolgálati egységekkel és más megfelelő hatóságokkal, szolgálatokkal.

5.2.2 Riasztási állapot

A riasztási állapot bekövetkezésekor a mentés koordináló központ azonnal riassza a megfelelő kutató és mentő szolgálati egységeket és indítsa meg a szükséges műveleteket.

5.2.3 Veszély állapot

Veszély állapot kialakulásakor a mentés koordináló központ:

a) kutató és mentő egységei azonnal kezdjék meg a részletes műveleti terv szerinti ténykedéseket;

b) állapítsa meg a légijármű pozícióját, becsülje meg ennek a helyzetnek a bizonytalansági fokát és ezen tájékozódás, valamint a körülmények alapján határozza meg a kutatandó terület kiterjedtségét;

c) értesítse az üzemeltetőt - ahol ez lehetséges - és a fejleményekről folyamatosan tájékoztassa;

d) tájékoztassa azokat a szomszédos mentés koordináló központokat, amelyektől várhatóan segítségre lesz szüksége, illetőleg amelyek a műveletek részeseivé válhatnak;

e) értesítse a kapcsolódó légiforgalmi szolgálati egységet abban az esetben, ha a kényszerhelyzetről kapott tájékoztatás más forrásból származik;

f) a lehető leghamarabb kérje fel a megfelelő műveleti tervben kifejezetten nem szereplő azon légijárműveket, hajókat, parti állomásokat, vagy egyéb szolgálatokat, amelyek segíthetnek:

1) a rádió figyelésben, figyelhetik a vészhelyzetben lévő légijárműről, vagy a túlélő rádióról érkező adásokat, vagy a baleseti helyazonosító rádióadó adásait.

Megjegyzés. - A baleseti helyazonosító rádióadóra (ELT) vonatkozó műszaki leírásokban megadott frekvenciák a 10. Annex III. Kötete értelmében: 121.5 MHz és 406 MHz.

2) a veszélyben lévő légijárműnek - amennyire lehetséges;

3) tájékoztathatják a mentés koordináló központot bármi fejleményről;

g) a rendelkezésre álló információkból készítsen részletes tervet a szükséges kutató és/vagy mentő műveletek lefolytatására és útmutatás céljából közölje tervét az ilyen műveleteket közvetlenül irányító hatóságokkal;

h) a körülményeknek változásának megfelelően módosítsa a részletes műveleti tervet;

i) értesítse az illetékes baleset kivizsgáló hatóságot;

j) értesítse a légijárművet lajstromozó államot.

Az előbbiekben előírt tevékenységek sorrendjét be kell tartani kivéve, ha a körülmények másképp diktálják.

5.2.4. - Kutató és mentő műveletek megkezdése ismeretlen tartózkodási helyű légi-jármű esetében

Ismeretlen tartózkodási helyű légijárműre vonatkozó kényszerhelyzeti állapot bejelentésekor a következőket kell tenni, ha a légijármű feltehetően két, vagy több kutató és mentő körzet valamelyikében található:

a) Ha a mentés koordináló központ kényszerhelyzet fennállásáról értesül, de nincs tudomása róla, hogy más központ már tett megfelelő intézkedéseket, akkor magára kell vállalnia az 5.2. pontban leírt eljárások végrehajtásának kezdeményezési felelősséget, és közben tanácskoznia kell a szomszédos mentés koordináló központokkal annak a mentés koordináló központ kijelölése céljából, amelyik haladéktalanul átveszi a felelősséget.

b) Hacsak az érintett mentés koordináló központok közös megegyezéssel másként nem döntöttek, a kijelölendő mentés koordináló központ az a központ legyen, amelyik felelős:

- azért a körzetért, amelyben a légijármű az utolsó helyzet jelentése szerint tartózkodott; vagy

- azért a körzetért, amelyik felé a légijármű haladt, ha az utolsó helyzetjelentése szerinti tartózkodási helye két kutató- mentő körzet határán volt; vagy

- azért a körzetért, amelyikben a légijármű rendeltetési helye található, ha a légijármű nem volt felszerelve megfelelő kétoldalú rádióösszeköttetést biztosító berendezéssekkel, vagy rádióösszeköttetés tartására nem volt köteles; vagy

- azért a körzetért, amelyben a Cospas-Sarsat rendszer azonosítása szerint a vészhelyzet helyszíne található.

c) A veszély állapot bejelentése után a kutató mentő tevékenység teljeskörű összehangolásáért felelős mentés koordináló központ a kényszer állapot minden körülményéről és az azt követő fejleményekről köteles tájékoztatni mindazon mentés koordináló központokat, amelyek érintve lehetnek a műveletben. Hasonlóképpen, mindazon mentés koordináló központok, amelyek az esettel kapcsolatos bármilyen információval rendelkeznek, kötelesek tájékoztatni a kutató mentő műveleteket összehangoló mentés koordináló központot.

5.2.5 Tájékoztatás a kényszerhelyzeti állapotban lévőnek nyilvánított légijármű részére

Amikor csak lehetséges, a kutató mentő tevékenységért felelős mentés koordináló központ köteles a megkezdett kutatási és mentési tevékenységgel kapcsolatos információkat továbbítania mindazon légiforgalmi szolgálati egységeknek, amelyek repülés tájékoztató körzetében a légijármű tartózkodik, abból a célból, hogy ezt a tájékoztatást a légijárműnek továbbítsák.

5.3. Eljárások, amikor a működésért a felelősség két, vagy több szerződő államra terjed ki

Ahol a teljes kutató mentő körzetben a feladatok végrehajtásáért egynél több szerződő állam felelős, ott mindegyik szerződő államnak a műveleti tervvel összhangban kell cselekednie akkor, amikor a körzet mentés koordináló központja erre felkérte.

5.4. A területen működő hatóságok eljárásai

A mentési munkák, vagy azok bármely részének közvetlen irányítását végző hatóságok:

a) adjanak utasításokat az irányításuk alatt álló egységeknek és ezekről az utasításokról értesítsék a mentés koordináló központot; és

b) a fejleményekről folyamatosan tájékoztassák a mentés koordináló központot.

5. 5. A mentés koordináló központok eljárásai - műveletek befejezése és felfüggesztése

5.5.1 A kutató mentő tevékenységnek addig kell folytatódnia – ha lehetséges - amíg az összes túlélőt biztonságos helyre juttatták, vagy addig, amíg a további túlélők megmentésének minden ésszerű reménye megszűnt.

5.5.2 Az illetékes mentés koordináló központ felelős rendszerint dönteni, hogy a kutató mentő tevékenységgel mikor hagynak fel.

Megjegyzés. – A kutató mentő tevékenység felhagyásához vezető döntési folyamatban a szerződő állam megfelelő más állami hatóságoktól bekérhet információkat, véleményeket.

5.5.3 Ha a kutató mentő tevékenység sikerrel járt, vagy, ha a mentés koordináló központ úgy tekinti, avagy olyan tájékoztatást kapott, hogy a veszély állapot a továbbiakban már nem áll fenn, akkor a veszély állapotot törölni kell, a kutató mentő műveleteket be kell fejezni és a korábban aktivizált, vagy értesített minden hatóságot, létesítményt azonnal tájékoztatni kötelező.

5.5.4 Ha a kutató mentő műveletek folytatása nem ésszerű, de a mentés koordináló központ szerint még lehetnek túlélők, a központ a további fejlemények függvényében időlegesen függesszen fel minden helyszíni tevékenységet és a korábban aktivizált, vagy értesített minden hatóságot, létesítményt, vagy szolgálatot azonnal tájékoztasson e tényről. Az ezt követően kapott vonatkozó tájékoztatást értékelnie kell és a műveleteket újra kell indítani, ha az lehetséges és a tájékoztatás azt indokolttá teszi.

5.6. - Baleset helyszíni eljárások

5.6.1 Amikor a baleset helyszíni kutató mentő tevékenységben többféle létesítményt vontak be, a mentés koordináló központ, avagy a mentés koordináló alközpont a helyszínen tartózkodók közül jelöljön ki egy, vagy több egységet az összes művelet összehangolására ezzel segítve a légi- és földi tevékenység biztonságosságának és hatékonyságának elősegítését, figyelembe véve a létesítmények kapacitását és üzemeltetési követelményeit.

5.6.2 Kivéve amikor nincs lehetősége rá, illetve a körülmények alapján ésszerűtlennek, vagy szükségtelennek ítéli meg, a parancsnok pilóta ha azt észleli, hogy akár egy másik légijármű, akár egy felszíni jármű veszélyben van:

a) tartsa szemmel a veszélyben lévő járművet mindaddig, amíg a helyszín elhagyására kényszerül, vagy a mentés koordináló központ értesítette, hogy jelenlétére nincs tovább szükség;

b) határozza meg a veszélyben lévő jármű helyzetét;

c) a mentés koordináló központnak, vagy a légiforgalmi szolgálati egységnek a következő adatok közül jelentse mindazt, amit lehet:

- a veszélyben lévő jármű típusa, azonossága és állapota;

- helyzete, földrajzi vagy grid koordinátákkal, vagy egy jellegzetes tárgytól, vagy egy rádió-navigációs berendezéstől mért távolsággal és tényleges irányszögével kifejezve;

- az észlelés időpontja UTC-ben kifejezett órák és percek szerint;

- az észlelt személyek száma;

- látható-e vajon, hogy a személyek a veszélyben lévő járművet elhagyják;

- a helyszíni időjárási körülmények;

- a túlélők látható fizikai állapota;

- a baleset helyszínéhez vezető nyilvánvalóan legmegfelelőbb földi útvonal; és

d) cselekedjen a mentés koordináló központ, vagy a légiforgalmi irányító szolgálati egység utasításai szerint.

5.6.2.1 Ha a baleset helyszínére elsőként érkező légijármű nem kutató-mentő légijármű, akkor annak át kell vennie az összes azután érkező légijármű tevékenységének irányítását egészen addig, amíg az első kutató-mentő légijármű megérkezik a baleset helyszínére. Ha ez idő alatt az elsőként érkezett légijármű nem képes összeköttetést teremteni a megfelelő mentés koordináló központtal, vagy légiforgalmi irányító szolgálati egységgel, akkor kölcsönös megegyezés alapján adja át az irányítást az ilyen összeköttetés megteremtésére és fenntartására képes légijármű részére egészen az első kutató-mentő légijármű megérkezéséig.

5.6.3 Ha szükségessé válik, hogy a légijármű a túlélőknek, vagy a felszíni mentő egységeknek tájékoztatást továbbítson és kétoldalú rádióösszeköttetés nem hozható létre, akkor, ha az kivitelezhető, a légijármű dobjon le közvetlen összeköttetés létesítését lehetővé tévő eszközt, vagy üzenet ledobásával továbbítsa a tájékoztatást.

5.6.4 Ha földi jelet helyeztek ki, akkor a légijármű az 5.6.3 pontban leírt eszközök segítségével, vagy ha azok nem használhatók, akkor a megfelelő látjelzést alkalmazva jelezzen az szerint, hogy az üzenetet megértette-e, vagy nem.

5.6.5 Ha arra van szükség, hogy a légijármű egy felszíni járművet irányítson a veszélyben lévő felszíni, vagy légijárműhöz, akkor a légijárműnek ezt bármilyen rendelkezésre álló eszközzel közvetített pontos utasításokkal kell megtennie. Ha nem lehet rádió összeköttetést létesíteni, akkor a légijármű alkalmazza a megfelelő látjelzéseket.

Megjegyzés. – A levegő-föld és a föld-levegő lát jeleket a Doc 9731 III Kötete tartalmazza.

5.7. - Vészadást fogó parancsnok pilóta eljárása

Ha valamely légijármű parancsnok pilótája vészadást vesz, akkor:

a) nyugtázza a vészadás vételét;

b) rögzítse a veszélyben lévő jármű helyzetét, ha azt megadták;

c) mérje be az adás irányát;

d) a vészközleményről az összes rendelkezésre álló adatot megadva tájékoztassa az illetékes mentés koordináló központot, vagy légiforgalmi irányító szolgálati egységet;

e) amíg utasításra vár, a pilóta döntése szerint haladjon a vészadásban megadott hely felé.

5.8 Kutató mentő jelzések

5.8.1 A függelékben szereplő levegő-föld és föld-levegő látjelzéseket alkalmazva azok csakis a függelékben közölt jelentéssel bírnak. Azokat csak a feltüntetett céllal szabad használni, bármiféle egyéb összetéveszthető jelzés alkalmazása nem engedélyezett.

5.8.2 A függelékben megadott bármely látjelet észlelvén, a parancsnok pilóta hajtsa végre azt a műveletet, amelyet a jel függelékben megadott értelme megkíván.

5.9 Nyilvántartások vezetése

5.9.1 **Ajánlás**. - *Minden mentés koordináló központ vezessen nyilvántartást körzete kutató és mentő szervezetének műveleti teljesítőképességéről.*

5.9.2 **Ajánlás**. - *Minden mentés koordináló központ készítsen értékelést a körzetében folyó aktuális kutató és mentő műveletekről. Ezek az értékelések tartalmazzák az alkalmazott eljárásokra, továbbá a túlélési felszerelésekre és mentőeszközökre vonatkozó észrevételeket, valamint ezeknek az eljárásoknak és felszerelések tökéletesítésére vonatkozó indítványokat. Azokat az értékeléseket, amelyek valószínűleg más államokat is érdekelnek, be kell nyújtani az ICAO-hoz tájékoztatás és nyilvánosságra hozatal végett.*

FÜGGELÉK – KUTATÓ MENTŐ LÁTJELEK

(Megjegyzés. - lásd az Annex 5. Fejezetének 5.8 pontját)

1. Felszíni járművekkel váltott lát jelzések

1.1 Ha a légijármű sorrendben hajtja végre az alábbi manővereket, akkor azt jelzi, hogy a légijármű a felszíni járművet veszélyben lévő légijármű, vagy felszíni jármű felé kívánja irányítani:

a) a felszíni jármű fölött legalább egy kört ír le;

b) közvetlenül a felszíni jármű előtt kis magasságban keresztezi annak haladási irányát és
- szárnybillegtetéssel; vagy
- gázadással és levétellel; vagy
- a légcsavar állásszög változtatásával jelez.

Megjegyzés. - a felszíni jármű kabinjában uralkodó nagy zaj következtében a 2) és a 3) pont hangjelzései kevésbé hatékonyak lehetnek, mint az 1) pontban ismertetett lát jelek, ezért ezeket a figyelem felkeltés alternatív eszközeinek tekinthetők.

c) Annak az iránynak a felvétele, amerre a felszíni járművet irányítani akarja.

Ugyanezen manőverek megismétlése azonos jelentéssel bír.

1.2 Ha légijármű a következők szerint manőverezik, akkor az azt jelenti, hogy a továbbiakban nincs szükség annak a felszíni járműnek a segítségére, amelynek a jelzések szóltak:

- közvetlenül a felszíni jármű mögött kis magasságban keresztezi annak nyomvonalát és

1) szárnybillegtetéssel; vagy

2) gázadással és levétellel; vagy

3) a légcsavar állásszög változtatásával jelez.

Megjegyzés. - az 1.1 pontban lévő jelzésekre a felszíni jármű a következők szerint válaszolhat:

- *a jel vételének nyugtázására:*

1) A „Zászlójel Kód" (függőleges vörös és fehér sávok) felvonása, összezárása fent (szándékát értem);
2) jelzőlámpával egymást követően „T" morzejelek adása;
3) az útirány megváltoztatása a légijármű követésére.

- annak jelzésére, hogy a teljesítésre képtelen:

1) A nemzetközi zászlójel kód „N" jelzésének felvonása (kék-fehér kockás négyzet);
2) egymást követően „N" morzejelek felvillantása.

Megjegyzés.- Lásd az 1.1 b), 3) utáni megjegyzést.

2. Föld-levegő látjelek

2.1 A baleset túlélői által alkalmazandó föld-levegő lát jelek

Sorszám	Közlendő	Látjel
1	Segítséget kérünk	V
2	Orvosi segítséget kérünk	X
3	NEM vagy NEMLEGES	N
4	IGEN vagy HELYESLÉS	Y
5	Ebben az irányban haladunk	↑

2.2 Mentőegységek által alkalmazandó föld-levegő lát jelek

Sorszám	Közlendő	Látjel
1	Művelet befejezve	LLL
2	Minden személyt megtaláltunk	LL
3	Csak néhány személyt találtunk meg	++
4	Nem tudjuk folytatni. Visszatérünk a bázisra	XX
5	Két csoportra oszlottunk. Mindegyik a jelzett irányban halad	→ / ←
6	A tájékoztatást vettük, hogy a légijármű ebben az irányban van	→→
7	Semmit sem találtunk. A kutatást folytatjuk	NN

2.3 A jelek legyenek legalább 2,5 méter (8 láb) hosszúak és annyira szembetűnők, amennyire csak lehetséges.

1. Megjegyzés. - a jelek bármilyen eszköz felhasználásával készíthetők, úgy mint: szövet csíkokból, ejtőernyő anyagból, fadarabokból, kövekből, vagy egyéb hasonló anyagokból, továbbá a talaj kitaposásával, vagy olaj kiöntésével stb.

2. Megjegyzés. - a fenti jelekre a figyelem egyéb eszközökkel is felhívható, például rádióval, fáklyával, füsttel, fényvisszaveréssel stb.

3. Levegőből a földre irányuló jelzések

3.1 A légijármű által leadott következő jelzések azt jelentik, hogy a földi jeleket megértették:

a) nappali fénynél:

- a légi-jármű szárnyának billegtetése;

b) sötétben:

- a légijármű leszálló fényének, vagy ha ilyennel nem rendelkezik, akkor a navigációs fényének kétszeri be- és kikapcsolása

3.2 A fenti jelzések hiánya azt jelzi, hogy nem értették meg a földi jelzéseket.

ANNEX 13.
Légijármű balesetek és események kivizsgálása

9. kiadás – 2001. július
11. módosítással

A jelen kiadás magába foglalja a Tanács által 2001. február 27. előtt elfogadott összes módosítást, és 2001. november 1-én hatálytalanítja a 13. Annex összes korábbi kiadását.
A szabványok és ajánlott gyakorlatok alkalmazhatóságára vonatkozó információkat lásd a 2. Fejezetben és az Előszóban.
Kilencedik Kiadás - 2001.Július
Nemzetközi Polgári Repülési Szervezet

MÓDOSÍTÁSOK

A módosítások kiadását az ICAO Bulletin és az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusának havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.

A MÓDOSÍTÁSOK ÉS HELYESBÍTÉSEK NYILVÁNTARTÁSA

Módosítások			
Sor szám	Alkalmazhatóság Dátuma	Bevezetés dátuma	Bevezette
1-10	Belefoglalva a jelen kiadásba		2001. november 1
11. Módosítás (a Tanács által 2006. március 3-án elfogadva)	2006. július 17.	2006. november 23	
-	-	-	-

ELŐSZÓ

Történeti áttekintés

A Nemzetközi Polgári Repülésről szóló Egyezmény (Chicago 1944.) 37. cikkelyének folyományaként a Tanács először 1951. április 11-én fogadott el légijármű balesetek kivizsgálására vonatkozó szabványokat és ajánlott gyakorlatokat. Ezeket az Egyezmény 13. Annex-eként jelölték meg. A szabványok és ajánlott gyakorlatok a baleset kivizsgálási osztály legelső, 1946. Februári ülésszakának ajánlásain alapultak, és ezeket az osztály 2. ülésszakán 1947 februárjában tovább fejlesztették.

A Közgyűlés 14. ülésszaka (Róma, 1962. augusztus - szeptember) a légijármű balesetek kivizsgálásának témájával foglalkozott és elfogadta az A 14-22 és az A 14-27 határozatokat, "P"[i]* függelék. Ezek közül az előző:

1. Utasította a Tanácsot, hogy:

a) Tanulmányozza egy, az államok által annak érdekében alkalmazandó egységes eljárás bevezetésének lehetőségét, hogy haladéktalanul hozzáférhetővé váljanak a légijármű balesetek kivizsgálásáról és vizsgálatáról készült jelentések, különösen akkor, ha azok nagy, modern közforgalmi légijárművekre vonatkoznak, és ily módon javuljon e jelentések többi Szerződő Állam közötti terjesztése;

b) Tanulmányozza olyan eljárások kidolgozásának lehetőségét, melyek alapján a gyártó állama, illetve a légijármű típus alkalmassági bizonyítványát elsőként kiadó állam megfelelő esetekben és felkérésre, képesített szakértőket bocsátana rendelkezésre tanácsadásra és konzultálásra a balesetek kivizsgálásához, majd a tanulmány eredményeinek figyelembe vételével:

i) Határozza meg, miképpen érhető el a legkönnyebben az, hogy az ilyen szakértők speciális tudását a lehető legelőnyösebben tudják felhasználni és erről tájékoztassák az összes Szerződő Államot; továbbá

ii) Az összes Szerződő Államot ösztönözze együttműködésre az ilyen szakértők repülés biztonságot előmozdító igénybevételében;

valamint

2. Szólítsa fel "A Szerződő Államokat arra, hogy a gyártó államát, illetve a légijármű típus alkalmassági bizonyítványát elsőként kiadó államot időben értesítsék légijárművek-különösen a nagy, modern közforgalmi légijárművek-balesetéről minden olyan esetben, amikor úgy ítélik meg, hogy ez az intézkedés helyénvaló".

Továbbá az A 14-27 Határozat "P" függelékében a Közgyűlés úgy határozott, hogy "baleset kivizsgálását illetően, az általános repülés biztonsági szint javítása szempontjából nagy jelentőségű, hogy a Szerződő Állam, amely területén nem saját gyártmányú légijárművet érintő baleset történt, a gyakorlatilag elérhető legnagyobb részletességgel és a lehető leghamarabb közöljön a gyártó államával a vizsgálatból származó minden olyan információt, amely a légijármű típus, illetve berendezésének légi-alkalmassági állapotát tükrözi, vagy amely a biztonság fokozásának kezdeményezésére felhasználható".

Az "A" táblázatban található a soron következő módosítások felsorolása, a módosítások eredete az érintett főbb témakörökkel és azokkal a dátumokkal együtt, amikor az Annex-et és módosításait a Tanács elfogadta, amikor azok hatályba léptek és amikor alkalmazandóvá váltak.

Alkalmazás

Bár az Annex-et az Egyezmény 37. cikkelyének rendelkezései értelmében fogadták el, a légijármű baleset kivizsgálása önmagában véve azonban az Egyezmény 26. cikkelyének témája. Ez a cikkely kötelezi a baleset helyszínének államát, hogy meghatározott körülmények között vizsgálatot indítson és- amennyire ezt a saját jogszabályai engedik- a vizsgálatot az ICAO eljárásának megfelelően végezze. A 26. cikkely azonban nem zárja ki, hogy a balesetkivizsgálás területén további intézkedéseket tegyenek, továbbá a jelen Annex-ben lefektetett eljárások nem csupán a 26. cikkely követelményei szerint indított kivizsgálásra korlátozódnak, de meghatározott körülmények esetén bármely "légijármű baleset" kivizsgálásra az itt szereplő fogalmak szerint alkalmazandók. A 26. cikkely és a jelen Annex rendelkezései közötti megfelelő összefüggés fenntartása érdekében a következő alapelveket vették figyelembe:

a) Légijármű baleset kivizsgálás témájú Annex kidolgozásában az Egyezmény 37. cikkelye az irányadó, de az Annexben szereplők közül semmi sem lehet ellentétes a 26. cikkelyben, vagy az Egyezmény egyéb más cikkelyében kifejezett fogalmakkal, továbbá nem tartalmazhat semmi olyan rendelkezést, amely az Egyezmény szellemével és szándékával ellenkezne.

b) Az a) pontban foglaltak figyelembe vételével az Annex foglalkozhat a tárgyhoz tartozó bármely kérdéssel, függetlenül attól, hogy az Egyezmény 26. cikkelye, vagy bármely más cikkelye foglalkozik-e azzal, vagy sem. Például, az Annex nem sérti az Egyezményt az által, ha foglalkozik más olyan államok jogaival és kötelezettségeivel, amely államok nem azonosak a lajstromozó állammal és azzal az állammal, amelyben a baleset bekövetkezett; Hasonlóképpen foglalkozhat az Annex azoknak a megfigyelőknek adandó jogokkal, akik a 26. cikkely szerint jogosultak arra, hogy "jelen" legyenek a vizsgálatnál. Ezek olyan kérdések, amelyről a 26. cikkely nem szól semmit. Az Annex ezen kívül foglalkozhat a 26. cikkely hatálya alá nem eső jellegzetességgel bíró balesetekkel is.

A 13. Annex és az Egyezmény 26. cikkelye közötti összefüggés

A 26. cikkely és a jelen Annex intézkedései közötti összefüggés tisztázása céljából, 1951. április 13-án a Tanács 12. ülésszakának 20. értekezletén az alábbi kiegészítő határozatot fogadták el:

"Miután az Egyezmény 26. cikkelye úgy intézkedik, hogy az az állam, amelyben a cikkely értelmezése szerinti légijármű baleset bekövetkezik és 'amennyire saját jogszabályai engedik, köteles a baleset körülményeit a Nemzetközi Polgári Repülési Szervezet által erre ajánlott eljárással összhangban kivizsgálni'; és

"Miután a Tanács 12. ülésszakának 18. értekezletén, 1951. április 11-én a légijármű baleset kivizsgálására vonatkozóan a 13. Annexet elfogadta;

"A Tanács javasolja, hogy az Egyezmény 13. Annex-ében a légijármű baleset kivizsgálására vonatkozó szabványok és ajánlott gyakorlatok képezzék a halállal, vagy súlyos sérüléssel járó balesetek 26. cikkely intézkedései értelmében megindított kivizsgálása során a Szerződő Államok részéről követendő eljárást".

"Elfogadva azt:
"1) Hogy az államok az Egyezmény 38. cikkelye alapján eltérhetnek a 13. Annex bármely rendelkezésétől, kivéve azt, hogy olyan balesetek vonatkozásában, amelyekre az Egyezmény 26. cikkelyének intézkedései érvényesek és ezen cikkely szerint 'a baleset helyszínének állama köteles vizsgálatot indítani', továbbá 'a légijárművet lajstromozó államnak lehetővé kell tenni, hogy kijelölt megfigyelői a kivizsgáláson jelen lehessenek' és 'a vizsgálatot végző állam köteles közölni az érdekelt állammal az esetről szóló jelentést és megállapításokat'; továbbá

"2) Hogy az itt ajánlott eljárás nem alkalmazható abban az esetben, amikor halálesettel vagy súlyos sérüléssel nem járó légijármű baleset 'a légijárműben vagy a légi-navigációs berendezésekben keletkezett súlyos műszaki hibára utal', amely esetben és mindaddig amíg az ICAO ilyen értelmű eljárásra nem tesz ajánlást, a vizsgálatot a 26. cikkely intézkedéseiből származó kötelezettség figyelembe vételével az érintett állam nemzeti eljárása szerint kell elvégezni."

Az Annex-ben említett meghatalmazott képviselő és a tanácsadók együttesen alkotják azokat a megfigyelőket, akik a 26. cikkely értelmében a vizsgálatnál jogosultak jelen lenni.

A Szerződő Államok Ténykedése

Az eltérések bejelentése. Felhívjuk a Szerződő Állam figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségére, mely értelmében a Szerződő Állam köteles a szervezet számára bejelenteni minden olyan eltérést, amely nemzeti előírásai és gyakorlatai, valamint a jelen Annex-ben és annak bármely módosításában található nemzetközi szabványok között fennáll. Felkérjük a Szerződő Államot, hogy az ilyen a bejelentést terjessze ki a jelen Annex-ben és annak bármely módosításában található ajánlott gyakorlatoktól történő eltérésekre is, ha az ilyen eltérések bejelentése a repülés biztonságra nézve fontos. Továbbá, felkérjük a Szerződő Államot, hogy a szervezetet folyamatosan tájékoztassa az esetleg később keletkező eltérésekről, illetve a korábban bejelentett eltérés megszűnéséről is. A jelen Annex módosításainak elfogadását követően a Szerződő Államhoz azonnal külön felkérést juttatunk el az eltérés bejelentése céljából.

Felhívjuk az állam figyelmét a 15. Annex rendelkezéseire is, amely az államoknak az Egyezmény 38. cikkelyéből fakadó kötelezettségén kívül előírja, hogy a nemzeti előírások és gyakorlatok, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket a légiforgalmi tájékoztató szolgálat útján közzé kell tenni.

Az Annex szövegének felhasználása a nemzeti szabályozásban A Tanács 1948. április 13-án elfogadott egyik határozatában felhívja a szerződő állam figyelmét annak szükségességére, hogy saját nemzeti szabályzataiban a megoldható legteljesebb mértékben használja a szabályozó jellegű ICAO szabványok szabatos nyelvezetét, továbbá annak szükségességére, hogy jelezze a szabványoktól való eltéréseket, beleértve mindazon kiegészítő nemzeti előírásokat, amelyek a légi-navigáció biztonságára és rendszerességére nézve lényegesek. Bár a 13. Annex szabványai és ajánlott gyakorlatai általánosan alkalmazandók, mégis sok esetben megerősítést igényelnek annak érdekében, hogy a teljes nemzeti jogszabály megszövegezés létre jöjjön.

Az Annex alkotóelemeinek jogállása

Egy Annex az alábbi alkotóelemekből áll, habár nem minden elem található meg szükségképpen minden Annex-ben. Az egyes alkotóelemek az alábbiakban feltüntetett jogállással rendelkeznek:

1. A szoros értelemben vett Annex-et alkotó anyag:

a) *Szabvány és ajánlott gyakorlat*, amelyet a Tanács az Egyezmény rendelkezései értelmében elfogadott. Ezek meghatározása a következő:

Szabvány: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazása a nemzetközi repülés biztonsága és rendszeressége szempontjából elismerten szükséges és amelyet a szerződő állam az Egyezmény értelmében betart; ha nem tartható be, akkor a 38. cikkely értelmében erről a Tanácsot köteles értesíteni.

Ajánlott gyakorlat: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazása a nemzetközi repülés biztonsága, rendszeressége és hatékony lebonyolítása szempontjából kívánatosnak minősül és, amelynek betartására a Szerződő Állam az Egyezmény értelmében törekedni fog.

b) *Függelék*: kényelmi szempontból külön csoportosított anyagot tartalmaz, de a Tanács által elfogadott szabványok és ajánlott gyakorlatok részét képezi.

c) *Rendelkezés*: a szabványok és ajánlott gyakorlatok alkalmazhatóságát szabályozza.

d) *Meghatározás*: A szabványokban és ajánlott gyakorlatokban használt, önmagát elfogadott saját szótári jelentés híján nem magyarázó kifejezés meghatározása. A meghatározás független jogállással nem rendelkezik, de lényeges része minden szabványnak és ajánlott gyakorlatnak, amelyben szerepel, hisz a kifejezés értelmének megváltoztatása hatással lehet az előírásra is.

2.- A Tanács által a szabványokkal és ajánlott gyakorlatokkal együttes közzétételre jóváhagyott anyag:

a) *Előszó*: a Tanács tevékenységén alapuló történeti áttekintő és magyarázó jellegű anyag, illetve az államok részére szolgáltat magyarázatot a szabványok és ajánlott gyakorlatok alkalmazásáról és az Egyezményből és az elfogadási határozatból eredő kötelezettségeikről.

b) *Bevezető rész*: az Annex részeinek, fejezeteinek, vagy szakaszainak elején szereplő, a szöveg alkalmazásának megértését segítő magyarázó anyag.

c) *Megjegyzés*: az érintett szabvánnyal és ajánlott gyakorlattal kapcsolatban tárgyi felvilágosítással, vagy hivatkozással szolgáló, de a szabvány és az ajánlott gyakorlat részét nem képező, a szükséges helyeken a szövegbe beépített anyag.

d) *Melléklet*: a szabványokat és az ajánlott gyakorlatokat kiegészítő anyag, vagy ezek alkalmazásához útmutatóul szolgáló anyag.

A nyelv kiválasztása

Ezt az Annex-et hat nyelven, angolul, arabul, kínaiul, franciául, spanyolul és oroszul fogadták el. Felkérjük a szerződő államot, hogy a hazai bevezetés céljára, illetve az Egyezményben meghatározott egyéb célokra az említett hat szöveg közül egyet válasszon ki és közvetlenül, vagy saját nyelvre lefordítva használja azt és az ICAO-t erről tájékoztassa.

Szerkesztési gyakorlat

Annak érdekében, hogy minden alkotórész jogállása első pillantásra szembetűnjön, az alábbi gyakorlatot alkalmaztuk: a *szabványokat* vékony álló betűkkel, az *ajánlott gyakorlatokat* vékony dőlt betűkkel nyomtattuk, a jogállásukat vastag álló betűvel szedett **Ajánlás** szó jelzi. A megjegyzéseket vékony dőlt betűvel szedtük, jogállásukat a dőlt betűs "*Megjegyzés*" jelzi.

Megjegyzendő, hogy az angol szövegben a követelmények leírásánál az alábbi szerkesztői gyakorlatot követtük: a szabványok esetében a kell (shall), és az ajánlott eljárásokban pedig a szükséges (should) szavakat alkalmaztuk.

A jelen dokumentum bármely számmal azonosított részére történő utalás magában foglalja az adott rész alpontjait is.

Jelen Annex teljes egészében alkalmazott hímnemű személyes névmást úgy kell tekinteni, mint amely egyaránt vonatkozik a nőnemű és a hímnemű személyekre is.

Módosítás	Forrása(i)	Tárgya(i)	Jóváhagyva Hatályba lépés Alkalmazandó
1. Kiadás	A baleset kivizsgálási osztály 1. és 2. ülésszaka	-	1951.ápr.11. 1951.szept. 1. 1951.dec. 1.
1 (2. kiadás)	Az A14-22 és az A14-27 Közgyűlési határozat P Függeléke A baleset kivizsgálási osztály 3. ülésszaka	Új meghatározások. A gyártó állam jogai és kötelezettségei. Balesetről szóló első és későbbi tájékoztatás. Az üzemeltető képviselőinek jelenléte. Jelentés a vizsgálatról. A jelentés összefoglalása és formája.	1965.nov. 4. 1966.már. 24. 1966.aug. 25.
2	A baleset kivizsgálási osztály 3. ülésszaka	Légijármű balesetről szóló értesítés küldési távközlési eljárások.	1966.dec. 5. 1967.ápr. 5. 1967.aug.24.
3	Személyi jogosítás/kiképzési gyakorlati/orvosi osztályértekezlet(1970)	A légijármű balesetek áldozatainak boncolása és az eredmények jelentése.	1972.már.27. 1972.júl.27. 1972.dec. 7.
4 (3. kiadás)	A Léginavigációs Bizottság tanulmánya.	A 2250 kg (5000 font) feletti több hajtóműves légijárművet ért minden baleset jelentése; értesítés és az eseményekkel kapcsolatos értesülések cseréje.	1972.dec.12. 1973.ápr.12. 1973.aug.16.
5 (4. kiadás)	Baleset kivizsgálási és megelőzési osztály értekezlet (AIG/1974), a jogellenes cselekmények bizottsága.	Cím változás; egyes meghatározások törlése és újak beiktatása; a kivizsgálás célja; repülési adatrögzítők használata és privilegizált státusz biztosítása bizonyos vizsgálási jegyzökönyvek részére; repülésbiztonsági ajánlásokat fogadó állam által teendő intézkedések; a lajstromozó állam felelőssége, hogy bizonyos balesetek kivizsgálásában részt vegyen, hogy meghatározott feltételek mellett biztosítsa a repülési adatrögzítőket amikor arra felkérik, továbbá, hogy kérje a gyártó államának részvételét, amikor az előbbi állam végzi el a kivizsgálást és légi alkalmassági kérdésekről van szó; a gyártó államának joga és kötelezettsége, hogy bizonyos kivizsgálásokban részt vegyen. Valamely balesetben állampolgárainak haláleseténél fogva különösen érdekelt állam jogai és előjogai; a baleset-, rendkívüli esemény adatjelentő (ADREP) rendszer; a vizsgálat felelős vezetője részéről a repülés védelmi hatóságok részére indokolt esetben adandó tájékoztatás.	1975.dec.18. 1976.ápr.18. 1976.aug.12.

6 (5. kiadás)	Baleset Kivizsgálási és Megelőzési osztályértekezlet (AIG/1974)	A meghatalmazott képviselő, a tanácsadó és a vizsgálat felelős vezetője meghatározások kiegészítése "képesítései alapján" kifejezéssel; az üzemeltető államára vonatkozó új meghatározás és rendelkezések a kölcsönben, bérben, vagy cserében üzemeltetett légijárművek esetében; a lajstromozó állam felelőssége baleseti értesítést küldeni minden esetben, amikor baleseti kivizsgálást indít; koordináció a vizsgálat felelős vezetője és a jogi hatóságok között; a hajtóművek darabszámára vonatkozó utalás törlése; a zárójelentés közzétételére vonatkozó új rendelkezések.	1978.nov.24. 1979.már.24. 1979.nov.29.
7 (6. kiadás)	Baleset kivizsgálási és megelőzési osztály értekezlet (AIG/1979)	A baleset meghatározás kiegészítése a légijármű részeivel, vagy levegősugárral okozott sérülésekkel; a vizsgálat lefolyásával kapcsolatos általános rendelkezés megerősítése; a jegyzőkönyvek hozzáférhetővé tételével kapcsolatos rendelkezések megerősítése; a zárójelentéssel kapcsolatos konzultációra vonatkozó rendelkezés megerősítése; a zárójelentés kivonatára vonatkozó előírások és az erre vonatkozó utalások törlése; a záró jelentés ICAO-hoz megküldését előíró rendelkezés módosítása; a zárójelentés és az ezzel kapcsolatos dokumentációk közzétételével kapcsolatos rendelkezés kiterjesztése; új fejezet a baleset megelőző intézkedésekről; új melléklet a zárójelentések államok közötti cseréjéről és az államok birtokában lévő zárójelentések jegyzékéről.	1980.nov.24. 1981.már.24. 1981.nov.26.
8 (7. kiadás)	Léginavigációs Bizottság	A súlyos sérülés meghatározás kibővítése a fertőző anyagnak, illetve roncsoló radioaktív sugárzásnak való kitettségre vonatkozóan; új melléklet a jelentések hozzáférhetőségére vonatkozóan; és szerkesztői módosítások.	1988.jan.22. 1988.máj.22. 1988.nov.17.

9 (8. kiadás)	Baleset kivizsgálási osztály értekezlet (AIG/1992)	Cím változás; az okok, a kivizsgálás, a rendkívüli esemény, a tervező állam, a gyártó állam és az üzemeltető állama módosított, vagy új meghatározása; a kivizsgálás alkalmazandóságával és céljával kapcsolatos rendelkezések megerősítése; a gyártó állam és a tervező állam felelősségével, jogával és felhatalmazásával kapcsolatos rendelkezések megerősítése; új rendelkezések a rendkívüli események kivizsgálásával és a tájékoztatás adással kapcsolatban; a balesetekről és a rendkívüli eseményekről adandó tájékoztatásokra vonatkozó rendelkezések megerősítése; új rendelkezés a nemzetközi vizeken történt balesethez legközelebbi államok által nyújtandó segítségről; a vád vagy a felelősség kiosztására irányuló jogi, vagy adminiszratív eljárások és a baleset kivizsgálási eljárások szétválasztására vonatkozó új rendelkezés; a repülési adatrögzítők használatára és a belőlük származó kiértékelésekre vonatkozó rendelkezések megerősítése; a boncolási vizsgálatokra és a jogi hatóságokkal való koordinációra vonatkozó rendelkezések megerősítése; a feljegyzések nyilvánosságra hozatalával kapcsolatos rendelkezések megerősítése és a kapcsolatos melléklet törlése; a többi állam információ adásra vonatkozó felelősségével és részvételi jogukkal kapcsolatos rendelkezések megerősítése; új rendelkezés a szervezési információkkal kapcsolatban és az üzemeltető részvételére vonatkozó rendelkezések megerősítése; a delegált képviselő kinevezésére vonatkozó rendelkezések megerősítése és új rendelkezés a kötelezettségeikre vonatkozóan; azon állam részvételi jogára vonatkozó rendelkezések megerősítése, amely állam polgárai a balesetben életüket vesztették vagy súlyos sérülést szenvedtek; az ADREP előzetes jelentésre és a baleset/esemény adatjelentésre vonatkozó előírásainak megerősítése; a zárójelentéssel kapcsolatos konzultáció, a zárójelentés szétosztása és kiadása tekintetében meglévő előírások szigorítása; a balesetmegelőzési intézkedésekkel kapcsolatban új és megerősített előírások; új alpont és a függelékben szereplő zárójelentés formájának módosítása; naprakésszé tett értesítési és jelentési ellenőrző jegyzék a B Mellékletben; új, D Melléklet a rendkívüli események példáinak felsorolása.	1994.már.23. 1994.júl.25. 1994.nov.10.

10 (9.Kiadás)	Baleset kivizsgálási és megelőzési osztály (AIG) értekezlet (1999)	A balesetről, rendkívüli eseményről szóló értesítés módosítása és új rendelkezés az értesítés kézhezvételéről való visszaigazolásról; új rendelkezés a veszélyes anyagok részletadatainak biztosításáról; a kivizsgálás elindítási-, végrehajtási- és a kivizsgálás átruházási felelősséggel foglalkozó előírások szélesítése; új rendelkezés az orvosi vizsgálatra vonatkozóan; a lajstromozó állam és az üzemeltető állam jogainak és kötelmeinek összehangolása a gyártó állam és a tervező állam jogaival és kötelmeivel; azon állam részvételi jogára vonatkozó rendelkezések megerősítése, amely állam polgárai életüket vesztették; a zárójelentés biztosítására vonatkozó rendelkezéseket tartalmazó 6. Fejezet új címet kapott; a konzultációs eljárás megerősítése és az üzemeltető, illetve a gyártó állam bevonása; új rendelkezések az időközi jelentésekre; az ADREP jelentő rendszerre vonatkozó rendelkezéseket tartalmazó 7. Fejezet új címet kapott; a kötelező esemény jelentő rendszerre vonatkozó rendelkezések megerősítése; új rendelkezés az önkéntes esemény jelentő rendszerről és a büntetés mentes környezetről; az adatbázis rendszerekről, az adatok elemzéséről és megelőző ténykedésekről szóló rendelkezések megerősítése; új rendelkezés a biztonsági információk cseréjéről; a B Melléklet naprakéssé tétele; a C Melléklet törlése; új Melléklet amely a repülési adatrögzítő kiolvasásra és elemzésre vonatkozó útmutatót tartalmazza.	2001.feb.26. 2001.júl.16. 2001.nov.1.
11	Baleset kivizsgálási és megelőzési osztály (AIG) értekezlet (1999); Léginavigációs Bizottság; A35-17 Közgyűlési Határozat	a) Más államok részvétele a kivizsgálásban; b) A légiforgalmi irányító egységeknél rögzített adatok és azok átiratainak bizalmas kezelése c) Jogi útmutató a biztonsági adat gyűjtő és feldolgozó rendszerekből származó információ védelméhez	2006.márc.3 2006.júl.17 2006.nov.23

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

1. FEJEZET - MEGHATÁROZÁSOK

Ha a légijármű baleset és esemény kivizsgálással kapcsolatos szabványokban és ajánlott gyakorlatokban az alább következő kifejezéseket használják, akkor azok értelme a következő:

Baleset (accident) - A légijármű üzemeléséhez kapcsolódó azon időpont alatt lejátszódó esemény, ami bárkinek repülési szándékkal történő fedélzetre lépésétől kezdve eltelik addig, amíg minden ilyen személy a repülőgépet elhagyja és amely során:

a) Valamely személy halálos, vagy súlyos sérülést szenved el annak következtében, hogy:

- A légijárművön tartózkodott, vagy
- A légijármű bármely részével közvetlenül érintkezésbe került - beleértve azokat a részeket is, amelyek a légijárműről leváltak, vagy
- A kiáramló gázsugárral közvetlen érintkezésbe került, kivéve, ha a sérülés természetes okból következett be vagy, ha azokat az illető saját maga, vagy egy másik személy idézte elő továbbá, ha a sérülés az utasok és a személyzet által szabályosan elérhető területen kívül elrejtőzött potyautas szenvedi el; vagy

b) A légijármű olyan rongálódást és szerkezeti meghibásodást szenved el, amely:
- Kedvezőtlenül befolyásolja a szerkezet szilárdságát, a teljesítményjellemzőket, vagy a légijármű repülési tulajdonságait és
- Általában az érintett alkotórész nagyobb javítását, vagy cseréjét teszi szükségessé, kivéve, a hajtómű meghibásodását, vagy rongálódását, amikor a rongálódás a hajtóműre, gondolájára vagy szerelvényeire korlátozódik; vagy a rongálódás a légcsavarokra, a szárnyvégekre, antennákra, a kerékköpenyekre, a fékekre, áramvonalazó idomokra, kisebb horpadásokra, a légijármű borítólemezeinek apró átlyukadásaira korlátozódik; vagy

c) A légijármű eltűnt, vagy teljesen hozzáférhetetlen.

1. Megjegyzés.- Csak a statisztikai egyöntetűség kedvéért az ICAO azt a sérülést tekinti halálosnak, amely a baleset bekövetkezésétől számított 30 napon belüli halált eredményez.

2. Megjegyzés.- A légijárművet akkor nyilvánítják eltűntnek, ha a hivatalos kutatás véget ért és a roncsot nem lelték meg.

Meghatalmazott képviselő (accredited representative) - Valamely állam által arra a feladatra képzettsége alapján kijelölt személy, hogy egy másik állam által folytatott kivizsgálásban részt vegyen.

Tanácsadó (adviser) - Valamely állam által meghatalmazott képviselőjének valamely kivizsgálásban történő segítésére a képzettsége alapján kinevezett személy.

Légijármű (aircraft) - Minden olyan szerkezet, amelynek levegőben maradását a földfelszínre ható aerodinamikai reakciótól eltérő aerodinamikai reakciók biztosítják.

Ok (cause) - Baleset, vagy rendkívüli esemény bekövetkezéséhez vezető tevékenység(ek), mulasztás(ok), esemémy(ek), körülmény(ek), vagy ezek kombinációja.

Repülési adatrögzítő (flight recorder) - A légijármű fedélzetére baleset/esemény kivizsgálás megkönnyítése érdekében felépített bármely adatrögzítő berendezés fajta.

Megjegyzés.- Lásd a 6. Annex I. II. és III. részét, a repülési adatrögzítőkre vonatkozó előírások tekintetében.

Esemény (incident) - A légijármű üzemelésével kapcsolatos nem balesetnek minősülő eset, amely a biztonságos üzemelést hátrányosan befolyásolja, vagy befolyásolhatja.

Megjegyzés.- A Nemzetközi Polgári Repülési Szervezet számára baleset megelőzési tanulmány készítés szempontjából az érdeklődés középpontjában álló esemény típusokat az ICAO Baleset/Esemény Jelentési Kézikönyv (Doc 9156) sorolja fel.

Kivizsgálás (investigation) - Baleset megelőzése céljából végrehajtott eljárás, amelyhez hozzátartozik információk gyűjtése és elemzése, következtetések levonása, ideértve az ok(ok) meghatározását és, ha szükséges, biztonsági ajánlások megtételét is.

A vizsgálat felelős vezetője (investigator-in-charge) - A kivizsgálás megszervezésének, lefolytatásának és irányításának felelősségével képzettsége alapján megbízott személy.

Megjegyzés.- A fenti meghatározásban semmi sem célozza annak kizárását, hogy a vizsgálat felelős vezetőjének feladataival egy bizottságot, vagy más testületet ruházzanak fel.

Maximum tömeg (maximum Mass) - Hitelesített legnagyobb felszálló tömeg.

Üzemeltető (operator) - Légijármű üzemeltetésében résztvevő, vagy arra vállalkozó személy, szervezet, vagy vállalat.

Előzetes jelentés (preliminary report) - A kivizsgálás korai szakaszából származó adatok gyors közzétételére használt kiadvány.

Biztonsági ajánlás (safety recommendation) - A kivizsgálást végző állam kivizsgáló bizottságának a kivizsgálásból nyert információkon alapuló és balesetek, vagy események megelőzése céljából készített javaslata.

Rendkívüli esemény (Serious Incident) - Olyan körülményeket magába foglaló esemény, melyek jelzik, hogy majdnem baleset történt.

1. Megjegyzés.- A baleset és a rendkívüli repülőesemény közötti különbség csak az eredményben van.

2. Megjegyzés.- A rendkívüli esemnyekre példák a 13. Annex C Mellékletében és az ICAO Baleset/Esemény Jelentési Kézikönyvében (Doc (9156) találhatók.

Súlyos sérülés (serious injury) - Valamely személy által balesetben elszenvedett sérülés, amely:

a) Több, mint 48 órás kórházi ápolást igényel a sérülés napjától számított hetedik napon belül kezdődően; vagy

b) Bármiféle csonttörést okoz, (kivéve az ujjak, a fogak, vagy az orr egyszerű törését); vagy

c) Olyan zúzott sebet okoz, melynek hatására erős vérzés, ideg-, izom-, vagy ínsérülés keletkezik; vagy

d) Bármely belső szerv sérülését okozza; vagy

e) Másod-, vagy harmadfokú égési sérülést okoz, illetve a test felületének több mint 5 százalékát érintő bármiféle égési sérülést okoz; vagy

f) Bizonyítottan fertőző anyagok, vagy roncsoló sugárzás közrehatásával keletkeznek.

Tervező állam (state of design) - A típus tervéért felelős szervezet felett rendelkezési joggal bíró állam.

Gyártó állam (state of manufacture) - A légijármű végső összeszereléséért felelős szervezet felett rendelkezési joggal bíró állam.

Az esemény helyszín állama (state of occurence) - Az az állam, amelynek felségterületén a baleset, vagy az esemény bekövetkezett.

Üzemeltető állama (state of the operator) - Az az állam, amelyben az üzemeltető elsődleges üzleti tevékenységét kifejti vagy, ha ilyen üzleti területtel nem rendelkezik, akkor állandó székhelyének állama.
Lajstromozó állam (state of registery) - Az az állam, amelynek lajstromába a légijárművet bevezették.

Megjegyzés: Nemzetközi üzemeltető szervezet légijárműveinek nem nemzeti alapon való lajstromozása esetén a szervezetet alkotó államok együttesen és egyetemlegesen kötelesek vállalni azokat a kötelezettségeket, amelyek a Chicagoi Egyezmény szerint a lajstromozó államra hárulnak. Ezzel kapcsolatban lásd a Tanácsnak a "Nemzetközi üzemeltető szervezetek által üzemeltetett légijárművek nemzetisége és lajstromozása" vonatkozásában 1967. december 14-én hozott határozatát, amely az Irányelvek és Útmutatás a Nemzetközi Légiszállítás Gazdasági Szabályozásáról (Doc 9578) –ben található.

2. FEJEZET - ALKALMAZHATÓSÁG

2.1. Kivéve, ha ezt külön jelzik, a jelen Annexben szereplő rendelkezések a baleseteket és eseményeket követő tevékenységekre alkalmazandók - bárhol is következtek be azok.

Megjegyzés.- Az 5.2 és 5.3 pontok foglalkoznak ezen rendelkezések alkalmazandóságával olyan balesetek és események ügyében, amelyek nem-szerződő álam területén, nem meghatározott felségjogú területen, vagy a nemzetközi vizek felett következnek be.

2.2. A jelen Annex-ben az üzemeltető államára vonatkozó rendelkezések csak akkor alkalmazandók, ha a légijárművet kölcsönben, bérletben vagy cserében üzemeltetik és, ha ez az állam nem a lajstromozó állam, valamint a jelen Annex tekintetében részben, vagy teljes egészében teljesíti a lajstromozó állam funkcióit és kötelezettségeit.

3. FEJEZET - ÁLTALÁNOS RÉSZ

Megjegyzés.- Az üzemeltető államának a kölcsönben, bérben, vagy egymás közötti cserében üzemeltetett légijárműveket ért balesetek, vagy események esetén fennálló jogaira és kötelezettségeire vonatkozó útmutató anyagot az "A" melléklet tartalmazza.

A KIVIZSGÁLÁS CÉLJA

3.1. Baleset, vagy esemény kivizsgálásának alapvető célja a balesetek és események megelőzése. E tevékenységnek a felelősség, vagy vétkesség megjelölése nem célja.

A BIZONYÍTÉKOK MEGÓVÁSA, A LÉGIJÁRMŰ ŐRZÉSE ÉS ELTÁVOLÍTÁSA

AZ ESEMÉNY HELYSZÍN ÁLLAMÁNAK FELELŐSSÉGE

Általános rész

3.2. Az esemény helyszínének állama minden ésszerű intézkedést köteles megtenni, hogy a bizonyítékokat megóvja és a légijárművet, valamint tartalmát azon időszakon át biztonságos őrizet alatt tartsa, amely idő a kivizsgálás céljai érdekében szükséges lehet. A bizonyítékok megóvásának magában kell foglalnia minden olyan bizonyíték fényképészeti, vagy más módszerrel történő megőrzését, amelyek eltávolíthatók, letörölhetők, elveszhetnek vagy megsemmisülhetnek. A biztonságos őrizet akadályozza meg a további rongálódást, az illetéktelen személyek általi hozzáférést, a fosztogatást és az állagromlást.

1. Megjegyzés: A roncs felügyeletével az 5.6 pont foglalkozik.

2. Megjegyzés: A repülési adatrögzítő bizonyítékainak védelme megköveteli, hogy a rögzítő berendezést és ennek regisztrátumainak kiemelését és kezelését, csak szakképzett személyzetre bízzák.

Kérelem a lajstromozó állam, az üzemeltető állam, a gyártó állam, vagy a tervező állam részéről

3.3. Ha a lajstromozó állam, az üzemeltető állam, a gyártó állam, vagy a tervező állam kéri, hogy a légijármű, annak tartalma és minden más bizonyíték ezen igényt bejelentő állam meghatalmazott képviselője által végzett ellenőrzésig maradjon érintetlenül, akkor az esemény helyszín állama az ésszerűség keretei között és a kivizsgálással való összeegyeztethetőségnek megfelelően köteles az ilyen kérés teljesítése érdekében minden szükséges intézkedést megtenni annak feltételével, hogy a légijármű ahhoz elegendő mértékben legyen mozdítható, ami a személyek, állatok, posta és értéktárgyak kiszabadításához, tűz megakadályozásához, vagy egyéb okokból bekövetkező pusztítás, illetve annak megszüntetése érdekében szükséges, ha a légi-közlekedésre, más közlekedési módra, illetve a nagyközönségre nézve veszélyes lehet, vagy akadályt jelent, továbbá feltéve, hogy ez a légijármű újbóli szolgálatba állításában - amennyiben ez gyakorlatilag megvalósítható - indokolatlan késedelmet nem okoz.

Az őrizet feloldása

3.4. A 3.2 és a 3.3 pontok rendelkezéseitől függően az esemény helyszínének állama a légijárművet, annak tartalmát, vagy annak bármely olyan részét, amelyre a kivizsgálásban már nincs szükség, köteles kiszolgáltatni a lajstromozó állam, vagy az üzemeltető állam által - ahogy ez alkalmazható - megfelelő módon kijelölt személy, vagy személyek számára. Ebből a célból az esemény helyszínének állama köteles megkönnyíteni a légijárműhöz való hozzáférést, azzal a feltétellel, hogy ha a légijármű, annak tartalma vagy annak bármely része olyan területen fekszik amelyen belül az állam úgy tekinti, hogy a hozzáférési jog megadása nem praktikus, akkor magának az államnak kell a szállítást egy olyan pontig elvégezni, ahol a hozzáférhetőség már biztosítható.

4. FEJEZET - ÉRTESÍTÉS

1. Megjegyzés: a B Melléklet értesítési és jelentési ellenőrző jegyzékkel szolgál.

2. Megjegyzés: a légijármű baleset és esemény kivizsgáló hatóságok cím jegyzéke a Légijármű baleset és esemény kivizsgálási Kézikönyv, I. Rész – Szervezet és tervezés (Doc 9756)-ban, illetve az ICAO/AIG web oldalán (amint igénybe vehetővé válik, lesz) található.

A SZERZŐDŐ ÁLLAM TERÜLETÉN EGY MÁSIK SZERZŐDŐ ÁLLAM LÉGIJÁRMŰVÉVEL BEKÖVETKEZETT BALESET, VAGY RENDKÍVÜLI ESEMÉNY

A HELYSZÍN ÁLLAMÁNAK FELELŐSSÉGE

Értesítés küldése

4.1. Az esemény helyszínének állama balesetről, vagy rendkívüli eseményről a lehető legkisebb késedelemmel és a rendelkezésre álló legalkalmasabb és leggyorsabb módon köteles értesítést küldeni:

a) A lajstromozó államnak,

b) Az üzemeltető államának,

c) A tervező államnak

d) A gyártó államnak és

e) A Nemzetközi Polgári Repülési Szervezetnek, ha az érintett légijármű maximum tömege 2250 kg felett van.

Ha azonban az esemény helyszín állam nincs tudatában, hogy rendkívüli esemény történt, akkor a lajstromozó állam, vagy az üzemeltető állama - amelyik vonatkozik- az ilyen eseményekről köteles jelentést küldeni a tervező állam, a gyártó állam és az esemény helyszín állama részére.
1. Megjegyzés: az esetek többségében "a rendelkezésre álló legalkalmasabb és leggyorsabb mód"-ot a telefon, a fax, az e-mail, vagy az állandó helyű távközlési hálózat (AFTN) biztosítja. Legalább két féle kommunikációs eszköz megléte kívánatos.

2. Megjegyzés: a veszélyállapotról a mentést koordináló központ által a lajstromozó állam részére küldendő értesítéssel kapcsolatos rendelkezéseket a 12. Annex tartalmazza.

A forma és a tartalom

4.2. Az értesítésnek nyílt nyelven kell készülnie és az adott pillanatban rendelkezésre állásuk szerint az alábbi információk közül az a lehető legtöbbet tartalmazza, az értesítés elküldése azonban egyes információk hiánya miatt késedelmet nem szenvedhet:

a) balesetekhez az ACCID és rendkívüli eseményekhez az INCID azonosító rövidítés;

b) a légijármű gyártója, típusa, felség- és lajstrom jele és széria száma;

c) a légijármű tulajdonosának, üzemeltetőjének és bérlőjének - ha ilyen van - neve;

d) a parancsnok pilóta neve és a személyzet és utasok nemzeti hovatartozása;

e) a baleset, vagy rendkívüli esemény dátuma és időpontja (helyi idő, vagy UTC idő);

f) a légijármű utolsó elindulásának helye és tervezett leszállási helye;

g) a légijárműnek valamilyen könnyen meghatározható földrajzi ponthoz viszonyított helyzete és földrajzi szélesség és hosszúság;

h) a személyzet és az utasok száma; a fedélzeten tartózkodók közül elhunytak és súlyosan sérültek száma, egyéb halottak és súlyosan sérültek száma;

i) a baleset, vagy a rendkívüli esemény természete és a légijármű rongálódásának mértéke, amilyen mértékű ismeret rendelkezésre áll;

j) Annak jelzése, hogy az esemény helyszín állama milyen mértékig folytatja a kivizsgálást, vagy javasolja annak átruházását;

k) A baleset, vagy rendkívüli esemény területének fizikai jellemzői, valamint az elérési nehézségek jelzése, vagy a helyszín elérés különleges igényei;

l) A közleményt kiadó hatóság azonosítója, valamint a kivizsgálást vezető, illetve a baleset helyszíni állam baleset kivizsgáló hatóságának állandó, folyamatos elérését biztosító eszköz; és

m) a légijármű fedélzetén van-e veszélyes anyag, és ha van, akkor annak ismertetése is.

1. Megjegyzés: a légijármű baleset, vagy rendkívüli esemény kivizsgálásáért felelős hatóságoknak AFTN-en keresztül küldött közlemények esetén a (8 betűs) címzést, az ICAO 4 betűs kóddal együtt használt 4 betűs "YLYX" jelzés adja. A nyilvános távközlési szolgálaton keresztül küldött közlemények esetén ilyen cím jelölés nem alkalmazható, ezért azokat postai, vagy távirati címmel kell helyettesíteni.
A 8 - betűs kódolt címeket, valamint a megfelelő postai és távirat címeket - amennyiben ezeket az ICAO-nak bejelentették - az ICAO "Légijármű Üzemeltető Szervezetek, Légügyi Hatóságok és Szolgálatok azonosítói" (Doc 8585) címü kiadványában teszik közzé.
2. Megjegyzés: Az ICAO Légijármű Baleset Kivizsgálási Kézikönyv I. Rész – Szervezet és tervezés (Doc 9756) tartalmaz útmutatást az értesítő közlemények elkészítésére, valamint a közleményeknek a címzett részére történő azonnali megküldése érdekében teendő intézkedésekre.

Az értesítés nyelve

4.3. Az értesítést az ICAO egyik munkanyelvén készítsék el, figyelembe véve az értesítést kézhez vevők anyanyelvét minden olyan alkalommal, amikor ez indokolatlan késedelem okozása nélkül lehetséges.

Kiegészítő tájékoztatás

4.4. Az esemény helyszín állama - amint lehetőség nyílik arra - köteles az értesítésből kimaradt részleteket, valamint az ismertté vált egyéb kapcsolódó információkat is megküldeni.

A LAJSTROMOZÓ ÁLLAM, AZ ÜZEMELTETŐ ÁLLAM, A GYÁRTÓ ÁLLAM ÉS A TERVEZŐ ÁLLAM FELELŐSSÉGE

Tájékoztatás - részvétel

4.5. **Ajánlás.**- *balesetről, vagy rendkívüli eseményről vett értesítésről a lajstromozó állam, az üzemeltető állam, a gyártó állam és a tervező állam adjon visszaigazolást (vonatkozó pont a 4.1).*

4.6 Az értesítés vételekor a lajstromozó állam és az üzemeltető állama, a gyártó állama és a tervező állama az esemény helyszín állama számára, amilyen hamar csak lehetséges, köteles a balesetben, vagy rendkívüli eseményben érintett légijárművel és hajózó személyzetével kapcsolatos minden rendelkezésére álló információt továbbítani. Ezek az államok arról is kötelesek tájékoztatni az esemény helyszín államát, hogy szándékoznak- e meghatalmazott képviselőt kinevezni, és ha ilyen meghatalmazott képviselőt kineveznek, akkor jelezniük kell a képviselő nevét, kapcsolati címét; továbbá várható érkezési idejét, ha a meghatalmazott képviselő az esemény helyszín állam területére utazik.

1. Megjegyzés: az 5.18-al összhangban, a lajstromozó állam, az üzemeltető állam, a gyártó állam és a tervező állam jogában áll, hogy kivizsgálásban való részvételhez meghatalmazott képviselőt nevezzen ki.

2. Megjegyzés: az 5.22-vel összhangban, felhívjuk a lajstromozó állam, az üzemeltető állam, a gyártó állam és a tervező állam figyelmét azon kötelezettségükre, hogy kivizsgálásban való részvételhez meghatalmazott képviselőt nevezzen ki, ha azt valamely 2250 kg feletti légijármű balesetét kivizsgáló állam kifejezetten kéri. Figyelmüket felhívjuk arra is, hogy jelenlétük és részvételük a kivizsgálásban hasznos.

4.7 Az értesítés vételét követően az üzemeltető állama késedelem nélkül és a rendelkezésre álló legalkalmasabb, illetve leggyorsabb módszerrel továbbítsa az esemény helyszín állama részére a légijármű fedélzetén található veszélyes anyagok részleteit.

A LAJSTROMOZO ÁLLAM TERÜLETÉN, NEM-SZERZŐDŐTT ÁLLAMBAN, VAGY BÁRMELY ÁLLAM TERÜLETÉN KIVÜL BEKÖVETKEZETT BALESETEK, VAGY RENDKÍVÜLI REPÜLŐ ESEMÉNYEK

A LAJSTROMOZÓ ÁLLAM FELELŐSSÉGE

Értesítés küldése

4.8 Ha a lajstromozó állam légijármű balesetének, vagy rendkívüli eseményének kivizsgálását indítja meg, akkor ez az állam a lehető legkisebb késedelemmel és a rendelkezésre álló legalkalmasabb és leggyorsabb módon küldjön értesítést a 4.2 és a 4.3 pontokban foglaltak szerint:

a) Az üzemeltető államának,

b) A tervező államnak,

c) A gyártó államnak és

d) A Nemzetközi Polgári Repülési Szervezetnek, ha az érintett légijármű maximum tömege 2250 kg feletti.

1. Megjegyzés: az esetek többségében "a rendelkezésre álló legalkalmasabb és leggyorsabb mód"-ot a telefon, a fax, az e-mail, vagy az állandó helyű távközlési hálózat (AFTN) biztosítja. Legalább két féle kommunikációs eszköz megléte kívánatos.

2. Megjegyzés: a veszélyállapotról a mentést koordináló központ által a lajstromozó állam részére küldendő értesítéssel kapcsolatos rendelkezéseket a 12. Annex tartalmazza.

AZ ÜZEMELTETŐ ÁLLAM, A TERVEZŐ ÁLLAM ÉS A GYÁRTO ÁLLAM FELELŐSSÉGE

Tájékoztatás - részvétel

4.9. **Ajánlás**.- *balesetről, vagy rendkívüli eseményről vett értesítésről az üzemeltető állam, a gyártó állam és a tervező állam adjon visszaigazolást (vonatkozó pont a 4.1).*

4.10 Az értesítés vételekor az üzemeltető államа, a gyártó állama és a tervező állama a lajstromozó állam számára, amilyen hamar csak lehetséges, köteles a balesetben, vagy rendkívüli eseményben érintett légijárművel és hajózó személyzetével kapcsolatos minden rendelkezésére álló információt továbbítani. Ezek az államok arról is kötelesek tájékoztatni az esemény helyszín államát, hogy szándékoznak-e meghatalmazott képviselőt kinevezni, és ha ilyen meghatalmazott képviselőt kineveznek, akkor jelezniük kell a képviselő nevét, kapcsolati címét; továbbá várható érkezési idejét, ha a meghatalmazott képviselő a kivizsgálásnál jelen lesz.

1. Megjegyzés: az 5.18-al összhangban, az üzemeltető állam, a gyártó állam és a tervező állam jogában áll, hogy kivizsgálásban való részvételhez meghatalmazott képviselőt nevezzen ki.

2. Megjegyzés: az 5.22-vel összhangban, felhívjuk az üzemeltető állam, a gyártó állam és a tervező állam figyelmét azon kötelezettségükre, hogy kivizsgálásban való részvételhez meghatalmazott képviselőt nevezzenek ki, amikor azt valamely 2250 kg feletti légijármű balesetét kivizsgáló állam kifejezetten kéri. Figyelmüket felhívjuk arra is, hogy jelenlétük és részvételük a kivizsgálásban hasznos.

4.11 Az értesítés vételét követően az üzemeltető állama késedelem nélkül és a rendelkezésre álló legalkalmasabb, illetve leggyorsabb módszerrel továbbítsa a lajstromozó állam részére a légijármű fedélzetén található veszélyes anyagok részleteit.

5. FEJEZET - KIVIZSGÁLÁS

A KIVIZSGÁLÁS MEGINDITÁSÁNAK ÉS LEFOLYTATÁSÁNAK FELELŐSSÉGE

SZERZŐDŐ ÁLLAM TERÜLETÉN BEKÖVETKEZETT BALESET, VAGY RENDKÍVÜLI ESEMÉNY

Az eset helyszínének állama

5.1. Baleset körülményeinek kivizsgálását az eset helyszín állama köteles megindítani. Ez az állam felelős a kivizsgálás lefolytatásáért is, de a kivizsgálás lefolytatásának egészét, vagy annak bármely részét közösen kialakított keretek között és hozzájárulással egy másik államra ruházhatja. Bármely esetben az eset helyszín állama a kivizsgálás megkönnyítésére köteles minden eszközt megragadni.

5.1.1 **Ajánlás**.- *Az eset helyszínének állama a rendkívüli esemény körülményeinek kivizsgálására indítson kivizsgálást. Ez az állam felelős a kivizsgálás lefolytatásáért is, de a kivizsgálás lefolytatásának egészét, vagy annak bármely részét közösen kialakított keretek között és hozzájárulással egy másik államra ruházhatja. Bármely esetben az eset helyszín állama a kivizsgálás megkönnyítésére minden eszközt ragadjon meg.*

1. Megjegyzés.- A fenti rendelkezés nem zárja ki az események (akár rendkívüli akár nem) egyéb szervezetek általi kivizsgálásának már meglévő formáit.

2. Megjegyzés.- Ha a teljes kivizsgálást más államra ruházták, akkor elvárhatóan ez az állam felelős a kivizsgálás lefolytatásáért, beleértve a zárójelentés kiadását és az ADREP jelentést is. Rendszerint a helyszín állama marad felelős a kivizsgálás lefolytatásáért olyan esetekben, amikor a kivizsgálásnak csak egy részét ruházták át.

NEM SZERZŐDŐ ÁLLAM TERÜLETÉN TÖRTÉNT BALESET, VAGY RENDKÍVÜI ESEMÉNY

A lajstromozó állam

5.2. **Ajánlás**.- *Ha a baleset, vagy a rendkívüli esemény nem szerződő állam területén történt és az esemény helyszín állama nem szándékozik a 13. Annex-el összhangban álló kivizsgálást lefolytatni, akkor a lajstromozó állam, vagy ha nem teszi, akkor az üzemeltető állama, a tervezésért felelős állam, vagy a gyártó állama törekedjen arra, hogy az eset helyszínének államával együttműködve induljon és folyjon le a kivizsgálás, azonban, ha az együttműködés nem jön létre, akkor köteles saját maga a rendelkezésre álló információk alapján a kivizsgálást elvégezni.*

EGYETLEN ÁLLAMHOZ SEM TARTOZÓ TERÜLETEN TÖRTÉNT BALESET, VAGY RENDKÍVÜLI ESEMÉNY

A lajstromozó állam

5.3. Ha valamely baleset, vagy rendkívüli esemény helyéről nem állapítható meg határozottan, hogy az valamely állam területén van, akkor a lajstromozó állam köteles a balesettel, vagy rendkívüli eseménnyel kapcsolatos minden szükséges vizsgálatot megindítani és lefolytatni. Kölcsönös megállapodással és hozzájárulással azonban a kivizsgálás bármely részét másik államra is átruházhatja.

5.3.1 A nemzetközi vizeken történt baleset helyszínéhez közel fekvő államok kötelesek képességeik szerint segítséget nyújtani és - hasonló mértékben- biztosítani a lajstromozó állam által kért segítséget.

5.3.2. **Ajánlás**.- *Ha a lajstromozó állam nem szerződött állam és nem szándékozik a 13. Annex-el összhangban álló kivizsgálást lefolytatni, akkor az üzemeltető állama, vagy ha nem teszi, akkor a tervezésért felelős állam, vagy a gyártó állama törekedjen arra, hogy megindítsa és lefolytassa a kivizsgálást. Kölcsönös megállapodással és hozzájárulással azonban a kivizsgálás bármely részét másik államra is átruházhatja.*

A KIVIZSGÁLÁS MEGSZERVEZÉSE ÉS LEBONYOLITÁSA

Megjegyzés: Az ICAO Légijármű Baleset Kivizsgálási Kézikönyve (Doc 6920) útmutató anyagot tartalmaz a kivizsgálás megszervezésére, lebonyolítására és irányítására vonatkozóan.

A KIVIZSGÁLO ÁLLAM FELELŐSSÉGE

Megjegyzés: az alábbi rendelkezésekben semmi sem célozza azt, hogy a kivizsgáló állam számára lehetetlenné tegye azt, hogy akármilyen forrásból is, de a legjobb műszaki - szakmai segítséget vegye igénybe.

Általános rész

5.4. A baleset kivizsgáló hatóságnak a vizsgálat lebonyolításában függetlennek kell lennie és a lebonyolításhoz korlátlan, a jelen Annex rendelkezéseivel összhangban lévő felhatalmazással kell rendelkeznie. A kivizsgálás foglalja magába:

a) a balesetről, eseményről az összes elérhető és felhasználható információ összegyűjtését, rögzítését és elemzését;

b) ha megfelelő, biztonsági ajánlások kiadását;

c) ha lehetséges, az ok(ok) meghatározását; és

d) zárójelentés elkészítését.

Ha lehetséges a baleset helyszínét fel kell keresni, a roncsot meg kell vizsgálni és a tanúk vallomásait fel kell venni.

5.4.1 **Ajánlás**.- *a jelen Annex szellemében végzett minden kivizsgálást el kell választani a vád és a jogi* *felelősség megállapítására irányuló bármiféle bírói, vagy adminisztratív eljárástól.*

A vizsgálat felelős vezetője - kinevezés

5.5. A kivizsgáló állam a vizsgálat felelős vezetőjét jelölje ki és a kivizsgálást azonnal kezdje meg.

A vizsgálat felelős vezetője – Hozzáférés és ellenőrzés

5.6. A vizsgálat felelős vezetőjének a roncshoz és minden kapcsolatos anyaghoz, beleértve a légijármű adatrögzítőket is és az ATS felvételeit is, akadálytalan hozzáférhetőséggel kell rendelkeznie és ezek felett korlátlan hatalommal kell rendelkeznie annak érdekében, hogy a kivizsgálásban résztvevő felhatalmazott személyzet a részletes vizsgálatot késedelem nélkül elvégezhesse.

Légijármű adatrögzítők - Baleset és rendkívüli esemény

5.7 A baleset, vagy a rendkívüli esemény kivizsgálásában a légijármű adatrögzítőket a legteljesebb mértékben hatékonyan kell felhasználni. A kivizsgálást végrehajtó állam köteles haladéktalanul gondoskodni a légijármű adatrögzítők információinak visszanyeréséről.

5.8 **Ajánlás**.- *Ha a baleset, vagy a rendkívüli esemény kivizsgálását végző állam nem rendelkezik megfelelő létesítménnyel a légijármű adatrögzítők információinak visszanyerésére, akkor használja egy másik állam által a rendelkezésére bocsátott létesítményt, a következőket tartva szem előtt:*

a) az információ visszanyerő létesítmény adottságai;

b) az információ visszanyerés idő igénye; és

c) az információ visszanyerő létesítmény helye.

Megjegyzés.- a radar adatok és a légiforgalmi irányítási kommunikáció rögzítésének követelményeit a 11. Annex 6. Fejezete tartalmazza

Boncolási vizsgálatok

5.9 Halálos kimenetelű balesetet kivizsgáló állam intézkedjen teljes kórbonctani vizsgálat végrehajtásáról a halálos sérüléseket szenvedett repülőszemélyzet és a sajátos körülményektől függően a halálos sérüléseket szenvedett utasok és utaskísérők tekintetében, amely boncolásos vizsgálatot lehetőség szerint a baleset kivizsgálásban jártas kórboncnok hajtson végre. Ezek a vizsgálatok legyenek célratörők és teljesek.

Megjegyzés.- A boncolásokkal kapcsolatos útmutató anyag az ICAO Polgári Repülő-orvosi Kézikönyvben (Manual of Civil Aviation Medicine - Doc 8984) és az ICAO Baleset Kivizsgálási Kézikönyvben (Manual of Accident Investigation - Doc 6920) található, amelyek közül az előző részletes útmutatást nyújt a toxikológiai vizsgálatokról.

Orvosi vizsgálat

5.9.1 Amikor ez megfelelő, a kivizsgáló állam intézkedjen teljes a repülőszemélyzet, az utasok és az érintett légi-közlekedési személyzet orvosi vizsgálatáról, amely orvosi vizsgálatot lehetőség szerint a baleset kivizsgálásban jártas orvos hajtson végre. Ezek a vizsgálatok legyenek célratörők.

1. Megjegyzés.- az ilyenfajta vizsgálat segíthet annak meghatározásában is, hogy vajon a repülőszemélyzet, az utasok és a közvetlenül érintett légi-közlekedési személyzet fizikai és pszichikai állapotának szintje elegendő-e, hogy a kivizsgáláshoz hozzájárulhassanak.

2. Megjegyzés.- az ICAO Polgári Repülő-orvosi Kézikönyvben (Manual of Civil Aviation Medicine - Doc 8984) útmutatás található az orvosi vizsgálatról.

Együttműködés - jogi hatóságok

5.10 Szükséges, hogy a kivizsgáló állam elismerje a vizsgálat felelős vezetője és a jogi hatóságok közötti együttműködés szükségességét. Fordítsanak különös figyelmet azokra a bizonyítékokra, amelyek azonnali rögzítést és elemzést igényelnek a kivizsgálás eredményessége érdekében. Ezek közé tartozik például az áldozatok megvizsgálása és azonosítása, valamint a légi-jármű adatrögzítők feljegyzéseinek kinyerése.

1. Megjegyzés: Az eset helyszín állama ezen együttműködéséért való felelősségét az 5.1 pont állapítja meg.

2. Megjegyzés: A kivizsgáló és a jogi hatóságok között a légijármű adatrögzítők és feljegyzéseik őrizetével kapcsolatos esetleges konfliktusok megoldásához talán alkalmazható módszer az, hogy a feljegyzést tartalmazó anyagot a jogi hatóság egy tisztviselője szállítja a kiértékelés helyére, így tartva fenn az őrizetet.

A légiközlekedés védelméért felelős hatóságok tájékoztatása

5.11 Ha a kivizsgálás során gyanítják, vagy ismeretessé válik, hogy jogellenes cselekmény történt, akkor a vizsgálat felelős vezetője azonnal intézkedni köteles, hogy biztosított legyen az érintett állam(ok) légi-közlekedés védelemért felelős hatóságainak ilyen értelmű tájékoztatása.

A feljegyzések bizalmas kezelése

5.12 Baleset, vagy esemény kivizsgálását végző állam baleset, vagy esemény kivizsgálásán kívül más célra ne bocsássa rendelkezésre az alábbiakban felsorolt feljegyzéseket kivéve, ha az illető állam igazságügyi adminisztrációjának megfelelő hatósága úgy határoz, hogy ezek feltárása fontosabb azon belföldi és nemzetközi hatásoknál, amelyeket az ilyen lépés az adott, vagy esetleges jövőbeli kivizsgálásokra gyakorolhat:

a) a kivizsgáló hatóság által a kivizsgálás folyamán személyektől beszerzett minden nyilatkozat;

b) a légjármű üzemeltetésében érintett személyek közötti bármiféle kommunikáció;

c) a balesetben, vagy eseményben érintett személyekkel kapcsolatos egészségügyi, vagy magánjellegű információk;

d) a pilótakabin hangrögzítő felvételei, vagy az ilyen felvételekről készült átiratok;

e) a légiforgalmi irányító egységeknél rögzített adatok, vagy az ilyen adatokból készült átiratok;

f) az információ elemzésben kifejtett vélemények, beleértve a légijármű adatrögzítő információkat is.

5.12.1 Ezeket a feljegyzéseket csak akkor kell a zárójelentésbe, vagy annak függelékeibe foglalni, ha azok a baleset, vagy az esemény elemzéséhez kapcsolódnak. Ne tárják fel a feljegyzések azon részeit, amelyek az elemzéshez nem kapcsolódnak.

1. Megjegyzés.- a baleset, vagy esemény kivizsgálása folyamán a személyek által önként adott információkat is magukba foglaló fentiekben felsorolt feljegyzésekben tartalmazott információk nem megfelelő helyű felhasználására kerülhet sor a soron következő fegyelmi, polgári, igazgatási és büntetőjogi eljárások folyamán. Ha ezeket az információkat kiszolgáltatják, lehet, hogy ezeket a jövőben többé nyíltan nem tárják a kivizsgálók elé. Az ilyen információkhoz való hozzájutás meghiúsulása a kivizsgálási folyamatot akadályozná és a repülés biztonságot súlyosan érintené.

2. Megjegyzés.- Az „E" Melléklet jogi útmutatót tartalmaz a biztonsági adat gyűjtő és feldolgozó rendszerekből származó információ védelméhez

A kivizsgálás felújítása

5.13. Ha a kivizsgálás lezárása után új és jelentős bizonyíték kerül napvilágra, akkor a kivizsgálást korábban lefolytató államnak a kivizsgálást fel kell újítania. Ha azonban a vizsgálatot előzőleg lefolytató állam ezt nem kezdeményezi, akkor ehhez szerezze meg a kivizsgálást kezdeményező állam hozzájárulását.

BÁRMELY MÁS ÁLLAM FELELŐSSÉGE

Tájékoztatás - baleset és események

5.14. Minden állam köteles a kivizsgáló állam kérésére a balesettel, vagy eseménnyel kapcsolatban minden rendelkezésre álló tájékoztatást megadni.

Megjegyzés: Lásd még az 5.16 pontot is.

5.15 Az állam, amelynek létesítményeit és szolgáltatásait az illető légijármű a baleset, vagy esemény előtt igénybe vette, vagy rendes körülmények között igénybe vette volna és, ha ez az állam a kivizsgálásban felhasználható információval rendelkezik, akkor köteles ezeket az információkat a kivizsgáló államnak megadni.

A LAJSTROMOZÓ ÁLLAM ÉS AZ ÜZEMELTETŐ ÁLLAMÁNAK FELELŐSSÉGE

Légijármű adatrögzítők - baleset, vagy rendkívüli események

5.16 Ha a baleset, vagy rendkívüli eseményben érintett légijármű nem az eset helyszínének államában száll le, akkor a lajstromozó állam, vagy az üzemeltető állama a kivizsgáló állam kérésére köteles a légijármű adatrögzítők feljegyzéseit hordozó anyagot és ha szükséges, akkor az érintett légijármű adatrögzítőket is ez utóbbi részére átadni.

Megjegyzés.- Alkalmazva az 5.16-ot, a lajstromozó állam, vagy az üzemeltető állam a repülőgép repülési adatrögzítő rögzített adatainak visszanyeréséhez más államok segítségét is kérheti.

Tájékoztatás a szervezetekről

5.17 A lajstromozó állam, vagy az üzemeltető állama a kivizsgáló állam kérésére köteles bármiféle olyan szervezettel kapcsolatos információt megadni, amely szervezet tevékenysége a légijármű üzemeltetésére közvetlen, vagy közvetett hatással lehetett.

RÉSZVÉTEL A KIVIZSGÁLÁSBAN

Megjegyzés: A jelen Annex-ben semmi sem kívánja azt sugallni, hogy az állam meghatalmazott képviselőjének és tanácsadóinak mindig jelen kell lenniük a kivizsgálást lefolytató államban.

A LASTROMOZÓ ÁLLAM, AZ ÜZEMELTETŐ ÁLLAM, A GYÁRTÓ ÁLLAM ÉS A TERVEZŐ ÁLLAM RÉSZVÉTELE

Jogok

5.18 A lajstromozó állam, az üzemeltető állam, a gyártó állam és a tervező állam joga, hogy a kivizsgálásban való részvételre meghatalmazott képviselőjét kijelölje.

Megjegyzés: A jelen szabványban semmi sem célozza azt, hogy eleve elzárja a légijármű hajtóművét, vagy főbb alkotóelemeit tervező, vagy gyártó államot attól, hogy részvételét kérhesse valamely baleset kivizsgálásában.

5.19 A lajstromozó állam, vagy az üzemeltető állama az üzemeltető által ajánlott egy, vagy több tanácsadót nevezzen ki az állam meghatalmazott képviselőjének segítésére.

5.19.1 **Ajánlás.-** *Ha se a lajstromozó állam, sem az üzemeltető állama nem jelöl ki meghatalmazott képviselőt, akkor a kivizsgálást lebonyolító állam - eljárásától függően- az üzemeltetőt hívja meg részvételre.*

5.20 A gyártó állam és a tervező állam is legyen jogosult, hogy a típus tervezetért, illetve a légijármű végső kialakításért felelős szervezetek által ajánlott egy, vagy több tanácsadót nevezzen ki az állam meghatalmazott képviselőjének segítésére.

5.21 **Ajánlás.-** *Ha se a gyártó állam sem a tervező állam nem jelöl ki meghatalmazott képviselőt, akkor a kivizsgálást lebonyolító állam - eljárásától függően- a típus tervezetért, illetve a légijármű végső kialakításért felelős szervezeteket hívja meg részvételre.*

Kötelezettségek

5.22 Ha valamely 2250 kg maximális tömeg feletti légijármű balesetét kivizsgáló állam kifejezetten kéri a lajstromozó állam, az üzemeltető állam, a gyártó állam, vagy a tervező állam részvételét, akkor ezeknek az államoknak (külön-külön) meghatalmazott képviselőt kell küldeniük.

1. Megjegyzés.- Az 5.22-ben semmi sem célozza megakadályozni a kivizsgáló államot abban, hogy a légijármű hajtóművét, vagy főbb alkotóelemeit tervező, vagy gyártó államot felkérje nevezze ki *meghatalmazott képviselőjét bármely olyan esetben, ha a kivizsgáló állam úgy véli, hogy ezáltal a kivizsgáláshoz hasznosan járulhatnának hozzá vagy, ha az ilyen részvétel a repülésbiztonság fokozódásához vezethet.*

2. Megjegyzés.- Az 5.22 pontban semmi sem célozza a kivizsgálást lefolytató állam eleve megakadályozását abban, hogy a tervező államát és a gyártó államát felkérje az 5.22 pontban leírtaktól eltérő egyéb balesetek kivizsgálásában való segítségnyújtásra.

MÁS ÁLLAMOK RÉSZVÉTELE

Jogok

5.23 Bármely államot, amely kérésre információkat, eszközöket, vagy szakértőket biztosít a kivizsgáló állam részére, fel kell jogosítani arra, hogy a kivizsgálásban való részvételre meghatalmazott képviselőt jelöljön ki.

Megjegyzés.- A kivizsgálásban való részvételre meghatalmazott képviselő kijelölésére ugyancsak fel kell jogosítani minden olyan államot, amely a helyszíni vizsgálatokhoz üzemelési bázist biztosít, avagy a kutatás-mentési, vagy roncs kiemelési műveletekben érintett, avagy érintett mint az üzemeltető megosztott járatszám-, vagy szövetségesi partnerének állama.

A MEGHATALMAZOTT KÉPVISELŐK FELHATALMAZÁSA

Tanácsadók

5.24 Meghatalmazott képviselők kijelölésére jogosult állam arra is jogosult, hogy meghatalmazott képviselőjének a kivizsgálásban való segítése céljából egy, vagy több tanácsadót jelöljön ki.

1. Megjegyzés: A fenti rendelkezésben semmi sem célozza azt, hogy a kivizsgálásban résztvevő államot eleve meggátolja abban, hogy a legjobb műszaki szakértőt (szakértőket) bármely forrásból igénybe vegye, és az ilyen szakértőt (szakértőket) meghatalmazott képviselője mellé tanácsadóként kijelölje.

2. Megjegyzés: A meghatalmazott képviselők tanácsadóik és felszerelésük beléptetésének megkönnyítésével az "Egyszerűsítések" címet viselő 9. Annex foglalkozik. A hivatali, vagy szolgálati útlevél megkönnyebbítheti a belépést.

5.24.1 A meghatalmazott képviselőt segítő tanácsadóknak lehetővé kell tenni, hogy képviselőjük felügyelete alatt olyan mértékig vegyenek részt a kivizsgálásban, ami a meghatalmazott képviselő részvételének hatékonnyá tételéhez szükséges.

Részvétel

5.25 A kivizsgálásban való részvétel kötelezően adjon felhatalmazást a vizsgálat felelős vezetőjének felügyelete alatt a kivizsgálás minden vonatkozásában való részvételre, lényegében a:

a) a baleset helyszínének látogatása;

b) a roncs megvizsgálására;

c) a tanúk kikérdezésére a tanúktól információ beszerzésére és kikérdezéshez témakör ajánlására;

d) amint lehetséges, minden bizonyítékhoz való teljes hozzáférésre;

e) minden kapcsolatos dokumentumról másolathoz jutásra; és

f) a rögzített adatok hordozóinak kiolvasásában való részvételre;

g) a helyszíntől távoli kivizsgáló tevékenységben való részvételre, mint például részegység vizsgálatok, műszaki tájékoztatók, tesztelések és szimulációk;

h) részvételre a kivizsgálás haladásáról tartott értekezleteken, beleértve az elemzésekkel, feltártakkal, okokkal és a biztonsági ajánlásokkal kapcsolatos szándékokat is; és

i) a kivizsgálás különböző elemeire vonatkozó előterjesztés tételre.

Mindazonáltal a lajstromozó államán, az üzemeltető államán, a tervező államán és a gyártó államán kívül más államok részvétele azokra a témákra korlátozhatók, amelyek az ilyen államokat az 5.23 pont szerint a részvételre feljogosítják.

1. Megjegyzés: Elfogadott az, hogy a részvétel formája annak az államnak az eljárásaitól függ, amely a kivizsgálást, vagy annak egy részét lefolytatja.

2. Megjegyzés: Az információk összegyűjtését és rögzítését nem szükséges késleltetni, hogy ezzel egy meghatalmazott képviselő érkezését bevárják.

3. Megjegyzés.- A jelen szabványban semmi sem akadályozza a kivizsgáló államot abban, hogy a részvételi lehetőséget a felsoroltakon túlra is kiterjessze.

4. Megjegyzés.- az e) alpontban említett kapcsolatos dokumentáció magában foglal olyan dokumentumokat is, mint például a részegységek vizsgálatáról készült jelentések, avagy a kivizsgálás keretében végrehajtott tanulmányok.

Kötelezettségek

5.26 A meghatalmazott képviselő és tanácsadója:

a) minden vonatkozó és rendelkezésükre álló információt kötelesek a kivizsgáló állam rendelkezésére bocsátani; és

b) a kivizsgálást végrehajtó állam kifejezett hozzájárulásának esetét kivéve, a kivizsgálás előrehaladásáról és a feltártakról információt nem adhatnak.

Megjegyzés.- eme szabványban semmi sem szándékozik megakadályozni a tények gyors közzétételét, ha azt a kivizsgáló állam engedélyezte, továbbá eme szabvány azt sem szándékozik megakadályozni, hogy a meghatalmazott képviselő megfelelő biztonsági ténykedések előmozdítása érdekében saját államának jelentsen.

AZ ESET KÖVETKEZTÉBEN ELHUNYT, VAGY SÚLYOSAN SÉRÜLT POLGÁROK ÁLLAMÁNAK RÉSZVÉTELE

Jogok és felhatalmazás

5.27 A balesetben elhunyt, vagy súlyosan sérült polgárai miatt különösen érdekelt állam részére és e tekintetben benyújtott kérésére a kivizsgáló állam engedélyezze a kivizsgálásban résztvevő egy szakértő kijelölését, aki a következőkre jogosítandó:

a) A baleset helyszínének felkeresése;

b) A vonatkozó ténybeli információkhoz való hozzáférés;

c) Az áldozatok azonosításában való részvétel;

d) a szakértő államának túlélő polgárai kikérdezésében való segédkezésre; és

e) A zárójelentés egy példányának kézhezvételére.

6. FEJEZET - ZÁRÓJELENTÉS

6.1 **Ajánlás**.- *a Függelékben szereplő zárójelentés forma alkalmazandó. Ezzel együtt azonban, az a baleset, vagy esemény körülményeihez igazítható.*

MINDEN ÁLLAM KÖTELESSÉGE

Közzététel - hozzájárulás

6.2 A kivizsgáló állam kifejezett beleegyezése nélkül az államok ne publikálják, ne köröztessék és ne tegyék hozzáférhetővé a baleset, vagy repülő esemény zárójelentés előzetest, vagy annak bármely részét, a kivizsgálás közben beszerzett dokumentumokat, kivéve azt az esetet, ha a kivizsgáló állam ezeket a jelentéseket, vagy dokumentumokat már közzétette.

A KIVIZSGÁLÓ ÁLLAM FELELŐSSÉGE

Konzultáció

6.3 A kivizsgáló állam a zárójelentés tervezetet küldje meg a kivizsgálást kezdeményező államnak, és mindazon államoknak, amelyek a kivizsgálásban részt vettek, felkérve őket a jelentéssel kapcsolatos fontos és megalapozott észrevételeik lehető legrövidebb időn belül történő megtételére. A kivizsgálás zárójelentés tervezetét az alábbiak részére kell véleményezésre elküldeni:

a) A lajstromozó államnak;

b) Az üzemeltető államának;

c) A tervező államnak; és

d) A gyártó államnak.

Ha a kivizsgáló állam a felkérő levél elküldését követő 60 napon belül kap észrevételeket, akkor azok lényegét vagy építse be a zárójelentésbe, vagy, ha azt az észrevételt küldő állam kéri, mellékletként csatolja a zárójelentéshez. Ha a kivizsgáló állam 60 napon belül nem kap észrevételeket, akkor a zárójelentést a 6.4-el összhangban adja ki, hacsak ezen időszak meghosszabbításáról az érdekelt államokkal meg nem egyezett.

1. Megjegyzés.- E szabványban nincs semmi olyan szándék, amely a kivizsgálást lefolytató államot szándékozna megakadályozni abban, hogy más egyéb államokkal konzultáljon, mint például amely vonatkozó adatokat közölt, jelentős létesítményt, avagy az 5.27 értelmében a kivizsgálásban résztvevő szakértőket bocsátott rendelkezésre.

2. Megjegyzés.- A zárójelentéshez csatolandó észrevételek a zárójelentésnek nem szerkesztői jellegű, azon meghatározott műszaki szempontjaira korlátozódjanak, amelyek terén nem jött létre megegyezés.

3. Megjegyzés.- A zárójelentés tervezet címzettekhez juttatásakor a kivizsgáló állam a legalkalmasabb és rendelkezésre álló leggyorsabb olyan továbbítási lehetőség alkalmazását veheti figyelembe, mint például a fax, e-mail, a futárszolgálat, vagy az expressz postaküldemény.

6.3.1 **Ajánlás**.- *A kivizsgálást lefolytató állam az üzemeltető államán keresztül küldje meg a zárójelentés tervezet egy példányát az üzemeltetőhöz, ezáltal téve lehetővé az üzemeltetőnek, hogy a zárójelentésről a véleményét kifejtse.*

6.3.2 **Ajánlás.-** *A kivizsgálást lefolytató állam a tervező államán, illetve a gyártó államán keresztül küldje meg a zárójelentés tervezet egy példányát a légijármű tervezőjének, illetve gyártójának, ezáltal téve lehetővé a gyártó és a tervező számára, hogy a zárójelentésről a véleményüket kifejtsék.*

A zárójelentés címzettei

6.4 A kivizsgálást folytató állam a baleset kivizsgálásáról készített zárójelentést a lehető legkisebb késedelemmel küldje meg:

a) A kivizsgálást kezdeményező államnak;

b) A lajstromozó államnak;

c) Az üzemeltető államának;

d) A tervező államnak;

e) A gyártó államnak;

f) Annak az államnak, amelynek polgárai a balesetben életüket vesztették vagy súlyos sérüléseket szenvedtek; és

g) Minden állam számára, amely a kivizsgáláshoz tájékoztatást, jelentős segítséget, vagy szakértőket biztosított.

A zárójelentés közzététele

6.5 Balesetek megelőzése érdekében a balesetet, vagy eseményt kivizsgáló állam a lehető leghamarabb adja ki a zárójelentést.

6.6 **Ajánlás**.- *a kivizsgáló állam a lehető leghamarabb adja ki a zárójelentést és ha lehet az eseménytől számított 12 hónapon belül. Ha a jelentés nem adható ki 12 hónapon belül, akkor a kivizsgáló állam az eset minden évfordulóján időközi jelentést adjon ki, részletezve a kivizsgálás előrehaladását, illetve a felmerült biztonsági kérdéseket.*

6.7 Az 5700 kg maximum tömeget meghaladó légijármű baleset, vagy esemény esetében, ha a kivizsgáló állam erről zárójelentést adott ki, akkor a zárójelentés egy példányát köteles a Nemzetközi Polgári Repülési Szervezet részére megküldeni.

Megjegyzés.- Minden esetben amikor az gyakorlatilag lehetséges, az ICAO-nak küldendő zárójelentést a szervezet egyik munkanyelvén készítsék a Függelékben mutatott formában.
Biztonsági ajánlások

6.8 A kivizsgáló állam hatósága, ha a baleset, vagy az esemény kivizsgálás bármely szakaszában kívánatos, hogy ajánlást tegyen az illetékes hatóságok részére, ideértve más államok hatóságait is, köteles ajánlást tenni minden olyan óvintézkedésről, amelyet hasonló esetek megelőzése érdekében azonnal meg kell tenni.

6.9 A balesetet, vagy eseményt kivizsgáló állam hatósága –amikor megfelelő- a kivizsgálásból eredő minden biztonsági ajánlást küldjön meg minden érintett állam baleset kivizsgáló hatóságának és, ha ICAO dokumentum érintett az esetben, akkor küldje meg az ICAO-nak is.

Megjegyzés.- ha a zárójelentés az ICAO-nak címzett biztonsági ajánlást tartalmaz, mert ICAO dokumentum érintett az esetben, akkor az ilyen zárójelentést kisérő levéllel kell kiegészíteni, amely körvonalazza a javasolt konkrét lépéseket.

A BIZTONSÁGI AJÁNLÁST KÉZHEZ VEVŐ ÁLLAM FELELŐSSÉGE

Biztonsági ajánlás vételekor teendő lépések

6.10 A biztonsági ajánlást vevő állam a javaslatot tévő államot tájékoztassa a megtett, illetve megfontolás alatt álló lépésekről, illetve annak okáról, ha nem tesz lépéseket.

Megjegyzés.- e szabványban semmi sem szándékozik akadályozni a kivizsgáló államot abban, hogy biztonsági ajánlástól eltérő megelőző intézkedésekre tegyen javaslatot.

7. FEJEZET – ADREP JELENTÉS

1. Megjegyzés: Az értesítési és jelentési ellenőrző listát a "B" melléklet tartalmazza.

2. Megjegyzés: A jelen fejezet rendelkezései bármely balesetről, vagy repülő eseményről két különböző jelentést kívánhatnak meg, ezek:

Előzetes jelentés
Adat jelentés balesetről és repülő eseményről

3. Megjegyzés: Az előzetes jelentés és a balesetről/repülő eseményről szóló adat jelentés elkészítésére vonatkozó útmutatást az ICAO Baleset/Repülő esemény Jelentési Kézikönyve (Doc 9156) tartalmazza.

ELŐZETES JELENTÉS

A KIVIZSGÁLÓ ÁLLAM FELELŐSSÉGE

2250 kg-nál nagyobb tömegű légijármü balesete

7.1 A 5700 kg - nál nagyobb maximum tömegű légijármü balesetét kivizsgáló állam köteles az alábbiak részére előzetes jelentést küldeni:

a) A lajstromozó államnak, vagy az esemény helyszín államának, a helyzetnek megfelelően;

b) Az üzemeltető államának;

c) A tervező államnak;

d) A gyártó államának;

e) Minden államnak, mely az esettel kapcsolatban tájékoztatást, fontos eszközöket, vagy szakértőket adott; és

f) A Nemzetközi Polgári Repülési Szervezet részére.

2250 kg, vagy ettől kisebb tömegű légijármü balesete

7.2 A 7.1 pont által nem részletezett légijármüvekkel történt baleset esetén és, ha légi-alkalmasságot érintő, vagy más államok részére fontosnak ítélt kérdésekről van szó, a kivizsgálást végző állam az alábbiak részére küldjön előzetes jelentést:

a) A lajstromozó államnak, illetve a baleseti helyszín államának - a szükségnek megfelelően;

b) Az üzemeltető államának;

c) A tervező államnak;

d) A gyártó államnak;

e) Mindegyik államnak, amely az esettel kapcsolatban tájékoztatást, fontos eszközöket, vagy szakértőket adott.

A jelentés nyelve

7.3 Az előzetes jelentést az ICAO egyik hivatalos nyelvén kell az illetékes államok és a Nemzetközi Polgári Repülési Szervezet részére megküldeni.

A jelentés továbbítása

7.4 Az előzetes jelentést a baleset napjától számított 30 napon belül faxon, e-mailben, vagy légipostával kell elküldeni, hacsak eddig az időpontig a balesetről/eseményről szóló adat jelentést már meg nem küldték. Ha a biztonságot közvetlenül érintő kérdésről van szó, akkor ezt, amint rendelkezésre áll, azonnal a rendelkezésre álló legalkalmasabb és leggyorsabb módon kell elküldeni.

ADAT JELENTÉS BALESETRŐL/REPÜLŐ ESEMÉNYRŐL

A KIVIZSGÁLO ÁLLAM FELELŐSSÉGE

2250 kg-nál nagyobb tömegű légijármű balesete

7.5 Ha a balesetben érintett légijármű maximum tömege 2250 kg feletti, akkor a kivizsgáló állam a baleseti adat jelentést a kivizsgálást követően, amilyen gyorsan csak lehet, köteles a Nemzetközi Polgári Repülési Szervezetnek megküldeni.

7.6 **Ajánlás**.- *A kivizsgálást lefolytató állam más államok kérésére adja meg a baleset/repülő esemény adat jelentésben rendelkezésre bocsátott ismereteket kiegészítő információkat.*

5700 kg-nál nagyobb tömegű légijármű eseménye

7.7 5700 kg maximum tömeg feletti légijármű repülő eseményét kivizsgáló állam, a kivizsgálás után amilyen hamar csak gyakorlatban lehetséges, a repülő eseményről szóló adat jelentést minden esetben küldje meg a Nemzetközi Polgári Repülési Szervezetnek.

Megjegyzés.- Baleset megelőzési tanulmányok készítése okán a nemzetközi polgári repülési szervezet érdeklődésének középpontjában álló esemény fajtákat a "C" Melléklet tartalmazza.

8. FEJEZET - BALESET MEGELŐZŐ INTÉZKEDÉSEK

Megjegyzés.- Az itt közölt rendelkezések célja a baleset megelőzés előmozdítása a baleseti és esemény adatok elemzésével, illetve az információk haladéktalan cseréjével.

Esemény jelentő rendszer

8.1 Az állam alakítson ki hivatalos esemény jelentő rendszert a tényleges, vagy a lehetséges biztonsági hiányosságokról szóló információk összegyűjtéséhez.

8.2 **Ajánlás.-** *A kötelező esemény jelentő rendszer által esetleg napvilágra nem kerülő információk összegyűjtése érdekében az állam alakítson ki önkéntes esemény jelentő rendszert.*

8.3 Az önkéntes esemény jelentő rendszer nem lehet büntető célzatú és az információ forrás számára biztosítson védelmet.

1. Megjegyzés.- az önkéntes jelentéstétel tekintetében alapvető a büntetés mentes környezet.

2. Megjegyzés.- Az államokat bátorítjuk, hogy vonatkozó jogszabályaik, törvényeik és irányelveik szükség szerinti módosításával mozdítsák elő és támogassák a repülés biztonságot érinthető események önkéntes jelentését.

3. Megjegyzés.- Az ICAO Biztonság Kezelési Kézikönyve (SMM) (Doc 9859) közöl útmutatást mind az önkéntes, mind a kötelező esemény jelentőrendszerről.

4. Megjegyzés.- az „E" Melléklet tartalmaz jogi útmutatót a biztonsági adat gyűjtő és feldolgozó rendszerekből származó információ védelméhez.

Adatnyilvántartó rendszer

8.4 **Ajánlás.-** *Az információk –beleértve a saját esemény jelentő rendszer révén nyert információkat is,- hatékony elemzésének elősegítése érdekében az állam alakítson ki baleset és esemény adatnyilvántartó rendszert.*

8.5 **Ajánlás.-** *az adatnyilvántartó rendszer az adatcsere elősegítése érdekében szabványosított formátumot alkalmazzon.*

1. Megjegyzés.- az ilyenfajta adatnyilvántartó rendszerek jellemzőivel kapcsolatos útmutató anyagot az ICAO az államok kérésére biztosítja.

2. Megjegyzés.- a 8.4 megvalósítása terén az államokat bátorítjuk, törekedjenek körzeti megállapodásokra – amikor az megfelelő.

Az adatok elemzése – megelőző intézkedések

8.6 A baleset és esemény adatbázist, valamint eseményjelentő rendszert kialakító államnak elemeznie kell a baleseti/eseményjelentésekben található információkat és az adatbázist annak érdekében, hogy meghatározhassák a szükséges megelőző intézkedéseket.

Megjegyzés. –A kivizsgált balesetekről, illetve eseményekről szóló Zárójelentések tartalmazhatják azokat a további információkat, amelyekre a megfelelő intézkedések alapozhatók.

8.7 **Ajánlás.-** *Amennyiben egy állam az adatbázisában található információk elemzése során olyan biztonsági kérdéseket fed fel, amelyek további államokat is érintenek, ennek az államnak minél előbb továbbítania kell ezeket a biztonsági információkat a többi állam részére.*

8.8 **Ajánlás.-** *A baleset és eseményvizsgálatból eredő biztonsági ajánlásokon felül a biztonsági ajánlások különböző forrásokból eredhetnek, beleértve a biztonsági tanulmányokat is. Ha a biztonsági ajánlásokat egy másik állam szervezetének címezik, azokat továbbítaniuk kell az állam vizsgálati hatósága részére is.*

Biztonsági információ csere

8.9 ***Ajánlás.-*** *az államok támogassák a légiközlekedési rendszer minden felhasználóját összekötő biztonsági információ elosztó hálózat felállítását és segítsék elő az aktuális és potenciális biztonsági hiányosságokról szóló információk szabad cseréjét.*

1. Megjegyzés.- az adatcsere elősegítése érdekében szabványosított meghatározások, besorolások és formátumok szükségesek. Az ilyenfajta információ elosztó hálózat jellemzőivel kapcsolatos útmutató anyagot az ICAO az államok kérésére biztosítja.

FÜGGELÉK. A ZÁRÓJELENTÉS FORMÁJA

(Lásd 6. a Fejezetet)

CÉL

Az itt bemutatott zárójelentés forma célja, hogy kényelmes és egységes nyomtatványt biztosítson.

A zárójelentés egyes részeinek kitöltésére vonatkozó részletes utasítás az ICAO Légijármű Baleset Kivizsgálási Kézikönyvében (Doc 6920) található.

A ZÁRÓJELENTÉS RÉSZEI

Cím. A zárójelentés az alábbiakat tartalmazó címmel kezdődik:
Az üzemeltető neve; a légijármű gyártója, típusa, nemzetiségi és lajstrom jele; A baleset vagy esemény helye és időpontja.

Áttekintés. A címet követően rövid áttekintés következik az alábbi információkra vonatkozóan: A belföldi és külföldi hatóságok értesítése a balesetről; A baleset kivizsgáló hatóság aznosítása és meghatalmazott képviselője; A kivizsgálás szervezete; A jelentést kiadó hatóság neve és a kiadás időpontja;

Valamint egy rövid összefoglalóval záródik, melyben a balesethez vezető okokat taglalják.

A zárójelentés fő részei. A zárójelentés fő részét a következő címek szerint osztják fel:

1. Ténybeli információk

2. Elemzés

3. Következtetések

4. Biztonsági ajánlások

mindenegyes cím alatt több alcím található, amelyet a következőkben körvonalazunk.

Függelékek: Szükség szerint csatolandók

Megjegyzés: Zárójelentés készítése során e formátum alkalmazása biztosítja, hogy:

a) A ténybeli információk, elemzések és következtetések megértéséhez szükséges minden tájékoztatást tartalmazzanak a megfelelő címszavak alatt;

b) Ahol az "1 - Ténybeli információk" fejezet bármely pontjával kapcsolatosan információ nem áll rendelkezésre, vagy az nincs összefüggésben a balesethez vezető körülményekkel, ott ilyen értelmű megjegyzés legyen beiktatva a megfelelő alcímek alatt.

1. TÉNYBELI INFORMÁCIÓK

1.1 ***A repülés lefolyása.*** Rövid leíró jellegű ismertetés, amely az alábbiakról tájékoztat:

- Járatszám, az üzemelés fajtája, az utolsó indulási hely, az indulás ideje (helyi, vagy UTC idő), tervezett leszállóhely;

- A repülés előkészítése, a repülés és a balesethez vezető események leírása, beleértve a repülési pálya fontos szakaszának rekonstruálását a szükségnek megfelelően;

- A baleset helye (földrajzi szélesség, hosszúság, tengerszint feletti magasság), ideje (helyi, vagy UTC idő), nappal, vagy éjjel;

1.2 ***Személyi sérülések***. Az alábbi táblázat kitöltése (számokkal)

Sérülések	Személyzet	Utasok	Mások
Halálos			
Súlyos			
Kisebb / Semmilyen			

Megjegyzés: Halálos sérülések közé kell számítani az összes halálesetet, amelyről megállapították, hogy az a balesetben szenvedett sérülések közvetlen következménye. A súlyos sérülések meghatározását az Annex I. Fejezete tartalmazza.

1.3 ***A Légijármű rongálódása.*** A légijárművet a balesetben ért rongálódások rövid ismertetése (megsemmisült, jelentősen megrongálódott, kissé megrongálódott, nem sérült).

1.4 ***Egyéb kár***. Nem a légijármű, hanem egyéb tárgyakban keletkezett rongálódások rövid ismertetése.

1.5 ***A személyzet adatai:***

a) A hajózó személyzet összes tagjára vonatkozó adatok:
életkor, a szakszolgálati engedély érvényessége, jogosítások, kötelező ellenőrzések, repülési tapasztalat (összesen és az adott típuson), és a munkaidőre vonatkozó megfelelő tájékoztatások.

b) A személyzet egyéb tagjainak képesítésére és gyakorlatára vonatkozó rövid ismertető.

c) Az egyéb személyekre, mint például a légiforgalmi és a karbantartó szolgálat tagjaira stb. vonatkozó információk, amennyiben ezek a témához tartoznak.

1.6 ***A légijármű adatai:***

a) A légijármű légi-alkalmasságának és karbantartásának rövid ismertetése (amelyben a repülés előtti és alatti ismert hiányosságokat is fel kell sorolni, ha azoknak bármi kihatásuk lehetett a balesetre).

b) A teljesítmény rövid értékelése, ha ez lényeges, valamint annak ismertetése, hogy a tömeg és a tömeg-középpont az előírt határokon belül volt-e a balesettel kapcsolatos repülési szakasz folyamán. (Ha nem és, ha ennek bármilyen kihatása volt a balesetre, akkor ezt részletesen kell ismertetni).

c) A használt tüzelőanyag fajtája.

1.7 ***Meteorológiai adatok***

a) Az időjárási körülmények rövid ismertetése, beleértve az előre jelzett és a tényleges körülményeket is, továbbá azt, hogy a személyzet számára ezek a meteorológiai információk rendelkezésre álltak-e.

b) A természetes fényviszonyok a baleset időpontjában (a napfény, holdfény, szürkület, stb.).

1.8 ***Navigációs berendezések.*** A rendelkezésre álló navigációs berendezések vonatkozó adatai, beleértve az olyan leszállító berendezéseket, mint például a ILS, MLS, NDB, PAR, VOR, az optikai földi segédberendezéseket stb. és az adott időpontban tapasztalt, hatékonyságukra vonatkozó információkat.

1.9 ***Összeköttetés.*** A légiforgalmi mozgó és a légiforgalmi állandó helyű szolgálat összeköttetésére és ennek hatékonyságára vonatkozó információk.

1.10 ***Repülőtéri adatok***. A repülőtérre, létesítményeire és állapotukra, illetve ha a felszállás, vagy a leszállás nem a repülőtéren történt, akkor a felszállási, vagy a leszállási területre vonatkozó témához tartozó információk.

1.11 ***Légijármű adatrögzítők***. A légijármű adatrögzítők telepítési helye a légijárműben, állapotuk a megtaláláskor és a belőlük nyert adatok.

1.12 ***A roncsra és a becsapódásra vonatkozó adat***ok. Általános információk a baleset helyszínéről és a roncs szétszóródásáról; felderített anyaghibák, vagy alkatrész hibák. A roncs különböző darabjainak helyére és állapotára vonatkozó részletekre rendszerint nincs szükség, csak akkor, ha ezzel a légijármű becsapódás előtti széthullását szükséges jelezni. Vázlatok, térképek és fényképfelvételek ebben a részben helyezhetők el, vagy a Függelékhez csatolhatók.

1.13 ***Orvosi és boncolási adatok***. Az elvégzett vizsgálatok eredményeinek és az azokból rendelkezésre álló adatok rövid leírása.

Megjegyzés: A hajózó személyzet szakszolgálati engedélyével kapcsolatos egészségügyi adatokat az "1.5 - A személyzet adatai" című részben kell közölni.

1.14 ***Tűz.*** Ha tűz keletkezett, akkor az eset természetére, valamint az oltáshoz használt tűzoltó eszközökre és hatékonyságukra vonatkozó információk.

1.15 ***A túlélés lehetősége.*** A kutatás, vészelhagyás és mentés rövid leírása, a személyzet és az utasok elhelyezkedése az elszenvedett sérülések viszonylatában, az olyan szerkezetek elégtelensége, mint például ülések és biztonsági övek bekötő pontjai.

1.16 ***Próbák és kísérletek***. Rövid nyilatkozat a próbák és kísérletek eredményeiről.

1.17 ***Szervezeti és vezetőségi jellemzések***. A légijármű üzemelését befolyásoló szervezetekkel és ezek vezetőségével összefüggő vonatkozó információk. Ezen szervezetek közé tartozik például az üzemeltető, a légiforgalmi szolgálat(ok), az útvonal-, a repülőtéri- és az időjárási szolgálati ügynökségek és a szabályozó hatóság. Az információ tartalmazhatja, de ne csak a szervezeti felépítésre és funkciókra, erőforrásokra, a gazdasági helyzetre, a vezetési irányelvekre és gyakorlatra és a szabályozási keretekre korlátozódjon.

1.18 ***Kiegészítő adatok***. Az 1.1 - 1.17 pontokban nem szereplő, de a témához tartozó információk.

1.19 ***Hasznos, vagy hatékony kivizsgálási módszerek.*** Ha a kivizsgálás során hasznos, vagy hatékony kivizsgálási módszereket alkalmaztak, akkor röviden tüntessék fel e módszerek alkalmazásának okát, utaljanak főbb jellemző vonásaikra, továbbá az 1.1-től - 1.17 pontig terjedő alcímek alatt ismertessék az eredményeket.

2. ELEMZÉS

Szükség szerint csak azokat az információkat elemezzék, amelyeket az "1 - Ténybeli információk" szakaszban rögzítettek, és amelyek a következtetések és az ok(ok) meghatározásához tartoznak.

3. KÖVETKEZTETÉSEK

Sorolja fel a kivizsgálás során megállapított tényeket és okokat. Az okok listája foglalja magába mind a közvetlen, mind a mélyebb, rendszerben rejlő okokat is.

4. BIZTONSÁGI AJÁNLÁSOK

Ha alkalmazható, rövid nyilatkozat a baleset megelőzése érdekében tett bármely javaslatról, és ennek eredményeként megtett korrigáló lépésről.

FÜGGELÉKEK

A szükségnek megfelelően itt kell közölni minden egyéb, a jelentés megértése szempontjából szükségesnek tekinthető vonatkozó információt.

A 13. ANNEX MELLÉKLETEI

Ezek a mellékletek a 13. Annex - "Légijármű baleset kivizsgálása" részét nem képezik.
Az ezekben közölt anyag célja a 13. Annex alkalmazásának megkönnyítése.

A. MELLÉKLET - AZ ÜZEMELTETŐ ÁLLAMÁNAK JOGA ÉS KÖTELESSÉGE A KÖLCSÖNBEN, BÉRBEN, VAGY CSERÉBEN ÜZEMELTETETT LÉGIJÁRMŰVEKET ÉRT BALESETEKKEL, VAGY ESEMÉNYEKKEL KAPCSOLATBAN

A 13. Annex - Légijármű baleset és esemény kivizsgálás szabványait és ajánlott gyakorlatait még akkor dolgozták ki, amikor a lajstromozó állam és az üzemeltető állama általában ugyan az volt. Az utóbbi években azonban nemzetközi légijármű bérlési és csere megállapodások jöttek létre, ezáltal sok esetben az üzemeltető állama nem azonos a lajstromozó állammal.

A bérleti, vagy csere megállapodások esetenként a hajózó személyzetnek a lajstromozó államból való biztosítását tartalmazzák. Gyakoribb azonban az az eset, hogy a hajózó személyzetet az üzemeltető állam biztosítja és a légijárművet az üzemeltető államának törvényei szerint üzemeltetik. Ennek megfelelően, ezen megállapodásokból a légi-alkalmasságra vonatkozóan is különféle megegyezések születhetnek. A légi-alkalmasság felelőssége részben, vagy teljes egészében terhelheti az üzemeltető államot, vagy a lajstromozó államot. Néha az üzemeltető a lajstromozó állam által előírt légi-alkalmassági ellenőrzési rendszernek megfelelően hajtja végre a karbantartást és vezeti a nyilvántartásokat.

Baleset, vagy esemény alkalmával lényeges, hogy bármely államnak, amely a légijármű biztonságáért felelősséget vállalt, joga legyen részt venni a kivizsgálásban, legalábbis e felelősség vonatkozásában. Lényeges az is, hogy a kivizsgáló állam az adott kivizsgáláshoz fontos minden dokumentumhoz és egyéb információhoz gyorsan hozzájusson.

Ha egy baleset, vagy esemény helyszínéről határozottan nem állapítható meg, hogy az valamely állam területén van, akkor az üzemeltető állama a lajstromozó állammal történt megbeszélés után vállalja a baleset kivizsgálás részbeni, vagy teljes felelősségét.

B. MELLÉKLET - ÉRTESITÉSEK ÉS JELENTÉSEK ELLENŐRZŐ JEGYZÉKE

Megjegyzés.- Ebben az ellenőrző jegyzékben szereplő alábbi kifejezések a következő értelemmel bírnak:

- Nemzetközi eset: Valamely szerződő állam területén egy másik szerződő államban lajstromozott légijárművel bekövetkezett baleset, vagy rendkívüli esemény;

- Belföldi eset: A lajstromozó állam területén bekövetkezett baleset, vagy rendkívüli esemény;

- Egyéb eset: Nem szerződő állam területén bekövetkezett, vagy egyetlen államhoz sem tartozó területen bekövetkezett baleset, vagy rendkívüli esemény.

1. ÉRTESITÉS – BALESET, VAGY RENDKÍVÜLI ESEMÉNY

Küldi	Milyen esetben	Kinek	A 13. Annex vonatkozó pontja
Az eset helyszínének állama	Nemzetközi eset: Minden légijármű fajta esetén	Lajstromozó állam Üzemeltető állam Tervező állam Gyártó állam ICAO (2250 kg feletti légijármű esetén)	4.1
Lajstromozó állam	Belföldi és egyéb eset: 2250 kg feletti légijármű	Üzemeltető állam Tervező állam Gyártó állam ICAO (2250 kg feletti légijármű esetén)	4.8

2. ZÁRÓJELENTÉS

Baleset, vagy rendkívüli esemény, bárhol is történt				
Küldi	A jelentés fajtája	Milyen légijármű esetében	Kinek	A 13. Annex vonatkozó pontja
Kivizsgáló Állam	Zárójelentés	minden légijármű	kivizsgálást kezdeményező állam Lajstromozó állam Üzemeltető állam Tervező állam Gyártó állam Halálos áldozatok miatt érdekelt állam Információkat, fontos eszközöket vagy szakértőket adó állam	6.4
		5700 kg feletti légi-jármű	ICAO	6.7

3. ADREP JELENTÉS

Baleset, vagy rendkívüli esemény, bárhol is történt				
Küldi	A jelentés fajtája	Milyen esetben	Kinek	A 13. Annex vonatkozó pontja
Kivizsgáló állam	ELŐZETES JELENTÉS	2250 kg feletti légijármű baleset	Lajstromozó állam, vagy a helyszín állama üzemeltető állam tervező állam gyártó állam Információkat, fontos eszközöket, vagy szakértőket adó állam ICAO	7.1
		2250 kg, vagy ez alatti légijármű baeset, ha légi-alkalmassági, vagy érdeklődésre számot tartó téma érintett	Az ICAO kivételével ugyanaz, mint fent	7.2
	BALESETI ADATJELENTÉS	2250 kg feletti légijármű baleset	ICAO	7.5
	ESEMÉNY ADATJELENTÉS	5700 kg feletti légijármű eseménye	ICAO	7.7

4. BALESET MEGELŐ INTÉZKEDÉSEK

Más államok érdeklődésére számot tartó biztonsági témák				
Küldi	A jelentés fajtája	Milyen esetben	Kinek	A 13. Annex vonatkozó pontja
Biztonsági adatot elemző állam	bármilyen	Más állam érdeklődésére számot tartó biztonsági téma	Érdekelt államok	8.7
Biztonsági ajánlást közlő állam	biztonsági ajánlás	Más államok részére megfogalmazott ajánlás	az illető állam baleset kivizsgáló hatósága	6.8 8.8

C MELLÉKLET - RENDKÍVÜLI ESEMÉNYEK PÉLDÁINAK LISTÁJA

1. A "rendkívüli esemény"-t az 1. Fejezet a következőképp határozza meg:

Rendkívüli esemény (Serious Incident). Olyan körülményekkel járó esemény, melyek jelzik, hogy majdnem baleset történt.

2. A felsorolt események a valószínűen rendkívüli események jellegzetes példái. A felsorolás nem teljes és csupán a rendkívüli esemény meghatározásához szolgál útmutatóként.

Az összeütközés, vagy a veszélyes helyzet elkerülése érdekében kivédési manővert igénylő veszélyes közelség. Vagy amely alkalmával kikerülő ténykedés helytálló lett volna.

Éppen hogy elkerült kormányzott földnek ütközés.

Felszállás megszakítás zárt, vagy foglalt futópályán.

Felszállás végrehajtása zárt, vagy foglalt futópályáról az akadályoktól nem kellő elkülönítettséggel.

Leszállás vagy leszállási kísérlet zárt, vagy foglalt futópályára.

Felszállás során, vagy az emelkedés kezdetén nagymérvű hibák a számított teljesítmény létrehozásában.

Tűz, vagy füst az utas-kabinban, csomagtérben, illetve hajtómű tűz, még akkor is, ha a tüzet tűzoltó anyag alkalmazásával eloltották.

A hajózó személyzet részéről az oxigén vész-használatát igénylő esetek.

A légijármű szerkezeti meghibásodása, vagy a hajtómű szétesése, amely eseteket nem balesetként osztályoztak.

A légijármű működését súlyosan érintő egy, vagy több légijármű rendszer többszörös, illetve egyidejű meghibásodása.

A hajózó személyzet cselekvőképtelenné válása repülés közben.

A légijármű vezető részéről vészhelyzet nyilvánítást igénylő üzemanyag mennyiség.

Felszállási, vagy leszállási események. Olyanok, mint például küszöb előtti földet érés, túlfutás, vagy a futópálya oldalhatárain kívülre futás.

Rendszer meghibásodások, időjárási jelenségek, üzemelés a repülés engedélyezett teljesítmény tartományain kívül, vagy egyéb más olyan esetek, amelyek a légijármű kormányozhatóságában nehézséget okozhattak volna.

Valamely tartalékolt és a repülés vezérléséhez és navigáláshoz kötelező egynél több rendszer meghibásodása.

D MELLÉKLET – ÚTMUTATÓ A LÉGIJÁRMŰ ADATRÖGZÍTŐ KIOLVASÁSHOZ ÉS ELEMZÉSHEZ

Indító lépések

A nagy balesetet követő időszak bármely állam baleset kivizsgáló szervezete számára súlyos időszakot jelent. A legsürgetőbb döntést igénylő témák egyike annak eldöntése, hogy hol olvassák ki és elemezzék a légijármű adatrögzítőit. Rendkívül fontos, hogy a légijármű adatrögzítők kiolvasására és értékelésére a balesetet követően a lehető leghamarabb sor kerüljön. A problémás területek mielőbbi behatárolása befolyásolhatja a helyszíni vizsgálatokat, aholis a nyomok néha tünékenyek. A problémás területek mielőbbi behatárolása egyúttal a hasonló események megelőzéséhez fontos sürgős biztonsági ajánlásokat is eredményezhet.

Az államok többsége nem rendelkezik saját létesítménnyel ahol a légijármű adatrögzítők (beleértve mind hang-, mind az adatrögzítők) információi visszajátszhatók és elemezhetők volnának és következésképp más államok segítségéért folyamodnak. Éppen ezért lényeges, hogy az állam kivizsgálást lefolytató baleset kivizsgáló hatósága időben intézkedjen a légijármű adatrögzítők megfelelő létesítményben történő kiolvasása tekintetében.

Létesítmény választék

A kivizsgáló állam kérheti bármely állam segítségét, amely véleménye szerint a kivizsgálás érdekeit a legjobban szolgálja. A légitársaságok és műszaki karbantartó létesítmények által jellemzően alkalmazott szabvány gyártói lejátszó berendezés és visszajátszó szoftver baleset kivizsgálás kivizsgálási célra nem megfelelő. Ha az adatrögzítők sérültek, rendszerint speciális visszanyerő és elemző technikára van szükség.

A légijármű adatrögzítő kiolvasására igénybevett létesítménynek a következő lehetőségekkel kell rendelkeznie:

a) képesség a súlyosan sérült adatrögzítő szétszerelésére és kiolvasására;

b) képesség az eredeti felvétel/memória modul visszajátszására gyártói másoló eszköz nélkül, illetve a balesetben, vagy az eseményben érintett adatrögzítő ház igénybevételének szüksége nélkül;

c) képesség a digitális szalagos légijármű adatrögzítők nyers bináris hullámformáinak manuális elemzésére;

d) képesség arra, hogy alkalmas szoftver digitálisan fokozza és szűrje a beszédhang felvételeket; és

e) képesség az adatok grafikus elemzésére, a kifejezetten nem rögzített kiegészítő adatok származtatására, az adatok keresztellenőrzéssel végzett hitelesítésére és egyéb analitikai módszerekre az adat pontosság és korlátok meghatározására.

A gyártó állam (vagy a tervező állam) és az üzemeltető állam részvétele

A gyártó állam (vagy a tervező állam) légi-alkalmassági felelősséggel tartozik és rendszerint rendelkezik is a légijármű adatrögzítő információk kiolvasáshoz és elemzéséhez szükséges szakértelemmel. Tekintve, hogy a légijármű adatrögzítő információk gyakran vethetnek fel légi-alkalmassági problémákat, ezért a gyártó állam (vagy a tervező állam) képviselőjének jelen kell lennie amikor a légijármű adatrögzítők kiolvasását és elemzését nem a gyártó (vagy a tervező) államban hajtják végre.

Az üzemeltető állama szabályozói felelősséggel tartozik a repülő tevékenység tekintetében és bepillantási lehetőséget biztosíthat kifejezetten az üzemeltetőre vonatkozó üzemeltetési kérdésekbe. Tekintettel arra, hogy a légijármű adatrögzítő információk üzemeltetési problémákra deríthet fényt, ezért az üzemeltető állam képviselőjének ugyancsak jelen kell lennie a légijármű adatrögzítők kiolvasásának és elemzésének végrehajtásakor.

Ajánlott eljárások

A repülési adatrögzítő és a pilótakabin hangrögzítő kiolvasását ugyanabban a létesítményben kell elvégezni, mivel egymást kiegészítő adatokat tartalmaznak, amelyek segítségre lehetnek minden felvétel hitelesítésében és segítenek az idő meghatározásában, illetve a szinkronizálás létrehozásában.

A légijármű adatrögzítőket ne nyissák fel, vagy ne helyezzék áram alá, illetve az eredeti felvételt ne másolják (főleg ne nagysebességű másoló berendezésen) a kiolvasást megelőzően, mert azzal a rögzített adatok sérülését kockáztatják.

Más állam részére légijármű adatrögzítő kiolvasást végző intézmény számára lehetőséget kell biztosítani a zárójelentés véleményezésére annak érdekében, hogy a légijármű adatrögzítő elemzés jellemzői figyelembe legyenek véve.

Légijármű adatrögzítő kiolvasást végző létesítmény részéről esetleg a légijármű gyártó és az üzemeltető szakértelmére lehet szükség, hogy a kalibrációs adatokat hitelesítse és a rögzített információt igazolja.

Kiegészítő igények, vagy megerősítés kérések időbeli teljesítésének érdekében a kivizsgálást lefolytató állam az eredeti felvételeket, vagy azok másolatát a kiolvasó létesítménynél hagyhatja a kivizsgálás lezárásáig, feltéve, hogy a felvételek megőrzéséhez a létesítmény megfelelő biztonsági eljárással rendelkezik.

E MELLÉKLET – JOGI ÚTMUTATÓ A BIZTONSÁGI ADAT GYŰJTŐ ÉS FELDOLGOZÓ RENDSZEREKBŐL SZÁRMAZÓ INFORMÁCIÓ VÉDELMÉHEZ

1. BEVEZETŐ RÉSZ

1.1 A biztonsági információ nem megfelelő felhasználattal szembeni védelme alapvető ezek jövőbeni beszerezhetőségének biztosítása érdekében, tekintve, hogy a biztonsági információk biztonsággal össze nem függő célokra történő használata gátat vethet az ilyen információk jövőbeni beszerezhetősége tekintetében, amely hátrányosan érinti a biztonságot. Az ICAO 35. Közgyűlése ezt a tényt ismerte el, megjegyezve, hogy több állam jelenlegi nemzeti törvényei és szabályozói nem megfelelően foglalkozik a biztonsági információ nem megfelelő használattal szembeni védelmezésének módszerével.

1.2 A jelen Mellékletben található útmutató anyag célja ezért az államok segítése a biztonsági adat gyűjtő és feldolgozó rendszerekből (SDCPS) származó információ védelmét célzó nemzeti törvények és rendeletek beiktatásában, egyúttal megfelelő teret engedve az igazság szolgáltatásnak. A cél a kizárólag repülés biztonság javítás céljából összegyűjtött információ védelmét biztosítani a nem megfelelő használattal szemben.

1.3 Az államok eltérő jogrendszere miatt a jogi útmutató köteles azt a rugalmasságot az államnak megadni, hogy törvényeit és rendeleteit saját nemzeti irányelvei és gyakorlata szerint szövegezhesse meg.

1.4 Ezért, a jelen Mellékletbe foglalt jogi útmutató anyag az államok által rendelkezésre bocsátott törvény és előírás példákból leszűrt elvek sorozatában ölt testet. Az ezen elvekben megfogalmazot irányelvek a biztonsági információ védelmét célzó nemzeti törvényt és rendeletet beiktató állam egyedi igényeinek teljesítése érdekében átvehetők, vagy módosíthatók.

1.5 E Melléklet teljes egészében:

a) *biztonsági információ* – kizárólag repülés biztonsági célból létrehozott és védelmét tekintve az alábbi 3.1 szerinti előírt feltételek alapján minősített SDCPS rendszerekben tárolt információ;

b) *üzemeltető személyzet* – a repülési üzemben érintett és az SDCPS rendszer felé biztonsági információ jelentési pozícióban lévő személy. Az efféle személyzet felöleli, de nem korlátozódik kizárólag a repülőgép személyzetre, a légiforgalmi irányítóra, légiforgalm állomás működtetőre, karbantartó mérnökre, utaskabin személyzetre, repülés diszpécserekre (flight dispatchers) és előtér személyzetre;

c) *nem megfelelő használat* – a biztonsági információnak az összegyűjtés céljával eltérő célra történő használata, nevezetesen, az információ feltárása a nagyközönségnek, vagy az információ használata az üzemeltető

személyzettel szemben folyó fegyelmi, polgári, igazgatási, vagy büntetőjogi eljárásokban;

d) SDCPS jelet feldolgozó és jelentő rendszert, adatbázist, információ csere szisztémát és rögzített információt, magában foglalva:

1) az 5. Fejezetben meghatározottak szerinti baleset és esemény kivizsgálást érintő feljegyzéseket;

2) a 8. Fejezetben meghatározottak szerinti kötelező esemény jelentő rendszereket;

3) a 8. Fejezetben meghatározottak szerinti önkéntes jelentő rendszereket;

4) a 6. Annex I. Rész 3. Fejezetében leírtak szerinti „ön leleplező” jelentő rendszereket, beleértve az automata adat –fogó rendszereket, valamint a manuális adat-fogó rendszereket.

Megjegyzés.- Az ICAO Biztonság Kezelési Kézikönyve (SMM) (Doc 9859) közöl tájékoztatást a biztonsági adat gyűjtő és feldolgozó rendszerekről.

2. ÁLTALÁNOS IRÁNYELVEK

2.1 A biztonsági információ nem megfelelő felhasználattal szembeni védelmének célja az információ jövőbeni beszerezhetőségének biztosítása, ezáltal időbeli és megfelelő megelőző lépések lehetővé tétele és a repülés biztonság javítása.

2.2. A biztonsági információ védelmének nem célja keresztezni az államok megfelelő igazságszolgáltatását.

2.3 A biztonsági információt védelmező nemzeti törvény és előírás biztosítson egyensúlyt a biztonsági információ repülés biztonság javítását célzó védelmezésének szüksége és a megfelelő igazságszolgáltatás szükségessége között.

2.4 A biztonsági információt védelmező nemzeti törvény és előírás akadályozza meg annak nem megfelelő használatát.

2.5 Az állam biztonsággal kapcsolatos felelősségének része védelmet biztosítani a minősített biztonsági információ részére meghatározott feltételek között .

3. VÉDELMEZÉSI IRÁNYELVEK

3.1 A biztonsági információ nem megfelelő használattal szembeni védelemre jogosultsága meghatározott feltételek szerint minősítendő, amely magában foglalja, de szükségszerűn korlátozandó csak a következőkre: az információ begyűjtése kizárólag biztonsági célból történt és az információ feltárás megakadályozná jövőbeni beszerezhetőségét.

3.2 A védelem minden SDCPS esetében legyen egyedi az általa tárolt biztonsági információ jellegének megfelelően.

3.3 A minősített biztonsági információ előírt feltételekkel egyező védelmének biztosítására hivatalos eljárást kell kialakítani.

3.4 A biztonsági információ nem használható begyűjtésének céljától eltérő módon.

3.5 A biztonsági információ csak a nemzeti törvény által biztosított megfelelő óvintézkedések esetén alapján használható fel fegyelmi, polgári, igazgatási, vagy büntetőjogi eljárásokban.

4. KIVÉTELEZÉSI ELVEK

A biztonsági információ védelme alól felmentést a nemzeti törvény, vagy rendelet csak akkor adjon, ha:

a) bizonyték van rá, hogy az esetet -a törvényi értelemben a figyelmetlenséggel, gondatlansággal, vagy szándékos mulasztással egyenértékűnek tekintett - kár okozási szándékkal végrehajtott, vagy a kár keletkezés valószínűségének ismeretében végrehajtott cselekmény okozta;

b) az illetékes hatóság megítélése szerint a körülmények megalapozottan jelzik, hogy az eseményt a figyelmetlenséggel, gondatlansággal, vagy szándékos mulasztással egyenértékű kár okozási szándékkal végrehajtott, vagy a kár keletkezés valószínűségének ismeretében végrehajtott cselekmény okozhatta; vagy

c) illetékes hatóság, tanulmányozást követően határozott, hogy a megfelelő igazságszolgáltatás érdekében a biztonsági információ feltárása fontos és, hogy feltárása bőven ellensúlyozza a feltárás által a biztonsági információk jövőbeli beszerezhetőségére gyakorolt káros belföldi és nemzetközi hatásokat.

5. NYILVÁNOSSÁGRA HOZATAL

5.1 A fentiekben megfogalmazott védelmi és kivételezési elvek függvényében, a biztonsági információt nyilvánosságra hozni szándékozó személy indokolja meg közzétételének okát.

5.2 Hivatalos kritériumokat kell kialakítani a biztonsági információ felfedés tekintetében, amely kritériumok foglalják magukba az alábbiakat, de szükségszerűen ne csak ezekre korlátozódjanak:

a) a biztonsági információ felfedése szükséges a repülés biztonságot veszélyeztető körülmények megszüntetéséhez és/vagy irányelvek és rendeletek megváltoztatásához;

b) a biztonsági információ feltárása nem gátolja –a biztonság javítása érdekében- a biztonsági információk jövőbeli beszerezhetőségét;

c) a biztonsági információba ágyazott, érintett személy személyére vonatkozó információ feltárása az alkalmazandó személyiség jogi törvényekkel egyezésben történik; és

d) a biztonsági információ feltárása azonosítóktól megfosztott, vagy összefoglaló, vagy összesítő formában történik.

6. A BIZTONSÁGI INFORMÁCIÓT ŐRZŐ FELELŐSSÉGE

Minden SDCPS rendelkezzen kijelölt felügyelővel. A biztonsági információ felügyelő felelőssége, hogy a biztonsági információ feltárásával szemben minden lehetséges védelmet alkalmazzon, kivéve:

a) a biztonsági információ felügyelője rendelkezik a az információ szerzőjének a felfedésre vonatkozó hozzájárulásával; vagy

b) a biztonsági információ felügyelője megbizonyosodott felőle, hogy a biztonsági információ felfedése a kivételekre vonatkozó elvekkel összhangban áll.

7. RÖGZÍTETT INFORMÁCIÓ VÉDELME

Figyelembe véve, hogy a törvény által előírt közvetlen munkakörnyezeti adatrögzítés –mint például a pilóta kabin hangrögzítés (CVR)- felfogható az üzemeltető személyzet magán szférájába való behatolásként, amelynek más szakmák nincsenek kitéve:

a) a fentiekben megfogalmazott védelmi és kivételezési elvek függvényében, a nemzeti törvények és előírások a jogszabályban előírt közvetlen munkakörnyezeti adatrögzítés adatait tekintsék különleges védelmet igénylő információnak, azaz fokozott védelmet igénylő információnak; és

b) a nemzeti törvények és rendelkezések az ilyen felvételeknek biztosítsanak nevesített, bizalmasságukra és a nyilvánosság általi hozzáférhetőségükre vonatkozó védelmet. A törvény által előírt munkahelyi felvételek ilyen nevesített védelmi intézkedése lehet egy, a nyilvánosságra hozatalt tiltó rendelet kiadása.

- VÉGE -

ANNEX 14/I.
Repülőterek: Repülőtér tervezés és üzemeltetés

I. kötet 4. kiadás – 2004. július
9. módosítással

A jelen kiadvány magába foglalja a 14. Annex I. kötetének a Tanács részéről 2004. február 28-a előtt elfogadott összes módosítását és 2004. november 25-től hatálytalanítja a 14. Annex I. kötetének összes korábbi kiadásait.
A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságára vonatkozóan lásd az Előszót valamint az 1. Fejezet 1.2 pontját.

Nemzetközi Polgári Légiközlekedési Szervezet

ICAO

A nemzetközi előírások és ajánlott gyakorlati eljárások alkalmazhatóságával kapcsolatosan lásd az Előszót valamint az 1. Fejezet 1.2 pontját.

Módosítások

A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás

száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette
Negyedik kiadás (tartalmazza az 1-6. Módosítást	2004. július 12.	2004. november 25.	
7. módosítás (A Tanács 2005. március 2-án fogadta el)	2005. július 11.	2005. november 24.	2005. július 11. ICAO
8. Módosítás (a Tanács 2005 március 14-én fogadta el)	2006. július 17.	2006. november 23.	
9. módosítás (a Tanács 2006 június 15-én fogadta el)			

Kiegészítés

száma	kiadás időpontja	alkalmazhatóság időpontja	bevezette

14. Annex
I. kötet — Repülőterek

Tartalomjegyzék

A 14. Annex I. kötetében alkalmazott rövidítések és jelzések

Rövidítések

ACN	Légijármű osztályozási szám
aprx	Körülbelül (kb.)
ASDA	Rendelkezésre álló - gyorsításból történő megállási - távolság
ATS	Légiforgalmi Szolgálatok
cd	Gyertyafény(erő) érték
C	Celsius fok
CBR	Kalifornia irány arányérték
CIE	Commission Internationale de l Éclairage
cm	centiméter
DME	Távolságmérő berendezés
ft	láb
IMC	Műszeres időjárási körülmények
K	Kelvin fok
kg	kilogramm
km	kilométer
km/h	kilométer/óra
kt	csomó
l	liter
LDA	Rendelkezésre álló leszállási távolság
m	méter
max.	legnagyobb (maximális)
mnm.	legkisebb (minimális)
mm	milliméter
MN	Meganewton
MPa	Megapascal
NM	tengeri mérföld
NU	nem használható
OCA/H	Akadálymentes tengerszint / földfelszín feletti magasság
OFZ	Akadálymentes zóna
PCN	Burkolat osztályozási szám
RESA	Futópálya végbiztonsági terület
RVR	Futópálya menti látástávolság
TODA	Rendelkezésre álló felszállási távolság
TORA	Rendelkezésre álló felszállási nekifutási távolság
VMC	Látási időjárási körülmények
VOR	Ultra-rövidhullámú rádió irányadó berendezés

Jelölések

°	fok
=	egyenlő
’	ívperc
μ	súrlódási együttható
>	nagyobb, mint
<	kisebb, mint
%	százalék

A jelen Annex előírásaival kapcsolatos kézikönyvek

Repülőtér Tervezési Kézikönyv (Doc 9157)
1. rész - Futópálya
2. rész – Guruló utak, forgalmi előterek és kitérő várakozó helyek
3. rész - Burkolt felületek
4. rész - Látásos segédeszközök és berendezések
5. rész - Elektromos rendszerek
6. rész - Akadályok letörhetősége

Légiforgalmi Tájékoztató Szolgálatok Kézikönyve (DOC 8136)

Repülőtéri Előtervezés Kézikönyve (Doc 9184)
1. rész - Alaptervezés
2. rész - Földterület felhasználás és környezetvédelem
3. rész - Útmutató anyag az építési és szakértői szervezetek részére

Repülőtéri Szolgálatok Kézikönyve (Doc 9137)
1.rész - Tűzoltó és mentő szolgálatok
2. rész - Burkolt felületek állapota
3. rész - Madárveszély és annak csökkentése
5. rész - A mozgásképtelen légijármű eltávolítása
6. rész - Akadályok ellenőrzése és jelölése
7. rész - Repülőtér kényszerhelyzeti illetve vészhelyzeti terv
8. rész - Repülőtér üzemi szolgálatok
9. rész - Repülőtér karbantartási eljárások

Légiforgalmi Szolgálatok Tervezési Kézikönyve (Doc 9426)

Légialkalmassági Kézikönyv (Doc 9760)
I. Kötet - Szervezet és eljárások
II. Kötet - Légialkalmasság engedélyezésének és meghosszabbításnak tervezése

Útmutató a légijármű zajigazgatásának kiegyensúlyozott közelítéséhez (Doc 9829)

Helikopter repülőtér kézikönyv (Doc 9126)

Kiképzési kézikönyv az emberi tényezők figyelembevételéhez (Doc 9683)

A légijármű jégtelenítés/jegesedés-gátlás üzemeltetésének kézikönyve (Doc 9640)

Földfelszíni mozgáseligazító és irányító rendszerek (SMGCS) kézikönyve (Doc 9476)

Repülőtér jogosítási és ellenőrzési kézikönyv (Doc 9774)

Kézikönyv a lézer-sugárzásról és a repülésbiztonságról (Doc 9815)

Kézikönyv az ICAO madárveszély tájékoztatási rendszerről (IBIS) (Doc 9332)

Léginavigációs szolgáltatások eljárásai – Légijármű üzemeltetés (PANS-OPS) (Doc 8168)
I. Kötet - Repülési eljárások
II. Kötet – Látva repülési és műszerrepülési eljárások konstruálása

Léginavigációs szolgálatok eljárásai – Légiforgalom igazgatás (PANS-ATM) (Doc 4444)

Biztonságigazgatási kézikönyv (SSM) (Doc 9859)

STOL Repülőtér kézikönyv (Doc 9150)

A világ földmérési rendszerének – 1984 (WGS-84) - kézikönyve (Doc 9674)

Előszó

Történeti háttér

A repülőterekre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944) 37. cikkelyének rendelkezései alapján 1951 május 29-én fogadta el és foglalta a 14. számú Annex-be. A nemzetközi előírások és ajánlott gyakorlati eljárások a Repülőtéri, Légiútvonal és Földi Segédeszközök Bizottság 1947. szeptemberi harmadik és 1949 novemberi negyedik ülése javaslatai alapján kerültek kidolgozásra.

Az A. táblázat a vonatkozó tárgy és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

A szerződő államok tevékenysége

Az eltérések jelentése

Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi előírásai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlati eljárásokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezenfelül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO előírások és ajánlott gyakorlati eljárások közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele

A jelen Annex-ben ismertetett nemzetközi előírások és ajánlott gyakorlati eljárások alapján biztosított, a légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész minden egyes Annex-ben megtalálható legyen.

Az egyes részek jogállása a következő:

1.— Az Annex anyaga :

a*) Nemzetközi előírások és ajánlott gyakorlati eljárások,* amelyeket az Egyezmény rendelkezései szerint a

Tanács fogad el. Ezek meghatározása a következő:
Előírás vagy Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében, és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlati eljárás: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek, és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) *Függelék:* A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi előírások és ajánlott gyakorlati eljárások szerves részét képezik.

c) *Meghatározások:* A nemzetközi előírások és az ajánlott gyakorlati eljárások ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi előírásnak vagy ajánlott gyakorlati eljárásnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása az előírást befolyásolja.

d) *Táblázatok és ábrák:* Ezek egy nemzetközi előírást vagy ajánlott gyakorlati eljárást egészítenek ki, vagy szemléltetnek, és amelyekre egy adott nemzetközi előírásban vagy ajánlott gyakorlati eljárásban utalnak. A táblázatok és az ábrák az adott nemzetközi előírás vagy ajánlott gyakorlati eljárás részét képezik és jogállásuk ezekkel megegyező.

Megjegyzendő, hogy a jelen Annex egyes előírásai olyan követelményeket is tartalmaznak, melyek jogállása ajánlott gyakorlati eljárás. Az ilyen esetekben a Szerződő Államok az Egyezmény értelmében ezek alkalmazására törekszenek.

2.— *A nemzetközi előírásokkal és az ajánlott gyakorlati eljárásokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:*

a) *Előszó:* Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit, illetve az ezekre vonatkozó magyarázatokat a nemzetközi eljárások és gyakorlati eljárások alkalmazására az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) *Bevezető:* Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) *Megjegyzések:* Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi előírásra vagy ajánlott gyakorlati eljárásra vonatkozóan, azonban nem képezi ezek szerves részét.

d) *Mellékletek:* A nemzetközi előírást és ajánlott gyakorlati eljárást kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et öt nyelven - angolul, arabul, franciául, oroszul és spanyolul fogadták el. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Kérjük, erről értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi előírásokat* vékony álló, az ajánlott gyakorlati eljárásokat vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***"Ajánlás"*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a *"Megjegyzés : "* felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall - kell" kifejezéssel és az ajánlott gyakorlati eljárásokat „should - szükséges" kifejezéssel jelezzük. Mindazonáltal a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI, alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlők és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel - vonatkozik az adott rész minden egyes alpontjára is.

Bevezető		*6. — 10. fejezet*	*(C)*
1. — 4. fejezet	*(A)*	*Függelékek*	*(ATT)*
5. fejezet	*(B)*	*Mellékletek*	*(APP)*

A. táblázat — A 14. Annex I. kötetének módosításai

(módosítás — forrás — tárgy — elfogadva/ hatályos/ alkalmazható)

Első kiadás
Repülőtéri, Légiútvonal és Földi Segédeszközök Bizottság 1947 szeptemberi harmadik és 1949 novemberi negyedik ülése

1951 május 29. 1951 november 1. 1952/1954 június 1.

1-6) Repülőtéri, Légiútvonal és Földi Segédeszközök Bizottság ötödik ülése
Futópályák, leszálló területek, biztonsági területek, végbiztonsági területek, gurulóutak és forgalmi előterek fizikai jellemzői; alagutak, gurulási váró helyek, gurulási forduló helyek és csörlési területek fizikai jellemzői; akadályok eltávolítása és jelölése; a mozgási területek nem használható részeinek megjelölése; kiegészítő tápfeszültség biztosítása; repülőtér helyjel adó; futópálya jelölések; végbiztonsági terület jelölések; megközelítő, bevezető és futópálya fények.

1953 május 20. 1953 szeptember 1. 1955 január 1.

7-13) Repülőtéri, Légiútvonal és Földi Segédeszközök Bizottság hatodik ülése
Futópályák, leszálló területek, biztonsági területek fizikai jellemzői; megközelítési és felszállási területek és felületek; akadályok eltávolítása és jelölése; a mozgási területek nem használható részeinek megjelölése;

futópálya, gurulóút és végbiztonsági terület jelölések; megközelítő, bevezető és futópálya fények; gurulóút világítása; körözési irányfények; tűzoltó és mentő szolgálatok.

1958 május 12. 1958 szeptember 1. 1958 december 1.

14) Külső forrás

Precíziós bevezető fényrendszer

1959 május 7. 1959 október 1. 1959 október 1.

15) Függőleges elkülönítési munkacsoport

Repülés végrehajtás előtti magasságmérő ellenőrzési pont

1959 május 15. 1959 október 1. 1959 október 1.

16-17)) Külső forrás

Tűzoltó anyagok és Repülés végrehajtás előtti magasságmérő ellenőrzési pont

1960 december 2.

18) Léginavigációs bizottság látás utáni segédeszközök munkacsoport első ülése

Látás utáni megközelítési siklópálya rendszer (VASIS)

1961 június 9. 1961 október 1

19) Repülőtéri, Légiútvonal és Földi Segédeszközök Bizottság hetedik ülése

Futópályák, biztonsági sávok, végbiztonsági sávok és területek, gurulóutak és forgalmi előterek fizikai jellemzői; felszállási és megközelítési területek; akadályok meghatározása, eltávolítása és jelölése; szélirány jelző; leszállási irány jelző; repülőtér helyjel adó; futópálya jelölések; bevezető fénysor rendszer; földetérési terület és futópálya középvonal valamint fények; futópálya irányjelzés; tűzoltó és mentő szolgálatok.

1964 március 23. 1964 augusztus 1. 1964 november 1.

20) Léginavigációs bizottság látás utáni segédeszközök munkacsoport második ülése

II. teljesítmény osztályú üzemelés látás utáni segédeszközei

1965 december 13. 1966 április 13 1966 augusztus 25.

21) Negyedik Léginavigációs Konferencia és a Léginavigációs bizottság látás utáni segédeszközök munkacsoport negyedik ülése

Vészhelyzeti világítás; futópálya küszöb jelölések; állandó távolság jelölések; bevezető fényjeladó; gurulóút középvonal fények; kiegészítő elektromos hálózat; repülőtér fények és jelölések karbantartása; látás utáni segédeszközök ellenőrzése.

1967 június 28. 1967 október 27. 1968 február 8.

22) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport és külső forrás

VOR repülőtér ellenőrzési pont meghatározás és jelölés

1968 június 28. 1968 október 28. 1969 szeptember 18.

23) — Ötödik Léginavigációs Konferencia

Kijelölt távolságok; burkolt felület teherbíró képessége; a repülőtér állapotáról szóló tájékoztatások; referencia kód betű kiosztás; kitérő várakozó helyek; futópálya hossz korrekció a lejtviszonyok alapján; futópálya sávok; gurulóút biztonsági távolságok; gurulási várópontok jelölése; bevezető fényrendszer; látás utáni siklópálya jelző rendszer; kiegészítő repülőtér elektromos hálózat; tűzoltó és mentő szolgálatok; madárveszély ellenőrzése és csökkentése.

1971 március 31. 1971 szeptember 6. 1972 január 6.

24) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport ötödik valamint a tűzoltó és mentő munkacsoport első ülése

A mozgási terület nem használható részeinek jelölése; földetérési terület jelölése; II. kategóriás várópontok meghatározása és jelölése; T és A/T VASIS; futópálya szegélyfények; leguruló út középvonal fények; megállító keresztfénysor és akadály jelző fénysor; kényszerhelyzeti megközelítési utak; a fények szín meghatározása.

1971 március 31. 1971 szeptember 6. 1972 január 6.

25) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport

Hosszú törzsű légijárművek látás utáni megközelítés siklópálya jelzőberendezése.

1971 május 26. 1971 szeptember 26. 1972 január 6.

26-27) — A Szervezet 17. ülésszaka, Léginavigációs bizottság látás utáni segédeszközök munkacsoport és a Közel Keleti/Kelet Ázsiai léginavigációs konferencia.

Repülőtér biztonsága; vízi mentő járművek; futópálya középvonal fények szín meghatározása; karbantartó szolgálatok.

1972 március 20. 1972 július 20. 1972 december 7.

28) — Titkárság és Léginavigációs bizottság látás utáni segédeszközök munkacsoport hatodik ülése

A talajon felgyülemlett hó meghatározása; a fényrendszer elemeinek letörhetősége; futópálya középvonal jelölés; fények szín meghatározása.

1972 december 11. 1973 április 11. 1973 augusztus 16.

29-30) — A Tanács tevékenysége a Közgyülés A17-10 és A18-10 határozatainak megfelelően — Nyolcadik Léginavigációs Konferencia és az Annex szerkesztői módosítása

Repülőtér biztonság; futópálya padkák és sávok; futópálya végbiztonsági területek; repülőtér referencia hőmérséklet; biztonsági területek; kitérő várakozó helyek; gurulóútak fizikai jellemzői; gurulóút padkák és sávok; burkolt felület teherbírása; futópálya keresztirányú lejtése; futópálya fékhatás; akadály korlátozási felületek; III. kategóriás futópálya fények és jelölések; gurulóút fények; megállító keresztfénysor; tűzoltó és mentő szolgálatok; a mozgásképtelen légijármű eltávolítása.

1976 február 3. 1976 június 3. 1976 december 30.

31) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport hetedik és a Léginavigációs bizottság akadály mentességi munkacsoport ötödik ülése

Akadály korlátozási felületek; fényintenzitás szabályzása; gurulóút középvonal fények; forgalmi előtér megvilágítása; látás utáni beállító rendszerek; jelölések; látás utáni segédeszközök karbantartása.

1976 december 13. 1977 április 13. 1977 október 6.

32) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport és külső forrás

A letörhetőség meghatározása; az üzemeltetési területek berendezéseinek és létesítményeinek elhelyezése valamint felszerelése; a fények és jelölések szín meghatározása.

1977 december 14. 1978 április 14. 1978 augusztus 10.

33) — Titkárság és külső forrás

Az optikai megközelítési siklópálya jelző rendszerrel kapcsolatos tájékoztatások bejelentése; futópálya, gurulóút és gurulási váró pont jelölések; áthelyezett futópálya küszöb bevezető fénysora; futópálya szegély és középvonal fények; repülőtér kényszerhelyzeti tervezés.

1979 március 26. 1979 július 26. 1979 november 29.

34) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport nyolcadik ülése

Forgalmi előtér jelölések; precíziós bevezető fényrendszer; optikai megközelítési siklópálya jelző rendszerek; körözési fényjelzések; futópálya bevezető villanófények; megállító keresztfénysor; látás utáni beállító rendszerek; légijármű állóhely útbaigazító és azonosító jelzések; akadályok jelölése és kivilágítása.

1979 november 30. 1980 március 30. 1980 november 27.

35) — Titkárság és Léginavigációs bizottság látás utáni segédeszközök munkacsoport

A burkolt felület teherbíró képességének jelentése; optikai megközelítési siklópálya jelző rendszer ; bevezető fényrendszer; fények karbantartása.

1981 március 23. 1981 július 23. 1981 november 26.

36 - 37) — Repülőtér, légi útvonal és földi segédeszközök csoport konferencia (1981) — a Léginavigációs bizottság látás utáni segédeszközök munkacsoport kilencedik ülése — Titkárság

Repülőtér referencia kód; futópálya súrlódási együttható jellemzők; futópálya végbiztonsági területek; gurulóút biztonsági távolságok; gyorsleguruló utak; gurulóútak hidakon; kitérő várakozó helyek; akadály korlátozási felületek; PAPI; gurulási váró pont jelölések és fények; futópálya középvonal irányvezetés; földi látjelek; tűzoltó és mentő szolgálatok; forgalmi előtér szervezés; kijelölt távolságok; a légijárművek földi kiszolgálása; mértékegységek; üzemanyag-feltöltés.

1983 március 29. 1983 július 29. 1983 november 24.

38) — Titkárság és Léginavigációs bizottság látás utáni segédeszközök munkacsoport

Repülőtér adatok; APAPI; leguruló út középvonal fény szín jelölés kódok; megállító keresztfénysor; gurulási váró pont fények; gurulóút szegélyfények; magasban elhelyezett vezetékek megjelölése; a világító tornyok akadály világítása; gurulóút középvonal fények karbantartása; felület jelző színek.

1986 március 17. 1986 július 27. 1986 november 20.

39) — 14. Annex I. kötet első kiadás módosítása — Titkárság — Léginavigációs bizottság látás utáni segédeszközök munkacsoport

1. Az Annex-et két kötetben adják ki: az I. kötet a *Repülőtér tervezés és üzemeltetés*-el foglalkozik a 39. módosítás anyagáig bezárólag és a II. kötet a *Helikopter repülőtér* előírásait ismerteti.

2. Felszállásra használt futópályák; repülőtér referencia kód; a burkolat teherbíró képességének jelentése; futópálya felületi surlódás jellemzői; a mozgási terület feltételei; a párhuzamos futópályák közötti elkülönítés; gurulóút legkisebb elkülönítési távolságok; gurulási váró pont jelölések; PAPI felszerelési határértékek; akadály védelmi felület; megállító keresztfénysor; gurulóút középvonal jelölés; repülőtér biztonsága; a földi mozgás ellenőrzése és irányítása; repülőtér kényszerhelyzeti tervezés; tűzoltó és mentő szolgálatok; karbantartás; futópálya burkolt felület karbantartás és felújítás; madárveszély csökkentése; forgalmi előtér üzemeltetés; fényvisszaverő jelzések és táblák; légiforgalmi földi fények jellemzői.

1990 március 9. 1990 július 30. 1990 november 15.

14. Annex I. kötet — Második kiadás

1) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport tizenkettedik ülése — Titkárság
Letörhető tárgyak meghatározása; precíziós megközelítésű futópályák; utak és út várakozó pontok; futópálya védő fények; gurulási váró pontok; szabványos földrajzi referencia rendszer; rádió magasságmérő üzemeltetési terület; párhuzamos futópályák közötti legkisebb biztonságos távolság; letörhetőség; futópálya és gurulóút jelölések; légiforgalmi jeladók; MLS üzemeltetés kiegészítő fényberendezései; az optikai megközelítési siklópálya jelző rendszer típusok — (A)VASIS és 3 BAR (A)VASIS — megkülönböztetésének törlése; megállító keresztfénysor; futópálya fények; látás utáni beállító rendszer; gurulási irányító jelzések; akadály fények; a korlátozottan igénybe vehető területek látjelei; kiegészítő áramforrás és rendszere; elektromos rendszerek; tűzoltó és mentő szolgálatok; repülőtér tervezés és üzemeltetés; földi mozgások irányítása és ellenőrzése; látjelek karbantartása; légiforgalmi földi fények jellemzői; tájékoztató jelzések elosztása és kialakítása; gurulási tájékoztató jelzések tervezése; nedves futópálya felületi súrlódás jellemzői.

1995 március 13. 1995 július 24. 1995 november 9.

2) — Léginavigációs bizottság

A léginavigációs adatbázisok és függőleges adat összetevők az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) alapján

1997 március 20. 1997 július 21. 1997 november 6.

14. Annex I. kötet — Harmadik kiadás

3) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport tizenharmadik ülése — Titkárság
Meghatározások: repülőtéri forgalom sűrűsége, jégmentesítő és jégtelenítő létesítmény, jégmentesítő és jégtelenítő hely, jégmentesség időtartama, emberi tényezők alapelvei, emberi teljesítőképesség, közbenső várakozó hely, futópálya várakozási hely, jelzések, átkapcsolási idő; új "F" repülőtér vonatkozási kód betű az 1-1. táblázatban; futópálya és gurulóút valamint gurulóutak közötti legkisebb oldaltávolság az "F" kód szerinti repülőgép üzemeltetés esetén; látástávolság; futópálya sáv, futópálya végbiztonsági területek, felszállási biztonsági terület, megállási biztonsági terület, hidakon kialakított gurulóutak, kitérő várakozó helyek, futópálya várakozási helyek, közbenső várakozó helyek és út gurulási váró pontok; jégmentesítő és jégtelenítő létesítmények; "F" repülőtér vonatkozási kód akadálymentességi zóna; futópálya és közbenső várakozó hely jelölések; kötelező utasítást adó jelölések; jégmentesítő és jégtelenítő létesítmény jelölések; megközelítési fényrendszerek; futópálya és gurulóút középvonal fények; megállító keresztfénysor; közbenső várakozási hely és futópálya védőfények; változó tájékoztatást nyújtó jelek; becsatlakozási helynél végrehajtandó felszállás jelzései; az akadályok megjelölésére használt látás utáni segédeszközök; másodlagos (tartalék) áramforrás átkapcsolási idő; biztonsági intézkedések a repülőtér tervezésnél; a nem látás utáni segédeszközök letörhetősége az üzemeltetési területeken; a repülőtér kényszer-helyzeti tervezés és a tűzoltó és mentő szolgálatok tevékenységi tervének kidolgozásánál alkalmazott emberi tényező alapelvek; II. és III. kategóriás precíziós megközelítésű futópályák megelőző karbantartás rendszere; a légiforgalmi földi fények szín fényerő mérése; a nagyintenzítású gurulóút középvonal és futópálya védőfények fényerő diagrammja; a repülőtér karbantartásnál alkalmazott emberi tényező alapelvek; a jelzés átlagos fényerejének mérése; 4. Függelék 4-1. táblázat; 6. Függelék.

1999 március 20. 1999 július 19. 1999. november 4.

4) — Titkárság és a Léginavigációs bizottság akadály mentességi munkacsoport tizenkettedik ülése
Új meghatározások: repülőtér üzemeltetési engedély (jogosítvány), jogosított repülőtér, biztonsági igazgatási rendszer; a repülőterek jogosítványa (működési engedély), akadály korlátozási felületek módosítása; további előírások a repülőtéri kényszer-helyzeti terv valamint a tűzoltó és mentő szolgálatok vonatkozásában.

2001 március 12. 2001 július 16. 2001. november 1.

5) — Titkárság

Lézer-sugárzás mentes légterek (repülésvégrehajtási területek); madárveszély csökkentés; szerkesztői módosítások.

2003 március 7. 2003 július 14. 2003 november 27.

14. Annex I.kötet - Negyedik kiadás

6) — Léginavigációs bizottság látás utáni segédeszközök munkacsoport tizennegyedik ülése és a Titkárság

Meghatározások: futópálya megforduló sáv, futópálya megforduló sáv fizikai jellemzői, jelzései és fényei, naptár, alapadat, Gergely naptár, akadályok, egységes (WGS-84) vonatkozási rendszer, repülőtér méretek és

vonatkozó tájékoztatások, gyors legurulóút jelzőfények, tájékoztató jelzések, megállító keresztfénysorok, futópálya védő (biztosító) fények, a futópálya középvonal és gyors legurulóút fények intenzitása, a magas építmények jelzése és fényei (6-2. ábra), a légiforgalmi létesítmények elektromos tápfeszültség rendszerei, a fényrendszerek felügyelete; 1. Függelék — A légiforgalmi földi fények színei;
2. Függelék — A légiforgalmi földi fények jellemzői; 5. Függelék — A léginavigációs adatok minőségi előírásai.

2004 február 27. 2004 július 12. 2004 november 25.

7) - A Légiforgalmi Környezetvédelmi bizottság hatodik ülése és a Titkárság

Megjegyzés a futópálya várakozóhely meghatározásához; repülőterek működési engedélye; ajánlások a terület használat tervezéséhez és a légijármű zajkezelésének kiegyensúlyozott megközelítéséhez; futópálya megforduló sáv; gurulóutak; madárveszély csökkentése; kerítés; burkolt felületek karbantartása.

2005 március 2. 2005 július 11. 2005 november 24.

8) – Az ICAO Szervezet 35. Ülésszaka; a Léginavigációs Bizottság Akadálymentességi Munkacsoport 14. konferenciája; 11. léginavigációs konferencia

A megszakított leszállás definíciói, biztonsági program és biztonságigazgatási rendszer; akadálymentes zóna.

2006 március 14. 2006 július 17. 2006 november 23.

9) – Titkárság

Feljegyzés a guruló utakon a szegélytől való keréktávolságról.

2006 június 15.

(Szerkesztői megjegyzés: A 14. Annex I. kötet szerkesztési okokból az alábbi oldalszám egységekre van felosztva:

Bevezető		*6. — 10. fejezet*	*(C)*
1. — 4. fejezet	*(A)*	*Függelékek*	*(ATT)*
5. fejezet	*(B)*	*Mellékletek*	*(APP)*

6. – 10. fejezet *(C)*

Függelékek *(ATT)*

Mellékletek *(APP)*

Nemzetközi előírások és ajánlott gyakorlati eljárások

1. fejezet

Általános rész

Bevezető Megjegyzés: A jelen Annex tartalmazza azokat az előírásokat és ajánlott gyakorlati eljárásokat (részletes műszaki előírások), amelyek szabályozzák a repülőterek fizikai jellemzőit, kialakítandó akadály korlátozásai felületeit továbbá ismerteti a repülőtér bizonyos létesítményeit és az ott általában biztosított műszaki szolgáltatásokat. Ezen előírásoknak nem célja a légijármű üzemeltetés korlátozása vagy szabályzása.

A 14. Annex I. kötetében az egyes berendezésekre vagy létesítményekre vonatkozó előírások illetve meghatározások nagymértékben kapcsolódnak a jelen fejezetben ismertetett vonatkozási kód rendszerhez valamint azon futópálya típus meghatározáshoz, amelyen az adott berendezést alkalmazzák. A kifejezések a meghatározások szerint értendők, és ez nem csak leegyszerűsíti a jelen Annex I. kötetének olvasását, hanem amennyiben követik az előírásokat, azok a legtöbb esetben egyértelműen jelzik a repülőtér igénybevételi lehetőségeit is.

A repülőterekre vonatkozó minimális előírásokat a jelenleg üzemelő vagy üzembeállításra tervezett légijármű típus(ok) alapján dolgoztuk ki. Ezért az igényesebb légijármű vonatkozásában esetleg szükséges további biztonsági intézkedéseket nem vettünk figyelembe. Az illetékes hatóság az adott repülőtér vonatkozásában szükség szerint értékelje ki a jellemzőket és vezesse be a szükséges intézkedéseket. A jövőben üzembe állítandó légijárművek egyes lehetséges igényeire vonatkozóan a Repülőtér Tervezési Kézikönyv *(DOC 9157) 2. része tartalmaz útmutatást.*

Megjegyzendő, hogy a II. és III. kategóriás precíziós megközelítésű futópályákra vonatkozó előírások csak azokra a futópályákra alkalmazhatók, amelyeken 3. és 4. osztályozási számú repülőgépek üzemelését tervezik.

A 14. Annex I. kötete nem tartalmaz előírásokat a teljes körű repülőtér tervezésre (mint például elkülönítés, illetve biztonságos távolságok két szomszédos repülőtér között vagy az egyes repülőterek kapacitása), a környezetre gyakorolt hatásra és nem foglalkozik olyan gazdasági vagy nem műszaki tényezőkkel, amelyeket a repülőtér kialakításánál figyelembe kell venni. Ezekre vonatkozóan a Repülőtér Tervezési Kézikönyv *(Doc 9184) I. része tartalmaz útmutatást. A repülőtér fejlesztésével és üzemeltetésével kapcsolatos környezeti szempontok útmutatásait a* Repülőtér Tervezési Kézikönyv *2. része tartalmazza.*

A repülőtér tervezés és üzemeltetés alapvető és szerves része a légiközlekedés biztonsága. A 14. Annex I kötete számos olyan előírást tartalmaz, amelynek célja a repülőtér biztonsági szintjének növelése. A más létesítményekre vonatkozó, azok biztonságát és védelmét érintő előírások a 17. Annex-ben, a részletes útmutatás az ICAO Biztonsági Kézikönyvben található.

1.1 Meghatározások

A jelen Annex szövegében használt kifejezések jelentése a következő:

Accuracy — Pontosság
A mért, vagy becsült, valamint a tényleges érték közötti egyezés mértéke.

Megjegyzés: A mért helyzet adatok esetében a pontosságot rendszerint egy jelzett helyzettől számított távolság értékben fejezik ki és a tényleges helyzet meghatározott pontossággal ezen belülre esik.

Aerodrome — Repülőtér
Szárazföldön, vagy vízfelszínen kijelölt terület (beleértve bármely épületet, létesítményt és berendezést), amely egészében, vagy részben a légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Aerodrome beacon — Repülőtéri helyleadó
Egy repülőtér elhelyezkedésének a levegőből történő megállapítását szolgáló légiforgalmi jeladó.

Aerodrome certificate — Repülőtér üzemeltetési engedély
Az illetékes hatóság részéről az adott repülőtér üzemeltetésére vonatkozó előírások alapján kiadott jogosítvány.

Aerodrome elevation — Repülőtér tengerszinthez viszonyított magassága
A leszállási terület legmagasabb pontjának tengerszinthez viszonyított magassága.

Aerodrome identification sign — Repülőtér azonosító jel
A repülőtéren elhelyezett jelzés, amely a repülőtér levegőből történő azonosítását segíti.

Aerodrome reference point — Repülőtér vonatkozási pont
A repülőtér kijelölt földrajzi helye.

Aerodrome traffic density — Repülőtéri forgalom sűrűsége
Gyenge — Ahol az átlagos egy órás forgalmi időszakban a mozgások óránkénti száma futópályánként 15-nél nem több, vagy összes repülőtéri mozgásonként általában 20-nál kevesebb.
Közepes — Ahol az átlagos egy órás forgalmi időszakban a mozgások óránkénti száma futópályánként 16 és 25 között több, vagy összes repülőtéri mozgásonként általában 20 és 35 között van.
Erős — Ahol az átlagos egy órás forgalmi időszakban a mozgások óránkénti száma futópályánként 26 vagy több, vagy összes repülőtéri mozgásonként általában 35-nél több.
1. Megjegyzés: Az átlagos egy órás forgalmi időszak mozgásainak száma a napi legforgalmasabb óra mozgásainak egy évre kiszámított átlaga lesz.
2. Megjegyzés: Egy felszállás, vagy egy leszállás egy légijármű mozgásnak számít.

Aeronautical beacon — Légiforgalmi jeladó
Minden irányszögből folyamatosan, vagy megszakításokkal látható légiforgalmi földi fény jeladó, amely a földfelszín meghatározott pontjának kijelölésére szolgál.

Aeronautical ground light — Légiforgalmi földi fény
A léginavigáció elősegítésére külön elhelyezett bármely fény, a légijárművön található fények kivételével.

Aeroplane reference field length — Repülőgép vonatkozási futópálya hosszúság
A felszálláshoz szükséges minimális futópálya hosszúság a repülőgép legnagyobb engedélyezett felszálló súlya mellett, tengerszinten, szabvány atmoszféra (nemzetközi műlégkör) viszonyok között, nyugodt levegő

tömegnél és vízszintes (lejtviszony érték nulla) futópálya felület esetében, ahogy azt a légialkalmasságot elbíráló hatóság előírása szerint az adott repülőgép repülés-végrehajtási kézikönyve, vagy más, a repülőgép gyártótól származó egyenértékű adat tartalmazza. A futópálya hosszúság a repülőgépek esetében a kiegyenlített futópálya hosszúság, vagy más esetekben ha ez alkalmazható, a felszállási távolság.

Megjegyzés: Az A. Melléklet 2. szakasza nyújt tájékoztatást a kiegyenlített futópálya hosszúság elméletről. A felszállási távolságokkal kapcsolatos tájékoztatót a Légialkalmassági Műszaki Kézikönyv *(Doc 9760) tartalmazza.*

Aircraft classification number (ACN) — Légijármű osztályozási szám
Egy adott légijármű burkolatra gyakorolt relatív hatását kifejező szám meghatározott szabványos alcsoport figyelembevételével.
Megjegyzés: A légijármű osztályozási szám a súlypont helyzet (CG) alapján a kritikus futóműre nehezedő terhelés alapján kerül kiszámításra. Általában a legnagyobb repülőgép tömeg (legnagyobb súly a forgalmi előtéren) leghátsó súlypont helyzetét használják a szám megállapítására, bár különleges, illetve kivételes esetekben kritikusabb lehet az orrfutóra ható legelső súlypont helyzet.

Aircraft stand — Légijármű állóhely
A forgalmi előtéren a légijármű parkírozására kijelölt terület.

Apron — Forgalmi előtér
A szárazföldi repülőtéren kijelölt terület, amely az utasok, posta, vagy teherárú küldemények be és kirakodására, valamint a légijármű üzemanyaggal történő feltöltésére, parkírozására, vagy karbantartására szolgál.

Apron management service — Forgalmi előtér ügyeleti szolgálat
A forgalmi előtér légijármű és gépjármű forgalmának szabályzására és ellenőrzésére biztosított ügyeleti szolgálat.

Balked landing – Megszakított leszállás
Az akadály elkülönítési magasság (OCA/H) alatt bármely ponton váratlanul nem folytatott leszállási manőver.

Barrette — Kereszt-fénysor (rövid)
Három vagy több, egymáshoz olyan közel elhelyezett légiközlekedési földi fény, hogy azok bizonyos távolságból folyamatos rövid fény-csíknak látszanak.

Calendar — Naptár
Egyedi időmeghatározási rendszer, amely egy napos időtartamon belül pontos időmeghatározási alapot biztosít (ISO 19108 - A jelen fejezet végén az összes ISO szabvány felsorolásra kerül).

Capacitor discharge light — Nagy intenzitású villanófény
Nagy intenzitású, igen rövid felvillanásokat biztosító fény berendezés, amely a zárt gáztöltésű égőben keletkező nagyfeszültségű elektromos kisülés alapján működik.

Certified aerodrome — Jogosított repülőtér
Olyan repülőtér, amelynek üzemeltetője számára repülőtér működési (üzemeltetési) engedélyt adtak ki.

Clearway — Biztonsági felszállási terület
A föld, vagy vízfelszín felett meghatározott, az illetékes hatóság ellenőrzése alatt álló szögletes terület, amelyet úgy választottak, vagy képeztek ki, hogy alkalmas legyen arra, hogy felette egy repülőgép kezdeti meghatározott magasságig tartó emelkedésének egy szakaszát végrehajthassa.

Cyclic Redundancy check (CRC) — CRC matematikai képlet ellenőrzés
Az adatátvitel digitális ellenőrzéséhez és időszakonként történő összevetéséhez használt matematikai algoritmus, amely megfelelő biztonsági szintet nyújt az adat vesztéssel vagy változással szemben[2].

Data quality — Adat minőség
Megbízhatósági fok, vagy szint, amely azt mutatja, hogy a megadott adat pontosság, felbontás és megbízhatóság szempontjából megfelel az adatfelhasználó igényeinek.

Datum — Alapadat
Bármilyen mennyiségi érték vagy értékek, amely más mennyiségek kiszámításának alapjául szolgálhatnak (ISO 19104 – A jelen fejezet végén az összes ISO szabvány felsorolásra kerül).

De-icing/anti-icing facility — Jégmentesítő és jégtelenítő létesítmény
Az a létesítmény, ahol a repülőgépről letisztítják a jeget vagy havat, hogy tiszta felületet biztosítsanak és/vagy ahol a repülőgép tiszta felületeire a felfagyás, a jégkéreg kialakulás, vagy a hó felgyülemlés korlátozott ideig történő megakadályozása érdekében jégtelenítő anyagot hordanak fel.
Megjegyzés: További tájékoztatás a Légijármű földi jégtelenítés és jégmentesítés Kézikönyve (Doc 9640) kiadványban található.

De-icing/anti-icing pad — Jégmentesítő és jégtelenítő hely
A repülőgép parkolására szolgáló belső területből, valamint két, vagy több mozgó jégtelenítő berendezés mozgására alkalmas külső területből álló bármely hely, ahol a jégmentesítő és jégtelenítő kezelést elvégzik.

Declared clearances - Kijelölt távolságok

a) *Rendelkezésre álló felszállási nekifutási távolság (TORA)* — A futópálya azon hosszúsága, amelyet a felszálló repülőgép földi nekifutására alkalmasnak és igénybe vehetőnek nyilvánítanak.

b) *Rendelkezésre álló felszállási távolság (TODA)* — A rendelkezésre álló felszállás nekifutási távolság valamint ha ilyet kijelöltek, a biztonsági felszálló terület együttes hossza.

c) *Rendelkezésre álló gyorsítás-megállási távolság (ASDA)* — A rendelkezésre álló felszállás nekifutási távolság, valamint ha ilyet kijelöltek, a biztonsági megállási terület együttes hossza.

d) *Rendelkezésre álló leszállási távolság (LDA)* — A futópálya azon hosszúsága, amelyet a felszálló repülőgép leszállási utáni földi kigurulására alkalmasnak és igénybe vehetőnek nyilvánítanak.

Dependent parallel approaches — Egymástól függő párhuzamos megközelítések
Párhuzamos vagy közel párhuzamos műszeres futópályákra végrehajtott egyidejű megközelítések, amelyeknél a szomszédos futópályák meghosszabbított középvonalain közeledő légijárművek között radar elkülönítési minimumot írtak elő.

Displaced threshold — Áthelyezett futópálya küszöb
Olyan küszöb, amely nem a futópálya végén helyezkedik el.

Effective intensity — Tényleges intenzitás
Egy villanófény tényleges fényereje, amely azonos megfigyelési körülmények valamint látástávolság mellett az ugyanolyan színű állandó fény berendezés intenzitásának felel meg.

Ellipsoid (geodetic) height — Földmérési ellipszoid magasság
A földméréshez használt matematikai vonatkozási föld modellhez (ellipszoid) viszonyított, a külső határoló ív mentén, az adott ponton mért magasság.

Fixed light — Állandó fény
Egy meghatározott pontból megfigyelve állandó fényerősséggel rendelkező fény berendezés.

Frangible object — Letörhető tárgy
Olyan könnyű tárgy, amely nekiütközéskor letörik, elhajlik vagy kitér és így a legkisebb veszélyt jelenti a légijármű számára.

Megjegyzés: A tárgyak letörhető kialakítására vonatkozó tervezési útmutatás a Repülőtér Tervezési Kézikönyv *(Doc 9157) 6. részében található.*

Geodetic datum — Földmérési alapadat
Egy adott területi vonatkozási rendszer helyének és irányának meghatározásához szükséges jellemző adatok legkisebb mennyisége a földi vonatkozási rendszer (hálózat) alapján.

Geoid — Földalak
A föld gravitációs mezőjének egyenlő ábrázolású felülete, amely egybeesik a földrészekre folyamatosan kiterjedő, egyenletes, természeti tagozódás nélküli, közepes tengerszint feletti magassággal (MSL).

Megjegyzés: A földalak a helyi gravitációs elhajlások és tagozódások (szél okozta ár-apályok, tengervíz sótartalma, tengeráramlások, stb.) miatt ténylegesen nem szabályos.

Geoid undulation — Földalak egyenetlenség (felszíni tagozódás)
A földalak egy pontjának távolsága a földméréshez használt matematikai vonatkozási föld modell (ellipszoid) pontja felett (pozitív) vagy alatt (negatív).

Megjegyzés: A az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) ellipszoid vonatkozásában az egyenetlenség a WGS-84 ellipszoid magasság és a magasságmérés alapján meghatározott magasság különbsége.

Gregorian calendar — Gergely-naptár
Általános használatban levő éves naptár; 1582-ben vették először használatba, egy tropikus évnek a Gyula-naptárnál pontosabb meghatározására (ISO 19108*).

Megjegyzés: A Gergely-naptár szerint egy év tizenkét egymást követő hónapra felosztott 365 napból áll, amely négyévenként 366 napra egészül ki.

Hazard beacon — Veszélyt jelző jeladó
A légiforgalomra veszélyt jelentő akadály megjelölésére alkalmazott légiforgalmi jeladó.

Heliport — Helikopter repülőtér
Olyan repülőtér vagy szerkezeti építmény meghatározott része, amelyet teljes egészében, vagy részben a forgószárnyas légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Holding bay — Kitérő várakozó hely
Olyan meghatározott terület, amelyen a légijármű földi mozgások megkönnyítése és hatékony szervezése érdekében egy légijármű várakozhat vagy kikerülhető.

Holdover time — Jégmentesség időtartama
Az a várható időtartam, amely alatt a jégtelenítő folyadék (kezelés) megakadályozza a fagyás illetve jég kialakulását, vagy a hó felgyülemlését a repülőgép védett (kezelt) felületein.

Human Factors principles — Emberi tényezők alapelvei
A légiközlekedési tervezés, jogosítás, kiképzés, üzemeltetés és karbantartás vonatkozó alapelvei, amelyek célja az emberi teljesítmény és teljesítőképesség tényezőinek tökéletes figyelembevételével biztonságos kapcsolat kialakítása a személyek és a rendszer egyes (műszaki) elemei között.

Human performance — Emberi teljesítmény és teljesítőképesség
Az egyéni emberi képességek és korlátozó tényezők, amelyek hatással vannak a légiközlekedési üzemeltetés biztonságára és hatékonyságára.

Identification beacon — Azonosító jeladó
Kódolt jeleket sugárzó légiforgalmi jeladó, amelyekkel egy adott vonatkozási pont azonosítható.

Independent parallel approaches — Egymástól független párhuzamos megközelítések
Párhuzamos, vagy közel párhuzamos műszeres futópályákra végrehajtott egyidejű megközelítések, amelyeknél a szomszédos futópályák meghosszabbított középvonalain közeledő légjárművek között radar elkülönítési minimumot nem írtak elő.
Independent parallel departures — Egymástól független párhuzamos indulások
Párhuzamos, vagy közel párhuzamos műszeres futópályákra végrehajtott egyidejű indulások.

Instrument runway — Műszeres futópálya
A műszeres megközelítési eljárást alkalmazó légijármű üzemeltetésére az alábbi futópálya típusok használhatók:

a) *Nem precíziós megközelítésű futópálya* — Látás utáni segédeszközökkel és legalább a közvetlen megközelítéshez megfelelő irányvezetést biztosító egyéb berendezéssel felszerelt műszeres futópálya.

b) *I. kategóriás precíziós megközelítésű futópálya* — ILS és / vagy MLS leszállító berendezéssel, valamint látás utáni segédeszközökkel felszerelt műszeres futópálya, amelyet 60 méternél (200 láb) nem alacsonyabb elhatározási magasság, valamint 800 méternél nem alacsonyabb látástávolság vagy, 550 méternél nem kevesebb futópálya menti látástávolság mellett kívánnak üzemeltetni.

c) *II. kategóriás precíziós megközelítésű futópálya* — ILS és / vagy MLS leszállító berendezéssel, valamint látás utáni segédeszközökkel felszerelt műszeres futópálya, amelyet 60 méternél (200 láb) alacsonyabb, azonban 30 méternél (100 láb) nem alacsonyabb elhatározási magasság, valamint 350 méternél nem kevesebb futópálya menti látástávolság mellett kívánnak üzemeltetni.

d) *III. kategóriás precíziós megközelítésű futópálya* — A futópálya megközelítéséhez és annak mentén ILS és / vagy MLS leszállító berendezéssel felszerelt műszeres futópálya:

A — amelyet 30 méternél (100 láb) alacsonyabb elhatározási magasság mellett, vagy elhatározási magasság megállapítása nélkül, valamint 200 méternél nem kevesebb futópálya menti látástávolság mellett kívánnak üzemeltetni.

B — amelyet 15 méternél (50 láb) alacsonyabb elhatározási magasság mellett vagy, elhatározási magasság megállapítása nélkül, valamint kevesebb mint 200 méter, de nem kevesebb mint 50 méter futópálya menti látástávolság mellett kívánnak üzemeltetni.

C — amelyet elhatározási magasság megállapítása, valamint futópálya menti látástávolság korlátozás nélkül kívánnak üzemeltetni.

1. Megjegyzés: A vonatkozó ILS és / vagy MLS előírások a 10. Annex I. kötetében találhatók.

2. Megjegyzés: A látás utáni segédeszközöknek nem kell feltétlenül megfelelniük az egyéb berendezések kategóriáinak. A látás utáni segédeszközök kiválasztását a kívánt légijármű üzemeltetés feltételei és körülményei határozzák meg.

Integrity (aeronautical data) — Megbízhatóság
A léginavigációs adat és értéke(i) megbízhatóságának és pontosságának foka, amely jelzi, hogy az a meghatározás, vagy a jóváhagyott módosítás óta nem változott vagy veszett el.

Intermediate holding position — Közbenső várakozó hely
A forgalom irányítására szolgáló kijelölt hely, amelynél a repülőtéri irányító torony utasításának megfelelően a guruló légijármű és egyéb járművek megállnak és a további gurulásra vonatkozó légiforgalmi irányítói engedélyig várakoznak.

Landing area — Leszállási terület
A mozgási terület azon része, amelyet a légijármű le, vagy felszállására kívánnak igénybe venni.

Landing direction indicator — Leszállási irány jelző
A le és felszállás végrehajtására ténylegesen kijelölt irányt jelző látás utáni segédeszköz.

Laser-beam critical flight zone — Lézer sugárzás szempontjából kritikus légtér (LCFZ)
Egy repülőtér közelében, azonban a lézer sugárzás mentes repülési területen (LFFZ) túl elhelyezkedő légtér, ahol a kisugárzást olyan szintre korlátozzák, hogy az valószínűleg nem okoz vakító hatást.

Laser-beam free flight zone — Lézer sugárzás mentes légtér (LFFZ)
Egy repülőtér közvetlen közelében elhelyezkedő légtér, ahol a kisugárzást olyan szintre korlátozzák, hogy az valószínűleg semmi látásromlást nem okoz.

Laser-beam sensitive flight zone — Lézer sugárzás szempontjából érzékeny légtér (LSFZ)
A lézer sugárzás mentes és érzékeny repülési területeken kívül elhelyezkedő, azokkal nem szükségszerűen határos légtér, ahol a kisugárzást olyan szintre korlátozzák, hogy az valószínűleg nem okoz vakítást, vagy a hirtelen felvillanást követő optikai káprázat utóhatást.

Lighting system reliability — Fényrendszer megbízhatósága
Annak valószínűsége, hogy az egész rendszer a meghatározott tűrési határértékeken belül működik, valamint hogy ez a rendszer gyakorlati szempontból így használható.

Manoeuvring area — Munkaterület
Egy repülőtérnek a légijárművek fel és leszállására, valamint gurulására használandó része a forgalmi előterek kivételével.

Marker — Jelző
A talajszint felett egy akadály megjelölésére, vagy egy határvonal kijelölésére elhelyezett tárgy.

Marking — Jelzés
A mozgási terület felszínén látható jel, vagy jelcsoport, amely légiforgalmi tájékoztatást biztosít.

Movement area — Mozgási terület
Egy repülőtérnek a légijárművek fel és leszállására, valamint gurulására használandó része amely a munkaterületet és a forgalmi előtere(ke)t foglalja magába.

Near-parallel runways — Egymással közel párhuzamos futópályák
Olyan egymást nem keresztező futópályák, amelyek meghosszabbított középvonalai között az összetartás, vagy széttartás 15 fok, vagy kevesebb.

Non-instrument runway — Nem műszeres futópálya
Látás utáni megközelítési eljárásokat alkalmazó légijármű üzemeltetésére használható futópálya.

Normal flight zone — Közönséges légtér (NFZ)
Lézer sugárzás szempontjából kritikus, érzékeny, vagy attól mentes légtérként nem meghatározott repülési terület, amelyet azonban a szem biológiai károsodását okozó lézer sugárzástól védeni kell.

Obstacle — Akadály
Minden olyan rögzített, vagy mozgó (ideiglenes vagy állandó) tárgy, vagy annak része, amely a légijármű mozgásra kijelölt felszíni (talajszint) területeken található, vagy a repülés közben levő légijármű védelmére meghatározott felületen túlnyúlik.

Obstacle free zone (OFZ) — Akadály mentes zóna
A belső megközelítési felület, a belső átmeneti felületek és a megszakított leszállási felület, valamint ezen felületek között levő sáv felett levő légtér, amelybe nem nyúlik be rögzített akadály, kivéve a könnyű és letörhető rögzítéssel ellátott azon tárgyakat, amelyekre léginavigációs célokból szükség van.

Orthometric height — Földmérési magasság
A földalakhoz viszonyított pont rendszerint közepes tengerszint feletti magasságban (MSL) kifejezett magassága.

Pavement classification number (PCN) — Burkolat osztályozási szám
A burkolt felület korlátlan igénybevételű teherbíró-képességét kifejező szám érték.

Precision approach runway — Precíziós megközelítésű futópálya
… lásd a Műszeres futópálya meghatározást.

Primary runway(s) — Elsődleges futópálya(ák)
Más futópályákkal szemben előnyben részesített futópályák, ha ezt a körülmények lehetővé teszik.

Protected flight zones — Védett légterek
Lézer sugárzás káros hatásainak csökkentése szempontjából külön meghatározott légtér(ek).

Road — Út
A mozgási területen kizárólag a gépjármű forgalom részére kijelölt felszíni út.

Road-holding position — Út váró hely
Kijelölt pont, ahol a gépjárművek várakoztathatók.

Runway — Futópálya
Egy szárazföldi repülőtéren meghatározott derékszögű terület, amelyet a légijármű le és felszállására alakítottak ki.

Runway end safety area (RESA) — Futópálya végbiztonsági terület
A futópálya meghosszabbított középvonalára szimmetrikus terület a futópálya sáv végén, amelyet elsősorban a futópálya előtt földtérő, vagy a futópályán túlfutó repülőgép sérülési kockázatának csökkentése érdekében alakítottak ki.

Runway guard lights — Futópálya védő (biztosító) fények
A repülőgépvezetők, vagy a gépjárművezetők figyelmeztetésére kialakított fényrendszer, amely figyelmezteti őket, hogy üzemben levő aktív futópályára történő belépés előtt állnak.

Runway-holding position — Futópálya várakozási hely
A futópálya, egy akadálykorlátozási felület, vagy az ILS/MLS kritikus/érzékeny terület védelmére kijelölt hely, amelynél a guruló légijárműnek és egyéb járműveknek a repülőtéri irányító torony ettől eltérő engedélyének hiányában meg kell állniuk, és várakozniuk kell.

Megjegyzés: A rádió távközlési kifejezésmódban a 'holding point' várakozási pont kifejezést használják a futópálya várakozási hely megnevezésére.

Runway strip — Futópálya sáv
A futópályát és ha ilyet kijelöltek, a biztonsági megállási területet magába foglaló meghatározott terület, amelynek feladata:

a) a futópályáról lefutó légijármű sérülési kockázatának csökkentése; és

b) a terület felett le és felszállás végrehajtása alkalmával átrepülő légijármű védelme.

Runway turn pad — Futópálya forduló szegély
A szárazföldi repülőtéren a futópálya mellett kialakított terület, amelynek célja a futópályán történő 180°-os forduló végrehajtásának biztosítása.

Runway visual range (RVR) — Futópálya menti látástávolság
Az a távolság, ameddig a futópálya középvonalán álló légijármű vezetője látja a futópálya felületi jelöléseket, vagy a futópálya szélét kijelölő illetve középvonalát azonosító fényeket.

Safety programme -- Biztonsági program
A biztonság javítását célzó szabályozások és cselekmények rendszerbefoglalt sorozata.

Safety management system — Biztonságigazgatási rendszer
A biztonság igazgatásának rendszerbefoglalt megközelítése, amely magába foglalja a szükséges szervezeti felépítést, felelősségi köröket, irányelveket és eljárásokat.

Segregated parallel operations — Megosztott párhuzamos üzemelések
Párhuzamos, vagy közel párhuzamos műszeres futópályákon végrehajtott egyidejű üzemeltetés, amely során az egyik futópályát kizárólag megközelítések, a másikat pedig kizárólag az indulások végrehajtására használják.

Shoulder — Padka
A burkolt felület széle mellett levő terület, amely átmenetet képez a burkolat és a szomszédos felület között.

Sign — Jel

a) Állandó tájékoztató jel — Egy tájékoztatást nyújtó jel.

b) Változó tájékoztató jel — Szükség szerint több előre meghatározott tájékoztatás nyújtására alkalmas vagy tájékoztatást nem nyújtó - üres - jel.

Signal area — Jelterület
A repülőtéren a földi látjelek kihelyezésére használt terület.

Slush — Latyak
Vízzel átitatott hóréteg, amely lábbal történő talajra toppantás alkalmával szétfröccsen — fajsúlya 0.5 - 0.8 értékű.

Megjegyzés: A jég, hó és/vagy állóvíz keveredése, különösen eső, havas eső, vagy hó hullásakor 0.8- nál magasabb fajsúly értékű elegyet alkothat. Ezek magas víz, illetve jég tartalmuk miatt átlátszók, azaz vízszerűek és különösen nagyobb fajsúly mellett a latyaktól jól megkülönböztethetők.

Snow — Hó a talajon

a) *Száraz hó* — Olyan lehullott hó, amelynek állaga laza, elfújható és ha kézzel labdává összegyúrják, elengedés után szétesik. Fajsúlya 0.35 értékig (0.35 érték már nem) terjed.

b) *Nedves hó* — Olyan lehullott hó, amely ha kézzel labdává összegyúrják, elengedés után összetapadt marad. Fajsúlya 0.35 - 0.5 közötti értékig (0.5 érték már nem) terjed.

c) *Összenyomott hó* — Olyan lehullott hó, amely ha tömegében összenyomják, egy adott mértéknél jobban már nem tömörül, és elengedés után összetapadva marad, vagy felemelve tömbökre törik. Fajsúlya 0.5 értékű vagy több.

Station declination — Állomás mágneses elhajlás
Egy VOR állomás nulla fokos radiálja és a földrajzi észak közötti, a VOR állomás kalibrálásának időpontjában meghatározott iránykülönbség.

Stopway — Biztonsági megállási terület
A rendelkezésre álló felszállási távolság végén a talajon meghatározott derékszögű terület, amelyet úgy alakítottak ki, hogy azon a légijármű a felszállás megszakítása esetében megállítható legyen.

Switch-over time (light) — Átkapcsolási idő (fény)
Egy adott irányba mért fény tényleges intenzitásának 50 százalékos értékről történő lecsökkenése és 50 százalékos értékre történő ismételt felerősödése között szükséges időtartam a tápfeszültség (áramforrás) váltás alatt, amikor az adott fény-egység 25 százalékos, vagy ennél nagyobb fényerővel üzemel.

Take-off runway — Felszálló futópálya
Kizárólag felszállásra igénybe vett futópálya.

Taxiway — Gurulóút
Egy szárazföldi repülőtéren a légijárművek gurulására kialakított út, amelynek feladata a repülőtér egyes részei közötti összeköttetés biztosítása. A guruló utak közé tartoznak az alábbiak is:

a) *Légijármű állóhely gurulási nyomvonal* — A forgalmi előtér gurulóútként kijelölt része, amelynek kizárólagos feladata a légijármű állóhelyek megközelítésének biztosítása.

b) *Forgalmi előtér gurulóút* — A gurulóút rendszer forgalmi előtéren átvezető része, amelynek feladata a forgalmi előtéren történő átgurulás biztosítása.

c) *Gyors legurulóút* — Egy futópályához hegyes szögben csatlakozó gurulóút, amely lehetővé teszi, hogy a leszállt repülőgépek más legurulásra használható gurulóutakkal szemben nagyobb sebességgel hagyják el a futópályát, ily módon csökkentve annak foglaltsági idejét.

Taxiway intersection — Gurulóút kereszteződés
Két, vagy több gurulóút kereszteződési pontja.

Taxiway strip — Gurulóút biztonsági sáv
A gurulóutat is magába foglaló, az ott üzemelő légijármű védelmére szolgáló terület, amely csökkenti a gurulóútról véletlenül leguruló légijármű sérülésének kockázatát.

Threshold — Küszöb
A futópálya leszállásra használható részének kezdete.
Touchdown zone — Földtérési terület
A futópálya felület küszöbön túl található része, ahol a leszálló repülőgépek először érintik meg a futópályát.

Usability factor — Felhasználhatóság / Igénybevételi tényező
Azon időtartam százalékos értéke, amelyben a futópálya vagy futópálya rendszer használatát a kereszt-szél összetevő érték nem korlátozza.

Megjegyzés: A kereszt-szél összetevő érték a futópálya középvonalához viszonyított megfelelő szögben mérhető talaj szelet jelenti.

1.2 Alkalmazhatóság

1.2.1 Az Annex-ben található egyes előírások értelmezéséből egyértelműen látható, hogy a mérlegelést, a döntéshozatalt, illetve az adott feladat végrehajtását az illetékes hatóságnak kell elvégeznie. Más előírások esetében az illetékes hatóság kifejezés ténylegesen nem szerepel, bár annak tevékenységére ebben az esetben is szükség van. Mindkét esetben bármely szükséges döntésért, vagy feladat végrehajtásért a repülőtér joghatóságát gyakorló állam felelős.

1.2.2 Az előírások, a külön jelölt eltérések kivételével az Egyezmény 15. cikkelye rendelkezései értelmében minden nyilvános repülőtérre vonatkoznak. A 14. Annex I. kötet 3. fejezetében található előírások kizárólag szárazföldi repülőterekre alkalmazandók. A jelen kötet alkalmazható előírásai a helikopter repülőterekre is vonatkoznak, azonban a rövid fel és leszálló pályával rendelkező STOL repülőterekre nem alkalmazhatók.

Megjegyzés: Bár jelenleg nincs külön előírás kötet (Annex) a rövid fel és leszálló pályával rendelkező STOL repülőterekre, de szándékunk szerint ezeket a kidolgozás után felvesszük megfelelő kiadványba. Az átmeneti időszakban az ilyen létesítményre vonatkozóan az STOL Repülőtéri Kézikönyv *(Doc 9150) tartalmaz útmutatást.*

1.2.3 Ahol a jelen Annex-ben valamilyen színt jelzünk, az adott színre az 1. Függelék előírásai vonatkoznak.

1.3 Egységes vonatkozási rendszer

1.3.1 Vízszintes vonatkozási rendszer

Világ Földrajzi Hely Meghatározási Rendszer – 1984: A vízszintes földrajzi vonatkozási rendszerként az egész világon egységesen alkalmazható (WGS-84) földrajzi hely meghatározási rendszert alkalmazzák. A közzétett légiközlekedési (szélességi és hosszúsági) földrajzi koordinátákat a WGS-84 földmérési alapadat szerint határozzák meg.

Megjegyzés: A WGS-84 földrajzi helymeghatározási rendszerre vonatkozó részletes útmutatást az egész világon egységesen alkalmazható Földrajzi Hely Meghatározási Rendszer (WGS-84) Kézikönyv *(Doc 9674) tartalmazza.*

1.3.2 Függőleges vonatkozási rendszer

A függőleges vonatkozási rendszerhez a közepes tengerszint feletti magasság (MSL) alapadatot alkalmazzák, amely föld gravitációs mezőjének egyenlő ábrázolású felületéhez viszonyítva határozható meg.

1. Megjegyzés: A földalak általában egybeesik közepes tengerszint feletti magassággal (MSL). A földalak a föld gravitációs mezőjében megállapított egyenlő ábrázolású felület, amely egybeesik földrészekre folyamatosan kiterjedő, egyenletes, természeti tagozódás nélküli, közepes tengerszint feletti magassággal (MSL).

2. Megjegyzés: A felszíni tagozódással összefüggő magasságokat földmérési magasságnak is nevezik, míg az ellipszoid magasság a vonatkozási föld modellhez viszonyított pontok magassága annak külső határoló íve mentén az adott ponton mért távolságnak felel meg.

1.3.3 Időmeghatározási rendszer

1.3.3.1 Az idő meghatározásához a Gergely-naptárt és az Egyeztetett Világidőt (UTC) használják.

1.3.3.2 Ahol ettől eltérő időmeghatározási rendszert alkalmaznak, ezt a Légiforgalmi Tájékoztató Kiadvány (AIP) Általános rész 2.1.2 pontjában tegyék közzé, lásd Annex 15., 1. Függelék.

1.4 A repülőterek működési engedélye

Megjegyzés: A következő előírások célja egy olyan szabályozási rendszer kialakítása, amelynek alapján hatékonyan biztosítani lehet a jelen Annex-ben található előírások kötelező teljesítését. Elismert tény, hogy az egyes államokban különböző a repülőtér tulajdonviszonyai, üzemeltetése és felügyelete. Az alkalmazható előírások betartásának, illetve kötelező érvényű betartatásnak legjobb és leginkább átlátható módszere a külön biztonsági ellenőrző szervezet, valamint egy jól megtervezett biztonsági felülvizsgálati rendszer kialakítása, amely megfelelő jogi szabályozás segítségével elvégezheti a repülőterek biztonsági ellenőrzésének s felülvizsgálatának feladatait.

1.4.1 2003 november 27-től a nemzetközi üzemeltetésre igénybe vett repülőtereket az államok a megfelelő szabályozó és ellenőrző rendszer keretén belül, a jelen Annex-ben található, valamint más vonatkozó ICAO előírások alapján működési engedéllyel jogosítsák.

1.4.2 ***Ajánlás** — Az államok a nyilvános repülőtereket a megfelelő szabályozó és ellenőrző rendszer keretén belül, a jelen Annex-ben található valamint más vonatkozó ICAO előírások alapján működési engedéllyel jogosítsák.*

1.4.3 A szabályozó és ellenőrző rendszer tartalmazza a repülőtér üzemeltetési jogosítására vonatkozó követelményeket.

Megjegyzés: A szabályozó és ellenőrző rendszerre vonatkozó útmutató a Repülőterek Működési Engedélye Kézikönyvben *található.*

1.4.4 A repülőtér működési engedélyezési eljárása részeként az államok biztosítsák, hogy az engedélyezést/elfogadást kérő a repülőtér jogosítás kiadása előtt benyújtja a repülőtéri kézikönyvet, amely tartalmazza az összes alapvető tájékoztatást a repülőtér helyszínéről, létesítményeiről, felszereléséről, üzemeltetési eljárásairól, szolgáltatásairól, szervezetéről és igazgatási rendszeréről – beleértve a biztonságigazgatási rendszert is.

Megjegyzés: A biztonságigazgatási rendszer szándéka, hogy a repülőtér üzemeltetője a repülőtér biztonságigazgatása tekintetében helyben rendelkezzen szervezett és rendezett megoldással. A repülőtéri biztonságiigazgatási rendszerre vonatkozó útmutató a Biztonságigazgatási Kézikönyvben (SSM) *(Doc 9859) és a* Repülőterek Működési Engedélye Kézikönyvben *(Doc 9774) található.*

1.5 Repülőtér tervezés

1.5.1 Az államoknak létre kell hozniuk biztonsági programot annak érdekében, hogy a repülőtér üzemeltetésben elfogadott biztonsági szintet érjenek el.

1.5.2 Az elérendő elfogadott biztonsági szint(ek)et az érintett állam(ok)nak kell létrehoznia/uk.
Megjegyzés: A biztonsági programokra és az elfogadott biztonsági szintek meghatározására vonatkozó útmutatásokat az Annex 11 E. Függeléke és a Biztonságigazgatási Kézikönyv (SSM) *(Doc 9859) foglalja magában.*

1.5.3 A biztonsági programjuk részeként az államoknak igényelniük kel, hogy egy jogosított repülőtér üzemeltető végezze el az állam által elfogadott biztonságigazgatási rendszer létesítését, amely legkevesebb:

a) azonosítja a biztonsági kockázatokat;
b) biztosítja, hogy a biztonság elfogadott szintjének fenntartásához szükséges helyreállítási intézkedéseket megteszik;
c) gondoskodik az elért biztonsági szint folyamatos figyelemmel kíséréséről és rendszeres értékeléséről; és
d) célul tűzi ki a teljes biztonsági szint folyamatos javítását.

1.5.4. A biztonságigazgatási rendszernek világosan meg kell határoznia a biztonság felelősségi köreit egy jogosított repülőtér üzemeltető útján, beleértve a legfelső vezetés biztonság iránti közvetlen felelősségét.

Megjegyzés: A biztonságigazgatási rendszerekre vonatkozó útmutatást a Biztonságigazgatási Kézikönyv (SSM) *(Doc 9859) és a* Repülőterek Működési Engedélye Kézikönyv *(Doc 9774) tartalmazza.*

1.6 Repülőtér tervezés

1.6.1 A nemzetközi polgári légiközlekedés biztonsági intézkedéseinek legjobb és leghatékonyabb alkalmazásához szükséges építészeti és infrastrukturális követelményeket vegyék figyelembe és teljesítsék az új repülőtér létesítmények tervezésénél és építésénél, illetve a meglévő repülőtéri létesítmények átalakításánál.

Megjegyzés: A repülőtér tervezésre vonatkozó, a biztonsági jellemzőket is figyelembe vevő útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9184) 1. részében található.*

1.6.2 ***Ajánlás* — *Ahol lehet, a repülőterek tervezése során vegyék figyelembe a terület használat és a környezeti ellenőrző vizsgálatokat.***

Megjegyzés: A területhasználat tervezésre és a környezeti ellenőrző vizsgálatokra vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9184) 2. részében található.*

1.7. Repülőtér vonatkozási kód

Bevezető megjegyzés: A repülőtéri vonatkozási kód célja az, hogy egyszerű módszert biztosítson a repülőterek jellemzőire vonatkozó számos előírás összevetéséhez. A kóddal így egyszerű formában jelezni *lehet azokat a repülőtéri létesítményeket és berendezés csoportokat, amelyek megfelelnek a repülőtéren üzemeltetni kívánt repülőgépek igényeinek. A kód azonban nem a futópálya hosszúság, vagy a burkolt felület teherbíró-képesség követelményeinek meghatározására szolgál. A repülőtéri vonatkozási kód a repülőgép teljesítmény jellemzőivel, valamint méreteivel összefüggő két elemből áll. Az 1. számú elem a repülőgép referencia futópálya hosszának, a 2. számú pedig a repülőgép fesztáv és a külső főfutó abroncs távolság alapján került meghatározásra. Egy adott meghatározás a két legmegfelelőbb kód elem kombinációjából, vagy a megfelelőbb kód elem kiválasztásából áll. A tervezési célokra kiválasztott elem kód betű vagy szám azon kritikus repülőgép lényeges jellemzőire vonatkozik, amelyre a létesítmény rendelkezésre áll. A 14. Annex I. kötetének alkalmazása esetén először azokat a repülőgépeket határozzák meg, amelyek a repülőtéren várhatóan üzemelni fognak majd ezt követően válasszák ki a megfelelő két kód elemet.*

1.7.1 A repülőtér tervezési célokra meghatározott vonatkozási kódot — *kód szám és betű* — azon repülőgép típus jellemzői alapján válasszák ki, amely számára a repülőtéri létesítményt tervezték.

1.7.2 A repülőtéri vonatkozási kód szám és betű értelmezése az 1-1. táblázatnak megfelelő legyen.

1.7.3 Az 1. számú elem kód számát az 1-1. táblázat 1. oszlopa alapján határozzák meg azt a számot kiválasztva, amely a leginkább megfelel azon repülőgépek legnagyobb repülőgép referencia futópálya hossz értékének, amelyek kiszolgálására a futópályát tervezték.

Megjegyzés: A repülőgép referencia futópálya hossz érték meghatározása csak a kód szám kiválasztásra szolgál, és nem kívánja befolyásolni az építendő futópálya tényleges hosszát.

1.7.4 A 2. számú elem kód betűt az 1-1. táblázat 3. oszlopa alapján határozzák meg azt a betűt kiválasztva, amely a leginkább megfelel a legnagyobb repülőgép szárny fesztáv értéknek, vagy a legnagyobb külső főfutó kerékabroncs távolságnak — amelyik a nagyobb — azon repülőgépek közül, amelyek számára a létesítményt tervezték.
Megjegyzés: A repülőtér referencia kód meghatározásához az illetékes hatóság számára útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 1. és 2. részeiben található.*

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* ISO szabvány

19104, Földrajzi tájékoztató - Szaknyelv

19108, Földrajzi tájékoztató – Időleges minta

1-1. táblázat

Repülőtér referencia kódok *(lásd 1.7.2 — 1.7.4 pontok)*

1. kód elem

Kód szám (1)	*Repülőgép referencia futópálya hosszúság (2)*
1	kevesebb mint 800 méter
2	800 métertől 1199 méterig
3	1200 métertől 1799 méterig
4	1800 méter és több

2. ***kód elem***

Kód betű (3)	*Szárny fesztáv (4)*	*Külső főfutó kerékabroncs távolság[a] (5)*
A	kevesebb mint 15 méter	kevesebb mint 4.5 méter
B	15.00 métertől 23.99 méterig	4.5 métertől 5.99 méterig
C	24.00 métertől 35.99 méterig	6.00 métertől 8.99 méterig
D	36.00 métertől 51.99 méterig	9.00 métertől 13.99 méterig
E	52.00 métertől 64.99 méterig	9.00 métertől 13.99 méterig
F	65.00 métertől 79.99 méterig	14.00 métertől 15.99 méterig

[a] A főfutó kerékabroncsok külső szélei között mért távolság

Megjegyzés a táblázathoz: A 80 méternél nagyobb szárny fesztávval rendelkező repülőgépekhez történő tervezésre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 1. és 2. részében található*

2. fejezet
Repülőtéri adatok

2.1 Léginavigációs adatok

2.1.1 A repülőtérre vonatkozó léginavigációs adat meghatározását és közzétételét az 5. Függelék 1. — 5. táblázataiban található megbízhatósági és pontossági előírások szerint, a kidolgozott minőség biztosítási eljárások figyelembevételével kell végezni. A léginavigációs adatok pontossága 95 %-os megbízhatósági szintű legyen és ebben a vonatkozásban három típusú helyzet adatot azonosítsanak az alábbiak szerint; földméréssel felmért pontok (például futópálya küszöbök); számított pontok (a térben ténylegesen felmért pontok alapján matematikai számítással meghatározott állandó pontok); kijelölt és közzétett pontok (például repüléstájékoztató körzet határpontok).

Megjegyzés: A minőségi rendszerre vonatkozó előírások a 15. Annex 3. fejezetében találhatók.

2.1.2 A szerződő államok biztosítsák, hogy a léginavigációs adatok megbízhatósága az adatfeldolgozás során, a felméréstől vagy első számítástól a felhasználóig folyamatosan állandó legyen. A léginavigációs adatok megbízhatósági követelményeit az adat felhasználás során lehetséges változás, valamint az adatra vonatkozó felhasználói igényeket jelző kockázati tényező alapján kell meghatározni. Ennek megfelelően a következő osztályozás és adat megbízhatósági szint alkalmazandó:

a) *kritikus adat — megbízhatósági szint* 1×10^{-8}*:* a hibás vagy pontatlan kritikus adat felhasználásánál nagy valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása nagyon veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

b) *alapvető adat — megbízhatósági szint* 1×10^{-5}*:* a hibás vagy pontatlan alapvető adat felhasználásánál csekély valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása nagyon veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

c) *általános felhasználású adat — megbízhatósági szint* 1×10^{-3}*:* a hibás vagy pontatlan általános adat felhasználásánál nagyon csekély valószínűsége van annak, hogy egy légijármű biztonságos repülésének folytatása és a leszállás végrehajtása veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is.

2.1.3 Az elektronikus léginavigációs adat tárolása és átvitele alkalmával azt teljes egészében rendszeres időszakos felülvizsgálattal (*CRC — az egész adatcsoportra kiterjedő rendszeres paritás ellenőrzés a rendszer külső és fogadó pontján*) kell ellenőrizni. A fenti 2.1.2 szerint osztályozott kritikus és alapvető léginavigációs adatok megbízhatóságának a védelméhez 32 illetve 24 bites algoritmust kell használni.

2.1.4 ***Ajánlás** — A fenti 2.1.2 szerint osztályozott általános felhasználású léginavigációs adatok megbízhatóságának a védelméhez 16 bites algoritmust használjanak.*

Megjegyzés: A léginavigációs adat minőségi követelményeket (pontosság, felbontás, megbízhatóság, adatvédelem és eredetvizsgálat) az Egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer 1984 (WGS-84) Kézikönyv (Doc 9674) tartalmazza. Az 5. Függelék léginavigációs adat pontossági és megbízhatósági előírásaira vonatkozó kiegészítő tájékoztatás az RTCA DO-201A és az európai polgári légiközlekedési berendezések EUROCAE ED-77 „A léginavigációs tájékoztatás ipari előírásai” kiadványokban található.

2.1.5 A szélességi és hosszúsági fokokat jelző földrajzi koordinátákat a légiforgalmi tájékoztató szolgálat hatósága a World Geodetic System — 1984 az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) alapadat formátumban határozza meg és tegye közzé, külön kijelölve azokat a földrajzi koordinátákat, amelyeket matematikai módszerrel a fenti WGS-84 alap adattá számoltak át és amelyeknél az eredeti földmérési adatok nem felelnek meg az 5. Függelék A5-1. táblázat előírásainak.

2.1.6 A tényleges földmérési munka pontossága olyan legyen, hogy a kapott üzemeltetési navigációs adatok legnagyobb eltérései, figyelembe véve az adott koordináta rendszer jellegét, a repülés végrehajtásának szakaszaiban az 5. Függelék táblázataiban jelzett értékeken belül legyenek.

2.1.7 A repülőterek meghatározott földméréssel felmért földi pontjainak közepes tengerszint feletti magassága mellett határozzák meg és a léginavigációs tájékoztató szolgálat hatósága számára jelentsék az 5. Függelékben jelzett pontok (a WGS-84 ellipszoidhoz viszonyított) felszíni egyenetlenségét (tagozódás) is.

1. Megjegyzés: A megfelelő alkalmas koordináta rendszer az, amely lehetővé teszi az adott repülőtér minden szükséges földrajzi adatának WGS-84 alapján történő felmérését.

2. Megjegyzés: A WGS-84 koordináta rendszer alapján meghatározott koordináták közzétételével kapcsolatos előírásokat a 4. Annex 2. fejezete és a 15. Annex 3. fejezete tartalmazza.

2.2 Repülőtér vonatkozási pont

2.2.1 Minden repülőtéren jelöljenek ki repülőtér vonatkozási pontot.

2.2.2 A repülőtér vonatkozási pont a repülőtér tervezett, vagy első mértani középpontja közelében helyezkedjen el és általában ott is maradjon.

2.2.3 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben és másodpercben adják meg a repülőtér vonatkozási pont földrajzi koordinátáit.

2.3 Repülőtér és futópálya tengerszint feletti magassága

2.3.1 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fél-méter, vagy láb pontossággal adják meg a repülőtér tengerszint feletti magasságát, valamint a földalakhoz4 viszonyított felszíni tagozódását.

2.3.2 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fél-méter, vagy láb pontossággal adják meg a nemzetközi polgári légiközlekedésben nem-precíziós megközelítéssel igénybe vett repülőtér minden egyes futópálya küszöbe, a futópálya mentén levő bármely jelentős magas vagy alacsony pontja és a futópálya vége tengerszint feletti magasságát, valamint a földalakhoz viszonyított felszíni tagozódását.

2.3.3 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára egy-negyed méter, vagy láb pontossággal adják meg a precíziós megközelítéssel igénybe vett futópálya küszöbe, a futópálya vége, valamint a földetérési terület legnagyobb temgerszint feletti magasságát, valamint a földalakhoz viszonyított felszíni tagozódását.

Megjegyzés: A földalakhoz viszonyított felszíni tagozódást az alkalmazott koordináta rendszernek megfelelő módon kell mérni.

2.4 Repülőtér vonatkozási hőmérséklet

2.4.1 A repülőtér vonatkozási hőmérsékletét Celsius fok értékben kell meghatározni.

2.4.2 ***Ajánlás** — A repülőtér vonatkozási hőmérséklete az év legmelegebb hónapja napi legmagasabb hőmérsékleteinek havi átlagos értéke legyen. A legmelegebb hónap az a hónap, amelynek havi átlag hőmérséklete a legmagasabb. A vonatkozási hőmérséklet megállapítása alkalmával több év átlagát vegyék figyelembe.*

2.5 A repülőtér méretei és a kapcsolódó tájékoztatások

2.5.1 A repülőtéren biztosított minden egyes létesítmény és szerkezeti egység következő adatait mérjék meg, vagy tegyék közzé:

a) futópálya — tényleges földrajzi irányszög egy-század fok értékben, futópálya irány jelzőszám, a legközelebbi egész méter, vagy láb értékre kerekített hosszúság, szélesség, valamint áthelyezett küszöb helye, lejtviszonyok, burkolt felület típus, futópálya típusa, továbbá az I. kategóriás precíziós megközelítésű futópálya esetében az akadálymentes zóna, ha ilyet kijelöltek;

b) futópálya sáv, futópálya végbiztonsági terület, futópálya biztonsági megállási terület —, a legközelebbi egész méterre, vagy lábra kerekített hosszúság és szélesség, burkolt felület típus;

c) gurulóút — megjelölés, szélesség, burkolt felület típus;

d) forgalmi előtér — burkolt felület típus, légijármű állóhelyek;

e) a légiforgalmi irányító szolgálat határai;

f) biztonsági felszálló terület — a legközelebbi egész méterre, vagy lábra felkerekített hosszúság, talaj profil;

g) a megközelítési eljárások látás utáni segédeszközei, a futópályák, gurulóutak és forgalmi előterek jelölése és fényei, a gurulóutak és forgalmi előterek egyéb látás utáni tájékoztató és irányító segédeszközei, beleértve a gurulási váró helyeket és a megállító kereszt-fénysorokat, valamint a látás utáni beállító rendszerek típusát és helyét;

h) bármely repülőtéri VOR ellenőrzési pont elhelyezkedése és frekvenciája;

i) a kijelölt szabványos gurulási útvonalak elhelyezkedése és megjelölése; és

j) a műszeres leszállító rendszer (ILS) részét képező iránysáv és siklópálya adó, vagy a mikrohullámú leszállító rendszer (MLS) részét képező oldalszög és magasság adó antenna a legközelebbi egész méterre vagy lábra kerekített távolsága a megfelelő futópálya végektől.

2.5.2 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg repülőtér minden egyes futópálya küszöbének földrajzi koordinátáit.

2.5.3 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg a megfelelő gurulóút középvonal pontok földrajzi koordinátáit.

2.5.4 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg minden egyes légijármű állóhely földrajzi koordinátáit.

2.5.5 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és tized-másodpercben adják meg a 2. területen (a repülőtér határain belül) valamint a 3. területen belül levő jelentős akadályok földrajzi koordinátáit. Ezen kívül a légiforgalmi tájékoztató szolgálat hatósága számára adják meg az akadályok legnagyobb magasságát, típusát, jelölését és kivilágítását (ha van).

1. Megjegyzés: A 2. és 3. területeken elhelyezkedő akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és követelményrendszer grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 2. és 3. területeken elhelyezkedő akadály adatok meghatározásának előírásait a jelen Annex 1. Függeléke tartalmazza.

3. Megjegyzés: A 15. Annex 10.6.1.2 pontjának 2010 november 18-i bevezetését, amely a 2. és 3. területek akadály adatainak előírás szerinti rendelkezésre bocsátására vonatkozik, megkönnyíti az ilyen adatok megfelelő előzetes tervezés alapján történő összegyűjtése és feldolgozása.

2.6 A burkolt felületek teherbíró-képessége

2.6.1 Határozzák meg a burkolatok teherbíró-képességét.

2.6.2 Az 5700 kg. súlynál (tömeg) nehezebb légijárművek kiszolgálására létesített forgalmi előtér (rakodóhely) burkolt felületének teherbíró-képességét a légijármű osztályozási szám — burkolat osztályozási szám (ACN-PCN) módszerrel, az összes alábbi tájékoztatás megadásával tegyék közzé:

a) burkolat osztályozási szám (PCN);

b) burkolt felület típusa az ACN-PCN meghatározáshoz;

c) alapzat teherbíró-képesség;

d) legnagyobb engedélyezett gumiabroncs nyomás kategória, vagy nyomás érték; és

d) kiértékelési módszer.

Megjegyzés: Amennyiben szükséges, a burkolat osztályozási szám (PCN) értékek egy-tizedes pontossággal adhatók meg.

2.6.3 A közzétett burkolat osztályozási szám (PCN) azt jelzi, hogy az ennek megfelelő, vagy ennél alacsonyabb légijármű osztályozási számmal (ACN) rendelkező légijármű az adott burkolaton bármely gumiabroncs nyomás, vagy repülőgép teljes felszálló-súly korlátozás betartása mellett üzemelhet.

Megjegyzés: Amennyiben a burkolt felület teherbíró-képességét az évszakok jelentős mértékben befolyásolják, különböző PCN értékeket tehetnek közzé.

2.6.4 A légijármű osztályozási számot az ACN-PCN módszerhez tartozó szabványos számítási eljárások segítségével határozzák meg.

Megjegyzés: A légijármű osztályozási szám meghatározásának szabványos módszereit a Repülőtér Tervezési Kézikönyv 3. része tartalmazza. A gyakorlati felhasználhatóság megkönnyítése érdekében a merev és rugalmas burkolatok vonatkozásában az alábbi 2.6.6 b) alpont négy osztályozási csoportja figyelembevételével számos jelenleg forgalomban levő légijármű típust értékeltek ki. Az eredményeket táblázatos formában a fenti kézikönyv tartalmazza.

2.6.5 Az ACN meghatározása szempontjából a burkolt felület „viselkedését" merev, vagy rugalmas szerkezetűnek kell osztályozni.

2.6.6 A burkolat típus ismertetését az ACN-PCN meghatározásához, a teherbíró-képesség szerinti osztályozási csoportokat, a legnagyobb engedélyezett gumiabroncs nyomás kategóriát vagy nyomás értéket, illetve a kiértékelési módszert a következő kódok felhasználásával tegyék közzé:

a) burkolat típus az ACN-PCN meghatározásához:
merev burkolt felület R *kód*
rugalmas burkolt felület F *kód*

Megjegyzés: Amennyiben a tényleges építési anyag összetett, vagy nem szabványos, ezt külön megjegyzésben jelezzék (lásd a lenti 2. példát).

b) *Teherbíró-képesség szerinti osztályozási csoportok:*

Magas teherbíró-képesség — A *kód* — 150 MN/m^3 K érték jellemzi és a merev burkolat esetében az összes K érték ténylegesen mindig magasabb mint 120 MN/m^3. A rugalmas burkolat esetében a CBR érték = 15 és az összes CBR érték ténylegesen mindig magasabb mint 13.

Közepes teherbíró-képesség — B *kód* — 80 MN/m^3 K érték jellemzi, ami a merev burkolat esetében 60 — 120 MN/m^3 K értéket jelent. A rugalmas burkolat esetén a CBR érték = 10, ami ténylegesen 8 — 13 közötti értéket jelent.

Alacsony teherbíró-képesség — C *kód* — 40 MN/m^3 K érték jellemzi, ami a merev burkolat esetében 25 — 60 MN/m^3 K értéket jelent. A rugalmas burkolat esetén a CBR érték = 6, ami ténylegesen 4 — 8 közötti értéket jelent.

Nagyon alacsony teherbíró-képesség —D *kód* — 20 MN/m^3 K érték jellemzi, ami a merev burkolat esetében mindig 25 MN/m^3 alatti K értéket jelent. A rugalmas burkolat esetén a CBR érték = 3, ami ténylegesen mindig 4 alatti értéket jelent.

c) *Legnagyobb engedélyezett gumiabroncs nyomás kategória:*

Magas — W *kód* — nincs nyomás korlátozás;

Közepes — X *kód* — nyomás korlátozás 1.50 MPa értékre;

Alacsony — Y *kód* — nyomás korlátozás 1.00 MPa értékre;

Nagyon alacsony — Z *kód* — nyomás korlátozás 0.50 MPa értékre.

d) *Kiértékelési módszer:*

Műszaki értékelés — T *kód* — a burkolat jellemzőinek egyedi vizsgálata, valamint a burkolt felület „viselkedésének" elemzése.

Légijármű tapasztalat felhasználása — U *kód* — annak tapasztalati ismerete, hogy az adott burkolt felület rendszeres használat mellett elbírt egy adott típusú és tömegű légijárművet.

Megjegyzés: Az alábbi példák bemutatják az ACN-PCN módszerrel közzétett burkolat teherbíró-képesség tájékoztatást.

1. példa — Ha a közepes teherbíró-képességű alapzaton kialakított merev burkolat teherbíró-képességét műszaki értékelés segítségével PCN 80-ban állapították meg és gumiabroncs nyomás korlátozást nem határoztak meg, a tájékoztatás a következő formátumban kerül kiadásra:
PCN 80 / R / B / W / T

2. példa — Ha a különböző nem szabványos anyagokból kialakított, rugalmas tulajdonságokat mutató, igen magas teherbíró-képességű alapzaton kialakított burkolat teherbíró-képességét légijármű tapasztalat felhasználásával PCN 50-ben állapították meg és az engedélyezett legnagyobb gumiabroncs nyomás 1.00 MPa, a tájékoztatás a következő formátumban kerül kiadásra:
PCN 50 / F / A / Y / U

Megjegyzés: Összetett burkolat szerkezet.

3. példa — Ha a közepes teherbíró-képességű alapzaton kialakított rugalmas burkolat teherbíró-képességét műszaki értékelés segítségével PCN 40-ben állapították meg és az engedélyezett legnagyobb gumiabroncs nyomás 0.80 MPa, a tájékoztatás a következő formátumban kerül kiadásra:
PCN 40 / F / B / 0.80 MPa / T

4. példa — Ha a burkolatra Boeing 747-400 típusú repülőgép 390 000 kg. legnagyobb felszálló súly korlátozást állapítottak meg, a tájékoztatás tartalmazza a következő megjegyzést:

Megjegyzés: A megadott PCN érték B747-400 típus 390 000 kg. legnagyobb felszálló súly korlátozás alá tartozik.

2.6.7 ***Ajánlás*** — *Határozzanak meg követelmény rendszert a burkolat olyan légijármű által történő igénybevételére, amelynek ACN értéke magasabb, mint a burkolatra a 2.6.2 és 2.6.3 pontok alapján meghatározott PCN érték.*

Megjegyzés: Az A. melléklet 19. részében egyszerű módszert ismertetünk a túlterhelés és határainak megfelelő szabályozására és a Repülőtér Tervezési Kézikönyv 3. része tartalmazza a burkolatok értékelésének, valamint a korlátozott túlterheléssel történő igénybevételének részletes ismertetését.

2.6.8 Az 5700 kg. súlyú (tömeg), vagy ennél könnyebb légijárművek kiszolgálására létesített forgalmi előtér (rakodóhely) burkolt felületének teherbíró-képességét a következő tájékoztatások megadásával tegyék közzé:

a) legnagyobb engedélyezett légijármű súly (tömeg); és

b) legnagyobb engedélyezett gumiabroncs nyomás kategória.

Például: 4000 kg / 0.50 MPa.

2.7 Repülés előtti magasságmérő ellenőrzési hely

2.7.1 A repülőtéren létesítsenek egy, vagy több repülés előtti magasságmérő ellenőrzési helyet.

2.7.2 ***Ajánlás — A repülés előtti magasságmérő ellenőrzési helyet a forgalmi előtéren jelöljék ki.***

1. Megjegyzés: A forgalmi előtéren kijelölt repülés előtti magasságmérő ellenőrzési hely lehetővé teszi a légijármű magasságmérő ellenőrzését a gurulási engedély beszerzése előtt és ezzel kiküszöbölhető az ilyen célú megállás szükségessége a forgalmi előtér elhagyása után.

2. Megjegyzés: Általában a teljes forgalmi előtér alkalmas lehet a megfelelő repülés előtti magasságmérő ellenőrzési hely kijelölésére.

2.7.3 A repülés előtti magasságmérő ellenőrzési hely tengerszint feletti magasságát a legközelebbi méterre, vagy lábra kerekítve azon terület átlagos magasság értékében határozzák meg, ahol az elhelyezkedik. A repülés előtti magasságmérő ellenőrzési hely bármely részének tengerszint feletti magassága az adott hely átlagos magassága 3 méteres (10 láb) értékén belül kell, hogy legyen.

2.8 Kijelölt távolságok

A nemzetközi kereskedelmi légiszállításban igénybe vett futópálya vonatkozásában a legközelebbi méterre, vagy lábra kerekítve a következő távolságokat határozzák meg:

a) rendelkezésre álló felszállási nekifutási távolság;

b) rendelkezésre álló felszállási távolság;

c) rendelkezésre álló gyorsításból történő megállási távolság; és

d) rendelkezésre álló leszállási távolság.

Megjegyzés: A kijelölt távolságok kiszámításához az A. Melléklet 3. szakasza tartalmaz útmutatást.

2.9 A mozgási terület és a csatlakozó létesítmények állapota

2.9.1 Az illetékes légiforgalmi tájékoztató szolgálati egységeket tájékoztassák mozgási területek állapotáról, valamint a csatlakozó létesítmények üzemeltetési körülményeiről — azaz az igénybevétel lehetőségeiről és feltételeiről — és ezeket az üzemeltetési szempontból lényeges tájékoztatásokat adják meg a légiforgalmi szolgálati egységeknek is, hogy azok szükség szerint tájékoztatni tudják az érkező és induló légijárműveket. A tájékoztatás mindig időszerű legyen és késedelem nélkül jelentsék a körülményekben beállott bármely változást.

2.9.2 Kísérjék figyelemmel a mozgási területek jellemzőit, valamint a csatlakozó létesítmények üzemeltetési állapotát és jelentsék az üzemeltetési szempontból jelentős, vagy a légijármű teljesítményét befolyásoló tényezőket, különös tekintettel az alábbiakra:

a) építési vagy karbantartási munkálatok;

b) a futópálya, gurulóút, vagy forgalmi előtér rész burkolt felületén sérülés vagy (ki)törés van;

c) a futópálya, gurulóút, vagy forgalmi előtér felületén hó, latyak vagy jég van;

d) a futópálya, gurulóút, vagy forgalmi előtér felületén víz van;

e) a futópálya, gurulóút, vagy forgalmi előtér mellett hópadok, hó gerincek, vagy víz-folyás van;

f) a futópálya, vagy gurulóút felületén jégtelenítő, vagy jégoldó kémiai anyagok vannak;

g) egyéb ideiglenes veszélyek, beleértve a parkírozó légijárműveket is;

h) a repülőtér látás utáni segédeszközeinek teljes, vagy részleges meghibásodása, illetve rendszertelen működése következett be; és

i) az elsődleges fő, vagy a tartalék tápfeszültség rendszer meghibásodása következett be.

2.9.3 ***Ajánlás** — A 2.9.1 és 2.9.2 pontok előírásainak teljesítése megkönnyítése érdekében a mozgási terület ellenőrzését az 1. és 2. kód jelzésű repülőtereken minden nap legalább egyszer, illetve a 3. és 4. kód jelzésű repülőtereken legalább kétszer végezzék el.*

Megjegyzés: A mozgási terület napi ellenőrzéseinek végrehajtására vonatkozó tájékoztatás a Repülőtér Szolgálati Kézikönyv *8. részében valamint a* Földi mozgás irányító és ellenőrző rendszerek Kézikönyvében *(SMGCS) található.*

Víz a futópályán

2.9.4 ***Ajánlás** — Ha a futópályán víz van, a futópálya teljes szélességének középső felén belül levő felület állapotának ismertetését, beleértve a vízmélység becsült értékét — ahol lehetséges — a következő kifejezések segítségével tegyék közzé:*
DAMP (nyirkos) — A felület színe a nedvesség hatására megváltozik.
WET (nedves) — A felület észrevehetően nedves, vizes, azonban állóvíz nincs rajta.
WATER PATCHES (vízfoltok) — A felületen jelentős állóvíz foltok láthatók.
FLOODED (elárasztva) — A felületen nagy kiterjedésű állóvíz látható.

2.9.5 Adjanak ki tájékoztatást abban az esetben, ha a futópálya, vagy annak egy része nedves állapotban síkos lehet.

2.9.6 A futópálya, vagy annak egy része nedves állapotban síkosnak minősítendő, ha a 10.2.3 pontban előírt, folyamatos mérést végző berendezéssel végrehajtott mérések szerint a futópálya felületi súrlódás jellemzői az állam által meghatározott legalacsonyabb súrlódás szint alatt vannak.

Megjegyzés: A legalacsonyabb futópálya felületi súrlódás szint meghatározására és közzétételére vonatkozó tájékoztatás az A. Melléklet 7. szakaszában található.

2.9.7 Tegyék közzé az állam által a síkos futópálya állapot jelentésére meghatározott legalacsonyabb súrlódás szint értékét és a felhasznált súrlódási együttható mérőberendezés típusát is.

2.9.8 ***Ajánlás*** *— Amennyiben szokatlan időjárási körülmények miatt a futópálya várhatóan síkos lesz, végezzenek további méréseket akkor, amikor ezek a körülmények ténylegesen bekövetkeznek. Ennek célja, hogy amennyiben ezek a további mérések azt mutatják, hogy a futópálya, vagy annak egy része síkossá vált, a futópálya felületi súrlódás jellemzőkről szóló megfelelő tájékoztatás az illetékes egységek rendelkezésére álljon.*

Hó, latyak vagy jég a futópályán

1. Megjegyzés: A jelen ajánlások célja a 15. Annex SNOWTAM és NOTAM kiadványokra és ezek szétosztására vonatkozó előírásainak teljesítése.

2. Megjegyzés: Futópálya felület állapot érzékelők használhatók a futópálya tényleges és várható állapotának érzékelésére és folyamatos megjelenítésére. Az érzékelő tájékoztatást, valamint előrejelzést nyújthat olyan futópálya felületi körülményekről, mint például a nedvesség jelenléte, vagy a jégképződés.

2.9.9 ***Ajánlás*** *— Amikor a futópálya hóval, latyakkal vagy jéggel borított és nem volt lehetséges a csapadék szennyeződés teljes eltávolítása, mérjék fel a futópálya állapotát és jelentsék a mért súrlódási együttható értéket.*

Megjegyzés: A hóval és jéggel borított burkolt felületek súrlódási jellemzőinek meghatározására és jelentésére vonatkozó tájékoztatás az A. Melléklet 6. szakaszában található.

2.9.10 ***Ajánlás*** *— A hóval, latyakkal, vagy jéggel borított burkolt felületek súrlódásmérő berendezéssel történő mérésének adatai megfelelően egyezzenek legalább egy másik ilyen berendezés mért adataival.*

Megjegyzés: A légijármű gumiabroncs ténylegesen tapasztalt súrlódásának megfelelő futópálya felületi súrlódás mérés elsődleges célja a tapasztalati eredmény olyan módon történő meghatározása, amelynél közvetlen összefüggés van a súrlódás mérő berendezés és a légijármű fékezési teljesítménye között.

2.9.11 ***Ajánlás*** *— Ha a futópályán száraz hó, nedves hó, vagy latyak van, a futópálya minden egyes harmadában mérhető átlagos mélységet körülbelül a következő pontossággal határozzák meg: száraz hó — 2 cm; nedves hó — 1 cm; latyak — 0.3 cm.*

2.10 A mozgásképtelen légijármű eltávolítása

Megjegyzés: A mozgásképtelen légijármű eltávolítását végző szolgálatokra vonatkozó tájékoztatás a 9.3 pontban található.

2.10.1 ***Ajánlás*** *— A mozgásképtelen légijármű mozgási területről, vagy annak közeléből történő eltávolítását koordináló repülőtéri iroda telefon és telex számait kérésre adják meg a légijárművek üzemeltetői részére.*

2.10.2 ***Ajánlás*** *— A mozgásképtelen légijármű mozgási területről, vagy annak közeléből történő eltávolításának lehetőségét illetve az erre történő felkészültséget megfelelő formában tegyék közzé.*

Megjegyzés: A mozgásképtelen légijármű eltávolításának lehetőségét azon legnagyobb légijármű típus megjelölésével tegyék közzé, amelynek eltávolítására a repülőtér alkalmas felszereléssel rendelkezik.

2.11 Tűzoltó és mentő szolgálatok

Megjegyzés: A tűzoltó és mentő szolgálatokra vonatkozó tájékoztatás a 9.2 pontban található.

2.11.1 Tegyenek közzé megfelelő tájékoztatást a repülőtéren a légijárművek védelmére biztosított tűzoltó és mentő szolgálatok szintjéről.

2.11.2 ***Ajánlás** — A repülőtéren általában rendelkezésre álló védelem szintjét a 9.2 pontban ismertetettek alapján, a repülőtéren rendszerint rendelkezésre álló tűzoltó anyagok típusa, valamint mennyisége figyelembevételével tűzoltó és mentő szolgálati kategóriában fejezzék ki.*

2.11.3 A repülőtéren általában rendelkezésre álló tűzoltó és mentő szolgálatok védelmi szintjének jelentős változásairól tájékoztassák az illetékes légiforgalmi szolgálati és légiforgalmi tájékoztató egységeket, hogy azok tájékoztatni tudják az érkező és induló légijárműveket. Amikor a változás hatályát veszti, erről a fenti egységek számára hasonló módon adjanak tájékoztatást.

Megjegyzés: A védelmi szint jelentős változásának tekinthető repülőtéren általában rendelkezésre álló tűzoltó és mentő szolgálatok kategóriájának változása, amely a rendelkezésre álló tűzoltó anyagok, ezek felhasználására szolgáló berendezések és felszerelések mennyiségének, vagy a feladatokat végző személyek számának módosulása miatt következik be.

2.11.4 ***Ajánlás** — A jelentős változást a repülőtéren rendelkezésre álló új tűzoltó és mentő szolgálati kategóriában fejezzék ki.*

2.12 Látás utáni megközelítési siklópálya jelző rendszerek

A látás utáni megközelítési siklópálya jelző rendszerekre vonatkozóan a következő tájékoztatásokat tegyék közzé:

a) a megfelelő futópálya azonosító jelző szám;

b) az 5.3.5.2 pont alapján meghatározott rendszer típus. Az AT-VASIS, PAPI vagy APAPI rendszerek esetében jelezzék, hogy azok fényelemeit a futópálya melyik oldalán, azaz a bal, vagy a jobb oldalon helyezték el;

c) ahol a rendszer tengelye nem párhuzamos a futópálya középvonalával, jelezzék az eltérés szögét és helyzetét is, azaz az eltérés a bal, vagy a jobb oldalon van;

d) névleges megközelítési siklópálya szög értéke(k); A T-VASIS, vagy az AT-VASIS esetében ez az 5-17. ábra képlete szerint θ érték; a PAPI, vagy APAPI esetében pedig az 5-19. ábra szerint (B + C) /2 illetve (A + B) /2 lehet; és

e) a futópálya küszöb felett a siklópályán történő megközelítés jelzésének legalacsonyabb szem-magassága. A T-VASIS, vagy AT-VASIS az a minimális magasság, amelyen csak a kereszt-fénysorok láthatók; mindazonáltal, ha a megközelítési segédeszközt használó légijármű szempontjából ez hasznos, jelezhetik azokat a magasságokat is, amelyeken a kereszt-fénysorok továbbá egy, kettő, vagy három magasság változtatásra történő utasítást jelző fényegység is látható lesz. A PAPI berendezésnél ez harmadik fényegység beállítási szöge a futópályához viszonyítva mínusz 2 perc, azaz B szög mínusz 2’ illetve az APAPI berendezésnél ez a futópályától távolabb levő fényegység beállítási szöge mínusz 2 perc, azaz A szög mínusz 2’.

2.13 Együttműködés a légiforgalmi tájékoztató szolgálatok és a repülőtéri hatóságok között

2.13.1 Annak érdekében, hogy a légiforgalmi tájékoztató szolgálati egységek megkapják azokat a tájékoztatásokat, amelyek lehetővé teszik számukra az aktuális és pontos repülés előtti, valamint repülés közbeni tájékoztatások iránti igények kielégítését, hozzanak megfelelő intézkedéseket a légiforgalmi tájékoztató szolgálatok és a repülőtéri szolgáltatások biztosításáért felelős repülőtéri hatóságok között azért, hogy az utóbbiak a lehető legkisebb késéssel jelentsék a légiforgalmi tájékoztató szolgálati egységeknek a következőket:

a) a repülőtér állapotára vonatkozó tájékoztatások (lásd a fenti 2.9, 2.10, 2.11 és 2.12 pontokat);

b) a felelősségi körzetükön belül található üzemi létesítmények, szolgáltatások, szolgálatok és navigációs berendezések működési állapota;

c) bármely, az üzemeltetés szempontjából lényegesnek ítélt egyéb tájékoztatás.

2.13.2 A léginavigációs rendszer megváltoztatásának bevezetése előtt az ilyen változtatásért felelős szolgálatok vegyék figyelembe azt az időtartamot, amely a légiforgalmi tájékoztató szolgálatnak a tájékoztató anyagok kidolgozásához, elkészítéséhez és kiadásához szükséges. Ezért az érintett szervezetek szoros együttműködése szükséges annak biztosítása érdekében, hogy a légiforgalmi tájékoztató szolgálatok a vonatkozó tájékoztatásokat időben megkapják.

2.13.3 Különösen fontosak azok a térképeket és/vagy a számítógépes navigációs rendszereket érintő a léginavigációs tájékoztatások, amelyek változásáról a 15. Annex 6. fejezete és 4. Függeléke előírásai szerint a léginavigációs tájékoztatás szabályzó és ellenőrző rendszere (AIRAC) tájékoztatást kell biztosítson. A felelős repülőtéri szolgálatok a légiforgalmi tájékoztató szolgálat számára benyújtandó tájékoztató anyagok és adatok továbbításánál a meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontokat a 14 napos postai átfutási idővel együtt vegyék figyelembe.

2.13.4 A légiforgalmi tájékoztató szolgálatok számára benyújtandó tájékoztató anyagok és adatok biztosításáért felelős repülőtéri szolgálatok a jelen Annex 5. Függelékében meghatározott léginavigációs adat pontossági és megbízhatósági követelmények figyelembevételével végezzék el ezt a feladatot.

1. Megjegyzés: A NOTAM és SNOWTAM kiadására vonatkozó előírások a 15. Annex 5. fejezet 6. és 2. Függelékében találhatók.

2. Megjegyzés: Az AIRAC tájékoztatást a légiforgalmi tájékoztató szolgálat legalább 42 nappal az AIRAC hatálybalépési időpontja előtt osztja szét azzal a céllal, hogy az anyag legalább a hatálybalépés előtt 28 nappal eljusson az érintettekhez (címzettekhez).

3. Megjegyzés: A meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontok tervezett 28 napos beosztását, beleértve 1997 november 6-át és az AIRAC felhasználásra vonatkozó tájékoztatót az AIS légiforgalmi tájékoztató szolgálatok Kézikönyve (Doc 8126 — 3. fejezet 3.1.1 és 4. fejezet 4.4 pont) tartalmazza.

3. fejezet
Fizikai jellemzők

3.1 Futópályák

Futópályák száma és iránya

Bevezető megjegyzés: A futópályák irányát, elhelyezkedését és számát számos tényező befolyásolja. Az egyik fontos tényező a felhasználhatóság, amelyet az alábbiakban ismertetésre kerülő szél-megoszlás határoz meg. A 4. fejezetben meghatározott megközelítési felületek alapján történő megközelítések végrehajtásának biztosítása érdekében másik fontos tényező a futópálya iránya. Ezekre és további egyéb jellemzőkre vonatkozóan az A. Melléklet 1. szakasza tartalmaz tájékoztatást.

Amikor egy új műszeres futópálya elhelyezését határozzák meg, szenteljenek különös figyelmet azoknak a területeknek, amelyek felett a repülőgépeknek a műszer szerinti megközelítés illetve a megszakított megközelítési eljárás alatt repülniük kell, hogy az itt található akadályok, vagy más tényezők ne korlátozzák azon repülőgépek működését, amelyek részére a futópályát tervezik.

3.1.1 ***Ajánlás*** *— A repülőtér futópályáinak száma és iránya olyan legyen, hogy a repülőtér felhasználhatósága, azaz igénybevételi tényezője 95 %-nál ne legyen alacsonyabb azon repülőgépek vonatkozásában, amelyek üzemeltetését a repülőtéren tervezik.*

3.1.2 ***Ajánlás -*** *Ahol lehet, a repülőtér futópályáinak elhelyezése és iránya olyan legyen, hogy az érkezési és indulási útirányok a lehető legkevesebb zavarást jelentsék a lakóterületekre és más, a repülőtér környékén lévő zajérzékeny területekre, a későbbi problémák elkerülése érdekében.*

Megjegyzés: A zajproblémák kezelésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 2. részében és a Repülőgép Zaj Kezelésének Kiegyensúlyozott Megközelítése Útmutatójában található (Doc 9829).

3.1.3 A legnagyobb engedélyezett kereszt-szél értékek (összetevők)

Ajánlás *— A 3.1.1 pont alkalmazásánál abból a feltételezésből induljanak ki, hogy általános körülmények között kizárt a repülőgépek le és felszállása, amennyiben a kereszt-szél érték a következőket meghaladja:*

— azon repülőgépek esetében, amelyek vonatkozási futópálya hosszúsága 1500 méter vagy több, 37 km/h (20 csomó) kivéve, ha a nem megfelelő hosszirányú futópálya felületi súrlódás miatt bizonyos gyakorisággal gyenge fékhatást tapasztalnak, mert ebben az esetben 24 km/h (13 csomó) értéket vegyenek figyelembe;

— azon repülőgépek esetében, amelyek vonatkozási futópálya hosszúsága 1200 méternél több, azonban 1500 méternél kevesebb, 24 km/h

(13 csomó); és

— azon repülőgépek esetében, amelyek vonatkozási futópálya hosszúsága 1200 méternél kevesebb, 19 km/h (10 csomó).

Megjegyzés: A igénybevételi tényező és korlátozó jellemzők valamint az egyes különleges körülmények esetén figyelembe vehető engedmények tervezésére és kiszámítására az A. Melléklet 1. szakasza tartalmaz útmutatót.

3.1.4 Felhasználandó adatok

***Ajánlás** — A felhasználhatóság / igénybevételi tényező kiszámításához alkalmazott adatok kiválasztását a lehető leghosszabb, de legalább öt éves időszakra vonatkozó megbízható szél-megoszlási statisztikák alapján végezzék. A megfigyeléseket legalább naponta nyolc alkalommal, egyenlő időközönként végezzék.*
Megjegyzés: A jelzett szél sebesség és irány értékek átlagot jelentenek. A széllökések figyelembevételével kapcsolatos tájékoztatások az A. Melléklet 1. szakaszában találhatók.

A futópálya küszöb elhelyezkedése

3.1.5 ***Ajánlás** — A küszöb általában a futópálya végén helyezkedik el, kivéve ha üzemeltetési szempontok más hely kijelölését indokolják.*

Megjegyzés: A futópálya küszöb elhelyezkedésével kapcsolatos útmutató az A. Melléklet 10. szakaszában található.

3.1.6 ***Ajánlás** — Amennyiben akár állandó, akár ideiglenes jelleggel a futópálya küszöb áthelyezése szükséges, vegyék figyelembe azokat a különböző tényezőket, amelyek a küszöb helyét befolyásolhatják. Ahol az áthelyezés a futópálya javíthatatlan állapota miatt szükséges, az áthelyezett futópálya küszöb és a forgalom elől elzárt (javíthatatlan) terület között legalább 60 méter hosszú, tiszta és elegyengetett terület helyezkedjen el. Amennyiben erre szükség van, további távolságot biztosítsanak a futópálya végbiztonsági terület számára.*

Megjegyzés: Az áthelyezett futópálya küszöb meghatározását befolyásoló tényezők figyelembevételére vonatkozó útmutató az A. Melléklet 10. szakaszában található.

A futópályák tényleges hossza

3.1.7 Elsődleges futópálya

***Ajánlás** — Az elődleges futópálya tényleges hosszúsága, a 3.1.9 pontban előírtak kivételével feleljen meg azon repülőgépek üzemeltetési követelményeinek, amelyek számára a futópályát tervezték és ne legyen kevesebb, mint a helyi üzemeltetési körülmények, valamint a vonatkozó repülőgépek teljesítmény jellemzői alapján módosított meghatározott távolság.*

1. Megjegyzés: Ez az előírás nem jelenti szükségszerűen azt, hogy a számításoknál figyelembe vett kritikus repülőgép típus a területen legnagyobb felszálló-súlyával üzemelhet.

2. Megjegyzés: A rendelkezésre álló futópálya hossz meghatározásánál úgy a leszállásra, mint a felszállásra vonatkozó követelményeket, valamint azt az igényt is vegyék figyelembe, hogy az üzemeltetést mindkét futópálya irányba szükséges végezni.

3. Megjegyzés: A figyelembe veendő helyi tényezők közé tartozik a terület tengerszint feletti magassága, átlaghőmérséklete, futópálya lejtviszonyai, páratartalom, valamint a futópálya felületi jellemzői.

4. Megjegyzés: Amennyiben nem ismerik azon repülőgépek teljesítmény adatait, amelyek üzemeltetésére a futópályát tervezik, az elsődleges futópálya tényleges hosszának megfelelő általános korrekciókkal történő meghatározásához a Repülőtér Tervezési Kézikönyv *1. része tartalmaz útmutatást.*

3.1.8 Másodlagos futópálya

***Ajánlás** — A másodlagos futópálya hosszának meghatározását az elsődleges futópálya hosszához hasonlóan* *végezzék, azonban ez csak azon repülőgép igényeinek kell megfeleljen, amelyeknek a legalább 95 %-os felhasználás biztosítása érdekében más futópálya, vagy futópályák mellett az adott másodlagos futópályát is igénybe kell venniük.*

3.1.9 Futópályák biztonsági megállási vagy biztonsági felszálló területtel

***Ajánlás* — *Ahol a futópálya mellett biztonsági megállási vagy biztonsági felszálló területet is kijelöltek, a 3.1.7 vagy 3.1.8 pontok alkalmazásával megállapított hosszúságnál rövidebb tényleges futópálya hossz is megfelelőnek tekinthető, azonban ebben az esetben a futópálya, a biztonsági megállási és a biztonsági felszálló területek bármely kijelölése tegye lehetővé azon repülőgépek fel és leszállására vonatkozó üzemeltetési követelmények kielégítését, amelyek kiszolgálására a futópályát tervezték.*

Megjegyzés: A biztonsági megállási és a biztonsági felszálló területek igénybevételével kapcsolatos útmutató az A. Melléklet 2. szakaszában található.

A futópályák szélessége

3.1.10 ***Ajánlás* —** *A futópálya szélessége ne legyen kevesebb, mint a következő táblázatban a megfelelő kód-számhoz és kód-betűhöz (méterben) megadott érték:*

Kód-betű	**A**	**B**	**C**	**D**	**E**	**F**
Kód-szám						
1[a]	18 m	18 m	23 m	-	-	-
2[a]	23 m	23 m	30 m	-	-	-
3	30 m	30 m	30 m	45 m	-	-
4	-	-	45 m	45 m	45 m	60 m

a = A precíziós megközelítésű futópálya szélessége 1 vagy 2 kód-szám esetében ne legyen kevesebb, mint 30 méter.

1. Megjegyzés: A futópálya szélesség meghatározására szolgáló kód-szám és betű kombinációkat átlagos repülőgép jellemzők alapján dolgoztuk ki.

2. Megjegyzés: A futópálya szélességét befolyásoló tényezőket a Repülőtér Tervezési Kézikönyv 1. része tartalmazza.

Párhuzamos futópályák közötti legkisebb távolság

3.1.11 ***Ajánlás* —** *Ahol egymással párhuzamos nem-műszeres futópályák egyidejű használatát tervezik, a futópálya középvonalak közötti legkisebb távolság a következő legyen:*
— 210 méter, ahol a magasabb kód-szám 3 vagy 4 ;
— 150 méter, ahol a magasabb kód-szám 2 ; és
— 120 méter, ahol a magasabb kód-szám 1.

Megjegyzés: A légijárművek turbulencia kategória osztályozása, valamint a légijármű keltette turbulencia esetén alkalmazandó megnövelt hosszirányú elkülönítési minimumok a A Légiforgalmi Szolgálatok Eljárásai és Légiforgalom Szervezés (PANS-ATM) Doc 4444. 4. rész 4.9 valamint 5. rész 5.8 pontokban találhatók.

3.1.12 ***Ajánlás —*** *Ahol egymással párhuzamos műszeres futópályák egyidejű használatát tervezik a PANS-ATM (Doc 4444) és PANS-OPS (Doc 8168) I. kötet alapján, a futópálya középvonalak közötti legkisebb távolság a következő legyen:*

— egymástól független párhuzamos megközelítések esetén 1035 méter;

— egymástól függő párhuzamos megközelítések esetén 915 méter;

— egymástól független párhuzamos indulások esetén 760 méter;

— megosztott párhuzamos üzemelés esetén 760 méter; kivéve hogy

a) a megosztott párhuzamos üzemelés esetére meghatározott legkisebb távolság:
1) legfeljebb 300 méterig annyiszor 30 méterrel csökkenthető, ahányszor 150 méterrel a leszállásra szolgáló futópálya az érkező légijármű irányába el van tolva; és
2) annyiszor 30 méterrel növelendő, ahányszor 150 méterrel a leszállásra szolgáló futópálya az érkező légijármű irányától (azaz a leszállás irányába) el van tolva;

b) az egymástól független párhuzamos megközelítések esetére a PANS-ATM (Doc 4444.) kiadványban meghatározottaktól eltérő más legkisebb távolságok, valamint egyéb körülmények alkalmazhatók, ha az illetékes hatóság megállapítja, hogy az ilyen eltérések nem befolyásolják hátrányosan a légijármű üzemeltetés biztonságát.

Megjegyzés: A párhuzamos vagy közel párhuzamos műszeres futópályák egyidejű üzemeltetésének eljárásai és szükséges berendezései a PANS-ATM (Doc 4444) 4. részében, a PANS-OPS (Doc 8168) I. kötet 7. valamint II. kötet 2. és 3. részében találhatók. A vonatkozó útmutatót a Párhuzamos vagy közel párhuzamos műszeres futópályák egyidejű üzemeltetésének eljárásai Kézikönyve (Doc 9643) tartalmazza.

Futópályák lejtviszonyai

3.1.13 Hosszirányú lejtés

Ajánlás — *A futópálya középvonal mentén mért legalacsonyabb és legmagasabb tengerszint feletti magasság különbség és a futópálya hossz hányadosából megállapított lejtés ne haladja meg az alábbi értéket:*

— 1 %, ahol a kód-szám 3 vagy 4; és

— 2 %, ahol a kód-szám 1 vagy 2.

3.1.14 ***Ajánlás —*** *A hosszirányú lejtés a futópálya egyik szakaszán se haladja meg az alábbi értéket:*

— 1.25 %, ahol a kód-szám 4 – azonban a futópálya első és utolsó negyedében a hosszirányú lejtés értéke ne haladja meg a 0.8 %-ot;

— 1.5 %, ahol a kód-szám 3 – azonban a II. vagy III. kategóriájú precíziós megközelítésű futópálya első és utolsó negyedében a hosszirányú lejtés értéke ne haladja meg a 0.8 %-ot; és

— 2 %, ahol a kód-szám 1 vagy 2.

3.1.15 A hosszirányú lejtés változása

Ajánlás — *Ahol a lejtés változása elkerülhetetlen, az egymást követő szakaszok közötti lejtviszony változás ne haladja meg az alábbi értéket:*

— *1.5 %, ahol a kód-szám 3 vagy 4; és*

— *— 2 %, ahol a kód-szám 1 vagy 2.*

Megjegyzés: A futópálya előtti lejtés változására vonatkozó útmutató az A. Melléklet 4. szakaszában található.

3.1.16 ***Ajánlás —*** *Az egyik lejtésből a másikba történő átmenetet ívelt felülettel biztosítsák, amelynek változása ne haladja meg az alábbi értékeket:*

— 0.1 % / 30 méter (30 000 méter legkisebb ívsugár) ahol a kód-szám 4;

— 0.2 % / 30 méter (15 000 méter legkisebb ívsugár) ahol a kód-szám 3;

— 0.4 % / 30 méter (7500 méter legkisebb ívsugár) ahol a kód-szám 2 vagy 1.

3.1.17 Látási távolság (beláthatóság)

Ajánlás — *Ahol a lejtés változása elkerülhetetlen, az olyan legyen, hogy az akadálytalan látás távolsága azaz a beláthatóság legalább az alábbi mértékű legyen:*

• a futópálya felett 3 méter magasságból bármely más pont felett 3 méter magasságra legalább a futópálya teljes hosszának fele, ha a kód-betű C, D, E vagy F;

• a futópálya felett 2 méter magasságból bármely más pont felett 2 méter magasságra legalább a futópálya teljes hosszának fele, ha a kód-betű B; és

• a futópálya felett 1.5 méter magasságból bármely más pont felett 1.5 méter magasságra legalább a futópálya teljes hosszának fele, ha a kód-betű A.

Megjegyzés: Fontolják meg az akadálytalan látás távolság (beláthatóság) biztosítását a futópálya teljes hosszában ott, ahol egy önálló futópálya mellett annak teljes hosszában párhuzamos gurulóút nem áll rendelkezésre. Ahol a repülőtéren keresztező futópályák helyezkednek el, az üzemeltetés biztonsága szempontjából a keresztezés területén további láthatósági követelményeket is figyelembe kell venni. Lásd Repülőtér Tervezési Kézikönyv 1. Rész.

3.1.18 A lejtés változások közötti távolság

Ajánlás —*A futópálya mentén egymáshoz közel levő lejtések észrevehető változásai, vagy hullámzásai kerülendők. A két egymást követő ív keresztezési pontjai közötti távolság ne legyen kevesebb, mint a következő érték:*

a) a megfelelő lejtviszony változás értékek abszolút számainak, valamint a következő értékeknek szorzata:

— 30 000 méter, ahol a kód-szám 4;

— 15 000 méter, ahol a kód szám 3; és

— 5 000 méter, ahol a kód szám 1 vagy 2; vagy

b) 45 méter;

amelyik a nagyobb érték.

Megjegyzés: A fenti előírás alkalmazásával kapcsolatos útmutató az A. Melléklet 4. szakaszában található.

3.1.19 Keresztirányú lejtés

***Ajánlás** — A leggyorsabb vízelvezetés biztosítása érdekében a futópálya felületét lehetőség szerint enyhén ívelt formában alakítsák ki, kivéve azt a területet, ahol egy egyszerű, az esővel általában párosuló szél irányának megfelelő, fentről lefelé egy-irányú lejtés biztosítja a gyors vízelvezetést. A legkedvezőbb helyzetben a keresztirányú lejtés értéke a következő:*

— 1.5 %, ahol a kód-betű C, D, E vagy F; és

— 2 %, ahol a kód-betű A vagy B;

azonban lehetőség szerint sehol ne haladja meg a fenti értékeket és ne legyen kevesebb mint 1 %, kivéve a futópálya, vagy gurulóút kereszteződést, ahol kisebb lejtés érték válhat szükségessé. Amennyiben a felületet enyhén ívelt formában alakítják ki, a lejtés a középvonal mindkét oldalán szimmetrikus legyen.

Megjegyzés: Nedves futópályákon, kereszt-szél esetében, a gyenge vízelvezetés miatt felmerülhet a gumiabroncs vízen csúszás problémája. Az erre vonatkozó, valamint más befolyásoló tényezőkkel kapcsolatos tájékoztatások az A. Melléklet 7. szakaszában találhatók.

3.1.20 ***Ajánlás** — A keresztirányú lejtés az egész futópálya mentén végig azonos legyen, kivéve a másik futópályával, vagy egy gurulóúttal történő kereszteződés helyét, ahol a megfelelő vízelvezetés biztosítása mellett más, kisebb lejtés alakítható ki.*

Megjegyzés: A keresztirányú lejtésre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 3. részében található.

A futópálya teherbíró-képessége

3.1.21 ***Ajánlás** — A futópálya ellenálló legyen azon repülőgépek forgalmából származó megterhelésekkel szemben, amelyek kiszolgálására a futópályát tervezték.*

A futópálya felülete

3.1.22 A futópálya építése során küszöböljék ki az olyan felületi egyenetlenségeket, amelyek előidézhetik a futópálya felületi súrlódás jellemzők romlását, vagy más módon hátrányosan befolyásolják a repülőgép fel, vagy leszállását.

1. Megjegyzés: A felületi egyenetlenségek túlságosan nagyfokú rázkódással, remegéssel, hosszirányú mozgásváltozással, vagy egyéb stabilitást csökkentő módon hátrányosan befolyásolhatják a repülőgép fel vagy leszállását.

2. Megjegyzés: A tervezési lehetőségekkel és korlátokkal kapcsolatos, valamint egyéb tájékoztatások az A. Melléklet 5. szakaszában, további útmutató pedig a Repülőtér Tervezési Kézikönyv 3. részében található.

3.1.23 A futópálya burkolt felületét úgy kell megépíteni, hogy az nedves állapotban jó súrlódási együttható jellemzőket biztosítson.

3.1.24 ***Ajánlás*** *— Az új vagy felújított felületű futópálya súrlódási jellemzőinek mérését ön-nedvesítő egységgel ellátott, folyamatos mérést végző berendezéssel végezzék el, biztosítva ezzel a futópálya felület súrlódási jellemzőkre vonatkozó tervezési célkitűzések teljesítését.*

Megjegyzés: Az új futópálya felületek súrlódási jellemzőivel kapcsolatos útmutatás az A. Melléklet 7. szakaszában, további tájékoztatás pedig a Repülőtér Szolgálati Kézikönyv 2. részében található.

3.1.25 ***Ajánlás*** *— Az új burkolt felület átlagos makró szerkezeti mélysége 1.0 mm-nél ne legyen kevesebb.*

1. Megjegyzés: Ehhez általában valamilyen különleges felület kialakítási módszer szükséges.

2. Megjegyzés: A burkolt felület szerkezeti mélységének mérésére vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv 2. részében található.

3.1.26 ***Ajánlás*** *— Ahol a felületet hornyolással, vagy érdesítéssel készítik, a hornyok, vagy rovátkák a futópálya középvonalára merőlegesek legyenek, vagy ahol ez alkalmazható, párhuzamosak legyenek a középvonalra nem merőleges keresztirányú burkolati hézagokkal.*

Megjegyzés: A futópálya burkolt felület szerkezetének jobb kialakítását célzó módszerekre vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv 3. részében található.

3.2 Futópálya padkák

Általános rész

Megjegyzés: A futópálya padkák jellemzőire és kialakítására vonatkozó útmutató az A. Melléklet 8. szakaszában, valamint a Repülőtér Tervezési Kézikönyv 1. részében található.

3.2.1 ***Ajánlás*** *— Azon a futópályán, amelynek kód-betűje D, vagy E és szélessége kevesebb mint 60 méter, alakítsanak ki futópálya padkát.*

3.2.2 ***Ajánlás*** *— Azon a futópályán, amelynek kód-betűje F, alakítsanak ki futópálya padkát.*
A futópálya padka szélessége

3.2.3 ***Ajánlás*** *— A futópálya padkák a futópálya mindkét oldalán szimmetrikusan helyezkedjenek el úgy, hogy a futópálya és padkáinak teljes szélessége ne legyen kevesebb, mint:*

— 60 méter, ahol a kód betű D, vagy E; és

— 75 méter, ahol a kód betű F.

A futópálya padkák lejtése

3.2.4 ***Ajánlás*** *— A padka futópályával határos felülete (széle) azzal egy síkban legyen és a padka keresztirányú lejtése ne haladja meg a 2.5 % értéket.*

A futópálya padkák teherbíró-képessége

3.2.5 ***Ajánlás*** *— A futópálya padkákat úgy alakítsák ki vagy építsék meg, hogy az elbírja a futópályáról lefutó repülőgép, valamint az egyéb a padkán is működő földi járművek súlyát és ezzel megakadályozza szerkezeti sérülésüket.*

Megjegyzés: A futópálya padkák teherbíró-képességére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 1. részében található.

3.3 Futópálya megforduló sáv

Általános rész

3.3.1 Ahol egy D, E, vagy F kód betűvel jelzett futópálya végén nincs gurulóút, vagy visszafordulási terület, a repülőgépek 180°–os fordulásának megkönnyítése érdekében megforduló sávot kell kialakítani (lásd 3-1. ábra).

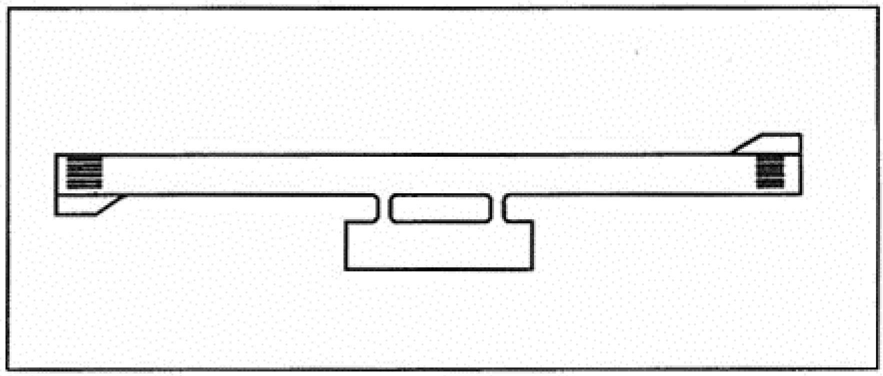
3.3.2 ***Ajánlás** — Ahol egy A, B, vagy C kód betűvel jelzett futópálya végén nincs gurulóút, vagy visszafordulási terület, a repülőgépek 180°–os fordulásának megkönnyítése érdekében megforduló sávot alakítsanak ki.*

1. Megjegyzés: Az ilyen területek biztosítása a futópálya mentén hasznos lehet a gurulási időtartam és távolság csökkentése érdekében is az olyan repülőgépek esetén, amelyek nem igénylik a futópálya teljes hosszát.

2. Megjegyzés: A futópálya megforduló sávok tervezésére kialakítására vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 1. részében található. A gurulóút visszafordulási területre, mint alternatív megoldásra vonatkozó tájékoztató a Repülőtér Tervezési Kézikönyv 2. részében található.

3.3.3 ***Ajánlás** — A futópálya megforduló sáv a futópálya jobb, vagy bal oldalán a futópálya burkolatához csatlakozva annak mindkét végén, továbbá bármely szükségesnek ítélt helyen egyaránt elhelyezkedhet.*

Megjegyzés: A forduló megkezdését megkönnyíti, ha a megforduló sávot a futópálya bal oldalán helyezik el, mert rendszerint a bal oldali ülés a légijármű parancsnokának helye.



3-1. ábra: Futópálya megforduló sáv (tipikus)

3.3.4 ***Ajánlás** — A futópálya megforduló sáv csatlakozási szöge ne haladja meg a 30° értéket.*

3.3.5 ***Ajánlás** — A futópálya megforduló sáv tervezésénél alkalmazott orrfutó kormányzási szög ne haladja meg a 45° értéket.*

3.3.6 A futópálya megforduló sávot úgy tervezzék meg, hogy amikor annak repülőgépnek pilótakabinja, amely számára a megforduló sávot tervezték, a sáv jelzése felett halad, a biztonságos távolság a repülőgép futóművének bármely abroncsa és a megforduló sáv burkolat szegélye között ne legyen kevesebb, mint az alábbi táblázatban megadott érték:

Kód betű	*Biztonsági távolság*
A	1.5 méter
B	2.25 méter
C	3 méter, ha a futópálya megforduló sávot 18 méternél kisebb tengelytávú repülőgép számára alakították ki; 4.5 méter, ha a futópálya megforduló sávot 18 méter, vagy ennél nagyobb tengelytávú repülőgép számára alakították ki;
D	4.5 méter
E	4.5 méter
F	4.5 méter

Megjegyzés: A tengelytáv az orrfutó és a főfutók geometriai középpontja közötti hossz-távolságot jelenti.

3.3.7 ***Ajánlás*** *— Ahol a kedvezőtlen időjárási körülmények és ezek miatt gyenge súrlódási együttható értékek jellemzők, az E, vagy F kód betű esetén megnövelt, 6 méteres futóabroncs és burkolat szegély közötti biztonsági távolságot biztosítsanak.*

A futópálya megforduló sáv lejtése

3.3.8 ***Ajánlás*** *— A futópálya megforduló sáv hossz és keresztirányú lejtése elegendő legyen ahhoz, hogy a felületen a víz ne gyűljön össze és a lejtés biztosítsa a gyors vízelvezetést. A felület lejtése a csatlakozó futópálya felületek lejtésével azonos legyen.*

A futópálya megforduló sáv teherbíró képessége

3.3.9 ***Ajánlás*** *— A futópálya megforduló sáv teherbíró képessége legalább azonos legyen a csatlakozó futópálya teherbíró képességével, azonban figyelembe kell venni azt a tényt is, hogy a megforduló sávon alacsony sebességgel és erőteljes fordulókat végeznek, amely nagyobb mértékben terheli a burkolt felületet.*

Megjegyzés: Ahol a futópálya megforduló sáv rugalmas burkolattal készül, a felületnek ellent kell állnia a forduló végrehajtása során a fő futómű abroncsok oldalirányú erőhatásából származó terheléseinek is.

A futópálya megforduló sáv felülete

3.3.10 ***Ajánlás*** *— A futópálya megforduló sáv felülete mentes legyen a felületi egyenetlenségektől, amelyek a sávot igénybe vevő repülőgép sérülését okozhatják.*

3.3.11 ***Ajánlás*** *— A futópálya megforduló sáv felületét úgy alakítsák ki, hogy nedves felület esetén is jó súrlódási együtthatót biztosítson a sávot igénybe vevő repülőgépek számára.*

Futópálya megforduló sáv padkák

3.3.12 ***Ajánlás*** *— A futópálya megforduló sávot olyan padkával készítsék el, amely ellenáll a sávot igénybe vevő legnagyobb repülőgép hajtóművéből kiáramló erős gázsugár eróziós hatásainak és megakadályozzák a felszínen levő idegen tárgy hajtóműbe történő beszívását is.*

Megjegyzés: A padka legkisebb szélessége feleljen meg a sávot igénybe vevő legnagyobb repülőgép külső hajtóműve elhelyezkedésének és így az szélesebb legyen, mint a csatlakozó futópálya padkák szélessége.

3.3.13 ***Ajánlás*** *— A futópálya megforduló sáv padkák teherbíró képessége olyan legyen, hogy azok elbírják a rajtuk áthaladó repülőgép súlyát és ezzel megakadályozza szerkezeti sérülésüket valamint az egyéb, a padkán is működő földi járművek súlyát is.*

3.4 Futópálya vég-sávok

Általános rész

3.4.1 A futópálya vég sáv egy futópálya és bármely ehhez csatlakozó biztonsági megállási terület egysége.
A futópálya vég sávok hossza

3.4.2 A futópálya küszöb előtt és a futópálya vagy a biztonsági megállási terület vége után levő sáv, melynek hossza legalább:

— 60 méter, ahol a kód-szám 2, 3 vagy 4;

— 60 méter, ahol a műszeres futópálya kód-száma 1; és

— 30 méter, ahol a nem-műszeres futópálya kód-száma 1.

A futópálya vég sávok szélessége

3.4.3 Egy precíziós megközelítésű futópályához tartozó, azt magába foglaló futópálya vég sáv szélessége, ahol ez gyakorlati szempontból megvalósítható, oldalirányba a futópálya középvonalának valamint a meghosszabbított középvonalnak mindkét oldalán legalább az alábbi távolságra kell, hogy kiterjedjen:

— 150 méter, ahol a kód-szám 3 vagy 4; és

— 75 méter, ahol a kód-szám 1 vagy 2.

3.4.4 ***Ajánlás*** *— A nem precíziós megközelítésű futópályához tartozó futópálya vég sáv szélessége oldalirányba a futópálya középvonalának valamint a meghosszabbított középvonalnak mindkét oldalán legalább az alábbi távolságra terjedjen ki:*

— 150 méter, ahol a kód-szám 3 vagy 4 ; és

— 75 méter, ahol a kód-szám 1 vagy 2.

3.4.5 ***Ajánlás*** *— A nem műszeres futópályához tartozó futópálya vég sáv szélessége oldalirányba a futópálya középvonalának valamint a meghosszabbított középvonalnak mindkét oldalán legalább az alábbi távolságra terjedjen ki:*

— 75 méter, ahol a kód-szám 3 vagy 4;

— 40 méter, ahol a kód-szám 2 ; és

— 30 méter, ahol a kód-szám 1.

Tárgyak a futópálya sávokban

Megjegyzés: A futópálya vég sávokban elhelyezendő berendezések és szerkezetek kialakítására, elhelyezésére és felszerelésére vonatkozó tájékoztatás a 9.9 pontban található.

3.4.6 ***Ajánlás** — A futópálya vég sávban elhelyezkedő bármely tárgy, amely a repülőgépeket veszélyeztetheti, akadálynak tekintendő és lehetőség szerint eltávolítandó.*

3.4.7 A látás utáni segédeszközök kivételével, amelyekre a léginavigációs célokból szükség van és amelyek eleget tesznek az 5. fejezet letörhetőséggel kapcsolatos vonatkozó előírásainak, a futópálya vég sávon belül más rögzített tárgy nem helyezhető el:

a) ha a kód szám 4 és a kód betű F, az I, II vagy III kategóriás precíziós megközelítésű futópálya középvonalától számított 77.5 méter távolságon belül;

b) ha a kód-szám 3 vagy 4, az I, II vagy III kategóriás precíziós megközelítésű futópálya középvonalától számított 60 méter távolságon belül; és

c) ha a kód-szám 1 vagy 2, az I. kategóriás precíziós megközelítésű futópálya középvonalától számított 45 méter távolságon belül.

A futópálya vég sáv ezen részén rögzítetlen tárgy (berendezés vagy jármű) nem lehet (tartózkodhat) akkor, amikor a futópályát le és felszállásra használják.

A futópálya vég sávok talajának elegyengetése

3.4.8 ***Ajánlás** — Egy műszeres futópálya vég sáv azon része, amely mindkét oldalra legalább:*

— 3 vagy 4 kód-szám esetében 75 méter távolságra; és

— 2 vagy 1 kód-szám esetében 40 méter távolságra;

van a futópálya középvonalától és annak meghosszabbított középvonaltól megfelelő módon legyen elegyengetve, hogy a futópályán üzemeltetni kívánt repülőgépnek a futópályáról történő lefutás esetében elegendő biztonságos hely álljon rendelkezésre.

Megjegyzés: A 3 vagy 4 kód-számú, precíziós megközelítésű futópályát magába foglaló vég sáv nagyobb területének szintezésére és elegyengetésére vonatkozó útmutató az A. Melléklet 8. szakaszában található.

3.4.9 ***Ajánlás** — Egy nem műszeres futópálya vég sáv azon része, amely mindkét oldalra legalább:*

— 3 vagy 4 kód-szám esetében 75 méter távolságra;

— 2 kód-szám esetében 40 méter távolságra; és

— 1 kód-szám esetében 30 méter távolságra;

van a futópálya középvonalától és annak meghosszabbított középvonaltól megfelelő módon legyen elegyengetve, hogy a futópályán üzemeltetni kívánt repülőgépnek a futópályáról történő lefutás esetében elegendő biztonságos hely álljon rendelkezésre.

3.4.10 A sáv azon részének felülete, amely a futópályával, a padkával vagy a végbiztonsági megállási területtel érintkezik, azokkal egy szintben legyen.

3.4.11 ***Ajánlás** — A futópálya vég sáv küszöb előtt elhelyezkedő legalább 30 méteres részét úgy képezzék ki,* *hogy az ellenálljon a légijármű hajtómű gázsugár okozta eróziónak és ezzel védje a leszálló repülőgépet a kiálló éles felületek veszélyeitől.*

A futópálya vég sávok lejtviszonyai

3.4.12 Hosszirányú lejtés

Ajánlás *— A sáv elegyengetett részének hosszirányú lejtése ne haladja meg az alábbi értéket:*

— 1.5 %, ahol a kód-szám 4;

— 1.75 %, ahol a kód-szám 3; és

— 2.0 %, ahol a kód szám 2 vagy 1.

3.4.13 Hosszirányú lejtés változása

Ajánlás — *A sáv elegyengetett részének hosszirányú lejtésének változásai a lehetőségek szerint egyenletesek legyenek, kerüljék a hirtelen változásokat, letöréseket és emelkedőket.*

3.4.14 Keresztirányú lejtés

Ajánlás — *A sáv elegyengetett részének keresztirányú lejtése megfelelő legyen annak megakadályozásra, hogy a felületen víz gyűljön össze, azonban ne haladja meg az alábbi értéket:*

— 2.5 %, ahol a kód-szám 3 vagy 4; és

— 3.0 %, ahol a kód szám 1 vagy 2;

kivéve ha a vízelvezetés megkönnyítése érdekében a futópálya burkolt felülettől, padkától vagy biztonsági megállási területtől kezdődő első három métere kifelé lejtős és ez a lejtés akár 5 %-os is lehet.

3.4.15 ***Ajánlás —*** *A sáv elegyengetett részén túl, a futópálya irányától kifelé terjedő bármely rész keresztirányú emelkedése ne haladja meg az 5 %-os értéket.*

Futópálya vég sávok teherbíró-képessége

3.4.16 ***Ajánlás —*** *Egy műszeres futópálya sáv azon része, amely mindkét oldalra legalább:*

— 3 vagy 4 kód-szám esetében 75 méter távolságra; és

— 1 vagy 2 kód-szám esetében 40 méter távolságra;

van a futópálya középvonalától és a meghosszabbított középvonaltól megfelelő módon legyen elkészítve vagy megépítve, hogy a futópályán üzemeltetni kívánt repülőgépnek a futópályáról történő lefutása esetére az elegendő teherbíró-képességgel rendelkezzen és így a legkisebbre csökkentse a teherbíró-képességek közötti különbségből adódó veszélyeket.

Megjegyzés: A futópálya vég sávok elkészítésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 1. részében található.

3.4.17 ***Ajánlás —*** *Egy nem-műszeres futópálya vég sáv azon része, amely mindkét oldalra legalább:*

— 3 vagy 4 kód-szám esetében 75 méter távolságra;

— 2 kód-szám esetében 40 méter távolságra; és

— 1 kód-szám esetében 30 méter távolságra;

van a futópálya középvonalától és a meghosszabbított középvonaltól megfelelő módon legyen elkészítve vagy megépítve, hogy a futópályán üzemeltetni kívánt repülőgépnek a futópályáról történő lefutása esetére az elegendő teherbíró-képességgel rendelkezzen és így a legkisebbre csökkentse a teherbíró-képességek közötti különbségből adódó veszélyeket.

3.5 Futópálya végbiztonsági területek

Általános rész

3.5.1 A futópálya vég sáv mindegyik végén létesítsenek végbiztonsági területet5 abban az esetben, ha:

— a kód-szám 3 vagy 4; és

— a műszeres futópálya kód-száma 2 vagy 1.

Megjegyzés: A futópálya végbiztonsági területtel kapcsolatos útmutató az A. Melléklet 9. szakaszában található.

A futópálya végbiztonsági területek mérete

3.5.2 A futópálya végbiztonsági terület a futópálya vég sávtól számítva legalább 90 méter hosszúságú legyen.

3.5.3 ***Ajánlás** — A futópálya végbiztonsági terület a futópálya vég sávtól számítva lehetőleg:*

- *ahol a kód-szám 3 vagy 4, legalább 240 méter; és*

- *ahol a kód-szám 1 vagy 2, legalább 120 méter hosszúságú legyen.*

3.5.4 A futópálya végbiztonsági terület szélessége legalább kétszerese legyen az adott futópálya szélességének.

3.5.5 ***Ajánlás** — A futópálya végbiztonsági terület szélessége lehetőleg egyenlő legyen az adott futópálya vég sáv elegyengetett részének szélességével.*

Tárgyak a futópálya végbiztonsági területeken

Megjegyzés: A futópálya végbiztonsági területen elhelyezkedő berendezések és szerkezetek kialakítására, elhelyezésére és felszerelésére vonatkozó tájékoztató a 9.9 pontban található.

3.5.6 ***Ajánlás** — A futópálya végbiztonsági területen elhelyezkedő bármely tárgy, amely veszélyeztetheti a repülőgépeket, akadálynak tekintendő és lehetőség szerint eltávolítandó.*

A futópálya végbiztonsági területek tisztítása és elegyengetése

3.5.7 ***Ajánlás** — A futópálya végbiztonsági területet egyenletes és tiszta felülettel alakítsák ki, az megfelelő* *módon legyen elegyengetve, hogy a futópályán üzemeltetni kívánt repülőgépnek a futópálya előtt történő földetérés, vagy a futópályáról történő lefutás esetében elegendő biztonságos hely álljon rendelkezésre.*

Megjegyzés: A futópálya végbiztonsági terület talaját nem kell olyan minőségben kialakítani, mint a futópálya vég sávot, mindazonáltal vegyék figyelembe a 3.5.11 pont ajánlását.

A futópálya végbiztonsági területek lejtviszonyai

3.5.8 Általános rész

Ajánlás *— A futópálya végbiztonsági terület lejtése olyan legyen, hogy a megközelítési, vagy felszállási emelkedési felületbe a terület egyik része se nyúljon be.*

3.5.9 Hosszirányú lejtés

Ajánlás *— A futópálya végbiztonsági terület hosszirányú lejtése ne haladja meg az 5 %-os értéket. A hosszirányú lejtés változásai a lehetőségek szerint fokozatosak legyenek, a lejtés hirtelen változásai úgy lefelé, mint felfelé kerülendők.*

3.5.10 Keresztirányú lejtés

Ajánlás *— A futópálya végbiztonsági terület keresztirányú lejtése lefelé, vagy felfelé ne haladja meg az 5 %-os értéket. A különböző lejtviszonyok közötti átmenet lehetőleg sima, fokozatos legyen.*

A futópálya végbiztonsági területek teherbíró-képessége

3.5.11 ***Ajánlás*** *— A futópálya végbiztonsági területet úgy készítsék elő és alakítsák ki, hogy ezzel csökkentsék a repülőgép sérülésének veszélyét futópálya előtt történő földetérés, vagy a futópályáról történő lefutás esetében, fokozzák (növeljék) a repülőgép lassulását és a 9.2.26 — 9.2.28 pontok előírásai szerint könnyítsék meg a tűzoltó és mentő gépjárművek mozgását.*

Megjegyzés: A futópálya végbiztonsági terület teherbíró-képességére vonatkozó útmutatót a Repülőtér Tervezési Kézikönyv *1. része tartalmazza.*

3.6 Biztonsági felszállási területek

Megjegyzés: A biztonsági felszállási területekről szóló, a jelen részben található részletes előírások nem jelentik azt, hogy ilyen területet kötelező létesíteni. A biztonsági felszállási területek6 alkalmazásával és igénybevételével kapcsolatos útmutató az A. Melléklet 2. szakaszában található.

A biztonsági felszállási területek helye

3.6.1 ***Ajánlás*** *— A biztonsági felszállási terület kezdete a rendelkezésre álló felszállási nekifutási távolság végénél helyezkedjen el.*

A biztonsági felszállási területek hossza

3.6.2 ***Ajánlás*** *— A biztonsági felszállási terület hossza ne haladja meg a rendelkezésre álló felszállási nekifutási távolság hosszának felét.*

A biztonsági felszállási területek szélessége

3.6.3 ***Ajánlás*** *— A biztonsági felszállási terület vízszintesen a futópálya meghosszabbított középvonalától mindkét oldalra legalább 75 méterre terjedjen.*

A biztonsági felszállási területek lejtviszonyai

3.6.4 ***Ajánlás*** *— A biztonsági felszállási terület talaja ne emelkedjen 1.25 %-os emelkedésű sík fölé, alsó határa pedig vízszintes vonal, amely:*

a) *a futópálya középvonalat magába foglaló függőleges síkra merőleges; és*

b) *a rendelkezésre álló felszállási nekifutási távolság végénél áthalad a futópálya középvonalon kijelölt ponton.*

Megjegyzés: A futópálya, padka vagy sáv kereszt és hosszirányú lejtése miatt bizonyos esetekben a biztonsági felszállási terület fentiek szerint meghatározott alsó síkja a futópálya, padka vagy sáv tengerszint feletti magassága alatt lehet. Nem szükséges és javasolt, hogy ezeket a biztonsági felszállási terület alsó síkjával egy magasságra hozzák és az sem, hogy a futópálya sávon túl a biztonsági terület síkja fölé nyúló, de ennek szintje alatt levő talajt, vagy tárgyakat eltávolítsák kivéve, ha az a légijárművek biztonságát veszélyeztetheti.

3.6.5 ***Ajánlás*** *— Amennyiben a biztonsági felszállási területen a talaj lejtése relatív kis mértékű, vagy ha az átlagos érték felfelé irányuló, kerüljék a lejtés hirtelen változásait. Az ilyen esetekben a meghosszabbított középvonal mindkét oldalán, attól 22.5 méterre, vagy a futópálya szélességének fele távolságra — amelyik a nagyobb érték — terjedő biztonsági felszállási terület szakaszon belül a lejtés, a lejtés változása, valamint a futópálya és biztonsági terület közötti átmenet általában feleljen meg a futópálya hasonló jellemzőinek.*

Tárgyak a biztonsági felszállási területeken

Megjegyzés: A biztonsági felszállási területen levő berendezések és szerkezetek kialakítására, elhelyezésére és felszerelésére vonatkozó tájékoztatás a 9.9 pontban található.

3.6.6 ***Ajánlás*** *— A biztonsági felszállási területen elhelyezkedő bármely tárgy, amely veszélyeztetheti a levegőben levő repülőgépeket, akadálynak tekintendő és eltávolítandó.*

3.7 Biztonsági megállási terület

Megjegyzés: A biztonsági megállási területekről szóló, a jelen részben található részletes előírások nem jelentik azt, hogy ilyen területet kötelező létesíteni. A biztonsági megállási területek alkalmazásával és igénybevételével kapcsolatos útmutató az A. Melléklet 2. részében található.

A biztonsági megállási terület szélessége

3.7.1 A biztonsági megállási terület ugyanolyan széles legyen, mint az a futópálya, amelyhez azt létesítették.

A biztonsági megállási terület lejtviszonyai

3.7.2 ***Ajánlás*** *— A biztonsági megállási terület lejtése és annak változásai, valamint a futópálya és a biztonsági megállási terület közötti átmenet feleljenek meg a 3.1.13 — 3.1.19 pontok előírásainak azon futópálya vonatkozásában, amelyhez biztonsági megállási területet kialakították, kivéve;*

a) *a futópálya első és utolsó negyedére a 3.1.14 pontban előírt 0.8 %-os lejtés értéket a biztonsági megállási területre nem szükséges alkalmazni; és*

b) *a 3 és 4 kód-számú futópályák esetében a biztonsági megállási terület és a futópálya csatlakozásánál valamint a biztonsági megállási terület mentén a legnagyobb lejtés értéke 30 méterenként 0.3 % lehet (legkisebb ívsugár 10 000 méter) .*

A biztonsági megállási területek teherbíró-képessége

3.7.3 ***Ajánlás*** *— A biztonsági megállási területet úgy készítsék elő és alakítsák ki, hogy a felszállás megszakítása esetén szerkezeti sérülés okozása nélkül elbírja azon repülőgép súlyát, amelynek kiszolgálására a megállási területet tervezték.*

Megjegyzés: A biztonsági megállási terület teherbíró-képességére vonatkozó útmutatót az A. Melléklet 2. szakasza tartalmazza.

A biztonsági megállási terület felülete

3.7.4 ***Ajánlás*** *— A burkolattal ellátott biztonsági megállási terület felületét úgy alakítsák ki, hogy nedves állapotban jó felületi súrlódási együtthatót biztosítson, amely megfelel a hozzá tartozó futópálya hasonló jellemzőinek.*

3.7.5 ***Ajánlás*** *— A burkolattal el nem látott biztonsági megállási terület súrlódási jellemzői ne legyenek jelentősen gyengébbek, mint azon futópálya hasonló jellemzői, amelyhez az tartozik.*

3.8 Rádió magasságmérő üzemeltetési terület

Általános rész

3.8.1 ***Ajánlás*** *— A precíziós megközelítésű futópálya küszöb előtti területén rádió magasságmérő üzemeltetési területet jelöljenek ki.*

A terület hossza

3.8.2 ***Ajánlás*** *— A rádió magasságmérő üzemeltetési terület legalább a futópálya küszöb előtt 300 méter távolságra terjedjen ki.*

A terület szélessége

3.8.3 ***Ajánlás*** *— A rádió magasságmérő üzemeltetési terület a futópálya meghosszabbított középvonalától mindkét oldalra vízszintesen 60 méter távolságra terjedjen kivéve, ha ezt a körülmények szükségessé teszik, lehetséges ennek a szélességnek legfeljebb 30 méterre történő csökkentése, abban az esetben, ha a légiforgalmi ellenőrzés azt jelzi, hogy ez a csökkentés a légijármű üzemeltetés biztonságát nem befolyásolja hátrányosan.*

Hosszirányú lejt viszonyok változása

3.8.4. ***Ajánlás*** *– A rádió magasságmérő üzemeltetési területen kerülendők vagy a lehető legkisebb mértékűre korlátozandók a lejtési viszonyok változásai. Ahol a szintváltozás elkerülhetetlen, a lejtés a lehető legfolytonosabb legyen, a hirtelen változásokat illetve lejtés irányváltását kerüljék. A két egymást követő lejtős terület közötti változás értéke ne haladja meg 30 méterenként a 2% értéket.*

Megjegyzés: Rádió magasságmérő üzemeltetési területtel kapcsolatos útmutatás az A Melléklet 4.3 részében valamint a Minden Időjárási Körülmények Között Végrehajtott Légijármű Üzemeltetés Kézikönyve *(DOC 9365) 5.2 részében található. A rádió magasságmérő üzemeltetési terület igénybevételével kapcsolatos útmutatás a PANS-OPS II. kötet, 3. rész 21. fejezetében található.*

3.9 Guruló utak

Megjegyzés: A jelen részben ismertetett előírások minden gurulóút típusra alkalmazandók kivéve, ha ezt külön másként jelezzük.

Általános rész

3.9.1 ***Ajánlás** — A légijármű felszíni mozgásának biztonsága és gyorsítása érdekében létesítsenek guruló utakat.*

Megjegyzés: A gurulóút elrendezésére és kialakítására vonatkozó útmutatás a Repülőtér Tervezési Kézikönyv *(Doc 9157) 2. részében található.*

3.9.2 ***Ajánlás** — Egy futópályához a repülőgépek mozgásának meggyorsítása érdekében megfelelő számú ki és le-gurulóutat biztosítsanak továbbá, amennyiben a forgalom nagyságrendje nagy, vegyék fontolóra a gyors leguruló utak kialakításának lehetőségét is.*

3.9.3 ***Ajánlás** — A gurulóút tervezése és kialakítása olyan legyen, hogy amikor azon repülőgép pilótakabinja, amely kiszolgálására a guruló utat tervezték a gurulóút középvonal jelölés felett marad, a repülőgép külső főfutó abroncsa és a gurulóút széle között levő biztonsági távolság nem lesz kevesebb, mint a következő biztonsági távolság táblázatban megadott érték.*

Kód-betű	Biztonsági távolság (méter)
A	1.5 m
B	2.25 m
C	3.0 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a guruló utat tervezték kevesebb, mint 18 m
	4.5 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a guruló utat tervezték több, mint 18 m
D	4.5 m
E	4.5 m
F	4.5 m

1. Megjegyzés: A tengelytávolság az orrfutó és a főfutó mértani középpontja közötti hossz-távolságot jelenti.

2. Megjegyzés: Ahol a kód betű F és a forgalom sűrűsége nagy, a magasabb gurulási sebesség lehetővé tétele érdekében 4.5 méternél nagyobb futómű gumiabroncs és gurulóút széle közötti biztonsági távolságot is kialakíthatnak.

3.9.4 2008 november 20. után a gurulóút tervezése és kialakítása olyan legyen, hogy amikor azon repülőgép pilótakabinja, amely kiszolgálására a gurulóutat tervezték, a gurulóút középvonal jelölés felett marad, a repülőgép külső főfutó abroncsa és a gurulóút széle között levő biztonsági távolság nem lehet kevesebb, mint a következő biztonsági távolság táblázatban megadott érték:

Kód-betű	Biztonsági távolság (méter)
A	1.5 m
B	2.25 m
C	3.0 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a gurulóutat tervezték kevesebb mint 18 m
	4.5 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a gurulóutat tervezték több mint 18 m
D	4.5 m
E	4.5 m
F	4.5 m

1. Megjegyzés: A tengelytávolság az orrfutó és a főfutó mértani középpontja közötti hossz-távolságot jelenti.

2. Megjegyzés: Ahol a kód betű F és a forgalom sűrűsége nagy, a magasabb gurulási sebesség lehetővé tétele érdekében 4.5 méternél nagyobb futómű gumiabroncs és gurulóút széle közötti biztonsági távolságot is kialakíthatnak.

3. Megjegyzés: Ez a kitétel a 2008. november 20-án vagy azt követően első alkalommal használatba helyezett guruló utakra vonatkozik.

A guruló utak szélessége

3.9.5 ***Ajánlás** — A gurulóút egyenes szakaszának szélessége ne legyen kevesebb, mint a következő gurulóút szélesség táblázatban megadott érték:*

Kód-betű	Gurulóút szélessége (méter)
A	7.5 m
B	10.5 m
C	15 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a guruló utat tervezték kevesebb, mint 18 méter
	18 m, ha a repülőgépek tengelytávolsága, amelyek kiszolgálására a guruló utat tervezték 18 méter vagy több
D	18 m, ha a repülőgépek külső főfutó abroncsok közötti oldaltávolsága, amelyek kiszolgálására a guruló utat tervezték, kevesebb mint 9 méter
	23 m, ha a repülőgépek külső főfutó abroncsok közötti oldaltávolsága, amelyek kiszolgálására a guruló utat tervezték 9 méter vagy több
E	23 m
F	25 m

Megjegyzés: A guruló utak szélességére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 2. részében található.*

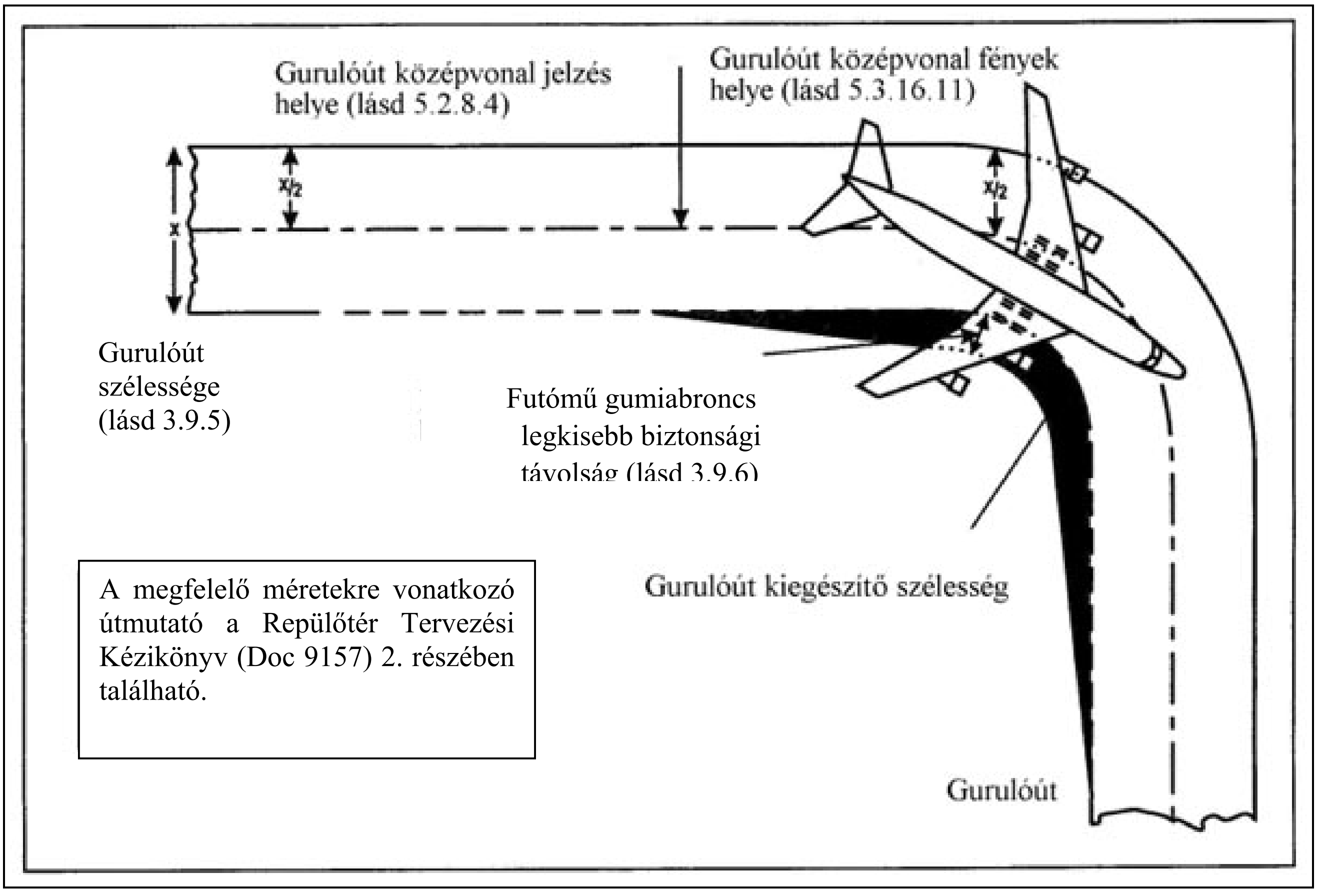
Gurulóút ívek

3.9.6 ***Ajánlás*** *— A guruló utak irányának változása a lehető legkevesebb és legkisebb mértékű legyen. Az ívek sugara feleljen meg azon repülőgépek normál sebességű gurulási sebességének és manőverező képességének, amelyek részére a gurulóutat tervezték. A gurulóút ívét úgy tervezzék meg, hogy amikor a repülőgép pilótafülkéje a gurulóút középvonal jelölés felett marad, akkor a repülőgép külső főfutó abroncsok és a gurulóút széle közötti biztonsági távolság nem lesz kevesebb, mint a 3.9.3 pontban meghatározott érték.*

1. Megjegyzés: A gurulóút szélesítésének példája a megfelelő biztonsági távolság elérése érdekében a 3-2. ábrán látható. Az alkalmas méretekre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 2. részében található.*

2. Megjegyzés: A gurulóút középvonal jelölések és fények elhelyezését az 5.2.8.4 és az 5.3.16.11 pontokban határozzuk meg.

3. Megjegyzés: Az összetett ívek csökkenthetik, vagy kiküszöbölhetik a gurulóút kiszélesítésének szükségességét.



3-2. ábra: Gurulóút-ívelt szakasza

Az ábra a gurulóút ív szélesítésének példáját mutatja be az ívelt szakaszon megfelelő futómű gumiabroncs biztonsági távolság elérése érdekében (lásd 3.9.6)

Csatlakozások és kereszteződések

3.9.7 ***Ajánlás —*** *A repülőgépek mozgásának megkönnyítése érdekében a gurulóútak, valamint a futópályák, forgalmi előterek és egyéb gurulóútak csatlakozásainál és kereszteződéseinél kiegészítő lekerekítő sávokat építsenek ki. A kiegészítő lekerekítő sávok biztosítsák a 3.9.3 pontban meghatározott legkisebb biztonsági távolságok fenntartását abban az esetben, ha a repülőgépek a csatlakozásokban és kereszteződésekben mozognak.*

Megjegyzés: A kiegészítő lekerekítő sávok tervezése alkalmával legyenek tekintettel a repülőgép alap hosszúságára. A tervezéssel és az alap hosszúsággal kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv 2. részében található.

Gurulóutak legkisebb biztonsági távolsága

3.9.8 ***Ajánlás —*** *Egy gurulóút középvonala és egy futópálya középvonala, illetve az azzal párhuzamos gurulóút középvonala vagy egy akadály közötti biztonsági távolság ne legyen kevesebb, mint a 3-1. táblázatban meghatározott megfelelő érték. Kivétel, hogy egy már meglevő repülőtéren engedélyezhető a kisebb biztonsági távolságok melletti üzemeltetés, ha a légiforgalmi irányítás azt jelzi, hogy az ilyen alacsonyabb biztonsági oldaltávolságok nem befolyásolják hátrányosan a repülésbiztonságot, és nem csökkentik jelentős mértékben a repülőgép üzemeltetés rendszerességét és menetrendszerűségét.*

3-1. táblázat: Gurulóút legkisebb elkülönítési oldaltávolságok

Kód-betű	***A futópálya és a gurulóút középvonalak közötti távolság (méter)***							
	Műszeres futópálya				Nem műszeres futópálya			
	Kód-szám				*Kód-szám*			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
A	82.5	82.5	—	—	37.5	47.5	—	—
B	87	87	—	—	42	52	—	—
C	—	—	168	—	—	—	93	—
D	—	—	176	176	—	—	101	101
E	—	—	—	182.5	—	—	—	107.5
F	—	—	—	190	—	—	—	115

	Gurulóút középvonalak közötti távolság	*Gurulóút8 középvonalak és akadályok közötti távolság*	*Légijármű állóhely gurulási középvonal és akadályok közötti távolság*
Kód-betű	*(10)*	*(11)*	(12)
A	23.75	16.25	12
B	33.5	21.5	16.5
C	44	26	24.5
D	66.5	40.5	36
E	80	47.5	42.5
F	97.5	57.5	50.5

1. Megjegyzés a táblázathoz: A (2) és (9) oszlop oldaltávolság értékei általános elrendezésű futópálya és gurulóút rendszerre vonatkoznak. Lásd a Repülőtér Tervezési Kézikönyv 2. részét.

2. Megjegyzés a táblázathoz: A (2) és (9) oszlop távolság értékei nem nyújtanak elegendő biztonsági távolságot egy várakozó repülőgép mögött egy másiknak a párhuzamos gurulóúton való elhaladásához. Lásd a Repülőtér Tervezési Kézikönyv 2. részét.

A gurulóút lejtviszonyai

3.9.9 Hosszirányú lejtés

Ajánlás *— Egy gurulóút hosszirányú lejtése ne haladja meg a következő értéket:*

— 1.5 %, ahol a kód-betű C, D vagy E; és

— 3.0 %, ahol a kód-betű A vagy B.

3.9.10 Hosszirányú lejtés változásai

Ajánlás *— Ahol a gurulóút lejtviszonyainak változása elkerülhetetlen, az egyik lejtésből a másikba vezető átmenet olyan ívelt felülettel legyen kialakítva, amelynek mértéke ne haladja meg a következőket:*

— 30 méterenként 1 %, ahol a kód-betű C, D, E vagy F (legkisebb ív sugár 3000 m); és

— 25 méterenként 1 %, ahol a kód-betű A vagy B (legkisebb ív sugár 2500 m).

3.9.11 Látástávolság (láthatóság)

Ajánlás *— Ahol a gurulóút lejtés változása elkerülhetetlen, az olyan legyen, hogy az akadálytalan látás távolsága (láthatóság) legalább az alábbi értékű maradjon:*

— a gurulóút felett 3 méter magasságból legalább az adott ponttól mért 300 méter távolságig látható legyen a gurulóút egész felülete, ahol a kód-betű C, D, E vagy F;

— a gurulóút felett 2 méter magasságból legalább az adott ponttól mért 200 méter távolságig látható legyen a gurulóút egész felülete, ahol a kód-betű B; és

— a gurulóút felett 1.5 méter magasságból legalább az adott ponttól mért 150 méter távolságig látható legyen a gurulóút egész felülete, ahol a kód-betű A.

3.9.12 Keresztirányú lejtés

Ajánlás *— Egy gurulóút keresztirányú lejtése megfelelő legyen a víz felgyülemlésének megakadályozására a gurulóút felületén, azonban ne haladja meg a következő értéket:*

— 1.5 %, ahol a kód-betű C, D, E vagy F; és

— 2.0 %, ahol a kód-betű A vagy B.

Megjegyzés: A légijármű állóhely gurulási nyomvonal keresztirányú lejtésére vonatkozóan lásd a 3.13.4 alpontot.

A gurulóút teherbíró-képessége

3.9.13 ***Ajánlás*** *— A gurulóút teherbíró-képessége legalább azonos legyen azon futópálya teherbíró-képességével, amelyet az kiszolgál és vegyék figyelembe azt a tényt is, hogy a gurulóút a forgalom nagyobb sűrűsége, valamint a lassan guruló és megálló repülőgépek súlya miatt fokozottabb igénybevételnek van kitéve, mint a futópálya amelyet kiszolgál.*

Megjegyzés: A gurulóút és futópálya teherbíró-képességének arányával kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *3. részében található.*

A gurulóút felülete

3.9.14 ***Ajánlás*** *— A gurulóút felületén ne legyenek olyan rendellenességek, amelyek a repülőgép szerkezeti sérülését okozhatják.*

3.9.15 ***Ajánlás*** *— A burkolattal ellátott gurulóút felülete olyan legyen, hogy nedves állapotban is jó súrlódási jellemzőkkel rendelkezzen.*

Gyors legurulóutak

Megjegyzés: A következőkben kifejezetten a gyors legurulóutakra vonatkozó előírásokat ismertetjük. A gyors legurulóútra, amely a 3-3. ábrán látható, a gurulóútra vonatkozó általános követelmények alkalmazandók. Az ilyen gurulóút létesítésére, elhelyezésére és tervezésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *2. részében található.*

3.9.16 ***Ajánlás*** *— A gyors legurulóutat úgy tervezzék meg, hogy a lefordulási ív sugara legalább a következő legyen:*

— 550 méter, ahol a kód-szám 3 vagy 4; és

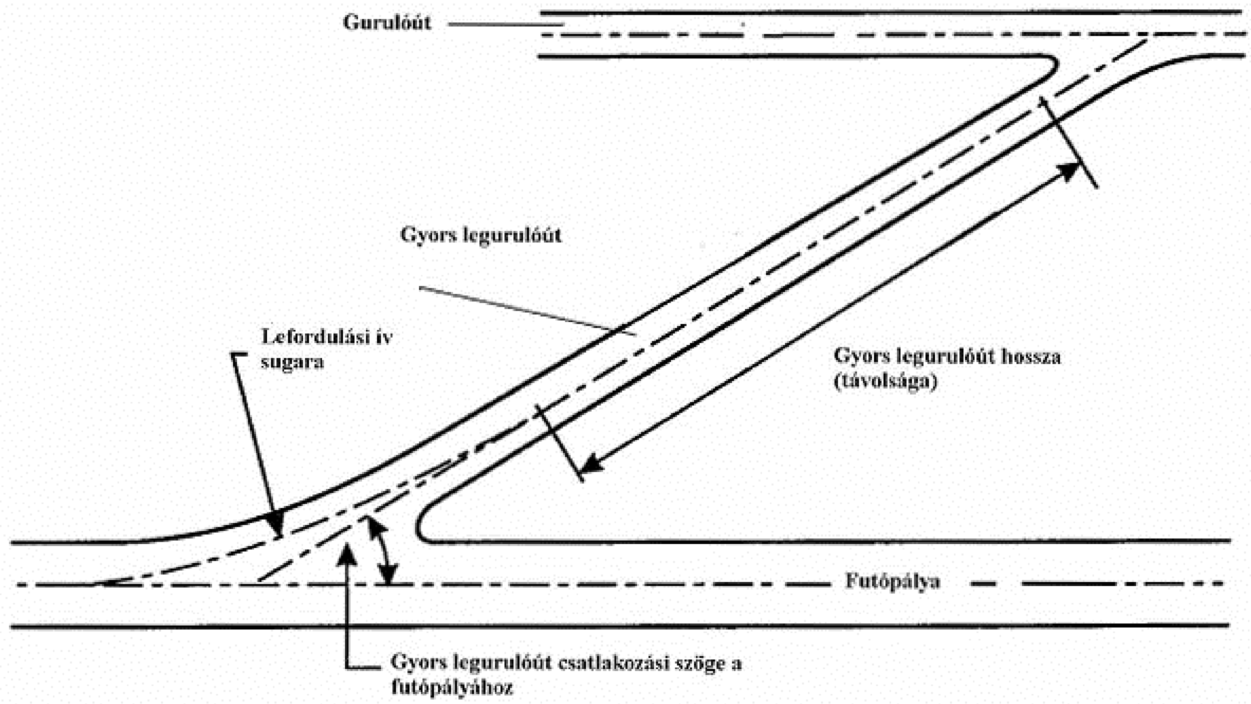
— 275 méter, ahol a kód-szám 1 vagy 2;

mert ez lehetővé tesz, hogy a légijármű nedves burkolt felület esetében:

— 93 km/h sebességgel, ahol a kód-szám 3 vagy 4; és

— 65 km/h sebességgel, ahol a kód szám 1 vagy 2 hagyja el a futópályát.

Megjegyzés: A gyors legurulóutak futópálya mentén történő elhelyezése a különböző sebességi és egyéb körülményektől függ, amelyeket a Repülőtér Tervezési Kézikönyv *2. részében ismertetünk.*



3-3. ábra: Gyors legurulóút

3.9.17 ***Ajánlás** — A gyors legurulóút ívének belsejénél levő kiegészítő lekerekítő sáv sugara elegendő legyen ahhoz, hogy kiszélesített gurulóút torkolatot képezzen bejáratának idejekorán történő felismeréséhez valamint a gurulóútra történő leforduláshoz.*

3.9.18 ***Ajánlás** — A gyors legurulóúton a lefordulási ív után megfelelő egyenes szakaszt alakítsanak ki, amely elegendő hosszú ahhoz, hogy azon a futópályát elhagyó légijármű bármely más keresztező gurulóút előtt biztonságos távolságban teljesen megálljon.*

3.9.19 ***Ajánlás** — A gyors legurulóút csatlakozási szöge a futópályához ne legyen nagyobb, mint 45° és ne legyen kisebb, mint 25°. A legmegfelelőbb csatlakozási szög 30°.*

Gurulóút hidakon

3.9.20 A gurulóút híd azon részének szélessége, amely megfelelő teherbírással rendelkezik a repülőgépek működéséhez a középvonalra merőlegesen mérve ne legyen kevesebb, mint az adott gurulóút sáv elegyengetett területének szélessége, kivéve ha az oldalirányú lecsúszást olyan megbízható módszerrel akadályozzák meg, amely nem jelent veszélyt azokra a repülőgépekre, amelyek kiszolgálására a gurulóutat tervezték.

3.9.21 ***Ajánlás** — Megfelelő feljárattal tegyék lehetővé, hogy a tűzoltó és mentő gépjárművek mindkét irányból, a gurulóút híd igénybevételére tervezett legnagyobb méretű repülőgépre meghatározott beavatkozási időn belül felhajthassanak a hídra.*

Megjegyzés: Ha a repülőgép hajtóművei a híd szerkezetén túl nyúlnak, szükséges lehet a környező területek védelme a hajtóműből kiáramló erős gázsugárral szemben.

3.9.22 ***Ajánlás —** A hidat a gurulóút egyenes szakaszán építsék fel és a hídhoz közeledő repülőgépek pontos és megfelelő irányú gurulásának megkönnyítése érdekében a híd mindkét végén egyenes gurulóút szakaszt alakítsanak ki.*

3.10 Gurulóút padkák

Megjegyzés: A gurulóút útpadkák jellemzőivel és kialakításával kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *2. részében található.*

3.10.1 ***Ajánlás** — A C, D, E vagy F kód-betű esetében a gurulóút egyenes szakaszait mindkét oldalon szimmetrikusan útpadkával lássák el úgy, hogy az egyenes szakaszon a gurulóút és az útpadka együttes szélessége ne legyen kevesebb, mint:*

— 60 méter, ahol a kód-betű F;

— 44 méter, ahol a kód-betű E;

— 38 méter, ahol a kód-betű D; és

— 25 méter, ahol a kód-betű C.

A gurulóút íveknél, csatlakozásoknál és kereszteződéseknél, ahol a burkolt felületet megnövelték, az útpadka szélessége az egyenes szakaszok útpadka szélességénél ne legyen kevesebb.

3.10.2 ***Ajánlás*** *— Amikor a gurulóutat gázsugár hajtóműves légijárművek üzemeltetésére kívánják igénybe venni, a gurulóút útpadka felületét úgy készítsék el, hogy az ellenálljon a hajtóműből kiáramló erős gázsugár eróziós hatásainak és megakadályozzák a felszínen levő idegen tárgy hajtóműbe történő beszívását is.*

3.11 Gurulóút biztonsági sávok

Megjegyzés: A gurulóút sávok jellemzőivel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv 2. részében található.

Általános rész

3.11.1 A gurulóút körül, a légijármű állóhely gurulási nyomvonal kivételével jelöljenek ki (biztonsági) sávot.

A gurulóút sáv szélessége

3.11.2 ***Ajánlás*** *— A gurulóút sáv a gurulóút középvonalának mindkét oldalán, annak teljes hosszában kijelölt (biztonsági) sáv, melynek szélessége legalább a 3-1. táblázat 11. oszlopában meghatározott értékű legyen.*

Tárgyak a gurulóút sávban

Megjegyzés: A gurulóút sávban elhelyezhető felszerelések és létesítmények ismertetése a 9.9 pontban található.

3.11.3 ***Ajánlás*** *— A gurulóút sáv olyan terület legyen, amely mentes azoktól a tárgyaktól és idegen anyagoktól, amelyek veszélyeztethetik a guruló repülőgépeket.*

Megjegyzés: Gondoskodni kell a gurulóút sávban levő vízelvezető csatornák alkalmas elhelyezéséről és tervezéséről, hogy megakadályozzák a gurulóútról véletlenül lefutó repülőgép sérülését. Szükség lehet megfelelően megtervezett csatorna fedőlapok elhelyezésére is.

A gurulóút sáv elegyengetése

3.11.4 ***Ajánlás*** *— A gurulóút sáv középső szakasza a gurulóút középvonalától mért alábbi távolság értékekig megfelelő módon legyen elegyengetve:*

— legalább 11 méter, ahol a kód-betű A;

— legalább 12.5 méter, ahol a kód-betű B vagy C;

— legalább 19 méter, ahol a kód-betű D; és

— legalább 22 méter, ahol a kód-betű E

— legalább 30 méter, ahol a kód-betű F.

A gurulóút sáv lejtviszonyai

3.11.5 ***Ajánlás*** *— A sáv felülete azonos szintben legyen a gurulóút, vagy ha ilyet kialakítottak, az útpadka csatlakozással és az elegyengetett rész keresztirányú emelkedése ne haladja meg az alábbi értéket:*

— 2.5 % a gurulóút sávnál, ahol a kód-betű C, D, E vagy F; és

— 3.0 % a gurulóút sávnál, ahol a kód-betű A vagy B;

az emelkedést a szomszédos gurulóút felület keresztirányú lejtéséhez és ne a vízszinteshez viszonyítva mérjék. A keresztirányú lejtés értéke ne haladja meg a vízszinteshez viszonyított 5 % értéket.

3.11.6 ***Ajánlás —*** *A gurulóút sáv elegyengetett részén túl terjedő bármely rész keresztirányú emelkedése a gurulóút irányától kifelé mérve ne haladja meg az 5 %-os értéket.*

3.12 Kitérő várakozó hely, futópálya várakozási hely, közbenső várakozási hely és út váró hely

Általános rész

3.12.1 ***Ajánlás —*** *Ha a repülőtér forgalma közepes vagy nagy, létesítsenek kitérő várakozó hely(ek)et.*

3.12.2 Jelöljenek ki futópálya várakozási helyet vagy helyeket:

a) a gurulóúton a futópálya és egy gurulóút csatlakozásánál; és

b) a futópálya és egy másik futópálya csatlakozásánál, amennyiben az előbbi egy szabványos gurulási útvonal részét képezi.

3.12.3 A gurulóúton jelöljenek ki futópálya várakozási helyet, ha a gurulóút elhelyezkedése vagy iránya olyan, hogy az ott guruló légijármű, vagy gépjármű megsértheti az akadály korlátozási felületeket, vagy interferenciával zavarhatja a rádiónavigációs berendezések működését.

3.12.4 ***Ajánlás —*** *A gurulóúton a futópálya várakozási helytől eltérő bármely más ponton jelöljenek ki közbenső várakozási helyet, ha egy adott várakozási határpont megállapítása kívánatos.*

3.12.5 A futópálya és egy út csatlakozásánál jelöljenek ki gépjármű út váró helyet.

Elhelyezkedés

3.12.6 A kitérő várakozó, a futópálya és gurulóút csatlakozásnál létesített futópálya várakozási, vagy út váró helyek, valamint a futópálya középvonal közötti távolság feleljen meg a 3-2. táblázatban előírt értékeknek és a precíziós megközelítésű futópálya esetében a távolságok olyanok legyenek, hogy az ott várakozó légijármű, vagy gépjármű ne zavarja interferenciával a rádiónavigációs berendezések működését.

3.12.7 ***Ajánlás*** — *A 700 méternél (2300 láb) nagyobb tengerszinthez viszonyított magasság felett fekvő repülőtér esetében a 3-2. táblázatban meghatározott 90 méteres távolságot a 4 kód-számú precíziós megközelítésű futópálya esetében a következőképpen növeljék meg:*

a) 2000 méter (6600 láb) tengerszinthez viszonyított magasságig 700 méter (2300 láb) magasság felett minden 100 méterenként (330 láb) 1 méterrel;

b) 2000 méter (6600 láb) és 4000 méter (13320 láb) közötti tengerszinthez viszonyított magasságig 13 méterrel továbbá 2000 méter (6600 láb) magasság felett minden 100 méterenként (330 láb) 1.5 méterrel; és

c) 4000 méter (13320 láb) és 5000 méter (16650 láb) közötti tengerszinthez viszonyított magasságig 43 méterrel továbbá 4000 méter (133200 láb) magasság felett minden 100 méterenként (330 láb) 2 méterrel.

3.12.8 ***Ajánlás*** — *Amennyiben a 4 kód-számú precíziós megközelítésű futópálya kitérő várakozó helye, futópálya várakozási helye, vagy út váró helye a futópálya küszöbnél magasabban fekszik, a 3-2. táblázatban meghatározott 90, illetve 107.5 méteres távolságot a hely és a futópálya küszöb magasság különbség minden métereként 5 méterrel növeljék.*

3.12.9 A 3.11.3 pont alapján létesített futópálya várakozási hely elhelyezkedése olyan legyen, hogy az ott várakozó légijármű, vagy gépjármű ne sértse meg az akadálykorlátozási felületet, megközelítési felületet, felszállási emelkedési felületet, vagy az ILS / MLS kritikus, vagy érzékeny területet, továbbá interferenciával ne zavarja a rádiónavigációs berendezések működését.

3-2. táblázat: Legkisebb távolság a futópálya középvonal és a kitérő várakozó hely, a futópálya várakozási hely vagy út váró hely között

	Kód-szám			
Futópálya típusa	1	2	3	4
Nem-műszeres	30 m	40 m	75 m	75 m
Nem-műszeres megközelítésű	40 m	40 m	75 m	75 m
I. kategóriás műszeres megközelítésű	60 m[b]	60 m[b]	90 m[a,b]	90 m[a,b,c]
II. és III. kategóriás műszeresmegközelítésű			90 m[a,b]	90 m[a,b,c]
Felszállási	30 m	40 m	75 m	75 m

Megjegyzések a 3-2. táblázathoz:

a) Amennyiben a kitérő várakozó hely, a futópálya várakozási hely vagy az út váró hely a futópálya küszöbnél alacsonyabban fekszik, a távolságot a hely és a futópálya küszöb közötti negatív magasság különbség minden métereként 5 méterrel csökkenthetik, feltéve, hogy a belső átmeneti felületet nem sértik meg.

b) A földi rádió berendezések zavarásának elkerülése érdekében, különösen a siklópálya és iránysáv adó berendezések figyelembevételével a távolság növelésére lehet szükség. Az ILS és MLS berendezések kritikus *és érzékeny területeire vonatkozó tájékoztatás a 10. Annex I. kötet 1. része C. és G. mellékleteiben található (lásd még 3.12.6).*

1. Megjegyzés: A 3 és 4 kód-számhoz meghatározott 90 méteres távolság esetében olyan légijárművet vettünk alapul, amelynek függőleges vezérsík magassága 20 méter, a legmagasabb pontnak a légijármű orrától mért távolsága 52.7 méter és az orr magassága 10 méter. A fenti légijármű a futópálya középvonalához viszonyítva 45°-os, vagy ennél nagyobb szögben várakozik az akadálymentes zónán kívül és az OCA/H számítás szempontjából nem vettük figyelembe.

2. Megjegyzés: A 2 kód-számhoz meghatározott 60 méteres távolság esetében olyan légijárművet vettünk alapul, amelynek függőleges vezérsík magassága 8 méter, a legmagasabb pontnak a légijármű orrától mért távolsága 24.6 méter és az orr magassága 5.2 méter. A fenti légijármű a futópálya középvonalához viszonyítva 45°-os, vagy ennél nagyobb szögben várakozik az akadály mentes zónán kívül.

c) Az F repülőtér vonatkozási kód betű esetében ez a távolság 107.5 méter.

Megjegyzés: A 4 kód-számhoz és F kód-betűhöz meghatározott 107.5 méteres távolság esetében olyan légijárművet vettünk alapul, amelynek függőleges vezérsík magassága 24 méter, a legmagasabb pontnak a légijármű orrától mért távolsága 62.2 méter és az orr magassága 10 méter. A fenti légijármű a futópálya középvonalához viszonyítva 45°-os, vagy ennél nagyobb szögben várakozik az akadálymentes zónán kívül.

3.13 Forgalmi előtér

Általános rész

3.13.1 ***Ajánlás** — Ahol az utasok be és kiszállásához, a teherárú, vagy posta küldemények be és kirakodásához, valamint a légijármű kiszolgálásához a repülőtér forgalmának zavarása, illetve akadályozása elkerülése érdekében erre szükség van, létesítsenek forgalmi előtereket.*

A forgalmi előtér mérete

3.13.2 ***Ajánlás** — A forgalmi előtér teljes területe megfelelő legyen a várható legnagyobb repülőtéri forgalom gyors és zökkenőmentes kiszolgálásához.*

A forgalmi előtér teherbíró-képessége

3.13.3 ***Ajánlás** — A forgalmi előtér minden egyes részének teherbíró-képessége feleljen meg annak a légijármű típus forgalomnak, amelynek kiszolgálására tervezték és vegyék figyelembe azt a tényt is, hogy a forgalmi előtér egyes részein nagyobb a forgalom sűrűsége, valamint a lassan guruló és megálló légijárművek súlya miatt az nagyobb igénybevételnek van kitéve, mint egy futópálya.*

A forgalmi előtér lejtviszonyai

3.13.4 ***Ajánlás** — A forgalmi előtér, beleértve a légijármű állóhely gurulási nyomvonalat is, lejtése megfelelő legyen a víz felgyülemlésének megakadályozására a forgalmi előtér felületén, azonban a vízelvezetési követelmények figyelembevétele mellett lehetőleg sík legyen.*

3.13.5 ***Ajánlás** — A légijármű állóhely legnagyobb lejtése az 1 % értéket ne haladja meg.*

Biztonsági távolság a légijármű állóhelyek között

3.13.6 ***Ajánlás*** *— A légijármű állóhelyen az ott tartózkodó légijármű és bármely más szomszédos épület, légijármű vagy egyéb tárgy és akadály közötti legalább a következő távolságot biztosítsák:*

Kód-betű	A	B	C	D	E	F
Biztonsági távolság	3.0 m	3.0 m	4.5 m	7.5 m	7.5 m	7.5 m

Ahol a különleges körülmények megkövetelik, a D, E vagy F kód-betű esetében az orral befelé beálló légijármű állóhelynél ezek a távolságok csökkenthetők:

a) *a forgalmi épület és a légijármű orra között, beleértve bármely rögzített utasbeszálló hidat is; és*

b) *a látás utáni (oldalszög irány-jelzés) beállító rendszerrel felszerelt légijármű állóhely bármely részén.*

Megjegyzés: A forgalmi előtereken figyelembe kell venni a kiszolgáló utak, valamint a földi kiszolgáló berendezések és eszközök működésével, szállításával és mozgatásával kapcsolatos területek iránti igényeket is (lásd Repülőtér Tervezési Kézikönyv 2. rész — A földi kiszolgáló berendezések és eszközök tárolása).

3.14 Elkülönített légijármű várakozó (álló) hely

3.14.1 Jelöljenek ki elkülönített légijármű várakozó (álló) helyet, vagy tájékoztassák a repülőtéri irányító tornyot arról a területről illetve helyszínekről, amelyek alkalmasak a ténylegesen, vagy feltételezetten jogtalan beavatkozás alatt álló, vagy egyéb okokból a repülőtér rendes forgalmától elkülönítendő légijármű parkolására.

3.14.2 ***Ajánlás*** *— Az elkülönített légijármű várakozó (álló) hely a lehető legnagyobb távolságra, de soha nem kevesebb, mint 100 méterre legyen más légijármű állóhelytől, épülettől, vagy nyilvános területtől, stb. Gondoskodjanak arról, hogy az állóhely ne helyezkedjen el olyan föld alatti létesítmények felett, mint például gáz vagy üzemanyag távvezeték és ha lehet, ne helyezkedjen el elektromos, vagy távközlési vezetékek felett sem.*

3.15 Jégmentesítő és jégtelenítő létesítmények

Megjegyzés: A repülőgép jégmentesítő és jégtelenítő létesítmények kialakítása alkalmával elsődleges fontosságú a biztonságos és hatékony repülőgép üzemeltetés. További útmutató a Légijármű Földi Jégtelenítési és Jégmentesítési Kézikönyvben található (Doc 9640).

Általános rész

3.15.1 ***Ajánlás — Azon*** *a repülőtéren, ahol jegesedés időjárási körülmények várhatók, biztosítsanak repülőgép jégmentesítő és jégtelenítő létesítményeket.*

Elhelyezés

3.15.2 ***Ajánlás*** *— A jégmentesítő és jégtelenítő létesítményeket a légijármű állóhelyeknél, vagy a felszállásra kijelölt futópályához vezető gurulóút mentén helyezzék el feltéve, ha a felesleges jégmentesítő és jégtelenítő folyadékok összegyűjtésére és elvezetésére, valamint talajvíz szennyezés megakadályozására megfelelő csatornázást alakítanak ki. Vegyék figyelembe a forgalom nagyságrendjét, valamint az induló forgalom megoszlását is.*

1. Megjegyzés: A jégmentesítő és jégtelenítő létesítmény elhelyezését befolyásoló egyik elsődleges tényező annak biztosítása, hogy a jégmentesség időtartama nem jár le a felszálláshoz történő gurulás végén, amikor a kezelt repülőgép felszállási engedélyt kap.

2. Megjegyzés: A távoli létesítmények alkalmasak az időjárási körülmények változásainak ellensúlyozására abban az esetben, amikor a repülőgépnek a felszállásra kijelölt futópályához vezető gurulási útvonala mentén jegesedés, vagy hófúvás várható.

3.15.3 ***Ajánlás** — A távoli jégmentesítő és jégtelenítő létesítményt úgy helyezzék el, hogy az ne érjen a 4. fejezetben meghatározott akadálykorlátozási felületekbe, ne okozzon interferenciás zavart a rádiónavigációs berendezések működésében és a jégtelenítés alatt álló repülőgép további engedélyezésének érdekében a repülőtéri irányító toronyból jól látható legyen.*

3.15.4 ***Ajánlás** — A távoli jégmentesítő és jégtelenítő létesítményt úgy helyezzék el, hogy az, esetleg kitérő gurulóút szakasz létesítésével és igénybevételével lehetővé tegye a forgalom gyors áramlását, továbbá a létesítményre történő be és kiállás ne igényeljen szokatlan gurulási műveleteket.*

Megjegyzés: A jégtelenítő kezelés hatásfoka csökkenésének elkerülése érdekében figyelembe kell venni a jégtelenítés alatt álló repülőgép mögött levő, vagy mozgó repülőgép sugárhajtóművéből származó gázsugár hatásokat is.

A jégmentesítő és jégtelenítő létesítmények száma és mérete

Megjegyzés: A repülőgép jégmentesítő és jégtelenítő létesítmény (hely) az alábbi két területből áll:

a) *a jégtelenítendő repülőgép parkírozására szolgáló belső terület; és*

b) *két, vagy több mozgó jégmentesítő és jégtelenítő berendezés mozgására szolgáló külső terület.*

3.15.5 ***Ajánlás** — A jégmentesítő és jégtelenítő létesítmény (hely) mérete azonos legyen az adott kategóriába tartozó legnagyobb repülőgéphez szükséges parkírozási terület nagyságával. A jégmentesítő és jégtelenítő gépjárművek mozgására repülőgép körül teljes körben legalább 3.8 méter szélességű tiszta, burkolattal ellátott terület álljon rendelkezésre.*

Megjegyzés: Amikor egynél több jégmentesítő és jégtelenítő helyet alakítanak ki, gondolni kell a szomszédos létesítményen működő jégmentesítő és jégtelenítő gépjárművek mozgására is. Az ilyen mozgási (külső) területek ne fedjék egymást. Biztosítani kell továbbá, hogy a terület mellett elhaladó más repülőgépek ne sértsék meg a 3.15.9 és 3.15.10 pontokban meghatározott biztonsági távolságot.

3.15.6 ***Ajánlás** — A szükséges jégmentesítő és jégtelenítő helyek számát az időjárási körülmények, a kiszolgált repülőgépek típusa, a jégtelenítő folyadék felhordásának módszere és a felhasznált berendezés teljesítőképessége, valamint az induló forgalom nagyságrendje alapján határozzák meg.*
Megjegyzés: Lásd a Repülőtér Tervezési Kézikönyv 2. részét.

A jégmentesítő és jégtelenítő létesítmények lejtviszonyai

3.15.7 ***Ajánlás** — A terület kielégítő folyadék elvezetésének, valamint a repülőgépről lefolyó felesleges jégtelenítő és jégmentesítő anyagok összegyűjtésének biztosítása érdekében megfelelő burkolat lejtést alakítsanak ki. A legnagyobb hosszirányú lejtés a gyakorlati szempontból lehető legkisebb legyen és a keresztirányú lejtés ne haladja meg az egy százalék értéket.*

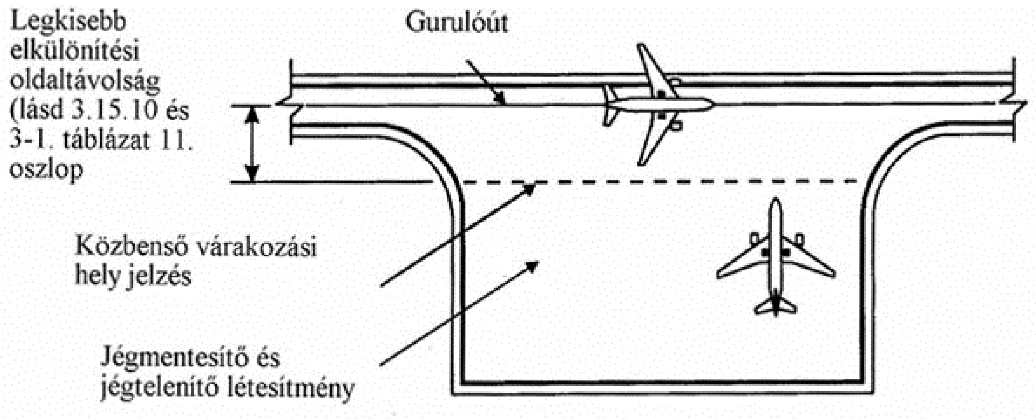
A jégmentesítő és jégtelenítő létesítmények teherbíró-képessége

3.15.8 ***Ajánlás*** *— A jégmentesítő és jégtelenítő létesítmény (hely)teherbíró-képessége feleljen meg annak a légijármű típus forgalomnak, amelynek kiszolgálására tervezték és vegyék figyelembe azt a tényt is, hogy a létesítménynek, a forgalmi előtérhez hasonlóan nagyobb a forgalom sűrűsége, valamint a lassan guruló és megálló légijárművek súlya miatt nagyobb igénybevételnek van kitéve, mint egy futópálya.*

Biztonsági távolság a jégmentesítő és jégtelenítő létesítmények (helyek) között

3.15.9 ***Ajánlás*** *— A létesítménynél biztosítsák a légijármű állóhelyhez a 3.13.6 pontban meghatározott legkisebb biztonsági távolságokat. Amennyiben a kitérő gurulási módszert használják, alkalmazzák a 3-1. táblázat 12. oszlopában található legkisebb elkülönítési oldaltávolságokat.*

3.15.10 ***Ajánlás*** *— Ha a jégmentesítő és jégtelenítő létesítmény egy általánosan használt gurulóút mellett helyezkedik el, biztosítsák a 3-1. táblázat 11. oszlopában található legkisebb elkülönítési oldaltávolságokat (lásd 3-4. ábra).*



3-4. ábra: A jégtelenítő és jégmentesítő létesítmény és egyéb területek
közötti legkisebb biztonsági távolság

Környezetvédelmi megfontolások

Megjegyzés: A repülőgépről lefolyó felesleges jégtelenítő és jégmentesítő anyagok a talajvíz szennyezésének kockázata mellett befolyásolják a burkolat felületének súrlódási jellemzői is.

3.15.11 **Ajánlás** — Azon a területen, ahol jégtelenítő és jégmentesítő feladatokat végeznek, a talajvíz szennyezésének megakadályozása érdekében a burkolt felület folyadék elvezetését úgy tervezzék meg és alakítsák ki, hogy elkerüljék a felesleges jégtelenítő és jégmentesítő anyagok, valamint a felületen felgyülemlő általános (természetes) folyadékok keveredését.

4. fejezet
Akadálykorlátozás és eltávolítás

1. Megjegyzés: A jelen fejezetben található előírások célja a repülőterek körüli légtér akadálymentességének biztosítása, lehetővé téve ezzel a repülőtereken várható légijármű forgalom biztonságos lebonyolítását, továbbá megakadályozva, hogy a repülőterek a körülöttük levő akadályok növekedése miatt használhatatlanná váljanak. Ez az akadálykorlátozási felületek sorozatának meghatározásával érhető el, amely felületek korlátozzák azt a magasságot, ameddig az adott légtérben a tárgyak nyúlhatnak.

2. Megjegyzés: A jelen fejezetben ismertetésre kerülő akadálykorlátozási felületekbe nyúló tárgyak, bizonyos körülmények között növelhetik a műszeres megközelítési eljárásokhoz, vagy bármely más ehhez csatlakozó látás utáni körözési eljáráshoz tartozó akadálymentes tengerszint, vagy földfelszín feletti (OCA/H) magasságokat. Az akadályok értékelésének feltételeit és tényezőit a Léginavigációs Szolgálatok Eljárásai — Légijármű Üzemeltetés (PANS-OPS) (Doc 8168) tartalmazza.

3. Megjegyzés: A látás utáni megközelítési siklópálya jelző rendszer létesítésére és jellemzőire vonatkozó akadály mentes felület meghatározása az 5.3.5.41 - 5.3.5.45 alpontokban található.

4.1 Akadálykorlátozási felületek

Megjegyzés: Lásd a 4-1. ábrát.

Külső vízszintes felület

Megjegyzés: A külső vízszintes felület kijelölésének szükségességével valamint jellemzőivel kapcsolatos útmutatás a Repülőtéri Szolgáltatások Kézikönyvének *(Doc 9137) 6. részében található.*

Kúpos felület

4.1.1 *Ismertetés – kúpos felület*

A kúpos felület a belső vízszintes felület külső szélétől felfelé és kifelé terjedő felület.

4.1.2 *Jellemzők*

A kúpos felület határai a következők:

a) alsó éle egybe esik a belső vízszintes felület külső szélével; és

b) felső éle a belső vízszintes felület felett meghatározott magasságban helyezkedik el.

4.1.3. A kúpos felület lejtését a belső vízszintes felület külső szélére merőleges függőleges síkhoz viszonyítva mérjék.

Belső vízszintes felület

4.1.4 *Ismertetés – Belső vízszintes felület*

A belső vízszintes felület a repülőtér és környéke felett vízszintes síkban helyezkedik el.

4.1.5 *Jellemzők*

A belső vízszintes felület sugara vagy külső határait a repülőtér vonatozási ponthoz vagy ilyen célokra meghatározott pontokhoz viszonyítva mérjék.

Megjegyzés: A belső vízszintes felület formája nem szükségszerűen kör alakú. A belső vízszintes felület méretének meghatározásával kapcsolatos útmutatás a Repülőtéri Szolgálatok Kézikönyvének *(Doc 9137) 6. részében található.*

4.1.6. A belső vízszintes felület magasságát az ilyen célokra meghatározott magassági alappont felett mérjék.

Megjegyzés: A magassági alappont meghatározásával kapcsolatos útmutatás a Repülőtéri Szolgáltatások Kézikönyvének *(Doc 9137) 6. részében található.*

Megközelítési felület

4.1.7 *Ismertetés – Megközelítési felület*

A futópálya küszöb előtt elhelyezkedő lejtős síkfelület vagy síkfelületek összessége.

4.1.8 *Jellemzők*

A megközelítési felület határai a következők:

a) meghatározott hosszúságú belső vízszintes él, amely merőleges a futópálya meghosszabbított középvonalára és a küszöb előtt meghatározott távolságra helyezkedik el;

b) két oldalsó él, amelyek a belső élek végeinél kezdődnek és a futópálya meghosszabbított középvonala mentén egységesen, meghatározott szögben terjednek; és

c) a belső éllel párhuzamos külső él; és

d) amennyiben oldalirányban eltolt, a középvonalhoz viszonyítva szélességben eltolt, vagy ívelt irányvezetésű megközelítéseket alkalmaznak, a fenti felületek specifikusan variálandók úgy, hogy a belső él két végétől kezdődik a két oldal, és egységes, meghatározott szög értékben tartanak szét az oldalirányban eltolt, eltolt vagy ívelt irányvezetés meghosszabbított középvonalától.

4.1.9 A belső él magassága megegyezik a küszöb középpont magassággal.

4.1.10 A megközelítési felület lejtését a futópálya középvonalát magába foglaló függőleges síkhoz viszonyítva mérjék, és ez folytatólagosan foglalja magába bármely oldalirányban eltolt vagy ívelt repülési pálya középvonalát.

Belső megközelítési felület

4.1.11 *Ismertetés — Belső megközelítési felület*

A megközelítési felület szögletes része, amely közvetlenül a futópálya küszöb előtt helyezkedik el.

4.1.12 *Jellemzők*

A belső megközelítési felület határai a következők:

a) a belső él egybeesik a megközelítési felület belső élével, azonban külön meghatározott hosszúságú;

b) két oldalsó szél, amelyek a belső élek végeinél kezdődnek és a futópálya meghosszabbított középvonala mentén párhuzamosan terjednek; és

c) a belső éllel párhuzamos külső él.

Átmeneti felület

4.1.13 *Ismertetés —Átmeneti felület*

A futópálya sáv oldala, valamint a megközelítési felület oldalának egy része mentén húzódó összetett felület, amely a belső vízszintes felületig felfelé és kifelé terjed.

4.1.14 *Jellemzők*

Az átmeneti felület határai a következők:

a) alsó éle a megközelítési felület oldalának, valamint a belső vízszintes felületnek a metszésvonalánál kezdődik, majd a megközelítési felület mentén nyúlik tovább annak belső éléig, onnan pedig a futópálya középvonalával párhuzamosan a sáv teljes hosszában folytatódik; és

b) felső éle a belső vízszintes felülettel egy síkban van.

4.1.15 Az alsó élen levő pont magassága:

a) a megközelítési felület oldala mentén — megegyezik a megközelítési felület magasságával az adott ponton; és

b) a sáv mentén — megegyezik a futópálya középvonalának, vagy annak meghosszabbítása legközelebbi pontjának magasságával.

Megjegyzés: A b) alpont eredményeképpen a sáv mentén elhelyezkedő átmeneti felület ívelt lesz, ha a futópálya profilja is ívelt és sík lesz, ha a futópálya profil sík. Az átmeneti felület és a belső vízszintes felület metszése a futópálya profiljától függően szintén ívelt, vagy sík lesz.

4.1.16 Az átmeneti felület lejtését a futópálya középvonalához viszonyítva megfelelő szögben, síkban kell mérni.

Belső átmeneti felület

Megjegyzés: Az a szándékunk, hogy a belső átmeneti felület legyen az az akadálykorlátozási felület, amelybe nem nyúlhatnak be azok a navigációs berendezések és eszközök, légijárművek és más járművek, amelyeknek a futópálya közelében kell lenniük. Kivételt képeznek a fenti igénynek megfelelő letörhető berendezések és eszközök. A 4.1.13 pontban ismertetett átmeneti felület az épületek és egyéb hasonló létesítmények akadály korlátozási felülete marad.

4.1.17 *Ismertetés — Belső átmeneti felület*

Az átmeneti felülethez hasonló, de a futópályához közelebb eső felület.

4.1.18 *Jellemzők*

A belső átmeneti felület határai a következők:

a) alsó éle a belső megközelítési felületnél kezdődik, majd a belső megközelítési felület mentén nyúlik tovább annak belső éléig, onnan pedig a futópálya középvonalával párhuzamosan a megszakított leszállási felület belső éléig, majd a megszakított leszállási felület és a belső vízszintes felület metszéséig folytatódik; és

b) felső éle a belső vízszintes felülettel egy síkban van.

4.1.19 Az alsó élen levő pont magassága:

a) a belső megközelítési felület és a megszakított leszállási felület oldala mentén — megegyezik az adott felület magasságával azon a ponton; és

b) a sáv mentén — megegyezik a futópálya középvonalának, vagy annak meghosszabbítása legközelebbi pontjának magasságával.

Megjegyzés: A b) alpont eredményeképpen a futópálya sáv mentén elhelyezkedő belső átmeneti felület ívelt lesz, ha a futópálya profilja is ívelt és sík lesz, ha a futópálya profil sík. A belső átmeneti felület és a belső vízszintes felület metszése a futópálya profiljától függően szintén ívelt, vagy sík lesz.

4.1.20 A belső átmeneti felület lejtését függőleges síkban a futópálya középvonalához viszonyítva megfelelő szögben kell mérni.

Megszakított leszállási felület

4.1.21 *Ismertetés — Megszakított leszállási felület*

A futópálya küszöb után meghatározott távolságra, a belső átmeneti felületek között elhelyezkedő lejtős sík.

4.1.22 *Jellemzők*

A megszakított leszállási felület határai a következők:

a) a futópálya küszöb után meghatározott távolságra levő belső éle vízszintes és merőleges a futópálya középvonalára;

b) két oldala a belső élnél kezdődik és a futópálya középvonala mentén a függőleges síktól egységesen, meghatározott széttartó szög értékben kiszélesedik; és

c) a belső éllel párhuzamos külső éle a belső vízszintes felület síkjában helyezkedik el.

4.1.23 A belső él magassága megegyezik a futópálya középvonal magasságával a belső él helyén.

4.1.24 A megszakított leszállási felület lejtését a futópálya középvonalát magába foglaló függőleges síkhoz viszonyítva kell mérni.

Felszállási emelkedési felület

4.1.25 Ismertetés — Felszállási emelkedési felület

A futópálya, vagy a biztonsági terület vége után elhelyezkedő lejtős sík vagy más meghatározott felület.

4.1.26 *Jellemzők*

A felszállási emelkedési felület határai a következők:

a) a futópálya, vagy ha ilyet kialakítottak, a biztonsági terület vége után meghatározott távolságra levő vízszintes belső él, amely merőleges a futópálya középvonalára és hossza meghaladja a kijelölt távolságokat;

b) a belső él végénél kezdődő két oldal, amely a felszállási repülési útvonal mentén a vízszintes síktól meghatározott szögben egységesen eltérve tart egy meghatározott szélességig, majd ez után tovább párhuzamosan az adott szélességben a felszállási emelkedési felület teljes hosszában kifelé; és

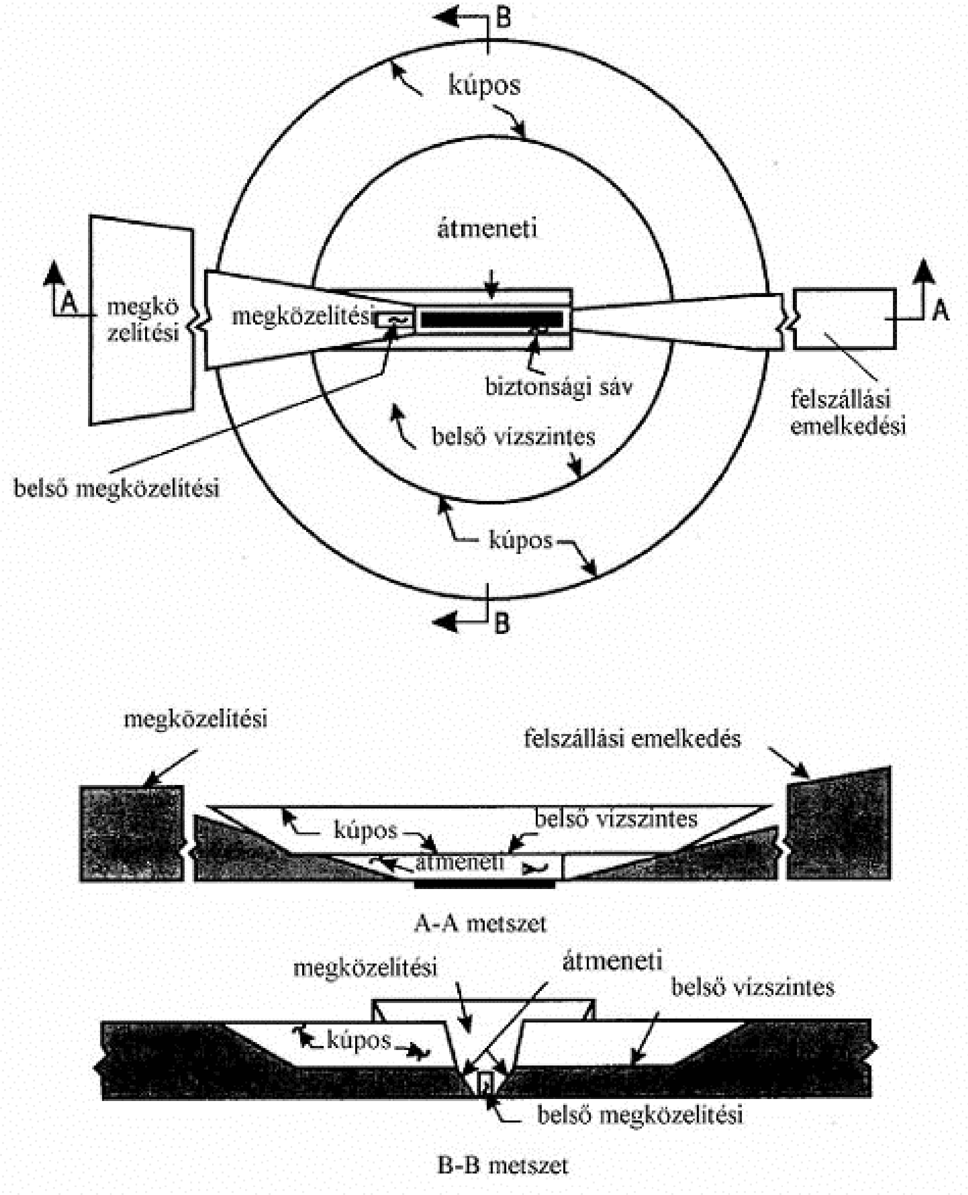
c) a meghatározott felszállási irányra merőleges, vízszintes külső él.

4.1.27 A belső él magassága megegyezik a futópálya vége és a belső él között a meghosszabbított futópálya középvonal legmagasabb pontjának magasságával kivéve, ha biztonsági területet alakítottak ki, mert ebben az esetben a magasság megegyezik a biztonsági terület középvonalában levő legmagasabb pont magasságával.

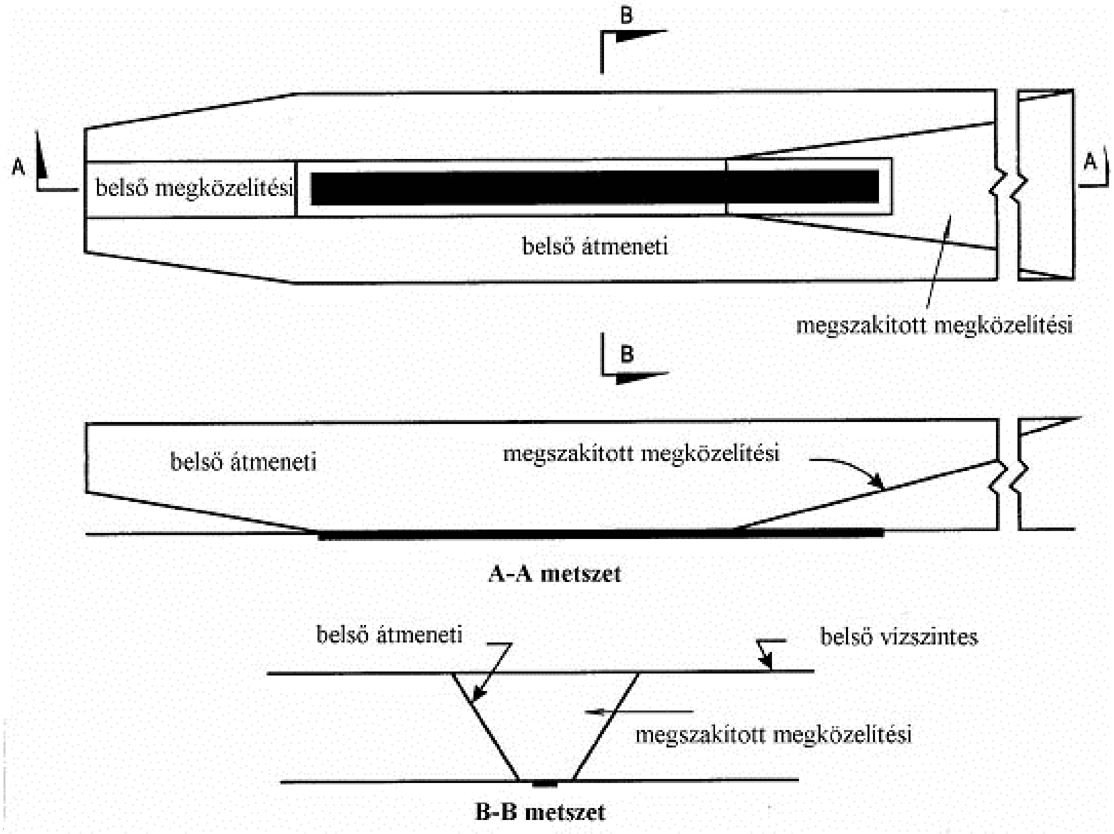
4.1.28 Az egyenes felszállási repülési útvonal esetében a felszállási emelkedési felület lejtését a futópálya középvonalát magába foglaló függőleges síkhoz viszonyítva kell mérni.

4.1.29 A fordulót is magába foglaló felszállási repülési útvonal esetében a felszállási emelkedési felület egy összetett felület lesz, amely kis vízszintes síkokat tartalmaz a középvonal mentén és lejtését az egyenes felszállási repülési útvonalhoz hasonlóan kell mérni.

Megjegyzés: A belső átmeneti és megszakított megközelítési akadálykorlátozási felületek a 4-2. ábrán, a három dimenziós nézet pedig a B. Mellékletben található.



4-1. ábra: Akadálykorlátozási felületek



4-2. ábra: Belső megközelítési, belső átmeneti és megszakított megközelítési akadálykorlátozási felületek

4.2 Akadálykorlátozási előírások

Megjegyzés: Az akadálykorlátozási felületekre vonatkozó előírásokat a futópálya várható és tervezett felhasználása alapján határozzák meg, mint például a fel, vagy leszállás, valamint a megközelítés típusa és akkor alkalmazzák, ha a futópályát a tervezett feladatok végrehajtására igénybe veszik. Amennyiben a futópálya üzemeltetése során mindkét irányt használják, bizonyos felületek feladataira nincs szükség, mert az alacsonyabban kijelölt másik felület követelmény rendszere szigorúbb.

Nem-műszeres futópálya

4.2.1 A nem-műszeres futópálya vonatkozásában a következő akadálykorlátozási felületeket határozzák meg:

— kúpos felület;

— belső vízszintes felület;

— megközelítési felület; és

— átmeneti felületek.

4.2.2 A felületek földfelszín feletti magassága és lejtése nem lehet nagyobb és egyéb mérete nem lehet kisebb, mint a 4-1. táblázatban meghatározott érték.

4.2.3 Új tárgyak, vagy a meglevő tárgyak megnagyobbításai nem nyúlhatnak a megközelítési, vagy átmeneti felület fölé, kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos „árnyékolás” alapelv joggal alkalmazható, a Repülőtér Szolgálati Kézikönyv *6. részében kerültek ismertetésre.*

4.2.4 ***Ajánlás*** *— Új tárgyak, vagy a meglevő tárgyak megnagyobbításai ne nyúljanak a kúpos, vagy a belső vízszintes felület fölé, kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy azok nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

4.2.5 ***Ajánlás*** *— A 4.2.1 pontban előírt bármely felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el, kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

Megjegyzés: A sáv kereszt, vagy hosszirányú lejtése miatt bizonyos esetekben a megközelítési felület belső éle a megfelelő sáv magassága alatt lehet. Nincs szükség arra és nem javasoljuk, hogy a sávot a megközelítési felület belső élének magasságára csökkentsék le és azt sem, hogy a sáv végén túl a megközelítési felület felett, de a sáv szintje alatt levő talajt, vagy tárgyakat eltávolítsák, kivéve, ha az a szakemberek véleménye szerint veszélyeztetheti a repülőgépeket.

4.2.6 ***Ajánlás*** *— Az építési tervek és javaslatok megvizsgálása, illetve kidolgozása alkalmával vegyék figyelembe egy műszeres futópálya jövőbeni megépítésének lehetőségét és az ehhez társuló szigorúbb akadálykorlátozási felület előírásokat.*

Nem-precíziós megközelítésű futópálya

4.2.7 A nem-precíziós megközelítésű futópálya vonatkozásában a következő akadálykorlátozási felületeket határozzák meg:

— kúpos felület;

— belső vízszintes felület;

— megközelítési felület; és

— átmeneti felületek.

4.2.8 A felületek földfelszín feletti magassága és lejtése nem lehet nagyobb és egyéb mérete nem lehet kisebb, mint a 4-1. táblázatban meghatározott értékek, kivéve a megközelítési felület vízszintes szakaszát (lásd 4.2.9 pont).

4.2.9 A megközelítési felület vízszintes legyen azon pont után, amelynél a 2.5 %-os lejtés metszi:

a) a vízszintes síkot, 150 méterrel a küszöb magasság felett; vagy

b) a vízszintes sík áthalad bármely olyan tárgy tetején, amely meghatározza az akadálymentes tengerszint, vagy földfelszín feletti magasságot (OCA/H);

amelyik a magasabb.

4-1. táblázat: Akadálykorlátozási felületek méretei és lejtviszonyai — Megközelítési futópálya

	Futópálya osztályozás									
	Nem-műszeres futópálya kód szám				Nem-precíziós megközelítésű futópálya kód-szám			Precíziós megközelítésű futópálya kategória / kód szám		
Felületek és méretek[a]	1	2	3	4	1, 2	3	4	I/ 1, 2	I/ 3, 4	II/III 3, 4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
KÚPOS lejtviszony	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %	5 %
magasság	35 m	55 m	75 m	100 m	60 m	75 m	100 m	60 m	100 m	100 m
BELSŐ VÍZSZINTES magasság	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m
sugár	2000 m	2500 m	4000 m	4000 m	3500 m	4000 m	4000 m	3500 m	4000 m	4000 m
BELSŐ MEGKÖZELÍTÉSI szélesség	*	*	*	*	*	*	*	90 m	120 m[e]	120 m[e]
távolság a futópálya küszöbtől	*	*	*	*	*	*	*	60 m	60 m	60 m
hosszúság	*	*	*	*	*	*	*	900 m	900 m	900 m
lejtviszony	*	*	*	*	*	*	*	2.5 %	2.0 %	2.0 %
MEGKÖZELÍTÉSI belső szél hossza	60 m	80 m	150 m	150 m	150 m	300 m	300 m	150 m	300 m	300 m
távolság a futópálya küszöbtől	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
oldalirányú eltérés (széttartás mindkét oldalon)	10 %	10 %	10 %	10 %	15 %	15 %	15 %	15 %	15 %	15 %
Első szakasz hosszúság	1600 m	2500 m	3000 m	3000 m	2500 m	3000 m	3000 m	3000 m	3000 m	3000 m
lejtviszony	5 %	4 %	3.33 %	2.5 %	3.33 %	2 %	2 %	2.5 %	2 %	2 %
Második szakasz hosszúság	*	*	*	*	*	3600 m[b]	3600 m[b]	12000 m	3600 m[b]	3600 m[b]
lejtviszony	*	*	*	*	*	2.5 %	2.5 %	3 %	2.5 %	2.5 %
Vízszintes szakasz hosszúság	*	*	*	*	*	8400 m[b]	8400 m[b]	*	8400 m[b]	8400 m[b]
teljes hosszúság	*	*	*	*	*	15000 m	15000 m	15000 m	15000 m	15000 m
ÁTMENETI lejtviszony	20 %	20 %	14.3 %	14.3 %	20 %	14.3 %	14.3 %	14.3 %	14.3 %	14.3 %
BELSŐ ÁTMENETI lejtviszony	*	*	*	*	*	*	*	40 %	33.3 %	33.3 %
MEGSZAKÍTOTT LESZÁLLÁSI FELÜLET belső szél hosszúsága	*	*	*	*	*	*	*	90 m	120 m[e]	120 m[e]
távolság a futópálya küszöbtől	*	*	*	*	*	*	*	c	1800 m[d]	1800 m[d]
oldalirányú eltérés (széttartás mindkét oldalon)	*	*	*	*	*	*	*	10 %	10 %	10 %
lejtviszony	*	*	*	*	*	*	*	4 %	3.33 %	3.33 %

[a] Az összes méret vízszintesen mért, ha másképp nincs meghatározva

[b] Változó hosszúság a 4.2.9, vagy a 4.2.17 pontok szerint

[c] A sáv végéig tartó távolság

[d] Vagy a futópálya vége, amelyik a kisebb

[e] Ahol az 1-1. táblázat 3. oszlopában a kód betű F, a szélesség 155 méterre növelt. A „go-around" (átstartolást követő) eljárás során a felvett útirányszög tartásához kormányzási utasításokat biztosító digitális navigációs berendezésekkel felszerelt repülőgépek F betű kódra vonatkozó tájékoztatáshoz lásd a 301. Körlevelet – Új Szélesebb törzsű repülőgépek. Az Akadálymentes Zóna Feltörése: Üzemeltetési Intézkedések és Légiforgalmi Tanulmány.

4.2.10 Új tárgyak, vagy a meglevő tárgyak megnagyobbításai nem nyúlhatnak a megközelítési felület, vagy az átmeneti felület fölé a belső éltől 3000 méter távolságon belül kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába" kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos „árnyékolás" alapelv alkalmazható, a Repülőtér Szolgálati Kézikönyv 6. részében kerültek ismertetésre.

4.2.11 ***Ajánlás*** *— Új tárgyak, vagy a meglevő tárgyak megnagyobbításai ne nyúljanak a megközelítési felület, a kúpos, vagy a belső vízszintes felület fölé a belső éltől 3000 méter távolságon belül kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába" kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

4.2.12 ***Ajánlás*** *— A 4.2.7 pontban előírt bármely felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába" kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

Megjegyzés: A biztonsági sáv kereszt, vagy hosszirányú lejtése miatt bizonyos esetekben a megközelítési felület belső éle a megfelelő sáv magassága alatt lehet. Nincs szükség arra és nem javasoljuk, hogy a sávot a megközelítési felület belső élének magasságára csökkentsék le és azt sem, hogy a sáv végén túl a megközelítési felület felett, de a sáv szintje alatt levő talajt, vagy tárgyakat eltávolítsák, kivéve ha az a szakemberek véleménye szerint veszélyeztetheti a repülőgépeket.

Precíziós megközelítésű futópálya

1. Megjegyzés: Az üzemeltetési területeken levő berendezések és felszerelések elhelyezésére és kialakítására lásd a 9.9 pontot.

2. Megjegyzés: A precíziós megközelítésű futópálya akadály korlátozási felületeire vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv *6. részében található.*

4.2.13 Az I. kategóriás precíziós megközelítésű futópályához következő akadálykorlátozási felületeket határozzák meg:

— kúpos felület;

— belső vízszintes felület;

— megközelítési felület; és

— átmeneti felületek.

4.2.14 ***Ajánlás*** *— Az I. kategóriás precíziós megközelítésű futópályához a következő akadálykorlátozási felületeket határozhatják meg:*

— belső megközelítési felület;

— belső átmeneti felület;

— megszakított leszállási felület.

4.2.15 A II. vagy III. kategóriás precíziós megközelítésű futópályához következő akadálykorlátozási felületeket határozzák meg:

— kúpos felület;

— belső vízszintes felület;

— megközelítési és belső megközelítési felület;

— átmeneti felületek;

— belső átmeneti felületek; és

— megszakított leszállási felület.

4.2.16 A felületek magassága és lejtése nem lehet nagyobb és egyéb mérete nem lehet kisebb, mint a 4-1. táblázatban meghatározott érték, kivéve a megközelítési felület vízszintes részét (lásd 4.2.17 pont).

4.2.17 A megközelítési felület vízszintes legyen azon pont után, amelynél a 2.5 %-os lejtés metszi:

a) a vízszintes síkot, 150 méterrel a küszöb magasság felett; vagy

b) a vízszintes sík áthalad bármely olyan tárgy tetején, amely meghatározza az akadálykorlátozási határt; amelyik a magasabb.

4.2.18 Rögzített tárgyak nem nyúlhatnak a belső megközelítési felület, a belső átmeneti felület, vagy a megszakított leszállási felület fölé. Kivételt képeznek azok a letörhető tárgyak, amelyeket feladatuk miatt a biztonsági sávon belül kell elhelyezni. Amikor a futópályát leszállásra használják, a mozgó tárgyak nem nyúlhatnak a fenti felületek fölé.

4.2.19 Új tárgyak, vagy a meglevő tárgyak megnagyobbításai nem nyúlhatnak a megközelítési felület, vagy az átmeneti felület fölé kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos „árnyékolás” alapelv alkalmazható, a Repülőtér Szolgálati Kézikönyv *6. részében kerültek ismertetésre.*

4.2.20 ***Ajánlás*** *— Új tárgyak, vagy a meglevő tárgyak megnagyobbításai ne nyúljanak a kúpos vagy a belső vízszintes felület fölé kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

4.2.21 ***Ajánlás*** *— A megközelítési felület, az átmeneti felület, a kúpos felület és a belső vízszintes felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába” kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

Megjegyzés: A biztonsági sáv kereszt, vagy hosszirányú lejtése miatt bizonyos esetekben a megközelítési felület belső éle, vagy annak szakaszai a megfelelő sáv magassága alatt lehet. Nincs szükség arra és nem javasoljuk, hogy a sávot a megközelítési felület belső élének magasságára csökkentsék le és azt sem, hogy a *sáv végén túl a megközelítési felület felett, de a sáv szintje alatt levő talajt, vagy tárgyakat eltávolítsák, kivéve, ha az a szakemberek véleménye szerint veszélyeztetheti a repülőgépeket.*

Felszállásra igénybe vett futópálya

4.2.22 A felszállás végrehajtására kijelölt futópálya vonatkozásában a következő akadálykorlátozási felületet határozzák meg:

— felszállási emelkedési felület.

4.2.23 A felület magassága nem lehet kisebb, mint a 4-2. táblázatban meghatározott érték, kivéve, hogy rövidebb felszállási emelkedési felület alkalmazható, ha ez megfelel a repülőgépek kirepülését szabályzó eljárásoknak és előírásoknak.

4.2.24 ***Ajánlás*** *— Vizsgálják meg azon repülőgépek üzemeltetési jellemzőit, amelyek kiszolgálására a futópályát tervezték, annak megállapítása érdekében, hogy kritikus üzemeltetési körülmények esetében kívánatos-e a 4-2. táblázatban meghatározott lejtés csökkentése. Ha csökkentik a meghatározott lejtést, ennek megfelelően módosítsák a felszállási emelkedési felület hosszát is, hogy az megfelelő védelmet nyújtson a 300 méteres földfelszín feletti magasság eléréséig.*

Megjegyzés: Amennyiben a helyi körülmények nagymértékben eltérnek a tengerszinti szabvány atmoszférikus körülményektől, tanácsos lehet a 4-2. táblázatban előírt lejtés csökkentése. A csökkentés foka függ a helyi és a tengerszinti szabványos atmoszféra körülmények közötti eltérés nagyságától, valamint azon repülőgépek üzemeltetési jellemzőitől, amelyek kiszolgálására a futópályát tervezték.

4.2.25 Új tárgyak, vagy a meglevő tárgyak megnagyobbításai nem nyúlhatnak a felszállási emelkedési felület fölé, kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába" kerülnek.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos „árnyékolás" alapelv alkalmazható, a Repülőtér Szolgálati Kézikönyv *6. részében kerültek ismertetésre.*

4.2.26 ***Ajánlás*** *— Ha semmiféle tárgy nem éri el a 2 %-os (1:50) felszállási emelkedési felületet, az új tárgyakat a meglevő akadálymentes felület fenntartása, vagy az 1.6 %-os (1:62.5) lejtés kialakítása mellett helyezzék el.*

4.2.27 ***Ajánlás*** *— A felszállási emelkedési felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak „árnyékába" kerülnek vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a repülőgépek rendszeres üzemeltetésére.*

Megjegyzés: A biztonsági sáv, vagy terület keresztirányú lejtése miatt bizonyos esetekben a felszállási emelkedési felület belső éle a megfelelő biztonsági sáv, vagy terület magassága alatt lehet. Nincs szükség arra és nem javasoljuk, hogy a biztonsági sávot, vagy a területet a felszállási emelkedési felület belső élének magasságára csökkentsék le és azt sem, hogy a biztonsági sáv, vagy a terület végén túl a felszállási emelkedési felület felett, de a biztonsági sáv, vagy terület szintje alatt levő talajt, vagy tárgyakat eltávolítsák kivéve, ha az a szakemberek véleménye szerint veszélyeztetheti a repülőgépeket. Hasonló megfontolások vonatkoznak a biztonsági sáv és a terület csatlakozására is, ahol a keresztirányú lejtviszonyok különbözőek.

4-2. táblázat: Felszállásra kijelölt futópálya akadály korlátozási felületeinek méretei és lejtviszonyai

Felületek és méretek[a]	Futópálya kód szám		
	1	2	3 vagy 4
(1)	(2)	(3)	(4)
FELSZÁLLÁSI EMELKEDÉSI belső él hossza	60 m	80 m	180 m
távolság a futópálya végétől [b]	30 m	60 m	60 m
oldalirányú eltérés (széttartás mindkét oldalon)	10 %	10 %	12.5 %
végső szélesség	380 m	580 m	1200 m / 1800 m[c]
hosszúság	1600 m	2500 m	15 000 m
lejtés	5 %	4 %	2 %[d]

[a] Az összes méret vízszintesen mért, ha másképp nincs meghatározva
[b] A felszállási emelkedési felület a biztonsági felszállási terület végén kezdődik, ha annak hossza a jelzett távolságnál nagyobb
[c] 1800 méter, ha a tervezett repülési útvonal irányváltása IMC és éjszakai VMC üzemeltetés esetén 15°-nál nagyobb
[d] Lásd a 4.2.24 és 4.2.26 pontokat.

4.3 Tárgyak az akadály korlátozási felületeken kívül

4.3.1 ***Ajánlás*** — *Foganatosítsanak megfelelő intézkedéseket, hogy az akadály korlátozási felületek határain túl tervezett és javasolt építkezések megkezdése előtt konzultálhassanak az illetékes hatósággal, ha a tervezett épületek magassága meghaladja a hatóság által megállapított szintet. Ezzel lehetővé teszik a légiforgalmi vizsgálat elvégzését annak megállapítása érdekében, hogy a tervezett épület milyen hatással lesz a repülőgépek üzemeltetésére.*

4.3.2 ***Ajánlás*** — *Az akadály korlátozási felületek határain túl legalább a talajszinthez viszonyítva 150 méter, vagy ennél magasabb tárgyak tekintendők akadálynak kivéve, ha külön légiforgalmi vizsgálat azt mutatja, hogy ezek nem jelentek veszélyt a repülőgépek számára.*

Megjegyzés: A vizsgálatban foglalkozhatnak a megfelelő repülőgép üzemeltetési műveletekkel, körülményekkel és megkülönböztethetik a nappali valamint az éjszakai üzemet is.

4.4 Egyéb tárgyak

4.4.1 ***Ajánlás*** — *A megközelítési felületben nem benyúló, azonban a látási, vagy nem-látási segédeszközök optimális elhelyezését, vagy felhasználhatóságát hátrányosan befolyásoló tárgyakat lehetőség szerint távolítsák el.*

4.4.2 ***Ajánlás*** — *Az illetékes hatóság által elvégzett légiforgalmi vizsgálat alapján a belső vízszintes, vagy kúpos felületek határain belül levő, a mozgási területen, vagy a levegőben üzemelő repülőgépeket veszélyeztető bármely tárgy akadálynak tekinthető és ezeket lehetőség szerint távolítsák el.*

Megjegyzés: Bizonyos körülmények között a 4.1 szakaszban ismertetett bármely felületbe nem benyúló tárgyak is veszélyt jelenthetnek a repülőgépek számára, például ott, ahol a repülőtér közelében egy, vagy több különálló tárgy található.

5. fejezet
Látás utáni segédeszközök

5.1 Jelzések és jelző berendezések

5.1.1 Szélirány jelzők

Alkalmazás

5.1.1.1 A repülőtéren legalább egy darab szélirány jelzőt kell elhelyezni.

Elhelyezés

5.1.1.2 A szélirány jelzőt úgy helyezzék el, hogy az a mozgási területen, vagy a levegőben üzemelő légijárműből látható legyen és a közeli tárgyaknál keletkező turbulencia hatásai a pontos széljelzést ne befolyásolják.

Jellemzők

5.1.1.3 ***Ajánlás** — A szélirány jelző műanyag, vagy textil szövetből készített, kúpos, legalább 3.6 méter hosszú henger legyen. Nagyobb végének átmérője legkevesebb 0.9 méter és a jelzőt úgy készítsék el, hogy az egyértelműen mutassa a szél irányát és általánosan jelezze a szél sebességét. A környezetet és hátteret figyelembe véve a szélirány jelző színét úgy válasszák meg, hogy ezzel a jelző legalább 300 méter magasságból tisztán látható és értelmezhető legyen. Ahol lehetséges, egy-színű, lehetőleg fehér, vagy narancssárga jelzőt használjanak. Ahol két szín kombinációja szükséges ahhoz, hogy a szélirány jelző megfelelően kiemelkedjen a változó háttérből, a választott szín lehetőleg narancssárga és fehér, vörös és fehér vagy fekete és fehér legyen. A csíkozás legalább öt változó csíkból álljon olyan formában, hogy az első és utolsó csík a sötétebbik színből készüljön.*

5.1.1.4 ***Ajánlás** — Legalább egy szélirány jelző helyét 15 méter átmérőjű és 1.2 méter körsáv szélességű körrel jelezzék. A felfestett köralak középpontja a szélirány jelző tartóoszlopa körül legyen és színét úgy válasszák meg, hogy az elüssön a környezettől. Javasoljuk a fehér szín alkalmazását.*

5.1.1.5 ***Ajánlás** — Az éjszaka is használni kívánt repülőtéren legalább egy szélirány jelzőt világítsanak meg.*

5.1.2 Leszállási irány jelző

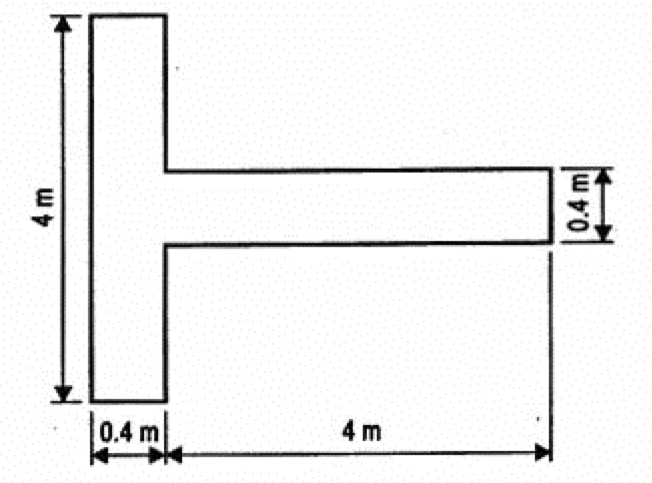
Elhelyezés

5.1.2.1 Ahol ilyet elhelyeznek, a leszállási irány jelző a repülőtér jól látható területén legyen.

Jellemzők

5.1.2.2 ***Ajánlás** — A leszállási irány jelző "T" alakú legyen.*

5.1.2.3 A leszállási irány jelző formája és legkisebb méretei az 5-1. ábrán láthatók. A leszállási irány jelző "T" színe fehér vagy narancssárga legyen attól függően, hogy melyik szín emelkedik ki jobban a háttérből. Ahol a jelző az éjszakai üzemeltetéshez szükséges, a "T" jelzést világítsák meg, vagy körvonalaihoz fehér fényeket helyezzenek el.



5-1. ábra
Leszállási irány jelző
Szín: fehér vagy narancssárga — Világítás: megvilágítás vagy körvonal világítás

5.1.3 Jelzőlámpa

Alkalmazás

5.1.3.1 Az ellenőrzött repülőtér repülőtéri irányító tornyában jelzőlámpát kell elhelyezni.

Jellemzők

5.1.3.2 ***Ajánlás** — A jelzőlámpa vörös, zöld és fehér fényjelek adására legyen alkalmas, továbbá:*

— szükség szerint bármely célpontra kézzel irányítható legyen;

— az egyik színű jelzés megadását követően másik két színű jelzés bármelyike leadható legyen; és

— a három szín közül bármelyikkel legalább percenként négy szó sebességgel Morze-jelek legyenek adhatók.

A zöld szín kiválasztása esetén a használat az l. Függelék 2.1.2 pontja szerint a zöld szín alkalmazhatósági határain belül legyen lehetséges.

5.1.3.3 ***Ajánlás** — A fénysáv szélessége ne legyen 1°-nál kisebb és 3°-nál nagyobb. A 3°-os határon túl látható fény elhanyagolható legyen. Ha a jelzőlámpát nappali időszakban is használni kívánják, a színes fények intenzitása 6000 cd gyertyafény-erőnél kevesebb ne legyen.*

5.1.4 Jelzések (eszközök) és jel terület

Megjegyzés: A jel terület részletes ismertetése ebben a szakaszban nem jelenti azt, hogy ilyet létesíteni kell. Az A. Melléklet 15. része útmutatót nyújt a földi jelzések létesítéséhez és elhelyezéséhez. A 2. Annex 1. Függeléke meghatározza a földi látjelek formáját, színét és használatát. Tervezésükre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 4. részében található.

A jel terület elhelyezése

5.1.4.1 ***Ajánlás** — A jel területet úgy helyezzék el, hogy az a horizont felett 10°-os, vagy ennél nagyobb szögben, 300 méter magasságból minden irányból látható legyen.*

A jel terület jellemzői

5.1.4.2 A jel terület legalább 9 méteres egyenlő oldalú, sík, vízszintes négyzet legyen.

5.1.4.3 ***Ajánlás*** *— A jel terület színét úgy válasszák meg, hogy az megfelelő mértékben elüssön az alkalmazott jelzések színétől és a jel területet legalább 0.3 m széles fehér határoló sávval vegyék körül.*

5.2 Jelzések

5.2.1 Általános rész

A futópálya jelzések megszakítása

5.2.1.1 Két (vagy több) futópálya kereszteződésében a futópálya széle jelölés kivételével a fontosabb futópálya jelzései legyenek láthatók, illetve folyamatosak és a másik futópálya(k) jelzéseit szakítsák meg. A fontosabb futópálya széle (sáv) jelzést a kereszteződésben folytatni lehet, vagy az is megszakítható.

5.2.1.2 ***Ajánlás*** *— A futópálya jelzések kialakítása és megjelenítése szempontjából a futópályák fontossági sorrendje a következő:*

elsődleges — precíziós megközelítésű futópálya;

másodlagos — nem-precíziós megközelítésű futópálya; és

harmadlagos — nem-műszeres futópálya.

5.2.1.3 A futópálya és a gurulóút kereszteződésében a futópálya jelzései legyenek láthatók, illetve folyamatosak és a gurulóút jelzéseit szakítsák meg, azonban a futópálya széle (sáv) jelzések megszakíthatók.

Megjegyzés: A futópálya és gurulóút középvonal jelzés csatlakozására vonatkozóan lásd az 5.2.8.5 pontot.

Szín és feltűnőség (láthatóság)

5.2.1.4 A futópálya jelzések fehér színűek legyenek.

1. Megjegyzés: Megállapították, hogy a világos színű burkolt futópálya felületek esetében a fehér jelzések láthatóságát fekete körvonalakkal fokozni lehet.

2. Megjegyzés: A jelzések felületének egyenetlen súrlódási jellemzőiből származó kockázatok csökkentése érdekében lehetőség szerint megfelelő minőségű festékanyagot használjanak.

3. Megjegyzés: A jelzések folyamatos felületű jelzés területekből, vagy több részből, illetve hosszirányú sávok sorozatából állhatnak, amelyek azonos látványt biztosítanak a folyamatos felületű jelzés területekkel.

5.2.1.5 A gurulóút, a futópálya megforduló sáv és a légijármű állóhely jelzések sárga színűek legyenek.

5.2.1.6 A forgalmi előtér biztonsági határait a légijármű állóhely jelzésektől eltérő, jól látható színnel jelöljék.

5.2.1.7 ***Ajánlás —*** *Az éjszaka is üzemeltetett repülőtereken a burkolati jeleket azok láthatóságának növelése* *érdekében fényvisszaverő anyagokból tervezzék és készítsék el.*

Megjegyzés: A fényvisszaverő anyagokra vonatkozó útmutató a Repülőtér Tervezési Kézikönyv 4. részében található.

Nem burkolt felületű gurulóútak

5.2.1.8 ***Ajánlás* — *A nem burkolt felületű gurulóutat lehetőség szerint olyan jelzésekkel lássák el, mint amelyek a burkolt felületű gurulóutakra alkalmazandók.***

5.2.2 Futópálya irány jelzés

Alkalmazás

5.2.2.1 A burkolt felülettel ellátott futópálya küszöböknél futópálya irány jelzést helyezzenek el.

5.2.2.2 ***Ajánlás*** — *A nem burkolt felületű futópálya küszöböknél lehetőség szerint helyezzenek el futópálya irány jelzést.*

Elhelyezés

5.2.2.3 A futópálya irány jelzést az 5-2. ábrán látható módon kell elhelyezni.

Megjegyzés: Amennyiben a küszöböt áthelyezték a futópálya végéről, a felszálló repülőgépek számára futópálya irány jelölés helyezhető el.

Jellemzők

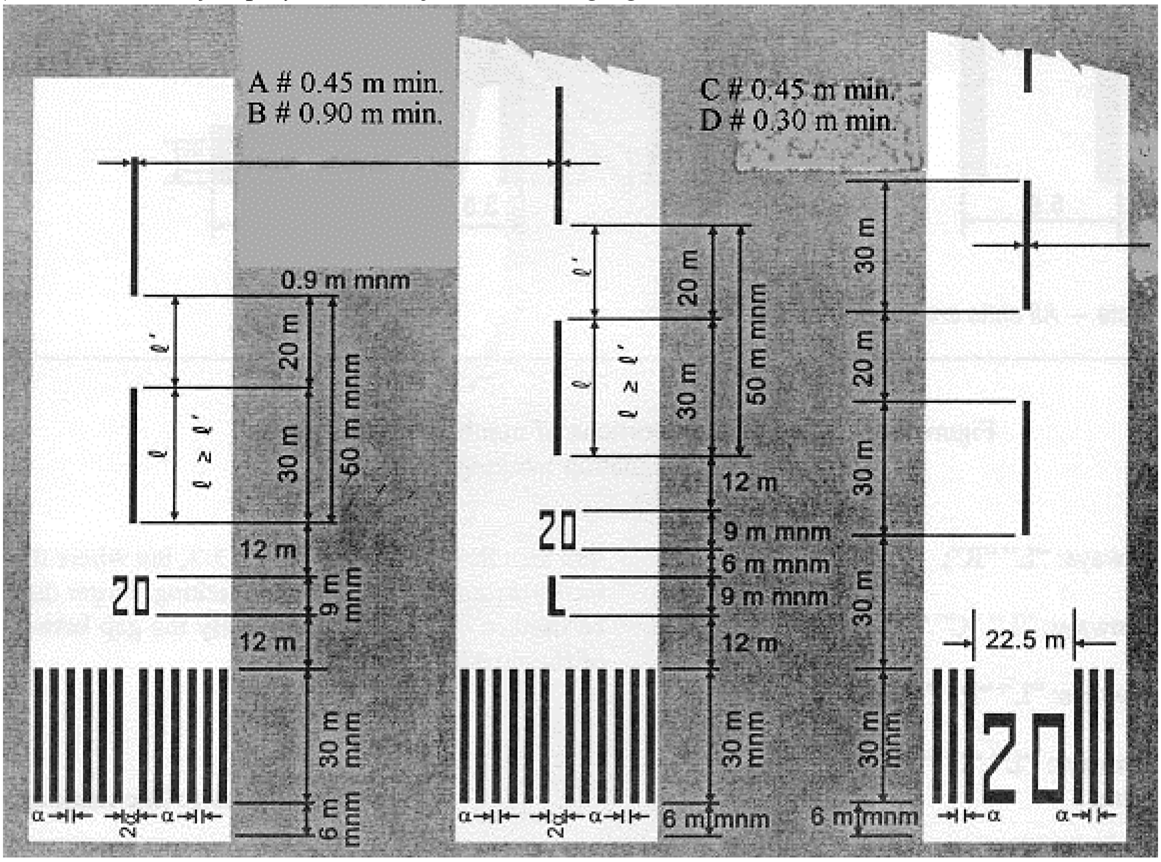
5.2.2.4 A futópálya irány jelzés két számjegyből álló szám, amelyet a párhuzamos futópályák esetében egy betű egészít ki. Az egy futópálya, illetve a kettő, vagy három párhuzamos futópályák esetében a két számjegyből álló szám a megközelítés irányból nézve a mágneses észak egy-tizedéhez legközelebb eső egész szám lesz. Négy, vagy több párhuzamos futópálya esetén a szomszédos futópályák egy csoportja a mágneses irányszög egy-tizedéhez legközelebb eső szám és a másik csoport pedig a következő mágneses irányszög egy-tizedéhez legközelebb eső számmal lesz jelölve. Amennyiben a fenti szabály eredményeképpen a jelzés csak egy számjegyből álló lesz, az irány jelzés elé helyezzenek el egy nullát ("0").

5.2.2.5 A párhuzamos futópályák esetében minden egyes futópálya irány jelzés számot a megközelítés irányából nézve balról jobbra sorrendben az alábbiak szerint egy betűvel kell kiegészíteni:

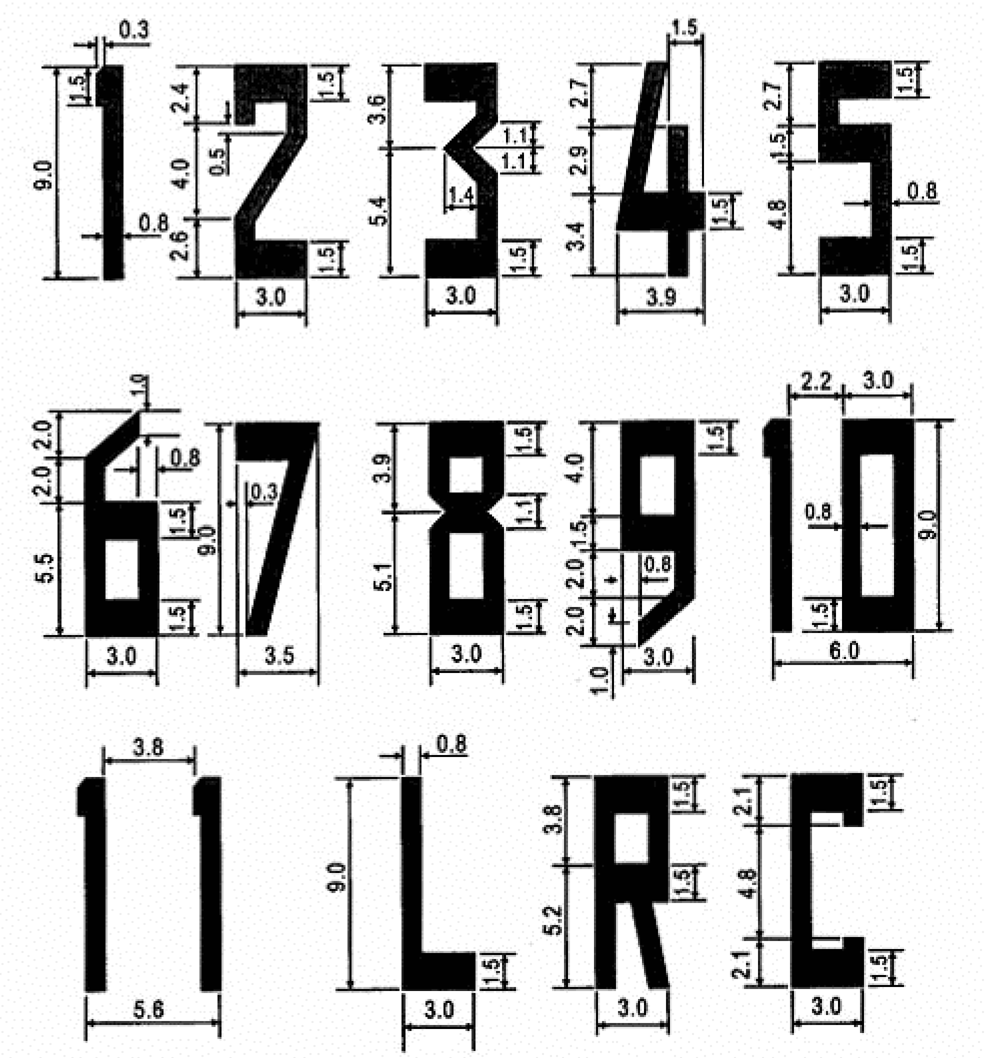
kettő párhuzamos futópálya	"L" "R"
három párhuzamos futópálya	L" "C" "R"
négy párhuzamos futópálya	"L" "R" "L" "R"
öt párhuzamos futópálya	"L" "C" "R" "L" "R" vagy "L" "R" "L" "C" "R";
hat párhuzamos futópálya	"L" "C" "R" "L" "C" "R"

5.2.2.6 A jelzés számai és betűi az 5-3. ábrán látható formában és méretben készüljenek. A méretek ne legyenek kisebbek, mint ami az 5-3. ábrán látható, azonban ahol a számok a futópálya küszöb jelölésben helyezkednek el, a futópálya küszöböt jelölő sávok közötti terület megfelelő betöltése érdekében nagyobb méretek használhatók.

(I) Általános és minden precíziós megközelítésű futópálya	***(II) Párhuzamos futópályák***	***(III) Választható elrendezés***
(A) I. kategóriás precíziós és nem precíziós megközelítésű futópálya	jelzések vastagsága 0.45 méter	? = futópálya küszöb jelzések közötti távolság körülbelül 1.8 méter
(B) II. és III. kategóriás precíziós megközelítésű futópálya	jelzések vastagsága 0.9 méter	
(C) Nem-precíziós megközelítésű futópálya	jelzések vastagsága 0.45 méter	min = legkisebb távolság
(D) Nem-műszeres futópálya	jelzések vastagsága 0.3 méter	



5-2. ábra:Futópálya irány jelzés, középvonal és küszöb jelölések



5-3. ábra: Futópálya irány jelzés számok és betűk méretei, valamint arányai
Megjegyzés: A jelzett méretek méterben értendők.

5.2.3 Futópálya középvonal jelzés

Alkalmazás

5.2.3.1 A burkolt felülettel ellátott futópályát középvonal jelzéssel kell ellátni.

Elhelyezés

5.2.3.2 A futópálya középvonal jelzést az 5-2. ábrán látható futópálya irány jelzések között a futópálya középvonalán helyezzék el kivéve, amikor azt az 5.2.1.1 alpontnak megfelelően megszakítják.

Jellemzők

5.2.3.3 A futópálya középvonal jelzés egyforma hosszúságú sávokból és szünetekből álljon. A sáv és a szünet együttes hossza ne legyen kevesebb, mint 50 és ne legyen több, mint 75 méter. Az egyes sávok hossza legalább 30 méter, vagy a szünet, azaz a festett sávok közötti szakasz hossza legyen — amelyik a nagyobb érték.

5.2.3.4 A sávok szélessége ne legyen kevesebb mint:

— II. és III. kategóriás precíziós megközelítésű futópálya esetében 0.90 méter;

— I. kategóriás precíziós valamint 3, vagy 4 kód-számú nem-precíziós megközelítésű futópálya esetében 0.45 méter; és

— 1, vagy 2 kód-számú nem-precíziós megközelítésű, valamint nem-műszeres futópálya esetében 0.30 méter.

5.2.4 Futópálya küszöb jelzés

Alkalmazás

5.2.4.1 A burkolt felülettel ellátott műszeres, valamint a nemzetközi kereskedelmi légiszállításban használni kívánt 3, vagy 4 kód-számú, burkolt felülettel ellátott nem-műszeres futópálya küszöbnél futópálya küszöb jelzést kell elhelyezni.

5.2.4.2 ***Ajánlás** — A nemzetközi kereskedelmi légiszállítástól eltérő más üzemeltetésre használni kívánt 3, vagy 4 kód-számú, burkolt felülettel ellátott nem-műszeres futópálya küszöbnél helyezzenek el futópálya küszöb jelzést.*

5.2.4.3 ***Ajánlás** — A burkolt felülettel el nem látott futópálya küszöböknél lehetőség szerint helyezzenek el futópálya küszöb jelzést.*

Megjegyzés: A Repülőtér Tervezési Kézikönyv 4. része mutatja be azokat a jelzéseket, amelyek megfelelőnek mutatkoztak a közvetlenül a futópálya küszöb előtt levő lejtős területek jelölésére.

Elhelyezés

5.2.4.4 A futópálya küszöb jelzés sávjai 6 méterrel a küszöb után kezdődjenek.

Jellemzők

5.2.4.5 A futópálya küszöb jelzés egyenlő méretű, hosszirányú, a futópálya középvonal mentén szimmetrikusan elhelyezett (jelzés) sávokból áll.

Az 5-2. ábra (I.) és (II.) változata a 45 méter széles futópálya jelzését ábrázolja. A sávok száma az alábbiak szerint a futópálya szélességétől függ:

Futópálya szélessége	*Sávok száma*
18 m	4
23 m	6
30 m	8
45 m	12
60 m	16

kivéve a 45 méter, vagy ennél szélesebb nem-precíziós megközelítésű, vagy nem-műszeres futópályát, amely az 5-2. ábra (III.) változat szerint is kialakítható.

5.2.4.6 A sávok oldalirányba a futópálya szélétől 3 méterig, vagy a futópálya középvonaltól mindkét oldalra 27 méter távolságig — amelyik a kisebb oldaltávolság a futópálya szélétől — terjedhetnek. Ahol a futópálya irány jelzést a küszöb jelzésben helyezik el, a futópálya középvonalának mindkét oldalán legalább három jelzés sáv legyen. Ahol a futópálya irány jelzés a küszöb jelzés felett helyezkedik el, a sávok a futópálya teljes szélességében folytatódjanak. A sáv hossza legalább 30 méter, szélessége körülbelül 1.80 méter és a közöttük levő távolság körülbelül 1.80 méter legyen kivéve, ha a sávok a futópálya teljes szélességében folytatódnak: ekkor a futópálya középvonalhoz legközelebb eső két sávot elválasztó távolságot kettőzzék meg. Amennyiben a futópálya irány jelzés a küszöb jelzésben helyezkedik el, ez a távolság 22.5 méter legyen.

Keresztirányú sáv

5.2.4.7 ***Ajánlás*** *— Ahol a küszöböt a futópálya végéről áthelyezték, vagy ahol a futópálya vége nem merőleges a középvonalra, a futópálya küszöb jelzést az 5-4. ábra (B) változata szerint keresztirányú jelző sávval egészítsék ki.*

5.2.4.8 A keresztirányú jelző sáv szélessége 1.8 méternél ne legyen kevesebb.

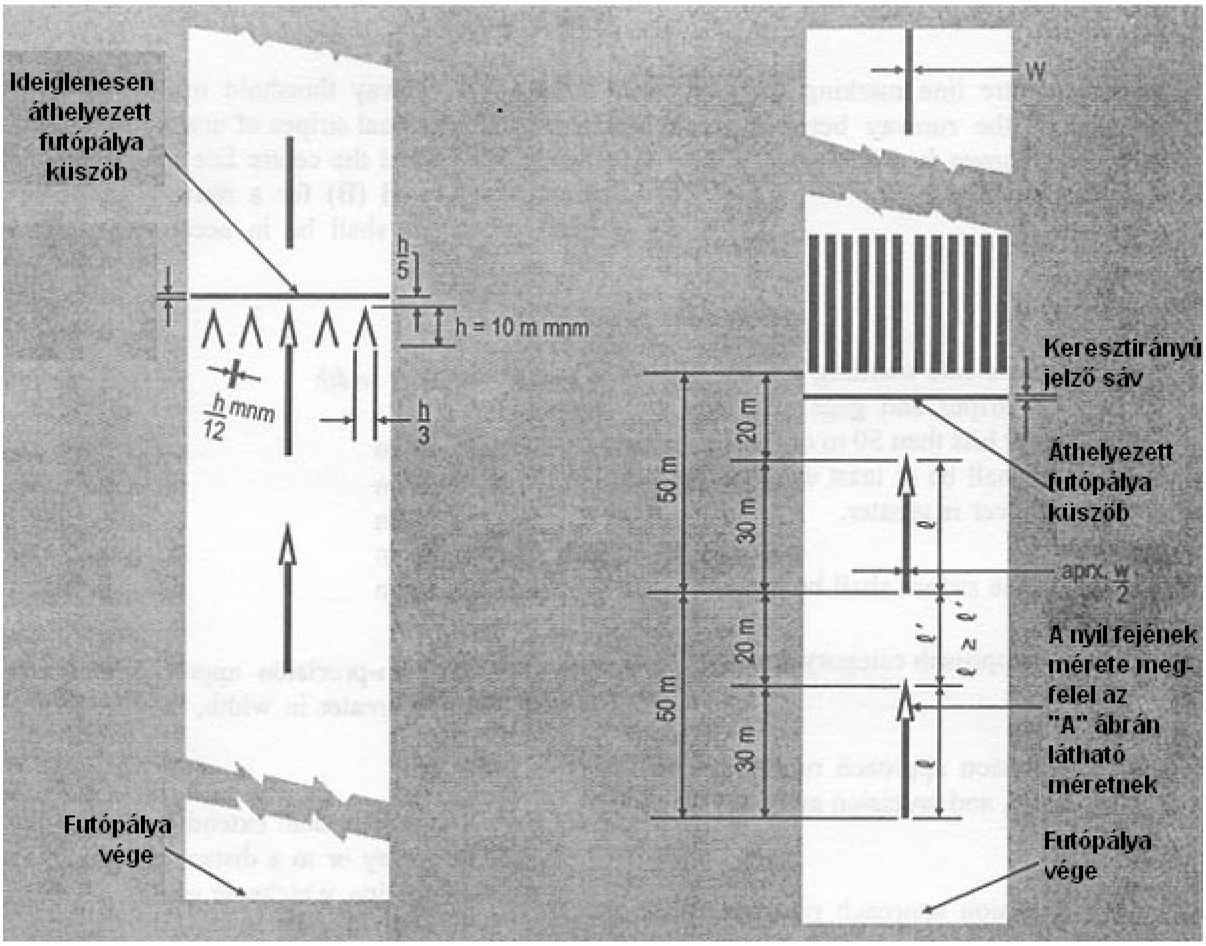
Nyilak

5.2.4.9 Ahol a futópálya küszöböt állandó jelleggel áthelyezték, a futópálya áthelyezett küszöb előtti szakaszára az 5-4. ábra (B) változata szerint helyezzenek el jelző nyilakat.

5.2.4.10 Ahol a futópálya küszöböt rendes helyéről ideiglenes jelleggel áthelyezték, az 5-4. ábra (A), vagy (B) változata szerint lássák el jelzésekkel. Az áthelyezett küszöb előtt levő összes jelzést távolítsák (takarják) el a futópálya középvonal jelzés kivételével, amelyet nyilakká alakítsanak át.

1. Megjegyzés: Ha a futópálya küszöböt ideiglenesen és csak rövid időre helyezik át, a jelzések futópályára történő felfestése helyett megfelelőnek bizonyult a megfelelő színű és formájú áthelyezett küszöb jelző eszközök használata.

2. Megjegyzés: Ha az áthelyezett futópálya küszöb előtti terület nem alkalmas a légijármű földi mozgására, oda a 7.1.4 pontban ismertetettek szerint lezáró jelzéseket kell elhelyezni.



5-4. ábra
Áthelyezett futópálya küszöb jelzések

(A) Ideiglenesen áthelyezett küszöb ***(B) Ideiglenesen, vagy állandóan áthelyezett küszöb***

Megjegyzés: A jelzett méretek méterben értendők.

5.2.5 Célpont jelzés

Alkalmazás

5.2.5.1 Az 5.2.5 és 5.2.6 szakaszok előírásai 2005 január 1. előtt nem teszik kötelezővé a meglevő jelzések cseréjét.

5.2.5.2 A burkolt felülettel ellátott 2, 3, vagy 4 kód-számú, műszeres futópálya minden egyes megközelítési végénél helyezzenek el célpont jelzést.

5.2.5.3 ***Ajánlás*** — *Ha a célpont fokozott láthatóságának biztosítása és jobb felismerhetősége kívánatos:*

a) a burkolt felülettel ellátott 3 vagy 4 kód-számú nem műszeres futópálya;

b) a burkolt felülettel ellátott 1 kód-számú műszeres futópálya;
minden megközelítési végénél helyezzenek el célpont jelzést.

Elhelyezés

5.2.5.4 A célpont jelzés ne kezdődjön az 5-1. táblázat megfelelő oszlopában jelzett távolságnál közelebb a futópálya küszöbhöz, kivéve a látás utáni megközelítési siklópálya jelző rendszerrel ellátott futópályát, ahol jelzés kezdete essen egybe a megközelítési siklópálya kiinduló pontjával.

5.2.5.5 A célpont jelzés két jól látható, feltűnő sávból áll. A sávok méretei és a belső oldalaik közötti távolság feleljen meg az 5-1. táblázat megfelelő oszlopában előírtaknak. Ahol földetérési terület jelzést alakítottak ki, a célpont jelzések között oldalirányú távolság azonos legyen a földetérési terület jelzések közötti távolsággal.

5-1. táblázat**:** Célpont jelzés elhelyezése és méretei

Elhelyezés és méretek	*Rendelkezésre álló leszállási távolság*			
	kevesebb mint 800 m	*800 m — 1199 m*	*1200 m — 2399 m*	*több mint 2400 m*
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Távolság a küszöb és a jelzés kezdete között	150 m	250 m	300 m	400 m
A jelzés sáv hossza [a]	30 - 45 m	30 - 45 m	45 - 60 m	45 - 60 m
A jelzés sáv szélessége	4 m	6 m	6 - 10 m [b]	6 - 10 m [b]
A jelzés sávok belső szélei közötti oldaltávolság	6 m [c]	9 m [c]	18 - 22.5 m	18 - 22.5 m

Megjegyzések:

[a] = A meghatározott távolság értékek közül a nagyobbat alkalmazzák, ha kívánatos a pont fokozott láthatóságának biztosítása és jobb felismerhetősége.

[b] = A jelölések gumimaradvánnyal való szennyezettségének csökkentése érdekében az oldalirányú távközöket a jelzett határokon belül változtathatják.

[c] = Ezt a távolság elemet a külső főfutó kerékabroncs távolság értékéből határoztuk meg, amely az 1. fejezet 1-1. táblázat repülőtér referencia kód 2. eleme.

5.2.6 Földetérési terület jelzés

Alkalmazás

5.2.6.1 A burkolt felülettel ellátott 2, 3, vagy 4 kód-számú, precíziós megközelítésű futópálya földetérési területét földetérési terület jelzéssel kell ellátni.

5.2.6.2 ***Ajánlás*** *— A burkolt felülettel ellátott 3, vagy 4 kód-számú, nem-precíziós megközelítésű, vagy nem-műszeres futópálya földetérési területén, ahol annak fokozott láthatóságának biztosítása, illetve jobb felismerése kívánatos, helyezzenek el földetérési terület jelzést.*

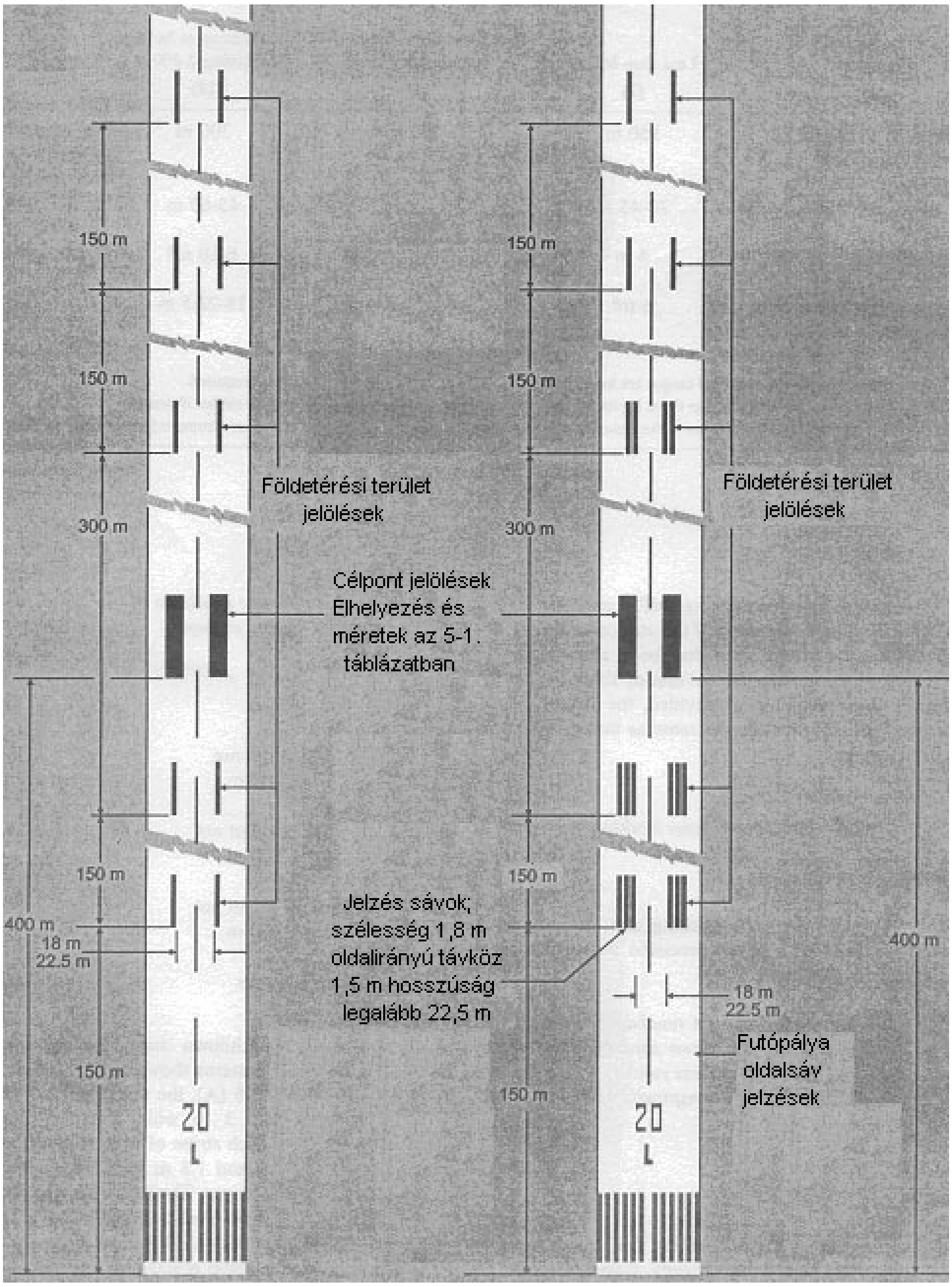
Elhelyezés és jellemzők

5.2.6.3 A földetérési terület a futópálya középvonala mentén szimmetrikusan elhelyezett téglalap alakú jelzés párokból áll, amelyek száma összefüggésben van a rendelkezésre álló leszállási távolsággal, továbbá amennyiben a terület jelzést a futópálya mindkét leszállási irányában elhelyezik, a küszöbök közötti távolsággal a következő táblázat szerint:

Rendelkezésre álló leszállási vagy a küszöbök közötti távolság (méter)	*Jelzés párok száma*
kevesebb mint 900 m	1
több mint 900 m de kevesebb mint 1199 m	2
1200 m vagy több, de kevesebb mint 1499 m	3
1500 m vagy több, de kevesebb mint 2399 m	4
2400 m vagy több	6

5.2.6.4 A földetérési terület jelzése az 5-5. ábrán látható két változat közül az egyiknek feleljen meg. Az (A) változat szerinti elrendezés esetében a jelzések mérete ne legyen kisebb, mint 22.5 méter hosszúság és 3 méter szélesség. A (B) változat szerinti elrendezés esetében minden jelölés minden jelző sávjának mérete ne legyen kisebb, mint 22.5 méter hosszúság és 1.8 méter szélesség és az egymás mellett levő sávok között legalább 1.5 méter távolság legyen. A jelzések (téglalapok) belső oldalai közötti távolság azonos legyen a célpont jelzések közötti távolsággal, ha ilyet kialakítottak. Ahol célpont jelölést nem helyeztek el, a jelzések (téglalapok) belső oldalai közötti távolság feleljen meg az 5-1. táblázatban a célpont jelzésekre meghatározott távolságoknak (a megfelelő 2, 3, 4 vagy 5 oszlop). A jelzés párokat a küszöbtől kezdődően hosszirányban egymástól 150 méter távolságra helyezzék el, azonban a földetérési terület jelöléssel egybe eső, vagy ahhoz számított 50 méteres távolságon belül levő jelzés párokat ne helyezzék el.

5.2.6.5 ***Ajánlás*** *— A 2 kód-számú, nem-precíziós műszeres megközelítésű futópályán a célpont jelzés kezdetétől 150 méter távolságra helyezzenek el egy további földetérési terület jelzés sáv-párt.*



(A) Alap elrendezés *(B) Távolság jelzéssel*

5-5. ábra: Célpont és földetérési terület jelzések 2400 méter, vagy ennél hosszabb futópályánál

5.2.7 Futópálya széle jelzés

Alkalmazás

5.2.7.1 A burkolt felülettel ellátott futópálya küszöbök között, ahol a futópálya szélek, valamint a padkák, vagy a környező talajfelszín között nincs megfelelően látható eltérés, futópálya széle jelző sávot helyezzenek el.

5.2.7.2 ***Ajánlás*** — *A precíziós megközelítésű futópályán a futópálya szélek, valamint a padkák, vagy a környező talaj felszín között tapasztalható eltéréstől függetlenül helyezzenek el futópálya széle jelző sávot.*

Elhelyezés

5.2.7.3 ***Ajánlás*** — *A futópálya széle jelző a futópálya mindkét oldalán felfestett egy-egy sáv, amelyeknek külső szegélye körülbelül a futópálya szélén van. Amennyiben a futópálya 60 méternél szélesebb, a sávok a középvonaltól mindkét oldalra 30 méter távolságra helyezkedjenek el.*

5.2.7.4 ***Ajánlás —*** *Ahol futópálya megforduló sávot alakítottak ki, a futópálya széle jelző sáv folyamatosan haladjon tovább a futópálya és a megforduló sáv között.*

Jellemzők

5.2.7.5 ***Ajánlás*** — *A futópálya széle jelző sáv teljes szélessége a 30 méter, vagy ennél nagyobb szélességű futópálya esetében legalább 0.9 méter, keskenyebb futópálya esetén pedig legalább 0.45 méter legyen.*

5.2.8 Gurulóút középvonal jelzés

Alkalmazás

5.2.8.1 A 3, vagy 4 kód-szám esetén a burkolt felületű gurulóutat, jégtelenítő és jégmentesítő létesítményt, valamint a forgalmi előteret el kell látni gurulóút középvonal jelzéssel oly módon, hogy az folyamatos gurulási útmutatót biztosítson a futópálya középvonal és a légijármű állóhelyek között.

5.2.8.2 ***Ajánlás*** — *Az 1, vagy 2 kód-szám esetén a burkolt felületű gurulóutat, jégtelenítő és jégmentesítő létesítményt, valamint a forgalmi előteret lássák el gurulóút középvonal jelzéssel oly módon, hogy az folyamatos gurulási útmutatót biztosítson a futópálya középvonal és a légijármű állóhelyek között.*

5.2.8.3 A burkolt felületű futópályát, amennyiben az a szabványos gurulási útvonal rendszer részét képezi: és:

a) azon futópálya középvonal jelzés nem található; vagy

b) a gurulóút középvonal nem esik egybe a futópálya középvonallal; gurulóút középvonal jelzéssel lássák el.

Elhelyezés

5.2.8.4 ***Ajánlás —*** *A gurulóút egyenes szakaszán a gurulóút középvonal jelzés a középvonal mentén helyezkedjen el. A gurulóút ívelt szakaszán a középvonal jelzés az egyenes szakasztól kezdődően a gurulóút ív külső szélétől állandó távolságra folytatódjon.*

Megjegyzés: Lásd a 3.9.6 pontot és 3-2. ábrát.

5.2.8.5 ***Ajánlás*** — *A gurulóút és futópálya csatlakozásánál, ahol a gurulóút a futópálya elhagyására szolgál, a gurulóút középvonal jelzés az 5-6. valamint az 5-25. ábrák szerint ívvel csatlakozzon a futópálya középvonal jelzéshez. A gurulóút középvonal jelzés a futópálya középvonallal a csatlakozási ponttól a 3, vagy 4 kód-szám esetében legalább 60 méter és az 1 vagy 2 kód-szám esetében legalább 30 méter hosszan párhuzamosan haladjon.*

5.2.8.6 ***Ajánlás*** — *Ahol a futópályán az 5.2.8.3 pont alapján gurulóút középvonal jelzést alakítanak ki, a jelzés a kijelölt gurulóút középvonalán helyezkedjen el.*

Jellemzők

5.2.8.7 A gurulóút középvonal jelzés legalább 15 cm széles legyen és a futópálya várakozási, vagy közbenső várakozási hely jelzés keresztezésektől eltekintve az 5-6. ábrának megfelelően folyamatosan haladjon.

5.2.9 Futópálya megforduló sáv jelzés

Alkalmazás

5.2.9.1 Ahol futópálya megforduló sávot létesítettek, a megforduló sáv jelzése folyamatos irányvezetést biztosítson a repülőgép számára a 180°-os forduló végrehajtásához és a futópálya középvonalához történő visszatéréshez.

Elhelyezés

5.2.9.2 ***Ajánlás*** *— A futópálya megforduló sáv jelzése a futópálya középvonaltól kezdődően a megforduló sávhoz ívelt legyen. Az ív sugara feleljen meg azon repülőgépek gurulási jellemzőinek és sebességeinek, amelyek kiszolgálására a megforduló sávot tervezték. A futópálya megforduló sáv jelzés és a futópálya középvonal csatlakozási szöge 30°-osnál nagyobb ne legyen.*

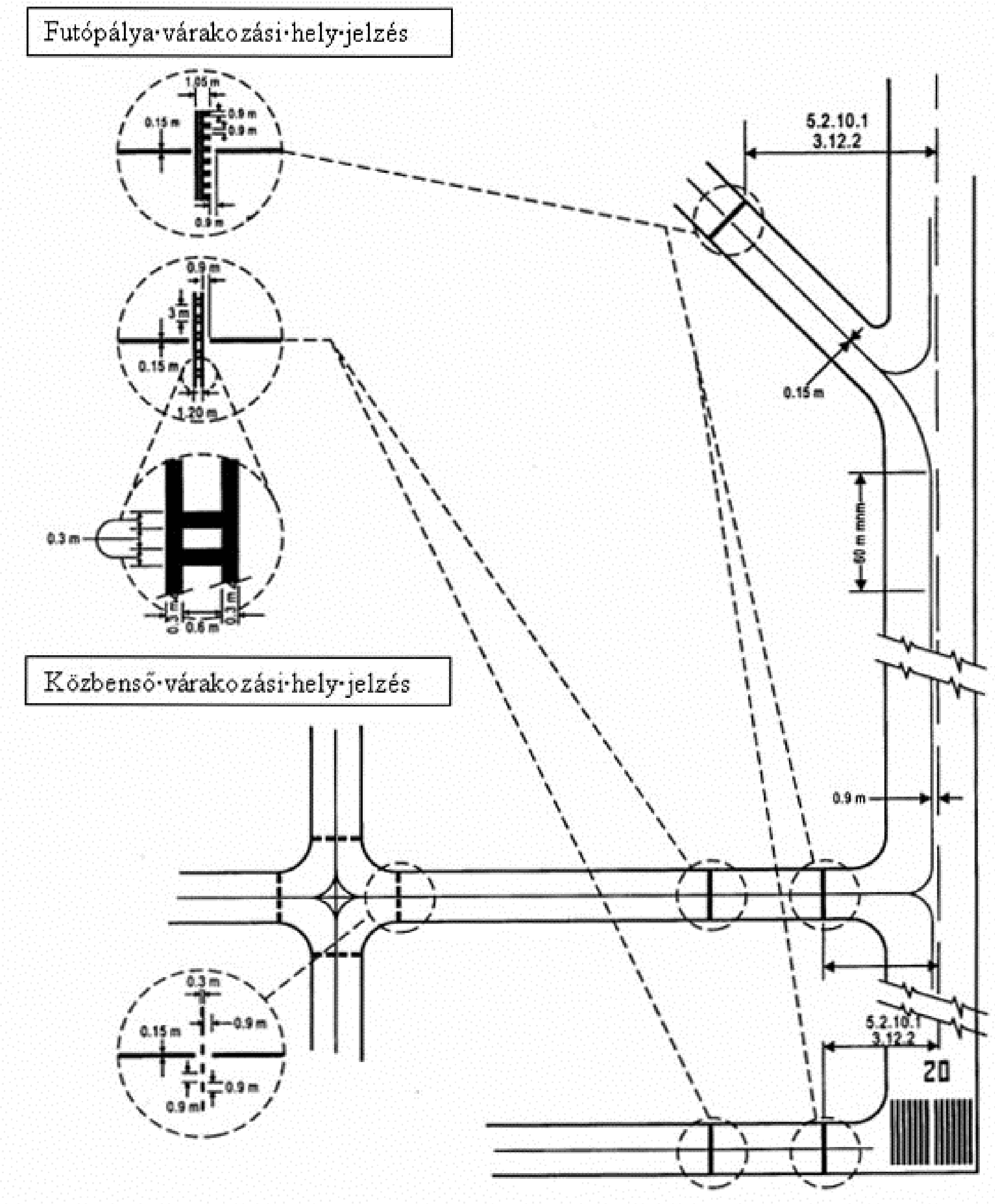
5.2.9.3 ***Ajánlás*** *— A futópálya megforduló sáv jelzése a futópálya középvonallal a csatlakozási ponttól a 3, vagy 4 kód-szám esetében legalább 60 méter és az 1, vagy 2 kód-szám esetében legalább 30 méter hosszan párhuzamosan haladjon.*

5.2.9.4 ***Ajánlás*** *— A futópálya megforduló sáv jelzése úgy vezesse a repülőgépet, hogy lehetővé tegye az egyenes gurulást addig a pontig, ahol a 180°-os fordulót megkezdi. A futópálya megforduló sáv jelzés egyenes szakasza párhuzamos legyen a futópálya megforduló sáv külső szélével.*

5.2.9.5 ***Ajánlás*** *— Az ívet úgy tervezzék meg, hogy a repülőgép a 180°-os fordulót 45°-nál nem nagyobb orrfutó kormányzási értékkel kezdhesse meg.*

5.2.9.6 **Ajánlás** — A futópálya megforduló sáv jelzést úgy tervezzék meg, hogy amikor a repülőgép pilótakabinja a megforduló sáv jelzés felett halad, a repülőgép futóművének bármely kereke és a futópálya megforduló sáv külső széle között a biztonsági távolság a 3.3.6 pontban meghatározott értéknél kevesebb ne legyen.

Megjegyzés: A repülőgép mozgás megkönnyítése érdekében vegyék figyelembe a nagyobb futómű és szegély közötti biztonsági távolság kialakításának lehetőségét az E és F kóddal rendelkező repülőgépek számára. Lásd 3.3.7 pont.



5-6. ábra:Gurulóút (és alapvető futópálya) jelzések
A változat: Négy vonal és három térköz, egymástól 0.15 m távolságra.
B változat: Két 0.3 m szélességű vonal egymástól 0.6 m térköz távolságra.

Jellemzők

5.2.9.7 A futópálya megforduló sáv jelzés hosszirányban folyamatos és szélessége legalább 15 cm. legyen.

5.2.10 Futópálya várakozási hely jelzés

Alkalmazás és elhelyezés

5.2.10.1 A futópálya várakozási helyet el kell látni futópálya várakozási hely jelzéssel.

Megjegyzés: A futópálya várakozási helyek megjelölése vonatkozásában lásd az 5.4.2 pontot.

Jellemzők

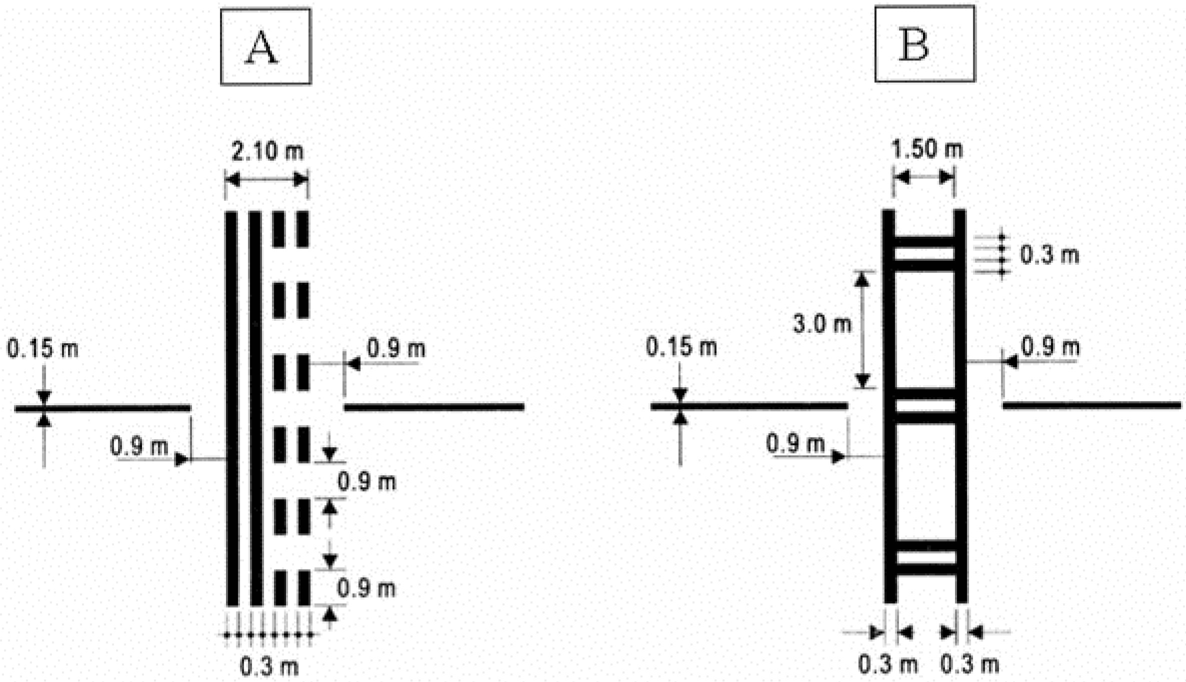
5.2.10.2 A gurulóút és a nem-műszeres, nem-precíziós megközelítésű, vagy felszállási futópálya csatlakozásánál, illetve kereszteződésénél a futópálya várakozási hely jelzést az 5-6. ábra (A) változata szerint kell kialakítani.

5.2.10.3 Ahol a gurulóút és az I. II. vagy III. kategóriás precíziós megközelítésű futópálya csatlakozásánál, illetve kereszteződésénél csak egy futópálya várakozási helyet jelöltek ki, a hely jelzést az 5-6. ábra (A) változata szerint alakítsák ki. Ahol egy ilyen csatlakozásnál két, vagy három futópálya várakozási hely van, a futópályához (leg)közelebb eső futópálya várakozási hely jelzését az (A) változat és a távolabb eső várakozási helyek jelzését a (B) változat szerint készítsék el.

5.2.10.4 A 3.12.3 pont alapján kijelölt futópálya várakozási helynél elhelyezett várakozási hely jelzést az 5-6. ábra (A) változata szerint kell kialakítani.

5.2.10.5 ***Ajánlás*** *— Ahol a futópálya várakozási hely feltűnő, fokozott láthatóságának biztosítása szükséges, a jelzést az 5-7. ábra megfelelő (A) vagy (B) változata szerint készítsék el.*

5.2.10.6 ***Ajánlás*** *— Ahol a (B) változat szerinti futópálya várakozási hely jelzés olyan területen van, amelynek hossza meghaladja a 60 métert, a futópálya várakozási hely jelzés végénél levő felületeken és az egymást követő jelzések között maximálisan 45 méter távolságon belül használják a felületre felfestett megfelelő "CAT.II" vagy "CAT.III" kifejezéseket. A betűk magassága ne legyen kevesebb 1.8 méternél és azok a futópálya várakozási hely jelzéstől ne legyenek 0.9 méternél távolabb.*



5-7. ábra: Futópálya várakozási hely jelzések
A változat: Négy vonal és három térköz, összesen 2.1 m széles, egymástól 0.3 m távolságra
B változat: Két 0.3 m szélességű vonal egymástól 1.5 m térköz távolságra

5.2.10.7 A futópályák csatlakozásánál, vagy kereszteződésénél a futópálya várakozási hely jelzés merőleges legyen a szabványos gurulási útvonal részét képező futópálya középvonalára. A jelzést az 5-7. ábra (A) változata szerint kell kialakítani.

5.2.11 Közbenső várakozási hely jelzés

Alkalmazás és elhelyezés

5.2.11.1 ***Ajánlás** — A közbenső várakozási helyet lássák el közbenső várakozási hely jelzéssel.*

5.2.11.2 ***Ajánlás** — A gurulóúthoz csatlakozó távoli jégtelenítő és jégmentesítő létesítmény kijáratát (határát) lássák el közbenső várakozási hely jelzéssel.*

5.2.11.3 Ahol a közbenső várakozási hely jelzés két burkolt felületű gurulóút csatlakozásánál helyezkedik el, az a guruló légijárművek közötti biztonsági távolság fenntartása érdekében a gurulóúton megfelelő távolságra legyen a csatlakozó gurulóút kezdeti széle előtt. Ahol ilyen jelzést létesítettek, az együtt legyen a megállító keresztfénysorral, vagy a közbenső várakozási hely fényekkel.

5.2.11.4 A forgalmi előtértől távoli jégtelenítő és jégmentesítő létesítmény kijáratánál levő közbenső várakozási hely jelzés és a csatlakozó gurulóút középvonala közötti távolság ne legyen kevesebb, mint a 3-1. táblázat 11. oszlopában meghatározott érték.

Jellemzők

5.2.11.5 A közbenső várakozási hely jelzésnek az 5-6. ábrának megfelelően egy szaggatott vonalból kell állnia.

5.2.12 Repülőtéri VOR ellenőrző pont jelzés

Alkalmazás

5.2.12.1 Amikor repülőtéri VOR ellenőrző pontot alakítanak ki, azt megfelelő jelzéssel és táblával kell ellátni.

Megjegyzés: A repülőtéri VOR ellenőrző pont tábla ismertetése az 5.4.4 pontban található.

5.2.12.2 *Hely kiválasztása*

Megjegyzés: A repülőtéri VOR ellenőrző pont helyszíneinek kiválasztásával kapcsolatos útmutató a 10. Annex I. kötet E. Mellékletében található.

Elhelyezés

5.2.12.3 A repülőtéri VOR ellenőrző pont középpontja az a hely legyen, amelyen a parkírozó légijármű pontos VOR jeleket vesz.

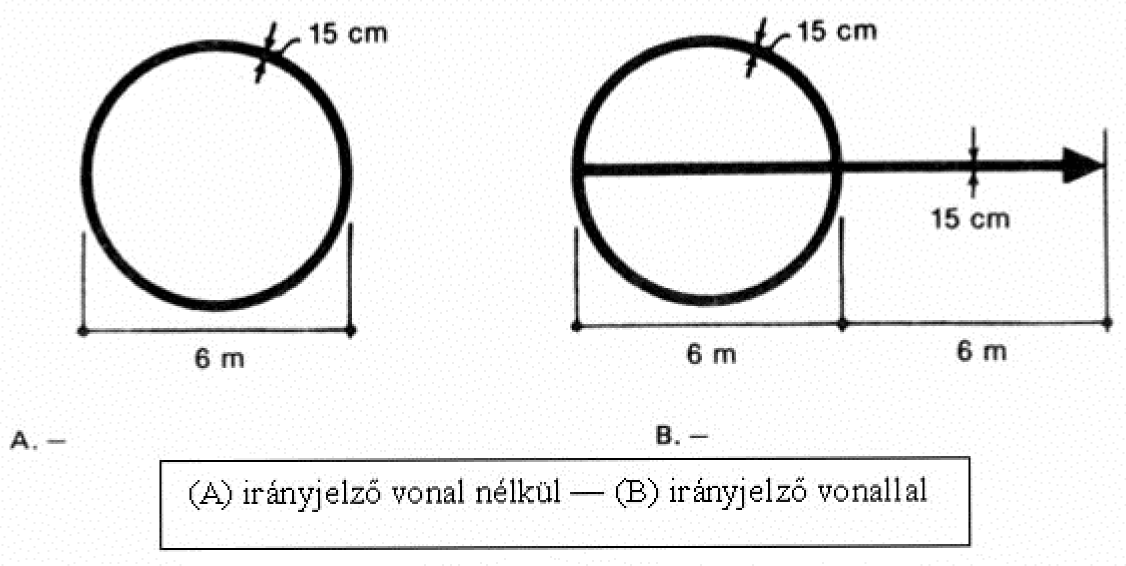
Jellemzők

5.2.12.4 A repülőtéri VOR ellenőrző pont jelzés egy 6 méter átmérőjű kör, melynek körsáv szélessége 15 cm (lásd 5-8. ábra (A) változat).

5.2.12.5 ***Ajánlás*** *— Ha kívánatos a légijármű egy adott irányba történő beállítása, a kör középpontján átmenő, a kívánt géptengely iránnyal egyező egyenessel jelezzék ezt az irányt. Az egyenes a kör szélén 6 méterrel nyúljon túl és nyílhegyben végződjön. A vonal szélessége 15 cm (lásd 5-8. ábra (B) változat).*

5.2.12.6 ***Ajánlás*** *— A repülőtéri VOR ellenőrző pont jelzés színe lehetőleg fehér legyen, de minden esetben különbözzön a gurulóút jelzésre használt színtől.*

Megjegyzés: A megfelelő kontraszt biztosításához a jelzést fekete szegéllyel lehet ellátni.



5-8. ábra: Repülőtéri VOR ellenőrző pont jelzés

Megjegyzés az ábrához: Az irányjelző vonalat csak akkor szükséges kialakítani, ha a légijárművet egy meghatározott irányba kell beállítani.

5.2.13 Légijármű állóhely jelzés

Megjegyzés: A légijármű állóhely jelzésekkel és jelölésekkel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Alkalmazás

5.2.13.1 ***Ajánlás*** *— A burkolt felülettel ellátott forgalmi előtéren, valamint a jégtelenítő és jégmentesítő létesítménynél kijelölt parkírozó helyeket légijármű állóhely jelzéssel lássák el.*

Elhelyezés

5.2.13.2 ***Ajánlás*** *— A burkolt felülettel ellátott forgalmi előtéren, valamint jégtelenítő és jégmentesítő létesítménynél levő légijármű állóhely jelzést úgy alakítsák ki, hogy ha a légijármű orrfutója a jelzésen halad, a 3.13.6, illetve 3.15.9 pontokban meghatározott biztonsági távolságok fennmaradjanak.*

Jellemzők

5.2.13.3 ***Ajánlás*** *— A légijármű állóhely jelzés a parkírozási elrendezés igényei, valamint a kiegészítő berendezéseknek megfelelően tartalmazzon olyan elemeket, mint az állóhely azonosítója, bevezető vonal, forduló jelző és vezető vonal, megállító jelzővonal, valamint kigurulási nyomvonal.*

5.2.13.4 ***Ajánlás*** *— A légijármű állóhely azonosító (betű és/vagy szám) röviddel a bevezető vonal kezdete után legyen elhelyezve. Az azonosító magassága olyan legyen, hogy azt az állóhelyet igénybe vevő légijármű pilótakabinjából el lehessen olvasni.*

5.2.13.5 ***Ajánlás*** *— Ahol a forgalmi előtér rugalmasabb felhasználhatósága érdekében két légijármű állóhely jelzés-csoport van egymáson és nehéz annak eldöntése, hogy melyiket kövessék, vagy veszélyes lehet a rossz jelzés követése, a légijármű állóhely azonosítót az alábbiak szerint egészítsék ki azon légijármű megnevezésével, amelyre az adott jelzés vonatkozik:*

Például: 2A-B747, 2B-F28.

5.2.13.6 ***Ajánlás*** *— A bevezető, forduló és kivezető vonalak általában folyamatos és legalább 15 cm széles sávok. Ahol az állóhely jelzésen egy, vagy több vonal halad át, a legnagyobb (legigényesebb) típusra vonatkozó jelzés folyamatos és a többi szaggatott vonal legyen.*

5.2.13.7 ***Ajánlás*** *— Az ívelt bevezető, forduló és kivezető vonalak, illetve szakaszok sugara annak a legnagyobb (legigényesebb) típusnak megfelelő legyen, amely kiszolgálására az állóhely jelzéseket tervezték.*

5.2.13.8 ***Ajánlás*** *— Ahol a helyi igények miatt a légijármű csak egy irányba haladhat, a követendő irányt a be, vagy kivezető vonalakat kiegészítő nyíllal jelezzék.*

5.2.13.9 ***Ajánlás*** *— A bevezető vonalhoz megfelelő szögben, a forduló megkezdésének tervezett pontján, a pilótakabin bal oldala mellett helyezzenek el a forduló irányát jelző nyíllal ellátott forduló jelzést, amelynek hossza legalább 6 méter és szélessége legalább 15 cm.*

Megjegyzés: A forduló jelzés és a bevezető vonal közötti távolság a légijármű típusoktól függően változhat. Meghatározásánál vegyék figyelembe a repülőgépvezető látóterét.

5.2.13.10 ***Ajánlás*** *— Ha több, mint egy forduló jelzésre és/vagy megállító vonalra van szükség, ezeket megfelelően kódolják.*

5.2.13.11 ***Ajánlás*** *— A légijármű állóhelyen helyezzenek el beállító jelzés vonalat, amely egybeesik a kijelölt állóhelyen levő légijármű meghosszabbított középvonalával és amelyet a repülőgépvezető a beállási művelet utolsó szakaszában láthat. A vonal szélessége legalább 15 cm legyen.*

5.2.13.12 ***Ajánlás*** *— A beállító jelzés vonalhoz megfelelő szögben, a tervezett megállási pontnál, megállító jelzést helyezzenek el a pilótakabin bal oldalán. A jelzés hossza legalább 6 méter és szélessége legalább 15 cm legyen.*

Megjegyzés: A megállító jelzés és a bevezető vonal közötti távolság a légijármű típusoktól függően változhat. Meghatározásánál vegyék figyelembe a repülőgépvezető látóterét.

5.2.14 Forgalmi előtér biztonsági (határ) jelzés

Megjegyzés: A forgalmi előtéren elhelyezendő biztonsági jelzésekkel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Alkalmazás

5.2.14.1 ***Ajánlás*** *— A légijármű állóhely elrendezéstől, valamint a földi létesítményektől és berendezésektől függően a burkolt felülettel ellátott forgalmi előtéren helyezzenek el biztonsági (jelző) határvonalakat.*

Elhelyezés

5.2.14.2 A biztonsági határvonalakat úgy alakítsák ki, hogy pontosan meghatározzák a földi gépjárművek és egyéb légijármű kiszolgáló berendezések használatára kijelölt, valamint egyéb területeket, hogy ezek a légijárműtől biztonságos távolságra üzemeljenek.

Jellemzők

5.2.14.3 ***Ajánlás*** *— A forgalmi előtér biztonsági határvonalak olyan elemekből állnak, mint például a szárnyvég biztonsági távolság vonal és a kiszolgálási utak határvonalai. Az elrendezésük a légijármű állóhelyektől és a földi berendezésektől függ.*

5.2.14.4 ***Ajánlás*** *— A forgalmi előtér biztonsági határvonalak folyamatos, legalább 10 cm széles sávok legyenek.*

5.2.15 Út váró hely jelzés

Alkalmazás

5.2.15.1 A futópálya összes gépjármű út bejáratához út váró hely jelzést kell elhelyezni.

Elhelyezés

5.2.15.2 A gépjármű út váró hely jelzést az úton, a váró pontnál keresztben kell elhelyezni.

Jellemzők

5.2.15.3 A gépjármű út váró hely jelzés összhangban kell, hogy legyen a helyi közúti közlekedésben alkalmazott előírásokkal és szabályokkal.

5.2.16 Kötelező utasítást adó jelzés

Megjegyzés: A kötelező utasítást adó jelzéssel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Alkalmazás

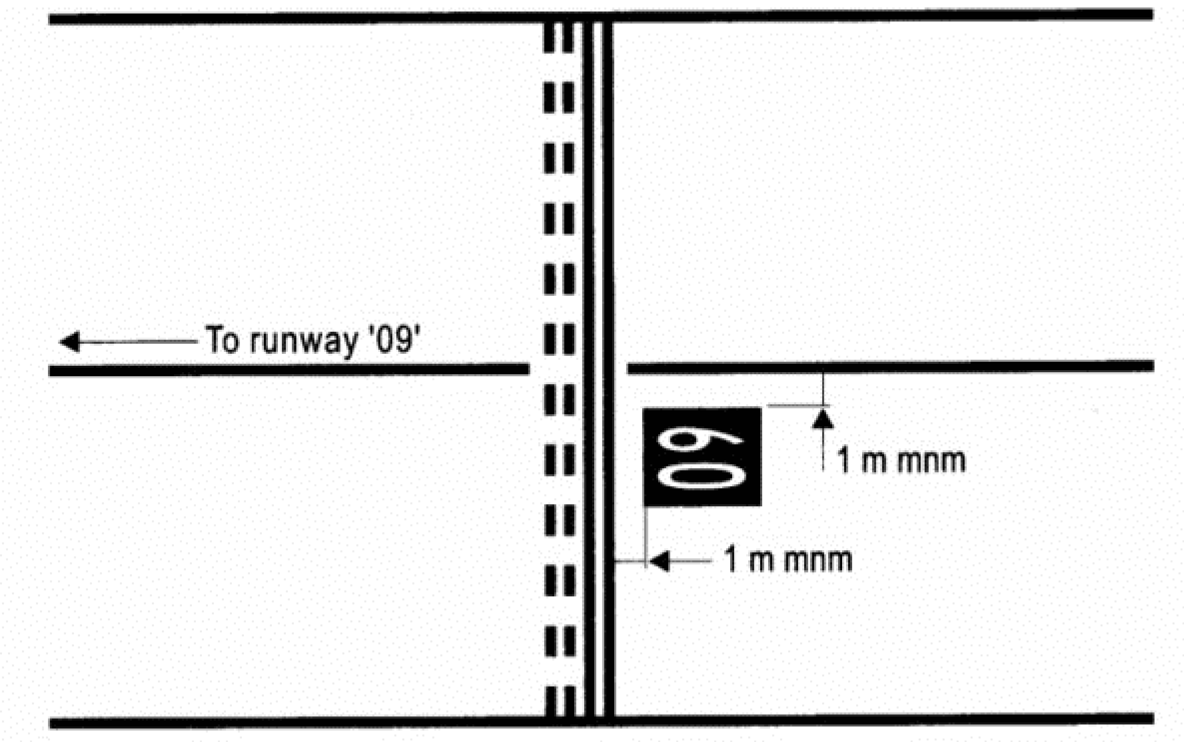
5.2.16.1 Ahol a kötelező utasítást adó tábla elhelyezése az 5.4.2.1 pont alapján gyakorlati okokból nem megvalósítható, a kötelező utasítást adó jelzést a burkolat felületén kell kialakítani.

5.2.16.2 ***Ajánlás — Ahol ez üzemeltetési szempontból szükséges, mint például a 60 méternél szélesebb gurulóút esetében, a kötelező utasítást adó táblát kötelező utasítást adó jelzéssel egészítsék ki.***

Elhelyezés

5.2.16.3 A kötelező utasítást adó jelzést az 5-9. ábra szerint a gurulóút középvonal jelzés bal oldalán és a futópálya várakozási hely várakozási oldalán kell elhelyezni. A futópálya várakozási hely vagy a gurulóút középvonal jelzés valamint a kötelező utasítást adó jelzés közelebbi széle között legalább 1 méter távolság legyen.

5.2.16.4 ***Ajánlás — A futópályán ne helyezzenek el kötelező utasítást adó jelzést, kivéve, ha ezt üzemeltetési okok szükségessé teszik.***



5-9. ábra: Kötelező utasítást adó jelzés

Megjegyzés az ábrához: Az utasítás értelmezése: Futópálya várakozási hely a 09 futópályához

Jellemzők

5.2.16.5 A kötelező utasítást adó jelzés vörös színű alapon fehér felirat legyen. A belépni tilos (NO ENTRY) jelzés kivételével a felirat a megfelelő kötelező utasítást adó táblával egyező rendelkezést jelezzen.

5.2.16.6 A belépni tilos (NO ENTRY) jelzés vörös színű alapon fehér felirat legyen.

5.2.16.7 Ha a jelzés és a burkolat felülete között nem megfelelő a kontraszt, kötelező utasítást adó jelzés a jelzést megfelelő, lehetőség szerint fehér vagy fekete kerettel lássák el.

5.2.16.8 ***Ajánlás*** — *A jelzés feliratának magassága 4 méter legyen és a feliratok arányait a 3. Függelékben előírtak szerint alakítsák ki.*

5.2.16.9 ***Ajánlás*** — *A háttér szögletes legyen és minden irányba legalább 0.5 méterrel haladja meg a felirat méretét illetve ennek határait.*

5.2.17 Tájékoztató jelzés

Megjegyzés: A tájékoztató jelzésekre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv (Doc 9157) *4. részében található.*

Alkalmazás

5.2.17.1 Ahová általában tájékoztató táblát állítanának fel, azonban ez fizikai okok miatt nem lehetséges, a tájékoztató jelzést a burkolat felületére helyezzék el.

5.2.17.2 **Ajánlás** — *Ahol ez üzemeltetési szempontból szükséges, a tájékoztató táblát tájékoztató jelzéssel egészítsék ki.*

5.2.17.3 **Ajánlás** — *Az összetett gurulóút csatlakozás előtt és után helyezzenek el tájékoztató jelzést (irány/hely), amennyiben az üzemeltetési tapasztalatok azt mutatták, hogy egy kiegészítő gurulóútjelzés segítséget nyújthat a hajózószemélyzet számára a földi tájékozódáshoz.*

5.2.17.4 ***Ajánlás*** — *A nagy hosszúságú guruló utak mentén, azok burkolt felületén rendszeres távközökben helyezzenek el tájékoztató (hely) jelzést.*

Elhelyezés

5.2.17.5 ***Ajánlás*** — *A tájékoztató jelzés a gurulóút vagy a forgalmi előtér felületén - a szükséges helyen kereszt irányban - úgy helyezkedjen el, hogy azt a közeledő légijármű pilótakabinjából el lehessen olvasni.*

Jellemzők

5.2.17.6 A tájékoztató jelzés a következő formájú legyen:

a) ha helyjelző táblát helyettesít, vagy egészít ki, fekete háttéren sárga felirat; és

b) ha irány- vagy céljelző táblát helyettesít, vagy egészít ki, sárga háttéren fekete felirat.

5.2.17.7 Ha a jelzés és a burkolat felülete között nem megfelelő a kontraszt, a jelzést vonják körbe:

a) fekete kerettel, ha a felirat fekete; és

b) sárga kerettel, ha a felirat sárga.

5.2.17.8 ***Ajánlás*** — *A jelzés feliratának magassága 4 méter legyen és a feliratok a 3. Függelékben előírtak szerint készüljenek.*

5.3 Fények

5.3.1 Általános rész

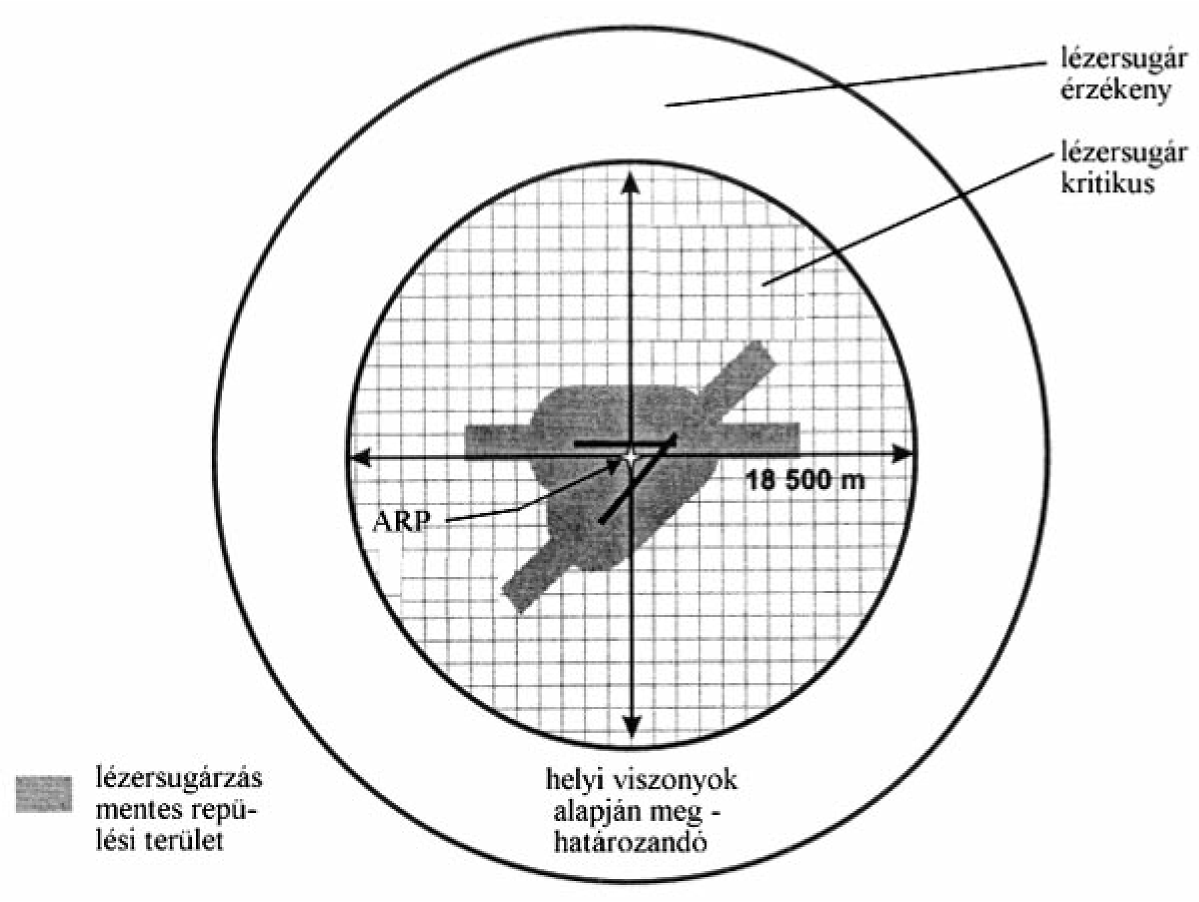
Fények, amelyek a légijármű biztonságára veszélyt jelentenek

5.3.1.1 A repülőtér körül, annak közelében levő nem légiforgalmi fényeket, amelyek veszélyeztethetik légijármű biztonságát, a veszély kiküszöbölése érdekében kapcsolják le, árnyékolják vagy más megfelelő módon alakítsák át.

Lézersugárzás, amely a légijármű biztonságára veszélyt jelent

5.3.1.2 ***Ajánlás*** — *A légijármű biztonságának a lézersugárzás veszélyes hatásai ellen történő védelme érdekében a repülőtér körül a következő védett területeket alakítsák ki:*

• *Lézersugárzás-mentes légtér (LFFZ)*
• *Lézersugárzás szempontjából kritikus légtér (LCFZ)*
• *Lézersugárzás szempontjából érzékeny légtér (LSFZ)*



5-10. ábra: Védett repülési területek

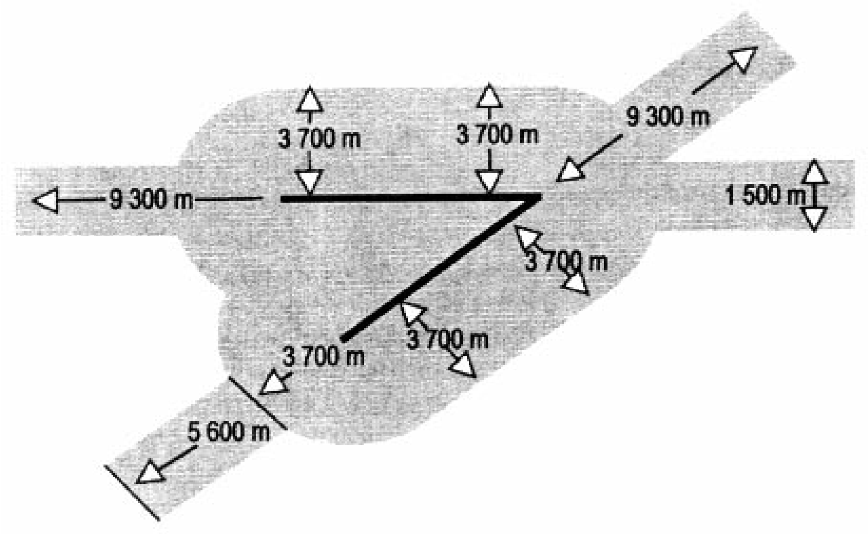
1. Megjegyzés: A lézer sugárzási szint és a repülési üzemet megfelelő módon védő távolságok meghatározásához felhasználhatják az 5-10, 5-11. valamint 5-12. ábrákat.

2. Megjegyzés: A három (LFFZ, LCFZ, LSFZ) védett repülési területen (légtérben) a lézer sugárzás alkalmazásának korlátozásai csak a látható lézer sugarakra korlátozódnak. Kivételt képeznek a hatóságok által a repülésbiztonság figyelembevételével, azzal összhangban üzemeltetett lézersugárzó berendezések. A repülés-végrehajtásra igénybe vett összes légtérben bármely, látható és láthatatlan lézer sugárzás összértéke a legnagyobb megengedett sugárterhelés (MPE) értéke vagy ennél alacsonyabb legyen. Kivételt képez az a sugárzás, amelyről értesítették az illetékes hatóságot és a sugárzásra ez engedélyt adott.

3. Megjegyzés: A védett repülési területeket a repülőtér közelében üzemelő lézer sugárzó berendezésektől származó kockázati tényezők csökkentése érdekében alakítsák ki.

4. Megjegyzés: A repülési üzemeltetést hátrányosan befolyásoló lézersugár kibocsátásra vonatkozó tájékoztatás a Lézersugár Kibocsátás és Repülésbiztonság Kézikönyv-*ben (Doc 9815) található.*

5. Megjegyzés: Lásd még a 11. Annex - Légiforgalmi Szolgálatok - 2. fejezetét1.



5-11. ábra: Több futópálya lézer sugárzásmentes légtere

Megjegyzés: A megadott méretek csak tájékoztatás céljára szolgálnak.

Fények, amelyek zavart okozhatnak

5.3.1.3 ***Ajánlás*** — *Azt a nem légiforgalmi földi fényt, amelynek fényereje, elrendezése vagy színe miatt megakadályozhatja, vagy megzavarhatja a légiforgalmi földi fények pontos megfigyelését és értelmezését, e lehetőség kiküszöbölése érdekében kapcsolják le, árnyékolják, vagy más megfelelő módon alakítsák át. Különös figyelmet fordítsanak az alábbiakban felsorolt helyeken, a megközelítési területeken belül elhelyezkedő, levegőből látható nem légiforgalmi földi fényeknek:*

a) műszeres futópályán — 4 kód-számmal;

a futópálya küszöb előtti és vége utáni területeken, amelyek a küszöbtől legalább 4500 méter távolságra és a meghosszabbított futópálya középvonal mindkét oldalától 750 méterre terjednek.

b) műszeres futópálya — 2 vagy 3 kód-számmal;

mint a fenti a) esetben, de a távolság legalább 3000 méter.

c) műszeres futópálya — 1 kód-számmal;
valamint nem-műszeres futópálya;

a megközelítési területen belül.

Légiforgalmi földi fények, amelyek a hajózásban zavart okozhatnak

Megjegyzés: A hajózható vizek közelében elhelyezett légiforgalmi földi fények esetében legyenek tekintettel arra, hogy a fények ne okozzanak zavart vagy félreértést a hajózásban.

Fény berendezések és tartó szerkezetek

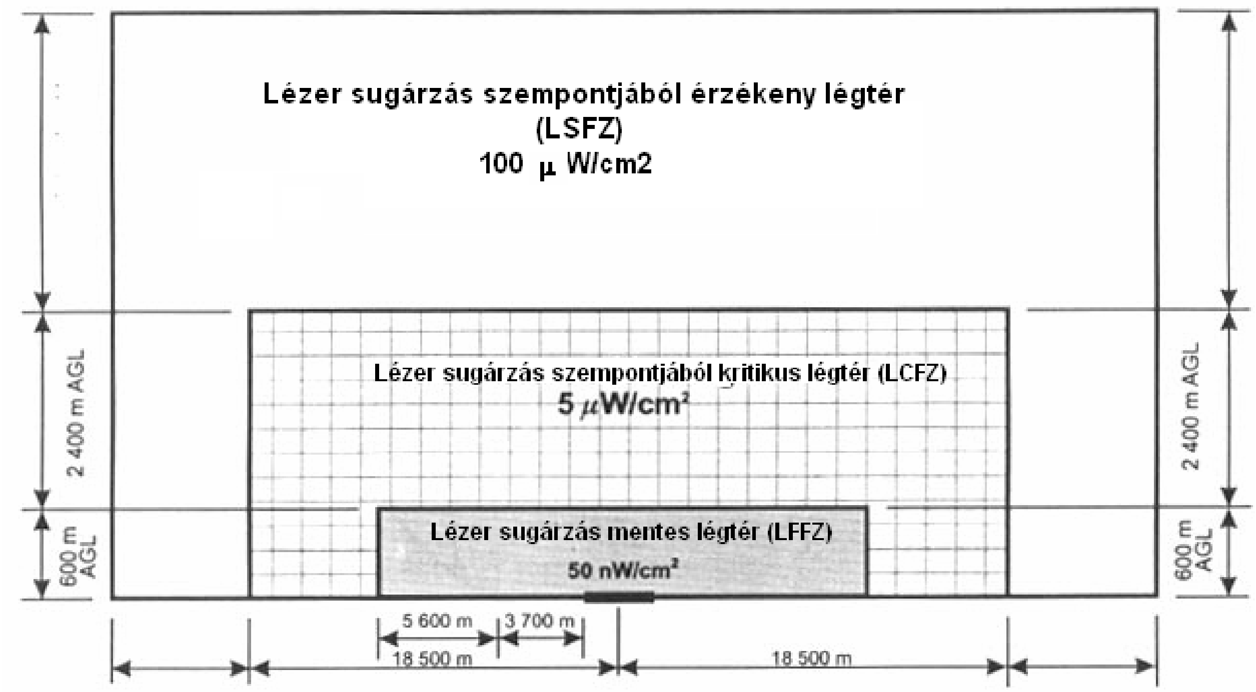
Megjegyzés: A berendezések és szerkezetek elhelyezésére és kialakítására az üzemi területeken a 9.9 pont, a fény berendezések és tartó szerkezetek letörhetőségével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 6. részében található.*

5.3.1.4 Az emelt szintű bevezető fények és tartó szerkezeteik letörhetők legyenek, kivéve a küszöbtől 300 méter távolságon túl levő bevezető fény rendszer elemeket, amelyek esetében:

a) ahol a tartószerkezet magassága több mint 12 méter, a letörhetőség követelménye csak a felső 12 méterre vonatkozik; és

b) ahol a tartószerkezetet nem letörhető tárgyak veszik körül, a szerkezetnek csak azon része legyen letörhető, amely a környező tárgyak közül kiemelkedik.

5.3.1.5 Az 5.3.1.4 alpont előírása nem teszi kötelezővé a meglevő létesítmények lecserélését 2005 január 1. előtt.



5-12. ábra: Védett repülési területek a látható lézer sugárzás megengedett legnagyobb sugárzási szintjével
Repülőtér vonatkozási pont (ARP)
A helyi repülőtéri repülési üzem alapján határozzák meg

5.3.1.6 Amennyiben egy bevezető fény berendezés, vagy tartószerkezet önmagában nem elég feltűnő, azt megfelelő jelzéssel kell ellátni.

Emelt szintű fények

5.3.1.7 Az emelt szintű futópálya, biztonsági megállási terület és gurulóút fények letörhetők legyenek. A fények elég alacsonyak legyenek ahhoz, hogy megfelelő biztonsági távolság maradjon fenn a légcsavarok, valamint a sugárhajtóműves légijárművek hajtómű gondolái és a fények között.

Talajszinten elhelyezett fények

5.3.1.8 A futópályák, biztonsági megállási területek, gurulóutak és forgalmi előterek burkolatában elhelyezett fény szerkezeteket úgy tervezzék meg és szereljék be, hogy azok a légijármű, vagy saját maguk sérülése nélkül ellenálljanak a légijármű súlyának, amikor az a fény szerkezeten átgurul.

5.3.1.9 ***Ajánlás** — A talajszintbe süllyesztett fény szerkezet által hővezetéssel, vagy kisugárzással létrehozott, a légijármű gumiabroncsát érő hőhatás ne haladja meg a 10 perces érintkezési időtartam alatt a 160°C értéket.*

Megjegyzés: A beépített fények hőmérsékletének mérésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Fény intenzitás és szabályzása

Megjegyzés: Szürkületben, vagy rossz látási körülmények között nappal a fények hatásosabbak lehetnek, mint a jelzések. Ahhoz, hogy a fények ilyen körülmények között, vagy éjszaka rossz látás esetében hatásosak legyenek, azoknak megfelelő intenzitással kell rendelkezniük. A megfelelő intenzitás biztosítása érdekében általában a fények irányítása szükséges. Ebben az esetben a fényív az üzemeltetési igényeknek megfelelően irányított és látható legyen. A futópálya fényrendszert teljes egészként kell értelmezni annak érdekében, hogy a relatív fényerő mindenütt azonos legyen. (Lásd az A. Melléklet 14. szakaszt és a Repülőtér Tervezési Kézikönyv *4. részét).*

5.3.1.10 A futópálya fényrendszer fényereje megfelelő legyen ahhoz a legrosszabb látástávolsághoz és környezeti fényviszonyokhoz, amelyek között a futópálya használatát tervezik, továbbá legyen összhangban a bevezető fényrendszer legközelebbi szakaszával, ha ilyen létesítettek.

Megjegyzés: Bár a bevezető fényrendszer fényeinek intenzitása nagyobb lehet, mint a futópálya fényeké, helyes gyakorlat az intenzitás hirtelen változtatásának elkerülése, mert ez azt a hamis benyomást keltheti a repülőgépvezetőben, hogy a látástávolság a bevezetés során változik.

5.3.1.11 Ahol nagyintenzitású fényrendszert létesítettek, azt megfelelő fényerő szabályzással kell ellátni, hogy a fényerőt mindig az uralkodó körülményeknek megfelelően lehessen állítani. Külön fényerő szabályzással, vagy más alkalmas módszerrel kell biztosítani, hogy a következő rendszerek — ha ezeket alkalmazzák — egymással összhangban működjenek:

• bevezető fényrendszer;

• futópálya szegélyfények;

• futópálya küszöb fények;

• futópálya záró (végbiztonsági) fények;

• futópálya középvonal fények;

• futópálya földetérési terület fények; és

• gurulóút középvonal fények.

5.3.1.12 A 2. Függelék A2-1. — A2-10. közötti ábrákon kijelölt fő fénysugarat meghatározó ellipszisen belül és ennek peremén a legnagyobb fényerő érték az előírások alapján mért legkisebb fényerő érték háromszorosánál ne legyen nagyobb. (Az előírásokat lásd 2. Függelék A2.1 — A2.11 ábrák megjegyzései illetve 2. Megjegyzés).

5.3.1.13 A 2. Függelék A2-12. — A2-20. közötti ábrákon kijelölt fő fénysugarat meghatározó ellipszisen belül és ennek peremén a legnagyobb fényerő érték az előírások alapján mért legkisebb fényerő érték háromszorosánál ne legyen nagyobb. (Az előírásokat lásd 2. Függelék A2.12 — A2.21 ábrák megjegyzései illetve 2. Megjegyzés).

5.3.2 Vészvilágítás

Alkalmazás

5.3.2.1 ***Ajánlás*** — *A futópálya fényekkel ellátott repülőtéren, ahol tartalék áramforrás rendszer nem áll rendelkezésre, legalább az elsődleges futópályához biztosítsanak egyszerűen felszerelhető megfelelő vészvilágítás fényeket, amelyeket az általános fény rendszer meghibásodása esetén felhasználhatnak.*

Megjegyzés: A vészvilágítás hasznos lehet az akadályok megjelölésére, vagy a gurulóutak és forgalmi előterek kijelölésénél is.

Elhelyezés

5.3.2.2 ***Ajánlás*** — *Ha a futópályán vészvilágítás fényeket szerelnek fel, azok elrendezése legalább a nem-műszeres futópályára vonatkozó elrendezési előírásoknak megfelelő legyen.*

Jellemzők

5.3.2.3 ***Ajánlás*** — *A vészvilágítás fényeinek színe feleljen meg a futópálya fényekre vonatkozó szín előírásoknak kivéve, ha a küszöbre és a futópálya végére vonatkozó szín előírás gyakorlati szempontból nem megvalósítható, mert ebben az esetben az összes fény változtatható intenzitású fehér, vagy ehhez leginkább hasonló színű legyen.*

5.3.3 Légiforgalmi fényjeladók

Alkalmazás

5.3.3.1 Ahol ez gyakorlati szempontból szükséges, minden éjszaka használni kívánt repülőtéren biztosítani kell repülőtéri helyjeladó, vagy azonosító fényt.

5.3.3.2 Az üzemeltetési előírásokat és követelményeket a repülőteret igénybe vevő légi forgalom, a repülőtéri létesítmények és azok helyzete a környezetben valamint a repülőtéren levő egyéb látás utáni és nem látásos segédeszközök alapján kell meghatározni.

Repülőtéri helyjeladó

5.3.3.3 Repülőtéri helyjeladó fényt kell biztosítani az éjszaka is használni kívánt repülőtéren, ha az alábbi feltételek közül egy, vagy több fennáll:

a) a légijárművek elsősorban látás utáni navigációval közlekednek;

b) gyakori a csökkent látástávolság kialakulása; vagy

c) a repülőtér azonosítása a környező fények, vagy terep miatt nehézségekbe ütközik.

Elhelyezés

5.3.3.4 A repülőtéri helyjeladó fényt a repülőtéren, vagy annak közelében viszonylag sötét, alacsony háttér-világítású területen kell el helyezni.

5.3.3.5 ***Ajánlás*** — *A repülőtéri helyjeladó fény elhelyezkedése olyan legyen, hogy a fényt más tárgyak a lényeges irányokba ne takarják és a kibocsátott fény a leszálláshoz történő megközelítést végző repülőgépvezetőt ne vakítsa.*

Jellemzők

5.3.3.6 A repülőtéri helyjeladó fény egyenlő időközökben változó fehér-színes, vagy csak fehér felvillanásokat bocsájtson ki. A felvillanások sűrűsége percenként 20 — 30 között legyen. Ahol színes felvillanásokat használnak, azok színe a szárazföldi repülőtér esetében zöld, a vízi repülőtér esetében pedig sárga legyen. A kombinált, szárazföldi és vízi repülőtér esetében azt a színt válasszák, amely az elsődleges fontosságú repülőtéri egységet jelzi.

5.3.3.7 A fényjeladó fénye vízszintesen minden szögben látható kell, hogy legyen. A függőleges fény elosztás 1°-os emelkedő szinttől kezdődően az illetékes hatóság által megállapított legmagasabb szintig terjedjen, amelyen a helyjeladó tájékoztatásra kívánják használni. A felvillanások tényleges fényereje ne legyen kevesebb mint 2000 cd gyertyafényerő érték.

Megjegyzés: Azokon a területeken, amelyeken a magas környező háttérvilágítás szint elkerülhetetlen, szükséges lehet a tényleges felvillanások fényerejének legfeljebb tízszeres növelése.

Azonosító jeladó

Alkalmazás

5.3.3.8 Az éjszaka használni kívánt és a levegőből más módszerrel könnyen nem azonosítható repülőtéren azonosító jeladó fényt kell biztosítani.

Elhelyezés

5.3.3.9 Az azonosító jeladó fényt a repülőtéren, vagy annak közelében viszonylag sötét, alacsony háttér-világítású területen kell elhelyezni.

5.3.3.10 ***Ajánlás** — Az azonosító jeladó fény elhelyezkedése olyan legyen, hogy a fényt más tárgyak a lényeges irányokba ne takarják és a kibocsátott fény a leszálláshoz történő megközelítést végző repülőgépvezetőt ne vakítsa.*

Jellemzők

5.3.3.11 Az azonosító jeladó a szárazföldi repülőtéren vízszintesen minden szögben látható kell, hogy legyen. A függőleges fény elosztás 1°-os emelkedő szinttől kezdődően az illetékes hatóság által megállapított legmagasabb szintig terjedjen, amelyen a helyjeladó tájékoztatásra kívánják használni. A felvillanások tényleges fényereje 2000 cd gyertyafényerő értéknél kevesebb ne legyen.

Megjegyzés: Azokon a területeken, amelyeken a magas környező háttérvilágítás szint elkerülhetetlen, szükséges lehet a tényleges felvillanások fényerejének legfeljebb tízszeres növelése.

5.3.3.12 Az azonosító jeladó fény a szárazföldi repülőtéren zöld színű, a vízi repülőtéren sárga színű felvillanásokat bocsájtson ki.

5.3.3.13 Az azonosító jelek a nemzetközi Morze ABC szerint továbbított jelek legyenek.

5.3.3.14 ***Ajánlás** — A jeladás sebessége percenként hat — nyolc szó legyen, amely az egyes felvillanások / Morse jelek 0.15 — 0.2 mp-es időtartamának felel meg.*

5.3.4 Bevezető fényrendszer

Megjegyzés: Az a cél, hogy az 5.3.4.21, 5.3.4.39, 5.3.9.10, 5.3.10.10, 5.3.10.11, 5.3.11.5, 5.3.12.8, 5.3.13.6 és 5.3.16.8 pontok előírásainak nem megfelelő, jelenleg meglevő fényrendszereket 2005. január 1. előtt lecseréljék.

Alkalmazás

5.3.4.1 *Alkalmazás*

A.— Nem-műszeres futópálya

***Ajánlás** — Ahol ez fizikailag megvalósítható, a 3 vagy 4 kód-számú, éjszaka is üzemeltetni kívánt nem-műszeres futópályát lássák el az 5.3.4.2 — 5.3.4.9 pontokban meghatározott egyszerű bevezető fényrendszerrel kivéve, ha azt csak jó időjárási körülmények között használják és más látás utáni segédeszközök megfelelő irányvezetést biztosítanak.*

Megjegyzés: Az egyszerű bevezető fényrendszer nappal is biztosíthat irányvezetést a látás utáni megközelítéshez.

B.— Nem-precíziós megközelítésű futópálya

Ahol ez fizikailag megvalósítható, az éjszaka is üzemeltetni kívánt nem-precíziós megközelítésű futópályát el kell látni az 5.3.4.2 — 5.3.4.9 pontokban meghatározott egyszerű bevezető fényrendszerrel kivéve, ha azt csak jó időjárási körülmények között használják és más látás utáni segédeszközök megfelelő irányvezetést biztosítanak.

Megjegyzés: Javasoljuk, hogy fontolják meg az I. kategóriás precíziós bevezető fényrendszer telepítésének, vagy a futópálya bevezető (befutó) fények kialakításának lehetőségét.

C.— I. kategóriás precíziós megközelítésű futópálya

Ahol ez fizikailag megvalósítható, az I. kategóriás precíziós megközelítésű futópályát el kell látni az 5.3.4.10 — 5.3.4.21 pontokban meghatározott I. kategóriás precíziós bevezető fényrendszerrel.

D. — II. és III. kategóriás precíziós megközelítésű futópálya

A II. vagy III. kategóriás precíziós megközelítésű futópályát el kell látni az 5.3.4.22 — 5.3.4.39 pontokban meghatározott II. és III. kategóriás precíziós bevezető fényrendszerrel.

Egyszerű bevezető fényrendszer

Elhelyezés

5.3.4.2 Az egyszerű bevezető fényrendszer a futópálya meghosszabbított középvonalában elhelyezett fénysorból áll, amely ahol lehetséges a küszöbtől legalább, nem kevesebb, mint 420 méter távolságig tart és amelyet a küszöbtől 300 méteres távolságban 18, vagy 30 méter széles keresztfénysor egészít ki.

5.3.4.3 A keresztfénysort alkotó fények a lehetőségek szerint egyenes vonalban, a középvonal fényekre szimmetrikusan és megfelelő szögben legyenek elhelyezve. A középvonal fényekkel egyenlően kettéválasztott keresztfénysor fényeit egymástól olyan távolságra helyezzék el, hogy azok vonalként látszódjanak. Kivételt képez a 30 méter széles keresztfénysor, ahol a középvonal fény mindkét oldalán bizonyos térköz alakítható ki. Ennek legkisebb mértékét a helyi előírások alapján határozzák meg, azonban a térköz 6 méternél nagyobb ne legyen.

1. Megjegyzés: A keresztfénysor fények közötti távolság a gyakorlatban általában 1 és 4 méter között van. A középvonal fény mindkét oldalán kialakított térköz fokozza az irányvezetés hatásosságát abban az esetben, amikor a megközelítés során az oldalirányú eltérés nagyobb mértékű, továbbá megkönnyíti a tűzoltó és mentő gépjárművek mozgását.

2. Megjegyzés: A telepítési határértékek az A. Melléklet 11. szakaszban találhatók.

5.3.4.4 A középvonal fénysort alkotó fények közötti távolság 60 méter legyen, kivéve, ha az irányvezetés javítása szükséges, mert ebben az esetben 30 méteres távolság is alkalmazható. A fénysor legutolsó tagja a telepítéshez kiválasztott hosszirányú távolságtól függően 60, vagy 30 méterre legyen a futópálya küszöbtől.

5.3.4.5 ***Ajánlás** — Amennyiben fizikailag nem lehetséges, hogy a középvonal fénysor a küszöbtől 420 méter távolságig tartson, annak hossza a keresztfénysorral együtt 300 méter legyen. Ha ez sem lehetséges, alakítsák ki a lehető leghosszabb középvonal fénysort és ebben az esetben minden egyes fény-egység egy legalább 3 méter hosszú rövid keresztfénysor legyen. Amennyiben a bevezető fényrendszer a küszöbtől 300 méter távolságban keresztfénysorral van ellátva, a küszöb előtt 150 méterrel egy másik keresztfénysort is elhelyezhetnek.*

5.3.4.6 A rendszer lehetőség szerint a futópálya küszöbön áthaladó vízszintes síkban helyezkedjen el feltéve, hogy:

a) a rendszer középvonalától számított 60 méter távolságon belül az ILS iránysáv, vagy MLS oldalszög antenna kivételével más tárgy nem nyúlik túl a bevezető fények síkján; és

b) a bevezető keresztfénysor középső részén belül levő, vagy a középvonalat alkotó rövid keresztfénysor fényei (nem ezek szélei) kivételével más fény a megközelítést végző légijárműből nem látható.

A fények síkján túlnyúló bármely ILS iránysáv, vagy MLS oldalszög antenna akadálynak tekintendő, kialakítása, jelölése és világítása ennek megfelelő kell, hogy legyen.

Jellemzők

5.3.4.7 Az egyszerű bevezető fényrendszer fényei állandó rögzített fények legyenek, színük biztosítsa az egyéb légiforgalmi földi és ha vannak, más külső fényektől történő egyértelmű megkülönböztethetőséget.
Minden egyes középvonal fény:

a) egy darab fényforrásból; vagy

b) egy legalább 3 méter hosszúságú rövid keresztfénysorból álljon.

1. Megjegyzés: Amennyiben a b) alpontban ismertetett rövid keresztfénysorban fénypontok helyezkednek el, a közöttük levő 1.5 méter távolság kielégítőnek bizonyult.

2. Megjegyzés: Ha az egyszerű bevezető fényrendszert a későbbiek során várhatóan precíziós bevezető fényrendszerré alakítják át, tanácsos lehet a 4 méter hosszúságú rövid keresztfénysor alkalmazása.

3. Megjegyzés: Ahol az egyszerű bevezető fényrendszer azonosítása éjszaka a környező fények miatt nehézségekbe ütközik, a rendszer külső részén elhelyezett villanófények megoldhatják a problémát.

5.3.4.8 ***Ajánlás** —Ahol a bevezető fényrendszert nem-műszeres futópályához telepítették, az alapfalon és a* *végső egyenesen levő légijármű repülőgép-vezetője számára szükséges fények bármely oldalszögből láthatók legyenek. A fények fényereje a telepített rendszer környezete fényeinek, valamint minden időjárási körülménynek megfelelő legyen.*

5.3.4.9 ***Ajánlás*** *— Ahol a bevezető fényrendszert nem-precíziós futópályához telepítették, a végső egyenesen levő légijármű repülőgépvezetője számára a nem látás utáni segédeszközökkel meghatározott iránysávtól történő nem túlságosan nagy mértékű eltérés mellett a fények bármely oldalszögből láthatók legyenek. A fényeket úgy tervezzék meg, hogy azok a rendszer környezetében levő fények figyelembevételével nappal és éjszaka, a legrosszabb látási körülmények és fényviszonyok között is biztosítsanak irányvezetést egészen azon állapotig, amíg a rendszert használhatónak tervezik.*

I. kategóriás precíziós bevezető fényrendszer

Elhelyezés

5.3.4.10 Az I. kategóriás precíziós bevezető fényrendszer a futópálya meghosszabbított középvonalában elhelyezett fénysorból áll, amely ahol lehetséges a futópálya küszöbtől 900 méter távolságig tart és amelyet a küszöbtől 300 méteres távolságban 30 méter széles bevezető keresztfénysor egészít ki.

Megjegyzés: A 900 méternél rövidebb bevezető fényrendszer létesítése a futópálya üzemeltetési korlátozását eredményezheti, amely az A. Melléklet 11. szakaszában kerül ismertetésre.

5.3.4.11 A keresztfénysort alkotó fények a lehetőségek szerint egyenes vonalban, a középvonal fényekre szimmetrikusan és megfelelő szögben legyenek elhelyezve. A középvonal fényekkel egyenlően kettéválasztott keresztfénysor fényeit egymástól olyan távolságra helyezzék el, hogy azok vonalként látszódjanak, kivéve, hogy a középvonal fény mindkét oldalán bizonyos térköz alakítható ki. Ennek mértékét minimálisan a helyi előírások alapján határozzák meg, azonban 6 méternél nagyobb ne legyen.

1. Megjegyzés: A keresztfénysor fények közötti távolság a gyakorlatban általában 1 és 4 méter között van. A középvonal fény mindkét oldalán kialakított térköz fokozza az irányvezetés hatásosságát, amikor a megközelítés során az oldalirányú eltérés nagyobb mértékű, továbbá megkönnyíti a tűzoltó és mentő gépjárművek mozgását.

2. Megjegyzés: A telepítési határtértékek az A. Melléklet 11. szakaszában találhatók.

5.3.4.12 A középvonal fénysort alkotó fények közötti távolság 30 méter legyen és a fények legutolsó tagja a futópálya küszöbtől 30 méter távolságra helyezkedjen el.

5.3.4.13 A rendszer lehetőség szerint a futópálya küszöbön áthaladó vízszintes síkban helyezkedjen el feltéve, hogy:

a) a rendszer középvonalától számított 60 méter távolságon belül az ILS iránysáv, vagy MLS oldalszög antenna kivételével más tárgy nem nyúlik túl a bevezető fények síkján; és

b) a bevezető keresztfénysor középső részén belül levő, vagy a középvonalat alkotó rövid keresztfénysor fényei (nem ezek szélei) kivételével más fény a megközelítést végző légijárműből nem látható.

A fények síkján túlnyúló bármely ILS iránysáv, vagy MLS oldalszög antenna akadálynak tekintendő, kialakítása, jelölése és világítása ennek megfelelő legyen.

Jellemzők

5.3.4.14 Az I. kategóriás precíziós bevezető fényrendszer középvonal és bevezető keresztfénysor fényei változtatható intenzitású, fehér színű, állandó rögzített fények legyenek. Minden egyes középvonal fényegység:

a) a távolság tájékoztatás biztosítása érdekében a középvonal legbelső 300 méterén egy darab, középső 300 méterén kettő darab és külső 300 méterén három darab fényforrásból; vagy

b) egy rövid keresztfénysorból álljon.

5.3.4.15 Ahol a bevezető fények állandó működési szintjét a 10.4.10 pont megelőző karbantartási célkitűzése alapján igazolni lehet, minden egyes középvonal fényegység:

a) egy darab fényforrásból; vagy

b) egy darab rövid keresztfénysorból állhat.

5.3.4.16 A rövid keresztfénysor legalább 4 méter hosszúságú legyen. Ahol a rövid keresztfénysorban fénypontok helyezkednek el, a fényeket egyenlően, egymástól nem több mint 1.5 méter távolságra helyezzék el.

5.3.4.17 ***Ajánlás*** *— Ha a középvonal fénysor az 5.3.4.14 b) vagy 5.3.4.15 b) alpontban ismertetett rövid keresztfénysorokból áll, minden egyes rövid keresztfénysort nagy intenzitású villanófénnyel egészítsenek ki kivéve, ha a rendszer jellemzőinek és az időjárási körülmények természetének figyelembevételével azt szükségtelennek ítélik.*

5.3.4.18 Az 5.3.4.17 pontban ismertetett minden egyes nagy intenzitású villanófény másodpercenként kettő villanással, a legkülső fénytől a futópálya küszöb felé a legbelső fényig befelé futva villanjon. Az elektromos áramkört úgy tervezzék meg, hogy ezeket a fényeket a bevezető fényrendszer más fényeitől függetlenül lehessen üzemeltetni.

5.3.4.19 Ha a középvonal fénysor az 5.3.4.14 a) vagy 5.3.4.15 a) alpontokban ismertetett fényekből áll, a futópálya küszöbtől 300 méter távolságra elhelyezett bevezető keresztfénysor mellett 150, 450, 600 és 750 méter távolságokra is telepítsenek ilyen keresztfénysorokat. Minden egyes keresztfénysort alkotó fény a lehetőségek szerint egyenes vonalban, a középvonal fényekre szimmetrikusan és megfelelő szögben legyen elhelyezve. A középvonal fényekkel egyenlően kettéválasztott keresztfénysor fényeit egymástól olyan távolságra helyezzék el, hogy azok vonalként látszódjanak kivéve, hogy a középvonal fény mindkét oldalán bizonyos térköz alakítható ki. Ennek mértéke a helyi előírások alapján meghatározott minimum, azonban ez 6 méternél több ne legyen.

Megjegyzés: A telepítés részletes ismertetése az A. Melléklet 11. szakaszában található.

5.3.4.20 Ahol a rendszerben elhelyezték az 5.3.4.19 pontban ismertetett további bevezető keresztfénysorokat, azok külső széle két egyenes vonalat alkosson, amely vagy párhuzamos a futópálya középvonalával, vagy pedig összetartó és azt a küszöbtől 300 méter távolságban metszi.

5.3.4.21 A fények feleljenek meg a 2. Függelék A2-1 ábrájában található követelményeknek.

Megjegyzés: A fények tervezéséhez felhasznált repülési pálya jellemzők az A. Melléklet A-4. ábráján láthatók.

II. és III. kategóriás precíziós bevezető fényrendszer

Elhelyezés

5.3.4.22 Az I. kategóriás precíziós bevezető fényrendszer a futópálya meghosszabbított középvonalában elhelyezett fénysorból áll amely, ahol lehetséges a küszöbtől 900 méter távolságig tart. Ezen kívül az 5-13. ábrán látható rendszer rendelkezik a küszöbtől 270 méter távolságig tartó további két oldal fénysorral, valamint a küszöbtől 150 és 300 méter távolságra levő két keresztfénysorral is. Ahol a bevezető fények állandó működési szintjét a 10.4.7 pont megelőző karbantartási célkitűzése alapján bizonyítani lehet, a rendszer a küszöbtől 240 méter távolságig tartó további két oldal fénysorral, valamint a küszöbtől 150 és 300 méter távolságra levő két keresztfénysorral is rendelkezhet (lásd 5-14. ábra).

Megjegyzés: A 900 méter hosszúság az I. II. és II. kategóriás üzemeltetés irányvezetési követelményei alapján került meghatározásra. A rövidebb bevezető fényrendszer létesítése megfelelhet a II. és III. kategóriás üzemeltetésnek, azonban az I. kategóriás üzemeltetés korlátozásával járhat, amely az A. Melléklet 11. szakaszában kerül ismertetésre.

5.3.4.23 A középvonal fénysort alkotó fények közötti távolság 30 méter legyen és a fények legutolsó tagja a futópálya küszöbtől 30 méter távolságra helyezkedjen el.

5.3.4.24 Az oldal fénysort alkotó fényeket a középvonal két oldalán, hosszirányban egymástól a középvonal fényeknek megfelelő távolságra úgy helyezzék el, hogy az első fény a küszöbtől 30 méterre legyen. Ahol a bevezető fények állandó működési szintjét a 10.4.7 pont megelőző karbantartási célkitűzése alapján igazolni lehet, az oldal fénysort alkotó fényeket a középvonal jobb és bal oldalán egymástól 60 méter távolságban helyezhetik el úgy, hogy az első fény a küszöbtől 60 méterre legyen. A fénysor oldaltávolsága, azaz a legbelső fények közötti távolság lehetőleg 18 méter, azonban 18 méternél kevesebb és 22.5 méternél több ne legyen. Az elrendezés (távolság) minden esetben azonos legyen a földetérési terület fényeinek elhelyezésével.

5.3.4.25 A futópálya küszöbtől 150 méter távolságra elhelyezett keresztfénysor töltse ki a középvonal és az oldal fénysorok közötti térközt.

5.3.4.26 A futópálya küszöbtől 300 méter távolságra elhelyezett keresztfénysor a középvonal fénysor mindkét oldalán 15 méter távolságra nyúljon.

5.3.4.27 Ha a futópálya küszöbtől 300 méter távolságon túl a középvonal fénysor az 5.3.4.31 b) vagy 5.3.4.32 b) alpontokban ismertetett fényekből áll, a küszöbtől 450, 600 és 750 méter távolságokra telepítsenek további keresztfénysorokat.

5.3.4.28 Ahol a rendszerben elhelyezték a fenti 5.3.4.27 pontban ismertetett további keresztfénysorokat, azok külső széle két egyenes vonalat alkosson, amely vagy párhuzamos a futópálya középvonalával, vagy pedig összetartó és azt a küszöbtől 300 méter távolságban metszi.

5.3.4.29 A rendszer lehetőség szerint a futópálya küszöbön áthaladó vízszintes síkban helyezkedjen el feltéve, hogy:

a) a rendszer középvonalától számított 60 méter távolságon belül az ILS iránysáv, vagy MLS oldalszög antenna kivételével más tárgy nem nyúlik túl a bevezető fények síkján; és

b) a keresztfénysor középső részén belül levő, vagy a középvonalat alkotó rövid keresztfénysor fényei (nem ezek szélei) kivételével más fény a megközelítést végző légijárműből nem látható.

A fények síkján túlnyúló bármely ILS iránysáv, vagy MLS oldalszög antenna akadálynak tekintendő, kialakítása, jelölése és világítása ennek megfelelő legyen.

Jellemzők

5.3.4.30 A II. és III. kategóriás precíziós bevezető fényrendszer középvonala a futópálya küszöbtől mért első 300 méter távolságig változtatható intenzitású fehér színű rövid keresztfénysorokból álljon. Kivételt képez a 300 méter, vagy nagyobb távolságra áthelyezett küszöb, mert ebben az esetben a középvonal egy változtatható intenzitású fehér színű fénysorból állhat. Ahol a bevezető fények állandó működési szintjét a 10.4.7 pont megelőző karbantartási célkitűzése alapján igazolni lehet, a II. és III. kategóriás fényrendszer a küszöbtől 300 méter távolságig tartó első része:

a) rövid keresztfénysorokból állhat, ha a küszöbtől 300 méter távolságig tartó rész az 5.3.4.32 a) alpontban ismertetett rövid keresztfénysorokból készült;

b) váltakozva egyedi fényforrásokból és rövid keresztfénysorokból állhat ha a küszöbtől 300 méter távolságig tartó rész az 5.3.4.32 b) alpontban ismertetett egyedi fényforrásokból készült, ahol a legközelebbi fényforrás egység 30 méterre és a legközelebbi rövid keresztfénysor 60 méterre van a küszöbtől; vagy

c) egyedi fényforrásokból állhat, ha a küszöböt 300 méterrel, vagy többel áthelyezték.

A fények változtatható intenzitású, fehér színű fények legyenek.

5.3.4.31 A futópálya küszöbtől mért 300 méter távolságon túl minden egyes középvonal fény:

a) a belső 300 méteren használt rövid keresztfénysorból; vagy

b) a középvonal középső 300 méterén kettő darab, külső 300 méterén pedig három darab fényforrásból álljon,

A fények változtatható intenzitású, fehér színű fények legyenek.

5.3.4.32 Ahol a bevezető fények állandó működési szintjét a 10.4.7 pont megelőző karbantartási célkitűzése alapján igazolni lehet, a küszöbtől 300 méter távolságon túl levő minden egyes fényegység:

a) egy rövid keresztfénysorból; vagy

b) egyedi fényforrásból állhat.

A fények változtatható intenzitású, fehér színű fények legyenek.

5.3.4.33 A rövid keresztfénysorok legalább 4 méter hosszúságúak legyenek. Ahol a rövid keresztfénysorok egyedi fényforrásokból állnak, a fényeket egységes térközökben, egymástól nem több, mint 1.5 méter távolságra helyezzék el.

5.3.4.34 ***Ajánlás** — Ha a középvonal fénysor az 5.3.4.31 a), vagy 5.3.4.32 a) alpontokban ismertetett rövid keresztfénysorokból áll, 300 méteres távolságon túl minden egyes rövid keresztfénysort nagy intenzitású villanófénnyel egészítsenek ki, kivéve, ha a rendszer jellemzőinek és az időjárási körülmények természetének figyelembevételével azt szükségtelennek ítélik.*

5.3.4.35 Minden egyes nagy intenzitású villanófény másodpercenként kettő villanással, a legkülső fénytől a futópálya küszöb felé a legbelső fényig befelé futva villanjon. Az elektromos áramkört úgy tervezzék meg, hogy ezeket a fényeket a bevezető fényrendszer más fényeitől függetlenül lehessen üzemeltetni.

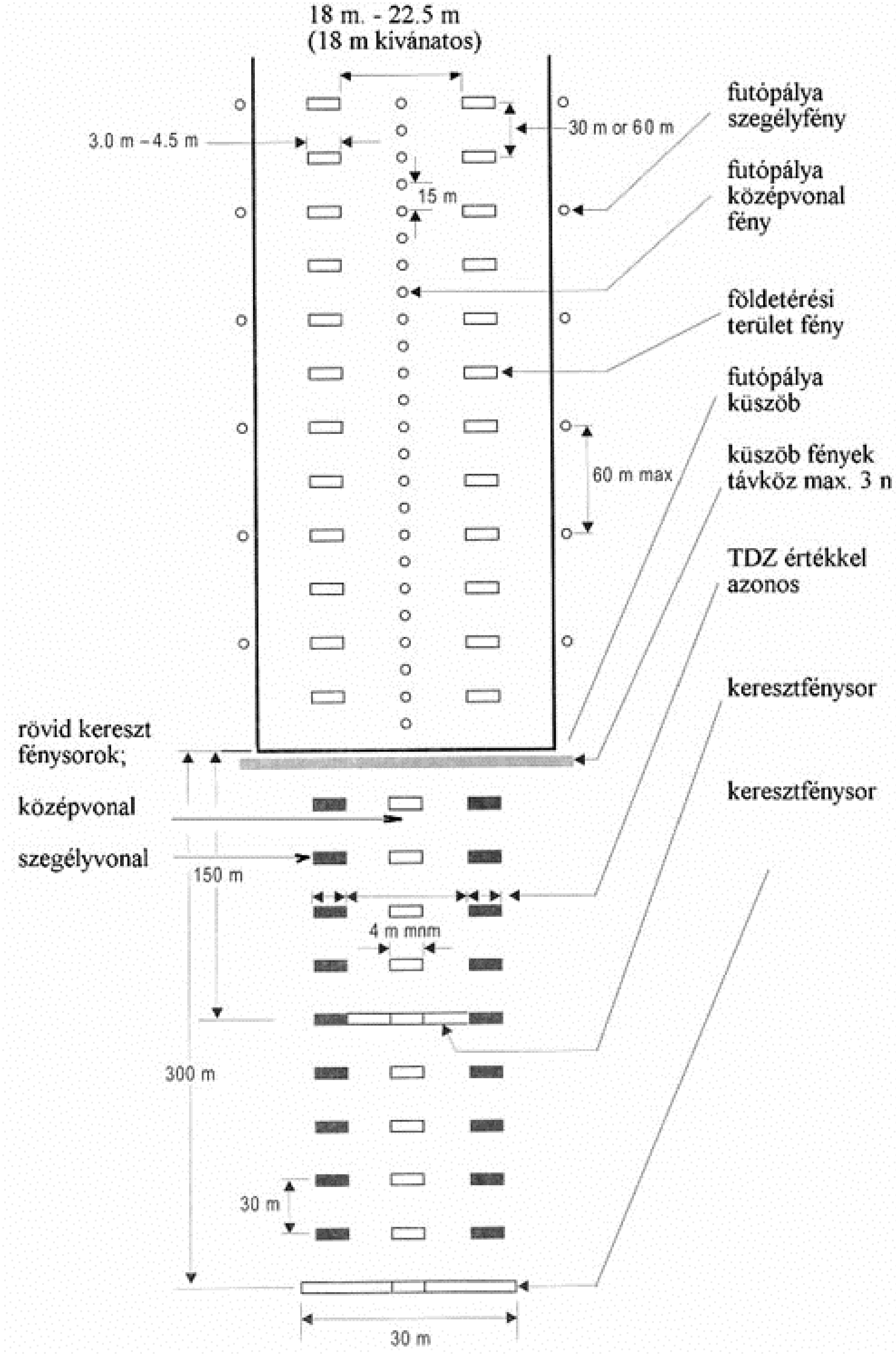
5.3.4.36 Az oldal fénysort alkotó rövid keresztfénysorok színe vörös legyen. Hosszuk valamint a közöttük levő távolság azonos legyen a földetérési terület rövid keresztfénysorainak vonatkozó értékeivel.

5.3.4.37 A keresztfénysort alkotó fények rögzített, változtatható intenzitású, fehér fények legyenek. A fényeket egységes térközökben, egymástól nem több, mint 2.7 méter távolságra helyezzék el.

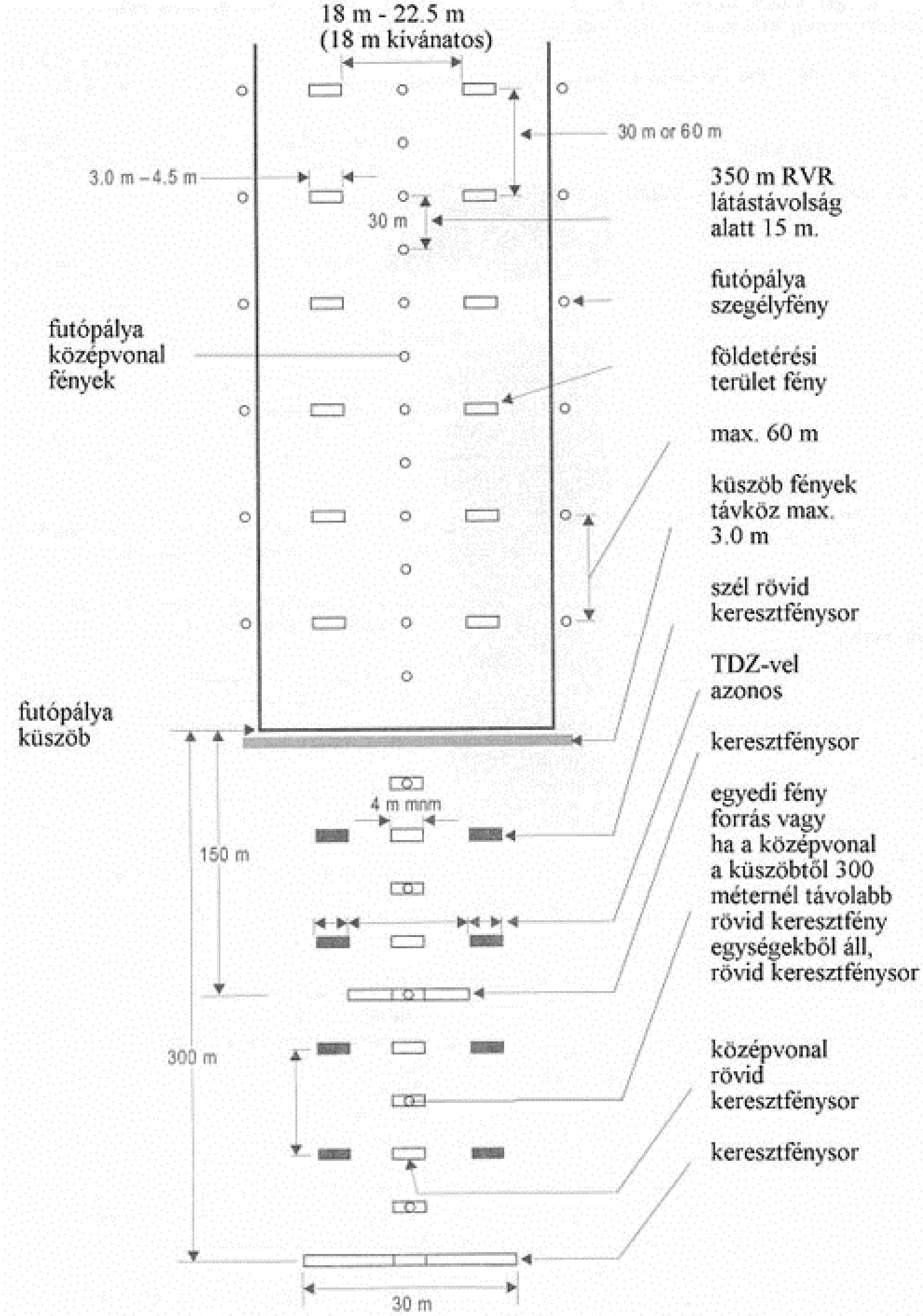
5.3.4.38 A változtatható intenzitású vörös színű fények fényereje a fehér színűeknek megfelelő legyen.

5.3.4.39 A fények feleljenek meg a 2. Függelék A2-1, vagy A2-2 ábráján ismertetett követelményeknek.

Megjegyzés: A fények tervezéséhez felhasznált repülési útvonal jellemzők az A. Melléklet A-4. ábráján láthatók.



5-13. ábra: II. és III. kategóriás precíziós megközelítésű futópálya bevezető fényrendszer legbelső 300 métere, valamint a futópálya földetérési területe



5-14. ábra: II. és III. kategóriás precíziós megközelítésű futópálya bevezető fényrendszer legbelső 300 métere, valamint a futópálya földetérési területe

megjegyzés: Ahol a bevezető fények állandó működési szintjét a 10. fejezet megelőző karbantartási célkitűzése alapján igazolni lehet.

5.3.5 Optikai megközelítési siklópálya jelző rendszer

Alkalmazás

5.3.5.1 Azon futópálya megközelítésének elősegítése érdekében, amelynél a következő feltételek közül egy, vagy több fennáll, optikai megközelítési siklópálya jelző rendszert kell biztosítani függetlenül attól, hogy a futópályát más látás utáni megközelítési, vagy egyéb nem látásos segédeszközök kiszolgálják:

a) a futópályát hasonló megközelítési irányvezetési rendszer igényekkel rendelkező gázsugár hajtóműves, vagy egyéb repülőgépek használják;

b) bármely típusú légijármű repülőgépvezetője számára nehézséget okozhat a megközelítés végrehajtása, mert:

1) a tapasztalatok szerint nappal víz, vagy jellegtelen talaj felszín miatt a megközelítés végrehajtásához nincs elegendő látás utáni irányvezetés, illetve tájékozódási lehetőség, vagy éjszaka a megközelítési területen nincs elegendő tájékoztató fény; vagy

2) a környező talajfelszín, vagy futópálya lejtviszonyok miatt félrevezető tájékoztatások lehetségesek;

c) a megközelítési területen levő tárgyak komoly veszélyt jelenthetnek a repülőgép számára, ha az a megközelítési siklópálya alá süllyed, különösen abban az esetben, ha az ilyen tárgyakra látjelek, vagy egyéb jelzések nem figyelmeztetnek;

d) a futópálya bármely végének fizikai állapota komoly veszélyt jelent a repülőgép számára, ha az a futópálya előtt ér földet, vagy túlfut azon; és

e) olyan földfelszín, vagy uralkodó időjárási körülmények lehetségesek, hogy a repülőgép a megközelítés végrehajtása alatt szokatlan turbulenciába kerülhet.

Megjegyzés: Az optikai megközelítési siklópálya jelző rendszer telepítésével kapcsolatos útmutató az A. Melléklet 12. szakaszában található.

5.3.5.2 A szabványos optikai megközelítési siklópálya jelző rendszer a következő részekből áll:

a) T-VASIS és AT-VASIS, amely megfelel az 5.3.5.6 - 5.3.5.22; és

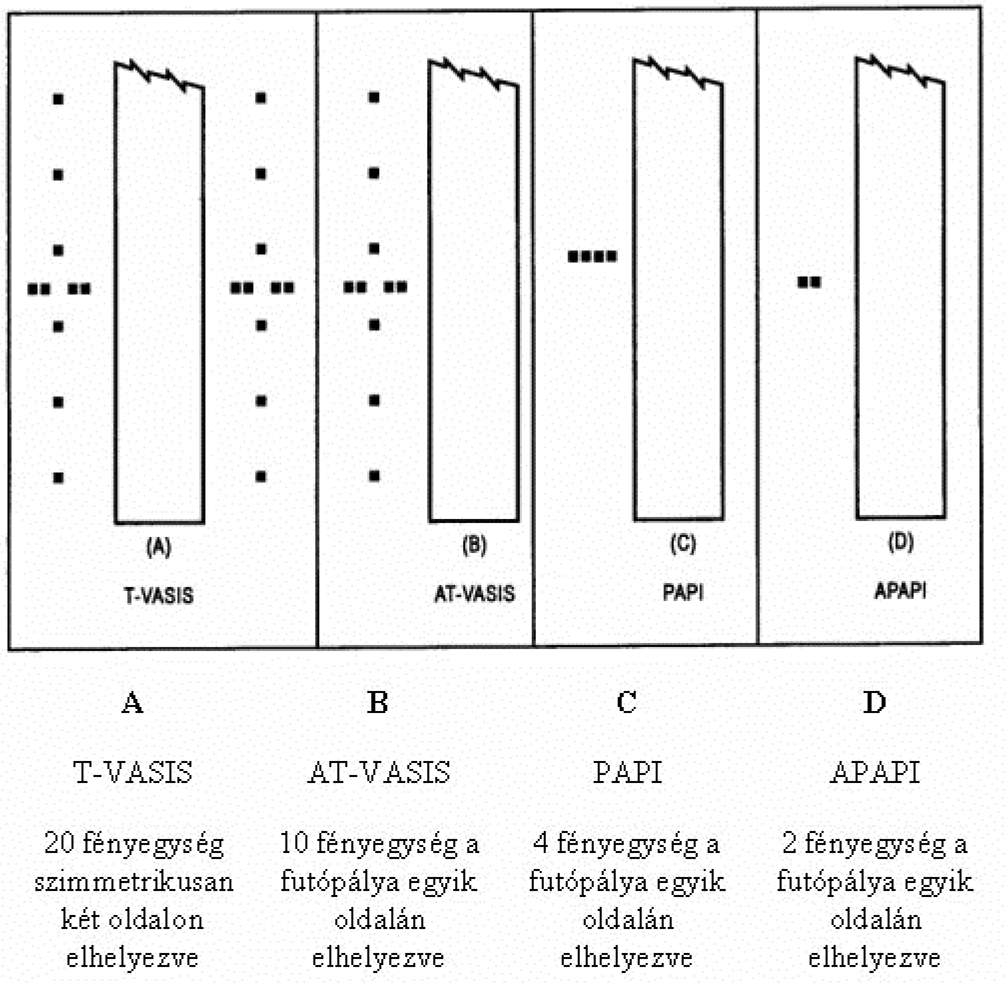
b) PAPI és APAPI, amely megfelel az 5.3.5.23 - 5.3.5.40 pontok előírásainak:

ahogy ez az 5-15. ábrán látható.

5.3.5.3 Ahol az 5.3.5.1 pontban ismertetett feltételek közül egy, vagy több fennáll, a 3 vagy 4 kód-számú futópályához szereljenek fel PAPI, T-VASIS, vagy AT-VASIS berendezést.

5.3.5.4 Ahol az 5.3.5.1 pontban ismertetett feltételek közül egy, vagy több fennáll, az 1 vagy 2 kód-számú futópályához szereljenek fel PAPI, vagy APAPI berendezést.

5.3.5.5 ***Ajánlás** — Amennyiben a futópálya küszöböt ideiglenesen áthelyezték és az 5.3.5.1 pontban ismertetett feltételek közül egy, vagy több fennáll, szereljenek fel PAPI berendezést. Az 1 vagy 2 kód-szám esetén alkalmazhatnak APAPI berendezést is.*



5-15. ábra: Optikai megközelítési siklópálya jelző rendszerek

T-VASIS és AT-VASIS berendezések

Ismertetés

5.3.5.6 A T-VASIS berendezés a futópálya középvonal két oldalán szimmetrikusan összesen húsz darab, oldalanként hosszirányban elhelyezett hat darab fény-egységből áll, amelyet középen, keresztirányban négy darab fény-egységből álló rövid kereszt-fénysor metsz (lásd 5-16. ábra).

5.3.5.7 Az AT-VASIS berendezés a futópálya egyik oldalán elhelyezett összesen tíz darab, hosszirányban elhelyezett hat darab fény-egységből áll, amelyet középen, keresztirányban négy darab fény-egységből álló rövid kereszt-fénysor metsz.

5.3.5.8 A fény-egységeket úgy készítsék és helyezzék el, hogy a megközelítést végző repülőgép vezetője a következő fény-jelzés utasításokat láthassa:

a) a megközelítési siklópálya felett repülve a szárny kereszt-fénysor(oka)t fehérnek lássa, valamint a süllyedésre utasító fények közül egy, kettő, vagy három darabot lásson annál nagyobb számban, minél magasabban van a megközelítési siklópálya felett;

b) a megközelítési siklópályán repülve a szárny kereszt-fénysor(oka)t fehérnek lássa; és

c) a megközelítési siklópálya alatt repülve a szárny kereszt-fénysor(oka)t fehérnek lássa, valamint az emelkedésre utasító fények közül egy, kettő, vagy három darabot fehérnek lásson annál nagyobb számban, minél alacsonyabban van a megközelítési siklópálya alatt; amennyiben a repülőgép jóval a megközelítési siklópálya alatt van, a kereszt-fénysor(oka)t és a három emelkedésre utasító fényt vörösnek lássa.

Amikor a légijármű a megközelítési siklópályán, vagy felette repül, ne látszódjanak az emelkedésre utasító fények, ha pedig a megközelítési siklópályán, vagy alatta repül, ne látszódjanak a süllyedésre utasító fények.

Elhelyezés

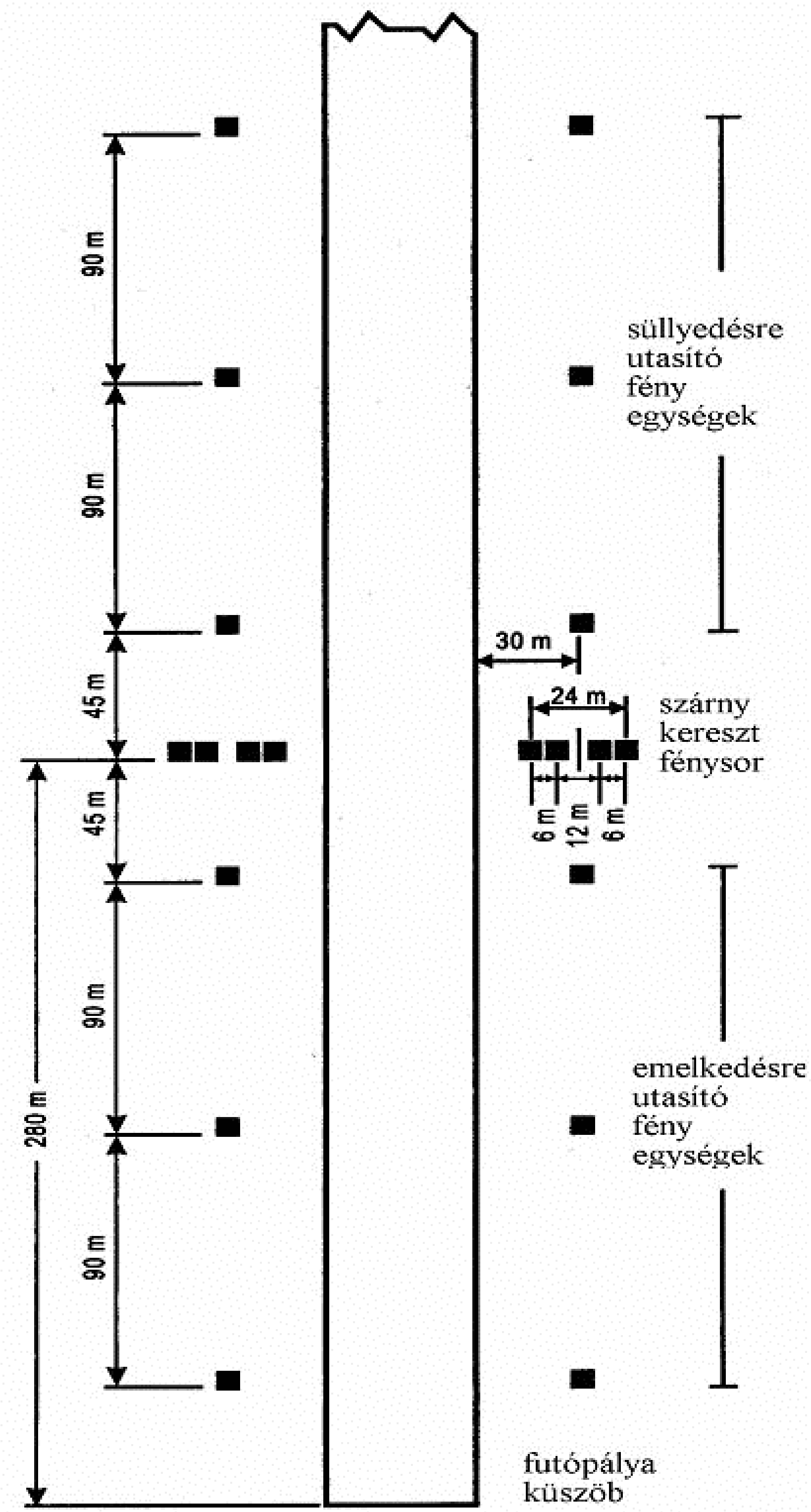
5.3.5.9 A fény-egységeket az 5-16. ábra alapján, a meghatározott létesítési határértékeken belül kell elhelyezni.

Megjegyzés: A T-VASIS elhelyezése biztosítja, hogy 3°-os siklópálya és 15 méteres küszöb feletti névleges szemmagasság (lásd 5.3.5.6 és 5.3.5.19 pontok) esetében, ténylegesen 13 — 17 méter közötti repülőgépvezető szemmagasságból csak a szárny keresztfénysor fények láthatók. Amennyiben a küszöb felett (a megfelelő futómű távolság érdekében) nagyobb szemmagasság érték szükséges, a megközelítést egy, vagy több süllyedésre utasító fény látása mellett végre lehet hajtani. Ebben az esetben a repülőgépvezető a küszöb feletti szemmagassága függvényében a következőket láthatja:

szárny keresztfénysor és egy darab süllyedésre utasító fény 17 — 22 m

szárny keresztfénysor és kettő darab süllyedésre utasító fény 22 — 28 m

szárny keresztfénysor és három darab süllyedésre utasító fény 28 — 54 m



5-16. ábra: A T-VASIS rendszer fény-egységeinek elhelyezése

Az 5-16. ábrán látható elhelyezés esetén az illetékes hatóság:

a) *a futópálya küszöb feletti, siklópályának megfelelő névleges szemmagasságot 12 és 16 méteres határok között változtathatja, kivéve azt az esetet, amikor szabványos ILS siklópálya és/vagy legalacsonyabb MLS siklópálya áll rendelkezésre; a futópálya küszöb feletti magasság érték meghatározásánál kerülni kell az* *optikai megközelítési siklópálya jelző rendszer jelzései, valamint az ILS siklópálya használható szakasza és/vagy az MLS legkisebb siklópálya szög jelzései közötti eltérés lehetőségét;*

b) *nem több, mint tíz százalékkal változtathatja az egyes fény-egységek közötti hosszirányú távolságot, vagy a teljes rendszer hosszát;*

c) *nem több, mint ± 3 méterrel változtathatja a futópálya szélétől mért távolságot, azonban a rendszer elemeit a futópálya középvonalhoz viszonyítva szimmetrikusan kell elhelyezni;*

d) *ahol a talajfelszín hosszirányú lejtéssel rendelkezik, a fény-egységek közötti hosszirányú távolságot a futópálya küszöbtől számított szintkülönbség alapján, annak kiegyenlítésére módosíthatja;*

e) *ahol a talajfelszín keresztirányú lejtéssel rendelkezik, a két fény-egység, vagy keresztfénysor közötti hosszirányú távolságot a szintkülönbség kiegyenlítésére, az 5.3.5.16 pont előírásának teljesítése érdekében szükség szerint módosíthatja;*

A keresztfénysor és a futópálya küszöb közötti távolság a 3°-os megközelítési siklópálya alapján, szintben elhelyezkedő futópályához, 15 méteres névleges szemmagasság mellett került meghatározásra. A gyakorlatban a keresztfénysor és a futópálya küszöb közötti távolságot a következők határozzák meg:

a) *a kiválasztott megközelítési siklópálya;*

b) *a futópálya hosszlejtése; és*

c) *a kiválasztott futópálya küszöb feletti névleges szemmagasság.*

A fény-egységek jellemzői

5.3.5.10 A rendszerek alkalmasak kell, hogy legyenek úgy nappali, mint éjszakai üzemelésre.

5.3.5.11 Minden egyes fény-egység fény (sugár) elosztása a megközelítés irányába széles oldalszög íven legyezőszerű legyen. A szárny keresztfénysor fény-egységeknek függőleges 1° 54' és 6° között fehér fényű; 0° azaz vízszintes és függőleges 1° 54' között pedig vörös fényű sugárnyalábot kell kibocsátaniuk. A süllyedésre utasító fény-egységeknek fehér fényű sugárnyalábot kell kibocsátaniuk 6°-os magasság (azaz vízszinteshez viszonyított függőleges szög érték) és körülbelül a megközelítési siklópálya között, ahol a fény hirtelen eltűnik. Az emelkedésre utasító fény-egységeknek fehér fényű sugárnyalábot kell kibocsátaniuk körülbelül a megközelítési siklópálya és ez alatt 1° 54' függőleges szög értékig, majd 1° 54' alatt a színnek vörösre kell váltania. A szárny keresztfénysor és az emelkedésre utasító fény-egységek felső vörös fénysugár szögét az 5.3.5.21 pont előírásának teljesítése érdekében növelni lehet.

5.3.5.12 A süllyedésre és az emelkedésre utasító, valamint a szárny keresztfénysor fény-egységek fény intenzitás elosztását a 2. Függelék A2-22 ábrája szerint kell kialakítani.

5.3.5.13 A vörös és a fehér színek közötti átmenet a függőleges síkban olyan legyen, hogy azt a megfigyelő nem kevesebb, mint 300 méter távolságból nem nagyobb, mint 15' függőleges szögön belül észlelje.

5.3.5.14 Teljes fényerőnél a vörös színű fény "Y" koordinátája ne haladja meg a 0.320 értéket.

5.3.5.15 Ki kell alakítani megfelelő fényerő szabályzást annak érdekében, hogy lehetővé tegyék az uralkodó környezeti viszonyoknak megfelelő fényintenzitás beállítását, valamint a megközelítés és leszállás végrehajtása során elkerüljék a repülőgépvezető elvakítását.

5.3.5.16 A szárny keresztfénysorokat, vagy az emelkedési, illetve süllyedési utasítást adó párokat alkotó fény-egységeket úgy szereljék fel, hogy azok a megközelítést végző repülőgép vezetője számára alapjában véve vízszintes vonalnak látszódjanak. A fény-egységeket a lehető legalacsonyabbra helyezzék el és azok letörhetők legyenek.

5.3.5.17 Az optikai megközelítési siklópálya jelző rendszer elemeit úgy tervezzék meg, hogy az optikai sugárzó, vagy visszaverő felületeken keletkező lecsapódások, szennyeződések, stb. a lehető legkisebb mértékben akadályozzák a fényjelek kibocsátását és semmiféle formában ne befolyásolják a sugárnyalábok irányát (magasságát), vagy a vörös és fehér fények között látható különbséget. A fény-egységek szerkezete olyan legyen, hogy a lehető legkisebbre csökkentse a rések hóval, vagy jéggel történő részleges, vagy teljes eltömődésének lehetőségét olyan helyeken, amelyeken ilyen kedvezőtlen időjárási jelenségek várhatók.

A fény-sugarak megközelítési siklópálya és magasság beállítása

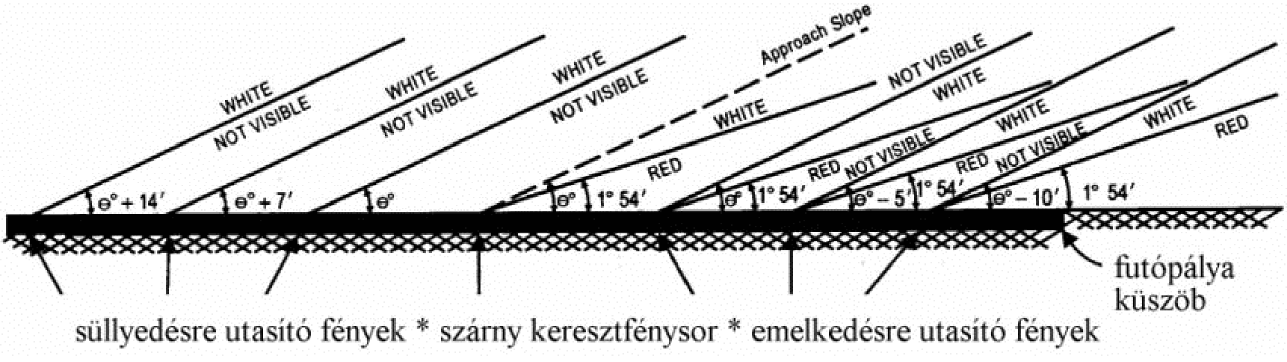
5.3.5.18 A megközelítési siklópályának megfelelőnek kell lennie a megközelítést végrehajtó repülőgépek számára.

5.3.5.19 Annál a futópályánál, amelyhez T-VASIS egységet telepítettek, ILS és/vagy MLS berendezéssel is fel van szerelve, a fény-egységek elhelyezése és magassága olyan legyen, hogy a látási utáni megközelítési siklópálya a lehető legnagyobb mértékben essen egybe az ILS siklópályával és/vagy az MLS legalacsonyabb megközelítési siklópályával.

5.3.5.20 A futópálya két oldalán elhelyezett szárny keresztfénysorok sugárnyaláb magassága (vízszinteshez viszonyított függőleges szög értéke) azonos legyen. Az egyes szárny keresztfénysorokhoz legközelebb eső emelkedési utasítást adó fény-egység felső, valamint a süllyedési utasítást adó fény-egység alsó fénysugarainak magassága azonos és a megközelítési siklópályának megfelelő legyen. Az emelkedési utasítást adó fény-egység egymást követő fényei a szárny keresztfénysortól kezdődően 5' magassági szögpercenként tűnjenek el. A süllyedési utasítást adó fény-egység egymást követő fényei a szárny kereszt-fénysortól kezdődően 7' szögpercenként tűnjenek fel (lásd az 5-17. ábrát).

5.3.5.21 A szárny keresztfénysor vörös fényének felső sávja, valamint az emelkedési utasítást adó fény-egységeknek magasság beállítása olyan legyen, hogy a megközelítés végrehajtása során a repülőgép vezetője, aki látja a szárny keresztfénysort és a három emelkedési utasítást adó fény-egységet, azonban a fények közül egyik szín sem látszik vörösnek, a megközelítési területen levő összes tárgy felett megfelelő biztonsági távolságban marad.

5.3.5.22 Ahol egy tárgy a rendszer akadályvédelmi felületen kívül, azonban a fénysugár oldalhatárain belül van és túlnyúlik az akadályvédelmi felület síkján, továbbá a légiforgalmi vizsgálat azt jelzi, hogy a tárgy hátrányosan befolyásolhatja az üzemeltetés biztonságát, megfelelően korlátozzák a fénysugár oldalszög terjedését úgy, hogy a tárgy a fénysugár határain kívül maradjon.



5-17. ábra: A T-VASIS és AT-VASIS rendszerek fénysugárzás és magasság beállítása

Süllyedésre utasító fény egységek	*Keresztfénysor egységek*	*Emelkedésre utasító fény egységek*
fehér (white)	megközelítési siklópálya (approach slope)	nem látható (n.v.)
nem látható (not visible)	fehér (white)	fehér (white)
	vörös (red)	vörös (red)

Megjegyzés: Az akadályvédelmi felületekre vonatkozóan lásd az 5.3.5.41 - 5.3.5.45 pontokat.

PAPI és APAPI

Ismertetés

5.3.5.23 A PAPI rendszer egymástól egyenlő távolságra elhelyezett, négy darab határozott színváltású fény-egységből (vagy egy égős lámpa párból) álló szárny keresztfénysor. A rendszert a futópálya bal oldalán kell elhelyezni, kivéve, ha ez fizikai szempontból nem lehetséges.

Megjegyzés: Ahol a futópályát látás után végrehajtandó forduló tájékoztatást igénylő légijármű használja és ezt a tájékoztatást más külső eszközzel nem biztosítják, a futópálya másik oldalán egy második szárny keresztfénysor helyezhető el.

5.3.5.24 Az APAPI rendszer egymástól egyenlő távolságra elhelyezett, kettő darab határozott színváltású fény-egységből (vagy egy égős lámpa párból) álló szárny keresztfénysor. A rendszert a futópálya bal oldalán kell elhelyezni, kivéve, ha ez gyakorlati szempontból nem lehetséges.

Megjegyzés: Ahol a futópályát látás után végrehajtandó forduló tájékoztatást igénylő légijármű használja és ezt a tájékoztatást más külső eszközzel nem biztosítják, a futópálya másik oldalán egy második szárny keresztfénysor helyezhető el.

5.3.5.25 A PAPI szárny keresztfénysort úgy alakítsák ki és helyezzék el, hogy a megközelítést végző repülőgép vezetője a következő fényjelzéseket lássa:

a) ha a megközelítési siklópályán, vagy ahhoz közel van, a futópályához közelebb levő két egység fénye vörös, a futópályától távolabb levő két egység fénye fehér;

b) ha a megközelítési siklópálya felett van, a futópályához legközelebb levő egység fénye vörös, a futópályától távolabb levő három egység fénye fehér; amikor még inkább a megközelítési siklópálya fölé kerül, az összes egység színe fehér; és

c) ha a megközelítési siklópálya alatt van, a futópályához legközelebb levő három egység fénye vörös, a futópályától legtávolabb levő egység fénye fehér; amikor még inkább a megközelítési siklópálya alá kerül, az összes egység színe vörös.

5.3.5.26 Az APAPI szárny keresztfénysort úgy alakítsák ki és helyezzék el, hogy a megközelítést végző repülőgép vezetője a következő fényjelzéseket lássa:

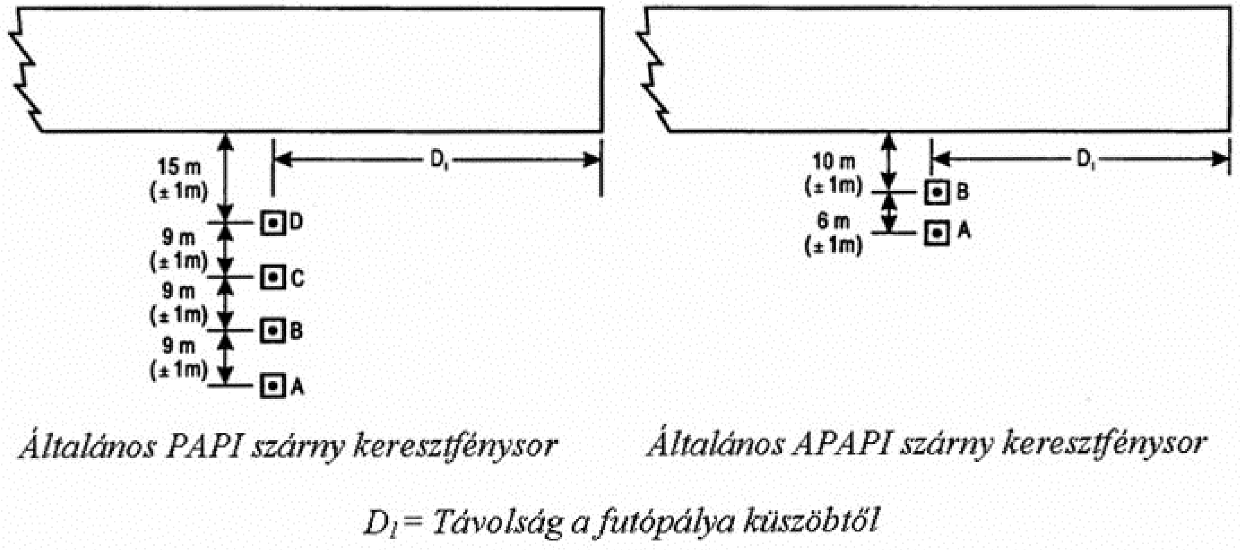
a) ha a megközelítési siklópályán, vagy ahhoz közel van, a futópályához közelebb levő egység fénye vörös, a futópályától távolabb levő egység fénye fehér;

b) ha a megközelítési siklópálya felett van, mindkét egység fénye fehér; és

c) ha a megközelítési siklópálya alatt van, mindkét egység fénye vörös.

Elhelyezés

5.3.5.27 A fény-egységeket az 5-18. ábrán látható alapelrendezés szerint, a meghatározott létesítési határértékeken belül kell elhelyezni. A szárny keresztfénysort alkotó fény-egységeket úgy szereljék fel, hogy azok a megközelítést végző repülőgép vezetője számára alapjában véve vízszintes vonalnak látszanak. A fény-egységeket a lehető legalacsonyabbra helyezzék el és azok letörhetők legyenek.



5-18. ábra: PAPI és APAPI rendszerek elhelyezése

Az 5-18. ábrán látható elhelyezés esetén a ***létesítési határértékek*** *a következők:*

a) *Ahol a PAPI, vagy APAPI berendezést ILS, vagy MLS nélküli futópályához telepítik, számítsák ki a D_1 távolságot annak biztosítása érdekében, hogy az a legalacsonyabb magasság, amelyen a repülőgépvezető helyes megközelítési siklópálya jelzést lát (5-19. ábra B szög PAPI és A szög APAPI esetén), az 5-2. táblázatban meghatározott futómű biztonsági távolságát biztosítja a futópálya küszöb felett azon legigényesebb repülőgépek vonatkozásában, amelyek a futópályát rendszeresen igénybe veszik.*

b) *Ahol a PAPI, vagy APAPI berendezést ILS és/vagy MLS-el ellátott futópályához telepítik, számítsák ki a D_1 távolságot annak biztosítása érdekében, hogy a futópályát rendszeresen igénybe vevő repülőgépek szemmagasság és antenna magasság közötti módosító tényezői figyelembevételével a lehető legjobb összhang legyen a látás utáni és a műszeres berendezések jelzései között. A távolság azonos legyen a futópálya küszöb és az ILS siklópálya, vagy az MLS legalacsonyabb megközelítési siklópálya kezdőpontja közötti távolsággal, továbbá itt vegyék figyelembe a szemmagasság és antenna magasság közötti módosító tényező értékét, amelynek kiszámításához az átlagos szem — antenna magasság értéket szorozzák meg a megközelítési szög kotangens értékével. Mindazonáltal a távolság olyan legyen, hogy a futómű biztonsági távolság semmi esetre se legyen kevesebb, mint az 5-2. táblázat (3) oszlopában meghatározott érték.*

c) *Ha bizonyos légijármű típushoz a fenti a) pontban meghatározottnál nagyobb biztonsági távolság szükséges, ez a D_1 növelésével elérhető.*

d) *A D_1 távolságot a fény-egységek lámpáinak, illetve lencséinek középpontja, valamint a futópálya küszöb magasságok különbségének megfelelően módosítsák.*

e) *A fény-egység lehető legalacsonyabbra történő elhelyezésének, valamint a keresztirányú lejtés figyelembevételének biztosítása érdekében az egységek között kis mértékű, legfeljebb 5 cm-es magasság különbség, továbbá 1.25 %-nál nem nagyobb oldalirányú távolság eltérés elfogadható feltéve, hogy ez utóbbit az egységeknél egységesen alkalmazzák.*

f) *Az 1 és 2 kód-számok esetében a PAPI egységek között 6 méter (± 1 m) térköz alkalmazható. Ebben az esetben a belső PAPI egység nem kevesebb, mint 10 méter (± 1 m) távolságra legyen a futópálya szélétől.*

Megjegyzés: A fény-egységek közötti térköz csökkentése a rendszer igénybevételi (hatótávolság) lehetőséget csökkenti.

g) *Az APAPI egységek közötti oldalirányú térköz 9 méterre (± 1 m) növelhető, ha nagyobb hatótávolság szükséges, vagy a rendszer várhatóan később teljes PAPI rendszerre alakítják át. Ez utóbbi esetben a belső APAPI egység a futópálya szélétől 15 méterre (± 1 m) helyezkedjen el.*

Megjegyzés: Lásd még a célpont jelzésre vonatkozó előírásokat az 5.2.5 részben. A PAPI, ILS és/vagy MLS jelzések összehangolásával kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

A fény-egységek jellemzői

5.3.5.28 A rendszer alkalmas legyen nappali és éjszakai üzemelésre.

5.3.5.29 A vörös és a fehér színek közötti átmenet a függőleges síkban olyan legyen, hogy a megfigyelő azt nem kevesebb, mint 300 méter távolságból nem több, mint 3' függőleges szögön belül észlelje.

5.3.5.30 Teljes fényerőnél a vörös színű fény "Y" koordinátája ne haladja meg a 0.320 értéket.

5.3.5.31 A fény-egységek fényerősség elosztása a 2. Függelék A2-23. ábrájának megfelelő legyen.

Megjegyzés: A fény-egységek további jellemzőivel kapcsolatos további útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

5.3.5.32 Ki kell alakítani megfelelő fényerő szabályzást annak érdekében, hogy lehetővé tegyék az uralkodó környezeti viszonyoknak megfelelő fényintenzitás beállítását, valamint a megközelítés és leszállás végrehajtása során elkerüljék a repülőgépvezető elvakítását.

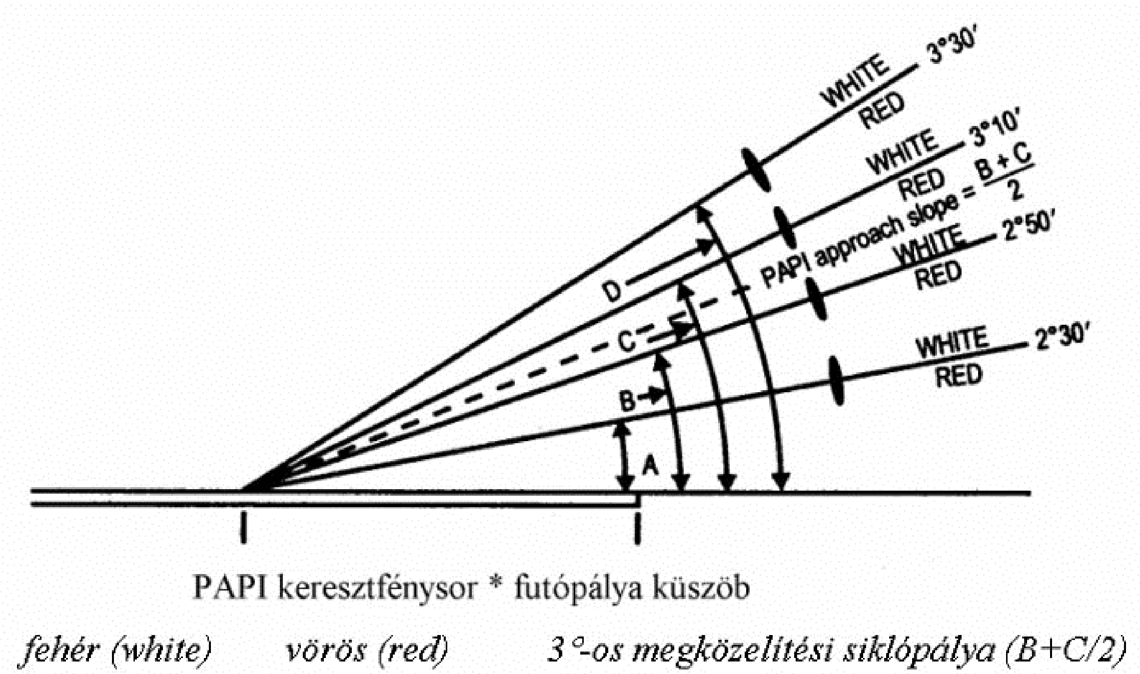
5.3.5.33 Minden egyes fény-egység magassága állítható legyen, hogy a fehér fénysugár alsó határa a vízszintes felett 1° 30', valamint legalább 4° 30' között bármely szögben beállítható és rögzíthető legyen.

5.3.5.34 Az optikai megközelítési siklópálya jelző rendszer elemeit úgy tervezzék meg, hogy az optikai sugárzó, vagy visszaverő felületeken keletkező lecsapódások, szennyeződések, stb. a lehető legkisebb mértékben akadályozzák a fényjelek kibocsátását, továbbá semmiféle formában ne befolyásolják az átmeneti szektor magasságát, vagy a vörös és fehér fények között látható különbséget.

A fény-egységek megközelítési siklópálya és magasság beállítása

5.3.5.35 Az 5-19. ábrákon meghatározott megközelítési siklópálya megfelelő kell, hogy legyen a megközelítést végrehajtó repülőgépek számára.

5.3.5.36 Amennyiben az a futópálya ILS és/vagy MLS berendezéssel is fel van szerelve, a fény-egységek elhelyezése és magassági szöge olyan legyen, hogy a látási utáni megközelítési siklópálya a lehető legnagyobb mértékben essen egybe az ILS siklópályával és/vagy az MLS legalacsonyabb megközelítési siklópályával.

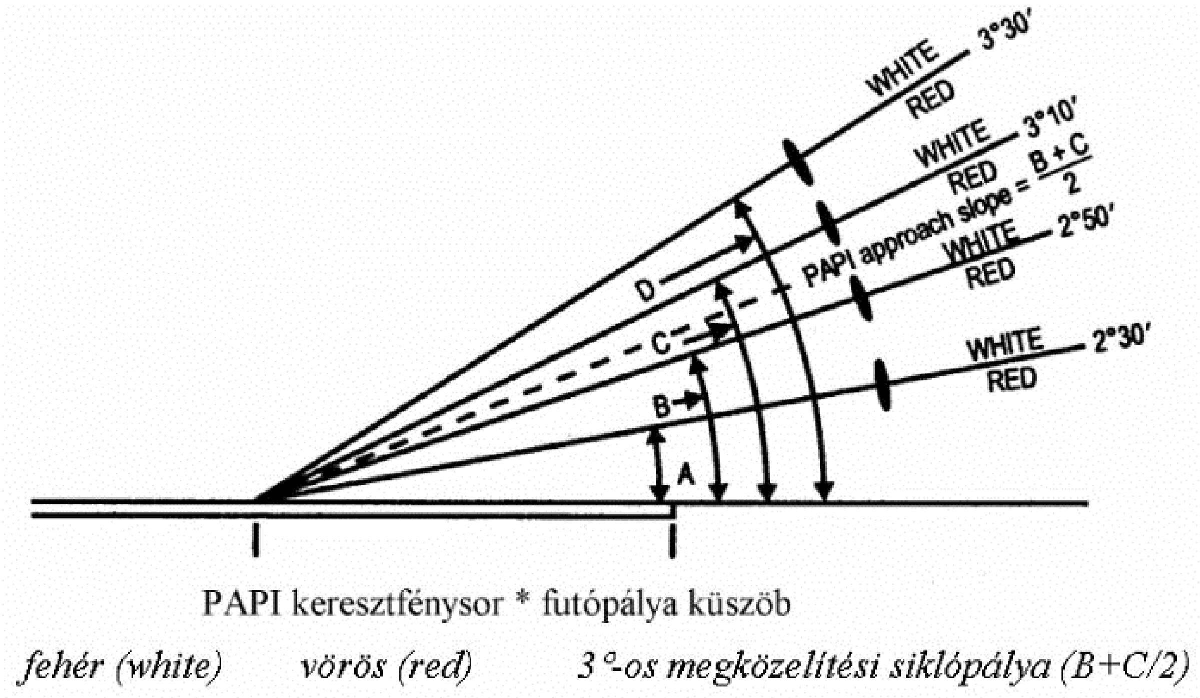


5-19-A. ábra: PAPI rendszer fénysugárzás és magassági szög beállítása

Megjegyzés: (3°-os precíziós megközelítési siklópálya) A repülőgépvezető szemmagassága a megközelítési siklópálya felett a repülőgép típustól és a megközelítés során fennálló repülési helyzettől függően változik. A látási utáni PAPI megközelítési siklópálya jelzés és az ILS siklópálya és/vagy az MLS legalacsonyabb siklópálya összehangolása a futópálya küszöbhöz közelebb eső ponton a siklópályán jelzés szektorának 20'-ről 30'-re történő növelésével biztosítható. A 3°-os megközelítési siklópálya beállítási szögei ekkor a következők lehetnek: 2°25', 2°45, 3°15' és 3°35'.

5.3.5.37 A PAPI szárny keresztfénysor fény-egységeinek magassági szög beállítása olyan legyen, hogy a megközelítés végrehajtása során a repülőgép vezetője, aki egy fehér és három vörös fényt lát, a megközelítési területen levő összes tárgy felett megfelelő biztonsági távolságban marad.

5.3.5.38 Az APAPI szárny keresztfénysor fény-egységeinek magassági szög beállítása olyan legyen, hogy a megközelítés végrehajtása során a repülőgép vezetője, aki a legalacsonyabb siklópályán jelzést, azaz egy fehér és egy vörös fényt lát, a megközelítési területen levő összes tárgy felett megfelelő biztonsági távolságban marad.



5-19-B ábra: APAPI rendszer fénysugárzás és magassági szög beállítása

5.3.5.39 Ahol egy tárgy a PAPI vagy APAPI rendszer akadályvédelmi felületen kívül, azonban a fénysugár oldalhatárain belül van és túlnyúlik az akadályvédelmi felület síkján, továbbá a légiforgalmi vizsgálat azt jelzi, hogy a tárgy hátrányosan befolyásolhatja az üzemeltetés biztonságát, megfelelően korlátozzák a fénysugár oldalszög terjedését úgy, hogy a tárgy a fénysugár határain kívül maradjon.

Megjegyzés: A megfelelő akadályvédelmi felületekre vonatkozóan lásd az 5.3.5.41 - 5.3.5.45 pontokat.

5.3.5.40 Ahol a futópálya mindkét oldalán látás utáni forduló tájékoztatást biztosító szárny keresztfénysort helyeztek el, a megfelelő egységeket azonos szögbe állítsák be, hogy az egyes keresztfénysorok jelzései egyszerre szimmetrikusan változzanak.

Akadályvédelmi felületek

Megjegyzés: A következő előírások a T- VASIS, AT-VASIS, VASIS, PAPI és APAPI rendszerekre vonatkoznak.

5.3.5.41 Amennyiben optikai megközelítési siklópálya jelző rendszert kívánnak telepíteni, akadályvédelmi felületeket kell kijelölni.

5.3.5.42 Az akadályvédelmi felületek jellemzői feleljenek meg az 5-3. táblázat megfelelő oszlopában, valamint az 5-20. ábrán meghatározott kiindulási pontoknak, széttartásnak, hosszúságnak és lejtviszonynak.

5.3.5.43 Új tárgyak, vagy a meglevő tárgyak megnagyobbítása nem nyúlhatnak az akadályvédelmi felület fölé kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos "árnyékolás" alapelv alkalmazható, a Repülőtér Szolgálati Kézikönyv *6. részében kerülnek ismertetésre.*

5.3.5.44 Az akadályvédelmi felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek, vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a repülőgép üzemeltetés biztonságát.

5.3.5.45 Ha a légiforgalmi vizsgálat azt jelzi, hogy az akadályvédelmi felület fölé nyúló tárgy hátrányosan befolyásolja a repülőgép üzemeltetés biztonságát, a következő intézkedést vagy intézkedéseket hajtsák végre:

a) megfelelő mértékben növeljék meg a rendszer megközelítési siklópályáját;

b) csökkentsék a rendszer oldalszög kiterjedésének mértékét úgy, hogy a tárgy a fénysugár-nyaláb határain kívül legyen;

c) a rendszer tengelyét és az ahhoz kapcsolódó akadályvédelmi felületet nem több mint 5° értékkel helyezzék át;

d) a küszöböt megfelelő mértékkel helyezzék át; és

e) ahol a d) alpont végrehajtása gyakorlati okokból nem lehetséges, megfelelő mértékben állítsák át a rendszert, hogy az akadályvédelmi felület megsértésének (tárgy behatolási magassága) megfelelő mértékben növeljék a futópálya küszöb átrepülési magasságot.

Megjegyzés: A témakörrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

5-2. táblázat: PAPI és APAPI berendezésekhez alkalmazandó futómű biztonsági távolság a futópálya küszöb felett

Repülőgépvezető szemmagasság és a repülőgép futómű közötti távolság megközelítési repülési helyzetben [a]	***Kívánatos futómű biztonsági távolság*** [b, c]	***Legkisebb futómű biztonsági távolság*** [d]
(1)	(2)	(3)
2.99 méterig	6	3 [e]
3.00 métertől 4.99 méterig	9	4
5.00 métertől 7.99 méterig	9	5
8.00 métertől 13.99 méterig	9	6

Megjegyzések az 5-2. táblázathoz:

a. A repülőgépvezető szemmagasság és a repülőgép futómű közötti távolság csoport kiválasztásánál csak azokat a repülőgépeket kell figyelembe venni, amelyek a rendszert rendszeresen igénybe veszik. A csoportot a legigényesebb típus, azaz a legnagyobb fenti távolsággal rendelkező típus jellemzi.

b. Ahol ez gyakorlatilag lehetséges, biztosítsák a (2) oszlopban található értékeket.

c. A (2) oszlopban található értékek legfeljebb a (3) oszlopban levő értékekig csökkenthető, ott ahol a légiforgalmi vizsgálat azt jelzi, hogy az ilyen csökkentés elfogadható.

d. Amennyiben egy áthelyezett küszöbnél alkalmazzák a csökkentett értékeket, biztosítsák, hogy ha egy felső csoportba tartozó repülőgép átrepüli a futópálya végét, a (2) oszlopban meghatározott megfelelő kívánatos futómű biztonsági távolság ott megtartható lesz.

e. Ez a futómű biztonsági távolság lecsökkenthető 1.5 méterre azokon a futópályákon, amelyeket főként könnyű, légcsavaros repülőgépek vesznek igénybe.

5-3. táblázat: Akadályvédelmi felület méretei és lejtése

Nem műszeres futópálya	***Kód-szám***			
	1	2	3	4
A felületek jellemzői				
A belső él hossza	60 m	80 m [a]	150 m	150 m
Távolság a küszöbtől	30 m	60 m	60 m	60 m
Széttartás mindkét oldalon	10 %	10 %	10 %	10 %
Teljes hosszúság	7500 m	7500 m [b]	15000 m	15000 m
Lejtés				
a) T-VASIS és AT-VASIS	__ c	1.9°	1.9°	1.9°
b) PAPI [d]	—	A-0.57°	A-0.57°	A-0.57°
c) APAPI [d]	A-0.9°	A-0.9°	—	—

Műszeres futópálya	***Kód-szám***			
	1	2	3	4
A felületek jellemzői				
A belső él hossza	150 m	150 m	300 m	300 m
Távolság a küszöbtől	60 m	60 m	60 m	60 m
Széttartás mindkét oldalon	15 %	15 %	15 %	15 %
Teljes hosszúság	7500 m	7500 m [b]	15000 m	15000 m
Lejtés				
a) T-VASIS és AT-VASIS	—	1.9°	1.9°	1.9°
b) PAPI [d]	A-0.57°	A-0.57°	A-0.57°	A-0.57°
c) APAPI [d]	A-0.9°	A-0.9°	—	—

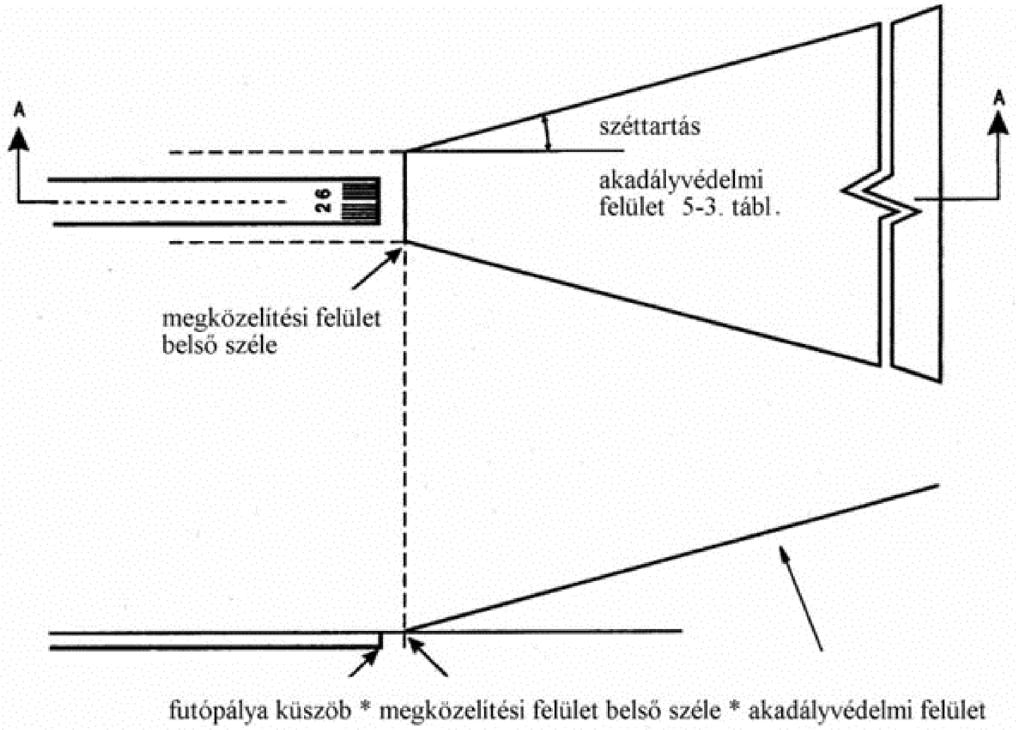
Megjegyzések az 5-3. táblázathoz:

a. Ez a hosszúság a T-VASIS, vagy AT-VASIS esetében 150 méterre növelendő.

b. Ez a hosszúság a T-VASIS, vagy AT-VASIS esetében 15000 méterre növelendő.

c. Nincs lejtés meghatározva, ha a rendszer alkalmazása a jelzett futópálya típus és kód-számnál valószínűtlen.

d. A szög értékeket az 5-19. ábra is tartalmazza.



5-20. ábra: Az optikai megközelítési siklópálya jelző rendszerek akadályvédelmi felületei

Megjegyzés az ábrához: Az akadályvédelmi felületek méretei és lejtése az 5-3. táblázatban.

5.3.6 Körözési tájékoztató (jelző) fény

Alkalmazás

5.3.6.1 ***Ajánlás** — Helyezzenek el körözési tájékoztató fényeket abban az esetben, ha a meglevő bevezető, valamint futópálya fényrendszerek a körözést végző légijármű számára nem teszik lehetővé a futópálya és/vagy megközelítési terület egyértelmű azonosítását olyan körülmények között, amelyek között a futópályát körözésből történő megközelítésre kívánják felhasználni.*

Elhelyezés

5.3.6.2 ***Ajánlás** — A körözési tájékoztató fények száma és elhelyezése megfelelő legyen ahhoz, hogy a repülőgépvezető szükség szerint képes legyen:*

a) belépni a futópálya forgalmi körének hosszúfalára, vagy megfelelő távolságban elérni és követni a végső egyenest, valamint megfelelő módon felismerni az átrepült futópálya küszöböt; és

b) folyamatosan látni a futópálya küszöböt és/vagy más olyan jellegzetességeket, amelyek az egyéb látás utáni segédeszközök jelzéseit is figyelembe véve lehetővé teszik az alapforduló végrehajtását, valamint a végső megközelítés megkezdése helyének megítélését.

5.3.6.3 ***Ajánlás** — A körözési tájékoztató fények a következők:*

a) a futópálya meghosszabbított középvonalát és/vagy bármely bevezető fény rendszer részeit jelző fények; vagy *b) a futópálya küszöb helyét jelző fények; vagy*

c) a futópálya irányt jelző fények;

vagy az adott futópálya vonatkozásában a fenti fény-egységek kombinációja.

Megjegyzés: A körözési tájékoztató fények telepítésével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Jellemzők

5.3.6.4 ***Ajánlás*** *— A körözési tájékoztató fények állandó sugárzó, vagy villogó fények legyenek, fényerejük és fény-sugár terjedésük megfelelő legyen azokhoz a látási körülményekhez valamint környezeti fény viszonyokhoz, amelyek között a látás utáni körözéses megközelítéseket végre kívánják hajtani. A villogó fények színe fehér és az állandó fények színe fehér, vagy világos, gázzal töltött égő szín legyen.*

5.3.6.5 ***Ajánlás*** *— A fényeket úgy tervezzék meg és helyezzék el, hogy azok ne vakítsák, vagy zavarják meg a leszálláshoz történő megközelítést, felszállást, vagy gurulást végrehajtó repülőgépvezetőt.*

5.3.7 Futópálya bevezető irány-fény rendszer

Alkalmazás

5.3.7.1 ***Ajánlás*** *— A futópálya bevezető irány-fény rendszert olyan helyen telepítsék, ahol egy meghatározott megközelítési repülési pálya mentén, például a veszélyes földfelszíni képződmények elkerülése, vagy zajcsökkentés céljából kívánatos a látás utáni irányvezetés biztosító segédeszközök alkalmazása.*

Megjegyzés: A futópálya bevezető irány-fény rendszer telepítésével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Elhelyezés

5.3.7.2 ***Ajánlás*** *— A futópálya bevezető irány-fény rendszer olyan fény csoportokból áll, amelyek kijelölik a kívánatos megközelítési repülési pályát. Az egyes fénycsoportok az előzőtől láthatók legyenek és a közöttük levő távolság ne haladja meg a kb. 1600 métert.*

Megjegyzés: A futópálya bevezető irány-fény rendszerek egyenes, ívelt vagy kombinált elrendezésűek lehetnek.

5.3.7.3 ***Ajánlás*** *— A futópálya bevezető irány-fény rendszer az illetékes hatóság által meghatározott ponttól addig a pontig tart, amelytől a bevezető fény rendszer — ha van — vagy a futópálya, illetve a futópálya fény rendszer látható lesz.*

Jellemzők

5.3.7.4 ***Ajánlás*** *— A futópálya bevezető irány-fény rendszerek minden egyes fény egysége legalább három sorban, vagy más formációban elhelyezett villogó fényből álljon. Ahol ez a rendszer azonosításához segítséget nyújt, a fény rendszert folyamatos fényű egységekkel is kiegészíthetik.*

5.3.7.5 ***Ajánlás*** *— A villogó fény fehér, a folyamatos fény világos, gázzal töltött égő szín legyen.*

5.3.7.6 ***Ajánlás*** *— Ahol lehetséges, a villogó fények a futópálya felé befutó sorrendben villanjanak fel.*

5.3.8 Futópálya küszöb azonosító fények

Alkalmazás

5.3.8.1 ***Ajánlás*** *— Helyezzenek el futópálya küszöb azonosító fényt:*

a) a nem-precíziós megközelítésű futópálya küszöbénél, ha szükséges annak külön megjelölése és más bevezető fény rendszer biztosítása gyakorlati szempontból nem lehetséges; és

b) ahol a futópálya küszöböt a futópálya végéről állandó jelleggel, vagy rendes helyéről ideiglenesen áthelyezték és annak külön feltűnő megjelölése szükséges.

Elhelyezés

5.3.8.2 A futópálya küszöb azonosító fényeket a küszöbbel egy vonalba, a futópálya középvonal mentén szimmetrikusan és a futópálya szegély fények vonalától körülbelül 10 méterre kifelé helyezzék el.

Jellemzők

5.3.8.3 ***Ajánlás*** *— A futópálya küszöb azonosító fények percenként 60 - 120 villanással villogó fehér színű fények legyenek.*

5.3.8.4 A fények csak a futópálya megközelítési irányából legyenek láthatók.

5.3.9 Futópálya szegély fények

Alkalmazás

5.3.9.1 Az éjszaka használni kívánt futópályához, valamint a nappal, vagy éjszaka használni kívánt precíziós megközelítésű futópályához futópálya szegély fényeket kell elhelyezni.

5.3.9.2 ***Ajánlás*** *— Helyezzenek el szegély fényeket ahhoz a futópályához, amelyet nappal 800 méternél alacsonyabb futópályamenti látástávolság üzemeltetési minimummal kívánnak felszállásra igénybe venni.*

Elhelyezés

5.3.9.3 A futópálya szegély fényeket a futópálya teljes hosszában, a középvonaltól egyenlő távolságra levő két párhuzamos sorban kell elhelyezni.

5.3.9.4 A futópálya szegély fényeket a futópálya használatra kijelölt területének szélén, vagy a terület szélétől nem több, mint 3 méter távolságra kell elhelyezni.

5.3.9.5 ***Ajánlás*** *— Ahol a futópályaként kijelölt terület szélessége több, mint 60 méter, a fénysorok közötti távolságot az üzemeltetés természete, a futópálya szegély fények fényelosztási jellemzői és a futópályát kiszolgáló más látás utáni segédeszközök alapján határozzák meg.*

5.3.9.6 A fényeket egymástól egyenlő távolságra levő sorokban helyezzék el, amely távolság a műszeres futópálya esetében 60 méternél és a nem-műszeres futópálya esetében 100 méternél nem lehet nagyobb. A másik futópálya tengely (irány) fények az adott tengelyhez viszonyítva megfelelő szögben helyezkedjenek el. A futópályák kereszteződésénél a fényeket rendszertelen térközökkel helyezhetik el, vagy elhagyhatják, feltéve, hogy elegendő további útmutató jelzés marad a repülőgépvezető számára.

Jellemzők

5.3.9.7 A futópálya szegély fények állandó sugárzó, változtatható fényerejű fehér színű fények legyenek, kivéve:

a) az áthelyezett futópálya küszöb esetében a futópálya kezdete és az áthelyezett küszöb közötti terület fényei a megközelítés irányába vörös színűek legyenek; és

b) a felszálláshoz történő nekifutás kezdetétől nézve a futópálya végső egy harmadának, vagy 600 méterének megfelelő hosszúságban — amelyik a kevesebb — levő fények sárga színűek lehetnek.

5.3.9.8 A futópálya szegély fények minden olyan oldalszög irányba látszódjanak, amelyek a bármely irányba le, vagy felszállást végrehajtó repülőgépvezető számára szükségesek. Ha a futópálya szegély fényeket körözési tájékoztató jelzésként is fel kívánják használni, azok minden oldalszög irányba látszódjanak (lásd 5.3.6.1 pont).

5.3.9.9 A futópálya szegély fények minden, a fenti 5.3.9.8 pontban előírt oldalszög irányba a vízszintes felett 15°-ig látszódjanak. Fényerejük megfelelő legyen azoknak a látástávolság és környező fény körülményeknek, amelyek között a futópályát fel, vagy leszállásra használni kívánják. A fényerő minden esetben legalább 50 cd értékű legyen, kivéve azt a repülőteret, amelyen nincs külső környezeti fény, itt a fényerő a repülőgépvezető elvakításának elkerülése érdekében legfeljebb 25 cd értékre csökkenthető.

5.3.9.10 A precíziós megközelítésű futópálya szegély fényei feleljenek meg a 2. Függelék A2-9. vagy A2-10. ábráin látható előírásoknak.

5.3.10 Futópálya küszöb és szárny keresztfénysor fények (lásd 5-21. ábra)

A futópálya küszöb fények alkalmazása

5.3.10.1 A futópálya szegély fényekkel ellátott futópályához el kell helyezni küszöb fényeket. Kivételt képez az a nem-műszeres, vagy nem-precíziós megközelítésű futópálya, amelynek küszöbét áthelyezték és ehhez szárny keresztfénysort biztosítanak.

A futópálya küszöb fények elhelyezése

5.3.10.2 Ha a küszöb a futópálya végén helyezkedik el, a küszöb fényeket a futópálya tengelyéhez viszonyított megfelelő szögben, a futópálya végéhez lehető legközelebb, de attól nem több, mint 3 méter távolságra, egy sorban helyezzék el.

5.3.10.3 Ha a küszöböt a futópálya végéről áthelyezik, a küszöb fényeket a futópálya tengelyéhez viszonyított megfelelő szögben az áthelyezett küszöbnél egy sorban helyezzék el.

5.3.10.4 A futópálya küszöb fény a következő fény-egységekből áll:

a) a nem-műszeres, vagy nem-precíziós megközelítésű futópályánál legalább hat darab fény;

b) az I. kategóriás precíziós megközelítésű futópályánál legalább olyan számú fény, amennyi akkor szükséges, ha a futópálya szegély fénysorok között egymástól egységesen 3 méter távolságra fényeket helyeznének el; és

c) a II. és III. kategóriás precíziós megközelítésű futópályánál a futópálya szegély fénysorok között egymástól egységesen nem több, mint 3 méter távolságra elhelyezett fények.

5.3.10.5 ***Ajánlás*** *— Az 5.3.10.4 a) és b) alpontokban jelzett fények elhelyezése:*

a) a futópálya szegély-fénysorok között egységes legyen; vagy

b) a futópálya középvonala mentén szimmetrikusan elhelyezett két csoportban legyen, amelyekben a fények egymástól egységes távolságra vannak és a csoportok közötti távolság megfelel a földetérési terület jelzés, vagy világítás elemek közötti távolságnak, ha ilyet kialakítottak. Egyéb esetben a távolság ne legyen több, mint a futópálya szegély fénysorok közötti távolság fele.

Szárny keresztfénysorok alkalmazása

5.3.10.6 ***Ajánlás*** *— A precíziós megközelítésű futópályánál helyezzenek el szárny keresztfénysort, ha kívánatosnak tartják annak feltűnőbb megjelölését.*

5.3.10.7 Helyezzenek el szárny keresztfénysort annál a nem-műszeres vagy nem-precíziós futópályánál, amelynek küszöbét áthelyezték és futópálya küszöb világítás szükséges, azonban ezt nem biztosították.

Szárny keresztfénysorok elhelyezése

5.3.10.8 A szárny keresztfénysorokat a küszöbnél, a futópálya középvonala mentén szimmetrikusan két csoportban (azaz két szárnyban) helyezzék el. Minden keresztfénysor legalább 10 méter szélességben, legalább öt fény-egységből, a futópálya szegély fénysorhoz viszonyított megfelelő szögben álljon. Minden egyes keresztfénysor legbelső fénye a futópálya szegély fénysorral egy vonalban legyen.

A futópálya küszöb és a szárny keresztfénysor fények jellemzői

5.3.10.9 A futópálya küszöb és a szárny keresztfénysor fények állandó rögzített, egyirányú, a futópálya megközelítési irányába zöld színt mutató fények legyenek. A fények erőssége és fény-sugár terjedése megfelelő legyen azoknak a látástávolság és környezeti fény körülményeknek, amelyek között a futópályát használni kívánják.

5.3.10.10 A precíziós megközelítésű futópálya küszöb fényei feleljenek meg a 2. Függelék A2-3. ábrán látható előírásoknak.

5.3.10.11 A precíziós megközelítésű futópálya szárny keresztfénysor fényei feleljenek meg a 2. Függelék A2-4. ábrán látható előírásoknak.

5.3.11 Futópálya-vég fények (lásd 5-21. ábra)

Alkalmazás

5.3.11.1 A futópálya szegély fényekkel ellátott futópályán el kell helyezni futópálya-vég fényeket.

Megjegyzés: Ha a küszöb a futópálya végén helyezkedik el, a küszöb fények futópálya-vég fényként alkalmazhatók.

Elhelyezés

5.3.11.2 A futópálya-vég fényeket egy sorban, a futópálya tengelyéhez viszonyított megfelelő szögben, a futópálya végéhez lehető legközelebb, de attól (kifelé) legfeljebb 3 méter távolságra helyezzék el.

5.3.11.3 ***Ajánlás*** *— A futópálya-vég fénysor legalább hat darab fény-egységből álljon, melyek elhelyezése:*

a) a futópálya szegély-fénysorok között egységes legyen; vagy

b) a futópálya középvonala mentén szimmetrikusan elhelyezett két csoportban legyen, amelyekben a fények egymástól egységes távolságra vannak és ez a távolság ne legyen több, mint a futópálya szegély fénysorok közötti távolság fele.

A III. kategóriás precíziós megközelítésű futópálya esetében a futópálya-vég fények közötti távolság a két legbelső fény kivételével ne haladja meg a 6 métert.

Jellemzők

5.3.11.4 A futópálya-vég fények állandó rögzített, egyirányú, a futópálya irányba vörös színt mutató fények legyenek. A fények erőssége és fény-sugár terjedése megfelelő legyen azoknak a látástávolság és környező fény körülményeknek, amelyek között a futópályát használni kívánják.

5.3.11.5 A precíziós megközelítésű futópálya küszöb fényei feleljenek meg a 2. Függelék A2-8. ábrán látható előírásoknak.

5.3.12 Futópálya középvonal fények

Alkalmazás

5.3.12.1 A II. és III. kategóriás precíziós megközelítésű futópályán el kell helyezni futópálya középvonal fénysort.

5.3.12.2 ***Ajánlás*** *— Az I. kategóriás precíziós megközelítésű futópályán helyezzenek el futópálya középvonal fénysort, különösen abban az esetben, ha a futópályát nagy leszálló sebességű légijárművek veszik igénybe, vagy a futópálya szegély fények közötti távolság több, mint 50 méter.*

5.3.12.3 El kell helyezni futópálya középvonal fénysort azon a futópályán, amelyet 400 méternél alacsonyabb futópályamenti látástávolság üzemeltetési minimummal kívánnak felszállásra használni.

5.3.12.4 ***Ajánlás*** *— Helyezzenek el futópálya középvonal fénysort azon a futópályán, amelyet 400 méter, vagy magasabb futópályamenti látástávolság üzemeltetési minimummal kívánnak felszállásra használni és a futópályát igen nagy felszálló sebességű légijárművek veszik igénybe, különösen abban az esetben, ha a futópálya szegély fények közötti távolság több mint 50 méter.*

Elhelyezés

5.3.12.5 A futópálya középvonal fények a futópálya középvonalán helyezkedjenek el kivéve, ha ezeket gyakorlati szempontból nem lehet a középvonalon elhelyezni; ebben az esetben fényeket a futópálya középvonalától egy azonos oldalra, a középvonaltól legfeljebb 60 cm távolságra egységesen helyezzék el. A fények a küszöbtől a futópálya végéig egy sorban, egymástól körülbelül 15 méter hossztávolságban legyenek. Ahol a futópálya középvonal fények állandó működési szintjét a 10.4.7, vagy 10.4.11 pontok megelőző karbantartási célkitűzése alapján igazolni lehet és a futópályát 350 méter, vagy magasabb futópályamenti látástávolság üzemeltetési minimummal kívánják felhasználni, a fények közötti hossztávolság körülbelül 30 méter lehet.

Megjegyzés: Nem szükséges lecserélni azokat a jelenlegi meglevő futópálya középvonal fényeket, amelyek között a hossztávolság 7.5 méter.

5.3.12.6 ***Ajánlás*** *— A felszálláshoz szükséges középvonal irányvezetést a futópálya kezdetétől az áthelyezett küszöbig a következőkkel biztosítsák:*

a) bevezető fény rendszer, ha jellemzői és fényerősség beállításai lehetővé teszik a felszálláshoz szükséges irányvezetés ilyen formában történő biztosítását, a felszállást végrehajtó légijármű vezetőjének elvakítása nélkül; vagy

b) futópálya középvonal fények; vagy

c) legalább 3 méter hosszú és egységes 30 méteres távközönként elhelyezett keresztfénysorok (lásd 5-22. ábra), amelyek fénysugárzási jellemzői és fényerősség beállításai lehetővé teszik a felszálláshoz szükséges irányvezetés ilyen formában történő biztosítását, a felszállást végrehajtó légijármű vezetőjének elvakítása nélkül.

Ahol ez szükséges, foganatosítsanak intézkedéseket a b) alpontban jelzett középvonal fények lekapcsolására, vagy a bevezető fény rendszer, illetve a keresztfénysorok fényerősségének megfelelő szabályzására abban az esetben, ha a futópályát leszállásra használják. Az egy tápforrásból üzemelő futópálya középvonal fénysor semmi esetre se legyen látható a futópálya kezdete és az áthelyezett küszöb között, ha a futópályát leszállásra használják.

Jellemzők

5.3.12.7 A futópálya középvonal fények állandó rögzített, szabályozható és a következő színű fények legyenek: a futópálya küszöb és a futópálya végétől számított 900 méter pont között fehér; a futópálya vége előtt 900 és 300 méter távolság pontok között váltakozó vörös és állítható fehér; a futópálya végétől számított 300 méter pont és a futópálya vége között vörös, kivéve, hogy az 1800 méternél rövidebb futópálya esetében a váltakozó vörös és állítható fehér fények a leszállásra használható futópálya középpontjától a futópálya végétől számított 300 méter pontig helyezkedjenek el.

Megjegyzés: Az elektromos rendszer tervezésénél gondoskodjanak arról, hogy a rendszer egy részének meghibásodása, vagy üzemképtelensége ne eredményezze a megmaradt rendelkezésre álló futópálya hosszúság helytelen jelzését.

5.3.12.8 A futópálya középvonal fényei feleljenek meg a 2. Függelék A2-6. vagy A2-7. ábráin látható előírásoknak.

5.3.13 Futópálya földetérési terület fények

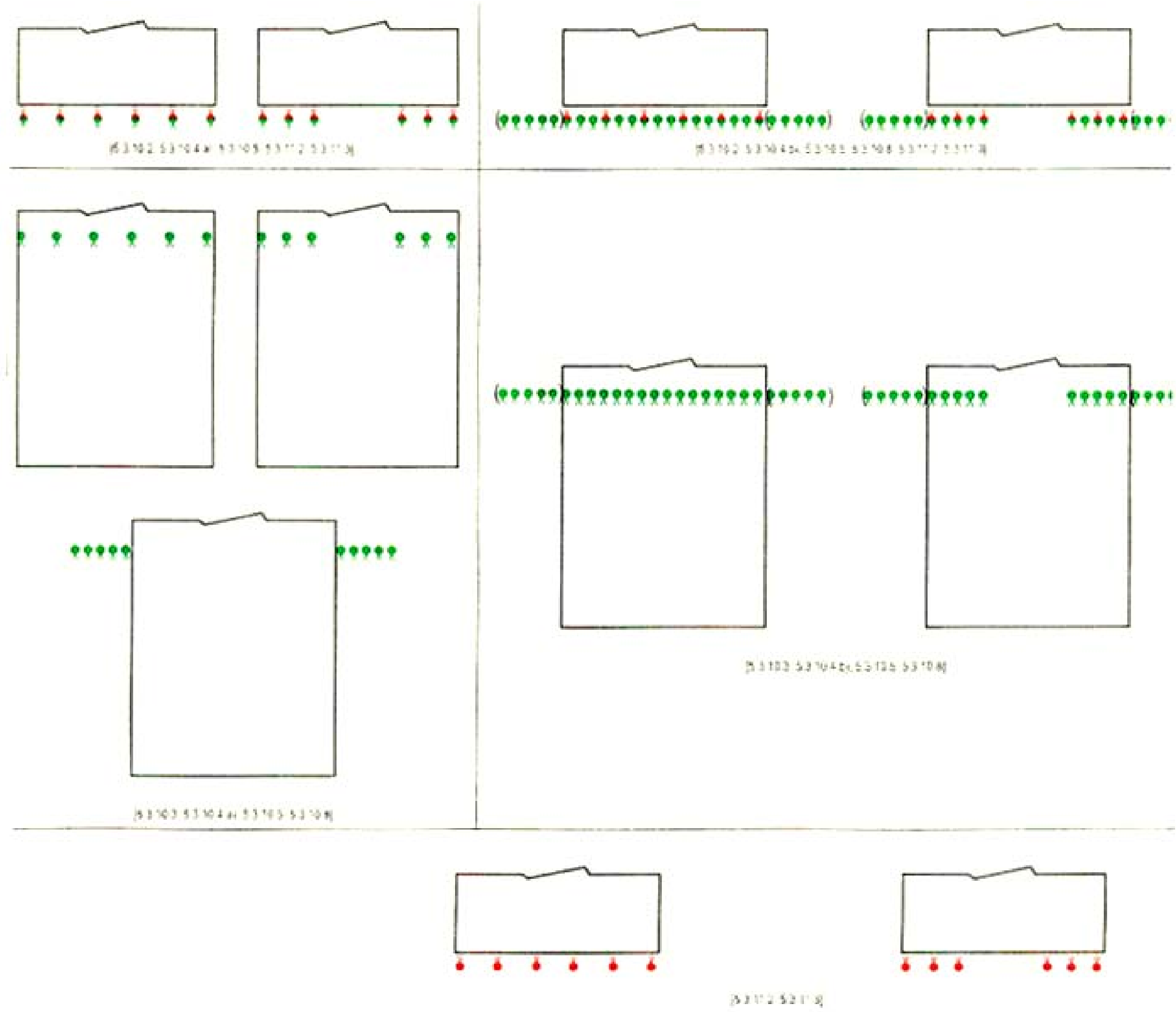
Alkalmazás

5.3.13.1 A II. és III. kategóriás precíziós megközelítésű futópályán el kell helyezni futópálya földetérési terület fényeket.

Elhelyezés

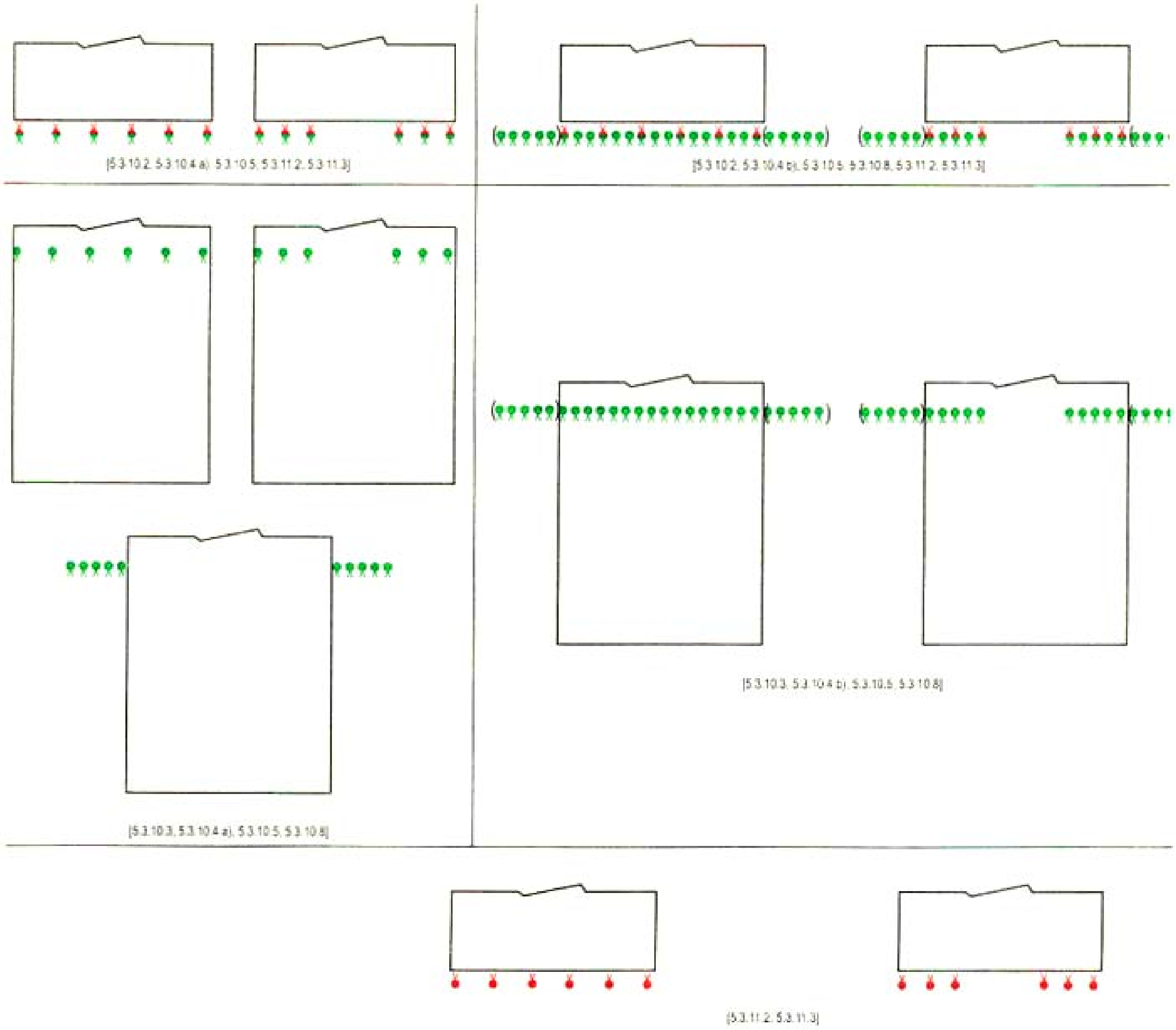
5.3.13.2 A földetérési terület fények a futópálya küszöbtől hosszirányban 900 méter távolságig terjedjenek, kivéve az 1800 méternél rövidebb futópályákat, ahol a fény rendszert úgy rövidítsék meg, hogy az ne terjedjen a futópálya középpontján túl. A fények futópálya középvonala mentén szimmetrikusan elrendezett rövid keresztfénysor párokból álljanak. A párok legbelső fényei közötti térköz (szélesség) azonos legyen a földetérési terület jelzések közötti távközzel. A keresztfénysor párok hosszirányú távköze 30, vagy 60 méter legyen.

Megjegyzés: Az alacsonyabb látástávolság minimummal történő üzemeltetés érdekében a keresztfénysorok között tanácsos lehet a 30 méteres hosszirányú távköz alkalmazása.



Fények # a sugárzás irányát a nyitott (^) jelzi	*Nem műszeres és nem precíziós futópálya*	*I. kategóriás precíziós megközelítésű futópálya*
Futópálya küszöb és futópálya-vég fények	vörös zöld	vörös zöld
Futópálya küszöb fények	zöld	zöld
Futópálya vég fények	vörös	vörös

5-21. (A). ábra: Futópálya küszöb és futópálya-vég fények elrendezése



Fények # a sugárzás irányát a nyitott (^) jelzi	*II. kategóriás precíziós megközelítésű futópálya*	*III. kategóriás precíziós megközelítésű futópálya*
Futópálya küszöb és futópálya-vég fények	vörös zöld	vörös zöld
Futópálya küszöb fények	zöld	zöld
Futópálya vég fények	vörös	vörös

5-21. (B) ábra: Futópálya küszöb és futópálya-vég fények elrendezése

5-21. ábra magyarázat

Futópálya küszöb és futópálya-vég fények elrendezése

Feltétel	**Fények** A sugárzás irányát a nyitott (^) jelzi	Nem műszeres és nem precíziós futópálya	I. kategóriás precíziós megközelítésű futópálya	II. kategóriás precíziós megközelítésű futópálya	III. kategóriás precíziós megközelítésű futópálya
Futópálya küszöb a futópálya végén helyezkedik el	Futópálya küszöb és futópálya-vég fények	vörös zöld	vörös zöld	vörös zöld	vörös zöld
Futópálya küszöb áthelyezve a futópálya végéről	Futópálya küszöb fények	zöld	zöld	zöld	zöld
	Futópálya vég fények	vörös			vörös

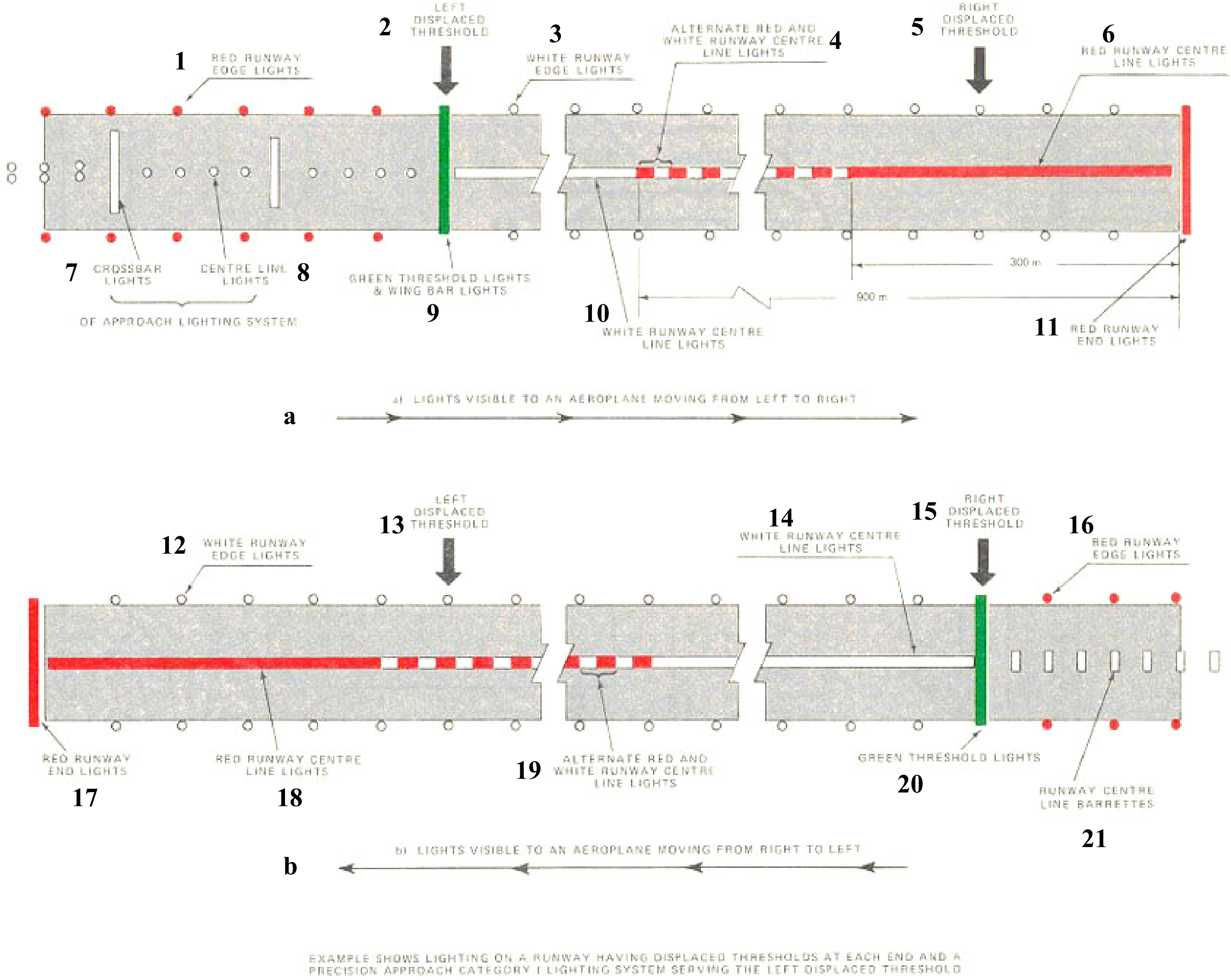
Megjegyzés az ábrához: Az 5-21. ábrán a minimális fény egység szám látható 45 méter széles futópálya esetében, ahol a futópálya szegély fények a futópálya szélén helyezkednek el.

Jellemzők

5.3.13.3 A rövid keresztfénysor legalább három fény-egységből álljon és a közöttük levő térköz 1.5 méternél ne legyen több.

5.3.13.4 ***Ajánlás** — A rövid keresztfénysor hossza ne legyen kevesebb, mint 3 és ne legyen több, mint 4.5 méter.*

5.3.13.5 A földetérési terület fényei állandó rögzített, egyirányú, szabályozható fehér színű fények legyenek.



5-22. ábra: Áthelyezett küszöbbel rendelkező futópálya bevezető és futópálya fény rendszere

Megjegyzés az ábrához: A példában szereplő futópálya mindkét végén áthelyezték a küszöböt és a bal oldali áthelyezett küszöbhöz I. kategóriás precíziós megközelítési bevezető fényrendszert telepítettek.

5-22. ábra magyarázat
Áthelyezett küszöbbel rendelkező futópálya bevezető és futópálya fény rendszere

a) Balról jobbra mozgó repülőgép számára látható fények ***b) Jobbról balra mozgó repülőgép számára látható fények***			
1)	vörös futópálya szegély fény - red runway edge lights	12)	fehér futópálya szegély fény - white runway edge lights
2)	bal oldali áthelyezett futópálya küszöb - left displaced threshold	13)	bal oldali áthelyezett futópálya küszöb - left displaced threshold
3)	fehér futópálya szegély fény - white runway edge light	14)	fehér futópálya középvonal fény - white runway centre line lights
4)	váltakozó vörös és fehér futópálya középvonal fény - alternate red and white runway centre line lights	15)	jobb oldali áthelyezett futópálya küszöb - right displaced threshold
5)	jobb oldali áthelyezett futópálya küszöb - right displaced threshold	16)	vörös futópálya szegély fény - red runway edge lights
6)	vörös futópálya szegély fény - red runway centre line lights	17)	vörös futópálya-vég fény - red runway end lights
7)	bevezető fényrendszer szárny keresztfénysor - crossbar lights of approach lighting system	18)	vörös futópálya középvonal fény - red runway centre line lights
8)	bevezető fényrendszer középvonal fény - centre line lights of approach lighting system	19)	váltakozó vörös és fehér futópálya középvonal fény - alternate red and white runway centre line lights
9)	zöld küszöb fény és szárny keresztfénysor - green threshold lights and wing bar lights	20)	zöld futópálya küszöb fény - green threshold lights
10)	fehér futópálya középvonal fény - white runway centre line lights	21)	futópálya középvonal keresztfénysor - runway centre line barretes
11)	vörös futópálya-vég fény - red runway end lights		

5.3.13.6 A földetérési terület fényei feleljenek meg a 2. Függelék A2-5. ábrán látható előírásoknak.

5.3.14 Gyors legurulóút jelzőfények

Megjegyzés: A gyors legurulóút jelzőfények (RETIL) célja, hogy távolság tájékoztatást nyújtsanak a repülőgépvezető számára a futópályánál található legközelebbi gyors legurulóútról, rossz látási körülmények esetén felhívja erre a figyelmét, valamint lehetővé tegye, hogy a repülőgépvezető a leszállás után hatékonyabb kigurulási és futópálya elhagyási sebességet válasszon. Alapvető fontosságú ezért, hogy a gyors legurulóút jelzőfényekkel ellátott futópályákon működő repülőgépvezetők ismerjék az ilyen fények célját.

Alkalmazás

5.3.14.1 ***Ajánlás*** *— Helyezzenek el gyors legurulóút jelzőfényeket azon a futópályán, amelyet 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak használni és/vagy ahol a repülőtér forgalom sűrűsége erős.*

Megjegyzés: Lásd A. Melléklet 14. szakasz.

5.3.14.2 A gyors legurulóút jelzőfények ne legyenek láthatók fényegység égő, vagy más meghibásodás esetén, amely megakadályozza, hogy a jelzőfények az 5-23. ábrának megfelelően teljes egészükben láthatók legyenek.

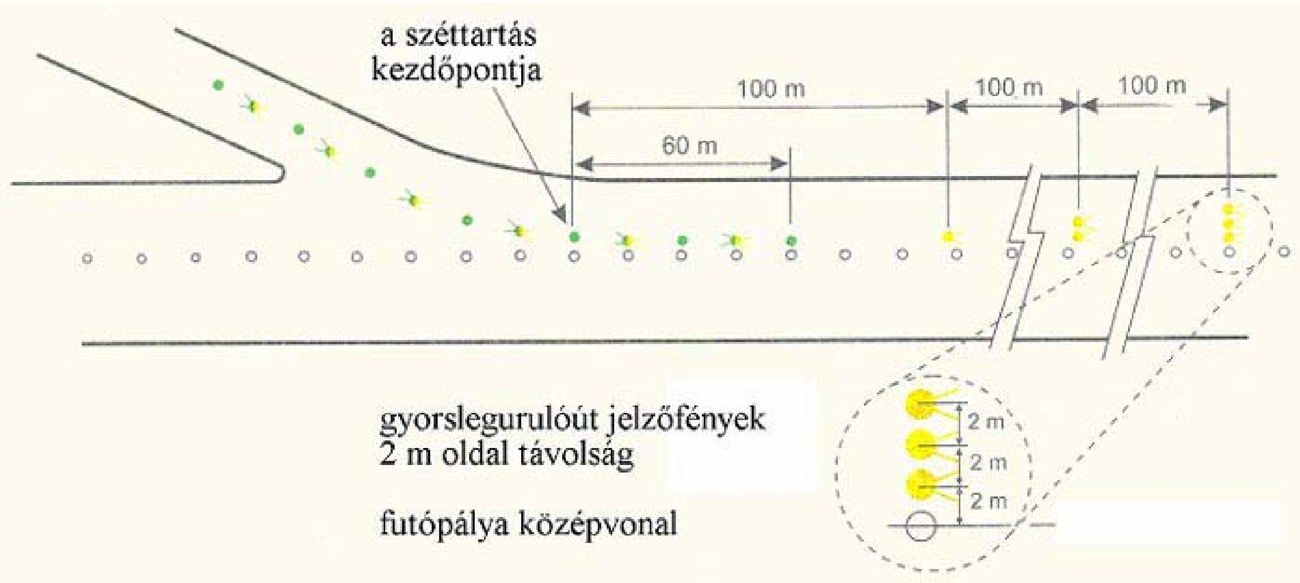
Elhelyezés

5.3.14.3 Gyors legurulóút jelzőfényeket a futópálya középvonal azon oldalára helyezzék el, amelyen a gyors legurulóút található. Az 5-23. ábra szerint telepített jelzőfény sor fények egymástól 2 méterre helyezkedjenek el és a futópálya középvonalhoz legközelebb levő fényegység attól 2 méterre legyen.

5.3.14.4 Ahol a futópályánál egynél több gyors legurulóút található, az egyes legurulóutakhoz tartozó jelzőfények működő állapotban ne fedjék egymást.

Jellemzők

5.3.14.5 A gyors legurulóút jelzőfények rögzített, egyirányú, sárga színt sugárzó fények legyenek, amelyek a leszálló repülőgép vezetője számára a futópálya megközelítési irányából láthatók.



5-23. ábra: Gyors legurulóút jelzőfények (RETILS)

5.3.14.6 A gyors legurulóút jelzőfények feleljenek meg a 2. Függelék A2-6. vagy A2-7. ábráin látható előírásoknak.

5.3.14.7 ***Ajánlás*** *— A gyors legurulóút jelzőfényeket más futópálya fényektől különálló áramkörön lássák el tápfeszültséggel, hogy azok akkor is használható legyenek, amikor más fényeket lekapcsolnak.*

5.3.15 Biztonsági megállási terület fények

Alkalmazás

5.3.15.1 Az éjszaka használt végbiztonsági megállási területhez el kell helyezni biztonsági megállási terület fényeket.

Elhelyezés

5.3.15.2 A biztonsági megállási terület fényeket a terület teljes hosszában, a futópálya középvonalától egyenlő távolságra és a futópálya szegélyfényekkel egy vonalba, két párhuzamos sorban helyezzék el. A végbiztonsági megállási terület végén túl, annak tengelyére megfelelő szögben és a terület végéhez lehető legközelebb, azonban semmi esetre sem több, mint 3 méterrel azon túl is biztosítsanak ilyen fényeket.

Jellemzők

5.3.15.3 A biztonsági megállási terület fények állandó, egyirányú és a futópálya irányba vörös színt sugárzó fények legyenek.

5.3.16 Gurulóút középvonal fények

Alkalmazás

5.3.16.1 A gyors legurulóúton, gurulóúton, jégtelenítő és jégmentesítő létesítménynél és a forgalmi előtéren el kell helyezni gurulóút középvonal fényeket, ha azokat 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánják használni. A fények folyamatos gurulási irányvezetést biztosítsanak a futópálya középvonala és a légijármű állóhely között. A gurulóút középvonal fények nem szükségesek ott, ahol a forgalom alacsony és a gurulóút szegélyfények, valamint a középvonal jelzés megfelelő gurulási útmutatást nyújtanak.

5.3.16.2 ***Ajánlás*** *—Az éjszaka 350 méter, vagy nagyobb futópályamenti látástávolság érték mellett használni kívánt gurulóúton, valamint elsősorban összetett gurulóút kereszteződésekben és gyors legurulóutakon helyezzenek el gurulóút középvonal fényeket. Ezek a gurulóút középvonal fények nem szükségesek ott, ahol a forgalom alacsony és a gurulóút szegélyfények, valamint a középvonal jelzés megfelelő gurulási útmutatást nyújtanak.*

Megjegyzés: Ahol a gurulóút szegélyeinek kijelölése szükséges, például gyors legurulóúton, szűk gurulóúton, vagy havas időjárási körülmények között, ez a gurulóút szegély fényekkel, vagy jelzésekkel teljesíthető.

5.3.16.3 ***Ajánlás —*** *Bármely időjárási körülmények között történő igénybevételre, a felszíni légijármű és gépjármű mozgást irányító és ellenőrző rendszer részeként kijelölt gyors legurulóúton, gurulóúton, jégtelenítő és jégmentesítő létesítményen és forgalmi előtéren helyezzenek el gurulóút középvonal fényeket, hogy azok folyamatos gurulási irányvezetést biztosítsanak a futópálya középvonala és a légijármű állóhely között.*

5.3.16.4 A szabványos gurulási útvonal részét képező futópályán, amelyet 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak gurulásra használni, el kell helyezni gurulóút középvonal fényeket, kivéve, ha a gurulóút középvonal fények nem szükségesek, mert a forgalom alacsony és a gurulóút szegélyfények, valamint a középvonal jelzés megfelelő gurulási útmutatást nyújtanak.

Megjegyzés: A futópálya és gurulóút fényrendszerek összehangolására vonatkozó előírások a 8.2.3 pontban találhatók.

5.3.16.5 ***Ajánlás — *** *Bármely időjárási körülmények között történő igénybevételre, a felszíni mozgást irányító és ellenőrző rendszer részeként meghatározott, a szabványos gurulási útvonal részeként kijelölt futópályán helyezzenek el gurulóút középvonal fényeket.*

Jellemzők

5.3.16.6 A gurulóúton elhelyezett gurulóút középvonal fények, a legurulóút és a szabványos gurulási útvonal részét képező futópálya kivételével állandó rögzített, zöld színt sugárzó fények legyenek, amelyek sugárzási jellemzői olyanok, hogy a fény csak a gurulóúton, vagy annak közelében levő repülőgépekből látható.

5.3.16.7 A legurulóúton elhelyezett gurulóút középvonal fények állandó rögzített fények legyenek. A váltakozó színű gurulóút középvonal fények a futópálya középvonalától kezdődően az ILS/MLS kritikus és érzékeny terület határáig, vagy a belső átmeneti felület alsó éléig — amelyik a futópályától távolabb van — zöld és sárga, majd ez után csak zöld színt sugárzó fények legyenek. (lásd 5-24. ábra) A jelzett határhoz legközelebb levő fény színe mindig sárga legyen. Ahol a légijármű mindkét irányba követheti ugyanazt a középvonalat, az összes középvonal fény a futópályát közelítő légijármű felé zöld színt mutasson.

1. Megjegyzés: A futópályán, vagy annak közelében a futópálya küszöb fényekkel történő összetévesztés lehetőségének kiküszöbölése érdekében gondoskodni kell a zöld színű fények fényelosztásának korlátozásáról.

2. Megjegyzés: A sárga szűrő jellemzői az 1. Függelék 2.2 pontjában találhatók.

3. Megjegyzés: Az ILS/MLS kritikus, vagy érzékeny terület mérete a telepített berendezésektől és egyéb tényezőktől függ. A témakörrel kapcsolatos útmutató a 10. Annex I. kötet 1. Rész C. és G. Mellékleteiben található.

4. Megjegyzés: A futópálya elhagyását jelző jelzés az 5.4.3 pontban található.

5.3.16.8 A gurulóút középvonal fények feleljenek meg a következő előírásoknak:

a) azon gurulóútak, amelyeket 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak gurulásra felhasználni — 2. Függelék A2-12, A2-13. vagy A2-14. ábrák; és

b) egyéb gurulóútak — 2. Függelék A2-15. vagy A2-16. ábra.

5.3.16.9 ***Ajánlás*** *— Ahol üzemeltetési szempontból nagyobb fény intenzitás szükséges, a 350 méternél alacsonyabb futópályamenti látástávolság érték mellett történő igénybevételre tervezett gyors legurulóutak középvonal fényei feleljenek meg a 2. Függelék A2-12. ábra előírásainak. A fényerő beállítási értékek száma annyi legyen, mint amennyit a futópálya középvonal fényeknél alkalmaznak.*

5.3.16.10 ***Ajánlás*** *— Ahol a gurulóút középvonal fények a felszíni mozgást irányító és ellenőrző rendszer kijelölt részei és ahol üzemeltetési szempontokból a földi mozgás bizonyos sebességgel történő fenntartásához igen alacsony látástávolság értékek, vagy nagyon világos nappali körülmények között nagyobb fény intenzitás szükséges, a gurulóút középvonal fények feleljenek meg a 2. Függelék A2-17, A2-18. vagy A2-19. ábrák előírásainak.*

Megjegyzés: A nagy intenzitású középvonal fényeket csak kivételes szükség esetén, egyedi helyszíni tanulmányok elvégzése után használják.

Elhelyezés

5.3.16.11 ***Ajánlás*** *— A gurulóút középvonal fényeket általában a gurulóút középvonal jelzésen helyezzék el kivéve, ha ez gyakorlati szempontból nem célszerű; ekkor azokat a középvonaltól legfeljebb 30 cm oldaltávolságra helyezhetik el.*

Gurulóút középvonal fények a gurulóúton

Elhelyezés

5.3.16.12 ***Ajánlás*** *— A gurulóút egyenes szakaszán a gurulóút középvonal fényeket egymástól legfeljebb 30 méter hosszirányú távolságra helyezzék el, kivéve:*

a) 60 métert nem meghaladó nagyobb távközök is alkalmazhatók, ha a gurulóút középvonal fény az uralkodó időjárási körülmények mellett ilyen távközökkel is megfelelő gurulási irányvezetést nyújt;

b) a rövid egyenes szakaszokon 30 méternél rövidebb távközöket alkalmazhatnak; és

c) azon a gurulóúton, amelyet 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak gurulásra felhasználni, a hosszirányú távköz ne haladja meg a 15 métert.

5.3.16.13 ***Ajánlás** — A gurulóút ívelt szakaszán a gurulóút középvonal fényeket az egyenes szakasztól kezdődően egyenlő távközökben és a gurulóút ív külső szélétől mindig azonos távolságra helyezzék el úgy, hogy az egyértelműen jelezze a gurulás illetve a gurulóút ívét.*

5.3.16.14 ***Ajánlás** — Azon a gurulóúton, amelyet 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak gurulásra felhasználni, az ívelt szakaszon a fények között levő hosszirányú távköz ne haladja meg a 15 métert és ha az ív sugara kisebb, mint 400 méter, a fényeket egymástól legfeljebb 7.5 méterre helyezzék el. Ez a meghatározott távköz az ív előtt és után 60 méter távolságig tarthat.*

1. Megjegyzés: Azon a gurulóúton, amelyet 350 méter, vagy nagyobb futópályamenti látástávolság érték mellett kívánnak gurulásra felhasználni, az ívelt szakaszok fényei között az alábbi távközöket találtuk megfelelőnek:

Ívelt szakasz sugara	*Gurulóút középvonal fény távköz*
400 méterig	*7.5 m*
401 métertől 899 méterig	*15.0 m*
900 méter vagy nagyobb	*30.0 m*

2. Megjegyzés: Lásd a 3.9.6 pontot, valamint a 3-2. ábrát.

Gurulóút középvonal fények a gyors legurulóúton

Elhelyezés

5.3.16.15 ***Ajánlás** — A gyors legurulóúton a gurulóút középvonal fények legalább 60 méterrel a gurulóút középvonal ívelt szakasza előtt kezdődjenek és az ív végén a gurulóút középvonalon levő azon pontig tartsanak, ahol a repülőgép várhatóan rendes gurulási sebességre lassul le. A fények a futópálya középvonallal párhuzamos szakaszon az 5-25. ábrának megfelelően bármely futópálya középvonal fénysor fény-egységtől legalább 60 cm távolságra helyezkedjenek el.*

5.3.16.16 ***Ajánlás** — A fényeket egymástól legfeljebb 15 méter hosszirányú távolságban helyezzék el, kivéve azokat a helyeket, ahol futópálya középvonal fényeket nem használnak, mert itt 30 métert meg nem haladó nagyobb távközöket is alkalmazhatnak.*

Gurulóút középvonal fények más legurulóúton

Elhelyezés

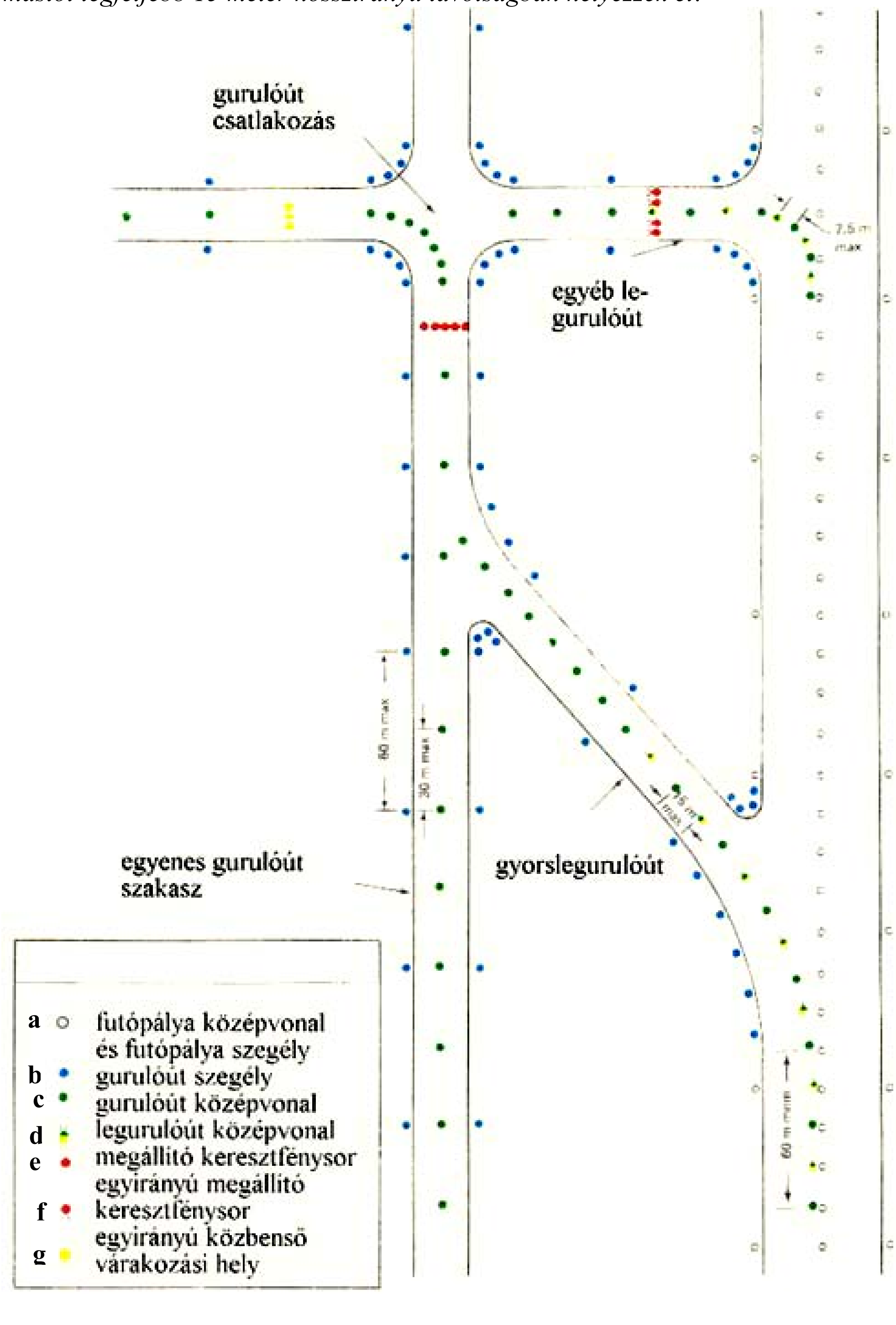
5.3.16.17. ***Ajánlás** — A nem gyors legurulóúton a gurulóút középvonal fények ott kezdődjenek, ahol a gurulóút középvonal jelzés a futópálya középvonaltól elkanyarodik és legalább addig kövessék az ívelt gurulóút középvonal jelzést, amíg az a futópályát elhagyja. Az első fény az 5-25. ábrának megfelelően bármely futópálya középvonal fénysor fény-egységtől legalább 60 cm távolságra helyezkedjen el.*

5.3.16.18 ***Ajánlás** — A fényeket egymástól legfeljebb 7.5 méter hosszirányú távolságban helyezzék el.*

Gurulóút középvonal fények a futópályán

Elhelyezés

5.3.16.19 ***Ajánlás*** *— A szabványos gurulási útvonal részét képező futópályán, amelyet 350 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánnak gurulásra használni, a gurulóút középvonal fényeket egymástól legfeljebb 15 méter hosszirányú távolságban helyezzék el.*



5-24. ábra: Gurulóút fények

5-24. ábra magyarázata

a) futópálya középvonal és szegély fények

b) gurulóút szegély fények (kék)

c) gurulóút középvonal fények (zöld)

d) legurulóút középvonal fények (zöld és sárga)

e) megállító keresztfénysor (vörös)

f) egy-irányba sugárzó megállító keresztfénysor (vörös)

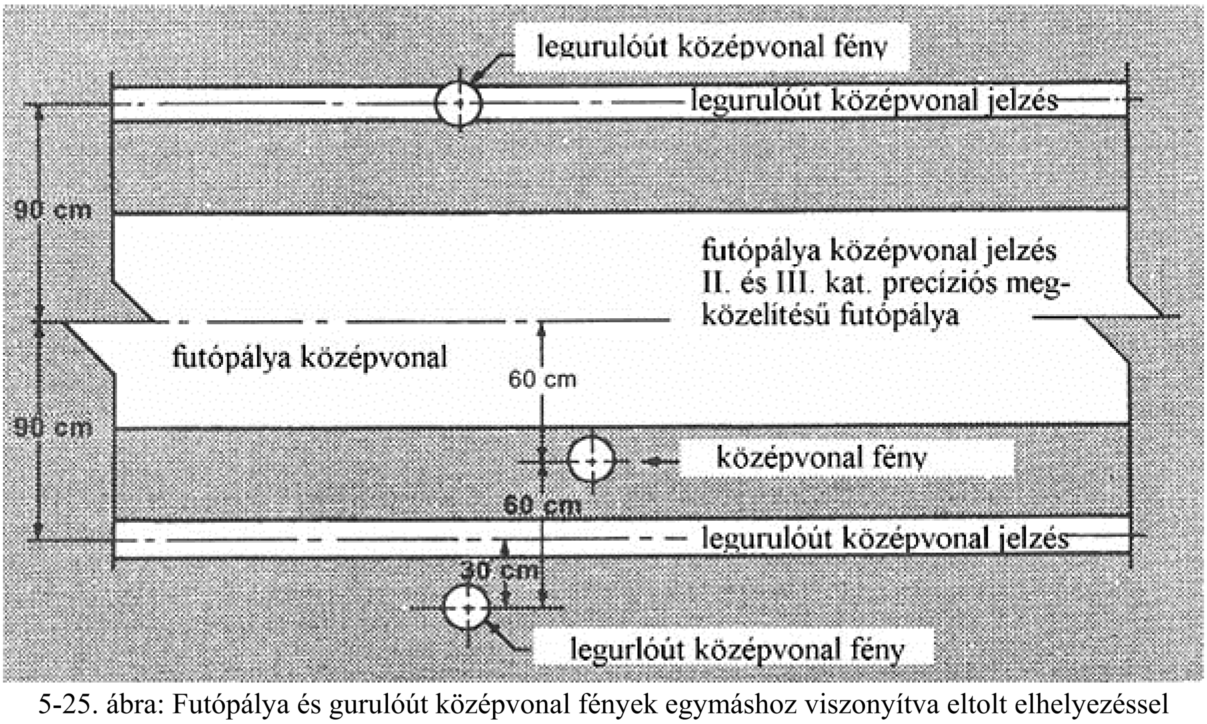
g) egy-irányba sugárzó közbenső várakozási hely fények (sárga)

5.3.17 Gurulóút szegély fények

Alkalmazás

5.3.17.1 El kell helyezni gurulóút szegély fényeket az éjszaka használni kívánt futópálya megforduló sávon, kitérő várakozó helyen, jégtelenítő és jégmentesítő létesítménynél, forgalmi előtéren, valamint a gurulóút középvonal fényekkel el nem látott éjszaka is igénybe vett gurulóúton. A gurulóút szegély fények nem szükségesek ott, ahol az üzemeltetés természetéből adódóan a felület megvilágításával, vagy egyéb módon megfelelő gurulási útmutatás biztosítható.

Megjegyzés: A gurulóút szegély jelzések ismertetése az 5.5.5 pontban található.



5-25. ábra: Futópálya és gurulóút középvonal fények egymáshoz viszonyítva eltolt elhelyezéssel

Megjegyzés az ábrához: Határ területek a futópálya és gurulóút középvonal fények közötti 60 cm. távolság fenntartásához.

5.3.17.2 El kell helyezni gurulóút szegély fényeket a szabványos gurulási útvonal részét képező és éjszaka gurulásra használni kívánt futópályán, amennyiben az gurulóút középvonal fényekkel nincs ellátva.

Megjegyzés: A futópálya és gurulóút fényrendszer összehangolására vonatkozó előírások a 8.2.3 pontban találhatók.

Elhelyezés

5.3.17.3 ***Ajánlás*** *— A szabványos gurulási útvonal részét képező futópályán, valamint a gurulóút egyenes szakaszán a gurulóút szegély fényeket egységesen, egymástól legfeljebb 60 méter hosszirányú távolságban helyezzék el. A fényeket a gurulóút ívelt szakaszán egymástól 60 méternél kisebb távolságra úgy helyezzék el, hogy a fények egyértelműen jelezzék a gurulóút fordulót.*

Megjegyzés: A gurulóút szegélyfények ívelt szakaszon történő elhelyezésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

5.3.17.4 ***Ajánlás*** *— A gurulóút szegély fényeket a kitérő várakozó helyen, jégtelenítő és jégmentesítő létesítménynél, forgalmi előtéren, stb. egységesen, egymástól legfeljebb 60 méter hosszirányú távolságban helyezzék el.*

5.3.17.5 ***Ajánlás*** *— A gurulóút szegély fényeket a futópálya megforduló sávon egységesen, egymástól legfeljebb 60 méter hosszirányú távolságban helyezzék el.*

5.3.17.6 ***Ajánlás*** *— A fényeket a futópálya megforduló sáv, a gurulóút, kitérő várakozó hely, jégtelenítő és jégmentesítő létesítmény, forgalmi előtér, vagy futópálya széléhez lehető legközelebb, vagy a szegélyen túl, de attól legfeljebb 3 méterre helyezzék el.*

Jellemzők

5.3.17.7 A gurulóút szegély fények rögzített, kék színt sugárzó fények legyenek, amelyek a vízszintes felett legalább 30°-os és minden olyan oldalszögbe láthatók, amely a gurulást bármely irányba végrehajtó repülőgépvezető számára szükséges. A csatlakozásnál, kijáratnál, vagy ívelt szakasznál a fényeket úgy árnyékolják, hogy azok ne látszódjanak olyan oldalszögben, amelyben más fényekkel összetéveszthetők lehetnek.

5.3.18 Futópálya megforduló sáv fények

Alkalmazás

5.3.18.1 El kell helyezni futópálya megforduló sáv fényeket a 350 méternél alacsonyabb futópályamenti látástávolság érték mellett használni kívánt futópálya megforduló sávon, hogy folyamatos irányvezetést biztosítson a repülőgép részére a 180°-os megfordulás végrehajtásához és a futópálya középvonalához történő visszatéréshez.

5.3.18.2 ***Ajánlás*** *— Helyezzenek el futópálya megforduló sáv fényeket az éjszaka használni kívánt futópálya megforduló sávon.*

Elhelyezés

5.3.18.3 ***Ajánlás*** — A *futópálya megforduló sáv fényeket általában a futópálya megforduló sáv jelzésen helyezzék el kivéve, ha ez gyakorlati szempontból nem célszerű; ekkor azokat a középvonaltól legfeljebb 30 cm oldaltávolságra helyezhetik el.*

5.3.18.4 ***Ajánlás*** *— A futópálya megforduló sáv fényeket a futópálya megforduló sáv jelzés egyenes szakaszán egymástól legfeljebb 15 méter hosszirányú távolságra helyezzék el.*

5.3.18.5 ***Ajánlás*** *— A futópálya megforduló sáv jelzés ívelt szakaszán a futópálya megforduló sáv fények közötti távköz 7.5 méternél több ne legyen.*

Jellemzők

5.3.18.6 A futópálya megforduló sáv fények rögzített, egyirányú, zöld színt sugárzó fények legyenek, olyan fénysugárzással, hogy az csak a futópálya megforduló sávot megközelítő repülőgépekből legyen látható.

5.3.18.7 A futópálya megforduló sáv fényei feleljenek meg a 2. Függelék A2-12, A2-13. vagy A2-14. ábra előírásainak.

5.3.19 Megállító keresztfénysor

Alkalmazás

1. Megjegyzés: A megállító keresztfénysor alkalmazása esetében azt a légiforgalmi szolgálatoknak kézi, vagy automatikus vezérléssel kell működtetniük.

2. Megjegyzés: A futópályára engedély nélkül történő belépés minden időjárási és látási körülmények között bekövetkezhet. A megállító keresztfénysor elhelyezése és alkalmazása a futópálya várakozási helyeknél éjszaka és 550 méternél magasabb futópályamenti látástávolság érték mellett hatékony védelmet jelenthet a futópályára történő engedély nélküli belépés megelőzésére.

5.3.19.1 El kell helyezni megállító keresztfénysort a futópályát kiszolgáló minden futópálya várakozási helynél, amikor a futópályát 350 méternél alacsonyabb futópályamenti látástávolság értéknél kívánják használni kivéve, ahol:

a) megfelelő segédeszközök és eljárások állnak rendelkezésre a légijármű és egyéb járművek futópályára történő véletlen és engedély nélküli belépésének megelőzésére; vagy

b) az 550 méternél alacsonyabb futópályamenti látástávolság érték esetére üzemeltetési eljárásokat dolgoztak ki és alkalmaznak:

1) a mozgási területen egy időben üzemelő légijárművek számának egyre történő korlátozására; és

2) a mozgási területen működő egyéb járművek számának a szükséges legkisebbre történő korlátozására.

5.3.19.2 El kell helyezni megállító keresztfénysort a futópályát kiszolgáló minden futópálya várakozási helynél, amikor a futópályát 550 méter és 350 méter közötti futópályamenti látástávolság értéknél kívánják használni kivéve, ahol:

a) megfelelő segédeszközök és eljárások állnak rendelkezésre a légijármű és egyéb járművek futópályára történő véletlen és engedély nélküli belépésének megelőzésére; vagy

b) az 550 méternél alacsonyabb futópályamenti látástávolság érték esetére üzemeltetési eljárásokat dolgoztak ki és alkalmaznak:

1) a mozgási területen egy időben üzemelő légijárművek számának egyre történő korlátozására; és

2) a mozgási területen működő egyéb járművek számának a szükséges legkisebbre történő korlátozására.

5.3.19.3 ***Ajánlás*** *— A közbenső várakozási helynél helyezzenek megállító keresztfénysort, ha kívánatos a jelzések fényekkel történő kiegészítése és a forgalom látás utáni eszközökkel történő irányítása.*

5.3.19.4 ***Ajánlás*** *— Ahol a megállító keresztfénysor takarásba kerülhet, vagy bizonyos körülmények között, mint például eső, vagy havazás, a repülőgépvezető számára nem látható, illetve ahol a repülőgépvezető a fényekhez olyan közel kell megállítsa a légijárművet, hogy annak (sárkány) szerkezete a megállító keresztfénysort eltakarja, a fényegység minden végére emelt fény-párt szereljenek fel.*

Elhelyezés

5.3.19.5 A megállító keresztfénysort a gurulóút azon pontján helyezzék el, ahol a forgalmat meg akarják állítani. Ahol az 5.3.19.4 pontban jelzett kiegészítő fényeket alkalmazzák, ezek a gurulóút szélétől legalább 3 méter távolságra legyenek.

Jellemzők

5.3.19.6 A megállító keresztfénysor a gurulóúton keresztbe, 3 méterenként elhelyezett, a kereszteződés, vagy futópálya várakozási hely megközelítésének várható irányaiba vörös színt mutató fényekből álljon.

5.3.19.7 A futópálya várakozási helynél elhelyezett megállító keresztfénysor egyirányú, a futópálya megközelítésének irányába vörös színt sugárzó fényekből álljon.

5.3.19.8 Ahol az 5.3.19.4 pontban meghatározott kiegészítő fényeket alkalmazzák, ezek a megállító keresztfénysorral azonos jellemzőkkel rendelkezzenek, azonban azok a közeledő légijármű számára egészen a megállító keresztfénysor helyéig láthatók legyenek.

5.3.19.9 Külön kapcsolható megállító fényeket helyezzenek el legalább három gurulóút középvonal fénnyel együttesen (a megállító keresztfény-sortól legalább 90 méter hosszan) abba az irányba, amelybe a légijármű a megállító kereszt-fénysortól haladni fog.

Megjegyzés: A gurulóút középvonal fények között távközre vonatkozó előírás az 5.3.16.12 pontban található.

5.3.19.10 A megállító keresztfénysor vörös színű fényeinek intenzitása és sugárzása feleljen meg a 2. Függelék A2-12. — A2-16. ábrák előírásainak.

5.3.19.11 ***Ajánlás —*** *Ahol a megállító keresztfénysorok a felszíni légijármű és gépjármű mozgást irányító és ellenőrző rendszer részei, valamint ahol üzemeltetési szempontokból a földi mozgás bizonyos sebességgel történő fenntartásához igen alacsony látástávolság értékek, vagy nagyon világos nappali körülmények között nagyobb fény intenzitás szükséges, a megállító keresztfénysorok vörös fénye és sugárzása feleljen meg a 2. Függelék A2-17, A2-18. vagy A2-19. ábrák előírásainak.*

Megjegyzés: A nagy intenzitású megállító keresztfénysor fényeket csak kivételes szükség esetén, egyedi helyszíni tanulmányok elvégzése után használják.

5.3.19.12 ***Ajánlás —*** *Ahol széles sugárzású fény-egység szükséges, a megállító keresztfénysorok vörös fénye és sugárzása feleljen meg a 2. Függelék A2-17. vagy A2-19. ábra előírásainak.*

5.3.19.13 A fények elektromos áramköreit úgy tervezzék meg, hogy:

a) a bejárati gurulóutakon keresztben elhelyezett megállító keresztfénysorok külön kapcsolhatók legyenek;

b) a csak legurulásra használni kívánt gurulóutakon keresztben elhelyezett megállító keresztfénysorok külön, vagy csoportokban kapcsolhatók legyenek;

c) ha a megállító keresztfénysor világít, az utána elhelyezett gurulóút középvonal fények legalább 90 méter hosszan legyenek kikapcsolva; és

d) a megállító keresztfénysorok a gurulóút középvonal fényekhez úgy legyenek csatlakoztatva, hogy ha a megállító keresztfénysor után levő gurulóút középvonal fények világítanak, a keresztfénysor kikapcsolt helyzetben legyen és fordítva.

1. Megjegyzés: A megállító keresztfénysor bekapcsolt állapotban azt jelzi, hogy a forgalom itt álljon meg, kikapcsolt állapotban pedig azt, hogy a forgalom továbbhaladhat.

2. Megjegyzés: Az elektromos rendszer tervezésénél gondoskodjanak arról, hogy a megállító keresztfénysor összes fény-egysége ne váljon egy-időben üzemképtelenné. A témakörrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *5. részében található.*

5.3.20 Közbenső várakozási hely fények

Megjegyzés: A közbenső várakozási hely jelzésekre vonatkozó előírások az 5.2.11 pontban találhatók.

Alkalmazás

5.3.20.1 Ha nem telepítettek megállító keresztfénysort, a közbenső várakozási helynél el kell helyezni közbenső várakozási hely fényeket abban az esetben, amennyiben a futópályát 350 méternél alacsonyabb futópályamenti látástávolság értéknél kívánják használni.

5.3.20.2 ***Ajánlás*** *— Helyezzenek el közbenső várakozási hely fényeket azon a közbenső várakozási helyen, ahol a megállító keresztfénysor állj/tovább jelzésére nincs szükség.*

Elhelyezés

5.3.20.3 A közbenső várakozási hely fényeket a közbenső várakozási hely jelzésnél, a jelzés előtt 0.3 méterrel helyezzék el.

Jellemzők

5.3.20.4 A közbenső várakozási hely fények legalább három darab, állandó rögzített, egyirányú, a közbenső várakozási hely megközelítési irányába sárga színt sugárzó fény-egységből álljanak és fény elosztásuk a gurulóút középvonal fényekhez (ha ilyet telepítettek) hasonló legyen. A fényeket szimmetrikusan, a gurulóút középvonalhoz viszonyítva megfelelő szögben, egymástól 1.5 méterre helyezzék el.

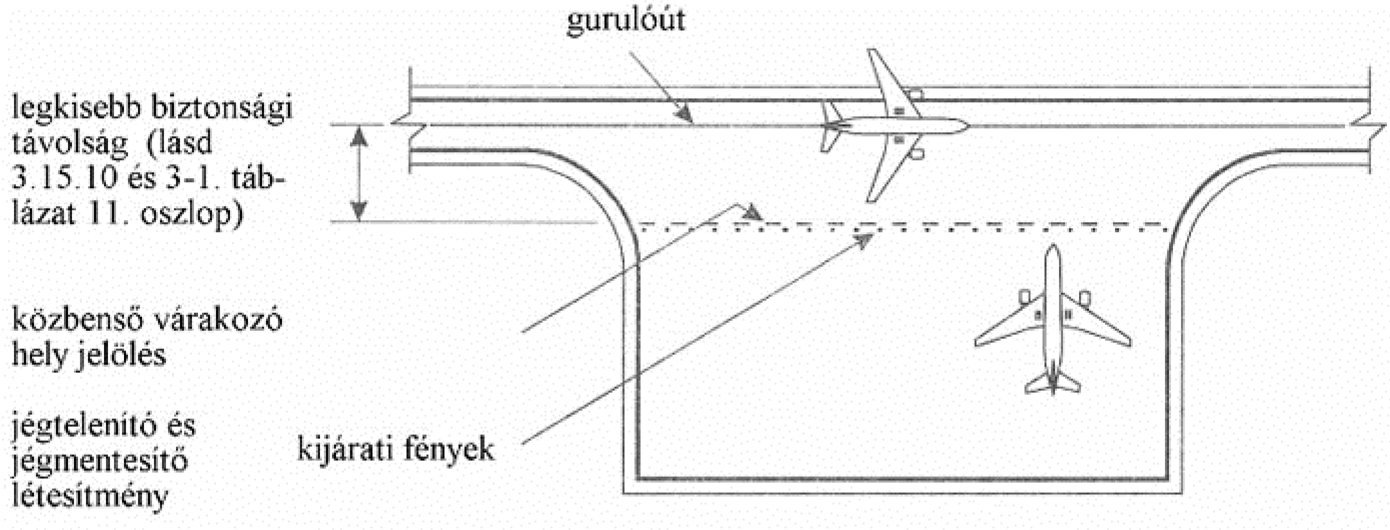
5.3.21 Jégtelenítő és jégmentesítő létesítmény kijárati fények

Alkalmazás

5.3.21.1 ***Ajánlás —*** *Helyezzenek el jégtelenítő és jégmentesítő létesítmény kijárati fényeket a gurulóúthoz csatlakozó távoli jégtelenítő és jégmentesítő létesítmény határán.*

Elhelyezés

5.3.21.2 A jégtelenítő és jégmentesítő létesítmény kijárati fényeket a távoli jégtelenítő és jégmentesítő létesítmény határán levő közbenső várakozási hely jelzéstől befelé, attól 0.3 méter távolságra helyezzék el.



5-26. ábra: A légijármű állóhelytől távoli jégtelenítő és jégmentesítő létesítmény általános elrendezése

Jellemzők

5.3.21.3 A jégtelenítő és jégmentesítő létesítmény kijárati fények a burkolatba épített állandó rögzített, egymástól 6 méter távolságra levő, egyirányú, a kijárat megközelítési irányába sárga színt sugárzó fényegységből álljanak és fény elosztásuk a gurulóút középvonal fényekhez hasonló legyen (lásd 5-26. ábra).

5.3.22 Futópálya védő (biztosító) fény

Megjegyzés: A futópálya védő biztosító fények célja a gurulóúton közlekedő légijárművek és gépjárművek vezetőinek figyelmeztetése arra, hogy aktív futópályára történő belépés előtt állnak. A futópálya védő biztosító fényeket két szabványos elrendezésben az 5-27. ábra szerint lehet elhelyezni.

Alkalmazás

5.3.22.1 Az A. elrendezés szerint el kell helyezni futópálya védő biztosító fényeket minden egyes gurulóút és futópálya kereszteződésnél, amennyiben a futópályát a következő körülmények között kívánják használni:

a) a futópályamenti látástávolság érték 550 méternél kevesebb és megállító keresztfénysort nem helyeztek el; és

b) a futópályamenti látástávolság érték 550 és 1200 méter között van és nagy a forgalom.

5.3.22.2 ***Ajánlás*** *— Az A. elrendezés szerint helyezzenek el futópálya védő biztosító fényeket minden egyes gurulóút és futópálya kereszteződésnél, amennyiben a futópályát a következő körülmények között kívánják használni:*

a) a futópályamenti látástávolság érték 550 méternél kevesebb és megállító keresztfénysort helyeztek el; és

b) a futópályamenti látástávolság érték 550 és 1200 méter között van és a forgalom közepes vagy alacsony.

5.3.22.3 ***Ajánlás*** *— Helyezzenek el futópálya védő biztosító fényeket az A. vagy a B. illetve mindkét elrendezés szerint minden egyes gurulóút és futópálya kereszteződésnél, ha szükséges a kereszteződés jobb* *megjelölése, például a széles gurulóút torkolat esetében. A B. elrendezés szerinti futópálya védő biztosító fényekkel együtt megállító keresztfénysort ne helyezzenek el.*

Elhelyezés

5.3.22.4 Az A. elrendezés szerint telepített futópálya védő biztosító fényeket a gurulóút mindkét oldalán, a futópálya középvonaltól számítva, a felszálló futópályára a 3-2. táblázatban meghatározott távolságnál nem közelebb helyezzék el.

5.3.22.5 A B. elrendezés szerint telepített futópálya védő biztosító fényeket a gurulóúton keresztbe, a futópálya középvonaltól számítva, a felszálló futópályára a 3-2. táblázatban meghatározott távolságnál nem közelebb helyezzék el.

Jellemzők

5.3.22.6 Az A. elrendezés szerint telepített futópálya védő biztosító fények két pár sárga színű fény egységből álljanak.

5.3.22.7 ***Ajánlás** — Ahol a nappal felhasználni kívánt A. elrendezés szerint telepített futópálya védő biztosító fények be és kikapcsolt állapotának jobb megkülönböztethetősége szükséges, minden egyes fényegység felett a napsugárzás a lencse-rendszerbe történő behatolásának megelőzése érdekében megfelelő méretű árnyékolást alakítsanak ki úgy, hogy az ne zavarja az egység működését.*

Megjegyzés: Az árnyékolás helyet más alkalmas eszköz, vagy módszer, például különleges lencse-rendszer is használható.

5.3.22.8 A B. elrendezés szerint telepített futópálya védő biztosító fények a gurulóúton keresztben, egymástól 3 méter távolságra elhelyezett sárga színű fény egységekből álljanak.

5.3.22.9 A fénysugár(zás) egyirányú legyen és azt úgy szabályozzák be, hogy a várakozási helyhez közeledő repülőgép vezetője számára látható legyen.

5.3.22.10 ***Ajánlás** — Az A. elrendezés szerint telepített futópálya védő biztosító sárga fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-24. ábráján látható előírásnak.*

5.3.22.11 ***Ajánlás** — A nappal felhasználni kívánt A. elrendezés szerint telepített futópálya védő biztosító fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-25. ábra előírásának.*

5.3.22.12 ***Ajánlás** — Ahol a futópálya védő biztosító fények a felszíni mozgást irányító és ellenőrző rendszer kijelölt részei és nagyobb fény intenzitás szükséges, az A. elrendezés szerint telepített sárga fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-25. ábra előírásának.*

Megjegyzés: A földi mozgás rossz látási körülmények között bizonyos sebességgel történő fenntartásához nagyobb intenzitásra is szükség lehet.

5.3.22.13 ***Ajánlás** — A B. elrendezés szerint telepített futópálya védő biztosító sárga fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-12. ábra előírásának.*

5.3.22.14 ***Ajánlás** — A nappal felhasználni kívánt B. elrendezés szerint telepített futópálya védő biztosító fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-20. ábra előírásának.*

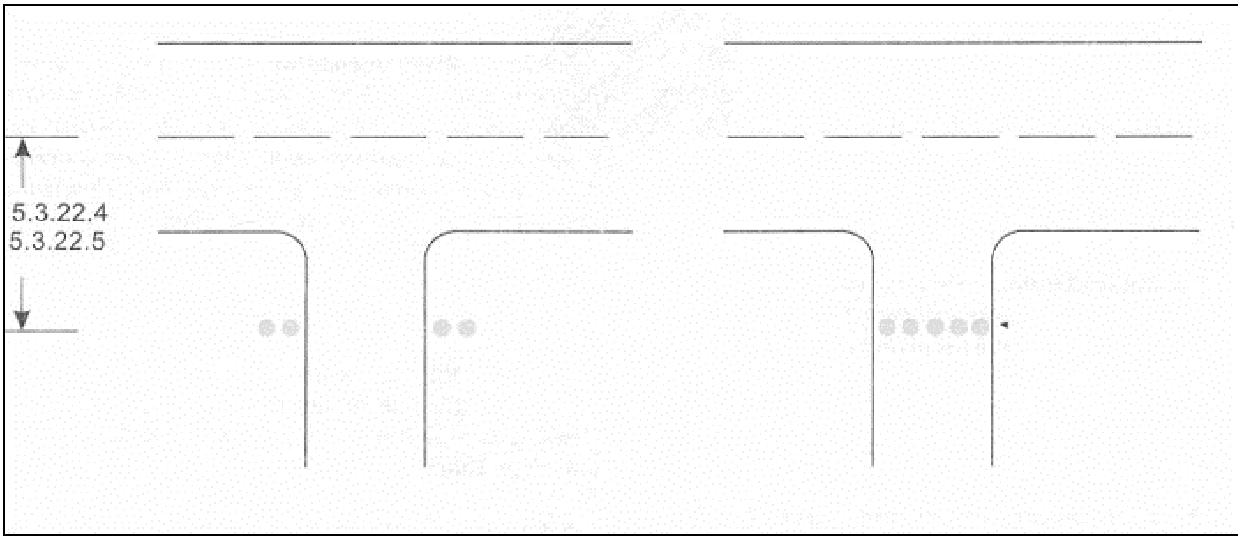
5.3.22.15 ***Ajánlás** — Ahol a futópálya védő biztosító fények a felszíni légijármű és gépjármű mozgást irányító és ellenőrző rendszer részei és nagyobb fény intenzitás szükséges, a B. elrendezés szerint telepített* *sárga fények tényleges fényerőssége és fénysugárzása feleljen meg a 2. Függelék A2-20. ábra előírásának.*

5.3.22.16 Az A. elrendezés szerint telepített fény egységek egyes fényei külön váltakozva villogjanak.

5.3.22.17 A B. elrendezés szerint telepített fény egységek egymás mellett levő fényei váltakozva és a sorban egységesen villogjanak.

5.3.22.18 A fények percenként 30 és 60 alkalom között villanjanak fel, a felvillanási, illetve a sötét időszakok az egyes fényeknél váltakozók és azonosak legyenek.

Megjegyzés: A legkedvezőbb felvillanási arány érték az alkalmazott égők felgyulladási jellemzőitől függnek. Az A. elrendezés szerint 6.6 Amperes soros áramkörbe telepített fény egységek égői percenként 45 — 50 felvillanásnál, a B. elrendezés szerint 6.6 Amperes soros áramkörbe telepített fény egységek égői pedig percenként 30 — 32 alkalommal történő felvillanásnál látszottak a legjobban.



A. elrendezés
egy pár egyirányú, villogó, sárga színt sugárzó fény-egység

B. elrendezés
egyirányú, villogó, sárga színt sugárzó fény-egységek egymástól 3 méter távközökben

legkisebb biztonsági távolság a középvonaltól - lásd: 5.3.22.4 és 5.3.22.5 pontokat

5-27. ábra: Futópálya védő (biztosító) fények

5.3.23 Forgalmi előtér reflektoros világítása (lásd még 5.3.16.1 és 5.3.17.1 pontok)

Alkalmazás

5.3.23.1 ***Ajánlás*** — *Az éjszaka használni kívánt forgalmi előteret, jégtelenítő és jégmentesítő létesítményt, valamint kijelölt elkülönített légijármű állóhelyet lássák el reflektoros világítással.*

1. Megjegyzés: Ahol a jégtelenítő és jégmentesítő létesítmény a futópálya közelében található és az állandó reflektoros világítás zavarhatja a repülőgépvezetőket, a létesítmény más módszerrel történő megvilágítására lehet szükség.

2. Megjegyzés: Az elkülönített légijármű állóhely meghatározása a 3.14 pontban található.

3. Megjegyzés: A forgalmi előtér reflektoros világításra vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Elhelyezés

5.3.23.2 ***Ajánlás*** *— A forgalmi előtér reflektoros világítását úgy helyezzék el, hogy az megfelelően megvilágítsa a forgalmi előtér összes kiszolgálási területét, a lehető legkisebb mértékben vakítsa, vagy tükröződéssel zavarja a levegőben, vagy a földön üzemelő légijármű vezetőit, a repülőtér légiforgalmi irányítóit, valamint a forgalmi előtéren dolgozó személyeket. A reflektorok fénysugárzását úgy állítsák be és szabályozzák, hogy az árnyék vetés korlátozása érdekében egy légijármű állóhely legalább két, vagy több irányból kapjon fényt.*

Jellemzők

5.3.23.3 A forgalmi előtér reflektoros világításának fényelosztása olyan legyen, hogy a légijárművek rendszeres kiszolgálásával kapcsolatos jelölések, valamint a felületi és akadály jelzések színei jól felismerhetők és pontosan azonosíthatók legyenek.

5.3.23.4 ***Ajánlás*** *— Az átlagos fénysugárzási érték legalább a következő legyen:*

Légijármű állóhely:

— vízszintes fénysugárzás — nem több, mint 4:1 arányú változás mellett (átlagostól a legalacsonyabbig) 20 lux fényerő; és

— függőleges fénysugárzás — a forgalmi előtér szintje felett 2 méter magasságban a megfelelő irányokba 20 lux fényerő.

Más területek a forgalmi előtéren:

— vízszintes fénysugárzás — nem több, mint 4:1 arányú változás mellett (átlagostól a legalacsonyabbig) a légijármű állóhely világítás érték 50 %-a.

5.3.24 Látás utáni beállító rendszer

Alkalmazás

5.3.24.1 Ha a légijármű pontos beállását a légijármű állóhelyre látás utáni berendezéssel kívánják biztosítani és más módszer alkalmazása (például előtér-ügyeletes igénybevétele) gyakorlati szempontból nem megfelelő, az állóhelynél látás utáni beállító rendszert kell elhelyezni.

Megjegyzés: A látás utáni beállító rendszer igénybevételét indokoló tényezők elsősorban a következők:

— a légijármű állóhelyet igénybe vevő légijárművek száma és típusa;

— időjárási körülmények;

— a forgalmi előtéren rendelkezésre álló terület nagysága; és

— a légijármű állóhelyre történő beállás pontosságának foka a kiszolgáló berendezések, mint például az utasbeszálló hidak és gépészeti egységek függvényében.

Megjegyzés: A megfelelő rendszerek kiválasztására vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében* - Látás utáni segédberendezések - *található.*

5.3.24.2 A következő pontokban található előírások nem teszik szükségessé a meglevő berendezések lecserélését 2005 január 1. előtt:

5.3.24.3 — 5.3.24.7 valamint 5.3.24.9, 5.3.24.10, 5.3.24.12 — 5.3.24.15, 5.3.24.17, 5.3.24.18 és 5.3.24.20.

Jellemzők

5.3.24.3 A rendszer középvonal irányvezetést, valamint megállási helyzetjelzést kell, hogy adjon.

5.3.24.4 A középvonal irányvezető egység és a megállási helyzetjelző alkalmas legyen nappal, valamint éjszaka, minden időjárási, látási, háttér világítási körülmény és minden fajta burkolt felület állapot között tervezett igénybevételre. A rendszer (fény)egységei a repülőgépvezetőt ne vakítsák.

Megjegyzés: A rendszer tervezésénél és helyszíni telepítésénél gondoskodjanak arról, hogy a napfény, vagy más fény visszaverődése ne csökkentse a rendszer által biztosított látás utáni tájékoztatások pontosságát és láthatóságát.

5.3.24.5 A középvonal irányvezető egység és a megállási helyzetjelző:

a) olyan legyen, hogy pontosan és egyértelműen jelezze az egyik, vagy mindkét egység meghibásodását a repülőgépvezető számára; és

b) kikapcsolható legyen.

5.3.24.6 A középvonal irányvezető egységet és a megállási helyzetjelzőt úgy helyezzék el, hogy folyamatos irányvezetést biztosítson a légijármű állóhely jelzések és légijármű állóhely beállító fények — ha vannak — illetve a látás utáni beállító rendszer között.

5.3.24.7 A látás utáni beállító rendszer pontossága feleljen meg azon utasbeszálló híd, valamint a rögzített légijármű kiszolgáló berendezések típusainak, amelyekkel azt együtt használják.

5.3.24.8 ***Ajánlás** — A rendszer lehetőleg választó kapcsolás nélkül használható legyen minden olyan légijármű típus számára, amelyik a légijármű állóhelyet igénybe veszi.*

5.3.24.9 Ha a rendszert egy adott légijármű típus számára az igénybevétel előtt át kell kapcsolni, azon a repülőgépvezető, valamint a rendszer kezelője számára jól látható legyen a kiválasztott légijármű típus, mert ezzel biztosítható a helyes beállítás ellenőrzése.

Középvonal irányvezető egység

Elhelyezés

5.3.24.10 A középvonal irányvezető egység a légijármű előtt, az állóhely középvonalának meghosszabbításában, vagy annak közelében helyezkedjen el úgy, hogy jelzései a teljes beállási művelet alatt a pilótakabinból jól láthatók és legalább a bal ülésben helyet foglaló repülőgépvezető számára használhatók legyenek.

5.3.24.11 ***Ajánlás** — A középvonal irányvezető egység használható legyen úgy a bal, mint a jobb ülésben helyet foglaló repülőgépvezető számára.*

Jellemzők

5.3.24.12 A középvonal irányvezető egység adjon egyértelmű jobb és bal irányjelzést, amely lehetővé teszi, hogy a repülőgépvezető túlkormányzás nélkül ráálljon és tartsa a bevezető gurulási nyomvonalat.

5.3.24.13 Ha a középvonal irányvezetés színváltozással történik, a középvonal jelzése zöld és az attól való eltérés vörös színű legyen.

Megállási helyzetjelző

Elhelyezés

5.3.24.14 A megállási helyzetjelző a középvonal irányvezető egységgel együtt, vagy ahhoz elég közel helyezkedjen el úgy, hogy a repülőgépvezető fejének elfordítása nélkül láthassa mindkét egység jelzéseit.

5.3.24.15 A megállási helyzetjelző használható legyen legalább a bal ülésben helyet foglaló repülőgépvezető számára.

5.3.24.16 ***Ajánlás** — A megállási helyzetjelző használható legyen úgy a bal, mint a jobb ülésben helyet foglaló repülőgépvezető számára.*
Jellemzők

5.3.24.17 A helyzetjelző megállási tájékoztatásai egy adott légijármű típus vonatkozásában olyanok legyenek, hogy azok az általános repülőgépvezető szemmagasság és/vagy látszög különbségeket figyelembe veszik.

5.3.24.18 A megállási helyzetjelző jelezze a megfelelő megállási helyzetet azon légijármű számára, amelynek a látás utáni beállító tájékoztatást biztosítja. Ez a tájékoztatás folyamatos és elég fokozatos legyen ahhoz, hogy a repülőgépvezető folyamatosan csökkenthesse a légijármű gurulási sebességét és a tervezett megállási ponton megálljon.

5.3.24.19 ***Ajánlás** — A megállási helyzetjelző legalább 10 méter hosszan biztosítson folyamatos és fokozatos közelítési tájékoztatást.*

5.3.24.20 Ha a megállási helyzet jelzése színváltozással történik, a zöld szín azt mutassa, hogy a légijármű tovább gurulhat és a vörös szín pedig a megállási pont elérést jelezze, kivéve, hogy a megállási pont előtt röviddel egy harmadik színt is használhatnak a megállási pont közelségének jelzésére.

5.3.25 Légijármű állóhely beállító fények

Alkalmazás

5.3.25.1 ***Ajánlás** — Légijármű állóhely beállító fények alkalmazhatók a rossz látási körülmények között használni kívánt burkolt forgalmi előtéren, vagy jégtelenítő és jégmentesítő létesítménynél levő légijármű állóhelyre történő beállás megkönnyítésére, ha más megfelelő irányvezető berendezést nem biztosítanak.*

Elhelyezés

5.3.25.2 A légijármű állóhely beállító fényeket a légijármű állóhely jelzésekkel együtt kell elhelyezni.

Jellemzők

5.3.25.3 A légijármű állóhely beállító fények a megállási helyzetet jelző fények kivételével állandó rögzített, sárga színű fények legyenek, amelyeket azon irányokból lehet látni, amelyek felé gurulási tájékoztatást biztosítanak, azaz amelyekből a beállás történik.

5.3.25.4 ***Ajánlás*** *— A begurulást, fordulást és kigurulást jelző fény egységeket az ívelt szakaszokon egymástól legfeljebb 7.5 méter, az egyenes szakaszokon pedig egymástól legfeljebb 15 méter távolságra helyezzék el.*

5.3.25.5 A megállási helyzetet jelző fények állandó rögzített, vörös színű, egyirányú fények legyenek.

5.3.25.6 ***Ajánlás*** *— A fényerősség megfelelő legyen azoknak a látási körülményeknek, valamint a környező fényviszonyoknak, amelyek között a légijármű állóhelyet használni kívánják.*

5.3.25.7 ***Ajánlás*** *— A fény egységek elektromos áramköreit úgy tervezzék meg, hogy a fényeket bekapcsolhassák annak jelzésére, hogy a légijármű állóhely használható és kikapcsolhassák annak jelzésére, hogy az nem használható.*

5.3.26 Út váró hely fény

Alkalmazás

5.3.26.1 El kell helyezni út váró hely fényt a futópályát kiszolgáló út minden egyes út váró helyén, ha a futópályát 350 méternél alacsonyabb futópályamenti látástávolság értéknél kívánják használni.

5.3.26.2 ***Ajánlás*** *— Helyezzenek el út váró hely fényt a futópályát kiszolgáló út minden egyes út váró helyén, ha a futópályát 550 és 350 méter közötti futópályamenti látástávolság értéknél kívánják használni.*

Elhelyezés

5.3.26.3 Az út váró hely fényt a váró hely jelzés közelében, az út egyik oldalától 1.5 méter (± 0.5 m) távolságra, a helyi közlekedési szabályoknak megfelelően jobb, vagy bal oldalra helyezzék el.

Megjegyzés: A futópálya sávban elhelyezett navigációs berendezések tömeg és magasság korlátozására, valamint a letörhetőségére vonatkozóan lásd a 9.9 szakasz előírásait.

Jellemzők

5.3.26.4 Az út váró hely fény a következő legyen:

a) állítható vörös (állj) és zöld (mehet) közlekedési lámpa; vagy

b) villogó vörös fény.

Megjegyzés: Célszerű és gyakorlati szempontból kívánatos, hogy az a) alpontban jelzett fényt a légiforgalmi szolgálati egység kezelje.

5.3.26.5 Az út váró hely fény egység sugárzása egyirányú legyen és azt úgy szabályozzák be, hogy a váró helyhez közeledő gépjármű vezetője számára látható legyen.

5.3.26.6 A fényerősség megfelelő legyen azoknak a látási körülményeknek, valamint a környező fényviszonyoknak, amelyek között az út váró helyet használni kívánják, de ne vakítsa a gépjármű vezetőjét.

Megjegyzés: Az általánosan használt közlekedési lámpák a legtöbb esetben megfelelnek az 5.3.26.5 és

5.3.26.6 pontok előírásainak.

5.3.26.7 A villogó vörös fény felvillanása percenként 30 és 60 között legyen.

5.4 Táblák

5.4.1 Általános rész

Megjegyzés: Az állandó és változó tájékoztatást tartalmazó táblákra vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

Alkalmazás

5.4.1.1 A kötelező érvényű utasítás, a mozgási területen levő meghatározott helyre, vagy célra vonatkozó tájékoztatás, valamint a 9.8.1 pont előírásának megfelelő egyéb információ megadása érdekében el kell helyezni táblákat.

Megjegyzés: A tájékoztató jelzésre vonatkozóan lásd az 5.2.17 szakaszt.

5.4.1.2 ***Ajánlás —*** *Helyezzenek el változó tájékoztatást tartalmazó táblát ott, ahol:*

a) a táblán található utasítás, vagy tájékoztatás csak egy meghatározott időtartamig érvényes; és/vagy

b) a 9.8.1 pont előírásainak megfelelő változó, előre meghatározott tájékoztatásra van szükség.

Jellemzők

5.4.1.3 A táblák letörhetők legyenek. A futópálya, vagy gurulóút közelében elhelyezett táblák elég alacsonyak legyenek ahhoz, hogy a légijárművek légcsavarjai, illetve sugárhajtómű gondolái és a táblák közötti biztonsági távolság fennmaradjon. Az elhelyezett tábla magassága ne haladja meg az 5-4. táblázat megfelelő oszlopában szereplő méretet.

5.4.1.4 A táblák az 5-28. és 5-29. ábrán láthatók szerint szögletesek legyenek és hosszabb oldalukkal vízszintesen álljanak.

5.4.1.5 A mozgási területen csak a kötelező utasítást adó táblánál alkalmazzanak vörös színt.

5-4. táblázat: A gurulási tájékoztató táblák (beleértve a futópálya legurulási — kijárati táblákat) elhelyezésére vonatkozó távolságok

Kód-szám	**1 vagy 2**	**1 vagy 2**	**3 vagy 4**	**3 vagy 4**
Felirat magassága (mm)	200	300	300	400
Tábla magassága (min. mm)	400	600	600	800
Elhelyezési magasság (max. mm)	700	900	900	1100
Merőleges távolság [a] (méter)	5 - 11	5 - 11	11 - 21	11 - 21
Merőleges távolság [b] (méter)	3 - 10	3 - 10	8 - 15	8 - 15

Megjegyzés:

a = A gurulóút burkolat szélétől a tábla közelebb eső széléig.

b = A futópálya burkolat szélétől a tábla közelebb eső széléig.

5.4.1.6 A tábla felirata feleljen meg a 4. Függelék előírásainak.

5.4.1.7 A táblákat a 4. Függelék előírásainak megfelelően világítsák meg, ha azokat:

a) 800 méternél alacsonyabb futópályamenti látástávolság érték mellett kívánják használni;

b) éjszaka műszeres futópályához kívánják használni; és

c) éjszaka 3 vagy 4 kód-számú nem-műszeres futópályához kívánják használni.

5.4.1.8 A táblákat a 4. Függelék előírásainak megfelelően világítsák meg és/vagy legyenek fényvisszaverők, ha azokat éjszaka 1 vagy 2 kód-számú nem-műszeres futópályához kívánják használni.

5.4.1.9 A változó tájékoztatást tartalmazó tábla használaton kívül üres kell, hogy legyen.

5.4.1.10 Meghibásodás esetén a változó tájékoztatást tartalmazó tábla ne adjon olyan tájékoztatást, amely a repülőgépvezető, vagy gépjárművezető nem biztonságos tevékenységéhez vezethet.

5.4.1.11 ***Ajánlás*** *— A változó tájékoztatást tartalmazó tábla tájékoztatás váltási ideje a lehető legrövidebb legyen és ne haladja meg az öt másodpercet.*

5.4.2 Kötelező utasítást adó táblák

Megjegyzés: Az 5-28. ábra a kötelező utasítást adó táblákat, az 5-30. ábra pedig a táblák elhelyezését mutatja be a gurulóút és futópálya kereszteződéseknél.

Alkalmazás

5.4.2.1 El kell helyezni kötelező utasítást adó táblát és ezzel azonosítsák azt a helyet, amelyen túl a guruló légijármű, vagy gépjármű csak a repülőtéri irányító torony engedélyével haladhat.

5.4.2.2 A kötelező utasítást adó táblák közé tartozik a futópálya azonosító, az I. II. vagy III. kategóriás váró pontot, a futópálya várakozási helyet és az út váró helyet megjelölő, valamint a begurulni tilos (NO ENTRY) tábla.

Megjegyzés: Az út váró hely jelzőtáblára vonatkozóan lásd az 5.4.7 szakaszt.

Bal oldal ***Jobb oldal***

5-28. ábra: Kötelező utasítást adó táblák

5.4.2.3 A futópálya és gurulóút vagy két futópálya kereszteződésében levő, (A) változat szerint kialakított futópálya várakozási hely jelzést futópálya azonosító táblával kell kiegészíteni.

5.4.2.4 A (B) változat szerint kialakított futópálya várakozási hely jelzést I. II. vagy III. kategóriás várakozási hely táblával kell kiegészíteni.

5.4.2.5 A 3.11.3 pont előírása szerint kialakított futópálya várakozási helyen, az (A) változatnak megfelelő futópálya várakozási hely jelzést futópálya várakozási hely táblával kell kiegészíteni.

Megjegyzés: A futópálya várakozási hely jelzés előírásaira vonatkozóan lásd az 5.2.10 szakaszt.

5.4.2.6 ***Ajánlás*** *— A futópálya és gurulóút kereszteződésnél levő futópálya azonosító táblát annak külső (a gurulóúttól távolabb eső) részén megfelelő helyszín megjelöléssel egészítsék ki.*

Megjegyzés: A helyszín megjelölő táblára vonatkozóan lásd az 5.4.3 szakaszt.

5.4.2.7 El kell helyezni megfelelő tiltó táblát (NO ENTRY), ha a területre történő belépés illetve begurulás tilos.

Elhelyezés

5.4.2.8 A futópálya és gurulóút, vagy két futópálya kereszteződésnél a futópálya azonosító táblát a futópálya várakozási hely jelzés mindkét oldalán, a futópálya megközelítésének irányából látható módon helyezzék el.

5.4.2.9 Az I. II. vagy III. kategóriás várakozási hely táblát a futópálya várakozási hely jelzés mindkét oldalán, a kritikus terület megközelítési irányából látható módon helyezzék el.

5.4.2.10 A begurulást tiltó táblát (NO ENTRY) a gurulóút mindkét oldalán helyezzék el, a repülőgépvezető felöl nézve azon terület kezdeténél, amelyre a belépés illetve begurulás tilos.

5.4.2.11 A 3.12.3 pont előírása szerint kialakított futópálya várakozási hely mindkét oldalán, az akadálykorlátozási felület, vagy az ILS/MLS kritikus illetve érzékeny terület megközelítési irányából látható módon futópálya várakozási hely táblát kell elhelyezni.

Jellemzők

5.4.2.12 A kötelező utasítást adó táblán a fehér színű felirat vörös alapon helyezkedjen el.

5.4.2.13 A futópálya azonosító tábla felirata a keresztező futópálya azonosítóit mutassa a tábla nézetének megfelelően beállítva. Ha a futópálya azonosító tábla a futópálya vége közelében helyezkedik el, elegendő, hogy azon csak a megfelelő futópálya küszöb azonosító szerepeljen.

5.4.2.14 Az I. II. vagy III. kategóriás várakozási hely, vagy a közös II/III. kategóriás várakozási hely tábla feliratán, a futópálya azonosító mellett helyezzék el a megfelelő kiegészítést az alábbiak szerint:

CAT I — CAT II — CAT III — CAT II/III

5.4.2.15 A begurulást tiltó tábla (NO ENTRY) az 5-28. ábrának megfelelő kell, hogy legyen.

5.4.2.16 A 3.11.3 pont alapján kialakított futópálya várakozási helynél elhelyezett futópálya várakozási hely tábla a gurulóút jelzést és egy számot is tartalmazzon.

5.4.2.17 Ahol ez szükséges, a következő feliratokat, illetve jeleket használják:

Felirat, vagy jel	*Alkalmazás*
Futópálya azonosítók a futópálya végén	Futópálya várakozási hely jelzése a futópálya végénél, vagy
Felirat, vagy jel	*Alkalmazás*
Futópálya azonosítók a futópálya mindkét végén	Futópálya várakozási hely jelzése más gurulóút és futópálya vagy, két futópálya kereszteződésben
25 CAT I (példa)	I. kategóriás futópálya várakozási hely jelzése a 25 futópálya küszöbnél
25 CAT II (példa)	II. kategóriás futópálya várakozási hely jelzése a 25 futópálya küszöbnél
25 CAT III (példa)	III. kategóriás futópálya várakozási hely jelzése a 25 futópálya küszöbnél
25 CAT II/III (példa)	Közös II/III. kategóriás futópálya várakozási hely jelzése a 25 futópálya küszöbnél
Belépni tilos (NO ENTRY) jel	Területre történő belépés, illetve begurulás tiltásának jelzése
B2 (példa)	3.11.3 pont alapján kialakított futópálya várakozási hely jelzése

5.4.3 Tájékoztató táblák

Megjegyzés: Az 5-29. ábra a tájékoztató táblák feliratait és elrendezését mutatja be.

5.4.3.1 Ahol egy adott hely, vagy gurulási útvonal tájékoztatás (irány, vagy úticél, illetve helyszín) táblával történő megadása gyakorlati szempontból szükséges, el kell helyezni tájékoztató táblát.

5.4.3.2 A tájékoztató táblák közé tartoznak az útirány jelző, helyszín jelző, úticél jelző, futópálya kijárati gurulóút, futópálya elhagyását, valamint a futópálya kereszteződéstől felszállásra igénybe vehető távolságot jelző táblák.

5.4.3.3 El kell helyezni futópálya kijárat táblát ott, ahol egy futópálya kijárat táblával történő azonosítása gyakorlati szempontból szükséges.

5.4.3.4 El kell helyezni futópálya elhagyását jelző táblát ott, ahol a legurulóút nincs ellátva gurulóút középvonal fényekkel és a repülőgépvezető számára szükséges annak jelzése, hogy elhagyta a futópálya ILM/MLS kritikus illetve érzékeny területét, vagy a belső átmeneti felület alsó élét — amelyik a futópálya középvonaltól távolabb helyezkedik el.

Megjegyzés: A gurulóút középvonal fények szín kódolására vonatkozóan lásd az 5.3.16 pontot.

5.4.3.5 ***Ajánlás*** *— Ahol a gurulóút csatlakozástól rendelkezésre álló maradék felszállási nekifutási távolság (TORA) jelzése üzemeltetési szempontból szükséges, helyezzenek el futópálya kereszteződéstől felszállásra igénybe vehető távolság jelzőtáblát.*

5.4.3.6 ***Ajánlás — Ahol szükséges, helyezzenek el úticél táblát a repülőtér meghatározott területére vezető irány jelzésére. Ilyen terület lehet a teherárú forgalmi előtér, vagy az általános célú légiközlekedést kiszolgáló forgalmi előtér, stb.***

5.4.3.7 El kell helyezni összetett helyszín és útirány táblát, ha egy gurulóút kereszteződés előtt útirány tájékoztatást kívánnak nyújtani.

5.4.3.8 El kell helyezni útirány táblát ott, ahol a gurulóutak azonosítójának és irányának megadása egy adott kereszteződésben gyakorlati szempontból szükséges.

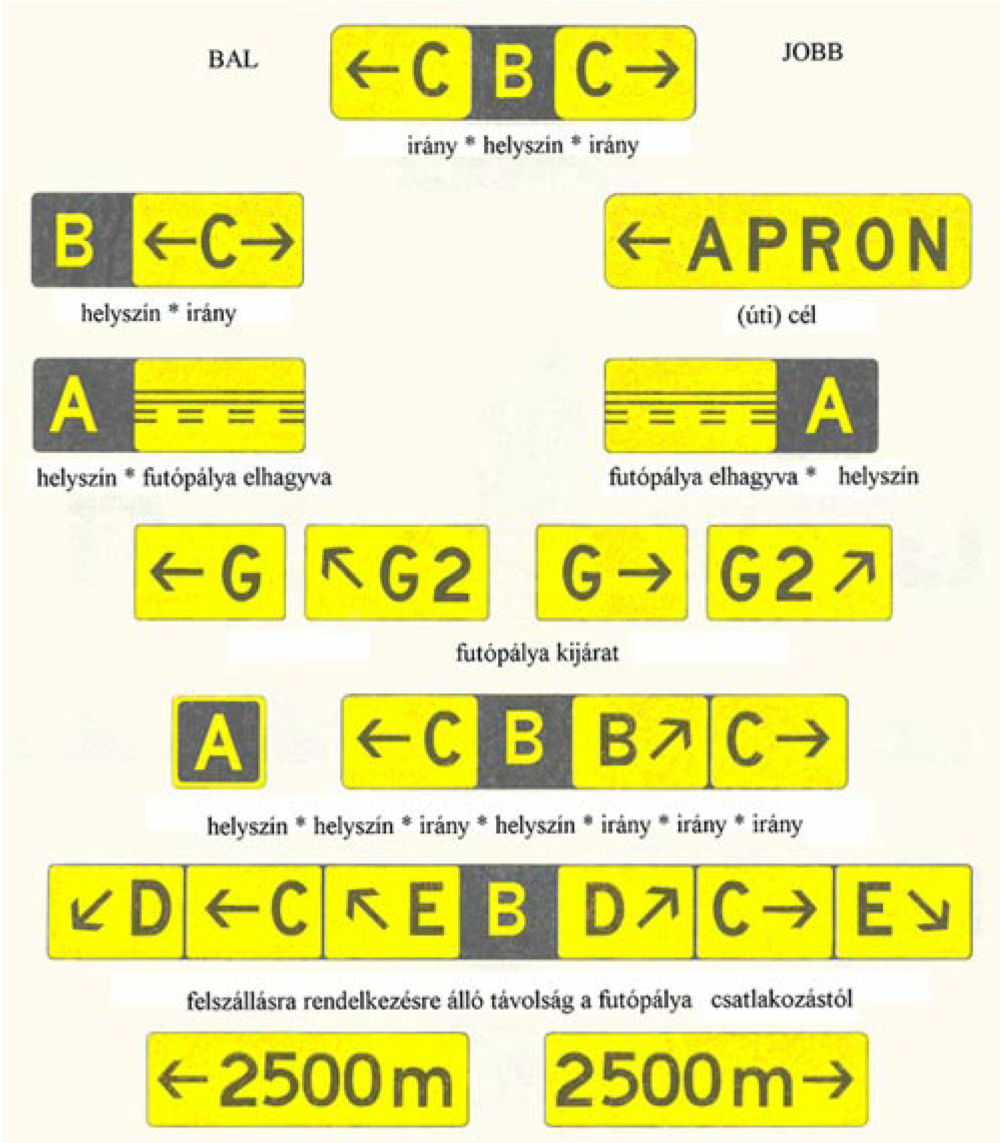
5.4.3.9 ***Ajánlás — A közbenső várakozási helyen helyezzenek el helyszín jelző táblát.***

5.4.3.10 A két futópálya kereszteződése kivételével a futópálya azonosító táblához el kell helyezni helyszín táblát.

5.4.3.11 A helyszín táblát ki kell egészíteni útirány jelző táblával, kivéve, ha a légiforgalmi felülvizsgálat szerint ez nem szükséges.

5.4.3.12 ***Ajánlás*** *— A forgalmi előtérhez csatlakozó kijárati gurulóúthoz, vagy a gurulóút kereszteződés után szükség szerint helyezzenek el helyszín táblát.*

5.4.3.13 ***Ajánlás*** *— Ahol a gurulóút "T" alakú kereszteződésbe torkollik és ennek jelzése szükséges, alkalmazzanak látjelet, útirány táblát, vagy más megfelelő látás utáni segédeszközt.*



5-29. ábra: Tájékoztató táblák

Elhelyezés

5.4.3.14 Az 5.4.3.16 és 5.4.3.24 pontokban jelzettek kivételével a tájékoztató táblákat lehetőség szerint a gurulóút bal oldalán, az 5-4. táblázatban előírtaknak megfelelően helyezzék el.

5.4.3.15 A gurulóút kereszteződéseknél a tájékoztató táblákat a kereszteződés előtt, a gurulóút kereszteződés jelzéssel egy vonalban helyezzék el. Ahol ilyen jelzés nincs, a táblákat a keresztező gurulóút középvonalától 3. vagy 4. kód-szám esetén legalább 60 méterre, illetve 1. vagy 2. kód-szám esetén legalább 40 méterre helyezzék el.

Megjegyzés: A gurulóút kereszteződés után levő helyszín táblát a gurulóút bármelyik oldalára elhelyezhetik.

5.4.3.16 A futópálya kijárat táblát a futópálya azon oldalán helyezzék el, amelyen a legurulóút található. A táblát a futópálya bal, vagy jobb oldalán, az 5-4. táblázatban előírtaknak megfelelően helyezzék el.

5.4.3.17 A futópálya kijárat táblát a futópálya elhagyási pontja előtt, a lefordulás megkezdése előtt 3. vagy 4.

kód-szám esetén legalább 60 méterre, illetve 1. vagy 2. kód-szám esetén legalább 30 méterre helyezzék el.

5.4.3.18 A futópálya elhagyását jelző táblát legalább a gurulóút egyik oldalára helyezzék el és a tábla, valamint a futópálya középvonala közötti távolság ne legyen kevesebb, mint az alábbiak közül a nagyobb érték:

a) a futópálya középvonala és az ILS/MLS kritikus, illetve érzékeny terület határa közötti távolság; vagy

b) a futópálya középvonala és a belső átmeneti felület alsó éle közötti távolság.

5.4.3.19 Ahol a futópálya elhagyását jelző táblához gurulóút azonosító táblát helyeztek el, a gurulóút helyszín tábla mindig kívülre kerüljön.

5.4.3.20 A futópálya kereszteződéstől felszállásra igénybe vehető távolság jelzőtáblát a futópályára csatlakozó gurulóút bal oldalán helyezzék el. A tábla és a futópálya középvonala közötti távolság 3. vagy 4. kód-szám esetén legalább 60 méter, illetve 1. vagy 2. kód-szám esetén legalább 40 méter legyen.

5.4.3.21 A futópálya azonosítóval együtt elhelyezett gurulóút helyszín tábla esetében a gurulóút azonosító mindig kívülre kerüljön.

5.4.3.22 ***Ajánlás*** *— Az úticél táblát a helyszín vagy útirány jelző táblával együtt általában ne helyezzék el.*

5.4.3.23 A helyszín tábla kivételével más tájékoztató táblát a kötelező utasítást adó táblával együtt ne helyezzenek el.

5.4.3.24 ***Ajánlás*** *— A "T" kereszteződést azonosító útirány jelzőt, látjelet és/vagy más megfelelő látás utáni segédeszközt a kereszteződés gurulóúttal szemben levő oldalán helyezzék el.*

Jellemzők

5.4.3.25 A tájékoztató táblán a helyszín tájékoztató tábla kivételével a fekete színű felirat sárga alapon helyezkedjen el.

5.4.3.26 A helyszín tájékoztató táblán a sárga színű felirat fekete alapon helyezkedjen el és ha az magában áll, a táblát sárga szegély vegye körbe.

5.4.3.27 A futópálya kijárat táblán a legurulóút azonosítóján kívül a követendő útirányt jelző nyíl is szerepeljen.

5.4.3.28 A futópálya elhagyását jelző táblán az 5-29. ábrának megfelelően szerepeljen az (A) változat szerinti futópálya várakozási hely jelzés is.

5.4.3.29 A futópálya kereszteződéstől felszállásra igénybe vehető távolság jelző táblán az 5-29. ábrának megfelelően számokkal szerepeljen a gurulóút csatlakozástól rendelkezésre álló maradék felszállási nekifutási távolság (TORA) méterben, valamint a helyes irányba mutató és formájú nyíl felszállási irány jelzés is.

5.4.3.30 Az úticél jelző táblán az 5-29. ábrának megfelelően szereplő felirat betűkkel, számokkal, vagy ezek kombinációjával jelezze a követendő úticélt és ezt útirány jelző nyíllal egészítsék ki.

5.4.3.31 Az útirány táblán az 5-29. ábrának megfelelően szereplő felirat betűkkel, vagy betű-szám kombinációkkal azonosítsa a gurulóút(akat) és ezt helyes irányba mutató nyíllal, vagy nyilakkal egészítsék ki.

5.4.3.32 A helyszín táblán szereplő felirat tartalmazza a gurulóút, futópálya vagy más burkolt felület megnevezését, amelyen légijármű közlekedik, vagy amelyre belép és a táblán nyíl ne szerepeljen.

5.4.3.33 ***Ajánlás*** *— Ahol az ugyanazon a gurulóúton elhelyezkedő közbenső várakozási helyek sorozatának egyes egységeit kell azonosítani, a helyszín táblán a gurulóút azonosító mellett egy szám is szerepeljen.*

5.4.3.34 Ahol a helyszín és útirány táblákat együttesen használják:

a) a bal fordulót jelző összes útirány tájékoztatás a helyszín jelző bal oldalára és a jobb fordulót jelző összes útirány tájékoztatás a helyszín jelző jobb oldalára kerüljön, kivéve a gurulóút kereszteződés esetét, amelyben a helyszín jelzés a bal oldalra kerülhet;

b) az útirány táblákat úgy helyezzék el, hogy a nyilak iránya a függőlegestől a csatlakozó gurulóút elfordulási szögének megfelelően változzon;

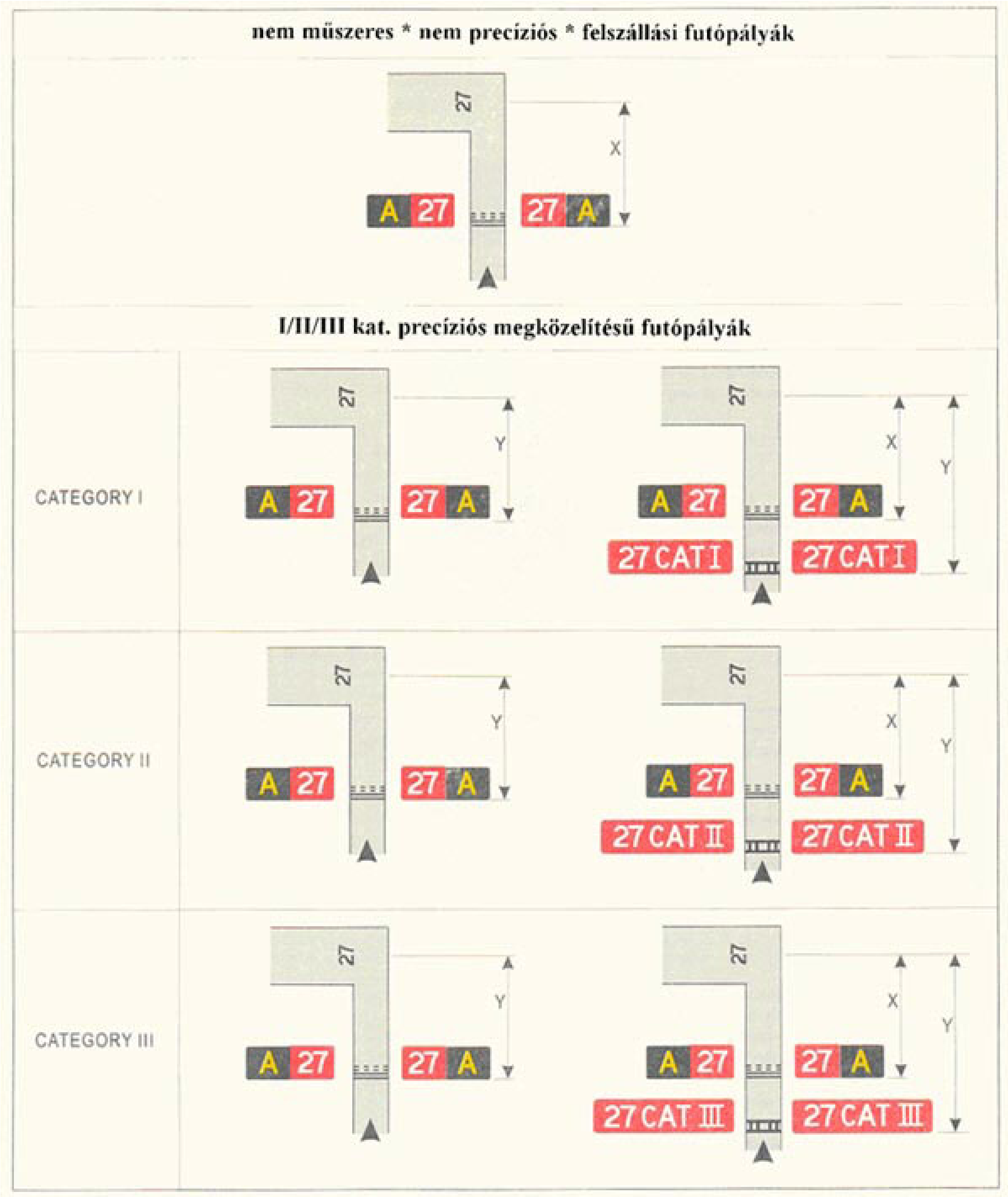
c) a helyszín tábla mellé helyezzenek el megfelelő útirány jelzőt, amennyiben a gurulóút iránya a kereszteződés után jelentős mértékben megváltozik; és

d) az egymás mellett levő útirány táblákat az 5-29. ábrának megfelelően függőleges fekete vonallal válasszák el egymástól.

5.4.3.35 Egy gurulóutat betű, betűk, betűk kombinációi, vagy betűk és számok kombinációi segítségével kell azonosítani.

5.4.3.36 ***Ajánlás*** *— A gurulóutak megnevezésénél lehetőleg kerüljék az "I", "O" vagy "X" betűket, valamint az olyan kifejezéseket, mint belső, vagy külső, hogy azokat ne téveszthessék össze az 1 illetve 0 számokkal és a lezárt terület (X) jelzéssel.*

5.4.3.37 A mozgási területen a számok kizárólagos használata a futópálya azonosítókra kell, hogy korlátozódjon.



5-30. ábra: Táblák elhelyezése a nem-műszeres, nem-precíziós, felszállási és I./II./III. kategóriás precíziós megközelítésű futópályák és gurulóútak csatlakozásánál

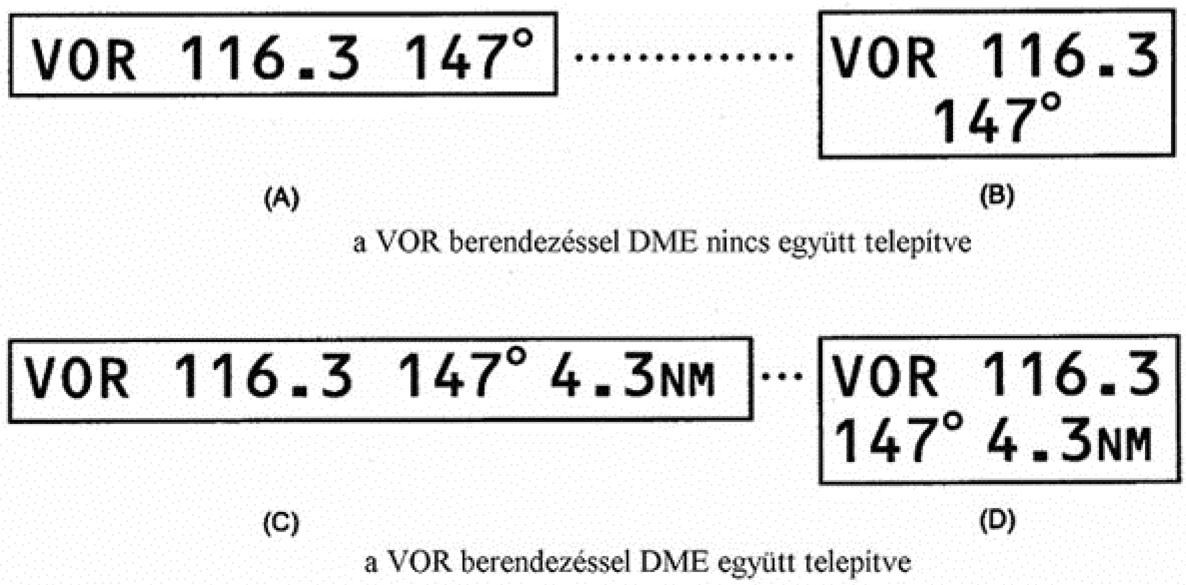
Az X távolságot a 3-2 táblázat alapján, az Y távolságot az ILS/MLS kritikus, illetve érzékeny terület határán határozzák meg.

5.4.4 Repülőtéri VOR ellenőrző pont tábla

Alkalmazás

5.4.4.1 Ha repülőtéri VOR ellenőrző pontot alakítanak ki, azt megfelelő jelzéssel és táblával kell ellátni.

Megjegyzés: A repülőtéri VOR ellenőrző pont jelzés az 5.2.12 pontban található.



5-31. ábra: Repülőtéri VOR ellenőrző pont jelzés

Elhelyezés

5.4.4.2 A repülőtéri VOR ellenőrző pont táblát az ellenőrző ponthoz lehető legközelebb kell elhelyezni úgy, hogy annak felirata a repülőtéri VOR ellenőrző ponton megfelelő módon beállítva, a légijármű pilótakabinjából látható legyen.

Jellemzők

5.4.4.3 A repülőtéri VOR ellenőrző pont jelzőtáblán a fekete színű felirat sárga háttéren helyezkedjen el.

5.4.4.4 ***Ajánlás*** *— A repülőtéri VOR ellenőrző pont jelzőtáblán a felirat feleljen meg az 5-31. ábrán látható változatok egyikének, amelyben:*

VOR	*a VOR ellenőrző pontot jelző rövidítés*
116.3	*a megfelelő VOR rádióadó frekvenciája (példa)*
147°	*a megfelelő VOR irány jelzése a legközelebbi fokra kerekítve, amelyet az ellenőrző ponton tüntessenek fel (példa)*
4.3 NM	*a VOR berendezéssel együtt telepített DME berendezés távolsága tengeri mérföld értékben (példa)*

Megjegyzés: A táblán jelzett VOR irány értékhatárait a 10. Annex I. kötet I. rész E. Melléklete tartalmazza. Megjegyzendő, hogy az ellenőrző pont légijármű üzemeltetésre csak akkor használható, ha az időszakos ellenőrzések szerint a eltérés ± 2° határon belül van.

5.4.5 Repülőtér azonosító tábla

Alkalmazás

5.4.5.1 ***Ajánlás*** — *Helyezzenek el repülőtér azonosító táblát azon a repülőtéren, amelyen a repülőtér látás utáni azonosítására nincs más alkalmas lehetőség.*

Elhelyezés

5.4.5.2 ***Ajánlás*** — *A repülőtér azonosító táblát a repülőtéren úgy helyezzék el, hogy az a vízszintes felett gyakorlati szempontból minden megfelelő szögből olvasható legyen.*

Jellemzők

5.4.5.3 A repülőtér azonosító táblán a repülőtér neve kell, hogy szerepeljen.

5.4.5.4 ***Ajánlás* —** *A tábla valamint a felirat színe a háttérből jól emelkedjen ki.*

5.4.5.5 ***Ajánlás* —** *A felirat (betűk) nagysága legalább 3 méter legyen.*

5.4.6 Légijármű állóhely azonosító tábla

Alkalmazás

5.4.6.1 ***Ajánlás*** — A légijármű állóhely azonosító jelzést, ahol ez szükséges és lehetséges, légijármű állóhely azonosító táblával egészítsék ki.

Elhelyezés

5.4.6.2 ***Ajánlás*** — *A légijármű állóhely azonosító táblát úgy helyezzék el, hogy az a légijármű állóhelyre beálló légijármű pilótakabinjából jól látható legyen.*

Jellemzők

5.4.6.3 ***Ajánlás* —** *A légijármű állóhely azonosító táblán a fekete színű felirat sárga alapon helyezkedjen el.*

5.4.7 Út váróhely tábla

5.4.7.1 A futópályára becsatlakozó összes úton helyezzenek el út váróhely táblát.

Elhelyezés

5.4.7.2 Az út váróhely táblát a váróhelynél, az út szélétől 1.5 méter távolságra a helyi közlekedési szabályoknak megfelelően jobb- vagy baloldalra helyezzék el.

Jellemzők

5.4.7.3 Az út váróhely jelzőtáblán a fehér színű felirat vörös alapon helyezkedjen el.

5.4.7.4 Az út váróhely tábla feliratát a helyi közlekedési szabályoknak megfelelően nemzeti nyelven készítsék el, és ez a következőket tartalmazza:

a) megállásra felszólító utasítás; és

b) ahol ez szükséges:

1) légiforgalmi irányítói engedély kérésére felszólító utasítás; és

2) helyszín megjelölés (azonosító).

Megjegyzés: Az út váróhely táblák példái a Repülőtér Tervezési Kézikönyv *(Doc 9157) 4. részében találhatók.*

5.4.7.5 Az éjszaka használni kívánt út váró hely táblát világítsák meg vagy az fényvisszaverő legyen.

5.5 Jelző tárgyak

5.5.1 Általános rész

A jelzőtárgyak (jelzők) letörhetők legyenek. A futópálya vagy gurulóút közelében elhelyezett jelzőtárgyak elég alacsonyak legyenek ahhoz, hogy a légijárművek légcsavarjai illetve sugárhajtómű gondolái, és a táblák közötti biztonsági távolság fennmaradjon.

1. Megjegyzés: Néhány esetben a rögzítésükről letört jelzők elfújásának megakadályozása érdekében horgonyokat vagy láncokat alkalmaznak.

2. Megjegyzés: A jelző tárgyak letörhetőségére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 6. részében (előkészületben) található.*

5.5.2 Burkolattal el nem látott futópálya szegély-jelző tárgyak

Alkalmazás

5.5.2.1 ***Ajánlás*** *— Helyezzenek el jelzőket, ha a burkolattal el nem látott futópálya felszíne a környező talajjal összevetve egyértelműen nem különböztethető meg.*

Elhelyezés

5.5.2.2 ***Ajánlás*** *— Ahol futópálya fényeket biztosítanak, a jelzőket a fényekkel egy szerkezetben helyezzék el. Ahol fények nincsenek, el a futópálya határainak kijelölésére szögletes vagy kúpos jelző tárgyakat helyezzenek.*

Jellemzők

5.5.2.3 ***Ajánlás*** *— A szögleges jelző tárgyak mérete legalább 1 m x 3 m legyen, és hosszabb oldalukat a futópálya középvonallal párhuzamosan helyezzék el. A kúpos jelző tárgyak magassága ne haladja meg az 50 centiméter értéket.*

5.5.3 Biztonsági megállási terület jelző tárgyak

Alkalmazás

5.5.3.1 ***Ajánlás*** *— Helyezzenek el biztonsági megállási terület (szegély) jelzőket, ha a biztonsági megállási terület kiterjedése a környező talajjal összevetve egyértelműen nem állapítható meg.*

Jellemzők

5.5.3.2 A biztonsági megállási terület jelzők megfelelő mértékben különbözzenek a futópálya szegély jelzőktől, hogy a két jelző tárgy típust ne lehessen összetéveszteni.

Megjegyzés: Kis méretű függőleges, a futópálya felöl nézve hátlapjukon befestett táblák gyakorlati szempontból megfelelőnek bizonyultak.

5.5.4 Hóval borított futópálya felület szegély-jelző tárgyak

Alkalmazás

5.5.4.1 ***Ajánlás*** *— Hóval borított futópálya felületek esetében, ha a használható felület határai más módon nem láthatók, megfelelő szegély-jelzőket alkalmazzanak.*

Megjegyzés: A szegélyek jelzésére a futópálya fények megfelelőek.

Elhelyezés

5.5.4.2 ***Ajánlás*** *— A hóval borított futópálya felületek szegély jelzőit a futópálya szélén, a futópálya középvonala mentén szimmetrikusan, egymástól legfeljebb 100 méter távolságra helyezzék el. Biztosítsák, hogy a légijárművek szárnyvégei, illetve sugárhajtómű gondolái és a jelzők közötti biztonsági távolság fennmaradjon. A futópálya küszöbnél és végénél is helyezzenek el megfelelő jelzőket.*

Jellemzők

5.5.4.3 ***Ajánlás*** *— A hóval borított futópálya felületek szegély jelzői jól látható tárgyak legyenek, mint például a kb. 1.5 méter magas örökzöldek, vagy könnyű-súlyú jelző tárgyak.*

5.5.5 Gurulóút szegély jelző tárgyak

Alkalmazás

5.5.5.1 ***Ajánlás*** *— Helyezzenek el gurulóút szegély jelzőket az 1 vagy 2 kód-számú repülőtér gurulóútjánál, ha gurulóút középvonalat, szegély fényeket vagy gurulóút középvonal jelzőket nem biztosítanak.*

Elhelyezés

5.5.5.2 ***Ajánlás*** *— A gurulóút szegély jelzőket legalább olyan helyekre és távközökbe helyezzék el, mint a szegélyfényeket (ha ilyeneket biztosítottak volna).*

Jellemzők

5.5.5.3 A gurulóút szegély jelző tárgy fényvisszaverő, kék színű legyen.

5.5.5.4 ***Ajánlás*** *— A repülőgépvezető által látható jelzett felület szögletes és legalább 150 cm^2 területű legyen.*

5.5.5.5 A gurulóút szegély jelző tárgyak letörhetők kell, hogy legyenek. Magasságuk megfelelő legyen ahhoz, hogy a légijárművek légcsavarjai, illetve sugárhajtómű gondolái és a jelzők közötti biztonsági távolság fennmaradjon.

5.5.6 Gurulóút középvonal jelző tárgyak

Alkalmazás

5.5.6.1 ***Ajánlás*** *— Helyezzenek el gurulóút középvonal jelzőket az 1 vagy 2 kód-számú repülőtér gurulóútjánál, ha gurulóút középvonalat, szegély fényeket, vagy gurulóút szegély jelzőket nem biztosítanak.*

5.5.6.2 ***Ajánlás*** *— Helyezzenek el gurulóút középvonal jelzőket a 3 vagy 4 kód-számú repülőtér gurulóútjánál, ha gurulóút középvonal fényeket nem biztosítanak és a gurulási irányvezetés fokozása szükségesnek látszik.*

Elhelyezés

5.5.6.3 ***Ajánlás*** *— A gurulóút középvonal jelzőket legalább olyan helyekre és távközökbe helyezzék el, mint a középvonal fényeket (ha ilyeneket biztosítottak volna).*

Megjegyzés: A gurulóút középvonal fények távközei az 5.3.16.12 pontban találhatók.

5.5.6.4 ***Ajánlás*** *— A gurulóút középvonal jelzőket általában a gurulóút középvonal jelzésen helyezzék el, kivéve azokat a helyeket, ahol ez gyakorlati szempontból nem megvalósítható. Ebben az esetben a jelző tárgyakat a jelzéstől legfeljebb 30 centiméterre lehet elhelyezni.*

Jellemzők

5.5.6.5 A gurulóút középvonal jelző fényvisszaverő, zöld színű felületi elem kell, hogy legyen.

5.5.6.6 ***Ajánlás*** *— A repülőgépvezető által látható jelzett felület szögletes és legalább 20 cm^2 területű legyen.*

5.5.6.7 A gurulóút középvonal jelző felületi elemeket úgy tervezzék meg és helyezzék el, hogy azok a légijármű, vagy a jelző szerelvény sérülése nélkül ellenálljanak a rágurulásból eredő hatásoknak.

5.5.7 Burkolattal el nem látott gurulóút szegély-jelző tárgyak

Alkalmazás

5.5.7.1 ***Ajánlás*** *— Helyezzenek el jelzőket, ha a burkolattal el nem látott gurulóút kiterjedése a környező talajjal összevetve egyértelműen nem állapítható meg.*

Elhelyezés

5.5.7.2 ***Ajánlás*** *— Ahol gurulóút fényeket biztosítanak, a jelzőket a fényekkel egy szerkezetbe helyezzék el. Ahol fények nincsenek, kúpos jelzőket helyezzenek el a gurulóút szegélyének kijelölésére.*

5.5.8 Határjelző tárgyak

Alkalmazás

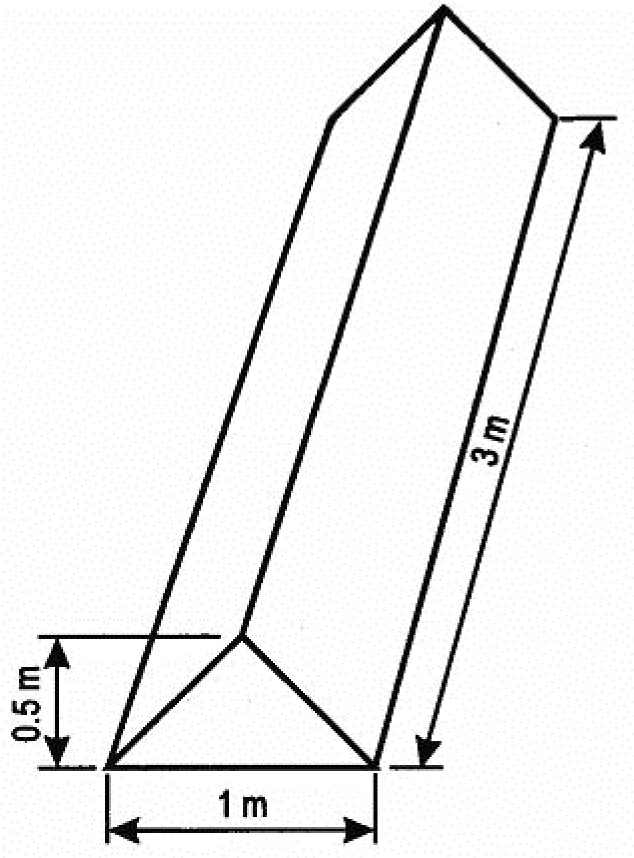
5.5.8.1 El kell helyezni határjelző tárgyakat azon a repülőtéren, amelyen a leszállási területen nincs futópálya.

Elhelyezés

5.5.8.2 A határjelző tárgyakat a leszállási terület határa mentén egymástól nem több, mint 200 méter távolságra helyezzék el, ha az 5-32. ábrán látható típust használják. Ha bármely sarkán megjelölt kúpos típust alkalmaznak, a határjelzőket egymástól kb. 90 méter távolságra helyezzék el.

Jellemzők

5.5.8.3 ***Ajánlás*** *— A határjelzők formájukban hasonlóak legyenek az 5-32. ábrán látható típushoz, vagy olyan kúpos formájuk legyen, melynek magassága nem kevesebb, mint 50 és alapjának átmérője nem kevesebb, mint 75 centiméter. A jelzők színe megfelelő módon elüssön a háttértől. Használjanak egy színt (narancssárga, vagy vörös), vagy két egymástól különböző színt (narancssárga és fehér, vagy vörös és fehér) kivéve, ha ezek a színek beleolvadnak a háttérbe.*



5-32. ábra: Határjelző tárgy és mérete

6. fejezet
Látjelek az akadályok megjelölésére

6.1 Megjelölendő és/vagy kivilágítandó tárgyak

Megjegyzés: Az akadályok megjelölésének és/vagy kivilágításának célja a légijármű veszélyeztetésének csökkentése az akadályok meglétének jelzésével. Ez nem csökkenti szükségszerűen azokat az üzemeltetési korlátozásokat, amelyeket az akadály miatt foganatosíthatnak.

6.1.1 ***Ajánlás*** *— A felszállási emelkedési felületen túlnyúló, annak belső élétől 3000 méter távolságon belül elhelyezkedő állandó akadályt lássanak el jelöléssel és ha a futópályát éjszaka is használják, kivilágítással, kivéve:*

a) az ilyen jelölés és kivilágítás elhagyható, ha az akadályt másik állandó akadály takarja;

b) a jelölés elhagyható, ha az akadályt nappal, „A” típusú, közepes intenzitású akadályfénnyel kivilágítják és az akadály magassága a környező talajfelszínhez viszonyítva nem haladja meg a 150 métert;

c) a jelölés elhagyható, ha az akadályt nappal, nagy intenzitású akadályfénnyel kivilágítják; és

d) a kivilágítás elhagyható, ha az akadály maga világítótorony és a légiforgalmi vizsgálat azt jelzi, hogy a világítótorony saját fénye megfelelő az akadály jelzésére.

6.1.2 ***Ajánlás*** *— A felszállási emelkedési felület közvetlen közelében levő bármely állandó rögzített tárgyat, amely nem akadály, lássanak el jelöléssel és ha a futópályát éjszaka is használják, kivilágítással, amennyiben ezt a megjelölést és kivilágítást a tárgy elkerülésének biztosítása érdekében szükségesnek ítélik. Kivételt képez, ha:*

a) ha az akadályt nappal, „A” típusú, közepes intenzitású akadályfénnyel kivilágítják és az akadály magassága a környező talajfelszínhez viszonyítva nem haladja meg a 150 métert; és

b) a tárgyat nappal, nagy intenzitású akadályfénnyel kivilágítják.

6.1.3 A megközelítési vagy átmeneti felületen túlnyúló, a megközelítési felület belső élétől 3000 méter távolságon belül levő állandó akadályt el kell látni jelöléssel és ha a futópályát éjszaka is használják, kivilágítással, kivéve:

a) az ilyen jelölés és kivilágítás elhagyható, ha az akadályt másik állandó akadály takarja;

b) a jelölés elhagyható, ha az akadályt nappal, „A” típusú, közepes intenzitású akadályfénnyel kivilágítják és az akadály magassága a környező talajfelszínhez viszonyítva nem haladja meg a 150 métert;

c) a jelölés elhagyható, ha az akadályt nappal, nagy intenzitású akadályfénnyel kivilágítják; és

d) a kivilágítás elhagyható, ha az akadály maga világítótorony és a légiforgalmi vizsgálat azt jelzi, hogy a világítótorony saját fénye megfelelő az akadály jelzésére.

6.1.4 ***Ajánlás*** *— A vízszintes felületen túlnyúló állandó akadályt lássanak el jelöléssel és ha a futópályát éjszaka is használják, kivilágítással, kivéve:*

a) az ilyen jelölés és kivilágítás elhagyható, ha:

1) az akadályt másik állandó akadály takarja; vagy

2) a kivilágítás megvalósítása mozdíthatatlan tárgyak, vagy a földfelszín miatt nagy nehézségekbe ütközik és a kijelölt repülési útvonalon megfelelő eljárásokkal biztosították a függőleges biztonsági távolságot; vagy

3) légiforgalmi vizsgálat azt jelzi, hogy az akadály üzemeltetési szempontból nem jelentős;

b) a jelölés elhagyható, ha az akadályt nappal, „A” típusú, közepes intenzitású akadályfénnyel kivilágítják és az akadály magassága a környező talajfelszínhez viszonyítva nem haladja meg a 150 métert;

c) a jelölés elhagyható, ha az akadályt nappal, nagy intenzitású akadályfénnyel kivilágítják; és

d) a kivilágítás elhagyható, ha az akadály maga világítótorony és a légiforgalmi vizsgálat azt jelzi, hogy a világítótorony saját fénye megfelelő az akadály jelzésére.

6.1.5 Az akadály védelmi felületen túlnyúló állandó rögzített tárgyat el kell látni jelöléssel és ha a futópályát éjszaka is használják, kivilágítással.

Megjegyzés: Az akadály védelmi felületre vonatkozó tájékoztatás az 5.3.5 pontban található.

6.1.6 A repülőtér mozgási területén működő gépjárművek és más mozgó tárgyak a légijármű kivételével akadályoknak tekintendők. Ezeket lássák el jelöléssel és ha a gépjárműveket, valamint a repülőteret éjszaka, vagy rossz látási körülmények között is használják, kivilágítással. Kivételt képezhetnek a kizárólag a forgalmi előtéren működő légijármű kiszolgáló járművek és berendezések.

6.1.7 A mozgási területen található emelt szintű (magas) légiforgalmi földi fényeket úgy jelöljék meg, hogy azok nappal feltűnőek legyenek. A mozgási területen levő emelt szintű földi fényekre, vagy magas táblákra ne helyezzenek el akadályvilágítást.

6.1.8 A gurulóút, a forgalmi előtér, vagy légijármű állóhely gurulási nyomvonal középvonalától a 3-1. táblázat 11. vagy 12. oszlopában meghatározott távolságokon belül levő minden akadályt lássanak el jelöléssel és ha a gurulóutat, a forgalmi előtér, vagy légijármű állóhely gurulási nyomvonalat éjszaka is használják, kivilágítással.

6.1.9 ***Ajánlás** — A 4.3.2 pontban jelzett akadályokat lássák el jelöléssel kivilágítással kivéve, hogy a jelölés elhagyható, ha az akadályt nappal, nagy intenzitású akadályfénnyel kivilágítják.*

6.1.10 ***Ajánlás** — Egy folyót, völgyet, vagy széles utat átívelő magasfeszültségű távvezetékeket, elektromos, vagy egyéb vezetéket, stb. lássák el jelöléssel továbbá tartószerkezeteiket (oszlopaikat) lássák el jelöléssel és kivilágítással, ha a légiforgalmi vizsgálat azt jelzi, hogy ezek veszélyt jelenthetnek a légijármű számára. A tartószerkezetek megjelölése elhagyható, ha azokat nappal, nagy intenzitású akadályfénnyel kivilágítják.*

6.1.11 ***Ajánlás** — Ha megállapították, hogy a távvezeték, egyéb vezeték, stb. megjelölése szükséges, azonban ezekre gyakorlati szempontból nem megfelelő a jelzések elhelyezése, tartószerkezeteiket (oszlopaikat) lássák el „B” típusú, nagy intenzitású akadály világítással.*

6.2 Tárgyak megjelölése

Általános rész

6.2.1 Az összes megjelölendő állandó rögzített tárgyat lehetőség szerint el kell látni megfelelő színezéssel, de ha ez gyakorlati szempontból nem lehetséges, azokon vagy azok felett helyezzenek el jelzéseket, vagy zászlókat. Kivételt képeznek azok a tárgyak, amelyek méreteik, alakjuk, vagy színük miatt elég feltűnőek és így megjelölésük más módon nem szükséges.

6.2.2 Az összes mozgó tárgyat megfelelő színezéssel, vagy jelző zászlókkal kell ellátni.

Színek használata

6.2.3 ***Ajánlás*** *— Az alapvetően egyenletes felületű és bármely síkban 4.5 méter, vagy ennél nagyobb kiterjedésű tárgyat olyan módon színezzék, hogy a színek kockákat adjanak. A mintázat 1.5 méternél nem kisebb és 3.0 méternél nem nagyobb négyszögekből álljon úgy, hogy a sötétebbik színű négyszögek a sarkokon helyezkedjenek el. A mintázat színei egymással, valamint a háttérrel kontrasztot alkossanak, megfelelő módon kiemelkedjenek. Használják a narancssárga és fehér ,vagy vörös és fehér színösszeállítást kivéve, ha ezek beleolvadnak a háttérbe (lásd 6-1. ábra).*

6.2.4 ***Ajánlás*** *— A tárgyat váltakozó színű sávokkal színezzék, ha:*

a) az alapvetően egyenletes felületű, egyik — vízszintes, vagy függőleges — mérete nagyobb, mint 1.5 méter és a másik — vízszintes, vagy függőleges — mérete pedig kisebb, mint 4.5 méter; vagy

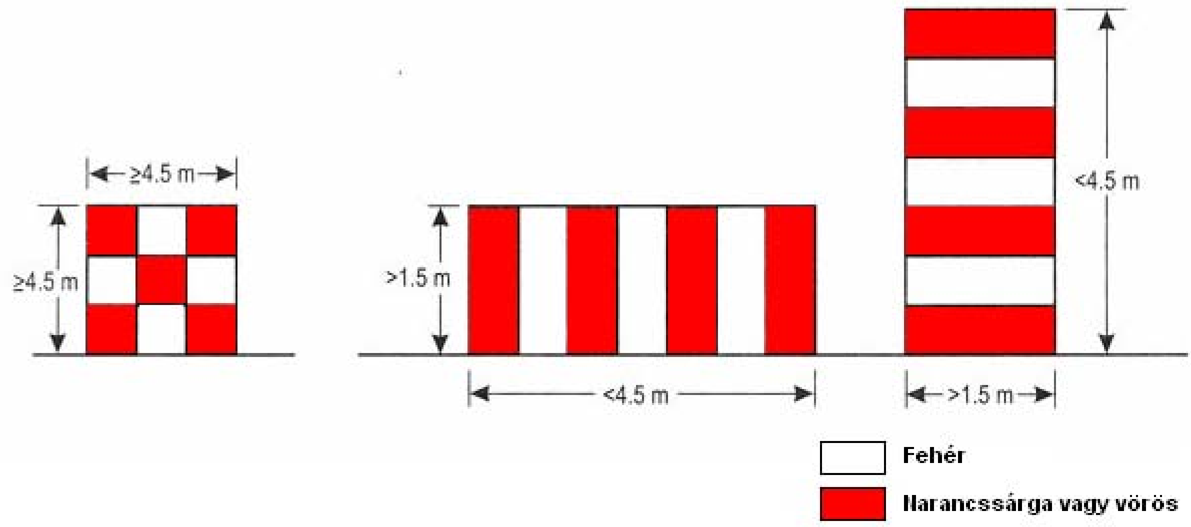
b) rácsos szerkezetű és bármely mérete nagyobb, mint 1.5 méter.

A színezés sávok merőlegesek legyenek a nagyobbik méretre és szélességük körülbelül a nagyobbik méret 1/7-e, vagy 30 méter — amelyik a kisebb érték. A sávok színe a háttérrel kontrasztban legyen, abból a sávok megfelelő módon kiemelkedjenek. A tárgy szélén a sötétebb sávok helyezkedjenek el (lásd 6-1. és 6-2. ábrák).

Megjegyzés: A 6-1. táblázat számítási módszert tartalmaz a sávok szélességének, valamint a páratlan számának meghatározására, amely utóbbi lehetővé teszi, hogy tárgy (hosszabb) szélén a sötétebb sávok helyezkedjenek el.

6.2.5 ***Ajánlás*** *—Bármely, a függőleges síkban 1.5 méternél kisebb méretű tárgyat egyetlen feltűnő színre színezzék. A szín a háttérrel kontrasztban legyen, abból megfelelő módon kiemelkedjen. Használják a narancssárga, vagy vörös színt, kivéve, ha ez beleolvad a háttérbe.*

Megjegyzés: Bizonyos háttér terep színek esetében a megfelelő kontraszt biztosítása érdekében szükségesnek ítélhetik a narancssárgától, vagy vöröstől eltérő szín alkalmazását.



6-1. ábra: Alapvető színezés és mintázat

6.2.6 ***Ajánlás*** *— Ha a mozgó tárgyakat színekkel jelölik meg, használjanak egyetlen feltűnő színt; a kényszerhelyzeti gépjárművek esetében a vörös, vagy sárgászöld, a kiszolgáló gépjárművek esetében a sárga szín kívánatos.*

Jelzések (jelzők) használata

6.2.7 A tárgyakon, vagy azok közelében elhelyezett jelzések olyan helyzetben kell, hogy legyenek, hogy azok mutassák a tárgy formáját és jó időben a levegőből legalább 1000 méter, a földről legalább 300 méter távolságból felismerhetők legyenek minden olyan irányból, amelyből a légijármű a tárgyat megközelítheti. A jelzések formája olyan legyen, hogy azokat más tájékoztatások megadására szolgáló jelzésekkel ne téveszthessék össze. A jelzés továbbá olyan legyen, hogy az ne növelje a tárgy által okozott veszélyt.

6.2.8 ***Ajánlás*** *— A magasfeszültségű távvezetéken, elektromos és egyéb vezetéken, stb. elhelyezett jelzés (jelző tárgy) legalább 60 cm. átmérőjű gömb legyen.*

6-1. táblázat: A jelölés sávok szélessége

Legnagyobb méret		Jelölés sávok szélessége
több mint	nem több mint	
1.5 m	210 m	leghosszabb méret 1/7 része
210 m	270 m	leghosszabb méret 1/9 része
270 m	330 m	leghosszabb méret 1/11 része
330 m	390 m	leghosszabb méret 1/13 része
390 m	450 m	leghosszabb méret 1/15 része
450 m	510 m	leghosszabb méret 1/17 része
510 m	570 m	leghosszabb méret 1/19 része
570 m	630 m	leghosszabb méret 1/21 része

6.2.9 ***Ajánlás*** *— A két egymás után elhelyezett jelző tárgy, vagy a tartószerkezet és a jelző közötti távköz feleljen meg a jelzés méretének, de semmi esetre se haladja meg:*

a) a 30 métert, ha a jelző átmérője 60 cm. és folyamatosan növekedjen *b) 35 méterre, ha a jelző átmérője 80 cm. és folyamatosan tovább növekedjen legfeljebb*

c) 40 méterre, ha a jelző átmérője legalább 130 cm.

Ahol több szálon futó nagyfeszültségű távvezetéket, elektromos, vagy egyéb vezetéket jelölnek meg, a jelző tárgy ne legyen alacsonyabban, mint a jelölt pont legmagasabban levő vezetéke.

6.2.10 ***Ajánlás** — A jelző tárgy egyszínű legyen. A jelzések elhelyezésénél váltakozó színeket alkalmazzanak, amely lehet fehér és vörös, vagy fehér és narancssárga. A kiválasztott szín a háttérrel megfelelő kontrasztban legyen, abból kiemelkedjen.*

Zászlók használata

6.2.11 A tárgyak megjelölésére használt zászlókat a tárgy körül, a tárgyon, vagy annak legmagasabb részén (szélén) kell elhelyezni. Ha a zászlókat nagy méretű tárgyak, vagy egymáshoz közel álló tárgyak csoportjának megjelölésére használják, legalább 15 méter távközönként helyezzenek el egy zászlót. A zászlók ne fokozzák a veszélyt, amit a velük kijelölt tárgyak jelentenek.

6.2.12 Az állandó rögzített tárgyak megjelölésére használt zászlók mérete ne legyen kevesebb, mint 0.6 négyzetméter. A mozgó tárgyak megjelölésére használt zászlók mérete ne legyen kevesebb, mint 0.9 négyzetméter.

6.2.13 ***Ajánlás** — Az állandó rögzített tárgyak megjelölésére használt zászlók színe narancssárga, vagy a két háromszögletű részből álló zászlóé narancssárga és fehér, vagy vörös és fehér legyen, kivéve, ha ezek a színek beleolvadnak a háttérbe. Ebben az esetben más feltűnő színeket alkalmazzanak.*

6.2.14 A mozgó tárgyak megjelölésére használt zászlók mintázata oldalanként 0.3 méternél nem kisebb négyszögekből kell, hogy álljon. A mintázat színei egymással valamint a háttérrel kontrasztban legyenek, abból megfelelő módon kiemelkedjenek. Használják a narancssárga és fehér, vagy vörös és fehér színösszeállítást, kivéve, ha ezek beleolvadnak a háttérbe.

6.3 Tárgyak kivilágítása

Az akadályfények használata

6.3.1 Azon tárgyak jelenlétét, amelyeket a 6.1 pont alapján ki kell világítani, alacsony, közepes, vagy nagy intenzitású akadályfényekkel, vagy ezek kombinációjával kell jelezni.

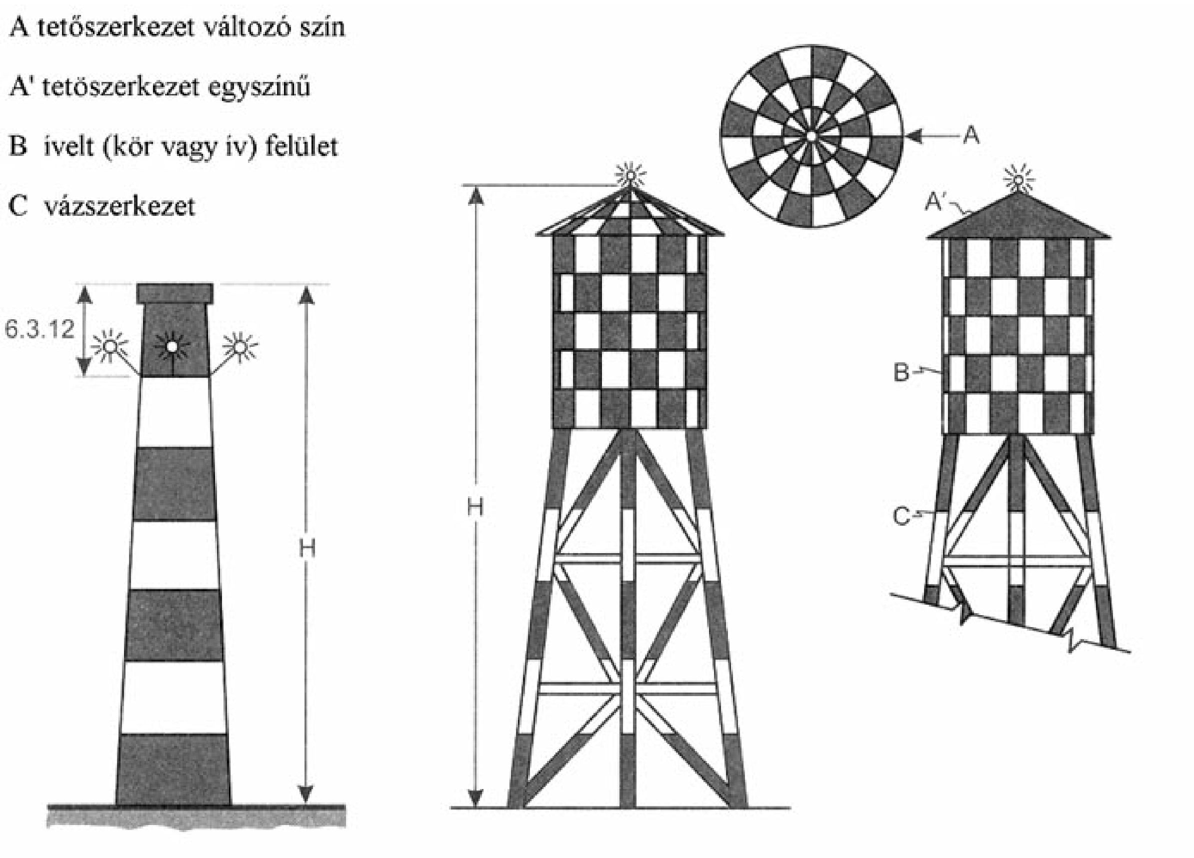
Megjegyzés: A nagy intenzitású akadályfények nappali és éjszakai használatra készültek. Gondoskodjanak arról, hogy ezek ne vakítsanak. A fények tervezésével, elhelyezésével és üzemeltetésével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv 4. részében található.

6.3.2 ***Ajánlás** — A. vagy B. típusú alacsony intenzitású akadályfényeket használjanak a kis méretű tárgyak megjelölésére, amelyek magassága a környező talajfelszínhez viszonyítva kevesebb, mint 45 méter.*

6.3.3 ***Ajánlás** — Ahol az A. vagy B. típusú alacsony intenzitású akadályfények használata nem megfelelő, vagy korai figyelmeztetés (figyelemfelhívás) szükséges, használjanak közepes, vagy nagy intenzitású akadályfényeket.*

6.3.4 A gépjárműveken és egyéb mozgó tárgyakon, a légijármű kivételével, el kell helyezni C. típusú alacsony intenzitású akadályfényt.

6.3.5 A beállító gépjárműveken (FOLLOW-ME) helyezzenek el D. típusú alacsony intenzitású akadályfényt.



6-2. (A) ábra: Magas szerkezetek jelölése és kivilágítása

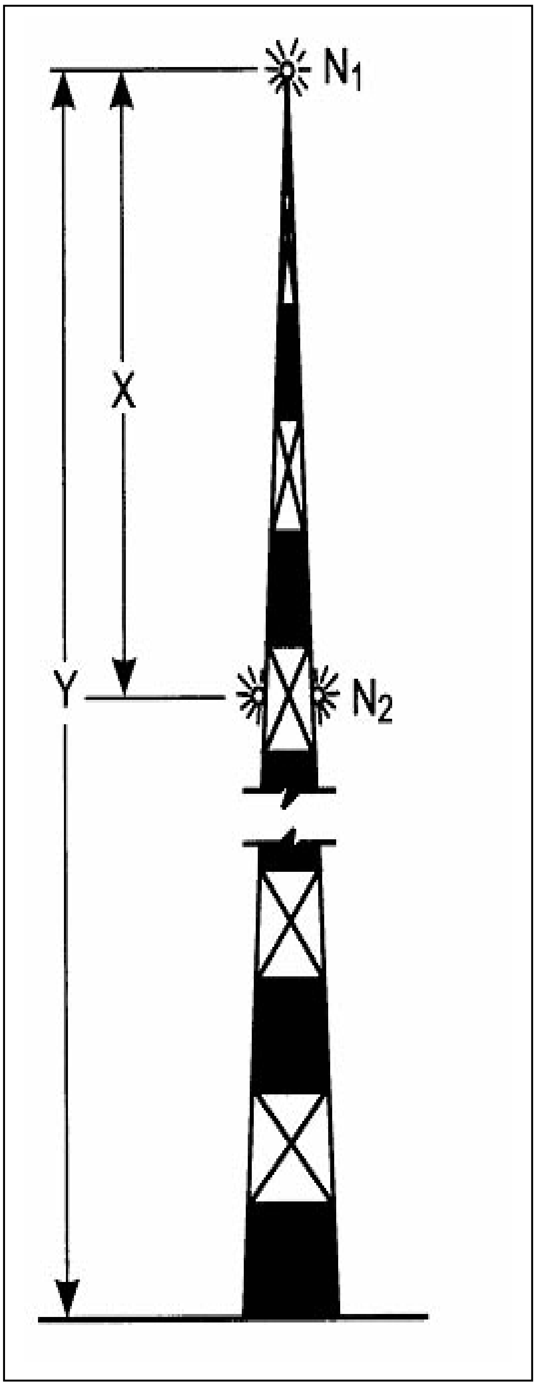
Ha „H" több mint 45 méter, az ilyen nagyobb magasságok esetén közbenső fényeket kell elhelyezni (lásd 6-2 B. ábra)

6.3.6 ***Ajánlás*** — A B. típusú alacsony intenzitású akadályfényeket a 6.3.7 pont szerint magukban vagy B. típusú közepes intenzitású akadályfényekkel együttesen használjanak.

6.3.7 ***Ajánlás*** — *Ahol a tárgy nagyméretű vagy magassága több mint 45 méterrel a környező talajfelszín szintje fölé nyúlik, A, B. vagy C. típusú közepes intenzitású akadályfényeket alkalmazzanak. Az A. és C. típusú közepes intenzitású akadályfényeket magukban, míg B. típusú közepes intenzitású akadályfényeket magukban vagy a B. típusú alacsony intenzitású akadályfényekkel együttesen használják.*

Megjegyzés: Épületek vagy fák csoportja nagyméretű tárgynak tekintendő.

Ha „H” több mint 45 méter, az ilyen nagyobb magasságok esetén közbenső fényeket kell elhelyezni Távköz = X (6. Függelék szerint) Fények száma: N = Y/X.



6-2. (B) ábra:Magas szerkezetek jelölése és kivilágítása

*6.3.8 **Ajánlás** — A.. típusú nagy intenzitású akadályfényeket alkalmazzanak azon tárgy megjelölésére, amelynek magassága több mint 150 méterrel a környező talajfelszín szintje fölé nyúlik és légiforgalmi vizsgálat azt jelzi, hogy a tárgy nappali felismeréséhez ilyen akadályfényekre van szükség.*

*6.3.9 **Ajánlás** — B. típusú nagy intenzitású akadályfényeket használjanak a nagyfeszültségű távvezetékeket, elektromos vagy egyéb vezetékeket, stb. tartó torony megjelölésére, ha:*

a) *légiforgalmi vizsgálat azt jelzi, hogy a vezetékek, stb. nappali felismeréséhez ilyen akadályfényekre van szükség; vagy*

b) *gyakorlati szempontban megoldhatatlannak ítélték a vezetékek jelzésekkel történő felszerelését.*

6.3.10 ***Ajánlás*** *— Ahol az illetékes hatóság véleménye szerint az A. illetve B. típusú nagy intenzitású, vagy az A. típusú közepes intenzitású akadályfények éjszaka a repülőtér (kb. 10 km sugarú) körzetében vakíthatják a repülőgépvezetőt, vagy jelentős környezeti ártalmat idézhetnek elő, kettős akadály világítási rendszert alkalmazzanak. Ez a rendszer nappali és szürkületi időszakra szükség szerint A. illetve B. típusú nagy intenzitású, vagy A. típusú közepes intenzitású, valamint az éjszakai időszakra B. vagy C. típusú közepes intenzitású akadályfényekből álljon.*

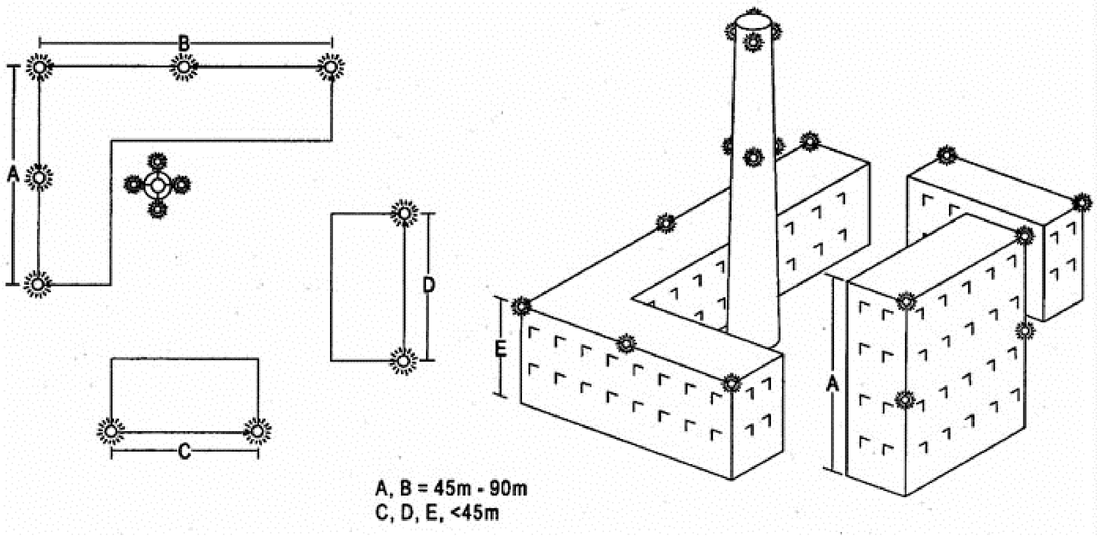
Az akadályfények elhelyezése

Megjegyzés: Az akadályokon elhelyezendő alacsony, közepes és/vagy nagy intenzitású akadályfények összetételére vonatkozó ajánlásokat a 6. Függelék tartalmazza.

6.3.11 A tárgy tetején, vagy ahhoz lehető legközelebb el kell helyezni egy, vagy több alacsony, közepes, vagy nagy intenzitású akadályfényt. A felső fényeket úgy rendezzék el, hogy azok az akadály korlátozási felület figyelembevételével legalább a tárgy legmagasabb pontjait, vagy széleit jelöljék meg.

6.3.12 ***Ajánlás*** *— A kémények, vagy más hasonló feladatokat ellátó építmények esetében a felső fényeket az építmény felső szegélyéhez képest elég alacsonyan helyezzék el ahhoz, hogy a lehető legkisebbre csökkentsék a fény-egység füst, vagy egyéb anyaggal történő szennyeződésének lehetőségét (lásd 6-2. és 6-3. ábra).*

6.3.13 A nappal, nagy intenzitású akadályfénnyel jelzett torony, vagy antenna esetében, amelyen 12 méternél nagyobb szerkezeti elem helyezkedik el és gyakorlati szempontból nem kívánatos a nagy intenzitású akadályfény felszerelése a szerkezet tetejére, ezt a fényt a lehető legmagasabb pontra kell elhelyezni és amennyiben lehetséges, a szerkezet tetejére A. típusú közepes intenzitású akadályfényt szereljenek fel.



6-3. ábra: Épületek kivilágítása

6.3.14 A nagy méretű tárgy, vagy egymáshoz közel álló tárgyak csoportjának megjelölése esetében az akadály korlátozási felület figyelembevételével legalább a tárgyak legmagasabb pontjait, vagy éleit meg kell jelölni fényekkel úgy, hogy ezzel a tárgyak általános formáját és méreteit jelezzék. Ha két, vagy több él azonos magasságú, a leszállási területhez legközelebb eső élt kell megjelölni. Ahol alacsony intenzitású akadályfényt használnak, ezeket egymástól nem több, mint 45 méter távolságra, ahol pedig közepes intenzitású akadályfényt használnak, ezeket egymástól nem több, mint 900 méter távolságra kell elhelyezni.

6.3.15 ***Ajánlás*** *— Ahol a vonatkozó akadály korlátozási felület lejtős és az akadály korlátozási felület feletti legmagasabb pont nem a tárgy legmagasabb pontja, a tárgy legmagasabb pontján helyezzenek el további kiegészítő akadályfényeket.*

6.3.16 Ahol a tárgyat A. típusú közepes intenzitású akadályfényekkel jelölik meg és a tárgy teteje több, mint 105 méterrel a környező talajfelszín szintje, vagy a közeli épületek (ha a tárgyat ilyen épületek veszik körül) tetejének szintje fölé nyúlik, a közbenső szinteken el kell helyezni kiegészítő akadályfényeket. Ezeket lehetőség szerint a felső fények és a talaj szintje, vagy a közeli épületek tetejének szintje között egymástól egyenlő távközökben helyezzék el, de a távköz ne haladja meg a 105 métert (lásd 6.3.7 pont).

6.3.17 Ahol a tárgyat B. típusú közepes intenzitású akadályfényekkel jelölik meg és a tárgy teteje több, mint 45 méterrel a környező talajfelszín szintje, vagy a közeli épületek (ha a tárgyat ilyen épületek veszik körül) tetejének szintje fölé nyúlik, a közbenső szinteken el kell helyezni kiegészítő akadályfényeket. Ezek a kiegészítő közbenső fények váltakozva B. típusú alacsony és közepes intenzitású akadályfények legyenek, amelyeket a lehetőség szerint a felső fények és a talaj szintje, vagy a közeli épületek tetejének szintje között egymástól egyenlő távközökben helyezzék el, de a távköz ne haladja meg az 52 métert.

6.3.18 Ahol a tárgyat C. típusú közepes intenzitású akadályfényekkel jelölik meg és a tárgy teteje több, mint 45 méterrel a környező talajfelszín szintje, vagy a közeli épületek (ha a tárgyat ilyen épületek veszik körül) tetejének szintje fölé nyúlik, a közbenső szinteken el kell helyezni kiegészítő akadályfényeket. Ezeket a kiegészítő közbenső fényeket lehetőség szerint a felső fények és a talaj szintje vagy a közeli épületek tetejének szintje között egymástól egyenlő távközökben helyezzék el, de a távköz ne haladja meg az 52 métert.

6.3.19 Ahol A. típusú nagy intenzitású akadályfényeket használnak, azokat egymástól egyenlő, de 105 méternél nem nagyobb távolságra kell elhelyezni a talaj szintje és a 6.3.11 pont alapján meghatározott felső fény(ek) között, azonban ahol a megjelölendő tárgyat épületek veszik körül, az épületek felső szintje számítható a talaj szintjének és a fény-egységek számát ennek alapján kell meghatározni.

6.3.20 Ahol B. típusú nagy intenzitású akadályfényeket használnak, azokat három szinten kell elhelyezni az alábbiak szerint:
— a torony tetején;
— a távvezetékek, elektromos, vagy egyéb vezetékek bekötésének (rögzítésének) legalacsonyabb pontján; és
— körülbelül félúton a fenti két szint között.

Megjegyzés: Egyes esetekben ehhez szükség lehet arra, hogy a fényeket ne a tornyon helyezzék el.

6.3.21 ***Ajánlás*** *— Az A. és B. típusú nagy intenzitású akadályfények beállítási szögei feleljenek meg a 6-2. táblázat előírásainak.*

6.3.22 Az egyes megjelölendő szintek alacsony, közepes, vagy nagy intenzitású akadályfényeinek száma és elrendezése olyan kell, hogy legyen, hogy azok a tárgyat minden oldalszögből jelezzék. Ahol a tárgyat annak egy része, vagy egy szomszédos tárgy bármely irányból takarja, azon a tárgyon el kell helyezni megfelelő akadályfényt, hogy ez jelezze a megjelölendő tárgy általános kiterjedését. Ha az eltakart fény nem látható és így nem jelzi a fenti tárgyat, az elhagyható.

6-2. táblázat: A nagy intenzitású akadályfények beállítási szögei

A fény egység elhelyezési magassága a földfelszín felett	*A legnagyobb sugárzási fényerő szöge a vízszintes felett*
több mint 151 méter AGL[2]	0°
122 méter — 151 méter között AGL	1°
92 méter és 122 méter között AGL	2°
kevesebb mint 92 méter AGL	3°

Alacsony intenzitású akadályfény — Jellemzők

6.3.23 Az állandó rögzített tárgyakon elhelyezett A. és B. típusú alacsony intenzitású akadályfények állandó vörös színű fények kell, hogy legyenek.

6.3.24 Az A. és B. típusú alacsony intenzitású akadályfények meg kell, hogy feleljenek a 6-3. táblázatban található előírásoknak.

6.3.25 A a vészhelyzeti és biztonsági gépjárműveken elhelyezett C. típusú alacsony intenzitású akadályfények színe villogó kék, az egyéb gépjárműveken elhelyezett ilyen fények színe villogó sárga kell, hogy legyen.

6.3.26 A beállító gépjárműveken elhelyezett D. típusú alacsony intenzitású akadályfény színe villogó sárga kell, hogy legyen.

6.3.27 A C. és D. típusú alacsony intenzitású akadályfények meg kell, hogy feleljenek a 6-3. táblázatban található előírásoknak.

6.3.28 A korlátozott mozgással rendelkező tárgyakon (mint például utasbeszálló híd) elhelyezett alacsony intenzitású akadályfények színe vörös kell, hogy legyen. Az akadályfények fényereje olyan legyen, hogy a környező fények intenzitását, valamint a jellemző általános megvilágítást figyelembe véve azok jól láthatók maradjanak.

Megjegyzés: A légijármű fényei a 2. Annexben találhatók.

6.3.29 A korlátozott mozgással rendelkező tárgyakon elhelyezett alacsony intenzitású akadályfények meg kell, hogy feleljenek legalább a 6-3. táblázatban az A. típusú alacsony intenzitású akadályfényekre vonatkozó előírásoknak.

Közepes intenzitású akadályfény — Jellemzők

6.3.30 Az A. típusú közepes intenzitású akadályfények színe villogó fehér, a B. típusú fények színe villogó vörös és a C. típusú fények színe állandó vörös kell, hogy legyen.

6.3.31 Az A, B. és C. típusú közepes intenzitású akadályfények meg kell, hogy feleljenek a 6-3. táblázatban található előírásoknak.

6.3.32 Egy tárgyon elhelyezett A. és B. típusú közepes intenzitású akadályfények egyszerre kell, hogy villogjanak.

Nagy intenzitású akadályfény — Jellemzők

6.3.33 Az A. és B. típusú nagy intenzitású akadályfények színe villogó fehér kell, hogy legyen.

6.3.34 Az A. és B. típusú nagy intenzitású akadályfények meg kell, hogy feleljenek a 6-3. táblázatban található előírásoknak.

6.3.35 Egy tárgyon elhelyezett A. típusú nagy intenzitású akadályfények egyszerre kell, hogy villogjanak.

6.3.36 ***Ajánlás —*** *Magasfeszültségű vezetéket, vagy egyéb kábelt tartó tornyot (oszlop) jelző B. típusú nagy intenzitású akadályfények sorban váltakozva villanjanak: először a középső fény, azután a felső fény majd végül az alsó fény. A felvillanások közötti időtartam aránya körülbelül a következő táblázatnak megfelelő legyen:*

Felvillanások közötti időtartam	*Ciklus idő aránya*
középső és felső fények között	*1/13*
felső és alsó fények között	*2/13*
alsó és középső fények között	*10/13*

6-3. táblázat: Az akadályfények jellemzői

1	2	3	4	5	6	7	8	9	10	11	12
Fény egység típusa	**Szín**	**Jelzés típusa**	**Legnagyobb fényerősség (cd) adott háttér világítás mellett**			**Fénysugár szélesség**	**Fényerősség (cd) adott magassági szögekben, ha a fény egység szintben van (d)**				
		(felvillanási arány)	**500 cd/m^2 felett**	**50 - 500 cd/m^2 között**	**50 cd/m^2 alatt**	**(c)**	**-10° (e)**	**-1° (f)**	**± 0 ° (f)**	**+ 6°**	**+ 10°**
A. típusú alacsony intenzitású (állandó akadály)	vörös	állandó	N/A	min. 10	min. 10	10°	N/A	N/A	N/A	min. 10	min. 10
A. típusú alacsony intenzitású (állandó akadály)	vörös	állandó	N/A	min. 32	min. 32	10°	N/A	N/A	N/A	min. 32	min. 32
C. típusú alacsony intenzitású (mozgó akadály)	sárga és kék (a)	villogó 60-90 fpm	N/A	min. 40 (b) max. 400	min. 40 (b) max. 400	12° (g)	N/A	N/A	N/A	N/A	N/A
D. típusú alacsony intenzitású (beállító gépjármű)	sárga	villogó 60-90 fpm	N/A	min. 200 (b) max. 400	min. 200 (b) max. 400	12° (h)	N/A	N/A	N/A	N/A	N/A

Fény egység típusa	Szín	Jelzés típusa	Legnagyobb fényerősség (cd) adott háttér világítás mellett			Fénysugár szélesség	Fényerősség (cd) adott magassági szögekben, ha a fény egység szintben van (d)				
		(felvillanási arány)	500 cd/m2 felett	50 - 500 cd/m2 között	50 cd/m2 alatt	(c)	-10° (e)	-1° (f)	± 0 ° (f)	+ 6°	+ 10°
A. típusú közepes intenzitású	fehér	villogó 20 - 60 fpm	20000 (b) ± 25%	20000 (b) ± 25%	2000 (b) ± 25%	min. 3°	max. 3%	min. 50% max. 75%	min. 100%	N/A	N/A
B. típusú közepes intenzitású	vörös	villogó 20 - 60 fpm	N/A	N/A	2000 (b) ± 25%	min. 3°	N/A	min. 50% max. 75%	min. 100%	N/A	N/A
C. típusú közepes intenzitású	vörös	állandó	N/A	N/A	2000 (b) ± 25%	min. 3°	N/A	min. 50% max. 75%	min. 100%	N/A	N/A
A. típusú nagy intenzitású	fehér	villogó 40 - 60 fpm	200000 (b) ± 25%	20000 (b) ± 25%	2000 (b) ± 25%	3° - 7°	max. 3%	min. 50% max. 75%	min. 100%	N/A	N/A
B. típusú nagy intenzitású	fehér	villogó 40 - 60 fpm	100000 (b) ± 25%	20000 (b) ± 25%	2000 (b) ± 25%	3° - 7°	max. 3%	min. 50% max. 75%	min. 100%	N/A	N/A

Az akadályfények jellemzői (6-3. táblázat magyarázat)

a) Lásd 6.3.25 pont.

b) A tényleges fényerősség a *Repülőtér Tervezési Kézikönyv* 4. rész alapján.

c) A fénysugár terjedés (szélesség) egy síkban két irány által bezárt szög, amelynél a fényerősség megfelel a 4, 5. és 6. oszlopokban jelzett alacsonyabb tűrési határérték 50 százalékának. A fénysugár terjedés a magassági szög mentén, ahol a legnagyobb fényerő tapasztalható, nem feltétlenül szimmetrikus.

d) A magassági (függőleges) szögek a vízszinteshez viszonyítva értendők.

e) Bármely meghatározott vízszintes oldalszögben tapasztalt intenzitás a legnagyobb intenzitás érték százalékában a 4, 5. és 6. oszlopokban jelzett fényerősségek használata mellett.

f) Bármely meghatározott vízszintes oldalszögben tapasztalt intenzitás a 4, 5. és 6. oszlopokban jelzett alacsonyabb tűrési határérték százalékában.

g) A meghatározott értékek mellett a fények intenzítása elegendő legyen ±0° és 50° között a láthatóság biztosításához.

h) A legnagyobb intenzitás körülbelül 2.5° magassági (függőleges) szögnél.

i) A legnagyobb intenzitás körülbelül 17° magassági (függőleges) szögnél.

Megjegyzés: Ez a táblázat ajánlott vízszintes fénysugár terjedést (szöget) nem tartalmaz. A 6.3.22 pont 360°-os fedést ír elő az akadály körül. Ezért az előírás teljesítéséhez szükséges fény egységek száma az egyes fények vízszintes sugárzásától és az akadály alakjától függ. Ezért keskenyebb fény-sugár terjedési szög esetében nagyobb fényre lesz szükség.

7. fejezet
Látjelek a korlátozottan használható területek megjelölésére

7.1 Lezárt futópálya és gurulóút, vagy ezek részei

Alkalmazás

7.1.1 Azon a futópályán, a gurulóúton, vagy ezek részén, amely állandó jelleggel le van zárva az összes légijármű forgalom elől, záró jelzést kell elhelyezni.

7.1.2 ***Ajánlás*** *— Az ideiglenes jelleggel lezárt futópályán, gurulóúton, vagy ezek lezárt szakaszain helyezzenek el záró jelzést kivéve, ha a lezárás csak rövid ideig tart és erről a légiforgalmi szolgálatok megfelelő tájékoztatást, illetve figyelmeztetést nyújtanak.*

Elhelyezés

7.1.3 A lezárt futópálya, vagy annak lezárt szakasza mindkét végére helyezzék el a záró jelzést, valamint helyezzenek el kiegészítő jelzéseket úgy, hogy a közöttük levő legnagyobb távolság ne legyen több, mint 300 méter. A gurulóúton legalább a gurulóút, vagy annak lezárt szakaszának mindkét végére helyezzék el a záró jelzést.

Jellemzők

7.1.4 A futópályán elhelyezett záró jelzés olyan alakú és arányú legyen, mint ahogy a 7-1. ábra a) képén látható. A gurulóúton elhelyezett záró jelzés olyan alakú és arányú legyen, mint ahogy a 7-1. ábra b) képén látható. A jelzések színe a futópályán fehér és a gurulóúton sárga legyen.

Megjegyzés: Amikor a területet ideiglenesen zárják le, a lezárt terület kijelölésére letörhető záró kerítéseket, nem felfestett jelöléseket, vagy más alkalmas módszereket használhatnak.

7.1.5 A futópályán, a gurulóúton, vagy ezek részén, amely állandó jelleggel le van zárva a légijármű forgalom elől, el kell tüntetni az összes általánosan használatos futópálya és gurulóút jelzést.

7.1.6 A lezárt futópályán, a gurulóúton, vagy ezek lezárt részén a fényberendezéseket — karbantartás kivételével — nem szabad üzemeltetni.

7.1.7 Ha a futópályát, a gurulóutat, vagy ezek lezárt szakaszait éjszaka is működő, használható futópálya, vagy gurulóút keresztezi, a záró jelzések mellett a lezárt terület elején, egymástól nem több, mint 3 méter távolságra el kell helyezni záró fényeket. A fények ismertetése a 7.4.4 pontban található.

7.2 Nem teherbíró felületek

Alkalmazás

7.2.1 A gurulóutak, kitérő várakozó helyek, futópálya megforduló sávok, forgalmi előterek padkáit, valamint más nem teherbíró felületeket, amelyeket nem lehet egyértelműen megkülönböztetni a teherbíró felületektől és amelyek igénybevétel esetén a légijármű sárkányszerkezetének sérülését okozhatják, megfelelő határvonallal kell megjelölni. Az ilyen felületek és a teherbíró felületek közötti határvonal jelölése a gurulási (szegély) oldal sáv jelzés.

Megjegyzés: A futópálya oldal sáv jelzés ismertetése az 5.2.7 pontban található.

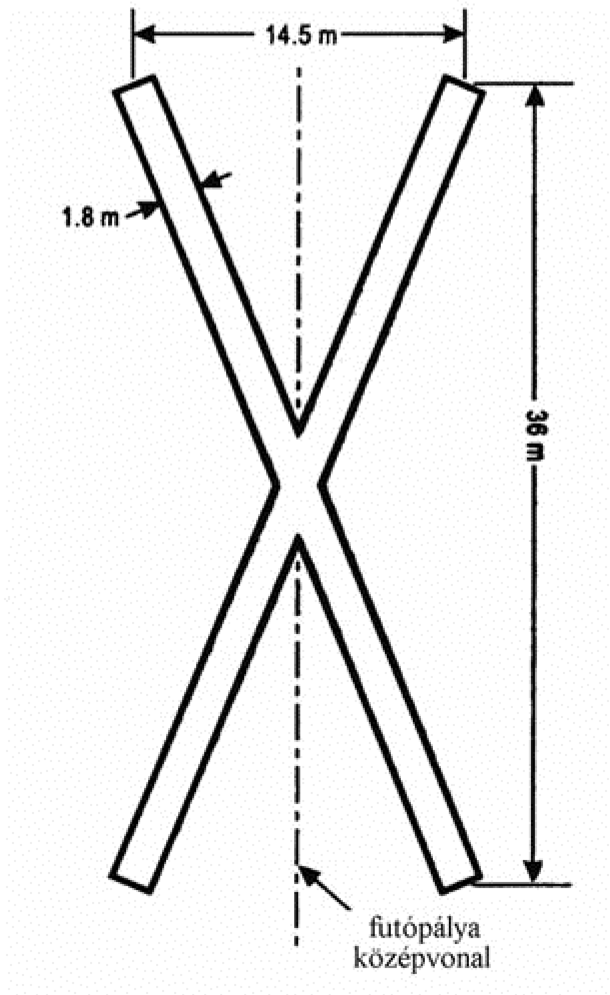
Elhelyezés

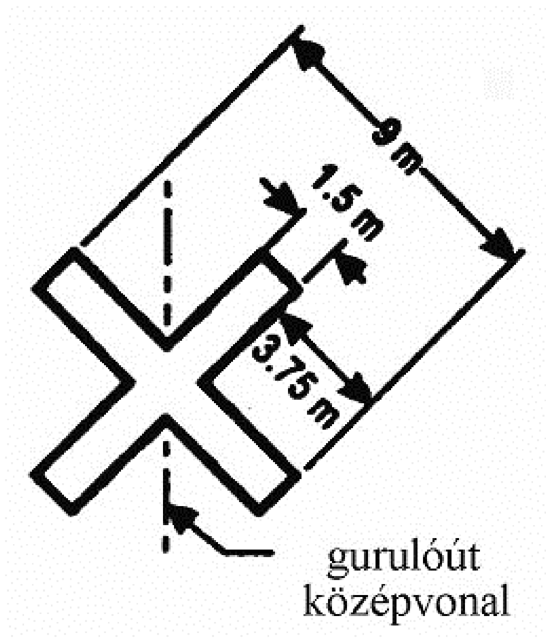
7.2.2 ***Ajánlás*** *— A gurulási oldal sáv jelzést a teherbíró burkolat széle mentén helyezzék el úgy, hogy a jelzés külső széle körülbelül egybe essen a teherbíró burkolat szélével.*

Jellemzők

7.2.3 ***Ajánlás*** *— A gurulási oldal sáv jelzés két folyamatos, egymástól 15 cm. távolságra kialakított 15 cm. széles vonal, amelyek színe megegyezik a gurulóút középvonal jelzés színével.*

Megjegyzés: A kereszteződésekben, vagy a forgalmi előtér kis területein elhelyezhető további keresztirányú jelzés sávokkal kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*





7-1 (a) ábra: Lezárt futópálya jelzés 7-1. (b) ábra: Lezárt gurulóút jelzés

7.3 Futópálya küszöb előtti terület

Alkalmazás

7.3.1 ***Ajánlás*** *— Amikor a futópálya küszöb előtt terület burkolt felülettel van ellátva, hossza meghaladja a 60 métert és ez a terület légijárművek általános üzemelésére nem alkalmas, a küszöb előtti területet teljes hosszában irány-nyilazás jelzésekkel jelöljék meg.*

Elhelyezés

7.3.2 ***Ajánlás*** *— Az irány-nyilazás jelzés a futópálya irányába mutasson és azt a 7-2. ábrának megfelelően helyezzék el.*

Jellemzők

7.3.3 ***Ajánlás*** *— Az irány-nyilazás jelzés feltűnő és a futópálya jelzésektől eltérő színű legyen. Kívánatos a sárga szín használata. A sávok szélessége legalább 0.9 méter legyen.*

7.4 Légijármű üzemelésre nem használható területek

Alkalmazás

7.4.1 Légijármű üzemelésre nem használható terület jelzést kell elhelyezni a gurulóút, forgalmi előtér, vagy kitérő várakozó hely bármely szakaszára, amely (légijármű általi) igénybevételre nem alkalmas, azonban a terület mellett a légijármű biztonságosan elhaladhat. Az éjszaka használatos mozgási területen üzemelésre nem használható terület fényeket kell elhelyezni.

Megjegyzés: Légijármű üzemelésre nem használható terület jelzések és fények alkalmazhatók a gurulóút, vagy a forgalmi előtér burkolt felülettel ellátott területén levő lyukak, vagy karbantartás alatt levő burkolat szakaszok megjelölésére és így a repülőgépvezető figyelmeztetésre. Ezek nem használhatók, ha a futópálya egy szakasza, vagy a gurulóút szélesebb szakaszai alkalmatlanok az igénybevételre. Ilyen esetekben a futópályát, vagy a gurulóutat általában lezárják

Elhelyezés

7.4.2 A légijármű üzemelésre nem használható terület jelzéseket és fényeket az adott terület határainak megjelölése érdekében ahhoz elég közel kell elhelyezni.

Megjegyzés: A Légijármű üzemelésre nem használható terület fények elhelyezésével kapcsolatos útmutató az A. Melléklet 13. részében található.

Légijármű üzemelésre nem használható terület jelzés jellemzői

7.4.3 A légijármű üzemelésre nem használható terület jelzések feltűnő, álló helyzetű elemek, mint például a zászlók, jelzőkúpok, vagy határ-táblák kell, hogy legyenek.

Légijármű üzemelésre nem használható terület fények

7.4.4 A légijármű üzemelésre nem használható terület fények állandó, vörös színű fények kell, hogy legyenek, amelyek fényereje olyan, hogy a környező fények intenzitását, valamint a jellemző általános megvilágítást figyelembe véve jól láthatók. A vörös színű fény fényereje semmi esetre se legyen alacsonyabb, mint 10 cd érték.

Légijármű üzemelésre nem használható terület jelzés kúpok jellemzői

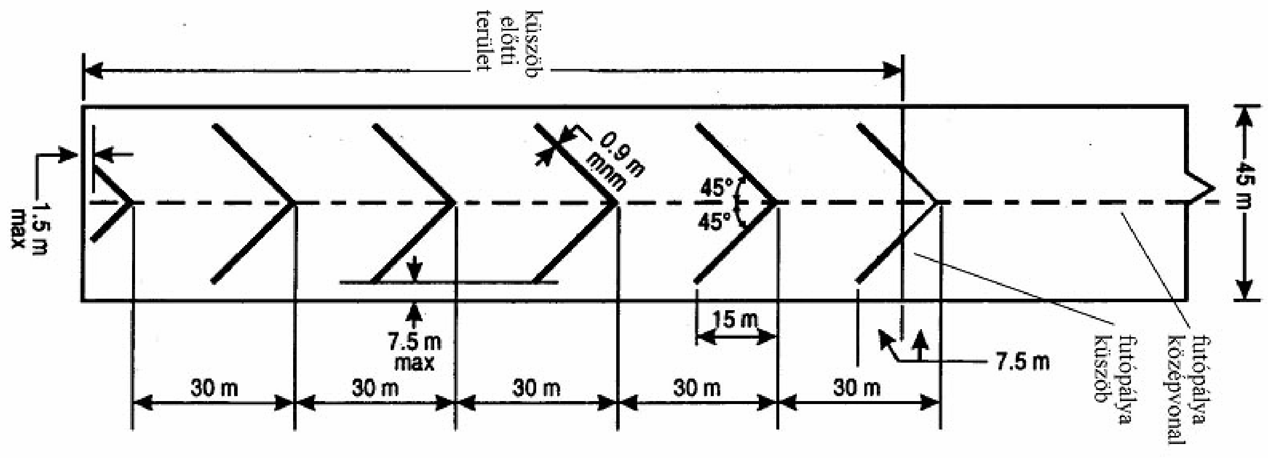
7.4.5 ***Ajánlás*** *— A légijármű üzemelésre nem használható terület jelzés kúp magassága legalább 50 centiméter, színe pedig vörös, narancssárga, sárga, vagy ezen bármely színek fehérrel való kombinációja legyen.*

Légijármű üzemelésre nem használható terület jelzés zászlók jellemzői

7.4.6 ***Ajánlás*** *— A légijármű üzemelésre nem használható terület jelzés zászlók mérete legalább 0.5 négyzetméter, alakja négyszögletes, színe pedig vörös, narancssárga, sárga, vagy ezen bármely színek fehérrel való kombinációja legyen.*

Légijármű üzemelésre nem használható terület jelzés határ táblák jellemzői

7.4.7 ***Ajánlás*** *— A légijármű üzemelésre nem használható terület jelzés határ táblák magassága legalább 50, szélessége legalább 90 centiméter, alakja négyszögletes, színezése (festése) váltakozó vörös és fehér, vagy narancssárga és fehér sávokból álljon.*



7-2. ábra: Futópálya küszöb előtti terület jelzése

8. fejezet
Elektromos rendszerek

8.1 A légiforgalmi létesítmények tápfeszültség rendszerei

Bevezető megjegyzés: A repülőtér biztonságos üzemeltetése a tápfeszültség minőségétől függ. A teljes elektromos tápfeszültség rendszer egy, vagy több külső elektromos hálózathoz való csatlakozásból, egy, vagy több áramfejlesztő létesítményt, transzformátorokat és kapcsolóegységeket tartalmazó belső, helyi elektromos elosztó rendszerből állhat. A repülőterek elektromos tápfeszültség rendszereinek tervezésekor számos egyéb, a rendszert felhasználó repülőtéri létesítményt is figyelembe kell venni.

8.1.1 A repülőtereken megfelelő elsődleges elektromos tápfeszültség rendszer kell, hogy rendelkezésre álljon a légiforgalmi létesítmények biztonságos üzemeltetéséhez.

8.1.2 A repülőtér látás utáni és rádiónavigációs létesítményeit kiszolgáló elektromos tápfeszültség rendszert úgy tervezzék meg és szereljék fel, hogy egy berendezés meghibásodása miatt a repülőgépvezető ne kapjon, illetve ne kaphasson elégtelen látás utáni, vagy rádiónavigációs irányvezetés tájékoztatásokat, vagy félrevezető információkat.

Megjegyzés: Az elektromos tápfeszültség rendszer úgy megtervezésénél, mind felszerelésénél vegyék figyelembe azokat a tényezőket, amelyek meghibásodást okozhatnak. Ezek közé tartoznak az elektromágneses zavarok, a tápfeszültség vezeték veszteségek, az esetleges feszültség ingadozások és kimaradások. További tájékoztató a Repülőtér Tervezési Kézikönyv 5. részében található.

8.1.3 ***Ajánlás** — Azokhoz a létesítményekhez csatlakozó elektromos tápfeszültség rendszer vezetékeket és szerkezeti elemeket, amelyeknél másodlagos (tartalék) tápfeszültség biztosítása szükséges, úgy szereljék be, hogy azok a fő tápfeszültség rendszer meghibásodása esetén automatikusan működésbe lépjenek.*

8.1.4 ***Ajánlás** — Az elsődleges tápfeszültség rendszer meghibásodása és a 8.1.10 pontban ismertetett berendezések teljes üzemére történő átállás ideje a lehető legrövidebb legyen. Kivételt képez a nem-precíziós, a precíziós megközelítésű és a felszállási futópálya látás utáni segédeszközeire meghatározott időtartam, amelyre a 8-1. táblázatban meghatározott legnagyobb átkapcsolási idő előírás alkalmazandó.*

Megjegyzés: Az átkapcsolási idő meghatározása az 1. fejezetben található.

8.1.5 Az átkapcsolási idő meghatározására vonatkozó előírás nem teszi szükségessé a meglevő másodlagos (tartalék) tápfeszültség rendszer lecserélését 2010 január 1. előtt. Mindazonáltal az 1999 november 4. után felszerelt másodlagos tápfeszültség rendszer esetében az azokhoz a berendezésekhez csatlakozó vezetékek és szerkezeti elemek, amelyekhez másodlagos tápfeszültség biztosítása szükséges, tegyenek eleget az 1. fejezetben ismertetett átkapcsolási időre vonatkozó, a 8-1. táblázatban meghatározott előírásnak.

Látás utáni segédeszközök

Alkalmazás

8.1.6 A precíziós megközelítésű futópályához biztosítani kell a 8-1. táblázatban előírt, a futópálya kategóriának megfelelő másodlagos (tartalék) tápfeszültség rendszert. Azokhoz a létesítményekhez csatlakozó elektromos tápfeszültség rendszer vezetékeket és szerkezeti elemeket, amelyeknél másodlagos tápfeszültség biztosítása szükséges, úgy szereljék be, hogy azok a fő tápfeszültség rendszer meghibásodása esetén automatikusan a másodlagos rendszerre kapcsolódjanak.

8.1.7 A 800 méternél alacsonyabb futópályamenti látástávolság érték mellett felszállásra felhasználni kívánt futópálya esetében biztosítani kell a 8-1. táblázat előírásainak megfelelő másodlagos (tartalék) tápfeszültség rendszert.

8.1.8 ***Ajánlás*** *— Azon a repülőtéren, amelyen az elsődleges futópálya nem-precíziós megközelítésű futópálya, biztosítsák a 8-1. táblázat előírásainak megfelelő másodlagos (tartalék) tápfeszültség rendszert, azonban a látás utáni segédeszközök vonatkozásában másodlagos tápfeszültség rendszert nem szükséges egynél több nem-precíziós megközelítésű futópályához biztosítani.*

8.1.9 ***Ajánlás*** *— Azon a repülőtéren, amelyen az elsődleges futópálya nem-műszeres futópálya, biztosítsák a 8.1.4 pont előírásainak megfelelő másodlagos (tartalék) tápfeszültség rendszert. Kivételt képez az a repülőtér, amelyen a látás utáni segédeszközökhöz nem szükséges ilyen kiegészítő tápfeszültség rendszer kialakítása, ha az 5.3.2 pont alapján legalább az elsődleges futópályához biztosítanak vészvilágítás fényeket és ezek 15 percen belül kihelyezhetők.*

8.1.10 ***Ajánlás*** *—A következő repülőtéri létesítményekhez és berendezésekhez biztosítsanak olyan másodlagos (tartalék) tápfeszültség rendszert, amely az elsődleges rendszer meghibásodása esetén képes a tápfeszültség ellátásra:*

a) a jelző fény és a minimális világítás, amely lehetővé tesz a légiforgalmi szolgálati egységek személyzete számára feladataik ellátását;

Megjegyzés: A minimális világításra vonatkozó előírás nem csak elektromos berendezésekkel teljesíthető.

b) az összes akadály fény-egység, amely az illetékes hatóság véleménye szerint alapvetően szükséges a légijárművek biztonságos üzemeltetéséhez;

c) a 8.1-6 — 8.1.9 pontokban meghatározott bevezető, futópálya és gurulóút világítás;

d) meteorológiai berendezések;

e) alapvető biztonsági fények, ha ilyeneket a 9.11 pont alapján elhelyeztek;

f) a repülőtér vészhelyzeti (tűzoltó, mentő és műszaki mentő) szolgálatainak szükséges alapvető berendezések és létesítmények;

g) a kijelölt elkülönített légijármű állóhely reflektoros megvilágítása, ha ilyet az 5.3.21.1 pont alapján létesítettek: és

h) a forgalmi előtér azon területeinek megvilágítása, amelyen az utasok közlekedhetnek.

Megjegyzés: A rádiónavigációs berendezések és földi távközlési rendszer létesítményei másodlagos (tartalék) elektromos tápfeszültségére vonatkozó előírások a 10. Annex I. kötet, 1. rész, 2. fejezetében találhatók.

8.1.11 ***Ajánlás*** *— A másodlagos (tartalék) tápfeszültség rendszerre vonatkozó előírás a következők közül bármelyikkel teljesíthető:*

— független, külső nyilvános tápfeszültség hálózat, amely a repülőtéri szolgálatokat rendszeresen ellátó alállomástól eltérő alállomásról, továbbá független tápvezetékről működik olyan módon, hogy az általános ellátó és a független kiegészítő külső nyilvános tápfeszültség hálózatok egyidejű meghibásodásának lehetősége nagyon valószínűtlen; vagy

— különálló egyedi kiegészítő tápfeszültség egység(ek), mint például a motoros generátorok, akkumulátorok, stb. amelyek elektromos energiát biztosítanak.

Megjegyzés: A kiegészítő tápfeszültség rendszerrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *5. részében található*

.

8.2 Elektromos rendszerek tervezése

8. 2.1 Az 550 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt futópálya esetében a 8-1. táblázatban található tápfeszültség, világítás és világítás vezérlő elektromos rendszereket úgy kell megtervezni, hogy egy berendezés meghibásodása miatt a repülőgépvezető ne kapjon, illetve ne kaphasson elégtelen látás utáni, vagy rádiónavigációs irányvezetés tájékoztatásokat, vagy félrevezető információkat.

Megjegyzés: A fenti védelemmel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *5. részében — Elektromos Rendszerek — található.*

8.2.2 Ahol a repülőteret kiszolgáló másodlagos tápfeszültség rendszert kettős táplálással biztosítják, ezeket úgy fizikai, mint elektromos vonatkozásban el kell választani egymástól, hogy fenntarthassák a kívánatos függetlenség, azaz önálló működés szintjét.

8.2.3 Ahol egy futópálya a szabványos gurulási útvonal részét képezi és ez futópálya, valamint gurulóút fényekkel is el van látva, az elektromos rendszert úgy kell bekötni, hogy kiküszöböljék a két világítás rendszer egyidejű működésének lehetőségét.

8.3 Rendszer ellenőrzés

Megjegyzés: A témakörrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *5. részében található.*

8.3.1 ***Ajánlás** — A fényrendszer megbízható működése érdekében alkalmazzanak megfelelő ellenőrző rendszert a látás utáni segédeszközök (fények) ellenőrzésére.*

8.3.2 Ahol a fényrendszert a légijármű irányítás céljaira használják, a rendszert automatikus eszközökkel kell ellenőrízni, amelyek azonnal jeleznek bármely olyan meghibásodást, amely hatással lehet az irányítási feladatokra. A tájékoztatást automatikusan kell továbbítani a légiforgalmi szolgálati egységnek.

8.3.3 ***Ajánlás** — Ahol a fények üzemállapotában változás következik be, erről a futópálya várakozási hely megállító keresztfénysornál kettő, minden más látás utáni segédeszköz esetében öt másodpercen belül érkezzen jelzés.*

8.3.4 ***Ajánlás —** Az 550 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt futópálya esetében a 8-1. táblázatban részletezett fény rendszereket, illetve egységeket olyan ellenőrző eszközökkel lássák el és ellenőrizzék, amelyek azonnal jelzik, ha a rendszerek bármelyik elemének üzemelési szintje a 10.4.7 — 10.4.11 pontban ismertetett minimális üzemelési szint alá csökken. A tájékoztatást azonnal továbbítsák a karbantartó személyzetnek.*

8.3.5 ***Ajánlás** — Az 550 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt futópálya esetében a 8-1. táblázatban részletezett fény rendszereket, illetve egységeket olyan automatikus ellenőrző eszközökkel lássák el és ellenőrizzék, amelyek azonnal jelzik, ha a rendszerek bármelyik elemének üzemelési szintje az illetékes hatóság által megállapított azon minimális üzemelési szint alá csökken, amelynél az üzemeltetés nem folytatható. A tájékoztatást automatikusan továbbítsák a légiforgalmi szolgálati egység személyzetének és ezt jól észrevehető helyen jelenítsék meg.*

Megjegyzés: A légiforgalmi irányítási tájékoztató panelre és látás utáni segédeszközök ellenőrző rendszerére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *5. részében — Elektromos Rendszerek — található.*

8-1. táblázat: Kiegészítő tápfeszültség rendszer előírások (8.1.4 pont)

Futópálya	***Tápfeszültséget igénylő fény-egység***	***Maximális átkapcsolási idő***
Nem-műszeres	optikai megközelítési siklópálya jelző rendszer[a]	lásd 8.1.4 és 8.1.9
	futópálya szegélyfények[b]	
	futópálya küszöbfények[b]	
	futópálya vége fények[b]	
	akadályfények[a]	
Nem-precíziós megközelítésű	bevezető fényrendszer	15 mp.
	optikai megközelítési siklópálya jelző rendszer[a]	15 mp.
	futópálya szegélyfények	15 mp.
	futópálya küszöbfények	15 mp.
	futópálya vége fények	15 mp.
	akadályfények[a]	15 mp.
I. kategóriás precíziós megközelítésű	bevezető fényrendszer	15 mp.
	optikai megközelítési siklópálya jelző rendszer[a]	15 mp.
	futópálya szegélyfények	15 mp.
	futópálya küszöbfények	15 mp.
	futópálya vége fények	15 mp.
	elsődleges gurulóút[a]	15 mp.
	akadályfények[a]	15 mp.
II/III. kategóriás precíziós megközelítésű	bevezető fényrendszer	15 mp.
	kiegészítő bevezető fényrendszer keresztfénysor	1 mp.
	akadályfények[a]	15 mp.
	futópálya szegélyfények	15 mp.
	futópálya küszöbfények	1 mp.
	futópálya vége fények	1 mp.
	futópálya középvonal fények	1 mp.
	futópálya földetérési terület fények	1 mp.
	megállító keresztfénysor (összes)	1 mp.
	elsődleges gurulóút[a]	15 mp.
Felszállási RVR (—) 800 méter [d]	futópálya szegélyfények	15 mp.[c]
	futópálya vége fények	1 mp.
	futópálya középvonal fények	1 mp.
	megállító keresztfénysor (összes)	1 mp.
	elsődleges gurulóút[a]	15 mp.
	akadályfények[a]	15 mp.

Megjegyzések:
a — másodlagos (tartalék) tápfeszültséggel ellátva, ha működése a repülésbiztonság szempontjából alapvető fontosságú.
b — A vészvilágításra vonatkozóan lásd az 5. fejezet 5.3.2 pontot.
c — 1 másodperc ott, ahol futópálya középvonal fény nincs elhelyezve.
d —1 másodperc ott, ahol a megközelítés veszélyes, vagy meredek földfelszín felett történik.

9. fejezet
Repülőtér üzemeltetési szolgálatok, berendezések és létesítmények

9.1 Repülőtéri kényszerhelyzeti tervezés

Általános rész

Bevezető megjegyzés: A repülőtéri kényszerhelyzeti tervezés a repülőtér felkészítése arra, hogy megfelelő módon elláthassa a repülőtéren, vagy annak közelében bekövetkező vészhelyzetből adódó feladatait. A repülőtéri kényszerhelyzeti tervezés célja a vészhelyzet (kényszerhelyzet) hatásainak csökkentése, különös tekintettel az életmentésre, valamint a légijármű üzemeltetés fenntartására. A repülőtéri kényszerhelyzeti terv intézkedési eljárásokat tartalmaz a vészhelyzet következményeinek felszámolásában részt vevő különböző repülőtéri szervezetek (vagy szolgálatok), valamint külső szervezetek feladatainak és tevékenységének összehangolására. A repülőtéri kényszerhelyzeti terv elkészítéséhez az illetékes hatóság számára a Repülőtér Szolgálati Kézikönyv *7. része tartalmaz útmutatásokat.*

9.1.1 A repülőtéren üzemelő légijárművek forgalmával és a repülőtér egyéb tevékenységével összhangban ki kell dolgozni és be kell vezetni megfelelő repülőtéri kényszerhelyzeti tervet.

9.1.2 A repülőtéri kényszerhelyzeti tervnek biztosítania kell a szükséges elvégzendő feladatok egyeztetését és összehangolását a repülőtéren, vagy annak közelében bekövetkező vészhelyzet esetében.

Megjegyzés: A vészhelyzetek közé tartoznak a légijármű kényszerhelyzetek, szabotázs akciók a repülőtér ellen, beleértve a bomba-fenyegetést is, légijárművel szemben végrehajtott jogtalan beavatkozás, veszélyes teherárú miatt szükséges kényszerintézkedések, épület tüzek, valamint természeti katasztrófák.

9.1.3 A tervben határozzák meg és egyeztessék az összes szervezet és szolgálat tevékenységét, valamint részvételét, amelyek az illetékes hatóság álláspontja szerint tevékenyen közreműködhetnek a vészhelyzet következményeinek felszámolásában.

Megjegyzés: Ilyen szervezetek és szolgálatok közé tartozhatnak az alábbiak:

— Repülőtéren: légiforgalmi szolgálati egység, tűzoltó és mentő szolgálatok, repülőtér igazgatóság, repülőtéri egészségügyi szolgálat, légijármű járatók illetve üzemeltetők, biztonsági szolgálatok és rendőrség;

— A repülőtéren kívül: tűzoltóság, rendőrség, mentőszolgálat, egészségügyi szervezetek, kórházak, fegyveres testületek (beleértve a honvédség, légierő, tengerészet, stb. szervezeteit).

9.1.4 ***Ajánlás** — A terv szükség szerint tartalmazza a vészhelyzeti irányító központtal történő együttműködés és koordináció részleteit.*

9.1.5 ***Ajánlás** — A repülőtéri kényszerhelyzeti terv legalább a következőket tartalmazza:*

a) a terv elkészítésénél figyelembe vett vészhelyzetek típusai;

b) a tervben résztvevő szervezetek és szolgálatok;

c) az egyes szervezetek, szolgálatok, a vészhelyzeti irányító központ, valamint a parancsnoki álláspont feladatai és felelőssége minden egyes figyelembe vett vészhelyzet típusnak megfelelően;

d) az adott vészhelyzet esetén értesítendő szervezetek, hivatalok, vagy személyek neve, telefonszáma; és *e) a repülőtér és közvetlen környezetének pontos, négyzetrácsokra felosztott térképe.*

9.1.6 A terv kidolgozásánál a vészhelyzeti feladatokban résztvevő összes szervezet lehető legjobb tevékenysége érdekében vegyék figyelembe az Emberi Tényezők Alapelveit.

Megjegyzés: Az Emberi Tényezők Alapelveivel kapcsolatos tájékoztatót az Emberi Tényezőkkel Foglalkozó Kiképzési Kézikönyv *tartalmazza.*

Vészhelyzeti irányító központ és parancsnoki álláspont

9.1.7 ***Ajánlás** — A vészhelyzet esetén történő igénybevételre alakítsanak ki állandó vészhelyzeti irányító központot és mozgó parancsnoki álláspontot.*

9.1.8 ***Ajánlás** — A repülőtéri létesítmények közé tartozó vészhelyzeti irányító központ felelős a vészhelyzet következményeinek felszámolásáért végzett tevékenységek általános irányvonalának meghatározásáért, valamint a feladatok és intézkedések összehangolásáért.*

9.1.9 ***Ajánlás** — A mozgó parancsnoki álláspont olyan létesítmény, amelyet szükség szerint gyorsan a vészhelyzet helyszínére lehet szállítani és ez ott alkalmas a vészhelyzet következményeinek felszámolásában részt vevő szervezetek és szolgálatok feladatainak helyi összehangolására.*

9.1.10 ***Ajánlás** — A vészhelyzeti irányító központ és ha ilyet kialakítottak, a mozgó parancsnoki álláspont vezetésére jelöljenek ki egy-egy alkalmas személyt.*

Távközlési rendszer

9.1.11 ***Ajánlás** — A vészhelyzeti irányító központ, a mozgó parancsnoki álláspont, valamint a feladatokban résztvevő szervezetek és szolgálatok között a kölcsönös kapcsolattartás biztosítása érdekében, a kényszerhelyzeti terv alapján, valamint a repülőtér jellemzőinek és adottságainak figyelembevételével megfelelő távközlési rendszert alakítsanak ki.*

Repülőtér vészhelyzeti gyakorlat

9.1.12 A repülőtéri kényszerhelyzeti terv a hatékonyság növelése érdekében eljárásokat kell, hogy tartalmazzon az intézkedések és feladatok időszakos ellenőrzésére, illetve felülvizsgálatára.

Megjegyzés: A terv terjedjen ki az összes résztvevő szervezetre illetve szolgálatra valamint felszerelésükre is.

9.1.13 A tervet az alábbiak szerint kell ellenőrizni:

a) két évet nem meghaladó időszakonként teljes, átfogó repülőtéri vészhelyzeti gyakorlat végrehajtásával; és

b) a közbenső időszakban részleges vészhelyzeti gyakorlatok végrehajtásával annak biztosítására, hogy az átfogó repülőtéri vészhelyzeti gyakorlat során feltárt hiányosságokat kiküszöbölték.
A fentieken túlmenően, a gyakorlatok végrehajtása, vagy egy tényleges vészhelyzet bekövetkezése után a tervet a feltárt hiányosságok kiküszöbölése érdekében szükség szerint módosítsák.

Megjegyzés: Az átfogó repülőtéri vészhelyzeti gyakorlat célja annak megállapítása, hogy a repülőtéri kényszerhelyzeti terv megfelel a különböző vészhelyzet típusok követelményeinek. A részleges gyakorlatok célja az egyes résztvevő szervezetek és szolgálatok, valamint a terv egyes részeinek, mint például a távközlési rendszernek ellenőrzése annak biztosítása érdekében, hogy azok megfeleljenek a követelményeknek.

Vészhelyzetek különleges környezetben

9.1.14 A terv terjedjen ki a megfelelő különleges mentő szolgálatok vészhelyzet alkalmával történő azonnali bevetésére és a velük való együttműködésre az olyan repülőtéren, amely vizek és/vagy mocsaras területek közelében helyezkedik el, valamint ahol a megközelítési és indulási műveletek jelentős része ilyen területek felett történik.

9.1.15 ***Ajánlás*** *— A vizek és/vagy mocsaras területek közelében, vagy különleges földrajzi környezetben elhelyezkedő repülőtereken a repülőtéri kényszerhelyzeti terv tartalmazza a különleges mentő szolgálatok létrehozását, kiképzését, intézkedéseik előzetes tervezését és rendszeres időközönként végzett ellenőrzését is.*

9.2 Tűzoltó és mentő szolgálat

Általános rész

Bevezető megjegyzés: A tűzoltó és mentő szolgálat legfőbb célja és feladata az életmentés. Ezért a tervben elsősorban a repülőtéren és annak közvetlen környékén bekövetkező légijármű balesetekkel, vagy repeseményekkel foglalkozzanak, mert ez az a terület, ahol a legnagyobb lehetőség adódik az életmentésre. Minden esetben fel kell tételezni a tűzoltás lehetőségét és szükségességét, mivel a tűz közvetlenül a légijármű baleset, illetve repesemény után, vagy a mentési műveletek alatt bármikor bekövetkezhet.

A túlélhető légijármű balesetek hatásos mentésének legfontosabb tényezői a következők: a mentésben résztvevő személyek kiképzése, az igénybe vett felszerelések hatékonysága, a beavatkozás gyorsasága azaz a sebesség, amellyel a tűzoltó és mentő szolgálatok személyzete és felszerelései bevethetők.

Az épület és üzemanyag tároló létesítmények tűzvédelmét, valamint a futópálya habbal történő beterítését, illetve ezek követelményeit nem vettük figyelembe.

Alkalmazás

9.2.1 A repülőtéren biztosítani kell tűzoltó és mentő szolgálatot, valamint megfelelő felszerelést.

Megjegyzés: Megfelelő elhelyezéssel és felszereléssel rendelkező nyilvános (köz), vagy magán szervezetek kijelölhetők a tűzoltó és mentő szolgálatok feladatainak ellátására. Kívánatos, hogy az ilyen szervezetek, vagy szolgálatok tűzoltósági épülete a repülőtér területén belül legyen, azonban ettől eltérő elhelyezés sincs kizárva, amennyiben a beavatkozási időre vonatkozó előírások teljesíthetők.

9.2.2 Ahol a repülőtér vizek és/vagy mocsaras területek közelében, vagy különleges földrajzi környezetben helyezkedik el, valamint ahol a megközelítési és indulási műveletek jelentős része ilyen területek felett történik, a lehetséges vészhelyzetnek illetve kockázatnak megfelelő különleges mentő szolgálat kell, hogy rendelkezésre álljon.

1. Megjegyzés: A túlnyomórészt vízzel borított területeknél különleges tűzoltó felszereléseket nem szükséges biztosítani: azonban ez nincs kizárva, ha gyakorlati szempontból az adott területen, mint például zátonyok és szigetek esetében ezekre szükség van.

2. Megjegyzés: A cél a szükséges úszó mentőeszközök lehető leggyorsabb eljuttatásának és üzembe helyezésének előzetes megtervezése olyan számban, amely megfelel a repülőteret általában igénybe vevő legnagyobb repülőgépnek. További kiegészítő tájékoztató a Repülőtér Szolgálati Kézikönyv I. rész 13. fejezetében található.

A biztosítandó védelem szintje

9.2.3 A repülőtéren biztosítandó tűzoltó és mentő szolgálat védelmi szintje meg kell, hogy feleljen a 9.2.4 és 9.2.5 pont alapelvei szerint meghatározott repülőtéri kategóriának kivéve, ahol a repülőteret általában igénybe vevő legmagasabb kategóriába tartozó repülőgépek mozgás-száma az egymást követő legforgalmasabb három hónap alatt kevesebb, mint 700, mert itt a biztosítandó védelem szintje ne legyen alacsonyabb, mint a megállapított kategóriánál egy szinttel alacsonyabb védelmi szint.

Megjegyzés: A mozgás-szám számításnál egy felszállás, vagy egy leszállás egy mozgást jelent.

9.2.4 ***Ajánlás** — 2005 január 1.-től a repülőtéren biztosítandó tűzoltó és mentő szolgálat védelmi szintje feleljen meg a 9.2.4 és 9.2.5 pont alapelvei szerint meghatározott repülőtéri kategóriának.*

9.2.5 A repülőtér kategóriát a repülőteret általában igénybe vevő leghosszabb repülőgépek és törzs-szélességük alapján a 9-1. táblázat szerint kell meghatározni.

Megjegyzés: A repülőteret általában igénybe vevő repülőgépek kategóriájának meghatározása alkalmával először a teljes hosszt, majd a törzs szélességet vegyék alapul.

9.2.6 Ha a legnagyobb hossznak megfelelő kategória kiválasztása után kiderül, hogy a repülőgép törzsének szélessége nagyobb, mint a 9-1. táblázat 3. oszlopában meghatározott legnagyobb szélesség, az adott repülőgép vonatkozásában eggyel magasabb kategóriát kell választani.

Megjegyzés: A repülőtér tűzoltó és mentő szolgálati kategóriájának, valamint a tűzoltó és mentő felszerelések és szolgálatok meghatározásával kapcsolatos útmutató az A. Melléklet 17. részében, valamint a Repülőtér Szolgálati Kézikönyv *1. részében található.*

9-1. táblázat: Repülőtér kategóriák a tűzoltó és mentő szolgálat biztosítására

Repülőtér kategória (1)	*Repülőgép teljes hossza (2)*	*Legnagyobb törzs szélesség(3)*
1	0.00 métertől 8.99 méterig	2 méter
2	9.00 métertől 11.99 méterig	2 méter
3	12.00 métertől 17.99 méterig	3 méter
4	18.00 métertől 23.99 méterig	4 méter
5	24.00 métertől 27.99 méterig	4 méter
6	28.00 métertől 38.99 méterig	5 méter
7	39.00 métertől 48.99 méterig	5 méter
8	49.00 métertől 60.99 méterig	7 méter
9	61.00 métertől 75.99 méterig	7 méter
10	76.00 métertől 89.99 méterig	8 méter

9.2.7 A csökkent forgalom várható időszakai alatt a biztosítandó védelem szintje a repülőgép mozgások számától függetlenül nem lehet alacsonyabb, mint a repülőteret tervek szerint igénybe vevő legmagasabb repülőgép kategória által igényelt szint.

Tűzoltó anyagok

9.2.8 ***Ajánlás** — A repülőtéren biztosítsák úgy az alapvető, mint a kiegészítő tűzoltó anyagokat.*

Megjegyzés: A tűzoltó anyagok ismertetése a Repülőtér Szolgálati Kézikönyv *1. részében található.*

9.2.9 ***Ajánlás*** *— Az alapvető tűzoltó anyag a következő:*

a) minimális A. teljesítmény szintnek megfelelő oltóhab; vagy

b) minimális B. teljesítmény szintnek megfelelő oltóhab; vagy

c) ezek keveréke;

kivéve, hogy az 1 — 3 kategóriákba tartozó repülőterek számára biztosított alapvető tűzoltó anyag lehetőleg feleljen meg a minimális B. teljesítmény szintnek.

Megjegyzés: A tűzoltóhab fizikai jellemzőiről, valamint a megfelelő minimális A. vagy B. teljesítmény szint eléréséhez szükséges tulajdonságairól szóló tájékoztatás a Repülőtér Szolgálati Kézikönyv *I. részében található.*

9.2.10 ***Ajánlás*** *— Kiegészítő tűzoltó anyagok a szénhidrogén tüzek oltására alkalmas száraz kémiai porok.*

1. Megjegyzés: Ha a száraz kémiai porokat oltóhabbal együttesen használják, figyelni kell arra, hogy az anyagok egymással együttesen alkalmazhatók (kompatibilisek) legyenek.

2. Megjegyzés: Alkalmazhatnak más, hasonló tűzoltási tulajdonságokkal rendelkező kiegészítő anyagokat is. A kiegészítő anyagokról szóló tájékoztatás a Repülőtér Szolgálati Kézikönyv *I. részében található.*

9.2.11 A tűzoltó szolgálat gépjárművein biztosított, az oltóhab készítéshez szükséges víz, valamint a kiegészítő anyagok mennyisége meg kell, hogy feleljen a 9-2. táblázatban, valamint a 9.2.3 — 9.2.6 pontokban meghatározott repülőtér kategóriáknak, azonban az anyagok a következők szerint módosíthatók:

a) az 1 és 2 repülőtér kategóriák esetében a víz 100 %-a helyettesíthető kiegészítő anyaggal; vagy

b) a 3 — 10 repülőtér kategóriák esetében, ahol A. minimális teljesítmény szintű oltóhabot használnak, a víz 30 %-a helyettesíthető kiegészítő anyaggal.

Az anyagok mennyiségét és minőségét tekintve a következő összevetés alkalmazható:

1 kg. *kiegészítő anyag*	=	1.0 liter víz minimális A. teljesítmény szintű oltóhab készítéséhez
1 kg. *kiegészítő anyag*	=	0.66 liter víz minimális B. teljesítmény szintű oltóhab készítéséhez

1. Megjegyzés: Az oltóhab készítéshez meghatározott vízmennyiségek a következő felhasználási arányra vannak kiszámítva:
minimális A. szint = 8.2 liter/min/m^2 *— minimális B. szint = 5.5 liter/min/m*^{2}

2. Megjegyzés: Amikor bármely egyéb kiegészítő anyagot használnak, ellenőrizni kell a helyettesítési arány értékeket.

9.2.12 Az egyes gépjárműveken az oltóhab készítéshez külön-külön biztosított hab-koncentrátum mennyisége meg kell, hogy feleljen a kiválasztott oltóhab típusnak és az ehhez szükséges víz mennyiségének.

9.2.13 ***Ajánlás** — Az egyes gépjárműveken az oltóhab készítéshez biztosított hab-koncentrátum mennyisége elegendő legyen legalább két teljes adag oltóhab készítésére.*

9.2.14 ***Ajánlás** — Biztosítsanak elegendő kiegészítő víz utánpótlást a légijármű baleset színhelyén tevékenykedő tűzoltó gépjárművek gyors utántöltéséhez.*

9.2.15 ***Ajánlás** — Amennyiben mindkét, A. és B. teljesítmény szintű oltóhabot alkalmazzák, az oltóhab készítéshez biztosított víz mennyiségét úgy számolják ki, hogy először vegyék azt a mennyiséget, amelyik a kizárólag A. szintű oltóhab készítéséhez lenne szükséges, majd ezt a B. szintű oltóhab készítéshez minden 2 liter vízmennyiségnél 3 literrel csökkentsék.*

9.2.16 A tűzoltóhab kibocsátás mennyisége nem lehet kevesebb, mint a 9-2. táblázat megfelelő oszlopában meghatározott arány érték.

9.2.17 ***Ajánlás** — A kiegészítő tűzoltó anyagok feleljenek meg a Nemzetközi Szabványügyi Szervezet (ISO) vonatkozó előírásainak.*

Megjegyzés: Lásd a következő ISO kiadványok: Széndioxid (ISO 5923), Halon anyagok (ISO 7201), Száraz kémiai porok (ISO 7202).

9.2.18 ***Ajánlás** — A kiegészítő tűzoltó anyagok kibocsátásának mennyiségét az anyag legkedvezőbb hatékonysága alapján határozzák meg.*

9.2.19 ***Ajánlás** — A repülőtéren a tűzoltó gépjárművek feltöltése céljából, a tűzoltó és mentő gépjárművekben elhelyezhető mennyiség 200 százalékának megfelelő mennyiségű habkoncentrátumot és kiegészítő anyagot tartalékoljanak. Ahol a tartalékok beszerzése várhatóan jelentősebb késést szenvedhet, növeljék meg a tartalékokat.*

9-2. táblázat: A tűzoltó anyagok legkisebb felhasználható mennyisége

Repülőtér kategória (1)	***A. teljesítmény szintű oltóhab***		***B. teljesítmény szintű oltóhab***		***Kiegészítő tűzoltó anyag***
	Víz [1] liter (2)	Oltóhab keverék kibocsátás perc/liter (3)	Víz [1] liter (4)	Oltóhab keverék kibocsátás perc/liter (5)	Száraz kémiai porok[2] kg. (6)
1	350	350	230	230	45
2	1000	800	670	550	90
3	1800	1300	1200	900	135
4	3600	2600	2400	1800	135
5	8100	4500	5400	3000	180
6	11 800	6000	7900	4000	225
7	18 200	7900	12 100	5300	225
8	27 300	10 800	18 200	7200	450
9	36 400	13 500	24 300	9000	450
10	48 200	16 600	32 300	11 200	450

Megjegyzések:

1.) A 2. és 4. oszlopban jelzett vízmennyiség az adott kategóriába tartozó átlagos repülőgép legnagyobb teljes hossza alapján került megállapításra. Ahol az átlagosnál nagyobb méretű repülőgépek üzemeltetése várható, a vízmennyiség ismételt kiszámítására lehet szükség. További tájékoztatás a Repülőtér Szolgálati

Kézikönyv *I. részében található.*

2.) Alkalmazhatnak más, egyenértékű tűzoltási tulajdonságokkal rendelkező kiegészítő anyagokat is.

Mentőfelszerelés

9.2.20 ***Ajánlás** — A tűzoltó és mentő szolgálatok gépjárműveit lássák el a légijármű üzemeltetés szintjének megfelelő mentőfelszereléssel.*

Megjegyzés: A repülőtéren biztosítandó mentőfelszerelésekre vonatkozó útmutatás a Repülőtér Szolgálati Kézikönyv *1. részében található.*

Beavatkozási idő

9.2.21 A tűzoltó és mentő szolgálatok gyakorlati célja a három percet meg nem haladó beavatkozási idő biztosítása, azaz optimális látási körülmények és talajviszonyok között minden üzemelő futópálya bármely részének három percen belül történő elérése és a beavatkozás megkezdése.

9.2.22 ***Ajánlás** — A tűzoltó és mentő szolgálatok gyakorlati célja a kettő percet meg nem haladó beavatkozási idő elérése, illetve biztosítása, azaz optimális látási körülmények és talajviszonyok között minden üzemelő futópálya bármely részének kettő percen belül történő elérése és a beavatkozás megkezdése.*

9.2.23 ***Ajánlás** — A tűzoltó és mentő szolgálatok gyakorlati célja az optimális látási körülmények és talajviszonyok között a három percet meg nem haladó beavatkozási idő elérése illetve biztosítása a mozgási terület bármely pontján.*

1. Megjegyzés: A beavatkozási idő a tűzoltó és mentő szolgálatok első riasztásától eltelt idő addig, amíg az első beavatkozó gépjármű(vek) megfelelő helyzetbe kerülnek és megkezdik a beavatkozást úgy, hogy legalább a 9-2. táblázatban meghatározott tűzoltóhab kibocsátási mennyiség 50 százalékát alkalmazzák.

2. Megjegyzés: A lehető legjobb gyakorlati bevetés biztosítása érdekében az optimálisnál rosszabb látási körülmények esetén szükséges lehet a tűzoltó és mentő gépjárművek helyszínre történő irányítása és/vagy a helyszín eléréshez szükséges eljárások kidolgozása.

3. Megjegyzés: Az optimális látási körülmények és talajviszonyok a meghatározás szerint a következők: nappal, jó látási körülmények között, csapadékmentes időjárás, az általános megközelítési utak szabadok és szennyeződéstől, azaz víztől, hótól, jégtől, stb. mentesek.

9.2.24 ***Ajánlás** — A tűzoltó anyagoknak a 9-2. táblázatban meghatározott mennyiségét szállító bármely egyéb gépjármű a folyamatos tűzoltó anyag felhasználás, illetve alkalmazás biztosítása érdekében ne érkezzen az első beavatkozó gépjármű(vek) után több, mint egy perccel a helyszínre.*

9.2.25 ***Ajánlás** — A tűzoltó és mentő gépjárművek megelőző karbantartásában olyan rendszert alkalmazzanak, amellyel biztosítható, hogy a gépjármű üzemi élettartama alatt mindig megfelelően működik és a meghatározott beavatkozási idő fenntartható.*

Vészhelyzeti megközelítési utak

9.2.26 ***Ajánlás** — Azon a repülőtéren, amelyen a talajviszonyok ezt lehetővé teszik, vészhelyzeti megközelítési utakat alakítsanak ki a legalacsonyabb beavatkozási idő fenntartásának megkönnyítésére. Különös figyelmet szenteljenek a futópálya küszöb előtti 1000 méter távolságra levő megközelítési, vagy legalább a repülőtér határáig terjedő terület gyors és egyszerű elérésének. Ha a repülőtér határán kerítést helyeznek el, vegyék figyelembe a külső területek egyszerű és gyors megközelíthetőségét is.*

Megjegyzés: A repülőtéri szolgálati utak, ha elhelyezkedésük és szerkezetük megfelelő, vészhelyzeti megközelítési utaknak használhatók.

9.2.27 ***Ajánlás*** *— A vészhelyzeti megközelítési utak teherbírása megfelelő legyen az azokat használó legnehezebb gépjárművek súlyának. A vészhelyzeti megközelítési utak minden időjárási körülmény között használhatók legyenek. A futópálya 90 méteres körzetében levő utakat a felszín eróziójának és az idegen anyagoknak a futópályára történő felhordása megakadályozásának érdekében burkolt felülettel lássák el. Az út felett elhelyezett tárgyak a legnagyobb méretű gépjárműtől megfelelő biztonsági távolságra legyenek.*

9.2.28 ***Ajánlás*** *— Ha az út felületét a környező területtől nem lehet megkülönböztetni, vagy az út elhelyezkedését a hó megállapíthatatlanná teheti, az út szélén, egymástól kb. 10 méter távolságra útjelzőket helyezzenek el.*

Tűzoltó állomások

9.2.29 ***Ajánlás*** *— Az összes tűzoltó és mentő gépjárművet általában a tűzoltó állomáson helyezzék el. Ahol a beavatkozási idő fenntartása egy központi tűzoltó állomással nem lehetséges, létesítsenek kihelyezett tűzoltó állomásokat.*

9.2.30 ***Ajánlás*** *— A tűzoltó állomást úgy helyezzék el, hogy a tűzoltó és mentő gépjárművek onnan közvetlenül és akadályok nélkül, a lehető legkisebb számú fordulóval megközelíthessék a futópálya területét.*

Távközlési és riasztó rendszerek

9.2.31 ***Ajánlás*** *— A központi és bármely más repülőtéri tűzoltó állomás és a repülőtéri irányító torony, valamint a repülőtéren állomásozó tűzoltó és mentő gépjárművek között külön távközlési rendszert alakítsanak ki.*

9.2.32 ***Ajánlás*** *— Alakítsanak ki a tűzoltó és mentő szolgálat személyzetét riasztó megfelelő rendszert, amelyet a központi és repülőtér területén levő bármely más repülőtéri tűzoltó állomásról, valamint a repülőtéri irányító toronyból is működtetni lehet.*

Tűzoltó és mentő gépjárművek száma

9.2.33 ***Ajánlás*** *— A repülőtéren állomásozó tűzoltó és mentő gépjárművek legkisebb száma a következő táblázatnak megfelelő legyen:*

Repülőtér kategória	***Tűzoltó és mentő gépjárművek száma***
1	1
2	1
3	1
4	1
5	1
6	2
7	2
8	3
9	3
10	3

Megjegyzés: A tűzoltó és mentő gépjárművek előírt minimális jellemzőire vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv *1. részében található.*

Személyzet

9.2.34 A tűzoltó és mentő szolgálatok teljes személyzete feladataik hatásos elvégzésének biztosítása érdekében megfelelő kiképzésben és továbbképzésben kell, hogy részesüljön. A személyzet vegyen részt tényleges, a repülőtéren üzemelő légijármű típusoknak, valamint az alkalmazott tűzoltó és mentő berendezéseknek megfelelő tűzoltási gyakorlatokban, beleértve a túl-nyomás alatt levő üzemanyag tüzeket is.

1. Megjegyzés: Az illetékes hatóság számára a megfelelő kiképzéssel kapcsolatos útmutató a jelen 14. Annex A. Melléklet 16. részében, a Repülőtér Szolgálati Kézikönyv *1. részében, valamint a* Kiképzési Kézikönyv *E-2. részében található.*

2. Megjegyzés: A fenti említett "túl-nyomás alatt levő üzemanyag tűz" kifejezés a sérült üzemanyag tartályból nagy nyomással kiömlő tüzelőanyag, illetve üzemanyag tűzre vonatkozik.

9.2.35 A tűzoltó és mentő szolgálatok személyzetének kiképzési programja tartalmazzon az emberi tevékenységet és teljesítményt fejlesztő elméleti és gyakorlati képzést, beleértve a csoportok közötti együttműködést is.

Megjegyzés: Az emberi teljesítmény fejlesztését és a csoport-együttműködést célzó kiképzési programok tervezéséhez útmutató anyag az Emberi Tényezők Kiképzési Kézikönyvben *található.*

9.2.36 ***Ajánlás*** *— A repülőtér üzemeltetése alatt elegendő számú kiképzett személyzetet állomásoztassanak és tartsanak beavatkozásra készenlétben a tűzoltó és mentő gépjárművek maximális kapacitással történő üzemeltetésére. A kiképzett személyek vezénylését úgy szervezzék és végezzék, hogy mindig biztosítani tudják a legkisebb beavatkozási időt, valamint a tűzoltó anyag előírt mennyiségű folyamatos alkalmazását. Vegyék figyelembe továbbá a légijármű tűzoltó és mentő műveletek során általában használt kézi tűzoltó vezetékek, létrák, valamint egyéb berendezések és felszerelések üzemeltetéséhez szükséges igényeket.*

9.2.37 ***Ajánlás*** *— A mentéshez biztosítandó személyzet számának meghatározásánál vegyék figyelembe a repülőteret használó légijármű típusokat.*

9.2.38 A beavatkozásban részt vevő összes tűzoltó és mentő személyzetet feladataik hatásos elvégzésének biztosítása érdekében védőruházattal és légző-készülékkel kell ellátni.

9.3 Mozgásképtelen légijármű eltávolítása

Megjegyzés: A mozgásképtelen légijármű eltávolításával kapcsolatos útmutató — beleértve az ehhez szükséges felszereléseket is — a Repülőtér Szolgálati Kézikönyv *5. részében található. A légijármű eltávolításával, őrzésével és az esemény jellemzőit bizonyító szerkezetek és egységek védelmével kapcsolatosan lásd még a 13. Annex előírásait.*

9.3.1 ***Ajánlás*** *— A repülőtér mozgási területén, vagy annak közelében levő mozgásképtelen légijármű eltávolítására dolgozzanak ki tervet és ha szükséges, jelöljék ki a terv végrehajtását egyeztető és ellenőrző személyt is.*

9.3.2 ***Ajánlás*** *— A repülőtér mozgási területén, vagy annak közelében levő mozgásképtelen légijármű eltávolítására kidolgozott terv azon légijármű típusokon alapuljon, amelyek várhatóan a repülőteret* *általában igénybe veszik. A terv többek között a következőket tartalmazza:*

a) a repülőtéren, vagy annak közelében található személyzet és felszerelések felsorolása, amelyeket ilyen feladatokra igénybe lehet venni; és

b) a légijármű eltávolításához szükséges felszerelések gyors beszerzésének módja más repülőterekről és az ehhez szükséges megállapodások.

9.4 A madárveszély csökkentése

9.4.1 A madárral történő összeütközés veszélyét a repülőtéren, vagy annak közelében a következő módszerekkel kell felmérni:

a) országos eljárás kidolgozása a légijármű madárral történő ütközésének feljegyzése és közzététele érdekében; és

b) a légijármű járatoktól, üzemeltetőktől és más repülőtéri alkalmazottaktól a repülőtéren, vagy annak közelében tartózkodó madár-csoportokról szóló tájékoztatások összegyűjtése.

Megjegyzés: Lásd a 15. Annex 8. fejezet 8.3 szakaszát.

9.4.2 A madárral történő ütközésről szóló jelentéseket Madárveszély Tájékoztatási Rendszer (IBIS) adatbázisába történő felvétel céljából gyűjtsék össze és továbbítsák az ICAO részére.

Megjegyzés: Az IBIS-t azért fejlesztették ki, hogy összegyűjtse és közzétegye a légijármű madárral történő ütközés információját. A rendszerről felvilágosítást az ICAO Madárveszély Tájékoztatási Rendszer Kézikönyve *tartalmaz.*

9.4.3 Ha a repülőtéren madárveszélyt tapasztalnak, az illetékes hatóság foganatosítson megfelelő intézkedést a légijármű üzemeltetésre tényleges veszélyt jelentő madarak számának csökkentésére — a madaraknak a repülőtér, vagy annak közeléből történő elriasztására.

Megjegyzés: A hatásos intézkedésekkel kapcsolatos útmutatás, amelyekkel megállapítható, hogy a repülőtéren, vagy annak közelében található madarak jelentenek-e tényleges veszélyt a légijármű üzemeltetésre, valamint az elriasztásukat célzó intézkedések módszereiről szóló tájékoztatások a Repülőtér Szolgálati Kézikönyv *3. részében találhatók.*

9.4.4 A repülőtéren, vagy annak közelében levő, a madarakat vonzó létesítményeket, mint például a szeméttárolókat szüntessék meg és létesítésüket akadályozzák meg, kivéve, ha megfelelő légiforgalmi vizsgálat jelzi, hogy ezek valószínűleg nem teremtenek olyan körülményeket, amelyek révén madárveszély alakul ki.

Megjegyzés: A repülőtér üzemeltetők gondosan vizsgálják meg a repülőtér határaihoz közeli földterület fejlesztési terveket, amelyek eredményei vonzóak lehetnek a madarak és a vadon élő állatok számára.

9.5 Forgalmi előtér ügyeleti szolgálat

9.5.1 ***Ajánlás*** *— Ha a légiforgalom nagysága és az üzemeltetési körülmények ezt szükségessé teszik, a repülőtéri légiforgalmi szolgálati egység, más repülőtér üzemeltető hatóság, vagy ezek közösen a forgalmi előtéren létesítsenek forgalmi előtér ügyeleti szolgálatot, amely:*

a) a légijárművek, valamint a légijárművek és az akadályok közötti összeütközés elkerülése érdekében szabályozza és irányítja a mozgást;

b) a repülőtéri irányító toronnyal együtt szabályozza a légijárművek a forgalmi előtérre történő belépését, valamint egyezteti ezek kilépését a forgalmi előtérről; és

c) biztosítja a gépjárművek folyamatos, biztonságos és gyors mozgását, valamint megfelelő módon szabályozza a forgalmi előtér más tevékenységét.

9.5.2 ***Ajánlás*** *— Amennyiben a repülőtéri irányító torony nem vesz részt a forgalmi előtér forgalmának szabályozásában, dolgozzanak ki alkalmas eljárásokat a légijármű megfelelő átadására a forgalmi előtér ügyeleti szolgálat és a repülőtéri irányító torony között.*

Megjegyzés: A forgalmi előtér ügyeleti szolgálat tevékenységére vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv *8. részében, valamint a* Felszíni Mozgás Ellenőrzése és Irányítása *(SMGCS) című kézikönyvben találhatók.*

9.5.3 A forgalmi előtér ügyeleti szolgálatot rádió-távbeszélő berendezésekkel kell felszerelni.

9.5.4 Ahol alacsony látástávolság mellett történő üzemeltetési eljárásokat alkalmaznak, a forgalmi előtéren közlekedő és feladatot végző személyek és gépjárművek számát a lehető legkisebbre kell korlátozni.

Megjegyzés: Az alacsony látástávolság mellett történő üzemeltetésre vonatkozó külön eljárások a Felszíni Mozgás Ellenőrzése és Irányítása *(SMGCS) című kézikönyvben találhatók.*

9.5.5 A vészhelyzet esetén beavatkozó gépjármű az összes többi felszíni forgalommal szemben elsőbbséget kell, hogy élvezzen.

9.5.6 A forgalmi előtéren üzemelő gépjármű:

a) adjon elsőbbséget a vészhelyzeti gépjárműnek; a gurulást megkezdő, guruló, vontatott, vagy tolt légijárműnek; és

b) adjon elsőbbséget azoknak a gépjárműveknek, amelyek a helyi előírások alapján elsőbbséggel rendelkeznek.

9.5.7 A légijármű állóhelyen látással ellenőrizzék, hogy az állóhelyet elfoglaló légijármű mellett betartják az ajánlott biztonsági távolságokat.

9.6 A légijármű földi kiszolgálása

9.6.1 A légijármű földi kiszolgálása alatt a légijármű közelében üzemanyag tűz esetére legalább a kezdeti beavatkozásra alkalmas tűzoltó berendezés és kiképzett személyzet álljon készenlétben. Biztosítsák továbbá a tűzoltó és mentő szolgálat gyors bevetésének lehetőségét tűzeset, vagy jelentősebb üzemanyagfolyás esetére.

9.6.2 Ha a légijárművet az utasok beszállása, kiszállása, vagy fedélzeten történő tartózkodása alatt töltik fel üzemanyaggal, a földi berendezéseket úgy helyezzék el, hogy:

a) lehetővé tegyék elegendő számú vészkijárat igénybevételét a légijármű gyors kiürítésére; és

b) vészhelyzet esetében biztosítsák az egyes vészkijáratoktól vezető menekülési utak gyors és akadálytalan igénybevételét.

9.7 Repülőtéri gépjármű üzemeltetés

1. Megjegyzés: A repülőtéri gépjármű üzemeltetésre vonatkozó útmutató az A. Melléklet 18. részében, a forgalmi szabályok és előírások a Felszíni Mozgás Ellenőrzése és Irányítása *(SMGCS) című kézikönyvben találhatók.*

2. Megjegyzés: A mozgási területen található utak forgalmát hasznos és kívánatos kizárólag a repülőtéri és egyéb jogosult személyekre korlátozni. Célszerű továbbá, hogy a nyilvános épületek megközelítéséhez nem jogosult személynek ne legyen szüksége az ilyen utak igénybevételére.

9.7.1 A gépjárművek a következő engedélyek alapján üzemelhetnek:

a) a mozgási területen csak a repülőtéri irányító torony engedélye: és

b) a forgalmi előtéren csak az illetékes kijelölt hatóság engedélye.

9.7.2 A mozgási területen közlekedő gépjármű vezetője tartsa be az összes kötelező utasítást, amelyeket a táblák és jelzések adnak meg, kivéve, ha:

a) a mozgási területen a repülőtéri irányító toronytól; vagy

b) a forgalmi előtéren az illetékes kijelölt hatóságtól más utasítást, vagy engedélyt kap.

9.7.3 A mozgási területen közlekedő gépjármű vezetője tartsa be az összes kötelező utasítást, amelyeket a fény-berendezések adnak meg.

9.7.4 A mozgási területen közlekedő gépjármű vezetője kapjon megfelelő kiképzést feladatairól és kötelezettségeiről, valamint tartsa be az összes utasítást, amelyeket:

a) a mozgási területen a repülőtéri irányító toronytól; vagy

b) a forgalmi előtéren az illetékes kijelölt hatóságtól kap.

9.7.5 A rádió-berendezéssel felszerelt gépjármű vezetője a mozgási területre történő belépés előtt a repülőtéri irányító toronnyal, a forgalmi előtérre történő belépés előtt pedig az illetékes kijelölt szervvel vegyen fel kétoldalú rádiókapcsolatot. A mozgási területen történő tartózkodás alatt a gépjármű vezetője folyamatosan figyelje (hallgassa) a kijelölt rádió frekvenciát.

9.8 Felszíni mozgás ellenőrzése és irányítása (rendszerek)

Alkalmazás

9.8.1 A repülőtéren ki kell alakítani felszíni (földi) légijármű és gépjármű mozgás ellenőrzési és irányítási rendszert.

Megjegyzés: A felszíni mozgás ellenőrzésére és irányítására vonatkozó útmutató a Felszíni Mozgás Ellenőrzése és Irányítása *(SMGCS) című kézikönyvben található.*

Jellemzők

9.8.2 ***Ajánlás*** *— A felszíni mozgás ellenőrzési és irányítási rendszer megtervezésénél a következő tényezőket vegyék figyelembe:*
a) a forgalom sűrűsége, nagysága;

b) a tervezett üzemeltetés során várható látási körülmények;

c) a repülőgépvezető (útirány és helyszín) tájékoztatásának szükségessége;

d) a repülőtér területi elrendezése, annak összetettsége, nehézségi foka; és

e) a repülőtér gépjármű forgalma.

9.8.3 ***Ajánlás*** *— A felszíni mozgás ellenőrzési és irányítási rendszer látás utáni segédeszközeit, azaz a jelzéseket, fényeket és táblákat az 5.2, 5.3. és 5.4. szakaszok előírásainak megfelelően tervezzék meg.*

9.8.4 ***Ajánlás*** *— A felszíni mozgás ellenőrzési és irányítási rendszert úgy tervezzék meg, hogy az elősegítse az üzemben levő, használatos futópályára történő engedély nélküli és véletlenszerű légijármű, valamint gépjármű belépés megelőzését.*

9.8.5 ***Ajánlás*** *— A rendszert úgy tervezzék meg, hogy az elősegítse a légijárművek, valamint a légijárművek és gépjárművek, vagy egyéb tárgyak összeütközésének megelőzését a mozgási terület bármely részén.*

Megjegyzés: A megállító keresztfénysorok indukciós hurkokkal történő vezérlésével, valamint a látás utáni gurulási tájékoztatási és ellenőrzési rendszerre vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

9.8.6 Ahol a felszíni mozgás ellenőrzése és irányítása a megállító kereszt-fénysorok és a gurulóút középvonal fények választó-kapcsolásával történik, tegyenek eleget a következő előírásoknak:

a) a kivilágított gurulóút középvonal fényekkel jelzett gurulási útvonalak bekapcsolt megállító kereszt-fénysor esetében ennél végződjenek;

b) a kapcsoló áramköröket úgy tervezzék meg, hogy ha a légijármű előtt levő megállító kereszt-fénysor bekapcsolt helyzetben van, a gurulóút középvonal megállító kereszt-fénysor utáni része ne világítson; és
c) ha a légijármű előtt levő megállító kereszt-fénysor kikapcsolt helyzetben van, a gurulóút középvonal megállító kereszt-fénysor utáni része működjön (világítson).

1. Megjegyzés: A gurulóút középvonal fények előírásai az 5.3.16 pontban, a megállító kereszt-fénysorokra vonatkozók pedig az 5.3.19 pontban találhatók.

2. Megjegyzés: A megállító kereszt-fénysorok és a gurulóút középvonal fények létesítésével és a felszíni mozgás ellenőrzési és irányítási rendszerbe történő alkalmazására vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

9.8.7 ***Ajánlás*** *— A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt repülőtéren a mozgási terület ellenőrzésére telepítsenek felszín felderítő — gurító (SMR) radarberendezést.*

9.8.8 ***Ajánlás*** *— Ha a forgalom nagysága és az üzemeltetési körülmények olyanok, hogy a légiforgalom rendszeres áramlása más eljárásokkal és létesítményekkel nem tartható fenn, a 9.8.7 pontban meghatározottól eltérő körülmények között használt repülőtéren telepítsenek repülőtéri felszín felderítő —*

gurító (SMR) radarberendezést.

Megjegyzés: A repülőtéri felszín felderítő — gurító (SMR) radarberendezés használatára vonatkozó útmutató a Felszíni Mozgás Ellenőrzése és Irányítása (SMGCS) *és a* Légiforgalmi Szolgálatok Tervezési Kézikönyve *(Doc 9426) című kiadványokban található.*

9.9 Az üzemeltetési területek létesítményeinek és berendezéseinek elhelyezése és felépítése

1. Megjegyzés: Az akadálykorlátozási felületekre vonatkozó előírások a 4.2 részben találhatók.

2. Megjegyzés: A fény-egységek és tartószerkezeteik, az optikai megközelítési siklópálya jelző rendszer elemei, a jelzések és táblák tervezésére vonatkozó előírások az alábbi pontokban találhatók: 5.3.1, 5.3.5, 5.4.1 és 5.5.1 . A látás utáni és egyéb navigációs segédeszközök letörhetőségével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 6. részében található.*

9.9.1 Berendezést, vagy létesítményt ne helyezzenek el a következő területeken, kivéve, ha azokra léginavigációval összefüggő feladatuk miatt ott van szükség:

a) futópálya sáv, futópálya végbiztonsági terület, gurulóút sáv, vagy a 3-1. táblázat 11. oszlopában meghatározott távolságokon belül, ha az veszélyeztetheti a légijárművet; vagy

b) biztonsági felszállási területen, ha az veszélyeztetheti a levegőben levő légijárművet.

9.9.2 A léginavigációs célokból szükséges bármely berendezés, vagy létesítmény, amelyet:

a) futópálya sáv alábbi pontján kell elhelyezni:

1) 3. vagy 4. kód szám esetében a futópálya középvonaltól 75 méter távolságon belül;

2) 1. vagy 2. kód szám esetében a futópálya középvonaltól 45 méter távolságon belül; vagy

b) a futópálya végbiztonsági területen, a gurulóút sávban, vagy a 3-1. táblázatban meghatározott távolságokon belül kell elhelyezni; vagy

c) a biztonsági felszállási területen kell elhelyezni, és az veszélyeztetheti a levegőben levő légijárművet;

letörhető legyen, és azt a lehető legalacsonyabbra helyezzék el.

9.9.3 A jelenleg meglevő nem látás utáni segédeszközöknek 2010 január 1-ig nem kell eleget tenniük a 9.9.2 pont előírásának.

9.9.4 ***Ajánlás*** *— A léginavigációs célokból szükséges olyan berendezések vagy létesítmények, amelyek a futópálya sáv nem elegyengetett részén kell elhelyezni, akadálynak minősülnek, ezért letörhetőnek kell lenniük, és a lehető legalacsonyabban ajánlatos felszerelni.*

Megjegyzés: A navigációs segédeszközök telepítésére vonatkozó útmutató a Repülőtér Tervezési Kézikönyv *(Doc 9157) 6. részében található.*

9.9.5 Az I. II. vagy III. kategóriás precíziós megközelítésű futópálya sáv végétől számított 240 méter, valamint az alábbi távolságon belül ne helyezzenek el berendezést vagy létesítményt:

a) 3, vagy 4 kód-szám esetén a futópálya középvonalától 60 méter távolságon belül; vagy
b) 1, vagy 2 kód-szám esetén a futópálya középvonalától 45 méter távolságon belül kivéve, ha feladata léginavigációs okokból az ilyen elhelyezést tesz szükségessé.

9.9.6 A léginavigációs célokból szükséges bármely berendezés, vagy létesítmény, amelyet az I. II. vagy III. kategóriás precíziós megközelítésű futópálya sávban, vagy annak közelében kell elhelyezni és amelyik:

a) a sávban 4. kód szám és F. kód betű esetében a futópálya középvonaltól számított 77.5 méter távolságon belül;

b) sáv végétől számított 240 méter, valamint az alábbi távolságon belül:

1) 3. vagy 4. kód szám esetében a futópálya középvonaltól 60 méter távolságon belül;

2) 1. vagy 2. kód szám esetében a futópálya középvonaltól 45 méter távolságon belül; vagy

c) benyúlik a belső megközelítési, a belső átmeneti, vagy a megszakított leszállási felületekbe;

letörhető legyen, és azt a lehető legalacsonyabbra helyezzék el.

9.9.7 A jelenleg meglevő nem látás utáni segédeszközöknek 2010 január 1-ig nem kell eleget tenniük a 9.9.6 b) pont előírásának.

Megjegyzés: A jelenleg meglevő magas bevezető fények védelmi időpontja az 5.3.1.5 pontban található.

9.9.8 ***Ajánlás** — A léginavigációs célokból szükséges bármely berendezés, vagy létesítmény, amely a 4.2.4, 4.2.11, 4.2.20 vagy 4.2.27 pontok alapján üzemeltetési szempontból akadályt jelent, letörhető legyen, valamint azt a lehető legalacsonyabbra helyezzék el.*

9.10 Kerítés

Alkalmazás

9.10.1 ***Ajánlás** — A repülőtéren helyezzenek el kerítést, vagy más alkalmas akadályt az olyan állatok mozgási területre történő behatolásának megelőzése érdekében, amelyek elég nagyok ahhoz, hogy veszélyt jelentsenek a légijármű számára.*

9.10.2 *2006 november 26. után a repülőtéren helyezzenek el kerítést, vagy más alkalmas akadályt az olyan állatok mozgási területre történő behatolásának megelőzése érdekében, amelyek elég nagyok ahhoz, hogy veszélyt jelentsenek a légijármű számára.*

9.10.3 ***Ajánlás** — A repülőtéren helyezzenek el kerítést, vagy más alkalmas akadályt a jogosulatlan személyeknek a repülőtér nem nyilvános területére történő szándékos vagy véletlen behatolásának megakadályozása érdekében.*

1. Megjegyzés: Idetartozik a csatornák, vezeték alagutak és árkok, stb. elkerítése is, ha ezeknél szükséges a behatolás megelőzése.

2. Megjegyzés: Különleges intézkedések válhatnak szükségessé a jogosulatlan személyeknek a nyilvános utak felett áthaladó futópályára, vagy gurulóútra történő szándékos, vagy véletlen behatolásának megelőzése érdekében.

9.10.4 *2006 november 23. után a repülőtéren helyezzenek el kerítést, vagy más alkalmas akadályt a jogosulatlan személyeknek a repülőtér nem nyilvános területére történő szándékos, vagy véletlen behatolásának megakadályozása érdekében.*

1. Megjegyzés: Idetartozik a csatornák, vezeték alagutak és árkok, stb. elkerítése is, ha ezeknél szükséges a behatolás megelőzése.

2. Megjegyzés: Különleges intézkedések válhatnak szükségessé a jogosulatlan személyeknek a nyilvános utak felett áthaladó futópályára, vagy gurulóútra történő szándékos, vagy véletlen behatolásának megelőzése érdekében.

9.10.5 ***Ajánlás** — Biztosítsanak megfelelő védelmi módszereket a jogosulatlan személyeknek a polgári légiközlekedés biztonságához nélkülözhetetlen, a repülőtér területén kívül eső földi létesítményekhez és berendezésekhez történő szándékos, vagy véletlen behatolásának megakadályozása érdekében.*

9.10.6 2006 november 23. után biztosítsanak megfelelő védelmi módszereket a jogosulatlan személyeknek a polgári légiközlekedés biztonságához nélkülözhetetlen, a repülőtér területén kívül eső földi létesítményekhez és berendezésekhez történő szándékos, vagy véletlen behatolásának megakadályozása érdekében.

Elhelyezés

9.10.7 ***Ajánlás** — A kerítést, vagy akadályt úgy helyezzék el, hogy az elválassza a repülőtér mozgási területét és a légijárművek biztonságos üzemeltetése szempontjából jelentős más létesítményeit, vagy területeit a nagyközönség számára nyitott (nyilvános) területektől.*
9.10.8 **Ajánlás** — 2006 november 23. után a kerítést, vagy akadályt úgy helyezzék el, hogy az elválassza a repülőtér mozgási területét és a légijárművek biztonságos üzemeltetése szempontjából jelentős más létesítményeit, vagy területeit a nagyközönség számára nyitott (nyilvános) területektől.

9.10.9 ***Ajánlás** — Ha nagyobb fokú biztonságot tartanak szükségesnek, a kerítés, vagy más védőeszköz mindkét oldalán létesítsenek tiszta ellenőrző sávot, amelyben a biztonsági személyzet könnyen mozoghat, és amely a behatolást megnehezíti.*
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9.11 Biztonsági világítás

***Ajánlás** — Azon a repülőtéren, amelyen biztonsági okokból a nemzetközi polgári légiközlekedés és létesítményei védelmét szolgáló kerítés, vagy más védőeszköz megvilágítását kívánatosnak ítélik, ezt a minimális szükséges szinten biztosítsák. A fények elhelyezésénél gondoskodjanak arról, hogy a kerítés mindkét oldalának (talaj) felszínét, különösen pedig a bejárati pontokat megvilágítsák.*

10. fejezet
Repülőtér karbantartás

10.1 Általános rész

10.1.1 ***Ajánlás*** *— Dolgozzanak ki karbantartási programot, szükség szerint beleértve a tervszerű megelőző karbantartást is a repülőtéri létesítmények olyan állapotban történő fenntartására, amely nem csökkenti, vagy befolyásolja hátrányosan a légiközlekedés biztonságát, rendszerességét, illetve hatékonyságát.*

1. Megjegyzés: A tervszerű megelőző karbantartási program a létesítmények olyan rendszeres karbantartását jelenti, amellyel megakadályozható azok meghibásodása, vagy teljesítmény-csökkenése.

2. Megjegyzés: A létesítmények közé tartoznak többek között olyan egységek is, mint a burkolt felületek, látási utáni segédeszközök, kerítések, csatornázás és épületek.

10.1.2 ***Ajánlás — A karbantartási program tervezésénél és alkalmazásánál vegyék figyelembe az Emberi Tényezők Alapelveit.***

Megjegyzés: Az Emberi Tényezők alapelveivel kapcsolatos útmutató anyag az Emberi Tényezők Kiképzési Kézikönyvben található.

10.2 Burkolt felületek

10.2.1 A burkolt felülettel ellátott területeket (futópálya, gurulóút, forgalmi előtér, stb.) tisztán kell tartani a laza törmeléktől és az idegen anyagoktól, amelyek a légijármű szerkezetének, vagy hajtóműveinek sérülését okozhatják, illetve hátrányosan befolyásolhatják a légijármű rendszereinek üzemeltetését.

Megjegyzés: A padkák felületének tisztántartására vonatkozó megelőző karbantartó intézkedésekkel kapcsolatos útmutató az A Melléklet 8. részében és a Repülőtér Tervezési Kézikönyv *2. részében található.*

10.2.2 A futópálya felületét olyan állapotban kell tartani, hogy megelőzzék a káros rendellenességek kialakulását.

Megjegyzés: Lásd A. melléklet 5. részt.

10.2.3 A futópálya felület súrlódási jellemzőinek mérését rendszeres időszakonként ön-nedvesítő, folyamatos súrlódás mérést végző berendezéssel kell elvégezni.

Megjegyzés: A futópálya felület súrlódási jellemzőinek értékelésére vonatkozó útmutató az A. Melléklet 7. részében és további tájékoztatás a Repülőtér Szolgálati Kézikönyv *2. részében található.*

10.2.4 Foganatosítsanak megfelelő intézkedéseket, ha a futópálya felület súrlódási jellemzők értéke az egész futópályán, vagy annak egy részén az állami előírásokban meghatározott szint alá csökken.

Megjegyzés: A tájékoztatás és intézkedés vonatkozásában futópálya 100 méteres szakasza jelentősnek tekinthető.

10.2.5 ***Ajánlás*** *— Vegyék fontolóra a megfelelő javító karbantartó intézkedések lehetőségét, ha a futópálya felület súrlódási jellemzők értéke az egész futópályán, vagy annak egy részén az állami karbantartás tervezési előírásokban meghatározott szint alá csökken.*

10.2.6 ***Ajánlás** — Ha okkal feltételezik, hogy a futópályán, vagy annak egy részén a lejtviszonyok, vagy felszíni változások következtében a vízelvezetés nem megfelelő, természetes, vagy helyi esőt szimuláló körülmények között mérjék fel a futópálya felület súrlódási jellemzőket és szükség szerint foganatosítsanak megfelelő javító intézkedéseket.*

10.2.7 ***Ajánlás** — Ha a gurulóutat gázsugár hajtóműves légijárművek veszik igénybe, a gurulóút padkák felületét tartsák tisztán a laza törmeléktől és az idegen anyagoktól, amelyeket a légijármű hajtóművei beszívhatnak.*

Megjegyzés: A témakörrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *2. részében található.*

10.2.8 A burkolt felülettel ellátott futópályát tartsák olyan állapotban, hogy a felület jó súrlódási együttható jellemzőket és az alacsony gördülési ellenállást biztosítson. A felgyülemlett hó, latyak, jég, álló víz, sár, por, homok, olaj, gumi és egyéb szennyeződéseket a lehető legrövidebb időn belül és legnagyobb mértékben távolítsák el.

Megjegyzés: A havas, vagy jeges körülmények közötti elkerülhetetlen gyenge súrlódási jellemzők meghatározásával és közzétételével kapcsolatos útmutató az A. Melléklet 6. részében található. A témakörrel kapcsolatos további, a futópálya tisztítására és a futópálya felület súrlódási jellemzők javítására vonatkozó útmutató a Repülőtér Szolgálati Kézikönyv *2. részében található.*

10.2.9 ***Ajánlás** — A gurulóutat tartsák hótól, latyaktól, jégtől, stb. tisztán olyan mértékben, amely ahhoz szükséges, hogy a légijármű a használatos futópályát megközelíthesse, illetve elhagyhassa.*

10.2.10 ***Ajánlás** — A forgalmi előteret tartsák hótól, latyaktól, jégtől, stb. tisztán olyan mértékben, amely ahhoz szükséges, hogy a légijármű ott biztonságosan mozoghasson és ahol ez szükséges, a légijárművet biztonságosan vontathassák, vagy tolhassák.*

10.2.11 ***Ajánlás** — Ahol a hó, latyak, jég, stb. eltávolítását a mozgási terület különböző részeiről nem tudják egyidejűleg elvégezni, a következő elsőbbségi sorrendet állapíthatják meg, azonban ezt a repülőtér felhasználóival történő megbeszélés alapján szükség szerint módosíthatják:*

1. *használatos futópálya(ák);*

2. *használatos futópályá(ka)t kiszolgáló gurulóútak;*

3. *forgalmi előtér(ek);*

4. *kitérő várakozó helyek; és*

5. *egyéb területek.*

10.2.12 ***Ajánlás** — A repülőtér burkolt felülettel ellátott területeinek jégmentesítésére akkor használjanak kémiai anyagokat, ha a körülmények azt jelzik, hogy ezek alkalmazása hatásos lesz. A kémiai anyagok alkalmazásánál óvatosan járjanak el, hogy ez ne eredményezzen még síkosabb felületet.*

Megjegyzés: A repülőtéri burkolatoknál használt kémiai anyagokkal kapcsolatos útmutatás a Repülőtér Szolgálati Kézikönyv *2. részében található.*

10.2.13 Ne használják azokat a kémiai anyagokat, amelyek káros hatással lehetnek a légijárműre, vagy a burkolt felületekre, illetve amelyek szennyezőek, illetve mérgező hatással lehetnek a repülőtér (biológiai) környezetére.

10.3 Futópálya felület burkolat átmenetei

Megjegyzés: A következő előírások arra az esetre vonatkoznak, ha a burkolt felülettel ellátott futópályát az egész felület újraburkolásának befejezése előtt átadják a forgalomnak és ezért általában az új és a régi futópálya felület között ideiglenes átmeneti szakasz kialakítása szükséges. A témakörrel kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *3. részében található.*

10.3.1 Az ideiglenes átmeneti szakasz hosszirányú lejtése a meglevő futópálya felülethez, vagy a korábban elhelyezett burkolathoz viszonyítva a következő legyen:

a) legfeljebb 5 centiméter vastagságú új burkolat esetén 0.5 — 1.0 %; és

b) több mint 5 centiméter vastagságú új burkolat esetén nem több, mint 0.5 %.

10.3.2 ***Ajánlás*** *— Az újraburkolást a futópálya egyik végétől a másik végéig olyan haladási irányba végezzék, amely egybeesik legtöbb légijármű típus üzemeltetésének általános irányával.*

10.3.3 ***Ajánlás*** *— Az egyes munka-időszakok alatt az újraburkolást minden egyes alkalommal a futópálya teljes szélességében végezzék el.*

10.3.4 Mielőtt az újraburkolt futópályát ideiglenes jelleggel átadnák a forgalomnak, azon az 5.2.3 szakasz előírásainak megfelelően helyezzék el a futópálya középvonal jelzéseket. Ezen kívül bármely ideiglenes áthelyezett futópálya küszöböt 3.6 méter szélességű keresztirányú sávokkal jelöljenek meg.

10.4 Látás utáni segédeszközök

Megjegyzés: Ezek az előírások a karbantartási teljesítmény szint célkitűzéseket jelzik, nem kívánják meghatározni a fényrendszer üzemi meghibásodás jellemzőit.

10.4.1 A fény-egység üzemképtelennek tekintendő, ha a fő fénysugár átlagos fényereje a 2. Függelék meghatározott értékének 50 százalékánál kevesebb. Azoknál a fény-egységeknél, amelyeknél a fő fénysugár tervezett átlagos fényereje a 2. Függelékben meghatározott értéknél magasabb, az 50 százalék erre a tervezett értékre vonatkozik.

10.4.2 Az alkalmazott fény rendszer és a jelző rendszer megbízhatóságának fenntartása érdekében rendszeres megelőző karbantartást kell végezni.

Megjegyzés: A látás utáni segédeszközök megelőző karbantartásával kapcsolatos útmutató a Repülőtér Szolgálati Kézikönyv *9. részében található.*

10.4.3 ***Ajánlás — A II. vagy III. kategóriás precíziós megközelítésű futópálya esetében alkalmazott tervszerű megelőző karbantartás legalább a következő ellenőrzésekre terjedjen ki:***

a) *a bevezető és futópálya fényrendszer fényeinek fény intenzitás, fénysugár terjedés és irány látás útján történő ellenőrzése és helyszíni mérése;*

b) *a bevezető és futópálya fényrendszer minden egyes áramkörének ellenőrzése, valamint az elektromos jellemzők mérése; és*

c) *a légiforgalmi irányítás által alkalmazott fényerő szabályzás helyes működésének ellenőrzése.*

10.4.4 ***Ajánlás*** — *A II. vagy III. kategóriás precíziós megközelítésű futópálya bevezető és futópálya* *fényrendszer fényeinek fény intenzitás, fénysugár terjedés és irány helyszíni mérése alkalmával a 2. Függelék alkalmazható előírásainak teljesítése érdekében a lehetőségek szerint minden fény-egységet mérjenek be.*

10.4.5 ***Ajánlás** — A II. vagy III. kategóriás precíziós megközelítésű futópálya bevezető és futópálya fényrendszer fényeinek fény intenzitás, fénysugár terjedés és irány mérését az egyes fény-egységek jellemzőinek megfelelő pontosságú hordozható mérőeszközzel végezzék el.*

10.4.6 ***Ajánlás** — A II. vagy III. kategóriás precíziós megközelítésű futópálya fényeinek ellenőrzési idejét a forgalom sűrűsége, a helyi levegő szennyezettség szintje, az elhelyezett berendezések műszaki megbízhatósága, valamint a helyszíni mérések eredményei alapján határozzák meg, azonban ez a gyakoriság ne legyen kevesebb, mint a burkolatba beépített fények esetében évi kettő, más fények esetében pedig évi egy alkalom.*

10.4.7 A II. vagy III. kategóriás precíziós megközelítésű futópálya esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy a II. vagy III. kategóriás üzemelés bármely időszakában az összes bevezető és futópálya fények üzemképesek legyenek és hogy minden esetben:

a) a következő különösen fontos egységek mindegyikében egyenként a fények legalább 95 %-a;

1) II. és III. kategóriás precíziós bevezető fényrendszer belső 450 métere;

2) futópálya középvonal fények;

3) futópálya küszöb fények; és

4) futópálya szegély fények;

b) a földetérési terület fények legalább 90 %-a;

c) precíziós bevezető fényrendszer belső 450 méterén túl levő fények legalább 85 %-a; és

d) a futópálya vége fények legalább 75 %-a üzemképes legyen.

A látás utáni irányvezetés folyamatosságának biztosítása érdekében a megengedhető számú üzemképtelen fény-egységek nem változtathatják meg a fény rendszer alapvető rajzát, illetve látható elrendezését. Ezen kívül az üzemképtelen fény-egységek nem lehetnek egymás mellett, kivéve a rövid, vagy teljes keresztfénysort, ahol két üzemképtelen fény-egység elhelyezkedhet egymás mellett.

Megjegyzés: A rövid és teljes keresztfénysor és a futópálya szegélyfény vonatkozásában a fény-egységek egymás mellett levőnek tekintendők, ha egymást követően helyezkednek el és:

— oldalirányban azonos keresztfénysorban vannak; vagy

— hosszirányban a szegélyfények, vagy keresztfénysor fények azonos sorában vannak.

10.4.8 A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt futópályához kapcsolódó futópálya várakozási helyen levő megállító keresztfénysor esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy:

a) két fény-egységnél több ne legyen üzemképtelen; és

b) két egymás mellett levő fény-egység ne legyen üzemképtelen kivéve, ha a fények közötti távolság jóval kisebb a meghatározottnál.

10.4.9 A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett felhasználni kívánt gurulóút esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy két egymás mellett levő fény-egység ne legyen üzemképtelen.

10.4.10 Az I. kategóriás precíziós megközelítésű futópálya esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy az I. kategóriás üzemelés bármely időszakában az összes bevezető és futópálya fények üzemképesek legyenek és hogy bármely esetben legalább az alábbi fények 85 %-a üzemképes legyen:

a) kategóriás precíziós bevezető fényrendszer;

b) futópálya küszöb fények;

c) futópálya szegély fények; és

d) a futópálya vége fények.

A látás utáni tájékoztatások folyamatosságának biztosítása érdekében az üzemképtelen fény-egységek nem lehetnek egymás mellett, kivéve, ha a fények közötti távolság jóval kisebb a meghatározottnál.

Megjegyzés: A rövid, vagy teljes keresztfénysor esetében a tájékoztatás két egymás mellett levő fény-egység meghibásodása esetén fennmarad.

10.4.11 Az 550 méternél alacsonyabb futópályamenti látástávolság érték mellett felszállásra felhasználni kívánt futópálya esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy az üzemelés bármely időszakában az összes futópálya fények üzemképesek legyenek és hogy bármely esetben:

a) a futópálya középvonal fények (ha van) és a futópálya szegély fények legalább 95 %-a; és

b) a futópálya vége fények legalább 75 %-a

üzemképes legyen.

A látás utáni tájékoztatások folyamatosságának biztosítása érdekében egymás mellett üzemképtelen fény-egységek nem lehetnek.

10.4.12 Az 550 méter, vagy magasabb futópályamenti látástávolság érték mellett felszállásra felhasználni kívánt futópálya esetében alkalmazott tervszerű megelőző karbantartás rendszerének célja az, hogy az üzemelés bármely időszakában az összes futópálya fények üzemképesek legyenek és hogy bármely esetben a futópálya szegély és vége fények legalább 85 %-a üzemképes legyen. A látás utáni tájékoztatások folyamatosságának biztosítása érdekében egymás mellett üzemképtelen fény-egységek nem lehetnek.

10.4.13 *Ajánlás — Az alacsony látástávolság mellett történő üzemeltetés alatt az illetékes hatóság korlátozhatja a repülőtér elektromos rendszerei közelében történő munkavégzést.*

1. Függelék
Légiforgalmi földi fények, jelölések, táblák és jelzések színei

1. Általános rész

Bevezető megjegyzés: A következő előírások meghatározzák a légiforgalmi földi fények, jelölések, táblák és jelzések használandó színeit. Ez a meghatározás összhangban van a Nemzetközi Világítási Bizottság (CIE) 1983. évi előírásaival.

Nem lehetséges olyan, színekre vonatkozó előírásokat kidolgozni, amelyek kizárják az összetévesztés lehetőségét. Az elfogadható biztonságú felismerés érdekében fontos, hogy a megvilágítás jóval az érzékelési küszöb fölött legyen, a környezeti és légköri hatások a színt ne változtassák meg nagy mértékben, valamint az érzékelő szín-felismerése is megfelelő legyen. Fennáll a színtévesztés lehetősége akkor is, ha a megvilágítás szintje — mint például a közelről szemlélt nagy intenzitású fények esetében — különösen nagy. A tapasztalatok azt mutatják, hogy ha elég figyelmet szentelnek a fenti tényezőknek, kielégítő színfelismerés biztosítható.

A szabványos megfigyelő és koordináta rendszer alapján kifejezett színskála értékeket a CIE 1931. évi nyolcadik cambridge-i értekezletén fogadták el (lásd CIE 15. számú kiadvány 1971).

2. A légiforgalmi földi fények színe

2.1 Színskála értékek

2.1.1 A légiforgalmi földi fények színskálája a következő értékhatárokon belül kell, hogy legyen:
CIE számított értékek (lásd A1-1. ábra) alapján:

a) vörös		
bíbor szín határ	y = 0,980 - x	
sárga szín határ	y = 0,335	
b) sárga		
vörös szín határ	y = 0,382	
fehér szín határ	y = 0,790 - 0,667 x	
zöld szín határ	y = x - 0,120	
c) zöld		
sárga szín határ	x = 0,360 - 0,080 y	
fehér szín határ	x = 0,650 y	
kék szín határ	y = 0,390 - 0,171 x	
d) kék		
zöld szín határ	y = 0,805 x + 0,065	
fehér szín határ	y = 0,0400 - x	
bíbor szín határ	x = 0,600 y + 0,133	
e) fehér		
sárga szín határ	x = 0,500	
kék szín határ	x = 0,285	
zöld szín határ	y = 0,440 és	y = 0,150 + 0,640 x
bíbor szín határ	y = 0,050 + 0,750 x és	y = 0,382
f) változtatható fehér		
sárga szín határ	x = 0,255 + 0,750 y és	x = 10185 - 1,500 y
kék szín határ	x = 0,285	
zöld szín határ	y = 0,440 és	y = 0,150 + 0,640 x
bíbor szín határ	y = 0,050 + 0,750 y és	y = 0,382

Megjegyzés: A színszűrő elemek hőmérsékletének változása miatt bekövetkező színskála változásokkal kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

2.1.2 ***Ajánlás** — Ahol a fényerő csökkentése nem szükséges, vagy ahol a színtévesztő megfigyelőnek is fel kell ismernie a fény színét, a zöld jelzések a következő szín határ értékeken belül maradjanak:*

sárga szín határ	*y 7 0,726 - 0,726 x*
fehér szín határ	*x = 0,650 y*
kék szín határ	*y = 0,390 - 0,171 x*

2.1.3 ***Ajánlás** — Ahol a helyes szín felismerésének a biztonsága fontosabb, mint a legnagyobb lehetséges látási távolság elérése, a zöld jelzések a következő szín határ értékeken belül maradjanak:*

sárga szín határ	*y = 7 0,726 - 0,726 x*
fehér szín határ	*x = 0,625 y - 0,041*
kék szín határ	*y = 0,390 - 0,171 x*

2.2 Fények megkülönböztetése

2.2.1 ***Ajánlás** — Ahol a sárga és fehér fények megkülönböztetése szükséges, azokat egymáshoz képest időben, vagy térben közel helyezzék el. Például a fények azonos fény-egységen belül felváltva villogjanak.*

.2.2 ***Ajánlás** — Ahol a sárga, illetve zöld és/vagy fehér színek megkülönböztetése szükséges, például a legurulóút középvonal fények esetében, a sárga fény határ "y" koordinátája ne haladja meg a 0,40 értéket.*

Megjegyzés: A fehér szín határ értékek kialakítása azon a feltételezésen alapszik, hogy azt olyan körülmények között alkalmazzák, amikor a fényforrás jellemzők (szín-hőmérséklet) gyakorlatilag állandóak.

2.2.3 ***Ajánlás** — A változtatható fehér szín csak olyan fény-egységeknél kerüljön alkalmazásra, amelyek fényerejét, például a vakítás elkerülése érdekében változtatni kell. Ha ezt a színt a sárgától meg kell különböztetni, a fény-egységet úgy tervezzék és üzemeltessék, hogy:*

a) a sárga szín határ "x" koordinátája a fehér szín határ "x" koordinátájánál legalább 0,050 értékkel nagyobb legyen; és

b) a fény-egységek elhelyezése olyan legyen, hogy a sárga szín a fehér színnel együtt legyen látható és ahhoz közel helyezkedjen el.

2.2.4 Meg kell vizsgálni, hogy a légiforgalmi földi fények színe valóban az A1-1. ábrán meghatározott határok között legyen. A vizsgálatot a legbelső gyertyafényerő ív területén belül, a meghatározott áramerősség, vagy feszültség melletti üzemeltetés során öt ponton végrehajtott méréssel végezzék (lásd a 2. Függelék fényerő ív ábráit). Ellipszis, vagy kör alakú fény ívek esetében a szín mérést a középpontban, valamint a vízszintes és függőleges határokon végezzék. Szögletes fény hatások esetén a szín mérést a középpontban, valamint az átfogók határán (sarkok) végezzék. Ezen kívül ellenőrizzék a fényt a legkülső gyertyafényerő ívnél annak biztosítására, hogy nincs olyan szín-váltás, vagy változás, amely zavaró jelet adhat a repülőgépvezető számára.

1. Megjegyzés: Végezzék el és jegyezzék fel a szín koordinátákat a legkülső gyertyafényerő ívnél, hogy az adatok segítségével az illetékes hatóság felülvizsgálja és használhatónak nyilváníthassa a fény-egységet.

2. Megjegyzés: Bizonyos fény-egységeket úgy is beszabályozhatják, hogy azt a repülőgépvezető a legkülső gyertyafényerő íven túli irányokból is láthatja és használhatja. Ilyen például a különösen széles futópálya *várakozási helyeknél elhelyezett megállító keresztfénysor fény. Ilyen esetekben az illetékes hatóság értékelje a ténylegesen felszerelt egységeket és szükség esetén írja elő a szín-váltás felülvizsgálatát, valamint a legkülső íven túli szögtartományokba történő beszabályozást.*

2.2.5 Az optikai megközelítési siklópálya jelző rendszer és más, átmeneti szín szektorral rendelkező fény egységek esetében a színt a 2.2.4 pontban ismertetettek szerint mérjék fel, azonban az egyes szín területeket külön kezeljék és az átmeneti szektor fél fokos sugárzásán belül ne jelöljenek ki (mérő) pontot.

3. A jelek, táblák és jelzések színei

1. Megjegyzés: A jelek, táblák és jelzések színekre vonatkozó alábbi előírások csak a friss festésre értendők. A jelek, jelzések és táblák elkészítésénél alkalmazott festékek idővel kifakulnak és ezért felújításukra van szükség.

2. Megjegyzés: A felület jelzés színekre vonatkozó útmutató a Felületen elhelyezett látjelek színei *— No. 39-2 (TC-106) 1983 CIE kiadványban található.*

3. Megjegyzés: A kivilágított táblákra vonatkozóan alábbi 3.4 pontban javasolt, a CIE előírások alapján kidolgozott szín határ értékek átmeneti jellegűek. A későbbiek során, mikor a CIE kidolgozza a kivilágított táblákra vonatkozó előírásait, ezeket módosítani szándékozzuk.

3.1 Az általános színek, fényvisszaverő és kivilágított (belső világítással kivilágított) táblák és jelzések színeinek színskála és fényerő tényezőit a következő szabványos körülmények alapján kell meghatározni:

a) megvilágítás szöge: 45°;

b) a nézet iránya (amelyből a fényt az észlelő látja): a felületre merőleges; és

c) megvilágítás: szabványos CIE D_{65}.

3.2 ***Ajánlás*** *— A jelzések, valamint a külső világítással megvilágított jelek és táblák esetén alkalmazott általános színek színskála érték és fényerő tényezői szabványos környezeti körülmények között a következő értékeken belül legyenek:*

CIE számított értékek (lásd A1-2. ábra) alapján:

a) vörös			
bíbor szín határ	$y = 0{,}345 - 0{,}051\,x$	*narancssárga szín határ*	$y = 0{,}314 + 0{,}047\,x$
fehér szín határ	$y = 0{,}910 - x$	*fényerő tényező*	$\beta = 0{,}07$ *(min)*
b) narancssárga			
vörös szín határ	$y = 0{,}265 + 0{,}205\,x$	*fehér szín határ*	$y = 0{,}910 - x$
sárga szín határ	$y = 0{,}207 + 0{,}390\,x$	*fényerő tényező*	$\beta = 0{,}20$ *(min)*
c) sárga			
fehér szín határ	$y = 0{,}910 - x$	*narancssárga szín határ*	$y = 0{,}108 + 0{,}707\,x$
zöld szín határ	$y = 1{,}35\,x - 0{,}093$	*fényerő tényező*	$\beta = 0{,}45$ *(min)*
d) fehér			
bíbor szín határ	$y = 0{,}010 + x$	*kék szín határ*	$y = 0{,}610 - x$
zöld szín határ	$y = 0{,}030 + x$	*sárga szín határ*	$y = 0{,}710 - x$

fényerő tényező	*b = 0,75 (min)*		

e) fekete

bíbor szín határ	*y = x - 0,030*	*kék szín határ*	*y = 0,570 - x*
zöld szín határ	*y = 0,050 + x*	*sárga szín határ*	*y = 0,740 - x*
fényerő tényező	*β = 0,03 (max.)*		

f) sárgás zöld

zöld szín határ	*y = 1,317 x + 0,4*	*fehér szín határ*	*y = 0,910 - x*
sárga szín határ	*y = 0,867 x + 0,4*		

Megjegyzés: A felületen levő vörös és narancssárga színek közötti kis mértékű különbség nem elegendő a színek megkülönböztetésére, ha ezeket (egymástól) külön látják.

3.3 ***Ajánlás*** *— A fényvisszaverő anyaggal készült jelzések, jelek és táblák színeinek színskála érték és fényerő tényezői szabványos környezeti körülmények között a következő értékeken belül legyenek:*

CIE számított értékek (lásd A1-3. ábra) alapján:

a) vörös

bíbor szín határ	*y = 0,345 - 0,051 x*	*fehér szín határ*	*y = 0,910 - x*
narancssárga szín határ	*y = 0,314 + 0,047 x*	*fényerő tényező*	*β = 0,03 (min)*

b) narancssárga

vörös szín határ	*y =0,265 + 0,205 x*	*fehér szín határ*	*y = 0,910 - x*
sárga szín határ	*y = 0,207 + 0,390 x*	*fényerő tényező*	*β = 0,14 (min)*

c) sárga

narancssárga szín határ	*y = 0,160 + 0,540 x*	*fehér szín határ*	*y = 0,910 - x*
zöld szín határ	*y = 1,35 x - 0,093*	*fényerő tényező*	*β = 0,16 (min)*

d) fehér

bíbor szín határ	*y = x*	*kék szín határ*	*y = 0,610 - x*
zöld szín határ	*y = 0,040 + x*	*sárga szín határ*	*y = 0,710 - x*
fényerő tényező	*β = 0,27 (min)*		

e) kék

zöld szín határ	*y = 0,118 + 0,675 x*	*fehér szín határ*	*y = 0,370 - x*
bíbor szín határ	*y = 1,65 x - 0,187*	*fényerő tényező*	*β = 0,01 (min)*

f) zöld

sárga szín határ	*y = 0,711 - 1,22 x*	*fehér szín határ*	*y = 0,243 + 0,670 x*
kék szín határ	*y = 0,405 - 0,243 x*	*fényerő tényező*	*β = 0,03 (min)*

3.4 ***Ajánlás*** *—A kivilágított (belső világítással rendelkező) táblák és jelzések színeinek színskála érték és fényerő tényezői szabványos környezeti körülmények között a következő értékeken belül legyenek:*

CIE számított értékek (lásd A1-4. ábra) alapján:

a) vörös

bíbor szín határ	*y = 0,345 - 0,051 x*	*fehér szín határ*	*y = 0,910 - x*
narancssárga szín határ	*y = 0,314 + 0,047 x*	*fényerő tényező (nappali körülmények esetén)*	β *= 0,07 (min)*
(éjszakai körülmények esetén)			
relatív fényerő	*5 % (min)*	*relatív fényerő fehérhez*	*20 % (max)*

b) sárga

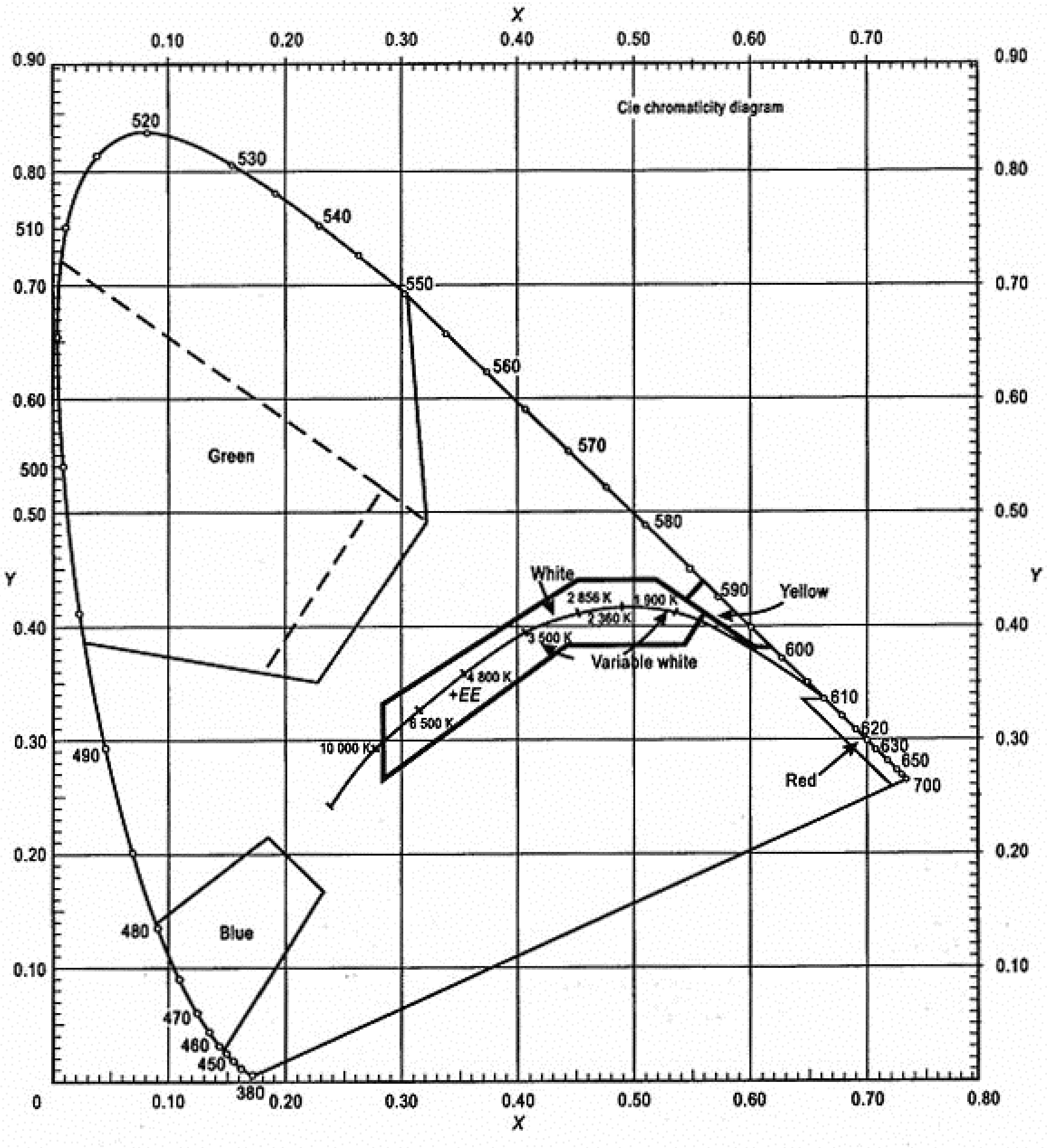
fehér szín határ	*y = 0,910 - x*	*zöld szín határ*	*y = 1,35 x - 0,093*
narancssárga szín határ	*y = 0,108 + 0,707 x*	*fényerő tényező (nappali körülmények esetén)*	β *= 0,45 (min)*
(éjszakai körülmények esetén)			
relatív fényerő	*30 %*	*relatív fényerő fehérhez*	*80 %*

c) fehér

bíbor szín határ	*y = 0,010 + x*	*kék szín határ*	*y = 0,610 - x*
zöld szín határ	*y = 0,030 + x*	*sárga szín határ*	*y = 0,710 - x*
fényerő tényező (nappali körülmények esetén)			
relatív fényerő fehérhez (éjszakai körülmények esetén)			*%*

d) fekete

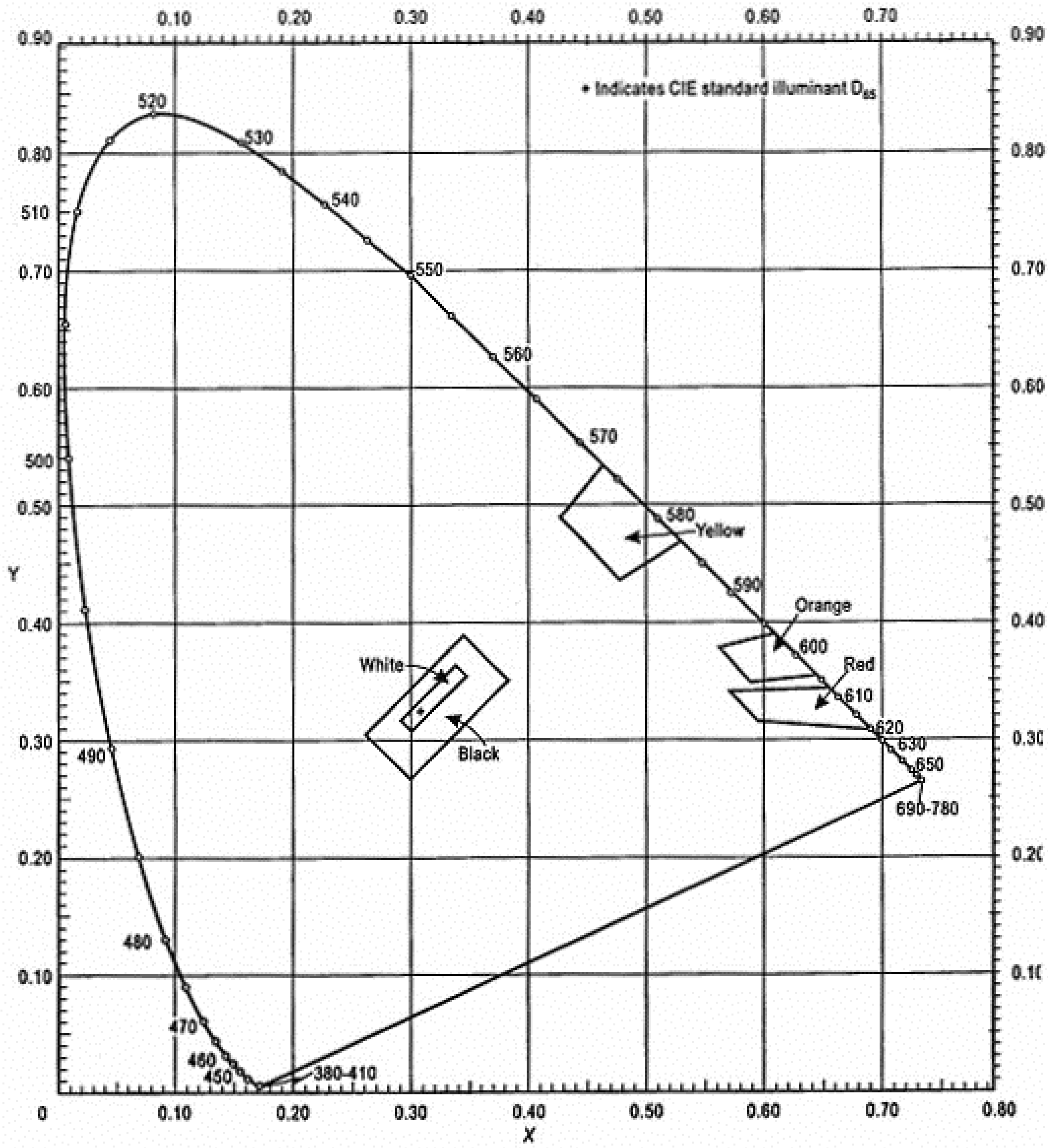
bíbor szín határ	*y = x - 0,030*	*kék szín határ*	*y = 0,570 - x*
zöld szín határ	*y = 0,050 + x*	*sárga szín határ*	*y = 0,740 - x*
fényerő tényező (nappali körülmények esetén)			β *= 0,03 (max)*
(éjszakai körülmények esetén)			
relatív fényerő	*0 % (min)*	*relatív fényerő fehérhez 2 % (max)*	



A1-1. ábra: Légiforgalmi földi fények szín jellemzői

CIE színskála felosztási rajz

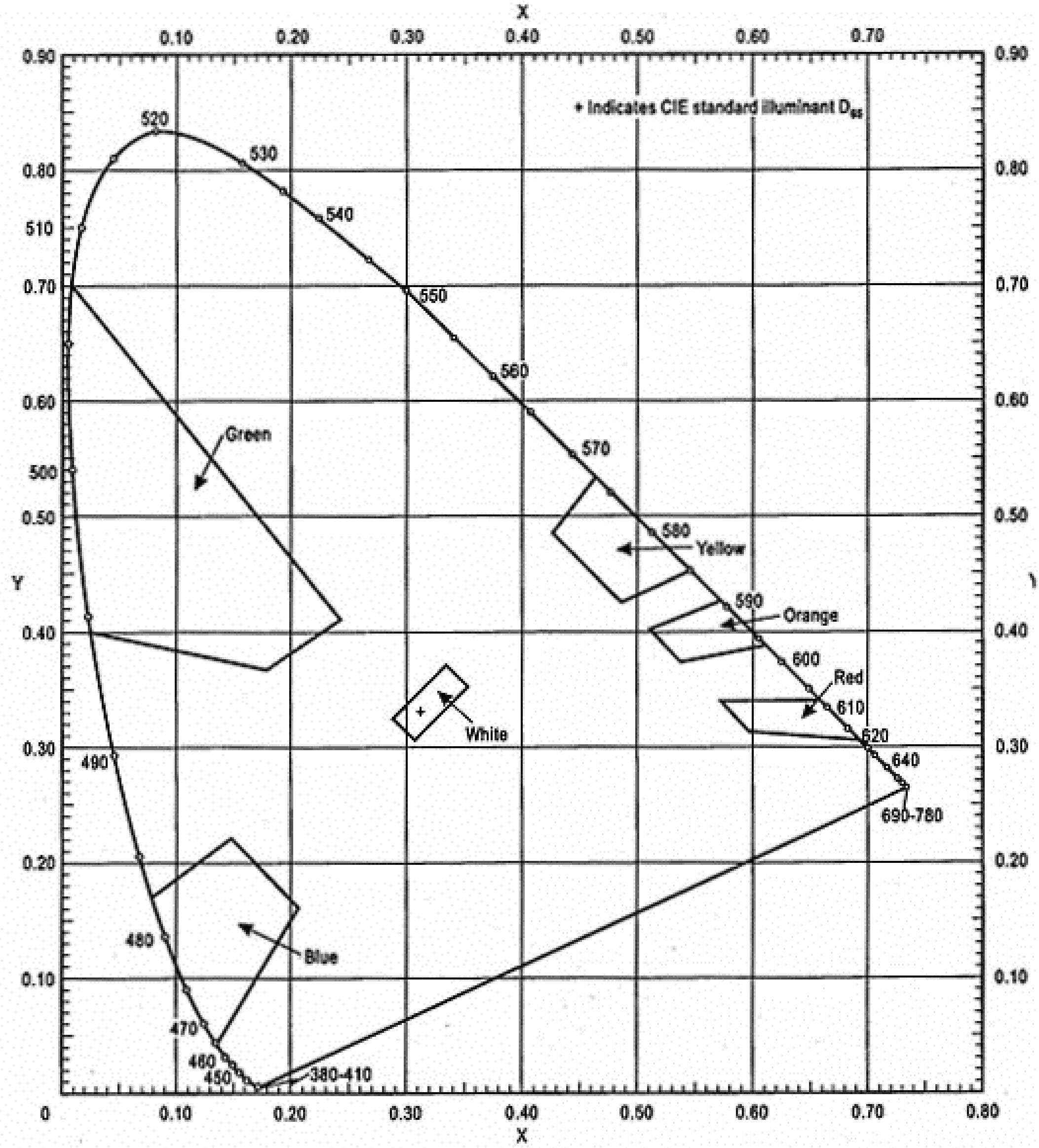
green – zöld/ white – fehér/ variable white - változtatható fehér/ yellow - sárga/ red - vörös



A1-2. ábra: Felület jelzések, valamint kívülről megvilágított jelzések és táblák általános színei

CIE szabványos megvilágítás D_{65}

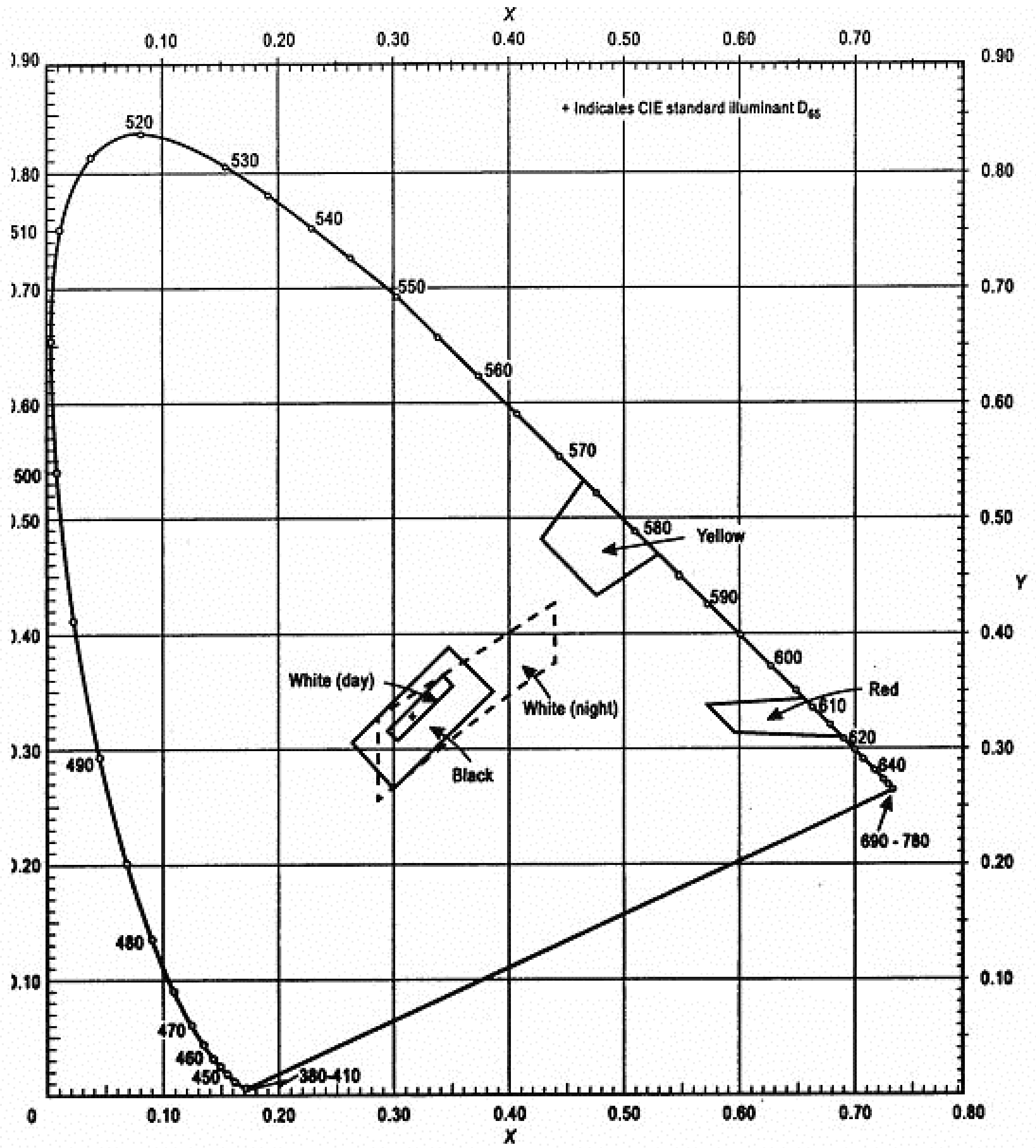
black – fekete/ white – fehér/ yellow – sárga/ red - vörös



A1-3. ábra: Felület jelzések, jelölések és táblák elkészítéséhez alkalmazott fényvisszaverő anyagok színei

green – zöld/ white – fehér/ blue - kék/ yellow - sárga/ red – vörös/ orange - narancssárga

CIE szabványos megvilágítás D_{65}



A1-4. ábra: Belső világítással rendelkező (átvilágított) táblák és jelzések színei

white (day)– fehér (nappal)/ white (night)– fehér (éjszaka)

blue - kék/ yellow - sárga/ red – vörös

CIE szabványos megvilágítás D_{65}

2. Függelék
Légiforgalmi földi fények jellemzői

Közös megjegyzések az A2-1. — A2-11. ábrákhoz

1. Az ábrákon bemutatott körívek a közös függőleges és vízszintes tengelyekhez viszonyítva szimmetrikusak.

2. Az A2-1. — A2-11. ábrák a legkisebb fényerősség értéket mutatják be. A fő fénysugár átlagos fényerejét az A2-11. ábrán látható rács-háló pontok kijelölésével számítottuk ki a fő fénysugarat jelző köríven és azon belül elhelyezkedő összes pont felhasználásával. Az átlagos érték az összes jelentős pontban mért fényerősség matematikai átlaga. A fényerősség gyertyafényerő értékben (cd) került megállapításra.

3. Ha a fény-egység szerkezet beállítása megfelelő, a fő fénysugáron belül eltérés nem lehetséges.

4. Átlagos fényerő arányérték — Egy általános új fény-egység fő fénysugarát kijelölő köríven belül mért átlagos fényerő, valamint egy új futópálya szegély fény fő fénysugár átlagos fényerő közötti arány a következő:

A2-1. ábra	bevezető középvonal fény és keresztfénysor	1.5 : 2.0 (fehér)
A2-2. ábra	bevezető oldalsó fénysor	0.5 : 1.0 (vörös)
A2-3. ábra	futópálya küszöb	1.0 : 1.5 (zöld)
A2-4. ábra	futópálya küszöb keresztfénysor	1.0 : 1.5 (zöld)
A2-5. ábra	földetérési terület	0.5 : 1:0 (fehér)
A2-6. ábra	futópálya középvonal fénysor (térköz 30 m)	0.5 : 1.0 (fehér)
A2-7. ábra	futópálya középvonal fénysor (térköz 15 m)	0.5 : 1.0 (fehér) III.kat.
A2-7. ábra	futópálya középvonal fénysor (térköz 15 m)	0.25 : 0.5 (fehér) I/II. kat.
A2-8. ábra	futópálya vége	0.25 : 0.5 (vörös)
A2-9. ábra	futópálya szegély (szélesség 45 m)	1.0 (fehér)
A2-10. ábra	futópálya szegély (szélesség 60 m)	1.0 (fehér)

5. Az ábrákon látható fénysugár fedési terület biztosítja a szükséges bevezetési tájékoztatást 150 méter futópályamenti látástávolság értékig és a szükséges felszállási tájékoztatást 100 méter futópályamenti látástávolság értékig.

6. A vízszintes szögeket a függőleges síkhoz viszonyítva a futópálya középvonalán át mértük. A futópálya középvonal fények kivételével a fény-egységek beállítása a középvonal felé irányul. A függőleges szögeket a vízszintes síkhoz viszonyítva mértük.

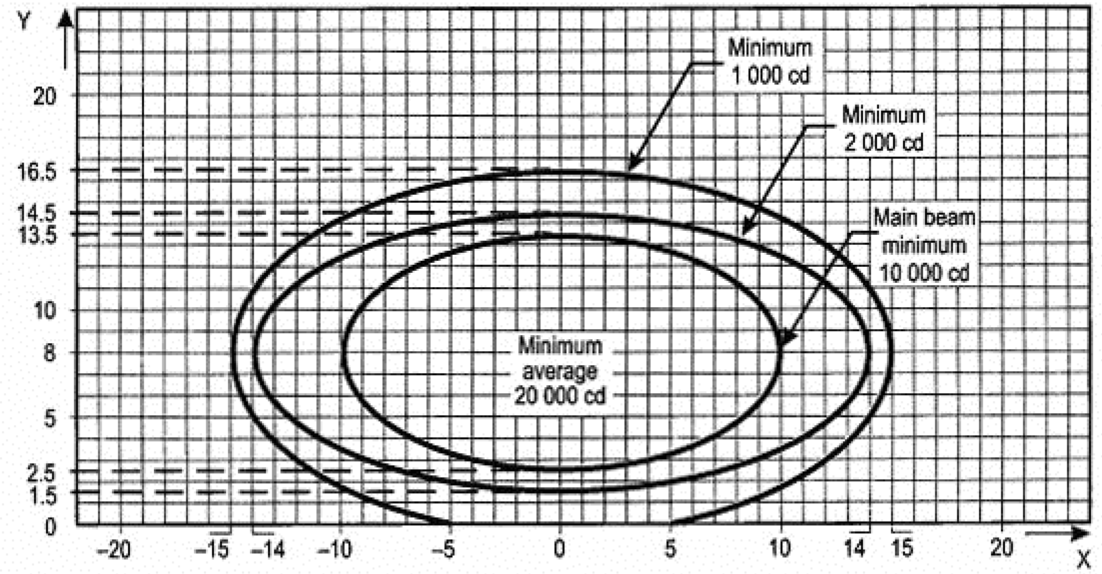
7. Ahol a bevezető középvonal fények és keresztfénysorok, valamint a bevezető fénysor oldalsó fények esetében magas szerkezet helyett beépített fény-egységeket alkalmaznak, például áthelyezett futópálya küszöb esetén, a fényerősségre vonatkozó előírás egy helyen telepített kettő, vagy három alacsonyabb intenzitású elemmel is teljesíthető.

8. Nem lehet eléggé hangsúlyozni a megfelelő karbantartás fontosságát. Az átlagos fényerősség (intenzitás) soha ne legyen kevesebb, mint az ábrákon jelzett értékek 50 %-a. Az illetékes repülőtéri hatóság feladata a fény-egység teljesítmény szintjét a meghatározott legkisebb átlagos gyertyafényerő érték körül tartani.

9. A fény-egységet úgy helyezzék el, hogy a fő fénysugár sugárzása legalább fél fokkal a meghatározott értékeken belül legyen.

Az ábrák feliratai és a körök jelentései a következők:

Y (vertical degrees)	függőleges tengely fokokban
X (horizontal degrees)	vízszintes tengely fokokban
külső körív	legkisebb fényerősség (gyertyafényerő)
középső körív	legkisebb fényerősség (gyertyafényerő)
belső körív	fő fénysugár legkisebb fényerősség (gyertyafényerő)
minimum average > cd	legkisebb átlagos fényerősség (gyertyafényerő)



A2-1. ábra: A bevezető fénysor középvonal és keresztfénysor fények fényerősség ábrája
(fehér színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

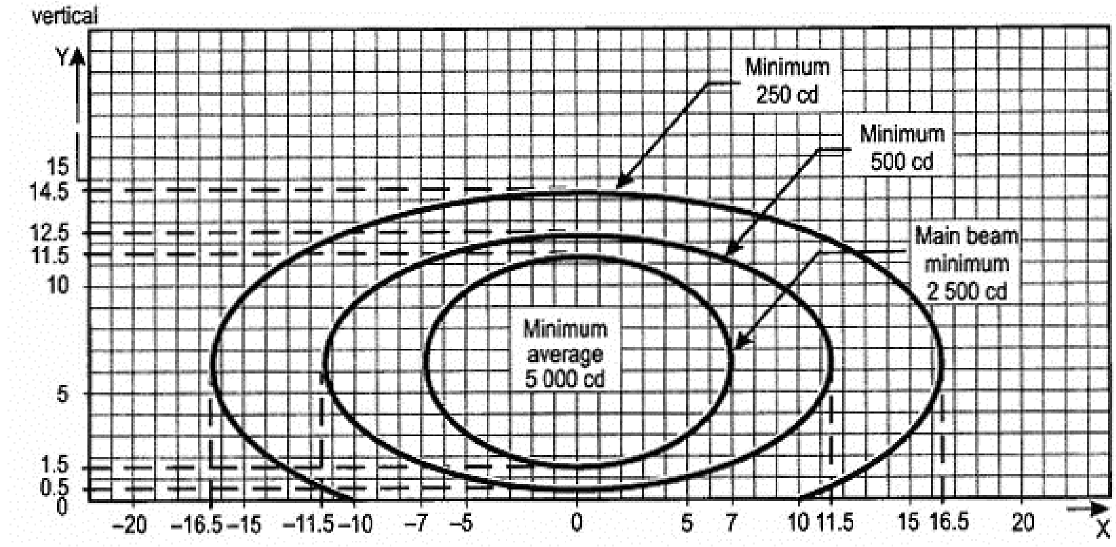
a	10	14	15
b	5.5	6.5	8.5

2.) A fény-egységek függőleges beállítási szöge olyan legyen, hogy a fő fénysugár a következő (az ábrán bemutatott) fedésterületen belül legyen látható:

távolság a futópálya küszöbtől	fő fénysugár fedésterület
küszöbtől — 315 méterig	0° — 11°
316 méter — 475 méter között	0.5° — 11.5°
476 méter — 640 méter között	1.5° — 12.5°
641 méter — és ezen túl	2.5° — 13.5°

3.) A középvonaltól számított 22.5 méter távolságon túl elhelyezkedő keresztfénysor fényeket befelé 2°-os szögbe állítsák be, az összes többi fény a futópálya középvonalával párhuzamos legyen.

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-2. ábra: A bevezető fénysor oldalsó fények fényerősség ábrája
(vörös színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

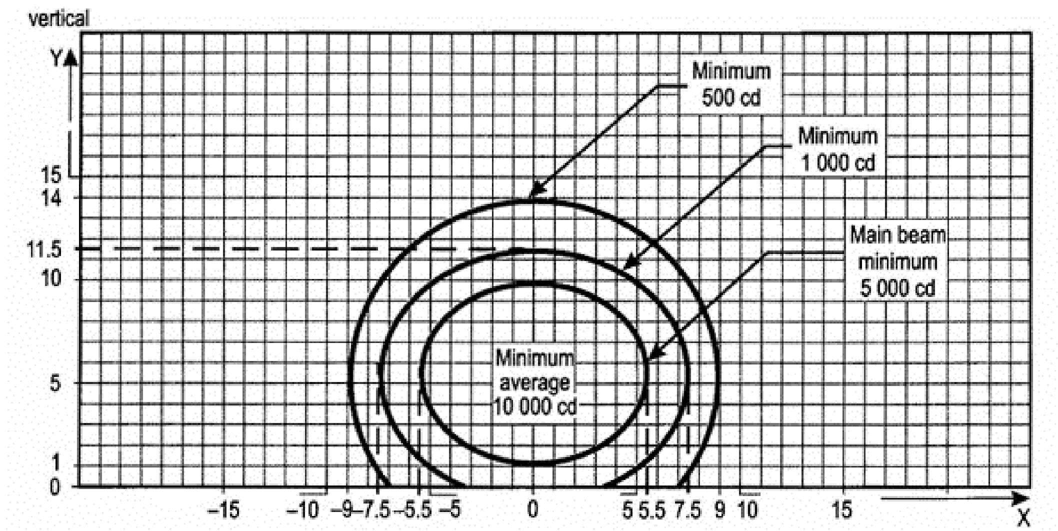
a	7.0	11.5	16.5
b	5.0	6.0	8.0

2.) A fényeket befelé 2°-os szögbe állítsák be.

3.) A fény-egységek függőleges beállítási szöge olyan legyen, hogy a fő fénysugár a következő fedésterületen belül legyen látható:

távolság a futópálya küszöbtől	fő fénysugár fedésterület
küszöbtől — 115 méterig	0.5° — 11.5°
116 méter — 215 méter között	1° — 11°
216 méter — és ezen túl	1.5° — 11.5°(az ábrán látható)

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



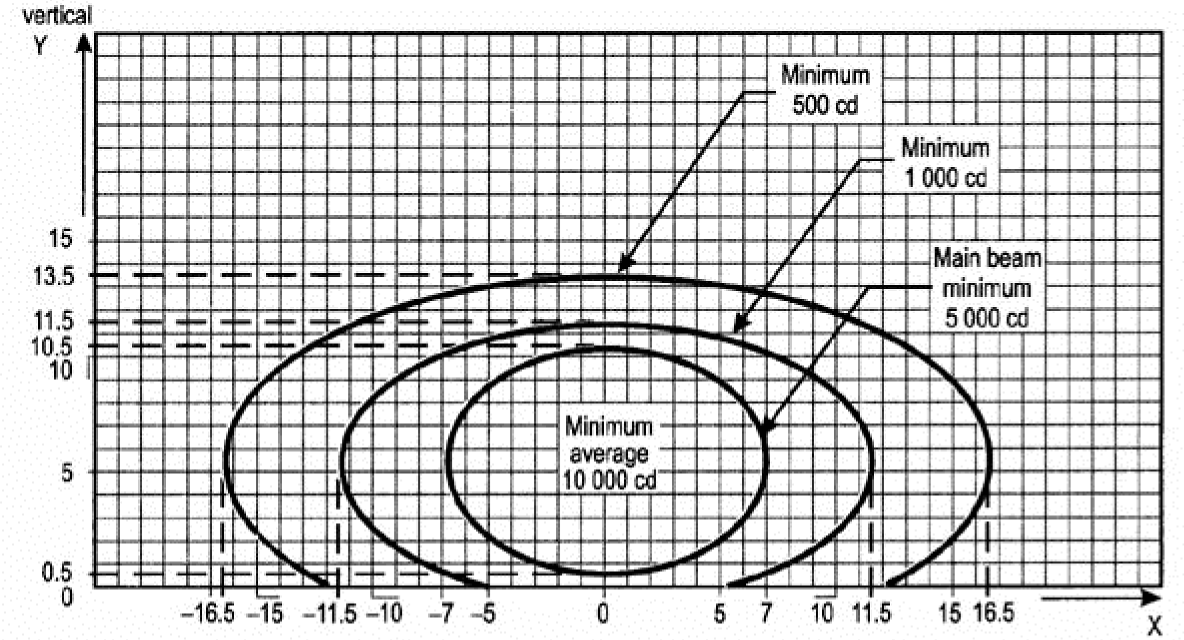
A2-3. ábra: A futópálya küszöb fények fényerősség ábrája
(zöld színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	5.5	7.5	9.0
b	4.5	6.0	8.5

2.) A fényeket befelé 3.5°-os szögbe állítsák be.

3.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



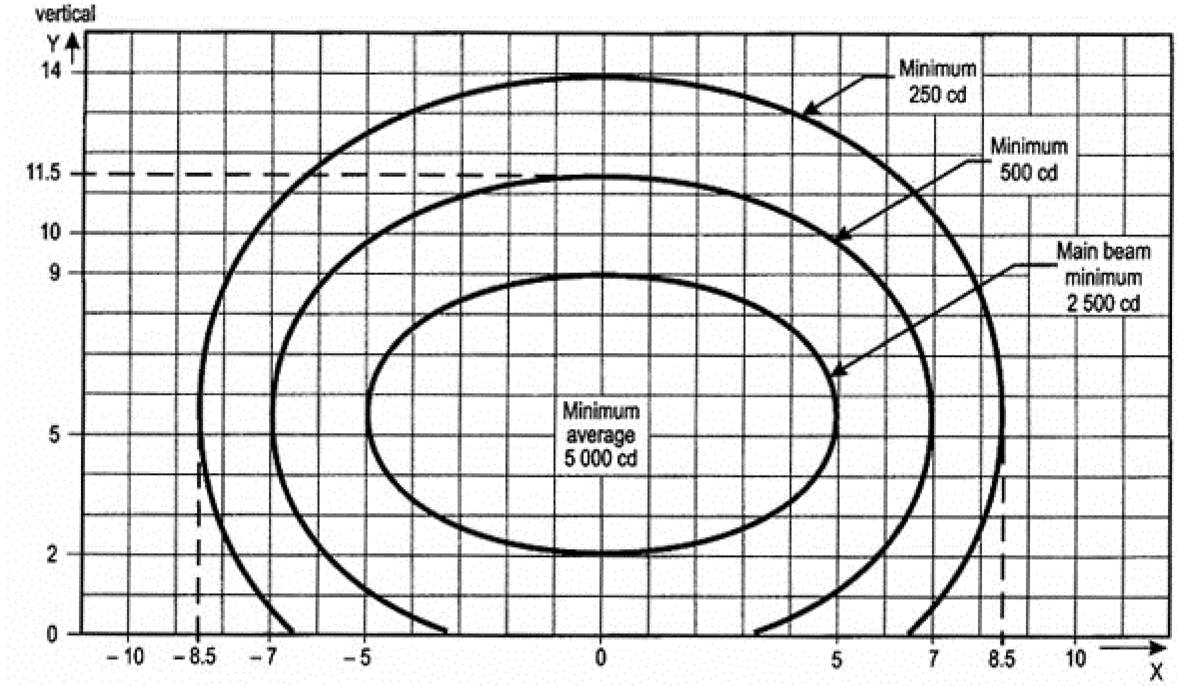
A2-4. ábra: A futópálya küszöb keresztfénysor fények fényerősség ábrája
(zöld színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	7.0	11.5	16.5
b	5.0	6.0	8.0

2.) A fényeket befelé 2°-os szögbe állítsák be.

3.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



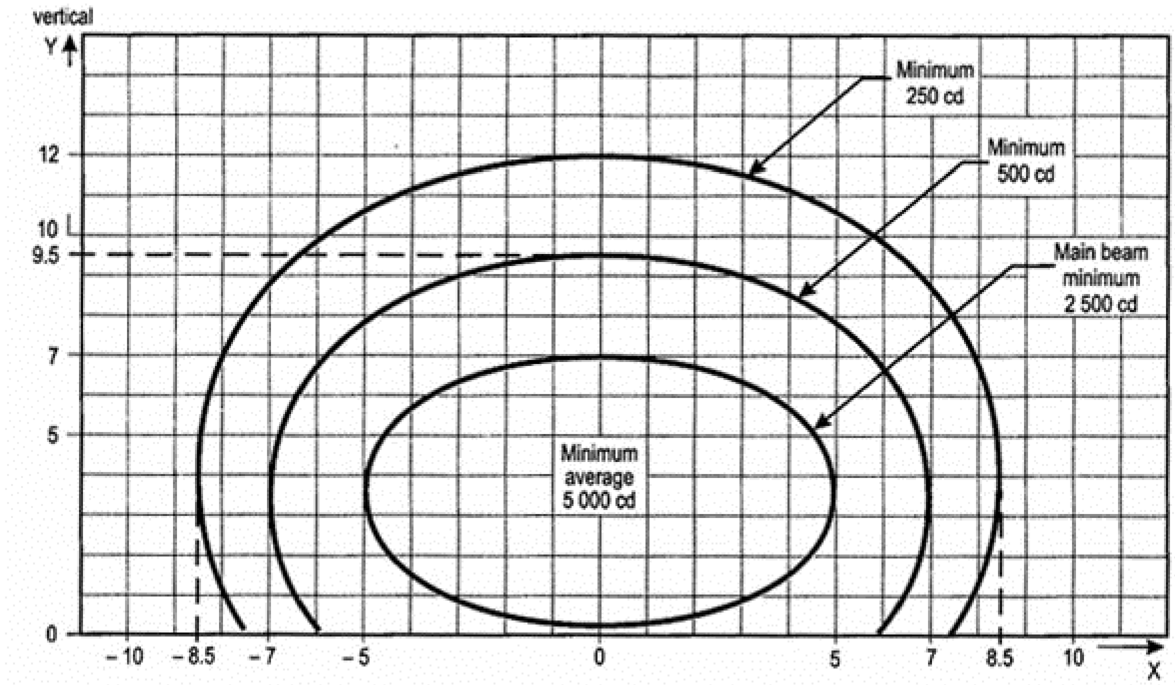
A2-5. ábra: A földetérési terület fények fényerősség ábrája
(fehér színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	5.0	7.0	8.5
b	3.5	6.0	8.5

2.) A fényeket befelé 4°-os szögbe állítsák be.

3.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-6. ábra: Az egymástól 30 méter távközzel elhelyezett futópálya középvonal fények(fehér színű fény-egység) és gyors legurulóút kijárati jelzőfény (sárga színű fény-egység) fényerősség ábrája

1.) Körívek kiszámítási képlete

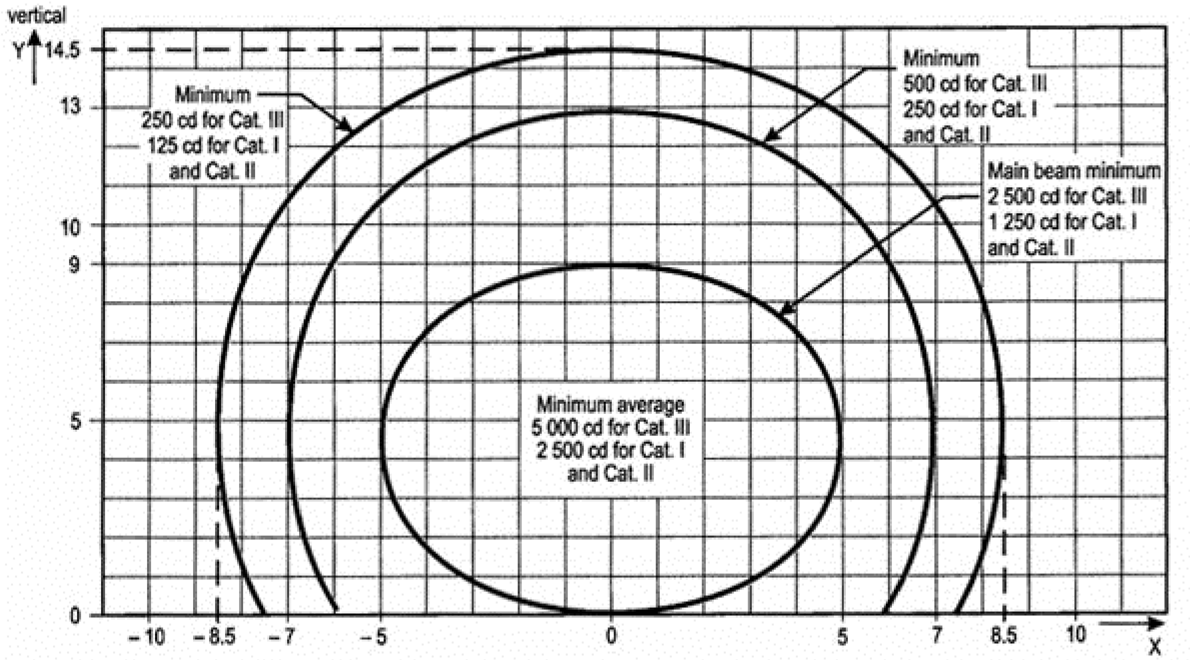
$x^2 / a^2 + y^2 / b^2 = 1$

a	5.0	7.0	8.5
b	3.5	6.0	8.5

2.) A vörös színű fényhez az értékeket 0.15-el szorozza meg.

3.) A sárga színű fényhez az értékeket 0.40-el szorozza meg.

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-7. ábra: Az egymástól 15 méter távközzel elhelyezett futópálya középvonal fények(fehér színű fény-egység) és gyors legurulóút kijárati jelzőfény (sárga színű fény-egység) fényerősség ábrája

1.) Körívek kiszámítási képlete

$x^2 / a^2 + y^2 / b^2 = 1$

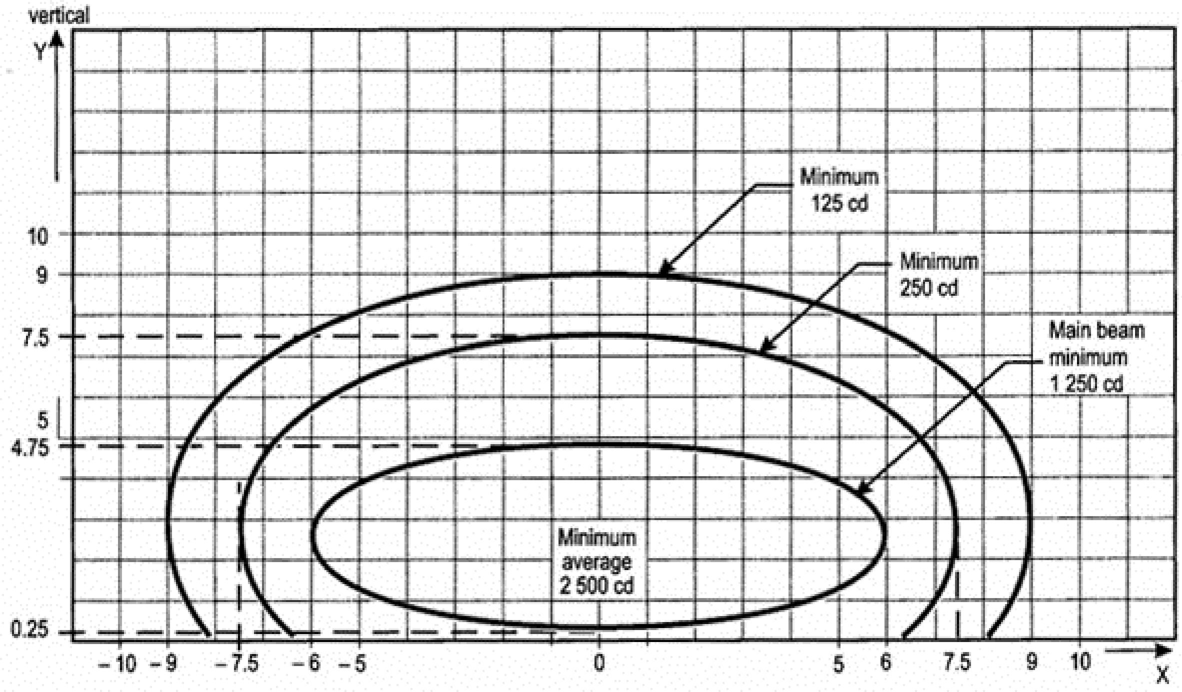
a	5.0	7.0	8.5
b	4.5	8.5	10

2.) A vörös színű fényhez az értékeket 0.15-el szorozza meg.

3.) A sárga színű fényhez az értékeket 0.40-el szorozza meg.

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.

Futópálya kategória	*I. és II. kategória*	*III. kategória*
legkisebb fényerősség (külső)	125 cd	250 cd
legkisebb fényerősség (középső)	250 cd	500 cd
fő fénysugár legkisebb fényerősség	1250 cd	2500 cd
legkisebb átlagos fényerősség	2500 cd	5000 cd

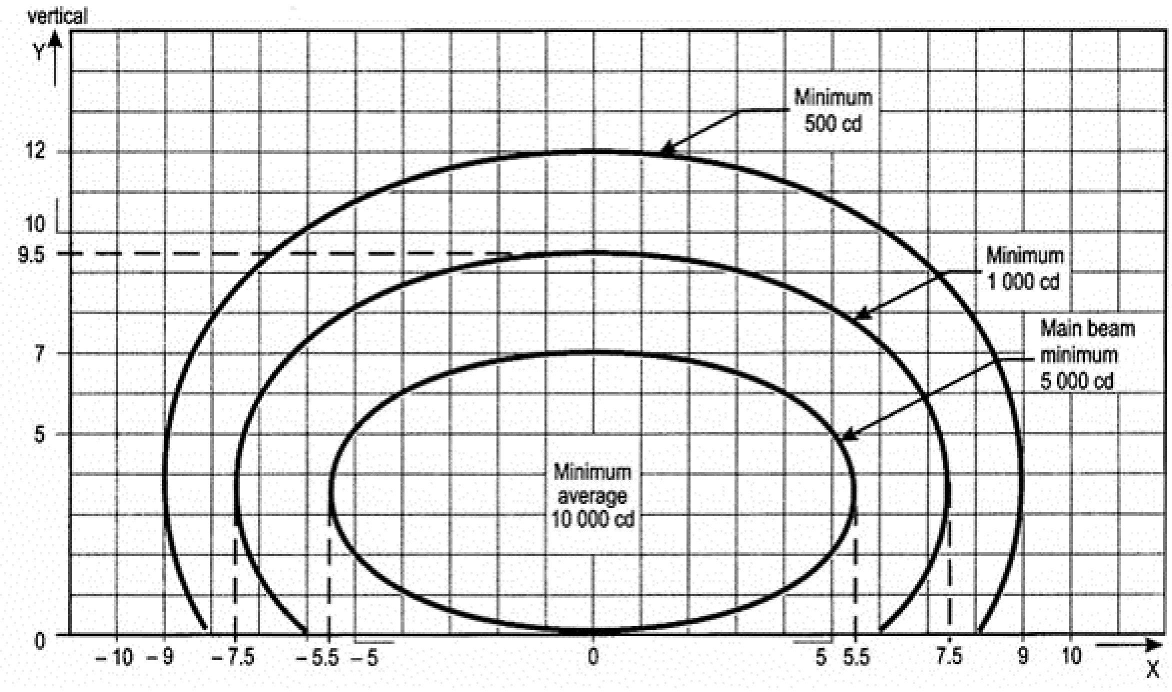


A2-8. ábra: A futópálya vége jelző fények fényerősség ábrája
(vörös színű fény-egység)

1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	6.0	7.5	9.0
b	2.25	5.0	6.5

2.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-9. ábra: A futópálya szegély fények fényerősség ábrája — futópálya szélessége 45 méter
(fehér színű fény-egység)

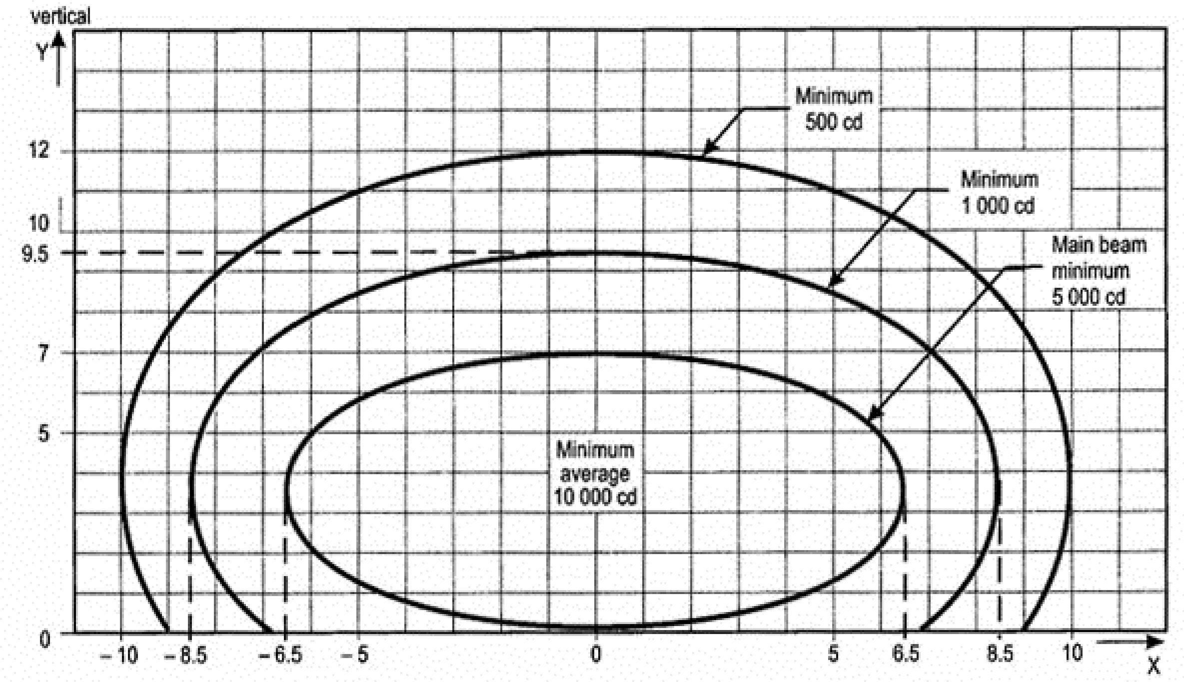
1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	5.5	7.5	9.0
b	3.5	6.0	8.5

2.) A fényeket befelé 3.5°-os szögbe állítsák be.

3.) A sárga színű fényhez az értékeket 0.40-el szorozza meg.

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-10. ábra: A futópálya szegély fények fényerősség ábrája — futópálya szélessége 60 méter (fehér színű fény-egység)

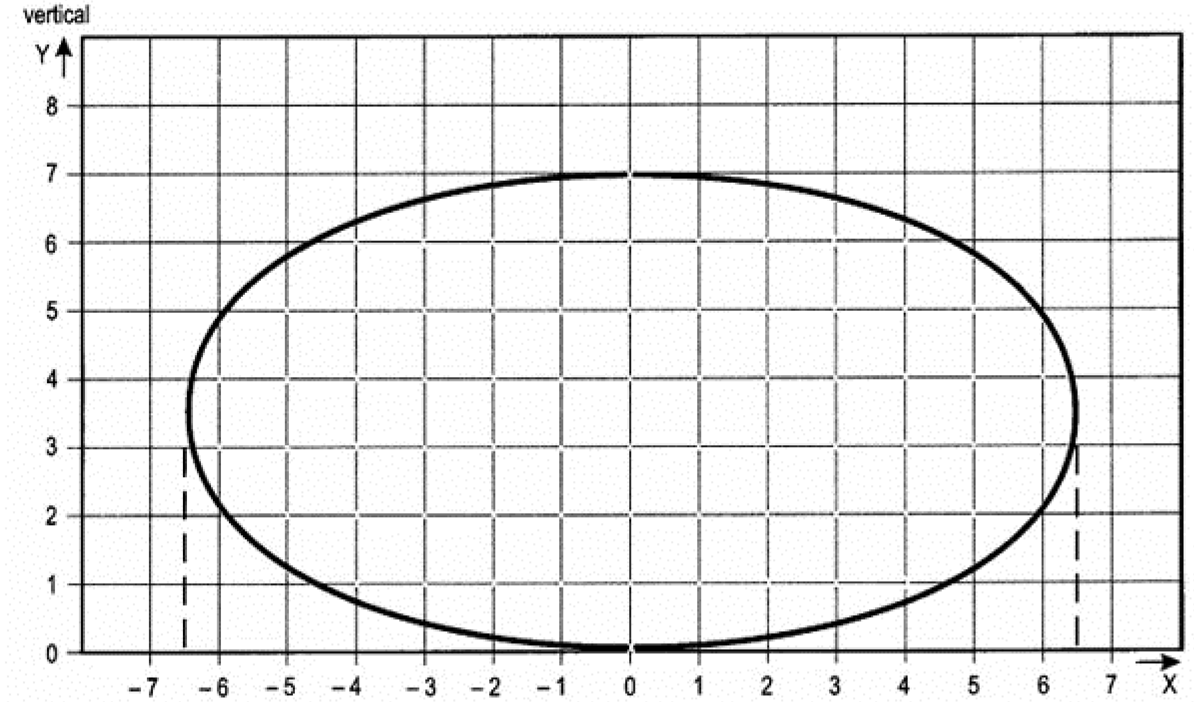
1.) Körívek kiszámítási képlete
$x^2 / a^2 + y^2 / b^2 = 1$

a	6.5	8.5	10.0
b	3.5	6.0	8.5

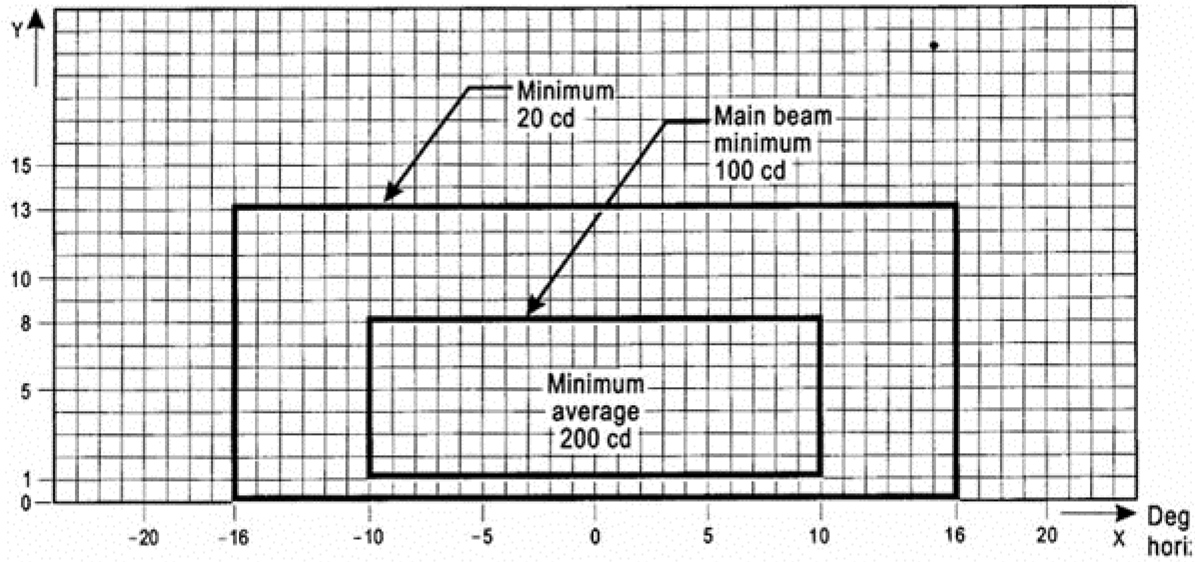
2.) A fényeket befelé 4.5°-os szögbe állítsák be.

3.) A sárga színű fényhez az értékeket 0.40-el szorozza meg.

4.) Lásd még az A2-1. — A2-11. ábrákra vonatkozó közös megjegyzéseket.



A2-11. ábra: A bevezető és futópálya fények átlagos fényerősség számításhoz alkalmazott rács pontok

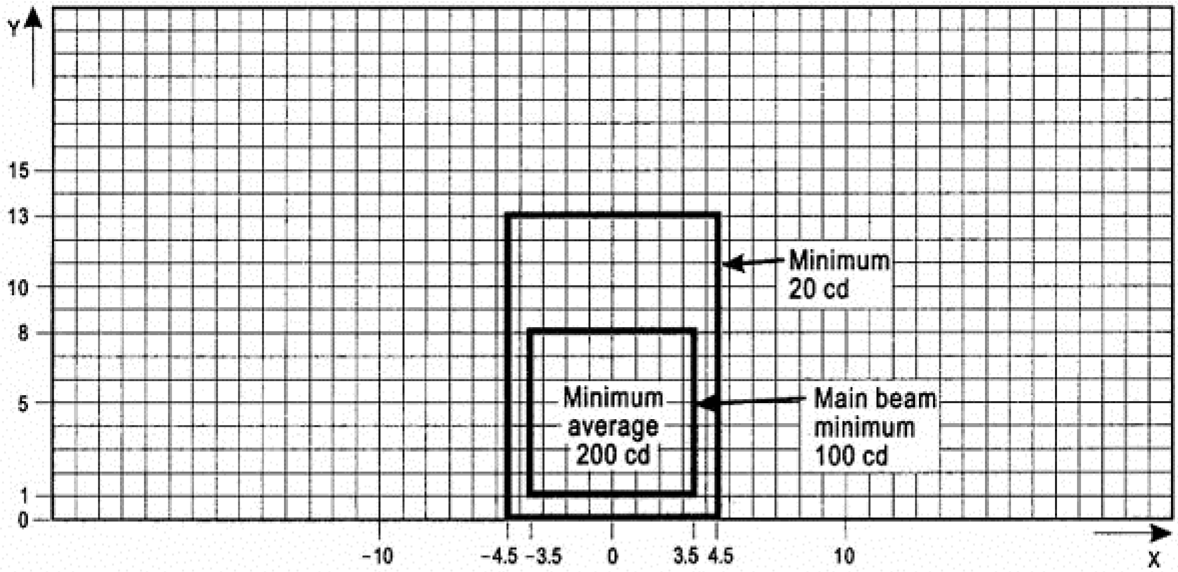


A2-12. ábra: A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett igénybe vett gurulóút egyenes szakaszán egymástól 15 méter távközzel elhelyezett gurulóút középvonal és megállító keresztfénysor fények ahol jelentősebb irányváltások lehetségesek, valamint B. elrendezés szerint elhelyezett alacsony intenzitású futópálya védő fények fényerősség ábrája

1.) Ezek a fénysugár fedésterületek lehetővé teszik a légijármű pilótakabin 12 méter nagyságrendű oldalirányú gurulási eltérését.
A fedésterületek célja a gurulóút ívek előtti, valamint utáni mozgás figyelembevétele.

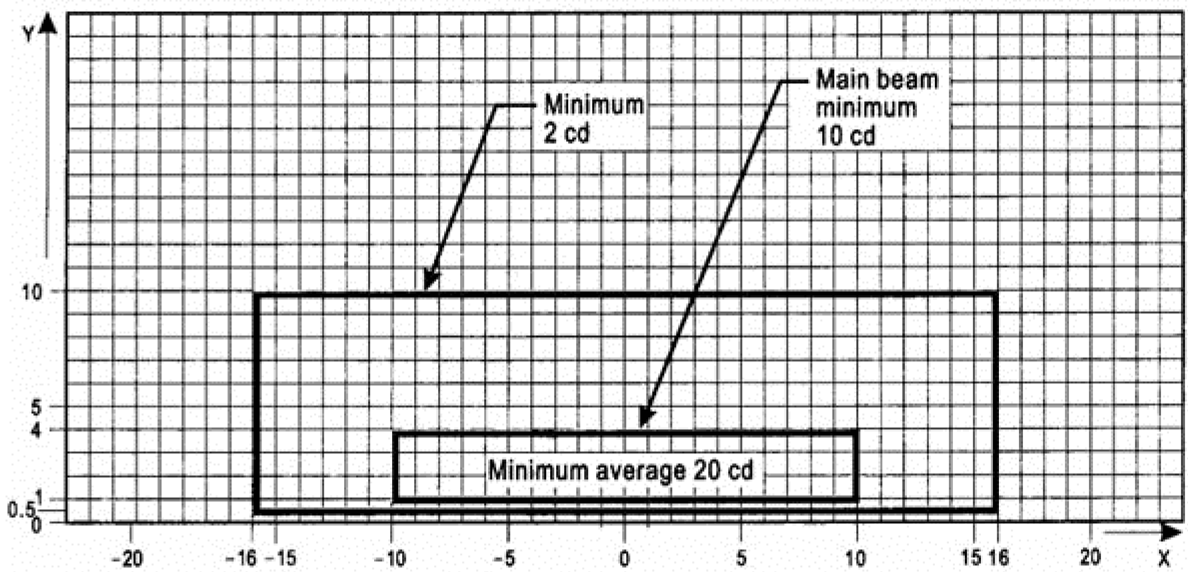
2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.

3.) Az 5.3.16.9 pontban ajánlott gyors legurulóút középvonal fények megnövelt intenzitása az adott érték négyszerese (azaz például a legkisebb átlagos fénysugárzási értéknél 800 cd.)



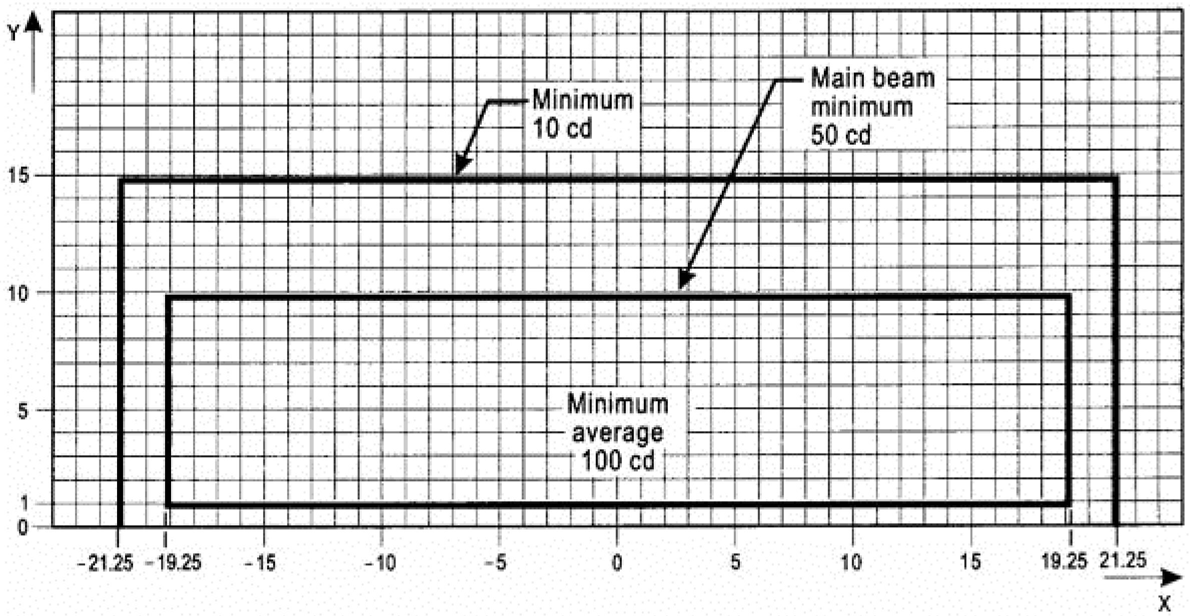
A2-13. ábra: A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett igénybe vett gurulóút egyenes szakaszán egymástól 15 méter távközzel elhelyezett gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája

1.) Ezek a fénysugár fedésterületek általában megfelelőek, lehetővé teszik a légijármű pilótakabin általános, körülbelül 3 méter nagyságrendű oldalirányú gurulási eltérését.
2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.



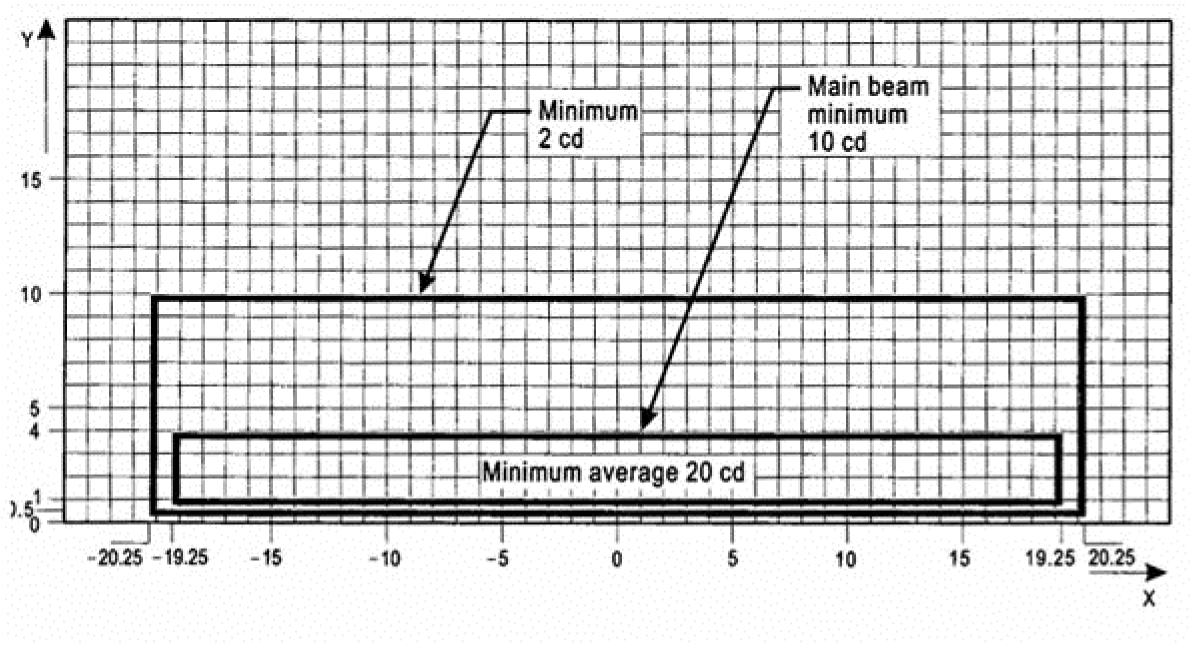
A2-14. ábra: A 350 méternél alacsonyabb futópályamenti látástávolság érték mellett igénybe vett gurulóút ívelt szakaszán egymástól 7.5 méter távközzel elhelyezett gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája

1.) Az ívelt szakaszokon a fénysugár befelé állítás értéke az ív érintőjéhez viszonyítva 15.75 fok.
2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.



A2-15. ábra
A 350 méter, vagy nagyobb futópályamenti látástávolság érték mellett igénybe vett gurulóút egyenes szakaszán egymástól 30 és 60 méter távközzel elhelyezett gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája

1.) Azokon a helyeken, ahol a háttér fényereje általában magas, valamint ahol a fény egység fényerejét a por, hó, vagy egyéb helyi szennyeződés jelentős mértékben rontja, a jelzett gyertyafényerő értéket 2.5-el szorozzák meg.
2.) Ahol körsugárzó fényeket használnak, ezek tegyenek eleget az ábra függőleges fénysugárra vonatkozó előírásainak.
3.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.



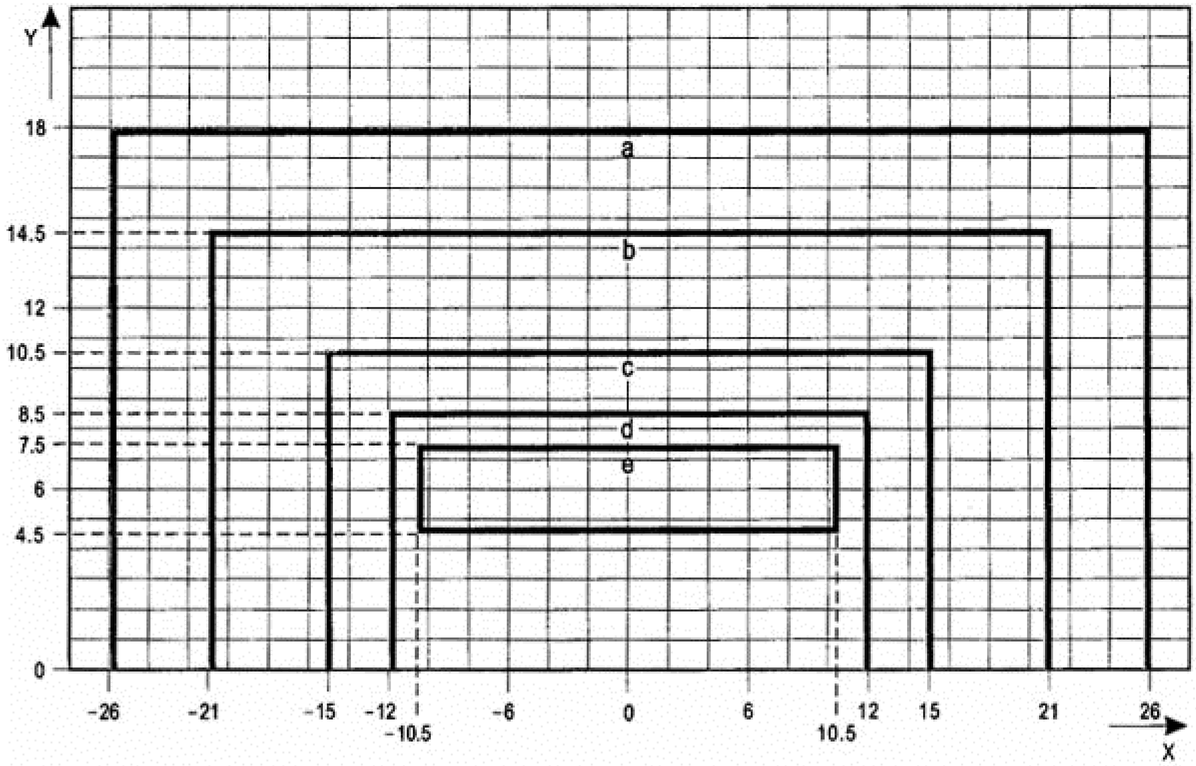
A2-16. ábra: A 350 méter, vagy nagyobb futópályamenti látástávolság érték mellett igénybe vett gurulóút ívelt szakaszán egymástól 7.5, 15 és 30 méter távközzel elhelyezett gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája

1.) Az ívelt szakaszokon a fénysugár befelé állítás értéke az ív érintőjéhez viszonyítva 15.75 fok.

2.) Azokon a helyeken, ahol a háttér fényereje általában magas, valamint ahol a fény egység fényerejét a por, hó, vagy egyéb helyi szennyeződés jelentős mértékben rontja, a jelzett gyertyafényerő értéket 2.5-el szorozzák meg.

3.) Ezek a fénysugár fedésterületek lehetővé teszik a légijármű pilótakabin 12 méter nagyságrendű oldalirányú gurulási eltérését a gurulóút ívek végén.

4.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.

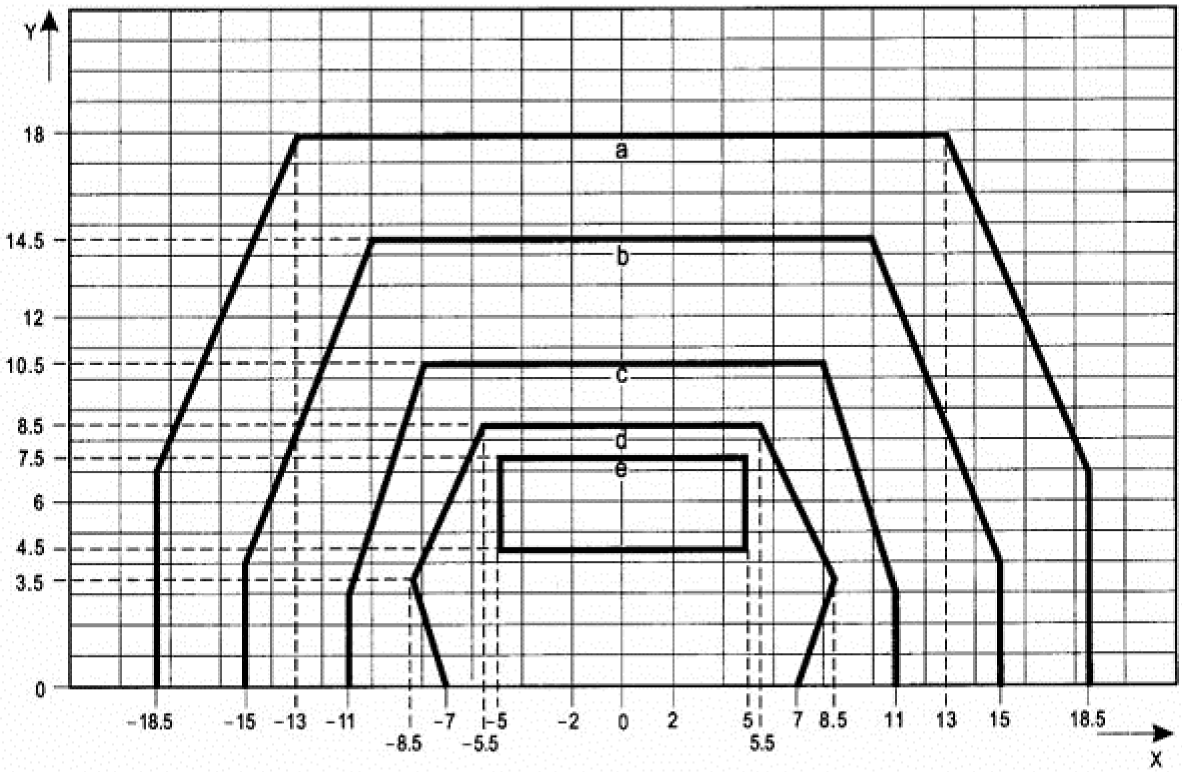


A2-17. ábra: A gurulóút egyenes szakaszán egymástól 15 méter távközzel elhelyezett nagy intenzitású gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája a felszíni mozgást irányító és ellenőrző rendszerben felhasznált gurulóutaknál, amelyeknél nagyobb fényerősség szükséges és nagyobb oldalirányú gurulási eltérések lehetségesek

Ív (határ)	**a**	**b**	**c**	**d**	**e**
Fényerősség	8 cd	20 cd	100 cd	450 cd	1800 cd

1.) Ezek a fénysugár fedésterületek lehetővé teszik a légijármű pilótakabin 12 méter nagyságrendű oldalirányú gurulási eltérését és céljuk a gurulóút ívek előtti valamint utáni mozgás figyelembevétele.

2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.

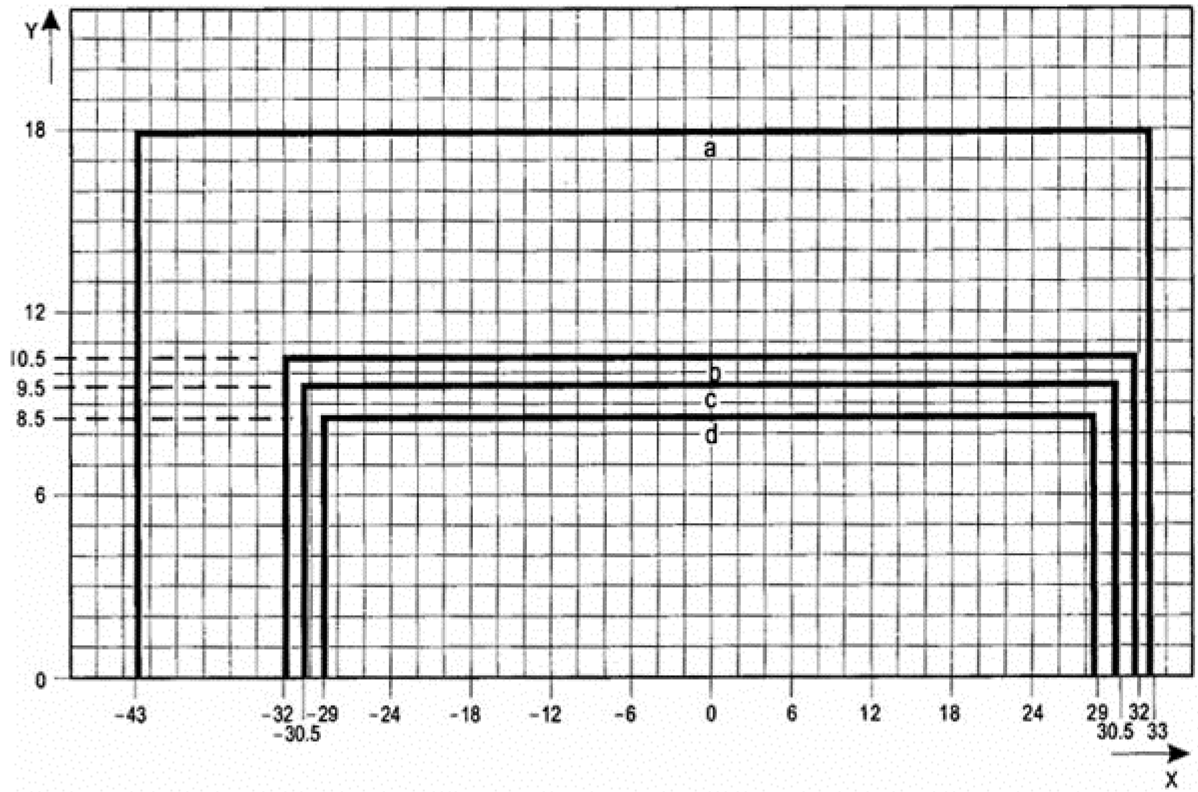


A2-18. ábra: A gurulóút egyenes szakaszán egymástól 15 méter távközzel elhelyezett nagy intenzitású gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája a felszíni mozgást irányító és ellenőrző rendszerben felhasznált gurulóutaknál, amelyeknél nagyobb fényerősség szükséges

Ív (határ)	**a**	**b**	**c**	**d**	**e**
Fényerősség	8 cd	20 cd	100 cd	450 cd	1800 cd

1.) Ezek a fénysugár fedésterületek általában megfelelőek, lehetővé teszik a légijármű pilótakabin általános oldalirányú gurulási eltérését, amikor a külső főfutó a gurulóút szélén halad.

2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.

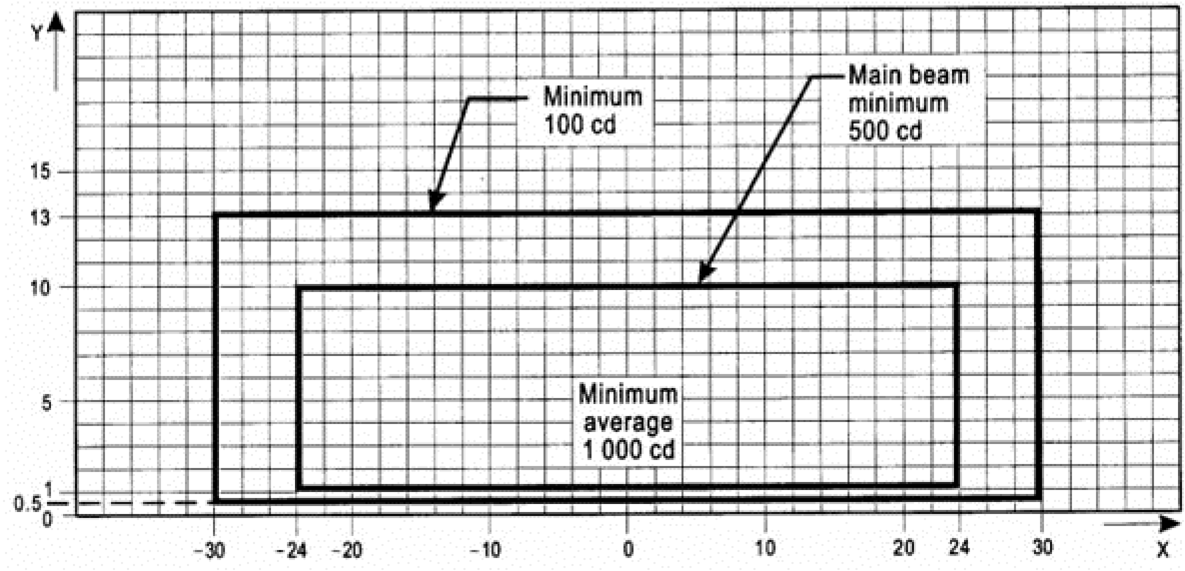


A2-19. ábra: A gurulóút egyenes szakaszán egymástól 7.5 méter távközzel elhelyezett nagy intenzitású gurulóút középvonal és megállító keresztfénysor fények fényerősség ábrája a felszíni mozgást irányító és ellenőrző rendszerben felhasznált gurulóutaknál, amelyeknél nagyobb fényerősség szükséges

Ív (határ)	**a**	**b**	**c**	**d**
Fényerősség	8 cd	100 cd	200 cd	400 cd

1.) Az ívelt szakaszokon a fénysugár befelé állítás értéke az ív érintőjéhez viszonyítva 17 fok.

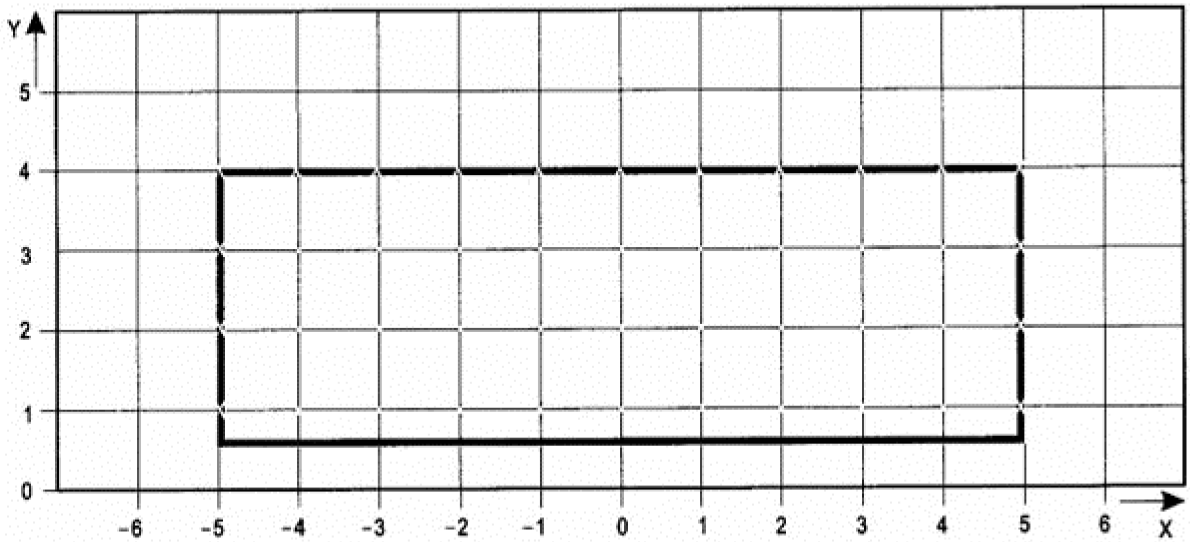
2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.



A2-20. ábra: A B. elrendezés szerinti nagy intenzitású futópálya védő (biztosító) fények fényerősség ábrája

1.) Bár a normál üzemeltetés során a fények villognak, a fényerősséget úgy határozzák meg, mintha a fény egységek állandó égőkkel üzemelnének.

2.) Lásd még az A2-12. — A2-21. ábrákra vonatkozó közös megjegyzéseket.



A2-21. ábra: Gurulóút középvonal és megállító keresztfénysor fények átlagos fényerejének kiszámításához alkalmazott rácsháló rendszer

Közös megjegyzések az A2-12. — A2-21. ábrákhoz

1. Az A2-12. — A2-20. ábrák a zöld és sárga színű gurulóút középvonal, sárga színű futópálya védő és vörös színű megállító keresztfénysor fények gyertyafény értékeit jelzik.

2. Az A2-12. — A2-20. ábrák a megengedhető legkisebb fényerősség értéket mutatják be. A fő fénysugár átlagos fényerejét az A2-21. ábra rács-háló pontok kijelölésével számítottuk ki az összes pont felhasználásával, amelyek a fő fénysugarat jelző kereten (határon) és azon belül helyezkedtek el. Az átlagos érték az összes jelentős pontban mért fényerősség matematikai átlaga.

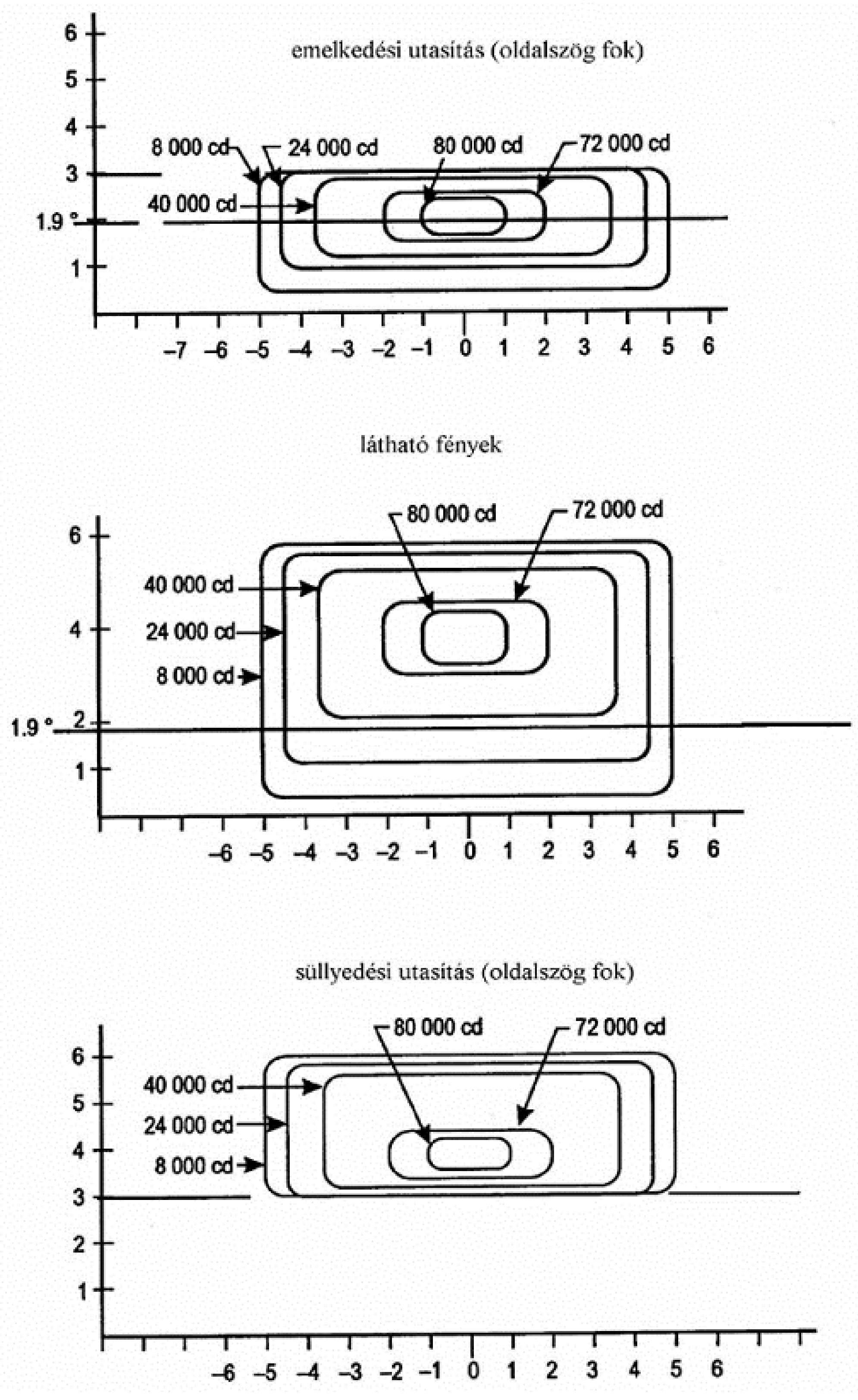
3. Ha a fény-egység szerkezet beállítása megfelelő, a fő, vagy a legbelső fénysugáron (amelyik alkalmazható) belül eltérés nem lehetséges.

4. A vízszintes szögeket az ívek kivételével a függőleges síkhoz viszonyítva a gurulóút középvonalán át mértük. Az ívek (ívelt szakaszok) esetében a vízszintes szögeket az ívek érintőjéhez viszonyítva határoztuk meg.

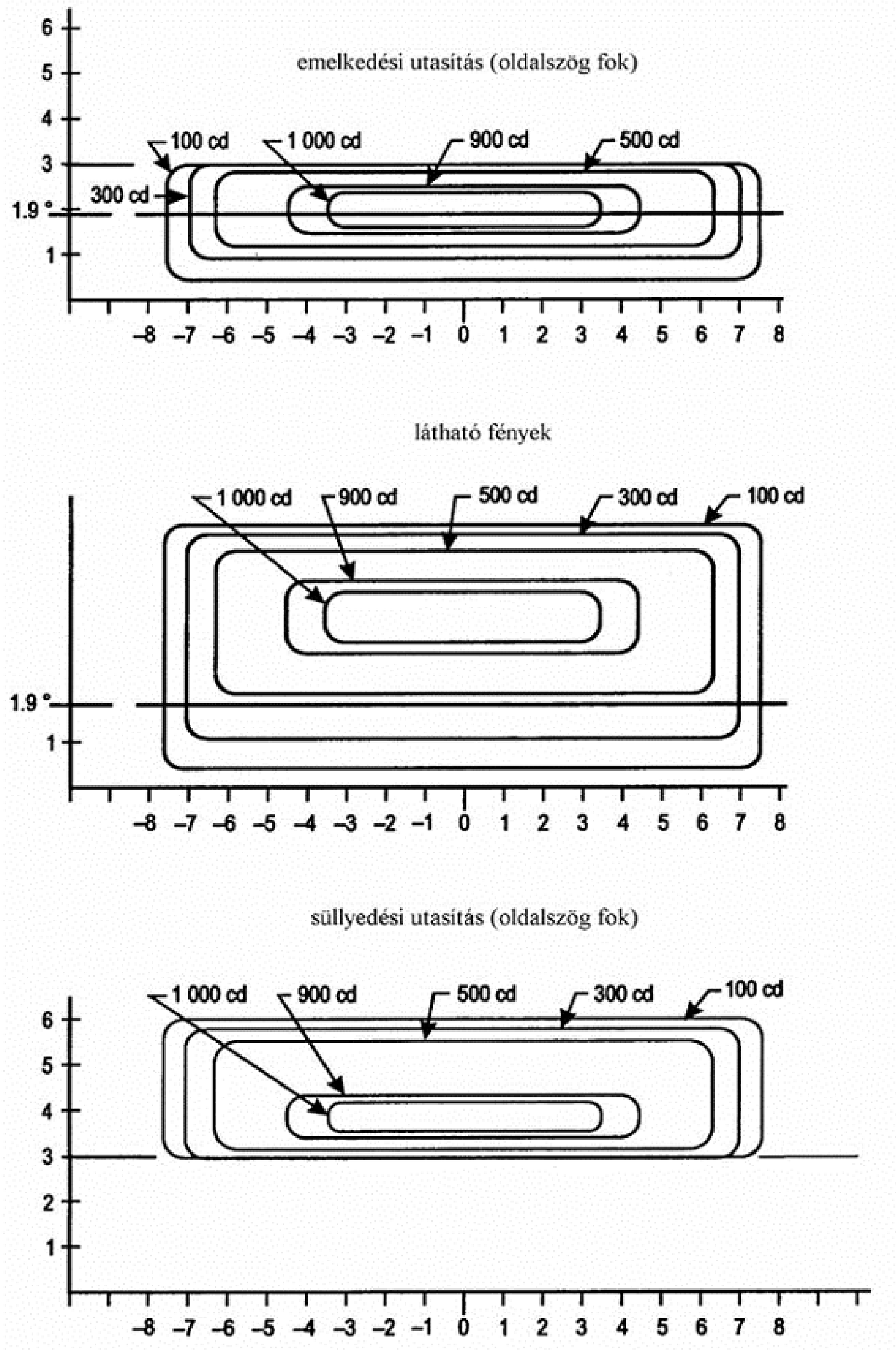
5. A függőleges szögeket a gurulóút felületének hosszirányú lejtésétől mértük.

6. Nem lehet eléggé hangsúlyozni a megfelelő karbantartás fontosságát. Az átlagos fényerősség (intenzitás) soha ne legyen kevesebb, mint az ábrákon jelzett értékek 50 %-a. Az illetékes hatóság feladata a fény-egység teljesítmény szintjét a meghatározott legkisebb átlagos gyertyafényerő érték körül tartani.

7. A fény-egységet úgy helyezzék el, hogy a fő, vagy a legbelső fénysugár (amelyik alkalmazható) sugárzása legalább fél fokkal a meghatározott értékeken belül legyen.



A2-22. (A) ábra T-VASIS berendezés emelkedés, keresztfénysor és süllyedés egységeinek fényerősség eloszlása nappali körülmények között



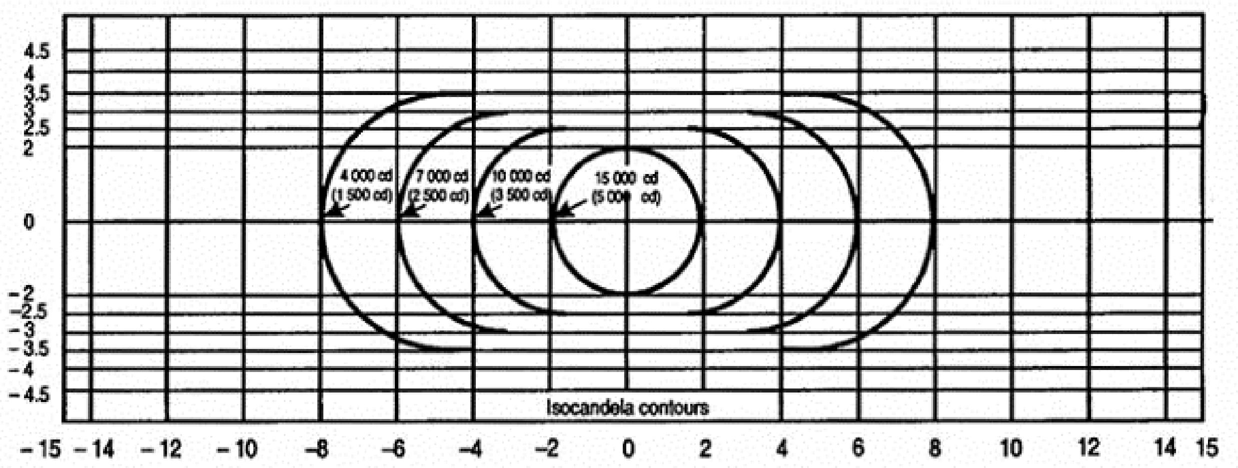
A2-22. (B) ábra T-VASIS berendezés emelkedés, keresztfénysor és süllyedés egységeinek fényerősség eloszlása éjszakai körülmények között

Közös megjegyzések a 2.22 ábrákhoz

1. A VASIS egységeknél ábrázolt ívek a fehér színű fény legkisebb fényerejére vonatkoznak.

2. A vörös szín-szűrök üzemi hőmérsékleten minimálisan 15 %-os átvilágítási értékkel rendelkeznek.

3. A T-VASIS működésénél a (magassági) jelzés során nélkülözhetetlen a fehér szín hirtelen megszűnése. A pontos magassági beállítást az 5-14. ábra mutatja be.



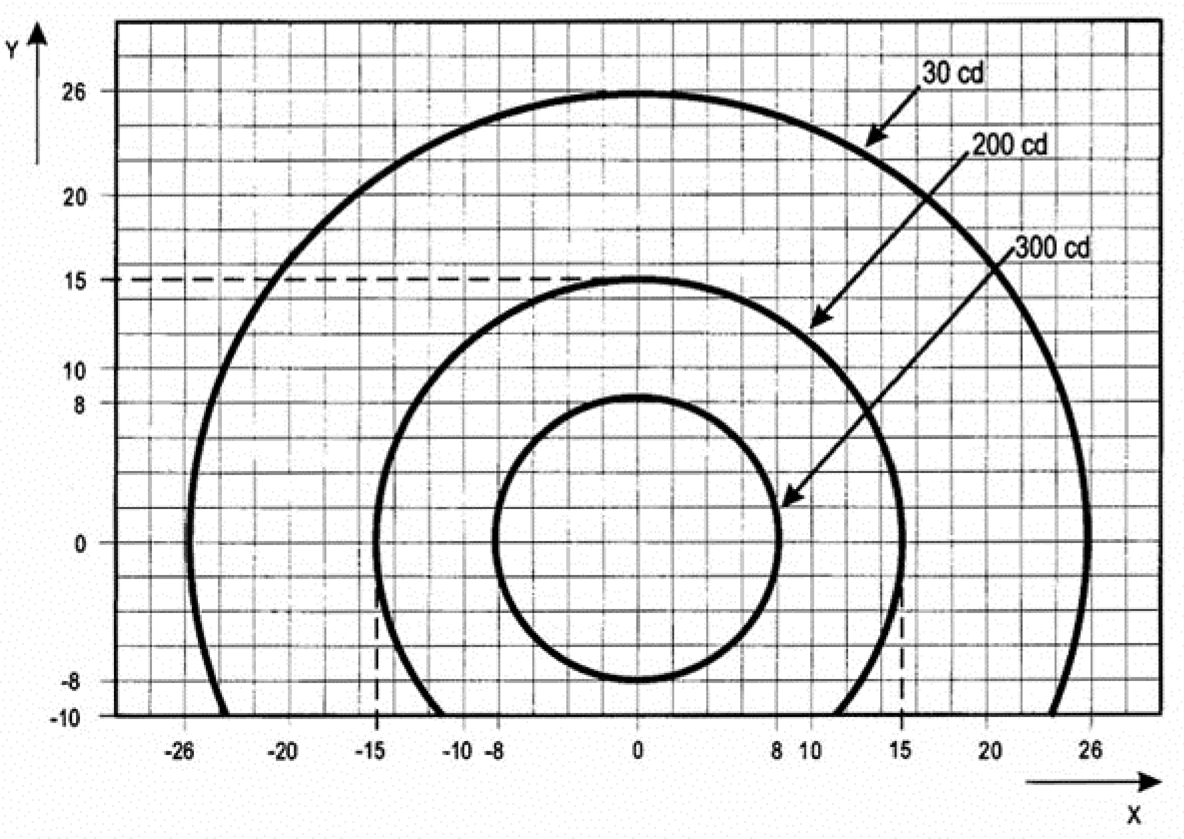
A2-23. ábra: PAPI és APAPI berendezés fényerősség eloszlása

Megjegyzések az A2-23. ábrához

1. A PAPI egységeknél ábrázolt ívek a vörös színű fény legkisebb fényerejére vonatkoznak.

2. A fénysugár fehér szektorának fényerősség értéke a vörös szektorhoz viszonyítva kétszeresnél kevesebb ne legyen, de elérheti a 6.5-szeres értéket is.

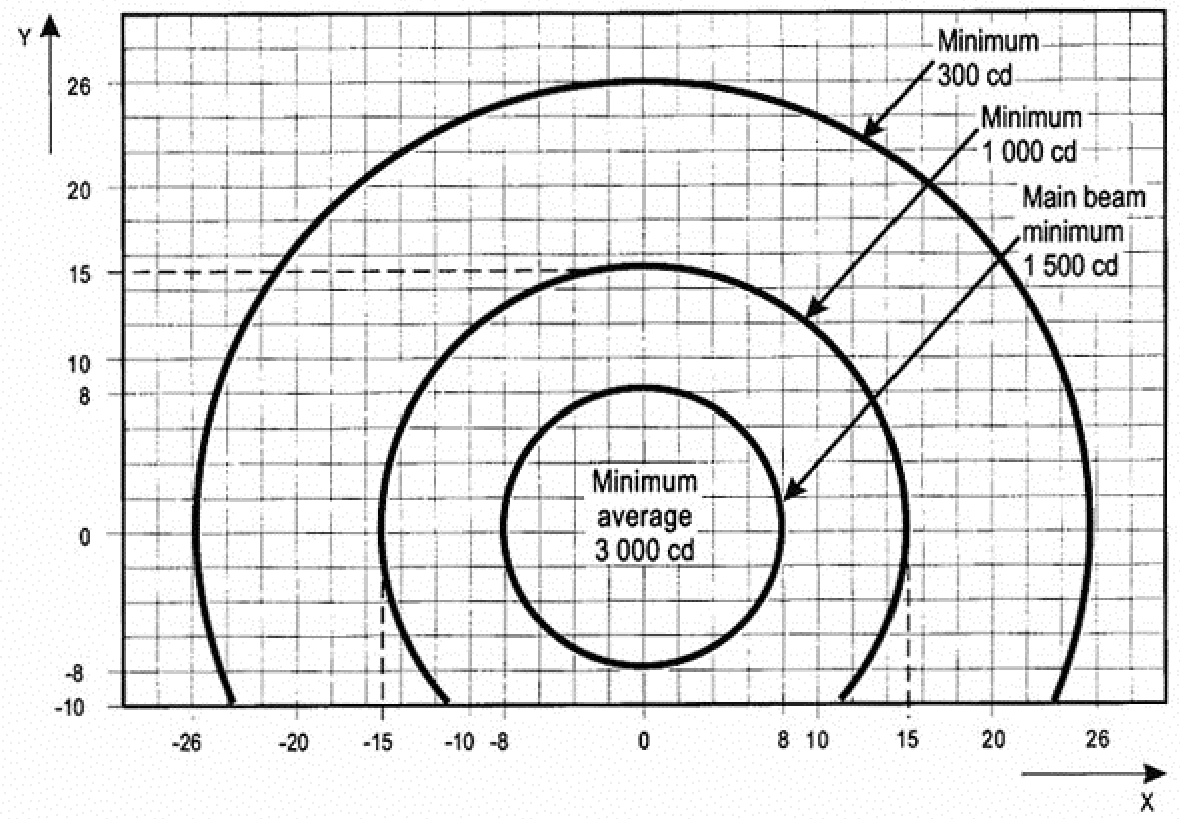
3. A zárójelben jelzett fényerősség értékek az APAPI rendszerre vonatkoznak.



A2-24. ábra: A. elrendezés szerinti alacsony intenzitású futópálya védő (biztosító) fények fényerősség ábrája

1.) Bár a normál üzemeltetés során a fények villognak, a fényerősséget úgy határozzák meg, mintha a fény egységek állandó égőkkel üzemelnének.

2.) A jelzett fényerő értékek sárga színű fényre vonatkoznak.



A2-25. ábra: A. elrendezés szerinti nagy intenzitású futópálya védő (biztosító) fények fényerősség ábrája

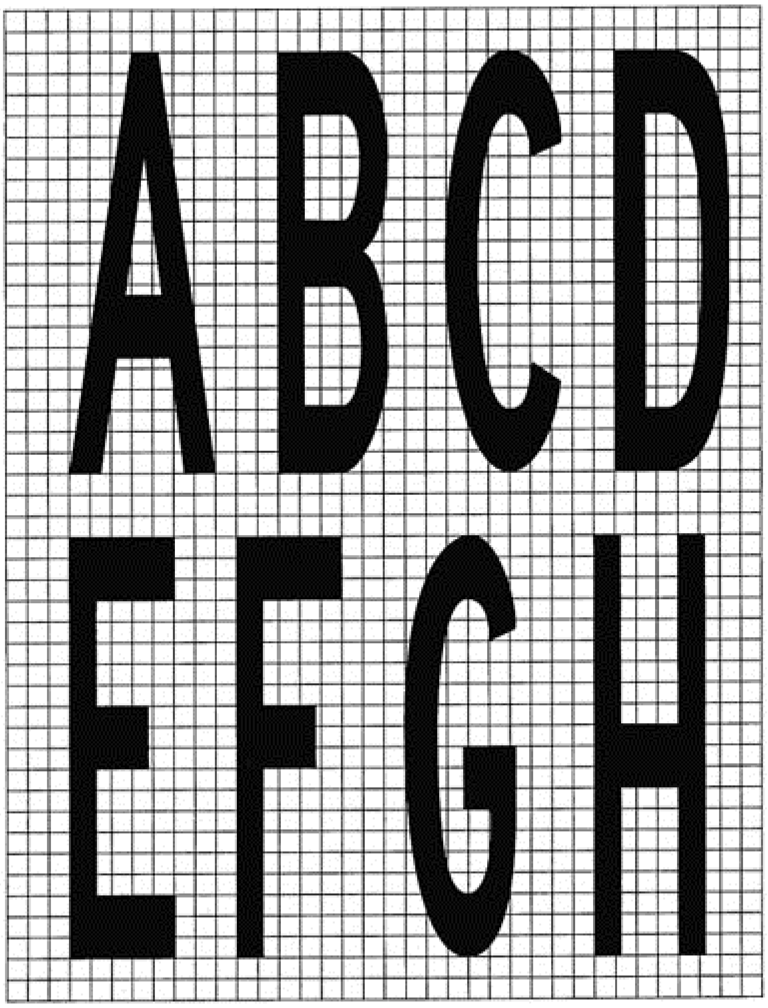
1.) Bár a normál üzemeltetés során a fények villognak, a fényerősséget úgy határozzák meg, mintha a fény egységek állandó égőkkel üzemelnének.

2.) A jelzett fényerő értékek sárga színű fényre vonatkoznak.

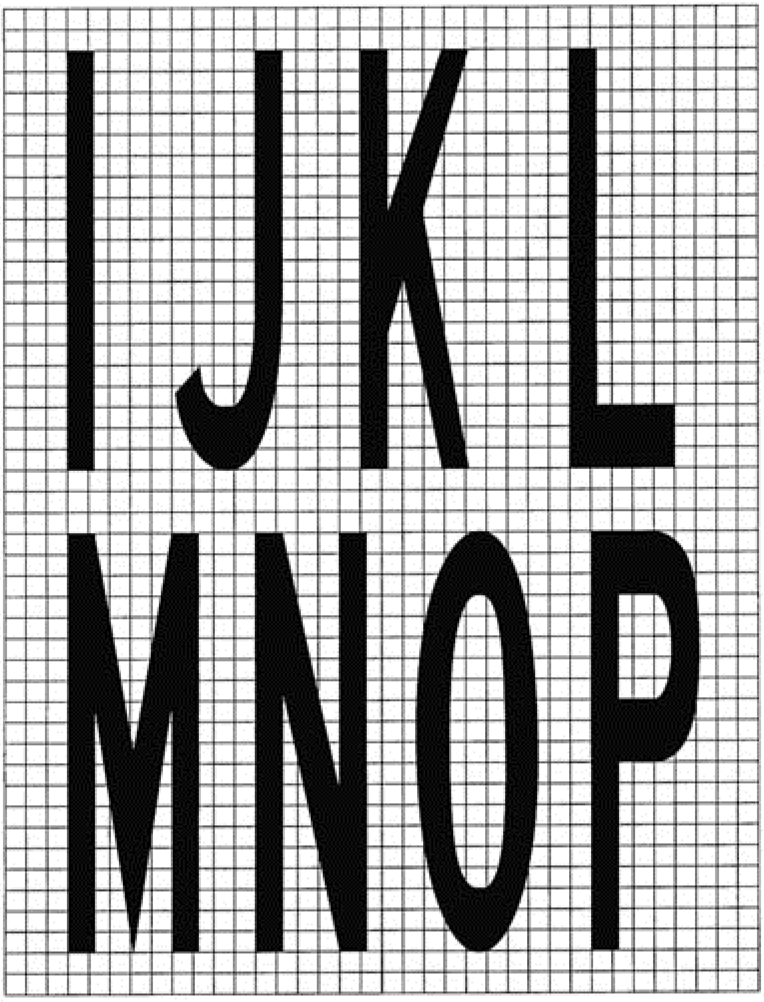
3. Függelék
Kötelező utasítást, valamint tájékoztatást adó jelzések

1. Megjegyzés: A kötelező utasítást adó valamint tájékozató jelzések alkalmazására, elhelyezésére és jellemzőire vonatkozóan lásd az 5. fejezet 5.2.16 és 5.2.17 szakaszokat.

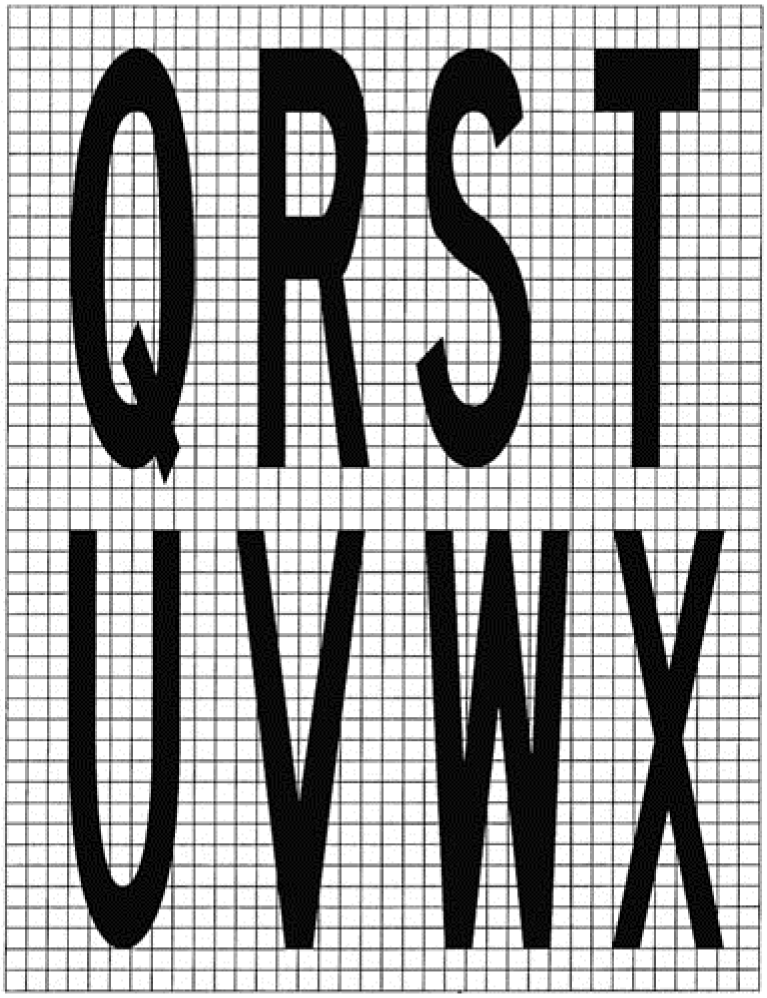
2. Megjegyzés: A következőkben a kötelező utasítást adó, valamint tájékozató betűk, számok, valamint jelzések arányos elrendezését ábrázoljuk. A rajzon a négyzetháló kocka mérete 20 centiméter.



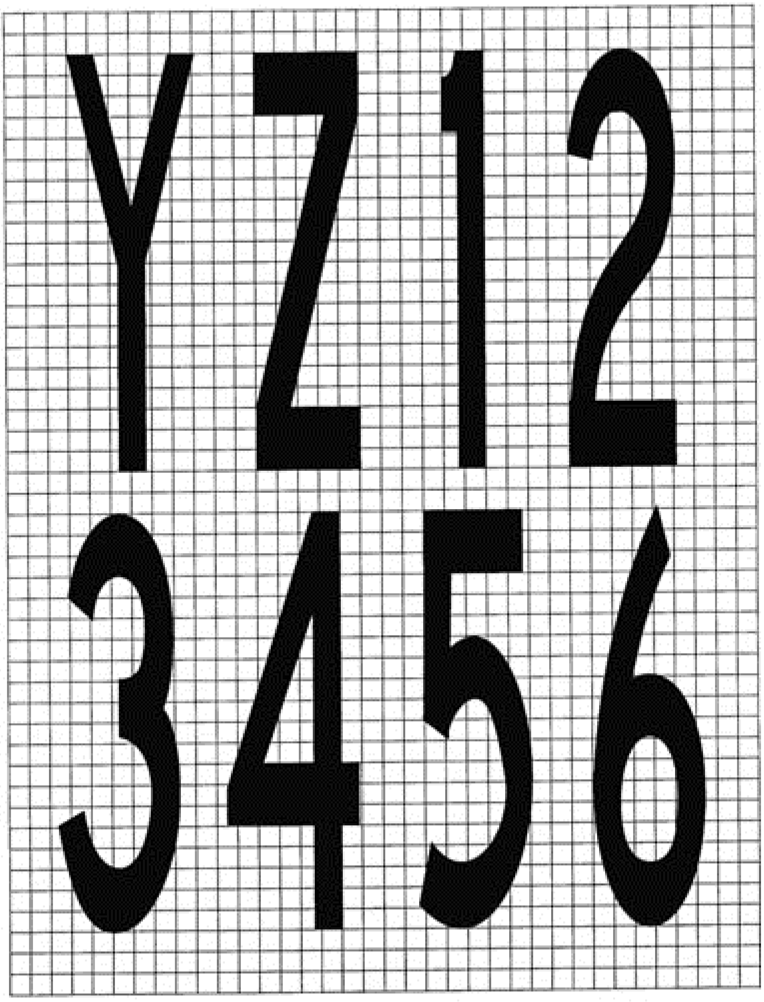
A betűk mérete és formája (A — H)



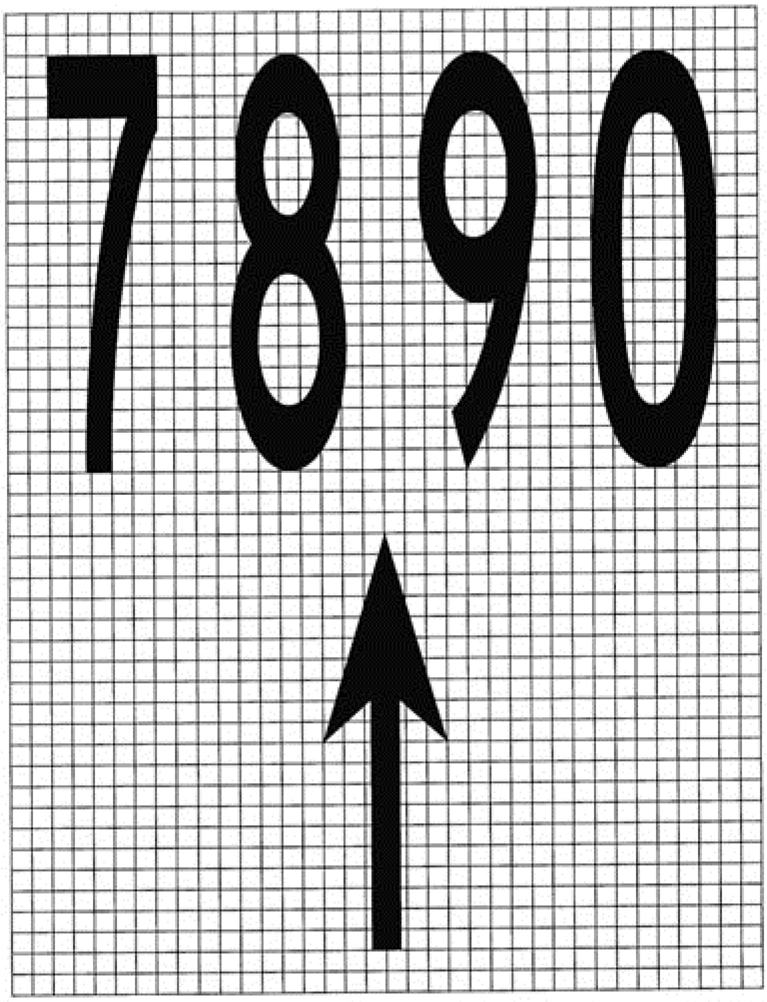
A betűk mérete és formája (I — P)



A betűk mérete és formája (Q — X)



A betűk mérete és formája (Y — Z — 1 — 6)



A betűk mérete és formája (7 — 0 — –)

4. Függelék
A gurulási tájékoztató táblák tervezésére és elkészítésére vonatkozó előírások

Megjegyzés: A táblák alkalmazására, elhelyezésére és jellemzőire vonatkozó előírások az 5. fejezet 5.4 szakaszában találhatók.

1. A feliratok magassága feleljen meg a következő táblázatnak.

futópálya kód-szám	*legkisebb betű-magasság*		
	kötelező utasítást adó tábla	*Tájékoztató tábla*	
		futópálya kijárat és elhagyást jelző tábla	*egyéb tájékoztató tábla*
1 vagy 2	300 mm	300 mm	200 mm
3 vagy 4	400 mm	400 mm	300 mm

Megjegyzés: Ahol a gurulóút jelzés táblát egy futópálya jelző táblával együtt helyeztek el (lásd 5.4.3.22), a feliratok mérete a kötelező utasítást adó táblára meghatározott legyen.

2. A nyíl mérete a következő legyen:

nyíl hossza	*nyíl (jelzés csík) szélessége*
200 mm	32 mm
300 mm	48 mm
400 mm	64 mm

3. A betű (rajzolat) szélessége a következő legyen:

betű hossza	*betű (rajz-vonal) szélessége*
200 mm	32 mm
300 mm	48 mm
400 mm	64 mm

4. A jelzés fényerőssége átlagos tábla háttérvilágítás mellett a következő legyen:

a) A 800 méternél alacsonyabb futópályamenti látástávolság érték mellett üzemeltetni kívánt repülőtér esetében a tábla jelzéseinek átlagos fényereje az alábbi legyen:

vörös színnél	legalább: 30 cd/m^2
sárga színnél	legalább: 150 cd/m^2
fehér színnél	legalább: 300 cd/m^2

b) Ahol az üzemeltetés az 5.4.1.7 b) és c) valamint 5.4.1.8 pontok alapján történik, a tábla jelzéseinek átlagos fényereje az alábbi legyen:

vörös színnél	legalább: 10 cd/m^2
sárga színnél	legalább: 50 cd/m^2
fehér színnél	legalább: 100 cd/m^2

Megjegyzés: A 400 méternél alacsonyabb futópályamenti látástávolság érték esetében a táblák használhatósága bizonyos mértékben korlátozott lesz.

5. A kötelező utasítást adó táblán a vörös és fehér színek közötti fényerő arányérték 1:5 és 1:10 -között legyen.

6. Az átlagos fényerő kiszámítása az A4-1. ábra alapján, meghatározott rács-pontok számításával és az összes mérvadó, a táblát jelző négyszögön belül levő rács-pontok mérésével történik.

7. Az átlagos érték az összes kijelölt rács-pontban mért fényerősség matematikai átlaga.

Megjegyzés: A táblák átlagos fényerejének mérésével kapcsolatos útmutató a Repülőtér Tervezési Kézikönyv *4. részében található.*

8. A szomszédos rács-pontok fényerősség értékei közötti arány ne haladja meg az 1.5:1.0 értéket. A tábla azon helyein, ahol a rács-pontok közötti térköz 7.5 cm, szomszédos rács-pontok fényerősség értékei közötti arány ne haladja meg az 1.25:1.0 értéket. A tábla egész felületén a legnagyobb és legkisebb fényerő közötti arány ne legyen 5:1 értékűnél több.

9. A táblán elhelyezett jelzések, azaz betűk, számok, nyilak és szimbólumok alakja az A4-2. ábrán láthatónak megfelelő legyen. Az egyes betűk, vagy számok szélessége és a közöttük levő térköz feleljen meg az A4-1. táblázatban meghatározottaknak.

10. A tábla mérete (homloklap) a következő legyen:

a jelzés magassága	200 mm	300 mm	400 mm
a homloklap magassága (min)	400 mm	600 mm	800 mm

11. A tábla homloklapjának szélességét az A4-3. ábra alapján kell meghatározni, azonban ahol a kötelező utasítást adó táblát csak a gurulóút egyik oldalán helyezik el, a tábla homloklapjának szélessége ne legyen kevesebb, mint:

a) 3 vagy 4 kód-szám esetén 1.94 méter; és

b) 1 vagy 2 kód-szám esetén 1.46 méter.

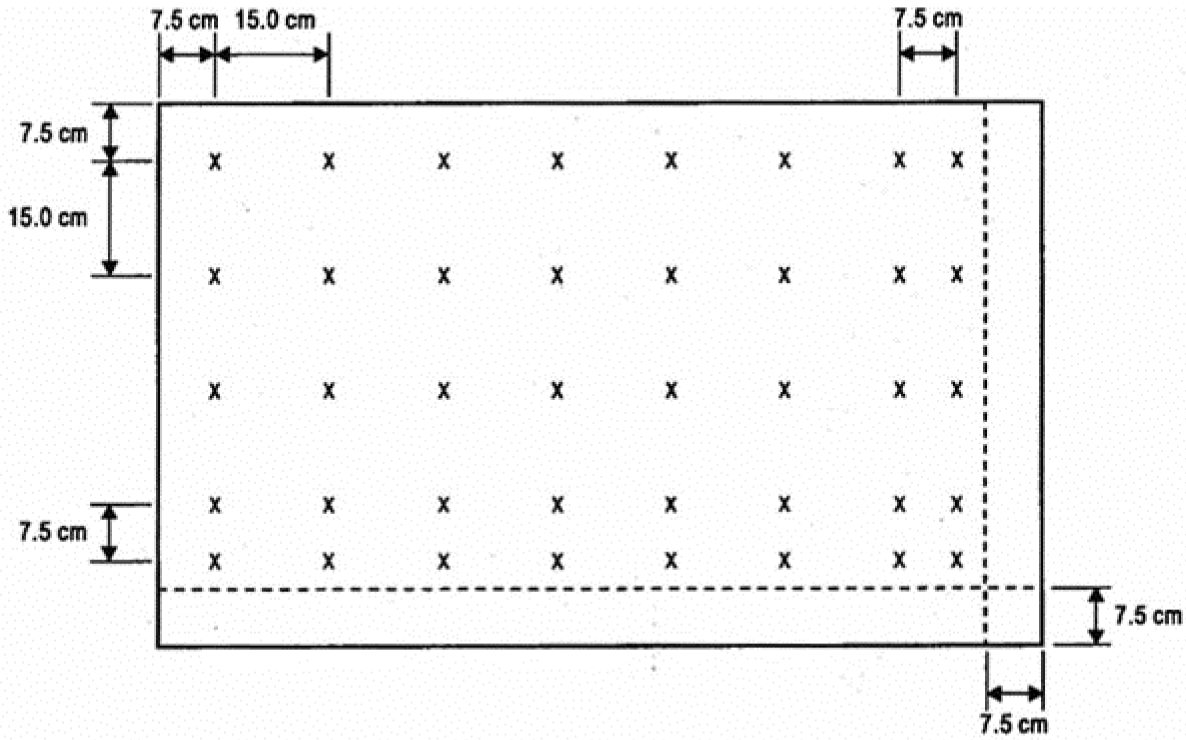
Megjegyzés: A tábla homloklap szélesség meghatározásához a Repülőtér Tervezési Kézikönyv *4. része tartalmaz további útmutatót.*

12. Szegélyek

a) Az egymás mellett levő irányjelző táblák közötti függőleges, fekete színű elválasztó vonal szélessége körülbelül a vonal szélesség 70 %-a.

b) Az egyedül elhelyezett hely jelző tábla sárga színű körszegély szélessége körülbelül a vonal szélesség 50 %-a.

13. A táblák színe feleljen meg az 1. Függelék vonatkozó előírásainak.



A4-1. ábra: A tábla átlagos fényerejének kiszámításához alkalmazott rácsháló rendszer

1. Megjegyzés: A tábla hátterének átlagos fényerejét az általános felirattal és a megfelelő háttérszínnel (vörös a kötelező utasítás és sárga az irány és cél tájékoztatások esetén) ellátott táblán a következők szerint számítsák ki:

a) A tábla homloklap bal felső sarkánál kezdve a bal széltől és a tábla felső szélétől 7.5 cm. távolságra jelöljenek ki egy vonatkozási rács-pontot;

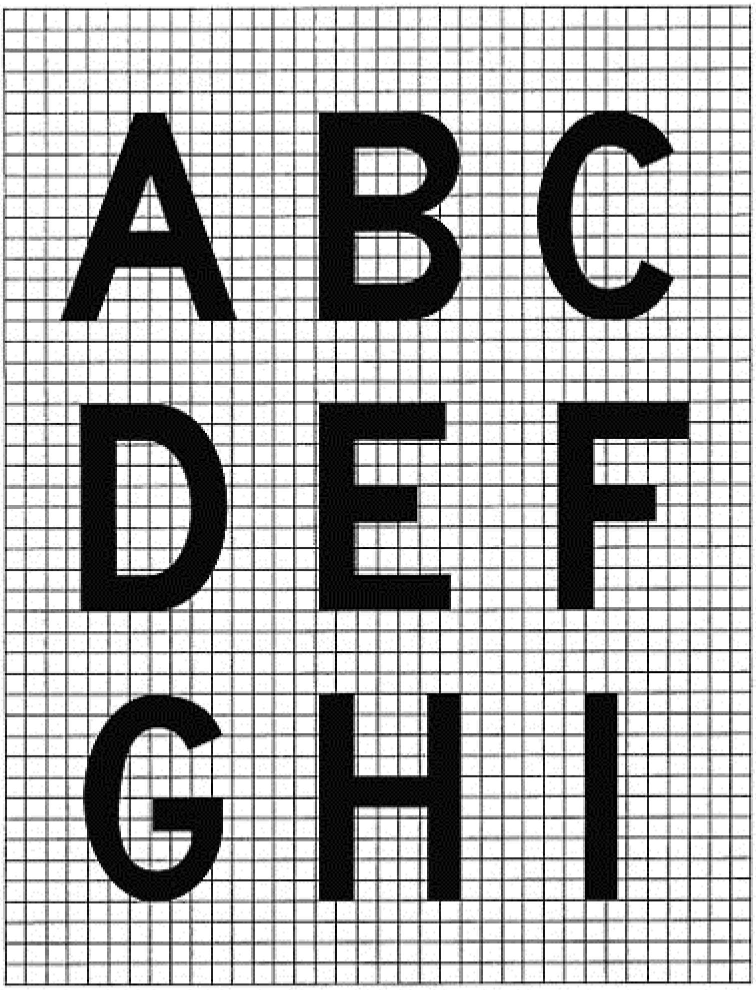
b) A rács-ponttól vízszintesen és függőlegesen 15 cm.-es térközökkel alakítsanak ki egy rács-hálót. A tábla széléhez 7.5 cm. távolságon belül elhelyezkedő rács-pontokat hagyják figyelmen kívül;

c) Ahol az utolsó oszlop, vagy sor rács pontjai a tábla széléhez 22.5 és 15 cm. közötti távolságon belülre esnek, ezen pontok után 7.5 cm.-el jelöljenek ki további pontokat;

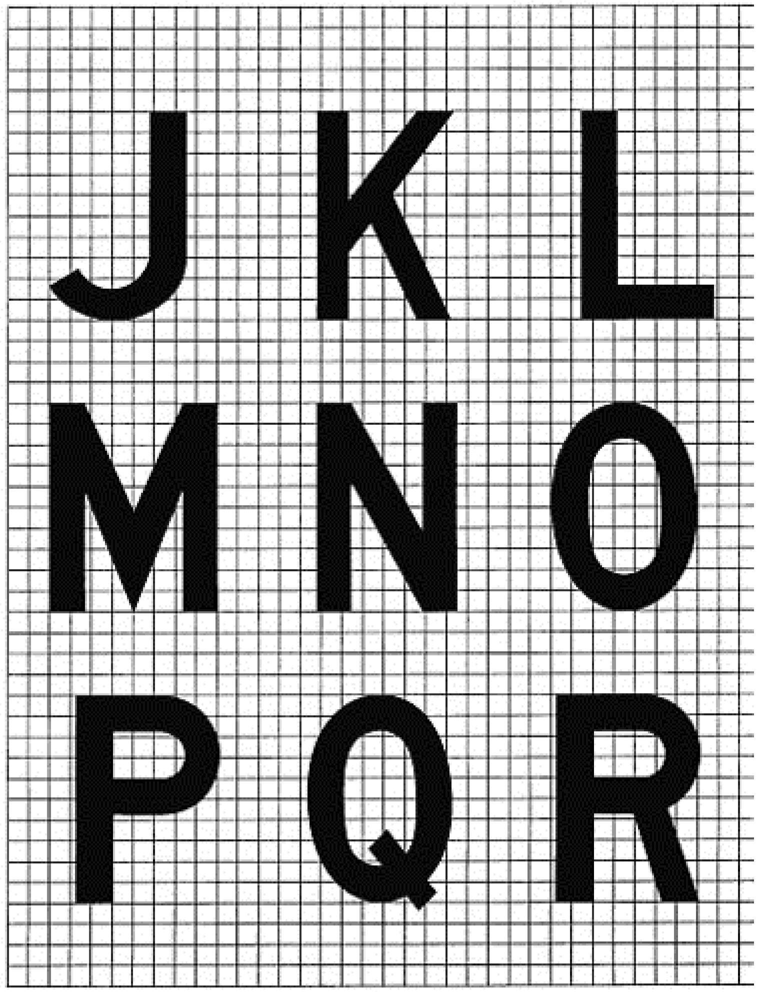
d) Ahol a rács-pont a felirat és a háttér határára esik, a pontot kissé tolják el, hogy az a feliraton teljesen kívül legyen.

2. Megjegyzés: Annak érdekében, hogy minden egyes felirati betű, szám, vagy jel legalább öt egyenlően elosztott rács-pontot tartalmazzon, kiegészítő pontokra lehet szükség.

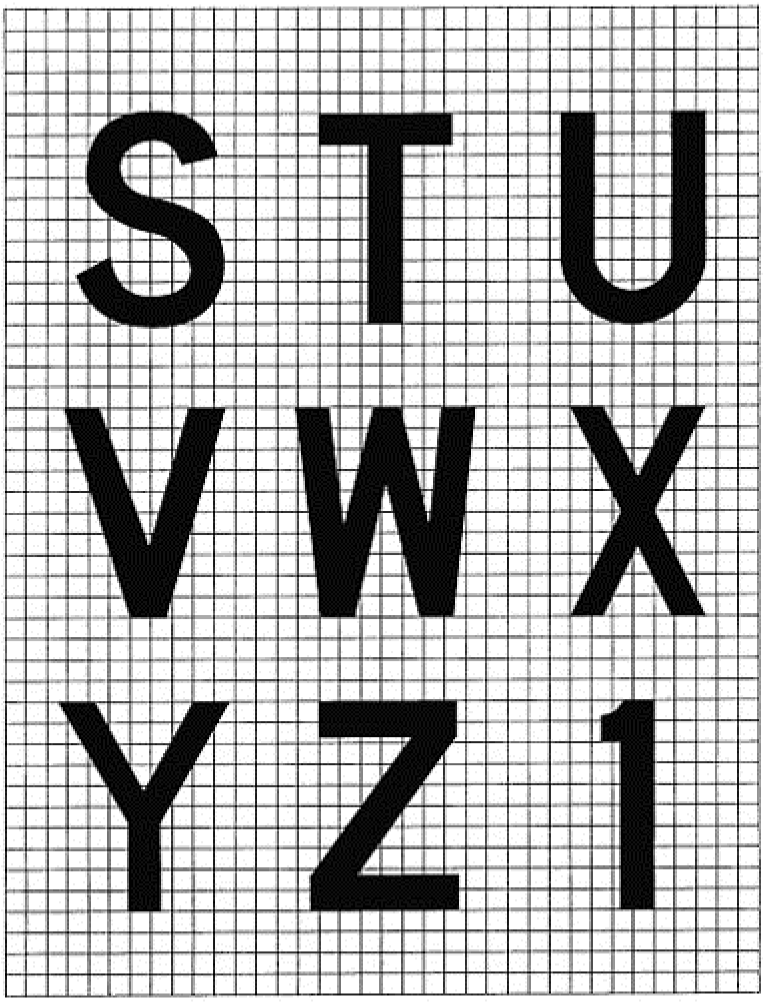
3. Megjegyzés: Ahol egy egység két fajta táblát tartalmaz, az egyes táblákhoz külön rács-háló határozzanak meg.



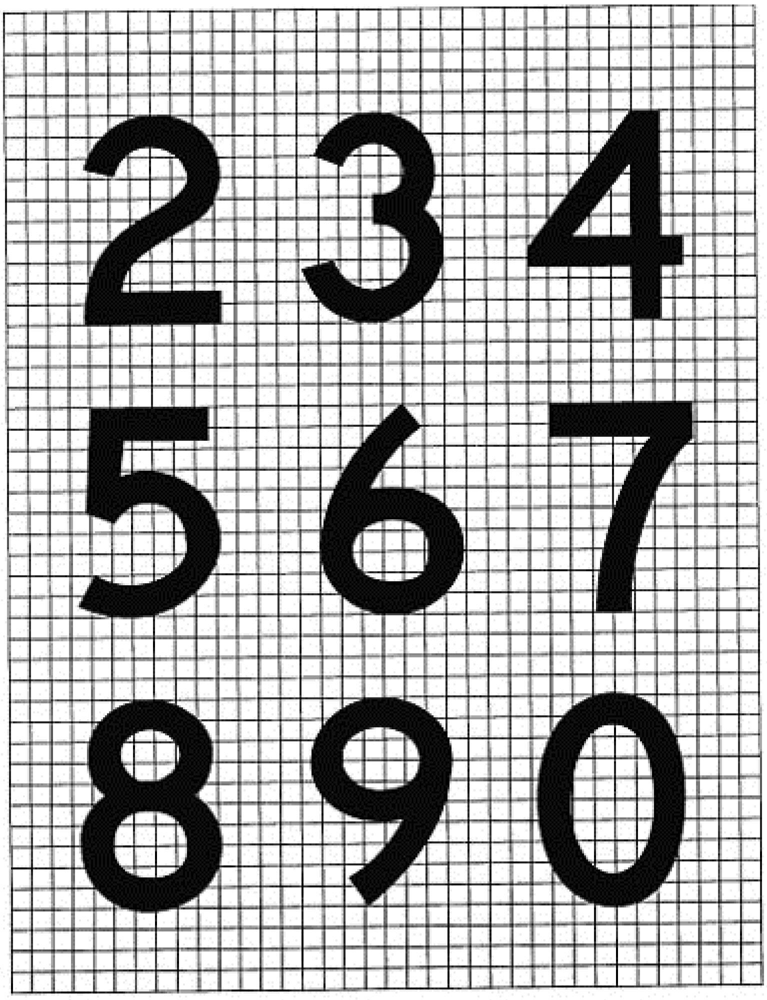
A4-2. ábra
A betűk mérete és formája (A — I)



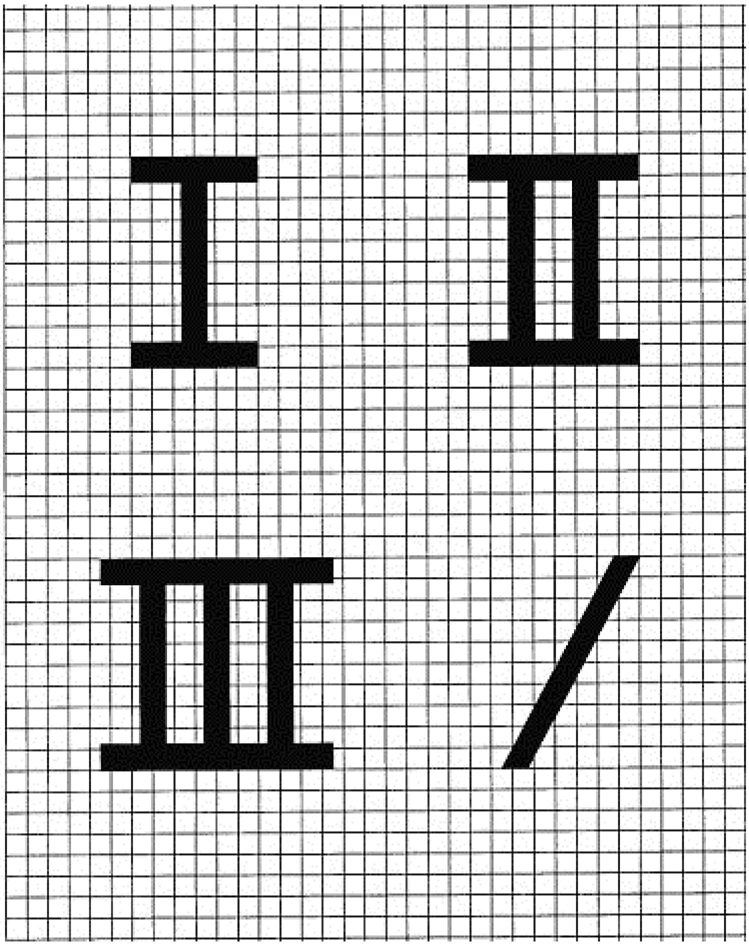
A4-2. ábra
A betűk mérete és formája (J — R)



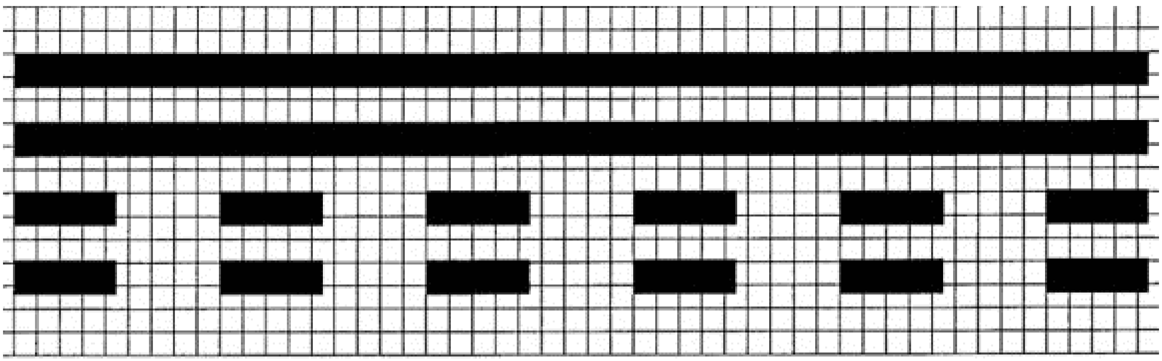
A4-2. ábra
A betűk és számok mérete és formája (S — Z — 1)



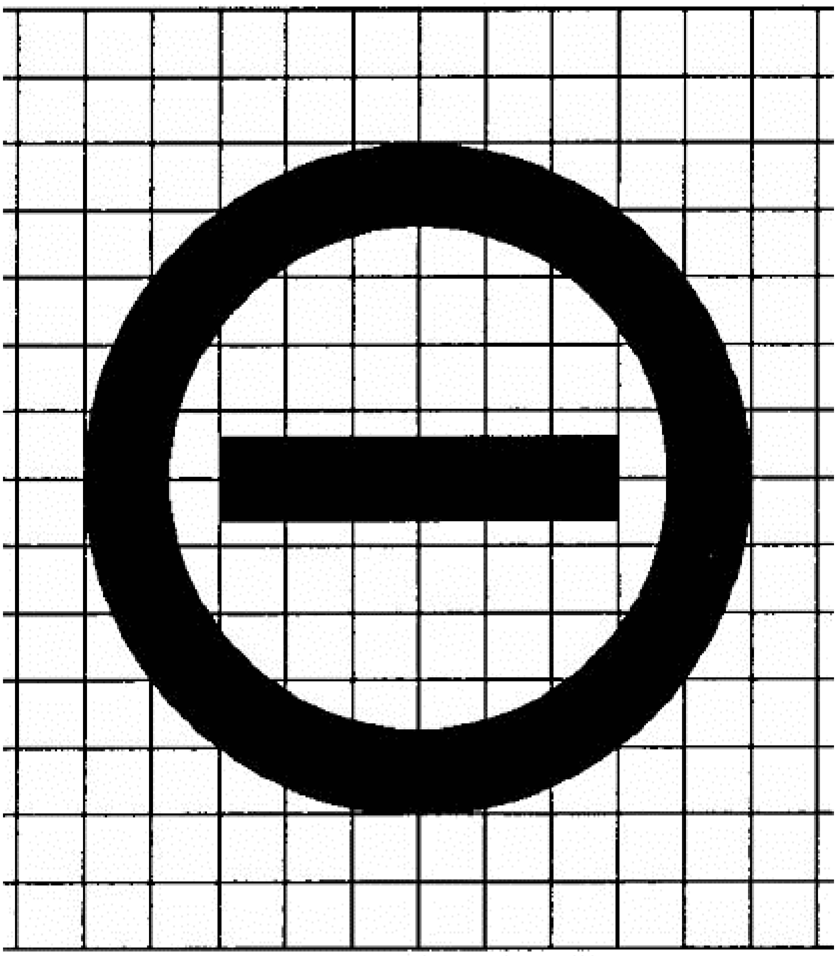
A4-2. ábra
A számok mérete és formája (2 — 0)



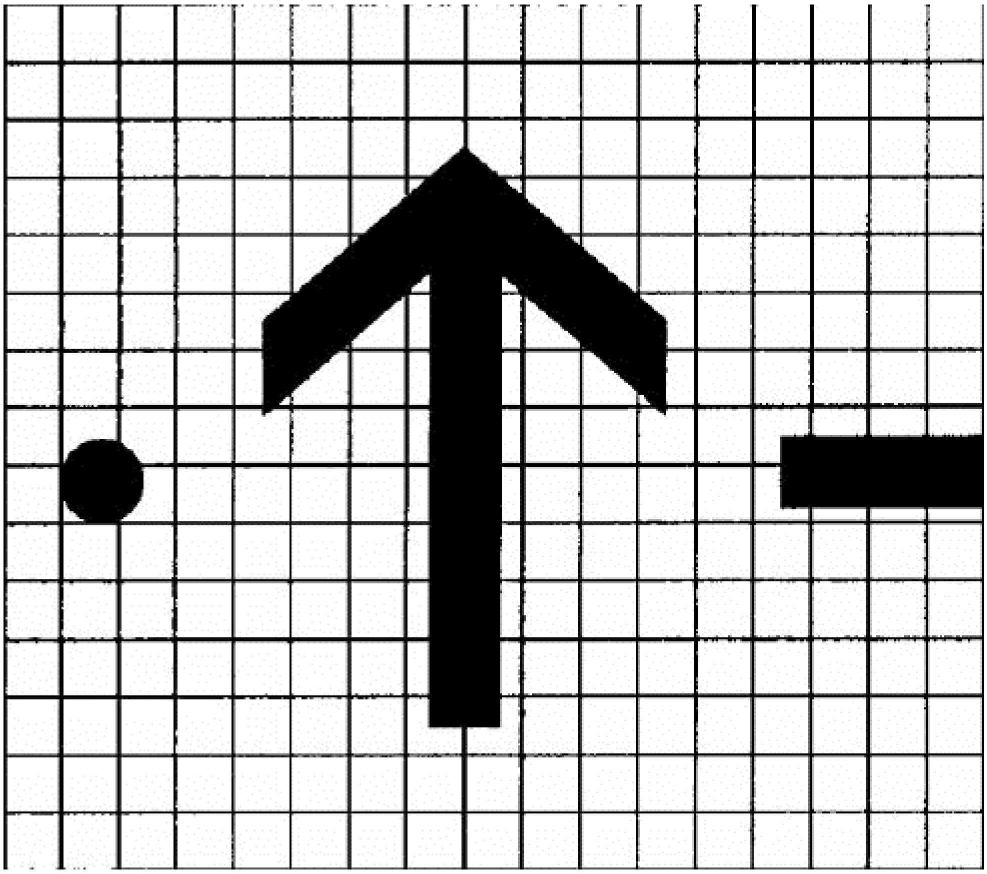
A4-2. ábra
A futópálya kategória jelzések mérete és formája (I — III)



Futópálya szabad (elhagyva) tábla



Belépni (begurulni) tilos tábla



Nyíl, pont és vonás jelzések a táblán

1. Megjegyzés: A nyíl, a kör, valamint a vonás jelzések szélessége arányos legyen a betűk, vagy számok (jelzések) szélességével.

2. Megjegyzés: Egy adott méretű tábla esetén az alkalmazott nyilak mérete a nyíl irányától függetlenül azonos maradjon.

A4-1. táblázat: A betűk és számok szélessége és a közöttük szükséges térköz

a) Betű és betű közötti kód szám			
Előző betű	*Következő betű*		
	B, D, E, F, H, I, K, L, M, N, P, R, U	C, G, O, Q, S, X, Z	A, J, T, V, W, Y
	Kód szám		
A	2	2	4
B	1	2	2
C	2	2	3
D	1	2	2
E	2	2	3
F	2	2	2
G	1	2	2
H	1	1	2
I	1	1	2
J	1	1	2
K	2	2	3
L	2	2	4
M	1	1	2
N	1	1	2
O	1	2	2
P	1	2	2
Q	1	2	2
R	1	2	2
S	1	2	2
T	2	2	4
U	1	1	2
V	2	2	4
W	2	2	4
X	2	2	3
Y	2	2	3
Z	2	2	3

b) Szám és szám közötti kód szám

Előző szám	*Következő szám*		
	1, 5	2, 3, 6, 8, 9, 0	4, 7
	Kód szám		
1	1	1	2
2	1	2	2
3	1	2	2
4	2	2	4
5	1	2	2
6	1	2	2
7	2	2	4
8	1	2	2
9	1	2	2
0	1	2	2

c) Karakterek közötti térköz

Kód szám	*Betű magasság*		
	200 mm	300 mm	400 mm
	Térköz (mm értékben)		
1	48	71	96
2	38	57	76
3	25	38	50
4	13	19	26

d) Betűk szélessége

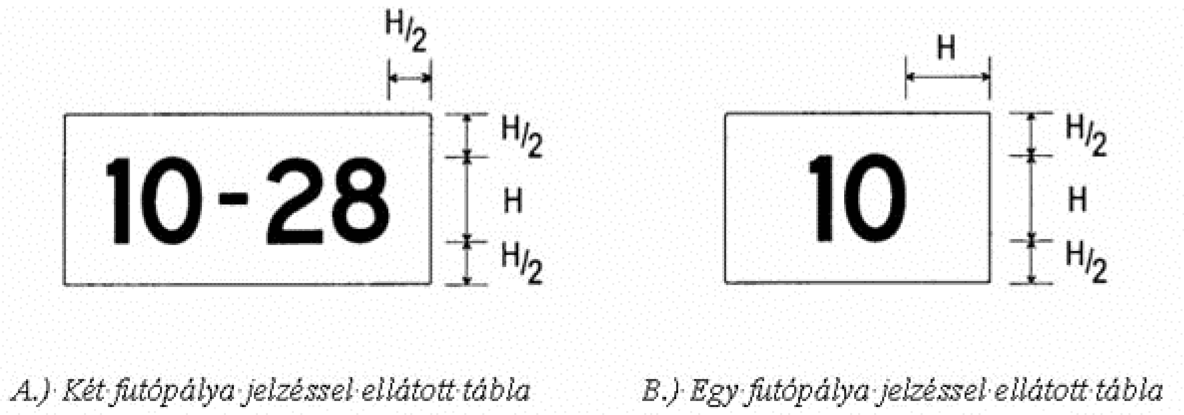
Betű	*Betű magasság*		
	200 mm	300 mm	400 mm
	Szélesség (mm)		
A	170	255	340
B	137	205	274
C	137	205	274
D	137	205	274
E	124	186	248
F	124	186	248
G	137	205	274
H	137	205	274
I	32	48	64
J	127	190	254
K	140	210	280
L	124	186	248
M	157	236	314
N	137	205	274
O	143	214	286
P	137	205	274
Q	143	214	286
R	137	205	274
S	137	205	274
T	124	186	248
U	137	205	274
V	152	229	304
W	178	267	356
X	137	205	274
Y	171	257	342
Z	137	205	274

e) Számok szélessége

Szám	*Szám magasság*		
	200 mm	300 mm	400 mm
	Szélesség (mm)		
1	50	74	98
2	137	205	274
3	137	205	274
4	149	224	298
5	137	205	274
6	137	205	274
7	137	205	274
8	137	205	274
9	137	205	274
0	143	214	286

Útbaigazítások:

1. A betűk, vagy számok közötti megfelelő térköz meghatározásához keressük ki az a), vagy b) táblázatból a kód számot és keressük ki a c) táblázatban a hozzá tartozó értéket a kívánt betű, vagy szám magasság alapján.
2. A rövidítést, vagy szimbólumot formáló karakterek szavai, vagy csoportjai közötti térköznek a felhasznált karakterek magasságának a 0.5 – 0.75-szörösének kell lennie, kivéve ahol egy nyíl van egy karakter mellett, például: ’A →’, itt a térköz lecsökkenthető a karakter magasságának nem kevesebb, mint az ¼-ére a jó látási egyensúly érdekében.
3. Ahol a számot betű követ, vagy viszont, ott használjuk a Kód 1-et.
4. Ahol egy karaktert kötőjel, pont, vagy ferde vonal követ, vagy viszont, ott használjuk a Kód 1-et.



A4-3. ábra
Kettő, illetve egy futópálya azonosító jelzéssel ellátott tábla
A táblák mérete (arányok)

5. Függelék
A léginavigációs adatok minőségi előírásai

A5-1. táblázat: Földrajzi szélesség és hosszúság

Szélesség és hosszúság	*Pontosság Adat típus*	*Osztályzás Megbízhatóság*
Repülőtér vonatkozási pont	30 méter földmérési/ számított	általános 1×10^{-3}
Navigációs berendezések a repülőtér területén	3 méter földmérési	alapvető 1×10^{-5}
Akadályok a 3. területen	0.5 méter földmérési	alapvető 1×10^{-5}
Akadályok a 2. területen (a repülőtér határain belül)	5 méter földmérési	alapvető 1×10^{-5}
Futópálya küszöbök	1 méter földmérési	kritikus 1×10^{-8}
Futópálya vége (repülési pálya csatlakozási pont)	0.5 méter földmérési/ számított	alapvető 1×10^{-5}
Futópálya középvonal pontok	1 méter földmérési	kritikus 1×10^{-8}
Futópálya várakozási hely	0.5 méter földmérési	kritikus 1×10^{-8}
Gurulóút középvonal és állóhely bevezető vonal pontok	0.5 méter földmérési	alapvető 1×10^{-5}
Gurulóút csatlakozás jelölése	0.5 méter földmérési	alapvető 1×10^{-5}
Futópálya legurulóút jelölése	0.5 méter földmérési	alapvető 1×10^{-5}
Forgalmi előtér határai (sokszög)	1 méter földmérési	általános 1×10^{-3}
Jégtelenítő és jégmentesítő létesítmény (sokszög)	1 méter földmérési	általános 1×10^{-3}
Légijármű állóhely pontok — Inerciális navigációs (INS) ellenőrző pontok	0.5 méter földmérési	általános 1×10^{-3}

1. Megjegyzés: A meghatározott területeken található akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és előírások grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 15. Annex 2. és 3. Területek akadály adataira vonatkozó 10.6.1.2 pontjának 2010 november 18. utáni alkalmazását megkönnyítheti az ilyen adatok tervszerű előzetes összegyűjtése és feldolgozása.

A5-2. táblázat: Tengerszint és talajszint feletti magasság

Tengerszint feletti magasság és Földfelszín feletti magasság	*Pontosság Adat típus*	*Osztályzás Megbízhatóság*
Repülőtér tengerszint feletti magassága	0.5 méter földmérési	alapvető 1×10^{-5}
Földalak egyenetlenség a WGS-84 szerint a repülőtér tengerszint feletti magassága helyzetében	0.5 méter földmérési	alapvető 1×10^{-5}
Futópálya küszöb, nem-precíziós megközelítések	0.5 méter földmérési	alapvető 1×10^{-5}
Földalak egyenetlenség a WGS-84 szerint a futópálya küszöbnél, nem-precíziós megközelítések esetében	0.5 méter földmérési	alapvető 1×10^{-5}
Futópálya küszöb, precíziós megközelítések	0.25 méter földmérési	kritikus 1×10^{-8}
Földalak egyenetlenség a WGS-84 szerint a futópálya küszöbnél, precíziós megközelítések esetében	0.25 méter földmérési	kritikus 1×10^{-8}
Futópálya középvonal pontok	0.25 méter földmérési	kritikus 1×10^{-8}
Gurulóút középvonal és állóhely bevezető vonal pontok	1 méter földmérési	alapvető 1×10^{-5}
Akadályok a 2. területen (a repülőtér határain belül)	3 méter földmérési	alapvető 1×10^{-5}
Akadályok a 3. területen	0.5 méter földmérési	alapvető 1×10^{-5}
Precíziós távolságmérő berendezés (DME/P)	3 méter földmérési	alapvető 1×10^{-5}

1. Megjegyzés: A meghatározott területeken található akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és előírások grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 15. Annex 2. és 3. Területek akadály adataira vonatkozó 10.6.1.2 pontjának 2010 november 18. utáni alkalmazását megkönnyítheti az ilyen adatok tervszerű előzetes összegyűjtése és feldolgozása.

A5-3. táblázat: Mágneses elhajlás és mágneses változás

Elhajlás és változás	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Repülőtér mágneses elhajlás	1 fok földmérési	alapvető 1×10^{-5}
ILS iránysáv-adó antenna mágneses elhajlás	1 fok földmérési	alapvető 1×10^{-5}
MLS oldalszög-adó antenna mágneses elhajlás	1 fok földmérési	alapvető 1×10^{-5}

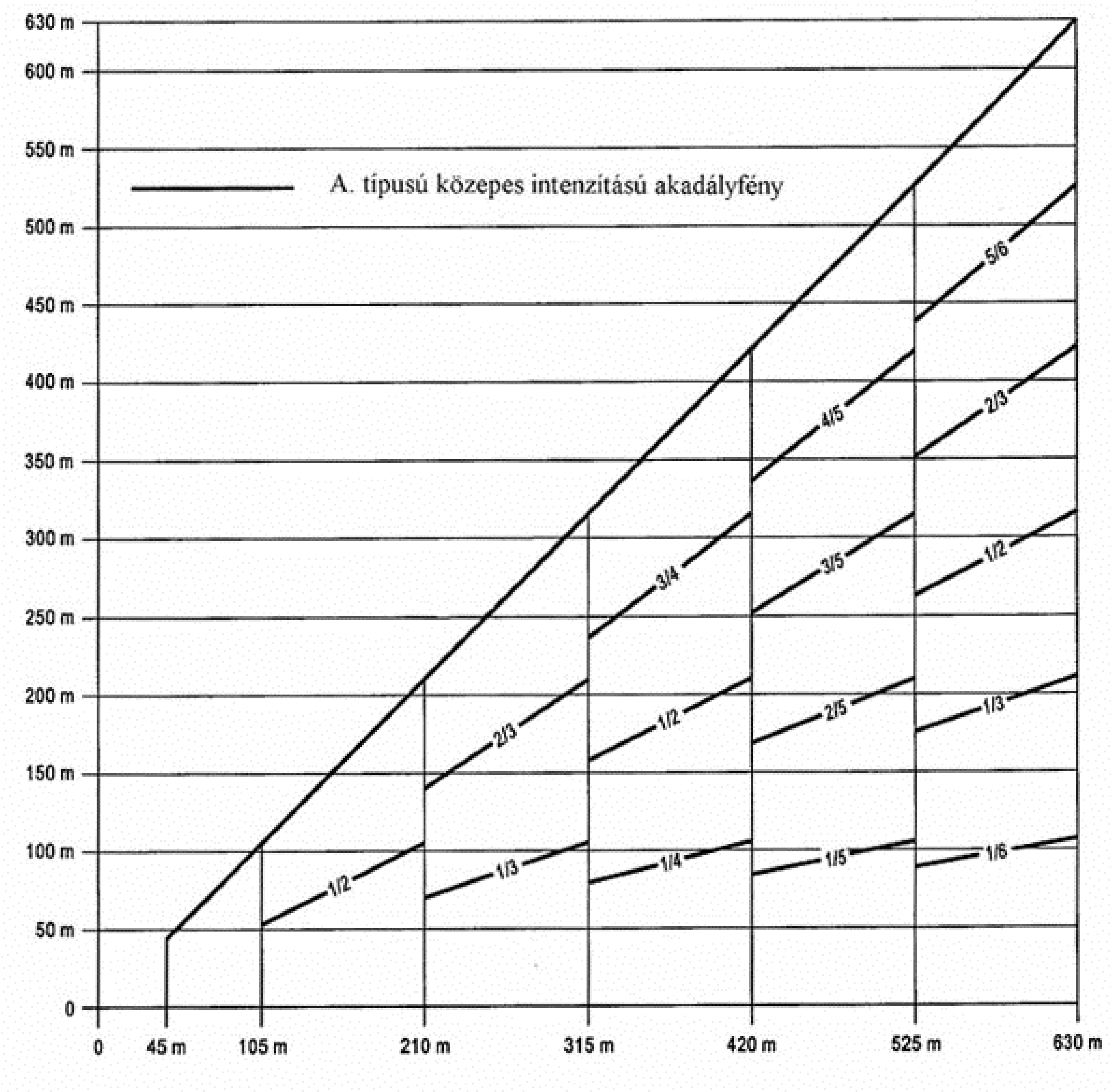
A5-4. táblázat: Irányszög

Irányszög	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
ILS iránysávadó beállítás	1/100 fok földmérési	alapvető 1×10^{-5}
MLS nulla oldaszög irányvezetés beállítás	1/100 fok földmérési	alapvető 1×10^{-5}
Futópálya irányszög (tényleges)	1/100 fok földmérési	általános 1×10^{-3}

A5-5. táblázat: Hosszúság — Távolság — Méretek

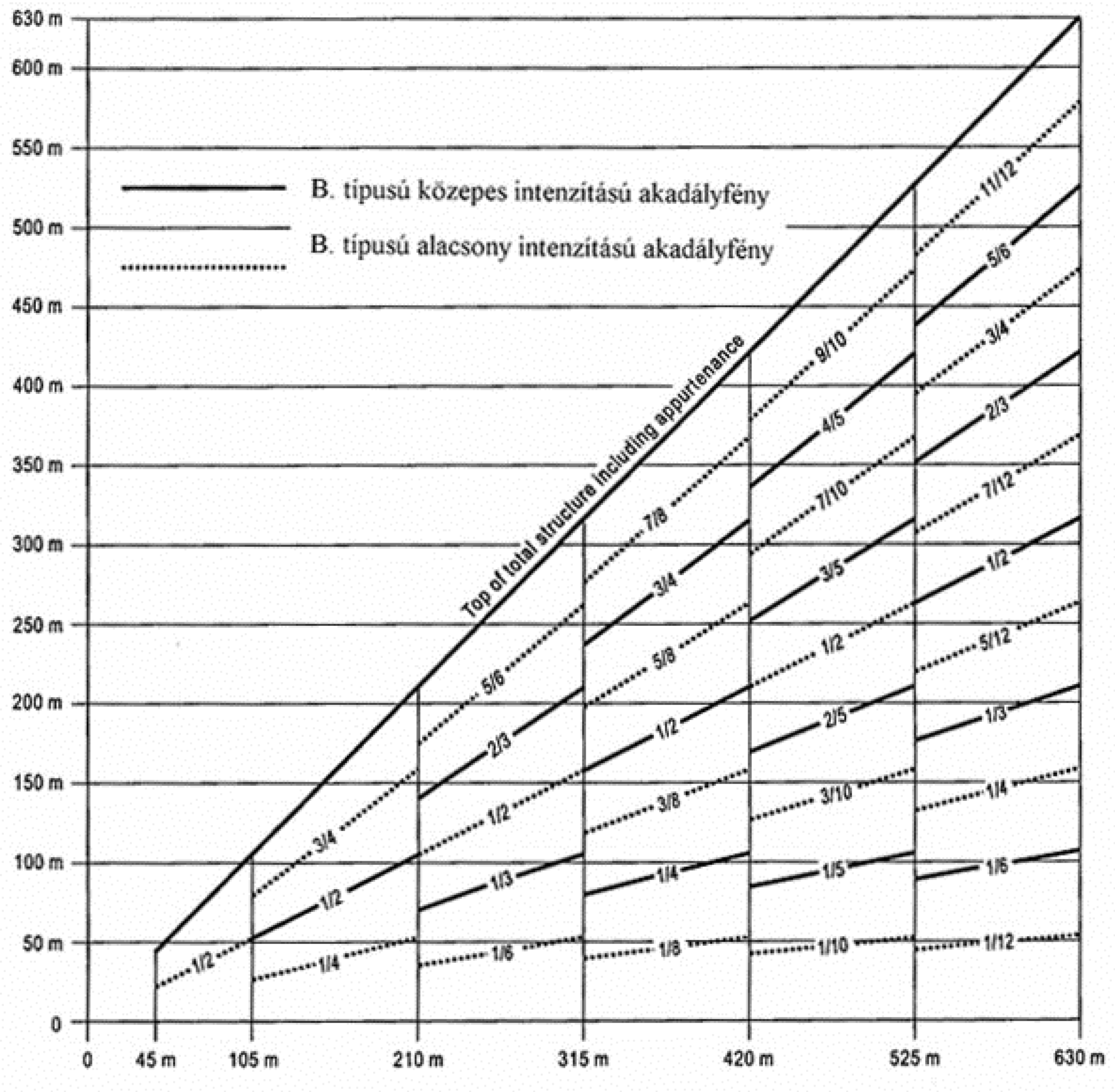
Hosszúság — Távolság — Méretek	*Pontosság Adat típus*	*Osztályzás Megbízhatóság*
Futópálya hosszúsága	1 méter földmérési	kritikus 1×10^{-8}
Futópálya szélessége	1 méter földmérési	alapvető 1×10^{-5}
Áthelyezett futópálya küszöb távolsága	1 méter földmérési	általános 1×10^{-3}
Biztonsági megállási terület hosszúsága és szélessége	1 méter földmérési	kritikus 1×10^{-8}
Biztonsági felszállási terület hosszúsága és szélessége	1 méter földmérési	alapvető 1×10^{-5}
Rendelkezésre álló leszállási távolság	1 méter földmérési	kritikus 1×10^{-8}
Rendelkezésre álló felszállási nekifutási távolság	1 méter földmérési	kritikus 1×10^{-8}
Rendelkezésre álló felszállási távolság	1 méter földmérési	kritikus 1×10^{-8}
Gyorsításból történő megálláshoz rendelkezésre álló távolság	1 méter földmérési	kritikus 1×10^{-8}
Futópálya padka szélessége	1 méter földmérési	alapvető 1×10^{-5}
Gurulóút szélessége	1 méter földmérési	alapvető 1×10^{-5}
Gurulóút padka szélessége	1 méter földmérési	alapvető 1×10^{-5}
ILS iránysáv-adó antenna és a futópálya vége közötti távolság	3 méter számított	általános 1×10^{-3}
ILS siklópálya-adó antenna és a futópálya vége közötti távolság a középvonal mentén	3 méter számított	általános 1×10^{-3}
ILS marker adók és a futópálya küszöb közötti távolság	3 méter számított	alapvető 1×10^{-5}
ILS DME berendezés antenna és a futópálya küszöb közötti távolság a középvonal mentén	3 méter számított	alapvető 1×10^{-5}
MLS oldalszög-adó antenna és a futópálya vége közötti távolság	3 méter számított	általános 1×10^{-3}
MLS magasságadó antenna és a futópálya vége közötti távolság a középvonal mentén	3 méter számított	általános 1×10^{-3}
MLS precíziós távolságmérő berendezés (DME/P) antenna és a futópálya vége közötti távolság a középvonal mentén	3 méter számított	alapvető 1×10^{-5}

6. Függelék
A fények elhelyezkedése az akadályokon



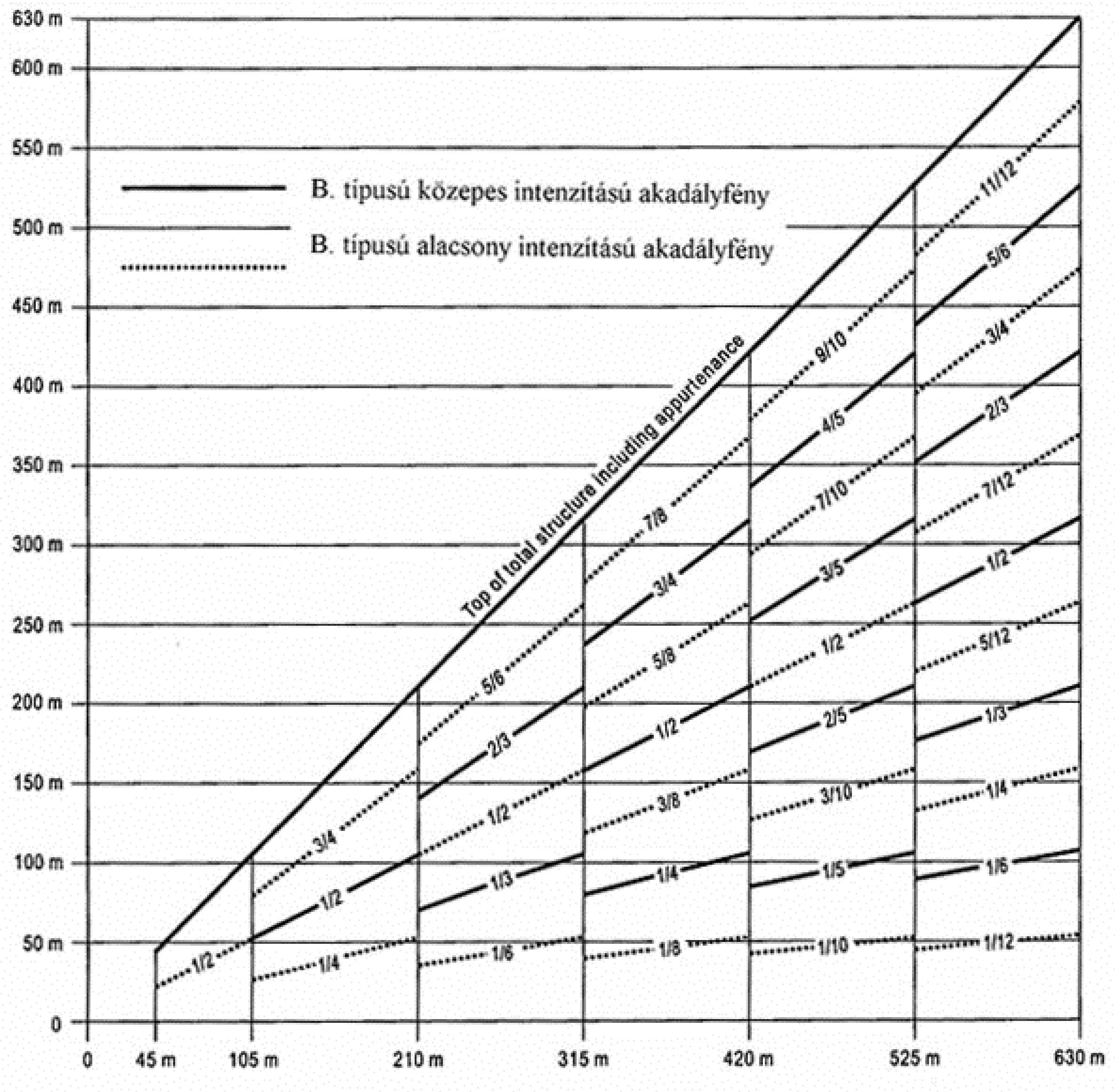
A6-1 ábra: A. típusú közepes intenzitású fehér villanó akadályfény rendszer

Megjegyzés: A felszín felett 150 méternél magasabb szerkezetek esetében a nagy intenzitású akadályfény alkalmazása kívánatos; ha közepes intenzitást használnak, az akadályt jelöléssel is el kell látni.



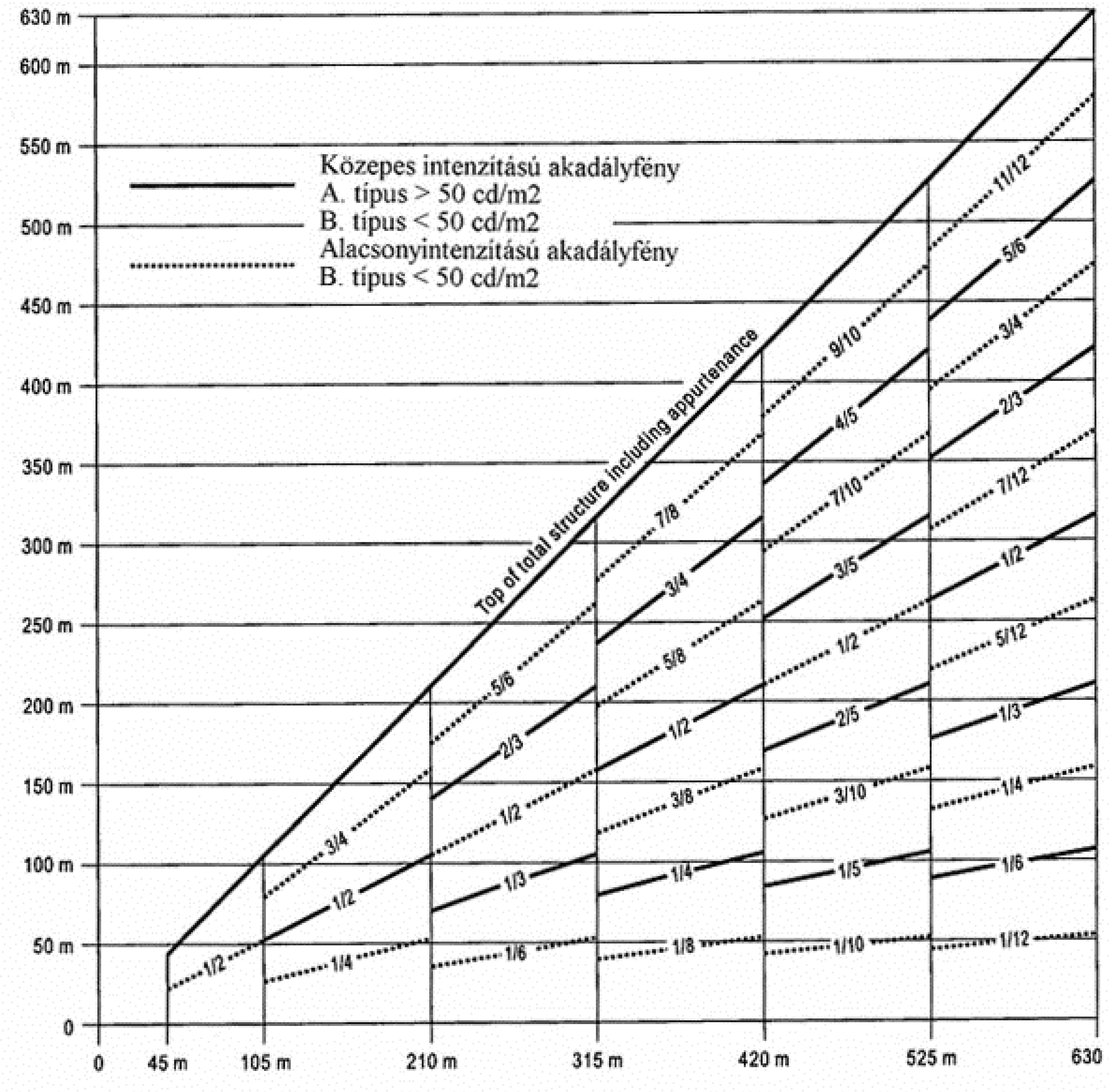
A6-2 ábra: B. típusú közepes intenzitású vörös villanó akadályfény rendszer

Megjegyzés: Csak éjszakai használatra.



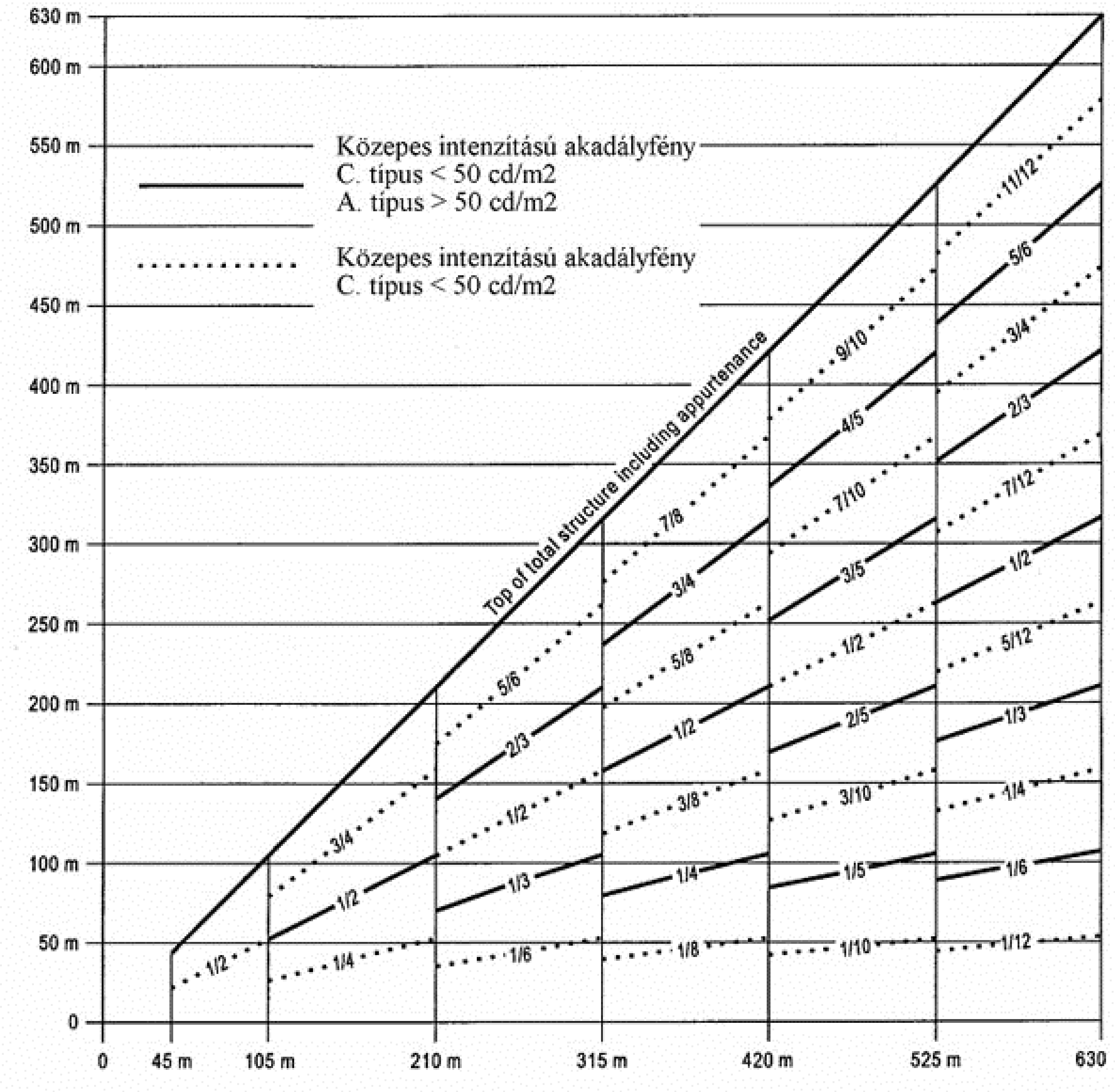
A6-3 ábra: C. típusú közepes intenzitású vörös állandó akadályfény rendszer

Megjegyzés: Csak éjszakai használatra.



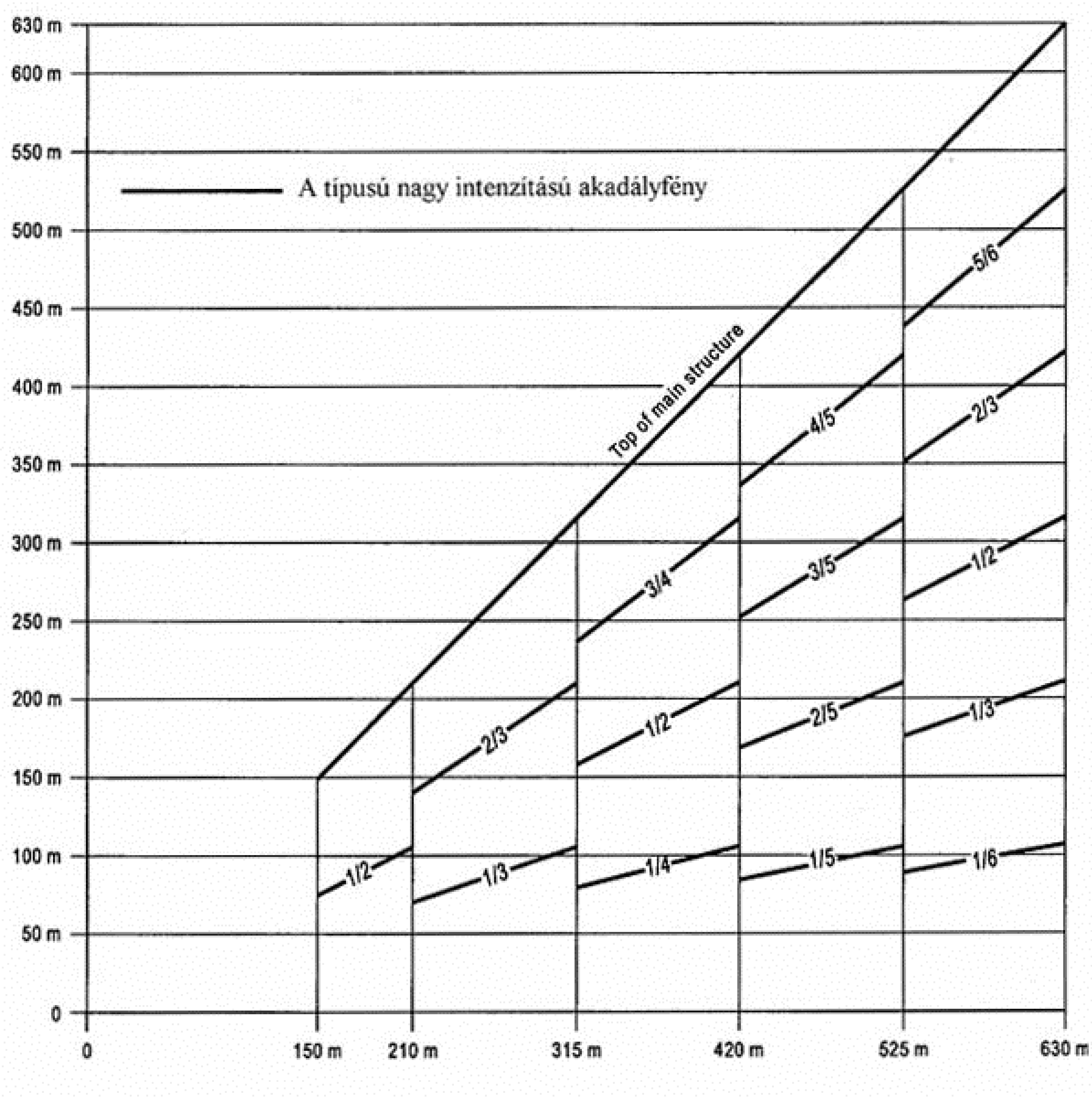
A6-4 ábra: A. és B. típusú közepes intenzitású kettős akadályfény rendszer

Megjegyzés: A felszín felett 150 méternél magasabb szerkezetek esetében a nagy intenzitású akadályfény alkalmazása kívánatos; ha közepes intenzitást használnak, az akadályt jelöléssel is el kell látni.

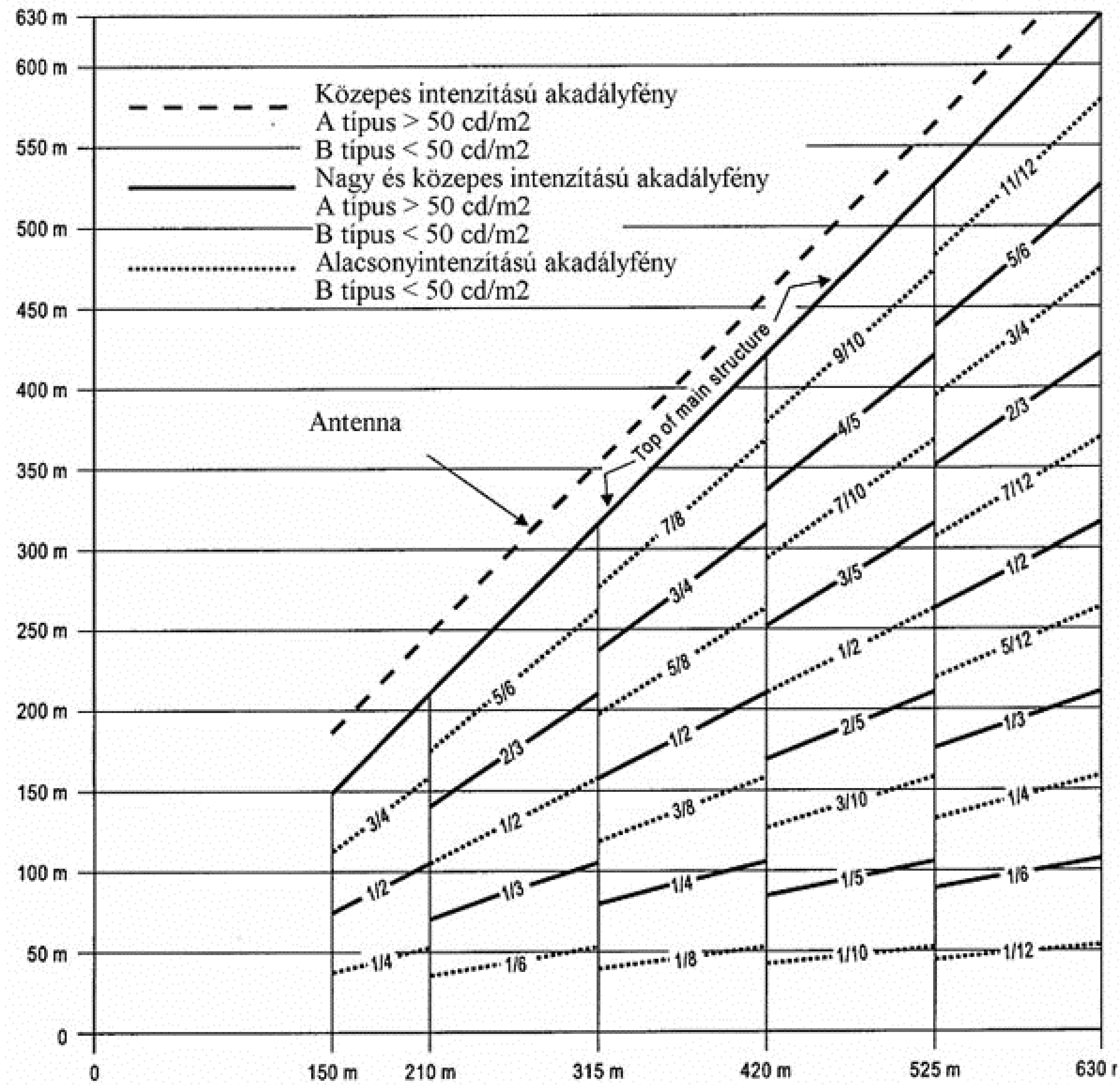


A6-5 ábra: A. és C. típusú közepes intenzitású kettős akadályfény rendszer

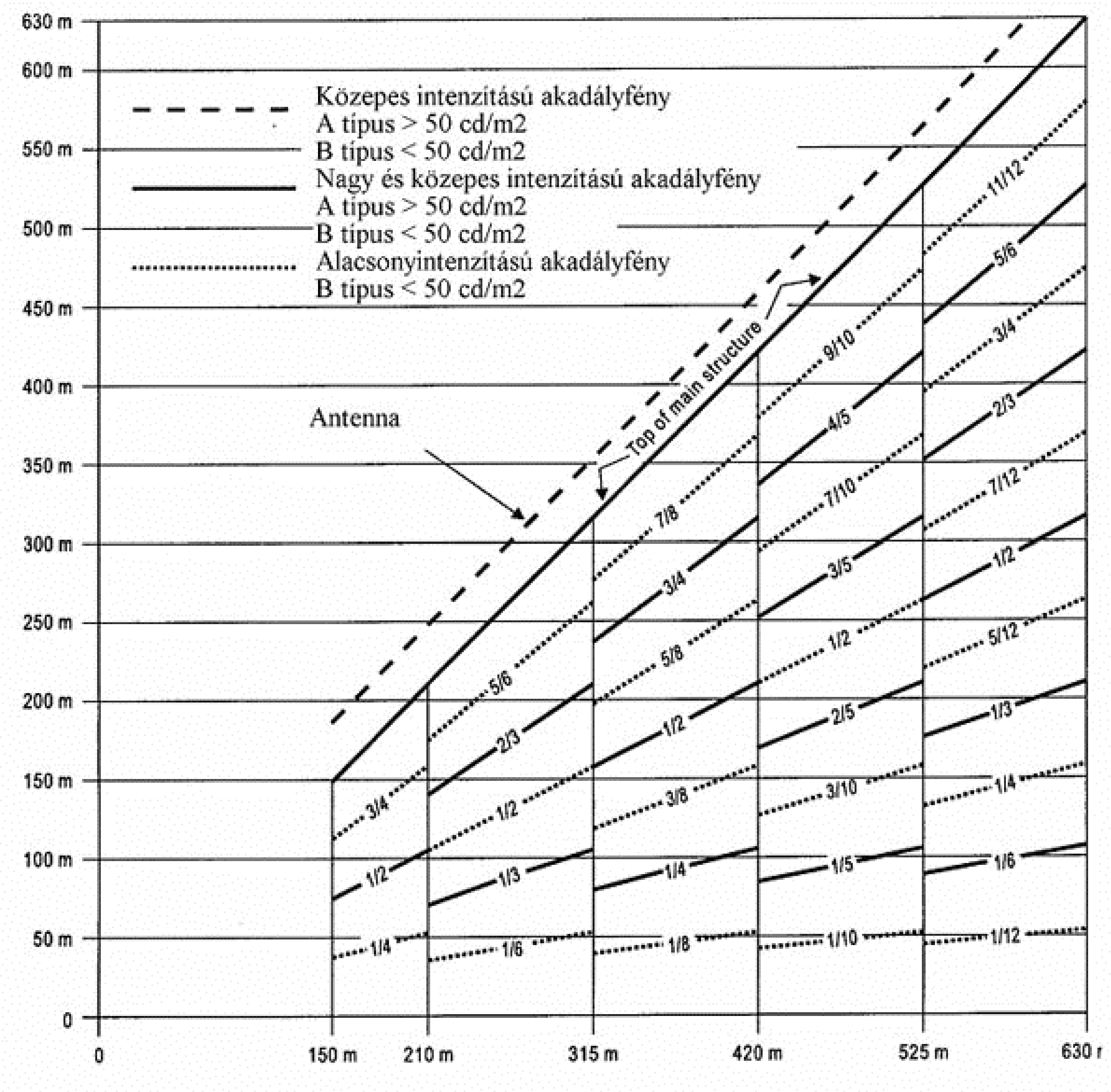
Megjegyzés: A felszín felett 150 méternél magasabb szerkezetek esetében a nagy intenzitású akadályfény alkalmazása kívánatos; ha közepes intenzitást használnak, az akadályt jelöléssel is el kell látni.



A6-6 ábra: A. típusú nagy intenzitású vörös villanó akadályfény rendszer



A6-7 ábra: A. és B. típusú nagy, valamint közepes intenzitású kettős akadályfény rendszer



A6-8 ábra: A. és C. típusú nagy, valamint közepes intenzitású kettős akadályfény rendszer

Közös megjegyzés: Függőleges: A szerkezeten levő fények talajszint feletti magassága; Vízszintes: A szerkezetek talajszint feletti magassága.

A. Melléklet

A 14. Annex I. kötet kiegészítő tájékoztatója

1. A futópályák száma, elhelyezése és iránya

A futópálya elhelyezése és iránya

1.1 A futópályák elhelyezésének és irányának meghatározásakor számos tényezőt kell figyelembe venni. A tényezők tételes és teljes felsorolásának, valamint ezek elemzésének igénye nélkül hasznosnak látszik, hogy az alábbiakban ismertessük azokat a tényezőket, amelyek a leggyakrabban vizsgálat alá kell vonni. A tényezők négy fő csoportra oszthatók:

1.1.1 *Az üzemeltetés típusa.* Különös figyelmet szenteljenek annak, hogy az adott repülőteret bármely, vagy csak látás utáni időjárási körülmények között, illetve éjjel — nappal, vagy csak nappal kívánják használni.

1.1.2 *Időjárási körülmények.* A repülőtér igénybevételi tényezőjének meghatározása alkalmával tanulmányozzák az uralkodó szélirányokat, illetve a kereszt-szél összetevőket. Ebben a vonatkozásban különösen figyeljenek a következőkre:

a) Az igénybevételi tényező kiszámításához alkalmazott szélirány, valamint sebesség statisztikák és ezek adatai általában nagymértékben függnek az észlelések gyakoriságától és pontosságától. Ha nincs egészen biztos tájékoztatás a tényleges egyedi szél-jellemzőkről, általában átlagértékeket vesznek figyelembe, mert ezek tájékoztatást biztosítanak a legkedvezőbb futópálya irányról. Ennek eredménye azonban az, hogy az igénybevételi tényező kissé általános jellegű lesz.

b) A 3. fejezet 3.1.3 részében meghatározott legnagyobb átlagos kereszt-szél értékek (összetevők) általános időjárási körülményekre vonatkoznak. Vannak olyan tényezők, amelyek miatt egy adott repülőtér esetében a legnagyobb értéket csökkenteni kell. Ezek közé tartoznak a következők:

1) A különböző jelenlegi és jövőben forgalomba álló repülőgép típusok üzemeltetési tényezői, valamint engedélyezett legnagyobb kereszt-szél értékei között tapasztalható széleskörű különbségek, figyelembe véve a 3.1.3 pontban meghatározott mind a három csoportot;

2) a széllökések előfordulási gyakorisága és természete;

3) a turbulencia előfordulási gyakorisága és természete;

4) másodlagos futópálya igénybevételének lehetősége;

5) a futópályák szélessége;

6) a futópálya felületének állapota — a futópálya felületeken levő víz, hó és jég ténylegesen csökkenti az engedélyezett kereszt-szél értéket; és

7) a korlátozó kereszt-szél értékkel összefüggő szélerősség.

Tanulmányozzák továbbá a gyenge látástávolság és/vagy az alacsony felhőalap előfordulásának gyakoriságát is. Ennél a vizsgálatnál is vegyék fegyelembe a jelenséghez párosuló szélirányt és sebességet.

1.1.3 *A repülőtér, a végső megközelítési területek és a repülőtér környezetének felszíne,* különös tekintettel a következőkre:

a) az akadálykorlátozási felületekre vonatkozó előírások betartása;

b) a jelenlegi és jövőbeni földterület felhasználás: a terület elhelyezkedése és tájolása olyan legyen, hogy a különösen érzékeny külső környező területek, mint például a lakott területek, iskolák és kórházak a lehető legnagyobb védelmet kapják a légijármű zaj okozta negatív hatásokkal szemben. Erről a témáról részletes információ a Repülőtér Tervezési Kézikönyv 2. részében és a Légijármű Zajkeltésének Kiegyensúlyozott Megközelítéséhez Útmutatóban (Doc 9829) található;

c) a jelenleg és a jövőben szükséges, biztosítandó futópálya hossz;

d) építési költségek; és

e) a leszálláshoz történő megközelítéshez szükséges, megfelelő látás utáni és műszeres eszközök (berendezések) telepítésének lehetősége.

1.1.4 *A repülőtér környékének légiforgalma,* különös tekintettel az alábbiakra:

a) más repülőterek, vagy légiforgalmi szolgálati útvonalak közelsége;

b) a légiforgalom sűrűsége, nagysága; és

c) légiforgalmi irányítása és a megszakított megközelítési eljárások.

A futópályák száma az egyes irányokba

1.2 Az egyes irányokban kialakítandó futópályák száma a kiszolgálandó légijármű mozgások számától függ.

2. Biztonsági felszállási és végbiztonsági megállási területek

2.1 A futópálya hossz növelése helyett a biztonsági felszállási és/vagy végbiztonsági megállási területek kialakítására vonatkozó döntés a futópálya végén túl rendelkezésre álló területtől, valamint a várható repülőgép típusok üzemeltetési igényeitől függ. A futópálya, a biztonsági felszállási és a végbiztonsági megállási területek hosszát a futópályát igénybe vevő repülőgépek felszálló teljesítménye alapján határozzák meg, de ugyanakkor ellenőrizzék azok leszállási távolságát is, hogy a futópálya a leszálláshoz is elég hosszú legyen. Mindazonáltal a biztonsági felszállási terület hossza nem haladhatja meg a rendelkezésre álló felszállási nekifutási távolság felét.

2.2 A repülőgép üzemeltetési teljesítmény korlátozások miatt olyan futópálya hosszúság szükséges, amely biztosítja, hogy a repülőgép a felszállás megkezdése után azt biztonságosan végrehajtja, vagy (megszakított felszállás esetén) megállítható. Jelen útmutatónknál feltételezzük, hogy a futópálya, a biztonsági felszállási és végbiztonsági megállási területek hossza a felszálló-súly, a futópálya jellemzők és a környezeti körülmények figyelembevételével éppen elegendő a leghosszabb felszállási és gyorsításból történő megállási távolságot igénylő repülőgép számára. A fentiek alapján minden egyes felszállás végrehajtásánál van egy meghatározott sebesség, amely az un. elhatározási sebesség; ez alatt a hajtómű meghibásodása esetén a felszállást meg kell szakítani, felette pedig végre kell hajtani. Az elhatározási sebesség elérése előtt, a hajtómű meghibásodása esetén a felszállás végrehajtásához az alacsony sebesség és a kis tolóerő miatt nagyon hosszú felszállási nekifutási távolságra lenne szükség. Ezzel szemben, ha a repülőgépvezető azonnal intézkedik, a rendelkezésre álló gyorsításból történő megállási távolságon belül nem okoz nehézséget a légijármű megállítása és ezért a fenti körülmények között a felszállás megszakítása lesz a helyes intézkedés.

2.3 Másrészt azonban az elhatározási sebesség elérése után bekövetkező hajtómű meghibásodás esetén a repülőgép elég nagy sebességgel és tolóerővel rendelkezik a felszállás biztonságos végrehajtásához a rendelkezésre álló felszállási nekifutási távolságon belül, viszont a nagy sebesség miatt megállítása nehézségekbe ütközhet.

2.4 Az elhatározási sebesség az egyes repülőgépeknél nem egy állandó sebesség érték, hanem azt a repülőgépvezető a rendelkezésre álló felszállási, valamint a gyorsításból történő megállási távolság határain belül a repülőgép teljes felszálló tömege (súlya), a futópálya jellemzői és a repülőtéren uralkodó időjárási (környezeti) körülmények alapján határozhatja meg. Általában a rendelkezésre álló gyorsításból történő megállási távolság növekedésével magasabb elhatározási sebességet választanak.

2.5 Az adott repülőgép típushoz szükséges gyorsításból történő megállási, valamint felszállási távolságok különböző változatai határozhatók meg a felszálló-súly, a futópálya jellemzők és repülőtéri körülmények figyelembevételével. Minden egyes változathoz egyedi felszállási nekifutási távolság tartozik.

2.6 A legáltalánosabb eset az, amikor olyan az elhatározási sebesség, amelynél a szükséges felszállási távolság megegyezik a szükséges gyorsításból történő megállási távolsággal. Ez az érték a kiegyenlített leszállómező hosszúság. Ahol biztonsági felszállási és végbiztonsági megállási területet nem alakítanak ki, ezek a távolságok azonosak a futópálya hosszával. Mindazonáltal, ha nem vesszük figyelembe a leszállási távolságot, a kiegyenlített leszállómező hosszúság nem szükségszerűen azonos a futópálya hosszával, mert a felszálláshoz szükséges nekifutási távolság természetesen rövidebb, mint a kiegyenlített leszállómező hosszúság. Ez a távolság a futópálya mellett azonos hosszúságú biztonsági felszállási és végbiztonsági megállási területtel biztosítható, tehát nem szükséges, hogy az egész távolság futópálya legyen. Ha a felszállásra a futópálya mindkét irányát használják, annak mindkét végén alakítsák ki a fenti területeket. Az előbbiek alapján tehát a futópálya felület hossz csökkentésének ára a teljes hosszúság növelése.

2.7 Amennyiben a gazdasági számítások kizárják a végbiztonsági megállási terület kialakításának lehetőségét és csak futópályát és biztonsági felszállási területet biztosítanak, a futópálya hossza (a leszálláshoz szükséges igények figyelmen kívül hagyása mellett) megegyezik a szükséges gyorsításból történő megállási, vagy felszállási nekifutási távolsággal — amelyik a nagyobb érték. A rendelkezésre álló felszállási távolság a futópálya és a biztonsági felszállási terület együttes hossza.

2.8 A kialakítandó legkisebb futópálya és legnagyobb biztonsági felszállási, vagy végbiztonsági megállási terület hosszúságot a futópályára vonatkozóan legnagyobb pályahossz igénnyel rendelkező repülőgép üzemeltetési kézikönyvében található adatok alapján a következők szerint határozhatják meg:

a) ha gazdasági szempontból lehetséges a végbiztonsági megállási terület kialakítása, a biztosítandó távolságok megegyeznek a kiegyenlített leszállómező hosszúsággal. A futópálya hossza a szükséges felszállási nekifutási, vagy a leszállási távolság — amelyik a nagyobb érték. Ha a szükséges gyorsításból történő megállási távolság nagyobb, mint az így megállapított futópálya hossz, a fennmaradó távolság általában a futópálya mindkét végén kialakított végbiztonsági megállási területtel biztosítható. Ezen felül, biztosítani kell a végbiztonsági megállási területtel azonos hosszúságú biztonsági felszállási területet is;

b) amennyiben végbiztonsági megállási területet nem biztosítanak, a futópálya hossza a szükséges leszállási, vagy ha ez nagyobb érték, a szükséges gyorsításból történő megállási távolság legyen, amely megfelel a gyakorlati szempontból legalacsonyabb elhatározási sebesség értéknek. A szükséges felszállási távolság fennmaradó része általában a futópálya mindkét végén kialakított biztonsági felszállási területtel biztosítható.

2.9 A fentiekben vázolt körülményeken túl bizonyos esetekben a biztonsági felszállási területek olyan esetben is alkalmazhatók, amikor a minden működő hajtómű mellett szükséges felszállási távolság meghaladja a hajtómű meghibásodás esetére szükséges értékeket.

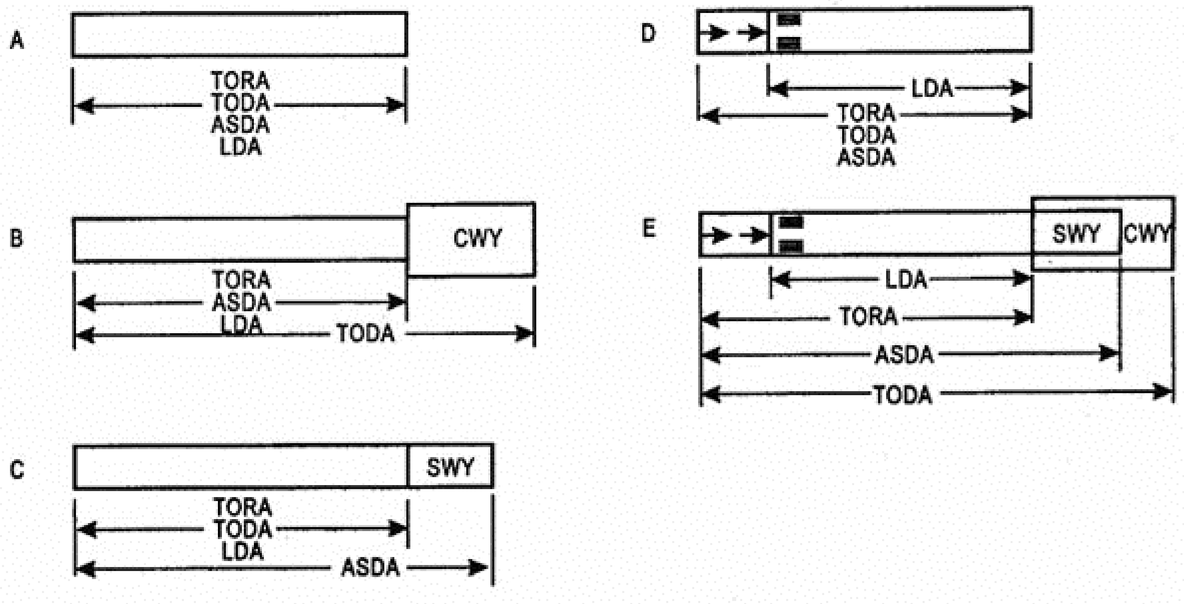
2.10 A végbiztonsági megállási terület gyakorlati haszna teljes mértékben elveszhet, ha azt minden igénybevétel után javítani kell. Ezért a területet úgy tervezzék meg, hogy az legalább bizonyos számú használat rongáló hatásának a repülőgép szerkezetének károsítása nélkül ellenálljon.

3. A kijelölt távolságok kiszámítása

3.1 Minden egyes futópálya irány vonatkozásában számítsák ki a következő kijelölt távolságokat:

rendelkezésre álló felszállási nekifutási távolság	TORA
rendelkezésre álló felszállási távolság	TODA
rendelkezésre álló gyorsításból történő megállási távolság	ASDA
rendelkezésre álló leszállási távolság	LDA

3.2 Ahol a futópályát nem egészítik ki végbiztonsági megállási, vagy biztonsági felszállási területtel és a küszöb a futópálya végén helyezkedik el, a meghatározott négy kijelölt távolság az A-1. (A) ábra szerint azonos a futópálya hosszával.

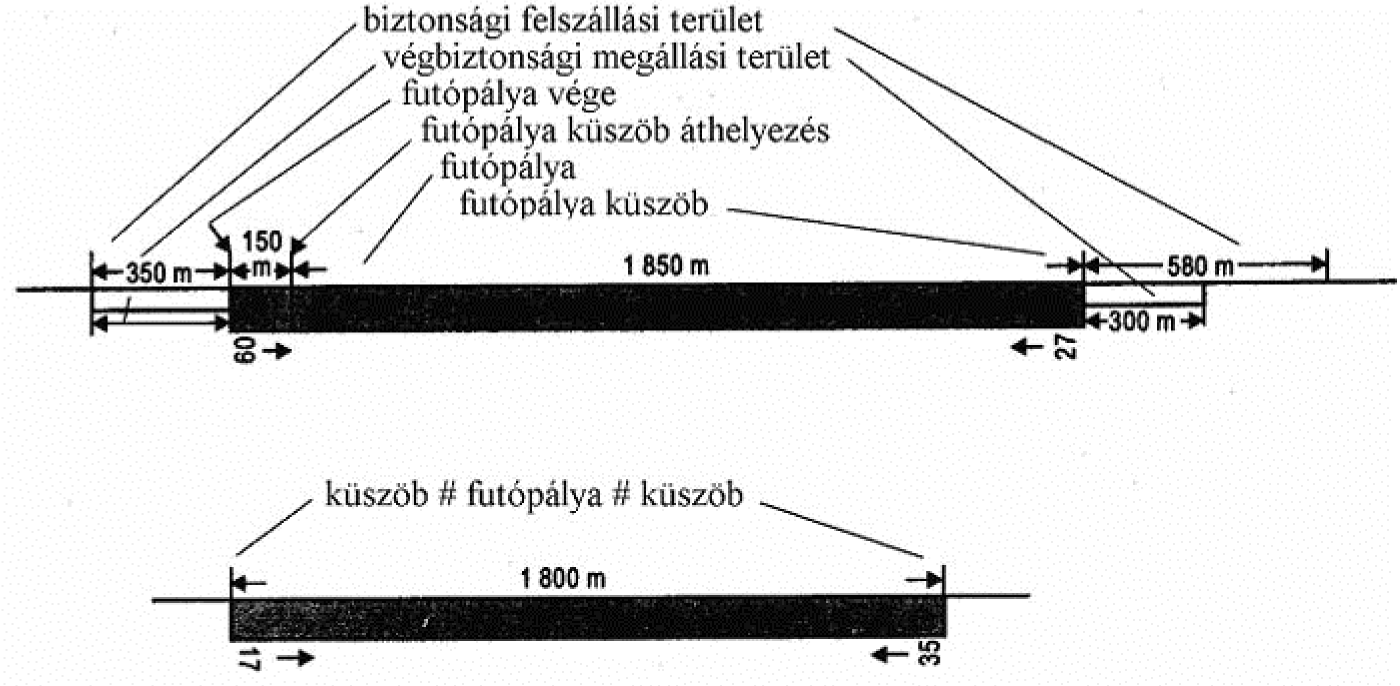


A-1. ábra: Kijelölt távolságok (balról jobbra ábrázolva)

3.3 Ahol a futópálya után biztonsági felszállási területet (CWY) alakítanak ki, a rendelkezésre álló felszállási távolság az A-1. (B) ábra szerint tartalmazza ennek hosszát is.

3.4 Ahol a futópálya után végbiztonsági megállási területet (SWY) alakítanak ki, a rendelkezésre álló gyorsításból történő megállási távolság az A-1. (C) ábra szerint tartalmazza ennek hosszát is.

Futópálya	09	27	17	35
TORA	2000 m	2000 m	NH	1800 m
ASDA	2300 m	2350 m	NH	1800 m
TODA	2580 m	2350 m	NH	1800 m
LDA	1850 m	2000 m	1800 m	NH



A-1. (F) ábra: Kijelölt távolságok

3.5 Ahol a futópálya küszöböt áthelyezték, a rendelkezésre álló leszállási távolság azzal a távolsággal csökken az A-1. (D) ábra szerint, amellyel a küszöb a futópálya végétől áthelyezésre került. Az áthelyezett küszöb csak arra a futópálya küszöbre végrehajtott megközelítésekhez rendelkezésre álló leszállási távolságot befolyásolja, az ellentétes irányra végrehajtott műveletek kijelölt távolságait nem érinti.

3.6 Az A-1. (B — D) ábrák biztonsági felszállási, vagy végbiztonsági megállási területtel, illetve áthelyezett küszöbbel rendelkező futópályát ábrázolnak. Ahol ezen jellemzők közül több is előfordul, tehát több kijelölt távolság változik, a módosítást azonos alapelv és módszer szerint végezzék el. Ilyen helyzetet mutat be az A-1. (E) ábra.

3.7 A kijelölt távolságok közzétételének javasolt módszerét az A-1. (F) ábra, illetve a mellékelt táblázat mutatja be. Ha egy futópálya irányt nem lehet fel, vagy leszállásra, esetleg mindkettőre igénybe venni, mert ez üzemeltetési szempontok miatt tilos, a távolságokat ne tegyék közzé, vagy az "NH" — nem használható kifejezést alkalmazzák.

4. A futópálya lejtviszonyok

4.1 Lejtviszony változások közötti távolság

A következő példa a lejtviszony változások közötti távolság meghatározását mutatja be (lásd A-2. ábra):

A 3 kód-számú futópálya esetében a "D" érték legalább a következő legyen:

15 000 {(x-y) + (y-z)} m
ahol:
(x-y) az x-y abszolút számértéke
(y-z) az y-z abszolút számértéke

feltételezve, hogy;

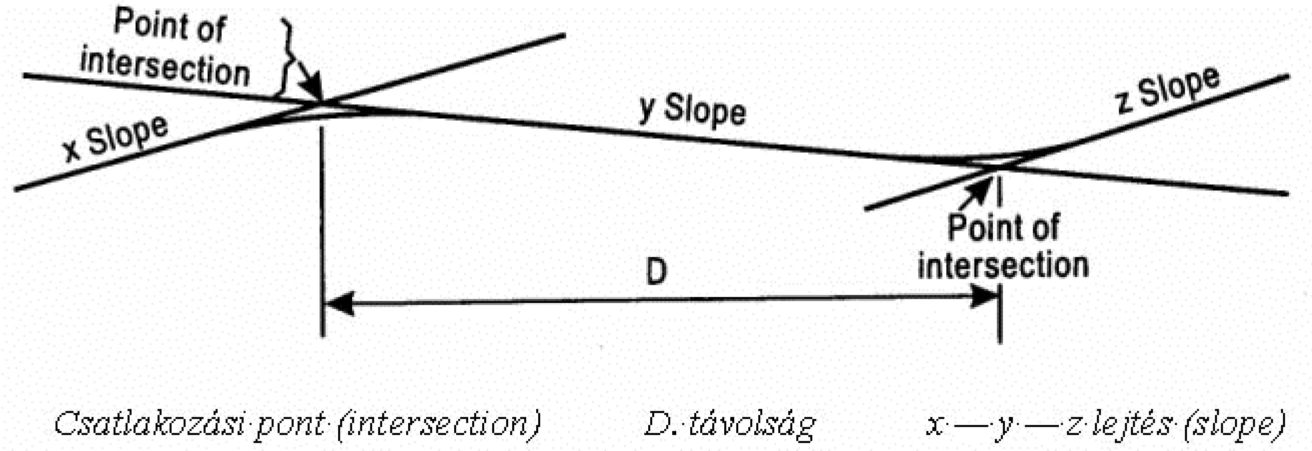
x = + 00.1 y = — 0.005 z = + 0.005

ebből;

(x-y) = 0.015 (y-z) = 0.010

A számítás alapján "D" nem lehet kevesebb, mint:

15 000 (0.015 + 0.010) m azaz 15 000 x 0.025 = 375 m.



A-2. ábra: A futópálya középvonal profilja

4.2 Hossz és keresztirányú lejtés

Ha a tervezett futópálya lejtviszonyai különböző jellegűek és a változások a 3. fejezet 3.1.13 — 3.1.19 pontjaiban engedélyezett szélső határok között vannak, vizsgálják meg, hogy a kialakítandó futópálya profil nem befolyásolja hátrányosan a repülőgépek üzemeltetését.

4.3 Rádió magasságmérő üzemeltetési terület

Az időjárási körülményektől független végső megközelítési szakaszra történő automatikus ráállást, vagy automatikus repülésvezérléssel történő leszállást végrehajtó repülőgép üzemeltetési igényeinek kielégítése érdekében kívánatos, hogy legalább a precíziós megközelítésű futópálya küszöb előtti 300 méter hosszú négyszögletes területen kerüljék, vagy a legkisebbre korlátozzák a lejtviszonyok változásait. A terület a meghosszabbított középvonal mentén szimmetrikusan helyezkedjen el, szélessége 120 méter legyen. Ha különleges körülmények ezt szükségessé teszik, lehetséges ennek a szélességnek legfeljebb 60 méterre történő csökkentése, de csak abban az esetben, ha a légiforgalmi vizsgálat azt jelzi, hogy ez a csökkentés nem befolyásolja hátrányosan a légijármű üzemeltetés biztonságát. Ez kívánatos, mert a rádió magasságmérővel felszerelt repülőgépek, amelyek azt a megközelítés végső szakaszában, közvetlenül a futópálya küszöb fölött és a kilebegtetésnél pontos magassági tájékoztatás céljából használják, a rádió magasságmérő információit automatikusan a robotpilótához továbbítják. Ahol a lejtviszony változás elkerülhetetlen, a két egymást követő lejtős terület közötti változás értéke ne haladja meg a 2 % / 30 méter értéket.

5. Futópálya felület egyenetlensége

5.1 A futópálya burkolt felületének egyenetlenségei a következő általános, szabványos határon belül, rövid, három méteres távolságok vonatkozásában elfogadhatók és gyakorlati szempontból megfelelők:

A műszaki csatornák fedőlapjai, valamint a vízelvezető árkok kivételével a teherviselő terület felső burkolt felülete bármely három méter hosszú vizsgált szakaszon bármely irányba olyan egyenletes legyen, hogy azon a burkolat felső szintje és a vizsgált szakasz legmélyebb pontja között 3 mm-nél nagyobb mélység-eltérés ne legyen.

5.2 A futópálya fények, vagy a vízelvezető rendszer elemeinek (rácsok) elhelyezése alkalmával vigyázzanak arra, hogy fenntartsák a futópálya burkolt felületeinek egyenletességét (simaságát).

5.3 A légijármű üzemeltetés, valamint a felületek alapozásának különböző fokú tömörülése a felület egyenetlenségeinek kialakulásához vezet. A fenti határértéktől való kis eltérés nem veszélyezteti komolyan a légijárművek üzemeltetését. Általában a felület elszórt, különálló 2.5 — 3.0 cm mélységű egyenetlenségei 45 méteres távolságon belül elfogadhatók. A legnagyobb elfogadható egyenetlenség értékek pontos meghatározása a különböző légijármű típusok és sebességek miatt nem lehetséges.

5.4 A futópálya felület szerkezetének változása miatt idővel növekszik az úgynevezett "víz-teknők" kialakulásának lehetősége. Az akár már alig 3 mm mélységű teknők, különösen ha azok olyan helyen vannak, ahol a leszálló légijárművek futóművei nagy sebességgel gurulnak, gumiabroncs vízen csúszást okozhatnak és ez a sokkal kisebb vízmennyiséggel fedett, nedves futópályán folyamatosan fennmaradhat.
A jelentősebb hosszúságú, illetve mélységű víz-teknőknek a vízen csúszásra gyakorolt hatására vonatkozó újabb útmutatások kidolgozásához további vizsgálatok szükségesek. Természetesen különösen lényeges a hibák kijavítása akkor, ha a tócsák megfagyhatnak.

6. A hóval és/vagy jéggel borított burkolt felületek súrlódási jellemzőinek meghatározása és közzététele

6.1 A hóval és/vagy jéggel borított futópályák súrlódási jellemzőiről megbízható és egységes tájékoztatás közzététele szükséges. A futópálya burkolt felület súrlódási jellemzők pontos és megbízható meghatározását súrlódási mérő berendezésekkel lehet elvégezni. Mindazonáltal az ilyen berendezésekkel beszerzett adatok és a repülőgépek fékezési teljesítménye közötti kapcsolatot a számos függő tényező miatt, mint például a repülőgép tömege, sebessége, fékberendezése, gumiabroncs szerkezete, futómű jellemzők és így tovább, még tovább szükséges vizsgálni.

6.2 Amennyiben a futópálya részben, vagy egészben hóval, vagy jéggel borított, mérjék meg a súrlódási együttható értékét és ezt a mérést a körülmények változásakor ismételjék meg. A futópályán kívül, más burkolt felülettel ellátott területek súrlódás mérését és/vagy fékhatás ellenőrzését akkor végezzék el, ha ezeken kedvezőtlen súrlódási együttható jellemzők kialakulása várható.

6.3 A burkolt felület súrlódási állapot meghatározásának legjobb alapja a súrlódási együttható értékek mérése. A futópálya felületi súrlódás értéke az a legnagyobb érték, amelynél a gumiabroncs még forog, de már csúszik. A mérést különböző berendezésekkel lehet elvégezni, azonban mivel gyakorlati szempontból a futópálya felületi súrlódás felmérésének és jelentésének egységessége szükséges, a mérést lehetőleg olyan berendezéssel végezzék, amely a futópálya teljes hosszában folyamatos mérésre képes. A különböző mérési módszerekkel és a súrlódási együttható mérőberendezések jellemzőivel kapcsolatos útmutató a *Repülőtér Szolgálati Kézikönyv* 2. részében található.

6.4 A *Repülőtér Szolgálati Kézikönyv* olyan táblázatot tartalmaz, amelyben ismertetjük a kiválasztott hóval és/vagy jéggel borított futópálya felületeken végzett vizsgálatokat és bemutatjuk az egyes súrlódási együttható mérőberendezések, valamint a fenti felületek közötti összefüggést is.

6.5 A futópálya súrlódási állapotát "fékhatás tájékoztatás"-ként a mért, vagy számított súrlódási együttható μ értékben, vagy becsült fékhatás értékben fejezzék ki. Az egyes számszerű μ értékek szükségszerű összefüggésben vannak a súrlódási együttható mérőberendezéssel, az ellenőrzött burkolt felület kialakításával és állapotával, valamint a mérés sebességével.

6.6 A következő táblázatot csak összenyomott hó és jég állapotra vonatkozó súrlódási adatokból készítették és adatai ezért nem tekinthetők abszolút, minden csapadék szennyeződésre érvényes μ értékeknek. Ha a felületen hó és/vagy jég található és a jelentett fékhatás "jó", a repülőgépvezetők várhatóan nem számíthatnak olyan jó fékhatásra, mint amelyet a száraz és tiszta futópálya burkolt felületnél tapasztalhatnak (ahol a rendelkezésre álló súrlódás jóval nagyobb lehet, mint amilyenre bármely esetben szükség van). A "jó" fékhatás érték tehát csak egy összehasonlító, viszonylagos jellemző, amely jelzi, hogy a repülőgépnek, különösen a leszállás végrehajtása során nem lesznek iránytartási és fékezési nehézségei.

6.7 Szükségesnek bizonyult, hogy a felületi súrlódásra vonatkozó tájékoztatást futópálya minden egyes harmadrészére adják meg. A futópálya egyes harmadrészeit A, B és C szakaszként határozzák meg. A légiforgalmi szolgálati egységeknek szóló tájékoztatás szempontjából az „A” harmad mindig az a futópálya szakasz, amely alacsonyabb értékű futópálya azonosítóval rendelkezik. Mindazonáltal, amikor a tájékoztatást a repülőgépvezetőnek a leszállás előtt adják meg, a szakaszok megnevezése: a futópálya első, második és harmadik része. Az elő rész minden esetben a futópálya leszállási irányból látható első harmada.

Mért súrlódási együttható	***Becsült fékhatás***	***Fékhatás kód-érték***
0.40 és magasabb	jó	5
0.39 -től 0.36 -ig	közepes — jó	4
0.35 -től 0.30 -ig	közepes	3
0.29 -től 0.26 -ig	közepes — gyenge	2
0.25 és ez alatt	gyenge	1

A súrlódás mérést a futópálya két párhuzamos sávjában végzik, azaz a futópálya középvonal mentén mindkét oldalon körülbelül 3 méter, vagy az általános igénybevételnek megfelelő olyan oldaltávolságban, ahol a legtöbb légijármű működik. Az ellenőrzés célja az A, B és C szakaszok (harmad) átlagos súrlódási együttható (μ) értékeinek meghatározása. Amikor folyamatos súrlódás mérőt alkalmaznak, az átlagos értéket az egyes szakaszok mért súrlódási értékeiből számítják ki. Ha egyes pontokban mérő berendezést használnak, a mérési pontok közötti távolság ne legyen nagyobb, mint futópálya felhasználható hosszának körülbelül 10 százaléka. Amennyiben úgy ítélik meg, hogy a futópálya középvonal egy oldalán, egy sávban elvégzett ellenőrzés elegendő, az egyes harmadokon belül legalább három — három mérést végezzenek. Az ellenőrzés eredményét és a számított átlagos súrlódási együttható értékeket megfelelő táblázatban jelezzék (lásd a *Repülőtéri Szolgálati Kézikönyv* 2. része).

Megjegyzés: Ahol ez alkalmazható, kérésre közöljék a végbiztonsági megállási terület súrlódási értékeit is.

6.8 Az összenyomott hóval és/vagy jéggel borított futópálya felületek súrlódási értékeinek mérésére folyamatos mérést végző berendezések használhatók. Ezek közé tartoznak a Skiddométer, SFT felületi súrlódás vizsgáló, Mu-méter, Grip típusú ellenőrző, vagy az RFT futópálya burkolt felület súrlódás ellenőrző berendezések. Bizonyos felületi körülmények között, mint például összenyomott havon és jégen levő igen vékony száraz hó réteg esetén a lassulásmérő berendezések használhatók (Tapley és Bakemeter-Dynometer típusok). A futópálya felületi súrlódás mérésére más súrlódás mérő berendezések is használhatók, feltéve hogy azokat az alkalmazás előtt összevetették a fent említett típusok egyikével. A lassulásmérőt ne használják laza havon, vagy latyakban, mert a kapott eredmények félrevezetők lehetnek. Bizonyos szennyeződések, illetve levegő és burkolat hőmérséklet kombinációk esetén más berendezések is félrevezető eredményt adhatnak.

6.9 Az ellenőrző berendezések egységes felhasználására és ezzel az egységes mérési eredmények biztosítására, a felületi szennyeződések eltávolítására és a futópálya felületi súrlódás jellemzők javítására vonatkozóan a *Repülőtéri Szolgálati Kézikönyv* 2. része tartalmaz útmutatót.

7. A nedves futópálya felületek súrlódási jellemzőinek meghatározása

7.1 A burkolt felülettel ellátott nedves futópálya súrlódási jellemzőinek mérése a következő célokból történik:

a) az új, vagy újra burkolt futópálya nedves állapotban tapasztalható súrlódási jellemzőinek meghatározása (3. fejezet 3.1.24 pont);

b) a burkolt felülettel ellátott futópálya nedves állapotban tapasztalható időszakos síkosságának felmérése (10. fejezet 10.2.3 pont);

c) a gyenge vízelvezetés súrlódásra gyakorolt hatásainak meghatározása (10. fejezet 10.2.6 pont); és

d) a szokatlan és különleges körülmények között síkossá váló burkolt felülettel ellátott futópálya súrlódásának meghatározása (2. fejezet 2.9.8 pont).

7.2 A nedves futópálya felület súrlódási jellemzők meghatározása érdekében ellenőrizni kell az új építésű, vagy új burkolattal ellátott futópályákat. Bár ismert tény, hogy a súrlódás a futópálya használata során csökken, ez a kapott érték jelzi a rendelkezésre álló felületi súrlódás értékét a futópálya relatív hosszú középső szakaszán, amelyen nincs a repülőgépek üzemeltetésénél bekövetkező gumimaradvány szennyeződés és így közvetlen gyakorlati haszonnal rendelkezik. Az ellenőrzéseket és méréseket tiszta felületen végezzék. Ha a vizsgálat végrehajtása előtt a felületet nem lehet letisztítani, az alapméréseket a futópálya középső, tiszta szakaszán végezhetik el.

7.3 A meglevő felületek állapotát meghatározó súrlódási ellenőrző vizsgálatokat a nedves állapotban gyenge súrlódási jellemzőkkel rendelkező futópályák azonosítása érdekében időszakosan el kell végezni. Az állam határozza meg az elfogadhatónak tekinthető legalacsonyabb súrlódás szintjét és ezt a Légiforgalmi Tájékoztató Kiadványban (AIP) tegyék közzé. A nedves állapotban az elfogadhatónak tekinthető legalacsonyabb súrlódás értékénél gyengébb súrlódással rendelkező futópálya síkosnak / csúszósnak osztályozandó. Amikor egy futópálya, vagy futópálya szakasz súrlódási értéke a közzétett érték alatt van, a megfelelő tájékoztatást NOTAM formájában tegyék közzé. Az állam továbbá határozzon meg egy adott karbantartás tervezési szintet is, amely alatt megfelelő javító intézkedések szükségesek a súrlódási érték javítására. Mindazonáltal, ha az egész futópálya, vagy egy futópálya szakasz súrlódási értéke a közzétett minimális érték alatt van, karbantartást, illetve a megfelelő javító intézkedéseket késedelem nélkül, azonnal végre kell hajtani. A súrlódási ellenőrző méréseket olyan időközökben végezzék el, amelyek biztosítják a karbantartást, vagy különleges felületi kezelést igénylő futópályák azonosítását még a nem kielégítő állapot bekövetkezése előtt. A mérések közötti időszak olyan tényezőktől függ, mint a repülőteret igénybe vevő légijárművek típusa, a forgalom nagyságrendje, az időjárási körülmények, a burkolt felület típusa, állapota és karbantartása, valamint a helyi műszaki követelmények.

7.4 A meglevő, új, vagy újra burkolt futópályák súrlódás ellenőrző vizsgálatát az egységesség, valamint a más futópályákkal történő összehasonlíthatóság érdekében folyamatos súrlódás mérésre alkalmas berendezéssel végezzék, amely megfelelő mintázatú gumiabronccsal rendelkezik. A mérést ön-nedvesítésre alkalmas berendezéssel végezzék, amely legalább 1 mm. vízmélység mellett teszi lehetővé a felület súrlódási jellemzőinek mérését.

7.5 Amikor azt feltételezik, hogy a gyenge vízelvezetés, a nem megfelelő lejtviszonyok, valamint az anyag (alapozás) tömörülése miatt a futópálya súrlódási jellemzői csökkenhetnek, további ellenőrzés szükséges, de ekkor már természetes *(helyi eső)* körülmények között. Ez a vizsgálat különbözik az előzőtől, mert a gyenge vízelvezetéssel rendelkező területen a felgyülemlett víz mélysége a helyi eső kialakulásakor általában nagyobb. A korábbiakban jelzett ön-nedvesítő berendezés segítségével történő méréssel szemben ezzel a vizsgálattal jobban meg tudják határozni a várható gyenge súrlódás értéket, amely gumiabroncs vízen csúszás bekövetkezéséhez vezethet. Amennyiben a helyi körülmények nem teszik lehetővé a természetes körülmények között végzett vizsgálatot, ezt megfelelő módon szimulálni is lehet.

7.6 Számításba kell venni, hogy bizonyos szokatlan körülmények esetén, például ha hosszú ideig tartó szárazság után először esik nagyobb mennyiségű eső, akkor bár a súrlódás a csúszós futópályára közzétett állami értékek felett van, az adott futópálya nedves állapotban síkossá válhat. Amennyiben ilyen körülmények kialakulásáról tudomást szereznek, végezzék el a futópálya felületi súrlódás méréseket, mert gyanítható, hogy a futópálya síkossá válik.

7.7 Amennyiben a 7.3 — 7.6 pontokban jelzett mérések bármelyike azt jelzi, hogy csak a futópálya egy része síkos, egyaránt fontos a tájékoztatás közzététele, valamint a megfelelő tisztítás elvégzése is.

7.8 A nedves futópályán végzett súrlódási ellenőrzés során fontos figyelembe venni azt, hogy az összenyomott hóval, vagy jéggel borított felületek eseteivel szemben — ahol a súrlódási együttható értékét a sebesség csak igen kis mértékben befolyásolja — a sebesség növekedésével a súrlódás csökken. Mindazonáltal a sebesség növekedésével a súrlódás csökkenésének aránya kisebb mértékű lesz. A futómű gumiabroncs és a futópálya felület közötti súrlódási együttható értékét befolyásoló tényezők közül különösen fontos a burkolat szerkezete. Ha a futópálya jó makró szerkezete lehetővé teszi a víz kiszorítását a gumiabroncs alól, tehát az abroncs és az érintkező felület közül, a súrlódás értékét a sebesség kevésbé befolyásolja. Ezzel szemben, a gyenge makró szerkezet esetében a sebesség növekedésével a súrlódás értéke jelentősen csökken. A fentiek alapján a futópályák ellenőrzése során, amikor a súrlódást és az esetleg szükséges karbantartási intézkedéseket határozzák meg, a súrlódás/sebesség változatok figyelembevétele érdekében elég magas sebességgel dolgozzanak.

7.9 A 14. Annex I. kötete előírásai alapján az államok a következő két súrlódási szintet határozzák meg:

a) a karbantartási súrlódási szintet, amely alatt kezdjék meg a javító karbantartás végrehajtását; és

b) legalacsonyabb súrlódási szintet, amely alatt tájékoztatást kell közzétenni arról, hogy a futópálya nedvesen síkossá válhat.

Ezen túlmenően az államok határozzák meg az új, vagy újra burkolt futópálya felület súrlódási jellemzőit is. Az A-1. táblázat útmutatást nyújt az új futópálya felületek tervezéséhez, valamint karbantartási terveihez. A táblázat továbbá tartalmazza a használatos futópálya felületek legalacsonyabb súrlódási szintjét is.

7.10 A megadott, egy tagállamban kísérletek alapján kidolgozott súrlódási értékek abszolút értékek, amelyek tűrés nélkül alkalmazandók. A Mu-méteren elhelyezett két darab sima mintázatú, különleges anyagú gumiabroncsot a berendezés hosszirányú tengelyéhez viszonyítva 15°-os értékben elfordítva alkalmazták (A. típus). A RFT futópálya súrlódás ellenőrző, SFT burkolt felület súrlódás mérő, TATRA és Skiddométer berendezéseken hasonló, azonban csak egy darab gumiabroncsot használtak (B. típus). A Griptester berendezésnél a fentiekhez hasonló, de kisebb gumiabroncs segítségével végezték a vizsgálatot (C. típus). A gumiabroncsok meghatározását a *Repülőtéri Szolgálati Kézikönyv* 2. része tartalmazza.

A programban ismertetett gumiabroncsoktól eltérő szerkezetű, mintázatú, nyomású abroncsokkal, eltérő vízmélység és vizsgálati sebesség mellett végzett súrlódás ellenőrzések nem hozhatók közvetlen összefüggésbe a táblázat értékeivel. Az 5, 6 és 7 oszlopokban levő értékek a futópálya, vagy ennek jelentős részére vonatkozó átlagértékek. Kívánatos, hogy a burkolt felülettel ellátott futópálya felületi súrlódás jellemzőit több ellenőrzési sebességgel határozzák meg.

7.11 A nedves futópályák súrlódási értékeinek mérésére a fentiektől eltérő berendezéseket is lehet használni feltéve, hogy azok megfelelnek a vonatkozó előírásoknak és azokat ellenőrzésként legalább egyszer összevetették a fent megjelölt berendezések egyikével. A tervezési célkitűzéseknek, a karbantartási tervezési szintnek, valamint a legalacsonyabb felületi súrlódás értékének megfelelő futópálya felületi súrlódás értékek egyéb berendezésekkel történő meghatározása módszereivel kapcsolatos útmutatás a *Repülőtéri Szolgálati Kézikönyv* 2. részében található.

A-1. táblázat: Az új vagy újra burkolt futópálya felületek súrlódási jellemzői

Futópálya felületi súrlódás ellenőrző berendezés	Súrlódás mérő gumiabroncs típusa	Súrlódás mérő gumiabroncs nyomása (kPa)	Súrlódás ellenőrző vizsgálat sebessége (km/h)	Vizsgálati víz mélység (mm)	Új futópálya felület tervezési szint átlagérték	Futópálya felület karbantartási tervezési szint átlagérték	Futópálya felület legalacsonyabb súrlódási szint átlagérték
(1)	(2)	(2)	(3)	(4)	(5)	(6)	(7)
Vontatott Mu-méter	A	70	65	1,0	0,72	0,52	0,42
	A	70	95	1,0	0,66	0,38	0,26
Vontatott Skiddométer	B	210	65	1,0	0,82	0,60	0,50
	B	210	95	1,0	0,74	0,47	0,34
SFT fékhatás ellenőrző gépjármű	B	210	65	1,0	0,82	0,60	0,50
	B	210	95	1,0	0,74	0,47	0,34
RFT fékhatás ellenőrző gépjármű	B	210	65	1,0	0,82	0,60	0,50
	B	210	95	1,0	0,74	0,54	0,41
TATRA fékhatás ellenőrző gépjármű	B	210	65	1,0	0,76	0,57	0,48
	B	210	95	1,0	0,76	0,57	0,48
Vontatott GRIPTESTER	C	140	65	1,0	0,74	0,53	0,43
	C	140	95	1,0	0,64	0,36	0,24

8. Futópálya sávok

8.1 Padkák

8.1.1 A futópálya, vagy végbiztonsági megállási terület padkát úgy készítsék el, vagy alakítsák ki, hogy a lehető legkisebbre csökkentsék a lefutó repülőgép sérülésének kockázatát. A következőkben ismertetünk néhány konkrét nehézséget, illetve ezek megoldását célzó útmutatást, valamint olyan intézkedéseket, amelyekkel megakadályozható a felszínen levő laza kő, vagy más idegen tárgy hajtóműbe történő beszívása.

8.1.2 Egyes esetekben a futópálya sáv talajának természetes teherbíró-képessége külön egyedi munkálatok nélkül elegendő lehet a megfelelő követelmények teljesítésére. Ahol a talaj különleges előkészítésére és kialakítására van szükség, az alkalmazott módszerek a helyi talajviszonyoktól és az repülőgépek tömegétől függ, amelyek kiszolgálására a futópályát tervezték. A legjobb módszer meghatározásához (például vízelvezetés, rögzítés, alapozás, könnyű burkolat kialakítás) segítséget nyújt a talajvizsgálatok elvégezése.

8.1.3 A padka tervezése alkalmával különösen figyeljenek annak megakadályozására, hogy a felszínen levő laza köveket, vagy más idegen tárgyakat a hajtómű beszívja. Ebben az esetben is hasonló meggondolások alkalmazandók, mint *Repülőtéri Tervezési Kézikönyv* 2. részében a gurulóút tervezés esetében tárgyaltunk. Megfelelő figyelmet szenteljenek úgy a szükséges intézkedéseknek, mint a távolságoknak, amelyeken belül ezek az intézkedések szükségesek.

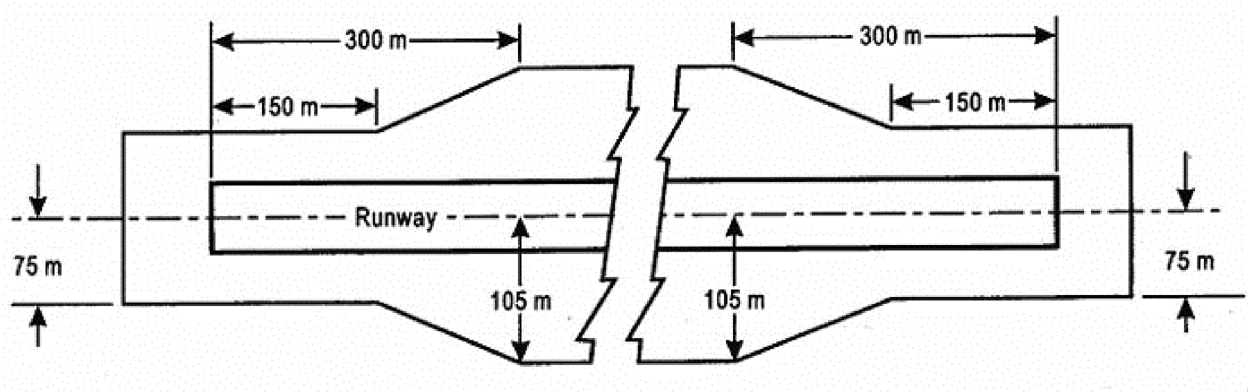
8.1.4 Ahol a padkákat a szükséges teherbíró-képesség biztosítása, vagy a kövek és idegen anyagok jelenlétének megakadályozása érdekében különleges módszerekkel alakították ki, nehézséget okozhat a futópálya burkolt felület és a szomszédos sáv megfelelő, jól látható megkülönböztetése. Ez a nehézség megoldható a futópálya burkolat és a sáv eltérő felületű (szín, vagy egyéb jól látható különbség) kialakításával, vagy a futópálya oldalsáv jelzés elhelyezésével.

8.2 Tárgyak a futópálya sávokban

A futópálya mellett elhelyezkedő sáv területén belül megfelelő intézkedésekkel előzzék meg, hogy a sáv talajába süllyedő repülőgép futómű ott kemény, kiálló (függőleges) akadályba ütközzön. Különleges nehézségek adódhatnak a sávon belül, vagy egy gurulóút, illetve más futópálya kereszteződésnél elhelyezett futópálya fény-egység talapzatok, vagy más hasonló szerkezeti elemek miatt. Ezért a futópálya, vagy gurulóút építése során, ahol a felületnek egy síkban kell lennie a sáv felületével, illetve szintjével, a kemény kiálló tárgyak okozta veszély kiküszöbölhető úgy, hogy merev szerkezetének felső szintje nem kevesebb, mint 30 cm-el a sáv talajszintje alatt helyezkedik el. Más tárgyak esetében, amelyeknek feladatuk miatt nem kell a talajszinten elhelyezkedniük, azokat legalább 30 cm-el a sáv talajszintje alá betemetve helyezzék el.

8.3 A precíziós megközelítésű futópálya sávjának elegyengetése

A 3. fejezet 3.4.8 pontjának ajánlása szerint egy 3 vagy 4 kód-számú műszeres futópálya sáv azon része, amely a futópálya középvonalától mindkét oldalra legalább 75 méter távolságon belül van, megfelelő módon legyen elegyengetve. A 3 vagy 4 kód-számú precíziós megközelítésű futópálya esetében kívánatos lehet a szélesség növelése. Az ilyen futópálya esetében alkalmazható sáv méretét és alakját az A-3. ábra mutatja be. A sávot a futópályáról lefutó légijárművekről szóló tájékoztatások alapján tervezték meg. Az elegyengetendő rész a középvonaltól 105 méter távolságig terjed, azonban ezt a távolságot a sáv két végén, a futópálya végétől 150 méter hosszan fokozatosan a középvonaltól 75 méterre csökkenthetik.



A-3. ábra: Precíziós megközelítésű futópálya sávjának elegyengetett része 3 vagy 4 kód-szám esetén

9. Futópálya végbiztonsági területek

9.1 Ha a 3. fejezet előírásaival összhangban futópálya végbiztonsági területet alakítanak ki, az elég hosszú legyen ahhoz, hogy a kedvezőtlen üzemeltetési tényezők miatt bekövetkező túlfutás, vagy küszöb előtti földetérés esetén a légijármű ott akadályba ne ütközzön. A precíziós megközelítésű futópálya esetében az első akadály általában az ILS iránysáv antenna; a végbiztonsági sáv eddig terjedjen. Más körülmények között, továbbá a nem-precíziós, vagy nem-műszeres megközelítésű futópálya esetében az első akadály általában egy út, egy vasútvonal, illetve más mesterséges, vagy természetes képződmény. Ilyenkor a végbiztonsági sáv eddig az akadályig terjedjen.

9.2 Ahol a futópálya végbiztonsági terület kialakítása olyan területeken történne, ahol ez komoly nehézségekbe ütközik, vagy nem valósítható meg, azonban az illetékes hatóság ilyen terület kialakítását szükségesnek ítéli, vegyék számításba a kijelölt távolságok csökkentésének lehetőségét.

10. A futópálya küszöb elhelyezése

10.1 Általános rész

10.1.1 A futópálya küszöb általában a futópálya végén helyezkedik el feltéve, hogy a megközelítési felület fölé akadály nem nyúlik. A helyi körülmények miatt bizonyos esetekben szükséges lehet a küszöb állandó áthelyezése, amellyel a következő pontban foglalkozunk. Az elhelyezés tervezése alkalmával vegyék figyelembe az ILS vonatkozási alap-magasságot és/vagy MLS megközelítési vonatkozási magasság alap-adatot, valamint határozzák meg az akadálykorlátozási határértékeket is (lásd 10. Annex I. kötet).

10.1.2 Annak megállapítása során, hogy a megközelítési felületbe (fölé) nem nyúlik akadály, a megközelítési terület futópálya küszöbtől számított legalább 1200 méter hosszúságú és nem kevesebb, mint 150 méter szélességű szakaszán belül vegyék figyelembe az előforduló mozgó tárgyakat is (mint például gépjárművek az utakon vagy vonatszerelvények, stb.).

10.2 Áthelyezett futópálya küszöb

10.2.1 Ha egy akadály a megközelítési felületbe nyúlik és azt nem lehet eltávolítani, vegyék fontolóra a futópálya küszöb állandó áthelyezését.

10.2.2 A 4. fejezet akadály korlátozási céljainak teljesítése érdekében a legkedvezőbb esetben a küszöböt a futópályán olyan távolságra helyezzék át, amely a megközelítési felület akadálymentességének biztosításához szükséges.

10.2.3 Természetesen a küszöb áthelyezése a futópálya végéről csökkenteni fogja a rendelkezésre álló leszállási távolságot és ez üzemeltetési szempontból nagyobb jelentőségű lehet, mint a megközelítési felület jelzett és kivilágított akadállyal történő megsértése. Ezért a futópálya küszöb áthelyezésére és a megfelelő távolság meghatározására vonatkozó döntés során az akadálymentes megközelítési felület és a leszállási távolság között optimális egyensúly kialakítására van szükség. A mérlegelésnél vegyék figyelembe azokat a repülőgép típusokat, amelyek kiszolgálására a futópályát tervezték, a korlátozó látástávolság és felhőalap tényezőket, amelyek között a futópályát üzemeltetni fogják, az akadály helyét a küszöbhöz és a meghosszabbított középvonalhoz viszonyítva, valamint a precíziós megközelítésű futópálya esetén az akadálynak az akadálykorlátozási határértékek meghatározására gyakorolt jelentőségét.

10.2.4 A rendelkezésre álló leszállási távolság megállapításánál ne hagyják figyelmen kívül, hogy a küszöb kiválasztott helye ne eredményezze a küszöbhöz csatlakozó akadálymentes felület lejtésének:

– 4 kód-szám esetén több mint 3.3 % -osra; és

– 3 kód-szám esetén több mint 5.0 %-osra történő növekedését.

10.2.5 Ha a küszöböt az akadálymentes felületekre vonatkozó fenti követelmények alapján helyezik el, vegyék figyelembe a 6. fejezet áthelyezett küszöbre vonatkozó akadály jelölési előírásait.

11. Bevezető fény rendszerek

11.1 Típusok és jellemzők

11.1.1 A jelen kötetben található előírások az egyszerű és a precíziós bevezető fényrendszer jellemzőit ismertetik. A rendszerek egyes elemeinél, mint például a középvonal fények és keresztfénysorok térköze esetében bizonyos oldalirányú eltérés lehetséges. Az általánosan elfogadott bevezető fényrendszerek elrendezését az A-5. és A-6. ábrák mutatják be. A II. és III. kategóriás precíziós bevezető fényrendszer belső 300 méterének elrendezése az 5-13. ábrán látható.

11.1.2 A bevezető fényrendszer elrendezése független a futópálya küszöb helyétől, azaz attól, hogy a küszöb a futópálya végén, vagy másutt helyezkedik el. A bevezető fényrendszer mindkét esetben a küszöbig tart, bár az áthelyezett küszöb esetében a meghatározott elrendezés biztosítása érdekében a futópálya vége és a küszöb között beépített fényeket használnak. Ezek tegyenek eleget az 5. fejezet 5.3.1.9 szerkezeti, valamint a 2. Függelék A2-1. vagy A2-2. ábrák fényerősségre vonatkozó követelményeinek.

11.1.3 A fényrendszer tervezésénél alkalmazott repülési pálya határokat és értékeket az A-4. ábra mutatja be.

11.2 Létesítési határértékek

Vízszintes

11.2.1 A létesítési határértékeket az A-6. ábra ábrázolja.

11.2.2 A bevezető fényrendszer középvonala a lehető legnagyobb mértékben, de maximálisan ±15’ (fok-perc) tűréshatáron belül essen egybe a futópálya meghosszabbított középvonalával.

11.2.3 A középvonal fények hosszirányú távköze olyan legyen, hogy minden egyes keresztfénysor egy-egy fény-egysége, vagy fény csoportja, valamint a metsző középvonal fények egymáshoz képest a lehető leginkább egyenletes távolságra elosztva helyezkedjenek el. Ez vonatkozik a küszöb és a keresztfénysor, valamint két keresztfénysor egység közötti középvonal fényekre is.

11.2.4 A rövid és a teljes keresztfénysor egységek a bevezető fényrendszer középvonalfényeihez viszonyítva megfelelő szögben, de az A-6.(A) ábra esetén maximálisan ±30’ (fok-perc), az A-6. (B) ábra esetén ±2° tűréshatáron belül helyezkedjenek el.

11.2.5 Ha a keresztfénysort eredeti kijelölt helyéről át kell helyezni, a vele szomszédos keresztfénysort is helyezzék át lehetőség szerint olyan mértékben, hogy a távközök változatlanul egyenlők maradjanak.

11.2.6 Amennyiben az A-6. (A) ábrán látható rendszerben levő keresztfénysort eredeti helyéről áthelyezték, annak teljes hosszát úgy változtassák meg, hogy az a vonatkozási ponttól számított tényleges távolság 1/20 része maradjon. Mindazonáltal nem szükséges a fény-egységek közötti szabványos 2.7 méteres távolság megváltoztatása, de a keresztfénysorok s bevezető fényrendszer középvonala mentén változatlanul szimmetrikusan helyezkedjenek el.

Függőleges

11.2.7 A legkedvezőbb elrendezés az, ha az összes bevezető fény-egység a küszöbön vízszintes síkban halad át (lásd A-7. ábra), tehát a helyi körülmények figyelembevétele mellett ezt a célkitűzést tartsák szem előtt. Mindazonáltal az épületek, fák és egyéb tárgyak nem takarhatják el a fényeket a repülőgépvezető (látótere) elől, aki a külső jeladó berendezés (marker) környékén várhatóan 1°-al az elektronikus megközelítési siklópálya alatt repül.

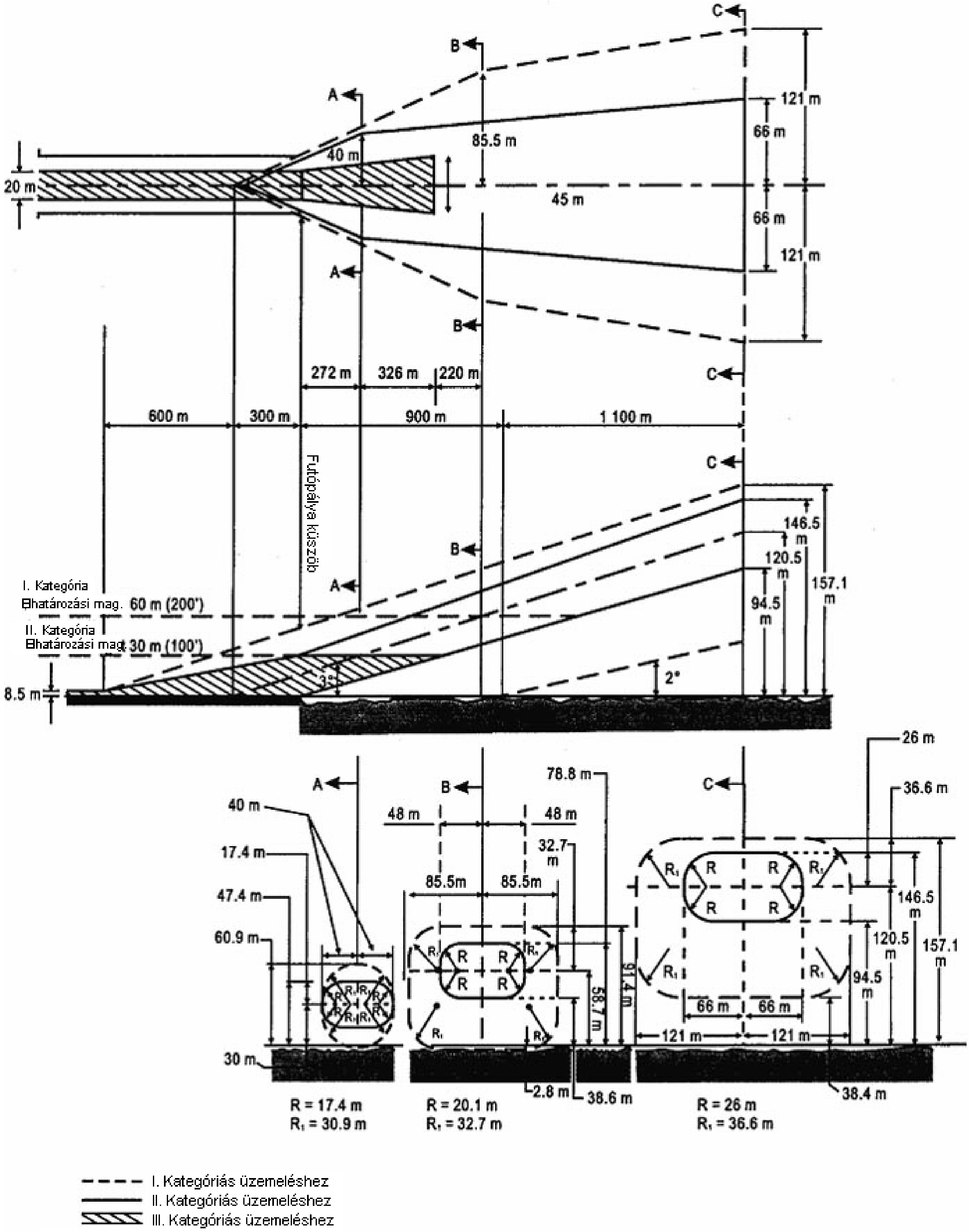
11.2.8 A futópálya végétől 150 méter távolságon belül, valamint a biztonsági felszállási, vagy végbiztonsági megállási területen a fényeket a helyi körülmények figyelembevétele mellett a talajhoz lehető legközelebb helyezzék el, hogy a lehető legnagyobb mértékben csökkentsék túlfutás, vagy korai földetérés miatt a repülőgépet fenyegető veszély illetve sérülés kockázatát. A biztonsági felszállási, vagy végbiztonsági megállási területen túl nem annyira szükséges a földhöz közeli elhelyezés és ezért a földfelszín egyenetlenségeit a megfelelő magasságú tartószerkezetek felhasználásával kiegyenlíthetik.

11.2.9 Kívánatos, hogy a fény-egységeket lehetőleg úgy szereljék fel, hogy a középvonal mindkét oldalán 60 méter távolságon belül semmiféle tárgy ne nyúljon a bevezető fényrendszer síkja fölé. Ahol a középvonaltól 60 méter távolságon belül és precíziós bevezető fényrendszer esetén a küszöbtől 1350 méter, vagy egyszerű bevezető fényrendszer esetén 900 méter távolságon belül magas tárgy helyezkedik el, tanácsos a fényeket úgy elhelyezni, hogy a fényrendszer síkjának külső fele a tárgy fölé nyúljon.

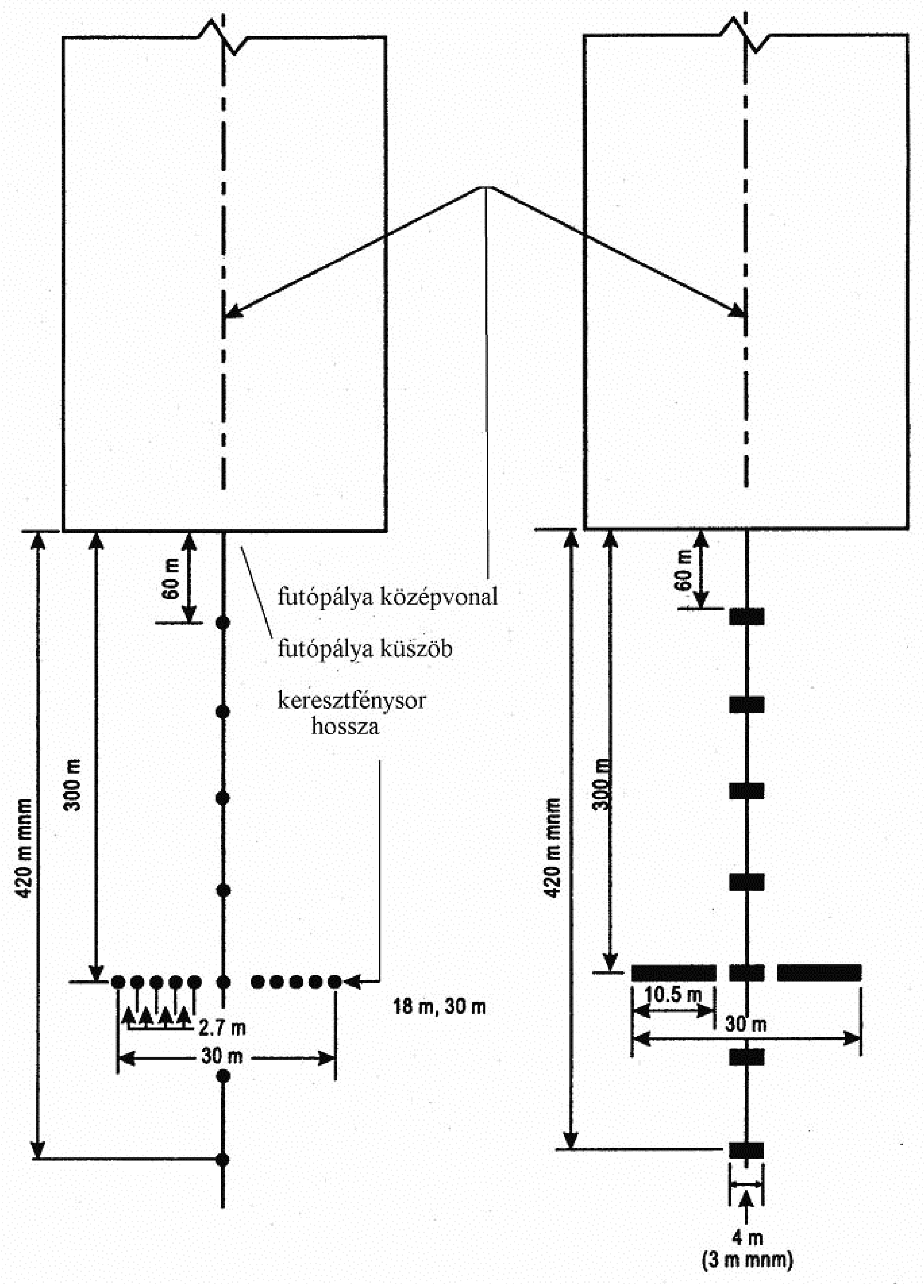
11.2.10 A felszín síkja téves ábrázolásának elkerülése érdekében a fényeket a futópálya a küszöbtől kifelé 300 méter távolságig 1:66 aránynál, ezen túl pedig 1:40 aránynál nagyobb mértékben lejtve ne helyezzék el. A II. és III. kategóriás bevezető fényrendszernél szigorúbb követelmény lehet szükséges, például a küszöbtől számított 450 méter távolságon belül lejtés nem lehetséges.

11.2.11 *Középvonal.* A bevezető fényrendszer középvonal bármely részének (beleértve a biztonsági felszállási és a végbiztonsági megállási területeket is) lejtése, vagy emelkedése a lehető legkisebb legyen, de ne haladja meg az 1:60 arányt. A gyakorlati tapasztalatok azt mutatták, hogy emelkedés esetén 1:66 arány, lejtés esetén pedig 1:40 arány bármely részen elfogadható.

11.2.12 Keresztfénysor. A keresztfénysor fény-egységeket úgy helyezzék el, hogy a csatlakozó középvonalon áthaladó egyenes szakasz lehetőleg vízszintes legyen. Mindazonáltal megengedhető, hogy a keresztfénysor fény-egységet nem több, mint 1:80 arányú keresztirányú lejtésben szereljék fel, ha ez lehetővé teszi a talaj közelében történő elhelyezést a biztonsági felszállási, vagy végbiztonsági megállási területen belül ott, ahol maga a terület keresztirányban lejt.



A-4. ábra:I. II. és III. kategóriás üzemelés repülési pálya szakaszai a fényrendszer tervezéshez (a névleges megközelítési siklópálya 99 % valószínűséggel 3°)



A/ egy fény-egységből álló rendszer B/ keresztfénysor egységből álló rendszer

A-5. ábra: Egyszerű bevezető fényrendszerek

11.3 Akadálymentesség

11.3.1 Az akadálymentesség biztosítása érdekében fényrendszer síkot határoztunk meg és a bevezető fényrendszer összes fény-egysége ezen síkon helyezkedik el. A sík formája négyszögletes és oldalai a középvonal mentén szimmetrikusak. A sík a futópálya küszöbnél kezdődik és a bevezető fényrendszer megközelítési végétől 60 méter távolságig tart, szélessége 120 méter.

11.3.2 A fényrendszer síkjának határain belül, az alábbi kivételektől eltekintve semmiféle tárgy nem nyúlhat ezen sík fölé. Az összes út és autópálya szakasz, amelynek legnagyobb magassága több mint 4.8 méter (az út alapszint felett), akadálynak tekintendő. Kivételt képeznek a repülőtéri szolgálati utak, amelyeken az összes gépjármű forgalom a repülőtéri hatóság ellenőrzése és a repülőtéri irányító szolgálat irányítása alatt áll. A vasúti pályák, amelynek legnagyobb magassága több mint 5.4 méter (a sínek felső szintje felett), a forgalom nagyságától függetlenül akadálynak tekintendők.

11.3.3 Elismert tény, hogy az elektronikus leszállító rendszer egyes részeit, mint például az antennákat, reflektorokat és monitorokat a fényrendszer síkja fölé kell elhelyezni. Tegyenek meg mindent azért, hogy ezek az eszközök a fényrendszer síkján kívülre kerüljenek, ami különösen a reflektorok és monitorok esetében sokszor megvalósítható.

11.3.4 Ahol az ILS iránysáv adót a fényrendszer síkjának határain belül helyezik el, az adó, vagy legalább annak antennája a sík fölé kell nyúljon. Ilyen esetekben a szerkezet magasságát a legkisebbre korlátozzák és azt a küszöbtől lehető legtávolabbra helyezzék el. Általános szabályként elfogadható, hogy a megengedhető magasság értéke a küszöbtől számított 30 méterenként 15 cm. Például, ha egy iránysáv adó 300 méterre van a futópálya küszöbtől, az antenna rendszer legfeljebb tízszer 15 cm. magassággal, azaz 150 cm-el nyúlhat a bevezető fényrendszer síkja fölé, azonban ezt a magasságot az ILS berendezés megfelelő működésének biztosítása mellett a lehető legkisebbre korlátozzák.

11.3.5 Az MLS oldalszög adóantenna elhelyezésével kapcsolatosan kövessék a *10. Annex G. Melléklet* 1. részében található útmutatót. Ebben az anyagban tájékoztatást adunk az ILS iránysáv adóval együtt történő telepítésre is és jelezzük, hogy az MLS oldalszög adóantennát a fényrendszer határain belül is elhelyezhetik, ahol annak más, a bevezető fényrendszer határain túl történő telepítése nem lehetséges, vagy nem kívánatos. Ha az MLS oldalszög adóantenna a futópálya meghosszabbított középvonalában helyezkedik el, az a lehető legtávolabb legyen a hozzá legközelebb eső fény-egységtől (a futópálya vége irányba). Ezen felül az MLS oldalszög adóantenna fázis-központja legalább 30 cm-el magasabban legyen, mint a hozzá legközelebb eső fény-egység. Ez a magasság 15 cm-re csökkenthető, ha a területen kedvezőtlen sugárterjedést nem tapasztalnak.

A fenti előírás teljesítése, melynek célja az, hogy az MLS jelminőségét a bevezető fényrendszer elemei ne befolyásolják, azt eredményezheti, hogy az MLS oldalszög adóantenna részben takarja a fényrendszert. Annak érdekében, hogy ez a fényrendszer teljesítményét, illetve felhasználhatóságát ne csökkentse, az antennát ne helyezzék el a futópálya végétől számított 300 méter távolságon belül.

A legjobb elhelyezési pont a 300 méter távolságra levő keresztfénysor után 25 méterre van. Ezzel az antenna 5 méterrel a futópálya vége mögött 330 méter távolságra levő fény-egység elé kerül. Ahol az MLS oldalszög adóantennát így telepítik, az csak a keresztfénysor középső fényét takarja részlegesen. Természetesen lényeges, hogy a keresztfénysor többi fénye mindig működőképes maradjon.

11.3.6 A fényrendszer sík határain belül levő olyan tárgyakat, amelyek miatt az előírások teljesítése érdekében a sík lejtésének növelése lenne szükséges, távolítsák el, helyezzék át, vagy csökkentsék annak magasságát, amennyiben ez a lejtés növelésével szemben gazdaságosabban végrehajtható.

11.3.7 Bizonyos esetekben létezhetnek olyan tárgyak, amelyek eltávolítása, áthelyezése, vagy magasságának csökkentése gazdaságosan és hatékonyan nem végezhető el. Ezek a futópálya küszöbhöz olyan közel helyezhetők el, hogy megsérthetik a 2 %-os lejtő síkját. Ahol ez szükséges és nincs más megoldás, a 2 százalékos lejtést olyan mértékben növeljék, hogy a bevezető fényrendszer a tárgy fölött legyen. Ez a lehetőség csak olyan helyekre vonatkozik, ahol az előírás teljesítése nem lehetséges. A lejtés növelését a lehető legkisebbre korlátozzák és a rendszer legkülső részén negatív lejtés nem lehetséges.

11.4 A csökkentett hosszúságú fényrendszer hatásai

11.4.1 A precíziós bevezetés végrehajtása során a repülőgépvezetőnek közvetlenül a leszállás előtt látás utáni tájékozódásra van szüksége és ezért nem lehet eléggé hangsúlyozni a precíziós bevezetések végrehajtását segítő megfelelő fénytechnikai berendezések szükségességét. Az ilyen üzemeltetés biztonsága és rendszeressége a látás utáni tájékozódás minőségétől függ. A futópálya küszöb feletti azon magasság, amelyen a repülőgépvezető eldönti, hogy megfelelő látás után tájékozódás áll rendelkezésére a precíziós megközelítés folytatására és a leszállás végrehajtására a megközelítés típusától, az időjárási körülményektől, a földi és légijármű berendezésektől, stb. függ. Az összes típusú megközelítés végrehajtásához megfelelő bevezető fényrendszer hosszúsága 900 méter és lehetőség szerint mindig biztosítsák ezt a hosszúságot.

11.4.2 Bizonyos futópálya helyszínek esetében azonban a precíziós megközelítések végrehajtásához nem lehetséges ilyen, 900 méter hosszú bevezető fényrendszer kialakítása.

11.4.3 A fenti esetekben tegyenek meg mindent a lehető leghosszabb bevezető fényrendszer biztosítása érdekében. A csökkentett hosszúságú fényrendszerrel rendelkező futópálya vonatkozásában az illetékes hatóság üzemeltetési korlátozásokat rendelhet el. Számos tényező befolyásolja azt a magasságot, amelyen a repülőgépvezetőnek el kell döntenie, hogy folytatja a leszálláshoz történő megközelítést, vagy megszakítja azt. Tudomásul kell venni, hogy a meghatározott magasság elérésénél a repülőgépvezető nem pillanatnyi, gyors döntést hoz. A megközelítési és leszállási manőver folytatásának eldöntése folyamatos szellemi tevékenység, amelynek csak végső pontja, azaz befejezése történhet meg a meghatározott magasságon. Ha a fények a döntési pont elérése előtt nem láthatók, a repülőgépvezető látás utáni tájékozódásának folyamata korlátozott lesz és jelentősen megnő a megszakított megközelítés végrehajtásának (azaz az átstartolásnak) valószínűsége. Az illetékes hatóságnak számos üzemeltetési tényezőt kell figyelembe venni a precíziós megközelítésre vonatkozó korlátozások elrendelése előtt, amelyeket a 6. Annex-ben részletesen ismeretünk.

12. Az optikai megközelítési siklópálya jelző rendszerek telepítésének elsőbbsége

12.1 Gyakorlati szempontból szükségtelennek találtuk az átfogó elemzés készítését arra vonatkozóan, hogy a repülőtér melyik futópályájára telepítsenek először optikai megközelítési siklópálya jelző rendszert, azonban a döntéshozatal során a következő tényezőket figyelembe kell venni:

a) a futópálya igénybevételének gyakorisága;

b) a kockázati tényező nagyságrendje, azaz a veszély komolysága;

c) a rendelkezésre álló egyéb látás utáni és műszeres segédeszközök; és

d) a kedvezőtlen időjárási körülmények gyakorisága és típusa, amelyek között a futópályát használják.

12.2 A kockázati tényező nagyságrendje, azaz a veszély komolysága tekintetében általános iránymutatóként használható az 5. fejezet 5.3.5.1 b). — e) pontjaiban található optikai megközelítési siklópálya jelző rendszer alkalmazási előírás, amely szerint biztosítsanak ilyen rendszert, ha:

a) nincs megfelelő látás utáni tájékozódás és irányvezetés, mert:

1) a megközelítést nappal víz, vagy jellegtelen talaj felszín felett hajtják végre éjszaka a megközelítési területen nincs elegendő tájékoztató fény; vagy

2) a környező talajfelszín, vagy futópálya lejtviszonyok miatt félrevezető tájékoztatások lehetségesek;

b) a megközelítés során súlyos kockázati tényezők lehetségesek;

c) komoly veszélyt jelent a repülőgép számára, ha az a futópálya előtt ér földet, vagy túlfut azon; és

d) a repülőgép a megközelítés végrehajtása alatt szokatlan turbulenciába kerülhet.

12.3 Az egyéb műszeres és látás utáni segédeszközök létezése, azaz igénybevételének lehetősége nagyon fontos tényező. Az ILS, vagy MLS berendezéssel ellátott futópálya általában nem kap elsőbbséget az optikai megközelítési siklópálya jelző rendszer telepítésénél, bár emlékeztetnünk kell arra, hogy a rendszer látás utáni megközelítési tájékoztatást nyújt és az elektronikus segédeszközök kiegészítője lehet. Amikor a légijármű üzemeltetés kockázati tényezője magas és/vagy a futópályát jelentős számú olyan repülőgép veszi igénybe, amely nem rendelkezik ILS, vagy MLS berendezéssel, az optikai megközelítési siklópálya jelző rendszer telepítése ennél a futópályánál elsőbbségben részesülhet.

12.4 A telepítésnél részesítsék elsőbbségben azokat a futópályákat, amelyeket gázsugár hajtóműves légijárművek használnak.

13. Nem használható területek kivilágítása

13.1 Ahol légijármű üzemelésre ideiglenesen nem használható terület található, azt állandó, vörös színű fényekkel jelölhetik meg. A fények a terület legveszélyesebb széleit jelezzék. Legalább négy darab ilyen fény-egységet használjanak, azonban a háromszög alakú területeken elegendő három darab fény. Ha a terület nagy, vagy szokatlan alaprajzú, használjanak több fény-egységet. A fényeket terület peremén legfeljebb egymástól 7.5 méter távolságra helyezzék el és ha azok irányított fények, fénysugarukat lehetőleg abba az irányba állítsák be, amelyből a légijárművek, vagy gépjárművel közelednek. Ha ez általában több irányból történik, vegyék fontolóra a fény-egységek számának növelését, vagy a körsugárzó fények használatát, hogy a terület minden irányból látszódjon. A légijármű üzemelésre nem használható terület fényei letörhetők legyenek. Magasságuk megfelelő legyen ahhoz, hogy fennmaradjon a légijárművek légcsavarjai, illetve sugárhajtómű gondolái és a fények közötti biztonsági távolság.

14. Gyors legurulóút kijárati jelzőfények

14.1 A gyors legurulóút kijárati jelzőfények a futópálya középvonala mellé telepített egyirányú sugárzású sárga színű fények. A fényeket 3-2-1 csoportosításban 10 méteres távközökben helyezik el a gyors legurulóút kijárati középvonal csatlakozási pontja előtt. A céljuk az, hogy a repülőgépvezető számára jelezzék a legközelebbi rendelkezésre álló gyors legurulóutat.

14.2 Alacsony látástávolság mellett a gyors legurulóút kijárati jelzőfények hasznos helyzettájékoztatást nyújtanak, miközben a repülőgépvezető a futópálya középvonalon történő gurulásra figyelhet.

14.3 A leszállást követő futópálya foglaltsági idő nagymértékben befolyásolja az elérhető legkedvezőbb futópálya kapacitást. A gyors legurulóút kijárati jelzőfények lehetővé teszik, hogy a légijármű magas kigurulási sebességgel haladjon addig, amíg megfelelő sebességre kell lassítania a gyors legurulóútra történő forduláshoz. Az első, hármas fény egység eléréséig a 60 csomós kigurulási sebesség bizonyult leginkább használhatónak.

15. A bevezető és futópálya fények fényerő szabályozása

15.1 A fények láthatósága a fény és a háttér közötti kontraszt-hatástól függ. Ahhoz, hogy a fényt a repülőgépvezető nappal megközelítés végrehajtása során használni tudja, annak legalább 2000, vagy 3000 cd fényerővel kell világítania és a bevezető fényrendszer esetében kívánatos a 20 000 cd fényerő. Erős nappali világosságban bekövetkező köd esetén esetleg nem lehet olyan nagy fényerőt biztosítani, amely használható lehet. Ezzel szemben, sötét éjszaka alkalmasnak és elegendőnek találhatják a 100 cd fényerőt a bevezető fénysor és az 50 cd fényerőt a futópálya szegélyfények használatára. Még ebben az esetben is előfordult, hogy a fények közelsége miatt a repülőgépvezetők néha panaszkodtak arról, hogy a szegélyfények túlságosan erősek.

15.2 A ködben a fényszóródás igen nagyfokú. Éjszaka a szétszórt fény olyan nagymértékben növeli a köd erősségét (fényesség) a megközelítési területen és a futópályán, hogy 2000 — 3000 cd fényerő fölött már csak igen kis mértékű látás (távolság) javulás tapasztalható. Amikor a fényerőt éjszaka annak érdekében növelik, hogy a fényeket minél távolabbról meg lehessen látni, azt nem szabad olyan nagyra fokozni, hogy a távolság csökkenésével a fények a repülőgépvezetőt vakítsák.

15.3 A fentiekből nyilvánvaló a repülőtéri fényrendszer fényerő szabályozásának fontossága az uralkodó körülmények alapján annak érdekében, hogy biztosítsák a fényrendszer legjobb hatásfokú felhasználását a repülőgépvezető (el)vakítása nélkül. A megfelelő fényerő beállítás minden egyes esetben a háttérvilágítástól, valamint a látástávolságtól függ. A különböző környezeti körülmények között kiválasztandó fényerővel kapcsolatos útmutató a *Repülőtér Tervezési Kézikönyv* 4. részében található.

16. Jel terület

Jel területet csak akkor szükséges kialakítani, ha azt a levegőben levő légijárművekkel földi látjelek útján történő összeköttetés tartásra kívánják felhasználni. Ilyen összeköttetés és jelzések szükségesek például akkor, ha a repülőtér nem rendelkezik repülőtéri irányító toronnyal, vagy repülőtéri repüléstájékoztató szolgálati egységgel, vagy ha a repülőteret olyan repülőgépek használják, amelyek nincsenek rádió-berendezéssel felszerelve. A földi látjelek továbbá hasznosak lehetnek a kétoldalú rádióösszeköttetés megszakadása esetében is. Mindazonáltal tény, hogy a földi látjelek segítségével adható tájékoztatások beszerezhetők az AIP kiadványokból és a NOTAM közleményekből. Ezért a jel terület kialakítására vonatkozó döntés előtt mérjék fel, hogy ténylegesen szükség van-e a földi látjelekre.

17. Tűzoltó és mentő szolgálatok

17.1 Adminisztráció

17.1.1 A repülőtéri tűzoltó és mentő szolgálat a repülőtér igazgatóság adminisztratív vezetése alatt áll és az igazgatóság felelős annak biztosításáért, hogy a tűzoltó és mentő szolgálatok feladataik hatásos elvégzésének biztosítása érdekében jól szervezettek és felszereltek, teljes személyzetük megfelelő kiképzésben és továbbképzésben részesült.

17.1.2 A kutató és mentő feladatok elvégzésére 12. Annex 4.2.1 pontjának megfelelően kidolgozandó részletes intézkedési terv elkészítése során a repülőtér igazgatósága egyeztesse azt az illetékes mentést koordináló központokkal, hogy a repülőtér körzetében bekövetkező légijármű baleset esetére pontosan meghatározzák és tisztázzák az egyes szolgálatok valamint központok felelősségi körét.

17.1.3 A repülőtéri tűzoltó és mentő szolgálatok és a védelmi szervezetek, mint például a helyi tűzoltóság, rendőrség, mentőszolgálat, egészségügyi szervezetek, kórházak, fegyveres testületek (beleértve a honvédség, légierő, tengerészet, stb. szervezeteit) közötti együttműködést a légijármű baleset esetére előzetes megállapodással szabályozzák.

17.1.4 Az érintett repülőtéri szolgálatok számára készítsék el és adják át a repülőtér és közvetlen környezetének pontos, négyzetrácsokra felosztott térképét. Jelezzék rajta a talajviszonyokat, a földfelszín jellegzetességeit, bejárati utakat, valamint a víz-vételi lehetőségek helyét is. A térképet a repülőtéri irányító toronyban és a tűzoltó állomáson jól látható helyen helyezzék el, valamint bocsátsák a tűzoltó és mentő gépjárművek és más, a légijármű balesetben, vagy eseményben tevékenykedő gépjárművek személyzete rendelkezésére. Javasoljuk, hogy a térkép példányait osszák szét a közszolgálati védelmi szervezetek között is.

17.1.5 Az érintettekkel közösen határozzák meg a vészhelyzet esetére kidolgozott utasításokat és felelősségi köröket. Az illetékes hatóság feladata az utasítások szétosztása és annak ellenőrzése, hogy az érintettek megismerjék azokat.

17.2 Kiképzés

A tűzoltó és mentő szolgálatok személyzetének kiképzési és továbbképzési programja tartalmazza legalább a következő témaköröket:

a) repülőtéri helyszín ismeretek;

b) légijármű típus ismeretek;

c) tűzoltó és mentő szolgálatok személyzetének személyi biztonsága;

d) a repülőtér vészhelyzeti távközlési rendszerei, beleértve a légijármű tűzesetre történő riasztás módszereit;

e) a 9. fejezet 9.2 részében előírtak teljesítéséhez szükséges tűzoltó tömlők, szórófejek, habágyúk és egyéb berendezések használata;

f) a 9. fejezet 9.2 részében előírtak teljesítéséhez szükséges tűzoltó anyagok;

g) segítségnyújtás a légijármű vészkiürítéséhez;

h) tűzoltási műveletek;

i) a légijármű tűzoltó és mentő feladatok végrehajtásánál alkalmazott különleges mentő eszközök és felszerelések jellemzői és használata;

j) veszélyes árucikkek és jellemzőik;

k) a tűzoltó személyzet feladatainak ismertetése és részletes tanulmányozása a repülőtéri kényszerhelyzeti terv alapján; és

l) védőruházat és légző-felszerelés ismertetése és használata.

17.3 A biztosítandó védelem szintje

17.3.1 A 9. fejezet 9.2 része alapján a repülőtéren biztosítandó tűzoltó és mentő szolgálat védelmi szintje a meghatározott repülőtéri kategóriának feleljen meg.

17.3.2 Mindazonáltal a 9. fejezet 9.2.3 pontja lehetővé teszi, hogy korlátozott ideig alacsonyabb védelmi szintet biztosítsanak ott, ahol a repülőteret általában igénybe vevő legmagasabb kategóriába tartozó repülőgépek mozgás-száma az egymást követő legforgalmasabb három hónap alatt 700-nál alacsonyabb. Fontos megjegyezni, hogy ez a 9.2.3 pontban ismertetett lehetőség csak ott alkalmazható, ahol a 700 mozgás számú forgalomban nagy eltérések vannak a résztvevő légijárművek méretei között.

17.4 Különleges körülmények esetén használt mentőfelszerelések

17.4.1 Azon a repülőtéren, amely vízfelület, mocsár, vagy más nehezen megközelíthető hely közelében helyezkedik el és a szolgálatot hagyományos gépjárművekkel teljes mértékben ellátni nem lehet, biztosítsanak alkalmas mentő felszerelést és szolgálatot. Ez különösen fontos ott, ahol a megközelítés, vagy indulás jelentős része ilyen területek felett történik.

17.4.2 A mentő felszerelést az adott területen történő üzemelésre alkalmas csónakon, vagy más járművön, például helikopteren, kétéltű, vagy légpárnás járművön szállítsák. Ezeket úgy helyezzék el, hogy a szolgálat területén belül gyorsan bevethetők legyenek.

17.4.3 A vízparton levő repülőtéren a csónakokat, vagy más járműveket lehetőség szerint a repülőtéren helyezzék el és biztosítsanak alkalmas kikötőt, illetve vízrebocsátási helyet is. Amennyiben ezeket a járműveket nem a repülőtér területén helyezik el, a csónakok, vagy egyéb megfelelő járművek a repülőtéri tűzoltó és mentő szolgálat rendelkezési állományába tartozzanak vagy ha ez nem lehetséges, olyan közszolgálati, vagy magán szervezet ellenőrzése és irányítása alatt álljanak, amely szoros együttműködést tart fenn a repülőtéri tűzoltó és mentő szolgálattal. Ezek közé tartozhat a rendőrség, a fegyveres testületek, a parti őrség, vagy a kikötő őrség.

17.4.4 Alkalmazzák a lehető legnagyobb sebességű csónakokat, vagy más járműveket annak érdekében, hogy ezek a baleset helyszínét a lehető leggyorsabban érjék el. A mentési feladatok végrehajtása során bekövetkező sérülések számának csökkentése érdekében javasoljuk, hogy a hajócsavar meghajtású csónakok helyett vízsugár meghajtású csónakokat használjanak, kivéve ha a hajócsavarok megfelelő burkolattal vannak ellátva. Amennyiben a szolgálat területén levő vízfelületek az év jelentős részében befagynak, a járművek kiválasztásánál ezt is vegyék figyelembe. A szolgálat járműveit szereljék fel tutajokkal és mentőmellényekkel, kétoldalú rádióösszeköttetést biztosító berendezésekkel, valamint éjszakai feladatokhoz szükséges reflektoros világítással. A tutajok és mentőmellények mennyisége vonatkozásában a repülőteret általában igénybe vevő nagyobb légijármű jellemzőit vegyék alapul. Ha rossz látás körülmények közötti légijármű üzemelés várható, vagy lehetséges, a tűzoltó és mentő gépjárművek helyszínre történő irányítása, illetve a helyszín eléréshez szükséges tájékoztatások és útmutatások megadása válhat szükségessé.

17.4.5 A felszerelések üzemeltetésére kijelölt tűzoltó és mentő személyzet feladataik hatásos elvégzésének biztosítása érdekében a repülőtér körülményeinek megfelelő kiképzésben és továbbképzésben részesüljön.

17.5 Berendezések és eszközök

17.5.1 Az alapvető fontosságú vészhelyzeti és általános rutin tájékoztatások független rendszeren történő továbbításának biztosítása érdekében kívánatos a tűzoltó és mentő szolgálatok külön telefon, kétoldalú rádióösszeköttetés, valamint általános riasztó rendszerének kialakítása. Az egyes repülőterek igényei és jellemzői figyelembevétele mellett a fenti eszközök a következő célokat szolgálják:

a) közvetlen kapcsolattartás a riasztást végző hatóság és a repülőtéri tűzoltó állomás között a légijármű baleset, vagy esemény alkalmával szükséges gyors és szakszerű riasztás végrehajtásának, továbbá a tűzoltó és mentő szolgálat személyzetének és gépjárműveinek helyszínre történő irányításának biztosítására;

b) a nem készenléti szolgálatban levő kijelölt személyzet azonnali és egyértelmű riasztása;

c) egyéb, a repülőtér területén, vagy azon kívül elhelyezkedő szolgálatok szükség szerinti riasztása; és

d) kétoldalú rádióösszeköttetés fenntartása a légijármű baleset, vagy esemény során beavatkozó és készenlétben álló tűzoltó és mentő egységekkel, valamint járművekkel.

17.5.2 A légijármű baleset sérültjeinek, valamint áldozatainak mentése és ellátása céljából rendelkezésre álló mentő és orvosi eszközök, illetve berendezések kiválasztásánál az illetékes hatóság az általános, egész repülőtérre vonatkozó repülőtéri kényszerhelyzeti terv keretén belül nagyon gondosan mérje fel az igényeket és ezek szerint intézkedjen.

18. Gépjárművek üzemeltetői

18.1 A mozgási területen a gépjárművek üzemeltetéséért felelős illetékes hatóság biztosítsa, hogy a gépjárművek üzemeltetői megfelelő képzésben részesüljenek, amely a gépjárművezető szakmai képzésén túl a következőket tartalmazhatja:

a) a repülőtér felszíne és terepviszonyai;

b) a repülőtéri jelzések, jelölések és fények;

c) rádió összeköttetési és használati eljárások;

d) a repülőtéri irányítás által alkalmazott közlemények és kifejezések, beleértve az ICAO ABC-t is;

e) a légiforgalmi szolgálatok szabályai, amennyiben azok a földi üzemelést érintik;

f) a repülőtér szabályai és előírásai; és

g) egyéb, például a tűzoltó és mentő tevékenységgel összefüggő ellátandó, illetve teljesítendő feladatok.

18.2 A gépjárművek üzemeltetői szükség szerint megfelelő vizsgával bizonyítsák, hogy:

a) ismerik a gépjármű adó-vevő berendezésének működését, vagy használatát;

b) értik és betartják a légiforgalmi irányítás szabályait, valamint a helyi eljárásokat;

c) ismerik a repülőtér területét és képesek a gépjárművel történő tájékozódásra; és

d) rendelkeznek az egyes feladatokhoz szükséges különleges szakismereteket.

Ezen felül a gépjármű üzemeltetője rendelkezzen állami vezetői engedéllyel, állami rádiótávbeszélő kezelői, vagy más megfelelő engedéllyel.

18.3 A fenti előírásokat a gépjármű üzemeltetője által elvégzendő feladatoknak megfelelő módon alkalmazzák, tehát nem szükségszerű, hogy minden üzemeltető azonos szintű képzésben részesüljön. Például azon gépjármű üzemeltetője, akinek feladatai csak a forgalmi előtérre korlátozódnak, csak ennek megfelelő kiképzést kapjon.

18.4 Ha a rossz látási körülmények közötti üzemelésre külön eljárások és előírások érvényesek, kívánatos, hogy a gépjármű üzemeltetője ezek ismeretéből időszakonként vizsgát tegyen.

19. A burkolt felület teherbíró-képesség meghatározás ACN-PCN módszere

19.1 Túlterhelés

19.1.1 A burkolt felületek túlterhelése a túlságosan nagy terheléstől, a folyamatosan növekvő terheléstől, vagy mindkettőtől bekövetkezhet. A tervezési, vagy kiértékelési teherbíró-képességnél nagyobb terhelés lerövidíti a burkolt felület műszaki élettartamát, míg a kisebb terhelés meghosszabbítja azt. A különösen nagy túlterheléstől eltekintve a burkolatok szerkezeti viselkedése nem olyan, hogy egy adott határ feletti terhelés esetén hirtelen károsodnak. A burkolat tervezési műszaki élettartama alatt bizonyos számú meghatározható terhelés hatásainak ellenáll, tehát esetenként kismértékű túlterhelés is elfogadható, amennyiben az rövid ideig tart és nem rendszeres. Ebben az esetben csak kis mértékben csökken a műszaki élettartam és romlik a burkolt felület műszaki állapota. Azon üzemeltetések vonatkozásában, amelyeknél a túlterhelés nagyságrendje és/vagy gyakorisága nincs részletesen kidolgozva, javasoljuk a következő tényezők figyelembevételét:

a) rugalmas burkolatok esetében olyan légijárművek időszakos (alkalomszerű) mozgása, amelyek ACN[2] értéke nem több, mint 10 százalékkal haladja meg a közzétett PCN[3] felső értéket, a burkolatot nem károsítja;

b) a merev, vagy olyan összetett burkolatok esetében, amelyeknél a merev réteg képezi a szerkezet elsődleges részét, olyan légijárművek időszakos (alkalomszerű) mozgása, amelyek ACN értéke nem több, mint 5 százalékkal haladja meg a közzétett PCN felső értéket, a burkolatot nem károsítja;

c) ha nem ismerik a burkolt felület szerkezetét, alkalmazzák az 5 százalékos korlátozást; és

d) a túlterhelések (mozgások) éves száma ne haladja meg a teljes évi légijármű mozgások számának körülbelül 5 százalékát.

19.1.2 A túlterhelés általában nem lehetséges olyan burkolatok esetében, amelyek elöregedés, szerkezeti károsodás, vagy egyéb meghibásodás jeleit mutatják. Ezen kívül kerüljék a burkolt felület túlterhelését fagyveszélyes időszakok után ,valamint ha a burkolatot, illetve annak alapozás rétegeit víz gyengíthette meg. A burkolat túlterhelését eredményező üzemeltetés esetén az illetékes hatóság rendszeresen ellenőrizze a burkolat állapotát és gondosan figyelje a túlterhelésre vonatkozó fenti tényezőket, mert a túlzott túlterhelés nagy mértékben csökkentheti a burkolat műszaki élettartamát, vagy olyan meghibásodásokat okozhat, amelyek kijavítása költséges és nagy munka.

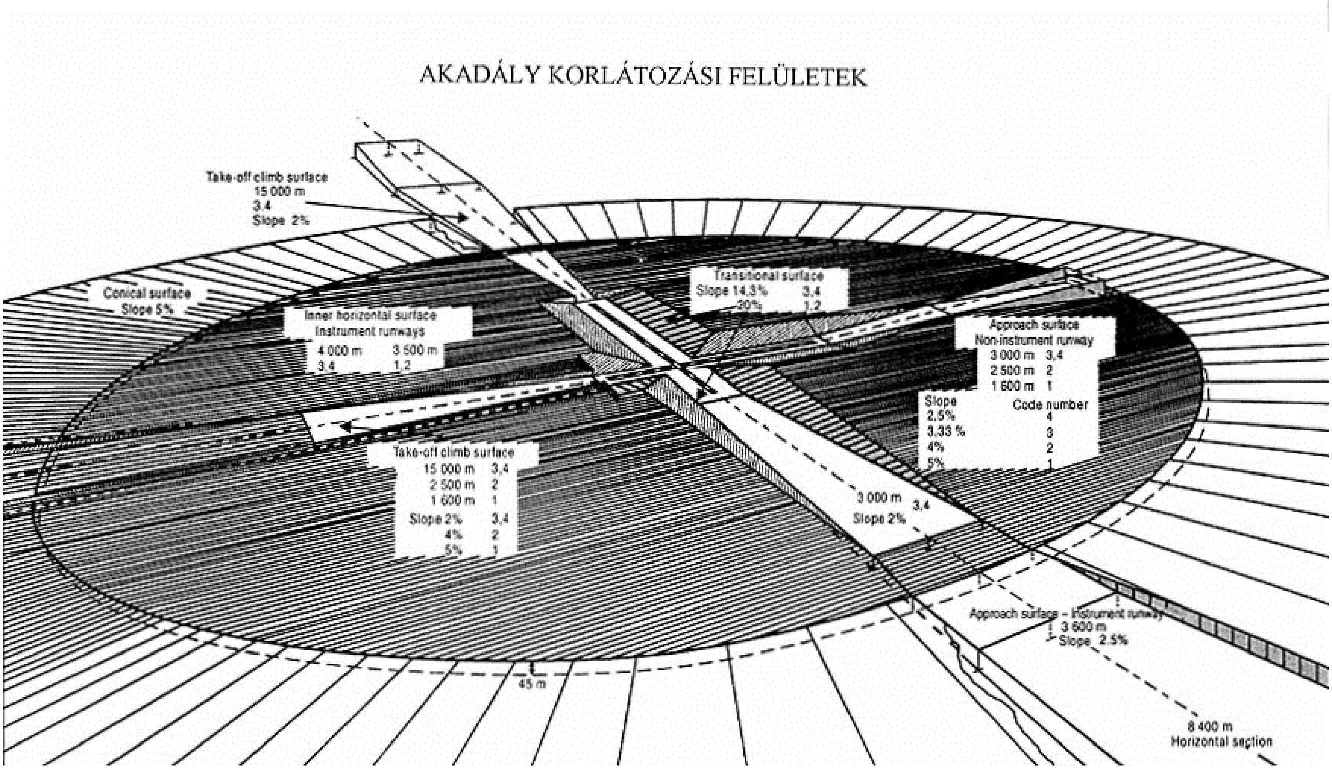
19.2 A légijármű típusok osztályozási szám értéke

A felhasználás megkönnyítése érdekében a 2. fejezet 2.6.6 b) pontja alapján meghatároztuk számos, ma üzemelő légijármű típus merev és rugalmas burkolatokra vonatkozó ACN-PCN értékét és az eredményeket a *Repülőtér Tervezési Kézikönyv* 3. részében táblázatban tettük közzé.

B. Melléklet

A 14. Annex I. kötet kiegészítő tájékoztatója

1. Az akadály korlátozási felületek



B-1. ábra: Két futópályával rendelkező repülőtér akadály korlátozási felületei

Megjegyzés: A futópályák közül az egyik műszeres, a másik nem-műszeres futópálya és mindkettőt felszállásra is használják.

Felületek	***Felület hossza***			***Lejtés***
	3. és 4. kategória	*2. kategória*	*1. kategória*	
Felszállási emelkedési felület	15000 méter	2500 méter	1600 méter	4. kat/ 2 % 3. kat/ 2 % 2. kat/ 4 % 1. kat/ 5 %
Műszeres futópálya belső vízszintes felület	4000 méter	3500 méter	3500 méter	
Átmeneti felület				3. és 4. kat/ 14.3 % 1. és 2. kat/ 20 %
Műszeres futópálya megközelítési felület	3000 méter	3600 méter	3600 méter	3. és 4. kat/ 2 % 1. és 2. kat/ 2.5 %
Nem-műszeres futópálya megközelítési felület	3000 méter	2500 méter	1600 méter	4. kat/ 2.5 % 3. kat/ 3.33 % 2. kat/ 4 % 1. kat/ 5 %
Vízszintes szakasz	8400 méter			
Kúpos felület				5 %

ANNEX 14/II.
Repülőterek: Heliportok

II. kötet 2. kiadás – 1995. július
3. módosítással
A jelen kiadvány magába foglalja a 14. Annex II. kötetének 1995 március 14-e előtt elfogadott összes módosításait és 1995 november 9-től hatálytalanítja a 14. Annex II. kötetének összes korábbi kiadásait.

Nemzetközi Polgári Légiközlekedési Szervezet
ICAO
A nemzetközi szabványok és ajánlott gyakorlatok alkalmazhatóságával kapcsolatosan lásd az Előszót valamint az egyes Fejezetek vonatkozó pontját.

Módosítások
A módosítások kiadásáról az ICAO Journal és az egyéb ICAO kiadványok valamint Audio-vizuális kiképzési segédanyagok havi katalógusa rendszeres tájékoztatást biztosítanak. Kísérjék figyelemmel a fenti kiadványokat és a módosításokat az alábbi rovatokba vezessék be:

Módosítás			
száma	*kiadás időpontja*	*alkalmazhatóság időpontja*	*bevezette*
Második kiadás (Első módosítással)	1994. július 24.	1995. november 09.	
Második kiadás második módosítása (A Tanács 1997. március 20-án fogadta el)	1997. július 21.	1997. november 06.	
Harmadik módosítás (A Tanács 2004. február 27-én fogadta el)	2004. július 12.	2004. november 25.	

Kiegészítés			
száma	*kiadás időpontja*	*alkalmazhatóság időpontja*	*bevezette*

Tartalomjegyzék

A 14. Annex II. kötetében alkalmazott rövidítések és jelzések

Rövidítések	
cd	Gyertyafény érték
cm	centiméter
D	forgószárnyas légi-jármű legnagyobb teljes mérete
FATO	végső megközelítési és felszállási terület
ft	láb
HAPI	forgószárnyas légi-jármű megközelítési siklópálya jelzőberendezés
Hz	Hertz
IMC	Műszeres időjárási körülmények
kg	kilogramm
km/h	kilométer/óra
kt	csomó
L	liter
L/min	liter / perc
LDAH	Rendelkezésre álló leszállási távolság
m	méter
RD	a legnagyobb forgószárny átmérő
RTODAH	rendelkezésre álló megszakított felszállási távolság
s	másodperc
TLOF	földetérési és elemelkedési terület
TODAH	rendelkezésre álló felszállási távolság
VMC	Látási időjárási körülmények

Jelölések	
°	fok
=	egyenlő
%	százalék
+/-	plusz vagy mínusz

A jelen Annex előírásaival kapcsolatos kézikönyvek

Repülőtér Létesítménytervezési Kézikönyv (Doc 9157)
1.rész - Futópálya
2.rész - Gurulóutak, forgalmi előterek és kitérő várakozó helyek
3. rész - Burkolt felületek
4. rész - Látásos segédeszközök és berendezések
5. rész - Elektromos rendszerek
Repülőtéri Tervezés Kézikönyve (Doc 9184)
1. rész - Alaptervezés
2. rész - Földterület felhasználás és környezetvédelem
3. rész - Építési tanácsadó segédanyag
Repülőtér Szolgálati Kézikönyv (Doc 9137)
1.rész - Tűzoltó és mentő szolgálatok
2. rész - Burkolt felületek állapota
3. rész - Madárveszély és annak csökkentése
4. rész - Köd oszlatás (visszavonva)
5. rész - A mozgásképtelen légi-jármű eltávolítása
6. rész - Akadályok ellenőrzése és jelölése
7. rész - Repülőtér kényszerhelyzeti illetve vészhelyzeti terv
8. rész - Repülőtér üzemi szolgálatok
9. rész - Repülőtér karbantartási eljárások
Helikopter repülőtér kézikönyv (Doc 9261)
STOL repülőtér kézikönyv (Doc 9150)
ICAO madárveszély tájékoztatási kézikönyv IBIS (Doc 9332)
Földi mozgás irányítási és ellenőrző rendszerek kézikönyve SMGCS (Doc 9476)

Előszó

Történeti háttér

A repülőterekre vonatkozó nemzetközi előírásokat és ajánlott gyakorlati eljárásokat a Tanács először a Nemzetközi Polgári Légiközlekedési Egyezmény (Chicago 1944) 37. cikkelyének rendelkezései alapján 1951 május 29-én fogadta el és foglalta a 14. számú Annex-be. Ezeket a nemzetközi szabványokat és ajánlott gyakorlatokat jelenleg a 14. Annex I. kötete tartalmazza, amely általában a repülőtér tervezéssel, kialakítással és üzemeltetéssel foglalkozik, azonban nem alkalmazható a helikopter repülőtérre.

Ezért a helikopter repülőterekre vonatkozó előírások közzététele érdekében elkészítettük a II. kötetet. A helikopter repülőtér tervezésre, kialakításra és üzemeltetésre vonatkozó átfogó nemzetközi szabványokat és ajánlott gyakorlatokat a Léginavigációs Bizottság látás utáni segédeszközökkel foglalkozó valamint forgószárnyas légi-jármű üzemeltetési munkacsoportjainak segítségével dolgoztuk ki.

Az A. táblázat a vonatkozó tárgy és az időpontok megjelölésével mutatja a módosításokat, amely időpontokban azokat a Tanács elfogadta, azok érvénybe léptek illetve alkalmazhatóvá váltak.

A szerződő államok tevékenysége

Az eltérések jelentése
Felhívjuk a szerződő államok figyelmét az Egyezmény 38. cikkelyéből adódó azon kötelezettségükre, hogy a szerződő állam értesítse a Szervezetet bármely eltérésről, amely saját országos előírásai és gyakorlata illetve a jelen Annex nemzetközi szabványai és ennek bármely módosítása között van. Felkérjük továbbá a szerződő államokat, hogy az ilyen értesítést terjesszék ki valamennyi olyan eltérésre is, amely a jelen Annex-ben található ajánlott gyakorlatokat és ezek bármely módosítását érinti, amennyiben ezen eltérések a légiközlekedés biztonsága szempontjából lényegesek. Ezen felül kérjük, hogy a szerződő államok folyamatosan tájékoztassák a Szervezetet bármilyen jövőbeni eltérésről valamint a korábbiakban jelzett eltérés megszűnéséről. A jelen Annex minden egyes módosításának elfogadása után külön az eltérésekről szóló értesítést kérő levelet küldünk majd minden szerződő államnak.

Felhívjuk a szerződő államok figyelmét a 15. Annex rendelkezéseire, amelynek alapján saját országos szabályaik és gyakorlatuk valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltérésekről szóló tájékoztatásaikat az Egyezmény 38. cikkelyében előírt kötelezettségük mellett a Légiforgalmi Tájékoztató Szolgálat útján is tegyék közzé.

A tájékoztatások továbbítása és közzététele
A jelen Annex-ben ismertetett nemzetközi szabványok és ajánlott gyakorlatok alapján biztosított, a forgószárnyas légijárművek üzemeltetését érintő létesítmények, szolgálatok és eljárások létrehozását illetve megszüntetését a 15. Annex előírásainak megfelelően jelentsék be.

Az Annex részeinek jogállása

Az Annex a következő részekből áll, de nem feltétlenül szükséges, hogy minden rész megtalálható legyen minden egyes Annex-ben.

Az egyes részek jogállása a következő:

1.— Az Annex anyaga:

a) *Nemzetközi szabványok és ajánlott gyakorlatok*, amelyeket az Egyezmény rendelkezései szerint a Tanács fogad el. Ezek meghatározása a következő:

Szabvány: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amelynek egységes alkalmazását szükségesnek tartják a nemzetközi légiközlekedés biztonsága és menetrendszerű fenntartása érdekében és amellyel kapcsolatban az Egyezmény alapján a Szerződő Államok megállapodnak. Amennyiben a teljes megállapodás nem lehetséges, az eltérést az Egyezmény 38. cikkelyében foglaltak alapján az érintett Államoknak a Tanács felé jelenteniük kell.

Ajánlott gyakorlat: Bármilyen fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre vagy eljárásra vonatkozó követelmény, amely egységes alkalmazását a nemzetközi légiközlekedés biztonsága, menetrendszerű és hatékony lebonyolítása érdekében kívánatosnak minősítenek és amelyek alkalmazására a Szerződő Államok az Egyezmény értelmében törekszenek.

b) *Függelék:* A célszerűség érdekében külön csoportosított anyagok, amelyek azonban a Tanács által elfogadott nemzetközi szabványok és ajánlott gyakorlatok szerves részét képezik.

c) *Meghatározások:* A nemzetközi szabványok és az ajánlott gyakorlatok ismertetésénél alkalmazott azon fogalmak pontos magyarázata, amelyek elfogadott szótári jelentés hiányában nem maguktól értetődőek. A meghatározás külön jogállással nem rendelkezik, azonban szerves részét képezi azon nemzetközi szabványnak vagy ajánlott gyakorlatnak, amelyben előfordul, mert a meghatározás értelmének megváltoztatása azokat befolyásolja.

d) *Táblázatok és ábrák:* Ezek egy nemzetközi szabványt vagy ajánlott gyakorlatot egészítenek ki vagy szemléltetnek és amelyekre egy adott nemzetközi szabványban vagy ajánlott gyakorlatban utalnak. A táblázatok és az ábrák az adott nemzetközi szabvány vagy ajánlott gyakorlat részét képezik és jogállásuk ezekkel megegyező.

2.— A nemzetközi szabványokkal és az ajánlott gyakorlatokkal együtt, a Tanács egyetértésével kiadott egyéb anyagok:

a) *Előszó:* Történeti áttekintés és magyarázat a Tanács tevékenysége alapján. Tartalmazza továbbá az államok kötelezettségeit illetve az ezekre vonatkozó magyarázatokat a nemzetközi szabványok és gyakorlatok alkalmazására, az Egyezmény és a Bevezetési Határozat előírásainak megfelelően.

b) *Bevezető:* Az Annex egyes köteteinek, részeinek vagy fejezeteinek elején található magyarázó szöveg, amely segítséget nyújt a vonatkozó szöveg megértéséhez illetve alkalmazásához.

c) *Megjegyzések:* Szükség szerint a szövegbe iktatott anyag, amely tényszerű tájékoztatást vagy utalást tartalmaz a szóban forgó nemzetközi szabványra vagy ajánlott gyakorlatra vonatkozóan, azonban nem képezi ezek szerves részét.

d) *Mellékletek:* A nemzetközi szabványt és ajánlott gyakorlatot kiegészítő anyagot tartalmaznak, vagy azok alkalmazásához szükséges tájékoztatással szolgálnak.

Az alkalmazandó nyelv kiválasztása

A jelen Annex-et négy nyelven fogadták el - angolul, franciául, spanyolul és oroszul. Minden egyes szerződő államot felkérünk, hogy ezek közül válasszon ki egy nyelvet az országos bevezetés céljára vagy bármely egyéb, az egyezményben előirt ténykedés megtételére akár az adott nyelv közvetlen felhasználásával, akár saját nemzeti nyelvére történő lefordításával. Erről kérjük, értesítsék a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy minden egyes szerkezeti anyag jogállását az első pillantásra jelezhessük, az alábbi szerkesztői gyakorlatot követjük: A *nemzetközi szabványokat* vékony álló, az *ajánlott gyakorlatokat* vékony *dőlt* betűkkel nyomtatjuk. Ez utóbbiak jogállását ***"Ajánlás"*** felirattal is jelezzük. A vékony dőlt betűvel szedett megjegyzéseket a "*Megjegyzés :* " felirat egészíti ki.

Az írásmód / stílus szempontjából az angol szövegben az előírásokat "shall - kell/köteles" kifejezéssel és az ajánlott gyakorlati eljárásokat „should - szükséges/kívánatos" kifejezéssel jelezzük. (Mindazonáltal, a magyar fordítás alkalmával ezt a gyakorlatot nem minden esetben alkalmazzuk, mert a jelzett jogállás és a nyelvi sajátosságok ezt szükségtelenné teszik. Ha ez szükséges, a fordításban nyomatékos (kell) felszólító módot alkalmazunk.)

A jelen kiadványban alkalmazott mértékegységek a nemzetközi polgári légiközlekedésről szóló Egyezmény 5. Annex előírásainak megfelelően a nemzetközi mértékegység rendszerrel /SI/ összhangban állnak. Ahol az 5. Annex lehetővé teszi a nem SI alternatív mértékegységek alkalmazását, ott az alapegységet követően ezen mértékegységek zárójelben szerepelnek. Ahol az anyagban két mértékegység fajtát alkalmazunk, ott nem szabad azt feltételezni, hogy a mértékegységek értékei egyenlőek és azok egymással korlátlanul felcserélhetők. Mindazonáltal lehetséges, hogy azonos biztonsági szint érhető el bármelyik mértékegység kizárólagos alkalmazásával.

A jelen kiadvány bármelyik részére történő hivatkozás akár számmal, akár címmel vagy pedig mindkettővel - vonatkozik az adott rész minden egyes alpontjára is.

A. táblázat — A 14. Annex II. kötetének módosításai

(Tagolási sorrend: Módosítás — Forrás(ok) — Tárgy(ak) — Elfogadva / Hatályos / Alkalmazható)

Első kiadás
A Léginavigációs Bizottság forgószárnyas légi-jármű üzemeltetési munkacsoportjának negyedik ülése; A Léginavigációs Bizottság látás utáni segédeszközökkel foglalkozó munkacsoportjának és a Titkárság tizenegyedik ülése
Futópályák, leszálló területek, biztonsági területek, végbiztonsági területek, stb. fizikai jellemzői; Akadály korlátozási felületek; Látás utáni időjárási körülmények között alkalmazható látjelek; Tűzoltó és mentő szolgálatok.
1990 március 9. 1990 július 30. 1990 november 15.

1) Második kiadás
Léginavigációs bizottság látás utáni segédeszközök munkacsoport tizenkettedik ülése és Titkárság WGS-84 szabványos földrajzi vonatkozási rendszer; Letörhető tárgyak meghatározása; Látjelek a nem-precíziós forgószárnyas légi-jármű megközelítésekhez; Látás utáni bevezető irányító rendszer.
1995 március 13. 1995 július 24. 1995 november 9.

2) Léginavigációs bizottság
A léginavigációs adatbázisok és függőleges adat összetevők az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) alapján
1997 március 21. 1997 július 21. 1997 november 6.

3) Léginavigációs bizottság látás utáni segédeszközök munkacsoport tizennegyedik ülése és a Titkárság
Meghatározások: naptár, alapadat, Gergely naptár, akadályok, egységes (WGS-84) vonatkozási rendszer, helikopter repülőtér méretek és vonatkozó tájékoztatások, földetérési és elemelkedési terület fényrendszere; 1. Függelék — A léginavigációs adatok minőségi előírásai.
2004 február 27. 2004 július 12. 2004 november 25.

Nemzetközi előírások és ajánlott gyakorlati eljárások

1. fejezet
Általános rész

Bevezető megjegyzés: A jelen Annex II. kötete tartalmazza azokat a szabványokat és ajánlott gyakorlatkat (specifikációk), amelyek szabályozzák a helikopter repülőterek fizikai jellemzőit, kialakítandó akadály korlátozásai felületeit továbbá ismerteti a helikopter repülőtér bizonyos létesítményeit és az ott általában biztosított műszaki szolgáltatásokat. Ezen előírásoknak nem célja a légi-jármű üzemeltetés korlátozása vagy szabályzása.

A jelen kötetben található specifikációk, ahol megegyezőek, a 14. Annex I. kötetében levő módosítások vagy kiegészítések tekintetében a helikopter repülőtérre is alkalmazhatók. Más módon kifejezve tehát, amennyiben egy bizonyos témakörre vonatkozóan a jelen kötet előírást tartalmaz, ez alkalmazandó és minden esetben hatálytalanítja az I. kötet bármely megfelelő részét. Bár a jelen kötetben a helikopter repülőtér kifejezést használjuk; mindazonáltal az előírások vonatkoznak az elsősorban repülőgépek üzemeltetésre tervezett repülőtér azon területeire is, amelyeket elsősorban forgószárnyas légijárművek vesznek igénybe.

Megjegyzendő, hogy a forgószárnyas légi-jármű üzemeltetésére vonatkozó előírásokat a 6. Annex III. része tartalmazza.

1.1 Meghatározások

A jelen kötetben alkalmazott egyedi kifejezések jelentése az alábbiakban található. A 14. Annex I. kötetében találhatók azok a kifejezések, melyek mindkét kötetben felhasználásra kerültek.

Adat minőség — Data quality Megbízhatósági fok vagy szint amely azt mutatja, hogy a megadott adat pontosság, felbontás és megbízhatóság szempontjából megfelel az adatfelhasználó igényeinek.

Akadály — Obstacle Minden olyan rögzített vagy mozgó (ideiglenes vagy állandó) tárgy vagy annak része, amely a légi-jármű mozgásra kijelölt felszíni (talajszint) területeken található vagy a repülés közben levő légi-jármű védelmére meghatározott felületen túlnyúlik.

Alapadat — Datum Bármilyen mennyiségi érték vagy értékek, amely más mennyiségek kiszámításának alapjául szolgálhatnak (ISO 19104[1]*).

Állomás mágneses elhajlás — Station declination Egy VOR állomás nulla fokos radiálja és a földrajzi észak közötti, a VOR állomás kalibrálásának időpontjában meghatározott iránykülönbség.

Biztonsági terület — Safety area A helikopter repülőtér végső megközelítési és felszállási területe körül meghatározott terület, amelyen a léginavigációs célokból szükséges eszközökön kívül egyéb akadály nem található. A terület célja a sérülés és veszélyhelyzet kockázatának csökkentése abban az esetben, ha a forgószárnyas légi-jármű véletlenül eltér a kijelölt végső megközelítési és felszállási területtől.

CRC matematikai képlet ellenőrzés — Cyclic Redundancy check (CRC) Az adatok digitális kifejezéséhez használt matematikai algoritmus, amely megfelelő biztonsági szintet nyújt az adat vesztéssel vagy változással szemben.
Szerk. megjegyzés: Az adatok időszakonként történő összevetése és a felesleges adatok törlése — adatvesztési védelem.

Emelt szinten létesített helikopter leszállóhely — Elevated heliport Szárazföldön, talajszint felett levő emelt szerkezeten kialakított forgószárnyas légi-jármű leszállóhely.

Felszíni helikopter repülőtér — Surface level heliport A szárazföld vagy vízfelület felszínén létesített helikopter repülőtér vagy leszállóhely.

Földalak — Geoid A föld gravitációs mezőjének egyenlő ábrázolású felülete, amely egybeesik a földrészekre folyamatosan kiterjedő, egyenletes, természeti tagozódás nélküli, közepes tengerszint feletti magassággal (MSL).

Megjegyzés: A földalak a helyi gravitációs elhajlások és tagozódások (szél okozta ár-apályok, tengervíz sótartalma, tengeráramlások, stb.) miatt ténylegesen nem szabályos.

Földalak egyenetlenség (felszíni tagozódás) — Geoid undulation A földalak egy pontjának távolsága a földméréshez használt matematikai vonatkozási föld modell (ellipszoid) pontja felett (pozitív) vagy alatt (negatív).

Megjegyzés: A az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) ellipszoid vonatkozásában a WGS-84 földalak egyenetlenség a WGS-84 ellipszoid magasság és a magasságmérés alapján meghatározott magasság különbsége.

Földetérési és elemelkedési terület (TLOF) — Touchdown and lift-off area Olyan teherviselő felület, amelyen a forgószárnyas légi-jármű földetérést vagy elemelkedést hajthat végre.

Földmérési alapadat — Geodetic datum A területi vonatkozási rendszer helyének és irányának meghatározásához szükséges jellemző adatok legkisebb mennyisége a földi vonatkozási rendszer (hálózat) alapján.

Földmérési ellipszoid magasság — Ellipsoid (geodetic) height A földméréshez használt matematikai vonatkozási föld modellhez (ellipszoid) viszonyított, a külső határoló ív mentén, az adott ponton mért magasság.

Földmérési magasság — Orthometric height A földalakhoz viszonyított pont általában közepes tengerszint feletti magasságban (MSL) kifejezett magassága.

Gergely-naptár — Gregorian calendar Általános használatban levő éves naptár; 1582-ben vették először használatba, egy tropikus évnek a Gyula-naptárnál pontosabb meghatározására (ISO 19108[2]*).

Megjegyzés: A Gergely-naptár szerint egy év tizenkét egymást követő hónapra felosztott 365 napból áll, amely négyévenként 366 napra egészül ki.

Helikopter állóhely — Helicopter stand A forgószárnyas légijárművek parkírozására szolgáló légi-jármű állóhely, ahol a helikopter földet ér és elemelkedik valamint légi gurulási feladatokat hajtanak végre.

Helikopter biztonsági felszálló terület — Helicopter clearway Az illetékes hatóság ellenőrzése alatt álló, talaj vagy vízfelszín felett meghatározott terület, amelyet úgy választottak és/vagy alakítottak ki, hogy alkalmas legyen arra, hogy felette az 1. teljesítmény osztályú forgószárnyas légijárművek meghatározott magasságot érjenek el.

Helikopter gurulóút — Helicopter ground taxiway Olyan földi gurulóút, amelyet kizárólag forgószárnyas légijárművek vesznek igénybe.

Helikopter leszállási hely — Helideck Úszó vagy rögzített vízi szerkezeten a forgószárnyas légijárművek üzemeltetésére létesített leszállóhely.

Helikopter repülőtér — Heliport Repülőtér vagy egy építmény meghatározott területén kialakított leszállóhely, amelyet teljes egészében vagy részben forgószárnyas légijárművek érkezésére, indulására és felszíni mozgására kívánnak felhasználni.

Kijelölt távolságok — Declared distances

a) *Rendelkezésre álló felszállási távolság (TODAH).* A rendelkezésre álló végső megközelítési és felszállási terület valamint ha ilyet meghatároztak, a helikopter biztonsági terület együttes hossza, amelyet a forgószárnyas légijárművek felszállásának végrehajtására alkalmasnak nyilvánítottak.

b) *Rendelkezésre álló megszakított felszállási távolság (RTODAH).* A rendelkezésre álló végső megközelítési és felszállási terület hossza, amelyet az 1. teljesítmény osztályú forgószárnyas légijárművek felszállásának megszakítására alkalmasnak nyilvánítottak.

c) *Rendelkezésre álló leszállási távolság (LDAH).* A rendelkezésre álló végső megközelítési és felszállási terület valamint bármely más terület együttes hossza, amelyet a forgószárnyas légijárművek egy meghatározott magasságból történő leszállásának végrehajtására felhasználhatónak és alkalmasnak nyilvánítottak.

Légi gurulóút — Air taxiway A talajszinten kijelölt megfelelő útvonal a forgószárnyas légijárművek légi gurulására.

Légi közlekedési útvonal — Air transit route A talajszinten kijelölt útvonal a forgószárnyas légijárművek légi közlekedésére.

Megbízhatóság (léginavigációs adat) — Integrity (aeronautical data) A léginavigációs adat és értékei megbízhatóságának és pontosságának foka amely jelzi, hogy az a meghatározás vagy az elfogadott módosítás óta nem változik vagy veszik el.

Naptár — Calendar Egyedi időmeghatározási rendszer, amely egy napos időtartamon belül pontos időmeghatározási alapot biztosít (ISO 19108[3]*).

Pontosság — Accuracy A mért vagy becsült valamint a tényleges érték közötti azonosság mértéke.

Megjegyzés: A mért helyzet adatok esetében a pontosságot általában egy jelzett helyzettől számított távolság értékben fejezik ki és a tényleges helyzet meghatározott bizonyossággal ezen belülre esik.

Végső megközelítési és felszállási terület (FATO) — Final approach and take-off area Meghatározott terület, amely felett a függeszkedés megkezdéséig vagy a teljes leszállásig tartó végső megközelítést végrehajtják és amelyen a felszállási műveletet megkezdik. Ahol a végső megközelítési és felszállási területet 1. teljesítmény osztályú forgószárnyas légijárművek veszik igénybe, a rendelkezésre álló megszakított felszállási terület is ehhez a meghatározott területhez tartozik.

1.2 Alkalmazhatóság

1.2.1 Az Annex-ben található egyes meghatározások illetve előírások értelmezéséből egyértelműen látható, hogy a mérlegelést, a döntéshozatalt illetve az adott feladat végrehajtását az illetékes hatóságnak kell elvégeznie. Más előírások esetében az illetékes hatóság kifejezés nem szerepel, bár annak tevékenységére ebben az esetben is szükség van. Mindkét esetben bármely szükséges döntésért vagy feladat végrehajtásért a helikopter repülőtér joghatóságát gyakorló állam felelős.

1.2.2 A 14 Annex II. kötetében található specifikációk a nemzetközi polgári légiközlekedésben üzemelő forgószárnyas légijárművek kiszolgálására használt helikopter repülőterekre vonatkoznak. A 14. Annex I. kötetében található előírásokat szükség szerint alkalmazzák a helikopter repülőterekre is.

1.2.3 Ahol az Annex-ben valamilyen színt jelzünk, az adott színre a 14. Annex I. kötet 1. Függelék specifikációi vonatkoznak.

1.3 Egységes vonatkozási rendszer

1.3.1 Vízszintes vonatkozási rendszer

1.3.1.1 A vízszintes földrajzi vonatkozási rendszerként az egész világon egységesen alkalmazható (WGS-84) földrajzi hely meghatározási rendszert alkalmazzák. A közzétett légiközlekedési (szélességi és hosszúsági) földrajzi koordinátákat a WGS-84 földmérési alapadat szerint határozzák meg.

Megjegyzés: A WGS-84 földrajzi helymeghatározási rendszerre vonatkozó részletes útmutatást) az Egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) kézikönyv (Doc 9674) tartalmazza
.

1.3.2 Függőleges vonatkozási rendszer

1.3.2.1 A függőleges vonatkozási rendszerhez a közepes tengerszint feletti magasság (MSL) alapadatot alkalmazzák, amely föld gravitációs mezőjének egyenlő ábrázolású felületéhez viszonyítva határozható meg.

1. Megjegyzés: A földalak általában egybeesik közepes tengerszint feletti magassággal (MSL). A földalak a föld gravitációs mezőjében megállapított egyenlő ábrázolású felület, amely egybeesik földrészekre folyamatosan kiterjedő, egyenletes, természeti tagozódás nélküli, közepes tengerszint feletti magassággal (MSL).

2. Megjegyzés: A felszíni tagozódással összefüggő magasságokat földmérési magasságnak is nevezik, míg az ellipszoid magasság a vonatkozási föld modellhez viszonyított pontok magassága annak külső határoló íve mentén az adott ponton mért távolságnak felel meg.

1.3.3 Időmeghatározási rendszer

1.3.3.1 Az idő meghatározásához a Gergely-naptárt és az Egyeztetett Egyezményes Időt (UTC) használják.

1.3.3.2 Ahol ettől eltérő időmeghatározási rendszert alkalmaznak, ezt a légiforgalmi tájékoztató kiadvány (AIP) Általános rész 2.1.2 pontjában tegyék közzé.

* ISO SZABVÁNY 19104 Földrajzi tájékoztatás - Terminológia
19108 Földrajzi tájékoztatás - Időmeghatározás

2. fejezet
Helikopter repülőtéri adatok

2.1 Léginavigációs adatok

2.1.1 A helikopter repülőtérre vonatkozó léginavigációs adat meghatározását és közzétételét az 1. Függelék 1. — 5. táblázataiban található megbízhatósági és pontossági előírások szerint, a kidolgozott minőség biztosítási eljárások figyelembevételével végezzék. A léginavigációs adatok pontossága 95 %-os megbízhatósági szintű legyen és ebben a vonatkozásban három típusú helyzet adatot azonosítsanak az alábbiak szerint; földméréssel felmért pontok (például a végső megközelítési és felszállási terület küszöbök); számított pontok (a térben felmért pontok alapján matematikai számítással meghatározott állandó pontok); kijelölt és közzétett pontok (például a repüléstájékoztató körzet határpontok).

Megjegyzés: A minőségi rendszerre vonatkozó előírások a 15. Annex 3. fejezetében találhatók.

2.1.2 A szerződő államok biztosítsák, hogy a léginavigációs adatok megbízhatósága az adatfeldolgozás során, a felméréstől vagy első számítástól a felhasználóig folyamatosan állandó legyen. A léginavigációs adatok megbízhatósági követelményeit adat felhasználás során lehetséges változását valamint az adatra vonatkozó felhasználói igényeket jelző kockázati tényező alapján határozzák meg. Ennek megfelelően a következő osztályozás és adat megbízhatósági szint alkalmazandó:

a) kritikus adat — megbízhatósági szint 1×10^{-8}: a hibás vagy pontatlan kritikus adat felhasználásánál nagy valószínűsége van annak, hogy egy légi-jármű biztonságos repülésének folytatása és a leszállás végrehajtása igen veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

b) alapvető adat — megbízhatósági szint 1×10^{-5}: a hibás vagy pontatlan alapvető adat felhasználásánál csekély valószínűsége van annak, hogy egy légi-jármű biztonságos repülésének folytatása és a leszállás végrehajtása igen veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is;

c) általános felhasználású adat — megbízhatósági szint 1×10^{-3}: a hibás vagy pontatlan általános adat felhasználásánál nagyon csekély valószínűsége van annak, hogy egy légi-jármű biztonságos repülésének folytatása és a leszállás végrehajtása veszélyes lesz, kockáztatva akár a légikatasztrófa lehetőségét is.

2.1.3 Az elektronikus léginavigációs adat tárolása és átvitele alkalmával azt teljes egészében rendszeres időszakos felülvizsgálattal (CRC — az egész adatcsoportra kiterjedő rendszeres paritás ellenőrzés a rendszer külső és fogadó pontján) ellenőrizzék. A fenti 2.1.2 szerint osztályozott kritikus és alapvető léginavigációs adatok megbízhatóságának a védelméhez 32 illetve 24 bites algoritmust használjanak.

2.1.4 ***Ajánlás*** *— A fenti 2.1.2 szerint osztályozott általános felhasználású léginavigációs adatok megbízhatóságának a védelméhez 16 bites algoritmust használjanak.*

Megjegyzés: A léginavigációs adat minőségi követelményeket (pontosság, felbontás, megbízhatóság, adatvédelem és eredetvizsgálat) az Egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (WGS-84) kézikönyv (Doc 9674) tartalmazza. Az 1. Függelék léginavigációs adat pontossági és megbízhatósági előírásaira vonatkozó kiegészítő tájékoztatás az RTCA DO-201A és az európai polgári légiközlekedési berendezések EUROCAE ED-77 "A léginavigációs tájékoztatás ipari előírásai" kiadványokban található.

2.1.5 A szélességi és hosszúsági fokokat jelző földrajzi koordinátákat a légiforgalmi tájékoztató szolgálat hatósága a WGS-84 az egész világon egységesen alkalmazható földrajzi hely meghatározási rendszer (World Geodetic System — 1984) alapadat formátumban határozza meg és tegye közzé, külön megjelölve azokat a földrajzi koordinátákat, amelyeket matematikai módszerrel a fenti WGS-84 alapadattá számoltak át illetve amelyeknél az eredeti földmérési adatok nem felelnek meg az 1. Függelék 1. táblázat előírásainak.

2.1.6 A tényleges földmérési munka pontossága olyan legyen, hogy a kapott üzemeltetési navigációs adatok legnagyobb eltérései figyelembe véve az adott koordináta rendszer jellegét, a repülés végrehajtásának szakaszaiban az 1. Függelék táblázataiban jelzett értékeken belül legyenek.

2.1.7 A helikopter repülőterek meghatározott földméréssel felmért földi pontjainak közepes tengerszint feletti magassága mellett határozzák meg és az illetékes léginavigációs tájékoztató hatóság számára jelentsék ezen, az 1. Függelékben jelzett pontok (a WGS-84 ellipszoidhoz viszonyított) felszíni tagozódását is.

1. Megjegyzés: A megfelelő alkalmas koordináta rendszer az, amely lehetővé teszi az adott helikopter repülőtér minden szükséges földrajzi adatának WGS-84 alapján történő felmérését.

2. Megjegyzés: A WGS-84 koordináta rendszer alapján meghatározott koordináták közzétételével kapcsolatos előírásokat a 4. Annex 2. fejezete valamint a 15. Annex 3. fejezete tartalmazza.

2.2 Helikopter repülőtér vonatkozási pont

2.2.1 Minden repülőtérrel nem együtt létesített helikopter repülőtéren jelöljenek ki helikopter repülőtér vonatkozási pontot.

Megjegyzés: Ha a helikopter repülőteret repülőtérrel együtt (annak területén) létesítik, a meghatározott repülőtér vonatkozási pont mindkét létesítményre alkalmazható.

2.2.2 A helikopter repülőtér vonatkozási pont a helikopter repülőtér tervezett vagy első mértani középpontja közelében helyezkedjen el és általában ott is maradjon.

2.2.3 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben és másodpercben jelentsék helikopter repülőtér vonatkozási pont földrajzi koordinátáit.

2.3 Helikopter repülőtér tengerszint feletti magassága

2.3.1 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fél-méter vagy egy láb pontossággal adják meg a helikopter repülőtér tengerszint feletti magasságát valamint a földalakhoz viszonyított felszíni tagozódását.

2.3.2 A nemzetközi polgári légiközlekedésben igénybe vett helikopter repülőtér esetében mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára az alábbi pontossággal adják meg a földetérési és elemelkedési terület tengerszint feletti magasságát és/vagy a végső megközelítési és felszállási terület minden egyes küszöbének (ahol ilyet kijelöltek) tengerszint feletti magasságát valamint a földalakhoz viszonyított felszíni tagozódását:

· nem-precíziós megközelítés esetén fél méter vagy egy láb; és

· precíziós megközelítés esetén negyed méter vagy egy láb.

Megjegyzés: A földalakhoz viszonyított felszíni tagozódást az alkalmazott koordináta rendszernek megfelelő módon kell mérni.

2.4 A helikopter repülőtér méretei és a kapcsolódó tájékoztatások

2.4.1 A helikopter repülőtéren biztosított minden egyes létesítmény és szerkezet következő adatait mérjék meg vagy ismertessék (tegyék közzé):

a) helikopter repülőtér típusa — talajszinten vagy talajszint felett létesített helikopter repülőtér, helikopter leszállóhely vagy leszállási hely;

b) földetérési és elemelkedési terület — méretek, lejtviszonyok, burkolt felület típus, teherbíró-képesség tonnában (1000 kg);

c) végső megközelítési és felszállási terület — típus, megjelölés, tényleges földrajzi irány egy század-fok értékben, jelzőszám (ha van), hosszússág és szélesség legközelebbi egész méterre vagy lábra kerekítve, lejtviszonyok, felület típus;

d) biztonsági terület — hosszúság, szélesség, felület típus;

e) helikopter földi és légi gurulóútak, légi közlekedési utak — megjelölés, szélesség, felület típus;

f) forgalmi előtér — felület típus, forgószárnyas légi-jármű állóhelyek;

g) biztonsági felszálló terület — hosszúság, talaj-felszín profil;

h) a megközelítési eljárások látás utáni segédeszközei, a végső megközelítési és felszállási terület, a földetérési és elemelkedési terület valamint a gurulóutak és forgalmi előterek jelölése és fényei; és

i) a műszeres leszállító rendszer (ILS) részét képező iránysáv és siklópálya adó vagy a mikrohullámú leszállító rendszer (MLS) részét képező oldalszög és magasság adó antenna a legközelebbi egész méterre vagy lábra kerekített távolsága a megfelelő TLOF vagy FATO végektől.

2.4.2 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg a helikopter repülőtér földetérési és elemelkedési területének mértani középpontja és/vagy a végső megközelítési és felszállási terület minden egyes küszöbének (ahol ilyet kijelöltek) földrajzi koordinátáit.

2.4.3 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg a megfelelő helikopter földi és légi gurulóútak, légi közlekedési utak középvonal pontok földrajzi koordinátáit.

2.4.4 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és század-másodpercben adják meg minden egyes forgószárnyas légi-jármű állóhely földrajzi koordinátáit.

2.4.5 Mérjék fel és a légiforgalmi tájékoztató szolgálat hatósága számára fokban, percben, másodpercben és tized-másodpercben adják meg a 2. területen (a helikopter repülőtér határain belül) valamint a 3. területen belül levő jelentős akadályok földrajzi koordinátáit. Ezen kívül a légiforgalmi tájékoztató szolgálat hatósága számára adják meg az akadályok legnagyobb magasságát, típusát, jelölését és kivilágítását (ha van).

1. Megjegyzés: A 2. és 3. területeken elhelyezkedő akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és követelményrendszer grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 2. és 3. területeken elhelyezkedő akadály adatok meghatározásának előírásait a jelen Annex 1. Függeléke tartalmazza.

3. Megjegyzés: A 15. Annex 10.6.1.2 pontjának 2010 november 18-i bevezetését, amely a 2. és 3. területek akadály adatainak előírás szerinti rendelkezésre bocsátására vonatkozik, megkönnyíti az ilyen adatok megfelelő előzetes tervezés alapján történő összegyűjtése és feldolgozása.

2.5 Kijelölt távolságok

Tegyék közzé a helikopter repülőtérre vonatkozó, a legközelebbi egész méter vagy láb értékre kerekített következő távolságokat:

a) rendelkezésre álló felszállási távolság;

b) rendelkezésre álló megszakított felszállási távolság; és

c) rendelkezésre álló leszállási távolság.

2.6 A légiforgalmi tájékoztató szolgálatok és a helikopter repülőtéri hatóságok közötti koordináció

2.6.1 Annak érdekében, hogy a légiforgalmi tájékoztató szolgálati egységek megkapják azokat a tájékoztatásokat, amelyek lehetővé teszik számukra az aktuális és pontos repülés előtti valamint repülés közbeni tájékoztatások iránti igények kielégítését, hozzanak megfelelő intézkedéseket a légiforgalmi tájékoztató szolgálatok és a helikopter repülőtéri szolgáltatások biztosításáért felelős helikopter repülőtéri hatóságok között azért, hogy az utóbbiak a lehető legkisebb késéssel jelentsék a légiforgalmi tájékoztató szolgálati egységeknek a következőket:

a) a helikopter repülőtér állapotára vonatkozó tájékoztatások;

b) a felelősségi körzetükön belül található üzemi létesítmények, szolgáltatások, szolgálatok és navigációs berendezések működési állapota;

c) bármely, az üzemeltetés szempontjából lényegesnek ítélt egyéb tájékoztatás.

2.6.2 A léginavigációs rendszer megváltoztatásának bevezetése előtt az ilyen változtatásért felelős szolgálatok vegyék figyelembe azt az időtartamot, amely a légiforgalmi tájékoztató szolgálatnak a tájékoztató anyagok kidolgozásához, elkészítéséhez és kiadásához szükséges. Ezért annak biztosítása érdekében, hogy a légiforgalmi tájékoztató szolgálat időben megkapja a vonatkozó tájékoztatásokat, az érintett szervezetek szoros együttműködése szükséges.

2.6.3 Különösen fontosak azok a térképeket és/vagy a számítógépes navigációs rendszereket érintő léginavigációs tájékoztatások, amelyek változásáról a 15. Annex 6. fejezete és 4. Függeléke előírásai szerint az AIRAC — léginavigációs tájékoztató szabályzó és ellenőrző rendszer — tájékoztatást kell biztosítson. A felelős repülőtéri szolgálatok a légiforgalmi tájékoztató szolgálat számára benyújtandó tájékoztató anyagok és alap-adatok továbbításánál a meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontokat 14 napos postai átfutási idővel együtt vegyék figyelembe.

2.6.4 A légiforgalmi tájékoztató szolgálatok számára benyújtandó tájékoztató anyagok és alap-adatok biztosításáért felelős helikopter repülőtéri szolgálatok ezt a feladatot a jelen Annex 1. Függelékében meghatározott léginavigációs adat pontossági és megbízhatósági követelmények figyelembevételével végezzék el.

1. Megjegyzés: A NOTAM és SNOWTAM kiadására vonatkozó előírások a 15. Annex 5. fejezet 6. és 2. Függelékében találhatók.

2. Megjegyzés: Az AIRAC tájékoztatást a légiforgalmi tájékoztató szolgálat legalább 42 nappal az AIRAC hatálybalépési időpontja előtt osztja szét azzal a céllal, hogy az anyag legalább a hatálybalépés előtt 28 nappal eljusson az érintettekhez (címzettekhez).

3. Megjegyzés: A meghatározott és nemzetközileg elfogadott AIRAC hatálybalépési időpontok tervezett 28 napos beosztását, beleértve 1997 november 6-át és az AIRAC felhasználásra vonatkozó tájékoztatót az AIS légiforgalmi tájékoztató szolgálati kézikönyv (Doc. 8126, 2. fejezet 2.6 pont) tartalmazza.

3. Fejezet
Fizikai jellemzők

3.1 Földfelszíni helikopter repülőtér

Megjegyzés : A következő előírások a jelzett kivételektől eltekintve a szárazföld felszínén létesített helikopter repülőtérre vonatkoznak.

Végső megközelítési és felszállási területek

3.1.1 A felszíni helikopter repülőtéren legalább egy végső megközelítési és felszállási területet (FATO) jelöljenek ki.

Megjegyzés : A végső megközelítési és felszállási terület egy futópálya vagy gurulóút sáv közelében is elhelyezhető.

3.1.2 A végső megközelítési és felszállási terület (FATO) méretei a következők:

a) olyan helikopter repülőtér esetében, amelyet 1. teljesítmény osztályú (a forgószárnyas légi-jármű üzemeltetési kézikönyv meghatározása szerint) helikopterek vesznek igénybe, kivéve ha a terület szélessége nincs meghatározva, az nem lehet kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) másfélszerese;

b) olyan vízfelszínen létesített helikopter repülőtér esetében, amelyet 1. teljesítmény osztályú helikopterek vesznek igénybe, a fenti a) pont szerinti érték és annak további 10 %-a szükséges;

c) olyan helikopter repülőtér esetében, amelyet 2 és 3. teljesítmény osztályú helikopterek vesznek igénybe, megfelelő méretű és alakú terület, amelyen belül egy olyan átmérőjű kör húzható meg, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) másfélszerese; és

d) olyan vízfelszínen létesített helikopter repülőtér esetében, amelyet 2 és 3. teljesítmény osztályú helikopterek vesznek igénybe, megfelelő méretű és alakú terület, amelyen belül egy olyan átmérőjű kör húzható meg, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) kétszerese.

Megjegyzés : A végső megközelítési és felszállási terület meghatározása alkalmával olyan helyi körülmények figyelembevétele lehet szükséges, mint például a tengerszint feletti magasság és a hőmérsékleti viszonyok.

3.1.3 A végső megközelítési és felszállási terület teljes lejtése bármely irányba ne haladja meg a 3 % értéket. A terület egyes részeinek lejtése ne haladja meg:

a) olyan helikopter repülőtér esetében, amelyet 1. teljesítmény osztályú helikopterek vesznek igénybe, 5 % értéket; és

b) olyan helikopter repülőtér esetében, amelyet 2 és 3. teljesítmény osztályú helikopterek vesznek igénybe, 7 % értéket.

3.1.4 A végső megközelítési és felszállási terület felülete:

a) ellenálló legyen a forgószárny keltette erős lefelé irányuló áramlás hatásaival szemben;

b) mentes legyen azoktól a felületi egyenetlenségektől, amelyek hátrányosan befolyásolják a forgószárnyas légi-jármű fel vagy leszállását; és

c) olyan teherbíró-képességgel rendelkezzen, amely alkalmas az 1. teljesítmény osztályú helikopter által végrehajtott megszakított felszállástól származó erőhatások elviselésére.

3.1.5 ***Ajánlás*** *— A végső megközelítési és felszállási terület megfelelő földpárna hatást biztosítson.*

Helikopter biztonsági felszálló területek

3.1.6 Amennyiben helikopter biztonsági felszálló terület kialakítása szükséges, azt a rendelkezésre álló megszakított felszállási terület szembeszél vége után jelöljék ki.

3.1.7 ***Ajánlás*** *— A helikopter biztonsági felszálló terület szélessége ne legyen kevesebb, mint a hozzá csatlakozó biztonsági terület szélessége.*

3.1.8 ***Ajánlás*** *— A helikopter biztonsági felszálló terület talajszintje ne emelkedjen a felszín 3 %-os síkja fölé és a sík alsó határa a végső megközelítési és felszállási terület peremén levő vízszintes egyenes legyen.*

3.1.9 ***Ajánlás*** *— A helikopter biztonsági felszálló területen elhelyezkedő bármely tárgy, amely veszélyeztetheti a repülőgépeket, akadálynak tekintendő és lehetőség szerint eltávolítandó.*

Földetérési és elemelkedési területek

3.1.10 A helikopter repülőtéren legalább egy földetérési és elemelkedési területet jelöljenek ki.

Megjegyzés : A földetérési és elemelkedési terület a végső megközelítési és felszállási területen belül és azon kívül is elhelyezhető.

3.1.11 A földetérési és elemelkedési terület megfelelő méretű legyen, amelyen belül egy olyan átmérőjű kör húzható meg, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű futóműve hosszúsági vagy szélességi méretének (amelyik a nagyobb) másfélszerese;

Megjegyzés : A földetérési és elemelkedési terület bármilyen alakú lehet.

3.1.12 A földetérési és elemelkedési terület lejtése megfelelő legyen ahhoz, megakadályozza a víz összegyűlését a területen, azonban a lejtés értéke semmilyen irányba ne haladja meg a 2 % értéket.

3.1.13 A földetérési és elemelkedési terület felülete képes legyen ellenállni a területet várhatóan igénybe vevő forgószárnyas légijárművek üzemeltetéséből származó erőhatásoknak.

Biztonsági területek

3.1.14 A végső megközelítési és felszállási terület körül létesítsenek biztonsági területet.

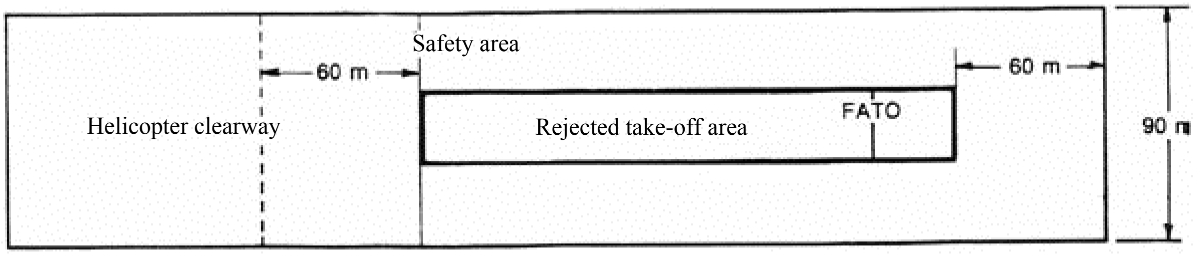
3.1.15 A látási időjárási körülmények (VMC) között tervezett felhasználás esetében a végső megközelítési és felszállási területet körülvevő biztonsági terület a FATO külső szélétől legalább 3 méteres távolságig vagy a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) 0,25-szereséig terjedjen.

3.1.16 A műszeres időjárási körülmények (IMC) között forgószárnyas légi-jármű üzemeltetésre tervezett felhasználás esetében a végső megközelítési és felszállási területet körülvevő biztonsági terület:

a) oldalirányba a középvonaltól mindkét irányba legalább 45 méter távolságig; és

b) hosszirányba a végső megközelítési és felszállási terület végeitől legalább 60 méter távolságig terjedjen.

Megjegyzés : Lásd a 3-1. ábrát.



3-1. ábra: Műszeres végső megközelítési és felszállási terület biztonsági területe

Safety area = Biztonsági terület
Helicopter clearway = Helikopter biztonsági terület
Rejected take-off area = Rendelkezésre álló megszakított felszállási terület
FATO = Végső megközelítési és felszállási terület

3.1.17 A biztonsági területen belül nem lehetnek rögzített tárgyak, kivéve azokat a letörhető tárgyakat, amelyeket feladatuk miatt az adott területen belül kell elhelyezni. Forgószárnyas légi-jármű üzemelés alatt a biztonsági területen mozgó tárgyak nem helyezkedhetnek el.

3.1.18 Azoknak a tárgyaknak magassága, amelyeket feladatuk miatt a biztonsági területen belül a végső megközelítési és felszállási terület széle mentén kell elhelyezni, ne haladja meg a 25 centimétert és ne nyúljon a FATO széle felett 25 cm. magasságban kezdődő majd kifelé és felfelé 5 %-os értékben emelkedő sík fölé.

3.1.19 A biztonsági terület felülete a végső megközelítési és felszállási terület szélétől kifelé ne emelkedjen 4 %-nál nagyobb mértékben.

3.1.20 A biztonsági terület felületét úgy alakítsák ki, hogy megakadályozzák a szennyeződések és idegen anyagok sodródását, a forgószárny keltette erős lefelé irányuló áramlások hatására bekövetkező fel és elrepülését.

3.1.21 A végső megközelítési és felszállási területtel határos biztonsági terület felülete összefüggő legyen a FATO felszínével és szerkezeti sérülések nélkül képes legyen ellenállni a helikopter repülőteret várhatóan igénybe vevő forgószárnyas légijárművek üzemeltetéséből származó erőhatásoknak.

Helikopter földi gurulóutak

Megjegyzés : A helikopter gurulóút a futóművel felszerelt forgószárnyas légi-jármű számára lehetővé teszi a földön, saját hajtóművei segítségével végzett felszíni mozgást. A 14. Annex I. kötetének gurulóutakra, gurulóút padkákra és sávokra vonatkozó előírásai az alábbi módosítások figyelembevételével a helikopter repülőtérre is alkalmazhatók. Ha a gurulóutat repülőgépek és forgószárnyas légijárművek is igénybe veszik, vizsgálják meg az összes vonatkozó előírást és alkalmazzák a szigorúbb követelményeket.

3.1.22 A helikopter (földi) gurulóút szélessége ne legyen kevesebb, mint:

Helikopter főfutó fesztáv	***Gurulóút szélesség***
4.49 méterig (	7.5 méter
4.50 métertől 5.99 méterig	10.5 méter
6.00 métertől 9.99 méterig	15.0 méter
10.00 méter és több	20.0 méter

3.1.23 A helikopter földi gurulóút és egy másik földi vagy légi gurulóút, tárgy vagy helikopter állóhely közötti biztonsági távolság ne legyen kevesebb, mint a 3-1. táblázatban meghatározott megfelelő érték.

3.1.24 A helikopter (földi) gurulóút hosszirányú lejtése a 3 % értéket ne haladja meg.

3.1.25 ***Ajánlás*** *— A helikopter földi gurulóút képes legyen ellenállni a helikopter gurulóutat várhatóan igénybe vevő forgószárnyas légijárművek forgalmából származó erőhatásoknak.*

3.1.26 ***Ajánlás*** *— A helikopter földi gurulóút mindkét oldalán szimmetrikusan alakítsanak ki útpadkát, amelynek szélessége legalább a helikopter gurulóutat várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű teljes szélességének fele legyen.*

3.1.27 A helikopter földi gurulóút és útpadkája gyors vízelvezetést biztosítson, azonban keresztirányú lejtése ne haladja meg a 2 % értéket.

3.1.28 ***Ajánlás*** *— A helikopter földi gurulóút felülete ellenálló legyen a forgószárny keltette erős lefelé irányuló áramlás hatásaival szemben.*

Légi gurulóutak

Megjegyzés : A légi gurulóút feladata a forgószárnyas légi-jármű talajszint feletti mozgásának lehetővé tétele olyan magasságban, amelyen a föld felszínére ható párnahatás érvényesül és általában 20 csomónál (37 km/h) alacsonyabb sebességnél.

3.1.29 A légi gurulóút szélessége legalább a légi gurulóutat várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű teljes szélességének kétszerese legyen.
3.1.30 A légi gurulóút felülete:

a) álljon ellen a forgószárny keltette erős lefelé irányuló áramlások hatásainak; és

b) alkalmas legyen a kényszerleszállások végrehajtására.

3.1.31 ***Ajánlás*** *— A légi gurulóút felülete biztosítson földi párnahatást.*

3.1.32 ***Ajánlás*** *— A légi gurulóút keresztirányú lejtése ne haladja meg a 10 %, hosszirányú lejtése pedig a 7 % értéket. A lejtés semmi esetre sem haladja meg a légi gurulóutat várhatóan igénybe vevő forgószárnyas légijárművek leszállási lejtviszony korlátozásait.*

3.1.33 A légi gurulóút és egy másik légi vagy földi gurulóút, tárgy vagy helikopter állóhely közötti biztonsági távolság ne legyen kevesebb, mint a 3-1. táblázatban meghatározott megfelelő érték.

Légi közlekedési útvonalak

Megjegyzés : A légi közlekedési útvonal feladata a forgószárnyas légi-jármű talajszint feletti mozgásának lehetővé tétele általában 100 lábat (30 méter) nem meghaladó magasságban és 20 csomónál (37 km/h) nagyobb sebességnél.

3.1.34 A légi gurulóút szélessége ne legyen kevesebb, mint:

a) a légi-jármű forgószárny átmérőjének hétszerese, ha a légi közlekedési útvonalat csak nappal használják; és

b) a légi-jármű forgószárny átmérőjének tízszerese, ha a légi közlekedési útvonalat éjszaka használják,
amikor is a forgószárny átmérő (RD) a légi közlekedési útvonalat várhatóan igénybe vevő légi-jármű legnagyobb forgószárny átmérője.

3.1.35 A légi közlekedési útvonal középvonalának bármely 120° értéket nem meghaladó irányváltozását úgy tervezzék meg, hogy ne legyen szükség 270 méternél kisebb forduló sugárra.

Megjegyzés : A légi közlekedési útvonalat úgy válasszák ki, hogy lehetővé tegye az autórotációval történő vagy az egyik hajtómű leállását követően a leszállás végrehajtását. Minimális követelmény, hogy a kényszerleszállás a földön vagy vízen tartózkodó személyek és elhelyezett vagyontárgyak legkisebb mértékű veszélyeztetésével végrehajtható legyen.

Forgalmi előterek

Megjegyzés : A 14. Annex I. kötet 3. fejezetének a forgalmi előterekre vonatkozó előírásai az alábbi módosítások figyelembevételével a helikopter repülőtérre is alkalmazhatók.

3.1.36 A forgószárnyas légi-jármű állóhely lejtése semmilyen irányba ne haladja meg a 2 % értéket.

3.1.37 Az állóhelyet használó forgószárnyas légi-jármű és bármely tárgy vagy egy másik állóhelyet használó légi-jármű között a biztonsági távolság ne legyen kevesebb, mint az állóhelyet igénybe vevő legnagyobb forgószárnyas légi-jármű szélességének fele.

Megjegyzés : Ahol a területen egyidejű függeszkedési műveletek végrehajtását engedélyezik, alkalmazzák a 3-1. táblázatban a két légi gurulóút közötti biztonsági távolságra meghatározott értékeket.

3.1.38 A helikopter állóhely területe elég nagy legyen ahhoz, hogy azon belül egy olyan átmérőjű kör húzható meg, amelynek átmérője nem kevesebb, mint a helikopter állóhelyet várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb mérete.

A végső megközelítési és felszállási terület elhelyezése egy futópályához vagy gurulóúthoz viszonyítva

3.1.39 Ahol a végső megközelítési és felszállási területet futópálya vagy gurulóút mellé helyezik el, és egyidejű látási időjárási körülmények közötti üzemeltetést terveznek, a futópálya vagy gurulóút valamint a végső megközelítési és felszállási terület szélei közötti távolság ne legyen kevesebb, mint a 3-2. táblázatban meghatározott megfelelő távolság érték.

3.1.40 ***Ajánlás** — A végső megközelítési és felszállási terület ne helyezkedjen el:*

a) gurulóút kereszteződéseknél vagy gurulási váró helyek közelében, ahol a sugárhajtómű nagynyomású gázsugara erős turbulenciát okoz;

b) olyan területeken, ahol a légi-jármű keltette örvényzónák kialakulása valószínű.

3-1. táblázat: Helikopter földi és légi gurulóút biztonsági távolságok

(A forgószárnyas légijárművek működő forgószárny melletti legnagyobb szélesség értékének többszörösében kifejezett érték)

Létesítmény	Helikopter földi gurulóút	Helikopter légi gurulóút
Heliopter földi gurulóút	2 (szélek között)	4 (középvonalak között)
Légi gurulóút	4 (középvonalak között)	4 (középvonalak között)
Tárgy	1 (széltől a tárgyig)	1 1/2 (középvonaltól a tárgyig
Helikopter állóhely	2 (szélek között)	4 (középvonaltól a szélig)

3-2. táblázat: Végső megközelítési és felszállási terület biztonsági távolságok

Ha a repülőgép és/vagy forgószárnyas légi-jármű tömege	Távolság a FATO széle és a futópálya vagy gurulóút széle között
2719 kg-ig	60 méter
2720 kg — 5759 kg között	120 méter
5760 kg — 99 999 kg között	180 méter
100 000 kg és nagyobb	250 méter

3.2 Emelt szinten létesített helikopter leszállóhelyek

Végső megközelítési és felszállási terület, földetérési és elemelkedési terület

Megjegyzés : Az emelt szinten létesített helikopter leszállóhelynél feltételezzük, hogy a végső megközelítési és felszállási terület és a földetérési és elemelkedési terület egybeesik.

3.2.1 Az emelt szinten létesített helikopter leszállóhelyen (repülőtéren) legalább egy végső megközelítési és felszállási területet (FATO) jelöljenek ki.

3.2.2 A végső megközelítési és felszállási terület méretei a következők:

a) olyan helikopter leszállóhely esetében, amelyet 1. teljesítmény osztályú helikopterek vesznek igénybe, a forgószárnyas légi-jármű üzemeltetési kézikönyv meghatározása szerint, kivéve ha a terület szélessége nincs meghatározva, az nem lehet kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) másfélszerese;

b) olyan helikopter leszállóhely esetében, amelyet 2. teljesítmény osztályú helikopterek vesznek igénybe, megfelelő méretű és alakú terület, amelyen belül egy olyan átmérőjű kör húzható meg, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) másfélszerese.

3.2.3 ***Ajánlás*** *— Az emelt szinten létesített helikopter leszállóhely lejtviszonyai feleljenek meg a 3.1.3 pontban ismertetett, felszíni helikopter repülőtérre vonatkozó követelményeknek.*

3.2.4 A végső megközelítési és felszállási terület felülete képes legyen ellenállni a leszállóhelyet várhatóan igénybe vevő forgószárnyas légijárművek üzemeltetéséből származó erőhatásoknak. A tervezésnél vegyék figyelembe azokat a további megterheléseket, amelyek különböző üzemi és környezeti okokból a felületre nehezednek. Ezek közé tartozik a személyek, hó, teherárú, tűzoltó berendezések, stb. jelenléte, az üzemanyag-feltöltés és egyéb mozgás.

Megjegyzés : Az emelt szinten létesített helikopter leszállóhely szerkezeti tervezésével kapcsolatos útmutató a Helikopter Repülőtér Kézikönyv-*ben található.*

Biztonsági terület

3.2.5 A végső megközelítési és felszállási terület körül alakítsanak ki biztonsági területet.

3.2.6 A végső megközelítési és felszállási területet körülvevő biztonsági terület a FATO külső szélétől legalább 3 méteres távolságig vagy az emelt szinten létesített helikopter leszállóhelyet várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági vagy szélességi méretének (amelyik a nagyobb) 0,25-szöröséig terjedjen.

3.2.7 A biztonsági területen belül nem lehetnek rögzített tárgyak, kivéve azokat a letörhető tárgyakat, amelyeket feladatuk miatt az adott területen belül kell elhelyezni. A forgószárnyas légi-jármű üzemelés alatt a biztonsági területen mozgó tárgyak nem helyezkedhetnek el.

3.2.8 Azoknak a tárgyaknak magassága, amelyeket feladatuk miatt a biztonsági területen belül a végső megközelítési és felszállási terület széle mentén kell elhelyezni, ne haladja meg a 25 centimétert és ne nyúljon a FATO széle felett 25 cm. magasságban kezdődő majd kifelé és felfelé 5 %-os értékben emelkedő sík fölé.

3.2.9 A biztonsági terület felülete a végső megközelítési és felszállási terület szélétől kifelé ne emelkedjen 4 %-nál nagyobb mértékben.

3.2.10 A végső megközelítési és felszállási területtel határos biztonsági terület felülete összefüggő legyen a FATO felszínével és szerkezeti sérülések nélkül képes legyen ellenállni a helikopter leszállóhelyet várhatóan igénybe vevő forgószárnyas légijárművek üzemeltetéséből származó erőhatásoknak.

3.3 Helikopter le/felszállóhelyek

Megjegyzés : A következő előírások olyan helikopter le/felszállóhelyekre vonatkoznak, amelyek például bányászati, kutató vagy építési torony-szerkezeteken vagy egyéb létesítményeken kerültek kialakításra. A hajókon elhelyezett helikopter leszállási helyek ismertetését a 3.4 alfejezet tartalmazza.

Végső megközelítési és felszállási terület, földetérési és elemelkedési terület

Megjegyzés : A helikopter le/felszállási helyek esetében feltételezzük, hogy a FATO valamint a földetérési és elemelkedési terület egybeesnek. A légáramlás irányára, a turbulenciára, az uralkodó szélsebességre, a sugárhajtóműből kiáramló nagysebességű illetve magas hőmérsékletű gázoknak a területre gyakorolt hatásaira vonatkozó útmutató a Helikopter Repülőtér Kézikönyv-*ben található.*

3.3.1 A helikopter le/felszállási helyen legalább egy végső megközelítési és felszállási területet jelöljenek ki.

3.3.2 A végső megközelítési és felszállási terület alakja bármilyen lehet, azonban mérete az egy fő forgószárnnyal vagy kettős fő forgószárnnyal ellátott helikopterek esetében megfelelő legyen ahhoz, hogy abban egy olyan átmérőjű kör legyen meghúzható, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb mérete a forgószárnyak működése (forgása) közben.

3.3.3 Ahol több irányból végrehajtható leszállások végrehajtását tervezik olyan helikopterekkel, amelyek hossztengelyükön egymás mögött elhelyezett forgószárnnyal vannak ellátva, a végső megközelítési és felszállási terület mérete megfelelő legyen ahhoz, hogy abban egy olyan átmérőjű kör legyen meghúzható, amelynek átmérője nem kevesebb, mint a forgószárnyak első és hátsó végpontja közötti távolság 90 %-a. Amennyiben nem tudják a fenti előírást teljesíteni, a végső megközelítési és felszállási terület olyan szögletes, téglalap alakú terület legyen, amelynek rövidebb oldala nem kevesebb mint 75 % és hosszabb oldala nem kevesebb mint 90 % (a forgószárnyak első és hátsó végpontja közötti távolság). Ebben az esetben a téglalapon belül csak kétirányú, a hosszabbik oldal irányába eső leszállások hajthatók végre.

3.3.4 A végső megközelítési és felszállási terület széle mentén nem lehetnek rögzített tárgyak, kivéve azokat a letörhető tárgyakat, amelyeket feladatuk miatt az adott területen belül kell elhelyezni.

3.3.5 Azoknak a tárgyaknak magassága, amelyeket feladatuk miatt a végső megközelítési és felszállási terület széle mentén kell elhelyezni, ne haladja meg a 25 centimétert.

3.3.6 A végső megközelítési és felszállási terület felülete úgy a forgószárnyas légijárművek mint az ott tevékenykedő személyek részére csúszásmentes legyen és a felület lejtése akadályozza meg a folyadékok összegyűlését. Ahol a helikopter leszállási hely felülete rácsos kiképzésű, a leszállási hely alatt levő felépítmény biztosítsa, hogy a földi párnahatás nem csökken.

Megjegyzés : A végső megközelítési és felszállási terület felületének csúszásmentesítésével kapcsolatos útmutató a Helikopter Repülőtér Kézikönyv-*ben található.*

3.4 Hajón létesített helikopter le/felszállóhelyek

3.4.1 Amennyiben a forgószárnyas légi-jármű működési területek egy hajó orr vagy tat-részén helyezkednek el vagy a hajó felépítménye fölött alakították azt ki, ezek általános leszállási helynek tekintendők, amelyekre a 3.3 alfejezet előírásai vonatkoznak.

Végső megközelítési és felszállási terület, földetérési és elemelkedési terület

Megjegyzés : A hajó más részén kialakított helikopter le/felszállási helyek esetében feltételezzük, hogy a FATO valamint a földetérési és elemelkedési terület egybeesnek. A légáramlás irányára, a turbulenciára, az uralkodó szélsebességre, a sugárhajtóműből kiáramló nagysebességű illetve magas hőmérsékletű gázoknak a területre gyakorolt hatásaira vonatkozó útmutató a Helikopter Repülőtér Kézikönyv-*ben található.*

3.4.2 A hajón kialakított helikopter le/felszállási helyen legalább egy végső megközelítési és felszállási területet jelöljenek ki.

3.4.3 A hajón kialakított végső megközelítési és felszállási terület kör alakú, mérete megfelelő legyen ahhoz, hogy abban egy olyan átmérőjű kör legyen meghúzható, amelynek átmérője nem kevesebb, mint a létesítményt várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb mérete a forgószárnyak működése (forgása) közben.

3.4.4 A végső megközelítési és felszállási terület felülete mind a forgószárnyas légijárművek mind az ott tevékenykedő személyek részére csúszásmentes legyen.

4. fejezet
Akadály korlátozás és eltávolítás

Megjegyzés : A jelen fejezetben található előírások célja a helikopter repülőterek körüli légtér akadálymentességének biztosítása úgy, hogy a helikopter repülőtereken várható forgószárnyas légi-jármű forgalom biztonságosan bonyolítható legyen és megakadályozzák, hogy a helikopter repülőterek a körülöttük levő akadályok növekedése miatt használhatatlanná váljanak. Ez az akadály korlátozási felületek sorozatának meghatározásával érhető el, amelyek korlátozzák azt a magasságot, ameddig az adott légtérben a tárgyak nyúlhatnak.

4.1 Akadály korlátozási felületek és szektorok

Megközelítési felület

4.1.1 *Leírás*

A biztonsági terület végétől felfelé terjedő és a végső megközelítési és felszállási terület középvonalán áthaladó lejtős sík vagy síkok összessége.

Megjegyzés : Lásd a 4-1. ábrát.

4.1.2 *Jellemzők*

A megközelítési felület határai a következők:

a) a végső megközelítési és felszállási és a biztonsági területek hosszának megfelelő hosszúságú belső vízszintes él, amely merőleges a megközelítési felület középvonalára és a biztonsági terület külső szélén helyezkedik el;

b) két oldalsó él, amelyek a belső élek végeinél kezdődnek és:

1) a precíziós megközelítésű FATO kivételével a vízszintes síkhoz képest egységesen széttartó meghatározott szögben halad a végső megközelítési és felszállási terület középvonala mentén;

2) a precíziós megközelítésű FATO esetében a vízszintes síkhoz képest egységesen széttartó meghatározott szögben halad a végső megközelítési és felszállási terület középvonala mentén a terület felett meghatározott magasságig, majd ezt követően egységesen széttartó meghatározott szögben halad tovább a végső szélesség értékig, amely után ilyen szélesen folytatódik a felület végéig; és

c) a FATO magassága felett meghatározott magasságban húzódó vízszintes külső éle merőleges a megközelítési felület középvonalára.

4.1.3 A belső él magassága megegyezik a helikopter biztonsági terület magasságával azon a ponton, ahol a megközelítési felület középvonala metszi a belső él egyenesét.

4.1.4 A megközelítési felület lejtsíkjait a felület középvonalával egybe eső függőleges síkban mérjék.

Megjegyzés : Azon helikopter repülőterek esetében, amelyeket 2. és 3. teljesítmény osztályú helikopterek használnak, a megközelítési útvonalat úgy válasszák ki, hogy lehetővé tegye a biztonságos kényszerleszállás vagy az egyik hajtómű leállását követő leszállás végrehajtását. Minimális követelmény, hogy a *kényszerleszállás a földön vagy vízen tartózkodó személyek és elhelyezett vagyontárgyak legkisebb mértékű veszélyeztetésével végrehajtható legyen. A kényszerleszállásra alkalmas területek biztosítsák, hogy a forgószárnyas légijárműben tartózkodó személyek sérülésének lehetősége a legkisebb legyen. Az ilyen területek alkalmasságának meghatározásakor vegyék figyelembe a környezeti körülményeket valamint a létesítményt várhatóan igénybe vevő leginkább mérvadó forgószárnyas légi-jármű típust.*

Átmeneti felület

4.1.5 *Leírás*

A biztonsági terület oldala, valamint a megközelítési felület oldalának egy része mentén húzódó összetett felület, amely a belső vízszintes felületig vagy egy előre meghatározott magasságig felfelé és kifelé terjed.

Megjegyzés : Lásd a 4-1. ábrát.

4.1.6 *Jellemzők*
Az átmeneti felület határai a következők:

a) alsó éle a megközelítési felület oldalának valamint a belső vízszintes felületnek metszésvonalánál vagy ha belső vízszintes felületet nem jelöltek ki, az alsó él felett meghatározott magasságon kezdődik, majd a megközelítési felület mentén nyúlik tovább annak belső éléig, onnan pedig a végső megközelítési és felszállási terület középvonalával párhuzamosan a biztonsági terület teljes hosszában folytatódik; és

b) felső éle a belső vízszintes felülettel egy síkban vagy ha belső vízszintes felületet nem jelöltek ki, az alsó él felett meghatározott magasságon helyezkedik el.

4.1.7 Az alsó élen levő pont magassága:

a) a megközelítési felület oldala mentén — megegyezik a megközelítési felület magasságával az adott ponton; és

b) a biztonsági terület mentén — megegyezik a végső megközelítési és felszállási terület középvonalának magasságával az adott ponttal szemben.

Megjegyzés : A b) alpont eredményeképpen a biztonsági terület mentén elhelyezkedő átmeneti felület ívelt lesz abban az esetben, ha a végső megközelítési és felszállási terület profilja is ívelt, illetve sík lesz, ha a FATO profilja sík egyenes. Az átmeneti felület és a belső vízszintes felület metszése, vagy ha ilyen nem jelöltek ki, a felső él a fentiek szerint a végső megközelítési és felszállási terület profiljának megfelelően ugyancsak ívelt vagy sík lesz.

4.1.8 Az átmeneti felület lejtését a FATO középvonalához viszonyított megfelelő függőleges síkban mérjék.

Belső vízszintes felület

Megjegyzés: A belső vízszintes felület célja a biztonságos látás utáni forgószárnyas légi-jármű üzemeltetés lehetővé tétele.

4.1.9 *Leírás*

A végső megközelítési és felszállási terület és környéke felett vízszintes síkban elhelyezkedő kör alakú felület.

Megjegyzés : Lásd a 4-1. ábrát.

4.1.10 *Jellemzők*

A belső vízszintes felület sugarát a végső megközelítési és felszállási terület középpontjától mérjék.

4.1.11 A belső vízszintes felület magasságát az erre a célra kijelölt magassági pont felett (azaz ahhoz viszonyítva) mérjék.

Megjegyzés: A magassági adatok meghatározásával kapcsolatos útmutatás a Helikopter Repülőtér Kézikönyvben *található.*

Kúpos felület

4.1.12 *Leírás*

A belső vízszintes felület peremétől vagy ha ilyet nem jelöltek ki, az átmeneti felület külső határától felfelé és kifelé terjedő lejtős felület

Megjegyzés : Lásd a 4-1. ábrát.

4.1.13 *Jellemzők*
A kúpos felület határai a következők:

a) alsó éle egybeesik a belső vízszintes felület peremével vagy ha ilyet nem jelöltek ki, az átmeneti felület külső határával; és

b) felső éle a belső vízszintes felület felett vagy ha ilyet nem jelöltek ki, a végső megközelítési és felszállási terület legalacsonyabb vége felett meghatározott magasságban helyezkedik el.

4.1.14 A kúpos felület lejtését a vízszintes felett mérjék.

Felszállási emelkedési felület

4.1.15 *Leírás*

Megjegyzés : Lásd a 4-1. ábrát.

A végső megközelítési és felszállási terület középvonalán áthaladó lejtős sík, síkok összessége vagy ha a felületbe ívelt szakasz (forduló) tartozik, összetett emelkedő felület, amely biztonsági terület vége után felfelé terjed.

4.1.16 *Jellemzők*

A felszállási emelkedési felület határai a következők:

a) belső éle vízszintes és a végső megközelítési és felszállási terület valamint a biztonsági területek legkisebb meghatározott szélességével egyenlő hosszúságú továbbá a felszállási emelkedési felületre és merőleges és a biztonsági terület vagy a helikopter biztonsági terület peremén helyezkedik el;

b) két oldala a belső élnél kezdődik és egységesen széttartó meghatározott szögben halad a végső megközelítési és felszállási terület középvonala mentén; és

c) a külső éle vízszintes és a felszállási emelkedési terület középvonalára merőleges, a végső megközelítési és felszállási terület felett meghatározott magasságban helyezkedik el.

4.1.17 A belső él magassága megegyezik a biztonsági terület belső élének magasságával azon a ponton, ahol azt a felszállási emelkedési felület középvonala metszi, kivéve, ha helikopter biztonsági területet alakítottak ki, mert ebben az esetben a magasság megegyezik a terület középvonalában levő legmagasabb pont magasságával.

4.1.18 Az egyenes felszállási emelkedési felület esetében annak lejtését a felület középvonalát magába foglaló függőleges síkhoz viszonyítva mérjék.

4.1.19 A fordulót is magába foglaló felszállási emelkedési felület esetében az egy összetett felület lesz, amely kis vízszintes síkokat tartalmaz a középvonal mentén és lejtése az egyenes felszállási emelkedési felülethez hasonló lesz. A belső él és a belső él felett 30 méter magasságig terjedő szakasz egyenes legyen.

4.1.20 A felszállási emelkedési felület középvonalának bármely irányváltozását úgy tervezzék meg, hogy ne legyen szükség 270 méternél kisebb forduló sugárra.

Megjegyzés : Azon helikopter repülőterek esetében, amelyeket 2. és 3. teljesítmény osztályú helikopterek használnak, az indulási útvonalat úgy válasszák ki, hogy lehetővé tegye a biztonságos kényszerleszállás vagy az egyik hajtómű leállását követő leszállás végrehajtását. Minimális követelmény, hogy a kényszerleszállás a földön vagy vízen tartózkodó személyek és elhelyezett vagyontárgyak legkisebb mértékű veszélyeztetésével végrehajtható legyen. A kényszerleszállásra alkalmas területek biztosítsák, hogy a forgószárnyas légijárműben tartózkodó személyek sérülésének lehetősége a legkisebb legyen. Az ilyen területek alkalmasságának meghatározásakor vegyék figyelembe a környezeti körülményeket valamint a létesítményt várhatóan igénybe vevő leginkább mérvadó forgószárnyas légi-jármű típust.

Akadály mentes szektor/felület — Helikopter le/felszállási hely

4.1.21 *Leírás*

A helikopter le/felszállási hely végső megközelítési és felszállási területének szélén kijelölt vonatkozási ponttól meghatározott magasságig terjedő összetett felület.

4.1.22 *Jellemzők*

Az akadály mentes felület illetve szektor meghatározott szögű ívelt területet alkot.

4.1.23 A helikopter le/felszállási hely vonatkozásában az akadálymentes szektor egy 210 °-os körszeletet foglal magába, amely addig a távolságig terjed kifelé, amely megfelel a leszállási helyet várhatóan igénybe vevő leginkább mérvadó forgószárnyas légi-jármű egy üzemképtelen hajtóművel történő üzemeltethetőségének. A felület a helikopter leszállási hely magasságával egy síkban levő legyen, kivéve hogy a végső megközelítési és felszállási terület középpontján áthaladó 180 °-os körszeleten belül a felület a vízfelszín síkján helyezkedjen el és olyan távolságig terjedjen, amely megfelel a leszállási helyet várhatóan igénybe vevő leginkább mérvadó forgószárnyas légi-jármű felszállási terület igényeinek (lásd 4-2. ábra).

Akadály korlátozási felület— Helikopter le/felszállási hely

4.1.24 *Leírás*

Az akadály mentes szektor vonatkozási pontjától kiinduló, annak területén kívül eső összetett felület, amelyen belül a végső megközelítési és felszállási terület felett levő akadályok magassága korlátozott.

Megjegyzés : Lásd a 4-3, 4-4. és 4-5. ábrákat.

4.1.25 *Jellemzők*

Az akadály korlátozási felület íve nem lehet nagyobb egy meghatározott szög értéknél és elég nagy legyen ahhoz, hogy magába foglalja az akadály mentes szektor által meghatározott területet.

4.2 Akadály korlátozási előírások

Megjegyzés : Az akadály korlátozási felületekre vonatkozó előírások a végső megközelítési és felszállási terület tervezett felhasználásának, azaz a függeszkedéshez vagy leszálláshoz végrehajtott megközelítés és annak típusai továbbá a felszállás repülési műveletei alapján kerültek kidolgozásra. Az előírásokat a végső megközelítési és felszállási terület ilyen jellegű igénybevétele esetén alkalmazzák. Abban az esetben, ha a forgószárnyas légi-jármű repülési műveleteket mindkét irányból illetve irányba hajtják végre, bizonyos felületek feladata megszűnik mert a másik, alacsonyabb felület előírásai ennél szigorúbbak.

Földfelszíni helikopter repülőtér

4.2.1 A precíziós megközelítésű végső megközelítési és felszállási területhez határozzák meg a következő akadály korlátozási felületeket:

a) felszállási emelkedési felület;

b) megközelítési felület;

c) átmeneti felület; és

d) kúpos felület.

4.2.2 A nem-precíziós megközelítésű végső megközelítési és felszállási területhez határozzák meg a következő akadály korlátozási felületeket:

a) felszállási emelkedési felület;

b) megközelítési felület;

c) átmeneti felület; és

d) kúpos felület, ha belső vízszintes felületet nem határoztak meg.

4.2.3 A nem-műszeres végső megközelítési és felszállási területhez határozzák meg a következő akadály korlátozási felületeket:

a) felszállási emelkedési felület; és

b) megközelítési felület.

4.2.4 ***Ajánlás*** *— A nem-precíziós megközelítésű végső megközelítési és felszállási területhez határozzák meg a következő akadály korlátozási felületeket:*

a) belső vízszintes felület; és

b) kúpos felület.

Megjegyzés : Belső vízszintes felületre nincs szükség, ha a végső megközelítési és felszállási terület mindkét végén közvetlen, nem-precíziós megközelítéséket hajtanak végre.

4.2.5 A felületek lejtése ne legyen nagyobb és méreteik ne legyenek kisebbek, mint a 4-1. — 4-4. táblázatokban meghatározott értékek. Kijelölésük a 4-6. — 4-10. ábrákban ismertetettek szerint történjen.

4.2.6 Új tárgyak vagy a meglevő tárgyak megnagyobbítása nem nyúlhatnak a 4.2.1 — 4.2.4 pontokban ismertetett felületek fölé, kivéve ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek.

Megjegyzés : Azon körülmények, amelyek között ez a bizonyos "árnyékolás" alapelv alkalmazható, a Repülőtér Szolgálati Kézikönyv *6. részében kerültek ismertetésre.*

4.2.7 ***Ajánlás** — A 4.2.1 — 4.2.4 pontban előírt bármely felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el, kivéve ha az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy azok nem befolyásolják hátrányosan a biztonságot, illetve nincsenek jelentős hatással a forgószárnyas légijárművek rendszeres üzemeltetésére.*

Megjegyzés : A 4.1.19 pontban meghatározott ívelt felszállási emelkedési felületek alkalmazása csökkentheti azokat a nehézségeket, amelyeket a jelzett felületek fölé emelkedő tárgyak okoznak.

4.2.8 A felszíni helikopter repülőtéren legalább két, egymástól nem kevesebb mint 150 °-al eltérő felszállási emelkedési és megközelítési felületet jelöljenek ki.

4.2.9 ***Ajánlás** — A felszállási emelkedési és megközelítési felületek száma és iránya olyan legyen, hogy a helikopter repülőtér igénybevételi tényezője a létesítményt várhatóan igénybe vevő forgószárnyas légi-jármű típusok vonatkozásában 95 %-nál kevesebb ne legyen.*

Emelt szinten létesített helikopter repülőtér

4.2.10 Az emelt szinten létesített helikopter repülőtér akadály korlátozási előírásai feleljenek meg a felszíni helikopter repülőtérre vonatkozó előírásoknak (lásd 4.2.1 — 4.2.7 pontokat).

4.2.11 Az emelt szinten létesített helikopter repülőtéren legalább két, egymástól nem kevesebb mint 150 °-al eltérő felszállási emelkedési és megközelítési felületet jelöljenek ki.

Helikopter le/felszállási hely

Megjegyzés : A következő előírások olyan helikopter le/felszállási helyekre vonatkoznak, amelyek például bányászati, kutató vagy építési torony-szerkezeteken vagy egyéb létesítményeken kerültek kialakításra. A hajókon elhelyezett helikopter le/felszállási helyekre ezek az előírások nem vonatkoznak.

4.2.12 A helikopter le/felszállási helyen akadály mentes szektort és ha szükséges, akadály korlátozási szektort is jelöljenek ki.

4.2.13 Az akadály mentes szektoron belül az akadály mentes felület felett rögzített akadály nem helyezkedhet el.

4.2.14 A helikopter le/felszállási hely közvetlen közelében a leszállási hely szintje alatt is biztosítsák a forgószárnyas légijárművek akadály-védelmét. A védelem területe a végső megközelítési és felszállási terület középpontjától kezdődően legalább 180 °-os körszeletre terjedjen és lejtése a terület szélétől mérve, a 180 °-os szektoron belül vízszintesen 1 és függőlegesen 5 egység arányértékű legyen .

4.2.15 Ahol a létesítmény üzemeltetéséhez mozgó akadályra vagy akadályok kombinációjára van szükség az akadály mentes szektoron belül, az akadályok elhelyezkedése ne terjedjen a végső megközelítési és felszállási terület középpontjától mért 30 °-os körszeleten túl.

4.2.16 Az egy fő forgószárnnyal valamint két egymás mellett elhelyezett forgószárnnyal rendelkező helikopterek esetében a 150 °-os akadály korlátozási felületen a végső megközelítési és felszállási terület középpontjától mért 0.62 D (forgószárnyas légi-jármű legnagyobb mérete) távolságon belül a tárgyak magassága nem haladhatja meg a FATO szintje feletti 0.05 D értéket. A körszeleten túl 0.83 D távolságig az akadály korlátozási felület 2 vizszintres egységenként 1 függőleges egység arányban emelkedik.

4.2.17 Egymás mögött elhelyezett (tandem) fő forgószárnnyal rendelkező helikopterek több irányú üzemeltetése esetében a 150 °-os akadály korlátozási felületen a végső megközelítési és felszállási terület középpontjától mért 0.62 D távolságon belül rögzített akadályok nem helyezkedhetnek el. A körszeleten túl 0.83 D távolságig a tárgyak magassága nem haladhatja meg a FATO szintje feletti 0.05 D értéket (lásd 4-4. ábra).

4.2.18 Egymás mögött elhelyezett (tandem) fő forgószárnnyal rendelkező helikopterek több irányú üzemeltetése esetében a 150 °-os akadály korlátozási felületen a végső megközelítési és felszállási terület középpontjától mért 0.62 D távolságon belül a tárgyak magassága ne legyen több, mint 1.1 méter a végső megközelítési és felszállási terület szintje felett (lásd 4-5. ábra).

Hajón létesített helikopter le/felszállási helyek

A hajó fedélzet középső része

4.2.19 A végső megközelítési és felszállási terület eleje és vége két szimmetrikusan kijelölt szektor legyen, amelyek körszelet mérete 150 °-os és a körszeletek csúcspontja a FATO referencia kör peremén helyezkedik el. A két szektor területén belül ne legyen a végső megközelítési és felszállási terület szintjénél magasabb tárgy, kivéve azokat a segédeszközöket, amelyek a forgószárnyas légi-jármű üzemeltetéséhez szükségesek, azonban ezek magassága sem haladhatja meg a 25 cm-t.

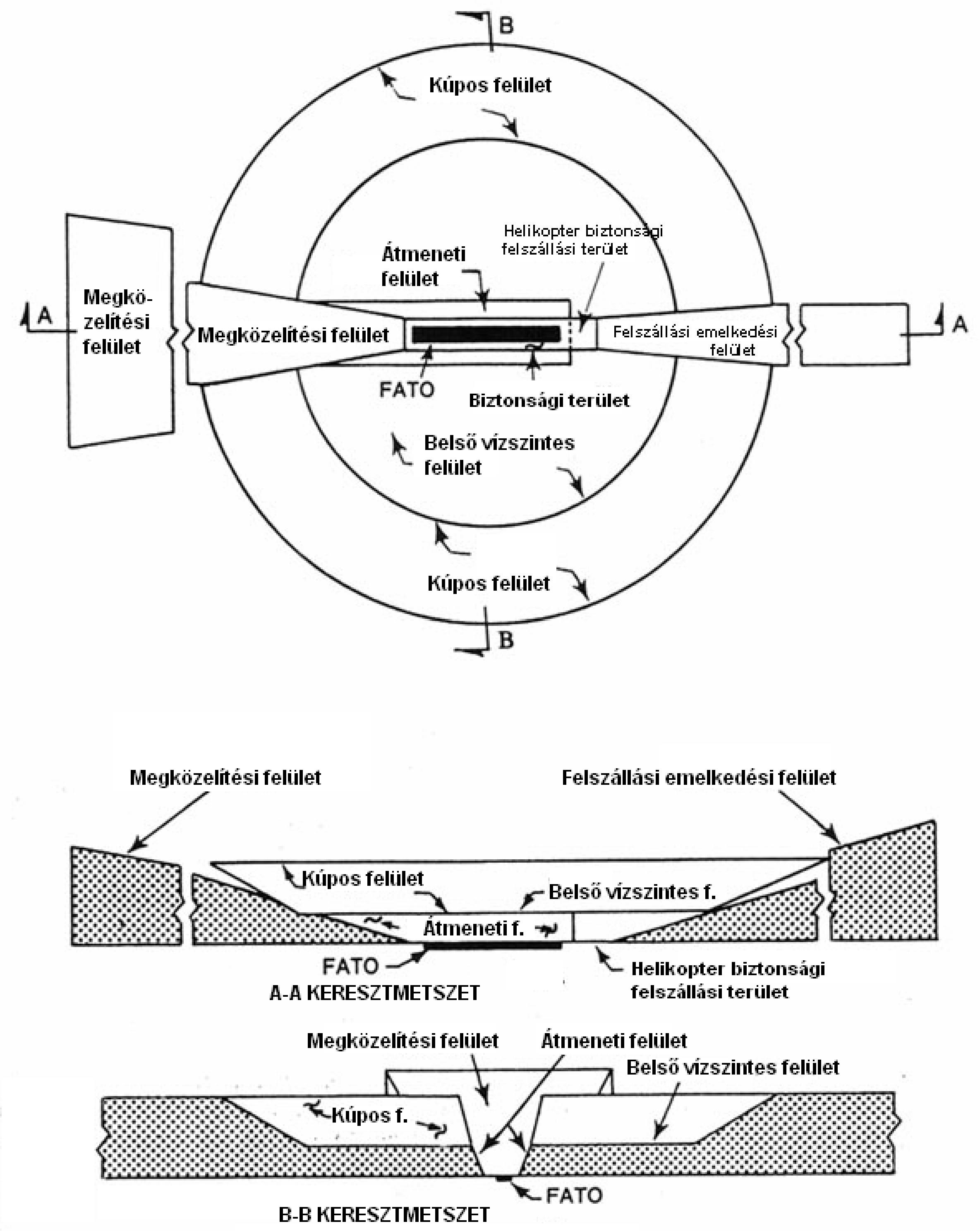
4.2.20 A FATO előtti és mögötti terület további akadályvédelmének biztosítása érdekében 1:5 (függőleges és vízszintes) arányban emelkedő felületeket jelöljenek ki, amelyek a két 150 °-os körszelet mentén, azok teljes hosszában olyan távolságig terjedjenek, amely megfelel legalább a végső megközelítési és felszállási terület átmérőjének. A felület szintje fölé akadály ne nyúljon (lásd 4-11. ábra).

A hajó fedélzet oldala

4.2.21 A "D" referencia kör első és hátsó középpontjától kezdődően a hajó fedélzet korlátjáig jelöljenek ki egy legalább végső megközelítési és felszállási terület átmérőjének 1,5-szörös távolságig terjedő területet, amelyen belül ne legyen a FATO szintjénél magasabb tárgy, kivéve azokat a segédeszközöket, amelyek a forgószárnyas légi-jármű üzemeltetéséhez szükségesek, azonban ezek magassága sem haladhatja meg a 25 cm-t (lásd 4-12. ábra).

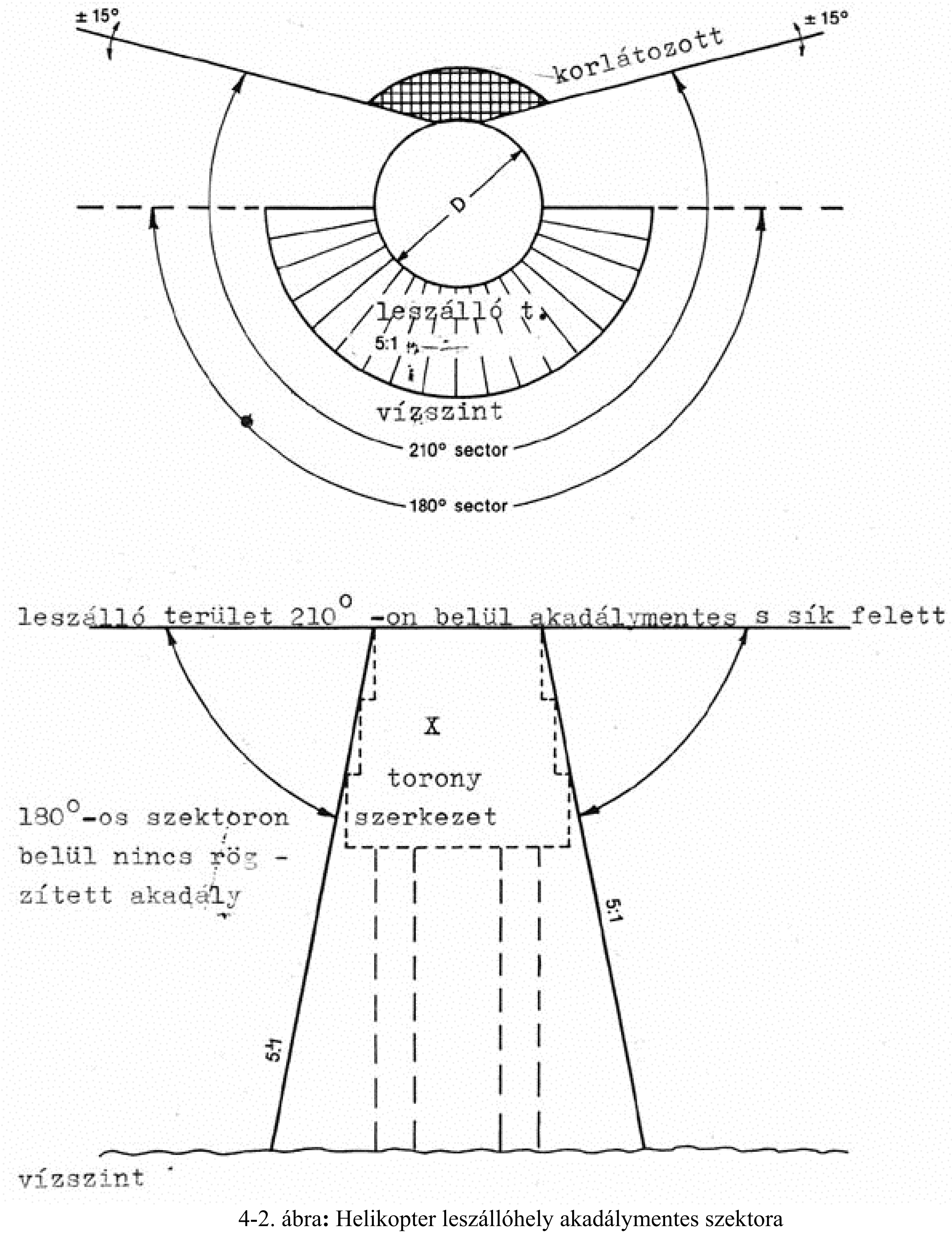
4.2.22 Jelöljenek ki egy vízszintes felületet, amely legalább a "D" referencia kör 0,25-szöröse. A felület vegye körbe a végső megközelítési és felszállási területet és az akadály mentes szektort, magassága a "D" érték 0.05-szöröse legyen, amely szint fölé akadály ne nyúljon.

Ábrák



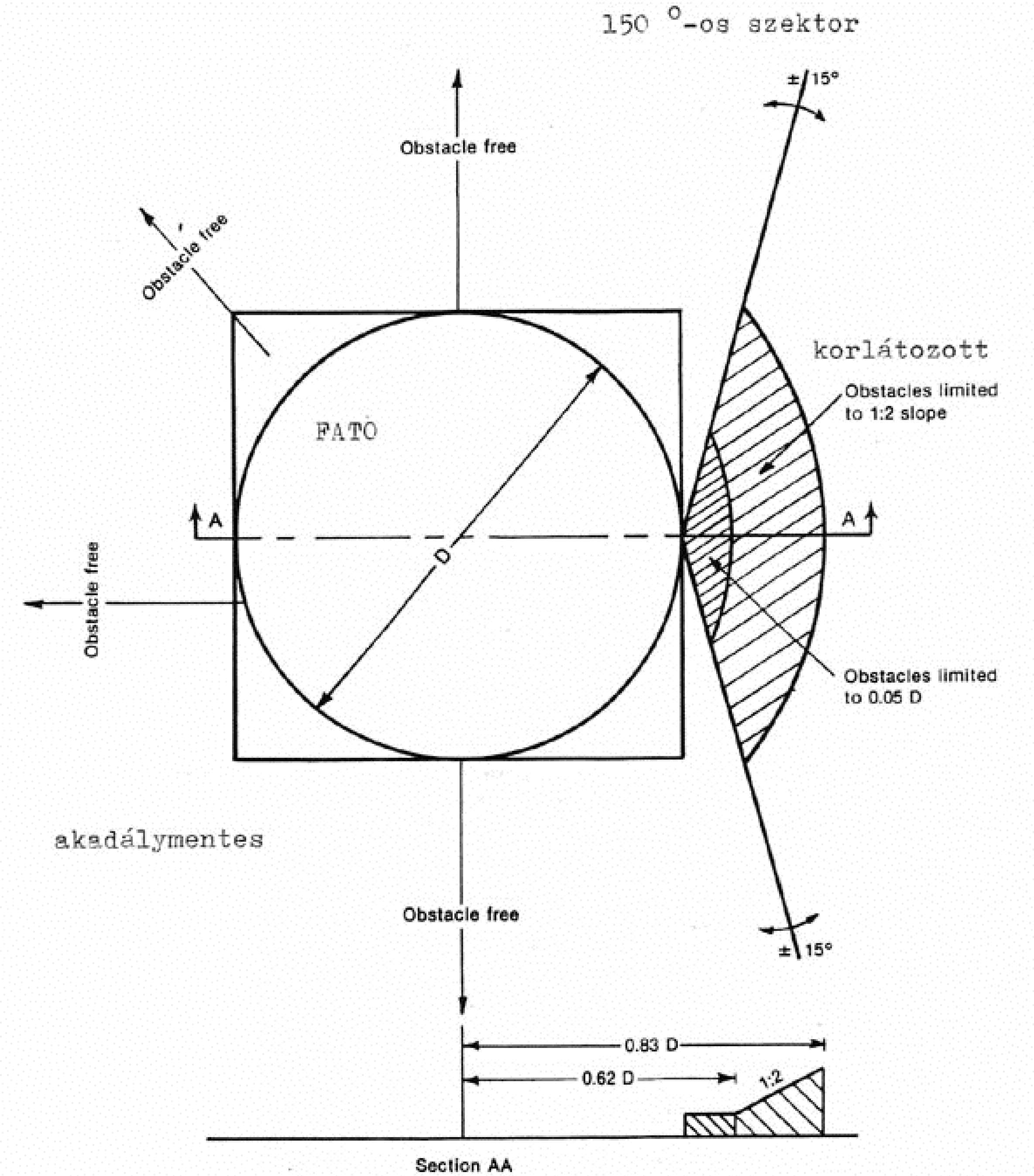
4-1. ábra**:** Akadály korlátozási felületek

Megjegyzés: - Az ábrán nem-precíziós megközelítésű végső megközelítési és felszállási valamint helikopter biztonsági felszállási területekkel rendelkező helikopter repülőtér akadálymentességi felületei láthatók



4-2. ábra**:** Helikopter leszállóhely akadálymentes szektora

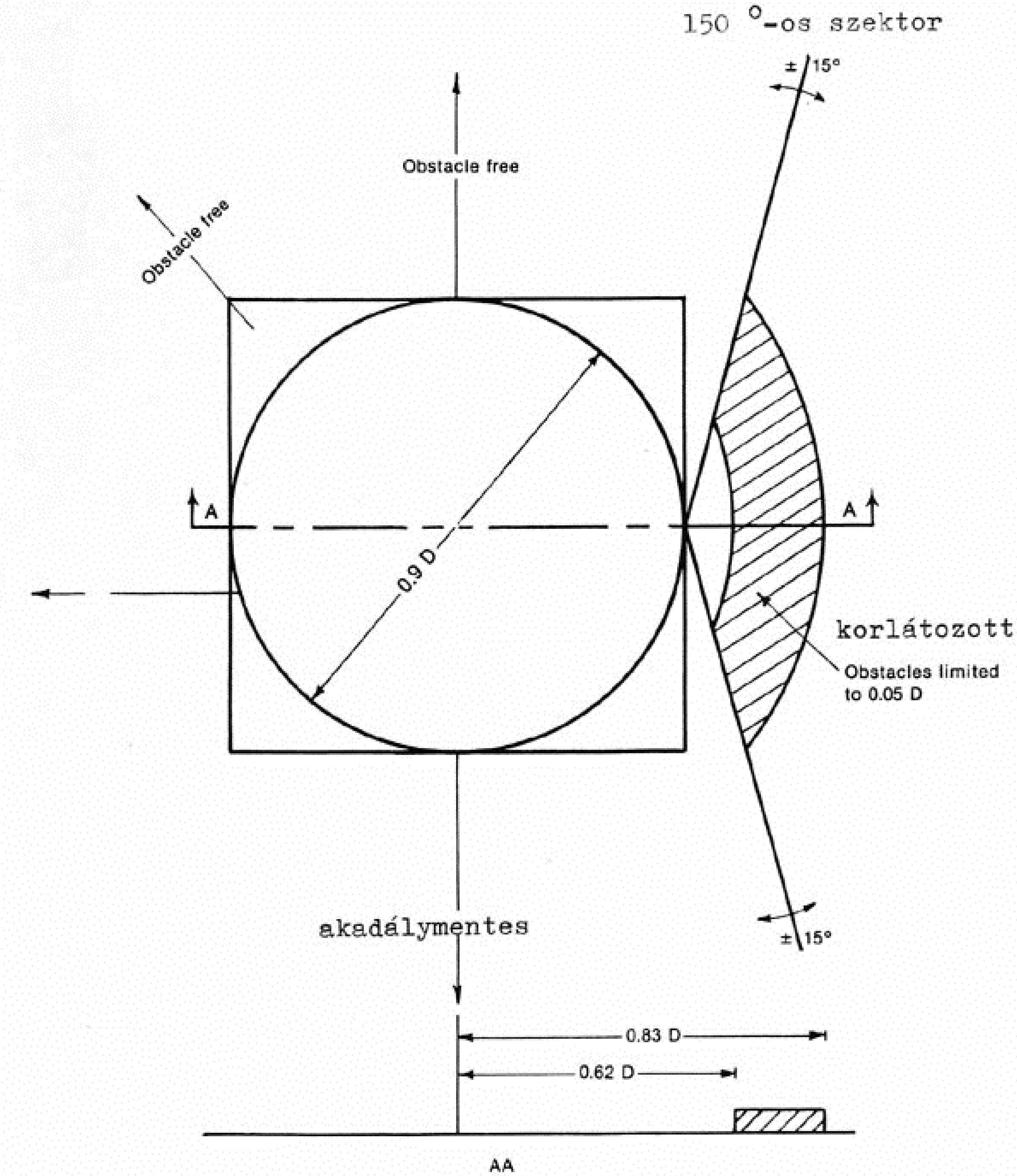
A terület szélének és az egész szektornak +/- 15° -os áthelyezése lehetséges.
A 180 °-os szektoron belül rögzített építmény elhelyezhető.



4-3.ábra:Helikopter leszállási hely akadály korlátozási szektora.

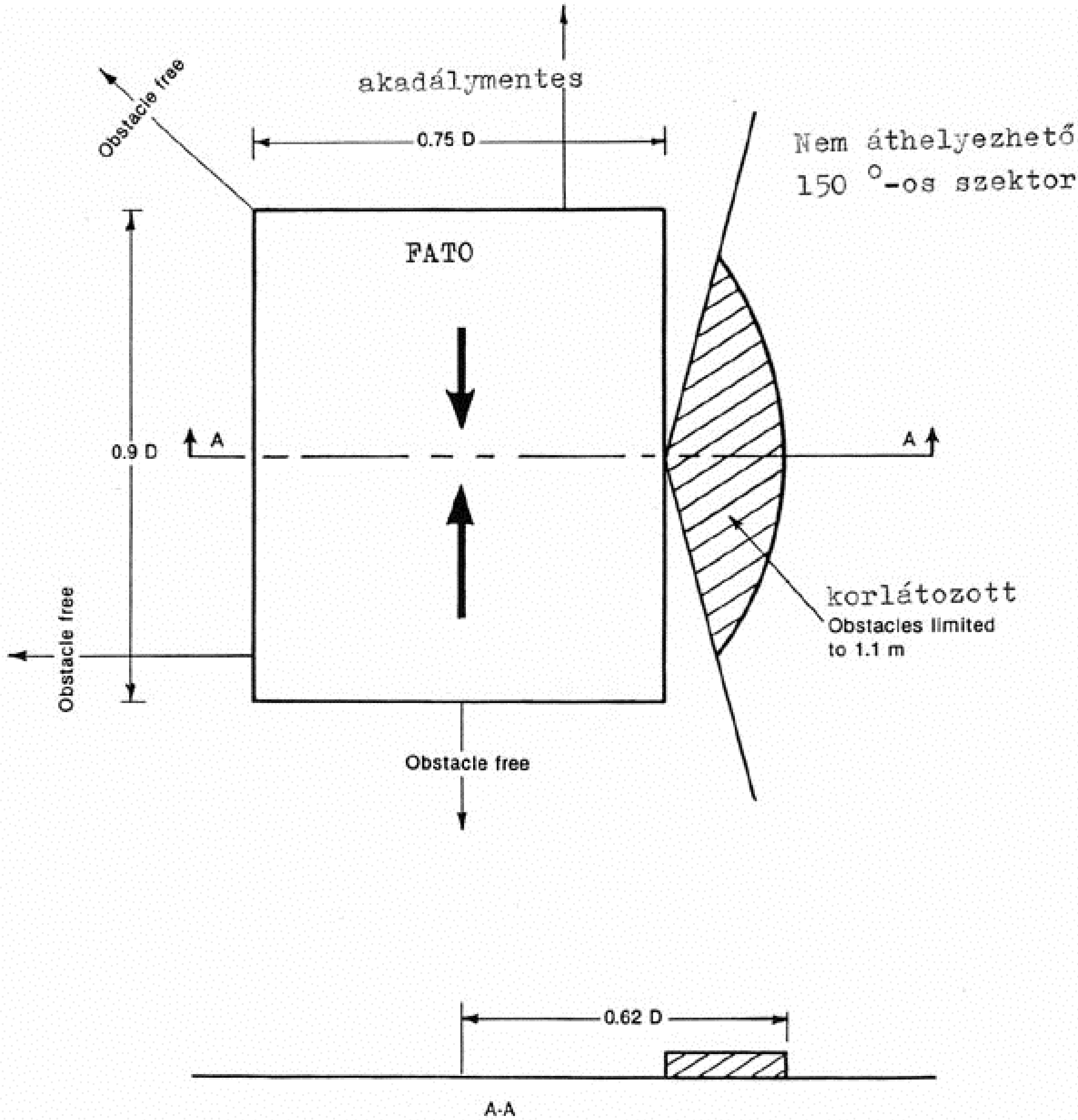
Egy fő forgőszárnyas és két egymás mellett elhelyezett forgószárnyas helikopterek.

A terület szélének és az egész szektornak +/- 15° -os áthelyezése lehetséges



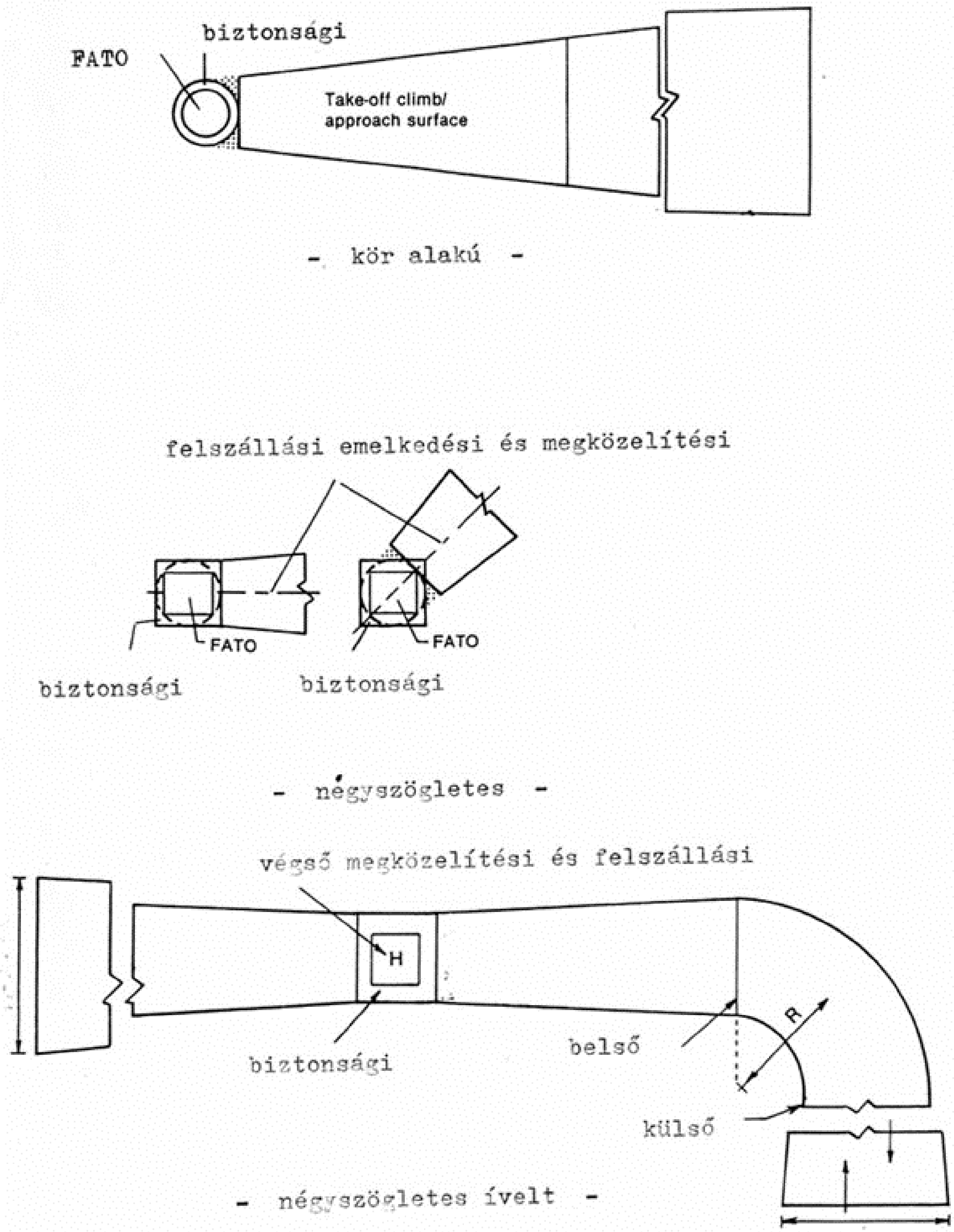
4-4. ábra: Helikopter leszállási hely akadály korlátozási szektora két egymás mögött elhelyezett forgószárnnyal ellátott helikopter több irányból történő üzemeltetésénél

A terület szélének és az egész szektornak +/- 15° -os áthelyezése lehetséges



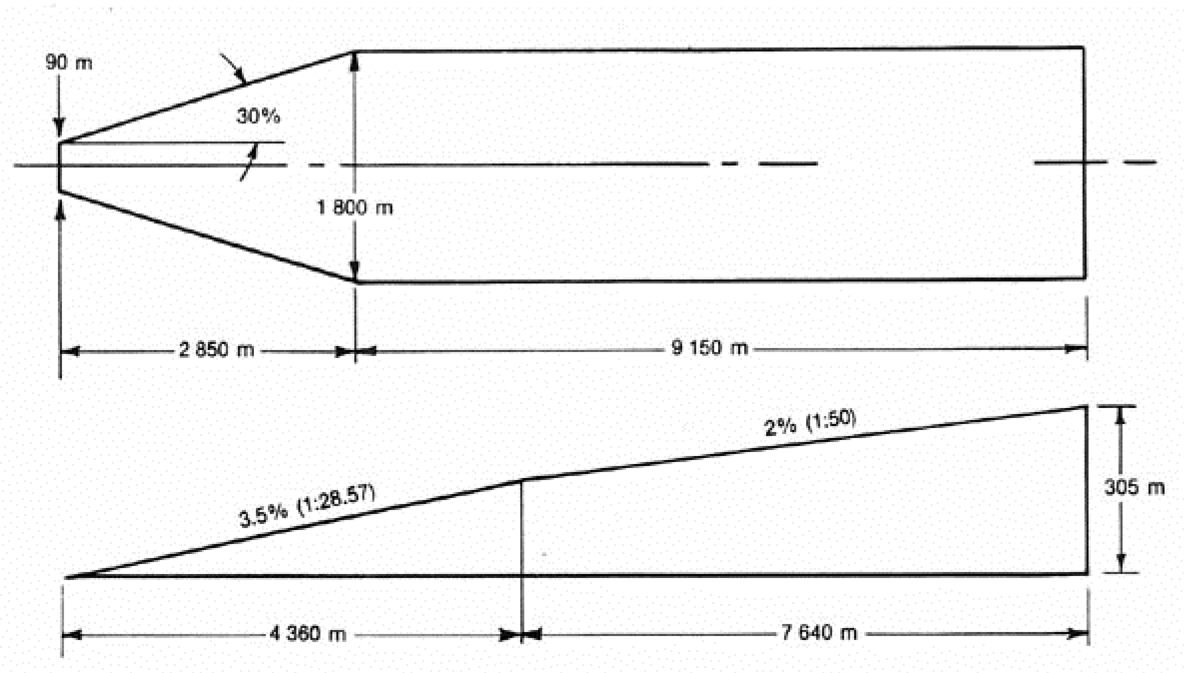
4-5. ábra: Helikopter leszállási hely akadály korlátozási szektora két egymás mögött elhelyezett forgószárnnyal ellátott helikopter két-irányból történő üzemeltetésénél

(Vastag nyilak jelzik a leszállás irányát)

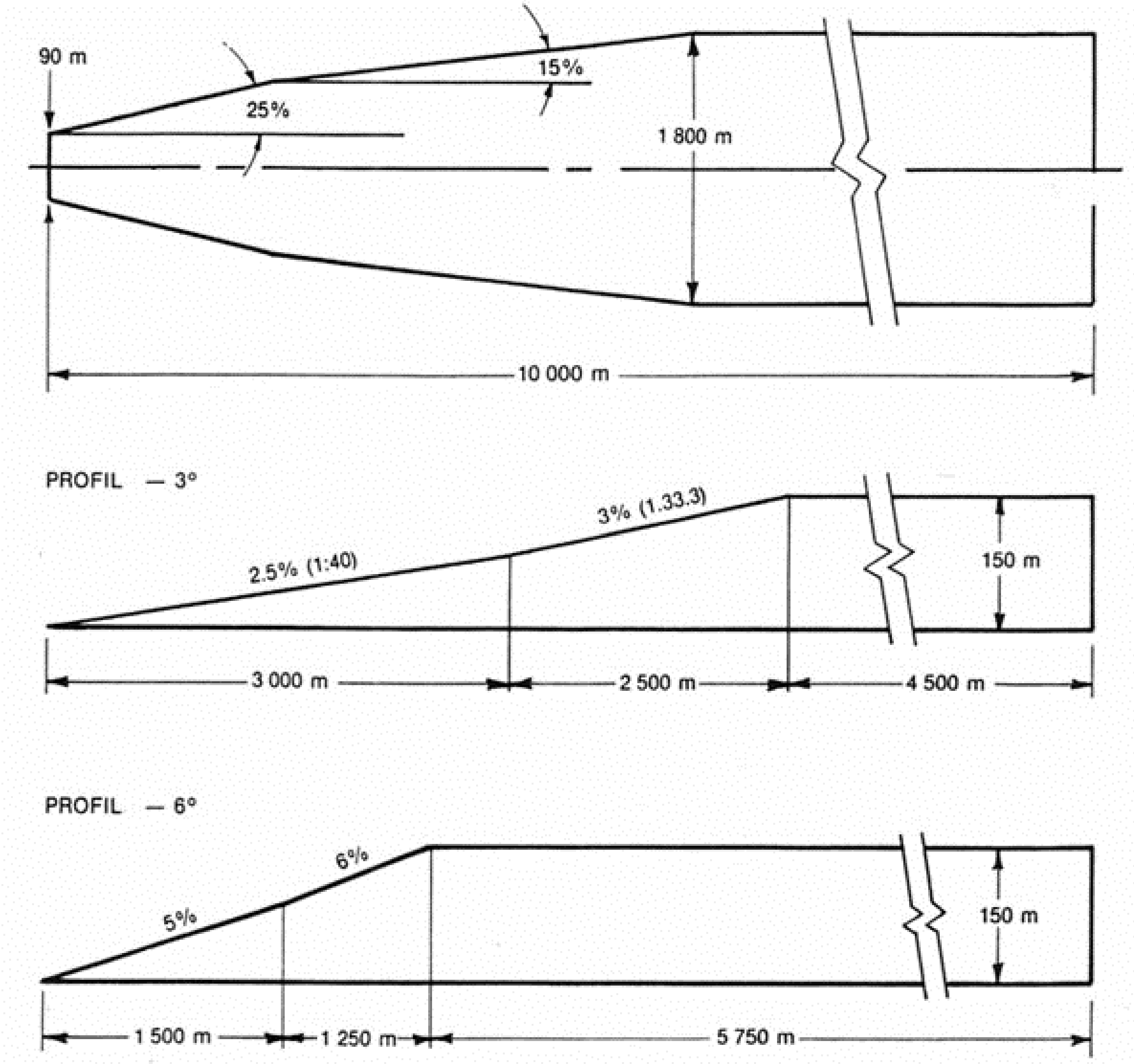


4-6. ábra: Felszállási emelkedési és megközelítési felületek (nem-műszeres FATO)

Legfelül: Kör alakú végső megközelítési és felszállási terület (egyenes megközelítés-elindulás)
Középen: Négyszögletű végső megközelítési és felszállási terület (egyenes megközelítés-elindulás)
Alul: Négyszögletű végső megközelítési és felszállási terület (ívelt megközelítés-elindulás)



4-7. ábra: A műszeres végső megközelítési és felszállási terület felszállási emelkedési felülete

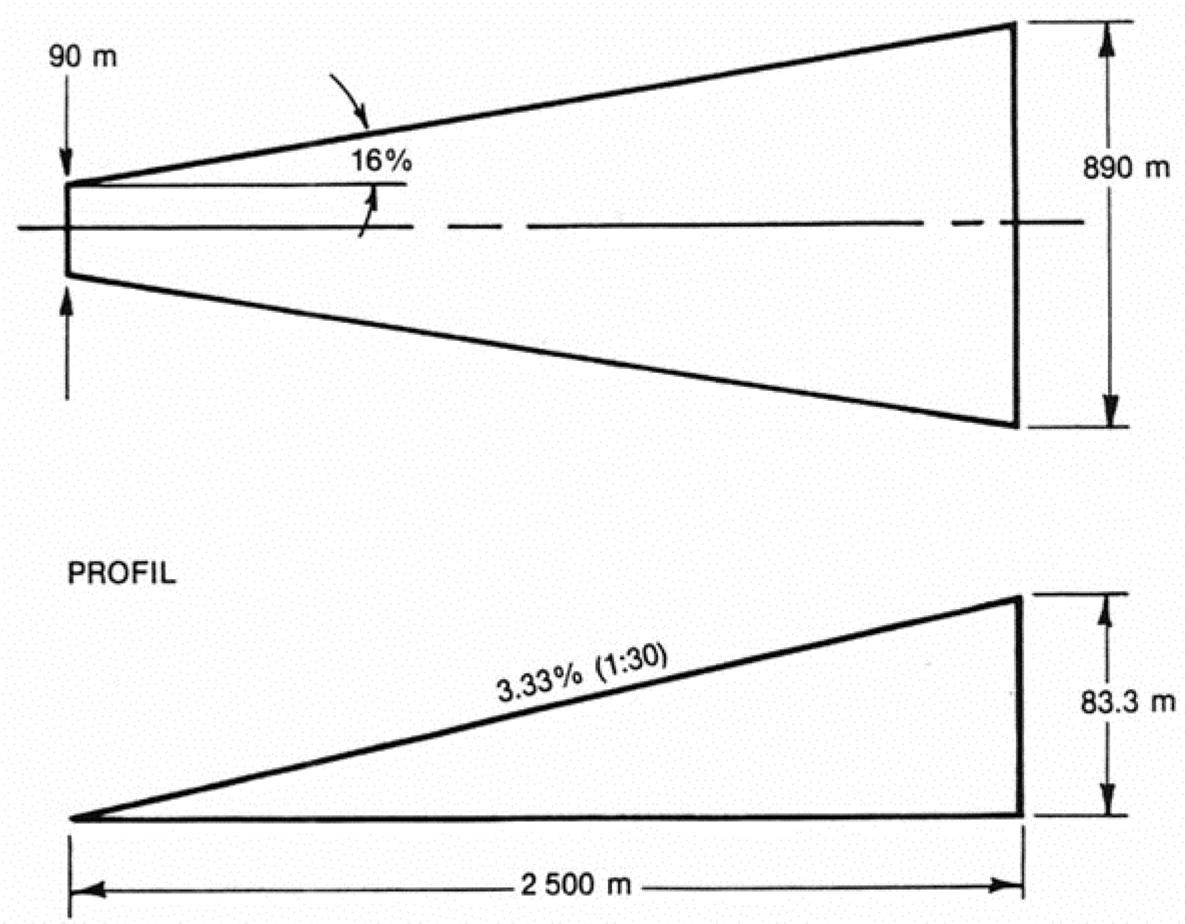


4-8. ábra: A precíziós megközelítésű FATO végső megközelítés felülete

Felső ábra: Felülnézet
extended centerline = meghosszabbított középvonal
outer edge = külső szél

Középső ábra: Oldalnézet, 3° -os megközelítés
horizontal - vízszintes

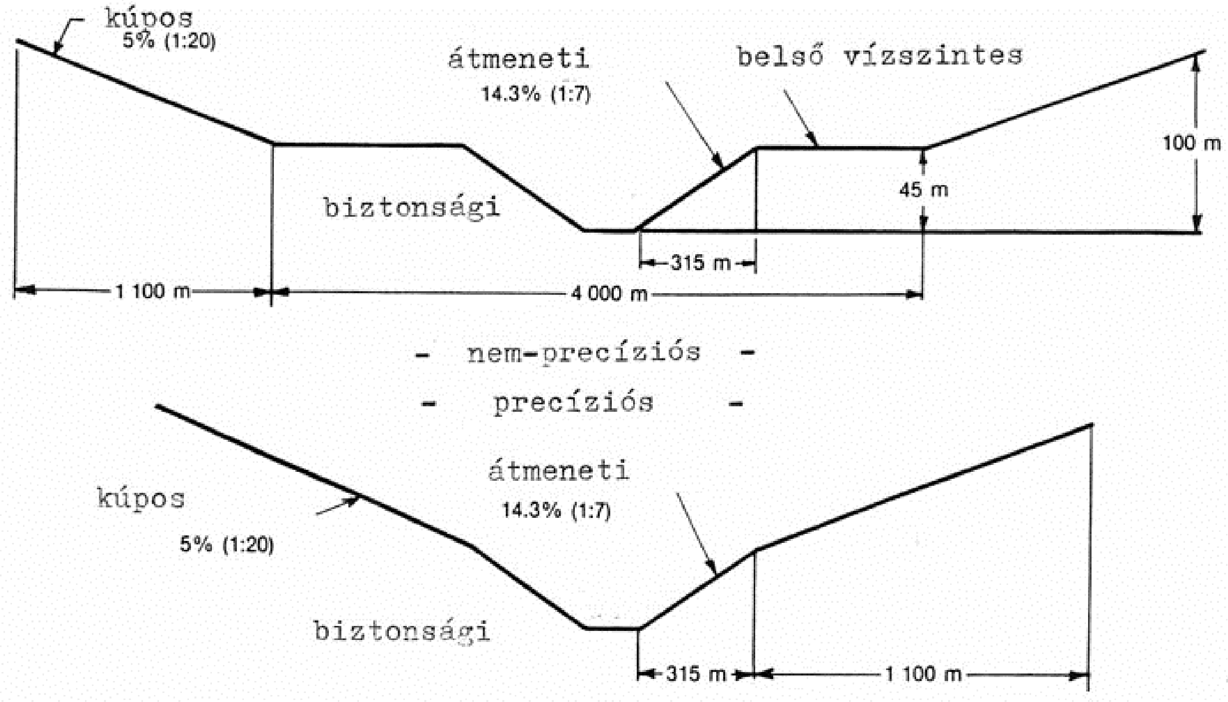
Alsó ábra: Oldalnézet, 6° -os megközelítés



4-9. ábra
Nem-precíziós megközelítésű FATO megközelítési felülete

Felső ábra: felülnézet

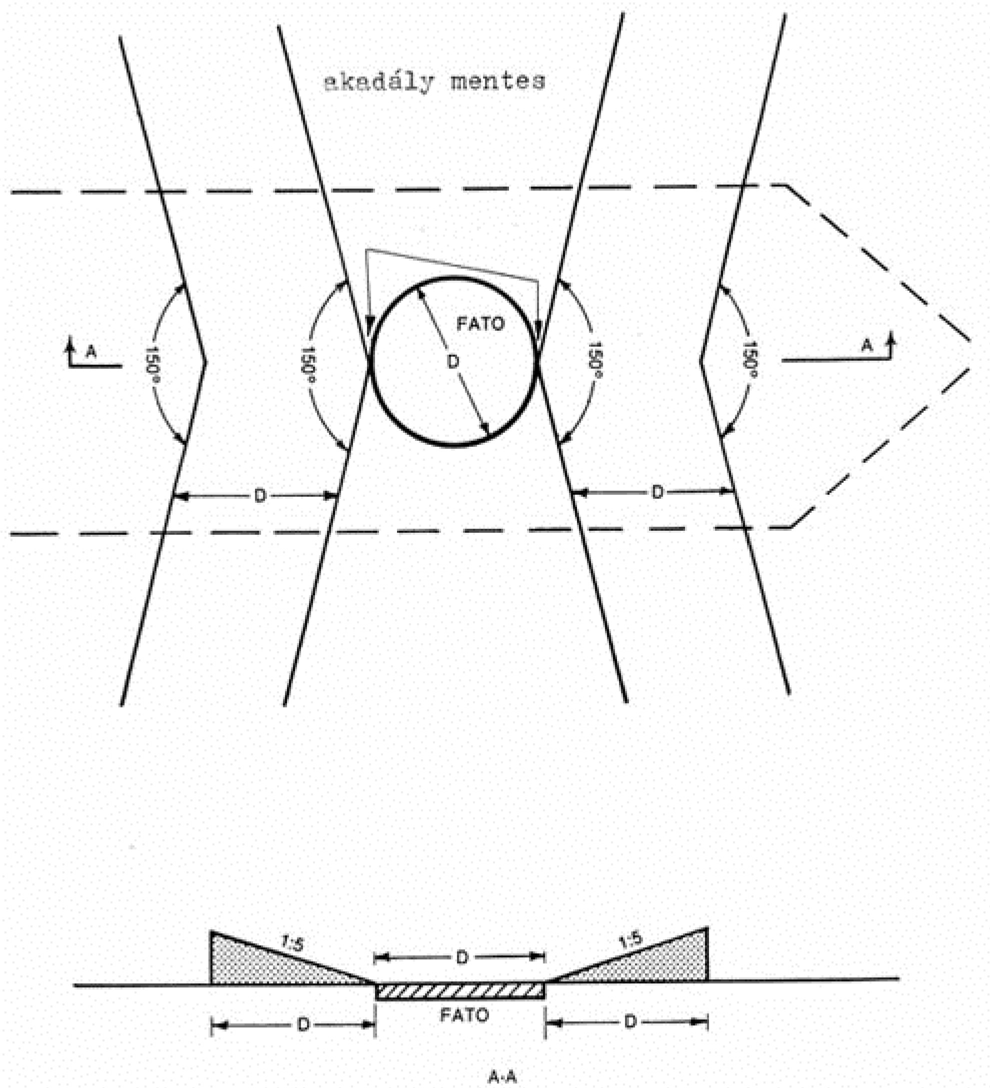
Alsó ábra: oldalnézet



4-10. ábra: Átmeneti, belső vízszintes és kúpos akadály korlátozási felületek

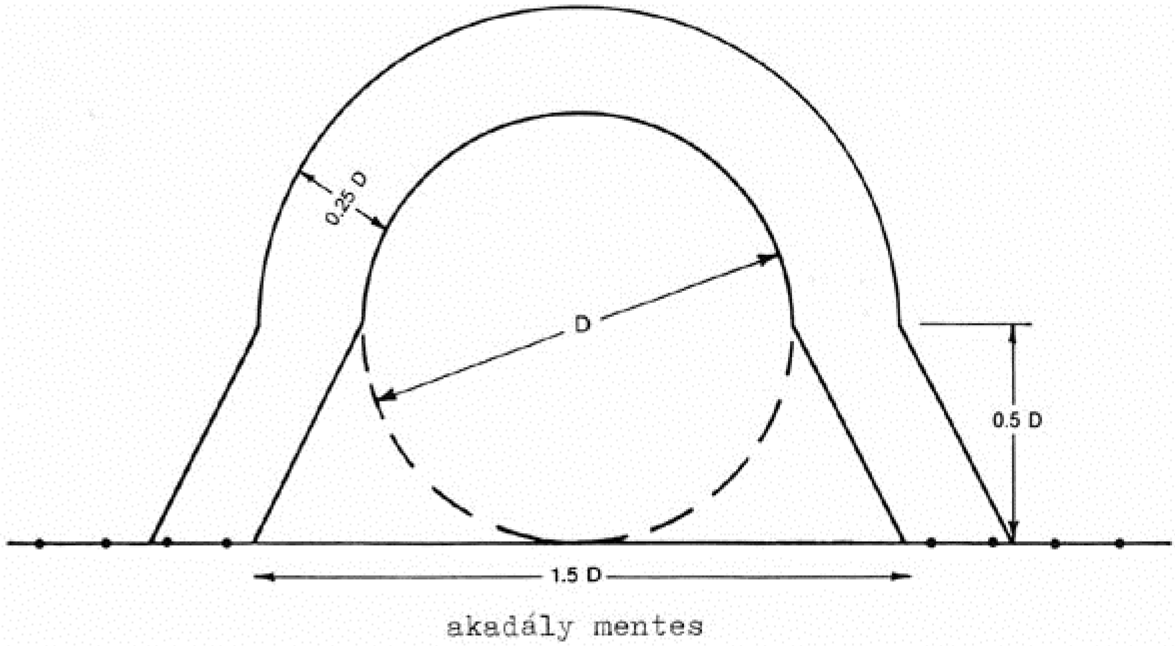
:
Felső ábra: Nem-precíziós megközelítés

Alsó ábra: Precíziós megközelítés esetén
(ha nincs belső vízszintes felület kijelölve)



4-11. ábra
A hajó fedélzetén, nem-kiépített helikopter leszállási hely akadály korlátozási felületei

D = a helikopter legnagyobb teljes mérete
Limited obstacle sector = akadály korlátozott szektor
Reference points = vonatkozási pontok



4-12. ábra: A hajó oldala mentén, nem-kiépített helikopter leszállási hely akadály korlátozási felületei

Limited obstacle sector maximum height 0.05 D = akadály korlátozott szektor magassága legfeljebb 0.05 D érték, kiterjedése 0,25D
Final approach and take-off area = végső megközelítési és felszállási terület kiterjedése D
Obstacle-free sector = akadálymentes szektor kiterjedése 1,5 D
A végső megközelítési és felszállási terület középpontja a hajó korlátjától számított 0.5 D érték
D = a helikopter legnagyobb teljes mérete

Táblázatok

4-1. táblázat: Akadály korlátozási felületek méretei és lejtviszonyai
Nem-műszeres és nem-precíziós végső megközelítési és felszállási terület

			Nem-műszeres (látás utáni) FATO Helikopter teljesítmény osztály			Nem-precíziós (műszeres) FATO
Felület és méretek			1	2	3	
MEGKÖZELÍTÉSI FELÜLET						
Belső él szélessége Belső él helye				Biztonsági terület szélessége Határok		
Első rész						
széttartása	nappal		10 %	10 %	10 %	16 %
éjszaka		15 %	15 %	15 %		
hossza	nappal		245 m a	245 m a	245 m a	2500 m
éjszaka		245 m a	245 m a	245 m a		
külső szélessége	nappal		49 m b	49 m b	49 m b	890 m
éjszaka		73.5 m b	73.5 m b	73.5 m b		
max. lejtése			8 % a	8 % a	8 % a	3.33 %
Második rész						
széttartása	nappal		10 %	10 %	10 %	
éjszaka		15 %	15 %	15 %		
hossza	nappal		c	c	c	
éjszaka		c	c	c		
külső szélessége	nappal		d	d	d	
éjszaka		d	d	d		
max. lejtése			12.5 %	12.5 %	12.5 %	
Harmadik rész						
széttartása				párhuzamos		
hossza	nappal		e	e	e	
éjszaka		e	e	e		
külső szélessége	nappal		d	d	d	
éjszaka		d	d	d		
max. lejtése			15 %	15 %	15 %	
BELSŐ VÍZSZINTES						
magassága						45 m
sugara						2000 m
KÚPOS						
lejtése						5 %
magassága						55 m
ÁTMENETI						
lejtése						20 %
magassága						45 m

Betűvel jelzetthez tartozó magyarázó szövegek:

a) A felület lejtése (emelkedése) és hossza lehetővé teszi, hogy a forgószárnyas légi-jármű lassítson a leszállás végrehajtásához és ezalatt megfigyelje az elkerülendő területeket.

b) A belső él szélességét adják hozzá a jelzett értékhez.

c) A belső él és azon pont közötti távolság, ahol az egységesen széttartó meghatározott szögben haladó egyenesek olyan szélességet érnek el, amely megfelel nappali üzemeltetés esetén 7x és éjszakai üzemeltetés esetén 10x forgószárny átmérő értéknek.

d) Teljes szélesség megfelel nappali üzemeltetés esetén 7x és éjszakai üzemeltetés esetén 10x forgószárny átmérő értéknek.

e) A belső él és azon pont közötti távolság, ahol a megközelítési felület eléri a belső él magassága feletti 150 méteres magasságot.

4-2. táblázat — Akadály korlátozási felületek méretei és lejtviszonyai
Műszeres(precíziós megközelítésű) végső megközelítési és felszállási terület

4-2. táblázat

3 °-os megközelítés — Magasság a FATO felett — 6 °-os megközelítés

90 m (300 ft)	60 m (200 ft)	45 m (150 ft)	30 m (100 ft)		90 m (300 ft)	60 m (200 ft)	45 m (150 ft)	30 m (100 ft)
90 m	90 m	90 m	90 m	a	90 m	90 m	90 m	90 m
60 m	60 m	60 m	60 m	b	60 m	60 m	60 m	60m
25%	25%	25%	25%	c	25%	25%	25%	25%
1 745 m	1 163 m	872 m	581 m	d	870 m	580 m	435 m	290 m
962 m	671 m	526 m	380 m	e	521 m	380 m	307.5 m	235 m
15%	15%	15%	15%	c	15%	15%	15%	15%
2 793 m	3 763 m	4 246 m	4 733 m	f	4 250 m	4 733 m	4 975 m	5 217 m
1 800 m	1 800 m	1 800 m	1 800 m	g	1 800 m	1 800 m	1 800 m	1 800 m
5 462 m	5 074 m	4 882 m	4 686 m	h	3 380 m	3 187 m	3 090 m	2 993 m
1 800 m	1 800 m	1 800 m	1 800 m	i	1 800 m	1 800 m	1 800 m	1 800 m
2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	2.5% (1:40)	j	5% (1:20)	5% (1:20)	5% (1:20)	5% (1:20)
3 000 m	3 000 m	3 000 m	3 000 m	k	1 500 m	1 500 m	1 500 m	1 500 m
3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	3% (1:33.3)	l	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)	6% (1:16.66)
2 500 m	2 500 m	2 500 m	2 500 m	m	1 250 m	1 250 m	1 250 m	1 250 m
10 000 m	10 000 m	10 000 m	10 000 m	n	8 500 m	8 500 m	8 500 m	8 500 m
5% 55 m	5% 55 m	5% 55 m	5% 55 m	o - p	5% 55 m	5% 55 m	5% 55 m	5% 55 m
14.3% 45 m	14.3% 45 m	14.3% 45 m	14.3% 45 m	q r	14.3% 45 m	14.3% 45 m	14.3% 45 m	14.3% 45 m

Felület és méretek (a táblázat közepén abc... szerint)

Megközelítési felület
a) belső él hossza
b) távolság a végső megközelítési és felszállási terület végétől
c) mindkét oldal széttartása a végső megközelítési és felszállási terület feletti meghatározott magasságig
d) távolság a végső megközelítési és felszállási terület feletti meghatározott magasságig
e) szélesség a végső megközelítési és felszállási terület feletti magasságon
f) a párhuzamos rész (szektor) távolsága
g) a párhuzamos rész (szektor) szélessége
h) a külső él távolsága
i) a külső él szélessége
j) az első rész lejtviszonya (lejtés %-ban és arányértékben)
k) az első rész hossza
l) a második rész lejtviszonya (lejtés %-ban és arányértékben)
m) a második rész hossza
n) a felület teljes hossza

Kúpos
o) lejtése
p) magassága

Átmeneti
q) lejtése
r) magassága

4-3. táblázat: Akadály korlátozási felületek méretei és lejtviszonyai
Egyenes felszállási útvonal

			Nem-műszeres (látás utáni) FATO Helikopter teljesítmény osztály			műszeres FATO
Felület és méretek			1	2	3	
Felszállási emelkedés						
Belső él szélessége				Biztonsági terület szélessége		90m
Belső él helye				A biztonsági felszállási terület határa vagy vége		
Első rész						
széttartása	nappal		10 %	10 %	10 %	30 %
éjszaka		15 %	15 %	15 %		
hossza	nappal		a	245 m b	245 m b	2850 m
éjszaka		a	245 m b	245 m b		
külső szélessége	nappal		c	49 m d	49 m d	1800 m
éjszaka		c	73.5 m d	73.5 m d		
max. lejtése			4.5 % #	8 % b	8 % b	3.5 %
Második rész						
széttartása	nappal		párhuzamos	10 %	10 %	párhuzamos
éjszaka		párhuzamos	15 %	15 %		
hossza	nappal		e	a	a	1510 m
éjszaka		e	a	a		
külső szélessége	nappal		c	c	c	1800 m
éjszaka		c	c	c		
max. lejtése			4.5 % #	15 %	15 %	3.5 % #
Harmadik rész						
hossza	nappal		-	e	e	7640 m
	éjszaka		-	e	e	
széttartása			-		párhuzamos	
külső szélessége	nappal		-	c	c	1800 m
éjszaka		-	c	c		
max. lejtése			-	15 %	15 %	2 %

Ez a lejtviszony érték meghaladja a jelenleg üzemelő forgószárnyas légijárművek nagy részének legnagyobb felszállósúly mellett egy üzemképtelen hajtóművel történő emelkedés-i mértékét.

Betűvel jelzetthez tartozó magyarázó szövegek:

a) A belső él és azon pont közötti távolság, ahol az egységesen széttartó meghatározott szögben haladó egyenesek elérik a következő szélesség értéket:
a forgószárny átmérő hétszerese nappali és tízszerese éjszakai üzemeltetés esetén.
b) A felület lejtése (emelkedése) és hossza lehetővé teszi, hogy a forgószárnyas légi-jármű lassítson a leszállás végrehajtásához és ezalatt megfigyelje az elkerülendő területeket.
c) Teljes szélesség megfelel nappali üzemeltetés esetén 7x és éjszakai üzemeltetés esetén 10x forgószárny átmérő értéknek.
d) A belső él szélességét adják hozzá a jelzett értékhez.
e) A belső él és azon pont közötti távolság, ahol a megközelítési felület eléri a belső él magassága feletti 150 méteres magasságot.

4-4. táblázat: Ívelt felszállási emelkedési és megközelítési terület kritérumai
Nem-műszeres végső megközelítés és felszállás

Jellemző	Előírás
irányváltozás	szükség szerint — de legfeljebb 120°
a középvonal fordulósugara	nem kevesebb mint 270 m
a belső megközelítési kapu távolsága #	(a) 1. teljesítmény osztályú helikopter — a biztonsági területtől vagy a helikopter akadálymentes sávtól nem kevesebb mint 305 m (b) 2. és 3. teljesítmény osztályú helikopter — a végső megközelítési és felszállási terület végétől nem kevesebb mint 370 m
a belső megközelítési kapu szélessége	nappal — a belső él szélessége és a fenti távolság 20 %-a éjszaka — a belső él szélessége és a fenti távolság 30 %-a
a külső megközelítési kapu szélessége	nappal — a belső él szélessége és a 7 RD távolság 20 %-a éjszaka — a belső él szélessége és a 10 RD távolság 30 %-a
a belső és külső megközelítési kapuk magassága	a belső éltől mért távolság és a kijelölt lejtviszony arány alapján meghatározva
lejtviszonyok	4-1. — 4-3. táblázatok alapján
széttartás	4-1. — 4-3. táblázatok alapján
a terület teljes hossza	4-1. — 4-3. táblázatok alapján

A legkisebb szükséges távolság a felszállás utáni forduló megkezdéséig vagy végső megközelítés esetén az utolsó forduló befejezéséig.

7 RD = A forgószárny átmérő hétszeresének megfelelő szélesség érték.
10 RD = A forgószárny átmérő tízszeresének megfelelő szélesség érték.

Megjegyzés: - A felszállási emelkedési és megközelítési terület teljes hosszán szükség lehet egynél több fordulóra is. Az egymást követő minden egyes fordulóra azonos előírások vonatkoznak, azonban a belső és a külső kapuk szélessége általában a terület teljes szélessége legyen.

5. fejezet
Látás utáni segédeszközök

5.1 Jelző berendezések

5.1.1 Szélirány jelzők

Alkalmazás

5.1.1.1 A helikopter repülőtéren legalább egy darab szélirány jelzőt helyezzenek el.

Elhelyezés

5.1.1.2 A szélirány jelzőt úgy helyezzék el, hogy az jelezze a végső megközelítési és felszállási területen uralkodó szélviszonyokat és annak helyes működését a közeli tárgyak, épületek körül keletkező vagy a forgószárny keltette erős lefelé irányuló áramlás ne befolyásolja. A szélirány jelző a mozgási területen vagy a levegőben üzemelő, függeszkedő forgószárnyas légijárműből látható legyen.

5.1.1.3 ***Ajánlás*** *— Ahol a földetérési és elemelkedési területen turbulens áramlások várhatók, a területhez közel további szélirány jelzőket helyezzenek el, amelyek az adott területen tapasztalható talajszelet jelzik.*
Megjegyzés : A szélirány jelző elhelyezésével kapcsolatos útmutató a Helikopter Repülőtér Kézikönyv*-ben található.*

Jellemzők

5.1.1.4 A szélirány jelzőt úgy készítsék el, hogy a szél irányát egyértelműen mutassa és a szél sebességét általában jelezze.

5.1.1.5. ***Ajánlás*** *— A szélirány jelző kúpos henger alakú legyen, műanyag vagy textil szövetből készüljön. Méretei legalább a következők legyenek:*

	Felszíni helikopter repülőtér	Emelt szinten létesített helikopter repülőtér vagy helikopter leszállóhely
hossza	2.4 méter	1.2 méter
átmérője (a nagyobb végén)	0.6 méter	0.3 méter
átmérője (a kisebb végén)	0.3 méter	0.15 méter

5.1.1.6 ***Ajánlás*** *— A környezetet és hátteret figyelembe véve a szélirány jelző színét úgy válasszák meg, hogy ezzel a jelző tisztán látható és értelmezhető legyen a helikopter repülőtér felett legalább 200 méter (650 láb) magasságból. Ahol lehetséges, egy-színű, lehetőleg fehér vagy narancssárga jelzőt használjanak. Ahol két szín kombinációja szükséges ahhoz, hogy a szélirány jelző megfelelően kiemelkedjen a változó háttérből, a választott szín lehetőleg narancssárga és fehér, vörös és fehér vagy fekete és fehér legyen. A csíkozás legalább öt változó csíkból álljon olyan formában, hogy az első és utolsó csík a sötétebbik színből legyen.*

5.1.1.7 Az éjszaka is használni kívánt helikopter repülőtéren a szélirány jelzőt világítsák meg.

5.2 Jelzések és jelzők

Megjegyzés: - A jelzések feltűnésének javítására vonatkozóan lásd a 14. Annex I. kötete 5.2.1.4. pont 1.Megjegyzését.

5.2.1 Csörlési terület jelzése

Alkalmazás

5.2.1.1 ***Ajánlás*** *— A csörlési területen helyezzenek el csörlési terület jelzést.*

Elhelyezés

5.2.1.2 A csörlési terület jelzést úgy helyezzék el, hogy annak középpontja egybeessen a csörlési terület akadálymentes zónájának középpontjával.

Jellemzők

5.2.1.3 A csörlési területet egy legalább 5 méter átmérőjű, sárga színű tömör körrel jelöljék meg.

5.2.2 Helikopter repülőtér azonosító jelzés

Alkalmazás

5.2.2.1 A helikopter repülőtéren helyezzenek el azonosító jelzést.

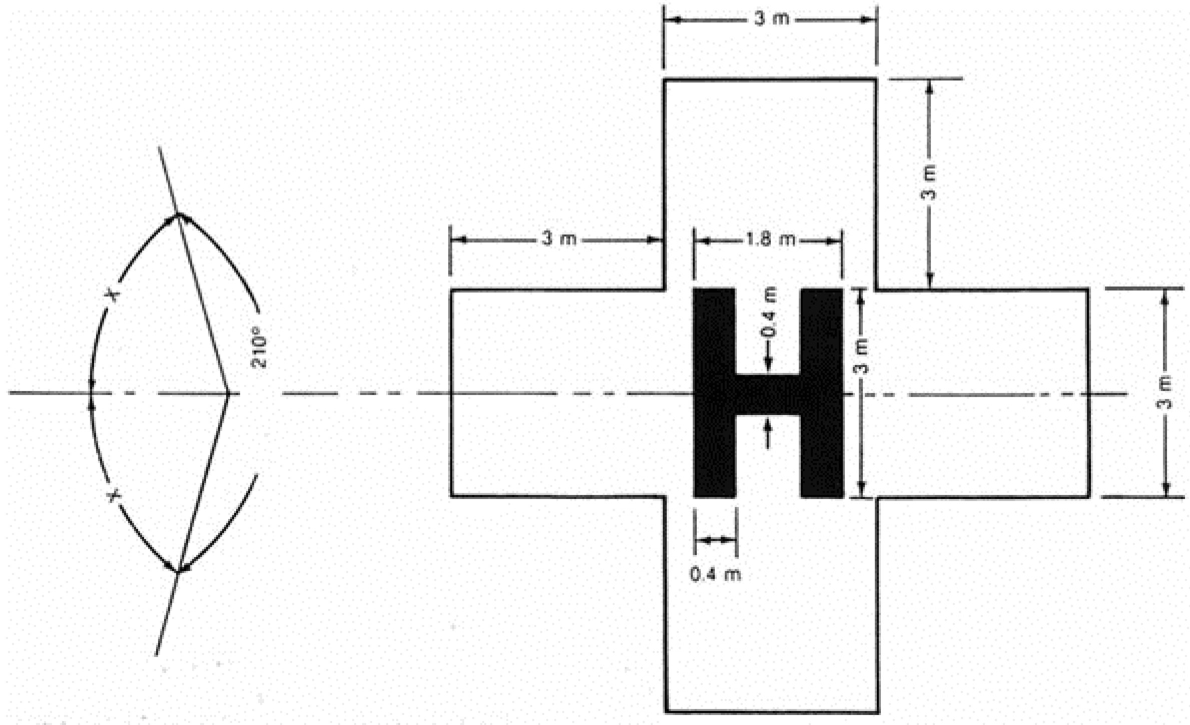
Elhelyezés

5.2.2.2 A helikopter repülőtér azonosító jelzést a végső megközelítési és felszállási területen belül, a terület közepén vagy annak közelében helyezzék el. Amennyiben futópálya azonosító (irány) jelölést is alkalmaznak, a helikopter repülőtér azonosító jelzést a terület mindkét végén helyezzék el.

Jellemzők

5.2.2.3 A kórházi helikopter repülőtér kivételével az azonosító jelzés fehér színű "H" betű legyen. A betű méretei ne legyenek kisebbek az 5-1. ábrán bemutatott méreteknél és ahol az 5.2.5 szakasz előírásai szerint a helikopter repülőtér azonosító jelzést a végső megközelítési és felszállási terület azonosító jelzéssel együtt alkalmazzák, a méreteket 3-al szorozzák meg.

Megjegyzés : A kötélhálóval borított helikopter leszállási hely esetében hasznos lehet a jelzés magasságának 4 méterre valamint a többi méret ennek megfelelőre történő növelése.



5-1. ábra: Helikopter repülőtér azonosító jelzés
(kórházi leszállási hely jelző kereszttel és az akadály mentes szektor (X) oldalnézetben)

5.2.2.4 A kórházi helikopter repülőtér vagy helikopter leszállási hely azonosító jelzése egymás mellett elhelyezett négyzetekből kialakított fehér színű kereszten vörös színű "H" betű legyen. A kórházi azonosító jelzés és méretei az 5-1. ábrán láthatók.

5.2.2.5 A helikopter repülőtér vagy helikopter leszállási hely azonosító jelzés "H" betűjét úgy helyezzék el, hogy annak szárai jelezzék a kívánatos végső megközelítési irányt. A helikopter leszállási helyen a keresztszár az 5-1. ábrának megfelelően az akadály mentes szektor felezővonalán vagy azzal párhuzamosan helyezkedjen el.

5.2.3 Legnagyobb megengedett tömeg jelzés

Alkalmazás

5.2.3.1 ***Ajánlás*** *— Az emelt szinten létesített helikopter leszállóhelyen valamint a helikopter leszállási helyen legnagyobb megengedett tömeg jelzést helyezzenek el.*

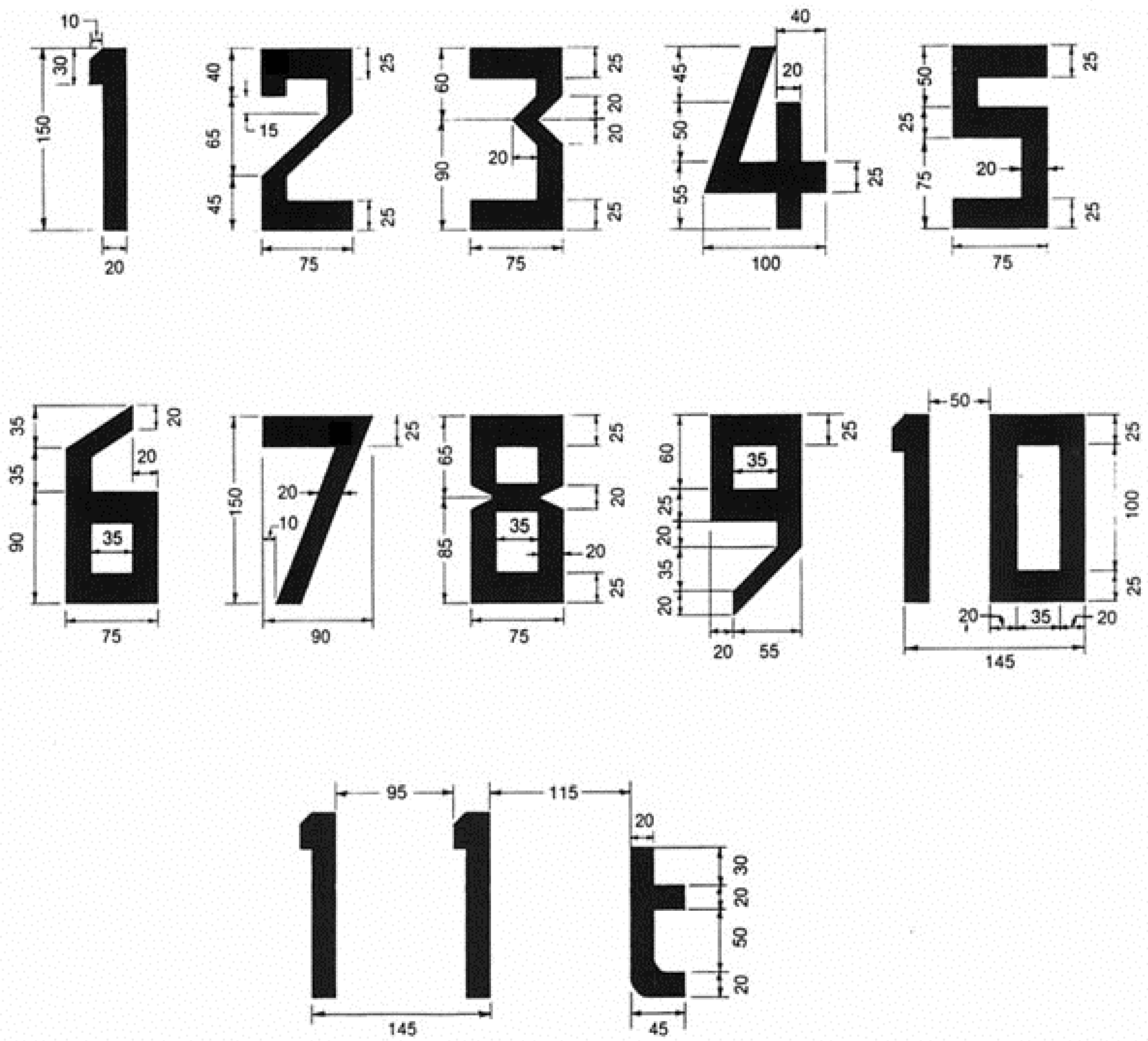
Elhelyezés

5.2.3.2 ***Ajánlás*** *— A legnagyobb megengedett tömeg jelzést a földetérési és elemelkedési területen belül úgy helyezzék el, hogy az a kívánatos végső megközelítési irányból jól olvasható legyen.*

Jellemzők

5.2.3.3 A legnagyobb megengedett tömeg jelzés két számjegyből álljon, amelyeket egy "t" betű követ. A két számjegy tonnában jelzi a legnagyobb megengedett tömeget (1000 kg).

5.2.3.4 ***Ajánlás*** *— A jelzés számai és betűje a háttértől kellően megkülönböztethető színűek legyenek, méreteik és arányaik az alábbi ábrán láthatók.*



5-2. ábra: A legnagyobb megengedett tömeg jelzés számai és betűje (méretek: centiméterben)

5.2.4 Végső megközelítési és felszállási terület jelzés vagy jelző

Alkalmazás

5.2.4.1 A szárazföldön létesített felszíni helikopter repülőtéren, ott ahol a végső megközelítési és felszállási terület határai nem maguktól értetődőek, helyezzenek el végső megközelítési és felszállási terület jelzést vagy jelzőt.

Elhelyezés

5.2.4.2 A végső megközelítési és felszállási terület jelzést vagy jelzőt a végső megközelítési és felszállási terület határán helyezzék el.

Jellemzők

5.2.4.3 A végső megközelítési és felszállási terület jelzés vagy jelző elhelyezése a következő legyen:

a) a négyzet vagy téglalap alaprajzú területeken egymástól nem több mint 50 méteres egyenlő távközönként, oldalanként legalább három darab jelzés vagy jelző, közöttük egy minden sarok-pontban; és

b) bármely más alaprajzú, közöttük a kör alaprajzú területen egymástól nem több mint 10 méteres egyenlő távközönként legalább öt darab jelzés vagy jelző.

5.2.4.4 A végső megközelítési és felszállási terület jelzés szögletes sáv legyen, melynek hossza 9 méter vagy a végső megközelítési és felszállási terület oldalhosszúságának 20 %-a (1/5-e) és szélessége 1 méter. Ahol jelzőt alkalmaznak, az feleljen meg a 14. Annex I. kötet 5.5.8.3 pont előírásainak, azonban a jelző magassága ne haladja meg a talajszint vagy hófelszín felett 25 cm értéket.

5.2.4.5 A végső megközelítési és felszállási terület jelzés színe fehér legyen.

5.2.5 Végső megközelítési és felszállási terület azonosító jelzés

Alkalmazás

5.2.5.1 ***Ajánlás*** *— Helyezzenek el végső megközelítési és felszállási terület azonosító (irány) jelzést ott, ahol a légi-jármű vezető számára szükséges a terület megfelelő azonosítása.*

Elhelyezés

5.2.5.2 A végső megközelítési és felszállási terület azonosító jelzést az 5-3. ábra szerint, a végső megközelítési és felszállási terület elején helyezzék el.

Jellemzők

5.2.5.3 A végső megközelítési és felszállási terület azonosító jelzés a 14. Annex I. kötet 5.2.2.4 és 5.2.2.5 pontjaiban előírt futópálya (irány) azonosító jelzés legyen, amelyet a fenti 5.2.2 szakaszban jelzett "H" betűvel egészítsenek ki (Lásd 5-3. ábra).

5.2.6 Célpont jelzés

Alkalmazás

5.2.6.1 ***Ajánlás*** *— Helyezzenek el célpont jelzést azon a helikopter repülőtéren, amelyen a légi-jármű vezető egy adott pontra hajtja végre a megközelítést, mielőtt a földetérési és elemelkedési területre repülne tovább.*

Elhelyezés

5.2.6.2 A célpont jelzést a végső megközelítési és felszállási területen belül helyezzék el.

Jellemzők

5.2.6.3 A célpont jelzés egy egyenlő oldalú háromszög, amelynek felső csúcsából húzott felezővonala a kívánatos végső megközelítési iránnyal párhuzamos. A jelzés az 5-4. ábra szerint folyamatos fehér színű vonalakból (sávok) álljon.

5.2.7 Földetérési és elemelkedési terület jelzés

Alkalmazás

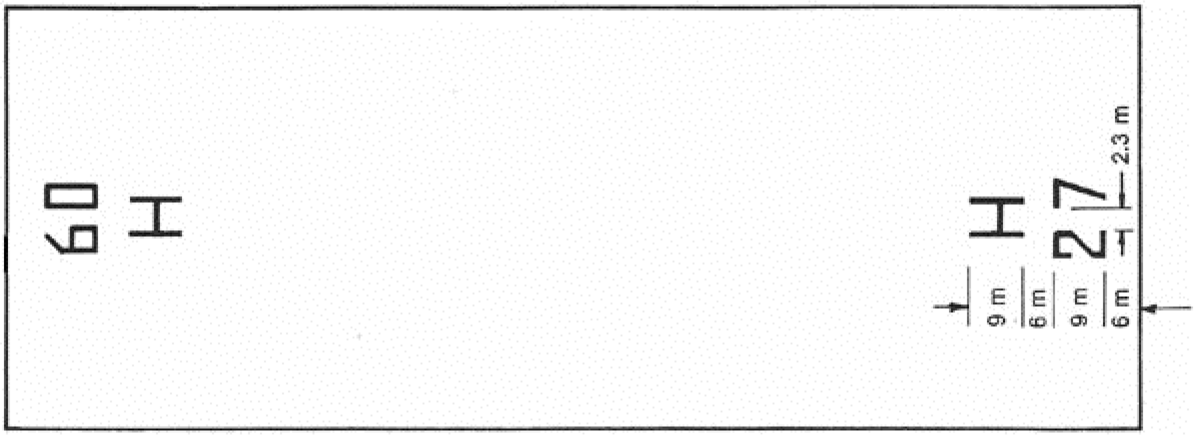
5.2.7.1 A helikopter leszállási helyen földetérési és elemelkedési terület jelzést helyezzenek el.

5.2.7.2 ***Ajánlás*** *— A helikopter leszállási helyen kívül a helikopter repülőtéren is helyezzenek el földetérési és elemelkedési terület jelzést, ha a terület határai nem maguktól értetődőek.*

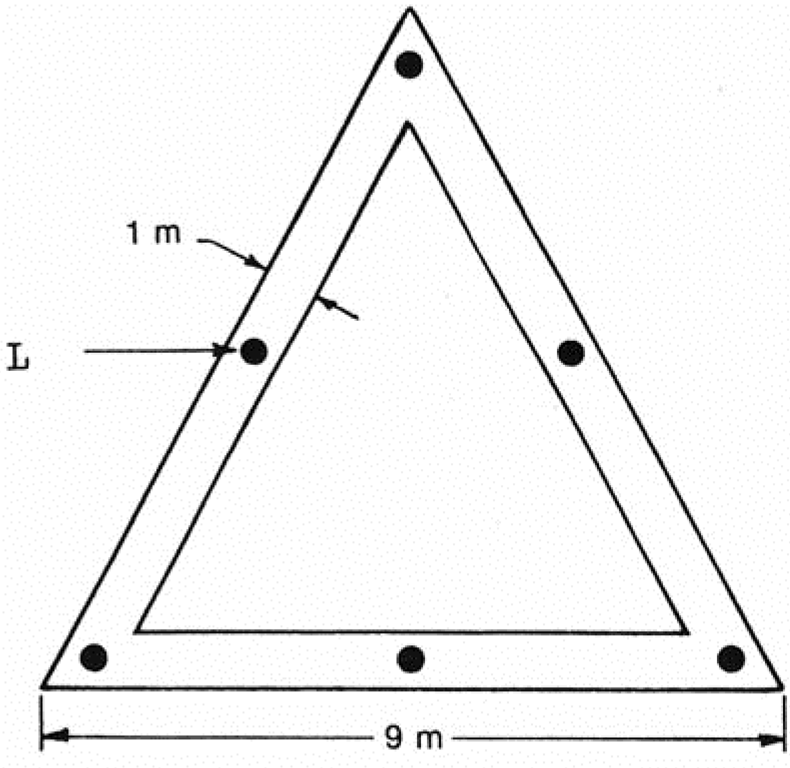
Elhelyezés

5.2.7.3 A földetérési és elemelkedési terület jelzést a terület határa mentén helyezzék el.
Jellemzők

5.2.7.4 A földetérési és elemelkedési terület jelzés legalább 30 cm szélességű, folyamatos fehér színű vonal legyen.



5-3. ábra: Végső megközelítési és felszállási terület azonosító jelzés



5-4. ábra
Célpont jelzés világítással (L=light=fény)

5.2.8 Földetérési pont jelzés

Alkalmazás

5.2.8.1 ***Ajánlás*** *— A földetérési pont jelzést ott helyezzék el, ahol szükséges, hogy a forgószárnyas légi-jármű egy meghatározott helyzetben érjen földet.*

Elhelyezés

5.2.8.2 A földetérési pont jelzést úgy helyezzék el, hogy amikor a forgószárnyas légi-jármű, amely részére a jelzést biztosítják a leszállás végrehajtásához helyezkedik és főfutója a jelzés határain belül, vezetője pedig a jelzés felett van, a forgószárnyas légi-jármű minden része megfelelő biztonsági távolságra legyen minden akadálytól.

5.2.8.3 A helikopter leszállási helyen vagy emelt szinten létesített helikopter repülőtéren a földetérési pont jelzés középpontja a földetérési és elemelkedési terület középpontjában legyen, kivéve, hogy a jelzés elhelyezhető az akadály mentes szektor középpontjából nem több mint 0.1 D távolságra, ha a légiforgalmi vizsgálat azt jelzi, hogy erre szükség van és az oldalirányú áthelyezés nem befolyásolja hátrányosan a repülésbiztonságot.

Jellemzők

5.2.8.4 A földetérési pont jelzés sárga színű kör, melynek sávszélessége legalább 50 cm, helikopter leszállási hely esetében legalább 1 méter legyen.
5.2.8.5 A helikopter leszállási hely esetében a kör belső átmérője a leszállási hely "D" értékének fele vagy 6 méter — amelyik a nagyobb érték — legyen.

5.2.9 Helikopter repülőtérnév jelzés

Alkalmazás

5.2.9.1 ***Ajánlás*** *— Amennyiben a helikopter repülőtér látás utáni azonosítására nincs megfelelő lehetőség, azon helyezzenek el helikopter repülőtér megnevezés jelzést.*

Elhelyezés

5.2.9.2 ***Ajánlás*** *— A helikopter repülőtér megnevezés jelzést úgy helyezzék el, hogy az lehetőség szerint a vízszintes felett minden szögből látható legyen. Ahol akadály szektort határoztak meg, a jelzést a "H" azonosító jelzés akadály felöli oldalán helyezzék el.*

Jellemzők

5.2.9.3 A helikopter repülőtér megnevezés jelzés a helikopter repülőtér nevéből vagy a rádiólevelezésben használt azonosítójából álljon.

5.2.9.4 ***Ajánlás*** *— A jelzés betűinek magassága a felszíni helikopter repülőtér esetében nem kevesebb mint 3 méter, emelt szinten létesített helikopter repülőtér vagy helikopter leszállási hely esetében nem kevesebb mint 1.2 méter legyen. A jelzés színű megfelelő módon kiemelkedjen a háttérből.*
5.2.9.5 A rossz látási körülmények között vagy éjszaka használt helikopter repülőtér megnevezés jelzést lássák el belső világítással vagy azt kívülről világítsák meg.

5.2.10 Helikopter le/felszállási hely akadálymentes szektor jelzés

Alkalmazás

5.2.10.1 ***Ajánlás*** *— A helikopter le/felszállási helyen helyezzenek el akadálymentes szektor jelzést.*

Elhelyezés

5.2.10.2 A helikopter le/felszállási hely akadálymentes szektor jelzést a földetérési és elemelkedési terület jelzésen helyezzék el.

Jellemzők

5.2.10.3 A helikopter le/felszállási hely akadálymentes szektor jelzés mutatja az akadály mentes szektor kezdetét, a határának irányait valamint a le/felszállási hely "D" értékét hatszögletű alakú leszállási hely esetében az 5-5. ábrának megfelelően.

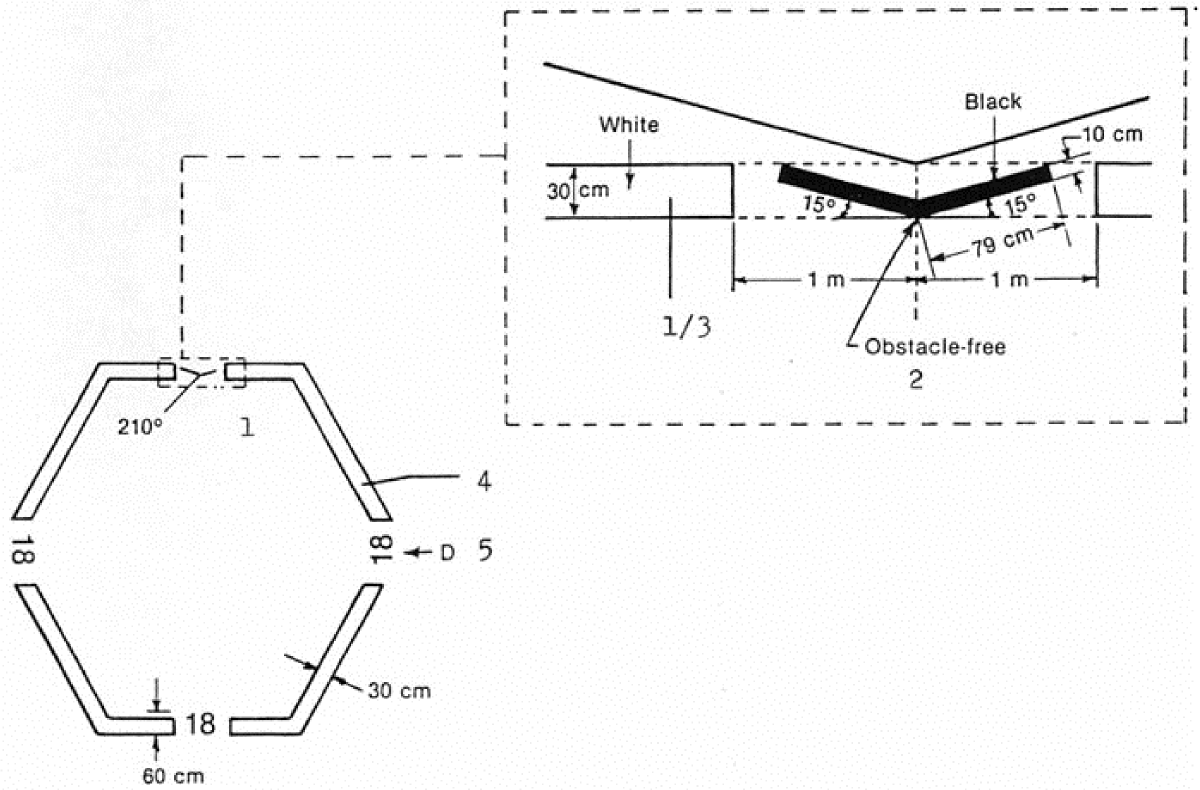
Megjegyzés : A "D" érték a forgószárnyas légi-jármű legnagyobb mérete a forgószárnyak működése (forgása) közben.

5.2.10.4 A jelzővonal magassága illetve mérete azonos legyen a földetérési és elemelkedési terület jelzés *(fehér — white)* vonalának szélességével *(az ábrán feketével — black — jelezve)*.

5.2.10.5 A jelzővonal fekete színű legyen.

5.2.11 Gurulóút jelzések

Megjegyzés : A 14. Annex I. kötet 5.2.8 és 5.2.9 szakaszaiban ismertetett, a gurulóút középvonal és gurulási váró hely jelzésekre vonatkozó előírások alkalmazhatók a forgószárnyas légijárművek földi gurulására használt gurulóútak esetében is.



5-5. ábra:Helikopter leszállási hely akadály mentes szektor jelzés

1) Akadály mentes szektor
2) Akadály mentes szektor kezdőpontja (black)
3) Földetérési és elemelkedési terület jelzés (white)
4) Földetérési és elemelkedési terület jelzés hatszögletű terület esetén
5) "D" érték (az ábrán 18)

5.2.12 Légi gurulóút jelzés

Alkalmazás

5.2.12.1 ***Ajánlás*** *— A légi gurulóutat megfelelő jelzéssel jelöljék meg.*

Megjegyzés : Ezeket a jelzéseket a földi helikopter gurulóút esetében ne használják.

Elhelyezés

5.2.12.2 A légi gurulóút jelzéseket a légi gurulóút középvonalán egyenes szakasz esetében egymástól nem több mint 30 méter, ívelt szakasz esetében pedig egymástól nem több mint 15 méter távolságra helyezzék el.

Jellemzők

5.2.12.3 A légi gurulóút jelzés letörhető legyen és magassága telepítéskor a talaj vagy hófelszín felett 35 cm magasságot ne haladja meg. A légi-jármű vezető által látható felülete téglalap alakú, legkisebb mérete

150 cm^2 legyen, amint az 5-6.ábrán látható.

5.2.12.4 A légi gurulóút jelzés három egyenlő részre osztott vízszintes mezőből áll, melyek színei sorrendben sárga — zöld — sárga. Ha a légi gurulóutat éjszaka is használják, azt belső világítással lássák el vagy fényvisszaverő anyagból készítsék.

5.2.13 Légi közlekedési útvonal jelzés

Alkalmazás

5.2.13.1 ***Ajánlás*** *— Ha légi közlekedési útvonalat jelöltek ki, azt lássák el megfelelő jelzéssel.*

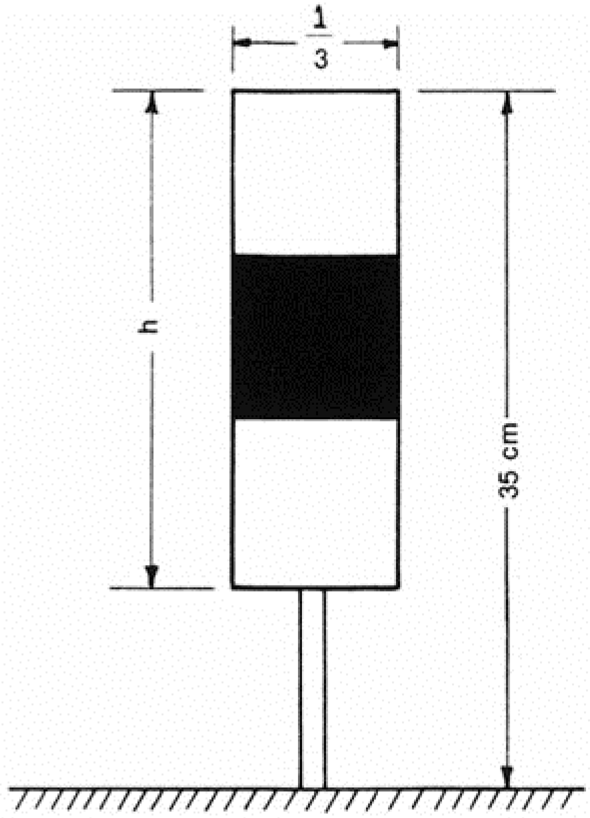
Elhelyezés

5.2.13.2 A légi közlekedési útvonal jelzéseket a légi közlekedési útvonal középvonalán egyenes szakasz esetében egymástól nem több mint 60 méter, ívelt szakasz esetében pedig egymástól nem több mint 15 méter távolságra helyezzék el.

Jellemzők

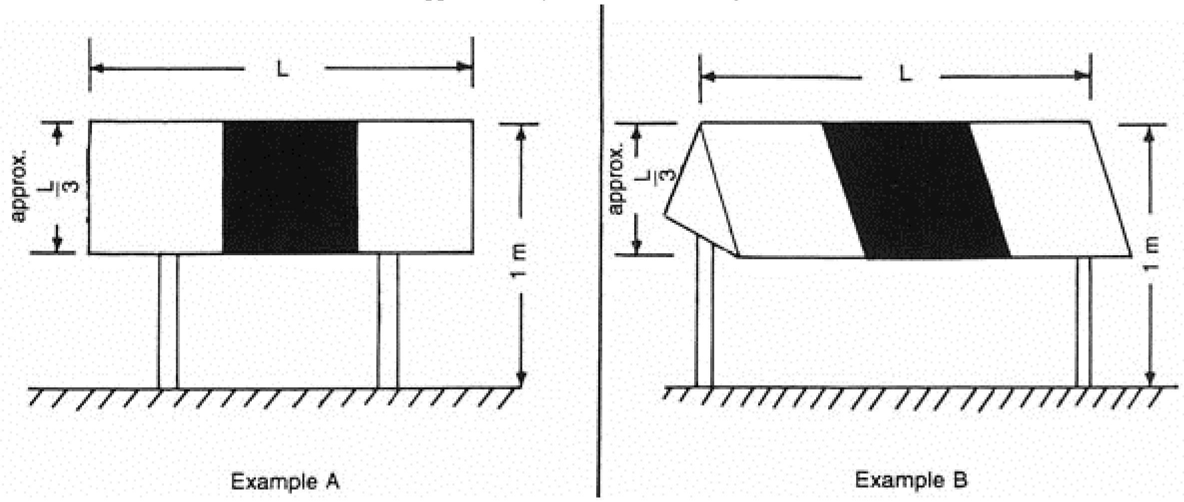
5.2.13.3 A légi közlekedési útvonal jelzés letörhető legyen és magassága telepítéskor a talaj vagy hófelszín felett 1 méter magasságot ne haladja meg. A légi-jármű vezető által látható felülete 1:3 magasság és szélesség arányú (fekvő) téglalap alakú, legkisebb mérete 1500 cm^2 legyen, amint ez az 5-7.ábra példáiban látható.

5.2.13.4 A légi gurulóút jelzés három egyenlő részre osztott függőleges mezőből áll, melyek színei sorrendben sárga — zöld — sárga. Ha a légi gurulóutat éjszaka is használják, azt belső világítással lássák el vagy fényvisszaverő anyagból készítsék.



5-6. ábra: Légi gurulóút jelzés

Approximately h/3 = hozzávetőleg h/3



5-7. ábra: Légi közlekedési útvonal jelzés

Approx. L/3 = hozzávetőleg L/3

5.3 Fények

5.3.1 Általános rész

1. Megjegyzés : A nem légiforgalmi földi fények árnyékolására valamint az emelt szinten elhelyezett és süllyesztett fények tervezésére vonatkozó előírások a 14. Annex I. kötet 5.3.1 szakaszában találhatók.

2. Megjegyzés : A hajózható vizek közelében létesített emelt szintű helikopter repülőtér és helikopter leszállási helyek esetében gondoskodjanak arról, hogy a légiközlekedési földi fények ne okozzanak zavart a hajózásban, azaz azokat a hajózási fényekkel ne téveszthessék össze.

3. Megjegyzés : Mivel a forgószárnyas légijárművek általában nagyon közel jönnek az erős fényű fényforrásokhoz, különösen fontos, hogy a nemzetközi előírásoknak megfelelően telepített léginavigációs fények kivételével a fényeket úgy helyezzék el vagy árnyékolják, hogy elkerüljék a közvetlen vagy visszavert erős fénysugárzást.

4. Megjegyzés : A következő előírásokat a nem-műszeres vagy nem-precíziós megközelítési eljárásokat alkalmazó végső megközelítési és felszállási területre illetve az ilyen területen történő felhasználásra dolgoztuk ki.

5.3.2 Helikopter repülőtér fényjeladó

Alkalmazás

5.3.2.1 ***Ajánlás*** *— Helyezzenek el helikopter repülőtér fényjeladót ott, ahol:*

a) Távolról látható látjelek alkalmazását ítélik szükségesnek és ezt más eszközökkel nem biztosítják; és

b) a környező fények vagy terep miatt nehézségekbe ütközik a helikopter repülőtér azonosítása.

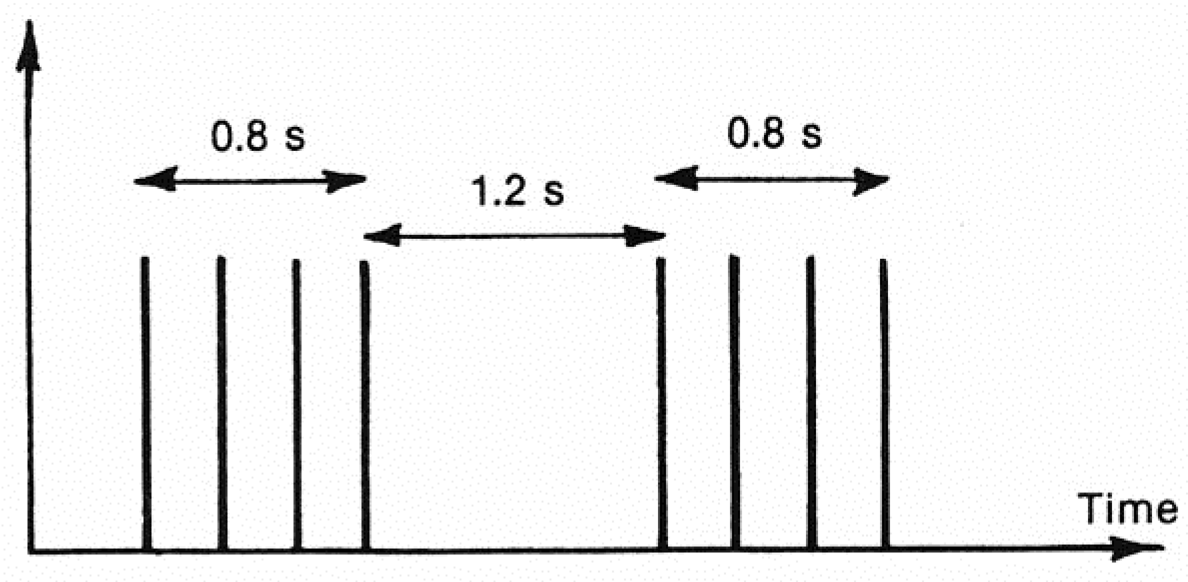
Elhelyezés

5.3.2.2 A helikopter repülőtéri fényjeladót a helikopter repülőtéren vagy annak közelében emelt szinten és úgy helyezzék el, hogy az közelről ne vakítsa a légi-jármű vezetőjét.

Megjegyzés : Ha a helikopter repülőtér fényjeladó közelről valószínűleg vakítaná a légi-jármű vezetőjét, az kikapcsolható legyen a megközelítés befejező szakaszán és leszálláskor..

Jellemzők

5.3.2.3 A repülőtéri fényjeladó az 5-8. ábrán jelölt módon egyenlő időközökben fehér felvillanásokat bocsájtson ki.



5-8. ábra: Helikopter repülőtér fényjeladó felvillanás jellemzők

Intensity = Intenzitás
Flash duaration 0.5 - 2.0 milliseconds = A felvillanások időtartama 0.5 - 2.0 ms

5.3.2.4 A fényjeladó fénye az azimut minden szögében látható legyen.

5.3.2.5 ***Ajánlás*** *— Az egyes felvillanások tényleges intenzitás elosztása feleljen meg az 5-9. ábra 1. képe előírásának.*

Megjegyzés : Azokon a területeken, amelyeken az intenzitás beállítása kívánatos, kielégítőnek mutatkozott a 10 %-os valamint a 3 %-os beállítási érték. Ezen kívül bizonyos árnyékolás szükséges ahhoz, hogy a fények a megközelítés és leszállás végrehajtásának utolsó szakaszában ne vakítsák a légi-jármű vezetőjét.

5.3.3 Bevezető fényrendszer

Alkalmazás

5.3.3.1 ***Ajánlás*** *— Helyezzenek el bevezető fényrendszert azon a helikopter repülőtéren, ahol gyakorlati szempontból szükséges és hasznos a kívánatos megközelítési irány jelzése.*

Elhelyezés

5.3.3.2 A bevezető fényrendszert a kívánatos megközelítési irány mentén egyenes vonalban helyezzék el.

Jellemzők

5.3.3.3 ***Ajánlás*** *— A bevezető fényrendszer három darab - egymástól 30 méter távolságra elhelyezett - fény-egységből álló fénysorból valamint egy, a végső megközelítési és felszállási terület szélétől 90 méter távolságra elhelyezett 18 méter széles keresztfénysorból álljon. A keresztfénysort alkotó fények lehetőség szerint egyenes vízszintes vonalban, a középvonal fénysor mentén megfelelő szögben, annak két oldalán egységesen elosztva, egymástól 4.5 méter oldaltávolságra helyezkedjenek el. Ahol a végső megközelítési útvonal feltűnőbb megjelölése szükséges, a keresztfénysor után, az egyenes mentén egyenlő 30 méteres távolságokban további kiegészítő fény-egységek is elhelyezhetők. Ezek a fények a környezettől függően állandó sugárzású vagy villanó fények lehetnek. A bevezető fényrendszer az 5-10. ábrán látható.*

Megjegyzés : A villanó fények hasznosak lehetnek ott, ahol a bevezető fényrendszer azonosítása a környező egyéb fények miatt nehézségekbe ütközhet.

5.3.3.4 ***Ajánlás*** *— Ahol a nem-precíziós végső megközelítési és felszállási területhez bevezető fényrendszert alakítanak ki, a rendszer hossza 210 méternél kevesebb ne legyen.*

5.3.3.5 Az állandó, körsugárzó fények színe fehér legyen.

5.3.3.6 ***Ajánlás*** *— Az állandó fények fényelosztása feleljen meg az 5-9. ábra 2. kép előírásának, azonban a nem-precíziós végső megközelítési és felszállási terület esetében az intenzitást 3-al növeljék.*

5.3.3.7 A villanó, körsugárzó fények színe fehér legyen.

5.3.3.8 ***Ajánlás*** *— A villanó fények felvillanási időszaka másodpercenként egy villanás legyen. Fényelosztásuk feleljen meg az 5-9. ábra 3. kép előírásának. A villanó fények a legkülső fény-egységtől kezdődően a keresztfénysor felé befutó sorrendben villanjanak fel.*

5.3.3.9 ***Ajánlás*** *— A bevezető fényrendszert lássák el alkalmas intenzitás szabályzással, hogy lehetséges legyen a környezeti körülményeknek megfelelő fényintenzitás beállítása.*

Megjegyzés : A következő fényerő (intenzitás) értékek bizonyultak megfelelőnek:

a) állandó fények — 100 % - 30 % - 10 % ; és

b) villanó fények — 100 % - 10 % - 3 % .

5.3.4 Optikai megközelítési irányjelző rendszer

Alkalmazás

5.3.4.1 ***Ajánlás*** *— A helikopter repülőtér megközelítéséhez biztosítsanak optikai megközelítési irányjelző rendszert ott, ahol különösen éjszaka a következő feltétel vagy feltételek fennállnak:*

a) az akadályvédelem, zajcsökkentés vagy légiforgalmi irányítási eljárások miatt meghatározott bevezetési irány követése szükséges;

b) a helikopter repülőtér környezetében kevés felszíni vonatkozási pont (látás utáni jellemző) található; és
c) fizikailag megoldhatatlan a bevezető fényrendszer telepítése.

Elhelyezés

5.3.4.2 Az optikai megközelítési irányjelző rendszert úgy helyezzék el, hogy az a forgószárnyas légijárművet egy meghatározott repülési útvonalon a végső megközelítési és felszállási területhez vezesse.

5.3.4.3 ***Ajánlás*** *— Az optikai megközelítési irányjelző rendszert a végső megközelítési és felszállási terület végén, a kívánatos megközelítés irányába beállítva helyezzék el.*

5.3.4.4 A fény-egységek letörhetők legyenek és azokat a lehető legalacsonyabbra helyezzék el.

5.3.4.5 Ahol a rendszer fényeit különálló fényforrásként szükséges látni, a fény-egységeket úgy helyezzék el, hogy a légi-jármű vezetője által látható fénysugárzási szögek értéke 3 ívpercnél kevesebb ne legyen.

5.3.4.6 A rendszer fény-egységei valamint más, ezekkel összehasonlítható erősebb (nagyobb intenzitású) fények fénysugárzási szög értékei se legyenek 3 ívpercnél kisebbek.

Megjegyzés : Az 5.3.4.5 és 5.3.4.6 ajánlások teljesíthetők a fénysugár egyenese mentén, ha a fény-egységeket egymástól 1 km látástávolságonként 1 méterre helyezik el.

Jelforma

5.3.4.7 A rendszer legalább három, egymástól jól megkülönböztethető jelzést biztosítson (három különálló jelzés-szektorba) az alábbiak szerint:

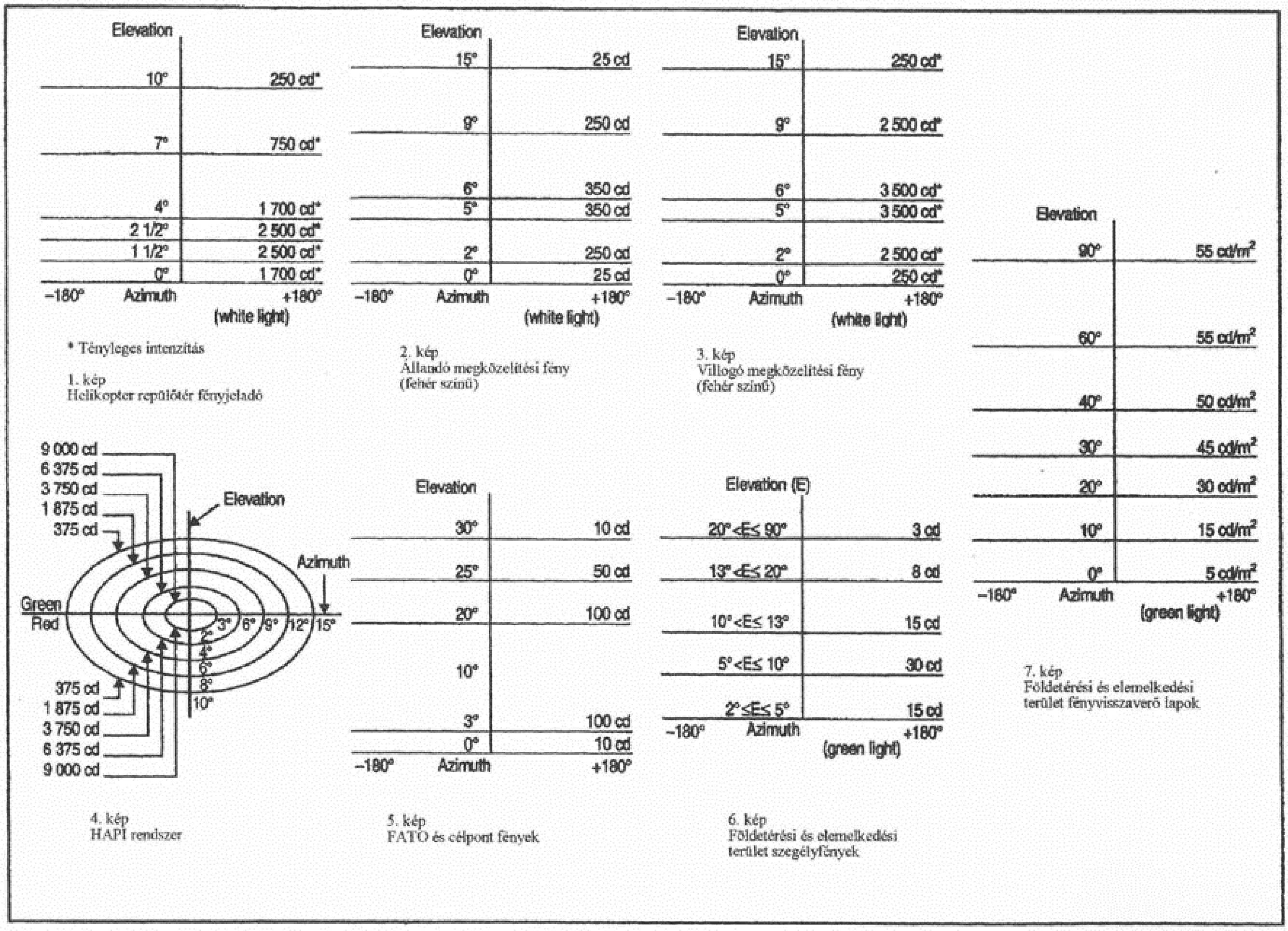
— megközelítési iránytól balra;

— megközelítési irányon; és

— megközelítési iránytól jobbra.

5.3.4.8 A rendszer "megközelítési irányon" szektorának megosztása felejen meg az 5-11. ábrán mutatottnak.

5.3.4.9 A rendszer jelzései olyanok legyenek, hogy azokat ne lehessen összetéveszteni a vele közösen telepített optikai megközelítési siklópálya jelző rendszer vagy egyéb látási utáni segédeszközök jelzéseivel.



5-9. ábra:Izogyertyafényerő diagramok helikopteres műszer nélküli és nem-precíziós megközelítésekhez

Ábrabeli megjegyzés: - Forgószárnyas légijárművek nem-műszeres és nem-precíziós megközelítéséhez biztosított fények fényereje és sugárzási jellemzői

Ábrabeli szövegek:

Alkalmazott színek: fehér (white), vörös (red) és zöld (green)

Szögértékek fokokban: magassági szög (azimuth)

Amennyiben a berendezés fény segítségével két foknál alacsonyabb magassági szögben azonosítandó,

további kiegészítő gyertyafényerő érték szükséges.

5.3.4.10 Az optikai megközelítési irányjelző rendszer kódolása eltérő legyen bármely vele együtt telepített optikai megközelítési siklópálya jelző rendszer kódolásától.

5.3.4.11 A jelzés formátum alapján a rendszer minden üzemeltetési körülmények között egyedi és jól megkülönböztethető legyen.

5.3.4.12 A rendszer használata ne növelje jelentősen a légi-jármű vezető munkaterhét.

Fényelosztás

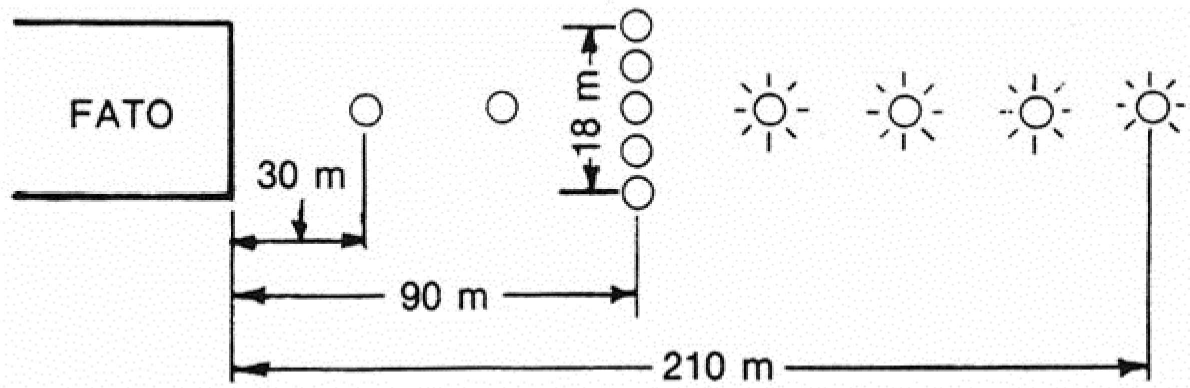
5.3.4.13 Az optikai megközelítési irányjelző rendszer fedésterülete azonos vagy nagyobb legyen a vele közösen telepített optikai megközelítési siklópálya jelző rendszer fedésterületével.

5.3.4.14 Alakítsanak ki megfelelő fényerő szabályzást annak érdekében, hogy lehetővé tegyék az uralkodó környezeti viszonyoknak megfelelő fényintenzitás beállítását valamint elkerüljék a légi-jármű vezető elvakítását a megközelítés és leszállás végrehajtása során.

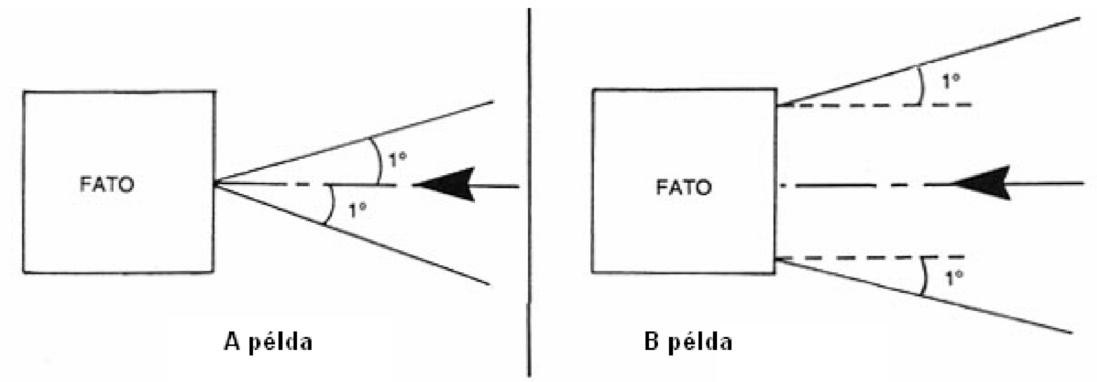
Megközelítési irány és oldalszög beállítás

5.3.4.15 Az optikai megközelítési irányjelző rendszer oldalszög beállítása a kívánatos megközelítési irányba +/- 5 ív-perc értékben legyen lehetséges.

5.3.4.16 Az optikai megközelítési irányjelző rendszer oldalszög beállítása olyan legyen, hogy a megközelítés végrehajtása során a légi-jármű vezetője, aki a "megközelítési irányon" jelzésen halad, a megközelítési területen levő összes tárgy felett megfelelő biztonsági távolságban marad.



5-10. ábra:Bevezető fényrendszer



5 - 11. ábra: A "megközelítési irányon" jelzés megosztása

5.3.4.17 Az akadály védelmi felület jellemzői (5.3.5.23 pont, 5-1. táblázat és 5-13. ábra) vonatkoznak az optikai megközelítési irányjelző rendszerre is.

Az optikai megközelítési irányjelző rendszer jellemzői

5.3.4.18 A jelzést befolyásoló bármely egység meghibásodása esetén a rendszer automatikusan kapcsolódjon ki.

5.3.4.19 Az optikai megközelítési irányjelző rendszer elemeit úgy tervezzék meg, hogy az optikai sugárzó vagy visszaverő felületeken keletkező lecsapódások, jég, szennyeződések, stb. a lehető legkisebb mértékben akadályozzák a fényjelek kibocsátását és semmiféle formában ne adjanak félrevezető vagy helytelen jelzést.

5.3.5 Optikai megközelítési siklópálya jelző rendszer

Alkalmazás

5.3.5.1 ***Ajánlás*** *— Függetlenül attól, hogy a helikopter repülőtér megközelítéséhez egyéb látás utáni vagy műszeres megközelítési segédeszközök rendelkezésre állnak, biztosítsanak optikai megközelítési siklópálya rendszert azon a helikopter repülőtéren, ahol különösen éjszaka a következő feltétel vagy feltételek fennállnak:*

a) az akadályvédelem, zajcsökkentés vagy légiforgalmi irányítási eljárások miatt meghatározott bevezetési irány követése szükséges;

b) a helikopter repülőtér környezetében kevés felszíni vonatkozási pont (látás utáni jellemző) található; és

c) a forgószárnyas légi-jármű üzemeltetési jellemzői stabilizált végső megközelítést igényelnek.

5.3.5.2 A forgószárnyas légi-jármű üzemeltetéséhez telepített szabványos optikai megközelítési siklópálya jelző rendszer a következőkből álljon:

a) a 14. Annex I. kötet 5.3.5.23 — 5.3.5.40 pontjai előírásainak megfelelő PAPI és APAPI rendszerek, azonban a "siklópályán" szektor méretét 45 szög-perc értékre növeljék; és

b) az 5.3.5.6 — 5.3.5.21 pontok előírásainak megfelelő forgószárnyas légi-jármű megközelítési siklópálya jelzőrendszer (HAPI).

Elhelyezés

5.3.5.3 Az optikai megközelítési siklópálya jelző rendszert úgy helyezzék el, hogy az a forgószárnyas légijárművet a végső megközelítési és felszállási területen meghatározott pontra vezesse és a végső megközelítés és leszállás végrehajtása során ne vakítsa a légi-jármű vezetőt.

5.3.5.4 ***Ajánlás*** *— Az optikai megközelítési siklópálya jelző rendszert a kijelölt célpont közelében, a kívánatos megközelítés irányába beállítva helyezzék el.*

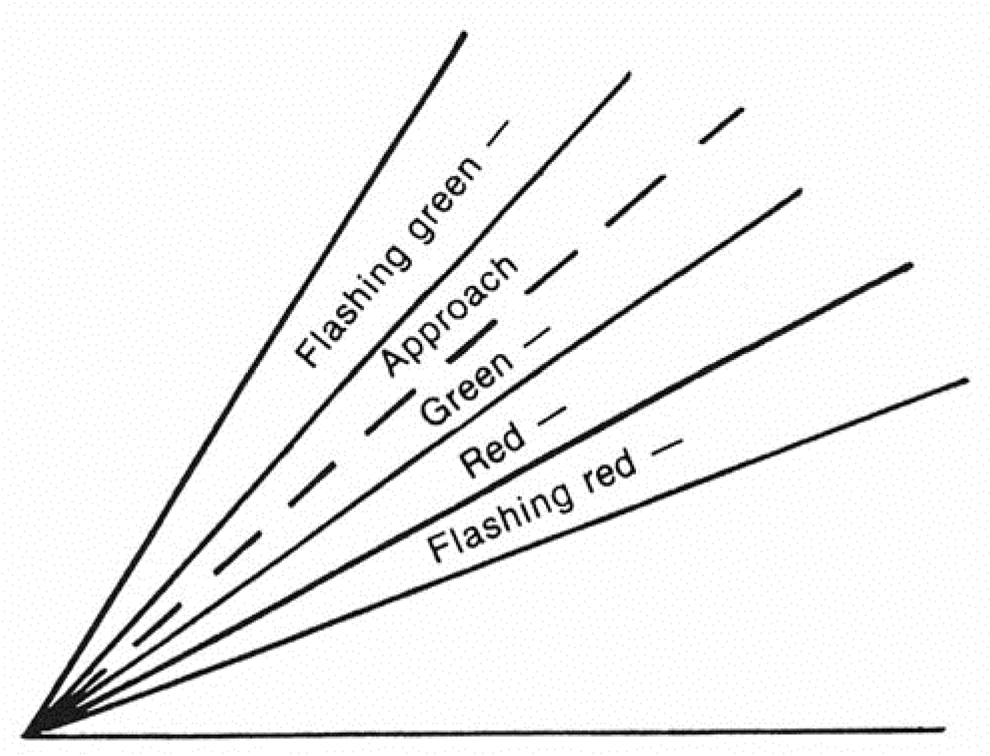
5.3.5.5 A fény-egységek letörhetők legyenek és azokat a lehető legalacsonyabbra helyezzék el.

HAPI jelzésforma

5.3.5.6 A HAPI berendezés jelzései négy egymástól jól megkülönböztethető jelzések legyenek a következő tájékoztatások biztosítása céljából:

A forgószárnyas légi-jármű a siklópálya felett — a siklópályán — kissé a siklópálya alatt — a siklópálya alatt repül.

5.3.5.7 A HAPI berendezés jelzései az alábbi ábrának megfelelőek legyenek.

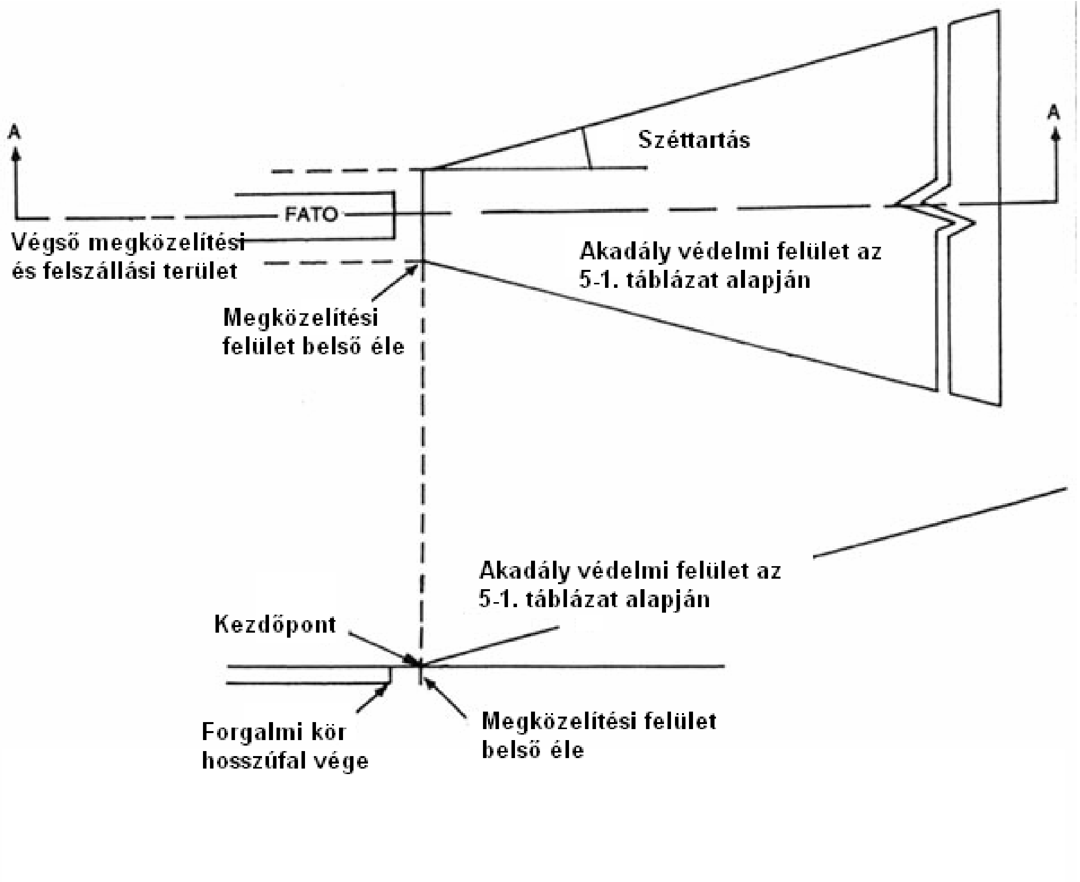


5-12. ábra: Forgószárnyas légi-jármű megközelítési siklópálya jelzőberendezés

Ábraszöveg:

Szektor	*Jelzés*	*Felirat (angol)*
siklópálya felett	villogó zöld	flashing green
siklópályán	zöld	green
megközelítési siklópálya		*approach slope*
kissé siklópálya alatt	vörös	red
siklópálya alatt	villogó vörös	flashing red

Megjegyzés : Az egység tervezésénél gondoskodni kell arról, hogy a jel-szektorok valamint az oldalszög fedésterületek (határai) között a hamis jelek lehetőségét a legkisebbre csökkentsék.



5-13. ábra

Optikai megközelítési siklópálya jelző rendszer akadály védelmi felülete

5.3.5.8 A HAPI berendezés villogó szektorában a jelek felvillanási frekvenciája legalább 2 Hz legyen.

5.3.5.9 ***Ajánlás** — A HAPI berendezés villogó jelzéseinek felvillanási aránya 1:1 (felvillan : kialszik a fényjelzés) és a modulációs mélység legalább 80 %-os legyen.*

5.3.5.10 A HAPI berendezés "siklópályán" jelzésének szektor mérete, azaz szögtartománya 45 szög-perc értékű legyen.

5.3.5.11 A HAPI berendezés "kissé a siklópálya alatt" jelzésének szektor mérete, azaz szögtartománya 15 szög-perc értékű legyen.

Fényelosztás

5.3.5.12 ***Ajánlás** — A berendezés vörös és zöld színű fényeinek fényerőssége és fényelosztása feleljen meg az 5-9. ábra 4. kép előírásának.*

Megjegyzés : A HAPI berendezés illetve rendszer forgatható alapra történő felszerelésével nagyobb oldalszög fedés biztosítható.

5.3.5.13 A HAPI berendezés függőleges síkban tapasztalható színváltozása olyan legyen, hogy azt a megfigyelő nem kevesebb mint 300 méter távolságból nem több mint három szög-percen belül észlelhesse.

5.3.5.14 A vörös vagy zöld szűrő átvilágítási tényező értéke a legnagyobb fénysugárzás (fényerő) mellett 15 % -nál kevesebb ne legyen.

5.3.5.15 Teljes fényerőnél a vörös színű fény "Y" koordinátája ne haladja meg a 0.320 értéket és a zöld színű fény a 14. Annex I. kötet 1. Függelék 2.1.3 pontjában meghatározott értékhatárokon belül maradjon.

5.3.5.16 Alakítsanak ki megfelelő fényerő szabályzást annak érdekében, hogy lehetővé tegyék az uralkodó környezeti viszonyoknak megfelelő fényintenzitás beállítását valamint elkerüljék a légi-jármű vezető elvakítását a megközelítés és leszállás végrehajtása során.

Megközelítési siklópálya és magasság beállítás

5.3.5.17 A forgószárnyas légi-jármű optikai megközelítési jelző rendszer magasság beállítása a vízszintes felett 1°-tól 12°-ig bármely kívánt szögbe +/- 5 szög-perc pontossággal elvégezhető legyen.

5.3.5.18 A forgószárnyas légi-jármű optikai megközelítési jelző rendszer oldalszög beállítása olyan legyen, hogy a megközelítés végrehajtása során a légi-jármű vezetője, aki a "siklópálya alatt" jelzés felső határát látja, a megközelítési területen levő összes tárgy felett megfelelő biztonsági távolságban marad.

A fény-egység jellemzői

5.3.5.19 A rendszert úgy tervezzék meg, hogy:

a) ha az egység függőleges hibája meghaladja a +/- 0.5° azaz +/- 30 szög-perc értéket, a rendszer automatikusan kikapcsolódjon; és

b) ha a villogó berendezés romlik el, a villogással működő szektor(ok)ba fénykibocsájtás nem történik.

5.3.5.20 A HAPI rendszer fény-egységét úgy tervezzék meg, hogy az optikai sugárzó vagy visszaverő felületeken keletkező lecsapódások, jég, szennyeződések, stb. a lehető legkisebb mértékben akadályozzák a fényjelek kibocsátását és semmiféle formában ne adjanak félrevezető vagy helytelen jelzést.

5.3.5.21 ***Ajánlás*** *— Az úszó helikopter leszállási helyen történő elhelyezésre tervezett HAPI rendszer sugárzási jellemző olyanok legyenek, amelyek biztosítják a fénysugár nyalábok +/-1/4° értéken belüli pontosságát az úszó szerkezet +/- 3° -os imbolygása során.*

Akadály védelmi felület

Megjegyzés:- A következő előírások a PAPI, APAPI és HAPI rendszerekre vonatkoznak.
5.3.5.22 Ha látás utáni megközelítési siklópálya jelzőrendszert kívánnak biztosítani, jelöljenek ki akadály védelmi felületet.

5.3.5.23 Az akadály védelmi felület jellemzői, azaz kezdőpontja, széttartása, hossza és lejtése feleljen meg az 5-1. táblázat megfelelő oszlopában valamint az 5-13. ábrán ismertetett értékeknek.

5.3.5.24 Új tárgyak vagy a meglevő tárgyak megnagyobbítása nem nyúlhatnak az akadály védelmi felület fölé kivéve, ha azok az illetékes hatóság véleménye szerint egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek.

Megjegyzés: Azon körülmények, amelyek között ez a bizonyos "árnyékolás" alapelv joggal alkalmazható, a Repülőtér Szolgálati Kézikönyv 6. részében (DOC 9137) kerültek ismertetésre.

5.3.5.25 Az akadály védelmi felület fölé nyúló meglevő tárgyakat lehetőség szerint távolítsák el kivéve, ha az illetékes hatóság véleménye szerint azok egy már meglevő, nem mozdítható tárgy mögé, annak "árnyékába" kerülnek vagy megfelelő légiforgalmi vizsgálat azt jelzi, hogy nem befolyásolják hátrányosan a forgószárnyas légijárművek üzemeltetésének biztonságát.

5.3.5.26 Amennyiben a légiforgalmi vizsgálat azt jelzi, hogy az akadály védelmi felület fölé nyúló meglevő tárgy hátrányosan befolyásolja a forgószárnyas légijárművek üzemeltetésének biztonságát, hajtsák vége a következő intézkedést vagy intézkedéseket:

a) megfelelő mértékben emeljék fel a rendszer megközelítési siklópályáját;

b) csökkentsék a rendszer oldalszög terjedését olyan mértékben, hogy a tárgy a fénysugárzás határain kívülre kerüljön;

c) 5°-nál kisebb mértékben helyezzék át a rendszer és a vele összefüggő akadály védelmi felület tengelyét;

d) megfelelő módon helyezzék át a végső megközelítési és felszállási területet; és

e) szereljenek fel egy, az 5.3.4 szakaszban ismertetett optikai megközelítési irányjelző rendszert.

Megjegyzés: A témakörre vonatkozó útmutatót a Helikopter Repülőtér Kézikönyv *(Doc 9261) tartalmazza.*

5.3.6 Végső megközelítési és felszállási terület fények

Alkalmazás

5.3.6.1 Amennyiben az éjszaka használni kívánt, szárazföldön létesített felszíni helikopter repülőtéren végső megközelítési és felszállási terület jelöltek ki, biztosítsanak alkalmas végső megközelítési és felszállási terület világítást kivéve, ha a végső megközelítési és felszállási és a földetérési és elemelkedési területek majdnem egybeesnek, vagy ha a végső megközelítési és felszállási terület határai egészen nyilvánvalóak.

Elhelyezés

5.3.6.2 A végső megközelítési és felszállási terület fényeket a terület határai mentén, annak szélén helyezzék el. A fény-egységeket egymástól egységesen az alábbi távolságokra helyezzék el:

a) négyszögletes vagy téglalap alaprajzú terület esetében legalább négy darab fény-egység egymástól nem több mint 50 méter távolságra, köztük egy-egy fény-egység minden sarokpontban; és

b) bármely más alaprajzú terület esetében, beleértve a kört is, legalább tíz darab fény-egység egymástól nem több mint 5 méter távolságra.

Jellemzők

5.3.6.3 A végső megközelítési és felszállási terület fényei állandó körsugárzó, fehér színű fények legyenek. Ahol a fényerősség változtatható, a fények változó intenzitású fehér színű fények legyenek.

5.3.6.4 ***Ajánlás*** *— A végső megközelítési és felszállási terület fényeinek fényerőssége és fényelosztása feleljen meg az 5-9. ábra 5. kép előírásának.*

5.3.6.5 ***Ajánlás*** *— A fény-egységek magassága ne haladja meg a 25 cm-t. Amennyiben a talajszint fölé emelkedő fények veszélyeztetik a forgószárnyas légi-jármű üzemeltetést, alkalmazzanak beépített fény-egységeket. Ahol a végső megközelítési és felszállási területet földetérésre vagy elemelkedésre nem használják, a fény-egységek magassága a talaj vagy hó-felszín feletti 25 cm magasságot ne haladja meg.*

5-1. táblázat: Az akadály védelmi felületek méretei és lejtviszonya

Felület és méretek	*Nem-műszeres FATO*		*Nem-precíziós FATO*
a belső él hossza	*a biztonsági terület szélessége*		*a biztonsági terület szélessége*
távolság a FATO végétől	legalább 3 méter		60 méter
széttartás	10 %		15 %
teljes hossz	2500 méter		2500 méter
lejtviszonyok	PAPI	A[1] - 0.57°	A[1] - 0.57°
	HAPI	A[2] - 0.65°	A[2] - 0.65°
	APAPI	A[1] - 0.90°	A[1] - 0.90°

1) A 14. Annex I. kötet 5-13. ábrájának megfelelően.
2) A "siklópálya alatt" jelzés felső határának szöge.

5.3.7 Célpont fények

Alkalmazás

5.3.7.1 ***Ajánlás*** — *Ha az éjszaka használni kívánt helikopter repülőtéren célpont jelzést helyeznek el, célpont fényeket is alkalmazzanak.*

Elhelyezés

5.3.7.2 A célpont fényeket a célpont jelzéssel együtt telepítsék.

Jellemzők

5.3.7.3 A célpont fények egy legalább hat körsugárzó fényből álló, az 5-4. ábrán látható alakzatot mutassanak. Amennyiben a talajszint fölé nyúló fények veszélyeztethetik a forgószárnyas légijárművek üzemeltetését, alkalmazzanak beépített fényeket.
5.3.7.4 ***Ajánlás*** *— A célpont fények fényerőssége és fényelosztása feleljen meg az 5-9. ábra 5. kép előírásának.*

5.3.8 Földetérési és elemelkedési terület fényrendszer

Alkalmazás

5.3.8.1 Az éjszaka használni kívánt helikopter repülőtéren alakítsanak ki földetérési és elemelkedési terület fényrendszert.

5.3.8.2 A felszíni helikopter repülőtér földetérési és elemelkedési terület fényrendszere a következők egyikéből vagy több eleméből álljon:

a) szegélyfények; vagy

b) reflektoros kivilágítás; vagy

c) ha az a) és b) alpontokban jelzett fények telepítése nem célszerű és végső megközelítési és felszállási terület világítás rendelkezésre áll, a terület azonosítására szelvényes, pontfény egységekből álló (ASPSL) vagy világító panel (fénycső*) világítás.

5.3.8.3 Az emelt szinten létesített helikopter repülőtér vagy helikopter leszállási hely földetérési és elemelkedési terület fényrendszere a következők egyikéből vagy több eleméből álljon:

a) szegélyfények; vagy

b) ahol ilyet létesítettek, a földetérési pont jelzés azonosítására szelvényes, pontfény egységekből álló (ASPSL) és/vagy világító panel (fénycső) világítás és/vagy a földetérési és elemelkedési terület megvilágítására reflektoros kivilágítás.

Megjegyzés: Az emelt szinten létesített helikopter repülőtér vagy helikopter leszállási hely esetében a végső megközelítés és leszállás végrehajtása során a forgószárnyas légi-jármű helyes irányításához alapvető fontosságú a felület jellemzőinek megfelelő ismerete. Ez a szegélyfények mellett különféle világítás rendszerek (szelvényes, pontfény egységekből álló (ASPSL), világító panel (fénycső), reflektoros világítás vagy ezek kombinációi) alkalmazásával biztosítható. A gyakorlati tapasztalatok szerint a földetérési és forgószárnyas légi-jármű repülőtér jelzések azonosítására a legjobb eredmény a szegélyfényekből és a szelvényes, fénykibocsátó dióda (LED) egységekből álló fényforrások alkalmazásával érhető el.

5.3.8.4 ***Ajánlás** — Az éjszaka használni kívánt felszíni helikopter repülőtér esetében, ha a felület jellemzőinek fokozott ismerete szükséges, a földetérési pont jelzés azonosítására a földetérési és elemelkedési területen szelvényes, pontfény egységekből álló (ASPSL) és/vagy világító panel (fénycső) világítást továbbá reflektoros kivilágítást alkalmazzanak.*

Elhelyezés

5.3.8.5 A a földetérési és elemelkedési terület szegélyfényeket a földetérési és elemelkedési területként történő igénybevételre kijelölt terület szélén vagy attól 1.5 méter távolságon belül helyezzék el. Ahol a terület kör alaprajzú, a fényeket:

a) egyenes vonalakban olyan formában helyezzék el, hogy azok megfelelő tájékoztatást biztosítsanak a légi-jármű vezető számára a helyezkedéshez; és

b) ahol az a) alpont teljesítése nem célszerű, a fényeket a földetérési és elemelkedési terület peremén egyenlő távolságokban helyezzék el, kivéve egy 45°-os szektort, ahol a távolságokat felezzék meg és a fényeket ilyen távközökben helyezzék el.

5.3.8.6 A földetérési és elemelkedési terület szegélyfényeket az emelt szinten létesített helikopter repülőtér és helikopter leszállási hely esetében egymástól nem több mint 3 méter, a felszíni helikopter repülőtér esetében egymástól nem több mint 5 méter távolságra helyezzék el. Alkalmazzanak legalább oldalanként négy darab fény-egységet köztük egy-egy egységet minden sarokpontban. Az 5.3.8.5 b) alpont szerint kialakított kör alaprajzú terület esetén legalább 14 darab fény-egységet alkalmazzanak.

Megjegyzés: A témakörre vonatkozó útmutatót a Helikopter Repülőtér Kézikönyv *(Doc 9261) tartalmazza.*

5.3.8.7 Az emelt szinten létesített helikopter repülőtér vagy rögzített helikopter leszállási hely esetében a földetérési és elemelkedési terület szegélyfényeket úgy helyezzék el, hogy a légi-jármű vezetője a fényrendszer rajzolatát a földetérési és elemelkedési terület magassági szintje alól ne láthassa.

5.3.8.8 Az úszó helikopter leszállási hely esetében a földetérési és elemelkedési terület szegélyfényeket úgy helyezzék el, hogy nyugodt vízfelszín esetén, amikor a létesítmény nem mozog, a légi-jármű vezetője a fényrendszer rajzolatát a földetérési és elemelkedési terület magassági szintje alól ne láthassa.

5.3.8.9 Amennyiben a felszíni helikopter repülőtéren földetérési és elemelkedési terület azonosítására szelvényes, pontfény egységekből álló (ASPSL) vagy világító panel (fénycső) világítást alkalmaznak, azt a földetérési és elemelkedési terület szélének jelzése mentén helyezzék el. Ahol a terület kör alaprajzú, a fény-egységeket a terület körvonala mentén egyenes vonalban helyezzék el.

5.3.8.10 A felszíni helikopter repülőtér esetében a földetérési és elemelkedési területen legalább kilenc darab világító panel (fénycső) világító testet alkalmazzanak, amelyeknek teljes hossza ne legyen kevesebb, mint a terület kerületének fele. A terület minden oldalán páratlan számú, de legalább három darab fény-egységet helyezzenek el, köztük egy-egy egységet minden sarokpontban. A világító panel (fénycső) világító testek szélei közötti távolság ne legyen több mint 5 méter.

5.3.8.11 ***Ajánlás*** *— Ahol az emelt szinten létesített helikopter repülőtér vagy helikopter leszállási hely felületének jobb megvilágítására elektromos paneleket (LP) alkalmaznak, azokat ne a szegélyfények mellett, hanem a földetérési terület jelzés körül (ha van) vagy a helikopter repülőtér azonosítóval együtt helyezzék el.*

5.3.8.12 A földetérési és elemelkedési terület reflektoros kivilágítását úgy alakítsák ki, hogy az ne vakítsa a légi-jármű vezetőjét a repülés és a területen dolgozó személyeket munkavégzés közben. A reflektoros világítást úgy rendezzék és szabályozzák, hogy az árnyékvetést a lehető legkisebbre korlátozzák.

Megjegyzés: A földetérési és/vagy helikopter repülőtér azonosító jelzések megjelölésére alkalmazott szelvényes, pontfény egységekből álló (ASPSL) és elektromos panel (fénycső) világítás a felület fizikai jellemzőinek megvilágítására jobbnak bizonyult, mint az alacsony intenzitású reflektoros kivilágítás. A reflektoros kivilágítás esetén az egységeket a rossz helyezkedés lehetőségének kiküszöbölésre rendszeresen ellenőrizni szükséges, hogy azok mindig megfeleljenek az 5.3.8 szakaszban található előírásoknak.

Jellemzők

5.3.8.13 A földetérési és elemelkedési terület szegélyfények rögzített, körsugárzó, zöld színű fények legyenek.

5.3.8.14 A felszíni helikopter repülőtéren a földetérési és elemelkedési terület határainak kijelölésére alkalmazott szelvényes, pontfény egységekből álló (ASPSL) vagy világító panel (fénycső) világítás fénye zöld színű legyen.

5.3.8.15 A fenti 5.3.8.13 és 5.3.8.14 pontok előírásai nem teszik szükségessé a meglevő létesítmények lecserélését 2009 január 1. előtt.

5.3.8.16 ***Ajánlás*** *— A világító panel (fénycső) világítás színskála értéke és fényereje feleljen meg a 14. Annex I. kötet 1. Függelék 3.4 szakasz előírásainak.*

5.3.8.17 A világító panel (fénycső) világítás fény-egység legkisebb szélessége 6 cm. A világítótest burkolatának színe a megfelelő jelzés színével azonos legyen.

5.3.8.18 ***Ajánlás*** *— A szegélyfény fény-egységek magassága ne haladja meg a 25 cm-t és ha a felület szintje fölé emelkedő fények veszélyeztetik a forgószárnyas légi-jármű üzemeltetést, alkalmazzanak beépített fény-egységeket.*

5.3.8.19 ***Ajánlás*** *— A helikopter repülőtér biztonsági területén vagy a helikopter leszállóhely akadálymentes szektorán belül elhelyezett földetérési és elemelkedési terület reflektoros világítás fény-egységeinek magassága ne haladja meg a 25 cm-t.*

5.3.8.20 A világító panel (fénycső) világítás fény-egységei ne nyúljanak 2.5 cm-nél magasabbra a felület szintje fölé.

5.3.8.21 ***Ajánlás*** *— A szegélyfények fényerőssége és fényelosztása feleljen meg az 5-9. ábra 6. kép előírásának.*

5.3.8.22 ***Ajánlás*** *— A világító panel (fénycső) világítás fény-egységeinek fényerőssége és fényelosztása feleljen meg az 5-9. ábra 7. kép előírásának.*

5.3.8.23 A földetérési és elemelkedési terület reflektoros világítás spektrális fényelosztása olyan legyen, hogy a felületi és akadály jelzések pontosan azonosíthatók legyenek.

5.3.8.24 ***Ajánlás*** *— A reflektoros világítás átlagos vízszintes sugárzási értéke legalább 10 lux értékű legyen és a fényerősség ingadozás mértéke a földetérési és elemelkedési terület felületén mérve ne haladja meg a 8:1 (átlagos — legalacsonyabb) arányértéket.*

5.3.8.25 ***Ajánlás —*** *A földetérési jelzés azonosítására használt fények körben szakaszosan elhelyezett szelvényes, pontfény egységekből álló (ASPSL) körsugárzó sárga színű fények legyenek. A szelvények álljanak ASPSL fény-egységekből, amelynek teljes hossza ne legyen kevesebb, mint a kör kerületének fele.*

5.3.8.26 ***Ajánlás —*** *A helikopter repülőtér azonosító jelzés megvilágítása (ha van) körsugárzó zöld színű fény legyen.*

5.3.9 Csörlési terület reflektoros világítása

Alkalmazás

5.3.9.1 Az éjszaka használni kívánt csörlési területet reflektoros világítással lássák el.

Elhelyezés

5.3.9.2 A csörlési terület reflektoros kivilágítását úgy alakítsák ki, hogy az ne vakítsa a légi-jármű vezetőjét a repülés és a területen dolgozó személyeket munkavégzés közben. A reflektoros világítást úgy rendezzék és szabályozzák, hogy az árnyékvetést a lehető legkisebbre korlátozzák.

Jellemzők

5.3.9.3 A csörlési terület reflektoros világítás spektrális fényelosztása olyan legyen, hogy a felületi és akadály jelzések pontosan azonosíthatók legyenek.

5.3.9.4 ***Ajánlás*** *— A reflektoros világítás átlagos vízszintes sugárzási értéke a csörlési terület felületén mérve legalább 10 lux értékű legyen.*

5.3.10 Gurulóút fények

Megjegyzés: A 14. Annex I. kötet 5.3.15 és 5.3.16 szakaszaiban ismertetett, a gurulóút középvonal és szegélyfényekre vonatkozó előírások a forgószárnyas légijárművek földi gurulására használt gurulóutak esetében is alkalmazhatók.

5.3.11 Az akadályok megjelölésére használt látás utáni segédeszközök

Megjegyzés: A 14. Annex I. kötet 6. fejezetében az akadályok jelzésére és világítására vonatkozó előírások a helikopter repülőterekre és csörlési területekre is alkalmazhatók.

5.3.12 Az akadályok reflektoros megvilágítása

Alkalmazás

5.3.12.1 Az éjszaka használni kívánt helikopter repülőtéren az akadályokat reflektoros világítással világítsák meg, ha azokon akadályfényeket nem lehet elhelyezni.

Elhelyezés

5.3.12.2 Az akadályok reflektoros világítását úgy alakítsák ki, hogy az megvilágítsa az egész akadályt és lehetőség szerint ne vakítsa a forgószárnyas légi-jármű vezetőjét.

Jellemzők

5.3.12.3 ***Ajánlás*** *— Az akadály reflektoros világításának fényereje legalább 10 cd/m2 megvilágítást biztosítson.*

6. fejezet
Helikopter repülőtér szolgálatok

6.1 Tűzoltó és mentő szolgálat

Általános rész

Bevezető Megjegyzés : Ezek az előírások kizárólag felszíni és emelt szinten létesített helikopter repülőterekre vonatkoznak. Az előírások kiegészítik a 14. Annex I. kötet 9.2 szakasz repülőtéri tűzoltó és mentő szolgálatokra vonatkozó előírásait.

A tűzoltó és mentő szolgálat legfőbb célja és feladata az életmentés. Ezért az előírások elsősorban a helikopter repülőtéren és annak közvetlen környékén bekövetkező forgószárnyas légi-jármű balesetekre vagy repülési eseményekre vonatkoznak, mert ez az a terület, ahol a legnagyobb lehetőség adódik az életmentésre. Minden esetben fel kell tételezni a tűzoltás lehetőségét és szükségességét, mivel a tűz közvetlenül a forgószárnyas légi-jármű balesete illetve repülési eseménye után, vagy a mentési műveletek alatt bármikor bekövetkezhet.

A túlélhető forgószárnyas légi-jármű balesetek hatásos mentésének legfontosabb tényezői a következők: a mentésben résztvevő személyek kiképzése, az igénybe vett felszerelések hatékonysága, a beavatkozás gyorsasága, azaz a sebesség, amellyel a tűzoltó és mentő szolgálatok személyzete és felszerelései bevethetők.

Az emelt szinten létesített helikopter repülőtér esetében az épület vagy bármely egyéb szerkezet tűzvédelmét, amelyen a helikopter repülőtér elhelyezkedik, illetve ennek követelményeit nem vettük figyelembe.

A helikopter leszállási helyekre vonatkozó tűzoltó és mentő szolgálati előírásokat a Helikopter Repülőtér Kézikönyv *tartalmazza.*

A biztosítandó védelmi szint

6.1.1 ***Ajánlás*** *— A tűzoltó és mentő szolgálatok által biztosítandó védelem szintjét általában a helikopter repülőteret várhatóan igénybe vevő legnagyobb forgószárnyas légi-jármű legnagyobb hosszúsági méretének alapján, a 6-1. táblázattal összhangban határozzák meg, kivéve azt a kevéssé igénybe vett helikopter repülőteret, amelyen a légi-jármű mozgások száma alacsony.*

Megjegyzés : A felszíni és az emelt szinten létesített helikopter repülőtér tűzoltó és mentő felszerelési és szolgálatai meghatározásával kapcsolatos útmutatót az illetékes hatóság részére a Helikopter Repülőtér Kézikönyv *tartalmazza.*

6.1.2 ***Ajánlás*** *— A kisebb forgószárnyas légijárművek üzemelésének várható időszakai alatt a helikopter repülőtér tűzoltó kategóriája mérsékelhető azon legnagyobb típusnak megfelelő kategóriára, amely az adott időszakban a létesítményt várhatóan igénybe veszi.*

Tűzoltó anyagok

6.1.3 ***Ajánlás*** *— Az alapvető tűzoltó anyag a B. minimális teljesítmény szintnek megfelelő oltóhab.*
Megjegyzés : A tűzoltóhab fizikai jellemzőiről valamint a megfelelő minimális B. teljesítmény szint eléréséhez szükséges tulajdonságairól szóló tájékoztatás a Repülőtér Szolgálati Kézikönyv *I. részében található.*

6.1.4 ***Ajánlás*** *—Az oltóhab készítéshez szükséges víz valamint a kiegészítő anyagok mennyisége feleljen meg a 6-2. vagy 6-3. táblázatban valamint a 6.1.1 pontban meghatározott helikopter repülőtér tűzoltó kategóriának.*

Megjegyzés : Az emelt szinten létesített helikopter repülőtérre meghatározott vízmennyiséget nem kell a helikopter repülőtéren vagy annak közvetlen közelében tárolni, ha megfelelő túlnyomásos vezetékes vízrendszer áll rendelkezésre és ez rendelkezik a szükséges kapacitással.

6.1.5 ***Ajánlás** — A felszíni helikopter repülőtéren az oltóhab készítéshez szükséges víz egy része vagy egésze helyettesíthető más kiegészítő anyaggal is.*

*6.1.6 **Ajánlás** —A tűzoltóhab kibocsátás mennyisége ne legyen kevesebb, mint a 6-2. vagy 6-3. táblázat megfelelő oszlopában meghatározott érték. A kiegészítő anyag kibocsátás mennyiségét az felhasznált anyag leghatásosabb alkalmazásához válasszák meg.*

6.1.7 ***Ajánlás** — Az emelt szinten létesített helikopter repülőtéren biztosítsanak egy legalább 250 liter/perc kapacitású, megfelelő oltóhab-sugár szórófejjel ellátott tűzoltó tömlő vezetéket. A 2. és 3. kategóriájú létesítmény esetében biztosítsanak legalább további két darab monitor szórófejet, amelyek rendelkeznek az előírt kibocsátási mennyiség kapacitással és különböző helyeken vannak felszerelve. Erre azért van szükség, hogy bármilyen időjárási körülmények esetén a helikopter repülőtér bármely részén alkalmazható legyen az oltóhab és a lehető legkisebbre csökkentsék annak lehetőségét, hogy egy esetleges forgószárnyas légi-jármű baleset következtében mindkét szórófej működésképtelenné váljon.*

6.1.8 ***Ajánlás** — Az emelt szinten létesített helikopter repülőtér mentőfelszerelését a létesítmény közvetlen közelében tárolják.*

Megjegyzés : A helikopter repülőtéren biztosítandó mentőfelszerelésekről szóló útmutatót a Helikopter Repülőtér Kézikönyv *tartalmazza.*

Beavatkozási idő

6.1.9 ***Ajánlás** — A felszíni helikopter repülőtéren a tűzoltó és mentő szolgálatok gyakorlati célja optimális látási körülmények és talajviszonyok között a lehetőleg kettő percet meg nem haladó beavatkozási idő elérése illetve biztosítása.*

Megjegyzés : A beavatkozási idő a tűzoltó és mentő szolgálatok első riasztásától eltelt idő addig, amíg az első beavatkozó gépjármű(vek) vagy egység(ek) megfelelő helyzetbe kerülnek és megkezdik a beavatkozást úgy, hogy legalább a 6-2. táblázatban meghatározott tűzoltóhab kibocsátási mennyiség 50 %-át alkalmazzák.

6.1.10 ***Ajánlás** — Az emelt szinten létesített helikopter repülőtéren vagy annak közvetlen közelében a forgószárnyas légijárművek üzemeltetése alatt a tűzoltó és mentő szolgálat azonnali beavatkozásra készen álljon.*

6-1. táblázat: Helikopter repülőtér tűzoltó kategóriák

Helikopter repülőtér kategória	Forgószárnyas légi-jármű legnagyobb hossza #
H1	0.00 métertől 14.99 méterig
H2	15.00 métertől 23.99 méterig
H3	24.00 métertől 34.99 méterig

A forgószárnyas légi-jármű teljes hossza forgószárnytól (orrtól) a hátsó rotorokig.

6-2. táblázat: A tűzoltó anyagok legkisebb felhasználható mennyisége a felszíni helikopter repülőtér esetében

	B. teljesítmény szintű oltóhab		**Kiegészítő tűzoltó anyagok** (választható anyagok)		
Helikopter repülőtér kategória (1)	Víz liter (2)	Oltóhab keverék kibocsátás perc/liter (3)	Száraz kémiai porok kg. (4)	Halon anyagok kg. (5)	Széndioxid CO_2 kg. (6)
H1	500	250	23	23	45
H2	1000	500	45	45	90
H3	1600	800	90	90	180

6-3. táblázat: A tűzoltó anyagok legkisebb felhasználható mennyisége a emelt szinten létesített helikopter repülőtér esetében

	B. teljesítmény szintű oltóhab		**Kiegészítő tűzoltó anyagok** (választható anyagok)		
Helikopter repülőtér kategória (1)	Víz liter (2)	Oltóhab keverék kibocsátás perc/liter (3)	Száraz kémiai porok kg. (4)	Halon anyagok kg. (5)	Széndioxid CO_2 kg. (6)
H1	2500	250	45	45	90
H2	5000	500	45	45	90
H3	8000	800	45	45	90

1. Függelék

A léginavigációs adatok minőségi követelményei

1. táblázat: Szélesség és hosszúság (földrajzi értelemben)

Szélesség és hosszúság	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Helikopter repülőtér vonatkozási pont	30 méter földmérési/ számított	1 x 10 -3 rutin
Navigációs berendezések a helikopter repülőtér területén	3 méter földmérési	1 x 10 -5 alapvető
Akadályok a 3. területen	0.5 méter földmérési/ számított	1 x 10 -5 alapvető
Akadályok a 2. területen (a helikopter repülőtér határain belül)	5 méter földmérési	1 x 10 -5 alapvető
A földetérési és elemelkedési valamint a végső megközelítési és felszállási terület küszöbök mértani középpontja	1 méter földmérési	1 x 10 -8 kritikus
Földi és légi gurulóút valamint légi közlekedési útvonal középvonal pontok	0.5 méter földmérési/ számított	1 x 10 -5 alapvető
Földi gurulóút csatlakozási pontok jelölése	0.5 méter földmérési/ számított	1 x 10 -5 alapvető
Földi legurulóút jelölése	0.5 méter földmérési/ számított	1 x 10 -5 alapvető
Forgalmi előtér határai (sokszög)	1 méter földmérési	1 x 10 -3 rutin
Jégtelenítő és jégmentesítő létesítmény (sokszög)	1 méter földmérési	1 x 10 -3 rutin
Forgószárnyas légi-jármű állóhely pontok — Inercia navigációs (INS) ellenőrző pontok	0.5 méter földmérési	1 x 10 -3 rutin

1. Megjegyzés: A meghatározott területeken található akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és előírások grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 15. Annex 2. és 3. Területek akadály adataira vonatkozó 10.6.1.2 pontjának 2010 november 18. utáni alkalmazását megkönnyítheti az ilyen adatok tervszerű előzetes összegyűjtése és feldolgozása.

2. Táblázat: Közepes tengerszint/tengerszint/talajszint feletti magasság

közepes tengerszint/tengerszint/talajszint feletti magasság	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Helikopter repülőtér tengerszint feletti magassága	0.5 méter földmérési	alapvető 1 x 10 -5
Földalak egyenetlenség a WGS-84 szerint a helikopter repülőtér tengerszint feletti magassága helyzetében	0.5 méter földmérési	alapvető 1 x 10 -5
Végső megközelítési és felszállási terület küszöb, nem-precíziós megközelítés esetén	0.5 méter földmérési	alapvető 1 x 10 -5
Földalak egyenetlenség a WGS-84 szerint a FATO küszöbnél, a TLOF mértani középpontjában, nem-precíziós megközelítés esetén	0.5 méter földmérési	alapvető 1 x 10 -5
Végső megközelítési és felszállási terület küszöb, precíziós megközelítés esetén	0.25 méter földmérési	kritikus 1 x 10 -8
Földalak egyenetlenség a WGS-84 szerint a FATO küszöbnél, a TLOF mértani középpontjában, precíziós megközelítés esetén	0.25 méter földmérési	kritikus 1 x 10 -8
Földi és légi gurulóút valamint légi közlekedési útvonal középvonal pontok	1 méter földmérési	alapvető 1 x 10 -5
Akadályok a 2. területen (a helikopter repülőtér határain belül)	3 méter földmérési	alapvető 1 x 10 -5
Akadályok a 3. területen	0.5 méter földmérési	alapvető 1 x 10 -5
Precíziós távolságmérő berendezés (DME/P)	3 méter földmérési	alapvető 1 x 10 -5

1. Megjegyzés: A meghatározott területeken található akadályok azonosításához alkalmazott akadály adatgyűjtési felületek és előírások grafikus ábrázolása a 15. Annex 8. Függelékében található.

2. Megjegyzés: A 15. Annex 2. és 3. Területek akadály adataira vonatkozó 10.6.1.2 pontjának 2010 november 18. utáni alkalmazását megkönnyítheti az ilyen adatok tervszerű előzetes összegyűjtése és feldolgozása.

3. táblázat: Deklináció (elhajlás) és mágneses eltérés

Deklináció/eltérés	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Helikopter repülőtér mágneses eltérés	1 fok földmérési	1 x 10 -5 alapvető
ILS iránysávadó antenna mágneses eltérés	1 fok földmérési	1 x 10 -5 alapvető
MLS oldalszög-adó antenna mágneses eltérés	1 fok földmérési	1 x 10 -5 alapvető

4. táblázat: Irányszög

Irányszög	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
ILS iránysávadó beállítás	1/100 fok földmérési	alapvető 1 x 10 -5
MLS nulla oldaszög irányvezetés beállítás	1/100 fok földmérési	alapvető 1 x 10 -5
Végső megközelítési és felszállási terület irányszög	1/100 fok földmérési	általános 1 x 10 -3

5. táblázat: Hosszúság — Távolság — Méret

Hosszúság — Távolság — Méret	*Pontosság* *Adat típus*	*Osztályzás* *Megbízhatóság*
Végső megközelítési és felszállási terület hosszúsága, földetérési és elemelkedési terület méretei	1 méter földmérési	kritikus 1 x 10 -8
Biztonsági terület hossza és szélessége	1 méter földmérési	alapvető 1 x 10 -5
Rendelkezésre álló leszállási távolság	1 méter földmérési	kritikus 1 x 10 -8
Rendelkezésre álló felszállási távolság	1 méter földmérési	kritikus 1 x 10 -8
Rendelkezésre álló megszakított felszállási távolság	1 méter földmérési	kritikus 1 x 10 -8
Gurulóút szélesség	1 méter földmérési	alapvető 1 x 10 -5
ILS iránysávadó antenna és FATO vég közötti távolság	3 méter számított	rutin 1 x 10 -3
ILS siklópálya-adó antenna és a küszöb közötti távolság a középvonal mentén	3 méter számított	rutin 1 x 10 -3
ILS markerek és a küszöb közötti távolság	3 méter számított	alapvető 1 x 10 -5
ILS DME berendezés antenna és a küszöb közötti távolság a középvonal mentén	3 méter számított	alapvető 1 x 10 -5
MLS oldalszög-adó antenna és a FATO vég közötti távolság	3 méter számított	rutin 1 x 10 -3
MLS magasság-adó antenna és a küszöb közötti távolság a középvonal mentén	3 méter számított	rutin 1 x 10 -3
MLS precíziós távolságmérő berendezés (DME/P) antenna és a küszöb közötti távolság a középvonal mentén	3 méter számított	alapvető 1 x 10 -5

[1] ** ISO Szabvány*
19104 — Földrajzi tájékoztatások — Meghatározások
[2] ** ISO Szabvány*
19108 — Földrajzi tájékoztatások — Időmeghatározási rendszer
[3] ** ISO Szabvány*
19108 — Földrajzi tájékoztatások — Időmeghatározási rendszer

ANNEX 15.
Légiforgalmi tájékoztató szolgálatok

12. kiadás – 2004. július
33. módosítással
TIZENKETTEDIK KIADÁS – 2004 JÚLIUS
Ez a Kiadás magában foglalja a Tanács által 2004. február 24-e előtt elfogadott összes módosítást, és 2004. november 25-től helyettesíti a 15. Annex minden korábbi kiadását.
A Szabványok és az Ajánlott Gyakorlati Eljárások felhasználását érintő információkat *lásd* az Előszóban.
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Az Annex 15 módosításainak, kiegészítéseinek ellenőrző jegyzéke.

MÓDOSÍTÁSOK, KIEGÉSZÍTÉSEK

A módosítások kiadását rendszeresen közlik az ***ICAO Journal***-ban és a havonta megjelenő ***Supplement to the Catalogue of ICAO Publications and Audio-visual Training Aids (Melléklet, Kiegészítés az ICAO Kiadványok és Audio-vizuális Segédeszközök Listájához)***, melyeket ezen kiadványok tulajdonosai kísérjenek figyelemmel. Az alább biztosított táblázat ezen módosítások, kiegészítések nyilvántartására szolgál.

	A hatályosság dátuma	Az alkalmazhatóság dátuma
Tizedik Kiadás (tartalmazza az 1-29. Módosításokat	1997. július 21.	1997. november 6. 1998. január 1. 1998. november 5.
30. Módosítás (a Tanács 2000. február 21-én fogadta el)	2000. július 17.	2000. november 2.
31. Módosítás (a Tanács 2001. március 7-én fogadta el)	2001. július 16.	2001. november 1.
31. Módosítás (a Tanács 2001. március 7-én fogadta el)	2003. július 14.	27. november 2003
1-33 Ez a kiadás tartalmazza		

ELŐSZÓ

Történelmi háttér

A Légiforgalmi Tájékoztató Szolgálatokra vonatkozó Szabványokat és Ajánlott Gyakorlati Eljárásokat a Tanács először 1953. május 15-én fogadta el, a Nemzetközi Polgári Repülési Egyezmény (Chicago, 1944) 37. Cikkelyének előírásai szerint, amelyeket az Egyezmény 15. Annex-ének nevezett el.

A 15. Annex jelenleg érvényes formáját az alábbiakban részletezett fejlődési folyamaton keresztül nyerte el. Az első követelményeket a Körzeti Repülési Értekezletek (*Regional Air Navigation Meetings*) ajánlásai alapján a Repülési Bizottság (*Air Navigation Committee*) alakította ki és ezt a Tanács hatáskörében, mint a "Hajózók Értesítésének Nemzetközi Eljárásai"-t (PANS-NOTAM, PICAO Doc 2713) 1947. januárjában adták ki. Az 1949-ben megtartott Rendkívüli NOTAM Értekezlet ezt felülvizsgálta, és módosításokat, kiegészítéseket javasolt ezekhez az eljárásokhoz, amelyeket később "A Légiforgalmi Szolgálatok Eljárásai"

(*Procedures for Air Navigation Services*) (PANS-AIS, Doc 71O6) címen adtak ki, amely 1951. augusztus 1-én vált alkalmazhatóvá. 1952-ben a PANS-AIS-t a Légiforgalmi Tájékoztató Szolgálatok Osztályának (*Aeronautical Information Services Division*) Első Ülése felülvizsgálta, majd a Szabványok és Ajánlott Gyakorlati Eljárások (SARPS) elfogadását ajánlotta. Valamennyi Szerződő Tagállam figyelmes vizsgálata után, ezeket az ajánlásokat, javaslatokat a Repülési Bizottság felülvizsgálta, majd a Tanács a Szabványok és Gyakorlati Ajánlások első gyűjteményét 1953. május 15-én, a Repülési Egyezmény 15. Annex-eként hagyta jóvá. Ez az Annex 1954. április l-én vált alkalmazhatóvá.

Az "A" Táblázat az egymást követő módosítások forrását, valamint a legfontosabb érintett témák listáját, és azokat az időpontokat tartalmazza, amikor az Annex-et és annak módosításait a Tanács elfogadta, amikor azok érvénybe léptek és alkalmazhatóvá váltak.

A Szerződő Államok tennivalói

Eltérések bejelentése. A Szerződő Államok figyelmét felhívják az Egyezmény 38. Cikkelyében előírt kötelezettségeikre, amelyek értelmében a Szerződő Államokat felkérik arra, hogy értesítsék a Szervezetet minden olyan eltérésről, amely a nemzeti jogszabályaik és gyakorlati eljárásaik, és az ebben az Annex-ben szereplő Nemzetközi Szabványok, illetve a hozzá tartozó bármely módosítás között fennáll. A Szerződő Tagállamokat felkérik arra, hogy a jelen Annex-ben, illetve az annak módosításaiban található Gyakorlati Eljárásoktól való minden eltérésre terjesszék ki az ilyen bejelentéseiket akkor, ha az ilyen eltérések bejelentése fontos a repülés, a légiközlekedés biztonsága érdekében. A továbbiakban felkérik a Szerződő Tagállamokat arra, hogy folyamatosan tájékoztassák a Szervezetet azokról az eltérésekről, amelyek a későbbiek során keletkezhetnek, vagy bármely, korábban bejelentett eltérés megszűnéséről. Ezen Annex minden módosításának elfogadása után azonnal külön kérést küldenek a Szerződő Államok felé az eltéréseik bejelentését kérve.

Az Annex részeinek státusza

Egy Annex az alábbi részekből épül fel, azonban ezek nem mindegyike található meg szükségszerűen minden egyes Annex-ben; ezek a jelzett státusszal rendelkeznek:

1.- *Az Annex állandó részét alkotó anyagok*:

a) *Szabványok és Ajánlott Gyakorlati Eljárások (SARPS)*, amelyeket a Tanács fogadott el, az Egyezmény előírásainak megfelelően. Ezek az alábbiak szerint kerültek meghatározásra:

Szabvány: Fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyekre, vagy eljárásokra vonatkozó bármely előírás, amelynek egységes alkalmazását szükségesnek ítélik a nemzetközi légiközlekedés biztonsága, vagy rendszerességének fenntartása szempontjából és amelyhez a Szerződő Államok az Egyezménynek megfelelően alkalmazkodni fognak; ezek teljesítésének lehetetlensége esetén a Tanácsot a 38. Cikkely értelmében kötelezően értesíteni kell.

Ajánlott Gyakorlati Eljárások: Fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyekre, vagy eljárásokra vonatkozó bármely előírás, amelynek egységes alkalmazását kívánatosnak ítélik meg a nemzetközi légiközlekedés biztonsága, rendszeressége, vagy hatékonysága érdekében és amelyekhez a Szerződő Államok igyekeznek alkalmazkodni az Egyezmény értelmében.

b) *Függelékek:* kényelmi okokból külön csoportosított anyagokat tartalmaznak, azonban a Tanács által elfogadott Szabványok és Ajánlott Gyakorlati Eljárások részét képezik.

c) *Meghatározások:* Azoknak a Szabványokban és az Ajánlott Gyakorlati Eljárásokban használt fogalmaknak az értelmezése, amelyek nem nyilvánvalóak, mivel nincs elfogadott szótári meghatározásuk. A meghatározásnak nincs önálló státusza, de nélkülözhetetlen részét képezi azoknak a Szabványoknak és Ajánlott Gyakorlati Eljárásoknak, amelyekben az adott fogalmat használják, mivel a kifejezés értelmezésének megváltozása kihatással lenne magára a meghatározásra is.

d) *Táblázatok és Ábrák:* amelyek kiegészítik, vagy illusztrálják a Szabványokat vagy az Ajánlott Gyakorlati Eljárásokat és azokban hivatkoznak rájuk, a velük kapcsolatos Szabványoknak, vagy Ajánlott Gyakorlati Eljárásoknak részét képezik, valamint a státuszuk is megegyezik vele.

Meg kell jegyezni, hogy ebben az Annex-ben található néhány olyan Szabvány, amelyek utalás formájában olyan más meghatározásokat is tartalmaznak, amelyek státuszukat tekintve Ajánlott Gyakorlati Eljárások. Ilyen esetekben az Ajánlott Gyakorlati Eljárás szövege az adott Szabvány részévé válik.

2.- *A Szabványokkal és az Ajánlott Gyakorlati Eljárásokkal kapcsolatosan a Tanács által kiadásra jóváhagyott anyag*:

a) *Előszó:* a Tanács tevékenységén, intézkedésein alapuló történeti áttekintést és magyarázatot tartalmazó anyag, mely tartalmazza az Államok Egyezményből és Elfogadási Határozatból eredő, a Szabványok és Ajánlott Gyakorlati Eljárások alkalmazásával kapcsolatos kötelezettségeinek magyarázatát is.

b) *Bevezetés:* Magyarázó anyag az Annex egyes részeinek, fejezeteinek, vagy szakaszainak elején, hogy segítséget adjon a szöveg alkalmazásának megértéséhez.

c) *Megjegyzések:* melyek, ahol szükséges, a szövegben találhatók, hogy tárgyszerű tájékoztatást nyújtsanak, vagy utalást tartalmazzanak a kérdéses Szabványok vagy Ajánlott Gyakorlati Eljárások vonatkozásában, de maguknak a Szabványoknak vagy Ajánlott Gyakorlati Eljárásoknak nem képezik részét.

d) *Mellékletek:* Kiegészítő anyagokat tartalmaznak a Szabványokhoz és Ajánlott Gyakorlati Eljárásokhoz, vagy ezek alkalmazásához útmutatóként méllekelték.

A nyelv kiválasztása

Ez az Annex hat nyelven - angolul, arabul, kínaiul, franciául, oroszul és spanyolul - került elfogadásra. Minden egyes Szerződő Tagállamot felkérnek arra, hogy válasszon ki ezen változatok közül egy szöveget, nemzeti alkalmazásra és egyéb, az Egyezmény által biztosított célra, akár a közvetlen adott nyelvű felhasználásra, akár a saját nemzeti nyelvükre lefordítva és erről értesítse a Szervezetet.

A szerkesztés gyakorlati eljárásai

A szerkesztők a következő gyakorlatot követték, hogy az egyes meghatározások státuszát már ránézésre is fel lehessen ismerni: a *Szabványokat* normál vastagságú antikva (egyenes) betűtípussal (*light face roman*) nyomtatták; az *Ajánlott Gyakorlati Eljárásokat* normál vastagságú dőlt betűkkel (*light face italics*) nyomtatták, míg a státuszt eközben az **Ajánlás (Recommendation)** előtaggal jelezték; A *Megjegyzéseket* normál vastagságú dőlt betűkkel (*light face italics*) nyomtatták, a státuszát pedig *Megjegyzés* (*Note*) előtaggal jelezték.

Az alábbi szerkesztési gyakorlatot használták a részletes, pontos meghatározások esetén: a Szabványok esetében a "*shall*" (nyomatékosító "kell"; "szükséges") szót, az Ajánlott Gyakorlati Eljárásoknál pedig a "*should*" (a kevésbé nyomatékos "kellene"; "szükséges volna") szavakat használták.

Az ebben a dokumentumban használt mértékegységek megfelelnek a International System of Units (SI) - Nemzetközi Mértékegységrendszer előírásainak úgy, ahogy az a Nemzetközi Polgári Repülésügyi Egyezmény 5. Annex-ében található. Ahol az 5. Annex megengedi más, nem SI szabvány szerinti alternatív mértékegység használatát, ott ezek zárójelben követik az alap mértékegységet. Ahol két mértékegység szerepel, ezt az értékpárt nem szabad egyenlőnek és egymással felcserélhetőnek gondolni. Azonban az bizonyítható, hogy bármelyik mértékegység típus kizárólagos használata esetén is a biztonság ugyanolyan szintje valósul meg.

A dokumentum számmal és/vagy címmel jelzett valamely részére való bármely hivatkozás egyben az adott rész minden alpontjára is vonatkozik.

"A" Táblázat. A 15. Annex módosításai, kiegészítései

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
1. Kiadás	A Légiforgalmi Tájékoztató Szolgálatok Részlegének 1. Ülése		1953.05.15. 1953.09.01. 1954.04.01.
1	Konzultációk az Államokkal	Szerkesztési módosítások a szaknyelv egységes alkalmazása érdekében	1955.05.27. 1955.10.01. 1955.10.01.
2	Konzultációk az Államokkal	Szerkesztési módosítások a szaknyelv egységes alkalmazása érdekében	1956.05.15. 1956.09.15. 1956.12.01.
3	Konzultációk az Államokkal	Tiltott, korlátozott és veszélyes légterek meghatározása és azonosítása.	1957.04.16. 1957.09.01. 1957.12.01
4	Konzultációk az Államokkal	Tájékoztató anyag a tiltott, korlátozott és veszélyes légterek, területek meghatározásainak alkalmazására	1958.11.14. -- 1958.11.14.
5	Konzultációk az Államokkal	Szerkesztési módosítások, kiegészítések a szaknyelv egységes alkalmazása érdekében; a helységnév rövidítések helyett szabványos helységnév kódrendszer világméretű alkalmazásának bevezetése	1959.03.24. 1959.09.01. 1959.10.01.
6	Légiforgalmi Tájékoztató szolgálatok és Légiforgalmi Térképek Részlege	Légiforgalmi Tájékoztató kiadványok (AIP) tartalma; Légiforgalmi Tájékoztató Körlevelekre vonatkozó előírások és NOTAM kódok.	1960.07.20. 1960.10.01. 1961.01.01.
7	Légiforgalmi Tájékoztató szolgálatok és Légiforgalmi Térképek Részlege	A tájékoztató anyag törlése	1960.12.02. -- 1961.01.01.
8	Az új "*ABC - ICAO Rövidítések és Kódok*" (Doc 8400) Tanács általi jóváhagyásával kapcsolatos levelezés és tevékenységek.	Az AIRAC - A Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje; a "NOTAM kód" és a "Légiforgalmi Tájékoztató Szolgálatok által felhasználandó rövidítések" törlése; az 1. Függelék kisebb módosításai	1964.03.25. 1964.08.01. 1964.11.01.
9	A Repülési Szabályok és a Légiforgalmi Szolgálatok/ Üzemeltetés Részleg Értekezlete	Veszélyes, tiltott és korlátozott légterek, területek meghatározásai.	1965.12.10. 1966.04.10. 1966.08.25.
10	Légiforgalmi Tájékoztató Szolgálatok és Légiforgalmi Térképek Részlege (1966)	Snowplan (Hóeltakarítási Terv) előírások; SNOWTAM (a repülőtér mozgási területein található v. eltakarítás alatt lévő hó, jég, latyak, vagy ezzel kapcsolatos állóvíz miatti veszélyes körülményekről szóló különleges NOTAM sorozat megjelölése) meghatározása és formai leírása; az I. osztályú NOTAM szövege; az AIP tartalma; korlátozott légterek azonosítása és ábrázolása; Légiforgalmi tájékoztató Körlevelek	1967.07.13. 1967.10.08. 1968.09.18.

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
11	Ötödik Légiközlekedési Konferencia	Repülés előtti tájékoztató szolgálat; tájékoztatás a futópálya menti látástávolság (RVR) mérő rendszerekről.	1969.01.23. 1969.05.23. 1969.09.18.
12	Hatodik Légiközlekedési Konferencia és áttérés a Körzeti Kiegészítő Eljárásokról	Tájékoztatás kiadása a Légiforgalmi Szolgálatok rendszereiről, azaz a jelen- tőpontokról és a minimális tengerszint feletti repülési magasságokról; NOTAM tájékoztatás a kutatási és mentési műveletek lebonyolításáról	1970.05.15. 1970.09.15. 1971. 02.04.
13	Légiforgalmi Tájékoztató szolgálatok és Légiforgalmi Térképek Részlege, Hatodik Légiközlekedési Konferencia	Az I. osztályú NOTAM-ok előre meghatározott elosztási rendszere, a NOTAM összeállítása, a nemzetközi légiközlekedés rendelkezésére álló légiforgalmi meteorológiai berendezésekről és szolgálatokról szóló tájékoztatások.	1971.03.19. 1971.09.06. 1972.01.06.
14	Körzeti Léginavigációs Értekezlet Ajánlásai világméretű felhasználásra. CAR IV RAN értekezlet 19/29 számú ajánlása (1966); SAM/SAT/III RAN Értekezlet 19/10 ajánlása (1967); MID/SEA RAN Értekezlet 19/4 és 19/5 számú ajánlásai (1968); NAT/V RAN Értekezlet 17/5 számú ajánlása (1970).	Légiforgalmi Tájékoztató Szolgálat alkalmazhatósága ott, ahol nem biztosítanak 24 órás folyamatos szolgálatot; NOTAM-ok dekódolása a repülés előtti tervezés során; tájékoztatás közzététele arról, hogy nem adtak ki II. osztályú NOTAM-ot; légijárműveket üzemeltető valamennyi állami szolgálat által biztosított tájékoztatások a Légiforgalmi Tájékoztató Szolgálatok számára; a légiforgalmi mozgó szolgálatot és /vagy légiforgalmi navigációs szolgálatot ellátó állomások antenna koordinátáinak közzététele az AIP-ben, legalább 1/10 perc pontossággal.	1971.12.15. 1972.04.15. 1972.12.07.
15	A 4. Annex - *Légiforgalmi Térképek* - 43. számú Módosítása; a PANS-RAC (Doc 4444) 10. kiadásának 1. módosítása; a 6. EUM RAN Értekezlet 16/3, 16/8, 16/10 b) és 16/15 számú Ajánlásai; a 14. Annex - *Repülőterek* - 28. számú Módosítása; a 10. Annex - *Légiforgalmi Távközlés* - 51. számú Módosítása	A repülőtéri VOR és INS ellenőrző pontok helyének AIP-ben való közzététele; ATS útvonalak meghatározó fontos pontok nevének, kódjelzésének és földrajzi koordinátáinak, és a repülőterek környezetében tapasztalható madárcsapatok és madárvándorlás AIP-ben történő közzététele; NOTAM-ba nem illő tájékoztatások típusainak felsorolása; a Légiforgalmi Tájékoztató Körlevelekhez alkalmas tájékoztatástípusok; a talaj felszínén lévő hóra vonatkozó terminológia egyeztetése a 14. Annex-ben található meghatározásokkal.	1973.03.19. 1973.07.30. 1974.05.23.
16	A Tanács kérése (78-14), mely arra vonatkozik, hogy egyeztessék az államokkal az Annex-ektől és a PANS-tól való eltérések AIP-ben való közzétételét; a PANS-RAC 6. Módosítása.	Egy Állam nemzeti előírásai és gyakorlati eljárásai, valamint a vonatkozó ICAO Szabványok, Ajánlott Gyakorlatok és Eljárások közötti eltérések AIP-ben való közzététele; az 1. Függelék követelményei és az Annex-ben található eredeti, forrás előírások közötti ellentmondások megszüntetése; az ATIS-ra vonatkozó tájékoztatásokat érintő követelmények áthelyezése a MET részből az AIP RAC fejezetébe.	1974.06.25. 1974.10.25. 1975.02.27.

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
17	A Műszaki Bizottság Hangsebesség Feletti Szállítás Üzemeltetésével foglalkozó Negyedik Értekezletének 2/6 Ajánlása; A Léginavigációs Bizottság légijárművek elfogásával foglalkozó tanulmánya	A napból származó kozmikus sugárzás előrejelzésének (ha ez biztosított) NOTAM formájában történő terjesztése; az alkalmazott elfogási eljárások és látás utáni jelzések közzététele az AIP-ben.	1975.02.04. 1975.06.04. 1975.10.09.
18	Körzeti Léginavigációs Értekezletek (EUM 6 Rec 9/4, AFI/5 Rec 6/2 c) d) és ASIA/PAC Rec 6/3 c)) ajánlásai, és a IATA kérése, hogy módosítsák a 14. Annex-et; a 14. Annex teljes felülvizsgálata.	A repülőtereken a mozgásképtelenné vált légijárművek eltávolítására vonatkozó tájékoztatás AIP-ben való közzététele; a repülőtereken rendelkezésre álló mentő és tűzoltó szolgálatok státuszának bejelentése a készenléti szint jelentős mértékű változásairól; a munkaterület és a mozgási terület meghatározása; a "Magasságmérő Ellenőrzési Hely" kifejezés megváltoztatása "Magasságmérő Ellenőrzési Pont"-ra.	1976.02.05. 1976.06.05. 1976.12.30.
19	A 7. Léginavigációs Konferencia 3/16 Ajánlása; a 3. Annex - *Meteorológiai Szolgálat a Nemzetközi Léginavigáció számára* - felülvizsgálata (60. számú Módosítás).	ILS berendezés telepítése esetén a 10. Annex előírásaival összhangban az iránysávadó és a siklópálya sugárzási adatainak és az ILS referencia pont magasságának közzététele az AIP-ben; a 4. Rész - Meteorológia - módosítása a 3. Annex 60. számú Módosításában bevezetett új előírásoknak és szakkifejezéseknek megfelelően.	1977.06.27. 1977.10.27. 1978.02.23.
20	9. Léginavigációs Konferencia	ATS útvonalak leírásának közzététele az AIP-ben; az Északi irány vonatkoztatása (mágneses, földrajzi és koordináta háló szerinti) útirányokra, vagy irányszögekre.	1977.12.09. 1978.04.09. 1978.08.10.
21	A Német Szövetségi Köztársaság (az Egyesült Királyság nevében is) és a Szovjetunió által benyújtott javaslatok.	I. osztályú NOTAM formátum és az AIP módosítások közzététele.	1980.03.31. 1980.07.31. 1980.11.27.
22	A Léginavigációs Bizottság tanulmányából származtatott javaslat és a Titkárság által benyújtott javaslat.	Olyan tevékenységek, melyek potenciális veszélyt jelentenek a polgári légijárművek repülésére és az AIRAC NOTAM vétele az érvénybelépés előtt 28 nappal.	1981.03.13. 1980.07.13. 1981.11.26.
23	A Titkárság és az Egyesült Királyság által benyújtott javaslatok.	Nyílt szövegű repülés előtti tájékoztató bulletinek, polgári légijárművek elfogása és az AIRAC NOTAM "Nincs Értesítés"-e.	1982.04.02. 1982.08.02. 1982.11.25.

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
24	A Repülőterek, Légiútvonalak és Földi Segédberendezések Részlege Értekezletének (1981) 7/5, 7/8 és 10/2 javaslatai.	Felülvizsgált SNOWTAM formanyomtatvány; a nedves futópálya-felület fékhatás értékeinek és egy akadálymentes zóna meglétének közzététele az AIP-ben.	1982.11.17. 1983.03.17. 1983.11.24.
25	A Repülőterek, Légiútvonalak és Földi Segédberendezések Részlege Értekezletének (1981) 7/7 javaslata.	Dátum/idő hivatkozási módszer.	1985.03.25. 1985.07.29. 1985.11.21.
26	Különféle források, beleértve az Európai Léginavigációs Tervező Csoport (EANPG) 22/24 és 24/20 Határozatai; az Időjárástól Független Repülő üzemeltetés kérdésével foglalkozó Bizottság (AWOP) 9. Javaslata; az Akadálymentesség kérdésével foglalkozó Bizottság (OCP) 1/4 Javaslata; a 3, 4 és 14. Annex-eknek a 64-es, 47-es és 38-as Módosítása; az Egyesült Királyság és a Titkárság által benyújtott javaslatok.	Az A-4es méretű AIP lapok alkalmazására vonatkozó előírások korszerűbbé tétele; a NOTAM és az AIC kiadása és szétosztása; a légiforgalmi tájékoztatás és a Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendjének (AIRAC) alkalmassága és hitelessége; változások az I. osztályú NOTAM-ok előre meghatározott elosztási rendszerében; a rövidített fejrész bevezetése és változások a SNOWTAM formanyomtatványban, útmutató a kitöltéséhez; a DME zéró-távolság kijelölő pontja helyének közzététele az AIP-ben; az AIP részét képező térképsorozatok jegyzékének korszerűsítése; szabványos légijármű gurulási útvonalakra, precíziós megközelítésű futópályák földetérési zónája legmagasabb pontjának tengerszint feletti magasságára és a küszöbök és légijármű állóhelyek földrajzi koordinátáira vonatkozó további üzemeltetési adatok közzététele az AIP-ben; a címjelzések hetedik és nyolcadik betűjére vonatkozó utalások beépítése az előre meghatározott elosztási rendszerben; a vulkáni hamufelhőkkel kapcsolatos előzetes figyelmeztetések.	1987.03.06. 1987.07.27. 1987.10.22.
27	Különféle források, beleértve az Európai Léginavigációs Tervező Csoport (EANPG) 30/15 Határozatát; a Léginavigációs Bizottság Annex-felülvizsgálatai; a Látvarepülési Szabályok szerinti Üzemeltetéssel foglalkozó Bizottság (VFOP) 3/3 javaslata; néhány európai állam által benyújtott javaslat; a 14. Annex 39. Módosítása.	Az Integrált Légiforgalmi Tájékoztató Egységcsomag és a felülvizsgált NOTAM Formátum bevezetése; a tájékoztatás közzététele azokról a körzetekről, vagy útvonalakról, ahol fennáll az elfogás lehetősége, tájékoztatások közzététele a nemzetközi polgári repülés jogellenes beavatkozással szemben való védelmére vonatkozóan; új ATS légtér-osztályozás bevezetése; a madárveszély csökkentése; a burkolt felületek fékhatásának mérésére alkalmazott eszközök jegyzékének és az alkalmazott szakkifejezéseknek a pontosítása, frissítése; helikopter repülőterekkel kapcsolatos adatok bevezetése.	1991.03.04. 1991.07.28. 1991.11.14.

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
28	Különféle források, beleértve az Európai Léginavigációs Tervező Csoport (EANPG) 34/12 Határozatát; a Tanács a WGS-84-et (World Geodetic System) fogadja el, mint szabványos geodéziai vonatkoztatási rendszert a nemzetközi repülés számára; az RGCSP/8 javaslata; a Titkárság.	A helikopter repülőterekre és az Integrált Légiforgalmi Tájékoztató egységcsomagra vonatkozó új és felülvizsgált meghatározások bevezetése az 2. Fejezetben; a légiforgalmi tájékoztatás kölcsönös cseréjével kapcsolatos módosítások és a WGS-84-gyel kapcsolatos földrajzi koordináták közzétételére vonatkozó új előírások beillesztése a 3. Fejezetbe; a 4. fejezet módosítása és átrendezése az AIP átszerkesztett tartalmát és általános előírásait, az AIP Módosítás és az AIP Melléklet előírásait és azok szétosztását illetően; az 5. fejezet módosításai a NOTAM kiadás és szétosztás, és egy olyan új előírás bevezetésének vonatkozásában, amely szabályozza az atmoszférába kerülő radioaktív anyagok és mérgező kémiai anyagok megjelenésével kapcsolatos tájékoztatás közzétételét; a 6. Fejezet szabványos előírás szerinti korszerűsítése az AIRAC dátumoknak a kartográfiai munkát igénylő változások közzétételében és a navigációs adatbázisok korszerűsítésében történő felhasználás vonatkozásában; a repülés előtti tájékoztató bulletinek formátumáról szóló Ajánlott Gyakorlati Eljárás törlése a 8. Fejezetből; a 9. Fejezetben a "Légiforgalmi Állandóhelyű Távközlési Hálózat (AFTN)" szakkifejezés helyettesítése a "Légiforgalmi Állandóhelyű Szolgálat (AFS)" általános kifejezéssel; az AIP teljesen átszerkesztett tartalmának bevezetése az 1. Függelékbe.	1994.02.28. 1994.06.28. 1994.11.10. 1996.04.25. 1998.01.01.
29 Tizedik Kiadás	Léginavigációs Bizottság és Vulkanikus Hamu Riasztásokat Tanulmányozó Csoport (VAWSG)	Léginavigációs (légiforgalmi) adatbázisok, humanitárius repülések, a NOTAM-ok egy különleges sorozata, mely a vulkanikus jelenségekkel foglalkozik, és a WGS-84 (World Geodetic System 1984 - Világszintű Geodéziai Rendszer 1984) függőleges komponense	1997.03.20. 1997.07.21. 1997.11.06. 1998.01.01. 1998.11.05.
30	A Légiforgalmi Tájékoztató Szolgálatok/ Légiforgalmi Térképek (AIS/MAP) Körzeti Értekezletének 1.2/1, 3.3/2 és 4.1/2 Ajánlásai (1998); Léginavigációs Bizottság	A léginavigációs adatok, a légiforgalmi tájékoztatások és a Légiforgalmi Tájékoztató Szolgálatok, az ADIZ (Légvédelmi Azonosítási Körzet), az AIS termékek, az Emberi Elem (tényező) Alapelemei, minőségirányítás új fogalmainak, meghatározásainak beillesztése a 2. Fejezetbe; a 3. Fejezetben a minőségbiztosítási rendszerrel, a léginavigációs (légiforgalmi) Információkkal/adatokkal, a szerzői jogokkal (copyright) a költségek fedezetével, az Emberi Elem (Tényező) tekintetbevételével kapcsolatos új rendelkezések; a 6. Fejezetben új és átszerkesztett rendelkezések, melyek az AIRAC információk elektronikus formában történő biztosításával foglalkoznak; az ADIZ-zal kapcsolatos rendelkezések bevezetése az 1. Függelékben.	2000.02.21 2000.07.17 2000.11.02
31	Titkárság	A 8. Fejezetben új rendelkezések az automatizált légiforgalmi tájékoztató rendszerek és az összehangolt Légiforgalmi Tájékoztató Szolgálatok/Meteorológia (AIS/MET) repülés előtti eligazításának vonatkozásában, valamint az 1. Függelék módosítása a veszélyes természetű és egyéb potenciális veszélyt okozó tevékenységekről szóló információk biztosításával kapcsolatban.	2001. márc. 7. 2001. július 16. 2001. nov. 1.

Módosítás	Forrás/ok/	Téma/ák/, tárgya/i/	Elfogadás Hatályos Alkalmazható
32. (Tizen-egyedik Kiadás)	Különféle források, beleértve az Európai Léginavigációs Tervező Csoport (EANPG) 40/51 Határozatát; az AFI Tervező és Megvalósító Körzeti Csoport (APIRG) 13/51 Határozatát; Léginavigációs Bizottság (ANC); és a Titkárság	A 3. Fejezetben a módosított meghatározások bevezetése az Integrált Légiforgalmi Tájékoztató Csomag részére; A 3. Fejezetben az angol nyelvű szöveg használatára vonatkozó előírás átminősítése Szabvánnyá; a 4. Fejezet módosítása az AIP Módosításaira és Mellékleteire vonatkozó előírásokkal; az 5. Fejezet és a 6. Függelék előírásainak újraszerkesztése és kiegészítése; a váratlan eseményekre vonatkozó intézkedések nyilvánosságra hozása NOTAM útján; új előrások a 8. Fejezetben a repülőtereken/helikopter repülőtereken, a légijárművek üzemeltetésére veszélyt jelentő madarak jelenléte esetén az információk gyűjtésére; valamint az 1. Függelék összehangolása a 3. Annex előírásaival.	2003. febr. 28. 2003. július 14. 2003. nov. 27. 2003. febr. 28. 2003. július 14. 2003. nov. 27.
33 (12. Kiadás)	Az Akadálymentesség kérdésével foglalkozó Bizottság (OCP)/12 4/6 Ajánlása; Az Akadálymentesség kérdésével foglalkozó Bizottság (OCP)/13 5.3/2 Ajánlása; A GNSSP/4 - 3/1 Ajánlása; A Léginavigációs Bizottság; és a Titkárság	A fogalom meghatározásokkal kapcsolatban új rendelkezések; a függőleges referencia rendszer és az időbeli referencia rendszer a nemzetközi polgári repülés számára; elektronikus terep és akadály adatok; léginavigációs adatok minőségi követelményei; a GNSS-től származó elemek csatolása a léginavigációs adatokhoz; a Radar Vektorálás Minimális Tengerszint feletti Magasságainak Térképe – ICAO; a WGS-84-el (World Geodetic System 1984 - Világszintű Geodéziai Rendszer 1984-el) és a Légiforgalmi Tájékoztató Kiadványokkal (AIP-vel) kapcsolatos, érvényben lévő rendelkezések, utasítások frissítése.	2004. febr. 23. 2004. július 12. 2004. nov. 25; 2008.nov.20. 2010.nov.18.

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATI ELJÁRÁSOK

1. FEJEZET - BEVEZETÉS

A Légiforgalmi Tájékoztató Szolgálat célja a nemzetközi léginavigáció biztonsága, rendszeressége és hatékonysága szempontjából szükséges tájékoztatás áramlásának folyamatos biztosítása. A légiforgalmi tájékoztatások/adatok szerepe és fontossága jelentősen megváltozott az RNAV (Area Navigation - Területi Navigáció), a Megkövetelt Navigációs Teljesítőképesség (RNP - Required Navigation Performance) és a fedélzeti számítógépes navigációs rendszerek bevezetésével. A sérült, vagy hibás légiforgalmi tájékoztatások/adatok potenciálisan hatással lehetnek a légiközlekedés, a léginavigáció biztonságára.

Hogy a légiforgalmi tájékoztatások biztosításában kielégíthessék az egységesség és a következetesség követelményét, mely elengedhetetlen a számítógépen alapuló navigációs rendszerek üzemeltetéséhez, az Államok, amennyire csak lehetséges, el ***kell*** kerüljék azon Szabványoknak és Eljárásoknak felhasználását, melyeket nem a nemzetközi alkalmazásra állítottak össze.

Ezeket a Szabványokat és Ajánlott Gyakorlati Eljárásokat a Légiforgalmi Szolgálatok Eljárásai – ICAO Rövidítések és Kódokkal *(Procedures for Air Navigation Services – ICAO abbreviations and Codes -PANS-ABC, Doc 8400)* egyetértésben kell felhasználni.

Elfogadott tény, hogy bizonyos esetekben Kiegészítő Eljárásokra lehet szükség, hogy ezzel az ICAO Körzetek bizonyos követelményeit kielégíthessék.

A Légiforgalmi Tájékoztató Szolgálatok megszervezésére és üzemeltetésére vonatkozó tájékoztató anyag a *Légiforgalmi Tájékoztató Szolgálatok Kézikönyve* (Aeronautical Information Services Manual - Doc 8126) című kiadványban található.

2. FEJEZET - MEGHATÁROZÁSOK

Amikor az alábbi fogalmakat használják a Légiforgalmi Tájékoztató Szolgálatok számára készült Szabványok és Gyakorlati Eljárásokban, azok az alábbi jelentéssel rendelkeznek:

Pontosság *(Accuracy)*. A számított, vagy mért érték és a valós érték közötti megegyezőség mértéke.

Megjegyzés: A mért helyzetadatok számára a pontosságot rendes körülmények között távolságban fejezik ki a megállapított helyzettől számítva, melyen belül a valós pozíció meghatározott bizonyossággal megtalálható.

Léginavigációs adatok *(Aeronautical Data)*. A léginavigációs tények, fogalmak, vagy utasítások megjelenítése olyan formátumban, amely megfelel a kommunikáció, a kiértékelés, vagy feldolgozás követelményeinek.

Légiforgalmi tájékoztatások *(Aeronautical information)*. Olyan információk, melyek a léginavigációs adatok összegyűjtéséből, elemzéséből és megfelelő formába rendezéséből származnak.

Légiforgalmi Tájékoztató Körlevél *(Aeronautical Information Circular /AIC/)*. Olyan közlemények, melyek nem teszik szükségessé, hogy miattuk NOTAM-ot adjanak ki, vagy azt, hogy őket az AIP-be illesszék, azonban a repülés biztonságára, a légiforgalomra, műszaki, igazgatási és jogi ügyekre vonatkoznak.

Légiforgalmi Tájékoztató Kiadvány *(Aeronautical Information Publication - AIP)*. Olyan tartósan érvényben maradó Légiforgalmi Tájékoztatásokat tartalmazó kiadvány, mely alapvető fontosságú a légiközlekedés számára, és amelyet az Állam maga, vagy meghatalmazottja útján ad ki.

Légiforgalmi tájékoztató szolgálat *(Aeronautical Information Service - AIS)*. A légi navigáció biztonsága, rendszeressége és hatékonysága számára szükséges légiforgalmi tájékoztatások/léginavigációs adatok biztosításáért felelős szolgálat, melyet egy bizonyos területi egységen belül hoztak létre.

Az AIP Módosítása *(AIP Amendment)*. Az AIP-ben található információk állandó jellegű változtatásai.

Az AIP Kiegészítése *(AIP Supplement)*. Az AIP-ben található információk ideiglenes jellegű változtatásai, melyeket különálló lapok formájában adnak ki.

AIRAC *(Aeronautical Information Regulation And Control - A Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje)*. Betűszó - jelentése egy közösen meghatározott időpontokon alapuló olyan rendszer, melynek célja az előzetes tájékoztatás kiadása azokról a körülményekről, melyek az üzemeltetési eljárásokban jelentős változások bevezetését teszik szükségessé.

Légvédelmi Azonosítási Körzet *(ADIZ – Air Defence Identification Zone).* Egy különlegesen kijelölt légtér, meghatározott fizikai méretekkel, melyen belül a légijárműveknek az ATS (Légiforgalmi Szolgálatok) biztosításával összefüggőkön kívül, más különleges azonosítási és/vagy jelentési eljárásokat is be kell tartaniuk.

AIS termék *(AIS product).* Az Integrált Légiforgalmi Tájékoztatási Csomag elemeként biztosított Légiforgalmi Tájékoztatás, beleértve a légiforgalmi térképeket is, vagy az olyan légiforgalmi tájékoztatásokat, melyeket megfelelő elektronikus adathordozó segítségével nyújtanak, (kivéve a NOTAM-okat és a Repülés Előtti Bulletineket /PIB/).

Alkalmazás *(Application)* A felhasználó követelményeinek kielégítése érdekében végzett adatkezelés és adatfeldolgozás (ISO 19104[1]*)

ASHTAM *(ASHTAM).* A NOTAM-ok egy speciális sorozata, mely meghatározott formátumával információkat ad egy vulkán aktivitásának változásáról, egy vulkáni kitörésről és/vagy egy vulkáni hamufelhőről, melyek jelentős hatással lehetnek a légijárművek üzemeltetésére.

Összeállítás *(Assemble).* A Légiforgalmi Tájékoztatások többféle forrásból egy adatbázisba való összeállításának folyamata, valamint a későbbi feldolgozás alapjának létrehozása.
Megjegyzés.— Az összeállítás fázisa tartalmazza az adatok ellenőrzését és annak biztosítását, hogy a felismert hibák és hiányosságok kijavításra kerülnek.

Csupasz, kopár földterület *(Bare Earth)* A Föld felszíne, beleértve a felszíni vizeket és állandó jég-, és hómezőket, a vegetáció és ember által létrehozott tárgyak, akadályok kivételével.

Naptár *(Calendar)* Pontosan meghatározott időbeli referencia rendszer, amely alapul szolgál egy időpont meghatározásához, napi felbontással (ISO 19108[2]*).

A lombozat felszíne *(Canopy)* A csupasz, kopár földfelszín kiegészítve a vegetáció magasságával.

Műtárgyak *(Culture)* Minden ember által készített tereptárgy, amely a föld felszínén található, mint például települések, vasútvonalak és csatornák.

CRC *(Ciclic Redundancy Check - Ciklikus Redundancia Vizsgálat).* A digitális formában tárolt adatok ellenőrzésére használt olyan matematikai algoritmus, mely gondoskodik az adatvesztés, vagy a nem szándékos adatváltozás elleni garancia meghatározott szintjéről.

Veszélyes légtér *(Danger area).* Meghatározott kiterjedésű légtér, melyen belül a repülésekre veszélyt jelentő tevékenységeket folytathatnak egy adott időszakban.

Adatbázis *(Database).* Az adatok egy, vagy több állománya olyan módon tárolva, hogy egy megfelelő alkalmazás (program) segítségével az adatok visszanyerhetők és frissíthetők legyenek.
Megjegyzés. - Ez elsődlegesen inkább az elektronikus formában tárolt, számítógép segítségével elérhető adatokra vonatkozik, mint a hagyományos nyomtatott formában, dossziéban tároltakra.

Adattermék *(Data product)* Olyan adatállomány, vagy az adatállomány olyan sorozata, amely megfelel az "Adattermék" ISO 19131[3]*-ben található specifikációnak.

Adattermék specifikációja *(Data product specification)* Az adatállomány, vagy az adatállomány sorozatának részletes leírása, további információkkal együtt, amely lehetővé teszi, hogy létrehozzák és egy másik fél számára használatra átadják (ISO 19131[4]*).

Megjegyzés. – Az adattermék specifikációja részletesen leírja a teljes adattartományt, valamint a teljes adattartomány adatkészletté való leképezését. Felhasználhatják az előállítás, eladás, végfelhasználás és egyéb célokra is.

Adatminőség *(Data quality).* A bizonyosságnak az a foka, vagy szintje, hogy a biztosított adatok a pontosság, a felbontóképesség és az integritás tekintetében megfelelnek az adatfelhasználó követelményeinek.

Adatkészlet *(Data set)* Az adatok azonosítható, meghatározható gyüjteménye (ISO 19101[5]*)

Adatkészlet sorozat *(Data set series)* Olyan adatkészletek kollekciója, melyeknek azonos a termék specifikációja (ISO19115[6]*).

Alapadat *(Datum)* Bármely mennyiség, vagy mennyiségek sorozata, amely referenciaként, vagy kiindulási alapként használható fel más mennyiségek kiszámításához. (ISO19104[7]*).

Digitális Közepes Tengerszint Feletti Magassági Modell *(Digital Elevation Model - DEM)* A domborzat felszínének ábrázolása egy meghatározott koordinátaháló valamennyi metszéspontjában folyamatos közepes tengerszint feletti magasságokkal megadva, melyeket egy közös alapadathoz viszonyítanak.

Megjegyzés.- Néha a DTM-re (Digital Terrain Model – Digitális Domborzat Modellre), mint DEM-re hivatkoznak.

Közvetlen Tranzit Megállapodások *(Direct transit arrangements).* Az érintett állami hatóságok által jóváhagyott különleges megállapodások, melyek alapján a Szerződő Államon való áthaladása során, az útját rövid időre megszakító forgalom közvetlen ellenőrzésük alatt maradhat.

Ellipszoid magasság /Geodéziai magasság/ *(Ellipsoid height /Geodetic height/)* - A referencia ellipszoidhoz mért magasság, az ellipszoid külsejére állított, a kérdéses ponton áthaladó merőleges vonalon mérve.

Jellemző tulajdonság, sajátosság *(Feature)* A valós világ jelenségeinek absztrakciója (ISO19101[8]*)

A jellemző tulajdonság, sajátosság attribútuma *(Feature attribute)* A jellemző tulajdonság sajátosságai (ISO19101[9]*).

Megjegyzés.- A jellemző tulajdonság, sajátosság attribútumának van egy hozzá kapcsolt neve, egy adattípusa és egy adattartománya.

A jellemző tulajdonsággal, sajátossággal elvégzett művelet *(Feature operation)* - Olyan művelet, amelyben a jellemző tulajdonság, sajátosság valamennyi példánya szerepelhet (ISO19110[10]*).
Megjegyzés.- Amikor megemelik a duzzasztógát magasságát, az egy a jellemző tulajdonságú duzzasztógáttal végzett művelet. Ennek a műveletnek az eredménye az, hogy a víztározóban lévő víz szintje megemelkedik.

A jellemző tulajdonságok közötti viszony *(Feature relationship)* Kölcsönhatás, amely kapcsolatot teremt a jellemző tulajdonság típusának egyedei és ugyanazon, vagy más jellemző tulajdonság típus egyedei között. (ISO19101[11]*)

A jellemző tulajdonság típusa *(Feature type)* Közös tulajdonságokkal rendelkező valós világbéli jelenségek osztálya (ISO19110[12]*).

Megjegyzés.- A jellemző tulajdonságok valamely jegyzékében az osztályzás alapszintje a jellemző tulajdonság típusa.

Geodéziai távolság *(Geodesic distance)*. A matematikailag meghatározott ellipszoid felületén található két pont közötti legkisebb távolság.

Geodéziai alapadat / földrajzi alappont *(Geodetic datum)*. Egy lokális referenciarendszer helymeghatározása és tájolása során a szükséges paraméterek minimális készlete, a globális referencia rendszer/keret figyelembevételével.

Geoid - Földalak. *(Geoid)* A Föld gravitációs mezejében található equipotenciális felület, mely megegyezik a nyugodt tenger felszínével (MSL = Mean Sea Level), melyet a szárazföldek fölé folytatólagosan kiterjesztenek.
Megjegyzés: - A geoid formája szabálytalan a helyi gravitációs zavarok következtében (szél, árapály, sótartalom, áramlások, stb.) és a gravitáció iránya a geoidra minden pontban merőleges.

A Geoid (földalak) hullámossága, egyenetlensége *(Geoid undulation)*. A geoid távolsága a matematikai referencia ellipszoid felett (pozitív) és alatt (negatív).
Megjegyzés. - A WGS-84 (World Geodetic System – 1984 - Világszintű Geodéziai Rendszer – 1984) által meghatározott ellipszoid tekintetében a WGS-84 ellipszoid magassága és az orthometrikus magasság közötti eltérés adja meg a WGS-84 geoid hullámosságát.

Gergely-naptár (*Gregorian calendar*) Általánosan használt naptár; melyet először 1582-ben alkalmaztak az év meghatározására, amely jobban megközelíti a tropikus évet, mint a Julián-féle naptár (ISO19108[13]*).

Megjegyzés.- A Gergely-naptárban az átlagos évek 365 nap hosszúak, míg a szökőév 366 napos, melyeket 12 egymást követő hónapra osztanak fel.

Magasság *(Height)* Egy szint, pont, vagy egy pontként figyelembe vett tárgy, akadály függőleges távolsága egy meghatározott alapadattól mérve.

Helikopter repülőtér *(Heliport)*. Egy repülőtér, vagy egy szerkezeten, építményen, épületen található meghatározott terület, melyet teljes egészében, vagy részben helikopterek érkezésére, felszállására és földi mozgására szándékoznak felhasználni.

Az Emberi Tényező (Ergonómia) alapelvei *(Human Factors Principles)* Olyan alapelvek, melyeket a léginavigációs, légiforgalmi tervezés, hitelesítés, képzés, üzemeltetés és karbantartás kapcsán alkalmaznak és amelyek biztonságos kapcsolódási, érintkezési felületre törekszenek az emberi és más rendszer komponensek közötti kölcsönhatásban úgy, hogy megfelelő módon veszik figyelembe az emberi teljesítőképesség jellemzőit.

Integrált Légiforgalmi Tájékoztató Csomag *(Integrated Aeronautical Information Package)*. Egy (szolgáltatás)csomag, amely az alábbi elemeket tartalmazza:

· AIP, beleértve az AIP módosítások szolgáltatását (*Amendment*);
· AIP kiegészítések, mellékletek (*Supplement*);
· NOTAM-ok és a repülés előtti Bulletinek *(PIB - pre-flight information bulletins)*;
· AIC - *(Aeronautical Information Circular)* - Légiforgalmi Tájékoztató Körlevél;
· Az érvényben lévő NOTAM-ok ellenőrző jegyzékei és összesítői;

Integritás /léginavigációs adatok/ *(Integrity /aeronautical data/).* Annak a garanciának a mértéke, hogy a léginavigációs adatok és értékük nem veszett el és nem változott meg, mióta az adat keletkezett, vagy jogosult módon kiegészítésre, frissítésre került.

Nemzetközi Repülőtér *(International airport)*. Bármely repülőtér, melyet a Szerződő Állam saját területén nemzetközi légiforgalom érkezésére és indulására jelöl ki, ahol a vámmal, bevándorlással, közegészségüggyel, állat és növény karanténnal kapcsolatos formaságokat, és ennek megfelelő eljárásokat biztosítanak.

Nemzetközi NOTAM Iroda *(International NOTAM office)*. Egy Állam által a NOTAM-ok nemzetközi cseréjére kijelölt iroda.

Munkaterület *(Manoeuvring area).* A repülőtér azon része, melyet a légijárművek felszállására, leszállására és gurulására használnak, az előterek kivételével.

Meta-adatok *(Metadata)* Adatok az adatokról (ISO 19115[14]*).

Megjegyzés.- Adatok, melyek adatokat írnak le és adatokat dokumentálnak.

Mozgási terület *(Movement area)*. A repülőtér azon része, melyet a légijárművek felszállására, leszállására és gurulására használnak, amely a munkaterületből és az előtér(ek)ből áll.

NOTAM *(NOTAM)* Távközlési eszközök segítségével terjesztett tájékoztatás, mely bármely légiforgalmi berendezés, szolgálat, eljárás, vagy veszély létesítéséről, keletkezéséről, állapotáról és változásáról olyan információkat tartalmaz, melyek kellő időben történő ismerete alapvető fontosságú a repülésben érintett személyzet számára.

Akadály *(Obstacle)* Valamennyi rögzített helyű (akár időszakos, vagy állandó) és mozgatható tárgy, vagy azok részei, amelyek olyan területen találhatók, ahol légijárművek földi mozgása történik, vagy amelyek egy a légijárművek repülés közbeni védelmére meghatározott felület fölé nyúlnak.

Akadály/terep adatok gyűjtési felülete *(Obstacle/terrain data collection surface)* Egy meghatározott felület, mely akadály/terep adatok gyűjtésére szolgál.

Orthometrikus magasság *(Orthometric height)*. Egy pont magassága a geoidhoz (földalakhoz) vonatkoztatva, rendszerint tengerszint (MSL) feletti magasságként megadva.

Leírás *(Portrayal)* Információk nyújtása emberek számára (ISO 19117[15]*)

Helyzet /földrajzi/ *(Position /geographical/)* A matematikai referencia ellipszoidra vonatkoztatott olyan koordinátapár (szélesség és hosszúság), amely egy pont helyzetét határozza meg a Föld felszínén.

Jelzőpontok közötti távolság *(Post spacing)* Szögbeli, vagy egyenes irányú távolság két szomszédos magassági pont között.

Ábrázolási pontosság *(Precision)*. Az a legkisebb eltérés, amit még megbízhatóan meg lehet különböztetni egy mérési folyamat során.

Megjegyzés. - A geodéziai terepfelvétel esetében a pontosság a tökéletesség mértéke egy művelet végrehajtásakor, vagy a mérés folyamán az eszközök és módszerek hibátlanság mértéke.

Repülés Előtti Tájékoztató Bulletin *(Pre-flight information bulletin /PIB/)*. A repülés végrehajtása előtt készített összesítés, mely az üzemeltetésre fontos érvényes NOTAM információkat tartalmazza.

Tiltott légtér *(Prohibited area)*. Meghatározott kiterjedésű légtér egy Állam területe, vagy felségvizei felett, amelyben tiltott a légijárművek repülése.

Minőség *(Quality)*. Egy bizonyos dolog, entitás azon jellemzőinek összessége, melyek arra a képességére vonatkoznak, hogy az előírt, vagy azokból következő igényeket mennyiben képes kielégíteni (ISO-8402[16]*)

Megjegyzés: - Ez a bizonyos dolog, entitás egy tétel, amelyet egyedileg lehet leírni és megvizsgálni (ISO 8402[17]*).

Minőségbiztosítás *(Quality assurance)*. A minőségi rendszeren belül megvalósított minden tervezett és rendszeres tevékenység, amelyeket szükségesnek tekintenek, hogy megfelelő bizonyosságról gondoskodjanak arról, hogy egy bizonyos dolog (entitás) kielégítse a minőségre vonatkozó követelményeket (ISO-8402[18]*).

Minőség-ellenőrzés, minőségszabályozás *(Quality control)* A minőségre vonatkozó követelmények kielégítésére alkalmazott üzemeltetési technikák és tevékenységek összessége (ISO-8402[19]*).

Minőségirányítás *(Quality Management)* Az átfogó irányítási feladatok összes olyan tevékenysége, melyek meghatározzák a minőséggel kapcsolatos irányelveket, célkitűzéseket, kötelezettségeket, felelősséget, és ezeket olyan eszközök segítségével valósítják meg, mint amilyen a minőségi rendszeren belül a minőségtervezés, a minőségellenőrzés, a minőségbiztosítás, és a minőségfejlesztés. (ISO-8402[20]*)

Minőségi rendszer *(Quality system)* A minőségirányítás megvalósításához szükséges szervezeti felépítés, felelősségi körök, eljárások, folyamatok és erőforrások (ISO-8402[21]*).

Domborzat *(Relief)* A Föld felszínének magassági egyenetlenségei, melyeket a léginavigációs térképeken magassági kontúrvonalakkal, magassági (hipszometrikus) színezéssel, árnyalással, vagy magassági pontokkal ábrázolnak.

Minőségre vonatkozó követelmények *(Requirements for quality)*. Igényeknek a megfogalmazása, illetve ezek átalakítása egy dolog (entitás) mennyiségileg, illetve minőségileg meghatározott jellemzőivel szemben felállított követelményekké, hogy lehetővé tegyék ezek megvalósítását és ellenőrzését (ISO 8402[22]*)

Felbontóképesség *(Resolution)*. A mértékegységek, vagy számjegyek számossága, amellyel a mért, vagy számított adatot kifejezik és használják.

Korlátozott légtér *(Restricted area)*. Meghatározott kiterjedésű légtér, egy Állam területe, vagy felségvizei felett, melyben a légijárművek repülése bizonyos meghatározott feltételek szerint korlátozva van.

Utazási szakasz *(Route stage)*. Útvonal, vagy egy útvonal része, melyet közbülső leszállás nélkül repülnek le.

SNOWTAM *(SNOWTAM)*. Különleges NOTAM sorozat, amely a mozgási területen levő hó, jég, latyak, vagy hóval, latyakkal és jéggel kapcsolatos állóvíz által okozott veszélyes állapotokról és megszüntetésükről tájékoztat kötött, meghatározott formai követelmények szerint.

Telepítési hely mágneses deklinációja *(Station declination)*. Egy VOR állomás nulla fokos radiálja és a földrajzi észak közötti beállított eltérés, melyet a VOR állomás kalibrálásakor határoznak meg.

Terep *(Terrain)* A Föld felszíne, melyen megtalálhatóak a természetes módon előforduló sajátosságok, jellemző tulajdonságok, amilyenek a hegyek, dombok, hegyláncok, völgyek, víztömegek, állandó jéggel és hóval borított felületek, kivéve a mesterséges akadályokat (*obstacle*).

Megjegyzés - A gyakorlati használatban az alkalmazott adatgyűjtés módjától függően a terep a csupasz földön lévő folyamatos felszínt, a lombozat tetejét, vagy a közöttük lévő valamit jelenti, ami az 'első visszaverő felületként' ismeretes.

Nyomonkövethetőség *(Traceability)*. Egy dolog (entitás) időbeli előzményeinek, felhasználásának, elhelyezkedésének nyomon követhetőségi képessége rögzített azonosítók segítségével (ISO 8402[23]*).

Érvényesítés *(Validation)*. Vizsgálat segítségével annak megerősítése és objektív bizonyítása, hogy az adott tervezett felhasználás meghatározott követelményeit teljesítették. (ISO 8402[24]*).

Hitelesítés *(Verification)*. Vizsgálat segítségével annak megerősítése és objektív bizonyítása, hogy a meghatározott követelményeket teljesítették. (ISO 8402).

Megjegyzés: - Az objektív bizonyíték egy olyan információ, melynek igazsága bizonyítható, mely megfigyeléseken, tényeken, méréseken, teszteken és más módszereken alapulva beszerezhető (ISO 8402[25]*)

3. FEJEZET - ÁLTALÁNOS RÉSZ

3.1. Felelősségek és hatáskörök

3.1.1. Minden Szerződő Állam kell, hogy:

a) gondoskodjon egy légiforgalmi tájékoztató szolgálatról; vagy

b) megállapodjon egy, vagy több más Szerződő Állammal egy ilyen közös szolgálat felállításáról; vagy

c) meghatalmazzon egy nem kormányzati képviseletet, szervezetet ennek a szolgálatnak az ellátásával, azzal a feltétellel, hogy az ebben az Annex-ben található Szabványokat és Ajánlott Gyakorlati Eljárásokat mindenben követik.

3.1.1.1. Az érintett Állam továbbra is felelős kell, hogy maradjon a kiadott tájékoztatásokért. Egy Állam által, vagy nevében kiadott légiforgalmi tájékoztatásoknak egyértelműen tartalmazniuk kell, hogy azt az adott Állam fennhatósága alatt adták ki.

3.1.1.2. Minden Szerződő Államnak meg kell tennie az összes szükséges intézkedést, hogy biztosítsa azt, hogy a tőle származó légiforgalmi tájékoztatások/adatok, melyek a saját területére vonatkoznak, valamint azokra a területekre, ahol az Állam a saját területén kívül felelős a légiforgalmi szolgálatok ellátásáért, megfeleljenek a szükséges kívánalmaknak a megkövetelt minőség és érvényesség tekintetében. Ennek ki kell terjednie az olyan egyezményekre is, melyek alapján az Állam valamennyi repülőgépek üzemeltetésével foglalkozó szolgálata időben biztosítja a szükséges információkat a légiforgalmi tájékoztató szolgálat számára.

3.1.1.3 Ahol nem biztosítanak 24 órás szolgálatot, a szolgálatnak rendelkezésre kell állnia, amikor egy légiforgalmi tájékoztató szolgálat illetékességi területén belül egy légijármű repülése van folyamatban, valamint az ezen időszak előtti és utáni 2 órában. A szolgálatnak ezen kívül rendelkezésre kell állnia még más olyan időpontokban is, amikor ezt egy megfelelő földi szervezet igényli.

3.1.2. Egy légiforgalmi tájékoztató szolgálat a fentieken kívül olyan információkat kell, hogy beszerezzen, mely lehetővé teszi számára a repülés előtti tájékoztatás ellátását, valamint a repülés közbeni tájékoztatás igényének kielégítését:

a) más Államok légiforgalmi tájékoztató szolgálataitól;

b) egyéb más forrásokból, melyek rendelkezésre állhatnak.

Megjegyzés.- Az egyik ilyen forrás a 8.3 pontban szereplő előírás tárgya.

3.1.3. A 3.1.2. a) pont szerint beszerzett légiforgalmi tájékoztatásoknak szétosztás esetén egyértelműen tartalmazniuk kell, hogy azok a forrásul szereplő Állam hatáskörébe tartoznak.

3.1.4. A 3.1.2. b) pont szerint beszerzett tájékoztatásokat, ha lehetséges, a szétosztás előtt ellenőrizni, hitelesíteni kell, ha ez nem történhetett meg, akkor ezt a tájékoztatás szétosztásakor egyértelműen jelezni kell.

3.1.5. Egy légiforgalmi tájékoztató szolgálat haladéktalanul rendelkezésére kell bocsásson más államok légiforgalmi tájékoztató szolgálatainak minden olyan tájékoztatást, ami annak számára szükséges a légiforgalom biztonsága, rendszeressége és hatékonysága érdekében, hogy ezek a légiforgalmi tájékoztató szolgálatok eleget tudjanak tenni a következő, 3.1.6. pontban leírtaknak.

3.1.6. Egy légiforgalmi tájékoztató szolgálatnak biztosítania kell, hogy a légiforgalom biztonsága, rendszeressége és hatékonysága szempontjából elengedhetetlen légiforgalmi tájékoztatások/adatok az alábbiakban felsorolt személyek és szolgálatok üzemeltetéssel kapcsolatos követelményeinek megfelelő formában álljanak rendelkezésre:

a) a repülés üzemeltetésében részt vevő személyzet számára, beleértve a hajózó-személyzetet, a repülés előzetes tervezését végző és a repülési szimulátorokat (*flight simulator*) üzemeltető személyzetet is; valamint

b) a repülés tájékoztató szolgálat ellátásáért felelős Légiforgalmi Szolgálati Egység, valamint a repülés előtti tájékoztatások biztosításáért felelős szolgálat számára.

3.1.7. Egy légiforgalmi tájékoztató szolgálat kell, hogy fogadja és/vagy létrehozza, összeegyeztesse, vagy összeállítsa, szerkessze, megfelelő formába öntse, kiadja/tárolja és szétossza mindazokat a légiforgalmi tájékoztatásokat/adatokat, melyek az adott Állam teljes területére, valamint arra a területre vonatkoznak, amelyen belül az Állam jogosult a légiforgalmi szolgálatok ellátásáért. A légiforgalmi tájékoztatásokat Integrált Légiforgalmi Tájékoztató Csomagként (IAIP) kell közzétenni.

3.2. Minőségi rendszer (Quality system)

3.2.1. Minden Szerződő Állam tegye meg az összes szükséges intézkedést, hogy egy megfelelően szervezett minőségi rendszert tudjon bevezetni, olyan eljárásokkal, feldolgozási folyamatokkal, és forrásokkal, melyek a minőségirányítás megvalósításához valamennyi működési szinten szükségesek, ahogy azt a 3.1.7. pont leírt az előzőekben. Egy ilyen minőségirányítás megvalósítását, amikor az szükséges, minden működési szint számára bizonyíthatóvá kell tenni.

3.2.2. Ajánlás.- A 3.2.1 pont szerint létrehozott minőségi rendszer összhangban kell legyen a Minőségbiztosítási Szabványok (International Organization for Standardization /ISO/ - Nemzetközi Szabványosítási Szervezet) ISO 9000-es sorozatával, és ezt egy jogosítással rendelkező szervezetnek kell hitelesítenie.

Megjegyzés.- A Minőségbiztosítási Szabványok (International Organization for Standardization /ISO/ - Nemzetközi Szabványosítási Szervezet) ISO 9000-es sorozata a minőségbiztosítási program kifejlesztésének alapjaként szolgál. A sikeres program részleteit valamennyi államnak magának kell kidolgoznia és ez a legtöbb esetben egyedi az adott állam szervezeti felépítését tekintve.

3.2.3. A minőségi rendszerrel összefüggő minden egyes feladathoz szükséges szakértelmet és tudást meg kell határozni, valamint az ezen feladatok végrehajtásával megbízott személyzetet megfelelő szinten kell kiképezni. Az államoknak garantálniuk kell, hogy a személyzet rendelkezik az adott, számára kijelölt feladatkörök ellátásához nélkülözhetetlen szakértelemmel és alkalmassággal, erről megfelelő dokumentációt kell vezetnie, ezzel biztosítva, hogy a szakszemélyzet képesítése megerősíthető, igazolható legyen. Meg kell szervezni a szakszemélyzet előzetes és időszakos kiértékelését, amelyeken a személyzet tagjainak a szükséges szakértelmet és alkalmasságot kell bizonyítaniuk. A szakszemélyzet rendszeres időszakonkénti értékelését a lehetséges hiányosságok kimutatásának és kijavításának eszközeként kell használni.

3.2.4. Az államoknak garantálniuk kell, hogy olyan bevezetett eljárásokkal rendelkezik, melyek a léginavigációs adatok tekintetében lehetővé teszik, hogy azok bármely adott pillanatban az adat forrásáig nyomon követhetőek legyenek és ezzel lehetővé tegyék, hogy a létrehozási/karbantartási fázisban, vagy az adatok felhasználása során felfedezett adat rendellenességek, vagy hibák kijavításra kerüljenek.

3.2.5. A létrehozott minőségi rendszer a felhasználók számára a szükséges biztosítékot és bizonyosságot kell garantálja, hogy a kiosztásra kerülő légiforgalmi tájékoztatások/léginavigációs adatok megfelelnek az adatminőséggel kapcsolatosan előírt követelményeknek (pontosság, felbontóképesség, integritás/sértetlenség/), valamint a nyomon követhetőség kívánalmainak úgy, hogy az adatok előállításának, vagy módosításának valamennyi fázisában a követelményeknek megfelelő, alkalmas eljárásokat használnak. A rendszernek ezen felül biztosítania kell a léginavigációs adatok tervezett felhasználása során az alkalmazhatósági időszak jótállását, valamint azt, hogy az egyeztetett kiadási időpontokat be fogják tartani.

3.2.6. A léginavigációs adatok pontossági mértéke rendjének, mely 95 %-os bizonyossági szinten alapszik, olyannak kell lennie, mint azt a 11. Annex - 2. Fejezetében, és a 14. Annex - I. és II. Rész - 2. Fejezetében leírták. Ebben a vonatkozásban a földrajzi helyzetet megadó adatok három típusát kell megkülönböztetni: úgymint terepen felvett pontok (pl. futópálya küszöbök, telepített navigációs berendezések helyzete, stb.), számított pontok (ismert terepen felvett pontokból matematikai számítással származtatott pontok a térben, helyzetpontok), valamint deklarált pontok (pl. Repüléstájékoztató Körzet határának pontsorozata).

3.2.7. Az államoknak garantálniuk kell, hogy a léginavigációs adatok közzétételi határozatának rendje olyan, ahogy azt az 1. és 7. Függelékben meghatározták.

3.2.8. A Szerződő Államoknak biztosítaniuk kell, hogy a léginavigációs adatok integritását megőrzik az adatfeldolgozás folyamatában, a kiindulási helyen történő adatfelvétel/adatforrás szintjétől az adatok következő tervezett felhasználója számára történő közzétételig. A léginavigációs adatok integritási követelményeit az adatok sérüléséből származó potenciális veszély mértékére, valamint arra a felhasználásra kell alapozni, melyben az adatelemet alkalmazni fogják. Következésképpen az alábbi besorolásokat és adat integritási szinteket kell alkalmazni:

a) Kritikus adatok , az integritási szint 1×10^{-8} :

ha sérült kritikus adatokat használnának, akkor nagy a valószínűsége annak, hogy egy légijármű repülésének biztonságos folytatása és leszállása komoly veszélybe kerül, mely katasztrófával fenyeget;

b) Alapvető, lényeges adatok, az integritási szint 1×10^{-5} :
ha sérült alapvető, lényeges adatokat használnának, akkor csekély valószínűsége van annak, hogy egy légijármű repülésének biztonságos folytatása és leszállása komoly veszélybe kerül, mely katasztrófával fenyeget; valamint

c) Rutin adatok, az integritási szint 1 x 10^{-3} :

ha sérült rutin adatokat használnának, akkor nagyon kevés valószínűsége van annak, hogy egy légijármű repülésének biztonságos folytatása és leszállása komoly veszélybe kerül, mely katasztrófával fenyeget.

3.2.9. A Léginavigációs Adatok Adatminőségi követelményei, melyek az adatok osztályozásával és az adatok integritásával állnak kapcsolatban, meg kell feleljenek a 7. Függelék A7-1 - A7-5 Táblázatokban található előírásoknak.

3.2.10. A tárolása, vagy továbbítása során az elektronikus léginavigációs adatok védelmét teljes mértékben Ciklikus Redundancia Vizsgálattal (CRC - Ciclic Redundancy Check) kell ellenőrizni. Hogy a kritikus és alapvető (lényeges) adatok integritási szintjének védelmét a 3.2.8 pontban leírt kategóriák szerint megvalósítsák, az adott szintnek megfelelően 32 bites, illetve 24 bites CRC algoritmust kell használni.

3.2.11. Ajánlás.- Hogy a rutin adatok integritási szintjének védelmét a 3.2.8 pontban leírt kategória szerint megvalósíthassák, 16 bites CRC algoritmust szükséges használni.

3.2.12. Az Integrált Légiforgalmi Tájékoztató Csomag (IAIP) részeként kiadandó anyagot alaposan, mindenre kiterjedően kell ellenőrizni, és egyeztetni kell a felelős szolgálatokkal, mielőtt közreadnák a Légiforgalmi Tájékoztató Szolgálatoknak, hogy a kiadást megelőzően bizonyosak lehessenek abban, hogy az összeállított anyag az összes szükséges információt tartalmazza, valamint minden részletre kiterjedően hibátlan. Érvényesítési és hitelesítési eljárásokat kell bevezetni, melyek biztosítják, hogy a minőségi követelményeket (pontosság, felbontóképesség, sértetlenség), valamint a léginavigációs adatok nyomonkövethetőségét betartsák.

Megjegyzés: - a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Doc 8126) található a többi, vele kapcsolatban álló szolgálattal történő kölcsönös kapcsolattartásra vonatkozó útmutató anyag.

3.2.13. Az alkalmazott minőségi rendszer megvalósulását felülvizsgálattal kell bizonyítani. Ha eltérést fedeznek fel, akkor az eltérés okának kijavítására irányuló intézkedéseket kell meghatározni és megvalósítani. Az átvizsgálás összes megállapítását és a helyreigazítás, kijavítás érdekében hozott valamennyi intézkedést alá kell támasztani, és megfelelő módon dokumentálni kell.

Megjegyzés.- a Világszintű Geodéziai Rendszer - 1984 (WGS-84 ; Doc 9674) Kézikönyvében található útmutató anyag a léginavigációs adatok minőségi követelményeiről (pontosság, felbontóképesség, integritás/sértetlenség/, adatvédelem és nyomonkövethetőség). Az 1. és 7. Függelékben található, a léginavigációs adatok közzétételi határozatával és sértetlenségével kapcsolatos rendelkezésekkel összefüggő segédanyag az "RTCA DO-201A" és a Polgári Légiforgalmi Berendezések Európai Szervezete (European Organization for Civil Aviation Equipment - EUROCAE) "ED-77 - A Légiforgalmi Tájékoztatások Ipari Követelményei" dokumentumokban található.

3.3. Légiforgalmi tájékoztatások/léginavigációs adatok cseréje

3.3.1. Minden Államnak ki kell jelölnie az irodát, ahová az Integrált Légiforgalmi Tájékoztató Csomag (IAIP-Integrated Aeronautical Information Package) minden más Államból származó elemét el kell juttatni. Egy ilyen irodának alkalmasnak kell lennie arra, hogy a más Államokból származó információ kéréseket kielégítse.

3.3.2. Ahol az Állam egynél több nemzetközi NOTAM irodát jelölt ki, meg kell határoznia minden iroda felelősségének és illetékességi területének kiterjedését is.

3.3.3. Egy légiforgalmi tájékoztató szolgálatnak, szükség szerint eleget kell tennie az üzemeltetési követelményeknek a NOTAM-ok távközlési eszközökkel történő kiadása és vétele vonatkozásában.

3.3.4. Az Államok, ahol csak lehetséges, közvetlen kapcsolatot kell, hogy létesítsenek a légiforgalmi tájékoztató szolgálatok között, hogy ezzel elősegítsék a légiforgalmi tájékoztatások/adatok nemzetközi cseréjét.

3.3.5. Az Integrált Légiforgalmi Tájékoztató Csomag (IAIP) minden egyes elemének egy másolatát, akár papír, akár elektronikus formátumban, vagy mindkettőben, amelyet valamely ICAO Szerződő Tagállam légiforgalmi tájékoztató szolgálata kért, az anyagot létrehozó Államnak, kölcsönösen egyeztetett formá(k)ban, ingyenesen kell rendelkezésre bocsátania, még abban az esetben is, ha a kiadás/tárolás és szétosztás feladatával egy kereskedelmi szervezetet bíztak meg.

3.3.6**. Ajánlás**.- Az Integrált Légiforgalmi Tájékoztató Csomag elemeinek több, mint egy példányát érintő, és más légiforgalmi dokumentumok cseréje, beleértve azokat, melyek légiforgalmi jogszabályalkotást és rendeleteket tartalmaznak, akár papír és/vagy elektronikus formátumúak, lehetőség szerint képezzék az ICAO Szerződő Tagállamok közötti kétoldalú megállapodás tárgyát.

3.3.7. Ajánlás.- Egy nem ICAO Szerződő Tagálammal, vagy más jogi személlyel a légiforgalmi tájékoztatások/léginavigációs adatok beszerzésének megszervezése – ideértve az Integrált Légiforgalmi Tájékoztató Csomag elemeit is, valamint más léginavigációs dokumentumokat, beleértve azokat, melyek légiforgalmi jogszabályalkotást és rendeleteket tartalmaznak, akár papír és/vagy elektronikus formátumúak – lehetőleg képezze az anyagot összeállító, kiadó Állammal külön szerződés tárgyát.

3.4. Szerzői jogok (Copyright)

Megjegyzés.- Annak érdekében, hogy egy Állam AIS-e (Légiforgalmi Tájékoztató Szolgálata) által előállított termékekben a befektetéseket megvédjék, valamint, hogy felhasználásuk ellenőrzését jobban biztosítsák, az Államok - saját nemzeti törvényeiknek megfelelő módon - ezekre az általuk előállított termékekre megkövetelhetik a szerzői jogok alkalmazását.

Egy Állam AIS-e (Légiforgalmi Tájékoztató Szolgálata) által előállított bármely terméket, mely az adott Állam által szerzői jogvédelemben részesül és amelyet egy másik Államnak a 3.3 pontban leírtaknak megfelelően átadtak, egy harmadik fél számára csak akkor lehet hozzáférhetővé tenni, ha az érintett harmadik felet értesítik arról, hogy ezt a terméket szerzői jogok védik, valamint feltéve, ha megfelelő módon jegyzetekkel, kísérő magyarázattal jelzik, hogy ez a termék a kibocsátó Állam által szerzői jogvédelemben részesül.

3.5. Költségek fedezete

Ajánlás.- a légiforgalmi tájékoztatások/léginavigációs adatok összegyűjtésének és feldolgozásának általános költségeit lehetőleg számolják hozzá a repülőterek és légiforgalmi szolgálatok díjainak kiadási költség alapjához, értelemszerűen, az "ICAO Repülőterek és Léginavigációs (Légiforgalmi) Szolgálatok Költségeiről szóló Irányelvek (Doc 9082)" hivatalos dokumentumban található alapelvekkel összhangban.

Megjegyzés.- Amikor a légiforgalmi tájékoztatások/léginavigációs adatok összegyűjtésének és feldolgozásának költségeit a repülőterek és légiforgalmi szolgálatok díjain keresztül teremtik elő, egy egyéni vevő számára egy bizonyos - akár papír, akár elektronikus formátumú - AIS termék szolgáltatásáért a költséget a papír másolatok nyomtatási, vagy az elektronikus formátumú adathordozó költségeire, valamint a továbbítás költségére lehet alapozni.

3.6. Általános előírások

3.6.1. A nemzetközi terjesztésre szánt Integrált Légiforgalmi Tájékoztató Csomag minden elemének angol szöveget kell tartalmaznia azokon a részeken, melyek nyílt szöveget tartalmaznak.

3.6.2. A helységneveket a helyi nyelvhasználat szerint kell leírni (betűzni), ha szükséges, átírva azt a Latin ABC betűire.

3.6.3. **Ajánlás.** A légiforgalmi tájékoztatások/léginavigációs adatok szétosztásában használt mértékegységek lehetőség szerint feleljenek meg annak a döntésnek, melyeket az Állam, az Egyezmény 5. Annex-ében - A Légi és Földi Üzemelés Során Használandó Mértékegységek - található táblázatok felhasználásával kapcsolatban elfogadott.

3.6.4. A ICAO rövidítéseinek használata

A légiforgalmi tájékoztató szolgálatoknál ICAO rövidítéseket kell alkalmazni, amikor csak lehetséges, és amikor használatuk megkönnyíti a tájékoztatások/adatok szétosztását.

3.6.5. Az automatizálás alkalmazása

Ajánlás. Az automatizálást az AIS területén lehetőség szerint azért kell bevezetni, hogy a légiforgalmi tájékoztató szolgálatoknál javítsa a feldolgozási sebességet, pontosságot, hatékonyságot és költséghatékonyságot.

3.6.6. Tiltott, korlátozott és veszélyes légterek azonosítása és ábrázolása

3.6.6.1. Egy Állam által létesített valamennyi tiltott, korlátozott és veszélyes légtér kezdeti létrehozásakor egy azonosítót kell, hogy kapjon és minden részletes adatát nyilvánosságra kell hozni (lásd az 1. Függelék ENR 5.1 pontját).

3.6.6.2. A légtér azonosítására az ily módon kijelölt azonosítót kell használni minden olyan későbbi közleményben, ami erre a területre vonatkozik.

3.6.6.3. Az azonosítót betűk és számok csoportjából - az alábbiak szerint kell összeállítani:

a) a légteret kijelölő Állam, vagy tartomány számára kijelölt Helységnév Azonosító (Location Indicator) nemzetet azonosító betűi;

b) egy "P" betű (Prohibited area) a Tiltott Légtér, "R" (Restricted area) a Korlátozott Légtér és "D" betű (Danger area) a Veszélyes Légtér esetén, értelemszerűen;

c) egy szám, mely egyedi az Államon, vagy a tartományon belül.

Megjegyzés. A nemzeti azonosítók azok, melyek a Location Indicators (Helységnév-Azonosítók, Doc 7910) kiadványban megtalálhatóak.

3.6.6.4. A tévedések elkerülése érdekében a légtér azonosításában használt számot az érintett légtér törlése után legalább egy évig ki kell hagyni az újrafelhasználásból.

3.6.6.5. **Ajánlás.** Amikor egy tiltott, korlátozott, vagy veszélyes légteret létesítenek, lehetőség szerint a légtérnek a lehető legkisebbnek és egyszerű geometriai határok közöttinek kell lennie, hogy az összes érintett fél számára megkönnyítsék a légtérre vonatkozó hivatkozást.

3.6.7. Az emberi tényezők (Human Factors) szempontjai

A Légiforgalmi Tájékoztató Szolgálat (AIS) létesítése, valamint a légiforgalmi tájékoztatások/léginavigációs adatok megtervezése, tartalmának meghatározása, feldolgozása és terjesztése során figyelembe kell venni az emberi tényezők (Human Factors) alapelveit, amelyek megkönnyítik ezek optimális használatát.

3.7. Közös koordináta (referencia) rendszer a légiközlekedés számára

3.7.1. Vízszintes referencia rendszer

3.7.1.1. A World Geodetic System 1984 - Világszintű Geodéziai Rendszer 1984 (WGS-84)-et kell használni a nemzetközi légiközlekedés vízszintes irányú (geodéziai) referencia rendszerének. Következésképpen, a kiadott léginavigációs földrajzi koordinátákat (melyek földrajzi szélességet és hosszúságot adnak meg) a "Világszintű Geodéziai Rendszer - 1984" szerinti geodéziai referencia alapadatban kifejezve kell megadni.

Megjegyzés 1.-- A WGS-84-el kapcsolatos átfogó tájékoztatóanyagot a World Geodetic System 1984 - Világszintű Geodéziai Rendszer 1984 (WGS-84) Kézikönyve (Doc 9674) tartalmazza.

Megjegyzés 2.-A Légiforgalmi Szolgálatok által meghatározott földrajzi helymeghatározások számára a WGS-84-el összefüggő léginavigációs koordináták meghatározását és jelentését szabályozó előírások (a terepen végzett munka pontossága és az adatok integritása) a 11. Annex – 2. Fejezetében, és az 5. Függelék 1. táblázatában találhatóak. A repülőterek/helikopter repülőterek számára a 14. Annex – I. és II. kötetében – a 2. Fejezetben, valamint az 5. és 1. Függelékben az A5-1. és az 1. Táblázatban találhatóak.

3.7.1.2. Ajánlás.- A tektonikus lemezek mozgásában bekövetkező időszakos változásokat és az árapály földkéregre gyakorolt hatását lehetőség szerint kell modellezni, és kiszámítani a pontos földméréstani, valamint néhány léginavigációs alkalmazásban. Az időszakos hatásokra válaszul, minden abszolut állomás koordináta készlethez egy epocha adandó.

Megjegyzés 1.- A WGS-84 (G873) koordináta rendszerének epocha éve 1997.0, miközben a legutóbbi WGS-84 (G1150) koordináta rendszernek, mely tartalmazza a lemez mozgások modelljét, az epocha éve 2001.0. (G jelöli azt, hogy a koordinátát a globális helymeghatározás módszerének segítségével /Global Positioning System - GPS/ biztosították, a G-t követő szám jelöli azt a GPS hetet, amikor ezeket a koordinátákat kiegészítették az USA Nemzeti Térképészeti és Térinformatikai Információs Hivatalainak (NGA) pontos bolygópozíció számítási folyamataiban.

Megjegyzés 2.- A WGS-84 koordináta rendszer legfrissebb megvalósítása számára (WGS-84 (G1150)) a világszinten kiosztott állandó GPS követő állomások földrajzi koordinátáinak adathalmaza a Doc 9674-ben lett kiadva. Valamennyi állandó GPS követő állomás számára az egyenként kiszámított helyzetadatok pontossága a WGS-84-ben (G1150) elérte az 1 cm-es (1 σ) értéket.

Megjegyzés 3.- Egy másik világméretű földi koordináta rendszer az IERS (International Earth Rotation Service - Nemzetközi Földforgás-figyelő Szolgálat) ITRS (International Terrestrial Reference System - Nemzetközi Földi Vonatkozási Rendszer) rendszere. Az ITRS megvalósítása az ITRF (IERS TRF - IERS Terrestrial Reference Frame - IERS Földi Koordináta Rendszer). Az ITRS-re vonatkozó tájékoztató anyag a Doc 9674 - C Függelékében található. A WGS-84 legfrissebb (G1150) változata az ITRF 2000 epocha évére hivatkozik. A WGS-84 (G1150) megegyezik az ITRF 2000-el, a gyakorlati megvalósításban a két rendszer közötti különbség az 1-2 cm-es tartományban marad az egész világon, ami azt jelenti, hogy a WGS-84 (G1150) és az ITRF 2000 alapjában azonosnak tekinthetők.

3.7.1.3. Azokat a földrajzi koordinátákat, melyeket WGS-84 koordinátákká transzformáltak át, de az eredeti terepfelvétel során a munka pontossága nem elégítette ki a 11. Annex - 2. Fejezet, és a 14. Annex - I. és II. Kötet - 2. Fejezet előírásait, csillaggal kell jelölni.

3.7.1.4. A földrajzi koordináták közzétételekor a felbontóképesség rendje meg kell, hogy feleljen az 1. Függelék és a 7. Függelék A7-1. Táblázat előírásainak, miközben a térképeken a földrajzi koordináták felbontóképességének rendje meg kell, hogy feleljen az Annex 4. - 6. Függelék - 1. Táblázat előírásainak.

3.7.2. Függőleges Referencia Rendszer

3.7.2.1. Az MSL (Mean Sea Level - Közepes Tengerszint) alapsíkot – mely meghatározza a gravitációfüggő magasság (elevation - közepes tengerszint feletti magasság) viszonyát a geoid-ként ismert felülettel – kell használni függőleges referenciarendszerként a nemzetközi légiközlekedésben.

Megjegyzés 1.- Világszinten legjobban a geoid (földalak) közelíti meg az MSL-t. Meghatározása: A Föld gravitációs mezejében található azonos potenciájú (equipotenciális) felület, mely megegyezik a nyugodt tenger felszínével (MSL), melyet folytatólagosan kiterjesztenek a szárazföldek fölé.

Megjegyzés 2.- A gravitációfüggő magasságokat (elevations - közepes tengerszint feletti magasságok) említik még ortometrikus magasságoknak is (orthometric heights), miközben az ellipszoid felett a pontok távolságára ellipszoid magasságként hivatkoznak.

3.7.2.2. A Földi Gravitációs Modell - 1996-ot (Earth Gravitational Model - 1996 : EGM-96) - mely tartalmazza a hosszúhullámú gravitációs erőtér adatokat 360 fokig és rendig - kell használni a nemzetközi légiforgalomban, mint az egész Földre kiterjedő gravitációs modellt.

Megjegyzés.- Az EGM-96-ra vonatkozó tájékoztató anyag a Doc 9674-ben található.

3.7.2.3. Azokban a földrajzi pozíciókban, ahol az EGM-96-os pontossága nem éri el a 14. Annex - I. és II. Kötetében a közepes tengerszint feletti magasság és a geoid egyenetlenség pontosságára meghatározott követelményeket, ott az EGM-96 adatok alapján nagy felbontású (rövidhullámú) gravitációs mező adatokat tartalmazó körzeti, nemzeti, vagy helyi geoid modelleket kell kidolgozni. Amikor az EGM-96-tól eltérő modellt használnak geoid modellként, akkor a felhasznált modell leírását, valamint az EGM-96 és a felhasznált modell közötti magasság konverzióhoz szükséges paramétereket meg kell adni a Légiforgalmi Tájékoztató Kiadványban (AIP).

Megjegyzés.- A repülőterek/helikopter repülőterek megadott pontjain a közepes tengerszint feletti magasság és a geoid egyenetlenség meghatározását és jelentését szabályozó előírások (a terepmunka pontossága, az adatok integritása) az 14. Annex - I. és II. Kötet - 2. Fejezetében, valamint az 5. és 1. Függelék A5-2. és 2. Táblázatában lettek megadva.

3.7.2.4. A terepen felvett meghatározott pontok számára az MSL-től (geoid) mért közepes tengerszint feletti magasságon kívül, az 1. Függelékben meghatározott pontokban, nyilvánosságra kell hozni a geoid egyenetlenségét is.

3.7.2.5. A közepes tengerszint feletti magasság és a geoid egyenetlenség közzétételekor a felbontóképesség rendje meg kell feleljen az 1. Függelék és a 7. Függelék A7-2. Táblázat előírásainak, miközben a térképeken a közepes tengerszint feletti magasság és a geoid egyenetlenség felbontóképességének rendje meg kell feleljen a 4. Annex - 6. Függelék - 2. Táblázat előírásainak.

3.7.3. Időbeli referencia rendszer

3.7.3.1. A nemzetközi légiközlekedés számára a Gergely-naptárt és UTC (Coordinated Universal Time - Koordinált Világidő) időt kell használni, mint időbeli referencia rendszert.

Megjegyzés 1.- Az idő tárgykörébe tartozó érték egy időbeli pont/pozíció, aminek a mérése az időbeli referencia rendszerhez viszonyítva történik.

Megjegyzés 2.- A Koordinált Világidő (UTC) egy időskála, rendszer, melyet a BIH (Bureau International de l'Heure - Nemzetközi Időszolgálat) és az IERS (International Earth Rotation Service - Nemzetközi Földforgás Szolgálat) tart fenn, és amely alapját képzi a szabványos frekvencia és időjelek valamely egyeztetett közzétételének.

Megjegyzés 3.- Az UTC-re vonatkozó tájékoztató anyagot az 5. Annex - D. Mellékletében találhatnak.

Megjegyzés 4.- Az ISO8601 szabvány részletesen szabályozza a Gergely-naptár és a 24 órás helyi, vagy UTC idő használatát az információ csere során, miközben az ISO19108 szabvány a Gergely-naptárt és a UTC időt határozza meg, mint a földrajzi információkkal elsődlegesen használandó időbeli referenciarendszert.

3.7.3.2. Amikor egy bizonyos alkalmazás esetében eltérő időbeli referencia rendszert használnak, a tulajdonságokat leíró jegyzéknek; vagy egy alkalmazás sémájával, vagy adatkészletével összefüggő meta-adatoknak, értelemszerűen, tartalmazniuk kell ennek a referencia rendszernek a leírását, vagy annak a dokumentumnak a megnevezését, amely meghatározza, bemutatja ezt az időbeli referencia rendszert.
Megjegyzés.– Az ISO 19108 Szabvány D. Függeléke részletesen bemutatja a naptárak néhány olyan irányelvét, szempontját, melyet érdemes lenne megfontolni egy ilyenfajta leírás elkészítésekor.

4. FEJEZET - LÉGIFORGALMI TÁJÉKOZTATÓ KIADVÁNYOK (AIP)

1. Megjegyzés.- Az AIP elsődleges célja a légiforgalom szempontjából lényeges, tartós jellegű tájékoztatások cseréjére megállapított nemzetközi követelmények kielégítése. Ha lehetséges, a kiadványt olyan formában kell összeállítani, amely elősegíti repülés közbeni használatát.

2. Megjegyzés.- Az AIP a tartós jellegű tájékoztatások és a hosszabb érvényességű ideiglenes változások alapvető információs forrásául szolgál.

4.1. Tartalom

4.1.1. Egy Légiforgalmi Tájékoztató Kiadványnak tartalmaznia kell, három részben, fejezeteket és alfejezeteket, melyekben egységes formában szerepelnek az utalások, hivatkozások, hogy ilyen módon lehetségessé váljon az érvényes információk szabványos elektronikus adattárolása és visszakeresése, azokra a témákra vonatkozóan, melyek az 1. Függelékben antikva betűtípussal (*Roman type*) lettek részletesen felsorolva, kivéve azt az esetet, amikor az AIP, vagy az AIP kötet alapvetően a repülés közbeni használatot támogatva készült, akkor ugyanis a pontos formátum és az elrendezés kérdése az állam önálló megítélésére bízható, feltéve, hogy a kiadvány tartalmaz egy megfelelő formátumú tartalomjegyzéket.

4.1.1.1. **Ajánlás.-** *A Légiforgalmi Tájékoztató Kiadványoknak lehetőség szerint aktuális, naprakész tájékoztatást kell nyújtaniuk azokra a témákra vonatkozóan is, amelyek az 1. Függelékben dőlt betűvel (Italic type) szerepelnek.*

4.1.2. A Légiforgalmi Tájékoztató Kiadványoknak a következőket kell tartalmazniuk az 1. Részben (GEN - Általános Tájékoztatások);

a) az AIP-ben közölt légiforgalmi berendezésekért, szolgálatokért, vagy eljárásokért felelős illetékes hatóság megjelölését;

b) azokat az általános feltételeket, amelyek alapján a szolgálatok, vagy a berendezések nemzetközi használatra igénybe vehetőek;

c) egy listát azokról a jelentős eltérésekről, amelyek az Állam nemzeti szabályozása és gyakorlati eljárásai, valamint a vonatkozó ICAO Szabványok, Gyakorlati Ajánlások és Eljárások között fennállnak; ez a lista olyan formában készüljön, amely lehetővé teszi a felhasználó számára, hogy azonnal különbséget tehessen az Állam követelményei és a kapcsolódó ICAO előírások, rendelkezések között;

d) az Állam választását minden jelentős esetben, ahol az ICAO Szabványok, Gyakorlati Ajánlások és Eljárások alternatív lépések lehetőségét kínálják.

4.1.3. Ha a kijelölt nemzetközi repülőterek/helikopter repülőterek alábbi , ABC sorrendben felsorolt légiforgalmi térképei rendelkezésre állnak, akkor ezek az AIP részét kell képezzék, vagy külön kell kiosztani azok között, akik megkapják az AIP kiadványt:

a) Repülőtér/Helikopter Repülőtér Térkép - ICAO;

b) Repülőtéri Földi Mozgások Térképe;

c) Repülőtéri Akadályok Térképe - ICAO A típus;

d) Légijármű Parkolási/Beállítási Térkép - ICAO;

e) Körzeti Térkép - ICAO;

f) Minimális Tengerszint Feletti Magasság Radar Térkép – ICAO

g) Műszeres Megközelítési Térkép - ICAO;

h) Precíziós Megközelítés Térkép - ICAO;

i) Szabványos Érkezési Útvonalak Térképe - Műszeres /STAR/ - ICAO;

j) Szabványos Indulási Útvonalak Térképe - Műszeres /SID/ - ICAO;

k) Látvamegközelítési Térkép - ICAO;

4.1.4. Ha alkalmasak rá, térképeket, térképvázlatokat, vagy diagramokat, kell alkalmazni arra, hogy kiegészítsék, vagy helyettesítsék a Légiforgalmi Tájékoztató Kiadvány (AIP) táblázatait, vagy szövegét.

Megjegyzés.- Értelemszerűen, a 4. Annex (Légiforgalmi Térképek) előírásai szerint készített térképeket lehet felhasználni az előző követelmény kielégítésére. A Légiforgalmi Tájékoztató Kiadványokban található index térképek és diagramok pontos leírására vonatkozó segédanyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében található (Aeronautical Information Services Manual - Doc 8126).

4.2. Általános előírások

4.2.1. Minden Légiforgalmi Tájékoztató Kiadványnak önállónak kell lennie, és külön tartalomjegyzékkel kell rendelkeznie.

Megjegyzés.- Ha egy AIP-nek - a nagy terjedelem okán, vagy kényelmi szempontok miatt - szükségessé válik két, vagy több részben, vagy kötetben történő megjelentetése, ezek mindegyikében jelezni kell azt, hogy a fennmaradó információk a másik rész(ek)ben, vagy kötet(ek)ben találhatók.

4.2.1.1. Valamennyi AIP esetén el kell kerülni az információk ismétlését, úgy az AIP-n belül, úgy más forrásokból is.

4.2.1.2. Amikor két, vagy több Állam közösen, egyesített AIP kiadványt ad ki, akkor ezt a borítón és a tartalomjegyzékben is egyértelműen fel kell tüntetni.

4.2.2. **Ajánlás.-** *Az AIP-t lehetőség szerint cserelapos formában kell kiadni, kivéve, ha rövid időközönként az egész kiadványt újra kiadják.*

4.2.3. Minden Légiforgalmi Tájékoztató Kiadványt el kell látni időpont megjelölésével. Ha a Légiforgalmi Tájékoztató Kiadványt cserelapos formátumban adták ki, akkor minden oldalon szerepelnie kell az időpontnak. A dátum, amely tartalmazza a napot, a hónapot (névvel) és az évet, vagy a kiadás időpontja, vagy az információ hatálybalépésének időpontja legyen.

4.2.4. A Légiforgalmi Tájékoztató Kiadvány sorozat összes oldalának, aktuális dátumát tartalmazó ellenőrzőjegyzékét gyakori időközönként, ismételten ki kell adni, ezzel segítve a felhasználót, hogy a Kiadványt naprakészen tarthassa. Az oldalszámot/a táblázat/a térkép megnevezését és az ellenőrző jegyzék kiadási dátumát magán az ellenőrző jegyzéken is fel kell tüntetni.

4.2.5. Minden bekötött, könyv formátumban kiadott Légiforgalmi Tájékoztató Kiadványt, valamint a cserelapos formátumban kiadott Légiforgalmi Tájékoztató Kiadvány minden oldalát úgy kell feliratozni, hogy az egyértelműen jelezze:

a) A Légiforgalmi Tájékoztató Kiadvány azonosítását;

b) a lefedett, érintett területet, és ahol szükséges, annak felosztásait;

c) a kiadó Állam és az előállító szervezet (hatóság) megnevezését;

d) oldalszámokat/táblázat/térkép megnevezéseket;

e) a megbízhatóság fokát, ha a tájékoztatás bizonytalan.

4.2.6. **Ajánlás.-** *A lapok mérete lehetőség szerint ne haladja meg a 210x297 mm-es (szabványos A4-es) méretet, azonban nagyobb lapokat is fel lehet használni, feltéve, ha azokat ilyen méretre hajtják össze.*

4.2.7. Az AIP összes változását, vagy egy újra kiadott oldalon szereplő új tájékoztatást egyértelmű jelöléssel, vagy magyarázó jegyzettel kell meg jelölni.

4.2.8. Az AIP üzemeltetési szempontból jelentős változtatásait az AIRAC (*Aeronautical Information Regulation and Control Cycle* – Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje) eljárásaival összhangban kell kiadni, valamint ezt egyértelműen jelezni kell az AIRAC betűszóval.

4.2.9. Az AIP-t olyan rendszeres időközönként kell módosítani, vagy újra kiadni, mely ahhoz lehet szükséges, hogy megőrizzék naprakész állapotát. A kézi módosítások, vagy magyarázó jegyzetek alkalmazásának számát a minimálisra kell visszaszorítani. A módosítás szokásos, elfogadott módszerének a cserélhető lapot kell használni.

4.2.9.1. A 4.2.9. pontban említett rendszeres időközöket az AIP 1. Részében - (GEN - Általános rész) kell közölni.

*Megjegyzés.- Az AIP Módosítások kiadási időpontjai közötti időintervallumok megállapítására vonatkozó útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (*Aeronautical Information Services Manual - *Doc 8126) található.*

4.3. Az AIP Módosításaira (*Amendments*) érvényes előírások

4.3.1. Az AIP- tartós jellegű változásait AIP Módosítások formájában kell közzétenni.

4.3.2. Minden AIP Módosítást sorszámmal kell ellátni, melyek folytatólagosak legyenek.

4.3.3. Az AIP Módosítás minden lapját, beleértve a borítót is, el kell látni a kiadás dátumával.

4.3.4. AZ AIRAC (Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje) AIP Módosítás minden lapján, beleértve a borítólapot is, fel kell tüntetni a hatálybalépés dátumát.

4.3.5. Amikor egy AIP Módosítást kiadnak, annak utalást kell tartalmaznia az Integrált Légiforgalmi Tájékoztatási Csomag azon elemeinek sorszámára (ha vannak ilyenek), melyeket beépítettek a Módosításba.

4.3.6. Az AIP Módosítás borítóján röviden jelezni kell a módosítás által érintett témákat.

4.3.7. Ha egy AIP Módosítás nem kerül közzétételre a meghatározott időintervallumban, vagy a tervezett kiadási időpontban, akkor egy NIL tájékoztatást kell összeállítani és szétosztani az érvényben lévő NOTAM-okról készített, nyomtatott formájú, nyílt szövegű havi NOTAM összesítőben az 5.2.13.3. pont előírásai szerint.

4.4. Az AIP Kiegészítésekre (*Supplements*) érvényes előírások

4.4.1. A hosszú ideig érvényben (három hónapig, vagy tovább) maradó ideiglenes változásokat, valamint a rövid ideig érvényes tájékoztatásokat, melyek terjedelmes szöveges részt és/vagy ábrákat tartalmaznak, AIP Kiegészítések formájában kell közzétenni.

*Megjegyzés: - Az AIP Kiegészítések használatára vonatkozó útmutató anyag, valamint a Kiegészítések ilyen használatára példák a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (*Aeronautical Information Services Manual - *Doc 8126) találhatók.*

4.4.2. Minden AIP Kiegészítést sorszámmal kell ellátni, melyek folytatólagosak és az adott naptári évre vonatkoznak.

4.4.3. Az AIP Kiegészítés lapjait addig kell az AIP-ben tartani, amíg a teljes tartalmuk, vagy annak egy része érvényben van.

4.4.4. Amikor egy NOTAM helyettesítésére egy AIP kiegészítést küldenek, akkor annak a NOTAM sorszámára vonatkozóan utalást kell tartalmaznia.

4.4.5. Az érvényben lévő AIP Kiegészítésekről legalább havi gyakorisággal ellenőrző jegyzéket kell kiadni. Ezt a tájékoztatást az 5.2.13.3. pont előírásai szerint, az érvényben lévő NOTAM-okról készülő nyomtatott formájú, nyílt szövegű havi NOTAM összesítő útján kell közzétenni.

4.4.6. **Ajánlás.-** *Az AIP Kiegészítés lapjait a jól láthatóság kedvéért, lehetőség szerint, feltűnő sárgára színezzék.*

4.4.7. **Ajánlás.-** *Az AIP Kiegészítések lapjait lehetőleg az első helyen kell tartani az AIP részekben.*

4.5. Szétosztás

Az AIP-t, az AIP Módosításokat és az AIP Kiegészítéseket a lehető leggyorsabb, leghatékonyabb módon kell szétosztani.

5. FEJEZET - NOTAM

5.1. Összeállítás

5.1.1. Késedelem nélkül NOTAM-ot kell összeállítani és kiadni, ha a továbbítandó tájékoztatás ideiglenes jellegű és rövid időszakon át érvényes, vagy amikor üzemeltetést érintő tartós változások, vagy hosszabb időszakon át érvényes ideiglenes jellegű változások nagyon rövid határidejű bejelentését tartalmazza, kivéve, ha terjedelmes szöveget és/vagy ábrákat tartalmazna.

Megjegyzés 1.- A 4. Függelék , 1. Részében felsorolt körülményekre vonatkozó, az üzemeltetést jelentősen befolyásoló változásokat a 6. Fejezetben részletesen bemutatott AIRAC - A Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje (Aeronautical Information Regulation and Control) szerint kell kiadni.

Megjegyzés 2.- A olyan rövid időszakra vonatkozó információkat, melyek terjedelmes szöveges részt és/vagy grafikát tartalmaznak, AIP Kiegészítésként adják ki (lásd a 4. Fejezet – 4.4 pontját).

5.1.1.1. Az alábbi információkkal kapcsolatosan NOTAM-ot kell összeállítani és kiadni:

a) repülőtér (repülőterek)/helikopter repülőtér (helikopter repülőterek), vagy futópályák létesítése, bezárása, vagy az üzemeltetésükben bekövetkező jelentős változások;

b) légiforgalmi szolgálatok /AGA, AIS, ATS, COM, MET, SAR, stb./ létesítése, megszüntetése, vagy a működésükben bekövetkező jelentős változások;

c) elektronikus és egyéb léginavigációs és repülőtéri/helikopter repülőtéri berendezések létesítése, vagy megszüntetése. Ezek az alábbiak lehetnek: a szolgálatok üzemelésének megszakítása, vagy újrakezdése; üzemi frekvencia változásai; a közzétett üzemeltetési idő változásai; azonosító jel változása; tájolás változása (az iránymérő berendezéseknél); a telepítés helyének megváltozása; a teljesítmény 50 %-os, vagy azt meghaladó mértékű növekedése, vagy csökkenése; az adásidők menetrendjének, vagy az adás tartalmának változása; vagy az üzemeltetés rendellenessége, vagy megbízhatatlansága bármely rádiónavigációs elektronikus berendezés, és levegő-föld közötti összeköttetési szolgálat esetén;

d) látjelek létesítése, megszüntetése, vagy jelentős módosítása;

e) repülőtéri fényrendszereket alkotó fontosabb berendezések üzemelésének megszakadása, vagy működésük helyreállása;

f) a léginavigációs szolgálatok eljárásainak létesítése, vagy visszavonása, eljárásaiban történt jelentős változások;

g) a munkaterületen előforduló nagyobb hibák, hiányosságok, vagy akadályok előfordulása, vagy kijavítása;

h) üzemanyag, olaj és oxigén ellátásban bekövetkezett változások és korlátozások;

i) a rendelkezésre álló kutató-mentő felszerelésben és szolgálatban történt jelentősebb változások;

j) a légiforgalmi akadályokat jelölő vészjeladók létesítése, megszüntetése, vagy ismételt üzembe állítása;

k) az előírásokban, szabályokban bevezetett azonnali intézkedést megkövetelő változások, pl. a tiltott légterek SAR (kutatás-mentés) tevékenység biztosítására;

l) a légiforgalomra hatással lévő veszélyek jelenléte (beleértve az akadályokat, katonai gyakorlatokat, légibemutatókat, versenyeket, nagyobb ejtőernyős eseményeket a közzétett légtereken kívül);

m) a légiforgalmat érintő jelentősebb akadályok létesítése, eltávolítása, vagy változása a felszállási/emelkedési, a megszakított megközelítési, megközelítési területeken és a futópályán;

n) tiltott, korlátozott, vagy veszélyes légterek kijelölése, vagy megszüntetése (beleértve az aktivizálást és felfüggesztést), értelemszerűen, vagy e légterek állapotának változásai;

o) olyan körzetek, útvonalak, vagy ezek részeinek, szakaszainak létesítése, vagy megszüntetése, ahol fennáll a légijárművek elfogásának a lehetősége, és ezért szükséges a 121.5 MHz-es VHF kényszerhelyzeti frekvencia folyamatos figyelése;

p) helységnév azonosítók kiosztása, törlése, vagy megváltoztatása;

q) egy repülőtéren a mentő és tűzoltó szolgálatok szokásos készenléti szintjének jelentős mértékű változása esetén. NOTAM-ot csak akkor kell kiadni, ha a változás érinti a kategóriát is és az ilyen kategória-változást egyértelműen kell jelezni (lásd 14. Annex - I. Kötet - 9. Fejezet, és az A Melléklet -17. Fejezet);

r) a mozgási területen hó, latyak, jég, víz okozta veszélyes körülmények előfordulása, felszámolása, vagy jelentős mértékű változása;

s) járványok kitörése, amelyek szükségessé teszik a védőoltásra, és vesztegzár intézkedésekre vonatkozó korábban közzétett követelmények megváltoztatását;

t) a naptevékenység okozta kozmikus sugárzás előrejelzése, ha ez rendelkezésre áll;

u) a vulkanikus tevékenységben a repülések üzemeltetését érintő jelentős változásokról, a vulkáni kitörések helyéről, időpontjáról és/vagy a hamufelhők vízszintes és függőleges kiterjedéséről, beleértve a mozgási irányukat, a repülési szinteket és útvonalakat, vagy útvonalszakaszokat, melyekre hatással lehetnek;

v) radioaktív, vagy mérgező vegyi anyagok kijutása az atmoszférába nukleáris, vagy kémiai balesetet, váratlan eseményt követően, az esemény helyszíne, dátuma és időpontja, az esetleg érintett repülési szintek és útvonalak, vagy útvonalszakaszok, valamint a mozgás iránya legyen benne;

w) olyan humanitárius segélyezési feladatok, küldetések lebonyolításának megkezdése, mint amilyeneket az ENSZ védnöksége alatt bonyolítanak, azokkal az eljárásokkal és/vagy korlátozásokkal, melyek hatással lehetnek a légiforgalomra.

x) rövidtávú intézkedések bevezetése váratlan, előre nem látható események kapcsán, a légiforgalmi szolgálatok és a munkájukat segítő szolgálatok üzemének megszakadása, részleges szünetelése esetén.

Megjegyzés.- Lásd a 11. Annex – 2.28 pontját és ugyanezen Annex D Mellékletét.

5.1.1.2. **Ajánlás.-** *NOTAM összeállításának szükségességét lehetőleg bármely olyan más esetben is fontolóra kell venni, amely hatással lehet a légijárművek üzemeltetésére.*

5.1.1.3. Az alábbi információkat nem kell NOTAM-ban közzétenni:

a) szokásos, rendszeresen végzett karbantartási munkálatok az előtereken és gurulóutakon, melyek nem befolyásolják a légijárművek biztonságos mozgását;

b) futópálya jelzések festési munkálatai esetén, amikor a légijármű mozgások biztonságosan végrehajthatóak más rendelkezésre álló futópályákon, vagy szükség esetén a munkát végző festőberendezés eltávolítható.

c) ideiglenes jellegű akadályok esetén a repülőterek / helikopter repülőterek közelében, amelyek nem befolyásolják a légijárművek biztonságos üzemelését;

d) a repülőtér / helikopter repülőtér fényeinek részleges meghibásodása esetén, amennyiben az ilyen hiba közvetlen módon nem befolyásolja a légijárművek üzemelését;

e) levegő-föld rádióösszeköttetések részleges ideiglenes meghibásodása esetén, amikor a megfelelő rendelkezésre álló, tartalék frekvenciák ismertek, és azok üzemképesek;

f) előtéri beállító szolgálat és közúti forgalom ellenőrzésének hiánya esetén;

g) a repülőtér mozgási területén a helyzet, rendeltetési hely, és más utasításokat adó jelzések üzemképtelensége esetén;

h) ejtőernyős ugrások esetén, ha azokat ellenőrzött légtéren kívül, látvarepülési (VFR) szabályok szerint hajtják végre (ld. 5.1.1.1.1), valamint ellenőrzött légtérben, ha előzetesen közzétett helyszíneken, vagy veszélyes/tiltott légtereken belül hajtják fel;

i) egyéb, hasonlóan ideiglenes jellegű információk esetén;

5.1.1.4. A létrehozott veszélyes, korlátozott, vagy tiltott légterek aktivizálását és minden olyan, nem a kényszerhelyzetekkel kapcsolatos tevékenységet, amely ideiglenes légtérkorlátozással jár, legalább hét nappal korábban közölni kell.

5.1.1.4.1. **Ajánlás.-** *A tevékenység későbbi törléséről, vagy a légtér üzemidejének, méretének bármilyen csökkentéséről a lehető leghamarabb tájékoztatást kell kiadni.*

Megjegyzés.- Valahányszor lehetséges, legalább a 24 órával korábban kiadott tájékoztatás a kívánatos, hogy az értesítési folyamat időben történő befejezését lehetővé tegye és segítse a légtérgazdálkodás tervezési munkáját.

5.1.1.5. Amikor egy léginavigációs segédeszköz, berendezés, vagy egy távközlési szolgálat működésképtelenségéről adnak ki értesítést, a NOTAM-ban meg kell adni a működésképtelenség várható időtartamát, vagy azt az időpontot, amikorra a szolgálat helyreállítását számítják.

5.1.1.6. Amikor az AIRAC (Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje) eljárásai szerint egy AIP Módosítást, vagy egy AIP Mellékletet, Kiegészítést tesznek közzé, egy NOTAM-ot kell összeállítani, amely megadja a tartalom rövid leírását, a hatálybalépés dátumát és a Módosítás, vagy Melléklet, Kiegészítés hivatkozási számát. E NOTAM hatálybalépési időpontjának meg kell egyeznie a Módosítás, vagy Melléklet, Kiegészítés hatálybalépési időpontjával, és 14 napos időtartammal kell érvényben maradjon a PIB-kben (Repülés Előtti Tájékoztató Bulletin-ekben).

*Megjegyzés.- Az AIRAC AIP Módosítások, vagy AIP Mellékletek megjelenését kihirdető NOTAM-ok ("Trigger /Indító/ NOTAM") összeállításáról szóló útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (*Aeronautical Information Services Manual - Doc 8126*) található.*

5.2. Általános előírások

5.2.1. Az 5.2.3 és 5.2.4 pontban előírtak kivételével, valamennyi NOTAM a 6. Függelékben található NOTAM formanyomtatvány által megadott sorrendben kell, hogy tartalmazza az információkat.

5.2.2. A NOTAM-ok szövegét az ICAO NOTAM Kódok számára kijelölt jelekből/egységes rövidített frazeológiából kell összeállítani, kiegészítve az ICAO rövidítésekkel, helységnév azonosítókkal, azonosító jelekkel, jelölésekkel, hívójelekkel, frekvenciákkal, számokkal és nyílt szöveggel.

5.2.2.1. Amikor egy NOTAM-ot nemzetközi kiosztásra választanak ki, akkor az angol nyelvet kell használni a nyílt szöveges részekben.

Megjegyzés.- Az ICAO NOTAM Kódokat, valamint a jeleket/egységes rövidített frazeológiát, és az ICAO rövidítéseket az ICAO PANS-ABC (Doc 8400) kiadvány tartalmazza.

5.2.3 Amikor a repülőtéri / helikopter repülőtéri burkolatokat borító hóval, jéggel, vagy állóvízzel kapcsolatos tájékoztatás SNOWTAM formában kerül közzétételre, akkor a SNOWTAM az adatokat a 2. Függelékben található SNOWTAM Formanyomtatványban bemutatott sorrendben kell tartalmazza.

5.2.4. Amikor a vulkanikus aktivitás üzemeltetést nagymértékben befolyásoló változásáról, a vulkáni kitörésekről és/vagy hamufelhőkről szóló tájékoztatás ASHTAM formában kerül közzétételre, akkor az ASHTAM az adatokat a 3. Függelékben található ASHTAM Formanyomtatványban bemutatott sorrendben kell tartalmazza.

5.2.5. A NOTAM összeállítója minden NOTAM számára meg kell, hogy határozzon egy sorfolytonos azonosítót, amely egy betűből és egy négyjegyű számból áll, amit egy törtvonal és az év jelzésére 2 további számjegy követ. A négyjegyű számoknak folytatólagosnak kell lenniük, és a naptári éven kell alapulniuk.

Megjegyzés.- A NOTAM sorozatok azonosítására az ABC betűit használják, A-tól Z-ig, az S és a T betű kivételével.

5.2.6. Ha egy NOTAM-ban hibák fordulnak elő, egy új sorszámmal azonosított NOTAM-ot kell kiadni, hogy a hibás NOTAM-ot lecserélje.

5.2.7. Amikor kiadnak egy olyan NOTAM-ot, amely töröl, vagy lecserél egy korábban kiadott NOTAM-ot, akkor a korábbi NOTAM sorozatát és számát meg kell adni. Mindkét NOTAM sorozatának, helységnév azonosítójának és tárgyának azonosnak kell lennie. Egy NOTAM-mal csak egyetlen egy NOTAM-ot lehet törölni, vagy lecserélni.

5.2.8. Minden egyes NOTAM csak egyetlen tárggyal, és annak egyetlen jellemzőjével foglalkozhat.

Megjegyzés.- A NOTAM-ok Kiválasztási Feltételeivel egyetértésben, a NOTAM tárgya és a tárgy jellemzőinek kombinációjára vonatkozó útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - Doc 8126) *található.*

5.2.9. Minden egyes NOTAM-nak a lehető legrövidebbnek kell lennie, és úgy kell összeszerkeszteni, hogy jelentése, más okmányokra való hivatkozás nélkül is világos legyen.

5.2.10. Minden egyes NOTAM-ot önálló távközlési közleményként kell továbbítani.

5.2.11. Egy NOTAM, amely állandó, vagy hosszan tartó ideiglenes információkat tartalmaz, megfelelő AIP, vagy AIP Melléklet, Kiegészítés referenciákat, hivatkozásokat kell, hogy tartalmazzon

5.2.12. A NOTAM-ok szövegében található helységnév azonosító kódoknak meg kell egyezniük azokkal, melyek a *Helységnév Azonosító Kódok* kiadványban (Location Indicators – *DOC 7910*) szerepelnek.

5.2.12.1. Semmi esetre sem szabad ezen azonosítók rövidített változatát használni.

5.2.12.2. Amennyiben egy helységnek nincs kijelölt ICAO helységnév azonosítója, akkor a helység nevét a 3.6.2 pontban előírt helyesírási követelményeknek megfelelően leírva kell a nyílt szövegbe beilleszteni.

5.2.13. Az érvényes NOTAM-okról legalább havonta egyszer egy ellenőrzőjegyzéket kell kiadni NOTAM formájában, a Légiforgalmi Állandóhelyű Szolgálaton keresztül (*Aeronautical Fixed Service - AFS*), a 6. Függelékben meghatározott NOTAM formátumot használva. Minden NOTAM sorozathoz egy NOTAM-ot kell kiadni.

5.2.13.1. A NOTAM ellenőrzőjegyzéknek hivatkoznia kell a legújabb AIP Módosításokra, AIP Mellékletekre, Kiegészítésekre és legalább a nemzetközi szétosztású AIC-ékre (*Aeronautical Information Circulars* - Légiforgalmi Tájékoztató Körlevelekre).

5.2.13.2. A NOTAM ellenőrzőjegyzéket ugyanazon címekre kell kiosztani, mint akik azt a tájékoztatás sorozatot kapták, amire az ellenőrzőjegyzék vonatkozik és ezt a tájékoztatást egyértelműen ellenőrzőjegyzéknek kell nevezni.

5.2.13.3. A lehető legkisebb késéssel havonta kinyomtatott nyílt szövegű összesítőt kell készíteni az érvényben lévő NOTAM-okról, melynek tartalmaznia kell az utolsó kiadott AIP Módosításokat, az AIC-k megjelölését, az AIP Mellékletek, Kiegészítések ellenőrző jegyzékét, majd ezt az összesítőt a lehető leggyorsabb eszközt felhasználva el kell juttatni azokhoz, akik az Integrált Légiforgalmi Tájékoztató Csomagot megkapják.

5.3. Szétosztás

5.3.1. A NOTAM-okat kérés alapján kell kiosztani.

5.3.2. A NOTAM-ot az ICAO távközlési eljárások idevonatkozó előírásainak megfelelően kell összeállítani.

5.3.2.1. Amikor csak lehetséges, a NOTAM-ok szétosztásához a Légiforgalmi Állandóhelyű Szolgálatot (*AFS - Aeronautical Fixed Service*) kell alkalmazni.

5.3.2.2. Ha a NOTAM-ok cseréje az 5.3.4. pont alapján nem a Légiforgalmi Állandóhelyű Szolgálat (AFS) segítségével történik, akkor a szöveget megelőzően a NOTAM kiadás dátumát és időpontját hat számjegyből álló dátum/idő csoporttal kell jelölni, és használni kell a kiadó azonosítóját.

5.3.3. A kibocsátó Államnak kell kiválasztania azokat a NOTAM-okat, melyeket nemzetközi szétosztásra szánnak.

5.3.3.1. **Ajánlás.-** *Amennyiben megvalósítható, lehetőleg szelektív kiosztási listákat kell alkalmazni.*

Megjegyzés.- Ezek a listák a tájékoztatások felesleges szétosztásának megelőzésére szolgálnak. Az erre vonatkozó útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - *Doc 8126*) *található.*

5.3.4. A NOTAM-ok nemzetközi cseréje csak az érintett nemzetközi NOTAM irodák közötti kölcsönös megegyezés alapján történhet. Az ASHTAM (lásd 5.2.4.) nemzetközi cseréjébe, valamint azokban az Államokban, ahol a vulkánok aktivitásával kapcsolatos tájékoztatások szétosztására továbbra is a NOTAM közleményt használják, a NOTAM közlemények nemzetközi cseréjébe be kell vonni a Vulkáni Hamufelhők Tanácsadói Központjait (*Vulcanic Ash Advisory Centre*s), valamint figyelembe kell vennie a nagy hatósugarú üzemeltetés követelményeit is.

Megjegyzés.- A repülőterek / helikopter repülőterek közötti közvetlen SNOWTAM (lásd a 2. Függeléket) cserére egyezményeket lehet kötni.

5.3.4.1. A nemzetközi NOTAM irodák között az ilyen NOTAM cseréket, amennyire csak gyakorlatilag lehetséges, a tájékoztatást fogadó érintett Államok követelményeire kell korlátozni, legalább a nemzetközi és a belföldi járatok számára készített külön sorozatok biztosításával,.

5.3.4.2. Az 5.3.4. pontban leírt követelményeknek megfelelően, amikor csak lehetséges, az 5. Függelékkel összhangban, a Légiforgalmi Állandóhelyű Szolgálat segítségével (AFS) továbbított NOTAM közleményekhez egy előre meghatározott szétosztási rendszert kell használni.

6. FEJEZET - A LÉGIFORGALMI TÁJÉKOZTATÓ KÖZLEMÉNYEK MEGHATÁROZOTT KIADÁSI RENDJE (AIRAC)

6.1. Általános előírások

6.1.1. A 4. Függelék - 1. részében felsorolt körülményekre vonatkozó tájékoztatásokat az AIRAC meghatározott rendje szerint kell szétosztani, azaz az alapok létrehozását, a visszavonást és a jelentős módosításokat a hatálybalépési időpontok szokásos 28 naponkénti sorozata szerint kell végrehajtani, az 1998. január 29-ei naptól kezdődően. Az ilyen módon közölt információkat, tájékoztatásokat a hatálybalépés utáni további 28 napig nem változtathatják meg, kivéve, ha a közölt körülmény ideiglenes jellegű és így nem tart a teljes időszak végéig.

Megjegyzés.- Az AIRAC rendszerrel kapcsolatosan alkalmazható eljárásokra vonatkozó útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - Doc 8126) *található.*

6.1.2. **Ajánlás.-** *Lehetőleg az AIRAC szabályozott rendszerét kell használni a 4. Függelék 2. Részében felsorolt körülmények bevezetésével, megszüntetésével és előre megfontolt jelentős változtatásával kapcsolatos tájékoztatások kiadására is.*

6.1.3. Ha az AIRAC időpontjára a kiadandó tájékoztatást még nem nyújtották be, egy NIL értesítést kell összeállítani és NOTAM, vagy más alkalmas eszköz útján szétosztani, legalább egy ciklussal korábban, mint amelyre az AIRAC hatálybalépési dátuma vonatkozik.

6.1.4. Az AIRAC hatálybalépési dátumától eltérő bevezetési dátumokat nem szabad használni az olyan előre tervezett, üzemeltetést jelentősen érintő változások esetén, melyek térképészeti munkákat igényelnek, és/vagy melyek navigációs adatbázisokat aktualizálnak.

6.1.5. **Ajánlás.-** *Az AIRAC rendszer szerinti jelentős változások bevezetésének hatálybalépési dátumaként az AIRAC ciklusban lehetőleg kerülendő a december 21-e és január 17-e közötti időpontok használata, ezeket a napokat is beleértve.*

6.2. Tájékoztatások biztosítása papír másolat formájában

6.2.1. Az AIRAC rendszer szerint szétosztott tájékoztatásokat minden esetben meg kell jelentetni papír másolat formájában és azt az AIS-nek (Légiforgalmi Tájékoztató Szolgálat) legalább 42 nappal a hatálybalépés dátuma előtt ki kell adnia abból a célból, hogy a tájékoztatás a hatálybalépési dátum előtt legalább 28 nappal korábban eljusson a címzettekhez.

6.2.2. **Ajánlás.-** *Amikor jelentősebb változásokat terveznek és ahol az előzetes értesítés kívánatos lehet és használható, a kiadás dátuma lehetőség szerint legalább 56 nappal előzze meg a hatálybalépés dátumát.*

6.3. Tájékoztatások biztosítása elektronikus formátumban

6.3.1. Azoknak az Államoknak, melyek létrehoztak egy légiforgalmi adatbázist, amikor annak tartalmát a 4. Függelék - 1. Részben felsorolt körülményekre vonatkozóan frissítik, garantálniuk kell, hogy az adatok hatálybalépési időpontjai megegyezzenek azon AIRAC hatálybalépési időpontokkal, melyeket a papír másolat formájában biztosított tájékoztatások számára használtak fel.

6.3.2. A 4. Függelék - 1. Részben felsorolt körülményekre vonatkozó, elektronikus formátumban nyújtott tájékoztatásokat az AIS-nek (Légiforgalmi Tájékoztató Szolgálatnak) oly módon kell kiadnia/hozzáférhetővé tennie, hogy a tájékoztatás az AIRAC hatálybalépési dátuma előtt legalább 28 nappal korábban eljusson a címzettekhez.

6.3.3. **Ajánlás.-** *Amikor jelentősebb változásokat terveznek és ahol az előzetes értesítés kívánatos lehet és használható, az elektronikus formátumban nyújtott tájékoztatásokat, lehetőség szerint, a hatálybalépési dátumot megelőzően legalább 56 nappal korábban kell kiadni/hozzáférhetővé tenni.*

7. FEJEZET - LÉGIFORGALMI TÁJÉKOZTATÓ KÖRLEVELEK (AIC)

7.1. A körlevelek összeállítása

7.1.1. Egy AIC-t kell kiadni, amikor egy olyan légiforgalmi tájékoztatás közzététele szükséges, ami nem minősül:

a) a 4.1. pont előírásai értelmében olyannak, hogy azt egy Légiforgalmi Tájékoztató Kiadványban (AIP) kellene kiadni; vagy

b) az 5.1. pont előírásai értelmében olyannak, hogy azt egy NOTAM-ban kellene kiadni.

7.1.1.1. Egy AIC-t kell kiadni, amikor az alábbiak közzététele kívánatos:

a) jogszabályokkal, rendelkezésekkel, eljárásokkal és berendezésekkel kapcsolatos bármely fontosabb változás hosszú távú előrejelzése;

b) pusztán csak magyarázó, vagy tanácsadó jellegű tájékoztatások, melyek hatással lehetnek a repülés biztonságára;

c) műszaki, jogi, vagy tisztán adminisztratív ügyekre vonatkozó magyarázó, vagy tanácsadó jellegű tájékoztatások, vagy értesítések;

Ezeknek tartalmaznia kell az alábbiakat:

1. a biztosított léginavigációs eljárások, szolgálatok és berendezések fontos változásainak előrejelzését;

2. az új navigációs rendszerek létesítésének előrejelzését;

3. légijármű baleset/esemény kivizsgálása során feltárt olyan fontos tájékoztatásokat, amelyek összefüggnek a repülés biztonságával;

4. tájékoztatásokat a nemzetközi polgári légiközlekedés jogellenes beavatkozás elleni védelmével összefüggő szabályozásokról, rendelkezésekről;

5. tanácsokat a légijármű-vezetőket különösen érintő orvosi kérdésekkel kapcsolatban;

6. a pilóták részére olyan figyelmeztetéseket, hogy hogyan kerüljék el az egészségükre leselkedő veszélyeket;

7. bizonyos időjárási rendellenességeknek a légijárművek üzemeltetésére gyakorolt hatását;

8. tájékoztatást az újabb veszélyekről, melyek a légijármű kiszolgálási módszereket, tevékenységeket érintik;

9. korlátozás alá eső árucikkek légi szállítására vonatkozó rendszabályokat;

10. utalást a nemzeti törvényalkotás követelményeire és bekövetkezett változások közzétételére;

11. a hajózószemélyzet szakszolgálati képesítésével kapcsolatos megállapodásokat, egyezményeket;

12. a légiközlekedésben foglalkoztatott személyek képzését, oktatását;

13. a nemzeti törvényhozás követelményeinek alkalmazását, vagy az azok alóli mentességet;

14. meghatározott, bizonyos típusú berendezések használatára és karbantartására vonatkozó tanácsokat;

15. a légiforgalmi térképek új, vagy átdolgozott kiadásának pillanatnyi, vagy tervezett elérhetőségét;

16. rádió-berendezések szállítását a fedélzeten;

17. a zajcsökkentési eljárásokra vonatkozó magyarázó tájékoztatásokat;

18. kiválasztott légialkalmassági irányelveket;

19. NOTAM sorozatokban, vagy szétosztásukban bekövetkezett változásokat, az AIP új kiadásait, vagy az AIP tartalmának, jogkörének, vagy formátumának jelentősebb változásait;

20. előzetes tájékoztatást a hóeltakarítási tervről (lásd 7.1.1.2. pontot);

21. hasonló jellegű, egyéb tájékoztatásokat.

Megjegyzés.- Egy AIC kiadása nem mentesít a 4. és 5. Fejezetben ismertetett kötelezettségek alól.

7.1.1.2. Az 1. Függelék AD 1.2.2. pontja szerint kiadott hóeltakarítási tervet idényjellegű tájékoztatásokkal kell kiegészíteni, és még jóval valamennyi téli időszak kezdete előtt kell kiadni - nem később, mint egy hónappal a téli körülmények szokásos beállta előtt. A hóeltakarítási tervnek az alábbi tájékoztatásokat kell tartalmaznia:

a) azoknak a repülőtereknek/helikopter repülőtereknek a jegyzékét, amelyeken az elkövetkező téli időszakban várhatóan hóeltakarítást fognak végezni;

1) a futópálya- és gurulóút-rendszereknek megfelelően; vagy[26]*

2) a tervezett hóeltakarítást, a futópálya rendszertől eltérően (futópályák hosszúsága, szélessége és száma, az érintett gurulóutak és forgalmi előterek, vagy ezek részei);[27]*

b) [28]*tájékoztatást bármely kijelölt központról, amelyet kijelöltek, hogy koordinálja a hóeltakarítás menetének pillanatnyi állapotával, a futópályák, gurulóutak és forgalmi előterek pillanatnyi állapotával kapcsolatos tájékoztatásokat.

c) a repülőterek/helikopter repülőterek felosztását SNOWTAM kiosztási listákra, hogy elejét vegyék a túlzott mértékű, felesleges SNOWTAM kiosztást.

d) [29]*szükség szerint az érvényes hóeltakarítási terv kisebb módosításairól szóló információt.

e) [30]*a hóeltakarítás eszközeinek részletes leírását tartalmazó jegyzékét;

f) [31]*egy listát arról, hogy mit tekintenek majd a hópad legkisebb jelentendő magasságának, minden repülőtéren/helikopter repülőtéren, ahol a jelentést el fogják kezdeni.

7.2. Általános előírások

7.2.1. Az AIC-t nyomtatott formában kell kiadni.

Megjegyzés.- A kiadott anyag szöveget és ábrákat egyaránt tartalmazhat.

7.2.1.1. A kiadó Államnak kell kiválasztania azt az AIC-t, melyet nemzetközi szétosztásra szánnak.

7.2.1.2. Minden AIC-nek egy sorszámot kell adni, mely sorszámoknak folytatólagosaknak kell lenniük, és a naptári éven kell alapuljanak.

7.2.1.3. Ha az AIC-ket több, mint egy sorozatban osztják szét, minden sorozatot egyedi betűjelzéssel kell ellátni.

7.2.1.4. **Ajánlás.-** *Ahol az érvényben lévő AIC-k nagy száma elegendő ahhoz, hogy az azonosításra ilyen formában kerüljön sor, az egyes AIC témakörök tárgy szerinti megkülönböztetésére és azonosítására lehetőség szerint szín szerinti kódolást kell alkalmazni.*

Megjegyzés.- Az AIC- k tárgy szerinti szín-kódolására vonatkozó tájékoztató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - *Doc 8126*) *található.*

7.2.2. Legalább évente egyszer, az AIC-kkel azonos címekre történő kiosztással, ellenőrző jegyzéket kell kiadni az érvényben lévő AIC-ről.

7.3. Szétosztás, kiosztás

A nemzetközi szétosztásra szánt AIC-k számára az Államoknak ugyanazt a kiosztást kell biztosítaniuk, mint az AIP-jük esetén.

8. FEJEZET - A REPÜLÉS ELŐTTI ÉS REPÜLÉS UTÁNI TÁJÉKOZTATÁS / ADATOK

8.1. Repülés előtti tájékoztatás

8.1.1. Minden olyan repülőtéren/helikopter repülőtéren, amelyet rendes körülmények között nemzetközi légiforgalom üzemeltetésére vesznek igénybe, a repülés biztonsága, rendszeressége és hatékonysága szempontjából lényeges, és az adott repülőtérről/helikopter repülőtérről kiinduló repülési útvonalszakaszokra vonatkozó légiforgalmi tájékoztatásokat a repülési tevékenységeket végző személyzet rendelkezésére kell bocsátani, beleértve a hajózó személyzeteket és a repülés előtti tájékoztatásokért felelős szolgálatokat is.

8.1.2. A 8.1.1. pontban említett repülőtereken/helikopter repülőtereken a repülés előtti tervezés céljaira biztosított légiforgalmi tájékoztatásoknak magukba kell foglalniuk az alábbi lényeges összetevőket:

a) az Integrált Légiforgalmi Tájékoztató Csomag elemeit;

b) térképeket és navigációs térképvázlatokat.

Megjegyzés: - Az a) és b) pontokban felsorolt dokumentációt korlátozhatják a nemzeti kiadványokra és ahol ez megoldható, a közvetlenül szomszédos Államok kiadványaira, feltéve, hogy a légiforgalmi tájékoztatások teljes könyvtára rendelkezésre áll egy központi helyen, valamint, hogy a közvetlen kommunikáció eszközei használhatók a repülőtér AIS egysége és ezen könyvtár között.

8.1.2.1. Kiegészítő naprakész tájékoztatásokat kell biztosítani az indulási repülőtérre vonatkozóan az alábbiakról:
a) építési, vagy karbantartási munkálatok a munkaterületen, vagy közvetlenül a munkaterület mellett;

b) a munkaterület bármely egyenetlen része, függetlenül attól, hogy megjelölték, vagy nem, pl. ilyenek a futópályák és gurulóutak felszínének töredezett részei;

c) hó, jég és víz jelenléte és vastagsága a futópályán és a gurulóutakon, beleértve hatását a felület fékhatására;

d) összefújt, vagy felhalmozódott hó a futópályákon és gurulóutakon, vagy mellettük;

e) parkoló légijármű, vagy más akadályok a gurulóutakon, vagy közvetlenül mellettük;

f) más ideiglenes veszély jelenléte;

g) madarak jelenléte, amely potenciális veszélyt jelent a légijárművek üzemeltetésére;

h) a repülőtér fényrendszere egy részének, vagy egészének meghibásodása, vagy szabálytalan működése, beleértve a bevezető -, a küszöb -, a futópálya -, a gurulóút -, akadály - és a munkaterületek használaton kívüli részeit jelölő fényeket, valamint a repülőtér energiaellátását.

i) az ILS (markerekkel együtt), MLS, az alap GNSS, SBAS (Satellite Based Augmentation Systems - Műholdas Alapú, Megnövelt Területen Működő Szolgáltatás), GBAS (Ground Based Augmentation System - Földi Telepítésű Kiterjesztő Rendszer), SRE, PAR, DME, SSR, VOR, NDB berendezések, VHF légiforgalmi mozgószolgálati csatornák, RVR észlelő rendszerek és a másodlagos energia rendszer meghibásodása, vagy szabálytalan működése és üzemeltetési státuszának változása;

j) humanitárius segélyezési feladatok, küldetések jelenléte és műveletei, mint amilyeneket az ENSZ védnöksége alatt folytatnak, az alkalmazott eljárásokkal és/vagy az okozott korlátozásokkal együtt.

8.1.3. Az érvényes NOTAM-ok és más sürgős jellegű tájékoztatások ismételt összefoglalását nyílt szöveges repülés előtti tájékoztató bulletin (PIB) formájában kell hozzáférhetővé tenni a repülő személyzet számára.
Megjegyzés.- a PIB (Pre-flight Information Bulletins - Repülés Előtti Tájékoztató Bulletin) összeállítására vonatkozó útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - *Doc 8126*) *található.*

8.2. Automatizált légiforgalmi tájékoztató rendszerek

8.2.1. Ott, ahol a polgári légügyi hatóság, vagy az az ügynökség, melyre a 3.1.1. c) pontban leírtaknak megfelelően a szolgáltatás felügyeletét átruházták, automatizált repülés előtti légiforgalmi tájékoztató rendszereket használ, hogy segítségével a légiforgalmi tájékoztatásokat/léginavigációs adatokat hozzáférhetővé tegyék az üzemeltetést végző személyzet részére, beleértve a hajózó-személyzet tagjait is, a repülésük előtti önálló eligazítás, repülés tervezés és a repülés tájékoztató szolgálat céljaira, a rendelkezésre bocsátott tájékoztatások/adatok meg kell feleljenek a 8.1.2. és 8.1.3. pontban leírt rendelkezéseknek.

8.2.2. **Ajánlás.-** *A repülés előtti automatizált légiforgalmi tájékoztató rendszereket, melyek az üzemeltetést végző személyzet részére, beleértve a hajózó-személyzet tagjait, és más érintett légiforgalmi személyzeteket is, egy összehangolt, közös hozzáférési lehetőséget biztosítanak a légiforgalmi tájékoztatásokhoz - a 8.2.1. pontban leírtaknak megfelelően - valamint a meteorológiai tájékoztatásokhoz - a* Meteorológiai Szolgálat a Nemzetközi Légiközlekedés Számára – *3. Annex – 9.5.1. pontja alapján - lehetőség szerint a polgári légügyi hatóság, vagy az az ügynökség - melyre a 3.1.1. c) pontban leírtaknak megfelelően a szolgáltatás felügyeletét átruházták - és az illetékes meteorológiai hatóság között kötött egyezményben foglaltak szerint kell felállítani.*

8.2.3. Ahol repülés előtti automatizált légiforgalmi tájékoztató rendszereket használnak összehangolt, közös hozzáférési lehetőségként az üzemeltetést végző személyzet részére, beleértve a hajózó-személyzet tagjait, és más érintett légiforgalmi személyzeteket is, a légiforgalmi tájékoztatásokhoz/adatokhoz, valamint a meteorológiai tájékoztatásokhoz, a polgári légügyi hatóság, vagy az az ügynökség, melyre a 3.1.1. c) pontban leírtaknak megfelelően a szolgáltatás felügyeletét átruházták, továbbra is felelősséggel tartozik az ilyen rendszerek segítségével biztosított légiforgalmi tájékoztatások/adatok minőségéért és időszerűségéért.

Megjegyzés – Az érintett meteorológiai hatóság tartozik felelősséggel az ilyen rendszerek segítségével biztosított meteorológiai tájékoztatások minőségéért, a 3. Annex – 9.5.1. pontja alapján.

8.2.4. Egy automatizált légiforgalmi tájékoztató rendszer repülés előtti saját-eligazítási eszközeinek szükség szerint hozzáférést kell biztosítaniuk a légiforgalmi tájékoztató szolgálatokkal történő konzultáció lehetőségéhez telefon, vagy más alkalmas telekommunikációs eszköz segítségével az üzemeltetést végző személyzet részére, beleértve a hajózószemélyzet tagjait is és más érintett légiforgalmi személyzeteket is. Az ilyen eszközök ember/gép közötti kapcsolatot megvalósító műszaki megoldásainak könnyű, segítségről is gondoskodó hozzáférést kell biztosítaniuk minden vonatkozó tájékoztatáshoz/adathoz.

8.2.5. **Ajánlás.-** *A repülés előtti saját-eligazítás, repülés tervezés és repülés tájékoztató szolgálat céljaira légiforgalmi tájékoztatásokat/adatokat biztosító automatizált légiforgalmi tájékoztató rendszereknek lehetőség szerint:*

a) gondoskodniuk kell a rendszer adatbázisának folyamatos és megfelelő időben történő frissítéséről és a tárolt légiforgalmi tájékoztatások érvényességének és minőségének figyelemmel kiséréséről;

b) lehetővé kell tegyék az üzemeltetést végző személyzet részére, beleértve a hajózó-személyzet tagjait és más érintett légiforgalmi személyzeteket és légiforgalmi felhasználókat is, hogy megfelelő telekommunikációs eszközökön keresztül hozzáférjenek a rendszerhez;

c) biztosítaniuk kell, hogy a megtekintett légiforgalmi tájékoztatások/adatok szükség szerint papírmásolat formájában is rendelkezésre álljanak;

d) olyan hozzáférési és lekérdezési eljárásokat kell használniuk, melyek rövidített nyílt szövegen és ICAO helységnév-azonosítókon alapulnak, értelemszerűen, vagy egy menüvezérelt felhasználói felületen, vagy más alkalmazható struktúrán keresztül, ahogy abban a polgári légügyi hatóság és az érintett üzemeltetők megegyeztek; és

e) egy tájékoztatást igénylő felhasználói kérés esetén gyors válaszadásról kell gondoskodniuk.

Megjegyzés.- Az ICAO rövidítések és kódok, valamint helységnév-azonosítók a Légiforgalmi Szolgálatok Eljárásai – ICAO Rövidítések és Kódok *(Procedures for Air Navigation Services – ICAO abbreviations and Codes - PANS-ABC, Doc 8400), illetve a* Helységnév-azonosítók *(Locations Indicators - Doc 7910) alapján kerülnek megadásra.*

8.3. Repülés utáni tájékoztatás

8.3.1 Az Államoknak biztosítaniuk kell, hogy intézkedéseket tegyenek a repülőtereken/helikopter repülőtereken, a légijárművek személyzetétől kapott, a léginavigációs berendezések állapotáról és működéséről szóló tájékoztatások átvételére, valamint gondoskodniuk kell arról, hogy az ilyen tájékoztatások a légiforgalmi tájékoztató szolgálat rendelkezésére álljanak olyan szétosztás céljára, ahogy azt a körülmények szükségessé teszik.

8.3.2. Az Államoknak biztosítaniuk kell, hogy intézkedéseket tegyenek a repülőtereken/helikopter repülőtereken a légijárművek személyzetétől kapott, az általuk megfigyelt madarak jelenlétéről szóló információ átvételére, valamint gondoskodniuk kell arról, hogy az ilyen tájékoztatások a légiforgalmi tájékoztató szolgálat rendelkezésére álljanak olyan szétosztás céljára, ahogy azt a körülmények szükségessé teszik.

Megjegyzés.- Lásd a 14. Annex – I. Kötet – 9. Fejezet – 9.4. bekezdését!

9. FEJEZET - TÁVKÖZLÉSI KÖVETELMÉNYEK

9.1. A nemzetközi NOTAM irodákat össze kell kötni a légiforgalmi állandóhelyű szolgálattal (AFS).

9.1.1. Az összeköttetéseknek biztosítaniuk kell a nyomtatott formátumú közlemények cseréjét.

9.2. Minden nemzetközi NOTAM irodát, azon a területen belül, ahol szolgáltatásokat biztosít, a légiforgalmi állandóhelyű szolgálaton (AFS) keresztül az alábbi pontokkal kell összekapcsolni:
a) körzeti irányító központok és repülés tájékoztató központok;
b) repülőterek/helikopter repülőterek, melyeken, a 8. Fejezettel összhangban, létrehozták a tájékoztató szolgálatot.

10. FEJEZET - ELEKTRONIKUS TEREP ÉS AKADÁLY ADATOK

10.1. Feladatok

Az elektronikus terep és akadály adatok állományai, légiforgalmi adatokkal együtt használva, értelemszerűen, ki kell elégítsék a felhasználók által támasztott azon követelményeket, melyek az alábbi léginavigációs alkalmazások, programok támogatására szükségesek:

a) földközelségre figyelmeztető riasztó rendszer (*GPWS - Ground Proximity Warning System*), előretekintő domborzat elkerülő funkcióval és Minimális Biztonságos Tengerszint Feletti Magasságra Figyelmeztető Rendszerrel (*MSAW - Minimum Safe Altitude Warning*);

b) A megszakított megközelítés, átstartolás (*missed approach*), vagy felszállás során bekövetkező kényszerhelyzet, vészhelyzet esetén követendő eljárások meghatározása;

c) légijármű üzemeltetési korlátainak elemzése;

d) műszeres eljárások tervezése (beleértve a körözéssel történő megközelítési eljárást is);

e) Az útvonalrepülés során történő *"drift-down"* (magasságvesztési, lecsúszási) eljárás és az útvonalrepülés során a kényszerleszállás helyének meghatározása;

f) A-SMGCS (*Advanced Surface Movement Guidance and Control Systems*) - Fejlett, Felszíni Mozgásokat Figyelő És Ellenőrző Rendszer;

g) léginavigációs térképek előállítása és fedélzeti adatbázisok;

h) repülési szimulátorok;

i) *Synthetic Vision* – Mesterséges Látás (egyfajta virtuális valóság kijelzése – rossz, vagy éjszakai látási körülmények között is tiszta, elektronikusan előállított kép a pilótafülke előtti világról); és

j) repülőtéri/helikopter repülőtéri akadályok korlátozása és eltávolítása.

10.2. Lefedés (felszínborítás), valamint a terep és akadály adatok formai követelményei

10.2.1. Hogy kielégíthessék a 10.1 pontban meghatározott léginavigációs rendszerek, vagy feladatok, funkciók biztosításához szükséges követelményeket, az alábbi lefedési területeknek (felszínborításnak) megfelelően elektronikus terep és akadály adatsorozatokat kell összegyűjteni és adatbázisokba kell rendezni.

1. Terület: egy Állam teljes területe;

2. Terület: *Terminal Control Area (TMA)* – Közelkörzeti Irányító Körzet;

3. Terület: Repülőtér/Helikopter repülőtér területe;

4. Terület: II-es, vagy III-as kategóriás üzem területe

Megjegyzés.- A meghatározott lefedési területek (felszínborításnak) grafikus ábrázolásával kapcsolatban lásd a 8. Függeléket!

10.2.2. Az 1. Területnek le kell fednie az Állam teljes területét, beleértve a repülőtereket/helikopter repülőtereket is. A 2. Területnek meg kell egyeznie a Közelkörzeti Irányító Körzettel, ahogy azt az Állam Légiforgalmi Tájékoztató Kiadványában (*AIP*) közzétették, vagy a repülőtér/helikopter repülőtér vonatkozási pontjától maximálisan 45 km sugarú körre kell korlátozni, amelyik a kisebb. IFR repülőtereken/helikopter repülőtereken, ahol nem hoztak létre TMA-t, a 2. Területnek meg kell egyeznie a repülőtér/helikopter repülőtér vonatkozási pontjától számított 45 km-es sugarú körrel határolt területtel.

10.2.3. Az IFR repülőtereken/helikopter repülőtereken a 3. Terület meg kell egyezzen azzal a területtel, mely a futópálya(ák) szegélyétől (szegélyeitől) a futópálya(ák) középvonalától mért 90 méteres távolságig terjed ki, a repülőtér/helikopter repülőtér mozgási területének többi részénél az így meghatározott terület(ek) szegélyétől számított 50 méter széles területet is magába foglalja.

10.2.4. A 4. Területnek azokra a futópályákra kell korlátozódnia, melyekre II-es és III-as kategóriás precíziós bevezetéseket határoztak meg és ahol a felhasználók számára részletes domborzati információk szükségesek, hogy lehetővé váljon számukra, a rádió-magasságmérő használatával, a domborzat hatásának elemzése az elhatározási magasság kijelölésére. A terület szélessége 60-60 méter mindkét oldalra a futópálya meghosszabbított egyenesétől mérve, a hossza 900 méter a futópálya küszöbétől mérve, a meghosszabbított futópálya középvonal mentén.

10.2.5. A 10.1 pontban felsorolt léginavigációs alkalmazásoknak és a lefedettségnek megfelelően, az elektronikus domborzati/terep adatkészleteknek ki kell elégíteniük a 8. Függelék – A8-1. táblázatában meghatározott numerikus követelményeket, mialatt az akadály adatoknak ki kell elégíteniük a 8. Függelék – A8-2. táblázatában megadott numerikus követelményeket.

Megjegyzés 1.- A 2. Terület számára a terep és akadály adatokkal szemben támasztott követelmények, melyek a legszigorúbb program, alkalmazás követelményei alapján lettek meghatározva (a 10.1 b alatt felsorolt alkalmazás), a 8. Függelék – A8-1, illetve az A8-2 Táblázatában találhatóak.

Megjegyzés 2.- Elismert tény, hogy a 10.1 pont alatt felsorolt alkalmazások némelyike megfelelően ellátható olyan terep és akadály adatkészletekkel, melyek jellemzői a 8. Függelék – A8-1, illetve A8-2 Táblázatokban meghatározott követelményeknél gyengébbek. Következésképpen szükség van az adatfelhasználók által a rendelkezésre álló adatkészletek gondos kiértékelésére, hogy meghatározhassák, vajon a termékek megfelelnek-e a tervezett felhasználáshoz.

10.3. Terep, domborzat adatbázis – tartalom és szerkezet

10.3.1. A terep adatbázisnak tartalmaznia kell az adatok elektronikus készletét, melyek a domborzat felületét testesítik meg, folyamatos tengerszint feletti magasság értékek formájában, egy meghatározott hálózat valamennyi keresztezési pontjában, melyeket közös alapponthoz viszonyítanak. A domborzati hálózatnak szögletesnek, vagy lineárisnak, valamint szabályos, vagy szabálytalan alakúnak kell lennie.

Megjegyzés.- Olyan területeken, melyek távolabb találhatók az egyenlítőtől, a szélességi hálózat osztástávolságát úgy lehet szabályozni, hogy a mérési pontok állandó lineáris sűrűségét tartsák fenn.

10.3.2. Az elektronikus terep (domborzat) adatok készleteinek tartalmazniuk kell térbeli (pozíció és közepes tengerszint feletti magasság), tematikus és időbeli nézőpontból a Föld felszínén természetes módon megtalálható ismertetőjeleket, mint amilyenek a hegységek, hegyek, gerincek, völgyek, víztömegek, állandó jég és hó - az akadályok kivételével. A gyakorlatban, a begyűjtés módszerétől függően, ennek egy folyamatos felületet kell megjelenítenie a csupasz földfelszínen, a vegetáció felületén, vagy a kettő között valamin, amit úgy is ismerünk, hogy az "*első visszatükröző felület*".

10.3.3. A terep adatokat a 10.2 pont alatt meghatározott körzeteknek, a 8. Függelék – A8-1. Táblázatban megadott terep adatgyűjtési felületeknek és kritériumoknak megfelelően, valamint a 8. Függelék – A8-1.

táblázatában közzétett, a terep adatokkal szemben meghatározott numerikus követelményekkel összhangban kell összegyűjteni. A terep, domborzat adatbázisokban csak egyféle jellemző típust, azaz a domborzatot kell rögzíteni. A terepet leíró jellegzetesség attribútumoknak meg kell egyezniük a 8. Függelék A8-3. Táblázatban felsoroltakkal. Az A8-3. Táblázatban felsorolt domborzati jellegzetesség attribútumok jelentik a domborzati attribútumok minimális készletét és amelyek kötelezőnek vannak jelölve, azokat kell a domborzati adatbázisokban feljegyezni.

10.4. Akadály adatbázis – tartalom és szerkezet

10.4.1. Egy akadály adatbázisnak tartalmaznia kell az akadály adatok egy elektronikus készletét és tartalmaznia kell azokat a jellemzőket, melyeknek, a szomszédos és környezetében lévő légi közlekedésre veszélyesnek ítélt jellegzetességekkel összevetve, függőleges jelentőségük van. Az akadály adatnak tartalmaznia kell az ember által készített objektumok függőleges és vízszintes kiterjedésének digitális értelmezését, leképezését. Az akadályok nem szerepelhetnek a domborzati, terep adatbázisokban. Az akadály adatelemek jellemzők, jellegzetességek, melyeket az adatbázisban pontokkal, vonalakkal és poligonokkal (sokszögekkel) kell ábrázolni.

10.4.2. Az akadályokat – melyek a definíciónak megfelelően lehetnek rögzítettek (állandóak és ideiglenesek), vagy mobil, mozgathatóak – azonosítani kell a 10.2 pontban meghatározott területeken belül, a 8. Függelék, A8-2. Táblázatában található akadály adatgyűjtési felületek és kritériumok alapján, valamint a 8. Függelék – A8-2. Táblázatában közzétett, az akadály adatokkal szemben meghatározott numerikus követelményekkel összhangban kell összegyűjteni. Egy akadály adatbázisban, az összes akadály jellegzetesség típust rögzíteni kell és valamennyit a 8. Függelék, A8-4. Táblázatában közzétett kötelező attribútumok felsorolásának megfelelően kell leírni.

Megjegyzés.- Bizonyos attribútumok, melyek mobil (jellegzetességekhez tartozó tevékenységekkel) és ideiglenes típusú akadályokkal vannak kapcsolatban a 8. Függelék, A8-4. Táblázatban opcionális attribútumokként vannak megjelölve. Ha az ilyen típusú akadályokat kell rögzíteni az adatbázisban, akkor az ilyen akadályokat leíró megfelelő attribútumokra is szükség van.

10.5. A terep és akadály adatokból összeállított termék részletes leírása

10.5.0 Hogy lehetővé tegyék és támogassák az elektronikus domborzat és akadály adatkészletek cseréjét és felhasználását a különböző adatszolgáltatók és adatfelhasználók között, a térinformatikára vonatkozó szabványok ISO 19100 sorozatát kell használni az általános adatmodellezés alapjaként.

10.5.2. A rendelkezésre álló domborzati és akadály adatkészletek egy minden részletre kiterjedő jegyzékét kell közzétenni, a domborzati adattermék, valamint az akadály adattermék részletes leírásának formájában, melyek alapján a légiközlekedési felhasználók képesek lesznek a termékek értékelésére és annak megállapítására, hogy vajon a termékek megfelelnek-e a tervezett felhasználás követelményeinek.

Megjegyzés.- A 19131-es ISO szabvány pontosan meghatározza a térinformatika számára az adattermék részletes leírásának követelményeit és áttekintését.

10.5.3. Valamennyi domborzati adattermék részletes leírásának tartalmaznia kell egy áttekintést, a részletes leírás érvényességi tartományát, az adattermék azonosítását, az adatok összetételét és szerkezetét, a referencia rendszert, az adat minőségét, az adat rögzítését, az adatok karbantartását, az adat ábrázolását, az adattermék továbbítását, kiegészítő információkat, és a meta-adatokat (adatok az adatokról).

10.5.4. A domborzati adattermék, vagy akadály adattermék részletes leírása áttekintő részének biztosítania kell a termék informális leírását, valamint általános információkat kell, hogy tartalmazzon az adattermékről. A domborzati adatok részletes leírása lehet, hogy nem teljesen homogén az egész adatterméken belül, hanem lehetnek eltérések az adatkészlet különböző részeiben. Az adatok minden ilyen alkészlete számára meg kell határozni a részletes leírás érvényességi tartományát. A domborzat, valamint az akadály adattermékekre vonatkozó azonosító információknak tartalmazniuk kell a termék elnevezését; a tartalom egy tömör, leíró összegzését, a rendeltetését, és ha rendelkezésre áll, a térbeli felbontóképességét (egy általános bejelentést a térbeli adatok sűrűségéről); az adattermék által lefedett földrajzi területet; és kiegészítő adatokat.

10.5.5. A tereptárgyakra, jellegzetességekre alapuló domborzati, vagy akadály adatkészletek információtartalmát mindkét esetben egy alkalmazási séma és egy tereptárgy, jellegzetesség jegyzék formájában kell meghatározni. Az alkalmazási sémának biztosítania kell az adatszerkezet formai leírását és az adatkészletek tartalmát, miközben a jellegzetességek jegyzékének kell biztosítania valamennyi jellegzetesség típus szemantikáját, az attribútumaival együtt, és az attribútum értéktartományokat, a jellegzetesség típusok és műveletek közötti kapcsolat típusokat, az átöröklési viszonyokat és kötöttségeket. A felszínborítást egy jellegzetesség egy altípusának tekintik és azt az azonos attribútumokkal rendelkező jellegzetességek egy gyűjteményéből lehet származtatni. Mind a domborzat, mind az akadály adattermék részletes leírása egyértelműen meg kell, hogy határozza a felszínborítást és/ vagy ábrázolást, amit tartalmaznak, és biztosítaniuk kell valamennyi részletes leírását.

Megjegyzés 1.- Az ISO 19109 Szabvány tartalmazza az alkalmazási séma számára a szabályokat, miközben a 19110-es ISO Szabvány a térinformatika számára részletezi a jellegzetesség katalogizálás módszertanát.

Megjegyzés 2.- Az ISO 19123 Szabvány tartalmazza a Geometriai felszínborítás (lefedés) és funkcióinak sémáját.

10.5.6. Mind a domborzat, mind az akadály adattermék részletes leírásának tartalmaznia kell olyan információkat, melyek azonosítják az adattermékben felhasznált vonatkozási rendszert. Ennek tartalmaznia kell egy térbeli referencia rendszert és egy időbeli vonatkozási rendszert. Kiegészítésképpen, mindkét adattermék részletes leírásának azonosítania kell az adatminőségi követelményeket minden egyes adattermék számára. Ennek tartalmaznia kell egy nyilatkozatot az elfogadható megfelelőségi minőségi szintekről és a megfelelő adatminőségi intézkedésekről. Ennek a nyilatkozatnak le kell fednie az összes adatminőségi elemet és adatminőségi alelemet, még akkor is, ha csak azt kell megállapítsa, hogy az adott adatminőségi elem, vagy alelem nem alkalmazható.

Megjegyzés.- Az ISO 19113-as Szabvány a térinformatika számára tartalmaz minőségi alapelveket, miközben az ISO 19114-es szabvány a minőség értékelési eljárásokkal foglalkozik.

10.5.7. A domborzati adattermék részletes leírásának tartalmaznia kell egy adatrögzítési nyilatkozatot, amely a források, valamint a domborzati adatok rögzítésére használt eljárások általános leírása. A részletes leírással együtt a domborzati adatkészletek és akadály adatkészletek karbantartására használt elveket és kritériumokat szintén közzé kell tenni, mellékelve az adattermék frissítésének gyakoriságát is. Különösen fontosak az akadály adatkészletek karbantartására vonatkozó információk, valamint az akadály adatok karbantartására használt elvek, módszerek és kritériumok közlése.

10.5.8. A domborzati adattermék részletes leírásainak információkat kell tartalmaznia arról, hogy a tárolt adatokat hogyan mutatják be az adatkészletekkel, azaz mint grafikus kimenetet, térképpontot, vagy mint egy képet. Mind a domborzati, mind az akadály termék részletes leírásának tartalmaznia kell az adattermék átadási információit is, amelynek meg kell adnia az átadási formátumot és az átadás közvetítő eszközéről, adathordozójáról szóló információkat.

Megjegyzés.- Az ISO 19117-es szabvány tartalmazza annak a sémának a definícióját, amely leírja a földrajzi információk ábrázolását, beleértve a szimbólumok leírásának módszertanát és a séma leképezését egy alkalmazási sémára.

10.5.9. A domborzati és akadály meta-adat alap elemeket mellékelni kell az adattermék részletes leírásához. Bármely biztosítandó kiegészítő meta-adat tételt fel kell tüntetni valamennyi termék részletes ismertetőjében, a meta-adat formátumával és kódolásával együtt.

Megjegyzés.- A ISO 19115 Szabvány határozza meg a térinformatikai meta-adatokkal szemben támasztott követelményeket.

10.6 Hozzáférhetőség

10.6.1. Az Államoknak biztosítaniuk kell, hogy a teljes területükre vonatkozó elektronikus domborzati és akadály adatok hozzáférhetőek legyenek a nemzetközi polgári légiközlekedésben való felhasználásra, a 10.2, 10.3, és 10.4 pontokban meghatározott módon.

10.6.1.1. Az Államoknak 2008. november 20.-tól kezdődően biztosítaniuk kell, hogy elektronikus domborzati és akadály adataik hozzáférhetőek legyenek az 1-es számú Terület részletes leírásának megfelelő módon, valamint a domborzati adataik a 4-es számú Terület részletes leírásának megfelelő módon.

10.6.1.2. Az Államoknak 2010. november 18.-tól kezdődően biztosítaniuk kell, hogy elektronikus domborzati és akadály adataik hozzáférhetőek legyenek az 2-es és 3-as számú Terület részletes leírásának megfelelő módon.

10.6.1.3**. Ajánlás.-** *Az Államoknak lehetőség szerint biztosítaniuk kell, hogy elektronikus domborzati és akadály adataik hozzáférhetőek legyenek az 1-es, 2-es, 3-as számú Terület részletes leírásának megfelelő módon, valamint a domborzati adataik a 4-es számú Terület részletes leírásának megfelelő módon.*

10.6.2. **Ajánlás.-** *Azokon a repülőtereken, amelyek az állam határához közel találhatók, lehetőség szerint az érintett államok között megállapodást kell kötni, hogy a teljes 2-es számú Területre megosztják egymás közt a domborzati és akadály adatokat.*

1. FÜGGELÉK - A LÉGIFORGALMI TÁJÉKOZTATÓ KIADVÁNY (AIP) TARTALMA

(lásd a 4. Fejezetet)

1. RÉSZ - ÁLTALÁNOS TUDNIVALÓK (GEN)

Abban az esetben, ha egy AIP egynél több kötetben készül el, és kerül kibocsátásra, valamint mindegyik kötethez külön módosító és kiegészítő szolgáltatás tartozik, akkor minden egyes kötetnek tartalmaznia kell egy külön bevezetést (előszót), az AIP Módosítások (*Amendments*) jegyzékét, az AIP Mellékletek, Kiegészítések (*Supplements*) jegyzékét, az AIP lapok ellenőrző jegyzékét és a legutóbbi, kézzel bevezetett érvényes módosítások listáját.

GEN 0.1. - Előszó

A Légiforgalmi Tájékoztató Kiadvány (AIP) rövid leírása, mely tartalmazza:
1) a kiadó hatóság nevét;
2) az alkalmazható ICAO dokumentumokat;
3) az AIP felépítését és a rendszeres módosítások meghatározott időszakait; és
4) az AIP-ben lévő hibák, vagy hiányosságok észlelése esetén értesítendő szolgálat megnevezését.

GEN 0.2. - Az AIP Módosítások Nyilvántartása

Módosítások *(Ammendments)* nyilvántartása
Az AIP Módosítások és az AIRAC AIP Módosítások (melyeket az AIRAC rendszer szabályai szerint adtak ki) nyilvántartása a következőket tartalmazza:
1) a módosítás számát;
2) a kiadás dátumát;
3) a beillesztés dátumát (az AIRAC AIP Módosítás esetén a hatálybalépés dátuma); és
4) annak a tisztviselőnek a kézjegye, aki beillesztette a Módosítást.

GEN 0.3. - Az AIP Kiegészítések, Mellékletek Nyilvántartása

Mellékletek (*Supplements*) Nyilvántartása
A kiadott AIP Kiegészítések, Mellékletek jegyzéke a következőket tartalmazza:
1) a Kiegészítés, Melléklet számát;
2) a Kiegészítés, Melléklet tárgyát;
3) az érintett AIP bekezdés(eke)t, fejezeteket;
4) az érvényesség időtartamát; és
5) érvénytelenítési bejegyzést.

GEN 0.4. - Az AIP oldalak Ellenőrzőjegyzéke

Az AIP lapok Ellenőrzőjegyzéke a következőket tartalmazza:
1) oldalszám / térkép megnevezését; és
2) a légiforgalmi tájékoztatás közzétételének, vagy hatálybalépésének dátumát (nap, hónap – névvel megadva, és az év).

GEN 0.5. - Az AIP kézi módosításainak nyilvántartása

Az AIP-be kézzel bevezetett érvényes módosítások nyilvántartása a következőket tartalmazza:
1) az érintett AIP oldal(aka)t;
2) a módosítás szövegét; és

3) annak az AIP Módosításnak a számát, amely értelmében a kézzel végzett módosítást bevezették.

GEN 0.6. - Az 1. Rész tartalomjegyzéke

A 1. Általános részben – (GEN) található fejezetek és alfejezetek listája.
Megjegyzés: - Az alfejezeteket ABC sorrendben is fel lehet sorolni.

GEN 1. - NEMZETI ELŐÍRÁSOK ÉS KÖVETELMÉNYEK

GEN 1.1. - Kijelölt hatóságok

A nemzetközi légiforgalom érdekében dolgozó, annak támogatásában érintett, kijelölt hatóságok (polgári repülési, meteorológiai, vámügyi, bevándorlási, egészségügyi, útvonal - és repülőtéri / helikopter repülőtéri díjakkal, mezőgazdasági karantén ügyekkel foglalkozó, valamint légijármű-baleseteket kivizsgáló) címei, melyek minden egyes hatóságról az alábbiakat tartalmazzák:

1) kijelölt hatóságot;

2) a hatóság nevét;

3) a hatóság postai címét;

4) a telefonszámát;

5) a telefax számát;

6) a telex számát; és

7) a légiforgalmi állandóhelyű szolgálat (AFS) címét.

GEN 1.2. - Légijárművek beléptetése, tranzitálása és kiléptetése

A nemzetközi légiforgalomban résztvevő légijárművek beléptetésével, tranzitálásával és kiléptetésével kapcsolatos előzetes bejelentés és engedélykérés szabályai és követelményei.

GEN 1.3. - Utasok és légijármű személyzetek beléptetése, tranzitálása és kiléptetése

A nem bevándorló utasok és a személyzetek beléptetésével, tranzitálásával és kiléptetésével kapcsolatos rendszabályok (beleértve a vám-, bevándorlási- és karantén szabályokat, valamint az előzetes bejelentés és engedélykérés követelményeit).

GEN 1.4. - Áruszállítmány beléptetése, tranzitálása és kiléptetése

Az áruszállítmányok beléptetésével, tranzitálásával és kiléptetésével kapcsolatos rendszabályok (beleértve a vámszabályokat, valamint az előzetes bejelentés és engedélykérés követelményeit).

Megjegyzés: - a GEN 3.6. (Kutatás és mentés) fejezetben találhatóak részletesen a kutatás, mentés, mentési munkálatok, kivizsgálás, javítás és az eltűnt, vagy sérült repülőgépekkel kapcsolatos mentési munkálatok céljára belépni, vagy indulni szándékozók támogatására szolgáló intézkedések.

GEN 1.5. - Légijármű műszerek, berendezések és repülési dokumentumok.

A légijárművek műszerezettségének, berendezéseinek és repülési dokumentumainak rövid leírása, az alábbiakat beleértve:

1) Műszerezettség, berendezések (ide tartoznak a légijármű kommunikációs és navigációs berendezései), valamint a repülési okmányok, melyeket egy légijármű fedélzetén kell tartani, beleértve minden további szükséges speciális követelményt, az Annex 6 - I. Rész - 6. és 7. Fejezeteiben pontosan meghatározottakon kívül; és

2) Vészrádió, Vészjeladó Rádióállomás (Emergency Locator Transmitter – ELT), jelzőkészülékek és életmentő berendezések, ahogy az Annex 6 - I. Részének - 6.6. pontja és II. Részének - 6.4. pontja tartalmazza ezeket, ha így határoztak a körzeti légiforgalmi értekezleteken a kijelölt szárazföldi területek fölött közlekedő járatok vonatkozásában.

GEN 1.6. - A légiközlekedésre vonatkozó nemzeti jogszabályok és a nemzetközi megállapodások/egyezmények összefoglalása

A légiközlekedésre kihatással bíró nemzeti jogszabályok címeinek, megnevezéseinek és hivatkozásainak listája, valamint ahol alkalmazható összegzésük, együttesen az állam által ratifikált nemzetközi megállapodások / egyezmények, szerződések listájával.

GEN 1.7. - Eltérések az ICAO Szabványoktól, Gyakorlati Ajánlásoktól és Eljárásoktól.

Az Állam nemzeti jogszabályai és gyakorlata, valamint a vonatkozó ICAO rendelkezések között mutatkozó jelentős eltérések listája, beleértve az alábbiakat:

1) az érintett jogszabály /az Annex és a kiadás száma, paragrafus/; és

2) az eltérés, részletes szöveggel.

Ebben az alfejezetben az összes jelentős eltérést fel kell sorolni. Szám szerinti sorrendben kell felsorolni az összes Annex-et még akkor is, ha valamely Annex-el kapcsolatban nincs eltérés – ebben az esetben NIL jelzésről kell gondoskodni. A körzeti kiegészítő eljárásoktól /SUPPS/ való nemzeti eltéréseket, vagy az alkalmazásuktól való eltérés mértékét, közvetlenül azt az Annex-et követően kell közzétenni, mellyel a kiegészítő eljárás összefügg.

GEN 2. - TÁBLÁZATOK ÉS KÓDOK

GEN 2.1. – Mérési rendszer, légijárművek jelzései, ünnepnapok

GEN 2.1.1 – Mértékegységek

Az alkalmazott mértékegységek leírása, beleértve a mértékegységek táblázatát.

GEN 2.1.2. – Időbeli referencia rendszer

Az alkalmazott időbeli vonatkozási rendszer leírása (naptár és időrendszer), valamint annak jelzése, hogy alkalmaznak-e, vagy sem nyári időszámítást a nappali órák számának növelésére, és annak feltüntetése, hogy az időbeli referencia rendszert milyen módon mutatták be az AIP anyagaiban.

GEN 2.1.3. – Vízszintes referencia rendszer

A felhasznált vízszintes (geodéziai) vonatkozási rendszer rövid leírása, beleértve az alábbiakat:

1) a referencia rendszer megnevezése/meghatározása;

2) a projekció azonosítása;

3) a felhasznált ellipszoid azonosítása;

4) a felhasznált alapadat (*datum*) azonosítása

5) az alkalmazás területe(i); és

6) ha alkalmazható, akkor magyarázat azoknak a koordinátáknak csillaggal való jelölésére, melyek nem elégítik ki a 11. Annex, és 14. Annex követelményeit.

GEN 2.1.4 – Függőleges referencia rendszer

A használatban lévő függőleges referencia rendszer rövid leírása, beleértve a következőket:

1) a referencia rendszer megnevezése/meghatározása;

2) a felhasznált geoid (földalak) modell meghatározása, mellékelve azokat a paramétereket, amelyek a felhasznált modell és az EGM-96 közötti magassági transzformációhoz szükségesek; és

3) magyarázat, amennyiben alkalmazható, azoknak a tengerszint feletti magasság / geoid egyenetlenségek csillaggal való jelölésére, melyek nem elégítik ki a 14. Annex követelményeit.

GEN 2.1.5. - Légijárművek nemzeti hovatartozásának és lajstromozásának jelzései

A légijármű nemzeti hovatartozásának és lajstromozásának az adott Állam által elfogadott jelzései.

GEN 2.1.6. - Hivatalos Ünnepnapok

A hivatalos munkaszüneti napok listája, valamint annak feltüntetése, hogy ez mely szolgálatokat érinti.

GEN 2.2. – Az AIS kiadványokban használt rövidítések

Az Állam által kiadott Légiforgalmi Tájékoztató Kiadványokban és a szétosztásra kerülő légiforgalmi tájékoztatásokban/adatokban használt rövidítésekből ABC sorrendben összeállított lista, a jelentésükkel, megfelelő magyarázatokkal ellátva azokkal a nemzeti rövidítésekkel, amelyek eltérnek a "Légiforgalmi Szolgálatok Eljárásai – ICAO Rövidítések és Kódok *(Procedures for Air Navigation Services – ICAO abbreviations and Codes - PANS-ABC, Doc 8400)*" című kiadványban leírtaktól.

Megjegyzés.- Ezt ki lehet még egészíteni egy ABC sorrendbe szedett meghatározások listájával / szakkifejezések magyarázatos szójegyzékével.

GEN 2.3. – A térképeken használt jelek

A térképeken használt jelek listája, azon térkép-sorozatok alapján sorba rendezve, amelyeken a jeleket alkalmazták.

GEN 2.4. - Helységnév azonosítók

A légiforgalmi állandóhelyű állomások helymeghatározására kijelölt helységnév-azonosítók ABC sorrendbe szedett listája kódolás és dekódolás céljára. Biztosítani kell a Légiforgalmi Állandóhelyű Szolgálattal /AFS-el/ összeköttetésben nem álló helységnév-azonosítókra való hivatkozást.

GEN 2.5. – Rádiónavigációs berendezések felsorolása

A rádiónavigációs berendezések ABC sorrendbe szedett listája, mely az alábbiakat tartalmazza:

1) azonosító;

2) az állomás neve;

3) a létesítmény/berendezés típusa;

4) hogy a berendezés milyen célokat szolgál: útvonal (E), repülőtér (A), vagy mindkettő (AE).

GEN 2.6. – Átszámítási táblázatok

Átszámításra használt táblázatok az alábbi mértékegységek között:

1) tengeri mérföldről kilométerre, és viszont;

2) lábról méterre, és viszont;

3) decimális ívpercek és ívmásodpercek, oda-vissza;

4) más átszámítási táblázatok, értelemszerűen.

GEN 2.7. – Napkelte / napnyugta táblázatok

A napkelte/napnyugta táblázatokban megadott időpontok meghatározására felhasznált kritériumok rövid, vázlatos leírása, azoknak a helyeknek ABC sorrendbe szedett listájával, melyekre az időpontokat megadták a táblázatban, hivatkozással a vonatkozó oldalakra, valamint a kiválasztott állomások/helyek számára a napkelte/napnyugta táblázatok, beleértve:

1) az állomás nevét;

2) az ICAO helységnév azonosítót;

3) a földrajzi koordinátákat fokokban és percekben megadva;

4) az(ok) a dátum(ok), amely(ek)re az időpontokat megadták;

5) a hajnali polgári szürkület kezdetének időpontja;

6) a napkelte időpontja;

7) a napnyugta időpontja; és

8) az esti polgári szürkület végének időpontja;

GEN 3. – SZOLGÁLATOK

GEN 3.1. – Légiforgalmi Tájékoztató Szolgálat

GEN 3.1.1. – Felelős, illetékes szolgálat

A rendelkezésre bocsátott Légiforgalmi Tájékoztató Szolgálat (AIS) és a főbb összetevőinek leírása, beleértve:

1) a szolgálat/egység nevét;

2) postai címét;

3) telefonszámát;

4) telefax-számát;

5) telex-számát;

6) AFS címét;

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták, és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket; és

8) annak jelzése, ha a szolgálat nem folyamatos (H24) üzemű;

GEN 3.1.2. Illetékesség, hatáskör

A Légiforgalmi Tájékoztató Szolgálat illetékessége, hatásköre.

GEN 3.1.3 – Légiforgalmi Kiadványok

Az Integrált Légiforgalmi Tájékoztatási Csomag (*Integrated Aeronautical Information Package*) elemeinek leírása, beleértve az alábbiakat:

1) AIP és a hozzá kapcsolódó módosító (*amendment*) szolgálat;

2) AIP Kiegészítések (*Supplements*);

3) AIC (Légiforgalmi Tájékoztató Körlevél - *Aeronautical Information Circular*);

4) NOTAM és repülés előtti tájékoztató bulletin (PIB – *Pre-flight Information Bulletins*);

5) az érvényben lévő NOTAM-ok ellenőrző listái és összesítései;

6) hogyan lehet ezeket beszerezni.

Amikor egy AIC-t használnak arra, hogy a kiadványok árát közzétegyék, akkor ezt az AIP ezen fejezetében kell jelezni.

GEN 3.1.4. - AIRAC (A Légiforgalmi Tájékoztató Közlemények Meghatározott Kiadási Rendje – *Aeronautical Information Regulation and Control*) rendszer

Az adott AIRAC rendszer rövid leírása, mellékelve egy táblázatot a jelenlegi és a közeljövőre vonatkozó AIRAC kiadási dátumokkal.

GEN 3.1.5. - Repülés előtti tájékoztató szolgálat a repülőtereken / helikopter repülőtereken
Azoknak a repülőtereknek / helikopter repülőtereknek a listája, amelyeken a repülés előtti tájékoztatás rutinszerűen rendelkezésre áll, beleértve az alábbi lényeges dolgok feltüntetését:

1) az Integrált Légiforgalmi Tájékoztató Csomag rendelkezésre álló elemei;

2) a rendelkezésre álló térképek és részletes navigációs térképek;

3) az ilyen jellegű adatok általános érvényességi területe.

GEN 3.1.6. - Elektronikus terep és akadály adat

Az elektronikus terep és akadály adat beszerzésének részletei, tartalmazva a következőket:

1) a felelős személy, szolgálat, vagy szervezet nevét;

2) a felelős személy, szolgálat, vagy szervezet postai címét és internet (e-mail) címét;

3) a felelős személy, szolgálat, vagy szervezet telefax számát;

4) a felelős személy, szolgálat, vagy szervezet elérhetőségi telefonszámát;

5) a szolgálat elérhetőségének idejét (idő tartam, beleértve az időzónát, amikor a kapcsolatot fel lehet venni);

6) folyamatos (on-line) tájékoztatás, ami felhasználható a személy, a szolgálat, vagy a szervezet felé történő kapcsolatfelvételre; és

7) kiegészítő információ, ha szükséges, annak érdekében, hogy hogyan és mikor lehet a személlyel, a szolgálattal, vagy a szervezettel a kapcsolatot felvenni.

GEN 3.2. – Légiforgalmi térképek

GEN 3.2.1. – Felelős szolgálat(ok)

A légiforgalmi térképek előállításáért felelős szolgálat(ok) leírása, beleértve:

1) a szolgálat nevét;

2) postai címét;

3) telefonszámát;

4) telefax-számát;

5) telex-számát;

6) az AFS-címét;

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket; és

8) annak jelzése, ha a szolgálat nem folyamatos (H24) üzemű;

GEN 3.2.2. – A térképek naprakészen tartása, karbantartása

Rövid leírása annak, hogy a navigációs térképeket hogyan vizsgálják felül, és hogyan módosítják.

GEN 3.2.3. – A beszerzés lehetőségei

Részletes ismertetése annak, hogy a térképeket hogyan lehet beszerezni, mely az alábbiakat tartalmazza:

1) a szolgálat(ok)at / az árusítással megbízott szervezet(ek)et;

2) postai címeket;

3) telefonszámot;

4) telefax-számot;

5) telex-számot; és

6) AFS címet.

GEN 3.2.4. – A rendelkezésre álló légiforgalmi térkép sorozatok

A rendelkezésre álló légiforgalmi térkép sorozatok listája, továbbá minden egyes sorozat általános leírása és a lehetséges felhasználás megjelölése:

GEN 3.2.5. – A rendelkezésre álló légiforgalmi térképek listája

A rendelkezésre álló légiforgalmi térképek listája, mely az alábbiakat tartalmazza:

1) a térképsorozat címe;

2) a térképsorozat léptéke;

3) egy sorozat minden egyes térképének, vagy a sorozat minden egyes lapjának az elnevezése és/vagy a száma;

4) az ár, laponként számítva; és

5) a legutóbbi módosítás dátuma.

GEN 3.2.6. – A World Aeronautical Chart (WAC) – A Léginavigációs Világtérkép indextérképe ICAO – 1 : 1 000 000

Ez egy indextérkép, mely egy Állam által kiadott WAC 1 : 1 000 000 térkép fedésterületét és lapjainak beosztását, tördelését mutatja be.
Ha ICAO – 1: 500 000-es Léginavigációs Térképet adnak ki a WAC –1 : 1 000 000-as helyett, akkor az ICAO – 1: 500 000-es Léginavigációs Térkép fedésterületét és lapjainak beosztását, tördelését kell az indextérképen bemutatni.

GEN 3.2.7. – Topográfiai térképek

Annak részletes ismertetése, hogy hogyan lehet hozzájutni a topográfiai térképekhez. A következőket tartalmazza:

1) a szolgálat(ok)/szervezet(ek) megnevezését;

2) postai címet;

3) telefonszámot;

4) telefax számot;

5) telex számot; és

6) AFS címet.

GEN 3.2.8. – Az AIP-ben nem szereplő navigációs térképek javítása

Az AIP-ben nem szerepeltetett navigációs térképeken végrehajtott javítások felsorolása, vagy annak közlése, hogy hol lehet az ilyen információkat beszerezni.

GEN 3.3. – ATS - Légiforgalmi Szolgálatok

GEN 3.3.1. – Felelős szolgálat

A légiforgalmi szolgálat és annak nagyobb részeinek leírása, beleértve:

1) a szolgálat megnevezését;

2) postai címét;

3) telefonszámát;

4) telefax-számát;

5) telex-számát;

6) AFS-címét;

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták, és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket; és

8) annak jelzése, ha a szolgálat nem folyamatos (H24) üzemű;

GEN 3.3.2. – Illetékesség, hatáskör

A légiforgalmi szolgálatok illetékességének, hatáskörének rövid leírása, amiért a szolgálatokat létesítették.

GEN 3.3.3. – A szolgálatok típusai

A biztosított légiforgalmi szolgálatok főbb típusainak rövid leírása.

GEN 3.3.4. – A járatók (üzemeltetők) és az ATS közötti koordinálás

Általános feltételek, melyek mellett a járatók (üzemeltetők) és az ATS szolgálatok közötti koordináció létrejön.

GEN 3.3.5. – Minimális tengerszint feletti repülési magasságok

A minimális tengerszint feletti repülési magasságok meghatározásához használt kritériumok.

GEN 3.3.6. – ATS egységek címjegyzéke

Az ATS egységek és címük listája ABC sorrendbe szedve, mely az alábbiakat tartalmazza:

1) az egység megnevezését;

2) postai címét;

3) telefonszámát;

4) telefax-számát;

5) telex-számát; és

6) AFS-címét;

GEN 3.4. – Hírközlési Szolgálatok

GEN 3.4.1. – Illetékes szolgálat

A hírközlési és a navigációs berendezések biztosításáért felelős szolgálat leírása, beleértve az alábbiakat:

1) a szolgálat megnevezését;

2) postai címet;

3) telefonszámot;

4) telefax-számot;

5) telex-számot;

6) AFS- címet;

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták, és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket; és

8) annak jelzése, ha a szolgálat nem folyamatos (H24) üzemű;

GEN 3.4.2. – Illetékesség, hatáskör

Annak a hatáskörnek a rövid leírása, melynek számára a Hírközlési Szolgálatot biztosítják.

GEN 3.4.3. – A szolgálatok típusai

A szolgálat és szolgáltatások, berendezések főbb típusainak rövid leírása, beleértve:

1) rádiónavigációs szolgálatokat;

2) mozgó szolgálatot;

3) rádióadó szolgálatot;

4) a felhasznált nyelve(ke)t; és

5) annak közlését, hogy hol szerezhető be részletes információ.

GEN 3.4.4. – Követelmények és feltételek

Azoknak a követelményeknek és feltételeknek a rövid leírása, melyek alapján a hírközlési szolgálat rendelkezésre áll.

GEN 3.5. – Meteorológiai szolgálatok

GEN 3.5.1. – Illetékes szolgálat

A meteorológiai szolgálat biztosításáért felelős meteorológiai szolgálat rövid leírása, beleértve az alábbiakat:

1) a szolgálat megnevezését;

2) postai címét;

3) telefonszámát;

4) telefax-számát;

5) telex-számát;

6) AFS-címét;

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták, és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket; és

8) annak jelzése, ha a szolgálat nem folyamatos (H24) üzemű;
GEN 3.5.2. – Illetékesség, hatáskör

Annak a körzetnek és/vagy útvonalaknak a rövid leírása, melyek számára a meteorológiai szolgálatot biztosítják.

GEN 3.5.3. – Meteorológiai megfigyelések és jelentések

A nemzetközi légiforgalom számára biztosított meteorológia megfigyelések és jelentések részletes leírása, beleértve az alábbiakat:

1) az állomás neve és ICAO helységnév azonosítója;

2) a megfigyelés típusa és gyakorisága, az automatikus megfigyelő berendezés megnevezésével együtt;

3) a meteorológiai jelentések típusai (pl. METAR) és a "trend" típusú leszállási előrejelzés hozzáférhetősége;

4) A talaj menti szél, a látástávolság, a futópálya menti látástávolság, a felhőalap, a hőmérséklet és ahol alkalmazható a szélnyírás (pl. *anemometer* /szélsebességmérő/ a futópályák kereszteződésében, *transmissometer* /látástávolság-mérő/ a földetérési pont közelében) megfigyelésére, észlelésére és jelentésére használt megfigyelési rendszer meghatározott típusa és a megfigyelési pontok száma;

5) a szolgálat üzemideje; és

6) a rendelkezésre álló légiforgalmi klimatológiai tájékoztatások megjelölése.

GEN 3.5.4. A szolgálatok típusai

A biztosított szolgálatok, szolgáltatások főbb típusainak rövid leírása, részletesen ismertetve az eligazítást, a szaktanácsadást (konzultációt), a meteorológiai információk bemutatását, az üzemeltetők és a hajózó személyzetek számára rendelkezésre álló repülési dokumentációt, valamint azokat a módszereket és eszközöket, amelyeket a meteorológiai információ szolgáltatására alkalmaznak és használnak.

GEN 3.5.5. – A járatóktól (üzemeltetőktől) megkövetelt értesítések

Az a minimális mennyiségű előzetes értesítés, bejelentés, amit a meteorológiai hatóság megkíván az üzemeltetőktől az eligazítás, a szaktanácsadás (konzultáció) és a repülési dokumentáció tekintetében, és egyéb olyan meteorológiai információ, amit megkövetelnek, vagy kicserélnek.

GEN 3.5.6. – Légijárművektől származó jelentések

Szükség szerint a meteorológiai hatóság követelményei a légijárművekről származó jelentések összeállításáról és továbbításáról.

GEN 3.5.7. – VOLMET szolgálat

A VOLMET szolgáltatás leírása, az alábbiakat beleértve:

1) az adó állomás neve:

2) hívójel, vagy azonosító és a rádióadásban használt rövidítések;

3) az sugárzásra használt frekvencia, vagy frekvenciák;

4) az adási időszakok;

5) üzemidő;

6) azoknak a repülőtereknek/helikopter repülőtereknek a listája, amelyek számára a jelentéseket és/vagy előrejelzéseket kiadják; és

7) a kiadott jelentések, előrejelzések, valamint a SIGMET tájékoztatások és a megjegyzések.

GEN 3.5.8. – SIGMET és AIRMET szolgálat

A légiforgalmi szolgálattal ellátott Repüléstájékoztató Körzeten, vagy irányítói körzeten belül biztosított meteorológiai megfigyelések leírása, beleértve a meteorológiai megfigyelő állomások listáját, az alábbiakkal:

1) meteorológiai megfigyelő állomás neve és ICAO helységnév azonosítója;

2) üzemidő;

3) a kiszolgált Repüléstájékoztató Körzet(ek), vagy irányítói körzet(ek);

4) a kiadott SIGMET tájékoztatások típusai (SIGMET, SST SIGMET) és az érvényességi időszakok;

5) a SIGMET tájékoztatással kapcsolatban alkalmazott meghatározott eljárások (pl. vulkáni hamu, trópusi ciklon);

6) az AIRMET tájékoztatás eljárásai (a vonatkozó körzeti légiforgalmi egyezményekkel, megállapodásokkal összhangban);

7) a SIGMET és AIRMET tájékoztatásokkal ellátott légiforgalmi szolgálati egység(ek); és

8) kiegészítő információk (pl. a szolgáltatás bármilyen jellegű korlátozását illetően, stb.).

3.5.9. – Egyéb automatizált meteorológiai szolgáltatások

A rendelkezésre álló, meteorológiai információkat biztosító, automatizált szolgáltatások leírása (pl. telefon és/vagy számítógépes modem útján elérhető automatizált repülés előtti tájékoztató szolgáltatás), amely az alábbiakat tartalmazza:

1) a szolgálat nevét;

2) a rendelkezésre álló tájékoztatásokat;

3) az érintett körzeteket, útvonalakat és repülőtereket; és

4) telefon-, telex - és fax számo(ka)t.

GEN 3.6. – Kutatás és mentés

GEN 3.6.1. – Illetékes szolgálat(ok)

A kutatás és mentés (SAR – *Search and Rescue*) biztosításáért felelős szolgálat(ok) rövid leírása, amely tartalmazza az alábbiakat:

1) a szolgálat/egység nevét;

2) postai címet;

3) telefonszámot;

4) telefax számot;

5) telex számot;

6) AFS címet; és

7) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálat munkáját alapozták, és utalást arra az AIP részre, ahol, ha vannak, felsorolták az eltéréseket;

GEN 3.6.2. – Illetékesség, hatáskör

Annak az illetékességi területnek a rövid leírása, amelyen belül kutató és mentő szolgálatot biztosítanak.

GEN 3.6.3. – A szolgálat típusai

Ahol alkalmazható, a biztosított szolgálat és szolgáltatások, eszközök rövid leírása és földrajzi ábrázolása, beleértve annak jelzését, hogy a SAR szolgálat légi fedésterülete hol függ a légijárművek jelentős mértékű letelepítésétől.

GEN 3.6.4. – SAR megállapodások, egyezmények

A pillanatnyilag érvényben lévő SAR megállapodások, egyezmények rövid leírása, beleértve azokat az előkészületeket, melyeket, akár csak a felszállást követő közvetlen bejelentéssel, vagy a repülési terv benyújtása után, más Államok légijárművei kutatás, mentés, anyagi javak mentése, elveszett, vagy megsérült légijárművel kapcsolatos javítás, vagy anyagi javak, rakomány mentése céljából történő belépésének és indulásának elősegítésére tettek.

GEN 3.6.5. – A felhasználhatóság feltételei

A kutatással és mentéssel kapcsolatos előkészületek, intézkedések rövid leírása. Tartalmazza azokat az általános feltételeket, melyek alapján a szolgálat és eszközei a nemzetközi légiforgalom számára hozzáférhető. Tartalmazza annak jelzését is, hogy vajon a kutatás, mentés részére rendelkezésre bocsátott eszközök, szolgáltatások a SAR feladatokra és szerepekre specializáltak, vagy egyébként más célra használatosak, de kiképzéssel és megfelelő eszközök, felszerelés segítségével alkalmassá tették SAR célokra is, vagy csak alkalomszerűen állnak rendelkezésre és nem képezték ki, vagy készítették fel az adott SAR munkára.

GEN 3.6.6. – Alkalmazott eljárások és jelzések

A mentésben résztvevő légijármű által alkalmazott eljárások és jelzések rövid leírása és egy táblázat, amely a túlélők által használandó jelzéseket mutatja be.

GEN4. – REPÜLŐTEREK / HELIKOPTER REPÜLŐTEREK ÉS LÉGINAVIGÁCIÓS SZOLGÁLATOK HASZNÁLATI DÍJAI

Ha ebben a fejezetben nem szerepelnek részletesen, akkor itt adhatják meg, hogy hol található a pillanatnyi díjak részletes ismertetése.

GEN 4.1. – R epülőtereken / helikopter repülőtereken fizetendő díjak

A nemzetközi forgalomban használható repülőtereken / helikopter repülőtereken alkalmazható díjak típusainak rövid leírása, beleértve az alábbiakat:

1) *a légijármű leszállását;*

2) *légijármű parkolását, hangárban történő elhelyezését és hosszú ideig tartó tárolását;*

3) *utasokkal kapcsolatos szolgáltatások díjait;*

4) *a biztonsággal kapcsolatos díjakat;*

5) *zajjal kapcsolatos díjakat;*

6) *egyéb díjakat (vám, egészségügy, bevándorlás, stb.);*

7) *kivételeket / engedményeket; és*

8) *fizetési módozatokat.*

GEN 4.2. – A léginavigációs / légiforgalmi szolgálatokért fizetendő díjak

A nemzetközi használatra biztosított léginavigációs / légiforgalmi szolgálatokért kiróható díjak rövid leírása, beleértve az alábbiakat:

1) *a bevezető irányítást;*

2) *az útvonalon biztosított léginavigációs / légiforgalmi szolgálatokat;*

3) *a léginavigációs / légiforgalmi szolgálatok költség alapját, valamint a kivételeket / engedményeket; és*

4) *a fizetési módozatokat.*

2. RÉSZ - ENR (EN-ROUTE) ÚTVONALREPÜLÉS

Abban az esetben, ha egy AIP egynél több kötetben készül el, és kerül kibocsátásra, valamint mindegyik kötethez külön módosító és kiegészítő szolgáltatás tartozik, akkor minden egyes kötetnek tartalmaznia kell egy külön bevezető részt (előszót), az AIP Módosítások (*Amendments*) jegyzékét, az AIP Kiegészítések (*Supplements*) jegyzékét, az AIP lapok ellenőrző jegyzékét és a legutóbbi, kézzel bevezetett érvényes módosítások listáját. Abban az esetben, ha az AIP-t egyetlen kötetben adták ki, a "Nem alkalmazható" jelzéssel kell ellátni az előbb felsorolt összes alfejezetet.

A megfelelő alfejezetben jelezni kell, ha a nemzeti szabályozás, valamint az ICAO SARP-ok (Nemzetközi Szabványok és Gyakorlati Ajánlások) és eljárások között eltérés áll fenn, és hogy ezek részletes ismertetése a GEN 1.7 részben található.

ENR 0.6. - A 2. Rész tartalomjegyzéke

A 2. Részben (*En-route* - Útvonalrepülés) található fejezetek és alfejezetek jegyzéke.
Megjegyzés: - Az alfejezetek felsorolását ABC sorrendben is meg lehet adni.

ENR 1. - ÁLTALÁNOS SZABÁLYOK ÉS ELJÁRÁSOK

ENR 1.1. - Általános szabályok

Az általános szabályok közzétételét úgy követelik meg, ahogy azt az Államon belül alkalmazzák.

ENR 1.2. – VFR – Látvarepülési Szabályok

A Látvarepülési Szabályok közzétételét úgy követelik meg, ahogy azt az Államon belül alkalmazzák.

ENR 1.3. – IFR – Műszerrepülési Szabályok

A Műszerrepülési Szabályok közzétételét úgy követelik meg, ahogy azt az Államon belül alkalmazzák.

ENR 1.4. – ATS légterek osztályozása

Az ATS légtér osztályok leírása, a 11. Annex, 4. Függelékében található ATS légtér osztályba-sorolási táblázat formájában, megfelelő módon megjelölve azokat a légtér osztályokat, melyeket az Állam nem használt fel.

ENR 1.5. – Várakozási, megközelítési (érkezési) és indulási eljárások

ENR 1.5.1. – Általános szabályok

Azokat a kritériumokat kell ebben a pontban nyilvánosságra hozni, melyekre a várakozási, megközelítési (érkezési) és indulási eljárásokat kidolgozták. Ha ezek eltérnek az ICAO által előírtaktól, akkor táblázatos formában kell közzétenni a felhasznált kritériumokat.

ENR 1.5.2. – Érkező légijárművek

Azoknak az eljárásoknak (hagyományos, vagy területi navigációs, vagy mindkettő) a közzétételét követelik meg az érkező légijárművek számára, melyek közösek az azonos típusú légtérbe belépő, vagy az abban a légtérben repülő légijárművek számára. Ha eltérő eljárásokat alkalmaznak a Közelkörzetben, ezt a tényt jelezni kell, utalással arra, hogy az adott eljárásokat hol lehet megtalálni.

ENR 1.5.3. – Induló légijárművek

Az induló légijárművek számára azoknak az eljárásoknak (hagyományos, vagy területi navigációs, vagy mindkettő) a közzétételét követelik meg, melyek közösek bármely repülőtérről / helikopter repülőtérről felszálló légijármű számára.

ENR 1.6. – Radar szolgálatok és eljárások

ENR 1.6.1 – Elsődleges radar

Az elsődleges radar szolgálatok és eljárások leírása, beleértve az alábbiakat:

1) kiegészítő, pótlólagos szolgálatok;

2) a radar irányító szolgálat alkalmazása;

3) radar - és rádióhiba esetén alkalmazandó eljárások; és

4) a radar fedésterületének grafikus ábrázolása.

ENR 1.6.2. – Másodlagos Légtérellenőrző Radar (SSR)

A Másodlagos Légtérellenőrző Radar üzemeltetési eljárásainak részletes leírása, az alábbiakat beleértve:

1) kényszerhelyzeti eljárások;

2) rádióhiba és jogellenes beavatkozás esetén követendő eljárások;

3) a másodlagos kód kijelölésének rendszere;

4) az SSR radar fedésterületének grafikus ábrázolása;

Megjegyzés - Másodlagos Ellenőrző Radar eljárások leírása különös fontossággal bír azokon a területeken, vagy útvonalakon, ahol az elfogás lehetősége fennáll.

ENR 1.7. – Magasságmérő beállítási eljárások

Megkövetelik az alkalmazott magasságmérő beállítási eljárások közzétételét, az alábbiakat beleértve:

1) rövid bevezetés azoknak az ICAO dokumentumoknak a bemutatásával, melyekre az eljárásokat alapozták, valamint az ICAO előírásaitól való eltérések, ha vannak ilyenek;

2) alapvető magasságmérő beállítási eljárások;

3) magasságmérő beállítási körzet(ek) leírása;

4) A járatók (üzemeltetők) (beleértve a pilóták) által alkalmazható eljárások; és

5) az utazómagasságok táblázata;

ENR 1.8. – Regionális kiegészítő eljárások

Megkövetelik a teljes illetékességi területet érintő körzeti kiegészítő eljárások (SUPPS) közzétételét, kiegészítve a pontosan bemutatott nemzeti eltérésekkel, ha vannak ilyenek.

ENR 1.9. – Légiforgalmi áramlásszervezés

A Légiforgalmi áramlásszervezés (ATFM) rendszerének rövid ismertetése, az alábbiakat beleértve:
1) Az ATFM felépítése, a szolgálat illetékességi területe, a biztosított szolgálatok, az egység(ek) helye és az üzemidejük;

2) az áramlás-szervezésben használatos üzenetek típusai, valamint a formátumok leírása; és

3) az induló légijárművek számára alkalmazandó eljárások, az alábbiakat tartalmazva:

a) az alkalmazott ATFM intézkedésekkel kapcsolatos információ biztosításáért felelős szolgálat;

b) repülési tervvel kapcsolatos követelmények; és

c) résidő kiosztás.

ENR 1.10. – Repülés tervezés

Megkövetelik a repülés tervezési szakaszához kapcsolódó minden olyan megszorítás, korlátozás, vagy tanácsadó információ közzétételét, amely a felhasználó segítségére lehet a tervezett repülés bejelentésében, beleértve az alábbiakat:

1) a repülési terv benyújtásának eljárásai;

2) az ismétlődő repülési terv rendszere; és

3) a benyújtott repülési tervben szereplő adatok megváltoztatása.

ENR 1.11. – A repülési terv közlemények címzése

Megkövetelik a repülési tervekben alkalmazható címek közzétételét táblázatos formában, bemutatva az alábbiakat:

1) a repülés kategóriája (IFR, VFR, vagy mindkettő);

2) útvonal (a FIR-be, vagy a FIR-en keresztül és/vagy a TMA-ba, vagy azon keresztül);

3) közlemény címe;

ENR 1.12. – Polgári légijárművek elfogása

Megkövetelik az alkalmazandó elfogási eljárások és vizuális jelzések maradéktalan közzétételét, valamint egyértelműen jelezni kell, hogy alkalmazzák-e az ICAO rendelkezéseket, ha nem, akkor az eltéréseket részletesen be kell mutassák.

ENR 1.13. – Jogellenes beavatkozás

Megkövetelik a jogellenes beavatkozás esetén alkalmazandó, megfelelő eljárások közzétételét.

ENR 1.14. – Légiforgalmi váratlan események

A légiforgalmi események jelentési rendszerének leírása, mely az alábbiakat tartalmazza:

1) a légiforgalmi események részletes leírása;

2) a "Légiforgalmi események jelentésére használt formanyomtatvány", ("*Air Traffic Incident Reporting Form*") használata;

3) az események jelentésének eljárásai (beleértve a repülés közbeni eljárásokat is); valamint

4) a jelentés célját és a formanyomtatvány kezelését.

ENR 2. – A LÉGIFORGALMI SZOLGÁLATOK LÉGTEREI

ENR 2.1. – FIR, UIR, TMA

A repüléstájékoztató körzetek (*FIR - Flight Information Region*), magaslégtéri repüléstájékoztató körzetek (*UIR - Upper Flight Information Region*), közelkörzetek (*TMA - Terminal Control Area*) részletes leírása, beleértve az alábbiakat:

1) a FIR/UIR neve, oldalhatárainak földrajzi koordináta pontjai fokokban, percekben, a TMA oldalhatárai fokokban, percekben és másodpercekben megadva, függőleges határaik és a légterek osztályba sorolása;

2) a szolgálatot biztosító egység azonosítása;

3) az egységet kiszolgáló légiforgalmi állomás hívójele, a használatos nyelv(ek), a terület és a feltételek pontos meghatározása, hogy mikor és hol használandó, ha alkalmazható;

4) a frekvenciák, kiegészítve a konkrét célok megjelölésével; és

5) megjegyzések.

A katonai légitámaszpontok körül található, az AIP-ben egyébként más módon le nem írt repülőtéri irányítói körzeteket (*Control Zone*) ebben az alfejezetben kell megadni. Azokon a területeken, ahol a 2. Annex a repülési tervekkel, a kétirányú összeköttetéssel és a helyzetjelentéssel kapcsolatos követelményei az összes járatra vonatkoznak, annak érdekében, hogy kiküszöböljék, vagy csökkentsék az elfogások szükségességét, és/vagy ahol az elfogás lehetősége fennáll és szükséges a folyamatos figyelés a 121.5 MHz kényszerhelyzeti frekvencián, akkor ezt a tényt a vonatkozó terület(ek)ről, vagy azoknak részé(i)ről itt kell közölni.

Azon kijelölt területek részletes leírása, amelyek felett szükséges egy kényszerhelyzeti Vészjeladó Rádióállomás megléte a fedélzeten (*ELT - Emergency Locator Transmitter*), és ahol a légijárművek személyzeteinek folyamatosan figyelniük kell a 121.5 MHz kényszerhelyzeti URH frekvencián, kivéve azokat az időszakokat, amikor a légijármű személyzete más URH csatornákon kommunikál, vagy amikor a fedélzeti berendezésekre érvényes korlátozások, vagy a pilótafülkében elvégzendő feladatok nem teszik lehetővé a két csatorna egyidejű figyelését.

Megjegyzés.- A repülőterek / helikopter repülőterek körüli más légtér-típusok leírása, mint amilyenek a repülőtéri irányító körzetek és a repülőtéri forgalmi körzetek, a vonatkozó repülőtéri, vagy helikopter repülőtéri fejezetben található.

ENR 2.2. – Egyéb, szabályozott légterek

Ahol ilyeneket létesítettek, a szabályozott légtér egyéb típusainak részletes leírása, valamint a légtér osztályozása.

ENR 3. - ATS ÚTVONALAK

Megjegyzés 1.- A rádióirányszögeket, az útirányszögeket és a radiálokat általában a mágneses északhoz viszonyítva adják meg. Az egyenlítőtől távolabb található területek esetében, ahol az illetékes hatóság megállapítása szerint a mágneses északhoz való viszonyítás gyakorlatilag nem alkalmazható, más alkalmas vonatkozatást, pl. a földrajzi északot, vagy a koordináta-háló szerinti északi irányt lehet használni.

Megjegyzés 2.- Két rádiónavigációs berendezés közötti távolság felénél kijelölt, vagy olyan útvonal esetében, amelynek iránya a navigációs berendezések között módosul, a két radiál kereszteződésénél kijelölt átkapcsolási pontot nem kell feltüntetni minden egyes útvonalszakasz vonatkozásában, amennyiben ezen pontok létezését általános formában közlik.

ENR 3.1. – Alacsony légtéri ATS útvonalak

Az alacsony légtéri ATS útvonalak részletes leírása, beleértve az alábbiakat:

1) az útvonal megjelölése, a meghatározott útvonalszakaszo/ko/n alkalmazható Megkövetelt Navigációs Teljesítőképesség (RNP – *Required Navigation Performance*) típus(ok), az útvonalat meghatározó valamennyi fontos pont neve, kódolt megjelölése vagy név-kódja, és földrajzi koordinátái fokokban, percekben és másodpercekben megadva, beleértve a "kötelező" és "kérésre közlendő" jelentőpontokat is;

2) útirányszögek, vagy VOR radiálok, kerekítve a legközelebbi fokra, geodetikus távolságok (*geodesic distance*)[32]* a legközelebbi 1/10 kilométerre, vagy tengeri mérföldre kerekítve, minden egymást követő kijelölt fontos pont között, valamint a VOR radiálok esetén az átkapcsolási pontok között;

3) felső és alsó határok, vagy a minimális tengerszint feletti repülési magasságok kerekítve a következő felette lévő 50 méterre, vagy 100 lábra, valamint a légtér osztályba-sorolása;

4) oldalhatárok;

5) az utazó magasságok (repülési szintek) iránya; és

6) megjegyzések, beleértve az irányító egység megjelölését, valamint üzemi frekvenciáját.

Megjegyzés.- a 11. Annex, 1. Függelékével összefüggésben és repüléstervezési célokra, a meghatározott RNP (Megkövetelt Navigációs Teljesítőképesség) típust nem tekintik az útvonal megnevezés szerves részének.

ENR 3.2. – Felső légtéri ATS útvonalak

A felső légtéri ATS útvonalak részletes leírása, beleértve az alábbiakat:

1) az útvonal megjelölése, a meghatározott útvonalszakaszo/ko/n alkalmazható Megkövetelt Navigációs Teljesítőképesség (RNP – *Required Navigation Performance*) típus(ok), az útvonalat meghatározó valamennyi fontos pont neve, kódolt megjelölése vagy név-kódja, és földrajzi koordinátái fokokban, percekben és másodpercekben megadva, beleértve a "kötelező" és "kérésre közlendő" jelentőpontokat is;

2) útirányszögek, vagy VOR radiálok, kerekítve a legközelebbi fokra, geodetikus távolságok (*geodesic distance*)[33]* a legközelebbi 1/10 kilométerre, vagy tengeri mérföldre kerekítve, minden egymást követő kijelölt fontos pont között, valamint a VOR radiálok esetén az átkapcsolási pontok között;
3) felső és alsó határok, valamint a légtér osztályba-sorolása;

4) oldalhatárok;

5) az utazó magasságok (repülési szintek) iránya;

6) megjegyzések, beleértve az irányító egység megjelölését, valamint üzemi frekvenciáját.

Megjegyzés.- a 11. Annex, 1. Függelékével összefüggésben és repüléstervezési célokra, a meghatározott RNP (Megkövetelt Navigációs Teljesítőképesség) típust nem tekintik az útvonal megnevezés szerves részének.

ENR 3.3. – Területi navigációs útvonalak

A területi navigációs útvonalak (RNAV) részletes leírása, beleértve az alábbiakat:
1) az útvonal megjelölése, a meghatározott útvonalszakaszo/ko/n alkalmazható Megkövetelt Navigációs Teljesítőképesség (RNP – *Required Navigation Performance*) típus(ok), az útvonalat meghatározó valamennyi fontos pont neve, kódolt megjelölése, vagy név-kódja és földrajzi koordinátái fokokban, percekben és másodpercekben megadva, beleértve a "kötelező" és "kérésre közlendő" jelentőpontokat is;

2) egy VOR/DME területi navigációs útvonalakat kitűző, meghatározó útvonalpontok tekintetében, kiegészítésképpen:

a) a referencia VOR/DME állomás azonosítója;

b) irányszöge a legközelebbi fokra kerekítve, valamint a referencia VOR/DME-től való távolsága a legközelebbi 1/10 kilométerre, vagy tengeri mérföldre kerekítve, ha az útvonalpont nem ugyanabban a pontban található; és

c) a DME adó-antennájának tengerszint feletti magassága a legközelebbi 30 méterre (100 lábra) kerekítve;

3) geodetikus távolságok (*geodesic distance*)[34]* a legközelebbi 1/10 kilométerre, vagy tengeri mérföldre kerekítve, a meghatározott végpontok, valamint az összes egymást követő kijelölt fontos pont között;

4) felső és alsó határok és légtér osztályba-sorolása;

5) az utazó magasságok (repülési szintek) iránya;

6) megjegyzések, beleértve az irányító egység megjelölését, valamint üzemi frekvenciáját.

Megjegyzés.- a 11. Annex, 1. Függelékével összefüggésben és repüléstervezési célokra, a meghatározott RNP (Megkövetelt Navigációs Teljesítőképesség) típust nem tekintik az útvonal megnevezés szerves részének.

ENR 3.4. – Helikopter útvonalak

A helikopter útvonalak részletes leírása, beleértve a következőket:

1) az útvonal megjelölése, a meghatározott útvonalszakaszo/ko/n alkalmazható Megkövetelt Navigációs Teljesítőképesség (RNP – *Required Navigation Performance*) típus(ok), az útvonalat meghatározó valamennyi fontos pont neve, kódolt megjelölése, vagy név-kódja és földrajzi koordinátái fokokban, percekben és másodpercekben megadva, beleértve a "kötelező" és "kérésre közlendő" jelentőpontokat is;

2) útirányszögek, vagy VOR radiálok, kerekítve a legközelebbi fokra, geodetikus távolságok (*geodesic distance*) a legközelebbi 1/10 kilométerre, vagy tengeri mérföldre kerekítve, minden egymást követő kijelölt fontos pont között, valamint a VOR radiálok esetén az átkapcsolási pontok között;

3) felső és alsó határok, valamint a légtér osztályba-sorolása;

4) a minimális tengerszint feletti repülési magasságok (*minimum flight altitudes*), kerekítve a legközelebbi magasabb 50[35]** méterre vagy 100 lábra; és
(**valószínűleg az 50 méter hibás adat, a 100 lábból csak 30 méter következne!! - Fordító)

5) megjegyzések, beleértve az irányító egység megjelölését, valamint üzemi frekvenciáját.

Megjegyzés.- az Annex 11, 1. Függelékével összefüggésben és repüléstervezési célokra, a meghatározott RNP (Megkövetelt Navigációs Teljesítőképesség) típust nem tekintik az útvonal megnevezés szerves részének.

ENR 3.5. – Egyéb útvonalak

Megkövetelik azoknak a pontosan kijelölt útvonalaknak a leírását, melyek használata kötelező a meghatározott légtér(ek)en belül.

Megjegyzés: - Az érkezési, átrepülő és indulási útvonalakat, melyeket a repülőterekről / helikopter repülőterekről induló, érkező forgalom eljárásaival kapcsolatosan határoztak meg, nem ebben a részben kell meghatározni, mivel ezek a 3. Rész - Repülőterek idevágó szakaszában lettek részletezve.

ENR 3.6. – Várakozás az útvonalon

Az útvonalon való várakozási eljárások részletes leírását követelik meg, mely az alábbiakat tartalmazza:

1) a várakozási eljárás azonosítása (ha van ilyen) és a várakozási pont (navigációs berendezés), vagy útvonalpont földrajzi koordinátákkal, fokban, percben és másodpercben megadva;

2) a rárepülés útiránya;

3) az eljárás fordulóinak iránya;

4) maximális műszer szerinti repülési sebesség (IAS);

5) a várakozásra használható minimális és maximális repülési szintek;

6) a kirepülés ideje/távolsága; és

7) az irányító egység megjelölését, valamint üzemi frekvenciáját.

Megjegyzés.- a várakozási eljárásokkal kapcsolatos akadálymentességi kritériumokat a "Léginavigációs Szolgálatok Eljárásai, a Légijárművek Üzemeltetése (PANS - OPS, Doc 8168), I. és II. Kötete tartalmazza.

ENR 4. - RÁDIÓNAVIGÁCIÓS SEGÉDESZKÖZÖK / RENDSZEREK

ENR 4.1. - Rádiónavigációs Segédeszközök - Útvonalrepülés

Az útvonalrepülés céljára létesített, rádiónavigációs szolgálatot biztosító állomások listája, az állomások neve szerint betűrendbe szedve, az alábbiakat beleértve:

1) az állomás neve és a mágneses elhajlás a legközelebbi fokra kerekítve, valamint a VOR-ok számára a VOR berendezés deklinációja (*Station declination)*[36]* a legközelebbi fokra kerekítve, melyet a berendezés műszaki beállításakor használnak;

2) azonosító;

3) az összes elem frekvenciája/csatornája;

4) üzemeltetési ideje;

5) a sugárzásra használt antenna telepítési helyének földrajzi koordinátái fokokban, percekben és másodpercekben megadva;

6) a DME adó antennájának tengerszint feletti magassága, kerekítve a legközelebbi 30 méterre (100 lábra); és

7) megjegyzések.

Ha a berendezést üzemeltető hatóság nem ugyanaz, mint a kijelölt állami képviselet, akkor az üzemeltetést végző hatóság nevét a megjegyzés rovatban kell feltüntetni. A berendezés hatótávolságát a megjegyzés rovatban kell jelezni.

ENR 4.2. – Különleges navigációs rendszerek.

A különleges navigációs rendszerekkel kapcsolatban lévő állomások leírása (DECCA, LORAN, stb.), az alábbiakat beleértve:

1) az állomás, vagy állomáslánc neve;

2) a rendelkezésre álló szolgálat típusa (vezérlő jel, segéd jel, szín);

3) frekvencia (csatornaszám, alap impulzus gyakoriság, ismétlődési sebesség, ahogy alkalmazható);

4) üzemidő;

5) az adóállomás telepítési helyének földrajzi koordinátái fokokban, percekben és másodpercekben megadva; és

6) megjegyzések.

Ha a berendezést üzemeltető hatóság nem ugyanaz, mint a kijelölt állami képviselet, akkor az üzemeltetést végző hatóság nevét a megjegyzés rovatban kell feltüntetni. A berendezés hatótávolságát a megjegyzés rovatban kell jelezni.

ENR 4.3 – GNSS – Globális navigációs műholdrendszer

A navigációs szolgáltatást biztosító, útvonalrepülés céljára létesített Globális Navigációs Műholdrendszer (GNSS) elemeinek listája és meghatározása, az elemek neve alapján betűrendbe szedve, az alábbiakat tartalmazza:

1) A GNSS elem (GPS, GLONASS, EGNOS, MSAS, WAAS, stb.) neve;

2) frekvencia (frekvenciák), értelemszerűen;

3) a névleges szolgálati terület és a lefedési terület földrajzi koordinátái fokokban, percekben és másodpercekben megadva; és

4) megjegyzések.

Ha a berendezést üzemeltető hatóság nem ugyanaz, mint a kijelölt állami képviselet, akkor az üzemeltetést végző hatóság nevét a megjegyzés rovatban kell feltüntetni.

ENR 4.4. – Fontos Pontok Név-kódjának kijelölése

A nem rádiónavigációs berendezések telepítési helyével kijelölt fontos pontok számára létrehozott név - kód elnevezések (5 betűs, kiejthető név-kódok) betűrendbe rendezett listája, beleértve:

1) név-kód elnevezés;

2) a pozíció földrajzi koordinátái fokokban, percekben és másodpercekben megadva; és

3) utalás azokra az ATS, vagy egyéb útvonalakra, amelyeken az adott pont elhelyezkedik.

ENR 4.5. – Légiforgalmi földi fények – útvonalon

Az Állam által fontosnak minősített földrajzi pontot jelölő léginavigációs földi fények, és más fényjeladók listája, az alábbiakat beleértve:

1) nagyobb, vagy kisebb város neve, vagy a fényjeladó egyéb azonosítója;

2) a fényjeladó típusa, és a fényintenzitás 1000 candelában ("cd" – gyertya) kifejezve;

3) a jelzés karakterisztikája;

4) üzemideje; és

5) megjegyzések.

ENR 5. – NAVIGÁCIÓS FIGYELMEZTETÉSEK

ENR 5.1. – Tiltott, korlátozott és veszélyes légterek

A tiltott, korlátozott és veszélyes légterek leírása, ahol lehetséges grafikus ábrázolással kiegészítve, olyan információkkal, melyek létesítésükkel és a működtetésükkel kapcsolatosak, az alábbiakat tartalmazza:

1) a légtér azonosítója, neve, valamint a légtér oldalhatárainak földrajzi koordinátái fokokban, percekben és másodpercekben, amennyiben az irányítói körzeteken / repülőtéri irányítói körzeteken belül található, valamint fokokban és percekben, amennyiben kívül helyezkedik el;

2) a felső és alsó határok; valamint

3) megjegyzések, beleértve az aktivitás idejét.
A megjegyzés rovatban jelezni kell a korlátozás típusát, vagy a veszély természetét és az elfogás kockázatát, amennyiben megsértenék ezt a légteret.

ENR 5.2. – Katonai gyakorló és kiképzési légterek, területek, valamint a Légvédelmi Azonosítási Körzet (*ADIZ – Air Defence Identification Zone*)

A létesített katonai kiképzési területek és a rendszeres időközönként végrehajtott katonai gyakorlatok, valamint a létesített Légvédelmi Azonosítási Körzet (ADIZ) részletes leírása, ahol alkalmazható grafikus ábrázolással kiegészítve, az alábbiakat beleértve:

1) oldalhatárainak földrajzi koordinátái fokokban, percekben és másodpercekben, amennyiben az irányítói körzeteken / repülőtéri irányítói körzeteken belül, fokokban és percekben amennyiben azokon kívül helyezkedik el;

2) a felső és alsó határai, valamint a működtetés bejelentésének rendszere és eszközei, azokkal az információkkal együtt, melyek a polgári repülésre vonatkoznak, valamint az alkalmazható ADIZ (*Légvédelmi Azonosítási Körzet – Air Defence Identification Zone*) eljárások;

3) megjegyzések, beleértve a működtetés idejét, valamint az elfogás kockázatát, amennyiben megsértenék a ADIZ légterét (*Légvédelmi Azonosítási Körzet – Air Defence Identification Zone*).

ENR 5.3. – Egyéb veszélyes jellegű tevékenységek és más potenciális veszélyek

ENR 5.3.1. – Egyéb veszélyes jellegű tevékenységek
A repülésekre esetleg hatással lévő tevékenységek leírása, ahol lehetséges térképvázlatokkal kiegészítve, az alábbiakat beleértve:

1) a terület középpontjának földrajzi koordinátái fokokban és percekben, valamint kiterjedése;

2) függőleges határok;

3) tanácsadói intézkedések;

4) az információk biztosításáért felelős hatóság; és

5) megjegyzések, beleértve az aktivitás idejét.

ENR 5.3.2. – Egyéb potenciális veszélyek

A repülésekre esetleg hatással lévő potenciális veszélyek (pl. működő vulkáni tevékenység, nukleáris erőművek, stb.) részletes leírása, ahol lehetséges navigációs térképpel kiegészítve, az alábbiakat beleértve:

1) a potenciális veszély helyének földrajzi koordinátái fokokban és percekben;

2) függőleges határok;
3) tanácsadói intézkedések;

4) az információk biztosításáért felelős hatóság; és

5) megjegyzések.

ENR 5.4. – Légiforgalmi akadályok

Az 1-es számú Területen (az Állam teljes területén) a légiközlekedést befolyásoló akadályok listája, a következőket beleértve:

1) az akadály azonosítóját, vagy megnevezését;

2) az akadály típusát;

3) az akadály helyzetét, fokokban, percekben és másodpercekben megadott földrajzi koordinátákkal;

4) az akadály tengerszint feletti magasságát, valamint függőleges kiterjedését a legközelebbi méterre, vagy lábra;

5) az akadály fényeinek (ha van ilyen) típusa és színe; és

6) ha alkalmazható, akkor annak jelzése, hogy az akadályok listája hozzáférhető elektronikus formában és egy hivatkozás a GEN 3.1.6 pontra;

Megjegyzés 1.- Egy akadály, aminek a magassága a föld felett 100 m, vagy több, akadálynak számít az 1-es számú Területen.

Megjegyzés 2.- Az 1-es számú Területen az akadályok helyzetének (földrajzi hosszúság és szélesség), valamint tengerszint feletti magasságának / függőleges kiterjedésének meghatározását és jelentését (a terepen végzett munka pontosságát és az adatok integritását) szabályzó részletes előírások, értelemszerűen, a 11. Annex, 5. Függelék, 1. és 2. Táblázatában találhatóak.

ENR 5.5 – Légi sport és szabadidős tevékenységek

Az intenzív légi sport és szabadidős tevékenységek rövid leírása, végrehajtásuk feltételeivel, körülményeivel, ahol alkalmazható, kiegészítve ezek grafikus ábrázolásával, beleértve az alábbiakat:

1) az azonosítója, neve és oldalhatárainak földrajzi koordinátái fokokban, percekben és másodpercekben, amennyiben az irányítói körzeteken / repülőtéri irányítói körzeteken belül található, fokokban és percekben, amennyiben azokon kívül helyezkedik el;

2) függőleges határai;

3) az üzemeltető/felhasználó telefonszáma; és

4) megjegyzések, beleértve aktivitás idejét.

Megjegyzés: - Ez a paragrafus további különböző fejezetekre bontható, minden egyes különböző tevékenységi osztály számára, minden esetben feltüntetve a részleteket.

ENR 5.6. – Madárvándorlás és az érzékeny faunával rendelkező területek

A madarak vándorlásával összefüggő mozgások leírása, beleértve ezek útvonalát is, a madarak állandó pihenőhelyeit, valamint a védelemre szoruló, érzékeny faunával rendelkező területeket is, ahol ez megvalósítható, navigációs térképekkel is kiegészítve.

ENR 6. – ÚTVONAL-TÉRKÉPEK

Ennek a szakasznak kell tartalmaznia az ICAO – Útvonal–térképeket, valamint az indextérképeket.

3. RÉSZ – AERODROMES (AD) – REPÜLŐTEREK

Abban az esetben, ha egy AIP egynél több kötetben készül el és kerül kibocsátásra, valamint mindegyik kötethez külön módosító és kiegészítő szolgáltatás tartozik, akkor minden egyes kötetnek tartalmaznia kell egy külön bevezető részt (előszót), az AIP Módosítások (*Amendments*) jegyzékét, az AIP Kiegészítések (*Supplements*) jegyzékét, az AIP lapok ellenőrző jegyzékét és a legutóbbi, kézzel bevezetett érvényes módosítások listáját. Abban az esetben, ha az AIP-t egyetlen kötetben adták ki, a "Nem alkalmazható" jelzéssel kell ellátni az előbb felsorolt összes alfejezetet.

AD 0.6. – A 3. Rész tartalomjegyzéke

A 3. Részben (Aerodromes /AD – Repülőterek/) található fejezetek és alfejezetek felsorolása.

Megjegyzés: - az alfejezeteket betűrendbe szedve is meg lehet adni.

AD 1. – REPÜLŐTEREK / HELIKOPTER REPÜLŐTEREK – BEVEZETÉS

AD 1.1. – Repülőterek / Helikopter Repülőterek hozzáférhetősége

A repülőterek és helikopter repülőterek vonatkozásában az Állam által kijelölt felelős hatóság rövid leírása, beleértve az alábbiakat:

1) azokat az általános feltételeket, melyek alapján a repülőtér / helikopter repülőtér rendelkezésre áll, használható;

2) azoknak az ICAO dokumentumoknak a megnevezését, melyekre a szolgálatok munkáját alapozták, és utalást arra az AIP részre, ahol felsorolták az eltéréseket, ha vannak ilyenek;

3) azokat a szabályokat, ha vannak ilyenek, melyek alapján a katonai légitámaszpontokat polgári célra igénybe lehet venni;

4) azokat az általános feltételeket, ha vannak ilyenek, melyek alapján a repülőterek CAT II / III szerinti üzemelésére a "Rossz látási körülmények eljárásai" alkalmazhatóak;

5) a fékhatás mérésére használt eszközök és az a futópályán mérhető súrlódási együttható érték, amely alatt az Állam a futópályát csúszósnak fogja nyilvánítani, ha a felülete nedves; és

6) egyéb, hasonló természetű információk.

AD 1.2. – Műszaki mentő és tűzoltó szolgálatok, valamint a hóeltakarítási terv

AD 1.2.1. – Műszaki mentő és tűzoltó szolgálatok

A nyilvánosan rendelkezésre álló (közhasznú) repülőtereken / helikopter repülőtereken a mentő és tűzoltó szolgálatok létesítését meghatározó szabályok rövid leírása, valamint az Állam által megállapított mentő és tűzoltó kategóriák ismertetése.

AD 1.2.2. - Hóeltakarítási terv

Az általános hóeltakarítási terv szempontjainak rövid leírása azon közhasznú repülőterek / helikopter repülőterek számára, ahol rendszerint előfordulhat havazás, az alábbiakat beleértve:

1) a téli szolgáltatásokat végző szervezet;

2) a mozgási területek felügyelete;

3) mérési módszerek és az elvégzett mérések;

4) a mozgási területek használhatóságának megőrzése érdekében tett intézkedések;

5) a jelentések rendszere és eszközei;

6) a futópálya zárás esetei; és

7) a hóval kapcsolatos körülményekről szóló információk szétosztása.

Megjegyzés.- ahol a repülőtereken / helikopter repülőtereken eltérő hóeltakarítási-terv szempontokat alkalmaznak, ott ennek megfelelően lehet felosztani ezt az alfejezetet.

AD 1.3. – Repülőterek / helikopter repülőterek jegyzéke

Az Állam területén található repülőterek és helikopter repülőterek grafikus ábrázolással kiegészített listája, az alábbiakat beleértve:

1) a repülőtér / helikopter repülőtér neve és ICAO által kiosztott helységnév azonosítója;

2) milyen típusú forgalom számára engedik meg a repülőtér / helikopter repülőtér használatát (nemzetközi / belföldi, IFR / VFR, menetrend szerinti / menetrenden kívüli, magán); és

3) hivatkozás az AIP – 3. Részének azon alfejezetére, melyben a repülőterek / helikopter repülőterek részletes adatai megtalálhatóak.

AD 1.4. – A repülőterek / helikopter repülőterek csoportosítása

A repülőterek / helikopter repülőterek csoportosításában az Állam által használt követelmények rövid leírása tájékoztatások elkészítése/ szétosztása/biztosítása céljából (pl. nemzetközi/belföldi; elsődleges/ másodlagos; nagyobb/egyéb; polgári/katonai; stb.).

AD 2. – REPÜLŐTEREK

*Megjegyzés: - A leírásokban a **** behelyettesítendő a vonatkozó ICAO helységnév azonosító kóddal.*

**** AD 2.1. – A repülőtér helységnév azonosító kódja és neve

Megkövetelik a repülőtér számára kiosztott ICAO helységnév azonosító kódjának és nevének közzétételét. Egy ICAO helységnév azonosító kód szerves részét kell képezze az AD 2. fejezet minden alfejezetében alkalmazandó hivatkozási rendszernek.

**** AD 2.2. – A repülőtér földrajzi és adminisztratív adatai

Itt követelik meg a repülőtér földrajzi és közigazgatási, adminisztratív adatainak közzétételét, az alábbiakat beleértve:

1) a repülőtér vonatkozási pontja (földrajzi koordinátái fokokban, percekben és másodpercekben) és elhelyezkedése;

2) a repülőtér vonatkozási pontjának iránya és távolsága a repülőtér által kiszolgált település (nagyváros, város) központjától;

3) a repülőtér tengerszint feletti magassága, kerekítve a legközelebbi méterre, vagy lábra, valamint a referencia hőmérséklet;

4) a Geoid (földalak) hullámossága, egyenetlensége (*Geoid undulation*) a repülőtér tengerszint feletti vonatkozási pontján, a legközelebbi méterre, vagy lábra kerekítve;

5) mágneses elhajlás a legközelebbi fokra kerekítve, az adat keletkezésének időpontja, az éves változása;

6) a repülőtéri igazgatóság, hatóság megnevezése, címe, telefax és telex számai és AFS címe;

7) milyen típusú forgalom számára engedik meg a repülőtér használatát (IFR / VFR); és

8) megjegyzések.

****** AD 2.3. – Üzemidő**

A repülőtéren található szolgálatok üzemidejének részletes leírása, beleértve az alábbiakat:

1) repülőtéri igazgatóság;

2) vámhivatal és bevándorlási hivatal;

3) egészségügyi és közegészségügyi szolgálat;

4) AIS (*Aeronautical Information Services* - Légiforgalmi Tájékoztató Szolgálat) eligazító irodája;

5) ATS (*Air Traffic Services* – Légiforgalmi Szolgálatok) bejelentő irodája (*ARO – ATS reporting office*);

6) MET (repülés meteorológia) eligazító iroda;

7) légiforgalmi szolgálatok;

8) üzemanyag szolgáltatások;

9) földi kiszolgálás, utaskezelés;

10) biztonsági szolgálatok;

11) jégtelenítés; és

12) megjegyzések.

****** AD 2.4. – Földi kiszolgálás és eszközei**

A repülőtéren a rendelkezésre álló földi kiszolgálás és a földi kiszolgálás eszközeinek részletes leírása, beleértve az alábbiakat:

1) a teherárú, rakomány kezelésére szolgáló létesítmények, eszközök, szolgáltatások;
2) a rendelkezésre álló üzemanyag és olajfajták;
3) az üzemanyag ellátás létesítményei, berendezései és kapacitásuk;
4) jégtelenítő létesítmények, berendezések, szolgáltatás;
5) hangár férőhelyek légijárművek átmeneti tárolására;
6) javítási szolgáltatások az átmenetileg itt tartózkodó légijárművek számára; és
7) megjegyzések.

****** AD 2.5. - Az utasok kiszolgálása és létesítményei**

A repülőtéren az utasok rendelkezésére álló létesítmények, berendezések, utas-kiszolgálás rövid leírása, az alábbiakat beleértve:

1) *szálloda (szállodák) a repülőtéren, vagy annak közvetlen környezetében;*
2) *étterem (éttermek) a repülőtéren, vagy annak közvetlen környezetében;*
3) *közlekedési, szállítási lehetőségek;*
4) egészségügyi létesítmények;
5) *bankok, postahivatalok a repülőtéren, vagy annak közvetlen környezetében;*
6) *idegenforgalmi iroda;* és
7) megjegyzések.

**** AD 2.6. – Mentési és tűzoltó szolgálatok

A repülőtéren rendelkezésre álló (műszaki) mentési és tűzoltó szolgálatok és berendezések, felszerelések részletes leírása, beleértve az alábbiakat:

1) a repülőtér tűzoltási kategóriája;
2) a műszaki mentés berendezései;
3) *a mozgásképtelenné vált légijárművek eltávolításának képessége, lehetősége;* és
4) megjegyzések.

**** AD 2.7. – Idényjellegű, időszakos használhatóság – hóeltakarítás

A repülőtér mozgási területein a hóeltakarításra használt berendezéseknek, valamint a hóeltakarítás meghatározott elsőbbségi rendjének részletes leírása, az alábbiakat beleértve:

1) a hóeltakarításra használt eszköz(ök) típusa(i);
2) a hóeltakarítás sorrendje, elsőbbsége; és
3) megjegyzések.

**** AD 2.8. – Előterek, gurulóutak és az ellenőrző helyek / pontok adatai

Az előterek, gurulóutak és a kijelölt ellenőrző pontok helyének/pozíciójának fizikai jellemzőivel kapcsolatos részletek, az alábbiakat beleértve:

1) a forgalmi előterek burkolata és teherbírása;
2) a gurulóutak szélessége, burkolata, és teherbírása;
3) a magasságmérő ellenőrzésére kijelölt pontok helyzetének meghatározása és a tengerszint feletti magassága, kerekítve a legközelebbi méterre, vagy lábra;
4) VOR ellenőrzésre kijelölt pontok helymeghatározása;
5) az INS (*Inertial Reference System* - Inerciális Referencia Rendszer) ellenőrzésére kijelölt pontok helyzetének meghatározása fokokban, percekben, másodpercekben és 1/100 másodpercekben; és
6) megjegyzések.
Ha az ellenőrző helyek / pontok szerepelnek egy repülőtér térképen, akkor erről információt kell biztosítani ebben az alfejezetben.

**** AD 2.9. – A földi mozgásokat irányító és ellenőrző rendszer, valamint a jelölések

A gurulásokat irányító és ellenőrző rendszer, valamint a futópálya és gurulóút jelölések rövid leírása, az alábbiakat beleértve:

1) a légijármű állóhely azonosító jeleinek, a gurulóút nyomvonalaknak és a légijármű állóhelyeken található látás szerinti beállító / utas-beszállító hídhoz vezető rendszernek (*visual docking/parking guidance system*) a használata;
2) futópálya és gurulóút jelölések és fények;
3) megállító keresztfénysorok (ha vannak ilyenek); és
4) megjegyzések.

**** AD 2.10. – Repülőtéri akadályok

Az akadályok részletes ismertetése, az alábbiakat beleértve:

1) akadályok a 2-es számú Területen:

a) az akadály azonosítása, vagy neve;
b) az akadály típusa;
c) az akadály pozíciójának földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben;
d) az akadály tengerszint feletti magassága és függőleges kiterjedése a legközelebbi méterre, vagy lábra kerekítve;
e) az akadály jelölése, és az akadályfények típusa, színe (ha van);
f) ha alkalmazható, akkor annak jelzése, hogy az akadályok listája hozzáférhető elektronikus formában és egy hivatkozás a GEN 3.1.6 pontra; és
g) NIL jelölés, ha alkalmazható.

Megjegyzés 1.- A 10. Fejezet 10.2.2 pontja tartalmazza a 2-es számú Terület meghatározását, míg a 8. Függelék, A8-2 ábrája grafikus formában szemlélteti az akadály adatok gyűjtésére használandó felületeket, valamint a 2-es számú Területen az akadályok azonosításának kritériumait.

Megjegyzés 2.- Az 2-es számú Területen az akadályok helyzetének (földrajzi hosszúság és szélesség), valamint tengerszint feletti magasságának / függőleges kiterjedésének meghatározását és jelentését (a terepen végzett munka pontosságát és az adatok integritását) szabályzó részletes előírások, értelemszerűen, a 11. Annex, 5. Függelék, 1. és 2. Táblázatában találhatóak, valamint a 14. Annex, I. Kötet, 5. Függelék, A5-1 és A5-2 Táblázatában.

2) akadályok a 3-as számú Területen:
a) az akadály azonosítása, vagy neve;
b) az akadály típusa;
c) az akadály pozíciójának földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben;
d) az akadály tengerszint feletti magassága és függőleges kiterjedése a legközelebbi méterre, vagy lábra kerekítve;
e) az akadály jelölése és az akadályfények típusa, színe (ha van);
f) ha alkalmazható, akkor annak jelzése, hogy az akadályok listája hozzáférhető elektronikus formában és egy hivatkozás a GEN 3.1.6 pontra; és
g) NIL jelölés, ha helyénvaló.

Megjegyzés 1.- A 10. Fejezet 10.2.3 pontja tartalmazza a 3-as számú Terület meghatározását, míg a 8. Függelék, A8-3 ábrája grafikus formában szemlélteti az akadály adatok gyűjtésére használandó felületeket, valamint az akadályok azonosításának kritériumait a 3-es számú Területen.

Megjegyzés 2.- Az 3-as számú Területen az akadályok helyzetének (földrajzi hosszúság és szélesség), valamint tengerszint feletti magasságának / függőleges kiterjedésének meghatározását és jelentését (a terepen végzett munka pontosságát és az adatok integritását) szabályzó részletes előírások a 14. Annex, I. Kötet, 5. Függelék, A5-1 és A5-2 Táblázatában találhatók, értelemszerűen.

**** AD 2.11. - A biztosított meteorológiai tájékoztatás

A repülőtéren biztosított meteorológiai tájékoztatások részletes leírása, valamint annak jelzése, hogy melyik meteorológiai iroda felelős a felsorolt szolgáltatások biztosításáért, beleértve a következőket:

1) a kapcsolódó meteorológiai iroda megnevezése;

2) üzemidő és ahol ez alkalmazható, az ezen az időszakon túl felelős meteorológiai irodának a megnevezése;

3) a TAF-ok összeállításáért felelős iroda megnevezése, érvényességi időszakai és az előrejelzések kiadásának idő-intervallumai;

4) a repülőtér számára rendelkezésre álló trend típusú előrejelzések és a kiadásának idő-intervallumai;

5) információk arról, hogy az eligazításokat és/vagy konzultációkat milyen módon biztosítják;

6) a biztosított repülési dokumentáció típusai és a repülési dokumentációban használt nyelv(ek);

7) az eligazítás, vagy konzultáció idején bemutatott, vagy rendelkezésre álló térképek és egyéb információ;

8) olyan kiegészítő berendezések, melyek segítségével a meteorológiai körülményekről információkat biztosíthatnak, ilyenek lehetnek a meteorológiai radar és a meteorológiai műhold által biztosított képi ábrázolások;

9) a meteorológiai információval ellátott Légiforgalmi Szolgálati Egység(ek) (*Air Traffic Services Unit(s)*); és

10) további információk (pl. a szolgálat bármilyen fajta korlátozásáról, stb.).

**** AD 2.12. – A futópálya fizikai jellemzői

Minden egyes futópálya esetén a futópálya fizikai jellemzőinek részletes leírása, beleértve a következőket:
1) megnevezések;
2) földrajzi irányszögek 1/100 fokra kerekítve;
3) a futópálya méretei a legközelebbi méterre, vagy lábra kerekítve;
4) minden egyes futópálya és a hozzájuk tartozó végbiztonsági sávok burkolatának, valamint felületének teherbírása (PCN és a hozzákapcsolódó adatok);
5) minden egyes futópálya küszöbének és pályavégének földrajzi koordinátái fokokban, percekben, másodpercekben és 1/100 másodpercekben megadva, valamint a Földalak (*Geoid*) hullámossága, egyenetlensége (*Geoid undulation*), melyet a legközelebbi 1/2 méterre, vagy lábra kerekítenek, minden egyes küszöb esetén;
6) tengerszint feletti magassága:
· a nem precíziós futópályák küszöbének a legközelebbi méterre, vagy lábra kerekítve; és
· a precíziós futópályák küszöbének és a földetérési zóna legmagasabban fekvő pontjának, a legközelebbi 1/2 méterre, vagy lábra kerekítve;
7) minden egyes futópálya és hozzájuk tartozó végbiztonsági sávok lejtési viszonyai;
8) a végbiztonsági sáv (*stopway*) mérete a legközelebbi méterre, vagy lábra kerekítve (ha van ilyen);
9) az akadálymentes, felszállási biztonsági sáv (*clearway*) mérete (ha van ilyen) kerekítve a legközelebbi méterre, vagy lábra;
10) a leszállósávok (*strips*) méretei;
11) akadályoktól mentes zóna megléte; és
12) megjegyzések.

**** AD 2.13. – Közzétett távolságok

A közzétett, meghatározott távolságok kerekítve a legközelebbi méterre, vagy lábra minden egyes futópályának minden egyes felszálló irányára, beleértve az alábbiakat;
1) futópálya megnevezése;
2) TORA – az igénybe vehető nekifutási távolság;
3) TODA – az igénybe vehető felszállási távolság;
4) ASDA – az igénybe vehető gyorsítási-megállási távolság;
5) LDA – az igénybe vehető leszállási távolság; és
6) megjegyzések.
Ha egy futópálya valamelyik iránya nem használható felszállásra, leszállásra, vagy mindkettőre, mert azt üzemeltetési szempontból megtiltották, akkor ezt közzé kell tenni, és a "Nem Használható" (*Not Usable*) szavakat, vagy a "NU" rövidítést kell alkalmazni. (Annex 14, 1. Kötet, "A" Melléklet, 3. Szakasz).

**** AD 2.14. – Bevezető és futópálya fények

A bevezető és a futópálya fények részletes leírása, beleértve az alábbiakat:
1) a futópálya megnevezését;
2) a bevezető fényrendszer típusát, hosszúságát és intenzitását;
3) a futópálya küszöb fényeit, színüket és a szárny-fénysorokat (*VASIS*-ból);
4) a VASIS (*visual approach slope indicator system* - optikai siklópálya rendszer) típusát;
5) a futópálya földetérési zóna (*touchdown zone*) fényeinek a hosszúságát;
6) a futópálya középvonal fények (*centre line lights*) hosszúságát, a két lámpatest közötti távolságot, színüket és intenzitásukat;
7) a futópálya szegélyfények (*edge lights*) hosszúságát, a két lámpatest közötti távolságot, színüket és intenzitásukat;
8) a futópálya záró-fények és szárny-fénysorok (*wing bars)* színét;
9) a végbiztonsági sáv (*stopway*) fényeinek hosszát és színét; és
10) megjegyzéseket.

**** AD 2.15. – Egyéb fények, tartalék energia ellátás

Az egyéb repülőtéri fények, tartalék energia ellátás részletes leírása, az alábbiakat beleértve:
1) a repülőtéri fényjeladó / azonosító fényjeladó (ha van ilyen) telepítési helye, karakterisztikája, és üzemeltetési ideje;
2) a szélsebesség mérő / leszállási irány kijelző telepítési helye és megvilágítása (ha van ilyen);
3) a gurulóutak szegély- és középvonal fényei;
4) tartalék, másodlagos áramellátás beleértve az átkapcsolási időt is; és
5) megjegyzések.

**** AD 2.16. – Helikopter leszálló terület

A repülőtéren a helikopterek leszállására biztosított terület részletes leírása, az alábbiakat beleértve:
1) a földetérési és elemelkedési (*TLOF*) terület, vagy a végső megközelítési és felszállási (*FATO*) terület mindegyik küszöbe mértani középpontjának (ahol alkalmazható) földrajzi koordinátái fokokban, percekben, másodpercekben és 1/100 másodpercekben, valamint a (*Geoid*) Földalak hullámossága, egyenetlensége (*Geoid undulation*) a legközelebbi 1/2 méterre, vagy lábra kerekítve;
2) TLOF és/vagy FATO terület tengerszint feletti magassága;
· nem precíziós bevezetések esetén a legközelebbi méterre, vagy lábra kerekítve; és
· precíziós bevezetések esetén a legközelebbi 1/2 méterre, vagy lábra kerekítve;
3) a TLOF és FATO területek mérete a legközelebbi méterre, vagy lábra kerekítve, a burkolat típusa, teherbíró-képessége, felületi nyomószilárdsága és jelzései;
4) a FATO földrajzi irányszöge, 1/100 fokra kerekítve;
5) a rendelkezésre álló, közzétett, meghatározott távolságok a legközelebbi méterre, vagy lábra kerekítve;
6) bevezető és FATO fények; és
7) megjegyzések;

**** AD 2.17. – A Légiforgalmi Szolgálatok légtere

A repülőtéren kialakított Légiforgalmi Szolgálatok (ATS) légterének részletes leírása, beleértve az alábbiakat:
1) a légtér megnevezését és oldalhatárainak földrajzi koordinátáit fokokban, percekben és másodpercekben megadva;
2) függőleges határait;
3) a légtér osztályba sorolását;
4) a szolgálatot biztosító ATS egység hívójelét és a használható nyelvet (nyelveket);
5) az átváltási magasságot; és
6) megjegyzéseket.

**** AD 2.18. – A Légiforgalmi Szolgálatok hírközlési berendezései

A repülőtéren kialakított Légiforgalmi Szolgálatok hírközlési berendezéseinek részletes leírása, az alábbiakat beleértve:
1) a szolgálat megnevezése;
2) hívójele;
3) frekvenciája (frekvenciái);
4) üzemidő; és
5) megjegyzések.

**** AD 2.l9. – Rádió-navigációs és leszállító berendezések

A repülőtéren a műszeres megközelítéssel és a közelkörzeti eljárásokkal kapcsolatos rádiónavigációs és leszállító berendezések részletes bemutatása, az alábbiakat beleértve:
1) a berendezés típusa, és a mágneses elhajlás a legközelebbi fokra kerekítve, értelemszerűen, és a támogatott ILS/MLS, alap GNSS, SBAS, és GBAS üzemeltetés, valamint a VOR/ILS/MLS számára a telepítési hely mágneses deklinációja (*Station declination*) is, a legközelebbi fokra kerekítve, melyet a berendezés műszaki beállítására használnak fel;
2) azonosítója, ha szükséges;
3) frekvenciája (frekvenciái), értelemszerűen;
4) üzemideje, értelemszerűen;
5) az adásra használt antenna telepítési helyének földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben megadva, értelemszerűen;
6) a DME berendezés adó-antennájának tengerszint feletti magassága, kerekítve a legközelebbi 30 méterre (100 lábra), valamint a DME/P antenna esetén a legközelebbi 3 méterre (10 lábra); és
7) megjegyzések.
Abban az esetben, amikor ugyanazt a berendezést használják útvonalrepülési és repülőtéri célokra is, akkor a leírását meg kell adni az ENR 4. fejezetben is. Ha a Földi Bázisú (telepítésű) Kiterjesztő Rendszer (GBAS - *Ground Based Augmentation System*) több, mint egy repülőteret szolgál ki, akkor a berendezés leírását valamennyi repülőtérnél biztosítani kell. Amennyiben a berendezést üzemeltető hatóság nem ugyanaz, mint a kijelölt állami szervezet, akkor az üzemeltető hatóság nevét a megjegyzés rovatban fel kell tüntetni. A berendezés hatótávolságát jelezni kell a megjegyzés rovatban.

**** AD 2.20. - A forgalmat érintő helyi előírások, rendelkezések

A repülőtér forgalmára vonatkozó előírások részletes leírása, beleértve a guruló légijárművek szabványos gurulási nyomvonalát, beállítási, parkolási előírásokat, oktató és kiképző repüléseket, valamint a hasonló, de kizárt, visszautasított repülési eljárásokat.

**** AD 2.21. - Zajcsökkentő eljárások

A repülőtéren alkalmazott zajcsökkentő eljárások részletes leírása.

**** AD 2.22. - Repülési eljárások

A repülőtéren, a légtérszervezés alapján kialakított feltételek és repülési eljárások részletes leírása, beleértve a radar eljárásokat is.

**** AD 2.23. - Kiegészítő információk

A repülőtérre vonatkozó kiegészítő információk, olyanok, mint például a repülőtéren található madárcsoportok, kiegészítve a pihenőhely és táplálkozási hely közötti jelentős napi mozgások feltüntetésével, amennyire csak lehetséges.

**** AD 2.24. - A repülőtérrel kapcsolatos navigációs térképek

Itt követelik meg a repülőtérre vonatkozó térképek közzétételét, az alábbi sorrendben:
1) Repülőtér / Helikopter repülőtér Térkép – ICAO;
2) Légijármű Parkolási / Beállítási Térkép – ICAO;
3) Repülőtéri Földi Mozgások Térképe – ICAO;
4) Repülőtéri Akadály térkép – ICAO A típusú (minden egyes futópályára);
5) Precíziós Megközelítési Domborzati Térkép – ICAO - (Precíziós megközelítés Cat II. és Cat III. üzemre alkalmas futópályákra);
6) Körzeti Térkép – ICAO (indulási és tranzit útvonalakhoz);
7) Szabványos Indulási Útvonalak Térképe – Műszeres (*SID*) – ICAO;
8) Körzeti Térkép – ICAO (érkezési és tranzit útvonalakhoz);
9) Szabványos Érkezési Útvonalak Térképe – Műszeres (*STAR*) – ICAO;
10) A Radarvektorálásnál használható Minimális Tengerszint feletti Magasságok Térképe – ICAO;
11) Műszeres Megközelítési Térkép – ICAO (minden egyes futópályára és eljárás típusra);
12) Látvarepülési Megközelítési Térkép – ICAO; és
13) A repülőtér közvetlen környezetében található madárkolóniák, élőhelyek.
Ha a térképek közül valamelyiket nem adják ki, akkor erre a tényre utalni kell a GEN 3. 2. (Léginavigációs térképek) szakaszban.

AD 3. – HELIKOPTER REPÜLŐTEREK

Amikor egy repülőtéren helikopterek leszállására szolgáló területet biztosítanak, akkor az ezzel összefüggő adatokat a "**** AD 2.16." pont alatt kell felsorolni.

*Megjegyzés: - **** behelyettesítendő a vonatkozó ICAO helységnév azonosítóval*.

**** AD 3.1. – A helikopter repülőtér helységnév azonosítója és neve

Itt követelik meg a helikopter repülőtér helységnév azonosítójának és nevének közzétételét. Egy ICAO helységnév azonosító szerves részét kell képezze az AD 3. fejezet minden alfejezetében alkalmazandó hivatkozási rendszernek.

**** AD 3.2. – A helikopter repülőtér földrajzi és üzemeltetői adatai

Megkövetelik a helikopter repülőtér földrajzi és adminisztratív adatainak közzétételét, az alábbiakat beleértve:
1) a helikopter repülőtér vonatkozási pontja (a földrajzi koordináták fokokban, percekben és másodpercekben) és elhelyezkedése;
2) a helikopter repülőtér vonatkozási pontjának iránya és távolsága a helikopter repülőtér által kiszolgált település (nagyváros, város) központjától;
3) a repülőtér tengerszint feletti magassága kerekítve a legközelebbi méterre, vagy lábra, valamint a referencia hőmérséklet;
4) a Földalak (*Geoid*) hullámossága, egyenetlensége (*Geoid undulation*) a helikopter repülőtér tengerszint feletti magasságának helyén a legközelebbi méterre, vagy lábra kerekítve;
5) mágneses elhajlás a legközelebbi fokra kerekítve, az adat keletkezésének időpontja, és az éves változás;
6) a helikopter repülőtéri igazgatóság megnevezése, címe, telefax és telex számai és AFS (Légiforgalmi Állandóhelyű Szolgálat) címe;
7) milyen típusú forgalom számára engedik meg a helikopter repülőtér használatát (IFR / VFR); és
8) megjegyzések.

**** AD 3.3. – Üzemidő

A helikopter repülőtéren található alábbi szolgálatok üzemidejének részletes leírása:
1) helikopter repülőtér igazgatóság;

2) a vámhivatal és a bevándorlási hivatal;
3) az egészségügyi és a közegészségügyi szolgálat;
4) AIS (*Aeronautical Information Services* - Légiforgalmi Tájékoztató Szolgálat) eligazító irodája
5) ATS (*Air Traffic Services* - Légiforgalmi Szolgálatok) bejelentő irodája (*ARO – ATS reporting office*);
6) MET (repülés meteorológia) eligazító iroda;
7) légiforgalmi szolgálatok (*Air Traffic Services*);
8) üzemanyag szolgáltatás;
9) földi kiszolgálás;
10) biztonsági szolgálatok;
11) jégtelenítés; és
12) megjegyzések.

****** AD 3.4. – Földi kiszolgálás és eszközei**

A helikopter repülőtéren rendelkezésre álló földi kiszolgálás és a földi kiszolgálás eszközeinek részletes leírása, beleértve az alábbiakat:
1) a teherárú kezelésére szolgáló létesítmények, eszközök, szolgáltatások;
2) a rendelkezésre álló üzemanyag és olajfajták;
3) az üzemanyag ellátás létesítményei, berendezései és kapacitásuk;
4) jégtelenítő létesítmények, berendezések, szolgáltatás;
5) hangár férőhelyek helikopterek átmeneti tárolására;
6) javítási szolgáltatások az átmenetileg itt tartózkodó helikopterek számára; és
7) megjegyzések.

****** AD 3.5. – Az utasok kiszolgálása és létesítményei**

A helikopter repülőtéren az utasok rendelkezésre álló létesítmények, berendezések, utas-kiszolgálás rövid leírása, az alábbiakat beleértve:
1) *szálloda (szállodák) a helikopter repülőtéren, vagy közvetlen környezetében;*
2) *étterem (éttermek) a helikopter repülőtéren, vagy közvetlen környezetében;*
3) *közlekedési, szállítási lehetőségek;*
4) egészségügyi létesítmények;
5) *bankok, postahivatalok a helikopter repülőtéren, vagy annak közvetlen környezetében;*
6) *idegenforgalmi iroda;* és
7) megjegyzések.

****** AD 3.6 – Mentő és tűzoltó szolgálatok**

A helikopter repülőtéren rendelkezésre álló (műszaki) mentési és tűzoltó szolgálatok és berendezések, felszerelések részletes leírása, beleértve az alábbiakat:
1) a helikopter repülőtér tűzoltási kategóriája;
2) a műszaki mentés berendezései;
3) *a mozgásképtelenné vált helikopterek eltávolításának képessége, lehetősége;* és
4) megjegyzések.

****** AD 3.7. – Idényjellegű, időszakos használhatóság - hóeltakarítás**

A helikopter repülőtér mozgási területein a hóeltakarításra használt berendezéseknek, valamint a hóeltakarítás meghatározott elsőbbségi rendjének részletes leírása, az alábbiakat beleértve:
1) a hóeltakarításra használt eszköz(ök) típusa(i);
2) a hóeltakarítás sorrendje, elsőbbsége; és
3) megjegyzések.

**** AD 3.8. – Előterek, gurulóutak és ellenőrző helyek / pontok adatai

Az előterek, gurulóutak és kijelölt ellenőrző pontok helyének/pozíciójának fizikai jellemzőivel kapcsolatos részletek, az alábbiakat beleértve:
1) a forgalmi előterek és a helikopter állóhelyek burkolata és teherbírása;
2) a helikopterek földi gurulására használatos gurulóutak szélessége, burkolatának kivitele, teherbírása és megnevezése;
3) a helikopter légi gurulóutak, valamint a légi tranzit útvonalak szélessége és jelölése;
4) a magasságmérő ellenőrzésére kijelölt pontok helyzetének meghatározása és a tengerszint feletti magassága, kerekítve a legközelebbi méterre, vagy lábra;
5) VOR ellenőrzésre kijelölt pontok helymeghatározása;
6) az INS (*Inertial Reference System* - Inerciális Referencia Rendszer) ellenőrzésére kijelölt pontok helyzetének meghatározása fokokban, percekben, másodpercekben és 1/100 másodpercekben; és
7) megjegyzések.
Ha az ellenőrző helyek / pontok szerepelnek egy helikopter repülőtér navigációs térképén, akkor erről a tényről információt kell biztosítani ebben az alfejezetben.

**** AD 3.9. – Jelölések és jelzések

A végső megközelítési – és felszállási terület, valamint a gurulóutak jelöléseinek és jelzéseinek rövid leírása, az alábbiakat beleértve:
1) A végső megközelítési - és felszállási terület jelölései;
2) gurulóutak jelölései, légi gurulóutak jelzései, valamint a légi tranzit útvonalak jelzései; és
3) megjegyzések.

**** AD 3.10. – A helikopter repülőtéren található akadályok

Az akadályok részletes ismertetése, az alábbiakat beleértve:
1) akadályok a 2-es számú Területen:
a) az akadály azonosítása, vagy neve;
b) az akadály típusa;
c) az akadály pozíciójának földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben;
d) az akadály tengerszint feletti magassága, és függőleges kiterjedése a legközelebbi méterre, vagy lábra kerekítve;
e) az akadály jelölése, és az akadályfények típusa, színe (ha van);
f) ha alkalmazható, akkor annak jelzése, hogy az akadályok listája hozzáférhető elektronikus formában és egy hivatkozás a GEN 3.1.6 pontra; és
g) NIL jelölés, ha alkalmazható.

Megjegyzés 1.- A 10. Fejezet 10.2.2 pontja tartalmazza a 2-es számú Terület meghatározását, míg a 8. Függelék, A8-2 ábrája grafikus formában szemlélteti az akadály adatok gyűjtésére használandó felületeket, valamint a 2-es számú Területen az akadályok azonosításának kritériumait.

Megjegyzés 2.- Az 2-es számú Területen az akadályok helyzetének (földrajzi hosszúság és szélesség), valamint tengerszint feletti magasságának / függőleges kiterjedésének meghatározását és jelentését (a terepen végzett munka pontosságát és az adatok integritását) szabályzó részletes előírások, értelemszerűen, a 11. Annex, 5. Függelék, 1. és 2. Táblázatában találhatóak, valamint a 14. Annex, II. Kötet, 1. Függelék, 1. és 2. Táblázatában.

2) akadályok a 3-as számú Területen:
a) az akadály azonosítása, vagy neve;
b) az akadály típusa;
c) az akadály pozíciójának földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben;

d) az akadály tengerszint feletti magassága, és függőleges kiterjedése a legközelebbi méterre, vagy lábra kerekítve;
e) az akadály jelölése, és az akadályfények típusa, színe (ha van);
f) ha alkalmazható, akkor annak jelzése, hogy az akadályok listája hozzáférhető elektronikus formában és egy hivatkozás a GEN 3.1.6 pontra; és
g) NIL jelölés, ha helyénvaló.

Megjegyzés 1.- A 10. Fejezet 10.2.3 pontja tartalmazza a 3-as számú Terület meghatározását, míg a 8. Függelék, A8-3 ábrája grafikus formában szemlélteti az akadály adatok gyűjtésére használandó felületeket, valamint az akadályok azonosításának kritériumait a 3-es számú Területen.

Megjegyzés 2.- Az 3-as számú Területen az akadályok helyzetének (földrajzi hosszúság és szélesség), valamint tengerszint feletti magasságának / függőleges kiterjedésének meghatározását és jelentését (a terepen végzett munka pontosságát és az adatok integritását) szabályzó részletes előírások, értelemszerűen, a 14. Annex, II. Kötet, 1. Függelék, 1. és 2. Táblázatában találhatók.

**** AD 3.11 – A biztosított meteorológiai tájékoztatás

A helikopter repülőtéren biztosított meteorológiai tájékoztatások részletes leírása, valamint annak jelzése, hogy melyik meteorológiai iroda felelős a felsorolt szolgáltatások biztosításáért, beleértve a következőket:

1) a kapcsolódó meteorológiai iroda megnevezése;
2) üzemidő, és ahol ez alkalmazható, az ezen az időszakon túl felelős meteorológiai irodának a megnevezése;
3) a TAF-ok összeállításáért felelős iroda megnevezése és az előrejelzések érvényességi időszakai;
4) a helikopter repülőtér számára rendelkezésre álló trend típusú előrejelzések és a kiadásának időintervallumai;
5) információk arról, hogy az eligazításokat és/vagy konzultációkat milyen módon biztosítják;
6) a biztosított repülési dokumentáció típusai és a repülési dokumentációban használt nyelv(ek);
7) az eligazítás, vagy konzultáció idején bemutatott, vagy rendelkezésre álló térképek és egyéb információ;
8) olyan kiegészítő berendezések, melyek segítségével a meteorológiai körülményekről információkat biztosíthatnak, ilyenek lehetnek a meteorológiai radar és a meteorológiai műhold által biztosított képi ábrázolások;
9) a meteorológiai információval ellátott Légiforgalmi Szolgálati Egység(ek) (*Air Traffic Services Unit(s)*); és
10) további információk (pl. a szolgálat bármilyen fajta korlátozásáról, stb.).

**** AD 3.12. – A helikopter repülőtér adatai

A helikopter repülőtér méreteinek és kapcsolódó adatainak részletes leírása, az alábbiakat beleértve:
1) a helikopter repülőtér típusa – talajszinten, kiemelkedésen, vagy külön az erre a célra készített emelvényen (*helideck*);
2) földetérési és elemelkedési (TLOF – *touchdown and lift-off*) terület méretei a legközelebbi méterre, vagy lábra kerekítve;
3) a végső megközelítési és felszállási terület (FATO – *final approach and take-off*) földrajzi irányszöge 1/100 fokra kerekítve;
4) a végső megközelítési és felszállási terület (FATO) terület mérete a legközelebbi méterre, vagy lábra kerekítve és a burkolat típusa;
5) a földetérési és elemelkedési (TLOF) terület burkolatának teherbíró képessége és felületi nyomószilárdsága tonnákban (1 000 kg)
6) a földetérési és elemelkedési (*TLOF*) terület, vagy a végső megközelítési és felszállási (*FATO*) terület mindegyik küszöbe mértani középpontjának (ahol alkalmazható) földrajzi koordinátái fokokban, percekben, másodpercekben és 1/100 másodpercekben, valamint a (*Geoid*) Földalak hullámossága, egyenetlensége (*Geoid undulation*) a legközelebbi 1/2 méterre, vagy lábra kerekítve;
7) a TLOF és/vagy FATO terület lejtése és tengerszint feletti magassága:

· a nem precíziós bevezetések esetén a legközelebbi méterre, vagy lábra kerekítve; és
· a precíziós bevezetések esetén a legközelebbi 1/2 méterre, vagy lábra kerekítve;
8) a biztonsági terület méretei;
9) a helikopter felszállási biztonsági, akadálymentességi sáv mérete a legközelebbi méterre, vagy lábra kerekítve;
10) az akadálymentességi szektor megléte, és
11) megjegyzések.

**** AD 3.13. – Közzétett távolságok

A közzétett, meghatározott távolságok kerekítve a legközelebbi méterre, vagy lábra, ahol ez a helikopter repülőtérre alkalmazható, beleértve az alábbiakat:
1) TODA – az igénybe vehető felszállási távolság;
2) a megszakított felszállásra igénybe vehető távolság;
3) LDA – az igénybe vehető leszállási távolság; és
4) megjegyzések;

**** AD 3.14. – Bevezető és FATO fények

A bevezető és a FATO fények részletes leírása, beleértve az alábbiakat:
1) a bevezető, megközelítési fényrendszer típusa, hosszúsága és intenzitása;
2) a VASIS (*Visual Approach Slope Indicator System* - Optikai Siklópálya Jelző Rendszer) típusa;
3) a végső megközelítési és felszállási (FATO) terület fényeinek elhelyezkedése és jellemzői;
4) a bevezetési pont fényeinek (a FATO-n található, háromszöggel jelölt felület) elhelyezkedése és jellemzői;
5) a földetérési és elemelkedési (TLOF) terület fényrendszerének elhelyezkedése és jellemzői; és
6) megjegyzések.

**** AD 3.15. – Egyéb fények, tartalék energia ellátás

Az egyéb fények, és a tartalék energia ellátás részletes leírása, az alábbiakat beleértve:
1) a helikopter repülőtéri fényjeladó / azonosító fényjeladó telepítési helye, jellemzői, és üzemideje;
2) a szélsebesség kijelző (WDI – *Wind Direction Indicator*) telepítési helye és megvilágítása;
3) a gurulóutak szegély- és középvonal fényei;
4) a tartalék áramellátás beleértve az átkapcsolási időt is; és
5) megjegyzések.

**** AD 3.16. – A Légiforgalmi Szolgálatok légtere

A helikopter repülőtéren kialakított Légiforgalmi Szolgálatok (ATS) légterének részletes leírása, beleértve az alábbiakat:
1) a légtér megnevezését és oldalhatárainak földrajzi koordinátáit fokokban, percekben és másodpercekben megadva;
2) függőleges határait;
3) a légtér osztályba sorolását;
4) a szolgálatot biztosító ATS egység hívójelét és a használható nyelvet (nyelveket);
5) az átváltási magasságot; és
6) megjegyzéseket.

**** AD 3.17. – A Légiforgalmi Szolgálatok hírközlési berendezései

A helikopter repülőtéren kialakított Légiforgalmi Szolgálatok hírközlési berendezéseinek részletes leírása, az alábbiakat beleértve:
1) a szolgálat megnevezése;
2) hívójele;
3) frekvenciája (frekvenciái);
4) üzemidő; és
5) megjegyzések.

**** AD 3.18. – Rádió-navigációs és leszállító berendezések

A helikopter repülőtéren a műszeres megközelítéssel és a közelkörzeti eljárásokkal összefüggő rádiónavigációs és leszállító berendezések részletes leírása, az alábbiakat beleértve:
1) a berendezés típusa és a mágneses elhajlás (*VOR* számára a telepítési hely mágneses deklinációja /*Station declination*/, melyet a berendezés műszaki beállítására használnak fel) a legközelebbi fokra kerekítve, valamint a ILS, MLS, alap GNSS, SBAS és GBAS üzemeltetés típusai;
2) azonosító, ha szükséges;
3) frekvencia (frekvenciák), értelemszerűen;
4) üzemideje, értelemszerűen;
5) az adásra használt antenna telepítési helyének földrajzi koordinátái fokokban, percekben, másodpercekben és 1/10 másodpercekben megadva, értelemszerűen;
6) a DME berendezés adó-antennájának tengerszint feletti magassága, kerekítve a legközelebbi 30 méterre (100 lábra), valamint a DME/P antennáé a legközelebbi 3 méterre (10 lábra); és
7) megjegyzések.
Abban az esetben, amikor ugyanazt a berendezést használják útvonalrepülési és helikopter repülőtéri célokra is, akkor ennek leírását meg kell adni az ENR 4. fejezetben is. Ha a Földi Bázisú (telepítésű) Kiterjesztő Rendszer (GBAS - *Ground Based Augmentation System*) több, mint egy helikopter repülőteret szolgál ki, akkor a berendezés leírását valamennyi repülőtérnél biztosítani kell. Amennyiben a berendezést üzemeltető hatóság nem ugyanaz, mint a kijelölt állami szervezet, akkor az üzemeltető hatóság nevét a megjegyzés rovatban fel kell tüntetni. A berendezés hatótávolságát jelezni kell a megjegyzés rovatban.

**** AD 3.19. – A forgalmat érintő helyi előírások, rendelkezések

A helikopter repülőtér forgalmára vonatkozó előírások részletes leírása, beleértve a guruló helikopterek szabvány gurulási nyomvonalát, beállítási, parkolási előírásokat, oktató és kiképző repüléseket, valamint a hasonló, de kizárt, visszautasított repülési eljárásokat.

**** AD 3.20. – Zajcsökkentő eljárások

A helikopter repülőtéren alkalmazott zajcsökkentő eljárások részletes leírása.

****** AD 3.21 – Repülési eljárások**

A helikopter repülőtéren, a légtérszervezés alapján kialakított feltételek és a kijelölt repülési eljárások, beleértve a radar eljárásokat is.

****** AD 3.22 – Kiegészítő információk**

A helikopter repülőtérre vonatkozó kiegészítő információk, olyanok, mint például a repülőtéren található madárcsoportok, kiegészítve a pihenőhely és táplálkozási hely közötti jelentős napi mozgások feltüntetésével, amennyire csak lehetséges.

****** AD 3.23 – A helikopter repülőtérrel kapcsolatos térképek**

Itt követelik meg a helikopter repülőtérre vonatkozó térképek közzétételét, az alábbi sorrendben:
1) Repülőtér / Helikopter repülőtér Térkép – ICAO;
2) Körzeti Térkép – ICAO (indulási és tranzit útvonalak);
3) Szabványos Indulási Útvonalak Térképe – Műszeres (*SID*) – ICAO;
4) Körzeti Térkép – ICAO (érkezési és tranzit útvonalak);
5) Szabványos Érkezési Útvonalak Térképe – Műszeres (*STAR*) – ICAO;
6) A Radarvektorálásnál használható Minimális Tengerszint feletti Magasságok Térképe – ICAO;
7) Műszeres Megközelítési Térkép – ICAO (minden egyes eljárás típusra);
8) Látvarepülési Megközelítési Térkép – ICAO; és
9) A helikopter repülőtér közvetlen környezetében található madárkolóniák.

Ha a térképek közül valamelyiket nem adják ki, akkor erre a tényre utalni kell a GEN 3.2 (Léginavigációs térképek) szakaszban.

2. FÜGGELÉK - SNOWTAM FORMANYOMTATVÁNY

(lásd az 5. Fejezet, 5.2.3. pontját)

<table>
<tr><td rowspan="2">(COM fejrész)</td><td>(ELSŐBBSÉGI JEL)</td><td colspan="3">(CÍMZETTEK) <<≡</td></tr>
<tr><td>(KITÖLTÉS DÁTUMA ÉS IDŐPONTJA)</td><td colspan="3">(A FELADÓ JELZÉSE) <<≡</td></tr>
<tr><td>(Rövidített fejrész)</td><td>(SWAA * SOROZATSZÁM)
S W * *</td><td>(HELYSÉGNÉV AZONOSÍTÓ)</td><td>(ÉSZLELÉS DÁTUMA/ IDŐPONTJA)</td><td>(VÁLASZT-HATÓ CSOPORT) <<≡</td></tr>
</table>

SNOWTAM	(Sorozatszám) →
(REPÜLŐTÉR HELYSÉGNÉV AZONOSÍTÓJA)	A) →
(AZ ÉSZLELÉS DÁTUMA/IDŐPONTJA (*a mérés befejezésének időpontja UTC-ben*)	B) →
(A FUTÓPÁLYA MEGNEVEZÉSE, AZONOSÍTÓI)	C) →
(A FUTÓPÁLYA LETISZTÍTOTT HOSSZA, HA AZ KISEBB, MINT A FUTÓPÁLYA KÖZZÉTETT HOSSZA (*méterben*))	D) →
(A FUTÓPÁLYA LETISZTÍTOTT SZÉLESSÉGE, HA AZ KISEBB, MINT A FUTÓPÁLYA KÖZZÉTETT SZÉLESSÉGE (*méterben; ha a középvonaltól jobbra, vagy balra eltér, akkor "R", vagy "L" betűvel jelölendő*))	E) →
(A FUTÓPÁLYA TELJES HOSSZÁT BORÍTÓ CSAPADÉK JELLEGE - (*a futópálya valamennyi harmadán megmérve, attól a küszöbtől kezdődően, melynek kisebb a futópálya azonosítási száma.*) NIL - TISZTA, SZÁRAZ 1 - NEDVES 2 - VIZES, VAGY VÍZTÓCSÁK 3 - ZÚZMARA , VAGY DÉR BORíTOTT (*összefüggő, mélysége kevesebb, mint 1 mm*) 4 - SZÁRAZ HÓ 5 - NEDVES HÓ 6 - LATYAK 7 - JÉG 8 - ÖSSZENYOMOTT, VAGY HENGERELT HÓ 9 - FAGYOTT KERÉKNYOMOK, VAGY GERINCEK)	F) →
(A CSAPADÉK ÁTLAGOS MÉLYSÉGE (*mm*-ben) A FUTÓPÁLYA TELJES HOSSZÁN, HARMADONKÉNT)	G) →
(A FÉKHATÁS ÉRTÉKE A FUTÓPÁLYA MINDEN HARMADÁN ÉS A MÉRÉSRE HASZNÁLT ESZKÖZ) MÉRT, VAGY SZÁMÍTOTT SURLÓDÁSI EGYÜTTHATÓ *vagy* BECSÜLT FÉKHATÁS KÓD --- 0.40 és felette JÓ - 5 0.39 - 0.36 KÖZEPES/JÓ - 4 0.35 - 0.30 KÖZEPES - 3 0.29 - 0.26 KÖZEPES/ROSSZ - 2	H) →

0.25 és alatta ROSSZ - 1 9 - megbízhatatlan MEGBÍZHATATLAN -9 (*Ha mért koefficiensre hivatkozik, használja az észlelés két számjegyét, amelyet a használt fékhatásmérő berendezés rövidítése követ. Ha becsült értékre hivatkozik, egyetlen számjegyet használjon.*)	
(KRITIKUS MAGASSÁGÚ HÓPADOK (*Ha vannak, adja meg a magasságát (cm-ben) / a futópálya szélétől mért távolságát (m-ben), melyet "L", "R", vagy "LR" betűk kövessenek szükség szerint.*))	J) →
(FUTÓPÁLYA FÉNYEK (*Ha a fények takarva vannak,jelezze "YES"-szel (igen), melyet "L", "R", vagy "LR" betűk kövessenek, szükség szerint.*)	K) →
(TOVÁBBI TAKARÍTÁS (*ha további takarítás van tervbe véve, adja meg a letakarításra tervezett futópálya hosszúságot (m) / szélességet(m) vagy ha a futópálya teljes terjedelmében letakarításra kerül, a "TOTAL" szót*)	L) →
(TOVÁBBI TAKARÍTÁS BEFEJEZÉSÉNEK VÁRHATÓ IDEJE .... IDŐPONTRA (*UTC*))	M) →
(GURULÓÚT (*ha nincs megfelelő gurulóút, akkor a "NO" szót kell beilleszteni*))	N) →
(GURULÓÚT HÓPADOK (*ha a hópadok magasabbak, mint 60 cm, akkor a "YES" szó adandó meg, melyet a hópad gurulóút szélétől mért távolsága követ méterben*))	P) →
(FORGALMI ELŐTEREK (*ha nem használható, akkor a "NO" szó adandó meg*))	R) →
(A KÖVETKEZŐ TERVEZETT ÉSZLELÉS/MÉRÉS IDEJE (*hónap/nap/óra UTC-ben*))	S) →
(NYÍLT SZÖVEGŰ MEGJEGYZÉSEK (*beleértve a szennyezettség kiterjedését és más, az üzemeltetést jelentősen érintő tájékoztatást, pl. homokszórás, jégtelenítés*))	T)) <<≡
MEGJEGYZÉSEK: 1. * Írja be az ICAO országot jelölő kódját az ICAO DOC 7910, 2. rész szerint. 2. Más futópályákra vonatkozó tájékoztatáshoz ismételje meg a C-től P pontokig. 3. A zárójelben ( ) lévő szavakat nem kell továbbítani.	

A FELADÓ ALÁÍRÁSA (*nem továbbítandó*)

A SNOWTAM FORMANYOMTATVÁNY KITÖLTÉSÉNEK IRÁNYELVEI

1. *Általános rész*

a) Amikor a jelentés két, vagy három futópályára vonatkozik, akkor a C-től P-ig terjedő pontok adatait meg kell ismételni.

b) Azokat a pontokat, melyek nem tartalmaznak adatot, az azonosítójukkal együtt ki kell hagyni.

c) Metrikus mértékegységet kell használni és a mértékegységet nem kell jelenteni.

d) Egy SNOWTAM érvényessége maximálisan 24 órára terjedhet ki. Új SNOWTAM-ot kell kiadni, ha bármilyen jelentős változás áll be a körülményekben. Az alábbi futópálya állapot változásokat kell jelentősnek tekinteni:

1) ha a fékhatás együtthatójának változása 0.05 egység;

2) ha a felületen található csapadék mélységének változása több, mint:
20 mm – száraz hó;
10 mm – nedves hó;
3 mm – latyak
esetén;

3) ha a futópálya rendelkezésre álló hosszának, vagy szélességének változása eléri a 10 %-ot, vagy annál több;

4) ha a csapadékréteg fajtájának, vagy a fedett területek kiterjedésének változása, mely a SNOWTAM F) és T) adattételének újbóli besorolását teszi szükségessé;

5) ha kritikus hópadok, torlaszok találhatók a futópálya egyik, vagy mindkét oldalán, akkor a magasságának, vagy a futópálya középvonalától való távolságának bármilyen változásakor;

6) bármilyen változás a futópálya fényeinek láthatóságában, melyet a fények takarása okoz;

7) minden egyéb körülmény, melyet a helyi tapasztalatok, körülmények alapján fontosnak ítélnek meg.
e) Rövidített fejrészt, "TTAAiiii CCCC MMYYGGgg (BBB)", kell beilleszteni, hogy ezzel a számítógépes adatbázisokban elősegítsék a SNOWTAM automatizált feldolgozását.

Ezeknek a szimbólumoknak az értelmezése az alábbi:

TT = a SNOWTAM adatok azonosítója = SW;
AA = az Államok számára kiosztott földrajzi azonosító:
pl. LF - Franciaország,
EG - United Kingdom (Egyesült Királyság)
(lásd *Location Indicators* - Helységnév Azonosítók (Doc 7910), 2. Rész, A helységnév azonosítók jegyzéke);
iiii = a SNOWTAM sorszáma négy számjeggyel;
CCCC = a SNOWTAM által érintett repülőtér négybetűs helységnév azonosítója (lásd Location Indicators – Helységnév Azonosítók (Doc 7910);
MMYYGGgg = a megfigyelés/mérés dátuma/időpontja, ahol:
MM = hónap, például:
01 = január,
12 = december;
YY = a hónap napja;
GGgg = az időpont órája (GG) és percei (gg) UTC-ben;
(BBB) = választható csoport, mely:
egy korábban azonos számmal kiadott SNOWTAM tájékoztatás javítása esetén = COR.

Megjegyzés.– a (BBB) esetén használt zárójelek jelzik azt, hogy ez a csoport választható (opcionális).

Példa: A Zürich - ből érkezett 149-es számú SNOWTAM rövidített fejléce, melynek mérési/észlelési ideje november 7-e, 0620 UTC:
SWLS0149 LSZH 11070620

2. *A adatelem* – A repülőtér helységnév azonosítója (négybetűs).

3. *B adatelem* – Nyolc számjegyből álló dátum/időpont mező, mely megadja az észlelés időpontját, hónap,

nap, óra és perc sorrendben, UTC-ben meghatározva; ezt az adatelemet mindig ki kell tölteni.

4. *C adatelem* – a futópálya kisebb számú azonosítója.

5. *D adatelem* – a futópálya letisztított hossza méterben megadva, ha kevesebb, mint a közzétett hosszúság, (lásd a *T adatelem*-et a le nem tisztított futópályarészről);

6. *E adatelem* – a futópálya letisztított szélessége méterben megadva, ha kevesebb, mint a közzétett szélesség; ha a középvonaltól jobbra, balra eltér, akkor "R" (jobb), vagy "L" (bal) betűvel jelölve, a kisebb azonosító számú küszöbtől tekintve.

7. *F adatelem* – a teljes futópályát borító csapadék fajtája, ahogy azt a SNOWTAM formanyomtatványnál előírták. Ezeknek a számoknak a megfelelő kombinációit lehet használni a futópálya szakaszok változó állapotának jelzésére. Ha egy adott szakaszon belül a futópályán több, mint egyféle csapadékréteg is található, akkor ezt sorban kell jelezni, fentről lefelé haladva. Hófúvás, az átlagos értéknél észrevehetően nagyobb mélységű csapadékréteg, vagy a csapadékréteg más fontos jellemzője jelenthető a "T" adatelemben, nyílt szöveg formájában.

Megjegyzés: - a különböző típusú hófajták meghatározása ennek a Függeléknek a végén található.

8. *G adatelem* – a csapadékréteg átlagos mélysége milliméterben a futópálya minden harmadára, vagy "XX" betűkkel jelezve, ha nem mérhető vastagságú, vagy az üzemeltetés szempontjából lényegtelen; száraz hó esetén 20 mm, nedves hó esetén 10 mm, latyak esetén 3 mm pontossággal kell az értékelést elvégezni.

9. *H adatelem* – fékhatás mérések a futópálya minden harmadán és a fékhatás mérésére használt eszköz. A mért, vagy számított súrlódási együttható (két számjeggyel), vagy ha nem áll rendelkezésre, a becsült fékhatás (egy számjeggyel) a kisebb számú küszöbtől kiindulva. Ha a felület állapota, vagy a rendelkezésre álló fékhatás-mérő eszköz nem teszi lehetővé, hogy megbízható fékhatás mérést végezzenek, akkor ide a 9-es kódot kell beírni. Használja az alábbi rövidítéseket a használt fékhatás-mérő eszköz jelzésére:
BRD *Brakemeter-Dynamometer* (fékhatás-mérő készülék, fék-dinamométer)
GRT *Grip Tester* (tapadás vizsgáló)
MUM *Mu-meter* (súrlódási tényező mérő)
RFT *Runway friction tester* (futópálya fékhatás vizsgáló)
SFH *Surface friction tester (high pressure tire)* (felületi fékhatás tesztelő /magas nyomású kerékkel/)
SFL *Surface friction tester (low pressure tire)* (felületi fékhatás tesztelő /alacsony nyomású kerékkel/)
SKH *Skiddometer (high pressure tire)* (/magas nyomású kerékkel/)
SKL *Skiddometer (low pressure tire)* (/alacsony nyomású kerékkel/)
AP *Tapley meter* (megcsúszás-mérő)
Ha más eszközt használnak, akkor nyílt szöveggel kell meghatározni.

10. *J adatelem* – Kritikus magasságú hópadok. Ha vannak ilyenek, akkor magasságukat kell megadni centiméterben és távolságát a futópálya szélétől méterben, melyet a bal ("L"), jobb ("R"), vagy mindkét oldal ("LR") jelölése követ, melyet a kisebb számú küszöbtől kell tekinteni.

11. *K adatelem* – Ha a futópálya fényei takarva vannak, itt "YES"-nek kell szerepelnie, melyet a bal ("L"), jobb ("R"), vagy mindkét oldal ("LR") jelölése követ, melyet a kisebb számú küszöbtől kell tekinteni.

12. *L adatelem* – ha további takarítás várható, meg kell adni a takarítandó futópálya hosszát és szélességét, vagy a "TOTAL" szót, ha a teljes futópálya takarításra kerül.

13. *M adatelem* – ide kell beírni a befejezés várható idejét UTC-ben.

14. *N adatelem* – az "F" adatelemnél használt kódokat lehet használni a gurulóút állapotok leírására is, a

"NO" szó szerepeljen, ha a futópályához tartozó, kapcsolódó gurulóutak egyike sem használható.

15. *P adatelem* – ha alkalmazható, akkor a "YES"-t kell ide írni, majd az oldaltávolságot méterben.

16. *R adatelem* – az "F" adatelemnél használt kódokat lehet használni az előtér állapotok leírására is, a "NO" szó szerepeljen, ha az előtér nem használható.

17. *S adatelem* – ide kell beírni a következő megfigyelés/mérés várható idejét, UTC-ben.

18. *T adatelem* – nyílt szöveggel kell leírni bármely az üzemeltetés szempontjából lényeges információt, de minden esetben tüntesse fel a tisztítatlan futópálya hosszúságát ("D" adatelem) és a futópálya szennyezettségének a mértékét ("F" adatelem), a futópálya mindegyik harmadára (ha alkalmazható) az alábbi skálának megfelelően:
Futópálya szennyezettsége – 10% – ha a futópálya kevesebb, mint 10 %-a szennyezett;
Futópálya szennyezettsége – 25% – ha a futópálya 11-25 %-a szennyezett;
Futópálya szennyezettsége – 50% – ha a futópálya 26-50 %-a szennyezett;
Futópálya szennyezettsége – 100% – ha a futópálya 51-100 %-a szennyezett.

PÉLDA A KITÖLTÖTT SNOWTAM FORMANYOMTATVÁNYRA

GG EHAMZQZX EDDFZQZX EKCHZQZX
070645 LSZHYNYX
SWLS0149 LSZH 11070620
SNOWTAM 0149

A) LSZH	B) 11070620	C) 02	D) ... P)
		C) 09	D) ... P)
		C) 12	D) ... P)
R) NO	S) 11070920	T) DEICING)	

A hó különféle fajtáinak pontos meghatározása

Latyak (*Slush*): Vízzel átitatott olyan hó, melyre ha teljes talppal a földre toppantanak, szétloccsan a talp alól; fajsúlya: 0.5 - 0.8.

Megjegyzés: - Jég, hó és/vagy állóvíz keveréke, különösen akkor, amikor eső, havas eső, vagy hó esik, eredményezhet 0.8 feletti fajsúlyú anyagokat is. Ezek az anyagok, a magas víz/jég tartalmuk miatt inkább átlátszóak, mint zavarosak, és magasabb fajsúlyuk miatt, könnyedén meg lehet őket különböztetni a latyaktól.

Hó (a földön):

a) *Száraz hó: (dry snow)* hó, amely természetes állapotában elfújható, vagy ha kézzel összenyomják, elengedés után darabjaira hullik szét; fajsúlya nem éri el a 0.35 értéket.

b) *Nedves hó: (wet snow)* hó, amely ha kézzel összenyomják, összetapad, és hajlamos hógolyóvá összeállni, vagy hógolyóvá áll össze; fajsúlya: 0.35, vagy több, de kevesebb, mint 0.5.

c) *Összenyomott hó: (compacted snow)* hó, melyet szilárd tömeggé nyomtak össze, amely ellenáll a további összenyomásnak, egyben marad, vagy nagyobb darabokba törik, ha felemelik, fajsúlya: 0.5, vagy több.

3. FÜGGELÉK - ASHTAM FORMANYOMTATVÁNY

(lásd az 5. Fejezet, 5.2.4. pontját)

(COM fejrész)	(ELSŐBBSÉGI JEL)	(CÍMZETTEK JELZÉSE(I)) 1		
	(KITÖLTÉS DÁTUMA ÉS IDŐPONTJA)	(A FELADÓ JELZÉSE)		
(Rövidített fejrész)	(VA *2 SOROZATSZÁM) V | A | *2 | *2 | | | |	(HELYSÉG-NÉV AZO-NOSÍTÓ)	(KIADÁS DÁTUMA / IDŐPONTJA)	(VÁLASZT-HATÓ CSOPORT)

ASHTAM	(SOROZATSZÁM)

(AZ ÉRINTETT REPÜLÉSTÁJÉKOZTATÓ KÖRZET - FIR)	A)
(A KITÖRÉS DÁTUMA/IDŐPONTJA UTC-BEN)	B)
(A TŰZHÁNYÓ NEVE ÉS SZÁMA)	C)
(A TŰZHÁNYÓ FÖLDRAJZI SZÉLESSÉGE/HOSSZÚSÁGA, VAGY A TŰZHÁNYÓ RADIÁLJA ÉS TÁVOLSÁGA EGY NAVIGÁCIÓS BERENDEZÉSTŐL MÉRVE)	D)
(A TŰZHÁNYÓ AKTIVITÁSÁNAK RIASZTÁSI SZINTJÉT JELZŐ SZÍNKÓD, BELEÉRTVE BÁRMELY KORÁBBI RIASZTÁSI SZÍNKÓDJÁT) 3	E)
(A VULKÁNI HAMUFELHŐ MEGLÉTE, VALAMINT ANNAK VÍZSZINTES ÉS FÜGGŐLEGES KITERJEDÉSE) 4	F)
(A VULKÁNI HAMUFELHŐ MOZGÁSÁNAK IRÁNYA) 4	G)
(REPÜLÉSI ÚTVONALAK, VAGY ÚTVONAL SZAKASZOK, VALAMINT REPÜLÉSI SZINTEK, MELYEKET ÉRINT)	H)
(LÉGTÉR ÉS/VAGY ÚTVONALAK, VAGY ÚTVONAL SZAKASZOK BEZÁRÁSA, VALAMINT A RENDELKEZÉSRE ÁLLÓ VÁLASZTHATÓ, ELKERÜLŐ ÚTVONALAK)	I)
(A TÁJÉKOZTATÁS FORRÁSA)	J)
(NYÍLT SZÖVEGŰ MEGJEGYZÉSEK)	K)

MEGJEGYZÉSEK:
1. Lásd még az 5. Függeléket, a helységnév azonosítók használatával kapcsolatban, egy előre meghatározott szétosztási rendszerben.
2. *Írja be az államot jelölő ICAO betűkódot, az ICAO DOC 7910, 2. rész szerint.
3. Lásd később a 3.5 pontot.
4. Tanácsokat a vulkáni hamufelhők létezéséről, kiterjedéséről és mozgásáról, a G) és H) pontokhoz adatokat az érintett, adott FIR-ért felelős Vulkáni Hamufelhők Tanácsadói Központjától /Központjaitól/ (*Volcanic Ash Advisory Centre/s/*) lehet beszerezni.
5. A zárójelben ( ) szereplő adatelemeket nem kell továbbítani!

A FELADÓ ALÁÍRÁSA (*nem továbbítandó*)

AZ ASHTAM FORMANYOMTATVÁNY KITÖLTÉSÉNEK IRÁNYELVEI

1. Általános rész

1.1. Az ASHTAM egy tűzhányó aktivitásáról szolgáltat információkat, amikor az aktivitásában beálló valamely változás fontos, vagy várhatóan fontos az üzemeltetés szempontjából. Ezt az információt a tűzhányó aktivitás riasztási szintjének megfelelő színkód felhasználásával biztosítják, mely a későbbi 3.5 pont alatt található.

1.2. Abban az esetben, amikor egy vulkánkitörés után olyan vulkáni hamufelhő keletkezik a légkörben, mely az üzemeltetésre jelentős hatással van, az ASHTAM tájékoztatást nyújt a vulkáni hamufelhő elhelyezkedéséről, kiterjedéséről és mozgásáról, valamint az érintett repülési útvonalakról és repülési szintekről is.

1.3. Egy vulkánkitörésről tájékoztatást adó ASHTAM 3. fejezet szerinti kiadását **nem szabad** késleltetni addig, amíg az összes információ, A)-tól K)-ig rendelkezésre nem áll, hanem azt azonnal ki kell adni, amint értesítést kapnak egy vulkánkitörésről, vagy egy várható kitörésről, vagy az üzemeltetésre jelentős hatással bíró tűzhányó bekövetkezett, vagy várható aktivitás változásáról, valamint ha egy vulkáni hamufelhőt jelentettek. Várható vulkánkitörés esetén, amikor még nincs hamufelhő a levegőben, az A)-tól E) pontokban található információkat kell kitölteni az ASHTAM-ban, az F)-től az I)-pontig pedig jelezni kell, hogy azok nem alkalmazhatóak : *"not applicable"*.
Hasonlóképpen, ha vulkáni hamufelhőt jelentettek, pl. egy levegőből leadott légi jelentés formájában, de maga a tűzhányó, amelyből a vulkáni hamufelhő származik, az adott időpontban még nem ismert, az előzetes ASHTAM-ot úgy kell kitölteni és kiadni, hogy az A)-tól E)-ig tartó adattételeket "nem ismert"-nek (*"unknown")* kell jelezni, valamint az F)-től K)-ig terjedő adatelemeket kell szükség szerint teljesen kitölteni a légi jelentés alapján, mialatt a további információk megérkezésére várnak. Más esetben, ha az A)-tól K)-ig az adatelemek valamelyike nem áll rendelkezésre, ezt "NIL"-lel kell jelezni.

1.4. Az ASHTAM-ok maximális érvényességi időszaka 24 óra. Új ASHTAM-ot kell kiadni, amikor a riasztás szintjében változás következik be.

2. Rövidített fejrész

2.1. A szokásos AFTN (Légiforgalmi Állandóhelyű Távközlési Hálózat) távközlési fejléc után az alábbi rövidített fejlécet, "TT AAiiii CCCC MMYYGGgg (BBB)", illesztik az ASHTAM közlemény elejére, hogy ezzel könnyítsék meg az ASHTAM automatikus feldolgozását a számítógépes adatbázisokban. Ezeknek a szimbólumoknak az értelmezése az alábbi:

TT = az ASHTAM adatok azonosítója = VA;
AA = az Államok földrajzi azonosítója pl.:
NZ = Új-Zéland, (lásd *Location Indicators* - Helységnév Azonosítók (Doc 7910), 2. Rész, A Helységnév Azonosítókban az Államot jelző Betűkódok Mutatója);
iiii = az ASHTAM sorszáma, négy számjeggyel megadva;
CCCC = az ASHTAM által érintett körzet négybetűs helységnév azonosítója (lásd *Location Indicators*-Helységnév Azonosítók (Doc 7910), 5. rész, a FIR/UIR-ben a felügyeletet ellátó központok címe);
MMYYGGgg = a jelentés dátuma/időpontja, melyből az:
MM = hónap, például a 01 = január, 12 = december;
YY = a hónap napjai;
GGgg = az időpont órája (GG) és perce (gg) UTC-ben;
(BBB) = opcionális csoport, egy korábban azonos számmal kiadott ASHTAM tájékoztatás javítása esetén ez = COR.

Megjegyzés.– a (BBB) esetén használt zárójelek jelzik azt, hogy ez a csoport választható, (opcionális).

Példa: Rövidített ASHTAM fejléc az "Auckland Oceanic FIR" részére, November 7-én, 0620 UTC-kor kiadott jelentés:

VANZ0001 NZZO 11070620

3. Az ASHTAM tartalma

3.1. A adatelem – Az érintett FIR (Repüléstájékoztató Körzet), a nyílt szövegű megfelelője a rövidített fejlécben található Helységnév Azonosítónak, amely ebben a példában "Auckland Oceanic FIR".

3.2. B adatelem – az első kitörés dátuma és időpontja (UTC).

3.3. C adatelem – a tűzhányó neve, a tűzhányó száma, ahogy az az ICAO kiadványában (*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691) - Vulkáni Hamu, Radioaktív Anyagok és Toxikus Vegyi Anyagok Felhői – Kézikönyvében (Doc 9691), H Függelék), valamint ahogyan a *World Map of Volcanos and Principal Aeronautical Features* - Vulkánok és Legfontosabb Léginavigációs Jellegzetességek, Tereptárgyak Világtérképén szerepel.

3.4. D adatelem – a tűzhányó földrajzi szélessége/hosszúsága teljes fokokban kifejezve, vagy a tűzhányó radiállal és távolsággal kifejezett helyzete egy navigációs berendezéstől (*NAVAID*). (Ahogyan az ICAO kiadványában (*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691) - Vulkáni Hamu, Radioaktív Anyagok és Toxikus Vegyi Anyagok Felhői - Kézikönyv (Doc 9691), H Függelék), valamint a *World Map of Volcanos and Principal Aeronautical Features* - Vulkánok és Legfontosabb Léginavigációs Jellegzetességek, Tereptárgyak Világtérképén szerepel).

3.5. E adatelem – színkód, mely jelzi a tűzhányó aktivitás riasztási szintjét, beleértve bármely korábbi riasztási színkódot, az alábbiak szerint:

A tűzhányó aktivitás riasztási szintjét jelző színkód	A tűzhányó aktivitásának állapota
VÖRÖS RIASZTÁS	A vulkánkitörés pillanatnyilag is folyamatban van. Hamucsóvát/-felhőt jelentettek FL 250 felett, *vagy* A tűzhányó veszélyes, valószínű a kitörés, olyan hamucsóva/-felhő várható, amely FL 250 fölé nyúlik.
NARANCS RIASZTÁS	A vulkánkitörés pillanatnyilag is folyamatban van, de a hamu csóva/felhő nem éri el és nem is várják, hogy eléri a FL 250-et, *vagy* A tűzhányó veszélyes, a kitörés valószínű, de a hamucsóva/felhő várhatóan nem éri el a FL 250-et.
SÁRGA RIASZTÁS	A tűzhányót időnként aktívnak tudják, és a tűzhányó aktivitása a közelmúltban jelentősen megnövekedett, a vulkánt pillanatnyilag nem ítélik veszélyesnek, de óvatosnak kell lenni. *vagy* (Egy kitörés után, azaz PIROS-ról, vagy NARANCS-ról a riasztás szintjét SÁRGÁ-ra változtatják.) A tűzhányó aktivitása jelentősen csökkent, a tűzhányót pillanatnyilag nem ítélik veszélyesnek, de ennek ellenére óvatosnak kell lenni.
ZÖLD RIASZTÁS	Úgy vélik, hogy a tűzhányó aktivitása szünetel, és a tűzhányó visszatért normális állapotába.

Megjegyzés. – Az érintett Állam területén a Körzeti Irányító Központ számára az illetékes vulkanológiai szervezetnek kell biztosítania a tűzhányó aktivitás riasztási szintjét jelző színkódot, és a korábbi szintben beálló bármilyen változást, pl. "RED ALERT FOLLOWING YELLOW" , *vagy "GREEN ALERT FOLLOWING ORANGE", azaz* "VÖRÖS RIASZTÁS A SÁRGA UTÁN", *vagy* "ZÖLD RIASZTÁS A NARANCS UTÁN".

3.6. F adatelem - Ha az üzemeltetésre jelentős hatású vulkáni hamufelhőt jelentettek, jelezni kell a vulkáni hamufelhő vízszintes kiterjedését a földrajzi szélesség / hosszúság felhasználásával (teljes fokokban kifejezve), a hamufelhő alsó/felső szintjét a tengerszinthez viszonyítva (*altitude*) 1000 méterben (lábban), és/vagy a kibocsátó vulkánhoz viszonyított radiállal és távolsággal. A tájékoztatást kezdetben csupán a különleges légi-jelentésekre is alapozhatják, de az illetékes meteorológiai figyelő állomásoktól és/vagy a Vulkáni Hamufelhők Tanácsadói Központjaitól (*Volcanic Ash Advisory Centre/s/*) származó értesítések jó alapot szolgáltathatnak a későbbi részletesebb tájékoztatások számára.

3.7. G adatelem – az illetékes meteorológiai megfigyelő állomásoktól és/vagy a Vulkáni Hamufelhők Tanácsadói Központjától származó értesítésekre alapozva jelezni kell a vulkáni hamufelhő mozgásának várható irányát a kiválasztott repülési szinteken.

3.8. H adatelem – jelezni kell azokat a repülési útvonalakat és repülési útvonal szakaszokat, valamint repülési szinteket, amelyeket a természeti jelenség érint, vagy várhatóan érinteni fog.

3.9. I adatelem – jelezni kell a légtér, a repülési útvonalak, vagy útvonalszakaszok zárását, valamint a rendelkezésre álló elkerülő útvonalak lehetőségét.

3.10. J adatelem – az információforrás jelzése, például "különleges légi-jelentés" ("*special air-report*"), vagy "vulkanológiai szervezet" ("*vulcanological agency*"), stb. Az információ forrását minden esetben fel kell tüntetni, akár éppen kitört egy vulkán, vagy egy vulkáni hamufelhőt jelentettek, akár nem.

3.11. K adatelem – az előző pontokhoz kiegészítésképpen, nyílt szöveggel leírva, bármely üzemeltetési szempontból fontos, lényeges információ.

4. FÜGGELÉK – AIRAC - A LÉGIFORGALMI TÁJÉKOZTATÓ KÖZLEMÉNYEK MEGHATÁROZOTT KIADÁSI RENDJE ALAPJÁN BIZTOSÍTANDÓ TÁJÉKOZTATÁSOK

(lásd az 6. Fejezet, 6.1.1. pontját)

1. RÉSZ

1. Az alábbiak létesítésére, megszüntetésére, valamint előre elhatározott jelentős változtatására (beleértve az üzemeltetési kísérleteket is) vonatkozó tájékoztatások:

1.1. Határok (vízszintes és függőleges), rendszabályok és eljárások az alábbiakra vonatkozóan:

a) repüléstájékoztató körzetek (FIR);

b) irányítói körzetek;

c) repülőtéri irányítói körzetek;

d) tanácsadói körzetek;

e) ATS útvonalak;

f) állandó veszélyes, tiltott és korlátozott légterek (ha ismert, akkor a tevékenység típusát és időszakait is beleértve), valamint ADIZ (*Air Defense Identification Zone* - A Légvédelmi Azonosítási Körzet).

g) állandó körzetek, vagy útvonalak, vagy ezek részei, ahol az elfogás veszélye fennáll.

1.2. A rádió-navigációs berendezések és kommunikációs eszközök telepítési helye, frekvenciái, hívójelei, ismert rendellenességei, valamint karbantartási időszakaszai.

1.3. Várakozási és megközelítési eljárások, érkezési és indulási eljárások, zajcsökkentő eljárások és bármely más idetartozó ATS eljárás.

1.4. Meteorológiai eszközök, felszerelések (beleértve a sugárzást, adást is), valamint eljárások.

1.5. Futópályák és végbiztonsági sávok.

2. RÉSZ

2. Az alábbiak létesítésére és megszüntetésére, valamint előre elhatározott jelentős változtatására vonatkozó tájékoztatások:

2.1. Navigációs, repülési akadályok helyzete, magassága és megvilágítása.

2.2. Gurulóutak és forgalmi előterek;

2.3. Üzemeltetési időszak: repülőterek, berendezések és szolgáltatások esetén;

2.4. Vám, bevándorlási és egészségügyi szolgálatok;

2.5. Ideiglenes veszélyes, tiltott és korlátozott légterek és navigációs, repülési veszélyek, katonai gyakorlatok és repülőgépek tömeges mozgása.

2.6. Olyan ideiglenes körzetek vagy útvonalak, vagy útvonal szakaszok, ahol fennáll az elfogás lehetősége.

5. FÜGGELÉK – A NOTAMOK ELŐRE MEGHATÁROZOTT ELOSZTÁSI RENDSZERE

(lásd az 5. Fejezet, 5.3.4.2, valamint az Annex 10 II. Kötete, 4. Fejezet, 4.4.14. pontját)

1. Az előre meghatározott szétosztási rendszer lehetővé teszi, hogy a beérkező NOTAM-ok (a SNOWTAM-ot is és az ASHTAM-ot is beleértve) az AFTN csatornáin keresztül közvetlenül az érintett fogadó ország által kijelölt címekre kerüljenek, miközben ezzel egyidejűleg a nemzetközi NOTAM iroda is megkapja ellenőrzési és felügyeleti célokra.

2. A kijelölt címek számára a címzett jelzését az alábbiak szerint állítják össze:

1) Az első és második betű:
A fogadó ország illetékes nemzetközi NOTAM irodájával összeköttetésben álló AFTN hírközlési központ Helységnév Azonosítójának (*Location Indicator*) első két betűje.

2) A harmadik és a negyedik betű:
A "ZZ" betűk, melyek jelzik a különleges szétosztás követelményét.

3) Ötödik betű:
Az ötödik betű azonosítja a NOTAM-ot ("N" betű), a SNOWTAM-ot ("S" betű) és az ASHTAM-ot ("V" betű).

4) Hatodik és hetedik betű:
A hatodik és hetedik betű, valamennyi az angol ABC betűi közül kerül ki, A-tól Z-ig, az(oka)t a nemzeti és/vagy nemzetközi szétosztási jegyzé(ke)ket jelöli(k), melye(ke)t a fogadó AFTN központnak kell használnia.

Megjegyzés: - Az ötödik, hatodik és hetedik betűk az "YNY" hárombetűs azonosítót helyettesítik, mely a szokásos szétosztási rendszerben a nemzetközi NOTAM irodát jelöli.

5) Nyolcadik betű:
A nyolcadik helyen álló betű helykitöltési célból mindig "X", hogy biztosítsák a szabványos nyolc betűből álló címzési azonosítót.

3. Az Államoknak tájékoztatniuk kell azokat az Államokat, ahonnan NOTAM-okat kaphatnak, a különböző körülmények esetén használandó hatodik és hetedik betűről, ezzel biztosítva a megfelelő, helyes NOTAM továbbítási útvonalat.

6. FÜGGELÉK – NOTAM - FORMANYOMTATVÁNY

(lásd az 5. Fejezet, 5.2.1 pontját)

Elsőbbségi jel	
Címzés	
	<<≡
A kitöltés dátuma és időpontja	→
Feladó jelzése	<<≡ (
A közlemény sorozata, száma és azonosítója	
Új információt tartalmazó	.... NOTAMN

NOTAM	(sorozata és száma/év)
Egy korábbi NOTAM helyébe lépő NOTAM	.... NOTAMR ….................................. (sorozata és száma/év) (a helyettesítendő NOTAM sorozata és száma/év)
Egy korábbi NOTAM-ot törlő NOTAM	.... NOTAM C ….................................. (sorozata és száma/év) (a törlendő NOTAM sorozata és száma/év) <<≡

Minősítő jelzők

	FIR	NOTAM kód	Forgalom	Cél	Hatáskör	Alsó határ	Felső határ	Koordináták, sugár	
Q)	/	Q /	/	/	/	/	/		<<≡

Azon ICAO Helységnév Azonosító jelzése, ahol a jelentésben szereplő berendezés, légtér, vagy körülmény található.	A) →

Az érvényesség időtartama

-Tól (*dátum-idő csoport*)	B)		→
-Ig (*PERM, vagy dátum-időpont csoport*)	C)	**EST* PERM***	<<≡
Időbeosztás (*ha rendelkezésre áll*)	D)		→
			<<≡

A NOTAM szövege; nyílt szöveg (az ICAO rövidítései használhatók)

E) <<≡

Alsó határ	→
Felső határ	<<≡
Aláírás	

*Szükség szerint törlendő

ÚTMUTATÓ A NOTAM FORMANYOMTATVÁNY KITÖLTÉSÉHEZ

1. Általános rész

A minősítő jelző sorát (Q adatelem) és összes azonosítót (A adatelemtől G adatelemig), valamennyi után egy lezáró zárójellel, ahogyan az a formanyomtatványon is látható, továbbítani kell, kivéve, ha nincs bejegyeznivaló az adott azonosító mellé.

2. A NOTAM-ok számozása

Minden NOTAM-hoz egy sorozatszámot kell hozzárendelni, amely egy betűből és egy négyjegyű számból áll, amit egy törtvonal után, az évet jelző két számjegy követ. (pl. A0023/03)

3. Minősítő jelzők (Q adatelem)

A Q adatelem nyolc mezőre van felosztva, valamennyit törtvonallal választják el egymástól. Ha egy mezőbe nem kerül bejegyzés, nincs szükség arra, hogy a törtvonalak között szóközöket továbbítsanak. A mezők kitöltésére példák a *Légiforgalmi Tájékoztató Szolgálatok Kézikönyve* (Aeronautical Information Services Manual - Doc 8126) című kiadványban találhatók. A mezők jelentése az alábbi:

1) FIR

a) az érintett FIR ICAO helységnév azonosítója, vagy ha egy Államon belül több FIR-re is alkalmazható, akkor az Állam helységnév azonosítójának első két betűje és "XX" kell legyen. Az érintett FIR-ek ICAO helységnév azonosítóit, vagy azon Állam, vagy nem kormányzati hatóság jelzését, mely több, mint egy Államon belül biztosítja a léginavigációs szolgálatot, az A) adattételben kell felsorolni.

b) Ha egy állam kiad egy olyan NOTAM-ot, amely az államok egy csoportjában lévő több FIR-re vonatkozik, akkor a kiadó állam helységnév azonosítójának első két betűjét és az "XX" csoportot kell megadni. Az érintett FIR-ek ICAO helységnév azonosítóit, vagy azon Állam, vagy nem kormányzati hatóság jelzését, mely több, mint egy Államon belül biztosítja a léginavigációs szolgálatot, az A) adattételben kell felsorolni,

2) NOTAM KÓD (*NOTAM CODE*)

Valamennyi NOTAM kódcsoport összesen öt-öt betűt tartalmaz, amelynek az első betűje mindig Q. A második és a harmadik betű azonosítja a NOTAM tárgyat, témáját, valamint a negyedik és ötödik betű a jelentés tárgyának, témájának pillanatnyi állapotát, státuszát jelzi. A második, harmadik, negyedik és ötödik betűk kombinációjaként használja azokat az ICAO NOTAM kódokat, amelyek a "Légiforgalmi Szolgálatok Eljárásai – ICAO Rövidítések és Kódok" *(Procedures for Air Navigation Services – ICAO abbreviations and Codes - PANS-ABC, Doc 8400)* kiadványban találhatóak, vagy azokat, amelyek a *Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében* (Aeronautical Information Services Manual - Doc 8126), a NOTAM Kiválasztás Követelményeiben találhatóak, vagy válasszon az alábbi kombinációk közül, értelemszerűen:

a) Ha a NOTAM tárgya nem található meg a NOTAM Kódok jegyzékében (Doc 8400), vagy a NOTAM Kiválasztás Követelményei között (Doc 8126), akkor a második és harmadik betű helyére "XX" betűcsoportot kell illeszteni (pl. QXXAK);

b) Ha a NOTAM tárgyának, témájának feltételei nem szerepelnek a NOTAM Kódok jegyzékében (Doc 8400), vagy a NOTAM Kiválasztás Követelményei között (Doc 8126), akkor a negyedik és ötödik betű helyére "XX" betűcsoportot kell illeszteni (pl. QFAXX);

c) Amikor egy NOTAM üzemeltetési szempontból fontos tájékoztatásokat tartalmaz és azt a 4. Függelék, 6. Fejezetével összhangban adták ki, valamint amikor azt az AIRAC AIP Kiegészítések és Mellékletek létének közzétételére használják, a "TT" betűcsoportot kell beilleszteni a NOTAM Kód negyedik és ötödik betűjének helyére;

d) Amikor egy NOTAM az érvényben lévő NOTAM-ok jegyzékét tartalmazza, akkor a második, harmadik, negyedik és ötödik betű helyére a "KKKK" betűcsoportot kell illeszteni; és

e) a NOTAM törlése esetén az alábbi negyedik és ötödik betűből álló NOTAM Kódokat kell használni:

AK : *RESUMED NORMAL OPERATION* - A NORMÁL ÜZEMELTETÉS HELYREÁLLÍTVA
AL : *OPERATIVE (OR RE-OPERATIVE) SUBJECT TO PREVIOUSLY PUBLISHED LIMITATIONS/CONDITIONS* -
A KORÁBBAN KÖZZÉTETT KORLÁTOZÁSOK / FELTÉTELEK SZERINT MŰKÖDIK (VAGY ISMÉT MŰKÖDIK) A NOTAM TÁRGYA.
AO : *OPERATIONAL* - MŰKÖDŐKÉPES
CC : *COMPLETED* - BEFEJEZVE, BEFEJEZETT
XX : *PLAIN LANGUAGE* - NYÍLT SZÖVEGŰ

3) FORGALOM (*TRAFFIC*)

I = IFR
V = VFR
K = Ez a NOTAM egy ellenőrző jegyzék.

*Megjegyzés: A NOTAM tárgyától és tartalmától függően a FORGALOM (*TRAFFIC*) minősítő mezőben összetett minősítők is lehetnek. A lehetséges kombinációk a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében* (Aeronautical Information Services Manual - Doc 8126), *a NOTAM Kiválasztás Követelményeiben találhatóak.*

4) CÉLJA (*PURPOSE*)

N = olyan NOTAM, melyet azért választottak ki, hogy a légijármű üzemeltetők azonnali figyelmébe ajánlják;
B = NOTAM, melyet PIB bejegyzésnek választottak ki (*Pre-flight Information Bulletin* - Repülés Előtti Tájékoztató Bulletin);
O = Az üzemeltetést érintő NOTAMOK;
M = Különféle NOTAM-ok; melyek nem tartoznak a repülés előtti tájékoztatáshoz, de ennek ellenére, kérésre rendelkezésre állnak.
K = Ez a NOTAM egy ellenőrző jegyzék.

Megjegyzés.– A NOTAM tárgyától és tartalmától függően a hatáskör, tárgykör (SCOPE) minősítő mezőben összetett minősítők is lehetnek. A lehetséges kombinációk a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - Doc 8126), *a NOTAM Kiválasztás Követelményeiben találhatóak.*

5) HATÁSKÖR, TÁRGYKÖR (*SCOPE*)

A = Repülőtér *(Aerodrome)*
E = Útvonal *(En-route)*
W = Navigációs figyelmeztetés *(Nav Warning)*
K = Ez a NOTAM egy ellenőrző jegyzék.

Megjegyzés.– A NOTAM tárgyától és tartalmától függően a hatáskör, tárgykör (SCOPE) minősítő mezőben összetett minősítők is lehetnek. A lehetséges kombinációk a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual - Doc 8126), *a NOTAM Kiválasztás Követelményeiben találhatóak.*
Ha a hatáskört AE-nek minősítik, akkor a repülőtér helységnév azonosítóját az A) adattételben kell jelenteni.

6) és 7) ALSÓ/FELSŐ HATÁR (*LOWER/UPPER*)

Az ALSÓ és FELSŐ határokat mindig ki kell tölteni és mindig repülési szintben (FL) kell megadni. Navigációs figyelmeztetések és légtér korlátozások esetén, a közölt értékeknek meg kell egyezniük az F) és a G) adatelemekben megadottakkal.

Ha az adatelem nem tartalmaz pontosan meghatározott magassági információt, "000"-t kell az ALSÓ értéknek, és "999"-et a FELSŐ értéknek beállítani, mint alapértelmezés szerinti értéket.

8) KOORDINÁTÁK, SUGÁR (*COORDINATES, RADIUS*)

A földrajzi szélesség és hosszúság 1 perc pontossággal megadva, valamint egy három számjeggyel meghatározott távolsági érték, mely tengeri mérföldben adja meg a hatókör sugarát, (például: 4700N01140E043). A koordináták egy kör közepét adják meg, megközelítő pontossággal, melynek sugara körülzárja a hatókör teljes területét és ha a NOTAM a teljes FIR/UIR-re vonatkozik, vagy több, mint egy FIR/UIR-re, akkor a rádiusz helyére a "999" alapértelmezés szerinti értéket kell beírni.

4. A) adatelem

Ide annak a repülőtérnek, vagy FIR-nek az ICAO helységnév azonosítóját kell beírni – ahogy azt a Helységnév Azonosítók *(Locations Indicators – ICAO Doc 7910)* című kiadvány tartalmazza – ahol a jelentésbe foglalt berendezés, légtér, vagy körülmény megtalálható. Amennyiben szükséges, nemcsak egy, hanem több FIR/UIR is megnevezhető. Amennyiben nem áll rendelkezésre megfelelő ICAO helységnév azonosító, akkor használja az ICAO által biztosított, az államot azonosító betűket, ahogy azt a Helységnév Azonosítók *(Locations Indicators – ICAO Doc 7910)* című kiadvány 2. Része tartalmazza, valamint "XX" betűket, majd a későbbiek során az E) adatelemben nyílt szöveggel kell megadni a nevet.

Ha a tájékoztatás GNSS-re vonatkozik, az adott GNSS egységnek kiosztott megfelelő ICAO telepítés azonosítót, vagy a GNSS összes egységére vonatkozó közös telepítés azonosítót kell beírni (kivéve GBAS).
Megjegyzés. - GNSS esetén a telepítés azonosítót fel lehet használni egy GNSS egység üzemkiesésének azonosítására (például, a KNMH egy GPS műhold üzemszünetét jelenti).

5. B) adatelem

A dátum/idő csoport céljára egy tíz számból álló adatcsoportot kell használni, UTC-ben megadva az évet, hónapot, napot, órát és perceket. Ez a bejegyzés annak a dátum/időpont-nak a jelzése, amikor a NOTAMN hatályba lép. Egy NOTAMR és NOTAMC esetén, a dátum/idő csoport az adott NOTAM létrehozásának valós ideje.

6. C) adatelem

A NOTAMC kivételével, itt egy dátum/idő adatcsoportot kell alkalmazni, (ez egy tíz számból álló adatcsoport, amely UTC-ben adja meg az évet, hónapot, napot, órát és perceket), mely feltünteti az információ érvényességének idejét, kivéve, ha az információ állandó természetű, mely esetben az adatcsoport helyére a "PERM" rövidítést kell illeszteni. Ha az időzítési információ még bizonytalan, akkor az érvényesség idejét egy dátum/idő adatcsoport alkalmazásával csak hozzávetőlegesen kell megadni, melyet az "EST" rövidítés kövessen. Minden olyan NOTAM-ot, mely tartalmazza az "EST" rövidítést, a későbbiek folyamán törölni kell, vagy le kell cserélni egy másik NOTAM-mal, még a C) adatelemben meghatározott dátum/idő adatcsoporttal megadott időpont előtt.

7. D) adatelem

Ha a jelentett veszély, üzemeltetési állapot, vagy berendezésekre vonatkozó kikötések, feltételek a megadott idő- és dátum ütemezés szerinti időszakokban lesznek érvényben, a B) és C) adatelemben közölt dátum/idő adatcsoport által meghatározott időpontok között, akkor az ilyen információkat a D) adatelemben kell jelezni. Ha a D) adatelem hossza meghaladná a 200 karaktert, akkor meg kell fontolni annak lehetőségét, hogy az ilyen információról szóló tájékoztatást önálló NOTAM-ban adják ki.

Megjegyzés.– A D) adatelem tartalmának egyeztetett, harmonizált meghatározásával kapcsolatos útmutató anyag a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében (Aeronautical Information Services Manual – Doc 8126) található.

8. E) adatelem

A kifejtett, dekódolt NOTAM kódot kell használni, ahol szükséges, kiegészítve azt az ICAO rövidítésekkel, jelzésekkel, azonosítókkal, elnevezésekkel, hívójelekkel, frekvenciákkal, számokkal és nyílt szöveges információval. Amennyiben a NOTAM-ot nemzetközi terjesztésre szánják, a nyílt szöveges részeknek a szöveget angolul kell tartalmazniuk. Ennek a bejegyzésnek érthetőnek és tömörnek kell lennie, hogy megfelelő, alkalmas PIB bejegyzést (Repülés Előtti Hivatalos Közlemény - *Pre-Flight Information Bulletins*) biztosítson.
NOTAMC (*cancellation* - törlés, érvénytelenítés) esetén a tárgyra vonatkozóan utalást, valamint állapotáról jelentést kell tartalmaznia, hogy ezzel lehetővé tegye a gondos valószínűség ellenőrzést.

9. F) és G) adatelemek

Ezek az elemek általában a navigációs figyelmeztetések, vagy a légtér korlátozások esetén használhatóak, és rendszerint részét képzik a PIB (Repülés Előtti Bulletinek - *Pre-Flight Information Bulletins*) bejegyzéseknek. Be kell jegyezni a tevékenység, vagy korlátozás alsó és felső magassági határát, egyértelműen feltüntetve a referencia alapadatot és a mérés mértékegységét.

Megjegyzés.- A NOTAM-okra példákat a Légiforgalmi Tájékoztató Szolgálatok Kézikönyvében *(Aeronautical Information Services Manual – Doc 8126) és a* Légiforgalmi Szolgálatok Eljárásai – ICAO Rövidítések és Kódok *kiadványban (Procedures for Air Navigation Services – ICAO abbreviations and Codes - PANS-ABC, Doc 8400) találhat.*

7. FÜGGELÉK – LÉGINAVIGÁCIÓS ADATOK ADATMINŐSÉGI KÖVETELMÉNYEI

A7-1. táblázat - Földrajzi szélesség és hosszúság

Földrajzi szélesség és hosszúság	**A közzétett adat felbontóképessége**	**Integritási osztálybasorolása**
A repüléstájékoztató körzetek (FIR - *flight information region*) határának pontjai	1 perc	1×10^{-3} rutin adat
P, R, D (tiltott, korlátozott, veszélyes) légterek határának pontjai (CTA/CTZ határain kívül)	1 perc	1×10^{-3} rutin adat
P, R, D (tiltott, korlátozott, veszélyes) légterek határának pontjai (CTA/CTZ határain belül)	1 mp	1×10^{-5} alapvető adat
CTA/CTZ (*Control area* - Irányítói terület *Control Zone* - Repülőtéri irányítói körzet határának pontjai)	1 mp	1×10^{-5} alapvető adat
Útvonalon található NAVAIDS-ek (léginavigációs berendezések), kötelező jelentőpontok, várakozási légterek, STAR/SID (Szabvány érkezési és indulási útvonalak) pontjai	1 mp	1×10^{-5} alapvető adat
Akadályok az 1-es számú Területen	1 mp	1×10^{-3} rutin adat
Repülőtér/helikopter repülőtér vonatkozási pontja	1 mp	1×10^{-3} rutin adat
NAVAIDS-ek (Léginavigációs Berendezések) a repülőtéren / helikopter repülőtéren	1/10 mp	1×10^{-5} alapvető adat
Akadályok a 3-as számú Területen	1/10 mp	1×10^{-5} alapvető adat
Akadályok a 2-es számú Területen	1/10 mp	1×10^{-5} alapvető adat
A végső megközelítés kezdőpontja (FAF)/ pontjai, valamint más lényeges kötelező jelentőpontok/pontok, melyek a műszeres megközelítési eljárás részét képezik	1/10 mp	1×10^{-5} alapvető adat
Futópálya küszöb	1/100 mp	1×10^{-8} kritikus adat
Futópálya vége (repülési útvonalak csatlakozási pontja)	1/100 mp	1×10^{-8} kritikus adat
Futópálya várópontja (*holding position*)	1/100 mp	1×10^{-8} kritikus adat
Gurulóutak középvonalának pontjai / parkolásához vezető vonal pontjai	1/100 mp	1×10^{-5} alapvető adat
Gurulóút kereszteződéseket jelölő vonal	1/100 mp	1×10^{-5} alapvető adat
Futópálya elhagyását vezérlő vonal	1/100 mp	1×10^{-5} alapvető adat
Repülőgép állóhely pontok / INS (*Inertial Reference System* - Inerciális Referencia Rendszer) ellenőrzésére kijelölt pontok	1/100 mp	1×10^{-3} rutin adat
A földetérési és elemelkedési (*TLOF – Touchdown And Lift-Off Area*) terület, vagy a végső megközelítési és felszállási (*FATO - Final Approach And Take-Off Area*) terület küszöbének mértani közepe, helikopter repülőterek	1/100 mp	1×10^{-8} kritikus adat
Az apron határai (sokszög)	1/10 sec	1×10^{-3} rutin adat
Jégtelenítés/Jegesedés megelőzés létesítményei (sokszög)	1/10 sec	1×10^{-3} rutin adat

Megjegyzés.- Lásd a 8. Függelékben az akadály adatok gyűjtési felületeinek grafikai ábrázolását és a meghatározott területeken az akadályok azonosításának kritériumait.

A7-2. táblázat – Egy terület közepes tengerszint feletti magassága/ Tengerszint feletti repülési magasság (QNH)/ Magasság (*Elevation/Altitude/Height*)

Egy terület közepes tengerszint feletti magassága / Tengerszint feletti repülési magasság / Magasság (*Elevation / Altitude / Height*)	**A közzétett adat felbontóképessége**	**Integritási osztálybasorolása**
Repülőtér / helikopter repülőtér tengerszint feletti magassága	1 m, vagy 1 láb	1 x 10^{-5} alapvető adat
WGS-84 Geoid (Földalak) hullámossága, egyenetlensége (*Geoid Undulation*) a repülőtér / helikopter repülőtér tengerszint feletti magasságán	1 m, vagy 1 láb	1 x 10^{-5} alapvető adat
A futópálya, vagy a végső megközelítési és felszállási terület (*FATO - Final Approach And Take-Off Area*) küszöbe, nem precíziós bevezetések	1 m, vagy 1 láb	1 x 10^{-5} alapvető adat
WGS-84 Geoid (Földalak) hullámossága, egyenetlensége (Geoid Undulation) a futópálya, vagy a végső megközelítési és felszállási (*FATO*) terület küszöbén, a földetérési és elemelkedési (*TLOF – Touchdown And Lift-Off Area*) terület mértani közepén, nem precíziós bevezetések	1 m, vagy 1 láb	1 x 10^{-5} alapvető adat
A futópálya, vagy a végső megközelítési és felszállási (FATO) terület küszöbe, precíziós bevezetések	0,1 m, vagy 0,1 láb	1 x 10^{-8} kritikus adat
WGS-84 Geoid (Földalak) hullámossága, egyenetlensége (Geoid Undulation) a futópálya, vagy a végső megközelítési és felszállási (FATO) terület küszöbén, a földetérési és elemelkedési (TLOF) terület mértani közepén, precíziós bevezetések	0,1 m, vagy 0,1 láb	1 x 10^{-8} kritikus adat
A küszöb keresztezésének magassága, precíziós bevezetések	0,1 m, vagy 0,1 láb	1 x 10^{-8} kritikus adat
Akadályok a 2-es számú Területen	1 m, vagy 1 láb	1 x 10^{-5} alapvető adat
Akadályok a 3-as számú Területen	0,1 m, vagy 0,1 láb	1 x 10^{-5} alapvető adat
Akadályok az 1-es számú Területen (az Állam teljes területe)	1 m, vagy 1 láb	1 x 10^{-3} rutin adat
Távolságmérő berendezés, precíziós (DME/P)	3 m (10 láb)	1 x 10^{-5} alapvető adat
Távolságmérő berendezés, (DME)	30 m (100 láb)	1 x 10^{-5} alapvető adat
Minimális tengerszint feletti repülési magasság	50 m, vagy 100 láb	1 x 10^{-3} rutin adat

Megjegyzés.- Lásd a 8. Függelékben az akadály adatok gyűjtési felületeinek grafikai ábrázolását és a meghatározott területeken az akadályok azonosításának kritériumait.

A7-3. táblázat - Deklináció és mágneses elhajlás

Deklináció / mágneses elhajlás	**A közzétett adat felbontóképessége**	**Integritási osztálybasorolása**
VHF NAVAID (Léginavigációs Berendezés) telepítési helyének mágneses deklinációja (*Station declination*), melyet műszaki beállításra használnak fel	1 fok	1 x 10^{-5} alapvető adat
NDB NAVAID (Léginavigációs Berendezés) mágneses deklinációja	1 fok	1 x 10^{-3} rutin adat
Repülőtér / helikopter repülőtér mágneses deklinációja	1 fok	1 x 10^{-5} alapvető adat
ILS iránysávadó (*localiser*) antenna mágneses deklinációja	1 fok	1 x 10^{-5} alapvető adat
MLS irányszög (*azimuth*) antenna mágneses deklinációja	1 fok	1 x 10^{-5} alapvető adat

A7-4. táblázat - Irányszög (*Bearing*)

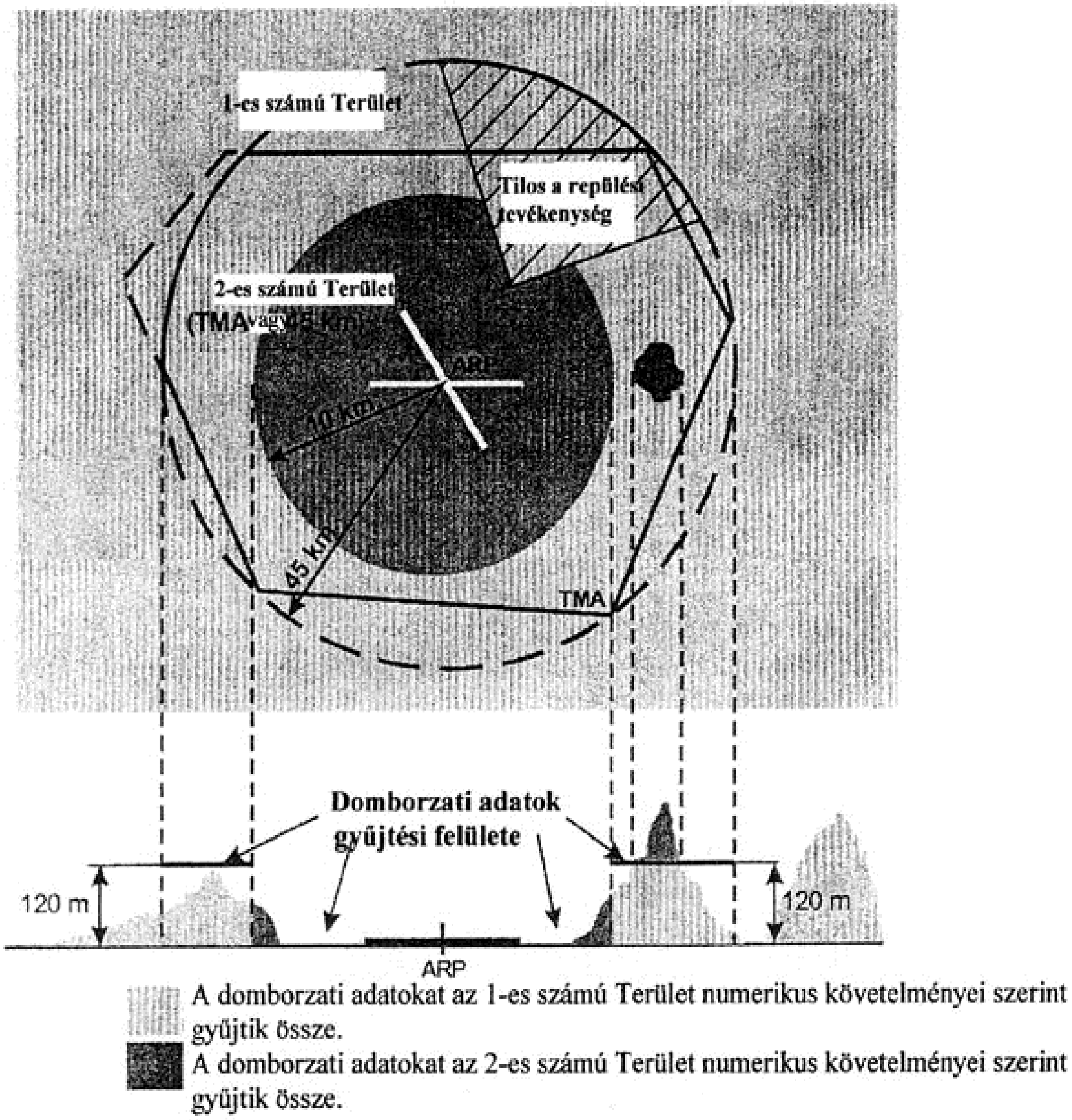
Irányszög (*Bearing*)	**A közzétett adat felbontóképessége**	**Integritási osztálybasorolása**
Útvonal szakaszok	1 fok	1×10^{-3} rutin adat
Útvonalon, vagy közelkörzetben lévő kötelező jelentőpont, ellenőrző pont csoportok	1/10 fok	1×10^{-3} rutin adat
Közelkörzeti érkezési/indulási útvonal szakaszok, szegmensek	1 fok	1×10^{-3} rutin adat
Műszeres megközelítési eljárás kötelező jelentőpont, ellenőrző pont csoportok	1/100 fok	1×10^{-5} alapvető adat
ILS iránysávadó beállítása (Földrajzi)	1/100 fok földrajzi	1×10^{-5} alapvető adat
MLS nulla irányszög (*azimuth*) beállítása (Földrajzi)	1/100 fok földrajzi	1×10^{-5} alapvető adat
A futópálya, vagy a végső megközelítési és felszállási (*FATO - Final Approach And Take-Off Area*) terület irányszöge (Földrajzi)	1/100 fok földrajzi	1×10^{-3} rutin adat

A7-5. táblázat - Hossz, távolság, méret (Length/distance/dimension)

Hossz, távolság, méret (Length/distance/dimension)	**A közzétett adat felbontóképessége**	**Integritási osztálybasorolása**
Repülési útvonal szakaszok hossza	1/10 km, vagy 1/10 NM	1×10^{-3} rutin adat
Útvonalon lévő kötelező jelentőpont, ellenőrző pont csoportok távolsága	1/10 km, vagy 1/10 NM	1×10^{-3} rutin adat
Közelkörzeti érkezési/indulási útvonal szakaszok hossza	1/100 km, vagy 1/100 NM	1×10^{-5} alapvető adat
Közelkörzeti és műszeres megközelítési eljárások kötelező jelentőpont, ellenőrző pont csoportjainak távolsága	1/100 km, vagy 1/100 NM	1×10^{-5} alapvető adat
A futópálya, vagy a végső megközelítési és felszállási terület (*FATO - Final Approach And Take-Off Area*) hossza, a földetérési és elemelkedési (*TLOF – Touchdown And Lift-Off Area*) terület mérete	1 m, vagy 1 láb	1×10^{-8} kritikus adat
A futópálya szélessége	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Áthelyezett küszöb távolsága	1 m, vagy 1 láb	1×10^{-3} rutin adat
Felszállási biztonsági sáv, akadálymentességi sáv (*Clearway*) hossza és szélessége	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Végbiztonsági sáv (*Stopway*) hossza és szélessége	1 m, vagy 1 láb	1×10^{-8} kritikus adat
Az Igénybe Vehető Leszállási Távolság (*LDA - Landing Distance Available*)	1 m, vagy 1 láb	1×10^{-8} kritikus adat
Az Igénybevehető Nekifutási Távolság (*TORA - Take-Off Run Available*)	1 m, vagy 1 láb	1×10^{-8} kritikus adat
Az Igénybevehető Felszállási Távolság (*TODA - Take-Off Distance Available*)	1 m, vagy 1 láb	1×10^{-8} kritikus adat
Az Igénybevehető Gyorsítási-Megállási Távolság (*ASDA - Accelerate-Stop Distance Available*)	1 m, vagy 1 láb	1×10^{-8} kritikus adat
A futópálya padka (*Runway Shoulder*) szélessége	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Gurulóút szélessége	1 m, vagy 1 láb	1×10^{-5} alapvető adat
A gurulóút padka (*Taxiway Shoulder*) szélessége	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Az ILS iránysávadó antenna - futópálya vége közötti távolság	1 m, vagy 1 láb	1×10^{-3} rutin adat
ILS siklópályaadó antenna - futópálya küszöb középvonal mentén mért távolsága	1 m, vagy 1 láb	1×10^{-3} rutin adat
ILS markerek - futópálya küszöb közötti távolság	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Az ILS-hez tartozó DME adóantenna – futópálya küszöb közötti távolság, a középvonal mentén mérve	1 m, vagy 1 láb	1×10^{-5} alapvető adat
Az MLS irányszög (*azimuth*) antenna – futópálya vége közötti távolság	1 m, vagy 1 láb	1×10^{-3} rutin adat
Az MLS magassági antenna (*elevation*) - futópálya küszöb közötti távolság, a középvonal mentén mérve	1 m, vagy 1 láb	1×10^{-3} rutin adat
Az MLS-hez tartozó DME/P antenna – futópálya küszöb közötti távolság, a középvonal mentén mérve	1 m, vagy 1 láb	1×10^{-5} alapvető adat

8. FÜGGELÉK – A TEREP ÉS AKADÁLY ADATOKKAL SZEMBEN TÁMASZTOTT KÖVETELMÉNYEK

(lásd a 10. Fejezetet)



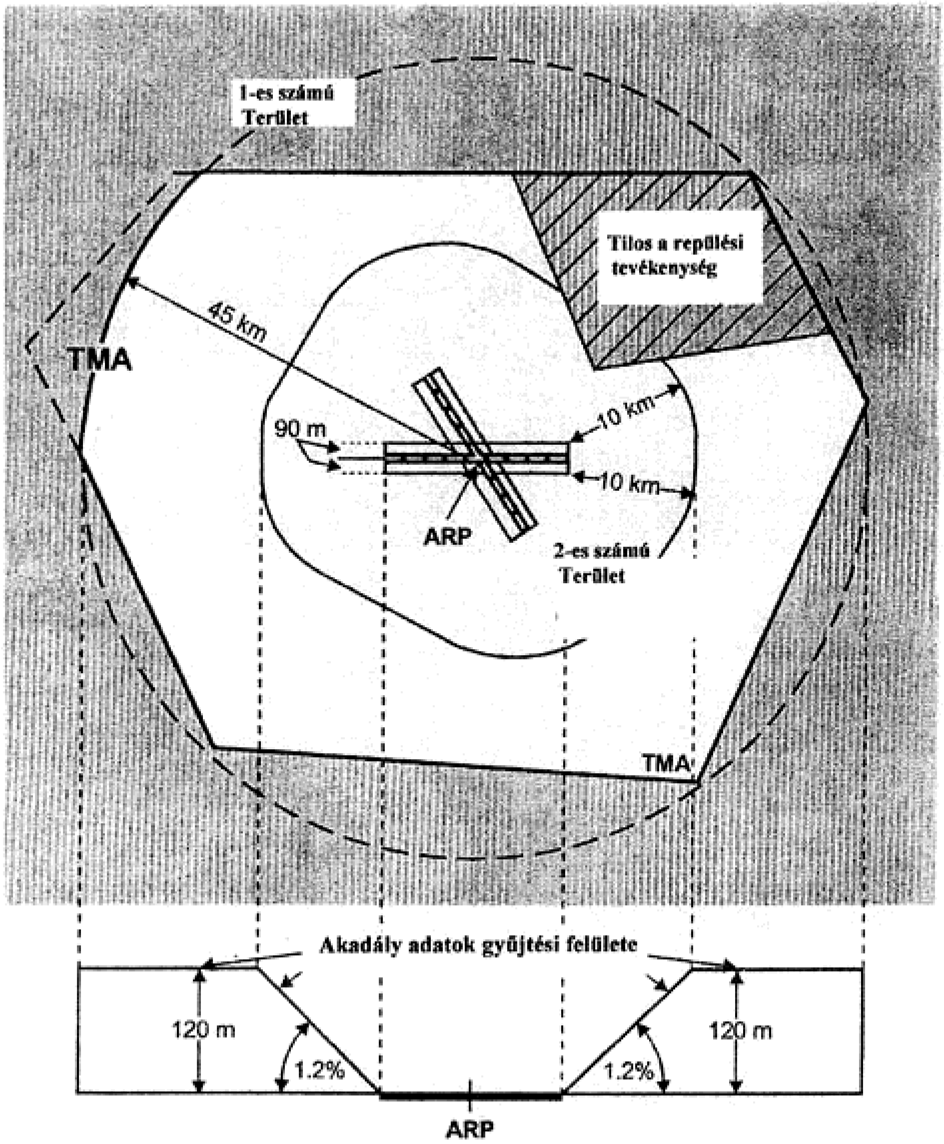
A8-1. ábra: Domborzati, terep adatok gyűjtési felületei – 1-es és 2-es számú Területek

1. A Repülőtér Referencia Pontjától (ARP - *Airport Reference Point*) egy 10 km-es körrel fedett területen belül a domborzati adatokat a 2-es számú Terület numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.

2. A 10 km-es körrel fedett terület és a TMA (*Terminal Control Area* – Repülőtéri Irányítói Körzet) határa, vagy egy 45 km sugarú kör közötti (amelyik a kisebb) területen belül azokat a domborzati adatokat, melyek a futópálya legalacsonyabb tengerszint szerinti magassága felett 120 m-re lévő vízszintes síkon áthatolnak, a 2-es számú Terület numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.

3. A 10 km-es körrel fedett terület és a TMA határa, vagy egy 45 km sugarú kör közötti (amelyik a kisebb) területen belül azokat a domborzati adatokat, melyek a futópálya legalacsonyabb tengerszint szerinti magassága felett 120 m-re lévő vízszintes síkot nem érik el, az 1-es számú Terület numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.

4. A 2-es számú Területen belül lévő olyan területeken, ahol tilos a repülés a túl magas domborzat miatt, vagy más helyi korlátozás és/vagy szabályozás miatt, a domborzati adatokat csak az 1-es számú Terület numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.
Megjegyzés.- Az 1-es és 2-es számú Területek számára a domborzati adatokkal szemben támasztott követelmények az A8-1 Táblázatban vannak részletesen ismertetve.



A8-2. ábra: Akadály adatok gyűjtési felületei – 1-es és 2-es számú Területek

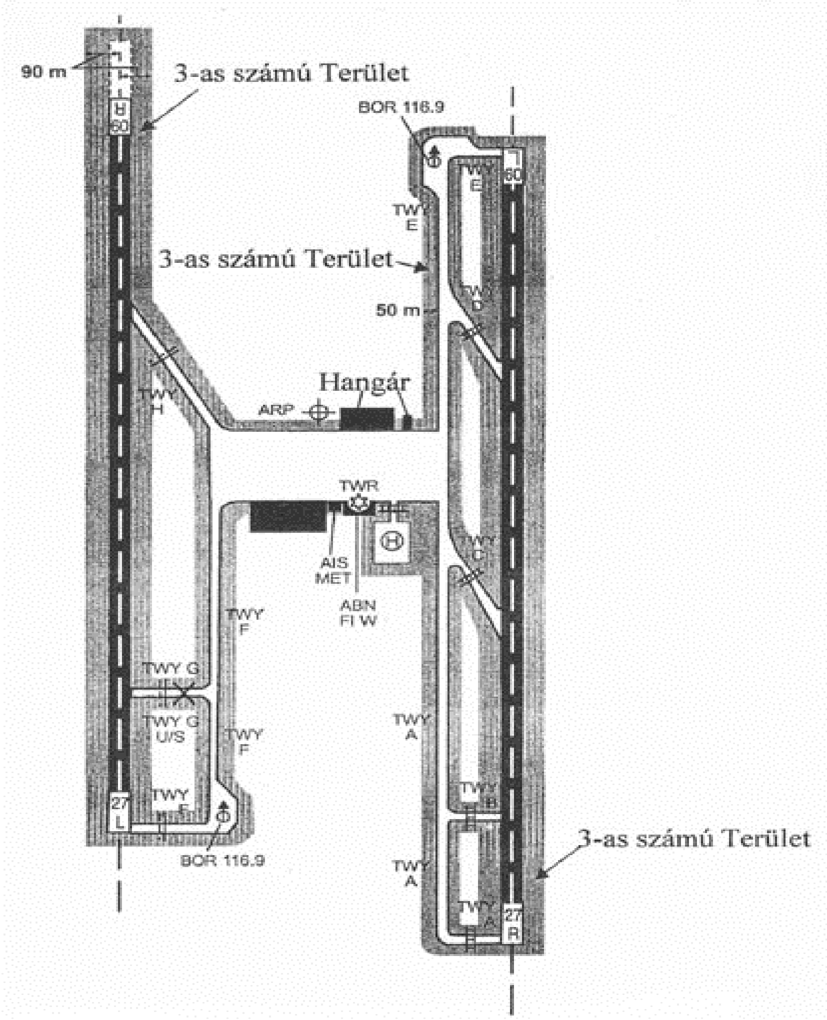
Kiegészítés a '2-es számú Terület'-hez: (TMA, vagy 45kM).

1. Az akadály adatokat a 2-es számú Terület A8-2 Táblázatban részletesen meghatározott numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni:

a) bármely olyan akadály, amely áthatol a futópálya középvonalától 180 m széles téglalap alakú területtől a futópálya legközelebbi pontjának tengerszint feletti magasságából indított kúpos felületen, melynek az emelkedése 1,2 %, amíg el nem éri valamennyi, a repülőtéren üzemben lévő futópálya legalacsonyabb tengerszint szerinti magassága felett 120 m-re lévő vízszintes síkot, (az 1,2 %-os emelkedésű ferde sík 10 km távolságra éri el ezt a 120 m-es magasságot); vagy áthatol a 2-es számú Terület fennmaradó részén lévő (azaz a 10 km-es körrel fedett terület és a TMA határa, vagy egy 45 km sugarú kör közötti (amelyik a kisebb) területen belül) a 120 m-es vízszintes síkon a futópálya legalacsonyabb tengerszint feletti magassága felett; és

b) A 2-es számú Területen belül lévő olyan területeken, ahol tilos a repülés a túl magas domborzat miatt, vagy más helyi korlátozás és/vagy szabályozás miatt, a domborzati adatokat csak az 1-es számú Terület numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.

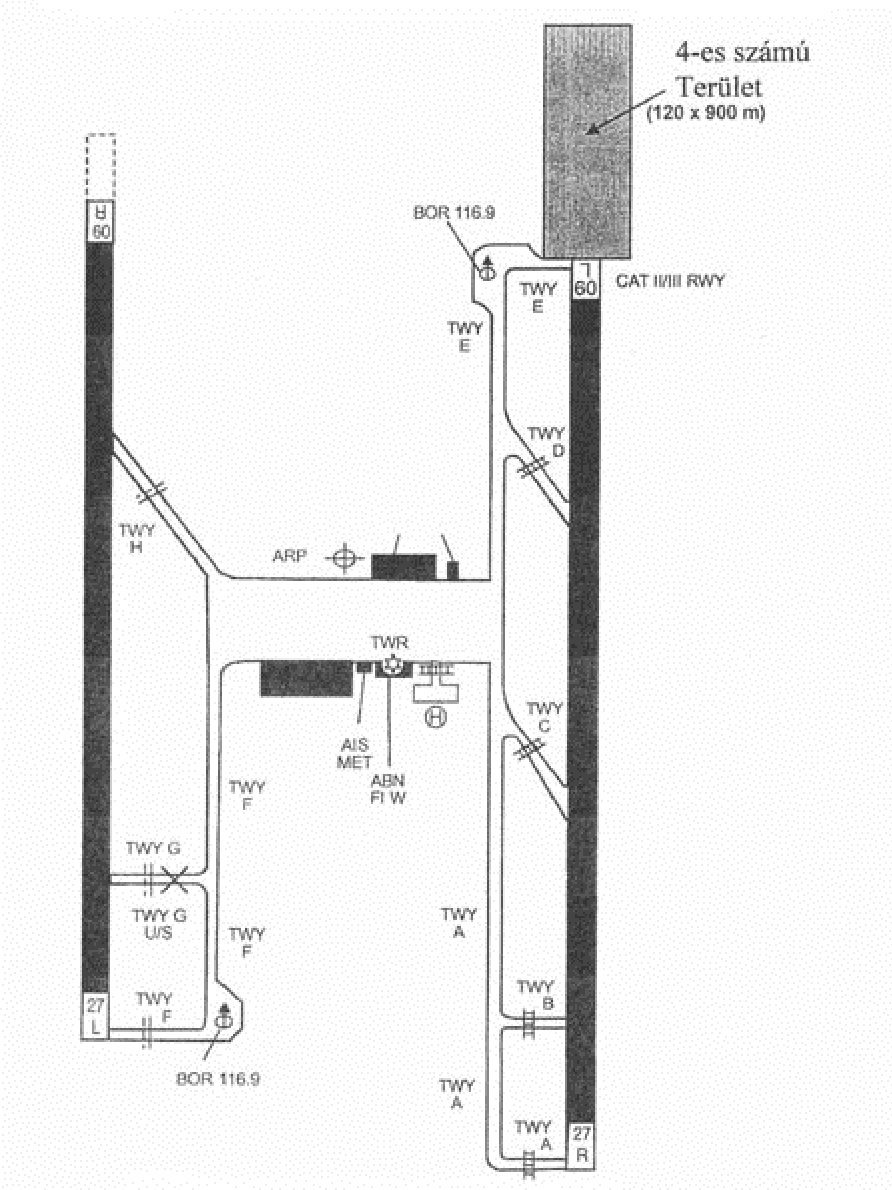
2. Valamennyi akadályról, mely az 1-es számú Területen belül találha?ó és magassága a terep felett 100 m, vagy több, az adatokat az 1-es számú Terület A8-2 Táblázatban részletesen meghatározott numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni az adatbázisban.



A8-3. Domborzati és akadály adatok gyűjtési felületei – 3-as számú Terület

1. A repülőtér / helikopter repülőtér mozgási területén (*movement area*) lévő legközelebbi ponton áthaladó vízszintes sík fölé több, mint 0,5 m-el kiemelkedő domborzat és akadály adatokat össze kell gyűjteni, és rögzíteni kell.

2. A 3-as számú Területen a domborzat és akadály adatokat az A8-1, illetve az A8-2 Táblázatban részletesen meghatározott numerikus követelményeinek megfelelően kell összegyűjteni és rögzíteni.



A8-4. Domborzati adatok gyűjtési felülete – 4-es számú Terület

A 4-es számú Területen az A8-1 Táblázatban részletesen meghatározott numerikus követelményeinek megfelelően csak a domborzati adatokat kell összegyűjteni és rögzíteni.

A8-1. Táblázat – Domborzati adatok numerikus követelményei

	1-es Terület	2-es Terület	3-as Terület	4-es Terület
(Post spacing) Jelzőoszlop, pózna térköze	3 ívmp. (kb. 90m)	1 ívmp. (kb. 30m)	0,6 ívmp. (kb. 20m)	0,3 ívmp. (kb. 9m)
(Vertical accuracy) Függőleges pontosság	30 m	3 m	0,5 m	1 m
(Vertical resolution) Függőleges felbontóképesség	1 m	0,1 m	0,01 m	0,1 m
(Horizontal accuracy) Vízszintes pontosság	50 m	5 m	0,5 m	2,5 m
(Confidence level) Konfidenciaszint (1σ)	90%	90%	90%	90%
(Data classification) Adat osztálybasorolása *(Integrity level)* Integritási szint	rutin 1×10^{-3}	alapvető 1×10^{-5}	alapvető 1×10^{-5}	alapvető 1×10^{-5}
(Maintenance period) Karbantartási ciklus, idő	szükség szerint	szükség szerint	szükség szerint	szükség szerint

A8-2. Táblázat – Akadály adatok numerikus követelményei

	1-es Terület	2-es Terület	3-as Terület
(Vertical accuracy) Függőleges pontosság	30 m	3 m	0,5 m
(Vertical resolution) Függőleges felbontóképesség	1 m	0,1 m	0,01 m
(Horizontal accuracy) Vízszintes pontosság	50 m	5 m	0,5 m
(Confidence level) Konfidenciaszint (1σ)	90%	90%	90%
(Data classification) Adat osztálybasorolása *(Integrity level)* Integritási szint	rutin 1×10^{-3}	alapvető 1×10^{-5}	alapvető 1×10^{-5}
(Maintenance period) Karbantartási ciklus, idő	szükség szerint	szükség szerint	szükség szerint

A8-3. Táblázat – Domborzati attribútumok

Domborzati attribútumok		**Kötelező/Opcionális**
Fedésterület	*Area of coverage*	Kötelező
Az adat létrehozójának azonosítója	*Data originator identifier*	Kötelező
Az adatgyűjtés módszere	*Acquisition method*	Kötelező
Jelzőoszlop, pózna térköze	*Post spacing*	Kötelező
Vízszintes referencia-rendszer	*Horizontal reference system*	Kötelező
Vízszintes felbontóképesség	*Horizontal resolution*	Kötelező
Vízszintes pontosság	*Horizontal accuracy*	Kötelező
Vízszintes konfidenciaszint	*Horizontal confidence level*	Kötelező
Vízszintes helyzet	*Horizontal position*	Kötelező
Közepes tengerszint szerinti magasság	*Elevation*	Kötelező
Közepes tengerszint szerinti magasság vonatkoztatási alap	*Elevation reference*	Kötelező
Függőleges referencia-rendszer	*Vertical reference system*	Kötelező
Függőleges felbontóképesség	*Vertical resolution*	Kötelező
Függőleges pontosság	*Vertical accuracy*	Kötelező
Függőleges konfidenciaszint	*Vertical confidence level*	Kötelező
A felszín típusa	*Surface type*	Kötelező
A felvett, rögzített felszín	*Recorded surface*	Kötelező
Áthatolási szint	*Penetration level*	Opcionális
Ismert ingadozás	*Known variation*	Opcionális
Integritás	*Integrity*	Kötelező
Dátum és időbélyeg	*Date and time stamp*	Kötelező
A felhasznált mértékegység	*Unit of measurement used*	Kötelező

A8-4. Táblázat – Akadály attribútumok

Akadály attribútumok		Kötelező/Opcionális
Fedésterület	*Area of coverage*	Kötelező
Az adat létrehozójának azonosítója	*Data originator identifier*	Kötelező
Az akadály azonosítója	*Obstacle identifier*	Kötelező
Vízszintes pontosság	*Horizontal accuracy*	Kötelező
Vízszintes konfidenciaszint	*Horizontal confidence level*	Kötelező
Vízszintes helyzet	*Horizontal position*	Kötelező
Vízszintes felbontóképesség	*Horizontal resolution*	Kötelező
Vízszintes kiterjedés	*Horizontal extent*	Kötelező
Vízszintes referencia-rendszer	*Horizontal reference system*	Kötelező
Közepes tengerszint szerinti magasság	*Elevation*	Kötelező
Függőleges pontosság	*Vertical accuracy*	Kötelező
Függőleges konfidenciaszint	*Vertical confidence level*	Kötelező
Közepes tengerszint szerinti magasság vonatkoztatási alap	*Elevation reference*	Kötelező
Függőleges felbontóképesség	*Vertical resolution*	Kötelező
Függőleges referencia-rendszer	*Vertical reference system*	Kötelező
Az akadály típusa	*Obstacle type*	Kötelező
Geometriai típusa	*Geometry type*	Kötelező
Integritás	*Integrity*	Kötelező
Dátum és időbélyeg	*Date and time stamp*	Kötelező
A felhasznált mértékegység	*Unit of measurement used*	Kötelező
Műveletek	*Operations*	Opcionális
Effektivitás, hatékonyság	*Effectivity*	Opcionális

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[1] ISO Szabványok :
ISO 19104 – Földrajzi információk – Fogalom meghatározások

[2] ISO Szabványok :
ISO 19108 – Földrajzi információk – Ideiglenes vázlat

[3] ISO Szabványok :
ISO 19131 – Földrajzi információk – Az adattermék (*Data product*) részletes leírása.

[4] ISO Szabványok :
ISO 19131 – Földrajzi információk – Az adattermék (*Data product*) részletes leírása.

[5] ISO Szabványok :
ISO 19101 – Földrajzi információk – Referencia modell

[6] ISO Szabványok :
ISO 19115 – Földrajzi információk – Meta-adatok

[7] ISO Szabványok :
ISO 19104 – Földrajzi információk – Fogalom meghatározások

[8] ISO Szabványok :
ISO 19101 – Földrajzi információk – Referencia modell

[9] ISO Szabványok :
ISO 19101 – Földrajzi információk – Referencia modell

[10] ISO Szabványok :
ISO 19110 – Földrajzi információk – Jellemző tulajdonságok nyilvántartásba vételének sémája

[11] ISO Szabványok :
ISO 19101 – Földrajzi információk – Referencia modell

[12] ISO Szabványok :
ISO 19110 – Földrajzi információk – Jellemző tulajdonságok nyilvántartásba vételének sémája

[13] ISO Szabványok :
ISO 19108 – Földrajzi információk – Ideiglenes vázlat

[14]ISO Szabványok :
ISO 19115 – Földrajzi információk – Meta-adatok

[15]ISO Szabványok :
ISO 19117 – Földrajzi információk – Leírás (*Portrayal*)
[16]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[17]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[18]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[19]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár
[20]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[21]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár
[22]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[23]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár

[24]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár
[25]ISO Szabványok :
ISO 8402 – Minőségirányítási és Minőségbiztosítási (Minőségügyi) Szakszótár
[26]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[27]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[28]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[29]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[30]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[31]*Ha szükségesnek látják, ezt az információt, vagy bármely részét az AIP is tartalmazhatja
[32]*a matematikailag meghatározott ellipszoid felületén található két pont közötti legkisebb távolság
[33]*a matematikailag meghatározott ellipszoid felületén található két pont közötti legkisebb távolság
[34]*a matematikailag meghatározott ellipszoid felületén található két pont közötti legkisebb távolság
[35]**valószínűleg az 50 méter hibás adat, a 100 lábból csak 30 méter következne!! - Fordító
[36]ez megegyezik az adott VOR telepítési pontjának mágneses elhajlásával, mert a VOR berendezés nulla fokos radiálja a mágneses északi irányhoz van kalibrálva, kivéve Kanada északi területeit.

- Vége -

ANNEX 16/I.
Környezetvédelem: Légijárművek zaja

I. kötet 4. kiadás – 2005. július
8. módosítással
Ez a kiadás a Tanács által 2005. Február 24. előtt elfogadott összes módosítást magában foglalja, és 2005. November 24-ével érvényteleníti az Annex 16, I. Kötet minden korábbi kiadását.

A szabványok és ajánlott eljárások alkalmazhatóságát illetően lásd az Előszó-t és a fejezetekben szereplő vonatkozó cikkelyeket.
NEMZETKÖZI POLGÁRI REPÜLÉSI SZERVEZET

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.
MÓDOSÍTÁSOK ÉS JAVÍTÁSOK JEGYZÉKE

MÓDOSÍTÁSOK				JAVÍTÁSOK			
Sor szám	Alkalmazás dátuma	Beépítés dátuma	Beépítette	Sor szám	Kiadás dátuma	Beépítés dátuma	Beépítette
1-8	E kiadásba belefoglalva						

ELŐSZÓ

Történeti áttekintés

A légijármű zajra vonatkozó szabványokat és ajánlott eljárásokat a Nemzetközi Polgári repülési egyezmény 37. cikkelye értelmében, 1971. április 2-án fogadta el a Tanács először, és ezeket az egyezmény 16. Annex-ének nevezte el. Az Annex a következők szerint készült:

A Közgyűlés 16. értekezletén 1976. szeptemberében Buenos Airesben a következő határozatot fogadták el:

A16-3; légijármű zaj a repülőterek közelében.

Miután a légijármű zaj problémája a világ számos repülőterének közelében olyan komoly mértéket öltött és mivel a közvélemény reakciója is olyan mértéket ért el, amely már aggodalomra ad okot és sürgős megoldást tesz szükségessé;

iután a lakosságot és a polgári légi-közlekedést aggodalommal eltöltő zajt a meglévő légijárművek forgalmának növekedése okozza;

Miután a jövőben beállítandó új légijármű típusok zaja a mostani zajt növelheti és súlyosbíthatja, ha a helyzet megoldására nem tesznek lépéseket;

Miután az 1966. novmberében Londonban megtartott, a polgári légi-közlekedés által keltett zajok és zavarás csökkentésével kapcsolatos nemzetközi konferencia fő követeléseire alapozva (londoni zaj értekezlet) az ICAO Montreálban 1967. novemberében tartott 5. légi-navigációs konferenciája már tett bizonyos ajánlásokat a kérdés ICAO szervezetének segítségével történő nemzetközi szintű megoldására; és

Miután a Közgyűlés tudomásul vette az államokkal és a megfelelő nemzetközi szervezetekkel egyeztetett folyamatban lévő Tanácsi lépéseket az 5. légi-navigációs konferencia ajánlásainak érvényre juttatása érdekében, ahogyan azt a főtitkár a Közgyűlésnek bejelentette;

A Közgyűlés határozata utasítja a Tanácsot, hogy:

1) Az ICAO keretein belül és figyelembe véve a megfelelő előkészítés szükségességét, a lehető leghamarabb hívjon össze egy, a légijárművek által a repülőterek közelében keltett zaj problémáját tárgyaló nemzetközi konferenciát;

2) állítson össze nemzetközi előírást és kapcsolódó tájékoztató anyagot a légijármű zajról;

3) A megfelelő meglévő Annex-ekbe és más idevágó ICAO dokumentumokba, illetve lehetőség szerint egy külön zajjal foglalkozó Annex-be illesszen be olyan anyagokat, mint a légijármű zaj mérésének módszere és leírása és a repülőterek közelében élő lakosságot érintő légijármű zaj megfelelő korlátozásai; és

4) A lehető leghamarabb kezdje meg az elkészült anyag folyamatos közzétételét.

A Közgyűlés A16-3 határozatának eredményeképp Montrealban öszszehívták a repülőterek közelében tapasztalható zajjal foglalkozó különleges értekezletet (1969. november - december), hogy megvizsgálják a légijármű okozta zajjal kapcsolatos következő kérdéseket:

a) A légijármű zaj leírásának és mérésének eljárásai;

b) A légijármű zajjal szembeni emberi tűrőképesség;

c) A légijármű zajminősítése;

d) A zajcsökkentő üzemeltetési eljárások kialakításának kritériumai

e) Földterület hasznosítási szabályozás; és

f) a hajtómű földi működtetésére vonatkozó zajcsökkentő eljárások.

A "repülőterek közelében tapasztalható légijármű zaj" témával foglalkozó különleges ülés ajánlásaira alapozva kidolgozták a légijármű zajra vonatkozó szabványok és ajánlott eljárások tervezetét és a Tanács a szervezet tagországaival való szokásos egyeztetés után azt elfogadta a jelen Annex szövegéül.

A légijármű hajtóművek által kibocsájtott szennyező anyagokat szabályozó szabványok és ajánlott eljárások kidolgozásával érezhetővé vált, hogy a repülés minden környezeti hatásával foglalkozó előírásokat egyetlen dokumentumban kell összefoglalni. Ennek megfelelően az 5. módosítást elfogadó határozat részeként megállapodtak abban, hogy a 16. Annex a "Környezetvédelem" címet kapja és az I. kötete tartalmazza az 5. módosítással kiegészített 16. Annex - légijármű zaj - (3. kiadás) meglévő szövegét; a II. kötet pedig a légijármű hajtóművek által kibocsájtott szennyeződésekkel foglalkozó előírásokat foglalja magába.

A repülőterek környezetében tapasztalható légijármű zajról tarott Speciális Találkozó óta több Közgyűlés és Tanácsi ülés foglalkozott a légijármű zaj kérdésével a légijármű zaj probléma Speciális Találkozón nevesített különféle vonatkozásaira összpontosítva. A Közgyűlés 33. Ülésszaka (Montreál, 2001 szeptember 25-től október 5-ig), A33-7 határozatában kiadta az ICAO Egységes Szerkezetbe foglalt Környezetvédelemmel Kapcsolatos Töretlen Irányelvei és Gyakorlata Nyilatkozatot, nagyrészt azért, hogy az "felölelje az ICAO légijármű zajjaj kapcsolatos új irányelveit és útmutató anyagait", valamint, hogy tükrözze -az idők folyamán kimunkált- a zaj kezelés "kiegyensúlyozott megközelítés" -ének elvét.

Amint azt az A33-7 Közgyűlési Határozat C Függeléke meghatározza, a zaj kezelésének kiegyensúlyozott megközelítése a következet jelenti: a repülőtéren a zaj probléma azonosítása és azt követően a zaj csökkentéséhez igénybevehető különféle intézkedési lehetőségek elemzése négy fő elem feltárásával, nevezetesen, csökkentés a forrásnál, földterület hasznosítás tervezés és irányítás, zajcsökkentő üzemeltetési eljárások és üzemeltetési korlátozások, azzal a céllal, hogy a zaj problémához a leginkább költséghatékony módszerrel közelítsenek.

A kiegyensúlyozott megközelítés elvéhez további részleteket biztosít, az A33-7 Határozat az államokat a zaj kezeléshez a kiegyensúlyozott megközelítés adoptálására sürgeti.

A kiegyensúlyozott megközelítési elv fő elemeit a 16. Annex, I. Kötete több helyen is tárgyalja és foglakozik velük az ICAO által elfogadott útmutató anyag is. A zaj, légijármű zajminősétés révén a zaj forrásánál történő csökkentését a 16. Annex, I. Kötet, II. Része tárgyalja. A kiegyensúlyozott megközelítés más elemeiről utalások az V. Részben találhatók.

Az "A" táblázat tartalmazza az eltelt idő folyamán végrehajtott módosítások eredetét a vonatkozó témák felsorolásával együtt és azt a dátumot, amikor a Tanács az Annex-et és a módosításokat elfogadta, amikor azok hatályba léptek, illetve alkalmazhatóvá váltak.

Alkalmazási rendelkezések

A 16. Annex I. Kötet I. része meghatározásokat tartalmaz, míg a II. Rész foglalja magába az adott Rész egyes fejezeteiben meghatározott légijármű osztályokra alkalmazható zaj alkalmasság megállapítási szabványokat és ajánlott eljárásokat, illetve irányelveket arra az esetre, ha az ilyen légijárművek a nemzetközi légi-közlekedésben vesznek részt.

Megjegyzés. - A 2. és a 3. Fejezet nem foglalkozik a rövid le - és felszálló pályát igénylő sugárhajtóműves repülőgépekkel, amelyek megfelelő definicióját az ICAO még most keresi, viszont ezek a repülőgépek a különféle fejezetekben, mint a légi-alkalmassági bizonyítvány szerinti maximális felszálló tömeg mellett 610 m vagy rövidebb (végbiztonsági sáv és akadálymentes sáv nélküli) futópályát igénylő repülőgépek szerepelnek

A 16. Annex I. Kötet, III., IV., és V. részei az államok általi felhasználhatóság céljaira szabványokat és ajánlott gyakorlatokat, valamint tájékoztató anyagot tartalmaznak az ellenőrzéshez végzett zajmérés, a repülőterek körüli zaj felmérés és a zaj kezelés kiegyensúlyozott megközelítése terén az egyöntetűség előmozdítása érdekében.

A szerződő államok teendői

Eltérések bejelentése.
A szerződő állam figyelmét felhívjuk az egyezmény 38. Cikkelyéből fakadó kötelezettségre, miszerint a szervezetet értesíteni köteles a nemzeti előírások és eljárások, illetve a jelen Annex bármelyik nemzetközi szabványa, vagy azok módosításai között fenálló bármilyen eltérésről. Felkérjük a szerződő államot, hogy e tájékoztatást terjessze ki az ajánlott eljárásoktól való eltérésekre is, beleértve a módosításoktól való eltéréseket is, ha azok bejelentése fontos a légi-közlekedés biztonsága szempontjából. Továbbá felkérjük a szerződő államot arra, hogy folyamatosan tájékoztassa a szervezetet bármilyen újonnal előálló eltérésről, illetve a korábbiakban bejelentett bármely eltérés megszűnéséről. Jelen Annex minden módosításának elfogadása után azonnal, a szerződő államhoz az eltérések bejelentésére vonatkozó külön felkérést juttatunk el.

Az egyezmény 38. cikkelye szerinti kötelezettségein túl, felhívjuk az állam figyelmét a 15. Annex előírásaira is, miszerint a nemzeti előírások és eljárások, illetve a vonatkozó ICAO szabványok és ajánlott eljárások közötti eltéréseket a Légi-forgalmi Tájékoztató Szolgálat (Aeronautical Information Service) útján is közzé kell tenni.

Az Annex szövegének alkalmazása a nemzeti szabályozásban. A Tanács, 1948. április 13-án elfogadott egyik határozatában felhívja a szerződő állam figyelmét arra, hogy nemzeti előírásaiban, amenynyire lehetséges, kívánatos az ICAO szabályozó jellegű szabványainak pontos nyelvezetét alkalmazni és kívánatos jelezni a szabványoktól való minden olyan további eltérést, beleértve minden szabályozó nemzeti előírást, amely a nemzetközi légi-navigáció biztonsága, vagy rendszeressége érdekében volt fontos. Jelen Annex előírásai - ahol ez lehetséges volt-, úgy készítettük, hogy a nemzeti előírásokba nagyobb szöveg változtatás nélkül történő bedolgozásukat megkönnyítsük.

Az Annex elemeinek jogállása

Egy Annex a következő részekből épül fel; ezeknek nem mindegyike szerepel szükségszerűen az összes Annexben; jogállásuk a következő;

1. - *A szoros értelemben vett Annex anyaga:*

a) *Szabványok és ajánlott eljárások*, az Egyezmény előírásainak megfelelően a Tanács által elfogadott anyag.Ezek meghatározása a következő:

Szabvány: Fizikai tulajdonságra, kialakításra, anyagra, teljesítményre, személyre, vagy eljárásra vonatkozó bármely előírás, amely egységes alkalmazása elismerten fontos a nemzetközi légi-közlekedés biztonsága, vagy rendszeressége szempontjából és amelyhez a szerződő államok az Egyezménnyel összhangban alkalmazkodni fognak; Ha teljesítésük nem lehetséges, akkor a 38. cikkely hatálya alapján a Tanácsot értesíteni kötelező.

Ajánlott gyakorlat: Fizikai tulajdonságra, kialakításra, anyagra, teljesítményre, személyre, vagy eljárásra vonatkozó bármilyen előírás, amelynek egységes alkalmaza elismerten kívánatos a nemzetközi légi-közlekedés biztonsága, rendszeressége, vagy hatékonysága érdekében és amely alkalmazására a szerződő állam az Egyezménnyel összhangban törekszik.

b) *Függelék*; a Tanács által elfogadott szabványok és ajánlott gyakorlatok részét képező, de a célszerűség érdekében külön csoportosított anyag.

c) *Előírások*; a szabványok és ajánlott eljárások alkalmazhatóságát szabályozzák szöveg részek.

d) *Meghatározások*; a szabványokban és ajánlott gyakorlatokban használatos olyan kifejezéseket magyarázatai, amelyek önálló szótári jelentés híján önmagukat nem ételmezik. A meghatározás önálló jogállással nem rendelkezik, de minden szabvány és ajánlott gyakorlat lényeges részét képezi, mivel a maghatározás megváltoztatása befolyásolhatja a szabványok értelmét.

2. - *A Tanács által a szabványok és az ajánlott gyakorlatokkal együtt történő kiadásra jóváhagyott anyag.*

a) *Előszó;* a Tanács intézkedésein alapuló történeti és magyarázó anyagot tartalmazó szövegrész, ideértve az államoknak az Egyezményből és az elfogadási határozatból fakadó, a szabványok és az ajánlott gyakorlatok alkalmazására vonatkozó kötelezettségeinek magyarázatát is.

b) *Bevezető rész*; az Annex egyes részeinek, Fejezeteinek, vagy szakaszainak elején a szöveg alkalmazásának jobb megértését segítő magyarázó anyag.

c) *Megjegyzés*; a szövegben megfelelő helyeken feltüntetett, az adott szabvánnyal, vagy ajánlott gyakorlattal kapcsolatos tényszerű tájékoztatás, vagy hivatkozás, de a szabványok, vagy ajánlott gyakorlatok részét nem képező anyag.

d) *Mellékletek*; a szabványokat és az ajánlott gyakorlatokat kiegészítő, vagy alkalmazásukhoz segítséget nyújtó anyagok.

Nyelvhasználat

Jelen Annexet négy nyelven fogadták el: angol, francia, orosz és spanyol. Felkérjük a szerződő államot, hogy a hazai bevezetés céljára és az Egyezményben megfogalmazott egyéb célok megvalósítására e szövegváltozatok valamelyikét - akár közvetlen felhasználáshoz, akár a nemzeti nyelvre történő lefordításhoz- válassza ki, illetve a választott megoldásról értesítse a Szervezetet.

Szerkesztői gyakorlat

Annak érdekében, hogy ránézéssel megállapítható legyen valamennyi megállapítás jogi helyzete, a következő módszert alkalmaztuk: A szabványokat vékony álló betűkkel nyomtattuk, az ajánlott gyakorlatokat vékony dőlt betűkkel szedtük, amelyek előtt vastag álló betűkkel **Ajánlás** szó olvasható; A megjegyzéseket vékony dőlt betűkkel szedtük, ezek jogi helyzetét a szöveg elején látható vékony dőlt betűvel szedett *Megjegyzés* szó mutatja.

Meg kell jegyezni, hogy az angol nyelvű szövegben az előírások megfogalmazásában a következő gyakorlatot követtük: A szabványokban a "shall", míg az ajánlásokban a "should" szót alkalmaztuk.

A jelen dokumentumban alkalmazott mértékegységek, teljes összhangban állnak a Nemzetközi Polgári Repülés Egyezményének 5. Annexében leírtak szerinti nemzetközi mértékegység rendszerrel, (SI)-vel. Ahol az 5. Annex lehetőséget ad nem SI alternatív mértékegység alkalmazására, ott ezt az alapegységet követően zárójelben tüntettük fel.

Ahol két különféle mértékegységben közölt adat párok láthatók, ott nem tételezhető fel az, hogy az értékpárok egyenlők és felcserélhetők. Oly módon viszont értelmezhető, hogy bármely mértékegység pár kizárólagos alkalmazásával azonos biztonsági szint valósítható meg.

A jelen dokumentum bármely számmal jelzett részére való hivatkozás magában foglalja az illető rész valamennyi alpontját is

Egyeztetés a ISO tevékenységgel

Az alkalmasság megállapítási eljárásokra vonatkozó előírásokban széleskörűen alkalmaztuk a nemzetközi szabványosítási szervezet (ISO) és a Nemzetközi Elektrotechnikai Bizottság (IEC) által kidolgozott idevágó leírásokat. Legtöbb esetben ezeket a leírásokat, közvetlen hivatkozás formájában építettük be az anyagba.

Ennek ellenére, egyes esetekben szükségessé vált a leírások megfelelő módosítása, hogy azok összhangba kerüljenek az ICAO követelményekkel, és ilyen esetben a módosított anyag teljes egészében megtalálható a jelen dokumentumban. A részletes előírások kidolgozásában a ISO által nyújtott segítséget nagyra értékeltük.

A-Táblázat - A 16. Annex módosításai

Módosítás	Forrás(ok)	Tárgy	Elfogadva Hatályba lépés Alkalmazandó
Első kiadás	Repülőterek közelében lévő légijármű zajjal foglalkozó különleges értekezlet		1971. április 2. 1971.augusztus 2 1972. január 6.
1	Légijármű zajbizottság első ülése	Hangsebesség alatti gázturbina sugárhajtású repülőgépek jövőbeli típusainak és továbbfejlesztett változatainak zajminősítési bizonyítványnyal történő ellátása és a légijármű súly leírására használt terminológia napra késszé tétele	1972.december 6. 1973. április 6. 1973.augusztus 16.
2.	Légijármű zajbizottság 3.ülése	5700 kg., vagy kisebb engedélyezett maximum felszálló súlyú könnyü, légcsavar hajtású repülőgépek és hangsebesség alatti gázturbina sugárhajtású repülőgépek zaj minősítési bizonyítvánnyal történő ellátása, illetve útmutatás az államoknak feladataik végrehajtásához légijármű bérlése, kölcsönzése, vagy cseréje esetére	1974. április 3. 1974.augusztus 3. 1975.február 27.
3. (2. kiadás)	Légijármű zajbizottság 4. ülése	A jövőbeli, hangsebesség alatti gázturbina sugárhajtású repülőgépek és légcsavarhajtású repülőgépek, amelyek nem STOL repülőgépek, zajminősítési bizonyítvánnyal történő ellátása, és útmutatás a jövőbeli hangsebesség feletti repülőgépek, légcsavar hajtású STOL repülőgépek és a földön működő beépített segédhajtóművek és kapcsolódó légijármű rendszerek zaj bizonyítvánnyal történő ellátásához	1976. június 21. 1976. október 21. 1977. október 6.
4. (3. kiadás)	Légijármű zajbizottság 5. ülése	új paraméter bevezetése, a hangsebesség alatti gázturbina sugárhajtású repülőgépek zajminősítési bizonyítvánnyal történő ellátásának szabványaiban, a hajtóművek számának tekintetében a részletes vizsgálati eljárások továbbfejlesztése, biztosítandó, hogy ugyan azonos szintű technológiát alkalmazzanak minden egyes légijármű típus tekintetében és szerkesztői változtatások, a nyelvezet ésszerűsítése és a következetlenségek kiküszöbölése érdekében	1978. március 6. 1978. július 6. 1978.augusztus 10.
5. (16.annex I. Kötet 1. Kiadás)	Légijármű zajbizottság 6. ülése	1. Az Annex új címe, Környezetvédelem és a következők szerinti két kötetben történő kiadá-sa: I. Kötet - légijármű zaj (tartalmazza a 16. Annex 5. módosítással kiegészített előírásait), és a II. Kötet - légijármű hajtómű által kibocsájtott szenyeződések 2. A helikopterek és a jelenlegi SST repülőgépek jövőben gyártandó példányainak zaj alkalmassági bizonyítvánnyal történő ellátás szabványainak bevezetése az I. Kötetbe. A beépített APU, és a kapcsolódó légijármű rendszerek zajminősítési bizonyítvánnyal történő ellátásáról szóló anyag	1981. május 11. 1981. szeptember 11. 1981. november 26.

Módosítás	Forrás(ok)	Tárgy	Elfogadva Hatályba lépés Alkalmazandó
		naprakésszé tétele és szerkesztői változtatások, többek között a mértékegységek változtatása, hogy az Annex megfeleljen az 5. Annex előírásainak	
1.	Az üzemeltetési panel 3. ülése	-SARP-ok bevezetése a zajcsökkentő üzemeltetési eljárások tekintetében, a részletes eljárások áthelyezése a PANS-OPS, I. Kötetébe	1983. március 30. 1983. július 29. 1983. november 24.
2.	A légijármű zajbizottság 7. ülése	a) A zajminősítő eljárások továbbfejlesztése b) A helikopterek maximális zajhatár értékeinek növelése	1985. március 6. 1985. július 29. 1985 november 21.
3. (16.Annex I. Kötet 2. Kiadás)	A repülési környezetvédelmi bizottság első értekezlete; a léginavigációs bizottság tanulmánya; az akadálymentességi panel ajánlását követően	a) A zaj minősítési eljárások további javítása b) A 9000 kg-ot nem meghaladó engedélyezett maximum felszálló tömegű légcsavarhajtású repülőgépekkel foglalkozó 10. Fejezet bevezetése c) Az V. Rész szerkesztői változtatása a vonatkozó PANS-OPS (Doc 8168) érvényes előírásaira hivatkozva	1988. március 4. 1988. július 31. 1988. november 17.
4. (3. kiadás)	A környezetvédelmi bizottság 2. találkozója; a légijármű zajbizottság 7.ülése; és az üzemeltetési panell, 5. találkozója	a) A zaj minősítési eljárások javítása b) A könnyű helikopterekre vonatkozó 11-es Fejezet bevezetése c) A helikopterek befogadása érdekében bővített 2. Függelék, és a 4. Függelék cseréje; valamint d) Az alkalmazási feltételekre vonatkozó útmutató bevezetése	1993. március 24. 1993. július 26. 1993. november 11.
5	A repülési környezetvédelmi bizottság harmadik értekezlete	a) a 3. Fejezetben szereplő légcsavaros légijárművekre vonatkozó zajminősítési sablonok egyszerűsítése és világosabbá tétele; b) a 8. és a 11. Fejezetben szereplő helikopterekre vonatkozó szabványok összhangba hozása a nemzeti előírásokkal c) a 10. Fejezetben szereplő felszálló tömeg érték egységesítése a légialkalmassági tömeghatárral	1997. Március 19. 1997. Július 21. 1997. November 6.
6	A repülési környezetvédelmi bizottság 4. ülése	a) az emberi teljesítőképesség új fogalom meghatározás beépítése az 1. Fejezetbe; b) a könnyű, egy-hajtóműves, légcsavaros repülőgépekre vonatkozó, 10. Fejezetben szereplő zaj követelmények szigorának fokozása; c) A 3., 8. és a 11. Fejezetek, valamint a 2. és a 4. függelékek egyöntetűségének fokozását célzó, részletezett, technológiai természetű változtatások d) Az V. részben az emberi tényezőkről szóló új rendelkezések e) Az európai közös légügyi előírások (European Joint Aviation Requirements - JARs) és az Egyesült Államok szövetségi légügyi előírások	1999. február 26. 1999. július 19. 1999. november 4.

Módosítás	Forrás(ok)	Tárgy	Elfogadva Hatályba lépés Alkalmazandó
		(Federal Aviation Requirements - FARs) folyamatban lévő összehangolása során keletkezett változtatások	
7	A repülési környezetvédelmi bizottság 5. ülése A 6. Annex 26. módosítása	a) A gázturbina és a nehéz, légcsavar hajtású repülőgépekre vonatkozó zaj előírások szigorának fokozása (új 4. Fejezet a korábbi 4. fejezet lett a 12. Fejezet); b) új rendelkezés a 3. Fejezetbe sorolt repülőgépek újra minősítéséről; c) A 8. és a 11. fejezetben szereplő, helikopterekre vonatkozó zaj előírások szigorának fokozása d) Módosítás a meglévő minősítési eljárások tisztázására és újra meghatározására, az összehangolt JAR/FAR követelményekhez igazításuk, a digitális műszerezettségre vonatkozó új rendelkezések bevezetése. e) Útmutató anyag bevezetése a dönthető forgószárny tengellyel rendelkező repülőgépek zaj minősítéséhez; és f) A zaj minősítési dokumentum egy angol nyelvű mintájának bedolgozása.	2001. június 29. 2001. október 29. 2002. március 21.
8 (4. Kiadás)	A repülési környezetvédelmi bizottság 6. ülése	a) környezeti zaj korrekciós eljárás, magában foglalva a "háttérzaj", a külső zaj" és a "szélessávú zaj" fogalom meghatározását; b) a vizsgálatok alatt megengedett szél sebesség korlátok; c) az alkalmazhatóság nyelvezetének megerősítése, magában foglalva a típus kialakítás időleges módosításait és az 5. Fejezet szerinti repülőgépek 4. Fejezet szerinti újra minősítését lehetővé tévő rendelkezés; d) forgószárnyas gépekkel kapcsolatos kérdések; és e) új G és H Mellékletek, amelyek a zaj minősítési dokumentumok kezeléséhez, illetve a földterület hasznosítás tervezés céljára helikopter zaj adatok beszerzéséről tartalmaznak útmutató anyagot -a sorrendnek megfelelően.	2005 február 23 2005 július 11 2005 november 24

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

I. RÉSZ - MEGHATÁROZÁSOK

Repülőgép - (Aeroplane) levegőnél nehezebb, erőgép meghajtású légijármű, amely repülés közben a felhajtó erőt főleg az olyan felületekre ható aerodinamikai reakciók révén nyeri, mely felületek az adott repülési körülmények között rögzített helyzetben maradnak.

Légijármű - (Aircraft) Minden olyan szerkezet, amely levegőben maradását a földfelszínre ható aerodinamikai reakcióktól eltérő aerodinamikai reakciók biztosítják.

Kapcsolódó légijármű rendszerek - (Associated aircraft systems) Azok a légijármű rendszerek, amelyek a földi üzem során az elektromos/pneumatikus teljesítményt a segédhajtóműtől kapják.

Segédhajtómű - (Auxiliary power-unit (APU)) Légijárművön elhelyezett önálló hajtóműegység, amely a földi üzem során elektromos és pneumatikus teljesítményt biztosít a légijármű különféle rendszerei részére.

Kétáramúsági viszony - (By-pass Ratio) Gázturbina hajtóművön a nagynyomású kompresszort megkerülő csatornán haladó levegőtömeg aránya az égőkamrákon áthaladó levegő tömegéhez viszonyítva a maximális tolóerőre számítva tengerszinten, a Nemzetközi Egyezményes Légkörben, álló helyzetben lévő légijárművet figyelembe véve.

Továbbfejlesztett repülőgép változat - (Derived Version of an Aeroplane) A légi-alkalmasság szempontjából a zajminősítési bizonyítvánnyal ellátott prototípushoz hasonló, de a típus tervében a zaj jellemzőit esetleg károsan befolyásoló változtatásokat tartalmazó légijármű.

1. Megjegyzés. - Amikor a bizonyítványt kiadó hatóság úgy találja, hogy a tervezett változtatások a tervezésben, kialakításban, teljesítményben, vagy a tömegben olyan mértékűek, hogy egy alapvetően új vizsgálat szükséges az érvényes légi-alkalmassági követelményeknek való megfelelés megállapításához, a légijárművet új típusnak és nem továbbfejlesztett változatnak kell tekinteni.

2. Megjegyzés. - A "hátrányosan" szó, a zajminősítési szintek bármelyikének 0,10 dB-nél nagyobb mérvű megnövekedését jelenti, kivéve, ha a típustervezet változtatásának felgyülemlett hatásait jóváhagyott eljárás szerint követik nyomon, amely esetben a "hátrányosan" szó, a zajminősítési szintek bármelyikének 0,3 dB-nél nagyobb mérvű megnövekedését, vagy az egyezés határértékét jelenti, amelyik a kisebb.

Továbbfejlesztett helikopter változat - (Derived Version of a helicopter) A légi-alkalmasság szempontjából a zajminősítési bizonyítvánnyal ellátott prototípushoz hasonló, de a típustervében a zaj jellemzőit esetleg károsan befolyásoló változtatásokat tartalmazó helikopter.

1. Megjegyzés. -Ha a meglévő prototípusra alapozott helikoptert a minősítő hatóság szerint légi-alkalmassági szempontból új típus tervezetként kell kezelni, akkor függetlenül az előzőktől, a jelen Annex szabványainak alkalmazásakor a helikoptert továbbfejlesztett változatként kell kezelni, amennyiben zajforrás jellemzőit a bizonyítványt kiadó hatóság a prototípusével azonosnak találja.

2. Megjegyzés. - A "hátrányosan" szó, a zajminősítési szintek bármelyikének 0,3 dB-nél nagyobb mérvű megnövekedését jelenti,

Külső berendezés (helikopter).- (External equipment (helicopter)) A helikopter külső felületéhez erősített, vagy abból kinyúló, de a repülésben lévő helikopter működtetésére és kormányzására nem használt és nem e célra szánt, továbbá a sárkány, illetve a hajtómű részét nem képező műszer, szerkezet, részegység, készülék, tartozék, vagy szerelvény.

Helikopter. - (Helicopter) Levegőnél nehezebb olyan légijármű, amelynek levegőben maradása elsősorban, egy, vagy több, lényegében függőleges tengelyre szerelt motorral meghajtott rotorra ható légreakción alapszik.

Emberi teljesítőképesség. - (Human performance) A repülő tevékenység hatékonyságát és biztonságosságát befolyásoló emberi képességek és korlátok.

Újra minősítés. - (Re-certification) A légjármű korábbi minősítésétől eltérő más szabványok szerinti minősítése akár hitelesített zajszintjének felülvizsgálatával, akár anélkül.

Önerős repülést biztosító motoros vitorlázó repülőgép. - (Self-sustaining powerd sailplane) Olyan teljesítményű motorral rendelkező motoros vitorlázó repülőgép, amely a repülőgép számára vízszintes repülést lehetővé tesz, de azt nem, hogy önerőből felszálljon.

Hangsebesség alatti repülőgép. - (Subsonic aeroplane) a 1,0 Mach-nál nagyobb sebességű vízszintes repülés fenntartására nem képes repülőgép.

II. RÉSZ - LÉGIJÁRMŰ ZAJMINŐSÍTÉSI BIZONYÍTVÁNY

1. FEJEZET - ADMINISZTRÁCIÓ

1.1 Az 1.2-től - 1.6-ig terjedő pontok előírásait kell alkalmazni minden egyes légijárműre, amelyeket a zajminősítés megállapítása céljából a jelen Rész, 2., 3., 4., 5., 6., 8., 10., 11., vagy 12. Fejezetében található osztályokba soroltak, ha az ilyen légijárművek a nemzetközi légi-közlekedésben részt vesznek.

1.2 A zajbizonyítványt a légijárművet lajstromozó állam akkor adja ki, vagy érvényesítse, ha megfelelően bizonyított, hogy a légijármű legalább a jelen Annex szabványaival egyenértékű előírásoknak megfelel.

1.3 Zaj újra minősítés kérelmezésekor azt a légijárművet lajstromozó állam köteles kiadni, vagy érvényesíteni kellő bizonyítékok alapján, miszerint a légijármű megfelel a jelen Annexben előírt alkalmazandó szabványokkal legalább azonos szintű követelményeknek. Az alkalmasságot vizsgáló hatóság az újra minősítési dátum alapjául az újra minősítési kérelem első elfogadásának dámutát vegye.

1.4 A zajminősítést igazoló dokumentumot a lajstromozó államnak jóvá kell hagynia és meg kell követelnie, hogy az a légijármű fedélzetén rendelkezésre álljon.

Megjegyzés.- A zajminősítést igazoló dokumentum angol nyelvre fordításával kapcsolatban lásd a 6. Annex, 1. Rész, 6.13 pontját.

1.5 A légijármű zajminősítését igazoló dokumentumnak, legalább a következőket kell tar-talmaznia:

1. tétel a lajstromozó állam neve;

2. tétel a dokumentum címe;

3. tétel a dokumentum szána;

4. tétel nemzetiségi, vagy közösségi és lajstromjel;

5. tétel gyártó és a légijármű gyártói neve

6. tétel gyártási sorozatszám;

7. tétel hajtómű gyártó, típus és modell;

8. tétel légcsavar típus és modell - a légcsavar hajtású repülőgép esetében;

9. tétel Maximum felszállótömeg kilogrammban;

10. tétel Maximum leszálló tömeg kilogrammban a jelen Annex 2., 3., 4., 5. és 12. Fejezete alapján kiadott minősítés esetén;

11. tétel a jelen Annex Fejezet- és szakasz száma, amely alapján a minősítést kiadták;

12. tétel az alkalmazandó zajminősítési szabványok teljesítése érdekében alkalmazott kiegészítő módosítások;

13. tétel az oldalsó/teljes-teljesítményhez tartozó zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5. és 12. Fejezete alapján kiadott minősítés esetén;

14. tétel a megközelítési zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5., 8. és 12. Fejezete alapján kiadott minősítés esetén;

15. tétel az átrepülési (flyover) zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5. és 12. Fejezete alapján kiadott minősítés esetén;

16. tétel az átrepülési (overflight) zajszint a megfelelő mértékegységben a jelen Annex 6., 8. és 11. Fejezete alapján kiadott minősítés esetén;

17. tétel a felszállási zajszint a megfelelő mértékegységben a jelen Annex 8 és 10. Fejezete alapján kiadott minősítés esetén;

18. tétel a megfelelésről szóló nyilatozat, tartalmazva a 16. Annex, I. kötetére való pontszám hivatkozást;

19. tétel a zajminősítési dokumentum kiadási dátuma;

20. tétel a kiadó hivatalnok aláírása

1.6 A zajminősítési dokumentumban a tételszámokat egységesen arab számokkal kell számozni az 1.5 pontban jelzettek szerint, oly módon, hogy bármely zajminősítő dokumentumban a számok -bármiféle elrendezés esetén- ugyanarra a tételre utaljanak, kivéve, hogy ha az 1-től 6-ig és a 18-tól a 20-ig tartó tételek részleteit a légialkalmassági bizonyítvány közli, amely esetben a 8. Annexben közöltek szerinti légialkalmassági bizonyítvány számozási rendszere a mérvadó.

1.7 A lajstromozó állam a zajminősítő dokumentáció bevezetéséhez köteles közigazgatási rendszert kialakítani.

Megjegyzés.- A zajminősítő dokumentum formájáról és tartalmáról útmutatás a G mellékletben látható.

1.8 A szerződő állam érvényesnek elismerheti valamely más szerződő állam által kiállított zajminősítési bizonyítványt, feltéve, hogy azok a követelmények, amelyek alapján az ilyen bizonyítványt kiállították, a jelen Annexben előírtak közül az alkalmazandó szabványokkal legalább egyenértékűek.

1.9 A szerződő állam függessze fel, vagy vonja vissza a lajstromában szereplő légijármű zajminősítési bizonyítványát, ha a légijármű a továbbiakban már nem felel meg az alkalmazandó zaj szabványoknak. A lajstromozó állam nem szakíthatja meg a zajbizonyítvány felfüggesztését és nem adhat ki új zajbizonyítványt, csak abban az esetben, ha a légijárművet egy újabb értékelés alapján az alkalmazandó zaj szabványoknak megfelelőnek találta.

1.10 Kivéve, ha az Annex jelen kötete másként rendelkezik, a szerződő állam a következő időpontok alapján döntse el, hogy a jelen Annexben lévő szabvány-alkalmazhatósági dátumok közül melyiket alkalmazza: vagy azt a dátumot, amikor a bizonyítványt kiállító hatóság a típus légi-alkalmassági vizsgálata iránti kérelmet elfogadta, vagy a hatóság által előírt egyenértékű eljárásra vonatkozó kérelem benyújtásának dátumát. A kérlem érvényességi tartama legyen azonos a légijármű típusra vonatkozó légi-alkalmassági szabályok kijelölésében alkalmazott periódussal., speciális esetek kivételével, amelyek esetében a bizonyítványt kiadó hatóság e periódus meghosszabbítását elfogadja.

1.11 Eme érvényességi tartam túllépése esetén, a dátum, amely alapján meghatározzák, hogy a jelen Annex szabványai közül melyek alkalmazandók, legyen a típus alkalmassági bizonyítvány kiadásának dátuma, vagy előírt, egyenértékű eljárás esetében a jóváhagyás kiadásának dátuma, leszámítva belőle az érvényesség tartamát.

2. FEJEZET
HANGSEBESSÉGTŐL LASABB GÁZTURBINA SUGÁRHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUSRA 1977. OKTÓBER 6. ELŐTT ELFOGADOTT LÉGI-ALKALMASSÁGI BIZONYÍTVÁNY KÉRELMEK

2.1 Alkalmazási Követelmények

Megjegyzés. - Lásd még az 1. Fejezet 1.9 pontját is.

2.1.1 Ezen Fejezet szabványai alkalmazandók a hangsebesség alatti gázturbina sugárhajtóműves azon repülőgépre, amelyekre a prototípus légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiállító hatóság 1977. október 6. előtt elfogadta el, vagy alkalmazott ezzel egyenértékű egyéb előírt eljárást, kivéve azokat a repülőgépeket, amelyek:

a) Légi-alkalmasságához engedélyezett legnagyobb tömegnél 610 m hosszú, vagy rövidebb futópályát igényelnek[1];

b) 2, vagy nagyobb kétáramúsági viszonyú hajtóművekkel rendelkeznek és amelyek egyedi légi-alkalmassági bizonyítványát először, 1972. március 1. előtt adták ki;

c) 2-nél kisebb kétáramúsági viszonnyú hajtóművekkel rendelkeznek és amelyeknél a bizonyítványt kiállító hatóság, 1969. január 1. előtt elfogadta a prototípus légi-alkalmassági bizonyítványa iránti kérelmet, vagy más, egyenértékű eljárást hajtott végre és amelyeknél az egyedi repülőgép légi-alkalmassági bizonyítványát első ízben 1976. január 1. előtt kiadták.

2.1.2 E Fejezet szabványai alkalmazandók a 2.1.1 pontban meghatározott repülőgépek módosított változataira is, amelyekre a típustervben bekövetkező változtatás miatti alkalmassági kérelmet a bizonyítványt kiállító hatóság 1981. november 26-án, vagy utána fogadta el, vagy alkalmazott ezzel egyenértékű egyéb eljárást.

2.1.3 A 2.1.1 és a 2.1.2-től eltekintve, a szerződő állam elfogadhatja, hogy a lajtromában álló sugárhajtású- és a légcsavar hajtású nehéz repülőgépek részéről az alább felsorolt körülmények között nem szükséges bemutatni a 16. Annex, I. Kötetével való egyezést:

[1] Végbiztonsági sáv, vagy akadálymentes sáv nélkül.

a) kibocsátott futóval végzett repülés egy, vagy több behúzható futószár kinti helyzetben a teljes repülés alatt;

b) a repülőgépen külső felfüggesztéssel szállított tartalék hajtómű és gondola (és a pilon, vagy egyéb külső felfüggesztő elem visszaszállítása); és

c) időben behatárolt hajtómű és/vagy gondola változtatás, amikor a típus kialakításban végzett változtatás előírja, hogy a repülőgép 90 napnál hosszabb tartamban nem üzemeltethető, kivéve, ha bemutatott, miszerint a típus kialakítás adott változtatása mellett is teljesülnek a 16. Annex, I. Kötetének előírásai. Ez csakis az előírt karbantartó tevékenységekből fakadó változtatásokra érvényes.

2.2 Zaj Értékelési Mérőszám

2.2.1 A zajértékelési mérőszám legyen az 1. Függelékben leírt EPNdB értékben kifejezett ténylegesen észlelt zajszint.

2.3 Zajmérési Pontok

A 2.6 pontban ismertetett vizsgálati repülési eljárásoknak megfelelően vizsgált repülőgép következő pontoknál mért zajszintje nem haladhatja meg a 2.4 pontban leírt zajszinteket:

a) *Oldalsó zajmérési pont*, a futópálya középvonalától, vagy meghosszabbított középvonalától 650 m-re elhelyezkedő, azzal párhuzamos egyenesen kijelölt pont, ahol a zajszint a felszállás során a legnagyobb;

b) *átrepülési (flyover) zajmérési pont*: A futópálya meghosszabbított középvonalán a felszálláshoz végzett nekifutás kezdeti pontjától 6,5 km-re elhelyezkedő pont; és

c) *Megközelítési zajmérési pont*: A földön, a futópálya meghosszabbított középvonalán és a küszöbön belül 300 m-re kezdődő 3 fokos siklópályán 120 (395 láb) m magasság alatt függőlegesen kijelölt pont. Ez a talajszinten megfelel a küszöbtől, 2000 m-re lévő helyzetnek.

2.4 Maximum Zajszintek

2.4.1 A fenti 2.1.1 pont szerinti repülőgépek 1. Függelék zaj értékelési módszere szerint meghatározott legnagyobb zajszintje nem haladhatja meg a következőket:

a) Az oldalsó és a megközelítési zajmérési pontokban:

108EPNdB a 272000 kg, vagy ennél nagyobb engedélyezett maximum felszálló tömegű repülőgépeknél, a tömeg logaritmusával lineárisan csökkentve 2EPNdB per a tömeg fele mértékkel a 34000 kg-nál lévő 102EPNdB-ig, amely után az érték állandó marad;

b) Az átrepülési (flyover) zajmérési pontban:

108EPNdB a 272000 kg, vagy e fölötti engedélyezett maximum felszálló tömegű repülőgépeknél a tömeg logaritmusával 5EPNdB per a tömeg fele mértékkel lineárisan csökkentve a 34000 kg-nál lévő 93EPNdB-ig, amely után az érték állandó marad.

Megjegyzés. - A zajszint felszálló tömeg függvényében történő kiszámításához tartozó egyenleteket Lásd az "A" Mellékletben.

2.4.2 A fenti 2.1.2 pont szerinti repülőgép 1. Függelék zaj értékelési módszerével meghatározott legnagyobb zajszintje nem haladhatja meg a következőket:

2.4.2.1 *Az oldalsó zajmérési pontban:*

106 EPNdB, a 400000 kg, vagy e fölötti engedélyezett maximum felszálló tömegű repülőgépeknél, a tömeg logaritmusával lineárisan csökkentve a 35000 kg-nál lévő 97 EPNdB-ig, amely után az érték állandó marad.

2.4.2.2 Az átrepülési (flyover) zajmérési pontban:

a) Kettő, vagy kevesebb hajtóművel felszerelt repülőgépeknél:

104 EPNdB, a 325000kg, vagy e fölötti engedélyezett maximum felszálló tömegű repülőgépeknél, amely a tömeg logaritmusával 4 EPNdB per a tömeg fele mértékben lineárisan csökken 93 EPNdB-ig, amely után az érték állandó marad.

b) Három hajtóművel felszerelt repülőgépeknél:
ugyanaz, mint az a) pontban szereplők, de 107 EPNdB a 325000 kg, vagy e feletti engedélyezett maximum felszálló tömegű repülőgépeknél,
vagy
a 2.4.1 b) pontban meghatározottak szerinti, amelyik a kisebb.

c) Négy, vagy több hajtóművel felszerelt repülőgépeknél:

ugyanaz, mint az a) pontban szereplők, de 108 EPNdB, a 325000 kg, vagy e feletti engedélyezett maximum felszálló tömegű repülőgépeknél,
vagy
a 2.4.1 b) pontban meghatározottak szerinti, amelyik a kisebb.

2.4.2.3 *Megközelítési zajmérési pont:*

108 EPNdB, a 280000 kg, vagy e feletti engedélyezett maximum felszálló tömegű repülőgépeknél, a tömeg logaritmusával lineárisan csökkentve a 35000 kg-nál lévő 101 EPNdB-ig, amely után az érték állandó marad.

Megjegyzés. - A zajszintnek tömeg függvényében történő kiszámítására szolgáló egyenleteket lásd az "A" mellékletben.

2.5 Kedvezmények

Ha a legnagyobb zajszint egy, vagy két mérési pontban meghaladja az előírtakat, akkor:

a) a többlet értéke nem haladhatja meg a 4 EPNdB értéket, kivéve a 2, vagy nagyobb kétáramúsági viszonyú hajtóművel rendelkező olyan 4 hajtóműves repülőgépeket amelyek esetében a prototípus légi-alkalmassági bizonyítványa iránti kérelmet a légi-alkalmassági bizonyítványt kiállító hatóság 1969. december 1. előtt fogadta el, vagy alkalmazott azzal egyenértékű egyéb előírt eljárást: amelyeknél a többlet értéke nem lehet nagyobb 5 EPNdB-nél.

b) A többlet érték egyetlen pontnál sem haladhatja meg a 3 EPNdB-t; és

c) Bármiféle többlet értéket a többi pontban, vagy pontokban fellépő megfelelő csökkenéseknek kell kiegyenlíteniük.

2.6 Vizsgálati Eljárások

2.6.1 Felszállási vizsgálati eljárás

2.6.1.1 Átlagos felszálló tolóerőt[2] kell alkalmazni a felszállás kezdetétől a legalább 210 m-es (690 láb) futópálya feletti magasság elérésének megfelelő pontig és ez után a tolóerő nem csökkenthető a legalább 4 százalékos emelkedési gradiens tartását biztosító érték alá.

2.6.1.2 Az emelkedés után, mihelyt lehetséges, V2 + 19 km/h (V2 + 10 Kt) értékű sebességet kell elérni és ezt a sebességet a felszállási zajminősítő vizsgálat alatt mindvégig tartani kell.

2.6.1.3 A kérelmező által kiválasztott állandó felszállási konfigurációt kell tartani a teljes felszállási zajminősítő vizsgálat alatt azzal a kivétellel, hogy a futóművek behúzhatók.

2.6.2 Megközelítési vizsgálati eljárás

2.6.2.1 A repülőgépet stabilizálni kell és 3^{o} $\pm 0{,}5^{o}$-os siklópályán kell tartani.

2.6.2.2 A megközelítést 1,3 Vs + 19 km/h-nál, (1,3 Vs + 10 Kts-nél) nem kisebb állandó műszersebességgel, stabilizált tolóerővel kell végezni a megközelítés folyamán és a mérő pont felett a földet érésig folytatni.

2.6.2.3 A repülőgép konfiguráció fékszárny helyzete a maximum engedélyezett leszálló fékszárny kitérítés legyen.

Megjegyzés. - Az egyenértékű eljárás alkalmazására vonatkozó segédanyag, az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" című kiadványban található.

[2] A sorozatgyártású hajtómű átlag jellemzőit képviselő felszálló tolóerő.

3. FEJEZET
1. - HANGSEBESSÉGNÉL LASSABB GÁZTURBINA SUGÁRHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNYA IRÁNT 1977. OKTÓBER 6-ÁN ÉS 2006 JANUÁR 1. ELŐTT ELFOGADOTT KÉRELMEK.

2. - 5700 KG-NÁL NEHEZEBB LÉGCSAVARHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNYA IRÁNT 1985. JANUÁR 1-ÉN, VAGY UTÁNNA, ÉS 1988. NOVEMBER 17. ELŐTT ELFOGADOTT KÉRELMEK.

3. - 8618 KG-NÁL NEHEZEBB LÉGCSAVARHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNYA IRÁNT 1988 NOVEMBER 17-ÉN ÉS 2006 JANUÁR 1. ELŐTT ELFOGADOTT KÉRELMEK.

3.1 Alkalmazási követelmények

1. Megjegyzés. - Lásd az 1. Fejezet 1.9 pontját is.

2. Megjegyzés. - Eme alkalmazási rendelkezések értelmezésére vonatkozó tájékoztató anyagot lásd az "E" Mellékletben.

3.1.1 Jelen fejezet szabványai az alábbiakra alkalmazandók:

a) Minden hangsebességnél lassabb gázturbina sugárhajtású repülőgépre és azok módosított változataira (kivéve azokat, amelyek 610 m, vagy rövidebb futópályát[1] igényelnek a légi-alkalmasságuk szerinti engedélyezett maximum tömeg mellett), amelyek esetében a prototípusra vonatkozó légi-alkalmassági vizsga kérelmet az engedélyező hatóság 1977. október 6-án, vagy utána és 2006. Január 1. előtt fogadta el, vagy alkalmazott más egyenértékű előírt eljárást;

b) 5700 kg-nál nagyobb engedélyezett maximum felszálló tömegű (kivéve a 6. Fejezet 6.1 pontban leírtakat) minden légcsavar hajtású repülőgépekre és azok módosított változataira, amelyek esetében a prototípus iránti légi-alkalmassági vizsga kérelmet az engedélyező hatóság 1985. január 1-én, vagy utána és 1988. november 17-e előtt fogadta el, vagy alkalmazott egyenértékű egyéb eljárást, kivéve azt az esetet, amikor a 10. Fejezet szabványai alkalmazandók; és

c) 8618 kg-nál nagyobb engedélyezett maximum felszálló tömegű minden légcsavar hajtású repülőgépre és azok módosított változataira, amelyek esetében a prototípus iránti légi-alkalmassági vizsga kérelmet az engedélyező hatóság 1988. november 17-én, vagy utána és 2006. Január 1. előtt fogadta el, vagy alkalmazott egyéb egyenértékű eljárást.

3.1.2 A 3.1.1-től eltekintve, a szerződő állam elfogadhatja, hogy a lajtromában álló sugárhajtású- és a légcsavar hajtású nehéz repülőgépek részéről az alább felsorolt körülményekre nem szükséges előírni a 16. Annex, I. Kötetével való egyezés bemutatását:

a) kibocsátott futóval végzett repülés egy, vagy több behúzható futószár kinti helyzetben a teljes repülés alatt;

b) a repülőgépen külső felfüggesztéssel szállított tartalék hajtómű és gondola (és a pilon, vagy egyéb külső felfüggesztő elem visszaszállítása); és

c) időben behatárolt hajtómű és/vagy gondola változtatás, amikor a típus kialakításban végzett változtatás előírja, hogy a repülőgép 90 napnál hosszabb tartamban nem üzemeltethető, kivéve, ha bemutatott, miszerint a típus kialakítás adott változtatása mellett is teljesülnek a 16. Annex, I. Kötetének előírásai. Ez csakis az előírt karbantartó tevékenységekből fakadó változtatásokra érvényes.

[1] Végbiztonsági, vagy akadálymentes sáv nélkül.

3.2 Zajmérések

3.2.1 Zaj értékelési mérőszám

A zajértékelési mérőszám a 2. Függelékben ismertetett EPNdB-ben mért ténylegesen észlelt zajszint legyen.

3.3 Zajmérő pontok

3.3.1 Referencia zajmérő pontok

A jelen szabványokkal összhangban vizsgált repülőgép zaja nem haladhatja meg a 3.4 pontban ismertetett zajszinteket a következő pontokon:

a) Oldalsó, teljes teljesítményhez tartozó referencia zajmérő pont:

1) gázturbina sugárhajtóműves repülőgépekre: a futópálya középvonalától 450 m-re lévő és azzal párhuzamos egyenesen elhelyezet pont, ahol a zajszint a felszállás folyamán a legnagyobb;

2) légcsavarhajtású repülőgépekre: a futópálya meghosszabbított középvonalán, teljes teljesítménnyel végzett emelkedés közben elért függőlegesen mért 650 m-es helyzetnek megfelelő pont, a 3.6.2-ben meghatározottak szerint. 2002 március 19-ig az oldasó zaj esetében alternatívaképp engedélyezni kell a 3.3.1 a) 1) követelményeit is.

Megjegyzés. - A 3.1.1 b) és a 3.1.1. c)-ben meghatározott repülőgépkre, amelyek esetében a légi-alkalmassági bizonyítvány iránti kérelmet a hatóság 2002 március 19. előtt fogadta el, a 3.3.1 a) 1)-ben szereplő oldalsó zajra vonatkozó követelmény alternatívaképp engedélyezett.

b) Átrepülési (flyover) referencia zajmérő pont: A futópálya meghosszabbított középvonalán a nekifutás kezdő pontjától 6,5 km-re elhelyezkedő pont;

c) *Megközelítési referencia zajmérő pont:* A földön a futópálya meghosszabbított középvonalán a küszöbtől 2000 m távolságra lévő pont. Vízszintes talajon ez a pont a küszöbön belül 300 m távolságban kezdődő 3 fokos siklópályán a 120 m (395 láb) magasságú helyzet alatt függőlegesen lévő pontnak felel meg.

3.3.2 Vizsgálati zajmérő pontok

3.3.2.1 Ha a vizsgálati zajmérő pontok nem a referencia zajmérő pontokon helyezkednek el, akkor az eltérés helyesbítéseit ugyan úgy kell elvégezni, mint az ellenőrző és referencia repülési pályák közötti különbség helyesbítéseit.

3.3.2.2 Elegendő számú oldalsó vizsgálati zajmérő pontot kell alkalmazni a bizonyítványt kiadó hatóság felé annak bizonyítására, miszerint a megfelelő oldalvonalban mutatkozó legnagyobb zajszintet egyértelműen meghatározták. Gázturbina sugárhajtású repülőgépek esetében egyidejű méréseket kell végezni egy, a futópálya átellenes oldalán szimmetrikusan elhelyezkedő pontban is. Légcsavar hajtású repülőgép esetében, mivel oldal irányban tapasztalható zajszintjük sajátossága az asszimetria, ezért egyszerre és egyidejűleg kell méréseket végezni a futópálya átellenes oldalán (a futópálya tengelyével (±10 m párhuzamosságon belül) szimmetrikusan elhelyezett minden egyes vizsgálati zajmérő pontnál is.

3.4 Maximum zajszintek

3.4.1 A 2. Függelék zaj értékelési módszerével meghatározott legnagyobb zajszintek nem haladhatják meg a következő értékeket.

3.4.1.1 *A teljes teljesítményhez tartozó oldalsó referencia zajmérő pontban:*

Ha a repülőgép zajminősítési kérelemben szereplő engedélyezett maximum felszálló tömege 400000 kg, vagy több, akkor 103 EPNdB, amely érték a tömeg logaritmusával lineárisan csökken 35000 kg-nál 94 EPNdB-ig, ami után az érték állandó marad.

3.4.1.2 *Az átrepülési (flyover) referencia zajmérő pontban*:

a) *Kettő vagy kevesebb hajtóművel felszerelt repülőgépek;*

Ha a repülőgép zajminősítési kérelemben szereplő engedélyezett maximum felszálló tömege 385000 kg, vagy több, akkor 101EPNdB, amely érték a repülőgép tömegének logaritmusával lineárisan csökken 4 EPNdB per a tömeg fele mértékben 89 EPNdB-ig, ami után az érték állandó marad.

b) *Három hajtóművel felszerelt repülőgépek;*

Az a) pontban szereplőkkel egyezően, de a 385000 kg és e fölötti engedélyezett maximum felszálló tömegű repülőgépeknél a kiinduló érték 104 EPNdB.

c) *Négy vagy több hajtóművel felszerelt repülőgépek;*

Az a) pontban szereplőkkel egyezően, de a 385000 kg és e feletti engedélyezett maximum felszálló tömegű repülőgépeknél a kiinduló érték 106 EPNdB.

3.4.1.3 *A megközelítési referencia zajmérő pontnál*

105 EPNdB a zajminősítési kérelemben szereplő 280000 kg, vagy nagyobb engedélyezett maximum felszálló tömegű repülőgépekre, amely a tömeg logaritmusával lineárisan csökken 35000 kg-nál 98 EPNdB-ig, amely után az érték állandó marad.

Megjegyzés. - A zajszintek felszálló tömeg függvényében történő számítására szolgáló egyenleteket lásd az "A" Függelékben.

3.5 Kedvezmények

Ha egy, vagy két mérőpontban a legnagyobb zajszintet túllépik:

a) A határértéken felüli összérték nem lehet több 3 EPNdB-nél;

b) A határértéken felüli érték egyetlen mérőpontnál sem lehet több 2 EPNdB-nél; és

c) A határértékeken felüli értékeket a másik pontban, vagy pontokban, azonos mértékű csökkenés(ek)nek kell kiegyenlítenie.

3.6 Zajminősítési referencia eljárások

3.6.1 Általános feltételek

3.6.1.1 A referencia eljárások álljanak összhangban a megfelelő légi-alkalmassági követelményekkel.

3.6.1.2 A referencia eljárások és a repülési pályák számításait a bizonyítványt kiállító hatóságoknak kell jóváhagyniuk.

3.6.1.3 A 3.6.1.4-ben meghatározott feltételek kivételével, a megközelítés, illetve a felszállás referencia eljárásai feleljenek meg a 3.6.2, illetve a 3.6.3 pontban előírtaknak.

3.6.1.4 Ha a kérelmező igazolja, hogy a repülőgép tervezési jellemzői nem teszik lehetővé, a 3.6.2 és a 3.6.3 pontban előírtak szerinti repülések végrehajtását, akkor a referencia eljárások:

a) Eltérhetnek a 3.6.2 és a 3.6.3 pontban meghatározott eljárásoktól, de csak olyan mértékben, amennyire azt a fenti eljárások végrehajtását lehetetlenné tévő tervezési jellemzők megkövetelik;

b) Az eljárásokat a bizonyítványt kiállító hatóság jóvá hagyta.

3.6.1.5 A referencia eljárásokat az alábbi légköri referencia feltételeknek megfelelően kell számítani:

a) Tengerszinti légnyomás, 1013,25 hPa;

b) Környezeti levegő hőmérséklet, 25^{o} C, azaz ISA + 10^{o} C;

c) Relatív páratartalom 70 százalék; és

d) Szélcsend; és

e) Mind a felszállási-, mind az oldalsó zajmérés esetében, a felszállási referencia profil meghatározás céljára a futópálya gradiense nulla.

Megjegyzés. - A hőmérséklet és a relatív páratartalom szempontjából a referencia légkör homogén, ha azokat a légköri elnyelési együtthatók kiszámításához alkalmazzák.

3.6.2 Felszállási referencia eljárás

A felszállási referencia repülési pályát a következők szerint kell kiszámítani:

a) Átlagos felszálló tolóerőt, vagy teljesítményt kell alkalmazni a felszállás megkezdésétől addig a pontig, amíg legalább a következő futópályaszint feletti magasságot elérik:
1) Kettő, vagy kevesebb hajtóművel rendelkező repülőgép - 300 m (984 láb),
2) Három hajtóműves repülőgép - 260 m (853 láb),
3) Négy, vagy többhajtóműves repülőgép - 210 m (689 láb),

b) A fenti a) pontban előírt magasság elérésekor a tolóerő, vagy teljesítmény nem csökkenthető azon érték alá, amely szükséges:
1) 4 százalékos emelkedési gradiens tartásához; és

2) Több hajtóműves repülőgép esetén, szintrepülés tartásához egy üzemképtelen hajtóművel; amelyik tolóerő, vagy teljesítmény a nagyobbik;

c) a teljes teljesítményhez tartozó oldalsó zajszint meghatározása céljából, a referencia felszálló pálya számítását tolóerő-, vagy teljesítménycsökkentés nélküli, mindvégig teljes teljesítmény, vagy tolóerő alkalmazására alapozva kell elvégezni;

d) A sebesség a kérelmező által a szokványos üzemeléshez kiválasztott, az összes hajtómű működésével végrehajtott felszállás emelkedő sebessége legyen, amely legalább V_2 + 19 km/h (V_2 + 10 Kt), de nem nagyobb, mint V_2 + 37 km/h (V_2 + 20 Kt), amelyet az elemelkedést követően, amint az gyakorlatilag lehetséges, el kell érni és a zajminősítés felszállási vizsgálata során végig tartani kell;

e) Egy, a kérelmező által kiválasztott állandó felszállási konfigurációt kell alkalmazni az egész felszállási vizsgálati eljárás során azzal az eltéréssel, hogy a futómű behúzható. A konfigurációt úgy kell értelmezni, amely jelenti a rendszerek állapotát, a súlypont helyzetét és magában kell foglalnia a használatos felhajtóerő növelő eszközök helyzetét és azt, hogy az APU működik-e és a levegő elvételi szelepek és a teljesítmény elvonások működnek-e;

f) A fékoldáskor a repülőgép tömege az a maximum felszálló tömeg legyen, amelyre a zajminősítési bizonyítványt kérték; és

g) Az átlagos hajtóművet a következők szerint kell meghatározni: A hitelesítési feltételeket teljesítő, a repülőgép berepülési vizsgálatai alatt a hitelesítésig és a hitelesítés alatt használt összes hajtómű átlaga, ha azokat a repülési kézikönyvben megadott korlátozások és eljárások betartásával üzemeltették. Ez egy technológiai szabvány értékrendet fog felállítani, beleértve a tolóerő/teljesítmény és a vezérlési paraméterek közötti viszonyokat (például N1, vagy EPR). Az alkalmassági vizsgálatok során végzett zajméréseket e szabványhoz kell korrigálni.

Megjegyzés. - Az alkalmazott felszálló teljesítmény/tolóerő a szokványos üzemelés esetén rendelkezésre álló azon maximum legyen, amelyet a repülőgép repülési Kézikönyvének teljesítményjellemzők részében a 3.6.1.5-ben megadott referencia légköri viszonyokra vezettek be.

3.6.3 Megközelítési referencia eljárás

A megközelítési referencia repülés pályáját a következők szerint kell kiszámítani:

a) A repülőgépet stabilizálni kell és 3^{o}-os siklópályán kell tartani;

b) A mérőpont felett állandósult V_{Ref} + 19 km/h (minimum V_{Ref} + 10 csomó) sebességet állandó tolóerő, vagy teljesítmény beállítást kell tartani;

Megjegyzés. - Légi-alkalmassági fogalmak szerint V_{Ref} a "referencia leszálló sebesség." E meghatározás értelmében a referencia leszálló sebesség "a repülőgép sebességét jelenti egy meghatározott leszálló konfigurációban és azon ponton keresztül süllyedés pillanatában, amely pont a meghatározások szerinti manuálisan végzett leszállás leszálló úthosszához tartozó leszállás kezdő magasságának felel meg."

c) A megközelítési referencia eljárás során végig a légi-alkalmasági vizsgálatok folyamán alkalmazott állandó megközelítési konfigurációt kell használni, de kibocsátott futóművekkel;

d) Földet éréskor a repülőgép tömege a 3.6.3.1 c)-ben meghatározott megközelítési konfigurációban engedélyezett maximum leszálló tömeg érték legyen, amelyre a zaj hitelesítést kérelmezték; és

e) Azt a tömeget kell alkalmazni, amelyre a zajminősítési bizonyítvány kiadását kérik és a legkritikusabb (azaz a legmagasabb zajszintet okozó) konfigurációt kell használni az aerodinamikai kormányfelületek szokványos alkalmazásával, beleértve a felhajtó erőt és a légellenállást előidéző eszközöket is. A konfiguráció magában foglalja a 2. Függelék 5.2.5 pontjában felsorolt összes olyan eszközt, amely a szokványos üzemelés során a maximum leszálló súlyhoz tartozóan a legzajosabb folyamatos állapot előidézéséhez hozzájárulnak.

3.7 Vizsgálati eljárások

3.7.1 A vizsgálati eljárásoknak, az alkalmassági bizonyítványt kiadó állam légi-alkalmassági és zajminősítési bizonyítványt kiállító hatóságai által elfogadhatónak kell lenniük.

3.7.2 A vizsgálati eljárásokat és a zajszint méréseket, olyan jóváhagyott módon kell végrehajtani és kiértékelni, hogy a 2. Függelékben leírtaknak megfelelően, a zaj Ténylegesen Észlelt Zaj-szintnek nevezett EPNdB egységben mért értékét kapják eredményül.

3.7.3 Az akusztikai adatokat a 2. Függelékben körvonalazott módszerekkel kell az ebben a Fejezetben meghatározott referencia feltételekre pontosítani. A sebességek és a tolóerő korrigálását a 2. Függelék 9. Részében leírtak szerint kell elvégezni.

3.7.4 Ha a tömeg a vizsgálat során különbözik attól a tömegtől, amelyre a zajminősítési bizonyítványt kérik, akkor a szükséges EPNdB korrekció a felszállások esetében a 2 EPNdB és a megközelítések esetében 1 EPNdB értéket nem haladhatja meg. A bizonyítványt kiadó hatóságok által jóváhagyott adatokat kell felhasználni az EPNL értékek tömeggel összefüggő változásainak meghatározásához, mind a felszállás, mind a megközelítés feltételeire. Hasonló módon, a megközelítési repülési pálya referencia repülési pályától való eltérésének szükséges EPNL korrekciója a 2 EPNdB értéket nem haladhatja meg.

3.7.5 A megközelítési feltételekre a vizsgálati eljárás akkor fogadható el, ha a repülőgép 3^{o} ($\pm 0{,}5^{o}$-os állandósult siklópályát követ.

3.7.6 Ha a referencia vizsgálattól eltérő egyenértékű vizsgálati eljárásokat alkalmaznak, akkor a vizsgálati eljárásokat és az eredmények referencia eljárásra történő átszámításának minden módszerét a bizonyítványt kiállító hatóságnak jóvá kell hagynia. A korrekció összege nem haladhatja meg felszállásnál a 16 EPNdB értéket, megközelítésnél a 8 EPNdB értéket és, ha a korrekció (az előző sorrendnek megfelelően) több, mint 8, vagy 4 EPNdB, akkor az eredményül kapott számok a 3.4 pontban meghatározott határzaj szinteket 2 EPNdB-nél jobban ne közelítsék meg.

Megjegyzés. - Az ekvivalens eljárásokat és használatukat az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft - Doc 9501" tartalmazza. (Légijárművek zajminősítésének megállapításánál használatos eljárásokra vonatkozó környezeti műszaki kézikönyv).

3.7.7 Felszállási, oldalsó és megközelítési feltételek esetében a repülőgép jelzett műszersebességének pillanatnyi változásait a 10 dB-es lefutási pontok közötti átlagos műszersebesség ±3 százalékán belül kell tartani. Ennek meghatározását a pilóta sebességmérője alapján kell végezni. Azonban, ha a 10dB-es lefutási pontok között a pillanatnyi jelzett műszersebesség átlagos műszersebességhez viszonyított változása ±5,5km/h-nál (±3kt) több, és a hitelesítő hatóság fedélzeten tartózkodó képviselője megítélése szerint ez a légköri turbulenciának tudható be, az ilyen módon befolyásolt repülés nem vehető figyelembe zajminősítési célokra.

4. FEJEZET

1. - HANGSEBESSÉGNÉL LASSABB GÁZTURBINÁS REPÜLŐGÉPEK - 2006. január 1. előtt elfogadott prototípus légialkalmassági bizonyítvány iránti kérelmek.

2. - 8618 KG-NÁL NEHEZEBB LÉGCSAVAR HAJTÁSÚ REPÜLŐGÉPEK - 2006. január 1.-én, vagy utána elfogadott prototípus légialkalmassági bizonyítvány iránti kérelmek.

4.1 Alkalmazási Követelmények

1. Megjegyzés. - Lásd az 1. Fejezet 1.9 pontját is.

4.1.1 Jelen fejezet szabványai az alábbiakra alkalmazandók:

a) Minden hangsebességnél lassabb gázturbina sugárhajtású repülőgépre és azok módosított változataira (kivéve azokat, amelyek 610 m, vagy rövidebb futópályát[1] igényelnek a légi-alkalmasságuk szerinti engedélyezett maximum tömeg mellett), amelyek prototípusára vonatkozó légi-alkalmassági vizsga kérelmet az engedélyező hatóság 2006. Január 1-én, vagy ezután fogadta el, vagy alkalmazott egyenértékű egyéb előírt eljárást;

b) 8618 kg engedélyezett maximum felszálló tömeget meghaladó minden légcsavar hajtású repülőgépekre és azok módosított változataira, amelyek esetében a prototípusra vonatkozó légi-alkalmassági vizsga kérelmet az engedélyező hatóság, 2006. január 1-én, vagy ez után fogadta el, vagy alkalmazott egyenértékű egyéb eljárást; és

c) A korábban a 16. Annex I. Kötet, 3. Fejezetét, vagy 5. Fejezetét teljesítőként minősített minden hangsebességnél lassabb sugárhajtóműves- és minden légcsavarhajtású repülőgépre, amelyek esetében a 4. Fejezet szerinti újraminősítést kérelmezik.

Megjegyzés. - Az újraminősítés alkalmazására vonatkozó anyag az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft - Doc 9501" tartalmazza. (Légijárművek zajminősítésének megállapításánál használatos eljárásokra vonatkozó környezeti műszaki kézikönyv).

4.1.2 A 4.1.1-től eltekintve, a szerződő állam elfogadhatja, hogy a lajtromában álló sugárhajtású és a légcsavar hajtású nehéz repülőgépek részéről az alábbi körülmények között nem szükséges bemutatni a 16. Annex, I. Kötetének előírásaival való egyezést:

a) kibocsátott futóval végzett repülés egy, vagy több behúzható futószár kinti helyzetben a teljes repülés alatt;

b) a repülőgépen külső felfüggesztéssel szállított tartalék hajtómű és gondola (és a pilon, vagy egyéb külső felfüggesztő elem visszaszállítása); és

c) időben behatárolt hajtómű és/vagy gondola változtatás, amikor a típus kialakításban végzett változtatás előírja, hogy a repülőgép 90 napnál hosszabb tartamban nem üzemeltethető, kivéve, ha bemutatott, miszerint a típus kialakítás adott változtatása mellett is teljesülnek a 16. Annex, I. Kötetének előírásai. Ez csakis az előírt karbantartó tevékenységekből fakadó változtatásokra érvényes.

[1] Végbiztonsági sáv, vagy akadálymentes sáv nélkül.

4.2 Zajmérések

4.2.1 Zaj értékelési mérőszám

A zajértékelési mérőszám a 2. Függelékben ismertetett, EPNdB-ben mért ténylegesen észlelt zajszint legyen.

4.3 Referencia zajmérő pontok

4.3.1 Az e szabványokkal összhangban vizsgált repülőgép zaja nem haladhatja meg a 4.4 pontban ismertetett zajszinteket a 3. Fejezet 3.3.1 a), b) és c)-ben előírt pontoknál.

4.3.2 Vizsgálati zajmérő pontok

A vizsgálati zajmérő pontokra a 3. Fejezet 3.3.2 pontjának rendelkezései alkalmazandók.

4.4 Maximum zajszintek

4.4.1 A megengedett legnagyobb zajszinteket a 3. Fejezet 3.4.1.1, 3.4.1.2 és 3.4.1.3 pontok határozzák meg és ezek egyik mérőpontnál sem léphetők túl.

4.4.1.1 A 3. Fejezet 3.4.1.1, 3.4.1.2 és 3.4.1.3-ban meghatározott megengedett legnagyobb zajszintek valamint a három mérőpontnál mért maximum zajszintek összegének különbsége 10 EPNdB-nél nem lehet kevesebb.

4.4.1.2 Bármely két mérőpont esetében a 3. Fejezet 3.4.1.1, 3.4.1.2 és 3.4.1.3-ban meghatározott megengedett megfelelő legnagyobb zajszintek, illetve a mért maximum zajszintek összegének különbsége 2 EPNdB-nél nem lehet kevesebb.

4.5 Zajminősítési referencia eljárások

Zajminősítési referencia eljárás a 3. Fejezet 3.6 pontjában meghatározottak szerinti legyen.

4.6 Vizsgálati eljárások

A vizsgálati eljárás a 3. Fejezet 3.7 pontjában meghatározottak szerinti legyen.

4.7 Újraminősítés

A 4.1 c)-ben meghatározott repülőgépek esetében az újraminősítés megadása azon az alapon történjen, hogy a 4. Fejezettel való egyezés megállapításához alkalmazott tényállás legalább annyira kielégítő, mint a 4.1 a) és b)-ben meghatározott repülőgéppel kapcsolatos tényállás.

5. FEJEZET
5700 KG-NÁL NEHEZEBB LÉGCSAVARHAJTÁSÚ REPÜLŐGÉPEK - 1985. JANUÁR 1. ELŐTT ELFOGADOTT PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNY IRÁNTI KÉRELMEK.

5.1 Alkalmazási Követelmények

1. Megjegyzés. - Lásd az 1. fejezet 1.9 pontját.

2. Megjegyzés. - Eme alkalmazási követelmények ételmezésére vonatkozó útmutató anyagot lásd az "E" Mellékletben.

5.1.1 Az alábbiakban ismertetett szabványok nem vonatkoznak:

a) Olyan repülőgépekre, amelyeknek a légi-alkalmasságuk szerinti engedélyezett maximum tömege mellett 610 m, vagy annál rövidebb futópályára[1] van szükségük;

b) Kifejezetten tűzoltásra tervezett repülőgépekre;

c) A kimondottan mezőgazdasági célokra tervezett repülőgépekre;

d) Repülőgépekre, amelyekre a 6. Fejezet szabványai alkalmazandók; és

e) Repülőgépekre, amelyekre a 10. Fejezet szabványai alkalmazandók.

5.1.2 A jelen Fejezet szabványai alkalmazandók az 5700 kg feletti engedélyezett maximum felszálló tömegű minden légcsavar hajtású repülőgépre, beleértve ezek módosított változatait is, amelyek prototípus légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiadó hatóság 1977. október 6-án, vagy utánna, és 1985. január 1. előtt fogadta el, vagy alkalmazott egyenértékű egyéb előírt eljárást.

5.1.3 A 2. Fejezet szabványai, a 2.1 és a 2.4.2 pontok kivételével alkalmazandók az 5700 kg engedélyezett maximum felszálló tömeget meghaladó egyes repülőgépekre és módosított változataikra, amelyekre a 6. Fejezet szabványai nem vonatkoznak és amelyek prototípusának légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiadó hatóság 1977. október 6. előtt fogadta el, vagy alkalmazott egyenértékű egyéb előírt eljárást és, amelyre az egyedi repülőgép légi-alkalmassági bizonyítványát, 1981. November 26-án, vagy ez után adták ki.

5.1.4 A 3. Fejezet szabványai, a 3.1 kivételével, alkalmazandók az 5700 kg feletti maximum felszálló tömegű minden légcsavarhajtású repülőgépre, beleértve a módosított változatokat is, amelyek prototípusának légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiadó hatóság 1985. január 1-én, vagy ezután fogadta el, vagy alkalmazott egyenértékű egyéb előírt eljárást.

Megjegyzés. - A 2. és 3. Fejezet szabványai -bár- korábban hangsebesség alatti gázturbina sugárhajtású repülőgépekre lettek kidolgozva, mégis megfelelőnek tekinthetők más repülőgép típusokra való alkalmazásra is, függetlenül a meghajtás fajtájától.

5.1.5 A 5.1.2-től az 5.1.4 -ig leírtaktól eltekintve, a szerződő állam elfogadhatja, hogy a lajtromában álló sugárhajtású- és a légcsavar hajtású nehéz repülőgépek részéről az alábbi körülmények között nem szükséges bemutatni a 16. Annex, I. Kötetével való egyezést:

a) kibocsátott futóval végzett repülés egy, vagy több behúzható futószár kinti helyzetben a teljes repülés alatt;

b) a repülőgépen külső felfüggesztéssel szállított tartalék hajtómű és gondola (és a pilon, vagy egyéb külső felfüggesztő elem visszaszállítása); és

c) időben behatárolt hajtómű és/vagy gondola változtatás, amikor a típus kialakításban végzett változtatás előírja, hogy a repülőgép 90 napnál hosszabb tartamban nem üzemeltethető, kivéve, ha bemutatott, miszerint a típus kialakítás adott változtatása mellett is teljesülnek a 16. Annex, I. Kötetének előírásai. Ez csakis az előírt karbantartó tevékenységekből fakadó változtatásokra érvényes.

[1] Végbiztonsági sáv, vagy akadálymentes sáv nélkül.

5.2 Zajmérések

5.2.1 A zajértékelési mérőszám

A zajértékelési mérőszám az EPNdB-ben kifejezett effektív érzékelt zajszint legyen, ahogyan azt a 2. Függelék ismerteti.

5.3 Zajmérő Pontok

5.3.1 Referencia Zajmérő Pontok

A jelen szabványoknak megfelelően vizsgált repülőgép nem lépheti túl az 5.4 pontban előírt zajszinteket a következő pontoknál:

a) *Oldalsó referencia zajmérő pont*: a futópálya középvonalával, vagy a futópálya meghosszabbított középvonalával párhuzamos és attól 450 m oldaltávolságú egyenesen lévő pont, amelynél a felszállás során a zajszint a legnagyobb;

b) *átrepülési (flyover) referencia zajmérő pont*: A futópálya meghosszabbított középvonalán a felszálláshoz való nekifutás kezdetétől 6,5 km távolságban lévő pont;

c) *Megközelítési referencia zajmérő pont:* a futópálya meghosszabbított középvonalán a küszöbtől 2000 m távolságban a föld felületén lévő pont. Vízszintes terep esetén ez megfelel a küszöbön belül 300 m távolságban eredő 3^{o}-os siklópálya alatt függőleges irányban 120 m-re (395 láb) található pontnak.

5.3.2 Vizsgálati zajmérő pontok

5.3.2.1 Ha a vizsgálati zajmérő pontok nem a referencia zajmérő pontoknál helyezkednek el, akkor az eltérő helyzetekre a korrekciót ugyanúgy kell alkalmazni, mint a vizsgálati és a referencia repülési pályák közötti eltérések esetén.

5.3.2.2 Megfelelő számú oldalsó vizsgálati zajmérő pontot kell alkalmazni, hogy a bizonyítványt kiadó hatóság számára bizonyított legyen, miszerint a megfelelő oldalvonalon a maximális zajszintet minden kétséget kizáróan megállapították. Egy zajmérő pont viszonylatában egyidejű mérést kell végezni a pálya másik oldalán szimmetrikusan elhelyezett másik zajmérő pontnál.

5.3.2.3 A kérelmezőnek be kell mutatnia a bizonyítványt kiadó hatóság számára, hogy a repülési vizsgálatok során az oldalsó és az átrepülési (flyover) zajszinteket egymás kárára nem optimalizálták külön-külön.

5.4 Maximum Zajszintek

A 2. Függelékben ismertetett zajértékelési módszernek megfelelően megállapított maximum zajszintek nem haladhatják meg a következő értékeket:

a) *Az oldalsó referencia zajmérő pontnál:* a repülőgép bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömegére fel egészen 34000 kg-ig 96 EPNdB állandó határérték. E ponttól a repülőgép tömeg logaritmusával lineárisan 2 EPNdB per kétszeres tömegmértékkel 103 EPNdB határértékig emelkedik, ami után a határérték állandó;

b) *Az átrepülési (flyover) referencia zajmérő pontnál*: a repülőgép bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömegére fel egészen 34000 kg-ig 89EPNdB állandó határérték. Ettől a ponttól a repülőgép tömeg logaritmusával lineárisan, 5 EPNdB per kétszeres tömegmértékkel 106 EPNdB határértékig emelkedik, ami után a határérték állandó;

c) *A megközelítési referencia zajmérő pontnál*: a repülőgép bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömegére fel egészen 34000 kg-ig 98 EPNdB állandó határérték. Ettől a ponttól a repülőgép tömeg logaritmusával lineárisan 2 EPNdB per kétszeres tömegmértékkel 105 EPNdB határértékig emelkedik, ami után a határérték állandó.

Megjegyzés. - A zajszintek felszálló tömeg függvényében történő kiszámítására vonatkozó egyenletek tekintetében lásd az "A" Mellékletet.

5.5 Engedmények

Ha a maximum zajszintet egy, vagy két mérőpontnál túllépik:

a) A túllépések összértéke nem lehet több, mint 3 EPNdB;

b) A túllépés egy adott pontnál nem lehet több, mint 2 EPNdB; és

c) A túllépést a másik pontnál, vagy pontoknál mért azonos csökkenésnek kell kiegyensúlyoznia.

5.6 Zaj Vizsgálati Referencia Eljárások

5.6.1 Általános feltételek

5.6.1.1 A referencia eljárások feleljenek meg az érvényes légi-alkalmassági követelményeknek.

5.6.1.2 A referencia eljárások és a repülési pályák számításait a bizonyítványt kiadó hatóságnak jóvá kell hagynia.

5.6.1.3 Az 5.6.1.4 pontban leírt feltételek kivételével a felszállási és megközelítési referencia eljárásoknak meg kell egyezniük az 5.6.2 és 5.6.3 - amelyik megfelelő - pontokban ismertetettekkel.

5.6.1.4 Ha a kérelmező bemutatja, hogy a repülőgép tervezési jellemzői kizárják a repülés 5.6.2 és 5.6.3 pontban előírtak szerinti végrehajtását, akkor a referencia eljárások:

a) Az 5.6.2 és 5.6.3 pontban előírtaktól csak olyan mértékben térhetnek el, ahogyan azt az eljárások végrehajtását lehetetlenné tévő tervezési jellemzők megkövetelik; és

b) A bizonyítványt kiadó hatóság által jóváhagyottak legyenek.

5.6.1.5 A referencia eljárásokat a következő referencia légköri feltételeknek megfelelően kell kiszámítani:

a) Tengerszinti légnyomás 1013,25 hPa;.

b) Környezeti levegő hőmérséklet 25^{o} C, azaz NEL + 10^{o} C kivéve, hogy a bizonyítványt kiadó hatóság döntésétől függően alternatív referencia környezeti hőmérsékletként a 15^{o} C, azaz NEL is alkalmazható;

c) Relatív páratartalom 70 százalék; és

d) Szélcsend.

5.6.2 Felszállási referencia eljárás

A felszállási repülési pályát a következők szerint kell kiszámítani:

a) Átlagos felszálló teljesítményt kell alkalmazni a felszállás kezdetétől addig a pontik, amíg a futópálya szintje felett legalább az alábbiakban jelzett magassgot el nem érik. Az alkalmazott felszálló teljesítmény, a repülőgép repülési kézikönyvének teljesítményjellemzők részében az 5.6.1.5-ben megadott referencia légköri viszonyokra bevezetett szokványos üzemeltetés esetén rendelkezésre álló maximum legyen.

1) Kettő, vagy kevesebb hajtóművel rendelkező repülőgépek - 300 m (985 láb);

2) Három hajtóművel rendelkező repülőgépek - 260 m (855 láb);

3) Négy, vagy több hajtóművel rendelkező repülőgépek - 210 m (690 láb);

b) A fenti a) pontban előírt magasság elérésétől kezdve a teljesítmény nem csökkenthető az alábbiakhoz szükséges érték alá:

1) 4 százalékos emelkedési gradiens tartása; vagy

2) Több hajtóműves repülőgépek esetén szintrepülés tartása miközben egy hajtómű nem működik;

Amely teljesítmény érték a magasabb;

c) A sebesség a kérelmező által a szokványos üzemre kiválasztott minden hajtómű működése esetén alkalmazandó felszálló emelkedési sebesség legyen, ami azonban legalább, V_2 + 19 km/h (V2 + 10 kt) és amely sebességet az elemelkedés után a lehető leghamarabb el kell érni, továbbá mindvégig tartani kell a felszállási zaj minősítési vizsgálat során;

d) A kérelmező által kiválasztott állandó felszálló konfigurációt kell tartani mindvégig, a fel szállási referencia eljárás során, kivéve, hogy a futómű behúzható; és
e) A repülőgép tömege a fékoldás pillanatában legyen egyenlő a zaj minősítési vizsgálat kérelemben megadott maximum felszálló tömeggel.

5.6.3 Megközelítési referencia eljárás

A megközelítési referencia repülési pályát a következők szerint kell kiszámítani:

a) A repülőgépnek stabilizált helyzetben kell lennie és 3 fokos siklópályát követnie kell;

b) A megközelítést a megközelítés során és a mérőpont felett 1,3 Vs + 19 km/h (1,3 Vs + 10 kt)-nál nem kisebb állandósult levegőhöz viszonyított sebességet tartva és állandósult teljesítménnyel kell végrehajtani és a megközelítést rendes földet érésig kell folytatni;

c) a megközelítési referencia eljárás során mindvégig, a légi-alkalmassági bizonyítvány kiadásához használt állandó megközelítési konfigurációt, kiengedett futóművekkel kell alkalmazni;

d) A földetéréskor a repülőgép tömege az 5.6.3 c) pontban meghatározott megközelítési konfiguráció által megengedett maximum leszállótömeg legyen, amelyre a zaj minősítést kérik; és

e) A zaj minősítési kérelemben szereplő tömehez legkritikusabb (a legnagyobb zajszintet létrehozó) konfigurációt kell alkalmazni.

5.7 Vizsgálati Eljárások

5.7.1 A vizsgálati eljárások legyenek elfogadhatók a bizonyítványt kiadó állam légi-alkalmassági és zaj bizonyítványt kiadó hatóságai számára.

5.7.2 A vizsgálati eljárást és a zajmérést jóváhagyott módszerekkel kell végrehajtani és feldolgozni, hogy az az EPNdB mértékegységben kifejzett ténylegesen érzékelt zajszintnek (EPNL) nevezett zajértékelési mérőszámot adja a 2. Függelékben leírtak szerint.

5.7.3 Az akusztikai adatokat a 2. Függelékben leírt módszerekkel kell módosítani a jelen Fejezetben előírt referencia körülményekre. A sebességre és teljesítményre vonatkozó módosításokat a 2. Függelék 9. pontjában előírtak szerint kell elvégezni.

5.7.4 Ha a tömeg a vizsgálat során eltér a zaj bizonyítványt kérelemben szereplőtől, akkor a szükséges EPNL módosítás felszállásnál 2 EPNdB-t és leszállások esetén 1 EPNdB-t nem haladhatja meg. Mind a felszállási, mind pedig a leszállási körülményekre az EPNL tömeg szerinti változásainak megállapításához a bizonyítványt kiadó hatóság által jóváhagyott adatokat kell használni. Hasonlóképp, a megközelítési repülési pályának a referencia repülési pályától való eltérése miatti EPNL korrekciók értéke 2 EPNdB-nél több nem lehet.

5.7.5 A megközelítési helyzetre a vizsgálati eljárás elfogadható, ha a légijármű állandósult 3 fok ± 0,5 fokos siklópályát követ.

5.7.6 Ha a referencia eljárástól eltérő egyenértékű vizsgálati eljárást alkalmaznak, ezt az eljárást, valamint az eredménynek a referencia eljárásra való minden helyesbítési eljárását is a bizonyítványt kiállító hatóságnak jóvá kell hagynia. A helyesbítések mértéke a felszállások vizsgálatában 16 EPNdB-nél és a megközelítések vizsgálatában 8 EPNdB-nél több nem lehet és, ha a korrekció - sorrend szerint - több mint 8 EPNdB, illetve 4 EPNdB, akkor az eredményként kapott számok nem lehetnek az 5.4 pontban előírt határ zajszintekhez 2 EPNdB-nél közelebb.

Megjegyzés. - Az egyenértékű eljárások használatára vonatkozó útmutató anyag az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501) kiadványban található.

6. FEJEZET
8618 KG, VAGY KÖNNYEBB LÉGCSAVARHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNYA IRÁNT 1988. NOVEMBER 17. ELŐTT ELFOGADOTT KÉRELMEK

6.1 Alkalmazási követelmények

1. Megjegyzés. - Lásd az 1. Fejezet 1.9 pontját is.

2. Megjegyzés. - Eme alkalmazási rendelkezések értelmezésére vonatkozó tájékoztató anyagot, lásd az "E" Mellékletben.

A kimondottan műrepülési célra, illetve mezőgazdasági, vagy tűzoltó feladatokra tervezett repülőgépek kivételével, a jelen Fejezetben található szabványok alkalmazandók a 8618 kg-tól nem nagyobb engedélyezett maximum felszálló tömegű minden olyan légcsavarhajtású repülőgépre, amelyre:

a) A prototípus légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiadó hatóság 1975. január 1-én, vagy ezután és 1988. November 17. előtt fogadta el, vagy alkalmazott egyenértékű egyéb eljárást, kivéve azon módosított változatok esetét, amelyekre a légi-alkalmassági bizonyítvány kérelmet a bizonyítványt kiadó hatóság 1988. november 17-én, vagy azt követően fogadta el, vagy alkalmazott egyenértékű egyéb eljárást, amely esetben a 10. Fejezet szabványai alkalmazandók; vagy

b) Az egyedi légijármű légi-alkalmassági bizonyítványt 1980. január 1-én, vagy azt követően adták ki.

6.2 Zajértékelési mérőszám

A zajértékelési mérőszám a Nemzetközi Elektrotechnikai Bizottság (IEC -International Electrotechnical Commission) 179[1] számú kiadványában meghatározottak szerinti súlyozott teljes hangnyomás szint legyen. A hangnyomás minden egyes szinuszos komponensére alkalmazott súlyozást a frekvencia függvényében kell megadni az "A" jelű szabvány referenciagörbe segítségével.

6.3 Maximum zajszintek

A 6.1 a) és a 6.1 b) pontban meghatározott repülőgépek esetében a 3. Függelékben leírt zajértékelési eljárással megállapított maximum zajszintek nem haladhatják meg a következő értékeket:

- Fel, egészen 600 kg repülőgép tömegig 68 dB(A) állandó határérték, amely e ponttól 1500 kg-ig a tömeggel egyenes arányban változik, ami után fel, egészen 8618 kg-ig a határ állandó 80 dB(A).

Megjegyzés. - Ha a repülőgépre a 10. Fejezet 10.1.2 pont előírásai vonatkoznak, akkor 80 dB(A) határ alkalmazandó 8618 kg-ig bezárólag.

6.4 Zajminősítési referencia eljárások

A referencia eljárásokat a következő referencia légköri viszonyokra kell kiszámítani:
a) Tengerszinti légnyomás 1013,25 hPa;

b) Környezeti hőmérséklet 25^{o} C, azaz NEL + 10^{o} C.

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[1] A módosításokkal együtt. Beszerezhető: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

6.5 Vizsgálati eljárások

6.5.1 Vagy a 6.5.2 és 6.5.3 pontokban előírt, vagy a bizonyítványt kiadó hatóság által jóváhagyott egyenértékes eljárásokat kell alkalmazni.

6.5.2 A 6.3.1 pontban előírt maximum zajszintnek való megfelelés bemutatása céljából szintrepülés sorozatot kell végrehajtani az alábbi, a zajmérő állomás feletti magasságon:

$$300^{+10}_{-30}\ \text{m}\ (985^{+30}_{-100}\ \text{ft})$$

A repülőgépnek a zajmérő pont fölött a függőlegestől mért ± 10 fokon belül kell átrepülnie.

6.5.3 Az átrepülést a szabályos üzemi felső határérték teljesítménnyel2[2], állandósult levegőhöz viszonyított sebességgel és utazó konfigurációban lévő repülőgéppel kell végrehajtani.

Megjegyzés. - Az egyenértékű eljárások használatára vonatkozó útmutató anyag az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" kiadványban található.

7. FEJEZET
LÉGCSAVARHAJTÁSÚ STOL REPÜLŐGÉPEK

Megjegyzés. - Az e Fejezetbe tartozó szabványokat és ajánlott eljárásokat még nem dolgozták ki. Addig is, a B. Függelékben megadott útmutató anyag alkalmazható azon légcsavarhajtású STOL repülőgépek zaj minősítésének megállapítására, amelyek számára az egyedi repülőgép légialkalmassági bozonyítványt először, 1976. január 1-én, vagy azt követően adták ki.

8. FEJEZET
HELIKOPTEREK

8.1 Alkalmazási rendelkezések

Megjegyzés. - Lásd az 1. Fejezet 1.9 pontját is.

8.1.1 A kizárólagosan mezőgazdasági, tűzoltási, vagy külsőleg függesztett teherszállítási célra tervezettek kivételével, a jelen Fejezet szabványai alkalmazandók minden olyan helikopterre, amelyre a 8.1.2, 8.1.3 és a 8.1.4 alkalmazandó.

8.1.2 Kivéve a 8.1.4-ben meghatározott helikoptereket, a 8.4.1 zajszintjei alkalmazandók azon helikopterekre, amelyekre a prototípus légi-alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 1985. január 1-én, vagy azt követően fogadta el, vagy alkalmazott egyenértékű egyéb előírt eljárást.

8.1.3 Kivéve a 8.1.4-ben meghatározott helikoptereket, a 8.4.1 zajszintjei alkalmazandók azon helikopterek

[2] Ezt rendszerint a repülőgép repülési kézikönyvében és a repülési műszereken feltüntetik.

továbbfejlesztett változataira, amelyekre a típus terv módosítása iránti kérelmet a bizonyítványt kiadó hatóság 1988. november 17-én, vagy azt követően fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást.

8.1.4 Minden olyan helikopterre, beleértve továbbfejlesztett változataikat is a 8.4.2 zajszintjei alkalmazandók, amelyekre a prototípus légi alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 2002. március 21-én, vagy azt követően fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást.

8.1.5 A külső teher, vagy berendezés hordozására alkalmas helikopterek minősítését ilyen terhek, vagy berendezések nélkül kell végrehajtani.

Megjegyzés. - Kivétel alkalmazható a belső rakománnyal a szabványokat teljesítő, de külső rakományt, vagy berendezést szállító helikopter esetében, ha az ilyen üzemelés össz. tömege, vagy egyéb működési paramétere meghaladja a belső teherszállítás esetére megállapított légi-alkalmassági értékeket.

8.1.6 Ha a helikopter engedélyezett maximum felszálló tömege 3175 kg, vagy kevesebb, a 8.1.1 pont szerinti kérelmező alternatívaképp választhatja, hogy a 8. Fejezet helyett a 11. Fejezettel való egyezést mutatja be.

8.2 Zajértékelési mérőszám

A zajértékelés mérőszáma a 2. Függelékben leírtak szerinti, EPNdB-ben kifejezett Ténylegesen Érzékelt Zajszint legyen.

8.3 Referencia zajmérő pontok

A jelen szabványokkal összhangban vizsgált helikopter zaja nem haladhatja meg a 8.4 pontban előírt zajszinteket a következő pontoknál:

a) *Felszállási referencia zajmérő pontok:*

1) egy, a felszállási referencia eljárásban (lásd 8.6.2) meghatározott repülési pálya alatt függőlegesen a talajon és a referencia eljárásban az emelkedő repülés megkezdésére történő átmenet megkezdésének pontjától elfelé repülés irányában vízszintesen 500 m-re elhelyezkedő repülési pálya referencia pont;

2) a felszállási referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150 -150 m-re elhelyezett két további pont.

b) *Átrepülési (overflight) referencia zajmérő pontok*

1) egy, a föld felületén az átrepülési referencia eljárásban előírt repülési pálya (lásd 8.6.3.1 pont) alatt függőlegesen 150 m-re (492 láb) elhelyezkedő repülési pálya referencia pont;

2) az átrepülési referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150 -150 m-re elhelyezett két további pont.

c) *Megközelítési referencia zajmérő pontok*

1) Egy, a megközelítési referencia eljárásban (lásd a 8.6.4 pontot) előírt repülési pálya alatt függőlegesen 120 m-re (394 láb) a föld felületén elhelyezkedő repülési pálya referencia pont. Vízszintes terepen ez a 6 fokos megközelítési pálya és a terepsík metszéspontjától 1140 m-re lévő pontnak felel meg.

2) a megközelítési referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150 -150 m-re elhelyezett két további pont.

Megjegyzés.- lásd a H Mellékletet (Helikopter zaj adatok beszerzése földterület hasznosítási célra), amely a földterület hasznosítás tervezésre (LUP) elfogadható kiegészítő adattal kapcsolatos eljárást írja le.

8.4 Maximum zajszintek

8.4.1 A 8.1.2 és a 8.13 pontban meghatározott helikopterek esetében a 2. Függelékben ismertetett zajértékelő módszerrel megállapított maximum zajszintek nem haladhatják meg a következőket:

8.4.1.1 *A felszállási repülési pálya referencia pontnál*: 109 EPNdB, ha a helikopter zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 89 EPNdB-ig, ami után a határérték állandó.

8.4.1.2 *Az átrepülési pálya referencia pontnál:* 108 EPNdB, ha a helikopter zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 88 EPNdB-ig, ami után a határérték állandó.

8.4.1.3 *A megközelítési repülési pálya referencia pontnál*: 110 EPNdB, ha a helikopter a zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 90 EPNdB-ig, ami után a határérték állandó.

Megjegyzés. - A zajszint felszálló tömeg változás függvényében történő kiszámításának egyenleteit lásd az "A" Mellékletben.

8.4.2 A 8.1.4 pontban meghatározott helikopterek esetében a 2. Függelékben ismertetett zajértékelő módszerrel megállapított maximum zajszintek nem haladhatják meg a következőket:

8.4.2.1 *A felszállási repülési pálya referencia pontnál:* 106 EPNdB, ha a helikopter a zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával, 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 86 EPNdB-ig, ami után a határérték állandó.

8.4.2.2 *Az átrepülési pálya referencia pontnál:* 104 EPNdB, ha a helikopter a zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával, 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 84 EPNdB-ig, ami után a határérték állandó.

8.4.2.3 *A megközelítési repülési pálya referencia pontnál:* 109 EPNdB, ha a helikopter a zajminősítési bizonyítvány kérelmében szereplő engedélyezett maximum felszálló tömege 80000 kg, vagy nagyobb és ez az érték a helikopter tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 89 EPNdB-ig, ami után a határérték állandó.

8.5 Engedmények

8.5.1 Ha a zajszint határértékeket egy, vagy két pontnál túllépik:

a) A túllépések összege nem haladhatja meg a 4 EPNdB-t;

b) Az adott pontra vonatkozó túllépés egyik pont esetében sem lehet 3 EPNdB-nél nagyobb; és

c) A túllépést a másik ponton, vagy pontokon mért megfelelő csökkenésnek kell kiegyensúlyoznia.

8.6 Zaj minősítési referencia eljárások

8.6.1 Általános feltételek

8.6.1.1 A referencia eljárások tegyenek eleget az érvényes légi-alkalmassági követelményeknek.

8.6.1.2 A referencia eljárásokat és repülési pályákat a bizonyítványt kiadó hatóságnak jóvá kell hagynia.

8.6.1.3 A 8.6.1.4 pontban leírt körülmények kivételével, a felszállási, átrepülési és megközelítési referencia eljárások a 8.6.2, 8.6.3, vagy 8.6.4 pontban leírtak legyenek.

8.6.1.4 Ha a kérelmező bizonyítja, hogy a helikopter tervezési jellegzetességei nem teszik lehetővé a 8.6.2, 8.6.3, vagy 8.6.4 pontban leírtak szerinti repülést, akkor a referencia eljárások:

a) Eltérhetnek a 8.6.2, 8.6.3, vagy a 8.6.4 pontban meghatározott referencia eljárásoktól, de csak olyan mértékig, ameddig a referencia eljárás végrehajtását lehetetlenné tévő tervezési jellegzetességek azt megkövetelik; és

b) Azokat a bizonyítványt kiadó hatóság jóvá hagyta.

8.6.1.5 A referencia eljárásokat a következő referencia légköri viszonyokra kell felállítani:

a) Tengerszinti légnyomás 1013,25 hPa;

b) Környezeti léghőmérséklet 25^{o} C, azaz NEL + 10^{o} C;

c) Relatív páratartalom 70 százalék;

d) Szélcsend.

8.6.1.6 A 8.6.2 c), 8.6.3.1 c) és 8.6.4 c) pontokban szereplő maximum normál üzemi fordulatszám legyen az adott referencia eljárásra a gyártó által előírt és a bizonyítványt kiadó hatóság által jóváhagyott légi-alkalmassági korlátozásokkal összhangban álló normál üzemi fordulatszám tartomány legnagyobb értéke. Ha a legnagyobb rotor fordulatszámot tűréssel tették közzé, akkor a maximum normál rotor fordulatszámot kell a legnagyobb rotor fordulatszámként venni, mint amelyre a tűrést közölték. Ha a repülési feltételekhez a rotor fordulatszám automatikusan kötődik, akkor az adott repülési feltételekhez tartozó maximum normál rotor fordulatszámot kell használni a zajminősítő eljárás alatt. Amennyiben a rotor fordulatszám pilóta beavatkozással változtatható, akkor a repülési kézikönyv korlátozások fejezetében a felkapcsolt erőhajtás körülményekre előírt legnagyobb normál üzemi rotor fordulatszámot kell a zajminősítő eljárás alatt alkalmazni.

8.6.2 Felszállási referencia eljárás

A felszállási referencia repülési eljárást a következők szerint kell kialakítani:

a) A helikoptert a következők szerint kell stabilizálni: a referencia környezeti feltételek között rendelkezésre álló felépített hajtómű(vek)-re vonatkozó előírt minimumnak, vagy az áttételház nyomaték határának megfelelő maximum felszálló teljesítménnyel - amelyik a kisebb, és a talajszint feletti 20 m (65 láb) magasságon a repülési pálya referencia pont előtt 500 m-el kezdődő pálya mentén;

b) a felszállási referencia eljárás során a legjobb emelkedési sebességhez tartozó Vy, sebesség, vagy a felszállás utáni emelkedésre jóváhagyott legalacsonyabb sebesség közül a nagyobbikat végig tartani kell;

c) A folyamatos emelkedést a felszállásra engedélyezett legnagyobb normál üzemi fordulatszámon stabilizált rotor sebesség mellett kell végezni;

d) A kérelmező által kiválasztott állandó felszálló konfigurációt kell alkalmazni végig a felszállási referencia eljárás során, miközben a futómű helyzete megfelel a legjobb emelkedési sebesség Vy megállapítására irányuló légi-alkalmassági teszt körülményekben alkalmazottakkal;

e) A helikopter tömege legyen egyenlő a zaj minősítési bizonyítvány kérelemben szereplő maximum felszálló tömeggel; és

f) A referencia felszálló pálya -definíció szerint- egy egyenes vonalú szakasz, amely a kezdőponttól (a központi mikrofonhely előtt 500 m-től és a föld felett 20 m-től (65 lábtól)) emelkedik olyan szögben, amelyet a legjobb emelkedési mérték (BRC - Best Rate of Climb) és az illető hajtómű széria leggyengébb hajtóművének teljesítményéhez tartozó Vy határoz meg.

8.6.3 Átrepülési referencia eljárás

8.6.3.1 Az átrepülési referencia eljárást a következők szerint kell kialakítani:

a) A helikoptert a repülési pálya referencia pont felett 150 m (492 láb) magasságban szintrepülésben kell stabilizálni;

b) Az átrepülési referencia eljárás során mindvégig a következők közül a legkisebb sebességet kell tartani: 0,9 V_H, vagy 0,9 V_{NE}, vagy 0,45 V_H+120 km/h (0,45 V_H+ 65 csomó), vagy 0,45 V_{NE}+120 km/h (0,45 V_{NE} + 65 csomó).

Megjegyzés. - Zaj minősítő vizsgálati célokra V_H az a szintrepülésre meghatározott sebesség, amelyet a felépítettek közül legkisebb teljesítményű hajtómű tengerszinti nyomáson (1013.25 hPa-n) és 25^o C-os környező levegőhőmérséklet mellett rendelkezésre álló maximum folyamatos teljesítményének megfelelő forgatónyomatékkal értek el. V_{NE} meghatározása a következő: a gyártó által kikötött és hitelesítő hatóság által jóváhagyott soha túl nem léphető légi-alkalmassági műszersebesség.

c) Az átrepülést a szintrepülésre engedélyezett maximum normál üzemi fordulatszámon stabilizált rotor fordulatszámmal kell végrehajtani;

d) A helikopternek utazó konfigurációban kell lennie; és

e) A helikopter tömege legyen egyenlő a zaj minősítési bizonyítvány kiadási kérelemben szereplő maximum felszálló tömeggel.

8.6.3.2 A zajminősítéshez alkalmazott V_H és/vagy V_{NE} értékeknek a jóváhagyott repülési kézikönyvben szerepelniük kell.

8.6.4 Megközelítési referencia eljárás

A megközelítési referencia eljárást a következők szerint kell kialakítani:

a) A helikopter legyen stabilizált és 6 fokos siklópályát kövessen;

b) A megközelítést a legjobb emelkedési sebességhez, Vy-hoz tartozó sebesség és a jóváhagyott legkisebb megközelítési sebesség közül a nagyobbikkal kell végrehajtani, a megközelítés során végig stabilizált teljesítménnyel, a zajmérő pont felett átrepülve és a normál földet érésig folytatott megközelítéssel;

c) A megközelítést a megközelítéshez engedélyezett maximum normál üzemi fordulatszámon stabilizált rotor sebességgel kell végrehajtani;

d) A légi-alkalmassági ellenőrzések során használt állandó megközelítési konfigurációt kiengedett futóművel kell tartani mindvégig a megközelítési referencia eljárás során; és

e) A helikopter tömege földet éréskor legyen egyenlő a zajminősítési bizonyítvány kérelemben szereplő maximum leszálló tömeggel

8.7 Vizsgálati eljárások

8.7.1 A vizsgálati eljárások legyenek elfogadhatók az állam légi-alkalmassági és zajminősítési bizonyítványt kiállító hatóságai számára.

8.7.2 A vizsgálati eljárásokat és a zajméréseket jóváhagyott módon kell végrehajtani és feldolgozni, hogy azok EPNdB értékben kifejezett Ténylegesen Érzékelt Zajszint, Zajértékelési mérőszámot (EPNL) eredményezzenek a 2. Függelékben leírtaknak megfelelően.

8.7.3 A vizsgálati körülményeknek és az eljárásoknak közel azonosaknak kell lenniük a referencia körülményekkel és eljárásokkal, vagy ellenkező esetben az akusztikai adatokat a 2. Függelékben leírt módszerekkel egyezésben módosítani kell a jelen Fejezetben ismertetett referencia körülményekre és eljárásokra.

8.7.4 A tényleges vizsgálati és referencia eljárások közötti különbségek miatti módosítások nem haladhatják meg az alábbiakat:

a) *Felszállásnál* a 4.0 EPNdB-t, amelynek D1 számtani közepe és a D2-ből a -7,5 log (QK/QrKr) kifejezés együttesen nem haladhatja meg a 2.0EPNdB-t;

b) *Átrepülésnél, vagy megközelítésnél* 2.0 EPNdB-t.

8.7.5 A vizsgálat során, a 10 dB-es csökkenési időtartam alatt a rotor átlagos fordulatszáma a maximum normál üzemi fordulatszámtól ± 1 százaléknál nagyobb mértékben nem térhet el.

8.7.6 A 10 dB-es csökkenési időtartam alatt a helikopter levegőhöz viszonyított sebessége ± 9 km/h-nál (5 csomó) nagyobb mértékben nem térhet el a repülési vizsgálatnak megfelelő referencia levegőhöz viszonyított sebességtől.

8.7.7 A szembeszélben végrehajtott szintrepülések száma egyezzen meg a hátszélben végrehajtott szintrepülések számával.

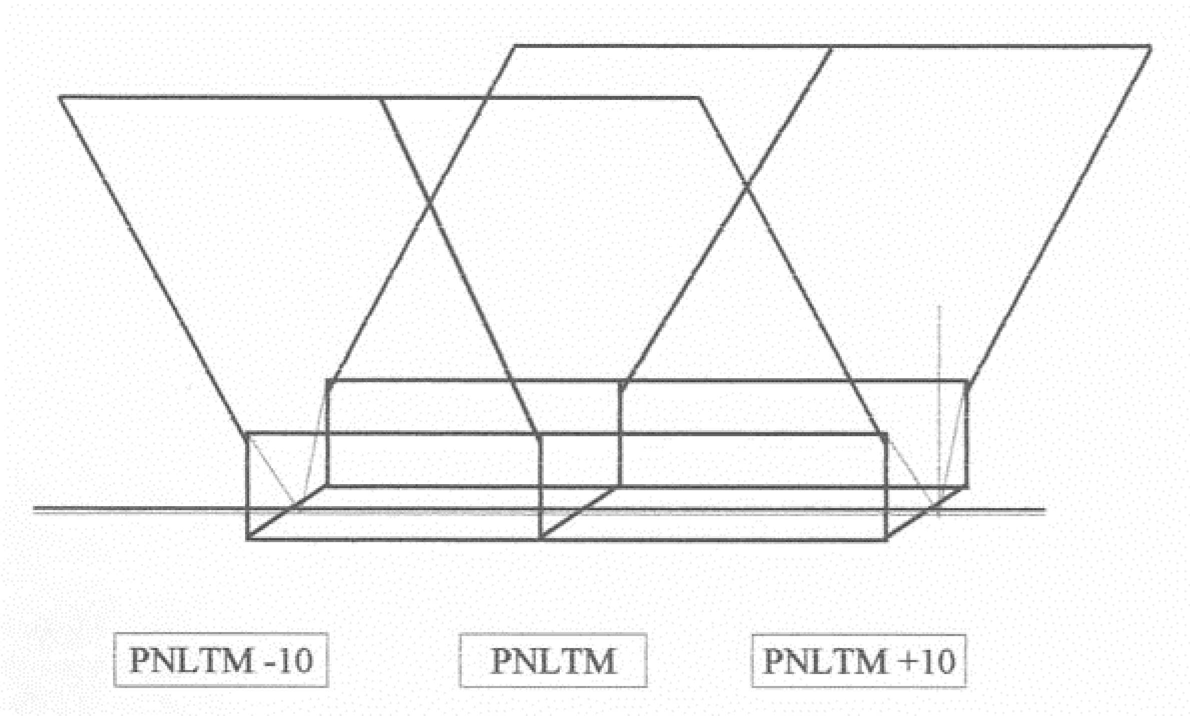
8.7.8 A teljes 10 dB-es lefutási időtartam alatt a helikopternek a referencia pályához mért függőlegestől számított ± 10 fokon vagy ±20 m-en belül kell repülnie, amelyik a nagyobb (lásd a 8-1 ábrát).

8.7.9 Az átrepülés során a helikopter magassága az átrepülési pontban mért referencia magasságtól ± 9 m-nél (30 láb) nagyobb mértékben ne térjen el.

8.7.10 A megközelítési zajvizsgálat alatt az 5,5^{o} és a 6,5^{o}-os megközelítési szögek által határolt légtérben a helikoptert stabilizált állandó sebességű megközelítésre kell állítani.

8.7.11 A vizsgálatot a helikopter vonatkozó engedélyezett maximum tömegének legalább 90 százalékával kell végrehajtani és végrehajtható a vonatkozó engedélyezett maximum tömeg 105 százalékát nem meghaladó tömeggel is. A három repülési feltétel mindegyike esetében legkevesebb egy-egy vizsgálatot végre kell hajtani e maximum hitelesített felszálló tömeggel, avagy ettől nagyobb tömeggel.

Megjegyzés. - Az egyenértékű eljárások használatára vonatkozó segédanyagot az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" tartalmazza.



A8-1 ábra A helikopter oldalirányú eltérésének tűréshatárai

9. FEJEZET BEÉPÍTETT SEGÉDHAJTÓMŰVEK (APU) ÉS KAPCSOLÓDÓ LÉGIJÁRMŰ RENDSZEREK FÖLDI ÜZEMELÉS KÖZBEN

Megjegyzés. - Az ebbe a Fejezetbe tartozó szabványokat és ajánlott eljárásokat még nem készítették el. Addig is, a "C" mellékletben szereplő irányelvek használhatók a beépített segédhajtóművek (APU) és a kapcsolódó légijármű rendszerek zaj minősítési vizsgálatához:

a) Minden olyan légijármű esetében, amely prototípusának légi alkalmassági bizonyítványa iránti kérelmet a bizonyítványt kiállító hatóság 1977. október 6-án, vagy ezután fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást; és

b) A már létező típusterv alapján gyártott légi járművek esetén, amelyek alapvetően a beépített fedélzeti segédhajtóművet érintő típusterv változtatásának kérelmét a bizonyítványt kiadó hatóság 1977. Október 6-án, vagy ez után fogadta el, vagy alaklmazott egyenértékű egyéb eljárást.

10. FEJEZET 8618 KG, VAGY KÖNNYEBB LÉGCSAVARHAJTÁSÚ REPÜLŐGÉPEK - A PROTOTÍPUSRA, VAGY MÓDOSÍTOTT VÁLTOZATÁRA 1988. NOVEMBER 17-ÉN, VAGY UTÁNNA ELFOGADOTT LÉGI-ALKALMASSÁGI BIZONYÍTVÁNY KÉRELMEK

10.1 Alkalmazási követelmények

1. Megjegyzés.- Lásd az 1. Fejezet 1.9 pontját is.

2. Megjegyzés.- Ezen alkalmazási rendelkezések értelmezéséről útmutató anyag az "E" Mellékletben található.

10.1.1 A kifejezetten műrepülésre, mezőgazdasági, vagy tűzoltó feladatokra, valamint önerős repülésre épített motoros vitorlázó repülőgépeket kivéve, e Fejezet szabványai alkalmazandók a 8618 kg hitelesített maximum felszálló tömeget meg nem haladó minden légcsavarhajtású repülőgépre és módosított változataikra.

10.1.2 Kivéve a 10.1.4-ben meghatározott repülőgépeket, a 10.4 a) pontban leírt zaj korlátok alkalmazandók arra a repülőgépre, amely prototípusára, vagy minden más módosított változatá-ra a légi-alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 1988. november 17-én, vagy utána fogadta el, vagy alkalmazott egyenértékű egyéb eljárást.

10.1.3 A 6. Fejezet szabványait kell alkalmazni a 10.1.2 pontban meghatározott, de a jelen Fejezet szabványait nem teljesítő repülőgépek esetében, amelyekre a prototípus, vagy annak módosított változataira a légi-alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 1993. november 17-e előtt fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást.

10.1.4 Kivéve a kifejezetten műrepülésre, mezőgazdasági, vagy tűzoltó feladatokra, valamint önerős repülésre épített motoros vitorlázó, valamint az úszótalpas, illetve a kétéltű egy-hajtóműves repülőgépeket, az egy hajtóműves repülőgép esetében:

a) Ha a prototípus, vagy annak módosított változatára a légi-alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 1999. November 4-én, vagy azután fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást, a10.4 b)-ben szereplő zaj korlátértékek alkalmazandók;

b) Ha a módosított változatra a légi-alkalmassági bizonyítvány iránti kérelmet a bizonyítványt kiadó hatóság 1999. november 4-én, vagy azután fogadta el, illetve hajtott végre egyenértékű előírt egyéb eljárást, de amelyek esetében a prototípus, vagy annak módosított változataira vonatkozó légi-alkalmassági bizonyítvány iránti kérelmet 1999. novem-ber 4 előtt fogadta el, illetve hajtotta végre egyenértékű előírt egyéb eljárást, a 10.4 b)-ben szereplő zaj korlátértékek alkalmazandók;

c) a fenti b) pont alkalmazandó, de ha nem teljesíti a 10.4 b) zaj korlát értékeit, a 10.4 a) zaj korlát értékei alkalmazandók feltéve, hogy a módosított változatra vonatkozó kérelmet 2004 november 4 előtt benyújtották.

10.2 Zajértékelési mérőszám

A zajértékelési mérőszám a maximum A-súlyozású zajszint (L_{AMAX}) legyen, a 6. Függelékben meghatározottak szerint.

10.3 Referencia zajmérő pontok

10.3.1 Az e szabványok szerint vizsgált repülőgép a felszállási referencia zajmérő pontnál nem lépheti túl a 10.4 pontban előírt zajszintet.

10.3.2 A felszállási referencia zajmérő pont a futópálya meghosszabbított középvonalán a felszálláshoz végzett nekifutás megkezdésétől 2500 m-re lévő pont.

10.4 Maximum zajszintek

A 6. Függelékben lévő zajértékelési módszerrel összhangban meghatározott maximum zajszintek nem léphetik túl az alábbiakat:

a) a 10.1.2-ben és a 10.1.4 c)-ben meghatározott repülőgépek esetében a 76 dB(A) állandó határértéket 600 kg-os repülőgép tömegig, ettől a ponttól a repülőgép tömegének logaritmusával lineárisan változva az 1400 kg-nál lévő 88 dB(A) korlát eléréséig, melyet követően a korlát 8618 kg-ig állandó érték; és

b) a 10.1.4 a)-ban és b)-ben meghatározott repülőgépek esetében a 70 dB(A) állandó határértéket 570 kg-os repülőgép tömegig, ettől a ponttól a repülőgép tömegének logaritmusával lineárisan változva az 1500 kg-nál lévő 85 dB(A) korlát eléréséig, melyet követően a korlát 8618 kg-ig állandó érték.

10.5 Zaj minősítési referencia eljárások

10.5.1 Általános feltételek

10.5.1.1 A referencia eljárások és repülési pályák számításait a bizonyítványt kiadó hatóságnak kell jóváhagynia.

10.5.1.2 A 10.5.1.3 pontban leírt feltételek kivételével, a felszállási referencia eljárás feleljen meg a

10.5.2 pontban előírtaknak.

10.5.1.3 Ha a kérelmező bizonyítja, hogy a repülőgép tervezési jellemzői nem teszik lehetővé a 10.5.2 pontban leírtak szerinti repülést, a referencia eljárások:

a) Eltérhetnek a meghatározott referencia eljárásoktól, de csak a referencia eljárás végrehajtását lehetetlenné tévő tervezési jellemzők által megkövetelt mértékig; és

b) Azokat a bizonyítványt kiadó hatóság jóváhagyta.

10.5.1.4 A referencia eljárásokat a következő referencia légköri viszonyokra kell kiszámítani:

a) Tengerszinti légnyomás 1013,25 hPa;

b) Környező levegőhőmérséklet 15^{o} C, azaz NEL;

c) Relatív páratartalom 70 százalék; és

d) Szélcsend.

10.5.1.5 Az akusztikai referencia légköri feltételek a repülés referencia légköri feltételeivel legyenek azonosak.

10.5.2 Felszállási referencia eljárások

A felszállási repülési pályát az alábbi két szakasz figyelembe vételével kell kiszámítani.

Első szakasz

a) Felszálló teljesítményt kell használni a fékek felengedésének pontjától a futópálya feletti 15 m (50 láb) magasság elérésének pontjáig.

b) A kérelmező által választott állandó felszállási konfigurációt eme első szakasz alatt végig fenn kell tartani.

c) A repülőgép tömege a fékek felengedésekor a zajminősítési bizonyítvány kérelemben szereplő maximum felszálló tömeg legyen.

d) Eme első szakasz hossza feleljen meg a légi-alkalmassági adatokban a lejtés mentes, burkolattal rendelkező futópályán végzett felszálláshoz megadott hossznak.

Második szakasz

a) A második szakasz az első szakasz végénél kezdődik.

b) A repülőgép a második szakasz alatt végig emelkedési konfigurációban legyen behúzott futóművekkel (ha azok behúzhatók) és a normál emelkedéshez tartozó megfelelő fékszárny állással.

c) A sebesség a legjobb emelkedési sebesség, Vy, legyen.

d) A felszálló teljesítményt és a változtatható légcsavar szögű, vagy állandó fordulatszámú légcsavarral rendelkező repülőgépek esetében a fordulatszámot a teljes második szakasz alatt tartani kell. Ha a légi-alkalmassági korlátok nem teszik lehetővé a felszálló teljesítmény és fordulatszám referencia pontig való tartását, akkor a felszálló teljesítményt és fordulatszámot mindaddig tartani kell, amíg ezek a korlátozások megengedik és azt követően maximum folytonos teljesítményt és fordulatszámot kell tartani. E fejezet teljesítése érdekében az időtartam korlátozása, amely alatt felszálló teljesítményt és fordulat-számot kell tartani - nem engedhető meg. A referencia magasságot az alkalmazott egyes teljesítmény beállításoknak megfelelő emelkedő gradiensek feltételezésével kell kiszámítani.

10.6 Vizsgálati eljárások

10.6.1 A vizsgálati eljárások legyenek elfogadhatóak az állam légi-alkalmassági és zajminősítési bizonyítványt kiadó hatósága számára.

10.6.2 A vizsgálati eljárásokat és a zajméréseket jóváhagyott módon kell végrehajtani és feldolgozni, hogy az zaj értékelési mérőszámot L_{AMAX} egységekben a 6. Függelékben leírtaknak megfelelően eredményezzen.

10.6.3 Az akusztikus adatokat az ebben a Fejezetben meghatározott referencia feltételekhez a 6. Függelékben körvonalazott módszerekkel kell beállítani.

10.6.4 Ha egyenértékű vizsgálati eljárásokat alkalmaznak, akkor a vizsgálati eljárások és az eredmények referencia eljárásokhoz korrigálásának módszereit a bizonyítványt kiadó hatóságnak jóvá kell hagynia.

Megjegyzés. - Az egyenértékű eljárások használatára vonatkozó segédanyagot az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" tartalmazza.

11. FEJEZET
3175 KG, VAGY KÖNNYEBB HITELESÍTETT MAXIMUM FELSZÁLLÓTÖMEGŰ HELIKOPTEREK

11.1 Alkalmazási követelmények

Megjegyzés. - Lásd még az 1. Fejezet 1.9 pontját is.

11.1.1 A kizárólagos mezőgazdasági, tűzoltási, vagy külső felfüggesztésű teherszállítási célokra tervezettek kivételével, a jelen Fejezet szabványai alkalmazandók a 3175 kg hitelesített maximum felszálló tömeget nem meghaladó minden olyan helikopterre, amelyre a 11.1.2, 11.1.3 és a 11.1.4 alkalmazandó.

11.1.2 A 11.1.4-ben meghatározott helikopterek kivételével, a 11.4.1 zajszintjei alkalmazandók azokra a helikopterekre, amelyek prototípus légi-alkalmassági bizonyítványát a bizonyítványt kiállító hatóság, 1993. november 11-én, vagy ez után állította ki, vagy alkalmazott egyenértékű előírt egyéb eljárást; vagy

11.1.3 A 11.1.4-ben meghatározott helikopterek kivételével, a 11.4.1 zajszintjei alkalmazandók azon helikopterek továbbfejlesztett változataira, amelyek típusterv módosítási kérelmére a légi-alkalmassági bizonyítványt a bizonyítványt kiállító hatóság 1993. november 11-én, vagy ez után adta ki, vagy alkalmazott egyenértékű előírt egyéb eljárást.

11.1.4 A 11.4.2 zajszintjei alkalmazandó minden olyan helikopterre és továbbfejlesztett változatára, amely prototípusának légi-alkalmassági bizonyítványa iránti kérelmét a bizonyítványt kiállító hatóság 2002. március 21-én vagy ezt követően fogadta el, vagy alkalmazott egyenértékű egyéb eljárást.

11.4.5 A külső felfüggesztésű teher, vagy külső felfüggesztésű berendezés szállítására képes helikopterek alkalmassági vizsgálatát ilyen terhek, illetve berendezések nélkül kell elvégezni.

Megjegyzés. - A belső teherszállítással a szabványokat teljesítő helikopterek külső terhet, vagy berendezést szállítva akkor menthetők fel, ha a külső teherszállító művelet a belső teherre vonatkozó légi-alkalmasságiban szereplőt meghaladó összsúllyal, vagy azokat meghaladó egyéb üzemeltetési paraméterekkel végzik.

11.1.6 A 11.1.1, 11.1.2, 11.1.3 és 11.1.4 hatálya alá eső kérelmező alternatívaképp választhatja, hogy e Fejezettel való egyezés helyett, a 8. Fejezettel való egyezést mutatja be.

11.2 Zajértékelési mérőszám

A zajértékelési mérőszám a 4. Függelékben leírtak szerinti zaj kitettségi szint (SEL - Sound Exposure Level) legyen.

11.3 Referencia zajmérő pont

A jelen szabványokkal egyezésben vizsgált helikopter az átrepülési referencia eljárásban (lásd 11.5.2.1) leírt repülési pálya 150 m (492 láb) magasságú pontja alatt függőlegesen a talajon lévő repülési pálya referencia pontnál nem lépheti túl a 11.4-ben meghatározott zajszinteket.

Megjegyzés.- lásd a földterület hasznosítás tervezéshez (LUP) elfogadható kiegészítő adat eljárását leíró H Mellékletet (Helikopter zaj adatok beszerzése földterület hasznosítási célra).

11.4 Maximum zajszintek

11.4.1 A 11.1.2 és 11.1.3 pontban meghatározott helikopterek esetében a 4. Függelékben szereplő zajértékelési módszerrel egyezésben megállapított zajszintek a zaj bizonyítvány kérelemben szereplő tömegnél 788 kg hitelesített maximum tömegig bezárólag a 82 decibel SEL-t nem haladhatják meg és 788 kg felett ez 3 decibel per kétszeres tömegmértékkel emelkedik.

11.4.2 A 11.1.4 pontban meghatározott helikopterek esetében a 4. Függelékben szereplő zajértékelési módszerrel egyezésben megállapított zajszintek a zaj bizonyítvány kérelemben szereplő tömegnél 1417 kg hitelesített maximum tömegig bezárólag a 82 decibel SEL-t nem haladhatják meg és 1417 kg felett ez 3 decibel per kétszeres tömegmértékkel emelkedik.

11.5 Zaj vizsgálati referencia eljárás

11.5.1 Általános feltételek

11.5.1.1 A referencia eljárás feleljen meg az érvényes légi-alkalmassági követelményeknek és a bizonyítványt kiállító hatóság hagyja jóvá.

11.5.1.2 Eltérő jóváhagyás kivételével, az átrepülési referencia eljárás a 11.5.2-ben leírt eljárás legyen.

11.5.1.3 Ha a kérelmező bizonyítja, hogy a helikopter tervezési jellemzői nem teszik lehetővé a repülés 11.5.2 szerinti végrehajtását, akkor a bizonyítványt kiállító hatóság jóváhagyásával engedélyezhető, hogy a referencia eljárás eltérjen a szabvány referencia eljárástól, de az eltérés csak a referencia eljárás végrehajtását kizáró tervezési jellemzők által igényelt mértékű lehet.

11.5.1.4 A referencia eljárást a következő referencia légköri viszonyokra kell megállapítani:

a) 1013,25 hPa tengerszinti légnyomás;

b) 25° C környezeti levegőhőmérséklet;

c) 70 százalékos relatív páratartalom; és

d) Szélcsend.

11.5.1.5 A gyártó által meghatározott és a bizonyítványt kiállító hatóság részéről az átre-pülésre elfogadott, a légi-alkalmassági korlátozásokkal összhangban álló legnagyobb rotor fordulatszámként a maximum normál üzemi fordulatszámot kell venni. Ha a legnagyobb rotor fordulatszámot tűréssel tették közzé, akkor a maximum normál üzemi rotor fordulatszámot kell a legnagyobb rotor fordulatszámként venni, mint amelyre a tűrést közölték. Ha a repülési feltételekhez a rotor fordulatszám automatikusan kötődik, akkor az adott repülési feltételekhez tartozó maximum normál rotor fordulatszámot kell használni a zaj minősítő eljárás alatt. Amennyiben a rotor fordulatszám pilóta beavatkozással változtatható, akkor a repülési kézikönyv korlátozások fejezetében a felkapcsolt erőhajtás körülményekre előírt legnagyobb normál üzemi rotor fordulatszámot kell a zaj minősítő eljárás alatt alkalmazni.

11.5.2 Referencia eljárás

A referencia eljárást a következők szerint kell megállapítani.

a) A helikoptert a repülési pálya referenciapont felett 150 m (492 láb) ± 15 m (50 láb) magasságon szintrepülésben kell stabilizálni;

b) Az átrepülési referencia eljárás során mindvégig a következők közül a legkisebb sebességet kell tartani: 0,9 V_H, vagy 0,9 V_{NE}, vagy 0,45 V_H+120 km/h (65 csomó), vagy 0,45 V_{NE}+120 km/h (65 csomó). Zaj minősítési célokra V_H a felépített legkisebb teljesítményű hajtóműnek a tengerszinti légnyomásnál (1013,25 hPa-nál), 25^o C környezeti hőmérséklet mellett rendelkezésre álló folytonos maximum teljesítményéhez tartozó forgatónyomatékkal megvalósított szintrepüléshez meghatározott sebesség. V_{NE} meghatározás szerint, a gyártó által megállapított és a légi-alkalmaság megállapító hatóság által elfogadott soha túl nem léphető légi-alkalmassági sebesség korlát;

c) Az átrepülést a szintrepülésre engedélyezett maximum normál üzemi fordulatszámon stabilizált rotor fordulatszámmal kell végrehajtani;

d) A helikopternek utazó konfigurációban kell lennie; és

e) A helikopter tömege legyen egyenlő a zajminősítési bizonyítvány kiadási kérelmben szereolő maximum felszálló tömeggel.

11.5.2.2, A zaj minősítéshez alkalmazott V_H és/vagy V_{NE} értékeknek a jóváhagyott repülési kézikönyvben szerepelniük kell.

11.6 Vizsgálati eljárások

11.6.1 A vizsgálati eljárás legyen elfogadható az állam légi-alkalmassági és zajminősítési bizonyítványt kiadó hatóságai számára.

11.6.2 A vizsgálati eljárásokat és a zajméréseket jóváhagyott módon kell végrehajtani és feldolgozni, hogy azok a zaj kitettségi szint (SEL) szerinti zajértékelési mérőszámot "A" súlyozott decibelben eredményezzék, amint az a 4. Függelékben szerepel.

11.6.3 A vizsgálati körülményeknek és eljárásoknak a referencia körülményekkel és eljárásokkal közel azonosaknak kell lenniük, vagy ellenkező esetben az akusztikai adatokat a 4. Függelékben leírt módszerekkel a jelen Fejezetben ismertetett referencia körülményekhez és eljárásokhoz kell korrigálni.

11.6.4 A vizsgálati repülés alatt egyenlő számban kell szembe szélben, illetve hátszélben végrehajtott repüléseket végezni.

11.6.5 A vizsgálati és a referencia repülési eljárások közötti eltérések helyesbítése 2,0 dB(A)-nál nagyobb nem lehet.

11.6.6 A vizsgálati eljárás alatt a 10 dB-es lefutási időtartam közben az átlagos rotor fordulatszám a normál maximum üzemeltetési fordulatszámtól ± 1,0 százaléknál nagyobb mértékben nem térhet el.

11.6.7 A helikopter sebessége a 10 dB-es lefutási időtartam alatt ± 5 km/h (±3 csomó)-nál nagyobb mértékben nem térhet el a 4. Függelékben leírt bemutató repülésnek megfelelő referencia sebességtől.

11.6.8 Zajmérő helyzetben a helikopter a referencia pálya földi vetülete feletti függőlegeshez viszonyítva ±10 fokon belül repüljön.

11.6.9 A vizsgálatot a helikopter vonatkozó engedélyezett maximum tömegének 90 százalékánál nem kisebb tömeggel kell végrehajtani és végrehajtható a vonatkozó engedélyezett maximum tömeg 105 százalékát meg nem haladó tömeggel is.

Megjegyzés. - Az egyenértékű eljárások használatára vonatkozó útmutató anyagot az "Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501) tartalmazza.

12. FEJEZET
HANGSEBESSÉGNÉL GYORSABB REPÜLŐGÉPEK

12.1 Hangsebességnél gyorsabb repülőgépek - 1975. január 1. előtt elfogadott prototípus légi-alkalmassági bizonyítvány iránti kérelmek.

12.1.1 A jelen Annex 2. Fejezetében ismertetett szabványok, a 2.4 pontban leírt legnagyobb zajszintek kivételével, alkalmazandók az összes hangsebesség feletti repülőgépre, ideértve módosí-tott változataikat is, amelyek prototípusának légi-alkalmassági bizonyítványa iránti kérelmet a bizonyítvány kiállító hatóság 1975. január 1. előtt fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást és amelyek egyedi repülőgép példányaira a légi-alkalmassági bizonyítványt első ízben 1981. November 26. után adta ki.

12.1.2 A 12.1.1 pontban ismertetett repülőgépek 1. Függelékben ismertetett módszerekkel megállapított legnagyobb zajszintje nem haladhatja meg a típus első légi-alkalmassági bizonyítvánnyal ellátott repülőgépének esetében mért zajszintet.

12.2 A hangsebesség feletti repülőgépek - 1975. január 1-én, vagy később elfogadott prototí-pus légi-alkalmassági bizonyítvány iránti kérelmek

Megjegyzés. - Az ilyen repülőgépekre vonatkozó szabványokat és ajánlott eljárásokat, még nem alkották meg, de a jelen Rész 3. Fejezetében a gázturbina sugárhajtóműves hangsebességnél lassabb légijárművekre közölt zajszintek irányelvként alkalmazhatók azokra a repülőgépekre is, amelyek prototípusának légi-alkalmassági bizonyítvány iránti kérelmét a bizonyítványt kiadó hatóság 1975. Január 1-én, vagy ez után fogadta el, vagy alkalmazott egyenértékű előírt egyéb eljárást.

13. FEJEZET DÖNTHETŐ FORGÓSZÁRNY TENGELLYEL RENDELKEZŐ REPÜLŐGÉPEK

1. Megjegyzés. - Az ilyen repülőgépekre vonatkozó szabványokat és ajánlott eljárásokat még nem alkották meg. Addig is, az F Mellékletben biztosított útmutató anyag irányelvként alkalmazható azon dönthető forgószárny tengellyel rendelkező repülőgépek zajminősítésére, amelyek prototípusára 1998. május 13-án, vagy utána adták ki a prototípus légi-alkalmassági bizonyítványát, valamint, hogy földterület hasznosítás tervezési célokra adatokkal szolgáljon.

2. Megjegyzés. - Ezen irányelvek kimunkálása során a 8. Fejezet helikopterekre vonatkozó zajminősítési szabványaira nagymértékben támaszkodtak - ahol az megoldható volt.

III. RÉSZ ZAJMÉRÉS ELLENŐRZÉSI CÉLOKRA

Megjegyzés. - A következő ajánlást a zajmérést ellenőrzési célokból végrehajtó államok segítésére dolgozták ki arra az időszakra, amíg mindenki számára elfogadható egyetlen eljárásról megállapodás jön létre.

Ajánlás. - *Ahol a légijármű zajt ellenőrzési célokkal mérik, ott, az 5. Függelékben ismertetett eljárást kell alkalmazni.*

Megjegyzés. - Az említett célok között szerepelnek a következők: Az esetlegesen már életbeléptetett zaj előírásoknak való megfelelés és az ilyen jellegű zajcsökkentési követelmények eredményességének ellenőrzése a levegőben, vagy a földön üzemelő légijárművekkel kapcsolatosan. A légijármű tervezési célokra használt zajmérési eljárásokkal nyert értékek és az ellenőrzési célokra alkalmazott módszerekkel nyert értékek közötti összefüggés mértékének jelzésére szükség lenne.

IV. RÉSZ A REPÜLŐTÉRI ZAJ FELMÉRÉSE

Megjegyzés.- Az alábbi eljárások kifejlesztésének célja a nemzetközi kommunikáció előmozdítása a földterület hasznosítás tervezés céljait szolgáló rendszer valamely változatát elfogadó államok között.

1. Ajánlás.- *A repülőterek körüli zajértékelés nemzetközi összehasonlítását a Circular 205-ben (Recommended Method for Computing Noise Contours Around Airports) meghatározott módszer alkalmazásával kell végrehajtani.*

2. Ajánlás.- A nemzeti zajértékelési módszerét megváltoztatni szándékozó, avagy ilyen módszert még nem alkalmazó állam a Circ. 205 "Recommended Method for Computing Noise Contours Around Airports-ban meghatározott módszert alkalmazza.

V. RÉSZ A ZAJ KEZELÉS KÉRDÉSÉNEK KIEGYENSÚLYOZOTT MEGKÖZELÍTÉSE

Megjegyzés.- Jelen Annex II. Részének rendelkezései zajminősítési célokat szolgálnak, amelyek a légijárművek által kibocsátott legnagyobb zajt jellemzik. A nemzeti hatóságok által elfogadott és az üzemeltetői kézikönyvekbe foglalt zajcsökkentő eljárások viszont a légijármű üzemelés közbeni zajának csökkentését teszik lehetővé.

1. A zaj kezelésének kiegyensúlyozott megközelítése a következőt jelenti: a repülőtéren a zaj probléma azonosítása és azt követően a zaj csökkentéséhez igénybevehető különféle intézkedési lehetőségek elemzése négy fő elem feltárásával, nevezetesen, csökkentés a forrásnál (ezzel jelen Annex II. Része foglalkozik), földterület hasznosítás tervezés és irányítás, zajcsökkentő üzemeltetési eljárások és üzemeltetési korlátozások, azzal a céllal, hogy a zaj problémához a leginkább költség-hatékony módszerrel közelítsenek. A kiegyensúlyozott megközelítés minden egyes elemét tárgyalja az Útmutató a zaj kezelésének kiegyensúlyozott megközelítésére című (Guidance on the Balanced Approach to Aircraft Noise Management - Doc 9829) kiadvány.

2. Zajcsökkentő üzemeltetési eljárások addig nem vezethetők be, amíg megfelelő tanulmányok és konzultációk alapján az illetékes hatóság meg nem állapította a zajprobléma létének valódiságát.

3. **Ajánlás.-** *A zajcsökkentő légijármű üzemeltetési eljárásokat az érintett repülőteret használó légitársaságok képviselőivel történt megbeszélés alapján kívánatos kialakítani.*

4. **Ajánlás.-** *A megfelelő zajcsökkentő légijármű üzemeltetési eljárások kialakításánál figyelembe veendő tényezők között szerepeljenek a következők:*

a) A zajprobléma természete és terjedelme, beleértve:

1) a zajérzékeny területek elhelyezkedését; és

2) a kritikus órákat.

b) Az érintett légijármű típusok, beleértve a légijármű tömeg, repülőtér tengerszint feletti magasság és hőmérsékleti megfontolásokat;

c) A várhatóan legeredményesebb eljárás típusokat;

d) Az akadály mentességet (PANS - OPS, I. és II. Kötet, Doc 8168); és

e) Az emberi teljesítőképességet az üzemeltetési eljárások alkalmazása tekintetében.

1. Megjegyzés.- A repülőgép zajcsökkentő üzemeltetési eljárások tekintetében lásd a 6. Annex I. Rész 4. Fejezetét.

2. Megjegyzés.- Az emberi teljesítőképességről útmutató anyag a Kiképző Könyv az Emberi Tényezőkről (Human Factors Training Manual - Doc 9683) kiadványban található.

5. **Ajánlás.-** *Bár az államok többségében a földterület hasznosítás tervezés irányításának felelőssége a nemzeti és/vagy a helyi tervező hatóságok hatáskörébe és nem a repülési hatóság hatáskörébe tartozik, az ICAO útmutató anyagot dolgozott ki, amely a tervező hatóságok segítségére lehet a megfelelő lépések megtételében, hogy a földterület hasznosítás kompatíbilis intézményét biztosítsák a repülőterek környezetében hasznot nyújtva mind a repülőtér számára, mind a környező közösségek számára (Airport Planning Manual, 2. Rész (Doc 9184)).*

1. FÜGGELÉK HANGSEBESSÉGNÉL LASSABB SUGÁRHAJTÓMŰVES REPÜLŐGÉPEK ZAJ ÉRTÉKELÉSI MÓDSZERE - A PROTOTÍPUS LÉGIALKALMASSÁGI BIZONYÍTVÁNYA IRÁNT 1977. OKTÓBER 6-A ELŐTT ELFOGADOTT KÉRELMEK

1. Megjegyzés. - Lásd a II. Rész 2. Fejezetét.

2. Megjegyzés. - Az ebben a Függelékben lévő eljárások a 5. és 12. Fejezetben szereplő egyes légijármű típusokra is vonatkoznak.

1. BEVEZETŐ RÉSZ

1. Megjegyzés. - A zajértékelési módszer a következőket foglalja magába:

a) A zaj minősítési vizsgálati és mérési feltételek;

b) A repülőgép földön észlelt zajának mérése;

c) A mért adatokból a ténylegesen észlelt zaj szint kiszámítása; és

c) A bizonyítványt kiadó hatóságok értesítése a mért adatokról és a mérési adatok korrekciója.

2. Megjegyzés. - Az e módszerben megadott utasításokat és eljárásokat világosan fogalmazták meg ahhoz, hogy biztosítsák a vizsgálatok egységes végrehajtását és lehetővé tegyék a különböző földrajzi helyeken, különféle repülőgép típusokon végzett vizsgálatok összehasonlíthatóságát. Ez csak a II. Rész 2. Fejezetének alkalmazhatósági határain belül lévő repülőgépeknél használható.

3. Megjegyzés. - Jelen Függelék 6 - 9 szakaszai tartalmazzák a jelölések és mértékegységek teljes felsorolást, a ténylegesen észlelt zaj matematikai megfogalmazását, a légköri zajcsillapítás megállapításának egyik módszerét és a nem referencia feltételek között mért zajszintek referencia feltételekre való korrigálásának részletezett eljárásait.

2. A ZAJMINŐSÍTÉS VIZSGÁLATI ÉS MÉRÉSI FELTÉTELEI

2.1 Általános rész

E szakasz írja le mindazokat a feltételeket, amelyek között a zajminősítési vizsgálatokat végezni kell és azokat a mérési eljárásokat, amelyeket alkalmazni kell.

Megjegyzés. - Sok zajminősítési bizonyítvány iránti kérelmet a légijármű eredeti típustervének csak kismértékű megváltoztatására nyújtanak be. A zajban mutatkozó eredő változások gyakran megbízhatóan megállapíthatók anélkül, hogy szükség lenne az ebben a Függelékben körvonalazott vizsgálat teljes körű elvégzésére. Ezért, a zaj minősítési bizonyítványt kiadó hatóságoknak érdemes a megfelelő "egyenértékű *eljárások" használatát engedélyezni. Vannak olyan egyenértékű eljárások is, amelyek a teljes zajminősítési vizsgálat során alkalmazhatók a költségek csökkentése és megbízható eredmények nyerése érdekében. A hangsebesség alatti gázturbina sugárhajtóműves repülőgépek zajminősítésének meghatározáshoz használható egyenértékű eljárásokra vonatkozó segédanyagot az "Enviromental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" tartalmazza.*

2.2 Általános vizsgálati feltételek

2.2.1 A rögzített zajminősítési szint teljesítését bizonyítani hívatott vizsgálatok felszállások és leszállások sorozatából állnak, amelyek során a méréseket a minősítő vizsgálatot végző hatóságok által megállapított mérési pontokban kell mérni. Ezek a pontok, tipikusan a következők:

Az átrepülési (flyover) zajmérési pont[1];

A megközelítési zajmérési pont; és

Az oldalsó zajmérő pont (vagy pontok)[2];

amelyek használatát zaj vizsgálati célokra a II. Rész 2. Fejezet 2.3 pontja rögzíti. A maximum szubjektív oldalsó zajszint meghatározása érdekében kellő számú oldalsó zajmérő pontot kell alkalmazni. A zajmezőben lehetséges asszimetria létezésének meghatározásához legalább egy mérőpontot az átellenes oldalon kell kijelölni. Az összes vizsgálati célú felszállás alkalmával egyidejűleg méréseket kell végezni az oldalsó mérő pontnál, a futópálya mindkét oldalán és a felszállási átrepülési mérőpontnál is.

2.2.2 A repülésben lévő repülőgép zajának mérését sűrű, vagy magas fű, vagy erdős terület által előidézhető jelentős zaj elnyelő jelleggel nem rendelkező megközelítőleg sík terepen elhelyezett mérési helyeken kell végezni. Nem lehetnek a repülőgéptől érkező hangmezőt jelentősen befolyásoló akadályok a mérési pont felett elhelyezkedő kúpon belül, amely kúp, egy a földfelszínre merőleges tengelyű 75 fokos félkúp szögű kúpként van meghatározva. Amennyiben, valamelyik méréspontban a terep magassága 6 m-nél (20 láb) többel eltér a futópálya legközelebbi pontjának magasságától, akkor korrekciót kell végrehajtania.

Megjegyzés. - A méréseket végrehajtó személyek maguk is képezhetnek ilyen jellegű akadályokat.

2.2.3 A vizsgálatokat a következő légköri körülmények között kell elvégezni:

a) Csapadékmentes idő;

b) Relatív páratartalom nem lehet 90 százaléknál magasabb, vagy 30 százaléknál alacsonyabb;

c) A talajszintje felett 10 m (33 láb) magasságban a környezeti levegő hőmérséklet nem magasabb 30^{o} C-nál és nem alacsonyabb 2^{o}C-nál;

d) a talajszintje felett 10 m (33 láb) magasságban mért átlagszél 19 km/h-nál (10 csomó) nem erősebb és az átlagos oldalszél összetevő 9 km/h-nál (5 csomó) nem erősebb; a 10 dB-es lefutási időszako(ka)t átfogó 30 mp-es átlagolási időperiódus javasolt;

e) Nem lehet a repülőgép zajszintjét jelentősen befolyásoló hőmérsékleti inverzió, vagy rendszertelen lökéses szél, amikor a zajminősítési bizonyítványt kiadó hatóságok által kijelölt mérési pontokban a zajt rögzítik.

1 - Néha 'felszállási zajmérő pont'-ként említik;

2 - Néha az 'oldalvonalon elhelyezett zajmérő pont (pontok)-ként említik.

2.3 Repülőgép vizsgálati eljárások:

2.3.1 A vizsgálati eljárásoknak elfogadhatóaknak kell lenniük a bizonyítványt kiadó állam légi-alkalmassági és zajminősítési vizsgálatot végző hatóságai részéről.

2.3.2 A repülőgép vizsgálati eljárásait és a zaj méréseit a Ténylegesen Észlelt Zajszint (EPNL) EPNdB egységekben mért értékét biztosító jóváhagyott módon kell végrehajtani, ahogy azt a jelen Függelék 4. pontja ismerteti.

2.3.3 A repülőgép magasságát és a futópálya meghosszabbított középvonalához mért oldalirányú helyzetét, az alkalmassági bizonyítványt kiadó hatóságok által jóváhagyott, a normál repülési műszerezettségtől független módszerrel kell meghatározni, mint például a radar célkövetés, teodolit háromszögelés, vagy fényképezéses mérési eljárások.

2.3.4 A repülőgép repülési pálya menti helyzetét szinkronizáló jelek segítségével kell a zajmérő pontokon rögzített zajra vonatkoztatni. A repülőgép futópályához viszonyított helyzetét a megközelítés során a küszöbtől legalább 7,4 km (4 tengeri mérföld) távolságra lévő pontból, és a felszállás során a felszálláshoz végzett nekifutás kezdetétől legalább 11 km (6 NM) távolságra lévő pontból kell rögzíteni.

2.3.5 Ha a felszállási vizsgálati eljárást a zajminősítési bizonyítványt kérelemben szereplő maximum felszálló tömegtől eltérő tömeggel hajtják végre, akkor a szükséges EPNL korrekció nem haladhatja meg a 2 EPNdB értéket. Ha a megközelítési vizsgálati eljárást a zajminősítési bizonyítványt kérelemben szereplő maximum leszálló tömegtől eltérő tömeggel hajtják végre, akkor a szükséges EPNL korrekció nem haladhatja meg az 1 EPNdB értéket. A bizonyítványt kiadó hatóság által elfogadott adatokat kell használni az EPNL értéknek a tömeg függvényében való változásainak meghatározására, mind a felszállási, mind a leszállási vizsgálati körülményekre.

2.4 Mérések

2.4.1 A jelen Függelék 5. pontjában említett és a korrekcióhoz szükséges helyzet- és teljesítményadatokat automatikusan kell rögzíteni jóváhagyott mintavételi gyakorisággal. A megközelítés során a repülőgép futópályához viszonyított helyzetét a földet érési küszöbtől legalább 7,4 km (4 tengeri mérföld) távolságra lévő pontból, a felszállás során pedig a felszálláshoz végzett nekifutás kezdetétől legalább 11 km (6NM) távolságban lévő pontból kell rögzíteni. A mérőeszközöket a bizonyítványt kiadó hatóságnak kell jóvá hagynia.

2.4.2 A helyzet- és teljesítmény adatokat a jelen Függelék 5. szakaszában vázolt módszerek szerint kell az 5.3 a) pontban leírt meteorológiai referencia feltételekre korrigálni.

2.4.3 Az akusztikai adatokat a jelen Függelék 5. szakaszában vázolt módszerek szerint kell az 5.3 a) 1), 2) és 3) pontjában leírt meteorológiai referencia feltételekre korrigálni. Akusztikai adatkorrekciót kell még végezni ezen kívül a repülőgép megközelítési útvonala és a megközelítési mérőpont közötti vizsgálati, illetve referencia minimum távolság változásokra az átrepülési mérőpont felett függőleges irányban lévő felszállás útvonalára és az olyan mérési pontoknál, amelyeknek a magasságkülönbsége a futópálya legközelebbi pontjához viszonyítva 6 m-nél (20 lábnál) nagyobb mértékben eltér.

2.4.4 Központi hely szerepre a repülőtéri irányító tornyot, vagy más létesítményt kell kijelölni, amely központi helynél a mért légköri jellemzők azon adott földrajzi térség feletti feltételeket képviselik, amelyben a repülőgép zajmérését végzik. Ennek ellenére a talajszél sebességét és a környezeti levegő hőmérsékletet a mikrofonok közelében kell mérni a megközelítési, oldalsó, és a felszállási mérési helyeken és a vizsgálatok csak akkor fogadhatók el, ha ezek a feltételek megfelelnek a jelen Függelék 2. pontjában foglaltaknak.

3. A REPÜLŐGÉP FÖLDÖN ÉSZLELT ZAJÁNAK MÉRÉSE

3.1 Általános rész

3.1.1 A méréseknek a repülőgép repülés közben keltett zajának idő függvényű és a megfigyelő állomásokra egyedileg vonatkoztatható egyharmad oktáv tartományos jellemzőinek meghatározásához kell adatokat szolgáltatni.

3.1.2 A mérőhelyek és a repülőgép közötti távolság meghatározására alkalmazott módszerek között szerepeljen teodolittal mért háromszögelési eljárás, a mérési pont felett közvetlenül elrepülő repülőgépről készült fényképek alapján a légijármű méreteiből történő meghatározás, radar magasságmérés, és a radar célkövető eljárás. Az alkalmazott módszereket a bizonyítványt kiadó hatóságnak kell jóváhagynia.

3.1.3 A zajértékelési célokra használt hangnyomásszint adatokat az alább meghatározottaknak (3.2 - 3.4 pontok) megfelelő jóváhagyott akusztikai felszereléssel és mérési eljárással kell megállapítani.

3.2 Mérőrendszer

Az akusztikai mérőrendszer a következőkkel egyenértékű jóváhagyott berendezésekből áll:

a) A 3.3 pontban megadott mérő és elemzőrendszer pontosságával egyező frekvencia átviteli karakterisztikával rendelkező mikrofonrendszer;

b) Három lábú, vagy egyéb rendszerű a mért hanggal való interferenciát minimálissá tévő mikrofon állványzatok;

c) A 3.3 pontban ismertetett átviteli és pontossági követelményeket teljesítő rögzítő és visszajátszó berendezés karakterisztika, frekvencia átviteli karakterisztika és dinamika tartomány;

d) Az ismert hangnyomásszint szinusz hullámát, vagy széles sávú zaját használó akusztikai kalibráló eszköz. Széles sávú zaj alkalmazása esetén a jelet túlterhelés nélküli jelszinten átlagos és maximum négyzetes középérték formájában kell leírni;

e) A 3.4 pontban ismertetett átviteli és pontossági követelményeket teljesítő elemző berendezés.

3.3 Érzékelő, felvevő és visszajátszó berendezések

3.3.1 A légijármű által keltett zajokat úgy kell rögzíteni, hogy időrendben a teljes hanganyag megmaradjon és visszajátszható legyen. A mágnesszalagos rögzítés alkalmazása elfogadható.

3.3.2 A rendszer jellemzői és karakterisztikái egyezzenek meg a IEC (Nemzetközi Elektrotechnikai Bizottság) 179[3]-es számú kiadványának a mikrofon és erősítő karakterisztikára vonatkozó fejezeteinek ajánlásaival.

Megjegyzés. - a "precíziós hangszintmérők" című 179[3]-as számú IEC kiadvány szövege és leírása hivatkozás révén jelen Függelék 4. Részébe belefoglalva szerepel, és ezért a Függelék Részét képezi.* [4]

3.3.3 A teljes rendszer átvitele a 45 - 11200 Hz frekvencia tartományban állandó amplitudójú az érzékelés síkjában folyamatos szinusz hullám esetében az IEC 1793 számú kiadványban előírt tűréshatáron belül legyen.

3.3.4 Ha a berendezés dinamika tartományának korlátai szükségessé teszik, akkor a rögzítő csatornát nagy frekvenciás előkiemeléssel kell kiegészíteni és viszonzásképp lejátszása alkalmával elnyomással kell kiegészíteni. Az elő kiemelést úgy kell alkalmazni, hogy a legnagyobb mért zajjel 800 és 11200 Hz közötti részében rögzített pillanatnyi hangnyomásszint az egyharmad oktávsávok maximum és minimum szintjei között ne változzon 20 dB-nél többet.

3.3.5 A berendezést a szabad mezős kalibrálásra használatos berendezések segítségével kell akusztikusan és a 3.4 pontban rögzítettek szerint elektronikusan kalibrálni.

3.3.6 Ha a szél sebessége 11 km/h-nál (6 csomónál) nagyobb, akkor a mikrofonhoz szélárnyékolót kell alkalmazni a repülőgép zajának mérése során. A mért adatokat a szélárnyékoló által okozott veszteségek miatt, frekvencia függvényében korrigálni kell és a korrekciókat jelenteni kell.

3.4 Kiértékelő berendezés

3.4.1 Az akusztikus jel frekvenciájának elemzését a Nemzetközi Elektrotechnikai Bizottság 225-ös számú[3] kiadványában szereplő ajánlásoknak megfelelő egyharmados oktávszűrők alkalmazásával egyenértékű módon kell végrehajtani.

Megjegyzés. - A IEC 225-ös számú[3] kiadványának szövegére és leírására a jelen Függelék hivatkozik és ezért az a Függelék részét képezi[5]. Címe "Hangok és rezgések elemzésére használatos egy-oktávú, fél-oktávú és harmad-oktávú sávszűrők".

3.4.2 A mérések folyamán 24 db egymás után következő egyharmad oktávsávos szűrőt, vagy ennek megfelelő szűrőrendszert kell alkalmazni. A készlet első szűrőjét az 50 Hz-es geometriai közép frekvenciára, míg az utolsó szűrőt a 10 KHz-es geometriai közép frekvenciára kell állítani.

3.4.3 Az elemző berendezés kijelzője lehet analóg, vagy digitális, vagy e kettő kombinációja. A jel feldolgozás alábbi sorrendjét kell előnyben részesíteni:

a) Az egyharmados oktávsáv szűrő kimeneti értékeinek négyzetre emelése;

b) átlagolás, vagy integrálás; és

c) Lineárisról logaritmusosra való átalakítás.

A kijelző berendezés minimum csúcsérték tényezője 3 értékű legyen és ± 1,0 dB tűrésen belül mérje a 24 db egyharmad oktávtartomány mindegyikében az adott jel valódi négyzetgyökös középértékének szintjét (rms). Ha valódi négyzetgyök középértékűtől eltérő berendezést alkalmaznak, akkor a használatos berendezést a nem szinuszos jelekre és az időben változó jelekre kalibrálni kell. A kalibrálás nyújtson módot a kimeneti szintek tényleges rms értékekre történő átalakításra.

3.4.4 Az elemző berendezés dinamikus reakciója a skálavég kitérést, illetve a skálavég kitérítési amplitudónál 20 dB-lel kisebb bemeneti jelekre nézve tegyen eleget a következő két követelménynek:

a) A maximum kimeneti értéknek 4 dB ± 1 dB értékkel kell kevesebbnek lennie az azonos frekvenciájú és amplitudójú állandó állapot jellel kapott értéknél abban az esetben, ha a bemeneti oldalra az összes egyharmad oktávtartomány középfrekvenciáján fél másodperc időtartamú szinusz impulzust visznek fel;

b) A maximum kimeneti értéknek 0,5 ± 0,5 dB-lel meg kell haladnia a végső, állandó állapotú értéket, ha az elemző berendezés bemeneti oldalára az egyharmad oktávtartományok mindegyikének geometriai középfrekvenciáján hirtelen egy állandó állapotú szimuszos jelet visznek fel, amelyet aztán állandó szinten tartanak.

3.4.5 A 24 egyharmad oktávtartomány mindegyikére minden 0,5 ± 0,01 mp.-en belül az rms szint egy értékét kell szolgáltatni. A 24 db egyharmad oktávtartomány mindegyikére a szinteket 50 miliszekundum időtartamon belül meg kell kapni. A mérésből egyetlen 0.5 mp-es időtartam 5 miliszekundumnál hosszabb adatát sem lehet kizárni.

3.4.6 Az elemző berendezés amplitudó felbontó képességének 0,50 dB, vagy ennél kisebbnek kell lennie.

3.4.7 Miután minden rendszerhibát kiküszöböltek, az elemző készülék egyes kimeneti szintjeinek pontossága a bemeneti jelhez voszonyítva ± 1,0 dB-on belül kell hogy legyen. Az egyes kimeneti szintek teljes rendszer hibája nem haladhatja meg a ± 3 dB-t. Az egymás után következő szűrőberendezés rendszereknél a szomszédos egyharmad oktávtartomány csatornák közötti rendszerhelyesbítés nem haladhatja meg a 4 dB-t.

3.4.8 Az elemző berendezés skálavég kitérés kimeneti szintje és maximum zajszintje közötti különbség tekintetében egy légijármű-zaj-esemény megjelenítéséhez az elemző készülék dinamika tartományának képessége legalább 45 dB legyen.

3.4.9 A teljes rendszert szinuszos, vagy széles sávú jelek felhasználásával 45 - 11200 Hz tartományban lévő frekvenciákon és a mikrofon által vett jelszintek tartományát fedő ismert amplitudókon, frekvencia és amplitudó elektromos kalibrálásnak kell alávetni. Ha széles sávú jeleket alkalmaznak, akkor azokat nem túlterheléses jelszintre, átlagos és maximum rms értékek formájában kell leírni.

[3] Módosításait is beleértve

[4] Ezt a kiadványt először 1965-ben adta ki a Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.)

[5] Ezt a kiadványt először 1966-ban adta ki a Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.5 Zajmérési eljárások

3.5.1 Az összes mikrofont egy ismert irányba kell beállítani, hogy az észlelt és legnagyobb erősségű hang lehetőleg pontosan abból az irányból érkezzen, amelyre a mikrofonokat kalibrálták. A mikrofonok érzékelő elemei a földtől kb. 1,2 m (4 -láb) magasságban legyenek elhelyezve.

3.5.2 A rendszer érzékenységének ellenőrzésére és a hangszint adatok analizálására használt vonatkoztatási szint megállapítsa érdekében az összes vizsgálat előtt és után azonnal, a rendszer felvételen rögzített akusztikus kalibrálását a helyszínen akusztikus kalibráló berendezések segítségével el kell végezni.

3.5.3 A berendezés- vagy kezelő hiba minimalizálására, ahol csak lehet, a helyszíni kalibrációt illesztő feszültség módszerrel kell kiegészíteni, amellyel közvetlenül a repülőgépzaj felvétele előtt és után ismert jelek vihetők fel a mikrofon bemeneti oldalára.

3.5.4 A rendszer erősítését a repülőgépzaj méréséhez használt szintekre beállítva, a mérési területen meg kell határozni és rögzíteni kell a környezeti zajt - beleértve az akusztikai háttérzajt és a mérő rendszer elektromos zaját is. Ha a repülőgépzaj hangnyomásszintjei legalább 10 dB-lel nem haladják meg a háttéri hangnyomás szinteket bármely szignifikáns egyharmados oktáv sávban, akkor az érzékelt hangnyomásszinthez adódó háttérhangnyomásra jóváhagyott korrekciókat kell alkalmazni.

4. A TÉNYLEGESEN ÉSZLELT ZAJSZINT KISZÁMÍTÁSA A MÉRT ZAJ ADATOKBOL

4.1 Általános rész

4.1.1 A zaj vizsgálat kritériumai között az alapvető elem az EPNL Ténylegesen Érzékelt Zajszint értékmérő EPNdB egységekben kifejezve, amely a repülőgépzaj emberre kifejtett szubjektív hatásainak egyetlen számmal kifejezett értékmérője. Egyszerűen kifejezve, az EPNL a pillanatnyilag észlelt zaj szintből PNL-ből áll, amelyet a spektrális szabálytalanságra ("hangmagasság korrekciós tényező"-nek nevezett korrekció, amelyet minden időpillanatban csak a legnagyobb hangmagasságra végeznek el) és az időtartamra korrigálnak.

4.1.2 A hangnyomás három alapvető fizikai tulajsonságát kell mérni, úgy mint: a szintet, a frekvencia eloszlást és az időtartam változást. Pontosabban, a pillanatnyi hangnyomásszint megkövetelt a zaj 24 darab egyharmad oktávtartományának mindegyikében a repülőgép átrepülése folyamán minden egyes félmásodperces időnövekményre.

4.1.3 A szubjektív reakció értékmérő EPNL származtatására a zaj fizikai mérését alkalmazó számítási eljárás a következő öt lépésből álljon:

a) A hangnyomásszint 24 darab egyharmados oktávsávját a Noy táblázat használatával kell az észlelt zajosságra átszámítani.[6] A Noy értékeket kombinálása és ezek után átalakítása PNL(k) pillanatnyi észlelt zajszintre;

b) A spektrális szabálytalanság jelenlétére adott szubjektív reakcióik figyelembevételéhez minden egyes spektumra a C(k) hangmagasság korrekciós tényező kiszámítása;

c) A hangmagasság-korrekciós tényező hozzáadása az észlelt zajszinthez, hogy az időtartam minden egyes fél másodperces növekményénél megkapjuk a PNLT(k) hangmagasságra korrigált észlelt zajszinteket:

$$PNLT(k) = PNL(k) + C(k)$$

a hangmagasságra korrigált észlelt zajszint pillanatnyi értékeinek származtatása és a maximum érték (PNLTM) meghatározása;

d) A D időtartam korrekciós tényező kiszámítása a hangmagasságra korrigált észlelt zajszint / idő görbe alatti integrálás révén.

e) A maximum tartamú és a hangmagasságra korrigált észlelt zajszint és az időtartam korrekciós tényező algebrai összegzésével az EPNL ténylegesen észlelt zajszint kiszámítása:

$$EPNL = PNLTM + D$$

[6] Lásd az A1-1 Táblázatot.

A1 - 1 Táblázat - NOY ÉRTÉKEK A HANGNYOMÁSSZINT FÜGGVÉNYÉBEN
(29 < SPL < 89)

SPL (dB)	Egyharmad oktávsáv középfrekvenciák /Hz/																						
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
29																			1.00	1.00				
30																		1.00	1.07	1.07	1.00			
31																		1.07	1.15	1.15	1.07	1.00		
32																	1.00	1.15	1.23	1.23	1.15	1.07		
33																	1.07	1.23	1.32	1.32	1.23	1.15		
34																1.00	1.15	1.32	1.41	1.41	1.32	1.23		
35																1.07	1.23	1.41	1.51	1.51	1.41	1.32		
36																1.15	1.32	1.51	1.62	1.62	1.51	1.41		
37																1.23	1.41	1.62	1.74	1.74	1.62	1.51	1.00	
38															1.00	1.32	1.51	1.74	1.86	1.86	1.74	1.62	1.10	
39															1.07	1.41	1.62	1.86	1.99	1.99	1.86	1.74	1.21	
40										1.00	1.00	1.00	1.00	1.00	1.15	1.51	1.74	1.99	2.14	2.14	1.99	1.86	1.34	
41										1.07	1.07	1.07	1.07	1.07	1.23	1.62	1.86	2.14	2.29	2.29	2.14	1.99	1.48	1.00
42									1.00	1.15	1.15	1.15	1.15	1.15	1.32	1.74	1.99	2.29	2.45	2.45	2.29	2.14	1.63	1.10
43									1.07	1.23	1.23	1.23	1.23	1.23	1.41	1.86	2.14	2.45	2.63	2.63	2.45	2.29	1.79	1.21
44								1.00	1.15	1.32	1.32	1.32	1.32	1.32	1.52	1.99	2.29	2.63	2.81	2.81	2.63	2.45	1.99	1.34
45								1.08	1.24	1.41	1.41	1.41	1.41	1.41	1.62	2.14	2.45	2.81	3.02	3.02	2.81	2.63	2.14	1.48
46							1.00	1.16	1.33	1.52	1.52	1.52	1.52	1.52	1.74	2.29	2.63	3.02	3.23	3.23	3.02	2.81	2.29	1.63
47							1.08	1.25	1.42	1.62	1.62	1.62	1.62	1.62	1.87	2.45	2.81	3.23	3.46	3.46	3.23	3.02	2.45	1.79
48						1.00	1.17	1.34	1.53	1.74	1.74	1.74	1.74	1.74	2.00	2.63	3.02	3.46	3.71	3.71	3.46	3.23	2.63	1.98
49						1.08	1.26	1.45	1.64	1.87	1.87	1.87	1.87	1.87	2.14	2.81	3.23	3.71	3.97	3.97	3.71	3.46	2.81	2.15
50						1.17	1.36	1.56	1.76	2.00	2.00	2.00	2.00	2.00	2.30	3.02	3.46	3.97	4.26	4.26	3.97	3.71	3.02	2.40
51					1.00	1.26	1.47	1.68	1.89	2.14	2.14	2.14	2.14	2.14	2.46	3.23	3.71	4.26	4.56	4.56	4.26	3.97	3.23	2.63
52					1.08	1.36	1.58	1.80	2.03	2.30	2.30	2.30	2.30	2.30	2.64	3.46	3.97	4.56	4.89	4.89	4.56	4.26	3.46	2.81
53				1.00	1.18	1.47	1.71	1.94	2.17	2.46	2.46	2.46	2.46	2.46	2.83	3.71	4.26	4.89	5.24	5.24	4.89	4.56	3.71	3.02
54				1.09	1.28	1.58	1.85	2.09	2.33	2.64	2.64	2.64	2.64	2.64	3.03	3.97	4.56	5.24	5.61	5.61	5.24	4.89	3.97	3.23
55				1.18	1.38	1.71	2.00	2.25	2.50	2.83	2.83	2.83	2.83	2.83	3.25	4.26	4.89	5.61	6.01	6.01	5.61	5.24	4.26	3.46
56			1.00	1.29	1.50	1.85	2.15	2.42	2.69	3.03	3.03	3.03	3.03	3.03	3.48	4.56	5.24	6.01	6.44	6.44	6.01	5.61	4.56	3.71
57			1.09	1.40	1.63	2.00	2.33	2.61	2.88	3.25	3.25	3.25	3.25	3.25	3.73	4.89	5.61	6.44	6.90	6.90	6.44	6.01	4.89	3.97
58			1.18	1.53	1.77	2.15	2.51	2.81	3.10	3.48	3.48	3.48	3.48	3.48	4.00	5.24	6.01	6.90	7.39	7.39	6.90	6.44	5.24	4.26
59			1.29	1.66	1.92	2.33	2.71	3.03	3.32	3.73	3.73	3.73	3.73	3.73	4.29	5.61	6.44	7.39	7.92	7.92	7.39	6.90	5.61	4.56
60		1.00	1.40	1.81	2.08	2.51	2.93	3.26	3.57	4.00	4.00	4.00	4.00	4.00	4.59	6.01	6.90	7.92	8.49	8.49	7.92	7.39	6.01	4.89
61		1.10	1.53	1.97	2.26	2.71	3.16	3.51	3.83	4.29	4.29	4.29	4.29	4.29	4.92	6.44	7.39	8.49	9.09	9.09	8.49	7.92	6.44	5.24
62		1.21	1.66	2.15	2.45	2.93	3.41	3.78	4.11	4.59	4.59	4.59	4.59	4.59	5.28	6.90	7.92	9.09	9.74	9.74	9.09	8.49	6.90	5.61
63		1.32	1.81	2.34	2.65	3.16	3.69	4.06	4.41	4.92	4.92	4.92	4.92	4.92	5.66	7.39	8.49	9.74	10.4	10.4	9.74	9.09	7.39	6.01
64	1.00	1.45	1.97	2.54	2.88	3.41	3.98	4.38	4.73	5.28	5.28	5.28	5.28	5.28	6.06	7.92	9.09	10.4	11.2	11.2	10.4	9.74	7.92	6.44
65	1.11	1.60	2.15	2.77	3.12	3.69	4.30	4.71	5.08	5.66	5.66	5.66	5.66	5.66	6.50	8.49	9.74	11.2	12.0	12.0	11.2	10.4	8.49	6.90
66	1.22	1.75	2.34	3.01	3.39	3.98	4.64	5.07	5.45	6.06	6.06	6.06	6.06	6.06	6.96	9.09	10.4	12.0	12.8	12.8	12.0	11.2	9.09	7.39
67	1.35	1.92	2.54	3.28	3.68	4.30	5.01	5.46	5.85	6.50	6.50	6.50	6.50	6.50	7.46	9.74	11.2	12.8	13.8	13.8	12.8	12.0	9.74	7.92
68	1.49	2.11	2.77	3.57	3.99	4.64	5.41	5.88	6.27	6.96	6.96	6.96	6.96	6.96	8.00	10.4	12.0	13.8	14.7	14.7	13.8	12.8	10.4	8.49
69	1.65	2.32	3.01	3.88	4.33	5.01	5.84	6.33	6.73	7.46	7.46	7.46	7.46	7.46	8.57	11.2	12.8	14.7	15.8	15.8	14.7	13.8	11.2	9.09
70	1.82	2.55	3.28	4.23	4.69	5.41	6.31	6.81	7.23	8.00	8.00	8.00	8.00	8.00	9.19	12.0	13.8	15.8	16.9	16.9	15.8	14.7	12.0	9.74
71	2.02	2.79	3.57	4.60	5.09	5.84	6.81	7.33	7.75	8.57	8.57	8.57	8.57	8.57	9.85	12.8	14.7	16.9	18.1	18.1	16.9	15.8	12.8	10.4
72	2.23	3.07	3.88	5.01	5.52	6.31	7.36	7.90	8.32	9.19	9.19	9.19	9.19	9.19	10.6	13.8	15.8	18.1	19.4	19.4	18.1	16.9	13.8	11.2
73	2.46	3.37	4.23	5.45	5.99	6.81	7.94	8.50	8.93	9.85	9.85	9.85	9.85	9.85	11.3	14.7	16.9	19.4	20.8	20.8	19.4	18.1	14.7	12.0
74	2.72	3.70	4.60	5.94	6.50	7.36	8.57	9.15	9.59	10.6	10.6	10.6	10.6	10.6	12.1	15.8	18.1	20.8	22.3	22.3	20.8	19.4	15.8	12.8
75	3.01	4.06	5.01	6.46	7.05	7.94	9.19	9.85	10.3	11.3	11.3	11.3	11.3	11.3	13.0	16.9	19.4	22.3	23.9	23.9	22.3	20.8	16.9	13.8
76	3.32	4.46	5.45	7.03	7.65	8.57	9.85	10.6	11.0	12.1	12.1	12.1	12.1	12.1	13.9	18.1	20.8	23.9	25.6	25.6	23.9	22.3	18.1	14.7
77	3.67	4.89	5.94	7.66	8.29	9.19	10.6	11.3	11.8	13.0	13.0	13.0	13.0	13.0	14.9	19.4	22.3	25.6	27.4	27.4	25.6	23.9	19.4	15.8
78	4.06	5.37	6.46	8.33	9.00	9.85	11.3	12.1	12.7	13.9	13.9	13.9	13.9	13.9	16.0	20.8	23.9	27.4	29.4	29.4	27.4	25.6	20.8	16.9
79	4.49	5.90	7.03	9.07	9.76	10.6	12.1	13.0	13.6	14.9	14.9	14.9	14.9	14.9	17.1	22.3	25.6	29.4	31.5	31.5	29.4	27.4	22.3	18.1
80	4.96	6.48	7.66	9.85	10.6	11.3	13.0	13.9	14.6	16.0	16.0	16.0	16.0	16.0	18.4	23.9	27.4	31.5	33.7	33.7	31.5	29.4	23.9	19.4
81	5.48	7.11	8.33	10.6	11.3	12.1	13.9	14.9	15.7	17.1	17.1	17.1	17.1	17.1	19.7	25.6	29.4	33.7	36.1	36.1	33.7	31.5	25.6	20.8
82	6.06	7.81	9.07	11.3	12.1	13.0	14.9	16.0	16.9	18.4	18.4	18.4	18.4	18.4	21.1	27.4	31.5	36.1	38.7	38.7	36.1	33.7	27.4	22.3
83	6.70	8.67	9.87	12.1	13.0	13.9	16.0	17.1	18.1	19.7	19.7	19.7	19.7	19.7	22.6	29.4	33.7	38.7	41.5	41.5	38.7	36.1	29.4	23.9
84	7.41	9.41	10.7	13.0	13.9	14.9	17.1	18.4	19.4	21.1	21.1	21.1	21.1	21.1	24.3	31.5	36.1	41.5	44.4	44.4	41.5	38.7	31.5	25.6
85	8.19	10.3	11.7	13.9	14.9	16.0	18.4	19.7	20.8	22.6	22.6	22.6	22.6	22.6	26.0	33.7	38.7	44.4	47.6	47.6	44.4	41.5	33.7	27.4
86	9.05	11.3	12.7	14.9	16.0	17.1	19.7	21.1	22.4	24.3	24.3	24.3	24.3	24.3	27.9	36.1	41.5	47.6	51.0	51.0	47.6	44.4	36.1	29.4
87	10.0	12.1	13.9	16.0	17.1	18.4	21.1	22.6	24.0	26.0	26.0	26.0	26.0	26.0	29.9	38.7	44.4	51.0	54.7	54.7	51.0	47.6	38.7	31.5
88	11.1	13.0	14.9	17.1	18.4	19.7	22.6	24.3	25.8	27.9	27.9	27.9	27.9	27.9	32.0	41.5	47.6	54.7	58.6	58.6	54.7	51.0	41.5	33.7
89	12.2	13.9	16.0	18.4	19.7	21.1	24.3	26.0	27.7	29.9	29.9	29.9	29.9	29.9	34.3	44.4	51.0	58.6	62.7	62.7	58.6	54.7	44.4	36.1

A1 - 1 Táblázat - NOY ÉRTÉKEK A HANGNYOMÁSSZINT FÜGGVÉNYÉBEN
(folytatás)
(90 < SPL <150)

SPL	Egyharmad oktávsáv középfrekvenciák /Hz/																						
(dB)	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
90	13.5	14.9	17.1	19.7	21.1	22.6	26.0	27.9	29.7	32.0	32.0	32.0	32.0	32.0	36.8	47.6	54.7	62.7	67.2	67.2	62.7	58.6	47.6	38.7
91	14.9	16.0	18.4	21.1	22.6	24.3	27.9	29.9	31.8	34.3	34.3	34.3	34.3	34.3	39.4	51.0	58.6	67.2	72.0	72.0	67.2	62.7	51.0	41.5
92	16.0	17.1	19.7	22.6	24.3	26.0	29.9	32.0	34.2	36.8	36.8	36.8	36.8	36.8	42.2	54.7	62.7	72.0	77.2	77.2	72.0	67.2	54.7	44.4
93	17.1	18.4	21.1	24.3	26.0	27.9	32.0	34.3	36.7	39.4	39.4	39.4	39.4	39.4	45.3	58.6	67.2	77.2	82.7	82.7	77.2	72.0	58.6	47.6
94	18.4	19.7	22.6	26.0	27.9	29.9	34.3	36.8	39.4	42.2	42.2	42.2	42.2	42.2	48.5	62.7	72.0	82.7	88.6	88.6	82.7	77.2	62.7	51.0
95	19.7	21.1	24.3	27.9	29.9	32.0	36.8	39.4	42.2	45.3	45.3	45.3	45.3	45.3	52.0	67.2	77.2	88.6	94.9	94.9	88.6	82.7	67.2	54.7
96	21.1	22.6	26.0	29.9	32.0	34.3	39.4	42.2	45.3	48.5	48.5	48.5	48.5	48.5	55.7	72.0	82.7	94.9	102	102	94.9	88.6	72.0	58.6
97	22.6	24.3	27.9	32.0	34.3	36.8	42.2	45.3	48.5	52.0	52.0	52.0	52.0	52.0	59.7	77.2	88.6	102	109	109	102	94.9	77.2	62.7
98	24.3	26.0	29.9	34.3	36.8	39.4	45.3	48.5	52.0	55.7	55.7	55.7	55.7	55.7	64.0	82.7	94.9	109	117	117	109	102	82.7	67.2
99	26.0	27.9	32.0	36.8	39.4	42.2	48.5	52.0	55.7	59.7	59.7	59.7	59.7	59.7	68.6	88.6	102	117	125	125	117	109	88.6	72.0
100	27.9	29.9	34.3	39.4	42.2	45.3	52.0	55.7	59.7	64.0	64.0	64.0	64.0	64.0	73.5	94.9	109	125	134	134	125	117	94.9	77.2
101	29.9	32.0	36.8	42.2	45.3	48.5	55.7	59.7	64.0	68.6	68.6	68.6	68.6	68.6	78.8	102	117	134	144	144	134	125	102	82.7
102	32.0	34.3	39.4	45.3	48.5	52.0	59.7	64.0	68.6	73.5	73.5	73.5	73.5	73.5	84.4	109	125	144	154	154	144	134	109	88.6
103	34.3	36.8	42.2	48.5	52.0	55.7	64.0	68.6	73.5	78.8	78.8	78.8	78.8	78.8	90.5	117	134	154	165	165	154	144	117	94.9
104	36.8	39.4	45.3	52.0	55.7	59.7	68.6	73.5	78.8	84.4	84.4	84.4	84.4	84.4	97.0	125	144	165	177	177	165	154	125	102
105	39.4	42.2	48.5	55.7	59.7	64.0	73.5	78.8	84.4	90.5	90.5	90.5	90.5	90.5	104	134	154	177	189	189	177	165	134	109
106	42.2	45.3	52.0	59.7	64.0	68.6	78.8	84.4	90.5	97.0	97.0	97.0	97.0	97.0	111	144	165	189	203	203	189	177	144	117
107	45.3	48.5	55.7	64.0	68.6	73.5	84.4	90.5	97.0	104	104	104	104	104	119	154	177	203	217	217	203	189	154	125
108	48.5	52.0	59.7	68.6	73.5	78.8	90.5	97.0	104	111	111	111	111	111	128	165	189	217	233	233	217	203	165	134
109	52.0	55.7	64.0	73.5	78.8	84.4	97.0	104	111	119	119	119	119	119	137	177	203	233	249	249	233	217	177	144
110	55.7	59.7	68.6	78.8	84.4	90.5	104	111	119	128	128	128	128	128	147	189	217	249	267	267	249	233	189	154
111	59.7	64.0	73.5	84.4	90.5	97.0	111	119	128	137	137	137	137	137	158	203	233	267	286	286	267	249	203	165
112	64.0	68.6	78.8	90.5	97.0	104	119	128	137	147	147	147	147	147	169	217	249	286	307	307	286	267	217	177
113	68.6	73.5	84.4	97.0	104	111	128	137	147	158	158	158	158	158	181	233	267	307	329	329	307	286	233	189
114	73.5	78.8	90.5	104	111	119	137	147	158	169	169	169	169	169	194	249	286	329	352	352	329	307	249	203
115	78.8	84.4	97.0	111	119	128	147	158	169	181	181	181	181	181	208	267	307	352	377	377	352	329	267	217
116	84.4	90.5	104	119	128	137	158	169	181	194	194	194	194	194	223	286	329	377	404	404	377	352	286	233
117	90.5	97.0	111	128	137	147	169	181	194	208	208	208	208	208	239	307	352	404	433	433	404	377	307	249
118	97.0	104	119	137	147	158	181	194	208	223	223	223	223	223	256	329	377	433	464	464	433	404	329	267
119	104	111	128	147	158	169	194	208	223	239	239	239	239	239	274	352	404	464	497	497	464	433	352	286
120	111	119	137	158	169	181	208	223	239	256	256	256	256	256	294	377	433	497	533	533	497	464	377	307
121	119	128	147	169	181	194	223	239	256	274	274	274	274	274	315	404	464	533	571	571	533	497	404	329
122	128	137	158	181	194	208	239	256	274	294	294	294	294	294	338	433	497	571	611	611	571	533	433	352
123	137	147	169	194	208	223	256	274	294	315	315	315	315	315	362	464	533	611	655	655	611	571	464	377
124	147	158	181	208	223	239	274	294	315	338	338	338	338	338	388	497	571	655	702	702	655	611	497	404
125	158	169	194	223	239	256	294	315	338	362	362	362	362	362	416	533	611	702	752	752	702	655	533	433
126	169	181	208	239	256	274	315	338	362	388	388	388	388	388	446	571	655	752	806	806	752	702	571	464
127	181	194	223	256	274	294	338	362	388	416	416	416	416	416	478	611	702	806	863	863	806	752	611	497
128	194	208	239	274	294	315	362	388	416	446	446	446	446	446	512	655	752	863	925	925	863	806	655	533
129	208	223	256	294	315	338	388	416	446	478	478	478	478	478	549	702	806	925	991	991	925	863	702	571
130	223	239	274	315	338	362	416	446	478	512	512	512	512	512	588	752	863	991	1062	1062	991	925	752	611
131	239	256	294	338	362	388	446	478	512	549	549	549	549	549	630	806	925	1062	1137	1137	1062	991	806	655
132	256	274	315	362	388	416	478	512	549	588	588	588	588	588	676	863	991	1137	1219	1219	1137	1062	863	702
133	274	294	338	388	416	446	512	549	588	630	630	630	630	630	724	925	1062	1219	1306	1306	1219	1137	925	752
134	294	315	362	416	446	478	549	588	630	676	676	676	676	676	776	991	1137	1306	1399	1399	1306	1219	991	806
135	315	338	388	446	478	512	588	630	676	724	724	724	724	724	832	1062	1219	1399	1499	1499	1399	1306	1062	863
136	338	362	416	478	512	549	630	676	724	776	776	776	776	776	891	1137	1306	1499	1606	1606	1499	1399	1137	925
137	362	388	446	512	549	588	676	724	776	832	832	832	832	832	955	1219	1399	1606	1721	1721	1606	1499	1219	991
138	388	416	478	549	588	630	724	776	832	891	891	891	891	891	1024	1306	1499	1721	1844	1844	1721	1606	1306	1062
139	416	446	512	588	630	676	776	832	891	955	955	955	955	955	1098	1399	1606	1844	1975	1975	1844	1721	1399	1137
140	446	478	549	630	676	724	832	891	955	1024	1024	1024	1024	1024	1176	1499	1721	1975			1975	1844	1499	1219
141	478	512	588	676	724	776	891	955	1024	1098	1098	1098	1098	1098	1261	1606	1844					1975	1606	1306
142	512	549	630	724	776	832	995	1024	1098	1176	1176	1176	1176	1176	1351	1721	1975						1721	1399
143	549	588	676	776	832	891	1024	1098	1176	1261	1261	1261	1261	1261	1448	1844							1844	1499
144	588	630	724	832	891	955	1098	1176	1261	1351	1351	1351	1351	1351	1552	1975							1975	1606
145	630	676	776	891	955	1024	1176	1261	1351	1448	1448	1448	1448	1448	1664									1721
146	676	724	832	955	1024	1098	1261	1351	1448	1552	1552	1552	1552	1552	1783									1844
147	724	776	891	1024	1098	1176	1351	1448	1552	1664	1664	1664	1664	1664	1911									1975
148	776	832	955	1098	1176	1261	1448	1552	1664	1783	1783	1783	1783	1783	2048									
149	832	891	1024	1176	1261	1351	1552	1664	1783	1911	1911	1911	1911	1911										
150	891	955	1098	1261	1351	1448	1664	1783	1911	2048	2048	2048	2048	2048										

4.2 Észlelt zajszint

Az SPL (i,k) pillanatnyi egyharmad oktávsáv hangnyomás szintekből az alábbi módon kell kiszámítani a PNL(k) pillanatnyi észlelt zajszintet;

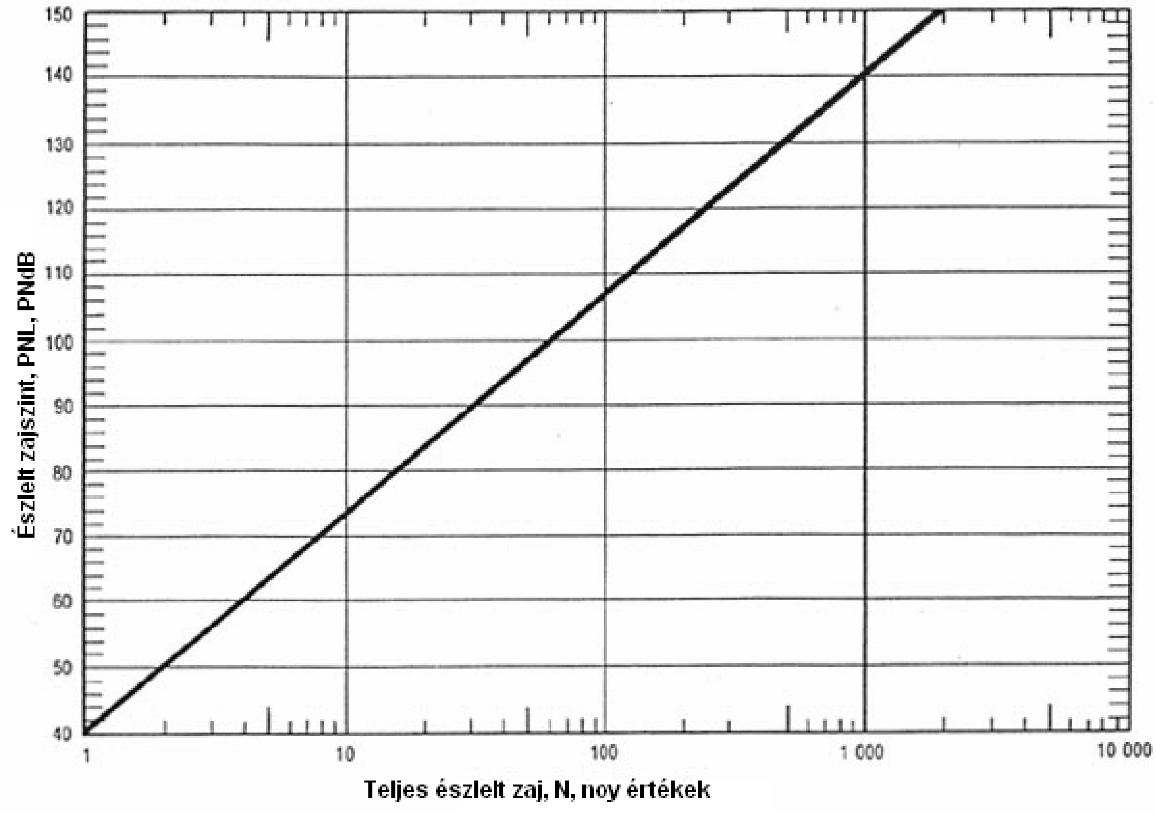
1. Lépés. Számítsa át 50 Hz és 10000 Hz között az összes egyharmad oktávsáv SPL(i,k)-t n(i,k) észlelt zajosságra az A1-1 sz. táblázat használatával, vagy a Noy táblázat 7. szakaszban megadott matematikai összefüggései alapján;

2. Lépés. Az 1. lépésben kapott n (i, k) észlelt zajértéket vonja össze a következő képlet segítségével:

$$N(k) = n(k) + 0{,}15 \left\{ \left[\sum_{i=1}^{24} n(i,k) \right] - n(k) \right\}$$

$$= 0{,}85\, n(k) + 0{,}15 \left[\sum_{i=1}^{24} n(i,k) \right]$$

ahol n(k) az n (i,k) 24 különböző értékéből a legnagyobb és N(k) a teljes észlelt zajosság.



A1-1. ÁBRA: AZ ÉSZLELT ZAJSZINT A TELJES ÉSZLELT ZAJ FÜGGVÉNYÉBEN

3. Lépés. A következő képlet segítségével számítsa át az N(k) teljes észlelt zajosságot PNL(k) észlelt zajszintre:

$$PNL(k) = 40{,}0 + \frac{10}{\log 2} \log N(k)$$

amelyet az A1-1 ábra vázol. PNL(k) értéke megkapható úgy is, hogy az A1-1 táblázat 1000 Hz oszlopában kiválasztja az N(k) értéket és utána leolvassa az ennek megfelelő SPL (i,k) értéket; ez 1000 Hz-nél a PNL (k)-val egyenlő.

4.3 A spektrális szabálytalanságok korrigálása

A jelentős spektrális szabálytalansággal rendelkező zajokat (pl. maximális diszkrét frekvencia komponenseket, vagy hangokat) C(k) korrekciós tényezővel kell korrigálni, amelyet a következőképpen kell számítani:

1. Lépés. A 80 Hz-es egyharmad oktávsávban lévő korrigált hangnyomásszinttel kezdve (harmadik számú sáv) számítsa ki a hangnyomásszint változásait (vagy "meredekségeket") a fennmaradó harmad oktáv sávokban a következő módon:

s (3, k) = nincs érték

s (4, k) = SPL (4, k) - SPL (3, k)

.
.
.
s (i, k) = SPL (i, k) - SPL [(i - 1),k]

.
.
.
s (24, k) = SPL (24, k) - SPL (23, k)

2. Lépés. Karikázza be a meredekség s(i,k) azon értékeit, ahol a meredekség változás abszolút értéke 5-nél nagyobb, vagyis ahol :

$$|\Delta s(i,k)| = |s(i,k) - [s\ (i-1),k]| > 5$$

3. Lépés.

a) Ha a meredekség bekarikázott s(i,k) értéke pozitív és algebrai értelemben nagyobb, mint az s[(i - 1) ,k] meredekség, karikázza be az SPL (i, k)-t.

b) Ha a meredekség bekarikázott s(i,k) értéke 0 vagy negatív szám, és az s[(i - 1),k] meredekség pozotív, akkor karikázza be az SPL[(i - 1),k]-t.

c) Az összes többi esetben nem kell bekarikázni a hangnyomásszint értékeket.

4. Lépés. Hagyja el a harmadik lépésben bekarikázott összes SPL (i,k)-t; és számítson új helyesbített SPL'(i,k) hangszomásszinteket a következő módon:

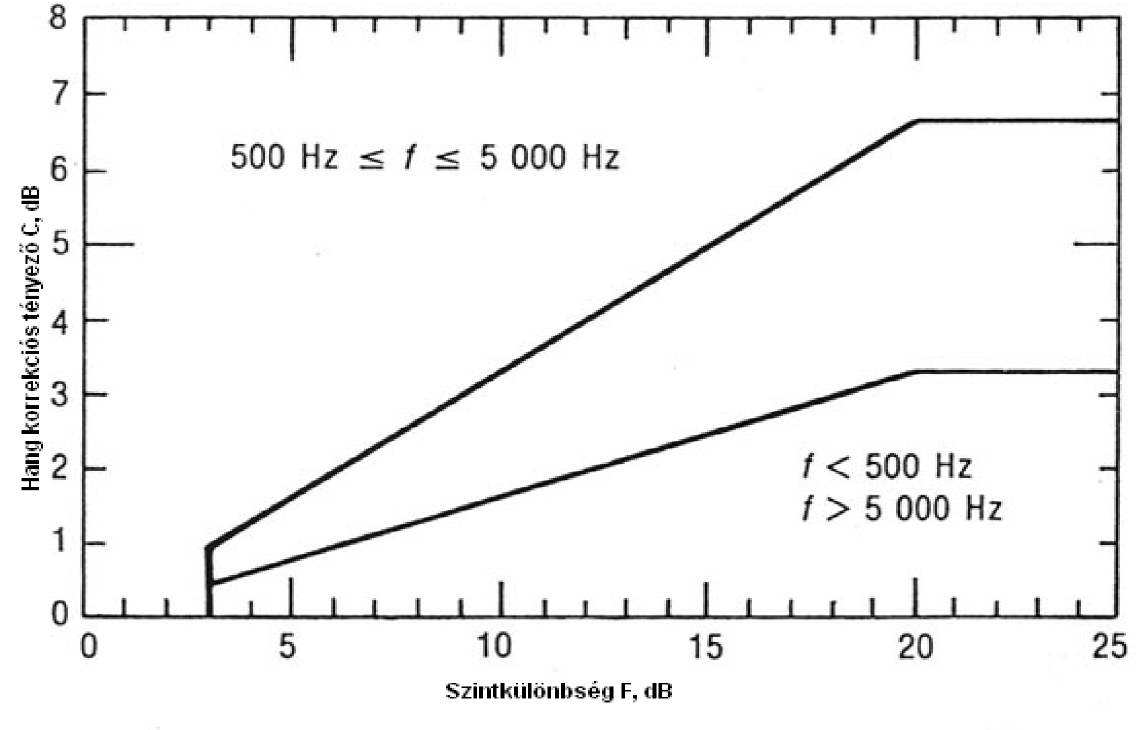
a) A nem bekarikázott hangnyomásszinteknél az új hangnyomásszintek legyenek egyenlőek az eredeti hangnyomásszintekkel, azaz SPL' (i, k) = SPL (i, k).

b) Az 1 és a 23 közötti sávokban lévő bekarikázott hangnyomásszinteknél az új hangnyomásszint legyen egyenlő az azt megelőző, és az azt követő hangnyomásszintek aritmetikai átlagával:

c) Ha a legmagasabb frekvenciasávban (i = 24) a hangnyomásszintet bekarikázta, akkor ebben a sávban az új hangnyomásszint legyen egyenlő a következővel:

SPL' (24, k) = SPL (23 , k) + s (23 , k)

A1-2. Táblázat: Hang korrekciós tényezők



Frekvencia f, Hz	Szintkülönbség F, dB	Hang korrekció C, dB
$50 \leq f < 500$	$3^{*} \leq F < 20$	$F/6$
	$20 \leq F$	$3^{1}/_{3}$
$500 \leq f \leq 5000$	$3^{*}\ F < 20$	$F/3$
	$20 \leq F$	$6^{2}/_{3}$
$5000 < f \leq 10000$	$3^{*} \leq F < 20$	$F/6$
	$20 \leq F$	$3^{1}/_{3}$

5. *Lépés.* Számoljon új s'(i,k) meredekségeket, amely tartalmaz egy képzeletbeli 25. sávra történő számítást is a következők szerint:

s' (3,k) = s' (4,k)
s' (4,k) = SPL' (4,k) - SPL' (3,k)
.
.
s' (i,k) = SPL' (i,k) - SPL'[(i - 1), k]
.
.
s' (24, k) = SPL'(24,k) - SPL'(23, k)
s' (25,k) = s'(24,k)

6. *Lépés.* A 3 - 23 i értékekre számítsa ki a három szomszédos meredekség aritmetikai középértékét a következők szerint:

s(i,k) = (1/3){s'(i,k)+s'[(i + 1),k]+ s'[(i+2),k]}

[*] Lásd 4.3 8. lépés.

7. *Lépés.* Számítsa ki az SPL"(i,k) végső egyharmad oktávsáv háttéri hangnyomásszinteket, kezdve a hármas számú sávval egészen a 24. sávig a következők szerint:

$$SPL''(3,k) = SPL(3,k)$$
$$SPL''(4,k) = SPL''(3,k) + \bar{s}(3,k)$$
$$.$$
$$.$$
$$SPL''(i,k) = SPL''[(i-1),k] + \bar{s}(i-1),k]$$
$$.$$
$$.$$
$$SPL''(24,k) = SPL'(23,k) + \bar{s}(23,k)$$

8. Lépés. Számítsa ki az eredeti hangnyomásszint és a végső háttér - hangnyomásszint közötti F (i,k) különbségeket a következők szerint:

$$F(i,k) = SPL(i,k) - SPL''(i,k)$$

és csak a háromnál nagyobb, vagy azzal egyenlő értékeket jegyezze meg

9. *Lépés*. A vonatkozó egyharmad oktávsávok mindegyikére (3-24) határozza meg az F (i,k) hangnyomásszint különbségekből és az A1-2 táblázatból a hangmagasság korrekciós tényezőket.

10. *Lépés.* Jelölje C(k)-val a 9. lépésben meghatározott hangmagasság korrekciós tényezők közül a legnagyobbat. Az A1-3 táblázatban példát mutatunk be a hangmagasság korrekciós eljárásra.
A hangmagasságra korrigált PNLT(k) észlelt zajszinteket a C(k) értékeket a megfelelő PNL(k) értékekkel összeadva kell meghatározni, azaz:

$$PNLT(k) = PNL(k) + C(k)$$

Egy oktáv egyharmadánál keskenyebb sávszélességű szűrővel további elemzést kell végezni bármely i-edik egyharmad oktávsávnál az idő bármely k-adik növekménynél, amelynél a korrekciós együtthatóról feltételezhető, hogy egy ténylegestől eltérő (vagy ahhoz hozzáadódó) hangszintből (vagy repülőgépzajtól különböző spektrál szabálytalanságból) ered. Ha a keskeny sáv elemzés alátámasztja ezeket a feltételezéseket, akkor a keskeny sáv analízisből kell meghatározni az SPL"(i,k) háttéri hangnyomásszint módosított értéket és ezt kell alkalmazni ezen egyharmad oktávsávra vonatkozó módosított hangmagasság korrekciós tényező kiszámításához.

4.4 Hangmagasságra korrigált legnagyobb észlelt zajszint

4.4.1 A PNLTM hangmagasságra korrigált legnagyobb észlelt zajszintnek a PNLT(k) hangmagasságra korrigált észlelt zajszint legnagyobb számított értékét kell venni. Ezt az értéket a 4.3 pontban közöltek szerint kell kiszámítani. Ahhoz, hogy kielégítő időtartamú azonosítható zajlefolyást nyerjünk, a méréseket fél másodpercenként kell elvégezni.

Megjegyzés.- Az A1-2 ábra egy olyan átrepülési zajlefolyási példát mutat, ahol a maximális zaj világosan látszik.

4.4.2 Ha a spektrumban még keskenysáv analízissel vizsgálva sincsennek hangsúlyozott szabálytalanságok, akkor a 4.3 pont alatt feltüntetett eljárást ki kell hagyni, mivel a PNLT(k) érték lényegében egyenlő a PNL(k) értékkel. Ebben az esetben a PNLTM érték legyen a PNL(k) legnagyobb értéke és egyeznie kell PNLM-el.

4.5 Időtartam korrekció

4.5.1 Az integrálással meghatározott D időtartam korrekciós tényezőt az alábbi kifejezéssel lehet definiálni:

$$D = 10 \log \left[\left(\frac{1}{T} \right) \int \frac{(2)}{t(1)} \text{antilog} \frac{\text{PNLT}}{10} \, dt \right] - \text{PNLTM}$$

ahol a T a normalizáló időállandó és a PNLTM a PNLT maximális értéke.

4.5.1.1 Ha a PNLTM több, mint 100 TPNdB, akkor t(1) legyen az első olyan időpont, amely után PNLT nagyobb, mint a PNLTM - 10; t(2) legyen az az időpont, amely után PNLT folyamatosan kisebb marad, mint a PNLT -10.

4.5.1.2 Ha a PNLT kisebb, mint 100 TPNdB, akkor t(1) legyen az az első időpont, amely után PNLT nagyobb lesz, mint 90 TPNdB és t(2) lesz az az időpont, amely után a PNLT folyamatosan kisebb marad, mint 90 TPNdB.

4.5.1.3 Ha PNLTM kisebb, mint 90 TPNdB, akkor az időtartam korrekciót nulla értékűnek kell venni.

4.5.2 Mivel a PNLT-t az SPL mért értékeiből számítjuk ki, általában nem kapunk az idő függvényében explicit egyenletet a PNLT-re. Ezért az egyenletet át kell írni, integrál jel helyett összegezési jelet alkalmazva a következőképpen:

$$D = 10 \log \left[\left(\frac{1}{T} \right) \sum_{k=0}^{d/\Delta t} \Delta t \cdot \text{antilog} \frac{\text{PNLT (k)}}{10} \right] - \text{PNLTM}$$

ahol, a Δt az idő egyforma növekményeinek az a hosszúsága, amelyre a PNLT(k) -t kiszámítottuk; a d érték a legközelebbi 1,0 másodpercig azon időintervallum, amely alatt a PNLT(k) nagyobb, vagy egyenlő marad PNLTM - 10 értékkel, vagy a 90 értékkel, megegyezően a fenti 4.5.1.1-től a 4.5.1.3 -ig terjedő pontokban leírtakkal.

A1 - 3. Táblázat. Hangmagasság korrigálás számítási példa egy légcsavaros-gázturbinás hajtóműre.

1	2	3	4	5	6	7	8	9	10	11
Band (*i*)	*f* Hz	SPL dB	S dB Step 1	1ΔS1 dB Step 2	SPL′ dB Step 4	S′ dB Step 5	$\bar{S}$ dB Step 6	SPL″ dB Step 7	*F* dB Step 8	*C* dB Step 9
1	50	—	—	—	—	—	—	—	—	—
2	63	—	—	—	—	—	—	—	—	—
3	80	70	—	—	70	−8	−2⅓	70	—	
4	100	62	−8	—	62	−8	+3⅓	67⅔	—	
5	125	70	+8	16	71	+9	+6⅔	71	—	
6	160	80	+10	2	80	+9	+2⅔	77⅔	—	
7	200	82	+2	8	82	+2	−1⅓	80⅓	—	
8	250	83	+1	1	79	−3	−1⅓	79	4	⅔
9	315	76	−7	8	76	−3	+⅓	77⅔	—	
10	400	80	+4	11	78	+2	+1	78	—	
11	500	80	0	4	80	+2	0	79	—	
12	630	79	−1	1	79	−1	0	79	—	
13	800	78	−1	0	78	−1	−⅓	79	—	
14	1 000	80	+2	3	80	+2	−⅔	78⅔	—	
15	1 250	78	−2	4	78	−2	−⅓	78	—	
16	1 600	76	−2	0	76	−2	+⅓	77⅔	—	
17	2 000	79	+3	5	79	+3	+1	78	—	
18	2 500	85	+6	3	79	0	−⅓	79	6	2
19	3 150	79	−6	12	79	0	−2⅔	78⅔	—	
20	4 000	78	−1	5	78	−1	−6⅓	76	—	
21	5 000	71	−7	6	71	−7	−8	69⅔	—	
22	6 300	60	−11	4	60	−11	−8⅔	61⅔	—	
23	8 000	54	−6	5	54	−6	−8	53	—	
24	10 000	45	−9	3	45	−9	—	45	—	
						−9				

Step 1	3(*i*) — 3(*i*−1)
Step 2	|4(*i*) — 4(*i*−1)|
Step 3	lásd az utasítást
Step 4	lásd az utasítást
Step 5	6(*i*) — 6(*i*−1)

Step 6	[7(*i*)+7(*i*+1)+ +7(*i*+2)]÷3
Step 7	9(*i*−1)+8(*i*−1)
Step 8	3(*i*) — 9(*i*)
Step 9	lásd az A1-2 táblázatot

4.5.3 Az észlelt zajszint kielégítő időbeli lefolyásának kinyeréséhez a következőket kell használni:

a) Δt-re fél másodperces időközöket, vagy

b) jóváhagyott határokkal és állandóval rendelkező rövidebb időközöket.

4.5.4 D érték 4.5.2 pontban megadottak szerinti számításához a T-re és a Δt-re a következő értékeket kell használni:

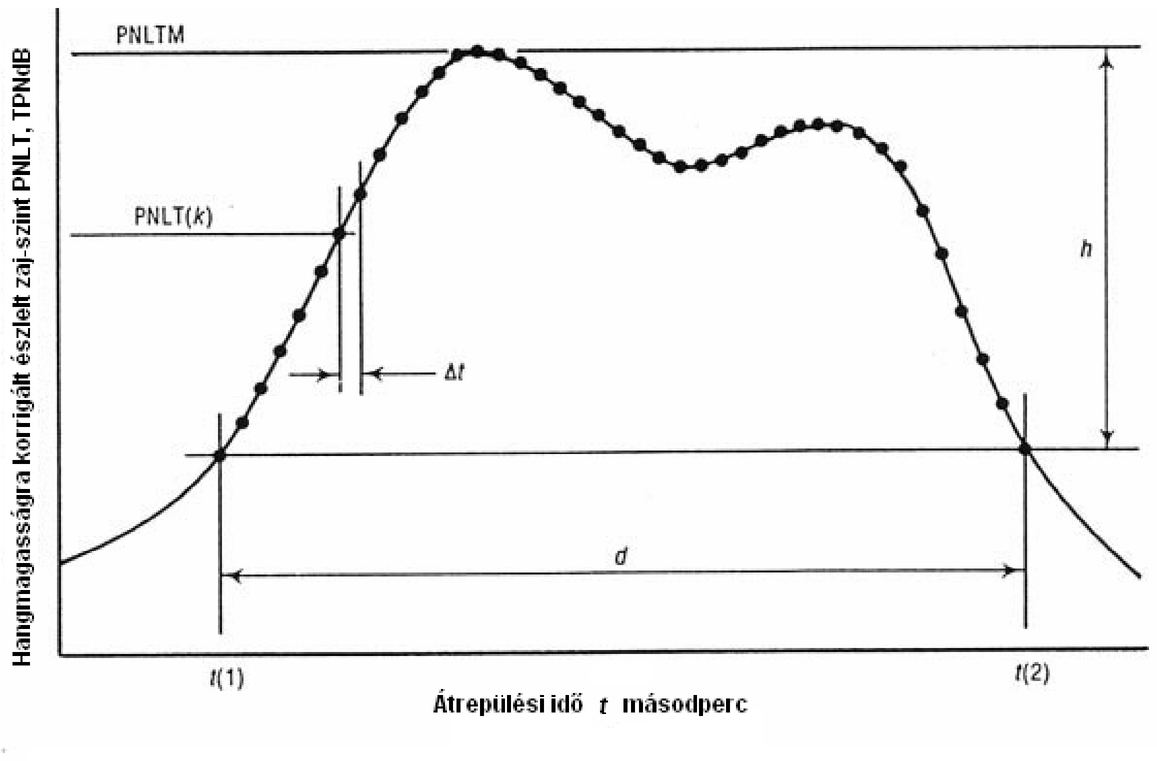
$$T = 10 \text{ mp és}$$
$$\Delta t = 0{,}5 \text{ mp}$$

A fenti értékek használatával D meghatározásának egyenlete a következő lesz:

$$D = 10 \log \left[\sum_{k=0}^{2d} \operatorname{antilog} \frac{PNLT\,(k)}{10} \right] - PNLTM - 13$$

ahol a d egész szám (az esetnek megfelelően) a PNLTM – 10, vagy 90 értékekhez tartozó pontok által definiált időtartam.

4.5.5 Ha a 4.5.2 pontban megadott eljárásban a PNLTM - 10, vagy 90 határok a PNLT(k) számított értékei közé esnek (szokásos eset), akkor az időtartamot korlátokat meghatározó
Hangmagasságra korrigált észlelt zajszint PNLT, TPNdB, PNLTM, PNLT(k) t(1) átrepülési idő t. sec. t(2); PNLT(k) értékeket a PNLTM-10-hez vagy a 90- hez legközelebb eső értékek közül kell kiválasztani, az esettől függően.



A1 - 2 Ábra. Példa: a repülőgép átrepülési idejének függvényében a hangmagasságra korrigált észlelt zaj-szint

4.6 Ténylegesen észlelt zajszint

4.6.1 Egy repülőgép átrepülésének Ténylegesen Észlelt Zajszint EPNL-nek neveznek teljes szubjektív hatása legyen egyenlő a hangszínre korrigált észlelt zajszint legnagyobb értéke és a D időtartam korrekció algebrai összegével.

Ennek megfelelően:

$$EPNL = PNLTM + D$$

ahol a PNLTM és a D értéket a 4.2, 4.3, 4.4 és a 4.5 pontokban megadottak szerint számították ki. Ha a D időtartam korrekció negatív és abszolút értékekben nagyobb, mint a PNLTM-90, akkor a D-t 90-PNLTM értékkel kell egyenlőnek venni.

5. AZ ADATOK JELENTÉSE A BIZONYÍTVÁNYT KIADÓ HATOSÁGNAK ÉS A MÉRT ADATOK KORREKCIÓJA

5.1 Általános rész

A fizikai mérési eredményeket, vagy a mért adatokra történt korrekciókat reprezentáló adatokat maradandó jellegű formában kell rögzíteni és mellékelni kell a felvételhez, kivéve a használt berendezés szokásos válaszjel eltéréseinek korrekcióit, amelyeket nem kell jelenteni. Az összes többi korrekciót jóvá kell hagyatni. Törekedni kell a végső eredmény eléréséhez szükséges műveleteknél elkövetett egyedi hibák számának minimumra csökkentésére.

5.2 Adatok jelentése

5.2.1 A mért és korrigált hangnyomásszinteket a jelen Függelék 3. pontjában ismertetett szabványoknak megfelelő berendezéssel nyert egyharmad oktávsávos szintekben kell kifejezni.

5.2.2 A repülőgép minden akusztikai teljesítményének és meteorológiai adat méréséhez és elemzéséhez használt berendezés típusát jeleteni kell.

5.2.3 A közvetlenül a vizsgálatok előtt, után, vagy alatt a jelen Függelék 2. pontjában előírt megfigyelési pontoknál mért alábbi légköri környezeti adatokat kell jelenteni kell:

a) Levegő hőmérséklet és relatív páratartalom;

b) Maximum, minimum és átlagos szélsebesség;

c) légnyomás.

5.2.4 A hangrögzítést befolyásolható helyi topográfiai, felszínfedettségi jellemzőket és eseményeket jelenteni kell.

5.2.5 A repülőgépről a következő információkat kell jelenteni:

a) A repülőgép és a hajtómű típusa, modell jelzése és (ha van) szériaszáma;

b) A repülőgép teljes méretei és a hajtóművek elhelyezkedése;

c) A repülőgép teljes tömege az egyes vizsgálatok során;

d) A repülőgép konfigurációja, például fékszárnyak és futóművek helyzete;

e) A műszer szerinti sebesség km/h (csomó) értékben kifejezve;

f) a repülőgép fedélzeti műszereinek adataiból és a gyártó cég adataiból nyert hajtómű teljesítmény a következők értelmében: nettó hajtómű teljesítmény, hajtómű nyomásviszonyok, kilépő gázsugár hőmérséklet, a ventillátor vagy kompresszor tengely fordulatszáma;

g) A repülőgép föld feletti magassága, amelyet a fedélzeti műszerektől független és a bizonyítványt kiadó hatóság által jóváhagyandó olyan módszerrel határoznak meg, mint például a radar célkövetés, teodolit háromszögelés, vagy fotometriai mérés.

5.2.6 A jelen fejezetben előírt referencia feltételekre korrigáláshoz a repülőgép sebességét és helyzetét, valamint a hajtómű teljesítmény paramétereit a zajméréssel szinkronban álló elégséges jóváhagyott mintavételi gyakorisággal kell rögzíteni.

5.2.6.1 Jelenteni kell a futópálya meghossazabbított középvonalától mért oldal irányú helyzetet, a konfigurációt és a teljes tömeget.

5.3 A zajminősítési referencia feltételek

A repülőgép helyzete és teljesítményadatai, illetve a zajmérések a következő zajminősítési referencia feltételekre legyenek korrigálva:

a) Meteorológiai feltételek:

1) 1013,25 hPa értékű tengerszinti légnyomás;

2) Környezeti levegőhőmérséklet 25°C, azaz NEL+10°C, kivéve ha a bizonyítványt kiadó hatóság megítélése szerint egy 15°, azaz NEL alternatív környezeti referencia levegő hőmérséklet használható.

3) Relatív páratartalom érték 70 százalék; és

4) Szélcsend;

b) A repülőgépre vonatkozó feltétlek:

1) a zaj bizonyítvány iránti kérelemben szereplő maximum fel- és leszálló tömeg;

2) 3°-os megközelítési pálya; és

3) Repülési magasság a megközelítési zajmérőhely feletti 120 m-en (395 láb).

5.4 Adatkorrekciók

5.4.1 A zaj adatokat a zaj minősítés referencia feltételeire kell korrigálni, az 5.3 pontban leírtaknak megfelelően. A mért légköri feltételek legyenek összhangban a jelen Függelék 2. pontjában találhatókkal. A légköri hangcsillapítási követelmények a jelen Függelék 8. pontjában találhatók. Ha 15°C környezeti levegőhőmérsékletet alkalmaznak (lásd 5.3 a) 2)), akkor az átrepülési mérési pontokon nyert zajszintekhez + 1 EPNdB értékű további korrekciót kell hozzáadni.

5.4.2 A mért repülési útvonalat a kérelmező által a vizsgálati feltételekhez előrejelzett és a zaj minősítési referencia feltételeihez tartozó repülési útvonalak közötti különbséggel egyenlő értékkel kell helyesbíteni.

Megjegyzés.- a repülőgép repülési pályája, vagy teljesítménye tekintetében a szükséges korrekciók származtathatók egyéb jóváhagyott adatokból is, nem csak a minősítő vizsgálati adatokból.

5.4.2.1 A repülési pálya megközelítési zajra való korrigálását a repülőgép egy kikötött referencia magasságára és a referencia süllyedési szögre vonatkoztatva kell elvégezni. A ténylegesen érzékelt zajszint korrekció 2 EPNdB-nél kisebb legyen, hogy az alábbiakra tűrést biztosítson :

a) repülőgép nem pont függőlegesen a mérőpont felett halad át;

b) a referencia magasság és a repülőgép ILS antenna megközelítési mérőpontponttól számított magassága közötti különbség; és

c) a referencia és a vizsgálati megközelítési szögek közötti eltérések.

Megjegyzés.- A jelen Függelék 9. szakaszában találhatók a részletes korrekció követelmények.

5.4.3 Adott mérés vizsgálati eredményei nem fogadhatók el, ha a számított EPNL érték és a referencia feltételekre korrigált érték közötti különbség meghaladja a 15 EPNdB értéket.

5.4.4 Ha a repülőgép hangnyomásszintjei egyetlen egyharmad oktávsávban sem haladják meg a környezeti hangnyomásszinteket legalább 10 EPNdB értékkel, akkor jóváhagyott korrekciókat kell alkalmazni a környezeti hangnyomásszintnek az észlelt hangnyomásszinthez való hozzáadódása miatt.

5.5 Az eredmények érvénnyessége

5.5.1 A vizsgálati eredményekből 3 átlagos EPNL értéket és ezeknek 90 százalékos megbízhatósági határát kell létrehozni, amely értékek egyenlőek a megfelelő mérési pont (felszállási, megközelítési, vagy oldalvonali zajmérő pontok) minden érvényes vizsgálat korrigált akusztikai mérés eredményének aritmetikai közepével. Ha egy adott méréshez több akusztikai mérőrendszert használnak (például szimmentrikus oldalvonal mérőpontokhoz), akkor az egyes vizsgálatokból kapott eredményeket egyetlen mérésként kell átlagolni.

5.5.2 A 3 vizsgálati pont mindegyikére az elfogadható minimális mintanagyság hat. A mintáknak eléggé nagyoknak kell lenniük ahhoz, hogy a 3 átlagos zajminősítési szint mindegyikéhez statisztikailag megállapítható legyen a 90 százalékos, ±1,5 EPNdB értéket nem meghaladó megbízhatóságú határt. Az átlagszámítási folyamatból nem szabad egyetlen vizsgálati eredményt sem kihagyni, hacsak a bizonyítványt kiállító hatóságok másképpen nem rendelkeznek.
5.5.3 Az előzőekben ismertetett eljárással nyert átlagos EPNL értékek és a 90 százalékos megbízhatósági határaik legyenek azok az értétek, emelyek alapján a repülőgép zaját az alkalmassági kritériumokkal összevetve értékelik és ezeket az értékeket kell jelenteni.

6. NÓMENKLATURA

6.1 Jelek és mértékegységek

Megjegyzés.- Az alábbiakban közreadjuk az ebben a Függelékben található jelek magyarázatát. Elfogadott tényként kell rögzíteni, hogy a 2. Függelékben szereplő, hasonló jelek más jelentéstartalommal rendelkezhetnek.

JEL	EGYSÉG	JELENTÉS
antilog	-	*10-es alapú antilogaritmus*
C(k)	db	*Hangmagasság korrekció*, olyan tényező, amelyet a PNL(k)-hoz kell hozzáadni a spektrális rendellenességek létezése, például az idők-adik növekményénél szereplő hangmagasságok figyelembe vételére.
d	sec	*Időtartam.* A szignifikáns zajlefutás hosszúsága, amely a t(1) és t(2) közötti

JEL	EGYSÉG	JELENTÉS
		időintervallum a legközelebbi másodpercig.
D	dB	*Időtartam korrekció.* Ezt a tényezőt kell a PNLTM értékhez hozzáadni a zaj időtartam figyelembe vételéhez.
EPNL	EPNdB.	*A ténylegesen észlelt zajszint*, PNL spektrális szabálytalanságok és a zaj időtartama szempontjából korrigáltak értéke (dB egység helyett EPNdB egység használt).
f(i)	Hz	*Frekvencia.* Az i-edik egyharmad oktávsáv geometriai középfrekvenciája.
F(i,k)	dB	*Delta dB.* Az eredeti hangnyomásszint és a végső háttérzaj-nyomásszint közötti különbség az i-edik egyharmad oktávsávban, a k-adik időintervallumban.
h	dB	*Levonandó dB*. A zaj időtartamát definiáló PNLTM értékből levonandó szint.
H	százalék	*Relatív páratartalom.* A környező légkör relatív páratartalma.
i	-	*Frekvenciasáv index.* Számszerű mutató, amely az 50 Hz-től a 10000 Hz-ig terjedő geometriai középfrekvenciájú 24 darab egyharmad oktávsáv valamelyikét jelöli.
k	-	*Időnövekmény index.* egy referencia 0 időponttól eltelt egyenlő időnövekmények számát jelölő számszerű mutató.
log	-	*Tizes alapú logoaritmus.*
log n(a)	-	*Noy töréspont koordináta.* Az SPL értéknek log n-nel való változását reprezentáló egyenes vonalak metszéspontjainak log n értéke.
M(b), M(c), stb.	-	*Noy inverz meredekség.* Az SPL értéknek log n-nel való változását stb. ábrázoló egyenes vonalak meredekségének reciprok értéke.
n	noy	*Észlelt zajosság.* Valamely időpillanatban egy adott frekvencia tartományban észlelt zajosság,
n(i,k)	noy	*Észlelt zajosság.* A k-adik időpillanatban észlelt zajosság, amely az i-edik egyharmad oktávsávban bekövetkezik.
n(k)	noy	*Legnagyobb észlelt zajosság.* Az n(i,k) 24 pillanatnyi értéke közül a k-adik pillanatban észlelt legnagyobb teljes zajosság.
N(k)	noy	*Teljes észlelt zajosság.* Az n(i,k) 24 pillanatnyi értékéből a k-adik pillanatban kiszámított teljes észlelt zajosság.
p(b) p(c) stb.	-	*Noy meredekség.* Az SPL log n-nel való változását ábrázoló egyenesek meredekségei.
PNL	PNdB	*Észlelt zajszint.* Valamely pillanatban észlelt zajszint (dB egység helyett PNdB egység használatos).
PNL(k)	PNdB	*Észlelt zajszint.* Az SPL(i,k) 24 értékéből kiszámított észlelt zajszint az idő k-adik növekményénél (dB egység helyett PNdB egység használatos).
PNLM	PNdB	*Észlelt legnagyobb zajszint.* A PNL(k) legnagyobb értéke (dB egység helyett PNdB egység használatos).
PNLT	TPNdB	*Hangmagasságra korrigált észlelt zajszint.* Valamely időpillanatban előforduló spektrális rendellenességekre korrigált PNL érték (dB egység helyett TPNdB egység használandó).
PNL(k)	TPNdB	*Hangmagasságra korrigált észlelt zajszint*. A k-adik időnövekménnyel előforduló spektrális szabálytalanságra korrigált PNLT(k) értéke (dB egység helyett TPNdB egység használandó).
PNLTM	TPNdB	*Hangmagasságra korrigált legnagyobb észlelt zajszint.* A PNLT(k) legnagyobb értéke (dB helyett TPNdB egység használandó).
s(i,k)	dB	*Hangnyomásszint meredekség.* A szomszédos egyharmad oktávsávos

JEL	EGYSÉG	JELENTÉS
		hangnyomásszintek közötti változás a k-adik időpillanatban az i-edik sávban.
Δs(i,k)	dB	*Hangnyomásszint meredekségének változása.*
s'(i,k)	dB	*Hangnyomásszint korrigált meredeksége.* A k-adik időpillanatban az i-edik sáv szomszédos korrigált egyharmad oktávsáv hangnyomásszintjei közötti változás.)
$\bar{s}$(i,k)	dB	*A hangnyomásszint átlagos meredeksége.*
SPL	dB-re 20 μPa	*Hangnyomásszint.* Valamely időpillanatban, meghatározott frekvencia tartományban előforduló hangnyomásszint.
SPL(a)	dB-re 20 μPa	*Noy töréspont koordináta.* Az SPL log n-nel való változását ábrázoló egyenesek metszéspontjának SPL értéke.
SPL(b) SPL(c)	dB-re 20 μ Pa	*Noy metszés.* Az SPL-nek log n-nel történő változását ábrázoló egyenes vonalak metszései az SPL tengelyen.
SPL (i,k)	dB-re 20 μ Pa	*Hangnyomásszint.* Az i-edik egyharmad oktávsávban a k-adik időpillanatban fellépő hangnyomásszint.
SPL' (i,k)	dB-re 20 μ Pa	*Korrigált hangnyomásszint.* Az i-edik egyharmad oktávsávban a k-adik időpillanatban a háttér hangnyomásszint első közelítése.
SPL(i)	dB-re 20 μPa	*Maximális hangnyomásszint*. PNLTM-re vonatkozó spektrum i-edik egyharmad oktávsávjában előforduló hangnyomásszint.
SPL(i)c	dB-re 20 μPa	*Korrigált legnagyobb hangnyomásszint.* PNLTM-re vonatkozó spektrum i-edik egyharmad oktávsávjában előforduló és a légköri hangelnyelésre korrigált hangnyomásszint.
SPL" (i,k)	dB-re 20 μPa	*Végső háttér hangnyomásszint.* háttér hangnyomásszint második és végső közelítése az i-edik egyharmad oktávsávban, a k-adik időpillanatra.
t	sec	*Eltelt idő.* A nulla referencia pillanattól mért eltelt idő hossza.
t(1) t(2)	sec	*Időhatár.* A h-val jelölt szignifikáns zaj időbeli lefolyásának kezdete és vége.
Δt	sec	*Időnövekmény.* Az időnek azok az egyforma növekményei, amelyekre a PNL(k) és a PNLT(k) értékeket kiszámítják.
T	sec	*Normalizáló időállandó.* Az időtartam korrekciók számításánál az integrál módszerénél referencia képpen használatos időtartam hosszúsága, ahol T = 10 sec.
t(oC)	(oC)	*Hőmérséklet.* A környező légkör hőmérséklete.
α(i)	dB/100 m	*Vizsgálati légköri csillapítás.* A mért légköri hőmérsékletre és relatív páratartalomra vonatkozó hangterjedés az i-edik egyharmad oktávsávban.
α(i)o	db/100 m	*Referencia légköri csillapítás.* Az i-edik egyharmad oktávsávban tapasztalt légköri hangterjedés a referencia képpen használatos légköri hőmérsékeleten és relatív páratartalomnál.
ß	fok	*Első állandó*[i]** emelkedési szög.*
γ	fok	*Második állandó*[ii]** emelkedési szög.*
δ ε	fok fok	*Tolóerő visszavételi szögek.* A felszállási repülési pályán a tolóerő csökkentés kezdetének és befejezésének (sorrend szerint) pontját kijelölő szögek.
η	fok	*Megközelítési szög.*
η_r	fok	*Referencia megközelítési szög*

[i] Futó bent, sebesség legalább V2 + 19 km/h: (V2 + 10 csomó), felszállási tolóerővel.

[ii] Futó bent, sebesség legalább V2 + 19 km/h (V2 + 10 csomó), a tolóerő visszavétele után.

JEL	EGYSÉG	JELENTÉS
θ	fok	*Felszállási zajszög.* A felszállási művelet repülési pályája és zaj pályája által bezárt szög. Ugyan az a mért és a korrigált repülési pályára is.
λ	fok	*Megközelítési zajszög.* A megközelítés során a megközelítési és a zajpálya által bezárt szög. Ugyan az a mért és a korrigált repülési pályára is.
Δ_1	fok	*PNLT korrekció.* A mért adatokból kiszámított EPNL-hez hozzáadandó korrekció, a légköri csillapításban és a zaj úthosszban, a referencia- és vizsgálati feltételekben mutatkozó különbség miatti zajszint változások figyelembe vételéhez.
Δ_2	EPNdB	*Zaj pálya időtartam korrekció*. A mért adatokból kiszámított EPNL-hez hozzáadandó korrekció, a referencia és vizsgálati feltételek közötti átrepülési magasság különbségéből adódó zaj időtartam okozta zajszint változások figyelembe vételéhez.
Δ_3	EPNdB	*Tömeg korrekció.* A mért adatokból származó EPNL-hez adandó korrekció, a vizsgált repülőgép maximum és tényleges tömege közötti különbség által okozott zajszint változások figyelembe vételéhez.
Δ_4	EPNdB	*Megközelítési szög korrekció*. A mért adatokból kiszámított EPNL-hez hozzáadandó korrekció, a referencia és a vizsgálati megközelítési szögek különbségéből adódó zajszint változás figyelembe vételével.
ΔAB Δß Δγ Δδ Δε	méter fok fok fok fok	*Felszállási repülési pálya változások.* A felszállási repülési pályát meghatározó alapvető paraméterek algebrai változásai a referencia és vizsgálati feltételek közötti különbségek miatt.

* Futó bent, sebesség legalább V_2 + 19 km/h: (V_2 + 10 csomó), felszálló tolóerő.
** Futó bent, sebesség legalább V_2 + 19 km/h (V_2 + 10 csomó), a tolóerő visszavétele után.

6.2 A repülési profil azonosítási pontjai

PONT	Meghatározás
A	A felszállási nekifutás kezdete.
B	Emelkedés.
C	Az első állandó emelkedés kezdete.
D	A tolóerő csökkentés kezdete.
E	A második állandó emelkedés kezdete.
Ec	A második állandó emelkedés kezdete a helyesbített repülési pályán.
F	A zaj minősítési felszállási repülési pálya vége
Fc	A zaj minősítési helyesbített felszállási repülési pálya vége.
G	A zaj minősítési megközelítési repülési pálya kezdete.
Gr	A zaj minősítési megközelítési referencia repülési pálya kezdete
H	A megközelítési pálya egy adott pontja közvetlenül a zajmérő pont felett.
Hr	A megközelítési referencia pálya egy adott pontja, közvetlenül a zajmérő pont felett.
I	A kilebegtetés kezdete.
Ir	A kilebegtetés kezdete a megközelítési referencia útvonalon.
J	Földet érés.

K	Átrepülési zajmérési pont.
L	Oldalsó zajmérési pont(ok), (nem a repülési nyomvonalon).
M	A zaj minősítési felszállási repülési nyomvonal vége.
N	Megközelítési zajmérő pont.
O	A futópálya megközelítsési küszöbe.
P	A zaj minősítési megközelítési repülési nyomvonal kezdete.
Q	A K mérőhely látszólagos PNLTM-jének megfelelő pont a mért felszállási repülési pályán. Lásd a 9.2 pontot.
Qc	A K mérési hely PNLTM-jének megfelelő helyzet a korrigált felszállási pályán. Lásd a 9.2 pontot.
R	A mért felszállási repülési pályán a "K" mérési helyhez legközelebb eső pont.
Rc	A korrigált felszállási repülési pályán a "K" mérési helyhez legközelebb eső pont.
S	A mért megközelítési repülési pályán az N mérési hely PNLTM-jének megfelelő pont.
Sr	A referencia megközelítési repülési pályán az N mérési hely PNLTM-jének megfelelő pont.
T	A mért megközelítési repülési pályán az N mérőhelyhez legközelebb eső pont.
Tr	A referencia megközelítési pályán az N mérési helyhez legközelebb eső pont.
X	A mért felszállási repülési pályán az "L" pont PNLTM-jének megfelelő pont.

6.3 A repülési profil távolságai

TÁVOLSÁG	EGYSÉG	JELENTÉSE
AB	méter	*A felszállási nekifutás úthossza.* A futópálya mentén a felszállási nekifutás kezdete és az emelkedés között mért távolság.
AK	méter	*Felszállási mérési távolság.* A futópálya meghosszabbított középvonala mentén a felszállási nekifutás kezdő pontja és a felszállási zajmérő pont között mért távolság.
AM	méter	*Felszállási repülési nyomvonal távolság.* A felszállási nekifutás kezdőpontja és a felszállási nyomvonal azon pontja között a futópálya meghosszabbított középvonala mentén mért távolság, amely pontnál már nincs szükség a repülőgépzaj rögzítésére.
KQ	méter	*Mért felszállási zajpálya.* A K mérési hely és a Q mért repülőgép helyzete közötti távolság.
KQc	méter	*Korrigált felszállási zajpálya.* A K mérési hely és a "Qc" korrigált repülőgép helyzet közötti távolság.
KR	méter	*Mért felszállási minimum távolság.* A K mérési hely és az R pont közötti távolság a mért repülési pályán.
KRc	méter	*Korrigált felszállási minimum távolság.* A K mérési hely és az Rc pont közötti távolság a korrigált repülési pályán.
LX	méter	*Mért oldalsó zajpálya.* Az L mérési hely és az X mért repülőgép helyzet közötti távolság.
NH	méter	*A repülőgép megközelítési magassága.* A repülőgép megközelítési mérőpont feletti magassága.
NHr	méter	*Referencia megközelítési magasság.* A referencia megközelítési pálya magassága a megközelítési nérőpont felett.
NS	méter	*Mért megközelítési zajpálya.* Az N mérési és az S mért repülőgép helyzet közötti távolság.
NSr	méter	*Referencia megközelítési zajpálya.* Az N mérési hely és az Sr repülőgép referencia helyzet közötti távolság.

NT	méter	*Mért megközelítési minimum távolság.* Az N mérési hely és a T pont közötti távolság a mért repülési útvonalon.
NTr	méter	*Referencia megközelítési minimum távolság.* Az N állomás és a Tr pont közötti távolság a korrigált repülési pályán.
ON	méter	*Megközelítési mérési távolság.* A küszöb és a megközelítési mérési hely között a futópálya meghosszabbított középvonalán mért távolság.
OP	méter	*Megközelítési repülési nyomvonal távolság*. A futópálya küszöbétől a futópálya meghosszabbított középvonalán kijelölt megközelítési repülési nyomvonal azon pontja között mért távolság, amely ponton már mérni kell a repülőgép zaját.

7. A NOY-TÁBLÁZATOK MATEMATIKAI MEGFOGALMAZÁSA

1. Megjegyzés.- A hangnyomásszint és az A1-1 táblázatban megadott érzékelt zajosság közötti viszonyt az A1-3 ábra szemlélteti. Az SPL érték log n-nel való változását adott egyharmad oktávsávban, egy, vagy két egyenes fejezi ki a referencia tartománytól függően. Az A1-3 a) ábra a kettős vonal esetét mutatja be a 400 Hz alatti és a 6300 Hz feletti frekvenciára, míg az A1-3b) az egyetlen vonal esetét ábrázolja minden frakvenciára.

A matematikai megfogalmazás legfontosabb tényezői a következők:

a) A p(b) és a p(c) egyenesek meredeksége;

b) Az egyenesek metszései SPL tengelyen, ezek az SPL(b) és az SPL(c); és

c) Az SPL(a) és log n(a) töréspont koordináták.

2. Megjegyzés.- Matematikailag a viszonyt a következőképpen lehet kifejezni:

1. eset: 1-3 a) ábra:

$$f < 400 \text{ Hz}$$
$$f > 6300 \text{ Hz}$$

$$\text{SPL(a)} = \frac{\text{p(c) SPL(b)} - \text{p(b) SPL(c)}}{\text{p(c)} - \text{p(b)}}$$

$$\log \text{n(a)} = \frac{\text{SPL(c)} - \text{SPL(b)}}{\text{p(b)} - \text{p(c)}}$$

a) SPL < SPL(a)

$$n = \text{antilog} \frac{\text{SPL} - \text{SPL(b)}}{\text{p(b)}}$$

b) SPL $\geq$ SPL(a)

$$n = \text{antilog} \frac{SPL - SPL(c)}{p(c)}$$

c) log n < log n(a)

$$SPL = p(b) \log n + SPL(b)$$

d) log n ≥ log n(a)

$$SPL = p(c) \log n + SPL(c)$$

2. eset: 1-3 b) ábra:

$$400 \text{ Hz} \leq f \leq 6300 \text{ Hz}$$

$$n = \text{antilog} \frac{SPL - SPL(c)}{p(c)}$$

$$SPL = p(c) \log n + SPL(c)$$

3. Megjegyzés.- Ha a meredekség reciprok értékei a következő képpen definiáltak:

$$M(b) = 1/p(b)$$

$$M(c) = 1/p(c),$$

akkor a 2. Megjegyzésben szereplő egyenletek az alábbiak szerint írhatók le:

1. eset: - 1-3 a) ábra: $f < 400$ Hz
$f > 6300$ Hz

$$SPL(a) = \frac{M(b)\ SPL(b) - M(c)\ SPL(c)}{M(b) - M(c)}$$

$$\log n(a) = \frac{M(b)\ M(c)\ [SPL(c) - SPL(b)]}{M(c) - M(b)}$$

a) SPL < SPL(a)

$$n = \text{antilog } M(b)\ [SPL - SPL(b)]$$

b) SPL ≥ SPL(a)

$$n = \text{antilog } M(c)\ [SPL - SPL(c)]$$

c) log n < log n(a)

$$SPL = \frac{\log n}{M(b)} + SPL(b)$$

d) $\log n \geq \log n(a)$

$$SPL = \frac{\log n}{M(c)} + SPL(c)$$

2. eset: - A1-3 b) ábra: $400 \leq f \leq 6300$ Hz

n= antilog M(c) [SPL - SPL(c)]

$$SPL = \frac{\log n}{M(c)} + SPL(c)$$

4. Megjegyzés.- A hangnyomásszinteknek az észlelt zajosság függvényeként történő kiszámításához szükséges fontos állandók értékeit az A1-4 táblázat sorolja fel.

8. A LEVEGŐ HANGCSILLAPÍTÁSA

8.1 A hang légköri csillapítását az alábbi eljárásokkal összhangban kell meghatározni.

8.2 A hangcsillapítás, frekvencia, hőmérséklet és páratartalom közötti kapcsolatot az alábbi egyenletek fejezik ki:

$$\alpha = 10^{[2{,}05 \log(f o/1000) + 1{,}1394 \text{ x } 10^{-3}\, \theta - 1{,}916984]}$$

$$+\eta(\delta) \times 10 \, [\log(f o) + 8{,}42994 \text{ x } 10^{-3}\, \theta - 2{,}755624]$$

$$\delta = \sqrt{\frac{1010}{f_o}} \; 10^{(\log H - 1{,}328924 + 3{,}179768 \text{ x } 10^{-2\theta})}$$

$$\times 10^{(-2{,}173716 \text{ x } 10^{-4}\, \theta^{-2} + 1{,}7496\, \xi\, 10^{-6}\, \theta^{-3}}\, /$$

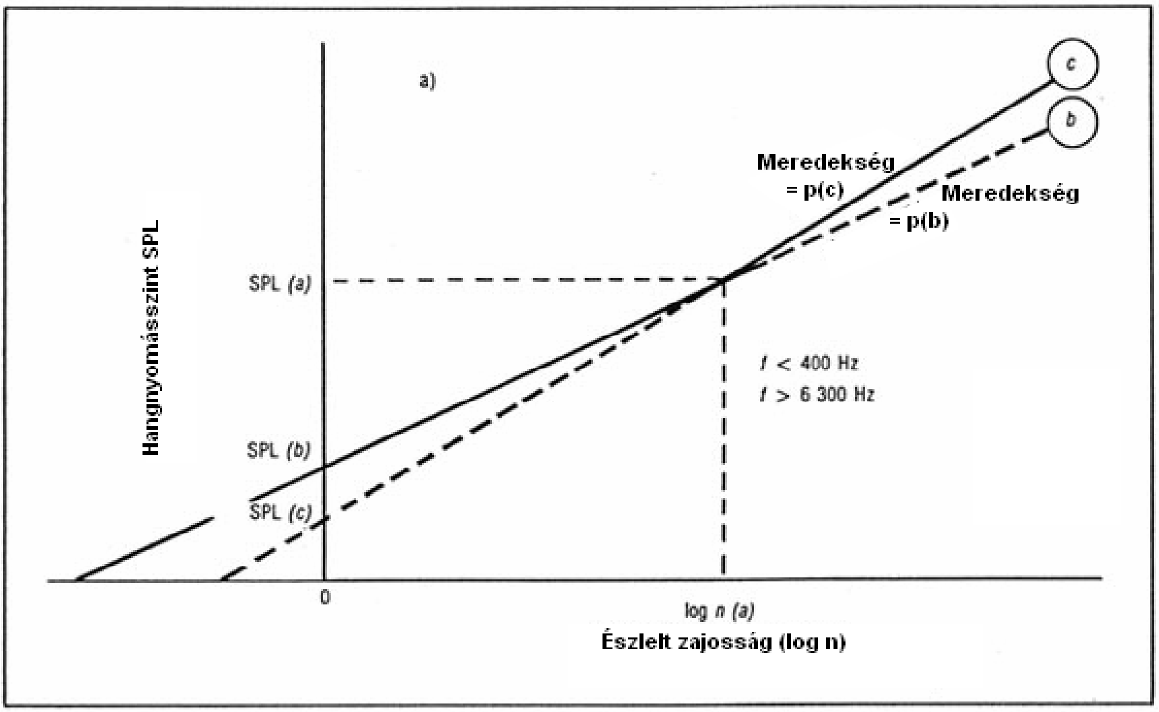
ahol

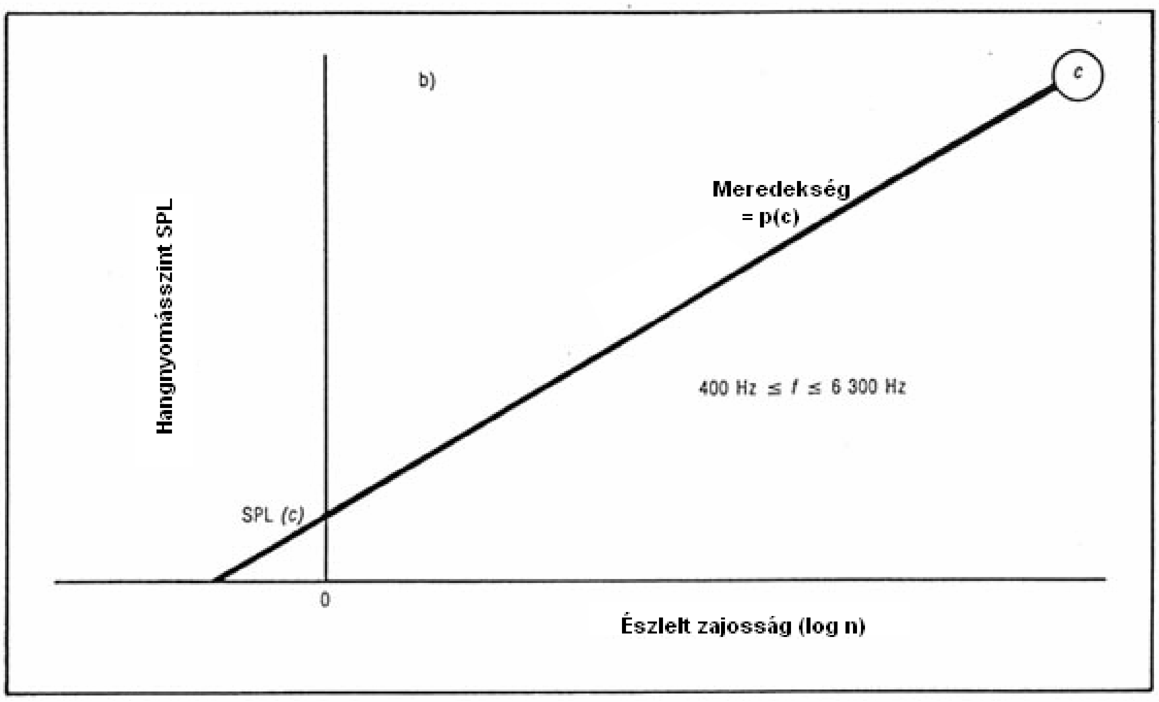
$\eta(\delta)$ értékét az A1-5 táblázat és az $f o$ értékét az A1-6 táblázat adja meg;

$\alpha(\iota)$ a csillapítási együttható dB/100 m-ben megadva;

Θ a hőmérséklet °C-ban; és

H a relatív páratartalom;





A1-3. Ábra. Hangnyomásszint az észlelt zajosság függvényében

A1 - 4. Táblázat. Matematikai úton meghatározott NOY értékeket konstansai

Sáv (i)	f Hz	$M(b)$	SPL (b) dB	SPL (a) dB	$M(c)$	SPL (c) dB
1	50	0.043478	64	91.0	0.030103	52
2	63	0.040570	60	85.9		51
3	80	0.036831	56	87.3		49
4	100	"	53	79.9		47
5	125	0.035336	51	79.8		46
6	160	0.033333	48	76.0		45
7	200	"	46	74.0		43
8	250	0.032051	44	74.9		42
9	315	0.030675	42	94.6		41
10	400	—	—	—		40
11	500	—	—	—		40
12	630	—	—	—		40
13	800	—	—	—		40
14	1 000	—	—	—		40
15	1 250	—	—	—	0.030103	38
16	1 600	—	—	—	0.029960	34
17	2 000	—	—	—		32
18	2 500	—	—	—		30
19	3 150	—	—	—		29
20	4 000	—	—	—		29
21	5 000	—	—	—		30
22	6 300	—	—	—		31
23	8 000	0.042285	37	44.3		34
24	10 000	0.042285	41	50.7	0.029960	37

NOT APPLICABLE

A1 - 5. Táblázat

δ	η	δ	η
0,00	0,000	2,30	0,495
0,25	0,315	2,50	0,450
0,50	0,700	2,80	0,400
0,60	0,840	3,00	0,370
0,70	0,930	3,30	0,330
0,80	0,975	3,60	0,300
0,90	0,996	4,15	0,260
1,00	1,000	4,45	0,245
1,10	0,970	4,80	0,230
1,20	0,900	5,20	0,220
1,30	0,840	5,70	0,210
1,50	0,750	6,05	0,205
1,70	0,670	6,50	0,200
2,00	0.570	7,00	0,200
		10,00	0,200

A1-6. Táblázat

egyharmad oktávsáv közép frekvencia	f_0 (Hz)	egyharmad oktávsáv közép frekvencia	f_0 (Hz)
50	50	800	800
63	63	1000	1000
80	80	1250	1250
100	100	1600	1600
125	125	2000	2000
160	160	2500	2500
200	200	3150	3150
250	250	4000	4000
315	315	5000	4500
400	400	6300	5600
500	500	8000	7100
630	630	10000	9000

A1 - 7. Táblázat Hang terjedési együttható dB/100 m-ben

Sáv közép frekvencia	Relatív páratartalom = 10%									
	Hőmérséklet, °C									
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,1	0,1	0,1
100	0,1	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
125	0,2	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,2	0,2	0,3	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1
200	0,2	0,3	0,3	0,3	0,2	0,2	0,1	0,1	0,1	0,1	0,2
250	0,2	0,4	0,4	0,4	0,3	0,3	0,2	0,2	0,2	0,2	0,2
315	0,2	0,4	0,5	0,6	0,5	0,4	0,3	0,2	0,2	0,2	0,2
400	0,3	0,5	0,7	0,8	0,6	0,5	0,4	0,3	0,3	0,3	0,3
500	0,3	0,5	0,8	1,0	0,9	0,7	0,6	0,5	0,4	0,4	0,4
630	0,3	0,6	0,9	1,2	1,2	1,0	0,9	0,7	0,6	0,5	0,5
800	0,4	0,6	1,0	1,5	1,7	1,5	1,2	1,0	0,8	0,7	0,6
1000	0,4	0,7	1,2	1,8	2,1	2,0	1,7	1,4	1,2	1,0	0,9
1250	0,4	0,8	1,3	2,1	2,6	2,8	2,4	2,0	1,7	1,4	1,2
1600	0,5	0,9	1,4	2,3	3,3	3,8	3,4	2,9	2,4	2,0	1,7
2000	0,6	1,0	1,6	2,6	3,9	4,7	4,7	4,1	3,4	2,8	2,3
2500	0,7	1.1	1,8	2,9	4,5	5,8	6,4	5,6	4,8	4,0	3,3
3150	0,8	1,2	2,0	3,3	5,1	7,1	8,3	7,7	6,8	5,7	4,8
4000	0,9	1,4	2,3	3,6	5,7	8,5	10,5	11,0	9,6	8,3	6,9
5000	1,0	1,6	2,4	3,8	6,1	9,2	11,7	12,8	11,3	9,9	8,3
6300	1,3	1,9	2,8	4,3	6,4	10,4	14,2	16,4	15,5	13,3	11,7
8000	1,6	2,3	3,4	5,0	7,7	11,8	17,0	20,8	22,0	19,4	16,8
10000	2,1	2,9	4,1	6,0	8,9	13,4	19,9	25,9	29,5	27,2	24,1
12500	2,9	3,7	5,0	7,1	10,3	15,3	22,7	31,2	36,9	37,6	33,4

A1 - 8. Táblázat Hang terjedési együttható dB/100 m-ben

Sáv közép frekvencia	Relatív páratartalom = 20%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,1	0,1	0,1	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,3	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,4	0,3	0,3	0,2	0,2	0,1	0,1	0,1	0,2	0,2	0,2
315	0,4	0,5	0,4	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2
400	0,5	0,6	0,5	0,4	0,3	0,3	0,2	0,2	0,3	0,3	0,3
500	0,6	0,8	0,7	0,6	0,5	0,4	0,3	0,3	0,3	0,3	0,4
630	0,7	1,0	1,0	0,8	0,7	0,5	0,4	0,4	0,4	0,4	0,5
800	0,8	1,2	1,4	1,2	0,9	0,7	0,6	0,5	0,5	0,6	0,6
1000	0,9	1,4	1,8	1,6	1,3	1,0	0,8	0,7	0,7	0,7	0,8
1250	0,9	1,6	2,2	2,2	1,8	1,5	1,2	1,0	0,9	0,9	1,0
1600	1,1	1,9	2,7	3,1	2,6	2,1	1,7	1,4	1,2	1,2	1,3
2000	1,2	2,0	3,2	3,9	3,6	3,0	2,5	2,0	1,7	1,5	1,6
2500	1,3	2,3	3,7	4,9	5,0	4,2	3,5	2,8	2,3	2,0	2,0
3150	1,5	2,5	4,2	6,0	6,8	5,8	4,9	4,0	3,3	2,8	2,7
4000	1,7	2,9	4,8	7,2	8,7	8,2	7,1	5,9	4,9	4,0	3,6
5000	1,9	3,1	5,1	7,9	9,8	9,7	8,4	7,0	5,9	4,8	4,2
6300	2,2	3,5	5,7	9,0	12,0	13,3	11,5	9,9	8,2	6,8	5,8
8000	2,7	4,1	6,5	10,4	14,8	17,4	16,2	14,1	12,0	10,0	8,3
10000	3,3	4,9	7,5	11,8	17,7	22,0	23,1	20,1	17,2	14,5	12,1
12500	4,1	5,9	8,8	13,4	20,5	27,1	30,6	27,5	24,2	20,6	17,4

A1 - 9. Táblázat Hang terjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 30%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,1	0,1	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,3	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,4	0,3	0,2	0,2	0,2	0,1	0,2	0,2	0,2	0,2	0,2
400	0,6	0,5	0,4	0,3	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,7	0,6	0,5	0,4	0,3	0,3	0,3	0,3	0,3	0,3	0,4
630	0,9	0,9	0,7	0,5	0,4	0,3	0,3	0,4	0,4	0,4	0,5
800	1,1	1,3	1,0	0,8	0,6	0,5	0,4	0,5	0,5	0,6	0,6
1000	1,3	1,6	1,4	1,1	0,9	0,7	0,6	0,6	0,6	0,7	0,8
1250	1,5	2,0	1,9	1,6	1,2	0,9	0,8	0,7	0,8	0,9	1,0
1600	1,7	2,5	2,7	2,2	1,8	1,4	1,1	1,0	1,0	1,1	1,3
2000	1,9	3,0	3,6	3,1	2,5	2,0	1,6	1,4	1,3	1,4	1,6
2500	2,1	3,5	4,4	4,2	3,5	2,8	2,2	1,9	1,7	1,8	2,0
3150	2,3	4,0	5,5	5,9	4,9	4,0	3,3	2,6	2,3	2,3	2,5
4000	2,6	4,5	6,8	7,9	6,9	5,8	4,7	3,8	3,3	3,1	3,3
5000	2,8	4,8	7,4	9,0	8,2	6,9	5,7	4,6	3,9	3,6	3,7
6300	3,2	5,3	8,6	11,1	11,3	9,6	8,0	6,6	5,4	4,8	4,7
8000	3,8	6,1	9,9	13,9	15,6	13,6	11,5	9,5	7,9	6,8	6,4
10000	4,5	7,1	11,4	16,9	20,3	19,1	16,6	13,9	11,6	9,7	8,8
12500	5,5	8,3	3,0	20,0	25,3	26,6	23,0	19,6	16,4	13,8	12,1

A1 - 10. Táblázat Hang terjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 40%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,1	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,1	0,1	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,2	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,3	0,2	0,2	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,5	0,4	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,6	0,5	0,4	0,3	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,9	0,7	0,5	0,4	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	1,2	1,0	0,8	0,6	0,4	0,4	0,4	0,5	0,5	0,6	0,6
1000	1,4	1,4	1,1	0,8	0,6	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,8	1,9	1,5	1,2	0,9	0,7	0,7	0,7	0,8	0,9	1,0
1600	2,1	2,6	2,1	1,7	1,3	1,0	0,9	0,9	1,0	1,1	1,3
2000	2,5	3,2	2,9	2,4	1,9	1,5	1,2	1,2	1,3	1,4	1,6
2500	2,8	4,0	4,1	3,3	2,6	2,1	1,7	1,6	1,7	1,8	2,0
3150	3,2	4,9	5,6	4,7	3,8	3,0	2,4	2,1	2,1	2,3	2,5
4000	3,6	5,9	7,2	6,5	5,4	4,3	3,5	3,0	2,8	3,0	3,3
5000	3,8	6,3	8,1	7,7	6,6	5,2	4,2	3,5	3,3	3,4	3,7
6300	4,3	7,2	10,0	10,7	9,0	7,3	6,0	4,9	4,4	4,3	4,7
8000	5,0	8,3	12,3	14,4	12,6	10,6	8,7	7,1	6,1	5,8	6,2
10000	5,8	9,5	14,8	18,4	17,8	15,2	12,7	10,5	8,8	8,1	8,1
12500	6,9	10,9	17,2	22,9	24,7	21,2	17,8	14,9	12,4	10,9	10,6

A1 - 11. Táblázat Hangterjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 50%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,1	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,3	0,2	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,4	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,5	0,4	0,3	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,7	0,6	0,4	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	1,0	0,8	0,6	0,5	0,4	0,4	0,4	0,5	0,5	0,6	0,6
1000	1,4	1,1	0,9	0,6	0,5	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,8	1,6	1,2	0,9	0,7	0,6	0,7	0,7	0,8	0,9	1,0
1600	2,3	2,2	1,8	1,3	1,0	0,9	0,9	0,9	1,0	1,1	1,3
2000	2,8	3,1	2,4	1,9	1,5	1,2	1,1	1,2	1,3	1,4	1,6
2500	3,3	4,0	3,4	2,7	2,1	1,6	1,5	1,5	1,7	1,8	2,0
3150	4,0	5,1	4,7	3,8	3,0	2,3	2,0	1,9	2,1	2,3	2,5
4000	4,6	6,4	6,7	5,5	4,4	3,4	2,8	2,6	2,7	3,0	3,3
5000	4,9	7,2	7,9	6,5	5,2	4,2	3,4	3,1	3,1	3,4	3,7
6300	5,4	8,6	10,2	8,9	7,3	5,9	4,7	4,1	4,0	4,3	4,7
8000	6,2	10,2	13,1	12,5	10,5	8,6	6,9	5,8	5,4	5,7	6,2
10000	7,2	11,9	16,4	17,8	15,0	12,4	10,2	8,4	7,5	7,4	8,1
12500	8,4	13,6	20,1	23,4	20,6	17,5	14,4	11,9	10,4	9,9	10,5

A1 - 12. Táblázat Hangterjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 60%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,1	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,2	0,2	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,5	0,3	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,6	0,5	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	0,9	0,7	0,5	0,4	0,4	0,4	0,4	0,5	0,5	0,6	0,6
1000	1,2	1,0	0,7	0,5	0,5	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,7	1,3	1,0	0,7	0,6	0,6	0,7	0,7	0,8	0,9	1,0
1600	2,3	1,9	1,5	1,1	0,9	0,8	0,9	0,9	1,0	1,1	1,3
2000	2,9	2,6	2,1	1,6	1,2	1,1	1,1	1,2	1,3	1,4	1,6
2500	3,6	3,6	2,9	2,2	1,7	1,4	1,4	1,5	1,7	1,8	2,0
3150	4,4	5,0	4,1	3,3	2,5	2,0	1,8	1,9	2,1	2,3	2,5
4000	5,3	6,6	5,7	4,6	3,6	2,8	2,5	2,5	2,7	3,0	3,3
5000	5,8	7,4	6,8	5,5	4,3	3,4	2,9	2,9	3,1	3,4	3,7
6300	6,6	9,2	9,3	7,7	6,1	4,9	4,0	3,8	4,0	4,3	4,7
8000	7,6	11,4	13,0	10,9	8,9	7,2	5,8	5,2	5,2	5,7	6,2
10000	8,7	13,8	16,9	15,3	12,8	10,4	8,5	7,3	7,0	7,4	8,1
12500	10,0	16,1	21,1	21,2	18,0	14,8	12,8	10,2	9,5	9,6	10,5

A1 - 13. Táblázat Hang terjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 70%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,1	0,1	0,1	0,2
250	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
315	0,2	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,3	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,4	0,3	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,4	0,4
630	0,6	0,4	0,3	0,3	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	0,8	0,6	0,4	0,4	0,4	0,4	0,4	0,5	0,5	0,6	0,6
1000	1,1	0,8	0,6	0,5	0,4	0,5	0,5	0,6	0,7	0,7	0,8
1250	1,5	1,1	0,9	0,7	0,6	0,6	0,7	0,7	0,8	0,9	1,0
1600	2,1	1,7	1,2	0,9	0,8	0,8	0,9	1,0	1,0	1,1	1,3
2000	2,9	2,3	1,8	1,3	1,0	1,0	1,1	1,2	1,3	1,4	1,6
2500	3,7	3,2	2,5	1,9	1,5	1,3	1,4	1,5	1,7	1,8	2,0
3150	4,6	4,4	3,5	2,7	2,1	1,8	1,8	1,9	2,1	2,3	2,5
4000	5,7	6,3	5,1	4,0	3,1	2,5	2,3	2,5	2,7	3,0	3,3
5000	6,3	7,3	6,0	4,7	3,7	3,0	2,7	2,9	3,1	3,4	3,7
6300	7,5	9,3	8,2	6,6	5,2	4,2	3,6	3,6	4,0	4,3	4,7
8000	8,8	11,8	11,6	9,5	7,6	6,1	5,1	4,9	5,2	5,7	6,2
10000	10,2	14,8	16,4	13,7	11,1	9,0	7,4	6,8	6,8	7,4	8,1
12500	11,6	18,0	21,4	18,8	15,7	12,8	10,5	9,2	9,0	9,6	10,5

A1 - 14. Táblázat Hangterjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 80%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,2	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,2	0,2	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,5	0,3	0,3	0,2	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	0,7	0,5	0,4	0,3	0,3	0,4	0,4	0,5	0,5	0,6	0,6
1000	1,0	0,7	0,5	0,4	0,4	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,3	1,1	0,7	0,6	0,6	0,6	0,7	0,7	0,8	0,9	1,0
1600	1,9	1,5	1,1	0,8	0,7	0,8	0,9	0,9	1,0	1,1	1,3
2000	2,6	2,0	1,5	1,1	1,0	1,0	1,1	1,2	1,3	1,4	1,6
2500	3,6	2,9	2,2	1,6	1,3	1,3	1,4	1,5	1,7	1,8	2,0
3150	4,7	4,0	3,1	2,4	1,9	1,7	1,8	1,9	2,1	2,3	2,5
4000	5,9	5,6	4,5	3,4	2,7	2,3	2,3	2,5	2,7	3,0	3,3
5000	6,6	6,6	5,3	4,1	3,2	2,7	2,6	2,8	3,1	3,4	3,7
6300	8,1	9,1	7,4	5,9	4,6	3,7	3,4	3,6	4,0	4,3	4,7
8000	9,8	12,0	10,4	8,4	6,7	5,4	4,8	4,8	5,2	5,7	6,2
10000	11,5	15,3	14,8	12,2	9,8	7,8	6,7	6,4	6,8	7,4	8,1
12500	13,3	18,9	20,5	17,0	13,9	11,3	9,4	8,7	8,9	9,6	10,5

A1 - 15. Táblázat Hangterjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 90%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,2	0,2	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,4	0,3	0,2	0,2	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	0,6	0,4	0,3	0,3	0,3	0,4	0,4	0,5	0,5	0,6	0,6
1000	0,9	0,6	0,5	0,4	0,4	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,2	0,9	0,6	0,5	0,6	0,6	0,7	0,7	0,8	0,9	1,0
1600	1,7	1,3	0,9	0,7	0,7	0,8	0,9	0,9	1,0	1,1	1,3
2000	2,4	1,8	1,3	1,0	0,9	1,0	1,1	1,2	1,3	1,4	1,6
2500	3,3	2,6	1,9	1,4	1,2	1,3	1,4	1,5	1,7	1,8	2,0
3150	4,6	3,6	2,8	2,1	1,7	1,6	1,8	1,9	2,1	2,3	2,5
4000	6,0	5,1	4,0	3,0	2,4	2,2	2,3	2,5	2,7	3,0	3,3
5000	6,7	6,0	4,8	3,7	2,9	2,6	2,6	2,8	3,1	3,4	3,7
6300	8,3	8,3	6,7	5,2	4,0	3,4	3,3	3,6	4,0	4,3	4,7
8000	10,4	11,7	9,5	7,6	6,0	4,9	4,5	4,8	5,2	5,7	6,2
10000	12,6	15,4	13,5	11,0	8,8	7,1	6,3	6,3	6,8	7,4	8,1
12500	14,8	19,4	18,6	15,4	12,4	10,1	8,7	8,3	8,9	9,6	10,5

A1 - 16. Táblázat Hangterjedési együttható dB/100 m-ben

Sáv közép-frekvencia	Relatív páratartalom = 100%										
	Hőmérséklet, °C										
Hz	-10	-5	0	5	10	15	20	25	30	35	40
50	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
63	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
80	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1
100	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
125	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1
160	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
200	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2
250	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2
315	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2
400	0,2	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3
500	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,3	0,3	0,3	0,4
630	0,4	0,3	0,2	0,2	0,3	0,3	0,3	0,4	0,4	0,4	0,5
800	0,6	0,4	0,3	0,3	0,3	0,4	0,4	0,5	0,5	0,6	0,6
1000	0,8	0,6	0,4	0,4	0,4	0,5	0,5	0,6	0,6	0,7	0,8
1250	1,1	0,8	0,6	0,5	0,6	0,6	0,7	0,7	0,8	0,9	1,0
1600	1,6	1,2	0,8	0,7	0,7	0,8	0,9	0,9	1,0	1,1	1,3
2000	2,2	1,6	1,2	0,9	0,9	1,0	1,1	1,2	1,3	1,4	1,6
2500	3,0	2,3	1,7	1,3	1,2	1,3	1,4	1,5	1,7	1,8	2,0
3150	4,2	3,3	2,5	1,9	1,6	1,6	1,8	1,9	2,1	2,3	2,5
4000	5,9	4,7	3,6	2,7	2,2	2,1	2,3	2,5	2,7	3,0	3,3
5000	6,8	5,5	4,3	3,3	2,6	2,4	2,6	2,8	3,1	3,4	3,7
6300	8,5	7,6	6,0	4,7	3,7	3,3	3,3	3,6	4,0	4,3	4,7
8000	10,7	10,8	8,7	6,8	5,3	4,5	4,4	4,8	5,2	5,7	6,2
10000	13,3	15,1	12,5	10,0	7,9	6,5	6,0	6,3	6,8	7,4	8,1
12500	16,0	19,5	7,2	14,0	11,3	9,2	8,2	8,2	8,9	9,6	10,5

8.3 A 8.2 pontban megadott egyenletek számítógépes feldolgozásra alkalmasak. Más esetekben történő használatra az egyenletekkel meghatározott számszerű értékeket az A1-7-től az A1-16-ig terjedő táblázatokban adtuk meg.

9. RÉSZLETEZETT KORREKCIÓS ELJÁRÁSOK

9.1 Bevezető rész

9.1.1 Abban az esetben, ha a zaj minősítési vizsgálati feltételek nem egyeznek meg a referencia feltételekkel, akkor a mért adatokból az ebben a szakaszban ismertetett módszerekkel számított EPNL értékekre megfelelő korrekciókat kell végezni.

1. Megjegyzés. - A referencia és vizsgálati feltételek közötti különbségek, amelyek a korrekciót megkövetelik, a következőkből erednek:

a) A referencia értéktől eltérő vizsgálati feltételek közötti légköri hangcsillapítás;

b) A referencia magasságtól eltérő magasságú repülési útvonal; és

c) A maximumtól eltérő vizsgálati repülőgép tömeg.

2. Megjegyzés. - Negatív korrekció jöhet létre, amennyiben a légköri hangcsillapítás a vizsgálati feltételek között kisebb, mint a referencia feltételek közötti és akkor is, ha a repülési útvonal alacsonyabb, mint a referencia feltételek között.

A felszállási vizsgálati repülési pálya magasabb is lehet, amennyiben a meteorológiai feltételek nagyobb repülőgép teljesítményt tesznek lehetővé ("hideg nap" hatás). Megfordítva a "meleg nap" hatás azt idézheti elő, hogy a felszállási vizsgálati repülési pálya a referencia repülési pályánál alacsonyabban helyezkedik el. A megközelítési repülési pálya a meteorológiai feltételektől függetlenül a referencia pályánál nagyobb, vagy kisebb magasságú is lehet

9.1.2 A mért zaj értékeket megfelelően korrigálni kell a referencia feltételekre, akár az alábbi integrált program alkalmazásával, akár az előbbivel egyenértékűként jóváhagyott módszerrel.

9.1.2.1 A korrekciós eljárások az EPNL értékekhez algebrailag hozzáadott egy, vagy több értékből álljanak, melyeket úgy kell kiszámítani, mintha a vizsgálat teljesen a zaj minősítési referencia feltételek között zajlott volna.

9.1.2.2 A repülési pályákat mind a felszállásra és a megközelítésre, mind a referencia, mind a vizsgálati feltételekre meg kell határozni. A vizsgálati eljárások követeljék meg a zaj és a repülési pálya egy szinkron időjellel együttesen történő rögzítését, amelyekből a vizsgálati profilt ábrázolható, beleértve azon repülőgép helyzeteket is, amelyekre a zajmérő helyen a PNLTM értéket megfigyelik. A felszállás esetében a referencia feltételekre korrigált repülési profilt a bizonyítványt kiállító hatóságok által jóváhagyott adatokból kell származtatni.

Megjegyzés. - A megközelítés referencia profilját az 5.3 pontban leírt referencia feltételek határozzák meg.

9.1.2.3 A vizsgálati és a referencia feltételekre meg kell határozni a repülőgéptől a zajmérő állomásig terjedő PNLTM-nek megfelelő különféle zaj pályahosszakat. Ezután a PNLTM spektrumában a következő hatások miatt kell az SPL értékeket korrigálni.

a) légköri hangcsillapításban beálló változás;

b) légköri hangcsillapítás a zajpálya hossz változásával; és

c) inverz négyzet törvény a zaj pályahosszúságának változására.

9.1.2.4 Ezután az SPL korrigált értékeit át kell alakítani PNLT értékekre, amelyből PNLTM-et le kell vonni.

Megjegyzés. - A különbség jelenti a mért adatokból nyert EPNL értékhez számtanilag hozzáadandó korrekciót.

9.1.3 A vizsgálati és a referencia profiloktól a zajmérési helyig terjedő minimum távolságokat ki kell számítani és fel kell használni a repülőgép átrepülési magasság változásai miatti zaj idő-tartam korrekció meghatározásához. Az időtartam korrekciót számtanilag hozzá kell adni a mért adatokból számított EPNL értékhez.

9.1.4 A maximum fel- és leszálló tömeg és a vizsgált repülőgép tömege közötti különbségből eredő zajszint változás figyelembe vételére, az EPNL felszálló és leszálló tömeg függvényű változásait görbék, táblázatok, vagy egyéb más módon megadó (bizonyítványt kiállító hatóság által jóváhagyott) gyártói adatokból korrekciókat kell meghatározni és hozzáadni a mért adatokból számított EPNL értékhez.

9.1.5 A referencia és vizsgálati megközelítési szög közötti különbségek miatti zajszint változás figyelembe vételéhez az EPNL megközelítési szög függvényű változását görbék, táblázatok, vagy egyéb más módon megadó (a bizonyítványt kiállító hatóság által jóváhagyott) gyártói adatokból korrekciókat kell meghatározni és számtanilag hozzáadni a mért adatokból számított EPNL értékhez.

9.2 Felszállási profilok

Megjegyzés. -

a) Az A1 - 4. ábra tipikus felszállási profilt mutat be. A repülőgép az A pontban kezdi meg a felszállási nekifutást, a B pontban emelkedik el és a C pontban kezdi meg az első állandó β szögű emelkedést. A zajcsökkentés miatti tolóerő visszavétel a D pontnál kezdődik és E pontnál fejeződik be, ahol a második állandó emelkedést a γ szög definiálja (általában százalékos gradiensben kifejezve).

b) A repülőgép zaj minősítési vizsgálati felszállási repülési pályája végét az F pont jelenti, amelynek a repülési pályára (a futópálya meghosszabbított középvonalára) való merőleges vetületét az M pont szolgáltatja. A repülőgép helyzetét legalább 11 km (6 tengeri mérföld) AM távolságig kell rögzíteni.

c) A K pozíció a felszállási zajmérés helye, amelynek AK távolsága az előírt felszállási mérési távolság. Az L pozíció az az oldalsó zajmérő hely a futópálya középvonalával párhuzamos egyenesen és előírt távolságra a futópálya meghosszabbított középvonalától, ahol felszálláskor a zajszint a legnagyobb.

d) A tolóerő csökkentést követő tolóerő beállítás, ha alkalmazzák, a vizsgálati feltételek között, legalább a légköri és a tömeg referencia feltételekhez tartozó előírt hitelesítési minimum gradienst létrehozzásához elégséges mértékű legyen.

e) A felszállási profil a következő öt paraméterrel kapcsolható össze: AB a felszállási nekifutás úthossza; β az első állandó emelkedési szög; γ a második állandó emelkedési szög; és δ és ε - a tolóerő csökkentések szögei. Ez az öt paraméter a repülőgép teljesítmény, tömeg és légköri feltételek (környezeti levegő hőmérséklet, nyomás és szélsebesség) függvényei. Ha a vizsgálat légköri feltételei nem egyeznek a referencia légköri feltételekkel, akkor a vonatkozó vizsgálati és referencia profilok paraméterei eltérőek lesznek, ahogyan azt az A1 - 5 ábra bemutatja. A profil paraméterek (ΔAB, $\Delta\beta$, $\Delta\gamma$, $\Delta\delta$ és a $\Delta\varepsilon$ jelekkel jelölt) változásai a (bizonyítványt kiadó hatóságok részéről jóváhagyott) gyártói adatokból nyerhetők és a referencia légköri feltételekre korrigált repülési profilt meghatározására kell használni, a repülőgép vizsgálati tömegét változatlanul hagyva. A mért és korrigált felszállási repülési profilok közötti *összefüggések ezután felhasználhatók a mért adatokból számított EPNL-nél alkalmazandó korrekciók meghatározására.*

f) Az A1 - 6 ábrán a mért és korrigált felszállási pályák szerepelnek, beleértve a hang terjedését befolyásoló jellemző geometriai összefüggéseket. EF jelenti a második állandó, mért repülési pályát, amelynek emelkedési szöge γ *és az EcFc jelenti a második állandó korrigált repülési pályát különböző magasságokon és különböző emelkedési szögekkel* $\gamma + \Delta\gamma$*.*

g) A Q helyzet jelenti a repülőgép mért felszállási pályáján azt a tartózkodási helyet, amelyre a PNLTM -et a K zajmérő állomáson észlelik; Qc az ennek megfelelő helyzet a korrigált repülési pályán. KQ és a KQc a mért és a korrigált zaj terjedési pályák, amelyekről feltételezhető, hogy a repülési pályájukkal azonos Θ *szöget zának be. Az állandó* Θ *szögek feltételezése nem feltétlenül érvényes minden esetben. Keresni kell a további finomítás lehetőségeit. Azonban e vizsgálati eljárás jelenlegi alkalmazásához minden eltérést kicsinek veszünk.*

h) A mért felszállási pályán R helyzet jelenti azt a pontot, amely a K zajmérő állomáshoz a legközelebb van, és Rc pedig a korrigált repülési pályán ennek megfelelő helyzetet. A mért és a korrigált repülési pályákhoz mért minimum távolságot a repülési pályájukra merőleges KR és KRc vonalak jelzik.

Ha az átrepülés folyamán PNLT két csúcsértékét figyelik meg, amely 2 TPNdB-nél kisebb értékkel különbözik attól a zajszinttől, amely a referencia feltételekre korrigáláskor a nagyobbik értéket adja, akkor a nagyobbikat kell a referencia feltételek melletti EPNL számítására használni. Ebben az esetben a második csúcsértékhez tartozó pontot a korrigált repülési pályán a gyártó cég jóváhagyott adatainak felhasználásával kell előállítani.

9.3 Megközelítési profilok

Megjegyzések.-

a) Az A1 - 7 ábra tipikus megközelítési profilt szemléltet. A zaj minősítési vizsgálati megközelítési profil kezdetét a G repülőgép helyzet jelenti, ennek függőleges vetülete a repülési pályára a P pont (a futópálya meghosszabbított középvonalán). A repülőgép helyzetét az O pályaküszöbtől mért legalább 7,4 km -es (4 NM) OP távolságban rögzítik.

b) A repülőgép η *szöggel hajtja végre a megközelítést, függőlegesen elrepül az N zajmérő pont felett NH magasságban, kilebegtetésbe kezd az I ponton és a J ponton földet ér.*

c) A megközelítési profilt a η *megközelítési szög és az NH magasság határozza meg, amelyek a repülőgépvezető által szabályozott repülőgép üzemeltetési feltételek függvényei. Ha a mért megközelítési profil paraméterek eltérnek a vonatkozó referencia megközelítési paraméterektől (lásd az A1-8 ábrát), akkor a mért adatokból számított EPNL értéket korrigálni kell.*

d) Az A1-9 ábra mutatja a mért és a referencia megközelítési repülési pályák egyes szakaszait, ideértve a hangterjedését befolyásoló jelentős geometriai összefüggéseket is. GI jelenti a η *megközelítési szögű mért megközelítési pályát és GrIr jelenti a referencia magasságon lévő* η_r*. referencia megközelítési szögű referencia repülési pályát.*

e) Az S helyzet jelenti a repülőgépnek a mért megközelítési pályán lévő helyzetét, amelyre N zajmérő pontban a PNLTM-et megfigyelik és Sr a referencia megközelítési pálya ennek megfelelő pontja. Az NS és a NSr a mért, illetve a helyesbített zajáterjedési pálya, amelyek a repülési útvonalaikkal ugyanazon λ *szöget zárják be.*

f) A T helyzet jelenti az N mérőponthoz legközelebb eső, a mért megközelítési pályán elhelyezkedő pontot és a Tr az ennek megfelelő pont a referencia megközelítési repülési pályán. Az NT, illetve NTr egyenesek a mért, illetve referencia repülési pályától a repülési pályára merőlegesen mért minimum távolságot jelentik.

9.4 PNLT korrekciók

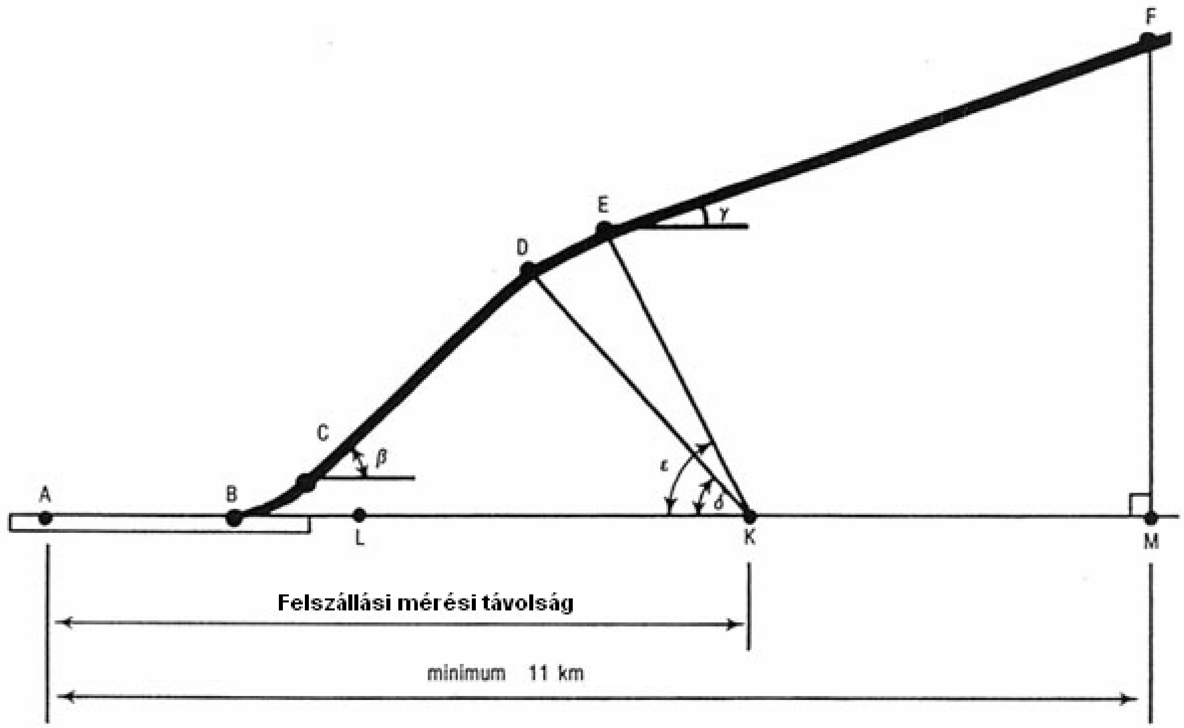
9.4.1 Amikor a környezeti légköri körülmények közül a hőmérséklet és a relatív páratartalom eltér a referencia körülményektől és/vagy a mért felszállási és megközelítési repülési pálya eltér a referencia repülési pályától, akkor a mért adatokból számított EPNL értékek korrekcióját a következők szerint kell kiszámítani:

9.4.1.1 Felszállás

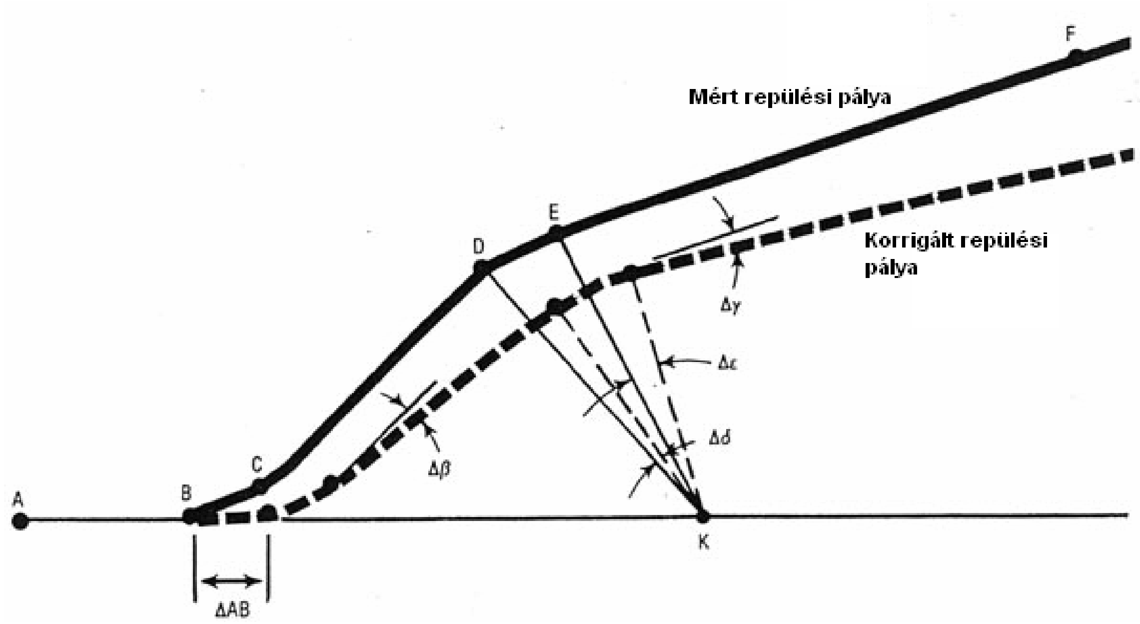
9.4.1.1.1 Az A1-6 ábrán látható jellemző felszállási repülési pályát alapul véve, a Q helyzetben lévő repülőgépre a K állomásnál megfigyelt PNLTM spektrumot szét kell választani egyedi SPL(i) értékeire. A korrigált érték készletet a következők szerint kell kiszámítani:

$$SPL(i)c = SPL(i) + 0{,}01\,[\,\alpha(i) - \alpha(i)o]\,KQ + 0{,}01\,\alpha(i)o(KQ - KQc) + 20\log(KQ/KQc)$$

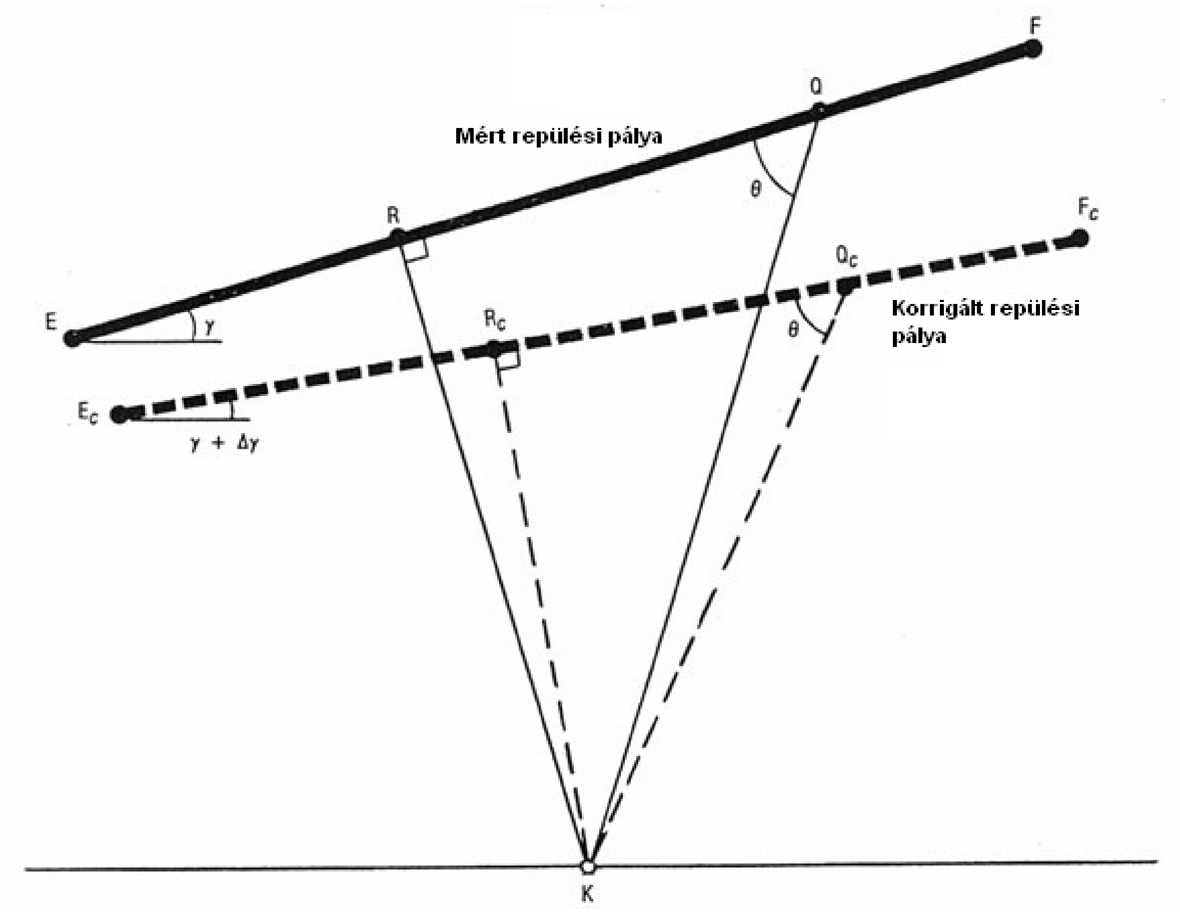
- a 0,01 ($\alpha(i)$ - $\alpha(i)o$) KQ kifejezés a légköri hangelnyelés változás hatásait veszi figyelembe, ahol is $\alpha(i)$ és $\alpha(i)o$ a hang csillapítás együtthatói a vizsgálati és a referencia körülményekre az i-edik egyharmad oktávsávra; KQ a mért felszállási zajpálya.
- A 0,01 $\alpha(i)o$ (KQ -KQc) kifejezés veszi figyelembe a légköri zajcsillapítás zajpályahossz változásra gyakorolt hatásait, ahol a KQc a korrigált felszállási zajpálya; és
- A 20 log(KQ/KQc) kifejezés veszi figyelembe a zaj pályahossz változásra gyakorolt inverz négyzet törvény hatásait.



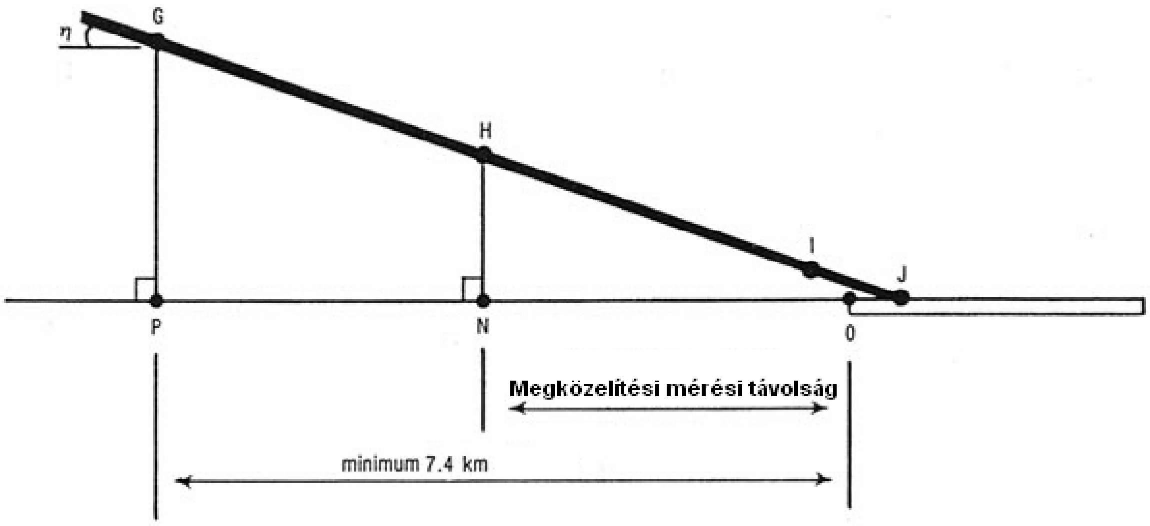
A1 - 4. Ábra - mért felszállási profil



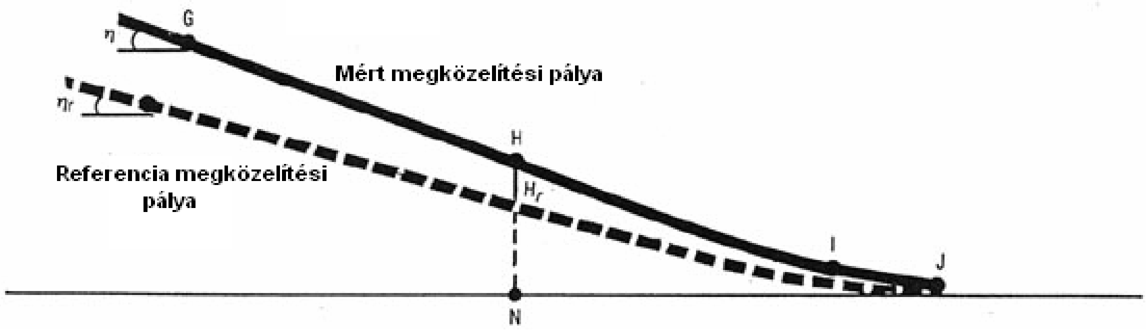
A1 - 5. Ábra - mért és korrigált felszállási profilok összehasonlítása



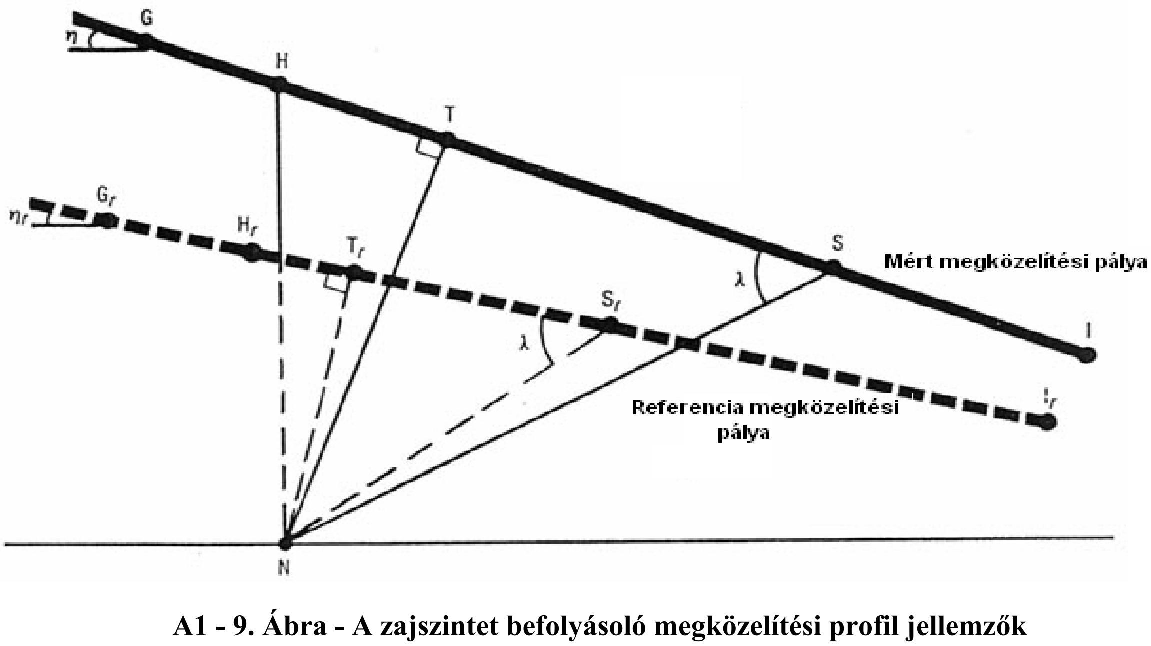
A1 - 6. Ábra - A zajszintet befolyásoló felszállási profil jellemzők



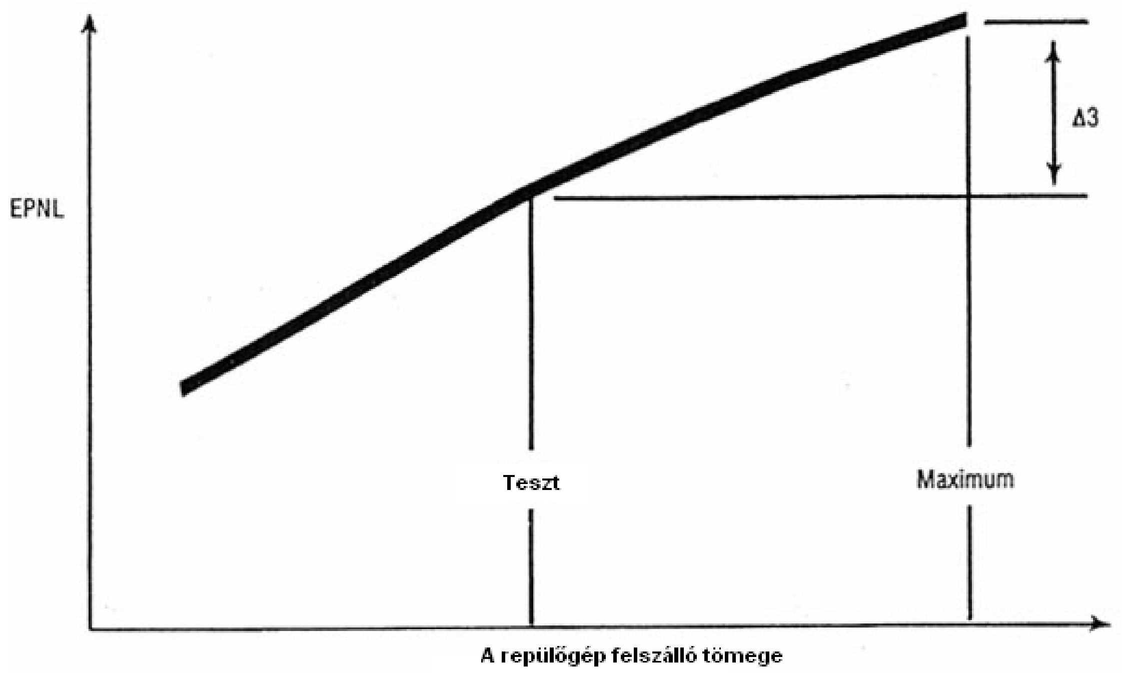
A1 - 7. Ábra - mért megközelítési profil



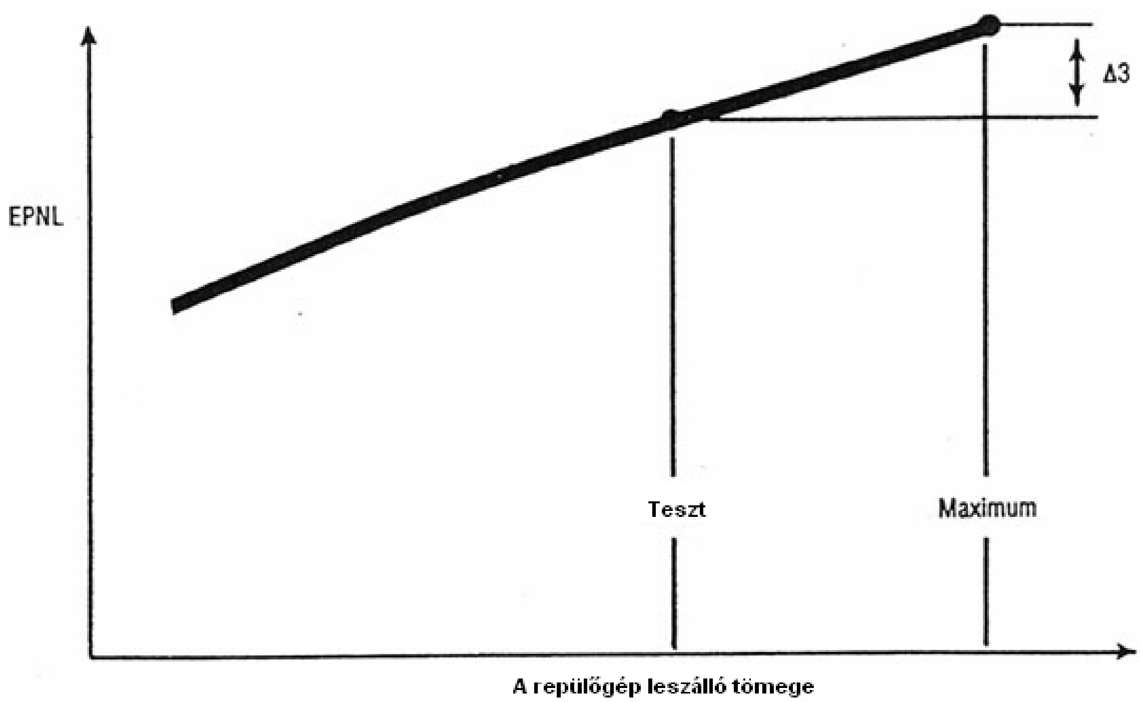
A1 - 8. Ábra - A mért és korrigált megközelítési profilok összehasonlítása



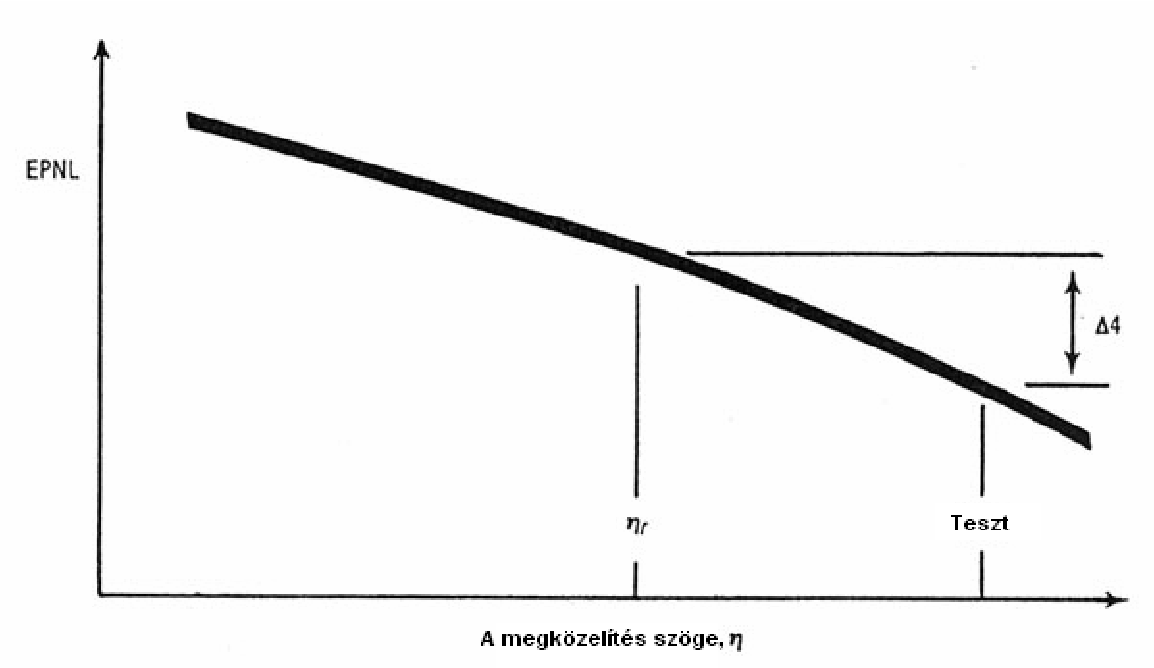
A1 - 9. Ábra - A zajszintet befolyásoló megközelítési profil jellemzők



A1-10. Ábra - Felszálló tömeg korrekció EPNL-hez



A1-11. Ábra - Megközelítési tömeg korrekció EPNL-hez



A1-12. Ábra - Megközelítési szög korrekció EPNL-hez

9.4.1.1.2 Az SPL(i)c korrigált értékeit ezután PNLT-re kell alakítani és ki kell számítani a korrekciós tagot a következők szerint:

$$\Delta\ 1 = \mathrm{PNLT} - \mathrm{PNLTM}$$

mely a mért értékekből számított EPNL-hez számtanilag hozzáadandó korrekciót jelenti.

9.4.1.2. Megközelítés

Ugyanezt az eljárást kell alkalmazni a megközelítési repülési pálya viszonylatában is, azzal a kivétellel, hogy az SPL(i)c értékek az A1-9 ábrán látható megközelítési zajpályára vonatkoznak, a következők szerint

$$\mathrm{SPL(i)c} = \mathrm{SPL(i)} + 0{,}01\ (\alpha(\mathrm{i}) - \alpha(\mathrm{i})\mathrm{o})\ \mathrm{NS} + 0{,}01\alpha(\mathrm{i})\mathrm{o}\ (\mathrm{NS} - \mathrm{NSr})) + 20 \log (\mathrm{NS/NSr})$$

ahol NS és NSr a mért és a referencia zajpályát jelentik. Az eljárás további része azonos a felszállási repülési pályával kapcsolatban leírtakkal.

9.4.1.3 Oldalirányú korrekciók
Ugyanezt az eljárást kell alkalmazni az oldalsó repülési pálya viszonylatában is, kivéve, hogy az SPL(i)c értékek csak a mért oldalsó zajpályára vonatkoznak, a következők szerint:

$$\mathrm{SPL(i)c} = \mathrm{SPL(i)} + 0{,}01\ (\alpha(\mathrm{i}) - \alpha(\mathrm{i})\mathrm{o})\ \mathrm{LX}$$

ahol az LX a mért oldal irányú zajpálya az L állomástól (A1-4 ábra) azon repülőgép X helyzetig, melyre a PNLTM-et az L állomásból észlelik. Csak a légköri hangelnyelésre vonatkozó korrekciós tagot kell figyelembe venni. A mért és a korrigált zajpálya közötti hosszúság különbséget elhanyagolhatónak kell feltételezni az oldalsó repülési pálya viszonylatában. Az eljárás további része azonos a felszállási repülési pályával kapcsolatban leírtakkal.

9.5 Időtartam korrekció

9.5.1 Ha a mért felszállási és megközelítési repülési pálya eltér a korrigált és a referencia repülési pályától, akkor a mért adatokból kiszámított EPNL értékeket időtartam szerint korrigálni kell. Ezeket a korrekciókat a következőkben ismertetettek szerint kell kiszámítani

9.5.1.1 Felszállás

Az A1-6 ábrán látható felszállási repülési pályára utalva, a korrekciós tagot a következőképpen kell kiszámítani:

$$\Delta_2 = -7{,}5 \log(KR/KRc)$$

amely a mért adatokból számított EPNL-hez számtanilag hozzáadandó korrekciót jelenti. A KR és KRc távolságok legyenek a vonatkozó mért és a korrigált felszállási minimum távolságok a K zajmérő állomástól a mért, illetve a korrigált repülési pályákig. A minusz jel azt jelezze, hogy az időtartam korrekció egy adott esetében, a mért adatokból számított EPNL-t csökkenteni kell, ha a mért repülési pálya nagyobb tengerszint feletti magasságra van, mint a korrigált repülési pálya.

9.5.1.2. Megközelítés

Ugyanezt az eljárást kell alkalmazni a megközelítési pálya viszonylatában is, kivéve, hogy a korrekciók az A1 - 9 ábrán feltüntetett megközelítési minimum távolságokra vonatkoznak a következők szerint:

$$\Delta_2 = -7{,}5 \log(NT/NTr)$$

ahol NT a mért megközelítési minimum távolság az N zajmérő állomástól a mért repülési pályáig.

9.5.1.3 Oldalirányú korrekció

Az oldalsó repülési pályára nem kell időtartam korrekciót számítani, mert a mért és a korrigált repülési pályák közötti különbségeket elhanyagolhatónak tekintjük.

9.6 Tömeg korrekció

Minden esetben, amikor a repülőgép tömege a zaj minősítési felszállási, vagy megközelítési vizsgálat alatt különbözik a megfelelő legnagyobb felszálló, vagy leszálló tömegtől, akkor a mért adatokból számított EPNL adatokra korrekciót kell alkalmazni. A korrekciókat (a bizonyítványt kiállító hatóság által jóváhagyott) gyártói adatokból kell kiszámítani. A gyártó cég adatai görbék, vagy táblázatok formájában állnak rendelkezésre, ahogyan ezeket az A1-10 és A1-11 ábra mutatja. A gyártó cég adatainak alkalmazhatóaknak kell lenniük a zaj minősítési referencia légköri feltételekhez.

9.7 A megközelítés szögének korrekciója

Minden esetben, amikor a repülőgép megközelítési szöge a zaj minősítési vizsgálat során különbözik a referencia megközelítési szögtől, akkor a mért adatokból számított EPNL értékre korrekciót kell végezni. A korrekciókat (a bizonyítványt kiállító hatóság által jóváhagyott) gyártói adatokból kell meghatározni. A gyártó cég adatai görbék, vagy táblázatok formájában állnak rendelkezésre, ahogyan ezeket az A1-12 ábra vázlatosan mutatja. A gyártó cég adatainak alkalmazhatóaknak kell lenniük a zaj minősítési referencia légköri feltételekhez és a vizsgálati leszállási tömeghez.

2. FÜGGELÉK - ÉRTÉKELÉSI MÓDSZEREK A ZAJMINŐSÍTÉSI VIZSGÁLATHOZ:

1. - HANGSEBESSÉGNÉL LASSABB SUGÁRHAJTÁSÚ REPÜLŐGÉPEK - a prototípus légi-alkalmassági bizonyítványa iránt 1977. október 6-án vagy később elfogadott kérelmek

2. - 5700 KG-NÁL NEHEZEBB LÉGCSAVAR HAJTÁSÚ REPÜLŐGÉPEK - a prototípus légi-alkalmassági bizonyítványa iránt 1985. január 1-én, vagy utána és 1988 november 17. előtt elfogadott kérelmek.

3. - 8618 KG-NÁL NEHEZEBB LÉGCSAVAR HAJTÁSÚ REPÜLŐGÉPEK - a prototípus légi-alkalmassági bizonyítványa iránt 1988 november 17-én, vagy utána elfogadott kérelmek.

4.- HELIKOPTEREK

Megjegyzés.- Lásd a II. Rész 3., 4. és 8. Fejezetét.

1. BEVEZETŐ RÉSZ

1. Megjegyzés.- A zaj értékelési eljárás tartalmazza:

a) A zaj minősítési vizsgálat és mérés körülményeit;

b) A repülőgép és helikopter földön észlelt zajának mérését;

c) A mért zaj adatokból a Ténylegesen Észlelt Zajszint kiszámítását; és

d) Az adatok jelentését a bizonyítványt kiállító hatóságnak és a mért adatok korrigálását.

2. Megjegyzés. - A módszer leírásában található utasítások és eljárások pontosan körvonalazottak, hogy a minősítési vizsgálatok során egységességet biztosítsanak, valamint, hogy lehetőség nyíljon a különféle légijármű típusokon végzett mérések összehasonlítására függetlenül attól, hogy azokra eltérő földrajzi helyeken került sor.

3. Megjegyzés. - Jelen Függelék 6 - 9 szakaszaiban található a jelek és mértékegységek teljes felsorolása, az érzékelt zajosság matematikai megfogalmazása, a légköri hangcsillapítás megállapításához alkalmas egyfajta módszer, valamint részletes eljárások, amelyek segítségével a zajszintek, nem referencia körülményekről referencia körülményekre korrigálhatók.

2. ZAJ MINŐSÍTÉSI VIZSGÁLATI ÉS MÉRÉSI FELTÉTELEK

2.1 Általános rész

Ez a szakasz írja elő a zaj minősítés végrehajtási feltételeit, valamint az alkalmazandó mérési eljárásokat.

Megjegyzés. - A zaj minősítési bizonyítvány iránt benyújtott kérelmek jelentős része a repülőgép típusterv *csak minimális megváltoztatásával függ össze. Az ebből eredő zajszint változás megfelelő biztonsággal gyakran megállapítható anélkül, hogy elvégeznék a jelen Függelékben leírt teljes eljárást. Éppen ezért javasoljuk a bizonyítványt kiadó hatóságoknak, hogy engedélyezzék a megfelelő "Egyenértékű Eljárások" használatát. Hasonlóképp, léteznek a teljes zaj minősítés megállapítási eljárás során alkalmazható egyenértékű eljárások a költségek csökkentése, de ugyanakkor megbízható eredmények elérése céljából. Az egyenértékű eljárásoknak a hangsebességnél lassabb sugárhajtású és légcsavar hajtású repülőgépek, valamint a helikopterek zaj minősítéséhez való használatára vonatkozó segédanyag az "Environmental Technical Manual on the use of Procedures in the Noise Certification of Aircraft" (Doc 9501) kiadványban található.*

2.2 Vizsgálati környezet

2.2.1 A levegőben lévő légijármű zajának méréséhez túlzott hangelnyelő tulajdonsággal (mint amit a sűrű, tömörödött, vagy hosszú fű, bokrok vagy erdős területek okoznak) nem rendelkező viszonylag lapos környezetű terepet kell kiválasztani. Nem lehetnek a repülőgép zajmezőjét jelentősen befolyásoló akadályok a mikrofon alatt függőlegesen lévő pont feletti kúpos térben, amely kúpot a földfelszínre merőleges tengely és e tengelyhez képest mért 80^{o}-os fél-szög határoz meg.

Megjegyzés. - A mérést végző személyek maguk is képezhetnek ilyen akadályt.
2.2.2 A 2.2.4-ban említett kivételekkel, a vizsgálatokat a következő légköri viszonyok mellett kell végezni:

a) Nincs csapadék;

b) Környezeti levegő hőmérséklet 35^{o}C-nál nem több és -10^{o}C-nál nem kevesebb, valamint a relatív páratartalom 95 százaléknál nem magasabb és 20 százaléknál nem alacsonyabb a földfelszín felett 10 méter (33 láb) magasságban lévő pont és a légi jármű közötti teljes zajpályán;

Megjegyzés. - Gondosan kell eljárni annak biztosítására, hogy a zajmérő-, a légi jármű pálya követő- és a meteorológiai műszereket környezeti feltétel korlátjaikon belül üzemeltessék.

c) A földfelszín felett 10 méter (33 láb) magasan lévő pont és a légijármű közötti zajpálya teljes egészén a relatív páratartalom és a környezeti hőmérséklet biztosítsa, hogy a 8 kHz középfrekvencia köré összpontosuló egyharmad oktávsávban a hang csillapodás 12 dB/100 m-nél több ne legyen.

d) Ha a PNLTM zajterjedési pálya mentén a 3150 Hz egyharmad oktávsávban a légköri elnyelési együttható ±0,5 dB/100 m-et meghaladó mértékben változik a felszín felett 10 m magasságban végrehajtott meteorológia mérésekből származó elnyelési együttható értékéhez képest, akkor a légkör "réteges" metszeteit kell alkalmazni az egyenértékes, súlyozott hangterjedés mindegyik egyharmad oktávsávos tartományra vonatkozó kiszámításához, minden egyharmad oktávsávban elegendő metszetet használva a bizonyítványt kiállító hatóság követelményeinek kielégítésére; ha nincs szükség többszörös rétegezésre, minden egyharmad oktávsávban egyenértékű hangcsillapodást kell megállapítani a következők szerint: átlagolni kell minden ilyen oktávsávnak a föld felett 10 m (33 láb) feletti sávon és a vizsgálati repülőgép repülési szintjén minden egyes mérés PNLTM időpontjában fennálló légköri elnyelési együtthatóját.

e) 10 méterrel (33 lábbal) a föld felett a szél sebessége repülőgép esetében a 22 km/órát (12 csomót) az oldalszél sebesség a 13 km/órát (7 csomót) nem haéadhatja meg, helikopter esetében a szél sebessége a 19 km/órát (10 csomót), az oldalszél sebessége a 9 km/órát (5 csomót) nem lépheti túl; repülőgép esetében a széllökés nem lehet több 28 km/h-nál (15 kt) és az oldalszél lökés nem haladhatja meg a 18 km/h-t (10 kt);

Megjegyzés. - az átlagszél meghatározása egy 30 másodperces időtartam alapján történik.

f) a bizonyítványt kiadó hatóság által meghatározott mérőpontoknál a zaj rögzítésekor nem állhatnak fenn a repülőgép zajszintjét jelentősen befolyásoló rendellenes szélviszonyok; és

g) a meteorológiai mérési eredmény az egyes zajmérési vizsgálatokhoz viszonyított 30 perces időtartamon belülről származzon; a meteorológiai adatokat mindegyik zajmérés tényleges idejére kell interpolálni.

2.2.3 Ha a 2.2.2 d) pontban foglaltak miatt többszörös rétegezési számításokat kell végezni, a légi jármű és a föld feletti 10 méter (33 láb) feletti szint közötti légréteget egyenlő vastagságú rétegekre kell osztani. A rétegek vastagsága legyen korlátozva, azaz a legkisebb rétegvastagság legyen 30 méter (100 láb) a legnagyobb vastagságot pedig azon réteg minimum vastagsága szerint kell meghatározni, amely a légkör elnyelési együttható ±0,5 dB/100 m-nél nem nagyobb változását adja a 3150 Hz-es egyharmad oktávsávban. Ezt a PNLTM terjedési pálya mentén kell alkalmazni. Az egyes rétegek elnyelési tulajdonságainak jellemzésére a légköri elnyelési együtthatók középértéke használható, amely középérték az egyes rétegek tetején és alján tapasztalható együtthatók átlaga.

2.2.4 A 2.2.2 b), c) és d)-ben szereplő követelményeket csak a talaj felett 10 m (33 láb) magasságban lévő pontokra kell alkalmazni a helikopter vizsgálat alkalmával.

2.2.5 A repülőtéri irányító tornyot, vagy más létesítményt kell olyan központi helyként használatra jóváhagyatni, amely légköri viszonyainak mért értékei reprezentálják a zajmérés helyének földrajzi körzetében uralkodó légköri viszonyokat.

2.3 Repülési pálya mérések

2.3.1 A légijármű repülési nyomvonalához tartozó magasságát és oldal irányú helyzetét a szokványos fedélzeti műszerektől független és a bizonyítványt kiadó hatóság által jóváhagyott eszközökkel kell megállapítani, mint például radarral, teodolitos háromszögeléssel, vagy fényképészeti módszerekkel.

2.3.2 A légijármű repülési pálya menti helyzetét ahhoz megfelelő úthosszon keresztül kell a zajmérő helyeken rögzített zajjal szinkronizáló jelek segítségével viszonyítani, hogy elegendő adat álljon rendelkezésre azon időperiódusról, amikor a zajszint a PNLT maximum értékétől számított 10 dB-es tartományon belül van.

2.3.3 A jelen Függelék 8., vagy 9. szakaszában említett korrekciók elvégzéséhez szükséges helyzet- és teljesítményadatokat jóváhagyott mintavételezési gyakorisággal automatikusan kell rögzíteni. A mérőberendezéseket a bizonyítványt kiadó hatósággal jóvá kell hagyatni.

3. REPÜLŐGÉP FÖLDÖN ÉSZLELT ZAJÁNAK MÉRÉSE

3.1 Meghatározások

E szakasz céljaira a következő fogalmak alkalmazandók:

Környezeti zaj (Ambient noise). A mikrofon telepítési helynél a légijármű zaj mérése alatt jelenlévő és nem a vizsgált légijárműtől származó akkusztikus zaj. A környezeti zaj a háttérzaj egyik eleme.

Háttérzaj (Background noise). A vizsgált légijármű zaját befolyásoló, vagy elfedő, a vizsgált légijárműtől eltérő forrásból eredő a mérő rendszerben jelenlévő kombinált zaj. A háttérzaj jellemző elemei között található (de az nem csak ezekből áll): a mikrofon telepítési helyének környezetéből származó környezeti zaj; a mérő rendszer elemei által keltett termo-elektromos zajok; az analóg szalagos rögzítők keltette mágneses fluxus zajok ("szalag sziszegés"); és digitális átalakítókban a "kvantizálási" hiba okozta digitalizálási zaj. A háttérzaj egyes elemei a légijármű zaját elfedhetik, mint például a digitalizálási zaj, mások, mint például a környezeti zajok, a mért légijármű zajához plusz energiát kölcsönözhetnek.

Széles sávú zaj (Broadband noise). Folytonos frekvencia spektrumú zaj (azaz egy adott tartományon belül minden frekvencián energia van jelen) és amelynek nincs egyetlen kiemelkedő frekvencia eleme sem (azaz hangmagassága).

Kalibrációs ellenőrző frekvencia (Calibration check frequency). A hang kalibráló eszköz által keltett szinuszos hangnyomás jel névleges frekvenciája hertzben kifejezve.

Kalibráló hangnyomás szint (Calibration sound pressure level). A mérő rendszer teljes akusztikai érzékenységének meghatározására alkalmazott hang kalibrátor rezonátor üregében a referencia körülmények között keltett, decibelben kifejezett hangnyomás szint.

A mikrofon rendszer szabadmezős érzékenységi szintje (Free-field sensitivity level of a microphone system). A mikrofon rendszer szabad mezős érzékenységének és az egy volt per pascal referencia érzékenységi szint arányának tízes alapú logaritmusának hússzorosa decibelben.

Megjegyzés. - A mikrofon rendszer szabad mezős érzékenysége meghatározható a mikrofont érő zaj esemény (decibel re 20m pascal-ban kifejezett) hangnyomás szintjét kivonva a mikrofon rendszer kimenetén mutatkozó (decibel re 1 V-ben kifejezett) feszültség szintjéből és az eredményhez 93.98 dB-t hozzáadva.

A mikrofon rendszer szabadmezős érzékenysége (Free-field sensitivity of a microphone system). Meghatározott frekvenciájú és meghatározott zaj beesési szögű síkban folytonos szinusz hullám esetében a mikrofon rendszer kimeneti feszültsége négyzetgyökének és a mikrofon hiányában a helyén keletkező hangnyomás szint négyzetgyökének hányadosa volt per pascalban.

Szint különbség (Level difference). Bármely névleges egyharmad oktáv fél sáv frekvencia esetében bármely szint tartományon mért kimenő jelszint mínusz a hozzá tartozó elektromos bemenő jel szintje decibelben.

Szint ingadozás (Level non-linearity). Bármely szint tartomány kinyilvánított egyharmad oktáv névleges közép sáv frekvenciáján mért szint különbség mínusz a hozzá tartozó referencia szint különbség decibelben kifejezve, minden bemenő és kimenő jel ugyanazon referencia mennyiségre vonatkoztatva.

Szint tartomány (Level range). A mérőrendszerben a zajnyomás jelek mérésére és egyharmad oktávsávos elemzésére biztosított kezelő szervek beállítása által meghatározott üzemelési tartomány decibelben kifejezve. Bármely adott szint tartományhoz kapcsolódó felső határt a legközelebbi egész számú decibelre kell kerekíteni.

Lineáris működési tartomány (Linear operating range). Kinyilvánított szinttartományra és frekvenciára, a teljes mérőrendszer (a mikrofon kivételével, de a mikrofon előerősítőt és minden egyéb, a mikrofon rendszer részének tekintett jel szabályozó elemet felölelő) bemeneténél alkalmazott állandó szinuszos elektromos jelek szintjeinek alsó határtól egy felső határig terjedő tartománya decibelben kifejezve, amelyben a szint ingadozás az előírt tűréshatáron belül van.

Megjegyzés. - nem szükséges, hogy a mikrofon csatlakoztató kábeleket szabad téren elrendezett formában vegyék figyelembe.

Mérő rendszer (Measurement system). A hangnyomás szint mérésére használt készülékek kombinációja, beleértve a hangkalibrátorokat, szélárnyékolókat, mikrofon rendszereket, a jel rőgzítő és szabályozó eszközöket és az egyharmad-sávos oktávtartomány elemző rendszert.

Megjegyzés. - A gyakorlatban alkalmazott rendszerek számos mikrofon rendszert foglalhatnak magukba és a tőlük származó kimenő jeleket többcsatornás rögzítő/elemző készülék egyidejűleg rögzíti megfelelő jel kiegyenlítők bevonásával. E szakasz céljaira, minden egyes teljes mérő csatornát olyan mérőrendszernek tekintünk, amelyekre a követelmények vonatkoznak.

Mikrofon rendszer (Microphone system). A mérőrendszer elemei, amelyek a bemenő hangnyomás jelre válaszként elektromos kimenő jelet keltenek és amelyek rendszerint mikrofont, előerősítőt, hosszabbító kábeleket és szükség szerint egyéb eszközöket foglalnak magukba.

Referencia irány (Reference direction). A mikrofon gyártója által 0^{o}-os hang beesési szöghöz viszonyítva meghatározott hang beesési irány (szög) fokban kifejezve, amelyre vonatkozóan a mikrofon rendszer szabadmezős érzékenységi szintje az előírt tűréshatárokon belül van.

Referencia szintkülönbség (Reference level difference). Kinyilvánított frekvenciára, a kalibrálási hangnyomás szintnek megfelelő, adott elektromos bemenő jelre mért szintkülönbség decibelben kifejezve, szükség szerint a szint tartományra helyesbítve.

Referencia szinttartomány (Reference level range). A mérőrendszer akusztikai érzékenysége meghatározásának kalibrációs hangnyomás szintet felölelő szint tartománya decibelben kifejezve.

Hang beesési szög (sound incidence angle). A mikrofon membrán közepétől a hangforrásig tartó vonal és a mikrofon elsődleges tengelye (ahogyan azt az IEC 61094-3[1] és az IEC 61094-4[2] és mindenkori helyesbítéseik meghatározzák) közötti szög fokban kifejezve.

Megjegyzés. - A 0^{o} beesési szögű hang esetében beszélünk arról, hogy a hang vétele a mikrofonnál "normál (merőleges) beesési szögű"; 90^{o} beesési szögű hang esetében a hangról azt mondjuk, hogy a hang vétele "érintőleges beesési szögű".

Idő átlagos sáv hangnyomás szint (Time-average band sound pressure level). Kinyilvánított időtartam alatt és egy meghatározott egyharmad oktávsávban a pillanatnyi hangnyomás időközepes eltérés négyzetének a 20 mPa referencia hangnyomás szint négyzetéhez viszonyított aránya tízes alapú logaritmusának tízszerese decibelben kifejezve.

Szélárnyékoló beviteli veszteség (Windscreen insertion loss). Kinyilvánított névleges egyharmad oktávsáv közép tartomány frekvencia mellett és a beviteli mikrofonnál, kinyilvánított hang beesési szöggel és leszerelt szélvédővel jelzett hangnyomás szint mínusz a felépített szélvédő esetén jelzett hangnyomás szint különbsége decibelben kifejezve.

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[1] IEC 61094-3; 1995 "Measurement microphones (mérő mikrofonok címet viselő) - 3. Rész; laboratóriumi minőséget képviselő mikrofonok reciprocitás módszerű szabadmezős kalibrálásának elsődleges módszere" ("Measurement microphones -- Part 3; Primary method for free-field calibration of laboratory standard microphones by the reciprocity technique"). Ez az IEC kiadvány beszerezhető a következő címről: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

[2] IEC 61094-4; 1995 "Measurement microphones (mérő mikrofonok címet viselő) - 4. Rész; Munka minőséget képviselő mikrofonok jellemzői" ("Measurement microphones - Part 4: Specifications for working standard microphones". Ez az IEC kiadvány beszerezhető a következő címről: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.2 Referencia környezeti feltételek

A mérőrendszer teljesítőképességét az alábbi környezeti állapotok között kell meghatározni:
- levegőhőmérséklet 23°C

- statikus légnyomás 101.325 kPa

- relatív páratartalom 50%

3.3 Általános rész

Megjegyzés. - Az eme szakasz előírásait teljesítő műszerezettséget alkalmazó légijármű zajmérések egyharmad oktávsávokban adják meg az egyes mérőhelyeken az idő függvényében észlelt zajszintet a Ténylegesen Észlelt Zajszint 4. Szakaszban leírtak szerinti kiszámításához.

3.3.1 A mérőrendszer a bizonyítványt kiadó hatóság által jóváhagyott eszközökből álljon és legyen egyenértékű a következőkkel:

a) szélárnyékoló (lásd 3.4);

b) mikrofon rendszer (lásd 3.5);

c) Rögzítő és visszajátszó rendszer a mért zajadatok későbbi elemzés céljából történő rögzítésére (lásd 3.6);

d) egyharmad oktávsávos elemző rendszer (lásd 3.7); és

e) kalibráló rendszer, a fenti rendszer akkusztikai érzékenységének előírt tűréshatárokon belül tartásához (lásd 3.8).

3.3.2 A mérőrendszer analóg jelet digitális jellé átalakító bármely eleme esetében, az átalakítást úgy kell megoldani, hogy a digitalizálási folyamat bármely lehetséges áljeleinek, vagy termékeinek szintje legalább 50 dB-vel kevesebb legyen minden 12.5 kHz-nél alacsonyabb frekvenciánál, mint a lineáris üzemelési tartomány felső határa. A mintavétel mértéke legalább 28 kHz legyen. A digitalizálási folyamat elé áljel szűrőt kell beiktatni.

3.4 Szélárnyékoló

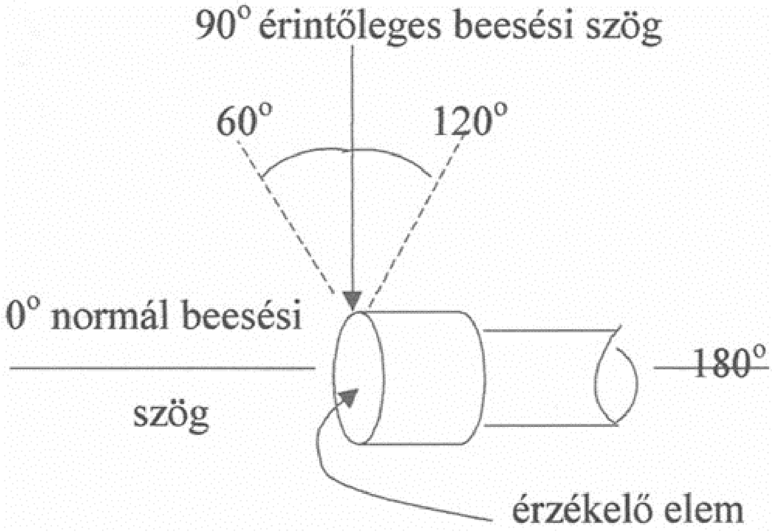
Szél hiányában és érintőleges beesési irányban szinuszos hangra a mikrofon köré épített megnevezett típusú szélárnyékoló okozta beviteli veszteség az 50 Hz-től 10 kHz-ig terjedő (ezeket is beleértve) névleges egyharmad oktávsávos fél tartomány frekvenciáknál nem haladhatja meg a ±1.5 dB-t.

3.5 Mikrofon rendszer

3.5.1 A mikrofon rendszer feleljen meg 3.5.2-től 3.5.4-ig terjedő előírásoknak. A bizonyítványt kiállító hatóság a teljes elektroakusztikai teljesítmény bemutatott egyenértékűsége alapján különféle mikrofon rendszereket hagyhat jóvá. Ha kettő, vagy több azonos típusú mikrofon rendszert használnak, akkor a típus megfelelőségének bizonyítására elegendő, ha legalább egy rendszerrel bizonyítják, hogy az mindenben megfelel az előírásoknak.

Megjegyzés.- Az egyenértékű teljesítmény eme bemutatása nem mentesít, hogy mindegyik rendszert a 3.9 pontban előírtaknak megfelelően kalibrálják és ellenőrizzék.

3.5.2 A mikrofont úgy kell felszerelni, hogy az érzékelőelem közepe 1,2 m (4 láb) magasságban legyen a helyi terep felülete felett, beesés irányra állítva, azaz az érzékelő elemnek alapvetően abba a síkban kell elhelyezkednie, amit a repülőgép, vagy helikopter névleges repülési pályája és a mérőállomás alkot. A mikrofon függesztési megoldás olyan legyen, amely a lehető legkisebbre csökkenti a mérendő hang tartóelemek általi interferenciáját. Az A2-1 ábra szemlélteti a mikrofonnal kapcsolatos beesési szögeket.



A2-1 ábra. Mikrofon hang beesési szögek szemléltetése

3.5.3 Referencia irányban a mikrofon és az előerősítő szabad mezős érzékenységi szintje legalább az 50 Hz-től 5 kHz-ig (ezeket is beleértve) terjedő egyharmad oktávsávos névleges fél tartomány frekvenciákon legyen azok ±1.0 dB-jén belül a kalibrációs ellenőrző frekvencián vizsgálva, illetve ±2.0 dB-en belül a 6.3 kHz, 8 kHz és 10kHz névleges közép tartomány frekvenciák esetében.

3.5.4 A szinuszos hanghullámok esetében az 50 Hz-től 10 kHz-ig terjedő (ezeket is beleértve) minden névleges egyharmad oktávsávos fél-tartomány frekvenciánál a mikrofon rendszer 30°, 60°, 90°, 120° és 150° hang beesési szöghöz tartozó szabad mezős érzékenységi szintje a 0° ("normál beesési szög") beesési szögű hang szabadmezős érzékenységi szintjétől az A2-1 Táblázatban jelzett értéknél jobban ne térjen el. Az A2-1 Táblázatban szereplő bármely két szomszédos hang beesési szög közötti beesési szög szabadmezős érzékenységi szint különbsége nem haladhatja meg a nagyobbik szögre vonatkozó tűrésértéket.

3.6 Hangrögzítő és visszajátszó rendszer

3.6.1 A soron következő elemzéshez a hangnyomás jelek megőrzéséhez rögzítő és visszajátszó rendszert kell alkalmazni, mint például digitális, vagy analóg mágnesszalagos rögzítő, számítógép alapú rendszer, vagy egyéb, az adatokat folyamatosan tároló készülék. A légijármű által keltett zajt oly módon kell rögzíteni, hogy a teljes akusztikai jel megőrződjön. A zajminősítési vizsgálatokhoz alkalmazott rögzítési sebességnél és/vagy mintavételi gyakoriságnál a felvevő és visszajátszó rendszer teljesítse a 3.6.2-től a 3.6.9-ig terjedő előírásokat. A megfelelőséget a vizsgálatokhoz választott frekvencia sávszélességre és rögzítési csatornákra be kell mutatni.

3.6.2 A rögzítő és visszajátszó rendszert a 3.9-ben leírtak szerint kell kalibrálni.

Megjegyzés. - A mérőrendszerbe megfelelő elő-kiemelő és kapcsolódó elnyomó hálózat építhető azon légijármű zaj jelekre, amelyek nagy frekvenciás spektrális szintjei a frekvencia növekedésével hirtelen esnek. A 800 Hz-től 10kHz-ig terjedő (ezeket is beleértve) névleges egyharmad oktáv fél sáv frekvenciák terjedelmében elő-kiemelés beépítése esetén, az elő-kiemelő hálózat által nyújtott elektromos erősítés ne haladja meg a 800 Hz-nél biztosított erősítéshez viszonyított 20 dB-t.

3.6.3 A teljes mérőrendszer (a mikrofon kivételével, de a mikrofon előerősítőt és minden egyéb, a mikrofon rendszer részének tekintett jel szabályozó elemet felölelő) bemeneténél a referencia szint tartományban a kalibráló hang nyomás szintjének megfelelő szint 5 dB tartományán belül választott jelszinten alkalmazott állandó szinuszos elektromos jelekre, a kijelző készülék által az 50 Hz-től 10 kHz-ig terjedő (ezeket is beleértve) bármely egyharmad oktávsávos névleges fél tartomány frekvenciáknál mutatott idő átlagolt jelszintje ±1.5 dB-nél jobban ne térjen el a kalibráló ellenőrző frekvencia esetében ugyanilyen feltételek mellett mutatottaktól. Az analóg jeleket digitális jellé alakító elemeket magába foglaló mérőrendszer frekvencia reakciója a 10 kHz-től 11.2 kHz-ig terjedő tartományban legyen a 10 kHz-re adott reakció ±0.3 dB-én belül.

Megjegyzés. - nem szükséges, hogy a mikrofon csatlakoztató kábeleket a szabad téren elrendezett formában vegyék figyelembe.

3.6.4 Analóg mágnesszalagos rögzítés esetén a kalibráló hangnyomásnak megfelelő szint 5 dB-jén belül rögzített 1 kHz-es szinusz jel amplitúdójának hullámzása ±0,5 dB értékén belüli legyen az alkalmazott mágnesszalag típus bármely használt tekercsének teljes egészében. Eme követelménynek való megfelelést olyan berendezés használatával kell bemutatni, amely a spektrum analizátoréval egyező idő átlagoló jellemzővel rendelkezik.

A2-1. Táblázat - A mikrofon irány érzékenységi követelményei

Maximum különbség a mikrofon rendszer normál beesési szög esetén tapasztalt szabadmezős érzékenységi szintje és meghatározott beesési szögű hangok esetében tapasztalható szabadmezős érzékenységi szintje között (dB)

Névleges középsáv frekvencia kHz	Hang beesési szögek				
	30	60	90	120	150
0.05 – 1.6	0.5	0.5	1.0	1.0	1.0
2.0	0.5	0.5	1.0	1.0	1.0
2.5	0.5	0.5	1.0	1.5	1.5
3.15	0.5	1.0	1.5	2.0	2.0
4.0	0.5	1.0	2.0	2.5	2.5
5.0	0.5	1.5	2.5	3.0	3.0
6.3	1.0	2.0	3.0	4.0	4.0
8.0	1.5	2.5	4.0	5.5	5.5
10.3	2.0	3.5	5.5	6.5	7.5

3.6.5 Minden megfelelő szinttartományra és a teljes mérőrendszer (a mikrofon kivételével, de a mikrofon előerősítőt és minden egyéb, a mikrofon rendszer részének tekintett jel szabályozó elemet felölelő) bemeneténél 50 Hz, 1 kHz és 10 kHz, valamint a kalibrálás ellenőrző frekvencián (ha ez nem azonos az előzőek valamelyikével) alkalmazott állandó szinuszos elektromos jelekre a szint ingadozás nem haladhatja meg a ±0.5 dB-t a szinttartomány felső határa alatt legalább 50 dB-vel lévő lineáris üzemi tartományban.

1. Megjegyzés. - A mérőrendszer elemeinek szint linearitás ellenőrzését (a kiadvány mindenkori helyesbítésnek megfelelően) az IEC 61265[3]-ban leírt módszerek szerint kell elvégezni.

2. Megjegyzés. - nem szükséges, hogy a mikrofon csatlakoztató kábeleket szabad téren elrendezett formában vegyék figyelembe.

[3] IEC 61265; 1995 "Electroacoustics- Instruments for measurement of aircraft noise (Elektroakkusztika - Légijármű zajmérő készülékek) - A szállító kategóriába tartozó repülőgépek zajminősítése során az egyharmad oktávsávos hang nyomás szintek mérésében alkalmazott rendszerekre vonatkozó teljesítmény követelmények". Ez az IEC kiadvány beszerezhető a következő címről: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.6.6 A referencia szint tartományban a kalibrációs hangnyomás szintnek megfelelő szint a szint tartomány felső határától legalább 5 dB-re, de maximum 30 dB-re lehet.

3.6.7 A szomszédos szinttartományokban a lineáris üzemelési tartomány legalább a követ-kezők szerint fedjék át egymást: 50 dB mínusz a szinttartomány vezérlők állítása révén bevitt csillapítási változások.

Megjegyzés. - Lehetséges, hogy a mérőrendszer olyan szint tartomány vezérlőkkel rendelkezzen, amelyek például vagy 10 dB, vagy 1 dB csillapítás változtatás bevitelt tesznek lehetővé. 10 dB-es lépés esetében az előírt legkisebb átfedés legalább 40 dB, míg 1 dB-es lépés esetében a legkisebb átfedés legalább 49 dB kell hogy legyen.

3.6.8 Minden vonatkozó szint tartomány túlterheléses körülményei között gondoskodni kell róla, hogy túlterheléses kijelzés történjen.

3.6.9 A mérőrendszerbe tartomány változás lehetővé tétele érdekében beépített csillapítók ismert dB lépésközzel kell, hogy működjenek.

3.7 Analizáló rendszer

3.7.1 Az elemző rendszer feleljen meg a 3.7.2-től 3.7.7-ig terjedő pontokban az elemzéshez használt frekvencia sávszélességre, a csatorna kialakításra és erősítés beállításra vonatkozó előírásoknak.

3.7.2 Az analizáló rendszer kimenete az idő függvényében tartalmazza az egyharmad oktávsávos hangszinteket, melyeket a (lehetőleg rögzített) zajjelek alábbi jellemzőkkel bíró elemző rendszerrel történő feldolgozásával nyernek:

a) 50 Hz és 10 kHz közötti (e frekvenciákat is beleértve) névleges középfrekvenciájú 24 darab egyharmad oktávsávos szűrő (vagy ezekkel egyenértékű) készlet;

b) megfelelő reagálási és átlagolási jellemzőkkel, amely (alapelvként) bármelyik egyharmad oktávsáv kimenetét négyzetre emeli, átlagolja és időátlagolt hangnyomás szintek formájában kijelzi, vagy tárolja.

c) spektrális elemzéshez (lassú (SLOW) idősúlyozással, vagy anélkül) az egymást követő hangnyomás szint minták közötti időtartam 500 ms ±5 ms legyen;

d) azon elemző rendszerek esetében, amelyek az analizátor kiolvasásához és/vagy újraállításához szükséges időtartam alatt a hangnyomás jeleket nem dolgozzák fel, az adatvesztés nem haladhatja meg az 5 ms időtartamot; és

e) az elemző rendszer 50 Hz-től legalább 12 kHz-ig, ezeket is beleértve, valós időben üzemeljen. Ez a követelmény vonatkozik a többcsatornás spektrális elemző rendszer minden egyes üzemelő csatornájára.

3.7.3 Az egyharmados oktávsáv elemző rendszer az egyharmad oktáv névleges középtartomány frekvenciák 50 Hz-tól 10 kHz-ig terjedő (ezeket is beleértve) tartományában legalább az IEC 61260[4] (mindenkori helyesbítése szerint) 2. Osztály elektromos teljesítmény követelményeit teljesítse.

Megjegyzés. - Az egyharmad oktávsávos elemző rendszer ellenőrzését az IEC 61260[4]-ben leírt módszerrel, vagy a bizonyítványt kiállító hatóság által jóváhagyott alternatív módszerrel egyezésben kell elvégezni a relatív csillapításra, az ál-jel szűrőkre, a valós idejű működésre, a szint linearitásra és a szűrőkkel adott átvitelre (effektív sávszélességre).

[4] IEC 61260; 1995 "Electroacoustics (Elektroakusztika) - Oktávsáv és töredék oktávsáv szűrők". Ez az IEC kiadvány beszerezhető a következő címről: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.7.4 Ha az elemző készülékben lassú (SLOW) idő átlagolás megy végbe, akkor az egyharmad oktávsávos elemző rendszer egy állandó szinuszos jel hirtelen beérkezésére, vagy megszakadására való reagálást, az adott egyharmad oktáv névleges középsáv frekvenciáján, a beérkezését követően 0,5, 1, 1,5 és 2 másodperc időpillanatban vett mintán, illetve a megszakadást követően a 0,5 és az 1 másodperces mintavételi időpillanatokban kell mérni. Az emelkedő reakció szintje az állandósult szinthez viszonyítva 0,5 másodpercnél -4 ± 1 dB, 1 másodpercnél -1,75 ± 0,75 dB, 1,5 másodpercnél -1 ± 0,5 dB és a 2. másodpercnél -0,5 ± 0,5 dB legyen. A lefutási reakció olyan legyen, hogy a kezdeti állandósult szinthez viszonyított kimenő jelszintek és a vonatkozó felfutási reakció leolvasott értékének összege -6,5 ± 1 dB legyen a 0,5 másodpercnél is és az 1 másodpercnél is. A soron következő mérések esetében az emelkedés és a csökkenés összege -7,5 dB, vagy kevesebb kell, hogy legyen. Ez, egy normál 1 másodperces időállandóval végzett (azaz 2 másodpernyi átlagolási idejű) exponenciális átlagolási folyamatnak (SLOW súlyozás) felel meg.

3.7.5 Ha az egyharmad oktávsávos hangnyomás szinteket a lassú (SLOW) idősúlyozással nem rendelkező elemző rendszer kimenetéből határozzák meg, akkor a lassú (SLOW) idősúlyozást a soron következő feldolgozás folyamán szimulálni kell. A szimulált, lassú (SLOW) súlyozású hangnyomás szintek folyamatos exponenciális átlagolási folyamattal a következő egyenlettel nyerhetők:

$$L_S(i,k) = 10 \log [(0{,}60653)\, 10^{0{,}1Ls(i,k-1)}) + (0{,}39347)\, 10^{0{,}1L(i,k)})]$$

Amelyben: Ls(i,k) a szimulált lassú (SLOW) súlyozású hangnyomás szint és L(i,k) az analizátortól származó mérés szerinti 1/2 másodperces átlagú hangnyomás szint a k-adik időpillanatban és az i-edik egyharmad oktávsávban. A k=1 esetére, a jobboldalon lévő lassú (SLOW) súlyozású hangnyomást Ls[i,(k-1=0)] zéró dB-re kell állítani.

A folyamatos exponenciális átlagolás megközelítőleges változatát egy négy mintás átlagolási folyamatra k=4-re, a következő egyenlet mutatja:

$$L_S(i,k) = 10 \log [(0{,}13)\, 10^{0{,}1L[i,(k-3)]} + (0{,}21)\, 10^{0{,}1L[i,(k-2)]} +$$

$$(0{,}27)\, 10^{0{,}1L[i,(k-1)]} + (0{,}39)\, 10^{0{,}1L[i,k]}]$$

amelyben: Ls(i,k) a szimulált lassú (SLOW) súlyozású hangnyomás szint és L(i,k) az analizátortól származó mérés szerinti 0.5 másodperces átlagú hangnyomás szint a k-adik időpillanatban és az i-edik egyharmad oktávsávban.

A két egyenletben a súlyozási tényezők összege 1,0. Bármelyik egyenlettel számított hangnyomás szintek a 6. és a soron következő 0.5 másodperces adatmintákra, avagy az adatelemzés megkezdésétől számított 2.5 másodpercnél nagyobb időpontokra érvényesek.

Megjegyzés. - A két egyenletben szereplő együtthatók az egyenértékes lassú (SLOW) súlyozású hangnyomás szinteknek a 0.5 másodperces minták idő átlagolt hangnyomás szintjeiből való meghatározásához lettek kiszámítva. Az egyenlet nem alkalmazható olyan adatminták esetében, amelyek esetében az átlagolási idő nem 0.5 másodperc.

3.7.6 Az időpillanat, amelyre a lassú (SLOW) idősúlyozású hangnyomás szintet jellemzik a tényleges leolvasási időpontot megelőző 0.75 másodperc legyen.

Megjegyzés. - Ezen időpillanat időbeli meghatározása szükséges ahhoz, hogy a rögzített zaj szinkronizálható legyen a repülőgép azon helyzetével, ahol a zajt kibocsátotta és figyelembe veszi a lassú (SLOW) súlyozás átlagolási időtartamát. Minden 0.5 másodpercnyi adatrögzítés esetére ez az időpillanat a következőkként is meghatározható: a kapcsolatos 2 másodperces átlagolási idő kezdetétől 1.25 másodperccel későbbi időpont.

3.7.7 A kijelzett és a megőrzött hangnyomás szint felbontása 0.1 dB, vagy jobb legyen.

3.8 Kalibráló rendszer

A mérőrendszer akusztikus érzékenységét ismert frekvencián ismert hangnyomásszintet előállító akusztikus kalibráló berendezés használatával kell meghatározni. A hang kalibrátor legalább az IEC 60945[5] mindenkori helyesbítése szerinti 1L osztály követelményeinek feleljen meg.

3.9 A rendszer kalibrálása és ellenőrzése

3.9.1 A zaj minősítő vizsgálatok során használatos mérő és analizáló rendszer teljes egészének és minden összetevő elemének kalibrálását és ellenőrzését a bizonyítványt kiadó hatóság számára elfogadhatón a 3.9.2-től 3.9.10-ig terjedő pontokban ismertetett módszerek szerint kell elvégezni. A hang kalibráló kimenő szintjére hatást gyakorló környezeti hatásokat is beleértve, a kalibrálási beállításokat a bizonyítványt kiadó hatóság részére jelenteni kell, valamint alkalmazni kell az elemző készülék kimenetéről meghatározott, mért egyharmad oktávos hangnyomás szintekre. A túlterheléses kijelzés alatt gyűjtött adat érvénytelen és nem szabad használni. Ha a túlterheléses körülmény rögzítés folyamán áll elő, akkor a kapcsolatos vizsgálati adatokat érvénytelennek kell tekinteni, ha azonban a túlterhelés az elemzés folyamán áll elő, akkor az elemzést a túlterhelést megszüntető alacsonyabb érzékenységgel meg kell ismételni.

3.9.2 A mikrofon rendszer szabadmezős frekvencia reakcióját a gyártó adataival kombináltan használt elektrosztatikus működtetővel, illetve visszhangmentes szabadmezős létesítményben tesztelve lehet meghatározni. A frekvencia reakció helyesbítését az adott vizsgálat sorozattól számított 90 napon belül meg kell határozni. A mikrofon rendszer egyenetlen frekvencia reagálásainak helyesbítését a bizonyítványt kiadó hatóság részére jelenteni kell, valamint alkalmazni kell az elemző készülék kimenetéről meghatározott mért egyharmad oktávos hangnyomás szintekre.

3.9.3 Ha a légijármű által kibocsátott hang beesési szöge az érintőleges beesési szögtől számított $\pm 30^{o}$-on belül van (lásd az A2-1 ábrát), akkor a beesési irány szerinti reakciók helyesbítéséhez elegendőnek tekintett az érintőleges beesésre alapozott egyetlen sorozat szabadmezős korrekció. Egyéb esetekre, minden 1 másodperces minta beesési szögét meg kell határozni és alkalmazni kell a beesési hatás szerinti helyesbítés elvégzésében.

3.9.4 Analóg mágnesszalagos rögzítő esetében, minden egyes mágnesszalag tekercs eleje és vége 30 másodperces tartamban tartalmazzon kopogó-, vagy ál-rendszertelen zaj villamos kalibráló jeleket. A szalagon rögzített jelekből nyert adatok csak akkor fogadhatók el megbízhatóként, ha a szalag elején illetve végén rögzített két jel 10 kHz -es egyharmad oktávsávos szintjeinek szintkülönbsége 0,75 dB-nél nem nagyobb.

3.9.5 Az ellenőrző vizsgálatok során a szabadtérbe kihelyezett teljes mérőrendszer -a mikrofon kivétele-vel- adott frekvencia reakcióját a kalibráló hang nyomás szintjének megfelelő szinttől számított 5 dB-en belüli szinten az ellenőrzéshez alkalmazott szint tartományban az 50 Hz-től 10 kHz-ig terjedő (ezeket is beleértve) névleges egyharmad oktávsávos fél tartomány frekvenciák mindegyikére, kopogó-, vagy ál-rendszertelen zaj villamos kalibráló jel alkalmazásával meg kell határozni. A zaj generátor kimenetét a nemzeti szabványügyi

[5] IEC 60942; 1997 "Elektroacoustics (Elektroakusztika) - Hang kalibrátorok". Ez az IEC kiadvány beszerezhető a következő címről: Bureau central de la Commission Electrotechnique Internationale, 3 rue de Varembé, Geneva, Switzerland.

laboratórium számára nyomon követhető módszerrel az egyes ellenőrző vizsgálatokat megelőző 6 hónapon belül kell meghatározni; a korábbi kalibrálás során mért egyes egyharmad oktávsávok relatív kimenetében a tűrt változások 0,2 dB -nél nagyobbak nem lehetnek. A frekvencia reakció helyesbítéseket a bizonyítványt kiadó hatóság részére jelenteni kell, valamint alkalmazni kell az elemző készülék kimenetéről meghatározott, mért egyharmad oktávos hangnyomás szintekre.

3.9.6 Zaj minősítési mérések és kalibrációk során használatos berendezésekben működő kapcsolt csillapítók teljesítményét az egyes ellenőrző vizsgálatokat megelőző 6 hónapon belül kell meghatározni annak biztosítására, hogy a legnagyobb hiba 0.1 dB-nél nagyobb ne legyen.

3.9.7 A hang kalibrátor rezonátor üregében keltett, decibelben kifejezett hangnyomás szintet az ellenőrző vizsgálat környezeti viszonyaira kell kiszámítani felhasználva a gyártó által a légköri nyomás és hőmérséklet változás hatásairól szolgáltatott adatok. A hangnyomás szintet a mérőrendszer akusztikai érzékenységének megállapításához kell használni. A hang kalibrátor kimenő jellemzőjét a nemzeti szabványügyi laboratórium számára nyomon követhető módszerrel az egyes ellenőrző vizsgálatokat megelőző 6 hónapon belül kell meghatározni; a korábbi kalibráláshoz képest a kimeneten 0,2 dB -nél nagyobb változások nem tűrhetők el.

3.9.8 Elegendő számú hangnyomás szintkalibrálást kell végezni a napi munka során annak biztosítása érdekében, hogy a mérő rendszer akusztikai érzékenysége ismert legyen az egyes ellenőrzés sorozatokhoz tartozó fennálló környezeti feltételekre vonatkozóan. A mérőrendszer megfelelőnek akkor minősíthető, ha az adott napon a közvetlenül a méréssorozat előtt és után mért akusztikai érzékenységi szintek közötti eltérés nem haladja meg a 0,5 dB-t. A 0.5 dB-es határ a kalibrátor kimenő szintjére mindenféle légköri nyomás korrekció meghatározását követően alkalmazandó. Az elő- és utómérések számtani középértékét kell alkalmazni a mérőrendszer adott vizsgálat sorozat alatti érzékenységének bemutatására. A kalibrálási pontosításokat a bizonyítványt kiadó hatóság részére jelenteni kell, valamint alkalmazni kell az elemző készülék kimenetéről meghatározott, mért egyharmad oktávos hangnyomás szintekre.

3.9.9 Minden adatrögzítő eszköz -mint például a mágnesszalag, kazetta, vagy mágneslemez- eleje és vége legalább 10 másodperc tartamú hangnyomás szint kalibráló jelet tartalmazzon.

3.9.10 A mikrofon köré épített szélárnyékoló okozta szabad mezős beviteli veszteséget az 50 Hz-től 10 kHz-ig terjedő (ezeket is beleértve) névleges egyharmad oktáv fél tartomány frekvenciák mindegyikére a beépített mikrofonra megfelelő beesési szögekben érkező szinuszos hang jelekkel kell meghatározni. A sérülésmentes és nem szennyezett mikrofon esetében a beviteli veszteség vehető a gyártó adataiból. Továbbá, a szélvédő okozta beviteli veszteség a nemzeti szabványügyi laboratórium számára nyomon követhető módszerrel az egyes ellenőrző vizsgálatokat megelőző 6 hónapon belül is meghatározhatók; a korábbi kalibrálásokból minden egyharmad oktáv frekvencia tartományra származó vonatkozó beviteli veszteséghez képest az eltérés 0,4 dB-nél nagyobb ne legyen. A szélvédő szabadmezős beviteli korrekciót a bizonyítványt kiadó hatóság részére jelenteni kell, valamint alkalmazni kell az elemző készülék kimenetéről meghatározott, mért egyharmad oktávos hangnyomás szintekre.

3.10 Háttérzaj korrekció

3.10.1 A mérőponton tapasztalható háttérzajt a mérőrendszer erősítését a repülőgép zajméréséhez használt szintre állítva rögzíteni kell (legalább 30 másodperces tartamban). A rögzített háttérzaj minta feleljen meg az ellenőrző vizsgálat során fennálló háttérzaj viszonyoknak. A repülőgép rögzített zaj adatai csak akkor fogadhatók el, ha az ugyanolyan módon analizált zajszint PNL-ben kifejezett értéke (lásd a 4.3.1 a) pontot), a repülőgép maximum PNL-jénél legalább 20 dB-lel kisebb.

3.10.2 A 10 dB lefutási pontokon belüli (lásd 4.5.1) repülőgép hangnyomásszinteknek a fent megállapított háttér zajszintet legalább 3 dB-lel kell meghaladniuk minden egyharmad oktávsávban, vagy pedig korrekciót kell alkalmazni Doc 9501, 3. Függelékében megadott módszer használatával.

4. A TÉNYLEGES ÉSZLELT ZAJSZINT KISZÁMÍTÁSA A MÉRT ZAJADATOKBÓL

4.1 Általános rész

4.1.1 A zajminősítési kritérium alapvető eleme legyen a zaj értékelési mérések által eredményezett és EPNdB egységekben kifejezett Tényleges Érzékelt Zajszint, EPNL, amely a repülőgép zaj emberi lényre gyakorolt szubjektív hatását kifejező értékelő szám. Egyszerűen kifejezve, az EPNL a pillanatnyilag érzékelt zajszintből (PNL) áll, amelyet megfelelően korrigálnak az időtartamra és a spektrális szabálytalanságokra (ezt a "hangmagasság korrekciós tényező"-nek nevezett korrekciót minden időnövekmény alkalmával csak a legerőteljesebb tónusra alkalmazzák).

4.1.2 A hangnyomás három alapvető fizikai tulajdonságát kell mérni, ezek a szint, a frekvencia eloszlás és az idő beli változás. Konkrétabban, a repülőgép zajmérés során a zaj 24 egyharmad oktávsávjának mindegyikéből minden 500 ms időnövekményre ismerni kell a pillanatnyi hangnyomás szintet.

4.1.3 A szubjektív reakció értékmérőjének (EPNL) származtatásához a zaj fizikai mérését alkalmazó számítási eljárás a következő öt lépésből álljon:

a) A 24 egyharmad oktávsávú hangnyomásszint átalakítása érzékelt zajosságra a 4.7 szakaszban szereplő módszerrel. A noy értékek kombinálása, majd PNL(k) pillanatnyi érzékelt zajszintre átalakítása;

b) A szubjektív reakció spektrális ingadozások jelenléte miatti kompenzálásához minden egyes tartományra a C(k) tónus korrekciós tényező kiszámítása.

c) minden egyes fél másodpercnyi időtartam növekményre a tónus szerint korrigált PNLT(k) érzékelt zajszint megkapása érdekében a hangmagasság korrekciós tényező és az érzékelt zajszint összeadása:

$$PNLT(k) = PNL(k) + C(k)$$

A tónus szerint korrigált érzékelt zajszint pillanatnyi értékeinek származtatása és maximum értékének (PNLTM) megállapítása;

d) A D időtartam korrekciós tényező kiszámítása a tónus szerint korrigált érzékelt zajszint - idő függvényű görbe alatti integrálásával;

e) A ténylegesen érzékelt zajszint, EPNL, meghatározása a maximum tónus szerint korrigált érzékelt zajszint és az időtartam korrekciós tényező számtani összeadásával:

$$EPNL = PNLTM + D$$

4.2 Észlelt zajszint

A PNL(k) pillanatnyi észlelt zajszinteket, a SPL(i,k) pillanatnyi egyharmad oktávsávú hangnyomás szintekből a következők szerint kell kiszámítani:

1. Lépés: a Doc 9501, 4. Függelékében közölt Érzékelt Zajossági Táblázat alapján, vagy a noy táblázat 4.7 szekcióban adott matematikai megfogalmazása alapján alakítsa át 50-től 10000 Hz-ig az összes egyes egyharmad oktávsávot, SPL(i,k), érzékelt zajosságra, n(i,k).

2. Lépés: az 1. Lépésben kapott észlelt zajossági értékeket, n(i,k) a következő képlet alkalmazásával kombinálja:

$$N(k) = n(k) + 0{,}15 \left\{ \left[\sum_{i=1}^{24} n(i,k)\right] - n(k) \right\} = 0{,}85\, n(k) + 0{,}15 \left[\sum_{i=1}^{24} n(i,k)\right.$$

aholis n(k) a 24 n(i,k) érték közül a legnagyobb és N(k) az érzékelt teljes zajosság.

3. Lépés: A következő képlet alkalmazásával alakítsa át a teljes észlelt zajosságot, N(k), észlelt zajszintté, PNL(k):

$$PNL(k) = 40{,}0 + \frac{10}{\log 2} \log N(k)$$

Megjegyzés. - PNL(k) ábrázolása a Doc 9501 4. Függelékének A4-1 ábráján látható.

4.3 Korrekció a spektrális szabálytalanságokra

4.3.1 A határozott spektrális szabálytalanságot (például a maximum jellemző frekvencia összetevő, vagy hang kép) mutató zajt az alábbiak szerint számított C(k) korrekciós tényezővel kell pontosítani:
1. Lépés.
A helikopterek esetében az 50 Hz-től induló (1. számú sáv) kivételével, a számítást kezdje a 80 Hz-es egyharmad oktávsáv (3. sáv) korrigált hangnyomásszintjével, a fennmaradó egyharmad oktávsávokban a következők szerint számítsa ki a hangnyomásszint változásokat (azaz a "meredekségeket"):

S(3,k) = nincs értéke
S(4,k) = SPL(4,k) - SPL(3,k)
.
.
.
S(i,k) = SPL(i,k) - SPL(i - 1,k)
.
.

S(24,k) = SPL(24,k) - SPL(23,k)

2. Lépés. - ahol a görbe változásának abszolút értéke nagyobb 5-nél, karikázza be az s(i,k) meredekség értékét, azaz, ahol:

$|\Delta s(i,k)| = |S(i,k) - s(i - 1,k)| > 5$
3. Lépés.

a) Ha az s(i,k) meredekség bekarikázott értéke pozitív és számszerűen nagyobb, mint az s(i - 1,K), karikázza be az SPL(i,k)-t.

b) Ha az s(i,k) meredekség bekarikázott értéke nulla, vagy negatív és az s(i - 1,k) meredekség pozitív,

karikázza be az SPL(i - 1,k) -t.
c) Az összes többi esetben nem kell a hangnyomásszinteket bekarikázni.

4. Lépés. Számítsa ki az új korrigált hangnyomásszinteket, SPL'(i,k), a következők szerint:

a) A be nem karikázott hangnyomásszintek tekintetében az új hangnyomásszint értékeket vegye egyenlőnek az eredeti hangnyomásszintekkel, SPL'(i,k) = SPL(i,k).

b) Az 1 - 23 sávokban a bekarikázott hangnyomásszintek esetében az új hangnyomásszinteket vegye egyenlőnek az előző és a következő hangnyomásszintek aritmetikai átlagával:

$$SPL'(i,k) = 1/2\ [SPL(i-1,k) + SPL(i+1,k)]$$

c) Ha a hangnyomásszint a legmagasabb frekvencia sávban (i = 24) be lett karikázvra, ezen sávban az új hangnyomásszintet vegye egyenlőnek:

$$SPL'(24,k) = SPL(23,k) + s(23,k)$$

5. Lépés. A következők szerint újraszámítsa ki az új s'(i,k) meredekséget, beleértve egy képzeletbeli 25-ik sávot is:

$$s'(3,k) = s'(4,k)$$
$$s'(4,k) = SPL'(4,k) - SPL'(3,k)$$
$$.$$
$$s'(i,k) = SPL'(i,k) - SPL'(i-1,k)$$
$$.$$
$$.$$
$$s'(24,k) = SPL'(24,k) - SPL'(23,k)$$

$$s'(25,k) = s'(24,k)$$

6. Lépés. Az i-re, a 3-tól 23-ig bezárólag (illetve helikopterek esetében 1-től 23-ig) számítsa ki a három szomszédos meredekség aritmetikai átlagát a következők szerint:

$$\bar{s}(i,k) = 1/3\ [s'(i,k) + s'(i+1,k) + s'(i+2,k)]$$

7. Lépés. Számítsa ki a végső egyharmad oktávsáv hangnyomás szinteket, SPL"(i,k), a 3. számú sávval kezdve (helikopterek esetében pedig az 1. számúval kezdve) és végig haladva a 24. számú sávig a következők szerint:

$$SPL''(3,k) = SPL(3,k)$$

$$SPL''(4,k) = SPL''(3,k) + s(3,k)$$

$$SPL''(i,k) = SPL''(i-1,k) + \bar{s}\ (i-1,k)$$

$$SPL''(24,k) = SPL''(23,k) + \bar{s}(23,k)$$

8. Lépés. A következők szerint számítsa ki az eredeti hangnyomásszint és a végső szélessávú hangnyomásszint közötti különbséget F(i,k)-t:

$$F(i,k) = SPL(i,k) - SPL''(i,k)$$

és csak azokat az értékeket jegyezze fel, amelyek értéke másfélnél, vagy másfélnél nagyobb.

9. Lépés. Mindegyik érintett egyharmad oktávsáv (3 - 24) viszonylatában, a hangnyomászszint különbségekből F(i,k) és az A2-2 táblázatot használva határozza meg a hangkép korrekciós tényezőket.

10. Lépés. A 9. lépésben megállapított hangkép korrekciós tényezők közül válassza ki a legnagyobbat, mint C(k)-t. A hangkép korrekciós eljárásra példát a Doc 9501 4. Függelékének A4-2 táblázatában találhat. A hangszín korrigált érzékelt zajszinteket, PNLT(k)-t, a megfelelő PNL(k) értékekhez a C(k) értékeket hozzáadva kell meghatározni, azaz

$$PNLT(k) = PNL(k) + C(k)$$

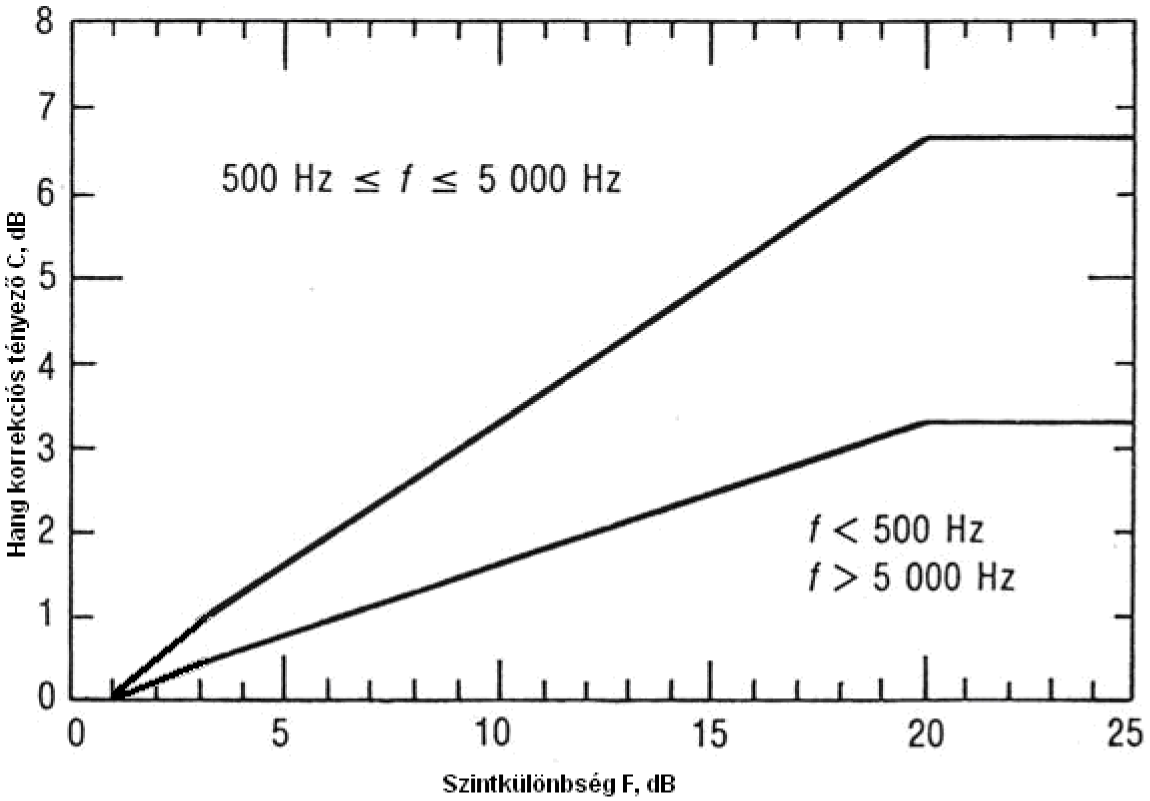
bármelyik i-edik egyharmad oktávsávra, bármelyik k-adik idő intervallumnál, amelynél feltételezik, hogy a hangkép korrekciós tényező a tényleges zajtól eltérő (vagy ahhoz hozzáadódó) hangképtől (vagy a légijármű zajon kívüli egyéb spektrális rendellenességből) ered, akkor az egyharmad oktávsávnál keskenyebb sávszélességű szűrő alkalmazásával kiegészítő elemzés végezhető. Ha a keskeny sávú elemzés megerősíti a fenti gyanút, akkor a háttér - hangnyomás, SPL"(i,k), felülvizsgált értékét a keskeny sávú elemzésből kell megállapítani és ezt az értéket kell alkalmazni a módosított hangkép korrekciós tényező kiszámításához, arra az adott egyharmad oktávsávra.

Megjegyzés. - a túlzott hangkép-korrekciók kiküszöbölésére más módszerek is alkalmazhatók, mint például amelyek a Doc 9501, 2. Függelékében találhatók.

4.3.2 Ez a módszer az EPNL-t alul értékeli, ha valamelyik fontos hangkép frekvenciája olyan, hogy azt két egymás melletti egyharmad oktávsávban rögzítik. A bizonyítványt kiállító hatóság számára megnyugtatóan bizonyítani kell:

vagy azt, hogy ez nem így történt,

vagy, ha ilyen eset állt elő azt, hogy a hangkép korrekciót megfelelőképpen pontosították, amely eredményeképp a korrekció annak megfelelő értékű, mint amikor az adott hangot teljes egészében egyetlen egyharmad oktávsávban rögzítették volna.



A2-2. táblázat - Hangkép korrekciós tényezők

Hangszín korrekció C, dB
Szintkülönbség *F,* dB

Frequency *f*, Hz	Szint különbség F, dB	Hangkép korrekció C, dB
50 ≤ *f* < 500	1½* ≤ F < 3 3 ≤ F < 20 20 ≤ F	F/3 - ½ F/6 3 1/3
500 ≤ *f* ≤ 5000	1½ * ≤ F < 3 3 ≤ F < 20 20 ≤ F	2F/3 - 1 F/3 6 2/3
5000 ≤ f ≤ 10000	1½ * ≤ F < 3 3 ≤ F < 20 20 ≤ F	F/3 - ½ F/6 3 1/3

** lásd a 4.3.1 pont 8. lépését.*

4.4 Hangképre korrigált észlelt maximum zajszint

4.4.1 A hangképre korrigált észlelt maximum zajszint (PNLTM), a hangképre korrigált érzékelt zajszint (PNLT(k)) számított maximum értéke legyen. Kiszámítását a 4.3 pontban leírt eljárás szerint kell végezni. A zaj időbeli lefutásáról kielégítő adatok megszerzése érdekében a méréseket 500 ms idő intervallumonként kell végezni.

1. Megjegyzés.- Az A2-5. ábra az átrepülési zaj időbeni lefolyásáról mutat példát, amely során a maximum érték egyértelműen látszik.
2. Megjegyzés.- Hangkép korrekciós tényező hiánya esetén PNLTM PNLM-el lenne egyenlő.
4.4.2 PNLTM értékének meghatározását követően, a legnagyobb hangkép korrekciós tényezőhöz tartozó frekvencia sávot meg kell találni a két megelőző és a két soron következő 500 ms-os adat mintára. Ezt, a hangképet megosztó egyharmad oktávsáv általi esetleges hangkép elnyomás lehetőségének megállapítása érdekében kell elvégezni. Ha a hangkép korrekció tényező PNLTM-re vonatkozó értéke (C(k)), kisebb mint az öt egymást követő időintervallum átlag C(k) értéke, akkor C(k) átlag értékét használva PNLTM értékét újra ki kell számítani.

4.5 Időtartam korrekció

4.5.1 Az integrál módszerrel meghatározandó D időtartam korrekciós tényezőt az alábbi képlettel kell kifejezni:

$$D = 10 \log \left[\left(\frac{1}{T} \right) \int_{1}^{2} \text{antilog} \frac{PNLT}{10} \, dt \right] - PNLTM$$

ahol T egy normalizáló időállandó, PNLTM a PNLT maximum értéke, t1 az az első időpont, mely után a PNLT nagyobb lesz, mint a PNLTM - 10, és t2 az az időpont, mely után PNLT állandóan kisebb, mint PNLTM - 10.

4.5.2 Mivel a PNLT-t az SPL mért értékeiből kell kiszámítani, ezért PNLT idő függvényére általában nincs egyértelmű egyenlet. Ennek következtében az egyenletet az integrál jel helyett összegező jellel kell írni, a következők szerint:

$$D = 10 \log \left[\left(\frac{1}{T} \right) \sum_{k=0}^{d/\Delta t} \Delta t \cdot \text{antilog} \frac{PNLT\ (k)}{10} \right] - PNLTM$$

ahol Δt az idő egyenlő tartamú növekményeinek hosszúsága, amelyre a PNLT(k) értéket kiszámítottuk, és d az az idő intervallum a legközelebbi 0,5 másodpercig, amely folyamán a PNLT(k) nagyobb, vagy egyenlő marad PNLTM - 10-el.

4.5.3 Az észlelt zajszint kielégítő lefolyásának meghatározásához,

a) Δt-re fél másodperces időközöket, vagy

b) jóváhagyott határokkal és állandókkal rendelkező rövidebb időközt kell használni.

4.5.4 D-nek a 4.5.2-ben közölt eljárásban történő kiszámításához T-re és Δt-re a következő értékeket kell használni:

T = 10 mp és

Δt = 0,5 mp

A fenti értékek alkalmazásával a D-re vonatkozó egyenlet a következőképp alakul:

$$D = 10 \log \left[\sum_{k=0}^{2d} \text{antilog} \frac{PNLT\ (k)}{10} \right] - PNLTM - 13$$

ahol a d a PNLTM - 10 értékeinek megfelelő pontok által meghatározott időtartam.

4.5.5 Ha a 4.5.2 pontban megadott eljárásokban a PNLTM-10 határai a kiszámított PNLT(k) értékek közé esnek (ez az általános eset), akkor az időtartam határait definiáló PNLT(k) értékeket a PNLTM - 10-hez legközelebbi PNLT(k) értékek közül kell kiválasztani. Olyan esetekre, amikor a PNLT(k) értéke egynél több csúcsértékkel rendelkezik, az alkalmazható határokat úgy kell választani, hogy a tartam idejére a lehetséges legnagyobb értéket nyerjük.

4.6 Ténylegesen észlelt zajszint

A repülőgép zaj esemény teljes szubjektív hatásának neve "ténylegesen észlelt zajszint", jelölése EPNL, amely a D időtartam helyesbítés és a hangképre korrigált észlelt zajszint (PNLTM) legnagyobb értékének számtani összegével kell, hogy egyenlő legyen. Azaz:

$$EPNL = PNLTM + D$$

ahol a PNLTM és a D a 4.2, a 4.3, a 4.4 és a 4.5 pontban megadottak szerint számítandók.

4.7 A NOY - TÁBLÁZATOK MATEMATIKAI MEGFOGALMAZÁSA

4.7.1 A hangnyomás szint (SPL) és az érzékelt zajosság logaritmusának összefüggését az A2-3 Táblázat és az A2-3 ábra szemlélteti.

4.7.2 A matematikai megfogalmazás legfontosabb tényezői a következők:

a) Az (M(b), M(c), M(d) és M(e)) egyenesek meredeksége;

b) Az SPL(b) és SPL(c) egyenesek metszései az SPL tengelyen; és

c) A töréspont koordináták, SPL(a) és log n(a); SPL(d) és log n = -1,0; és SPL(e) és log n = log(0,3).

4.7.3 A matematikai kifejezések a következők:

a) $SPL \geq SPL(a)$

$n = \text{antilog}\ \{M(c)\ [SPL - SPL(c)\ ]\}$

b) $SPL\ (b) \leq SPL < SPL(a)$

$n = \text{antilog}\ \{M(b)\ [SPL - SPL(b)\ ]\}$

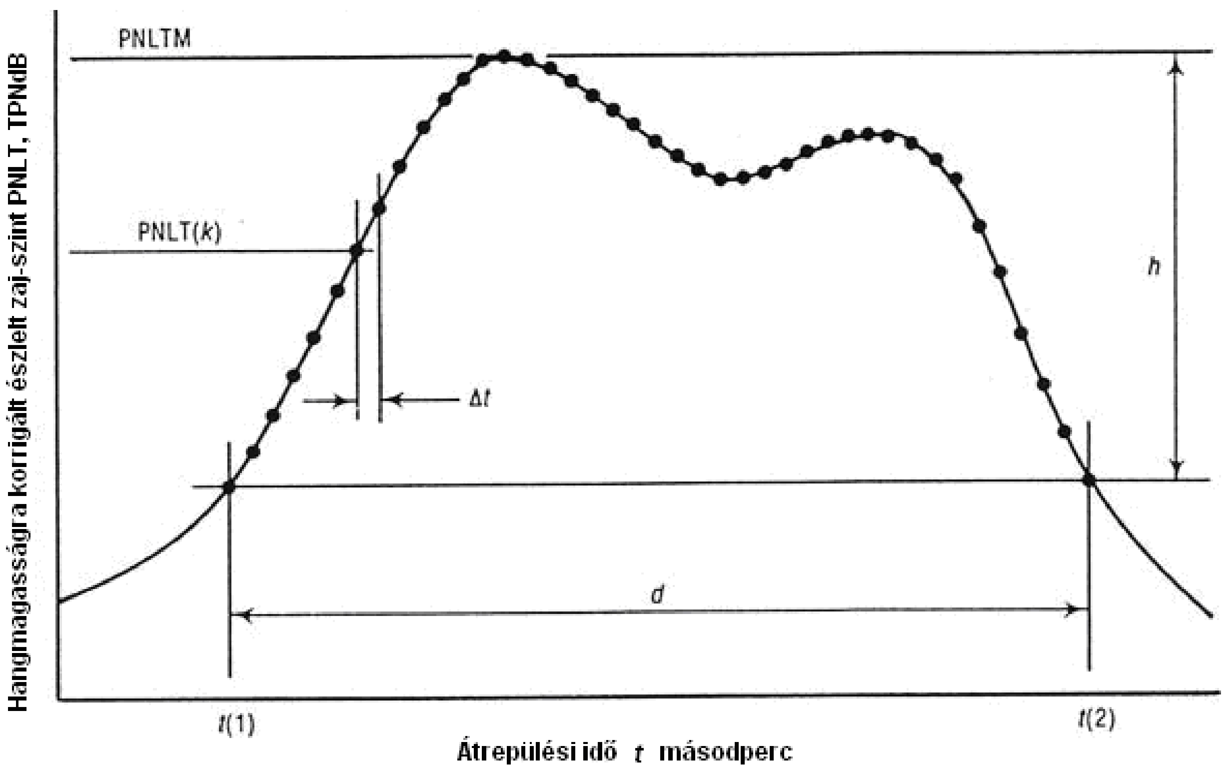
c) $SPL\ (e) \leq SPL < SPL(b)$

$n = 0{,}3\text{antilog}_{10}\ \{M(e)\ [SPL - SPL(e)\ ]\}$

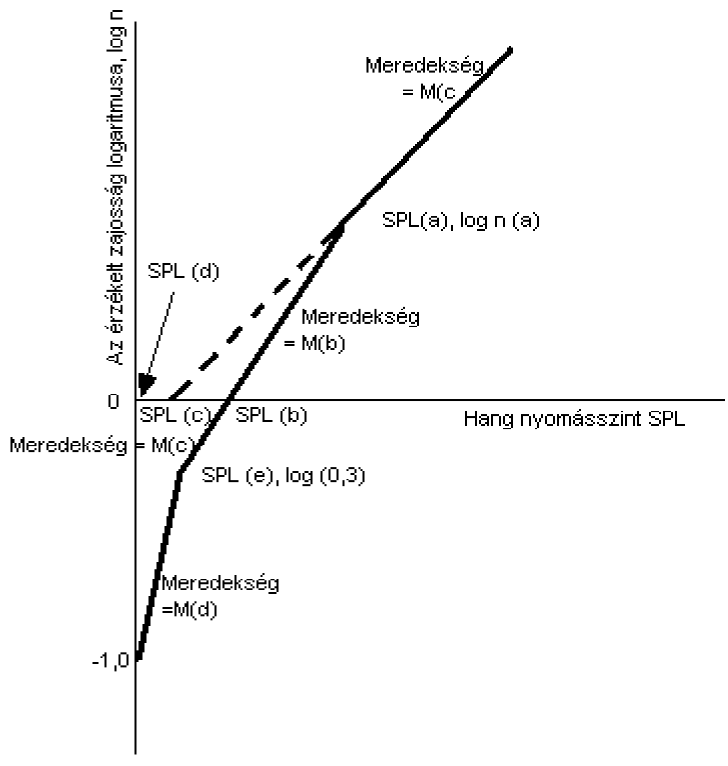
d) $SPL\ (d) \leq SPL < SPL(e)$

$n = 0{,}1\ \text{antilog}\ \{M(d)\ [SPL - SPL(d)\ ]\}$

4.7.4 Az észlelt zajosság hangnyomásszintek függvényében történő kiszámításához szükséges állandók értékeit az A2-3 táblázat sorolja fel.



A2 - 2 Ábra - Példa: a repülőgép átrepülési idejének függvényében a hangképre korrigált észlelt zajszint



A2 - 3 Ábra - Érzékelt zajosság a hangnyomás szint függvényében

A2-3. Táblázat – Állandók a matematikailag számított noy értékekhez

Sáv (i)	f Hz	SPL (a)	SPL (b)	SPL (c)	SPL (d)	SPL (e)	M(b)	M(c)	M(d)	M(e)
1	50	91.0	64	52	49	55	0.043478	0.030103	0.079520	0.058098
2	63	85.9	60	51	44	51	0.040570		0.068160	”
3	80	87.3	56	49	39	46	0.036831		”	0.052288
4	100	79.0	53	47	34	42	”		0.059640	0.047534
5	125	79.8	51	46	30	39	0.035336		0.053013	0.043573
6	160	76.0	48	45	27	36	0.033333			”
7	200	74.0	46	43	24	33	”			0.040221
8	250	74.9	44	42	21	30	0.032051			0.037349
9	315	94.6	42	41	18	27	0.030675	0.030103		0.034859
								N		
10	400	∞	40	40	16	25	0.030103	E		
11	500		40	40	16	25		M		
12	630		40	40	16	25				
13	800		40	40	16	25		A		
14	1000		40	40	16	25		L	0.053013	
15	1250		38	38	15	23	0.030103	K	0.059640	0.034859
16	1600		34	34	12	21	0.029960	A	0.053013	0.040221
17	2000		32	32	9	18		L	”	0.037349
18	2500		30	30	5	15		M	0.047712	0.034859
19	3150		29	29	4	14		A	”	
20	4000		29	29	5	14		Z	0.053013	
21	5000		30	30	6	15		HATÓ	”	0.034859
22	6300	∞	31	31	10	17	0.029960	0.029960	0.068160	0.037349
23	8000	44.3	37	34	17	23	0.042285		0.079520	”
24	10000	50.7	41	37	21	29	”	”	0.059640	0.043573

5. AZ ADATOK JELENTÉSE A ZAJ BIZONYÍTVÁNYT KIÁLLITÓ HATÁSÁGOK FELÉ

5.1 Általános rész

5.1.1 A gyakorlati méréseket, vagy a mért adatok korrekcióit reprezentáló adatokat maradandó formában kell rögzíteni és a mérési jegyzőkönyvhöz kell mellékelni.

5.1.2 Az összes korrekciót a bizonyítványt kiállító hatóság részéről jóvá kell hagyni. Elsősorban jelenteni kötelező a mérési eredmény azon korrekcióját, amelyet a berendezés eltérő reakciója miatt alkalmaztak.

5.1.3 Ha előírt, jelenteni kell a végeredmény eléréséhez alkalmazott műveletek során keletkezett egyedi hibák becsléseit.

5.2 Az adatok jelentése

5.2.1 A mért és korrigált hangnyomásszinteket a jelen Függelék 3. pontjában ismertetett szabványoknak megfelelő berendezésekkel kapott egyharmad oktávsávos szintekben kell bemutatni.

5.2.2 A repülőgép akusztikai adatok és meteorológiai adatok mérésére és elemzésére használt összes berendezés típusát jelenteni kell.

5.2.3 Jelenteni kell a jelen Függelék 2. Pontjában előírt megfigyelési pontokon közvetlenül a vizsgálatok előtt, után, vagy alatt mért következő légköri környezeti adatokat:

a) levegő hőmérséklet és a relatív légnedvesség;

b) a legnagyobb, a legkisebb és az átlagos szélsebesség; és

c) légnyomás.

5.2.4 Jelenteni kell a zajrögzítést esetleg befolyásolható helyi topográfiáról, felszín jellegzetességekről és eseményekről szóló véleményeket.

5.2.5 A következő adatokat kell jelenteni:

a) (alkalmazhatóság függvényében) a repülőgép, hajtómű, légcsavar, vagy forgószárny típusa, modell- és széria száma (ha ilyen létezik);

b) A repülőgép bruttó méretei és a hajtóművek és forgó szárnyak (ha van) felépítési helye;

c) A repülőgép össz. tömege az egyes vizsgálatok alatt és súlypont helyzet tartománya az egyes vizsgálat sorozatok folyamán;

d) A repülőgép konfigurációja, mint például a fékszárny, az aerodinamikai fékező eszközök és a futóművek helyzete valamint a légcsavarok (ha alkalmazható) állásszöge;

e) A fedélzeti segédhajtómű (APU) működési állapota, ha ilyent felépítettek;

f) A hajtómű levegőelvétel és teljesítmény elvétel aktuális körülményei;

g) A jelzett műszersebesség km/h értékben (csomóban);

h) 1) Gázsugár hajtóműves repülőgépekre: A hajtómű teljesítmény a következőkkel kifejezve: nettó tolóerő, hajtómű nyomásviszony, kilépő gázhőmérséklet, ventillátor fokozat, vagy kompresszor fokozat fordulatszám a repülőgép műszerei alapján és a gyártó cég adatai alapján;

2) Légcsavar hajtású repülőgépekre: Hajtómű teljesítmény az alábbiakkal kifejezve: féklóerő és másodlagos tolóerő, vagy tengelyen mért lóerő egyenértékes, vagy motor forgatónyomaték és légcsavar forgássebesség a repülőgép műszerei alapján és a gyártó cég adataiból megállapítva;

3) Helikopterekre: hajtómű teljesítményjellemző és forgószárny fordulatszám fordulat/perc-ben az egyes bemutatók során;

i) A légijármű repülési pályája és földfeletti sebessége az egyes bemutatók során; és

j) A bizonyítványt kiállító hatóság által jóváhagyott légijármű zaj jellemzőit valószínűleg befolyásoló bármiféle átalakítás, vagy nem szabvány felszerelés.

5.3 A zaj minősítő vizsgálatok referencia feltételeinek jelentése

A repülőgép helyzetét és a teljesítmény adatokat a zajmérésekkel együtt a II. Rész vonatkozó fejezetében leírt zaj alkalmassági vizsgálati referencia feltételekre kell korrigálni és ezeket a feltételeket kell jelenteni, beleértve a referencia paramétereket, eljárásokat és konfigurációkat is.

5.4 Az eredmények érvényessége

5.4.1 A vizsgálati eredményekből három átlagos EPNL értéket és ezek 90 százalékos megbízhatósági határát kell létrehozni és jelenteni, amelyek mindegyike a megfelelő mérési pontoknál (felszállás, megközelítés, vagy oldalsó, illetve átrepülési a helikopterek esetében) végzett összes érvényes vizsgálatra vonatkozó korrigált akusztikai mérések számtani átlaga. Ha valamelyik mérési ponton egynél több mérésrendszert használnak, akkor az egyes vizsgálatokból nyert eredményt egyetlen mérésre kell átlagolni. Helikoptereknél, minden repülés esetében a három mikrofon vizsgálati eredményt kell egyetlen méréssé átlagolni. A számítást a következők szerint kell elvégezni:

a) az egyes referencia mikrofon pontoktól származó értékeket használva, minden repülési szakaszra a számtani középérték kiszámítása;

b) az a)-ban szereplő adatok és a hozzájuk tartozó 90 százalékos megbízhatósági határok használatával, minden megfelelő referencia feltételre (felszállás, átrepülés, vagy megközelítés) a teljes számtani középérték kiszámítása.

Megjegyzés.- helikopter esetében egy repülés csak akkor tekinthető érvényesnek, ha egyidejű mérést végeztek mindhárom mérőpontnál.

5.4.2 Repülőgépek esetében a három hitelesítési mérőpont mindegyikére, illetve helikopterek esetében a három mikrofonból álló készletek mindegyikére az elfogadható legkevesebb mintavételi nagyság hat. A minták legyenek elégséges számúak ahhoz, hogy a három átlagos zaj alkalmassági szint mindegyikére ±1,5 EPNdB értéket meg nem haladó tűréssel statisztikai úton megállapítható legyen a 90 százalékos megbízhatósági határ. Az átlagolási eljárásból egyetlen vizsgálati eredményt sem szabad kihagyni, hacsak a bizonyítványt kiadó hatóság másképpen nem rendelkezik.

Megjegyzés: - A 90 százalékos megbízhatósági intervallum kiszámításának módszerei a Doc 9501 1. Függelékében találhatók.

5.4.3 Az előbbiekben ismertetett eljárással nyert átlagos EPNL számok azok, amelyeket a zaj alkalmassági kritériumokkal összevetve kell a légijárművek által előidézett zajt értékelni.

6. NOMENKLATURA: JELEK ÉS MÉRTÉKEGYSÉGEK

Jel	Mérték-egység	Jelentése
antilog	-	*Tízes alapú anti-logaritmus*:
C(k)	dB	*Hangkép korrekciós tényező.* Az egyes spektrális szabálytalanságok, mint például a k-adik idő növekménynél található hangképek (hangok) figyelembevételére a PNL(k) értékhez hozzáadandó tényező.
d	sec	*Időtartam.* A szignifikáns zaj időbeli lefutásának hossza, amely a t(1) és a t(2) közötti időintervallum a legközelebbi 0.5 másodperchez.
D	dB	*Időtartam korrekció*. A zajidőtartam figyelembevételére a PNLTM-hez hozzáadandó tényező.
EPNL	EPNdB	*Ténylegesen észlelt zajszint.* A PNL értékének a spektrális szabálytalanságokra és a zaj időtartamra korrigált értéke (EPNdB egység használatos a dB egység helyett).
f(i)	Hz	*Frekvencia*. Az i-edik egyharmad oktávsáv geometriai közép frekvenciája.
F(i,k)	dB	*Delta-dB.* Az eredeti hangnyomásszint és a végső szélessávú háttér hangnyomásszint közötti különbség az i-edik egyharmad oktávsávban a k-adik idő intervallumban.
h	dB	*Levonandó dB.* A zaj időtartamot meghatározó PNLTM-ből levonandó szint.
H	Relatív nedvesség	*Relatív nedvesség* A környezeti légkör relatív légnedvessége.
i	-	*Frekvenciatartomány index.* Az 50 - 10000 Hz-ig terjedő geometriai középfrekvenciájú 24 darab egyharmad oktávsávok valamelyikét kijelölő számszerű mutató.
k	-	*Időnövekmény index.* A zéró referenciától eltelt egyenlő időnövekmények számát jelölő számszerű mutató.
log	-	*Tízes alapú logaritmus.*
log n(a)	-	*Nov-töréspont koordináta.* Az SPL-nek

Jel	Mérték-egység	Jelentése
		a log n-nel való változását ábrázoló egyenes vonalak metszéspontjainak log.n értéke.
M(b), M(c), stb.	-	*Noy inverz meredekség.* Az SPL-nek a log n-nel való változását ábrázoló egyenes vonalak meredekségének reciprok értéke.
n	noy	*Érzékelt zajosság.* Meghatározott egyharmad oktávsávban bármely adott időpillanatban előforduló érzékelt zajosság.
n(i,k)	noy	*Észlelt zajosság.* Az i-edik egyharmad oktávsávban bekövetkezett észlelt zajosság a k-adik időpillanatban
n(k)	noy	*Észlelt maximum zajosság.* Az n(i) 24 értéke közül a legnagyobb, amely a k-adik időpillanatban jelentkezik.
N(k)	noy	*Teljes észlelt zajosság.* Az n(i,k) k-adik időpillanatban egyidőben mért 24 pillanatnyi értékeiből kiszámított teljes érzékelt zajosság
p(b), p(c), stb.	-	*Noy meredekség.* Az SPL-nek log n-vel való változásait jelző egyenes vonalak meredeksége
PNL	PNdB	*Észlelt zajszint.* Bármely időpillanatban érzékelt zajszint (dB egység helyett PNdB egység használatos)
PNL(k)	PNdB	*Észlelt zajszint.* Az SPL(i,k) k-adik időpillanatra vonatkozó 24 darab értékéből a kiszámított észlelt zajszint (PNdB egység használatos a dB egység helyett).
PNLM	PNdB	*Észlelt maximum zajszint.* A PNL(k) maximum értéke (dB egység helyett PNdB egység használatos).
PNLT	TPNdB	*Hangképre korrigált észlelt zajszint.* Bármely adott időpillanatban jelentkező spektrális szabálytalanságokra korrigált PNL érték. (dB egység helyett a TPNdB egység használatos).
PNLT(k)	TPNdB	*Hangképre korrigált észlelt zajszint.* A k-adik időpillanatban jelentkező spektrális szabálytalanságokra korrigált PNL érték (dB egység helyett a TPNdB egység használatos).
PNLTM	TPNdB	*Hangképre korrigált érzékelt maximum zajszint.* A PNLT(k) maximum értéke

Jel	Mérték-egység	Jelentése
		(dB egység helyett a TPNdB egység használatos).
PNLTr	TPNdB	*Hangképre korrigált és a referencia körülményekhez igazított észlelt zajszint*
s(i,k)	dB	*Hangnyomásszint meredekség.* A szomszédos egyharmad oktávsávok hang-nyomásszintjének szint változása az i-edik sávnál, a k-adik időpillanatban
Δs(i,k)	dB	*Hangnyomásszint meredekség változás*
s'(i,k)	dB	*Korrigált hangnyomásszint meredekség.* A szomszédos korrigált egyharmad oktávsávok hangnyomásszintjeinek változása, az i-edik sávnál a k-adik időpillanatban.
- s(i,k)	dB	*A hangnyomásszint átlagos meredeksége.*
SPL	dB re 20 μPa	*Hangnyomásszint.* Meghatározott frekvencia sávban bármely adott időpillanatban jelentkező hangnyomásszint.
SPL(a)	dB re 20 μPa	*Noy töréspont koordináta.* Az SPL-nek log n-re való változását képviselő egyenesek metszéspontjainak SPL értéke.
SPL(b) SPL(c)	dB re 20 μPa	*Noy metszés.* Az SPL-nek log n-nel való változását képviselő egyenesek metszése az SPL tengelyen.
SPL(i,k)	dB re 20 μPa	*Hangnyomásszint.* Az i-edik egyharmad oktávsávban a k-adik időpillanatban jelentkező hangnyomásszint
SPL'(i,k)	dB re 20 μPa	*Korrigált hangnyomásszint.* A szélessávú hangnyomásszint első közelítőleges értéke az i-edik egyharmad oktávsávban a k-adik időpillanatban.
SPL(i)	dB re 20 μPa	*Maximum hangnyomásszint.* A PNLTM spektrum i-edik egyharmad oktávsávjában jelentkező hangnyomásszint.
SPL(i)r	dB re 20 μPa	*Korrigált maximum hangnyomásszint.* A PNLTM spektrum i-edik egyharmad oktávsávjában jelentkező és a légköri hangelnyelésre korrigált legnagyobb

Jel	Mérték-egység	Jelentése
		hangnyomásszint
SPL"(i,k)	dB re 20 μPa	*Végső szélessávú hangnyomásszint.* A második és végleges közelítő szélessávú hangnyomásszint az i-edik egyharmad oktávsávban a k-adik időpillanatra.
t	sec	*Eltelt idő.* A referencia nullától mért időtartam hossza.
t1, t2	sec	*Időhatár.* A h által meghatározott szignifikáns zaj időbeni lefolyásának kezdete és vége a sorrendnek megfelelően.
Δt	sec	*Időnövekmény.* Az idő egyenlő nagyságú növekményei, amelyekre a PNL(k)-t és a PNLT(k)-t kiszámítják.
T	sec	*Normalizáló idő állandó.* Az integrál módszerben az időtartam korrekció kiszámításához referenciaként használt időtartam, ahol T = 10 másodperc.
t(°C)	°C	*Hőmérséklet.* A környezet légköri hőmérséklete.
α(i)	dB/100 m	*Vizsgálati légköri elnyelés.* Az i-edik egyharmad oktávsávban a mért légköri hőmérséklet és relatív páratartalom mellett jelentkező hang terjedés.
α(i)o	dB/100 m	*Referencia légköri elnyelés.* A légkör hang csillapítása az i-edik egyharmad oktávsávban a referencia légköri hőmérséklet és páratartalom mellett.
A1	fok	*Az első állandósult* emelkedési szög.*
A2	fok	*A második állandósult** emelkedési szög.*
δ ε	fok fok	*Tolóerő visszavételi szög.* A felszállást követő emelkedés pályáján azokat a pontokat kijelölő szögek, amely pontoknál a tolóerő csökkentését megkezdik és befejezik - a sorrend szerint.
η	fok	*Megközelítési szög.*
ηr	fok	*Referencia megközelítési szög.*
Θ	fok	*Zajszög,* (repülési pályához viszonyítva). A repülési pálya és a zajpálya közötti szög. A mért és a korrigált repülési pálya esetében azonos

Jel	Mérték-egység	Jelentése
ψ	fok	*Zajszög,* (földhöz viszonyítva). A föld és a zajpálya közötti szög. A mért és a korrigált repülési pályára is meghatározzák.
μ	fok	*Hajtómű zaj kibocsátási paraméter.* (Lásd a 9.3.4 pontot)
Δ1	EPNdB	*PNLT korrekció.* A referencia és a tényleges vizsgálati körülmények között fennálló légköri elnyelés és zaj pálya hossz eltérések miatt jelentkező zajszint változások figyelembevétele céljából a mért adatokból számított EPNL-hez adandó korrekció.
Δ2	EPNdB	*Időtartam korrekció helyesbítés.* A mért adatokból számított EPNL helyesbítése a referencia és a tényleges vizsgálati körülmények között fennálló zaj időtartam eltérésből eredő zajszint változások figyelembevétele céljából.
Δ3	EPNdB	*Forrás zaj korrekció.* A mért adatokból számított EPNL helyesbítése a referencia és a tényleges vizsgálati hajtómű üzemmódok közötti különbségek miatt keletkező zajszint változások figyelembevétele érdekében.

*Behúzott futók, legalább V2 + 19 km/h (V2 + 10 csomó) sebesség, felszálló teljesítmény.
** Behúzott futók, legalább V2 + 19 km/h (V2 + 10 csomó) sebesség a teljesítmény visszavétel után

7. A HANG TERJEDÉSE A LEVEGŐBEN

7.1 A hang légköri terjedését az alábbi eljárásokkal összhangban kell meghatározni.

7.2 A hang terjedés, frekvencia, hőmérséklet és páratartalom közötti kapcsolatot az alábbi egyenletek fejezik ki:

$$\alpha(i)= 10^{[2,05 \log(fo/1000)+ 1,1394 \times 10^{-3} \theta- 1,916984]} + \eta(\delta) \times 10[\log(fo) + 8,42994 \times 10^{-3} \theta-2,755624]$$

$$\delta = \sqrt{\frac{1010}{f_o}} \; 10^{(\log H - 1,328924 + 3,179768 \times 10^{-2}\theta)}$$

$$\times\ 10^{(-2,173716 \times 10^{-4} \theta^2 + 1,7496 \times 10^{-6} \theta)^{-3}}$$

ahol:

$\eta(\delta)$ értékét az A2-4 táblázat és az fo értékét az A2-5 táblázat adja meg;

$\alpha(\iota)$ a csillapítási együttható dB/100 m-ben megadva;

Θ a hőmérséklet C°-ban; és

H a százalékban kifejezett relatív páratartalom.

7.3 A 7.2 pontban megadott egyenletek számítógéppel végzett számítás végzéshez alkalmasak.

A2-4 Táblázat - η(δ) értékei

δ	η(δ)	δ	η(δ)
0,00	0,000	2,50	0,450
0,25	0,315	2,80	0,400
0,50	0,700	3,00	0,370
0,60	0,840	3,30	0,330
0,70	0,930	3,60	0,300
0,80	0,975	4,15	0,260
0,90	0,996	4,45	0,245
1,00	1,000	4,80	0,230
1,10	0,970	5,25	0,220
1,20	0,900	5,70	0,210
1,30	0,840	6,05	0.205
1,50	0,750	6,50	0,200
1,70	0,670	7,00	0,200
2,00	0.570	10,00	0,200
2.30	0.495		

Ahol szükséges, négyzetes interpolációs kifejezést kell alkalmazni.

A2-5. Táblázat - f_O értéke

1/3 oktávsáv közép frekvencia (Hz)	fo (Hz)	1/3 oktávsáv közép frekvencia (Hz)	fo (Hz)
50	50	800	800
63	63	1000	1000
80	80	1250	1250
100	100	1600	1600
125	125	2000	2000
160	160	2500	2500
200	200	3150	3150
250	250	4000	4000
315	315	5000	4500
400	400	6300	5600
500	500	8000	7100
630	630	10000	9000

8. A HELIKOPTER REPÜLÉSI VIZSGÁLATI EREDMÉNYEK PONTOSÍTÁSA

8.1 Bevezető rész

8.1.1 A mért zaj adatok pontosítását az e szakaszban közölt módszerek szerint kell elvégezni. A vizsgálat elfogadhatóságának alapfeltétele a 8. Fejezet 8.7.5 pontjában közölt vizsgálati feltételek betartása. A vizsgálati és a referencia repülési eljárások közötti különbségekre kell a pontosítást elvégezni és az alábbiakban közöltekben jelentkező eltéréseket kell figyelembe venni:

a) a helikopter repülési pálya referencia ponthoz viszonyított repülési pályája és sebessége;

b) a hang légköri terjedése;

c) az átrepülés esetében, a 8.5-ben leírtakhoz hasonló zajkeltő szerkezeteket érintő paraméterek.

8.1.2 A mért zaj adatok pontosítását a 8.3 és 8.4-ben előírt módszereket alkalmazva kell végezni az alábbiakban jelentkező különbségekre:

a) a zaj saját pályája menti terjedése, ahogyan azt az "inverz négyzet" és a légköri terjedési körülmények befolyásolják;

b) a zaj fennállásának időtartama, ahogyan azt a légijárműnek a repülési pálya referencia ponthoz viszonyított távolsága és sebessége befolyásolja;

c) az e szakaszban leírt pontosító eljárást az oldalsó mikrofonokhoz kell alkalmazni a felszállási, átrepülési és a megközelítési esetekben. Bár a zaj kibocsátás helikopter típusonként változva, erősen függ az irányítottság formájától, a 2. Függelék 9.3.2, A2-11 ábráján meghatározott θ terjedési szögnek a vizsgálati és a referencia pályák esetében egyeznie kell. A szintmagasság ψ szögét ne korlátozzák, amint az a 2. Függelék 9.3.2 harmadik megjegyzésében szerepel, de meg kell határozni és jelenteni kell. A bizonyítványt kiállító hatóságnak kell előírnia a ψ-re vonatkozó elfogadhatósági korlátokat. Ezen korlátok túllépése esetén a nyert adatokat a bizonyítványt kiállító hatóság által jóváhagyott eljárást alkalmazva kell pontosítani. Az oldalsó zajmérések különleges esetet jelentenek, mivel a hang terjedését nem csak az "inverz négyzet" és a légköri terjedés befolyásolja, de a talaj általi elnyelődés és a visszaverődési hatások is, amelyek főként a ψ szögtől függnek.

1. Megjegyzés.- E Kötet II. Részének 8. Fejezetében a 8.7.5 pont szab korlátokat a vizsgálati és a referencia repülési eljárások és körülmények között elvégezhető pontosítás legnagyobb mértékére.

2. Megjegyzés.- A bizonyítványt kiállító hatóság beleegyezésétől függően a vizsgálati zajszintnek a referencia körülményekre való pontosítása az e szakaszban szereplő módszerrel végezhető. A korrekciót egy sor - mindegyik referencia eljárásra vonatkozóan a PNLTM kibocsátásának pillanatát megfelelő paraméterekkel összekötő - görbéből származtatják. Az érzékenységi görbék a korrekciót igénylő paraméterek függvényében adják meg a zajszint változást.

8.2 repülési pályák

Megjegyzés.- A vizsgálati körülményekre vonatkozó repülési pályát a pálya talajhoz viszonyított geometriai jellemzőivel és a helikopter vonatkozó sebességével írják le.

8.2.1 Felszállási pálya

1. Megjegyzés: - Az A2-4. ábra jellemző vizsgálati és referencia pályákat mutat.

a) A tényleges vizsgálat közben a helikoptert előzőleg a legnagyobb emelkedő képességet adó emelkedési Vy sebességen az A pontban vízszintes stabilizálják és a B pontig halad, ahol is felszálló teljesítményt adnak és állandósult emelkedést kezdenek. Az állandósult emelkedést a 10 dB-es lefutási időtartam alatt és azután a vizsgálati repülési pálya végéig (F pontig) fenn kell tartani.

b) A K1 pont a felszálló pálya referencia pontja, NK1 pedig az állandósult emelkedés kezdetétől a felszállási pálya referencia pontjáig tartó távolság. A K1' és K1" pontok a kapcsolódó zajmérő pontok, amelyek a TM repülési pályairányra merőleges vonal mentén előírt távolságban helyezkednek el.

c) A TM távolság az a távolság, amelyen belül a helikopter helyzetét mérik és a zajméréssel szinkronizálják (lásd e Függelék 2.3.2 pontját).

2. Megjegyzés.- A B pont helyzete a bizonyítványt kiállító hatóság által engedélyezett határokon belül változhat.

8.2.2 Átrepülési pálya

Megjegyzés.- Az A2-5 ábra egy jellemző átrepülési pályát szemléltet.

a) A helikopter vízszintes repülésben stabilizált D pontnál és a repülési pálya referencia pont feletti W ponton keresztül halad egészen a vizsgálati átrepülési repülési pálya végét jelentő E pontig.

b) A K2 pont az átrepülési pálya referencia pontja, K2W pedig a helikopter repülési magassága az átrepülési repülési pálya referencia pontja felett. A K2' és K2" pontok a kapcsolódó zajmérő pontok, amelyek az RS átrepülési repülési pályairányra merőleges vonal mentén előírt távolságban helyezkednek el

c) Az RS távolság az a távolság, amelyen belül a helikopter helyzetét mérik és a zajméréssel szinkronizálják (lásd e Függelék 2.3.2 pontját).

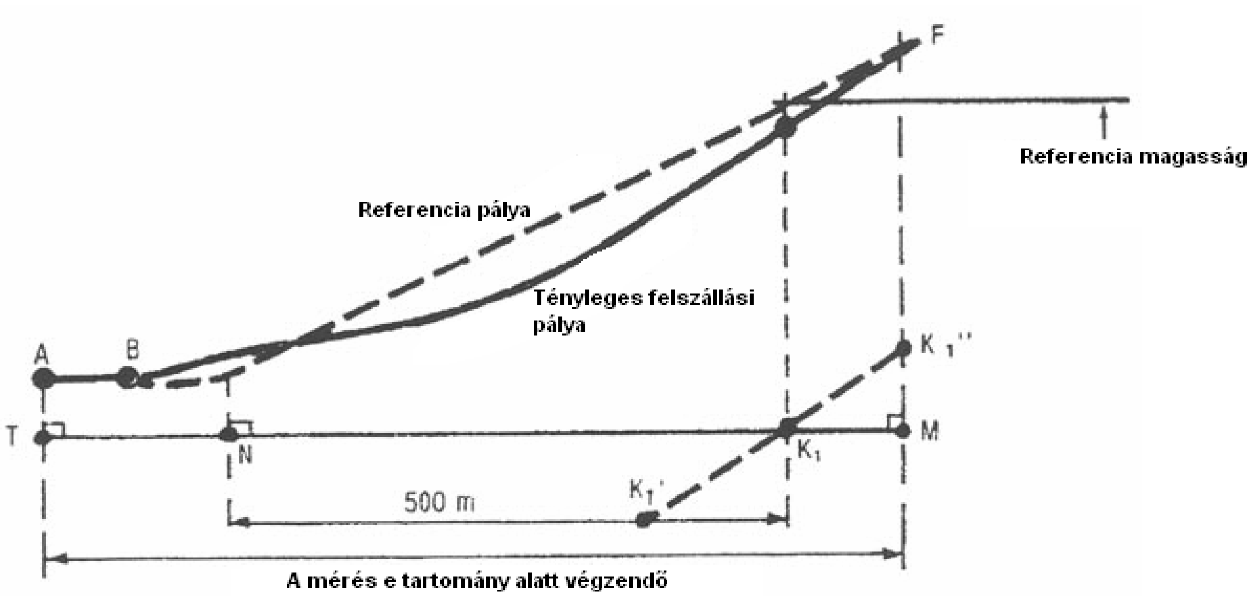
8.2.3 Megközelítési pálya

Megjegyzés.- Az A2-6 ábra egy jellemző megközelítési pályát szemléltet.

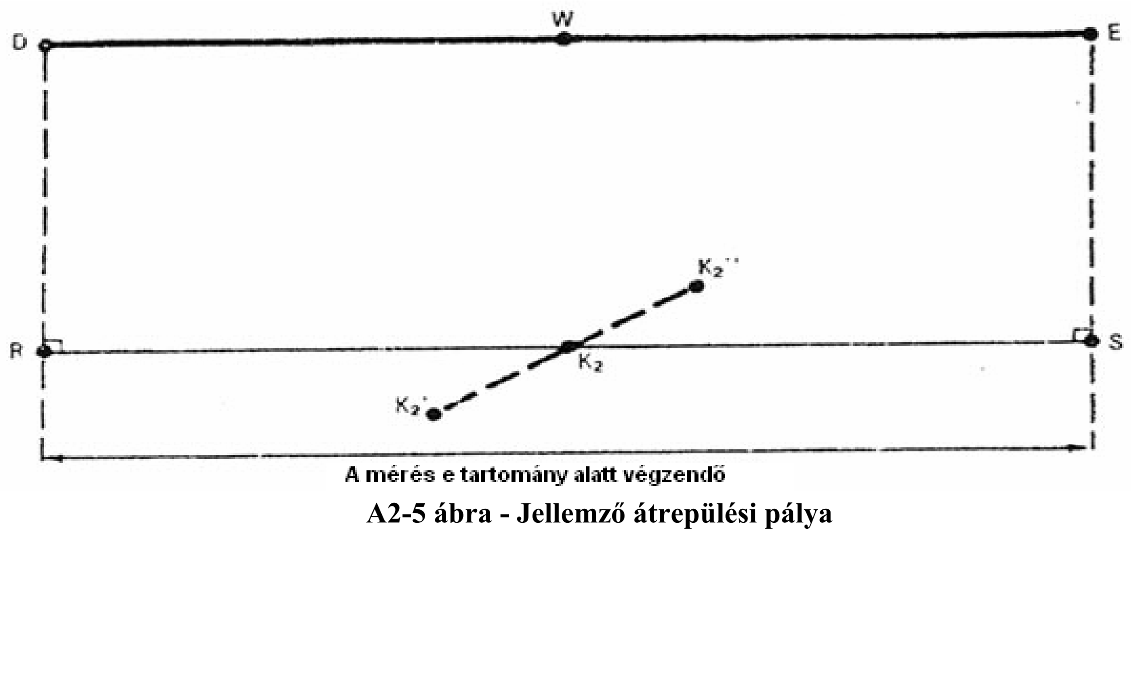
a) A helikopter az előírt megközelítési pálya szög követésére stabilizált G pontnál és így halad a H és I pontokon keresztül, hogy ezt követően földet érjen.

b) A K3 pont a megközelítési pálya referencia pontja, K3H pedig a helikopter repülési magassága a megközelítési repülési pálya referencia pontja felett. A K3' és K3" pontok a kapcsolódó zajmérő pontok, amelyek a PU megközelítési repülési pályairányra merőleges vonal mentén előírt távolságban helyezkednek el.

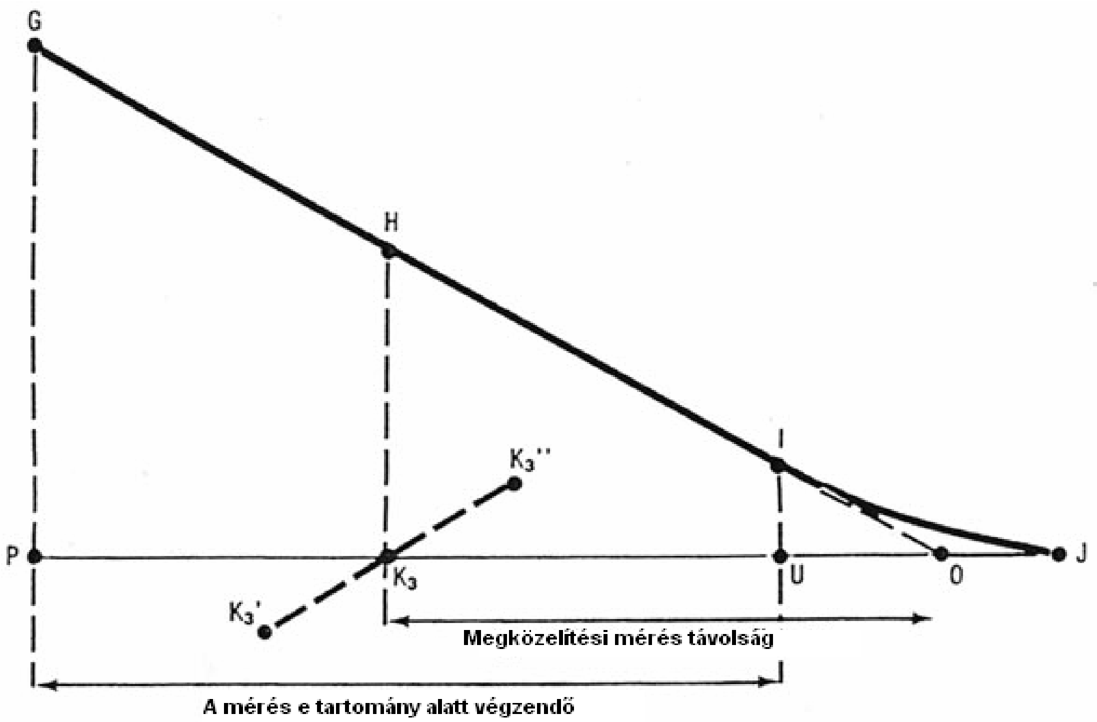
c) A PU távolság az a távolság, amelyen belül a helikopter helyzetét mérik és a zajméréssel szinkronizálják (lásd e Függelék 2.3.2 pontját).



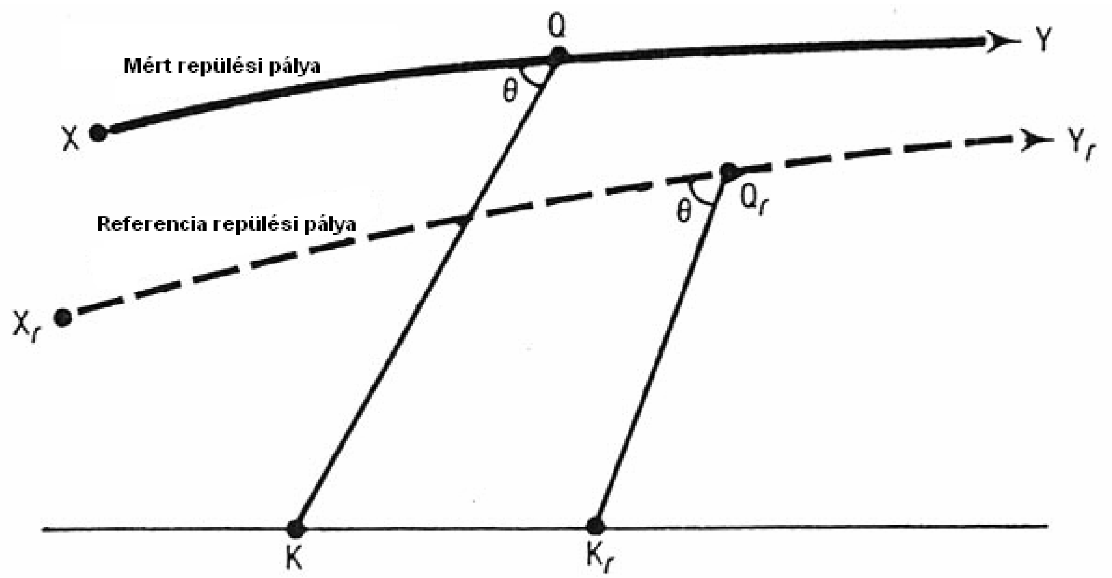
A2-4 ábra - Jellemző vizsgálati és referencia pályák



A2-5 ábra - Jellemző átrepülési pálya



A2-6 ábra – Jellemző megközelítési pálya



A2-7 ábra – A hangszintet befolyásoló pálya jellemzők

8.3 PNL és PNLT pontosítása

Megjegyzés.- A vizsgálati repülési pálya és a referencia repülési pálya EPNL számításhoz lényeges szakaszait az A2-7 ábra illusztrálja felszállási, átrepülési és megközelítési mérésekre.

a) XY jelöli a mért repülési pálya hasznos szakaszát, XrYr pedig az ennek megfelelő referencia repülési pálya hosszát.

b) Q a mért repülési pályán jelöli a helikopternek azt a helyzetét, aholis a K zajmérő pont által PNLTM-ként megfigyelhető zajkibocsátás történt. Qr az ennek megfelelő helyzet a referencia repülési pályán, Kr pedig a referencia zajmérő pont. QK és QrKr -a sorrend szerint- a mért és a referencia zaj terjedési pálya; Qr helyének kijelölése arra a feltételezésre alapul, hogy QK és QrKr saját vonatkozó repülési pályáikkal ugyanazt a Θ *szöget zárják be.*

8.3.1 A PNL-t (PNL a K-nál PNLTM észlelésének pillanatában) összetevő egyharmad oktávsáv szinteket (SPL(i)) referencia szintekre (SPL(i)r) a következők szerint kell pontosítani:

$$SPL(i)r = SPL(i) + 0{,}01[\alpha(i) - \alpha(i)o]QK$$

$$+ 0{,}01\ \alpha(i)o\ (QK - Q_rK_r)$$

$$+ 20 \log (QK/Q_rK_r)$$

E kifejezésben:

- 0,01 [α(i) - α(i)o] QK összefüggés veszi figyelembe a hang terjedési együttható változásainak hatásait, α(i) és α(i)o sorrendben a vizsgálati és a referencia légköri feltételek együtthatói, amelyek e Függelék 7. szakaszából származnak;

- a hangterjedésben 0,01 α(i)o (QK-QrKr) összefüggés veszi figyelembe a zajpálya hosszúságának változását;

- 20 log (QK/QrKr) összefüggés veszi figyelembe a zajpálya hosszában az "inverz négyzet" törvény miatti változások hatásait;

- QK és QrKr mértékegysége méter, míg α(i) és α(i)o dB/100m.

8.3.2 A korrigált SPL(i)r értékeket PNLTr-re kell átalakítani, a korrekciós kifejezés számítása a következők szerint történik:

$$\Delta 1 = PNLT_r - PNLTM$$

8.3.3 Δ1-et a mért adatból számított EPNL-hez számtanilag hozzá kell adni.

8.3.4 Ha a vizsgálati repülés alatt PNLT több olyan csúcsa észlelhető, amely 2 dB tűréssel a PNLTM-en belül van, akkor mindegyik csúcshoz a 8.3.1, 8.3.2 és a 8.3.3-ban meghatározott eljárást kell alkalmazni és az ilymódon kiszámított pontosítási kifejezést hozzá kell adni mindegyik csúcshoz, hogy azok a PNLT megfelelő pontosítású csúcsértékeit adják. Ha ezek a csúcsértékek a PNLTM pillanatában észleltekét meghaladják, akkor az ilyen túllépés maximum értékét a mért adatból számított EPNL-hez kell adni, mint további pontosítást.

8.4 Az időtartam korrekció pontosítása

8.4.1 Minden esetben, amikor a vizsgálati körülmények között mért repülési pályák és/vagy a földfeletti sebességek eltérnek a referencia körülményekben szereplő referencia repülési pályáktól és/vagy földfeletti sebességektől, a mért adatból számított EPNL-hez időtartam korrekciót kell alkalmazni. A pontosítás számítását az alább leírtak szerint kell végezni.

8.4.2 Az A2-7 ábrán szemléltetett repülési pályára vonatkozóan a pontosítási kifejezést az alábbiak szerint kell kiszámítani:

$$\Delta_2 = -7{,}5 \log (QK/Q_rK_r) + 10 \log(V/V_r)A$$

amely a mért adatból számított EPNL-hez számtanilag hozzáadandó pontosítást jelenti.

8.5 A zaj korrekciója a forrásnál

Az átrepülés esetében, ha az alábbi három tényező bármiféle kombinációban:

a) műszersebesség eltérés a referenciától;

b) forgószárny fordulatszám eltérés a referenciától;

c) hőmérséklet eltérés a referenciától;

elfogadott olyan zaj korrelációs paramétert eredményez, amely értéke, ha eltér e paraméter referencia értékétől, akkor a bizonyítványt kiállító hatóság által elfogadott gyártói adatból meg kell határozni a forrás zaj pontosítását. Ezt a korrekciót rendszerint a PNLTM egy, a haladó lapát végi Mach számmal szembeni érzékenységi görbéjének felhasználásával szükséges elvégezni; a korrekció azonban a bizonyítványt kiállító hatóság által jóváhagyott alternatív paraméter, vagy paraméterek alkalmazásával is elvégezhető.

1. Megjegyzés. - Ha a haladó lapát végi Mach szám, vagy az elfogadott referencia zaj korrelációs paraméter referencia értékének elérése nem lehetséges, akkor az érzékenységi görbe vizsgálati és a referencia feltételek közötti extrapolálása megengedett, feltéve, hogy az adat, a bizonyítványt kiállító hatóság által elfogadott zaj korrelációs paraméterek értékének egy tartományát fedi. A haladás közbeni lapát végi Mach számot, vagy az elfogadott zaj korrelációs paramétert a mérések szerinti adatokból kell kiszámítani. Mindegyik vizsgálati futam alkalmával a repülés irányához viszonyítottan meghatározva, mindhárom hitelesítési mikrofon helyre (középvonal, bal oldalsó, jobb oldalsó) önálló forrás zaj - haladás közbeni lapát végi Mach szám viszony görbét, vagy egyéb elfogadott zaj korrelációs paramétert kell származtatni.

2. Megjegyzés.- Ha haladás közbeni lapát végi Mach számot alkalmaznak, akkor azt tényleges műszersebesség, a repülés magasságán mért külső levegő hőmérséklet (OAT) és forgószárny fordulatszám használatával kell kiszámítani.

8.6 Repülési pálya azonosító pontok és paraméterek

8.6.1 Általános rész

Pont/ Paraméter	Jelentése
K	Zajmérő pont
Kr	Referencia mérő pont
V	A helikopter vizsgálati földfeletti sebesség
Vr	A helikopter referencia földfeletti sebessége
V_H	Legnagyobb sebesség a maximum folytonos teljesítménynél nem nagyobb teljesít-ménnyel végzett vízszintes repülésben,
V_{NE}	Határsebesség (soha túl nem léphető sebesség)
Vy	A legjobb emelkedőképességhez tartozó sebesség

8.6.2 Felszállás (lásd az A2-4 ábrát)

Pont	Jelentése
A	A zaj vizsgálati felszállási repülési pálya kezdete.
B	Az emelkedésre áttérés kezdete
F	A zaj vizsgálati felszállási repülési pálya vége
K1	Felszállási repülési pálya referencia pont
K1', K1"	Kapcsolódó (3 mikrofon elrendezésű) zajmérő pontok
M	A zaj alkalmasság vizsgálati felszállási repülési nyomvonal vége
N	Az emelkedésre áttérés kezdőpontja alatt függőleges irányban a talajon lévő pont
T	A zaj alkalmasság vizsgálati felszállási repülési nyomvonal kezdete, a talajon az A alatt függőleges irányban lévő pont

8.6.3 Átrepülés (lásd az A2-5 ábrát)

Pont	Jelentése
D	A zaj vizsgálati átrepülési repülési pálya kezdete
E	A zaj vizsgálati átrepülési repülési pálya vége
K2	Átrepülési repülési pálya referencia pont
K2', K2"	Kapcsolódó (3 mikrofonos elrendezésű) zajmérő pontok
R	A zaj vizsgálati árepülési repülési nyomvonal kezdete
S	A zaj vizsgálati felszállási repülési nyomvonal vége

8.6.4 Megközelítés (lásd az A2-6 ábrát)

Pont	Jelentése
G	A zaj vizsgálati megközelítési repülési pálya kezdete
H	A vizsgálati megközelítési repülési pályán a megközelítési repülési pálya referencia pont felett függőleges irányban lévő helyzet
I	A zaj vizsgálati megközelítési repülési pálya vége
J	Földet érés
K3	Megközelítési repülési pálya referencia pont
K3', K3"	Kapcsolódó (3 mikrofonos elrendezésű) zajmérő pontok
O	A megközelítési pálya és a talaj síkjának metszéspontja
P	A zaj vizsgálati felszállási repülési nyomvonal kezdete
U	A kilebegtetés kezdete alatt függőleges irányban a talajon lévő pont

8.7 repülési pálya távolságok

Távolság	Egység	Jelentése
NK_1	méter	*Felszállási mérési távolság.* Az emelkedésre áttérés kezdetétől a felszállási repülési pálya referencia pontig terjedő távolság.
TM	méter	*Felszállási repülési pálya nyomvonal távolsá*g. Az a távolság amely alatt a helikopter helyzetéről az adatokat rögzíteni kell.
K_2W	méter (láb)	*A helikopter átrepülési magassága.* A helikopter tartózkodási helyzetének magassága az átrepülési repülési referencia pont felett.

RS	méter	*Átrepülési repülési pálya nyomvonal távolság.* Az a távolság amely alatt a helikopter helyzetéről az adatokat rögzíteni kell.
K_3H	méter (láb)	*Helikopter megközelítési magasság.* A helikopter tartózkodási helyének magassága a megközelítési repülési referencia pont felett.
OK_3	méter	*Megközelítés mérési távolság.* A megközelítési pálya talaj síkkal alkotott metszéspontjától a megközelítési repülési pálya referencia pontjáig tartó távolság.
PU	méter	*Megközelítési repülési pálya nyomvonalátávolság.* Az a távolság, amely alatt a légijármű helyzetéről az adatokat rögzíteni kell.
QK	méter	*Mért zajpálya.* A helikopter mért Q helyzete és a K zajmérő pont közötti távolság.
Q_rK_r	méter	*Referencia zajpálya.* A helikopter Qr referencia helyzete és a Kr referencia zajmérő pont közötti távolság.

9. REPÜLŐGÉP REPÜLÉSI VIZSGÁLATI EREDMÉNYEK PONTOSÍTÁSA

9.1. Ha vizsgálati feltételek eltérnek a referencia feltételektől, akkor a mért zaj adatok pontosítását az e szakaszban közölt módszerek szerint kell pontosítani.

Megjegyzés.- A vizsgálati és a referencia repülési eljárások közötti különbségek az alább közöltekben eredményeznek eltéréseket:

a) a repülőgép repülési pálya referencia ponthoz viszonyított repülési pályája és sebessége;

b) a hang légköri terjedése;

c) a hajtómű zajt keltő szerkezeteit érintő paraméterek.

9.1.1 A mért zaj adatok pontosítását a 9.3 és 9.4-ben előírt módszerek valamelyikét alkalmazva kell végezni az alábbiakban jelentkező különbségekre:

a) a zaj saját pályája menti csillapodása az "inverz négyzet" és a légköri csillapítási körülmények hatására;

b) a zaj fennállásának időtartama, figyelembe véve a repülőgép repülési pálya referencia ponthoz viszonyított távolságának és sebességének hatásait;

c) a hajtómű által kibocsátott forrászaj, a vonatkozó paraméterek hatásának figyelembevételével.

d) a vizsgálati és a referencia műszersebesség közötti nagymérvű különbségek által befolyásolt repülőgép/hajtómű forrászaj. Az időtartamra gyakorolt hatás mellett, a műszersebesség jelentős hatással lehet a zaj forrásként viselkedő részegységre nézve is és ezt figyelembe kell venni; a hagyományos repülőgép konfigurációk esetében, amikor a referencia és a vizsgálati műszersebesség közötti különbség a 28 km/h (15 csomó) tényleges sebességet meghaladja, akkor az eredményként kapott hitelesítési zajszintekre gyakorolt műszersebesség pontosítás hatásainak számszerűsítéséhez a bizonyítványt kiadó hatóság által jóváhagyott vizsgálati adatot és/vagy elemzést kell alkalmazni.

9.1.2 Átrepülés és megközelítés során, a következő körülmények esetén a 9.4-ben leírt integráló módszert kell alkalmazni:

a) ha (az "egyszerűsített" módszer alkalmazásával) a pontosítás mértéke átrepülés során 8 dB-nél nagyobb, vagy leszállás esetén 4 dB-nél nagyobb; vagy

b) ha (az "egyszerűsített" eljárással) a felszállásra, vagy megközelítésre kapott EPNL értéke 1 dB-n belül van a 3. Fejezet 3.4 pontjában előírt korlátozó zajszintekhez viszonyítva.

Megjegyzés.- Lásd továbbá a II.Rész 3 Fejezetének 3.7.6 pontját is.

9.2 repülési pályák

Megjegyzés.- A repülés pályáját, mind a referencia feltételek, mind a vizsgálati körülmények esetében, a repülőgép talajhoz viszonyított geometriai jellemzőivel, a repülőgép vonatkozó földhöz viszonyított sebességével, illetve a repülőgép által kibocsátott zaj meghatározásához használt és az előzőkkel kapcsolatos hajtómű vezérlési paraméterekkel írják le.

9.2.1 Felszállási pálya

Megjegyzés: - Az A2-8. ábra jellemző felszállási pályát mutat be.

a) A repülőgép az A pontban kezdi meg a felszállási nekifutást, a B pontban elemelkedik, és a C pontban kezdi meg az első állandó szögű emelkedést. Ha tolóerő, vagy vonóerő visszavételt (amelyik megfelelő) alkalmaznak, azt a D pontnál kezdik és az E pontnál fejezik be. Innentől kezdi a repülőgép a második állandó szögű emelkedést egészen az F pontig, azaz a zaj hitelesítési felszállási repülési pálya végéig.

b) A K1 pont a felszállási zajmérési hely, AK1 pedig a nekifutás kezdetétől az átrepülési mérőpontig tartó távolság. K2 pozíció az az oldalsó zajmérő hely a futópálya középvonalával párhuzamos egyenesen és előírt távolságra a futópálya meghosszabbított középvonalától, ahol felszálláskor a zajszint a legnagyobb.

c) Az AF távolság az a távolság, amelyen belül a repülőgép helyzetét mérik és a zajméréssel szinkronizálják (lásd e Függelék 2.3.2 pontját).

9.2.2 Megközelítési profilok

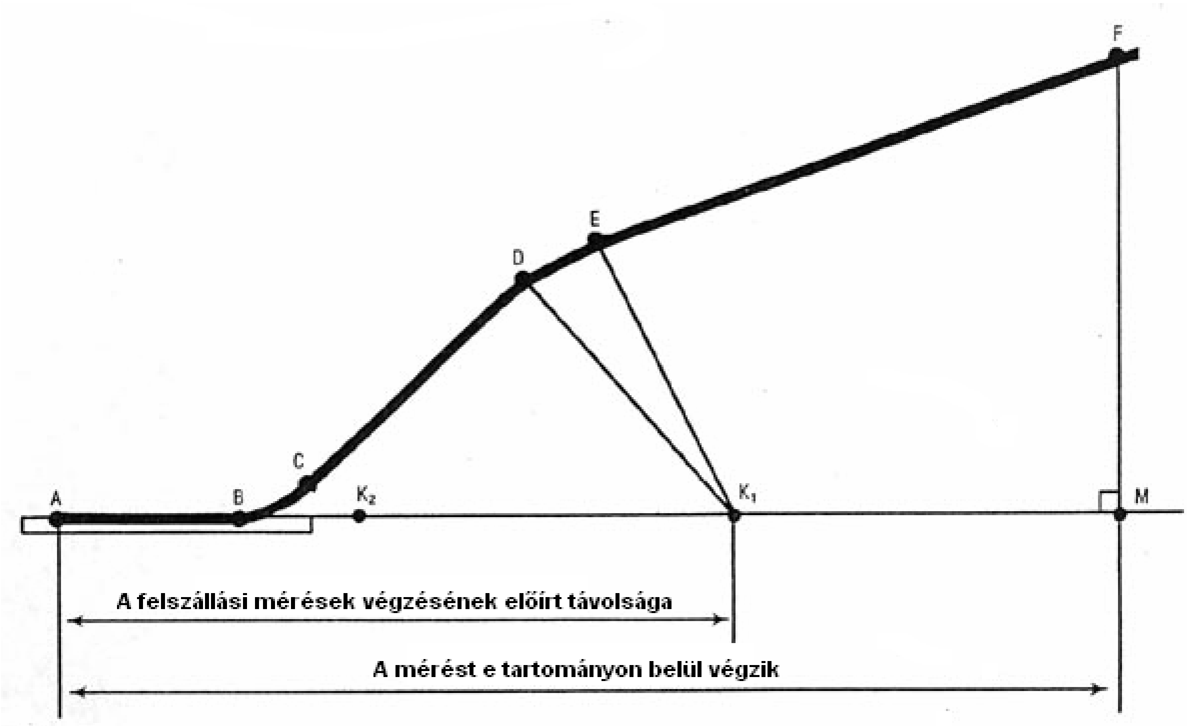
Megjegyzés.- Az A2-9 ábra egy jellemző megközelítési pályát szemléltet.

a) A zaj vizsgálati megközelítési pályát a repülőgép a G pontnál kezdi és a futópályán a J pontnál ér földet a küszöbtől OJ távolságra.

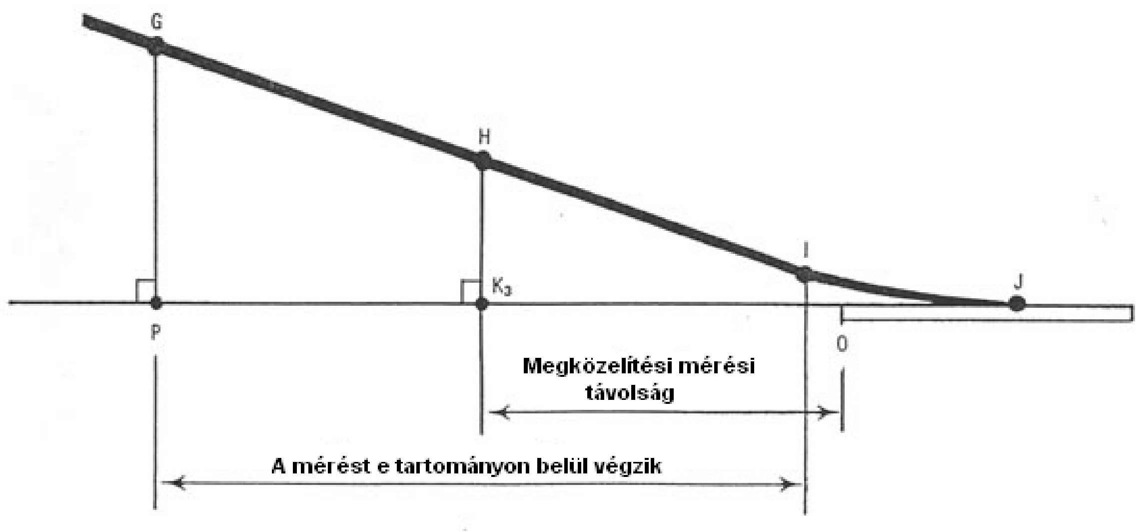
b) A K3 pont a megközelítési zajmérési hely, K3O pedig a megközelítési mérőponttól a küszöbig tartó távolság.

c) A GI távolság az a távolság, amelyen belül a repülőgép helyzetét mérik és a zajméréssel szinkronizálják (lásd e Függelék 2.3.2 pontját).

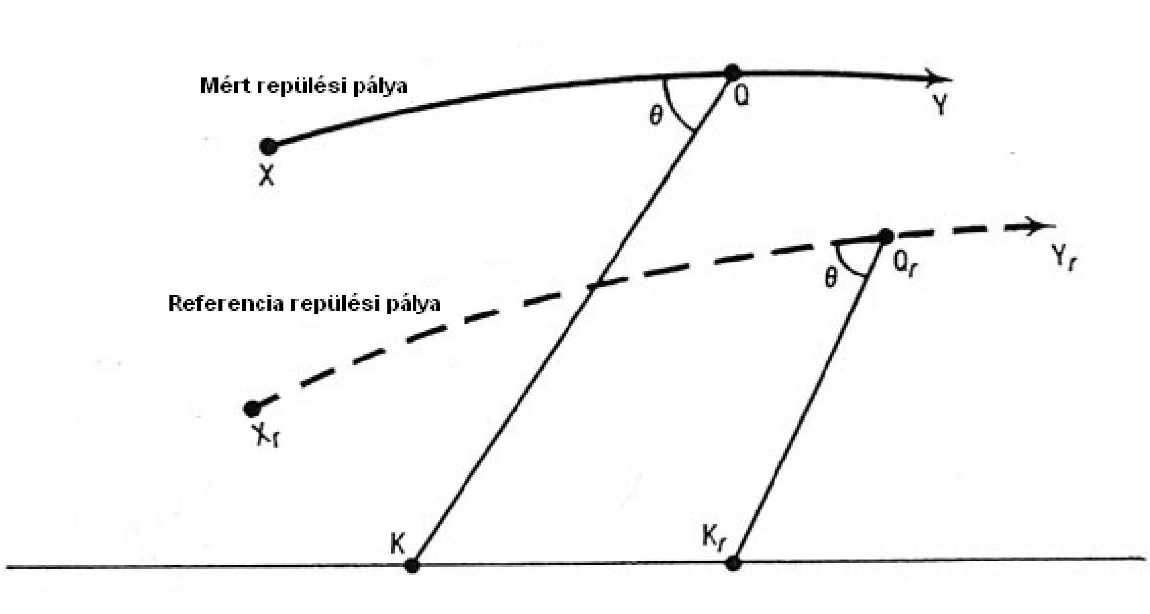
A megközelítési mérések folyamán a repülőgép referencia pontja az ILS antenna legyen.



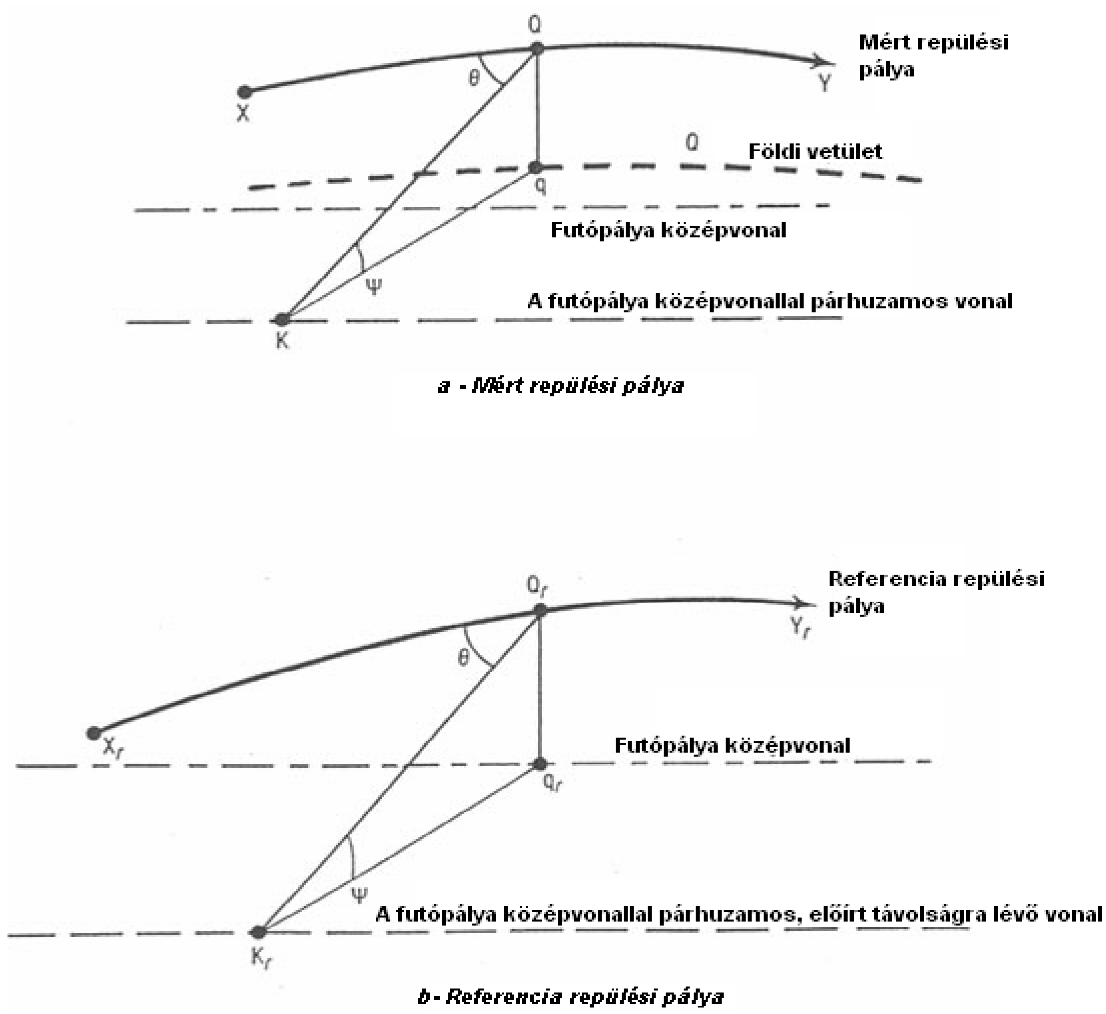
A2-8 ábra - Jellemző felszállási profil



A2-9 ábra - Jellemző megközelítési profil



A2-10 ábra - A hang szintet befolyásoló pálya jellemzők



A2-11 ábra - Oldal mérések - a referencia állomás meghatározása

9.3 A pontosítás "egyszerűsített" módszere

9.3.1 Általános rész

Megjegyzés.- Az "egyszerűsített" pontosító módszer lényege, hogy a mért adatokból számított EPNL-t a mért és a referencia feltételek között a PNLTM pillanatában fennálló különbségekre pontosítják.

9.3.2 PNL és PNLT pontosítása

1. Megjegyzés.- A vizsgálati repülési pálya és a referencia repülési pálya EPNL számításhoz lényeges szakaszait az A2-10 ábra illusztrálja átrepülési és megközelítési mérésekre.
a) XY jelöli a mért repülési pálya hasznos szakaszát, XrYr pedig az ennek megfelelő referencia repülési pálya szakaszt.

b) Q a mért repülési pályán jelöli a repülőgépnek azt a helyzetét, ahol is a K zajmérő pont által PNLTM-ként megfigyelt zajkibocsátás történt. Qr az ennek megfelelő helyzet a referencia repülési pályán, Kr pedig a referencia zajmérő pont. QK és QrKr -a sorrend szerint- a mért és a referencia zajterjedési pálya, Qr helyének kijelölése arra a feltételezésre alapul, hogy QK és QrKr saját vonatkozó repülési pályáikkal ugyanazt a θ szöget zárják be.

2. Megjegyzés.- A vizsgálati repülési pálya és a referencia repülési pálya EPNL számításhoz lényeges szakaszait az A2-11 a) és b) ábrák illusztrálják az oldalmérések esetére.

a) XY jelöli a mért repülési pálya hasznos szakaszát (A2-11 a) ábra), XrYr pedig a referencia repülési pálya ennek megfelelő szakaszát (A2-11 b) ábra).

b) Q a mért repülési pályán jelöli a repülőgépnek azt a helyzetét, ahol is a K zajmérő pont által PNLTM-ként megfigyelt zajkibocsátás történt. Qr az ennek megfelelő helyzet a referencia repülési pályán, Kr pedig a referencia zajmérő pont. QK és QrKr -a sor-rend szerint- a mért és a referencia zaj terjedési pálya. Ez esetben Kr csak olyan formán van kijelölve, hogy az egy meghatározott oldalsó vonal mentén helyezkedik el; Kr és Qr helye ennek megfelelően abból a feltételezésből határozható meg, hogy QK és QrKr:

1) saját vonatkozó repülési pályáikkal ugyanazt a θ szöget zárják be, és

2) a talajjal ugyanazt a ψ szöget zárják be.

3. Megjegyzés.- Az oldalsó zajmérések különleges esetet jelentenek, mivel a hang terjedését nem csak az "inverz négyzet" és a légköri terjedés befolyásolja, de a talaj általi elnyelődés és a visszaverődési hatások is, amelyek főként ψ szögtől függnek.

9.3.2.1 A PNL-t (PNL a K-nál PNLTM észlelésének pillanatában) összetevő egyharmad oktávsáv szinteket (SPL(i)) referencia szintekre (SPL(i)r) pontosítását a következők szerint kell elvégezni:

$$\begin{aligned} SPL(i)_r = {} & SPL(i) + 0{,}01\,[\alpha(i) - \alpha(i)_o]\,QK \\ & + 0{,}01\,\alpha(i)_o\,(QK - Q_rK_r) \\ & + 20 \log (QK/Q_rK_r) \end{aligned}$$

E kifejezésben:

- 0,01 [$\alpha(i)$ - $\alpha(i)_o$] QK összefüggés veszi figyelembe a hang terjedési együttható változásainak hatásait, $\alpha(i)$ és $\alpha(i)o$ sorrendben, az e Függelék 7. szakaszából származó a vizsgálati és a referencia légköri feltételek együtthatói;

- a hangterjedésben 0,01 $\alpha(i)_o$ (QK - Q_rK_r) összefüggés veszi figyelembe a zajpálya hosszúságának változását;

- 20 log (QK/QrKr) összefüggés veszi figyelembe a zajpálya hosszában az "inverz négyzet" törvény miatti változások hatásait;

- QK és QrKr mértékegysége méter, míg $\alpha(i)$ és $\alpha(i)o$ dB/100 m.

9.3.2.1.1 A korrigált SPL(i)r értékeket PNLTr-re kell átalakítani, a korrekciós kifejezés számítása a következők szerint történik:

$$\Delta1 = PNLT_r - PNLTM$$

9.3.2.1.2 Δ1-et a mért adatból számított EPNL-hez számtanilag hozzá kell adni.

9.3.2.2 Ha a vizsgálati repülés alatt PNLT több olyan csúcsa észlelhető, amely 2 dB tűréssel a PNLTM-en belül van, akkor mindegyik csúcshoz a 9.3.2.1-ben meghatározott eljárást kell alkalmazni és a 9.3.2.1 szerint kiszámított pontosító kifejezést hozzá kell adni mindegyik csúcshoz, hogy azok a PNLT megfelelő pontosítású csúcsértékeit adják. Ha ezek a csúcsértékek a PNLTM pillanatában észleltеket meghaladják, akkor az ilyen túllépések maximum értékét a mért adatból számított EPNL-hez kell adni, mint további pontosítást.

9.3.3 Az időtartam korrekció pontosítása

9.3.3.1 Minden esetben, amikor a vizsgálati körülmények között mért repülési pályák és/vagy a földfeletti sebességek eltérnek a referencia körülményekben szereplő referencia repülési pályáktól és/vagy földfeletti sebességektől, a mért adatból számított EPNL-hez időtartam korrekciót kell alkalmazni. A pontosítás számítását az alább leírtak szerint kell végezni.

9.3.3.2 Az A2-10 ábrán szemléltetett repülési pályára vonatkozóan a pontosító kifejezést az alábbiak szerint kell kiszámítani:

$$\Delta2 = -7{,}5 \log (QK/Q_rK_r) + 10 \log (V/V_r)$$

amely a mért adatból számított EPNL-hez számtanilag hozzáadandó pontosítást jelenti.

9.3.4 A forrás zaj korrekciója

9.3.4.1 A vizsgálati körülmények között mért hajtómű zajt befolyásoló paraméterek és a referencia feltételek között számított, vagy előírt paraméterek közötti különbségek figyelembe vételéhez a forrás zajt pontosítani kell. A pontosítást a bizonyítványt kiállító hatóság által elfogadott gyártói adatból kell meghatározni.

Megjegyzés.- Jellemző adatot az A2-12 ábra szemléltet, amelyen az EPNL és a hajtómű szabályozó paraméter (μ) összefüggését ábrázoló görbe szerepel és az EPNL adat az összes egyéb vonatkozó referencia feltételre (repülőgép tömeg, sebesség és magasság, levegő hőmérséklet) pontosított, továbbá *pontosítandó a telepített hajtómű és a repülési kézikönyv szerinti szabvány hajtómű zaja között minden μ érték esetén tapasztalható eltérésre. Ilyen jellegű adatok szükségesek az olyan μ értékek környezetében, amelyeket az oldalirányú, átrepülési és a megközelítési zajméréshez használnak.*

9.3.4.2 A ?3 pontosítási értéket a µ paraméterhez tartozó EPNL értéknek a µr paraméterhez tartozó EPNL értékből történő kivonásával kell kiszámítani és amelyet a mért adatból számított EPNL-hez számtanilag hozzá kell adni.

Megjegyzés.- Lásd az A2-12 ábrát, amelyen µ a hajtómű szabályozó paraméter értéke a re-pülési vizsgálati feltételek között, míg µr az ennek megfelelő érték a referencia feltételek között.

9.3.5 Szimmetria pontosítás

Az oldalirányú zaj esetében a szimmetria pontosítást (lásd a II. Rész, 3. Fejezet 3.3.2.2) a következ-ők szerint kell elvégezni:

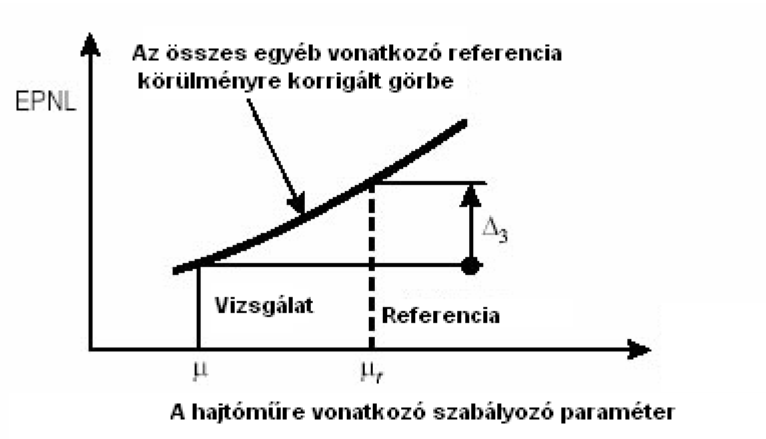
a) ha a szimmetrikusan elhelyezett mérőpont a fő oldalmérési vonalon lévő legnagyobb zaj észlelésének pontjával szemben helyezkedik el, akkor a vizsgálati zajszint az e két pont-nál mért zajszintek (aritmetikai) középértéke legyen (lásd az A2-13 a) ábrát);

b) ha nem így helyezkednek el, akkor azt kell feltételezni, hogy a zaj a repülőgép repülési magasságával mindkét oldalon ugyanúgy változik (azaz, a zajt mindkét oldal esetében a magasság függvényében mutató vonalak között a különbség állandó (lásd az A2-13 b) áb-rát). A vizsgűlati zajszint - ez esetben- a két görbe közötti középértékek közül a legna-gyobb értéke legyen.

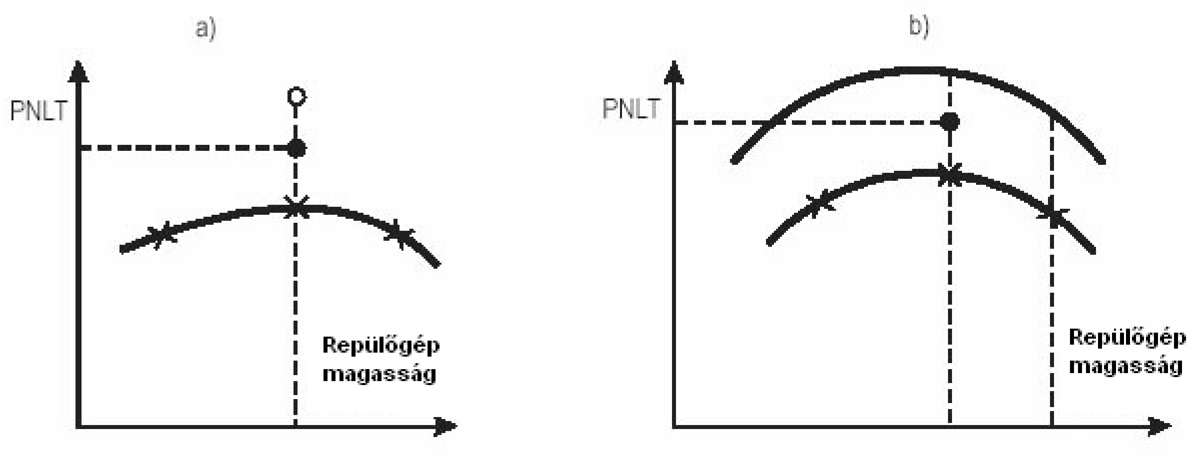
9.4 "Integrált" pontosító módszer

9.4.1 Általános rész

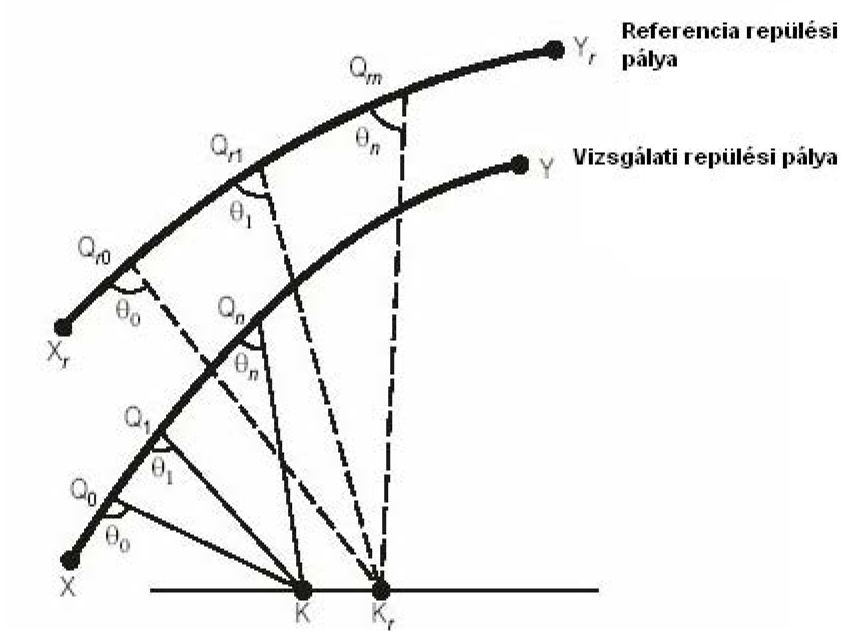
Megjegyzés.- Az "integrált" pontosító módszer a következőkből áll: a vizsgálatok során nyert mért pontoknak megfelelő, a PNLT időbeli alakulásán található pontok újra számítása a referencia körülmények közötti, továbbá az e módszer szerint nyert időbeli alakulásra közvetlen EPNL kiszámítása. A fő szempontok leírása alább következik.



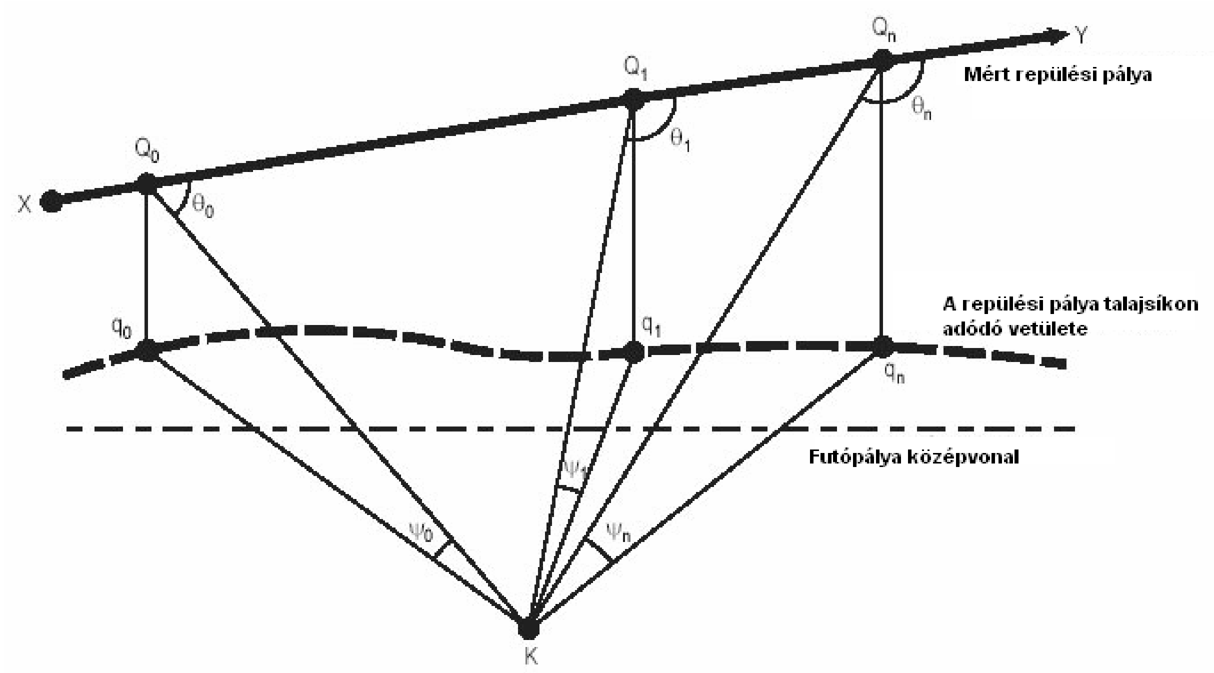
A2-12 ábra - A zajáteljesítmény szerinti korrekciója



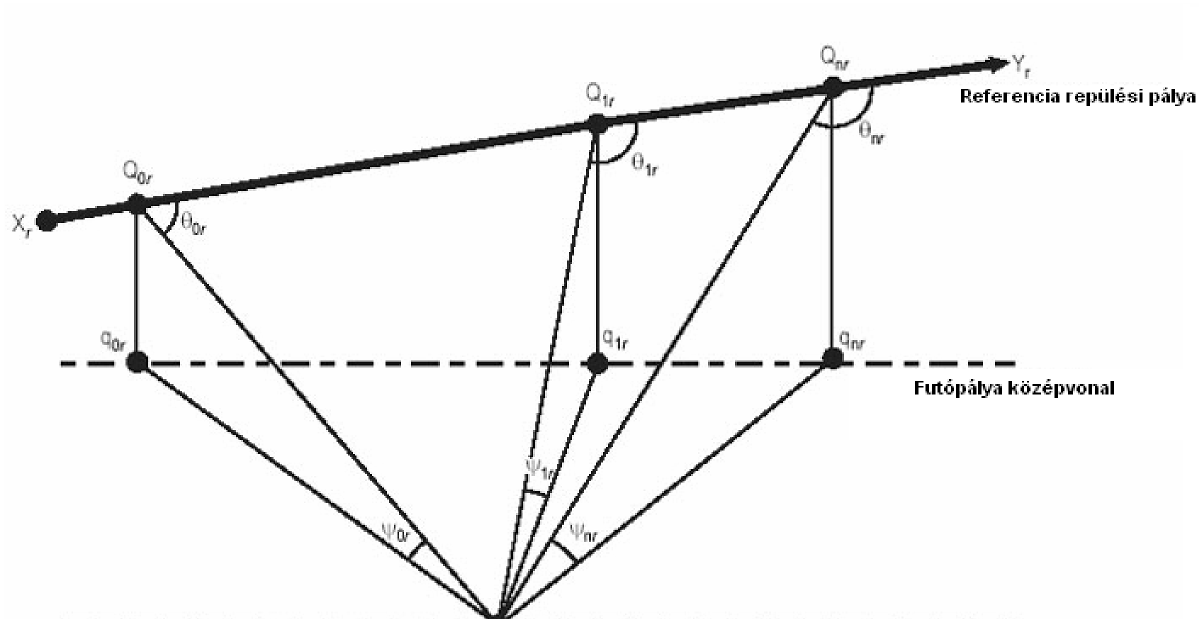
A2-13 ábra - Szimmetria korrekció



A2-14 ábra - A mért és a referencia repülési pályák közötti összefüggés az integrált korrekciós módszer alkalmazására vonatkozóan



A2-15 a) ábra - Mért repülési pálya



A2-15 b) ábra - Referencia repülési pálya

9.4.2 PNLT számítás

1. Megjegyzés.- A vizsgálati repülési pálya és a referencia repülési pálya EPNL számításhoz lényeges szakaszait a A2-14 ábra illusztrálja átrepülési, teljes teljesítmény és megközelítési zaj mérésekre.

a) XY jelöli a mért repülési pálya hasznos szakaszát, az XrYr pedig az ennek megfelelő referencia repülési pályát.

b) A Q0, Q1, Qn pontok a repülőgép helyzetét a mért repülési pályán t0, t1 és tn időpillanatokban jelölik a sorrendek megfelelően. Tekintsük a Q1 pontot úgy, hogy az itt kibocsátott zajt a K mérőpont t1 időpillanatban egyharmad oktávsávos SPL(i)1 értékekként észlelte. A referencia repülési pályán ennek megfelelő helyzetet a Qr1 pont jelöli arra a zajra, amelyet a Kr mérőpont tr1 időpillanatban egyharmad oktávsávos SPL(i)r1 értékekként észlelt. A Q1K és Qr1Kr -a sorrend szerint- a mért és a referencia zaj terjedési pályák, amelyek mindegyike θ1 szöget zár be saját vonatkozó repülési pályájával. A Qr0 és Qrn, hasonló módon, a referencia repülési pályán lévő és a mért pályán található Q0 és Qn-nek megfelelő pontok. Q0 és Qn megválasztása olyan, hogy a Qr0 és Qrn között (az alábbiak szerint kiszámított és leírt) a csúcsérték 10 dB-es tartományán belül lévő minden PNLTr érték fedve legyen.

2. Megjegyzés.- A vizsgálati repülési pálya és a referencia repülési pálya EPNL számításhoz lényeges szakaszait az A2-15 a) és b) ábrák illusztrálják az oldalmérések esetére.

a) XY jelöli a mért repülési pálya hasznos szakaszát, az XrYr pedig az ennek megfelelő referencia repülési pályát.

b) A Q0, Q1, Qn pontok a repülőgép helyzetét a mért repülési pályán t0, t1 és tn időpillanatokban jelölik - a sorrendek megfelelően. Tekintsük a Q1 pontot úgy, hogy az itt kibocsátott zajt a K mérőpont t1 időpillanatban egyharmad oktávsávos SPL(i)1 értékekként észlelte. A referencia repülési pályán ennek megfelelő helyzetet a Qr1 pont jelöli arra a zajra, amelyet a Kr mérőpont tr1 időpillanatban egyharmad oktávsávos SPL(i)r1 értékekként észlelt. A Q1K és Qr1Kr -a sorrend szerint- a mért és a referencia zajáterjedési pályák. A Qr0 és Qrn, hasonló módon, a referencia repülési pályán lévő és a mért pályán található Q0 és Qn-nek megfelelő pontok. Q0 és Qn megválasztása olyan, hogy a Qr0 és Qrn között (az alábbiak szerint kiszámított és leírt) a csúcsérték 10 dB-es tartományán belül lévő minden PNLTr érték fedve legyen. Ez esetben Kr csak annyiban van kijelölve, hogy az egy meghatározott oldalsó vonal mentén helyezkedik el. Kr és Qr1 helye ennek megfelelően abból a feltételezésből határozható meg, hogy:

1) Q1K és Qr1Kr saját vonatkozó repülési pályáikkal ugyanazt a θ1 szöget zárják be minden t1 időpillanatban; és

2) ψ1 és ψ1r szögek közötti különbséget az időbeli alakulás vonatkozó tartama során a bizonyítványt kiállító hatóság által jóváhagyott módszer szerint tartják a lehető legkisebb értéken.

3. Megjegyzés.- Az oldalsó zajmérések különleges esetet jelentenek, mivel a hang terjedését nem csak az "inverz négyzet" és a légköri terjedés befolyásolja, de a talaj általi elnyelődés és a visszaverődési hatások is, amelyek főként ψ szögtől függnek. Geometriai okoknál fogva rendszerint nincs lehetőség a Kr-t olymódon megválasztani, hogy a fenti 1) pontban szereplők teljesüljenek, amikor ezzel egyidőben ψ1 és ψ1r szögeket minden t1 időpillanatban egyenlőnek tartják.

4. Megjegyzés.- A (Qr1Kr>Q1K-ra vonatkozó) tr1 időpont t1-nél későbbi időpont, két külön mennyiség következtében:

a) a repülőgép számára a Qr1Qr0 távolság Vr sebességel végzett megtételének időtartama, minusz a Q1Q0 távolság V sebességel végzett megtételének időtartama;

b) a hang számára a Qr1Kr - Q1K távolság megtételéhez szükséges idő.

5. Megjegyzés. - Ha tolóerő vagy vonóerő visszavételt alkalmaznak, akkor többféle pálya adódik: a teljes tolóerő/vonóerőhöz tartozó és a visszavett tolóerő/vonóerőhöz tartozó vizsgálati és referencia repülési pályák adódnak. Ha az ezek közötti átmeneti szakasz a végső eredményt befolyásolja, akkor közöttük olyan elfogadott módszert alkalmazva kötelező interpolálni, mint amilyent a Doc 9501, 2. Fejezet 2.2.1 tartalmaz.

9.4.2.1 A mért és a referencia zajpálya hosszúság, a mért és a referencia légkör közötti különbségek tekintetében az SPL(i)1 stb. mért értékeit a referencia SPL(i)r1 stb. értékekhez az ezen Függelék 9.3.2.1 pontjában leírt módszerrel kell igazítani. A PNLr1 vonatkozó értékeit ki kell számolni.

9.4.2.2 Az ezen Függelék 4.3 pontjában leírt módszert alkalmazva, a PNLr1 minden értékére, SPL(i)r stb. referencia értékek elemzésével egy tiszta hang korrekciós tényezőt, C1-et, kell meghatározni és a PNLr1-hez hozzáadni, hogy az a PNLTr1-et kiadja..

9.4.3 Időtartam korrekció

Az egyes fél másodperces időközökhöz tartozó PNLT-knek megfelelő PNLTr értékeket az idő függvényeként fel kell rajzolni (PNLTr1 a tr1 időpontban stb.). Az időtartam korrekciót ezt követően az ezen Függelék 4.5.1 pontjában meghatározott módszer szerint kell megállapítani, hogy az EPNLr-t eredményezzen.

9.4.4 A zaj korrekciója a forrásnál

Végezetül, a jelen Függelék 9.3.4 pontjában közölt módszerrel Δ3 forrászaj pontosítást kell meghatározni.

9.5 repülési pálya azonosító pontok

Pont	Jelentése
A	A felszállási nekifutás kezdete
B	Elemelkedés
C	Az első állandósult emelkedés kezdete
D	Teljesítmény visszavétel kezdete
E	Második állandósult emelkedés kezdete
F	A zaj vizsgálati felszállási pálya vége
G	A zaj vizsgálati megközelítési repülési pálya kezdete
H	A megközelítési pályán pontosan a zajmérő állomás feletti pont helyzete.
I	A vizszintes repülés kezdete
J	Földet érés
K	Zajmérő pont
Kr	Referencia mérőpont
K1	Átrepülési zajmérőpont
K2	Oldalsó zajmérőpont
K2	Megközelítési zajmérőpont
M	A zaj vizsgálati felszállási repülési nyomvonal vége
O	A futópálya megközelítés felőli küszöbe
P	A zaj vizsgálati megközelítési repülési nyomvonal kezdete
Q	A mért felszállási repülési pályán az a pont, amely a K mérőpontnál észlelt PNLTM-nek felel meg. Lásd a 9.3.2 pontot.
Qr	A korrigált felszállási repülési pályán az a pont, amely megfelel a K mérőpontnál észlelt PNLTM-nek. Lásd a 9.3.2 pontot.
V	Repülőgép vizsgálati sebesség
Vr	Repülőgép referencia sebesség.

9.6 Repülési pálya távolságok

TÁVOLSÁG	EGYSÉG	JELENTÉSE
AB	méter	*Nekifutási úthossz.* A futópálya mentén a felszálláshoz végzett nekifutás kezdetétől az elemelkedésig tartó távolság
AK	méter	*Felszállási mérési távolsá*g. A nekifutás megkezdésétől a futópálya meghosszabbított középvonala mentén lévő felszállási zajmérő állomásig tartó távolság.
AM	méter	*Felszállási repülési nyomvonal távolság.* A nekifutás megkezdésétől a futópálya meghosszabbított középvonalán lévő felszállási repülési nyomvonal helyzetig tartó távolság, amelyen túl a repülőgép helyzet adatokat már nem kell rögzíteni.
QK	méter	*Mért zajpálya.* A repülőgép mért Q helyzete és a K állomás közötti távolság.
QrKr	méter	*Referencia zajpálya.* A repülőgép Qr referencia helyzete és a Kr állomás közötti távolság.
K3H	méter (láb)	*Repülőgép megközelítési magasság.* A repülőgép magassága a megközelítési mérőállomás felett.
OK3	méter	*Megközelítési mérési távolság.* A futópálya küszöbétől a megközelítési mérőállomásig a futópálya meghosszabbított középvonala mentén mért távolság.
OP	méter	*Megközelítési repülési nyomvonal távolság*. A futópálya küszöbétől a pálya meghosszabbított középvonalán lévő repülési nyomvonal helyzetig mért távolság, amelyen túl a repülőgép helyzet adatait már nem kell rögzíteni.

3. FÜGGELÉK Zajértékelési módszer a 8618 kg, vagy könnyebb légcsavar hajtású repülőgépek zajminősítési vizsgálatához - a prototípus légialkalmassági bizonyítványa iránt 1988 november 17-e előtt elfogadott kérvények

Megjegyzés. - Lásd a II. Rész 6. Fejezetét.

1. BEVEZETŐ RÉSZ

1. Megjegyzés. - E zajértékelési módszer a következőket foglalja magába:

a) A zaj vizsgálati és mérési feltételei;

b) A földön észlelt repülőgép zaj mérése; és

c) Az adatok jelentése a bizonyítványt kiadó hatóságoknak és a mérési adatok korrekciója.

2. Megjegyzés. - Az e módszerben megadott utasításokat és eljárásokat világosan fogalmazták meg ahhoz, hogy biztosítsák a vizsgálatok egységes végrehajtását és lehetővé tegyék a különböző földrajzi helyeken végzett vizsgálatok összehasonlíthatóságát. A módszer csak a II. Rész 6. Fejezetének alkalmazhatósági határain belül lévő repülőgépeknél használható.

2. A ZAJMINŐSÍTÉS VIZSGÁLATI ÉS MÉRÉSI FELTÉTELEI

2.1 Általános rész

Ez a szakasz leírja, hogy a zajminősítési vizsgálatokat milyen körülmények között kell végezni, illetve, hogy milyen mérési eljárásokat kell alkalmazni a vizsgálat tárgyát képező repülőgép által előidézett zaj méréséhez.

2.2 Általános vizsgálati feltételek

2.2.1 A levegőben lévő repülőgép zajának méréséhez túlzott hangelnyelő tulajdonsággal (mint amit a sűrű, tömörödött, vagy hosszú fű, bokrok vagy erdős területek okoznak) nem rendelkező viszonylag lapos környezetű terepet kell kiválasztani. Nem lehetnek a repülőgép zajmezőjét jelentősen befolyásoló akadályok a mérési pont felett elhelyezkedő kúpos térben, amely kúpot a földfelszínre merőleges tengely és e tengelyhez képest mért 75^{o}-os fél-szög határoz meg.

2.2.2 A vizsgálatokat a következő légköri körülmények között kell elvégezni:

a) Csapadékmentes idő;

b) Relatív páratartalom nem lehet 95 százaléknál magasabb, vagy 20 százaléknál alacsonyabb; a környezeti levegő hőmérséklet nem magasabb 35^{o} C-nál és nem alacsonyabb 2^{o} C-nál a talajszintje felett 1,2 m (4 láb) magasságban, kivéve, hogy a hőmérséklet és a relatív páratartalom szerinti grafikonon a 2^{o}C és 60 százalék valamint a 35^{o}C és 20 százalék között húzott egyenes alatti területén található hőmérséklet és relatív páratartalom kombinációk kerülendők.

c) a jelentett szélerősség a talajszintje felett 1,2 m (4 láb) magasságban mérve 19 km/h-nál (10 csomó) nem erősebb és az oldalszél összetevő 9 km/h-nál (5 csomó) nem erősebb; Egyenlő számban kell repüléseket végrehajtani szembeszél és hátszél viszonyok között; és

d) Nem lehet a repülőgép zajszintjét jelentősen befolyásoló hőmérsékleti inverzió, vagy rendszertelenül váltakozó szél miközben a zajt a bizonyítványt kiadó hatóságok által kijelölt mérési pontokban rögzítik.

2.3 Repülőgép vizsgálati eljárások

2.3.1 A vizsgálati eljárásoknak és a mérési eljárásoknak a bizonyítványt kiadó állam légi alkalmassági és zajminősítési hatóságai részéről elfogadhatóaknak kell lenniük.

2.3.2 A repülőgép magasságát és a mikrofonhoz viszonyított helyzetét, a bizonyítványt kiadó hatóság részéről jóváhagyott, a normál repülési műszerezettségtől független módszerrel kell meghatározni, mint például a radar célkövetés, a teodolitos háromszögelés, fényképezéses mérési eljárás, vagy egyéb módszer.

3. A REPÜLŐGÉP FÖLDÖN ÉSZLELT ZAJÁNAK MÉRÉSE

3.1 Általános rész

3.1.1 A bizonyítványt kiadó hatósággal minden mérőberendezést jóvá kell hagyatni.

3.1.2 A zajértékelési célokra használt hangnyomásszint adatokat az alábbi 3.2-ben közölt előírásoknak megfelelő jóváhagyott akusztikai felszereléssel és mérési eljárással kell megállapítani.

3.2 Mérőrendszer

Az akusztikai mérőrendszer a következőkkel egyenértékű jóváhagyott berendezésekből áll:

a) A 3.3 pontban megadott mérő és elemzőrendszer pontosságával egyező frekvencia átviteli karakterisztikával rendelkező mikrofonrendszer;

b) három lábú, vagy hasonló rendszerű a mért hanggal való interferenciát minimálissá tévő mikrofon felépítmények;

c) A 3.3 pontban ismertetett átviteli és pontossági követelményeket teljesítő karakterisztikával, frekvencia átviteli karakterisztikával és dinamika tartománnyal rendelkező rögzítő és visszajátszó berendezés;

d) Ismert hangnyomásszint szinusz hullámát, vagy széles sávú zaját használó akusztikai kalibráló eszköz. Széles sávú zaj alkalmazása esetén a jelet túlterhelés nélküli jelszinten átlagos és maximum négyzetes középérték formájában kell leírni;

3.3 Érzékelő, felvevő és visszajátszó berendezések

3.3.1 Ha a bizonyítványt kiállító hatóság előírja, akkor a légijármű által keltett zajokat úgy kell rögzíteni, hogy a teljes hanganyag - az időrendi jeleket is beleértve - megőrződjön. A mágnesszalagos rögzítés alkalmazása elfogadható.

3.3.2 A rendszer egészének karakterisztikái egyezzenek meg az IEC (Nemzetközi Elektrotechnikai Bizottság) 179-es számú1 kiadványa azon szakaszainak ajánlásaival, amelyek a mikrofon, erősítő és jelző műszer karakterisztikákkal foglalkoznak. A 179-es számú[1] IEC "precíziós hangszint mérők" címet viselő kiadványak szövege és műszaki jellemzői hivatkozás formájában jelen Függelékbe belefoglalva szerepel(nek) és ezért a Függelék részét képezi(k)..

Megjegyzés.- Ha mágnesszalagos rögzítő készüléket alkalmaznak, akkor az az IEC 561-es ajánlását teljesítő teljes rendszer részét képezi.[1]

3.3.3 45-11200 Hz frekvencia tartományban állandó amplitúdójú, érzékelhetően síkban folyamatos szinusz hullámra a teljes rendszer átvitele legyen az IEC 179 számú kiadvány[1] az I. Típusú műszerekre a IV. Táblázatban és az V. Táblázatban az "A" súlyozási görbére vonatkozóan előírt tűréshatárokon belül.

3.3.4 A rögzített zaj jelet az IEC 1791 számú kiadványában meghatározottak szerint egy "lassú"-ként osztályozott dinamika jellemzőkkel rendelkező "A" szűrőn keresztül kell kiolvasni.

Megjegyzés.- A nagy repülési sebességekkel végzett vizsgálatok során a tényleges szint eléréséhez "gyors" dinamika jellemzők válhatnak szükségessé.

3.3.5 A berendezést a szabad mezős kalibrálásra használatos berendezésekkel akusztikusan kalibrálni kell. A mérő rendszer össz érzékenységét a repülőgép egy sorozat repülésének zajszint mérését megelőzően és követően ellenőrizni kell ismert hangnyomásszintet ismert frekvencián előállító akusztikus kalibrátor igénybevételével.

Megjegyzés.- E célra általában névlegesen 124 dB-en és 250 Hz-en működő pisztofont alkalmaznak.
3.3.6 11 km/h-nál (6 csomónál) nagyobb szél sebesség esetén a mikrofonhoz szélárnyékolót kell alkalmazni bármiféle repülőgép zaj mérésekor. Jellemzői biztosítsák, hogy használatakor a teljes rendszer, beleértve a szélárnyékolót is, teljesíti a fenti előírásokat. Ismerni kell az általa az akusztikai kalibrátor frekvencián okozott beviteli veszteséget is és azt bele kell foglalni a mérés elemzéséhez biztosítandó akusztikai referencia szintbe.

1 Módosításait is beleértve. A kiadvány beszerezhetőségi helye: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

3.4 Zajmérési eljárások

3.4.1 Az összes mikrofont egy ismert irányba kell beállítani, hogy az észlelt és legnagyobb erősségű hang, lehetőleg pontosan abból az irányból érkezzen, amelyre a mikrofonokat kalibrálták. A mikrofonok érzékelő elemei a földtől kb. 1,2 m (4 láb) magasságban legyenek elhelyezve.

3.4.2 Minden vizsgálat előtt és után közvetlenül, a rendszer megörökített akusztikai kalibrálását a helyszínen, akusztikai kalibrátort alkalmazva el kell végezni a rendszer érzékenységének ellenőrzése céljából, illetve a hangszint adatok elemzéséhez egy akusztikai referencia szint biztosítása céljából.

3.4.3 A rendszer erősítését olyan szintre állítva, mint amelyet a repülőgép zajméréshez fognak használni, a vizsgálat helyszínén a környezeti zajt, beleértve a környezeti zajt és a rendszer elektromos zaját is, meg kell határozni és rögzíteni kell. Ha a repülőgép hangnyomásszintje legalább 10 dB(A)-val nem haladja meg a háttér hangnyomásszintet, akkor a háttér hangnyomásszint megfigyelt hangnyomásszintre gyakorolt hatásának figyelembe vételéhez megfelelő jóváhagyott korrekciókat kell alkalmazni.

4. AZ ADATOK JELENTÉSE A BIZONYITVÁNYT KIADO HATOSÁG FELÉ ÉS A MÉRT ÉRTÉKEK KORREKCIÓJA

4.1 Az adatok jelentése

4.1.1 A jelen Függelék 3. szakaszában előírtaknak megfelelő berendezésekkel kapott, mért és korrigált hangnyomásszinteket kell jelenteni.

4.1.2 A repülőgépek akusztikai teljesítményének mérésére és elemzésére, valamint a meteorológiai adatok mérésére és elemzésére alkalmazott minden berendezés típusát jelenteni kell.

4.1.3 Jelenteni kell a jelen Függelék 2. szakaszában előírt megfigyelési pontokon az egyes vizsgálatokat közvetlenül megelőzően, azok után, vagy a vizsgálatok közben észlelt következő légköri környezeti adatokat:

a) Levegő hőmérséklet és relatív nedvesség; és

b) Maximum, minimum és átlagos szélsebességek.

4.1.4 Jelenteni kell a hangrögzítést esetleg befolyásoló helyi topográfiára, talaj fedettségre és egyéb eseményekre vonatkozó észrevételeket is.

4.1.5 A repülőgépről az alábbi információkat kell jelenteni:

a) Repülőgép, motor és légcsavar(ok) típus, változat és sorozatszáma

b) A repülőgép zaj jellemzőit esetleg befolyásoló bármilyen átalakítás, vagy nem szabványos felszerelés;

c) Hitelesített maximum felszálló tömeg;

d) Minden átrepülésre, az átrepülés tengerszint feletti magasságán a levegőhöz viszonyított sebesség és levegő hőmérséklet megfelelően kalibrált műszerekkel megállapított értéke;

e) Megfelelően kalibrált műszerekkel megállapítva, minden átrepülésre a hajtómű teljesítmény (szívótérnyomás, vagy teljesítmény szerint), légcsavar fordulatszám (fordulat per percben), valamint egyéb lényeges vonatkozó paraméterek;

f) A repülőgép talaj feletti magassága (lásd a 2.3.2 pontot);

g) A gyártó megfelelő adatai a referencia feltételekre vonatkozóan, a fenti d) és e) pontokkal kapcsolatban.

4.2 Adat korrekció

4.2.1 Zaj korrekció a zajforrásnál

4.2.1.1 Ha a bizonyítványt kiadó hatóság előírja -jóváhagyott módszereket használva- megfelelő korrekciókat kell alkalmazni a vizsgálat során elért hajtómű teljesítmény és azon teljesítmény között fennálló különbségekre, amely teljesítmény a referencia körülmények között a normál üzemi működési sávban azonos típusú átlagos hajtóművel a legnagyobb teljesítményt adó beállításokkal, elérhető lenne.

4.2.1.2 Légcsavar lapátcsúcson mért 0.70, vagy kisebb Mach szám esetén nincs korrekcióra szükség, ha a vizsgálati lapátcsúcs Mach szám és a referencia lapátcsúcs Mach szám között 0,014-nél kisebb a különbség. A 0.70-nél nagyobb és 0.80, vagy kisebb légcsavar lapátcsúcs Mach szám esetén, nincs szükség korrekcióra, ha a vizsgálati lapátcsúcs Mach szám és a referencia lapátcsúcs Mach szám között 0,007-nél kisebb a különbség. 0,80 lapátcsúcs Mach szám fölött nincs korrekcióra szükség, ha a lapát-csúcs Mach szám és a referencia lapátcsúcs Mach szám között 0,005-nél kisebb a különbség. Ha a vizsgálati teljesítmény bármely lapátcsúcs Mach szám esetében a referencia teljesítménytől 10 százaléknál kisebb mértékben tér el, akkor nincs szükség korrekcióra a zajforrás teljesítmény szerinti változása tekintetében. Nem kell korrekciót alkalmazni a nem-állítható tollú légcsavar hajtású repülőgépek teljesítmény változtatása tekintetében sem. Ha a vizsgálati légcsavar lapátcsúcs Mach szám és a teljesítmény a fenti kikötéseknél nagyobb mértékben tér el a referencia körülményektől, akkor a ténylegesen vizsgált repülőgéptől, vagy egy hasonlóan konfigurált és a vizsgált repülőgéppel azonos hajtóművű és légcsavarú és azonosan üzemeltetett repülőgépről kapott adatokon alapuló korrekciót kell alkalmazni az "Enviromental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" 4.1 pontjában leírtaknak megfelelően..

4.2.2 A földön észlelt zaj korrekciója

A 300 métertől (985 lábtól) eltérő magasságon végzett zajméréseket az inverz négyzet szabályt alkalmazva 300 méterre (985 lábra) kell korrigálni.

4.2.3 Teljesítmény korrekció

Megjegyzés. - A teljesítmény korrekció célja a nagyobb teljesítményű légijárművek részére azon képességükre alapozva kedvezményt biztositani, hogy képesek meredekebb szögben emelkedni és a forgalmi körön képesek kisebb teljesítmény beállítással repülni. Hasonlóképpen, ez a korrekció hátrányt okoz a korlátozott teljesitmény jellemzőkkel rendelkezö légijárműveknek, mivel azok emelkedési mértéke alacsonyabb és a forgalmi körön nagyobb teljesítmény állás mellett repülnek.

4.2.3.1 Tengerszintre és 15^{o}C hőmérsékletre meghatározott, maximum 5 dB(A) értékre korlátozott teljesítmény korrekciót kell alkalmazni. A korrekció kiszámításához a 4.2.3.2 pontban leírt módszert kell használni és az eredményt a mért értékhez számtanilag hozzá kell adni.

4.2.3.2 A teljesítmény korrekció kiszámításához a következő képletet kell használni:

$$\Delta dB = 49{,}6 - 20 \log_{10} \left[(3\,500 - D_{15}) \frac{R/C}{V_y} + 15 \right]$$

Ahol D_{15} = felszállási távolság 15 méteres magasságig, hitelesített maximum felszálló tömeggel és maximum felszálló teljesítménnyel (szilárd burkolatú futópálya)

R/C = legjobb emelkedési mérték hitelesített maximum felszálló tömeggel és maximum felszálló teljesítménnyel

Vy = az R/C-nek megfelelő emelkedési sebesség maximum felszálló teljesítménnyel és ugyanazon mértékegységben kifejezve.

Megjegyzés. - Ha a felszállási távolság nincs hitelesítve, 610 métert kell alkalmazni az egy-motoros repülőgépek és 825 métert a többmotoros repülőgépek esetén.

4.3 Az eredmények érvényessége

4.3.1 A mérőpontot legalább négy alkalommal kell átrepülni. A vizsgálati eredményeknek átlagos dB(A) értéket és annak 90 százalékos megbízhatósági határát kell megadnia, a zajszint pedig a mérőpont összes érvényes átrepülése során kapott és korrigált akusztikai mérés érték aritmetikai átlaga.

4.3.2 A minták száma ahhoz elegendő legyen, hogy statisztikailag meghatározható legyen a ±1,5 dB(A)-t meg nem haladó 90 százalékos megbízhatósági határérték. Az átlagolási folyamatból egyetlen vizsgálati eredményt sem szabad kihagyni, kivéve, ha a bizonyítványt kiadó hatóság másként írja elő.

Megjegyzés.- A 90 százalékos megbízhatósági tartomány kiszámításának módszere a Doc 9501, 1. Függelékben található.

4. FÜGGELÉK - ÉRTÉKELÉSI MÓDSZEREK A 3175 KG, VAGY KISEBB HITELESÍTETT MAXIMUM FELSZÁLLÓ TÖMEGŰ HELIKOPTEREK ZAJMINŐSÍTÉSÉHEZ

Megjegyzés.- Lásd II. Rész, 11. Fejezet

1. BEVEZETŐ RÉSZ

1. Megjegyzés: - Ez a zajértékelési módszer tartalmazza:

a) A zaj hitelesítési vizsgálati és mérési feltételeket;

b) A zaj kitettségi szint mért zaj adat felhasználásával történő meghatározását;

c) A földön észlelt helikopter-zaj mérését;

d) A repülési vizsgálati eredmények pontosítását;

e) Az adatok jelentését a bizonyítványt kiadó hatóságnak;

2. Megjegyzés.- A módszerben adott utasítások és eljárások célja a vizsgálatok végrehajtásának egységességét biztosítani a különféle típusú helikopterekkel különféle földrajzi helyeken végzett vizsgálatok esetére. Ez a módszer csak a jelen Annex II. Rész, 11. Fejezet alkalmazási követelményeinek hatálya alá eső helikopterekre alkalmazandó.

2. ZAJ MINŐSÍTŐ VIZSGÁLATI ÉS MÉRÉSI FELTÉTELEK

2.1 Általános rész

Ez a szakasz határozza meg, hogy a zaj alkalmassági vizsgálatot milyen körülmények között kell végrehajtani, illetve, hogy milyen módszereket kell alkalmazani a meteorológiai és a repülési pálya mérésben.

2.2 Vizsgálati környezet

2.2.1 A levegőben lévő helikopter zajának méréséhez túlzott hangelnyelő tulajdonsággal (mint amit a sűrű, tömörödött, vagy hosszú fű, bokrok vagy erdős területek okoznak) nem rendelkező viszonylag lapos környezetű terepet kell kiválasztani. Nem lehetnek a helikopter zajmezőjét jelentősen befolyásoló akadályok a mérési pont felett elhelyezkedő kúpos térben, amely kúpot a földfelszínre merőleges tengely és e tengelyhez képest mért 80^{o}-os fél-szög határoz meg

Megjegyzés.- A vizsgálatokat végző személyek maguk is képezhetnek ilyen akadályt.

2.2.2 A vizsgálatot a következő légköri viszonyok mellett kell végezni:

a) Csapadékmentes időjárás;

b) Relatív páratartalom nem magasabb 95 százaléknál és nem kevesebb 20 százaléknál, míg a környezeti hőmérséklet 35^{o}C-nál nem magasabb és 2^{o}C-nál nem alacsonyabb a földfelszín felett 1,2 (4 láb) és 10 méter (33 láb) magasság között mérve (ha a mérés helye a repülőtér valamely időjárás észlelő helyéhez viszonyított 2000 m-nél közelebb van, akkor a repülőtér jelentett hőmérséklete, páratartalma és szélsebessége is használható). Kerülni kell a 8 KHz egyharmad oktávsáv tartományban 10 dB/100 m-nél nagyobb elnyelődési tényezőt okozó hőmérsékleti és páratartalom kombinációkat. A hőmérséklet és páratartalom függvényében megadott elnyelődési tényezők a 2. Függelék 7. Szakaszában, vagy a SAE ARP 866 A-ban szerepelnek;

c) A talajszint felett 1,2 m (4 láb) és 10 m (33 láb) magasságok között a mért és jelentett szélsebesség 19 km/h-nál (10 csomónál) nem erősebb, a repülés pályájára merőleges szélösszetevő pedig 9 km/h-nál (5 csomó) nem nagyobb.

Megjegyzés.- az átlagos szélsebesség meghatározása egy 30 másodperc tartamra alapul.

d) Nem lehet olyan szokatlan meteorológiai jelenség, mely jelentősebb mértékben befolyásolná a zajszintet, amikor azt a bizonyítványt kiadó hatóság által előírtaknak megfelelő mérőhelyen rögzítik.

2.3 repülési pálya mérések

2.3.1 A helikopter helyzetét a repülési pálya referencia ponthoz képest a szokványos fedélzeti műszerektől eltérő és a bizonyítványt kiadó hatóság által jóváhagyott független módszerrel kell megállapítani, mint például radarkövetés, teodolitos háromszögelés, fényképészeti eljárások.

2.3.2 A helikopter zaját elégséges távolságon keresztül kell mérni, hogy elegendő adat legyen biztosított arról az időszakról, amelyben a zaj a maximum dB(A) értékétől számított 10 dB(A)-n belül található.

2.3.3 A jelen Függelék 5. szakaszában előírt korrekciók elvégzéséhez szükséges helyzet és teljesítmény adatokat jóváhagyott mintavételezési sűrűséggel kell rögzíteni. A mérő felszerelést a bizonyítványt kiadó hatósággal jóvá kell hagyatni.

2.4 repülési vizsgálati körülmények

2.4.1 A helikopter átrepülési zaj vizsgálatát a II. Rész, 1. Fejezet 11.5.2-ben hivatkozott műszersebességgel kell végrehajtani, a műszersebességet úgy szabályozva, hogy az a referencia körülményekhez tartozó előrehaladás közbeni lapátvégi Mach számot idézze elő.

2.4.2 Az előrehaladás közbeni lapátvégi Mach szám (Mat) meghatározása a következő: a forgószárnyvég forgási sebességének (Vt) és a helikopter tényleges műszersebességének (Vr) aritmetikai összege, osztva a hang 25^{o}C-hez tartozó sebességével (c), azaz:

$$\mathrm{Mat} = \frac{(\mathrm{Vt} + \mathrm{Vr})}{\mathrm{c}}$$

3. A ZAJ MÉRTÉKEGYSÉG MEGHATÁROZÁSA

3.1 A zaj kitettségi szintet (LAE) a következők decibelben kifejezett szintjeként határozzák meg: a súlyozott A hangnyomás szint (PA) négyzetének idő integrálja egy adott időtartamon, vagy eseményen keresztül, viszonyítva a szabvány referencia hangnyomásszinthez (Po), vagy 20 mikropascalhoz és az egy másodperc tartamú referencia időtartamhoz.

3.2 Ezt az egységet az alábbi képlet fejezi ki:

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{2} \left(\frac{P_A(t)}{P_0} \right)^2 dt$$

ahol is To az egy másodperces referencia integrálási idő és (t2 - t1) az integrálási időtartam.

3.3 A fenti integrál a következőképp is kifejezhető:

$$L_{AE} = 10 \log \frac{1}{T_0} \int_{t1}^{2} 10^{La \frac{(t)}{10}} dt$$

aholis L_A(t) a súlyozott A hangnyomásszint változása az időben.

3.4 A (t2 - t1) integrálási idő a gyakorlatban ne legyen kevesebb attól az időtartamtól, amely során az LA(t) először lép be maximum értékétől (LAmax) számított 10 dB(A) tartományába és amikor utoljára csökken a maximum értékétől számított 10dB(A) érték alá.

3.5 A SEL a következő kifejezéssel becsülhető meg:

$$L_{AE} = L_{Amax} + \Delta A$$

ahol is ΔA az időtartam engedmény, amelyet

$$\Delta A = 10 \log_{10}\tau \text{ eredményez,}$$

amelyben τ = (t2 - t1)/2.

L_{Amax} meghatározása a következő: a súlyozott A hangnyomásszintnek (lassú reagálás) a szabvány referencia hang nyomás (Po) négyzetéhez viszonyított és decibelben megadott maximum szintje.

4. A HELIKOPTER FÖLDÖN ÉSZLELT ZAJÁNAK MÉRÉSE

4.1 Általános rész

4.1.1 A bizonyítványt kiállító hatósággal minden mérőeszközt jóvá kell hagyatni.

4.1.2 Zajértékelési célokra a hangnyomás szint adatokat a 4.2 pontban előírtaknak megfelelő akusztikai berendezésekkel és mérési módszerekkel kell előállítani.

4.2 Mérési rendszer

Az akusztikai mérőrendszer a következőkkel egyenértékű jóváhagyott berendezésekből áll:

a) A 4.3 pontban megadott mérő és elemzőrendszer pontosságával egyező frekvencia átviteli karakterisztikával rendelkező mikrofonrendszer;

b) háromlábú, vagy hasonló rendszerű, a mért hanggal való interferenciát minimálissá tévő mikrofon felépítmények;

c) A 4.3 pontban ismertetett átviteli és pontossági követelményeket teljesítő karakterisztikával, frekvencia átviteli karakterisztikával és dinamika tartománnyal rendelkező rögzítő és visszajátszó berendezés; és

d) Ismert hangnyomásszint szinusz hullámát, vagy széles sávú zaját használó akusztikai kalibráló eszköz. Széles sávú zaj alkalmazása esetén a jelet túlterhelés nélküli jelszinten átlagos és maximum négyzetes középérték formájában kell leírni;

4.3 Érzékelő, felvevő és visszajátszó berendezések

4.3.1 A bizonyítványt kiállító hatóság jóváhagyásával, a helikopter által keltett zajok későbbi értékelés céljára rögzíthetők mágnesszalagos rögzítő alkalmazásával.

Alternatívaképp, a súlyozott A hangnyomás időben végbement története, "lassú" reagálásra állított grafikus szint íróval is rögzíthető, amelyből a SEL érték meghatározható, vagy a SEL közvetlenül meghatározható, olyan összegző zajszint mérővel, amely teljesíti az International Electrotechnical Commission (IEC) No 804-es Kiadványában[1], a "lassú" reagálásra beállított Type I műszerre vonatkozó előírásokat. SEL értéke kiszámítható a 2. Függelék 3. Szakaszával összhangban nyert egyharmad oktáv tartományok adataiból is. Ez esetben mindegyik egyharmad oktáv sávos hangnyomás szintet az IEC 651 Kiadványában[1] megadott "A" súlyozási értékekkel kell súlyozni.

4.3.2 A rendszer egészének karakterisztikái egyezzenek meg a IEC (Nemzetközi Elektrotechnikai Bizottság) 651-es számú[1] kiadványának a mikrofon, erősítő és jelző műszer karakterisztikákkal foglalkozó szakaszainak ajánlásaival. A 651-es számú[1] IEC kiadvány "Hang szint mérők" címet viselő szövege és műszaki jellemzői hivatkozás formájában jelen szakaszba belefoglalva szerepel(nek) és ezért ennek részét képezi(k).

4.3.3 Ha mágnesszalagos rögzítő készüléket alkalmaznak, akkor az teljesítse az IEC 561-es ajánlását[1].

4.3.4 45-11500 Hz frekvencia tartományban állandó amplitúdójú, érzékelhetően síkban folyamatos szinusz hullám esetében a teljes rendszer átvitele az "A" súlyozási görbére vonatkozóan legyen az IEC 651 számú kiadvány I. Típusú műszerekre a IV. Táblázatban és az V. Táblázatban meghatározott tűréshatárokon belül.

4.3.5 A mérő felszerelés összesített érzékenységét a vizsgálatok megkezdése előtt és a vizsgálatok alatt időközönként ismert hangnyomásszintet ismert frekvencián előállító akusztikus kalibrátor igénybevételével ellenőrizni kell. A zaj generátor kimenete jogosított szabványügyi laboratórium által a vizsgálat sorozatot megelőző 6 hónapon belül legyen ellenőrizve; a kimenetében megtűrt változások 0,2 dB -nél nagyobbak nem lehetnek. A berendezés megfelelőnek akkor tekinthető, ha egy adott vizsgálati nap során az egyes vizsgálati

[1] Beszerezhető: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

meneteket közvetlenül megelőző és befejezését közvetlenül követő időpontok között a változások 0,5 dB-nél nem nagyobbak.

Megjegyzés.- E célra általában a névlegesen 124 dB-en és 250 Hz-en működő pisztofont alkalmaznak.

4.3.6 A helikopter zajmérés alatt a mikrofonnal együtt mindig szélárnyékolót kell alkalmazni. Ennek jellemzői olyanok legyenek, hogy amikor használják, a teljes rendszer -beleértve a szélárnyékolót is- teljesítse a fenti előírásokat. Ismerni kell az általa az akusztikai kalibrátor frekvencián okozott beviteli veszteséget is és azt bele kell foglalni a mérés elemzéséhez biztosítandó akusztikai referencia szintbe.

4.4 Zajmérési eljárások

4.4.1 A mikrofon legyen nyomás érzékeny típusú és kialakítása közel egységes reagálást biztosítson érintőleges beesési irányban.

4.4.2 A mikrofont érintőleges beesés irányra állítva, érzékelő elemének közepét a helyi terep felületétől 1,2 m magasságba helyezve kell felszerelni, azaz az érzékelő elemnek alapvetően abban a síkban kell elhelyezkednie amit a helikopter névleges repülési pályája és a mérőállomás alkot. A mikrofon függesztési megoldása a lehető legkisebbre csökkentse a mérendő hang tartóelemek általi interferenciáját.

4.4.3 Ha a zaj jelet mágnesszalagon rögzítik, akkor az elektromos rendszer frekvencia reakcióját a vizsgálat során használt skála végkitéréstől számított 10 dB-es tartományon belül, kopogó-, vagy ál-rendszertelen zaj használatával minden vizsgálat sorozat során meg kell határozni,. A zaj generátor kimenete jogosított szabványügyi laboratórium által a vizsgálat sorozatot megelőző 6 hónapon belül legyen ellenőrizve; az egyes egyharmad oktávsávok relatív kimenetében a tűrt változások 0,2 dB-nél nagyobbak nem lehetnek. Annak biztosításához elegendő számú meghatározást kell végezni, hogy a rendszer teljes kalibrálása ismert legyen minden vizsgálatra.

4.4.4 Ha a mérőláncban mágnesszalagos rögzítő egység is helyet kapott, erre a célra minden egyes mágnesszalag tekercs eleje és vége 30 másodperces tartamban tartalmazzon ilyen villamos kalibráló jelet. Ezen kívül, a szalagon rögzített jelekből nyert adatok csak akkor fogadhatók el megbízhatóként, ha a két jel 10 kHz-es egyharmad oktávsávos szűrt szintjeinek szint különbsége 0,75 dB-nél nem nagyobb.

4.4.5 A rendszer erősítését -a helikopter zajméréshez használt szintre állítva- a vizsgálat helyszínén meg kell határozni és rögzíteni kell a háttérzajt, beleértve a környezeti zajt és a rendszer elektromos zaját is. Ha a helikopter hangnyomásszintje legalább 15 dB(A)-val nem haladja meg a háttér hangnyomásszintet, akkor kisebb magasságban végzett átrepülések alkalmazhatók, de az eredményeket jóváhagyott módszer szerint a referencia mérőponthoz kell igazítani.

5. A VIZSGÁLATI EREDMÉNYEK PONTOSITÁSA

5.1 Ha a vizsgálatok körülményei a referencia körülményektől eltérnek, akkor a mért zaj adatok pontosítását a jelen szakaszban leírt módszerek szerint el kell végezni.

5.2 Korrekciók és pontosítások

5.2.1 A pontosítások a következőkre korlátozhatók: a helikopter vizsgálati repülési pálya és a referencia repülési pálya (valamint a referencia- és a pontosított referencia műszersebesség) között a gömb szerinti terjedésben tapasztalható eltérések hatásai. Pontosítást nem szükséges végezni a vizsgálati, illetve a referencia meteorológiai körülmények között mutatkozó légköri terjedési különbségekre és a helikopter vizsgálati, illetve referencia földfeletti sebessége közötti különbségekre.

5.2.2 A gömb szerinti terjedés és a tartam pontosítása a következők szerint becsülhető:

$$\Delta_1 = 12{,}5 \log_{10} (H/150)\mathrm{dB}$$

ahol is, H a közvetlenül a zajmérő pont felett tartózkodó vizsgálati helikopter méterben kifejezett magassága.

5.2.3 A referencia műszersebesség és a pontosított referencia műszersebesség különbségének pontosítását a következő képletből kell kiszámítani:

$$\Delta_2 = 10 \log_{10} \left(\frac{Var}{Vr}\right)\mathrm{dB}$$

ahol is Δ2 az átrepülés -zajmérő állomás által érzékeltek szerinti- mért eseményének tartamára a referencia műszersebesség pontosítása által gyakorolt hatás korrigálása érdekében a mért SEL zajszinthez hozzáadandó decibelben kifejezett mennyiség. Vr, a II. Rész, 11. fejezet 11.5.2 alattiak szerinti referencia műszersebesség, a Var pedig, a jelen Függelék 2.4.1 pontjában leírtak szerinti pontosított referencia műszersebesség.

6. ADAT JELENTÉS A BIZONYITVÁNYT KIADÓ HATÓSÁG FELÉ ÉS A MÉRT ÉRTÉKEK HITELESSÉGE

6.1 Az adatok jelentése

6.1.1 A jelen Függelék 4. szakaszában előírtaknak megfelelő berendezésekkel kapott, mért és korrigált hangnyomásszinteket kell jelenteni.

6.1.2 Jelenteni kell a helikopter akusztikai teljesítményének mérésére és elemzésére, valamint a meteorológiai adatok mérésére és elemzésére alkalmazott berendezések típusát.

6.1.3 Jelenteni kötelező a jelen Függelék 2. szakaszában előírt megfigyelési pontokon az egyes vizsgálatokat közvetlenül megelőzően, azok után, vagy a vizsgálatok közben észlelt következő légköri környezeti adatokat:

a) Levegő hőmérséklet és relatív nedvesség;

b) Szél sebesség és irány; és

c) Légköri nyomás.

6.1.4 Jelenteni kell a helyi topográfiai, talaj fedettségre és egyéb olyan eseményekre vonatkozó észrevételeket is, amelyek a hangrögzítést esetleg befolyásolhatják.

6.1.5 A helikopterről az alábbi információkat kell jelenteni:

a) Helikopter, motor(ok) és forgószárny(ak) típusa, modellje és sorozatszáma;

b) A helikopter zaj jellemzőit valószínűleg befolyásoló minden átalakítás, vagy nem szabványos felszerelés;

c) Hitelesített maximum felszálló és leszálló tömeg;

d) Mindegyik bemutató repülésre a jelzett műszersebesség kilométer per óra (csomó) és a forgószárny fordulatszám fordulat per perc értékben;

e) hajtómű teljesítmény paraméterek, mindegyik bemutató repülésre; és

f) a helikopter talaj feletti magassága, mindegyik bemutató repülésre.

6.2 A zaj vizsgálati referencia körülmények jelentése

A helikopter helyzet- és teljesítmény adatokat, valamint a mért zajt a jelen kötet II. Rész, 11. Fejezet, 11.5 pontjában megadott zaj vizsgálati referencia körülményekre kell korrigálni. E körülményeket, beleértve a referencia paramétereket, az eljárásokat és a konfigurációt, jelenteni kötelező.

6.3 Az eredmények érvényessége

6.3.1 A mérőpontot legalább hat alkalommal kell átrepülni. A vizsgálati eredményeknek egy átlag SEL-t és ennek 90 százalékos magbízhatósági határértékét kell eredményezni; a zajszint a mérőpont felett végzett összes érvényes vizsgálat referencia eljárásra korrigált akusztikai méréseinek aritmetikai átlaga.

6.3.2 Kellő mennyiségű mintának kell rendelkezésre állni ahhoz, hogy a ±1.5 dB(A)-t meg nem haladó 90 százalékos megbízhatósági határérték statisztikailag megállapítható legyen. Kivéve, ha a bizonyítványt kiadó hatóság jóváhagyja, az átlagolási folyamatból egyetlen vizsgálati eredmény sem hagyható ki.

Megjegyzés: - A 90 százalékos megbízhatósági intervallum kiszámításának módszere az "Enviromental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501)" 1. Függelékében található.

5. FÜGGELÉK - LÉGIJÁRMŰ ZAJ FIGYELÉSE A REPÜLŐTEREKEN ÉS AZOK KÖZELÉBEN

Megjegyzés: - Lásd a III. Részt.

1. BEVEZETŐ RÉSZ

1. Megjegyzés.- A sugárhajtású repülőgépek üzembe állítása és a légiforgalom általános növekedése a légijárműzaj miatt nemzetközi aggodalmat keltett. A légijárműzaj problémák megoldásában a nemzetközi együttműködés elősegítéséhez kívánatossá vált, hogy a repülőtereken és a repülőterek környezetében keltett légijármű zaj figyeléséhez ajánlott eljárás álljon rendelkezésre.

2. Megjegyzés. - A jelen Függelékben a figyelést a repülőtér üzemeltetés során a légijárművek által keltett zajszint rutin jellegű méréseként kell értelmezni. A figyelés -amelytől megkövetelt a légijárműzaj azonnali kijelzése- általában naponta nagyszámú mérést foglal magában.

3. Megjegyzés.- A repülőtér üzemelése során a légijárművek által keltett zajszintek mérésére alkalmazandó mérő berendezéseket a jelen Függelék határozza meg. A jelen Függelék szerint mért zajszint az I. Függelék 4.2 pontjában leírt módszerrel számított és PNdB-ben kifejezett PNL észlelt zajszintek értékeinek becslése.

A légijármű zaj figyelését, vagy hordozható berendezéssel -amely gyakran csak egy zajszint mérő-, vagy a terület különböző helyszínein felállított mikrofonokat, erősítőket és a mikrofonokat egy központi rögzítő berendezéssel összekötő adat átviteli rendszert magában foglaló helyhez rögzített berendezéssel kell mérni. A jelen Függelék elsődlegesen az utóbbi változatot ismerteti, de az ebben a Függelékben megadott leírások követendők a hordozható berendezések esetében is, amikor az előírások vonatkoztathatók rájuk.

2. MEGHATÁROZÁSOK

A légijármű zaj figyelése -meghatározás szerint- a repülőtéren és annak környezetében a légijárművek által keltett zaj rutin jellegű mérése a zajcsökkentési követelmények betartásának figyelemmel kisérése és az eljárások hatékonyságának ellenőrzése céljából.

3. MÉRŐ BERENDEZÉSEK

3.1 A mérő berendezések vagy hordozható közvetlenül leolvasható, vagy a területen egy, vagy több rögzített helyen elhelyezett, rádió - vagy kábel rendszer (pl. telefon, stb.) segítségével egy központi elhelyezésű, rögzítő berendezéssel összekapcsolt készülékek.

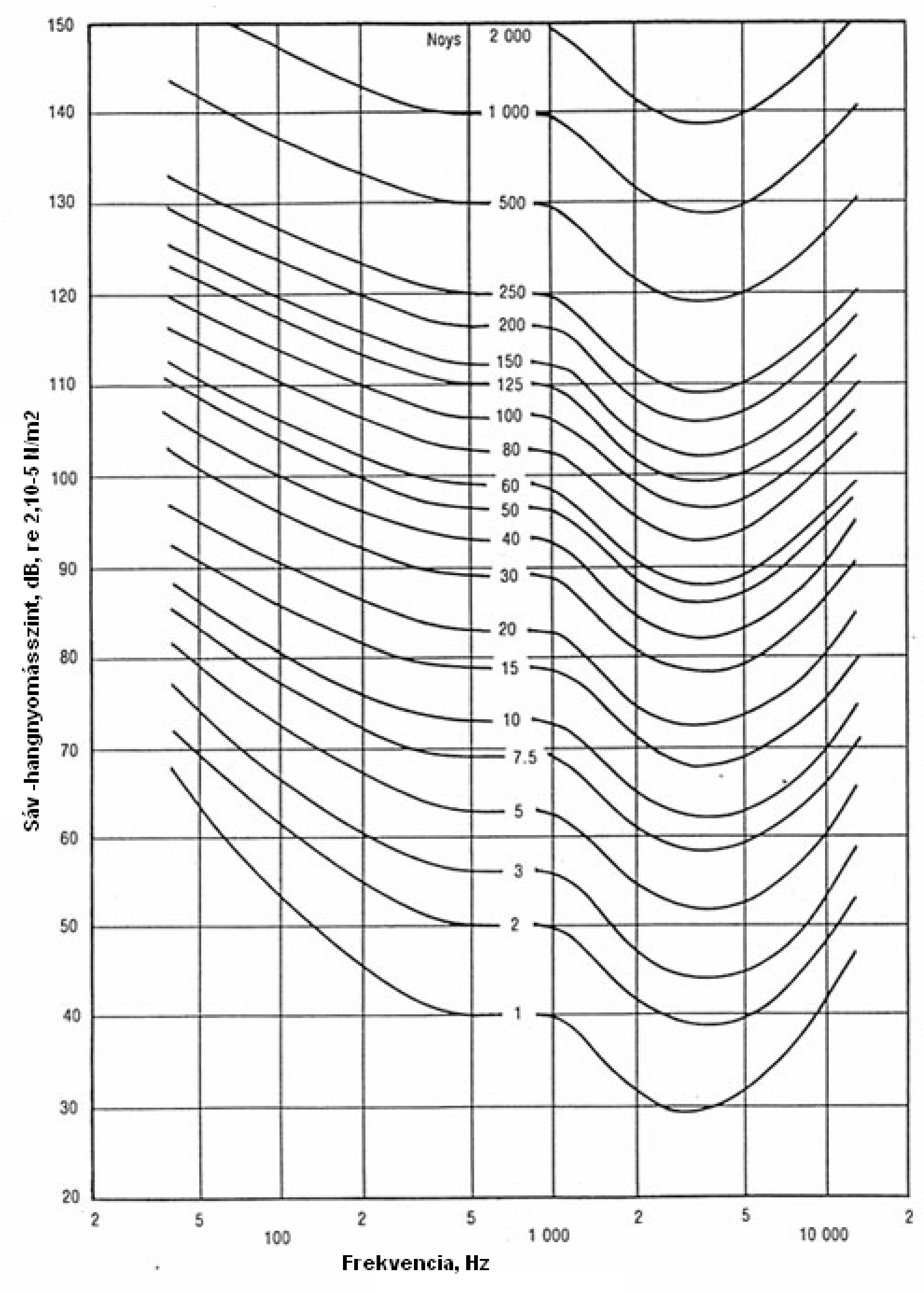
3.2 A területen elhelyezett berendezés jellemzőinek -ideértve az átviteli rendszert is,- teljesíteni kell az IEC 179[1] számú (Precíziós hangszint mérő berendezések) kiadványban szereplőket, kivéve, hogy a 40 noy kontúr inverzével egyenlő frekvencia súlyozást kell alkalmazni (lásd A5 - 1 ábra). Az 1000 Hz-hez viszonyított 40 noy kontúr inverzének legközelebbi dB-re becsült értékét az A5-1 táblázat adja meg. A berendezés súlyozási elemének relatív frekvencia válasza ±0,5 dB értékhatár között tartandó. Ha a közvetlen leolvasású berendezésben ilyen súlyozó hálózat kapott helyet, akkor a mikrofon akusztikus bemenete és a leolvasó egység közötti kapcsolatban a 40 noy-os kontúr inverzét az IEC 179[1] számú kiadványában a C súlyozási görbére nézve előírt tűréssel kell követni. A fent leírt műszerezettséggel végzett mérések 7 dB érték hozzáadása után a PNdB-ben megadott észlelt zajszintnek közelítőleges értékeit adják.

3.3 Az észlelt zajszint becslésének alternatív módszere a zajt egy A-súlyozási hálózattal[2] egybekötött hangszintmérővel mérő és az eredményhez egy -a zaj frekvencia spektrumtól függően rendszerint 9 és 14 dB közötti- K korrekciót hozzáadó eljárás. Az eredmények jelentésekor meg kell adni a K értéket és a mérést végző hatóság által ezen érték meghatározására használt módszert.

3.4 A légijármű zaj figyelésére használatos mikrofon rendszereket úgy kell elhelyezni a helyszínen, hogy az hó, eső és más káros időjárási tényezőkkel szemben a mikrofonoknak megfelelő védelmet nyújtson. A szélvédők és más védő felszerelések által előidézett beviteli veszteségekre a mért adatok frekvencia és az időjárási körülmények függvényében történő megfelelő korrekcióját el kell végezni.

[1] Ezt a kiadványt először 1965-ben tette közzé a Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

[2] Az A-súlyozású hálózat leírása az IEC 179. sz. kiadványában található.



A5 - 1. Ábra - Az észlelt zajosság kontúrjai

A5 - 1. Táblázat - Az 1000 Hz -nél felvett értékhez viszonyított 40 noy-os kontúr inverzének közelítése a legközelebbi decibelre

Hz	40	50	63	80	100	125	160
dB	-14	-12	-11	-9	-7	-6	-5
Hz	200	250	315	400	500	630	800
dB	-3	-2	-1	0	0	0	0
Hz	1000	1250	1600	2000	2500	3150	4000
dB	0	+2	+6	+8	+10	+11	+11
Hz	5000	6300	8000	10000	12500		
dB	+10	+9	+6	+3	0		

Megjegyzés.- Ha a zaj idő függvényű rögzítése előírt, akkor a zaj jel rögzíthető mágneses szalagon, grafikus szintrögzítőn, vagy más, a célra alkalmas berendezés révén.

3.5 A rögzítő és a kijelző berendezésnek teljesítenie kell az IEC 179. sz. Kiadvány[3] "lassú" reagálásúnak nevezett kijelző műszerekre vonatkozó dinamika jellemzőit.

Megjegyzés.- Ha a zaj jel előrelátható tartama 5 mp-nél kevesebb, akkor a "gyors" kitétellel jelölt dinamikus karakterisztikák alkalmazhatók.

A jelen megjegyzés céljaira az időtartam meghatározása a következő: a rögzített jel meghatározó lefolyási időtartama, amely során az inverz 40 noy-os kontúrral megegyező amplitúdó karakterisztikájú súlyozó hálózaton keresztül haladó rögzített zaj jel a maximum érték 10 dB-s határán belül marad.

3.6 A mikrofon rendszert eredetileg a szabadmezős kalibráció elvégzésére felszerelt laboratóriumban kell kalibrálni és kalibrációját minden hat hónapban újra ellenőrizni kell.

3.7 A mérési területen történő felállítása előtt és azt követően megfelelő időközönként a teljes mérő rendszert laboratóriumban kell kalibrálni annak biztosítására, hogy a rendszer átviteli frekvencia és dinamika tartomány követelményei jelen dokumentumban leírt előírásoknak megfeleljenek.

Megjegyzés.- Nem szándék kizárni, hogy az észlelt zajszintek közelítő értékeit a fentiekben leírtaktól eltérően eredményező közvetlen leolvasású mérő rendszereket használjanak a figyelésben.

4. A KÜLTÉRI BERENDEZÉS TELEPÍTÉSE

4.1 A légijármű üzemelés keltette zajszint figyelésére használatos mikrofonokat a megfelelő helyeken úgy kell elhelyezni, hogy maximum érzékenységi tengelyük a hanghullámok iránti legnagyobb érzékenységet elérő irányba mutasson. A mikrofonok felállítási helyeit úgy kell megválasztani, hogy a mikrofon aktív középpontján átmenő vízszintes sík felett a légijármű keltette zajmezőt befolyásoló akadály ne legyen.

1. Megjegyzés.- Esetenként a mikrofonokat jelentős mértékű háttérzajjal rendelkező területen kell elhelyezni, mint például, ahol motoros jármű közlekedés, játszó gyermekek, stb. zaja tapasztalható. Ilyen esetekben a mikrofont gyakran előnyös háztetőn, telefonpóznán, vagy más a talajtól magasabban lévő objektumon elhelyezni. Következésképp, mielőtt, vagy miután egy sorozat légijármű üzemelésre a zajszint mérés megkezdődne, a háttér zajszintet meg kell határozni és a mérőrendszer teljes érzékenységét egy, vagy több frekvencián a helyszínen ellenőrizni kell.

2. Megjegyzés.- Ha a rendszer közvetlen kalibrálása -a kezelő személyzet számára a mikrofon megközelíthetetlensége miatt- nehezézkesen valósítható meg mivel azt egy föld feletti objektumon helyezték el, akkor hasznos lehet a mikrofon telepítési helyénél egy kalibrált hangforrást elhelyezni. Ez a hangforrás lehet egy kisméretű hangszóró, elektrosztatikus aktuátor, vagy hasonló eszköz.

[3] Ezt a kiadványt először 1965-ben tette közzé a Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland.

4.2 A figyelés kiterjedhet egyetlen légijármű repülése, egy sorozat repülés, vagy egy meghatározott típusú légijármű, vagy különböző légijárművek nagyszámú repülése által keltett zajra. Egy adott figyelési pontról nézve a zajszintek -az alkalmazott repülési eljárások, vagy a meteorológiai körülmények változása miatt- változóak. A figyelés eredményeinek értelmezésében ezért a mért zajszintek statisztikai megoszlását figyelembe kell venni. A figyelési eljárás során megállapított eredmények ismertetésekor az észlelt zajszintek eloszlásának megfelelő leírásáról is gondoskodni kell.

6. FÜGGELÉK

Zajértékelési módszer a 8618 kg, vagy könnyebb légcsavar hajtású repülőgépek zajminősítő vizsgálatához - a prototípus légialkalmassági bizonyítványa iránt 1988. november 17-én, vagy később elfogadott légialkalmassági bizonyítvány kérvények

Megjegyzés.- Lásd a II. Rész 10. Fejezetét.

1. BEVEZETŐ RÉSZ

1. Megjegyzés.- Ez a zajértékelési módszer az alábbiakat foglalja magába:

a) Zaj vizsgálati és mérési feltételek;

b) Zaj mértékegység;

c) A földön észlelt repülőpépzaj mérése;

d) A vizsgálati adatok pontosítása; és

e) Az adatok jelentése a zaj bizonyítványt kiadó hatóság felé, és az eredmények érvényessége.

2. Megjegyzés. - Az e módszerben megadott utasításokat és eljárásokat világosan fogalmazták meg ahhoz, hogy biztosítsák a vizsgálatok egységes végrehajtását és lehetővé tegyék a különböző földrajzi helyeken végzett vizsgálatok összehasonlíthatóságát. *Ez a módszer csak a II. Rész 10. Fejezetének alkalmazhatósági határain belül lévő repülőgépeknél használható.*

2. ZAJMINŐSÍTŐ VIZSGÁLATI ÉS MÉRÉSI FELTÉTELEK

2.1 Általános rész

Ez a szakasz írja le, hogy a zaj vizsgálatokat milyen feltételek között kell végezni, illetve, hogy a vizsgálat alatt álló repülőgép által előidézett zaj méréséhez milyen mérési eljárásokat kell alkalmazni.

2.2 Általános vizsgálati feltételek

2.2.1 A repülésben lévő repülőgép zajának méréséhez túlzott hangelnyelő tulajdonsággal (mint amit a sűrű, tömörödött, vagy hosszú fű, bokrok vagy erdős területek okoznak) nem rendelkező viszonylag lapos környezetű terepet kell kiválasztani. Nem lehetnek a repülőgép zajmezőjét jelentősen befolyásoló akadályok a mérési pont felett elhelyezkedő kúpos térben, amely kúpot a földfelszínre merőleges tengely és e tengelyhez képest mért 75^{o}-os fél-szög határoz meg.

2.2.2 A vizsgálatokat az alábbi légköri feltételek mellett kell elvégezni:

a) Csapadékmentes időjárás;

b) Relatív páratartalom nem lehet 95 százaléknál magasabb, vagy 20 százaléknál alacsonyabb; a környezeti levegő hőmérséklet nem magasabb 35^{o} C-nál, és nem alacsonyabb 2^{o} C-nál,

c) az átlagos szélsebesség 19 km/h-nál (10 csomó) nem lehet több, az oldalszél 9 km/h-nál (5 csomó) nem lehet több;

Megjegyzés.- az átlagos szélerősséget 30 másodperc átlagában határozzák meg.

d) Nem állhat fenn olyan szokatlan meteorológiai jelenség, mely jelentősebb mértékben befolyásolná a zajszintet, amikor azt a bizonyítványt kiadó hatóság által előírtaknak megfelelő mérőhelyen rögzítik; és

e) A meteorológiai méréseket a talaj szintje felett 1,2 m és 10 m magasság között kötelező végezni. Ha a mérő hely valamely repülőtér meteorológiai állomásának 2000 m-es körzetén belül található, akkor az ezen állomástól származó mérések használhatók.

2.3 Repülőgép vizsgálati eljárások

2.3.1 A vizsgálati eljárások és a mérési eljárások legyenek elfogadhatók a bizonyítványt kiadó állam légialkalmassági és zajminősítési hatóságai részéről.

2.3.2 A repülés vizsgálati programot a repülőgép maximum felszálló tömegével kell megkezdeni és a repülés minden eltelt óráját követően a tömeget a maximum felszálló tömeghez kell igazitani.

2.3.3 A repülési vizsgálatot Vy ±9 km (5 csomó) müszersebességgel (IAS) kell végrehajtani.

2.3.4 A repülőgép repülési pályájának a referencia pothoz viszonyított helyzetét a normál fedélzeti műszerektől független és a bizonyítványt kiadó hatóság által jóváhagyott módszerekkel kell meghatározni, mint például radar követés, teodolit háromszögelés, vagy fényképészeti módszer.

2.3.5 A pontosan a mikrofon fölött tartózkodó repülőgép helyzetét jóváhagyott módszerrel kell mérni. A repülőgépnek a mikrofon felett a függőlegeshez viszonyítva ±10^{o}-on belül és a referencia magassághoz képest ±20 százalékon belül kell átrepülni (lásd az A6-1 ábrát).

2.3.6 Jelen Függelék 5. szakaszában hivatkozott korrekciók elvégzéséhez szükséges repülőgép sebesség, helyzet és teljesítmény adatokat akkor kell rögzíteni, amikor a repülőgép közvetlenül a mérési hely fölött van. A mérő berendezést a bizonyítványt kiadó hatósággal jóvá kell hagyatni.

2.3.7 Ha a vizsgált repülőgép mechanikus fordulatszám mérővel rendelkezik, akkor a tájolási és a beépítési hibák elkerülése érdekében a légcsavar forgási sebességének mérésére egy független, ±1 százalékon belüli pontosságú készüléket kell használni.

3. A ZAJ MÉRTÉKEGYSÉGÉNEK MEGHATÁROZÁSA

Az LAmax jelenti a 20 micropascal (µPa) szabvány referencia hangnyomás (Po) négyzetére vonatkozó és decibelben kifejezett A-súlyozású hangnyomás (lassú reakció) legmagasabb szintjét.

4. A REPÜLŐGÉP FÖLDÖN ÉSZLELT ZAJÁNAK MÉRÉSE

4.1 Általános rész

4.1.1 Minden mérő berendezést a bizonyítványt kiadó hatóság részéről jóvá kell hagyni.

4.1.2 Zaj értékelési célra a hangnyomásszint adatokat az alábbi 4.2 pontban megadott előírásokat teljesítő akusztikai berendezésekkel és mérési gyakorlattal kell megszerezni.

4.2 Mérő rendszerek

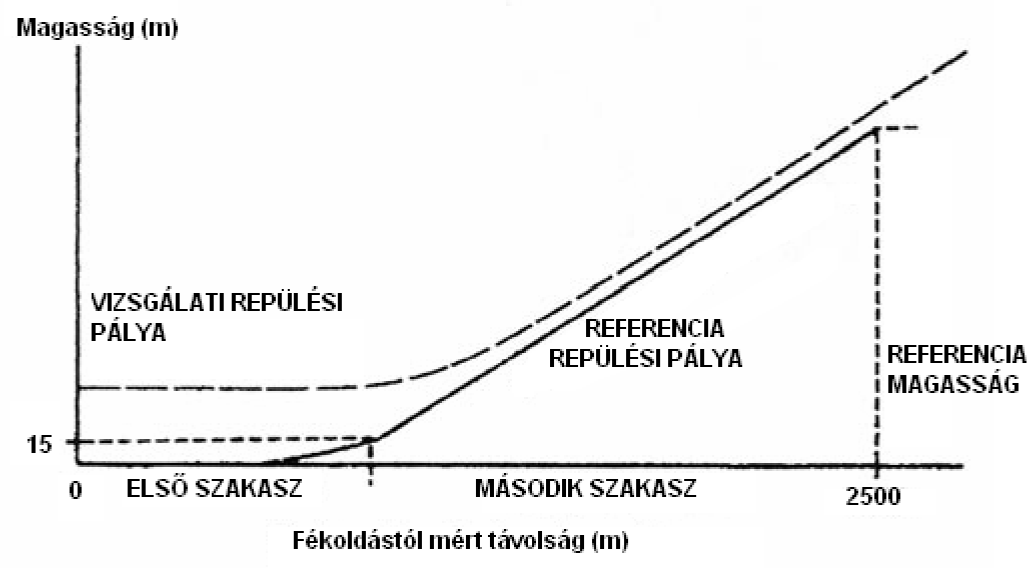
Az akusztikai mérő rendszernek az alábbiakkal egyenértékü engedélyezett berendezésekből kell állnia:

a) A 4.3 pontban megadott mérő és elemzőrendszer pontosságával egyező frekvencia átviteli karakterisztikával rendelkező mikrofonrendszer;

b) három lábú, vagy hasonló rendszerű a mért hanggal való interferenciát minimálissá tévő mikrofon felépítmények;

c) A 4.3 pontban ismertetett átviteli és pontossági követelményekkel összeegyeztethető karakterisztikával, frekvencia átviteli karakterisztikával és dinamika tartománnyal rendelkező rögzítő és visszajátszó berendezés;

d) Ismert hangnyomásszint szinusz hullámát, vagy széles sávú zaját használó akusztikai kalibráló eszköz. Széles sávú zaj alkalmazása esetén a jelet túlterhelés nélküli jelszinten átlagos és maximum négyzetes középérték formájában kell leírni;



A6-1 ábra - Jellemző vizsgálati és repülési pályák

4.3 Érzékelő, rögzítő és visszajátszó berendezés

4.3.1 A repülőgép által keltett zajszintet rögzíteni kell. Mágnes szalagos rögzítő, grafikus szintrögzítő, vagy hangszintmérő a bizonyítványt kiadó hatóság választása szerint elfogadható.

4.3.2 A rendszer egészének karakterisztikái egyezzenek meg az IEC (Nemzetközi Elektrotechnikai Bizottság) 651-es számú[1] kiadvány azon szakaszainak ajánlásaival, amelyek a mikrofon, erősítő és kijelző műszer karakterisztikákkal foglalkoznak. A "hangszint mérők" címet viselő 651-es számú[1] IEC kiadvány szövege és műszaki jellemzői hivatkozás formájában jelen Függelékbe belefoglalva szerepel(nek) és ezért a Függelék részét képezi(k).

Megjegyzés.- Ha a bizonyítványt kiállító hatóság mágnesszalagos rögzítő készülék alkalmazását írja elő, akkor a mágnesszalagos rögzitő készüléknek teljesítenie kell az IEC 561-es ajánlását.

4.3.3 Állandó amplitudójú, érzékelhetően síkban folyamatos szinusz hullám esetén a teljes rendszer átvitele az IEC 651[1] számú kiadvány IV. Táblázatában és az V. Táblázatában az I. Típusú műszerekre és az "A" súlyozási görbére a 45-11500 Hz frekvencia tartományban előírt tűréshatárokon belül legyen.

4.3.4 A zaj jelnek, az IEC 651 számú kiadványában meghatározottak szerint, egy "A" szűrőn kell keresztül haladnia.

4.3.5 A mérő rendszer össz érzékenységét a vizsgálat sorozat megkezdése előtt és a vizsgálat alatt időközönként, ismert hangnyomásszintet ismert frekvencián előállító akusztikus kalibrátor igénybevételével kell ellenőrizni.

Megjegyzés.- E célra általában olyan pisztofont alkalmaznak, amely névlegesen 124 dB-en és 250 Hz-en működik.

4.3.6 Ha szalagos hangrögzítést alkalmaznak, az A-súlyozású legnagyobb zajszint (LAmax) meghatározható egy grafikus szintrögzítővel, vagy ennek digitális megfelelőjével.

Megjegyzés.- A maximum zajszint (LAmax) egy jóváhagyott hangszintmérővel is meghatározható.

4.4 Zajmérési eljárások

4.4.1 A mikrofon 12,7 mm átmérőjű, nyomásérzékeny típusú, védőráccsal ellátott mikrofon legyen és fordított helyzetben védőrácsával kell felerősíteni úgy, hogy a mikrofon membránja 7 mm-rel egy kör alakú fémtányér felett és azzal párhuzamos legyen. E fehérre festett fémtányér legalább 40 cm átmérőjű és legalább 2,5 mm vastagságú legyen, amelyet vízszintesen a földfelszínnel egy síkban kell elhelyezni, a tányér alatt üregek nem lehetnek. A mikrofont a vizsgált repülőgép repülési vonalára merőleges sugáron a középpont és a széle közötti távolság háromnegyedén kell elhelyezni.

4.4.2 Ha a zaj jelet mágnesszalagon rögzítik, akkor az elektromos rendszer frekvencia reakcióját minden vizsgálat sorozat során rendszertelen-, vagy ál-rendszertelen zajt alkalmazva meg kell határozni a vizsgálat során használt skála végkitérés és ettől 10 dB értékkel kisebb tartományon belül. A zaj generátor kimenete jogosított szabványügyi laboratórium által a vizsgálat sorozatot megelőző 6 hónapon belül legyen ellenőrizve; az egyes egyharmad oktávsávok relatív kimenetében a tűrt változások 0,2 dB-nél nagyobbak

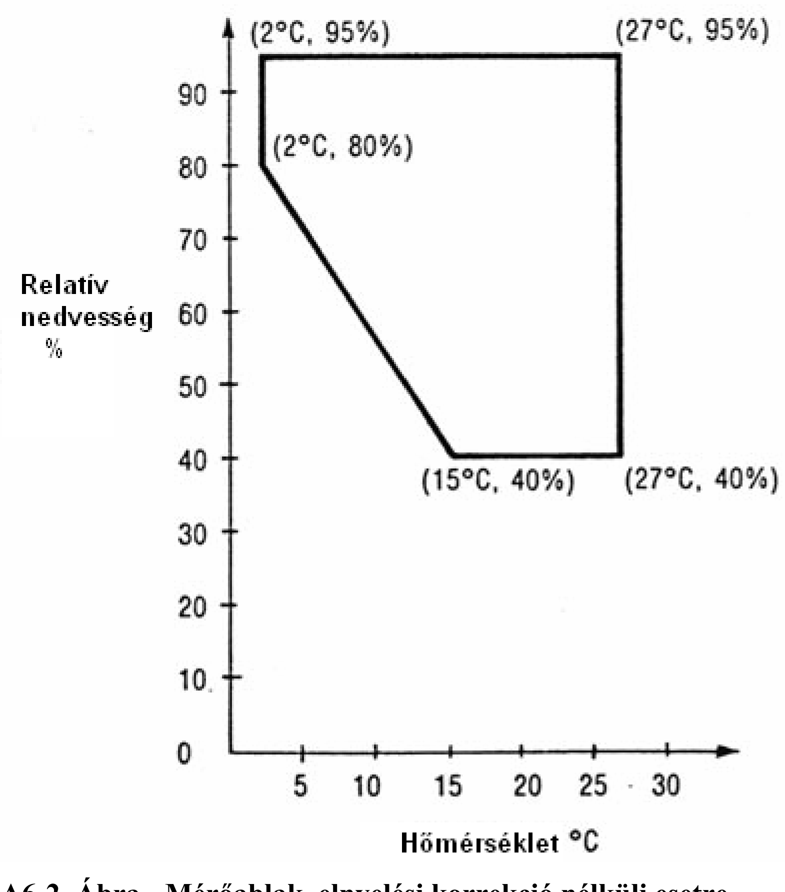
[1] A kiadvány beszerezhető: Central Office of the International Electrotechnical Commission, 3 rue de Varembé, Geneva, Switzerland

nem lehethek. Annak biztosításához kelő számú meghatározást kell végezni, hogy a rendszer teljes kalibrálása ismert legyen minden vizsgálatra.

4.4.3 Ha a mérőláncban mágnesszalagos rögzítőegység is helyet kapott, minden egyes mágnesszalag tekercs eleje és vége 30 másodperces tartamban hordozzon ilyen villamos kalibráló jelet kalibrálási célra. Ezen kívül a szalagon rögzített jelekből nyert adatok csak akkor fogadhatók el megbízhatóként, ha a két jel 10 kHz-es egyharmad oktávsávos szűrt szintjeinek szint különbsége 0,75 dB-nél nem nagyobb.
4.4.4 A rendszer erősítését -a repülőgép zajméréshez használandó szintre állítva- a vizsgálat helyszínén meg kell határozni és rögzíteni kell a háttérzajt zajt, beleértve a környezeti és a rendszer elektromos zaját is. Ha a repülőgép hangnyomásszintje legalább 10 dB(A)-val nem haladja meg a háttér hangnyomásszintet, akkor a nekifutás megkezdéséhez közelebb lévő felszállási mérőpontot kell alkalmazni, de az eredményeket jóváhagyott módszer szerint a referencia mérőponthoz kell igazítani.

5. A VIZSGÁLATI EREDMÉNYEK PONTOSITÁSA

5.1 Ha a vizsgálatok körülményei eltérnek a referencia körülményektől, akkor a mért zaj adatok pontosítását a jelen szakaszban leírt módszerek szerint el kell végezni.



A6-2. Ábra - Mérőablak, elnyelési korrekció nélküli esetre

5.2 Korrekciók és pontosítások

5.2.1 A pontosítás az alábbi hatásokat veszi figyelembe:

a) a vizsgálat meteorológiai feltételei és referencia feltételek között a légköri elnyelésben tapasztalható eltérés;

b) a repülőgép tényleges repülési pályája és a referencia repülési pálya közötti zaj pályahossz eltérések;

c) lapát-csúcs Mach-szám eltérés a vizsgálati és referencia feltételek között; és

d) hajtómű teljesítmény eltérés a vizsgálati és referencia feltételek között.

5.2.2 A referencia feltételek közzötti zajszint (L_{Amax}) REF, úgy kapható meg, hogy a vizsgálati nap zajszinthez (L_{Amax}) TEST hozzáadják a fenti hatásokból adódó egyes növekményeket.

$$(L_{Amax})\ REF = (L_{Amax})\ TEST + \Delta(M) + \Delta_1 + \Delta_2 + \Delta_3$$

ahol:

$\Delta(M)$ jelöli a vizsgálati és referencia feltételek közötti légköri elnyelés változás miatti pontosítást.

Δ_1 zaj pályahossz pontosítás

Δ_2 A lapát-csúcs Mach-szám miatti pontosítás; és

Δ_3 A hajtómű teljesítmény pontosítása.

a) Ha a vizsgálati feltételek az A6-2 ábrán meghatározott tartományon belül találhatók, akkor a légköri elnyelés eltéréseit nem szükséges pontosítani, azaz $\Delta(M) = O$. Ha a feltételek az A6-2 ábrán meghatározott tartományon kívül esnek, akkor kötelező pontosítást végezni, vagy egy jóváhagyott eljárással, vagy egy $\Delta(M)$ növekményt hozzáadva a vizsgálati nap zajszintjéhez, ahol:

$$\Delta(M) = 0{,}01\ (H_T\alpha - 0{,}2\ H_R)$$

és ahol H_T a közvetlenül a zajmérőpont felett tartózkodó vizsgált repülőgép méterben kifejezett magassága; H_R a repülőgép referenciamagassága a zajmérőpont felett; és α az 1. Függelék A1-5 - A1-16 táblázataiban meghatározottaknak megfelelő elnyelési mérték 500 Hz esetén;

b) A mért zajszintek pontosítását a repülőgépnek egy referencia napi zajmérőpont feletti magasságára, a mért zajszinthez számtanilag hozzáadott $\Delta 1$-el egyenlő növekménnyel kötelező elvégezni. Ha a vizsgálati napi feltételek az A6-2 ábrán megadott tartományon belül találhatók:

$$\Delta_1 = 22 \log (H_T/H_P)$$

Ha a vizsgálati napi feltételek az A6-2 ábrán megadott tartományon kívül esnek, akkor:

$$\Delta_1 = 20 \log (H_T/H_R)$$

ahol H_T a közvetlenül a zajmérőpont felett tartózkodó repülőgép magassága; és H_R a zajmérő pont felett tartózkodó repülőgép referencia magassága.

c) A lapát-csúcs Mach-szám változást nem kell pontosítani, ha a légcsavar lapát-csúcs Mach-száma:

1) 0,70, vagy kisebb és a vizsgálati lapát-csúcs Mach-szám a referencia lapát-csúcs Mach -számtól nem tér el 0,014 -nél jobban;

2) 0,70-nél nagyobb és 0,80-nál nem több és a vizsgálati lapát-csúcs Mach-szám a refe-rencia lapát-csúcs Mach-számtól nem tér el 0,007-nél jobban;

3) 0,80-nál nagyobb és a vizsgálati lapát-csúcs Mach-szám a referencia lapát-csúcs Mach-számtól nem tér

el 0,005-nél jobban. Mechanikus fordulatszámmérők esetén, ha a lapát-csúcs Mach-szám 0,80-nál nagyobb és a vizsgálati lapát-csúcs Mach-szám a referencia lapátcsúcs Mach-számtól nem tér el 0,008-nál jobban.

A fenti tűréshatárokon kívül eső mért zajszinteket lapát-csúcs Mach-számra az alábbiakkal egyenlő növekménnyel kell pontosítani:

$$\Delta_2 = K_2 \log (M_R/M_T)$$

Amelyet számtanilag hozzá kell adni a mért zajszinthez, ahol M_T és M_R a vizsgálati és a referencia lapát-csúcs Mach-számokat jelentik. A K_2 értéket a vizsgált repülőgéptől származó jóváhagyott adatokból kell kiszámítani. Vizsgálati repülési adatok hiányában és a bizonyítványt kiadó hatóság megítélése szerint K_2 = 150 érték használható, amikor M_T kisebb M_R-nél; azonban amikor M_T nagyobb, vagy egyenlő M_R-vel, akkor korrekciót nem kell végezni.

Megjegyzés.- Az M_R referencia lapát-csúcs Mach-szám a mérőpont feletti referencia feltételeknek megfelelő érték:

ahol

$$M_R = \frac{\left[\left(\frac{D\pi N}{6}\right)^2 + V_T^2\right]^{1/2}}{c}$$

ahol: D a légcsavar kör átmérője méterben

V_T a repülőgép tényleges müszersebessége a referencia feltételek között méter/sec-ben

N a légcsavar fordulatszáma a referencia feltételek között fordulat/perc-ben. Ha N nem áll rendelkezésre, akkor értéke úgy vehető, mint a repülési vizsgálatok alatt a névleg azonos teljesítmény körülmények közötti légcsavar fordulatszámok átlaga

c a hang sebessége a referencia napon a repülőgép magasságán méter/sec-ben és a referencia magasságon NEL (nemzetközi egyezményes légkör) körülmények között a magassághoz tartozó hőmérséklet változás szerinti hőmérsékletre alapozva.

d) A mért zajszintek hajtómű teljesítményre történő korrekcióját az alábbiakkal egyenlő növekmény számtani hozzáadásával kell elvégezni:

$$\Delta_3 = K_3 \log (P_R/P_T)$$

ahol P_T és P_R a szívótér nyomás/forgató nyomaték műszer értékekből és a hajtómű RPM-ből (fordulatszámból) nyert vizsgálati és a referencia hajtómű teljesítmény - a sorrendnek megfelelően. K_3 értékét a vizsgált repülőgép jóváhagyott adataiból kell kiszámítani. Vizsgálati repülési adatok hiányában és a bizonyítványt kiadó hatóságok megítélése szerint K_3=17 érték használható. A referencia teljesítmény P_R a referencia magasság nyomásszintjén és hőmérsékletén NEL (nemzetközi egyezményes légkör) körülmények között a hőmérséklet magasság szerinti változásához tartozó hőmérsékletre alapozva elért teljesítmény legyen.

6. ADAT JELENTÉS A BIZONYÍTVÁNYT KIADÓ HATÓSÁG FELÉ ÉS AZ EREDMÉNYEK HITELESSÉGE

6.1 Adatok jelentése

6.1.1 A jelen Függelék 4. szakaszában leírtakat kielégítő berendezésekkel nyert, mért és korrigált zaj nyomásszinteket kell jelenteni.

6.1.2 A repülőgép jellemző és a meteorológiai adat mérésére és elemzésére használt minden akusztikai berendezés típusát jelenteni kell.

6.1.3 A jelen Függelék 2. szakaszában előírt megfigyelési pontban közvetlenül az egyes vizsgálatok előtt, után, vagy alatt mért alábbi légköri környezeti adatokat kell jelenteni:

a) Levegő hőmérséklet és relatív nedvesség;
b) Szélerősség és irány; és
c) Légnyomás.

6.1.4 Jelenteni kell a helyi topográfiára, talaj fedettségre, és olyan eseményekre vonatkozó észrevételeket is, amelyek hatással lehetnek a hangrögzítésre.

6.1.5 Az alábbi repülőgép adatokat kell jelenteni:

a) A repülőgép, hajtómű(vek) és légcsvar(ok) típusa, modell és sorozatszáma;

b) Bármely átalakítás, vagy nem szabványos berendezés, amely a repülőgép zaj jellemzőit valószínűleg befolyásolja;

c) Hitelesített maximum felszálló tömeg;

d) Megfelelően kalibrált műszerekkel az átrepülési magasságon megállapított műszersebesség és léghőmérséklet minden átrepülésre;

e) Megfelelően kalibrált műszerekkel megállapított szívótér nyomás, vagy teljesítmény formában megadott hajtómű jellemzők, légcsavar fordulatszám fordulat/perc-ben és más idevágó paraméterek minden átrepülésre;

f) A repülőgép magassága a mérőpont felett; és

g) A gyártó 6.1.5 d), e) és f) pontokra vonatkozó adatai a referencia feltételekre.

6.2 Az eredmények érvényessége

6.2.1 A mérőpontot legalább hat alkalommal kell átrepülni. A vizsgálati eredményeknek egy átlagos zajszint értéket (LAmax) és annak 90 százalékos megbízhatósági határértékét kell biztosítaniuk, a zajszint pedig a mérőpont felett végzett összes érvényes vizsgálatra vonatkozó korrigált akusztikai mérések aritmetikai átlaga.

6.2.2 Kellő számú mintának kell rendelkezésre állni ahhoz, hogy a ±1,5 dB(A)-t meg nem haladó 90 százalékos megbízhatósági határérték statisztikailag megállapítható legyen. Kivéve, ha a bizonyítványt kiadó hatóság másképp írja elő, az átlagolási folyamatból egyetlen vizsgálati eredményt sem hagyható ki.

A 16. ANNEX 1. KÖTETÉNEK MELLÉKLETEI

"A" MELLÉKLET - EGYENLETEK A ZAJSZINT KISZÁMÍTÁSÁHOZ A FELSZÁLLÓ TÖMEG FÜGGVÉNYÉBEN

Megjegyzés.- Lásd a II. Rész 2.4.1, 2.4.2, 3.4.1, 4.4, 5.4, 6.3, 8.4.1, 8.4.2, 10.4, 11.4.1 és 11.4.2 pontokat

1. A 2. FEJEZET 2.4.1 PONTJÁBAN LEÍRT FELTÉTELEK

M=Legnagyobb felszálló tömeg 1000 kb-ban kifejezve	0	34	272
Oldalsó zajszint (EPNdB)	102	91,83 + 6,64 log M	108
Megközelítési zajszint (EPNdB)	102	91,83 + 6,64 log M	108
Átrepülési zajszint (EPNdB)	93	67,56+16,61 log M	108

2. A 2. FEJEZET 2.4.2 PONTJÁBAN LEIRT FELTÉTELEK

M = Legnagyobbfelszálló tömeg 1000 kg-ban kifejezve		0	34 35	48,3	66,72	133,45	280	325	400
Oldalsó zajszint (EPNdB) Valamennyi repülőgép		97				83,87 + 8,51 log M			106
Megközelítési zajszint (EPNdB) Valamennyi repülőgép		101			89,03 + 7,75 log M				108
Átrepülési zajszint (EPNdB)	2 hajtómű		93			70,62 + 13,29 log M			104
	3 hajtómű		93	67,56+16,61 logM		73,62+13,29log M			107
	4 hajtómű		93	67,65+16,61 logM		74,62+ 13,9log M2			108

3. A 3. FEJEZET 3.4.1 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve		0	20,2	28,6	35	48,1	280	385	400
Oldalsó, teljes teljesítmény zajszint (EPNdB) Valamennyi repülőgép			94				80,87 + 8,51 log M		103
Megközelítési zajszint (EPNdB) Valamennyi repülőgép			98			86,03 + 7,75 log M		105	
Átrepülési zajszint (EPNdB)	2 hajtómű vagy kevesebb		89				66,65 + 13,29 log M		101
	3 hajtómű		89			69,65 + 13,29 log M			104
	4 hajtómű vagy több	89			71,65 + 13,29 log M				106

4. A 4. FEJEZET 4.4 PONTJÁBAN LEÍRT FELTÉTELEK

Az alábbiak közül mindegyik feltétel alkalmazandó:
$EPNL_L \leq LIMIT_L$; $EPNL_A \leq LIMIT_A$; és $EPNL_F \leq LIMIT_F$;
$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F)] \geq 10$
$[(LIMIT_L - EPNL_L) + (LIMIT_A - EPNL_A) \geq 2$; $[(LIMIT_L - EPNL_L) + [(LIMIT_F - EPNL_F)] \geq 2$; és
$(LIMIT_A - EPNL_A) + (LIMIT_F - EPNL_F) \geq 2$

ahol is, $EPNL_L$; $EPNL_A$ és $EPNL_F$, a sorrendnek megfelelően és a 2. Függelék zajértékelési módszerével egyezésben az oldalsó, a megközelítési és az átrepülési referencia zajmérő pontoknál -ha kijelölt- mért és egy tizedesre kerekítve meghatározott zajszintek; valamint

$LIMIT_L$, $LIMIT_A$ és $LIMIT_F$ a 3. Fejezet 3.4.1 (3. Feltétel)-ben leírt feltételekre közölt egyenletekkel egyezésben az oldalsó, a megközelítési és az átrepülési referencia -a sorrendnek megfelelően- zajmérő pontoknál mért és egy tizedesre kerekítve közölt megengedett maximum zajszintek;

5. A 5. FEJEZET 5.4 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	5,7		34,0		358,9		384,7	
Oldalsó zajszint (EPNdB)		96		85,83 + 6,64 log M				103
Megközelítési zajszint (EPNdB)		98		87,83 + 6,64 log M				105
Átrepülési zajszint (EPNdB)		89		63,56 + 16,61 log M		106		

6. A 6. FEJEZET 6.3 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0		0,6	1,5	8,618	
dB(A) zajszint		68		60 + 13,33 M		80

7. A 8. FEJEZET 8.4.1 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0		0,788		80	
Oldalsó zajszint (EPNdB)		89		90,03 + 9,97 log M		109
Megközelítési zajszint (EPNdB)		90		91,03 + 9,97 log M		110
Átrepülési zajszint (EPNdB)		88		89,03 + 9,97 log M		108

8. A 8. FEJEZET 8.4.2 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0		0,788		80	
Oldalsó zajszint (EPNdB)		86		87,03 + 9,97 log M		106
Megközelítési zajszint (EPNdB)		89		90,03 + 9,97 log M		109
Átrepülési zajszint (EPNdB)		84		85,03 + 9,97 log M		104

9. A 10. Fejezet 10.4 a) és 10.4 b) PONTJÁBAN LEÍRT FELTÉTELEK

10.4 a):

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0	0,6	1,4	8,618
Zajszint dB(A)	76	83,23 + 32,67 log M		88

10.4 b):

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0	0,57	1,5	8,618
Zajszint dB(A)	70	78,71 + 35,70 log M		85

10. A 11. FEJEZET 11.4.1 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0	0,788	3 175
dB SEL zajszint	82	83,03 + 9,97 log M	

11. A 11. FEJEZET 11.4.2 PONTJÁBAN LEÍRT FELTÉTELEK

M = Legnagyobb felszálló tömeg 1000 kg-ban kifejezve	0	1417	3 175
dB SEL zajszint	82	80,49 + 9,97 log M	

"B" MELLÉKLET - A LÉGCSAVAR HAJTÁSÚ STOL REPÜLŐGÉPEK ZAJMINŐSÍTÉSÉNEK IRÁNYELVEI

Megjegyzés.- Lásd a II. Rész 7. Fejezetet.

1. Megjegyzés.- Az itt közölt irányelvekben STOL repülőgépeknek azok számítanak, amelyeket a vonatkozó légi-alkalmassági követelményekkel összhangban rövid le- és felszállási üzemmódban hitelesített maximum tömeggel üzemeltetve, 610 méternél hosszabb futópályát nem igényelnek (biztonsági sáv és akadálymentes terület nélkül).

2. Megjegyzés.- Az itt közölt irányelvek nem alkalmazhatók a függőleges le- felszállási képességekkel rendelkező repülőgépekre.

1. ALKALMAZÁSI ELŐÍRÁSOK

A következő irányelvek alkalmazandók minden STOL üzemeltetési módban üzemeltetetni szándékozott légcsavar meghajtású 5700 kg feletti hitelesített maximum felszálló tömegű olyan repülőgépre, amely a vonatkozó felszállási és leszállási távolság követelményekkel összhangban üzemeltetve 610 méternél hosszabb futópályát[1] nem igényel és amely az egyedi légi-alkalmassági bizonyítványát 1976. január 1-én vagy azután adták ki.

[1] Biztonsági sáv, vagy akadálymentes terület nélkül.

2. ZAJ MÉRTÉKEGYSÉG

A zaj értékmérője a ténylegesen észlelt zajszint EPNdB-ben a jelen Annex kötet 2. Függelékében leírtaknak megfelelően.

3. ZAJMÉRÉSI REFERENCIA PONTOK

A repülőgépet a 6. szakaszban szereplő repülési vizsgálati eljárással vizsgálva, zajszintje nem haladhatja meg a 4. szakaszban ismertetett zajszinteket a következő referencia pontokban:

a) *Oldalsó zaj referencia pont* - a futópálya középvonalával párhuzamos és attól, vagy a meghosszabbított középvonaltól 300 méterre eső egyenesen lévő pont, ahol a repülőgépet STOL üzemmódban üzemeltetve a repülőgépzaj a legnagyobb a le- és felszállás alatt;

b) *átrepülési zaj referencia pont* - a futópálya meghosszabbított középvonalán a nekifutás kezdetétől 1500 méterre lévő pont; és

c) *Megközelítési zaj referencia pont* - a futópálya meghosszabbított középvonalán a futópálya küszöbtől 900 méterre lévő pont.

4. MAXIMUM ZAJSZINTEK

A 2. Függelék zaj értékelő módszerével meghatározott legnagyobb zajszint 96 EPNdB-nél nagyobb érték egyik referencia pontnál sem lehet a 17000 kg, vagy ettől kevesebb hitelesített maximum tömegű repülőgépek esetében, a 17000 kg-nál nagyobb hitelesített maximum tömegű repülőgépek esetében ez a határérték a tömeg logaritmusával lineárisan 2 EPNdB per a tömeg kétszerese mértékkel növekszik.

5. ENGEDMÉNYEK

Ha a legnagyobb zajszintet egy, vagy két mérési pontban meghaladják:

a) A túllépések összege 4 EPNdB-nél nem lehet több;

b) Bármelyik adott pontnál az adott pontnál mért többlet 3 EPNdB-nél nem lehet több; és

c) Bármilyen egyedi pontnál mért többletet a másik, vagy a többi ponton megfelelő csökkenésnek kell kiegyenlíteni.

6. VIZSGÁLATI ELJÁRÁSOK

6.1 A felszállási referencia eljárás a következő legyen:

a) A repülőgép tömege a zaj bizonyítvány kérelemben szereplő maximum felszálló tömeg legyen;

b) A légcsavar és/vagy a hajtómű fordulatszám, valamint a hajtómű teljesítmény beállítás a STOL felszállási üzemmódra előírtnak legyen megfelelő; és

c) A teljes felszállási zaj vizsgálat folyamán a műszersebesség, az emelkedési gradiens, a repülőgép állásszög és a repülőgép konfiguráció a STOL üzemmódra a repülési Kézikönyvben szereplő vonatkozó utasításoknak feleljen meg.

6.2 A megközelítési referencia eljárást a következők szerint kell végrehajtani:

a) A repülőgép tömege a zaj bizonyítvány kérelemben szereplő maximum leszálló tömeg legyen;

b) A teljes leszállási zaj vizsgálat folyamán a légcsavar és/vagy a hajtómű fordulatszám, a hajtómű teljesítmény beállítás, a műszersebesség, a süllyedési gradiens, a repülőgép állásszög és a repülőgép konfiguráció a STOL üzemmódra a repülési Kézikönyvben szereplő, vonatkozó utasításoknak feleljen meg; és

c) A leszállás utáni sugárfék használat a repülési Kézikönyvben meghatározott maximumnak feleljen meg.

7. PÓTLÓLAGOS ZAJ ADATOK

Ha a zaj bizonyítványt kiállító hatóság előírja, akkor azokat az adatokat is rendelkezésre kell bocsátani, amelyek a mért zajszinteknek az A-súlyozott teljes hangnyomásszintek egységeiben való kiértékelésére is lehetőséget adnak.

"C" MELLÉKLET - FEDÉLZETI SEGÉD HAJTÓMŰVEK (APU) ÉS A KAPCSOLÓDÓ LÉGIJÁRMŰ RENDSZEREK FÖLDI MŰKÖDÉS KÖZBENI ZAJSZINT HITELESÍTÉSÉNEK IRÁNYELVEI

Megjegyzés.- Lásd a II. Rész 9. Fejezetét.

1.BEVEZETŐ RÉSZ

1.1 Az alábbi irányelveket az olyan államok tájékoztatása céljából fogalmazták meg, amelyek a normál földi üzemelés alatt működtetett beépített segéd hajtóművekre és kapcsolódó légijármű rendszerekre zaj minősítési követelményeket alakítanak ki.

1.2 Ez az anyag alkalmazandó az összes olyan beépített segéd hajtóműre és kapcsolódó légijármű rendszerre, amelyek prototípusának légi-alkalmassági bizonyítvány-, illetve más ekvivalens előírt eljárás iránti kérelmét 1981. november 26 -án, vagy később nyújtottak be.

1.3 A már létező légijármű típustervekre nézve, amelyekre 1981. november 26-án, vagy ezután az alapvető segéd hajtóműveket érintő típusterv változtatás iránti kérelmet nyújtottak be, vagy más előírt egyenértékű eljárást alkalmaztak, a beépített segéd hajtóművek és a kapcsolódó légijármű rendszerek által előidézett és az alábbi irányelvek szerint meghatározzott zajszint nem haladhatja meg a változtatás előtti zajszintet.

2. ZAJÉRTÉKELŐ ELJÁRÁS

A zaj értékelését a 4. pontban meghatározottak szerint kell végrehajtani.

3. MAXIMUM ZAJSZINTEK

A 4. szakaszban meghatározott zaj értékelési eljárással megállapított maximum zajszintek nem haladhatják meg a következő értékeket:

a) 85 dB(A), a 4.4.2 a), b) és c)-ben előírt pontoknál;

b) 90 dB(A), a C-2 ábrán bemutatott téglaalap kerületén elhelyezkedő pontokon.

4. ZAJ ÉRTÉKELŐ ELJÁRÁSOK

4.1 Általános tudnivalók

4.1.1 A vizsgálati eljárások meghatározott helyeken (utas- és cargo ajtók, kiszolgáló nyílások) végzendő zajmérésekre és a légijármű körüli általános zaj-feltérképezésre vonatkoznak.

4.1.2 A követelmények rendelkeznek a műszerezettségről, az akusztikus és légköri környezeti adatnyerésről, egyszerűsítésről és az előterjesztésről, továbbá egyéb, az eredmények közléséhez szükséges információkról.

4.1.3 Az eljárások felölelik az adatok mágnesszalagra rögzítését későbbi feldolgozás céljából. A magnetofonos idő-integráló elemző rendszer használata elkerülhetővé teszi a hangszintmérők, vagy oktávsáv analizátorok manuális leolvasásával járó változások szemmértékkel történő átlagolásának szükségességét és ezért pontosabb eredményeket biztosítanak.

4.1.4 Nincs rendelkezés arra, hogy a segédhajtómű zaját az alap hajtómű karakterisztikából állapítsák meg, de az egynél több, egyidőben üzemelő légijármű zajának mérésére se.

4.2 Általános vizsgálati feltételek

4.2.1 Meteorológiai feltételek
Szél: 19 km/h-nél (10 csomónál) nem erősebb.

Hőmérséklet: + 2^{o}C-nál nem alacsonyabb és + 35^{o}C-nál nem magasabb

Páratartalom: Relatív páratartalom 30 százaléknál nem kevesebb és 90 százaléknál nem több.

Csapadék: Nincs

Barometrikus nyomás: 800 hPa-nál nem alacsonyabb és 1100 hPa-nál nem magasabb

4.2.2 A vizsgálat színhelye

A mikrofon és a légijármű között a talaj egyenletes és kemény felületű legyen. A légijármű és a mérőpontok között semmilyen akadályt képező tárgy nem lehet és a hang terjedési pályákhoz az eredményt jelentős mértékben befolyásoló közelségben semmilyen visszaverő felület (a légijármű és a földfelszín kivételével) nem lehet. A légijármű körüli földfelszín érzékelhetően sima és vízszintes legyen, legalább azon a területen belül, amelyet a 4.4.2.2 d)-ben leírt legszélső helyre telepített mikrofon rendszer mögött 60 méterre lévő párhuzamos vonalak határolnak.

4.2.3 Környezeti zajok

Meg kell határozni a mérő rendszer és a vizsgálati terület környezeti zaját, azaz a környezet miatti háttérzajt és az akusztikus rendszer elektromos zajait.

4.2.4 APU szerelvény

Az érintett segéd hajtóművet és a kapcsolódó légijármű rendszereket minden olyan légijármű modell esetében meg kell vizsgálni, amelyekre az akusztikai adatokat megkövetelik.

4.2.5 A légijármű földi konfigurációja

A repülőgép kormányfelületeit "semleges" vagy "tiszta" konfigurációban bekapcsolt széllökés gátlókkal kell rögzíteni, vagy ahogyan azt a légijármű jóváhagyott üzemeltetési utasítása a szervizelés alatt álló légijármű esetére előírja.

4.3 Műszerezettség

4.3.1 Légijármű

A 4.5.3 pontban ismertetett működési adatokat a légijármű normál műszerei és kezelőszervei alapján kell meghatározni.

4.3.2 Akusztikai szempontok

4.3.2.1 Általános tudnivalók

A műszerezettségnek és a mérési eljárásoknak ki kell elégíteniük a hivatkozások között felsorolt megfelelő szabványok legutolsó alkalmazható kiadásaiban előírt követelményeket (lásd a 4.6 pontot). Az adat minták legalább két és félszer olyan hosszúak legyenek, mint az adat csökkentési integrciós időszak hossza, de minden eseben legalább 8 mp tartamúnak kell lenniük. Az összes hangnyomásszintet a 20 μPa referencia nyomáshoz képest decibelben kell megadni.

4.3.2.2 Adat vételi rendszer

A C-1 ábrán lévő blokk diagrammon bemutatott zaj rögzítésére és analizálására használatos műszer rendszernek a következő előírásokat kell teljesítenie:

4.3.2.2.1 Mikrofon rendszer

a) Legalább a 45 Hz és 11200 Hz közé eső frekvencia tartományban a rendszer teljesítse a 10. hivatkozási számú szakirodalom legújabb kiadásában a mikrofon rendszer teljesítmény jellemzők alatt szereplő követelményeket (lásd a 4.6 pontot).

b) A mikrofonok kör-vevő típusúak legyenek; ha kondenzátor mikrofonok, akkor nyomás kiegyenlítő szellőzéssel és ismert környezeti nyomás és hőmérséklet együtthatóval kell rendelkezniük. A mikrofon erősítő jellemzői legyenek egyeztethetők a mikrofon, illetve a mágnesszalagos rögzítő jellemzőivel.

c) 11 km/h-nál (6 kts) nagyobb szélsebesség esetén mikrofon szélvédőket kell használni. A mért adatokon frekvenciától függő korrekciókat kell alkalmazni a mikrofon szélvédők jelenlétének figyelembevételére.

4.3.2.2.2 Magnetofon

A magnetofon lehet közvetlen vagy FM felvételű, a következő karakterisztikákkal kell rendelkeznie:

a) Az oktávsávokban, vagy az egyharmad oktávsávokban legalább 50 dB dinamika tartomány;

b) A szalagsebesség pontossága a minősített sebesség ±0,2 százaléka legyen;

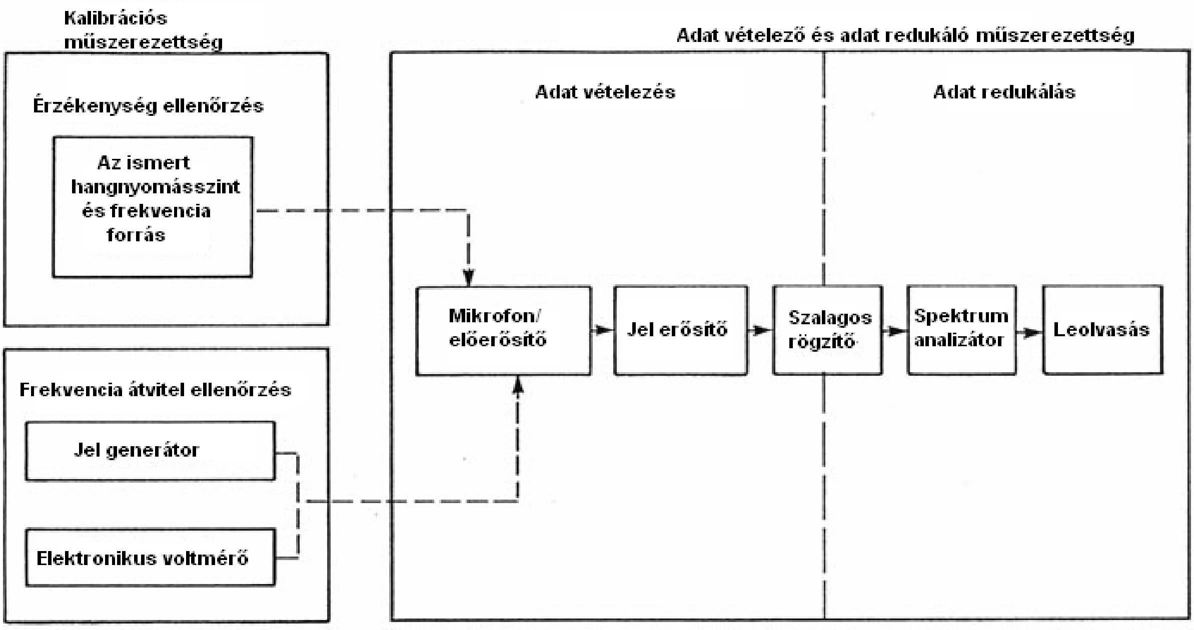
c) Nyávogás és remegés (csúcstól - csúcsig) a szalagsebesség 0,5 százalékánál kevesebb;

d) A maximum harmadik harmónikus torzítás 2 százaléknál kevesebb.

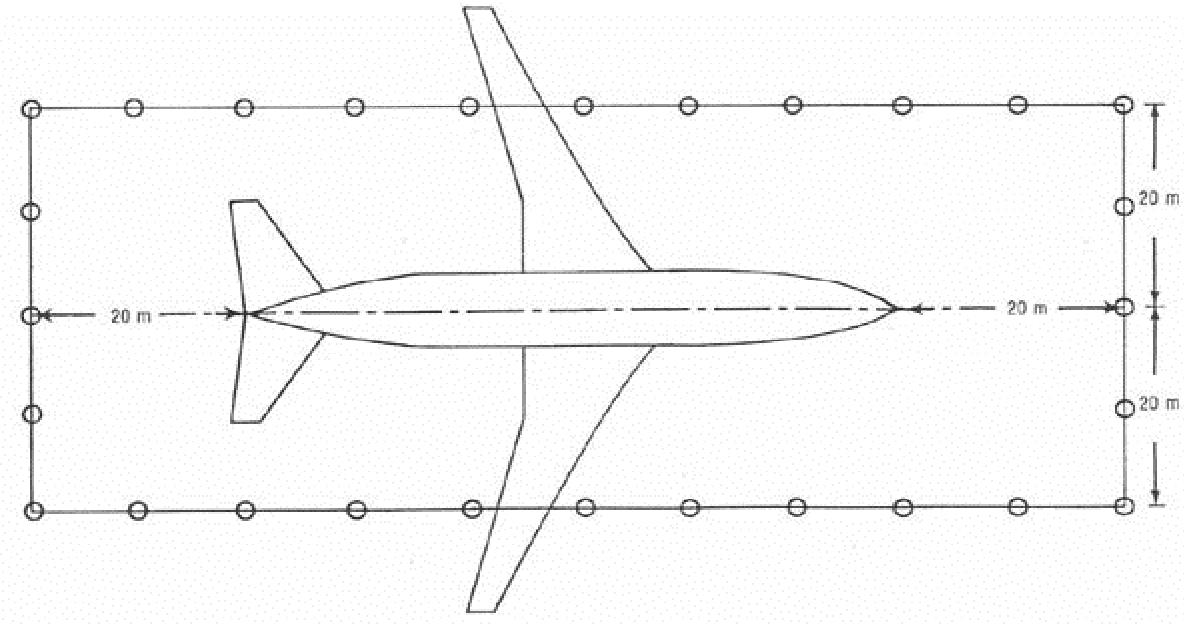
4.3.2.3 Kalibrálás

4.3.2.3.1 Mikrofon

A frekvencia átvitel kalibrálását a vizsgálat sorozat lebonyolítása előtt kell elvégezni és eme előkalibrálástól számított egy hónapon belül utólagos kalibrációt kell végrehajtani, további kalibrálást végezve olyan esetekben, amikor a rendszert feltehetően ütés, vagy károsodás érte. A reakció kalibrációnak a 45 - 11200 Hz közötti tartományra kell kiterjednie. A mikrofon nyomás reakció karakterisztikáit a véletlen szerű esemény kalibráció megvalósítása érdekében korrigálni kell.



C-1 Ábra - Zaj mérőrendszer



C-2 Ábra – Zajtérképező mérő rendszer pontok téglaalapja

4.3.2.3.2 Rögzítő rendszer

a) Kalibrációs szalag; a szalagon az egyes vizsgálatok kezdetén és végén a mérési területen, vagy laboratóriumban széles sávú zajt, vagy egy szinusz hullámos jelköteget kell rögzíteni legalább a 45 - 11200 Hz-es frekvencia tartományban. A szalag tartalmazzon a hangnyomás érzékenységi ellenőrzések során alkalmazni szándékozott frekvenciával rendelkező jeleket is, az alábbiakban leírtaknak megfelelően.

b) Ezt az inzert feszültség kalibrációs jelet a bemenetre kell vezetni és az akusztikus adatok rögzítésére használt minden jel szabályozó erősítőt, hálózati és rögzítő elektronikát be kell vonni. Ezen felül, a rendszer dinamika tartományának és zaj küszöbének ellenőrzésére egy legalább 20 másodperc tartamú "rövidre zárt bemenet" felvételt kell készíteni (azaz a mikrofon nyomásérzékelőt ekvivalens elektromos ellenállással kell helyettesíteni).

c) A C-1 ábrán bemutatottaknak megfelelő kialakítás mellett, a helyszínen naponta a mérések megkezdése előtt és befejezése után mindegyik mikrofon hangnyomás érzékenység kalibrációját el kell végezni. Ezeket a kalibrálásokat olyan kalibrátor alkalmazásával kell lebonyolítani, amely a 45-től 11200 Hz-ig terjedő frekvencia tartományban ismert és állandó amplitudójú hangnyomásszintet állít elő a 11. számú hivatkozás alatt szereplő kiadványban előírt egy, vagy több egyharmad oktávsáv közép frekvenciáján. Szükség szerint barometrikus korrekciót kell alkalmazni. A használatos kalibrátorok pontossága legalább ±0,5 dB értéken belül legyen és a kalibrációjukat a 6 - 9 hivatkozási szám alattiak szerint végezzék el (lásd a 4.6 pontot).

d) Minden szalag tekercsnek a kalibrációs szalaggal összehasonlítható frekvencia átviteli és háttérzaj karakterisztikával kell rendelkeznie. Az összes mágneses rögzítő szalagtekercs elején állandó amplitúdójú szinusz hullámot kell rögzíteni a hangnyomás érzékenység szalag tekercsről szalag tekercsre történő összehasonlításához. E szinusz hullám frekvenciája ugyanabban a frekvencia tartományban legyen, mint amit a hangnyomás érzékenységi vizsgálatokhoz használtak. Erre a célra egy különálló feszültség bevivő szerkezet, vagy egy akusztikai kalibrátor használható. Ha akusztikai kalibrátort használnak, azt gondosan kell "beültetni" és a környezeti nyomásra korrekciót kell végezni a nyomás által a kalibrátor- és a mikrofon reakcióra gyakorolt hatásának kiküszöbölésére.

e) Az akkumulátorról működő magnetofonokat a vizsgálat során gyakran kell ellenőrizni a megfelelő elem állapot biztosítása érdekében. Mérés közben a magnetofont nem szabad megmozdítani, kivéve, ha megállapították, hogy az ilyen mozgatás nem változtatja meg a magnetofon működési jellemzőit.

4.3.2.3.3 Adat redukáló berendezések

Az adat összevonó berendezéseket a 45 Hz-től 11200 Hz-ig terjedő frekvencia sávra kiterjedően ismert amplitudójú elektromos jelekkel kell kalibrálni, akár külön frekvenciák sorozatán, akár széles sávú jellel.

4.3.2.4 Adat redukálás

4.3.2.4.1 A C-1 ábrán látható adat redukáló berendezésnek egyharmad, vagy egy oktávsáv hangnyomásszinteket kell adnia. Az elemző szűrőknek a 12. számú referencia követelményeit (az oktávsávú szűrők esetében a II. osztály, és az egyharmad oktávsávos sávszűrők esetében a III. osztály) kell teljesíteniük. Az analizátor amplitudó felbontása nem lehet rosszabb 0,5 dB-nél; dinamika tartománya legalább 50 dB legyen az analizátor legmagasabb zajküszöbbel rendelkező oktávsávban tapasztalható zajküszöb értékének négyzetgyök középértéke és a teljes kitérés értéke között; az amplitudó reakció a felső 40 dB-es tartományban ±0,5 dB pontossággal lineáris legyen.

4.3.2.4.2 A hangnyomás négyzetes középértékét idő-átlagolni kell a frekvencia sávszűrők négyzetre emelt kimenetének integrálásával; az integrálás időtartama nem lehet kevesebb 8 másodpercnél. A 45 Hz-től 11 200 Hz-ig terjedő tartományban minden adatot fel kell dolgozni. Az adatokat minden ismert, vagy előre jelezhető olyan hibára korrigálni kell, mint például a rendszer frekvencia átvitelének eltérései az egyenestől (lineáristól).

4.3.2.5 A teljes rendszer

4.3.2.5.1 A rendszer elemekre vonatkozó előírásokon túlmenően, a kombinált adat felvevő és adat összegző rendszer frekvencia reakciója a 45-től 11200 Hz-ig tartó frekvenciasávban ±3 dB tűréssel legyen síma. A frekvencia reakció gradiens, ezen a sávon belül sehol sem haladhatja meg az 5 dB/oktávot.

4.3.2.5.2 Az amplitudó felbontás legalább 1,0 dB legyen. A dinamika tartomány legalább 45 dB legyen a teljes kitérés és a rendszer legmagasabb zajküszöbű sávjának négyzetgyök középértékű zajküszöb értéke között. Az egyes frekvencia sávok felső 35 dB-jében az amplitudó reakciója ±0,5 dB pontossággal lineráris legyen.

4.3.3 Meteorológia

A méréseket az alábbiakat teljesítő mérő készülékekkel kell mérni: szélsebesség mérő: mérési tartomány legalább 0 - 28 km/h (0 - 15 csomó) és pontosság legalább ±2 km/h (±1 csomó); hőmérséklet mérő: mérési tartomány legalább 0^{o}C - 40^{o}C, pontosság legalább ±0,5^{o}C; relatív páratartalom mérő: mérési tartomány 0 - 100 százalék és pontosság legalább ±5 százalék; légköri nyomás mérő: mérési tartomány legalább 800 -1100 hPa és pontosság legalább ±3 hPa.

4.4 Vizsgálati eljárás

4.4.1 Vizsgálati feltételek

4.4.1.1 A környezeti zaj mérését ahhoz elegendő számban kell elvégezni, hogy az az összes akusztikai mérőhelyre reprezentatív legyen -ahol szükséges-, korrekciós adatokat biztosítva a mért APU zajszintekre (lásd a 4.4.4 pontot).

4.4.1.2 A beépített APU-nak a 3.1 pontban meghatározott zajszint követelményeket az előírt mérőpontoknál kell teljesítenie jellemző terhelés mellett - beleértve és bezárólag - azokkal a terhelésekkel, amelyeket az elektromos generátor és légkondícionáló egység és bármilyen más kapcsolódó egység szokványos folyamatos maximum földi üzemeltetésük teljesítmény igénye jelent.

Megjegyzés.- Adott légijármű típusba beépített adott típusú segéd hajtómű zajmérési eredménye nem kezelhető jellemző eredményként se akkor, amikor ugyanilyen berendezés más légijárműbe van beépítve, sem akkor, amikor ugyanabba a légijármű típusba más APU van beépítve.

4.4.2 Akusztikai mérőhelyek

4.4.2.1 Kivéve, ha másként írják elő, a zajmérést 1,6 méter ±0,025 méter (5,25 láb ±1,0 hüvelyk) magasságban a talaj, vagy azon felület felett elhelyezett mikrofonnal kell mérni ahol az utasok, vagy a kiszolgáló személyzet állhat úgy, hogy a mikrofon membránja párhuzamos a földfelülettel és felfelé néz.

4.4.2.2 A zajmérési helyek a következők legyenek

a) *Raktér ajtók:* A mérést minden raktér ajtónál el kell végezni, nyitott ajtó mellett, miközben a légijármű jellemző földi kiszolgálási konfigurációban van. Ezeket a méréseket a nyílás középpontjában kell végezni, a törzsborítás síkjában;

b) *Utas ajtók:* A mérést minden utas ajtónál el kell végezni nyitott ajtó mellett, a nyílás függőleges középvonalában a törzsborítás síkjában.

c) *Kiszolgálási helyek:* A mérést minden kiszolgálási helynél el kell végezni, ahol személyek rendszeresen dolgoznak a légijármű földi kiszolgálása során; ezeket a helyeket a légijármű üzemeltetési és kiszolgálási kézikönyve alapján kell meghatározni.

d) *Mérési helyek:* Megfelelő mérőhelyeket kell kiválasztani a légijárművet övező téglalap oldalai mentén, ahogyan az a C-2 ábrán látható. A mérőpontok közötti távolság nagyobb légijárművek esetén ne legyen több 10 méternél. Ez a távolság csökkenthető, hogy a kisebb légijárművekre is megfelelő legyen, illetve különleges követelmények kielégítése céljából.

4.4.3 Meteorológiai mérési helyek

A meteorológiai adatokat a mérés helyén a C-2 ábrán látható mikrofon rendszeren belül, a légijármű előtt a szél felőli részen, a földfelszín felett 1,6 méter (5,25 láb) magasságban kell mérni.

4.4.4.1 Az A-súlyozott hangszinteket, a precíziós hangszintmérőkre vonatkozó szabványok alapján megkapott frekvencia súlyozó korrekciókat (10. referencia) az egyharmad-, vagy oktáv sávú hangnyomásszintekre alkalmazva kell kiszámolni. Az egy oktávsávú hangnyomásszintek a megfelelő egyharmad oktávsávok négyzetes középérték hangnyomásszintjeinek összegzésével határozhatók meg. A teljes hangnyomás szinteket a 45 - 11200 Hz-es frekvencia sávban lévő 24 egyharmad oktávsávú, vagy 8 egy oktávú frekvenciasáv négyzetes hangnyomásszint középértékeinek összegéből kell megállapítani.

4.4.4.2 A teljes hangnyomásszinteket, az A-súlyozott hangszinteket, és az egyharmad, vagy egy oktávú sáv adatokat, táblázatos formában a legközelebbi dB értékre kerekítve kell meg jeleníteni - ha szükséges, grafikus ábrázolással kiegészítve. A hangnyomásszinteket, ha szüszkséges, korrigálni kell a magas környezeti zaj figyelembevétele érdekében. Nincs korrekcióra szükség, ha egy adott hangnyomásszint a környezeti zajszintet legalább 10 dB-lel, vagy többel meghaladja. A környezeti zajtól 3 és 10 dB közötti értékkel erősebb hangnyomásszintek esetében mért értékeket a környezeti zajra a szintek logaritmikus kivonásával kell korrigálni. Ha a hangnyomásszintek a környezeti zajt még 3 dB-lel sem haladják meg, a mért értékek korrekciója a bizonyítványt kiadó hatóság által jóváhagyott módszerrel történhet.

4.4.4.3 Az akusztikai adatokat a légköri elnyelési veszteségre nem kell normalizálni. Az eredményeket a vizsgálati nap tényleges meteorológiai körülményei alapján kell jelenteni.

4.5 Az adatok jelentése

4.5.1 Azonosítási információk

a) Vizsgálati hely, dátum és a vizsgálat időpontja.

b) Az APU- és kapcsolódó berendezéseinek gyártója és a berendezés típusa.

c) A légijármű típusa, gyártója, model és lajstromba vételi száma.

d) A légijármű szintezési rajza és oldalnézeti körvonal képe, szükség szerint, feltüntetve az APU (beleértve a beömlő- és kiömlő nyílásokat) és a kapcsolódó berendezések elhelyezkedését, valamint az összes akusztikai mérő állomás helyét.

4.5.2 Vizsgálati hely bemutatása

a) A földfelület fajtája és helye.

b) Az esetleges földfelszín feletti visszaverő felületek helye és méretei, mint például épületek, vagy más légijárművek, amelyek a 4.2.2 pontban leírt elővigyázatossági intézkedések ellenére jelen lehettek.

4.5.3 Meteorológiai adatok

(mindegyik vizsgálati körülményre)

a) Szélsebesség km/h (csomó) és iránya fokban a légijármű tengelyéhez viszonyítva (0^{o} előre).

b) Környezeti hőmérséklet ^{o}C.

c) Relatív páratartalom százalékban.

d) légnyomás hPa.

4.5.4 Üzemeltetési adatok

(mindegyik vizsgálati körülményre)

a) Az üzemeltetett légkondícionáló csatornák száma és elhelyezkedésük.

b) Az APU tengely normál hitelesített fordulatszáma(i) fordulat/perc, vagy százalék.

c) Az APU normál hitelesített tengely fordulatszáma, fordulat/perc.

d) APU tengely terhelése (kW), lóerő és/vagy elektromos kimenő teljesítmény, kWA.

e) Pneumatikus terhelés, kg/perc, amit a vizsgálat során APU biztosít a pneumatikusan működő összes légijármű rendszernek (az előírt formában kiszámítva).

f) Az APU kiáramló gázhőmérséklete ^{o}C-ban, a légijármű jóváhagyott üzemeltetési kézikönyvében meghatározott helyen mérve.

g) A belső környezet szabályozó rendszer üzemmódja, hűtés, vagy fűtés.

h) Légkondícionáló elosztó rendszer tápcsatorna hőmérséklete ^{o}C.

i) A vizsgálat során történt események, melyek befolyásolhatják a mérés eredményeit.

4.5.5 Műszerezettség

a) Az akusztikai és meteorológiai mérő műszerek rövid leírása, (beleértve a gyártó nevét és a típus és model számát is).

b) Az adatvevő és adatfeldolgozó rendszer rövid leírása, (belértve a gyártó nevét és a típus és model számát is).

4.5.6 Akusztikai adatok

a) Környezeti zaj.

b) A 4.4.4 pontban meghatározott akusztikai adat a hozzátartozó mikrofon helyek leírásával.

c) Az alkalmazott szabványok felsorolása és az eltérések ismertetése és okai.

4.6 Referenciák

A műszerekre és a mérési eljárásokra vonatkozó szabványok

1. Nemzetközi Elektrotechnikai Szótár (International Electrotechnical Vocabular)), 2. Kiadás, IEC - 50(08) (1960).
2. Akusztikai szabvány hangoló frekvencia (Acoustic Standard Tuning Frequency), ISO - 16.

3. A hang, vagy zaj fizikai és szubjektív nagyságának kifejezése (Expression of the Physical and Subjective Magnitudes of Sound or Noise), ISO-131 (1959).

4. Akusztika - Az akusztikai szintek preferált referencia mennyiségei, ISO DIS 1638.2.

5. Útmutató az akusztikai zaj mérésére és a zaj emberre gyakorolt hatásának értékelése (Guide to the Measurement of Acoustical Noise and Evaluation of its Effects" on Man), ISO - 2204 (1973).

6. Az egy hüvelykes szabvány kondenzátor-mikrofon nyomás kalibrálásának precíziós módszere reciprocitás technikával (Precision Method for Pressure Calibration of One-inch Standard Condlenser Microphone by the Reciprocity Technique), IEC - 327 (1971).

7. Az egy hüvelykes szabvány kondenzátor-mikrofon szabad mezős kalibrálásának precíziós módszere a reciprocitás technikával (Precision Method for Free Field Calibration of One-inch Standard Condenser Microphone by the Reciprocity Technique), IEC-486 (1974).

8. Az egy hüvelykes szabvány kondenzátor-mikrofon szabad mezős és nyomás érzékenységi szintjei közötti különbségek értékei (Values for the Difference between Free Field and Pressure Sensitivity Levels for One-inch Standard Condenser Microphone), IEC - 655 (1979).

9. Az egy hüvelykes szabvány kondenzátor-mikrofon nyomás kalibrálásának egyszerűsített módszere reciprocitás technikával (Simplified Method for Pressure Calibration of One-inch Standard Condenser Microphone by the Reciprocity Technique), IEC - 402 (1972).

10. IEC ajánlás a hangszintmérők tekintetében. Nemzetközi Elektrotechnikai Bizottság (IEC Recommendations for Sound Level Meters, International Electrotechnical Commission), IEC 651 (1979).

11. ISO ajánlás az akusztikai mérések preferált frekvenciáit illetően, Nemzetközi Szabványosítási Szervezet (ISO Recommendations for Preferred Frequencies for Acoustical Measurements, International Organization for Standardization), ISO/R266- 1962(E).

12. IEC ajánlás a hangok és rezgések elemzését szolgáló oktávos, fél-oktávos és harmad-oktávos sávszűrők tekintetében, Nemzetközi Elektrotechnikai Bizottság (IEC Recommendations for Octave, Half-Octave and Third-Octave Band Filters Intended for the Analysis of Sounds and Vibrations, International Electrotechnical Commission), IEC 225 (1966).

Megjegyzés.- A fenti kiadványok szövegét és előírásait a módosításuknak megfelelő formában, jelen melléklet referencia alapként magában foglalja.

Az IEC kiadványok a következő címről szerezhetők be:
Central Office of the International

Electrotechnical Commission,

3 rue de Varembé,

Geneva, Switzerland

Az ISO kiadványok a következő címről szerezhetők be:
International Organization for Standardization

1 rue de Varembé
Geneva, Switzerland,

vagy az állami ISO tagszervezetektől.

"D" MELLÉKLET - IRÁNYELVEK A HELIKOPTEREK MEGKÖZELÍTÉS KÖZBENI ZAJ MÉRÉSÉRE SZOLGÁLÓ ALTERNATÍV MÓDSZEREK ÉRTÉKELÉSÉHEZ

Megjegyzés. - A II. Rész, 8. Fejezet 8.6.4 pontban leírt megközelítési referencia eljárás egyetlen megközelítési pályaszöget jelöl ki. Egyes helikopterek esetében ez egybe eshet a legerősebb zajt előidéző üzemmód pályájával, más helikopterek esetében viszont nem. Annak érdekében, hogy az előírások teljesítésének megállapításához alternatív módszereket lehessen kidolgozni, az államokat bátorítják, hogy az alábbiakban leírtak szerint további méréseket hajtsanak végre.

1. BEVEZETŐ RÉSZ

Az alábbi segédlet az államok számára készült, hogy elősegítse olyan további információk beszerzését, amelyen a 8. Fejezet megközelítési vizsgálati eljárásnak jövőbeli módosításai alapulhatnak.

2. MEGKÖZELITÉSI ZAJ ÉRTÉKELÉSI ELJÁRÁS

Az ilyen vizsgálatok végrehajtásakor a 8. Fejezet előírásait kell figyelembe venni az alábbiak kivételével.

2.1 Megközelítési referencia zajmérő pontok

A megközelítési referencia eljárásban kijelölt repülési pálya alatt függőlegesen 120 méterre (394 láb) a földön elhelyezkedő repülési pálya referencia pont. A föld felszínén ez a következő helyzeteket jelenti:

a) 2290 m távolság a 3^{o}-os megközelítési pálya és a föld síkjának metszés pontjától;

b) 1140 m távolság a 6^{o}-os megközelítési pálya és a föld síkjának metszés pontjától;

c) 760 m távolság a 9^{o}-os megközelítési pálya és a föld síkjának metszés pontjától.

2.2 Maximum zajszintek

A megközelítési repülési pálya referencia pontban: a 3°-os, 6°-os és 9°-os megközelítésekre korrigált szintek aritmetikai átlagaként kiszámított zajszint.

2.3 Megközelítési referencia eljárás

A megközelítési referencia eljárást az alábbiak szerint kell létrehozni:

a) A helikoptert stabilizálni kell és 3°-os, 6°-os és 9°-os megközelítési pályákat kell követnie;

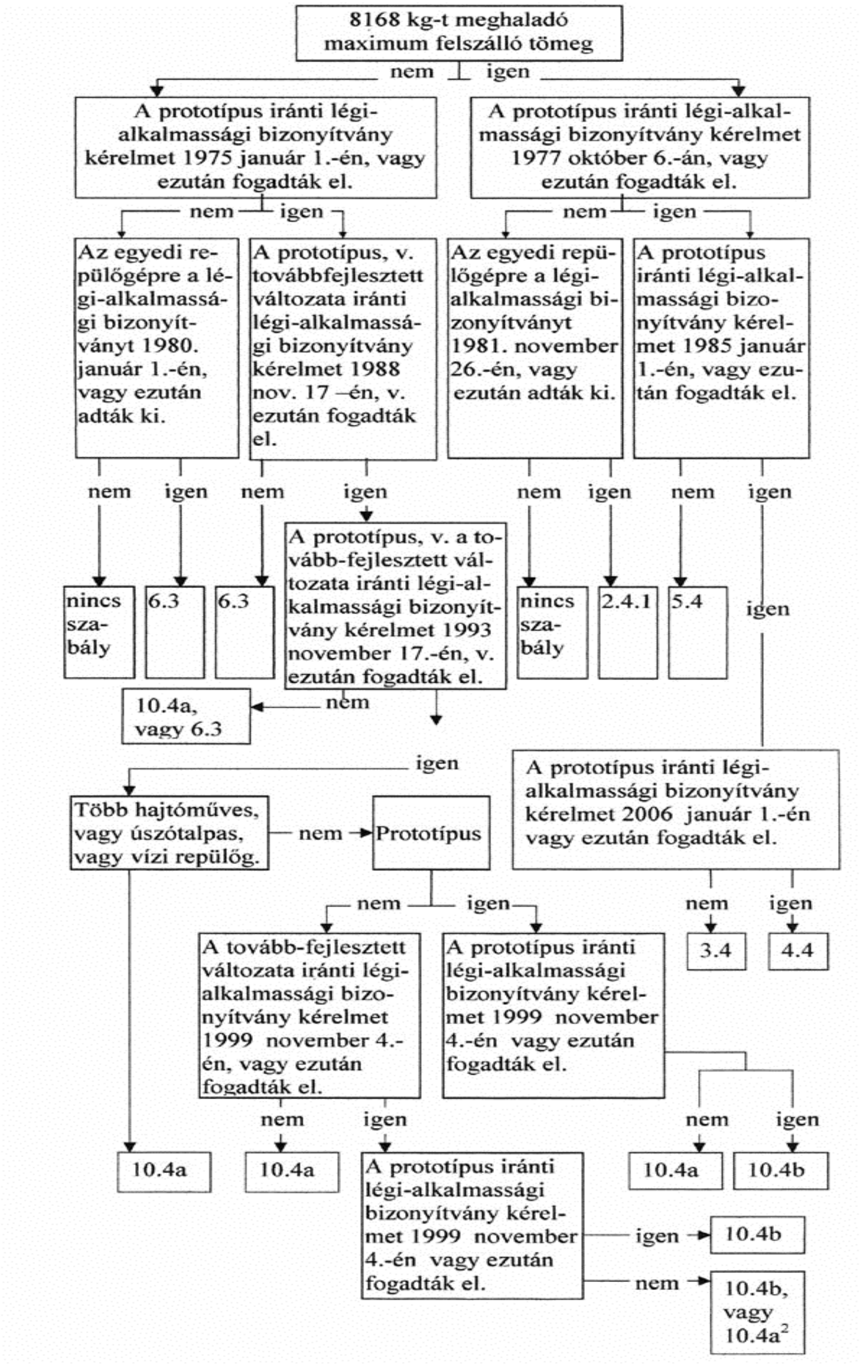
b) A megközelítést állandósult és a legjobb emelkedési sebességhez (Vy) tartozó sebességgel, vagy a jóváhagyott legkisebb megközelítési sebességgel kell végrehajtani, amelyik a nagyobb, a megközelítés során és a zajmérő pont felett stabilizált teljesítménnyel, a megközelítést normál födet érésig kell folytatni;

c) A megközelítést a megközelítéshez hitelesített legnagyobb normál forgószárny fordulatszámmal kell végrehajtani;

d) A légi-alkalmassági vizsgálatok során használt állandó megközelítési konfigurációt, kibocsátott futóművel kell tartani végig a megközelítési referencia eljárás során; és

e) A helikopter tömegének a földet éréskor meg kell egyeznie a zaj bizonyítványt iránti kérelemben szereplő maximum leszálló tömeggel.

E MELLÉKLET - AZ ICAO 16. ANNEX ZAJ HITELESÍTÉSRE VONATKOZÓ SZABVÁNYAINAK ALKALMAZHATÓSÁGA LÉGCSAVAR HAJTÁSÚ REPÜLŐGÉPEKRE[1]



1. Ezek a szabványok nem vonatkoznak a kifejezetten a következő célokra kialakított repülőgépekre: műrepülés, vagy mezőgazdasági, vagy tűzoltó célú használat, illetve az önerőből repülni képes motoros vitorlázó repülőgép.

2. A 10.4 a) szabvány választható alkalmazása nem vonatkozik a továbbfejlesztett változat légi-alkalmassági bizonyítványa iránti 2004 november 4-én, vagy azt követően elfogadott kérelmek esetében.

"F" MELLÉKLET - A DÖNTHETŐ FORGÓSZÁRNY TENGELLYEL RENDELKEZŐ LÉGIJÁRMŰVEK ZAJMINŐSÍTÉSÉNEK IRÁNYELVEI

Megjegyzés. - Lásd a II. Rész 13. Fejezetét.

1. Megjegyzés. - Ezek az irányelvek a levegőnél nehezebb légijárművek közül azokra vonatkoznak, amelyek repülés közben a felhajtó erőt, főleg kettő, vagy több erőmeghajtású olyan tengelyre épített forgószárnyra ható aerodinamikai reakciók révén nyerik, amely tengelyek iránya lényegében a függőlegestől a vízszintesig változtathatók.

2. Megjegyzés. - Nem áll szándékban, hogy ezeket az irányelveket azokra a dönthető tengelyre épített forgószárnyas légijárművekre alkalmazzák, amelyek egy, vagy több, kizárólag STOL üzemelésre légi-alkalmassá hitelesített konfigurációval rendelkeznek. Ilyen esetekben valószínűleg eltérő, vagy további irányelvekre volna szükség.

1. ALKALMAZÁSI RENDELKEZÉSEK

A következő irányelvek alkalmazandók minden olyan dönthető tengelyre épített forgószárnyas légijárműre és továbbfejlesztett változataira, amelyekre a bizonyítványt kiadó hatóság 1998. május 13-én, vagy azt követően adta ki a típus légi-alkalmassági bizonyítványát.

Megjegyzés.- A külső rakomány, vagy berendezés szállítására alkalmas dönthető tengelyre épített forgószárnyas légijárművek légi-alkalmassági vizsgálatait ilyen terhek, illetve berendezések nélkül kell elvégezni.

2. ZAJÉRTÉKELÉSI MÉRTÉKEGYSÉG

A zajértékelés mérőszáma a 2. Függelékben leírtak szerinti és EPNdB-ben kifejezett Ténylegesen Érzékelt Zajszint legyen.

Megjegyzés. - Föld területhasznosítás tervezési célokra a bizonyítványt kiadó hatóságok számára kiegészítésképp a 4. Függelékben meghatározottak szerinti SEL és LAmax, továbbá az LAmax-nak megfelelő, a 2. Függelékben meghatározottak szerinti egyharmad oktávsávos SPL-eket kell rendelkezésre bocsátani.

3. REFERENCIA ZAJMÉRŐ PONTOK

A 6. szakasz referencia eljárásaival és a 7. szakasz vizsgálati eljárásaival összhangban vizsgált dönthető tengelyre épített forgószárnyú légijármű zaj szintjei nem haladhatják meg a 4. szakaszban előírt zajszinteket a következő pontoknál:

a) *Felszállási referencia zajmérő pontok:*

1) repülési pálya referencia pont, amely a felszállási referencia eljárásban (lásd 6.2) meghatározott repülési pálya alatt függőlegesen a talajon és a referencia eljárásban az emelkedő repülés megkezdésére történő átmenet megkezdésének pontjától elfelé repülés irányában vízszintesen 500 m-re helyezkedik el;

2) a felszállási referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150 -150 m-re elhelyezett két további pont.

b) *Átrepülési referencia zajmérő pontok*

1) Egy repülési pálya referencia pont, amely a föld felületén az átrepülési referencia eljárásban előírt repülési pálya (lásd 6.3) alatt függőlegesen 150 m-re (492 láb) helyezkedik el;

2) az átrepülési referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150-150 m-re elhelyezett két további pont.

c) *Megközelítési referencia zajmérő pontok*

1) Egy repülési pálya referencia pont, amely a föld felületén helyezkedik el függőlegesen 120 m-re (394 láb) a megközelítési referencia eljárásban (lásd a 6.4. pontot) előírt repülési pálya alatt. Vízszintes terepen ez annak a pontnak felel meg, amely 1140 m-re van a 6 fokos megközelítési pálya és a terepsík metszéspontjától;

2) a megközelítési referencia eljárásban meghatározott repülési pálya két oldalán, a repülési pálya referencia ponton átmenő egyenesen a föld felszínén szimmetrikusan 150-150 m-re elhelyezett két további pont.

4. MAXIMUM ZAJSZINTEK

Az 1. szakaszban meghatározott dönthető tengelyre épített forgószárnnyal rendelkező légijárművek esetében a 2. Függelékben ismertetett zajértékelő módszerrel megállapított maximum zajszintek nem haladhatják meg a következőket:

a) *A felszállási repülési pálya referencia pontnál:* 109 EPNdB VTOL/áttérési módban, ha a dönthető tengelyre épített forgószárnnyal rendelkező légijármű engedélyezett maximum felszálló tömege - amelyre a zajminősítési bizonyítványt kérelmezik- 80000 kg, vagy nagyobb; ez az érték a dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 89 EPNdB-ig, ami után a határérték állandó;

b) *Az átrepülési pálya referencia pontnál*: 108 EPNdB VTOL/áttérési módban, ha a dönthető tengelyre épített forgószárnnyal rendelkező légijármű engedélyezett maximum felszálló tömege -amelyre a zajminősítési bizonyítványt kérelmezik- 80000 kg, vagy nagyobb; ez az érték a dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 88 EPNdB-ig, ami után a határérték állandó.

1. Megjegyzés.- a dönthető tengelyre épített forgószárnnyal rendelkező légijármű repülőgép üzemmódjára nincs maximum zajszint.

2. Megjegyzés. - VTOL/áttérési üzemmód magában foglal minden olyan jóváhagyott konfigurációt és repülési üzemmódot, amelyben a forgószárny tervezett forgási sebessége egyenlő a lebegésben alkalmazottéval.

c) *A megközelítési repülési pálya referencia pontnál:* 110 EPNdB VTOL/áttérési módban, ha a dönthető tengelyre épített forgószárnnyal rendelkező légijármű engedélyezett maximum felszálló tömege -amelyre a zajminősítési bizonyítványt kérelmezik- 80000 kg, vagy nagyobb; ez az érték a dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömeg logaritmusával 3 EPNdB per a tömeg fele mértékkel lineárisan csökken 90 EPNdB-ig, ami után a határérték állandó.

Megjegyzés.- A zajszinteknek az "A" Melléklet 8. szakaszában közölt felszálló tömegek függvényében és a 8. Fejezetben leírt feltételekre történő kiszámítására szolgáló egyenletek összeegyeztethetők az eme irányelvekben meghatározott maximum zajszintekkel.

5. ENGEDMÉNYEK

Ha a zajszint határértékeket egy, vagy több pontnál túllépik:

a) A túllépések összege nem haladhatja meg a 4 EPNdB-t;

b) Az adott pontra vonatkozó túllépés egyik pont esetében sem lehet 3 EPNdB-nél nagyobb; és

c) A túllépést a másik ponton, vagy pontokon mért megfelelő csökkenésnek kell kiegyensúlyoznia.

6. ZAJ MINŐSÍTÉSI REFERENCIA ELJÁRÁSOK

6.1 Általános feltételek

6.1.1 A referencia eljárások tegyenek eleget az érvényes légi-alkalmassági követelményeknek.

6.1.2 A referencia eljárásokat és repülési pályákat a bizonyítványt kiadó hatóságnak jóvá kell hagynia.

6.1.3 A 6.1.4 pontban leírt körülmények kivételével, a felszállási, átrepülési és megközelítési referencia eljárásoknak azonosaknak kell lenniük a 6.2, 6.3, vagy 6.4 pontban leírtakkal.

6.1.4 Ha a kérelmező bizonyítja, hogy a dönthető tengelyre épített forgószárnnyal rendelkező légijármű tervezési jellegzetességei nem teszik lehetővé a 6.2, 6.3, vagy 6.4 pontban leírtak szerinti repülést, akkor a referencia eljárások:

a) Eltérhetnek a 6.2, 6.3, vagy a 6.4 pontban meghatározott referencia eljárásoktól, de csak a referencia eljárás végrehajtását lehetetlenné tévő tervezési jellegzetesség által megkövetelt mértékig; és

b) Azokat a bizonyítványt kiadó hatóság jóváhagyta.

6.1.5 A referencia eljárásokat a következő referencia légköri viszonyokra kell felállítani:

a) Tengerszinti légnyomás 1013,25 hPa;

b) Környezeti léghőmérséklet 25^{o} C, azaz ISA + 10^{o} C;

c) Relatív páratartalom 70 százalék; és

d) Szélcsend.

6.1.6 A 6.2 d), 6.3.1 d) és 6.4 c) pontokban szereplő maximum normál üzemi fordulatszám legyen az adott referencia eljárásra a gyártó által előírt és a bizonyítványt kiadó hatóság által jóváhagyott légi-alkalmassági korlátozásokkal összhangban álló "normál üzemi fordulatszám tartomány legnagyobb értéke". Ha a legnagyobb rotor fordulatszámot tűréssel tették közzé, akkor a maximum normál rotor fordulatszámot kell a legnagyobb rotor fordulatszámként venni, mint amelyre a tűrést közölték. Ha a repülési feltételekhez a rotor fordulatszám automatikusan kötődik, akkor az adott repülési feltételekhez tartozó maximum normál rotor fordulatszámot kell használni a zajminősítő eljárás alatt. Amennyiben a rotor fordulatszám pilóta beavatkozással változtatható, akkor a repülési kézikönyv korlátozások fejezetében a felkapcsolt erőhajtás körülményekre előírt legnagyobb normál üzemi rotor fordulatszámot kell a zajminősítő eljárás alatt alkalmazni.

6.2 Felszállási referencia eljárás

A felszállási referencia repülési eljárást a következők szerint kell kialakítani:

a) a felszállási referencia eljárás során végig a kérelmező által választott állandó felszálló konfigurációt kell alkalmazni, beleértve a hajtómű gondola (elfordulási)szögét is;

b) A dönthető tengelyre épített forgószárnnyal rendelkező légijármű a következők szerint kell stabilizálni: a referencia környezeti feltételek között rendelkezésre álló felépített hajtómű(vek)-re vonatkozó előírt minimumnak megfelelő, vagy az áttételház nyomaték határának megfelelő maximum felszálló teljesítménnyel - amelyik a kisebb és a talajszint feletti 20 m (65 láb) magasságon a repülési pálya referencia pont előtt 500 m-el kezdődő pálya mentén;

c) a felszállási referencia eljárás során a gondola (elfordulási) szöget és a hozzá tartozó legjobb emelkedési sebesség, avagy a felszállás utáni emelkedésre jóváhagyott legalacsonyabb sebesség közül a nagyobbikat végig tartani kell;

d) A folyamatos emelkedést a felszállásra engedélyezett legnagyobb normál üzemi fordulatszámon stabilizált rotor sebesség mellett kell végezni;

e) A dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömegének egyenlőnek kell lennie a zaj bizonyítvány kérelemben szereplő maximum felszálló tömeggel; és

f) A referencia felszálló pálya - definíció szerint - egy egyenes vonalú szakasz, amely a kezdőponttól (a központi mikrofonhely előtt 500 m-től és a föld felett 20 m-től (65 lábtól)) emelkedik olyan szögben, amelyet a legjobb emelkedési mérték (BRC - Best Rate of Climb) és a választott gondola (döntés)szöghöz, valamint a hajtóműre előírt legkisebb teljesítményhez tartozó legjobb emelkedési sebesség határoz meg.

6.3 Átrepülési referencia eljárás

Az átrepülési referencia eljárást a következők szerint kell kialakítani:

a) A dönthető tengelyre épített forgószárnnyal rendelkező légijárművet a repülési pálya referencia pont felett 150 m (492 láb) magasságban szintrepülésben kell stabilizálni;

b) Az átrepülési referencia eljárás során mindvégig a kérelmező által választott konfigurációt kell tartani;

c) A dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömegének egyenlőnek kell lennie a zaj bizonyítvány kérelemben szereplő maximum felszálló tömeggel;

d) Az átrepülési referencia eljárás során mindvégig a következőket kell tartani:

- VTOL/áttérési üzemmód,

- gondola (döntési)szöge az engedélyezett azon rögzített üzemelési ponton, amely legközelebb van a levegőhöz viszonyított zéró sebességre légi-alkalmassá nyilvánított gondola (döntés)szöghöz,

- 0.9VCON sebesség és

- a forgószárny fordulatszám a szintrepülésre légi-alkalmassá nyilvánított maximum normál üzemi fordulatszámon stabilizálva;

Megjegyzés. - Zajminősítési célokra V_{CON} meghatározása a következő: adott gondola (döntés)szög mellett a VTOL/áttérés üzemmódra engedélyezett legnagyobb sebesség.

e) repülőgép üzemmódban a gondolát a lenti ütköző állásban kell tartani mindvégig az átrepülési referencia eljárások során a következők mellett:

1) a forgószárny fordulatszáma a VTOL/áttérés üzemmódhoz kapcsolódó fordulatszámon stabilizálva és $0.9V_{CON}$ sebesség; és

2) a forgószárny fordulatszáma a repülőgép üzemmódhoz kapcsolódó normál utazó fordulatszámon stabilizálva és a hozzá tartozó, szintrepülésre légi-alkalmassá minősített $0.9V_{MCP}$, vagy $0.9V_{MO}$ közül a kisebb sebesség.

1. Megjegyzés.- Zajminősítési célokra V_{MCP} és V_{MO} meghatározása a következő: V_{MCP} a repülőgép üzemmód üzemelési határsebesség maximuma, amely a felépítettek közül legkisebb teljesítményű hajtómű esetében a (1013.25 hPa) tengerszinti nyomáson, 25°C környező levegőhőmérséklet mellett rendelkezésre álló maximum folyamatos teljesítményhez (MCP) és a vonatkozó legnagyobb hitelesített tömeghez tartozik; és V_{MO} az üzemelés maximum sebességhatára (MO), amelyet szándékosan nem szabad túllépni.

2. Megjegyzés.- a zajminősítéshez alkalmazott V_{CON} és V_{MCP} vagy V_{MO} értékeit a jóváhagyott repülési kézikönyvnek tartalmaznia kell.

6.4 Megközelítési referencia eljárás

A megközelítési referencia eljárást a következők szerint kell kialakítani:

a) A dönthető tengelyre épített forgószárnnyal rendelkező légijármű legyen stabilizált és 6 fokos siklópályát kövessen;

b) A megközelítést következők szerint kell végrehajtani: a konfiguráció a légi-alkalmassá nyilvánítottak közül, a gondola (döntés)szöghöz tartozó legjobb emelkedési sebesség, vagy a jóváhagyott legkisebb megközelítési sebesség közül a nagyobbik sebességgel egyező állandósult levegőhöz viszonyított sebességgel a legnagyobb zajt okozó legyen és a megközelítés során végig stabilizált teljesítménnyel, a zajmérő pont felett átrepülve és a normál földet érésig folytatott megközelítéssel;

c) A megközelítést a megközelítéshez engedélyezett maximum normál üzemi fordulatszámon stabilizált rotor sebességgel kell végrehajtani;

d) A légi-alkalmassági ellenőrzések során használt állandó megközelítési konfigurációt kiengedett futóművel kell tartani mindvégig a megközelítési referencia eljárás során; és

e) A dönthető tengelyre épített forgószárnnyal rendelkező légijármű tömegének a földet éréskor meg kell egyeznie a zaj bizonyítvány iránti kérelemben szereplő maximum leszálló tömeggel.

7. Vizsgálati eljárások

7.1 A vizsgálati eljárásoknak elfogadhatóknak kell lenniük a bizonyítványt kiadó állam légi-alkalmassági és zajminősítési hatóságai számára.

7.2 A vizsgálati eljárásokat és a zajméréseket jóváhagyott módon kell végrehajtani és feldolgozni, hogy azok a 2. szakaszban meghatározott zajértékelési mérőszámot eredményezzenek.

7.3 A vizsgálati körülményeknek és az eljárásoknak közel azonosaknak kell lenniük a referencia körülményekkel és eljárásokkal, vagy ellenkező esetben az akusztikai adatokat a 2. Függelékben a helikopterekre leírt módszerekkel egyezésben módosítani kell a jelen Fejezetben ismertetett referencia körülményekre és eljárásokra.

7.4 A tényleges vizsgálati és referencia eljárások közötti különbségek miatti módosítások nem haladhatják meg az alábbiakat:

a) Felszállásnál a 4.0 EPNdB-t, amelyből a delta1, illetve a delta2-ből a -7,5 log (QK/QrKr) kifejezés aritmetikai összege nem lehet 2.0 EPNdB-nél több;

b) Átrepülésnél, vagy megközelítésnél 2.0 EPNdB-t.

7.5 A vizsgálat során, a 10 dB-es csökkenési időtartam alatt a rotor átlagos fordulatszáma a maximum normál üzemi fordulatszámtól ± 1 százaléknál nagyobb mértékben nem térhet el.

7.6 A 10 dB-es csökkenési időtartam alatt a dönthető tengelyre épített forgószárnnyal rendelkező légijármű levegőhöz viszonyított sebessége ± 9 km/h-nál (5 csomó) nagyobb mértékben nem térhet el a repülési vizsgálatnak megfelelő referencia levegőhöz viszonyított sebességtől.

7.7 A szembeszélben végrehajtott szintrepülések száma egyezzen meg a hátszélben végrehajtott szintrepülések számával.

7.8 A teljes 10 dB-es lefutási időtartam alatt a dönthető tengelyre épített forgószárnnyal rendelkező légijárműnek a referencia pályához mért függőlegestől számított ± 10 fokon, vagy ±20 m-en belül kell repülnie, amelyik a nagyobb (lásd II. Rész 8. Fejezet 8-1 ábra).

7.9 Az átrepülés során a dönthető tengelyre épített forgószárnnyal rendelkező légijármű magassága az átrepülési pontban mért referencia magasságtól ± 9 m-nél (30 láb) nagyobb mértékben ne térjen el.

7.10 A megközelítési zajvizsgálat alatt az 5,5^{o} és a 6,5^{o}-os megközelítési szögek által határolt légtérben a dönthető tengelyre épített forgószárnnyal rendelkező légijárművet stabilizált állandó sebességű megközelítésre kell állítani.

7.11 A vizsgálatot a dönthető tengelyre épített forgószárnnyal rendelkező légijármű vonatkozó engedélyezett maximum tömegének legalább 90 százalékával kell végrehajtani és végrehajtható a vonatkozó engedélyezett maximum tömeg 105 százalékát nem meghaladó tömeggel is. A három repülési feltétel mindegyike esetében legkevesebb egy-egy vizsgálatot végre kell hajtani e maximum hitelesített felszálló tömeggel, avagy ettől nagyobb tömeggel.

G FÜGGELÉK A ZAJMINŐSÍTÉSI DOKUMENTÁCIÓ KEZELÉSÉNEK IRÁNYELVEI

Megjegyzés.- Lásd a II. Rész 1. Fejezetét.

1. BEVEZETŐ RÉSZ

Az alábbi tájékoztatás azon államoknak szól, amelyek további útmutatást igényelnek a zajminősítési dokumentáció kezeléséről. Nincs szándék arra, hogy e tájékoztatást visszamenőleges hatállyal alkalmazzák, azonban, ha a javasolt formát az állam visszamenőlegesen szeretné alkalmazni, nincs akadálya, hogy ezt tegye.

2. ZAJMINŐSÍTÉSI DOKUMENTÁCIÓ

2.1 Biztosítandó információ

2.1.1 Az 1. Fejezet 1.5 pontja -minimumként- meghatározza azt az információ kört, amelyet a zajminősítő dokumentumnak tartalmaznia kell. E témában az alábbiak további útmutatást nyújtanak. Megjegyzendő, hogy a II. Rész, 1. Fejezet 1.5 és 1.6 pontjával összhangban, minden tételt arab számozással kell ellátni. Ez azért legyen így, hogy segítse az információhoz jutást azoknak is, akik számára a zajminősítő dokumentáció nyelve idegen. Egyes tételek csak adott fejezetekhez kötődnek. Ilyen esetekben a tétel feltünteti a vonatkozó fejezeteket.

2.1.2 *1. Tétel A lajstromozó állam neve*

A zajminősítő dolumentumot kiadó állam neve. E tétel legyen összhangban a lajstromozási és a légi-alkalmassági bizonyítvány tartalmával.

2.1.3 *2. Tétel A zaj dokumentum címe*

A 23. Szakasz magyarázata értelmében, az igazgatási rendszer által bevezetett zajminősítési dokumentáció függvényében különféle dokumentumok adhatók ki. A választott rendszer meghatározza, hogy a dokumentum milyen nevet fog viselni, például "zajbizonyítvány", "zajminősítő dokumentum", avagy a lajstromozó állam igazgatási rendszere által alkalmazott egyéb név

2.1.4 *3. Tétel A dokumentum szána*

A lajstromozó állam által adott és eme egyedi dokumentumot saját igazgatási rendszerében azonosító egyedi szám. E szám hívatkozási segítséget ad a dokumentummal kapcsolatos megkeresésekhez.

2.1.5 *4. Tétel Nemzetiségi-, vagy közösségi jel és lajstromjel*

A lajstromozó állam által a 7. Annex-el összhangban adott nemzeti, vagy közösségi jel és lajstromjel. E tétel legyen összhangban a lajstromozási és a légi-alkalmassági bizonyítvány tartalmával.

2.1.6 *5. Tétel Gyártó és a légijármű gyártói neve*

Az illető légijármű típusa és változat azonosítója. E tétel legyen összhangban a lajstromozási és a légi-alkalmassági bizonyítvány tartalmával.

2.1.7 *6. Tétel Gyártási sorozatszám*

A légijármű gyártói sorozatszáma a gyártó által megadott formában. E tétel legyen összhangban a lajstromozási és a légi-alkalmassági bizonyítvány tartalmával.

2.1.8 *7. Tétel Hajtómű gyártó és a hajtómű gyártói neve*

A légijármű azonosítása és konfigurációjának hitelesítése érdekében a felépített hajtóművek megnevezése. Tartalmazza az illető hajtómű(vek) típusát és modell azonosítóját. E megnevezés legyen összhangban az illető hajtóműre vonatkozó típus alkalmassági, illetve a kiegészítő típus alkalmassági bizonyítvány tartalmával.

2.1.9 *8. Tétel A légcsavar típusa és változata a légcsavar hajtású repülőgép esetében*
A légijármű azonosítása és konfigurációjának hitelesítése érdekében a felépített légcsavarok megnevezése. Tartalmazza az illető légcsavar(ok) típusát és modell azonosítóját. E megnevezés legyen összhangban a légcsavarra vonatkozó típus alkalmassági, illetve a kiegészítő típus alkalmassági bizonyítvány tartalmával. E tétel csak a légcsavar hajtású repülőgépek zajminősítő dokumentumában szerepeljen.

2.1.10 *9. Tétel Maximum felszállótömeg és mértékegysége*

A légijármű hitelesített zajszintjéhez tartozó maximum felszálló tömege kilogramban kifejezve. A félreértések elkerülése érdekében a mértékegységet (kg) egyértelműen közölni kell. Ha a tervező államban honos elsődleges tömeg mértékegység nem kilogram alapú, akkor az alkalmazott átszámítási szorzó feleljen meg az 5. Annexben szereplővel.

2.1.11 *10. Tétel Maximum leszálló tömeg és mértékegysége a 2., 3., 4., 5. és 12. Fejezet alapján kiadott bizonyítványokhoz*

A légijármű hitelesített zajszintjéhez tartozó maximum leszálló tömeg kilogramban kifejezve. A félreértések elkerülése érdekében a mértékegységet (kg) egyértelműen közölni kell. Ha a tervező államban honos elsődleges tömeg mértékegység nem kilogram alapú, akkor az alkalmazott átszámítási szorzó feleljen meg az 5. Annexben szereplővel. E tétel csak a légcsavar hajtású és 2., 3., 4., 5. és 12. Fejezet alapján kiadott légijármű zajminősítő dokumentumokban szerepeljen.

2.1.12 *11. Tétel A 16. Annex I. Kötetének az a Fejezet és szakasz száma, amely alapján a minősítést kiadták*

A 16. Annex I. Kötetének az a Fejezete, amely alapján a minősítést kiadták. A 2., 8., 10. és 11. Fejezet esetében a zajkorlátokat meghatározó szakaszok számát is fel kell tüntetni.

2.1.13 *12. Tétel Annak jelzése, hogy milyen kiegészítő módosításokat végeztek az alkalmazandó zajminősítési szabványok kielégítése érdekében*

E tételnek tartalmaznia kell - legalább - az 5., 7. és a 8. tételben megadott alap légijármű összes kiegészítő és a 11. tételben felsorolt olyan módosításait, amelyek a 16. Annex I. Kötetének azon Fejezetében megfogalmazott követelmények teljesítéséhez váltak szükségessé, amely Fejezet alapján a légijármű zajminősítését kiadták. Nem szükséges, de a lajstromozó hatóság döntése szerint megadhatók az adott Fejezet teljesítése szempontjából lényegtelen, de a kinyilvánítottak szerinti hitelesítési zajszint teljesítéséhez szükséges egyéb módosítások is. A kiegészítő módsításokat egyértelmű hivatkozással kell megadni, mint például kiegészítő típus alkalmassági bizonyítvány (STC) szám, a módosítás gyártója által adott egyedi részegység szám, vagy típus/változat azonosító.

2.1.14 *13. Tétel Az oldalsó/teljes teljesítményhez tartozó zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5. és 12. Fejezete alapján kiadott miniősítéshez.*

A vonatkozó Fejezet szerint meghatározott oldalsó/teljes teljesítményhez tartozó zajszint. Meg kell adni a zajszint mértékegységét (pl. EPNdB) és a zajszintet a legközelebbi tized dB-ben kell feltüntetnie. E tételt csak a 2., 3., 4., 5. és 12. Fejezet alapján minősített légijárműre kiadott zajminiősítési dokumentumban kell szerepeltetni.

2.1.15 *14. Tétel A megközelítési zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5., 8. és 12. Fejezete alapján kiadott miniősítés esetén;*

A vonatkozó Fejezet szerint meghatározott megközelítési zajszint. Meg kell adnia a zajszint mértékegységét (pl. EPNdB) és a zajszintet a legközelebbi tized dB-ben kell feltüntetnie. E tételt csak a 2., 3., 4., 5., 8. és 12. Fejezet alapján minősített légijárműre kiadott zajminiősítési dokumentumban kell szerepeltetni.

2.1.16 *15. Tétel Az átrepülési (flyover) zajszint a megfelelő mértékegységben a jelen Annex 2., 3., 4., 5. és 12. Fejezete alapján kiadott miniősítés esetén*

A vonatkozó Fejezet szerint meghatározott átrepülési (flyover) zajszint. Meg kell adnia a zajszint mértékegységét (pl. EPNdB) és a zajszintet a legközelebbi tized dB-ben kell feltüntetnie. E tételt csak a 2., 3., 4., 5. és 12. Fejezet alapján minősített légijárműre kiadott zajminiősítési dokumentumban kell szerepeltetni.

2.1.17 *16. Tétel Az átrepülési (overflight) zajszint a megfelelő mértékegységben a jelen Annex 6., 8. és 11. Fejezete alapján kiadott minősítés esetén;*

A vonatkozó Fejezet szerint meghatározott átrepülési (overflight) zajszint. Meg kell adnia a zajszint mértékegységét (pl. EPNdB) és a zajszintet a legközelebbi tized dB-ben kell feltüntetnie. E tételt csak a 6., 8. és 11. Fejezet alapján minősített légijárműre kiadott zajminiősítési dokumentumban kell szerepeltetni.

2.1.18 *17. Tétel A felszállási zajszint a megfelelő mértékegységben a jelen Annex 8 és 10. Fejezete alapján kiadott miniősítés esetén;*

A vonatkozó Fejezet szerint meghatározott felszállási zajszint. Meg kell adnia a zajszint mértékegységét (pl. EPNdB) és a zajszintet a legközelebbi tized dB-ben kell feltüntetnie. E tételt csak a 8. és 10. Fejezet alapján minősített légijárműre kiadott zajminiősítési dokumentumban kell szerepeltetni

2.1.19 *18. Tétel A megfelelésről szóló nyilatozat, tartalmazva a 16. Annex, I. kötetére való pontszám hivatkozást*

Nyilatkozat, miszerint az illető légijármű teljesíti a vonatkozó zaj követelményeket. Hivatkozást kell adni a 16. Annex, I. kötetére. Ezen felül a nemzeti zaj követelményekre vonatkozó hivatkozás is szerepeltethető.

2.1.20 *19. Tétel A zajminősítési dokumentum kiadási dátuma*

A zajminősítő dokumentum kiadásának dátuma.

2.1.21 *20. Tétel A kiadó hivatalnok aláírása*

A zajminősítő dokumentumot kiadó hivatalnok aláírása. Egyéb dolgok is alkalmazhatók, mint például a pecsét, vagy a bélyegző.

2.2 További adatok

2.2.1 Az állam -saját intézledési hatáskörben- a zajminősítő dokumentumban további információt közölhet. Körültekintően kell eljárni, biztosítva, hogy a közölt információ ne legyen összetéveszthető a hivatalos zajminősítési szintekkel. Főként a zajminősítési feltételektől eltérő körülmények között nyert zajszinteket kell kiegészítő zajszint információkként egyértelműen jelezni. A kiegészítő tájékoztatást vagy egy "Megjegyzés" keretbe, vagy külön keretbe kell foglalni. E kereteket ne lássák el számozással - elkerülendő a nem szabvány számozást és lehetőséget adva a számozási rendszer jövőbeni módosíthatóságára. A keret, vagy keretek tartalmazzanak kellő mennyiségű ismertetést, hogy milyen adatról van szó. A lehetséges kiegészítő tájékoztatásra minta példákat a 2.2.2-től 2.2.7-ig terjedő pontok tartalmaznak.

2.2.2 *A kibocsátó hatóság jele és neve*

A felismerés elősegítése érdekében feltüntethető a kibocsátó hatóság jele és neve.

2.2.3 *Zaj korlát értékek*

Ha közlik, akkor a zaj korlát értékeket a vonatkozó zaj követlemények szerint és a legközelebbi tized decibelre kerekítve és a megfelelő egységekben kell megadni. Ha a nemzeti zaj követelmények eltérő (szigorúbb, vagy enyhébb) korlát értékeket alkalmaznak, akkor ezt egyértelműen kell jelezni, továbbá a zavar elkerülése érdekében az ICAO zaj korlát értékeket is fel kell tüntetni.

2.2.4 *Alkalmazott nyelv*

A zajminősítő dokumentumait angoltól eltérő nyelven kiadó állam - a 6. Annex-el egyezésben- biztosítani köteles annak angol nyelvre fordított változatát.

2.2.5 *Hivatkozás a nemzeti követelményekre*

A nemzeti követelményekre hivatkozás a 18. tétellel kombinálható, de kiegészítő külön tételként is megadható.

2.2.6 *A légijármű egyéb módosításai*

A zaj konfiguráció további beazonosíthatósága érdekében a lajstromozó állam döntése alapján megadhatók az 5. Tétel és a 7.-től a 10.-g terjedő Tételekben közöltek szerinti alap légijárműtől eltérő egyéb módosítások is. Megjegyzendő, hogy a dokumentum kiadását képező zaj szabványok teljesítéséhez szükséges bármiféle módosítást a 12. Tételben kell közölni.

2.2.7 *Érvényességi határidő*

Ha a lajstromozó állam a zajminősítő dokumentum érvényességi tartamát korlátozza, akkor a lejárati dátumot meg kell adnia.

2.3 A zajminősítő dokumenrum formája

2.3.1 Tekintettel a sokféle közigazgatási igényre a zajminősítő dokumentálás rendszer terén, három szabvány alternatíva biztosított:

1) Önálló zajbizonyítvány, amely egyetlen doumentumként tartalmazza a 16. Annex I. Kötetében előírt információkat.

2) Két, egymsát kiegészítő dokumentum, melyből az egyik lehet a légijármű repülési kézikönyve (AFM), vagy a légijármű üzemeltetési kézikönyve (AOM).

3) Három, egymást kiegészítő dokumentum.

2.3.2 *I. változat: Egyetlen dokumentum*

Az első változat egy olyan adminisztratív rendszer, amelyben a zaj minősítést igazoló dokumentum egyeten dokumentum formáját öltve tartalmazza a II. Rész 1. Fejezet 1.5 szakaszában nevesített tételeket. Szabvány formáját a G-1 ábra mutatja. Az e formátumot alkalmazó állam ettől eltérhet, amikor ezt nemzeti előírásainak teljesítése szükségessé teszi és/vagy, ha kiegészítő tájékoztatást kíván belefoglalni.

Ettől függetlenül, azonban alapvetően egyeznie kell a G-1 ábrán látottakkal. Megjegyzendő, hogy nem minden tételnek kell szerepelnie minden egyes dokumentumon. Például a 13. Tételtől egészen a 17. Tételig mindegyik nem szerepelhet egy adott zajbizonyítványon, tekintve, hogy egyikük sem alkalmazható minden egyes Fejezetre. Adot légijármű széria számra rendszerint csak egy bizonyítvány adható ki és lehet érvényben egy adott időtartamban. Ha valamely bizonyítvány érvényessége lejárt, azt fel kell függeszteni, vagy újra érvényesíteni kell azért, hogy megelőzzék azt a helyzetet amikor egy légijárműre több zajbizonyítvány is érvényben van. Ha e változatban több dokumentumot adnak ki, legyen mindig könnyen meghatározható, hogy adott időszakban melyik dokumentum érvényes.

2.3.3 *2. Változat Két, egymást kiegészítő dokumentum*

2.3.2.1 A második változat egy olyan adminisztrációs rendszer, amelyben az első dokumentum tanúsítja a zajminősítést, de csak a légijármű azonosságára és a teljesítési nyilatkozatra szorítkozik és csak az 1-től 6-ig és a 18-tól a 20.-ig felsorolt Tételeket tartalmazza a 2.1 szakaszból. Ez szerepelhet egy (korlátozott) terjedelmű zaj bizonyítványban, avagy a légi-alkalmassági bizonyítványban olyan állam esetében, amelyik a zajminősítés követelményeit légi-alkalmassági követelményeik közé sorolják. Az utóbbi esetben, nincs szükség a 18. Tételre (alkalmassági nyilatkozat, meghívatkozva a 16. Annexet), hiszen a teljesítés értelemszerűen adott. A légi-alkalmassági bizonyítványban a tételek számozása a 8. Annexben lévő szabályok szerint történik. Ilyen esetben a 2.1 szakasz megmaradó tételeit egy szabványos kiegészítő zaj minősítő dokumentumba kell áttenni, rendszerint a lajstromozó állam által jóváhagyott AFM, vagy az AOM egy lapjaként, amely formájában lehet nagyon hasonló a 2.3.2 alatt leírt zajbizonyítvány formájához. Ezért, a G-1-ben bemutatott forma egyaránt szolgálhat a kiegészítő dokumentum szabvány formájaként is, mégha egyes tételeire nincs is szükség.

2.3.3.2 Általában e két dolumentum együttesből egy légijárműre csak egyetlen készletet adjanak ki. Ha a zajbizonyítvány érvényét veszti, azt fel kell függeszteni, vagy vissza kell vonni. Ha e változatban több készlet dokumentum kiadása történik, a dokumentációból egyértelműen ki kell tűnnie, hogy az adott időszakban mely dokumentum alkalmazandó.

2.3.4 *3. Változat Három, egymást kiegészítő dokumentum*

2.3.4.1 A harmadik változat egy olyan dokumentációs rendszer, melyben az első dokumentum azonos a 2.3.3.1 pont alatti 2. Változat első dokumentumával. Ez a zajminősítést igazolja és ezért csak a légijármű azonosítására és a megfelelési nyilatkozatra korlátozódik, a 2.1 szakasznak csak 1-től 6-ig és 18-tól 20-ig terjedő Tételeit tartalmazva. Ölthet zajbizonyítvány formát, vagy szerepelhet a légi-alkalmassági bizonyítványban olyan állam esetében, amely a zajminősítési követelményeket légi-alkalmassági követelményeik közé sorolják (a 2. Változatban közöltek figyelembe vételével). A 2.1 szakasz megmaradó tételeit egy második és egy harmadik kiegészítő zaj minősítő dokumentumba kell áttenni.

2.3.4.2 A második dokumentumot rendszerint a lajstromozó állam által jóváhagyott AFM, vagy az AOM egy lapjaként (vagy a következő lapok együtteseként) állítják elő, az oldal (vagy oldalak) kiadási dátumától számítottan felsorolva a légijármű flotta minden üzemi, illetve várható üzemi konfigurációját. E flottába beletartozik az azonos repülési kézikönyv szerint üzemeltett minden légijármű. Formájában lehet nagyon hasonló a 2.3.2 alatt leírt zajbizonyítvány formájához, egy adott konfigurációhoz tartozó összes információ az 5. és a 7.-től a 17.-ig tartó Tételeket öleli fel. A jellemzőket felsoroló mindegyik lista legyen "konfiguráció számozással", például "x"-el azonosítva. Ezért, a G-1-ben bemutatott forma a konfiguráció számmal kiegészített vonatkozó tételszámokat ugyanúgy szolgálhatja.

2.3.4.3 E változatban a harmadik dokumentum a nemzeti szabályozói folyamat szerint kiadott dokumentum. Kinyilvánítja, hogy az adott széria számú légijárművet eme harmadik dokumentum kiadásának időpontjától az "x" számú konfigurációban üzemeltetik. Ha e változatban több készlet dokumentum kiadása történik, a dokumentációból egyértelműen ki kell tűnnie, hogy az adott időszakban mely dokumentum alkalmazandó.

A lajstromozó állam tölti ki	**1. <Lajstromozó állam>**	3. A dokumentum száma:

2. ZAJ BIZONYÍTVÁNY

4. Nemzetiségi és Lajstrom jelek:	5. Gyártó és a légijármű gyártói megnevezése:	6. Légijármű széria szám:

7. Hajtómű:	8. Légcsavar:*

9. Legnagyobb felszálló tömeg: kg	10. Legnagyobb leszálló tömeg: kg	11. Zaj minősítési szabvány:

12. Az alkalmazandó zaj minősítő szabványok teljesítéséhez beépített kiegészítő módosítások:

13. Oldalsó/teljes teljesítmény zajszint:*	14. Megközelítési zajszint:*	15. Átrepülési (flyover) zajszint:*	16. Átrepülési (overflight) zajszint:*	17. Felszállási zajszint:*

Megjegyzések:

18. E zajbizonyítvány kiadása a fenti légijárműre a Nemzetközi Polgári Repülési Egyezmény 16. Annexe I. Kötetének értelmében történt. A fenti légijármű úgy tekinthető, hogy az teljesíti a feltüntetett zaj minősítő szabványokat, amennyiben karbantartása és üzemeltetése a vonatkozó követelmények és üzemeltetési korlátozások betartásával történik. 19. Kibocsátási dátum ………………………… 20. Aláírás………………………………………………..

* E rovat – a zaj minősítő szabvány függvényében – üresen hagyható.

1. G-1 ÁBRA. ZAJBIZONYÍTVÁNY

H FÜGGELÉK HELIKOPTER ZAJ ADATOK BESZERZÉSE FÖLDTERÜLET HASZNOSÍTÁS TERVEZÉSI CÉLOKRA

1. BEVEZETŐ RÉSZ

Az alábbi tájékoztató anyag azon államok számára készült, amelyek zaj minősítési, vagy választás szerinti kiegészítő vizsgálati adatokat szándékoznak alkalmazni föld terület hasznosítás tervezési célokra. Eme tájékoztató anyag célja adatokat szolgálni a helikopter zajhatás határvonalának előrejelzéséhez, illetve támogatni a helikopter repülőterek zajcsökkentő üzemeltetési eljárásainak kidolgozását.

2. ADATGYŰJTÉSI ELJÁRÁS

2.1 Földterület hasznosítás tervezés célokra alkalmas adat közvetlenül származtatható a 8. Fejezet zajmínősítési adatokból. A 8. Fejezet szerinti eljárást kérelmező választhatja, hogy a földterület hasznosítás tervezés céljára is alkalmas adatokat nyerjen a kérelmező által meghatározott és a tanúsító hatóság által elfogadott alternatív felszállási, megközelítési és/vagy átrepülési eljárások alkalmazásával. Az alternatív átrepülési eljárást a repülési pálya referencia pont előtt, 150 méter magasságban kell végrehajtani.

2.2 A 11. Fejezet zajmínősítési adatai biztosíthatnak alkalmas adatokat földterület hasznosítás tervezés célokra. A 11. Fejezet szerinti eljárást kérelmező választhatja, hogy a talaj szintje feletti 150 méter-en végrehajtott alternatív átrepülési eljárás révén a földterület hasznosítás tervezés céljára is biztosít adatokat. A földterület hasznosítás tervezés céljára adat biztosítását vállaló 11. Fejezet szerinti kérelmező fontolja meg, hogy az adatokat a repülési pályától 150 méter oldaltávban szimmetrikusan elhelyezett két kiegészítő mikrofontól és/vagy a kérelmező által meghatározott és a tanúsító hatóság által elfogadott alternatív kiegészítő felszálló- és megközelítési eljárás révén nyerje.

2.3 Földterület hasznosítás tervezés céljára biztosított minden adatot a 8. Fejezet és a 11. Fejezet jóváhagyott eljárásai révén kell a referencia feltételekhez igazítani, illetve alternatív repülési eljárások esetében azt a bizonyítványt kiadó hatóság által jóváhagyott megfelelő korrekciós módszerrel kell elvégezni.

3. ADAT JELENTÉS

3.1 A földterület hasznosítás tervezési célokra biztosított minden adatot a bizonyítványt kiállító hatósághoz jóváhagyásra be kell terjeszteni. A jóváhagyott adatokat és a vonatkozó repülési eljárásokat kiegészítő tájékoztatásként meg kell jeleníteni a helikopter repülési kézikönyvében.

3.2 Javasolt, hogy a földterület hasznosítás céljára biztosított adatokat a jelen kötet 4. Függelékében meghatározottak szerinti átlagos zaj kitettségi szintben (LAE) fejezzék ki minden egyes vizsgálati (repülésre) áthúzásra a repülés iránya szerinti bal oldalvonali, középvonali és jobb oldalvonali mérőpontokra vonatkoztatva. Az előírt zaj vizsgálati elemző eljárással egyeztethető módszerrel beszerzett és egyéb mértékegységben kifejezett további adatok is biztosíthatók.

- VÉGE -

ANNEX 16/II.
Környezetvédelem: Légijármű hajtóművek által okozott légszennyezés

II. kötet 2. kiadás – 1993. július
5. módosítással

E kiadás magában foglalja a 16. Annex a Tanács által 1993. március 25. előtt elfogadott minden módosítását, és 1993. november 11-én a korábbi kiadás helyébe lép.
A szabványok és ajánlott gyakorlatok alkalmazására vonatkozó információkat, lásd az Előszóban, és az egyes Fejezetek vonatkozó záradékaiban.

NEMZETKÖZI POLGÁRI REPÜLÉSI SZERVEZET

ICAO

ELLENŐRZŐ JEGYZÉK A 16. ANNEX II. KÖTETÉNEK MÓDOSÍTÁSAIHOZ

	Hatályosságának dátuma	Alkalmazásának dátuma
Második Kiadás	1993. július 26.	1993. november 11.
3. Módosítás (a Tanács által 1997. március 20-án elfogadva)	1997. március 20.	-
4. Módosítás (a Tanács által 1999 február 26-án elfogadva) Csere lapok (viii), 1, 7 és 8.	1999. július 19.	1999. november 4.
5. Módosítás(a Tanács által február 23-án elfogadva) Csere lapok (iii), (viii), 6, 7, 8, 9-től 11-ig, 23, 24, 26, 35, 43 és 44.	2005 július 11.	2005 november 24.

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.

A Táblázat - a 16. Annex módosításai

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
1. Kiadás	A repülőterek környezetében repülőgép által keltett		1971. Április 2. 1971. Augusztus 2. 1972. Január 6.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva Hatályba lép Alkalmazandó*
	zajjal foglalkozó értekezlet (1969)		
1	A Repülőgép zajbizottság első ülése	Hangsebességnél lassabb, gázturbina sugárhajtóműves repülőgépek jövőbeni és származtatott változatai gyártásának zaj szerinti minősítése, valamint a repülőgép tömeg leírásához használt kifejezések korszerűsítése	1972. december 6. 1973. április 6. 1973. augusztus 16.
2	A repülőgép zajbizottság harmadik ülése	5700 kg és ennél kisebb maximum felszálló tömegű könnyű, légcsavaros repülőgépek és a hangsebességnél lassabb gázturbina sugárhajtóműves repülőgépek zaj szerinti minősítése, valamint útmutató az államok feladatainak teljesítésére repülőgép kölcsönzés, bérlés és csere esetére.	1974. április 3. 1974. augusztus 3. 1975. február 27.
3 (2. Kiadás)	A repülőgép zajbizottság Negyedik ülése	A rövid fel- és leszálló a pálya igényű légijárműtől (STOL) eltérő, jövőbeni hangsebességnél lassúbb gázturbina sugárhajtóműves repülőgépek, és a légcsavaros repülőgépek zaj szerinti minősítési szabványai, valamint útmutató a jövőbeni hangsebességnél gyorsabb repülőgépek, légcsavaros STOL repülő gépek, és fedélzeti segédhajtóművek (APU), és a földön üzemeltetett ezekhez tartozó repülőgép rendszerek zaj szerinti minősítéséhez.	1976. június 21. 1976. október 21 1977. október 6.
4 (3. kiadás)	A repülőgép zajbizottság 5. ülése	Egy új paraméter, a hajtóművek száma bevezetése a hangsebességnél lassabb gázturbina sugárhajtómű-	1978. március 6. 1978. július 6. 1978. augusztus 10.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva Hatályba lép Alkalmazandó*
		ves légijárművek szabványaiba; tökéletesítések a részletes vizsgálati módszerekben annak biztosítására, hogy azonos műszaki szintet alkalmazzanak az összes légi jármű típusra; - valamint kiadói változtatások a nyelvezet egyszerűsítésére, és a következetlenségek kiküszöbölésére.	
5 (16. Annex I. Kötet, 1. Kiadás)	A repülőgép zajbizottság 6. ülése	1) Az Annex új elnevezése Környezetvédelem és kiadása az alábbi két kötetben: I. kötet Repülőgép zaj (felölelve a 16. Annex 3. kiadásának előírásait, ahogy azt az 5. módosítás változtatta) és I. kötet, Légijárművek által kibocsátott szennyező anyagok 2) I. kötet kiegészítése a helikopterekkel, és a már meglévő hangsebességnél gyorsabb szállító légijárművek (SST) jövőbeni gyártásával kapcsolatos zaj szerinti minősítési szabványokkal; a fedélzeti segédhajtóművek (APU), és a kapcsolódó repülőgép rendszerek zaj szerinti minősítési irányelveinek napra késszé tétele; és kiadói mósítások, ideértve a mértékegységek megváltoztatását, az Annexet, egységesítve az 5. Annex előírásaival összhangban.	1981. május 11. 1981.szeptember 11. 1981. november 26.
6 (16. Annex II. Kötet, 1. kiadás)	A légijármű hajtómű szennyező- dés kibocsátási bizottság 2. ülése	A II. Kötet bevezetése az újonnan gyártott hangsebesség feletti és hangsebesség alatti repülésre szolgáló gázturbina sugárhajtóművek, és ventillátor gázturbina sugár-	1981. június 30. 1981. október 30. 1982. február 18.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
		hajtóművek által kibocsátott tüzelőanyag, füst és gáznemű szennyező anyagok ellenőrzésére vonatkozó szabványok befogadására.	
1	A repülés Környezet-védelmi bizottság első ülése	A vizsgálati eljárásnál használandó tüzelőanyag jellemzőinek módosítása, 4. Függelék.	1988. március 4. 1988. július 31. 1988. november 17.
2 (Második kiadás)	A repülés környezet-bizottság második ülése	a) Az NO_x kibocsátási korlát érték további szigorítása; b) A füst és gáznemű anyag kibocsátás minősítő eljárás tökéletesítése.	1993. március 24. 1993. július 26. 1993. november 11.
3	A repülés Környezet-Védelmi bizottság harmadik ülése	a 3. és az 5. Függelékben szereplő kalibrációs és vizsgálati gázokra vonatkozó kritériumok módosítása	1997 március 20. 1997 március 20.
4	A repülés Környezet-Védelmi bizottság negyedik	Az NO_x kibocsátás korlátértékének fokozott szigorítása	1999 február 26 1999 július 19 1999 november 4
5	A repülés Környezet-Védelmi bizottság negyedik ülése	Az NO_x kibocsátási szabványok fokozott szigorítása	2005 február 23 2005 július 11 2005 november 24

TARTALOMJEGYZÉK

3. Függelék.	A gáznemű anyagok kibocsátásának mérési eljárásai és műszerei
	1. Bevezető rész
	2. Meghatározások
	3. Szükséges adatok
	4. A rendszer általános elrendezése
	5. A részegységek leírása
	6. Általános vizsgálati eljárások
	7. Számítások
A-Melléklet a 3. Függelékhez	HC elemző készülék műszaki követelményei
B-Melléklet a 3. Függelékhez	CO és a CO2 elemző készülékek műszaki követelményei
C-Melléklet a 3. Függelékhez	NOx elemző készülék műszaki követelményei
D-Melléklet a 3. Függelékhez	Kalibráláshoz és vizsgálatokhoz alkalmazott gázok
E-Melléklet a 3. Függelékhez	Alap, mérések korrigálása és alternatív numerikus módszer
F-Melléklet a 3. Függelékhez	Kiegészítő adatokra vonatkozó követelmények
4. Függelék	A légijármű gázturbina hajtóművei légszennyezésének vizsgálatainál alkalmazandó tüzelőanyagra vonatkozó műszaki követelmények
5. Függelék	Az utánégetővel rendelkező gázturbina hajtóművek, gáznemű anyag kibocsátására alkalmazandó műszerek és mérési módszerek
	1. Bevezető rész
	2. Fogalom meghatározások
	3. Szükséges adatok
	4. A rendszer általános elrendezése
	5. A részegységek leírása
	6. Általános vizsgálati eljárások
	7. Számítások

A-Melléklet az 5. Függelékhez	HC analizátor műszaki leírása
B-Melléklet az 5. Függelékhez	CO és a CO2 analizátorok műszaki követelményei
C-Melléklet az 5. Függelékhez	NOx analizátorok műszaki követelményei
D-Melléklet az 5. Függelékhez	Kalibráláshoz és vizsgálatokhoz alkalmazott gázok
E-Melléklet az 5. Függelékhez	A légszennyezési paraméterek számítása - alap mérések korrigálása és alternatív mumerikus módszer
F-Melléklet az 5. Függelékhez	Kiegészítő adatokra vonatkozó követelmények
6. Függelék	Gáznemű anyagok és füst kibocsátás elfogadhatóságának vizsgálati eljárása
	1. Bevezető rész
	2. Teljesítési eljárás
	3. Eljárás sikertelenség esetén

ELŐSZÓ

Történeti áttekintés

Az Egyesült Nemzetek emberi környezettel kapcsolatos konferenciáját, 1972-ben Stockholmban tartották meg. Az ICAO e konferencián képviselt álláspontja az A 18-11-es határozatában öltött testet, amely többek között a következő cikkelyt tartalmazta:
„2. Eleget téve eme feladatának, az ICAO tudatában van, hogy a repülőtevékenység összefüggésbe hozható a káros környezeti hatásokkal, tudatában van ezirányú felelősségének, és azon felelősségének, hogy szerződő államai a lehető legnagyobb fokú összeegyeztethetőséget valósítsák meg a polgári repülés biztonságos és megfelelő fejlesztése, illetve az emberi környezet védelme között.”

A környezet védelmével kapcsolatban a 18. Közgyülés elfogadta a 18-22 számú határozatot is, amely megállapítja:
„A KÖZGYŰLÉS:

1. Felkéri a Tanácsot, hogy a Szervezet más testületeinek és egyéb nemzetközi szervezetek közreműködésével, és együttműködésével nyomatékkal folytassá az emberi környezet védelmének minőségi fejlesztésével kapcsolatos szabványok, ajánlott gyakorlatok és eljárások és/vagy útmutatások kialakítására irányuló munkát;”

E határozatot követte az ICAO környezetvédelmi akció programjának kidolgozása. Az akció program részeként a légijármű hajtóművek által okozott légszennyezés témakörben a Titkárságot bizonyos feladatokban segítő tanulmányozó csoportot állítottak fel.

A munkacsoport munkájának eredményeképp, 1977-ben napvilágot látott az ICAO „légijármű hajtóművek által kibocsátott szennyező anyagok korlátozása - Control of Aircraft Engine Emissions” című (Circular 134) körlevele. A körlevél egyfajta minősítési eljárás formájában tartalmazott útmutató anyagot a hangsebesség alatti meghajtáshoz szánt új gázturbina sugárhajtóművek és ventillátoros gázturbina hajtóművek által kibocsátott füst és bizonyos gáznemű anyagok, illetve a tüzelőanyag levegőbe bocsátásának korlátozására.

A Tanács egyetértett abban, hogy a légijármű hajtóművek által keltett légszennyezés témája nem szorítkozhat kizárólag tárgyilagos műszaki kérdésekre, sőt a téma több terület szakértőinek vizsgálatát, valamint a szerződő államok ezzel kapcsolatos közvetlen állásfoglalását igényli. A téma különféle vonatkozásainak kidolgozására 1977-ben megalapították a Tanácshoz tartozó, Légijármű Hajtómű Szennyeződés Kibocsátási Bizottság (Committee on Aircraft Engine Emissons - CAEE) néven ismert bizottságot.

A légijármű hajtómű szennyeződés kibocsátási bizottság 1980. májusi 2.-i ülésén egy ICAO Annexbe foglalandó anyagra tett javaslatot. A Szervezet szerződő államaival folytatott szokásos konzultációt követő módosítás után, a Tanács elfogadta, hogy a javasolt anyag legyen e dokumentum szöveg anyaga. A Tanács egyetértett azzal a kívánalommal, hogy a repüléssel kapcsolatos összes környezetvédelmi rendelkezést egy Annex foglalja magába. Ezért a 16-os Annex-nek „Környezetvédelem” címmel új nevet adtak és a meglévő szöveg „I. Kötet – Repülőgép zaj” címet kapta, míg a jelen anyagot tartalmazó dokumentumnak a „II. Kötet – Légijármű hajtóművek által okozott légszennyezés” címet adta.

Alkalmazási követelmények

A 16. Annex II. kötetének I. része, fogalom meghatározásokat és jelöléseket tartalmaz, míg a II. rész a levegőbe juttatott üzemanyaggal kapcsolatos szabványokat tartalmaz. A III.rész pedig, a III.rész egyes fejezeteiben meghatározott légijármű hajtómű-osztályok esetében alkalmazandó szennyező anyag kibocsátás minősítésére vonatkozó szabványoknak ad helyet, arra az esetre, ha az illető hajtóművet a nemzetközi polgári repülésben résztvevő légijárműre építik fel.

A szerződő állam feladatai

Eltérések bejelentése. A szerződő állam figyelmét felhívjuk az Egyezmény 38. cikkelye által előírt kötelezettségére, amelynek értelmében a szerződő állam a Szervezetet értesíteni köteles a saját nemzeti szabályzata és eljárása, illetve a jelen Annex-ben szereplő nemzetközi szabványok és a hozzájuk készült bármiféle módosítás között fennálló minden eltérésről. Felkérik a szerződő államot, hogy az ilyen értesítést terjessze ki a jelen Annex-ben szereplő ajánlott eljárásokra és bármely további módosítására vonatkozó eltérésekre is, ha az eltérések bejelentése a repülés biztonsága szempontjából fontos. Ezen kívül felkérjük a szerződő államot, hogy a szervezetet folyamatosan tájékoztassa a későbbiekben esetleg keletkező eltérésekről, illetve a korábbiakban közölt bármely eltérés megszűnéséről. Jelen Annex módosításainak elfogadását követően azonnal, a szerződő államhoz külön kérelmet juttatunk el az eltérések bejelentésére. Az állam figyelmét felhívjuk a 15. Annex rendelkezésére is, miszerint az Egyezmény 38. cikkelyéből fakadó kötelezettségén felül a nemzeti szabályzat és gyakorlat, illetve a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket Légiforgalmi Tájékoztató Szolgálata révén is közzé kell tennie.

Az Annex szövegének felhasználása a nemzeti szabályzatokban

A Tanács 1948. április 13-án határozatot fogadott el, felhívva benne a szerződő államok figyelmét arra, hogy előnyös lenne, ha saját nemzeti szabályzataikban a lehető legnagyobb mértékben alkalmaznák a szabályozó jellegű ICAO szabványok szabatos szövegezését és a szabályoktól való eltérések jellemzésére is ezt a szövegezést alkalmaznák, beleértve minden olyan további nemzeti szabályt is, amely a légiközlekedés biztonsága, vagy rendszeressége szempontjából lényeges. Mindenütt, ahol lehetséges volt, a jelen Annex előírásait a lehető legteljesebb mértékben úgy szövegeztük, hogy a nemzeti jogszabályok szövegébe történő átvételük nagyobb szövegváltoztatások nélkül váljék lehetővé.

Az Annex részeinek jogállása

Az Annex-ek a következő részekből állnak, amelyek közül azonban nem mindegyik található meg feltétlenül az összes Annex-ben:

Jogi helyzetüket az alábbi felsorolás adja meg:

1. – *Az Annex alapját képező anyag:*

a) Az Egyezmény értelmében a Tanács által elfogadott szabványok és ajánlott gyakorlatok. Meghatározásuk az alábbi:

Szabvány: Fizikai jellemzőre, alakzatra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó bármely előírás, amely egységes alkalmazásának szükségessége a nemzetközi légiközlekedés biztonsága, vagy rendszeressége érdekében elismert és amelyhez a szerződő állam az Egyezmény értelmében igazodik; illetve, ha az igazodás nem lehetséges, akkor az eltérésről a 38. cikkely értelmében köteles a Tanács értesíteni.

Ajánlott gyakorlat: Fizikai jellemzőre, alakzatra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó bármely előírás, amelynek egységes alkalmazása elismerten kívánatos a nemzetközi légiközlekedés biztonsága, rendszeressége, vagy hatékonysága érdekében és amelynek betartására a szerződő állam az Egyezmény értelmében törekedni fog.

b) *Függelék:* az áttekinthetőség érdekében külön csoportosított, de a Tanács által jóváhagyott szabványok és ajánlott gyakorlatok részét nem képező anyag.

c) *Előírás:* A szabványok és ajánlott gyakorlatok érvényességi területét szabályozó szöveg részek.

d) *Fogalom meghatározások:* A szabványokban és ajánlott gyakorlatokban alkalmazott általánosan elfogadott, önálló szótári jelentés híjján önmagában nem értelmezhető fogalmak magyarázata. A fogalom meghatározások önálló joghelyzettel nem rendelkeznek, de minden szabványnak és ajánlott gyakorlatnak -amelyben szerepelnek- lényeges részei, tekintve, hogy a kifejezés jelentésének megváltoztatása hatással van az illető szabványra, illetve ajánlott gyakorlatra.

2. – *A Tanács által a szabványokkal és ajánlott gyakorlatokkal együttes közzétételre jóváhagyott anyagok:*

a) *Előszó*: Ez a Tanács ténykedésére alapozott történeti előzményeket és magyarázó anyagot tartalmaz, illetve magyarázatot szolgáltat az államok -Egyezményből és az elfogadási határozatból fakadó- kötelemeire a szabványok és ajánlott gyakorlatok átvétele tekintetében.

b) *Bevezető rész*: az Annex részeinek, fejezeteinek vagy bekezdéseinek elején található és a szöveg alkalmazásának megértését segítő magyarázó anyag.

c) *Megjegyzés*: szövegen belül megfelelő helyeken elhelyzett és a szabványok és ajánlott gyakorlatokhoz tényszerű információt, vagy hivatkozást közlő anyag , de amely nem képezi a szabványok, illetve ajánlott gyakorlatok részét.

d) *Melléklet:* a szabványok és ajánlott gyakorlatoknak kiegészítő anyagát képező, vagy a felhasználásukhoz útmutatást nyújtó anyag.

A nyelv kiválasztása

Jelen Annex-et négy nyelven fogadták el – angol, francia, orosz és spanyol. Felkérjük a szerződő államot, hogy a nemzeti bevezetés céljára, illetve az egyezményben előírt egyéb feladatok megvalósítására ezek közül egyet válasszon ki közvetlen használatra, vagy a nemzeti nyelvre történő lefordítás alapjául és, hogy a szervezetet ennek megfelelően értesítse.

Szerkesztői gyakorlat

Annak érdekében, hogy minden alkotórész jogállása első pillantásra szembetűnjön, az alábbi gyakorlatot alkalmaztuk: a *szabványokat* vékony álló betűkkel nyomtattuk, az *ajánlott gyakorlatokat* vékony dőlt betűkkel nyomtattuk. Az ajánlás esetében a jogállást vastag álló betűvel szedett **Ajánlás** szóval jeleztük. A *megjegyzések*et vékony dőlt betűvel szedtük, jogállásukat a dőlt betűvel szedett *Megjegyzés* címszó jelzi.

Az angol szövegben a követelmények leírásánál az alábbi szerkesztői gyakorlatot követtük: a szabványok esetében a kell (shall) és az ajánlott eljárásokban pedig a szükséges (should) szavakat alkalmaztuk.

Az 5. Annex-nek megfelelően, mértékegységként a Nemzetközi Mértékegség Rendszer (SI) használatos e dokumentum teljes egészében.

A jelen dokumentum bármely részére, számmal történő hivatkozás magába foglalja az adott rész minden alpontját is.

A Táblázat – 16. Annex módosításai

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
1. Kiadás	A repülőterek környezetében repülőgép által keltett zajjal foglalkozó különleges értekezlet (1969)		1971. április 2. 1971. augusztus 2. 1972. január 6.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
1	A Repülőgép Zajbizottság első ülése	Hangsebességnél lassabb, gázturbina sugárhajtóműves repülőgépek jövőbeni és származtatott változatai gyártásának zaj szerinti minősítése, valamint a légijármű tömeg leírásához használt meghatározás korszerűsítése	1972. december 6 1973. április 6. 1973. augusztus 16.
2	A Repülőgép Zajbizottság harmadik ülése	5700 kg és ennél kisebb maximum felszálló tömegű könnyű, légcsavaros repülőgépek és a hangsebességnél lassabb gázturbina sugárhajtóműves repülőgépek zaj szerinti minősítése, valamint útmutató az államok feladatainak teljesítésére repülőgép kölcsönzés, bérlés és csere esetére.	1974. április 3. 1974. augusztus 3. 1975. február 27.
3 (2. Kiadás)	A Repülőgép Zajbizottság negyedik ülése	A rövid fel- és leszálló pálya igényű légijárműtől (STOL) eltérő, jövőbeni hangsebességnél lassúbb gázturbina sugárhajtóműves repülőgépek, és a légcsavaros repülőgépek zaj szerinti minősítési szabványai, valamint útmutató a jövőbeni hangsebességnél gyorsabb repülőgépek, a légcsavaros STOL repülőgépek, a fedélzeti segédhajtóművek (APU) és a földön üzemeltetett, ezekhez tartozó repülőgép rendszerek zaj szerinti minősítéséhez.	1976. június 21. 1976. október 21. 1977. október 6.
4 (3. kiadás)	A repülőgép zajbizottság 5. ülése	Egy új paraméter, a hajtóművek száma bevezetése a hangsebességnél lassabb gázturbina sugárhajtóműves repülőgépek szaványaiba; tökéletesítések a részletes vizsgálati módszerekben annak biztosítására, hogy azonos műszaki szintet alkalmazzanak az összes légijármű típusra; valamint kiadói változtatások a nyelvezet egyszerűsítésére, és a következetlenségek kiküszöbölésére.	1798. március 6. 1978. július 6. 1978. augusztus 10.
5 (16. Annex I. Kötet, 1. Kiadás)	A repülőgép zajbizottság 6. ülése	1) Az Annex új elnevezése környezetvédelem, és kiadása az alábbi két kötetben: I. Kötet Légijármű zaj (felölelve a 16. Annex 3. kiadásának előírásait, ahogy azt az 5. módosítás változtatta) és II. kötet, Légijármű hajtóművek által okozott légszennyezés. 2) I. Kötet kiegészítése a helikopterekkel, és a már meglévő hangsebességnél gyorsabb szállító repülőgépek (SST) jövőbeni	1981. május 11. 1981. szeptember 11. 1981. november 26.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
		gyártásával kapcsolatos zaj szerinti minősítési szabványokkal; a fedélzeti segédhajtóművek (APU), és a kapcsolódó légijármű rendszerek zaj szerinti minősítési irányelveinek napra késszé tétele; és kiadói módosítások, ideértve a mértékegységek megváltoztatását, az Annexet összhangba hozva az 5. Annex előírásaival.	
6 (16. Annex II. Kötet, 1. kiadás)	A légijármű hajtómű szennyeződés kibocsátási bizottság 2. ülése	A II. Kötet bevezetése az újonnan gyártott hangsebesség feletti és hangsebesség alatti repülésre szolgáló gázturbina sugárhajtóművek, és ventillátor gázturbina sugárhajtóművek által kibocsátott tüzelőanyag, füst és gáznemű szennyező anyagok ellenőrzésére vonatkozó szabványok befogadására.	1981. június 30. 1981. október 30. 1982. február 18.
1	A Repülés környezetvédelmi bizottság első ülése	A vizsgálati eljárásnál használandó tüzelőanyag jellemzőinek módosítása, 4. Függelék.	1988. március 4. 1988. július 31. 1988. november 17.
2 (Második kiadás)	A repülés környezetvédelmi bizottság második ülése	a) Az NO_x kibocsátási korlát érték további szigorítása; b) A füst és gáznemű anyag kibocsátás minősítő eljárás tökéletesítése.	1993. március 24. 1993. július 26. 1993. november 11.
3	A repülés környezetvédelmi bizottság harmadik ülése	A 3. és az 5. függelékben szereplő kalibrációs és vizsgálati gázokra vonatkozó kritériumok módosítása	1997. március 20. 1997. március 20.
4	A repülés környezetvédelmi bizottság negyedik ülése	Az NO_x kibocsátás korlátértékének fokozott szigorítása	1999. február 20. 1999. július 19. 1999. november 4.
5	A repülés környezetvédelm bizottság negyedik ülése	Az NO_x kibocsátás korlátértékénel fokozott szigorítása	2005 február 23 2005 július 11 2005 november 24

TARTALOMJEGYZÉK

FÜGGELÉKEK	
1. Függelék	A referencia nyomásviszony mérése
	1. Általános rész
	2. Mérés
2. Függelék	A füst kibocsátás értékelése
	1. Bevezető rész és meghatározások
	2. A füst kibocsátás mérése
	3. A füst - szám számítása a mérési adatok alapján .
	4. A légialkalmassági bizonyítványt kiadó hatóság számára közlendő adatok
3. Függelék.	A gáznemű anyagok kibocsátásának mérési eljárásai és müszerei
	1. Bevezető rész
	2. Meghatározások
	3. Szükséges adatok
	4. A rendszer általános elrendezése
	5. A részegységek leírása
	6. Általános vizsgálati eljárások
	7. Számítások
A-Melléklet a 3. Függelékhez	HC elemző készülék müszaki követelményei
B-Melléklet a 3. Függelékhez	CO és a CO2 elemző készülékek műszaki követelményei
C-Melléklet a 3. Függelékhez	NOx elemző készülék műszaki követelményei
D-Melléklet a 3. Függelékhez	Kalibráláshoz és vizsgálatokhoz alkalmazott gázok
E-Melléklet a 3. Függelékhez	Alap, mérések korrigálása és alternatív numerikus módszer
F-Melléklet a 3. Függelékhez	Kiegészítő adatokra vonatkozó követelmények
4. Függelék	A légijármű gázturbina hajtóművei légszennyezésének vizsgálatainál alkalmazandó tüzelőanyagra vonatkozó műszaki követelmények

5. Függelék	Az utánégetővel rendelkező gázturbina hajtóművek, gáznemű anyag kibocsátására alkalmazandó műszerek és mérési módszerek
	1. Bevezető rész
	2. Fogalom meghatározások
	3. Szükséges adatok
	4. A rendszer általános elrendezése
	5. A részegységek leírása
	6. Általános vizsgálati eljárások
	7. Számítások
A-Melléklet az 5. Függelékhez	HC analizátor műszaki leírása
B-Melléklet az 5. Függelékhez	CO és a CO2 analizátorok műszaki követelményei
C-Melléklet az 5. Függelékhez	NOx analizátorok műszaki követelményei
D-Melléklet az 5. Függelékhez	Kalibráláshoz és vizsgálatokhoz alkalmazott gázok
E-Melléklet az 5. Függelékhez	A légszennyezési paraméterek számítása - alap mérések korrigálása és alternatív mumerikus módszer
F-Melléklet az 5. Függelékhez	Kiegészítő adatokra vonatkozó követelmények
6. Függelék	Gáznemű anyagok és füst kibocsátás elfogadhatóságának vizsgálati eljárása
	1. Bevezető rész
	2. Teljesítési eljárás
	3. Eljárás sikertelenség esetén

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT ELJÁRÁSOK

I. RÉSZ – MEGHATÁROZÁSOK ÉS JELÖLÉSEK

1. FEJEZET – FOGALOM MEGHATÁROZÁSOK

Ezen Annex II. Kötetében ahol a következő kifejezések szerepelnek, ott azok jelentése az alábbi:

Utánégetés. (Afterburning) Hajtómű üzemmód, amely esetében teljesen, vagy részlegesen szennyezett levegővel táplált égető rendszert alkalmaznak.

Megközelítési szakasz. (Approach phase) Azon időtartammal meghatározott, üzemeltetési szakasz, amely alatt a hajtóművet megközelítési üzemmódban működtetik.

Emelkedési szakasz. (Climb phase) Azon időtartammal meghatározott üzemeltetési szakasz, amely alatt a hajtóművet emelkedési üzemmódban működtetik.

Gyártási időpont. (Date of manufacture) Azon dokumentum kibocsátásának időpontja, amely igazolja, hogy az adott hajtómű típus követelményeinek a kérdéses légijármű, vagy hajtómű megfelel, illetve egy egyenértékű dokumentum dátuma.

Származtatott változat. (Derivative version) Az eredetileg típus alkalmassági bizonyítványt kapott hajtómű generáció családjához tartozó és a hajtómű mag és az égőkamra alapvető kialakítását megőrző gázturbina hajtómű és, amely tekintetében a bizonyítványt kiállító hatóság megállapította, hogy az egyéb tényezőkben nincs változás.

Megjegyzés. – Felhívjuk a figyelmet a 16. Annex I. Kötetében található „derived version of aircraft" „átalakított légijármű változat" meghatározás, illetve az ebben a kötetben található „derivative version" „származtatott változat" meghatározás közötti különbségre.

Nitrogén oxidok. (Oxides of nitrogen) A gázminta által tartalmazott nitrogénoxid és nitrogén dioxidok összege, amelynek számítása azt feltételezve történik, hogy a nitrogénoxid a mintában nitrogén dioxid formájában található.

Hitelesített kimenő teljesítmény. (Rated output) Hajtómű által kibocsátott anyagok céljából: a felszálláshoz normál NEL tengerszinti statikus üzemeltetési körülmények között a bizonyítványt kiállító hatóság szerint víz befecskendezése nélkül rendelkezésre álló a maximum teljesítmény, vagy tolóerő. A tolóerőt kilonewtonban fejezik ki.

Referencia nyomásviszony. (Reference pressure ratio) A kompresszor utolsó fokozatának kimenő síkjában lévő teljes nyomás átlag értékének és a kompresszor első fokozatának bemenő síkjában lévő teljes nyomás átlag értékének viszonya, miközben a hajtómű a Nemzetközi Egyezményes Légkör tengerszintre vonatkozó statikus állapotának megfelelő feltételek mellett, felszálló tolóerőt fejt ki.

Megjegyzés. – A nyomásviszony mérésének eljárásait az 1. számú függelék tartalmazza.

Füst. (Smoke) A hajtóműből kibocsátott anyagokban lévő széntartalmú és a fény áthatolását akadályozzó anyagok.

Füst-szám. (Smoke number) Mértékegység nélküli szám a füst kibocsátás jellemzésére. (Lásd 2. függelék 3. pontját).

Felszállási szakasz. (Take-off phase) Azon időtartam által meghatározott repülési szakasz, amely alatt a hajtómű hitelesített kimenőteljesítménnyel üzemel.

Gurulás/földi alapgáz. (Taxi/ground idle) A guruló és a földi alapgáz üzemmódot a hajtóművek indításától a felszálláshoz végzett nekifutás kezdetéig, illetve a futópályáról való legurulástól a hajtómű(vek) teljes leállásig terjedő szakaszt magába foglaló üzemelési szakasz.

El nem égetett szénhidrogének. (Unburned hydrocarbons) A gázmintában lévő bármi nemű és különféle molekula súlyú szénhidrogén vegyületek össz-mennyisége, arra a feltételezésre alapozva, hogy ezek a mintában metán formájában fordulnak elő.

2. FEJEZET – JELÖLÉSEK

Ahol ezen Annex II. kötetében a következő jelölések szerepelnek, ott azok jelentése az alábbi:

CO Szénmonoxid

D_p A kibocsátási referencia leszállási és felszállási szakasz közben kibocsátott bármely gáznemű szennyező anyag tömege

F_n A Nemzetközi Egyezményes Légkör tengerszintre vonatkozó állapotának megfelelő tolóerő, adott üzemmódban.

F_{00} Hitelesített teljesítmény (lásd a fogalom meghatározást).

F^*_{00} Hitelesített teljesítmény utánégetés alkalmazásával.

HC El nem égetett szénhidrogének (lásd a fogalom meghatározást)

NO Nitrogénoxid

NO_2 Nitrogén dioxid

NO Nitrogén oxidok (lásd a fogalom meghatározást)

SN Füst-szám (lásd a fogalom meghatározást)

π_{00} Referencia nyomásviszony (lásd a fogalom meghatározást)

II. RÉSZ
AZ ÜZEMANYAG LEVEGŐBE TÖRTÉNŐ KIBOCSÁTÁSA

1. FEJEZET

ÜGYVITELI RÉSZ

1.1 Az 1.2 - 1.4 rendelkezéseit a 2. és 3. Fejezetben szennyeződés kibocsátás minősítési célokból meghatározott osztályozásban szereplő minden olyan hajtóműre alkalmazni kell, amely hajtóműveket a nemzetközi léginavigációban résztvevő légi-járművekre szerelnek fel.

1.2 A szennyezőanyag kibocsátásra vonatkozó minősítést, a légi-alkalmassági bizonyítványt kiadó hatóság adja ki, olyan elegendő bizonyítékok alapján, amelyek azt igazolják, hogy az adott hajtómű megfelel a követelményeknek, amelyek szigorúságra nézve, egyenlőek ezen Annex II. Kötetében lefektetett előírásokkal. A 2. és a 3. Fejezetben leírt szennyeződés kibocsátási szintek teljesítése, a 6. Függelékben leírt eljárás felhasználásával kell bemutatni.

Megjegyzés. - A szennyeződés kibocsátás minősítésre vonatkozó bizonylat, lehet egy, a szennyeződés kibocsátás minősítésre vonatkozó külön bizonylat, vagy megfelelő hivatkozás a légi-alkalmassági bizonyítványt kiadó hatóság által jóváhagyott egy másik dokumentumban.

1.3 Az egyes hajtóművek egyéni szennyeződés kibocsátás minősítését bizonyító dokumentumnak legalább a következő információt kell tartalmaznia az adott hajtóműre vonatkozóan:

a) A légialkalmassági bizonyítványt kiadó hatóság neve;

b) A gyártó típus- és modell megnevezése;

c) A szennyeződés kibocsátás minősítési követelményeknek megfelelés céljából tett bármiféle kiegészítő módosításra vonatkozó bejegyzés;

d) Hitelesített teljesítmény;

e) Referencia nyomásviszony;

f) A füst- számra vonatkozó követelmények betartásáról szóló nyilatkozat;

g) A gáznemű szennyező anyagokra vonatkozó követelmények betartásáról szóló nyilatkozat.

1.4 A szennyeződés kibocsátásra vonatkozó, valamely más szerződő állam légi-alkalmassági bizonyítványt kiadó hatósága által kiadott minősítést a szerződő államok kötelesek érvényesnek elismerni olyan feltételek mellett, hogy a minősítés alapjául alkalmazott követelmények legalább olyan szigorúak, mint a jelen Annex II. Kötetében lefektetett előírások.

2. FEJEZET

ÜZEMANYAG LEVEGŐBE TÖRTÉNŐ SZÁNDÉKOS KIBOCSÁTÁSÁNAK MEGELŐZÉSE

A légijárművet úgy kell megtervezni és kialakítani, hogy elejét vegyék a folyékony üzemanyagnak az üzemanyag elosztó fővezetékből szokványos repülést, vagy földi üzemelést követő hajtómű leállítási folyamatból fakadó levegőbe történő kibocsátását.

III. RÉSZ
A SZENNYEZŐDÉS KIBOCSÁTÁSRA VONATKOZÓ MINŐSÍTÉS

1. FEJEZET

ÜGYVITELI RÉSZ

1.1 Az 1.2–1.4 rendelkezéseit a 2. és 3. fejezetben szennyeződés kibocsátás minősítési célokból meghatározott osztályozásban szereplő és a nemzetközi repülésben résztvevő légijárműre felépített minden hajtóműre alkalmazni kell.

1.2 A szennyezőanyag kibocsátásra vonatkozó minősítést a bizonyítványt kiállító hatóság olyan elegséges bizonyítékok alapján adja ki, amelyek igazolják, hogy az adott hajtómű megfelel a szigorúságát tekintve a jelen Annex II. Kötetében lefektetett előírásoktól nem enyhébb követelményeknek. A 2. és a 3. fejezetben leírt szennyeződés kibocsátási szintek teljesítését a 6. Függelékben leírt eljárást alkalmazva kell bemutatni.

Megjegyzés. – A szennyeződés kibocsátás minősítést tanúsító bizonyítvány, lehet egy, a szennyeződés kibocsátás minősítésre vonatkozó külön bizonyítvány, vagy egy megfelelő hivatkozás a bizonyítványt kiadó hatóság által jóváhagyott egy másik dokumentumban.

1.3 Az egyes hajtóművek egyéni szennyeződés kibocsátás minősítését bizonyító dokumentumnak legalább a következő információt kell tartalmaznia az adott hajtóműre vonatkozóan:

a) A bizonyítványt kiadó hatóság neve;

b) A gyártó típus- és modell megnevezése;

c) A szennyeződés kibocsátás minősítési követelményeknek megfelelés céljából tett bármiféle kiegészítő módosításra vonatkozó bejegyzés;

d) Hitelesített kimenő teljesítmény;

e) Referencia nyomásviszony;

f) A füst-számra vonatkozó követelmények betartását közlő nyilatkozat;

g) A gáznemű szennyező anyagokra vonatkozó követelmények betartását közlő nyilatkozat.

1.4 A szerződő állam érvényesként fogadja el a másik szerződő állam bizonyítványt kiállító hatósága által a szennyeződés kibocsátásról kiadott minősítést, ha a minősítés alapjául alkalmazott követelmények legalább olyan szigorúak, mint a jelen Annex II. Kötetében lefektetett előírások.

2. FEJEZET
A HANGSEBESSÉGNÉL LASSABB REPÜLÉSRE SZOLGÁLÓ GÁZTURBINA SUGÁRHAJTÓMŰVEK ÉS VENTILLÁTOR GÁZTURBINA HAJTÓMŰVEK

2.1 Általános rész

2.1.1 Alkalmazási követelmények

E Fejezet rendelkezéseit kell alkalmazni a 2.2 és 2.3-ban, további részletességgel meghatározott minden olyan gázturbina sugárhajtóműre és ventillátor gázturbina sugárhajtóműre, amely rendeltetése csak hangsebesség alatti hajtás biztosítása. Ez alól kivétel az az eset, amikor a bizonyítványt kiállító hatóság felmentést ad a következőkre:

a) olyan meghatározott hajtómű típusra, és az ilyen hajtómű módosított változatára, amelyre 1965. január 1-e előtt kiadták az első alaptípus típus alkalmassági bizonyítványát, illetve egyéb, egyenértékű előírt eljárást hajtottak végre; és

b) a 2.2 és a 2.3-ban meghatározott alkalmazási dátum utáni egyedi gyártmányú, korlátozott számú hajtóművekre.

2.1.1.2 Ilyen esetben, a légi-alkalmassági hatóság részéről kivételt alátámasztó dokumentumot kell kiadni, a hajtómű azonosító lemezén „EXEMPT” (felmentett) jelzést kell feltüntetni és a felmentés megadásának tényét a hajtómű állandó nyilvántartásába be kell vezetni.

2.1.1.3 E Fejezet rendelkezéseit kell alkalmazni az olyan célra készített hajtóművekre, amely célokat egyébként gázturbina sugárhajtómű, vagy ventillátor gázturbina hajtómű teljesítene.

Megjegyzés. - A kivételek kérdésének vizsgálatánál, a légi-alkalmassági bizonyítványt kiadó hatóságnak figyelembe kell vennie a gyártandó ilyen hajtóművek valószínű mennyiségét, és azok környezetre gyakorolt hatását. Ha ilyen kivételre sor kerül, akkor a légialkalmassági bizonyítványt kiadó hatóság fontolja meg az új légijárművekbe, vagy meglévő légi-járműre tartalékként - beépítendő ilyen hajtóművek jövőbeni gyártásának időbeni korlátozását.

2.1.2 Kibocsátott szennyeződés fajták

A légijárművek hajtóműveinek minősítése szempontjából a következő szennyező anyag kibocsátást kell ellenőrizni:

Füst

Gáznemű szennyeződés kibocsátás
El nem égetett szénhidrogének (HC);
Szénmonoxid (CO); és
Nitrogén oxidok (NOx).

2.1.3 Mértékegységek

2.1.3.1 A füst szennyeződés kibocsátást füst-számban (SN) kell kifejezni és közölni.

2.1.3.2 A referencia szennyeződés kibocsátás felszállási, leszállási (LTO) ciklusa során - amelyek meghatározását a 2.1.4.2 és 2.1.4.3 pontban adják meg, - a légkörbe kiváló gáznemű szennyező anyagok, HC, CO, és NOx tömegét (Dp), grammokban kell mérni és megadni.

2.1.4 Referencia feltételek

2.1.4.1 Légköri viszonyok

A légköri referencia feltételek egyezzenek a Nemzetközi Egyezményes Légkör (ISA) tengerszinti feltételeivel, kivéve, hogy a referencia abszolút nedvességtartalom 0,00629 kg víz/kg száraz levegő értékű legyen.

2.1.4.2 Tolóerő beállítások

A hajtóművet elegendő számú teljesítmény beállítások mellett kell vizsgálni, a hajtómű gáznemű anyag és füst kibocsátásának olyan módon történő meghatározásához, hogy a hitelesített kimenő teljesítmény következő meghatározott százalékos értékeinél -a légialkalmassági bizonyítványt kiadó hatósággal egyeztetettek szerint- a referencia környezeti körülményekre helyesbített tömeg kibocsátási mérték és füst-szám meghatározható legyen:

Üzemmód	Tolóerő érték
Felszállás	100 százalék hitelesített Foo
Emelkedés	85 százalék hitelesített Foo
Megközelítés	30 százalék hitelesített Foo
Gurulás/földi alapgáz üzemmód	7 százalék hitelesített Foo

2.1.4.3 Referencia szennyeződés kibocsátás, leszállási és felszállási (LTO) ciklus

A gáznemű szennyeződés kibocsátás számításához és jelentéséhez a referencia szennyeződés kibocsátás leszállási és felszállási (LTO) ciklust az egyes üzemmódokban a következő időtartamokkal kell bemutatni.

Szakasz	Működési időtartam az adott üzemmódban (perc)
Felszállás	0,7
Emelkedés	2,2
Megközelítés	4,0
Gurulás/földi alapgáz üzemmód	26,0

2.1.4.4 Tüzelőanyag jellemzők

A vizsgálatok során használt tüzelőanyag jellemzői feleljenek meg a 4. Függelékben leírt jellemzőknek. Nem tartalmazhatnak a füst elnyomására szolgáló (szerves fémvegyület) adalékokat.

2.1.5 Vizsgálati feltételek

2.1.5.1 A vizsgálatokat, vizsgáló padjukra helyezett hajtóműveken kell végezni.

2.1.5.2 A hajtómű, a hitelesített konfiguráció egy tipikus példánya, azaz a levegő elvezetés és segéd berendezések terheléseit, amelyek nem szükségesek a hajtómű alap üzemmódjában, nem kell utánozni (lásd, 6. Függelék).

2.1.6 Ha a vizsgálati feltételek eltérnek a 2.1.4 pontban tárgyalt referencia feltételektől, akkor a vizsgálatok eredményeit, a 3. Függelékben szereplő módszerek segítségével kell helyesbíteni.

2.2 Füst

2.2.1 Alkalmazási követelmények

A 2.2.2 pont előírásait azokra a hajtóművekre kell alkalmazni, amelyek gyártási ideje, 1983. január 1., vagy későbbi.

2.2.2 Füst-szám korlát

A füst-szám bármely tolóerő értéken, a 2. Függelék szabályainak megfelelően mérve és számítva, továbbá a 6. Függelék szabályainak megfelelően a jellemző szintre átszámítva, nem haladhatja meg a következő képlet által meghatározott értéket:

Füst- számkorlát = 83,6 $Foo^{-0,274}$, vagy 50, amelyik az alacsonyabb.

2.3 Gáznemű szennyező anyag kibocsátás

2.3.1 Alkalmazási rendelkezések

A 2.3.2 rendelkezései és a nitrogén oxidokra további részletekben meghatározottak szerint, a 26,7 kN-nál nagyobb hitelesített kimenőteljesítménnyel rendelkező, 1986. január 1-én, vagy azt követően gyártott hajtóművekre kell alkalmazni.

2.3.2 Korlátszintek

A gáznemű szennyező anyag kibocsátás szintjei, a 3. Függelék eljárásainak megfelelően mérve és számítva, valamint a 6. Függelék eljárásainak segítségével a jellemző szintekre átszámítva, nem haladhatják meg a következő képlet alapján számított korlátszinteket:

Szénhidrogének (HC): $D_p/F_{oo} = 19,6$

Szénmonoxid (CO): $D_p/F_{oo} = 118$

Nitrogén oxidok (NO_x):

a) Azokra a hajtómű típusokra, vagy modellekre, amelyeknek első önálló példányát, 1995. december 31-én, vagy ez előtt gyártották le és amely illető hajtómű legyártása 1999. december 31-én, vagy az előtt történt,

$$D_p/F_{oo} = 40 + 2\Pi_{oo}$$

b) Azokra a hajtómű típusokra, vagy modellekre, amelyeknek első önálló példányát, 1995. decembrer 31-e után gyártottak le, vagy amely illető hajtómű legyártása 1999. december 31-e után történt:

$$D_p/F_{oo} = 32 + 1{,}6\ \Pi_{oo}$$

c) Azokra a hajtómű típusokra, vagy modellekre, amelyeknek első önálló sorozat példányát 2003. decembrer 31-e után gyártották le:

1) 30, vagy kisebb nyomásviszonyú hajtóművek:

i) 89.0kN-nél nagyobb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 19 + 1{,}6\ \Pi_{oo}$$

ii) 26.7kN-nél nagyobb, de 89.0kN-nél kisebb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 37{,}572 + 1{,}6\ \Pi_{oo} – 0{,}2087\ F_{oo}$$

2) 30-nál nagyobb, de 62.5-nél kisebb nyomásviszonyú hajtóművek:

i) 89.0kN-nél nagyobb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 7 + 2.0\Pi_{oo}$$

ii) 26.7kN-nél nagyobb, de 89.0kN-nél kisebb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 42{,}71+1{,}428\Pi_{oo} – 0{,}4013F_{oo}+0{,}00642\Pi_{oo}\ x\ F_{oo}$$

3) 62,5-nél nagyobb nyomásviszonyú hajtóművek:

$$D_p/F_{oo} = 32 + 1{,}6\Pi_{oo}$$

d) Azokra a hajtómű típusokra, vagy modellekre, amelyeknek első önálló sorozat példányát 2007. decembrer 31-e után gyártották le:

1) 30, vagy kisebb nyomásviszonyú hajtóművek:

i) 89,0kN-nél nagyobb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 16{,}72+(1{,}.4080\ x\ \Pi_{oo})$$

ii) 26,7kN-nél nagyobb, de 89,0kN-nél kisebb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 38{,}5486 + (1{,}6823 \times \Pi_{oo}) - (0{,}2453 \times F_{oo}) - (0{,}00308 \times \Pi_{oo} \times F_{oo})$$

2) 30-nál nagyobb, de 82,6-nél kisebb nyomásviszonyú hajtóművek:

i) 89,0kN-nél nagyobb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = -1{,}04 + (2{,}0 \times \Pi_{oo})$$

ii) 26,7kN-nél nagyobb, de 89,0kN-nél kisebb hitelesített maximum kimenő teljesítményű hajtóművek:

$$D_p/F_{oo} = 46{,}1600+(1{,}4286 \times \Pi_{oo}) - (0{,}5303 \times F_{oo}) + (0{,}00642 \times \Pi_{oo} \times F_{oo})$$

3) 82,6-nél nagyobb nyomásviszonyú hajtóművek:

$$D_p/F_{oo} = 32 + (1{,}6 \times \Pi_{oo})$$

Megjegyzés. - A füst- szám, vagy a gáznemű szennyező anyag kibocsátás jellemző szintje, az összes vizsgált hajtóműre vonatkozó középérték, amelyet úgy nyernek, hogy a mért és a referencia alap-hajtóműre, és referencia környezeti feltételekre korrigált értékeket elosztják a vizsgált hajtóművek számának megfelelő együtthatóval, a 6. Függelék szerint.

Megjegyzés.- A szükséges információk három csoportra oszthatók: 1) Általános információ a hajtómű-jellemzők, az alkalmazott tüzelőanyag és az adatelmezési módszer meghatározására; 2) A hajtómű vizsgálat(ok) során kapott adatok; és 3) A hajtómű vizsgálatnál kapott adatokból levezetett eredmények.

2.4 Szükséges információk

2.4.1 Általános információk

Minden szennyező anyag kibocsátás szempontjából megvizsgálandó hajtómű típusra a következő információkat kell megadni:

a) Hajtómű megnevezés;

b) Hitelesített tolóerő (kilonewtonban);

c) Referencia nyomásviszony;

d) Tüzelőanyag megnevezés;

e) A tüzelőanyagban lévő hidrogén és szén mennyiségének viszonya;

f) Adatgyüjtési módszerek;

g) A környező feltételekhez korrekciós eljárások készítésének módszere;

h) Adat elemzési módszer.

2.4.2 Vizsgálati információk

A minősítés céljából vizsgált minden hajtómű esetében, annak a 2.1.4.2 pontban felsorolt minden egyes üzemmódjára az alábbi információkat kell megadni. Ezeket az információkat azután kell kiadni, miután - ha szükséges - ezeket a referencia környezeti feltételekre helyesbítették:

a) Tüzelőanyag- fogyasztás (kg/mp);

b) Szennyező anyag kibocsátási index (gr/kg) minden egyes gáznemű szennyező anyagra; és

c) Mért füst-szám.

2.4.3 Származtatott információk

2.4.3.1 Minősítés céljából vizsgált minden hajtóműnél a következő származtatott információt kell megadni:

a) Szennyeződés kibocsátási arány, azaz szennyeződés kibocsátási index x tüzelőanyag fogyasztás (gr/mp) minden egyes gáznemű szennyező anyagra;

b) A fel- és leszálló ciklus (LTO) során mért mindenféle gáznemű szennyeződés kibocsátás össz értéke (gr);

c) D_p/F_{oo} érték, minden egyes gáznemű szennyeződésre (gr/kilonewton); és

d) Maximum füst- szám.

2.4.3.2 A gáznemű szennyező anyagok kibocsátásának szintjeit és a jellemző füstszámot, minden egyes minősítendő hajtóműre meg kell adni.

Megjegyzés. - A füst-szám, vagy a gáznemű szennyező anyag kibocsátás jellemző szintek, az összes vizsgált hajtóműre vonatkozó középérték, amelyet úgy nyernek, hogy a mért és a referencia alap-hajtóműre, és a referencia környezeti feltételekre helyesbített értékeket elosztotják a vizsgált hajtóművek számának megfelelő együtthatóval, a 6. Függeléknek megfelelően.

3. FEJEZET
A HANGSEBESSÉG FELETTI REPÜLÉSRE SZOLGÁLÓ GÁZTURBINA SUGÁRHAJTÓMŰVEK ÉS VENTILLÁTOR GÁZTURBINA HAJTÓMŰVEK

3.1 Általános rész

3.1.1 Alkalmazási követelmények

E Fejezet előírásai, minden olyan hangsebesség feletti repülésre szolgáló gázturbina sugárhajtóműre és ventillátor gázturbina sugárhajtóműre alkalmazni kell, amely gyártási időpontja, 1982. február 18., vagy ez utánni.

3.1.2 Szennyeződés kibocsátás - fajták

A légijármű hajtóműveinek minősítése céljából a következő szennyező anyag kibocsátás-fajtákat kell ellenőrizni:

Füst
Gáznemű szennyező anyag kibocsátás:
El nem égetett szénhidrogének (HC);
Szénmonoxid (CO); és
Nitrogén oxidok (NOx).

3.1.3 Mértékegységek

3.1.3.1 A füst kibocsátás mérési eredményeket füstszámban (SN) kell kifejezni és megadni.

3.1.3.2 A 3.1.5.2 és a 3.1.5.3 pontokban leírt referencia szennyeződés kibocsátás, leszállási és felszállási ciklus (LTO) alatt, légtérbe kerülő HC, CO, vagy NOx gáznemű szennyező anyagok tömegét (Dp) grammokban kell kifejezni és megadni.

3.1.4 Jelölés

A jelen Fejezetben az F*oo kifejezést, Foo-val kell helyettesíteni azoknál a hajtóműveknél, amelyek utánégetést nem alkalmaznak. Gurulás, vagy földi alapgáz üzemmódnál, minden esetben az Foo-t kell használni.

3.1.5 Referencia feltételek

3.1.5.1 A légköri feltételek

A referencia légköri feltételekként a Nemzetközi Egyezményes Légkör (ISA International Standard Athmosphere) tengerszinti
körülményeit kell alkalmazni azzal a kivétellel, hogy a referencia abszolút nedvességtartalmat, 0.00629 kg víz/kg száraz levegő értéknek kell venni.

3.1.5.2 Tolóerő beállítások

A hajtóművet elegendő számú teljesítmény beállítások mellett kell vizsgálni, a hajtómű gáznemű anyag, és füst kibocsátásának olyan módon történő meghatározásához, hogy a hitelesített kimenő teljesítmény következő meghatározott százalékos értékeinél -a légialkalmassági bizonyítványt kiadó hatósággal egyeztetettek szerint- a referencia környezeti körülményekre hitelesített tömeg kibocsátási mérték, és füst-szám, meghatározható legyen:

Üzemmód	Tolóerő érték
Felszállás	100 százalék F^*_{oo}
Emelkedés	65 százalék F^*_{oo}
Süllyedés	15 százalék F^*_{oo}
Megközelítés	34 százalék F^*_{oo}

Gurulás/földi alapgáz üzem	5,8 százalék F^*_{oo}

3.1.5.3 Referencia szennyeződés kibocsátás, leszállási és felszállási ciklus (LTO)

A gáznemű szennyeződés kibocsátás számításához és jelentéséhez a referencia szennyeződés kibocsátás leszállási és felszállási (LTO) ciklust az egyes üzemmódokban a következő időtartamokkal kell bemutatni:

Szakasz	Működési időtartam az adott üzemmódban (perc)
Felszállás	1,2
Emelkedés	2,0
Süllyedés	1,2
Megközelítés	2,3
Gurulás/földi alapgáz üzemmód	26,0

3.1.5.4 Tüzelőanyag jellemzők

A vizsgálatok során használt tüzelőanyag jellemzőinek meg kell felelnie a 4. Függelékben leírt jellemzőknek. Nem tartalmazhat a füst elnyomására szolgáló adalékokat, (mint pl. szerves fémvegyületeket).

3.1.6 Vizsgálati feltételek

3.1.6.1 A vizsgálatokat vizsgáló padra helyezett hajtóművön kell végezni.

3.1.6.2 A hajtómű a hitelesített konfiguráció egy jellemző példánya legyen (lásd a 6. Függeléket); nem kell utánozni azokat a levegő elvezetéseket és a

segédberendezések terheléseit, amelyek alapvetően nem szükségesek a hajtómű alap üzemmódjában.

3.1.6.3 A 3.1.5.2 pontban leírt tolóerő értékeknél a szennyeződés kibocsátási szintek meghatározásához szükséges méréseket az utánégető szokásos szintű működése mellett kell végrehajtani.

3.1.7 Ha a vizsgálati feltételek eltérnek a 3.1.5 pontban tárgyalt referencia feltételektől, akkor a vizsgálatok eredményeit, az 5. Függelékben szereplő módszerek segítségével kell a referencia feltételekhez igazítani.

3.2 Füst

3.2.1 Korlátozó füst-szám

A füst-szám bármely tolóerő üzemmódban, a 2. Függelék szabályainak megfelelően mérve és számítva, valamint a 6. Függelék szabályainak segítségével, a jellemző szintre átszámítva, nem haladhatja meg a következő képlet által meghatározott értékeket:

Korlátozó füst-szám = 83,6 (F*oo)-0,274, vagy

50, amelyik az alacsonyabb.

Megjegyzés. - A légialkalmassági bizonyítványt kiadó hatóság alternatívaképp elfogadhatja azokat az értékeket, amelyeket utánégető alkalmazásával kaptak, feltéve, hogy ezen adatok hitelessége megfelelően alátámasztott.

3.3 Gáznemű szennyező anyagok kibocsátása

3.3.1 Korlátozó szintek

A 3., vagy az 5. Függelék (amelyik vonatkozik) eljárásainak megfelelően mért és számított, valamint a 6. Függelék szabályainak segítségével a jellemző szintre

átszámított gáznemű szennyező anyag kibocsátás szintek, nem haladhatják meg a következő képlet alapján számított korlátozó szinteket:

Szénhidrogének (HC): $D_p/F^*_{oo} = 140\ (0{,}92)\ \pi_{oo}$

Szénmonoxid (CO): $D_p/F^*_{oo} = 4550\ (\pi_{oo})^{-1{,}03}$

Nitrogén oxidok (NOx): $D_p/F^*_{oo} = 36 + 2{,}42\ \pi_{oo}$

Megjegyzés. - A füst-szám, vagy a gáznemű szennyező anyag kibocsátásának jellemző szintje, az összes vizsgált hajtóműre vonatkozó középérték, amelyet a mért és a referencia alap-hajtóműre és referencia környezeti feltételekre helyesbített értékeknek a vizsgált hajtóművek számának megfelelő együtthatóval történő elosztásával nyernek, ahogyan az a 6. Függelékben szerepel.

3.4 Szükséges információk

Megjegyzés.- A szükséges információk három csoportra oszthatók: 1) Általános információk a hajtómű, az alkalmazott tüzelőanyag jellemzőinek és az adatelemzés módszereinek azonosításához; 2) Hajtómű vizsgálat(ok) során kapott adatok; és 3) A hajtómű vizsgálatból származtatott eredmények.

3.4.1 A szennyeződés kibocsátás szempontjából vizsgálandó minden hajtómű típusra a következő információkat kell megadni:

a) hajtómű azonosító;

b) hitelesített tolóerő (kN-ban);

c) hitelesített teljesítmény, utánégető alkalmazásával (ha van) (kN-ban);

d) Referencia nyomásviszony;

e) Tüzelőanyag-fajta megnevezés;

f) A tüzelőanyagban lévő hidrogén és szén mennyiségének aránya;

g) Adatgyűjtési módszerek;

h) A környezeti feltételek miatti helyesbítések elvégzésének módszerei; és

i) Adatelemzési módszer.

3.4.2 Vizsgálati információk

A minősítés céljából vizsgált minden hajtómű esetében, azoknak a 3.1.5.2 pontban felsorolt minden üzemmódjára, az alábbi információkat kell megadni. Az információt a referencia környezeti feltételekre helyesbítés -ha szükséges- elvégzését követően kell megadni:

a) Tüelőanyag- fogyasztás (kilogramm/másodperc);

b) Szennyeződés kibocsátási index (gramm/kilogramm) minden gáznemű szennyező anyagra;

c) A tolóerő százalékos növekedése utánégetés révén; és

d) Mért füst-szám.

3.4.3 Származtatott információ

3.4.3.1 A minősítés céljából vizsgált minden hajtóműnél, a következő származtatott információkat kell megadni:

a) Szennyeződés kibocsátási szint, azaz szennyeződés kibocsátási index x tüzelőanyagfogyasztás (gramm/másodperc), minden egyes gáznemű szennyező anyagra;

b) A fel- és leszálló ciklus során mért, mindenféle gáznemű szennyező anyag kibocsátás összértéke (grammokban);

c) D_p / F^*_{oo} érték, minden egyes gáznemű szennyező anyagra (gramm/kN); és

d) Maximum füst-szám.

3.4.3.2 A jellemző gáznemű szennyező anyagot, a szennyező anyag kibocsátási szinteket és a füst-számot, minden minősítendő hajtómű típusra meg kell adni.

Megjegyzés. - A füst-szám, vagy a gáznemű szennyező anyag kibocsátásának jellemző szintje, az összes vizsgált hajtóműre vonatkozó középérték, amelyet a mért és a referencia alap-hajtóműre és referencia környezeti feltételekre helyesbített értékeknek a vizsgált hajtóművek számának megfelelő együtthatóval történő elosztásával nyernek, ahogyan az a 6. Függelékben szerepel.

1. FÜGGELÉK
REFERENCIA NYOMÁSVISZONY MÉRÉS

1. Általános rész

1.1. A nyomásviszony meghatározásához reprezentáns hajtóművet kell alkalmazni.

1.2 A referencia nyomásviszonyt a szabvány-napnak megfelelő környezeti hőmérsékletre helyesbített hajtómű teljesítmény és a mért nyomásviszony összefüggésbe hozásával kell származtatni és eme összefüggést a szabvány-napi hitelesített felszálló teljesítményre kell átvezetni.

2. Mérés

2.1 A teljes nyomást a kompresszor utolsó fokozatának kimenő síkjában és a kompresszor első fokozatának bemenetén kell mérni úgy, hogy legalább négy érzékelőt kell elhelyezni oly módon, hogy ezek a levegő áram területét négy egyenlő szektorra osszák, ezután a négy kapott érték átlagát kell venni.

Megjegyzés. – A kompresszor kimeneti teljes nyomás a kompresszor kimenő síkjához lehetőség szerint minél közelebb eső pontban mért teljes, vagy statikus nyomás alapján kapható meg. Azonban, ha a hajtómű konstrukció miatt a szennyeződés kibocsátás ellenőrző minősítő vizsgálat elvégzése során az érzékelők elhelyezése a fenti szompontok szerint nem lehetséges, akkor a bizonyítványt kiadó hatóság saját belátása szerint jóváhagyhat más módszert is a kompresszor kimenetén lévő teljes nyomás értékelésére.

2.2 A szükséges korrelációs számot a típus alkalmassági vizsgálatok során kell meghatározni, legkevesebb egy hajtómű, illetve minden kapcsolódó alkotóegységének vizsgálatával és elemzésével.

2.3 E módszereknek a bizonyítványt kiadó hatóság számára elfogadhatóaknak kell lenni.

2. FÜGGELÉK
FÜST KIBOCSÁTÁS ÉRTÉKELÉSE

1. Bevezető rész és meghatározások

Megjegyzés. – Az e részben leírt eljárások a következőkkel foglalkoznak:

Mintavétel a távozó gázokból;
A távozó gázok kibocsátott égéstermék mérőrendszerhez juttatása és elemzése e rendszerrel.

1.1 A függelékben leírt eljárásokon változtatni csak a bizonyítványt kiadó hatósághoz beadott előzetes kérelem és az általa történt jóváhagyás után lehet.

1.2 Ha a Függelékben a következő kifejezések és jelek szerepelnek, akkor azok jelentése a következő:

Mintavételi referencia méret (Sampling reference size), a minta anyag tömege a szennyezett szűrőfelület egy négyzetméterére vonatkoztatva 16,2 kg/m^2, amely – ha a szűrő anyagán áthatol, akkor az a visszaverődés változását eredményezi és az SN jellemző értékét adja.

Mintavételi méret (Sampling size), e függelék 2.5.3 h) pontjában meghatározott értékhatár közötti (a szennyezett szűrőfelület alapterületének egy négyzetméterére jutó, kg-ban kifejezett) tömeg nagysággal rendelkező, választott távozó gázminta, amely a szűrőanyagon áthatolva, a visszaverődést megváltoztatja és az SN′ jellemző értékét eredményezi.
Mintavételi térfogat (Sanpling volume), választott mintavételi (köbméterben kifejezett) térfogat, amelynek a jelen Függelék 3. pontja szerint számított egyenértékű tömege, megfelel a fenti „mintavételi méret” meghatározásnak.
SN füst-szám (Smoke Number); a szűrőnek, a távozó gázminta referencia tömege általi elszennyeződésére alapozott, a füst kibocsátási szint számértékét kifejező mértékegység nélküli fogalom, amelyet 0-tól 100-ig terjedő skálán osztályoznak, (lásd e Függelék 3. pontját).
SN′. Valamely egyedi füstmintából meghatározott füst-szám, (Smoke number); amely mintamérete nem feltétlenül egyezik a jelen függelék harmadik pontja szerint meghatározott referencia mérettel.
W. – A kimenőgáz egyes mintáinak tömege kg-ban, amelyet a minta térfogatát, nyomását és hőmérsékletét mérve számítanak ki, lásd ezen Függelék 3. pontját.

2. Füst kibocsátás mérés

2.1 Füst kibocsátás mintavevő készülék

a) A mintavevőt rozsdamentes acélból kell készíteni, ha keverő mintavevőt alkalmaznak, akkor a minta vételére szolgáló minden nyílásnak egyforma átmérőjűnek kell lennie.

b) A mintavevőkészüléket olymódon kell kialakítani, hogy a bekövetkező nyomásesés, legalább 80 százaléka a nyílásoknál menjen végbe.

c) A minták vételére szolgáló nyílások száma, legalább 12 legyen.

d) A mintavétel síkját annyira közel kell elhelyezni a hajtómű fóvőcső kimenő síkjához, amennyire azt a hajtómű teljesítményjellemzők lehetővé teszik, de bármely esetben a mintavevő síkja a fúvócső kimenősíkjától ne legyen távolabb, mint a fúvócső átmérő felének megfelelő távolság.

e) A kérelmező a bizonyítványt kiadó hatóság számára részletes áttekintés segítségével köteles bizonyítani, hogy az általa beterjesztett mintavevő készülék konstrukciója és elhelyezése biztosítja a jellemző minták megszerzését, minden előírt teljesítményre.

2.2 A füst kibocsátás mintaadagoló vezetéke

2.2.1 A mintavevőből a mintát a mintagyűjtő rendszerbe 4,0-8,5 mm belső átmérőjű vezetéken keresztül a lehető legrövidebb úton kell vezetni, amelynek hossza egyetlen esetben sem lehet több, 25 m-nél. A vezetékben a hőmérsékletet 60–175 °C között kell tartani, miközben az ingadozás 15 °C-nál nem lehet nagyobb, azt a szakaszt kivéve, amely a gáznak a hajtómű kilépő hőmérsékletről a vezeték szabályozott hőmérsékletére történő hűtéséhez szükséges.

2.2.2 A továbbító vezeték lehetőség szerint egész hossza mentén egyenes legyen, bármely elkerülhetetlen hajlat sugara, több, mint tízszerese legyen a vezeték belső átmérőjének. A vezetékeket a szilárd részek felgyülemlését, vagy a statikus feltöltődést meggátoló anyagból kell gyártani.

Megjegyzés. – A rozsdamentes acél, réz, vagy földelt, szénnel töltött politetrafluor etilén (PTFE) anyag, e követelményeket kielégítik.

2.3 Füst-elemzőrendszer

Megjegyzés. – Az alábbiakban leírt módszer a szűrő visszaverési együttható csökkenésének mérésére alapul, amely csökkenést adott tömegű elhasznált gázminta szűrőn történő átáramlása alkalmával fellépő szennyeződés okoz.

A szennyezett szűrő szükséges példányainak előállítására szolgáló rendszer különböző részeinek elhelyezését vázlatosan a 2-1 ábra mutatja. A térfogatmérő közé, választás szerint, egy megkerülő ág építhető, a műszer szerinti leolvasás szolgálatára. A rendszer fő elemei feleljenek meg a következő követelményeknek:

a) *Minta méret mérés:* A minták térfogatának ±2 százalék pontosságú mérésére nedves, vagy száraz, pozitív térfogat kiszorításos fogyasztásmérőt kell alkalmazni. A nyomást és a hőmérsékletet a fogyasztásmérő bemenetén 0,2 százalék és ±2 °C pontossággal kell mérni a sorrendnek megfelelően.

b) *A minta áramlás mérése:* A minta áramlását 14 ±0,5 L/perc határok között kell tartani, az e célra alkalmazott fogyasztásmérő pontossága ±5 százalék kell, hogy legyen.

c) *Szűrő és foglalat:* A szűrő foglalatát korrózióálló anyagból kell készíteni úgy, hogy az áramlás csatornájának kialakítása a 2-1 ábra szerinti legyen. A szűrőt Whatman (No. 4) típusú anyagból, vagy a bizonyítványt kiadó hatóság által jóváhagyott egyéb, egyenértékes anyagból kell készíteni.

d) *Szelepek:*Négy szelepet kell alkalmazni a 2-1 ábrának megfelelően:

1) Az „A” szelep gyors működésű teljes áramú, áramlás elosztó szelep legyen, tegye lehetővé a belépő áram mérőszűrőhöz, vagy kerülő csatornához terelését, illetve, hogy az áramlást el lehessen zárni.

Megjegyzés. – Szükség esetén az „A” szelep állhat két egymással összekapcsolt szelepből is a szükséges funkciók biztosítása érdekében.

2) A „B” és a „C” szelep a rendszer áramlás mértékének létrehozására szolgáló fojtó szelep legyen.

3) A „D” szelep elzáró szelep legyen, amely lehetővé teszi a szűrőfoglalat elszigetelését.

Minden szelepet korrózióálló anyagból kell készíteni.

e) *Vákumszivattyú:* E szivattyú áramlásmentes kapacitása -75kPa legyen a légköri nyomáshoz viszonyítva; normál hőmérsékleten és nyomáson a teljes áramlás mértéke 28 L/percnél kevesebb ne legyen.

f) *Hőmérséklet szabályozás:* A gázminta bemenő vezeték szűrőfoglalatig tartó szakaszában a hőmérsékletet ±15 °C pontossággal 60 °C–175 °C-on kell tartani.

Megjegyzés. – A cél a vízkondenzáció megakadályozása a szűrőfoglalat elérése előtt és magában a szűrőben.

g) Ha szükséges, hogy a mintavevőn keresztül nagyobb mintaáramlási értéket nyerjenek, mint a szűrőtartón keresztül, akkor a túlzott mennyiségű anyagáram eleresztéséhez tetszés szerinti áramlásosztó építhető be a mintavevő és az „A” szelep közé (2-1 ábra). Az eleresztő vezeték legyen a lehető legközelebb a mintavevő kimenetéhez és ne befolyásolja a mintavevőrendszert, hogy az képes legyen a mintavevő szerelmény mentén fellépő nyomásesés előírt 80 százalékát biztosítani. Az elvezetett áram továbbküldhető a CO_2 elemzőhöz, vagy a teljes égéstermék elemzőrendszerhez is.

h) Ha áramlásosztót alkalmaznak, akkor próbavizsgálatot kell végezni annak bemutatására, hogy a szűrőtartó felé áthaladó füstszintet az áramlásosztó nem változtatja meg. Ez végrehajtható az áramlásosztó kimenőnyílás vezetékeinek visszafordításával és azt bemutatva, hogy a módszer pontosságán belül a füstszint nem változik.

i) *Szivárgás jellemző:* Az alrendszer teljesítse az alábbi vizsgálat által támasztott követelményeket:

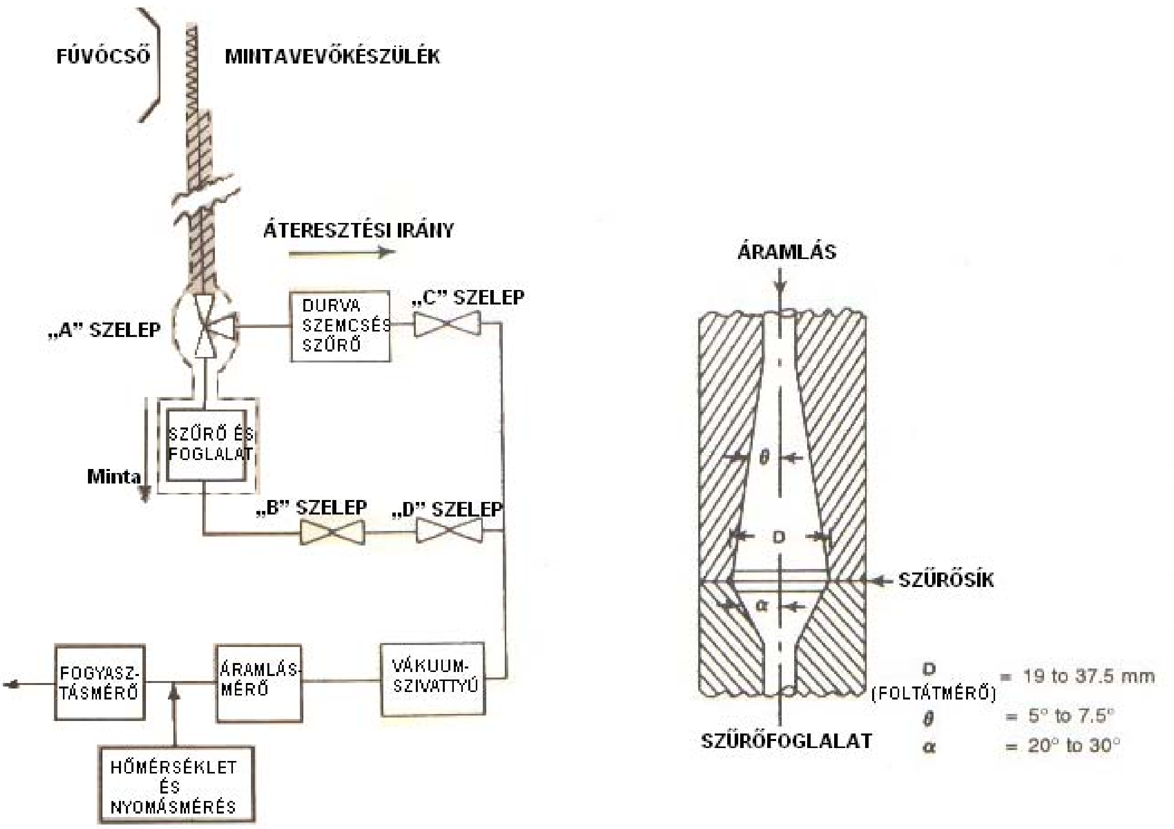
1) A foglalatba tiszta szűrőt kell helyezni;

2) Le kell zárni az „A” szelepet és teljesen kinyitni a „B”, „C” és a „D” szelepeket;

3) Egy percre be kell kapcsolni a vákumszivattyút, hogy egyensúlyi állapot jöjjön létre;

4) A szivattyút tovább működtetve 5 percen keresztül mérni kell a fogyasztásmérőn átáramló térfogatot. Ez a mennyiség nem haladhatja meg az 5 litert (normál hőmérsékleten és nyomáson), a rendszer addig nem használható, ameddig ez a követelmény nem teljesül;

j) *Reflektométer:* A szűrő anyagának visszaverődési együtthatóját az Amerikai Nemzeti Szabványügyi Intézet (ANSI) PH2.17/1977 számú szabványának megfelelő diffuziós visszaverődési sűrűségmérő műszerrel kell végezni. A reflektométer fénysugarának átmérője a szűrőpapíron nem haladhatja meg a D/2-t, de legalább D/10 legyen, ahol D a szűrőn lévő szennyeződésfolt átmérője, amint az a 2-1 ábrán szerepel.



2-1. Ábra: Füst elemző rendszer

2.4 Üzemanyag jellemző

Az üzemanyag jellemzők feleljenek meg a 4. Függelékben leírtaknak. Nem tartalmazható füstelnyomó adalék (pl. szerves fémvegyületeket).

2.5 Füstmérési eljárások

2.5.1 Hajtómű működtetés

2.5.1.1 A hajtóművet nagy pontosságú vizsgálatok elvégzéséhez alkalmas és megfelelő módon műszerezett statikus vizsgálópadon kell működtetni.

2.5.1.2 A vizsgálatot a bizonyítványt kiadó hatóság által jóváhagyott teljesítmény beállításokkal kell végrehajtani. A hajtómű állandósult működését minden beállításnál biztosítani kell.

2.5.2 A szivárgás és a tisztaság ellenőrzése

Semmilyen mérést nem lehet mindaddig elvégezni, amíg a mintákat továbbító vezetékeket és szelepeket elő nem melegítették és nem stabilizálták. A vizsgálatsorozat előtt a rendszert szivárgás és tisztaság szempontjából a következők alapján kell ellenőrizni:

a) *Szivárgás ellenőrzés:* A mintavevőt a vezetéktől le kell választani és a mintákat továbbító vezeték végét le kell zárni. A szivárgásra vonatkozó ellenőrzést a 2.3 g) pontban leírtak szerint kell végrehajtani, kivéve, hogy az „A" szelep nyitott és „áteresztés" helyzetbe van állítva, a „D" szelep zárt, a megengedett szivárgási szint pedig 2 L. Ezután a mintavevőt a vezetékkel újra össze kell kötni:

b) *A tisztaság ellenőrzése:*

1) A „B", „C" és „D" szelepeket nyissa ki;

2) Indítsa be a vákumszivattyút és váltakozva „áteresztést" és „minta" helyzetbe állítgassa 5 percen keresztül azzal a céllal, hogy az egész rendszert tiszta levegővel átfúvassa;

3) Az „A" szelepet állítsa „áteresztés" helyzetbe;

4) A „D" szelepet zárja le és a foglalatba tegyen tiszta szűrőanyagot. A „D" szelepet nyissa ki;

5) Az „A" szelepet állítsa „minta" helyzetbe és miután a szűrő négyzetméterre eső felületén 50 kg levegő ment át, az „A" szelepet állítsa újra „áteresztés" helyzetbe;

6) A szűrőn keletkezett SN´foltot a jelen Függelék 3. pontjában leírtak szerint mérje meg;

7) Ha ez az SN´érték a hármat meghaladja, a rendszert tisztítsa ki, (vagy más módon állítsa helyre) amíg háromnál kisebb értéket nem kap.

A rendszert addig nem szabad használni, amíg nem teljesíti a szivárgás és a tisztaság ellenőrzésével kapcsolatos eme követelményeket.

2.5.3 A füst mérése

A füst mérését egyéb mérésektől függetlenül kell végezni, azokat az eseteket kivéve, amikor a mérések során kapott mennyiségek jelentősen kisebbek a határértékeknél, vagy amikor az egyidejű méréseknél kapott füstértékek érvényessége bebizonyítható és ezekben az esetekben a füstjellemzők mérése történhet egyidejűleg a gáznemű anyagok kibocsátásának mérésével. Minden esetben szigorúan be kell tartani a 2.2.2 pontban leírt, a minták továbbítását szolgáló vezetékek hajlatainak sugaraira vonatkozó követelményeket. Hozza létre a 2.3 pontban leírt műszaki követelményeknek megfelelő füstelemző alrendszert. A 2-1 ábrákra hivatkozva, a szennyeződött szűrő példány előállításának főbb műveletei a következők legyenek:

a) A hajtómű működése alatt, ha a mintavevő a helyén áll, az „A" szelepet ne zárja el, mivel a vezetékben kialakulhatnak a szilárd részecskék lerakódásának a feltételei;

b) Az „A" szelepet áteresztés helyzetbe kell állítani, le kell zárni a „D" szelepet és a foglalatba tiszta szűrőt kell erősíteni. A kiömlő gázmintát „áteresztés" helyzetben legalább 5 percen keresztül folyamatosan kell átereszteni miközben a hajtómű a szükséges, vagy azt megközelítő üzemmódban működik, a „C" szelepet a 14 ±0,5 L/perc átáramlásnak megfelelő helyzetbe állítva;

c) A „D" szelepet nyissa ki és az „A" szelepet állítsa minta helyzetbe, a „B" szelepet használja a b) pontban leírt átáramlási mérték beállításához;

d) Az „A" szelepet állítsa „áteresztés" helyzetbe és a „D" szelepet zárja el, a foglalatba pedig tiszta szűrő anyagot kell erősíteni;

e) Ha a hajtómű állapota stabilizálódott, a d) pontban leírtak szerinti beállítással egy percen át hagyni kell, hogy a minta áramoljon;

f) Nyissa ki a „D” szelepet, az „A” szelepet állítsa „minta” helyzetbe, szükség esetén az áramlási mértéket újra állítsa be és hagyja hogy a kiválasztott minta mennyiség (lásd h)) áramoljon, mielőtt az „A” szelepet ismét „áteresztés” helyzetbe állítja, illetve a „D” szelepet lezárja;

g) A szennyeződött szűrőt elemzés céljára tegye félre és erősítsen tiszta szűrőt a foglalatba;

h) A választott gázminta méretek akkorák legyenek, hogy a szűrő egy négyzetméterére vetített 12–21 kg kibocsátott gáztartományon belül maradjanak és tartalmazzanak olyan mintákat is, amelyek a szűrő négyzetméterére vetített, vagy 12,6 kg kibocsátott gáz nagyságúak, vagy ezen érték alatti és feletti nagyságúak. A hajtómű egyes üzemi körülményeinek mindegyike esetében a vett minta száma nem lehet háromnál kevesebb és az e)-től g)-ig felsoroltakat szükség szerint meg kell ismételni.

3. Füst-szám számítás a mérési adatok alapján

A 2.5.3 pontban előírtaknak megfelelően kapott szennyezett szűrő példányokat reflektometer segítségével a 2.3 pontban meghatározottak szerint kell elemezni. Alátétként fekete színű, 3 százaléknál kisebb abszolút visszaverőképességű anyagot kell alkalmazni. Az egyes szennyezett szűrők abszolút visszaverőképességének értékeit R_S, a visszaverődés együttható csökkenésének következő képlet szerinti számításához kell használni:

$$SN' = 100\,(1 - R_S/R_w)$$

ahol R_w a tiszta szűrő anyagának abszolút visszaverőképessége.
A különböző minták tömegét a következő képlettel kell számítani:

$$W = 0{,}348\ PV/T \times 10^{-2}\ \text{(kg)}$$

ahol P és T (e sorrendnek megfelelően) közvetlenül a fogyasztásmérő előtt mért minta gáznyomás-értéke Pascal-ban és hőmérséklete K fokban. V pedig a mért minta térfogata köbméterben.

Külön minden hajtómű üzemmódra, amelyben a minta méretei a referencia értékektől a több, vagy a kevesebb irányba eltértek, az SN´ és W különböző értékeit, SN´ logaritmus W/A-szerint kell ábrázolni, ahol ‘A’ a szennyezett szűrő területe (négyzetméterben). A legkisebb négyzetek egyenese összehasonlító módszer alkalmazásával az SN´ értékét W/A = 16,2 kg/m2-re kell meghatározni és arra a hajtómű üzemmódra füst-számként (SN) azt kell jelenteni. Ha csak a referencia méret érték szerinti mintavételt alkalmazzák, akkor a jelentett SN a különböző egyedi SN´ értékek aritmetikai közepe legyen.

4. A bizonyítványt kiadó hatóság számára közlendő adatok

A mérési adatokat jelenteni kell a bizonyítványt kiadó hatóság felé. Továbbá, minden vizsgálatra vonatkozóan a következő adatokat kell megadni:

a) A minta hőmérséklete;

b) A minta nyomása;

c) A minta tényleges térfogata a mintavételi feltételeknél;

d) A mintául vett gázok tényleges áramlási mennyisége a mintavételi feltételeknél; és

e) A szivárgás és a tisztaság ellenőrzésének igazolása (lásd a 2.5.2 pontot).

3. FÜGGELÉK GÁZNEMŰ ANYAGOK KIBOCSÁTÁSÁNAK MÉRÉSI ELJÁRÁSAI ÉS MŰSZEREZETTSÉGE

1. Bevezető rész

Megjegyzés. – Jelen függelékben leírt eljárások a következőkre vonatkoznak: a kibocsátott gáz jellemző mintáinak megszerzése és azoknak a kibocsátás mérő rendszerbe történő juttatása, illetve elemzése a mérőrendszer által. Az eljárások nem vonatkoznak az utánégetőt alkalmazó hajtóművek esetére. A javasolt módszerek a legmegalapozottabb és a rendelkezésre álló legjobb megoldásokat képviselik.

A jelen függelékben közölt eljárásoktól eltérni csak a bizonyítványt kiadó hatóság előzetes értesítésével, illetve a hatóság jóváhagyását követően lehetséges.

2. Fogalom meghatározás

Ha jelen függelékben a következő kifejezések szerepelnek, ott azok jelentése a következő:

Pontosság. (Accuracy) A mért érték közelítésének foka a függetlenül meghatározott valóságos értékhez.

Levegő / tüzelőanyag viszony. (Air/fuel ratio) A hajtómű forró részén átáramló levegőtömeg és a hajtóműbe áramló üzemanyag aránya.

Kalibráló gáz. (Calibration gas) A műszerek szabályozásánál, beállításánál és időszakos ellenőrzésénél alkalmazott összetételében nagy pontosságú etalon gáz.

Koncentráció. (Concentration) A vizsgálat tárgyát képező összetevőnek a gázkeverékben elfoglalt térfogat része – térfogat százalékban, vagy részecskeszám-millióhoz viszonyítás szerint kifejezve.

Fúvócső (Exhaust nozzle) A kiáramló gáz mintavételezéshez kizárólag a gázgenerátor (fő) gázáram fúvókáját tekintik fúvókának azoknál a gázturbuna hajtóműveknél, amelyek kilépő gázsugara nem kevert (például egyes ventillátoros gázturbina hajtóművek ilyenek). Azokban az esetekben, amikor a gázsugarak keverednek, ott fúvókának a teljes fúvócsövet veszik.

Láng-ionizációs detektor. (Flame ionization detector) Diffúziós hidrogén-levegő lángdetektor, amely az e lángba egységnyi idő alatt belépő szénhidrogének mennyiségével névlegesen arányos jelet ad ki, általánosan feltételezve, hogy a jelet a lángba lépő szénatomok száma határozza meg.

Interferencia. (Interference) A műszer reakciója a mérendő anyagon kívűli egyéb, nem gáz (vagy gőz) komponensek jelenlétére.

Zaj. (Noise) A műszer kimenetén jelentkező, a műszer által mért minta jellemzőivel kapcsolatban nem álló és azok a kitérés jellemzőitől megkülönböztethető véletlenszerű kitérések.

Nem diszperz infravörös analizátor. (Non-dispersive infrared analyser) A kisugárzott infravörös energia elnyelése révén meghatározott komponensek szelektív mérését végző műszer.

Millió szén részecskére eső részecske szám. (Parts per million carbon – ppmC) Metán ekvivalencia alapján mért, 10^{-6}-al szorzott szánhidrogén moll része. Ilyen módon egy ppm metán kijelzése, egy ppmC-ként történik. Bármely ppm-ben kifejezett szénhidrogén koncentráció átalakítása ppmC-ben kifejezett ekvivalens mennyiséggé úgy történik, hogy a ppm-ben kifejezett mennyiséget megszorozzák a gázmolekula összetételébe tartozó szénatomok számával. Például: 1 ppm propán megfelel 3 ppmC szénhidrogénnek, 1 ppm hexán, pedig 6 ppmC szénhidrogénnek.

Millió részre jutó részecske szám rész (ppm). (Parts per million - ppm) A gázkeverékben jelen lévő gáz egységnyi térfogatkoncentrációja a gázkeverék millió résznyi térfogatára vetítve.

Etalon gáz. (Reference gas) Ismert és előírt összetételű gázkeverék, amelyet a műszer kitéréseinek a műszer által mért gáz koncentrációjának egységében kifejezett értelmezésére alkalmaznak.

Ismételhetőség. (Repeatability) A mérés eredmény adott változatlan mintán rövid időn belül ismételt méréssel történő reprodukálhatóságának pontossága anélkül, hogy a műszert közben újra beszabályoznák.

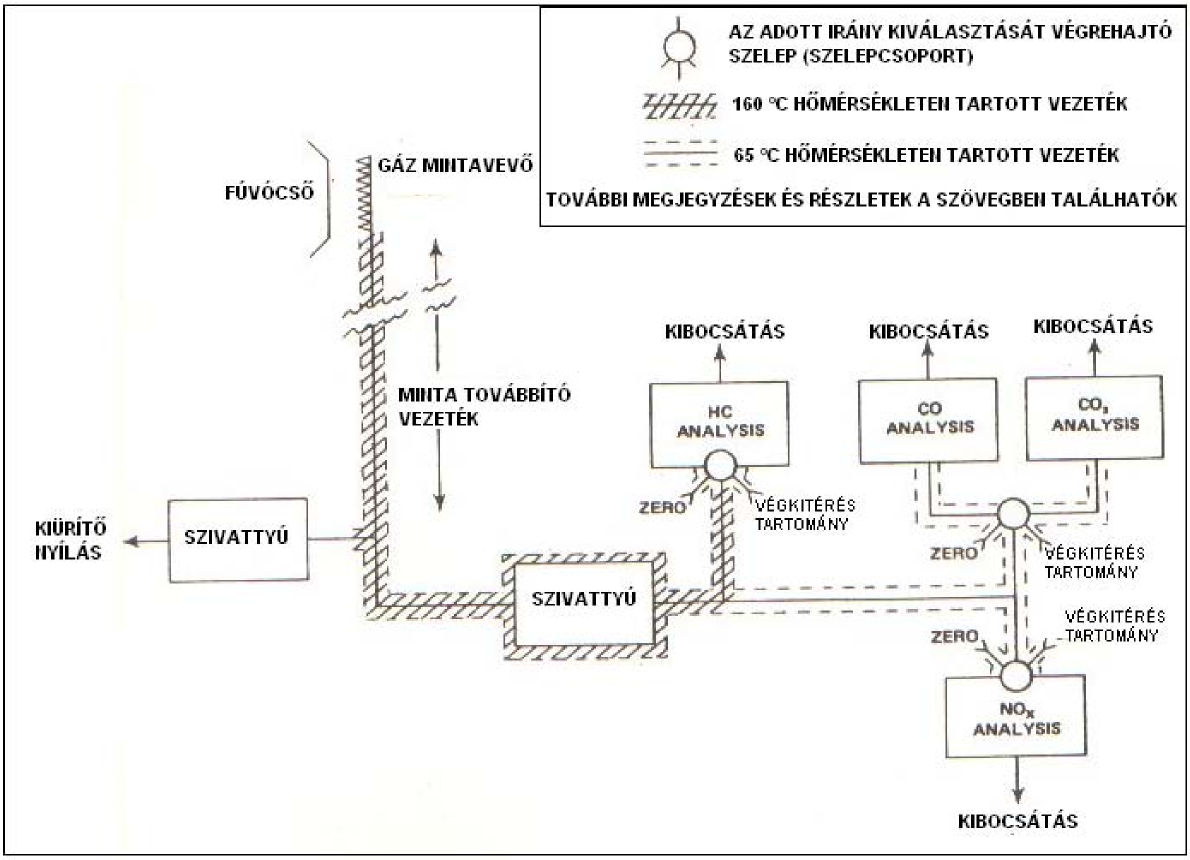
Felbontó képesség. (Resolution) A mérési eredményekben bekövetkezett és még kimutatható legkisebb változás.

Műszer reakció. (Response) A műszer kimeneti jelének változása a minta gázkoncentráció változásának függvényében, illetve a mintában lévő adott gázkoncentrációnak megfelelő kimeneti jel.

Stabilitás. (Stability) Egy adott, változatlan mintán végzett ismételt mérések adott időtartamon keresztül fenntartható pontossága.

Nulla elhúzás. (Zero drift) A műszer jelének idő függő kitérése a nulla értékről, miközben a rajta átáramló gáz nem tartalmazza a mérendő komponenst.

Nulla gáz. (Zero gas) Gáz, amelyet a műszer nulla, vagy semleges helyzetbe állításához alkalmaznak.



3-1 ábra. A mintavevő és elemző rendszer vázlata.

3. Szükséges adatok

3.1 Gáznemű szennyeződés kibocsátás

A következő gázok koncentrációját kell meghatározni:

a) Szénhidrogének (HC): A kiömlő gázokban jelenlévő összes szénhidrogén vegyületek együttes értékelése

b) Szénmonoxid (CO)

c) Széndioxid (CO_2)

Megjegyzés. – A CO_2 nem számít szennyezőanyagnak, de koncentráció értékére a számítás és ellenőrzés céljából szükség van.

d) Nitrogénoxidok (NO_2): A két oxid összegének értéke – a nitrogénoxidé (NO) és a nitrogéndioxidé (NO_2)

e) Nitrogénoxid (NO)

3.2 Egyéb információ

A szennyeződés kibocsátás mérési adatok normalizálása céljából, továbbá a hajtómű vizsgálatok karakterisztikáinak számszerűsítéséhez a következő kiegészítő információk szükségesek:

– Bemeneti hőmérséklet;
– Bemeneti nedvesség tartalom;
– Légköri nyomás;
– Hidrogén/szén aránya az üzemanyagban;
– Egyéb szükséges hajtómű paraméterek (mint például a tolóerő, a fordulatszám, a turbina hőmérséklet és a gázgenerátoron átáramló levegő mennyiség).

Ezeket az adatokat vagy közvetlen mérés, vagy számítás útján kell megállapítani a jelen Függelék „F" Mellékletében bemutatottak szerint.

4. A rendszer általános elrendezése

Sem szárító rendszert, sem szárító anyagot, illetve vízzárat, vagy ilyen berendezést nem szabad alkalmazni a nitrogénoxid és a szénhidrogén elemző berendezésen átáramló elhasznált gázminta kezelésénél. A rendszerhez tartozó alrendszerekkel szembeni követelmények az 5. pontban szerepelnek, azonban a következő felsorolás is ad néhány minőségi információt és változat lehetőséget.

a) Feltételezett, hogy minden egyes alrendszer tartalmazza a szükséges áramlás szabályozó, kondícionáló és mérő berendezéseket;

b) Az eleresztő és/vagy meleg mintaadagoló szivattyú alkalmazásának szükségességét a minta továbbítási időtartamra, illetve az elemző rendszer mintavételi mértékére vonatkozó követelmények teljesítésének képessége határozza meg. Ez viszont függ az elhasznált gázmintát hajtó nyomástól és a vezetékekben keletkező veszteségektől. Úgy veszik, hogy ezek a szivattyúk a hajtómű bizonyos üzemelési feltételei között szükségesek; és

c) A forró mintát adagoló szivattyú helye a gázanalizáló alrendszerhez képest szükség szerint változtatható (például némely HC analizátor forró mintát adagoló szivattyút is magában foglal, következésképp alkalmasnak ítélhetők arra, hogy azokat a rendszer forró mintaadagoló szivattyújának fő áramába építsék).

Megjegyzés. – A 3-1 ábra a kibocsátott gáz mintavevő és elemző rendszer vázlatát mutatja és általánosítja a gázkibocsátási mérésekkel kapcsolatos vizsgálatokra vonatkozó fő követelményeket.

5. Az összetevő részek leírása

Megjegyzés. – Az alábbiakban a hajtómű által kibocsátott gáz jellemzőinek mérését végző rendszer fő elemeinek és jellemzőinek általános leírását ismertetjük. Részletesebb leírás – ahol szükséges – jelen Függelék „A”, „B”, és „C” Mellékleteiben található.

5.1 Mintavevő rendszer

5.1.1 Mintavevő készülék

a) A mintavevőt rozsdamentes acélból kell készíteni. Ha keverő mintavevőt alkalmaznak, akkor a minta vételére szolgáló minden nyílás átmérője azonos legyen;

b) A mintavevő készüléket úgy kell kialakítani, hogy a mintavevő egységben bekövetkező nyomásesés legalább 80 százaléka a nyílásnál menjen végbe;

c) A minták vételére szolgáló nyílások száma legalább 12 legyen;

d) A mintavétel síkját annyira közel kell helyezni a hajtómű fúvócső síkjához, amennyire ezt a hajtómű teljesítményjellemzők lehetővé teszik, de minden esetben, a mintavevő síkja a fúvócső átmérő felének megfelelő távolságon belül legyen elhelyezve a kimenő síktól; és

e) A kérelmező részletes elemzések formájában nyújtson be bizonyítékokat a bizonyítványt kiadó hatósághoz, miszerint az általa beterjesztett mintavevő készülék konstrukciója és elhelyezése minden előírt teljesítménynél biztosítja a jellemző minták megszerzését.

5.1.2 Minta – adagoló vezeték

A minta a mintavevő készülékből 4,0–8,5 mm közötti belső átmérőjű, a lehető legrövidebb és 10 másodpercnél rövidebb szállítási időt biztosító vezetéken keresztül jut az elemzőbe. A vezetékben a hőmérsékletet 60–175 °C között ±15 °C kell tartani, miközben az ingadozás 10 °C-nál nem lehet nagyobb, azt a szakaszt kivéve, a) amely a gáznak a hajtómű kilépő hőmérsékletről a vezeték szabályozott hőmérsékletére történő hűtéséhez szükséges; b) azokat az elosztó ágakat, amelyek a CO, CO_2, és NO_x analizátoroknak szolgáltatják a mintát. E vezetékágaknak a hőmérsékletét 65 ±15 °C kell tartani (±10 °C pontossággal). Ha HC, CO, CO_2 és NO_x összetevők mérésére történik mintavétel, akkor a vezetéket rozsdamentes, vagy földelt, szénnel dúsított PTFE anyagból kell készíteni.

5.2 Hc analizátor

A minta össz szénhidrogén tartalmának mérését analizátor segítségével kell végezni, amelyben felmelegített láng ionizációs detektor (FID) elektródái között a hidrogén égési folyamatába lépő szénhidrogén tömeg arányával arányos ionizációs áram folyik. Az analizátor szükség szerűen tartalmazzon a mintában lévő gázok hőmérsékletét, illetve a minta, a kerülő ágon haladó minta, az üzemanyag és a hűtőgázok áramlási sebességét szabályozó elemeket, továbbá elemeket, amelyek biztosítják a mérési tartomány és a „zéró” effektív kalibrálás ellenőrzését.

Megjegyzés. – Az általános műszaki követelményeket e Függelék „A” melléklete tartalmazza.

5.3 CO és CO_2 analizátor

Ezen összetevők mérésére nem-diffúziós infravörös analizátort kell alkalmazni, amely konstrukciója szerint párhuzamosan működő referencia és mintagáz cellákban energiaelnyelés különbség elvét hasznosítva mér, az ezen gáz alkotóelemek cellája, vagy cella csoportjai legyenek megfelelő érzékenységre hangolva. Az elemző alrendszer tartalmazza a minta, a zéró gáz és a végkitérést okozó gáz áramlásának szabályozásához és kezeléséhez szükséges összes funkciót. A hőmérséklet szabályozása annak megfelelő legyen, hogy száraz, vagy nedves állapotú mérést végeznek.

Megjegyzés. – Az általános műszaki követelmények jelen Függelék „B” mellékletében találhatók.

5.4 NO_x analizátor

A nitrogénoxid (NO) koncentrációt a vegyi luminesszencia alapján kell mérni, amelynek megfelelően a reakcióba O_3 adalékkal belépő NO sugárzási intenzitásának mértéke megfelel az NO koncentráció mértékének. A mérés elvégzése előtt az NO_2 komponenst egy megfelelő hatékonysággal rendelkező konverterben NO komponensé kell átalakítani. A teljes NO_x mérőrendszer foglalja magába az összes szükséges áramlási, hőmérsékletet, és egyéb paraméterek szabályozását biztosító berendezést és biztosítsa a mérési tartomány és a zéró kiegyenlítés szokásos eljárásának elvégzését, valamint az NO_2 átalakítási hatékonyság ellenőrzést.

Megjegyzés. – Az általános műszaki követelmények jelen Függelék „C” mellékletében találhatók.

6. Általános vizsgálati eljárások

6.1 Hajtómű működés

6.1.1 A hajtóművet nagy pontosságú vizsgálatok elvégzéséhez a szükséges eszközökkel felszerelt statikus próbapadon kell működtetni.

6.1.2 A gáz kibocsátás vizsgálatokat a bizonyítványt kiadó hatóság által előírt tolóerő érték beállításokal kell végezni. A hajtómű üzemmódját minden tolóerő beállítás mellett stabilizálni kell.

6.2 A műszer alap kalibrálásai

Megjegyzés. – E kalibrálás általános célja a stabilitás és linearitás igazolása.

6.2.1 A kérelmező a bizonyítványt kiadó hatóság felé kielégítően bizonyítsa, hogy az elemzőrendszer kalibrációja a vizsgálat idején érvényes.

6.2.2 Ami a szénhidrogén analizátort illeti, ennek hitelesítésénél azt kell ellenőrizni, hogy a detektor oxigén és szénhidrogén különbségi reakciói a jelen Függelék „A” mellékletében megadott határok közé esnek-e. Az NO_2/NO konvertert a jelen Függelék „C” mellékletében leírt műszaki követelményeknek megfelelően ugyancsak ellenőrizni és hitelesíteni kell.

6.2.3 Mindegyik analizátor esetében a működési teljesítmény ellenőrző folyamat (jelen Függelék „D” mellékletében meghatározott hitelesítő és vizsgálati gázokat alkalmazva) a következő legyen:

a) Nulla gáz bevitele és a műszer nulla mutatás beszabályozása, a beállítás feljegyzése -amint az megfelelő;

b) Minden üzemszerűen alkalmazandó tartományra a teljes kitérést (FSD) előidéző (névlegesen) koncentráció 90 százalékának megfelelő kalibráló gáz bevitele; a műszer erősítés (gain) ennek megfelelő beszabályozása és a beállítás feljegyzése;

c) Megközelítőleg 30 százalék, 60 százalék és 90 százalék FSD koncentráció bevitele és az elemző kijelzés feljegyzése;

d) A „zéró”, a 30 százalékos, a 60 százalékos és a 90 százalékos koncentrációnak megfelelő pontokon keresztül a legkisebb négyzetek egyenes vonalának meghúzása. A kimenet linearizálása nélküli, alap formájában használt CO és/vagy, CO_2 analizátor esetében -ha szükségesnek ítélt, további kalibrálási pontokat alkalmazva- a megfelelő matematikai képlet alapján nyert legkisebb négyzetek görbéjének felillesztése. Ha bármely pont eltérése nagyobb, mint a műszer egész mérési tartomány értékének 2 százaléka (vagy ±1 ppm*, amelyik a nagyobb), akkor üzemi használatra kalibráló görbe készítése.

6.3 A mérés végrehajtása

6.3.1 Méréseket addig ne végezzenek, amíg minden műszer és mintatovábbító vezeték fel nem melegedett és nem stabilizálódott, továbbá a következő ellenőrzéseket nem hajtották végre:

a) Szivárgás ellenőrzés: Vizsgálatsorozat végzése előtt a rendszert a következők szerint kell szivárgás szempontjából ellenőrizni: A mintavevőt és az analizátort le kell választani; annak ellenőrzésére, hogy a rendszer szivárgási mértéke normál hőmérsékletre és nyomásra vetítve kevesebb 0,4 L/perc-nél, egy a füstmérő rendszerhez használt teljesítményűvel egynértékű vákumszivattyút kell csatlakoztatni és működtetni.

b) Tisztaság ellenőrzés: A mintavevőt szigetelje el a gázminta rendszertől. A rendszer mintatovábbító vezetékének végét csatlakoztassa „zéró” – gázforráshoz. A rendszert a szénhidrogén mérés végzéséhez szükséges üzemi hőmérsékletre melegítse fel. Hozza működésbe a mintaáramoltató szivattyút és az áramlás mértékét állítsa be a hajtómű által kibocsátott termékek vizsgálata során használt mértékre. Jegyezze fel a szénhidrogén analizátor kijelzését. A kijelzés nem lépheti túl a hajtómű alapjárati kibocsátási szintjének 1 százalékát, illetve az 1 ppm-et (mindkettő metánban értelmezve), amelyik a nagyobb.

1. Megjegyzés. – Jelentős mértékű szennyeződés felgyülemlésének megelőzése érdekében megfelelő gyakorlat a vezetékek járó hajtómű mellett történő ellentétes irányú kifuvatása, miközben a mintavevő a hajtómű gázáramban van, de a kibocsátást még nem mérik.

2. Megjegyzés. – Ugyancsak megfelelő gyakorlat a belépő levegő minőségének ellenőrzése a vizsgálat kezdetén és végén, illetve a vizsgálat alatt legalább óránként egy alkalommal. Ha a szintek jelentősnek tekinthetők, akkor azokat figyelembe kell venni.

6.3.2 Üzemi mérésre a következő eljárás alkalmazandó:

a) megfelelő zéró gáz bevitele és a műszerek minden szükséges beszabályozásának elvégzése;

b) minden használatos mérési tartományra az FSD (névlegesen) koncentráció 90 százalékos értékéhez tartozó koncentrációjú megfelelő kalibráló gáz bevitele és az erősítés (gain) megfelelő beszabályozása és feljegyzése;

c) a hajtómű működés kívánt üzemmódon történő stabilizálódását követően a hajtómű járatás folytatása és a szennyező anyagok koncentráció figyelemmel kísérése mindaddig, amíg stabil értékek nem állnak elő, majd ezek feljegyzse;

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* Kivéve a CO_2 analizátort, amelynél az értéknek ±100 ppm-nek kell lennie.

d) A vizsgálat végén, továbbá a vizsgálat alatt bizonyos időszakonként, maximum 1 óránként a „zéró” és a kalibráló pontok ismételt ellenőrzése. Ha valamelyik pont az FSD tartomány több, mint ±2 százalékával eltolódott, akkor a műszer megfelelő határok közé történő újra beszabályozása és a vizsgálat megismétélése.

6.4 Széntartalom egyensúly ellenőrzés

Minden vizsgálat foglalja magába a következő ellenőrzését: az összes minta teljes széntartalom koncentrációja alapján (a füst kizárásával) becsültek szerinti levegő/üzemanyag arány egyezik-e a gurulás/földi alapjárat ±15 százalékon belüli, illetve minden egyéb üzemmód 10 százalékán belüli hajtómű levegő/üzemanyag arány alapján becsültekkel (lásd 7.1.2).

7. Számítások

7.1 Gáznemű anyagok kibocsátása

7.1.1 Általános rész

Az analitikus mérések eredménye a különböző hajtómű üzemmódoknál a szennyező anyag különböző osztályainak az anyag saját analizátorának mérése szerinti koncentrációi legyenek és jelenteni ezeket kell.

Ezeken felül, a következő számítások alapján kapott** egyébb paramétereket is közölni kell.
** E Függelék „E” mellékletében egy sokkal átfogóbb és pontosabb elfogadható alternatív módszer található.

7.1.2 Fő paraméterek

$$EI_p \text{ (kibocsátási index p komponensre)} = \frac{\text{a képződött p komponens tömege gr-ban}}{\text{az alkalmazott üzemanyag tömege kg-ban}}$$

$$EI(CO) \quad \left(\frac{[CO]}{[CO_2]+[CO]+[HC]}\right)\left(\frac{10^3 M_{CO}}{M_C+(n/m)M_H}\right)\left(I+T(P_o/m)\right)$$

$$EI(HC) \quad \left(\frac{[CO]}{[CO_2]+[CO]+[HC]}\right)\left(\frac{10^3 M_{HC}}{M_C+(n/m)M_H}\right)\left(I+T(P_o/m)\right)$$

$$EI(NO_x) \quad \left(\frac{[NO_x]}{[CO_2]+[CO]+[HC]}\right)\left(\frac{10^3 M_{NO_x}}{M_C+(n/m)M_H}\right)\left(I+T(P_o/m)\right)$$

$$\text{(Air/fuel ratio = levegő/üzemanyag arány)} = (P_o/m)\left(\frac{M_{Levegő}}{M_C+(n/m)M_H}\right)$$

ahol:

$$P_o/m = \frac{2Z-(n/m)}{4(1+h\text{--}\,|TZ/2|}$$

és

$$Z = \frac{2 - [CO] - (|2/x| -- |y/2x|)\,[HC] + [NO_2]}{[CO_2]+[CO]+[HC]}$$

$M_{levegő}$ A száraz levegő molekula tömege = 28,966 gr., vagy ahol ez megfelelő, = (32 R + 28,156 4 S + 44,011 T) g

M_{HC} Kibocsátott szénhidrogének molekula tömege CH_4-ként véve = 16,043 g

M_{CO} CO molekula tömege = 28,011 g

M_{NO_2} NO_2 molekula tömege = 46,008 g

M_C Szénatom tömege = 12,011 g

M_H Hidrogénatom tömege = 1,008 g

R O_2 koncentráció száraz levegőben normál térfogaton = 0,209 5, rendszerint

S N_2 koncentráció + nemesgáz térfogat szerint, száraz levegőben = 0,709 2, rendszerint

T CO_2 koncentráció térfogat szerint, száraz levegőben = 0, 000 3, rendszerint

[HC) Kibocsátott szénhidrogén átlagos koncentráció térfogat/térfogat, szénként kifejezve

[CO] Közepes CO koncentráció térfogat/térfogat, nedves

$[CO_2]$ Közepes CO_2 koncentráció térfogat/térfogat, nedves

$[NO_x]$ Közepes NO_x koncentráció térfogat/térfogat, nedves = $[NO + NO_2)$

[NO] A kibocsátott gázmintában lévő NO közepes koncentráció térfogat/térfogat, nedves

$[NO_2]$ A kibocsátott gázmintában lévő NO_2 közepes koncentráció térfogat/térfogat, nedves

$$= \frac{([NO_x]_c - [NO])}{\eta}$$

$[NO_x]_c$ A kibocsátott gázmintában lévő NO közepes koncentráció az NO_2/NO konverteren való áthaladás után, térfogat/térfogat, nedves

η NO_2/NO konverter hatásfoka

h Környező levegő nedvességtartalma, víz térfogat/száraz levegő térfogat

m C atomok száma a jellemző tüzelőanyag molekulában

n A H atomok száma a jellemző tüzelőanyag molekulában

x C atomok száma a jellemző kibocsátott szénhidrogén molekulában

y H atomok száma a jellemző kibocsátott szénhidrogén molekulában

Az alkalmazott tüzelőanyagban lévő hidrogén atomok és szénatomok viszonyát az n/m értékét a tüzelőanyag fajta analízise útján határozzák meg. A környező levegő nedvességtartalmát a h-t, minden konkrét feltételnél mérni kell. Ellenkező bizonyítékok hiányában a kibocsátott szénhidrogének x, y jellemzőjeként az x = 1, y = 4 értékeket kell használni. Ha a mérésekben száraz, vagy félszáraz CO és CO_2 méréseket alkalmaznak, akkor ezek koncentráció értékét először a nedves, CO és CO_2 koncentrációjának ekvivalens értékeire kell átszámítani a jelen Függelék "E" Mellékletében leírtak szerint, amely interferencia korrekció beviteli képleteket is tartalmaz az alkalmazni szükséges esetekre.

7.1.3 A gáz kibocsátási index korrekciója a referencia feltételekre

A vizsgált hajtómű bemenetén a tényleges léghőmérséklet és nyomás referencia környezeti feltételektől (a Nemzetközi Egyezményes Légkör tengerszinthez tartozó feltételeitől) való eltérések figyelembe vétele céljából, a mérendő gáz kibocsátási indexen korrekciót kell alkalmazni minden szennyező anyagra, a hajtómű összes megfelelő üzemmódjára vonatkozóan. A referencia nedvességtartalom = 0,00634 kg víz/száraz levegő értékkel.

Következésképp, korrigált EI = K x mért EI,

ahol a K értékére adott általános kifejezés:

$$K = (P_{Bref} / P_B)^a \times (FAR_{ref} / FAR_B)^b \times \exp(|T_{Bref} - T_B|/c) \times \exp(d\backslash h - 0{,}00634|)$$

P_B Az égőkamra bemenetén mért nyomás

T_B Az égőkamra bemenetén mért hőmérséklet

FAR_B Tüzelőanyag/levegő arány az égőkamrában

h A környező levegő nedvessége

P_{ref} A Nemzetközi Egyezményes Légkör tengerszinthez tartozó nyomása

T_{ref} A Nemzetközi Egyezményes Légkör tengerszinthez tartozó hőmérséklete

P_{Bref} A vizsgált hajtómű égőkamrájának (vagy ha az adatot a referencia hajtóműhöz korrigálták, a referencia hajtómű) bemeneténél mért és a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotán mért T_B értékhez tartozó nyomás.

T_{Bref} A vizsgált hajtómű (vagy ha az adatot a referencia hajtóműre szándékoznak korrigálni, a referencia hajtómű) égőkamrájának bemenetén a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotán mért hőmérséklet. Ez a hőmérséklet az egyes hajtómű üzemmódokra meghatározott tolóerő-értékhez tartozó hőmérséklet.

FAR_{ref} Tüzelőanyag - levegő arány a vizsgált hajtómű égőkamrájában, a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotának megfelelően (vagy a kiinduló hajtóműnél mérve, ha az adatokat a kiinduló hajtóműre óhajtják korrigálni).

a, b, c, d Konstansok, amelyek szennyező anyagonként és hajtómű típusonként változhatnak.

Az égőtér bemeneti paramétereket kívánatos az égőkamra bemenetén mérni, de megfelelő képletekkel kiszámíthatók a környezeti feltételekből kiindulva is.

7.1.4 A kibocsátási minták égőtéri belépő hőmérséklethez rendelésére ajánlott grafikon illesztéses módszer alkalmazása, az általánosított egyenletből végeredményben megszüntetve az exp $((T_{Bref} - T_B)/C)$ kifejezést és az esetek többségében a (FAR_{ref} / FAR_B) kifejezés egynek tekinthető. A CO és a HC kibocsátási mintákra vonatkozóan számos vizsgáló létesítmény megállapította, hogy a nedvesség kifejezés, az 1-hez eléggé közel áll ahhoz, hogy a kifejezésből eltüntethető legyen továbbá, hogy a (P_{Bref} / P_B) kifejezés hatványa, 1-hez közel áll.

Ezáltal,

EI(CO) helyesbített = EI származtatva a
$(P_B / P_{Bref}) * EI(CO)$ versus T_B görbéből

EI(HC) helyesbített = EI származtatva a
$(P_B / P_{Bref}) * EI(HC)$ versus T_B görbéből

$EI(NO_x)$ helyesbített = EI származtatva az
$EI(NO_x)(P_{Bref}/PB)^{0,5\ exp}$ (19|h - 0,006 34|) versus T_B görbéből

Ha a CO és HC kibocsátási index helyesbítésre ajánlott ezen módszer nem biztosít kielégítő összerendelést, akkor a részegységek vizsgálatából származtatott paraméterek alkalmazásával alternatív módszer használható.

A CO, a CH és NO_x kibocsátási index esetében bármely más korrekciós eljárást, csak a légialkalmassági bizonyítványt kiállító hatóság jóváhagyásával lehet alkalmazni.

7.2 Szabályozó paraméter függvények (D_p, F_{oo}, π)

7.2.1 Fogalom meghatározások

D_p Bármely gáznemű szennyezőanyag tömege, amely a vonatkozó szennyeződés kibocsátási le- és felszálló ciklus alatt a légkörbe kerül.

F_{oo} A légialkalmassági bizonyítványt kiadó hatóság által jóváhagyott maximum tolóerő a felszálláshoz szükséges szokványos üzemi feltételek között és a Nemzetközi Egyezményes Légkör tengerszinthez tartozó statikus állapotának megfelelő feltételek mellett, víz befecskendezés alkalmazása nélkül.

π A kompresszor utolsó fokozatának kimenő síkjában mérhető teljes nyomás átlag értékének viszonya a kompresszor első lépcsőjének bemeneti síkjában mérhető teljes nyomás átlag értékéhez, amikor a Nemzetközi Egyezményes Légkör tengerszinthez tartozó statikus állapotának megfelelő feltételek között, a hajtómű felszálló tolóerőt fejt ki.

7.2.2 Az alapjárat, a megközelítés, az emelkedés és a felszállás, le- felszállási ciklusra előírt hajtómű üzemmód beállításokra (n), minden egyes egyenértékű helyesbített tolóerő viszonyra a 7.1.4 -ben leírtak szerint meg kell állapítani mindegyik szennyező anyagra a légköri nyomás és nedvesség tartalom szempontjából (ha szükséges) a referencia környezeti légköri állapotra helyesbített és, ha szükséges, a referencia hajtóműre helyesbített kibocsátási indexeket (EI). Az alapgáz üzemmód meghatározásához legkevesebb 3 vizsgálati pont szükséges. Minden egyes szennyező anyagra az alábbiak közötti összefüggéseket kell meghatározni:

a) Az EI és T_B közötti; és

b) W_f (a hajtómű üzemanyag mennyiség fogyasztás mértéke) és T_B közötti; valamint

c) F_n (Nemzetközi Egyezményes Légkör tengerszinti állapotára korrigált), és T_B (Nemzetközi Egyezményes Légkör tengerszinti állapotára korrigált) értékei közötti összefüggéseket.

Megjegyzés. - Ezeket, példaként a 3-2 a), b) és c) ábra szemlélteti.

Ha a vizsgált hajtómű nem egy "referencia" hajtómű, akkor az adatok a referencia hajtóműről nyert b) és c) összefüggést használva a "referencia" hajtómű állapotokra korrigálhatók. A referencia hajtómű a következőképp határozható meg: Lényegében a minősíteni kívánt hajtómű leírása szerinti kialakítású és a légialkalmassági bizonyítványt kiadó hatóság elfogadta, miszerint az, reprezentatív példánya annak a hajtómű típusnak, amelyhez a minősítést kérik.

Ezen összefüggések igazolásához a gyártó köteles a légi-alkalmassági bizonyítványt kiállító hatóságot ellátni minden szükséges hajtómű teljesítményjellemző adattal és a Nemzetközi Egyezményes Légkör tengerszinti környezeti feltételeire a következőkkel:

d) A maximum hitelesített tolóerő (F_{oo}); és

e) A maximum hitelesített tolóerőhöz tartozó hajtómű nyomásviszony (π).

Megjegyzés. - Ezeket a 3-2 d ábra illusztrálja.

7.2.3 A referencia környezeti feltételekre helyesbített, mindegyik előírt hajtómű üzemmódra megállapított és az egyes szennyező anyagra vonatkozó EI becslésnek a következő általános eljárással kell egyezni:

a) Minden egyes üzemmódra Fn, határozza meg a Nemzetközi Egyezményes Légköri feltételekre vonatkozó ekvivalens égőtér bemeneti hőmérsékletet (T_B)-t (3-2 c ábra));

b) Az EI/T_B jellemző (3-2 a) ábra) alapján határozza meg a T_B értéknek megfelelő, EI_n értékeket;

c) A W_f/T_B jellemző alapján (3 - 2 b) ábra)), határozza meg a T_B értéknek megfelelő W_{fn} értékeket;

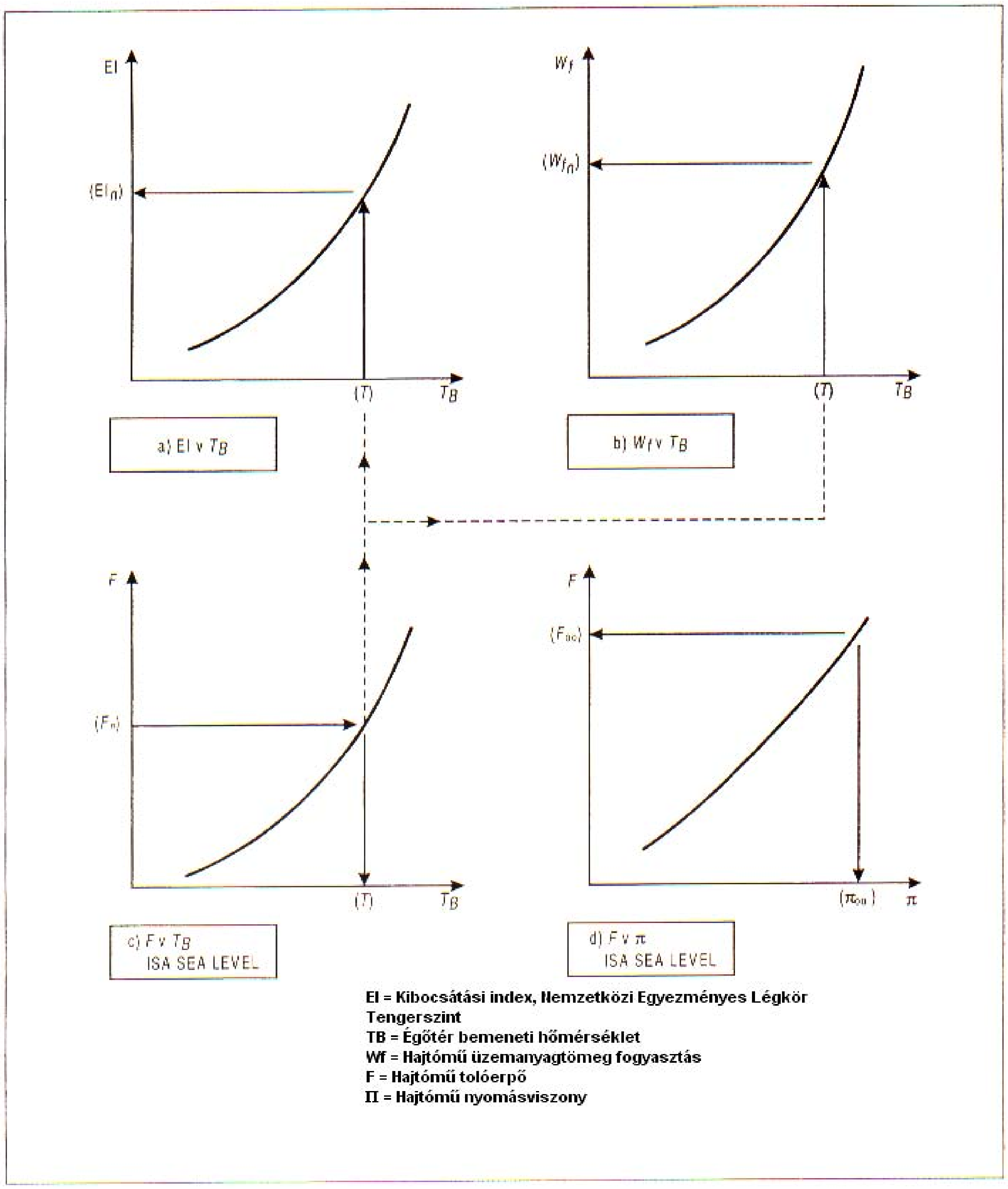
d) Jegyezze fel az ISA maximum hitelesített tolóerő és nyomásviszony értékeit. Ezek, a sorrendnek megfelelően F_{oo} és π (3-2 d) ábra).

e) Minden szennyező anyagra számítsa ki a $D_p = \Sigma (EI_n) (W_{fn}) (t)$, ahol:

t LTO üzemmódban mért idő (percekben)

W_{fn} Tüzelőanyagtömeg áramlás (kg/perc)

Σ A referencia LTO ciklust összetevő üzemmódok összegzése



3-2. ábra – Számítási eljárás

7.2.4 Mivel a fentiekben leírt módszer, ajánlott módszer, a légi-alkalmassági bizonyítványt kiadó hatóság jóvá hagyhat azonos értékű matematikai eljárást, amelyben függvénygörbéket megadó matemetikai kifejezéseket használnak, ha ezeket a kifejezéseket a függvénygörbék felvételére vonatkozó elfogadott módszer alkalmazásával nyerték.

7.3 A javasolt eljárásoktól való eltérés

Azokban az esetekben, ha a hajtómű konfiguráció, vagy egyéb feltétel nem teszi lehetővé ezen eljárás alkalmazását, a légi-alkalmassági bizonyítványt kiadó hatóság, miután megkapta azokat a bizonyítékokat, amelyek alátámasztják az alternatív szabályok segítségével kapott eredmények azonos értékűségét, jóváhagyhatja az alternatív eljárást.

3. FÜGGELÉK „A" MELLÉKLETE A HC ANALIZÁTOR MŰSZAKI LEÍRÁSA

1. Megjegyzés. – Ahogyan az a 3. Függelék 5.2 pontjában szerepel, az analizátor mérő eleme egy láng ionizációs detektor (FID), amelyben az egész gázmintát, vagy annak egy reprezentatív részét hidrogén lángba adagolják. Az elektródák megfelelő elhelyezésével ionizációs áram hozható létre, amely a lángba belépő szénhidrogén tömeg értékének függvénye. Ezt az áramot megfelelő zéróhoz viszonyítva, felerősítik és osztályozzák, hogy az eredményt megkapják, amely az ekvivalens ppmC számmal kifejezett szénhidrogén koncentráció mértékéül szolgál.

2. Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D" mellékletet.

1. Általános rész

Elővigyázatossági intézkedések: A megnevezett teljesítmény jellemző előírások rendszerint az analizátor teljes mérési (skála kitérési) tartományára vonatkoznak. A teljes kitéréstől kisebb jelzéseknél a hiba a kijelzett értékek nagyobb százaléka lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

Az alkalmazott műszer biztosítsa, hogy a detektorral és a gázmintával közvetlenül kapcsolatba kerülő részek hőmérséklete (±2 °C pontossággal) 155 °C-165 °C közötti hőmérséklet tartományban maradjon. Azzal a feltétellel, hogy a detektor érzékenysége optimális és a műszer egészében véve stabilizált, a fő műszaki jellemzők az alábbiak:

a) *Teljes mérési tartomány:* 0-5000 ppmC, a megfelelő mérési tartományokban;

b) *Felbontó képesség:* a műszer alkalmazott mérési tartományának 0,5 százalékánál, vagy 0,5 ppmC-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség:* a műszer alkalmazott mérési tartományának ±1 százalékánál, vagy ±0,5 ppmC-nél jobb, amelyik a nagyobb;

d) *Stabilitás*: egy órás tartamon keresztül a műszer alkalmazott mérési tartományának ±2 százalékánál, vagy ±1 ppmC-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül a műszer alkalmazott mérési tartományának ±1 százalékánál, vagy ±0,5 ppmC-nél kisebb, amelyik a nagyobb;

f) *Zaj – 0,5 Hz és ettől nagyobb:* egy órás tartamon keresztül a műszer alkalmazott mérési tartományának ±1 százalékánál, vagy ±0,5 ppmC-nél kisebb, amelyik a nagyobb;

g) *Beállási idő*: A mutató végleges kitérése 90 százalékáig történő kitéréséig maximum 10 másodperc a gázmintának az elemző rendszerbe bevitelétől számítva;

h) *Linearitás:* Minden mérési tartományban a levegőben lévő propánra reagálás egyenletessége a teljes mérési tartomány ±2 százalékán belüli - egyébként kalibráló helyesbítést kell végezni.

2. Szinergikus hatás

Megjegyzés. – Az alkalmazás során a mérés pontosságát két tényező befolyásolhatja:

a) Oxigén hatás (amikor a mintában jelenlévő oxigén arányok hatása következtében, a tényleges HC koncentrációtól eltérő szénhidrogén tartalom kijelzése történik); és

b) A szénhidrogénre vonatkozó relatív reakció (az az eset, amikor egy és ugyanazon mintára eltérő reakció történik az ekvivalens ppmC számban kifejezett szénhidrogén koncentrációra, amely a különböző osztályokba tartozó szénhidrogén vegyületek osztályától és keverékétől függ).
A fentiekben említett hatás mértékét az alábbiakban leírtak szerint kell meghatározni és értelemszerűen korlátozni.

Oxigén reagálás: levegőben lévő ±1 százalék relatív pontossággal ismert körülbelül 500 ppmC koncentrációjú, kétféle propánnal a következők szerint mérje meg a reagálást:

1) Propán 10 ±1 százalék O_2-ben, a többi N_2

2) Propán 21 ±1 százalék O_2-ben, a többi N_2

Ha R_1 és R_2 a normalizált hatás megfelelő értékei, akkor (R_1-R_2)-nek R_1 3 százalékánál kisebbnek kell lennie.

Szénhidrogén különbségi reakció: levegőben lévő ±1 százalék relatív pontossággal ismert körülbelül 500 ppmC koncentrációjú, négyféle szénhidrogénnel a következők szerint mérje meg a reagálást:

a) propán zéró levegőben

b) propilén zéró levegőben

c) toluén zéró levegőben

d) n-hexán zéró levegőben.

Ha R_a, R_b, R_c és R_d – a sorrendnek megfelelően – a propánra vonatkozó normalizált reakciók, akkor (R_a-R_b), (R_a-R_c) és (R_a-R_d) különbségek mindegyikének az R_a 5 százalékánál kisebbnek kell lennie.

3. A detektor reakció optimalizálása és kiegyenlítése

3.1 El kell végezni a gyártó által a kezdeti beállításra vonatkozó, illetve a szükséges kiegészítő szervizelés és táplálás megvalósítására vonatkozó előírásokat és hagyni kell a műszert, hogy stabilizálódjon. Minden beállító szabályozás esetén ismételten „zéró” ellenőrzést és szükség szerinti helyesbítést kell végrehajtani. Mintaként, levegőben lévő megközelítőleg 500 ppmC propánt használva, optimumának megválasztásához a reagálási karakterisztikákat hígító levegőáram változásokra először a tüzelőanyag áramlás változásaira, ezután közel optimális tüzelőanyag áramlásra kell meghatározni. Az oxigén és a szénhidrogén különbségi reakciókat ezután a fentiekben jelzettek szerint kell meghatározni.

3.2 Az analizátor minden mérési tartományának linearitását levegőben lévő, a teljes skála kitérés megközelítőleg 30, 60 és 90 százalék koncentrációjú propán adagolásával kell ellenőrizni. Az adott pontokat 0-val összekötő legkisebb négyzetek egyenesétől az említett pontok bármelyikének maximum reagálás eltérése a műszer teljes mérési tartományának ±2 százalékát nem haladhatja meg. Ha az eltérés ennél az értéknél nagyobb, akkor az üzemeltetéshez kalibráló görbét kell készíteni.

3. FÜGGELÉK „B” MELLÉKLETE CO ÉS CO_2 ANALIZÁTOR MŰSZAKI LEÍRÁSA

1. Megjegyzés. – A 3. Függelék 5.3 pontja foglalja össze az elhasznált gázokban lévő CO és CO_2 koncentrációk külön-külön történő méréseinél alkalmazandó analizáló alrendszer jellemzőit. A műszerek, az etalon és a kiválasztott gázzal töltött, párhuzamos elemekben végbemenő diffúzió mentes infravörös sugárzás elnyelésén alapulnak. A kívánt érzékenységi tartományok egy sor, kiválasztott gázra érzékeny elem segítségével, illetve az elektromosság változtatásával, vagy mindkét eljárással együttesen valósítható meg. Az átfedésben lévő elnyelődési tartománnyal bíró gázoktól származó interferenciát gáz elnyelő szűrőkkel és/vagy optikai szűrőkkel (lehetőség szerint az utóbbiakat alkalmazva) lehet minimalizálni.

2. Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D” mellékletet.

Elővigyázatossági intézkedések: A megnevezett teljesítmény jellemző előírások rendszerint az analizátor teljes mérési (skála kitérési) tartományára vonatkoznak. A teljes kitéréstől kisebb jelzéseknél a hiba a kijelzett érték nagyobb százaléka lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

A fő teljesítmény jellemzők az alábbiak legyenek:

CO analizátor

a) *Teljes mérési tartomány*: 0-2500 ppm, megfelelő tartomány osztásokkal;

b) *Felbontó képesség:* az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 1 ppm-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±2 ppm-nél jobb, amelyik a nagyobb;

d) *Stabilitás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±2 ppm-nél job, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

f) *Zaj – 0,5 Hz és ettől nagyobb*: az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

g) *Interferencia*: A kijelzett CO koncentráció tekintetében a következők szerint kell korlátozni:

1) az etilén glikol tartalom minden százaléka esetében 500 ppm-nél kisebb

2) A CO_2 tartalom minden százaléka esetében 2 ppm-nél kisebb

3) a vízpára tartalom minden százaléka esetében 2 ppm-nél kisebb*

Ha a CO_2-re és a vízpárára vonatkozó interferenciát nem lehet ezen határok közé szorítani, akkor a megfelelő korrekciós együtthatókat meg kell határozni és azokat jelenteni, illetve alkalmazni kötelező.

Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

CO_2 analizátor

a) *Teljes mérési tartomány*: 0-tól 10 százalékig, megfelelő tartomány beosztásokkal;

b) *Felbontó képesség*: az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 100 ppm-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±100 ppm-nél jobb, amelyik a nagyobb;

d) *Stabilitás*: egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±100 ppm-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±100 ppm-nél kisebb, amelyik a nagyobb;

f) *Zaj – 0,5 Hz és ettől nagyobb:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±100 ppm-nél kisebb, amelyik a nagyobb;

g) Az oxigén (O_2) CO_2 analizátorra gyakorolt hatását ellenőrizni kötelező. Adott CO_2 koncentrációra reagálás a kijelzett érték 2 százaléknál nagyobb mértékben nem változhat, amikor az O_2-t 0 százalékról 21 százalék O_2-re változtatják. Ha ez a határérték nem tartható, akkor megfelelő helyesbítési tényezőt kell alkalmazni.

Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

CO és CO_2 analizátorok

a) *Reakció idő:* a minta elemző rendszer bemenetén történő belépésétől számítva a végleges kitérés 90 százalékának elérése 10 másodpercnél ne legyen hosszabb időtartamú.

b) *A minta hőmérséklete:* a művelet elvégzésének megszokott módja az, hogy a mintát „nedves” (kezeletlen) állapotában vizsgálják. E miatt a mintát tartalmazó rekesz és az eme alrendszerben a mintával érintkezésbe kerülő minden szerkezeti elem hőmérsékletét ±2 °C pontossággal 50 °C hőmérsékleten kell tartani. A CO és a CO_2 száraz alapon (megfelelő víz csapdák alkalmazásával) történő mérése megengedett és ez esetben a H_2O-ra vonatkozó interferencia korlátokat megszüntetve fűtetlen elemzők használhatók, melyet követően a belépő vízpárára és ez égetés alkalmával keletkező vízre korrekciót kell végezni.

c) Kalibráló görbék:

* Nem kell alkalmazni, ha a méréseket „száraz” körülmények között végzik.

i) A lineáris kimenő jel karakterisztikával rendelkező elemző berendezést minden munka tartományban ismert, a teljes skála kitérés megközelítőleg 0, 30, 60 és 90 százalékos koncentrációjú kalibráló gázok használatával kötelező ellenőrizni. E pontok bármelyike esetében a zéró leolvasást és az ezen pontokat összekötő legkisebb négyzetek egyenesének vonalához viszonyított maximum reakció eltérés, a teljes sklála kitérési érték ±2 százalékánál nagyobb nem lehet. Ha az eltérés ettől nagyobb, akkor az üzemi használathoz kalibráló görbét kell készíteni.

ii) A nem lineáris kimenő jel karakterisztikával rendelkező, illetve a fentiekben megadott linearitást nem teljesítő elemző berendezéshez minden munka tartományra kalibráló görbét kell készíteni ismert, a teljes skála kitérés megközelítőleg 0, 30, 60 és 90 százalékos koncentrációjú kalibráló gázokat használva. A görbe pontos alakjának meghatározásához, ha szükséges, további gázkeverékeket kell használni.

A 3. FÜGGELÉK „C” MELLÉKLETE – NO_X ANALIZÁTOR MŰSZAKI LEÍRÁSA

Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D” mellékletet.

1. Ahogyan azt a 3. Függelék 5.4 pontja leírja, a nitrogén dioxid tartalom mérése kémiai luminesszencia alapján történik, mely során mérik az NO és az O_3 reakciója által kibocsátott sugárzást. Ez a módszer az NO_2-re érzéketlen, ezért, mielőtt az össz NO_x tartalmat megmérnék, a gázmintát konverteren bocsátják keresztül, amelyben az NO_2 NO-vá alakul át. Mérni kell mind az NO eredeti mennyiségét, mind az össz NO_x koncentrációt. Az NO_2 mennyiségét a különbség alapján kell meghatározni.

2. Az alkalmazott berendezés az áramlás szabályozásához szükséges minden részt tartalmazzon, például szabályozókat, szelepeket, fogyasztás mérőket stb. A gázmintával közvetlenül kapcsolatba kerülő anyagok legyenek ellenállók a nitrogén oxidok hatásaival szemben, ilyen anyag például rozsdamentes acél, az üveg stb. A gázminta hőmérsékletét a helyi nyomásnak megfelelő, a víz kicsapódás lehetőségét kizáró hőmérsékleten kell tartani.

Figyelmeztetés: a feltüntetett teljesítmény jellemzők általában az analizátor teljes skála kitérésére vonatkoznak. Részleges skála kitérésnél a hiba a kijelzett érték lényegesen nagyobb százaléka is lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

3. A 2 °C-on belüli stabilitású környezeti hőmérséklet körülmények között üzemeltetett műszerre meghatározott fő teljesítmény jellemzők az alábbiak:

a) *Teljes mérési tartomány:* 0-2500 ppm, a megfelelő mérési tartományokban;

b) *Felbontó képesség*: az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 1 ppm-nél jobb, amelyik a nagyobb;

b) *Ismételhetőség:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél jobb, amelyik a nagyobb;

c) *Stabilitás*: egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±1 ppm-nél jobb, amelyik a nagyobb;

d) *Nulla elhúzás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

e) *Zaj – 0,5 Hz és ettől nagyobb:* két órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

f) *Interferencia:* a CO_2-t és vízpárát tartalmazó minták esetében az elnyomást a következők szerint kell korlátozni:

- a CO_2 tartalom minden százaléka esetében a műszer kitérés 0,05 százalékánál kisebb;

- a vízpára tartalom minden százaléka esetében a műszer kitérés 0,1 százalékánál kisebb.
  Ha a CO_2-re és/vagy a vízpárára vonatkozó interferencia korlátozás nem tartható, akkor megfelelő korrekciós együtthatókat kell meghatározni és azokat jelenteni, illetve alkalmazni kötelező.

Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

h) *Reakció idő:* a minta elemző rendszer bemenetén történő belépésétől számítva a végleges kitérés 90 százalékának elérése 10 másodpercnél ne legyen hosszabb időtartamú.

i) *Linearitás:* az alkalmazott tartomány teljes skála kitérésének ±2 százalékánál jobb, vagy ±2 ppm, amelyik a nagyobb.

j) *Konverter:* tervezése és üzemeltetése oly módon történjen, hogy a mintában jelenlévő NO_2-t NO-ra redukálja. A konverter ne legyen hatással a mintában eredetileg jelenlévő NO-ra.

A konverter hatásfoka 90 százaléknál rosszabb nem lehet.

Ezt a hatásfok értéket kell használni a mintában lévő NO_2 mennyiség (azaz $(NO_x)_c$ - (NO)) arra az értékre korrigálásához, amelyet akkor kapnának, ha a konverter hatásfoka nem 100 százalék lenne.

A 3. FÜGGELÉK „D” MELLÉKLETE – KALIBRÁLÓ ÉS VIZSGÁLATI GÁZOK

Kalibráló gázok táblázata

Analizátor	*Gáz*	*Pontosság (A megbízhatóság 95 százalékos tartományában mérve)*
HC	Propán zéró levegőben	±2 százalék, vagy ±0,05 ppm Amelyik nagyobb.
CO_2	CO_2 zéró levegőben	±2 százalék, vagy ±100 ppm Amelyik nagyobb.
CO	CO zéró levegőben	±2 százalék, vagy ±2 ppm Amelyik nagyobb.
NO_X	NO_x zéró nitrogénben	±2 százalék, vagy ±1 ppm Amelyik nagyobb.

Az analizátorok szokványos üzemi használata alatti rutin kalibrálásának elvégzéséhez e gázokat kötelező alkalmazni.

Vizsgálati gázok táblázata

Analizátor	*Gáz*	*Pontosság (A megbízhatóság 95 százalékos tartományában mérve)*
HC	Propán 10 ±1 százalék O_2-ben, balansz zéró nitrogén	±1 százalék
HC	Propán 21 ±1 százalék O_2-ben, balansz zéró nitrogén	±1 százalék
HC	Propilén zéró levegőben	±1 százalék
HC	Toluén zéró levegőben	±1 százalék
HC	n-hexán zéró levegőben	±1 százalék
HC	Propán zéró levegőben	±1 százalék
CO_2	CO_2 zérő levegőben	±1 százalék
CO_2	CO_2 zéró nitrogénben	±1 százalék
CO	CO zéró levegőben	±1 százalék
NO_x	NO zéró nitrogénben	±1 százalék

Az „A”, „B” és „C” mellékletben szereplő vizsgálatok elvégzéséhez a fenti gázokat kötelező alkalmazni.

A szénmonoxid és a széndioxid kalibráló gázok keverhetők külön-külön, vagy kétkomponensű keverék formájában. A szénmonoxid, a széndioxid és a propán három komponensű keverékeit zéró levegőben akkor lehet alkalmazni, ha a keverés stabilitása biztosított.

A CO, CO_2 és a HC analizátorhoz előírt zéró gáz, a „zéró” levegő (amely 20-22 százalék O_2 és N_2 „mesterséges” levegő keverékből áll). Az NO_x analizátorhoz zéró gázként záró nitrogént kell alkalmazni. Mindkét zéró gáz esetében a szennyeződést az alábbiaknál kisebb értékre kell korlátozni:

1 ppm C
1 ppm CO
100 ppm CO_2
1 ppm NO_x

A kérelmezőnek meg kell bizonyosodnia róla, hogy a kereskedelmi gáz, amellyel ellátták, ezen jellemzőknek ténylegesen megfelel-e, illetve a szállító azt ily módon jellemezte-e.

3. FÜGGELÉK „E” MELLÉKLETE KIBOCSÁTÁSI PARAMÉTEREK SZÁMÍTÁSA – ALAPOK, MÉRÉSEK, KORREKCIÓK ÉS AZ ALTERNATÍV NUMERIKUS MÓDSZER

1. Jelölések

AFR Levegő/üzemanyag arány: A száraz levegő tömegáram mennyiségének viszonya az üzemanyag-tömegarány mennyiségéhez

EI Emissziós index: A kibocsátott gáznemű égésterméknek 10^3 szoros tömegű mennyisége/az egységnyi tömegben kifejezett üzemanyag fogyasztási mérték

K A nedves körülmények között mérhető koncentráció és a száraz körülmények között mérhető koncentráció viszonya

	(a hideg páraszeparátor után)
L, L´	Az analizátor interferencia együtthatója a CO_2 interferenciájára
M, M´	Az analizátor interferencia együtthatója a H_2O interferenciájára
$M_{levegő}$	A száraz levegő gramm molekulányi tömege = 28,966 g, vagy ahol megfelelő, = (32 R + 28,156 4 S + 44,011 T) g
M_{CO}	A CO gramm molekulányi tömege = 28,011 g
M_{HC}	Az elhasznált gázban lévő CH_4-ként vett szénhidrogén gramm molekulányi tömege = 16,043 g
N_{NO2}	Az NO_2 gramm molekulányi tömege = 46,008 g
M_C	A szénatom tömege = 12,011 g
M_H	A hidrogénatom tömege = 1,008 g
P_1	CO_2 mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_2	N_2 mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_3	O_2 mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_4	H_2O mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_5	CO mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_6	C_xH_x mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_7	NO_2 mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_8	NO mollszám, az elhasznált gázmintában mollnyi üzemanyagra véve
P_T	$P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8$
R	O_2 száraz levegőben lévő koncentrációja térfogat szerint = 0,2095, általában
S	N_2 + ritka gázok koncentrációja száraz levegőben térfogat szerint = 0,7902, általában
T	CO_2 koncentrációja száraz levegőben térfogat szerint = 0, 0003, általában
P_o	A levegő mollszáma/a kiinduló levegő/üzemanyag keverékben lévő üzemanyag mollszáma
Z	A 3.4 pontban meghatározott és használatos jelölés
(CO_2)	Átlagos CO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat
(CO)	Átlagos CO koncentráció az elhasznált gázmintában, térfogat/térfogat
(HC)	Átlagos szénhidrogén koncentráció az elhasznált gázmintában, térfogat/térfogat
(NO)	Átlagos NO koncentráció az elhasznált gázmintában, térfogat/térfogat
(NO_2)	Átlagos NO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat
(NO_x)	Átlagos NO és NO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat
$(NO_x)_C$	Átlagos NO koncentráció az elhasznált gázmintában, miután áthaladt az NO_2/NO konverteren, térfogat/térfogat
(NO_2)	Átlag = $\frac{((NO_x)_c - (NO))}{\eta}$
$()_d$	Átlag koncentráció az elhasznált gázmintában, a hidegcsapda után, térfogat/térfogat
$()_m$	Az átlag koncentráció mért értéke az alkalmazott műszer korrekció előtt, térfogat/térfogat
h	A környező levegő nedvességtartalma, víz térfogat/száraz levegő térfogat
h_d	Az elhasznált gázminta nedvessége miután a szárítót, vagy a hidegcsapdát elhagyta, víztérfogat/száraz minta térfogat
m	C atomok száma a jellemző üzemanyag molekulában
n	H atomok száma a jellemző üzemanyag molekulában
x	C atomok száma az elhasznált gáz jellemző szénhidrogénjének molekulájában
y	H atomok száma az elhasznált gáz jellemző szénhidrogénjének molekulájában
η	Az NO_2/NO konverter hatásfoka

2. EI és AFR paraméterek számításának alapjai

2.1 Feltételezett, hogy az eredeti üzemanyag és levegő keverék, illetve az eredményezett elhasznált gáz állapota közötti egyensúly a következő egyenlettel kifejezhető:

$$C_mH_n + P_o[R(O_2) + S(N_2) + T(CO_2) + h(H_2O)]$$
$$= P_1(CO_2) + P_2(N_2) + P_3(O_2) + P_4(H_2O)$$
$$+ P_5(CO) + P_6(C_xH_y) + P_7(NO_2) + P_8(NO)$$

amelyből a szükséges paraméterek definíció szerint kifejezhetők mint:

$$EI(CO) = P_5 \left(\frac{10^3 M_{CO}}{mM_C + nM_H}\right)$$

$$EI(HC) = xP_6 \left(\frac{10^3 M_{HC}}{mM_C + nM_H}\right) \text{ metán ekvivalensként kifejezve}$$

$$EI(NO_x) = (P_7 + P_8) \left(\frac{10^3 M_{NO_2}}{mM_C + nM_H}\right) \text{ } NO_2 \text{ ekvivalensként kifejezve}$$

$$AFR = P_0 \left(\frac{M_{LEVEGŐ}}{mM_C + nM_H}\right)$$

2.2 Az üzemanyag szénhidrogén összetételének értékeit (m, n) az üzemanyag minősítési okirata alapján vagy analízis útján kell meghatározni. Ha ilyen módon csak az n/m arány meghatározása történik meg, akkor az m értéke = 12-re vehető fel. A száraz levegő összetevőinek gramm molekulányi mennyiségeit (R, S, T), rendszerint egyenlőnek veszik az ajánlott szabvány mennyiségekkel, ugyanakkor felvehetők az alternatív mennyiségek azon korlátozás mellett, hogy R + S + T = 1 és, ha ezt a bizonyítványt kiállító hatóság jóváhagyta.

2.3 A környezeti levegő nedvesség tartalma (h) minden vizsgálati feltételnél a mérés szerinti érték. Ajánlott, hogy ha a kibocsátott szénhidrogén (x, y) jellemzőire nincs erre vonatkozó ellentétes bizonyíték, a következő értékek legyenek kijelölve: x = 1 és y = 4

2.4 A többi ismeretlen mennyiség meghatározásához meg kell oldani az alábbi lineáris szimultán egyenletrendszert, mely egyenletek közül a (1)-(4) az energia megmaradás törvényéből következik, míg az (5)-(9) egyenletek a gáznemű termékek koncentráció összefüggéseit képviselik.

$$m + TP_o = P_1 + P_5 + xP_6 \quad (1)$$
$$n + 2hP_o = 2P_4 + yP_6 \quad (2)$$
$$(2R + 2T + h)P_o = 2P_1 + 2P_3 + P_4 + P_5 + 2P_7 + P_8 \quad (3)$$
$$2SP_o = 2P_2 + P_7 + P_8 \quad (4)$$
$$(CO_2)P_T = P_1 \quad (5)$$
$$(CO)P_T = P_5 \quad (6)$$
$$(HC)P_T = x\,P_6 \quad (7)$$
$$(NO_x)_n\,P_T = \eta P_7 + P_8 \quad (8)$$
$$(NO)P_T = P_8 \quad (9)$$
$$P_T = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8 \quad (10)$$

A fentiekben leírt feltételes egyenletrendszer ahhoz az esethez tartozik, amikor a mért koncentrációk valódi értékek, azaz nincsenek interferencia hatása alatt, vagy nincs szükség a minta szárítása miatti korrekcióra. A gyakorlatban a CO, NO_x és NO méréseknél általában jelentős interferencia hatás van és gyakran alkalmazzák az alternatív mérés lehetőségét a CO_2 és CO esetében száraz, vagy részlegesen száraz alapon. A megfelelő egyenletek szükséges átalakításait a 2.5 és a 2.6 pontok tartalmazzák.

2.5 Az interferencia hatást főleg a mintában lévő CO_2 és H_2O jelenléte váltja ki, amelyek a CO és a NO_x analizátorokat alapvetően másképp befolyásolhatják. A CO analizátor hajlamos a „zéró” eltolódásra, míg a NO_x analizátor az érzékenység változásra, másképpen kifejezve:

$$[CO] = [CO]_m + L[CO_2] + M[H_2O]$$
$$\text{és}\quad [NO_x]_c = [NO_x]_{cm}\,(1 + L'[CO_2] + M'[H_2O])$$

amelyek a (6), (8) és (9) alternatív egyenletekre a következőképpen alakíthatók át, ha az interferencia hatás miatt korrekció szükséges:

$$(CO)_m P_T + LP_1 + MP_4 = P_5 \qquad (6A)$$
$$(NO_x)_{cm}\,(P_T + L'P_1 + M'P_4) = \eta\, P_7 + P_8 \qquad (8A)$$
$$(NO)_m(P_T + L'P_1 + M'P_4) = P_8 \qquad (9A)$$

2.6 A választás, hogy a CO_2 és CO koncentrációkat száraz, vagy részlegesen száraz minta alapján lehessen mérni, azaz a h_d értékig csökkentett minta nedvesség tartalommal, a következő módosított feltételes egyenletek alkalmazását teszi szükségessé:

$$(CO_2)_d(P_T - P_4)\,(1 + h_d) = P_1 \qquad (5A)$$

és

$$(CO_2)_d(P_T - P_4)(1 + h_d) = P_5$$

Ezzel együtt, ahogy az a fentiekben a 2.5 pontban is látható, a CO analizátor is interferencia hatás alá kerülhet, ezért a CO koncentrációjának alternatív mérésére szolgáló teljes egyenlet a következő lesz:

$$(CO)_{md}\,(P_T - P_4)\,(1 + h_a) + LP_1 + Mh_a\,(P_T - P_4) = P_5 \qquad \text{.......................................(6B)}$$

3. Analitikai képletek

3.1 Általános rész

Az (1)-(10) egyenletek az EI és AFR paraméterekre kifejezett analitikai formulákká alakíthatók át, ahogy az a jelen Annex 7.1 pontjában szerepel. Ez a redukálás a P_o, P_1 gyökök -P_8, P_T, gyökök általi fokozatos kiküszöbölését jelenti, olyan feltételek mellett, hogy az összes koncentráció mérés „nedves” minta alapján történik és nem igényel interferencia miatti, vagy más egyéb hasonló korrekciót. A gyakorlatban sokszor döntenek úgy, hogy a CO_2 és CO koncentráció mérését „száraz”, vagy „félszáraz” minta alapján végzik;

Hasonlóan gyakran találkoznak az interferencia miatti korrekció szükséges voltával. E különböző feltételek melletti használatra szolgáló kifejezéseket az alábbi 3.2, 3.3 és 3.4 pontok tartalmazzák.

3.2 A száraz koncentráció mérési eredményeinek nedves koncentrációra való átszámítását biztosító egyenlet

Nedves koncentráció = K × száraz koncentráció azaz

$$[\,] = K\,[\,]_d$$

Ha a CO és CO_2 meghatározása „száraz” minta alapján történt, akkor a K meghatározására a következő kifejezést kell használni:

$$K = \frac{\left\{4 + (n/m)\,T + (|n/m|T - 2h)\,([NO_2] - (2[HC]/x))\right.}{(2 + h)\left\{2 + (n/m)\,(1 + h_d)\,([CO_2]_d + [CO]_d)\right\}}$$

$$\frac{+ (2 + h)\,(|y/x| - |n/m|)\,[HC]\}\,(1 + h_d)}{-(|n/m|T - 2h)\,(1 - |1 + h_d|[CO]_d)}$$

3.3 Interferencia korrekciók

CO és/vagy NO_x és NO méréseinél lehet, hogy interferencia korrekciókat kell végezni a minta CO_2 és víz koncentrációjára vonatkozóan a fenti analitikai egyenletekben való alkalmazás előtt. Ilyen korrekciók, általában a következő módon írhatók le:

$$[CO] = [CO]m + L[CO_2] + M[H_2O]$$

$$[CO]_d = [CO]_{md} + L[CO_2]_d + M\left(\frac{h_d}{1 + h_d}\right)$$

$$[NO] = [NO]_m\,(1 + L'[CO_2] + M'[H_2O])$$

$$\eta[NO_2] = ([NO_x]_{cm} - [NO]_m)\,(1 + L'[CO_2] + M'[H_2O])$$

3.4 A mintában lévő víztartalom meghatározására szolgáló egyenlet

A mintában lévő víz koncentráció

$$[H_2O] = \frac{(\lvert n/2m \rvert + h \lvert P_0/m \rvert)([CO_2] + [CO] + [HC])}{1 + T(P_0/m)} - (y/2x)[HC]$$

ahol

$$P0/m = \frac{2Z - (n/m)}{4(1 + h - \lvert TZ/2 \rvert)}$$

és

$$Z = \frac{2 - [CO] - (\lvert 2/x \rvert -- \lvert y/2x \rvert)\,[HC] + [NO_2]}{[CO_2] + [CO] + [HC]}$$

Meg kell jegyezni, hogy a víz koncentráció ezen meghatározása a különböző koncentráció analízis adatainak a függvénye és lehet, hogy ezeket magukat is korrigálni kell víz interferencia szempontjából. Ezekben az esetekben a nagyobb pontosság elérése céljából iteratív eljárás szükséges ismételt víz koncentráció átszámításokat végezve addig, amíg a kapott eredmények a megkívánt stabilitást el nem érik. Az alternatív, numerikus megoldási módszer használatával ez a nehézség elkerülhető (lásd a 4. pontot).

4. ALTERNATÍV MÓDSZER – NUMERIKUS MEGOLDÁS

4.1 A 3. pontban összegzett analitikai eljárások alternatívájaként a kibocsátási indexek, a levegő/tüzelőanyag arány, a nedves feltételekre korrigált koncentráció, stb. minden egyes mérési sorozatra könnyen megkaphatók digitális számítógépet használva az (1)-(10) egyenletek numerikus megoldására.

4.2 Az interferenciát figyelembe vevő korrekciók és/vagy a száraz minták mérései miatti módosítások figyelembe vételére az (1)-(10) egyenletek rendszerében a koncentráció mérések tényleges eredményeit azokkal az (5A), (6A), stb. alternatív egyenletekkel váltják fel, amelyek elfogadottak a konkrét mérő rendszerre.

4.3 E célra széles körben elterjedtek a megfelelő egyszerű két dimenziós tömb egyenlet-megoldó gépi programok. Használatuk e célra kényelmes és rugalmas, lehetővé teszik bármely minta szárítási lehetőség, interferencia, vagy egyéb korrekció bedolgozását és azonosítását.

3. FÜGGELÉK „F” MELLÉKLETE. KIEGÉSZÍTŐ ADATOKRA VONATKOZÓ KÖVETELMÉNYEK

A 3. Függelék 3.2 pontjának megfelelően, a minta komponensek mért koncentrációján kívül meg kell adni a következő adatokat is:

a) Bemeneti hőmérséklet: Mérése "teljes" hőmérsékletként ±0,5 °C pontossággal történik a hajtómű légfelvevő bemeneti síkja átmérőjének megfelelő távolságon belül lévő pontban;

b) Nedvesség – szint a bemeneten (kg víz/kg száraz levegő): Mérése a hajtómű levegő beömlő síkjától 15 m-en belül lévő pontban ±5 százalék leolvasási pontossággal történik;

c) Légköri nyomás: A hajtómű vizsgálati helyétől 1 km-en belül mérik, -szükség esetén- ±100 Pascal pontossággal korrekciót hajtanak végre a vizsgálópad szintmagasságára.

d) Üzemanyag-tömeg áramlása: Közvetlen, ±2 százalék pontosságú méréssel;

e) Az üzemanyag H/C aránya: n/m-ként kifejezve, ahol C_mH_n a vizsgálat során alkalmazott reprezentáns üzemanyag ekvivalens szénhidrogén tartalma és amelyet a hajtómű üzemanyag fajta analízishez viszonyítva értékelnek;

f) Hajtómű-paraméterek:

1) Tolóerő: Közvetlen mérés a vizsgálatok során alkalmazott felszálló teljesítménynél ±1 százalék pontossággal, a minimum tolóerőnél ±5 százalék pontossággal és e két pont között lineáris változással;

2) Fordulatszám: Közvetlen mérés, legalább ±0,5 százalék pontossággal mérve;

3) A gázgenerátor levegő-áramlás: hajtómű teljesítmény kalibráció alapján ±2 százalék pontossággal meghatározva.

Az a), b), d) és f) pontokban felsorolt paramétereket a hajtóművek által kibocsátott gázokra vonatkozó minden vizsgálatsorozat alkalmával meg kell határozni, míg a c) pontban említet paramétert a kibocsátási vizsgálat alatt eltelt időtartam során, legalább 1 órás időközönként.

4. FÜGGELÉK A LÉGIJÁRMŰ GÁZTURBINA HAJTÓMŰ LÉGSZENNYEZÉS VIZSGÁLATÁBAN ALKALMAZOTT TÜZELŐANYAGRA VONATKOZÓ ELŐÍRÁSOK

Tulajdonságok	*Megengedet értéktar-tartományok*
Fajsúly kg/m^3 15^o C-on	780 - 820
Forrási hőmérséklet, ^{o}C	
10 százalék a forrásponttól	155 - 201
Végforrás pont	235 - 285
Nettó égéshő MJ/kg	42,86 - 43,50
Aromatikus anyagok tartalma térfogat százalék	15 – 23
Naftalin tartalom térfogat százalék	1,0 - 3,5
Füst pont mm	20 - 28
Hidrogén tartalom tömeg százalékban	13,4 - 14,3
Kén tartalom tömeg százalékban	0,3 – százaléknál kevesebb
Kinematikai viszkozitás -20^{o}C, mm^2/másodperc	2,5 - 6,5

5. FÜGGELÉK GÁZTURBINA HAJTÓMŰVEK UTÁNÉGETÉSE SORÁN KELETKEZETT GÁZNEMŰ LÉGSZENNYEZÉS MÉRÉSI ELJÁRÁSAI ÉS MŰSZEREZETTSÉGE

1. BEVEZETŐ RÉSZ

Megjegyzés. - Jelen Függelékben meghatározott eljárások a kibocsátott gázokból történő mintavétellel, a gázok gázkibocsátás mérő rendszerbe továbbításával és a gázok kibocsátás mérő rendszer általi elemzésével foglalkozik. Ezek az eljárások csak utánégető alkalmazása esetén használandók. A javasolt módszerek a rendelkezésre álló legjobb és leginkább megalapozott korszerű gyakorlatot jelentik. A környezeti feltételekre történő korrigálás szükségessége elismert és, ha majd rendelkezésre áll, akkor a módszer leírása is szerepelni fog. Addig is, az utánégető alkalmazáshoz használt bármely korrekciós eljárás csak a légialkalmassági bizonyítványt kiadó hatóság engedélyével használható.

A jelen Függelékben megfogalmazott eljárások megváltoztatása csak a légialkalmassági bizonyítványt kiadó hatósághoz erre vonatkozó előzetes kérelem benyújtásával és a hatóság jóváhagyásával történhet meg.

2. MEGHATÁROZÁSOK

Ha a jelen Függelék alábbiakban felsorolt kifejezésihez további magyarázat nem társul, akkor e kifejeések jelentése a következő:

Pontosság (Accuracy). A mért érték közelítésének foka, egy olyan valóságos értékhez, amelyet ettől a méréstől függetlenül határoztak meg.

Kalibráló gáz (Calibration gas). A műszerek szabályozásánál, beállításánál, és időszakos ellenőrzésénél alkalmazott nagyon pontos összetételű etalon referencia gáz.

Koncentráció (Concentration). Az illető alkotórész gázkeverékben jelen lévő térfogat része, térfogat százalékban, vagy részecske milliókban kifejezve.

Láng-ionizációs detektor (Flame ionization detector). Diffúziós hidrogén - levegő lángdetektor, amely az e lángba egységnyi idő alatt belépő szénhidrogének mennyiségével névlegesen arányos jelet ad ki, általánosan feltételezve, hogy kijelzéseit a lángba lépő szénhidrogén atomok száma határozza meg.

Interferencia (Interference) A műszer reakciója a mérni kívántakon kívül jelenlévő egyéb gáz-, vagy (gőz) komponensekre.

Zaj (Noise). A műszer kimenetén jelentkező olyan véletlenszerű kitérések, amelyek nincsennek kapcsolatban a műszer által mért minta jellemzőivel, azok elhúzás jellemzőitől megkülönböztethetőek.

Nem diszperz infravörös analizátor (Non-dispersive infrared analyster). Műszer, amely a kisugárzott ifravörös energia elnyelése segítségével, fajlagos komponensek szelektív mérését végzi.

Millió részecskékre eső részecskék (ppm) (Parts per million ppm). A gázkeverék millió egységből álló egységében az adott, és a keverék összetevőjét képező gáz egységnyi térfogat koncentrációja, egység/millió formában kifejezve.

Millió részecskékre eső szénrészecskék (ppmC) (Parts per million carbon - ppmC). A szénhidrogén moll része metán ekvivalencia alapján mérve és 10 a 6.-on-nal szorozva. Ilyen módon 1 ppm metán úgy jelölhető, hogy 1 ppmC. Bármely ppm-ben kifejezett szénhidrogén koncentráció átalakítása ppmC-ben, kifejezett ekvivalens mennyiséggé, úgy történik, hogy a ppm-ben kifejezett mennyiséget megszorozzák a gázmolekula összetételébe tartozó szénatomok számával. Például 1 ppm propán megfelel 3 ppmC szénhidrogénnek, 1 ppm hexán pedig, 6 ppmC szénhidrogénnek.

Füst kiáramlás (Plume). A hajtómű által elhasznált gázok kiáramlása, beleértve a környezeti levegőt is, amellyel az elhasznált gázok keverednek.

Etalon gáz (Reference gas). Adott és ismert összetételű gázkeverék, amelyet a műszer, a műszer által mérendő gáz koncentrációjának egységében kifejezett kitérések értelmezése alapjául használnak.

Ismételhetőség (Repeatability). Pontosság, amellyel egy adott változatlan mintán a mérés megismétlésével rövid időn belül reprodukálható, anélkül, hogy a műszert közben újra beszabályoznák.

Felbontó képesség (Resolution) A mérési eredményekben bekövetkezett legkisebb változás, amely kimutatható.

A műszer reakciója (Response). A műszer kimeneti jelének változása a minta gázkoncentráció változásának függvényében. Valamint az a kimeneti jel, amely megfelel a mintában lévő adott gázkoncentrációnak.

Stabilitás (Stability). Pontosság, amely egy adott mintán végzett ismételt mérések után, adott időtartamon keresztül fennáll.

Nulla elhúzás (Zero drift). A műszer jelének időtől függő kitérése, nulla értékről, abban az esetben, ha a rajta átáramló gáz, a mérendő komponenst nem tartalmazza.

Nulla gáz (Zero gas). Gáz, amelyet a műszer nulla, vagy semleges helyzetbe állításához használnak.

3. SZÜKSÉGES ADATOK

3.1 Gáz kibocsátások

A következő gáz kibocsátási koncentrációt kell meghatározni:

a) Szénhidrogének (HC): Az elhasznált gázban jelen lévő összes szénhidrogén értékelése.

b) Szénmonoxid (CO).

c) Széndioxid (CO_2).

Megjegyzés. - A CO_2 nem számít szennyező anyagnak, de koncentrációjának meghatározása szükséges a számítások és ellenőr zés érdekében.

d) Nitrogénoxidok (NO_2): A két oxid, a nitrogénoxid (NO) és a nitrogéndioxid (NO_2) összegének becsült értéke.

e) Nitrogénoxid (NO).

3.2 Egyéb információ

A kibocsátás mérési adatok normalizálása és a hajtómű vizsgálati jellemző számszerűsítése érdekében kiegészítésképp a 3. fejezet 3.4 pontjához a következő információkat kell megadni:

– Hőmérséklet a bemeneten;

– Nedvesség a bemeneten;

– Légköri nyomás;

– Szél összetevő iránya a hajtómű elhasznált gázsugarának tengely irányához képest;

– Hidrogén/szén arány az üzemanyagban;

– Hajtómű felépítési részletek;

– Egyéb szükséges hajtómű paraméterek (például: tolóerő, fordulatszám, turbina hőmérséklet);

– Szennyező anyag koncentráció adatok és statisztikai hitelesítő paraméterek.

Jelen függelék „F” mellékletének megfelelően, ezeket az adatokat vagy közvetlen méréssel, vagy számítások útján kell meghatározni.

4. A RENDSZER ÁLTALÁNOS FELÉPÍTÉSE

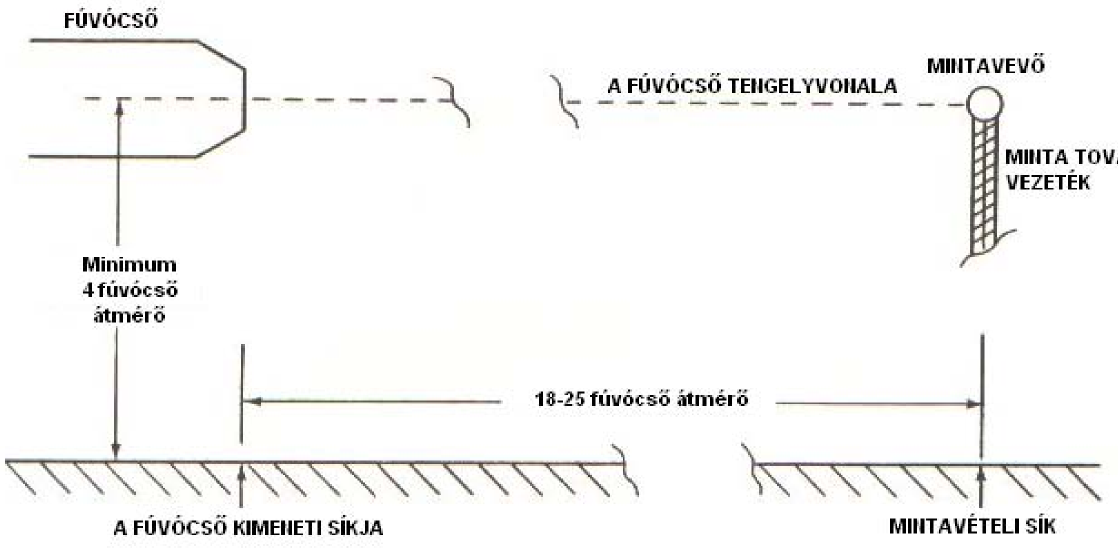
Figyelembe véve, hogy az utánégetéssel működő hajtómű elhasznált gázai vegyileg aktívak, biztosítani kell, hogy a mért elhasznált gázok ténylegesen azonosak legyenek a környező légkörbe valóban kikerülő gázokkal. Ez a feltétel teljesíthető, ha az elhasznált gázmintákat a hajtóműtől elegendően távoli gázáram szakaszból veszik, azaz, amikor az elhasznált gázok már olyan alacsony hőmérsékletre hűltek, amelynél megszakad a reakciók lefolyása. A nitrogénoxid- és szénhidrogén mérőkészülékhez áramló gázokat nem kell kezelni víztelenítő, szárító, vízleválasztó, vagy egyéb hasonló berendezések révén. Az 5. pont foglalja össze az alrendszerek különböző részeivel szembeni követelményeket, az alábbiakban viszont néhány minőségi információ és változati lehetőség felsorolására kerül sor:

a) Feltételezett, hogy minden különálló alrendszer tartalmazza a szükséges áramlás szabályozó, kondícionáló és mérő berendezéseket is.

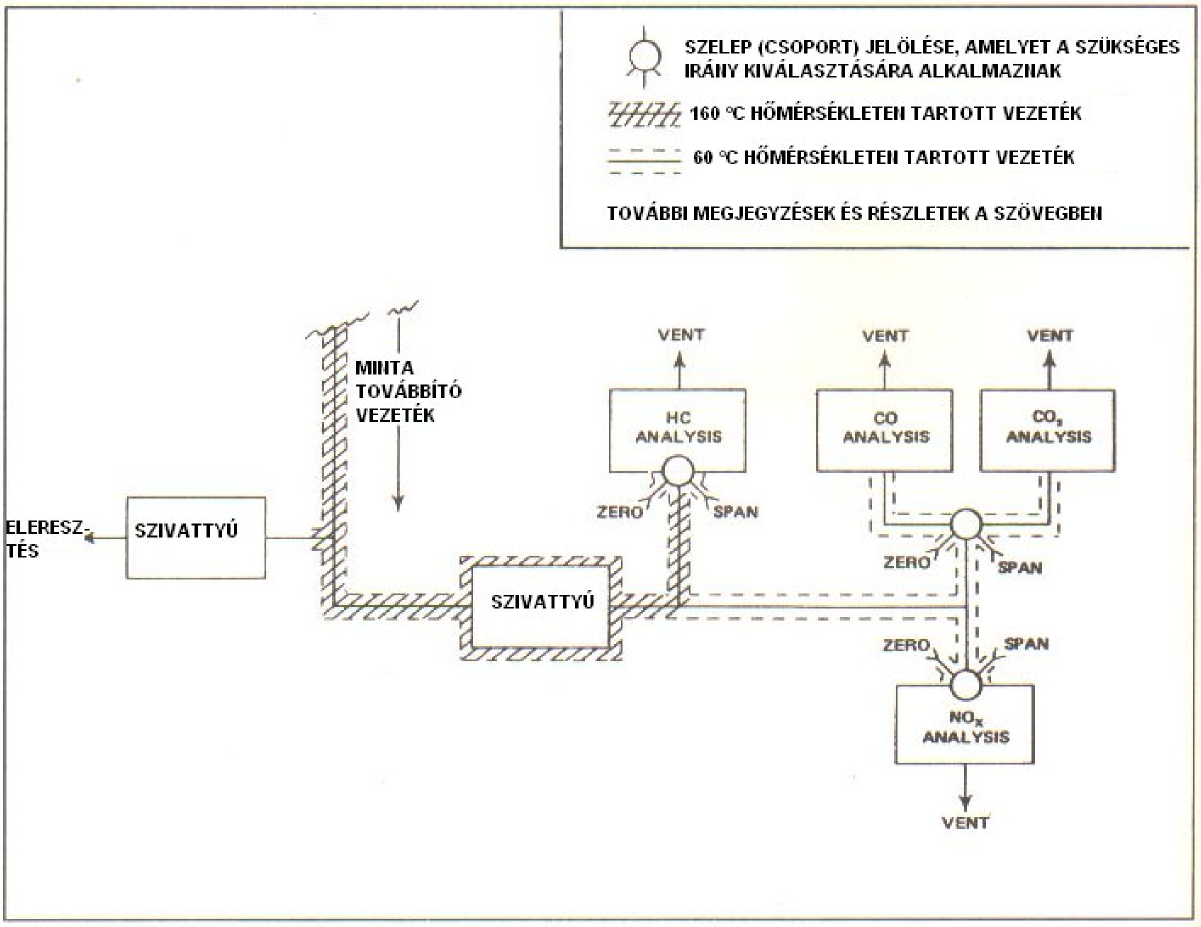
b) Eleresztő és/vagy forró minta szivattyú alkalmazásának szükségességét az dönti el, hogy teljesíthetők-e a minta továbbítási idejére és az elemző alrendszer minta áramlási sebességére vonatkozó követelmények. Ez viszont függ a mintavett gázokat szállító nyomástól és a vezetékekben fellépő veszteségektől. Úgy tekinthető, hogy ezek a szivattyúk általában a hajtómű bizonyos működési körülményei között szükségesek.

c) A gázminta adagoló szivattyú helyzete a gáz analizáló alrendszerhez képest szükség szerint változtatható. (Például: némely HC analizátorba beletartozik a melegminta szivattyú, következésképpen alkalmasak lehetnek a rendszer forró szivattyú főáramában történő használatra.

Megjegyzés. – Az 5–1 és 5–2 ábra a kibocsátott gáz mintavevő és elemző rendszerek vázlatát mutatja és általánosítja a gázkibocsátási mérésekkel kapcsolatos vizsgálatokra vonatkozó fő követelményeket.



5-1 ábra. Elhasznált gáz mintavételi vázlata



5-2 ábra. Minta továbbító és analizátor rendszer

5. AZ ÖSSZETEVŐ RÉSZEK LEÍRÁSA

Megjegyzés. – Az alábbiakban a hajtómű elhasznált gáz jellemzőinek mérését végző rendszer fő elemeinek általános leírására és jellemzésére kerül sor. Részletesebb leírás, ha ez szükséges, ezen függelék A, B és C mellékleteiben található.

5.1 Mintavevő rendszer

5.1.1 Mintavevő készülék

a) A mintavevő készülék konstrukciója tegye lehetővé, hogy az egyes mintákat az elhasznált gázsugár átmérőjén belül különböző pontokból vehessék. A kevert minták nem megengedettek.

b) A mintával érintkező rész anyaga rozsdamentes acél legyen és hőmérsékletét legalább 60 °C hőmérsékleten kell tartani.

c) A mintavevő síkját a hajtómű fúvócső tengely vonalára merőlegesen kell elhelyezni és lehetőség szerint minél közelebb a fúvócső kimenő síkjától mért 18 fúvócső átmérőnyi távolsághoz, a 7.1.2 pontnak megfelelően, de 25 fúvócső átmérőnyi távolságnál semmi esetre sem távolabb. A fúvócső kilépő átmérője a hajtómű maximum tolóerejéhez tartozó átmérő legyen. A fúvócső kimenő síkja és a mintavétel síkja között legyen egy, a hajtómű fúvócső tengelye, illetve annak meghosszabbított vonala mentén körkörös, a hajtómű fúvócső kilépő-átmérő legalább négyszeresének megfelelő sugarú, mindenféle akadálytól mentes térség.

d) Legalább 11 mintavételi pont legyen. A hajtóműtől X távolságban elhelyezett mérősíkot 3 szektorra kell osztani. Ezek határvonalát a kiáramló gáz tengelyvonala körül elhelyezkedő körök jelölik ki, amely körök sugara:

$R1 = 0,05X$

$R2 = 0,09X$

Minden szektorban legalább 3 pontból kell mintát venni. Az egyes szektorban a minták száma közötti különbség 3-nál kisebb legyen. A tengelytől legtávolabb vett minták mintavételi pontjai a 0,11X és 0,16X közötti sugár mentén helyezkedjenek el.

5.1.2 Minta-szállító vezetékek

A mintákat a mintavevő készüléktől vezetékeken keresztül kell továbbítani az analizátorok felé. A vezetékek belső átmérője 4,0-8,5 mm. A továbbítási útvonalnak a lehető legrövidebbnek kell lennie. Az áramlás mértéke biztosítsa, hogy a továbbítási idő 10 mp-nél kevesebb legyen. A vezetékben a hőmérsékletet (±10 °C pontossággal) 160 °C ±15 °C értéken kell tartani. Amikor a mintavétel a HC, CO, CO_2 és NO_x összetevők mérése céljából történik, akkor a vezeték rozsdamentes acél, vagy PTFE szénnel dúsított földelt cső legyen.

5.2 HC (Szénhidrogén) analizátor

A minta össz szénhidrogén tartalmának mérését analizátor segítségével kell végezni, amelyben felmelegített láng ionizációs detektor (FID), elektródái között a hidrogén égési folyamatába lépő szénhidrogén tömeg arányával arányos ionizációs áram folyik. Az analizátor szükség szerűen tartalmazzon a mintában lévő gázok hőmérsékletét, illetve a minta, a kerülő ágon haladó minta, az üzemanyag és a hűtőgázok áramlási sebességét szabályozó elemeket, továbbá elemeket, amelyek biztosítják a mérési tartomány és a „zéró” effektív kalibrálás ellenőrzését.

Megjegyzés. – Általános műszaki követelmények ezen függelék A mellékletében találhatók.

5.3 CO (szénmonoxid) és CO_2 (széndioxid) analizátorok

Ezen összetevők mérésére nem diffúziós infravörös analizátort kell alkalmazni, amely konstrukciója szerint párhuzamosan működő referencia és mintagáz cellákban energiaelnyelés különbség elvét hasznosítva mér, az ezen gáz alkotóelemek cellája, vagy cella csoportjai legyenek megfelelő érzékenységre hangolva. Az elemző alrendszer tartalmazza a minta, a zéró gáz és a végkitérést okozó gáz áramlásának szabályozásához és kezeléséhez szükséges összes funkciót. A hőmérséklet szabályozása annak megfelelő legyen, hogy száraz, vagy nedves állapotú mérést végeznek.

Megjegyzés. – Általános műszaki követelmények ezen függelék „B” mellékletében találhatók.

5.4 NO_x (nitrogénoxid) analizátor

A nitrogénoxid (NO) koncentrációt a vegyi luminesszencia alapján kell mérni, amelynek megfelelően a reakcióba O_3 adalékkal belépő NO sugárzási intenzitásának mértéke megfelel az NO koncentráció mértékének. A mérés elvégzése előtt az NO_2 komponenst egy megfelelő hatékonysággal rendelkező konverterben NO komponensé kell átalakítani. A teljes NO_x mérőrendszer foglalja magába az összes szükséges áramlási, hőmérsékletet, és egyéb paraméterek szabályozását biztosító berendezést és biztosítsa a mérési tartomány és a zéró kiegyenlítés szokásos eljárásának elvégzését, valamint az NO_2 átalakítási hatékonyság ellenőrzést.

Megjegyzés. – Az általános műszaki követelmények jelen függelék „C” mellékletében találhatók.

6. ÁLTALÁNOS VIZSGÁLATI ELJÁRÁSOK

6.1 A hajtómű működtetés

A hajtóművet a nagy pontosságú teljesítményjellemző vizsgálatok elvégzéséhez megfelelően felszerelt és a mintavevő készülék 5.1 pontban leírt követelményeit teljesítő szabad téri vizsgáló próbapadon kell működtetni. A gázkibocsátási vizsgálatokat a bizonyítványt kiadó hatóság által meghatározott tolóerő értékeknél kell elvégezni. A hajtómű működést minden tolóerő érték estében stabilizálni kell.

6.2 A környezeti levegővel kapcsolatos feltételek

6.2.1 A környezeti CO, HC, CO_2 és NO_x koncentrációt a vizsgálandó hajtóművet a vizsgálati feltételek között működtetve kell ellenőrizni. Rendkívül magas koncentrációk rendellenes állapotot jeleznek, például az elhasznált gázok vissza cirkulálását, tüzelőanyag szivárgást, vagy más okot, amelyek miatt a vizsgálat területére nem kívánt kibocsátás történik.

– Az ilyen állapotot ki kell küszöbölni, vagy lehetőség szerint el kell kerülni.

Megjegyzés. – útmutatásként: a normál CO_2 koncentráció a környezeti levegőben 0,03 százalék, és normál környezeti feltételek mellett a CO és HC koncentrációja nem haladja meg az 5 ppm-et, illetve az NO_x koncentrációja a 0,5 ppm-et.

6.2.2 El kell kerülni az olyan szélsőséges klíma állapotokat, mint például a csapadék, vagy a nagysebességű szél jelenléte.

6.3 A műszer alapkalibrálása

Megjegyzés. – E kalibrálásnak a fő célja a linearitás és stabilitás igazolása.

6.3.1 A kérelmező biztosítani köteles a bizonyítványt kiadó hatóságot a tekintetben, hogy az analizáló rendszer kalibrálása a vizsgálat időszakában, érvényes.

6.3.2 Ami a szénhidrogén analizátort illeti, ennek hitelesítésénél azt kell ellenőrizni, hogy a detektor oxigén és szénhidrogén különbségi reakciói a jelen függelék „A” mellékletében megadott határok közé esnek-e. Az NO_2/NO konvertert a jelen függelék „C” mellékletében leírt műszaki követelményeknek megfelelően, ugyancsak ellenőrizni és hitelesíteni kell.

6.3.3 Mindegyik analizátor esetében a működési teljesítmény ellenőrző folyamat (jelen függelék „D” mellékletében meghatározott hitelesítő és vizsgálati gázokat alkalmazva) a következő legyen:

a) Nulla gáz bevitele és a műszer nulla mutatás beszabályozása, a beállítás feljegyzése -amint az megfelelő;

b) Minden üzemszerűen alkalmazandó tartományra a teljes kitérést (FSD) előidéző (névlegesen) koncentráció 90 százalékának megfelelő kalibráló gáz bevitele; a műszer erősítés (gain) ennek megfelelő beszabályozása és a beállítás feljegyzése;

c) Megközelítőleg 30 százalék, 60 százalék és 90 százalék FSD koncentráció bevitele és az elemző kijelzés feljegyzése;

d) A „zéró”, a 30 százalékos, a 60 százalékos és a 90 százalékos koncentrációnak megfelelő pontokon keresztül a legkisebb négyzetek egyenes vonalának meghúzása. A kimenet linearizálása nélküli, alap formájában használt CO és/vagy CO_2 analizátor esetében -ha szükségesnek itélt, további kalibrálási pontokat alkalmazva- a megfelelő matematikai képlet alapján nyert legkisebb négyzetek görbéjének felillesztése. Ha bármely pont eltérése nagyobb, mint a műszer egész mérési tartomány értékének 2 százaléka (vagy ±1 ppm[*], amelyik a nagyobb), akkor üzemeli használatra kalibráló görbe készítése.

6.4 A mérés végrehjatása

6.4.1 Méréseket addig ne végezzenek, amíg minden műszer és mintatovábbító vezeték fel nem melegedett és nem stabilizálódott, továbbá a következő ellenőrzéseket nem hajtották végre:

a) Szivárgás ellenőrzés:íVizsgálatsorozat végzése előtt a rendszert a következők szerint kell szivárgás szempontjából ellenőrizni: A mintavevőt és az analizátort le kell választani; annak ellenőrzésére, hogy a rendszer szivárgási mértéke normál hőmérsékletre és nyomásra vetítve kevesebb 0,4 L/perc-nél, egy a füstmérő rendszerhez használt teljesítményűvel egynértékű vákumszivattyút kell csatlakoztatni és működtetni.

b) Tisztaság ellenőrzés: A mintavevőt szigetelje el a gázminta rendszertől. A rendszer mintatovábbító vezetékének végét csatlakoztassa „zéró” – gázforráshoz. A rendszert a szénhidrogén mérés végzéséhez szükséges üzemi hőmérsékletre melegítse fel. Hozza működésbe a mintaáramoltató szivattyút és az áramlás mértékét állítsa be a hajtómű által kibocsátott termékek vizsgálata során használt mértékre. Jegyezze fel a szénhidrogén analizátor kijelzését. A kijelzés nem lépheti túl a hajtómű alapjárati kibocsátási szintjének 1 százalékát, illetve az 1 ppm-et. (Mindkettő metánban értelmezve), amelyik a nagyobb.

[*] Kivéve a CO_2 analizátort, amelynél az értéknek ±100 ppm-nek kell lennie.

1. Megjegyzés. – Jelentős mértékű szennyeződés felgyülemlésének megelőzése érdekében megfelelő gyakorlat a vezetékek járó hajtómű mellett történő ellentétes irányú kifuvatása, miközben a mintavevő a hajtómű gázáramban van, de a kibocsátást még nem mérik.

2. Megjegyzés. – Ugyancsak megfelelő gyakorlat a belépő levegő minőségének ellenőrzése a vizsgálat kezdetén és végén, illetve a vizsgálat alatt, legalább óránként egy alkalommal. Ha a szintek jelentősnek tekinthetők, akkor azokat figyelembe kell venni.

6.4.2 Üzemi mérésre a következő eljárás alkalmazandó:

a) megfelelő zéró gáz bevitele és a műszerek minden szükséges beszabályozásának elvégzése;

b) minden használatos mérési tartományra az FSD (névlegesen) koncentráció 90 százalékos értékéhez tartozó koncentrációjú megfelelő kalibráló gáz bevitele és az erősítés (gain) megfelelő beszabályozása és feljegyzése;

c) a hajtómű működés kívánt üzemmódon történő stabilizálódását követően a hajtómű járatás folytatása és a szennyező anyagok koncentráció figyelemmel kísérése mindaddig, amíg stabil értékek nem állnak elő, majd ezek feljegyzse. Ugyanezen hajtómű üzemi körülmények között a mérési eljárás megismétlése az összes többi mintavételi pontra.

d) A vizsgálat végén, továbbá a vizsgálat alatt bizonyos időszakonként, maximum 1 óránként a „zéró” és a kalibráló pontok ismételt ellenőrzése. Ha valamelyik pont az FSD tartomány több, mint ±2 százalékával eltolódott, akkor a műszer megfelelő határok közé történő újra beszabályozása és a vizsgálat megismétlése.

7. SZÁMÍTÁSOK

7.1 Gáznemű kibocsátások

7.1.1 Általános rész

Az analitikus mérések eredménye a hajtómű vonatkozó utánégető üzemmódjainál és a mintavételi sík különböző pontjaiban a szennyező anyag különböző osztályainak koncentrációi legyenek és jelenteni ezeket kell. Ezen alapvető paramétereken felül, egyébb paramétereket is ki kell számítani, illetve közölni kell, a következők szerint.

7.1.2 Mérések elemzése és ellenőrzése

a) Minden egyes hajtómű-beállításnál, a különböző mintavételi pozícióknál mért koncentrációk az alábbi módon átlagolandó:

$$C_{i\,moy} = \sum_{j=1}^{n} C_{i\,j}$$

ahol:

$\sum_{j=1}^{n}$ A felhasznált teljes n számú mintavételi pozíció összegzése.

$C_{i\,j}$ Az i fajta koncentrációja, a j-ik mintavételi pozícióban mérve.

$C_{i\,moy}$ Az i fajta átlagos koncentrációja.

Minden száraz koncentrációban végzett mérés átalakítandó valós nedves koncetrációkká (lásd a jelen Függelék E Mellékletét).

b) Az egyes szennyezőanyagok mérési minősége a CO_2 mérésekkel elvégzett összehasonlítással kerül megállapításra, az alábbi korrelációs koefficiens felhasználásával:

$$r_i = \frac{n \sum_{j=1}^{n} C_{ij}CO_{2j} - \sum_{j=1}^{n} C_{ij} \sum_{j=1}^{n} CO_{2j}}{\sqrt{\left(\left\{n \sum_{j=1}^{n} (CO_{2j})^2 - \left(\sum_{j=1}^{n} CO_{2j}\right)^2\right\} \left\{n \sum_{j=1}^{n} C_{ij}^{\,2} - \left(\sum_{j=1}^{n} C_{ij}\right)^2\right\}\right)}}$$

Az 1-hez közelítő ri értékek azt mutatják, hogy a teljes mintavételi időszak alatt elvégzett mérések megfelelően stabilak és a görbék gaussiak. Amennyiben ri kevesebb, mint 0,95, a méréseket meg kell ismételni egy olyan mintavételi síkban, amely a légijármű hajtóművétől távolabb helyezkedik el. Maga a mérés folyamata után meg kell ismételni a korábbi számításokat és kimutatásokat.

7.1.3 Mérési adatok elemzése és megerősítése

Az egyes hajtómű-üzemmódban elvégzett méréseknél a 7.1.2 pontban meghatározottak alapján felbecsülik minden egyes gázminta átlagos koncentrációját, valamint elvégzik a száraz mintavétellel végzett mérések és/vagy az interferenciák utáni korrekciókat, a jelen Függelék útmutatásai alapján. Az átlagos koncentráció szükséges az alábbi alapparaméterek kiszámításához:

$$EI_p \text{ (kibocsátási index p komponenshez)} = \frac{\text{A képződött p komponens tömege (g)}}{\text{A felhasznált tüzelőanyag tömege (kg)}}$$

$$EI(CO) = \left(\frac{[CO]}{[CO_2] + [CO] + [HC]}\right)\left(\frac{10^3 M_{CO}}{M_C + (n/m)M_H}\right)\left(1 + T(P_0/m)\right)$$

$$\mathrm{EI(HC)} = \left(\frac{[\mathrm{HC}]}{[\mathrm{CO_2}] + [\mathrm{CO}] + [\mathrm{HC}]} \right)\left(\frac{10^3 M_{\mathrm{HC}}}{M_{\mathrm{C}} + (n/m)M_{\mathrm{H}}} \right)\left(1 + T(\mathrm{P_0}/m)\right)$$

$$\begin{matrix}\mathrm{EI(NO_x)} \\ \text{(mint } \mathrm{NO_2}\text{)}\end{matrix} = \left(\frac{[\mathrm{NO_x}]}{[\mathrm{CO_2}] + [\mathrm{CO}] + [\mathrm{HC}]} \right)\left(\frac{10^3 M_{\mathrm{NO_x}}}{M_{\mathrm{C}} + (n/m)M_{\mathrm{H}}} \right)\left(1 + T(\mathrm{P_0}/m)\right)$$

$$\text{Levegő/üzemanyag arány} = (\mathrm{P_0}/m)\left(\frac{M_{\mathrm{LEVEGŐ}}}{M_{\mathrm{C}} + (n/m)M_{\mathrm{H}}} \right)$$

$M_{levegő}$ A száraz levegő molekula tömege = 28,966 gr., vagy ahol ez megfelelő, = (32 R + 28,156 4 S + 44,011 T) g

M_{HC} Kibocsátott szénhidrogének molekula tömege CH_4-ként véve = 16,043 g

M_{CO} CO molekula tömege = 28,011 g

M_{NO_2} NO_2 molekula tömege = 46,008 g

M_C Szénatom tömege = 12,011 g

M_H Hidrogénatom tömege = 1,008 g

R O_2 koncentráció száraz levegőben normál térfogaton = 0,209 5, rendszerint

S N_2 koncentráció + nemesgáz térfogat szerint, száraz levegőben = 0,709 2, rendszerint

T CO_2 koncentráció térfogat szerint, száraz levegőben = 0, 000 3, rendszerint

[HC) Kibocsátott szénhidrogén átlagos koncentráció térfogat/térfogat, szénként kifejezve

[CO] Közepes CO koncentráció térfogat/térfogat, nedves

[CO_2] Közepes CO_2 koncentráció térfogat/térfogat, nedves

[NO] A kibocsátott gázmintában lévő NO közepes koncentráció térfogat/térfogat, nedves

[NO_2] A kibocsátott gázmintában lévő NO_2 közepes koncentráció térfogat/térfogat, nedves =

$$= \frac{([\mathrm{NO_x}]_c - [\mathrm{NO}])}{\eta}$$

$[NO_x]_c$ A kibocsátott gázmintában lévő NO közepes koncentráció az NO_2/NO konverteren való áthaladás után, térfogat/térfogat, nedves

η NO_2/NO konverter hatásfoka

h Környező levegő nedvességtartalma, víz térfogat/száraz levegő térfogat

m C atomok száma a jellemző tüzelőanyag molekulában

n A H atomok száma a jellemző tüzelőanyag molekulában

x C atomok száma a jellemző kibocsátott szénhidrogén molekulában

y H atomok száma a jellemző kibocsátott szénhidrogén molekulában

Az alkalmazott tüzelőanyagban lévő hidrogén atomok és szénatomok viszonyát az n/m értékét a tüzelőanyag fajta analízise útján határozzák meg. A környező levegő nedvességtartalmát a h-t, minden konkrét feltételnél mérni kell. Ellenkező bizonyítékok hiányában a kibocsátott szénhidrogének x, y jellemzőjeként az x = 1, y = 4 értékeket kell használni. Ha a mérésekben száraz, vagy félszáraz CO és CO_2 méréseket alkalmaznak, akkor ezek koncentráció értékét először a nedves, CO és CO_2 koncentrációjának ekvivalens értékeire kell átszámítani a jelen Függelék "E" Mellékletében leírtak szerint, amely interferencia korrekció beviteli képleteket is tartalmaz az alkalmazni szükséges esetekre.

7.1.4 A gáz kibocsátási index korrekciója a referencia feltételekre

A vizsgált hajtómű bemenetén a tényleges léghőmérséklet és nyomás referencia környezeti feltételektől (a Nemzetközi Egyezményes Légkör tengerszinthez tartozó feltételeitől) való eltérések figyelembe vétele céljából, a mérendő gáz kibocsátási indexen korrekciót kell alkalmazni minden szennyező anyagra, a hajtómű összes megfelelő üzemmódjára vonatkozóan. A referencia nedvességtartalom = 0,00634 kg víz/száraz levegő értékkel.

Következésképp, korrigált EI = K x mért EI,

ahol a K értékére adott általános kifejezés:

$$K = (P_{Bref} / P_B)^a \ x \ (FAR_{ref} / FAR_B)^b \ x \ \exp (|T_{Bref} - T_B|/c) \ x \ \exp (d\backslash h - 0{,}00634|)$$

P_B Az égőkamra bemenetén mért nyomás

T_B Az égőkamra bemenetén mért hőmérséklet

FAR_B Tüzelőanyag/levegő arány az égőkamrában

h A környező levegő nedvessége

P_{ref} A Nemzetközi Egyezményes Légkör tengerszinthez tartozó nyomása

T_{ref} A Nemzetközi Egyezményes Légkör tengerszinthez tartozó hőmérséklete

P_{Bref} A vizsgált hajtómű égőkamrájának (vagy ha az adatot a referencia hajtóműhöz korrigálták, a referencia hajtómű) bemeneténél mért és a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotán mért T_B értékhez tartozó nyomás.

T_{Bref} A vizsgált hajtómű (vagy ha az adatot a referencia hajtóműre szándékoznak korrigálni, a referencia hajtómű) égőkamrájának bemenetén a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotán mért hőmérséklet. Ez a hőmérséklet az egyes hajtómű üzemmódokra meghatározott tolóerő-értékhez tartozó hőmérséklet.

FAR_{ref} Tüzelőanyag - levegő arány a vizsgált hajtómű égőkamrájában, a Nemzetközi Egyezményes Légkör tengerszinthez tartozó állapotának megfelelően (vagy a kiinduló hajtóműnél mérve, ha az adatokat a kiinduló hajtóműre óhajtják korrigálni).

a, b, c, d Konstansok, amelyek szennyező anyagonként és hajtómű típusonként változhatnak.

Az égőtér bemeneti paramétereket kívánatos az égőkamra bemenetén mérni, de megfelelő képletekkel kiszámíthatók a környezeti feltételekből kiindulva is.

7.1.5 Az égőkamra bemenetén a kibocsátási indexek és a hőmérsékleti viszony összefüggéseinek megállapítására ajánlott pontonkénti görbe felvételi módszer, hatékonyan kiküszöböli az általános egyenletből az exp(\TBref - TB\/C) kifejezést, és az esetek többségében a (FARBref/FARB) kifejezés egynek vehető. A CO és a HC kibocsátási indexekre vonatkozóan számos vizsgáló létesítménynél úgy találták, hogy a nedvesség kifejezés ahhoz elég közel van, az "1" -hez, hogy a kifejezésből kivegyék, és azt, hogy a (PBref/PB) kifejezés, 1 - hez közeli.

Ily módon: Korrigált EI(CO) = EI(CO), amelyet a
(PB/PBref) szor EI(CO) v. TB görbéből származtatnak

Korrigált EI(HC) = EI, amelyet a (PB/PBref) × EI(CH) v. TB
görbéből származtatnak

Korrigált EI(NOx) = EI, amelyet a
EI(NOx)(PBref/PB)0,5 exp (19\h - 0,006 29\) v. TB
görbéből származtatnak

Ha a CO és HC kibocsátási indexek korrigálására ajánlott módszer megfelelő összefüggést nem biztosít, akkor az összetevő vizsgálatokból nyert paraméterek alkalmazásával, alternatív módszer alkalmazható.

Bármely más, a CO, HC és NOx emissziós indexek korrigálására alkalmazott módszer a légialkalmassági bizonyítványt kiadó hatóságnak kell jóvá hagynia.

7.2 Kontroll paraméter funkciók

(D_p, F_{oo}, π)

7.2.1 Meghatározások

D_p Bármely a leszállás és felszállás közbeni referencia kibocsátási ciklus alatt a légkörbe kivált gáznemű szennyezőanyag tömege.

F_{oo} A légialkalmassági bizonyítványt kiadó hatóság által jóváhagyott maximum tolóerő, a felszálláshoz szükséges szokványos üzemi feltételek mellett a Nemzetközi Egyezményes Légkör tengerszinthez tartozó statikus állapotának megfelelő feltételek mellett, víz befecskendezés használata nélkül.

π A kompresszor utolsó fokozatának kimenő síkjában és első fokozatának bemenő síkjában lévő teljes nyomások átlagainak viszonya, amikor a hajtómű a Nemzetközi Egyezményes Légkör tengerszinthez tartozó statikus állapotának megfelelő feltételek mellett, felszálló teljesítményt ad.

7.2.2 Minden egyes szennyezőanyag tekintetében a nyomásra és nedvesség tartalomra (amint az megfelelő) a 7.1.4 -ben jelzettek szerint a referencia környezeti légköri viszonyokra és, ha szükséges a referencia hajtóműre korrigált kibocsátási indexeket (EI), minden egyes korrigált teljesítmény mellett meg kell szerezni az előírt LTO hajtómű üzemmód beállításokra (n) vonatkozóan. Az alapjárati üzemmód meghatározásához legkevesebb 3 ellenőrzési pont előírt. Minden egyes szennyezőanyagra meg kell határozni a következő összefüggést:

a) EI és T_B között; és

b) W_f (a hajtómű tüzelőanyag áramlásának tömege) és T_B között; és

c) F_n (a Nemzetközi Egyezményes Légkör tengerszintre érvényes feltételeihez korrigált) és T_B (a Nemzetközi Egyezményes Légkör tengerszintre vonatkozó feltételeihez korrigált) között.

Megjegyzés. - Példaképpen ezeket az összefüggéseket az 5 - 3 a), b) és c) ábrák illusztrálják.

Amikor a vizsgált hajtómű nem egy referencia hajtómű, akkor az adatokat a referencia hajtómű feltételekhez viszonyítva lehet módosítani, felhasználva a referencia hajtóműből nyert b) és c) pontok szerinti összefüggéseit. A referencia hajtóművet úgy határozzák meg, mint egy olyan hajtómű, amely kialakítása

alapjában véve megegyezik a minősítendő hajtómű leírásával, és amelyet a légialkalmassági bizonyítványt kiadó hatóság elfogadott, miszerint az képviseli azt a hajtómű típust, amelyre a minősítést kérik.

A gyártónak szintén el kell látnia a légialkalmassági bizonyítványt kiadó hatóságot az összes szükséges hajtómű teljesítményadattal, ezeknek az összefüggéseknek a bizonyítására, és a Nemzetközi Egyezményes Légkör tengerszintre vonatkozó környező feltételeire vonatkozóan:

d) Maximum tolóerő (Foo); és

e) Hajtómű nyomásviszony (P) a hitelesített maximum tolóerőnél.

Megjegyzés. - Ezeket az 5 - 3 d ábra szemlélteti.

7.2.3 Minden szennyezőanyag EI értékének értékelését minden kívánt hajtómű üzemmódnál a referencia környezeti feltételekre korrigálva, a következő általános eljárással kell végezni:

a) Mindegyik hajtómű üzemmódnál a Nemzetközi Egyezményes Légkör tolóerő feltétele Fn-nél határozza meg az ekvivalens égőkamra bemenetén a hőmérsékletet (T_B) (5 - 3c) ábra);

b) Az EI/TB karakterisztika alapján határozza meg (5-3a) ábra), a T_B értéknek megfelelő EI_n értékét;

c) A Wf/TB karakterisztika alapján (5-3 b) ábra) határozza meg a T_B -nek megfelelő W_{fn} értéket;

d) Jegyezze fel a Nemzetközi Egyezményes Légkör szerinti maximum kifejtett tolóerő és nyomásviszony értékeket. Ezek a F_{oo} és P lesznek, (5 - 3 d) ábra);

e) Minden szennyezőanyagra végezze el a következő számítást:

$$Dp = \Sigma(EIn)\ (Wfn)\ (t)$$

ahol:

t LTO üzemelési módban való idő (percben)

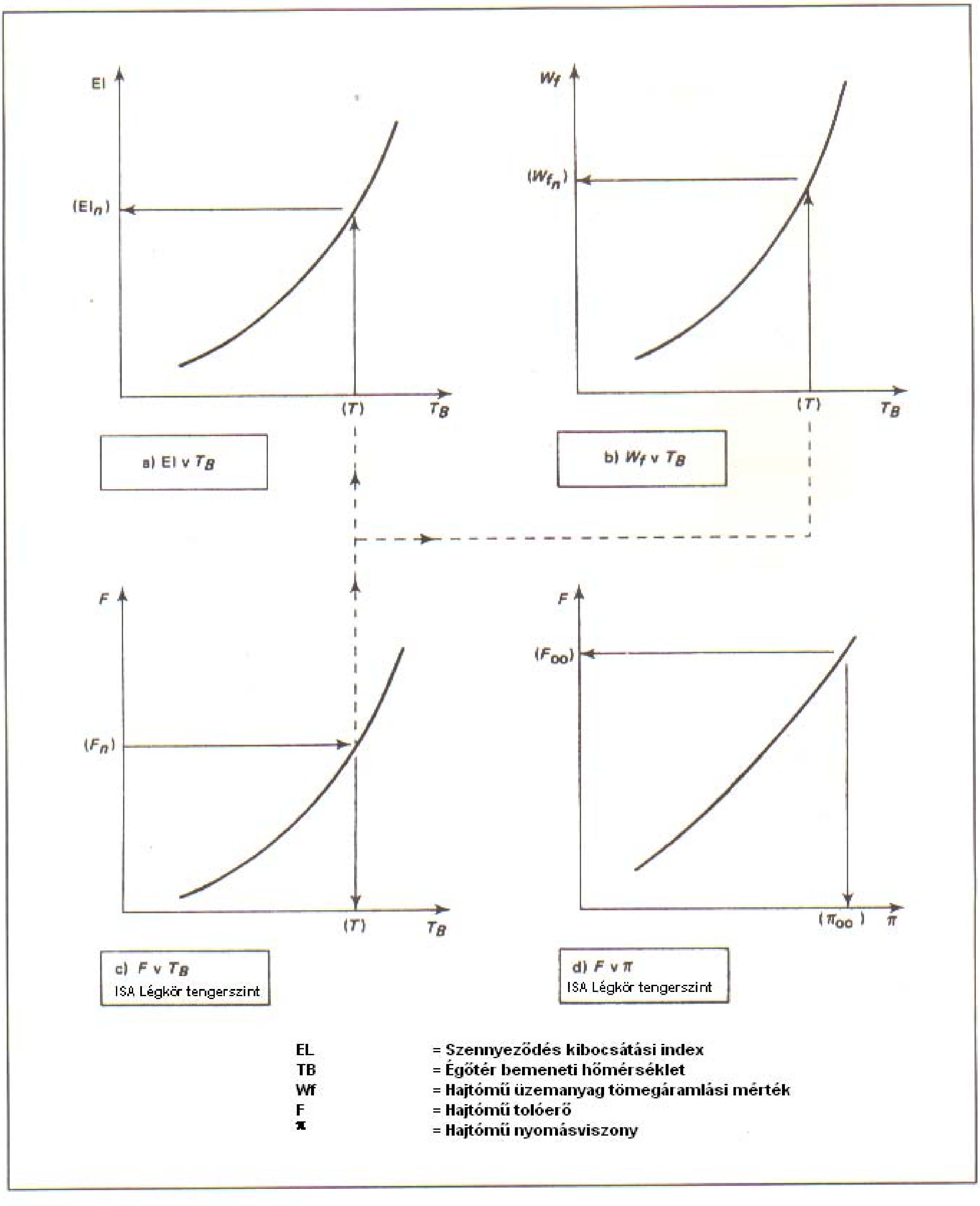
Wfn Tüzelőanyag áramlás tömege (kg/perc)

Σ A vonatkoztatási ciklust alkotó üzemmód sorozatra vonatkozó összegzés.

7.2.4 Míg a fent leírt módszer egy ajánlott módszer, a légi-alkalmassági bizonyítványt kiadó hatóság elfogadhat egy azonos értékű matematikai eljárást, amelyben olyan matematikai kifejezéseket alkalmaznak, amelyek az ábrázolt görbéket adják meg, ha a kifejezéseket a görbe pontonkénti felvételét leíró elfogadott módszer alapján kapták.

7.3 Javasolt eljárásoktól való eltérés

Azokban az esetekben, amikor a hajtómű konfiguráció, vagy más, egyéb meglévő feltételek nem teszik lehetővé ezen szabály alkalmazását, akkor az alklalmassági bizonyítványt kiadó hatóság elegendő bizonyíték birtokában, amelyek megerősítik azt, hogy az alternatív eljárás segítségével azonos értékű eredmények kaphatók, jóvá hagyhatja az alternatív eljárást.



5-3 ábra – Számítási eljárás

5. FÜGGELÉK „A” MELLÉKLETE A HC ANALIZÁTOR MŰSZAKI LEÍRÁSA

1. Megjegyzés. – Ahogyan az az 5. Függelék 5.2 pontjában szerepel, az analizátor mérő eleme egy láng-ionizációs detektor (FID), amelyben az egész gázmintát, vagy annak egy reprezentatív részét hidrogén lángba adagolják. Az elektródák megfelelő elhelyezésével ionizációs áram hozható létre, amely a lángba belépő szénhidrogén tömeg értékének függvénye. Ezt az áramot megfelelő zéróhoz viszonyítva felerősítik és tartományokba rendezik, hogy az ekvivalens ppmC számmal kifejezett szénhidrogén koncentráció mértékéül szolgáló kimenő jelet megkapják.

2. Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D” mellékletét.

1. Általános rész

Elővigyázatossági intézkedések: A megnevezett teljesítmény jellemző előírások rendszerint az analizátor teljes mérési (skála kitérési) tartományára vonatkoznak. A teljes kitéréstől kisebb jelzéseknél a hiba a kijelzett érték nagyobb százaléka lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

Az alkalmazott műszer legyen képes a detektorral és a gázmintával közvetlenül kapcsolatba kerülő részek hőmérsékletét ±2 °C pontossággal 155 °C–165 °C közötti hőmérséklet tartományban tartani. Az irányadó műszaki feltételek a következők: a detektor érzékenysége legyen optimalizált és a műszer egészében véve legyen stabilizált:

a) *Teljes mérési tartomány:* 0-500 ppmC, megfelelő tartomány beosztással;

b) *Felbontó képesség:* az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 0,5 ppmC-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±0,5 ppmC-nél jobb, amelyik a nagyobb;

d) *Stabilitás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±1 ppmC-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±0,5 ppmC-nél kisebb, amelyik a nagyobb;

f) *Zaj – 0,5 Hz és ettől nagyobb:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±0,5 ppmC-nél kisebb, amelyik a nagyobb;

g) *Reakció idő:* A gázminta elemző rendszerbe lépésétől a vég kitérés 90 százalékának megfelelő kitérés eléréséig eltelt idő 10 másodpercnél nem lehet több;

h) *Linearitás:* A levegőben lévő propánra reagálás egyenletessége minden mérési tartományban legyen a teljes tartomány ±2 százalékán belül, egyébként kalibráló helyesbítést kell végezni.

2. Szinergikus hatás

Megjegyzés. – Az alkalmazás során a mérés pontosságát két tényező befolyásolhatja:

a) *Oxigén hatás (amikor a mintában jelenlévő oxigén arányok hatása következtében a tényleges HC koncentráció mellett eltérő szénhidrogén tartalom kijelzése történik);és*

b) *A szénhidrogénre vonatkozó relatív reakció (az az eset, amikor az ekvivalens ppmC számban kifejezett azonos szénhidrogén minta koncentrációra eltérő reakciók történnek a különböző osztályokba tartozó szénhidrogén vegyületek osztályától és keverékétől függően).*

A fentiekben említett hatás mértékét az alábbiakban leírtak szerint kell meghatározni és értelemszerűen korlátozni.

Oxigén reakció: ±1 százalék relatív pontossággal ismert körülbelül 500 ppmC koncentrációjú, kétféle propánnal a következők szerint mérje meg a reagálást:

1) Propán, 10 ±1 százalék O_2-ben, a többi N_2

2) Propán, 21 ±1 százalék O_2-ben, a többi N_2.

Ha R_1 és R_2 a vonatkozó normalizált hatás értékei, akkor (R_1-R_2)-nek R_1 3 százalékánál kisebbnek kell lennie.

Szénhidrogén különbségi reakció: levegőben lévő és ±1 százalék relatív pontossággal ismert körülbelül 500 ppmC koncentrációjú, négyféle szénhidrogénnel a következők szerint mérje meg a reakciót:

a) propán zéró levegőben

b) propilén zéró levegőben

c) toluén zéró levegőben

d) n-hexán zéró levegőben.

Ha R_a, R_b, R_c és R_d – a sorrendnek megfelelően – a (propánra vonatkoztatott) vonatkozó normalizált reakciók, akkor (R_a-R_b), (R_a-R_c) és (R_a-R_d) különbségek mindegyikének az R_a 5 százalékánál kisebbnek kell lennie.

3. A detektor reakció optimalizálása és kiegyenlítése

3.1 El kell végezni a gyártó által a kezdeti beállításra vonatkozó, illetve a szükséges kiegészítő szervizelés és táplálás megvalósítására vonatkozó előírásokat és hagyni kell a műszert stabilizálódni. Minden beállító szabályozás esetén ismételten „zéró” ellenőrzést és szükség szerinti helyesbítést kell végrehajtani. Mintaként, levegőben lévő megközelítőleg 500 ppmC propánt használva a következőkre adott reagálás kakterisztikáit kell meghatározni: először az üzemanyg áramlásban történő változásokra, majd közel optimum üzemanyag áramlásra; a hígító levegőáram optimumának beállításához szükséges változtatásokra. Az oxigén és a szénhidrogén különbségi reakciókat ezután a fentiekben jelzettek szerint kell meghatározni.

3.2 Az analizátor minden mérés tartományának linearitását levegőben lévő, a teljes sklála kitérés megközelítőleg 30, 60 és 90 százalék koncentrációjú propán adagolásával kell ellenőrizni. Az adott pontokat

0-val összekötő legkisebb négyzetek egyenesétől az említett pontok bármelyikének legnagyobb reakció-eltérése nem lehet nagyobb a teljes tartomány érték ±2 százalékánál. Ha ennél nagyobb az eltérés, akkor üzemi kalibráló görbét kell készíteni.

5. FÜGGELÉK „B" MELLÉKLETE CO és CO_2 ANALIZÁTOR MŰSZAKI LEÍRÁSA

1. Megjegyzés. – Az 5. függelék 5.3 pontja foglalja össze az elhasznált gázokban lévő CO és CO_2 koncentrációk külön-külön történő méréseinél alkalmazandó analizáló alrendszer jellemzőit. A műszerek, az etalon és a kiválasztott gázzal töltött, párhuzamos elemekben végbemenő diffúzió mentes infravörös sugárzás elnyelésén alapulnak. A kívánt érzékenységi tartományok egy sor, kiválasztott gázra érzékeny elem segítségével, vagy elektromos áramköri módosítással, vagy mindkét eljárással együttesen valósítható meg. Az átfedésben lévő elnyelődési tartománnyal bíró gázok miatti interferenciát gáz elnyelő szűrőkkel és/vagy optikai szűrőkkel (lehetőség szerint az utóbbiakat alkalmazva) lehet minimalizálni.

2. Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D" mellékletet.

Elővigyázatossági intézkedések: A feltüntetett teljesítmény jellemző előírások rendszerint az analizátor teljes mérési (skála kitérési) tartományára vonatkoznak. A teljes kitéréstől kisebb jelzéseknél a hiba a kijelzett érték nagyobb százaléka lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

A fő teljesítmény jellemzők az alábbiak legyenek:

CO analizátor

a) *Teljes mérési tartomány*: 0–2500 ppm, megfelelő tartomány beosztásokkal;

b) *Felbontó képesség:* az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál jobb, vagy 1 ppm, amelyik a nagyobb;

c) *Ismételhetőség*: az alkalmazott tartomány "teljes.kitérés" ±1 százalékánál jobb, vagy ±2 ppm, amelyik a nagyobb;

d) *Stabilitás*: egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±2 ppm-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás*: egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±2 ppm-nél kisebb, amelyik a nagyobb;

f) *Zaj* – 0,5 Hz és ettől nagyobb: az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

g) *Interferencia:* A jelzett CO koncentráció tekintetében a következők szerint kell korlátozni:

1) az etilén glikol tartalom minden százaléka esetében 500 ppm-nél kisebb

2) a CO_2 tartalom minden százaléka esetében 2 ppm-nél kisebb

3) a vízpára tartalom minden százaléka esetében 2 ppm-nél kisebb*

* Nem kell alkalmazni, ha a méréseket „száraz" körülmények között végzik.

Ha a CO_2-re és a vízpárára vonatkozó interferenciát nem lehet ezen határok közé szorítani, akkor megfelelő korrekciós együtthatókat kell meghatározni és azokat jelenteni, illetve alkalmazni kötelező.

Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

CO_2 analizátor

a) *Teljes mérési tartomány*: 0-tól 10 százalékig, megfelelő tartomány beosztásokal;

b) *Felbontó képesség:* az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 100 ppm-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség:* az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±100 ppm-nél jobb, amelyik a nagyobb;

d) *Stabilitás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±100 ppm-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül a műszer alkalmazott mérési tartományának ±1 százalékánál, vagy ±100 ppm-nél kisebb, amelyik a nagyobb;

f) *Zaj* – 0,5 Hz és ettől nagyobb: a műszer alkalmazott mérési tartományának ±1 százalékánál, vagy ±100 ppm-nél kisebb, amelyik a nagyobb;

g) Az oxigén (O_2) CO_2 analizátorra gyakorolt hatását ellenőrizni kötelező. Adott CO_2 koncentrációra reagálás a kijelzett érték 2 százaléknál nagyobb mértékben nem változhat, amikor az O_2-t 0 százalékról 21 százalék O_2-re változtatják. Ha ez a határérték nem tartható, akkor megfelelő helyesbítési tényezőt kell alkalmazni.

   Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

CO és CO_2 analizátorok

a) *Reakció idő*: a minta elemző rendszer bemenetén történő belépésétől számítva a végleges kitérés 90 százalékának elérése 10 másodpercnél ne legyen hosszabb időtartamú.

b) *A minta hőmérséklete*: a művelet elvégzésének megszokott módja az, hogy a mintát „nedves” (kezeletlen) állapotában vizsgálják. E miatt a mintát tartalmazó rekesz és az eme alrendszerben a mintával érintkezésbe kerülő minden szerkezeti elem hőmérsékletét ±2 °C pontossággal 50 °C hőmérsékleten kell tartani. A CO és a CO_2 száraz alapon (megfelelő víz csapdák alkalmazásával) történő mérése megengedett és ez esetben a H_2O-ra vonatkozó interferencia korlátokat megszüntetve fűtetlen elemzők használhatók, melyet követően a belépő vízpárára és ez égetés alkalmával keletkező vízre korrekciót kell végezni.

c) Kalibráló görbék:

   i) A lineáris kimenő jel karakterisztikával rendelkező elemző berendezést minden munka tartományban, ismert, a "teljes -kitérés" megközelítőleg 0, 30, 60 és 90 százalékos koncentrációjú kalibráló gázok használatával kötelező ellenőrizni. E pontok bármelyike esetében a zéró leolvasást és az ezen pontokat összekötő legkisebb négyzetek egyenes vonalához viszonyított maximum reakció eltérés a teljes kitérési érték ±2 százalékánál nagyobb nem lehet. Ha az eltérés ettől nagyobb, akkor az üzemi használathoz kalibráló görbét kell készíteni.

ii) A nem lineáris kimenő jel karakterisztikával rendelkező, illetve a fentiekben megadott linearitást nem teljesítő elemző berendezéshez minden munka tartományra kalibráló görbét kell készíteni ismert, a teljes kitérés megközelítőleg 0, 30, 60 és 90 százalékos koncentrációjú kalibráló gázokat használva. A görbe pontos alakjának meghatározásához, ha szükséges további gázkeverékeket kell használni.

Az 5. FÜGGELÉK „C” MELLÉKLETE – NO_X ANALIZÁTOR MŰSZAKI LEÍRÁSA

Megjegyzés. – A vizsgálati és kalibrációs gázokról szóló tájékoztatás tekintetében lásd a „D” mellékletet.

1. Ahogyan azt az 5. Függelék 5.4 pontja leírja, a nitrogén dioxid tartalom mérése kémiai luminesszencia alapján történik, mely során mérik az NO és az O_3 reakciója által kibocsátott sugárzást. Ez a módszer az NO_2-re érzéketlen, ezért, mielőtt az össz NO_x tartalmat megmérnék, a gázmintát konverteren bocsátják keresztül, amelyben az NO_2 NO-vá alakul át. Mérni kell mind az NO eredeti mennyiségét, mind az össz NO_x koncentrációt. Az NO_2 mennyiségét a különbség alapján kell meghatározni.

2. Az alkalmazott berendezés az áramlás szabályozásához szükséges minden részt tartalmazzon, például szabályozókat, szelepeket, fogyasztás mérőket stb. A gázmintával közvetlenül kapcsolatba kerülő anyagok legyenek ellenállók a nitrogén oxidok hatásaival szemben, ilyen anyag például rozsdamentes acél, az üveg stb. A gázminta hőmérsékletét a helyi nyomásnak megfelelő, a víz kicsapódás lehetőségét kizáró hőmérsékleten kell tartani.

Figyelmeztetés: a feltüntetett teljesítmény jellemzők általában az analizátor teljes tartományára vonatkoznak. Részleges skála kitérésnél a hiba a kijelzett érték lényegesen nagyobb százaléka is lehet. A mérések előkészítésénél az ilyenfajta növekedések mérvadóságát és jelentőségét meg kell fontolni. Ha nagyobb pontosság szükséges, akkor megfelelő elővigyázatossági lépéseket kell tenni.

3. A 2 °C-on belüli stabilitású környezeti hőmérséklet körülmények között üzemeltetett műszerre meghatározott fő teljesítmény jellemzők az alábbiak:

a) *Teljes mérési tartomány:* 0–2500 ppm, megfelelő tartomány beosztással;

b) *Felbontó képesség:* az alkalmazott tartomány "teljes-kitérés" 0,5 százalékánál, vagy 1 ppm-nél jobb, amelyik a nagyobb;

c) *Ismételhetőség*: az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél jobb, amelyik a nagyobb;

d) *Stabilitás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál, vagy ±1 ppm-nél jobb, amelyik a nagyobb;

e) *Nulla elhúzás:* egy órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

f) *Zaj – 0,5 Hz és ettől nagyobb:* két órás tartamon keresztül az alkalmazott tartomány "teljes-kitérés" ±1 százalékánál, vagy ±1 ppm-nél kisebb, amelyik a nagyobb;

g) *Interferencia:* a CO_2-t és vízpárát tartalmazó minták esetében az elnyomást a következők szerint kell korlátozni:

- a CO_2 tartalom minden százaléka esetében a műszer kitérés 0,05 százalékánál kisebb;

- a vízpára tartalom minden százaléka esetében a műszer kitérés 0,1 százalékánál kisebb.

Ha a CO_2-re és/vagy a vízpárára vonatkozó interferencia korlátozás nem tartható, akkor a megfelelő korrekciós együtthatókat meg kell határozni és azokat jelenteni, illetve alkalmazni kötelező.

Megjegyzés. – A jól bevált gyakorlatnak megfelelően ajánlott, hogy ilyen korrekciós eljárásokat minden esetben alkalmazzanak.

h) *Reakció idő:* a minta elemző rendszer bemenetén történő belépésétől számítva a végleges kitérés 90 százalékának elérése 10 másodpercnél ne legyen hosszabb idő tartamú.

i) *Linearitás:* az alkalmazott tartomány "teljes-kitérés" ±2 százalékánál jobb, vagy ±ppm, amelyik a nagyobb.

j) *Konverter:* tervezése és üzemeltetése olymódon történjen, hogy a mintában jelenlévő NO_2-t NO-ra redukálja. A konverter ne legyen hatással a mintában eredetileg jelenlévő NO-ra.

A konverter hatásfoka 90 százaléknál rosszabb nem lehet.

Ezt a hatásfok értéket kell használni a mintában lévő NO_2 mennyiség (azaz $(NO_x)_c$ – (NO)) arra az értékre korrigálásához, amelyet akkor kapnának, ha a konverter hatásfoka nem 100 százalék lenne.

Az 5. FÜGGELÉK „D” MELLÉKLETE – KALIBRÁLÓ ÉS VIZSGÁLATI GÁZOK

Kalibráló gázok táblázata

Analizátor	*Gáz*	*Pontosság (A megbízhatóság 95 százalékos tartományában mérve)*
HC	Propán zéró levegőben	±2 százalék, vagy ±0,05 ppm Amelyik a nagyobbik.
CO_2	CO_2 zéró levegőben	±2 százalék, vagy ±100 ppm Amelyik a nagyobbik.
CO	CO zéró levegőben	±2 százalék, vagy ±2 ppm Amelyik a nagyobbik.
NO_x	NO_x zéró nitrogénben	±2 százalék, vagy ±1 ppm Amelyik a nagyobbik.

Az analizátorok szokványos üzemi használata alatti rutin kalibrálásának elvégzéséhez e gázokat kötelező alkalmazni.

Kalibráló gázok táblázata

Analizátor	*Gáz*	*Pontosság (A megbízhatóság 95 százalékos tartományában mérve.)*
HC	Propán 10 ±1 százalék O_2-ben, balansz zéró nitrogén	±1 százalék
HC	Propán 21 ±1 százalék O_2-ben, balansz zéró nitrogén	±1 százalék
HC	Propilén zéró levegőben	±1 százalék
HC	Tolulén zéró levegőben	±1 százalék
HC	n-hexán zéró levegőben	±1 százalék
HC	Propán zéró levegőben	±1 százalék
CO_2	CO_2 zéró levegőben	±1 százalék
CO_2	CO_2 zéró nitrogénben	±1 százalék
CO	CO zéró levegőben	±1 százalék
NO_x	NO zéró nitrogénben	±1 százalék

Az „A”, „B” és „C” mellékletben szereplő vizsgálatok elvégzéséhez a fenti gázokat kötelező alkalmazni.

A szénmonoxid és a széndioxid kalibráló gázok külön-külön is és összekeverve kétkomponensű keverék formájábanis használhatók. A szénmonoxid, a széndioxid és a propán három komponensű keverékeit zéró levegőben akkor lehet alkalmazni, ha a keverés stabilitása biztosított.

A CO, CO_2 és a HC analizátorhoz előírt zéró gáz, a „zéró” levegő (amely N_2 és 20-22 százalék O_2 „mesterséges” levegő keverékből áll). Az NO_x analizátorhoz zéró gázként zéró nitrogént kell alkalmazni. Mindkét zéró gáz esetében a szennyeződést az alábbiaknál kisebb értékre kell korlátozni:

1 ppm C
1 ppm CO
100 ppm CO_2
1 ppm NO_x

A kérelmezőnek meg kell bizonyosodnia róla, hogy a kereskedelmi gáz, amellyel ellátták ezen jellemzőknek ténylegesen megfelel, illetve a szállító azt ily módon jellemezte.

5. FÜGGELÉK „E” MELLÉKLETE A LÉGSZENNYEZÉSI PARAMÉTEREK SZÁMÍTÁSA – ALAP, MÉRÉS KORREKCIÓ ÉS ALTERNATÍV NUMERIKUS MÓDSZER

1. Jelölések

AFR	Levegő/üzemanyag arány; a száraz levegőtömeg áram mennyiségének az üzemanyag áram mennyiségéhez viszonyított aránya
EI	Kibocsátási index; a kiáramló gázban lévő kibocsátott gáznemű termék tömeg áramlási mértékének 10^3 × per egységnyi üzemanyag tömeg áramlási arány
K	A nedves körülmények, illetve a száraz körülmények között (a hideg leválasztó után) mért koncentráció aránya
L, L´	Analizátor interferencia együttható a CO_2 interferenciára
M, M´	Analizátor interferencia együttható a H_2O interferenciára
M_{AIR}	A száraz levegő gramm molekula tömege = 28,966 g, vagy ahol megfelelő = (32R + 28,156 4 S + 44,011 T) g
M_{CO}	A CO gramm molekula tömege = 28,011 g
M_{HC}	Az elhasznált gázban lévő szénhidrogén CH_4-nek tekintett gramm molekula tömege = 16,043 g
M_{NO_2}	Az NO_2 moll tömege = 46,008 g
M_C	A szénatom gramm atom tömege = 12,011 g
M_H	A hidrogén atom gramm atom tömege = 1,008 g
P_1	Az elhasznált mintagázban lévő CO_2 moll száma per az üzemanyag moll száma
P_2	Az elhasznált mintagázban lévő N_2 moll száma per az üzemanyag moll száma
P_3	Az elhasznált mintagázban lévő O_2 moll száma per az üzemanyag moll száma
P_4	Az elhasznált mintagázban lévő H_2O moll száma per az üzemanyag moll száma
P_5	Az elhasznált mintagázban lévő CO moll száma per az üzemanyag moll száma
P_6	Az elhasznált mintagázban lévő C_xH_y moll száma per az üzemanyag moll száma
P_7	Az elhasznált mintagázban lévő NO_2 moll száma per az üzemanyag moll száma
P_8	Az elhasznált mintagázban lévő NO moll száma per az üzemanyag moll száma
P_T	$P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8$
R	A száraz levegő O_2 tartalma térfogat szerint = 0,2095 általában
S	A száraz levegő N_2 +ritka gáz tartalma térfogat szerint = 0,7902 általában
T	A száraz levegő CO_2 tartalma térfogat szerint = 0,0003 általában
P_0	A levegőben lévő molekulák száma per a kiindulási levegő/üzemanyagban lévő molekulák száma
Z	A 3.4 pontban használt és ott leírt jelölés
$[CO_2]$	Átlagos CO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
[CO]	Átlagos CO koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
[HC]	Átlagos HC koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
[NO]	Átlagos NO koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
$[NO_2]$	Átlagos NO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
$[NO_x]$	Átlagos NO és NO_2 koncentráció az elhasznált gázmintában, térfogat/térfogat szerint
$[NO_x]_c$	Átlagos NO_2 koncentráció az elhasznált gázmintában, miután áthaladt az NO_2/NO konverteren, térfogat/térfogat szerint
$[NO_2]$	Átlag = $\dfrac{([NO_x]_C - [NO])}{\eta}$
$[\ ]_d$	A hideg leválasztó után az elhasznált gázmintában lévő átlagos tartalom, térfogat/térfogat szerint
$[\ ]_m$	A műszer korrekció elvégzése előtt kijelzett közepes koncentráció értéke, térfogat/térfogat szerint
H	A környezeti levegő nedvesség tartalma víz térfogat/száraz levegő térfogat szerint
h_d	A „szárítót”, avagy a „hideg leválasztót” elhagyó elhasznált minta gáz nedvesség tartalma víz térfogat/száraz minta térfogat szerint

M A szén atomok száma a jellemző üzemanyag gramm molekulában
N H atomok száma a jellemző üzemanyag gramm molekulában
x Szén atomok száma az elhasznált gáz szénhidrogénjének molekulájában
y H atomok száma az elhasznált gáz szénhidrogénjének molekulájában
η Az NO_2/NO konverter hatásfoka

2. EI és FAR paraméterek számításának alapjai

2.1 Feltételezett, hogy az eredeti üzemanyag és a levegő keverék, valamint a mintavett elhasznált gáz állapota közötti egyensúly a következő egyenlettel kifejezethető:

$$C_mH_n + P_0[R(O_2) + S(N_2) + T(CO_2) + h(H_2O)] = P_1(CO_2) + P_2(N_2) + P_3(O_2) + P_4(H_2O) + P_5(CO) + P_6(C_xH_y) + P_7(NO_2) + P_8(NO)$$

Amelyből a szükséges paraméterek definícióik alapján a következők szerint fejezhetők ki:

$$EI(CO) = P_5 \left(\frac{10^3 M_{CO}}{mM_C + nM_H}\right)$$

$$EI(HC) = xP_6 \left(\frac{10^3 M_{HC}}{mM_C + nM_H}\right)$$ metán ekvivalensként kifejezve

$$EI(NO_x) = (P_7 + P_8) \left(\frac{10^3 M_{NO_2}}{mM_C + nM_H}\right)$$ NO_2 ekvivalensként kifejezve

$$AFR = P_0 \left(\frac{M_{LEVEGŐ}}{mM_C + nM_H}\right)$$

2.2 Az üzemanyag szénhidrogén összetételének értékeit (m, n) az üzemanyag specifikáció szerint, vagy analízis útján kell meghatározni. Ha ilyen módon csak a n/m arányt határozzák meg, akkor az érték m = 12-re vehető fel. A száraz levegő összetevőinek gramm molekulányi mennyiségeit (R, S, T) rendszerint egyenlőnek veszik az ajánlott szabvány mennyiségekkel, ugyanakkor felvehetők alternatív mennyiségek, olyan korlátozás mellett, hogy R + S + T = 1 és, ha ezt a bizonyítványt kiadó hatóság jóváhagyja.

2.3 A környező levegő nedvességtartalma h, minden vizsgálati feltételnél a mérés szerinti érték. Ajánlott, hogy ha nincs erre vonatkozó ellentétes bizonyíték, a kibocsátott szénhidrogén (x, y) jellemzőit, x =1 és y = 4 értékben vegyék fel.

2.4 A többi ismeretlen mennyiség meghatározásához, meg kell oldani az alábbi lineáris szimultán egyenletrendszert, mely egyenletek közül a (1)–(4) az energia megmaradás alaptörvényéből következik, míg az (5)–(9) egyenletek a gáznemű termékek koncentráció összefüggésekből származnak.

$$m + TP_0 = P_1 + P_5 + xP_6 \quad (1)$$
$$n + 2hP_0 = 2P_4 + yP_6 \quad (2)$$
$$(2R + 2T + h)P_0 = 2P_1 + 2P_3 + P_4 + P_5 + 2P_7 + P_8 \quad (3)$$
$$2SP_0 = 2P_2 + P_7 + P_8 \quad (4)$$
$$[CO_2]P_T = P_1 \quad (5)$$
$$[CO]P_T = P_5 \quad (6)$$

$[HC]P_T = xP_6$ (7)

$[NO_x]_cP_T = \eta\ P_7 + P_8$ (8)

$[NO]P_T = P_8$ (9)

$P_T = P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8$ (10)

A fentiekben leírt feltételes egyenletrendszer ahhoz az esethez tartozik, amikor a mért koncentrációk valódi értékek, azaz, nincsenek interferencia hatása alatt és nincs szükség a minta szárítása miatti korrekcióra. A gyakorlatban általában jelentős interferencia hatás mutatkozik a CO, NO_x és NO méréseknél és gyakori, hogy a CO_2 és CO száraz, vagy részlegesen száraz alapon történő alternatív mérési lehetőséget alkalmazzák. A megfelelő egyenletek szükséges módosításait a 2.5 és a 2.6 pontok tartalmazzák.

2.5 Az interferencia hatást főként a mintában jelenlévő CO_2 és H_2O váltja ki, amelyek a CO és a NO analizátorok működésére teljesen eltérő módon hathatnak. A CO analizátor nulla eltolódásra, míg a NO_x analizátor érzékenység változásra hajlamos, ezek kifejezései:

$$[CO] = [CP]_m + L[CO_2] + M[H_2O]$$

és

$$[NO_x]_c = [NO_x]_{cm}\ (1 + L'[CO_2] + M'[H_2O])$$

amelyek - ha az interferencia hatás miatt korrekcióra van szükség - a következőképp módosítják a (6), (8) és (9) alternatív egyenleteket:

$[CO]_mP_T + LP_1 + MP_4 = P_5$ (6A)

$[NO_x]_{cm}\ (P_T + L'P_1 + M'P_4) = \eta\ P_7 + P_8$ (8A)

$[NO]_m\ (P_T + L'P_1 + M'P_4) = P_8$ (9A)

2.6 Ha a CO_2 és a CO koncentráció száraz, vagy részlegesen száraz minta alapján – azaz h_d értékig csökkentett minta nedvesség tartalommal – történő mérésére esik a választás, akkor az a következő módosított feltételes egyenletek alkalmazását is magával vonja:

$[CO_2]_d\ (P_T – P_4)\ (1 + h_d) = P_1$ .... (5A)

és

$[CO]_d\ (P_T – P_4)\ (1 + h_d) = P_5$

mivel azonban - ahogy ez a fentiekben a 2.5 pontban is látható - a CO analizátor interferencia hatása alá kerülhet, ezért a CO koncentrációjának alternatív mérésére szolgáló teljes egyenlet a következő lesz:

$[CO]_{md}\ (P_T – P_4)\ (1 + h_d) + LP_1 + Mh_d(P_T – P_4) = P_5$ .... (6B)

3. Analitikai egyenletek

3.1 Általános rész

A (1)–(10) egyenletek egyszerűsítésével megkaphatók a -jelen Függelék 7.1 pontja szerinti- EI és AFR paramétereket megfogalmazó analitikai képletek. Ez az egyszerűsítés a P_0, P_1 gyökök egészen a P_8, P_T gyökökig tartó fokozatos kiküszöbölését jelenti azt a feltételezést alkalmazva, hogy az összes koncentráció mérése „nedves” mintán történik és nem igényelnek interferencia miatti korrekciót, vagy hasonlókat. A valóságban sokszor élnek a választási lehetőséggel, hogy a CO_2 és a CO koncentráció mérését „száraz” vagy „félszáraz” minta alapján végezzék; úgyszintén gyakran szükséges koorekciót végezni az interferencia miatt. Eme különféle feltételek melletti használatra szolgáló egyenleteket az alábbi 3.2, 3.3 és 3.4 pontok tartalmazzák.

3.2 A száraz koncentráció mérési eredményeinek nedves koncentrációra történő átszámítását biztosító egyenlet

Nedves koncentráció = K × száraz koncentráció
azaz

$$[\ ] = K\,[\ ]_d$$

Ha a CO és CO_2 meghatározása „száraz” minta alapján történt, akkor a következő kifejezés használatos K meghatározására:

$$K = \frac{\left\{4 + (n/m)\,T + (|n/m|T - 2h)\,([NO_2] - (2[HC]/x))\right.}{(2+h)\,\left\{2 + (n/m)\,(1+h_d)\,([CO_2]_d + [CO]_d)\right\}}$$

$$\frac{\left.+ (2+h)\,(|y/x| - |n/m|)\,[HC]\right\}\ (1+h_d)}{-(|n/m|T - 2h)\,(1 - |1+h_d|[CO]_d)}$$

3.3 Interferencia korrekciók

A fenti analitikai egyenletekben alkalmazásuk előtt a C és/vagy NO_x és NO mérések interferencia korrekcióra szorulhatnak a minta CO_2 és víz koncentrációjára miatt. Ezek a korrekciók rendszerint a következő általános módon kifejezhetők:

$$[CO] = [CO]_m + L[CO_2] + M[H_2O]$$

$$[CO]_d = [CO]_{md} + L[CO_2]_d + M\left(\frac{h_d}{1+h_d}\right)$$

$$[NO] = [NO]_m\left(1 + L'[CO_2] + M'[H_2O]\right)$$

$$\eta[NO_2] = \left([NO_x]_{cm} - [NO]_m\right)\left(1 + L'[CO_2] + M'[H_2O]\right)$$

3.4 A mintában lévő víztartalom meghatározására szolgáló egyenlet

A mintában lévő vízkoncentráció

$$[H_2O] = \frac{(|n/2m| + h|P_0/m|)\ ([CO_2] + [CO] + [HC])}{1 + T(P_0/m)} - (y/2x)\ [HC]$$

ahol

$$P_o/m = \frac{2Z - (n/m)}{4(1 + h-- |TZ/2|}$$

és

$$Z = \frac{2 - [CO] - (|2/x| - |y/2x|)\ [HC] + [NO_2]}{[CO_2]+[CO]+[HC]}$$

Megjegyezendő, hogy e becslés a különféle analízisek koncentrációs adatainak a függvénye és lehet, hogy ezeket víz interferencia szempontjából önmagukban is korrigálni kell. Ezekben az esetekben a nagyobb pontosság elérése céljából iteratív eljárással ismételt víz koncentráció átszámításokat kell végezni mindaddig, amíg a kapott eredmények el nem érik a szükséges stabilitást. Az alternatív numerikus megoldási módszer (4) használatával ez a nehézség elkerülhető.

4. Alternatív módszer – numerikus megoldás

4.1 A 3. pontban összegzett analitikai eljárásokat alternatívájaként a kibocsátási indexek, a levegő/üzemanyag arány, a korrigált nedves koncentrációk, stb. könnyen megkaphatók, ha minden mérési sorozatra az (1)–(10) egyenleteket digitális számítógépen, numerikus módszerrel oldják meg.

4.3 Az interferencia korrekciók és/vagy a száraz mintás mérések figyelembevételére az (1)–(10) egyenletek rendszerében a koncentráció mérések tényleges eredményeit az (5A), (6A), stb. alternatív egyenletek közül a konkrét mérőrendszerre alkalmazandó egyenletekkel váltják fel.
4.3 Széles körben elterjedtek az egyszerű kétdimenziós tömb egyenletmegoldó gépi programok és azok kényelmesen és rugalmasan alkalmazhatók ilyen célra, lehetővé téve bármely minta számítási módszer, interferencia és más korrekció bevitelét és azonosítását.

5. FÜGGELÉK „F” MELLÉKLETE
KIEGÉSZÍTŐ ADATOKRA VONATKOZÓ KÖVETELMÉNYEK

A minta összetevőinek mért koncentrációján kívül, az 5. Függelék 3.2 pontjában megfogalmazott követelményeknek megfelelően, a következő adatokat szintén biztosítani kell:

a) Hőmérséklet a bemeneten: a hajtómű légfelvevő torok síkjától az átmérővel azonos távolságon belül lévő pontban ±0,5 °C-os pontossággal mért teljes hőmérséklet;

b) Nedvesség a bemeneten (kg víz/kg száraz levegő): A hajtómű légfelvevő torok sík előtt 15 m távolságon belül elhelyezkedő pontból ±5 százalékos leolvasási pontossággal mért nedvesség tartalom;

c) Légköri nyomás: A hajtómű vizsgálati helytől 1 km távolságon belül mért és szükség esetén ±100 Pascal pontossággal a próbapad magasságára korrigált érték;

d) Üzemanyag tömeg áramlás: ±2 százalék pontosságú, közvetlen mérés;

e) Üzemanyag H/C arány: n/m-ként kifejezett érték, amelyben C_mH_n a vizsgálatban használt üzemanyag és a hajtómű üzemanyag típusának analízisére vonatkoztatott ekvivalens szénhidrogén megfelelője;

f) Hajtómű paraméterek:

   1) Tolóerő: a minősítő vizsgálatok során alkalmazott felszálló teljesítménnyel ±1 százalék, minimum tolóerőnél ±5 százalék pontosságú és ezen pontok között lineárisan változó közvetlen mérés;

   2) Fordulatszám: legalább ±0,5 százalék pontosságú közvetlen mérés;

   3) Gázgenerátor levegő-áramlás: a hajtóműteljesítmény kalibrációra vonatkoztatott ±2 százalék pontossággal meghatározott érték.

Az a), b), d) és f) pontokban felsorolt paramétereket a hajtómű minden kibocsátás vizsgálati beállítására meg kell határozni, a c) pontban említett paramétert pedig a vizsgálati időtartamot is magába foglaló legalább egy órás időközönként.

6. FÜGGELÉK
GÁZNEMŰ ANYAG ÉS FÜST KIBOCSÁTÁSI SZINTEK BETARTÁSÁRA VONATKOZÓ ELJÁRÁS

1. Bevezető rész

Jelen Annex II. kötet, III. részének 2.2, 2.3, 3.2 és 3.3 pontjaiban megadott normatív szintek betartásához a következő általános elveket kell követni:

a) A gyártónak megengedett, hogy minősítő vizsgálat céljára tetszőleges számú hajtóművet válasszon ki, sőt, ha kívánja, e célból csak egy hajtóművet mutasson be;

b) A bizonyítványt kiadó hatóságnak a minősítő vizsgálat alatt kapott minden eredményt figyelembe kell vennie;

c) Legalább 3 hajtómű vizsgálatát kell végezni, ha pedig csak 1 hajtóművet nyújtanak be minősítésre, akkor azzal legalább 3-szor kell vizsgálatot végezni;

d) Ha az adott hajtóművet többször vették vizsgálat alá, akkor a vizsgálat átlagértékeként e hajtómű aritmetikai átlagértékeit kell tekinteni. Ily módon, ha a vizsgálat eredménye (X), akkor az az egyes hajtómű vizsgálatok során kapott eredmények (X_i) középértéke;

e) A gyártó a jelen Annex II. kötet, III. Részének, 2.4, vagy 3.4 pontja – amelyik megfelelő – szerint meghatározott információt köteles a bizonyítványt kiadó hatóságnak átadni;

f) A vizsgálatra átadott hajtóműveknek a minősítendő hajtóműtípusra jellemző kibocsátási tulajdonságokkal kell rendelkezniük. Ugyanakkor legalább 1 hajtóművet, lényegében a sorozatban gyártott hajtóműtípusnak megfelelően kell kialakítani és teljes egészében rendelkeznie kell a sorozatban gyártott típus üzemeltetési és teljesítményjellemzőivel. E hajtóművek közül az egyiket "referencia szabvány hajtómű"-ként kell kijelölni. Minden egyéb vizsgált hajtóműnek e referencia szabványhajtóműre történő korrigálásának módszerét a nemzeti minősítő hatóság részéről jóvá kell hagyni. A vizsgálati eredmények környezeti hatások miatti korrekcióját a 3. Függelék 7. pontjaiban, illetve az 5. Függelék 7. pontjában meghatározottak szerint kell végezni, amelyik alkalmazandó.

2. Teljesítési eljárás

A bizonyítványt kiadó hatóság akkor adja ki az egyezést hitelesítő bizonyítványt, ha mindegyik kipróbált hajtómű mért és a (a referencia hajtóműhöz és a referencia környezeti feltételekre) korrigált értékeinek együttes átlagát - az alábbi táblázatban a kipróbált hajtóművek számához (i) tartozó együttható alkalmazásával- jelemző szintre alakítva, a jellemző szint nem haladja meg a normatív határszintet.

Megjegyzés. – A füst-szám, vagy a gáznemű kibocsátási anyagok jellemző szintje = a vizsgált összes hajtóműre vonatkozó mért és a referencia szabvány hajtóműre és a referencia környezeti feltételekre korrigált értékek középértéke, osztva a vizsgált hajtóművek számának megfelelő tényezővel, amint azt az alábbi táblázat mutatja.

Vizsgált hajtóművek száma (i)	CO	HC	NO_x	SN
1	0,8147	0,6493	0,8627	0,7769
2	0,8777	0,7685	0,9094	0,8527
3	0,9246	0,8572	0,9441	0,9091
4	0,9347	0,8764	0,9516	0,9213
5	0,9416	0,8894	0,9567	0,9296
6	0,9467	0,8990	0,9605	0,9358
7	0,9506	0,9065	0,9634	0,9405
8	0,9538	0,9126	0,9658	0,9444
9	0,9565	0,9176	0,9677	09476
10	0,9587	0,9218	0,9694	0,9502
több, mint 10	$1 - \frac{0{,}130\ 59}{\sqrt{i}}$	$1 - \frac{0{,}247\ 24}{\sqrt{i}}$	$1 - \frac{0{,}096\ 78}{\sqrt{i}}$	$1 - \frac{0{,}157\ 36}{\sqrt{i}}$

3. Eljárás sikertelenség esetén

Megjegyzés. – Ha a minősítő vizsgálat nem sikerült az nem feltétlenül jelenti azt, hogy az adott hajtóműtípus a követelményeknek nem felel meg, hanem inkább azt jelenti, hogy a bizonyítványt kiadó hatóságnak benyújtott teljesítési szint megbízhatósága nem elég meggyőző, például 90 százaléknál alacsonyabb. Következésképp a gyártónak meg kell engedni, hogy további bizonyítékokat terjesszen be a hajtóműtípus megfelelőségéről.

3.1 Ha a hajtóműtípus sikertelennek mutatkozik a minősítő vizsgálatokon, akkor a bizonyítványt kiadó hatóság engedélyezni köteles, hogy a gyártó – amennyiben igényli – további vizsgálatok folytatását a minősítendő hajtóművel. Ha az össz vizsgálat eredménye még mindíg azt mutatja, hogy az adott hajtóműtípus nem felel meg a minősítő követelményeknek, úgy a gyártónak engedni kell, hogy tetszőleges mennyiségű hajtóművel további vizsgálatokat végezhessen. Ezután a vizsgálatok összesítő adatait a korábban kapott adatokkal együtt kell figyelembe venni.

3.2 Ha az eredmények továbbra is sikertelenek maradnak, akkor a gyártónak meg kell engedni, hogy egy, vagy több hajtóművet, módosítás céljából kiválasszon. A kiválasztott hajtómű, vagy hajtóművek még módosítást megelőző vizsgálati eredményeit meg kell vizsgálni és további vizsgálatokat kell végrehajtani úgy, hogy legalább, 3 vizsgálati eredmény álljon rendelkezésre. E vizsgálatok középértékét mindegyik hajtóműre meg kell határozni és "módosítatlan középérték"-ként kell leírni.

3.3 A hajtmű, vagy a hajtóművek ezt követően módosítható(k), majd legalább 3 vizsgálatot kell elvégezni a módosított hajtóművön (hajtóműveken). E vizsgálatok mindegyikének középértékét mindegyik esetre „módosított középérték”-ként kell leírni. A részarányos javulás meghatározása érdekében a módosított középértéket a módosítás nélküli középértékkel össze kell vetni. E részarányos értéket a megelőző minősítő vizsgálatok eredményeihez alkalmazva kell megállapítani, hogy a teljesítést sikerült-e megvalósítani. Bármely módosított hajtómű vizsgálatának megkezdése előtt meg kell állapítani, hogy a módosítás(ok) a megfelelő légialkalmassági előírásoknak eleget tesznek-e.

3.4 Ezt az eljárást addig kell ismételni, amíg a teljesítést be nem mutatják, vagy a hajtóműtípus kérvényét vissza nem vonják.

ANNEX 17.
Biztonság

A nemzetközi polgári repülés védelme a jogellenes beavatkozás cselekményei ellen

8. kiadás – 2002. április
11. módosítással

Ez a kiadás magában foglal a Tanács által 2005. december 1. előtt elfogadott minden módosítást és 2006. július 1.-től a 17. Annex minden korábbi kiadásának helyébe lép.

A szabványok és az ajánlott gyakorlatok alkalmazására vonatkozó tájékoztatás az Előszóban olvasható.

Nemzetközi Polgári Repülési Szervezet ICAO

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.

MÓDOSÍTÁSOK ÉS JAVÍTÁSOK JEGYZÉKE

MÓDOSÍTÁSOK			
Sorszám	Alkalmazás dátuma	Beépítés dátuma	Beépítette
1-11	E kiadásba belefoglalva		

TARTALOMJEGYZÉK

ELŐSZÓ

Történeti háttér

Az ezen Annexben szereplő anyagot a Közgyűlés két alábbi határozata alapján a Tanács dolgozta ki:

A17-10 határozat: a Közgyűlés által elfogadott védelmi előírások és gyakorlatok, továbbá az ICAO ilyen előírások és gyakorlatok terén végzett további tevékenységének államok részéről történő bevezetése

………

A KÖZGYŰLÉS:

………
(3) FELKÉRI a Tanácsot, hogy a Szervezet egyéb testületeinek segítségével e határozat függelékeinek anyagát dolgozza ki és a meglévő, vagy új Annexekbe, vagy a Szervezet egyéb szabályozó dokumentumaiba, vagy útmutató anyagaiba –amelyik megfelelő- szabványként, ajánlott gyakorlatként és eljárásként foglalja be.

A18-10 határozat: Kiegészítő technikai intézkedések a nemzetközi polgári légi-szállítás biztonságának védelmére

……….

A KÖZGYŰLÉS:

(1) FELKÉRI a Tanácsot, hogy a légi-szállítás védelmének műszaki vonatkozásai tekintetében gondoskodjon arról, hogy:

(a) a légi-szállítás biztonságára aktuálisan fennálló fenyegetettség mértéke szerinti elsőbbséggel, a légi-szállítás védelmének kérdését a Főtitkár továbbra is megfelelő figyelemben részesítse;

………..

A Légi-navigációs bizottság, a Légi-szállítási bizottság és a Jogellenes cselekmények bizottságának munkáját követően, továbbá azon szerződő államoktól és az érdekelt nemzetközi szervezetektől kapott vélemények eredményeképp – amelyek részére a tervezett anyagot megküldték-, a Tanács a nemzetközi polgári repülésről szóló egyezmény 37. Cikkelye alapján 1974. március 22-én elfogadta a védelem szabványait és ajánlott gyakorlatait, amelyeket "szabványok és ajánlott gyakorlatok – Védelem – A Nemzetközi

Polgári Repülés Védelme a Jogellenes Cselekményekkel szemben" címmel az egyezmény 17. Annexeként jelölt ki.

Az "A" táblázatban található a soron következő módosítások felsorolása, a módosítások eredete az érintett főbb témakörökkel, és azokkal a dátumokkal együtt, amikor az Annex-et és módosításait a Tanács elfogadta, amikor azok hatályba léptek, és amikor alkalmazandóvá váltak.

Bevezető rész

Annak érdekében, hogy az államok részére eme Annexben megfogalmazott védelmi intézkedések bevezetéséhez átfogó dokumentum álljon rendelkezésre, eme Annexhez tartozó melléklet a témával összefüggő kivonatot tartalmaz egyéb Annexekből, a veszélyes anyagok biztonságos légi-szállításának technikai kézikönyvéből (Doc 9284) és a PANS-ATM-ból, továbbá a PANS-OPS-ból az államok részéről a polgári repülés ellen irányuló jogellenes cselekmények megelőzésére, illetve ilyen események megtörténtekor teendő lépésekről.

Útmutató anyag

A védelmi kézikönyv a polgári repülés jogellenes cselekményekkel szembeni védelméről (Doc 8973 Bizalmas) részletes eljárásokat és útmutató anyagot közöl a repülés védelmi vonatkozásairól, amelyek célja az államok segítése a nemzetközi polgári repülési Egyezmény Annexei által előírt vonatkozó saját nemzeti polgári repülésvédelmi programok bevezetésében.

A Szerződő Államok Ténykedése

Alkalmazás: az e dokumentumban megfogalmazott szabvány és ajánlott gyakorlati rendelkezéseket a szerződő államoknak alkalmazni kell.

Az eltérések bejelentése. Felhívjuk a Szerződő Állam figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségére, mely értelmében a Szerződő Államtól megkövetelt, hogy a szervezet számára bejelentsen minden olyan eltérést, amely nemzeti előírásai és gyakorlatai, valamint a jelen Annex-ben és annak bármely módosításában található nemzetközi szabványok között fennáll. Felkérjük továbbá a Szerződő Államot, hogy folyamatosan tájékoztassa a szervezetet az esetleg később keletkező eltérésekről, illetve a korábban bejelentett eltérés visszavonásáról is. A jelen Annex minden egyes módosításának elfogadása után azonnal külön felkérést küldenek a Szerződő Államnak az eltérés bejelentése céljából.

Felkérjük a Szerződő Államot arra is, hogy ezt a bejelentést a jelen Annex-ben és annak bármely módosításában található ajánlott gyakorlatoktól történő eltérésekre is terjessze ki, ha az ilyen eltérések bejelentése a repülés biztonságra nézve fontos.

Felhívjuk az állam figyelmét a 15. Annex rendelkezéseire is, amely az államnak az Egyezmény 38. cikkelyéből fakadó kötelezettségén kívül előírja, hogy a nemzeti előírások és gyakorlatok, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket a légiforgalmi tájékoztató szolgálat útján közzé kell tenni.

A tájékoztatás közzététele. A jelen Annexben meghatározott szabványoknak és ajánlott gyakorlatoknak megfelelően biztosított létesítmények, szolgálatok és eljárások légi-jármű üzemeltetést befolyásoló létrehozására és megszüntetésére, vagy ezek megváltoztatására vonatkozó információt a 15. Annex előírásainak megfelelően kell közzétenni és érvénybe léptetni.

Az Annex szövegének használata a nemzeti szabályozásban. 1948 április 13-án a Tanács határozatot fogadott el, melyben a szerződő állam figyelmét felhívta, hogy amennyire csak lehetséges, kívánatos, hogy nemzeti szabályozásaiban a szabályozó jellegű ICAO szabványok pontos nyelvezetét használja és ezen szabványoktól való eltéréseket jelezze, ideértve bármiféle kiegészítő nemzeti szabályozást, amely lényeges a repülés biztonsága, vagy rendszeressége tekintetében. Ahol arra lehetőség nyílt, a jelen Annex rendelkezéseit oly módon fogalmazták meg, hogy azok nagyobb szövegmódosítás nélkül a nemzeti jogszabályokba beilleszthetők legyenek.

Általános tájékoztató

Egy Annex az alábbi alkotóelemekből áll, habár nem minden elem található meg szükségképpen minden Annex-ben. Az egyes alkotóelemek az alábbiakban feltüntetett jogállással rendelkeznek:

1. - *A szoros értelemben vett Annex-et alkotó anyag*:

a) *Szabványok és ajánlott gyakorlatok*, amelyeket a Tanács az Egyezmény rendelkezései értelmében elfogadott. Ezek meghatározása a következő:

Szabvány: fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága és rendszeressége szempontjából szükségesnek ismerték el és, amelyhez a Szerződő Államok az Egyezmény szerint alkalmazkodni fognak, illetőleg amelyek teljesítésének lehetetlensége esetén a Tanács értesítése a 38. cikkely értelmében kötelező

Ajánlott gyakorlat: fizikai jellemzőre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága, rendszeressége és hatékony lebonyolítása szempontjából kívánatosnak ismerték el és, amelyhez alkalmazkodni a Szerződő Államok az Egyezmény értelmében törekedni fognak.

b) *Függelékek:* ezek kényelmi szempontból külön csoportosított anyagot tartalmaznak, de a Tanács által elfogadott szabványok és ajánlott gyakorlatok részét képezik.

c) *Meghatározások:* A szabványokban és ajánlott gyakorlatokban használt olyan kifejezések meghatározásai, amelyek nem maguktól értetődők abban az értelemben, hogy elfogadott szótári jelentéssel nem rendelkeznek. A meghatározás független jogállással nem rendelkezik, de minden olyan szabványnak és ajánlott gyakorlatnak, amelyben a kifejezést használják, lényeges része, mivel a kifejezés értelmének megváltoztatása hatással volna az előírásra is.

2. - *A Tanács által a szabványokkal és ajánlott gyakorlatokkal együttes közzétételre jóváhagyott anyag:*

a) *Előszó:* a Tanács tevékenységén alapuló történeti áttekintést és magyarázó jellegű anyagot tartalmaz, valamint a szabványok és ajánlott gyakorlatok alkalmazására vonatkozóan az államok részére magyarázattal szolgál az Egyezményből és az elfogadási határozatból eredő kötelezettségeikhez.

b) *Bevezető rész:* magyarázó jellegű anyagot tartalmaz, amely azért szerepel az Annex részeinek, fejezeteinek, vagy szakaszainak elején, hogy elősegítse a szöveg alkalmazásának megértését.

c) *Megjegyzések:* ahol szükséges, a szövegbe beépített anyag, amely az érintett szabvánnyal és ajánlott gyakorlattal kapcsolatban tárgyi felvilágosítással, vagy hivatkozással szolgál, de a szabvány és az ajánlott gyakorlat részét nem képezi.

d) *Mellékletek:* a szabványokat és az ajánlott gyakorlatokat kiegészítő anyag, vagy ezek alkalmazásához útmutatóul szolgáló anyag.

Ezt az Annex-et hat nyelven, angolul, arabul, kínaiul, franciául, spanyolul és oroszul fogadták el. Minden egyes Szerződő Államot felkérnek arra, hogy a hazai bevezetés céljára, illetve az Egyezményben meghatározott egyéb célokra az említett hat szöveg közül egyet válasszon ki és közvetlenül, vagy saját nyelvre lefordítva használja azt, és az ICAO-t erről tájékoztassa.

Annak érdekében, hogy minden alkotórész jogállása első pillantásra szembetűnjön, az alábbi gyakorlatot alkalmazzák: a *szabványok*at vékony álló betűkkel nyomtatták, az *ajánlott gyakorlat*okat vékony dőlt betűkkel nyomtatták. Az ajánlás esetében a jogállást vastag álló betűvel szedett **Ajánlás** szóval jelzik. A *megjegyzés*eket vékony dőlt betűvel szedték, jogállásukat a dőlt betűvel szedett *Megjegyzés* címszó jelzi.

A jelen dokumentum bármely számmal és/vagy címmel azonosított részére történő utalás magában foglalja az adott rész alpontjait is.

"A" Táblázat - a 17. Annex módosításai

Módosítás	*Forrás(ok)*	*Tárgy*	*Elfogadva* *Hatályba lépés* *Alkalmazandó*
1. kiadás	A Tanács ténykedése a Közgyűlés A17-10 és A18-10 határozata alapján	---	1974. márc. 22 1974. aug. 22. 1975. feb.27
1.	A Tanács ténykedése a Közgyűlés A21-23 határozata alapján	A 3.1.2 és az 5.1.2 paragrafusok szabvánnyá változtatása; a jogellenes cselekmény alatt álló légi-járművel kapcsolatos információ összeállítása és szétosztása	1976. márc.31 1976. júl. 31 1976. dec. 30
2.	Néhány állam javaslata és a Tanács ténykedése a Közgyűlés A22-17 határozata értelmében	A 9. Annex – Alakiságok egyszerűsítése (7. Kiadás) 9. Fejezetében szereplő előírások áttétele a 17. Annexbe; az 5. Fejezetben új rendelkezés a továbbutazó és az átszálló utasok és utastérbeli poggyászaik ellenőrzése érdekében szükséges intézkedésekről; az 5.2.4-es paragrafus (17. Annex 5. Fejezet) megjegyzésének kibővítése a repülőtér kijelölt területeire engedély nélküli behatolás megakadályozására vonatkozó intézkedésekkel kapcsolatban	1977.dec. 15 1978.ápr.15 1978.aug. 10
3.	Néhány állam és a Titkárság javaslata, valamint a Tanács ténykedése a Közgyűlés A22-17 határozata értelmében	A fenyegetettség mértékének az állam általi elbírálásáról, a kiképzési tervek kidolgozásáról, a biztonsági ellenőrzésen átment utasok elkülönítéséről, a repülőgépek ellenőrzése rejtett fegyverek, vagy egyéb veszélyes eszközök felkutatásáról szóló előírások kiegészültek; intézkedéseket fogadtak el a jogellenesen eltérített repülőgép utasainak és személyzetének biztonságára vonatkozóan. Számos előírást kibővítettek és az állásidő alatt feltehetően támadásnak kitett légi-jármű különleges őrzésére és elszigetelésére vonatkozó előírás jogállását szabványra módosították.	1978. dec. 13 1979. ápr. 13 1979. nov. 29
4. (2. kiadás)	Néhány állam és egy nemzetközi szervezet javaslata, valamint a Tanács ténykedése a Közgyűlés A22-17 határozata	Az őrizetes személy szállításáról egy új előírást fogadtak el és két másik előírást módosítottak, hogy vonatkozzanak a bérelt, kölcsönzött és a csere gépekre is. A jogellenes cselekményeknek kitett légi-jármű utasainak és személyzetének biztonságával foglalkozó előírás jogállását szabványra változtatták; a szabotázs megelőzését	1981. jún. 15 1981. okt. 15 1981. nov. 26

Módosítás	*Forrás(ok)*	*Tárgy*	*Elfogadva Hatályba lépés Alkalmazandó*
	értelmében	tárgyaló előírás hatályát kibővítették és az 1. Fejezet – Alkalmazandóság, megszűnt (törölték)	
5.	A Jogellenes cselekmények albizottságának javaslatai és a Tanács ténykedése a Közgyűlés A22-17 határozata értelmében	A Megjegyzés – 1. Fejezethez tartózó megjegyzést törölték. A törvényt képviselő tiszt, vagy egyéb felhatalmazott személy által a légi-jármű fedélzetén történő fegyverviseléshez szükséges ténykedéseket szabályozó előírást módosították. Az Annexet a fegyverszállítás minden egyéb esetére vonatkozó előírással egészítették ki, valamint az őrizetlen légi-jármű biztonságával foglalkozó előírást egyértelműbbé tették.	1984. nov. 30 1985. ápr. 14 1985. nov. 21
6. (3. kiadás)	A Jogellenes cselekmények albizottságának egy eseti, repülés védelmi szakértő csoport segítségével tett ajánlásai és a Tanács ténykedése a Közgyűlés A22-17 határozata értelmében	A Tanács utasítására e módosítást sürgősséggel készítette el a Jogellenes cselekmények albizottsága egy eseti, a Tanács utasítására létrehozott repülés védelmi szakértő csoport segítségével. Következményként az Annexbe 11 új előírást vezettek be és 19 előírást szabvány szintre emeltek. Az 5.1.4-re vonatkozó különleges alkalmazási időpontok a szomszédos oszlopban láthatók. A Tanács javasolta, hogy az 5.1.4 tartalmát bevezetni képes államok azt az alkalmazási időpontot megelőzően azon nyomban tegyék meg, amint a megvalósítás kifizetődő és végrehajtható.	1985. dec.19 1986. márc. 19 1986. máj. 19 1987. okt. 19 1987. dec. 19
7. (4. kiadás)	A Jogellenes cselekmények albizottságának repülésvédelmi panellel (AVSEC) közösen tett ajánlásai és a Tanács ténykedése a Közgyűlés A26-7 határozata értelmében	Ez a módosítás a következőket tartalmazta: a) az Annex fejezeteinek átrendezése annak érdekében, hogy a célkitűzések, a kötelezettségek és a szervezéssel kapcsolatban szükséges ténykedések, megelőző biztonsági intézkedések és a válasz lépések irányítása ésszerű sorrendben következzenek; b) új, lényeges rendelkezések bevezetése, hogy a 17. Annex legutolsó, 1985-ben végrehajtott módosítása óta bekövetkezett fejlődést az Annex tükrözze és	1989. jún. 22 1989. okt. 30 1989. nov. 16

Módosítás	*Forrás(ok)*	*Tárgy*	*Elfogadva Hatályba lépés Alkalmazandó*
		segítséget nyújtson az államoknak szembeszállni a polgári repüléssel szembeni súlyos jogellenes cselekményekből származó új helyzetekkel; és c) a fenti a) és b) pontoknak megfelelően a meglévő rendelkezések módosítása, illetve finomítása, illetve, hogy ezek tükrözzék az ilyen intézkedések bevezetésével szerzett tapasztalatokat.	
8. (5. kiadás)	A Jogellenes cselekmények albizottságának repülésvédelmi panellel (AVSEC) segítségével tett ajánlásai, valamint a Tanács ténykedése a Közgyűlés A27-7 határozata értelmében	Ez a módosítás új, fontos módosításokat foglal magába a feladott poggyászok átfogó biztonsági ellenőrzéséről, az áru, a futáranyag és az expressz-, valamint a posta küldemények biztonsági ellenőrzéséről; változásokat hoz a biztonsági programokkal, a nemzetközi légi-járművek repülés előtti ellenőrzésével összefüggő eljárásokban és intézkedéseket tartalmaz azzal összefüggésben, hogy a repülőterek kialakítási tervébe biztonsági szempontokat foglaljanak abból a célból, hogy az államokat az ilyen fajta intézkedések megfelelő és egységes bevezetésében segítsék.	1992. szep. 11 1992. dec. 16 1993. ápr. 1
9. (6. kiadás)	A Jogellenes cselekmények albizottságának repülésvédelmi panellel (AVSEC) közösen tett ajánlásai, valamint a Tanács ténykedése a Közgyűlés A31-4 határozata értelmében	E módosítás a következőkkel kapcsolatban tartalmaz új rendelkezéseket: a védelmi ellenőrzés bevezetésében alkalmazott személyek alkalmazásba vétele előtti ellenőrzése és képességeik; a poggyász megbízhatósága és engedélyezése; a catering ellátmánnyal és az üzemeltető készleteivel és ellátmányaival kapcsolatban alkalmazandó intézkedések; a védelmi program hatékonyságának próbája; valamint a hatalomba kerített légi-jármű ismert, vagy feltételezett célállomása szerinti állam értesítésének szükségessége.	1996. nov. 12 1997. márc. 31 1997. aug. 1
10 (7. kiadás)	A repülésvédelmi panel (AVSEC) ajánlásai, valamint a Tanács ténykedése a Közgyűlés A33-1 határozata	E módosítás magában foglal különféle meghatározásokat és különféle rendelkezéseket a következőkkel kapcsolatban: jelen Annex alkalmazhatósága a belföldi üzemelésre, a fenyegetettségi információval kapcsolatos nemzetközi együttműködés, illetékes hatóság, nemzeti	2001. dec. 7 2002. ápr. 15 2002. júl. 1

Módosítás	*Forrás(ok)*	*Tárgy*	*Elfogadva Hatályba lépés Alkalmazandó*
	értelmében	repülés védelmi bizottság, nemzeti minőség biztosítás, közlekedés ellenőrzés, utasok és kabin-, illetve feladott poggyászaik, fedélzeti repülésvédelmi személyzet és a pilótakabin védelme, üzemelés osztott járatszámmal (code-share) / együttműködési megállapodások, emberi tényező és a jogellenes cselekményre tett válasz lépések irányítása. Számos rendelkezés jogállását szabvány szintre emelték.	
11 (8. kiadás)	A Jogellenes cselekmények albizottságának repülésvédelmi panellel (AVSEC) közösen tett ajánlásai, valamint a Tanács ténykedése a Közgyűlés A35-9 határozata értelmében	E módosítás rendelkezéseket tartalmaz a meglévő szabványok és ajánlott gyakorlatok (SARPs) szövegezésének további egyértelműsítésére, hogy a szerződő államok részére elősegítse mind az egyöntetű értelmezésüket mind a könnyű auditálhatóságukat az ICAO általános védelmi audit programja (USAP) keretében. A módosítás a következőket célozta meg: a 17. Annex alkalmazása; a nemzeti polgári repülésvédelmi ellenőrző programok rendelkezéseinek megerősítése; fedélzeti védelmi tisztek (IFSO); általános repülés és légi munkavégzés; az utas és poggyászainak egylépcsős védelmi módszere; kockázat felmérő módszer; a teljes cargo üzem védelme; és meghatározások.	2005.nov.30 2006.ápr.10 2006.júl.1

NEMZETKÖZI SZABVÁNYOK
ÉS AJÁNLOTT ELJÁRÁSOK

1. FEJEZET - MEGHATÁROZÁSOK

Jogellenes cselekmények (Acts of unlawful interference). Ezek a polgári repülés és légi szállítás biztonságának veszélyeztetése céljából elkövetett, vagy megkísérelt cselekmények, úgy mint:

- a levegőben tartózkodó légijármű jogellenes hatalomba vétele
- a földön tartózkodó légijármű jogellenes hatalomba kerítése
- túsz ejtés a légijármű fedélzetén, vagy a repülőtéren
- erőszakos behatolás a légijármű fedélzetén, vagy repülőtéren, vagy légiforgalmi létesítmény területén,
- bűncselekmény végrehajtása céljából fegyver, veszélyes eszköz, vagy anyag elhelyezése a légijármű fedélzetén, vagy repülőtéren
- félrevezető információ közlése az alábbiak biztonságát veszélyeztető módon: földön, vagy levegőben tartózkodó légijármű, repülőtéren, vagy polgári repülési létesítmény területén tartózkodó utasok, légijármű személyzet, földi személyzet, vagy nagy közönség.

Légi munkavégzés (aerial work). Légijármű üzemeltetés, amely során a légijárművet speciális szolgáltató feladatra használják, mint például növényvédelem, építkezés, fényképezés, felderítő megfigyelés és őrjárat, kutatás és mentés, légi hirdetés, stb.

Légi-jármű védelmi ellenőrzés (Aircraft security check). A légi-jármű azon belső részeinek átvizsgálása, amelyekhez utas hozzáférhetett és az adott rekesz átvizsgálása gyanús tárgyak, fegyverek, robbanóanyagok, vagy egyéb veszélyes készülékek felderítése érdekében.

Légijármű védelmi átkutatás (Aircraft security search). A légijármű külsejének és belsejének alapos átvizsgálása gyanús tárgy, fegyver, robbanószer, vagy veszélyes készülék, cikk és anyag felderítése céljából.

Légiforgalmi oldal (Airside). A repülőtér mozgási területe a szomszédos terep és épületek, vagy ezek részei, amelyekre a bejutást ellenőrzik.

Háttér ellenőrzés (Background check). Valamely személy azonosságának és múltjának ellenőrzése, beleértve –ha jogilag megengedhető- a rovott múltat is, azon felmérés részeként, hogy az illető személy esetében elfogadható-e, hogy a védelmileg korlátozott területekre kíséret nélkül bejuthasson, illetve alkalmazható-e védelmi ellenőrzési feladatra.

Rakomány (Cargo). A légi-járművön szállított bármiféle cikk a posta, a tartalék készletek és a kísérettel rendelkező-, vagy a tévesen kezelt poggyászok kivételével.

Igazolvány (Certification). A megfelelő repülés védelmi hatóság által, vagy felhatalmazásával készített hivatalos értékelés és igazolás miszerint az illető személy a szükséges hozzáértés birtokában van, hogy a megfelelő hatóság által meghatározott szintnek megfelelő kijelölt feladatokat ellásson.

Kereskedelmi légi-szállító üzem (Commercial air transport operation). Bérért, vagy ellenszolgáltatásért végzett utas, áru, vagy posta szállítására kiterjedő légijármű üzemeltetés.

Vállalati célú repülés (Corporate aviation). A vállalat repülőgépének a vállalat üzletvitelét elősegítő, nem kereskedelmi jellegű üzemeltetése, vagy használata utasok, vagy javak szállításához amely repülőgépet a repülőgép vezetésére alkalmazott hivatásos pilóta vezeti. (Megjegyzés: a vállalati célú repülés az általános célú repülés egyik ága).

Erőszakos utas (Disruptiv passenger). Utas, aki nem veszi figyelembe a repülőtéren, vagy a repülőgépen betartandó szabályokat, vagy nem engedelmeskedik a repülőtéri személyzet, vagy a légijármű személyzet utasításainak és ezáltal felborítja a közrendet és fegyelmet a repülőtéren, illetve a repülőgép fedélzetén.

Általános célú repülés (General aviation). A kereskedelmi légi-szállító üzemeléstől és a légi munkavégzéstől eltérő egyéb repülő üzem.

Emberi tényező elvek (Human factors principles). Kivitelezésre, jogosításra, kiképzésre, üzemeltetésre és karbantartásra alkalmazott elvek, amelyek az emberi teljesítő képesség megfelelő figyelembe vételével biztonságos összeilleszkedést igyekszenek megvalósítani az ember és más rendszer elemek között.

Emberi teljesítőképesség (Human performance). Az ember képességei és korlátjai, amelyek a légiforgalmi tevékenységek biztonságára, védelmére és hatékonyságára hatással vannak.

Szabályozott ügynök (Regualted agent). Valamely üzemeltetővel üzleti tevékenységet folytató és az áru, vagy a posta küldemények tekintetében a megfelelő hatóság által elfogadott, vagy előírt védelmi vizsgálatot biztosító ügynök, árutovábbító, vagy egyéb más közösség.

Szűrés (Screening). Fegyverek, robbanószerek, vagy jogellenes cselekmény elkövetésére alkalmas egyéb veszélyes eszközök, cikkek, vagy anyagok észlelése céljából alkalmazott műszaki eszköz, vagy egyéb módszer.

Megjegyzés. – A 18. Annex és a hozzá kapcsolódó Veszélyes anyagok Biztonságos szállításának Technológiai Kézikönyve (Doc 9284) bizonyos veszélyes anyagokat és cikkeket a veszélyes anyagok közé sorolnak be és amelyeket az említett kézikönyv szabályaival egyezésben kötelező szállítani. Továbbá, a Polgári repülés jogellenes cselekményekkel szembeni védelmezésének Védelmi Kézikönyve (Doc 8973 - Bizalmas) felsorolást tartalmaz azokról tiltott cikkekről, amelyek légijármű kabinban soha sem szállíthatók.

Védelem (Security). A nemzetközi polgári repülés jogellenes cselekményekkel szembeni védelme. E célkitűzés az intézkedések, az emberi és anyagi erőforrások kombinációja révén valósul meg.

Védelmi felmérés (Security audit). *A nemzeti repülés védelmi terv bevezetésének minden vonatkozására kiterjedő, részletekbe menő vizsgálat az egyezés megvalósulásáról.*

Védelmi ellenőrzés (Security control). Módszer, amellyel a jogellenes cselekedet elkövetésére valószínűleg alkalmas fegyverek, robbanóanyagok, vagy egyéb veszélyes készülékek, cikkek, vagy anyagok alkalmazása megelőzhető.

Védelmi vizsgálat (Security inspection). A nemzeti repülés védelmi terv vonatkozó követelményeinek légitársaság, repülőtér, vagy a védelemben érintett egyéb közösség által történt bevezetésének vizsgálata.

Védelmileg korlátozott terület (Security restricted area). A repülőtér légiforgalmi oldalon lévő és elsődlegesen veszélyes területként kijelölt területei, amelyek esetében a behatolás ellenőrzése mellett egyéb védelmi ellenőrzést is alkalmaznak. Rendszerint ezek -többek között- a következő területeket foglalják magukba: minden kereskedelmi repülési utas indító terület a szűrő pont és a légi-jármű között, a rakodó területek, a csomag összekészítő területek, beleértve azokat ahol a repülőgépet forgalomba állítják és szűrt poggyászok és áru van jelen, áru raktárakat, posta központok, a légiforgalmi oldali catering és a légi-jármű tisztításra szolgáló területek.

Védelmi értékelés (Security survey). A védelem igényeinek értékelése, beleértve azokat a hiányosságokat is, amelyek jogellenes cselekmények kivitelezésében kiaknázhatók, és javító intézkedések ajánlása.

Védelmi próba (Security test). Egy repülésvédelmi intézkedés nyílt, vagy burkolt kipróbálása, jogellenes cselekmény elkövetésének kísérletét utánozva.

Azonosítatlan poggyász (Unindetified baggage). A repülőtéren, poggyászazonosító címkével, vagy anélkül lévő poggyász, amelyet nem vett fel utas, illetve amely utashoz nem köthető.

2. FEJEZET – ÁLTALÁNOS ELVEK

2.1 Célkitűzések

2.1.1 A nemzetközi polgári repülés terén a jogellenes cselekedetekkel szembeni védekezéshez kapcsolódó minden ügyben, a szerződő állam elsődleges célkitűzésként kezelje az utas, a légi-jármű személyzet és a földi személyek, továbbá a nagyközönség védelmét.

2.1.2 A polgári repülés jogellenes cselekedetekkel szembeni védelmezése érdekében a szerződő állam, figyelembe véve a járatok biztonságát, menetrendszerűségét és hatékonyságát, köteles szervezetet létrehozni és szabályokat, módszereket és eljárásokat kidolgozni és bevezetni.

2.1.3 A polgári repülés jogellenes cselekedetekkel szembeni védelmezése érdekében a szerződő állam gondoskodjon róla, hogy az ilyen szervezet és az ilyen és szabályok, módszerek és eljárások:

a) biztosítsa az utas, a légijármű személyzet, a földi személyzet és a nagyközönség védelmét a polgári repülés jogellenes cselekményekkel szembeni védelmezéséhez kapcsolódó minden vonatkozása terén.

b) Gyors cselekvésre legyen képes kielégítve minden fokozott fenyegetettség igényét.

2.1.4 **Ajánlás.** – *A szerződő állam gondoskodjon a repülésvédelmi információk kellő mértékű védeleméről.*

1. Megjegyzés. – A következő fejezetekben tartalmazott szabványok és ajánlott gyakorlatok alkalmazásával megvalósítani kívánt nemzetközi polgári repülésvédelmi célkitűzésekre vonatkozó útmutató anyagot a Polgári Repülés Jogellenes Cselekményekkel szembeni Védelmezésének Védelmi Kézikönyve (Doc 8973 - Bizalmas) tartalmazza.

2. Megjegyzés. – A polgári repülésvédelmi célkitűzések megvalósításában az állam segítésére átfogó repülésvédelmi kiképző anyagot az ICAO Repülésvédelmi Kiképző Programja tartalmaz, amely egy sorozat Repülésvédelmi kiképző csomagból (ASTP – Aviation Security Training Packages) áll.

2.2 Alkalmazás

2.2.1 A szerződő állam alkalmazza a nemzeközi polgári repülés 17. Annexé-ben foglalt szabványokat és törekedjen alkalmazni az Ajánlott Gyakorlatokat.

2.2.2 A szerződő állam gondoskodjon róla, hogy a nemzetközi polgári repülés jogellenes cselekedetekkel szembeni védelmére kialakított intézkedéseket, az illetékes nemzeti hatóságok által elvégzett védelmi kockázati felmérésre alapozva, a lehetséges mértékben alkalmazza a belföldi üzemelésre is.

2.3 A védelem és az alakiságok egyszerűsítése

Ajánlás. – A szerződő állam amikor lehetséges, mindig oly módon köteles védelmi intézkedéseket és eljárásokat kialakítani, hogy azok a legkevésbé akadályozzák, vagy késleltessék a nemzetközi polgári repülés tevékenységét, feltéve, hogy az említett intézkedések és eljárások nem szenvednek csorbát.

2.4 Nemzetközi együttműködés

2.4.1 A szerződő állam gondoskodjon róla, hogy egy másik államtól az illető állam üzemeltetőjének egy adott járatára, vagy járataira vonatkozó különleges biztonsági intézkedéseket igénylő kérését a gyakorlatilag megvalósítható mértékig teljesítsék. A kérelmező állam vegye figyelembe a másik állam alternatív intézkedéseit ha azok az általa kérttel azonos szintűek.

2.4.2 A szerződő állam köteles szükség szerint együttműködni a többi szerződő állammal a nemzeti polgári repülésvédelmi programjaik, kiképző programjaik és a minőség ellenőrző programjaik kidolgozásában és a kapcsolatos információ cseréjében.

2.4.3 A szerződő állam köteles eljárásokat kidolgozni és bevezetni, hogy a többi szerződő állammal a gyakorlatilag megoldható mértékig megossza az illető államok repülésvédelmi érdekei közé tartozó fenyegetettségi információkat.

2.4.4 Az érzékeny repülésvédelmi információ nem megfelelő hasznosításának, vagy felfedésének elkerülése érdekében a szerződő állam dolgozzon ki és biztosítson kellő védelmet és megfelelő kezelési eljárást a másik szerződő állammal megosztott érzékeny repülésvédelmi információk, illetve a másik szerződő állam védelmi érdekeit érintő érzékeny védelmi információk tekintetében.

2.4.5. **Ajánlás.** – *A szerződő állam szükség szerint és önrendelkezésével összeegyeztethető mértékben ossza meg az ICAO által végzett védelmi felmérések eredményeit és a felülvizsgálat tárgyát képező állam által tett kiigazító lépéseket, ha azt egy másik állam kéri.*

2.4.6 **Ajánlás.** – *Kétoldalú légügyi megállapodásaiba a szerződő állam foglaljon be egy repülésvédelemmel kapcsolatos záradékot, figyelembe véve az ICAO által kidolgozott minta záradékot.*

2.4.7 **Ajánlás.** – *A szerződő állam, másik szerződő állam kérésére bocsássa rendelkezésre nemzeti polgári repülésvédelmi programja megfelelő részeinek írásos változatát.*

2.4.8 **Ajánlás.** – *A szerződő állam értesítse az ICAO-t, ha a 2.4.5 alattiak értelmében információt osztott meg.*

2.5 Berendezések, kutatások és fejlesztések

2.5.1 **Ajánlás.** - *A szerződő állam ösztönözze olyan új védelmi berendezések, folyamatok és eljárások kutatását és kifejlesztését, amelyek a polgári repülésvédelmi célkitűzések megvalósítását jobban szolgálják, továbbá e tekintetben működjön együtt más szerződő államokkal.*

2.5.2. **Ajánlás.** - *A szerződő állam gondoskodjon róla, hogy az új védelmi berendezések kifejlesztése során az emberi tényezővel kapcsolatos elveket érvényesítsék.*

Megjegyzés. – Az emberi tényezőkkel kapcsolatos elveket a következő kézikönyvek tartalmazzák: Human Factors in Civil Aviation Security Operations (Doc 9683) és a Human Factors Training Manual (Doc 9683) I. Rész, 4. Fejezetében.

3. FEJEZET - SZERVEZET

3.1 A nemzeti szervezet és az illetékes hatóság

3.1.1 A polgári repülő tevékenység jogellenes cselekményekkel szembeni védelme érdekében a szerződő állam a járatok biztonságát, menetrendszerűségét és hatékonyságát figyelembe vevő előírások, gyakorlatok és eljárások révén köteles írásba öntött nemzeti polgári repülésvédelmi programot kialakítani és a gyakorlatban megvalósítani.

3.1.2 A szerződő állam igazgatási rendszerében köteles kijelölni és az ICAO részére meghatározni a nemzeti repülésvédelmi program kidolgozásáért, bevezetéséért és fenntartásáért felelős illetékes hatóságot.

3.1.3 A szerződő állam köteles folyamatosan felülvizsgálni a saját területén fennálló veszély nagyságát és köteles irányelveket és eljárásokat kialakítani és életbe léptetni, hogy az illetékes nemzeti hatóságok által elvégzett védelmi kockázati felmérésre alapozva nemzeti repülésvédelmi programjának érintett részeit a helyzethez igazítsa.

Megjegyzés. – A fenyegetettség felmérésének és a kockázat kezelésének módszereiről útmutató anyagot a Polgári Repülés Jogellenes Cselekményekkel szembeni Védelmezésének Védelmi Kézikönyve (Doc 8973 - Bizalmas) tartalmaz.

3.1.4 A szerződő állam az illetékes hatóságtól követelje meg, hogy a hivatalok, ügynökségek és egyéb állami szervezetek, repülőterek és légi-jármű üzemeltetők, valamint az állam nemzeti polgári repülésvédelmi programjának különféle szempontjaiért felelős egyéb intézményei között a feladatokat meghatározza és kiossza, továbbá közöttük az együttműködést összehangolja.

3.1.5. A szerződő állam hozzon létre nemzeti repülésvédelmi bizottságot, vagy hasonló testületet a védelmi tevékenység összehangolására a hivatalok, ügynökségek és egyéb állami szervezetek, repülőterek és légi-jármű üzemeltetők, valamint az állam nemzeti polgári repülésvédelmi programjának különféle szempontjainak bevezetéséért felelős, vagy azzal összefüggő egyéb intézményei között.

3.1.6 A szerződő állam illetékes hatóságától követelje meg, hogy az biztosítsa a nemzeti polgári repülésvédelmi terv különféle vonatkozásainak bevezetéséért felelős, vagy azokban érintett minden közösség személyzetére vonatkozó nemzeti kiképző terv kidolgozását és bevezetését. E kiképző program kialakítása révén biztosítsa a nemzeti polgári repülésvédelmi terv hatékonyságát.

3.1.7 **Ajánlás.** – *A szerződő állam biztosítsa, hogy a kiképző személyek és a kiképző programok teljesítsék az illetékes hatóság által előírt szabványokat.*

3.1.8 A szerződő állam köteles gondoskodni róla, hogy az illetékes hatósága a nemzetközi polgári repülést szolgáló repülőtereik mindegyikén intézkedjen a repülésvédelmi szolgálatok által igényelt kiszolgálói erőforrások és létesítmények rendelkezésre állásáról.

3.1.9 A szerződő állam a repülőterei részére, illetve a felségterületére üzemelő légi-jármű üzemeltetők, illetve egyéb kapcsolatos közösségek számára tegye hozzáférhetővé nemzeti repülésvédelmi programja megfelelő részeinek írásos változatát és/vagy vonatkozó tájékoztatást, vagy útmutatást ezáltal képessé téve őket a nemzeti polgári repülési védelmi terv követelményeinek teljesítésére.

3.2 Repülőtér üzemeltetés

3.2.1 A szerződő állam követelje meg, hogy a polgári repülést kiszolgáló minden nemzetközi repülőtere alakítson ki, vezessen be és tartson fenn a nemzeti repülésvédelmi terv követelményeinek teljesítésére alkalmas írásban rögzített repülésvédelmi programot.

3.2.2 A szerződő állam intézkedni köteles róla, hogy a polgári repülést szolgáló minden nemzetközi repülőterén a védelmi ellenőrző intézkedések bevezetését összehangoló felelős hatóság legyen kijelölve.

3.2.3 A szerződő állam intézkedni köteles róla, hogy a polgári repülést kiszolgáló minden nemzetközi repülőterén a 3.2.2 pont alatt említett hatóságot a repülőtéri védelmi programban meghatározott védelmi intézkedések és eljárások összehangolásában és bevezetésében segítő repülőtéri védelmi bizottságot állítsanak fel.

3.2.4 A szerződő állam gondoskodni köteles róla, hogy a repülőtér kialakítási követelmények, beleértve az építészeti és az infrastruktúrális követelményeket, amelyek a nemzeti polgári repülésvédelmi tervben lévő védelmi intézkedésekhez szükségesek, beépüljenek az új létesítményeinek tervezetébe és kivitelezésébe, illetve a repülőtér már meglévő létesítményeinek átalakításába.

3.3 Légijármű üzemeltetők

3.3.1 A szerződő állam követelje meg, hogy a felségterületéről szolgáltatást nyújtó kereskedelmi légi-szállító üzemeltetők alakítsanak ki, vezessenek be és tartsanak fenn az illető állam nemzeti repülésvédelmi terv követelményeit teljesítő, írásban rögzített üzemeltetői repülésvédelmi programot.

3.3.2 **Ajánlás.** - *A szerződő állam követelje meg, hogy a felségterületéről 5700 kg-nál nagyobb maximum felszálló tömegű légijárművel általános célú üzemelést végrehajtó bármely közösség, beleértve a vállalati üzemelést is, rendelkezzen kialakított, bevezetett és fenntartott olyan írásos üzemeltetői védelmi tervvel, amely teljesíti az illető állam nemzeti polgári repülésvédelmi terv követelményeit.*

3.3.3 **Ajánlás.** - *A szerződő állam követelje meg, hogy a légi munkavégzést végző minden közösség rendelkezzen kialakított, bevezetett és fenntartott olyan írásos üzemeltetői védelmi tervvel, amely teljesíti az illető állam nemzeti polgári repülésvédelmi terv követelményeit.A terv tartalmazzon a végzett üzemelés fajtájának megfelelő üzemeltetési jellemzőket.*

3.3.4 **Ajánlás.** – *A szerződő álam a 3.3.1, 3.3.2 és a 3.3.3 alatti üzemeltetői, vagy közösségi védelmi program alapjául vegye figyelembe az ICAO minta szabályzatát.*

3.3.5 **Ajánlás.** - *A szerződő állam a felségterületéről szolgáltatást nyújtó és közös járatszám alatti üzemelésben, vagy más nemzetközi üzemeltetővel egyéb együttműködési szerződésben működő üzemeltetőktől követelje meg, hogy az illetékes hatóságot értesítsék az ilyenfajta szerződés természetéről, beleértve a társ üzemeltető azonosságát is.*

3.4 Minőség ellenőrzés

3.4.1 A szerződő állam gondoskodni köteles róla, hogy a védelmi intézkedéseket megvalósító személyeket háttér ellenőrzésnek és kiválasztási eljárásnak vessék alá.

3.4.2 A szerződő állam gondoskodni köteles róla, hogy a védelmi intézkedéseket megvalósító személyek a nemzeti polgári repülésvédelmi terv követelményeinek megfelelően legyenek kiképezve és saját feladataik teljesítéséhez szükséges minden jogosítással rendelkezzenek, továbbá, hogy megfelelő nyilvántartások napra készek legyenek. A vonatkozó teljesítmény szint szabványokat ki kell alakítani és alap, illetve időszakos felméréseket kell végezni a szabvány szint fenntartása érdekében.

3.4.3 A szerződő állam gondoskodni köteles róla, hogy a szűrő tevékenységet végző személyek a nemzeti polgári repülésvédelmi terv követelményei szerint rendelkezzenek bizonyítvánnyal, biztosítandó a teljesítmény szabványok célirányos és megbízható elérését.

3.4.4 A szerződő állam követelje meg az illetékes hatóságtól, hogy a nemzeti polgári repülésvédelmi terv hatékonyságának értékelése, illetve az azzal való egyezés felmérése érdekében gondoskodjon nemzeti polgári repülésvédelmi minőség ellenőrző program kidolgozásáról, bevezetéséről és fenntartásáról.

3.4.5 A szerződő állam köteles gondoskodni, hogy a védelmi intézkedések beveztését a nemzeti polgári repülési tervvel való egyezés tekintetében rendszeresen hitelesítésnek vessé alá. Az ellenőrző vizsgálatok elsődleges elemeit és gyakoriságát a megfeleő hatóság által végzett kockázat felmérés alapján kell meghatározni.

3.4.6 A szerződő állam gondoskodjon rendszeres védelmi felmérések, próbák, értékelések és vizsgálatok végrehajtásáról a nemzeti polgári repülésvédelmi tervvel való egyezés hitelesítése céljából, továbbá, hogy biztosítsa a hiányosságok gyors és hatékony felszámolását.

3.4.7 A szerződő állam gondoskodjon róla, hogy a nemzeti polgári repülési minőség ellenőrző terv elsődleges szempontjait és szervezetét felállító vezetőség függetlenül működjön a nemzeti polgári repülésvédelmi terv hatálya értelmében tett intézkedések bevezetéséért felelős közösségektől és személyektől. A szerződő állam egyben köteles:

a) gondoskodni róla, hogy a védelmi felmérések, próbák, értékelések és vizsgálatok végrehajtását végző személyzet a nemzeti polgári repülésvédelmi tervvel összhangban lévő megfelelő szabványok szerint legyenek kiképezve ezen feladatokra;

b) gondoskodni róla, hogy a védelmi felmérések, próbák, értékelések és vizsgálatok végrehajtását végző személyzet az információk beszerzéséhez megfelelő fennhatósággal rendelkezzen ezen feladatok végrehajtásához és a kiigazító lépések kikényszerítéséhez;

c) kiegészíteni a nemzeti polgári repülésvédelmi minőség ellenőrzési tervet egy titkos jelentő rendszerrel az olyan források által biztosított védelmi információk elemzéséhez, mint például az utas, repülőgép személyzet, vagy a földi személyzet; és

d) folyamatot kialakítani a nemzeti polgári repülésvédelmi minőség biztosító terv eredményeinek rögzítésére és elemzésére, ezáltal is hozzájárulva a nemzeti polgári repülésvédelmi terv hatékony kialakításához és bevezetéséhez, beleértve a nem-egyezés okainak és mintáinak azonosítását, illetve a kiigazító intézkedések bevezetésének és fenntartásának igazolását.

3.4.8 A jogellenes cselekménnyel kapcsolatba került szerződő állam követelje meg illetékes hatóságától a védelmi ellenőrző intézkedések és eljárások újra értékelését és az újra előfordulás megakadályozása érdekében időben tegye meg a szükséges lépéseket a gyenge láncszemek megerősítésére.

4. FEJEZET – MEGELŐZŐ VÉDELMI INTÉZKEDÉSEK

4.1 Célkitűzés

4.1.1 A szerződő állam köteles intézkedéseket hozni, hogy azokat a fegyvereket, robbanó szerkezeteket, vagy jogellenes cselekmény elkövetésére alkalmas egyéb veszélyes készülékeket, cikkeket, vagy anyagokat, amelyek szállítása, vagy viselése tilos, semmiféle módon ne lehessen a nemzetközi repülésben résztvevő légi-jármű fedélzetére feljuttatni.

4.2 A bejutás ellenőrzésére vonatkozó intézkedések

4.2.1 A szerződő állam gondoskodni köteles róla, hogy a nemzetközi polgári repülést szolgáló repülőterein a légiforgalmi oldalra történő bejutást ellenőrizzék az illetéktelen behatolások megakadályozása érdekében.

4.2.2 A szerződő állam gondoskodni köteles róla, hogy a nemzetközi polgári repülést szolgáló, állam által kijelölt repülőterein a megfelelő hatóságok által végzett kockázat felmérés alapján védelmileg korlátozott területeket alakítsanak ki.

4.2.3 A szerződő állam gondoskodni köteles róla, hogy a személyek és járművek tekintetében azonosító rendszereket hozzanak létre annak érdekében, hogy megakadályozzák az illetéktelenek behatolását a légiforgalmi oldalra és a védelmileg korlátozott területekre. A légiforgalmi oldalra és a védelmileg korlátozott területekre történő belépési engedély megadása előtt, az azonosságot kijelölt ellenőrző pontoknál kell hitelesíteni.

4.2.4 A szerződő állam gondoskodjon róla, hogy a védelmileg korlátozott területekre kíséret nélküli belépésre engedélyezett utasokon kívül minden személy háttérellenőrzését elvégezzék mielőtt számára engedélyeznék a védelmileg korlátozott területekre történő kíséret nélküli belépést.

4.2.5 A szerződő állam gondoskodjon róla, hogy a védelmileg korlátozott területeken a légijárműhöz való engedély nélküli hozzáférés megakadályozása érdekében a légi-járművekhez, illetve a légi-járművektől közlekedő személyek és járművek mozgását felügyeljék.

4.2.6 A szerződő állam gondoskodjon róla, hogy a repülőtér védelmileg korlátozott területeihez kíséret nélküli belépésre jogosított nem utas személyek legalább egy részét és magukkal vitt cikkeiket szűrjék. Arányukat a vonatkozó nemzeti hatóságok által elvégzett kockázat elemzéssel összhangban kell meghatározni.

4.2.7 **Ajánlás.** – *A szerződő állam gondoskodjon róla, hogy a légi-jármű személyzeti tagok részére kibocsátott azonossági dokumentum a dokumentum felismeréshez és hitelesítéshez egyeztetett és megbízható alapot adjon, a Géppel Olvasható Utazási Dokumentumok* (Machine Readable Travel Documents*) Doc 9303-ban kikötöttek közül a megfelelő előírásoknak megfelelve biztosítva engedélyezett bejutást a légiforgalmi oldalra és a védelmileg korlátozott területekre.*

4.2.8 **Ajánlás.** - *A szerződő állam gondoskodjon róla, hogy a 4.2.4-ben előírt ellenőrzéseket rendszeresen megismételjék minden olyan személy esetében, aki a védelmileg korlátozott területekhez kíséret nélküli belépésre jogosított.*

4.3 Légijárműre vonatkozó intézkedések

4.3.1 A szerződő állam köteles gondoskodni róla, hogy a kereskedelmi légi-szállításban résztvevő járatra kijelölt (originating) légi-jármű repülés előtti védelmi ellenőrzését, vagy védelmi átkutatását végrehajtsák. Az adott esetben az illetékes nemzeti hatóságok által végzett védelmi kockázat felmérésére alapozva kell meghatározni, hogy a védelmi ellenőrzés, vagy a védelmi átkutatás a megfelelő.

4.3.2 A szerződő állam gondoskodjon intézkedések megtételéről, amelyek biztosítják, hogy a kereskedelmi járat utasa a légijárművet bármikor is (végleg) elhagyva ne hagyjon tárgyakat a repülőgép fedélzetén.

4.3.3 A szerződő állam a kereskedelmi légi-szállító üzemeltetőitől megfelelő intézkedések megtételét követelje meg, amelyek révén megakadályozható, hogy a repülés tartamában engedéllyel nem rendelkező személy a pilótakabinba léphessen.

Megjegyzés.- A kereskedelmi légi-szállításban résztvevő légijármű pilóta kabinjának védelmére vonatkozó rendelkezéseket a 6. Annex, I. Része, 13. Fejezetének 13.2 szakasza tartalmazza.

4.3.4 A szerződő állam köteles biztosítani, hogy a 4.3.1 tárgyát képező légijárművet az engedély nélküli hozzáféréssel szemben őrizzék attól a pillanattól kezdve, amikor a légijármű átvizsgálása, vagy átkutatása megkezdődik, egészen addig, amíg a légijármű elindul.

4.3.5 **Ajánlás.** - *A szerződő állam gondoskodjon védelmi ellenőrzés kialakításáról, hogy megakadályozza a nem a védelmileg korlátozott területen tartózkodó légijárművel szembeni jogellenes cselekedeteket.*

4.4 Az utasra és kabin poggyászára vonatkozó intézkedések

4.4.1 A szerződő állam köteles intézkedéseket hozni, amelyek révén biztosítható, hogy a kereskedelmi légi-szállítási üzemelésben utazását megkezdő (originating) utast, illetve kabin poggyászát szűrésnek vessék alá, mielőtt a védelmileg korlátozott területről induló légijárműre beszáll.

4.4.2 A szerződő állam köteles gondoskodni róla, hogy a kereskedelmi légi-szállítási üzemelést igénybevevő átszálló utast, illetve kabin poggyászát légijárműre beszállás előtt szűrésnek vessék alá, kivéve, ha más szerződő államokkal együttműködésben –amikor ez alkalmazható- hitelesítő folyamatokat kialakítva és eljárások folyamatos bevezetésével biztosítja az ilyen utas és kabin poggyászának megfelelő szintű szűrését az utazás megkezdésének pontján és ezt követően azok védelmét a nem engedélyezett kapcsolatokkal szemben az utazás megkezdésének szűrő pontjától az átszálló állomásról induló légijárműig.

Megjegyzés. – A témához tartozó útmutató anyag a „Védelmi kézikönyv a polgári repülés jogellenes cselekményekkel szembeni védelmezéséről” (Doc 8973 Bizalmas) –ben található.

4.4.3 A szerződő állam köteles gondoskodni róla, hogy a nemzetközi repülőterein a biztonsági szűrésen már átesett utast és kabin poggyászát a védelmi szűrő pont elhagyásától a légijárműre szállásig őrizzék a nem engedélyezett érintkezések létrejöttétől. Ha keveredés, vagy érintkezés jött létre, akkor a légijárműre beszállás előtt az érintett utasokat és kabin poggyászaikat újra szűrni kell.

4.4.4 A szerződő állam repülőterein köteles átszállásokkal kapcsolatos intézkedéseket kialakíttatni, hogy az átszálló utasok poggyászait megvédjék a nem engedélyezett érintkezésektől és megőrizzék az átszállási repülőtér védelmi rendszerének csorbítatlanságát.

4.5 A feladott poggyászra vonatkozó intézkedések

4.5.1 A szerződő állam köteles intézkedéseket hozni, amelyek révén biztosítható, hogy a kereskedelmi légi-szállítási üzemelésben utazását megkezdő (originating) feladott poggyászt a védelmileg korlátozott területről induló légijárműre rakodásuk előtt szűrésnek vessék alá.

4.5.2 A szerződő állam köteles gondoskodni róla, hogy a kereskedelmi légi-szállítási üzemelésben szállítandó feladott poggyászt a szűrés, vagy a szállító gondozásába átvételének pontjától kezdve –amelyik a korábbi- őrizzék a nem engedélyezett érintkezésekkel szemben egészen addig, amíg a szándék szerinti szállítását végző légijármű elindul. Ha a feladott poggyász érintetlensége veszélybe került, akkor azt légijárműre rakodás előtt újra szűrni kell.

4.5.3 A szerződő állam köteles intézkedésekkel biztosítani, hogy a kereskedelmi légiszállítás üzemeltetői ne szállítsák a légi-jármű fedélzetén nem tartózkodó utas poggyászát, kivéve, ha az utastól elválasztottan szállított poggyászt feladott poggyászként azonosították és kiegészítő szűrésnek vetették alá.

4.5.4 A szerződő állam köteles gondoskodni róla, hogy a kereskedelmi légi-szállítási üzemelésben átrakodott poggyászt légijárműre rakodás előtt szűrésnek vessék alá, kivéve, ha más szerződő államokkal együttmműködésben –amikor ez alkalmazható- hitelesítő folyamatokat kialakítva és eljárások folyamatos bevezetésével biztosítja az ilyen feladott poggyász szűrését a szállítás megkezdésének pontján és ezt követően annak védelmét a nem engedélyezett kapcsolatokkal szemben a szállítás megkezdésének repülőterétől az átrakodási állomásról induló légijárműig.

Megjegyzés. – A témához tartozó útmutató anyag a „Védelmi kézikönyv a polgári repülés jogellenes cselekményekkel szembeni védelmezéséről” (Doc 8973 Bizalmas) –ben található.

4.5.5 A szerződő állam köteles biztosítani, hogy a kereskedelmi légi-szállításban résztvevő légijármű üzemeltetők a feladott poggyászok közül csak a „kísérettel rendelkező”, vagy „kíséret nélküli”-ként egyedileg azonosított, megfelelő szabvány szerint szűrt és a légi-szállító légijárművén való szállításra elfogadottakat szállítsák. Minden ilyen poggyászról nyilvántartást kell vezetni, miszerint ezen kritériumoknak megfelelt és az illető járaton való szállítása engedélyezett.

4.5.6 **Ajánlás. -** *A szerződő állam alakítson ki az azonosítatlan poggyászoknak az illetékes nemzeti hatóságok védelmi kockázati felmérésével összhangban lévő kezelésére szolgáló eljárást*

4.6 Az árura, postaküldeményre és egyéb javakra vonatkozó intézkedések

4.6.1 A szerződő állam köteles biztosítani, hogy az utasszállító kereskedelmi légi-szállítási üzemelésben alkalmazott légi-jármű fedélzetére rakodásuk előtt az áru- és a posta küldeményeket biztonsági ellenőrzésnek vessék alá.

4.6.2 A szerződő állam köteles biztosítani, hogy az utasszállító kereskedelmi légi-szállítási üzemelésben alkalmazott légi-jármű fedélzetén szállítandó áru- és postaküldeményt a nem engedélyezett érintkezéssel szemben őrizzék kezdve a védelmi szűrőponttól egészen a légijármű elindulásáig.

4.6.3 A szerződő állam köteles folyamatot kialakítani a szabályozott ügynökök jóváhagyására, ha a védelmi ellenőrzésben ilyen ügynökök érintettek.

4.6.4 A szerződő állam köteles biztosítani, hogy az üzemeltető csak akkor fogadjon el utasszállító kereskedelmi légi-szállítási üzemben alkalmazott légi-jármű fedélzetén történő szállításra áru-, vagy posta küldeményeket, ha azon küldemények védelmi biztonságosságáért egy szabályozott ügynök felelősséget vállal, illetve, ha az ilyen küldeményeket megfelelő védelmi ellenőrzések alá vetették.

4.6.5 A szerződő állam köteles biztosítani, hogy az utasszállító kereskedelmi légi-szállítási üzemelésben alkalmazott légi-jármű fedélzetén szállítandó utas ellátmány, készletek és üzemeltetői tartalékok megfelelő védelmi ellenőrzésen essenek át és azt követően a légijárműbe rakodásig őrizzék azokat.

4.6.7 **Ajánlás. -** *A szerződő állam biztosítsa, hogy a teljes áruszállító légijárművön szállítani kívánt áru- és postaküldeményekre alkalmazott védelmi ellenőrzéseket az illetékes nemzeti hatóságok védelmi kockázati szint felmérésére alapozva határozzák meg.*

4.7 Különleges utas kategóriákra vonatkozó intézkedések

4.7.1 A szerződő állam köteles a légiszállítók számára követelményeket előírni az erőszakra feltehetőleg kész és bírói-, vagy igazgatási eljárás miatt kényszerből utaztatott utas szállítására.

Megjegyzés. – A témához tartozó útmutató anyag a „Védelmi kézikönyv a polgári repülés jogellenes cselekményekkel szembeni védelmezéséről” (Doc 8973 Bizalmas) –ben található.

4.7.2 A szerződő állam köteles biztosítani, hogy a felségterületéről utasszállító szolgáltatást nyújtó üzemeltető védelmi programjába a fedélzeti biztonságról gondoskodó intézkedéseket és eljárásokat foglaljon arra az esetre, amikor bírói-, vagy igazgatási eljárás miatt valamely személyt kényszerből utaztatnak.

4.7.3 Hogy megfelelő védelmi intézkedések legyenek alkalmazhatók, a szerződő állam köteles biztosítani, hogy a légi-jármű üzemeltető és a parancsnok pilóta értesítése megtörténjen olyan esetekben, amikor bírói-, vagy igazgatási eljárás miatt valamely személyt kényszerből utaztatnak.

4.7.4 A szerződő állam biztosítsa, hogy a fedélzeten feladatát teljesítő karhatalmi tiszt, vagy egyéb felhatalmazott személy fedélzeten fegyvert kizárólag az érintett államok törvényeivel összhangban kiadott különleges engedélyhez kötve viselhessen.

4.7.5 A szerződő állam vegye figyelembe bármely más államtól érkező és a kérelmező állam üzemeltetőinek légi-járművein fegyveres személy –beleértve a fedélzeti védelmi tisztet is - utazásának engedélyezésére vonatkozó kérelmeket. Az ilyenfajta utazásokat csak az összes érintett állam beleegyezése esetén engedélyezzék.

4.7.6 A szerződő állam biztosítsa, hogy fegyver szállítását bármely más esetben csak akkor engedélyezzék, ha felhatalmazott és kellő képesítéssel rendelkező személy megállapította, hogy a fegyver nincs töltve –ha ez alkalmazható-, illetve csak akkor, ha repülés során a fegyvert mindenki számára hozzáférhetetlen helyen helyezték el.

4.7.7 Ha a szerződő állam fedélzeti védelmi tiszt bevetéséről döntött, köteles gondoskodni róla, hogy a tiszt a légijármű fedélzeti biztonsági és védelmi vonzatait figyelembe véve különlegesen kiválasztott és kiképzett állami alkalmazott legyen, és bevetése az illetékes hatóság fenyegetettségi felmérésével összhangban történjen. Ilyen tisztek bevetését az összes érintett állammal egyeztetni kell és szigorú titokként kell kezelni.

4.7.8 A szerződő állam gondoskodni köteles róla, hogy a parancsnok pilótát értesítsék a fegyveres személyek számáról és hogy melyik üléseken kaptak helyet.

5. FEJEZET – JOGELLENES CSELEKMÉNYEKRE TETT VÁLASZLÉPÉSEK IRÁNYÍTÁSA

5.1 Megelőzés

5.1.1 Arra az esetre, amikor megalapozottan gyanítható, miszerint a légi-jármű jogellenes cselekmény tárgyává válhat, a szerződő állam köteles intézkedéseket tenni a légi-jármű őrzésére ha az még a földön tartózkodik, továbbá, ha a légijármű már elindult, intézkedni, hogy az ilyen légi-jármű érkezéséről az érintett államok repülőtér hatóságait és légiforgalmi szolgálatait a lehető leghamarabb értesítsék.

5.1.2 Arra az esetre, amikor megalapozott információ szerint a légi-jármű jogellenes cselekmény tárgyává válhat, a szerződő állam köteles a légi-járművet elrejtett fegyverek, robbanóeszközök, vagy egyéb veszélyes készülékek, cikkek, vagy anyagok iránt átvizsgáltatni. Az érintett üzemeltetőt az átkutatásról előzetesen értesíteni kell.

5.1.3 A szerződő állam köteles gondoskodni róla, hogy kialakított megoldások álljanak készen a repülőterein lévő a gyanús veszélyes eszközök, vagy egyéb lehetséges veszélyek kivizsgálására, illetve –ha szükséges- az eszközök, vagy a veszélyek biztonságosnak ítélésére és/vagy felszámolására.

5.1.4 A szerződő állam köteles gondoskodni róla, hogy vészhelyzeti tervek legyenek kidolgozva és az erőforrások rendelkezésre álljanak a polgári repülés jogellenes cselekményekkel szembeni védelmére. A vészhelyzeti terveket rendszeres időközönként próbának kell alávetni.

5.1.5 A szerződő állam köteles biztosítani, hogy felhatalmazott és megfelelően képzett személyzet bevetésre készen álljon rendelkezésre a polgári repülést szolgáló repülőterein, hogy a polgári repüléssel szembeni gyanított, vagy tényleges jogellenes cselekmények kezelésében segítséget nyújtson.

5.2 Válaszlépések

5.2.1 A szerződő állam megfelelő intézkedéseket köteles tenni a jogellenes cselekmény tárgyát képező és az állam felségterületén földön tartózkodó légi-jármű utasainak, illetve a személyzeti tagjainak biztonsága érdekében mindaddig, amíg azok útjukat folytathatják.

5.2.2 A jogellenes cselekmény tárgyát képező légi-jármű számára légiforgalmi szolgáltatás nyújtásáért felelős szerződő állam az illető légi-jármű repüléséről köteles minden vonatkozó információt összegyűjteni és azt az információt az érintett légiforgalmi szolgálati egységekért felelős összes többi állam részére oly módon továbbítani, beleértve az ismert, vagy feltételezett leszállóhely államát is, hogy időbeli és megfelelő védelmi intézkedések legyenek tehetők a légi-jármű útvonalán és ismert, valószínű, vagy feltételezett célállomásán.

5.2.3 A szerződő állam a jogellenesen hatalomba kerített légi-jármű számára köteles a körülmények által szükségessé váló minden segítséget biztosítani, beleértve a navigációs berendezések, a légiforgalmi irányítói szolgáltatás biztosítását és a leszállás engedélyezését.

5.2.4 A szerződő állam, az általa praktikusnak talált intézkedéseket köteles megtenni annak biztosítására, hogy a jogellenesen hatalomba kerített és az illető állam felségterületén leszállt légi-járművet a földön tartsa, kivéve, ha annak tovább indulását az emberi élet védelmezésének mindenek előtt álló feladata teszi szükségessé. Mindazonáltal ezen intézkedéseknek tekintetbe kell venniük a tovább repülésben rejlő súlyos veszélyt. Az államnak be kell látnia továbbá a párbeszéd fontosságát –ahol erre lehetőség van- a légi-jármű üzemeltetőjének állama és azon állam között, amelyben a légi-jármű leszállt, illetve a feltételezett, vagy kinyilvánított cél-állam értesítésének fontosságát azon állam által, amelyben a légi-jármű leszállt.

5.2.5 Az a szerződő állam, amelynek területén egy jogellenes cselekmény tárgyát képező légi-jármű leszállt, erről a leggyorsabb eszközökkel köteles tájékoztatni a légi-járművet lajstromozó államot és az üzemeltető államát, továbbá hasonló módon a lehető leggyorsabb eszközökkel meg kell adni minden szükséges információt:

a) a két fent említett államnak

b) azoknak az államoknak, amelyek a polgárai életüket vesztették, vagy sérülést szenvedtek

c) azoknak az államoknak, akik polgárait túszul ejtették

d) minden szerződő államnak, amelynek polgárairól tudott, hogy a fedélzeten tartózkodnak és

e) a Nemzetközi Polgári Repülés Szervezetnek

5.2.6 **Ajánlás.** – *Szükséges, hogy a szerződő állam gondoskodjon az 5.2.2 értelmében tett lépések eredményeként kapott tájékoztatás mielőbbi helyi továbbításáról a légiforgalmi irányítói szolgálat érdekelt egységeihez, a megfelelő repülőtéri igazgatóságokhoz, az üzemeltetőhöz és más érintett felekhez.*

5.2.7 **Ajánlás.** – *A szerződő állam működjön együtt a többi szerződő állammal a jogellenes cselekmények terén közös válaszlépések biztosításában. Ha felségterületén a jogellenes cselekmény tárgyát képező légi-jármű utasainak és személyzetének kiszabadítására tesz intézkedéseket, a szerződő állam –szükség szerint- használja fel az üzemeltető állam, a gyártó állam és a légi-járművet lajstromozó állam tapasztalatait és lehetőségeit.*

5.3 Információ csere és jelentések

5.3.1 A jogellenes cselekményben érintett szerződő állam a cselekmény leküzdését követően köteles az ICAO-t a lehető leggyorsabban ellátni a jogellenes cselekmény biztonsági kérdéseivel összefüggő minden lényeges információval.

5.3.2 **Ajánlás. -** *A szerződő állam, az arra megfelelőnek ítélt más szerződő államokkal cserélje ki a nemzetközi polgári repülés ellen irányuló jogellenes cselekményre tett válaszlépésekre vonatkozó információit és egy időben ezekkel az információkkal lássa el az ICAO-t is.*

A 17. ANNEX MELLÉKLETEI

KIVONAT A „2. ANNEX – *REPÜLÉSI SZABÁLYOK*”-BÓL

3. FEJEZET - ÁLTALÁNOS SZABÁLYOK

…….

3.7 Jogellenes cselekmények

A jogellenes cselekmény tárgyát képező légi-jármű törekedjen a megfelelő ATS egység értesítésére, magáról a tényről és minden azzal kapcsolatos lényeges körülményről, továbbá az érvényes repülési tervtől –a helyzet kívánta- bármiféle eltérésről annak érdekében, hogy az ATS egység elsőbbséget biztosíthasson a légi-jármű számára, illetve, hogy egyéb légi-járművekkel az esetleges konfliktus lehetőségét a minimumra csökkenthesse.

1. Megjegyzés. – az ATS egység jogellenes cselekményekre vonatkozó felelősségét a 11. Annex tartalmazza.

2. Megjegyzés. – Ezen Annex B. mellékletében található az arra az esetre szolgáló útmutató anyag, amikor a légi-jármű jogellenes cselekmény tárgyává vált, de erről a tényről az ATS egységet nem képes értesíteni.

3. Megjegyzés. – A jogellenes cselekmény tárgyát képező, SSR-el felszerelt légi-jármű teendőit a 11. Annex, a PANS-ATM (Doc 4444) és a PANS-OPS (Doc 8168) tartalmazzák.

4. Megjegyzés. - A jogellenes cselekmény tárgyát képező, CPDLC-vel felszerelt légi-jármű teendőit a 11. Annex, a PANS-ATM (Doc 4444) tartalmazzák és a témáról útmutató anyagot a Kézikönyv az adatlánc alkalmazásáról a légiforgalmi szolgálatoknál (Doc 9694) tartalmaz.

………

B. MELLÉKLET – JOGELLENES CSELEKMÉNYEK

1. Általános rész

A következő eljárásokat légi-járművek számára olyan jogellenes cselekmények estében történő alkalmazásra közöljük, amikor a légi-jármű a tényről az ATS egységet nem képes értesíteni.

2. Eljárások

2.1 Kivéve, ha a légi-jármű fedélzetén fennálló körülmények másképp kívánják, a parancsnok pilóta a repülést próbálja meg a járatra kijelölt irányon és a kijelölt utazószinten folytatni legalább addig, amíg a tényről képes az ATS egységet értesíteni, vagy amíg radar fedésen belül tartózkodik.

2.2 Ha a jogellenes cselekmény tárgyát képező légi-járműnek a kijelölt iránytól, vagy a kijelölt utazószintjétől anélkül kell eltérnie, hogy rádiókapcsolatot tudna felvenni az ATS egységgel, a parancsnok pilóta amikor lehetséges, tegye a következőket:

a) kísérelje meg figyelmeztető adást leadni a VHF vészfrekvencián és minden egyéb megfelelő frekvencián, kivéve, ha a fedélzeten fennálló körülmények ezt másképp kívánják. Egyéb berendezéseket is, mint például a fedélzeti válaszjel adót, az adatláncot, stb-t. ugyancsak kívánatos alkalmazni, ha alkalmazásuk előnnyel jár és a körülmények ezt lehetővé teszik; és

b) Olyan esetekben, amikor a repülés közben kialakuló szokványostól eltérő körülmények esetére különleges eljárást alakítottak ki és azt a Doc 7030 – Körzeti Kiegészítő Eljárások című dokumentumban közzé tették, akkor ezekkel az eljárásokkal összhangban ténykedjen; vagy

c) Ha alkalmazható körzeti eljárás nincs kidolgozva, akkor az IFR repüléshez az illető körzetben rendszerint használt utazó magasságtól alábbiak szerint eltérő magasságon haladjon:

1) 150 m (500 ft) olyan térségekben, ahol 300 m (1000 ft) függőleges elkülönítési minimum van érvényben; vagy

2) 300 m (1000 ft) olyan térségekben, ahol 600 m (2000 ft) függőleges elkülönítési minimum van érvényben.

Megjegyzés. – Jelen Annex 3.8 pontjában szerepel az elfogott, de ezzel egy időben jogellenes cselekmény tárgyát képező légi-jármű által megteendő lépésekre vonatkozó előírás.

KIVONAT A 6. ANNEX-BŐL - LÉGIJÁRMŰ ÜZEMELTETÉS

I. RÉSZ – NEMZEKÖZI KERESKEDELMI LÉGISZALLÍTÁS – REPÜLŐGÉPEK

13. FEJEZET – VÉDELEM*

13.1 Belföldi kereskedelmi üzemelés

Ajánlás. – *Az e Fejezetben közölt nemzetközi szabványokat és ajánlott gyakorlatokat a szerződő állam alkalmazza a belföldi kereskedelmi üzemelésben is (légi szolgálatok).*

13.2 A repülő személyzet kabinjának védelme

13.2.1 A pilótakabin ajtóval rendelkező repülőgép pilótakabin ajtaja legyen zárható és biztosítson lehetőséget az utaskabin személyzet részére, hogy bizalmasan és feltűnés nélkül értesíthesse a hajózó-személyzetet az utaskabinban tapasztalható gyanús tevékenységről, vagy a védelem kikezdéséről.

13.2.2 2003 november 1-től a 45000 kg, vagy nagyobb hitelesített maximum felszállótömegű, vagy 60 főnél nagyobb utas befogadó képességű utasszállító repülőgépet a kézifegyver tűznek és a kézigránát szilánknak, illetve az illetéktelen személyek erőszakos behatolási kísérleteinek ellenálló módon kialakított pilótakabin ajtóval kell felszerelni. Ez az ajtó a repülőgépvezető ülések bármelyikéből legyen nyitható és zárható.

13.2.3 A 13.2.2 pont szerinti pilótakabin ajtóval ellátott repülőgépen:

a) a pilótakabin ajtó a légijármű összes külső ajtajának beszállítást követő bezárásától kezdve egészen bármelyikük kiszállítás céljából történő kinyitásáig legyen becsukva és zárva, kivéve amikor felhatalmazott személy be-, illetve kilépését kell szükségszerűen engedélyezni; és

* Jelen fejezettel összefüggésben, a „védelem” szó a polgári repüléssel szemben meg nem engedett cselekmények megelőzésére vonatkozik.

b) a pilótakabin ajtó előtti teljes terület bármely repülőgépvezető ülésétől való megfigyelhetőségét biztosítani kell annak érdekében, hogy a belépést kérő személy azonosítható, a gyanús viselkedés felfedezhető, vagy a tényleges veszélyhelyzet felismerhető legyen.

13.2.4 **Ajánlás.** — *Minden utasszállító repülőgéplehetőség szerint a kézifegyver tűznek és a kézigránát szilánknak, illetve az illetéktelen személyek erőszakos behatolási kísérleteinek ellenálló módon kialakított, jóváhagyott pilótakabin ajtóval legyen felszerelve. Ez az ajtó a repülőgépvezető ülések bármelyikéből legyen nyitható és zárható.*

13.2.4 **Ajánlás.** — *A 13.2.4 pont szerinti pilótakabin ajtóval ellátott repülőgépen:*

a) *a pilótakabin ajtó a légijármű összes külső ajtajának beszállítást követő bezárásától kezdve egészen bármelyikük kiszállítás céljából történő kinyitásáig legyen becsukva és zárva, kivéve amikor felhatalmazott személy be-, illetve kilépését kell szükségszerűen engedélyezni; és*

b) *a pilótakabin ajtó előtti teljes terület bármely repülőgépvezető ülésétől való megfigyelhetőségét biztosítani kell annak érdekében, hogy a belépést kérő személy azonosítható, a gyanús viselkedés felfedezhető, vagy a tényleges veszélyhelyzet felismerhető legyen.*

13.3 Repülőgép átkutatási ellenőrző jegyzék

Az üzemeltető köteles gondoskodni róla, hogy a fedélzeten ellenőrző jegyzék álljon rendelkezésre a robbanó eszközök szabotázsgyanús esetekben történő felkutatása során követendő eljárásokról, illetve elrejtett fegyver, robbanóanyag, vagy más veszélyes eszköz felleléséhez, amikor megalapozott gyanú áll fenn, miszerint a repülőgép jogellenes cselekmény tárgyává válhat. Az ellenőrző jegyzéket útmutató anyaggal kell kiegészíteni a következőkről: abban az esetben teendő lépések, ha bombát, vagy gyanús tárgyat találnak; tájékoztató a bomba elhelyezése tekintetében az illető repülőgépre legkisebb kockázatot jelentő térségről.

13.4 Kiképzés terv

13.4.1 Az üzemeltető köteles olyan jóváhagyott kiképzési tervet kidolgozni és betartani, amely a repülő személyzetet képessé teszi, hogy a jogellenes cselekmény következményeit a legmegfelelőbb fellépéssel minimálisra csökkentse. A terv legalább az alábbi elemeket foglalja magába:

a) bármely esemény súlyosságának meghatározása;

b) kapcsolattartás és együttműködés a hajózószemélyzet tagjai között;

c) megfelelő önvédelmi tevékenységek;

d) a személyzeti tagok számára kijelölt, halálos sérülést nem okozó védelmi eszközök használata, amelyek alkalmazását az üzemeltető állama jóváhagyta;

e) a terroristák viselkedésmódjának megismerése és megértése, amely a személyzet tagjai számára megkönnyíti a repülőgép eltérítő magatartásának és az utas reakciók kezelését;

f) különféle fenyegetési körülményeket érintő élő szituációs kiképző gyakorlatok;

g) a repülőgép védelmi pilótakabin eljárások; és

h) repülőgép átkutatási eljárások és szükség szerinti útmutatás a repülőgépre legkisebb kockázatot jelentő robbanószerkezet elhelyezési térségéről.

13.4.2 Az üzemeltető köteles kiképző programot létrehozni és fenntartani abból a célból, hogy megfelelő alkalmazottjait megismertesse a a légi-járművön szállítandó utas, poggyász, áru posta küldemény, felszerelés, tartalék és ellátmány esetére vonatkozó megelőző intézkedésekkel és módszerekkel, oly módon, hogy azok hozzájárulhassanak a szabotázs, vagy egyéb jogellenes cselekmények megakadályozásához.

13.5 A jogellenes cselekmények jelentése

Jogellenes cselekményt követően a parancsnok pilóta késedelem nélkül köteles az ilyen eseményekről jelentést tenni az erre kijelölt helyi hatóság számára.

13.6 Különféle rendelkezések

13.5.1 **Ajánlás.** – *A bomba fenyegetés céljából a legkisebb kockázatot jelentő térségnél történő használatra, speciális eszközt kell biztosítani, amellyel a léglökés terjedése és iránya irányítható.*

13.5.2 **Ajánlás.** – *Ha az üzemeltető vállalja az utasoktól elvett fegyverek szállítását, a repülőgépnek olyan megoldással kell rendelkeznie, hogy a repülés ideje alatt ezek a fegyverek személyek számára hozzáférhetetlen helyen legyenek tárolhatók.*

KIVONAT A 8. ANNEXBŐL - A LÉGIJÁRMŰ LÉGI-ALKALMASSÁGA

11. FEJEZET. VÉDELEM

11. 1 Belföldi kereskedelmi üzemelésben alkalmazott repülőgép

Ajánlás. – *Az e Fejezetben közölt nemzetközi szabványokat és ajánlott gyakorlatokat a szerződő állam alkalmazza a belföldi kereskedelmi üzemelésben résztvevő repülőgépekre is (légi szolgálatok).*

11. 2. Legkisebb kockázatú bombahely

A 45000 kg, vagy nagyobb hitelesített maximum felszállótömegű, vagy 60 főnél nagyobb utas befogadó képességű utasszállító repülőgép tervezése során, ha a repülőgép jogosítása iránti kérelmét 2000. március 12.-én vagy ezt követően nyújtották be, figyelembe kell venni a bomba elhelyezésre legkisebb kockázatot jelentő tér kialakításáról szóló előírást, hogy minimálisra csökkentsék a repülőgépen lévő bomba repülőgépre és a fedélzetén tartózkodókra gyakorolt hatását.

11. 3 A hajózó személyzet kabinjának védelme

Ajánlás.- *Mindazon repülőgépeknél, melyeknek az Annex 6 I. Rész 13. Fejezet előírásai szerint jóváhagyott pilótakabin ajtóval kell rendelkezniük, és amelyekre az illetékes nemzeti hatósághoz kérelmet nyújtottak be a típusbizonyítvány módosítására annak érdekében, hogy az magába foglaljon egy másodlagos típustervet, figyelmet kell fordítani a pilótakabin válaszfalainak, padlózatának és mennyezetének megerősítésére olymódon, hogy azok megakadályozzák a kisméretű lőfegyver golyóinak és gránátszilánkok áthatolását, illetve ellenálljanak az erőszakos behatolási kísérleteknek, ha ezek a területek repülés közben az utasok és a hajózó személyzet számára megközelíthetők.*

Megjegyzés.- A kereskedelmi utasszállító repülőgépek pilótakabin ajtóival szemben támasztott követelmények Szabványai és Ajánlott Eljárásai a 6. Annex I. Részének, 13. Fejezetben találhatók.

11. 4 Belső tér kialakítás

A 45000 kg, vagy nagyobb hitelesített maximum felszállótömegű, vagy 60 főnél nagyobb utas befogadó képességű utasszállító repülőgép tervezése során, ha a repülőgép jogosítása iránti kérelmét 2000. március 12.-én vagy ezt követően nyújtották be, olyan tervezési jellemzőket kell figyelembe venni, amelyek megnehezítik fegyverek, robbanóanyagok, vagy más veszélyes tárgyak könnyű elrejthetőségét a fedélzeten és amelyek megkönnyítik az ilyen tárgyak felkutatását.

KIVONAT A 9. ANNEXBŐL - ALAKÍSÁGOK EGYSZERŰSÍTÉSE

2. FEJEZET - LÉGIJÁRMŰVEK BELÉPÉSE ÉS KILÉPÉSE

A. - Általános rész

…………

2.2 A légi-járművekre vonatkozó hatékony engedélyeztetési eljárások kidolgozása során a szerződő állam –ahol megfelelő- köteles figyelembe venni a repülésvédelmi és a kábítószer ellenőrzési intézkedések alkalmazását.

…………

3. FEJEZET - SZEMÉLYEK ÉS POGGYÁSZAIK BELÉPÉSE ÉS KILÉPÉSE

A. - Általános rész

………

3.2 Az utas és a személyzet határ ellenőrzésének hatékony alkalmazását célzó eljárások kidolgozásakor a szerződő állam –ahol megfelelő- köteles figyelembe venni a repülésvédelmi, a határőrizeti, a kábítószer ellenőrzési és belépés ellenőrzési intézkedések alkalmazását.

…………..

3.4 A szerződő állam ne hosszabítsa meg a géppel olvasható útidokumentumainak érvényességét.

1. Megjegyzés. - A gépi olvasású úti okmányokra vonatkozó előírások (Doc 9303, sorozatai) nem engedélyezik a lejárati idő és a gépi olvasású területen belül lévő egyéb adatok módosítását.

2. Megjegyzés. – Azon államnak, amely jogszabályai, vagy rendelkezései engedélyezik az érvényességi időtartam meghosszabbítását, vállalnia kell, hogy a megfelelő szöveget ésszerű időn belül módosítja.

…………..

C. – Utiokmányok védelme

…………

3.7 A szerződő állam az új változatban kiadott útiokmányainak védelmi jellemzőit rendszeresen értékelje, hogy téves alkalmazásukat megakadályozza, illetve, hogy elősegítse azon esetek észlelését, amikor az ilyen dokumentumokat törvényellenesen adták ki, változtatták meg, vagy hamisították.

3.8 A szerződő állam alakítson ki ellenőrzést az úti okmányok előállítása és kiadása vonatkozásában, hogy készleteit a lopással szemben és az újonnan kiadott útiokmányokat a téves átruházással szemben védelmezze.

3.9 **Ajánlás. –** *A szerződő állam gépi olvasású útleveleibe, vízumaiba és egyéb hivatalos útiokmányaikba a választás szerint rendelkezésre álló egy, vagy több adattároló technológiát alkalmazva foglaljon be biometriai adatokat a gépi olvasású terület kiegészítése céljából, ahogyan azt a Doc 9303, Gépi Olvasású Útiokmányok kiadvány meghatározza. Az integrált aramkör chip-en tárolni szükséges adat ugyanaz, mint amit az adat oldalra kell nyomtatni, vagyis, a gépi olvasású területen tartalmazott adat, plusz a digitalizált fényképészeti kép. Az ujjlenyomat és az írisz képek választás szerinti lehetőségek azon szerződő állam számára, amely az útlevélben az arcképet egyéb biometrikai adattal kívánja kiegészíteni. A gépi olvasású úti okmányaiba biometriai adatok bedolgozó szerződő állam az adatokat az ISO/IEC 14443-al egyező, és az ICAO előírása szerint, a Logical Data Structure szerint programozott, kapcsolat nélküli integrált áramköri chip-en tárolja.*

D. – Útiokmányok

3.10 A szerződő állam, nem később, mint 2010. április 1., köteles elkezdeni a csak Gépi Olvasású, a Doc 9030, I. Részének előírásaival egyezésben lévő útlevél kiadást.

Megjegyzés.- E rendelkezés nem kívánja kizárni, hogy sürgős esetekben korlátozott érvényességű, géppel nem olvasható útlevél, vagy ideiglenes útiokmány legyen kiadható.

3.10.1 A 2005. November 24-e után kiadott géppel nem olvasható útlevelek esetében a szerződő állam köteles gondoskodni róla, hogy azok lejárati ideje 2015. November 24 előttre essék.

……….

I. – Útiokmány vizsgálat

3.31 A visszaélés és a csalás megakadályozása érdekében a szerződő állam köteles a légijármű üzemeltetőt segíteni az utas által bemutatott útiokmány értékelésében.

……….

3.33 A légijármű üzemeltető köteles a szükséges elővigyázatossági intézkedéseket megtenni a beszállítási ponton, hogy az utas rendelkezzen a tranzit és a célállomás által az e fejezetben leírt ellenőrzési célból előírt dokumentumokkal.

K. – Belépési eljárások és felelősségek

………..

3.46 A szerződő állam közhatóságai kötelesek bevonni minden meghamisított, utánzott, vagy csalárdan használt útiokmányt. A közhatóságok kötelesek bevonni a magát az útiokmány jogos tulajdonosának személyeként kiadó személy útiokmányait. Az ilyen okmányokat azonnal ki kell vonni a forgalomból és vissza kell juttatni a kiadóként megnevezett állam megfelelő hatóságaihoz, vagy azon állam állandó diplomáciai testületéhez.

3.47 **Ajánlás.** – *A szerződő állam, ahol ez megfelelő, előzetes utasinformáció rendszert vezessen be, amely kiterjed az útlevél, vagy vízum bizonyos adatainak indulást megelőző vételére, a részletek közhatóságokhoz történő elektronikus továbbítására és az ilyen adatok kockázat kezelés célú érkezést megelőző elemzésére az engedélyez meggyorsítása céljából. Az utas felvételkor a kezelési időtartam csökkentésére dokumentum olvasó készülékeket kell alkalmazni a gépi olvasású útiokmányban szereplő információ kinyeréséhez.*

……….

N. – A személyzet és a légijármű üzemeltető egyéb személyzetének azonosítása és belépése

…………

3.70 A CMC-k és egyéb hivatalos személyzet azonosító dokumentum kiadása felett megfelelő ellenőrző rendszert kell kialakítani a csalás megelőzése érdekében, például, kiadás előtti háttérellenőrzéssel és az alkalmazotti státusz igazolásával, az üres kártya készlet feletti ellenőrzéssel, és a kiadó személyzet tekintetében felelősségre vonási követelményekkel.

………..

4. FEJEZET - TEHERÁRU ÉS EGYÉB CIKKEK BELÉPÉSE ÉS KILÉPÉSE

A. - Általános rész

………

4.6 A hatékonyság javítása érdekében –ahol lehetséges- korszerű szűrő, vagy vizsgáló módszereket kell alkalmazni az import, vagy az export javak fizikai vizsgálatának segítésére.

………

5. FEJEZET – BE NEM BOCSÁTHATÓ ÉS KIUTASÍTOTT SZEMÉLYEK

………….

B. – Be nem bocsátható személyek

………….

5.8 A szerződő állam, ha oka van rá úgy vélni, hogy a be nem bocsátható személy eltávolításakor ellenállást fog kifejteni, köteles az illető légijármű üzemeltetőt a menetrend szerinti indulás előtt a lehető legkorábban úgy értesíteni, hogy a légijármű üzemeltető a járat védelme érdekében elővigyázatossági intézkedéseket tehessen.

………

C. – Kiutasított személyek

………

5.18 A kiutasított személyt felségterületéről eltávolító szerződő állam köteles vállalni az eltávolítással járó minden kötelezettséget, felelősséget és költséget.

KIVONAT A 10. ANNEXBŐL - LÉGIFORGALMI TÁVKÖZLÉS IV. KÖTET (FELDERÍTŐ RADAR ÉS ÜTKÖZÉS MEGELŐZŐ RENDSZER)

2. FEJEZET - ÁLTALANOS RÉSZ

………..

2.1 MÁSODLAGOS FELDERÍTŐ RADAR (SSR)

………..

2.1.4 "A" üzemmódú válasz kódok (információ impulzusok)

………..

2.1.4.2.1 A 7700-as kód a vészhelyzetben lévő légi-jármű felismerésére szolgál.

………..

2.1.4.2.3 A 7500-as kód a jogellenes cselekmény tárgyát képező légi-jármű felismerésére szolgál.

2.1.4.3 A földi telepítésű dekódoló készülékek tekintetében megfelelő módon kell biztosítani a 7500, a 7600 és a 7700, A üzemmódú kódok azonnali felismerését.

KIVONAT A 11. ANNEXBŐL - LÉGIFORGALMI SZOLGÁLATOK

2. FEJEZET - ÁLTALÁNOS RÉSZ

………….

2.22 A vészhelyzetben lévő légi-járműnek nyújtott szolgáltatás

2.22.1 A vészhelyzetben lévőnek tudott, vagy feltételezett légi-járműre, ideértve a jogellenes cselekmény tárgyát képező légi-járműveket is, maximális figyelmet kell fordítani és számukra maximális segítséget kell nyújtani, továbbá a többi légi-járművel szemben elsőbbséget kell részükre biztosítani, amint azt a körülmények szükségessé teszik.

Megjegyzés. – A megfelelő képességű adatlánc lehetőséggel és/vagy SSR válaszjel adóval felszerelt légi-jármű a fennálló vészhelyzet jelzésére berendezését az alábbiak szerint üzemeltetheti:

a) "A" Üzemmód, 7700-as kód, vagy

b) "A" Üzemmód, 7500-as kód; kimondottan a jogellenes cselekmény tényének jelzésére, vagy

c) aktivizálja az ADS megfelelő vészhelyzeti és/vagy sürgősségi lehetőségét, vagy

d) a CPDLC-n keresztül sugározza a megfelelő vészhelyzeti közleményt.

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2.22.2 Ha valamely légi-jármű jogellenes hatalomba vétele bekövetkezett, vagy az gyanítható, akkor az ATS egység köteles ezen légi-járműtől származó kérésékre azonnal reagálni. Továbbra is folyamatosan továbbítani kell a biztonságos repülés végrehajtásához tartozó információkat és minden repülési fázis végrehajtásának - különösen a légi-jármű biztonságos leszállásának - megkönnyítése érdekében, minden szükséges lépést meg kell tenni.

…………

5. FEJEZET - RIASZTÓSZOLGÁLAT

5.1 Alkalmazás

5.1.1 Riasztó szolgálatot kell biztosítani:

…………

c) Minden légi-jármű számára, amelyről tudott, vagy feltételezhető, hogy jogellenes cselekmény tárgyává vált.

………..

5.2 A mentés koordináló központ értesítése

5.2.1 Az 5.5.1-ben meghatározott eset kivételével, minden egyéb olyan körülményre való tekintet nélkül, amely az ilyen értesítést tanácsossá teheti, a légiforgalmi szolgálati egység az alábbiakkal összhangban haladéktalanul értesíteni köteles a mentés koordináló központot, amint valamely légi-járművet vészhelyzetben lévőnek ítél meg:

………..

b) Riasztási állapot, amikor:

………..

kivéve, ha a 1égi-jármű fedélzetén tartózkodók biztonságára vonatkozóan megnyugtató bizonyíték áll rendelkezésre, vagy amikor

4) Ismeretes, vagy feltételezhető, hogy a légi-jármű jogellenes cselekmény tárgya

……….

5.5 Az üzemeltető tájékoztatása

5.5.1 Ha a területi központ, vagy a repülés tájékoztató körzeti központ megítélése szerint valamely légi-jármű riasztási, vagy bizonytalansági állapotban van, akkor, ha megoldható, a mentés koordináló központ értesítése előtt köteles az üzemeltetőt tájékoztatni.

Megjegyzés. - Ha a légi-jármű kényszerhelyzeti állapotban van, a mentés koordináló központot az 5.2.1-el összhangban haladéktalanul értesíteni kell.

5.5.2 A területi irányító által, vagy a repülés tájékoztató központ által a mentés koordináló központnak továbbított minden információt késedelem nélkül el kell juttatni az üzemeltetőhöz is - amennyiben az lehetséges.

5.6 A vészhelyzetben lévő légi-jármű szomszédságában üzemelő légijármű számára adott tájékoztatás

5.6.1 Ha a légiforgalmi szolgálati egység megállapította, hogy valamely légi-jármű vészhelyzeti állapotban van, akkor, akkor az 5.6.2-ben előírtak kivételével, az érintett légi-jármű szomszédágában tartózkodónak tudott más légi-járműveket köteles leggyorsabban értesíteni a vészhelyzet természetéről.

5.6.2 A légi-forgalmi szolgálati egység, ha tudja, vagy feltételezi, hogy valamely légi-jármű jogellenes cselekmény tárgyává vált, akkor az ATS föld-levegő összeköttetésben ne tegyen utalást a vészhelyzet természetére, kivéve, ha erre az érintett légi-jármű összeköttetésében már utalt és, ha az ilyen utalás a helyzetet nem fogja súlyosbítani.

KIVONAT A 13. ANNEXBŐL - LÉGIJÁRMŰ BALESET ÉS ESEMÉNY KIVIZSGÁLÁS

5. FEJEZET - KIVIZSGÁLÁS

A KIVIZSGÁLÁS MEGSZERVEZÉSE ÉS LEBONYOLÍTÁSA

A KIVIZSGÁLÓ ÁLLAM FELELŐSSÉGE

A repülésvédelmi hatóságok értesítése

5.11 Ha a kivizsgálás során gyanítják, vagy ismeretessé válik az, hogy jogellenes cselekmény történt, akkor a vizsgálat felelős vezetőjének azonnal intézkednie kell, hogy biztosított legyen az érintett állam(ok) repü1ésvédelméért felelős hatósága(i)nak ilyen értelmű tájékoztatása.

KIVONAT A 14. ANNEXBŐL - REPÜLŐTEREK

I. KÖTET - *REPÜLŐTÉR TERVEZÉS ÉS ÜZEMELTETÉS*

3. FEJEZET - FIZIKAI JELLEMZŐK

3.14 Elkülönített légi-jármű állóhely

3.14.1 Elkülönített légi-jármű állóhelyet kell kialakítani, vagy a repülőtéri irányító tornyot tájékoztatni kell az olyan légi-jármű parkolására kijelölt alkalmas területről, vagy területekről, amely légi-járműről tudott, vagy feltételezett, hogy jogellenes cselekmény tárgya, vagy a repülőtér szokásos tevékenységétől egyéb okból el kell különíteni.

3.14.2 **Ajánlás.** - *Az eltérített légi-jármű állóhelyét a többi parkolóhelytől, épülettől, nyi1vános területtől, stb., a lehető legmesszebbre ke11 kijelölni, de 100 méternél semmi esetre sem kisebb távolságra. Az elkülönített á11óhe1y kijelölésekor ügyelni kell arra, hogy az ne földalatti közművek (mint pé1dáu1 gáz, üzemanyag, illetve amennyire ez megvalósítható, elektromos, vagy távközlési vezeték) felett helyezkedjen el.*

5. FEJEZET - NAVIGÁCIÓS LÁTJEL ESZKÖZÖK

5.3 Fényrendszer

5.3.20 Előtér térvilágítás

(lásd még 5.3.16.1 és 5.3.17.1)

Alka1mazás

5.3.23.11 **Ajánlás.** - *Előtéri térvilágító rendszert kell létrehozni az előtéren, a jégtelenítés/jegesedés gátlás létesítménynél és az éjszakai használatra tervezett minden kijelölt elkülönített légi-jármű állóhelyen.*

1. Megjegyzés. – Ha a jégtelenítő/jegesedés gátló létesítmény futópálya közvetlen közelségében helyezkedik el és a folyamatos térvilágítás a pilóták számára zavaró lehet, ott a létesítmény egyéb megvilágítási módjára lehet szükség.

2. Megjegyzés. - Az elkülönített légi-jármű állóhely kijelölésének követelményeit a 3.14 tartalmazza.

3. Megjegyzés. - Az előtéri vi1ágítás rendszerre vonatkozó útmutató az Aerodrome Design Manual *4. részében található.*

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8. FEJEZET - ELEKTROMOS RENDSZEREK

8.1 A léginavigációs létesítményekelektromos energia ellátó rendszerei

………..

Alkalmazás

8.1.10 **Ajánlás.** – *A következő repülőtéri létesítmények számára kell tartalék energia ellátást bell biztosítani, amely legalább az alábbiakban részletezett repülőtéri berendezések energia szükségleteinek kielégítésére képes az elsődleges energiaellátó rendszer meghibásodása esetén:*

……….

e) Alapvető védelmi fények, amennyiben azokat a 9.11-el összhangban biztosították;

……….

9. FEJEZET - REPÜLŐTÉR ÜZEMI SZOLGÁLATOK, BERENDEZÉSEK ÉS LÉTESÍTMÉNYEK

Repülőtéri vészhelyzeti tervezés

Általános rész

Bevezető megjegyzés. - A repülőtéri vészhelyzeti tervezés azt a folyamatot jelenti, amikor a repülőteret előkészítik a területén, vagy a környezetében bekövetkező vészhelyzetek esetére. A repülőtéri vészhelyzeti terv célkitűzése az, hogy minimálisra csökkentse a vészhelyzet következményeit, elsősorban az emberi élet megóvása és a légi-jármű üzemelés fenntartása érdekében. A repülőtéri vészhelyzeti terv előre kidolgozott együttműködési eljárásokat tartalmaz a különféle repülőtéri egységek (vagy szolgálatok) és azon környező közösségek azon egységeinek vészhelyzetben való ténykedésére, amelyek a ténykedésben segíthetnek. Az illetékes hatóság számára a repülőtéri vészhelyzeti tervezet kialakításához útmutató anyagot az Airport Service Manual *7. Része tartalmaz.*

9.1.1 A repülőtéren, az ott folyó légi-jármű üzemelésnek és egyéb tevékenységnek megfelelő repülőtéri vészhelyzeti tervet kell összeállítani.

9.1.2 A vészhelyzeti terv gondoskodjon a repülőtéren, vagy a repülőtér közvetlen környezetében bekövetkező vészhelyzetekben szükséges tevékenységek összehangolásáról.

Megjegyzés. - Példák a vészhelyzetre: légi-jármű vészhelyzetek, szabotázs - ideértve a bombafenyegetéseket is-, jogellenesen hatalomba kerített légi-járművek, veszélyes anyaggal előforduló események, épület tüzek és természeti katasztrófák.

9.1.3 A tervnek össze kell hangolnia minden egyes létező olyan egység tevékenységét vagy részvételét, amely az illetékes hatóság véleménye szerint a vészhelyzet felszámolásában segítségére lehet.

Megjegyzés. - A számba vehető egységek példái:

- *A repülőtéren: 1égiforgalmi irányító egységek, mentő-, tűzoltó szolgálatok, repülőtéri igazgatóság, betegszállító és egészségügyi szolgálatok, légi-jármű üzemeltetők, védelmi szolgálatok és a rendőrség;*

- *A repülőtéren kívül: tűzoltó állomások; rendőrség; betegszállító és egészségügyi szolgálatok, kórházak, honvédség és kikötő-, vagy parti őrség.*

9.1.4 **Ajánlás.** - *A terv a szükséges mértékben rendelkezzen a mentés koordináló központtal való együttműködésről és koordinációról.*

9.1.5 **Ajánlás.** - *A repülőtéri vészhelyzeti tervdokumentum minimum az alábbiakat tartalmazza:*

a) Vészhelyzetfajta, amelyre az előkészület megtörtént;

b) a tervben érdekelt szervek;

c) minden szerv, a vészhelyzeti irányító központ és a parancsnoki pont és szerepe, kitérve minden vészhelyzeti esetre;

d) Hivatalok személyek jegyzéke és telefonszámai, akikkel az adott vészhelyzetben a kapcsolatot fel kell venni; és

e) a repülőtér és közvetlen környezetének vonalhálós térképe

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Vészhelyzeti irányító központ és parancsnoki pont

9.1.7 **Ajánlás.** – *Vészhelyzetre kötött helyű vészhelyzeti irányító központ és mozgó parancsnoki pont álljon rendelkezésre.*

9.1.8 **Ajánlás.** – *A vészhelyzeti irányító központ a repülőtéri létesítmények szerves része kell, hogy legyen és legyen felelős a vészhelyzeti tevékenység átfogó összehangolásáért és általános irányításáért.*

9.1.9 **Ajánlás.** - *A parancsnoki pontnak szükség esetén a vészhelyzet helyszínére gyorsan kihelyezhető létesítménynek kell lenni és feladata a helyszínen ténykedő vészhelyzeti egységek helyszíni irányítása.*

9.1.10 **Ajánlás.** - *A vészhelyzeti irányító központ vezetésének felvételére egy személyt és a körülményektől függően egy másik személyt a parancsnoki pont élére a vezetés felvételére ki kell jelölni.*

Hírközlő rendszer

9.1.11 **Ajánlás.** - *A vészhelyzeti irányító központot és a parancsnoki pontot, valamint a résztvevő egységeket egymással összekötő megfelelő hírközlő hálózattal kell ellátni, a tervvel összhangban és a repülőtér sajátos követelményeinek megfelelően.*

Repülőtéri vészhelyzeti gyakorlat

9.1.12 A terv hatékonyságának fokozása érdekében a terv rendszeres kipróbálására és az eredmények értékelésére eljárásokat kell kidolgozni és az ezekre vonatkozó eljárásokat a tervnek tartalmaznia kell.

Megjegyzés. - A terv magában foglalja az összes résztvevő ügynökséget és az azokkal kapcsolatos eszközöket.

9.1.13 A tervet a következők végrehajtásával kell ellenőrizni:

a) Két évet meg nem haladó időközönként teljes mértékű repülőtéri vészhelyzeti gyakorlatokkal; és

b) Részleges vészhelyzeti gyakorlatokkal a közbeeső évek alatt annak biztosítása érdekében, hogy a teljes mértékű vészhelyzeti gyakorlatok során fellelt hiányosságokat kiigazítsák; és

ezután, vagy bármiféle tényleges vészhelyzetet követően, oly módon áttekintve, hogy az ilyen gyakorlatok során, vagy a tényleges vészhelyzetek alkalmával fellelt hiányosságokat megszüntessék.

Megjegyzés. - A teljes mértékű gyakorlatok célja biztosítani a terv megfelelőségét, hogy az a különféle vészhelyzet fajtákkal történő megbirkózáshoz alkalmas legyen. A részleges gyakorlatok célja biztosítani az egyedi résztvevő egységek ténykedésének és a terv összetevő elemeinek (mint például a hírközlő rendszer) megfelelőségét.

9.10 Elkerítés

Alkalmazás

……….

9.10.3 **Ajánlás.** - *Kerítést, vagy más, a célra megfelelő kor1át rendszert kell kiépíteni, amely az illetéktelen személyeknek a repülőtér nem nyilvános területeire figyelmetlenségből, vagy előre kitervelt szándékos behatolást hívatott megakadályozni.*

1. Megjegyzés - E rendelkezés célja biztosítani, hogy azokat a szennyvíz levezetőket, lefolyókat, alagutakat, stb.-ket elkerítsék, amelyeknél a behatolást meg kell akadályozni.

2. Megjegyzés. - Különleges intézkedések válhatnak szükségessé az illetéktelenek olyan futópályákra, vagy guruló utakhoz történő bejutásának megakadályozására, amelyek közforgalmi utakat kereszteznek.

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9.10.5 **Ajánlás.** - *A repülőtéren kívül elhelyezkedő, a po1gári repülés védelme tekintetében alapvető létesítményeket és földi eszközöket megfelelő védőberendezéssel kell ellátni illetéktelen személyek figyelmetlenségből, vagy előre kitervelt szándékos behatolásának megakadályozása érdekében.*

…………

Telepítés

9.10.7 **Ajánlás.** - *A kerítést vagy a korlátot úgy kell telepíteni, hogy az a repülőtér mozgási területét és a légi-járművek biztonságos üzemeléséhez szükséges egyéb, alapvető létesítményeket, vagy területeket a nagyközönség szármára nyitott területektől elkülönítse.*

……….

9.10.9 **Ajánlás.** - *Ahol nagyobb biztonságot vélnek szükségesnek, ott a kerítés, vagy a korlát mindkét oldala mentén szabad sávot kell létrehozni az őrszem munkájának megkönnyítésére és a területen való keresztülhatolás megnehezítésére. A repülőtér kerítésen belül mind a karbantartó személyzet, mind a védelmi őrök használatára a kerítés mentén szolgálati út biztosítása megfontolandó.*

9.11 Védelmi világítás

Ajánlás. - *Ha a nemzetközi polgári repülés és létesítményeinek védelme érdekében a repülőtéri kerítés, vagy korlát kivilágítását szükségesnek tartják, akkor azt a szükséges minimum szintű világítással kell kivilágítani. A lámpák elhelyezésénél figyelembe kell venni, hogy azok a kerítés, vagy a korlát mindkét oldalát megvilágítsák, elsősorban a behatolási pontoknál.*

KIVONAT A 18. ANNEXBŐL - VESZÉLYES ANYAGOK BIZTONSÁGOS LEGISZÁLLÍTÁSA

2. FEJEZET - ALKALMAZÁS

……………

2.2 Veszélyes anyagok technológiai utasítása

2.2.1 A szerződő állam köteles a szükséges intézkedéseket megtenni, hogy az ICAO Tanács által felállított eljárással egyezésben jóváhagyott, és időközönként kiadott és módosított *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284)-ben tartalmazott részletes rendelkezésekkel az egyezést megvalósítsa. A szerződő állam ugyancsak köteles a szükséges intézkedéseket megtenni a Technical Instructions bármely módosításával való egyezés megvalósítása érdekében, amely módosítás a Technical Instructions alkalmazhatóságának meghatározott érvényességi tartama során esetleg kiadásra kerülhet.

2.2.2 **Ajánlás.** – *A szerződő állam köteles az ICAO-t értesíteni a Technical Instructions, alkalmazásával kapcsolatban felmerülőt nehézségeiről, és arról, ha a Technical Instructions bármiféle módosítását szükségesnek tartja.*

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10. FEJEZET - KIKÉPZŐ PROGRAMOK LÉTREHOZÁSA

Veszélyes anyag kiképzési programot kell létrehozni és naprakészen tartani a Technical Instructions-ban szereplő rendelkezéseknek megfelelően.

KIVONAT A DOC 9284-BŐL - VESZÉLYES ANYAGOK BIZTONSÁGOSLÉGISZÁLLÍTÁSÁNAK TECHNOLÓGIAI UTASÍTÁSA

I. RÉSZ – ÁLTALÁNOS RÉSZ

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4. FEJEZET - KIKÉPZÉS

E fejezet részeit az AE 2, CA 18, HK 1 és az US 1 állami eltérések érintik; lásd az A-1 táblázatot.

4.1 KIKÉPZŐ PROGRAM LÉTREHOZÁSA

4.1.1 Veszélyes anyag alap és felfrissítő kiképzési programot kötelező létrehozni és fenntartani az alább felsoroltak által, vagy azok megbízásából:

……….

g) az utasak és poggyászaik védelmi ellenőrzésében résztvevő ügynökségek.

KIVONAT A LÉGINAVIGÁCIÓS SZOLGÁLATOK ELJÁRÁSAIBÓL -A LÉGIFORGALOM KEZELÉSE (Doc 4444)

5. FEJEZET - ELKÜLÖNÍTÉSI MÓDSZEREK ÉS MINIMUMOK

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5.2 AZ ELLENŐRZÖTT FORGALOM ELKÜLÖNÍTÉSÉRE VONATKOZÓ RENDELKEZÉSEK

……….

5.2.1.2 Az előírt minimumnál nagyobb elkülönítést kell alkalmazni minden esetben, amikor kivételes körülmények, mint például jogellenes beavatkozás, vagy navigációs nehézségek fokozott óvatosságra intenek. Mindezt az összes kapcsolódó tényező gondos mérlegelésével kell alkalmazni, kerülve a forgalom áramlásának a túlzott elkülönítéssel történő megzavarását.

Megjegyzés. – A légi-járművel történt jogellenes beavatkozás kivételes körülményt képez, amely szükségessé teheti, hogy a jogellenes cselekmény tárgyát képező légi-járművet az előírt minimumnál nagyobb mértékben különítsék el a többi légi-járműtől.

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15. FEJEZET - VÉSZHELYZETEKKEL, ÖSSZEKÖTTETÉS MEGSZAKADÁSI ESETEKKEL ÉS NEM SZOKVÁNYOS ESETEKKEL KAPCSOLATOS ELJÁRÁSOK

15.1 VÉSZHELYZETI ELJÁRÁSOK

15.1.1 Általános rész

15.1.1.1 Pontos, részletes eljárások kidolgozását az egyes vészhelyzetek körülményeinek kü1önbözősége kizárja. Az alábbiakban vázolt útmutatás célja a légi-forgalmi szolgálat személyzete számára irányvonalat biztosítani. A 1égiforga1mi irányító egységek teljes és tökéletes koordinációt kötelesek egymással fenntartani, szemé1yzeteik pedig a vészhelyzeteket a legjobb belátásuk szerint kezeljék.

1. Megjegyzés. – A 8. Fejezet 8.8.1 pontja tartalmazza a vész- és nem szokványos körülmények között alkalmazandó kiegészítő radar eljárásokat.

2. Megjegyzés. – Ha a vészhelyzetbe került légi-jármű pilótáját az ATS előzőleg arra utasította, hogy válaszjel adóját egy meghatározott kód beállítással működtesse, akkor általában ezt a kódot kell megtartani, kivéve ha - különleges körülmények között- a pilóta másképp határozott, vagy másként tanácsolták számára. Ha az ATC nem kérte egy adott kód beállítására, akkor a pilóta válaszjel adóját A üzemmódra és 7700-as kódra állítsa.

15.1.1.2 Ha a légi-jármű vészhelyzetet nyilvánított, az ATS egység a következők szerint köteles a megfelelő és vonatkozó lépéseket megtenni:

a) kivéve, a légi-jármű személyzete egyértelműen bejelentette, vagy egyéb módon ismertté vált, tegyen meg minden szükséges lépést, amely révén bizonyosságot szerezhet a légi-jármű azonosítójáról és típusáról, a vészhelyzet fajtájáról, a személyzet szándékáról, valamint a légi-jármű tartózkodási helyéről és repülési magasságáról;

b) döntsön a nyújtható segítség legmegfelelőbb fajtájáról;

c) vegye sorra az összes olyan ATS egység, vagy egyéb szolgálat lehetőségeit, amelyek a légi-jármű számára képesek segítséget nyújtani;

d) a repülő személyzet számára adjon meg minden Ő általuk kért információt, valamint minden vonatkozó további tájékoztatást, mint például a megfelelő repülőterek részletei, minimum biztonságos repülési magasságok, időjárási adatok;

e) az üzemeltetőtől, vagy a repülő személyzettől szerezze be az alábbiak közül megfelelő adatokat: a fedélzeten tartózkodók száma, az üzemanyag maradék mennyisége, veszélyes anyagok esetleges jelenléte és annak természete; és

f) a helyi utasításokban előírtak szerint értesítse a megfelelő ATS egységeket és hatóságokat.

15.1.1.3 Lehetőség szerint kerülni kell a rádió frekvencia és az SSR kód változtatásokat és rendszerint csak akkor tenni ilyent, ha és amikor az érintett légi-jármű számára magasabb szintű szolgáltatás biztosítható. A hajtómű meghibásodással küzdő légi-jármű számára adott manőverezési utasításokat a lehető legteljesebb mértékben kerülni kell. Ha az megfelelő, akkor a vészhelyzetben lévő légi-jármű környezetében üzemelő többi légijárművet a körülményekről tájékoztatni kell.

Megjegyzés. – A 15.1.1.2 e)-ben felsorolt adatok megszerzése érdekében a repülő személyzetet csak a leglényegesebb adatok beszerzésére és csak akkor vegyék igénybe, ha az üzemeltetőtől, vagy egyéb forrásoktól azok nem szerezhetők be.

15.1.2 Elsőbbség

Ha a légi-járműről tudott, vagy feltételezett, hogy vészhelyzetben van, ide értve a jogellenes beavatkozás esetét is, a többi légi-járművel szemben számára elsőbbséget kell biztosítani.

15.1.3 Jogellenes beavatkozás és a légi-jármű bombával való fenyegetése

15.1.3.1 A légiforgalmi szolgálatok személyzetét fel kell készíteni a légi-járművet ért jogellenes cselekményekre utaló minden jel felismerésére.

15.1.3.2 Ha feltételezhető, hogy a légi-jármű jogellenes cselekmény tárgyát képezi és az SSR A üzemmód 7500 és 7700-as kód automatikus megkülönböztető kijelzése nem biztosított, a radar irányító bármiféle gyanújának hitelesítése érdekében kísérelje meg az SSR dekódolót A üzemmódon 7500-as kódra, majd 7700-as kódra állítani.

Megjegyzés. - Az SSR válaszjel adóval felszerelt légi-járműtől elvárt, hogy kifejezetten a fennálló jogellenes cselekmény tényének jelzésére válaszjel adóját "A" üzemmódban a 7500-as kód beállításával üzemeltesse. A légi-jármű válaszjel adóját üzemeltetheti "A" üzemmódon 7700-as kód beállítással is, annak jelzésére, hogy súlyos és azonnali veszély fenyegeti és sürgős segítséget kér.

15.1.3.3 Bármikor, ha a légi-járművel szembeni jogellenes cselekmény ténye vá1ik ismertté, vagy az feltételezető, illetve bombával való fenyegetés vételekor az ATS egység köteles a légi-jármű kérésére vagy várható igényeire azonna1 reagálni, ide értve a járat útvonalával és a tervezett leszállás és miniden egyes repülőterével kapcsolatban a légi-navigációs berendezésekre, eljárásokra és szolgálatokra vonatkozó kéréseket is, és mindezen ténykedését a szükség megkívánta módon köteles végrehajtani, hogy a járat valamennyi szakaszának lebonyolítását megkönnyítse.

15.1.3.3.1 Az ATS egység köteles továbbá:

a) a járat biztonságos végrehajtásához tartozó információkat továbbítani és folytatni azok továbbítását anélkül, hogy a légi-járműtől választ várna;

b) a rendelkezésre álló eszközökkel figyelni és térképre vinni a járat haladását, továbbá összehangolni az irányítás átadását a szomszédos ATS egységeknek anélkül, hogy a légi-járműtől rádió adást, vagy egyéb reagálást kérne, kivéve, ha az illető légi-járművel az összeköttetés fennmaradt;

c) tájékoztatni a megfelelő ATS egységeket és a tájékoztatást folyamatosan fenntartani, beleértve a szomszédos FIR-ekben lévőket, amelyek a járat haladásával érintettekké válhatnak;

Megjegyzés. – E rendelkezést alkalmazva, a repülés előrehaladását érinthető minden tényezőt figyelembe kell venni, beleértve a rendelkezésre álló üzemanyaggal repülhető időtartamot és az útvonal és a célállomás hirtelen megváltoztatását. A cél az, hogy mindegyik ATS egységet a körülmények között a lehető leghamarabb megfelelő információval lássák el arról, hogy a légi-jármű feltételezések szerint, vagy várhatóan behatol felelősségi légterébe.

d) értesíteni:

1) az üzemeltetőt, vagy annak kijelölt képviselőjét;

2) a megfelelő kutatás összehangoló központot a megfelelő riasztási eljárással egyezésben;

3) a kijelölt védelmi hatóságot;

Megjegyzés. – Feltételezett, hogy a kijelölt védelmi hatóság és/vagy az üzemeltető ezt követően az előre felépített eljárásnak megfelelően értesíteni fogja a többi érdekelt felet.

e) a légi-jármű és a kijelölt hatóságok között továbbítja a jogellenes cselekmény körülményeihez kapcsolódó megfelelő üzeneteket.

15.1.3.4 Ha fenyegetés érkezik, amely légi-jármű fedélzetére helyezett bombáról, vagy más robbanószerkezetről árulkodik, akkor a következő kiegészítő intézkedéseket kell alkalmazni. A fenyegetési információt vevő ATS egység:

a) ha közvetlen rádiókapcsolatban áll a személyzettel, akkor késedelem nélkül tájékoztassa őket a fenyegetésről és a fenyegetést övező körülményekről; vagy

b) ha nincs közvetlen rádiókapcsolatban a légi-járművel, akkor a többi ATS egységen, vagy egyéb csatornák használatával a leggyorsabb módszerrel tájékoztassa a repülő személyzetet.

15.1.3.5 A légi-járművel kapcsolatban lévő ATS egység győződjön meg a repülő személyzet szándékáról és e szándékokról tájékoztassa az illető járattal összefüggésbe kerülhető többi ATS egységet.

15.1.3.6 Az illető légi-járművet a legsegítőkészebben kell kezelni, miközben –a lehetséges legteljesebb mértékben- gondoskodni kell a többi légi-jármű biztonságáról és hogy személyek és földi létesítmények ne legyenek veszélyeztetve.

15.1.3.7 A levegőben tartózkodó légi-jármű kérése szerinti új célállomás felé az engedély módosítást késedelem nélkül ki kell adni. A külső nyomás, illetve a kabin nyomása közötti nyomás különbség kiegyenlítése céljából a repülő személyzet emelkedésre, vagy süllyedésre vonatkozó kérelmét amint lehetséges engedélyezni kell.

15.1.3.8 A talajon tartózkodó légi-járművet tájékoztatni kell, hogy a többi légi-járműtől és a létesítményektől maradjon a lehető legtávolabb és – ha ez vonatkozik rá – hagyja el a futópályát. A légi-járművet utasítani kell, hogy a helyi utasításoknak megfelelően guruljon a kijelölt, vagy elkülönített állóhelyre. Ha a repülő személyzet az utasokat és a személyzetet azonnal kiszállíttatja, akkor a többi légi-járművet, gépjárművet és személyeket a fenyegetett légi-járműtől biztonságos távolságban kell tartani.

15.1.3.9 Az ATS személyzete ne adjon tanácsot, vagy javaslatot arra, hogy a repülő személyzet mit tegyen egy robbanó eszköz esetében.

15.1.3.10 Az ismerten, vagy feltételezetten jogellenes cselekmény alatt álló, vagy egyéb más okból a repülőtér szokásos tevékenységétől elkülöníteni szükséges légi-járművet a kijelölt elkülönített állóhelyre kell irányítani. Ha ilyen elkülönített légi-jármű állóhely nincs kijelölve, vagy, ha a kijelölt parkolóhely nem vehető igénybe, akkor a légi-járművet olyan területen lévő állóhelyre kell irányítani, amely területeket a repülőtéri hatóság előzetes engedélyével választottak ki. A gurulási engedélyben meg kell nevezni az állóhelyhez vezető követendő útvonalat. Ezt a guruló útvonalat úgy kell megválasztani, hogy az a repülőtéren található nagyközönség, más légi-jármű és létesítmény biztonságát legkevésbé tegye kockára.

Megjegyzés. - Lás d a 14. Annex I. Kötet 3. Fejezetét.

KIVONAT A LÉGINAVIGÁCIÓS SZOLGÁLATOK ELJÁRÁSAIBÓL LÉGIJÁRMŰ ÜZEMELÉS (Doc 8168), I. KÖTET - *REPÜLÉSI ELJÁRÁSOK*

VIII. RÉSZ - MÁSODLAGOS FELDERITŐ RADAR (SSR) VÁLASZJELADÓ ÜIZEMELTETÉSI ELJÁRÁSOK

1.FEJEZET - A VÁLASZJELADÓK MŰKÖDTETÉSE

………….

1.4 VÉSZHELYZETI ELJÁRÁSOK

1.4. 1 Vészhelyzetbe került 1égi-jármű pilótája köteles transzponderjét 'A' üzemmódra és 7700 kódra állítani, kivéve, ha az ATC előzetesen más, meghatározott kód beállítására utasította. Ez utóbbi esetben a pilóta tartsa a meghatározott kódot, kivéve, ha az ATC más utasítást ad.

1.4.2 Az 1.4.1-ben közölt eljárás ellenére a pilóta bármikor beállíthatja az "A" üzemmód 7700-as kódot, ha oka van rá azt vélni, hogy ez a leghelyesebb lépés.

…………

1.6 JOGELLENES CSELEKMÉNY A LEVEGŐBEN TARTÓZKODÓ LÉGI-JÁRMŰVÖN

1.6.1 Ha a légi-járművet repülés közben jogellenes cse1ekmény érné, akkor a 1égi-jármű parancsnok pilótája törekedjen arra, hogy válasz jeladóját "A" üzemmódra és 7500-as kódra állítsa be a helyzet jelzése érdekében, kivéve, ha a körülmények a 7700-as kód használatát követeli meg.

1.6.2 Ha az ’A' üzemmódot és 7500-as kódot a repülőgép vezető állított be és ezt követően az ATC az 1.1.5-el összhangban kéri a beállított kód visszaigazolását, akkor a körülményektől függően, a parancsnok pilóta nyugtázza azt, vagy egyáltalán ne válaszoljon.

Megjegyzés. - A parancsnok pilóta vá1aszának hiányát az ATC úgy értékeli, mint annak jelzését, hogy a 7500-as kód használata nem véletlen téves kód beállítás eredménye.

-VÉGE –

ANNEX 18.
Veszélyes áruk biztonságos légiszállítása

3. kiadás – 2001. július
8. módosítással

A Nemzetközi Polgári Repülésről szóló Egyezményhez
Ez a kiadás magában foglal a Tanács által 2001 március 8. előtt elfogadott minden módosítást és 2001 november 1-től a 18. Annex minden korábbi kiadásának helyébe lép.

A szabványok és az ajánlott gyakorlatok alkalmazási eljárásaira vonatkozó tájékoztatás az Előszóban és az egyes Fejezetek vonatkozó záradékaiban olvasható.

Nemzetközi Polgári Repülési Szervezet

ICAO

MÓDOSÍTÁSOK

A módosítások kiadását az *ICAO Journal* és *az ICAO Kiadványok és Audio-vizuális Kiképzési segédletek Katalógusá*nak havi kiegészítései rendszeresen közlik, a jelen Kiadvány tulajdonosai kísérjék ezeket figyelemmel. Az alábbi táblázat a módosítások nyilvántartására szolgál.

MÓDOSÍTÁSOK ÉS HELYESBÍTÉSEK JEGYZÉKE

MÓDOSÍTÁSOK			
Sorszám	Alkalmazás dátuma	Beépítés dátuma	Beépítette
1-6	E kiadásba belefoglalva		
7. módosítás (a Tanács által 2003 február 24-én elfogadva) Cserelapok (iii), (vii), 2-2 és 9-1	2003. július 14.	2003. november 27.	
8. módosítás (a Tanács által 2005 február 16-án elfogadva) Cserelapok (iii), (viii),9-1, 12-1 és 13-1	2005. július 11.	2005. november 24.	

TARTALOMJEGYZÉK

ELŐSZÓ

Történeti háttér

A jelen Annex szövegét a Légi-navigációs Bizottság dolgozta ki a szerződő államok részéről kinyilvánított igény kielégítése céljából, miszerint szükség van a veszélyes anyagok nemzetközi megegyezésen alapuló biztonságos légi-szállítását megszabó utasítások kidolgozására. Annak érdekében, hogy összhang alakuljon ki a veszélyes anyagok más szállítási módozatokra vonatkozó szabályzataival, a jelen Annex rendelkezései egyrészt az Egyesült Nemzetek Szervezete Veszélyes Anyag Szállítmányozási Szakértő Bizottsága által kidolgozott "Ajánlások a veszélyes anyagok szállítására", másrészt a Nemzetközi Atomenergia Ügynökség által kidolgozott "Radioaktív anyagok biztonságos szállítása" előírásokra alapozódnak.

Összefüggés a "*Veszélyes Anyagok Biztonságos Légi-szállításának Technológiai Utasíta"-val (*Doc 9284)

A 18. Annex előírásai a veszélyes anyagok nemzetközi légi-szállítását szabályozzák. Ezen Annex általános előírásait a Veszélyes Anyagok Biztonságos Légi-szállításának Technológiai Utasításában (Doc 9284) szereplő részletes eljárások fejtik ki.

A Szerződő Államok Ténykedése

Az eltérések bejelentése. Felhívjuk a szerződő állam figyelmét az Egyezmény 38. cikkelyéből fakadó kötelezettségére, mely értelmében a szerződő állam köteles a szervezet számára bejelenteni minden olyan eltérést, amelyek nemzeti előírásai és gyakorlatai, valamint a jelen Annex-ben és annak bármely módosításában található nemzetközi szabványok között fennáll. A szerződő államot felkérjük, hogy ezt a bejelentést a jelen Annex-ben és annak bármely módosításában található ajánlott gyakorlatoktól történő eltérésekre is terjessze ki, ha az ilyen eltérések bejelentése a légi-navigáció biztonságra nézve fontos. Ezen kívül, felkérjük a szerződő államot arra is, hogy a szervezetet folyamatosan tájékoztassa az esetleg később keletkező eltérésekről, illetve a korábban bejelentett eltérés visszavonásáról is. Jelen Annex minden új módosításának elfogadása után a szerződő államnak azonnal külön felkérést küldünk az eltérés bejelentése céljából.

Felhívjuk az államok figyelmét a 15. Annex rendelkezéseire is, amely az államoknak az Egyezmény 38. cikkelyéből fakadó kötelezettségén kívül előírja, hogy a nemzeti előírások és gyakorlatok, valamint a vonatkozó ICAO szabványok és ajánlott gyakorlatok közötti eltéréseket a légiforgalmi tájékoztató szolgálat útján közzé kell tenni.

A jelen Annex 2.2.1 pontjának különleges esetével kapcsolatban meg kell jegyezni, hogy az államoktól csak akkor várjuk el az eltérés bejelentését, ha a Technológiai Utasítás kötelező jellegét képtelenek elfogadni. A Technológiai Utasítás részletes előírásaitól való és az Utasítás szövegében közzé teendő eltéréseket az ICAO számára be kell jelenteni; ezt a bejelentési kötelezettséget a jelen Annex 2.5 szakasza írja elő. A Technológiai Utasítástól való és a fentiek szerint részletezett eltéréseket és egyéb más eltéréseket a jelen Annex kiegészítő jegyzékben nem fogja közölni, továbbá, azokat nem szükséges a 15. Annex előírásai szerint közzétenni.

A tájékoztatás közzététele. Az ebben az Annexben előírt szabványoknak megfelelően biztosított légijármű üzemeltetést érintő létesítmények, szolgálatok és eljárások létesítéséről, megszüntetéséről, vagy módosításáról szóló tájékoztatást a 15. Annex előírásainak megfelelően kell közzétenni és érvénybe léptetni.

Az Annex alkotóelemeinek jogállása

Egy Annex az alábbi alkotóelemekből áll, habár nem minden elem található meg szükségképpen minden Annex-ben. Az egyes alkotóelemek az alábbiakban feltüntetett jogállással rendelkeznek:
1. A szoros értelemben vett Annex-et alkotó anyag:

a) Szabványok és ajánlott gyakorlatok, amelyeket a Tanács az Egyezmény rendelkezései értelmében elfogadott. Ezek meghatározása a következő:

Szabvány: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága és rendszeressége szempontjából szükségesnek ismerték el és, amelyhez a szerződő államok az Egyezmény szerint alkalmazkodni fog, illetőleg amelyek teljesítésének lehetetlensége esetén a Tanács értesítése a 38. cikkely értelmében kötelező.

Ajánlott gyakorlat: fizikai jellemzőkre, kialakításra, anyagra, teljesítményre, személyzetre, vagy eljárásra vonatkozó minden olyan kikötés, amelynek egységes alkalmazását a nemzetközi repülés biztonsága, rendszeressége és hatékony lebonyolítása szempontjából kívánatosnak ismerték el és, amelyhez alkalmazkodni a szerződő állam az Egyezmény értelmében törekedni fog.

b) *Függelék:* kényelmi szempontból külön csoportosított anyagot tartalmaz, de a Tanács által elfogadott szabványok és ajánlott gyakorlatok részét képezi.

c) *Meghatározások:* A szabványokban és ajánlott gyakorlatokban használt, elfogadott szótári jelentés híjján önmagát nem értelmező kifejezések meghatározásai. A meghatározás független jogállással nem rendelkezik, de minden olyan szabványnak és ajánlott gyakorlatnak, amelyben a kifejezést használják, lényeges része, mivel a kifejezés értelmének megváltoztatása hatással volna az előírásra is.

d) *Táblázatok és ábrák* (Tables and figures): szabvány, vagy az ajánlott eljárás szövege által hivatkozott és valamely szabványhoz, vagy ajánlott gyakorlathoz kiegészítő, vagy szemléltető anyagot tartalmazó részek. A velük kapcsolatos szabvány, vagy ajánlott gyakorlat részét képezik és jogállásuk azokéval egyező.

2.- A Tanács által a szabványokkal és ajánlott gyakorlatokkal (SARPS) együttes közzétételre jóváhagyott anyag:

a) *Előszó:* a Tanács tevékenységén alapuló történeti áttekintést és magyarázó jellegű anyagot tartalmaz, valamint a szabványok és ajánlott gyakorlatok alkalmazására vonatkozóan az államok részére magyarázattal szolgál, az Egyezményből és az elfogadási határozatból eredő kötelezettségeikhez.

b) *Bevezető rész:* az Annex részeinek, fejezeteinek, vagy szakaszainak elején szereplő, a szöveg alkalmazásának megértését segítő magyarázó jellegű anyagot tartalmazó rész.

c) *Megjegyzések*: ahol szükséges, a szövegbe beépített, de a szabvány és az ajánlott gyakorlat részét nem képező, az érintett szabvánnyal és ajánlott gyakorlattal kapcsolatban tárgyi felvilágosítással, vagy hivatkozással szolgáló anyag.

d) *Melléklet:* a szabványokat és az ajánlott gyakorlatokat kiegészítő, avagy ezek alkalmazásához útmutatóul szolgáló anyag.

A nyelv kiválasztása

Ezt az Annex-et hat nyelven, angolul, arabul, kínaiul, franciául, spanyolul és oroszul fogadták el. A szerződő államot felkérjük, hogy a hazai bevezetés céljára és más, az Egyezményben foglalt célokra ezen szövegváltozatok valamelyikét válassza ki -akár közvetlenül felhasználva, akár a nemzeti nyelvre lefordítva azt, továbbá, a választott megoldásról értesítse a Szervezetet.

Szerkesztési gyakorlat

Annak érdekében, hogy minden alkotórész jogállása első pillantásra szembetűnjön, az alábbi gyakorlatot alkalmaztuk: a *szabványokat* vékony álló betűkkel nyomtattuk, az *ajánlott gyakorlatokat* vékony dőlt betűkkel nyomtattuk. Az ajánlás esetében a jogállást vastag álló betűvel szedett **Ajánlás** szóval jelztük. A *megjegyzések*et vékony dőlt betűvel szedtük, jogállásukat a dőlt betűvel szedett *Megjegyzés* címszó jelzi.

Az angol szövegben a követelmények leírásánál az alábbi szerkesztői gyakorlatot követtük: a szabványok esetében a kell (shall), és az ajánlott eljárásokban pedig a szükséges (should) szavakat alkalmaztuk.

A jelen dokumentum bármely számmal azonosított részére történő utalás magában foglalja az adott rész alpontjait is.

„A” Táblázat - a 18. Annex módosításai

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva* *Hatályba lép* *Alkalmazandó*
1. Kiadás	A Légi-navigációs Bizottság Tanulmánya		1981. jún. 26. 1983. jan. 1. 1984. jan. 1.
1.	A Veszélyes Anyagok Munkabizottság 6. ülése	Különféle módosítások annak érdekében, hogy egyezés jöjjön létre az Egyesült Nemzetek szakértői bizottsága és az IAEA ajánlásai között	1982. nov.26. 1983. már.26. 1984. jan. 1.
2.	A Veszélyes Anyagok Munkabizottság 5., 6. és 7. ülése	A “Gyűjtő csomagolás” és az “egység rakodóeszköz” meghatározás pontosítása. A csomag és csomagolás meghatározások egységessé tétele az Egyesült Nemzetek Szakértői Bizottságának ajánlásaival. Újabb szakasz beiktatása, amely a repülőtérre, vagy repülőtérről történő felszíni szállításra vonatkozik. Módosították azt a követelményt, hogy a parancsnok pilótát tájékoztatni kell, e szerint az új szöveg azt is tartalmazza, hogy ezt a tájékoztatást mikor kell megadni.	1983. jún. 1. 1983. okt. 1. 1984. jan. 1.
3.	A Veszélyes Anyagok Munkabizottság 8. ülése	A felmentés adhatóság körülményeinek tisztázása. A mérgező és fertőző anyagok állatoktól és élelmiszerektől való elkülönítési követelményeinek tisztázása.	1985. már.25. 1985. júl. 29. 1986. jan. 1.
4. (2. Kiadás)	A Veszélyes Anyagok Munkabizottság 11. ülése	A 18. Annex rendelkezéseinek általános egyszerűsítése a technológiai részletek eltávolítása révén. Különféle rendelkezések különféle módosítása.	1989. feb. 24. 1989. Júl. 23. 1989 nov 16.

Módosítás	*Forrása(i)*	*Tárgya(i)*	*Jóváhagyva Hatályba lép Alkalmazandó*
5.	A Veszélyes Anyagok Munkabizottság 14. és 16. ülése	Az állami felelősség nyomatékosítása, miszerint a Veszélyes Anyagok Biztonságos Légi-szállításának Technológiai Utasítása (Doc 9284) bármiféle módosítása esetén felelős az egyezés megvalósítását biztosítani. Az utas és a repülőgép személyzet által vitt veszélyes anyagokra vonatkozó kivételek egyértelműbbé tétele.	1999. már.10. 1999. Júl. 19. 1999. nov. 4.
6 (3. Kiadás)	A Veszélyes Anyagok Munkabizottság 17. ülése és a 6. Annex I. kötet 25. módosítása	a) a következő meghatározások módosítása: veszélyes anyagok, személyzeti tag és parancsnok pilóta; b) azon rendelkezés módosítása, miszerint az átrepülendő állam különleges körülmények között adjon felmentést, elősegítve a veszélyes anyag szállítást a területe felett átrepülő repülőgépek fedélzetén; c) a csomagolási rendelkezések összhangba hozatala a Technológia Utasításban szereplőkkel; d) rendelkezések bevezetése azon követelmény kezelésére, miszerint a veszélyes anyagokat a Technológiai Utasításban szereplőkkel összhangban kell berakodni és tárolni; e) azon rendelkezés módosítása, amely az utasok tájékoztatásának teljes felelősségét az államra terheli; f) a rendelkezések módosítása annak biztosítása érdekében, hogy a vészhelyzeti műveleti személyzet baleset, vagy esemény alkalmával késedelem nélkül kapjon tájékoztatást a légijármű fedélzetén rakományként szállított veszélyes anyagokról; g) a rendelkezések módosítása, hogy fokozzák az államok közötti együttműködést azon szállítmányozókkal szemben teendő lépések tekintetében, amely szállítmányozók szándékosan megsértik a veszélyes anyag szállítási előírásokat; és h) a pilótára vonatkozó azon rendelkezések módosítása, miszerint vészhelyzet esetén tájékoztatást kell biztosítania a fedélzeten lévő veszélyes anyagokról.	2001. már. 7. 2001. júl.16. 2001. nov. 1.
7	A Veszélyes Anyag Munkabizottság tizennyolcadik találkozója	a)a veszélyes anyagért felelős nemzeti hatóság részéről az ICAO értesítése b)veszélyes anyagra vonatkozó vészhelyzeti reagálási tájékoztatás biztosítása	2003 február 2 2003 július 14 2003 november 27
8	A veszélyes Anyag Panel tizenkilence-dik találkozója	a) a 9.6.1 pont finomítása annak egyértelműsítése érdekében, hogy veszélyes anyag jelenlétéről csak akkor kell jelentést tenni, ha súlyos esemény történt, amelyben veszélyes anyag valószínűleg érintve volt b) Új, 13. Fejezet létrehozása előírva az államnak, hogy alakítson ki veszélyes anyagokkal kapcsolatos védelmi intézkedéseket.	2005 február 16. 2005 július 11 2005 novembe 14.

NEMZETKÖZI SZABVÁNYOK ÉS AJÁNLOTT GYAKORLATOK

1. FEJEZET - MEGHATÁROZÁSOK

A jelen Annexben használt alábbi kifejezések a következő jelentéssel bírnak:

Áruszállító légijármű (Cargo aircraft) – utasszállító légijármű kivételével, termékeket és javakat szállító minden egyéb légijármű

Küldemény (Consignment) – egy, vagy több veszélyes anyagot tartalmazó csomag, amelye(ke)t egy üzemeltető egyetlen feladótól egy időpontban egy átvevőhelyen egy egységkénti szállításra és egyetlen címzettnek szóló egyazon rendeltetési helyű szállításhoz vállal fel.

A személyzet tagja (crew member) – az üzemeltető által a légijárművön a repülési munkaidő alatt szolgálat teljesítésére kijelölt személy.

Veszélyes anyagok (dangerous goods) – olyan cikkek, vagy anyagok, amelyek légi-szállításuk során az egészségre, a biztonságra, javakra, vagy a környezetre jelentős veszély lehetőséget rejtenek magukban, továbbá, amelye(ke)t a Technológiai Utasítás listája felsorol, avagy amelye(ke)t eme Utasítással összhangban osztályoztak.

Veszélyes anyaggal történt baleset (dangerous goods acident) – veszélyes anyagok légi-szállításával összefüggő és azzal kapcsolatba hozható eset, amely halálos, vagy súlyos sérülést, illetve tetemes anyagi kárt okoz.

Veszélyes anyaggal történt esemény (dangerous goods incident) - veszélyes anyagok légi-szállításával összefüggő és azzal kapcsolatba hozható eset, nem szükségszerűen a légijármű fedélzetén bekövetkező, a veszélyes anyaggal történt balesettől eltérő eset, aminek eredménye személyi sérülés, anyagi javak károsodása, tűz, törés, kiloccsanás, folyadékszivárgás, vagy radioaktív sugárzás, vagy egyéb bizonyíték arra vonatkozóan, hogy a csomagolóeszköz egységessége megszűnt. Veszélyes anyaggal összefüggő bármilyen eseményt, amely a légijárművet, vagy a fedélzeten tartózkodókat komolyan veszélyezteti, veszélyes anyaggal történt eseményként kell kezelni.

Kivétel (exeption) – a jelen Annex egy rendelkezése, amely a veszélyes anyagok egy részét az egyébként ezekre az anyagokra vonatkozó rendelkezések alól kizárja.

Felmentés (exemption) – az illetékes nemzeti hatóság által kibocsátott engedély, amely felmentést biztosít a jelen Annex rendelkezései alól.

Repülő személyzeti tag (flight crew member) – szakszolgálati engedéllyel rendelkező személyzeti tag, akit a légijárműnek repülési munkaidő alatti működtetéséhez lényeges feladatokkal bíztak meg.

Összeférhetetlen (incompatible) – azon veszélyes anyagok jellemzésére szolgál, amelyek ha egymással összekeverednek, hajlamosak arra, hogy veszélyes mértékű hőt, vagy gázt fejlesszenek, illetve, hogy valamilyen korrodáló anyagot hozzanak létre.

Üzemeltető (operator) – légijármű üzemeltetéssel foglalkozó, vagy arra vállalkozó személy, szervezet, vagy vállalat.

Gyűjtőcsomag (overpack) – egy egyedi feladó által a kezelés és tárolás kényelmesebbé tétele érdekében két, vagy több csomag egybeerősítésére használt burkolóeszköz.

Megjegyzés. – ez a meghatározás nem az egység-rakodóeszközre vonatkozik.

Csomag (package) – a csomagolási tevékenység végeredménye, amely a csomagoló eszközből és az abba csomagolt, szállításra előkészített tartalomból tevődik össze.

Csomagolóanyag (packaging) – a tárolóeszköz és annak minden egyes alkotóeleme, amely elem ahhoz szükséges, hogy a tárolóeszköz a tárló szerepét betölthesse.

Megjegyzés. – A radioaktív anyagok tekintetében lásd a Technológiai Utasítás *2. Részének 7.2 pontját.*

Utasszállító légijármű (passenger aircraft) – légijármű, amely a személyzet tagjain, az üzemeltető szolgálati rendeltetésű alkalmazottján, az illetékes nemzeti hatóság jogosított megbízottján, vagy a szállítmányt, vagy egyéb küldeményt kísérőn kívül bármely más személyt szállít.

Parancsnok-pilóta (pilot-in-command) - az üzemeltető által kijelölt, illetve az általános célú repülés esetében a tulajdonos, mint parancsokló és a repülés biztonságos végrehajtásának felelősségével felruházott személy.

Súlyos sérülés (serious injury) – személy által balesetben elszenvedett sérülés, amely:

a) több, mint 48 órás kórházi ápolást igényel a sérülés napjától számított 7 napon belül kezdődően; vagy

b) bármiféle csonttörést okoz (kivéve az újjak, a fogak, vagy az orr egyszerű törését); vagy

c) olyan zúzott sebet okoz, melynek hatására erős vérzés, ideg-, izom-, vagy ínsérülés keletkezik; vagy

d) bármelyik belső szerv sérülését okozza; vagy

e) másod-, vagy harmadfokú égési sérülést okoz, illetve a test felületének több, mint 5 %-át érintő bármiféle égési sérülést okoz; avagy

f) fertőző anyagnak, vagy roncsoló sugárzásnak való kitettséget bizonyítottan eredményez.

Származási állam (state of origin) – az az állam, amelynek területén a rakományt a légijárműre először rakodták.

Az üzemeltető állama (state of the operator) – az az állam, amelynek területén az üzemeltető üzleti tevékenységét elsősorban kifejti, amennyiben ilyen területtel nem rendelkezik, akkor az az állam, amelyben az üzemeltető székhelye található.

ENSZ szám (UN number) – az ENSZ veszélyes anyagok szállításával foglalkozó szakértő bizottsága által anyagok, vagy bizonyos anyag csoportok azonosítására kijelölt 4-jegyű szám.

Egység rakodó eszköz (unit load device) – mindenféle árukonténer, repülőgép-konténer, repülőgép-raklap hálóval, vagy repülőgép-raklap igluval és rajta lévő hálóval.

Megjegyzés. – Ebbe a meghatározásba a gyűjtőcsomagolás nem tartozik.

2. FEJEZET - ALKALMAZÁS

2.1. Az alkalmazás általános előírásai

Jelen Annex szabványait és ajánlott eljárásait a polgári légijárművek mindenféle nemzetközi tevékenységére alkalmazni kell. Különös sürgősség esetén, vagy amikor a szállítás egyéb módozatai nem megfelelőek, vagy ha az előírt követelmények maradéktalan betartása a közérdekkel ellentétbe kerülne, akkor az illetékes államok ezen rendelkezések alól felmentést adhatnak, feltéve, hogy ilyen esetekben mindent megtesznek a szállítás olyan átfogó szintű biztonságának elérése céljából, amely azonos szintű azzal a biztonsági szinttel, amit a jelen előírások által elérhetünk. Ha az átrepülő államra a felmentés adás egyetlen kritériuma sem vonatkozik, akkor felmentést adhat kizárólag arra alapozva, hogy feltevése alapján vajon a légi-szállítás során egyenértékes biztonsági szint biztosított-e.

1. Megjegyzés - Az illetékes államok: a származási állam, az az állam, ahol a szállítmány ideiglenesen állomásozik, amely államokat átrepüli, illetve rendeltetési helyének állama és az üzemeltető állama.

2. Megjegyzés - Az olyan veszélyes anyagok tekintetében lásd a 4.2 szakaszt, amelyek szokásos körülmények között tiltottak, de amelyekre az államok felmentést adhatnak.

3. Megjegyzés - A légi úton semmilyen körülmények között nem szállítható veszélyes anyagok tekintetében lásd a 4.3 szakaszt.

4. Megjegyzés - Nem cél a jelen Annexet úgy értelmezni, mint ami az üzemeltető számára előírja egy meghatározott cikk, vagy anyag szállítását, avagy ami az üzemeltetőt megakadályozza abban, hogy meghatározott cikkek, vagy anyagok szállítására vonatkozóan különleges követelményeket alkalmazzon.

2.2 Veszélyes anyagok Technológiai Utasítása

2.2.1 A szerződő állam minden szükséges lépést tegyen meg, hogy a veszélyes anyagok biztonságos légi-szállításának, az ICAO Tanácsa által kialakított eljárása szerint jóváhagyott, időszakonként kiadott és módosított Technológiai Utasításában (Doc 9284) részletezett előírásokkal az egyezést megvalósítsa. A szerződő állam a Technológiai Utasításhoz kiadott bármely módosítás esetében is tegyen meg minden szükséges lépést az egyezés megvalósítására; az ilyen módosításokat a Technológiai Utasítás adott Kiadására meghatározott alkalmazási időtartam alatt teszik közzé.

2.2.2 **Ajánlás.-** *A szerződő állam hozza az ICAO tudomására azokat a nehézségeket, amelyekkel a Technológiai Utasítás alkalmazása jár, illetve az előírások módosításának általa szükségesnek tartott javaslatait.*

2.2.3 **Ajánlás.-** *Dacára annak, hogy a szerződő állam esetleg még nem vezette be a Technológiai Utasítás biztonság miatt azonnal alkalmazandó módosítását, a szerződő állam mégis segítse elő felségterületén a más szerződő állam által feladott és a szóban forgó módosítással egyezésben előkészített veszélyes anyag mozgását, feltéve, hogy a veszélyes anyag teljes egészében eleget tesz a módosított követelményeknek.*

2.3 Belföldi polgári légijármű üzemelés

Ajánlás.- *A biztonság érdekében és azért, hogy a veszélyes anyagok nemzetközi szállításának fennakadási időtartama a minimumra csökkenjen, a szerződő állam tegyen meg minden szükséges intézkedést, hogy a jelen Annex és a Technológiai Utasítás előírásait a belföldi polgári légijárművekkel végzett üzemelésre is érvénybe léptesse.*

2.4 Kivételek

2.4.1 Jelen Annex rendelkezései alól kivételként kezelendők azok a termékek és anyagok, amelyek egyébként veszélyes anyagnak minősülnek, de amelyek az érvényes légi-alkalmassági követelményeknek és üzemelési szabályzatoknak megfelelően, vagy a Technológiai Utasításban meghatározott egyéb speciális célból a légijármű fedélzetén szükségesek.

2.4.2 Ha a Technológiai Utasítás azt megengedi, a 2.4.1-ben meghatározottak tartalékaként, vagy cseréhez leszerelten a légijármű fedélzetén szállított árucikkek, anyagok szállítását a jelen Annex előírásaival összhangban kell végrehajtani.

2.4.3 A jelen Annex rendelkezései alól a Technológiai Utasításban előírt mértékig kivételként kezelendők az utasok és személyzeti tagok személyes használatára szánt árucikkek és anyagok.

2.5 A Technológiai Utasítástól való eltérések közzé tétele

2.5.1 Ha valamely szerződő állam a Technológiai Utasításban részletezettektől eltérő utasítást alkalmaz, arról az ICAO-t azonnal értesítse, az eltérésnek a Technológiai Utasításban történő közzététele érdekében.

Megjegyzés. - a szerződő államtól elvárt, hogy a 2.2.1 szakasz előírásaitól fennálló eltérésekről csak akkor küldjön az Egyezmény 38. cikkelye szerinti értesítést, ha képtelen elfogadni a Technológiai Utasítás merev jellegét. Ha az állam a Technológiai Utasításban előírtaktól eltérő intézkedéseket fogadott el, akkor azt csak a 2.5 szakasz intézkedései szerint jelentse.

2.5.2 **Ajánlás. -** *Az üzemeltető állama tegyen intézkedést annak biztosítására, hogy ha valamely üzemeltetője a Technológiai Utasításban meghatározottaktól korlátozóbb követelményeket fogad el, arról az üzemeltetői eltérésekről az ICAO számára a Technológiai Utasításban való közzétételhez értesítés érkezzen.*

2.6 Felszíni szállítás

Ajánlás.- *Az állam gondoskodjon olyan intézkedésekről, amelyek lehetővé teszik az ICAO Technológiai Utasításának megfelelően előkészített, légi-szállításra szánt veszélyes anyagok repülőterekig, illetve a repülőterekről felszíni szállításra történő elfogadását.*

2.7 Nemzeti hatóság

Ajánlás.- A szerződő állam, államigazgatási rendszerén belül köteles a jelen Annex-el való egyezés megvalósulását biztosító megfelelő hatóságot kijelölni és erről az ICAO-t értesíteni.

3. FEJEZET - OSZTÁLYOZÁS

Az árucikk, vagy anyag osztályozását a Technológiai Utasítás rendelkezéseivel összhangban kell végezni.

Megjegyzés. – A veszélyes anyagok osztályainak részletes meghatározását a Technológiai Utasítás tartalmazza. Ezek az osztályok a veszélyes anyagok által légi-szállításuk során mutatott veszély-lehetőségit azonosítják és azok az osztályok, amelyeket az Egyesült Nemzetek Veszélyes Anyagok Szállításának Szakértő Bizottsága ajánl.

4. FEJEZET - VESZÉLYES ANYAGOK LÉGI-SZÁLLÍTÁSÁNAK KORLÁTOZÁSA

4.1 Légi úton szállítható veszélyes anyagok

Azt illető veszélyes anyag légi-szállítását meg kell tiltani, ha a jelen Annexben és a Technológiai Utasításában részletezett előírások nem teljesülnek.

4.2 Veszélyes anyagok, amelyek légi-szállítása felmentés hiányában tilos

Az itt felsorolt veszélyes anyagok légi úton csak abban az esetben szállíthatók, ha arra az illetékes államok a 2.1 szakasz értelmében mentesítést adnak, vagy ha a Technológiai Utasítás rendelkezései jelzik azt, hogy a származási állam által kiadott jóváhagyással szállíthatók:

a) Mindazok az árucikkek és anyagok, amelyeket a Technológiai Utasítás normál körülmények közötti szállításra tilosként tüntet fel; és

b) Fertőző élő állatok.

4.3 Légi úton semmilyen körülmények között sem szállítható veszélyes anyagok

Egyetlen légijárművön sem szállíthatók légi úton azok az anyagok és eszközök, amelyeket a Technológiai Utasítás név szerint, vagy általános meghatározás szerint “Légi-fuvarozása semmilyen körülmények között sem engedélyezett”-ként jelöl.

5. FEJEZET - CSOMAGOLÁS

5.1 Általános követelmények

A veszélyes anyagokat ezen fejezet rendelkezéseivel összhangban és a Technológiai Utasításban közöltek szerint kell csomagolni.

5.2 Csomagoló eszközök

5.2.1 Veszélyes anyagok légi-szállításához használt csomagoló eszköznek jó minőségűnek és oly módon összeállítottnak és biztonságosan lezártnak kell lennie, amely megakadályozza a szállítás normál körülményei között a hőmérséklet, a páratartalom, vagy a nyomásváltozás, illetve a rezgés által esetleg keletkező szivárgást.

5.2.2 A csomagoló eszköz legyen tartalmának megfelelő. Veszélyes anyaggal közvetlenül érintkező csomagolóanyag az ilyen veszélyes anyag bármely vegyi, vagy egyéb hatásának álljon ellen.

5.2.3 A csomagoló eszköz teljesítse a Technológiai Utasítás anyagra és szerkesztésre vonatkozó előírásait.

5.2.4 A csomagolást a Technológiai Utasítás rendelkezéseivel összhangban kell ellenőrizni.

5.2.5 Elsődlegesen folyadéktárolási céllal készült csomagoló eszköznek képesnek kell lennie folyás nélkül ellenállni a Technológiai Utasításban meghatározott nyomásnak.

5.2.6 A belső csomagoló eszközt úgy kell tömíteni, rögzíteni, vagy bélelni, hogy a repülés szokásos körülményei között az el ne törjön, ne szivárogjon és a külső csomagoló eszközben mozgása korlátozott legyen. A bélelő és az elnyelő anyag a tárolóeszköz tartalmával veszélyes kölcsönhatásba nem léphet.

5.2.7 Egyetlen tárolóeszköz sem használható fel ismételten mindaddig, amíg meg nem vizsgálták és azt korróziótól, vagy egyéb sérüléstől mentesnek nem találták. Ha valamely tárolóeszközt ismételten használnak fel, minden szükséges intézkedést meg kell tenni, hogy új tartalma ne szennyeződjék.

5.2.8 Amennyiben a tisztítatlan üres tároló eszköz előző tartalma természeténél fogva veszélyes lehet, azt szorosan le kell zárni és az általa képviselt veszélynek megfelelően kell kezelni.

5.2.9 Ártalmas mennyiségű veszélyes anyag a csomag külső felületéhez nem tapadhat.

6. FEJEZET - CÍMKÉZÉS ÉS JELÖLÉS

6.1 Címkék

Ha a Technológiai Utasítás máskép nem rendelkezik, minden egyes veszélyes anyagot tartalmazó csomagot az ebben az utasításban lefektetett rendelkezésekkel összhangban a megfelelő címkékkel kell felcímkézni.

6.2 Jelölések

6.2.1 Ha a Technológiai Utasítás másképp nem rendelkezik, akkor minden egyes veszélyes anyag csomagot el kell látni tartalmának megfelelő szállítmány nevével, ha kijelölték, akkor UN-számával és minden egyéb olyan jelöléssel, amelyet a Technológiai Utasítás előír.

6.2.2 *A csomagolóeszközön feltüntetett minősítő jelzések.* Ha a Technológiai Utasítás másképp nem rendelkezik, minden egyes, az Utasításban közölt jellemzők szerint készített csomagoló eszközt ennek megfelelően, az Utasítás vonatkozó rendelkezéseivel összhangban kell jelölni. Ha a csomagoló eszköz nem felel meg a Utasításban szereplő vonatkozó csomagoló eszköz minősítési eljárásoknak, akkor a csomagoló eszközt csomagminősítő jelzésekkel ellátni tilos.

6.3 A jelölésekhez alkalmazott nyelv

Ajánlás. – *A származási állam által előírt nyelv mellett és mindaddig, amíg általános használatra sokkal alkalmasabb formát ki nem dolgoznak és el nem fogadnak, a veszélyes anyagokkal kapcsolatos jelzésekhez az angol nyelvet kell alkalmazni.*

7. FEJEZET - A SZÁLLÍTTATÓ FELELŐSSÉGE

7.1 Általános követelmények

Mielőtt bárki bármiféle veszélyes árut tartalmazó csomagot, vagy gyűjtőcsomagolást légi-szállításra ajánl, az illető személy győződjön meg arról, hogy az adott veszélyes anyag légi-szállítása nem tiltott-e, gondoskodjon róla, hogy az megfelelően osztályozott, csomagolt, jelölt és címkézett legyen, valamint rendelkezzen megfelelően kitöltött veszélyes áruszállító dokumentummal, ahogy azt a jelen Annex és a Technológiai Utasítás előírja.

7.2 Veszélyes anyagok szállító dokumentuma

7.2.1 Ha a Technológiai Utasítás másképp nem rendelkezik, akkor a veszélyes anyagot szállításra ajánló személy köteles a Technológiai Utasításban előírt információkat tartalmazó veszélyes anyag szállító dokumentumot kiállítani, aláírni és az üzemeltető részére biztosítani.

7.2.2 A szállító dokumentum tartalmazzon a veszélyes anyagot szállításra felajánló által aláírt nyilatkozatot, amelyben szerepel az, hogy a veszélyes anyag megfelelő szállítmány nevével teljesen és pontosan meghatározott, az a vonatkozó előírásokkal összhangban osztályozott, csomagolt, jelölt, címkézett és a légi-szállításhoz megfelelő állapotban van.

7.3 Használatos nyelv

Ajánlás. – *A származási állam által előírt nyelv mellett és mindaddig, amíg általános használatra sokkal alkalmasabb formát ki nem dolgoznak és el nem fogadnak, a veszélyes anyagok szállítási dokumentumán az angol nyelvet kell alkalmazni.*

8. FEJEZET - AZ ÜZEMELTETŐ FELELŐSSÉGE

8.1 Elfogadás szállításra

Az üzemeltető veszélyes anyagot légi-szállításra nem fogadhat el:

a) ha a kitöltött veszélyes anyagszállító dokumentum nem kíséri, kivéve azt az esetet, amikor a Technológiai Utasítás jelzése szerint ilyen dokumentum nem szükséges;

b) addig, amíg a Technológiai Utasításban közölt átvételi eljárással egyezésben meg nem vizsgálta a veszélyes anyagot tartalmazó csomagot, gyűjtő csomagot, vagy konténert.

1. Megjegyzés. – A veszélyes anyagokkal kapcsolatos balesetek és események bejelentése tekintetében lásd a 12. Fejezetet.

2. Megjegyzés. – A gyűjtő csomag átvételére vonatkozó külön rendelkezéseket a Technológiai Utasítás tartalmazza.

8.2 Átvételi ellenőrző jegyzék

Az üzemeltető segédletként a 8.1 pont rendelkezésével való egyezés megvalósításához dolgozzon ki és használjon átvételi ellenőrző jegyzéket.

8.3 Rakodás és tárolás

8.3.1 Veszélyes anyagot tartalmazó csomagok, gyűjtő csomagokat és radioaktív anyagot tartalmazó árukonténerek légijárműbe rakodását és tárolását a Technológiai Utasítás rendelkezéseivel összhangban kell végrehajtani.

8.4 Ellenőrzés sérülés, vagy szivárgás tekintetében

8.4.1 A veszélyes anyagot tartalmazó csomagokat és gyűjtő csomagokat, továbbá radioaktív anyagot tartalmazó árukonténereket légijárműbe, vagy egység-rakodó eszközbe rakodásuk előtt szivárgás és sérülés tekintetében meg kell vizsgálni. Szivárgó, vagy sérült csomag, gyűjtőcsomag, vagy árukonténer légijárműbe nem rakodható.

8.4.2 Egység-rakodóeszköz légijárműbe mindaddig nem rakodható, amíg azt szemrevételezéssel meg nem vizsgálták és a benne lévő bármiféle veszélyes anyagtól származó sérüléstől, szivárgástól mentesnek nem találták.

8.4.3 Amennyiben a légijárműbe rakodott bármilyen veszélyes anyagot tartalmazó csomag sérültnek látszik, vagy szivárog, azt az üzemeltető azonnal távolítsa el, vagy megfelelő hatóság, vagy szervezet által eltávolíttatásáról gondoskodjon. Ezután győződjön meg arról, hogy a szállítmány maradék része légi-szállításhoz megfelelő állapotban van-e és, hogy a csomagok szennyeződés mentesek-e.

8.4.4 A veszélyes anyagokat tartalmazó csomagokat, gyűjtő csomagokat, továbbá radioaktív anyagot tartalmazó árukonténert légijárműből, vagy egység rakodó eszközből történő kirakodásukkor szivárgás és sérülés tekintetében meg kell vizsgálni. Amennyiben szivárgás, vagy sérülés jeleit észlelik, akkor a légijárműnek azon részét szennyeződés és sérülés tekintetében ellenőrizni kell, ahol a veszélyes anyagot, vagy az egység rakodóeszközt szállították.

8.5 Az utas- és a pilótakabinra vonatkozó rakodási korlátozások

A repülőgép utas kabinjában, ha ott utasok tartózkodnak, vagy pilótakabinjában veszélyes anyag nem szállítható, kivéve a Technológiai Utasítás rendelkezéseiben engedélyezett körülményeket.

8.6 Szennyeződés eltávolítása

8.6.1 A légijárművön veszélyes anyag sérülés, vagy szivárgás következtében feltárt bármely veszélyes anyag szennyeződést késedelem nélkül el kell távolítani.

8.6.2 Radioaktív anyaggal szennyeződött légijárművet azonnal ki kell vonni a forgalomból és mindaddig nem állítható vissza, amíg bármely hozzáférhető felületén a sugárzási szint, valamint a nem rögzült szennyeződés nagyobb mértékű, mint a Technológiai Utasításban meghatározott érték.

8.7 Elszigetelés és elkülönítés

8.7.1 Egymásra veszélyes kölcsönhatásra képes veszélyes anyagokat tartalmazó csomagok légijármű fedélzetén közvetlenül egymás mellett, illetve úgy nem tárolhatók, hogy szivárgás esetén közöttük kölcsönhatás jöhessen létre.

8.7.2 Mérget, vagy fertőző anyagot tartalmazó csomagokat a légjármű fedélzetén a Technológiai Utasítás rendelkezéseivel összhangban kell tárolni.

8.7.3 Radioaktív anyagot tartalmazó csomagot a légijármű fedélzetén úgy kell tárolni, hogy az a Technológiai Utasítás rendelkezéseivel egyezésben legyen elkülönítve személyektől, élő állatoktól és előhívatlan filmektől.

8.8 Veszélyes anyag rakomány rögzítése

Amennyiben a légijárműre ezen rendelkezések alá eső veszélyes anyagot rakodnak, akkor az üzemeltető köteles gondoskodni a rakomány sértetlenségéről. A légijárművön lévő ilyen javakat oly módon kell rögzíteni, amely a csomag repülés közbeni tájolási helyzetének megváltozását eredményező elmozdulását megakadályozza. Radioaktív anyagot tartalmazó csomagok esetében a rögzítés mindig legyen megfelelő a 8.7.3-ban előírt elkülönítési távolságok fenntartásához.

8.9 Rakodás áruszállító légijárműre

Ha a Technológiai Utasítás másképp nem rendelkezik, a "Csak áruszállító légijárművön" címkét viselő veszélyes anyag csomagot oly módon kell rakodni, hogy a személyzet tagja, vagy más jogosított személy az ilyen csomagot repülés közben láthassa, kezelhesse, ahol a méret és tömeg lehetővé teszi, az ilyen csomagokat az egyéb csomagoktól elkülöníthesse.

9. FEJEZET - ADATKÖZLÉS

9.1 Információ a parancsnok-pilóta számára

Légi-járművén veszélyes anyagot szállítani kívánó üzemeltető a légi-jármű indulása előtt lehető legkorábban köteles a légi-jármű parancsnokát a Technológiai Kézikönyvben meghatározott írásos információkkal ellátni.

9.2 Információ és utasítás a hajózó személyzet tagjai számára

Az üzemeltető Üzemeltetési Kézikönyvében tegyen közzé olyan információkat, amelyek a légi-jármű személyzete számára a veszélyes anyagok szállítására vonatkozó kötelmük gyakorlását lehetővé teszik, valamint közöljön utasításokat a veszélyes anyagok szállításakor előállt vészhelyzetek esetén teendőkre vonatkozóan.

9.3 Információ az utasok számára

Minden szerződő állam köteles gondoskodni, hogy az információ olyan formában legyen közzé téve, amely biztosítja az utasok figyelmének felhívását azon árufajtákra vonatkozóan, amelyek légi úton való szállítása tilos, amint arról a Technológiai Utasítás rendelkezik.

9.4 Információ egyéb személyek számára

Az üzemeltető, a szállítmányozó, vagy veszélyes áruk légi-fuvarozásában érintett egyéb más szervezet, köteles személyzete számára olyan információt biztosítani, amely lehetővé teszi számukra a veszélyes áru légi-fuvarozásával összefüggő kötelmeik végrehajtását és köteles utasítást biztosítani a veszélyes árut érintő vészhelyzetben megteendő lépésekre vonatkozóan.

9.5 Információ a parancsnok-pilótától a repülőtéri igazgatóság számára

Amennyiben repülés közben vészhelyzet áll elő, a parancsnok-pilóta amint a helyzet lehetővé teszi, köteles a megfelelő légiforgalmi szolgálatot értesíteni a repülőtér igazgatóságának értesítése érdekében a fedélzeten lévő összes veszélyes áruról, amint arról a Technológiai Kézikönyv rendelkezik.

9.6 Információ légi-jármű baleset, vagy esemény alkalmával

9.6.1 Ha

a) légi-jármű baleset; vagy

b) súlyos esemény történt és rakományként szállított veszélyes anyag érintettsége előfordulhatott,

a veszélyes árut mint rakományt szállító légi-jármű üzemeltetője késedelem nélkül köteles a veszélyes anyagról tájékoztatni a balesetre, vagy a súlyos eseményre reagáló vészhelyzeti személyzetet annak megfelelően, ahogy az a parancsnok-pilótának adott írásos tájékoztatóban szerepel. Az üzemeltető amilyen hamar csak lehetséges, ezt a tájékoztatást adja meg az üzemeltető megfelelő állami hatósága és azon állam megfelelő hatósága számára is, amelyben a baleset, vagy a súlyos esemény bekövetkezett.

9.6.2 Repülő eseményben érintett veszélyes anyagot mint rakományt szállító légi-jármű üzemeltetője, ha annak megtételére kérik, a parancsnok-pilótának adott írásos tájékoztatóban szereplők szerint és késedelem nélkül tájékoztassa a fedélzeten lévő veszélyes anyagról a vészhelyzetre reagáló vészhelyzeti személyzetet is és azon állam megfelelő hatóságát is, amelyben az esemény bekövetkezett.

Megjegyzés. – A “baleset”, “rendkívüli esemény” és “esemény” fogalmak magyarázata a 13. Annexben szerepel.

10. FEJEZET - KIKÉPZÉSI PROGRAM LÉTREHOZÁSA

A veszélyes anyagokra vonatkozó kiképző program összeállítását és tartalmának állandó korszerűsítését a Technológiai Utasítás által előírtak szerint kell végrehajtani.

11. FEJEZET - EGYEZÉS

11.1 Ellenőrző rendszerek

Veszélyes anyag szabályzata betartásának elérése céljából minden szerződő állam hozzon létre felügyeleti, felülvizsgálati és kényszerítő eljárást.

Megjegyzés. – Az a cél, hogy ezek az eljárások tartalmazzanak rendelkezéseket mind a dokumentumok, mind a rakomány, mind az üzemeltető gyakorlatának felülvizsgálatára, továbbá biztosítsanak módszert a szándékos megszegések kivizsgálására (lásd 11.3).

11.2 Együttműködés az államok között

Ajánlás. – *A szerződő állam működjön együtt a többi szerződő állammal a veszélyes áru szabályzatok megsértésére vonatkozóan rendelkezésükre álló minden információ egymást közti cseréjében, az ilyen kihágások megszüntetése érdekében. Az együttműködési törekvések közé tartozhat a kivizsgálási és kikényszerítő lépések összehangolása; információ csere egy szabályozás alá eső partner betartásra vonatkozó múltjáról; közös felügyelet és egyéb technikai kapcsolatok, a technikai személyzet cseréje, valamint közös találkozók és konferenciák. Az egymást közt cserélhető megfelelő információk között szerpelhetnek a következők:biztonsági figyelmeztetők, bulletinok, vagy veszélyes anyag tájékoztatók; javasolt és életbe léptetett szabályozói lépések; esemény jelentések; esemény kivizsgálás alkalmával kifejlesztett dokumentációs, vagy egyéb bizonyítékok; javasolt és végleges kikényszerítő lépések; és nyilvános szétosztásra alkalmas oktatási és szóróanyagok.*

11.3 Büntetések

11.3.1 Minden szerződő állam tegye meg az általa szükségesnek tartott intézkedéseket, melyek révén a veszélyes anyagokra vonatkozó szabályzataikkal való egyezés megvalósul, ideértve a megszegőkkel szemben megfelelő büntetések előírását.

11.3.2 **Ajánlás.** - *Minden szerződő állam tegye meg az általa szükségesnek tartott intézkedéseket, melyek révén a veszélyes anyagokra vonatkozó szabályzataikkal való egyezés megvalósul, ideértve a megszegőkkel szemben megfelelő büntetések előírását, amikor megszegésről szóló tájékoztatás más szerződő államtól érkezik, például amikor a szerződő állam veszélyes anyag szállítmány érkezésekor azt tapasztalja, hogy a küldemény nem teljesíti a Technológiai Utasítás követelményeit és erről az ügyről az állam értesíti a származási államot.*

11.4 Postán feladott veszélyes anyagok

Ajánlás. – *A szerződő állam hozzon létre eljárást a saját postaszolgálata által légi-szállításra továbbított veszélyes anyagok ellenőrzésére.*

Megjegyzés. – A postaszolgálatok által légi-szállításra továbbított veszélyes anyagok ellenőrzésének nemzetközi eljárásait a Nemzetközi Postaszövetség (Universal Postal Union) kidolgozta.

12. FEJEZET - VESZÉLYES ANYAGGAL TÖRTÉNT BALESET ÉS ESEMÉNY JELENTÉSE

12.1 Veszélyes anyagot érintő légi-jármű balesetek és repülőesemények ismételt előfordulásának megakadályozása érdekében a szerződő állam hozzon létre eljárásokat a felségterületén előfordult, más államból származó, vagy más államba tartó veszélyes anyag szállítását érintő légi-jármű balesetek, repülőesemények kivizsgálására és az ezzel kapcsolatos információk összeállítására. Az ilyen légi-jármű balesetről és repülőeseményről szóló jelentést a Technológiai Kézikönyv részletes előírásainak megfelelően kell elkészíteni.

12.2 **Ajánlás. –** Veszélyes anyagot érintő légi-jármű balesetek és repülőesemények ismételt előfordulásának megakadályozása érdekében a szerződő állam létesítsen eljárásokat a 12.1-ben nem szereplő egyéb ilyen, saját felségterületen előforduló baleset és repülőesemény kivizsgálására és az azzal kapcsolatos információk összeállítására. Az ilyen légi-jármű balesetekről és repülőeseményről szóló jelentést a Technológiai Kézikönyv részletes előírásainak megfelelően kell elkészíteni.

13. FEJEZET - VESZÉLYES ANYAGOKKAL KAPCSOLATOS VÉDELMI RENDELKEZÉSEK

A szerződő állam alakítson ki veszélyes anyagokkal kapcsolatos és a szállíttatók, üzemeltetők és a veszélyes anyagok légi-szállításában résztvevő más egyének által bevezetendő, az embereket, javakat, vagy a környezetet veszélyeztető veszélyes anyagok lopását, vagy nem rendeltetés szerű használatát minimumra csökkentő kötelezően alkalmazandó védelmi intézkedéseket. Az intézkedések legyenek összhangban a többi Annexben és a Technológia Kézikönyvben előírt védelmi intézkedésekkel.

- VÉGE-

Tisztelt Előfizetők!

Tájékoztatjuk Önöket, hogy a kiadónk terjesztésében levő lapokra és elektronikus kiadványokra szóló előfizetésüket folyamatosnak tekintjük. Csak akkor kell változást bejelenteniük a 2007. évre vonatkozó előfizetésre, ha a példányszámot, esetleg a címlistát módosítják, vagy új lapra szeretnének előfizetni (pontos szállítási, név- és utcacím-megjelöléssel). Az esetleges módosítást szíveskedjenek levélben vagy faxon megküldeni. Felhívjuk szíves figyelmüket, hogy a lapszállításról kizárólag az előfizetési díj beérkezését követően intézkedünk. Fontos, hogy az előfizetési díjakat a megadott 10300002-20377199-70213285 sz. számlára utalják, illetve a kiadó által kiküldött készpénz-átutalási megbízáson fizessék be.

Készpénzes befizetés kizárólag a Magyar Hivatalos Közlönykiadó ügyfélszolgálatán (1085 Budapest, Somogyi B. u. 6.) lehetséges. (Levélcím: Magyar Hivatalos Közlönykiadó, 1394 Budapest, 62. Pf. 357. Fax: 318-6668).

A 2007. évi előfizetési díjak

(Az árak az áfát tartalmazzák.)

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Cégközlöny CD

A **Cégközlöny** hatályos és hiteles céginformációs – az üzleti életben részt vevők számára nélkülözhetetlen, naprakész – adatbázisát tartalmazó, heti rendszerességgel lemezen megjelenő lap formátuma 2007. október 1-jétől várhatóan megújul. Erre tekintettel a CD a 2007. évben január 1-jétől szeptember 30-ig fizethető elő. A háromnegyed éves előfizetés díja a 20%-os áfával: 106 272 Ft.

Közbeszerzési Értesítő

A hetente több száz, minden szakterületre kiterjedő közbeszerzési felhívás részletes leírását és feltételeit tartalmazó **Közbeszerzési Értesítő** című hivatalos lap révén az előfizetők a leggyorsabban, autentikus forrásból értesülhetnek a pályázatokról. Az Értesítő – a tervezett formátumváltás miatt – a 2007. évben fél évre fizethető elő. A féléves előfizetés díja áfával: 55 062 Ft.

A HIVATALOS JOGSZABÁLYTÁR (CD)
hatályos jogszabályok hivatalos számítógépes gyűjteményének 2007. évi éves előfizetési díjai:
(Áraink az áfát nem tartalmazzák.)

Önálló változat	72 000 Ft	25 munkahelyes hálózati változat	260 000 Ft
5 munkahelyes hálózati változat	130 000 Ft	50 munkahelyes hálózati változat	340 000 Ft
10 munkahelyes hálózati változat	160 000 Ft	100 munkahelyes hálózati változat	590 000 Ft

Az EU-JOGSZABÁLYTÁR (CD)
Az Európai Unió Jogszabályai gyűjteményének 2007. évi éves előfizetési díja
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5 munkahelyes hálózati változat	130 000 Ft	50 munkahelyes hálózati változat	340 000 Ft
10 munkahelyes hálózati változat	160 000 Ft	100 munkahelyes hálózati változat	590 000 Ft

Facsimile Magyar Közlöny. A hivatalos lap 2006-os évfolyama jelenik meg CD-n az eredeti külalak megőrzésével, de könnyen kezelhetően. Ára: 12 000 Ft + áfa.

Szerkeszti a Miniszterelnöki Hivatal, a Szerkesztőbizottság közreműködésével. A Szerkesztőbizottság elnöke: Gilyán György.
A szerkesztésért felelős: Kovácsné dr. Szilágyi-Farkas Zsuzsanna. Budapest V., Kossuth tér 1–3.
Kiadja a Magyar Hivatalos Közlönykiadó. Felelős kiadó: dr. Kodela László elnök-vezérigazgató.
Budapest VIII., Somogyi Béla u. 6., www.mhk.hu. Telefon: 266-9290.

Előfizetésben megrendelhető a Magyar Hivatalos Közlönykiadónál
Budapest VIII., Somogyi Béla u. 6., 1394 Budapest 62. Pf. 357, vagy faxon 318-6668.
Előfizetésben terjeszti a Magyar Hivatalos Közlönykiadó a FÁMA Rt. közreműködésével. Telefon/fax: 266-6567.
Információ: tel.: 317-9999, 266-9290/245, 357 mellék.
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A kiadó az előfizetési díj évközbeni emelésének jogát fenntartja.

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